PR-HTML40-971107

HTML 4.0 Specification

W3C Proposed Recommendation *7-Nov-1997*

This version:
http://www.w3.org/TR/PR-html40-971107/
Latest version:
http://www.w3.org/TR/PR-html40/
Previous version:
http://www.w3.org/TR/WD-html40-970917/
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Abstract

This specification defines the HyperText Markup Language (HTML), version 4.0, the publishing language of the World Wide Web. In addition to the text, multimedia, and hyperlink features of the previous versions of HTML, HTML 4.0 supports more multimedia options, scripting languages, style sheets, better printing facilities, and documents that are more accessible to users with disabilities. HTML 4.0 also takes great strides towards the internationalization of documents, with the goal of making the Web truly World Wide.

HTML 4.0 is an SGML application conforming to International Standard ISO 8879 -- *Standard Generalized Markup Language* [ISO8879] [p.319]). As an SGML application, the syntax of conforming HTML 4.0 documents is defined by the combination of the SGML declaration [p.247] and the document type definition [p.249] (DTD). This specification defines the intended interpretation of HTML 4.0 elements and adds syntax constraints that may not be expressed by the DTD alone.

Status of this document

This is a stable document derived from the 17 September working draft of the HTML 4.0 specification. This document has been produced as part of the W3C HTML Activity. The publication of this document does not imply endorsement by the Consortium's staff or Member organizations.

On 7 November, this document enters a period of review by the Members of the World Wide Web Consortium. Details of this review will be distributed to the representatives of each W3C Member organization.

The review period will end on 5 December. Within 14 days after that date, the document's disposition will be announced: it may become a W3C Recommendation (possibly with minor changes), it may revert to Working Draft status, or it may be dropped as a W3C work item.

Most of this document represents technology tested by multiple implememntations. It includes a small number of features that have not had the benefit of extensive implementation experience. Nonetheless, the experience of the Working Group members with analogous features in other domains has resulted in consensus that these features belong in this specification.

The Working Group expects to resolve minor technical issues during the review phase and communicate its results to the W3C Director.

A list of current W3C Proposed Recommendations and Working Drafts can be found at: http://www.w3.org/TR.

It is proposed that HTML 4.0 be recommended for new documents and applications rather than HTML 3.2, specified in http://www.w3.org/TR/REC-html32.

Available formats

The HTML 4.0 W3C Proposed Recommendation is also available in the following formats:

a plain text file:
    http://www.w3.org/TR/PR-html40-971107/html40.txt (691Kb),
HTML as a gzip'ed tar file:
    http://www.w3.org/TR/PR-html40-971107/html40.tgz (293Kb),
HTML as a zip file (this is a '.zip' file not an '.exe'):
    http://www.w3.org/TR/PR-html40-971107/html40.zip (324Kb),
as well as a postscript file (thanks to html2ps written by Jan Kärrman):
    http://www.w3.org/TR/PR-html40-971107/html40.ps (3.5Mb, 339 pages),
and a PDF file:
    http://www.w3.org/TR/PR-html40-971107/html40.pdf (2Mb) file.

In case of a discrepancy between electronic and printed forms of the specification, the electronic version is considered the definitive version.

Available languages

The English version of this specification is the only normative version. However, for translations in other languages see http://www.w3.org/TR/PR-html40-971107/translations.html.

Comments

Please send detailed comments on this document to www-html-editor@w3.org. We cannot guarantee a personal response but we will try when it is appropriate. Public discussion on HTML features takes place on www-html@w3.org.

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1 About the HTML 4.0 Specification

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1.1 How the specification is organized

This specification is divided into the following sections:

Sections 2 and 3: Introduction to HTML 4.0

The introduction describes HTMLs place in the scheme of the World Wide Web, provides a brief history of the development of HTML, highlights what can be done with HTML 4.0, and provides some design tips for developing good HTML habits.

The brief SGML tutorial gives readers some understanding of HTML's relationship to SGML and gives summary information on how to read the HTML Document Type Declaration (DTD).

Sections 4 - 24: HTML 4.0 reference manual

The bulk of the reference manual consists of the HTML language reference, which defines all elements and attributes of the language.

This document has been organized by topic rather than by the grammar of HTML. Topics are grouped into three categories: structure, presentation, and interactivity. Although it is not easy to divide HTML constructs perfectly into these three categories, the model reflects the designers' experience that separating a document's structure from its presentation produces more effective and maintainable documents.

The language reference consists of the following information:

- What characters [p.35] may appear in an HTML document.
- Basic data types [p.41] of an HTML document.
- Elements that govern the structure of an HTML document, including text [p.81] , lists [p.95] , tables [p.103] , links [p.137] , and included objects, images, and applets [p.151] .
- Elements that govern the presentation of an HTML document, including style sheets [p.173] , fonts, colors, rules, and other visual presentation [p.185] , and frames for multi-windowed presentations [p.195] .
- Elements that govern interactivity with an HTML document, including forms for user input [p.207] and scripts for active documents [p.235] .

- The SGML formal definition of HTML:
  - The SGML declaration of HTML [p.247] .
  - Three DTDs: strict [p.249] , loose [p.265] , and frameset [p.285] .
  - The list of character references [p.287] .

Appendixes

The first appendix contains information about changes from HTML 3.2 [p.299] to help authors and implementors with the transition to HTML 4.0. The second appendix contains performance and implementation notes [p.303] and is primarily intended to help implementors create user agents for HTML 4.0.

References

A list of normative and informative references.

Indexes

Two indexes give readers rapid access to the definition of all elements [p.323] and attributes [p.327] The indexes also summarize some key characteristics of each element and attribute.

1.2 Document conventions

This document has been written with two types of readers in mind: authors and implementors. We hope the specification will provide authors with the tools they need to write efficient, attractive, and accessible documents, without over-exposing them to HTML's implementation details. Implementors, however, should find all they need to build conforming user agents.

The specification may be approached in several ways:

- **Read from beginning to end.** The specification begins with a general presentation of HTML and becomes more and more technical and specific towards the end.
- **Quick access to information.** In order to get information about syntax and semantics as quickly as possible, the online version of the specification includes the following features:
  1. Every reference to an element or attribute is linked to its definition in the specification. Each element or attribute is defined in only one location.
  2. Every page will include links to the indexes, so you will never be more than two links away from finding the definition of an element [p.323] or attribute [p.327] .
  3. The front pages of the three sections of the language reference manual extend the initial table of contents with more detail about each section.

1.2.1 Elements and attributes

Element names are written in upper case letters (e.g., BODY). Attribute names are written in lower case letters (e.g., lang, onsubmit). Recall that in HTML, element and attribute names are case-insensitive; the convention is meant to encourage readability.

Element and attribute names are marked within the source HTML for the specification and may be rendered specially by some user agents.

Each attribute definition specifies the type of its value. If the type allows a small set of possible values, the definition lists the set of values, separated by a bar (|).

After the type information, each attribute definition indicates the case-sensitivity of its values, between "[]" marks. See the section on case information [p.41] for details.

1.2.2 Notes and examples

Informative notes are emphasized to stand out from surrounding text and may be rendered specially by some user agents.

All examples illustrating deprecated usage are marked as "DEPRECATED EXAMPLE". Deprecated examples also include recommended alternate solutions. All examples that illustrates illegal usage are clearly marked as "ILLEGAL EXAMPLE".

Examples in the text conform to the strict document type declaration [p.249] unless otherwise indicated or unless the example in question refers to elements or attributes only defined by the loose document type declaration [p.265] or frameset document type declaration [p.285] . For convenience, most of the examples in this specification do not begin with the document type declaration [p.52] that is mandatory at the beginning of each HTML document.

Examples and notes are marked within the source HTML for the specification and some user agents may render them specially.

1.3 Acknowledgments

Thanks to everyone who has helped to author the working drafts that went into the HTML 4.0 specification, and all those who have sent suggestions and corrections. A particular thanks to T.V. Raman (Adobe) for his work on improving the accessibility of HTML forms for people with disabilities.

The authors of this specification, the members of the W3C HTML Working Group, deserve much applause for their diligent review of this document, their constructive comments, and their hard work: John D. Burger (MITRE), Steve Byrne (JavaSoft), Martin J. Dürst (University of Zurich), Daniel Glazman (Electricité de France), Scott Isaacs (Microsoft), Murray Maloney (GRIF), Steven Pemberton (CWI), Jared Sorensen (Novell), Powell Smith (IBM), Robert Stevahn (HP), Ed Tecot (Microsoft), Jeffrey Veen (HotWired), Mike Wexler (Adobe), Misha Wolf (Reuters), and Lauren Wood (SoftQuad).

Thank you Dan Connolly (W3C) for thoughtful input and guidance as chairman of the HTML working group. Thank you Sally Khudairi (W3C) for your indispensable work on the press release.

Thanks to David M. Abrahamson and Roger Price for their careful reading of the specification and astute comments.

Of particular help from the W3C at Sophia-Antipolis were Janet Bertot, Bert Bos, Stephane Boyera, Daniel Dardailler, Yves Lafon, Håkon Lie, Chris Lilley, and Colas Nahaboo from Bull.

Lastly, thanks to Tim Berners-Lee without whom none of this would have been possible.

2 Introduction to HTML 4.0

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2.1 What is the World Wide Web?

The World Wide Web is a network of information resources. The Web relies on three mechanisms to make these resources readily available to the widest possible audience:

1. A uniform naming scheme for locating resources on the Web (e.g., URLs).
2. Protocols, for access to named resources over the Web (e.g., HTTP).
3. Hypertext, for easy navigation among resources (e.g., HTML).

The ties between the three mechanisms are apparent throughout this specification.

2.1.1 Introduction to URLs

Every resource available on the Web -- HTML document, image, video clip, program, etc. -- has an address that may be encoded by a *Uniform Resource Locator*, or "URL".

URLs typically consist of three pieces:

1. The naming scheme of the mechanism used to access the resource.
2. The name of the machine hosting the resource.
3. The name of the resource itself, given as a path.

Consider the URL that designates the current HTML specification:

```
http://www.w3.org/TR/PR-html4/cover.html
```

This URL may be read as follows: There is a document available via the HTTP protocol (see [RFC2068]), residing on the machine www.w3.org, accessible via the path "/TR/PR-html4/cover.html". Other schemes you may see in HTML documents include "mailto" for email and "ftp" for FTP.

Here is another example of a URL. This one refers to a user's mailbox:

```
...this is text...
For all comments, please send email to
<A href="mailto:joe@someplace.com">Joe Cool</A>.
```

2.1.2 Fragment identifiers

Some URLs refer to a location within a resource. This kind of URL ends with "#" followed by an anchor identifier (called the "fragment identifier"). For instance, here is a URL pointing to an anchor named `section_2`:

```
http://somesite.com/html/top.html#section_2
```

2.1.3 Relative URLs

A *relative* URL doesn't contain any naming scheme information. Its path generally refers to a resource on the same machine as the current document. Relative URLs may contain relative path components (".." means one level up in the hierarchy defined by the path), and may contain fragment identifiers.

Relative URLs are resolved to full URLs [p.149] using a base URL. As an example of relative URL resolution, assume we have the base URL "http://www.acme.com/support/intro.html". The relative URL in the following markup for a hypertext link:

```
<A href="suppliers.html">Suppliers</A>
```

would expand to the full URL "http://www.acme.com/support/suppliers.html", while the relative URL in the following markup for an image

```
<IMG src="../icons/logo.gif" alt="logo">
```

would expand to the full URL "http://www.acme.com/icons/logo.gif".

In HTML, URLs play a role in these situations:

- linking to another document or resource, (see the `A` [p.141] and `LINK` [p.145] elements).
- linking to an external style sheet or script (see the `LINK` [p.145] and `SCRIPT` [p.236] elements).
- images, objects and applets for inclusion in a page, (see the `IMG` [p.152] , `OBJECT` [p.154] , `APPLET` [p.162] and `INPUT` [p.210] elements).
- image maps (see the `MAP` [p.166] and `AREA` [p.166] elements).
- form submission (see `FORM` [p.208]).

- frames (see the FRAME [p.198] and IFRAME [p.205] elements).
- citing an external reference (see the Q [p.84] , BLOCKQUOTE [p.84] , INS [p.91] and DEL [p.91] elements).
- referring to metadata conventions describing a document (see the HEAD [p.54] element).

Please consult the section on the URL [p.42] type for more information about URLs.

2.2 What is HTML?

To publish information for global distribution, one needs a universally understood language, a kind of publishing mother tongue that all computers may potentially understand. The publishing language used by the World Wide Web is HTML (from HyperText Markup Language).

HTML gives authors the means to:

- Publish online documents with headings, text, tables, lists, photos, etc.
- Retrieve online information via hypertext links, at the click of a button.
- Design forms for conducting transactions with remote services, for use in searching for information, making reservations, ordering products, etc.
- Include spread-sheets, video clips, sound clips, and other applications directly in their documents.

2.2.1 A brief history of HTML

HTML was originally developed by Tim Berners-Lee while at CERN, and popularized by the Mosaic browser developed at NCSA. During the course of the 1990s it has blossomed with the explosive growth of the Web. During this time, HTML has been extended in a number of ways. The Web depends on Web page authors and vendors sharing the same conventions for HTML. This has motivated joint work on specifications for HTML.

HTML 2.0 (November 1995, see [RFC1866] [p.322]) was developed under the aegis of the Internet Engineering Task Force (IETF) to codify common practice in late 1994. HTML+ (1993) and [HTML30] [p.321] (1995) proposed much richer versions of HTML. Despite never receiving consensus in standards discussions, these drafts led to the adoption of a range new features. The efforts of the World Wide Web Consortium's HTML working group to codify common practice in 1996 resulted in HTML 3.2 (January 1997, see [HTML32] [p.321]). Changes from HTML 3.2 are summarized in Appendix A [p.299]

Most people agree that HTML documents should work well across different browsers and platforms. Achieving interoperability lowers costs to content providers since they must develop only one version of a document. If the effort is not made, there is much greater risk that the Web will devolve into a proprietary world of incompatible formats, ultimately reducing the Web's commercial potential for all participants.

Each version of HTML has attempted to reflect greater consensus among industry players so that the investment made by content providers will not be wasted and that their documents will not become unreadable in a short period of time.

HTML has been developed with the vision that all manner of devices should be able to use information on the Web: PCs with graphics displays of varying resolution and color depths, cellular telephones, hand held devices, devices for speech for output and input, computers with high or low bandwidth, and so on.

2.3 HTML 4.0

HTML 4.0 extends HTML with mechanisms for style sheets, scripting, frames, embedding objects, improved support for right to left and mixed direction text, richer tables, and enhancements to forms, offering improved accessibility for people with disabilities.

2.3.1 Internationalization

This version of HTML has been designed with the help of experts in the field of internationalization, so that documents may be written in every language and be transported easily around the world. This has been accomplished by incorporating [RFC2070] [p.322] , which deals with the internationalization of HTML.

One important step has been the adoption of the ISO/IEC:10646 standard (see [ISO10646] [p.319]) as the document character set for HTML. This is the world's most inclusive standard dealing with issues of the representation of international characters, text direction, punctuation, and other world language issues.

HTML now offers greater support for diverse human languages within a document. This allows for more effective indexing of documents for search engines, higher-quality typography, better text-to-speech conversion, correct hyphenation, etc.

2.3.2 Accessibility

As the Web community grows and its members diversify in their abilities and skills, it is crucial that the underlying technologies be appropriate to their specific needs. HTML has been designed to make Web pages more accessible to those with physical limitations. HTML 4.0 developments in the area of accessibility include:

- Encouraging the use of style sheets (rather than tables) to achieve layout effect.
- Making it easier to provided alternate (textual and aural) descriptions of images for non-visual browsers.
- Providing labels for form fields
- Providing labeled hierarchical groupings for form fields.
- Providing the ability to associate a longer text description with an HTML element.

Authors who design pages with accessibility issues in mind will not only receive the blessings of the accessibility community, but will benefit in other ways as well: well-designed HTML documents that distinguish structure and presentation will adapt more easily to new technologies.

2.3.3 Tables

The new table model in HTML is based on [RFC1942] [p.322] . Authors now have greater control over structure and layout (e.g., column groups). The ability of designers to recommend column widths allows user agents to display table data incrementally (as it arrives) rather than waiting for the entire table before rendering.
Note. *At the time of writing, some HTML authoring tools rely extensively on tables for formatting, which may easily cause accessibility problems.*

2.3.4 Compound documents

HTML now offers a standard mechanism for embedding generic media objects and applications in HTML documents. The `OBJECT` [p.154] element (together with its more specific ancestor elements `IMG` [p.152] and `APPLET` [p.162]) provides a mechanism for including images, video, sound, mathematics, specialized applications, and other objects in a document. It also allows authors to specify a hierarchy of alternate renderings for user agents that don’t support a specific rendering.

2.3.5 Style sheets

Style sheets simplify HTML markup and largely relieve HTML of the responsibilities of presentation. They give both authors and users control over the presentation of documents -- font information, alignment, colors, etc.

Style information can be specified for specific elements or groups of elements either within an HTML document or in separate style sheets.

The mechanism for associating a style sheet with a document is independent of the style sheet language.

Before the advent of style sheets, authors had limited control over rendering. HTML 3.2 included a number of attributes and elements offering control over alignment, font size, and text color. Authors also exploited tables and images as a means for laying out pages. The relatively long time it takes for users to upgrade their browsers means that these features will continue to be used for some time. However, since style sheets offer more powerful presentation mechanisms, the World Wide Web Consortium will eventually phase out many of HTML’s presentation elements and attributes. Throughout the specification elements and attributes at risk are marked as "deprecated [p.32] ". They are usually accompanied by examples of how to achieve the same effects with other elements or style sheets.

This specification includes three Document Type Definitions (DTDs) that may be used to validate HTML 4.0 documents. One for use with framesets, a loose DTD for transitional documents and a strict DTD that excludes presentation elements and attributes.

2.3.6 Scripting

Through scripts, authors may create "smart forms" that react as users fill them out. Scripting allows designers to create dynamic Web pages, and to use HTML as a means to build networked applications. The mechanisms provided to associate HTML with scripts are independent of particular scripting languages.

2.3.7 Printing

Sometimes, authors will want to make it easy for users to print more than just the current document. When documents form part of a larger work, the relationships between them can be described using the HTML `LINK` [p.145] element or using W3C's Resource Description Language, see [RDF] [p.321] .

2.4 Designing documents with HTML 4.0

We recommend that authors and implementors observe the following general principles when working with HTML 4.0.

2.4.1 Separate structure and presentation

HTML has its roots in SGML which has always been a language for the specification of structural markup. As HTML matures, more and more of its presentational elements and attributes are being replaced by other mechanisms, in particular style sheets. Experience has shown that separating the structure of a document from its presentational aspects reduces the cost of serving a wide range of platforms, media, etc., and facilitates document revisions.

2.4.2 Consider universal accessibility to the Web

To make the Web more accessible to everyone, notably those with disabilities, authors should consider how their documents may be rendered on a variety of platforms: speech-based browsers, braille-readers, etc. We do not recommend that designers limit their creativity, only that they consider alternate renderings in their design. HTML offers a number of mechanisms to this end (e.g., the `alt` [p.172] attribute, the `accesskey` [p.229] attribute, etc.)

Furthermore, authors should keep in mind that their documents may be reaching a far-off audience with different computer configurations. In order for documents to be interpreted correctly, designers should include in their documents information about the natural language and direction of the text, how the document is encoded, and other issues related to internationalization.

2.4.3 Help user agents with incremental rendering

By carefully designing their tables and making use of new table features in HTML 4.0, designers can help user agents render documents more quickly. Authors can learn how to design tables for incremental rendering in the definition of the `TABLE` [p.105] element. Implementors should consult the notes on tables [p.309] in the appendix for information on incremental algorithms.

3 On SGML and HTML

Contents

1. Introduction to SGML [p.21]
2. SGML constructs used in HTML [p.22]
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3. How to read the HTML DTD [p.24]
    1. DTD Comments [p.24]
    2. Parameter entity definitions [p.24]
    3. Element declarations [p.25]
    4. Attribute definitions [p.27]

This section of the document introduces SGML and discusses its relationship to HTML. A complete discussion of SGML is left to the SGML standard (see [ISO8879] [p.319]).

3.1 Introduction to SGML

SGML is a system for defining markup languages. Authors "mark up" their documents by representing structural, presentational, and semantic information alongside content. HTML is one example of a markup language. Here is an example of an HTML document:

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0//EN">
<HTML>
   <HEAD>
      <TITLE>My first HTML document</TITLE>
   </HEAD>
   <BODY>
      <P>Hello world!
   </BODY>
</HTML>
```

An HTML document is divided into a head section (here, between <HEAD> and </HEAD>) and a body (here, between <BODY> and </BODY>). The title of the document appears in the head, and the bulk of the document appears in the body. This document body contains just one paragraph, marked up with <P>.

Each markup language defined in SGML is called an *SGML application*. An SGML application is generally characterized by:

1. An SGML declaration [p.247] . The SGML declaration specifies which characters and delimiters may appear in the application.
2. A document type declaration (DTD) [p.249] . The DTD defines the syntax of markup constructs. The DTD may include additional definitions such as character entity references [p.23] .
3. A specification that describes the semantics to be ascribed to the markup. This specification also

imposes syntax restrictions that cannot be expressed within the DTD.
4. Document instances containing data (content) and markup. Each instance contains a reference to the DTD to be used to interpret it.

The HTML 4.0 specification includes an SGML declaration [p.247] , three document type declarations (see the section on HTML version information [p.51] for a description of the three), and a list of character references [p.23] .

3.2 SGML constructs used in HTML

The following sections introduce SGML constructs that are used in HTML.

The appendix lists some SGML features [p.305] that are not widely supported by HTML tools and user agents and should be avoided.

3.2.1 Elements

An SGML document type definition [p.249] declares element types that represent structures or desired behavior. HTML includes element types that represent paragraphs, hypertext links, lists, tables, images, etc.

Each element type declaration generally describes three parts: a start tag, content, and an end tag.

The element's name appears in the start tag (written `<element-name>`) and the end tag (written `</element-name>`); note the slash before the element name in the end tag. For example, the start and end tags of the `UL` [p.96] element type delimit the items in a list:

```
<UL>
<LI><P>...list item 1...
<LI><P>...list item 2...
</UL>
```

Some HTML element types allow authors to omit end tags (e.g., the `P` [p.86] and `LI` [p.98] element types). A few element types also allow the start tags to be omitted; for example, `HEAD` [p.54] and `BODY` [p.61] . The HTML DTD indicates for each element type whether the start tag and end tag are required.

Some HTML element types have no content. For example, the line break element `BR` [p.87] has no content; its only role is to terminate a line of text. Such "empty" elements never have end tags. The document type definition [p.249] and the text of the specification indicate whether an element type is empty (has no content) or, if it can have content, what is considered legal content.

Element names are always case-insensitive.

Elements are not tags. *Some people refer to elements as tags (e.g., "the P tag"). Remember that the element is one thing, and the tag (be it start or end tag) is another. For instance, the HEAD element is always present, even though both start and end HEAD tags may be missing in the markup.*

All the element types declared in this specification are listed in the element index [p.323] .

3.2.2 Attributes

Elements may have associated properties, called *attributes*, which may have values (by default, or set by authors or scripts). Attribute/value pairs appear before the final ">" of an element's start tag. Any number of (legal) attribute value pairs, separated by spaces, may appear in an element's start tag. They may appear in any order.

In this example, the `id` [p.63] attribute is set for an `H1` [p.67] element:

```
<H1 id="section1">
This is an identified heading thanks to the id attribute
</H1>
```

By default, SGML requires that all attribute values be delimited using either double quotation marks (ASCII decimal 34) or single quotation marks (ASCII decimal 39). Single quote marks can be included within the attribute value when the value is delimited by double quote marks, and vice versa. Authors may also use numeric character references to represent double quotes (") and single quotes ('). For double quotes authors can also use the character entity reference ".

In certain cases, authors may specify the value of an attribute without any quotation marks. The attribute value may only contain letters (a-z and A-Z), digits (0-9), hyphens (ASCII decimal 45), and periods (ASCII decimal 46). We recommend using quotation marks even when it is possible to eliminate them.

Attribute names are always case-insensitive.

Attribute values are generally case-insensitive. The definition of each attribute in the reference manual indicates whether its value is case-insensitive.

All the attributes defined by this specification are listed in the attribute index [p.327] .

3.2.3 Entities

Character references are numeric or symbolic names for characters that may be included in an HTML document. They are useful for referring to rarely used characters, or those that authoring tools make it difficult or impossible to enter. You will see character entities throughout this document; they begin with a "&" sign and end with a semi-colon (;). Some common examples include:

- "<" represents the < sign.
- ">" represents the > sign.
- """ represents the " mark.
- "å" (in decimal) represents the letter "a" with a small circle above it.
- "И" (in decimal) represents the Cyrillic capital letter "I".
- "水" (in hexadecimal) represents the Chinese character for water.

We discuss HTML character entities [p.39] in detail later in the section on the HTML document character set [p.35] . The specification also contains a list of character references [p.287] that may appear in HTML 4.0 documents.

3.2.4 Comments

HTML comments have the following syntax:

```
<!-- this is a comment -->
<!-- and so is this one,
    which occupies more than one line -->
```

White space is not permitted between the markup declaration open delimiter("<!") and the comment open delimiter ("--"), but is permitted between the comment close delimiter ("--") and the markup declaration close delimiter (">"). A common error is to include a string of hyphens ("---") within a comment. Authors should avoid putting two or more adjacent hyphens inside comments.

Information that appears between comments has no special meaning (e.g., character references [p.23] are not interpreted as such).

3.3 How to read the HTML DTD

Each element and attribute declaration in this specification is accompanied by its document type definition [p.249] fragment. We have chosen to include the DTD fragments in the specification rather than seek a more approachable, but longer and less precise means of describing an element's properties. The following tutorial should allow readers unfamiliar with SGML to read the DTD and understand the technical details of the HTML specification.

3.3.1 DTD Comments

In DTDs, comments may spread over one or more lines. In the DTD, comments are delimited by a pair of "--" marks, e.g.

```
<!ELEMENT PARAM - O EMPTY       -- named property value -->
```

Here, the comment "named property value" explains the use of the `PARAM` [p.158] element type. Comments in the DTD are informative only.

3.3.2 Parameter entity definitions

The HTML DTD [p.249] begins with a series of parameter entity definitions. A *parameter entity definition* defines a kind of macro that may be referenced and expanded elsewhere in the DTD. These macros may not appear in HTML documents, only in the DTD. Other types of macros, called character references [p.23] , may be used in the text of an HTML document or within attribute values.

When the parameter entity is referred to by name in the DTD, it is expanded into a string.

A parameter entity definition begins with the keyword <!ENTITY % followed by the entity name, the quoted string the entity expands to, and finally a closing >. The following example defines the string that the %font entity will expand to.

```
<!ENTITY % font "TT | I | B | U | S | BIG | SMALL">
```

The string the parameter entity expands to may contain other parameter entity names. These names are expanded recursively. In the following example, the %inline parameter entity is defined to include the %font, %phrase, %special and %formctrl parameter entities.

```
<!ENTITY % inline "#PCDATA | %font | %phrase | %special | %formctrl">
```

You will encounter two DTD entities frequently in the HTML DTD [p.249] : %block and %inline. They are used when the content model includes block-level and inline elements [p.64] , respectively (defined in the section on the global structure of an HTML document [p.51]).

3.3.3 Element declarations

The bulk of the HTML DTD consists of the declarations of element types and their attributes. The <!ELEMENT keyword begins a declaration and the > character ends it. Between these are specified:

1. The element's name.
2. Whether the element's end tag is optional. Two hyphens that appear after the element name mean that the start and end tags are mandatory. One hyphen followed by the letter "O" indicates that the end tag can be omitted. A pair of letter "O"s indicate that both the start and end tags can be omitted.
3. The element's content, if any. The allowed content for an element is called its *content model*. Element types that are designed to have no content are called *empty* elements. The content model for such element types is declared using the keyword "EMPTY".

In this example:

```
<!ELEMENT UL - - (LI)+>
```

- The element type being declared is **UL**.
- The two hyphens indicate that both the start tag <UL> and the end tag </UL> for this element type are required.
- The content model for this element type is declared to be "at least one LI element". Below, we explain how to specify content models.

This example illustrates the declaration of an empty element type:

```
<!ELEMENT IMG - O EMPTY>
```

- The element type being declared is **IMG**.
- The hyphen and the following "O" indicate that the end tag can be omitted, but together with the content model "EMPTY", this is strengthened to the rule that the end tag **must** be omitted.

- The "EMPTY" keyword means that instances of this type must not have content.

Content model definitions

The content model describes what may be contained by an instance of an element type. Content definitions may include:

- The names of allowed or forbidden element types (e.g., the `UL` [p.96] element contains instances of the `LI` [p.98] element type, and the `P` [p.86] element type may not contain other `P` [p.86] elements).
- DTD entities (e.g., the `LABEL` [p.224] element contains instances of the %inline parameter entity).
- Document text (indicated by the SGML construct "#PCDATA"). Text may contain character references [p.39] . Recall that these begin with & and end with a semicolon (e.g., "Hergé's adventures of Tintin" contains the character entity reference for the "e acute" character).

The content model uses the following syntax to define what markup an element may contain:

(...)
: Specifies a group.

A | B
: Either A or B must occur but not both.

A , B
: Both A and B must occur in that order.

A & B
: Both A and B must occur, but may do so in any order.

A?
: A can occur zero or one times

A*
: A can occur zero or more times

A+
: A can occur one or more times

Here are some examples from the HTML DTD:

```
<!ELEMENT SELECT - - (OPTION+)>
```

The `SELECT` [p.218] element must contain one or more `OPTION` [p.218] elements.

```
<!ELEMENT DL - - (DT|DD)+>
```

The `DL` [p.98] element must contain one or more `DT` [p.98] or `DD` [p.98] elements in any order.

```
<!ELEMENT OPTION - O (#PCDATA)*>
```

The `OPTION` [p.218] element may only contain text and entities, such as & -- this is indicated by the SGML data type #PCDATA.

A few HTML element types use an additional SGML feature to exclude elements from content model. Excluded elements are preceded by a hyphen. Explicit exclusions override permitted elements.

In this example, the `-(A)` signifies that the element `A` [p.141] cannot appear in another `A` [p.141] element (i.e., anchors may not be nested).

```
<!ELEMENT A - - (%inline)* -(A)>
```

Note that the `A` [p.141] element type is part of the DTD parameter entity `%inline`, but is excluded explicitly because of `-(A)`.

Similarly, the following element type declaration for `FORM` [p.208] prohibits nested forms:

```
<!ELEMENT FORM - - %block -(FORM)>
```

3.3.4 Attribute definitions

The <!ATTLIST keyword begins the definition of attributes that an element may take. It is followed by the name of the element in question, a list of attribute definitions, and a closing >. An attribute definition is a triplet that defines:

- The name of an attribute.
- The type of the attribute's value or an explicit set of possible values. Values defined explicitly by the DTD are case-insensitive. Please consult the section on basic HTML data types [p.41] for more information about attribute value types.
- Whether the default value of the attribute is implicit (keyword "#IMPLIED"), in which case the default value must be supplied by the user agent (in some cases via inheritance from parent elements); always required (keyword "#REQUIRED"); or fixed to the given value (keyword "#FIXED"). Some attributes explicitly specify a default value for the attribute.

In this example, the `name` [p.166] attribute is defined for the `MAP` [p.166] element. The attribute is optional for this element.

```
<!ATTLIST MAP
  name        CDATA     #IMPLIED
  >
```

The type of values permitted for the attribute is given as CDATA, an SGML data type. CDATA is text that may contain character references [p.39] .

For more information about "CDATA", "NAME", "ID", and other data types, please consult the section on HTML data types [p.41] .

The following examples illustrate several attribute definitions:

```
rowspan     NUMBER     1         -- number of rows spanned by cell --
http-equiv  NAME       #IMPLIED  -- HTTP response header name  --
id          ID         #IMPLIED  -- document-wide unique id --
valign      (top|middle|bottom|baseline) #IMPLIED
```

The `rowspan` attribute requires values of type NUMBER. The default value is given explicitly as "1". The optional `http-equiv` attribute requires values of type NAME. The optional `id` attribute requires values of type ID. The optional `valign` attribute is constrained to take values from the set {top, middle, bottom, baseline}.

DTD entities in attribute definitions

Attribute definitions may also contain parameter entity references.

In this example, we see that the attribute definition list for the `LINK` [p.145] element begins with the %attrs parameter entity.

```
<!ELEMENT LINK - O EMPTY -- a media-independent link -->
<!ATTLIST LINK
  %attrs;                          -- %coreattrs, %i18n, %events --
  charset     %Charset;    #IMPLIED -- char encoding of linked resource --
  href        %URL;        #IMPLIED -- URL for linked resource --
  hreflang %LanguageCode; #IMPLIED -- language code --
  type      %ContentType; #IMPLIED -- advisory content type --
  rel         %LinkTypes; #IMPLIED -- forward link types --
  rev         %LinkTypes; #IMPLIED -- reverse link types --
  media       %MediaDesc; #IMPLIED -- for rendering on these media --
  target   %FrameTarget;     #IMPLIED -- render in this frame --
  >
```

Start tag: ***required****, End tag:* ***forbidden***

The %attrs parameter entity is defined as follows:

```
<!ENTITY % attrs "%coreattrs; %i18n; %events;">
```

The %coreattrs parameter entity in the %attrs definition expands as follows:

```
<!ENTITY % coreattrs
 "id          ID         #IMPLIED  -- document-wide unique id --
  class       CDATA      #IMPLIED  -- space separated list of classes --
  style       CDATA      #IMPLIED  -- associated style info --
  title       %Text;     #IMPLIED  -- advisory title/amplification --"
  >
```

The %attrs parameter entity has been defined for convenience since these attributes are defined for most HTML element types.

Similarly, the DTD defines the %URL parameter entity as expanding into the string "CDATA".

```
<!ENTITY % URL "CDATA"
    -- a Uniform Resource Locator,
       see [RFC1808] and [RFC1738]
    -->
```

As this example illustrates, the parameter entity %URL provides readers of the DTD with more information as to the type of data expected for an attribute. Similar entities have been defined for %Color, %Charset, %Length, %Pixels, etc.

Boolean attributes

Some attributes play the role of boolean variables (e.g., the `selected` [p.219] attribute for the `OPTION` [p.218] element). Their appearance in the start tag of an element implies that the value of the attribute is "true". Their absence implies a value of "false".

Boolean attributes may legally take a single value: the name of the attribute itself (e.g., `selected="selected"`).

This example defines the `selected` [p.219] attribute to be a boolean attribute.

```
selected     (selected)  #IMPLIED  -- reduced inter-item spacing --
```

The attribute is set to "true" by appearing in the element's start tag:

```
<OPTION selected="selected">
...contents...
<OPTION>
```

In HTML, boolean attributes may be appear in "minimized form" -- the attribute's **value** appears alone in the element's start tag. Thus, `selected` [p.219] may be set by writing:

```
<OPTION selected>
```

instead of:

```
<OPTION selected="selected">
```

Authors should be aware than many user agents **only** recognize the minimized form of boolean attributes and not the full form.

3.3.4 Attribute definitions

4 Conformance: requirements and recommendations

Contents

1. Definitions [p.31]
2. SGML [p.32]
3. The text/html content type [p.33]

In this section, we begin the specification of HTML 4.0, starting with the contract between authors, documents, users, and user agents.

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [RFC2119] [p.320] . However, for readability, these words do not appear in all upper case letters in this specification.

At times, the authors of this specification recommend good practice for authors and user agents. These recommendations are not normative and conformance with this specification does not depend on their realization. These recommendations contain the expression "We recommend ...", "This specification recommends ...", or some similar wording.

4.1 Definitions

HTML document
: An HTML document is an SGML document that meets the constraints of this specification.

Author
: An author is a person or program that writes or generates HTML documents.

User
: A user is a person who interacts with a user agent to view, hear, or otherwise use a rendered HTML document.

HTML user agent
: An HTML user agent is any device that interprets HTML documents. User agents include visual browsers (text-only and graphical), non-visual browsers (audio, Braille), search robots, proxies, etc.

  A *conforming user agent* for HTML 4.0 is one that observes the mandatory conditions ("must") set forth in this specification, including the following points:

  - A user agent should avoid imposing arbitrary length limits on attribute value literals (see the section on capacities in the SGML Declaration [p.247]). For introductory information on SGML attributes, please consult the section on attribute definitions.
  - A user agent must ensure that rendering is unchanged by the presence or absence of start tags and end tags when the HTML DTD indicates these are optional. See the section on element definitions for introductory information on SGML elements.

Error conditions
: This specification does not define how conforming user agents handle general error conditions, including how user agents behave when they encounter elements, attributes, attribute values, or entities not specified in this document.

However, to facilitate experimentation and interoperability between implementations of various versions of HTML, we recommend the following behavior:

- If a user agent encounters an element it does not recognize, it should try to render the element's content.
- If a user agent encounters an attribute it does not recognize, it should ignore the entire attribute specification (i.e., the attribute and its value).
- If a user agent encounters an attribute value it doesn't recognize, it should use the default attribute value.
- If it encounters an undeclared entity, the entity should be treated as character data.

We also recommend that user agents provide support for notifying the user of such errors.

Since user agents may vary in how they handle error conditions, authors and users must not rely on specific error recovery behavior.

Deprecated

A deprecated element or attribute is one that has been outdated by newer constructs. Deprecated elements are defined in the reference manual in appropriate locations, but are clearly marked as deprecated. Deprecated elements may become obsolete in future versions of HTML.

User agents should continue to support deprecated elements for reasons of backward compatibility.

Definitions of elements and attributes clearly indicate which are deprecated [p.32] .

This specification includes examples that illustrate how to avoid using deprecated elements. In most cases these depend on user agent support for style sheets. In general, authors should use style sheets to achieve stylistic and formatting effects rather than HTML presentational attributes. HTML presentational attributes have been deprecated when style sheet alternatives exist (see, for example, [CSS1]).

Obsolete

An obsolete element or attribute is one for which there is no guarantee of support by a user agent. Obsolete elements are no longer defined in the specification, but are listed for historical purposes in the changes section [p.299] of the reference manual.

4.2 SGML

HTML 4.0 is an SGML application conforming to International Standard ISO 8879 -- *Standard Generalized Markup Language* SGML (defined in [ISO8879]).

Comments appearing in the HTML 4.0 DTD [p.249] have no normative value; they are informative only.

User agents must not render SGML processing instructions (e.g., <?full volume>) or comments. For more information about this and other SGML features that may be legal in HTML but aren't widely supported by HTML user agents, please consult the section on SGML features with limited support. [p.305]

4.3 The text/html content type

HTML documents are sent over the Internet as a sequence of bytes accompanied by encoding information (described in the section on character encodings [p.36]). The structure of the transmission, termed a *message entity*, is defined in [RFC2045] [p.320]) and [RFC2068] [p.320] . A message entity with a content type [p.44] of "text/html" represents an HTML document.

The content type for HTML documents is defined as follows:

Content type name
: text
Content subtype name
: html
Required parameters
: none
Optional parameters
: charset
Encoding considerations
: any encoding is allowed
Security considerations
: See the notes on security [p.317]

The optional parameter "charset" refers to the character encoding [p.36] used to represent the HTML document as a sequence of bytes. Legal values for this parameter are defined in the section on character encodings [p.36] . Although this parameter is optional, we recommend that it always be present.

Note. *The relationship between this specification's encoding of line breaks [p.87] and [RFC2045] [p.320] , section 2.10 is not yet clear. The editors expect to review this relationship during the Proposed Recommendation review phase.*

5 HTML Document Representation

Contents

1. The Document Character Set [p.35]
2. Character encodings [p.36]
    1. Choosing an encoding [p.36]
    2. Specifying the character encoding [p.37]
3. Character references [p.39]
4. Undisplayable characters [p.40]

In this chapter, we discuss how HTML documents are represented on a computer and over the Internet.

The section on the document character set [p.35] addresses the issue of what abstract *characters* may be part of an HTML document. Characters include the Latin letter "A", the Cyrillic letter "I", the Chinese character meaning "water", etc.

The section on character encodings [p.36] addresses the issue of how those characters may be represented in a file or when transferred over the Internet. As some character encodings cannot directly represent all characters an author may want to include in a document, HTML offers other mechanisms, called character references [p.39] , for referring to any character.

Since there are a great number of characters throughout human languages, and a great variety of ways to represent those characters, proper care must be taken so that documents may be understood by user agents around the world.

5.1 The Document Character Set

To promote interoperability, SGML requires that each application (including HTML) specify its *document character set*. A document character set consists of:

- *A Repertoire*: A set of abstract characters, such as the Latin letter "A", the Cyrillic letter "I", the Chinese character meaning "water", etc.
- *Code positions*: A set of integer references to characters in the repertoire.

An SGML document (including HTML) is a sequence of characters from the repertoire. Computer systems identify each character by its code position; for example, in the ASCII character set, code positions 65, 66, and 67 refer to the characters ’A’, ’B’, and ’C’, respectively.

The ASCII character set is not sufficient for a global information system such as the Web, so HTML uses the much more complete character set called the *Universal Character Set* (UCS), defined in [ISO10646] [p.319] . This standard defines a repertoire of thousands of characters used by communities all over the world.

This set is character-by-character equivalent to Unicode 2.0 ([UNICODE] [p.321]). Both of these standards are updated from time to time with new characters and the amendments should be consulted at the respective Web sites. In the current specification, references to ISO/IEC-10646 or Unicode imply the same document character set. However, the HTML specification also refers to the Unicode specification for other issues such as the bidirectional text algorithm.

The document character set, however, does not suffice to allow user agents to correctly interpet HTML documents as they are typically exchanged -- encoded as a sequence of bytes in a file or during a network transmission. User agents must also know the specific character encoding [p.36] that was used to transform the document character stream into a byte stream.

5.2 Character encodings

What this specification calls a "character encoding" is known by different names in other specifications (which may cause some confusion). However, the concept is largely the same across the Internet. Also, protocol headers, attributes, and parameters refering to character encodings share the same name -- "charset" -- and use the same values from the [IANA] [p.319] registry (see [CHARSETS] [p.319] for a complete list).

The "charset" parameter identifies a *character encoding*, which is a method of converting a sequence of bytes into a sequence of characters. This conversion fits naturally with the scheme of Web activity: servers send HTML documents to user agents as a stream of bytes; user agents interpret them as a sequence of characters. The conversion method can range from simple one-to-one correspondence to complex switching schemes or algorithms.

A simple one-byte-per-character encoding technique is not sufficient for text strings over a character repertoire as large as [ISO10646] [p.319] . There are several different encodings of parts of [ISO10646] [p.319] in addition to encodings of the entire character set (such as UCS-4).

5.2.1 Choosing an encoding

The choice of character encoding mostly depends on the tools (i.e., text editors) available when authoring the document, and on the conventions used by the system software. These tools may employ any convenient encoding that covers most of the characters contained in the document, provided the encoding is correctly labeled. Occasional characters that fall outside this encoding may still be represented by numeric character references [p.39] . These always refer to the document character set, not the character encoding.

While authoring tools may encode HTML documents in the character encoding of their choice, servers and proxies may change this character encoding (called *transcoding*) on the fly to meet the requests of user agents (see section 14.2 of [RFC2068] [p.320] , the "Accept-Charset" HTTP request header). Servers and proxies do not have to serve a document in a character encoding that covers the entire document character set.

Commonly used character encodings on the Web include ISO-8859-1 (also referred to as "Latin-1"; usable for most Western European languages), ISO-8859-5 (which supports Cyrillic), SHIFT_JIS (a Japanese encoding), EUC-JP (another Japanese encoding), and UTF-8 (an encoding of ISO 10646 using a different number of bytes for different characters). Names for character encodings are case-insensitive, so that for example "SHIFT_JIS", "Shift_JIS", and "shift_jis" are equivalent.

This specification does not mandate which character encodings a user agent must support.

Notes on specific encodings

When HTML text is transmitted in UTF-16 (charset=UTF-16), text data should be transmitted in network byte order ("big-endian", high order byte first) in accordance with [ISO10646] [p.319] , Section 6.3 and [UNICODE] [p.321] , clause C3, page 3-1.

Furthermore, to maximize chances of proper interpretation, it is recommended that documents transmitted as UTF-16 always begin with a ZERO-WIDTH NON-BREAKING SPACE character (hexadecimal FEFF, also called Byte Order Mark (BOM)) which, when byte-reversed becomes hexadecimal FFFE, a character guaranteed to be never assigned. Thus, a user-agent receiving a hexadecimal FFFE as the first bytes of a text would know that bytes have to be reversed for the remainder of the text.

The UTF-1 transformation format of [ISO10646] (registered by IANA as ISO-10646-UTF-1), should not be used. For information about ISO 8859-8 and the bidirectional algorithm, please consult the section on bidirectionality and character encoding [p.78] .

5.2.2 Specifying the character encoding

How does a user agent know which character encoding has been used? The most straightforward way for a server to inform the user agent about the character encoding of the document is to use the "charset" parameter of the "Content-Type" header field of the HTTP protocol ([RFC2068] [p.320]) For example, the following HTTP header announces that the character encoding is EUC-JP:

```
Content-Type: text/html; charset=EUC-JP
```

Please consult the section on conformance for the definition of text/html.

How does a server determine which character encoding applies for a document it serves? Some servers examine the first few bytes of the document, or check against a database of known files and encodings. Many modern servers give Web masters more control over charset configuration that old servers do. Web masters should use these mechanisms to send out a "charset" parameter whenever possible, but should take care not to identify a document with the wrong "charset" parameter value.

The HTTP protocol ([RFC2068] [p.320]) mentions ISO-8859-1 as a default character encoding when the "charset" parameter is absent from the "Content-Type" header field. In practice, this recommendation has proved useless because some servers don’t allow a "charset" parameter to be sent, and others may not be configured to send the parameter. Therefore, user agents must not assume any default value for the "charset" parameter.

To address server or configuration limitations, HTML document headers may include explicit information about the document's character encoding; the `META` [p.56] element can be used to provide user agents with this information.

For example, to specify that the character encoding of the current document is "EUC-JP", a document should include the following `META` [p.56] declaration:

```
<META http-equiv="Content-Type" content="text/html; charset=EUC-JP">
```

The `META` [p.56] declaration must only be used when the character encoding is organized such that ASCII characters stand for themselves at least until the `META` [p.56] element is parsed. `META` [p.56] declarations should appear as early as possible in the `HEAD` [p.54] element.

For cases where neither the HTTP protocol nor the `META` [p.56] element provides information about the character encoding of a document, HTML also provides the `charset` [p.141] attribute on several elements. With these, a document provider can greatly improve the chances that, when the user retrieves a resource, the user agent will handle it correctly.

To sum up, conforming user agents must observe the following priorities when determining a document's character encoding (from highest priority to lowest):

1. An HTTP "charset" parameter in a "Content-Type" field.
2. A `META` [p.56] declaration with "http-equiv" set to "Content-Type" and a value set for "charset".
3. The `charset` [p.141] attribute set on an element that designates an external resource.

In addition to this list of priorities, the user agent may use heuristics and user settings. For example, many user agents use a heuristic to distinguish the various encodings used for Japanese text. Also, user agents typically have a user-definable local default character encoding which they apply in the absence of other indicators.

User agents may provide a mechanism that allows users to override incorrect "charset" information. However, if a user agent offers such a mechanism, it should only offer it for browsing and not for editing, to avoid the creation of Web pages marked with an incorrect "charset" parameter.

Conforming user agents must correctly map to Unicode all characters in any character encodings that they recognize (or they must behave as if they did).

This specification does not mandate which character encodings a user agent must accept and understand.

Note. *If, for a specific application, it becomes necessary to refer to characters outside [ISO10646] [p.319] , characters should be assigned to a private zone to avoid conflicts with present or future versions of the standard. This is highly discouraged, however, for reasons of portability.*

5.3 Character references

A given character encoding may not be able to express all characters of the document character set. For such encodings, or when hardware or software configurations do not allow users to input document characters directly, SGML *entity references* may be used. Entity references are a character encoding-independent mechanism for entering any character from the document character set.

Entity references in HTML may appear in two forms:

- Numeric character references (either decimal or hexadecimal).
- Character entity references.

Numeric character references specify the integer reference of a character in the document character set. A numeric character reference with the syntax "&#*D*;", where *D* is a decimal number, refers to the Unicode decimal character number *D*. A numeric character reference with the syntax "&#x*H*;" or "&#X*H*;", where *H* is an hexadecimal number, refers to the Unicode hexadecimal character number *H*. Although the hexadecimal representation is not defined in [ISO8879] [p.319] , it is expected to be in the revision, as described in [WEBSGML] [p.321] . This convention is particularly useful since character standards generally use hexadecimal representations. Hexadecimal numbers in numeric character references are case-insensitive.

Here are some examples:

- å (in decimal) represents the letter "a" with a small circle above it (used, for example, in Norwegian).
- å (in hexadecimal) represents the same character.
- å (in hexadecimal) represents the same character as well.
- И (in decimal) represents the Cyrillic capital letter "I".
- 水 (in hexadecimal) represents the Chinese character for water.

In order to give authors a more intuitive way to refer to characters in the document character set, HTML offers a set of *character entity references*. Character entity references replace integer references with symbolic names. The character entity reference å refers to the same Unicode character as å. There is no character entity reference for the Cyrillic capital letter "I".

Please consult the full list of character references [p.287] defined as part of HTML 4.0.

Character entity references are case-sensitive. Thus, Å refers to a different character (upper case A, ring) than å (lower case a, ring).

Four character entity references deserve special mention since they are frequently used to escape special characters:

- "&" to represent the & sign.
- "<" to represent the < sign.
- ">" to represent the > sign.
- "" to represent the " mark.

For text appearing as part of the content of an element, authors should escape "<" (ASCII decimal 60) as < to avoid possible confusion with the beginning of a tag (start tag open delimiter). The ampersand character "&" (ASCII decimal 38) should be escaped as & to avoid confusion with the beginning of an entity reference (entity reference open delimiter).

Authors should also escape ampersand within attribute values since entity references are allowed within CDATA [p.42] attribute values. In addition, authors should escape ">" (ASCII decimal 62) as > to avoid problems with older user agents that incorrectly perceive this as the end of a tag (tag close delimiter) when coming across this character in quoted attribute values.

Some authors use the character entity reference " to encode instances of the double quote mark (") since that character may be used to delimit attribute values.

Character entities within comments have no special meaning; they are comment data only.

Note. *HTML provides other ways to present character data, in particular inline images.*
Note: In SGML, it is possible to eliminate the final ";" after a character reference in some cases (e.g., at a line break or directly before a tag). In other circumstances it may not be eliminated (e.g., in the middle of a word). We strongly suggest using the ";" in all cases to avoid problems with user agents that require this character to be present.

5.4 Undisplayable characters

A user agent may not be able to render all characters in a document meaningfully, for instance, because the user agent lacks a suitable font, a character has a value that may not be expressed in the user agent's internal character encoding, etc.

Because there are many different things that may be done in such cases, this document does not prescribe any specific behavior. Depending on the implementation, undisplayable characters may also be handled by the underlying display system and not the application itself. In the absence of more sophisticated behavior, for example tailored to the needs of a particular script or language, we recommend the following behavior for user agents:

1. Adopt a clearly visible, but unobtrusive mechanism to alert the user of missing resources.
2. If missing characters are presented using their numeric representation, use the hexadecimal (not decimal) form since this is the form used in character set standards.

6 Basic HTML data types

Contents

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14. Script data [p.48]
15. Frame target names [p.49]

This section of the specification describes the basic data types that may appear as an element's content or an attribute's value.

For introductory information about reading the HTML DTD, please consult the SGML tutorial.

6.1 Case information

Each attribute definition includes information about the case-sensitivity of its values. The case information is presented with the following keys:

CS
: The value is case-sensitive (i.e., user agents interpret "a" and "A" differently).

CI
: The value is case-insensitive (i.e., user agents interpret "a" and "A" as the same).

CN
: The value is not subject to case changes, e.g., because it is a number or a character from the document character set.

CA
: The element or attribute definition itself gives case information.

CT
: Consult the type definition for details about case-sensitivity.

If an attribute value is a list, the keys apply to every value in the list, unless otherwise indicated.

6.2 SGML basic types

The document type declaration [p.249] specifies the syntax of HTML element content and attribute values using SGML tokens (e.g., PCDATA, CDATA, NAME, ID, etc.). Information on what these tokens mean and how user agents should interpret them may be found in [GOLD90] [p.321] .

The following is a summary of key information:

- **CDATA** is a sequence of characters from the document character set and may include character entities. User agents should interpret attribute values as follows:
  - Replace character entities with characters,
  - Ignore line feeds,
  - Replace each carriage return or tab with a single space.

  User agents may ignore leading and trailing white space in CDATA attribute values (e.g., " myval " may be interpreted as "myval"). Authors should not declare attribute values with leading or trailing white space.

  For some HTML 4.0 attributes with CDATA attribute values, the specification imposes further constraints on the set of legal values for the attribute that may not be expressed by the DTD.

  Although the `STYLE` [p.176] and `SCRIPT` [p.236] elements use CDATA for their data model, for these elements, CDATA must be handled differently by user agents. Markup and entities must be treated as raw text and passed to the application as is. The first occurrence of the character sequence "</" (end-tag open delimiter) is treated as terminating the end of the element’s content. In valid documents, this would be the end tag for the element.
- **ID** and **NAME** tokens must begin with a letter ([A-Za-z]) and may be followed by any number of letters, digits ([0-9]), hyphens ("-"), underscores ("_"), colons (":"), and periods (".").
- **IDREF** and **IDREFS** are references to ID tokens defined by other attributes. IDREF is a single token and IDREFS is a space-separated list of tokens.
- **NUMBER** tokens must contain at least one digit ([0-9]).

6.3 Text strings

A number of attributes (%Text; in the DTD) take text that is meant to be "human readable". For introductory about attributes, please consult the tutorial discussion of attributes.

6.4 URLs

This specification uses the term URL for the general case of resource identifiers called "URI" in [RFC1630] [p.322] , including the term "URL" as defined in [RFC1738] [p.320] and [RFC1808] [p.320] , and the term "URN" as defined in [RFC2141] [p.320] .

URLs are represented in the DTD by the parameter entity %URL [p.267] .

URLs in general are case-sensitive. There may be URLs, or parts of URLs, where case doesn't matter (e.g., machine names), but identifying these may not be easy. Users should always consider that URLs are case-sensitive.

Relative URLs are resolved to full URLs using a base URL. [RFC1808] [p.320] defines the normative algorithm for this process. For more information about base URLs, please consult the section on base URLs in the chapter on links [p.137] .

Please consult the appendix for information about representing non-ASCII characters in URLs [p.303] .

6.5 Colors

The attribute value type "color" (%Color [p.267]) refers to color definitions as specified in [SRGB] [p.320] . A color value may either be a hexadecimal number (prefixed by a hash mark) or one of the following sixteen color names. The color names are case-insensitive [p.41] .

Color names and sRGB values

Black = "#000000"		Green = "#008000"	
Silver = "#C0C0C0"		Lime = "#00FF00"	
Gray = "#808080"		Olive = "#808000"	
White = "#FFFFFF"		Yellow = "#FFFF00"	
Maroon = "#800000"		Navy = "#000080"	
Red = "#FF0000"		Blue = "#0000FF"	
Purple = "#800080"		Teal = "#008080"	
Fuchsia = "#FF00FF"		Aqua = "#00FFFF"	

Thus, the color values "#800080" and "Purple" both refer to the color purple.

6.5.1 Notes on using colors

Although colors can add significant amounts of information to document and make them more readable, please consider the following guidelines when including color in your documents:

- The use of HTML elements and attributes for specifying color is deprecated. You are encouraged to use style sheets [p.173] instead.
- Don't use color combinations that cause problems for people with color blindness in its various forms.
- If you use a background image or set the background color, then be sure to set the various text colors as well.
- Colors specified with the `BODY` [p.61] and `FONT` [p.190] elements and `bgcolor` [p.185] on tables look different on different platforms (e.g., workstations, Macs, Windows, and LCD panels vs. CRTs), so you shouldn't rely entirely on a specific effect. In the future, support for the [SRGB] [p.320] color model together with ICC color profiles should mitigate this problem.
- When practical, adopt common conventions to minimize user confusion.

6.6 Lengths

HTML specifies three types of length values for attributes:

1. **Pixel**: The value (%Pixels [p.255] in the DTD) is integer that represents the number of pixels of the canvas (screen, paper). Thus, the value "50" means fifty pixels. For normative information about the definition of a pixel, please consult [CSS1] [p.319] .
2. **Length**: The value (%Length [p.255] in the DTD) may be either a %Pixel; or a percentage of the available horizontal or vertical space. Thus, the value "50%" means half of the available space.
3. **MultiLength**: The value (%MultiLength [p.255] in the DTD) may be a %Length; or a *relative length*. A relative length has the form "i*", where "i" is an integer. When allotting space among elements competing for that space, user agents allot pixel and percentage lengths first, then divide up remaining available space among relative lengths. Each relative length receives a portion of the available space that is proportional to the integer preceding the "*". The value "*" is equivalent to "1*". Thus, if 60 pixels of space are available after the user agent allots pixel and percentage space, and the competing relative lengths are 1*, 2*, and 3*, the 1* will be alloted 10 pixels, the 2* will be alloted 20 pixels, and the 3* will be alloted 30 pixels.

Length values are case-neutral [p.41]

6.7 Content types (MIME types)

Note. *A* media type *(defined in [RFC2045] [p.320] and [RFC2046] [p.320]) specifies the nature of a linked resource. This specification employs the term* content type *rather than* media type *in accordance with current usage.*

This type is represented in the DTD by %ContentType [p.250] .

Content types are case-insensitive.

Examples of content types include "text/html", "image/png", "image/gif", "video/mpeg", "audio/basic", "text/tcl", "text/javascript", and "text/vbscript". For the current list of registered MIME types, please consult [MIMETYPES]. [p.319]

Note. *The content type "text/css", while not current registered with IANA, should be used when the linked resource is a [CSS1] [p.319] style sheet.*

6.8 Language codes

The value of attributes whose type is a language code (%LanguageCode [p.250] in the DTD) refers to a language code as specified by [RFC1766]. For information on specifying language codes in HTML, please consult the section on language codes [p.72] . Whitespace is not allowed within the language-code.

6.9 Character encodings

The "charset" attributes (%Charset [p.250] in the DTD) refer to a character encoding as described in the section on character encodings. Values must be strings (e.g., "euc-jp") from the IANA registry (see [CHARSETS] [p.319] for a complete list). Names for character encodings are case-insensitive.

User agents must follow the steps set out in the section on specifying character encodings in order to determine the character encoding of an external resource.

6.10 Single characters

Certain attributes call for single character from the document character set. These attributes take the %Character [p.250] type in the DTD.

Single characters may be specified with character references (e.g., "&").

6.11 Dates and times

[ISO8601] allows many options and variations in the representation of dates and times. The current specification uses one of the formats described in the profile [DATETIME] for its definition of legal date/time strings (%Datetime [p.251] in the DTD).

The format is:

```
YYYY-MM-DDThh:mm:ssTZD
```

where:

```
YYYY = four-digit year
MM   = two-digit month (01=January, etc.)
DD   = two-digit day of month (01 through 31)
hh   = two digits of hour (00 through 23) (am/pm NOT allowed)
mm   = two digits of minute (00 through 59)
ss   = two digits of second (00 through 59)
TZD  = time zone designator
```

The time zone designator is one of:

`Z`
: indicates UTC (Coordinated Universal Time). The "Z" must be upper case.

`+hh:mm`
: indicates that the time is a local time which is `hh` hours and `mm` minutes ahead of UTC.

`-hh:mm`
: indicates that the time is a local time which is `hh` hours and `mm` minutes behind UTC.

Exactly the components shown here must be present, with exactly this punctuation. Note that the `"T"` appears literally in the string (it must be upper case), to indicate the beginning of the time element, as specified in [ISO8601]

If a generating application does not know the time to the second, it may use the value "00" for the seconds (and minutes and hours if necessary).

Note. *[DATETIME] does not address the issue of leap seconds.*

6.12 Link types

Authors may use the following recognized link types, listed here with their conventional interpretations. These are defined as being case-insensitive, i.e., "Alternate" has the same meaning as "alternate". In the DTD, %LinkTypes [p.250] refers to a space-separated list of link types. White space characters are not permitted within link types.

User agents, search engines, etc. may interpret these link types in a variety of ways. For example, user agents may provide access to linked documents through a navigation bar.

Alternate
: Designates substitute versions for the document in which the link occurs. When used together with the `lang` [p.71] attribute, it implies a translated version of the document. When used together with the `media` [p.177] attribute, it implies a version designed for a different medium (or media).

Stylesheet
: Refers to an external style sheet. See the section on external style sheets for details. This is used together with the link type "Alternate" for user-selectable alternate style sheets.

Start
: Refers to the first document in a collection of documents. This link type tells search engines which document is considered by the author to be the starting point of the collection.

Next
: Refers to the next document in an linear sequence of documents. User agents may choose to preload the "next" document, to reduce the perceived load time.

Prev
: Refers to the previous document in an ordered series of documents. Some user agents also support the synonym *Previous*.

Contents
: Refers to a document serving as a table of contents. Some user agents also support the synonym *ToC* (from "Table of Contents").

Index
: Refers to a document providing an index for the current document.

Glossary
: Refers to a document providing a glossary of terms that pertain to the current document.

Copyright
: Refers to a copyright statement for the current document.

Chapter
: Refers to a document serving as a chapter in a collection of documents.

Section
: Refers to a document serving as a section in a collection of documents.

Subsection
: Refers to a document serving as a subsection in a collection of documents.

Appendix
: Refers to a document serving as an appendix in a collection of documents.

Help
: Refers to a document offering help (more information, links to other sources information, etc.)

Bookmark
: Refers to a bookmark. A bookmark is a link to a key entry point within an extended document. The `title` [p.55] attribute may be used, for example, to label the bookmark. Note that several bookmarks may be defined in each document.

Authors may wish to define additional link types not described in this specification. If they do so, they should use a profile to cite the conventions used to define the link types. Please see the `profile` [p.54] attribute of the `HEAD` [p.54] element for more details.

For further discussions about link types, please consult the section on links in HTML documents [p.137] .

6.13 Media descriptors

The following is a list of recognized media descriptors (%MediaDesc [p.250] in the DTD).

screen
: Intended primarily for non-paged computer screens, but also applicable to printed and projected presentations.

tty
: Intended for media using a fixed-pitch character grid, such as teletypes, terminals, or portable devices with limited display capabilities.

tv
: Intended for television-type devices (low resolution, color, limited scrollability).

projection
: Intended for projectors.

handheld
: Intended for handheld devices (small screen, monochrome, bitmapped graphics, limited bandwidth).

print
: Intended for paged, opaque material and for documents viewed on screen in print preview mode.

braille
: Intended for braille tactile feedback devices.

aural
: Intended for speech synthesizers.

all
: Suitable for all devices.

Future versions of HTML may introduce new values and may allow parameterized values. To facilitate the introduction of these extensions, user agents conforming to this specification must be able to parse the `media` [p.177] attribute value as follows:

1. Comma characters (Unicode decimal 44) are used to break the `media` [p.177] attribute value into a list of entries, e.g.:

   ```
   media="screen, 3d-glasses, print and resolution > 90dpi"
   ```

   is mapped to:

   ```
   "screen"
   "3d-glasses"
   "print and resolution > 90dpi"
   ```

2. Each entry is truncated just before the first character that isn't a US ASCII letter [a-zA-Z] (Unicode decimal 65-90, 97-122), digit [0-9] (Unicode hex 30-39), or hyphen (45). In the example, this gives:

   ```
   "screen"
   "3d-glasses"
   "print"
   ```

3. A case-sensitive match is then made with the set of media types defined above. User agents may ignore entries that don't match. In the example we are left with `screen` and `print`.

Note. *Style sheets may include media-dependent variations within them (e.g., the CSS* @media *construct). In such cases it may be appropriate to use "`media` [p.177] =all".*

6.14 Script data

The content of the `SCRIPT` [p.236] element and the value of intrinsic event attributes is script data (indicated by %Script; [p.251] in the DTD [p.249]). As such, this data must not be evaluated by the user agent as HTML markup. The user agent must pass it on as data to a script engine. The case-sensitivity of script data depends on the scripting language.

HTML parsers must be able to recognize script data as beginning immediately after the start tag and ending as soon as the ETAGO ("</") delimiters are followed by a name character ([a-zA-Z]). The script data does not necessarily end with the </SCRIPT> end tag, but is terminated by any "</" followed by a name character.

Consequently, any HTML markup that is meant to be sent to a script engine (which may do whatever it wants with the markup) must be "escaped" so as not to confuse the HTML parser. Designers of each scripting language should recommend language-specific support for resolving this issue.

ILLEGAL EXAMPLE:
The following code is invalid due the to presence of the "</" characters found, as part of "</EM>", inside the `SCRIPT` [p.236] element:

```
<SCRIPT type="text/javascript">
  document.write ("<EM>This won't work</EM>")
</SCRIPT>
```

A conforming parser must treat the "</" characters as the end of script data, which is clearly not what the author intended.

In JavaScript, this code can be expressed legally by ensuring that the apparent ETAGO delimiter does not appear immediately before an SGML name start character:

```
<SCRIPT type="text/javascript">
  document.write ("<EM>This will work<\/EM>")
</SCRIPT>
```

In Tcl, one may accomplish this as follows:

```
<SCRIPT type="text/tcl">
  document write "<EM>This will work<\/EM>"
</SCRIPT>
```

In VBScript, the problem may be avoided with the `Chr()` function:

```
"<EM>This will work<" & Chr(47) & "EM>"
```

6.15 Frame target names

Except for the reserved names listed below, frame target names (%FrameTarget; [p.251] in the DTD) must begin with an alphabetic character (a-zA-Z). User agents should ignore all other target names.

The following target names are reserved and have special meanings.

`_blank`
: The user agent should load the designated document in a new, unnamed window.

`_self`
: The user agent should load the document in the same frame as the element that refers to this target.

`_parent`
: The user agent should load the document into the immediate `FRAMESET` [p.196] parent of the current frame. This value is equivalent to `_self` if the current frame has no parent.

`_top`
: The user agent should load the document into the full, original window (thus cancelling all other frames). This value is equivalent to `_self` if the current frame has no parent.

6.15 Frame target names

7 The global structure of an HTML document

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7.1 Introduction to the structure of an HTML document

An HTML 4.0 document is composed of three parts:

1. a line containing HTML version information [p.52] ,
2. a declarative header section (delimited by the HEAD [p.54] element),
3. a body, which contains the document's actual content. The body may be implemented by the BODY [p.61] element or the FRAMESET [p.196] element.

White space (spaces, newlines, tabs, and comments) may appear before or after each section. Sections 2 and 3 should be delimited by the HTML [p.53] element.

Here's an example of a simple HTML document:

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0//EN">
<HTML>
   <HEAD>
      <TITLE>My first HTML document</TITLE>
   </HEAD>
   <BODY>
      <P>Hello world!
   </BODY>
</HTML>
```

7.2 HTML version information

The first part of a valid HTML 4.0 document specifies which version of HTML 4.0 is used in the document. The *document type declaration* names the DTD used by the document (see [GOLD90] [p.321]).

HTML 4.0 specifies three DTDs, so authors must include one of the following document type declarations in their documents. The DTDs vary in the elements they support.

- The HTML 4.0 Strict DTD [p.249] includes all elements and attributes that have not been deprecated. For documents represented by this DTD, use this document type declaration:

  ```
  <!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0//EN"
  "http://www.w3.org/TR/PR-html40/strict.dtd">
  ```

- The HTML 4.0 Transitional DTD [p.285] includes everything in the strict DTD plus deprecated elements and attributes (most of which concern visual presentation). For documents represented by this DTD, use this document type declaration:

  ```
  <!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN"
  "http://www.w3.org/TR/PR-html40/loose.dtd">
  ```

- The HTML 4.0 Frameset DTD [p.265] includes everything in the loose DTD plus frames as well. For documents represented by this DTD, use this document type declaration:

  ```
  <!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Frameset//EN"
  "http://www.w3.org/TR/PR-html40/frameset.dtd">
  ```

The URL in each document type declaration allows user agents to download the DTD and any entity sets [p.287] that are needed. The following URLs refer to DTDs and entity sets for HTML 4.0 that W3C supports:

- "http://www.w3.org/TR/PR-html40/strict.dtd" -- default strict DTD
- "http://www.w3.org/TR/PR-html40/loose.dtd" -- loose DTD
- "http://www.w3.org/TR/PR-html40/frameset.dtd" -- DTD for frameset documents
- "http://www.w3.org/TR/PR-html40/HTMLlat1.ent" -- Latin-1 entities
- "http://www.w3.org/TR/PR-html40/HTMLsymbol.ent" -- Symbol entities
- "http://www.w3.org/TR/PR-html40/HTMLspecial.ent" -- Special entities

The binding between public identifiers and files can be specified using a catalog file following the format recommended by the SGML Open Consortium (see [SGMLOPEN] [p.322]). A sample catalog file for HTML 4.0 is included at the beginning of the section on SGML reference information for HTML. The last two letters of the declaration indicate the language of the DTD. For HTML, this is always English ("EN").

SGML provides a way to extend the DTD using the <!DOCTYPE> element, for instance to add a new set of entity definitions, or to set entities controlling the use of marked sections. Authors must not use this feature with HTML due to the lack of widespread support.
ILLEGAL EXAMPLE:

The following is illegal in HTML:

```
<!DOCTYPE html PUBLIC "-//W3C//DTD HTML 4.0//EN" [
<!ENTITY % AcmeCorpSymbols SYSTEM
   "-//Acme Corp//ENTITIES Corporate Symbols//EN">
%AcmeCorpSymbols;
]>
```

7.3 The `HTML` element

```
<!ENTITY % version "version CDATA #FIXED '%HTML.Version;'">

<![ %HTML.Frameset; [
<!ENTITY % html.content "HEAD, FRAMESET">
]]>

<!ENTITY % html.content "HEAD, BODY">

<!ELEMENT HTML O O (%html.content;) -- document root element -->
<!ATTLIST HTML
  %version;
  %i18n;                          -- lang, dir --
  >
```

Start tag: ***optional****, End tag:* ***optional***

Attribute definitions

`version` = *cdata* [CN]
: **Deprecated.** The value of this attribute specifies which HTML DTD version governs the current document. This attribute has been deprecated because it is redundant with version information [p.52] provided by the document type declaration.

Attributes defined elsewhere

- `lang` [p.71] (language information [p.71]), `dir` [p.74] (text direction [p.73])

After document type declaration, the remainder of an HTML document is contained by the `HTML` [p.53] element. Thus, a typical HTML document has this structure:

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0//EN"
"http://www.w3.org/TR/PR-html40/strict.dtd">
<HTML>
...The head, body, etc. goes here...
</HTML>
```

7.4 The document head

7.4.1 HEAD element

```
<!-- %head.misc; defined earlier on as "SCRIPT | STYLE | META | LINK" -->
<!ENTITY % head.content "TITLE & ISINDEX? & BASE?">

<!ELEMENT HEAD O O (%head.content;) +(%head.misc;) -- document head -->
<!ATTLIST HEAD
  %i18n;                           -- lang, dir --
  profile     %URL;      #IMPLIED  -- named dictionary of meta info --
  >
```

Start tag: ***optional****, End tag:* ***optional***

Attribute definitions

`profile` = *url* [CT]
: This attribute specifies the location of one or more meta data profiles, separated by white space. For future extensions, user agents should consider the value to be a list even though this specification only considers the first URL to be significant. Profiles [p.60] are discussed below in the section on meta data [p.56] .

Attributes defined elsewhere

- `lang` [p.71] (language information [p.71]), `dir` [p.74] (text direction [p.73])

The `HEAD` [p.54] element contains information about the current document, such as its title, keywords that may be useful to search engines, and other data that is not considered document content. Elements within the `HEAD` [p.54] declaration must not be rendered by conforming user agents unless otherwise specified.

7.4.2 The TITLE element

```
<!-- The TITLE element is not considered part of the flow of text.
       It should be displayed, for example as the page header or
       window title. Exactly one title is required per document.
    -->
<!ELEMENT TITLE - - (#PCDATA) -(%head.misc;) -- document title -->
<!ATTLIST TITLE %i18n>
```

Start tag: ***required****, End tag:* ***required***

Attributes defined elsewhere

- `lang` [p.71] (language information [p.71]), `dir` [p.74] (text direction [p.73])

Every HTML document **must** have a `TITLE` [p.54] element in the `HEAD` [p.54] section.

Authors should use the `TITLE` [p.54] element to identify the contents of a document. Since users often consult documents out of context, authors should provide context-rich titles. Thus, instead of a title such as "Introduction", which doesn't provide much contextual background, authors should supply a title such as "Introduction to Medieval Bee-Keeping" instead.

For reasons of accessibility, user agents must always make the content of the TITLE [p.54] element available to users (including TITLE [p.54] elements that occur in frames). The mechanism for doing so depends on the user agent (e.g., as a caption, spoken).

Titles may contain character entities [p.287] (for accented characters, special characters, etc.), but may not contain other markup. Here is a sample document title:

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0//EN">
<HTML>
<HEAD>
<TITLE>A study of population dynamics</TITLE>
... other head elements...
</HEAD>
<BODY>
... document body...
</BODY>
</HTML>
```

7.4.3 The `title` attribute

Attribute definitions

`title` = *text* [CS]
This attribute offers advisory information about the element for which it is set.

Unlike the TITLE [p.54] element, which provides information about an entire document and may only appear once, the `title` [p.55] attribute may annotate any number of elements. Please consult an element's definition to verify that it supports this attribute. Values of the `title` [p.55] attribute may be rendered by user agents in a variety of ways. For instance, visual browsers frequently display the title as a "tool tip" (a short message that appears when the pointing device pauses over an object). Audio user agents may speak the title information in a similar context. For example, setting the attribute on a link allows user agents (visual and non-visual) to tell users about the nature of the linked resource:

```
...some text...
Here's a photo of
<A href="http://someplace.com/neatstuff.gif" title="Me scuba diving">
   me scuba diving last summer
</A>
...some more text...
```

The `title` [p.55] attribute has an additional role when used with the LINK [p.145] element to designate an external style sheet. [p.181] Please consult the section on links and style sheets [p.147] for details.

Note: To improve the quality of speech synthesis for cases handled poorly by standard techniques, future versions of HTML may include an attribute for encoding phonemic and prosodic information.

7.4.4 Meta data

As this specification is being written, work is underway that will allow authors to assign richer machine-readable information about HTML documents and other network-accessible resources. The W3C Resource Description Language (see [RDF] [p.321]) is being developed as a common framework for meta data.

HTML lets authors specify meta data -- information about a document rather than document content -- in a variety of ways.

For example, to specify the author of a document, one may use the `META` [p.56] element as follows:

```
<META name="Author" content="Dave Raggett">
```

The `META` [p.56] element specifies a property (here "Author") and assigns a value to it (here "Dave Raggett").

This specification does not define a set of legal meta data properties. The meaning of a property and the set of legal values for that property should be defined in a reference lexicon called profile [p.60] . For example, a profile designed to help search engines index documents might define properties such as "author", "copyright", "keywords", etc.

Specifying meta data

In general, specifying meta data involves two steps:

1. Declaring a property and a value for that property. This may be done in two ways:
    1. From within a document, via the `META` [p.56] element.
    2. From outside a document, by linking to meta data via the `LINK` [p.145] element (see the section on link types).
2. Referring to a profile [p.60] where the property and its legal values are defined. To designate a profile, use the `profile` [p.54] attribute of the `HEAD` [p.54] element.

Note that since a profile is defined for the `HEAD` [p.54] element, the same profile applies to all `META` [p.56] and `LINK` [p.145] elements in the document head.

User agents are not required to support meta data mechanisms. For those that choose to support meta data, this specification does not define how meta data should be interpreted.

The `META` element

```
<!ELEMENT META - O EMPTY        -- generic metainformation -->
<!ATTLIST META
  %i18n;                           -- lang, dir, for use with content string --
  http-equiv  NAME       #IMPLIED  -- HTTP response header name  --
  name        NAME       #IMPLIED  -- metainformation name --
  content     CDATA      #REQUIRED -- associated information --
  scheme      CDATA      #IMPLIED  -- select form of content --
  >
```

Start tag: ***required****, End tag:* ***forbidden***

Attribute definitions

For the following attributes, the permitted values and their interpretation are `profile` [p.54] dependent:

`name` = *name* [CS]
: This attribute identifies a property name. This specification does not list legal values for this attribute.

`content` = *cdata* [CS]
: This attribute specifies a property's value. This specification does not list legal values for this attribute.

`scheme` = *cdata* [CS]
: This attribute names a scheme to be used to interpret the property's value (see the section on profiles [p.60] for details).

`http-equiv` = *name* [CI]
: This attribute may be used in place of the `name` attribute. HTTP servers use this attribute to gather information for HTTP response message headers.

Attributes defined elsewhere

- `lang` [p.71] (language information [p.71]), `dir` [p.74] (text direction [p.73])

The `META` [p.56] element can be used to identify properties of a document (e.g., author, expiration date, a list of key words, etc.) and assign values to those properties. This specification does not define a normative set of properties.

Each `META` [p.56] element specifies a property/value pair. The `name` attribute identifies the property and the `content` [p.57] attribute specifies the property's value.

For example, the following declaration sets a value for the `Author` property:

```
<META name="Author" content="Dave Raggett">
```

The `lang` [p.71] attribute can be used with `META` [p.56] to specify the language for the value of the `content` [p.57] attribute. This enables speech synthesizers to apply language dependent pronunciation rules.

In this example, the author's name is declared to be French:

```
<META name="Author" lang="fr" content="Arnaud Le Hors">
```

Note. *The `META` [p.56] element is a generic mechanism for specifying meta data. However, some HTML elements and attributes already handle certain pieces of meta data and may be used by authors instead of `META` [p.56] to specify those pieces: the `TITLE` [p.54] element, the `ADDRESS` [p.68] element, the `INS` [p.91] and `DEL` [p.91] elements, the `title` [p.55] attribute, and the `cite` [p.91] attribute.*

Note. *When a property specified by a* `META` *[p.56] element takes a value that is a URL, some authors prefer to specify the meta data via the* `LINK` *[p.145] element. Thus, the following meta data declaration:*

```
<META name="DC.identifier"
      content="ftp://ds.internic.net/rfc/rfc1866.txt">
```

might also be written:

```
<LINK rel="DC.identifier"
         type="text/plain"
         href="ftp://ds.internic.net/rfc/rfc1866.txt">
```

`META` and HTTP headers

The `http-equiv` [p.57] attribute can be used in place of the `name` attribute and has a special significance when documents are retrieved via the Hypertext Transfer Protocol (HTTP). HTTP servers may use the property name specified by the `http-equiv` [p.57] attribute to create an [RFC822] [p.322] -style header in the HTTP response. Please see the HTTP specification ([RFC2068] [p.320]) for details on valid HTTP headers.

The following sample `META` [p.56] declaration:

```
<META http-equiv="Expires" content="Tue, 20 Aug 1996 14:25:27 GMT">
```

will result in the HTTP header:

```
Expires: Tue, 20 Aug 1996 14:25:27 GMT
```

This can be used by caches to determine when to fetch a fresh copy of the associated document.

Some user agents support the use of `META` [p.56] to refresh the current page after a specified number of seconds, with the option of replacing it by a different URL.

```
<META http-equiv="refresh" content="3,http://www.acme.com/intro.html">
```

The content is a number specifying the delay in seconds, followed by the URL to load when the time is up. This mechanism is generally used to show users a fleeting introductory page. However, since some user agents do not support this mechanism, authors should include content on the introductory page to allow users to navigate away from it (so they don’t remain "stranded" on the introductory page).

`META` and search engines

A common use for `META` [p.56] is to specify keywords that a search engine may use to improve the quality of search results. When several `META` [p.56] elements provide language-dependent information about a document, search engines may filter on the `lang` [p.71] attribute to display search results using the language preferences of the user. For example,

```
<-- For speakers of US English -->
<META name="keywords" lang="en-us"
         content="vacation, Greece, sunshine">
<-- For speakers of British English -->
<META name="keywords" lang="en"
         content="holiday, Greece, sunshine">
<-- For speakers of French -->
<META name="keywords" lang="fr"
         content="vacances, Gr&egrave;ce, soleil">
```

The effectiveness of search engines can also be increased by using the LINK [p.145] element to specify links to translations of the document in other languages, links to versions of the document in other media (e.g., PDF), and, when the document is part of a collection, links to an appropriate starting point for browsing the collection.

Further help is provided in the section on helping search engines index your Web site [p.306] .

META and PICS

The Platform for Internet Content Selection [PICS] [p.321] is an infrastructure for associating labels (meta data) with Internet content. Originally designed to help parents and teachers control what children can access on the Internet, it also facilitates other uses for labels, including code signing, privacy, and intellectual property rights management.

This example illustrates how one can use a META [p.56] declaration to include a PICS 1.1 label:

```
<HEAD>
 <META http-equiv="PICS-Label" content='
 (PICS-1.1 "http://www.gcf.org/v2.5"
    labels on "1994.11.05T08:15-0500"
      until "1995.12.31T23:59-0000"
      for "http://w3.org/PICS/Overview.html"
    ratings (suds 0.5 density 0 color/hue 1))
 '>
  <TITLE>... document title ...</TITLE>
</HEAD>
```

META and default information

The META [p.56] element may be used to specify the default information for a document in the following instances:

- The default scripting language.
- The default style sheet language [p.175] .
- The document character encoding.

The following example specifies the character encoding for a document as being ISO-8859-5

```
<META http-equiv="Content-Type" content="text/html; charset=ISO-8859-5">
```

Meta data profiles

The `profile` [p.54] attribute of the `HEAD` [p.54] specifies the location of a meta data profile. The value of the `profile` [p.54] attribute is a URL. User agents may use this URL in two ways:

- As a globally unique name. User agents may be able to recognize the name (without actually retrieving the profile) and perform some activity based on known conventions for that profile. For instance, search engines could provide an interface for searching through catalogs of HTML documents, where these documents all use the same profile for representing catalog entries.
- As a link. User agents may dereference the URL and, perform some activity based on the actual definitions within the profile (e.g., authorize the usage of the profile within the current HTML document). This specification does not define formats for profiles.

This example refers to a hypothetical profile that defines useful properties for document indexing. The properties defined by this profile -- including "author", "copyright", "keywords", and "date" -- have their values set by subsequent `META` [p.56] declarations.

```
<HEAD profile="http://www.acme.com/profiles/core">
 <TITLE>How to complete Memorandum cover sheets</TITLE>
 <META name="author" content="John Doe">
 <META name="copyright" content="&copy; 1997 Acme Corp.">
 <META name="keywords" content="corporate,guidelines,cataloging">
 <META name="date" content="1994-11-06T08:49:37+00:00">
</HEAD>
```

As this specification is being written, it is common practice to use the date formats described in [RFC2068] [p.320] . As these formats are relatively hard to process, we recommend that authors use the [ISO8601] [p.319] date format. For more information, see the sections on the `INS` [p.91] and `DEL` [p.91] elements.

The `scheme` [p.57] attribute allows authors to provide user agents more context for the correct interpretation of meta data. At times, such additional information may be critical, as when meta data may be specified in different formats. For example, an author might specify a date in the (ambiguous) format "10-9-97"; does this mean 9 October 1997 or 10 September 1997? The `scheme` [p.57] attribute value "Month-Date-Year" would disambiguate this date value.

At other times, the `scheme` [p.57] attribute may provide helpful but non-critical information to user agents.

For example, the following `scheme` [p.57] declaration may help a user agent determine that the value of the "identifier" property is an ISBN code number:

```
<META scheme="ISBN"  name="identifier" content="0-8230-2355-9">
```

Values for the `scheme` [p.57] attribute depend on the property `name` and the associated `profile` [p.54] .

Note: One sample profile is the Dublin Core[DCORE] [p.321] . This profile defines a set of recommended properties for electronic bibliographic descriptions, and is intended to promote interoperability among disparate description models.

7.5 The document body

7.5.1 The BODY element

```
<!ELEMENT BODY O O (%flow;)* +(INS|DEL) -- document body -->
<!ATTLIST BODY
  %attrs;                          -- %coreattrs, %i18n, %events --
  background  %URL;      #IMPLIED  -- texture tile for document background --
  %bodycolors;                     -- bgcolor, text, link, vlink, alink --
  onload      %Script;   #IMPLIED  -- the document has been loaded --
  onunload    %Script;   #IMPLIED  -- the document has been removed --
  >
```

Start tag: ***optional****, End tag:* ***optional***

Attribute definitions

`background` = *url* [CT]
: **Deprecated.**The value of this attribute is a URL that designates an image resource. The image generally tiles the background (for visual browsers).

`text` = *color* [CI]
: **Deprecated.**This attribute sets the foreground color for text (for visual browsers).

`link` = *color* [CI]
: **Deprecated.**This attribute sets the color of text marking unvisited hypertext links (for visual browsers).

`vlink` = *color* [CI]
: **Deprecated.**This attribute sets the color of text marking visited hypertext links (for visual browsers).

`alink` = *color* [CI]
: **Deprecated.**This attribute sets the color of text marking hypertext links when selected by the user (for visual browsers).

Attributes defined elsewhere

- `id` [p.63] , `class` [p.63] (document-wide identifiers)
- `lang` [p.71] (language information [p.71]), `dir` [p.74] (text direction [p.73])
- `title` [p.55] (element titles)
- `style` [p.176] (inline style information [p.176])
- `bgcolor` [p.185] (background color [p.185])
- `onload` [p.238] , `onunload` [p.238] (intrinsic events [p.238])
- `onclick` [p.238] , `ondblclick` [p.238] , `onmousedown` [p.238] , `onmouseup` [p.239] , `onmouseover` [p.239] , `onmousemove` [p.239] , `onmouseout` [p.239] , `onkeypress` [p.239] , `onkeydown` [p.239] , `onkeyup` [p.239] (intrinsic events [p.238])

The body of a document contains the document's content. The content may be presented by a user agent in a variety of ways. For example, for visual browsers, you can think of the body as a canvas where the content appears: text, images, colors, graphics, etc. For audio user agents, the same content may be spoken. Since style sheets are now the preferred way to specify a document's presentation, the presentational attributes of `BODY` [p.61] have been deprecated.

The following HTML fragment illustrates the use of the deprecated attributes. It sets the background color of the canvas to white, the text foreground color to black, and the color of hyperlinks to red initially, fuchsia when activated, and maroon once visited.

DEPRECATED EXAMPLE:

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN">
<HTML>
<HEAD>
 <TITLE>A study of population dynamics</TITLE>
</HEAD>
<BODY bgcolor="white" text="black"
  link="red" alink="fuchsia" vlink="maroon">
  ... document body...
</BODY>
</HTML>
```

Using style sheets, the same effect could be accomplished as follows:

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0//EN">
<HTML>
<HEAD>
 <TITLE>A study of population dynamics</TITLE>
 <STYLE type="text/css">
  BODY { background: white; color: black}
  A:link { color: red }
  A:visited { color: maroon }
  A:active { color: fuchsia }
 </STYLE>
</HEAD>
<BODY>
  ... document body...
</BODY>
</HTML>
```

Using external (linked) style sheets gives you the flexibility to change the presentation without revising the source HTML document:

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0//EN">
<HTML>
<HEAD>
 <TITLE>A study of population dynamics</TITLE>
 <LINK rel="stylesheet" type="text/css" href="smartstyle.css">
</HEAD>
<BODY>
  ... document body...
</BODY>
</HTML>
```

Framesets and HTML bodies. *Documents that contain framesets replace the* `BODY` *[p.61] element by the* `FRAMESET` *[p.196] element. Please consult the section on frames [p.195] for more information.*

7.5.2 Element identifiers: the `id` and `class` attributes

Attribute definitions

`id` = *name* [CS]
: This attribute assigns a name to an element. This name must be unique in a document.

`class` = *cdata-list* [CS]
: This attribute assigns a class name or set of class names to an element. Any number of elements may be assigned the same class name or names. Multiple class names must be separated by white space characters.

The `id` [p.63] attribute assigns a unique identifier to an element (which may be verified by an SGML parser). For example, the following paragraphs are distinguished by their `id` [p.63] values:

```
<P id="myparagraph"> This is a uniquely named paragraph.</P>
<P id="yourparagraph"> This is also a uniquely named paragraph.</P>
```

The `id` [p.63] attribute has several roles in HTML:

- As a style sheet [p.173] selector.
- As a target anchor [p.137] for hypertext links.
- As a means to reference a particular element from a script [p.238] .
- As the name of a declared `OBJECT` [p.154] element.
- For general purpose processing by user agents (e.g. for identifying fields when extracting data from HTML pages into a database, translating HTML documents into other formats, etc.).

The `class` [p.63] attribute, on the other hand, assigns one or more class names to an element; the element may be said to belong to these classes. A class name may be shared by several element instances. The `class` [p.63] attribute has several roles in HTML:

- As a style sheet [p.173] selector (when an author wishes to assign style information to a set of elements).
- For general purpose processing by user agents.

In the following example, the `SPAN` [p.65] element is used in conjunction with the `id` [p.63] and `class` [p.63] attributes to markup document messages. Messages appear in both English and French versions.

```
<!-- English messages -->
<P><SPAN id="msg1" class="info" lang="en">Variable declared twice</SPAN>
<P><SPAN id="msg2" class="warning" lang="en">Undeclared variable</SPAN>
<P><SPAN id="msg3" class="error" lang="en">Bad syntax for variable name</SPAN>

<!-- French messages -->
<P><SPAN id="msg1" class="info" lang="fr">Variable d&eacute;clar&eacute; deux fois</SPAN>
<P><SPAN id="msg2" class="warning" lang="fr">Variable ind&eacute;finie</SPAN>
<P><SPAN id="msg3" class="error" lang="fr">Erreur de syntaxe pour variable</SPAN>
```

The following CSS style rules would tell visual user agents to display informational messages in green, warning messages in yellow, and error messages in red:

```
SPAN.info    { color: green }
SPAN.warning { color: yellow }
SPAN.error   { color: red }
```

Note that the French "msg1" and the English "msg1" may not appear in the same document since they share the same `id` [p.63] value. Authors may make further use of the `id` [p.63] attribute to refine the presentation of individual messages, make them target anchors, etc.

Almost every HTML element may be assigned identifier and class information.

Suppose, for example, that we are writing a document about a programming language. The document is to include a number of preformatted examples. We use the `PRE` [p.88] element to format the examples. We also assign a background color (green) to all instances of the `PRE` [p.88] element belonging to the class "example".

```
<HEAD>
<TITLE>... document title ...</TITLE>
<STYLE type="text/css">
PRE.example { background : green }
</STYLE>
</HEAD>
<BODY>
<PRE class="example" id="example-1">
...example code here...
</PRE>
</BODY>
```

By setting the `id` [p.63] attribute for this example, we can (1) create a hyperlink to it and (2) override class style information with instance style information.

Note.*The `id` [p.63] attribute shares the same name space as the `name` attribute for the `A` [p.141] element. Please consult the section on anchors with `id` [p.144] for more information.*

7.5.3 Block-level and inline elements

Certain HTML elements that may appear in `BODY` [p.61] are said to be "block-level" while others are "inline" (also known as "text level"). The distinction is founded on several notions:

Content model
: Generally, block-level elements may contain inline elements and other block-level elements. Generally, inline elements may contain only data and other inline elements. Inherent in this structural distinction is the idea that block elements create "larger" structures than inline elements.

Formatting
: By default, block-level elements are formatted differently than inline elements. Generally, block-level elements begin on new lines, inline elements do not. Block-level elements will close an unterminated paragraph element. This enables you to omit end-tags for paragraphs in many cases.

Directionality

For technical reasons involving the [UNICODE] [p.321] bidirectional text algorithm, block-level and inline elements differ in how they inherit directionality information. For details, see the section on inheritance of text direction [p.75] .

Style sheets [p.173] provide the means to specify the rendering of arbitrary elements, including whether an element is rendered as block or inline. In some cases, such as an inline style for list elements, this may be appropriate, but generally speaking, authors are discouraged from overriding the conventional interpretation of HTML elements in this way.

The alteration of the traditional presentation idioms for block level and inline elements also has an impact on the bidirectional text algorithm. See the section on the effect of style sheets on bidirectionality [p.79] for more information.

7.5.4 Grouping elements: the `DIV` and `SPAN` elements

```
<!ELEMENT DIV - - (%flow;)* -- generic language/style container -->
<!ATTLIST DIV
  %attrs;                         -- %coreattrs, %i18n, %events --
  charset     %Charset;   #IMPLIED -- char encoding of linked resource --
  type      %ContentType; #IMPLIED -- advisory content type --
  href        %URL;       #IMPLIED -- URL for linked resource --
  hreflang %LanguageCode; #IMPLIED -- language code --
  target   %FrameTarget;  #IMPLIED -- render in this frame --
  rel         %LinkTypes; #IMPLIED -- forward link types --
  rev         %LinkTypes; #IMPLIED -- reverse link types --
  media       %MediaDesc; #IMPLIED -- for rendering on these media --
  %align;                         -- align, text alignment --
  >
<!ELEMENT SPAN - - (%inline;)*     -- generic language/style container -->
<!ATTLIST SPAN
  %attrs;                         -- %coreattrs, %i18n, %events --
  charset     %Charset;   #IMPLIED -- char encoding of linked resource --
  type      %ContentType; #IMPLIED -- advisory content type --
  href        %URL;       #IMPLIED -- URL for linked resource --
  hreflang %LanguageCode; #IMPLIED -- language code --
  target   %FrameTarget;  #IMPLIED -- render in this frame --
  rel         %LinkTypes; #IMPLIED -- forward link types --
  rev         %LinkTypes; #IMPLIED -- reverse link types --
  media       %MediaDesc; #IMPLIED -- for rendering on these media --
  >
```

Start tag: ***required****, End tag:* ***required***

Attribute definitions

`href` = *url* [CT]

This attribute specifies a resource that provides more information about the content of the `DIV` [p.65] or `SPAN` [p.65] element.

Attributes defined elsewhere

- id [p.63] , class [p.63] (document-wide identifiers)
- lang [p.71] (language information [p.71]), dir [p.74] (text direction [p.73])
- title [p.55] (element titles)
- style [p.176] (inline style information [p.176])
- hreflang [p.141] , type [p.141] , rel [p.141] , rev [p.141] , and media [p.177] (Links and anchors [p.137])
- target [p.201] (target frame information [p.201])
- align [p.185] (alignment [p.185])
- onclick [p.238] , ondblclick [p.238] , onmousedown [p.238] , onmouseup [p.239] , onmouseover [p.239] , onmousemove [p.239] , onmouseout [p.239] , onkeypress [p.239] , onkeydown [p.239] , onkeyup [p.239] (intrinsic events [p.238])

The DIV [p.65] and SPAN [p.65] elements, in conjunction with the id [p.63] and class [p.63] attributes, offer a generic mechanism for adding structure to documents. These elements define content to be inline (SPAN [p.65]) or block-level (DIV [p.65]) but impose no other presentational idioms on the content. Thus, authors may use these elements in conjunction with style sheets [p.173] , the lang [p.71] attribute, etc., to tailor HTML to their own needs and tastes.

Suppose, for example, that we wanted to generate an HTML document based on a database of client information. Since HTML does not include elements that identify objects such as "client", "telephone number", "email address", etc., we use DIV [p.65] and SPAN [p.65] to achieve the desired structural and presentational effects. We might use the TABLE [p.105] element as follows to structure the information:

```
<!-- Example of data from the client database: -->
<!-- Name: Stephane Boyera, Tel: (212) 555-1212, Email: sb@foo.org -->

<DIV id="client-boyera" class="client">
<P><SPAN class="client-title">Client information:</SPAN>
<TABLE class="client-data">
<TR><TH>Last name:<TD>Boyera</TR>
<TR><TH>First name:<TD>Stephane</TR>
<TR><TH>Tel:<TD>(212) 555-1212</TR>
<TR><TH>Email:<TD>sb@foo.org</TR>
</TABLE>
</DIV>

<DIV id="client-lafon" class="client">
<P><SPAN class="client-title">Client information:</SPAN>
<TABLE class="client-data">
<TR><TH>Last name:<TD>Lafon</TR>
<TR><TH>First name:<TD>Yves</TR>
<TR><TH>Tel:<TD>(617) 555-1212</TR>
<TR><TH>Email:<TD>yves@coucou.com</TR>
</TABLE>
</DIV>
```

Later, we may easily add style sheet declaration to fine tune the presentation of these database entries.

For another example of usage, please consult the example in the section on the `class` and `id` attributes [p.63] .

Note that since `DIV` [p.65] is a block-level element, authors must use it to group other block-level elements. A `DIV` [p.65] element following an unclosed `P` [p.86] element terminates that paragraph.

Visual user agents generally place a line break before and after `DIV` [p.65] elements, for instance:

```
<P>aaaaaaaaa<DIV>bbbbbbbbb</DIV><DIV>ccccc<P>ccccc</DIV>
```

This is typically rendered as:

```
aaaaaaaaa
bbbbbbbbb
ccccc

ccccc
```

Your user agent renders this as follows:

aaaaaaaaa
bbbbbbbbb
ccccc

ccccc

7.5.5 Headings: The `H1`, `H2`, `H3`, `H4`, `H5`, `H6` elements

```
<!ENTITY % heading "H1|H2|H3|H4|H5|H6">
<!--
  There are six levels of headings from H1 (the most important)
  to H6 (the least important).
-->

<!ELEMENT (%heading;)  - - (%inline;)* -- heading -->
<!ATTLIST (%heading;)
  %attrs;                         -- %coreattrs, %i18n, %events --
  %align;                         -- align, text alignment --
  >
```

Start tag: ***required****, End tag:* ***required***

Attributes defined elsewhere

- `id` [p.63] , `class` [p.63] (document-wide identifiers)
- `lang` [p.71] (language information [p.71]), `dir` [p.74] (text direction [p.73])
- `title` [p.55] (element titles)
- `style` [p.176] (inline style information [p.176])
- `align` [p.185] (alignment [p.185])

- onclick [p.238] , ondblclick [p.238] , onmousedown [p.238] , onmouseup [p.239] , onmouseover [p.239] , onmousemove [p.239] , onmouseout [p.239] , onkeypress [p.239] , onkeydown [p.239] , onkeyup [p.239] (intrinsic events [p.238])

A heading element briefly describes the topic of the section it introduces. Heading information may be used by user agents, for example, to construct a table of contents for a document automatically.

There are six levels of headings in HTML with H1 [p.67] as the most important and H6 [p.67] as the least. Visual browsers usually render more important headings in larger fonts than less important ones.

The following example shows how to use the DIV [p.65] element to associate a heading with the document section that follows it. Doing so allows you to define a style for the section (color the background, set the font, etc.) with style sheets.

```
<DIV class="section" id="forest-elephants" >
<H1>Forest elephants</H1>
<P>In this section, we discuss the lesser known forest elephants.
...this section continues...
<DIV class="subsection" id="forest-habitat" >
<H2>Habitat</H2>
<P>Forest elephants do not live in trees but among them.
...this subsection continues...
</DIV>
</DIV>
```

This structure may be decorated with style information such as:

```
<HEAD>
<TITLE>... document title ...</TITLE>
<STYLE type="text/css">
DIV.section { text-align: justify; font-size: 12pt}
DIV.subsection { text-indent: 2em }
H1 { font-style: italic; color: green }
H2 { color: green }
</STYLE>
</HEAD>
```

Numbered sections and references
HTML does not itself cause section numbers to be generated from headings. This facility may be offered by user agents, however. Soon, style sheet languages such as CSS will allow authors to control the generation of section numbers (handy for forward references in printed documents, as in "See section 7.2").

Some people consider skipping heading levels to be bad practice. They accept H1 H2 H1 while they do not accept H1 H3 H1 since the heading level H2 is skipped.

7.5.6 The ADDRESS element

```
<!ELEMENT ADDRESS - - ((%inline;) | P)* -- information on author -->
<!ATTLIST ADDRESS
  %attrs;                          -- %coreattrs, %i18n, %events --
  >
```

Start tag: ***required****, End tag:* ***required***

Attributes defined elsewhere

- `id` [p.63] , `class` [p.63] (document-wide identifiers)
- `lang` [p.71] (language information [p.71]), `dir` [p.74] (text direction [p.73])
- `onclick` [p.238] , `ondblclick` [p.238] , `onmousedown` [p.238] , `onmouseup` [p.239] , `onmouseover` [p.239] , `onmousemove` [p.239] , `onmouseout` [p.239] , `onkeypress` [p.239] , `onkeydown` [p.239] , `onkeyup` [p.239] (intrinsic events [p.238])

The `ADDRESS` [p.68] element may be used by authors to supply contact information for document or a major part of a document such as a form. This element often appears at the beginning or end of a document.

For example, a page at the W3C Web site related to HTML might include the following contact information:

```
<ADDRESS>
<P><A href="../People/Raggett/">Dave Raggett</A>,
   <A href="../People/Arnaud/">Arnaud Le Hors</A>,
contact persons for the <A href="Activity">W3C HTML Activity</A><BR>
$Date: 2013-05-28 21:38:41 $
</ADDRESS>
```

8 Language information and text direction

Contents

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    1. Language codes [p.72]
    2. Inheritance of language codes [p.72]
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2. Specifying the direction of text and tables: the `dir` attribute [p.73]
    1. Introduction to the bidirectional algorithm [p.74]
    2. Inheritance of text direction information [p.75]
    3. Setting the direction of embedded text [p.76]
    4. Overriding the bidirectional algorithm: the `BDO` element [p.76]
    5. Character entities for directionality and joining control [p.78]
    6. The effect of style sheets on bidirectionality [p.79]

This section of the document discusses two important issues that affect the internationalization of HTML: specifying the language (the `lang` [p.71] attribute) and direction (the `dir` [p.74] attribute) of text in a document.

8.1 Specifying the language of content: the `lang` attribute

Attribute definitions

`lang` = *language-code* [CI]
: This attribute specifies the base language of an element's attribute values and text content. The default value of this attribute is unknown.

Language information specified via the `lang` [p.71] attribute may be used by a user agent to control rendering in a variety of ways. Some situations where author-supplied language information may be helpful include:

- Assisting search engines
- Assisting speech synthesizers
- Helping a user agent select glyph variants for high quality typography
- Helping a user agent choose a set of quotation marks
- Helping a user agent make decisions about hyphenation [p.88] , ligatures, and spacing
- Assisting spell checkers and grammar checkers

The `lang` [p.71] attribute specifies the language of element content and attribute values; whether it is relevant for a given attribute depends on the syntax and semantics of the attribute and the operation involved.

The intent of the `lang` [p.71] attribute is to allow user agents to render content more meaningfully based on accepted cultural practice for a given language. This does not imply that user agents should render characters that are atypical for a particular language in less meaningful ways; user agents must make a best attempt to render all characters, regardless of the value specified by "lang".

For instance, if characters from the Greek alphabet appear in the midst of English text:

```
<P><Q lang="en">"Her super-powers were the result of
&gamma;-radiation,</Q> he explained.</P>
```

a user agent (1) should try to render the English content in an appropriate manner (e.g., in its handling the quotation marks) and (2) must make a best attempt to render γ even though it is not an English character.

Please consult the section on undisplayable characters for related information.

8.1.1 Language codes

The `lang` [p.71] attribute's value is a language code that identifies a natural language spoken, written, or otherwise used for the communication of information among people. Computer languages are explicitly excluded from language codes.

[RFC1766] [p.320] defines and explains the language codes that must be used in HTML documents.

Briefly, language codes consist of a primary code and a possibly empty series of subcodes:

```
language-code = primary-code ( "-" subcode )*
```

Here are some sample language codes:

- "en": English
- "en-US": the U.S. version of English.
- "en-cockney": the Cockney version of English.
- "i-navajo": the Navajo language spoken by some Native Americans.
- "x-klingon": The primary tag "x" indicates an experimental language tag

Two-letter primary codes are reserved for [ISO639] [p.319] language abbreviations. Two-letter codes include fr (French), de (German), it (Italian), nl (Dutch), el (Greek), es (Spanish), pt (Portuguese), ar (Arabic), he (Hebrew), ru (Russian), zh (Chinese), ja (Japanese), hi (Hindi), ur (Urdu), and sa (Sanskrit).

Any two-letter subcode is understood to be a [ISO3166] [p.319] country code.

8.1.2 Inheritance of language codes

An element inherits language code information according to the following order of precedence (highest to lowest):

- The `lang` [p.71] attribute set for the element itself.
- The closest parent element that has the `lang` [p.71] attribute set (i.e., the `lang` [p.71] attribute is inherited).
- The HTTP "Content-Language" header (which may be configured in a server). For example:

  ```
  Content-Language: en-cockney
  ```

- User agent default values and user preferences.

In this example, the primary language of the document is French ("fr"). One paragraph is declared to be in Spanish ("es"), after which the primary language returns to French. The following paragraph includes an embedded Japanese ("ja") phrase, after which the primary language returns to French.

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0//EN">
<HTML lang="fr">
<HEAD>
<TITLE>Un document multilingue</TITLE>
</HEAD>
<BODY>
...Interpreted as French...
<P lang="es">...Interpreted as Spanish...
<P>...Interpreted as French again...
<P>...French text interrupted by<EM lang="ja">some
         Japanese</EM>French begins here again...
</BODY>
</HTML>
```

Note. *Table cells may inherit `lang` [p.71] values not from its parent but from the first cell in a span. Please consult the section on alignment inheritance [p.125] for details.*

8.1.3 Interpretation of language codes

In the context of HTML, a language code should be interpreted by user agents as a hierarchy of tokens rather than a single token. When a user agent adjusts rendering according to language information (say, by comparing style sheet language codes and `lang` [p.71] values), it should always favor an exact match, but should also consider matching primary codes to be sufficient. Thus, if the `lang` [p.71] attribute value of "en-US" is set for the `HTML` element, a user agent should prefer style information that matches "en-US" first, then the more general value "en".

Note: Language code hierarchies do not guarantee that all languages with a common prefix will be understood by those fluent in one or more of those languages. They do allow a user to request this commonality when it is true for that user.

8.2 Specifying the direction of text and tables: the `dir` attribute

Attribute definitions

`dir` = `LTR` | `RTL` [CI]
: This attribute specifies the base direction of directionally neutral text (i.e., text that doesn't have inherent directionality as defined in [UNICODE] [p.321]) and the directionality of tables [p.106] . Possible values:
  - `LTR`: Left-to-right text or table.
  - `RTL`: Right-to-left text or table.

In addition to specifying the language of a document with the `lang` [p.71] attribute, authors may need to specify the base directionality (left-to-right or right-to-left) of portions of a document's text, of table structure, etc. This is done with the `dir` [p.74] attribute.

The [UNICODE] [p.321] specification assigns directionality to characters and defines a (complex) algorithm for determining the proper directionality of text. If a document does not contain a displayable right-to-left character, a conforming user agent is not required to apply the [UNICODE] [p.321] bidirectional algorithm. If a document contains right-to-left characters, and if the user agent displays these characters, the user agent must use the bidirectional algorithm.

Although Unicode specifies special characters that deal with text direction, HTML offers higher-level markup constructs that do the same thing: the `dir` [p.74] attribute (do not confuse with the `DIR` [p.101] element) and the `BDO` [p.76] element. Thus, to express a Hebrew quotation, it is more intuitive to write

```
<Q lang="he" dir="rtl">...a Hebrew quotation...</Q>
```

than the equivalent with Unicode references:

```
&#x202B;&#x05F4;...a Hebrew quotation...&#x05F4;&#x202C;
```

User agents must **not** use the `lang` [p.71] attribute to determine text directionality.

The `dir` [p.74] attribute is inherited and may be overridden. Please consult the section on the inheritance of text direction information [p.75] for details.

8.2.1 Introduction to the bidirectional algorithm

The following example illustrates the expected behavior of the bidirectional algorithm. It involves English, a left-to-right script, and Hebrew, a right-to-left script.

Consider the following example text:

```
english1 HEBREW2 english3 HEBREW4 english5 HEBREW6
```

The characters in this example (and in all related examples) are stored in the computer the way they are displayed here: the first character in the file is "e", the second is "n", and the last is "6".

Suppose the predominant language of the document containing this paragraph is English. This means that the base direction is left-to-right. The correct presentation of this line would be:

```
english1 2WERBEH english3 4WERBEH english5 6WERBEH
         <------          <------          <------
            H                H                H
-------------------------------------------------->
                        E
```

The dotted lines indicate the structure of the sentence: English predominates and some Hebrew text is embedded. Achieving the correct presentation requires no additional markup since the Hebrew fragments are reversed correctly by user agents applying the bidirectional algorithm.

If, on the other hand, the predominant language of the document is Hebrew, the base direction is right-to-left. The correct presentation is therefore:

```
6WERBEH english5 4WERBEH english3 2WERBEH english1
        ------->         ------->         ------->
            E                E                E
<--------------------------------------------------
                        H
```

In this case, the whole sentence has been presented as right-to-left and the embedded English sequences have been properly reversed by the bidirectional algorithm.

8.2.2 Inheritance of text direction information

The Unicode bidirectional algorithm requires a base text direction for text blocks. To specify the base direction of a block-level element, set the element's `dir` [p.74] attribute. The default value of the `dir` [p.74] attribute is "ltr" (left-to-right text).

When the `dir` [p.74] attribute is set for a block-level element, it remains in effect for the duration of the element and any nested block-level elements. Setting the `dir` [p.74] attribute on a nested element overrides the inherited value.

To set the base text direction for an entire document, set the `dir` [p.74] attribute on the `HTML` element.

For example:

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0//EN">
<HTML dir="RTL">
<HEAD>
<TITLE>...a right-to-left title...</TITLE>
</HEAD>
...right-to-left text...
<P dir="ltr">...left-to-right text...</P>
<P>...right-to-left text again...</P>
</HTML>
```

Inline elements, on the other hand, do not inherit the `dir` [p.74] attribute. This means that an inline element without a `dir` [p.74] attribute does **not** open an additional level of embedding with respect to the bidirectional algorithm. (Here, an element is considered to be block-level or inline based on its default presentation. Note that the `INS` [p.91] and `DEL` [p.91] elements can be block-level or inline depending on their context.)

8.2.3 Setting the direction of embedded text

The [UNICODE] [p.321] bidirectional algorithm automatically reverses embedded character sequences according to their inherent directionality (as illustrated by the previous examples). However, in general only one level of embedding can be accounted for. To achieve additional levels of embedded direction changes, you must make use of the `dir` [p.74] attribute on an inline element.

Consider the same example text as before:

```
english1 HEBREW2 english3 HEBREW4 english5 HEBREW6
```

Suppose the predominant language of the document containing this paragraph is English. Furthermore, the above English sentence contains a Hebrew section extending from HEBREW2 through HEBREW4 and the Hebrew section contains an English quotation (english3). The desired presentation of the text is thus:

```
english1 4WERBEH english3 2WERBEH english5 6WERBEH
                 ------->
                    E
         <-----------------------
                    H
------------------------------------------------>
                    E
```

To achieve two embedded direction changes, we must supply additional information, which we do by delimiting the second embedding explicitly. In this example, we use the `SPAN` element and the `dir` [p.74] attribute to mark up the text:

```
english1 <SPAN dir="RTL">HEBREW2 english3 HEBREW4</SPAN> english5 HEBREW6
```

Authors may also use special Unicode characters to achieve multiply embedded direction changes. To achieve left-to-right embedding, surround embedded text with the characters LEFT-TO-RIGHT EMBEDDING ("LRE", hexadecimal 202A) and POP DIRECTIONAL FORMATTING ("PDF", hexadecimal 202C). To achieve right-to-left embedding, surround embedded text with the characters RIGHT-TO-LEFT EMBEDDING ("RTE", hexadecimal 202B) and PDF.

Using HTML directionality markup with Unicode characters. *Authors and designers of authoring software should be aware that conflicts can arise if the `dir` [p.74] attribute is used on inline elements (including `BDO` [p.76]) concurrently with the corresponding [UNICODE] [p.321] formatting characters. Preferably one or the other should be used exclusively. The markup method offers a better guarantee of document structural integrity and alleviates some problems when editing bidirectional HTML text with a simple text editor, but some software may be more apt at using the [UNICODE] [p.321] characters. If both methods are used, great care should be exercised to insure proper nesting of markup and directional embedding or override, otherwise, rendering results are undefined.*

8.2.4 Overriding the bidirectional algorithm: the BDO element

```
<!ELEMENT BDO - - (%inline;)*      -- I18N BiDi over-ride -->
<!ATTLIST BDO
```

```
  %coreattrs;                      -- id, class, style, title --
  lang    %LanguageCode; #IMPLIED  -- language code --
  dir         (ltr|rtl)  #REQUIRED -- directionality --
  >
```

Start tag: ***required****, End tag:* ***required***

Attribute definitions

`dir` = `LTR` | `RTL` [CI]
: This mandatory attribute specifies the base direction of the element's text content. This direction overrides the inherent directionality of characters as defined in [UNICODE] [p.321] . Possible values:
  - `LTR`: Left-to-right text.
  - `RTL`: Right-to-left text.

Attributes defined elsewhere

- `lang` [p.71] (language information [p.71])

The bidirectional algorithm and the `dir` [p.74] attribute generally suffice to manage embedded direction changes. However, some situations may arise when the bidirectional algorithm results in incorrect presentation. The `BDO` [p.76] element allows authors to turn off the bidirectional algorithm for selected fragments of text.

Consider a document containing the same text as before:

```
english1 HEBREW2 english3 HEBREW4 english5 HEBREW6
```

but assume that this text has already been put in visual order. One reason for this may be that the MIME standard ([RFC2045] [p.320] , [RFC1556] [p.320]) favors visual order, i.e., that right-to-left character sequences are inserted right-to-left in the byte stream. In an email, the above might be formated, including line breaks, as:

```
english1 2WERBEH english3
4WERBEH english5 6WERBEH
```

This conflicts with the [UNICODE] [p.321] bidirectional algorithm, because that algorithm would invert `2WERBEH`, `4WERBEH`, and `6WERBEH` a second time, displaying the Hebrew words left-to-right instead of right-to-left.

The solution in this case is to override the bidirectional algorithm by putting the Email excerpt in a a `PRE` [p.88] element (to conserve line breaks) and each line in a `BDO` [p.76] element, whose `dir` [p.77] attribute is set to `LTR`:

```
<PRE>
<BDO dir="LTR">english1 2WERBEH english3</BDO>
<BDO dir="LTR">4WERBEH english5 6WERBEH</BDO>
</PRE>
```

This tells the bidirectional algorithm "Leave me left-to-right!" and would produce the desired presentation:

```
english1 2WERBEH english3
4WERBEH english5 6WERBEH
```

The BDO [p.76] element should be used in scenarios where absolute control over sequence order is required (e.g., multi-language part numbers). The dir [p.77] attribute is mandatory for this element.

Authors may also use special Unicode characters to override the bidirectional algorithm -- LEFT-TO-RIGHT OVERRIDE (202D) or RIGHT-TO-LEFT OVERRIDE (hexadecimal 202E). The POP DIRECTIONAL FORMATTING (hexadecimal 202C) character ends either bidirectional override.

Note: Recall that conflicts can arise if the dir [p.74] attribute is used on inline elements (including BDO [p.76]) concurrently with the corresponding [UNICODE] [p.321] formatting characters.

Bidirectionality and character encoding *According to [RFC1555] [p.320] and [RFC1556] [p.320] , there are special conventions for the use of "charset" parameter values to indicate bidirectional treatment in MIME mail, in particular to distinguish between visual, implicit, and explicit directionality. The parameter value "ISO-8859-8" (for Hebrew) denotes visual encoding, "ISO-8859-8-i" denotes implicit bidirectionality, and "ISO-8859-8-e" denotes explicit directionality.*

Because HTML uses the Unicode bidirectionality algorithm, conforming documents encoded using ISO 8859-8 must be labeled as "ISO-8859-8-i". Explicit directional control is also possible with HTML, but cannot be expressed with ISO 8859-8, so "ISO-8859-8-e" should not be used.

The value "ISO-8859-8" implies that the document is formatted visually, misusing some markup (such as TABLE [p.105] with right alignment and no line wrapping) to ensure reasonable display on older user agents that do not handle bidirectionality. Such documents do not conform to the present specification. If necessary, they can be made to conform to the current specification (and at the same time will be displayed correctly on older user agents) by adding BDO [p.76] markup where necessary. Contrary to what is said in [RFC1555] [p.320] and [RFC1556] [p.320] , ISO-8859-6 (Arabic) is ***not*** *visual ordering.*

8.2.5 Character entities for directionality and joining control

Since ambiguities sometimes arise as to the directionality of certain characters (e.g., punctuation), the [UNICODE] [p.321] specification includes characters to enable their proper resolution. Also, Unicode includes some characters to control joining behavior where this is necessary (e.g., some situations with Arabic letters). HTML 4.0 includes character entity references [p.287] for these characters.

The following DTD excerpt presents some of the directional entities:

```
<!ENTITY zwnj CDATA "&#8204;"--=zero width non-joiner-->
<!ENTITY zwj  CDATA "&#8205;"--=zero width joiner-->
<!ENTITY lrm  CDATA "&#8206;"--=left-to-right mark-->
<!ENTITY rlm  CDATA "&#8207;"--=right-to-left mark-->
```

The zwnj entity is used to block joining behavior in contexts where joining will occur but shouldn't. The zwj entity does the opposite; it forces joining when it wouldn't occur but should. For example, the Arabic letter "HEH" is used to abbreviate "Hijri", the name of the Islamic calendar system. Since the isolated form of "HEH" looks like the digit five as employed in Arabic script (based on Indic digits), in order to prevent confusing "HEH" as a final digit five in a year, the initial form of "HEH" is used. However, there is no following context (i.e., a joining letter) to which the "HEH" can join. The zwj character provides that context.

Similarly, in Persian texts, there are cases where a letter that normally would join a subsequent letter in a cursive connection should not. The character zwnj is used to block joining in such cases.

The other characters, lrm and rlm, are used to force directionality of directionally neutral characters. For example, if a double quotation mark comes between an Arabic (right-to-left) and a Latin (left-to-right) letter, the direction of the quotation mark is not clear (is it quoting the Arabic text or the Latin text?). The lrm and rlm characters have a directional property but no width and no word/line break property. Please consult [UNICODE] [p.321] for more details.

Mirrored character glyphs. *In general, the bidirectional algorithm does not mirror character glyphs but leaves them unaffected. An exception are characters such as parentheses (see [UNICODE] [p.321] , table 4-7). In cases where mirroring is desired, for example for Egyptian Hieroglyphs, Greek Bustrophedon, or special design effects, this should be controlled with styles.*

8.2.6 The effect of style sheets on bidirectionality

In general, using style sheets to change an element's visual rendering from block-level to inline or vice-versa is straightforward. However, because the bidirectional algorithm relies on the inline/block-level distinction, special care must be taken during the transformation.

When an inline element that does not have a dir [p.74] attribute is transformed to the style of a block-level element by a style sheet, it inherits the dir [p.74] attribute from its closest parent block element to define the base direction of the block.

When a block element that does not have a dir [p.74] attribute is transformed to the style of an inline element by a style sheet, the resulting presentation should be equivalent, in terms of bidirectional formatting, to the formatting obtained by explicitly adding a dir [p.74] attribute (assigned the inherited value) to the transformed element.

8.2.6 The effect of style sheets on bidirectionality

9 Text

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    1. Paragraphs: the P element [p.86]
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4. Marking document changes: The INS and DEL elements [p.91]

The following sections discuss issues surrounding the structuring of text. Elements that present text [p.185] (alignment elements, font elements, style sheets, etc.) are discussed elsewhere in the specification. For information about characters, please consult the section on the document character set.

9.1 White space

The document character set includes a wide variety of white space characters. Many of these are typographic elements used in some applications to produce particular visual spacing effects. HTML considers only the following characters to be *white space characters*:

- ASCII space ( )
- ASCII tab (	)
- ASCII form feed ()
- Zero-width space (	)

Line breaks [p.87] are also considered to be white space characters. Note that although   and   are defined in [ISO10646] [p.319] to unambiguously separate lines and paragraphs, respectively, these do not constitute line breaks in HTML, nor does this specification include them in the more general category of white space characters.

This specification does not indicate the behavior, rendering or otherwise, of space characters other than those explicitly identified here as white space characters.

For all HTML elements except PRE [p.88] , any sequence of white space characters immediately following a start tag should be ignored by user agents, and any subsequent sequence of contiguous white space characters should be interpreted as inter-word space. Thus, the following two examples must be rendered identically:

```
<!-- No leading spaces -->
<P>
Thomas is watching TV.
</P>

<!-- Two leading spaces -->
<P>
  Thomas is watching TV.
</P>
```

Since the (abstract) notion of *inter-word space* varies from script (written language) to script, user agents should collapse sequences of white space characters in script-sensitive ways. For example, in Latin scripts, inter-word space is typically rendered as an ASCII space ( ), while in Thai it is a zero-width word separator (). In Japanese and Chinese, no inter-word space is typically rendered at all.

The `PRE` [p.88] element is used for preformatted text [p.88] , where white space is significant. The `PRE` [p.88] element is described below.

Word space processing can and should be done even in the absence of language information specified by the `lang` attribute.

9.2 Structured text

9.2.1 Phrase elements: `EM`, `STRONG`, `DFN`, `CODE`, `SAMP`, `KBD`, `VAR`, `CITE`, and `ABBR`

```
<!ENTITY % phrase "EM | STRONG | DFN | CODE |
                   SAMP | KBD | VAR | CITE | ABBR">
<!ELEMENT (%fontstyle;|%phrase;) - - (%inline;)*>
<!ATTLIST (%fontstyle;|%phrase;)
  %attrs;                           -- %coreattrs, %i18n, %events --
  >
```

*Start tag: **required**, End tag: **required***

Attributes defined elsewhere

- `id`, `class` (document-wide identifiers)
- `lang` (language information), `dir` (text direction)
- `title` (element titles)
- `style` [p.176] (inline style information [p.176])
- `onclick` [p.238] , `ondblclick` [p.238] , `onmousedown` [p.238] , `onmouseup` [p.239] , `onmouseover` [p.239] , `onmousemove` [p.239] , `onmouseout` [p.239] , `onkeypress` [p.239] , `onkeydown` [p.239] , `onkeyup` [p.239] (intrinsic events [p.238])

Phrase elements add structural information to text fragments. The usual meanings of phrase elements are following:

EM:
Indicates emphasis.
STRONG:
Indicates stronger emphasis.
CITE:
Contains a citation or a reference to other sources.
DFN:
Indicates that this is the defining instance of the enclosed term.
CODE:
Designates a fragment of computer code.
SAMP:
Designates sample output from programs, scripts, etc.
KBD:
Indicates text to be entered by the user.
VAR:
Indicates an instance of a variable or program argument.
ABBR:
Indicates an abbreviated form (e.g., WWW, HTTP, URL, etc.).

EM [p.82] and STRONG [p.82] are used to indicate emphasis. The other phrase elements have particular significance in technical documents. These examples illustrate the rendering of some of the textual markup elements:

```
As <CITE>Harry S. Truman</CITE> said,
<Q lang="en-US">The buck stops here.</Q>

More information can be found in <CITE>[ISO-0000]</CITE>.

Please refer to the following reference number in future
correspondence: <STRONG>1-234-55</STRONG>
```

The presentation of phrase elements depends on the user agent. Generally, visual user agents present EM [p.82] text in italics and STRONG [p.82] text in bold font. Speech synthesizer user agents may change the synthesis parameters, such as volume, pitch and rate accordingly.

The ABBR [p.82] element allows authors to clearly indicate abbreviated expressions of various kinds. Western languages make extensive use of acronyms or "initialisms" such as "GmbH", "NATO", and "F.B.I.", as well as abbreviations like "M.", "Inc.", "et al.", "etc.". Both Chinese and Japanese use analogous abbreviation mechanisms, wherein a long name is referred to subsequently with a subset of the Han characters from the original occurrence. All of these expressions can be tagged with ABBR [p.82] , providing useful information to user agents and tools such as spell checkers, speech synthesizers, translation systems and search-engine indexers. The content of the ABBR [p.82] element specifies the abbreviated expression itself, as it would normally appear in running text. The title attribute on ABBR [p.82] may be used to provide the full or expanded form of the expression.

Here are some sample uses of ABBR [p.82] :

```
<ABBR title="World Wide Web">WWW</ABBR>
<ABBR lang="fr"
      title="Soci&eacute;t&eacute; Nationale de Chemins de Fer">
   SNCF
</ABBR>
<ABBR lang="es"
      title="Do&ntilde;a">
   D&ntilde;a
</ABBR>
<ABBR title="Abbreviation">abbr.</ABBR>
```

Note that abbreviated forms often have idiosyncratic pronunciations. For example, while "IRS" and "BBC" are typically pronounced letter by letter, "NATO" and "UNESCO" are pronounced phonetically. Still other abbreviated forms (e.g., "URL" and "SQL") are spelled out by some people and pronounced as words by other people. If necessary, authors should use style sheets to specify how a specific abbreviated form is to be pronounced.

Note. *In earlier versions of HTML and earlier drafts of HTML 4.0, this element was called ACRONYM.*

9.2.2 Quotations: The `BLOCKQUOTE` and `Q` elements

```
<!ELEMENT BLOCKQUOTE - - (%flow;)* -- long quotation -->
<!ATTLIST BLOCKQUOTE
  %attrs;                           -- %coreattrs, %i18n, %events --
  cite        %URL;       #IMPLIED  -- URL for source document or msg --
  >
<!ELEMENT Q - - (%inline;)* -- short inline quotation -->
<!ATTLIST Q
  %attrs;                           -- %coreattrs, %i18n, %events --
  cite        %URL;       #IMPLIED  -- URL for source document or msg --
  >
```

Start tag: ***required****, End tag:* ***required***

Attribute definitions

`cite` = *url* [CT]
: The value of this attribute is a URL that designates a source document or message. This attribute is intended to give information about the source from which the quotation was borrowed.

Attributes defined elsewhere

- `id`, `class` (document-wide identifiers)
- `lang` (language information), `dir` (text direction)
- `title` (element titles)
- `style` [p.176] (inline style information [p.176])
- `onclick` [p.238] , `ondblclick` [p.238] , `onmousedown` [p.238] , `onmouseup` [p.239] , `onmouseover` [p.239] , `onmousemove` [p.239] , `onmouseout` [p.239] , `onkeypress` [p.239] , `onkeydown` [p.239] , `onkeyup` [p.239] (intrinsic events [p.238])

These two elements designate quoted text. BLOCKQUOTE [p.84] is for long quotations (block-level content) and Q [p.84] is intended for short quotations (inline content) that don't require paragraph breaks.

This example formats an excerpt from "The Two Towers", by J.R.R. Tolkien, as a blockquote.

```
<BLOCKQUOTE cite="http://www.mycom.com/tolkien/twotowers.html">
<P>They went in single file, running like hounds on a strong scent,
and an eager light was in their eyes. Nearly due west the broad
swath of the marching Orcs tramped its ugly slot; the sweet grass
of Rohan had been bruised and blackened as they passed.</P>
</BLOCKQUOTE>
```

Visual user agents generally render BLOCKQUOTE [p.84] as an indented block.

Visual user agents must add delimiting quotation marks when rendering Q [p.84] ; users must not put delimiting quotation marks inside a Q [p.84] element. Furthermore, user agents should add quotation marks in a language-sensitive manner (see the lang attribute). Many languages use different quotation styles for outer and inner quotations, which should be respected by user-agents implementing this element.

Quotation marks *We recommend that style sheet implementations provide a mechanism for inserting quotation marks before and after a quotation delimited by BLOCKQUOTE [p.84] in a manner appropriate to the current language context and the degree of nesting of quotations.*

However, as some authors have used BLOCKQUOTE [p.84] merely as a mechanism to indent text, in order to preserve the intention of the authors, user agents should ***not*** *insert quotation marks in the default style.*

The usage of BLOCKQUOTE [p.84] to indent text is deprecated in favor of style sheets.

9.2.3 Subscripts and superscripts: the SUB and SUP elements

```
<!ELEMENT (SUB|SUP) - - (%inline;)* -- subscript, superscript -->
<!ATTLIST (SUB|SUP)
  %attrs;                          -- %coreattrs, %i18n, %events --
  >
```

Start tag: ***required****, End tag:* ***required***

Attributes defined elsewhere

- id, class (document-wide identifiers)
- lang (language information), dir (text direction)
- title (element titles)
- style [p.176] (inline style information [p.176])
- onclick [p.238] , ondblclick [p.238] , onmousedown [p.238] , onmouseup [p.239] , onmouseover [p.239] , onmousemove [p.239] , onmouseout [p.239] , onkeypress [p.239] , onkeydown [p.239] , onkeyup [p.239] (intrinsic events [p.238])

Many scripts (e.g., French) require superscripts or subscripts for proper rendering. The SUB [p.85] and SUP [p.85] elements should be used to markup text in these cases.

```
H<sub>2</sub>O
E = mc<sup>2</sup>
<SPAN lang="fr">M<sup>lle</sup> Dupont</SPAN>
```

9.3 Lines and Paragraphs

Authors traditionally divide their thoughts and arguments into sequences of paragraphs. The organization of information into paragraphs is not affected by how the paragraphs are presented: paragraphs that are double-justified contain the same thoughts as those that are left-justified.

The HTML markup for *defining* a paragraph is straightforward: the `P` [p.86] element defines a paragraph.

The visual presentation of paragraphs is not so simple. A number of issues, both stylistic and technical, must be addressed:

- Treatment of white space
- Line breaking and word wrapping
- Justification
- Hyphenation
- Written language conventions and text directionality
- Formatting of paragraphs with respect to surrounding content

We address these questions below. Paragraph alignment and floating objects [p.185] are discussed later in this document.

9.3.1 Paragraphs: the `P` element

```
<!ELEMENT P - O (%inline;)* -- paragraph -->
<!ATTLIST P
  %attrs;                         -- %coreattrs, %i18n, %events --
  %align;                         -- align, text alignment --
  >
```

Start tag: ***required****, End tag:* ***optional***

Attributes defined elsewhere

- `id`, `class` (document-wide identifiers)
- `lang` (language information), `dir` (text direction)
- `title` (element titles)
- `style` [p.176] (inline style information [p.176])
- `align` [p.185] (alignment [p.185])
- `onclick` [p.238] , `ondblclick` [p.238] , `onmousedown` [p.238] , `onmouseup` [p.239] , `onmouseover` [p.239] , `onmousemove` [p.239] , `onmouseout` [p.239] , `onkeypress` [p.239] , `onkeydown` [p.239] , `onkeyup` [p.239] (intrinsic events [p.238])

The P [p.86] element represents a paragraph. It cannot contain block-level elements (including P [p.86] itself). The end tag may be omitted, in which case it is implied by either the next block-level start tag or the end tag of the element that contains the P [p.86] element, whichever comes first.

For example, the following two paragraphs:

```
<P>This is the first paragraph.</P>
<P>This is the second paragraph.</P>
...a block element...
```

may be rewritten without their end tags:

```
<P>This is the first paragraph.
<P>This is the second paragraph.
...a block element...
```

since both are implicitly ended by the block elements that follow them. Similarly, if a paragraph is enclosed by a block element, as in:

```
<DIV>
<P>This is the paragraph.
</DIV>
```

the end tag of the enclosing block element (here, DIV) implies the end tag of the P [p.86] element.

We discourage authors from using empty P [p.86] elements. User agents should ignore empty P [p.86] elements.

9.3.2 Controlling line breaks

The SGML specification distinguishes record start characters and record end characters, which in HTML, are defined to be "line feed" (&#x00OA;) and "carriage return" (
), respectively.

On the Internet, some platforms use carriage return/line feed pairs to represent line breaks, some use just line feeds, and others just carriage returns. HTML user agents should interpret each carriage return, line feed, and carriage return/line feed pair as a single line break. Elsewhere in this specification, the term *line break* refers to any of the three.

All line breaks constitute white space. [p.81]

For more information about SGML's specification of line breaks, please consult the notes on line brakes [p.304] in the appendix.

Forcing a line break: the BR element

```
<!ELEMENT BR - O EMPTY              -- forced line break -->
<!ATTLIST BR
  %coreattrs;                       -- id, class, style, title --
  clear (left|all|right|none) none -- control of text flow --
  >
```

Start tag: ***required****, End tag:* ***forbidden***

Attributes defined elsewhere

- `id`, `class` (document-wide identifiers)
- `title` (element titles)
- `style` [p.176] (inline style information [p.176])
- `clear` [p.188] (alignment and floating objects [p.185])

The `BR` [p.87] element forcibly breaks (ends) the current line of text.

For visual user agents, the `clear` [p.188] attribute can be used to determine whether markup following the `BR` [p.87] element flows around images and other objects floated to the left or right margin, or whether it starts after the bottom of such objects. Further details are given in the section on alignment and floating objects [p.185] . Authors are advised to use style sheets to control text flow around floating images and other objects.

With respect to bidirectional formatting, the `BR` [p.87] element should be treated by user agents in the same way as a [ISO10646] [p.319] LINE SEPARATOR character.

Prohibiting a line break

Sometimes authors may want to prevent a line break from occurring between two words. The   entity (or) acts as a space where user agents should not cause a line break.

9.3.3 Hyphenation

In HTML, there are two types of hyphens: the plain hyphen and the soft hyphen. The plain hyphen should be interpreted by a user agent as just another character. The soft hyphen tells the user agent where a line break can occur.

Those browsers that interpret soft hyphens must observe the following semantics: If a line is broken at a soft hyphen, a hyphen character must be displayed at the end of the first line. If a line is not broken at a hyphen, the user agent must not display a hyphen character. For operations such as searching and sorting, the soft hyphen should always be ignored.

In HTML, the plain hyphen is represented by the "-" character (- or -). The soft hyphen is represented by the character entity reference (or)

9.3.4 Preformatted text: The `PRE` element

```
<!ENTITY % pre.exclusion "IMG|OBJECT|APPLET|BIG|SMALL|SUB|SUP|FONT|BASEFONT">

<!ELEMENT PRE - - (%inline;)* -(%pre.exclusion;) -- preformatted text -->
<!ATTLIST PRE
  %attrs;                           -- %coreattrs, %i18n, %events --
  width       NUMBER     #IMPLIED
  >
```

Start tag: ***required****, End tag:* ***required***

Attribute definitions

`width` = *number* [CN]
: This attribute provides a hint to visual user agents about the desired width of the formatted block. The user agent can use this information to select an appropriate font size or to indent the content appropriately. The desired width is expressed in number of characters. This attribute is not widely supported currently.

Attributes defined elsewhere

- `id`, `class` (document-wide identifiers)
- `lang` (language information), `dir` (text direction)
- `title` (element titles)
- `style` [p.176] (inline style information [p.176])
- `onclick` [p.238] , `ondblclick` [p.238] , `onmousedown` [p.238] , `onmouseup` [p.239] , `onmouseover` [p.239] , `onmousemove` [p.239] , `onmouseout` [p.239] , `onkeypress` [p.239] , `onkeydown` [p.239] , `onkeyup` [p.239] (intrinsic events [p.238])

The `PRE` [p.88] element tells visual user agents that the enclosed text is "preformatted". Visual user agents must treat preformatted text as follows:

- They may leave white space [p.81] intact.
- They may render text with a fixed-pitch font.
- They may disable automatic word wrap.
- They must not disable bidirectional processing.

Non-visual user agents may ignore the spacing and line breaks in this element's content.

Note that the SGML standard requires that the parser remove a newline immediately following the start tag or immediately preceding the end tag of the `PRE` [p.88] .

The DTD fragment above indicates which elements may not appear within a `PRE` [p.88] declaration. This is the same as in HTML 3.2, and is intended to preserve constant line spacing and column alignment for text rendered in a fixed pitch font. Authors are discouraged from altering this behavior through style sheets.

The following example shows a preformatted verse from Shelly's poem *To a Skylark*:

```
<PRE>
       Higher still and higher
         From the earth thou springest
       Like a cloud of fire;
         The blue deep thou wingest,
And singing still dost soar, and soaring ever singest.
</PRE>
```

Here is the same verse as rendered by your user agent:

```
       Higher still and higher
         From the earth thou springest
       Like a cloud of fire;
         The blue deep thou wingest,
And singing still dost soar, and soaring ever singest.
```

The horizontal tab character
The horizontal tab character (decimal 9 in [ISO10646] [p.319] and [ISO88591] [p.319]) is usually interpreted by visual user agents as the smallest non-zero number of spaces necessary to line characters up along tab stops that are every 8 characters. We strongly discourage using horizontal tabs in preformatted text since it is common practice, when editing, to set the tab-spacing to other values, leading to misaligned documents.

9.3.5 Visual rendering of paragraphs

Note.*The following section is an informative description of the behavior of some current visual user agents when formatting paragraphs. Style sheets allow better control of paragraph formatting.*

How paragraphs are rendered visually depends on the user agent. Paragraphs are usually rendered flush left with a ragged right margin. Other defaults are appropriate for right-to-left scripts.

HTML user agents have traditionally rendered paragraphs with white space before and after, e.g.,

```
  At the same time, there began to take form a system of numbering,
  the calendar, hieroglyphic writing, and a technically advanced
  art, all of which later influenced other peoples.

  Within the framework of this gradual evolution or cultural
  progress the Preclassic horizon has been divided into Lower,
  Middle and Upper periods, to which can be added a transitional
  or Protoclassic period with several features that would later
  distinguish the emerging civilizations of Mesoamerica.
```

This contrasts with the style used in novels which indents the first line of the paragraph and uses the regular line spacing between the final line of the current paragraph and the first line of the next, e.g.,

```
     At the same time, there began to take form a system of
  numbering, the calendar, hieroglyphic writing, and a technically
  advanced art, all of which later influenced other peoples.
     Within the framework of this gradual evolution or cultural
  progress the Preclassic horizon has been divided into Lower,
  Middle and Upper periods, to which can be added a transitional
  or Protoclassic period with several features that would later
  distinguish the emerging civilizations of Mesoamerica.
```

Following the precedent set by the NCSA Mosaic browser in 1993, user agents generally don’t justify both margins, in part because it’s hard to do this effectively without sophisticated hyphenation routines. The advent of style sheets, and anti-aliased fonts with subpixel positioning promises to offer richer choices to HTML authors than previously possible.

Style sheets provide rich control over the size and style of a font, the margins, space before and after a paragraph, the first line indent, justification and many other details. The user agent's default style sheet renders `P` [p.86] elements in a familiar form, as illustrated above. One could, in principle, override this to render paragraphs without the breaks that conventionally distinguish successive paragraphs. In general, since this may confuse readers, we discourage this practice.

By convention, visual HTML user agents wrap text lines to fit within the available margins. Wrapping algorithms depend on the script being formatted.

In Western scripts, for example, text should only be wrapped at white space. Early user agents incorrectly wrapped lines at the beginning (or end) of elements, which resulted in dangling punctuation. For example, consider this sentence:

```
A statue of the <a href="cih78">Cihuateteus</a>, who are patron ...
```

Wrapping the line at the end of the anchor tag causes the comma to be stranded at the beginning of the next line:

```
A statue of the Cihuateteus
, who are patron ...
```

This is an error, since there was no white space at that point in the markup.

9.4 Marking document changes: The INS and DEL elements

```
<!-- INS/DEL are handled by inclusion on BODY -->
<!ELEMENT (INS|DEL) - - (%flow;)* -- inserted text, deleted text -->
<!ATTLIST (INS|DEL)
  %attrs;                          -- %coreattrs, %i18n, %events --
  cite        %URL;      #IMPLIED  -- info on reason for change --
  datetime    %Datetime; #IMPLIED  -- date and time of change --
  >
```

Start tag: ***required****, End tag:* ***required***

Attribute definitions

`cite` = *url* [CT]
: The value of this attribute is a URL that designates a source document or message. This attribute is intended to point to information explaining why a document was changed.

`datetime` = *datetime* [CS]
: The value of this attribute specifies the date and time when the change was made.

Attributes defined elsewhere

- `id`, `class` (document-wide identifiers)
- `lang` (language information), `dir` (text direction)
- `title` (element titles)
- `style` [p.176] (inline style information [p.176])
- `onclick` [p.238] , `ondblclick` [p.238] , `onmousedown` [p.238] , `onmouseup` [p.239] ,

`onmouseover` [p.239] , `onmousemove` [p.239] , `onmouseout` [p.239] , `onkeypress` [p.239] , `onkeydown` [p.239] , `onkeyup` [p.239] (intrinsic events [p.238])

`INS` [p.91] and `DEL` [p.91] are used to markup sections of the document that have been inserted or deleted with respect to a different version of a document (e.g., in draft legislation where lawmakers need to view the changes).

These two elements are unusual for HTML in that they may serve as either block-level or inline elements (but not both). They may contain one or more words within a paragraph or contain one or more block-level elements such as paragraphs, lists and tables.

This example could be from a bill to change the legislation for how many deputies a County Sheriff can employ from 3 to 5.

```
<P>
  A Sheriff can employ <DEL>3</DEL><INS>5</INS> deputies.
</P>
```

The `INS` [p.91] and `DEL` [p.91] elements must not contain block-level content when these elements behave as inline elements.

ILLEGAL EXAMPLE:
The following is not considered legal HTML.

```
<P>
<INS><DIV>...block-level content...</DIV></INS>
</P>
```

User agents should render inserted and deleted text in ways that make the change obvious. For instance, inserted text may appear in a special font, deleted text may not be shown at all or be shown as struck-through or with special markings, etc.

Both of the following examples correspond to November 5, 1994, 8:15:30 am, US Eastern Standard Time.

```
1994-11-05T13:15:30Z
1994-11-05T08:15:30-05:00
```

Used with `INS` [p.91] , this gives:

```
<INS datetime="1994-11-05T08:15:30-05:00"
        cite="http://www.foo.org/mydoc/comments.html">
Furthermore, the latest figures from the marketing department
suggest that such practice is on the rise.
</INS>
```

The document "http://www.foo.org/mydoc/comments.html" would contain comments about why information was inserted into the document.

Authors may also make comments about inserted or deleted text by means of the `title` attribute for the `INS` [p.91] and `DEL` [p.91] elements. User agents may present this information to the user (e.g., as a popup note). For example:

```
<INS datetime="1994-11-05T08:15:30-05:00"
        title="Changed as a result of Steve B's comments in meeting.">
Furthermore, the latest figures from the marketing department
suggest that such practice is on the rise.
</INS>
```

10 Lists

Contents

1. Introduction to lists [p.95]
2. Unordered lists (UL), ordered lists (OL), and list items (LI) [p.96]
3. Definition lists: the DL, DT, and DD elements [p.98]
    1. Lists formatted by visual user agents [p.100]
4. The DIR and MENU elements [p.101]

10.1 Introduction to lists

HTML offers authors several mechanisms for specifying lists of information. All lists must contain one or more list elements. Lists may contain:

- Unordered information.
- Ordered information.
- Definitions.

The previous list, for example, is an unordered list, created with the UL [p.96] element:

```
<UL>
<LI>Unordered information.
<LI>Ordered information.
<LI>Definitions.
</UL>
```

An ordered list, created using the OL [p.96] element, should contain information where order should be emphasized, as in a recipe:

1. Mix dry ingredients thoroughly.
2. Pour in wet ingredients.
3. Mix for 10 minutes.
4. Bake for one hour at 300 degrees.

Definition lists, created using the DL [p.98] element, generally consist of a series of term/definition pairs (although definition lists may have other applications). Thus, when advertising a product, one might use a definition list:

Lower cost
: The new version of this product costs significantly less than the previous one!

Easier to use
: We've changed the product so that it's much easier to use!

Safe for kids
: You can leave your kids alone in a room with this product and they won't get hurt (not a guarantee).

defined in HTML as:

```
<DL>
<DT><STRONG>Lower cost</STRONG>
<DD>The new version of this product costs significantly less than the
previous one!
<DT><STRONG>Easier to use</STRONG>
<DD>We've changed the product so that it's much easier to use!
<DT><STRONG>Safe for kids</STRONG>
<DD>You can leave your kids alone in a room with this product and
they won't get hurt (not a guarantee).
</DL>
```

Lists may also be nested and different list types may be used together, as in the following example, which is a definition list that contains an unordered list (the ingredients) and an ordered list (the procedure):

The ingredients:

- 100 g. flour
- 10 g. sugar
- 1 cup water
- 2 eggs
- salt, pepper

The procedure:

1. Mix dry ingredients thoroughly.
2. Pour in wet ingredients.
3. Mix for 10 minutes.
4. Bake for one hour at 300 degrees.

Notes:

The recipe may be improved by adding raisins.

The exact presentation of the three list types depends on the user agent. We discourage authors from using lists purely as a means of indenting text. This is a stylistic issue and is properly handled by style sheets.

10.2 Unordered lists (`UL`), ordered lists (`OL`), and list items (`LI`)

```
<!ENTITY % ULStyle "(disc|square|circle)">

<!ELEMENT UL - - (LI)+ -- unordered list -->
<!ATTLIST UL
  %attrs;                          -- %coreattrs, %i18n, %events --
  type        %ULStyle;  #IMPLIED  -- bullet style --
  compact     (compact)  #IMPLIED  -- reduced interitem spacing --
  >
<!ENTITY % OLStyle "CDATA"      -- constrained to: "(1|a|A|i|I)" -->

<!ELEMENT OL - - (LI)+ -- ordered list -->
<!ATTLIST OL
  %attrs;                          -- %coreattrs, %i18n, %events --
```

```
  type        %OLStyle;  #IMPLIED  -- numbering style --
  compact     (compact)  #IMPLIED  -- reduced interitem spacing --
  start       NUMBER     #IMPLIED  -- starting sequence number --
  >
```

Start tag: ***required****, End tag:* ***required***

```
<!ENTITY % LIStyle "CDATA" -- constrained to: "(%ULStyle;|%OLStyle;)" -->

<!ELEMENT LI - O (%flow;)* -- list item -->
<!ATTLIST LI
  %attrs;                           -- %coreattrs, %i18n, %events --
  type        %LIStyle;  #IMPLIED  -- list item style --
  value       NUMBER     #IMPLIED  -- reset sequence number --
  >
```

Start tag: ***required****, End tag:* ***optional***

Attribute definitions

`type` = *style-information* [CI]
: **Deprecated.**This attribute sets the style of a list item. Currently available values are intended for visual user agents. Possible values [p.100] are described below (along with case information).

`start` = *number* [CN]
: **Deprecated.** For `OL` [p.96] only. This attribute specifies the starting number of the first item in an ordered list. The default starting number is "1". Note that while the value of this attribute is an integer, the corresponding label may be non-numeric. Thus, when the list item style is upper case latin letters (A, B, C, ...), `start=3` means "C". When the style is lower case roman numerals, `start=3` means "iii", etc.

`value` = *number* [CN]
: **Deprecated.** For `LI` [p.98] only. This attribute sets the number of the current list item. Note that while the value of this attribute is an integer, the corresponding label may be non-numeric (see the <start> attribute).

`compact` [CI]
: **Deprecated.** When set, this boolean attribute gives a hint to visual user agents to render the list in a more compact way. The interpretation of this attribute depends on the user agent.

Attributes defined elsewhere

- `id`, `class` (document-wide identifiers)
- `lang` (language information), `dir` (text direction)
- `title` (element titles)
- `style` [p.176] (inline style information [p.176])
- `onclick` [p.238] , `ondblclick` [p.238] , `onmousedown` [p.238] , `onmouseup` [p.239] , `onmouseover` [p.239] , `onmousemove` [p.239] , `onmouseout` [p.239] , `onkeypress` [p.239] , `onkeydown` [p.239] , `onkeyup` [p.239] (intrinsic events [p.238])

Ordered and unordered lists are rendered in an identical manner except that visual user agents number ordered list items. User agents may present those numbers in a variety of ways. Unordered list items are not numbered.

Both types of lists are made up of sequences of list items defined by the `LI` element (whose end tag may be omitted).

This example illustrates the basic structure of a list.

```
<UL>
   <LI> ... first list item...
   <LI> ... second list item...
   ...
</UL>
```

Lists may also be nested:

DEPRECATED EXAMPLE:

```
<UL>
     <LI> ... Level one, number one...
     <OL>
        <LI> ... Level two, number one...
        <LI> ... Level two, number two...
        <OL start="10">
           <LI> ... Level three, number one...
        </OL>
        <LI> ... Level two, number three...
     </OL>
     <LI> ... Level one, number two...
</UL>
```

Details about number order. *In ordered lists, it is not possible to continue list numbering automatically from a previous list or to hide numbering of some list items. However, authors can reset the number of a list item by setting its* `value` *attribute. Numbering continues from the new value for subsequent list items. For example:*

```
<ol>
<li value="30"> makes this list item number 30.
<li value="40"> makes this list item number 40.
<li> makes this list item number 41.
</ol>
```

10.3 Definition lists: the `DL`, `DT`, and `DD` elements

```
<!-- definition lists - DT for term, DD for its definition -->

<!ELEMENT DL - - (DT|DD)+ -- definition list -->
<!ATTLIST DL
  %attrs;                          -- %coreattrs, %i18n, %events --
  compact     (compact)  #IMPLIED  -- reduced interitem spacing --
  >
```

Start tag: ***required****, End tag:* ***required***

```
<!ELEMENT DT - O (%inline;)* -- definition term -->
<!ELEMENT DD - O (%flow;)*   -- definition description -->
<!ATTLIST (DT|DD)
  %attrs;                         -- %coreattrs, %i18n, %events --
  >
```

Start tag: ***required****, End tag:* ***optional***

Attributes defined elsewhere

- `id`, `class` (document-wide identifiers)
- `lang` (language information), `dir` (text direction)
- `title` (element titles)
- `style` [p.176] (inline style information [p.176])
- `onclick` [p.238] , `ondblclick` [p.238] , `onmousedown` [p.238] , `onmouseup` [p.239] , `onmouseover` [p.239] , `onmousemove` [p.239] , `onmouseout` [p.239] , `onkeypress` [p.239] , `onkeydown` [p.239] , `onkeyup` [p.239] (intrinsic events [p.238])

Definition lists vary only slightly from other types of lists in that list items consist of two parts: a term and a description. The term is given by the `DT` [p.98] element and is restricted to inline content. The description is given with a `DD` [p.98] element that contains block-level content.

Here is an example:

```
<DL>
  <DT>Dweeb
  <DD>young excitable person who may mature
    into a <EM>Nerd</EM> or <EM>Geek</EM>

  <DT>Cracker
  <DD>hacker on the Internet

  <DT>Nerd
  <DD>male so into the Net that he forgets
    his wife's birthday
</DL>
```

Here is an example with multiple terms and descriptions:

```
<DL>
   <DT>Center
   <DT>Centre
   <DD> A point equidistant from all points
            on the surface of a sphere.
   <DD> In some field sports, the player who
            holds the middle position on the field, court,
            or forward line.
</DL>
```

Another application of DL [p.98] , for example, is for marking up dialogues, with each DT [p.98] naming a speaker, and each DD [p.98] containing his or her words.

10.3.1 Lists formatted by visual user agents

Note.*The following is an informative description of the behavior of some current visual user agents when formatting lists. Style sheets allow better control of list formatting (e.g., for numbering, language-dependent conventions, indenting, etc.).*

Visual browsers usually present nested lists indented with respect to the current level of indentation.

For both OL [p.96] and UL [p.96] , the type [p.97] attribute specifies rendering options for visual user agents.

For the UL [p.96] element, possible values for the type [p.97] attribute are disc, square, and circle. The default value depends on the level of nesting of the current list. These values are case-insensitive.

How each value is presented depends on the user agent. User agents should attempt to present a "disc" as a small filled-in circle, a "circle" as a small circle outline, and a "square" as a small square outline.

Your user agent displays them as follows (the bullet glyph in the line may or may not vary):

- is produced by the value "disc"
- is produced by the value "square"
- is produced by the value "circle"

For the OL [p.96] element, possible values for the type [p.97] attribute are summarized in the table below (the are case-sensitive):

Type	Numbering style	
1	arabic numbers	1, 2, 3, ...
a	lower alpha	a, b, c, ...
A	upper alpha	A, B, C, ...
i	lower roman	i, ii, iii, ...
I	upper roman	I, II, III, ...

Note that the type [p.97] attribute is deprecated and list styles should be handled through style sheets.

For example, using CSS, one may specify that the style of numbers for list elements in a numbered list should be lower case roman numerals. In the excerpt below, every OL [p.96] element belonging to the class "withroman" will have roman numerals in front of its list items.

```
<STYLE type="text/css">
OL.withroman { list-style-type: lower-roman }
</STYLE>
<BODY>
<OL class="withroman">
<LI> Step one ...
<LI> Step two ...
</OL>
</BODY>
```

The rendering of a definition list also depends on the user agent. Your user agent renders this example:

```
<DL>
  <DT>Dweeb
  <DD>young excitable person who may mature
    into a <EM>Nerd</EM> or <EM>Geek</EM>

  <DT>Cracker
  <DD>hacker on the Internet

  <DT>Nerd
  <DD>male so into the Net that he forgets
    his wife's birthday
</DL>
```

as follows:

Dweeb
: young excitable person who may mature into a *Nerd* or *Geek*

Cracker
: hacker on the Internet

Nerd
: male so into the Net that he forgets his wife's birthday

10.4 The `DIR` and `MENU` elements

DIR and MENU are deprecated.

```
<!ELEMENT (DIR|MENU) - - (LI)+ -(%block;) -- directory list, menu list -->
<!ATTLIST DIR
  %attrs;                          -- %coreattrs, %i18n, %events --
  compact     (compact)  #IMPLIED
  >
<!ATTLIST MENU
  %attrs;                          -- %coreattrs, %i18n, %events --
  compact     (compact)  #IMPLIED
  >
```

Start tag: ***required****, End tag:* ***required***

Attributes defined elsewhere

- `id`, `class` (document-wide identifiers)
- `lang` (language information), `dir` (text direction)
- `title` (element titles)
- `style` [p.176] (inline style information [p.176])
- `onclick` [p.238] , `ondblclick` [p.238] , `onmousedown` [p.238] , `onmouseup` [p.239] , `onmouseover` [p.239] , `onmousemove` [p.239] , `onmouseout` [p.239] , `onkeypress` [p.239] , `onkeydown` [p.239] , `onkeyup` [p.239] (intrinsic events [p.238])

The `DIR` [p.101] element was designed to be used for creating multicolumn directory lists. The `MENU` [p.101] element was designed to be used for single column menu lists. Both elements have the same structure as `UL` [p.96] , just different rendering. In practice, a user agent will render a `DIR` [p.101] or `MENU` [p.101] list exactly as a `UL` [p.96] list.

We strongly recommend using `UL` [p.96] instead of these elements.

11 Tables

Contents

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11.1 Introduction to tables

The HTML table model allows authors to arrange data -- text, preformatted text, images, links, forms, form fields, other tables, etc. -- into rows and columns of cells.

Each table may have an associated caption (see the CAPTION [p.107] element) that provides a short description of the table's purpose. A longer description may also be provided (via the summary [p.105] attribute) for the benefit of people using speech or Braille-based user agents.

Table rows [p.108] may be grouped into a head, foot, and body sections, (via the THEAD [p.108] , TFOOT [p.108] and TBODY [p.108] elements, respectively). Row groups convey additional structural information and may be rendered by user agents in ways that emphasize this structure. User agents may exploit the head/body/foot division to support scrolling of body sections independently of the head and foot sections. When long tables are printed, the head and foot information may be repeated on each page that contains table data.

Authors may also group columns [p.110] to provide additional structural information that may be exploited by user agents. Furthermore, authors may declare column properties at the start of a table definition (via the COLGROUP [p.110] and COL [p.112] elements) in a way that enables user agents to render the table incrementally than having to wait for all the table data to arrive before rendering.

Table cells [p.116] may either contain "header" information (see the TH [p.116] element) or "data" (see the TD [p.116] element). Cells may span multiple rows and columns. The HTML 4.0 table model allows authors to label each cell so that non-visual user agents [p.127] may more easily communicate heading information about the cell to the user. Not only do these mechanisms greatly assist users with visual disabilities, they make it possible for multi-modal wireless browsers with limited display capabilities (e.g., Web-enabled pagers and phones) to handle tables.

Tables should not be used purely as a means to layout document content as this may present problems when rendering to non-visual media. Additionally, when used with graphics, these tables may force users to scroll horizontally to view a table designed on a system with a larger display. To minimize these problems, authors should use style sheets [p.173] to control layout rather than tables.

Note: This specification includes more detailed information about tables in sections on table design rationale and implementation issues [p.309] .

Here's a simple table that illustrates some of the features of the HTML table model. In "ascii art", the following table definition:

```
<TABLE border="border">
<CAPTION><EM>A test table with merged cells</EM></CAPTION>
<TR><TH rowspan="2"><TH colspan="2">Average
    <TH rowspan="2">Red<BR>eyes
<TR><TH>height<TH>weight
<TR><TH>Males<TD>1.9<TD>0.003<TD>40%
<TR><TH rowspan="2">Females<TD>1.7<TD>0.002<TD>43%
</TABLE>
```

might be rendered something like this:

```
          A test table with merged cells
    /---------------------------------------\
    |          |      Average      |   Red    |
    |          |-------------------|  eyes    |
    |          |  height |  weight |          |
    |----------------------------------------|
    |  Males   | 1.9     | 0.003   |          |
    |----------------------------------------|
    | Females  | 1.7     | 0.002   |          |
    \---------------------------------------/
```

Your user agent renders this table as follows:

A test table with merged cells

	Average		**Red eyes**
	height	**weight**	
Males	1.9	0.003	40%
Females	1.7	0.002	43%

11.2 Elements for constructing tables

11.2.1 The `TABLE` element

```
<!ELEMENT TABLE - -
     (CAPTION?, (COL*|COLGROUP*), THEAD?, TFOOT?, TBODY+)>
<!ATTLIST TABLE                  -- table element --
  %attrs;                           -- %coreattrs, %i18n, %events --
  summary     %Text;     #IMPLIED  -- purpose/structure for speech output --
  align       %TAlign;   #IMPLIED  -- table position relative to window --
  bgcolor     %Color;    #IMPLIED  -- background color for cells --
  width       %Pixels;   #IMPLIED  -- table width relative to window --
  border      CDATA      #IMPLIED  -- controls frame width around table --
  frame       %TFrame;   #IMPLIED  -- which parts of table frame to include --
  rules       %TRules;   #IMPLIED  -- rulings between rows and cols --
  cellspacing %Length;   #IMPLIED  -- spacing between cells --
  cellpadding %Length;   #IMPLIED  -- spacing within cells --
  >
```

Start tag: ***required****, End tag:* ***required***

Attribute definitions

`summary` = *text* [CS]
: This attribute provides a summary of the table's purpose and structure for user agents rendering to non-visual media such as speech and Braille.

`align` = `left` | `center` | `right` [CI]
: **Deprecated.** This attribute specifies the position of the table with respect to the document. Permitted values:
  - `left`: The table is to the left of the document.
  - `center`: The table is to the center of the document.
  - `right`: The table is to the right of the document.

`width` = *length* [CN]
: This attribute specifies the desired width of the entire table and is intended for visual user agents. In the absence of any width specification, table width is determined by the user agent.

Attributes defined elsewhere

- `id`, `class` (document-wide identifiers)
- `lang` (language information), `dir` (text direction)
- `title` (element titles)
- `style` [p.176] (inline style information [p.176])
- `onclick` [p.238] , `ondblclick` [p.238] , `onmousedown` [p.238] , `onmouseup` [p.239] , `onmouseover` [p.239] , `onmousemove` [p.239] , `onmouseout` [p.239] , `onkeypress` [p.239] , `onkeydown` [p.239] , `onkeyup` [p.239] (intrinsic events [p.238])
- `bgcolor` [p.185] (background color [p.185])
- `frame` [p.122] , `rules` [p.122] , `border` [p.122] (borders and rules [p.121])
- `cellspacing` [p.126] , `cellpadding` [p.126] (cell margins [p.126])

The TABLE [p.105] element contains all other elements that specify caption, rows, content, and formatting.

The following informative list describes what operations user agents may carry out when rendering a table:

- Make the table summary [p.105] available to the user. Authors should provide a summary of a table's content and structure so that people using non-visual user agents may better understand it.
- Render the caption, if one is defined.
- Render the table header, if one is specified. Render the table footer, if one is specified. User agents must know where to render the header and footer. For instance, if the output medium is paged, user agents may put the header at the top of each page and the footer at the bottom. Similarly, if the user agent provides a mechanism to scroll the rows, the header may appear at the top of the scrolled area and the footer at the bottom.
- Calculate the number of columns [p.113] in the table. Note that the number of rows in a table is equal to the number of TR [p.115] elements contained by the TABLE [p.105] element.
- Group the columns according to any column group [p.110] specifications.
- Render the cells, row by row and grouped in appropriate columns, between the header and footer. Visual user agents should format the table according to HTML attributes and style sheet specification.

The HTML table model has been designed so that, with author assistance, user agents may render tables *incrementally* (i.e., as table rows arrive) rather than having to wait for all the data before beginning to render.

In order for a user agent to format a table in one pass, authors must tell the user agent:

- The number of columns in the table. Please consult the section on calculating the number of columns in a table [p.113] for details on how to supply this information.
- The widths of these columns. Please consult the section on calculating the width of columns [p.114] for details on how to supply this information.

More precisely, a user agent may render a table in a single pass when the column widths are specified using a combination of COLGROUP [p.110] and COL [p.112] elements. If any of the columns are specified in relative or percentage terms (see the section on calculating the width of columns [p.114]), authors must also specify the width of the table itself.

Table directionality

The directionality of a table is either the inherited directionality (the default is left-to-right) or that specified by the dir attribute for the TABLE [p.105] element.

For a left-to-right table, column zero is on the left side and row zero is at the top. For a right-to-left table, column zero is on the right side and column zero is at the top.

When a user agent allots extra cells to a row (see the section on calculating the number of columns in a table [p.113]), extra row cells are added to the right of the table for left-to-right tables and to the left side for right-to-left tables.

Note that TABLE [p.105] is the only element on which dir reverses the visual order of the columns; a single table row (TR [p.115]) or a group of columns (COLGROUP [p.110]) cannot be independently reversed.

When set for the TABLE [p.105] element, the dir attribute also affects the direction of text within table cells (since the dir attribute is inherited by block-level elements).

To specify a right-to-left table, set the dir attribute as follows:

```
<TABLE dir="RTL">
...the rest of the table...
</TABLE>
```

The direction of text in individual cells can be changed by setting the dir attribute in an element that defines the cell. Please consult the section on bidirectional text for more information on text direction issues.

11.2.2 Table Captions: The CAPTION element

```
<!ELEMENT CAPTION  - - (%inline;)* -- table caption -->
<!ENTITY % CAlign "(top|bottom|left|right)">

<!ATTLIST CAPTION
  %attrs;                          -- %coreattrs, %i18n, %events --
  align       %CAlign;   #IMPLIED  -- relative to table --
  >
```

Start tag: ***required****, End tag:* ***required***

Attribute definitions

align = top | bottom | left | right [CI]
: **Deprecated.** For visual user agents, this attribute specifies the position of the caption with respect to the table. Possible values:
  - top: The caption is at the top of the table. This is the default value.
  - bottom: The caption is at the bottom of the table.
  - left: The caption is at the left of the table.
  - right: The caption is at the right of the table.

Attributes defined elsewhere

- id, class (document-wide identifiers)
- lang (language information), dir (text direction)
- title (element titles)
- style [p.176] (inline style information [p.176])

- onclick [p.238] , ondblclick [p.238] , onmousedown [p.238] , onmouseup [p.239] , onmouseover [p.239] , onmousemove [p.239] , onmouseout [p.239] , onkeypress [p.239] , onkeydown [p.239] , onkeyup [p.239] (intrinsic events [p.238])

When present, the CAPTION [p.107] element's text should describe the nature of the table. The CAPTION [p.107] element is only permitted immediately after the TABLE [p.105] start tag. A TABLE [p.105] element may only contain one CAPTION [p.107] element.

Visual user agents allow sighted people to quickly grasp the structure of the table from the headings as well as the caption. A consequence of this is that captions will often be inadequate as a summary of the purpose and structure of the table from the perspective of people relying on non-visual user agents.

Authors should therefore take care to provide additional information summarizing the purpose and structure of the table using the summary [p.105] attribute of the TABLE [p.105] element. This is especially important for tables without captions. Examples below illustrate the use of the summary [p.105] attribute.

Visual user agents should avoid clipping any part of the table including the caption, unless a means is provided to access all parts, e.g., by horizontal or vertical scrolling. We recommend that the caption text be wrapped to the same width as the table. (See also the section on recommended layout algorithms [p.311] .)

11.2.3 Row groups: the THEAD, TFOOT, and TBODY elements

```
<!ELEMENT THEAD    - O (TR)+       -- table header -->
<!ELEMENT TFOOT    - O (TR)+       -- table footer -->
```

Start tag: ***required****, End tag:* ***optional***

```
<!ELEMENT TBODY    O O (TR)+       -- table body -->
```

Start tag: ***optional****, End tag:* ***optional***

```
<!ATTLIST (THEAD|TBODY|TFOOT)   -- table section --
  %attrs;                       -- %coreattrs, %i18n, %events --
  %cellhalign;                  -- horizontal alignment in cells --
  %cellvalign;                  -- vertical alignment in cells --
  >
```

Attributes defined elsewhere

- id, class (document-wide identifiers)
- lang (language information), dir (text direction)
- title (element titles)
- style [p.176] (inline style information [p.176])
- onclick [p.238] , ondblclick [p.238] , onmousedown [p.238] , onmouseup [p.239] , onmouseover [p.239] , onmousemove [p.239] , onmouseout [p.239] , onkeypress [p.239] , onkeydown [p.239] , onkeyup [p.239] (intrinsic events [p.238])
- align [p.124] , char [p.124] , charoff [p.124] , valign [p.124] (cell alignment [p.124])

Table rows may be grouped into a table head, table foot, and one or more table body sections, using the THEAD [p.108] , TFOOT [p.108] and TBODY [p.108] elements, respectively. This division enables user agents to support scrolling of table bodies independently of the table head and foot. When long tables are printed, the table head and foot information may be repeated on each page that contains table data.

The table head and table foot should contain information about the table's columns. The table body should contain rows of table data.

When present, each THEAD [p.108] , TFOOT [p.108] , and TBODY [p.108] contains a *row group*. Each row group must contain at least one row, defined by the TR [p.115] element.

This example illustrates the order and structure of table heads, feet, and bodies.

```
<TABLE>
<THEAD>
     <TR> ...header information...
</THEAD>
<TFOOT>
     <TR> ...footer information...
</TFOOT>
<TBODY>
     <TR> ...first row of block one data...
     <TR> ...second row of block one data...
</TBODY>
<TBODY>
     <TR> ...first row of block two data...
     <TR> ...second row of block two data...
     <TR> ...third row of block two data...
</TBODY>
</TABLE>
```

TFOOT [p.108] must appear before TBODY [p.108] within a TABLE [p.105] definition so that user agents can render the foot before receiving all of the (potentially numerous) rows of data. The following summarizes which tags are required and which may be omitted:

- The TBODY [p.108] start tag is always required except when the table contains only one table body and no table head or foot sections. The TBODY [p.108] end tag may always be safely omitted.
- The start tags for THEAD [p.108] and TFOOT [p.108] are required when the table head and foot sections are present respectively, but the corresponding end tags may always be safely omitted.

Conforming user agent parsers must obey these rules for reasons of backward compatibility.

The table of the previous example could be shortened by removing certain end tags, as in:

```
<TABLE>
<THEAD>
     <TR> ...header information...
<TFOOT>
     <TR> ...footer information...
<TBODY>
     <TR> ...first row of block one data...
     <TR> ...second row of block one data...
<TBODY>
```

```
    <TR> ...first row of block two data...
    <TR> ...second row of block two data...
    <TR> ...third row of block two data...
</TABLE>
```

The THEAD [p.108] , TFOOT [p.108] , and TBODY [p.108] sections must contain the same number of columns.

11.2.4 Column groups: the COLGROUP and COL elements

Column groups allow authors to:

- Create structural (column) divisions within a table.
- Specify attributes (e.g., width [p.112]) that may be inherited by all columns within the group.
- Group columns together visually (see the rules [p.122] attribute for the TABLE [p.105] . For an example of the visual presentation of columns, consult the table sample [p.134] .

A column group may be defined explicitly (with the COLGROUP [p.110] element) or implicitly (all columns not belonging to a COLGROUP [p.110]). Thus, in the absence of any COLGROUP [p.110] element, a table has a single implicit column group that contains all of the table's columns.

The COLGROUP element

```
<!ELEMENT COLGROUP - O (col)*      -- table column group -->
<!ATTLIST COLGROUP
  %attrs;                          -- %coreattrs, %i18n, %events --
  span        NUMBER     1         -- default number of columns in group --
  width    %MultiLength; #IMPLIED  -- default width for enclosed COLs --
  %cellhalign;                     -- horizontal alignment in cells --
  %cellvalign;                     -- vertical alignment in cells --
  >
```

Start tag: ***required****, End tag:* ***optional***

Attribute definitions

span = *number* [CN]
: This attribute, which must be an integer > 0, is used to delimit column groups. Values mean the following:
  - In the absence of a span [p.110] attribute, each COLGROUP [p.110] defines a column group containing one column.
  - If the span [p.110] attribute is set to N > 0, the current COLGROUP [p.110] element defines a column group containing N columns.

  User agents **must** ignore this attribute if the current column group contains one or more COL [p.112] elements.

width = *multi-length* [CN]

This attribute specifies a default width for each column in the current column group. In addition to the standard pixel, percentage, and relative values, this attribute allows the special form "0*" (zero asterisk) which means that the width of the each column in the group should be the minimum width necessary to hold the column's contents. This implies that a column's entire contents must be known before its width may be correctly set. Authors should be aware that specifying "0*" will prevent visual user agents from rendering a table incrementally.

This attribute is overridden for any column in the column group whose `width` [p.112] is specified via a `COL` [p.112] element.

Attributes defined elsewhere

- `id`, `class` (document-wide identifiers)
- `lang` (language information), `dir` (text direction)
- `title` (element titles)
- `style` [p.176] (inline style information [p.176])
- `onclick` [p.238] , `ondblclick` [p.238] , `onmousedown` [p.238] , `onmouseup` [p.239] , `onmouseover` [p.239] , `onmousemove` [p.239] , `onmouseout` [p.239] , `onkeypress` [p.239] , `onkeydown` [p.239] , `onkeyup` [p.239] (intrinsic events [p.238])
- `align` [p.124] , `char` [p.124] , `charoff` [p.124] , `valign` [p.124] (cell alignment [p.124])

The `COLGROUP` [p.110] element creates an explicit column group. The number of columns in the column group may be specified in two, mutually exclusive ways:

1. The `span` [p.110] attribute (default value 1) specifies the number of columns in the group.
2. Each `COL` [p.112] element in the `COLGROUP` [p.110] represents one column in the group.

The advantage of using the `span` [p.110] attribute is that authors may group together information about column widths. Thus, if a table contains forty columns, all of which have a width of 20 pixels, it is easier to write:

```
<COLGROUP span="40" width="20">
</COLGROUP>
```

than:

```
<COLGROUP>
   <COL width="20">
   <COL width="20">
   ...a total of forty COL elements...
</COLGROUP>
```

When it is necessary to single out a column (e.g., for style information, to specify width information) within a group, authors must identify that column by using the `COL` [p.112] element. Thus, to apply special style information to the last column of the previous table, we single it out as follows:

```
<COLGROUP width="20">
   <COL repeat="39">
   <COL id="format-me-specially">
</COLGROUP>
```

The `width` [p.110] attribute of the `COLGROUP` [p.110] element is inherited by all 40 columns. The `COL` [p.112] element refers to the first 39 columns (doing nothing special to them) and the second one assigns an `id` value to the fortieth columns so that style sheets may refer to it.

The table in the following example contains two column groups. The first column group contains 10 columns and the second contains 5 columns. The default width for each column in the first column group is 50 pixels. The width of each column in the second column group will be the minimum for the column.

```
<TABLE>
<COLGROUP span="10" width="50">
<COLGROUP span="5" width="0*">
<THEAD>
<TR><TD> ...
</TABLE>
```

The `COL` element

```
<!ELEMENT COL      - O EMPTY       -- table column -->
<!ATTLIST COL                    -- column groups and properties --
  %attrs;                        -- %coreattrs, %i18n, %events --
  repeat      NUMBER     1       -- repeat count for COL --
  width    %MultiLength; #IMPLIED  -- column width specification --
  %cellhalign;                   -- horizontal alignment in cells --
  %cellvalign;                   -- vertical alignment in cells --
  >
```

Start tag: ***required****, End tag:* ***forbidden***

Attribute definitions

`repeat` = *number* [CN]
: This attribute, whose value must be an integer > 0, allows a `COL` [p.112] element to refer to more than one column, offering a convenient way for authors to specify attributes for more than one column. The default value for this attribute is 1 (i.e., the `COL` [p.112] element refers to a single column). If the `repeat` [p.112] attribute is set to N > 1, the current `COL` [p.112] element describes the properties of N adjacent columns.

`width` = *multi-length* [CN]
: This attribute specifies a default width for each column in the current column group. It has the same meaning as the `width` [p.110] attribute for the `COLGROUP` [p.110] element and overrides it.

Attributes defined elsewhere

- `id`, `class` (document-wide identifiers)
- `lang` (language information), `dir` (text direction)
- `title` (element titles)
- `style` [p.176] (inline style information [p.176])
- `onclick` [p.238] , `ondblclick` [p.238] , `onmousedown` [p.238] , `onmouseup` [p.239] , `onmouseover` [p.239] , `onmousemove` [p.239] , `onmouseout` [p.239] , `onkeypress` [p.239] , `onkeydown` [p.239] , `onkeyup` [p.239] (intrinsic events [p.238])
- `align` [p.124] , `char` [p.124] , `charoff` [p.124] , `valign` [p.124] (cell alignment [p.124])

The COL [p.112] element allows authors to group together attribute specifications for table columns. The COL [p.112] does **not** group columns together structurally -- that is the role of the COLGROUP [p.110] element. COL [p.112] elements are empty and serve only as a support for attributes. They may appear inside or outside an explicit column group (i.e., COLGROUP [p.110] element).

The width [p.112] attribute for COL [p.112] refers to the width of each column referred to by the element's repeat [p.112] attribute.

Calculating the number of columns in a table

There are two ways to determine the number of columns in a table (in order of precedence):

1. If the TABLE [p.105] element contains any COLGROUP [p.110] or COL [p.112] elements, user agents should calculate the number of columns by summing the following:
   - For each COL [p.112] element that does not appear inside a COLGROUP [p.110] , take the value of its repeat [p.112] attribute (default value 1).
   - If a COLGROUP [p.110] element contains at least one COL [p.112] element, ignore the span [p.110] attribute for the COLGROUP [p.110] element. For each COL [p.112] element, perform the calculation of step 1.
   - For each empty COLGROUP [p.110] element, take the value of the span [p.110] attribute (default value 1).
2. Otherwise, if the TABLE [p.105] element contains no COLGROUP [p.110] or COL [p.112] elements, user agents should base the number of columns on what is required by the rows. The number of columns is equal to the number of columns required by the row with the most columns, including cells that span multiple columns. For any row that has fewer than this number of columns, the end of that row should be padded with empty cells. The "end" of a row depends on the table directionality [p.106] .

It is considered an error if these two calculations do not result in the same number of columns. Authoring tools should detect this error. If a user agent carries out the first computation, then realizes that the number of columns for a given row exceeds the number calculated for the table, it should reflow the table.

Once the user agent has calculated the number of columns in the table, it may group them into column groups. [p.110]

For example, for each of the following tables, the two column calculation methods should result in three columns. The first three tables may be rendered incrementally.

```
<TABLE>
<COLGROUP span="3"></COLGROUP>
<TR><TD> ...
...rows...
</TABLE>

<TABLE>
<COLGROUP>
<COL>
<COL repeat="2">
</COLGROUP>
<TR><TD> ...
```

```
...rows...
</TABLE>

<TABLE>
<COLGROUP>
<COL>
</COLGROUP>
<COLGROUP span="2">
<TR><TD> ...
...rows...
</TABLE>

<TABLE>
<TR>
  <TD><TD><TD>
</TR>
</TABLE>
```

Calculating the width of columns

Authors may specify column widths in three ways:

Fixed
: A fixed width specification is given in pixels (e.g., `width="30"`). A fixed-width specification enables incremental rendering.

Percentage
: A percentage specification (e.g., `width="20%"`) is based on the percentage of the horizontal space available to the table (between the current left and right margins, including floats). Note that this space does not depend on the table itself, and thus percentage specifications enable incremental rendering.

Proportional
: Proportional specifications (e.g., `width="3*"`) refer to portions of the horizontal space *required* by a table. If the table width is given a fixed value via the `width` attribute of the `TABLE` [p.105] element, user agents may render the table incrementally even with proportional columns.

  However, if the table does not have a fixed width, user agents must receive all table data before they can determine the horizontal space required by the table. Only then may this space be allotted to proportional columns.

If an author specifies no width information for a column, a user agent may not be able to incrementally format the table since it must wait for the entire column of data to arrive in order to allot an appropriate width.

If column widths prove to be too narrow for the contents of a particular table cell, user agents may choose to reflow the table.

The table in this example contains six columns. The first one does not belong to an explicit column group. The next three belong to the first explicit column group and the last two belong to the second explicit column group. This table cannot be formatted incrementally since it contains proportional column width specifications and no value for the `width` [p.105] attribute for the `TABLE` [p.105] element.

Once the (visual) user agent has received the table's data: the available horizontal space will be alloted by the user agent as follows: First the user agent will allot 30 pixels to columns one and two. Then, the minimal space required for the third column will be reserved. The remaining horizontal space will be divided into six equal portions (since 2* + 1* + 3* = 6 portions). Column four (2*) will receive two of these portions, column five (1*) will receive one, and column six (3*) will receive three.

```
<TABLE>
<COLGROUP>
   <COL width="30">
<COLGROUP>
   <COL width="30">
   <COL width="0*">
   <COL width="2*">
<COLGROUP align="center">
   <COL width="1*">
   <COL width="3*" align="char" char=":">
<THEAD>
<TR><TD> ...
...rows...
</TABLE>
```

We have set the value of the `align` [p.124] attribute in the second column group to "center". All cells in every column in this group will inherit this value, but may override it. In fact, the final `COL` [p.112] does just that, by specifying that every cell in the column it governs will be aligned along the ":" character.

In the following table, the column width specifications allow the user agent to format the table incrementally:

```
<TABLE width="200">
<COLGROUP span="10" width="15">
<COLGROUP width="*">
   <COL id="penultimate-row">
   <COL id="last-row">
<THEAD>
<TR><TD> ...
...rows...
</TABLE>
```

The first ten columns will be 15 pixels wide each. The last two columns will each receive half of the remaining 50 pixels. Note that the `COL` [p.112] elements appear only so that an `id` value may be specified for the last two columns.
Note. *Although the `width` [p.105] attribute on the `TABLE` [p.105] element is not deprecated, authors are encouraged to use style sheets to specify table widths.*

11.2.5 Table rows: The `TR` element

```
<!ELEMENT TR       - O (TH|TD)+    -- table row -->
<!ATTLIST TR                       -- table row --
  %attrs;                             -- %coreattrs, %i18n, %events --
```

```
  %cellhalign;                    -- horizontal alignment in cells --
  %cellvalign;                    -- vertical alignment in cells --
  bgcolor     %Color;    #IMPLIED  -- background color for row --
  >
```

Start tag: ***required****, End tag:* ***optional***

Attributes defined elsewhere

- `id`, `class` (document-wide identifiers)
- `lang` (language information), `dir` (text direction)
- `title` (element titles)
- `style` [p.176] (inline style information [p.176])
- `onclick` [p.238] , `ondblclick` [p.238] , `onmousedown` [p.238] , `onmouseup` [p.239] , `onmouseover` [p.239] , `onmousemove` [p.239] , `onmouseout` [p.239] , `onkeypress` [p.239] , `onkeydown` [p.239] , `onkeyup` [p.239] (intrinsic events [p.238])
- `align` [p.124] , `char` [p.124] , `charoff` [p.124] , `valign` [p.124] (cell alignment [p.124])

The `TR` [p.115] elements acts as a container for a row of table cells. The end tag may be omitted.

This sample table contains three rows, each begun by the `TR` [p.115] element:

```
<TABLE summary="This table charts the number of cups
                  of coffee consumed by each senator, the type
                  of coffee (decaf or regular), and whether
                  taken with sugar.">
<CAPTION>Cups of coffee consumed by each senator</CAPTION>
<TR> ...A header row...
<TR> ...First row of data...
<TR> ...Second row of data...
...the rest of the table...
</TABLE>
```

11.2.6 Table cells: The `TH` and `TD` elements

```
<!ELEMENT (TH|TD)  - O (%flow;)*   -- table header cell, table data cell -->

<!-- Scope is simpler than axes attribute for common tables -->
<!ENTITY % Scope "(row|col|rowgroup|colgroup)">

<!-- TH is for headers, TD for data, but for cells acting as both use TD -->
<!ATTLIST (TH|TD)               -- header or data cell --
  %attrs;                          -- %coreattrs, %i18n, %events --
  abbr        %Text;     #IMPLIED  -- abbreviation for header cell --
  axis        CDATA      #IMPLIED  -- names groups of related headers--
  headers     IDREFS     #IMPLIED  -- list of id's for header cells --
  scope       %Scope;    #IMPLIED  -- scope covered by header cells --
  nowrap      (nowrap)   #IMPLIED  -- suppress word wrap --
  bgcolor     %Color;    #IMPLIED  -- cell background color --
  rowspan     NUMBER     1         -- number of rows spanned by cell --
  colspan     NUMBER     1         -- number of cols spanned by cell --
  %cellhalign;                     -- horizontal alignment in cells --
```

```
  %cellvalign;                      -- vertical alignment in cells --
  width       %Pixels;    #IMPLIED  -- width for cell --
  height      %Pixels;    #IMPLIED  -- height for cell --
  >
```

Start tag: ***required****, End tag:* ***optional***

Attribute definitions

`headers` = *idrefs* [CS]
: This attribute specifies the list of header cells that provide header information for the current data cell. The value of this attribute is a space-separated list of cell names; those cells must be named by setting their `id` attribute. Authors generally use the `headers` [p.117] attribute to help non-visual user agents render header information about data cells (e.g., header information is spoken prior to the cell data), but the attribute may also be used in conjunction with style sheets. See also the `scope` [p.117] attribute.

`scope` = *scope-name* [CI]
: This attribute specifies the set of data cells for which the current header cell provides header information. This attribute may be used in place of the `headers` [p.117] attribute, particularly for simple tables. When specified, this attribute must have one of the following values:
  - **row:** The current cell provides header information for the rest of the row that contains it (see also the section on table directionality [p.106]).
  - **col:** The current cell provides header information for the rest of the row that contains it.
  - **rowgroup:** The header cell provides header information for the rest of the row group [p.108] that contains it.
  - **colgroup:** The header cell provides header information for the rest of the column group [p.110] that contains it.

`abbr` = *text* [CS]
: This attribute should be used to provide an abbreviated form of the cell's content, and may be rendered by user agents when appropriate in place of the cell's content. Abbreviated names should be short since user agents may render them repeatedly. For instance, speech synthesizers may render the abbreviated headers relating to a particular cell before rendering that cell's content.

`axis` = *cdata* [CI]
: This attribute may be used to place a cell into conceptual categories that can be considered to form axes in an n-dimensional space. User agents may give users access to these categories (e.g., the user may query the user agent for all cells that belong to certain categories, the user agent may present table in the form of a table of contents, etc.). Please consult the section on categorizing cells [p.130] for more information. The value of this attribute is a comma-separated list of category names.

`rowspan` = *number* [CN]
: This attribute specifies the number of rows spanned by the current cell. The default value of this attribute is one ("1"). The value zero ("0") means that the cell spans all rows from the current row to the last row of the table.

`colspan` = *number* [CN]
: This attribute specifies the number of columns spanned by the current cell. The default value of this attribute is one ("1"). The value zero ("0") means that the cell spans all columns from the current column to the last column of the table.

`nowrap` [CI]
: **Deprecated.** When present, this boolean attribute tells visual user agents to disable automatic text wrapping for this cell. Style sheets should be used instead of this attribute to achieve wrapping effects. **Note.** if used carelessly, this attribute may result in excessively wide cells.

`width` = *pixels* [CN]
: **Deprecated.** This attribute supplies user agents with a recommended cell width.

`height` = *pixels* [CN]
: **Deprecated.** This attribute supplies user agents with a recommended cell height.

Attributes defined elsewhere

- `id`, `class` (document-wide identifiers)
- `lang` (language information), `dir` (text direction)
- `title` (element titles)
- `style` [p.176] (inline style information [p.176])
- `onclick` [p.238] , `ondblclick` [p.238] , `onmousedown` [p.238] , `onmouseup` [p.239] , `onmouseover` [p.239] , `onmousemove` [p.239] , `onmouseout` [p.239] , `onkeypress` [p.239] , `onkeydown` [p.239] , `onkeyup` [p.239] (intrinsic events [p.238])
- `bgcolor` [p.185] (background color [p.185])
- `align` [p.124] , `char` [p.124] , `charoff` [p.124] , `valign` [p.124] (cell alignment [p.124])

Table cells may contain two types of information: header information and actual data. This distinction enables user agents to render header and data cells distinctly, even in the absence of style sheets. For example, visual user agents may present header cell text with a bold font. Speech synthesizers may render header information with a distinct voice inflection.

The `TH` [p.116] element defines a cell that contains header information. User agents have two pieces of header information available: the contents of the `TH` [p.116] element and the value of the `abbr` [p.117] attribute. User agents must render either the contents of the cell or the value of the `abbr` [p.117] attribute. For visual media, the latter may be appropriate when there is insufficient space to render the full contents of the cell. For non-visual media `abbr` [p.117] may be used as an abbreviation for table headers when these are rendered along with the contents of the cells to which they apply.

The `headers` [p.117] and `scope` [p.117] attributes also allow authors to help non-visual user agents process header information. Please consult the section on labeling cells for non-visual user agents [p.127] for information and examples.

The `TD` [p.116] element defines a cell that contains data.

Cells may be empty (i.e., contain no data).

For example, the following table contains four columns of data, each headed by a column description.

```
<TABLE summary="This table charts the number of cups
                  of coffee consumed by each senator, the type
                  of coffee (decaf or regular), and whether
                  taken with sugar.">
<CAPTION>Cups of coffee consumed by each senator</CAPTION>
<TR>
```

```
   <TH>Name</TH>
   <TH>Cups</TH>
   <TH>Type of Coffee</TH>
   <TH>Sugar?</TH>
<TR>
   <TD>T. Sexton</TD>
   <TD>10</TD>
   <TD>Espresso</TD>
   <TD>No</TD>
<TR>
   <TD>J. Dinnen</TD>
   <TD>5</TD>
   <TD>Decaf</TD>
   <TD>Yes</TD>
</TABLE>
```

Your user agent renders the beginning of this table as follows:

Cups of coffee consumed by each senator

Name	Cups	Type of Coffee	Sugar?
T. Sexton	10	Espresso	No
J. Dinnen	5	Decaf	Yes

Cells that span several rows or columns

Cells may span several rows or columns. The number of rows or columns spanned by a cell is set by the `rowspan` [p.117] and `colspan` [p.117] attributes for the `TH` [p.116] and `TD` [p.116] elements.

In this table definition, we specify that the cell in row four, column two should span a total of three columns, including the current row.

```
<TABLE border="border">
<CAPTION>Cups of coffee consumed by each senator</CAPTION>
<TR><TH>Name<TH>Cups<TH>Type of Coffee<TH>Sugar?
<TR><TD>T. Sexton<TD>10<TD>Espresso<TD>No
<TR><TD>J. Dinnen<TD>5<TD>Decaf<TD>Yes
<TR><TD>A. Soria<TD colspan="3"><em>Not available</em>
</TABLE>
```

This table might be rendered by a visual user agent as follows:

```
Cups of coffee consumed by each senator
 ------------------------------------
 |   Name  |Cups|Type of Coffee|Sugar?|
 ------------------------------------
 |T. Sexton|10  |Espresso      |No    |
 ------------------------------------
 |J. Dinnen|5   |Decaf         |Yes   |
 ------------------------------------
 |A. Soria |Not available             |
 ------------------------------------
```

In your user agent this appears as:

Cups of coffee consumed by each senator

Name	Cups	Type of Coffee	Sugar?
T. Sexton	10	Espresso	No
J. Dinnen	5	Decaf	Yes
A. Soria	*Not available*		

The next example illustrates (with the help of table borders) how cell definitions that span more than one row or column affect the definition of later cells. Consider the following table definition:

```
<TABLE border="border">
<TR><TD>1 <TD rowspan="2">2 <TD>3
<TR><TD>4 <TD>6
<TR><TD>7 <TD>8 <TD>9
</TABLE>
```

As cell "2" spans the first and second rows, the definition of the second row will take it into account. Thus, the second `TD` [p.116] in row two actually defines the row's third cell. Visually, the table might be rendered something like this:

```
-------------
| 1 | 2 | 3 |
----|   |----
| 4 |   | 6 |
----|---|----
| 7 | 8 | 9 |
-------------
```

Your user agent renders this table as:

1	2	3
4		6
7	8	9

Note that if the `TD` [p.116] defining cell "6" had been omitted, an extra empty cell would have been added by the user agent to complete the row.

Similarly, in the following table definition:

```
<TABLE border="border">
<TR><TD>1 <TD>2 <TD>3
<TR><TD colspan="2">4 <TD>6
<TR><TD>7 <TD>8 <TD>9
</TABLE>
```

cell "4" spans two columns, so the second TD [p.116] in the row actually defines the third cell ("6"):

```
-------------
| 1 | 2 | 3 |
--------|----
| 4       | 6 |
--------|----
| 7 | 8 | 9 |
-------------
```

Your user agent renders this table as:

1	2	3
4		6
7	8	9

Defining overlapping cells is considered an error. User agents may vary in how they handle this error (e.g., rendering may vary).

The following illegal example illustrates how one might create overlapping cells. In this table, cell "5" spans two rows and cell "7" spans two columns, so there is overlap in the cell between "7" and "9":

```
<TABLE border="border">
<TR><TD>1 <TD>2 <TD>3
<TR><TD>4 <TD rowspan="2">5 <TD>6
<TR><TD colspan="2">7 <TD>9
</TABLE>
```

11.3 Table formatting by visual user agents

Note.*The following sections describe the HTML table attributes that concern visual formatting. Although style sheets will offer better control of visual table formatting, at the writing of this specification, [CSS1] [p.319] did not offer mechanisms to control all aspects of visual table formatting.*

HTML 4.0 includes mechanisms to control:

- border styles [p.121]
- horizontal and vertical alignment [p.124] of cell contents
- and cell margins [p.126]

11.3.1 Borders and rules

The following attributes affect a table’s external frame and internal rules.

Attribute definitions

`frame` = `void`|`above`|`below`|`hsides`|`lhs`|`rhs`|`vsides`|`box`|`border` [CI]
: This attribute specifies which sides of the frame that surrounds a table will be visible. Possible values:
  - `void`: No sides. This is the default value.
  - `above`: The top side only.
  - `below`: The bottom side only.
  - `hsides`: The top and bottom sides only.
  - `vsides`: The right and left sides only.
  - `lhs`: The left-hand side only.
  - `rhs`: The right-hand side only.
  - `box`: All four sides.
  - `border`: All four sides.

`rules` = `none`|`groups`|`rows`|`cols`|`all` [CI]
: This attribute specifies which rules will appear between cells within a table. The rendering of rules is user agent dependent. Possible values:
  - `none`: No rules. This is the default value.
  - `groups`: Rules will appear between row groups (see `THEAD` [p.108] , `TFOOT` [p.108] , and `TBODY` [p.108]) and column groups (see `COLGROUP` [p.110] and `COL` [p.112]) only.
  - `rows`: Rules will appear between rows only.
  - `cols`: Rules will appear between columns only.
  - `all`: Rules will appear between all rows and columns.

`border` = *cdata* [CN]
: This attributes specifies the width (in pixels only) of the frame around a table (see the Note below for more information about this attribute).

To help distinguish the cells of a table, we can set the `border` [p.122] attribute of the `TABLE` [p.105] element. Consider a previous example:

```
<TABLE border="border"
       summary="This table charts the number of cups
                of coffee consumed by each senator, the type
                of coffee (decaf or regular), and whether
                taken with sugar.">
<CAPTION>Cups of coffee consumed by each senator</CAPTION>
<TR>
   <TH>Name</TH>
   <TH>Cups</TH>
   <TH>Type of Coffee</TH>
   <TH>Sugar?</TH>
<TR>
   <TD>T. Sexton</TD>
   <TD>10</TD>
   <TD>Espresso</TD>
   <TD>No</TD>
<TR>
   <TD>J. Dinnen</TD>
```

```
   <TD>5</TD>
   <TD>Decaf</TD>
   <TD>Yes</TD>
</TABLE>
```

With the addition of the `border` [p.122] attribute, your user agent renders the beginning of this table as follows:

Cups of coffee consumed by each senator

Name	Cups	Type of Coffee	Sugar?
T. Sexton	10	Espresso	No
J. Dinnen	5	Decaf	Yes

In the following example, the user agent should show borders five pixels thick on the left-hand and right-hand sides of the table, with rules drawn between each column.

```
<TABLE border="5" frame="vsides" rules="cols">
<TR> <TD>1 <TD>2 <TD>3
<TR> <TD>4 <TD>5 <TD>6
<TR> <TD>7 <TD>8 <TD>9
</TABLE>
```

The following settings should be observed by user agents for backwards compatibility.

- Setting `border` [p.122] ="0" implies `frame` [p.122] ="void" and, unless otherwise specified, `rules` [p.122] ="none".
- Other values of `border` [p.122] imply `frame` [p.122] ="border" and, unless otherwise specified, `rules` [p.122] ="all".
- The value "border" in the start tag of the `TABLE` [p.105] element should be interpreted as the value of the `frame` [p.122] attribute. It implies `rules` [p.122] ="all" and some default (non-zero) value for the `border` [p.122] attribute.

For example, the following definitions are equivalent:

```
<TABLE border="2">
<TABLE border="2" frame="border" rules="all">
```

as are the following:

```
<TABLE border>
<TABLE frame="border" rules="all">
```

Note. *The `border` [p.171] attribute also defines the border behavior for the `OBJECT` [p.154] and `IMG` [p.152] elements, but takes different values for those elements.*

11.3.2 Horizontal and vertical alignment

The following attributes may be set for different table elements (see their definitions).

```
<!-- horizontal alignment attributes for cell contents -->
<!ENTITY % cellhalign
  "align (left|center|right|justify|char) #IMPLIED
   char       %Character;   #IMPLIED  -- alignment char, e.g. char=':' --
   charoff    %Length;      #IMPLIED  -- offset for alignment char --"
  >
<!-- vertical alignment attributes for cell contents -->
<!ENTITY % cellvalign
  "valign (top|middle|bottom|baseline) #IMPLIED"
  >
```

Attribute definitions

`align` = `left` | `center` | `right` | `justify` | `char` [CI]
: This attribute specifies the alignment of data and the justification of text in a cell. Possible values:
  - `left`: Left-flush data/Left-justify text. This is the default value for table data.
  - `center`: Center data/Center-justify text. This is the default value for table headers.
  - `right`: Right-flush data/Right-justify text.
  - `justify`: Double-justify text.
  - `char`: Align text around a specific character.

`valign` = `top` | `middle` | `bottom` | `baseline` [CI]
: This attribute specifies the vertical position of data within a cell. Possible values:
  - `top`: Cell data is flush with the top of the cell.
  - `middle`: Cell data is centered vertically within the cell. This is the default value.
  - `bottom`: Cell data is flush with the bottom of the cell.
  - `baseline`: All cells in the same row as a cell whose `valign` attribute has this value should have their textual data positioned so that the first text line occurs on a baseline common to all cells in the row. This constraint does not apply to subsequent text lines in these cells.

`char` = *character* [CN]
: This attribute specifies a single character within a text fragment that will act as an axis for alignment. The default value for this attribute is the decimal point character for the current language as set by the `lang` attribute (e.g., the period (".") in English and the comma (",") in French).

`charoff` = *length* [CN]
: When present, this attribute specifies the offset to the first occurrence of the alignment character on each line. If a line doesn't include the alignment character, it should be horizontally shifted to end at the alignment position.

  When `charoff` [p.124] is used to set the offset of an alignment character, the direction of offset is determined by the current text direction (set by the `dir` attribute). In left-to-right texts (the default), offset is from the left margin. In right-to-left texts, offset is from the right margin.

The table in this example aligns a row of currency values along a decimal point. We set the alignment character to "." explicitly.

```
<TABLE border="border">
<COLGROUP>
<COL><COL align="char" char=".">
<THEAD>
<TR><TH>Vegetable <TH>Cost per kilo
<TBODY>
<TR><TD>Lettuce        <TD>$1
<TR><TD>Silver carrots <TD>$10.50
<TR><TD>Golden turnips <TD>$100.30
</TABLE>
```

The formatted table should look something like this:

```
------------------------------
|   Vegetable  |Cost per kilo|
|--------------|-------------|
|Lettuce       |         $1  |
|--------------|-------------|
|Silver carrots|       $10.50|
|--------------|-------------|
|Golden turnips|      $100.30|
------------------------------
```

When the contents of a cell contain more than one instance of the alignment character specified by `char` [p.124] and the contents wrap, user agent behavior is undefined. Authors should therefore be attentive in their use of `char` [p.124] .

Note. *Visual user agents typically render `TH` [p.116] elements vertically and horizontally centered within the cell and with a bold font weight.*

Inheritance of alignment specifications

The alignment of cell contents can be specified on a cell by cell basis, or inherited from enclosing elements, such as the row, column or the table itself.

The order of precedence (from highest to lowest) for the attributes `align` [p.124] , `char` [p.124] , and `charoff` [p.124] is the following:

1. An alignment attribute set on an element within a cell's data (e.g., `P`).
2. An alignment attribute set on a cell (`TH` [p.116] and `TD` [p.116]).
3. An alignment attribute set on a column grouping element (`COL` [p.112] and `COLGROUP` [p.110]). When a cell is part of a multi-column span, the alignment property is inherited from the cell definition at the beginning of the span.
4. An alignment attribute set on a row or row grouping element (`TR` [p.115] , `THEAD` [p.108] , `TFOOT` [p.108] , and `TBODY` [p.108]). When a cell is part of a multi-row span, the alignment property is inherited from the cell definition at the beginning of the span.
5. An alignment attribute set on the table (`TABLE` [p.105]).
6. The default alignment value.

The order of precedence (from highest to lowest) for the attribute `valign` [p.124] (as well as the other inherited attributes `lang`, `dir`, and `style` [p.176]) is the following:

1. An attribute set on an element within a cell's data (e.g., `P`).
2. An attribute set on a cell (`TH` [p.116] and `TD` [p.116]).
3. An attribute set on a row or row grouping element (`TR` [p.115] , `THEAD` [p.108] , `TFOOT` [p.108] , and `TBODY` [p.108]). When a cell is part of a multi-row span, the attribute value is inherited from the cell definition at the beginning of the span.
4. An attribute set on a column grouping element (`COL` [p.112] and `COLGROUP` [p.110]). When a cell is part of a multi-column span, the attribute value is inherited from the cell definition at the beginning of the span.
5. An attribute set on the table (`TABLE` [p.105]).
6. The default attribute value.

Furthermore, when rendering cells, horizontal alignment is determined by columns in preference to rows, while for vertical alignment, rows are given preference over columns.

The default alignment for cells depends on the user agent. However, user agents should substitute the default attribute for the current directionality (i.e., not just "left" in all cases).

User agents that do not support the "justify" value of the `align` [p.124] attribute should use the value of the inherited directionality in its place.

Note. *Note that a cell may inherit an attribute not from its parent but from the first cell in a span. This is an exception to the general attribute inheritance rules.*

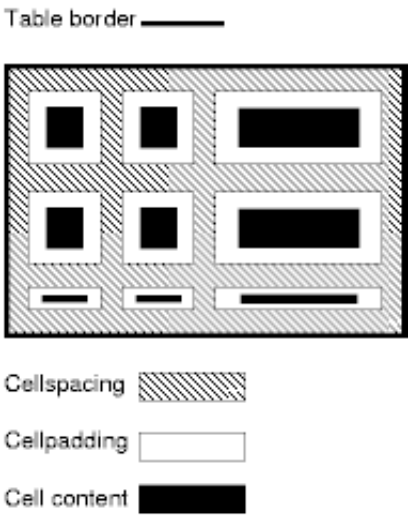
11.3.3 Cell margins

Attribute definitions

`cellspacing` = *length* [CN]
: This attribute specifies how much space the user agent should leave between the left side of the table and the left-hand side of the leftmost column, the top of the table and the top side of the topmost row, and so on for the right and bottom of the table. The attribute also specifies the amount of space to leave between cells.

`cellpadding` = *length* [CN]
: This attribute specifies the amount of space between the border of the cell and its contents. If the value of this attribute is a pixel length, all four margins should be this distance from the contents. If the value of the attribute is a percentage length, the top and bottom margins should be equally separated from the content based on a percentage of the available vertical space, and the left and right margins should be equally separated from the content based on a percentage of the available horizontal space.

These two attributes control spacing between and within cells. The following illustration explains how they relate:



In the following example, the `cellspacing` [p.126] attribute specifies that cells should be separated from each other and from the table frame by twenty pixels. The `cellpadding` [p.126] attribute specifies that the top margin of the cell and the bottom margin of the cell will each be separated from the cell's contents by 10% of the available vertical space (the total being 20%). Similarly, the left margin of the cell and the right margin of the cell will each be separated from the cell's contents by 10% of the available horizontal space (the total being 20%).

```
<TABLE cellspacing="20" cellpadding="20%">
<TR> <TD>Data1 <TD>Data2 <TD>Data3
</TABLE>
```

If a table or given column has a fixed width, `cellspacing` [p.126] and `cellpadding` [p.126] may demand more space than assigned. User agents may give these attributes precedence over the `width` [p.118] attribute when a conflict occurs, but are not required to.

11.4 Table rendering by non-visual user agents

11.4.1 Associating header information with data cells

Non-visual user agents such as speech synthesizers and Braille-based devices may use the following `TD` [p.116] and `TH` [p.116] element attributes to render table cells more intuitively:

- For a given data cell, the `headers` [p.117] attribute lists which cells provide pertinent header information. For this purpose, each header cell must be named using the `id` attribute. Note that its not always possible to make a clean division of cells into headers or data. You should use the `TD` [p.116] element for such cells together with the `id` or `scope` [p.117] attributes as appropriate.
- For a given header cell, the `scope` [p.117] attribute tells the user agent the data cells for which this header provides information. Authors may choose to use this attribute instead of `headers` [p.117] according to which is more convenient; the two attributes fulfill the same function. The `headers` [p.117] attribute is generally needed when headers are placed in irregular positions with respect to the data they apply to.

- The `abbr` [p.117] attribute specifies an abbreviated header for header cells so that user agents may render header information more rapidly.

In the following example, we assign header information to cells by setting the `headers` [p.117] attribute. Each cell in the same column refers to the same header cell (via the `id` attribute).

```
<TABLE border="border"
       summary="This table charts the number of cups
                of coffee consumed by each senator, the type
                of coffee (decaf or regular), and whether
                taken with sugar.">
<CAPTION>Cups of coffee consumed by each senator</CAPTION>
<TR>
   <TH id="t1">Name</TH>
   <TH id="t2">Cups</TH>
   <TH id="t3" abbr="Type">Type of Coffee</TH>
   <TH id="t4">Sugar?</TH>
<TR>
   <TD headers="t1">T. Sexton</TD>
   <TD headers="t2">10</TD>
   <TD headers="t3">Espresso</TD>
   <TD headers="t4">No</TD>
<TR>
   <TD headers="t1">J. Dinnen</TD>
   <TD headers="t2">5</TD>
   <TD headers="t3">Decaf</TD>
   <TD headers="t4">Yes</TD>
</TABLE>
```

A speech synthesizer might render this table as follows:

```
Caption: Cups of coffee consumed by each senator
Summary: This table charts the number of cups
         of coffee consumed by each senator, the type
         of coffee (decaf or regular), and whether
         taken with sugar.
Name: T. Sexton,   Cups: 10,   Type: Espresso,   Sugar: No
Name: J. Dinnen,   Cups: 5,    Type: Decaf,      Sugar: Yes
```

Note how the header "Type of Coffee" is abbreviated to "Type" using the `abbr` [p.117] attribute.

Here is the same example substituting the `scope` [p.117] attribute for the `headers` [p.117] attribute. Note the value "col" for the `scope` [p.117] attribute, meaning "all cells in the current column":

```
<TABLE border="border"
       summary="This table charts the number of cups
                of coffee consumed by each senator, the type
                of coffee (decaf or regular), and whether
                taken with sugar.">
<CAPTION>Cups of coffee consumed by each senator</CAPTION>
<TR>
   <TH scope="col">Name</TH>
   <TH scope="col">Cups</TH>
   <TH scope="col" abbr="Type">Type of Coffee</TH>
   <TH scope="col">Sugar?</TH>
```

```
<TR>
   <TD>T. Sexton</TD>
   <TD>10</TD>
   <TD>Espresso</TD>
   <TD>No</TD>
<TR>
   <TD>J. Dinnen</TD>
   <TD>5</TD>
   <TD>Decaf</TD>
   <TD>Yes</TD>
</TABLE>
```

Here's a somewhat more complex example illustrating other values for the `scope` [p.117] attribute:

```
<TABLE border="border" cellpadding="5" cellspacing="2"
  summary="History courses offered in the community of
           Bath arranged by course name, tutor, summary,
           code, and fee">
  <TR>
    <TH colspan="5" scope="colgroup">Community Courses -- Bath Autumn 1997</TH>
  </TR>
  <TR>
    <TH scope="col" abbr="Name">Course Name</TH>
    <TH scope="col" abbr="Tutor">Course Tutor</TH>
    <TH scope="col">Summary</TH>
    <TH scope="col">Code</TH>
    <TH scope="col">Fee</TH>
  </TR>
  <TR>
    <TD scope="row">After the Civil War</TD>
    <TD>Dr. John Wroughton</TD>
    <TD>
       The course will examine the turbulent years in England
       after 1646. <EM>6 weekly meetings starting Monday 13th
      October.</EM>
    </TD>
    <TD>H27</TD>
    <TD>&pound;32</TD>
  </TR>
  <TR>
    <TD scope="row">An Introduction to Anglo-Saxon England</TD>
    <TD>Mark Cottle</TD>
    <TD>
       One day course introducing the early medieval
       period reconstruction the Anglo-Saxons and
       their society. <EM>Saturday 18th October.</EM>
    </TD>
    <TD>H28</TD>
    <TD>&pound;18</TD>
  </TR>
  <TR>
    <TD scope="row">The Glory that was Greece</TD>
    <TD>Valerie Lorenz</TD>
    <TD>
     Birthplace of democracy, philosophy, heartland of theater, home of
     argument. The Romans may have done it but the Greeks did it
     first. <EM>Saturday day school 25th October 1997</EM>
```

```
    </TD>
    <TD>H30</TD>
    <TD>&pound;18</TD>
  </TR>
</TABLE>
```

Your user agent renders this table as follows:

Community Courses -- Bath Autumn 1997				
Course Name	**Course Tutor**	**Summary**	**Code**	**Fee**
After the Civil War	Dr. John Wroughton	The course will examine the turbulent years in England after 1646. *6 weekly meetings starting Monday 13th October.*	H27	£32
An Introduction to Anglo-Saxon England	Mark Cottle	One day course introducing the early medieval period reconstruction the Anglo-Saxons and their society. *Saturday 18th October.*	H28	£18
The Glory that was Greece	Valerie Lorenz	Birthplace of democracy, philosophy, heartland of theater, home of argument. The Romans may have done it but the Greeks did it first. *Saturday day school 25th October 1997*	H30	£18

Note the use of the `scope` [p.117] attribute with the "row" value. Although the first cell in each row contains data, not header information, the `scope` [p.117] attribute makes the data cell behave like a row header cell. This allows speech synthesizers to provide the relevant course name upon request or to state it immediately before each cell's content.

11.4.2 Categorizing cells

Users browsing a table with a speech-based user agent may wish to hear an explanation of a cell's contents in addition to the contents themselves. One way the user might provide an explanation is by speaking associated header information before speaking the data cell's contents (see the section on associating header information with data cells [p.127]).

Users may also want information about more than one cell, in which case header information provided at the cell level (by `headers` [p.117] , `scope` [p.117] , and `abbr` [p.117]) may not provide adequate context. Consider the following table, which classifies expenses for meals, hotels, and transport in two locations (San Jose and Seattle) over several days:

Travel Expense Report

	Meals	Hotels	Transport	subtotals
San Jose				
25-Aug-97	37.74	112.00	45.00	
26-Aug-97	27.28	112.00	45.00	
subtotals	65.02	224.00	90.00	379.02
Seattle				
27-Aug-97	96.25	109.00	36.00	
28-Aug-97	35.00	109.00	36.00	
subtotals	131.25	218.00	72.00	421.25
Totals	196.27	442.00	162.00	**800.27**

Users might want to extract information from the table in the form of queries:

- "What did I spend for all my meals?"
- "What did I spend for meals on 25 August?"
- "What did I spend for all expenses in San Jose?"

Each query involves a computation by the user agent that may involve zero or more cells. In order to determine, for example, the costs of meals on 25 August, the user agent must know which table cells refer to "Meals" (all of them) and which refer to "Dates" (specifically, 25 August), and find the intersection of the two sets.

To accommodate this type of query, the HTML 4.0 table model allows authors to place cell headers and data into categories. For example, for the travel expense table, an author could group the header cells "San Jose" and "Seattle" into the category "Location", the headers "Meals", "Hotels", and "Transport" in the category "Expenses", and the four days into the category "Date". The previous three questions would then have the following meanings:

- "What did I spend for all my meals?" means "What are all the data cells in the "Expenses=Meals" category?
- "What did I spend for meals on 25 August?" means "What are all the data cells in the "Expenses=Meals" and "Date=Aug-25-1997" categories?
- "What did I spend for all expenses in San Jose?" means "What are all the data cells in the "Expenses=Meals, Hotels, Transport" and "Location=San Jose" categories?

Authors categorize a header or data cell by setting the `axis` [p.117] attribute for the cell. For instance, in the travel expense table, the cell containing the information "San Jose" could be placed in the "Location" category as follows:

```
<TH id="a6" axis="location">San Jose</TH>
```

Any cell containing information related to "San Jose" should refer to this header cell via either the `headers` [p.117] or the `scope` [p.117] attribute. Thus, meal expenses for 25-Aug-1997 should be marked up to refer to `id` attribute (whose value here is "a6") of the "San Jose" header cell:

```
  <TD headers="a6">37.74</TD>
```

Each `headers` [p.117] attribute provides a list of `id` references. Authors may thus categorize a given cell in any number of ways (or, along any number of "headers", hence the name).

Below we mark up the travel expense table with category information:

```
<TABLE border="border">
<CAPTION>
  Travel Expense Report
</CAPTION>
<TR>
  <TH></TH>
  <TH id="a2" axis="expenses">Meals</TH>
  <TH id="a3" axis="expenses">Hotels</TH>
  <TH id="a4" axis="expenses">Transport</TH>
  <TD>subtotals</TD>
</TR>
<TR>
  <TH id="a6" axis="location">San Jose</TH>
  <TH></TH>
  <TH></TH>
  <TH></TH>
  <TD></TD>
</TR>
<TR>
  <TD id="a7" axis="date">25-Aug-97</TD>
  <TD headers="a6 a7 a2">37.74</TD>
  <TD headers="a6 a7 a3">112.00</TD>
  <TD headers="a6 a7 a4">45.00</TD>
  <TD></TD>
</TR>
<TR>
  <TD id="a8" axis="date">26-Aug-97</TD>
  <TD headers="a6 a8 a2">27.28</TD>
  <TD headers="a6 a8 a3">112.00</TD>
  <TD headers="a6 a8 a4">45.00</TD>
  <TD></TD>
</TR>
<TR>
  <TD>subtotals</TD>
  <TD>65.02</TD>
  <TD>224.00</TD>
  <TD>90.00</TD>
  <TD>379.02</TD>
</TR>
<TR>
  <TH id="a10" axis="location">Seattle</TH>
  <TH></TH>
  <TH></TH>
  <TH></TH>
  <TD></TD>
</TR>
<TR>
  <TD id="a11" axis="date">27-Aug-97</TD>
```

```
  <TD headers="a10 a11 a2">96.25</TD>
  <TD headers="a10 a11 a3">109.00</TD>
  <TD headers="a10 a11 a4">36.00</TD>
  <TD></TD>
</TR>
<TR>
  <TD id="a12" axis="date">28-Aug-97</TD>
  <TD headers="a10 a12 a2">35.00</TD>
  <TD headers="a10 a12 a3">109.00</TD>
  <TD headers="a10 a12 a4">36.00</TD>
  <TD></TD>
</TR>
<TR>
  <TD>subtotals</TD>
  <TD>131.25</TD>
  <TD>218.00</TD>
  <TD>72.00</TD>
  <TD>421.25</TD>
</TR>
<TR>
  <TH>Totals</TH>
  <TD>196.27</TD>
  <TD>442.00</TD>
  <TD>162.00</TD>
  <TD>800.27</TD>
</TR>
</TABLE>
```

Note that marking up the table this way also allows user agents to avoid confusing the user with unwanted information. For instance, if a speech synthesizer were to speak all of the figures in the "Meals" column of this table in response to the query "What were all my meal expenses?", a user would not be able to distinguish a day's expenses from subtotals or totals. By carefully categorizing cell data, authors allow user agents to make important semantic distinctions when rendering.

Of course, there is no limit to how authors may categorize information in a table. In the travel expense table, for example, we could add the additional categories "subtotals" and "totals".

This specification does not require user agents to handle information provided by the `axis` [p.117] attribute, nor does it make any recommendations about how user agents may present `axis` [p.117] information to users or how users may query the user agent about this information.

However, user agents, particularly speech synthesizers, may want to factor out information common to several cells that are the result of a query. For instance, if the user asks "What did I spend for meals in San Jose?", the user agent would first determine the cells in question (25-Aug-1997: 37.74, 26-Aug-1997:27.28), then render this information. One possible rendering of this information might be to speak:

```
Location: San Jose. Date: 25-Aug-1997. Expenses, Meals: 37.74
Location: San Jose. Date: 26-Aug-1997. Expenses, Meals: 27.28
```

Another might be less explicit:

```
San Jose, 25-Aug-1997, Meals: 37.74
San Jose, 26-Aug-1997, Meals: 27.28
```

An even more economical rendering would factor the common information and reorder it:

```
San Jose, Meals, 25-Aug-1997: 37.74
                 26-Aug-1997: 27.28
```

User agents that support this type of rendering should allow user agents a means to customize rendering (e.g., through style sheets).

11.4.3 Algorithm to find heading information

In the absence of header information from either the `scope` [p.117] or `headers` [p.117] attribute, user agents may construct header information according to the following algorithm. The goal of the algorithm is to find an ordered list of headers. (In the following description of the algorithm the table directionality [p.106] is assumed to be left-to-right.)

- First, search left from the cell's position to find row header cells. Then search upwards to find column header cells. The search in a given direction stops when the edge of the table is reached or when a data cell is found after a header cell.
- Row headers are inserted into the list in the order they appear in the table. For left-to-right tables, headers are inserted from left to right.
- Column headers are inserted after row headers, in the order they appear in the table, from top to bottom.
- If a header cell has the `headers` [p.117] attribute set, then the headers referenced by this attribute are inserted into the list and the search stops for the current direction.
- `TD` [p.116] cells that set the `axis` [p.117] attribute are also treated as header cells.

11.5 Sample table

This sample illustrates grouped rows and columns. The example is adapted from "Developing International Software", by Nadine Kano.

In "ascii art", the following table:

```
<TABLE border="2" frame="hsides" rules="groups">
<CAPTION>CODE-PAGE SUPPORT IN MICROSOFT WINDOWS</CAPTION>
<COLGROUP align="center">
<COLGROUP align="left">
<COLGROUP align="center" span="2">
<COLGROUP align="center" span="3">
<THEAD valign="top">
<TR>
<TH>Code-Page<BR>ID
<TH>Name
<TH>ACP
<TH>OEMCP
```

```
<TH>Windows<BR>NT 3.1
<TH>Windows<BR>NT 3.51
<TH>Windows<BR>95
<TBODY>
<TR><TD>1200<TD>Unicode (BMP of ISO/IEC-10646)<TD><TD><TD>X<TD>X<TD>*
<TR><TD>1250<TD>Windows 3.1 Eastern European<TD>X<TD><TD>X<TD>X<TD>X
<TR><TD>1251<TD>Windows 3.1 Cyrillic<TD>X<TD><TD>X<TD>X<TD>X
<TR><TD>1252<TD>Windows 3.1 US (ANSI)<TD>X<TD><TD>X<TD>X<TD>X
<TR><TD>1253<TD>Windows 3.1 Greek<TD>X<TD><TD>X<TD>X<TD>X
<TR><TD>1254<TD>Windows 3.1 Turkish<TD>X<TD><TD>X<TD>X<TD>X
<TR><TD>1255<TD>Hebrew<TD>X<TD><TD><TD><TD>X
<TR><TD>1256<TD>Arabic<TD>X<TD><TD><TD><TD>X
<TR><TD>1257<TD>Baltic<TD>X<TD><TD><TD><TD>X
<TR><TD>1361<TD>Korean (Johab)<TD>X<TD><TD><TD>**<TD>X
<TBODY>
<TR><TD>437<TD>MS-DOS United States<TD><TD>X<TD>X<TD>X<TD>X
<TR><TD>708<TD>Arabic (ASMO 708)<TD><TD>X<TD><TD><TD>X
<TR><TD>709<TD>Arabic (ASMO 449+, BCON V4)<TD><TD>X<TD><TD><TD><TD>X
<TR><TD>710<TD>Arabic (Transparent Arabic)<TD><TD>X<TD><TD><TD><TD>X
<TR><TD>720<TD>Arabic (Transparent ASMO)<TD><TD>X<TD><TD><TD><TD>X
</TABLE>
```

would be rendered something like this:

CODE-PAGE SUPPORT IN MICROSOFT WINDOWS

Code-Page ID	Name	ACP	OEMCP	Windows NT 3.1	Windows NT 3.51	Windows 95
1200	Unicode (BMP of ISO 10646)			X	X	*
1250	Windows 3.1 Eastern European	X		X	X	X
1251	Windows 3.1 Cyrillic	X		X	X	X
1252	Windows 3.1 US (ANSI)	X		X	X	X
1253	Windows 3.1 Greek	X		X	X	X
1254	Windows 3.1 Turkish	X		X	X	X
1255	Hebrew	X				X
1256	Arabic	X				X
1257	Baltic	X				X
1361	Korean (Johab)	X			**	X
437	MS-DOS United States		X	X	X	X
708	Arabic (ASMO 708)		X			X
709	Arabic (ASMO 449+, BCON V4)		X			X
710	Arabic (Transparent Arabic)		X			X
720	Arabic (Transparent ASMO)		X			X

Your user agent renders this table as follows:

CODE-PAGE SUPPORT IN MICROSOFT WINDOWS

Code-Page ID	Name	ACP	OEMCP	Windows NT 3.1	Windows NT 3.51	Windows 95
1200	Unicode (BMP of ISO/IEC-10646)			X	X	*
1250	Windows 3.1 Eastern European	X		X	X	X
1251	Windows 3.1 Cyrillic	X		X	X	X
1252	Windows 3.1 US (ANSI)	X		X	X	X
1253	Windows 3.1 Greek	X		X	X	X
1254	Windows 3.1 Turkish	X		X	X	X
1255	Hebrew	X				X
1256	Arabic	X				X
1257	Baltic	X				X
1361	Korean (Johab)	X			**	X
437	MS-DOS United States		X	X	X	X
708	Arabic (ASMO 708)		X			X
709	Arabic (ASMO 449+, BCON V4)		X			X
710	Arabic (Transparent Arabic)		X			X
720	Arabic (Transparent ASMO)		X			X

This example illustrates how `COLGROUP` [p.110] can be used to group columns and set the default column alignment. Similarly, `TBODY` [p.108] is used to group rows. The `frame` [p.122] and `rules` [p.122] attributes tell the user agent which borders and rules to render.

12 Links

Contents

1. Introduction to links and anchors [p.137]
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    2. Other link relationships [p.139]
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2. The A element [p.141]
    1. Syntax of anchor names [p.143]
    2. Nested links are illegal [p.144]
    3. Anchors with the id attribute [p.144]
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    1. Forward and reverse links [p.146]
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    3. Links and search engines [p.147]
4. Path information: the BASE element [p.148]
    1. Resolving relative URLs [p.149]

12.1 Introduction to links and anchors

HTML offers many of the conventional publishing idioms for rich text and structured documents, but what separates it from most other markup languages is its features for hypertext and interactive documents. This section introduces the *link* (or hyperlink, or Web link), the basic hypertext construct. A link is a connection from one Web resource to another. Although a simple concept, the link has been one of the primary forces driving the success of the Web.

A link has two ends -- called *anchors* -- and a direction. The link starts at the "source" anchor and points to the "destination" anchor, which may be any Web resource (e.g., an image, a video clip, a sound bite, a program, an HTML document, an element within an HTML document, etc.).

Even if a user agent does not have enough information to correctly process a it should make a best attempt at pro

12.1.1 Visiting a linked resource

The default behavior associated with a link is the retrieval of another Web resource. This behavior is commonly and implicitly obtained by selecting the link (e.g., by clicking, through keyboard input, etc.).

The following HTML excerpt contains two links, one whose destination anchor is an HTML document named "chapter2.html" and the other whose destination anchor is a GIF image in the file "forest.gif":

```
<BODY>
...some text...
<P>You'll find a lot more in  <A href="chapter2.html">chapter two</A>.
See also this <A href="../images/forest.gif">map of the enchanted forest.</A>
</BODY>
```

By activating these links (by clicking with the mouse, through keyboard input, voice commands, etc.), users may visit these resources. Note that the `href` [p.141] attribute in each source anchor specifies the address of the destination anchor with a URL.

The destination anchor of a link may be an element within an HTML document. The destination anchor must be given an anchor name and any URL addressing this anchor must include the name as its fragment identifier.

Destination anchors in HTML documents may be specified either by the `A` [p.141] element (naming it with the `name` [p.141] attribute), or by any other element (naming with the `id` attribute).

Thus, for example, an author might create a table of contents whose entries link to header elements `H2`, `H3`, etc., in the same document. Using the `A` [p.141] element to create destination anchors, we would write:

```
<H1>Table of Contents</H1>
<P><A href="#section1">Introduction</A><BR>
<A href="#section2">Some background</A><BR>
<A href="#section2.1">On a more personal note</A><BR>
...the rest of the table of contents...
...the document body...
<H2><A name="section1">Introduction</A></H2>
...section 1...
<H2><A name="section2">Some background</A></H2>
...section 2...
<H3><A name="section2.1">On a more personal note</A></H3>
...section 2.1...
```

We may achieve the same effect by making the header elements themselves the anchors:

```
<H1>Table of Contents</H1>
<P><A href="#section1">Introduction</A><BR>
<A href="#section2">Some background</A><BR>
<A href="#section2.1">On a more personal note</A><BR>
...the rest of the table of contents...
...the document body...
<H2 id="section1">Introduction</H2>
...section 1...
<H2 id="section2">Some background</H2>
...section 2...
<H3 id="section2.1">On a more personal note</H3>
...section 2.1...
```

12.1.2 Other link relationships

By far the most common *use* of a link is to retrieve another Web resource, as illustrated in the previous examples. However, authors may insert links in their documents that express other relationships between resources than simply "activate this link to visit that related resource". Links that express other types of relationships have one or more link type specified in their source anchor.

The *roles* of a link defined by `A` [p.141] or `LINK` [p.145] are specified via the `rel` [p.141] and `rev` [p.141] attributes.

For instance, links defined by the `LINK` [p.145] element may describe the position of a document within a series of documents. In the following excerpt, links within the document entitled "Chapter 5" point to the previous and next chapters:

```
<HEAD>
...other head information...
<TITLE>Chapter 5</TITLE>
<LINK rel="prev" href="chapter4.html">
<LINK rel="next" href="chapter6.html">
</HEAD>
```

The link type of the first link is "prev" and that of the second is "next" (two of several recognized link types). Links specified by `LINK` [p.145] are **not** rendered with the document's contents, although user agents may render them in other ways (e.g., as navigation tools).

Even if they are not used for navigation, these links may be interpreted in interesting ways. For example, a user agent that prints a series of HTML documents as a single document may use this link information as the basis of forming a coherent linear document. Further information is given below of using links for the benefit of search engines [p.147]

12.1.3 Specifying anchors and links

There are two HTML elements that create anchors and links: `LINK` [p.145] and `A` [p.141] . The `LINK` [p.145] element may only appear in the head of a document. The `A` [p.141] element may only appear in the body.

When the `A` [p.141] element's `href` [p.141] attribute is set, the element defines a source anchor for a link that may be activated by the user to retrieve a Web resource. The source anchor is the location of the `A` [p.141] instance and the destination anchor is the Web resource.

The retrieved resource may be handled by the user agent in several ways: by opening a new HTML document in the same user agent window, opening a new HTML document in a different window, starting a new program to handle the resource, etc. Since the `A` [p.141] element has content (text, images, etc.), user agents may render this content in such a way as to indicate the presence of a link (e.g., by underlining the content).

When the name [p.141] or id attributes of the A [p.141] element are set, the element defines an anchor that may be the destination of other links.

Authors may set the name [p.141] and href [p.141] attributes simultaneously in the same A [p.141] instance.

The LINK [p.145] element defines a relationship between the current document and another resource. Although LINK [p.145] has no content, the relationships it defines may be rendered by some user agents.

Note. *Technically speaking, many other HTML constructs create source anchors for links to other resources: the IMG [p.152] element, the OBJECT [p.154] element, FORM [p.208] elements, any element whose src attribute designates an external resource, etc. This section of the specification only discusses those links and anchors created with the A [p.141] and LINK [p.145] elements.*

12.1.4 Link titles

The title attribute may be set for both A [p.141] and LINK [p.145] to add information about the nature of a link. This information may be spoken by a user agent, rendered as a tool tip, cause a change in cursor image, etc.

Thus, we may augment a previous example [p.137] by supplying a title for each link:

```
<BODY>
...some text...
<P>You'll find a lot more in <A href="chapter2.html"
       title="Go to chapter two">chapter two</A>.
<A href="./chapter2.html"
       title="Get chapter two.">chapter two</A>.
See also this <A href="../images/forest.gif"
       title="GIF image of enchanted forest">map of
the enchanted forest.</A>
</BODY>
```

12.1.5 Internationalization and links

Since links may point to documents encoded with different character encodings, the A [p.141] and LINK [p.145] elements support the charset [p.141] attribute. This attribute allows authors to advise user agents about the encoding of data at the other end of the link.

The hreflang [p.141] attribute provides user agents about the language of a resource at the end of a link, just as the lang attribute provides information about the language of an element's content or attribute values.

Armed with this additional knowledge, user agents should be able to avoid presenting "garbage" to the user. Instead, they may either locate resources necessary for the correct presentation of the document or, if they cannot locate the resources, they should at least warn the user that the document will be unreadable and explain the cause.

12.2 The A element

```
<!ELEMENT A - - (%inline;)* -(A) -- anchor -->
<!ATTLIST A
  %attrs;                          -- %coreattrs, %i18n, %events --
  charset     %Charset;    #IMPLIED -- char encoding of linked resource --
  type      %ContentType;  #IMPLIED -- advisory content type --
  name         CDATA       #IMPLIED -- named link end --
  href        %URL;        #IMPLIED -- URL for linked resource --
  hreflang %LanguageCode;  #IMPLIED -- language code --
  target   %FrameTarget;   #IMPLIED -- render in this frame --
  rel         %LinkTypes;  #IMPLIED -- forward link types --
  rev         %LinkTypes;  #IMPLIED -- reverse link types --
  accesskey   %Character;  #IMPLIED -- accessibility key character --
  shape       %Shape;      rect     -- for use with OBJECT SHAPES --
  coords      %Coords;     #IMPLIED -- for use with OBJECT SHAPES --
  tabindex     NUMBER      #IMPLIED -- position in tabbing order --
  onfocus     %Script;     #IMPLIED -- the element got the focus --
  onblur      %Script;     #IMPLIED -- the element lost the focus --
  >
```

Start tag: ***required****, End tag:* ***required***

Attribute definitions

`name` = *cdata* [CS]
: This attribute names the current anchor so that it may be the destination of another link. The value of this attribute must be a unique anchor name. The scope of this name is the current document. Note that this attribute shares the same name space as the `id` attribute.

`href` = *url* [CT]
: This attribute specifies the location of a Web resource, thus defining a link between the current element (the source anchor) and the destination anchor defined by this attribute.

`hreflang` = *langcode* [CI]
: This attribute specifies the base language of the resource designated by `href` [p.141] and may only be used when `href` [p.141] is specified.

`type` = *content-type* [CI]
: When present, this attribute specifies the content type of a piece of content, for example, the result of dereferencing a resource. Content types are defined in [MIMETYPES] [p.319] .

`rel` = *link-types* [CI]
: This attribute describes the relationship from the current document to the anchor specified by the `href` [p.141] attribute. The value of this attribute is a space-separated list of link types.

`rev` = *link-types* [CI]
: This attribute is used to describe a reverse link [p.146] from the anchor specified by the `href` [p.141] attribute to the current document. The value of this attribute is a space-separated list of link types.

`charset` = *charset* [CI]
: This attribute specifies the character encoding of the resource designated by the link. Please consult the section on character encodings for more details.

Attributes defined elsewhere

- `id`, `class` (document-wide identifiers)
- `lang` (language information), `dir` (text direction)
- `title` (element titles)
- `style` [p.176] (inline style information [p.176])
- `shape` [p.167] and `coords` [p.167] (image maps [p.165])
- `onfocus` [p.239] , `onblur` [p.239] , `onclick` [p.238] , `ondblclick` [p.238] , `onmousedown` [p.238] , `onmouseup` [p.239] , `onmouseover` [p.239] , `onmousemove` [p.239] , `onmouseout` [p.239] , `onkeypress` [p.239] , `onkeydown` [p.239] , `onkeyup` [p.239] (intrinsic events [p.238])
- `target` [p.201] (target frame information [p.201])
- `tabindex` [p.228] (tabbing navigation [p.228])
- `accesskey` [p.229] (access keys [p.229])

Each `A` [p.141] element defines an anchor.

1. The `A` [p.141] element's content defines the position of the anchor.
2. The `name` [p.141] attribute names the anchor so that it may be the destination of zero or more links.
3. The `href` [p.141] attribute makes this anchor the source anchor of exactly one link.

In the example that follows, the `A` [p.141] element defines a link. The source anchor is the text "W3C Web site" and the destination anchor is "http://www.w3.org/":

```
For more information about W3C, please consult the
<A href="http://www.w3.org/">W3C Web site</A>.
```

This link designates the home page of the World Wide Web Consortium. When a user activates this link in a user agent, the user agent will retrieve the resource, in this case, an HTML document.

User agents generally render links in such a way as to make them obvious to users (underlining, reverse video, etc.). The exact rendering depends on the user agent. Rendering may vary according to whether the user has already visited the link or not. One possible rendering of the previous link might be:

```
For more information about W3C, please consult the W3C Web site.
                                                   ~~~~~~~~~~~~
```

To tell user agents explicitly what the character encoding of the destination page is, set the `charset` [p.141] attribute:

```
For more information about W3C, please consult the
<A href="http://www.w3.org/" charset="ISO-8859-1">W3C Web site</A>
```

Suppose we define an anchor named "anchor-one" in the file "one.html".

```
...text before the anchor...
<A name="anchor-one">This is the location of anchor one.</A>
...text after the anchor...
```

This creates an anchor around the text "This is the location of anchor one.". Usually, the contents of A [p.141] are not rendered in any special way when A [p.141] defines an anchor only.

Having defined the anchor, we may link to it from the same or another document. URLs that designate anchors contain a "#" character followed by the anchor name (the fragment identifier). Here are some examples of such URLs:

- An absolute URL: http://www.mycompany.com/one.html#anchor-one
- A relative URL: ./one.html#anchor-one or one.html#anchor-one
- When the link is defined in the same document: #anchor-one

Thus, a link defined in the file "two.html" in the same directory as "one.html" would refer to the anchor as follows:

```
...text before the link...
For more information, please consult <A href="./one.html#anchor-one"> anchor one</A>.
...text after the link...
```

The A [p.141] element in the following example specifies a link (with href [p.141]) and creates a named anchor (with name [p.141]) simultaneously:

```
I just returned from vacation! Here's a
<A name="anchor-two"
   href="http://www.somecompany.com/People/Ian/vacation/family.png">
photo of my family at the lake.</A>.
```

This example contains a link to a different type of Web resource (a PNG image). Activating the link should cause the image resource to be retrieved from the Web (and possibly displayed if the system has been configured to do so).

Note: User agents should be able to find anchors created by empty A [p.141] elements, but some fail to do so. For example, some user agents may not find the "empty-anchor" in the following HTML fragment:

```
<A name="empty-anchor"></A>
<EM>...some HTML...</EM>
<A href="#empty-anchor">Link to empty anchor</A>
```

Note. *We recommend that authors not make markup the content of an anchor. Thus:*

```
<H1><A name="xxx">My Heading</A></H1>
```

is preferred to:

```
<A name="xxx"><H1>My Heading</H1></A>
```

12.2.1 Syntax of anchor names

An anchor name is the value of either the name [p.141] or id attribute when used in the context of anchors. Anchor names must observe the following rules:

- **Uniqueness:** Anchor names must be unique within a document. Anchor names that differ only in case may not appear in the same document.
- **String matching:** Comparisons between fragment identifiers and anchor names must be done by exact (case-sensitive) match.

Thus, the following example is correct with respect to string matching and must be considered a match by user agents:

```
<P><A href="#xxx">...</A>
...more document...
<P><A name="xxx">...</A>
```

ILLEGAL EXAMPLE:
The following example is illegal with respect to uniqueness since the two names are the same except for case:

```
<P><A name="xxx">...</A>
<P><A name="XXX">...</A>
```

Although the following excerpt is considered legal HTML, the behavior of the user agent is not defined; some user agents may (incorrectly) consider this a match and others may not.

```
<P><A href="#xxx">...</A>
...more document...
<P><A name="XXX">...</A>
```

Anchor names should be restricted to ASCII characters. Please consult the section on representing non-ASCII characters is URLs [p.303] for more information.

12.2.2 Nested links are illegal

Links and anchors defined by the `A` [p.141] element must not be nested; an `A` [p.141] element must not contain any other `A` [p.141] elements.

Since the DTD defines `LINK` [p.145] element to be empty, `LINK` [p.145] elements may not be nested either.

12.2.3 Anchors with the `id` attribute

The `id` attribute may be used to create an anchor at the start tag of any element.

This example illustrates the use of the `id` attribute to position an anchor in an `H2` element. The anchor is linked to via the `A` [p.141] element.

```
You may read more about this in <A href="#section2">Section Two</A>.
...later in the document
<H2 id="section2">Section Two</H2>
...later in the document
<P>Please refer to <A href="#section2">Section Two</A> above
for more details.
```

The `id` and `name` [p.141] attributes share the same name space. This means that they cannot both define an anchor with the same name in the same document.

ILLEGAL EXAMPLE:
The following excerpt is illegal HTML since these attributes declare the same name twice in the same document.

```
<A href="#a1">...</A>
...
<H1 id="a1">
...pages and pages...
<A name="a1"></A>
```

Because of its specification in the HTML DTD, the `name` [p.141] attribute may contain entities. Thus, the value `Dürst` is a valid `name` [p.141] attribute value, as is `Dürst` . The `id` attribute, on the other hand, may not contain entities.

Use `id` or `name` [p.141] ? *Authors should consider the following issues when deciding whether to use `id` or `name` [p.141] for an anchor name:*

- *The `id` attribute can act as more than just an anchor name (e.g., style sheet selector, processing identifier, etc.).*
- *Some older user agents don't support anchors created with the `id` attribute.*
- *The `name` [p.141] attribute allows richer anchors names (with entities).*

12.2.4 Unavailable and unidentifiable resources

Unavailable and unidentifiable resources are considered errors, and user agents may vary in how they handle these errors. However, the following behavior is recommended:

- If a user agent cannot locate a linked resource, it should alert the user.
- If a user agent cannot identify the type of a linked resource, it should still attempt to process it. It should alert the user and may allow the user to intervene and identify the document type.

12.3 Document relationships: the `LINK` element

```
<!ELEMENT LINK - O EMPTY -- a media-independent link -->
<!ATTLIST LINK
  %attrs;                          -- %coreattrs, %i18n, %events --
  charset     %Charset;    #IMPLIED -- char encoding of linked resource --
  href        %URL;        #IMPLIED -- URL for linked resource --
  hreflang %LanguageCode; #IMPLIED -- language code --
  type      %ContentType; #IMPLIED -- advisory content type --
  rel         %LinkTypes; #IMPLIED -- forward link types --
  rev         %LinkTypes; #IMPLIED -- reverse link types --
  media       %MediaDesc; #IMPLIED -- for rendering on these media --
  target   %FrameTarget;     #IMPLIED -- render in this frame --
  >
```

Start tag: ***required****, End tag:* ***forbidden***

Attributes defined elsewhere

- `id`, `class` (document-wide identifiers)
- `lang` (language information), `dir` (text direction)
- `title` (element titles)
- `style` [p.176] (inline style information [p.176])
- `onclick` [p.238] , `ondblclick` [p.238] , `onmousedown` [p.238] , `onmouseup` [p.239] , `onmouseover` [p.239] , `onmousemove` [p.239] , `onmouseout` [p.239] , `onkeypress` [p.239] , `onkeydown` [p.239] , `onkeyup` [p.239] (intrinsic events [p.238])
- `href` [p.141] , `hreflang` [p.141] , `type` [p.141] , `rel` [p.141] , `rev` [p.141] (links and anchors [p.137])
- `target` [p.201] (target frame information [p.201])
- `media` [p.177] (header style information [p.176])
- `charset` [p.141] (character encodings)

This element defines a link. Unlike `A` [p.141] , it may only appear in the `HEAD` section of a document, although it may appear any number of times. Although `LINK` [p.145] has no content, it conveys relationship information that may be rendered by user agents in a variety of ways (e.g., a tool-bar with a drop-down menu of links).

This example illustrates how several `LINK` [p.145] definitions may appear in the `HEAD` section of a document. The current document is "Chapter2.html". The `rel` [p.141] attribute specifies the relationship of the linked document with the current document. The values "Index", "Next", and "Prev" are explained in the section on link types.

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0//EN">
<HTML>
<HEAD>
  <TITLE>Chapter 2</TITLE>
  <LINK rel="Index" href="../index.html">
  <LINK rel="Next"  href="Chapter3.html">
  <LINK rel="Prev"  href="Chapter1.html">
</HEAD>
...the rest of the document...
```

12.3.1 Forward and reverse links

The `rel` [p.141] and `rev` [p.141] attributes play complementary roles -- the `rel` [p.141] attribute specifies a forward link and the `rev` [p.141] attribute specifies a reverse link.

Consider two documents A and B.

```
Document A:       <LINK href="docB" rel="foo">
```

Has exactly the same meaning as:

```
Document B:       <LINK href="docA" rev="foo">
```

Both attributes may be specified simultaneously.

12.3.2 Links and external style sheets

When the `LINK` [p.145] element links an external style sheet to a document, the `type` [p.141] attribute specifies the style sheet language and the `media` [p.177] attribute specifies the intended rendering medium or media. User agents may save time by retrieving from the network only those style sheets that apply to the current device.

Media types [p.179] are further discussed in the section on style sheets.

12.3.3 Links and search engines

Authors may use the `LINK` [p.145] element to provide a variety of information to search engines, including:

- Links to alternate versions of a document, written in another human language.
- Links to alternate versions of a document, designed for different media, for instance a version especially suited for printing.
- Links to the starting page of a collection of documents.

The examples below illustrate how language information, media types, and link types may be combined to improve document handling by search engines.

In the following example, we use the `hreflang` [p.141] attribute to tell search engines where to find Dutch, Portuguese, and Arabic versions of a document. Note the use of the `dir` and `charset` [p.141] attributes for the Arabic manual, and the use of the `lang` attribute to indicate that the value of the `title` attribute for the `LINK` [p.145] element designating the French manual is in French.

```
<HEAD>
<TITLE>The manual in English</TITLE>
<LINK title="The manual in Dutch"
      type="text/html"
      rel="alternate"
      hreflang="nl"
      href="http://someplace.com/manual/dutch.html">
<LINK title="The manual in Portuguese"
      type="text/html"
      rel="alternate"
      hreflang="pt"
      href="http://someplace.com/manual/portuguese.html">
<LINK title="The manual in Arabic"
      dir="rtl"
      type="text/html"
      rel="alternate"
      charset="ISO-8859-6"
      hreflang="ar"
      href="http://someplace.com/manual/arabic.html">
<LINK lang="fr" title="La documentation en Fran&ccedil;ais"
```

```
      type="text/html"
      rel="alternate"
      hreflang="fr"
      href="http://someplace.com/manual/french.html">
</HEAD>
```

In the following example, we tell search engines where to find the printed version of a manual.

```
<HEAD>
<TITLE>Reference manual</TITLE>
<LINK media="print" title="The manual in postscript"
      type="application/postscript"
      rel="alternate"
      href="http://someplace.com/manual/postscript.ps">
</HEAD>
```

In the following example, we tell search engines where to find the front page of a collection of documents.

```
<HEAD>
<TITLE>Reference manual -- Page 5</TITLE>
<LINK rel="Start" title="The first page of the manual"
      type="text/html"
      href="http://someplace.com/manual/start.html">
</HEAD>
```

Further information is given in the notes in the appendix on helping search engines index your Web site [p.306] .

12.4 Path information: the BASE element

```
<!ELEMENT BASE - O EMPTY -- document base URL -->
<!ATTLIST BASE
  href        %URL;      #IMPLIED  -- URL that acts as base URL --
  target   %FrameTarget;    #IMPLIED -- render in this frame --
  >
```

Start tag: ***required****, End tag:* ***forbidden***

Attribute definitions

`href` = *url* [CT]
: This attribute specifies an absolute URL that acts as the base URL for resolving relative URLs.

Attributes defined elsewhere

- `target` [p.201] (target frame information [p.201])

In HTML, links and references to external images, applets, form-processing programs, style sheets, etc. are always specified by a URL. Relative URLs are resolved according to a base URL, which may come from a variety of sources. The `BASE` [p.148] element allows authors to specify a document's base URL explicitly.

When present, the BASE [p.148] element must appear in the HEAD section of an HTML document, before any element that refers to an external source. The path information specified by the BASE [p.148] element only affects URLs in the document where the element appears.

For example, given the following BASE [p.148] declaration and A [p.141] declaration:

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0//EN">
<HTML>
 <HEAD>
   <TITLE>Our Products</TITLE>
   <BASE href="http://www.aviary.com/products/intro.html">
 </HEAD>

 <BODY>
   <P>Have you seen our <A href="../cages/birds.gif">Bird Cages</A>?
 </BODY>
</HTML>
```

the relative URL "../cages/birds.gif" would resolve to:

```
http://www.aviary.com/cages/birds.gif
```

12.4.1 Resolving relative URLs

User agents must calculate the base URL for resolving relative URLs according to the [RFC1808]. The following describes how [RFC1808] applies specifically to HTML.

User agents must calculate the base URL according to the following precedences (highest priority to lowest):

1. The base URL is set by the BASE [p.148] element.
2. The base URL is given by meta data discovered during a protocol interaction, such as an HTTP header (see [RFC2068]).
3. By default, the base URL is that of the current document. Not all HTML documents have a base URL (e.g., a valid HTML document may appear in an email and may not be designated by a URL). Such HTML documents are considered erroneous if they contain relative URLs and rely on a default base URL.

Additionally, the OBJECT [p.154] and APPLET [p.162] elements define attributes that take precedence over the value set by the BASE [p.148] element. Please consult the definitions of these elements for more information about URL issues specific to them.

Link elements specified by HTTP headers are handled exactly as LINK [p.145] elements that appear explicitly in a document.

13 Objects, Images, and Applets

Contents

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13.1 Introduction to objects, images, and applets

HTML's multimedia features allow authors to include images, applets (programs that are automatically downloaded and run on the user's machine), video clips, and other HTML documents in their pages.

For example, to include a PNG image in a document, authors may write:

```
<BODY>
<P>Here's a closeup of the Grand Canyon:
<OBJECT data="canyon.png" type="image/png">
This is a <EM>closeup</EM> of the Grand Canyon.
</OBJECT>
</BODY>
```

Previous versions of HTML allowed authors to include images (via IMG [p.152]) and applets (via APPLET [p.162]). These elements have several limitations:

- They fail to solve the more general problem of how to include new and future media types.
- The APPLET [p.162] element only works with Java-based applets. This element is deprecated in favor of OBJECT [p.154] .
- They pose accessibility problems.

To address these issues, HTML 4.0 introduces the OBJECT [p.154] element, which offers an all-purpose solution to generic object inclusion. The OBJECT [p.154] element allows HTML authors to specify everything required by an object for its presentation by a user agent: source code, initial values, and run-time data. In this specification, the term "object" is used to describe the things that people want to place in HTML documents; other commonly used terms for these things are: applets, plug-ins, media handlers, etc.

The new OBJECT [p.154] element thus subsumes some of the tasks carried out by existing elements. Consider the following chart of functionalities:

Type of inclusion	Specific element	Generic element
Image	IMG [p.152]	OBJECT [p.154]
Applet	APPLET [p.162] **(Deprecated.)**	OBJECT [p.154]
Another HTML document	IFRAME [p.205]	OBJECT [p.154]

The chart indicates that each type of inclusion has a specific and a general solution. The generic OBJECT [p.154] element will serve as the solution for implementing future media types.

To include images, authors may continue to use the IMG [p.152] element as well.

To include applets, authors should use the OBJECT [p.154] element as the APPLET [p.162] element is deprecated.

To include one HTML document in another, authors may use either the new IFRAME [p.205] element or the OBJECT [p.154] element. In both cases, the embedded document remains independent of the main document. Visual user agents may present the embedded document in a distinct window within the main document. Please consult the section on including HTML in another HTML document [p.164] for a comparison of OBJECT [p.154] and IFRAME [p.205] for document inclusion.

Images and other included objects may have hyperlinks associated with them, both through the standard linking mechanisms, but also via *image maps* [p.165] . An image map specifies active geometric regions of an included object and assigns a link to each region. When activated, these links may cause a document to be retrieved, may run a program on the server, etc.

In the following sections, we discuss the various mechanisms available to authors for multimedia inclusions and creating image maps for those inclusions.

13.2 Including an image: the IMG element

```
<!-- To avoid problems with text-only UAs as well as
   to make image content understandable and navigable
   to users of non-visual UAs, you need to provide
   a description with ALT, and avoid server-side image maps -->
<!ELEMENT IMG - O EMPTY            --  Embedded image -->
<!ATTLIST IMG
  %attrs;                          -- %coreattrs, %i18n, %events --
```

```
src         %URL;       #REQUIRED -- URL of image to embed --
alt         %Text;      #REQUIRED -- short description --
longdesc    %URL;       #IMPLIED  -- link to long description (complements alt) --
height      %Length;    #IMPLIED  -- override height --
width       %Length;    #IMPLIED  -- override width --
align       %IAlign;    #IMPLIED  -- vertical or horizontal alignment --
border      %Length;    #IMPLIED  -- link border width --
hspace      %Pixels;    #IMPLIED  -- horizontal gutter --
vspace      %Pixels;    #IMPLIED  -- vertical gutter --
usemap      %URL;       #IMPLIED  -- use client-side image map --
ismap       (ismap)     #IMPLIED  -- use server-side image map --
>
```

Start tag: ***required****, End tag:* ***forbidden***

Attribute definitions

`src` = *url* [CT]
: This attribute specifies the location of the image resource. Examples of widely recognized image formats include GIF, JPEG, and PNG.

`longdesc` = *url* [CT]
: This attribute specifies a link to a long description of the image. This description should supplement the short description provided using the `alt` [p.172] attribute. When the image has an associated image map [p.165] , this attribute should provide information about the image map's contents. This is particularly important for server-side image maps.

Attributes defined elsewhere

- `id`, `class` (document-wide identifiers)
- `alt` [p.172] (alternate text [p.172])
- `lang` (language information), `dir` (text direction)
- `title` (element titles)
- `style` [p.176] (inline style information [p.176])
- `onclick` [p.238] , `ondblclick` [p.238] , `onmousedown` [p.238] , `onmouseup` [p.239] , `onmouseover` [p.239] , `onmousemove` [p.239] , `onmouseout` [p.239] , `onkeypress` [p.239] , `onkeydown` [p.239] , `onkeyup` [p.239] (intrinsic events [p.238])
- `ismap` [p.170] , `usemap` [p.166] (client side image maps [p.165])
- `align` [p.171] , `width` [p.171] , `height` [p.171] , `border` [p.171] , `hspace` [p.171] , `vspace` [p.171] (visual presentation of objects, images, and applets [p.170])

The `IMG` [p.152] element embeds an image in the current document at the location of the element's definition. The `IMG` [p.152] element has no content; it is usually replaced inline by the image designated by the `src` [p.153] attribute, the exception being for left or right-aligned images that are "floated" [p.187] out of line.

In an earlier example, we defined a link to a family photo. Here, we insert the photo directly into the current document:

```
<BODY>
<P>I just returned from vacation! Here's a photo of my family at the lake:
<IMG src="http://www.somecompany.com/People/Ian/vacation/family.png"
     alt="A photo of my family at the lake.">
</BODY>
```

This inclusion also be achieved with the `OBJECT` [p.154] element as follows:

```
<BODY>
<P>I just returned from vacation! Here's a photo of my family at the lake:
<OBJECT data="http://www.somecompany.com/People/Ian/vacation/family.png"
        type="image/png">
A photo of my family at the lake.
</OBJECT>
</BODY>
```

The `alt` [p.172] attribute specifies alternate text that is rendered when the image cannot be displayed (see below for information on how to specify alternate text [p.172]). User agents must render alternate next when they cannot support images, they cannot support a certain image type or when they are configured not to display images.

The following example shows how the `longdesc` attribute can be used to link to a richer description:

```
<BODY>
<P>
<IMG src="sitemap.gif"
     alt="HP Labs Site Map"
     longdesc="sitemap.html">
</BODY>
```

The `alt` [p.172] attribute provides a short description of the image. This should be sufficient to allow users to decide whether they want to follow the link given by the `longdesc` attribute to the longer description, here "sitemap.html".

Please consult the section on the visual presentation of objects, images, and applets [p.170] for information about image size, alignment, and borders.

13.3 Generic inclusion: the `OBJECT` element

```
<!ELEMENT OBJECT - - (PARAM | %flow;)*
 -- generic embedded object -->
<!ATTLIST OBJECT
  %attrs;                         -- %coreattrs, %i18n, %events --
  declare     (declare)  #IMPLIED  -- declare but don't instantiate flag --
  classid     %URL;      #IMPLIED  -- identifies an implementation --
  codebase    %URL;      #IMPLIED  -- base URL for classid, data, archive --
  data        %URL;      #IMPLIED  -- reference to object's data --
  type     %ContentType; #IMPLIED  -- content type for data --
  codetype %ContentType; #IMPLIED  -- content type for code --
  archive     %URL;      #IMPLIED  -- space separated archive list --
  standby     %Text;     #IMPLIED  -- message to show while loading --
  height      %Length;   #IMPLIED  -- override height --
  width       %Length;   #IMPLIED  -- override width --
```

```
  align       %IAlign;    #IMPLIED  -- vertical or horizontal alignment --
  border      %Length;    #IMPLIED  -- link border width --
  hspace      %Pixels;    #IMPLIED  -- horizontal gutter --
  vspace      %Pixels;    #IMPLIED  -- vertical gutter --
  usemap      %URL;       #IMPLIED  -- use client-side image map --
  shapes      (shapes)    #IMPLIED  -- object has shaped hypertext links --
  export      (export)    #IMPLIED  -- export shapes to parent  --
  name        CDATA       #IMPLIED  -- submit as part of form --
  tabindex    NUMBER      #IMPLIED  -- position in tabbing order --
  >
```

Start tag: ***required****, End tag:* ***required***

Attribute definitions

`classid` = *url* [CT]
: This attribute may be used to specify the location of an object's implementation via a URL. It may be used together with, or as an alternative to the `data` [p.155] attribute, depending on the type of object involved.

`codebase` = *url* [CT]
: This attribute specifies the base path used to resolve relative URLs specified by the `classid` [p.155] , `data` [p.155] , and `archive` [p.155] attributes. When absent, its default value is the base URL of the current document.

`codetype` = *content-type* [CI]
: This attribute specifies the content type of data expected when downloading the object specified by `classid` [p.155] . This attribute is optional but recommended when `classid` [p.155] is specified since it allows the user agent to avoid loading information for unsupported content types. When absent, it defaults to the value of the `type` attribute.

`data` = *url* [CT]
: This attribute may be used to specify the location of the object's data, for instance image data for objects defining images, or more generally, a serialized form of an object which can be used to recreate it. If given as a relative URL, it should be interpreted relative to the `codebase` attribute.

`type` = *content-type* [CI]
: This attribute specifies the content type for the data specified by `data` [p.155] . This attribute is optional but recommended when `data` [p.155] is specified since it allows the user agent to avoid loading information for unsupported content types.

`archive` = *url list* [CT]
: This attribute may be used to specify a space-separated list of URLs for archives containing resources relevant to the object, which may include the resources specified by the `classid` [p.155] and `data` [p.155] attributes. Preloading archives will generally result in reduced load times for objects. Archives specified as relative URLs should be interpreted relative to the `codebase` attribute.

`declare` [CI]
: When present, this boolean attribute makes the current `OBJECT` [p.154] definition a declaration only. The object must be instantiated by a subsequent `OBJECT` [p.154] definition referring to this declaration.

`standby` = *text* [CS]
: This attribute specifies a message that a user agent may render while loading the object's implementation and data.

Attributes defined elsewhere

- `id`, `class` (document-wide identifiers)
- `lang` (language information), `dir` (text direction)
- `title` (element titles)
- `style` [p.176] (inline style information [p.176])
- `onclick` [p.238] , `ondblclick` [p.238] , `onmousedown` [p.238] , `onmouseup` [p.239] , `onmouseover` [p.239] , `onmousemove` [p.239] , `onmouseout` [p.239] , `onkeypress` [p.239] , `onkeydown` [p.239] , `onkeyup` [p.239] (intrinsic events [p.238])
- `tabindex` [p.228] (tabbing navigation [p.228])
- `shapes` [p.168] , `usemap` [p.166] (client side image maps [p.165])
- `name` [p.211] (submitting objects with forms [p.232])
- `align` [p.171] , `width` [p.171] , `height` [p.171] , `border` [p.171] , `hspace` [p.171] , `vspace` [p.171] (visual presentation of objects, images, and applets [p.170])

Most user agents have built-in mechanisms for rendering common data types such as text, GIF images, colors, fonts, and a handful of graphic elements. To render data types they don't support natively, user agents generally run external applications. The `OBJECT` [p.154] element allows authors to control whether data should be rendered externally or by some program, specified by the author, that renders the data within the user agent.

In the most general case, an author may need to specify three types of information:

- The implementation of the included object. For instance, if the included object is a clock applet, the author must indicate the location of the applet's executable code.
- The data to be rendered. For instance, if the included object is a program that renders font data, the author must indicate the location of that data.
- Additional values required by the object at run-time. For example, some applets may require initial values for parameters.

The `OBJECT` [p.154] element allows authors to specify all three types of data, but authors may not have to specify all three at once. For example, some objects may not require data (e.g., a self-contained applet that performs a small animation). Others may not require run-time initialization. Still others may not require additional implementation information, i.e., the user agent itself may already know how to render that type of data (e.g., GIF images).

Authors specify an object's implementation and the location of the data to be rendered via the `OBJECT` [p.154] element. To specify run-time values, however, authors use the `PARAM` [p.158] element, which is discussed in the section on object initialization. [p.158]

13.3.1 Rules for rendering objects

A user agent must interpret an `OBJECT` [p.154] element according to the following precedence rules:

1. The user agent must first try to render the object. It should not render the element's contents, but it must examine them in case the element contains any direct children that are PARAM [p.158] elements (see object initialization [p.158]) or MAP [p.166] elements (see client-side image maps [p.165]).
2. If the user agent is not able to render the object for whatever reason (configured not to, lack of resources, wrong architecture, etc.), it must try to render its contents.

In the following example, we insert an analog clock applet in a document via the OBJECT [p.154] element. The applet, written in the Python language, requires no additional data or run-time values. The classid [p.155] attribute specifies the location of the applet:

```
<P><OBJECT classid="http://www.miamachina.it/analogclock.py">
</OBJECT>
```

Note that the clock will be rendered as soon as the user agent interprets this OBJECT [p.154] declaration. It is possible to delay rendering of an object by first *declaring* the object (described below).

Authors should complete this declaration by including alternate text as the contents of OBJECT [p.154] in case the user agent cannot render the clock.

```
<P><OBJECT classid="http://www.miamachina.it/analogclock.py">
An animated clock.
</OBJECT>
```

One significant consequence of the OBJECT [p.154] element's design is that it offers a mechanism for specifying alternate object renderings; each embedded OBJECT [p.154] declaration may specify alternate content types. If a user agent cannot render the outermost OBJECT [p.154] , it tries to render the contents, which may be another OBJECT [p.154] element, etc.

In the following example, we embed several OBJECT [p.154] declarations to illustrate how alternate renderings work. A user agent will attempt to render the first OBJECT [p.154] element it can, in the following order: (1) an Earth applet written in the Python language, (2) an MPEG animation of the Earth, (3) a GIF image of the Earth, (4) alternate text.

```
<P>                 <!-- First, try the Python applet -->
<OBJECT title="The Earth as seen from space"
        classid="http://www.observer.mars/TheEarth.py">
                    <!-- Else, try the MPEG video -->
  <OBJECT data="TheEarth.mpeg" type="application/mpeg">
                    <!-- Else, try the GIF image -->
    <OBJECT data="TheEarth.gif" type="image/gif">
                    <!-- Else render the text -->
     The <STRONG>Earth</STRONG> as seen from space.
    </OBJECT>
  </OBJECT>
</OBJECT>
```

The outermost declaration specifies an applet that requires no data or initial values. The second declaration specifies an MPEG animation and, since it does not define the location of an implementation to handle MPEG, relies on the user agent to handle the animation. We also set the type attribute so that a

user agent that knows it cannot render MPEG will not bother to retrieve "TheEarth.mpeg" from the network. The third declaration specifies the location of a GIF file and furnishes alternate text in case all other mechanisms fail.

Inline vs. external data. *Data to be rendered may be supplied in two ways: inline and from an external resource. While the former method will generally lead to faster rendering, it is not convenient when rendering large quantities of data.*

Here's an example that illustrates how inline data may be fed to an `OBJECT` *[p.154] :*

```
<P>
<OBJECT id="clock1"
        classid="clsid:663C8FEF-1EF9-11CF-A3DB-080036F12502"
        data="data:application/x-oleobject; base64, ...base64 data...">
    A clock.
</OBJECT>
```

Please consult the section on the visual presentation of objects, images, and applets [p.170] for information about object size, alignment, and borders.

13.3.2 Object initialization: the `PARAM` element

```
<!ELEMENT PARAM - O EMPTY          -- named property value -->
<!ATTLIST PARAM
  id          ID         #IMPLIED  -- document-wide unique id --
  name        CDATA      #REQUIRED -- property name --
  value       CDATA      #IMPLIED  -- property value --
  valuetype (DATA|REF|OBJECT) DATA -- How to interpret value --
  type     %ContentType; #IMPLIED  -- content type for value
                                      when valuetype=ref --
  >
```

Start tag: ***required****, End tag:* ***forbidden***

Attribute definitions

`name` = *cdata*
: This attribute defines the name of a run-time parameter name, assumed to be known by the inserted object. Whether the property name is case-sensitive depends on the specific object implementation.

`value` = *cdata*
: This attribute specifies the value of a run-time parameter specified by `name` [p.158] . Property values have no meaning to HTML; their meaning is determined by the object in question.

`valuetype` = `data` | `ref` | `object` [CI]
: This attribute specifies the type of the `value` attribute. Possible values:

- `data:` This is default value for the attribute. It means that the value specified by `value` will be evaluated and passed to the object's implementation as a string.
- `ref:` The value specified by `value` is a URL that designates a resource where run-time values are stored. This allows support tools to identify URLs given as parameters. The URL must be passed to the object **as is**, i.e., unresolved.
- `object:` The value specified by `value` is in identifier that refers to an `OBJECT` [p.154]

declaration in the same document. The identifier must be the value of the `id` attribute set for the declared `OBJECT` [p.154] element.

`type` = *content-type* [CI]
: This attribute specifies the content type of the resource designated by the `value` attribute **only** in the case where `valuetype` [p.158] is set to "ref". This attribute thus specifies for the user agent, the type of values that will be found at the URL designated by `value`.

Attributes defined elsewhere

- `id` (document-wide identifiers)

`PARAM` [p.158] elements specify a set of values that may be required by an object at run-time. Any number of `PARAM` [p.158] elements may appear in the content of an `OBJECT` [p.154] or `APPLET` [p.162] element, in any order, but must be placed at the start of the content of the enclosing `OBJECT` [p.154] or `APPLET` [p.162] element.

The syntax of names and values is assumed to be understood by the object's implementation. This document does not specify how user agents should retrieve name/value pairs nor how they should interpret parameter names that appear twice.

We return to the clock example to illustrate the use of `PARAM` [p.158] : suppose that the applet is able to handle two run-time parameters that define its initial height and width. We can set the initial dimensions to 40x40 pixels with two `PARAM` [p.158] elements.

```
<P><OBJECT classid="http://www.miamachina.it/analogclock.py">
<PARAM name="height" value="40" valuetype="data">
<PARAM name="width" value="40" valuetype="data">
This user agent cannot render Python applications.
</OBJECT>
```

In the following example, run-time data for the object's "Init_values" parameter is specified as an external resource (a GIF file). The value of the `valuetype` [p.158] attribute is thus set to "ref" and the `value` is a URL designating the resource.

```
<P><OBJECT classid="http://www.gifstuff.com/gifappli"
       standby="Loading Elvis...">
<PARAM name="Init_values"
       value="./images/elvis.gif">
       valuetype="ref">
</OBJECT>
```

Note that we have also set the `standby` [p.155] attribute so that the user agent may display a message while the rendering mechanism loads.

When an `OBJECT` [p.154] element is rendered, user agents must search the content for only those `PARAM` [p.158] elements that are direct children and "feed" them to the `OBJECT` [p.154] .

Thus, in the following example, if "obj1" is rendered, "param1" applies to "obj1" (and not "obj2"). If "obj1" is not rendered and "obj2" is, "param1" is ignored, and "param2" applies to "obj2". If neither `OBJECT` [p.154] is rendered, neither `PARAM` [p.158] applies.

```
<P>
<OBJECT id="obj1">
   <PARAM name="param1">
   <OBJECT id="obj2">
      <PARAM name="param2">
   </OBJECT>
</OBJECT>
```

13.3.3 Global naming schemes for objects

The location of an object's implementation is given by a URL. As we discussed in the intro to URLs, the first segment of an absolute URL specifies the naming scheme used to transfer the data designated by the URL. For HTML documents, this scheme is frequently "http". Some applets might employ other naming schemes. For instance, when specifying a Java applet, authors may use URLs that begin with "java" and for ActiveX applets, authors may use "clsid".

In the following example, we insert a Java applet into an HTML document.

```
<P><OBJECT classid="java:program.start">
</OBJECT>
```

By setting the `codetype` [p.155] attribute, a user agent can decide whether to retrieve the Java application based on its ability to do so.

```
<OBJECT codetype="application/java-archive"
        classid="java:program.start">
</OBJECT>
```

Some rendering schemes require additional information to identify their implementation and must be told where to find that information. Authors may give path information to the object's implementation via the `codebase` [p.162] attribute.

```
<OBJECT codetype="application/java-archive"
        classid="java:program.start">
        codebase="http://foooo.bar.com/java/myimplementation/"
</OBJECT>
```

The following example specifies (with the `classid` [p.155] attribute) an ActiveX object via a URL that begins with the naming scheme "clsid". The `data` [p.155] attribute locates the data to render (another clock).

```
<P><OBJECT classid="clsid:663C8FEF-1EF9-11CF-A3DB-080036F12502"
        data="http://www.acme.com/ole/clock.stm">
This application is not supported.
</OBJECT>
```

13.3.4 Object declarations and instantiations

The preceding examples have only illustrated isolated object definitions. When a document is to contain more than one instance of the same object, it is possible to separate the declaration of the object from its instantiations. Doing so has several advantages:

- Data may be retrieved from the network by the user agent *one time* (during the declaration) and reused for each instantiation.
- It is possible to instantiate an object from a location other than the object's declaration, for example, from a link.
- It is possible to specify objects as run-time data for other objects.

To declare an object so that it is not executed when read by the user agent, set the boolean `declare` [p.155] attribute in the `OBJECT` [p.154] element. At the same time, authors must identify the declaration by setting the `id` attribute in the `OBJECT` [p.154] element to a unique value. Later instantiations of the object will refer to this identifier.

A declared `OBJECT` [p.154] must appear in a document before the first instance of that `OBJECT` [p.154] .

An object defined with the `declare` [p.155] attribute is instantiated every time an element that refers to that object requires it to be rendered (e.g., a link that refers to it is activated, an object that refers to it is activated, etc.).

In the following example, we declare an `OBJECT` [p.154] and cause it so be instantiated by referring to it from a link. Thus, the object can be activated by clicking on some highlighted text, for example.

```
<P><OBJECT declare
        id="earth.declaration"
        data="TheEarth.mpeg"
        type="application/mpeg">
   The <STRONG>Earth</STRONG> as seen from space.
</OBJECT>
...later in the document...
<P>A neat <A href="#earth.declaration"> animation of The Earth!</A>
```

The following example illustrates how to specify run-time values that are other objects. In this example, we send text (a poem, in fact) to a hypothetical mechanism for viewing poems. The object recognizes a run-time parameter named "font" (say, for rendering the poem text in a certain font). The value for this parameter is itself an object that inserts (but does not render) the font object. The relationship between the font object and the poem viewer object is achieved by (1) assigning the `id` "tribune" to the font object declaration and (2) referring to it from the `PARAM` [p.158] element of the poem viewer object (with `valuetype` [p.158] and `value`).

```
<P><OBJECT declare
     id="tribune"
     type="application/x-webfont"
     data="tribune.gif">
</OBJECT>
...view the poem in KublaKhan.txt here...
<P><OBJECT classid="http://foo.bar.com/poem_viewer"
           data="KublaKhan.txt">
<PARAM name="font" valuetype="object" value="#tribune">
<P>You're missing a really cool poem viewer ...
</OBJECT>
```

User agents that don't support the `declare` [p.155] attribute must render the contents of the `OBJECT` [p.154] declaration.

13.4 Including an applet: the `APPLET` element

APPLET is deprecated (with all its attributes) in favor of `OBJECT` [p.154] .

```
<!ELEMENT APPLET - - (PARAM | %flow;)* -- Java applet -->
<!ATTLIST APPLET
  %coreattrs;                       -- id, class, style, title --
  codebase    %URL;       #IMPLIED  -- optional base URL for applet --
  archive     CDATA       #IMPLIED  -- comma separated archive list --
  code        CDATA       #IMPLIED  -- applet class file --
  object      CDATA       #IMPLIED  -- serialized applet file --
  alt         %Text;      #IMPLIED  -- short description --
  name        CDATA       #IMPLIED  -- allows applets to find each other --
  width       %Length;    #REQUIRED -- initial width --
  height      %Length;    #REQUIRED -- initial height --
  align       %IAlign;    #IMPLIED  -- vertical or horizontal alignment --
  hspace      %Pixels;    #IMPLIED  -- horizontal gutter --
  vspace      %Pixels;    #IMPLIED  -- vertical gutter --
  >
```

Start tag: ***required****, End tag:* ***required***

Attribute definitions

`codebase` = *url* [CT]
: This attribute specifies the base URL for the applet. If this attribute is not specified, then it defaults the same base URL as for the current document. Values for this attribute may only refer to subdirectories of the directory containing the current document.

`code` = *cdata* [CS]
: This attribute specifies either the name of the class file that contains the applet's compiled applet subclass or the path to get the class, including the class file itself. It is interpreted with respect to the applet's codebase. One of `code` [p.162] or `object` [p.163] must be present.

`name` = *cdata* [CS]
: This attribute specifies a name for the applet instance, which makes it possible for applets on the same page to find (and communicate with) each other.

`archive` = *url-list* [CT]
: This attribute specifies a comma-separated list of URLs for archives containing classes and other resources that will be "preloaded". The classes are loaded using an instance of an AppletClassLoader with the given `codebase` [p.162] . Relative URLs for archives are interpreted with respect to the applet's codebase. Preloading resources can significantly improve the performance of applets.

`object` = *cdata* [CS]
: This attribute names a resource containing a serialized representation of an applet's state. It is interpreted relative to the applet's codebase. The serialized data contains the applet's class name but not the implementation. The class name is used to retrieve the implementation from a class file or archive.

  When the applet is "deserialized" the `start()` method is invoked but not the `init()` method. Attributes valid when the original object was serialized are **not** restored. Any attributes passed to this `APPLET` [p.162] instance will be available to the applet. Authors should use this feature with extreme caution. An applet should be stopped before it is serialized.

  Either `code` [p.162] or `object` [p.163] must be present. If both `code` [p.162] and `object` [p.163] are given, it is an error if they provide different class names.

`width` = *length* [CI]
: This attribute specifies the initial width of the applet's display area (excluding any windows or dialogs that the applet creates).

`height` = *length* [CI]
: This attribute specifies the initial height of the applet's display area (excluding any windows or dialogs that the applet creates).

Attributes defined elsewhere

- `id`, `class` (document-wide identifiers)
- `title` (element titles)
- `style` [p.176] (inline style information [p.176])
- `alt` [p.172] (alternate text [p.172])
- `align` [p.171] , `hspace` [p.171] , `vspace` [p.171] (visual presentation of objects, images, and applets [p.170])

This element, supported by all Java-enabled browsers, allows designers to embed a Java applet in an HTML document. It has been deprecated in favor of the `OBJECT` [p.154] element.

The content of the `APPLET` [p.162] acts as alternate information for user agents that don't support this element or are currently configured not to support applets. User agents must ignore the content otherwise.

DEPRECATED EXAMPLE:
In the following example, the `APPLET` [p.162] element includes a Java applet in the document. Since no `codebase` [p.162] is supplied, the applet is assumed to be in the same directory as the current document.

```
<APPLET code="Bubbles.class" width="500" height="500">
Java applet that draws animated bubbles.
</APPLET>
```

This example may be rewritten as follows with OBJECT [p.154] as follows:

```
<P><OBJECT codetype="application/java"
        classid="java:Bubbles.class"
        width="500" height="500">
Java applet that draws animated bubbles.
</OBJECT>
```

Initial values may be supplied to the applet via the PARAM [p.158] element.

DEPRECATED EXAMPLE:
The following sample Java applet:

```
<APPLET code="AudioItem" width="15" height="15">
<PARAM name="snd" value="Hello.au|Welcome.au">
Java applet that plays a welcoming sound.
</APPLET>
```

may be rewritten as follows with OBJECT [p.154] :

```
<OBJECT codetype="application/java"
        classid="AudioItem"
        width="15" height="15">
<PARAM name="snd" value="Hello.au|Welcome.au">
Java applet that plays a welcoming sound.
</OBJECT>
```

13.5 Including HTML in another HTML document

Sometimes, rather than linking to another HTML document, it is helpful to include it directly into a primary HTML document. Authors may use either the IFRAME [p.205] element or the OBJECT [p.154] element for this purpose, but the elements differ in some ways. Not only do the two elements have different content models, the IFRAME [p.205] element may be a target frame (see the section on specifying target frame information [p.201] for details) and may be "selected" by a user agent as the focus for printing, viewing HTML source, etc. User agents may render selected frames elements in ways that distinguish them from unselected frames (e.g., by drawing a border around the selected frame).

An embedded document is entirely independent of the document in which it is embedded. For instance, relative URLs within the embedded document resolve according to the base URL of the embedded document, not that of the main document. Also, an embedded document does not inherit style information from the main document. An embedded document is only rendered within another document (e.g., in a subwindow); it remains otherwise independent.

For instance, the following line includes the contents of embed_me.html at the location where the OBJECT [p.154] definition occurs.

```
...text before...
<OBJECT data="embed_me.html">
Warning: embed_me.html could not be included.
</OBJECT>
...text after...
```

Recall that the contents of OBJECT [p.154] must only be rendered if the file specified by the data [p.155] attribute cannot be loaded.

The behavior of a user agent in cases where a file includes itself is not defined.

13.6 Image maps

Image maps allow authors to specify regions of an image or object and assign a specific action to each region (e.g., retrieve a document, run a program, etc.) When the region is activated by the user, the action is executed.

An image map is created by associating an object with a specification of sensitive geometric areas on the object.

There are two types of image maps:

- *Server-side.* When a user activates a region of a server-side image map with a mouse, the pixel coordinates of the click are sent to the server-side agent specified by the href attribute of the A element. The server-side agent interprets the coordinates and performs some action.
- *Client-side.* When a user activates a region of a client-side image map with a mouse, the pixel coordinates are interpreted by the user agent. The user agent selects a link that was specified for the activated region and follows it.

Client-side image maps are preferred over server-side image maps.

13.6.1 Client-side image maps

HTML 4.0 has two mechanisms for specifying client-side image maps:

1. An element employs an image map that is defined outside the element itself. In this case, the MAP [p.166] and AREA [p.166] elements define the image map. This method is available for the IMG [p.152] , OBJECT [p.154] , and INPUT [p.210] elements.
2. An element's content contains the image map. This method is only available for the OBJECT [p.154] element.

For an OBJECT [p.154] image map, the two methods are mutually exclusive. The presence of either the usemap [p.166] attribute or the shapes [p.168] attribute for an OBJECT [p.154] implies that the object being included is an image.

Furthermore, when the OBJECT [p.154] element has an associated client-side image map, user agents may implement user interaction with the OBJECT [p.154] solely in terms of the client-side image map. This allows user agents (such as an audio browser or robot) to interact with the OBJECT [p.154] without

having to process it; the user agent may even elect not to retrieve (or process) the object. When an OBJECT [p.154] has an associated image map, authors should not expect that the object will be retrieved or processed by every user agent.

Alternate access to image maps

User agents and authors should offer textual alternates to graphical image maps for cases when graphics are not available or the user cannot access them.

When MAP [p.166] and AREA [p.166] are used, authors are required to provide alternate text for each active region by way of the alt [p.172] attribute (see below for information on how to specify alternate text [p.172]). User agents may use this alternate text to create substitute textual links. These links may be activated in a variety of ways (keyboard, voice activation, etc.).

In the case of an OBJECT [p.154] with the shapes [p.168] attribute set, authors are required to specify links within the content of the OBJECT [p.154] itself. Each link defines both the geometry of an active region and the destination program, document, or other resource. When the OBJECT [p.154] element can be displayed, its content is ignored except for the definitions of the regions. When the OBJECT [p.154] cannot be displayed, its contents are rendered normally, including the links. Thus, authors are not required to specify alternate text via an alt [p.172] attribute. This technique also allows richer alternate content that what may be achieved with AREA [p.166] and its alt [p.172] attribute.

Client-side image maps with MAP, AREA, and usemap

All elements that may specify a client-side image map that is external to the element must identify by name the MAP [p.166] element that defines the image map. The usemap [p.166] attribute links an element to its image map.

Attribute definitions

usemap = *url* [CT]
: This attribute specifies the location of a map defined by MAP [p.166] and AREA [p.166] . The value of this attribute must match the value of the name [p.166] attribute for MAP [p.166] .

name = *cdata* [CI]
: This attribute assigns a name to the image map defined by this element.

Here are the DTD fragments for MAP [p.166] and AREA [p.166] .

```
<!ELEMENT MAP - - (AREA)+ -- client-side image map -->
<!ATTLIST MAP
  %attrs;                         -- %coreattrs, %i18n, %events --
  name        CDATA      #REQUIRED  -- name of image map for refs by usemap --
  >
```

Start tag: ***required****, End tag:* ***required***

```
<!ELEMENT AREA - O EMPTY -- client-side image map area -->
<!ATTLIST AREA
  %attrs;                         -- %coreattrs, %i18n, %events --
  shape       %Shape;    rect     -- controls interpretation of coords --
```

```
  coords      %Coords;   #IMPLIED  -- comma separated list of lengths --
  href        %URL;      #IMPLIED  -- URL for linked resource --
  target   %FrameTarget;    #IMPLIED -- render in this frame --
  nohref      (nohref)   #IMPLIED  -- this region has no action --
  alt         %Text;     #REQUIRED -- short description --
  tabindex    NUMBER     #IMPLIED  -- position in tabbing order --
  accesskey  %Character; #IMPLIED  -- accessibility key character --
  onfocus     %Script;   #IMPLIED  -- the element got the focus --
  onblur      %Script;   #IMPLIED  -- the element lost the focus --
  >
```

Start tag: ***required****, End tag:* ***forbidden***

Attribute definitions

`shape` = `default` | `rect` | `circle` | `poly` [CI]
: This attribute specifies the shape of a region. Possible values:
  - `default`: Specifies the entire region.
  - `rect`: Define a rectangular region.
  - `circle`: Define a circular region.
  - `poly`: Define a polygonal region.

`coords` = *coordinates* [CN]
: This attribute specifies the position a shape on the screen. The number and order of values depends on the shape being defined. Possible combinations:
  - `rect`: left-x, top-y, right-x, bottom-y.
  - `circle`: center-x, center-y, radius.
  - `poly`: x1, y1, x2, y2, ..., xN, yN.

  Coordinates are relative to the top, left corner of the object. All values are lengths. All values are separated by commas.

`nohref` [CI]
: When set, this boolean attribute specifies that a region has no associated link.

Attributes defined elsewhere

- `id`, `class` (document-wide identifiers)
- `lang` (language information), `dir` (text direction)
- `title` (element titles)
- `style` [p.176] (inline style information [p.176])
- `name` [p.211] (submitting objects with forms [p.232])
- `alt` [p.172] (alternate text [p.172])
- `href` (anchor reference) `target` [p.201] (frame target information [p.201])
- `tabindex` [p.228] (tabbing navigation [p.228])
- `accesskey` [p.229] (access keys [p.229])
- `shape` [p.167] (image maps [p.165])
- `onclick` [p.238] , `ondblclick` [p.238] , `onmousedown` [p.238] , `onmouseup` [p.239] , `onmouseover` [p.239] , `onmousemove` [p.239] , `onmouseout` [p.239] , `onkeypress` [p.239] , `onkeydown` [p.239] , `onkeyup` [p.239] , `onfocus` [p.239] , `onblur` [p.239] (intrinsic events

[p.238])

In the following example, we create a client-side image map for the OBJECT [p.154] element with MAP [p.166] and AREA [p.166] . We associate the image and the image map by (1) naming the image map with the name [p.211] attribute of the MAP [p.166] element and (2) designating that map by setting the usemap [p.166] attribute on the OBJECT [p.154] element.

```
<P><OBJECT data="navbar1.gif"
                type="image/gif"
                usemap="#map1">
<P>This is a navigation bar.
</OBJECT>

<MAP name="map1">
 <AREA href="guide.html"
          alt="Access Guide"
          shape="rect"
          coords="0,0,118,28">
 <AREA href="search.html"
          alt="Search"
          shape="rect"
          coords="184,0,276,28">
 <AREA href="shortcut.html"
          alt="Go"
          shape="circle"
          coords="184,200,60">
 <AREA href="top10.html"
          alt="Top Ten"
          shape="poly"
          coords="276,0,373,28,50,50,276,0">
</MAP>
```

Here is a similar version using the IMG [p.152] element instead of OBJECT [p.154] (with the same MAP [p.166] declaration):

```
<P><IMG src="navbar1.gif" usemap="#map1" alt="navigation bar">
```

If two or more defined regions overlap, the competing AREA [p.166] element defined earliest in the document takes precedence (i.e., responds to user input).

Note: MAP [p.166] is not backwards compatible with HTML 2.0 user agents.

Client-side image maps for OBJECT with shapes

Attribute definitions

shapes [CI]
: When set, this boolean attribute specifies that the element has an image map and that its contents contain the geometric descriptions of the active regions.

export [CI]
: When set, this boolean attribute allows an image map defined within this element's content to be exported to an enclosing OBJECT [p.154] element. This is only useful when inner and outer OBJECT

[p.154] elements are both images and have the same size.

The second way to specify a client-side image map for an OBJECT [p.154] element is for the author to set the shapes [p.168] attribute and then to define the image map within the element's content. Each region of the image map is specified by a link (the A element) that has an associated geometric shape (via the shape [p.167] attribute). The presence of the shapes [p.168] attribute implies that user agents must parse the contents of the element to look for anchors.

In the following example, we create a client-side image map for the OBJECT [p.154] element by associating URLs with regions specified by a series of A elements.

```
<P><OBJECT data="navbar.gif" shapes>
 <A href="guide.html" shape="rect" coords="0,0,118,28">Access Guide</a> |
 <A href="shortcut.html" shape="rect" coords="118,0,184,28">Go</A> |
 <A href="search.html" shape="circle" coords="184,200,60">Search</A> |
 <A href="top10.html" shape="poly" coords="276,0,373,28,50,50,276,0">Top Ten</A>
</OBJECT>
```

Nested OBJECT [p.154] elements are useful for providing fallbacks in case a user agent doesn't support certain formats. For example:

```
<P>
<OBJECT data="navbar.png" type="image/png">
  <OBJECT data="navbar.gif" type="image/gif">
    text describing the image...
  </OBJECT>
</OBJECT>
```

If the user agent doesn't support the PNG format, it tries to render the GIF image. If it doesn't support GIF (e.g., it's a speech-based user agent), it defaults to the text description provided as the content of the inner OBJECT [p.154] element.

When OBJECT [p.154] elements are nested this way, authors may share image maps among them. A nested OBJECT [p.154] shares an image map specified via the shapes [p.168] attribute with its parent OBJECT [p.154] by setting its export [p.168] attribute:

```
<P>
<OBJECT data="navbar.png" type="image/png" shapes>
  <OBJECT data="navbar.gif" type="image/gif" shapes export>
    <A href="guide.html" shape="rect" coords="0,0,118,28">Access Guide</a> |
    <A href="shortcut.html" shape="rect" coords="118,0,184,28">Go</A> |
    <A href="search.html" shape="circle" coords="184,200,60">Search</A> |
    <A href="top10.html" shape="poly" coords="276,0,373,28,50,50,276,0">Top Ten</A>
  </OBJECT>
</OBJECT>
```

If the user agent is able to render an OBJECT [p.154] element, and this element includes the shapes [p.168] attribute, then the user agent must look within its content for shaped regions defined by A elements. This process continues within nested OBJECT [p.154] elements provided these elements include both the shapes [p.168] and the export [p.168] attributes.

If the nested OBJECT [p.154] element defines an image map that should not be shared with its parent, then the the export [p.168] attribute must not be set.

13.6.2 Server-side image maps

Server-side image maps may be interesting in cases where the image map is too complicated for a client-side image map.

It is only possible to define a server-side image map for the IMG [p.152] and INPUT [p.210] elements.

In the case of IMG [p.152] , the IMG [p.152] must be enclosed by an A element.

In the case of INPUT [p.210] , the INPUT [p.210] must be of type "image".

In both cases, the boolean attribute ismap [CI] on the element must be set.

When the user activates the link by clicking on the image, the screen coordinates are sent directly to the server where the document resides. Screen coordinates are expressed as screen pixel values relative to the image. For normative information about the definition of a pixel and how to scale it, please consult [CSS1] [p.319] .

In the following example, the active region defines a server-side link. Thus, a click anywhere on the image will cause the click's coordinates to be sent to the server.

```
<P><A href="http://www.acme.com/cgi-bin/competition">
        <IMG src="game.gif" ismap alt="target"></A>
```

The location clicked is passed to the server as follows. The user agent derives a new URL from the URL specified by the href attribute of the A element, by appending '?' followed by the x and y coordinates, separated by a comma. The link is then followed using the new URL. For instance, in the given example, if the user clicks at at the location x=10, y=27 then the derived URL is "http://www.acme.com/cgi-bin/competition?10,27".

User agents that do not offer the user a means to select specific coordinates (e.g., non-graphical user agents that rely on keyboard input, speech-based user agents, etc.) should send the coordinates "0,0" to the server when the link is activated.

13.7 Visual presentation of images, objects, and applets

All IMG [p.152] and OBJECT [p.154] attributes that concern visual alignment and presentation have been deprecated in favor of style sheets.

13.7.1 Width and height

Attribute definitions

`width` = *length* [CN]
Image and object width override.
`height` = *length* [CN]
Image and object override.

When specified, the `width` [p.171] and `height` [p.171] attributes tell user agents to override the natural image or object size in favor of these values.

When the object is an image, it is scaled. User agents should do their best to scale an object or image to match the width and height specified by the author. Note that lengths expressed as percentages are based on the horizontal or vertical space currently available, not on the natural size of the image, object, or applet.

The `height` [p.171] and `width` [p.171] attributes give user agents an idea of the size of an image or object so that they may reserve space for it and continue rendering the document while waiting for the image data.

13.7.2 White space around images and objects

The `vspace` and `hspace` attributes specify the amount of white space to be inserted to the left and right (hspace) and above and below (vspace) an `IMG` [p.152] , `APPLET` [p.162] , `OBJECT` [p.154] . The default value for these attributes is not specified, but is generally a small, non-zero length. Both attributes take values of type *length*.

13.7.3 Borders

An image or object may be surrounded by a border (e.g., when a border is specified by the user or when the image is the content of an `A` element).

Attribute definitions

`border` = *pixels*
Deprecated. The `border` attribute specifies the width of this border in pixels. The default value for this attribute depends on the user agent.

13.7.4 Alignment

The `align` attribute specifies the position of an `IMG` [p.152] , `OBJECT` [p.154] , or `APPLET` [p.162] with respect to its context.

The following values for `align` [p.171] concern the object's position with respect to surrounding text:

- `bottom:` means that the bottom of the object should be vertically aligned with the current baseline. This is the default value.
- `middle:` means that the center of the object should be vertically aligned with the current baseline.
- `top:` means that the top of the object should be vertically aligned with the top of the current text line.

Two other values, `left` and `right`, cause the image to float to the current left or right margin. They are discussed in the section on floating objects [p.187] .

Differing interpretations of align. *User agents vary in their interpretation of the* `align` *[p.171] attribute. Some only take into account what has occurred on the text line prior to the element, some take into account the text on both sides of the element.*

13.8 How to specify alternate text

Attribute definitions

`alt` = *text* [CS]
: For user agents that cannot display images, forms, or applets, this attribute specifies alternate text. The language of the alternate text is specified by the `lang` attribute.

Several non-textual elements (`IMG` [p.152] , `AREA` [p.166] , `APPLET` [p.162] , and `INPUT` [p.210]) require authors to specify alternate text to serve as content when the element cannot be rendered normally. Specifying alternate text assists users without graphic display terminals, users whose browsers don’t support forms, visually impaired users, those who use speech synthesizers, those who have configured their graphical user agents not to display images, etc.

The `alt` [p.172] attribute must be specified for the `IMG` [p.152] and `AREA` [p.166] elements. It is optional for the `INPUT` [p.210] and `APPLET` [p.162] elements.

While alternate text may be very helpful, it must be handled with care. Authors should observe the following guidelines:

- Do not specify irrelevant alternate text when including images intended to *format* a page, for instance, `alt="red ball"` would be inappropriate for an image that adds a red ball for decorating a heading or paragraph. In such cases, the alternate text should be the empty string (""). Authors are in any case advised to avoid using images to format pages; style sheets should be used instead.
- Do not specify meaningless alternate text (e.g., "dummy text"). Not only will this frustrate users, it will slow down user agents that must convert text to speech or braille output.

Implementors should consult the section on generating alternate text [p.316] for information about how to handle cases of omitted alternate text.

14 Style Sheets

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14.1 Introduction to style sheets

Style sheets represent a major breakthrough for Web page designers, expanding their ability to improve the appearance of their pages. In the scientific environments in which the Web was conceived, people are more concerned with the content of their documents than the presentation. As people from wider walks of life discovered the Web, the limitations of HTML became a source of continuing frustration and authors were forced to sidestep HTML's stylistic limitations. While the intentions have been good -- to improve the presentation of Web pages -- the techniques for doing so have had unfortunate side effects. These techniques work for some of the people, some of the time, but not for all of the people, all of the time. They include:

- Using proprietary HTML extensions
- Converting text into images
- Using images for white space control
- Use of tables for page layout
- Writing a program instead of using HTML

These techniques considerably increase the complexity of Web pages, offer limited flexibility, suffer from interoperability problems, and create hardships for people with disabilities.

Style sheets solve these problems at the same time they supersede the limited range of presentation mechanisms in HTML. Style sheets make it easy to specify the amount of white space between text lines, the amount lines are indented, the colors used for the text and the backgrounds, the font size and style, and a host of other details.

For example, the following short CSS style sheet (stored in the file "special.css"), sets the text color of a paragraph to green and surrounds it with a solid red border:

```
P.special {
color : green;
border: solid red;
}
```

Authors may link this style sheet to their source HTML document with the `LINK` element:

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0//EN">
<HTML>
  <HEAD>
    <LINK href="special.css" rel="stylesheet" type="text/css">
  </HEAD>
  <BODY>
    <P class="special">This paragraph should have special green text.
  </BODY>
</HTML>
```

HTML 4.0 provides support for the following style sheet features:

Flexible placement of style information
: Placing style sheets in separate files makes them easy to reuse. Sometimes it's useful to include rendering instructions within the document to which they apply, either grouped at the start of the document, or in attributes of the elements throughout the body of the document. To make it easier to manage style on a site basis, this specification describes how to use HTTP headers to set the style sheets to be applied to a document.

Independence from specific style sheet languages
: This specification doesn't tie HTML to any particular style sheet language. This allows for a range of such languages to be used, for instance simple ones for the majority of users and much more complex ones for the minority of users with highly specialized needs. The examples included below all use the CSS (Cascading Style Sheets) language [CSS1] [p.319] , but other style sheet languages would be possible.

Cascading
: This is the capability provided by some style sheet languages such as CSS to allow style information from several sources to be blended together. These could be, for instance, corporate style guidelines, styles common to a group of documents, and styles specific to a single document. By storing these separately, style sheets can be reused, simplifying authoring and making more effective use of network caching. The cascade defines an ordered sequence of style sheets where rules in later sheets have greater precedence than earlier ones. Not all style sheet languages support cascading.

Media dependencies
: HTML allows authors to specify documents in a media-independent way. This allows users to access Web pages using a wide variety of devices and media, e.g., graphical displays for computers running Windows, Macintosh OS, and X11, devices for television sets, specially adapted phones and PDA-based portable devices, speech-based browsers, and braille-based tactile devices.

  Style sheets, by contrast, apply to specific media or media groups. A style sheet intended for screen use may be applicable when printing, but is of little use for speech-based browsers. This specification allows you to define the broad categories of media a given style sheet is applicable to. This allows user agents to avoid retrieving inappropriate style sheets. Style sheet languages may include features for describing media dependencies within the same style sheet.

Alternate styles
Authors may wish to offer readers several ways to view a document. For instance, a style sheet for rendering compact documents with small fonts, or one that specifies larger fonts for increased legibility. This specification allows authors to specify alternate style sheets and to declare a default style sheet. User agents should give users the opportunity to select from among alternate style sheets or to switch off style sheets altogether.

Performance concerns
Some people have voiced concerns over performance issues for style sheets. For instance, retrieving an external style sheet may delay the full presentation for the user. A similar situation arises if the document head includes a lengthy set of style rules.

The current proposal addresses these issues by allowing authors to include rendering instructions within each HTML element. The rendering information is then always available by the time the user agent wants to render each element.

In many cases, authors will take advantage of a common style sheet for a group of documents. In this case, distributing style rules throughout the document will actually lead to worse performance than using a linked style sheet, since for most documents, the style sheet will already be present in the local cache. The public availability of good style sheets will encourage this effect.

14.2 Adding style to HTML

Note. *The sample default style sheet for HTML 4.0 that is included in [CSS2] [p.321] expresses generally accepted default style information for each element. Authors and implementors alike might find this a useful resource.*

HTML documents may contain style sheet rules directly in them or they may import style sheets. Any style sheet language may be used with HTML. A simple style sheet language may suffice for the needs of most users, but other languages may be more suited to highly specialized needs. This specification uses the style language "Cascading Style Sheets" ([CSS1] [p.319]), abbreviated CSS, for examples.

14.2.1 Setting the default style sheet language

The syntax of style data is that of the style sheet language, not HTML. Since user agents that support style sheets must parse these rules, authors must specify which style sheet languages are being employed.

Authors should use the `META` element to set the default style sheet language for a document. For example, to set the default to CSS, authors should put the following declaration in the `HEAD` of their documents:

```
<META http-equiv="Content-Style-Type" content="text/css">
```

The default style sheet language may also be set with HTTP headers. The above `META` declaration is equivalent to the HTTP header:

```
Content-Style-Type: text/css
```

User agents should determine the default style sheet language for a document according to the following steps (highest to lowest priority):

1. If any `META` declarations specify the "Content-Style-Type", the last one in the character stream determines the default style sheet language.
2. Otherwise, if any HTTP headers specify the "Content-Style-Type", the last one in the character stream determines the default style sheet language.
3. Otherwise, the default style sheet language is "text/css".

Documents that include elements that set the `style` [p.176] attribute but which don't define a default style sheet language are incorrect. Authoring tools should generate default style sheet language information (typically a `META` declaration) so that user agents do not have to rely on a default of "text/css".

Conforming HTML parsers must be able to distinguish HTML from style sheet rules. The `STYLE` [p.176] element and the `style` [p.176] attribute define the beginning of style sheet data. The end of style sheet data is defined as the SGML end tag open delimiter (</). All style sheet data must be provided to the user agent's appropriate style sheet handler. Style sheets apply to the contents of HTML elements, which begin immediately after a start tag close delimiter (>). The end of this style sheet data is defined as the end tag open delimiter (14.2.2 Inline style information

Attribute definitions

`style` = *cdata* [CN]
This attribute specifies style information for the current element.

The `style` [p.176] attribute specifies style information for a single element. The style information is specified using the default style sheet language [p.175] .

This example sets color and font size information for the text in a specific paragraph.

```
<P style="font-size: 12pt; color: fuchsia">Aren't style sheets
wonderful?
```

Note the syntax of a CSS declaration: *name : value*. Property declarations are separated by a semi-colon.

The `style` [p.176] attribute may be used to apply a particular style to an individual HTML element. If the style will be reused for several elements, authors should use the `STYLE` element to regroup that information. For optimal flexibility, authors should define styles in external style sheets.

14.2.3 Header style information: the `STYLE` element

```
<!ELEMENT STYLE - - CDATA      -- style info -->
<!ATTLIST STYLE
  %i18n;                          -- lang, dir, for use with title --
  type     %ContentType; #REQUIRED -- content type of style language --
  media     %MediaDesc;  #IMPLIED  -- designed for use with these media --
  title     %Text;       #IMPLIED  -- advisory title --
  >
```

Start tag: ***required****, End tag:* ***required***

Attribute definitions

`type` = *content-type* [CI]
: This attribute specifies the style sheet language of the element's contents and overrides the default style sheet language. The style sheet language is specified as a content type (e.g., "text/css"). Authors must supply a value for this attribute; there is no default value for this attribute.

`media` = *media-descriptors* [CI]
: This attribute specifies the intended destination medium for style information. It may be a single media descriptor or a comma-separated list. The default value for this attribute is "screen".

Attributes defined elsewhere

- `lang` (language information), `dir` (text direction)

The `STYLE` [p.176] element allows authors to put style sheet rules in the header of the document. HTML permits any number of `STYLE` [p.176] elements in the `HEAD` section of a document.

User agents that don't support style sheets, or don't support the specific style sheet language used by a `STYLE` [p.176] element, **must** hide the contents of the `STYLE` [p.176] element. It is an error to render the content as part of the document's text. Some style sheet languages support syntax for hiding the content [p.182] from non-conforming user agents.

Some style sheet implementations may allow a wider variety of rules in the `STYLE` [p.176] element than in the `style` [p.176] attribute. For example, with CSS, rules may be declared within a `STYLE` [p.176] element for:

- All instances of a specific HTML element (e.g., all `P` elements, all `H1` elements, etc.)
- All instances of an HTML element belonging to a specific class (i.e., whose `class` attribute is set to some value).
- Single instances of an HTML element (i.e., whose `id` attribute is set to some value).

Rules for style rule precedences and inheritance depend on the style sheet language.

The following CSS `STYLE` [p.176] declaration puts a border around every `H1` element in the document and centers it on the page.

```
<HEAD>
 <STYLE type="text/css">
   H1 {border-width: 1; border: solid; text-align: center}
 </STYLE>
</HEAD>
```

To specify that this style information should only apply to `H1` elements of a specific class, we modify it as follows:

```
<HEAD>
 <STYLE type="text/css">
   H1.myclass {border-width: 1; border: solid; text-align: center}
 </STYLE>
</HEAD>
<BODY>
 <H1 class="myclass"> This H1 is affected by our style </H1>
 <H1> This one is not affected by our style </H1>
</BODY>
```

Finally, to limit the scope of the style information to a single instance of `H1`, set the `id` attribute:

```
<HEAD>
 <STYLE type="text/css">
   #myid {border-width: 1; border: solid; text-align: center}
 </STYLE>
</HEAD>
<BODY>
 <H1 class="myclass"> This H1 is not affected </H1>
 <H1 id="myid"> This H1 is affected by style </H1>
 <H1> This H1 is not affected </H1>
</BODY>
```

Although style information may be set for almost every HTML element, two elements, `DIV` and `SPAN`, are particularly useful in that they do not impose any presentation semantics (besides block-level vs. inline). When combined with style sheets, these elements allow users to extend HTML indefinitely, particularly when used with the `class` and `id` attributes.

In the following example, we use the `SPAN` element to set the font style of the first few words of a paragraph to small caps.

```
<HEAD>
 <STYLE type="text/css">
  SPAN.sc-ex { font-variant: small-caps }
 </STYLE>
</HEAD>
<BODY>
  <P><SPAN class="sc-ex">The first</SPAN> few words of
  this paragraph are in small-caps.
</BODY>
```

In the following example, we use `DIV` and the `class` attribute to set the text justification for a series of paragraphs that make up the abstract section of a scientific article. This style information could be reused for other abstract sections by setting the `class` attribute elsewhere in the document.

```
<HEAD>
 <STYLE type="text/css">
   DIV.Abstract { text-align: justify }
 </STYLE>
</HEAD>
<BODY>
 <DIV class="Abstract">
   <P>The Chieftain product range is our market winner for
     the coming year. This report sets out how to position
     Chieftain against competing products.
```

```
   <P>Chieftain replaces the Commander range, which will
     remain on the price list until further notice.
 </DIV>
</BODY>
```

14.2.4 Media types

HTML enables authors to create documents that can be rendered on a variety of media. For instance: graphical displays for personal computers and workstations, devices for televisions, specially adapted telephones and hand held wireless devices, speech-based browsers, and braille-based tactile devices. The `media` [p.177] attribute specifies the media to which the style rules apply.

The following sample declarations apply to `H1` elements. When projected in a business meeting, all instances will be blue. When printed, all instances will be centered.

```
<HEAD>
 <STYLE type="text/css" media="projection">
    H1 { color: blue}
 </STYLE>

 <STYLE type="text/css" media="print">
   H1 { text-align: center }
 </STYLE>
```

This example adds sound effects to anchors for use in speech output:

```
 <STYLE type="text/css" media="aural">
   A { cue-before: url(bell.aiff); cue-after: url(dong.wav)}
 </STYLE>
</HEAD>
```

Media control is particularly interesting when applied to external style sheets since user agents can save time by retrieving from the network only those style sheets that apply to the current device. For instance, speech-based browsers can avoid downloading style sheets designed for visual rendering. See the section on media-dependent cascades [p.181] for more information.

14.2.5 External style sheets

Style sheets may be defined separately from an HTML document. This has the advantage of offering the ability:

- to share style sheets across a number of documents (and sites)
- to change the style sheet without requiring modifications to the document

When style sheets are enabled, users may be offered a choice of styles. Each style is potentially a cascade of several style sheets. Some style sheets (known as *persistent*) are applied independently of the user's choice (as long as it refers to the correct media type), while others (known as *alternate*) only apply to specific choices. A *default style* sheet is one that applies when the page is loaded, but which the user can disable in favor of an *alternate style* sheet.

The LINK element designates an external style sheet. The following attributes must be set:

- Set the value of href to the location of the style sheet file. The value of href is a URL.
- Set the value of the type attribute to indicate the language of the linked (style sheet) resource. This allows the user agent to avoid downloading a style sheet for an unsupported style sheet language.
- Set the value of the rel attribute to indicate whether the style sheet is persistent or default (rel="stylesheet"), or alternate (rel="alternate stylesheet").
- Set the value of the title attribute when the style sheet is a default or alternate style sheet, i.e., when it may be activated or deactivated by the user.

In this example, we first specify a persistent external style sheet in the file mystyle.css.

```
<LINK href="mystyle.css" rel="stylesheet" type="text/css">
```

Setting the title attribute changes the style sheet from persistent to default; user agents should offer users the possibility of applying named styles, based upon the title attribute.

```
<LINK href="mystyle.css" title="Compact" rel="stylesheet"
type="text/css">
```

Adding the keyword "alternate" to the rel attribute makes this an alternate style sheet.

```
<LINK href="mystyle.css" title="Medium" rel="alternate stylesheet"
type="text/css">
```

All alternate styles sharing the same title will be applied when the user (through the user agent) activates that style. Style sheets with different titles will not be applied in this case. However, style sheets that do not have the title attribute set will always apply (unless the user turns off style sheets altogether).

User agents should provide a means for users to view and pick from the list of alternate styles. The value of the title attribute is recommended as the name of each choice.

Cascading style sheet languages such as CSS allow style information from several sources to be blended together. However, not all style sheet languages support cascading. To define a cascade you simply provide a sequence of LINK and/or STYLE [p.176] elements. The style information is cascaded in the order the elements appear in the HEAD.

In the following example, we define two alternate style sheets named "compact". If the user selects the "compact" style, both external style sheets will be applied, as well as the "common.css" style sheet, (always applied since its title attribute is not set). If the user selects the "big print" style, the files "bigprint.css" and "common.css" will be applied by the user agent, and the "compact" style sheets will not.

```
<LINK rel="alternate stylesheet" title="compact" href="small-base.css"
type="text/css">
<LINK rel="alternate stylesheet" title="compact"
href="small-extras.css" type="text/css">
<LINK rel="alternate stylesheet" title="big print" href="bigprint.css"
type="text/css">
```

```
<LINK rel="stylesheet" href="common.css" type="text/css">
```

Here is an example with both LINK and STYLE [p.176] elements.

```
<LINK rel="stylesheet" href="corporate.css" type="text/css">
<LINK rel="stylesheet" href="techreport.css" type="text/css">
<STYLE type="text/css">
    p.special { color: rgb(230, 100, 180) }
</STYLE>
```

14.2.6 Setting the default named style

Authors should use the META element to set the default named style for a document. For example, to set the default named style in a document to "compact" (see the preceding example), include the following line in the HEAD:

```
<META http-equiv="Default-Style" content="compact">
```

The default style can also be set with HTTP headers. The above META declaration is equivalent to the HTTP header:

```
Default-Style: "compact"
```

If two or more META declarations or HTTP headers specify the default style, the last one takes precedence. HTTP headers are considered as occurring earlier than the document HEAD for this purpose. In the absence of an explicit declaration, the default style is defined by the first LINK element whose title has been set and whose rel attribute has the value "stylesheet".

14.2.7 Media-dependent cascades

A cascade may include style sheets applicable to different media. Both LINK and STYLE [p.176] may be used with the media [p.177] attribute. The user agent is then responsible for filtering out those style sheets that do not apply to the current medium.

In the following example, we define a cascade where the "corporate" style sheet is provided in several versions: one suited to printing, one for screen use and one for speech-based browsers (useful, say, when reading email in the car). The "techreport" stylesheet applies to all media. The color rule defined by the STYLE [p.176] element is used for print and screen but not for aural rendering.

```
<LINK rel="stylesheet" media="aural" href="corporate-aural.css" type="text/css">
<LINK rel="stylesheet" media="screen" href="corporate-screen.css" type="text/css">
<LINK rel="stylesheet" media="print" href="corporate-print.css" type="text/css">
<LINK rel="stylesheet" href="techreport.css" type="text/css">
<STYLE type="text/css">
    p.special { color: rgb(230, 100, 180) }
</STYLE>
```

14.3 Inheritance and cascading

When the user agent wants to render a document, it needs to find values for style properties, e.g. the font family, font style, size, line height, text color and so on. The exact mechanism depends on the style sheet language, but the following description is generally applicable:

The cascading mechanism is used when a number of style rules all apply directly to an element. The mechanism allows the user agent to sort the rules by specificity, to determine which rule to apply. If no rule can be found, the next step depends on whether the style property can be inherited or not. Not all properties can be inherited. For these properties the style sheet language provides default values for use when there are no explicit rules for a particular element.

If the property can be inherited, the user agent examines the immediately enclosing element to see if a rule applies to that. This process continues until an applicable rule is found. This mechanism allows style sheets to be specified compactly. For instance, authors may specify the font family for all elements within the `BODY` by a single rule that applies to the `BODY` element.

14.4 Hiding the content of style elements from non-conforming user agents

Some style sheet languages support syntax intended to allow authors to hide the content of `STYLE` [p.176] elements from non-conforming user agents.

This example illustrates for CSS how to comment out the content of `STYLE` [p.176] elements to ensure that older non-conforming user agents will not render them as text.

```
<STYLE type="text/css">
<!--
   H1 { color: red }
   P  { color: blue}
   -->
</STYLE>
```

14.5 Specifying style through HTTP headers

Web server managers may find it convenient to configure a server so that a style sheet will be applied to a group of pages. The HTTP `Link` header described in [RFC2068] [p.320] has the same effect as a `LINK` element with the same attributes and values. Multiple `Link` headers correspond to multiple `LINK` elements occurring in the same order. For instance,

```
Link: <http://www.acme.com/corporate.css>; REL=stylesheet
```

corresponds to:

```
<LINK rel="stylesheet" href="http://www.acme.com/corporate.css">
```

It is possible to specify several alternate styles using multiple `Link` headers, and then use the `rel` attribute to determine the default style.

In the following example, "compact" is applied by default since it omits the "alternate" keyword for the `rel` attribute.

```
Link: <compact.css>; rel="stylesheet"; title="compact"
Link: <bigprint.css>; rel="alternate stylesheet"; title="big print"
```

This should also work when HTML documents are sent by email. Some email agents can alter the ordering of [RFC822] [p.322] headers. To protect against this affecting the cascading order for style sheets specified by `Link` headers, authors can use header concatenation to merge several instances of the same header field. The quote marks are only needed when the attribute values include whitespace. Use SGML entities to reference characters that are otherwise not permitted within HTTP or email headers, or that are likely to be affected by transit through gateways.

`LINK` and `META` elements implied by HTTP headers are defined as occurring before any explicit `LINK` and `META` elements in the document's `HEAD`.

15 Alignment, font styles, and horizontal rules

Contents

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    1. Background color [p.185]
    2. Alignment [p.185]
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2. Fonts [p.189]
    1. Font style elements: the `TT`, `I`, `B`, `BIG`, `SMALL`, `STRIKE`, `S`, and `U` elements [p.189]
    2. Font modifier elements: `FONT` and `BASEFONT` [p.190]
3. Rules: the `HR` element [p.192]

This section of the specification discusses some HTML elements and attributes that may be used for visual formatting of elements. Many of them are deprecated.

15.1 Formatting

15.1.1 Background color

Attribute definitions

`bgcolor` = *color* [CI]
: **Deprecated.** This attribute sets the background color for the document body or table cells.

This attribute sets the background color of the canvas for the document body (the `BODY` element) or for tables (the `TABLE`, `TR`, `TH`, and `TD` elements). Additional attributes for specifying text color can be used with the `BODY` element.

This attribute has been deprecated in favor of style sheets for specifying background color information.

15.1.2 Alignment

It is possible to align block elements (tables, images, objects, paragraphs, etc.) on the canvas with the `align` [p.185] element. Although this attribute may be set for many HTML elements, its range of possible values sometimes differs from element to element. Here we only discuss the meaning of the align attribute for text.

Attribute definitions

`align` = `left` | `center` | `right` | `justify` [CI]
: **Deprecated.** This attribute specifies the horizontal alignment of its element with respect to the surrounding context. Possible values:
    - `left`: text lines are rendered flush left.
    - `center`: text lines are centered.
    - `right`: text lines are rendered flush right.

- `justify`: text lines are justified to both margins.

The default depends on the base text direction. For left to right text, the default is `align=left`, while for right to left text, the default is `align=right`.

DEPRECATED EXAMPLE:
This example centers a heading on the canvas.

```
<H1 align="center"> How to Carve Wood </H1>
```

Using CSS, for example, you could achieve the same effect as follows:

```
<HEAD>
 <TITLE>How to Carve Wood</TITLE>
 <STYLE type="text/css">
  H1 { text-align: center}
 </STYLE>
<BODY>
 <H1> How to Carve Wood </H1>
```

Note that this would center all `H1` declarations. You could reduce the scope of the style by setting the `class` attribute on the element:

```
<HEAD>
 <TITLE>How to Carve Wood</TITLE>
 <STYLE type="text/css">
  H1.wood {text-align: center}
 </STYLE>
<BODY>
 <H1 class="wood"> How to Carve Wood </H1>
```

Similarly, to right align a paragraph on the canvas with HTML's `align` [p.185] attribute you could have:

```
<P align="right">...Lots of paragraph text...
```

which, with CSS, would be:

```
<HEAD>
 <TITLE>How to Carve Wood</TITLE>
 <STYLE type="text/css">
  P.mypar {text-align: right}
 </STYLE>
<BODY>
 <P class="mypar">...Lots of paragraph text...
```

To right align a series of paragraphs, group them with the `DIV` element:

```
<DIV align="right">
 <P>...text in first paragraph...
 <P>...text in second paragraph...
 <P>...text in third paragraph...
</DIV>
```

With CSS, the text-align property is inherited from the parent element, you can therefore use:

```
<HEAD>
 <TITLE>How to Carve Wood</TITLE>
 <STYLE type="text/css">
  DIV.mypars {text-align: right}
 </STYLE>
<BODY>
 <DIV class="mypars">
  <P>...text in first paragraph...
  <P>...text in second paragraph...
  <P>...text in third paragraph...
 </DIV>
```

To center the entire document with CSS:

```
<HEAD>
 <TITLE>How to Carve Wood</TITLE>
 <STYLE type="text/css">
  BODY {text-align: center}
 </STYLE>
<BODY>
 ...the body is centered...
</BODY>
```

The CENTER element is exactly equivalent to specifying the DIV element with the align [p.185] attribute set to "center". **The CENTER [p.187] element is deprecated.**

15.1.3 Floating objects

Images and objects may appear directly "in-line" or may be floated to one side of the page, temporarily altering the margins of text that may flow on either side of the object.

Float an object

The align [p.185] attribute for object, images, tables, frames, etc., causes the object to float to the left or right margin. Floating objects generally begin a new line. This attribute takes the following values:

- left: Floats the object to the current left margin. Subsequent text flows along the image's right side.
- right: Floats the object to the current right margin. Subsequent text flows along the image's left side.

DEPRECATED EXAMPLE:
The following example shows how to float an IMG element to the current left margin of the canvas.

```
<IMG align="left" src="http://foo.com/animage.gif" alt="my boat">
```

Some alignment attributes also permit the "center" value, which does not cause floating, but centers the the object within the current margins. However, for P and DIV, the value "center" causes the contents of the element to be centered.

Float text around an object

Another attribute, defined for the BR element, controls text flow around floating objects.

Attribute definitions

clear = none | left | right | all [CI]

Deprecated. Specifies where the next line should appear in a visual browser after the line break caused by this element. This attribute takes into account floating objects (images, tables, etc.). Possible values:

- none: The next line will begin normally. This is the default value.
- left: The next line will begin at nearest line below any floating objects on the left-hand margin.
- right: The next line will begin at nearest line below any floating objects on the right-hand margin.
- all: The next line will begin at nearest line below any floating objects on either margin.

Consider the following visual scenario, where text flows to the right of an image until a line is broken by a BR:

```
*********  -------
|       |  -------
| image |  --<BR>
|       |
*********
```

If the clear [p.188] attribute is set to none, the line following BR will begin immediately below it at the right margin of the image:

```
*********  -------
|       |  -------
| image |  --<BR>
|       |  ------
*********
```

DEPRECATED EXAMPLE:
If the clear [p.188] attribute is set to left or all, next line will appear as follows:

```
*********  -------
|       |  -------
| image |  --<BR clear="left">
|       |
*********
-----------------
```

Using style sheets, you could specify that all line breaks should behave this way for objects (images, tables, etc.) floating against the left margin. With CSS, you could achieve this as follows:

```
<STYLE type="text/css">
BR { clear: left }
</STYLE>
```

To specify this behavior for a specific instance of the `BR` element, you could combine style information and the `id` attribute:

```
<HEAD>
...
<STYLE type="text/css">
BR.mybr { clear: left }
</STYLE>
</HEAD>
<BODY>
<P>...
*********  -------
|       |  -------
| table |  --<BR id="mybr">
|       |
*********
-----------------
...
</BODY>
```

15.2 Fonts

The following HTML elements specify font information. Although they are not all deprecated, their use is discouraged in favor of style sheets.

15.2.1 Font style elements: the `TT`, `I`, `B`, `BIG`, `SMALL`, `STRIKE`, `S`, and `U` elements

```
<!ENTITY % fontstyle
 "TT | I | B | U | S | STRIKE | BIG | SMALL">
<!ELEMENT (%fontstyle;|%phrase;) - - (%inline;)*>
<!ATTLIST (%fontstyle;|%phrase;)
  %attrs;                          -- %coreattrs, %i18n, %events --
  >
```

Start tag: ***required****, End tag:* ***required***

Attributes defined elsewhere

- `id`, `class` (document-wide identifiers)
- `lang` (language information), `dir` (text direction)
- `title` (element titles)
- `style` (inline style information)
- `onclick` [p.238] , `ondblclick` [p.238] , `onmousedown` [p.238] , `onmouseup` [p.239] , `onmouseover` [p.239] , `onmousemove` [p.239] , `onmouseout` [p.239] , `onkeypress` [p.239] , `onkeydown` [p.239] `onkeyup` [p.239] (intrinsic events [p.238])

Rendering of font style elements depends on the user agent. The following is an informative description only.

TT: Renders as teletype or monospaced text.
I: Renders as italic text style.
B: Renders as bold text style.
BIG: Renders text in a "large" font.
SMALL: Renders text in a "small" font.
STRIKE and **S: Deprecated.** Render strike-through style text.
U: Deprecated. Renders underlined text.

The following sentence shows several types of text:

```
<P><b>bold</b>,
<i>italic</i>, <b><i>bold italic</i></b>, <tt>teletype text</tt>, and
<big>big</big> and <small>small</small> text.
```

Your browser renders the words as follows:

bold, *italic*, ***bold italic***, `teletype text`, and big and small text.

It is possible to achieve a much richer variety of font effects using style sheets. To specify blue, italic text in a paragraph with CSS:

```
<HEAD>
<STYLE type="text/css">
P.mypar {font-style: italic; color: blue}
</STYLE>
</HEAD>
<P id="mypar">...Lots of blue italic text...
```

Font style elements must be properly nested. Rendering of nested font style elements depends on the user agent.

15.2.2 Font modifier elements: `FONT` and `BASEFONT`

`FONT` [p.190] and `BASEFONT` [p.190] are deprecated.

```
<!ELEMENT FONT - - (%inline;)*  -- local change to font -->
<!ATTLIST FONT
  %coreattrs;                   -- id, class, style, title --
  %i18n;                        -- lang, dir --
  size        CDATA      #IMPLIED  -- [+|-]nn e.g. size="+1", size="4" --
  color       %Color;    #IMPLIED  -- "#RRGGBB" in hex, e.g. red: "#FF0000" --
  face        CDATA      #IMPLIED  -- comma separated list of font names --
  >
```

Start tag: ***required****, End tag:* ***required***

```
<!ELEMENT BASEFONT - O EMPTY -- base font size -->
<!ATTLIST BASEFONT
  id          ID         #IMPLIED  -- document-wide unique id --
  size        CDATA      #REQUIRED -- base font size for FONT elements --
  color       %Color;    #IMPLIED  -- "#RRGGBB" in hex, e.g. red: "#FF0000" --
  face        CDATA      #IMPLIED  -- comma separated list of font names --
  >
```

Start tag: ***required****, End tag:* ***forbidden***

Attribute definitions

`size` = *cdata* [CN]
: **Deprecated.** This attribute sets the size of the font. Possible values:
  - An integer between 1 and 7. This sets the font to some fixed size, whose rendering depends on the user agent. Not all user agents may render all seven sizes.
  - A relative increase in font size. The value "+1" means one size larger. The value "-3" means three sizes smaller. All sizes belong to the scale of 1 to 7.

`color` = *color* [CI]
: **Deprecated.** This attribute sets the text color.

`face` = *cdata* [CI]
: **Deprecated.** This attribute defines a comma-separated list of font names the user agent should search for in order of preference.

Attributes defined elsewhere

- `id`, `class` (document-wide identifiers)
- `lang` (language information), `dir` (text direction)
- `title` (element titles)
- `style` (inline style information)

The `FONT` [p.190] element changes the font size and color for text in its contents.

The `BASEFONT` [p.190] element sets the base font size (using the `size` attribute). Font size changes achieved with `FONT` [p.190] are relative to the base font size set by `BASEFONT` [p.190] . If `BASEFONT` [p.190] is not used, the default base font size is 3.

DEPRECATED EXAMPLE:
The following example will show the difference between the seven font sizes available with `FONT` [p.190] :

```
<P><font size=1>size=1</font>
<font size=2>size=2</font>
<font size=3>size=3</font>
<font size=4>size=4</font>
<font size=5>size=5</font>
<font size=6>size=6</font>
<font size=7>size=7</font>
```

Your user agent renders this as follows:

size=1 size=2 size=3 size=4 size=5 size=6 size=7

The following shows the effect of relative font sizes using a base font size of 3:

size=-4 size=-3 size=-2 size=-1 size=+1 size=+2 size=+3 size=+4

The same thing with a base font size of 6:

size=-4 size=-3 size=-2 size=-1 size=+1 size=+2 size=+3 size=+4

The base font size does not apply to headings, except where these are modified using the `FONT` [p.190] element with a relative font size change.

15.3 Rules: the `HR` element

```
<!ELEMENT HR - O EMPTY -- horizontal rule -->
<!ATTLIST HR
  %coreattrs;                    -- id, class, style, title --
  %events;
  align (left|center|right) #IMPLIED
  noshade     (noshade)  #IMPLIED
  size        %Pixels;   #IMPLIED
  width       %Length;   #IMPLIED
  >
```

Start tag: ***required****, End tag:* ***forbidden***

Attribute definitions

`align` = `left` | `center` | `right` [CI]
: **Deprecated.** This attribute specifies the horizontal alignment of the rule with respect to the surrounding context. Possible values:

  - `left`: the rule is rendered flush left.
  - `center`: the rule is centered.
  - `right`: the rule is rendered flush right.

  The default is `align=center`.

`noshade` [CI]
: **Deprecated.** When set, this boolean attribute requests that the user agent render the rule in a solid color rather than as the traditional two-color "groove".

`size` = *pixels* [CI]
: **Deprecated.** This attribute specifies the height of the rule. The default value for this attribute depends on the user agent.

`width` = *length* [CI]
: **Deprecated.** This attribute specifies the width of the rule. The default width is 100%, i.e., the rule extends across the entire canvas.

Attributes defined elsewhere

- `id`, `class` (document-wide identifiers)
- `lang` (language information), `dir` (text direction)
- `title` (element titles)
- `style` (inline style information)
- `onclick` [p.238] , `ondblclick` [p.238] , `onmousedown` [p.238] , `onmouseup` [p.239] , `onmouseover` [p.239] , `onmousemove` [p.239] , `onmouseout` [p.239] , `onkeypress` [p.239] , `onkeydown` [p.239] , `onkeyup` [p.239] (intrinsic events [p.238])
- `align` [p.192] (alignment [p.185])

The `HR` [p.192] element causes a horizontal rule to be rendered by visual user agents.

The amount of vertical space inserted between a rule and the content that surrounds it depends on the user agent.

DEPRECATED EXAMPLE:
This example centers the rules, sizing them to half the available width between the margins. The top rule has the default thickness while the bottom two are set to 5 pixels. The bottom rule should be rendered in a solid color without shading:

```
<HR width="50%" align="center">
<HR size="5" width="50%" align="center">
<HR noshade size="5" width="50%" align="center">
```

Your browser renders these rules as follows:

16 Frames

Contents

1. Introduction to frames [p.195]
2. Layout of frames [p.196]
    1. The FRAMESET element [p.196]
    2. The FRAME element [p.198]
3. Specifying target frame information [p.201]
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    2. Target semantics [p.203]
4. Alternate content [p.203]
    1. The NOFRAMES element [p.203]
5. Inline frames: the IFRAME element [p.205]

16.1 Introduction to frames

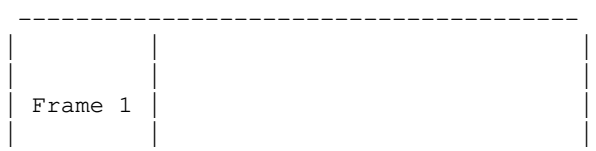
HTML frames allow authors to present documents in multiple views. Views may be independent windows or subwindows. Multiple views offer designers a way to keep certain information visible, while other views are scrolled or replaced. For instance, to use three frames: one for a static banner, one for a navigation menu, and one for a main view that can be scrolled though or replaced by clicking on an item in the navigation frame.

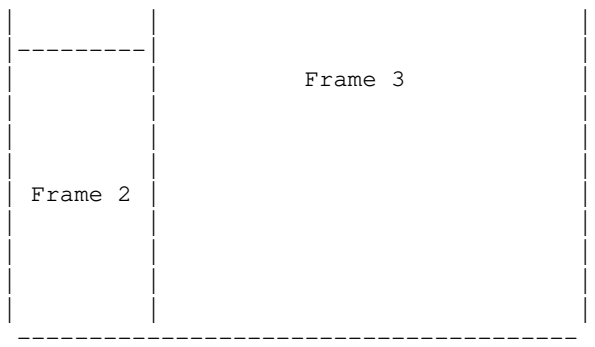
Note: This specification includes more detailed information about frames in the section notes on frames [p.316] .

Here's a simple frame document:

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Frameset//EN">
<HTML>
<HEAD>
<TITLE>A simple frameset document</TITLE>
</HEAD>
<FRAMESET cols="20%, 80%">
  <FRAMESET rows="100, 200">
      <FRAME src="contents_of_frame1.html">
      <FRAME src="contents_of_frame2.gif">
  </FRAMESET>
  <FRAME src="contents_of_frame3.html">
</FRAMESET>
</HTML>
```

that might create a frame layout something like this:





16.2 Layout of frames

An HTML document with frames has a different makeup than an HTML document without frames. A standard document has one HEAD section and one BODY. A document with frames has a HEAD, and a FRAMESET [p.196] in place of the BODY.

The FRAMESET [p.196] section of a document specifies the layout of views in the main user agent window.

In addition, the FRAMESET [p.196] section can contain a NOFRAMES [p.203] element to provide alternate content for user agents that do not support frames or are configured not to display frames. We discuss alternate content [p.203] in more detail below.

Elements that might normally be placed in the BODY element must not appear before the first FRAMESET [p.196] element or the FRAMESET [p.196] will be ignored.

16.2.1 The FRAMESET element

```
<![ %HTML.Frameset; [
<!ELEMENT FRAMESET - - ((FRAMESET|FRAME)+ & NOFRAMES?)
  -- window subdivision -->
<!ATTLIST FRAMESET
  %coreattrs;                      -- id, class, style, title --
  rows     %MultiLengths; #IMPLIED  -- list of lengths. Default: 100% (1 row) --
  cols     %MultiLengths; #IMPLIED  -- list of lengths. Default: 100% (1 col) --
  onload       %Script;   #IMPLIED  -- all the frames have been loaded  --
  onunload     %Script;   #IMPLIED  -- all the frames have been removed --
  >
]]>
```

Start tag: ***required****, End tag:* ***required***

Attribute definitions

rows = *multi-length-list* [CN]
: This attribute specifies the layout of horizontal frames. It is a comma-separated list of pixels, percentages, and relative lengths. The default value is 100%, meaning one row.

`cols` = = *multi-length-list* [CN]
: This attribute specifies the layout of vertical frames. It is a comma-separated list of pixels, percentages, and relative lengths. The default value is 100%, meaning one column.

Attributes defined elsewhere

- `id`, `class` (document-wide identifiers)
- `title` (element titles)
- `style` (inline style information)
- `onload` [p.238] , `onunload` [p.238] (intrinsic events [p.238])

The `FRAMESET` [p.196] element specifies the layout of the main user window in terms of rectangular subspaces.

Rows and columns

Setting the `rows` [p.196] attribute defines the number of horizontal subspaces. Setting the `cols` [p.197] attribute defines the number of vertical subspaces. Both attributes may be set simultaneously to create a grid.

If the `rows` [p.196] attribute is not set, each column extends the entire length of the page. If the `cols` [p.197] attribute is not set, each row extends the entire width of the page. If neither attribute is set, the frame takes up exactly the size of the page.

These two attributes have values that are comma-separated lists of lengths. A length may be absolute (given as a number of pixels or a percentage of the screen) or a relative length, indicated by the form "i*", where "i" is an integer. When allotting space to rows and columns, user agents allot absolute lengths first, then divide up remaining space among relative length rows or columns. The value "*" is equivalent to "1*".

Views are created left-to-right for columns and top-to-bottom for rows. When both attributes are specified, views are created left-to-right in the top row, left-to-right in the second row, etc.

The first example divides the screen vertically in two (i.e., creates a top half and a bottom half).

```
<FRAMESET rows="50%, 50%">
...the rest of the definition...
</FRAMESET>
```

The next example creates three columns: the second has a fixed width of 250 pixels (useful, for example, to hold an image with a known size). The first receives 25% of the remaining space and the third 75% of the remaining space.

```
<FRAMESET cols="1*,250,3*">
...the rest of the definition...
</FRAMESET>
```

The next example creates a 2x3 grid of subspaces.

```
<FRAMESET rows="30%,70%" cols="33%,34%,33%">
...the rest of the definition...
</FRAMESET>
```

For the next example, suppose the browser window is currently 1000 pixels high. The first view is allotted 30% of the total height (300 pixels). The second view is specified to be exactly 400 pixels high. This leaves 300 pixels to be divided between the other two frames. The fourth frame's height is specified as "2*", so it is twice as high as the third frame, whose height is only "*" (1*). Therefore the third frame will be 100 pixels high and the fourth will be 200 pixels high.

```
<FRAMESET rows="30%,400,*,2*">
...the rest of the definition...
</FRAMESET>
```

Absolute lengths that do not sum to 100% of the real available space should be adjusted by the user agent. When underspecified, remaining space should be allotted proportionally to each view. When overspecified, each view should be reduced according to its specified proportion of the total space.

Nested frame sets

Framesets may be nested to any level.

In the following example, the outer `FRAMESET` [p.196] divides the available space into three equal columns. The inner `FRAMESET` [p.196] then divides the second area into two rows of unequal height.

```
<FRAMESET cols="33%, 33%, 34%">
     ...contents of first frame...
     <FRAMESET rows="40%, 50%">
        ...contents of second frame, first row...
        ...contents of second frame, second row...
     </FRAMESET>
     ...contents of third frame...
</FRAMESET>
```

16.2.2 The `FRAME` element

```
<![ %HTML.Frameset; [
<!-- reserved frame names start with "_" otherwise starts with letter -->
<!ELEMENT FRAME - O EMPTY -- subwindow -->
<!ATTLIST FRAME
  %coreattrs;                      -- id, class, style, title --
  longdesc    %URL;       #IMPLIED  -- link to long description (complements title) --
  name        CDATA       #IMPLIED  -- name of frame for targetting --
  src         %URL;       #IMPLIED  -- source of frame content --
  frameborder (1|0)       1         -- request frame borders? --
  marginwidth %Pixels;    #IMPLIED  -- margin widths in pixels --
  marginheight %Pixels;   #IMPLIED  -- margin height in pixels --
  noresize    (noresize) #IMPLIED  -- allow users to resize frames? --
  scrolling (yes|no|auto) auto      -- scrollbar or none --
  >
]]>
```

Start tag: ***required****, End tag:* ***forbidden***

Attribute definitions

`name` = *cdata* [CI]
: This attribute assigns a name to the current frame. This name may be used as the target of subsequent links.

`longdesc` = *url* [CT]
: This attribute specifies a link to a long description of the frame. This description should supplement the short description provided using the `title` attribute, and may be particularly useful for non-visual user agents.

`src` = *url* [CT]
: This attribute specifies the location of the initial document to be contained in the frame.

`noresize` [CI]
: When present, this boolean attribute tells the user agent that the frame window must not be resizeable.

`scrolling` = `auto` | `yes` | `no` [CI]
: This attribute specifies scroll information for the frame window. Possible values
  - `auto`: This value tells the user agent to provide scrolling devices for the frame window when necessary. This is the default value.
  - `yes`: This value tells the user agent to always provide scrolling devices for the frame window.
  - `no`: This value tells the user agent not to provide scrolling devices for the frame window.

`frameborder` = `1` | `0` [CN]
: This attribute provides the user agent with information about the frame border. Possible values:
  - `1`: This value tells the user agent to draw a separator between this frame and every adjoining frame. This is the default value.
  - `0`: This value tells the user agent not to draw a separator between this frame and every adjoining frame. Note that separators may be drawn next to this frame nonetheless if specified by other frames.

`marginwidth` = *pixels* [CN]
: This attribute specifies the amount of space to be left between the frame's contents in its left and right margins. The value must be greater than one pixel. The default value depends on the user agent.

`marginheight` = *pixels* [CN]
: This attribute specifies the amount of space to be left between the frame's contents in its top and bottom margins. The value must be greater than one pixel. The default value depends on the user agent.

Attributes defined elsewhere

- `id`, `class` (document-wide identifiers)
- `title` (element titles)
- `style` (inline style information)
- `target` [p.201] (target frame information)

The FRAME [p.198] element defines the contents and appearance of a single view.

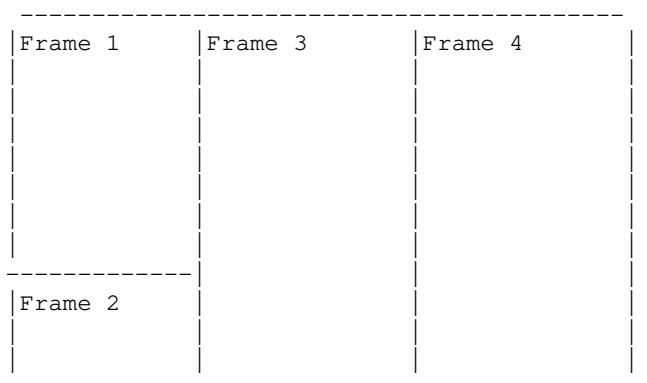
Setting the initial document in a frame

The src [p.211] attribute specifies the initial document the frame will contain. It is not possible for the contents of a frame to be in the same document as the frame's definition.

The following example example HTML document:

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Frameset//EN">
<HTML>
<HEAD>
<TITLE>A frameset document</TITLE>
</HEAD>
<FRAMESET cols="33%,33%,33%">
  <FRAMESET rows="*,200">
      <FRAME src="contents_of_frame1.html">
      <FRAME src="contents_of_frame2.gif">
  </FRAMESET>
  <FRAME src="contents_of_frame3.html">
  <FRAME src="contents_of_frame4.html">
</FRAMESET>
</HTML>
```

should create a frame layout something like this:



and cause the user agent to load each file into a separate view.

ILLEGAL EXAMPLE:
The following frameset definition is not legal HTML since the contents of the second frame are in the same document as the frameset.

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Frameset//EN">
<HTML>
<HEAD>
<TITLE>A frameset document</TITLE>
</HEAD>
<FRAMESET cols="50%,50%">
  <FRAME src="contents_of_frame1.html">
```

```
  <FRAME src="#anchor_in_same_document">
  <NOFRAMES>
  ...some text...
  <H2><A name="anchor_in_same_document">Important section</A></H2>
  ...some text...
  </NOFRAMES>
</FRAMESET>
</HTML>
```

Decorating a frame

The following example illustrates the usage of the decorative FRAME [p.198] attributes. We specify that frame 1 will allow no scroll bars. Frame 2 will leave white space around its contents (initially, an image file) and the frame will not be resizeable. No border will be drawn between frames 3 and 4. Borders will be drawn (by default) between frames 1, 2, and 3.

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Frameset//EN">
<HTML>
<HEAD>
<TITLE>A frameset document</TITLE>
</HEAD>
<FRAMESET cols="33%,33%,33%">
  <FRAMESET rows="*,200">
      <FRAME src="contents_of_frame1.html" scrolling="no">
      <FRAME src="contents_of_frame2.gif"
                marginwidth="10" marginheight="15"
                noresize>
  </FRAMESET>
  <FRAME src="contents_of_frame3.html" frameborder="0">
  <FRAME src="contents_of_frame4.html" frameborder="0">
</FRAMESET>
</HTML>
```

16.3 Specifying target frame information

Attribute definitions

target = *frame-target* [CI]
: This attribute specifies the name of a frame where a document is to be opened.

By assigning a name to a frame via the name [p.199] attribute, authors can refer to it as the "target" of links defined by other elements. The target [p.201] attribute may be set for elements that create links (A, LINK), image maps (AREA), and forms (FORM [p.208]).

Please consult the section on target frame names for information about recognized frame names.

This example illustrates how targets allow the dynamic modification of a frame's contents. First we define a frameset in the document frameset.html, shown here:

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Frameset//EN">
<HTML>
<HEAD>
<TITLE>A frameset document</TITLE>
</HEAD>
<FRAMESET rows="50%,50%">
   <FRAME name="fixed" src="init_fixed.html">
   <FRAME name="dynamic" src="init_dynamic.html">
</FRAMESET>
</HTML>
```

Then, in `init_dynamic.html`, we link to the frame named "dynamic".

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0//EN">
<HTML>
<HEAD>
<TITLE>A document with anchors with specific targets</TITLE>
</HEAD>
<BODY>
...beginning of the document...
<P>Now you may advance to
    <A href="slide2.html" target="dynamic">slide 2.</A>
...more document...
<P>You're doing great. Now on to
    <A href="slide3.html" target="dynamic">slide 3.</A>
</BODY>
</HTML>
```

Activating either link opens a new document in the frame named "dynamic" while the other frame, "fixed", maintains its initial contents.

Note: Once a frame's content is changed dynamically, the original frameset definition no longer reflects the true contents of each frame; the frameset definition does not change.

There is currently no way to encode the entire state of a frameset in a URL. Therefore, many user agents do not allow users to assign a bookmark to a frameset.

Framesets may make navigation forward and backward through your user agent's history more difficult for users.

16.3.1 Setting the default target for links

When many links in the same document designate the same target, it is possible to specify the target once and dispense with the `target` [p.201] attributes in each element. This is done by setting the `target` [p.201] attribute of the `BASE` element.

We return to the previous example, this time factorizing the target information by defining it in the `BASE` element and removing it from the `A` elements.

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0//EN">
<HTML>
<HEAD>
<TITLE>A document with BASE with a specific target</TITLE>
```

```
<BASE target="dynamic">
</HEAD>
<BODY>
...beginning of the document...
<P>Now you may advance to <A href="slide2.html">slide 2.</A>
...more document...
<P>You're doing great. Now on to
       <A href="slide3.html">slide 3.</A>
</BODY>
</HTML>
```

16.3.2 Target semantics

There are several methods for making a frame the target of a link. Here we define their interaction.

1. If an element has its target attribute set to a known frame, when the element is activated, the document designated by the element will be loaded into the target frame.
2. If an element does not have the `target` [p.201] attribute set but the `BASE` element does, the `BASE` element's target determines the frame, and loading obeys the same semantics as 1.
3. If neither the element nor the `BASE` element refer to a target, the document designated by the element will be loaded into the frame containing the element.
4. If any target refers to an unknown frame `F`, the user agent will create a new window and frame, assign the name `F` to the frame, and load the document designated by the element in the new frame.

User agents may provide users with a mechanism to override the `target` [p.201] attribute.

16.4 Alternate content

We strongly recommend providing alternate versions of content for those user agents that do not support frames or are configured not to display frames.

16.4.1 The `NOFRAMES` element

```
<![ %HTML.Frameset; [
<!ENTITY % noframes.content "(BODY) -(NOFRAMES)">
]]>

<!ENTITY % noframes.content "(%flow;)*">

<!ELEMENT NOFRAMES - - %noframes.content;
 -- alternate content container for non frame-based rendering -->
<!ATTLIST NOFRAMES
  %attrs;                          -- %coreattrs, %i18n, %events --
  >
```

Start tag: ***required****, End tag:* ***required***

The `NOFRAMES` [p.203] element specifies content that should be displayed only when frames are not being displayed. User agents that support frames must only display the contents of a `NOFRAMES` [p.203] declaration when configured not to display frames. User agents that do not support frames must display

the contents of NOFRAMES [p.203] in any case.

NOFRAMES [p.203] can be used either in the FRAMESET [p.196] section of a frameset document or directly in the BODY of a document used within a frameset.

Suppose we have a sample frameset defined in "top.html" that designates a document ("main.html") and a special table of contents ("table_of_contents.html") related to the main document. Here is "top.html":

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Frameset//EN">
<HTML>
<HEAD>
<TITLE>A frameset document</TITLE>
</HEAD>
<FRAMESET cols="50%, 50%">
   <FRAME src="main.html">
   <FRAME src="table_of_contents.html">
</FRAMESET>
</HTML>
```

What happens when the user reads "top.html" and the user agent is not displaying frames? The user won't see anything since we do not have a BODY in "top.html". If we insert "table_of_contents.html" and "main.html" directly in a NOFRAMES [p.203] element in the FRAMESET [p.196] , we solve the problem of associating the two documents, but we may cause user agents that support frames to retrieve the same data twice: one copy associated with the frameset and one copy inserted in the NOFRAMES [p.203] .

It is more economical to include the table of contents at the top of "main.html" within a NOFRAMES [p.203] element:

```
<!-- This is main.html -->
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0//EN">
<HTML>
<HEAD>
<TITLE>A document with NOFRAMES</TITLE>
</HEAD>
<BODY>
<NOFRAMES>
...the table of contents here...
</NOFRAMES>
...the rest of the document...
</BODY>
</HTML>
```

and to link to "main.html" from "top.html" for the case when frames are not displayed:

```
<!-- This is top.html -->
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Frameset//EN">
<HTML>
<HEAD>
<TITLE>A frameset document with NOFRAMES</TITLE>
</HEAD>
<FRAMESET cols="50%, 50%">
   <FRAME src="main.html">
   <FRAME src="table_of_contents.html">
   <NOFRAMES>
```

```
   Here's the <A href="main.html">for a non-frames version.</A>
   </NOFRAMES>
</FRAMESET>
</HTML>
```

16.5 Inline frames: the `IFRAME` element

```
<!ELEMENT IFRAME - - (%flow;)* -- inline subwindow -->
<!ATTLIST IFRAME
  %coreattrs;                      -- id, class, style, title --
  longdesc    %URL;       #IMPLIED  -- link to long description (complements title) --
  name        CDATA      #IMPLIED  -- name of frame for targetting --
  src         %URL;      #IMPLIED  -- source of frame content --
  frameborder (1|0)      1         -- request frame borders? --
  marginwidth %Pixels;   #IMPLIED  -- margin widths in pixels --
  marginheight %Pixels;  #IMPLIED  -- margin height in pixels --
  scrolling (yes|no|auto) auto     -- scrollbar or none --
  align       %IAlign;   #IMPLIED  -- vertical or horizontal alignment --
  height      %Length;   #IMPLIED  -- frame height --
  width       %Length;   #IMPLIED  -- frame width --
  >
```

Start tag: ***required****, End tag:* ***required***

Attribute definitions

`longdesc` = *url* [CT]
: This attribute specifies a link to a long description of the frame. This description should supplement the short description provided using the `title` attribute, and is particularly useful for non-visual user agents.

`name` = *cdata* [CI]
: This attribute assigns a name to the current frame. This name may be used as the target of subsequent links.

`width` = *length* [CN]
: The width of the inline frame.

`height` = *length* [CN]
: The height of the inline frame.

Attributes defined elsewhere

- `id`, `class` (document-wide identifiers)
- `title` (element titles)
- `style` (inline style information)
- `name` [p.199] , `src` [p.199] , `frameborder` [p.199] , `marginwidth` [p.199] , `marginheight` [p.199] , `scrolling` [p.199] (frame controls and decoration [p.198])
- `target` [p.201] (target frame information)
- `align` (alignment)

The IFRAME [p.205] element allows authors to insert a frame within a block of text. Inserting an inline frame within a section of text is much like inserting an object via the OBJECT element: they both allow you to insert an HTML document in the middle of another, they may both be aligned with surrounding text, etc.

The information to be inserted inline is designated by the src [p.211] attribute of this element. The *contents* of the IFRAME [p.205] element, on the other hand, should only be rendered by user agents that do not support frames or are configured not to display frames.

For user agents that support frames, the following example will place an inline frame surrounded by a border in the middle of the text.

```
<IFRAME src="foo.html" width="400" height="500"
           scrolling="auto" frameborder="1">
[Your user agent does not support frames or is currently configured
not to display frames. However, you may visit
<A href="foo.html">the related document.</A>]
</IFRAME>
```

Inline frames may not be resized (and thus, they do not take the noresize [p.199] attribute).

Note: HTML documents may also be embedded in other HTML documents with the OBJECT element. See the section on including files in HTML documents for details.

17 Forms

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17.1 Introduction to forms

An HTML form is a section of a document containing normal content, markup, special elements called *controls* [p.210] (check boxes, radio buttons, menus, etc.), and labels on those controls. Users generally "complete" forms by entering text, selecting menu items, etc., and then submitting the form for processing. Submitted forms may either be mailed to another user or fed to a program for treatment.

Each control may be assigned a name. When the form is submitted, some controls (depending on their state) [p.233] have their name and current value submitted along with the form. The nature of the value submitted depends on the control (e.g., the value of a text box is the input text).

Here's a simple form that includes labels, radio buttons, and push buttons (reset the form or submit it):

```
<FORM action="http://somesite.com/prog/adduser" method="post">
   <P>
   <LABEL for="firstname">First name: </LABEL>
            <INPUT type="text" id="firstname"><BR>
   <LABEL for="lastname">Last name: </LABEL>
            <INPUT type="text" id="lastname"><BR>
   <LABEL for="email">email: </LABEL>
            <INPUT type="text" id="email"><BR>
   <INPUT type="radio" name="sex" value="Male"> Male<BR>
```

```
    <INPUT type="radio" name="sex" value="Female"> Female<BR>
    <INPUT type="submit" value="Send"> <INPUT type="reset">
    </P>
 </FORM>
```

Note. *This specification includes more detailed information about forms in sections on form display issues [p.314] .*

17.2 The `FORM` element

```
<!ELEMENT FORM - - (%flow;)* -(FORM) -- interactive form -->
<!ATTLIST FORM
  %attrs;                          -- %coreattrs, %i18n, %events --
  action      %URL;      #REQUIRED -- server-side form handler --
  method      (GET|POST) GET       -- HTTP method used to submit the form --
  enctype  %ContentType; "application/x-www-form-urlencoded"
  onsubmit    %Script;   #IMPLIED  -- the form was submitted --
  onreset     %Script;   #IMPLIED  -- the form was reset --
  target   %FrameTarget;    #IMPLIED -- render in this frame --
  accept-charset %Charsets; #IMPLIED -- list of supported charsets --
  >
```

Start tag: ***required****, End tag:* ***required***

Attribute definitions

`action` = *url* [CT]
: This attribute specifies a program for handling the submitted form. Generally the URL is an HTTP URL (to submit the form to a program) or a mailto URL (to email the form).

`method` = `get` | `post` [CI]
: This attribute specifies which HTTP method will be used to submit name/value pairs to the form handler. Possible values (which are case-insensitive):
  - `post`**:** Use the HTTP POST method. This method includes name/value pairs in the body of the form and not in the URL specified by the `action` [p.208] attribute.
  - `get`**: Deprecated.**Use the HTTP GET method. This method appends name/value pairs to the URL specified by `action` [p.208] and sends this new URL to the server. This is the default value for backwards compatibility. This method has been deprecated for reasons of internationalization.

`enctype` = *content-type* [CI]
: This attribute specifies the content type used to submit the form to the server (when the value of `method` [p.208] is "post"). The default value for this attribute is "application/x-www-form-urlencoded". The value "multipart/form-data" should be used when the returned document includes submitted files.

`accept-charset` = *charset list* [CI]
: This attribute specifies the list of character encodings for input data that must be accepted by the server processing this form. The value is a space- and/or comma-delimited list of charset values. The server must interpret this list as an exclusive-or list, i.e., the server must be able to accept any single character encoding per entity received.

The default value for this attribute is the reserved string "UNKNOWN". User agents may interpret this value as the character encoding that was used to transmit the document containing this `FORM` [p.208] element.

`accept` = *content-type-list* [CI]
This attribute specifies a comma-separated list of content types that a server processing this form will handle correctly. User agents may use this information to filter out non-conforming files when prompting a user to select files to be sent to the server (cf. the `INPUT` [p.210] element when `type` [p.211] ="file").

Attributes defined elsewhere

- `id`, `class` (document-wide identifiers)
- `lang` (language information), `dir` (text direction)
- `style` (inline style information)
- `title` (element titles)
- `target` (target frame information)
- `onsubmit` [p.239] , `onreset` [p.239] , `onclick` [p.238] , `ondblclick` [p.238] , `onmousedown` [p.238] , `onmouseup` [p.239] , `onmouseover` [p.239] , `onmousemove` [p.239] , `onmouseout` [p.239] , `onkeypress` [p.239] , `onkeydown` [p.239] , `onkeyup` [p.239] (intrinsic events [p.238])

The `FORM` [p.208] element acts as a container for controls. It specifies:

- The layout of the form (given by the contents of the element).
- The program that will handle the completed and submitted form (the `action` [p.208] attribute). The receiving program must be able to parse name/value pairs in order to make use of them.
- The method by which user data will be sent to the server (the `method` [p.208] attribute).
- A character encoding that must accepted by the server in order to handle this form (the `accept-charset` [p.208] attribute). User agents may advise the user of the value of the `accept-charset` [p.208] attribute and/or to restrict the user's ability to enter unrecognized characters.

A form can contain text and markup (paragraphs, lists, etc.) as well as the controls listed below.

The scope of the `name` attribute for any controls within a `FORM` [p.208] element is the `FORM` [p.208] element.

The following example specifies that the submitted form will be processed by the "adduser" program. The form will be sent to the program using the HTTP POST method.

```
<FORM action="http://somesite.com/prog/adduser" method="post">
...form contents...
</FORM>
```

The following example shows how to send a submitted form to an email address.

```
<FORM action="mailto:Kligor.T@gee.whiz.com" method="post">
...form contents...
</FORM>
```

Note. *Further discussion of the behavior of servers that receive form data is beyond the scope of this specification. Please consult the section on form submission [p.232] for information about how user agents must prepare form data for servers and how user agents should handle expected responses.*

17.3 Controls

The following control elements generally appear within a `FORM` [p.208] element declaration. However, these elements may also appear outside of a `FORM` [p.208] element declaration when they are used to build user interfaces. This is discussed later in this specification, in the section on intrinsic events. [p.238]

17.3.1 The `INPUT` element

```
<!ENTITY % InputType
  "(TEXT | PASSWORD | CHECKBOX |
    RADIO | SUBMIT | RESET |
    FILE | HIDDEN | IMAGE | BUTTON)"
   >

<!-- attribute name required for all but submit & reset -->
<!ELEMENT INPUT - O EMPTY -- form control -->
<!ATTLIST INPUT
  %attrs;                         -- %coreattrs, %i18n, %events --
  type       %InputType; TEXT     -- what kind of widget is needed --
  name        CDATA      #IMPLIED  -- submit as part of form --
  value       CDATA      #IMPLIED  -- required for radio and checkboxes --
  checked    (checked)   #IMPLIED  -- for radio buttons and check boxes --
  disabled   (disabled)  #IMPLIED  -- control is unavailable in this context --
  readonly   (readonly)  #IMPLIED  -- for text and passwd --
  size        CDATA      #IMPLIED  -- specific to each type of field --
  maxlength   NUMBER     #IMPLIED  -- max chars for text fields --
  src         %URL;      #IMPLIED  -- for fields with images --
  alt         CDATA      #IMPLIED  -- short description --
  usemap      %URL;      #IMPLIED  -- use client-side image map --
  align       %IAlign;   #IMPLIED  -- vertical or horizontal alignment --
  tabindex    NUMBER     #IMPLIED  -- position in tabbing order --
  accesskey  %Character; #IMPLIED  -- accessibility key character --
  onfocus     %Script;   #IMPLIED  -- the element got the focus --
  onblur      %Script;   #IMPLIED  -- the element lost the focus --
  onselect    %Script;   #IMPLIED  -- some text was selected --
  onchange    %Script;   #IMPLIED  -- the element value was changed --
  accept  %ContentTypes; #IMPLIED  -- list of MIME types for file upload --
  >
```

Start tag: ***required****, End tag:* ***forbidden***

Attribute definitions

`type` =
`text`|`password`|`checkbox`|`radio`|`submit`|`reset`|`file`|`hidden`|`image`|`button` [CI]
This attribute specifies the type of input control to create. We discuss input control types [p.212] below. The default value for this attribute is "text".

`name` = *cdata* [CI]
This attribute assigns a name to the control. This name will be paired with the current value of the control if the element's value is submitted along with the form.

`value` = *cdata* [CA]
This attribute specifies the initial value of the control. It is optional except when the control type is "radio".

`size` = *cdata* [CN]
This attribute tells the user agent the initial width of the control. The width is given in pixels, except for control types "text" and "password" when it is the (integer) number of characters.

`maxlength` = *number* [CN]
When the control type is "text" or "password", this attribute specifies the maximum number of characters that may be entered. This number may exceed the specified `size` [p.211] , in which case the user agent should offer a scrolling mechanism. The default value for this attribute is an unlimited number.

`checked` [CI]
When the control type is "radio" or "checkbox", this boolean attribute specifies that the button is on. This attribute must be ignored for other control types.

`src` = *url* [CT]
When the control type is "image", this attribute specifies the location of the image to be used to decorate the graphical submit button.

Attributes defined elsewhere

- `id`, `class` (document-wide identifiers)
- `lang` (language information), `dir` (text direction)
- `title` (element titles)
- `style` (inline style information)
- `alt` (alternate text)
- `align` (alignment)
- `accept` [p.209] (legal content types for a server [p.208])
- `readonly` [p.231] (read-only input controls [p.231])
- `disabled` [p.230] (disabled input controls [p.230])
- `tabindex` [p.228] (tabbing navigation)
- `accesskey` [p.229] (access keys)
- `usemap` (client-side image maps)
- `onfocus` [p.239] , `onblur` [p.239] , `onselect` [p.239] , `onchange` [p.239] , `onclick` [p.238] , `ondblclick` [p.238] , `onmousedown` [p.238] , `onmouseup` [p.239] , `onmouseover` [p.239] , `onmousemove` [p.239] , `onmouseout` [p.239] , `onkeypress` [p.239] , `onkeydown` [p.239] , `onkeyup` [p.239] (intrinsic events [p.238])

The nature of a control defined by the INPUT [p.210] element depends on the value of the type [p.211] attribute.

Input types

The INPUT [p.210] element's type [p.211] attribute determines which control will be created.

text
: This type creates a single-line text box. The value submitted by a text control is the input text.

password
: Like "text", but the input text is rendered in such a way as to hide the characters (e.g., a series of asterisks). This control is used for sensitive input such as passwords. The value submitted by a password control is the input text (not the rendering).

Note. *Application designers should note that this mechanism affords only light security protection. Although the password is masked by user agents from casual observers, it is transmitted to the server in clear text, and may be read by anyone with low-level access to the network.*

checkbox
: A checkbox is an on/off switch. When the switch is on, the value of the checkbox is "active". When the switch is off, the value is inactive. The checkbox value is only submitted with the form when the switch is on.

Several checkboxes within the same form may bear the same name. Upon submission, each "on" checkbox with the same name submits a name/value pair with the same name component. This allows users to select more than one value for a given property.

radio
: A radio button is an on/off switch. When the switch is on, the value of the radio button is "active". When the switch is off, the value is inactive. The radio button value is only submitted with the form when the switch is on.

Several radio button within the same form may bear the same name. However, only one of these buttons may be "on" at any one time. All related buttons are set to "off" as soon as one is set to "on". Thus, for related radio buttons, only one name/value pair is ever submitted.

submit
: Creates a submit button. When this button is activated by the user, the form is submitted to the location specified by the action [p.208] attribute of the parent FORM [p.208] element.

A form may contain more than one submit button. Only the name/value pair of the activated submit button is submitted with the form.

image
: Creates a graphical *submit* button. The value of the src [p.211] attribute specifies the URL of the image that will decorate the button. For accessibility reasons, authors should provide alternate text to the image.

When a pointing device is used to click on the image, the form is submitted and the location passed to the server. The x value is measured in pixels from the left of the image, and the y value in pixels from the top of the image. The submitted data includes *name*.x=*x-value* and *name*.y=*y-value* where *"name"* is the value of the `name` attribute, and *x-value* and *y-value* are the x and y coordinate values respectively.

If the server takes different actions depending on the location clicked, users of non-graphical browsers will be disadvantaged. For this reason, authors should consider alternate approaches:

- Use multiple submit buttons (each with its own image) in place of a single graphical submit button. You can use style sheets to control the positioning of these buttons.
- Use a client-side image map together with scripting.

reset

Creates a reset button. When this button is activated by the user, all of the form's controls have their values reset to the initial values specified by their `value` attributes. The name/value for a reset button are not submitted with the form.

button

Creates a push button that has no default behavior. The behavior of the button is defined by associating the button with client-side scripts that are triggered when events affecting the button occur (e.g., clicking the button). The value of the `value` attribute is the label used for the button.

For example, the following declaration causes the function named `verify` to be executed when the button is clicked. The script must be defined by a `SCRIPT` [p.236] element.

```
<INPUT type="button" value="Click Me" onclick="verify()">
```

Please consult the section on intrinsic events [p.238] for more information about scripting and events.

hidden

Creates a element that is not rendered by the user agent. However, the element's name and value are submitted with the form.

This control type is generally used to store information between client/server exchanges that would otherwise be loss due to the stateless nature of HTTP.

`INPUT` [p.210] controls of type `hidden` have their values submitted with the form. The same holds for controls that are not rendered because of style information. The following control, though hidden by the user agent, will have its value submitted with the form.

```
<INPUT type="password" style="display:none"
          name="invisible-password"
          value="mypassword">
```

file

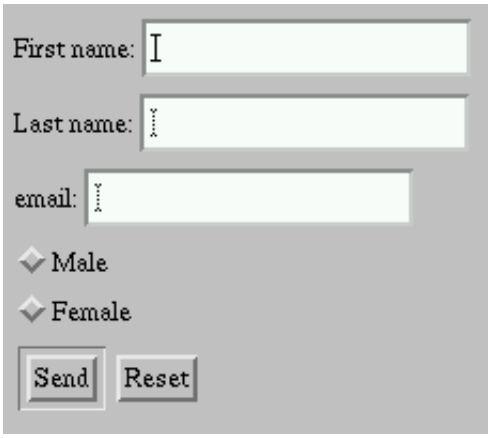
Prompts the user for a file name. When the form is submitted, the contents of the file are submitted to the server as well as other user input.

User agents should encapsulate multiple files in a MIME multipart document (see [RFC2045] [p.320]). This mechanism encapsulates each file in a a body-part of a multipart MIME body that is sent as the HTTP entity. Each each body part can be labeled with an appropriate "Content-Type", including if necessary a "charset" parameter that specifies the character encoding.

The following sample HTML fragment defines a simple form that allows the user to enter a first name, last name, email address, and sex. When the submit button is activated, the form is sent to the program specified by the `action` [p.208] attribute.

```
<FORM action="http://somesite.com/prog/adduser" method="post">
   <P>
   First name: <INPUT type="text" name="firstname"><BR>
   Last name: <INPUT type="text" name="lastname"><BR>
   email: <INPUT type="text" name="email"><BR>
   <INPUT type="radio" name="sex" value="Male"> Male<BR>
   <INPUT type="radio" name="sex" value="Female"> Female<BR>
   <INPUT type="submit" value="Send"> <INPUT type="reset">
   </P>
</FORM>
```

This form might be rendered as follows:



In the section on the `LABEL` [p.224] element, we discuss marking up labels such as "First name".

The following example shows how the contents of a user-specified file may be submitted with a form. This example is based on an example from [RFC1867] [p.320] .

In this example, the user is prompted to enter a name and a list of names of files whose contents should be submitted with the form. By specifying the `enctype` [p.208] value of "multipart/form-data", each file's contents are stored in a separate section of a multipart document.

```
<FORM action="http://server.dom/cgi/handle"
    enctype="multipart/form-data"
    method="post">
 <P>
 What is your name? <INPUT type="text" name="name_of_sender">
 What files are you sending? <INPUT type="file" name="name_of_files">
 </P>
</FORM>
```

Please consult [RFC1867] [p.320] for more information about file submissions.

Note. *Authors may prefer to use the* `BUTTON` *[p.216] element rather than the* `INPUT` *[p.210] element for types "submit", "reset", "button" since the* `BUTTON` *[p.216] element offers richer presentational control.*

The `ISINDEX` element

ISINDEX is deprecated. Users should use the `INPUT` [p.210] element instead of this element.

```
<!ELEMENT ISINDEX - O EMPTY -- single line prompt -->
<!ATTLIST ISINDEX
  %coreattrs;                      -- id, class, style, title --
  %i18n;                           -- lang, dir --
  prompt      %Text;    #IMPLIED  -- prompt message -->
```

Start tag: ***required****, End tag:* ***forbidden***

Attribute definitions

`prompt` = *text* [CS]
: **Deprecated.** This attribute specifies a prompt string for the input field.

Attributes defined elsewhere

- `id`, `class` (document-wide identifiers)
- `lang` (language information), `dir` (text direction)
- `title` (element titles)
- `style` (inline style information)

The `ISINDEX` [p.215] element causes the user agent to prompt the user for a single line of input (allowing any number of characters). The user agent may use the value of the `prompt` [p.215] attribute as a title for the prompt.

DEPRECATED EXAMPLE:
The following `ISINDEX` [p.215] declaration:

```
<ISINDEX prompt="Enter your search phrase: ">
```

is equivalent to the following `INPUT` [p.210] declaration:

```
<FORM action="..." method="post">
<P>Enter your search phrase: <INPUT type="text"></P>
</FORM>
```

Semantics of `ISINDEX`. *Currently, the semantics for `ISINDEX` [p.215] are only well-defined when the base URL for the enclosing document is an HTTP URL. In practice, the input string is restricted to Latin-1 as there is no mechanism for the URL to specify a different character set.*

17.3.2 The `BUTTON` element

```
<!ELEMENT BUTTON - -
     (%flow;)* -(A|%formctrl;|FORM|ISINDEX|FIELDSET|IFRAME)
     -- push button -->
<!ATTLIST BUTTON
  %attrs;                         -- %coreattrs, %i18n, %events --
  name        CDATA      #IMPLIED  -- for scripting/forms as submit button --
  value       CDATA      #IMPLIED  -- gets passed to server when submitted --
  type (button|submit|reset) submit -- for use as form submit/reset button --
  disabled    (disabled) #IMPLIED  -- control is unavailable in this context --
  tabindex    NUMBER     #IMPLIED  -- position in tabbing order --
  accesskey  %Character; #IMPLIED  -- accessibility key character --
  onfocus     %Script;   #IMPLIED  -- the element got the focus --
  onblur      %Script;   #IMPLIED  -- the element lost the focus --
  >
```

Start tag: ***required****, End tag:* ***required***

Attribute definitions

`name` = *cdata* [CI]
: This attribute assigns a name to the button.

`value` = *cdata* [CS]
: This attribute assigns a value to the button.

`type` = `submit` | `button` | `reset` [CI]
: This attribute declares the type of the button. Possible values:
  - `submit`: Creates a button that submits the form that contains it. This is the default value.
  - `button`: Creates a simple push button intended to trigger a script.
  - `reset`: Creates a button that resets the form that contains it.

Attributes defined elsewhere

- `disabled` [p.230] (disabled input controls [p.230])
- `accesskey` [p.229] (access keys)
- `usemap` (client-side image maps)
- `onfocus` [p.239] , `onblur` [p.239] , `onclick` [p.238] , `ondblclick` [p.238] , `onmousedown` [p.238] , `onmouseup` [p.239] , `onmouseover` [p.239] , `onmousemove` [p.239] , `onmouseout` [p.239] , `onkeypress` [p.239] , `onkeydown` [p.239] , `onkeyup` [p.239] (intrinsic events [p.238])

A BUTTON [p.216] element whose type is "submit" is very similar to an INPUT [p.210] element whose type is "submit". They both cause a form to be submitted, but the BUTTON [p.216] element allows richer presentational possibilities. When a BUTTON [p.216] whose type is "submit" is selected, the name [p.216] and value [p.216] are paired and submitted with the form (see the section on form submission [p.232] for details).

A BUTTON [p.216] element whose type is "submit" and whose content is an image (e.g., the IMG element) is very similar to an INPUT [p.210] element whose type is "image". They both cause a form to be submitted, but their presentation is different. In this context, a graphical user agent may render an INPUT [p.210] element as a "flat" image, and render a BUTTON [p.216] as a button (e.g., with relief and an up/down motion when clicked).

The following example expands a previous example by substituting the INPUT [p.210] elements that create submit and reset buttons with BUTTON [p.216] instances. The buttons contain images by way of the IMG element.

```
<FORM action="http://somesite.com/prog/adduser" method="post">
   <P>
   First name: <INPUT type="text" name="firstname"><BR>
   Last name: <INPUT type="text" name="lastname"><BR>
   email: <INPUT type="text" name="email"><BR>
   <INPUT type="radio" name="sex" value="Male"> Male<BR>
   <INPUT type="radio" name="sex" value="Female"> Female<BR>
   <BUTTON name="submit" value="submit" type="submit">
   Send<IMG src="/icons/wow.gif" alt="wow"></BUTTON>
   <BUTTON name="reset" type="reset">
   Reset<IMG src="/icons/oops.gif" alt="oops"></BUTTON>
   </P>
</FORM>
```

Authors that create a BUTTON [p.216] with an IMG element should specify alternate text for the image.

It is illegal to associate an image map with an IMG that appears as the contents of a BUTTON [p.216] element.

ILLEGAL EXAMPLE:
The following is not considered legal HTML.

```
<BUTTON>
<IMG src="foo.gif" usemap="...">
</BUTTON>
```

A BUTTON [p.216] element whose type is "reset" is very similar to an INPUT [p.210] element whose type is "reset". They both cause controls to regain their initial values, but the BUTTON [p.216] element allows richer presentation.

The BUTTON [p.216] element may also be used together with scripts, in which case it's type [p.216] should be "button". When such a button is activated, a client-side script is executed. We discuss this use of BUTTON [p.216] later in the specification in the section on intrinsic events [p.238] .

17.3.3 The `SELECT`, `OPTGROUP`, and `OPTION` elements

```
<!ELEMENT SELECT - - (OPTGROUP|OPTION)+ -- option selector -->
<!ATTLIST SELECT
  %attrs;                          -- %coreattrs, %i18n, %events --
  name        CDATA      #IMPLIED  -- field name --
  size        NUMBER     #IMPLIED  -- rows visible --
  multiple    (multiple) #IMPLIED  -- default is single selection --
  disabled    (disabled) #IMPLIED  -- control is unavailable in this context --
  tabindex    NUMBER     #IMPLIED  -- position in tabbing order --
  onfocus     %Script;   #IMPLIED  -- the element got the focus --
  onblur      %Script;   #IMPLIED  -- the element lost the focus --
  onchange    %Script;   #IMPLIED  -- the element value was changed --
  >
```

Start tag: ***required****, End tag:* ***required***

SELECT Attribute definitions

`name` = *cdata* [CI]
: This attribute assigns a name to the element. This name will be paired with any selected values when the form is submitted.

`size` = *number* [CN]
: When the `SELECT` [p.218] element is presented as a scrolling list box, this attribute specifies the number of rows in the list that should be visible at the same time. There is no requirement for visual user agents to present a `SELECT` [p.218] element as a list box, and one alternative is to use a drop-down menu.

`multiple` [CI]
: When set, this boolean attribute allows multiple selections. When not set, the `SELECT` [p.218] element only permits single selections.

The `SELECT` [p.218] element creates a group of choices that may be selected by the user. Each choice is represented by an `OPTION` [p.218] element. A `SELECT` [p.218] element must contain at least one `OPTION` [p.218] element.

The `OPTGROUP` [p.218] element allows authors to group choices into a hierarchy. This is particularly helpful to non-visual user agents when the user has many options to choose from; long flat lists are hard to remember It is generally easier to grasp hierarchical groupings of choices, for instance by expanding and collapsing levels of detail.

Zero or more choices may be pre-selected for the user. User agents should determine which choices are pre-selected as follows:

- If no `OPTION` [p.218] element has the `selected` [p.219] attribute set, no options should be pre-selected.
- If one `OPTION` [p.218] element has the `selected` [p.219] attribute set, it should be pre-selected.
- If the `SELECT` [p.218] element has the `multiple` [p.218] attribute set and more than one `OPTION` [p.218] element has the `selected` [p.219] attribute set, they should all be pre-selected.
- It is considered an error if more than one `OPTION` [p.218] element has the `selected` [p.219] attribute set and the `SELECT` [p.218] element does not have the `multiple` [p.218] attribute set.

User agents may vary in how they handle this error, but should not pre-select more than one choice.

```
<!ELEMENT OPTGROUP - - (OPTGROUP|OPTION)+ -- option group -->
<!ATTLIST OPTGROUP
  %attrs;                          -- %coreattrs, %i18n, %events --
  disabled    (disabled) #IMPLIED  -- control is unavailable in this context --
  label       %Text;     #REQUIRED -- for use in hierarchical menus --
  >
```

Start tag: ***required****, End tag:* ***required***

OPTGROUP Attribute definitions

`label` = *text* [CS]
This attribute specifies the label for the option group.

Attributes defined elsewhere

- `id`, `class` (document-wide identifiers)
- `lang` (language information), `dir` (text direction)
- `title` (element titles)
- `style` (inline style information)
- `disabled` [p.230] (disabled input controls [p.230])
- `onfocus` [p.239] , `onblur` [p.239] , `onchange` [p.239] , `onclick` [p.238] , `ondblclick` [p.238] , `onmousedown` [p.238] , `onmouseup` [p.239] , `onmouseover` [p.239] , `onmousemove` [p.239] , `onmouseout` [p.239] , `onkeypress` [p.239] , `onkeydown` [p.239] , `onkeyup` [p.239] (intrinsic events [p.238])

```
<!ELEMENT OPTION - O (#PCDATA) -- selectable choice -->
<!ATTLIST OPTION
  %attrs;                          -- %coreattrs, %i18n, %events --
  selected    (selected) #IMPLIED
  disabled    (disabled) #IMPLIED  -- control is unavailable in this context --
  label       %Text;     #IMPLIED  -- for use in hierarchical menus --
  value       CDATA      #IMPLIED  -- defaults to element content --
  >
```

Start tag: ***required****, End tag:* ***optional***

OPTION Attribute definitions

`selected` [CI]
When set, this boolean attribute specifies that this option is pre-selected.

`value` = *cdata* [CS]
This attribute specifies the value to be submitted for this choice if the choice is selected when the form is submitted. The value is paired with the `name` [p.218] set for the `SELECT` [p.218] element. If this attribute is not set, the submitted value defaults to the content of the `OPTION` [p.218] element.

`label` = *text* [CS]
When a `SELECT` [p.218] element is rendered as a hierarchy, the context provided by the hierarchy means that a shorter label may be preferable than when the `SELECT` [p.218] element is rendered as a

flat list. In this situation, the user agent should use the value of the `label` attribute instead of the content of the `OPTION` [p.218] element.

Attributes defined elsewhere

- `id`, `class` (document-wide identifiers)
- `lang` (language information), `dir` (text direction)
- `title` (element titles)
- `style` (inline style information)
- `disabled` [p.230] (disabled input controls [p.230])
- `onfocus` [p.239] , `onblur` [p.239] , `onchange` [p.239] , `onclick` [p.238] , `ondblclick` [p.238] , `onmousedown` [p.238] , `onmouseup` [p.239] , `onmouseover` [p.239] , `onmousemove` [p.239] , `onmouseout` [p.239] , `onkeypress` [p.239] , `onkeydown` [p.239] , `onkeyup` [p.239] (intrinsic events [p.238])

User agents should use the content of the `OPTION` [p.218] element as the displayed choice.

In this example, we create a menu that allows the user to select which of seven software components to install. The first and second components are pre-selected but may be deselected by the user. The remaining components are not pre-selected. The `size` [p.218] attribute states that the menu should only have 4 rows even though the user may select from among 7 options. The other options must be made available through a scrolling mechanism.

The `SELECT` [p.218] is followed by submit and reset buttons.

```
<FORM action="http://somesite.com/prog/component-select" method="post">
   <P>
   <SELECT multiple size="4" name="component-select">
      <OPTION selected value="Component_1_a">Component_1</OPTION>
      <OPTION selected value="Component_1_b">Component_2</OPTION>
      <OPTION>Component_3</OPTION>
      <OPTION>Component_4</OPTION>
      <OPTION>Component_5</OPTION>
      <OPTION>Component_6</OPTION>
      <OPTION>Component_7</OPTION>
   </SELECT>
   <INPUT type="submit" value="Send"><INPUT type="reset">
   </P>
</FORM>
```

When the form is submitted, each selected choice will be paired with the name "component-select" and submitted. The submitted value of each `OPTION` [p.218] will be its contents, except where overridden by the `value` attribute (here, in the first two components).

In this example we use the `OPTGROUP` [p.218] element to create a hierarchy of choices. The hierarchy of choice represented by this `SELECT` [p.218] element:

```
<FORM action="http://somesite.com/prog/someprog" method="post">
   <P>
 <SELECT name="ComOS">
   <OPTGROUP label="Comm Servers">
```

```
    <OPTGROUP label="PortMaster 3">
      <OPTION label="3.7.1" value="pm3_3.7.1">PortMaster 3 with ComOS 3.7.1
      <OPTION label="3.7" value="pm3_3.7">PortMaster 3 with ComOS 3.7
      <OPTION label="3.5" value="pm3_3.5">PortMaster 3 with ComOS 3.5
    </OPTGROUP>
    <OPTGROUP label="PortMaster 2">
      <OPTION label="3.7" value="pm2_3.7">PortMaster 2 with ComOS 3.7
      <OPTION label="3.5" value="pm2_3.5">PortMaster 2 with ComOS 3.5
    </OPTGROUP>
  </OPTGROUP>
  <OPTGROUP label="Routers">
    <OPTGROUP label="IRX">
      <OPTION label="3.7R" value="IRX_3.7R">IRX with ComOS 3.7R
      <OPTION label="3.5R" value="IRX_3.5R">IRX with ComOS 3.5R
    </OPTGROUP>
  </OPTGROUP>
 </SELECT>
</FORM>
```

is the following:

```
ComOS
   Comm Servers
      PortMaster 3
         3.7.1
         3.7
         3.5
      PortMaster 2
         3.7
         3.5
   Routers
      IRX
         3.7R
         3.5R
```

Visual user agents not supporting this element may render the options as a flat list. Visual user agents supporting this element may render the options with a hierarchical menu or some other mechanism that reflects the structure of choices. Note the use of the `label` attribute to provide shorter labels for hierarchical menus.

Your user agent renders this as:

◇ PortMaster 3 with ComOS 3.7.1

◇ PortMaster 3 with ComOS 3.7

◇ PortMaster 3 with ComOS 3.5

◇ PortMaster 2 with ComOS 3.7

◇ PortMaster 2 with ComOS 3.5

◇ IRX with ComOS 3.7R

◇ IRX with ComOS 3.5R

17.3.4 The `TEXTAREA` element

```
<!ELEMENT TEXTAREA - - (#PCDATA) -- multi-line text field -->
<!ATTLIST TEXTAREA
  %attrs;                         -- %coreattrs, %i18n, %events --
  name        CDATA      #IMPLIED
  rows        NUMBER     #REQUIRED
  cols        NUMBER     #REQUIRED
  disabled    (disabled) #IMPLIED  -- control is unavailable in this context --
  readonly    (readonly) #IMPLIED
  tabindex    NUMBER     #IMPLIED  -- position in tabbing order --
  onfocus     %Script;   #IMPLIED  -- the element got the focus --
  onblur      %Script;   #IMPLIED  -- the element lost the focus --
  onselect    %Script;   #IMPLIED  -- some text was selected --
  onchange    %Script;   #IMPLIED  -- the element value was changed --
  >
```

Start tag: ***required****, End tag:* ***required***

Attribute definitions

`name` = *cdata* [CI]
: This attribute assigns a name to the element. This name will be paired with the content of the element when submitted to the server.

`rows` = *number* [CN]
: Specifies the number of visible text lines. Users should be able to enter more lines than this, so user agents should provide some means to scroll through the contents of the textarea field when the contents extend beyond the visible area.

`cols` = *number* [CN]
: Specifies the visible width in average character widths. Users should be able to enter longer lines than this, so user agents should provide some means to scroll through the contents of the textarea field when the contents extend beyond the visible area. User agents may wrap visible text lines to keep long lines visible without the need for scrolling.

Attributes defined elsewhere

- id, class (document-wide identifiers)
- lang (language information), dir (text direction)
- title (element titles)
- style (inline style information)
- readonly [p.231] (read-only input controls [p.231])
- disabled [p.230] (disabled input controls [p.230])
- tabindex [p.228] (tabbing navigation)
- onfocus [p.239] , onblur [p.239] , onselect [p.239] , onchange [p.239] , onclick [p.238] , ondblclick [p.238] , onmousedown [p.238] , onmouseup [p.239] , onmouseover [p.239] , onmousemove [p.239] , onmouseout [p.239] , onkeypress [p.239] , onkeydown [p.239] , onkeyup [p.239] (intrinsic events [p.238])

The TEXTAREA [p.222] element creates a multi-line text input control (as opposed to a single-line INPUT [p.210] control). The content of this element provides the initial text presented by the control.

This example creates a TEXTAREA [p.222] control that is 20 rows by 80 columns and contains two lines of text initially. The TEXTAREA [p.222] is followed by submit and reset buttons.

```
<FORM action="http://somesite.com/prog/text-read" method="post">
   <P>
   <TEXTAREA name="thetext" rows="20" cols="80">
   First line of initial text.
   Second line of initial text.
   </TEXTAREA>
   <INPUT type="submit" value="Send"><INPUT type="reset">
   </P>
</FORM>
```

Setting the readonly [p.231] attribute allows authors to display unmodifiable text in a TEXTAREA [p.222] . This differs from using standard marked-up text in a document because the value of TEXTAREA [p.222] is submitted with the form.

User agents should canonicalize line endings to CR, LF (ASCII decimal 13, 10) when submitting the field's contents. The character set for submitted data should be ISO Latin-1, unless the server has previously indicated that it can support other character sets.

17.4 Labels

Some form controls automatically have labels associated with them (press buttons created by INPUT [p.210] and BUTTON [p.216]) while most do not (text fields created by INPUT [p.210] and TEXTAREA [p.222] , checkboxes and radio buttons created by INPUT [p.210] , and menus created by SELECT [p.218]).

For those controls that have implicit labels, user agents should take the value of the value attribute for the label string.

To specify labels for controls without implicit labels, authors may use the LABEL [p.224] element.

17.4.1 The LABEL element

```
<!ELEMENT LABEL - - (%inline;)* -(LABEL) -- form field label text -->
<!ATTLIST LABEL
  %attrs;                           -- %coreattrs, %i18n, %events --
  for         IDREF      #IMPLIED  -- matches field ID value --
  accesskey  %Character; #IMPLIED  -- accessibility key character --
  onfocus     %Script;   #IMPLIED  -- the element got the focus --
  onblur      %Script;   #IMPLIED  -- the element lost the focus --
  >
```

Start tag: ***required****, End tag:* ***required***

Attribute definitions

for = *idref* [CS]
: This attribute explicitly associates the label being defined with another control. The value of this attribute must be the value of the id attribute of some other control in the same document. In the absence of this attribute, the label being defined is associated with its contents.

Attributes defined elsewhere

- id, class (document-wide identifiers)
- lang (language information), dir (text direction)
- title (element titles)
- style (inline style information)
- accesskey [p.229] (access keys)
- tabindex [p.228] (tabbing navigation)
- onfocus [p.239] , onblur [p.239] , onclick [p.238] , ondblclick [p.238] , onmousedown [p.238] , onmouseup [p.239] , onmouseover [p.239] , onmousemove [p.239] , onmouseout [p.239] , onkeypress [p.239] , onkeydown [p.239] , onkeyup [p.239] (intrinsic events [p.238])

The LABEL [p.224] element may be used to attach information to control elements. Each LABEL [p.224] element is associated with exactly one form control.

To associate a label with another control explicitly, set the for [p.224] attribute of the LABEL [p.224] .

This example creates a table that is used to align two INPUT [p.210] controls and their associated labels. Each label is associated explicitly with one of the INPUT [p.210] elements.

```
<FORM action="..." method="post">
<TABLE>
  <TR>
    <TD><LABEL for="fname">First Name</LABEL>
    <TD><INPUT type="text" name="firstname" id="fname">
  <TR>
    <TD><LABEL for="lname">Last Name</LABEL>
    <TD><INPUT type="text" name="lastname" id="lname">
</TABLE>
</FORM>
```

This example extends a previous example form to include LABEL [p.224] elements. Note that the LABEL [p.224] elements are associated to the INPUT [p.210] elements through the id attribute.

```
 <FORM action="http://somesite.com/prog/adduser" method="post">
    <P>
    <LABEL for="firstname">First name: </LABEL>
              <INPUT type="text" id="firstname"><BR>
    <LABEL for="lastname">Last name: </LABEL>
              <INPUT type="text" id="lastname"><BR>
    <LABEL for="email">email: </LABEL>
              <INPUT type="text" id="email"><BR>
    <INPUT type="radio" name="sex" value="Male"> Male<BR>
    <INPUT type="radio" name="sex" value="Female"> Female<BR>
    <INPUT type="submit" value="Send"> <INPUT type="reset">
    </P>
 </FORM>
```

More than one LABEL [p.224] may be associated with the same control by creating multiple references via the for [p.224] attribute.

To associate a label with another control implicitly, make the control the contents of the LABEL [p.224] . In this case, the LABEL [p.224] may only contain one other control element. The label itself may be positioned before or after the associated control.

In this example, we implicitly associate two labels and two INPUT [p.210] elements. This technique cannot be used when a table is being used for layout, with the label in one cell and its associated control in another cell.

```
<FORM action="..." method="post">
<P>
<LABEL>
   First Name
   <INPUT type="text" name="firstname">
</LABEL>
<LABEL>
   <INPUT type="text" name="lastname">
   Last Name
</LABEL>
</P>
</FORM>
```

When a LABEL [p.224] element receives focus [p.228] , it passes the focus on to its associated control. See the section below on access keys for examples.

Labels may be rendered by user agents in a number of ways (e.g., visually, read by speech synthesizers, etc.)

17.5 Adding structure to forms: the FIELDSET and LEGEND elements

```
<!--
  #PCDATA is to solve the mixed content problem,
  per specification only whitespace is allowed there!
 -->
<!ELEMENT FIELDSET - - (#PCDATA,LEGEND,(%flow;)*) -- form control group -->
<!ATTLIST FIELDSET
  %attrs;                         -- %coreattrs, %i18n, %events --
  >

<!ELEMENT LEGEND - - (%inline;)* -- fieldset legend -->
<!ENTITY % LAlign "(top|bottom|left|right)">

<!ATTLIST LEGEND
  %attrs;                         -- %coreattrs, %i18n, %events --
  align       %LAlign;   #IMPLIED  -- relative to fieldset --
  accesskey  %Character; #IMPLIED  -- accessibility key character --
  >
```

Start tag: ***required****, End tag:* ***required***

LEGEND Attribute definitions

`align` = `top` | `bottom` | `left` | `right` [CI]
: **Deprecated.** This attribute specifies the position of the legend with respect to the fieldset. Possible values:
  - `top`: The legend is at the top of the fieldset. This is the default value.
  - `bottom`: The legend is at the bottom of the fieldset.
  - `left`: The legend is at the left of the fieldset.
  - `right`: The legend is at the right of the fieldset.

Attributes defined elsewhere

- `id`, `class` (document-wide identifiers)
- `lang` (language information), `dir` (text direction)
- `title` (element titles)
- `style` (inline style information)
- `accesskey` [p.229] (access keys)
- `onclick` [p.238] , `ondblclick` [p.238] , `onmousedown` [p.238] , `onmouseup` [p.239] , `onmouseover` [p.239] , `onmousemove` [p.239] , `onmouseout` [p.239] , `onkeypress` [p.239] , `onkeydown` [p.239] , `onkeyup` [p.239] (intrinsic events [p.238])

The FIELDSET [p.226] element allows form designers to group thematically related controls and labels. Grouping controls makes it easier for users to understand their purpose while simultaneously facilitating tabbing navigation for visual user agents and speech navigation for speech-oriented user agents. The proper use of this element makes documents more accessible to people with disabilities.

The LEGEND [p.226] element allows authors to assign a caption to a FIELDSET [p.226] . The legend improves accessibility when the FIELDSET [p.226] is rendered non-visually.

In this example, we create a form that one might fill out at the doctor's office. It is divided into three sections: personal information, medical history, and current medication. Each section contains controls for inputting the appropriate information.

```
<FORM action="..." method="post">
<P>
<FIELDSET>
<LEGEND>Personal Information</LEGEND>
Last Name: <INPUT name="personal_lastname" type="text" tabindex="1">
First Name: <INPUT name="personal_firstname" type="text" tabindex="2">
Address: <INPUT name="personal_address" type="text" tabindex="3">
...more personal information...
</FIELDSET>
<FIELDSET>
<LEGEND>Medical History</LEGEND>
<INPUT name="history_illness"
       type="checkbox"
       value="Smallpox" tabindex="20"> Smallpox
<INPUT name="history_illness"
       type="checkbox"
       value="Mumps" tabindex="21"> Mumps
<INPUT name="history_illness"
       type="checkbox"
       value="Dizziness" tabindex="22"> Dizziness
<INPUT name="history_illness"
       type="checkbox"
       value="Sneezing" tabindex="23"> Sneezing
...more medical history...
</FIELDSET>
<FIELDSET>
<LEGEND>Current Medication</LEGEND>
Are you currently taking any medication?
<INPUT name="medication_now"
       type="radio"
       value="Yes" tabindex="35">Yes
<INPUT name="medication_now"
       type="radio"
       value="No" tabindex="35">No

If you are currently taking medication, please indicate
it in the space below:
<TEXTAREA name="current_medication"
          rows="20" cols="50"
          tabindex="40">
</TEXTAREA>
</FIELDSET>
</FORM>
```

Note that in this example, we might improve the visual presentation of the form by aligning elements within each FIELDSET [p.226] (with style sheets), adding color and font information (with style sheets), adding scripting (say, to only open the "current medication" text area if the user indicates he or she is currently on medication), etc.

17.6 Giving focus to an element

Active elements in HTML documents must receive *focus* from the user in order to become active and perform their tasks. For example, users must activate a link specified by the A element in order to follow the specified link. Similarly, users must give a TEXTAREA [p.222] focus in order to enter text into it.

There are several ways to give focus to an element:

- Designate the element with a pointing device.
- Navigate from one element to the next with the keyboard. The document's author may define a *tabbing order* that specifies the order in which elements will receive focus if the user navigates the document with the keyboard (tabbing navigation [p.228]). Once selected, an element may be activated by some other key sequence.
- Select an element by a series of keyboard actions known as an *access key* [p.229] (sometimes called "keyboard shortcut" or "keyboard accelerator").

17.6.1 Tabbing navigation

Attribute definitions

tabindex = *number* [CN]
: This attribute specifies the position of the current element in the tabbing order for the current document. This value must be a number between 0 and 32767. User agents should ignore leading zeros.

The tabbing order defines the order in which elements will receive focus when navigated by the user via the keyboard. The tabbing order may include elements nested within other elements.

Elements that may receive focus should be navigated by user agents according to the following rules:

1. Those elements that support the tabindex [p.228] attribute and assign a positive value to it are navigated first. Navigation proceeds from the element with the lowest tabindex [p.228] value to the element with the highest value. Values need not be sequential nor must they begin with any particular value. Elements that have identical tabindex [p.228] values should be navigated in the order they appear in the character stream.
2. Those elements that do not support the tabindex [p.228] attribute or support it and assign it a value of "0" are navigated next. These elements are navigated in the order they appear in the character stream.
3. Elements that are disabled [p.230] do not participate in the tabbing order.

The following elements support the tabindex [p.228] attribute: A, AREA, OBJECT, INPUT [p.210] , SELECT [p.218] , TEXTAREA [p.222] , and BUTTON [p.216] .

In this example, the tabbing order will be the BUTTON [p.216] , the INPUT [p.210] elements in order (note that "field1" and the button share the same tabindex, but "field1" appears later in the document), and finally the link created by the A element.

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0//EN">
<HTML>
<HEAD>
<TITLE>A document with FORM</TITLE>
</HEAD>
<BODY>
...some text...
<P>Go to the
<A tabindex="10" href="http://www.w3.org/">W3C Web site.</A>
...some more...
<BUTTON type="button" name="get-database"
           tabindex="1" onclick="get-database">
Get the current database.
</BUTTON>
...some more...
<FORM action="..." method="post">
<P>
<INPUT tabindex="1" type="text" name="field1">
<INPUT tabindex="2" type="text" name="field2">
<INPUT tabindex="3" type="submit" name="submit">
</P>
</FORM>
</BODY>
</HTML>
```

Tabbing keys. *The actual key sequence that causes tabbing navigation or element activation depends on the configuration of the user agent (e.g., the "tab" key is used for navigation and the "enter" key is used to activate a selected element).*

User agents may also define key sequences to navigate the tabbing order in reverse. When the end (or beginning) of the tabbing order is reached, user agents may circle back to the beginning (or end).

17.6.2 Access keys

Attribute definitions

accesskey = *character* [CN]
: This attribute assigns an access key to an element. An access key is a single character from the document character set.**Note.** Authors should consider the input method of the expected reader when specifying an accesskey.

Pressing an access key assigned to an element gives focus to the element. The action that is executed when an element receives focus depends on the element. For example, when a user activates a link defined by the A element, the user agent generally follows the link. When a user activates a radio button, the user agent changes the value of the radio button. When the user activates a text field, it allows input, etc.

The following elements support the accesskey [p.229] attribute: A, AREA, LABEL [p.224] , INPUT [p.210] , and LEGEND [p.226] , and BUTTON [p.216] .

This example assigns the access key "U" to a label associated with an INPUT [p.210] control. Typing the access key gives focus to the label which in turn gives it to the associated control. The user may then enter text into the INPUT [p.210] area.

```
<FORM action="..." method="post">
<P>
<LABEL for="fuser" accesskey="U">
User Name
</LABEL>
<INPUT type="text" name="user" id="fuser">
</P>
</FORM>
```

In this example, we assign an access key to a link defined by the A element. Typing this access key takes the user to another document, in this case, a table of contents.

```
<P><A accesskey="C"
      href="http://someplace.com/specification/contents.html">
    Table of Contents</A>
```

The invocation of access keys depends on the underlying system. For instance, on machines running MS Windows, one generally has to press the "alt" key in addition to the access key. On Apple systems, one generally has to press the "cmd" key in addition to the access key.

The rendering of access keys depends on the user agent. We recommend that authors include the access key in label text or wherever the access key is to apply. User agents should render the value of an access key in such a way as to emphasize its role and to distinguish it from other characters (e.g., by underlining it).

17.7 Disabled and read-only elements

In contexts where user input is either undesirable or irrelevant, it is important to be able to disable an element or render it read-only. For example, one may want to disable a form’s submit button until the user has entered some required data. Similarly, an author may want to include a piece of read-only text that must be submitted as a value along with the form. The following sections describe disabled and read-only elements.

17.7.1 Disabled elements

Attribute definitions

disabled [CI]
: When set for a form control, this boolean attribute disables the control for user input.

When set, the `disabled` [p.230] attribute has the following effects on an element:

- Disabled controls do not receive focus [p.228] .
- Disabled controls are skipped in tabbing navigation [p.228] .
- Values of disabled controls are not submitted with a form [p.232] .

The following elements support the `disabled` [p.230] attribute: `INPUT` [p.210] , `SELECT` [p.218] , `OPTION` [p.218] , `TEXTAREA` [p.222] , and `BUTTON` [p.216] .

This attribute is inherited but local declarations override the inherited value.

How disabled elements are rendered depends on the user agent. For example, some user agents "gray out" disabled menu items, button labels, etc.

In this example, the disabled `INPUT` [p.210] element cannot receive user input nor will its value be submitted with the form.

```
<INPUT disabled name="fred" value="stone">
```

Note: The only way to modify dynamically the value of the `disabled` [p.230] attribute is through a script.

17.7.2 Read-only elements

Attribute definitions

`readonly` [CI]
: When set for a form control, this boolean attribute prohibits changes to control.

The `readonly` [p.231] attribute specifies whether the element may be modified by the user.

When set, the `readonly` [p.231] attribute has the following effects on an element:

- Read-only elements receive focus [p.228] but cannot be modified by the user.
- Read-only elements are included in tabbing navigation [p.228] .
- Values of read-only controls are submitted with a form [p.232] .

The following elements support the `readonly` [p.231] attribute: `INPUT` [p.210] , `TEXT`, `PASSWORD`, and `TEXTAREA` [p.222] .

How read-only elements are rendered depends on the user agent.

Note: The only way to modify dynamically the value of the `readonly` [p.231] attribute is through a script.

17.8 Form submission

17.8.1 Processing form data

A form may contain named form controls that may have initial values. The user may interact with some of the controls, possibly changing their values (e.g., entering text, toggling radio buttons, etc.). When the user submits the form (e.g., by activating a submit button), the user agent processes it as follows.

Step one: Build a form data set

First, the user agent builds a *form data set*, based on the values of the form controls at submission time. For form data set is a sequence of name/value pairs.

The names are values of the `name` attribute specified by each form control.

The type of each form control determines how its name is paired with values. For instance, when three `INPUT` [p.210] elements whose `type` [p.211] is "checkbox" share the same `name` [p.211] , each checkbox value is paired with one instance of the name in the form data set. On the other hand, when three `INPUT` [p.210] elements whose `type` [p.211] is "radio" share the same `name` [p.211] , the value of the active button is paired with the `name` [p.211] one time only. Please consult the definition of each form control for information about which value or values are paired with the control's name.

Not all form controls have their values submitted with the form. See the section on which control values are submitted [p.233] for details.

Each value is a character string. Please consult the definition of each form control for information about constraints on values imposed by the control.

Step two: Encode the form data set

The names and values of the form data set are then encoded according to the method specified by the `enctype` [p.208] attribute of the `FORM` [p.208] element. The default encoding is "application/x-www-form-urlencoded", which is defined as follows:

1. Form field names and values are escaped. Space characters are replaced by `'+'`, and then reserved characters are escaped as described in [RFC1738] [p.320] : Non-alphanumeric characters are replaced by `'%HH'`, a percent sign and two hexadecimal digits representing the ASCII code of the character. Line breaks, as in multi-line text field values, are represented as "CR LF" pairs, i.e., `'%0D%0A'`.
2. The fields are listed in the order they appear in the document with the name separated from the value by `'='` and the pairs separated from each other by `'&'`. Fields with null values may be omitted. In particular, unselected radio buttons and checkboxes should not appear in the encoded data, but hidden fields with `value` attributes present should.

Step three: Submit the encoded form data set

Finally, the encoded data is sent to the handler addressed by the `action` [p.208] attribute using the protocol specified by the `method` [p.208] attribute.

This specification does not specify all valid data set encodings and submission methods. However, HTML 4.0 user agents must support the established conventions in the following cases:

- If the `method` [p.208] is "get":
  - If `action` [p.208] is an HTTP URL, the user agent takes the value of `action` [p.208] , appends a `'?'` to it, then appends the form data set, encoded using the default encoding. The user agent then traverses the link to this URL.In this scenario, form data are restricted to ASCII codes.
  - For any other type of `action` [p.208] , behavior is unspecified.
- Else if the `method` [p.208] is "post":
  - If `action` [p.208] is an HTTP URL:
    - If the value of `enctype` [p.208] is "multipart/form-data", see [RFC1867] [p.320] , section 7.
    - Else, if the value of `enctype` [p.208] is the default value or "application/x-www-urlencoded", the user agent conducts an HTTP POST transaction using the value of `action` [p.208] and a message body of type "application/x-www-form-urlencoded".
    - Else, for other values of `enctype` [p.208] , behavior is unspecified.
  - For any other value of `action` [p.208] , behavior is unspecified.
- For any other value of `method` [p.208] , behavior is unspecified.

The user agent should display the response from either the HTTP GET or POST transactions.

Please consult the section on using form query URLs for links [p.304] for information about escaping "&" in such URLs.

17.8.2 Which control values are submitted

Not all elements have their values submitted with a form.

For `INPUT` [p.210] elements with `type` [p.211] ="radio" or `type` [p.211] ="checkbox", and `SELECT` [p.218] elements, only the selected values should be submitted.

Conforming user agents should **not** submit:

- Disabled form controls [p.210] .
- Form controls [p.210] without values for the `name` attribute.
- `OBJECT` elements without the `name` [p.211] attribute.
- `OBJECT` elements with the `declare` attribute.

18 Scripts

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18.1 Introduction to scripts

A client-side *script* is a program that may accompany an HTML document or be embedded directly in it. The program executes on the client's machine when the document loads, or at some other time such as when a link is activated. HTML's support for scripts is independent of the scripting language.

Scripts offer authors a means to extend HTML document in highly active and interactive ways. For example:

- Scripts may be evaluated as a document loads to modify the contents of the document dynamically.
- Scripts may accompany a form to process input as it is entered. Designers may dynamically fill out parts of a form based on the values of other fields. They may also ensure that input data conforms to predetermined ranges of values, that fields are mutually consistent, etc.
- Scripts may be triggered by events that affect the document, such as loading, unloading, element focus, mouse movement, etc.
- Scripts may be linked to form controls (e.g., buttons) to produce graphical user interface elements.

There are two types of scripts authors may attach to an HTML document:

- Those that are executed one time when the document is loaded by the user agent. Scripts that appear within a SCRIPT [p.236] element are executed when the document is loaded. For user agents that cannot or will not handle scripts, authors may include alternate content via the NOSCRIPT [p.242] element.
- Those that are executed every time a specific event occurs. These scripts may be assigned to a number of elements via the intrinsic event [p.238] attributes.

Note: This specification includes more detailed information about scripting in sections on script macros [p.315] .

18.2 Designing documents for user agents that support scripting

The following sections discuss issues that concern user agents that support scripting.

18.2.1 The SCRIPT element

```
<!ELEMENT SCRIPT - - CDATA      -- script statements -->
<!ATTLIST SCRIPT
  charset  %Charset;     #IMPLIED -- char encoding of linked resource --
  type     %ContentType; #REQUIRED -- content type of script language --
  language    CDATA      #IMPLIED  -- predefined script language name --
  src         %URL;      #IMPLIED  -- URL for an external script --
  defer       (defer)    #IMPLIED  -- UA may defer execution of script --
  >
```

Start tag: ***required****, End tag:* ***required***

Attribute definitions

`src` = *url* [CT]
: This attribute specifies the location of an external script.

`type` = *content-type* [CI]
: This attribute specifies the scripting language of the element's contents and overrides the default scripting language. The scripting language is specified as a content type (e.g., "text/css"). Authors must supply a value for this attribute. There is no default value for this attribute.

`language` = *cdata* [CI]
: **Deprecated.**This attribute specifies the scripting language of the contents of this element. Its value is an identifier for the language, but since these identifiers are not standard, this attribute has been deprecated in favor of `type`.

`defer` [CI]
: When set, this boolean attribute provides a hint to the user agent that the script is not going to generate any document content (e.g., no "document.write" in javascript) and thus, the user agent can continue parsing and rendering.

Attributes defined elsewhere

- `charset`(character encodings)

The `SCRIPT` [p.236] element places a script within a document. This element may appear any number of times in the `HEAD` or `BODY` of an HTML document.

The script may be defined within the contents of the `SCRIPT` element or in an external file. If the `src` attribute is not set, user agents must interpret the contents of the element as the script. If the `src` has a URL value, user agents must ignore the element's contents and retrieve the script via the URL. Note that the `charset` attribute refers to the character encoding of the script designated by the `src` attribute; it does not concern the content of the `SCRIPT` [p.236] element.

The syntax of script data depends on the scripting language.

Scripts are evaluated by *script engines* that must be known to a user agent.

18.2.2 Specifying the scripting language

As HTML does not rely on a specific scripting language, document authors must explicitly tell user agents the language of each script. This may be done either through a default declaration or a local declaration.

The default scripting language

Authors should specify the default scripting language for all scripts in a document by including the following `META` declaration in the `HEAD`:

```
<META http-equiv="Content-Script-Type" content="type">
```

where "type" is an content type naming the scripting language. Examples of values include "text/tcl", "text/javascript", "text/vbscript".

In the absence of a `META` declaration, the default can be set by a "Content-Script-Type" HTTP header.

```
    Content-Script-Type: type
```

where "type" is again an content type naming the scripting language.

User agents should determine the default scripting language for a document according to the following steps (highest to lowest priority):

1. If any `META` declarations specify the "Content-Script-Type", the last one in the character stream determines the default scripting language.
2. Otherwise, if any HTTP headers specify the "Content-Script-Type", the last one in the character stream determines the default scripting language.

Documents that do not specify a default scripting language information and that contain elements that specify an intrinsic event [p.238] script are incorrect. User agents may still attempt to interpret incorrectly specified scripts but are not required to. Authoring tools should generate default scripting language information to help authors avoid creating incorrect documents.

Local declaration of a scripting language

It is also possible to specify the scripting language in each `SCRIPT` [p.236] element via the `type` attribute. In the absence of a default scripting language specification, this attribute must be set on each `SCRIPT` [p.236] element. When a default scripting language has been specified, the `type` attribute overrides it.

In this example, we declare the default scripting language to be "text/tcl". We include one `SCRIPT` [p.236] in the header, whose script is located in an external file and is in the scripting language "text/vbscript". We also include one `SCRIPT` in the body, which contains its own script written in "text/javascript".

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0//EN">
<HTML>
<HEAD>
<TITLE>A document with SCRIPT</TITLE>
<META http-equiv="Content-Script-Type" content="text/tcl">
<SCRIPT type="text/vbscript" src="http://someplace.com/progs/vbcalc">
</SCRIPT>
</HEAD>
<BODY>
<SCRIPT type="text/javascript">
...some JavaScript...
</SCRIPT>
</BODY>
</HTML>
```

References to HTML elements from a script

Each scripting language has its own conventions for referring to HTML objects from within a script. This specification does not define a standard mechanism for referring to HTML objects.

However, scripts should refer to an element according to its assigned name. Scripting engines should observe the following precedence rules when identifying an element: a `name` attribute takes precedence over a `id` if both are set. Otherwise, one or the other may be used.

18.2.3 Intrinsic events

Note. *Authors of HTML documents are advised that changes are likely to occur in realm of intrinsic events (e.g., how scripts are bound to events). Research in this realm is carried on by members of the W3C Document Object Model working group (see the W3C Web Site at http://www.w3.org/ for more information).*

Attribute definitions

`onload` = *script* [CT]
: The `onload` event occurs when the user agent finishes loading a window or all frames within a `FRAMESET`. This attribute may be used with `BODY` and `FRAMESET` elements.

`onunload` = *script* [CT]
: The `onunload` event occurs when the user agent removes a document from a window or frame. This attribute may be used with `BODY` and `FRAMESET` elements.

`onclick` = *script* [CT]
: The `onclick` event occurs when the pointing device button is clicked over an element. This attribute may be used with most elements.

`ondblclick` = *script* [CT]
: The `ondblclick` event occurs when the pointing device button is double clicked over an element. This attribute may be used with most elements.

`onmousedown` = *script* [CT]
: The `onmousedown` event occurs when the pointing device button is pressed over an element. This attribute may be used with most elements.

`onmouseup` = *script* [CT]
: The `onmouseup` event occurs when the pointing device button is released over an element. This attribute may be used with most elements.

`onmouseover` = *script* [CT]
: The `onmouseover` event occurs when the pointing device is moved onto an element. This attribute may be used with most elements.

`onmousemove` = *script* [CT]
: The `onmousemove` event occurs when the pointing device is moved while it is over an element. This attribute may be used with most elements.

`onmouseout` = *script* [CT]
: The `onmouseout` event occurs when the pointing device is moved away from an element. This attribute may be used with most elements.

`onfocus` = *script* [CT]
: The `onfocus` event occurs when an element receives focus either by the pointing device or by tabbing navigation. This attribute may be used with the following elements: `LABEL`, `INPUT`, `SELECT`, `TEXTAREA`, and `BUTTON`.

`onblur` = *script* [CT]
: The `onblur` event occurs when an element loses focus either by the pointing device or by tabbing navigation. It may be used with the same elements as `onfocus`.

`onkeypress` = *script* [CT]
: The `onkeypress` event occurs when a key is pressed and released over an element. This attribute may be used with most elements.

`onkeydown` = *script* [CT]
: The `onkeydown` event occurs when a key is pressed down over an element. This attribute may be used with most elements.

`onkeyup` = *script* [CT]
: The `onkeyup` event occurs when a key is released over an element. This attribute may be used with most elements.

`onsubmit` = *script* [CT]
: The `onsubmit` event occurs when a form is submitted. It only applies to the `FORM` element.

`onreset` = *script* [CT]
: The `onreset` event occurs when a form is reset. It only applies to the `FORM` element.

`onselect` = *script* [CT]
: The `onselect` event occurs when a user selects some text in a text field. This attribute may be used with the `INPUT` and `TEXTAREA` elements.

`onchange` = *script* [CT]
: The `onchange` event occurs when a control loses the input focus *and* its value has been modified since gaining focus. This attribute applies to the following elements: `INPUT`, `SELECT`, and `TEXTAREA`.

It is possible to associate an action with a certain number of events that occur when a user interacts with a user agent. Each of the "intrinsic events" listed above takes a value that is a script. The script is executed whenever the event occurs for that element.

Control elements such as `INPUT`, `SELECT`, `BUTTON`, `TEXTAREA`, and `LABEL` all respond to certain intrinsic events. When these elements do not appear within a form, they may be used to augment the graphical user interface of the document.

For instance, authors may want to include press buttons in their documents that do not submit a form but still communicate with a server when they are activated.

The following examples show some possible control and user interface behavior based on intrinsic events.

In the following example, userName is a required text field. When a user attempts to leave the field, the `onblur` event calls a JavaScript function to confirm that userName has an acceptable value.

```
<INPUT NAME="userName" onblur="validUserName(this.value)">
```

Here is another JavaScript example:

```
<INPUT NAME="num"
    onchange="if (!checkNum(this.value, 1, 10))
        {this.focus();this.select();} else {thanks()}"
    VALUE="0">
```

Here is a VBScript example of an event handler for a text field:

```
    <INPUT name="edit1" size="50">
    <SCRIPT type="text/vbscript">
      Sub edit1_changed()
        If edit1.value = "abc" Then
          button1.enabled = True
        Else
          button1.enabled = False
        End If
      End Sub
    </SCRIPT>
```

Here is the same example using Tcl:

```
    <INPUT name="edit1" size="50">
    <SCRIPT type="text/tcl">
      proc edit1_changed {} {
        if {[edit value] == abc} {
          button1 enable 1
        } else {
          button1 enable 0
        }
      }
      edit1 onChange edit1_changed
    </SCRIPT>
```

Here is a JavaScript example for event binding within a script. First, here's a simple click handler:

```
<BUTTON type="button" name="mybutton" value="10">
<SCRIPT type="text/javascript">
      function my_onclick() {
         . . .
      }
    document.form.mybutton.onclick = my_onclick
 </SCRIPT>
 </BUTTON>
```

Here's a more interesting window handler:

```
<SCRIPT type="text/javascript">
      function my_onload() {
         . . .
      }

      var win = window.open("some/other/URL")
      if (win) win.onload = my_onload
</SCRIPT>
```

In Tcl this looks like:

```
 <SCRIPT type="text/tcl">
     proc my_onload {} {
       . . .
     }
     set win [window open "some/other/URL"]
     if {$win != ""} {
         $win onload my_onload
     }
 </SCRIPT>
```

Note that "document.write" or equivalent statements in intrinsic event handlers create and write to a new document rather than modifying the current one.

Parsing of intrinsic event scripts

The script attributes for intrinsic events are defined as CDATA. The SGML processing of CDATA attribute values requires that (1) entity replacement occur within the attribute value; and (2) that the attribute value be delimited by matching pairs of double quotes (") or single quotes (').

Given these lexical restrictions, the delimiters ('), ("), "&", and "&#" may not occur freely in the value of a script attribute. To resolve this issue, we recommend that script event handler attributes always use (") delimiters and that occurrences of (") and "&" inside an event handler attribute be written as follows:

```
    '"'  should be written as "&quot;" or "&#34;"
    '&'  should be written as "&amp;" or "&#38;"
```

Thus, for example, one could write:

```
<INPUT name="num" value="0"
onchange="if (compare(this.value, &quot;help&quot;)) {gethelp()}">
```

SGML permits (’) in attribute strings quoted by ("), and vice versa. The following is therefore correct:

```
"this is ’fine’" and ’so is "this"’
```

18.2.4 Dynamic modification of documents

Scripts that are executed when a document is loaded may be able to modify the document’s contents dynamically. The ability to do so depends on the scripting language itself (e.g., the "document.write" statement in the HTML object model supported by some vendors).

The dynamic modification of a document may be modeled as follows:

1. All SCRIPT [p.236] elements are evaluated in order as the document is loaded.
2. All script constructs within a given SCRIPT [p.236] element that generate SGML CDATA are evaluated. Their combined generated text is inserted in the document in place of the SCRIPT [p.236] element.
3. The generated CDATA is re-evaluated.

HTML documents are constrained to conform to the HTML DTD both before and after processing any SCRIPT [p.236] elements.

The following example illustrates how scripts may modify a document dynamically. The following script:

```
<TITLE>Test Document</TITLE>
<SCRIPT type="text/javascript">
    document.write("<p><b>Hello World!<\/b>")
</SCRIPT>
```

Has the same effect as this HTML markup:

```
<TITLE>Test Document</TITLE>
<P><B>Hello World!</B>
```

18.3 Designing documents for user agents that don’t support scripting

The following sections discuss issues about lack of support for scripting that authors should also consider when designing good HTML documents.

18.3.1 The NOSCRIPT element

```
<!ELEMENT NOSCRIPT - - (%flow;)*
  -- alternate content container for non script-based rendering -->
<!ATTLIST NOSCRIPT
  %attrs;                          -- %coreattrs, %i18n, %events --
  >
```

Start tag: ***required****, End tag:* ***required***

The NOSCRIPT [p.242] element allows authors to provide alternate content when a script is not executed. The content of a NOSCRIPT [p.242] element should only rendered by a script-aware user agent in the following cases:

- The user agent is configured not to evaluate scripts.
- The user agent doesn't support a scripting language invoked by a SCRIPT [p.236] element earlier in the document.

User agents that do not support client-side scripts must render this element's contents.

In the following example, a user agent that executes the SCRIPT [p.236] will include some dynamically created data in the document. If the user agent doesn't support scripts, the user may still retrieve the data through a link.

```
<SCRIPT type="text/tcl">
 ...some Tcl script to insert data...
</SCRIPT>
<NOSCRIPT>
 <P>Access the <A href="http://someplace.com/data">data.</A>
</NOSCRIPT>
```

18.3.2 Commenting out scripts

User agents that don't recognize the SCRIPT [p.236] element will likely render that element's contents as text. Some scripting engines, including those for languages JavaScript, VBScript, and Tcl allow the script statements to be enclosed in an SGML comment. User agents that don't recognize the SCRIPT [p.236] element will thus ignore the comment while smart scripting engines will understand that the script in comments should be executed.

Another solution to the problem is to keep scripts in external documents and refer to them with the src attribute.

Commenting scripts in JavaScript
The JavaScript engine allows the string "<!--" to occur at the start of a SCRIPT element, and ignores further characters until the end of the line. JavaScript interprets "//" as starting a comment extending to the end of the current line. This is needed to hide the string "-->" from the JavaScript parser.

```
<SCRIPT type="text/javascript">
<!--  to hide script contents from old browsers
  function square(i) {
    document.write("The call passed ", i ," to the function.","<BR>")
    return i * i
  }
  document.write("The function returned ",square(5),".")
// end hiding contents from old browsers  -->
</SCRIPT>
```

Commenting scripts in VBScript

In VBScript, a single quote character causes the rest of the current line to be treated as a comment. It can therefore be used to hide the string "-->" from VBScript, for instance:

```
<SCRIPT type="text/vbscript">
  <!--
    Sub foo()
     ...
    End Sub
  ' -->
 </SCRIPT>
```

Commenting scripts in TCL

In Tcl, the "#" character comments out the rest of the line:

```
<SCRIPT type="text/tcl">
<!--  to hide script contents from old browsers
  proc square {i} {
    document write "The call passed $i to the function.<BR>"
    return [expr $i * $i]
  }
  document write "The function returned [square 5]."
# end hiding contents from old browsers  -->
</SCRIPT>
```

Note: Some browsers close comments on the first ">" character, so to hide script content from such browsers, you can transpose operands for relational and shift operators (e.g., use "y < x" rather than "x > y") or use scripting language-dependent escapes for ">".

19 SGML reference information for HTML

Contents

1. Document Validation [p.245]
2. Sample SGML catalog [p.246]

The following sections contain the formal SGML definition of HTML 4.0. It includes the SGML declaration [p.247] , the Document Type Definition [p.249] (DTD), and the Character entity references [p.287] , as well as a sample SGML catalog [p.246] .

These files are also available in ASCII format as listed below:

Default DTD:
http://www.w3.org/TR/PR-html40-971107/strict.dtd
Transitional DTD:
http://www.w3.org/TR/PR-html40-971107/loose.dtd
Frameset DTD:
http://www.w3.org/TR/PR-html40-971107/frameset.dtd
SGML declaration:
http://www.w3.org/TR/PR-html40-971107/HTML4.decl
Entity definition files:
http://www.w3.org/TR/PR-html40-971107/HTMLspecial.ent
http://www.w3.org/TR/PR-html40-971107/HTMLsymbol.ent
http://www.w3.org/TR/PR-html40-971107/HTMLlat1.ent
A sample catalog:
http://www.w3.org/TR/PR-html40-971107/HTML4.cat

19.1 Document Validation

Many authors rely on a limited set of browsers to check on the documents they produce, assuming that if the browsers can render their documents they are valid. Unfortunately, this is a very ineffective means of verifying a document’s validity precisely because browsers are designed to cope with invalid documents by rendering them as well as they can to avoid frustrating users.

For better validation, you should check your document against an SGML parser such as nsgmls (see [SP] [p.322]), to verify that HTML documents conform to the HTML 4.0 DTD. If the document type declaration of your document includes a URL and your SGML parser supports this type of system identifier, it will get the DTD directly. Otherwise you can use the following sample SGML catalog. It assumes that the DTD has been saved as the file "strict.dtd" and that the entities are in the files "HTMLlat1.ent", "HTMLsymbol.ent" and "HTMLspecial.ent". In any case, make sure your SGML parser is capable of handling Unicode. See your validation tool documentation for further details.

Beware that such validation, although useful and highly recommended, does not guarantee that a document fully conforms to the HTML 4.0 specification. This is because an SGML parser relies solely on the given SGML DTD which does not express all aspects of a valid HTML 4.0 document. Specifically, an

SGML parser ensures that the syntax, the structure, the list of elements, and their attributes are valid. But for instance, it cannot catch errors such as setting the `width` attribute of an `IMG` element to an invalid value (i.e., "foo" or "12.5"). Although the specification restricts the value for this attribute to an "integer representing a length in pixels," the DTD only defines it to be CDATA, which actually allows any value. Only a specialized program could capture the complete specification of HTML 4.0.

Nevertheless, this type of validation is still highly recommended since it permits the detection of a large set of errors that make documents invalid.

19.2 Sample SGML catalog

This catalog includes the override directive to ensure that processing software such as nsgmls uses public identifiers in preference to system identifiers. This means that users do not have to be connected to the Web when retrieving URL-based system identifiers.

```
OVERRIDE YES

PUBLIC "-//W3C//DTD HTML 4.0//EN" strict.dtd
PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN" loose.dtd
PUBLIC "-//W3C//DTD HTML 4.0 Frameset//EN" frameset.dtd
PUBLIC "-//W3C//ENTITIES Latin1//EN//HTML" HTMLlat1.ent
PUBLIC "-//W3C//ENTITIES Special//EN//HTML" HTMLspecial.ent
PUBLIC "-//W3C//ENTITIES Symbols//EN//HTML" HTMLsymbol.ent
```

20 SGML Declaration of HTML 4.0

Note. *The total number of codepoints allowed in the document character set of this SGML declaration includes the first 17 planes of [ISO10646] [p.319] (17 times 65536). This limitation has been made because this number is limited to a length of 8 digits in the current version of the SGML standard. It does not imply any statement about the feasibility of a long-term restriction of characters in UCS to the first 17 planes. Chances are very high that the limitation to 8 digits in SGML will be removed before, and that this specification will be updated before, the first assignment of a character beyond the first 17 planes.*

Note. *Strictly speaking, ISO Registration Number 177 refers to the original state of [ISO10646] [p.319] in 1993, while in this specification, we always refer to the most up-to-date form of ISO 10646. Changes since 1993 have been the addition of characters and a one-time operation reallocating a large number of codepoints for Korean Hangul (Amendment 5).*

20.1 SGML Declaration

```
<!SGML  "ISO 8879:1986"
    --
         SGML Declaration for HyperText Markup Language version 4.0

         With support for the first 17 planes of ISO 10646 and
         increased limits for tag and literal lengths etc.
    --

    CHARSET
          BASESET  "ISO Registration Number 177//CHARSET
                    ISO/IEC 10646-1:1993 UCS-4 with
                    implementation level 3//ESC 2/5 2/15 4/6"
         DESCSET 0       9       UNUSED
                 9       2       9
                 11      2       UNUSED
                 13      1       13
                 14      18      UNUSED
                 32      95      32
                 127     1       UNUSED
                 128     32      UNUSED
                 160     55136   160
                 55296   2048    UNUSED  -- SURROGATES --
                 57344   1056768 57344

CAPACITY        SGMLREF
                TOTALCAP        150000
                GRPCAP          150000
                ENTCAP          150000

SCOPE    DOCUMENT
SYNTAX
         SHUNCHAR CONTROLS 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
           17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 127
         BASESET  "ISO 646IRV:1991//CHARSET
                   International Reference Version
                   (IRV)//ESC 2/8 4/2"
         DESCSET  0 128 0
```

```
        FUNCTION
                 RE            13
                 RS            10
                 SPACE         32
                 TAB SEPCHAR    9

        NAMING   LCNMSTRT ""
                 UCNMSTRT ""
                 LCNMCHAR ".-_:"
                 UCNMCHAR ".-_:"
                 NAMECASE GENERAL YES
                          ENTITY  NO
        DELIM    GENERAL  SGMLREF
                 SHORTREF SGMLREF
        NAMES    SGMLREF
        QUANTITY SGMLREF
                 ATTCNT   60      -- increased --
                 ATTSPLEN 65536   -- These are the largest values --
                 LITLEN   65536   -- permitted in the declaration --
                 NAMELEN  65536   -- Avoid fixed limits in actual --
                 PILEN    65536   -- implementations of HTML UA's --
                 TAGLVL   100
                 TAGLEN   65536
                 GRPGTCNT 150
                 GRPCNT   64

FEATURES
  MINIMIZE
    DATATAG  NO
    OMITTAG  YES
    RANK     NO
    SHORTTAG YES
  LINK
    SIMPLE   NO
    IMPLICIT NO
    EXPLICIT NO
  OTHER
    CONCUR   NO
    SUBDOC   NO
    FORMAL   YES
  APPINFO NONE
>
```

21 Document Type Definition

```
<!--
    This is an EXPERIMENTAL version of the HTML 4.0 DTD which
    excludes presentation attributes and elements that W3C expects
    to phase out as support for style sheets matures. If you need
    these features please use the transitional DTD. HTML 4.0
    includes mechanisms for style sheets, scripting, embedding
    objects, improved support for right to left and mixed direction
    text, and enhancements to forms for improved accessibility for
    people with disabilities.

          Draft: $Date: 2013-05-28 21:38:41 $

          Authors:
              Dave Raggett <dsr@w3.org>
              Arnaud Le Hors <lehors@w3.org>

    This is work in progress, subject to change at any time.
    It does not imply endorsement by, or the consensus of,
    either W3C or members of the HTML working group. Further
    information about HTML 4.0 is available at:

        http://www.w3.org/TR/PR-html40
-->
<!ENTITY % HTML.Version "-//W3C//DTD HTML 4.0//EN"
  -- Typical usage:

    <!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0//EN"
            "http://www.w3.org/TR/PR-html40/strict.dtd">
    <html>
    <head>
    ...
    </head>
    <body>
    ...
    </body>
    </html>

    The URL used as a system identifier with the public identifier allows
    the user agent to download the DTD and entity sets as needed.

    The FPI for the transitional HTML 4.0 DTD is:

        "-//W3C//DTD HTML 4.0 Transitional//EN

    and its URL is:

        http://www.w3.org/TR/PR-html40/loose.dtd

    If you are writing a frameset document you should use the
    following FPI:

        "-//W3C//DTD HTML 4.0 Frameset//EN"

    with the URL:
```

```
        http://www.w3.org/TR/PR-html40/frameset.dtd

    The following URLs are supported in relation to HTML 4.0

    "http://www.w3.org/TR/PR-html40/strict.dtd" (Strict DTD)
    "http://www.w3.org/TR/PR-html40/loose.dtd" (Loose DTD)
    "http://www.w3.org/TR/PR-html40/frameset.dtd" (Frameset DTD)
    "http://www.w3.org/TR/PR-html40/HTMLlat1.ent" (Latin-1 entities)
    "http://www.w3.org/TR/PR-html40/HTMLsymbol.ent" (Symbol entities)
    "http://www.w3.org/TR/PR-html40/HTMLspecial.ent" (Special entities)

    These URLs point to the latest version of each file. To reference
    this specific revision use the following URLs:

    "http://www.w3.org/TR/PR-html40-971107/strict.dtd"
    "http://www.w3.org/TR/PR-html40-971107/loose.dtd"
    "http://www.w3.org/TR/PR-html40-971107/frameset.dtd"
    "http://www.w3.org/TR/PR-html40-971107/HTMLlat1.ent"
    "http://www.w3.org/TR/PR-html40-971107/HTMLsymbol.ent"
    "http://www.w3.org/TR/PR-html40-971107/HTMLspecial.ent"

-->

<!--================== Imported Names ====================================-->

<!ENTITY % ContentType "CDATA"
    -- media type, as per [RFC2045]
    -->

<!ENTITY % ContentTypes "CDATA"
    -- comma-separated list of media types, as per [RFC2045]
    -->

<!ENTITY % Charset "CDATA"
    -- a character encoding, as per [RFC2045]
    -->

<!ENTITY % Charsets "CDATA"
    -- a space separated list of character encodings, as per [RFC2045]
    -->

<!ENTITY % LanguageCode "NAME"
    -- a language code, as per [RFC1766]
    -->

<!ENTITY % Character "CDATA"
    -- a single character from [ISO10646]
    -->

<!ENTITY % LinkTypes "CDATA"
    -- space-separated list of link types
    -->

<!ENTITY % MediaDesc "CDATA"
    -- single or comma-separated list of media descriptors
    -->
```

```
<!ENTITY % URL "CDATA"
    -- a Uniform Resource Locator,
       see [RFC1808] and [RFC1738]
    -->

<!ENTITY % Datetime "CDATA" -- date and time information. ISO date format -->


<!ENTITY % Script "CDATA" -- script expression -->

<!ENTITY % FrameTarget "CDATA" -- render in this frame -->


<!ENTITY % Text "CDATA" -- render in this frame -->


<!-- Parameter Entities -->

<!ENTITY % head.misc "SCRIPT|STYLE|META|LINK" -- repeatable head elements -->

<!ENTITY % heading "H1|H2|H3|H4|H5|H6">

<!ENTITY % list "UL | OL">

<!ENTITY % preformatted "PRE">


<!--================ Character mnemonic entities =========================-->

<!ENTITY % HTMLlat1 PUBLIC
   "-//W3C//ENTITIES Latin1//EN//HTML"
   "http://www.w3.org/TR/PR-html40/HTMLlat1.ent">
%HTMLlat1;

<!ENTITY % HTMLsymbol PUBLIC
   "-//W3C//ENTITIES Symbols//EN//HTML"
   "http://www.w3.org/TR/PR-html40/HTMLsymbol.ent">
%HTMLsymbol;

<!ENTITY % HTMLspecial PUBLIC
   "-//W3C//ENTITIES Special//EN//HTML"
   "http://www.w3.org/TR/PR-html40/HTMLspecial.ent">
%HTMLspecial;
<!--=================== Generic Attributes ================================-->

<!ENTITY % coreattrs
 "id          ID         #IMPLIED  -- document-wide unique id --
  class       CDATA      #IMPLIED  -- space separated list of classes --
  style       CDATA      #IMPLIED  -- associated style info --
  title       %Text;     #IMPLIED  -- advisory title/amplification --"
  >

<!ENTITY % i18n
 "lang    %LanguageCode; #IMPLIED  -- language code --
  dir         (ltr|rtl)  #IMPLIED  -- direction for weak/neutral text --"
  >
```

```
<!ENTITY % events
 "onclick     %Script;   #IMPLIED  -- a pointer button was clicked --
  ondblclick  %Script;   #IMPLIED  -- a pointer button was double clicked --
  onmousedown %Script;   #IMPLIED  -- a pointer button was pressed down --
  onmouseup   %Script;   #IMPLIED  -- a pointer button was released --
  onmouseover %Script;   #IMPLIED  -- a pointer was moved onto --
  onmousemove %Script;   #IMPLIED  -- a pointer was moved within --
  onmouseout  %Script;   #IMPLIED  -- a pointer was moved away --
  onkeypress  %Script;   #IMPLIED  -- a key was pressed and released --
  onkeydown   %Script;   #IMPLIED  -- a key was pressed down --
  onkeyup     %Script;   #IMPLIED  -- a key was released --"
  >

<!-- Reserved Feature Switch -->
<!ENTITY % HTML.Reserved "IGNORE">

<!-- The following attributes are reserved for possible future use -->
<![ %HTML.Reserved; [
<!ENTITY % reserved
 "datasrc     %URL;      #IMPLIED  -- a single or tabular Data Source --
  datafld     CDATA      #IMPLIED  -- the property or column name --
  dataformatas (plaintext|html) plaintext -- text or html --"
  >
]]>

<!ENTITY % reserved "">

<!ENTITY % attrs "%coreattrs; %i18n; %events;">


<!--================== Text Markup ===========================================-->

<!ENTITY % fontstyle
 "TT | I | B | BIG | SMALL">

<!ENTITY % phrase "EM | STRONG | DFN | CODE |
                   SAMP | KBD | VAR | CITE | ABBR">

<!ENTITY % special
   "A | IMG | OBJECT | BR | SCRIPT | MAP | Q | SUB | SUP | SPAN | BDO">

<!ENTITY % formctrl "INPUT | SELECT | TEXTAREA | LABEL | BUTTON">

<!-- %inline; covers inline or "text-level" elements -->
<!ENTITY % inline "#PCDATA | %fontstyle; | %phrase; | %special; | %formctrl;">

<!ELEMENT (%fontstyle;|%phrase;) - - (%inline;)*>
<!ATTLIST (%fontstyle;|%phrase;)
  %attrs;                           -- %coreattrs, %i18n, %events --
  >

<!ELEMENT (SUB|SUP) - - (%inline;)* -- subscript, superscript -->
<!ATTLIST (SUB|SUP)
  %attrs;                           -- %coreattrs, %i18n, %events --
  >
```

```
<!ELEMENT SPAN - - (%inline;)*     -- generic language/style container -->
<!ATTLIST SPAN
  %attrs;                          -- %coreattrs, %i18n, %events --
  charset     %Charset;   #IMPLIED -- char encoding of linked resource --
  type      %ContentType; #IMPLIED -- advisory content type --
  href        %URL;       #IMPLIED -- URL for linked resource --
  hreflang %LanguageCode; #IMPLIED -- language code --
  target   %FrameTarget;  #IMPLIED -- render in this frame --
  rel         %LinkTypes; #IMPLIED -- forward link types --
  rev         %LinkTypes; #IMPLIED -- reverse link types --
  media       %MediaDesc; #IMPLIED -- for rendering on these media --
  %reserved;                       -- reserved for possible future use --
  >

<!ELEMENT BDO - - (%inline;)*      -- I18N BiDi over-ride -->
<!ATTLIST BDO
  %coreattrs;                      -- id, class, style, title --
  lang    %LanguageCode; #IMPLIED  -- language code --
  dir         (ltr|rtl)  #REQUIRED -- directionality --
  >


<!ELEMENT BR - O EMPTY             -- forced line break -->
<!ATTLIST BR
  %coreattrs;                      -- id, class, style, title --
  >

<!--================== HTML content models ================================-->

<!--
    HTML has two basic content models:

        %inline;     character level elements and text strings
        %block;      block-like elements e.g. paragraphs and lists
-->

<!ENTITY % block
     "P | %heading; | %list; | %preformatted; | DL | DIV | NOSCRIPT |
      BLOCKQUOTE | FORM | HR | TABLE | FIELDSET | ADDRESS">

<!ENTITY % flow "%block; | %inline;">

<!--================== Document Body ======================================-->

<!ELEMENT BODY O O (%block;|SCRIPT)+ +(INS|DEL) -- document body -->
<!ATTLIST BODY
  %attrs;                          -- %coreattrs, %i18n, %events --
  onload      %Script;   #IMPLIED  -- the document has been loaded --
  onunload    %Script;   #IMPLIED  -- the document has been removed --
  >

<!ELEMENT ADDRESS - - (%inline;)* -- information on author -->
<!ATTLIST ADDRESS
  %attrs;                          -- %coreattrs, %i18n, %events --
  >

<!ELEMENT DIV - - (%block;|SCRIPT)+ -- generic language/style container -->
```

```
<!ATTLIST DIV
  %attrs;                          -- %coreattrs, %i18n, %events --
  charset     %Charset;   #IMPLIED -- char encoding of linked resource --
  type      %ContentType; #IMPLIED -- advisory content type --
  href        %URL;       #IMPLIED -- URL for linked resource --
  hreflang %LanguageCode; #IMPLIED -- language code --
  target   %FrameTarget;  #IMPLIED -- render in this frame --
  rel         %LinkTypes; #IMPLIED -- forward link types --
  rev         %LinkTypes; #IMPLIED -- reverse link types --
  media       %MediaDesc; #IMPLIED -- for rendering on these media --

  %reserved;                       -- reserved for possible future use --
  >


<!--================== The Anchor Element ================================-->

<!ENTITY % Shape "(rect|circle|poly|default)">
<!ENTITY % Coords "CDATA" -- comma separated list of numbers -->

<!ELEMENT A - - (%inline;)* -(A) -- anchor -->
<!ATTLIST A
  %attrs;                          -- %coreattrs, %i18n, %events --
  charset     %Charset;   #IMPLIED -- char encoding of linked resource --
  type      %ContentType; #IMPLIED -- advisory content type --
  name         CDATA      #IMPLIED -- named link end --
  href        %URL;       #IMPLIED -- URL for linked resource --
  hreflang %LanguageCode; #IMPLIED -- language code --
  target   %FrameTarget;  #IMPLIED -- render in this frame --
  rel         %LinkTypes; #IMPLIED -- forward link types --
  rev         %LinkTypes; #IMPLIED -- reverse link types --
  accesskey   %Character; #IMPLIED -- accessibility key character --
  shape       %Shape;     rect     -- for use with OBJECT SHAPES --
  coords      %Coords;    #IMPLIED -- for use with OBJECT SHAPES --
  tabindex     NUMBER     #IMPLIED -- position in tabbing order --
  onfocus     %Script;    #IMPLIED -- the element got the focus --
  onblur      %Script;    #IMPLIED -- the element lost the focus --
  >

<!--================== Client-side image maps ============================-->

<!-- These can be placed in the same document or grouped in a
     separate document although this isn't yet widely supported -->

<!ELEMENT MAP - - (AREA)+ -- client-side image map -->
<!ATTLIST MAP
  %attrs;                          -- %coreattrs, %i18n, %events --
  name        CDATA      #REQUIRED  -- name of image map for refs by usemap --
  >

<!ELEMENT AREA - O EMPTY -- client-side image map area -->
<!ATTLIST AREA
  %attrs;                          -- %coreattrs, %i18n, %events --
  shape       %Shape;    rect      -- controls interpretation of coords --
  coords      %Coords;   #IMPLIED  -- comma separated list of lengths --
  href        %URL;      #IMPLIED  -- URL for linked resource --
  target   %FrameTarget;    #IMPLIED -- render in this frame --
```

```
  nohref      (nohref)   #IMPLIED  -- this region has no action --
  alt         %Text;     #REQUIRED -- short description --
  tabindex    NUMBER     #IMPLIED  -- position in tabbing order --
  accesskey  %Character; #IMPLIED  -- accessibility key character --
  onfocus     %Script;   #IMPLIED  -- the element got the focus --
  onblur      %Script;   #IMPLIED  -- the element lost the focus --
  >

<!--================== The LINK Element ==================================-->

<!--
  Relationship values can be used in principle:

   a) for document specific toolbars/menus when used
      with the LINK element in document head e.g.
        start, contents, previous, next, index, end, help
   b) to link to a separate style sheet (rel=stylesheet)
   c) to make a link to a script (rel=script)
   d) by stylesheets to control how collections of
      html nodes are rendered into printed documents
   e) to make a link to a printable version of this document
      e.g. a postscript or pdf version (rel=alternate media=print)
-->

<!ELEMENT LINK - O EMPTY -- a media-independent link -->
<!ATTLIST LINK
  %attrs;                          -- %coreattrs, %i18n, %events --
  charset     %Charset;   #IMPLIED -- char encoding of linked resource --
  href        %URL;       #IMPLIED -- URL for linked resource --
  hreflang %LanguageCode; #IMPLIED -- language code --
  type      %ContentType; #IMPLIED -- advisory content type --
  rel         %LinkTypes; #IMPLIED -- forward link types --
  rev         %LinkTypes; #IMPLIED -- reverse link types --
  media       %MediaDesc; #IMPLIED -- for rendering on these media --
  target   %FrameTarget;     #IMPLIED -- render in this frame --
  >

<!--=================== Images ===================================-->

<!-- Length defined in strict DTD for cellpadding/cellspacing -->
<!ENTITY % Length "CDATA" -- nn for pixels or nn% for percentage length -->
<!ENTITY % MultiLength "CDATA" -- pixel, percentage, or relative -->

<!ENTITY % MultiLengths "CDATA" -- comma-separated list of MultiLength -->

<!ENTITY % Pixels "CDATA" -- integer representing length in pixels -->


<!-- To avoid problems with text-only UAs as well as
   to make image content understandable and navigable
   to users of non-visual UAs, you need to provide
   a description with ALT, and avoid server-side image maps -->
<!ELEMENT IMG - O EMPTY            --  Embedded image -->
<!ATTLIST IMG
  %attrs;                          -- %coreattrs, %i18n, %events --
  src         %URL;      #REQUIRED -- URL of image to embed --
  alt         %Text;     #REQUIRED -- short description --
```

```
  longdesc    %URL;       #IMPLIED  -- link to long description (complements alt) --
  height      %Length;    #IMPLIED  -- override height --
  width       %Length;    #IMPLIED  -- override width --
  usemap      %URL;       #IMPLIED  -- use client-side image map --
  ismap       (ismap)     #IMPLIED  -- use server-side image map --
  >

<!-- USEMAP points to a MAP element which may be in this document
  or an external document, although the latter is not widely supported -->

<!--=================== OBJECT ======================================-->
<!--
  OBJECT is used to embed objects as part of HTML pages
  PARAM elements should precede other content. SGML mixed content
  model technicality precludes specifying this formally ...
-->

<!ELEMENT OBJECT - - (PARAM | %flow;)*
 -- generic embedded object -->
<!ATTLIST OBJECT
  %attrs;                         -- %coreattrs, %i18n, %events --
  declare     (declare)  #IMPLIED  -- declare but don't instantiate flag --
  classid     %URL;      #IMPLIED  -- identifies an implementation --
  codebase    %URL;      #IMPLIED  -- base URL for classid, data, archive --
  data        %URL;      #IMPLIED  -- reference to object's data --
  type     %ContentType; #IMPLIED  -- content type for data --
  codetype %ContentType; #IMPLIED  -- content type for code --
  archive     %URL;      #IMPLIED  -- space separated archive list --
  standby     %Text;     #IMPLIED  -- message to show while loading --
  height      %Length;   #IMPLIED  -- override height --
  width       %Length;   #IMPLIED  -- override width --
  usemap      %URL;      #IMPLIED  -- use client-side image map --
  shapes      (shapes)   #IMPLIED  -- object has shaped hypertext links --
  export      (export)   #IMPLIED  -- export shapes to parent  --
  name        CDATA      #IMPLIED  -- submit as part of form --
  tabindex    NUMBER     #IMPLIED  -- position in tabbing order --
  %reserved;                       -- reserved for possible future use --
  >

<!ELEMENT PARAM - O EMPTY          -- named property value -->
<!ATTLIST PARAM
  id          ID         #IMPLIED  -- document-wide unique id --
  name        CDATA      #REQUIRED -- property name --
  value       CDATA      #IMPLIED  -- property value --
  valuetype (DATA|REF|OBJECT) DATA -- How to interpret value --
  type     %ContentType; #IMPLIED  -- content type for value
                                      when valuetype=ref --
  >


<!--=================== Horizontal Rule ================================-->

<!ELEMENT HR - O EMPTY -- horizontal rule -->
<!ATTLIST HR
  %coreattrs;                      -- id, class, style, title --
  %events;
  >
```

```
<!--================== Paragraphs ==========================================-->

<!ELEMENT P - O (%inline;)* -- paragraph -->
<!ATTLIST P
  %attrs;                           -- %coreattrs, %i18n, %events --
  >

<!--================== Headings ============================================-->

<!--
  There are six levels of headings from H1 (the most important)
  to H6 (the least important).
-->

<!ELEMENT (%heading;)  - - (%inline;)* -- heading -->
<!ATTLIST (%heading;)
  %attrs;                           -- %coreattrs, %i18n, %events --
  >

<!--================== Preformatted Text ===================================-->

<!-- excludes markup for images and changes in font size -->
<!ENTITY % pre.exclusion "IMG|OBJECT|BIG|SMALL|SUB|SUP">

<!ELEMENT PRE - - (%inline;)* -(%pre.exclusion;) -- preformatted text -->
<!ATTLIST PRE
  %attrs;                           -- %coreattrs, %i18n, %events --
  >

<!--================== Inline Quotes ===================================-->

<!ELEMENT Q - - (%inline;)* -- short inline quotation -->
<!ATTLIST Q
  %attrs;                           -- %coreattrs, %i18n, %events --
  cite        %URL;      #IMPLIED  -- URL for source document or msg --
  >

<!--================== Block-like Quotes ===================================-->

<!ELEMENT BLOCKQUOTE - - (%block;|SCRIPT)+ -- long quotation -->
<!ATTLIST BLOCKQUOTE
  %attrs;                           -- %coreattrs, %i18n, %events --
  cite        %URL;      #IMPLIED  -- URL for source document or msg --
  >

<!--================== Inserted/Deleted Text ===============================-->


<!-- INS/DEL are handled by inclusion on BODY -->
<!ELEMENT (INS|DEL) - - (%flow;)* -- inserted text, deleted text -->
<!ATTLIST (INS|DEL)
  %attrs;                           -- %coreattrs, %i18n, %events --
  cite        %URL;      #IMPLIED  -- info on reason for change --
  datetime    %Datetime; #IMPLIED  -- date and time of change --
  >
```

```
<!--=================== Lists ====================================-->

<!-- definition lists - DT for term, DD for its definition -->

<!ELEMENT DL - - (DT|DD)+ -- definition list -->
<!ATTLIST DL
  %attrs;                         -- %coreattrs, %i18n, %events --
  >

<!ELEMENT DT - O (%inline;)* -- definition term -->
<!ELEMENT DD - O (%flow;)*   -- definition description -->
<!ATTLIST (DT|DD)
  %attrs;                        -- %coreattrs, %i18n, %events --
  >


<!ELEMENT OL - - (LI)+ -- ordered list -->
<!ATTLIST OL
  %attrs;                         -- %coreattrs, %i18n, %events --
  >

<!-- Unordered Lists (UL) bullet styles -->

<!ELEMENT UL - - (LI)+ -- unordered list -->
<!ATTLIST UL
  %attrs;                         -- %coreattrs, %i18n, %events --
  >



<!ELEMENT LI - O (%flow;)* -- list item -->
<!ATTLIST LI
  %attrs;                         -- %coreattrs, %i18n, %events --
  >

<!--================ Forms ====================================-->
<!ELEMENT FORM - - (%block;|SCRIPT)+ -(FORM) -- interactive form -->
<!ATTLIST FORM
  %attrs;                         -- %coreattrs, %i18n, %events --
  action      %URL;      #REQUIRED -- server-side form handler --
  method      (GET|POST) GET       -- HTTP method used to submit the form --
  enctype  %ContentType; "application/x-www-form-urlencoded"
  onsubmit    %Script;   #IMPLIED  -- the form was submitted --
  onreset     %Script;   #IMPLIED  -- the form was reset --
  target   %FrameTarget;    #IMPLIED -- render in this frame --
  accept-charset %Charsets; #IMPLIED -- list of supported charsets --
  >

<!-- Each label must not contain more than ONE field -->
<!ELEMENT LABEL - - (%inline;)* -(LABEL) -- form field label text -->
<!ATTLIST LABEL
  %attrs;                         -- %coreattrs, %i18n, %events --
  for         IDREF      #IMPLIED  -- matches field ID value --
  accesskey  %Character; #IMPLIED  -- accessibility key character --
  onfocus     %Script;   #IMPLIED  -- the element got the focus --
  onblur      %Script;   #IMPLIED  -- the element lost the focus --
  >
```

```
<!ENTITY % InputType
  "(TEXT | PASSWORD | CHECKBOX |
    RADIO | SUBMIT | RESET |
    FILE | HIDDEN | IMAGE | BUTTON)"
   >

<!-- attribute name required for all but submit & reset -->
<!ELEMENT INPUT - O EMPTY -- form control -->
<!ATTLIST INPUT
  %attrs;                         -- %coreattrs, %i18n, %events --
  type       %InputType; TEXT     -- what kind of widget is needed --
  name        CDATA      #IMPLIED  -- submit as part of form --
  value       CDATA      #IMPLIED  -- required for radio and checkboxes --
  checked    (checked)   #IMPLIED  -- for radio buttons and check boxes --
  disabled   (disabled)  #IMPLIED  -- control is unavailable in this context --
  readonly   (readonly)  #IMPLIED  -- for text and passwd --
  size        CDATA      #IMPLIED  -- specific to each type of field --
  maxlength   NUMBER     #IMPLIED  -- max chars for text fields --
  src         %URL;      #IMPLIED  -- for fields with images --
  alt         CDATA      #IMPLIED  -- short description --
  usemap      %URL;      #IMPLIED  -- use client-side image map --
  tabindex    NUMBER     #IMPLIED  -- position in tabbing order --
  accesskey  %Character; #IMPLIED  -- accessibility key character --
  onfocus     %Script;   #IMPLIED  -- the element got the focus --
  onblur      %Script;   #IMPLIED  -- the element lost the focus --
  onselect    %Script;   #IMPLIED  -- some text was selected --
  onchange    %Script;   #IMPLIED  -- the element value was changed --
  accept  %ContentTypes; #IMPLIED  -- list of MIME types for file upload --
  %reserved;                      -- reserved for possible future use --
  >

<!ELEMENT SELECT - - (OPTGROUP|OPTION)+ -- option selector -->
<!ATTLIST SELECT
  %attrs;                         -- %coreattrs, %i18n, %events --
  name        CDATA      #IMPLIED  -- field name --
  size        NUMBER     #IMPLIED  -- rows visible --
  multiple    (multiple) #IMPLIED  -- default is single selection --
  disabled    (disabled) #IMPLIED  -- control is unavailable in this context --
  tabindex    NUMBER     #IMPLIED  -- position in tabbing order --
  onfocus     %Script;   #IMPLIED  -- the element got the focus --
  onblur      %Script;   #IMPLIED  -- the element lost the focus --
  onchange    %Script;   #IMPLIED  -- the element value was changed --
  %reserved;                      -- reserved for possible future use --
  >

<!ELEMENT OPTGROUP - - (OPTGROUP|OPTION)+ -- option group -->
<!ATTLIST OPTGROUP
  %attrs;                         -- %coreattrs, %i18n, %events --
  disabled    (disabled) #IMPLIED  -- control is unavailable in this context --
  label       %Text;     #REQUIRED -- for use in hierarchical menus --
  >

<!ELEMENT OPTION - O (#PCDATA) -- selectable choice -->
<!ATTLIST OPTION
  %attrs;                         -- %coreattrs, %i18n, %events --
  selected    (selected) #IMPLIED
```

```
  disabled    (disabled) #IMPLIED  -- control is unavailable in this context --
  label       %Text;     #IMPLIED  -- for use in hierarchical menus --
  value       CDATA      #IMPLIED  -- defaults to element content --
  >

<!ELEMENT TEXTAREA - - (#PCDATA) -- multi-line text field -->
<!ATTLIST TEXTAREA
  %attrs;                           -- %coreattrs, %i18n, %events --
  name        CDATA      #IMPLIED
  rows        NUMBER     #REQUIRED
  cols        NUMBER     #REQUIRED
  disabled    (disabled) #IMPLIED  -- control is unavailable in this context --
  readonly    (readonly) #IMPLIED
  tabindex    NUMBER     #IMPLIED  -- position in tabbing order --
  onfocus     %Script;   #IMPLIED  -- the element got the focus --
  onblur      %Script;   #IMPLIED  -- the element lost the focus --
  onselect    %Script;   #IMPLIED  -- some text was selected --
  onchange    %Script;   #IMPLIED  -- the element value was changed --
  %reserved;                        -- reserved for possible future use --
  >

<!--
  #PCDATA is to solve the mixed content problem,
  per specification only whitespace is allowed there!
 -->
<!ELEMENT FIELDSET - - (#PCDATA,LEGEND,(%flow;)*) -- form control group -->
<!ATTLIST FIELDSET
  %attrs;                           -- %coreattrs, %i18n, %events --
  >

<!ELEMENT LEGEND - - (%inline;)* -- fieldset legend -->
<!ENTITY % LAlign "(top|bottom|left|right)">

<!ATTLIST LEGEND
  %attrs;                           -- %coreattrs, %i18n, %events --
  accesskey  %Character; #IMPLIED  -- accessibility key character --
  >

<!ELEMENT BUTTON - -
     (%flow;)* -(A|%formctrl;|FORM|FIELDSET)
     -- push button -->
<!ATTLIST BUTTON
  %attrs;                           -- %coreattrs, %i18n, %events --
  name        CDATA      #IMPLIED  -- for scripting/forms as submit button --
  value       CDATA      #IMPLIED  -- gets passed to server when submitted --
  type (button|submit|reset) submit -- for use as form submit/reset button --
  disabled    (disabled) #IMPLIED  -- control is unavailable in this context --
  tabindex    NUMBER     #IMPLIED  -- position in tabbing order --
  accesskey  %Character; #IMPLIED  -- accessibility key character --
  onfocus     %Script;   #IMPLIED  -- the element got the focus --
  onblur      %Script;   #IMPLIED  -- the element lost the focus --
  %reserved;                        -- reserved for possible future use --
  >

<!--======================= Tables ========================================-->

<!-- IETF HTML table standard, see [RFC1942] -->
```

```
<!--
 The BORDER attribute sets the thickness of the frame around the
 table. The default units are screen pixels.

 The FRAME attribute specifies which parts of the frame around
 the table should be rendered. The values are not the same as
 CALS to avoid a name clash with the VALIGN attribute.

 The value "border" is included for backwards compatibility with
 <TABLE BORDER> which yields frame=border and border=implied
 For <TABLE BORDER=1> you get border=1 and frame=implied. In this
 case, it is appropriate to treat this as frame=border for backwards
 compatibility with deployed browsers.
-->
<!ENTITY % TFrame "(void|above|below|hsides|lhs|rhs|vsides|box|border)">

<!--
 The RULES attribute defines which rules to draw between cells:

 If RULES is absent then assume:
     "none" if BORDER is absent or BORDER=0 otherwise "all"
-->

<!ENTITY % TRules "(none | groups | rows | cols | all)">

<!-- horizontal placement of table relative to document -->
<!ENTITY % TAlign "(left|center|right)">

<!-- horizontal alignment attributes for cell contents -->
<!ENTITY % cellhalign
  "align (left|center|right|justify|char) #IMPLIED
   char       %Character;   #IMPLIED  -- alignment char, e.g. char=':' --
   charoff    %Length;      #IMPLIED  -- offset for alignment char --"
  >

<!-- vertical alignment attributes for cell contents -->
<!ENTITY % cellvalign
  "valign (top|middle|bottom|baseline) #IMPLIED"
  >

<!ELEMENT TABLE - -
     (CAPTION?, (COL*|COLGROUP*), THEAD?, TFOOT?, TBODY+)>
<!ELEMENT CAPTION  - - (%inline;)* -- table caption -->
<!ELEMENT THEAD    - O (TR)+       -- table header -->
<!ELEMENT TFOOT    - O (TR)+       -- table footer -->
<!ELEMENT TBODY    O O (TR)+       -- table body -->
<!ELEMENT COLGROUP - O (col)*      -- table column group -->
<!ELEMENT COL      - O EMPTY       -- table column -->
<!ELEMENT TR       - O (TH|TD)+    -- table row -->
<!ELEMENT (TH|TD)  - O (%flow;)*   -- table header cell, table data cell -->

<!ATTLIST TABLE                 -- table element --
  %attrs;                          -- %coreattrs, %i18n, %events --
  summary     %Text;     #IMPLIED  -- purpose/structure for speech output --
  width       %Pixels;   #IMPLIED  -- table width relative to window --
  border      CDATA      #IMPLIED  -- controls frame width around table --
```

```
  frame       %TFrame;   #IMPLIED  -- which parts of table frame to include --
  rules       %TRules;   #IMPLIED  -- rulings between rows and cols --
  cellspacing %Length;   #IMPLIED  -- spacing between cells --
  cellpadding %Length;   #IMPLIED  -- spacing within cells --
  %reserved;                       -- reserved for possible future use --
  >

<!ENTITY % CAlign "(top|bottom|left|right)">

<!ATTLIST CAPTION
  %attrs;                          -- %coreattrs, %i18n, %events --
  >

<!--
COLGROUP groups a set of COL elements. It allows you to group
several semantically related columns together.
-->
<!ATTLIST COLGROUP
  %attrs;                          -- %coreattrs, %i18n, %events --
  span        NUMBER     1         -- default number of columns in group --
  width    %MultiLength; #IMPLIED  -- default width for enclosed COLs --
  %cellhalign;                     -- horizontal alignment in cells --
  %cellvalign;                     -- vertical alignment in cells --
  >

<!--
 COL elements define the alignment properties for cells in
 one or more columns.

 The WIDTH attribute specifies the width of the columns, e.g.

     width=64        width in screen pixels
     width=0.5*      relative width of 0.5

 The REPEAT attribute allows you to repeat the effects of
 a COL element as if the same element was repeated n times.
 There are no grouping semantics for repeated columns.
-->
<!ATTLIST COL                   -- column groups and properties --
  %attrs;                          -- %coreattrs, %i18n, %events --
  repeat      NUMBER     1         -- repeat count for COL --
  width    %MultiLength; #IMPLIED  -- column width specification --
  %cellhalign;                     -- horizontal alignment in cells --
  %cellvalign;                     -- vertical alignment in cells --
  >

<!--
    Use THEAD to duplicate headers when breaking table
    across page boundaries, or for static headers when
    TBODY sections are rendered in scrolling panel.

    Use TFOOT to duplicate footers when breaking table
    across page boundaries, or for static footers when
    TBODY sections are rendered in scrolling panel.

    Use multiple TBODY sections when rules are needed
    between groups of table rows.
```

```
-->
<!ATTLIST (THEAD|TBODY|TFOOT)   -- table section --
  %attrs;                       -- %coreattrs, %i18n, %events --
  %cellhalign;                  -- horizontal alignment in cells --
  %cellvalign;                  -- vertical alignment in cells --
  >

<!ATTLIST TR                    -- table row --
  %attrs;                       -- %coreattrs, %i18n, %events --
  %cellhalign;                  -- horizontal alignment in cells --
  %cellvalign;                  -- vertical alignment in cells --
  >



<!-- Scope is simpler than axes attribute for common tables -->
<!ENTITY % Scope "(row|col|rowgroup|colgroup)">

<!-- TH is for headers, TD for data, but for cells acting as both use TD -->
<!ATTLIST (TH|TD)               -- header or data cell --
  %attrs;                       -- %coreattrs, %i18n, %events --
  abbr        %Text;      #IMPLIED  -- abbreviation for header cell --
  axis        CDATA       #IMPLIED  -- names groups of related headers--
  headers     IDREFS      #IMPLIED  -- list of id's for header cells --
  scope       %Scope;     #IMPLIED  -- scope covered by header cells --
  rowspan     NUMBER      1         -- number of rows spanned by cell --
  colspan     NUMBER      1         -- number of cols spanned by cell --
  %cellhalign;                  -- horizontal alignment in cells --
  %cellvalign;                  -- vertical alignment in cells --
  >


<!--================ Document Head =======================================-->
<!-- %head.misc; defined earlier on as "SCRIPT | STYLE | META | LINK" -->
<!ENTITY % head.content "TITLE & BASE?">

<!ELEMENT HEAD O O (%head.content;) +(%head.misc;) -- document head -->
<!ATTLIST HEAD
  %i18n;                        -- lang, dir --
  profile     %URL;       #IMPLIED  -- named dictionary of meta info --
  >

<!-- The TITLE element is not considered part of the flow of text.
       It should be displayed, for example as the page header or
       window title. Exactly one title is required per document.
    -->
<!ELEMENT TITLE - - (#PCDATA) -(%head.misc;) -- document title -->
<!ATTLIST TITLE %i18n>


<!ELEMENT BASE - O EMPTY -- document base URL -->
<!ATTLIST BASE
  href        %URL;       #IMPLIED  -- URL that acts as base URL --
  target   %FrameTarget;    #IMPLIED -- render in this frame --
  >

<!ELEMENT META - O EMPTY        -- generic metainformation -->
```

```
<!ATTLIST META
  %i18n;                           -- lang, dir, for use with content string --
  http-equiv  NAME       #IMPLIED  -- HTTP response header name  --
  name        NAME       #IMPLIED  -- metainformation name --
  content     CDATA      #REQUIRED -- associated information --
  scheme      CDATA      #IMPLIED  -- select form of content --
  >

<!ELEMENT STYLE - - CDATA      -- style info -->
<!ATTLIST STYLE
  %i18n;                           -- lang, dir, for use with title --
  type     %ContentType; #REQUIRED -- content type of style language --
  media     %MediaDesc;  #IMPLIED  -- designed for use with these media --
  title     %Text;       #IMPLIED  -- advisory title --
  >

<!ELEMENT SCRIPT - - CDATA      -- script statements -->
<!ATTLIST SCRIPT
  charset  %Charset;     #IMPLIED -- char encoding of linked resource --
  type     %ContentType; #REQUIRED -- content type of script language --
  language    CDATA      #IMPLIED  -- predefined script language name --
  src         %URL;      #IMPLIED  -- URL for an external script --
  defer       (defer)    #IMPLIED  -- UA may defer execution of script --
  >

<!ELEMENT NOSCRIPT - - (%block;)+
  -- alternate content container for non script-based rendering -->
<!ATTLIST NOSCRIPT
  %attrs;                          -- %coreattrs, %i18n, %events --
  >

<!--================ Document Structure ===================================-->
<!ENTITY % version "version CDATA #FIXED '%HTML.Version;'">


<!ENTITY % html.content "HEAD, BODY">

<!ELEMENT HTML O O (%html.content;) -- document root element -->
<!ATTLIST HTML
  %i18n;                           -- lang, dir --
  >
```

22 Transitional Document Type Definition

```
<!--
    This is an EXPERIMENTAL version of the HTML 4.0 "transitional"
    DTD which includes presentation attributes and elements that
    W3C expects to phase out as support for style sheets matures.
    HTML 4.0 includes mechanisms for style sheets, scripting,
    embedding objects, improved support for right to left and mixed
    direction text, and enhancements to forms for improved
    accessibility for people with disabilities.

          Draft: $Date: 2013-05-28 21:38:41 $

          Authors:
              Dave Raggett <dsr@w3.org>
              Arnaud Le Hors <lehors@w3.org>

    This is work in progress, subject to change at any time.
    It does not imply endorsement by, or the consensus of,
    either W3C or members of the HTML working group. Further
    information about HTML 4.0 is available at:

        http://www.w3.org/TR/PR-html40
-->
<!ENTITY % HTML.Version "-//W3C//DTD HTML 4.0 Transitional//EN"
  -- Typical usage:

    <!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN"
            "http://www.w3.org/TR/PR-html40/loose.dtd">
    <html>
    <head>
    ...
    </head>
    <body>
    ...
    </body>
    </html>

    The URL used as a system identifier with the public identifier allows
    the user agent to download the DTD and entity sets as needed.

    The FPI for the strict HTML 4.0 DTD is:

        "-//W3C//DTD HTML 4.0//EN"

    and its URL is:

        http://www.w3.org/TR/PR-html40/strict.dtd

    Authors should use the strict DTD unless they need the
    presentation control for user agents that don't (adequately)
    support style sheets.

    If you are writing a frameset document you should use the
    following FPI:
```

```
        "-//W3C//DTD HTML 4.0 Frameset//EN"

    with the URL:

        http://www.w3.org/TR/PR-html40/frameset.dtd

    The following URLs are supported in relation to HTML 4.0

    "http://www.w3.org/TR/PR-html40/strict.dtd" (Strict DTD)
    "http://www.w3.org/TR/PR-html40/loose.dtd" (Loose DTD)
    "http://www.w3.org/TR/PR-html40/frameset.dtd" (Frameset DTD)
    "http://www.w3.org/TR/PR-html40/HTMLlat1.ent" (Latin-1 entities)
    "http://www.w3.org/TR/PR-html40/HTMLsymbol.ent" (Symbol entities)
    "http://www.w3.org/TR/PR-html40/HTMLspecial.ent" (Special entities)

    These URLs point to the latest version of each file. To reference
    this specific revision use the following URLs:

    "http://www.w3.org/TR/PR-html40-971107/strict.dtd"
    "http://www.w3.org/TR/PR-html40-971107/loose.dtd"
    "http://www.w3.org/TR/PR-html40-971107/frameset.dtd"
    "http://www.w3.org/TR/PR-html40-971107/HTMLlat1.ent"
    "http://www.w3.org/TR/PR-html40-971107/HTMLsymbol.ent"
    "http://www.w3.org/TR/PR-html40-971107/HTMLspecial.ent"

-->

<!--================== Imported Names ====================================-->

<!ENTITY % ContentType "CDATA"
    -- media type, as per [RFC2045]
    -->

<!ENTITY % ContentTypes "CDATA"
    -- comma-separated list of media types, as per [RFC2045]
    -->

<!ENTITY % Charset "CDATA"
    -- a character encoding, as per [RFC2045]
    -->

<!ENTITY % Charsets "CDATA"
    -- a space separated list of character encodings, as per [RFC2045]
    -->

<!ENTITY % LanguageCode "NAME"
    -- a language code, as per [RFC1766]
    -->

<!ENTITY % Character "CDATA"
    -- a single character from [ISO10646]
    -->

<!ENTITY % LinkTypes "CDATA"
    -- space-separated list of link types
    -->
```

```
<!ENTITY % MediaDesc "CDATA"
    -- single or comma-separated list of media descriptors
    -->

<!ENTITY % URL "CDATA"
    -- a Uniform Resource Locator,
       see [RFC1808] and [RFC1738]
    -->

<!ENTITY % Datetime "CDATA" -- date and time information. ISO date format -->


<!ENTITY % Script "CDATA" -- script expression -->

<!ENTITY % FrameTarget "CDATA" -- render in this frame -->


<!ENTITY % Text "CDATA" -- render in this frame -->


<!-- Parameter Entities -->

<!ENTITY % head.misc "SCRIPT|STYLE|META|LINK" -- repeatable head elements -->

<!ENTITY % heading "H1|H2|H3|H4|H5|H6">

<!ENTITY % list "UL | OL |  DIR | MENU">

<!ENTITY % preformatted "PRE">

<!ENTITY % Color "CDATA" -- a color using sRGB: #RRGGBB as Hex values -->

<!-- There are also 16 widely known color names with their sRGB values:

    Black  = #000000    Green  = #008000
    Silver = #C0C0C0    Lime   = #00FF00
    Gray   = #808080    Olive  = #808000
    White  = #FFFFFF    Yellow = #FFFF00
    Maroon = #800000    Navy   = #000080
    Red    = #FF0000    Blue   = #0000FF
    Purple = #800080    Teal   = #008080
    Fuchsia= #FF00FF    Aqua   = #00FFFF
 -->

<!ENTITY % bodycolors "
  bgcolor %Color;   #IMPLIED       -- document background color --
  text    %Color;   #IMPLIED       -- document text color --
  link    %Color;   #IMPLIED       -- color of links --
  vlink   %Color;   #IMPLIED       -- color of visited links --
  alink   %Color;   #IMPLIED       -- color of selected links --
  ">

<!--================ Character mnemonic entities =========================-->

<!ENTITY % HTMLlat1 PUBLIC
   "-//W3C//ENTITIES Latin1//EN//HTML"
   "http://www.w3.org/TR/PR-html40/HTMLlat1.ent">
```

```
%HTMLlat1;

<!ENTITY % HTMLsymbol PUBLIC
   "-//W3C//ENTITIES Symbols//EN//HTML"
   "http://www.w3.org/TR/PR-html40/HTMLsymbol.ent">
%HTMLsymbol;

<!ENTITY % HTMLspecial PUBLIC
   "-//W3C//ENTITIES Special//EN//HTML"
   "http://www.w3.org/TR/PR-html40/HTMLspecial.ent">
%HTMLspecial;
<!--=================== Generic Attributes ================================-->

<!ENTITY % coreattrs
 "id          ID         #IMPLIED  -- document-wide unique id --
  class       CDATA      #IMPLIED  -- space separated list of classes --
  style       CDATA      #IMPLIED  -- associated style info --
  title       %Text;     #IMPLIED  -- advisory title/amplification --"
  >

<!ENTITY % i18n
 "lang    %LanguageCode; #IMPLIED  -- language code --
  dir         (ltr|rtl)  #IMPLIED  -- direction for weak/neutral text --"
  >

<!ENTITY % events
 "onclick     %Script;   #IMPLIED  -- a pointer button was clicked --
  ondblclick  %Script;   #IMPLIED  -- a pointer button was double clicked --
  onmousedown %Script;   #IMPLIED  -- a pointer button was pressed down --
  onmouseup   %Script;   #IMPLIED  -- a pointer button was released --
  onmouseover %Script;   #IMPLIED  -- a pointer was moved onto --
  onmousemove %Script;   #IMPLIED  -- a pointer was moved within --
  onmouseout  %Script;   #IMPLIED  -- a pointer was moved away --
  onkeypress  %Script;   #IMPLIED  -- a key was pressed and released --
  onkeydown   %Script;   #IMPLIED  -- a key was pressed down --
  onkeyup     %Script;   #IMPLIED  -- a key was released --"
  >

<!-- Reserved Feature Switch -->
<!ENTITY % HTML.Reserved "IGNORE">

<!-- The following attributes are reserved for possible future use -->
<![ %HTML.Reserved; [
<!ENTITY % reserved
 "datasrc     %URL;      #IMPLIED  -- a single or tabular Data Source --
  datafld     CDATA      #IMPLIED  -- the property or column name --
  dataformatas (plaintext|html) plaintext -- text or html --"
  >
]]>

<!ENTITY % reserved "">

<!ENTITY % attrs "%coreattrs; %i18n; %events;">

<!ENTITY % align "align (left|center|right|justify)  #IMPLIED"
                  -- default is left for ltr paragraphs, right for rtl --
  >
```

```
<!--=================== Text Markup ==================================-->

<!ENTITY % fontstyle
 "TT | I | B | U | S | STRIKE | BIG | SMALL">

<!ENTITY % phrase "EM | STRONG | DFN | CODE |
                   SAMP | KBD | VAR | CITE | ABBR">

<!ENTITY % special
   "A | IMG | APPLET | OBJECT | FONT | BASEFONT | BR | SCRIPT |
    MAP | Q | SUB | SUP | SPAN | BDO | IFRAME">

<!ENTITY % formctrl "INPUT | SELECT | TEXTAREA | LABEL | BUTTON">

<!-- %inline; covers inline or "text-level" elements -->
<!ENTITY % inline "#PCDATA | %fontstyle; | %phrase; | %special; | %formctrl;">

<!ELEMENT (%fontstyle;|%phrase;) - - (%inline;)*>
<!ATTLIST (%fontstyle;|%phrase;)
  %attrs;                           -- %coreattrs, %i18n, %events --
  >

<!ELEMENT (SUB|SUP) - - (%inline;)* -- subscript, superscript -->
<!ATTLIST (SUB|SUP)
  %attrs;                           -- %coreattrs, %i18n, %events --
  >

<!ELEMENT SPAN - - (%inline;)*      -- generic language/style container -->
<!ATTLIST SPAN
  %attrs;                           -- %coreattrs, %i18n, %events --
  charset     %Charset;   #IMPLIED -- char encoding of linked resource --
  type      %ContentType; #IMPLIED -- advisory content type --
  href        %URL;       #IMPLIED -- URL for linked resource --
  hreflang %LanguageCode; #IMPLIED -- language code --
  target   %FrameTarget;  #IMPLIED -- render in this frame --
  rel         %LinkTypes; #IMPLIED -- forward link types --
  rev         %LinkTypes; #IMPLIED -- reverse link types --
  media       %MediaDesc; #IMPLIED -- for rendering on these media --
  %reserved;                        -- reserved for possible future use --
  >

<!ELEMENT BDO - - (%inline;)*       -- I18N BiDi over-ride -->
<!ATTLIST BDO
  %coreattrs;                       -- id, class, style, title --
  lang    %LanguageCode; #IMPLIED  -- language code --
  dir         (ltr|rtl)  #REQUIRED -- directionality --
  >

<!ELEMENT BASEFONT - O EMPTY -- base font size -->
<!ATTLIST BASEFONT
  id          ID         #IMPLIED  -- document-wide unique id --
  size        CDATA      #REQUIRED -- base font size for FONT elements --
  color       %Color;    #IMPLIED  -- "#RRGGBB" in hex, e.g. red: "#FF0000" --
  face        CDATA      #IMPLIED  -- comma separated list of font names --
  >
```

```
<!ELEMENT FONT - - (%inline;)*  -- local change to font -->
<!ATTLIST FONT
  %coreattrs;                   -- id, class, style, title --
  %i18n;                        -- lang, dir --
  size        CDATA      #IMPLIED  -- [+|-]nn e.g. size="+1", size="4" --
  color       %Color;    #IMPLIED  -- "#RRGGBB" in hex, e.g. red: "#FF0000" --
  face        CDATA      #IMPLIED  -- comma separated list of font names --
  >

<!ELEMENT BR - O EMPTY              -- forced line break -->
<!ATTLIST BR
  %coreattrs;                   -- id, class, style, title --
  clear (left|all|right|none) none -- control of text flow --
  >

<!--================== HTML content models ================================-->

<!--
    HTML has two basic content models:

        %inline;     character level elements and text strings
        %block;      block-like elements e.g. paragraphs and lists
-->

<!ENTITY % block
     "P | %heading; | %list; | %preformatted; | DL | DIV | CENTER |
      NOSCRIPT | NOFRAMES | BLOCKQUOTE | FORM | ISINDEX | HR |
      TABLE | FIELDSET | ADDRESS">

<!ENTITY % flow "%block; | %inline;">

<!--=================== Document Body =====================================-->

<!ELEMENT BODY O O (%flow;)* +(INS|DEL) -- document body -->
<!ATTLIST BODY
  %attrs;                       -- %coreattrs, %i18n, %events --
  background  %URL;      #IMPLIED  -- texture tile for document background --
  %bodycolors;                  -- bgcolor, text, link, vlink, alink --
  onload      %Script;   #IMPLIED  -- the document has been loaded --
  onunload    %Script;   #IMPLIED  -- the document has been removed --
  >

<!ELEMENT ADDRESS - - ((%inline;) | P)* -- information on author -->
<!ATTLIST ADDRESS
  %attrs;                       -- %coreattrs, %i18n, %events --
  >

<!ELEMENT DIV - - (%flow;)* -- generic language/style container -->
<!ATTLIST DIV
  %attrs;                       -- %coreattrs, %i18n, %events --
  charset     %Charset;   #IMPLIED -- char encoding of linked resource --
  type      %ContentType; #IMPLIED -- advisory content type --
  href        %URL;       #IMPLIED -- URL for linked resource --
  hreflang %LanguageCode; #IMPLIED -- language code --
  target   %FrameTarget;  #IMPLIED -- render in this frame --
  rel         %LinkTypes; #IMPLIED -- forward link types --
  rev         %LinkTypes; #IMPLIED -- reverse link types --
```

```
  media       %MediaDesc; #IMPLIED -- for rendering on these media --
  %align;                 -- align, text alignment --

  %reserved;              -- reserved for possible future use --
  >

<!ELEMENT CENTER - - (%flow;)* -- shorthand for DIV with align=center -->
<!ATTLIST CENTER
  %attrs;                 -- %coreattrs, %i18n, %events --
  >

<!--================== The Anchor Element ================================-->

<!ENTITY % Shape "(rect|circle|poly|default)">
<!ENTITY % Coords "CDATA" -- comma separated list of numbers -->

<!ELEMENT A - - (%inline;)* -(A) -- anchor -->
<!ATTLIST A
  %attrs;                 -- %coreattrs, %i18n, %events --
  charset     %Charset;   #IMPLIED -- char encoding of linked resource --
  type      %ContentType; #IMPLIED -- advisory content type --
  name         CDATA      #IMPLIED -- named link end --
  href        %URL;       #IMPLIED -- URL for linked resource --
  hreflang %LanguageCode; #IMPLIED -- language code --
  target   %FrameTarget;  #IMPLIED -- render in this frame --
  rel         %LinkTypes; #IMPLIED -- forward link types --
  rev         %LinkTypes; #IMPLIED -- reverse link types --
  accesskey   %Character; #IMPLIED -- accessibility key character --
  shape       %Shape;     rect     -- for use with OBJECT SHAPES --
  coords      %Coords;    #IMPLIED -- for use with OBJECT SHAPES --
  tabindex     NUMBER     #IMPLIED -- position in tabbing order --
  onfocus     %Script;    #IMPLIED -- the element got the focus --
  onblur      %Script;    #IMPLIED -- the element lost the focus --
  >

<!--================== Client-side image maps ============================-->

<!-- These can be placed in the same document or grouped in a
     separate document although this isn't yet widely supported -->

<!ELEMENT MAP - - (AREA)+ -- client-side image map -->
<!ATTLIST MAP
  %attrs;                 -- %coreattrs, %i18n, %events --
  name        CDATA      #REQUIRED  -- name of image map for refs by usemap --
  >

<!ELEMENT AREA - O EMPTY -- client-side image map area -->
<!ATTLIST AREA
  %attrs;                 -- %coreattrs, %i18n, %events --
  shape       %Shape;    rect      -- controls interpretation of coords --
  coords      %Coords;   #IMPLIED  -- comma separated list of lengths --
  href        %URL;      #IMPLIED  -- URL for linked resource --
  target   %FrameTarget;    #IMPLIED -- render in this frame --
  nohref      (nohref)   #IMPLIED  -- this region has no action --
  alt         %Text;     #REQUIRED -- short description --
  tabindex    NUMBER     #IMPLIED  -- position in tabbing order --
  accesskey  %Character; #IMPLIED  -- accessibility key character --
```

```
  onfocus     %Script;   #IMPLIED  -- the element got the focus --
  onblur      %Script;   #IMPLIED  -- the element lost the focus --
  >

<!--================== The LINK Element ==================================-->

<!--
  Relationship values can be used in principle:

   a) for document specific toolbars/menus when used
      with the LINK element in document head e.g.
        start, contents, previous, next, index, end, help
   b) to link to a separate style sheet (rel=stylesheet)
   c) to make a link to a script (rel=script)
   d) by stylesheets to control how collections of
      html nodes are rendered into printed documents
   e) to make a link to a printable version of this document
      e.g. a postscript or pdf version (rel=alternate media=print)
-->

<!ELEMENT LINK - O EMPTY -- a media-independent link -->
<!ATTLIST LINK
  %attrs;                          -- %coreattrs, %i18n, %events --
  charset     %Charset;   #IMPLIED -- char encoding of linked resource --
  href        %URL;       #IMPLIED -- URL for linked resource --
  hreflang %LanguageCode; #IMPLIED -- language code --
  type      %ContentType; #IMPLIED -- advisory content type --
  rel         %LinkTypes; #IMPLIED -- forward link types --
  rev         %LinkTypes; #IMPLIED -- reverse link types --
  media       %MediaDesc; #IMPLIED -- for rendering on these media --
  target   %FrameTarget;     #IMPLIED -- render in this frame --
  >

<!--================== Images ============================================-->

<!-- Length defined in strict DTD for cellpadding/cellspacing -->
<!ENTITY % Length "CDATA" -- nn for pixels or nn% for percentage length -->
<!ENTITY % MultiLength "CDATA" -- pixel, percentage, or relative -->

<!ENTITY % MultiLengths "CDATA" -- comma-separated list of MultiLength -->

<!ENTITY % Pixels "CDATA" -- integer representing length in pixels -->

<!ENTITY % IAlign "(top|middle|bottom|left|right)"  -- center? -->

<!-- To avoid problems with text-only UAs as well as
   to make image content understandable and navigable
   to users of non-visual UAs, you need to provide
   a description with ALT, and avoid server-side image maps -->
<!ELEMENT IMG - O EMPTY            --  Embedded image -->
<!ATTLIST IMG
  %attrs;                          -- %coreattrs, %i18n, %events --
  src         %URL;      #REQUIRED -- URL of image to embed --
  alt         %Text;     #REQUIRED -- short description --
  longdesc    %URL;      #IMPLIED  -- link to long description (complements alt) --
  height      %Length;   #IMPLIED  -- override height --
  width       %Length;   #IMPLIED  -- override width --
```

```
  align       %IAlign;   #IMPLIED  -- vertical or horizontal alignment --
  border      %Length;   #IMPLIED  -- link border width --
  hspace      %Pixels;   #IMPLIED  -- horizontal gutter --
  vspace      %Pixels;   #IMPLIED  -- vertical gutter --
  usemap      %URL;      #IMPLIED  -- use client-side image map --
  ismap       (ismap)    #IMPLIED  -- use server-side image map --
  >

<!-- USEMAP points to a MAP element which may be in this document
  or an external document, although the latter is not widely supported -->

<!--=================== OBJECT ======================================-->
<!--
  OBJECT is used to embed objects as part of HTML pages
  PARAM elements should precede other content. SGML mixed content
  model technicality precludes specifying this formally ...
-->

<!ELEMENT OBJECT - - (PARAM | %flow;)*
 -- generic embedded object -->
<!ATTLIST OBJECT
  %attrs;                          -- %coreattrs, %i18n, %events --
  declare     (declare)  #IMPLIED  -- declare but don't instantiate flag --
  classid     %URL;      #IMPLIED  -- identifies an implementation --
  codebase    %URL;      #IMPLIED  -- base URL for classid, data, archive --
  data        %URL;      #IMPLIED  -- reference to object's data --
  type     %ContentType; #IMPLIED  -- content type for data --
  codetype %ContentType; #IMPLIED  -- content type for code --
  archive     %URL;      #IMPLIED  -- space separated archive list --
  standby     %Text;     #IMPLIED  -- message to show while loading --
  height      %Length;   #IMPLIED  -- override height --
  width       %Length;   #IMPLIED  -- override width --
  align       %IAlign;   #IMPLIED  -- vertical or horizontal alignment --
  border      %Length;   #IMPLIED  -- link border width --
  hspace      %Pixels;   #IMPLIED  -- horizontal gutter --
  vspace      %Pixels;   #IMPLIED  -- vertical gutter --
  usemap      %URL;      #IMPLIED  -- use client-side image map --
  shapes      (shapes)   #IMPLIED  -- object has shaped hypertext links --
  export      (export)   #IMPLIED  -- export shapes to parent  --
  name        CDATA      #IMPLIED  -- submit as part of form --
  tabindex    NUMBER     #IMPLIED  -- position in tabbing order --
  %reserved;                       -- reserved for possible future use --
  >

<!ELEMENT PARAM - O EMPTY          -- named property value -->
<!ATTLIST PARAM
  id          ID         #IMPLIED  -- document-wide unique id --
  name        CDATA      #REQUIRED -- property name --
  value       CDATA      #IMPLIED  -- property value --
  valuetype (DATA|REF|OBJECT) DATA -- How to interpret value --
  type     %ContentType; #IMPLIED  -- content type for value
                                      when valuetype=ref --
  >

<!--=================== Java APPLET ================================-->
<!--
  One of code or object attributes must be present.
```

```
  Place PARAM elements before other content.
-->
<!ELEMENT APPLET - - (PARAM | %flow;)* -- Java applet -->
<!ATTLIST APPLET
  %coreattrs;                       -- id, class, style, title --
  codebase    %URL;       #IMPLIED  -- optional base URL for applet --
  archive     CDATA       #IMPLIED  -- comma separated archive list --
  code        CDATA       #IMPLIED  -- applet class file --
  object      CDATA       #IMPLIED  -- serialized applet file --
  alt         %Text;      #IMPLIED  -- short description --
  name        CDATA       #IMPLIED  -- allows applets to find each other --
  width       %Length;    #REQUIRED -- initial width --
  height      %Length;    #REQUIRED -- initial height --
  align       %IAlign;    #IMPLIED  -- vertical or horizontal alignment --
  hspace      %Pixels;    #IMPLIED  -- horizontal gutter --
  vspace      %Pixels;    #IMPLIED  -- vertical gutter --
  >

<!--================== Horizontal Rule ===================================-->

<!ELEMENT HR - O EMPTY -- horizontal rule -->
<!ATTLIST HR
  %coreattrs;                       -- id, class, style, title --
  %events;
  align (left|center|right) #IMPLIED
  noshade     (noshade)  #IMPLIED
  size        %Pixels;   #IMPLIED
  width       %Length;   #IMPLIED
  >

<!--================== Paragraphs ========================================-->

<!ELEMENT P - O (%inline;)* -- paragraph -->
<!ATTLIST P
  %attrs;                           -- %coreattrs, %i18n, %events --
  %align;                           -- align, text alignment --
  >

<!--================== Headings ==========================================-->

<!--
  There are six levels of headings from H1 (the most important)
  to H6 (the least important).
-->

<!ELEMENT (%heading;)  - - (%inline;)* -- heading -->
<!ATTLIST (%heading;)
  %attrs;                           -- %coreattrs, %i18n, %events --
  %align;                           -- align, text alignment --
  >

<!--================== Preformatted Text =================================-->

<!-- excludes markup for images and changes in font size -->
<!ENTITY % pre.exclusion "IMG|OBJECT|APPLET|BIG|SMALL|SUB|SUP|FONT|BASEFONT">

<!ELEMENT PRE - - (%inline;)* -(%pre.exclusion;) -- preformatted text -->
```

```
<!ATTLIST PRE
  %attrs;                           -- %coreattrs, %i18n, %events --
  width       NUMBER     #IMPLIED
  >

<!--====================== Inline Quotes ===================================-->

<!ELEMENT Q - - (%inline;)* -- short inline quotation -->
<!ATTLIST Q
  %attrs;                           -- %coreattrs, %i18n, %events --
  cite        %URL;      #IMPLIED  -- URL for source document or msg --
  >

<!--====================== Block-like Quotes ===============================-->

<!ELEMENT BLOCKQUOTE - - (%flow;)* -- long quotation -->
<!ATTLIST BLOCKQUOTE
  %attrs;                           -- %coreattrs, %i18n, %events --
  cite        %URL;      #IMPLIED  -- URL for source document or msg --
  >

<!--====================== Inserted/Deleted Text ============================-->


<!-- INS/DEL are handled by inclusion on BODY -->
<!ELEMENT (INS|DEL) - - (%flow;)* -- inserted text, deleted text -->
<!ATTLIST (INS|DEL)
  %attrs;                           -- %coreattrs, %i18n, %events --
  cite        %URL;      #IMPLIED  -- info on reason for change --
  datetime    %Datetime; #IMPLIED  -- date and time of change --
  >

<!--====================== Lists ============================================-->

<!-- definition lists - DT for term, DD for its definition -->

<!ELEMENT DL - - (DT|DD)+ -- definition list -->
<!ATTLIST DL
  %attrs;                           -- %coreattrs, %i18n, %events --
  compact     (compact)  #IMPLIED  -- reduced interitem spacing --
  >

<!ELEMENT DT - O (%inline;)* -- definition term -->
<!ELEMENT DD - O (%flow;)*   -- definition description -->
<!ATTLIST (DT|DD)
  %attrs;                          -- %coreattrs, %i18n, %events --
  >

<!-- Ordered lists (OL) Numbering style

    1   arabic numbers     1, 2, 3, ...
    a   lower alpha        a, b, c, ...
    A   upper alpha        A, B, C, ...
    i   lower roman        i, ii, iii, ...
    I   upper roman        I, II, III, ...

    The style is applied to the sequence number which by default
```

```
    is reset to 1 for the first list item in an ordered list.

    This can't be expressed directly in SGML due to case folding.
-->

<!ENTITY % OLStyle "CDATA"      -- constrained to: "(1|a|A|i|I)" -->

<!ELEMENT OL - - (LI)+ -- ordered list -->
<!ATTLIST OL
  %attrs;                           -- %coreattrs, %i18n, %events --
  type        %OLStyle;  #IMPLIED  -- numbering style --
  compact     (compact)  #IMPLIED  -- reduced interitem spacing --
  start       NUMBER     #IMPLIED  -- starting sequence number --
  >

<!-- Unordered Lists (UL) bullet styles -->
<!ENTITY % ULStyle "(disc|square|circle)">

<!ELEMENT UL - - (LI)+ -- unordered list -->
<!ATTLIST UL
  %attrs;                           -- %coreattrs, %i18n, %events --
  type        %ULStyle;  #IMPLIED  -- bullet style --
  compact     (compact)  #IMPLIED  -- reduced interitem spacing --
  >

<!ELEMENT (DIR|MENU) - - (LI)+ -(%block;) -- directory list, menu list -->
<!ATTLIST DIR
  %attrs;                           -- %coreattrs, %i18n, %events --
  compact     (compact)  #IMPLIED
  >
<!ATTLIST MENU
  %attrs;                           -- %coreattrs, %i18n, %events --
  compact     (compact)  #IMPLIED
  >

<!-- <DIR>              Directory list                  -->
<!-- <DIR COMPACT>      Compact list style              -->
<!-- <MENU>             Menu list                       -->
<!-- <MENU COMPACT>     Compact list style              -->

<!ENTITY % LIStyle "CDATA" -- constrained to: "(%ULStyle;|%OLStyle;)" -->

<!ELEMENT LI - O (%flow;)* -- list item -->
<!ATTLIST LI
  %attrs;                           -- %coreattrs, %i18n, %events --
  type        %LIStyle;  #IMPLIED  -- list item style --
  value       NUMBER     #IMPLIED  -- reset sequence number --
  >

<!--================ Forms ===============================================-->
<!ELEMENT FORM - - (%flow;)* -(FORM) -- interactive form -->
<!ATTLIST FORM
  %attrs;                           -- %coreattrs, %i18n, %events --
  action      %URL;      #REQUIRED -- server-side form handler --
  method      (GET|POST) GET       -- HTTP method used to submit the form --
  enctype  %ContentType; "application/x-www-form-urlencoded"
  onsubmit    %Script;   #IMPLIED  -- the form was submitted --
```

```
  onreset     %Script;   #IMPLIED  -- the form was reset --
  target   %FrameTarget;    #IMPLIED -- render in this frame --
  accept-charset %Charsets; #IMPLIED -- list of supported charsets --
  >

<!-- Each label must not contain more than ONE field -->
<!ELEMENT LABEL - - (%inline;)* -(LABEL) -- form field label text -->
<!ATTLIST LABEL
  %attrs;                           -- %coreattrs, %i18n, %events --
  for         IDREF      #IMPLIED  -- matches field ID value --
  accesskey  %Character; #IMPLIED  -- accessibility key character --
  onfocus     %Script;   #IMPLIED  -- the element got the focus --
  onblur      %Script;   #IMPLIED  -- the element lost the focus --
  >

<!ENTITY % InputType
  "(TEXT | PASSWORD | CHECKBOX |
    RADIO | SUBMIT | RESET |
    FILE | HIDDEN | IMAGE | BUTTON)"
   >

<!-- attribute name required for all but submit & reset -->
<!ELEMENT INPUT - O EMPTY -- form control -->
<!ATTLIST INPUT
  %attrs;                           -- %coreattrs, %i18n, %events --
  type       %InputType; TEXT       -- what kind of widget is needed --
  name        CDATA      #IMPLIED  -- submit as part of form --
  value       CDATA      #IMPLIED  -- required for radio and checkboxes --
  checked   (checked)    #IMPLIED  -- for radio buttons and check boxes --
  disabled  (disabled)   #IMPLIED  -- control is unavailable in this context --
  readonly  (readonly)   #IMPLIED  -- for text and passwd --
  size        CDATA      #IMPLIED  -- specific to each type of field --
  maxlength   NUMBER     #IMPLIED  -- max chars for text fields --
  src         %URL;      #IMPLIED  -- for fields with images --
  alt         CDATA      #IMPLIED  -- short description --
  usemap      %URL;      #IMPLIED  -- use client-side image map --
  align       %IAlign;   #IMPLIED  -- vertical or horizontal alignment --
  tabindex    NUMBER     #IMPLIED  -- position in tabbing order --
  accesskey  %Character; #IMPLIED  -- accessibility key character --
  onfocus     %Script;   #IMPLIED  -- the element got the focus --
  onblur      %Script;   #IMPLIED  -- the element lost the focus --
  onselect    %Script;   #IMPLIED  -- some text was selected --
  onchange    %Script;   #IMPLIED  -- the element value was changed --
  accept  %ContentTypes; #IMPLIED  -- list of MIME types for file upload --
  %reserved;                        -- reserved for possible future use --
  >

<!ELEMENT SELECT - - (OPTGROUP|OPTION)+ -- option selector -->
<!ATTLIST SELECT
  %attrs;                           -- %coreattrs, %i18n, %events --
  name        CDATA      #IMPLIED  -- field name --
  size        NUMBER     #IMPLIED  -- rows visible --
  multiple    (multiple) #IMPLIED  -- default is single selection --
  disabled    (disabled) #IMPLIED  -- control is unavailable in this context --
  tabindex    NUMBER     #IMPLIED  -- position in tabbing order --
  onfocus     %Script;   #IMPLIED  -- the element got the focus --
  onblur      %Script;   #IMPLIED  -- the element lost the focus --
```

```
  onchange    %Script;   #IMPLIED  -- the element value was changed --
  %reserved;                       -- reserved for possible future use --
  >

<!ELEMENT OPTGROUP - - (OPTGROUP|OPTION)+ -- option group -->
<!ATTLIST OPTGROUP
  %attrs;                          -- %coreattrs, %i18n, %events --
  disabled    (disabled) #IMPLIED  -- control is unavailable in this context --
  label       %Text;     #REQUIRED -- for use in hierarchical menus --
  >

<!ELEMENT OPTION - O (#PCDATA) -- selectable choice -->
<!ATTLIST OPTION
  %attrs;                          -- %coreattrs, %i18n, %events --
  selected    (selected) #IMPLIED
  disabled    (disabled) #IMPLIED  -- control is unavailable in this context --
  label       %Text;     #IMPLIED  -- for use in hierarchical menus --
  value       CDATA      #IMPLIED  -- defaults to element content --
  >

<!ELEMENT TEXTAREA - - (#PCDATA) -- multi-line text field -->
<!ATTLIST TEXTAREA
  %attrs;                          -- %coreattrs, %i18n, %events --
  name        CDATA      #IMPLIED
  rows        NUMBER     #REQUIRED
  cols        NUMBER     #REQUIRED
  disabled    (disabled) #IMPLIED  -- control is unavailable in this context --
  readonly    (readonly) #IMPLIED
  tabindex    NUMBER     #IMPLIED  -- position in tabbing order --
  onfocus     %Script;   #IMPLIED  -- the element got the focus --
  onblur      %Script;   #IMPLIED  -- the element lost the focus --
  onselect    %Script;   #IMPLIED  -- some text was selected --
  onchange    %Script;   #IMPLIED  -- the element value was changed --
  %reserved;                       -- reserved for possible future use --
  >

<!--
  #PCDATA is to solve the mixed content problem,
  per specification only whitespace is allowed there!
 -->
<!ELEMENT FIELDSET - - (#PCDATA,LEGEND,(%flow;)*) -- form control group -->
<!ATTLIST FIELDSET
  %attrs;                          -- %coreattrs, %i18n, %events --
  >

<!ELEMENT LEGEND - - (%inline;)* -- fieldset legend -->
<!ENTITY % LAlign "(top|bottom|left|right)">

<!ATTLIST LEGEND
  %attrs;                          -- %coreattrs, %i18n, %events --
  align       %LAlign;   #IMPLIED  -- relative to fieldset --
  accesskey  %Character; #IMPLIED  -- accessibility key character --
  >

<!ELEMENT BUTTON - -
     (%flow;)* -(A|%formctrl;|FORM|ISINDEX|FIELDSET|IFRAME)
     -- push button -->
```

```
<!ATTLIST BUTTON
  %attrs;                          -- %coreattrs, %i18n, %events --
  name        CDATA      #IMPLIED  -- for scripting/forms as submit button --
  value       CDATA      #IMPLIED  -- gets passed to server when submitted --
  type (button|submit|reset) submit -- for use as form submit/reset button --
  disabled    (disabled) #IMPLIED  -- control is unavailable in this context --
  tabindex    NUMBER     #IMPLIED  -- position in tabbing order --
  accesskey  %Character; #IMPLIED  -- accessibility key character --
  onfocus     %Script;   #IMPLIED  -- the element got the focus --
  onblur      %Script;   #IMPLIED  -- the element lost the focus --
  %reserved;                       -- reserved for possible future use --
  >

<!--======================== Tables ========================================-->

<!-- IETF HTML table standard, see [RFC1942] -->

<!--
 The BORDER attribute sets the thickness of the frame around the
 table. The default units are screen pixels.

 The FRAME attribute specifies which parts of the frame around
 the table should be rendered. The values are not the same as
 CALS to avoid a name clash with the VALIGN attribute.

 The value "border" is included for backwards compatibility with
 <TABLE BORDER> which yields frame=border and border=implied
 For <TABLE BORDER=1> you get border=1 and frame=implied. In this
 case, it is appropriate to treat this as frame=border for backwards
 compatibility with deployed browsers.
-->
<!ENTITY % TFrame "(void|above|below|hsides|lhs|rhs|vsides|box|border)">

<!--
 The RULES attribute defines which rules to draw between cells:

 If RULES is absent then assume:
     "none" if BORDER is absent or BORDER=0 otherwise "all"
-->

<!ENTITY % TRules "(none | groups | rows | cols | all)">

<!-- horizontal placement of table relative to document -->
<!ENTITY % TAlign "(left|center|right)">

<!-- horizontal alignment attributes for cell contents -->
<!ENTITY % cellhalign
  "align (left|center|right|justify|char) #IMPLIED
   char       %Character;   #IMPLIED  -- alignment char, e.g. char=':' --
   charoff    %Length;      #IMPLIED  -- offset for alignment char --"
  >

<!-- vertical alignment attributes for cell contents -->
<!ENTITY % cellvalign
  "valign (top|middle|bottom|baseline) #IMPLIED"
  >
```

```
<!ELEMENT TABLE - -
     (CAPTION?, (COL*|COLGROUP*), THEAD?, TFOOT?, TBODY+)>
<!ELEMENT CAPTION  - - (%inline;)* -- table caption -->
<!ELEMENT THEAD    - O (TR)+       -- table header -->
<!ELEMENT TFOOT    - O (TR)+       -- table footer -->
<!ELEMENT TBODY    O O (TR)+       -- table body -->
<!ELEMENT COLGROUP - O (col)*      -- table column group -->
<!ELEMENT COL      - O EMPTY       -- table column -->
<!ELEMENT TR       - O (TH|TD)+    -- table row -->
<!ELEMENT (TH|TD)  - O (%flow;)*   -- table header cell, table data cell -->

<!ATTLIST TABLE                 -- table element --
  %attrs;                       -- %coreattrs, %i18n, %events --
  summary     %Text;     #IMPLIED  -- purpose/structure for speech output --
  align       %TAlign;   #IMPLIED  -- table position relative to window --
  bgcolor     %Color;    #IMPLIED  -- background color for cells --
  width       %Pixels;   #IMPLIED  -- table width relative to window --
  border      CDATA      #IMPLIED  -- controls frame width around table --
  frame       %TFrame;   #IMPLIED  -- which parts of table frame to include --
  rules       %TRules;   #IMPLIED  -- rulings between rows and cols --
  cellspacing %Length;   #IMPLIED  -- spacing between cells --
  cellpadding %Length;   #IMPLIED  -- spacing within cells --
  %reserved;                    -- reserved for possible future use --
  >

<!ENTITY % CAlign "(top|bottom|left|right)">

<!ATTLIST CAPTION
  %attrs;                       -- %coreattrs, %i18n, %events --
  align       %CAlign;   #IMPLIED  -- relative to table --
  >

<!--
COLGROUP groups a set of COL elements. It allows you to group
several semantically related columns together.
-->
<!ATTLIST COLGROUP
  %attrs;                       -- %coreattrs, %i18n, %events --
  span        NUMBER     1      -- default number of columns in group --
  width    %MultiLength; #IMPLIED  -- default width for enclosed COLs --
  %cellhalign;                  -- horizontal alignment in cells --
  %cellvalign;                  -- vertical alignment in cells --
  >

<!--
 COL elements define the alignment properties for cells in
 one or more columns.

 The WIDTH attribute specifies the width of the columns, e.g.

     width=64        width in screen pixels
     width=0.5*      relative width of 0.5

 The REPEAT attribute allows you to repeat the effects of
 a COL element as if the same element was repeated n times.
 There are no grouping semantics for repeated columns.
-->
```

```
<!ATTLIST COL                   -- column groups and properties --
  %attrs;                          -- %coreattrs, %i18n, %events --
  repeat      NUMBER     1         -- repeat count for COL --
  width    %MultiLength; #IMPLIED  -- column width specification --
  %cellhalign;                     -- horizontal alignment in cells --
  %cellvalign;                     -- vertical alignment in cells --
  >

<!--
    Use THEAD to duplicate headers when breaking table
    across page boundaries, or for static headers when
    TBODY sections are rendered in scrolling panel.

    Use TFOOT to duplicate footers when breaking table
    across page boundaries, or for static footers when
    TBODY sections are rendered in scrolling panel.

    Use multiple TBODY sections when rules are needed
    between groups of table rows.
-->
<!ATTLIST (THEAD|TBODY|TFOOT)   -- table section --
  %attrs;                          -- %coreattrs, %i18n, %events --
  %cellhalign;                     -- horizontal alignment in cells --
  %cellvalign;                     -- vertical alignment in cells --
  >

<!ATTLIST TR                    -- table row --
  %attrs;                          -- %coreattrs, %i18n, %events --
  %cellhalign;                     -- horizontal alignment in cells --
  %cellvalign;                     -- vertical alignment in cells --
  bgcolor     %Color;    #IMPLIED  -- background color for row --
  >



<!-- Scope is simpler than axes attribute for common tables -->
<!ENTITY % Scope "(row|col|rowgroup|colgroup)">

<!-- TH is for headers, TD for data, but for cells acting as both use TD -->
<!ATTLIST (TH|TD)               -- header or data cell --
  %attrs;                          -- %coreattrs, %i18n, %events --
  abbr        %Text;     #IMPLIED  -- abbreviation for header cell --
  axis        CDATA      #IMPLIED  -- names groups of related headers--
  headers     IDREFS     #IMPLIED  -- list of id's for header cells --
  scope       %Scope;    #IMPLIED  -- scope covered by header cells --
  nowrap      (nowrap)   #IMPLIED  -- suppress word wrap --
  bgcolor     %Color;    #IMPLIED  -- cell background color --
  rowspan     NUMBER     1         -- number of rows spanned by cell --
  colspan     NUMBER     1         -- number of cols spanned by cell --
  %cellhalign;                     -- horizontal alignment in cells --
  %cellvalign;                     -- vertical alignment in cells --
  width       %Pixels;   #IMPLIED  -- width for cell --
  height      %Pixels;   #IMPLIED  -- height for cell --
  >

<!--================== Document Frames ===================================-->
```

```
<!--
  The content model for HTML documents depends on whether the HEAD is
  followed by a FRAMESET or BODY element. The widespread omission of
  the BODY start tag makes it impractical to define the content model
  without the use of a marked section.
-->

<!-- Feature Switch for frameset documents -->
<!ENTITY % HTML.Frameset "IGNORE">

<![ %HTML.Frameset; [
<!ELEMENT FRAMESET - - ((FRAMESET|FRAME)+ & NOFRAMES?)
  -- window subdivision -->
<!ATTLIST FRAMESET
  %coreattrs;                      -- id, class, style, title --
  rows    %MultiLengths; #IMPLIED  -- list of lengths. Default: 100% (1 row) --
  cols    %MultiLengths; #IMPLIED  -- list of lengths. Default: 100% (1 col) --
  onload      %Script;   #IMPLIED  -- all the frames have been loaded  --
  onunload    %Script;   #IMPLIED  -- all the frames have been removed --
  >
]]>

<![ %HTML.Frameset; [
<!-- reserved frame names start with "_" otherwise starts with letter -->
<!ELEMENT FRAME - O EMPTY -- subwindow -->
<!ATTLIST FRAME
  %coreattrs;                      -- id, class, style, title --
  longdesc    %URL;       #IMPLIED  -- link to long description (complements title) --
  name        CDATA       #IMPLIED  -- name of frame for targetting --
  src         %URL;       #IMPLIED  -- source of frame content --
  frameborder (1|0)       1         -- request frame borders? --
  marginwidth %Pixels;    #IMPLIED  -- margin widths in pixels --
  marginheight %Pixels;   #IMPLIED  -- margin height in pixels --
  noresize    (noresize) #IMPLIED  -- allow users to resize frames? --
  scrolling (yes|no|auto) auto      -- scrollbar or none --
  >
]]>

<!ELEMENT IFRAME - - (%flow;)* -- inline subwindow -->
<!ATTLIST IFRAME
  %coreattrs;                      -- id, class, style, title --
  longdesc    %URL;        #IMPLIED  -- link to long description (complements title) --
  name        CDATA       #IMPLIED  -- name of frame for targetting --
  src         %URL;       #IMPLIED  -- source of frame content --
  frameborder (1|0)       1         -- request frame borders? --
  marginwidth %Pixels;    #IMPLIED  -- margin widths in pixels --
  marginheight %Pixels;   #IMPLIED  -- margin height in pixels --
  scrolling (yes|no|auto) auto      -- scrollbar or none --
  align       %IAlign;    #IMPLIED  -- vertical or horizontal alignment --
  height      %Length;    #IMPLIED  -- frame height --
  width       %Length;    #IMPLIED  -- frame width --
  >

<![ %HTML.Frameset; [
<!ENTITY % noframes.content "(BODY) -(NOFRAMES)">
]]>
```

```
<!ENTITY % noframes.content "(%flow;)*">

<!ELEMENT NOFRAMES - - %noframes.content;
 -- alternate content container for non frame-based rendering -->
<!ATTLIST NOFRAMES
  %attrs;                         -- %coreattrs, %i18n, %events --
  >

<!--================ Document Head =======================================-->
<!-- %head.misc; defined earlier on as "SCRIPT | STYLE | META | LINK" -->
<!ENTITY % head.content "TITLE & ISINDEX? & BASE?">

<!ELEMENT HEAD O O (%head.content;) +(%head.misc;) -- document head -->
<!ATTLIST HEAD
  %i18n;                          -- lang, dir --
  profile     %URL;       #IMPLIED  -- named dictionary of meta info --
  >

<!-- The TITLE element is not considered part of the flow of text.
       It should be displayed, for example as the page header or
       window title. Exactly one title is required per document.
    -->
<!ELEMENT TITLE - - (#PCDATA) -(%head.misc;) -- document title -->
<!ATTLIST TITLE %i18n>

<!ELEMENT ISINDEX - O EMPTY -- single line prompt -->
<!ATTLIST ISINDEX
  %coreattrs;                     -- id, class, style, title --
  %i18n;                          -- lang, dir --
  prompt      %Text;     #IMPLIED  -- prompt message -->

<!ELEMENT BASE - O EMPTY -- document base URL -->
<!ATTLIST BASE
  href        %URL;       #IMPLIED  -- URL that acts as base URL --
  target   %FrameTarget;    #IMPLIED -- render in this frame --
  >

<!ELEMENT META - O EMPTY        -- generic metainformation -->
<!ATTLIST META
  %i18n;                          -- lang, dir, for use with content string --
  http-equiv  NAME       #IMPLIED  -- HTTP response header name  --
  name        NAME       #IMPLIED  -- metainformation name --
  content     CDATA      #REQUIRED -- associated information --
  scheme      CDATA      #IMPLIED  -- select form of content --
  >

<!ELEMENT STYLE - - CDATA      -- style info -->
<!ATTLIST STYLE
  %i18n;                          -- lang, dir, for use with title --
  type     %ContentType; #REQUIRED -- content type of style language --
  media     %MediaDesc;  #IMPLIED  -- designed for use with these media --
  title     %Text;       #IMPLIED  -- advisory title --
  >

<!ELEMENT SCRIPT - - CDATA      -- script statements -->
<!ATTLIST SCRIPT
  charset  %Charset;     #IMPLIED -- char encoding of linked resource --
```

```
  type     %ContentType; #REQUIRED -- content type of script language --
  language    CDATA      #IMPLIED  -- predefined script language name --
  src         %URL;      #IMPLIED  -- URL for an external script --
  defer       (defer)    #IMPLIED  -- UA may defer execution of script --
  >

<!ELEMENT NOSCRIPT - - (%flow;)*
  -- alternate content container for non script-based rendering -->
<!ATTLIST NOSCRIPT
  %attrs;                          -- %coreattrs, %i18n, %events --
  >

<!--================ Document Structure ===================================-->
<!ENTITY % version "version CDATA #FIXED '%HTML.Version;'">

<![ %HTML.Frameset; [
<!ENTITY % html.content "HEAD, FRAMESET">
]]>

<!ENTITY % html.content "HEAD, BODY">

<!ELEMENT HTML O O (%html.content;) -- document root element -->
<!ATTLIST HTML
  %version;
  %i18n;                           -- lang, dir --
  >
```

23 Frameset Document Type Definition

```
<!--
    This is an EXPERIMENTAL version of the HTML 4.0 "frameset" DTD
    which differs from the normal DTD by the content of the HTML
    element. For frameset documents the FRAMESET element is used
    in place of the BODY element.

          Draft: $Date: 2013-05-28 21:38:41 $

          Authors:
              Dave Raggett <dsr@w3.org>
              Arnaud Le Hors <lehors@w3.org>

    This is work in progress, subject to change at any time.
    It does not imply endorsement by, or the consensus of,
    either W3C or members of the HTML working group. Further
    information about HTML 4.0 is available at:

          http://www.w3.org/TR/PR-html40/.
-->
<!ENTITY % HTML.Version "-//W3C//DTD HTML 4.0 Frameset//EN"
  -- Typical usage:

    <!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Frameset//EN"
            "http://www.w3.org/TR/PR-html40/frameset.dtd>
    <html>
    <head>
    ...
    </head>
    <frameset>
    ...
    </frameset>
    </html>
-->

<!ENTITY % HTML.Frameset "INCLUDE">
<!ENTITY % HTML4.dtd PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN">
%HTML4.dtd;
```

24 Character entity references in HTML 4.0

Contents

1. Introduction to character entity references [p.287]
2. Character entity references for ISO 8859-1 characters [p.287]
    1. The list of characters [p.288]
3. Character entity references for symbols, mathematical symbols, and Greek letters [p.291]
    1. The list of characters [p.292]
4. Character entity references for markup-significant and internationalization characters [p.296]
    1. The list of characters [p.296]

24.1 Introduction to character entity references

A character entity reference is an SGML construct that references a character of the document character set.

This version of HTML supports several sets of character entity references:

- ISO 8859-1 (Latin-1) characters [p.287] In accordance with section 14 of [RFC1866] [p.322] , the set of Latin-1 entities has been extended by this specification to cover the whole right part of ISO-8859-1 (all code positions with the high-order bit set), including the already commonly used , © and ®. The names of the entities are taken from the appendices of SGML (defined in [ISO8879] [p.319]).
- symbols, mathematical symbols, and Greek letters [p.291] . These characters may be represented by glyphs in the Adobe font "Symbol".
- markup-significant and internationalization characters [p.296] (e.g., for bidirectional text).

The following sections present the complete lists of character entity references. Although by convention, [ISO10646] [p.319] names are written with upper case letters, we have converted them to lower case in this specification for reasons of readability.

24.2 Character entity references for ISO 8859-1 characters

The character entity references in this section produce characters whose numeric equivalents should already be supported by conforming HTML 2.0 user agents. Thus, the character entity reference ÷ is a more convenient form than ÷ for obtaining the division sign (÷).

To support these named entities, user agents need only recognize the entity names and convert them to characters that lie within the repertoire of [ISO88591] [p.319] .

Character 65533 (FFFD hexadecimal) is the last valid character in UCS-2. 65534 (FFFE hexadecimal) is unassigned and reserved as the byte-swapped version of ZERO WIDTH NON-BREAKING SPACE for byte-order detection purposes. 65535 (FFFF hexadecimal) is unassigned.

24.2.1 The list of characters

```
<!-- Portions © International Organization for Standardization 1986
     Permission to copy in any form is granted for use with
     conforming SGML systems and applications as defined in
     ISO 8879, provided this notice is included in all copies.
-->
<!-- Character entity set. Typical invocation:
     <!ENTITY % HTMLlat1 PUBLIC
       "-//W3C//ENTITIES Full Latin 1//EN//HTML">
     %HTMLlat1;
-->

<!ENTITY nbsp   CDATA " " -- no-break space = non-breaking space,
                                  U+00A0 ISOnum -->
<!ENTITY iexcl  CDATA "&#161;" -- inverted exclamation mark, U+00A1 ISOnum -->
<!ENTITY cent   CDATA "&#162;" -- cent sign, U+00A2 ISOnum -->
<!ENTITY pound  CDATA "&#163;" -- pound sign, U+00A3 ISOnum -->
<!ENTITY curren CDATA "&#164;" -- currency sign, U+00A4 ISOnum -->
<!ENTITY yen    CDATA "&#165;" -- yen sign = yuan sign, U+00A5 ISOnum -->
<!ENTITY brvbar CDATA "&#166;" -- broken bar = broken vertical bar,
                                  U+00A6 ISOnum -->
<!ENTITY sect   CDATA "&#167;" -- section sign, U+00A7 ISOnum -->
<!ENTITY uml    CDATA "&#168;" -- diaeresis = spacing diaeresis,
                                  U+00A8 ISOdia -->
<!ENTITY copy   CDATA "&#169;" -- copyright sign, U+00A9 ISOnum -->
<!ENTITY ordf   CDATA "&#170;" -- feminine ordinal indicator, U+00AA ISOnum -->
<!ENTITY laquo  CDATA "&#171;" -- left-pointing double angle quotation mark
                                  = left pointing guillemet, U+00AB ISOnum -->
<!ENTITY not    CDATA "&#172;" -- not sign = discretionary hyphen,
                                  U+00AC ISOnum -->
<!ENTITY shy    CDATA "&#173;" -- soft hyphen = discretionary hyphen,
                                  U+00AD ISOnum -->
<!ENTITY reg    CDATA "&#174;" -- registered sign = registered trade mark sign,
                                  U+00AE ISOnum -->
<!ENTITY macr   CDATA "&#175;" -- macron = spacing macron = overline
                                  = APL overbar, U+00AF ISOdia -->
<!ENTITY deg    CDATA "&#176;" -- degree sign, U+00B0 ISOnum -->
<!ENTITY plusmn CDATA "&#177;" -- plus-minus sign = plus-or-minus sign,
                                  U+00B1 ISOnum -->
<!ENTITY sup2   CDATA "&#178;" -- superscript two = superscript digit two
                                  = squared, U+00B2 ISOnum -->
<!ENTITY sup3   CDATA "&#179;" -- superscript three = superscript digit three
                                  = cubed, U+00B3 ISOnum -->
<!ENTITY acute  CDATA "&#180;" -- acute accent = spacing acute,
                                  U+00B4 ISOdia -->
<!ENTITY micro  CDATA "&#181;" -- micro sign, U+00B5 ISOnum -->
<!ENTITY para   CDATA "&#182;" -- pilcrow sign = paragraph sign,
                                  U+00B6 ISOnum -->
<!ENTITY middot CDATA "&#183;" -- middle dot = Georgian comma
                                  = Greek middle dot, U+00B7 ISOnum -->
<!ENTITY cedil  CDATA "&#184;" -- cedilla = spacing cedilla, U+00B8 ISOdia -->
<!ENTITY sup1   CDATA "&#185;" -- superscript one = superscript digit one,
                                  U+00B9 ISOnum -->
<!ENTITY ordm   CDATA "&#186;" -- masculine ordinal indicator,
                                  U+00BA ISOnum -->
```

```
<!ENTITY raquo  CDATA "&#187;" -- right-pointing double angle quotation mark
                                  = right pointing guillemet, U+00BB ISOnum -->
<!ENTITY frac14 CDATA "&#188;" -- vulgar fraction one quarter
                                  = fraction one quarter, U+00BC ISOnum -->
<!ENTITY frac12 CDATA "&#189;" -- vulgar fraction one half
                                  = fraction one half, U+00BD ISOnum -->
<!ENTITY frac34 CDATA "&#190;" -- vulgar fraction three quarters
                                  = fraction three quarters, U+00BE ISOnum -->
<!ENTITY iquest CDATA "&#191;" -- inverted question mark
                                  = turned question mark, U+00BF ISOnum -->
<!ENTITY Agrave CDATA "&#192;" -- latin capital letter A with grave
                                  = latin capital letter A grave,
                                  U+00C0 ISOlat1 -->
<!ENTITY Aacute CDATA "&#193;" -- latin capital letter A with acute,
                                  U+00C1 ISOlat1 -->
<!ENTITY Acirc  CDATA "&#194;" -- latin capital letter A with circumflex,
                                  U+00C2 ISOlat1 -->
<!ENTITY Atilde CDATA "&#195;" -- latin capital letter A with tilde,
                                  U+00C3 ISOlat1 -->
<!ENTITY Auml   CDATA "&#196;" -- latin capital letter A with diaeresis,
                                  U+00C4 ISOlat1 -->
<!ENTITY Aring  CDATA "&#197;" -- latin capital letter A with ring above
                                  = latin capital letter A ring,
                                  U+00C5 ISOlat1 -->
<!ENTITY AElig  CDATA "&#198;" -- latin capital letter AE
                                  = latin capital ligature AE,
                                  U+00C6 ISOlat1 -->
<!ENTITY Ccedil CDATA "&#199;" -- latin capital letter C with cedilla,
                                  U+00C7 ISOlat1 -->
<!ENTITY Egrave CDATA "&#200;" -- latin capital letter E with grave,
                                  U+00C8 ISOlat1 -->
<!ENTITY Eacute CDATA "&#201;" -- latin capital letter E with acute,
                                  U+00C9 ISOlat1 -->
<!ENTITY Ecirc  CDATA "&#202;" -- latin capital letter E with circumflex,
                                  U+00CA ISOlat1 -->
<!ENTITY Euml   CDATA "&#203;" -- latin capital letter E with diaeresis,
                                  U+00CB ISOlat1 -->
<!ENTITY Igrave CDATA "&#204;" -- latin capital letter I with grave,
                                  U+00CC ISOlat1 -->
<!ENTITY Iacute CDATA "&#205;" -- latin capital letter I with acute,
                                  U+00CD ISOlat1 -->
<!ENTITY Icirc  CDATA "&#206;" -- latin capital letter I with circumflex,
                                  U+00CE ISOlat1 -->
<!ENTITY Iuml   CDATA "&#207;" -- latin capital letter I with diaeresis,
                                  U+00CF ISOlat1 -->
<!ENTITY ETH    CDATA "&#208;" -- latin capital letter ETH, U+00D0 ISOlat1 -->
<!ENTITY Ntilde CDATA "&#209;" -- latin capital letter N with tilde,
                                  U+00D1 ISOlat1 -->
<!ENTITY Ograve CDATA "&#210;" -- latin capital letter O with grave,
                                  U+00D2 ISOlat1 -->
<!ENTITY Oacute CDATA "&#211;" -- latin capital letter O with acute,
                                  U+00D3 ISOlat1 -->
<!ENTITY Ocirc  CDATA "&#212;" -- latin capital letter O with circumflex,
                                  U+00D4 ISOlat1 -->
<!ENTITY Otilde CDATA "&#213;" -- latin capital letter O with tilde,
                                  U+00D5 ISOlat1 -->
<!ENTITY Ouml   CDATA "&#214;" -- latin capital letter O with diaeresis,
```

```
                                  U+00D6 ISOlat1 -->
<!ENTITY times  CDATA "&#215;" -- multiplication sign, U+00D7 ISOnum -->
<!ENTITY Oslash CDATA "&#216;" -- latin capital letter O with stroke
                                  = latin capital letter O slash,
                                  U+00D8 ISOlat1 -->
<!ENTITY Ugrave CDATA "&#217;" -- latin capital letter U with grave,
                                  U+00D9 ISOlat1 -->
<!ENTITY Uacute CDATA "&#218;" -- latin capital letter U with acute,
                                  U+00DA ISOlat1 -->
<!ENTITY Ucirc  CDATA "&#219;" -- latin capital letter U with circumflex,
                                  U+00DB ISOlat1 -->
<!ENTITY Uuml   CDATA "&#220;" -- latin capital letter U with diaeresis,
                                  U+00DC ISOlat1 -->
<!ENTITY Yacute CDATA "&#221;" -- latin capital letter Y with acute,
                                  U+00DD ISOlat1 -->
<!ENTITY THORN  CDATA "&#222;" -- latin capital letter THORN,
                                  U+00DE ISOlat1 -->
<!ENTITY szlig  CDATA "&#223;" -- latin small letter sharp s = ess-zed,
                                  U+00DF ISOlat1 -->
<!ENTITY agrave CDATA "&#224;" -- latin small letter a with grave
                                  = latin small letter a grave,
                                  U+00E0 ISOlat1 -->
<!ENTITY aacute CDATA "&#225;" -- latin small letter a with acute,
                                  U+00E1 ISOlat1 -->
<!ENTITY acirc  CDATA "&#226;" -- latin small letter a with circumflex,
                                  U+00E2 ISOlat1 -->
<!ENTITY atilde CDATA "&#227;" -- latin small letter a with tilde,
                                  U+00E3 ISOlat1 -->
<!ENTITY auml   CDATA "&#228;" -- latin small letter a with diaeresis,
                                  U+00E4 ISOlat1 -->
<!ENTITY aring  CDATA "&#229;" -- latin small letter a with ring above
                                  = latin small letter a ring,
                                  U+00E5 ISOlat1 -->
<!ENTITY aelig  CDATA "&#230;" -- latin small letter ae
                                  = latin small ligature ae, U+00E6 ISOlat1 -->
<!ENTITY ccedil CDATA "&#231;" -- latin small letter c with cedilla,
                                  U+00E7 ISOlat1 -->
<!ENTITY egrave CDATA "&#232;" -- latin small letter e with grave,
                                  U+00E8 ISOlat1 -->
<!ENTITY eacute CDATA "&#233;" -- latin small letter e with acute,
                                  U+00E9 ISOlat1 -->
<!ENTITY ecirc  CDATA "&#234;" -- latin small letter e with circumflex,
                                  U+00EA ISOlat1 -->
<!ENTITY euml   CDATA "&#235;" -- latin small letter e with diaeresis,
                                  U+00EB ISOlat1 -->
<!ENTITY igrave CDATA "&#236;" -- latin small letter i with grave,
                                  U+00EC ISOlat1 -->
<!ENTITY iacute CDATA "&#237;" -- latin small letter i with acute,
                                  U+00ED ISOlat1 -->
<!ENTITY icirc  CDATA "&#238;" -- latin small letter i with circumflex,
                                  U+00EE ISOlat1 -->
<!ENTITY iuml   CDATA "&#239;" -- latin small letter i with diaeresis,
                                  U+00EF ISOlat1 -->
<!ENTITY eth    CDATA "&#240;" -- latin small letter eth, U+00F0 ISOlat1 -->
<!ENTITY ntilde CDATA "&#241;" -- latin small letter n with tilde,
                                  U+00F1 ISOlat1 -->
<!ENTITY ograve CDATA "&#242;" -- latin small letter o with grave,
```

```
                                    U+00F2 ISOlat1 -->
<!ENTITY oacute CDATA "&#243;" -- latin small letter o with acute,
                                    U+00F3 ISOlat1 -->
<!ENTITY ocirc  CDATA "&#244;" -- latin small letter o with circumflex,
                                    U+00F4 ISOlat1 -->
<!ENTITY otilde CDATA "&#245;" -- latin small letter o with tilde,
                                    U+00F5 ISOlat1 -->
<!ENTITY ouml   CDATA "&#246;" -- latin small letter o with diaeresis,
                                    U+00F6 ISOlat1 -->
<!ENTITY divide CDATA "&#247;" -- division sign, U+00F7 ISOnum -->
<!ENTITY oslash CDATA "&#248;" -- latin small letter o with stroke,
                                    = latin small letter o slash,
                                    U+00F8 ISOlat1 -->
<!ENTITY ugrave CDATA "&#249;" -- latin small letter u with grave,
                                    U+00F9 ISOlat1 -->
<!ENTITY uacute CDATA "&#250;" -- latin small letter u with acute,
                                    U+00FA ISOlat1 -->
<!ENTITY ucirc  CDATA "&#251;" -- latin small letter u with circumflex,
                                    U+00FB ISOlat1 -->
<!ENTITY uuml   CDATA "&#252;" -- latin small letter u with diaeresis,
                                    U+00FC ISOlat1 -->
<!ENTITY yacute CDATA "&#253;" -- latin small letter y with acute,
                                    U+00FD ISOlat1 -->
<!ENTITY thorn  CDATA "&#254;" -- latin small letter thorn with,
                                    U+00FE ISOlat1 -->
<!ENTITY yuml   CDATA "&#255;" -- latin small letter y with diaeresis,
                                    U+00FF ISOlat1 -->
```

24.3 Character entity references for symbols, mathematical symbols, and Greek letters

The character entity references in this section produce characters that may be represented by glyphs in the widely available Adobe Symbol font, including Greek characters, various bracketing symbols, and a selection of mathematical operators such as gradient, product, and summation symbols.

To support these entities, user agents may support full [ISO10646] [p.319] or use other means. Display of glyphs for these characters may be obtained by being able to display the relevant [ISO10646] [p.319] characters or by other means, such as internally mapping the listed entities, numeric character references, and characters to the appropriate position in some font that contains the requisite glyphs.

When to use Greek entities. *This entity set contains all the letters used in modern Greek. However, it does not include Greek punctuation, precomposed accented characters nor the non-spacing accents (tonos, dialytika) required to compose them. There are no archaic letters, Coptic-unique letters, or precomposed letters for Polytonic Greek. The entities defined here are not intended for the representation of modern Greek text and would not be an efficient representation; rather, they are intended for occasional Greek letters used in technical and mathematical works.*

24.3.1 The list of characters

```
<!-- Mathematical, Greek and Symbolic characters for HTML -->

<!-- Character entity set. Typical invocation:
     <!ENTITY % HTMLsymbol PUBLIC
       "-//W3C//ENTITIES Symbolic//EN//HTML">
     %HTMLsymbol; -->

<!-- Portions © International Organization for Standardization 1986:
     Permission to copy in any form is granted for use with
     conforming SGML systems and applications as defined in
     ISO 8879, provided this notice is included in all copies.
-->

<!-- Relevant ISO entity set is given unless names are newly introduced.
     New names (i.e., not in ISO 8879 list) do not clash with any
     existing ISO 8879 entity names. ISO 10646 character numbers
     are given for each character, in hex. CDATA values are decimal
     conversions of the ISO 10646 values and refer to the document
     character set. Names are Unicode 2.0 names.

-->

<!-- Latin Extended-B -->
<!ENTITY fnof     CDATA "&#402;" -- latin small f with hook = function
                                    = florin, U+0192 ISOtech -->

<!-- Greek -->
<!ENTITY Alpha    CDATA "&#913;" -- greek capital letter alpha, U+0391 -->
<!ENTITY Beta     CDATA "&#914;" -- greek capital letter beta, U+0392 -->
<!ENTITY Gamma    CDATA "&#915;" -- greek capital letter gamma,
                                    U+0393 ISOgrk3 -->
<!ENTITY Delta    CDATA "&#916;" -- greek capital letter delta,
                                    U+0394 ISOgrk3 -->
<!ENTITY Epsilon  CDATA "&#917;" -- greek capital letter epsilon, U+0395 -->
<!ENTITY Zeta     CDATA "&#918;" -- greek capital letter zeta, U+0396 -->
<!ENTITY Eta      CDATA "&#919;" -- greek capital letter eta, U+0397 -->
<!ENTITY Theta    CDATA "&#920;" -- greek capital letter theta,
                                    U+0398 ISOgrk3 -->
<!ENTITY Iota     CDATA "&#921;" -- greek capital letter iota, U+0399 -->
<!ENTITY Kappa    CDATA "&#922;" -- greek capital letter kappa, U+039A -->
<!ENTITY Lambda   CDATA "&#923;" -- greek capital letter lambda,
                                    U+039B ISOgrk3 -->
<!ENTITY Mu       CDATA "&#924;" -- greek capital letter mu, U+039C -->
<!ENTITY Nu       CDATA "&#925;" -- greek capital letter nu, U+039D -->
<!ENTITY Xi       CDATA "&#926;" -- greek capital letter xi, U+039E ISOgrk3 -->
<!ENTITY Omicron  CDATA "&#927;" -- greek capital letter omicron, U+039F -->
<!ENTITY Pi       CDATA "&#928;" -- greek capital letter pi, U+03A0 ISOgrk3 -->
<!ENTITY Rho      CDATA "&#929;" -- greek capital letter rho, U+03A1 -->
<!-- there is no Sigmaf, and no U+03A2 character either -->
<!ENTITY Sigma    CDATA "&#931;" -- greek capital letter sigma,
                                    U+03A3 ISOgrk3 -->
<!ENTITY Tau      CDATA "&#932;" -- greek capital letter tau, U+03A4 -->
<!ENTITY Upsilon  CDATA "&#933;" -- greek capital letter upsilon,
                                    U+03A5 ISOgrk3 -->
```

```
<!ENTITY Phi      CDATA "&#934;" -- greek capital letter phi,
                                    U+03A6 ISOgrk3 -->
<!ENTITY Chi      CDATA "&#935;" -- greek capital letter chi, U+03A7 -->
<!ENTITY Psi      CDATA "&#936;" -- greek capital letter psi,
                                    U+03A8 ISOgrk3 -->
<!ENTITY Omega    CDATA "&#937;" -- greek capital letter omega,
                                    U+03A9 ISOgrk3 -->

<!ENTITY alpha    CDATA "&#945;" -- greek small letter alpha,
                                    U+03B1 ISOgrk3 -->
<!ENTITY beta     CDATA "&#946;" -- greek small letter beta, U+03B2 ISOgrk3 -->
<!ENTITY gamma    CDATA "&#947;" -- greek small letter gamma,
                                    U+03B3 ISOgrk3 -->
<!ENTITY delta    CDATA "&#948;" -- greek small letter delta,
                                    U+03B4 ISOgrk3 -->
<!ENTITY epsilon  CDATA "&#949;" -- greek small letter epsilon,
                                    U+03B5 ISOgrk3 -->
<!ENTITY zeta     CDATA "&#950;" -- greek small letter zeta, U+03B6 ISOgrk3 -->
<!ENTITY eta      CDATA "&#951;" -- greek small letter eta, U+03B7 ISOgrk3 -->
<!ENTITY theta    CDATA "&#952;" -- greek small letter theta,
                                    U+03B8 ISOgrk3 -->
<!ENTITY iota     CDATA "&#953;" -- greek small letter iota, U+03B9 ISOgrk3 -->
<!ENTITY kappa    CDATA "&#954;" -- greek small letter kappa,
                                    U+03BA ISOgrk3 -->
<!ENTITY lambda   CDATA "&#955;" -- greek small letter lambda,
                                    U+03BB ISOgrk3 -->
<!ENTITY mu       CDATA "&#956;" -- greek small letter mu, U+03BC ISOgrk3 -->
<!ENTITY nu       CDATA "&#957;" -- greek small letter nu, U+03BD ISOgrk3 -->
<!ENTITY xi       CDATA "&#958;" -- greek small letter xi, U+03BE ISOgrk3 -->
<!ENTITY omicron  CDATA "&#959;" -- greek small letter omicron, U+03BF NEW -->
<!ENTITY pi       CDATA "&#960;" -- greek small letter pi, U+03C0 ISOgrk3 -->
<!ENTITY rho      CDATA "&#961;" -- greek small letter rho, U+03C1 ISOgrk3 -->
<!ENTITY sigmaf   CDATA "&#962;" -- greek small letter final sigma,
                                    U+03C2 ISOgrk3 -->
<!ENTITY sigma    CDATA "&#963;" -- greek small letter sigma,
                                    U+03C3 ISOgrk3 -->
<!ENTITY tau      CDATA "&#964;" -- greek small letter tau, U+03C4 ISOgrk3 -->
<!ENTITY upsilon  CDATA "&#965;" -- greek small letter upsilon,
                                    U+03C5 ISOgrk3 -->
<!ENTITY phi      CDATA "&#966;" -- greek small letter phi, U+03C6 ISOgrk3 -->
<!ENTITY chi      CDATA "&#967;" -- greek small letter chi, U+03C7 ISOgrk3 -->
<!ENTITY psi      CDATA "&#968;" -- greek small letter psi, U+03C8 ISOgrk3 -->
<!ENTITY omega    CDATA "&#969;" -- greek small letter omega,
                                    U+03C9 ISOgrk3 -->
<!ENTITY thetasym CDATA "&#977;" -- greek small letter theta symbol,
                                    U+03D1 NEW -->
<!ENTITY upsih    CDATA "&#978;" -- greek upsilon with hook symbol,
                                    U+03D2 NEW -->
<!ENTITY piv      CDATA "&#982;" -- greek pi symbol, U+03D6 ISOgrk3 -->

<!-- General Punctuation -->
<!ENTITY bull     CDATA "&#8226;" -- bullet = black small circle,
                                     U+2022 ISOpub  -->
<!-- bullet is NOT the same as bullet operator, U+2219 -->
<!ENTITY hellip   CDATA "&#8230;" -- horizontal ellipsis = three dot leader,
                                     U+2026 ISOpub  -->
<!ENTITY prime    CDATA "&#8242;" -- prime = minutes = feet, U+2032 ISOtech -->
```

```
<!ENTITY Prime    CDATA "&#8243;" -- double prime = seconds = inches,
                                     U+2033 ISOtech -->
<!ENTITY oline    CDATA "&#8254;" -- overline = spacing overscore,
                                     U+203E NEW -->
<!ENTITY frasl    CDATA "&#8260;" -- fraction slash, U+2044 NEW -->

<!-- Letterlike Symbols -->
<!ENTITY weierp   CDATA "&#8472;" -- script capital P = power set
                                     = Weierstrass p, U+2118 ISOamso -->
<!ENTITY image    CDATA "&#8465;" -- blackletter capital I = imaginary part,
                                     U+2111 ISOamso -->
<!ENTITY real     CDATA "&#8476;" -- blackletter capital R = real part symbol,
                                     U+211C ISOamso -->
<!ENTITY trade    CDATA "&#8482;" -- trade mark sign, U+2122 ISOnum -->
<!ENTITY alefsym  CDATA "&#8501;" -- alef symbol = first transfinite cardinal,
                                     U+2135 NEW -->
<!-- alef symbol is NOT the same as hebrew letter alef,
     U+05D0 although the same glyph could be used to depict both characters -->

<!-- Arrows -->
<!ENTITY larr     CDATA "&#8592;" -- leftwards arrow, U+2190 ISOnum -->
<!ENTITY uarr     CDATA "&#8593;" -- upwards arrow, U+2191 ISOnum-->
<!ENTITY rarr     CDATA "&#8594;" -- rightwards arrow, U+2192 ISOnum -->
<!ENTITY darr     CDATA "&#8595;" -- downwards arrow, U+2193 ISOnum -->
<!ENTITY harr     CDATA "&#8596;" -- left right arrow, U+2194 ISOamsa -->
<!ENTITY crarr    CDATA "&#8629;" -- downwards arrow with corner leftwards
                                     = carriage return, U+21B5 NEW -->
<!ENTITY lArr     CDATA "&#8656;" -- leftwards double arrow, U+21D0 ISOtech -->
<!-- Unicode does not say that lArr is the same as the 'is implied by' arrow
    but also does not have any other character for that function. So ? lArr can
    be used for 'is implied by' as ISOtech suggests -->
<!ENTITY uArr     CDATA "&#8657;" -- upwards double arrow, U+21D1 ISOamsa -->
<!ENTITY rArr     CDATA "&#8658;" -- rightwards double arrow,
                                     U+21D2 ISOtech -->
<!-- Unicode does not say this is the 'implies' character but does not have
     another character with this function so ?
     rArr can be used for 'implies' as ISOtech suggests -->
<!ENTITY dArr     CDATA "&#8659;" -- downwards double arrow, U+21D3 ISOamsa -->
<!ENTITY hArr     CDATA "&#8660;" -- left right double arrow,
                                     U+21D4 ISOamsa -->

<!-- Mathematical Operators -->
<!ENTITY forall   CDATA "&#8704;" -- for all, U+2200 ISOtech -->
<!ENTITY part     CDATA "&#8706;" -- partial differential, U+2202 ISOtech  -->
<!ENTITY exist    CDATA "&#8707;" -- there exists, U+2203 ISOtech -->
<!ENTITY empty    CDATA "&#8709;" -- empty set = null set = diameter,
                                     U+2205 ISOamso -->
<!ENTITY nabla    CDATA "&#8711;" -- nabla = backward difference,
                                     U+2207 ISOtech -->
<!ENTITY isin     CDATA "&#8712;" -- element of, U+2208 ISOtech -->
<!ENTITY notin    CDATA "&#8713;" -- not an element of, U+2209 ISOtech -->
<!ENTITY ni       CDATA "&#8715;" -- contains as member, U+220B ISOtech -->
<!-- should there be a more memorable name than 'ni'? -->
<!ENTITY prod     CDATA "&#8719;" -- n-ary product = product sign,
                                     U+220F ISOamsb -->
<!-- prod is NOT the same character as U+03A0 'greek capital letter pi' though
     the same glyph might be used for both -->
```

```
<!ENTITY sum      CDATA "&#8721;" -- n-ary sumation, U+2211 ISOamsb -->
<!-- sum is NOT the same character as U+03A3 'greek capital letter sigma'
     though the same glyph might be used for both -->
<!ENTITY minus    CDATA "&#8722;" -- minus sign, U+2212 ISOtech -->
<!ENTITY lowast   CDATA "&#8727;" -- asterisk operator, U+2217 ISOtech -->
<!ENTITY radic    CDATA "&#8730;" -- square root = radical sign,
                                     U+221A ISOtech -->
<!ENTITY prop     CDATA "&#8733;" -- proportional to, U+221D ISOtech -->
<!ENTITY infin    CDATA "&#8734;" -- infinity, U+221E ISOtech -->
<!ENTITY ang      CDATA "&#8736;" -- angle, U+2220 ISOamso -->
<!ENTITY and      CDATA "&#8743;" -- logical and = wedge, U+2227 ISOtech -->
<!ENTITY or       CDATA "&#8744;" -- logical or = vee, U+2228 ISOtech -->
<!ENTITY cap      CDATA "&#8745;" -- intersection = cap, U+2229 ISOtech -->
<!ENTITY cup      CDATA "&#8746;" -- union = cup, U+222A ISOtech -->
<!ENTITY int      CDATA "&#8747;" -- integral, U+222B ISOtech -->
<!ENTITY there4   CDATA "&#8756;" -- therefore, U+2234 ISOtech -->
<!ENTITY sim      CDATA "&#8764;" -- tilde operator = varies with = similar to,
                                     U+223C ISOtech -->
<!-- tilde operator is NOT the same character as the tilde, U+007E,
     although the same glyph might be used to represent both  -->
<!ENTITY cong     CDATA "&#8773;" -- approximately equal to, U+2245 ISOtech -->
<!ENTITY asymp    CDATA "&#8776;" -- almost equal to = asymptotic to,
                                     U+2248 ISOamsr -->
<!ENTITY ne       CDATA "&#8800;" -- not equal to, U+2260 ISOtech -->
<!ENTITY equiv    CDATA "&#8801;" -- identical to, U+2261 ISOtech -->
<!ENTITY le       CDATA "&#8804;" -- less-than or equal to, U+2264 ISOtech -->
<!ENTITY ge       CDATA "&#8805;" -- greater-than or equal to,
                                     U+2265 ISOtech -->
<!ENTITY sub      CDATA "&#8834;" -- subset of, U+2282 ISOtech -->
<!ENTITY sup      CDATA "&#8835;" -- superset of, U+2283 ISOtech -->
<!-- note that nsup, 'not a superset of, U+2283' is not covered by the Symbol
     font encoding and is not included. Should it be, for symmetry?
     It is in ISOamsn  -->
<!ENTITY nsub     CDATA "&#8836;" -- not a subset of, U+2284 ISOamsn -->
<!ENTITY sube     CDATA "&#8838;" -- subset of or equal to, U+2286 ISOtech -->
<!ENTITY supe     CDATA "&#8839;" -- superset of or equal to,
                                     U+2287 ISOtech -->
<!ENTITY oplus    CDATA "&#8853;" -- circled plus = direct sum,
                                     U+2295 ISOamsb -->
<!ENTITY otimes   CDATA "&#8855;" -- circled times = vector product,
                                     U+2297 ISOamsb -->
<!ENTITY perp     CDATA "&#8869;" -- up tack = orthogonal to = perpendicular,
                                     U+22A5 ISOtech -->
<!ENTITY sdot     CDATA "&#8901;" -- dot operator, U+22C5 ISOamsb -->
<!-- dot operator is NOT the same character as U+00B7 middle dot -->

<!-- Miscellaneous Technical -->
<!ENTITY lceil    CDATA "&#8968;" -- left ceiling = apl upstile,
                                     U+2308 ISOamsc  -->
<!ENTITY rceil    CDATA "&#8969;" -- right ceiling, U+2309 ISOamsc  -->
<!ENTITY lfloor   CDATA "&#8970;" -- left floor = apl downstile,
                                     U+230A ISOamsc  -->
<!ENTITY rfloor   CDATA "&#8971;" -- right floor, U+230B ISOamsc  -->
<!ENTITY lang     CDATA "&#9001;" -- left-pointing angle bracket = bra,
                                     U+2329 ISOtech -->
<!-- lang is NOT the same character as U+003C 'less than'
     or U+2039 'single left-pointing angle quotation mark' -->
```

```
<!ENTITY rang     CDATA "&#9002;" -- right-pointing angle bracket = ket,
                                     U+232A ISOtech -->
<!-- rang is NOT the same character as U+003E 'greater than'
     or U+203A 'single right-pointing angle quotation mark' -->

<!-- Geometric Shapes -->
<!ENTITY loz      CDATA "&#9674;" -- lozenge, U+25CA ISOpub -->

<!-- Miscellaneous Symbols -->
<!ENTITY spades   CDATA "&#9824;" -- black spade suit, U+2660 ISOpub -->
<!-- black here seems to mean filled as opposed to hollow -->
<!ENTITY clubs    CDATA "&#9827;" -- black club suit = shamrock,
                                     U+2663 ISOpub -->
<!ENTITY hearts   CDATA "&#9829;" -- black heart suit = valentine,
                                     U+2665 ISOpub -->
<!ENTITY diams    CDATA "&#9830;" -- black diamond suit, U+2666 ISOpub -->
```

24.4 Character entity references for markup-significant and internationalization characters

The character entity references in this section are for escaping markup-significant characters (these are the same as those in HTML 2.0 and 3.2), for denoting spaces and dashes. Other characters in this section apply to internationalization issues such as the disambiguation of bidirectional text (see the section on bidirectional text for details).

Entities have also been added for the remaining characters occurring in CP-1252 which do not occur in the HTMLlat1 or HTMLsymbol entity sets. These all occur in the 128 to 159 range within the cp-1252 charset. These entities permit the characters to be denoted in a platform-independent manner.

To support these entities, user agents may support full [ISO10646] [p.319] or use other means. Display of glyphs for these characters may be obtained by being able to display the relevant [ISO10646] [p.319] characters or by other means, such as internally mapping the listed entities, numeric character references, and characters to the appropriate position in some font that contains the requisite glyphs.

24.4.1 The list of characters

```
<!-- Special characters for HTML -->

<!-- Character entity set. Typical invocation:
     <!ENTITY % HTMLspecial PUBLIC
       "-//W3C//ENTITIES Special//EN//HTML">
     %HTMLspecial; -->

<!-- Portions © International Organization for Standardization 1986:
     Permission to copy in any form is granted for use with
     conforming SGML systems and applications as defined in
     ISO 8879, provided this notice is included in all copies.
-->

<!-- Relevant ISO entity set is given unless names are newly introduced.
     New names (i.e., not in ISO 8879 list) do not clash with any
     existing ISO 8879 entity names. ISO 10646 character numbers
```

```
     are given for each character, in hex. CDATA values are decimal
     conversions of the ISO 10646 values and refer to the document
     character set. Names are Unicode 2.0 names.

-->

<!-- C0 Controls and Basic Latin -->
<!ENTITY quot    CDATA "&#34;"   -- quotation mark = APL quote,
                                    U+0022 ISOnum -->
<!ENTITY amp     CDATA "&#38;"   -- ampersand, U+0026 ISOnum -->
<!ENTITY lt      CDATA "&#60;"   -- less-than sign, U+003C ISOnum -->
<!ENTITY gt      CDATA "&#62;"   -- greater-than sign, U+003E ISOnum -->

<!-- Latin Extended-A -->
<!ENTITY OElig   CDATA "&#338;"  -- latin capital ligature OE,
                                    U+0152 ISOlat2 -->
<!ENTITY oelig   CDATA "&#339;"  -- latin small ligature oe, U+0153 ISOlat2 -->
<!-- ligature is a misnomer, this is a separate character in some languages -->
<!ENTITY Scaron  CDATA "&#352;"  -- latin capital letter S with caron,
                                    U+0160 ISOlat2 -->
<!ENTITY scaron  CDATA "&#353;"  -- latin small letter s with caron,
                                    U+0161 ISOlat2 -->
<!ENTITY Yuml    CDATA "&#376;"  -- latin capital letter Y with diaeresis,
                                    U+0178 ISOlat2 -->

<!-- Spacing Modifier Letters -->
<!ENTITY circ    CDATA "&#710;"  -- modifier letter circumflex accent,
                                    U+02C6 ISOpub -->
<!ENTITY tilde   CDATA "&#732;"  -- small tilde, U+02DC ISOdia -->

<!-- General Punctuation -->
<!ENTITY ensp    CDATA " " -- en space, U+2002 ISOpub -->
<!ENTITY emsp    CDATA " " -- em space, U+2003 ISOpub -->
<!ENTITY thinsp  CDATA " " -- thin space, U+2009 ISOpub -->
<!ENTITY zwnj    CDATA "&#8204;" -- zero width non-joiner,
                                    U+200C NEW RFC 2070 -->
<!ENTITY zwj     CDATA "&#8205;" -- zero width joiner, U+200D NEW RFC 2070 -->
<!ENTITY lrm     CDATA "&#8206;" -- left-to-right mark, U+200E NEW RFC 2070 -->
<!ENTITY rlm     CDATA "&#8207;" -- right-to-left mark, U+200F NEW RFC 2070 -->
<!ENTITY ndash   CDATA "&#8211;" -- en dash, U+2013 ISOpub -->
<!ENTITY mdash   CDATA "&#8212;" -- em dash, U+2014 ISOpub -->
<!ENTITY lsquo   CDATA "&#8216;" -- left single quotation mark,
                                    U+2018 ISOnum -->
<!ENTITY rsquo   CDATA "&#8217;" -- right single quotation mark,
                                    U+2019 ISOnum -->
<!ENTITY sbquo   CDATA "&#8218;" -- single low-9 quotation mark, U+201A NEW -->
<!ENTITY ldquo   CDATA "&#8220;" -- left double quotation mark,
                                    U+201C ISOnum -->
<!ENTITY rdquo   CDATA "&#8221;" -- right double quotation mark,
                                    U+201D ISOnum -->
<!ENTITY bdquo   CDATA "&#8222;" -- double low-9 quotation mark, U+201E NEW -->
<!ENTITY dagger  CDATA "&#8224;" -- dagger, U+2020 ISOpub -->
<!ENTITY Dagger  CDATA "&#8225;" -- double dagger, U+2021 ISOpub -->
<!ENTITY permil  CDATA "&#8240;" -- per mille sign, U+2030 ISOtech -->
<!ENTITY lsaquo  CDATA "&#8249;" -- single left-pointing angle quotation mark,
                                    U+2039 ISO proposed -->
<!-- lsaquo is proposed but not yet ISO standardised -->
```

```
<!ENTITY rsaquo  CDATA "&#8250;" -- single right-pointing angle quotation mark,
                                    U+203A ISO proposed -->
<!-- rsaquo is proposed but not yet ISO standardised -->
<!ENTITY euro   CDATA "&#8364;"  -- euro sign, U+20AC NEW -->
```

Appendix A: Changes between HTML 3.2 and HTML 4.0

Contents

1. Changes to elements [p.299]
    1. New elements [p.299]
    2. Deprecated elements [p.299]
    3. Obsolete elements [p.299]
2. Changes to Tables [p.299]
3. Changes to Forms [p.300]
4. Changes for internationalization [p.301]

A.1 Changes to elements

A.1.1 New elements

The new elements in this version of HTML are `Q`, `INS`, `DEL`, `ABBR`, `LEGEND`, `COLGROUP`, `BUTTON`, `OPTGROUP`, and `FIELDSET`.

A.1.2 Deprecated elements

The following elements are now deprecated: `ISINDEX`, `APPLET`, `CENTER`, `FONT`, `BASEFONT`, `STRIKE`, `S`, `U`, `DIR`, and `MENU`.

A.1.3 Obsolete elements

The following elements are now obsolete: `XMP`, `PLAINTEXT`, and `LISTING`. For all of them, you should use the `PRE` element instead.

A.2 Changes to Tables

The HTML 4.0 table model has grown out of early work on HTML+ and the initial draft of HTML3.0 [p.321] . The earlier model has been extended in response to requests from information providers for improved control over the presentation of tabular information:

- The ability to align on designated characters such as "." and":"
  (e.g., aligning a column of numbers on the decimal point).
- The need for more flexibility in specifying table frames and rules.
- The need for incremental display of large tables as data is received.
- The ability to support scrollable tables with fixed headers plus better support for breaking tables across pages for printing.
- The need for optional column based defaults for alignment properties

In addition, a major goal has been to provide backwards compatibility with the widely deployed Netscape implementation of tables. Another goal has been to simplify importing tables conforming to the SGML CALS model. The latest draft makes the `align` attribute compatible with the latest versions of the most popular browsers. Some clarifications have been made to the role of the `dir` attribute attribute and recommended behavior when absolute and relative column widths are mixed.

A new element, `COLGROUP`, has been introduced to allow sets of columns to be grouped with different width and alignment properties specified by one or more `COL` elements. The semantics of `COLGROUP` have been clarified over previous drafts, and `rules="basic"` replaced by `rules="groups"`.

The `style` attribute is included as a means for extending the properties associated with edges and interiors of groups of cells. For instance, the line style: dotted, double, thin/thick etc; the color/pattern fill for the interior; cell margins and font information. This will be the subject for a companion specification on style sheets.

The `frame` and `rules` attributes have been modified to avoid SGML name clashes with each other, and to avoid clashes with the `align` and `valign` attributes. These changes were additionally motivated by the desire to avoid future problems if this specification is extended to allow `frame` and `rules` attributes with other table elements.

A.3 Changes to Forms

The forms specified in HTML 3.2 have the following problems:

- There is no provision for keyboard shortcuts for particular actions, for access keys for driving menus, etc.
- Although form controls can be made insensitive dynamically, they cannot be declared as such at initialization time.
- Along the same line form controls, such as form fields, cannot be made "read only".
- Labels for radio buttons and checkboxes are not sensitive, i.e., clicking on a label text doesn’t effect the button state.
- There is no way to markup groups of related form fields in a way that effectively supports browsing with speech-based user agents.
- There is no provision for checking values as they are entered into form fields. All checking is done at the server when the form’s contents are submitted.
- Nothing is provided to specify what type of data file is expected when the user is asked to submit files.
- Forms can only contain the two buttons submit and reset.
- There is no way to specify what character sets the server issuing a form can handle.

To solve these problems this specification introduces several new attributes and elements.

- The `accesskey` attribute provides for specifying direct keyboard access to form fields.
- The `disabled` attribute allows form providers to make a form control initially insensitive.
- And with the additional attribute `readonly`, authors can prohibit changes to a form field.
- The `LABEL` element associates a label with a particular form control. The `FIELDSET` element

groups related fields together and, in association with the LEGEND element, can be used to name the group. Both of these new elements allow better rendering and better interactivity. Speech-based browsers can better describe the form and graphic browsers can make labels sensitive.

- A new set of attributes, including onchange-INPUT, in association with support for scripting languages, allows form providers to verify user-entered data.
- The INPUT element has a new attribute accept that allows authors to specify a list of valid content types or type patterns for the input.
- The new BUTTON element can be used to make richer forms with more than just a submit and a reset button.
- The FORM element includes the attribute accept-charset, modeled on the HTTP "Accept-Charset" header (see [RFC2068] [p.320]). This attribute (first proposed in [RFC1867] [p.320]) may be used to specify a list of character sets acceptable to the server.

A.4 Changes for internationalization

HTML 4.0 takes into account recommendations of [RFC2070] [p.322] for the internationalization of HTML.

Appendix B: Performance, Implementation, and Design Notes

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The following notes are informative, not normative.

B.1 Representing non-ASCII characters in URLs

We recommend the following convention for representing non-ASCII characters in URLs: each character is represented in UTF-8 (see [RFC2044] [p.320]) as one or more bytes and these bytes are then escaped with the URL escaping mechanism (converting each byte to %HH, where HH is the hexadecimal notation of the byte value).

This procedure results in the same syntactically legal URL according to [RFC1738] [p.320] or [RFC2141] [p.320] and independent of the character encoding to which the HTML document carrying the URL may have been transcoded.

Note. *The procedure above doesn't guarantee that UTF-8 can be used in all schemes or on all resources of a scheme. The the producer of a URL (usually the HTML author) is responsible for ensuring that this works for the URL in question, or using another notation (with %HH escapes not corresponding to UTF-8 if necessary) to address the resource in question.*

Note. *Some older user agents trivially process URLs in HTML using the bytes of the character encoding in which the document was received. Some older HTML documents rely on this (illegal) practice and break when transcoded. User agents that want to handle these older documents should, on receiving a URL containing characters outside the legal set, first use the conversion based on UTF-8. Only if the resulting URL does not resolve should they try constructing a URL based on the bytes of the character encoding in which the document was received.*

Note. *The same conversion based on UTF-8 should be applied to anchor names as appearing in the* `name` *attribute of the* `A` *element.*

Note. *The URL that is constructed when a form is submitted may be used as an anchor-style link (e.g., the* `href` *attribute for the* `A` *element). Unfortunately, the use of the "&" character to separate form fields interacts with its use in SGML attribute values to delimit character entity references. For example, to use the URL "http://host/?x=1&y=2" as a linking URL, it must be written <A href="http://host/?x=1&y=2"> or <A href="http://host/?x=1&y=2">. HTTP server implementors, and in particular, CGI implementors are encouraged to support the use of ";" in place of "&" to save authors the trouble of escaping "&" characters in this manner.*

B.2 SGML implementation notes

B.2.1 Line breaks

SGML specifies that a line break immediately following a start tag must be ignored, as must a line break immediately before an end tag. This applies to all HTML elements without exception. Thus, the following two examples must be rendered identically:

The following three HTML examples should be rendered identically:

```
<P>Thomas is watching TV.</P>

<P>
Thomas is watching TV.
</P>
```

So must the following two examples:

```
<A>My favorite Website</A>

<A>
My favorite Website
</A>
```

B.2.2 SGML features with limited support

SGML systems conforming to [ISO8879] [p.319] are expected to recognize a number of features that aren't widely supported by HTML user agents. We recommend that authors avoid using all of these features.

B.2.3 Boolean attributes

Authors should be aware than many user agents only recognize the minimized form of boolean attributes and not the full form.

For instance, authors may want to specify:

```
<OPTION selected>
```

instead of

```
<OPTION selected="selected">
```

B.2.4 Marked Sections

Marked sections play a role similar to the #ifdef construct recognized by C preprocessors.

```
<![INCLUDE[
 <!-- this will be included -->
]]>

<![IGNORE[
 <!-- this will be ignored -->
]]>
```

SGML also defines the use of marked sections for CDATA content, within which "<" is not treated as the start of a tag, e.g.,

```
<![CDATA[
 <an> example of <sgml> markup that is
 not <painful> to write with < and such.
]]>
```

The telltale sign that a user agent doesn't recognize a marked section is the appearance of "]]>", which is seen when the user agent mistakenly uses the first ">" character as the end of the tag starting with "<![".

B.2.5 Processing Instructions

Processing instructions are a mechanism to capture platform-specific idioms. A processing instruction begins with <? and ends with >

```
<?instruction >
```

For example:

```
<?>
<?style tt = font courier>
<?page break>
<?experiment> ... <?/experiment>
```

Authors should be aware that many user agents render processing instructions as part of the document's text.

B.2.6 Shorthand markup

Some SGML SHORTTAG constructs save typing but add no expressive capability to the SGML application. Although these constructs technically introduce no ambiguity, they reduce the robustness of documents, especially when the language is enhanced to include new elements. Thus, while SHORTTAG constructs of SGML related to attributes are widely used and implemented, those related to elements are not. Documents that use them are conforming SGML documents, but are unlikely to work with many existing HTML tools.

The SHORTTAG constructs in question are the following:

- NET tags
  `<name/.../`
- closed Start Tag
  `<name1<name2>`
- Empty Start Tag
  `<>`
- Empty End Tag
  `</>`

B.3 Notes on helping search engines index your Web site

This section provides some simple suggestions that will make your documents more accessible to search engines.

Define the document language
: In the global context of the Web it is important to know which human language a page was written in. This is discussed in the section on language information.

Specify language variants of this document
: If you have prepared translations of this document into other languages, you should use the `LINK` element to reference these. This allows an indexing engine to offer users search results in the user's preferred language, regardless of how the query was written. For instance, the following links offer French and German alternatives to a search engine:

```
<LINK rel="alternate"
         type="text/html"
         href="mydoc-fr.html" hreflang="fr"
         lang="fr" title="La vie souterraine">
<LINK rel="alternate"
         type="text/html"
         href="mydoc-de.html" hreflang="de"
         lang="de" title="Das Leben im Untergrund">
```

Provide keywords and descriptions

Some indexing engines look for `META` elements that define a comma-separated list of keywords/phrases, or that give a short description. Search engines may present these keywords as the result of a search. The value of the `name` attribute sought by a search attribute is not defined by this specification. Consider these examples,

```
 <META name="keywords" content="vacation,Greece,sunshine">
 <META name="description" content="Idyllic European vacations">
```

Indicate the beginning of a collection

Collections of word processing documents or presentations are frequently translated into collections of HTML documents. It is helpful for search results to reference the beginning of the collection in addition to the page hit by the search. You may help search engines by using the `LINK` element with **rel="begin"** along with a `TITLE`, as in:

```
<LINK rel="begin"
         type="text/html"
         href="page1.html"
         title="General Theory of Relativity">
```

Provide robots with indexing instructions

People may be surprised to find that their site has been indexed by an indexing robot and that the robot should not have been permitted to visit a sensitive part of the site. Many Web robots offer facilities for Web site administrators and content providers to limit what the robot does. This is achieved through two mechanisms: a "robots.txt" file and the `META` element in HTML documents, described below.

B.3.1 Search robots

The robots.txt file

When a Robot visits a Web site, say http://www.foobar.com/, it firsts checks for http://www.foobar.com/robots.txt. If it can find this document, it will analyze its contents to see if it is allowed to retrieve the document. You can customize the robots.txt file to apply only to specific robots, and to disallow access to specific directories or files.

Here is a sample robots.txt file that prevents all robots from visiting the entire site

```
User-agent: *    # applies to all robots
Disallow: /      # disallow indexing of all pages
```

The Robot will simply look for a "/robots.txt" URL on your site, where a site is defined as a HTTP server running on a particular host and port number. Here are some sample locations for `robots.txt`:

Site URL	URL for **`robots.txt`**
http://www.w3.org/	http://www.w3.org/robots.txt
http://www.w3.org:80/	http://www.w3.org:80/robots.txt
http://www.w3.org:1234/	http://www.w3.org:1234/robots.txt
http://w3.org/	http://w3.org/robots.txt

There can only be a single "/robots.txt" on a site. Specifically, you should not put "robots.txt" files in user directories, because a robot will never look at them. If you want your users to be able to create their own "robots.txt", you will need to merge them all into a single "/robots.txt". If you don't want to do this your users might want to use the Robots META Tag instead.

Some tips: URL's are case-sensitive, and "/robots.txt" string must be all lower-case. Blank lines are not permitted.

There must be exactly one "User-agent" field. The robot should be liberal in interpreting this field. A case-insensitive substring match of the name without version information is recommended.

If the value is "*", the record describes the default access policy for any robot that has not matched any of the other records. It is not allowed to have multiple such records in the "/robots.txt" file.

The "Disallow" field specifies a partial URL that is not to be visited. This can be a full path, or a partial path; any URL that starts with this value will not be retrieved. For example,

```
Disallow: /help disallows both /help.html and /help/index.html, whereas
Disallow: /help/ would disallow /help/index.html but allow /help.html.
```

An empty value for "Disallow", indicates that all URLs can be retrieved. At least one "Disallow" field must be present in the robots.txt file.

Robots and the META element

The `META` element allows HTML authors to tell visiting robots whether a document may be indexed, or used to harvest more links. No server administrator action is required.

In the following example a robot should neither index this document, nor analyze it for links.

```
<META name="ROBOTS" content="NOINDEX, NOFOLLOW">
```

The list of terms in the content is `ALL`, `INDEX`, `NOFOLLOW`, `NOINDEX`. The name and the content attribute values are case-insensitive.

Note: In early 1997 only a few robots implement this, but this is expected to change as more public attention is given to controlling indexing robots.

B.4 Notes on tables

B.4.1 Design rationale

The HTML table model has evolved from studies of existing SGML tables models, the treatment of tables in common word processing packages, and a wide range of tabular layout techniques in magazines, books and other paper-based documents. The model was chosen to allow simple tables to be expressed simply with extra complexity available when needed. This makes it practical to create the markup for HTML tables with everyday text editors and reduces the learning curve for getting started. This feature has been very important to the success of HTML to date.

Increasingly, people are creating tables by converting from other document formats or by creating them directly with WYSIWYG editors. It is important that the HTML table model fit well with these authoring tools. This affects how the cells that span multiple rows or columns are represented, and how alignment and other presentation properties are associated with groups of cells.

Dynamic reformatting

A major consideration for the HTML table model is that the author does not control how a user will size a table, what fonts he or she will use, etc. This makes it risky to rely on column widths specified in terms of absolute pixel units. Instead, tables must be able to change sizes dynamically to match the current window size and fonts. Authors can provide guidance as to the relative widths of columns, but user agents should ensure that columns are wide enough to render the width of the largest element of the cell's content. If the author's specification must be overridden, relative widths of individual columns should not be changed drastically.

Incremental display

For large tables or slow network connections, incremental table display is important to user satisfaction. User agents should be able to begin displaying a table before all of the data has been received. The default window width for most user agents shows about 80 characters, and the graphics for many HTML pages are designed with these defaults in mind. By specifying the number of columns, and including provision for control of table width and the widths of different columns, authors can give hints to user agents that allow the incremental display of table contents.

For incremental display, the browser needs the number of columns and their widths. The default width of the table is the current window size (`width="100%"`). This can be altered by setting the `width-TABLE` attribute of the `TABLE` element. By default, all columns have the same width, but you can specify column widths with one or more `COL` elements before the table data starts.

The remaining issue is the number of columns. Some people have suggested waiting until the first row of the table has been received, but this could take a long time if the cells have a lot of content. On the whole it makes more sense, when incremental display is desired, to get authors to explicitly specify the number of columns in the `TABLE` element.

Authors still need a way of telling user agents whether to use incremental display or to size the table automatically to fit the cell contents. In the two pass auto-sizing mode, the number of columns is determined by the first pass. In the incremental mode, the number of columns must be stated up front. It makes more sense to set the `cols` attribute to the number of columns rather than using some "layout" attribute (e.g., layout="fixed" or layout="auto").

Structure and presentation

HTML distinguishes structural markup such as paragraphs and quotations from rendering idioms such as margins, fonts, colors, etc. How does this distinction affect tables? From the purist's point of view, the alignment of text within table cells and the borders between cells is a rendering issue, not one of structure. In practice, though, it is useful to group these with the structural information, as these features are highly portable from one application to the next. The HTML table model leaves most rendering information to associated style sheets. The model presented in this specification is designed to take advantage of such style sheets but not to require them.

Current desktop publishing packages provide very rich control over the rendering of tables, and it would be impractical to reproduce this in HTML, without making HTML into a bulky rich text format like RTF or MIF. This specification does, however, offer authors the ability to choose from a set of commonly used classes of border styles. The `frame` attribute controls the appearance of the border frame around the table while the `rules` attribute determines the choice of rulings within the table. A finer level of control will be supported via rendering annotations. The `style` attribute can be used for specifying rendering information for individual elements. Further rendering information can be given with the `STYLE` element in the document head or via linked style sheets.

During the development of this specification, a number of avenues were investigated for specifying the ruling patterns for tables. One issue concerns the kinds of statements that can be made. Including support for edge subtraction as well as edge addition leads to relatively complex algorithms. For instance, work on allowing the full set of table elements to include the `frame` and `rules` attributes led to an algorithm involving some 24 steps to determine whether a particular edge of a cell should be ruled or not. Even this additional complexity doesn't provide enough rendering control to meet the full range of needs for tables. The current specification deliberately sticks to a simple intuitive model, sufficient for most purposes. Further experimental work is needed before a more complex approach is standardized.

Row and column groups

This specification provides a superset of the simpler model presented in earlier work on HTML+. Tables are considered as being formed from an optional caption together with a sequence of rows, which in turn consist of a sequence of table cells. The model further differentiates header and data cells, and allows cells to span multiple rows and columns.

Following the CALS table model (see [CALS] [p.321]), this specification allows table rows to be grouped into head and body and foot sections. This simplifies the representation of rendering information and can be used to repeat table head and foot rows when breaking tables across page boundaries, or to provide fixed headers above a scrollable body panel. In the markup, the foot section is placed before the body sections. This is an optimization shared with CALS for dealing with very long tables. It allows the foot to be rendered without having to wait for the entire table to be processed.

Accessibility

For the visually impaired, HTML offers the hope of setting to rights the damage caused by the adoption of windows based graphical user interfaces. The HTML table model includes attributes for labeling each cell, to support high quality text to speech conversion. The same attributes can also be used to support automated import and export of table data to databases or spreadsheets.

B.4.2 Recommended Layout Algorithms

If the `cols` attribute on the `TABLE` element specifies the number of columns, then the table may be rendered using a fixed layout, otherwise the autolayout algorithm described below should be used.

If the `width` attribute is not specified, visual user agents should assume a default value of `100%` for formatting.

It is recommended that user agents increase table widths beyond the value specified by `width` in cases when cell contents would otherwise overflow. User agents that override the specified width should do so within reason. User agents may elect to split words across lines to avoid the need for excessive horizontal scrolling or when such scrolling is impractical or undesired.

For the purposes of layout, user agents should consider that table captions (specified by the `CAPTION` element) behave like cells. Each caption is a cell that spans all of the table's columns if at the top or bottom of the table, and rows if at the left or right side of the table.

Fixed Layout Algorithm

For this algorithm, it is assumed that the number of columns is known. The column widths by default should be set to the same size. Authors may override this by specifying relative or absolute column widths, using the `COLGROUP` or `COL` elements. The default table width is the space between the current left and right margins, but may be overridden by the `width` attribute on the `TABLE` element, or determined from absolute column widths. To deal with mixtures of absolute and relative column widths, the first step is to allocate space from the table width to columns with absolute widths. After this, the space remaining is divided up between the columns with relative widths.

The table syntax alone is insufficient to guarantee the consistency of attribute values. For instance, the number of columns specified by the `cols` attribute may be inconsistent with the number of columns implied by the `COL` elements. This in turn, may be inconsistent with the number of columns implied by the table cells. A further problem occurs when the columns are too narrow to avoid overflow of cell contents. The width of the table as specified by the `TABLE` element or `COL` elements may result in overflow of cell contents. It is recommended that user agents attempt to recover gracefully from these situations, e.g., by hyphenating words and resorting to splitting words if hyphenation points are unknown.

In the event that an indivisible element causes cell overflow, the user agent may consider adjusting column widths and re-rendering the table. In the worst case, clipping may be considered if column width adjustments and/or scrollable cell content are not feasible. In any case, if cell content is split or clipped this should be indicated to the user in an appropriate manner.

Autolayout Algorithm

If the `COLS` attribute is missing from the table start tag, then the user agent should use the following autolayout algorithm. It uses two passes through the table data and scales linearly with the size of the table.

In the first pass, line wrapping is disabled, and the user agent keeps track of the minimum and maximum width of each cell. The maximum width is given by the widest line. Since line wrap has been disabled, paragraphs are treated as long lines unless broken by `BR` elements. The minimum width is given by the widest text element (word, image, etc.) taking into account leading indents and list bullets, etc. In other words, it is necessary to determine the minimum width a cell would require in a window of its own before the cell begins to overflow. Allowing user agents to split words will minimize the need for horizontal scrolling or in the worst case, clipping the cell contents.

This process also applies to any nested tables occurring in cell content. The minimum and maximum widths for cells in nested tables are used to determine the minimum and maximum widths for these tables and hence for the parent table cell itself. The algorithm is linear with aggregate cell content, and broadly speaking, independent of the depth of nesting.

To cope with character alignment of cell contents, the algorithm keeps three running min/max totals for each column: Left of align char, right of align char and unaligned. The minimum width for a column is then: `max(min_left + min_right, min_non-aligned)`.

The minimum and maximum cell widths are then used to determine the corresponding minimum and maximum widths for the columns. These in turn, are used to find the minimum and maximum width for the table. Note that cells can contain nested tables, but this doesn’t complicate the code significantly. The next step is to assign column widths according to the available space (i.e., the space between the current left and right margins).

For cells that span multiple columns, a simple approach consists of apportioning the min/max widths evenly to each of the constituent columns. A slightly more complex approach is to use the min/max widths of unspanned cells to weight how spanned widths are apportioned. Experiments suggest that a blend of the two approaches gives good results for a wide range of tables.

The table borders and intercell margins need to be included in assigning column widths. There are three cases:

1. **The minimum table width is equal to or wider than the available space.** In this case, assign the minimum widths and allow the user to scroll horizontally. For conversion to braille, it will be necessary to replace the cells by references to notes containing their full content. By convention these appear before the table.
2. **The maximum table width fits within the available space.** In this case, set the columns to their maximum widths.
3. **The maximum width of the table is greater than the available space, but the minimum table width is smaller.** In this case, find the difference between the available space and the minimum table width, lets call it **W**. Lets also call **D** the difference between maximum and minimum width of the table.

   For each column, let **d** be the difference between maximum and minimum width of that column. Now set the column's width to the minimum width plus **d** times **W** over **D**. This makes columns with large differences between minimum and maximum widths wider than columns with smaller differences.

This assignment step is then repeated for nested tables using the minimum and maximum widths derived for all such tables in the first pass. In this case, the width of the parent table cell plays the role of the current window size in the above description. This process is repeated recursively for all nested tables. The topmost table is then rendered using the assigned widths. Nested tables are subsequently rendered as part of the parent table's cell contents.

If the table width is specified with the `width` attribute, the user agent attempts to set column widths to match. The `width` attribute is not binding if this results in columns having less than their minimum (i.e., indivisible) widths.

If relative widths are specified with the `COL` element, the algorithm is modified to increase column widths over the minimum width to meet the relative width constraints. The `COL` elements should be taken as hints only, so columns shouldn't be set to less than their minimum width. Similarly, columns shouldn't be made so wide that the table stretches well beyond the extent of the window. If a `COL` element specifies a relative width of zero, the column should always be set to its minimum width.

When using the two pass layout algorithm, the default alignment position in the absence of an explicit or inherited `charoff` attribute can be determined by choosing the position that would center lines for which the widths before and after the alignment character are at the maximum values for any of the lines in the column for which `align="char"`. For incremental table layout the suggested default is `charoff="50%"`. If several cells in different rows for the same column use character alignment, then by default, all such cells should line up, regardless of which character is used for alignment. Rules for handling objects too large for column apply when the explicit or implied alignment results in a situation where the data exceeds the assigned width of the column.

Choice of attribute names. *It would have been preferable to choose values for the `frame` attribute consistent with the `rules` attribute and the values used for alignment. For instance: `none, top, bottom, topbot, left, right, leftright, all`. Unfortunately, SGML requires*

enumerated attribute values to be unique for each element, independent of the attribute name. This causes immediate problems for "none", "left", "right" and "all". The values for the `frame` *attribute have been chosen to avoid clashes with the* `rules`*,* `align` *and* `valign=COLGROUP` *attributes. This provides a measure of future proofing, as it is anticipated that the* `frame` *and* `rules` *attributes will be added to other table elements in future revisions to this specification. An alternative would be to make* `frame` *a CDATA attribute. The consensus of the W3C HTML Working Group was that the benefits of being able to use SGML validation tools to check attributes based on enumerated values outweighs the need for consistent names.*

B.5 Notes on forms

B.5.1 Incremental display

The incremental display of documents being received from the network gives rise to certain problems with respect to forms. User agents should prevent forms from being submitted until all of the form's elements have been received.

The incremental display of documents raises some issues with respect to tabbing navigation. The heuristic of giving focus to the lowest valued `tabindex` in the document seems reasonable enough at first glance. However this implies having to wait until all of the document's text is received, since until then, the lowest valued `tabindex` may still change. If the user hits the tab key before then, it is reasonable for user agents to move the focus to the lowest currently available `tabindex`.

If forms are associated with client-side scripts, there is further potential for problems. For instance, a script handler for a given field may refer to a field that doesn't yet exist.

B.5.2 Future projects

This specification defines a set of elements and attributes powerful enough to fulfill the general need for producing forms. However there is still room for many possible improvements. For instance the following problems could be addressed in the future:

- The range of form field types is too limited in comparison with modern user interfaces. For instance there is no provision for tabular data entry, sliders or multiple page layouts.
- Servers cannot update the fields in a submitted form and instead have to send a complete HTML document causing screen flicker.
- These also cause problems for speech based browsers, making it difficult for the visually impaired to interact with HTML forms.

Another possible extension would be to add the `usemap` attribute to `INPUT` for use as as client-side image map when "`type`=image". The `AREA` element corresponding to the location clicked would contribute the value to be passed to the server. To avoid the need to modify server scripts, it may be appropriate to extend `AREA` to provide x and y values for use with the `INPUT` element.

B.6 Notes on scripting

B.6.1 Reserved syntax for future script macros

This specification reserves syntax for the future support of script macros in HTML CDATA attributes. The intention is to allow attributes to be set depending on the properties of objects that appear earlier on the page. The syntax is:

```
attribute = "... &{ macro body }; ... "
```

Current Practice for Script Macros

The macro body is made up of one or more statements in the default scripting language (as per intrinsic event attributes). The semicolon following the right brace is always needed, as otherwise the right brace character "}" is treated as being part of the macro body. Its also worth noting that quote marks are always needed for attributes containing script macros.

The processing of CDATA attributes proceeds as follows:

1. The SGML parser evaluates any SGML entities (e.g., ">").
2. Next the script macros are evaluated by the script engine.
3. Finally the resultant character string is passed to the application for subsequent processing.

Macro processing takes place when the document is loaded (or reloaded) but does not reoccur when the document is resized, repainted, etc.

DEPRECATED EXAMPLE:
Here are some examples using JavaScript. The first one randomizes the document background color:

```
<BODY bgcolor='&{randomrbg()};'>
```

Perhaps you want to dim the background for evening viewing:

```
<BODY bgcolor='&{if(Date.getHours > 18)...};'>
```

The next example uses JavaScript to set the coordinates for a client-side image map:

```
<MAP NAME=foo>
   <AREA shape="rect" coords="&{myrect(imageurl)};" href="&{myurl};" alt="">
 </MAP>
```

This example sets the size of an image based upon document properties:

```
<IMG src="bar.gif" width='&{document.banner.width/2};' height='50%' alt="banner">
```

You can set the URL for a link or image by script:

```
<SCRIPT type="text/javascript">
  function manufacturer(widget) {
      ...
  }
  function location(manufacturer) {
      ...
  }
  function logo(manufacturer) {
      ...
  }
</SCRIPT>
 <A href='&{location(manufacturer("widget"))};'>widget</A>
 <IMG src='&{logo(manufacturer("widget"))};' alt="logo">
```

This last example shows how SGML CDATA attributes can be quoted using single or double quote marks. If you use single quotes around the attribute string then you can include double quote marks as part of the attribute string. Another approach is use " for double quote marks:

```
<IMG src="&{logo(manufacturer(&quot;widget&quot;))};" alt="logo">
```

B.7 Notes on frames

B.7.1 Frame target algorithm

Since there is no guarantee that a frame target name is unique, it is appropriate to describe the current practice in finding a frame given a target name:

1. If the target name is a reserved word as described in the normative text, apply it as described.
2. Otherwise, perform a depth-first search of the frame hierarchy in the window that contained the link. Use the first frame whose name is an exact match.
3. If no such frame was found in (2), apply step 2 to each window, in a front-to-back ordering. Stop as soon as you encounter a frame with exactly the same name.
4. If no such frame was found in (3), create a new window and assign it the target name.

B.8 Notes on accessibility

B.8.1 Generating alternate text

When an author does not set the `alt` attribute for the `IMG` or `APPLET` elements, user agents should supply the alternate text, calculated in the following order:

1. If the `title` has been specified, its value should be used as alternate text.
2. Otherwise, if HTTP headers provide title information when the included object is retrieved, this information should be used as alternate text.
3. Otherwise, if the included object contains text fields (e.g., GIF images contain some text fields),

information extracted from the text fields should be used as alternate text. Since user agents may have to retrieve an entire object first in order to extract textual information, user agents may adopt more economical approaches (e.g., content negotiation).

4. Otherwise, in the absence of other information, user agents should use the file name (minus the extension) as alternate text.

When an author does not set the `alt` attribute for the `INPUT` element, user agents should supply the alternate text, calculated in the following order:

1. If the `title` has been specified, its value should be used as alternate text.
2. Otherwise, if the `name` has been specified, its value should be used as alternate text.
3. Otherwise (submit and reset buttons), the value of the `type` attribute should be used as alternate text.

B.9 Notes on security

Anchors, embedded images, and all other elements that contain URLs as parameters may cause the URL to be dereferenced in response to user input. In this case, the security issues of [RFC1738] [p.320] should be considered. The widely deployed methods for submitting form requests -- HTTP and SMTP -- provide little assurance of confidentiality. Information providers who request sensitive information via forms -- especially with the `INPUT` element, `type`="password" -- should be aware and make their users aware of the lack of confidentiality.

References

Contents

1. Normative references [p.319]
2. Informative references [p.321]

Normative references

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Index of Elements

*Legend: **O**ptional, **F**orbidden, **E**mpty, **D**eprecated, **L**oose DTD, **F**rameset DTD*

Name	Start Tag	End Tag	Empty	Depr.	DTD	Description
A						anchor
ABBR						abbreviated form (e.g., WWW, HTTP, etc.)
ADDRESS						information on author
APPLET				D	L	Java applet
AREA		F	E			client-side image map area
B						bold text style
BASE		F	E			document base URL
BASEFONT		F	E	D	L	base font size
BDO						I18N BiDi over-ride
BIG						large text style
BLOCKQUOTE						long quotation
BODY	O	O				document body
BR		F	E			forced line break
BUTTON						push button
CAPTION						table caption
CENTER				D	L	shorthand for DIV with align=center
CITE						citation
CODE						computer code fragment
COL		F	E			table column
COLGROUP		O				table column group
DD		O				definition description
DEL						deleted text
DFN						instance definition

DIR				D	L	directory list
DIV						generic language/style container
DL						definition list
DT		O				definition term
EM						emphasis
FIELDSET						form control group
FONT				D	L	local change to font
FORM						interactive form
FRAME		F	E		F	subwindow
FRAMESET					F	window subdivision
H1						heading
H2						heading
H3						heading
H4						heading
H5						heading
H6						heading
HEAD	O	O				document head
HR		F	E			horizontal rule
HTML	O	O				document root element
I						italic text style
IFRAME					L	inline subwindow
IMG		F	E			Embedded image
INPUT		F	E			form control
INS						inserted text
ISINDEX		F	E	D	L	single line prompt
KBD						text to be entered by the user
LABEL						form field label text
LEGEND						fieldset legend

LI		O				list item
LINK		F	E			a media-independent link
MAP						client-side image map
MENU				D	L	menu list
META		F	E			generic metainformation
NOFRAMES					F	alternate content container for non frame-based rendering
NOSCRIPT						alternate content container for non script-based rendering
OBJECT						generic embedded object
OL						ordered list
OPTGROUP						option group
OPTION		O				selectable choice
P		O				paragraph
PARAM		F	E			named property value
PRE						preformatted text
Q						short inline quotation
S				D	L	sstrike-through text style
SAMP						sample program output, scripts, etc.
SCRIPT						script statements
SELECT						option selector
SMALL						small text style
SPAN						generic language/style container
STRIKE				D	L	strike-through text
STRONG						strong emphasis
STYLE						style info
SUB						subscript
SUP						superscript
TABLE						

TBODY	O	O				table body
TD		O				table data cell
TEXTAREA						multi-line text field
TFOOT		O				table footer
TH		O				table header cell
THEAD		O				table header
TITLE						document title
TR		O				table row
TT						teletype or monospaced text style
U				D	L	underlined text style
UL						unordered list
VAR						instance of a variable or program argument

Index of Attributes

*Legend: **D**eprecated, **L**oose DTD, **F**rameset DTD*

Name	Related Elements	Type	Default	Depr.	DTD	Comment	
abbr	TD, TH	%Text;	#IMPLIED			abbreviation for header cell	
accept-charset	FORM	%Charsets;	#IMPLIED			list of supported charsets	
accept	INPUT	%ContentTypes;	#IMPLIED			list of MIME types for file upload	
accesskey	A, AREA, BUTTON, INPUT, LABEL, LEGEND	%Character;	#IMPLIED			accessibility key character	
action	FORM	%URL;	#REQUIRED			server-side form handler	
align	CAPTION	%CAlign;	#IMPLIED	D	L	relative to table	
align	APPLET, IFRAME, IMG, INPUT, OBJECT	%IAlign;	#IMPLIED	D	L	vertical or horizontal alignment	
align	LEGEND	%LAlign;	#IMPLIED	D	L	relative to fieldset	
align	TABLE	%TAlign;	#IMPLIED	D	L	table position relative to window	
align	HR	(left | center | right)	#IMPLIED	D	L		
align	DIV, H1, H2, H3, H4, H5, H6, P	(left | center | right | justify)	#IMPLIED	D	L	align, text alignment	
align	COL, COLGROUP, TBODY, TD, TFOOT, TH, THEAD, TR	(left | center | right | justify | char)	#IMPLIED				

alink	BODY	%Color;	#IMPLIED	D	L	color of selected links	
alt	APPLET	%Text;	#IMPLIED	D	L	short description	
alt	AREA, IMG	%Text;	#REQUIRED			short description	
alt	INPUT	CDATA	#IMPLIED			short description	
archive	OBJECT	%URL;	#IMPLIED			space separated archive list	
archive	APPLET	CDATA	#IMPLIED	D	L	comma separated archive list	
axis	TD, TH	CDATA	#IMPLIED			names groups of related headers	
background	BODY	%URL;	#IMPLIED	D	L	texture tile for document background	
bgcolor	TABLE	%Color;	#IMPLIED	D	L	background color for cells	
bgcolor	TR	%Color;	#IMPLIED	D	L	background color for row	
bgcolor	TD, TH	%Color;	#IMPLIED	D	L	cell background color	
bgcolor	BODY	%Color;	#IMPLIED	D	L	document background color	
border	IMG, OBJECT	%Length;	#IMPLIED	D	L	link border width	
border	TABLE	CDATA	#IMPLIED			controls frame width around table	
cellpadding	TABLE	%Length;	#IMPLIED			spacing within cells	
cellspacing	TABLE	%Length;	#IMPLIED			spacing between cells	
char	COL, COLGROUP, TBODY, TD, TFOOT, TH, THEAD, TR	%Character;	#IMPLIED			alignment char, e.g. char=’:’	

charoff	COL, COLGROUP, TBODY, TD, TFOOT, TH, THEAD, TR	%Length;	#IMPLIED			offset for alignment char	
charset	A, DIV, LINK, SCRIPT, SPAN	%Charset;	#IMPLIED			char encoding of linked resource	
checked	INPUT	(checked)	#IMPLIED			for radio buttons and check boxes	
cite	BLOCKQUOTE, Q	%URL;	#IMPLIED			URL for source document or msg	
cite	DEL, INS	%URL;	#IMPLIED			info on reason for change	
class	All elements but BASE, BASEFONT, HEAD, HTML, META, PARAM, SCRIPT, STYLE, TITLE	CDATA	#IMPLIED			space separated list of classes	
classid	OBJECT	%URL;	#IMPLIED			identifies an implementation	
clear	BR	(left | all | right | none)	none	D	L	control of text flow	
code	APPLET	CDATA	#IMPLIED	D	L	applet class file	
codebase	OBJECT	%URL;	#IMPLIED			base URL for classid, data, archive	
codebase	APPLET	%URL;	#IMPLIED	D	L	optional base URL for applet	
codetype	OBJECT	%ContentType;	#IMPLIED			content type for code	
color	BASEFONT, FONT	%Color;	#IMPLIED	D	L	"#RRGGBB" in hex, e.g. red: "#FF0000"	
cols	FRAMESET	%MultiLengths;	#IMPLIED		F	list of lengths. Default: 100% (1 col)	
cols	TEXTAREA	NUMBER	#REQUIRED				

colspan	TD, TH	NUMBER	1			number of cols spanned by cell	
compact	DIR, MENU	(compact)	#IMPLIED	D	L		
compact	DL, OL, UL	(compact)	#IMPLIED	D	L	reduced interitem spacing	
content	META	CDATA	#REQUIRED			associated information	
coords	AREA	%Coords;	#IMPLIED			comma separated list of lengths	
coords	A	%Coords;	#IMPLIED			for use with OBJECT SHAPES	
data	OBJECT	%URL;	#IMPLIED			reference to object's data	
datetime	DEL, INS	%Datetime;	#IMPLIED			date and time of change	
declare	OBJECT	(declare)	#IMPLIED			declare but don't instantiate flag	
defer	SCRIPT	(defer)	#IMPLIED			UA may defer execution of script	
dir	All elements but APPLET, BASE, BASEFONT, BDO, BR, FRAME, FRAMESET, HR, IFRAME, PARAM, SCRIPT	(ltr | rtl)	#IMPLIED			direction for weak/neutral text	
dir	BDO	(ltr | rtl)	#REQUIRED			directionality	
disabled	BUTTON, INPUT, OPTGROUP, OPTION, SELECT, TEXTAREA	(disabled)	#IMPLIED			control is unavailable in this context	
enctype	FORM	%ContentType;	"application/x-www-form-urlencoded"				
export	OBJECT	(export)	#IMPLIED			export shapes to parent	

face	BASEFONT, FONT	CDATA	#IMPLIED	D	L	comma separated list of font names	
for	LABEL	IDREF	#IMPLIED			matches field ID value	
frame	TABLE	%TFrame;	#IMPLIED			which parts of table frame to include	
frameborder	FRAME, IFRAME	(1 | 0)	1		F	request frame borders?	
headers	TD, TH	IDREFS	#IMPLIED			list of id's for header cells	
height	IFRAME	%Length;	#IMPLIED		L	frame height	
height	IMG, OBJECT	%Length;	#IMPLIED			override height	
height	APPLET	%Length;	#REQUIRED	D	L	initial height	
height	TD, TH	%Pixels;	#IMPLIED	D	L	height for cell	
href	A, AREA, DIV, LINK, SPAN	%URL;	#IMPLIED			URL for linked resource	
href	BASE	%URL;	#IMPLIED			URL that acts as base URL	
hreflang	A, DIV, LINK, SPAN	%LanguageCode;	#IMPLIED			language code	
hspace	APPLET, IMG, OBJECT	%Pixels;	#IMPLIED	D	L	horizontal gutter	
http-equiv	META	NAME	#IMPLIED			HTTP response header name	
id	All elements but BASE, HEAD, HTML, META, SCRIPT, STYLE, TITLE	ID	#IMPLIED			document-wide unique id	
ismap	IMG	(ismap)	#IMPLIED			use server-side image map	
label	OPTION	%Text;	#IMPLIED			for use in hierarchical menus	
label	OPTGROUP	%Text;	#REQUIRED			for use in hierarchical menus	

lang	All elements but APPLET, BASE, BASEFONT, BR, FRAME, FRAMESET, HR, IFRAME, PARAM, SCRIPT	%LanguageCode;	#IMPLIED			language code	
language	SCRIPT	CDATA	#IMPLIED			predefined script language name	
link	BODY	%Color;	#IMPLIED	D	L	color of links	
longdesc	IMG	%URL;	#IMPLIED			link to long description (complements alt)	
longdesc	FRAME, IFRAME	%URL;	#IMPLIED		F	link to long description (complements title)	
marginheight	FRAME, IFRAME	%Pixels;	#IMPLIED		F	margin height in pixels	
marginwidth	FRAME, IFRAME	%Pixels;	#IMPLIED		F	margin widths in pixels	
maxlength	INPUT	NUMBER	#IMPLIED			max chars for text fields	
media	STYLE	%MediaDesc;	#IMPLIED			designed for use with these media	
media	DIV, LINK, SPAN	%MediaDesc;	#IMPLIED			for rendering on these media	
method	FORM	(GET | POST)	GET			HTTP method used to submit the form	
multiple	SELECT	(multiple)	#IMPLIED			default is single selection	
name	TEXTAREA	CDATA	#IMPLIED				
name	APPLET	CDATA	#IMPLIED	D	L	allows applets to find each other	
name	SELECT	CDATA	#IMPLIED			field name	

name	BUTTON	CDATA	#IMPLIED			for scripting/forms as submit button	
name	FRAME, IFRAME	CDATA	#IMPLIED		F	name of frame for targetting	
name	A	CDATA	#IMPLIED			named link end	
name	INPUT, OBJECT	CDATA	#IMPLIED			submit as part of form	
name	MAP	CDATA	#REQUIRED			name of image map for refs by usemap	
name	PARAM	CDATA	#REQUIRED			property name	
name	META	NAME	#IMPLIED			metainformation name	
nohref	AREA	(nohref)	#IMPLIED			this region has no action	
noresize	FRAME	(noresize)	#IMPLIED		F	allow users to resize frames?	
noshade	HR	(noshade)	#IMPLIED	D	L		
nowrap	TD, TH	(nowrap)	#IMPLIED	D	L	suppress word wrap	
object	APPLET	CDATA	#IMPLIED	D	L	serialized applet file	
onblur	A, AREA, BUTTON, INPUT, LABEL, SELECT, TEXTAREA	%Script;	#IMPLIED			the element lost the focus	
onchange	INPUT, SELECT, TEXTAREA	%Script;	#IMPLIED			the element value was changed	

onclick	All elements but APPLET, BASE, BASEFONT, BDO, BR, FONT, FRAME, FRAMESET, HEAD, HTML, IFRAME, ISINDEX, META, PARAM, SCRIPT, STYLE, TITLE	%Script;	#IMPLIED			a pointer button was clicked	
ondblclick	All elements but APPLET, BASE, BASEFONT, BDO, BR, FONT, FRAME, FRAMESET, HEAD, HTML, IFRAME, ISINDEX, META, PARAM, SCRIPT, STYLE, TITLE	%Script;	#IMPLIED			a pointer button was double clicked	
onfocus	A, AREA, BUTTON, INPUT, LABEL, SELECT, TEXTAREA	%Script;	#IMPLIED			the element got the focus	
onkeydown	All elements but APPLET, BASE, BASEFONT, BDO, BR, FONT, FRAME, FRAMESET, HEAD, HTML, IFRAME, ISINDEX, META, PARAM, SCRIPT, STYLE, TITLE	%Script;	#IMPLIED			a key was pressed down	

onkeypress	All elements but APPLET, BASE, BASEFONT, BDO, BR, FONT, FRAME, FRAMESET, HEAD, HTML, IFRAME, ISINDEX, META, PARAM, SCRIPT, STYLE, TITLE	%Script;	#IMPLIED			a key was pressed and released	
onkeyup	All elements but APPLET, BASE, BASEFONT, BDO, BR, FONT, FRAME, FRAMESET, HEAD, HTML, IFRAME, ISINDEX, META, PARAM, SCRIPT, STYLE, TITLE	%Script;	#IMPLIED			a key was released	
onload	FRAMESET	%Script;	#IMPLIED		F	all the frames have been loaded	
onload	BODY	%Script;	#IMPLIED			the document has been loaded	
onmousedown	All elements but APPLET, BASE, BASEFONT, BDO, BR, FONT, FRAME, FRAMESET, HEAD, HTML, IFRAME, ISINDEX, META, PARAM, SCRIPT, STYLE, TITLE	%Script;	#IMPLIED			a pointer button was pressed down	

onmousemove	All elements but APPLET, BASE, BASEFONT, BDO, BR, FONT, FRAME, FRAMESET, HEAD, HTML, IFRAME, ISINDEX, META, PARAM, SCRIPT, STYLE, TITLE	%Script;	#IMPLIED			a pointer was moved within	
onmouseout	All elements but APPLET, BASE, BASEFONT, BDO, BR, FONT, FRAME, FRAMESET, HEAD, HTML, IFRAME, ISINDEX, META, PARAM, SCRIPT, STYLE, TITLE	%Script;	#IMPLIED			a pointer was moved away	
onmouseover	All elements but APPLET, BASE, BASEFONT, BDO, BR, FONT, FRAME, FRAMESET, HEAD, HTML, IFRAME, ISINDEX, META, PARAM, SCRIPT, STYLE, TITLE	%Script;	#IMPLIED			a pointer was moved onto	

onmouseup	All elements but APPLET, BASE, BASEFONT, BDO, BR, FONT, FRAME, FRAMESET, HEAD, HTML, IFRAME, ISINDEX, META, PARAM, SCRIPT, STYLE, TITLE	%Script;	#IMPLIED			a pointer button was released	
onreset	FORM	%Script;	#IMPLIED			the form was reset	
onselect	INPUT, TEXTAREA	%Script;	#IMPLIED			some text was selected	
onsubmit	FORM	%Script;	#IMPLIED			the form was submitted	
onunload	FRAMESET	%Script;	#IMPLIED		F	all the frames have been removed	
onunload	BODY	%Script;	#IMPLIED			the document has been removed	
profile	HEAD	%URL;	#IMPLIED			named dictionary of meta info	
prompt	ISINDEX	%Text;	#IMPLIED	D	L	prompt message	
readonly	TEXTAREA	(readonly)	#IMPLIED				
readonly	INPUT	(readonly)	#IMPLIED			for text and passwd	
rel	A, DIV, LINK, SPAN	%LinkTypes;	#IMPLIED			forward link types	
repeat	COL	NUMBER	1			repeat count for COL	
rev	A, DIV, LINK, SPAN	%LinkTypes;	#IMPLIED			reverse link types	
rows	FRAMESET	%MultiLengths;	#IMPLIED		F	list of lengths. Default: 100% (1 row)	
rows	TEXTAREA	NUMBER	#REQUIRED				

rowspan	TD, TH	NUMBER	1			number of rows spanned by cell	
rules	TABLE	%TRules;	#IMPLIED			rulings between rows and cols	
scheme	META	CDATA	#IMPLIED			select form of content	
scope	TD, TH	%Scope;	#IMPLIED			scope covered by header cells	
scrolling	FRAME, IFRAME	(yes | no | auto)	auto		F	scrollbar or none	
selected	OPTION	(selected)	#IMPLIED				
shape	AREA	%Shape;	rect			controls interpretation of coords	
shape	A	%Shape;	rect			for use with OBJECT SHAPES	
shapes	OBJECT	(shapes)	#IMPLIED			object has shaped hypertext links	
size	HR	%Pixels;	#IMPLIED	D	L		
size	FONT	CDATA	#IMPLIED	D	L	[+|-]nn e.g. size="+1", size="4"	
size	INPUT	CDATA	#IMPLIED			specific to each type of field	
size	BASEFONT	CDATA	#REQUIRED	D	L	base font size for FONT elements	
size	SELECT	NUMBER	#IMPLIED			rows visible	
span	COLGROUP	NUMBER	1			default number of columns in group	
src	SCRIPT	%URL;	#IMPLIED			URL for an external script	
src	INPUT	%URL;	#IMPLIED			for fields with images	
src	FRAME, IFRAME	%URL;	#IMPLIED		F	source of frame content	
src	IMG	%URL;	#REQUIRED			URL of image to embed	

standby	OBJECT	%Text;	#IMPLIED			message to show while loading	
start	OL	NUMBER	#IMPLIED	D	L	starting sequence number	
style	All elements but BASE, BASEFONT, HEAD, HTML, META, PARAM, SCRIPT, STYLE, TITLE	CDATA	#IMPLIED			associated style info	
summary	TABLE	%Text;	#IMPLIED			purpose/structure for speech output	
tabindex	A, AREA, BUTTON, INPUT, OBJECT, SELECT, TEXTAREA	NUMBER	#IMPLIED			position in tabbing order	
target	A, AREA, BASE, DIV, FORM, LINK, SPAN	%FrameTarget;	#IMPLIED			render in this frame	
text	BODY	%Color;	#IMPLIED	D	L	document text color	
title	STYLE	%Text;	#IMPLIED			advisory title	
title	All elements but BASE, BASEFONT, HEAD, HTML, META, PARAM, SCRIPT, STYLE, TITLE	%Text;	#IMPLIED			advisory title/amplification	
type	A, DIV, LINK, SPAN	%ContentType;	#IMPLIED			advisory content type	
type	OBJECT	%ContentType;	#IMPLIED			content type for data	
type	PARAM	%ContentType;	#IMPLIED			content type for value when valuetype=ref	

type	SCRIPT	%ContentType;	#REQUIRED			content type of script language	
type	STYLE	%ContentType;	#REQUIRED			content type of style language	
type	INPUT	%InputType;	TEXT			what kind of widget is needed	
type	LI	%LIStyle;	#IMPLIED	D	L	list item style	
type	OL	%OLStyle;	#IMPLIED	D	L	numbering style	
type	UL	%ULStyle;	#IMPLIED	D	L	bullet style	
type	BUTTON	(button | submit | reset)	submit			for use as form submit/reset button	
usemap	IMG, INPUT, OBJECT	%URL;	#IMPLIED			use client-side image map	
valign	COL, COLGROUP, TBODY, TD, TFOOT, TH, THEAD, TR	(top | middle | bottom | baseline)	#IMPLIED			vertical alignment in cells	
value	OPTION	CDATA	#IMPLIED			defaults to element content	
value	BUTTON	CDATA	#IMPLIED			gets passed to server when submitted	
value	PARAM	CDATA	#IMPLIED			property value	
value	INPUT	CDATA	#IMPLIED			required for radio and checkboxes	
value	LI	NUMBER	#IMPLIED	D	L	reset sequence number	
valuetype	PARAM	(DATA | REF | OBJECT)	DATA			How to interpret value	
version	HTML	CDATA	%HTML.Version;	D	L	Constant	
vlink	BODY	%Color;	#IMPLIED	D	L	color of visited links	
vspace	APPLET, IMG, OBJECT	%Pixels;	#IMPLIED	D	L	vertical gutter	
width	HR	%Length;	#IMPLIED	D	L		

width	IFRAME	%Length;	#IMPLIED		L	frame width	
width	IMG, OBJECT	%Length;	#IMPLIED			override width	
width	APPLET	%Length;	#REQUIRED	D	L	initial width	
width	COL	%MultiLength;	#IMPLIED			column width specification	
width	COLGROUP	%MultiLength;	#IMPLIED			default width for enclosed COLs	
width	TABLE	%Pixels;	#IMPLIED			table width relative to window	
width	TD, TH	%Pixels;	#IMPLIED	D	L	width for cell	
width	PRE	NUMBER	#IMPLIED	D	L		