Document Object Model (DOM) Level 3 XPath Specification

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Abstract

This specification defines the Document Object Model Level 3 XPath. It provides simple functionalities to access a DOM tree using [XPath 1.0].

Status of this document

This section describes the status of this document at the time of its publication. Other documents may supersede this document. The latest status of this document series is maintained at the W3C.

This is a Candidate Recommendation of "DOM Level 3 XPath" and is based on the feedback received during the Last Call period. The DOM Working Group expects to request that the Director advance this specification to Proposed Recommendation after the DOM Working Group documents two interoperable implementations of at least one normative binding. Basic tests of features of this specification will be produced and used in this effort. The two implementations must be produced by different organizations. The Working Group expects to satisfy those requirements **by 26 May 2003** and afterwards submit the

tests to the DOM Test Suite. Please send reviews before the review period ends to the public mailing list www-dom@w3.org. An archive is available at http://lists.w3.org/Archives/Public/www-dom/.

Individuals or organizations are also invited to send a message to the public mailing list if they intend to produce an implementation of this module.

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This document has been produced as part of the W3C DOM Activity. The authors of this document are the DOM Working Group members.

An implementation report is also available.

Patent disclosures relevant to this specification may be found on the Working Group's patent disclosure page.

A list of current W3C Recommendations and other technical documents can be found at http://www.w3.org/TR.

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1. Document Object Model XPath

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1.1. Introduction

XPath 1.0 [XPath 1.0] is becoming an important part of a variety of many specifications including XForms, XPointer, XSL, XML Query, and so on. It is also a clear advantage for user applications which use DOM to be able to use XPath expressions to locate nodes automatically and declaratively.

This specification was created to map between the Document Object Model's representation of the W3C Information Set and XPath's *model* [p.37] to permit XPath functions to be supplied and results returned within the framework of DOM *API* [p.37] s in a standard, interoperable way, allowing also for *liveness* [p.37] of data, which is not addressed by the XPath specification but is present in results coming from the DOM hierarchy.

1.2. Mapping DOM to XPath

This section presents a mapping between the Document Object Model [DOM Level 2 Core] and the XPath 1.0 [XPath 1.0] model for the purposes of implementing the APIs.

1.2.1. Element Nodes

The DOM model uses `Element` nodes to represent *Element Information Items*. These nodes of a document are directly used to represent the elements of an XPath result.

1.2.2. Attribute Nodes

The DOM model uses `Attr` nodes to represent *Attribute Information Items* of attribute and namespace attribute properties of *Element Information Item*. These nodes have no parent, but have an `ownerElement` which can be used as XPath defines an attribute's parent.

XPath 1.0 does not make available the namespace attributes of an element. The DOM implementation of XPath 1.0 using these defined interfaces never directly returns `Attr` nodes of namespace attributes, but returned `Element` nodes still contain them.

1.2.3. Namespace Nodes

The XPath model expects namespace nodes for each in-scope namespace to be attached to each *element* [p.37] . DOM only maintains the namespace attributes instead of replicating in-scope namespaces on each `Element` where they are in-scope. The DOM implementation of XPath produces a new node of type `XPATH_NAMESPACE_NODE`, defined in the `XPathNamespace` [p.21] interface, to properly preserve identity and ordering in a way that is compatible with XPath. This node type is only visible using the XPath evaluation methods.

The set of in-scope namespaces of an element is the default xml namespace combined with the contributions of namespace attributes of the current and all ancestor elements. In addition to explicit namespace attributes, any element has an implicit declaration of its own prefix, if any, or if no prefix then of the default namespace, which is enforced during namespace serialization, fixup, and lookup, which must be added to the set of in-scope namespaces when generating namespace nodes for an element. This causes the set of namespace nodes to be consistent with serialization, fixup, and lookup of namespaces in DOM Level 3.

1.2.4. Text Nodes

The XPath model relies on the XML Information Set [XML Information set] ands represents *Character Information Items* in a single logical text node where DOM may have multiple fragmented `Text` nodes due to cdata sections, entity references, etc. Instead of returning multiple nodes where XPath sees a single logical text node, only the first non-empty DOM `Text` or `CDATASection` node of any logical XPath text will be returned in the node set. Applications using XPath in an environment with fragmented text nodes must manually gather the text of a single logical text node possibly from multiple nodes beginning with the first `Text` node or `CDATASection` node returned by the implementation.

Note: In an attempt to better implement the XML Information Set, DOM Level 3 Core [DOM Level 3 Core] adds the attribute `wholeText` on the `Text` interface for retrieving the whole text for *logically-adjacent Text nodes* [p.37] and the method `replaceWholeText` for replacing those nodes.

1.2.5. Entity Reference Nodes

The DOM model may represent *Unexpanded Entity Reference Information Items* or may provide the position and URI of expanded entity hierarchies by using `EntityReference` nodes. XPath 1.0 does not preserve corresponding information.

Where the node represents an unexpanded entity reference, it is skipped as dictated by the XPath specifications for all infoset items besides those specifically processed.

Where there is a hierarchy underneath the node, these nodes are processed as though they were siblings of the entity reference, as is consistent with the rest of the DOM specification.

`EntityReference` nodes found within a DOM hierarchy are never returned as a node of the result, but returned nodes may contain or be contained within an `EntityReference` node. Text may be split partially inside and partially outside of an `EntityReference` node, but this is solved by handling `Text` nodes as described in the previous section.

1.2.6. Comment Nodes

The DOM model uses `Comment` nodes to represent *Comment Information Items*. These nodes of a document are directly used to represent the comments of an XPath result.

1.2.7. Processing Instruction Nodes

The DOM model uses `ProcessingInstruction` nodes to represent *Processing Instruction Information Items*. These nodes of a document are directly used to represent the processing instructions of an XPath result.

1.2.8. Document order

The *document order* [p.37] of nodes in the DOM Core has been defined to be compatible with the *XPath document order*. The XPath DOM extends the document order of the DOM Core to include the `XPathNamespace` [p.21] nodes. Element nodes occur before their children. The attribute nodes and namespace nodes of an element occur before the children of the element. The namespace nodes are defined to occur before the attribute nodes. The relative order of namespace nodes is implementation-dependent. The relative order of attribute nodes is implementation-dependent. The `compareTreePosition` method on the `Node` interface defined in the DOM Core must compare the `XPathNamespace` nodes using this extended document order if the XPath DOM module is supported.

Note: It is possible that in future versions of XPath, the order of namespace nodes or other aspects of document order may change incompatibly.

1.3. Conformance

This section explains conformance to DOM Level 3 XPath Module.

A DOM implementation must not return `true` to `hasFeature("xpath", "3.0")` unless the implementation conforms to that module. As documented in [DOM Level 3 Core], if a `null` or empty string is passed in for the second parameter, then conformance is still required to some version of the DOM XPath Module or `false` must be returned.

A conformant implementation is DOM Level 3 XPath must support all the interfaces as specified in that specification. In addition to implementing the interfaces in the DOM XPath Module, a conforming implementation must correctly implement each part of the XPath 1.0 specification when evaluating expressions including Location Paths, Expressions, the Core Function Library, and the mapping between DOM and the XPath 1.0 data model described in the DOM Level 3 XPath Module. The XPath `id()` function must return the corresponding element, if any, returned by the DOM method `Document.getElementById`.

After meeting the requirements for conformance, a conforming implementation may implement additional functions and variables. Applications which evaluate expressions using these extensions will not necessarily be portable to other implementations of the DOM Level 3 XPath Module.

1.4. Interfaces

An implementation is DOM Level 3 XPath conformant if it supports the Core module defined in [DOM Level 2 Core] and the module defined in this specification. An implementation conforms to a DOM module if it supports all the interfaces for that module and the associated semantics.

A DOM application may use the `hasFeature(feature, version)` method of the `DOMImplementation` interface with parameter values "XPath" and "3.0" (respectively) to determine whether or not the XPath module is supported by the implementation. In order to fully support this module, an implementation must also support the "Core" feature defined in the DOM Level 2 Core specification [DOM Level 2 Core].

A DOM implementation must not return `true` to the `hasFeature(feature, version)` method of the DOMImplementation interface for that feature unless the implementation conforms to that module. The version number for the feature used in this document is `"3.0"`.

Exception *XPathException*

A new exception has been created for exceptions specific to these XPath interfaces.

IDL Definition

```
exception XPathException {
  unsigned short   code;
};
// XPathExceptionCode
const unsigned short      INVALID_EXPRESSION_ERR         = 51;
const unsigned short      TYPE_ERR                       = 52;
```

Definition group *XPathExceptionCode*

Defined Constants

`INVALID_EXPRESSION_ERR`
: If the expression has a syntax error or otherwise is not a legal expression according to the rules of the specific `XPathEvaluator` [p.12] or contains specialized extension functions or variables not supported by this implementation.

`TYPE_ERR`
: If the expression cannot be converted to return the specified type.

Interface *XPathEvaluator*

The evaluation of XPath expressions is provided by `XPathEvaluator`. In a DOM implementation which supports the XPath 3.0 feature, as described above, the `XPathEvaluator` interface will be implemented on the same object which implements the `Document` interface permitting it to be obtained by the usual binding-specific method such as casting or by using the DOM Level 3 getInterface method. In this case the implementation obtained from the Document supports the XPath DOM module and is compatible with the XPath 1.0 specification.

Evaluation of expressions with specialized extension functions or variables may not work in all implementations and is, therefore, not portable. `XPathEvaluator` implementations may be available from other sources that could provide specific support for specialized extension functions or variables as would be defined by other specifications.

IDL Definition

```
interface XPathEvaluator {
  XPathExpression    createExpression(in DOMString expression,
                                      in XPathNSResolver resolver)
                                        raises(XPathException,
                                               DOMException);
  XPathNSResolver    createNSResolver(in Node nodeResolver);
  DOMObject          evaluate(in DOMString expression,
                              in Node contextNode,
                              in XPathNSResolver resolver,
                              in unsigned short type,
                              in DOMObject result)
                                        raises(XPathException,
                                               DOMException);
};
```

Methods

`createExpression`

Creates a parsed XPath expression with resolved namespaces. This is useful when an expression will be reused in an application since it makes it possible to compile the expression string into a more efficient internal form and preresolve all *namespace prefixes* [p.38] which occur within the expression.

Parameters

`expression` of type `DOMString`

The XPath expression string to be parsed.

`resolver` of type `XPathNSResolver` [p.16]

The `resolver` permits translation of all prefixes, including the `xml` namespace prefix, within the XPath expression into appropriate *namespace URIs* [p.38] . If this is specified as `null`, any *namespace prefix* [p.38] within the expression will result in `DOMException` being thrown with the code `NAMESPACE_ERR`.

Return Value

`XPathExpression` [p.15]	The compiled form of the XPath expression.

Exceptions

`XPathException` [p.12]	INVALID_EXPRESSION_ERR: Raised if the expression is not legal according to the rules of the `XPathEvaluator`.
`DOMException`	NAMESPACE_ERR: Raised if the expression contains *namespace prefixes* [p.38] which cannot be resolved by the specified `XPathNSResolver` [p.16] .

`createNSResolver`

Adapts any DOM node to resolve namespaces so that an XPath expression can be easily evaluated relative to the context of the node where it appeared within the document. This adapter works like the DOM Level 3 method `lookupNamespaceURI` on nodes in resolving the namespaceURI from a given prefix using the current information available in the node's hierarchy at the time lookupNamespaceURI is called. also correctly resolving the implicit xml prefix.

Parameters

`nodeResolver` of type `Node`

The node to be used as a context for namespace resolution.

Return Value

`XPathNSResolver` [p.16]	`XPathNSResolver` which resolves namespaces with respect to the definitions in scope for a specified node.

No Exceptions

`evaluate`

Evaluates an XPath expression string and returns a result of the specified type if possible.

Parameters

`expression` of type `DOMString`

The XPath expression string to be parsed and evaluated.

`contextNode` of type `Node`

The `context` is context node for the evaluation of this XPath expression. If the XPathEvaluator was obtained by casting the `Document` then this must be owned by the same document and must be a `Document`, `Element`, `Attribute`, `Text`, `CDATASection`, `Comment`, `ProcessingInstruction`, or `XPathNamespace` [p.21] node. If the context node is a `Text` or a `CDATASection`, then the context is interpreted as the whole logical text node as seen by XPath, unless the node is empty in which case it may not serve as the XPath context.

`resolver` of type `XPathNSResolver` [p.16]

The `resolver` permits translation of all prefixes, including the `xml` namespace prefix, within the XPath expression into appropriate *namespace URIs* [p.38] . If this is specified as `null`, any *namespace prefix* [p.38] within the expression will result in `DOMException` being thrown with the code `NAMESPACE_ERR`.

`type` of type `unsigned short`

If a specific `type` is specified, then the result will be returned as the corresponding type.

For XPath 1.0 results, this must be one of the codes of the `XPathResult` [p.17] interface.

`result` of type `DOMObject`

The `result` specifies a specific result object which may be reused and returned by this method. If this is specified as `null`or the implementation does not reuse the specified result, a new result object will be constructed and returned.

For XPath 1.0 results, this object will be of type `XPathResult` [p.17] .

Return Value

`DOMObject`	The result of the evaluation of the XPath expression. For XPath 1.0 results, this object will be of type `XPathResult` [p.17] .

Exceptions

`XPathException` [p.12]	INVALID_EXPRESSION_ERR: Raised if the expression is not legal according to the rules of the `XPathEvaluatori`
	TYPE_ERR: Raised if the result cannot be converted to return the specified type.
`DOMException`	NAMESPACE_ERR: Raised if the expression contains *namespace prefixes* [p.38] which cannot be resolved by the specified `XPathNSResolver` [p.16] .
	WRONG_DOCUMENT_ERR: The Node is from a document that is not supported by this `XPathEvaluator`.
	NOT_SUPPORTED_ERR: The Node is not a type permitted as an XPath context node or the request type is not permitted by this `XPathEvaluator`.

Interface *XPathExpression*

The `XPathExpression` interface represents a parsed and resolved XPath expression.

IDL Definition

```
interface XPathExpression {
  DOMObject          evaluate(in Node contextNode,
                              in unsigned short type,
                              in DOMObject result)
                                        raises(XPathException,
                                               DOMException);
};
```

Methods

`evaluate`

Evaluates this XPath expression and returns a result.

Parameters

`contextNode` of type `Node`

The `context` is context node for the evaluation of this XPath expression.
If the XPathEvaluator was obtained by casting the `Document` then this must be owned by the same document and must be a `Document`, `Element`, `Attribute`, `Text`, `CDATASection`, `Comment`, `ProcessingInstruction`, or `XPathNamespace` [p.21] node.
If the context node is a `Text` or a `CDATASection`, then the context is interpreted as the whole logical text node as seen by XPath, unless the node is empty in which case it may not serve as the XPath context.

`type` of type `unsigned short`

If a specific `type` is specified, then the result will be coerced to return the specified type relying on XPath conversions and fail if the desired coercion is not possible. This

must be one of the type codes of `XPathResult` [p.17] .

`result` of type `DOMObject`

The `result` specifies a specific result object which may be reused and returned by this method. If this is specified as `null`or the implementation does not reuse the specified result, a new result object will be constructed and returned.

For XPath 1.0 results, this object will be of type `XPathResult` [p.17] .

Return Value

`DOMObject`	The result of the evaluation of the XPath expression. For XPath 1.0 results, this object will be of type `XPathResult` [p.17] .

Exceptions

`XPathException` [p.12]	TYPE_ERR: Raised if the result cannot be converted to return the specified type.
`DOMException`	WRONG_DOCUMENT_ERR: The Node is from a document that is not supported by the XPathEvaluator that created this `XPathExpression`. NOT_SUPPORTED_ERR: The Node is not a type permitted as an XPath context node or the request type is not permitted by this `XPathExpression`.

Interface *XPathNSResolver*

The `XPathNSResolver` interface permit `prefix` strings in the expression to be properly bound to `namespaceURI` strings. `XPathEvaluator` [p.12] can construct an implementation of `XPathNSResolver` from a node, or the interface may be implemented by any application.

IDL Definition

```
interface XPathNSResolver {
  DOMString          lookupNamespaceURI(in DOMString prefix);
};
```

Methods

`lookupNamespaceURI`

Look up the *namespace URI* [p.38] associated to the given *namespace prefix* [p.38] . The XPath evaluator must never call this with a `null` or empty argument, because the result of doing this is undefined.

Parameters

`prefix` of type `DOMString`

The prefix to look for.

Return Value

`DOMString` Returns the associated *namespace URI* [p.38] or `null` if none is found.

No Exceptions

Interface *XPathResult*

The `XPathResult` interface represents the result of the evaluation of an XPath 1.0 expression within the context of a particular node. Since evaluation of an XPath expression can result in various result types, this object makes it possible to discover and manipulate the type and value of the result.

IDL Definition

```
interface XPathResult {

  // XPathResultType
  const unsigned short      ANY_TYPE                      = 0;
  const unsigned short      NUMBER_TYPE                   = 1;
  const unsigned short      STRING_TYPE                   = 2;
  const unsigned short      BOOLEAN_TYPE                  = 3;
  const unsigned short      UNORDERED_NODE_ITERATOR_TYPE  = 4;
  const unsigned short      ORDERED_NODE_ITERATOR_TYPE    = 5;
  const unsigned short      UNORDERED_NODE_SNAPSHOT_TYPE  = 6;
  const unsigned short      ORDERED_NODE_SNAPSHOT_TYPE    = 7;
  const unsigned short      ANY_UNORDERED_NODE_TYPE       = 8;
  const unsigned short      FIRST_ORDERED_NODE_TYPE       = 9;

  readonly attribute unsigned short  resultType;
  readonly attribute double          numberValue;
                                        // raises(XPathException) on retrieval

  readonly attribute DOMString       stringValue;
                                        // raises(XPathException) on retrieval

  readonly attribute boolean         booleanValue;
                                        // raises(XPathException) on retrieval

  readonly attribute Node            singleNodeValue;
                                        // raises(XPathException) on retrieval

  readonly attribute boolean         invalidIteratorState;
  readonly attribute unsigned long   snapshotLength;
                                        // raises(XPathException) on retrieval

  Node               iterateNext()
                                        raises(XPathException,
                                               DOMException);
  Node               snapshotItem(in unsigned long index)
                                        raises(XPathException);
};
```

Definition group *XPathResultType*

An integer indicating what type of result this is.

If a specific `type` is specified, then the result will be returned as the corresponding type, using *XPath type conversions* where required and possible.

Defined Constants

`ANY_TYPE`
: This code does not represent a specific type. An evaluation of an XPath expression will never produce this type. If this type is requested, then the evaluation returns whatever type naturally results from evaluation of the expression.
If the natural result is a node set when `ANY_TYPE` was requested, then `UNORDERED_NODE_ITERATOR_TYPE` is always the resulting type. Any other representation of a node set must be explicitly requested.

`ANY_UNORDERED_NODE_TYPE`
: The result is a *node set* as defined by [XPath 1.0] and will be accessed as a single node, which may be `null`if the node set is empty. Document modification does not invalidate the node, but may mean that the result node no longer corresponds to the current document. This is a convenience that permits optimization since the implementation can stop once any node in the resulting set has been found.
If there is more than one node in the actual result, the single node returned might not be the first in document order.

`BOOLEAN_TYPE`
: The result is a *boolean* as defined by [XPath 1.0]. Document modification does not invalidate the boolean, but may mean that reevaluation would not yield the same boolean.

`FIRST_ORDERED_NODE_TYPE`
: The result is a *node set* as defined by [XPath 1.0] and will be accessed as a single node, which may be `null` if the node set is empty. Document modification does not invalidate the node, but may mean that the result node no longer corresponds to the current document. This is a convenience that permits optimization since the implementation can stop once the first node in document order of the resulting set has been found.
If there are more than one node in the actual result, the single node returned will be the first in document order.

`NUMBER_TYPE`
: The result is a *number* as defined by [XPath 1.0]. Document modification does not invalidate the number, but may mean that reevaluation would not yield the same number.

`ORDERED_NODE_ITERATOR_TYPE`
: The result is a node set as defined by [XPath 1.0] that will be accessed iteratively, which will produce document-ordered nodes. Document modification invalidates the iteration.

`ORDERED_NODE_SNAPSHOT_TYPE`
: The result is a *node set* as defined by [XPath 1.0] that will be accessed as a snapshot list of nodes that will be in original document order. Document modification does not invalidate the snapshot but may mean that reevaluation would not yield the same snapshot and nodes in the snapshot may have been altered, moved, or removed from

the document.

`STRING_TYPE`
: The result is a *string* as defined by [XPath 1.0]. Document modification does not invalidate the string, but may mean that the string no longer corresponds to the current document.

`UNORDERED_NODE_ITERATOR_TYPE`
: The result is a *node set* as defined by [XPath 1.0] that will be accessed iteratively, which may not produce nodes in a particular order. Document modification invalidates the iteration.

  This is the default type returned if the result is a node set and `ANY_TYPE` is requested.

`UNORDERED_NODE_SNAPSHOT_TYPE`
: The result is a *node set* as defined by [XPath 1.0] that will be accessed as a snapshot list of nodes that may not be in a particular order. Document modification does not invalidate the snapshot but may mean that reevaluation would not yield the same snapshot and nodes in the snapshot may have been altered, moved, or removed from the document.

Attributes

`booleanValue` of type `boolean`, readonly
: The value of this boolean result.

  Exceptions on retrieval

`XPathException` [p.12]	TYPE_ERR: raised if `resultType` is not `BOOLEAN_TYPE`.

`invalidIteratorState` of type `boolean`, readonly
: Signifies that the iterator has become invalid. True if `resultType` is `UNORDERED_NODE_ITERATOR_TYPE` or `ORDERED_NODE_ITERATOR_TYPE` and the document has been modified since this result was returned.

`numberValue` of type `double`, readonly
: The value of this number result. If the native double type of the DOM binding does not directly support the exact IEEE 754 result of the XPath expression, then it is up to the definition of the binding to specify how the XPath number is converted to the native binding number.

  Exceptions on retrieval

`XPathException` [p.12]	TYPE_ERR: raised if `resultType` is not `NUMBER_TYPE`.

`resultType` of type `unsigned short`, readonly
: A code representing the type of this result, as defined by the type constants.

`singleNodeValue` of type `Node`, readonly
: The value of this single node result, which may be `null`.

  Exceptions on retrieval

`XPathException` [p.12]	TYPE_ERR: raised if `resultType` is not `ANY_UNORDERED_NODE_TYPE` or `FIRST_ORDERED_NODE_TYPE`.

`snapshotLength` of type `unsigned long`, readonly

The number of nodes in the result snapshot. Valid values for snapshotItem indices are `0` to `snapshotLength-1` inclusive.

Exceptions on retrieval

`XPathException` [p.12]	TYPE_ERR: raised if `resultType` is not `UNORDERED_NODE_SNAPSHOT_TYPE` or `ORDERED_NODE_SNAPSHOT_TYPE`.

`stringValue` of type `DOMString`, readonly

The value of this string result.

Exceptions on retrieval

`XPathException` [p.12]	TYPE_ERR: raised if `resultType` is not `STRING_TYPE`.

Methods

`iterateNext`

Iterates and returns the next node from the node set or `null`if there are no more nodes.

Return Value

`Node`	Returns the next node.

Exceptions

`XPathException` [p.12]	TYPE_ERR: raised if `resultType` is not `UNORDERED_NODE_ITERATOR_TYPE` or `ORDERED_NODE_ITERATOR_TYPE`.
`DOMException`	INVALID_STATE_ERR: The document has been mutated since the result was returned.

No Parameters

`snapshotItem`

Returns the `index`th item in the snapshot collection. If `index` is greater than or equal to the number of nodes in the list, this method returns `null`. Unlike the iterator result, the snapshot does not become invalid, but may not correspond to the current document if it is mutated.

Parameters

`index` of type `unsigned long`
Index into the snapshot collection.

Return Value

`Node` The node at the `index`th position in the `NodeList`, or `null` if that is not a valid index.

Exceptions

`XPathException` [p.12]	TYPE_ERR: raised if `resultType` is not `UNORDERED_NODE_SNAPSHOT_TYPE` or `ORDERED_NODE_SNAPSHOT_TYPE`.

Interface *XPathNamespace*

The `XPathNamespace` interface is returned by `XPathResult` [p.17] interfaces to represent the XPath namespace node type that DOM lacks. There is no public constructor for this node type. Attempts to place it into a hierarchy or a NamedNodeMap result in a `DOMException` with the code `HIERARCHY_REQUEST_ERR`. This node is *read only* [p.38] , so methods or setting of attributes that would mutate the node result in a DOMException with the code `NO_MODIFICATION_ALLOWED_ERR`.

The core specification describes attributes of the `Node` interface that are different for different node types but does not describe `XPATH_NAMESPACE_NODE`, so here is a description of those attributes for this node type. All attributes of `Node` not described in this section have a `null` or `false` value.

`ownerDocument` matches the `ownerDocument` of the `ownerElement` even if the element is later adopted.

`nodeName` is always the string "`#namespace`".

`prefix` is the prefix of the namespace represented by the node.

`localName` is the same as `prefix`.

`nodeType` is equal to `XPATH_NAMESPACE_NODE`.

`namespaceURI` is the namespace URI of the namespace represented by the node.

`nodeValue` is the same as `namespaceURI`.

`adoptNode`, `cloneNode`, and `importNode` fail on this node type by raising a `DOMException` with the code `NOT_SUPPORTED_ERR`.

Note: In future versions of the XPath specification, the definition of a namespace node may be changed incomatibly, in which case incompatible changes to field values may be required to implement versions beyond XPath 1.0.

IDL Definition

```
interface XPathNamespace : Node {

  // XPathNodeType
  const unsigned short      XPATH_NAMESPACE_NODE           = 13;

  readonly attribute Element         ownerElement;
};
```

Definition group *XPathNodeType*

An integer indicating which type of node this is.

Note: There is currently only one type of node which is specific to XPath. The numbers in this list must not collide with the values assigned to core node types.

Defined Constants

`XPATH_NAMESPACE_NODE`
: The node is a `Namespace`.

Attributes

`ownerElement` of type `Element`, readonly
: The `Element` on which the namespace was in scope when it was requested. This does not change on a returned namespace node even if the document changes such that the namespace goes out of scope on that *element* [p.37] and this node is no longer found there by XPath.

Appendix A: IDL Definitions

This appendix contains the complete OMG IDL [OMG IDL] for the Level 3 Document Object Model XPath definitions.

The IDL files are also available as:
http://www.w3.org/TR/2003/CR-DOM-Level-3-XPath-20030331/idl.zip

xpath.idl:

```
// File: xpath.idl

#ifndef _XPATH_IDL_
#define _XPATH_IDL_

#include "dom.idl"

#pragma prefix "dom.w3c.org"
module xpath
{

  typedef dom::DOMString DOMString;
  typedef dom::Node Node;
  typedef dom::DOMObject DOMObject;
  typedef dom::Element Element;

  interface XPathNSResolver;
  interface XPathExpression;

  exception XPathException {
    unsigned short   code;
  };
  // XPathExceptionCode
  const unsigned short      INVALID_EXPRESSION_ERR         = 51;
  const unsigned short      TYPE_ERR                       = 52;


  interface XPathEvaluator {
    XPathExpression    createExpression(in DOMString expression,
                                        in XPathNSResolver resolver)
                                        raises(XPathException,
                                               dom::DOMException);
    XPathNSResolver    createNSResolver(in Node nodeResolver);
    DOMObject          evaluate(in DOMString expression,
                                in Node contextNode,
                                in XPathNSResolver resolver,
                                in unsigned short type,
                                in DOMObject result)
                                        raises(XPathException,
                                               dom::DOMException);
  };

  interface XPathExpression {
    DOMObject          evaluate(in Node contextNode,
```

```
                                in unsigned short type,
                                in DOMObject result)
                                        raises(XPathException,
                                               dom::DOMException);
};

interface XPathNSResolver {
  DOMString          lookupNamespaceURI(in DOMString prefix);
};

interface XPathResult {

  // XPathResultType
  const unsigned short      ANY_TYPE                        = 0;
  const unsigned short      NUMBER_TYPE                     = 1;
  const unsigned short      STRING_TYPE                     = 2;
  const unsigned short      BOOLEAN_TYPE                    = 3;
  const unsigned short      UNORDERED_NODE_ITERATOR_TYPE    = 4;
  const unsigned short      ORDERED_NODE_ITERATOR_TYPE      = 5;
  const unsigned short      UNORDERED_NODE_SNAPSHOT_TYPE    = 6;
  const unsigned short      ORDERED_NODE_SNAPSHOT_TYPE      = 7;
  const unsigned short      ANY_UNORDERED_NODE_TYPE         = 8;
  const unsigned short      FIRST_ORDERED_NODE_TYPE         = 9;

  readonly attribute unsigned short  resultType;
  readonly attribute double          numberValue;
                                      // raises(XPathException) on retrieval

  readonly attribute DOMString       stringValue;
                                      // raises(XPathException) on retrieval

  readonly attribute boolean         booleanValue;
                                      // raises(XPathException) on retrieval

  readonly attribute Node            singleNodeValue;
                                      // raises(XPathException) on retrieval

  readonly attribute boolean         invalidIteratorState;
  readonly attribute unsigned long   snapshotLength;
                                      // raises(XPathException) on retrieval

  Node               iterateNext()
                                      raises(XPathException,
                                             dom::DOMException);
  Node               snapshotItem(in unsigned long index)
                                      raises(XPathException);
};

interface XPathNamespace : Node {

  // XPathNodeType
  const unsigned short      XPATH_NAMESPACE_NODE          = 13;

  readonly attribute Element         ownerElement;
```

```
  };
};

#endif // _XPATH_IDL_
```

xpath.idl:

Appendix B: Java Language Binding

This appendix contains the complete Java [Java] bindings for the Level 3 Document Object Model XPath.

The Java files are also available as
http://www.w3.org/TR/2003/CR-DOM-Level-3-XPath-20030331/java-binding.zip

B.1: Other XPath interfaces

org/w3c/dom/xpath/XPathException.java:

```
package org.w3c.dom.xpath;

public class XPathException extends RuntimeException {
    public XPathException(short code, String message) {
       super(message);
       this.code = code;
    }
    public short   code;
    // XPathExceptionCode
    public static final short INVALID_EXPRESSION_ERR    = 51;
    public static final short TYPE_ERR                  = 52;

}
```

org/w3c/dom/xpath/XPathEvaluator.java:

```
package org.w3c.dom.xpath;

import org.w3c.dom.Node;
import org.w3c.dom.DOMException;

public interface XPathEvaluator {
    public XPathExpression createExpression(String expression,
                                            XPathNSResolver resolver)
                                            throws XPathException, DOMException;

    public XPathNSResolver createNSResolver(Node nodeResolver);

    public Object evaluate(String expression,
                           Node contextNode,
                           XPathNSResolver resolver,
                           short type,
                           Object result)
                           throws XPathException, DOMException;

}
```

org/w3c/dom/xpath/XPathExpression.java:

```
package org.w3c.dom.xpath;

import org.w3c.dom.Node;
import org.w3c.dom.DOMException;

public interface XPathExpression {
    public Object evaluate(Node contextNode,
                           short type,
                           Object result)
                           throws XPathException, DOMException;

}
```

org/w3c/dom/xpath/XPathNSResolver.java:

```
package org.w3c.dom.xpath;

public interface XPathNSResolver {
    public String lookupNamespaceURI(String prefix);

}
```

org/w3c/dom/xpath/XPathResult.java:

```
package org.w3c.dom.xpath;

import org.w3c.dom.Node;
import org.w3c.dom.DOMException;

public interface XPathResult {
    // XPathResultType
    public static final short ANY_TYPE                 = 0;
    public static final short NUMBER_TYPE              = 1;
    public static final short STRING_TYPE              = 2;
    public static final short BOOLEAN_TYPE             = 3;
    public static final short UNORDERED_NODE_ITERATOR_TYPE = 4;
    public static final short ORDERED_NODE_ITERATOR_TYPE = 5;
    public static final short UNORDERED_NODE_SNAPSHOT_TYPE = 6;
    public static final short ORDERED_NODE_SNAPSHOT_TYPE = 7;
    public static final short ANY_UNORDERED_NODE_TYPE   = 8;
    public static final short FIRST_ORDERED_NODE_TYPE   = 9;

    public short getResultType();

    public double getNumberValue()
                                    throws XPathException;

    public String getStringValue()
                                    throws XPathException;

    public boolean getBooleanValue()
                                    throws XPathException;
```

```
    public Node getSingleNodeValue()
                                    throws XPathException;

    public boolean getInvalidIteratorState();

    public int getSnapshotLength()
                                    throws XPathException;

    public Node iterateNext()
                            throws XPathException, DOMException;

    public Node snapshotItem(int index)
                             throws XPathException;

}
```

org/w3c/dom/xpath/XPathNamespace.java:

```
package org.w3c.dom.xpath;

import org.w3c.dom.Element;
import org.w3c.dom.Node;

public interface XPathNamespace extends Node {
    // XPathNodeType
    public static final short XPATH_NAMESPACE_NODE      = 13;

    public Element getOwnerElement();

}
```

org/w3c/dom/xpath/XPathNamespace.java:

Appendix C: ECMAScript Language Binding

This appendix contains the complete ECMAScript [ECMAScript] binding for the Level 3 Document Object Model XPath definitions.

Properties of the **XPathException** Constructor function:

XPathException.INVALID_EXPRESSION_ERR

The value of the constant **XPathException.INVALID_EXPRESSION_ERR** is **51**.

XPathException.TYPE_ERR

The value of the constant **XPathException.TYPE_ERR** is **52**.

Objects that implement the **XPathException** interface:

Properties of objects that implement the **XPathException** interface:

code

This property is a **Number**.

Objects that implement the **XPathEvaluator** interface:

Functions of objects that implement the **XPathEvaluator** interface:

createExpression(expression, resolver)

This function returns an object that implements the **XPathExpression** interface.
The **expression** parameter is a **String**.
The **resolver** parameter is an object that implements the **XPathNSResolver** interface.
This function can raise an object that implements the **XPathException** interface or the **DOMException** interface.

createNSResolver(nodeResolver)

This function returns an object that implements the **XPathNSResolver** interface.
The **nodeResolver** parameter is an object that implements the **Node** interface.

evaluate(expression, contextNode, resolver, type, result)

This function returns an object that implements the **Object** interface.
The **expression** parameter is a **String**.
The **contextNode** parameter is an object that implements the **Node** interface.
The **resolver** parameter is an object that implements the **XPathNSResolver** interface.
The **type** parameter is a **Number**.
The **result** parameter is an object that implements the **Object** interface.
This function can raise an object that implements the **XPathException** interface or the **DOMException** interface.

Objects that implement the **XPathExpression** interface:

Functions of objects that implement the **XPathExpression** interface:

evaluate(contextNode, type, result)

This function returns an object that implements the **Object** interface.
The **contextNode** parameter is an object that implements the **Node** interface.
The **type** parameter is a **Number**.
The **result** parameter is an object that implements the **Object** interface.
This function can raise an object that implements the **XPathException** interface or the **DOMException** interface.

Objects that implement the **XPathNSResolver** interface:

Functions of objects that implement the **XPathNSResolver** interface:

lookupNamespaceURI(prefix)

This function returns a **String**.

The **prefix** parameter is a **String**.

Properties of the **XPathResult** Constructor function:

XPathResult.ANY_TYPE

The value of the constant **XPathResult.ANY_TYPE** is **0**.

XPathResult.NUMBER_TYPE

The value of the constant **XPathResult.NUMBER_TYPE** is **1**.

XPathResult.STRING_TYPE

The value of the constant **XPathResult.STRING_TYPE** is **2**.

XPathResult.BOOLEAN_TYPE

The value of the constant **XPathResult.BOOLEAN_TYPE** is **3**.

XPathResult.UNORDERED_NODE_ITERATOR_TYPE

The value of the constant **XPathResult.UNORDERED_NODE_ITERATOR_TYPE** is **4**.

XPathResult.ORDERED_NODE_ITERATOR_TYPE

The value of the constant **XPathResult.ORDERED_NODE_ITERATOR_TYPE** is **5**.

XPathResult.UNORDERED_NODE_SNAPSHOT_TYPE

The value of the constant **XPathResult.UNORDERED_NODE_SNAPSHOT_TYPE** is **6**.

XPathResult.ORDERED_NODE_SNAPSHOT_TYPE

The value of the constant **XPathResult.ORDERED_NODE_SNAPSHOT_TYPE** is **7**.

XPathResult.ANY_UNORDERED_NODE_TYPE

The value of the constant **XPathResult.ANY_UNORDERED_NODE_TYPE** is **8**.

XPathResult.FIRST_ORDERED_NODE_TYPE

The value of the constant **XPathResult.FIRST_ORDERED_NODE_TYPE** is **9**.

Objects that implement the **XPathResult** interface:

Properties of objects that implement the **XPathResult** interface:

resultType

This read-only property is a **Number**.

numberValue

This read-only property is an object that implements the **double** interface and can raise an object that implements the **XPathException** interface on retrieval.

stringValue

This read-only property is a **String** and can raise an object that implements the **XPathException** interface on retrieval.

booleanValue

This read-only property is a **Boolean** and can raise an object that implements the **XPathException** interface on retrieval.

singleNodeValue

This read-only property is an object that implements the **Node** interface and can raise an object that implements the **XPathException** interface on retrieval.

invalidIteratorState

This read-only property is a **Boolean**.

snapshotLength

This read-only property is a **Number** and can raise an object that implements the **XPathException** interface on retrieval.

Functions of objects that implement the **XPathResult** interface:

iterateNext()

This function returns an object that implements the **Node** interface.

This function can raise an object that implements the **XPathException** interface or the **DOMException** interface.

snapshotItem(index)

This function returns an object that implements the **Node** interface.

The **index** parameter is a **Number**.

This function can raise an object that implements the **XPathException** interface.

Properties of the **XPathNamespace** Constructor function:

XPathNamespace.XPATH_NAMESPACE_NODE

The value of the constant **XPathNamespace.XPATH_NAMESPACE_NODE** is **13**.

Objects that implement the **XPathNamespace** interface:

Objects that implement the **XPathNamespace** interface have all properties and functions of the **Node** interface as well as the properties and functions defined below.

Properties of objects that implement the **XPathNamespace** interface:

ownerElement

This read-only property is an object that implements the **Element** interface.

Note: The parameter `resolver` of the method `XPathEvaluator.evaluate` [p.14] is specified as an object that implements the `XPathNSResolver` [p.16] interface. ECMAScript users can also pass to this method a function which returns a `String` and takes a `String` parameter instead of the `resolver` parameter.

Appendix C: ECMAScript Language Binding

Appendix D: Acknowledgements

Many people contributed to the DOM specifications (Level 1, 2 or 3), including members of the DOM Working Group and the DOM Interest Group. We especially thank the following:

Andrew Watson (Object Management Group), Andy Heninger (IBM), Angel Diaz (IBM), Arnaud Le Hors (W3C and IBM), Ashok Malhotra (IBM and Microsoft), Ben Chang (Oracle), Bill Smith (Sun), Bill Shea (Merrill Lynch), Bob Sutor (IBM), Chris Lovett (Microsoft), Chris Wilson (Microsoft), David Brownell (Sun), David Ezell (Hewlett Packard Company), David Singer (IBM), Dimitris Dimitriadis (Improve AB and invited expert), Don Park (invited), Elena Litani (IBM), Eric Vasilik (Microsoft), Gavin Nicol (INSO), Ian Jacobs (W3C), James Clark (invited), James Davidson (Sun), Jared Sorensen (Novell), Jeroen van Rotterdam (X-Hive Corporation), Joe Kesselman (IBM), Joe Lapp (webMethods), Joe Marini (Macromedia), Johnny Stenback (Netscape/AOL), Jon Ferraiolo (Adobe), Jonathan Marsh (Microsoft), Jonathan Robie (Texcel Research and Software AG), Kim Adamson-Sharpe (SoftQuad Software Inc.), Lauren Wood (SoftQuad Software Inc., *former Chair*), Laurence Cable (Sun), Mark Davis (IBM), Mark Scardina (Oracle), Martin Dürst (W3C), Mary Brady (NIST), Mick Goulish (Software AG), Mike Champion (Arbortext and Software AG), Miles Sabin (Cromwell Media), Patti Lutsky (Arbortext), Paul Grosso (Arbortext), Peter Sharpe (SoftQuad Software Inc.), Phil Karlton (Netscape), Philippe Le Hégaret (W3C, *W3C team contact and former Chair*), Ramesh Lekshmynarayanan (Merrill Lynch), Ray Whitmer (iMall, Excite@Home, and Netscape/AOL, *Chair*), Rezaur Rahman (Intel), Rich Rollman (Microsoft), Rick Gessner (Netscape), Rick Jelliffe (invited), Rob Relyea (Microsoft), Scott Isaacs (Microsoft), Sharon Adler (INSO), Steve Byrne (JavaSoft), Tim Bray (invited), Tim Yu (Oracle), Tom Pixley (Netscape/AOL), Vidur Apparao (Netscape), Vinod Anupam (Lucent).

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D.1: Production Systems

This specification was written in XML. The HTML, OMG IDL, Java and ECMAScript bindings were all produced automatically.

Thanks to Joe English, author of cost, which was used as the basis for producing DOM Level 1. Thanks also to Gavin Nicol, who wrote the scripts which run on top of cost. Arnaud Le Hors and Philippe Le Hégaret maintained the scripts.

After DOM Level 1, we used Xerces as the basis DOM implementation and wish to thank the authors. Philippe Le Hégaret and Arnaud Le Hors wrote the Java programs which are the DOM application.

Thanks also to Jan Kärrman, author of html2ps, which we use in creating the PostScript version of the specification.

Glossary

Editors:
Arnaud Le Hors, W3C
Robert S. Sutor, IBM Research (for DOM Level 1)

Several of the following term definitions have been borrowed or modified from similar definitions in other W3C or standards documents. See the links within the definitions for more information.

API
An *API* is an Application Programming Interface, a set of functions or methods used to access some functionality.

document element
There is only one document element in a `Document`. This element node is a child of the `Document` node. See *Well-Formed XML Documents* in XML [XML 1.0].

document order
There is an ordering, *document order*, defined on all the nodes in the document corresponding to the order in which the first character of the XML representation of each node occurs in the XML representation of the document after expansion of general entities. Thus, the *document element* [p.37] node will be the first node. Element nodes occur before their children. Thus, document order orders element nodes in order of the occurrence of their start-tag in the XML (after expansion of entities). The attribute nodes of an element occur after the element and before its children. The relative order of attribute nodes is implementation-dependent.

element
Each document contains one or more elements, the boundaries of which are either delimited by start-tags and end-tags, or, for empty elements by an empty-element tag. Each element has a type, identified by name, and may have a set of attributes. Each attribute has a name and a value. See *Logical Structures* in XML [XML 1.0].

event
An event is the representation of some asynchronous occurrence (such as a mouse click on the presentation of the element, or the removal of child node from an element, or any of unthinkably many other possibilities) that gets associated with an *event target* [p.37] .

event target
The object to which an *event* [p.37] is targeted.

logically-adjacent text nodes
Logically-adjacent text nodes are `Text` or `CDataSection` nodes that may be visited sequentially in *document order* [p.37] without entering, exiting, or passing over `Element`, `Comment`, or `ProcessingInstruction` nodes.

live
An object is *live* if any change to the underlying document structure is reflected in the object.

model
A *model* is the actual data representation for the information at hand. Examples are the structural model and the style model representing the parse structure and the style information associated with a document. The model might be a tree, or a directed graph, or something else.

namespace prefix
A *namespace prefix* is a string that associates an element or attribute name with a *namespace URI* in XML. See namespace prefix in Namespaces in XML [XML Namespaces].

namespace URI
A *namespace URI* is a URI that identifies an XML namespace. This is called the namespace name in Namespaces in XML [XML Namespaces].

read only node
A *read only node* is a node that is immutable. This means its list of children, its content, and its attributes, when it is an element, cannot be changed in any way. However, a read only node can possibly be moved, when it is not itself contained in a read only node.

target node
The target node is the node representing the *event target* [p.37] to which an *event* [p.37] is targeted using the DOM event flow.

tokenized
The description given to various information items (for example, attribute values of various types, but not including the StringType CDATA) after having been processed by the XML processor. The process includes stripping leading and trailing white space, and replacing multiple space characters by one. See the definition of tokenized type.

well-formed
A node is a *well-formed* XML node if it matches its respective production in [XML 1.0], meets all well-formedness constraints related to the production, if the entities which are referenced within the node are also well-formed. See also the definition for *well-formed* XML documents in [XML 1.0].

References

For the latest version of any W3C specification please consult the list of W3C Technical Reports available at http://www.w3.org/TR.

F.1: Normative references

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XML Information Set, J. Cowan and R. Tobin, Editors. World Wide Web Consortium, 24 October 2001. This version of the XML Information Set Recommendation is http://www.w3.org/TR/2001/REC-xml-infoset-20011024. The latest version of XML Information Set is available at http://www.w3.org/TR/xml-infoset.

[XPath 1.0]
XML Path Language (XPath) Version 1.0, J. Clark and S. DeRose, Editors. World Wide Web Consortium, 16 November 1999. This version of the XPath 1.0 Recommendation is http://www.w3.org/TR/1999/REC-xpath-19991116. The latest version of XPath 1.0 is available at http://www.w3.org/TR/xpath.

F.2: Informative references

[DOM Level 3 Core]
Document Object Model Level 3 Core Specification, A. Le Hors, et al., Editors. World Wide Web Consortium, October 2002. This version of the Document Object Model Level 3 Core Specification is http://www.w3.org/TR/2002/WD-DOM-Level-3-Core-20021022. The latest version of DOM

Level 3 Core is available at http://www.w3.org/TR/DOM-Level-3-Core.

[XML Namespaces]

Namespaces in XML, T. Bray, D. Hollander, and A. Layman, Editors. World Wide Web Consortium, 14 January 1999. This version of the XML Information Set Recommendation is http://www.w3.org/TR/1999/REC-xml-names-19990114. The latest version of Namespaces in XML is available at http://www.w3.org/TR/REC-xml-names.

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