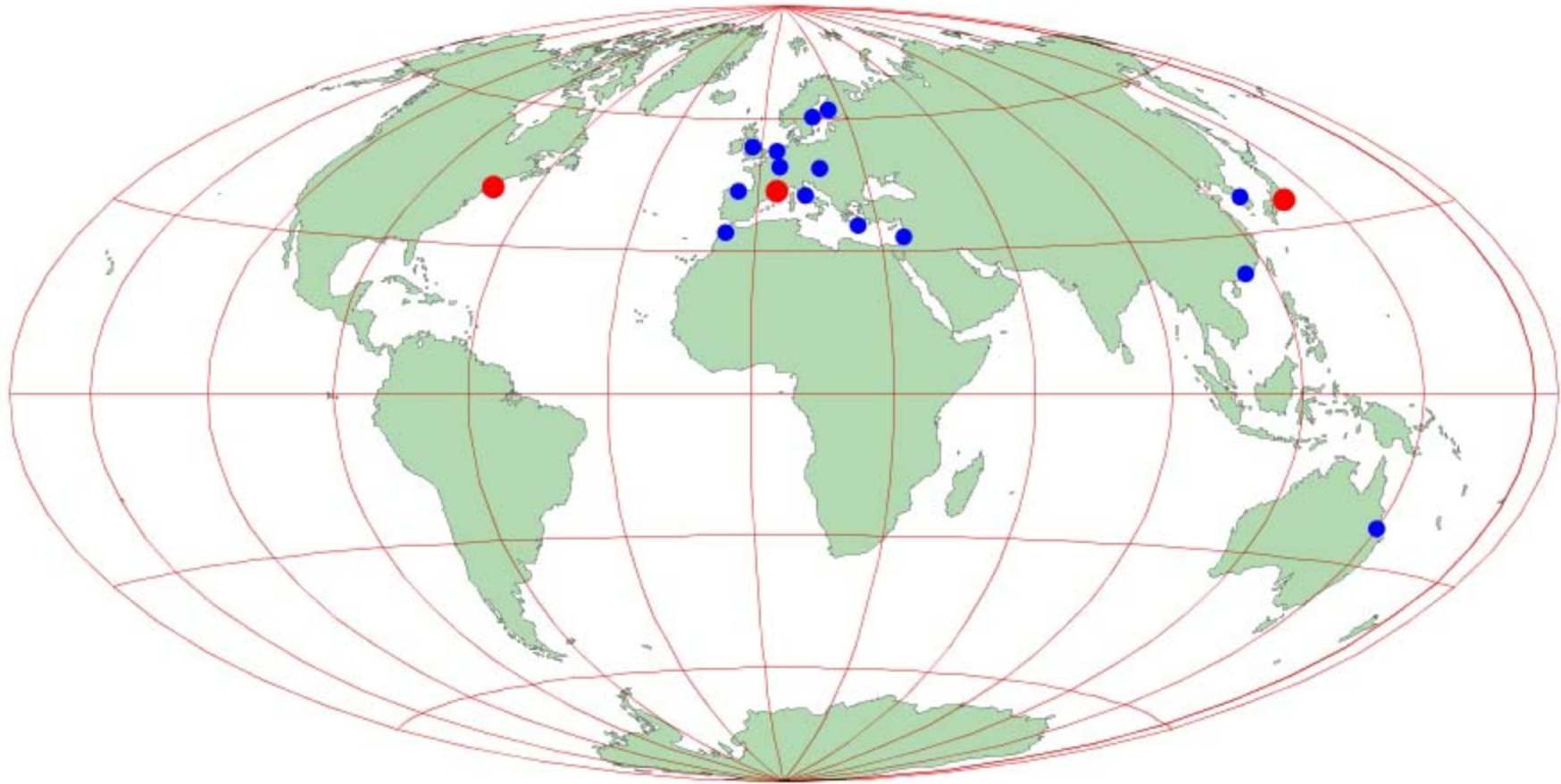


Some history

- W3C was formed in 1994 by Tim Berners-Lee
 - first “host” at MIT, Cambridge, USA
 - two more “hosts” joined later
 - INRIA, France; transferred to ERCIM in 2003
 - Keio University, Japan
 - there are 14 “offices” as local representations
 - including a Korean Office, at ETRI, in Daejeon!
- W3C is a member organization (nearly 400 members)
- Liaisons with more than 27 external organizations

- The World Wide Web Consortium (W3C):
the *neutral* forum where Web Standards are developed
- Our keywords: *consensus* and *vendor neutrality*
- Our mission: "... to lead the Web to its full potential."



- All the major players are members of W3C:
 - HP, Microsoft, Sun, WebMethods, Sony, Fujitsu, Software AG, IBM, Apple, Elisa, ...
 - Nokia, Siemens, Vodaphone, DoCoMo, T-Online, ...
 - Academia Sinica, FhG, MIT, CSIRO, EUnet, ETRI, ERCIM, ...
 - Boeing, ChevronTexaco, Agfa, Daimler Chrysler, Elsevier, ...
 - and many more...
- The technologies are developed *by the members*
 - *not* by the W3C team...
 - you should consider joining W3C if you want to influence the evolution of the Web!

Web Technologies should be interoperable

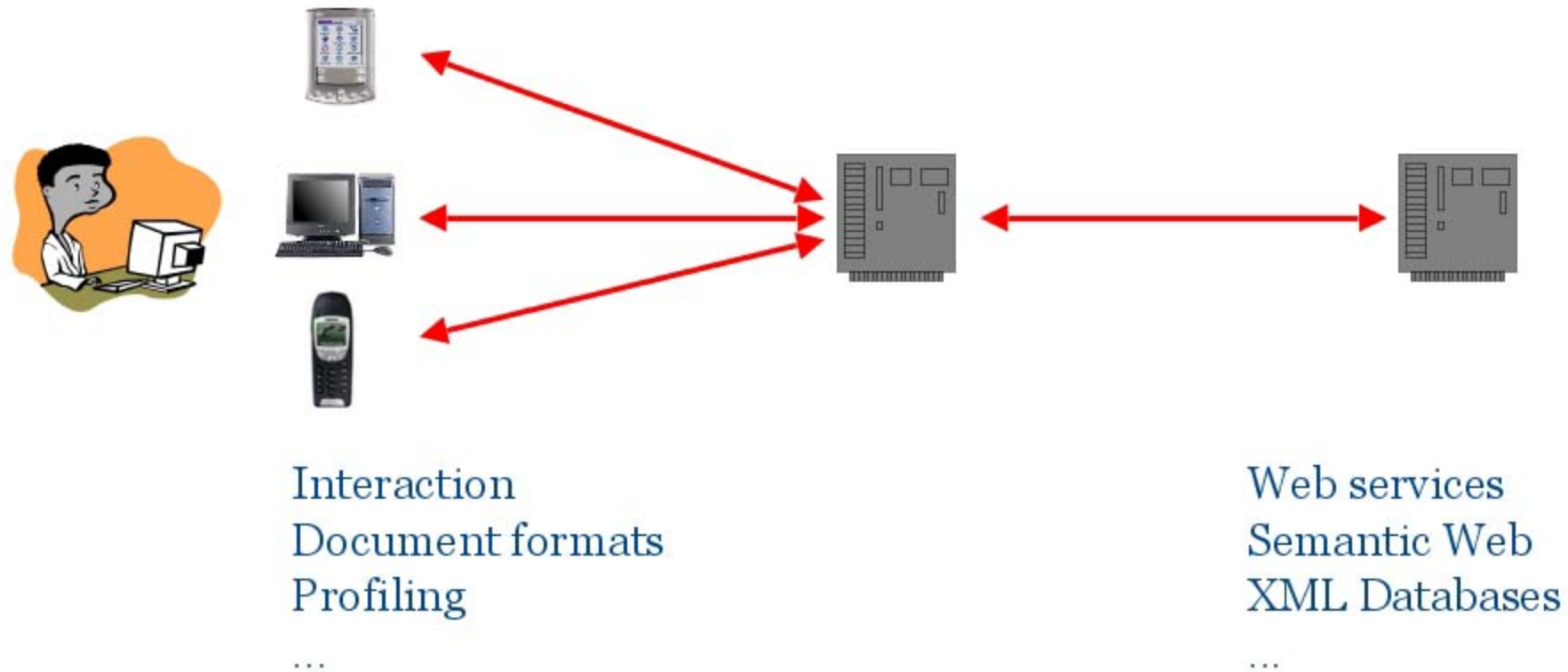
- the Web is based on a large palette of technologies
- no technology can pretend to cover *all* needs on the Web
- hence the *interoperability* of technologies is a must!

The Web is universal and for *everybody*, regardless of:

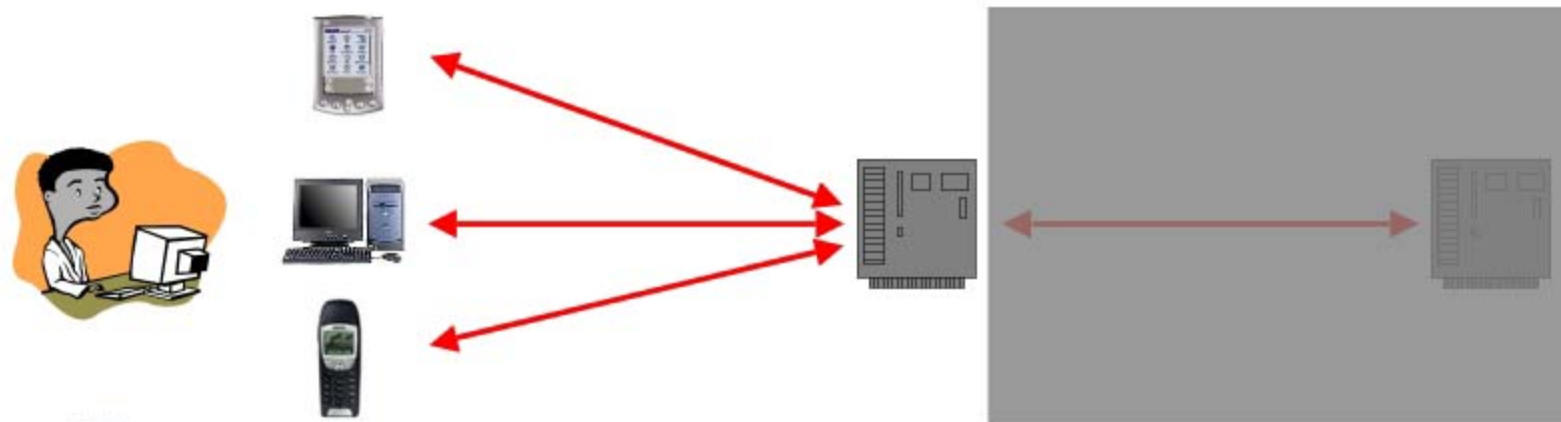
- device used for access
- language
- user capabilities
- geographical location
- ...

Data & People, Interaction

- XML is a key technology to ensure interoperability
- But XML, by itself, is not really useful... we need to:
 - *have datatypes, validation* (DTD-s, Schemas, ...)
 - *mix XML specifications/applications* (Namespaces)
 - *use hyperlinks* (XLink, XBase, ...)
 - *compose/decompose* (XInclude, Fragments, ...)
 - *refer to XML data content* (XPath, Query, ...)
 - *transform* (XSLT)
 - *encrypt, decrypt, sign* (Signature, Encryption, ...)
 - *interact, script* (DOM, Events, ...)
 - etc.
- They form the "*architectural*" foundation of the Web



- Technologies for:
 - text documents (XHTML, MathML)
 - graphics, multimedia (SVG, SMIL)
 - voice dialogs (VoiceXML)
 - interactive forms (XForms)
 - controlling presentation (CSS)
 - ...





SVG

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

MathML



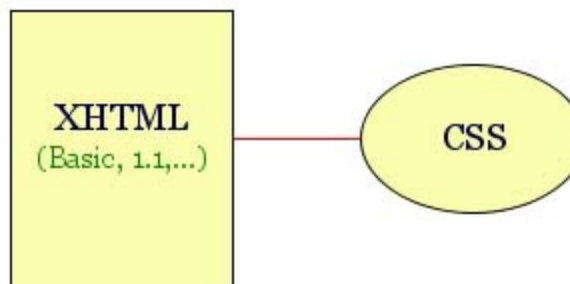
SMIL



XForms



VoiceXML



- Most of them are XML applications
 - W3C has some non-XML technologies, too (WebCGM, PNG)
- Most of them are fairly mature by now
- Tools and implementations emerge
- A challenge for coming years: *integration*
 - usage of XML is the key
 - example: integration of MathML, XHTML, and SVG in Amaya

- The Mobile industry is gaining huge momentum
 - we concentrate here *on mobile phones* and *network aware PDA-s*
- Big business in Europe and Asia, with US catching up fast
 - present penetration: 80% in Europe, Japan, Korea, 50% in the US
- Potentially huge number of users
 - 40 Million new users per year in China alone!
 - future: one PC per family, but one Mobile *per person*...
- Question: what does W3C contribute to this environment?

- Lots of hardware and software vendors (of course)
- Two main industry consortia:
 - Open Mobile Alliance (OMA) :
 - integrates a number of older consortia
 - WAP Forum, SyncML Initiative, ...
 - specifies interoperable technical specification for Mobile devices
 - 3rd Generation Partnership Project (3GPP)
 - specifies technical specification for 3rd Generation GSM networks
 - roughly: 3GPP is the radio, OMA is the application level
 - but there are overlaps
 - they try to cooperate and synchronize

- OMA and 3GPP usually *integrate* existing technologies (when available and possible)
 - e.g., 3GPP's Multimedia Messaging Service (MMS) specifications defines the media formats in terms of other technologies
 - if the technology does not exist, they define it themselves
- W3C's expertise lies in the basic Web architecture
- W3C provides already a number of "building blocks"
 - these may be (or are) integrated in 3GPP/OMA specifications
 - some technologies are used directly
 - W3C has been aware of the importance of Mobile for a while
- W3C takes a leading role in multimodal interaction

An Enabling Technology: Modularization

- Large specifications are defined in terms of small units
 - e.g., for XHTML: link, basic table, list
- “Profiles” are defined by choosing some units only
- A technology developed by W3C for XML and CSS
 - for XML, it was introduced in “XHTML Modularization” (W3C Rec.)
 - used by XHTML, SVG, SMIL, ...
 - CSS 3 is defined in terms of profiles, too
- Largely adopted by OMA and 3GPP

- XHTML Basic: a “minimized” profile of XHTML
 - ▶ had an early adoption for WAP 2
 - to be precise: there is an XHTML Mobile by OMA
 - a tiny superset of XHTML Basic
 - harmonization is planned
- CSS Mobile: under development
- Important for simple devices
- For higher end devices, it may not be that relevant...
 - there are browsers that can manage XHTML 1.1+CSS

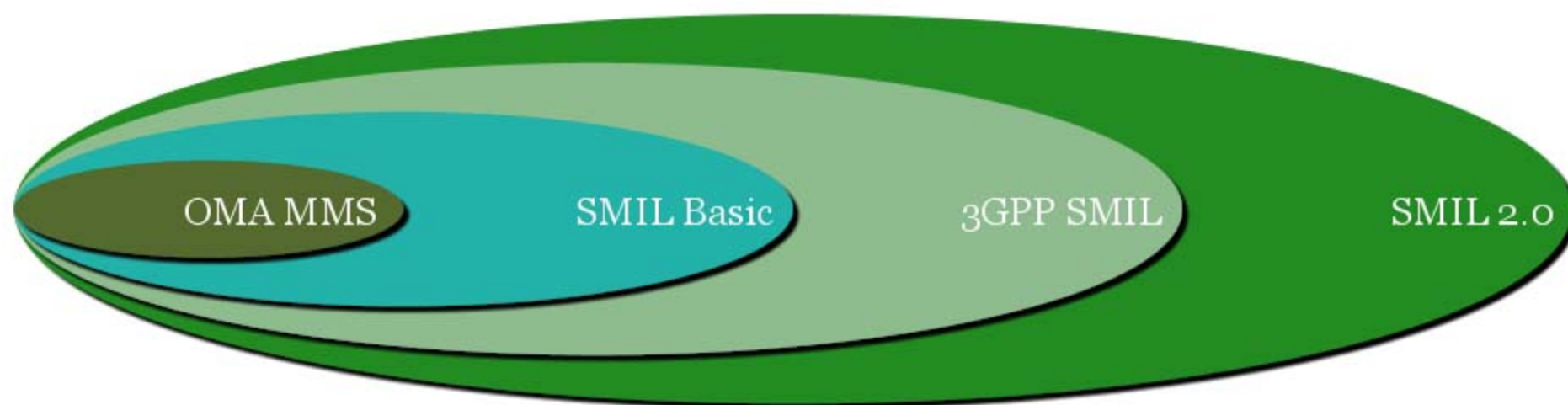


- SVG brings 2D vector graphics to the Web
- W3C defines two “Mobile” profiles: Tiny and Basic
- Several implementations exist already
 - on Windows CE, Symbian, for J2ME...
 - integration with better browsers is also happening
- W3C is working on SVG 1.2, with SVG 1.2 Tiny and Basic
- SVG Mobile becomes *the* vector graphics tool for Mobile!



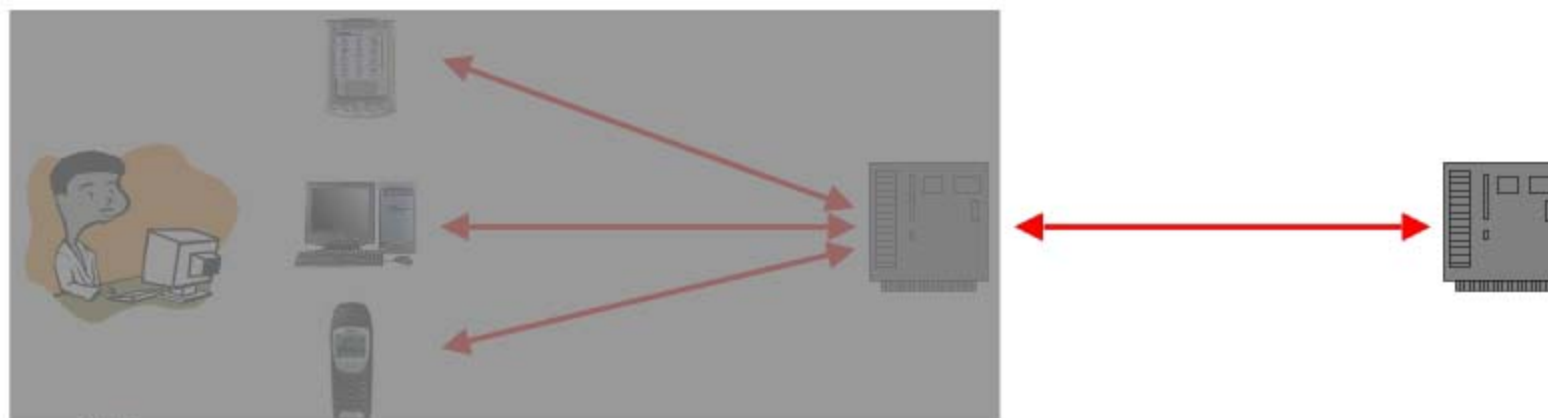
- SMIL is an *integrator* language:
 - “Synchronized Multimedia Integration Language”
 - coordinates the display of other media in time
 - audio, video, graphics, texts
 - relies on other media formats for real display
- W3C has defined two profiles:
 1. SMIL 2.0: the full set of possibilities
 2. SMIL 2.0 Basic: for simple devices
- There are stand-alone implementations for Mobile devices

- MMS is the next “cool” thing on phones:
 - send/receive messages with multimedia content
 - display those with various timing constraints
- There are several MMS formats, *each a SMIL profile*
 - OMA has a small MMS format, subset of SMIL Basic
 - 3GPP defines an MMS format, between SMIL Basic and full SMIL
 - this will dominate with better phones
 - W3C has just restarted the SMIL work, it should consolidate...



Data & Machines

- Computers co-operate through the Web
 - goal is to achieve an improved user experience
- Typical applications:
 - search engines, on-line catalogues, news services, user profiling, e-commerce, shared computing resources, computational services (stock values, translations, weather, ...)
- Two major, *complementary* approaches emerge:
 - service based
 - metadata based



- Area collectively known as *Web Services*
- Providers expose “active” services on the Web
 - documents are transferred to these services for processing
 - results may be returned as documents, too
- Defines a *document oriented distributed computing model*
 - reminiscent of other models, e.g., distributed objects
 - but not the same! E.g., there is no concept for object lifecycle
 - the ubiquitous Web infrastructure is a key for deployment

- W3C concentrates on some of the basics of WS:
 - protocol to transfer data over the Internet (SOAP)
 - description of the service interfaces (WSDL)
 - global view on cooperating services (WS-CDL)
 - referred to as "choreography"
 - based on π -calculus
 - other areas are under discussion
- **Other building blocks are done elsewhere**
 - these are usually on a higher level

- *Metadata* is added to Web resources
 - they describe *properties* of the resource
- Area collectively known as the *Semantic Web*
- We'll come back to the details later!

The Web is for Everybody!

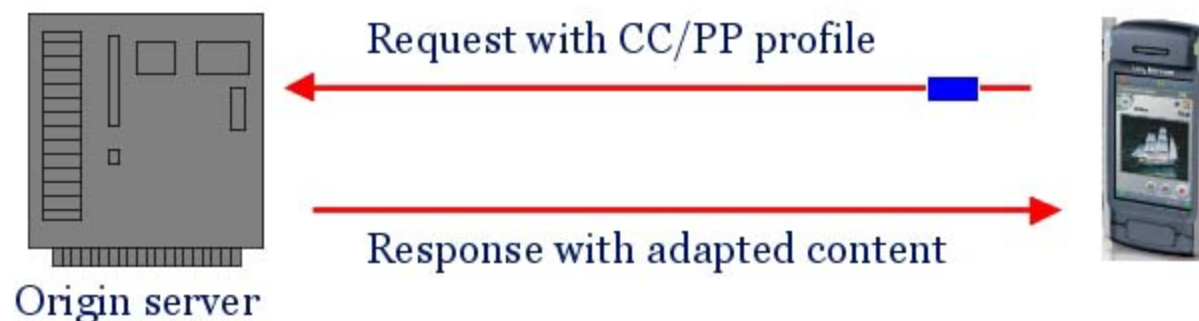
- **Regardless of device types and capabilities**
 - PC-s, phones, TV-s, PDA-s, ...
 - low bandwidth, small B/W screen, no sound, no screen, ...
- **Regardless of user capabilities**
 - color or total blindness, ...
 - difficulties with a keyboard, mouse (eg, RSI problems), ...
 - dyslexia, cognitive or neurological difficulties, ...
- **Regardless of language, culture, geographical location**
 - the majority of Web users are not English speakers
 - it is not only an issue of character sets...
 - directions of writing, ...
 - format of dates, phone numbers, ZIP codes, numbered items, ...
 - different keyboard types, ...

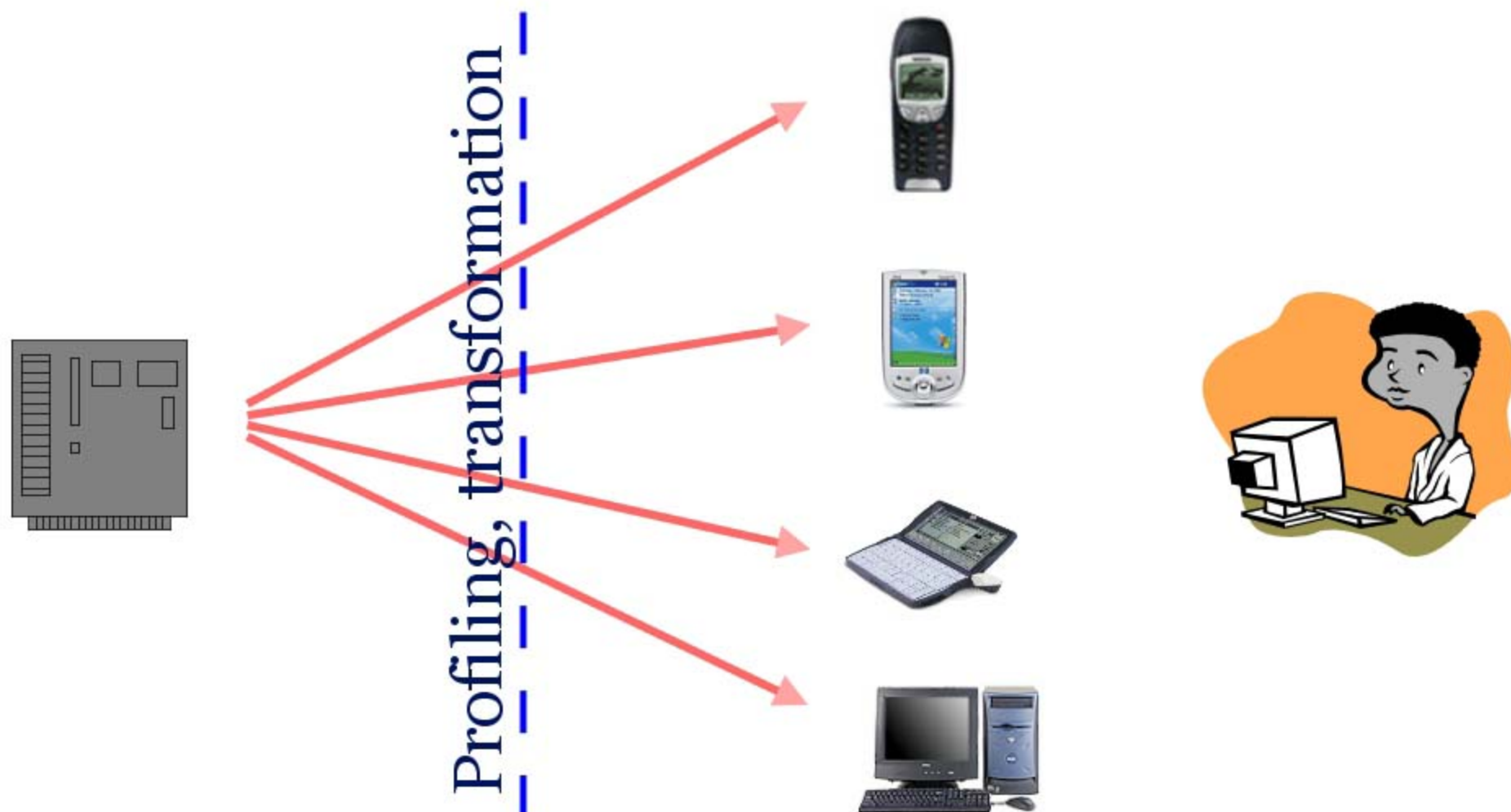
How do we Achieve This?



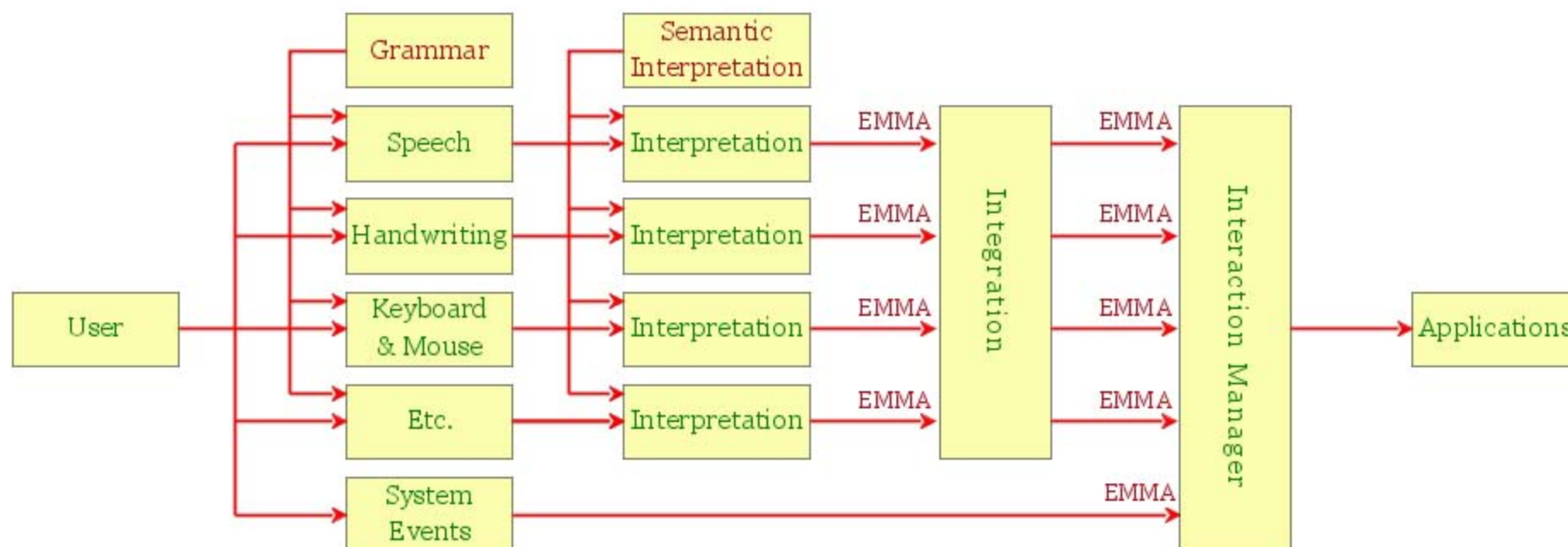
- The infrastructure should adapt itself:
 - separation of the *information* from the *presentation*
 - describe the environments and let the tools adapt
- XML formats should be usable in possibly *all* circumstances
 - e.g., proper data structures for dates, facilities for metadata
- XML data might have to be properly annotated
 - XHTML's **alt** attribute for images is a typical example
- The Semantic Web has an important role to play!
 - adding metadata to images
 - describing device capabilities
 - ...

- *Adaptation* of content becomes important
- With CC/PP devices and user capabilities can be *described*
 - CC/PP is a general framework
 - OMA defines a CC/PP Profile (UAPROF) for Mobiles
 - Semantic Web technologies are used
 - protocol adaptation is being worked on
- Basic CC/PP usage scenario:

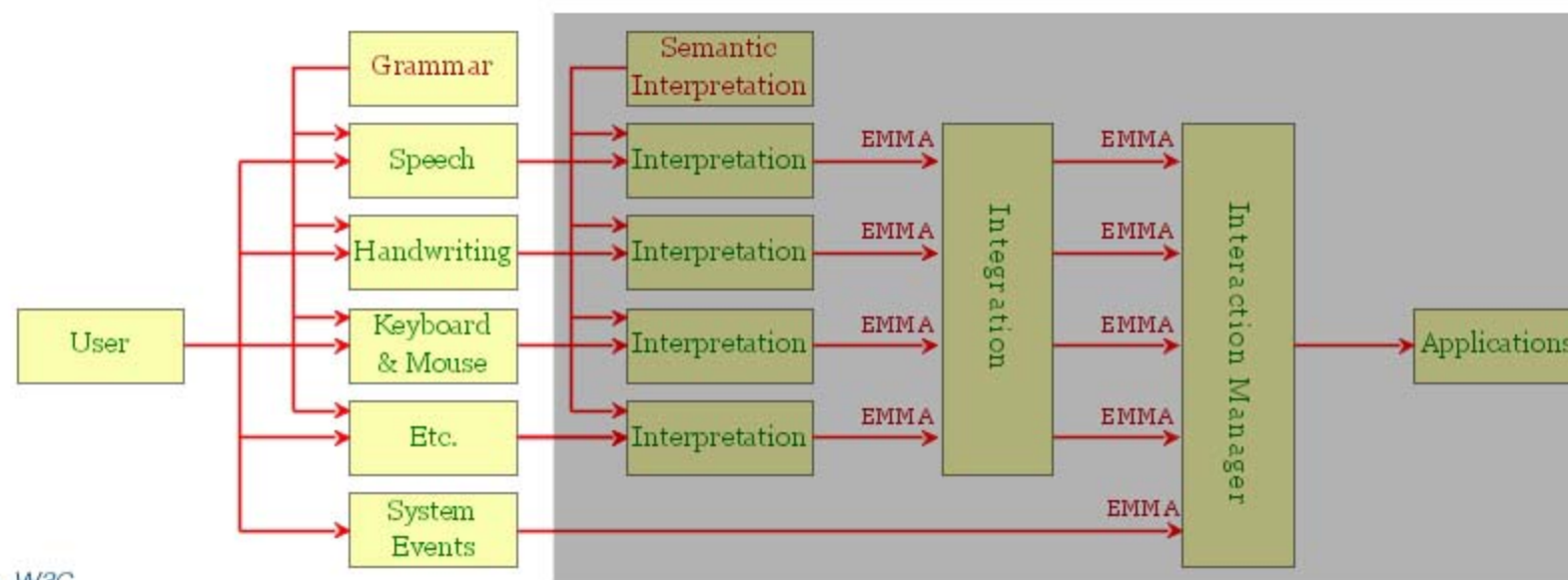




- “Everybody” means also a *multimodal* interaction
 - important for Mobile devices...
 - ... but also for people with disabilities!
- Separate Working group at W3C
- Develops a general framework for Multimodal Interaction...
- ... and specific technologies when necessary
- A (simplified) figure of the interaction path:



- W3C has two activities in this area (currently):
 - Speech Recognition Grammar (for speech)
 - InkML (for handwriting)



- SRGS is almost a W3C Recommendation
- Describes the *expected* utterances with a simple grammar
 - can be either in Augmented BNF or XML syntax
- Speech processors *know what they can expect in a context*, hence no need for a very general speech recognition
 - this makes speech input feasible
 - the “output” is the set of literals described by the grammar
- The grammar can also be used for non-speech input
 - eg, to interpret handwritten input


```
<grammar xmlns="...">
  <rule id="yes">
    <one-of>
      <item>yes</item> <item>yeah</item> <item>you bet</item>
      <item xml:lang="fr">oui</item>
    </one-of>
  </rule>
  <rule id="no">
    <one-of>
      <item>no</item> <item>nope</item> <item>no way</item>
      <item xml:lang="fr">non</item>
      <item xml:lang="fr">pas question</item>
    </one-of>
  </rule>
  <rule id="answer" scope="public">
    <one-of>
      <item> <ruleref uri="#yes"/> </item>
      <item> <ruleref uri="#no"/> </item>
    </one-of>
  </rule>
</grammar>
```

- Represents input data from electronic pen or stylus
- Includes information about:
 - contiguous ink points, with velocity and acceleration
 - pen tip force, orientation (azimuth, tilt, ...)
 - slide button states
- A handwriting processor can recover many information
 - eg, hand-written signatures can be characterized
- Currently a Working Draft, ongoing work



```
<ink xmlns="...">
  <captureDevice manufacturer="..." sampleRate="100" ...
    ...
  </captureDevice>
  <!-- Simple input with coordinate pairs only -->
  <trace id="tr1">
    10 0 9 14 8 28 7 42 6 56 6 70 8 84 8 98 8 112 9 126 1
    ...
  </trace>
  <!-- Pairs with velocity and acceleration -->
  <trace id = "tr2">
    1125 18432'23'43"7"-8 3-5+7
    ...
  </trace>
</ink>
```



- W3C has activities to reinforce the universality principle
 - “horizontal” review of *all* W3C technologies:
 - internationalization, multimodality, accessibility, device independence, ...
 - specification can be “sent back” to the drawing board if problems occur!
 - separate education and outreach activities:
 - tutorials, information for designers, quicktips, guidelines

Example: International Text



Japanese:
Webの可能性を最大限に導き出すために…

English: Leading the Web to its Full Potential...

Catalan: Duent la Web al seu ple potencial...

Dutch: Het Web tot zijn volle potentieel ontwikkelen...

French: Amener le Web vers son plein potentiel...

German: Alle Möglichkeiten des Web erschließen...

Greek: Οδηγώντας τον παγκόσμιο ιστό στο μέγιστο των δυνατοτήτων του...

Hungarian: Hogy kihasználhassuk a Web nyújtotta összes lehetőséget...

Italian: Sviluppare al massimo il potenziale del Web...

Chinese: 引发网络的全部潜能...

Korean: 웹의 모든 잠재력을 이끌어 내기 위하여...

Portuguese: Levando a Web em direcção ao seu potencial máximo...

Russian: Раскрывая весь потенциал Сети...

Spanish: Guiando la web hacia su máximo potencial...

Swedish: Se till att Webben når sin fulla potential...

Finnish: Ohjaamassa Webin kehittymistä täyteen mittaansa...

Hebrew: להוביל את הרשת למיצוי הפוטנציאל שלה...

Arabic: لإيصال الشبكة المعلوماتية إلى أقصى إمكاناتها...

Chinese: 引發網絡的全部潛能…

The Semantic Web

- *"The future of the Web is a universal medium for the exchange of data"*
- But... the current Web represents information using
 - natural language (English, Hungarian, Korean,...)
 - graphics, multimedia, page layout
- This is okay for humans; difficult for machines!

Example: Searching



- The best-known example...
 - Google et al. are great, but there are too many false hits
 - adding descriptions to resources should improve this

Example: Automatic Assistant



- Your own personal (digital) automatic assistant
 - knows about your preferences
 - builds up knowledge base using your past
 - can *combine* the local knowledge with remote services:
 - hotel reservations, airline preferences
 - dietary requirements
 - medical conditions
 - calendaring
 - etc
- It communicates with *remote* information (ie, on the Web!)
(D. Dertouzos: “The Unfinished Revolution”)

Example: Data(base) Integration



- Databases are very different in structure, in content
- Lots of applications require managing *several* databases
 - after company mergers
 - combination of administrative data for e-Government
 - biochemical, genetic, etc, research
 - etc
- Most of these data are now on the Web
- The *semantics* of the data(bases) should be known
 - how this semantics is mapped on internal structures is immaterial

Example: Digital Libraries



- It is a bit like the search example
- It means catalogues on the Web
 - librarians have known how to do that for centuries
 - goal is to have this on the Web, World-wide
 - extend it to multimedia data, too
- **But it is more: software agents should also be librarians!**
 - help you in finding the right publications

- Web services technology is great
- But if services are ubiquitous, searching issue comes up; for example:
 - “find me the most elegant Schrödinger equation solver”
 - what does it mean to be
 - “elegant”?
 - “*most* elegant”?
 - mathematicians ask these questions all the time...
- It is necessary to characterize the service
 - not only in terms of input and output parameters...
 - ...but also in terms of its *semantics*

- A resource should provide *information* about itself
 - also called “metadata”
 - metadata stored in XML or other, machine readable form
 - metadata vocabularies should be defined
 - agents should be able to “reason” about (meta)data

The “Semantic Web” is a metadata based infrastructure for reasoning on the Web

- It *extends* the current Web (and does not replace it)

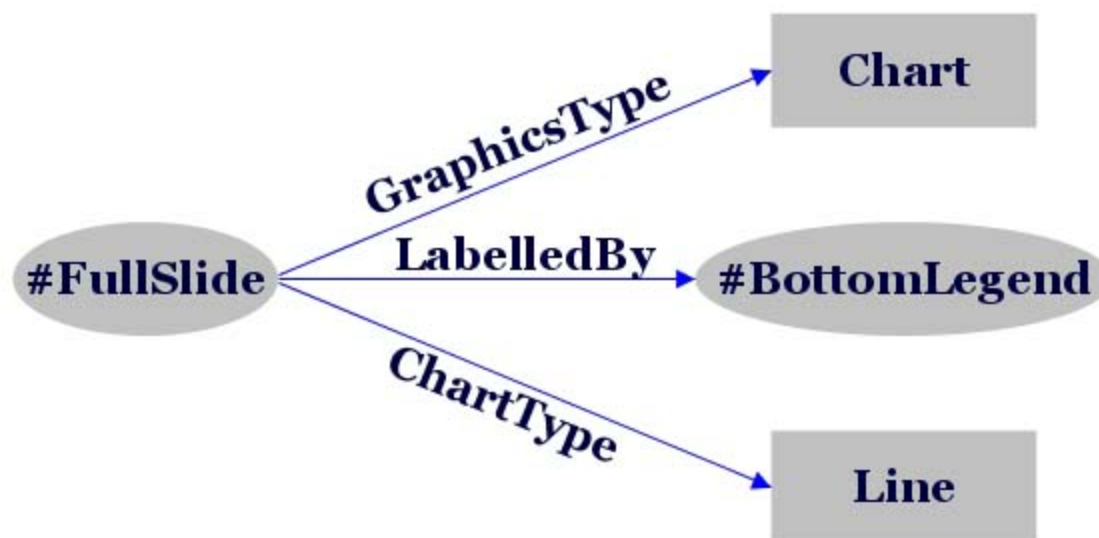
- Convey the meaning of a figure through text (important for accessibility)
 - add *metadata* to the image describing the content
 - let a tool produce some simple output using the metadata
 - use a standard metadata formalism



W3C Membership evolution 1994-2001

- The metadata is a set of *statements*
- In our example:
 - “the type of the full slide is a chart, and the chart type is «line»”
 - “the chart is labeled with an (SVG) text element”
 - “the legend is also a hyperlink”
 - “the target of the hyperlink is «URI»”
 - “the full slide consists of the legend, axes, and data lines”
 - “the data lines describe full and affiliate members, all members”
- The statements are about *resources*:
 - SVG elements, general URI-s, ...

- Statements can be modeled (mathematically) with:
 - Resources: an element, a URI, a literal, ...
 - Properties: *directed* relations between *two* resources
 - Statements: “triples” of two resources bound by a property
 - usual terminology: (s,p,o) for subject, property, object
- **RDF** is a general model for such statements
 - can be expressed in XML or other syntax (eg, n3)



```
<rdf:Description rdf:about="#FullSlide">
  <axsvg:GraphicsType>Chart</axsvg:GraphicsType>
  <axsvg:LabelledBy rdf:resource="#BottomLegend"/>
  <axsvg:ChartType>Line</axsvg:ChartType>
</rdf:Description>
```

- You can *uniquely* identify all resources on the web
- Uniqueness is vital to make consistent statements
- *Anybody* can create metadata on *any* resource on the Web
 - eg, the *same* SVG file could be annotated through other terms
- It becomes easy to *merge* metadata
 - applications may merge the SVG annotations coming from different sources
 - this can be done because they refer to the *same* URI-s!
- Watch out for upcoming IRI-s in internationalization, too!

- The full RDF of our example as a graph and in XML
- A more complicated set of statements ...
 - it is not as new as you might think...

The tool:

1. Uses an RDF parser to extract metadata
2. Resolves the URI-s in RDF to access the SVG elements
3. Extracts information for the output
 - eg, text element content, hyperlink data, descriptions
4. Combines this with a general text
5. Produces a (formatted) text for each RDF statement

RDF is not Enough...

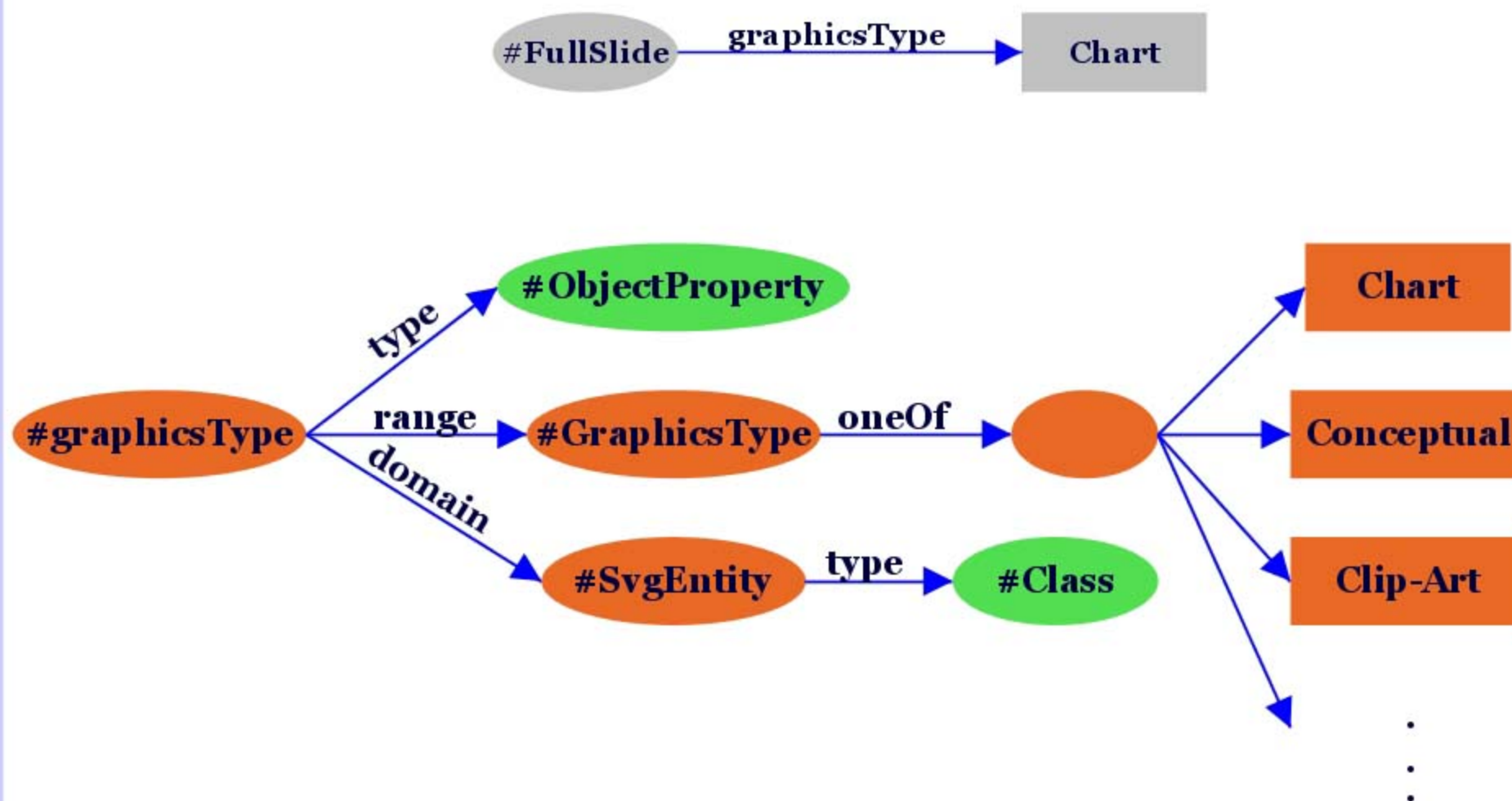


- Adding metadata and using it from a program works...
- ... provided the program *knows* what terms to use!
- We used terms like:
 - **Chart**, **LabelledBy**, **IsAnchor**, ...
 - **ChartType**, **GraphicsType**, ...
 - etc
- Are they all known? Are they all correct?
- It is a bit like defining record types for a database

- What are the possible terms?
 - “is the set of metadata terms known to the program?”
- Are the properties used correctly?
 - “do they make sense for the resources?”
- Can a program *reason* about some terms? Eg:
 - “if «A» is left of «B» and «B» is left of «C», is «A» left of «C»?”
 - obviously true for humans, not obvious for a program ...
 - ... programs should be able to *deduce* such statements
- If somebody else defines a set of terms: are they the same?
 - obvious issue in an international context

- The Semantic Web needs a support of *ontologies*:
"defines the concepts and relationships used to describe and represent an area of knowledge"
- We need a *Web Ontologies Language* to define:
 - the terminology used in a specific context
 - possible constraints on properties
 - the logical characteristics of properties
 - the equivalence of terms across ontologies
 - etc

- Categorizes the basic concepts in terms of *classes*:
 - classes can be viewed as “sets” of possible concepts
 - e.g., **svgEntity** in our example
 - hierarchies of concepts can be defined as *sub-classes*
- Properties are defined by:
 - constraints on their range and domain, or
 - specialization (*sub-properties*)



- The definition:

```
<owl:ObjectProperty rdf:ID="graphicsType">  
  <rdfs:domain rdf:resource="#SvgEntity" />  
  <rdfs:range rdf:resource="#GraphicsType" />  
</owl:ObjectProperty>
```

can be used two ways by a program:

- to *check* whether a RDF statement is correct
(a "type check")
 - to *deduce* that the (domain) resource *is* of type **SvgEntity**
(because the property requires it!)
- Which approach is used depends on the application

- Class (“concept”) hierarchies can be defined
- Classes can be constructed: union, intersection, complement,...
- Properties can be characterized: is it transitive, is it a function...
 - remember the “left of” example
- **Equivalence/difference of properties and classes**
 - eg, if ontologies from different origins are used...
 - ...or to handle multilingual cases
- Other vocabularies can be imported
- Version control
- etc

- RDF gives a firm basis to model metadata
- OWL can be used to define basic ontologies
- Rich applications can be built already
- But the work continues...
 - security/trust issues
 - complex query facilities for RDF data
 - other implementation issues
 - outreach to user communities
 - life sciences
 - geospatial information systems
 - libraries and digital repositories
 - ...
 - etc.
- Join the work if you are interested, there are things to do!
 - you will have to join W3C first, though...

A widely deployed Web Services infrastructure may be the most compelling business case for the Semantic Web

but, also:


The synergy of Semantic Web and Web Service will hugely benefit for the wide deployment of both!

- *Both areas are represented at W3C*
- The Groups on Web Services work on convergence, too
 - mapping of WSDL1.2 to RDF
 - Web Choreography development in terms of RDF
 - initiatives already exist, e.g., OWL-S (formerly DAML-S)
 - cooperation with the RDF Interest Group
 - there is a "Semantic Web Services" Interest Group
- The SW activity regards WS as one of its test cases

- **Large number of applications emerge**
 - some applications use RDF only
 - others begin to use ontologies, too
 - huge number of ontologies exist already, using proprietary formats
 - converting them to RDF/OWL will be a major task (but there are converters)
 - but it will be worth it!
- **SWAD-Europe survey:**
 - URI: <http://www.w3.org/2003/11/SWApplSurvey>
 - lists more than 50 applications in 12 categories...

Dublin Core

- vocabularies for distributed Digital Libraries
- one of the first metadata vocabularies in RDF
- URI: <http://www.dublincore.org>
- extensions exist, eg, PRISM that includes digital right tracking



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Dublin Core Metadata Initiative

Making it easier to find information.

The Dublin Core Metadata Registry

The [Dublin Core Metadata Initiative's](#) Metadata Registry is an application designed to enable users to explore the DCMI vocabulary in a way that simplifies the discovery and navigation of terms and their definitions, and that illustrates the relationship between terms. The goal of the Registry is to promote the discovery, reuse and extension of existing semantics, and to facilitate the creation of new vocabularies.

Help	Preferences	Search	Administration
Please select from one of the following supported languages or click on the Preferences link above for additional options. Having trouble displaying the international fonts? Click here for help. * DCES-only translations	العربية النسخة/مصرى [ar-SA] Česky [cs-CZ] Dansk [da-DK]* Ελληνικό [el-GR] Español [es-ES] Français [fr-FR] 日本語 [ja-JP] मराठी [mr-IN] Polski [pl-PL] Русский [ru-RU] ไทย [th-TH] 繁体中文 [zh-CN]	Catalan [ca-ES] Cymraeg [cy-GB]* Deutsch [de-DE] English [en-US] Suomeksi [fi-FI] Italiano [it-IT] 한국어 [ko-KR] Norsk [no-NO]* Português [pt-PT] Svenska [sv-SE] українська [uk-UA] 繁體中文 [zh-TW]	

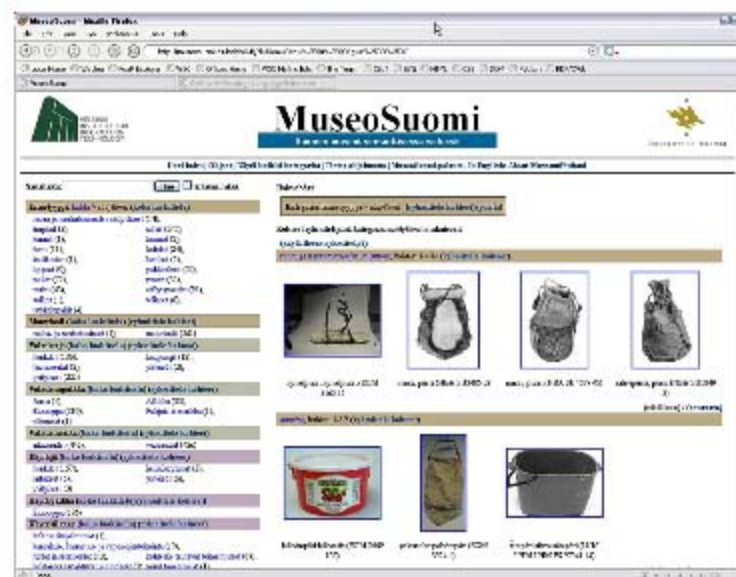
Web Content Syndication (RSS)

- can be used to specify the *important* content of a page
- there is a Yahoo discussion group and (non-W3C) working group
- URI: <http://purl.org/rss/>
- widely used in the weblog world!
- example: W3C home page syndicated

The top-left screenshot shows the W3C homepage with an RSS reader sidebar on the right. The top-right screenshot shows a detailed view of an RSS feed from the W3C homepage, displaying news items like 'W3C Launches XML Binary Characterization Working Group' and 'W3C Link Checker Released'. The bottom-right screenshot shows a web browser displaying an RSS feed from 'MEERKAT: AN OPEN WIRE SERVICE', showing a list of news items with their titles, sources, and dates.

Data integration

- achieve semantic integration of corporate resources or different databases
- RDF/RDFS/OWL based vocabularies as an "interlingua" among system components
- Boeing example: http://www.cs.rutgers.edu/~shklar/www11/final_submissions/paper3.pdf
- similar approaches: Artiste project, MITRE Corp., MuseoSuomi, ...
- there are companies specializing in the area

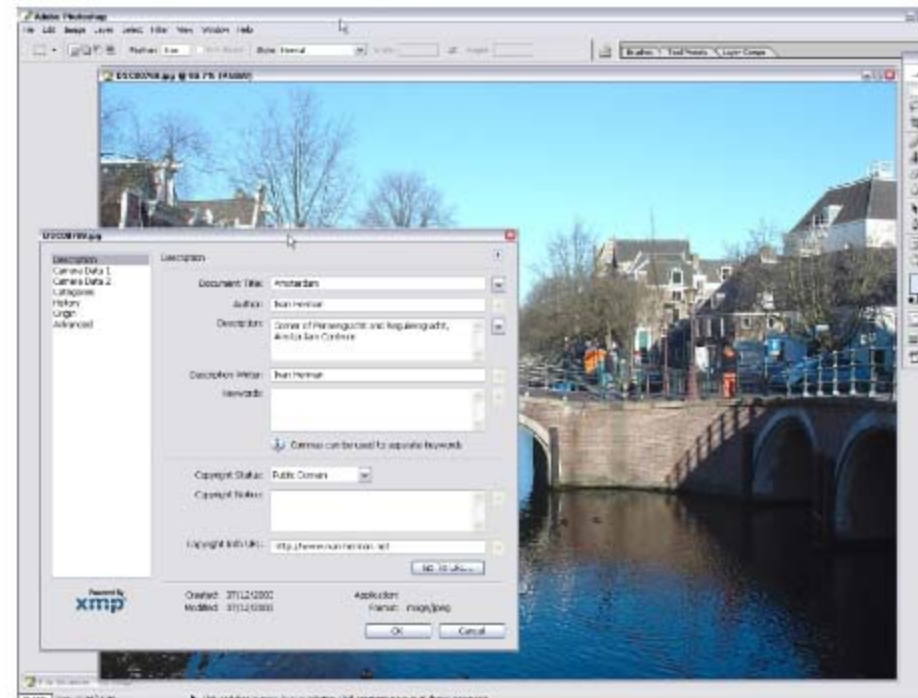


Sun's SwordFish

- Sun provides assisted support for its products, handbooks, etc
- Public queries go through an internal RDF engine for, eg:
 - Sun's White Papers collection
(<http://www.sun.com/servers/wp.html/>)
 - Sun's System Handbooks collection
(http://sunsolve.sun.com/handbook_pub/)

XMP

- Adobe's tool to add RDF-based metadata to *all* their file formats
 - eg, Photoshop in Creative Suite
 - millions of people use RDF without knowing it...
- the tool is available for all!
- URI: <http://www.adobe.com/products/xmp/main.html>



Mozilla

- internal data are stored in RDF (eg, bookmarks, conf. files)

Brandsoft

- enterprise Web Management
- all business models are stored in RDF
- easy to set up internal rules

Creative Commons

- an environment to express rights of digital content on the Web
 - legal constraints referred to in RDF, added to pages
- there are specialized browsers, browser plugins
- more than 1,000,000 users worldwide(!)
 - without knowing that they use RDF...



Baby CareLink

- centre of information for the treatment of premature babies
- provides an OWL service *as a Web Service*
 - combines disparate vocabularies like medical, insurance, etc
 - remember: ontology is hard!
 - users can add new entries to ontologies
 - complex questions can be asked through the service
- *perfect example for the synergy of Web Services and the Semantic Web!*

RDF Primer

URI: <http://www.w3.org/TR/rdf-primer>

OWL Guide

URI: <http://www.w3.org/TR/owl-guide/>

The documents contain links towards the “real” specifications

- **Bristol University has a huge list of documents, publications:**
 - URI: <http://www.ilt.bristol.ac.uk/discovery/rdf/resources/>
- **The SWAD-Europe project reports:**
 - lots of information on RDF integration, for example
 - URI: <http://www.w3.org/2001/sw/Europe/reports/intro.html>
- **W3C's Semantic Web home page is also a good start:**
 - URI: <http://www.w3.org/2001/sw/>

- Q: Isn't the Semantic Web research only?
(i.e., does it have anything to do with "business"?)
- A: Not any more...
 - SW has indeed a strong foundation in research result...
 - ...but we see more and more companies embracing it.
 - Remember:
 1. the Web was born at CERN...
 2. ...was first picked up by high energy physicists...
 3. ...then by academia at large...
 4. ...then by small businesses and start-ups...
 5. "big business" came only later!
 - Semantic Web is now at #4, and moving to #5!

- Q: Should we expect the author to type in all this metadata?
- A: Partially, but:
 - part of the metadata information is present in the tool...
...but thrown away at output
 - e.g., a business chart can be generated by a tool...
...it “knows” the structure, the classification, etc. of the chart
...but, usually, this information is lost
...storing it in metadata is easy!
 - “SW-aware” authoring tools will be of a great help
 - Ontologies also exist already
 - albeit mostly in proprietary formats
 - but conversion tools exist!

These slides are at:

<http://www.w3.org/2004/Talks/0624-Seoul-IH/>

More information about W3C:

<http://www.w3.org/Consortium/>

Korean Office of W3C

<http://www.w3c.or.kr>

Contact information:

<http://www.w3.org/Consortium/Contact>

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