

# XML: Summary and conclusions

- XML standards
- Software development and application interfaces
- Data Base Management case: Oracle
- Case: Microsoft .NET
- Web Services
- Semantic Web

# Conclusions: XML standards 1

- XML = Extended Markup Language
  - a meta language for the creation of languages to define document structures
- XSL = XML Stylesheet Language
  - XSLT = XSL Transformations
    - a transformation language to transform XML structures to other XML structures, HTML or text
  - FO = Formatting Objects (or XSL-FO)
    - a style language for XML document layout on paper or in electronic format

# Conclusions: XML standards 2

- Xpath = XML Path Language
  - a language for navigation of XML documents and locating elements
  - Xpointer & Xlink (little relevance)
- Namespaces in XML
  - unambiguous naming of elements and attributes
- XML Schema
- XHTML
- XForms 1.0 recommendation 14.10.03
- XQuery 1.0 recommendation 2007

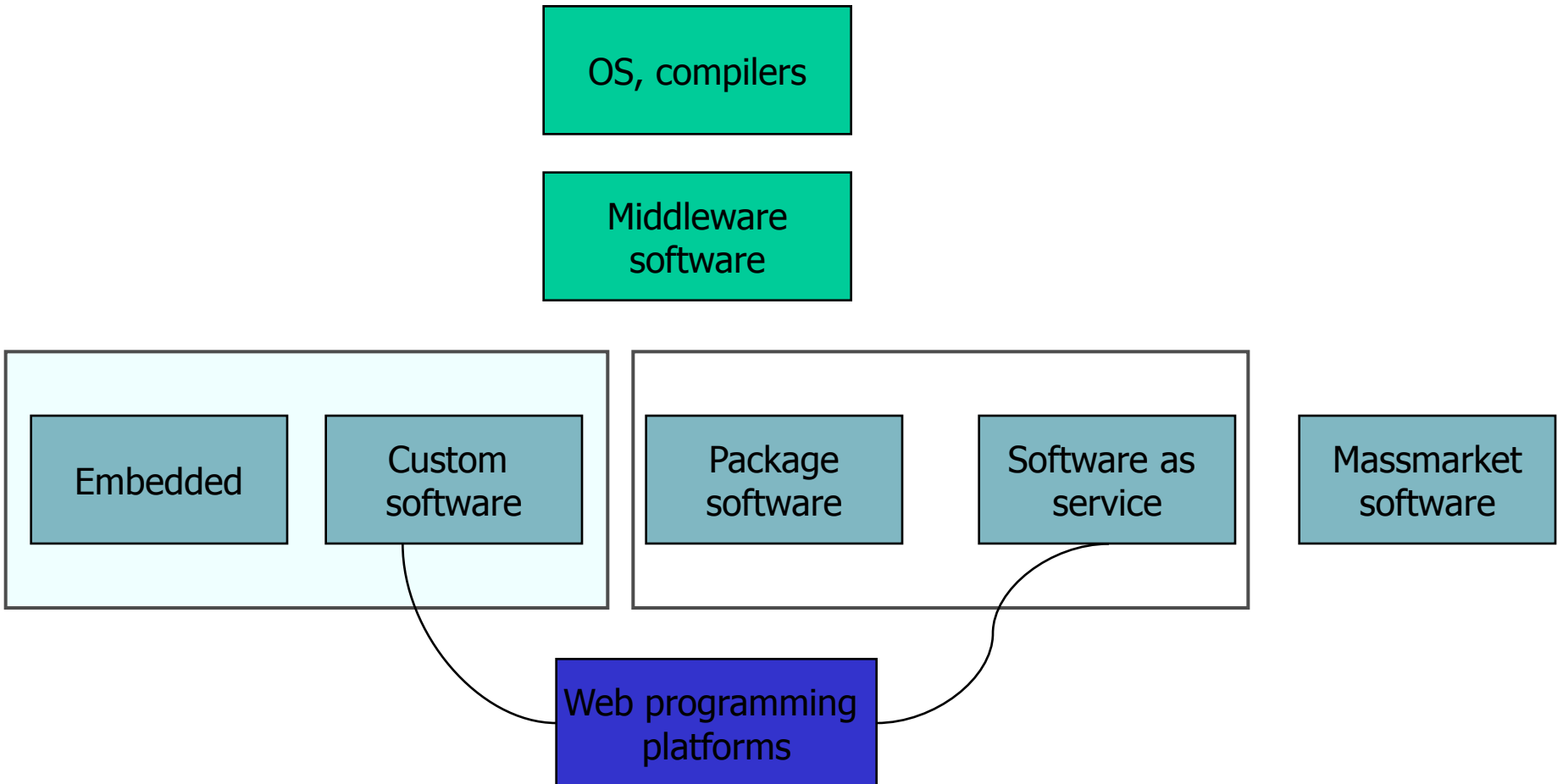
# XML application areas

- Multimedia
  - Voice XML
  - SVG 1.1
  - SMIL 3.0
  - X3D and x-smiles (Helsinki Univ. of Technology)
  - HTML5
- electronic commerce, EDI (Electronic Data Interchange)
  - ebXML: electronic business XML, UN/CEFACT and OASIS
    - main elements: ebXML storage, CPP – Collaboration Protocol Profile, CPA – Collaboration Partner agreement
  - BizTalk: Microsoft
  - RosettaNet & PapiNet
- HR-XML Human Resources management system for data exchange

# XML application areas

- Publishing, multichannel publishing
  - documents, DocBook
  - metadata
- Documentation:
  - technical documentation: manuals, term banks, spare part catalogs, language versions
  - for example Dublin Core
- Reusability:
  - same information can be delivered through different media: multichannel publishing
  - WWW, mobile devices, DVD, print

# Software development approaches



# Service-Oriented Architecture

## SOA

- Service-Oriented Architecture (SOA) facilitates the development of modular business services that can be easily integrated and reused—creating a truly flexible, adaptable IT infrastructure.
- CORBA, Web Services
- Distributed computing, cloud computing
- Modular programming
- SOA and Business Architecture; a mechanism for defining business services
- Example users:
  - SAP Enterprise Services Architecture
  - Oracle, Accenture, etc.

# Application design and UI languages

- XUL: Firefox & Thunderbird
- Silverlight for Designers Microsoft
  - "XAML browser application is a powerful declarative markup language that is the foundation for creating engaging graphics, animation, and media in Silverlight. XAML is similar to HTML, but it is more powerful and extensible."
  - for mobile devices as well
- Macromedia MXML
- XAMJ, Open Source, Java based, clientnet architecture
- XForms (W3C) > HTML5



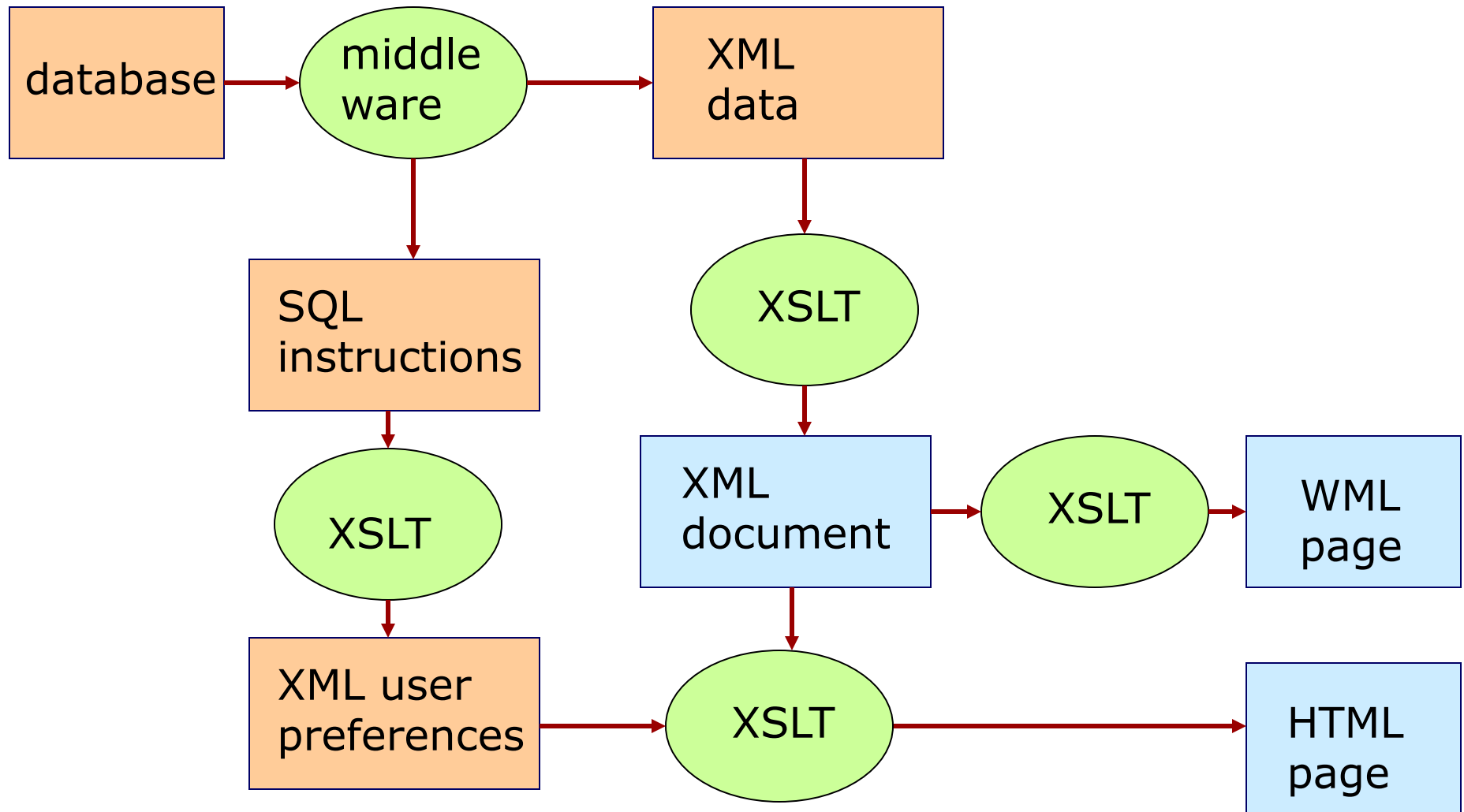
# XML application interfaces

- SAX = Simple API for XML
  - event-based programming interface for XML documents
- DOM = Document Object Model
  - XML documents can be manipulated in object oriented software using Document Object Model
  - The basic idea in DOM is to read XML documents into trees and manipulate the tree
    - DOM is a W3C ([www.w3.org](http://www.w3.org)) recommendation
- (DOM) interfaces:
  - programming language and implementation
  - independent interfaces available for several languages including Java, C++, Python, and IDL

# DOM

- DOM is also used in browsers to manipulate HTML content
- DOM levels
  - DOM Level 1
    - basic manipulation interfaces: application programming interface (API) for XML (and HTML) documents using tree-structure
  - DOM Level 2
    - builds on DOM1, adds interfaces for document navigation, CSS rules and event based XML document manipulation
  - DOM Level 3
    - XML Schemas, Xpath

# A pipeline for transformations



# XML in data exchange and document storage

- Data exchange and transfer: data-centered approach
  - data transfer in XML format
  - SOAP requests
  - the order of data elements is not important
- Storage: document-centered approach
  - XML format
  - i.e. SGML, XHTML, DocBook, news data bases
  - the order of data elements is important
  - designed to be read also by humans

# Tools for different purposes

- what is the main application of XML: storage or data transfer?
- data transfer:
  - XML is generated from a data base
  - XML documents are entered into tables
  - off-the-shelf tools or design of a tailored application
- XML functions as a document data base
  - are changes, searches or deletions needed?
  - versions?

# Case: Oracle DBMS and XML

- relational data base management system
- Oracle 8i
  - basic XML generation and processing
  - XML developer's kit (XDK)
- Oracle 9i R1
  - XML storage and searches integrated into data base
- Oracle 9i R2
  - native XML DB
- XDK
  - support for programming: Java, C, C++, PL/SQL

## Case: Oracle DBMS and XML 2

- XML DB: XML documents are processed in the data base
  - generation
  - validation
  - XSLT transformations
  - searches, updates, deletions
  - not a separate server but a collection of XML technologies added to the Oracle data base
  - inbuilt XML repository (directories)
  - searches and interfaces: SQL/ Java, WebDAV, FTP, HTTP

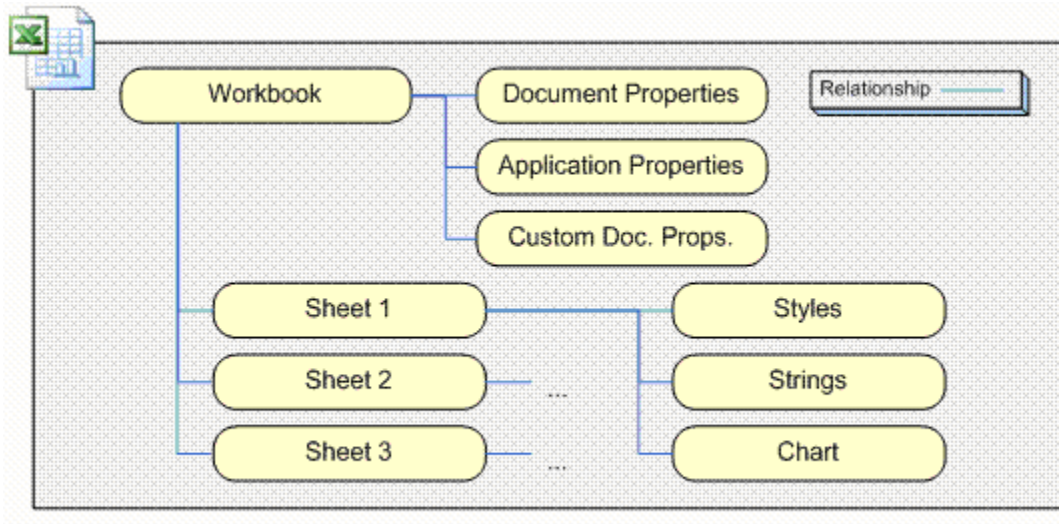
# Case : Microsoft .NET

Microsoft .NET has been released in late 2001 and covers the environment for application development with an emphasis for solutions over the internet.

- in 2011 .NET Framework 4
- .NET (dotnet) basic facts:
  - Visual Studio .NET
    - C++, C#, Visual Basic, based on CLR (Common Language Runtime)
  - Part of XP, 2003, Server 2008 & Vista, W7 operating systems
  - ADO data base interface implements XML
  - ASP.NET 2 (incl. Ajax)
  - Web Services based on XML
  - Most XML standards will be, only DOM supported



# Office Open XML File Format



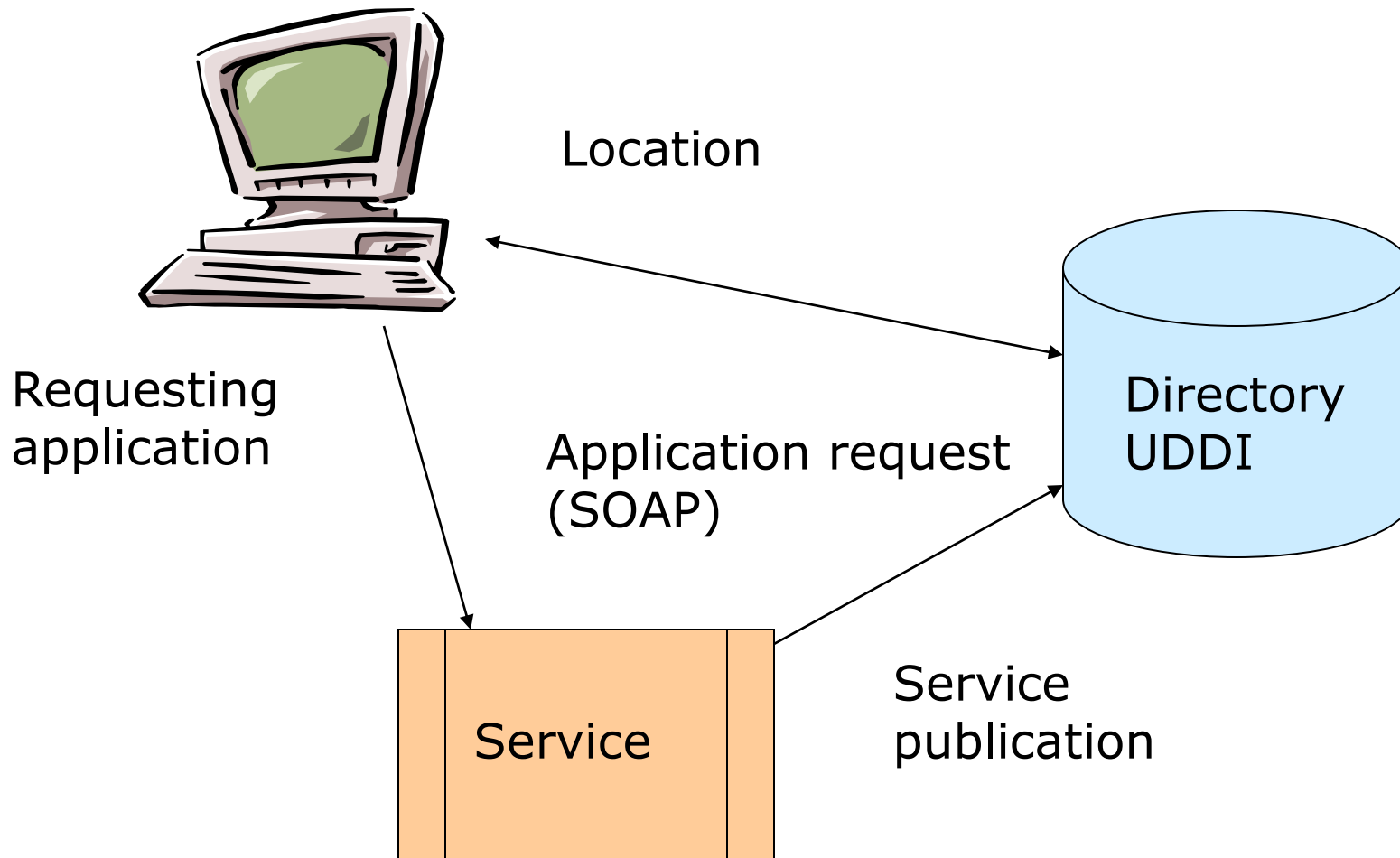
# Microsoft architecture

- WPF Windows Presentation Foundation
  - in XML format, vector based graphics
  - Graphics controls on desktop, animated user interfaces
  - Silverlight is based on WPF but runs on a Web browser
- WCF Windows Communication Foundation
  - Unified communications that link TCP/IP, WebServices, HTTP, etc.
- WWF Windows Workflow Foundation
  - BizTalk Server
  - Orchestrates workflows

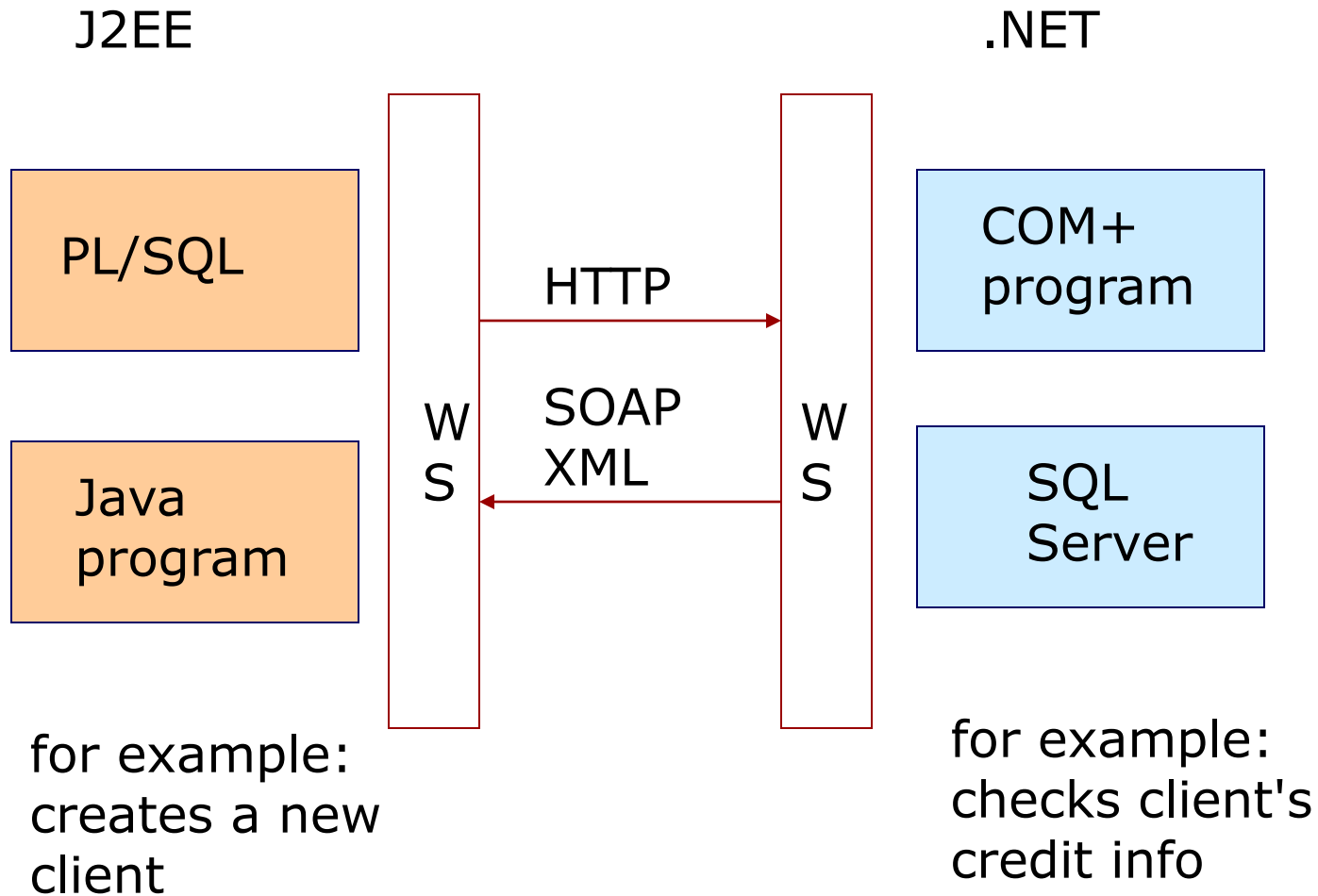
# Web Services

- are functional components or programs, format XML
- used over the internet (user server asks service component from another server and embeds it in the response file to the client)
- key components
  - SOAP Simple Object Access Protocol
  - HTTP
  - Universal Description, Discovery, and Integration (UDDI)
  - WSDL Web Service Description Language

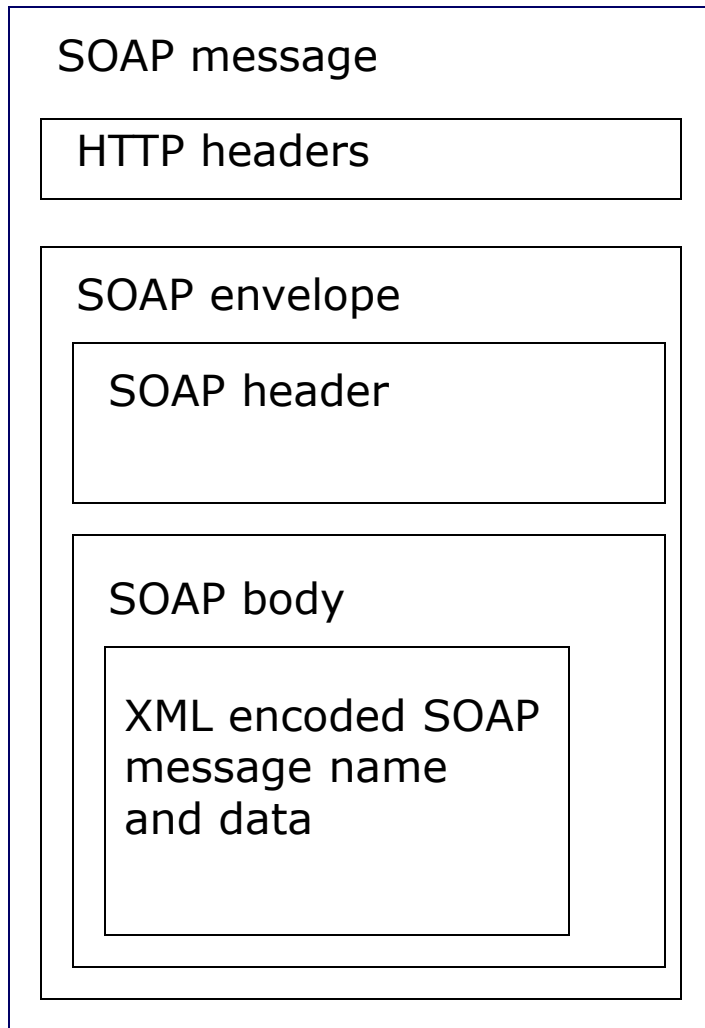
# Web Services concept



# Web Services between platforms



# SOAP message



# SOAP example

```
<SOAP-ENV: Envelope>  
  <SOAP-ENV:Body>  
    <GetStockQuote  
      xmlns:"urn:stock-quotes">  
        <StockSymbol>ORCL</StockSymbol>  
      </GetStockQuote>  
    </SOAP-ENV:Body>  
</SOAP-ENV: Envelope>
```

Request

```
<SOAP-ENV: Envelope>  
  <SOAP-ENV:Body>  
    <GetStockQuoteResponse  
      xmlns:"urn:stock-quotes">  
        <USD_Price>17.18</USD_Price>  
      </GetStockQuoteResponse>  
    </SOAP-ENV:Body>  
</SOAP-ENV: Envelope>
```

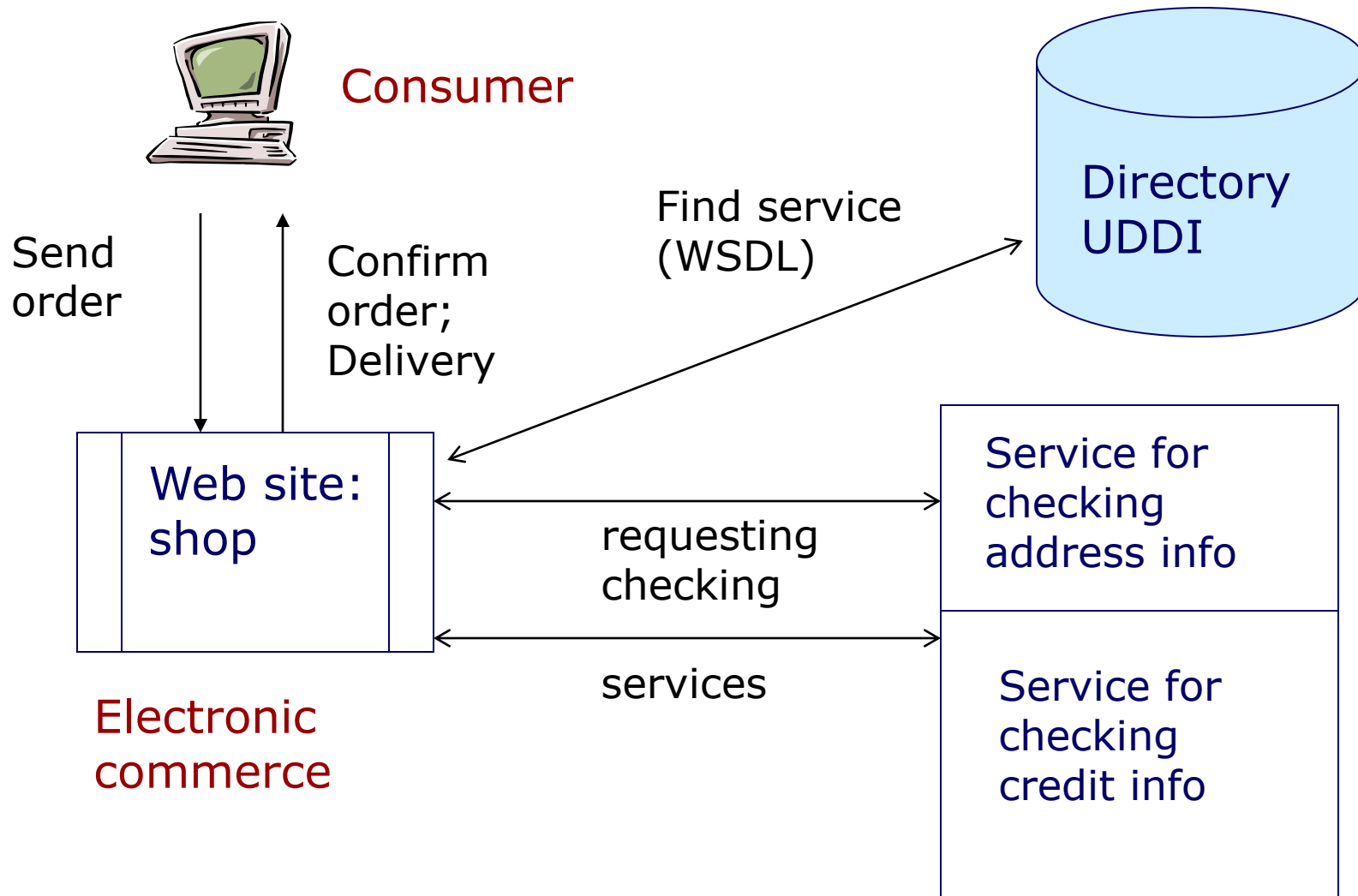
Response

# Web Services future

- Data security not included in the current definition, digital signatures
- key component in .NET architecture
- In Java EE 5 standard
- also CA (Computer Associates) Unicenter for Web-services management system
- platform-independent
- XML could be slow when a real time service is needed between two systems
- UDDI servers: MS, IBM, Ariba, NTT, Novell



# Web Services example



# XML in public administration

- data transfer between systems:
  - police and magistrate
  - municipalities and central government
  - application forms
    - construction permits (one-stop-shopping)
    - unemployment benefits
    - agricultural subsidies and production reports
- information dissemination services
  - weather conditions and forecasts
  - transport time tables
- archives and storing of information
  - from microfiches to XML-data, the National Archive

# RSS 2.0: feeds & podcasting

- RSS 2.0 and Atom
- information interchange on the Web
- a way to syndicate blog posts and news sites
- Amazon's OpenSearch technology uses RSS as a mechanism for providing search results and integrating search engines respectively
- Podcasting to syndicate digital media content
- Amazon's syndicated feeds

```

<?xml version="1.0" encoding="ISO-8859-1" ?>
<?xml-stylesheet title="XSL_formatting" type="text/xsl" href="/shared/bsp/xsl/rss/nolsol.xsl"?>

<rss version="2.0" xmlns:media="http://search.yahoo.com/mrss/">

<channel>
  <title>BBC News | News Front Page | World Edition</title>
  <link>http://news.bbc.co.uk/go/rss/-/2/hi/default.stm</link>
  <description>Visit BBC News for up-to-the-minute news, breaking news, video, audio and feature
  stories. </description>
  <language>en-gb</language>

  <lastBuildDate>Sun, 03 Feb 2008 09:57:26 GMT</lastBuildDate>
  <copyright>Copyright: (C) British Broadcasting Corporation</copyright>
  <docs>http://www.bbc.co.uk/syndication/</docs>
  <ttl>15</ttl>

<item>
  <title>Chad capital hit by new fighting</title>
  <description>Fresh fighting breaks out in Chads capital NDjamena as rebels try for a second day
  to take control of the city.</description>
  <link>http://news.bbc.co.uk/go/rss/-/2/hi/africa/7224691.stm</link>
  <guid isPermaLink="false">http://news.bbc.co.uk/2/hi/africa/7224691.stm</guid>
  <pubDate>Sun, 03 Feb 2008 09:39:54 GMT</pubDate>
  <category>Africa</category>
  <media:thumbnail width="66" height="49"
  url="http://newsimg.bbc.co.uk/media/images/42523000/jpg/_42523051_rebels_index66_afp.jpg"/>
</item>
  ...
</channel>
</rss>

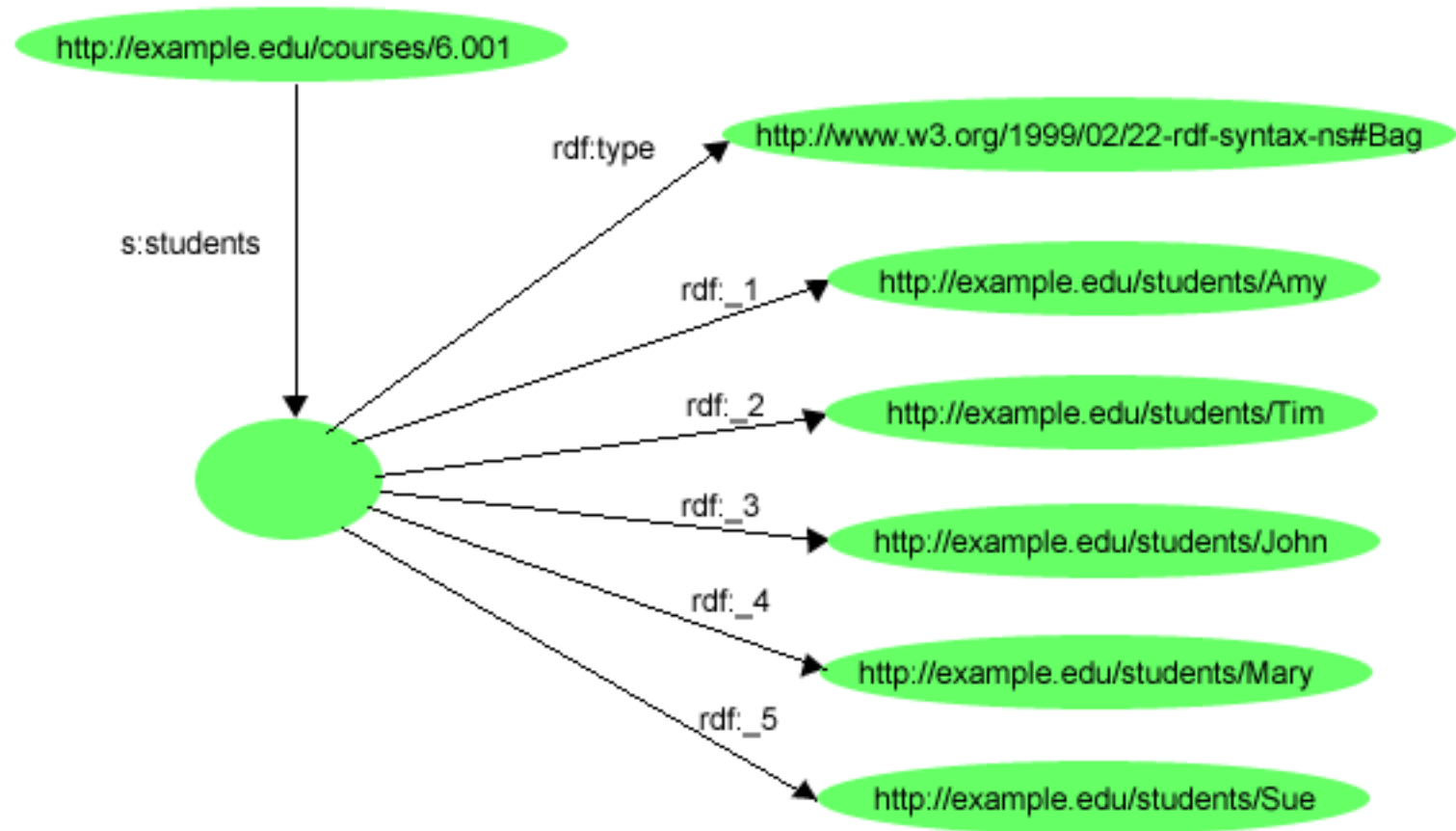
```

# XML application areas: XML is the basis for RDF and the Semantic Web

- Resource Description Framework (RDF) is an XML text format that supports resource description and metadata applications
- RDF integrates applications and agents into one Semantic Web
- Formal descriptions of terms in a certain area (shopping or manufacturing, for example) are called ontologies
- OWL-S version 1.0 (proposal) Ontology Web Language for services
- CC/PP Composite Capability / Preference Profiles Structure and Vocabularies 1.0 specification for mobile devices

```
<?xml version="1.0"?>
<rdf:RDF xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-
  ns#" xmlns:s="http://example.edu/students/vocab#">
<rdf:Description rdf:about="http://example.edu/courses/6.001">
  <s:students>
    <rdf:Bag>
      <rdf:li rdf:resource="http://example.edu/students/Amy"/>
      <rdf:li rdf:resource="http://example.edu/students/Tim"/>
      <rdf:li rdf:resource="http://example.edu/students/John"/>
      <rdf:li rdf:resource="http://example.edu/students/Mary"/>
      <rdf:li rdf:resource="http://example.edu/students/Sue"/>
    </rdf:Bag>
  </s:students>
</rdf:Description>
</rdf:RDF>
```

## Triples: subject-predicate-object expressions in RDF



# Recent metadata uses and standards

- Open Linked Data: a recommended best practice for exposing, sharing, and connecting pieces of data, information, and knowledge on the Semantic Web using URIs and RDF.
- <http://linkeddata.org/>
- <http://data.gov.uk/>
- RDFa (or RDF in attributes) adds a set of attribute level extensions to XHTML for embedding rich metadata within Web documents.
- Protocol for Web Description Resources (POWDER), a protocol for publishing descriptions of Web resources using RDF, OWL, and HTTP
- Simple Knowledge Organization System (SKOS) for connection to structured vocabularies