



VAASAN YLIOPISTO

# Using XML and web services in web based application development

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Finland



# Contents

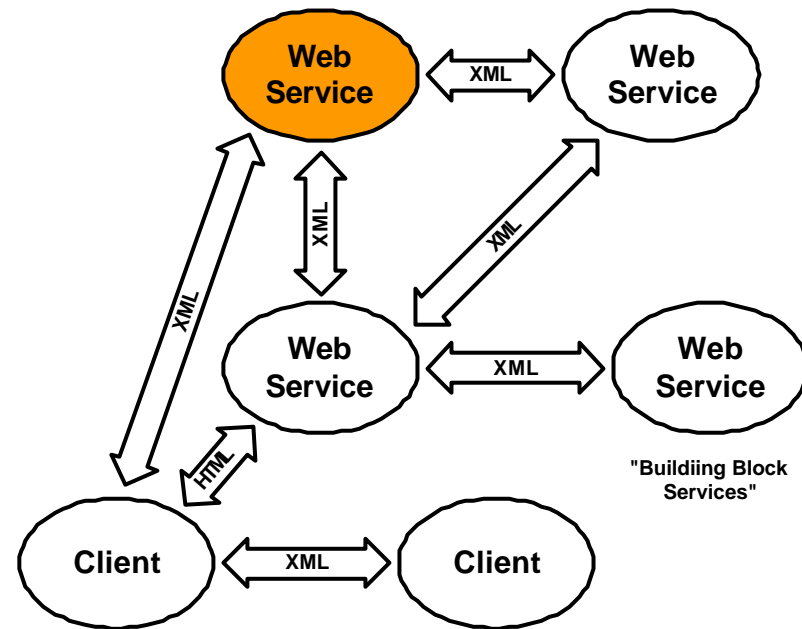
- Introduction to web services (WS)
- With XML technologies
- Implications of WS
- Some examples of WS with MS.NET
- WS and business integration
- Conclusions



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# Usage of web services (WS) and XML

- XML, WS and three(!) revolutions for software engineering
- Web Services "standards" and their implementation
- Rethinking business

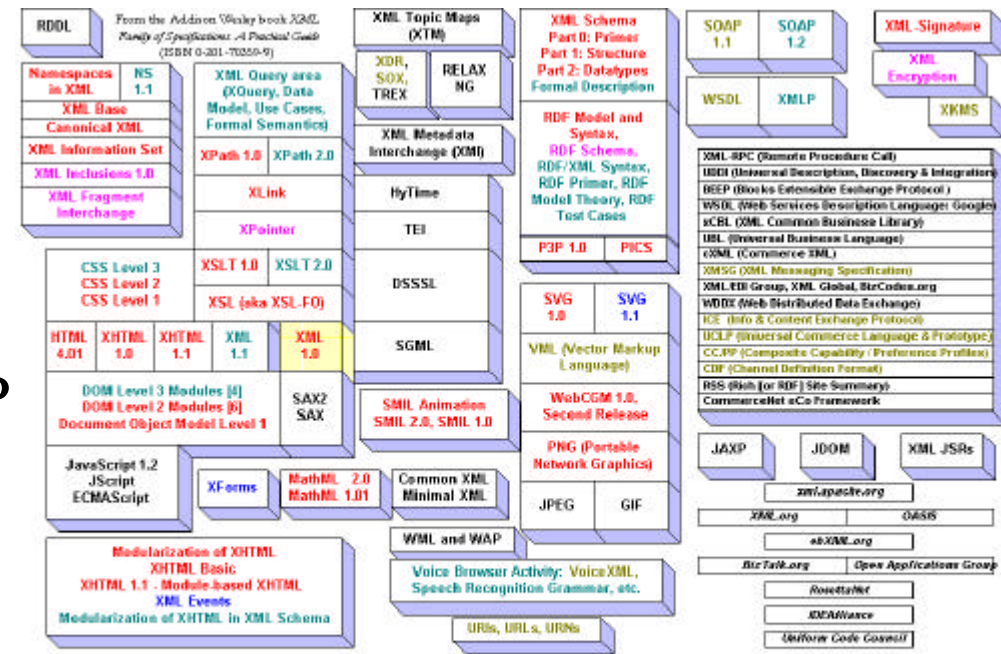


<http://msdn.microsoft.com/webservices/>  
for ISPs



# Standards behind WSs

- XML -- eXtensible Markup Language for structured data representation
- a near-universally agreed base specification (SOAP -- Simple Object Access Protocol) for structured message exchange
- a powerful vision for doing business online
- encompass the full spectrum of e-commerce



The XML Family of Specifications: The Big Picture

Last Updated: April 16, 2002



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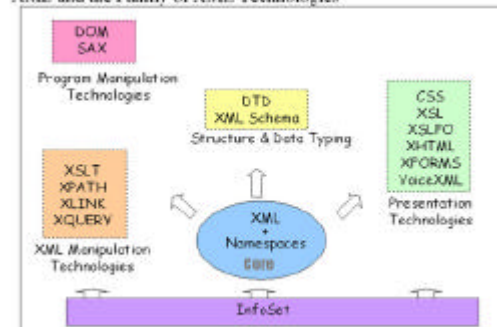
**Ken Sall: Family of XML technologies: big picture**



# XML ground works

- XML
- XML based tools and technologies for data manipulation
- web services use XML based SOAP and WSDL to obtain web based software components

XML and the Family of XML Technologies



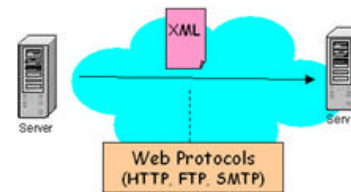
[http://www.acm.org/ubiquity/views/f\\_coyle\\_1.html](http://www.acm.org/ubiquity/views/f_coyle_1.html)



# XML and data

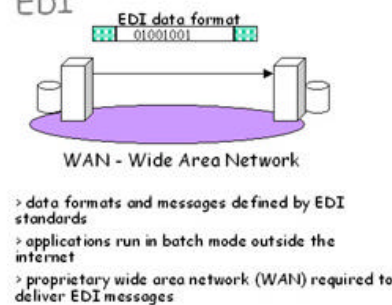
- online transactions -- within a domain, across domains, intra-organization, inter-organization, as well as parties involved in the transactions in their different roles and in different contexts (to consider developments as culminating in specific killer apps is missing the point)

## The Data Revolution

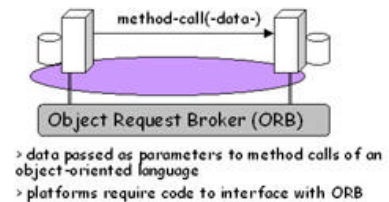


Data is free to move about the Web  
- not dependent on programming language or transport protocol

### EDI



### CORBA, RMI, DCOM



[http://www.acm.org/ubiquity/views/f\\_coyle\\_1.html](http://www.acm.org/ubiquity/views/f_coyle_1.html)

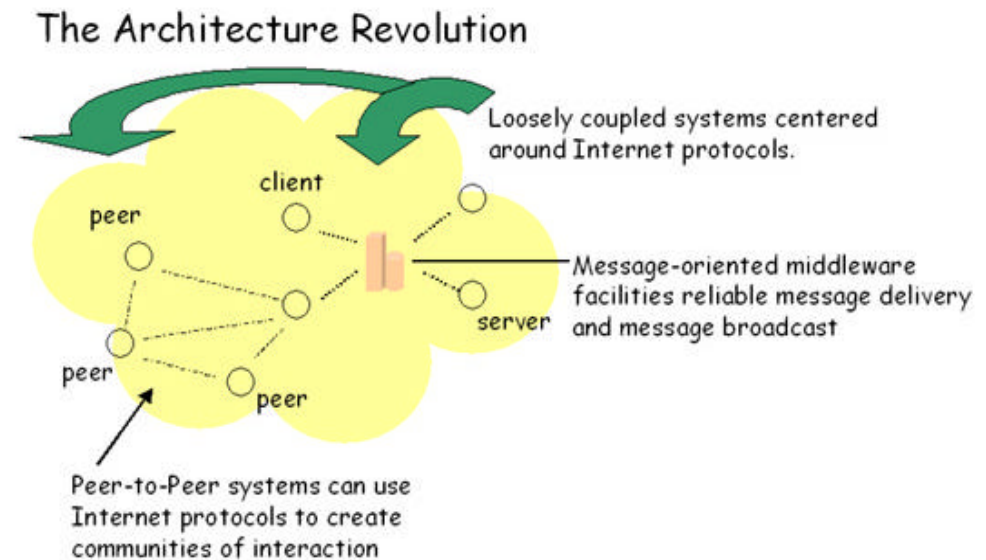


- XML is such an information presentation that is able to combine data and its meaning (data and semantics) and is relatively transferable with HTML, especially in XHTML, and hence it enables developing flexible web based applications
- XML applications transform web pages to a format that can also be understood by computers (“some” meaning of the data is coded in XML tags), and one can use information together with its meaning



# Development of WS

- Electronic Data Interchange (EDI)
- Enterprise application integration (EAI)
- The application service provider (ASP) model
- evolution of portals, as well as in peer-to-peer (P2P) applications



XML, Web Services and the Changing Face of Distributed Computing by Frank P. Coyle,

ACM Ubiquity magazine online:

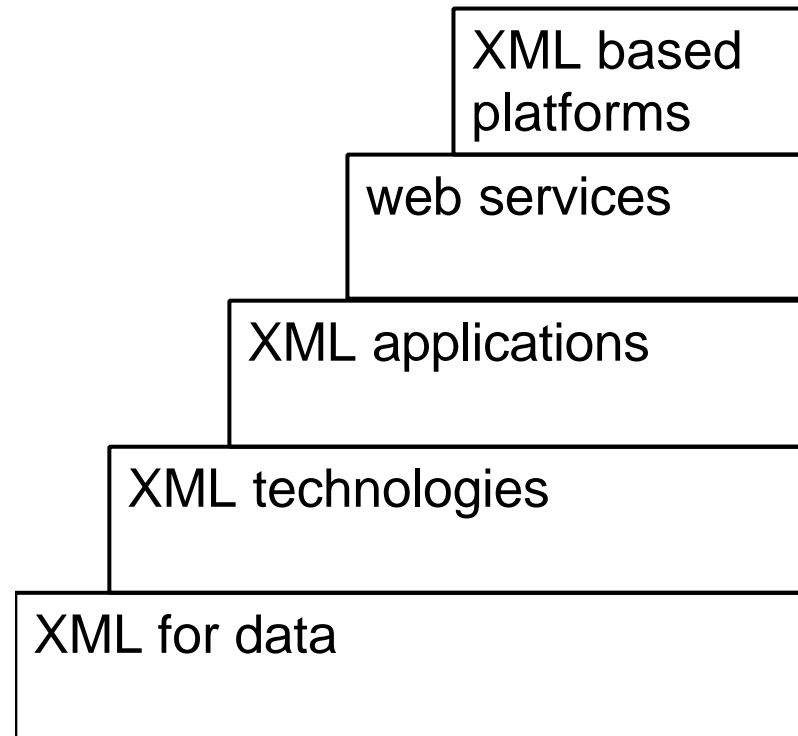
[http://www.acm.org/ubiquity/views/f\\_coyle\\_1.html](http://www.acm.org/ubiquity/views/f_coyle_1.html)





# Advantages of web services

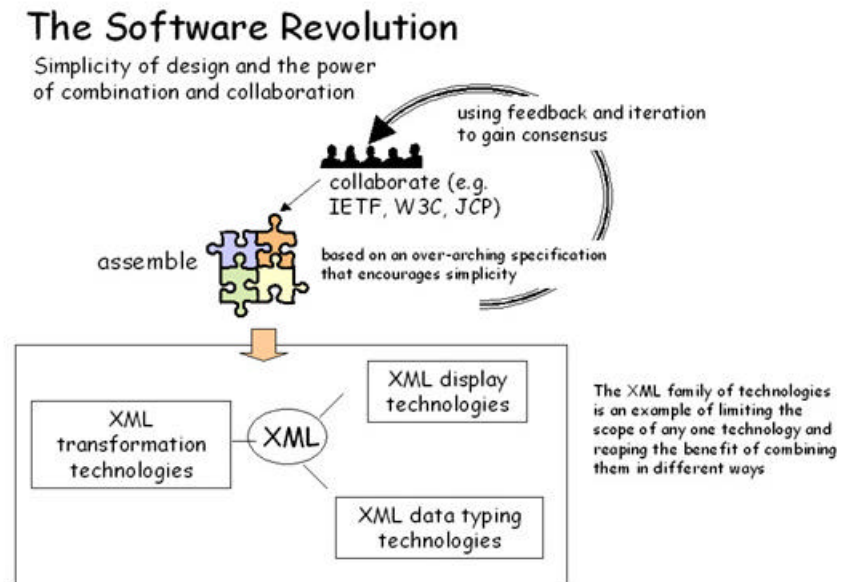
- Business services can be completely decentralized and distributed over the Internet and accessed by a wide variety of communications devices
- Businesses can be released from the burden of complex, slow and expensive software integration and focus instead on the value of their offerings and mission critical tasks





# Full vision of web services

- Web Services can interact with each other ("be orchestrated") in an infinite variety of manners and through multiple iterations in order to deliver a particular task within any context
- Web Services are infinitely flexible, elastic to needs and, just like its foundation protocol XML, "extensible"

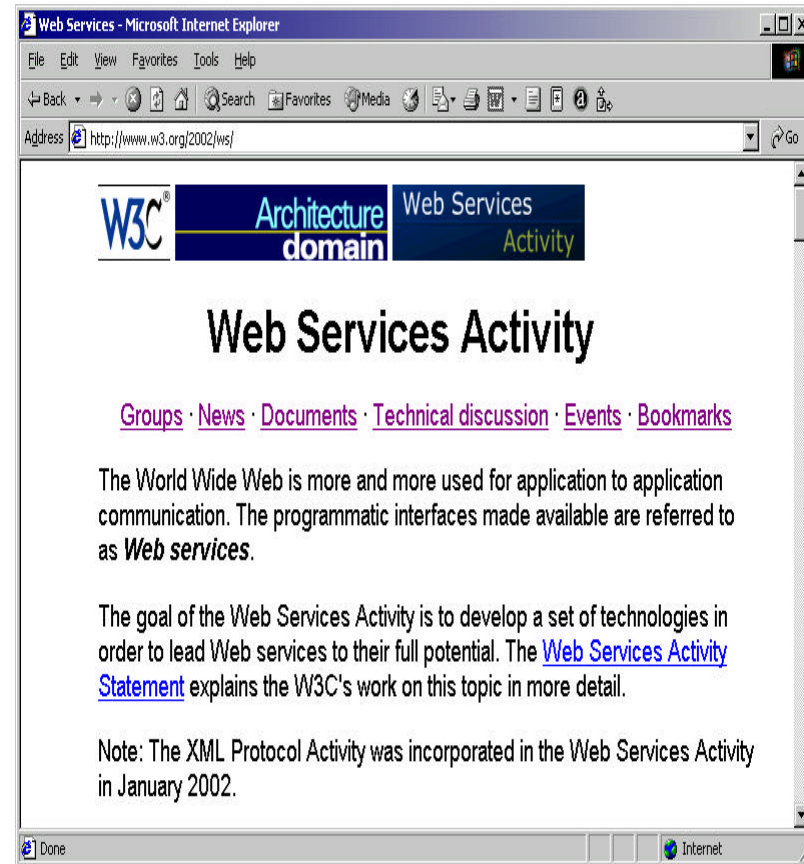


[http://www.acm.org/ubiquity/views/f\\_coy1e\\_1.html](http://www.acm.org/ubiquity/views/f_coy1e_1.html)



# Technical WS definition...

- Web Services connect computers and devices...
- ...with each other using the Internet to exchange data and combine data in new ways
- A web service communicates with messages (in general!)

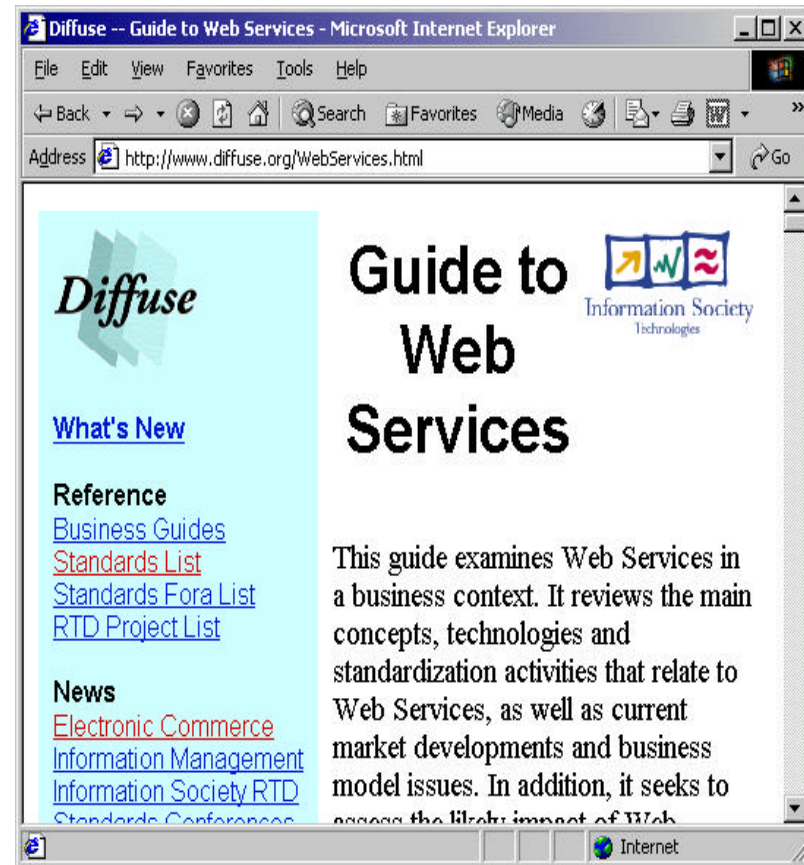


<http://www.w3.org/2002/ws/>



## ... from business point of view

- Web Services can be defined as software objects that can be assembled over the Internet...
- ...using standard protocols to perform functions or execute business processes

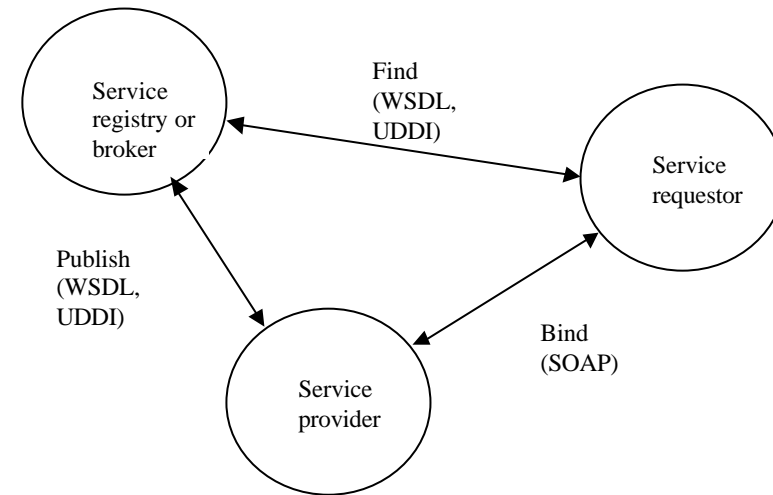


<http://www.diffuse.org/WebServices.html>



# WS usage principle

- The key to Web Services is on-the-fly service creation through the use of loosely coupled, reusable software components. This has fundamental implications in both technical and business terms:
- Software can be delivered and paid for as fluid streams of services as opposed to packaged products

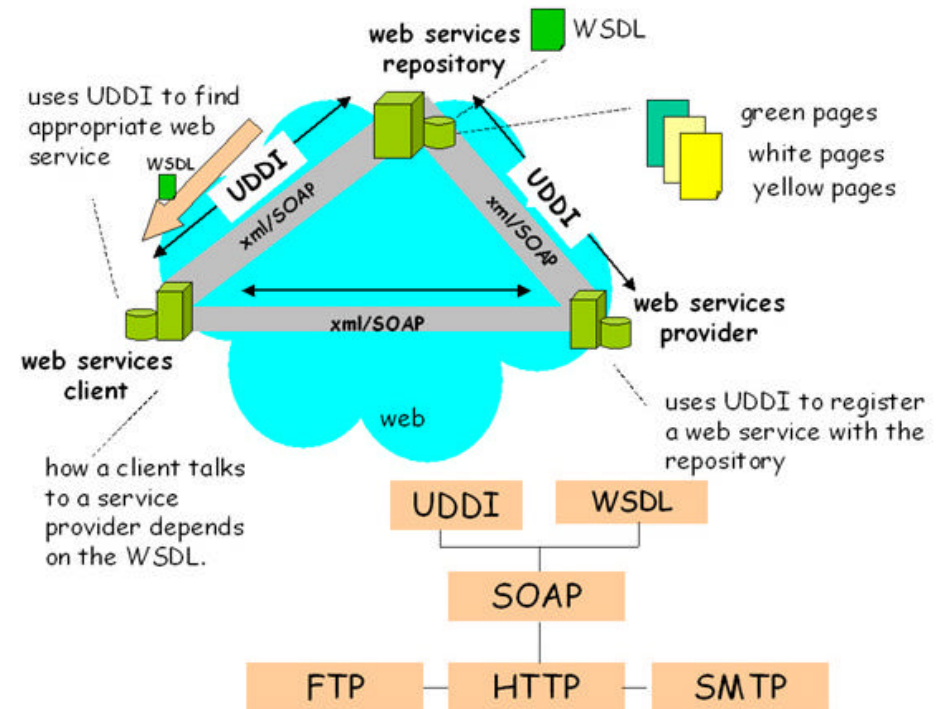


It is possible to achieve automatic, ad hoc interoperability between systems to accomplish business tasks



# WS technical usage

- SOAP and
- Web Services Description Language (WSDL) is for enabling a common description of Web Services particularly their interfaces and functions
- Universal Description, Discovery & Integration (UDDI) is for the aggregation and identification of WSDL documents by providing registry capabilities

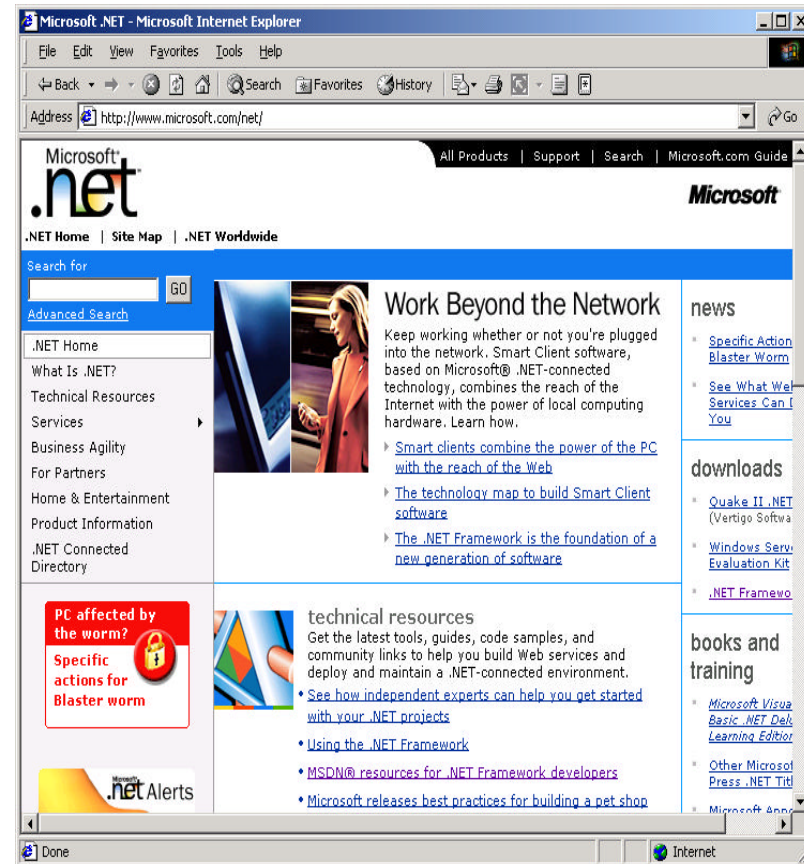


[http://www.acm.org/ubiquity/views/f\\_coy1e\\_1.html](http://www.acm.org/ubiquity/views/f_coy1e_1.html)



# Main IT vendors of WS

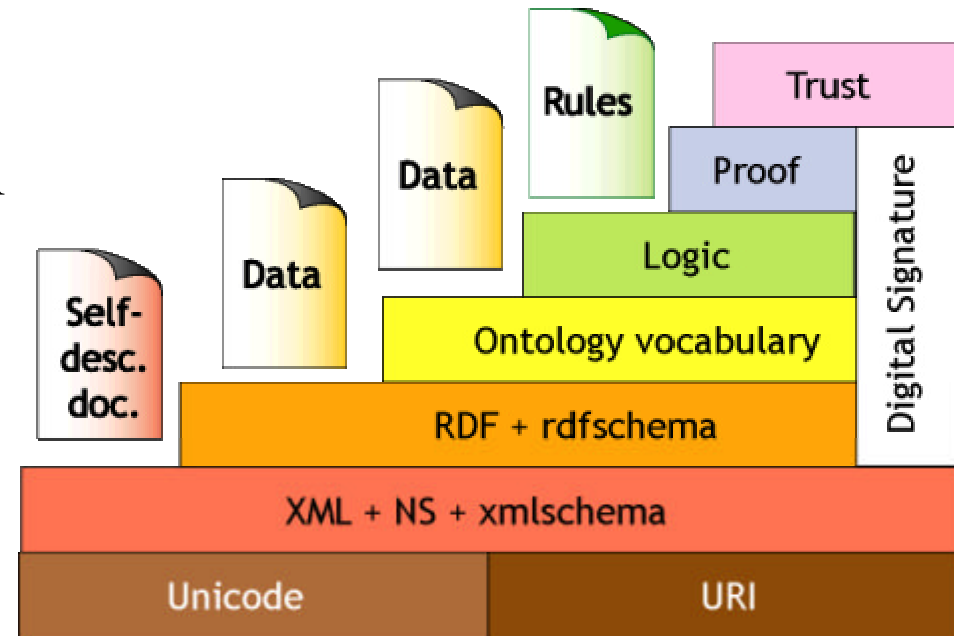
- Microsoft's .NET (in Windows Server 2003)
- runtimes for many environments like PDAs and mobile phones
- Sun Microsystems' Sun Open Net Environment (Sun ONE)
- IBM's Web Services offering which is aligned with its e-business WebSphere products





# Web architecture by W3C

- service model as opposed to the traditional technically oriented model (e.g. "discovery" rather than "directory", "orchestration" rather than "messaging" and "transaction processing", "usage" rather than "distributed computing", "personalization" rather than "agent technologies", and so on)



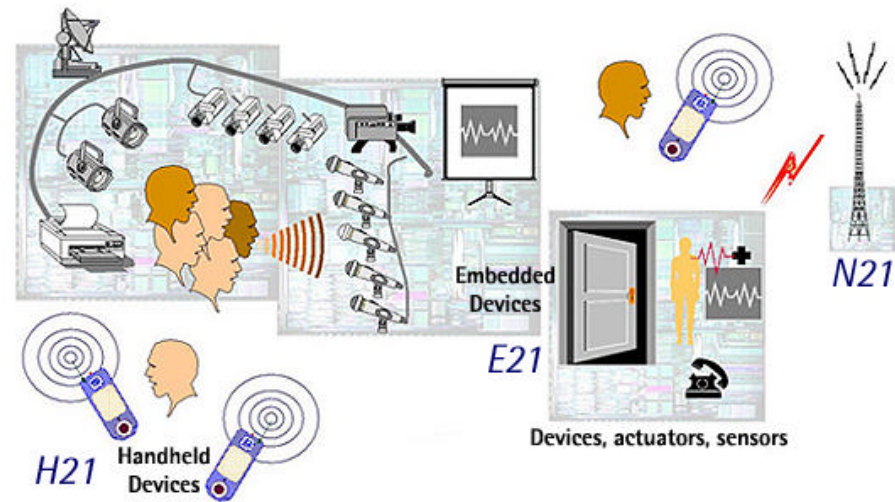
<http://www.w3.org/2000/Talks/1206-xml2k-tbl> by Tim Berners-Lee, <http://www.w3.org/People/Berners-Lee>





# Pervasiveness of Web Services

- Machine-to-machine communications is insufficient for the full vision of the Web Services. Machines need to "understand" the relevant processes in any particular interaction between Web Services



MIT Oxygen and HP Cooltown projects



# Some online examples of WSs

<http://www.xmethods.com>

- A listing of publicly accessible Web Services is provided by XMethods
- The Web Services listed in these directories indicate the enormous variety and scope of service offering, from simple calculators to messaging to games to different mechanisms and parameters for information search (or "discovery" where the search is not domain specific

**XMETHODS** [Home](#) · [Interfaces](#) · [Tools](#) · [Implementations](#) · [Manage](#) · [Register](#) · [Tutorials](#) · [Mailing List](#) · [About](#)

**Welcome to XMethods.**  
Emerging web services standards such as SOAP, WSDL and UDDI will enable system-to-system communication that is easier and cheaper than ever before. This site is a "virtual laboratory" for developers, listing publicly available web services and showcasing new ways this technology can be applied.

Updates	
2003-08-06	New tutorial: Systinet - Amazon Search <a href="#">[R]</a>
2003-07-01	New tutorial: Strikelron <a href="#">[Read]</a>
2003-04-04	New tutorial: MindreefSOAPScope 1.0 <a href="#">[R]</a>
2003-02-28	New tutorial: Dreamfactory <a href="#">[Read]</a>

**XMethods Utility Services**  
XMethods Utility Services are experimental building-block services that can be used as the foundation for building distributed web services applications.

[XSpace](#) Multi-user shared database "space" that stores keyed SOAP envelopes. Now with asynchronous events and document-style interface.

**Programmatic Interfaces**  
Access XMethods through a variety of interfaces:

- UDDI v2
- WS-Inspection
- RSS
- SOAP
- DISCO

For more information see the [Interfaces](#) page.

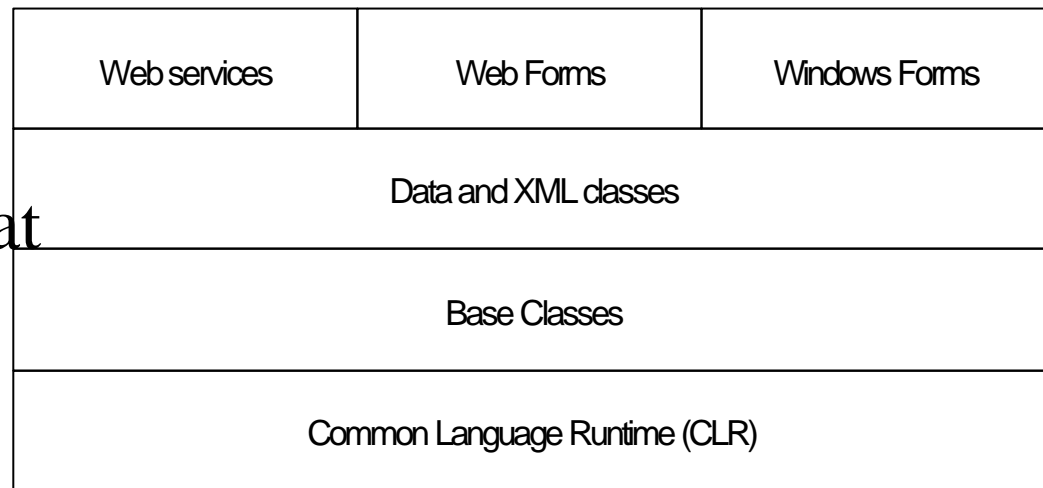
**The 30 Most Recent Listings [ See the FULL LIST ]**

Publisher	Style	Service Name	Description
xmrad.com	RPC	<a href="#">WSGenerator</a>	Generate globally unique ID with timestamp tracking
SauronNoClan	RPC	<a href="#">Maintain Business Partner</a>	Maintain Business Partner in a CRM application
ApokalipsXIII	DOC	<a href="#">Email Services</a>	Validate email address and access a POP3 mailbox



# Microsoft .NET

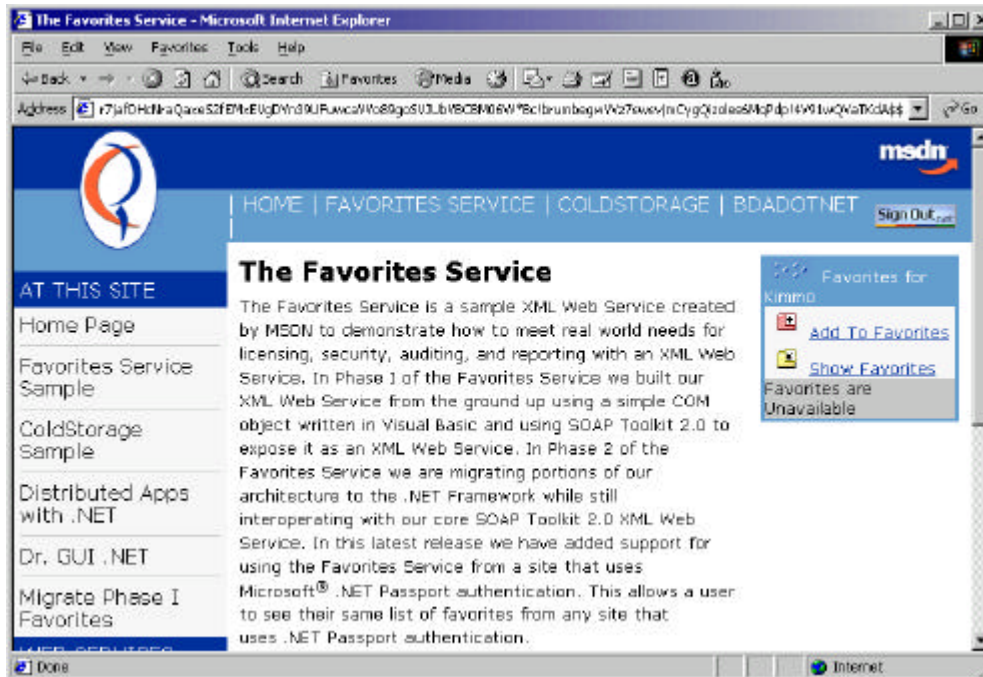
- There is not even a general common understanding of what is behind the increasingly ubiquitous Web Services label



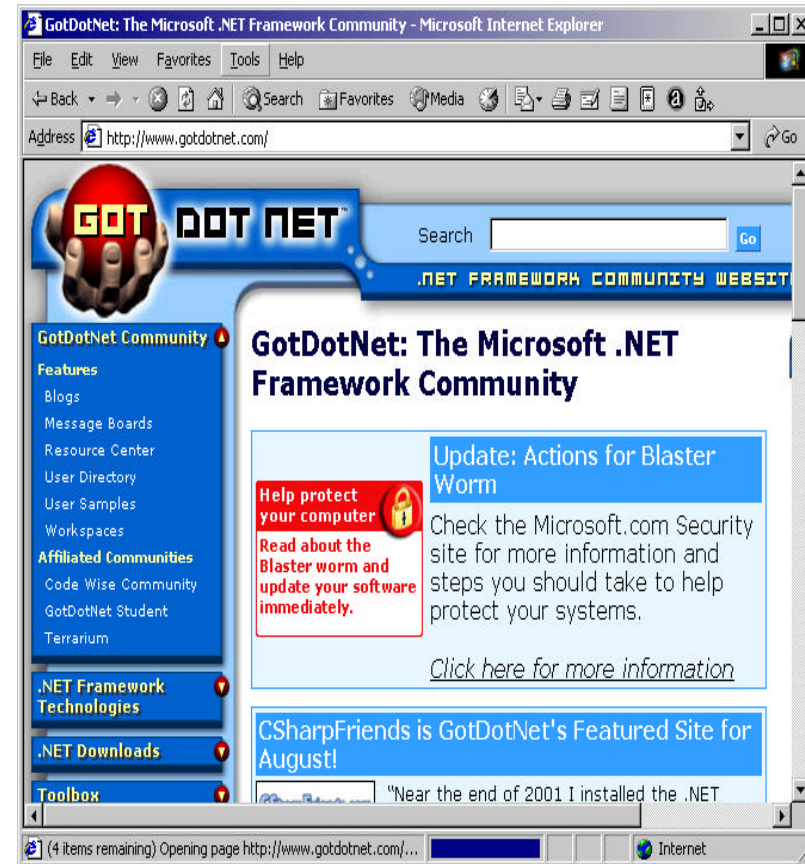
The ASP charging model would not apply (and if it were applied, would be unlikely to be sustainable), in that no Web Services provider can have a degree of control over his offering which is even remotely close to that of his ASP counterpart.



# Examples from Microsoft



<http://www.coldrooster.com/favorites.aspx>

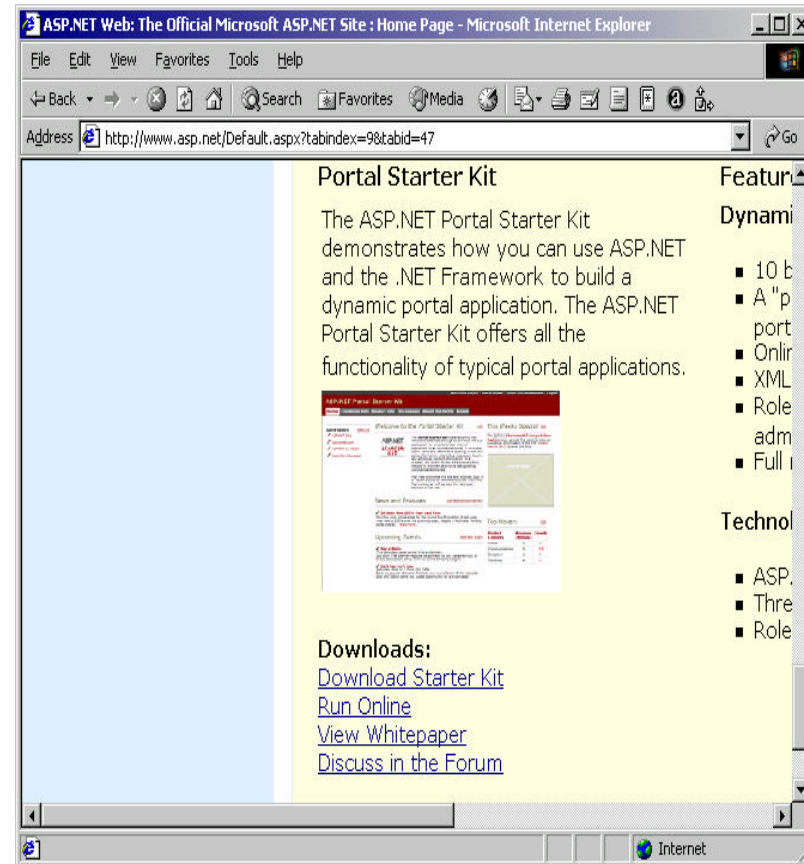


<http://www.gotdotnet.com/>



# Portal Starter Kit with ASP.NET

- 3 tier structure: data, business and GUI
- several downloadable versions (C#, VB, JS) with inline and code behind versions
- for tutorial and real world usage
- allows customization (without software coding)
- configuration in a XML file

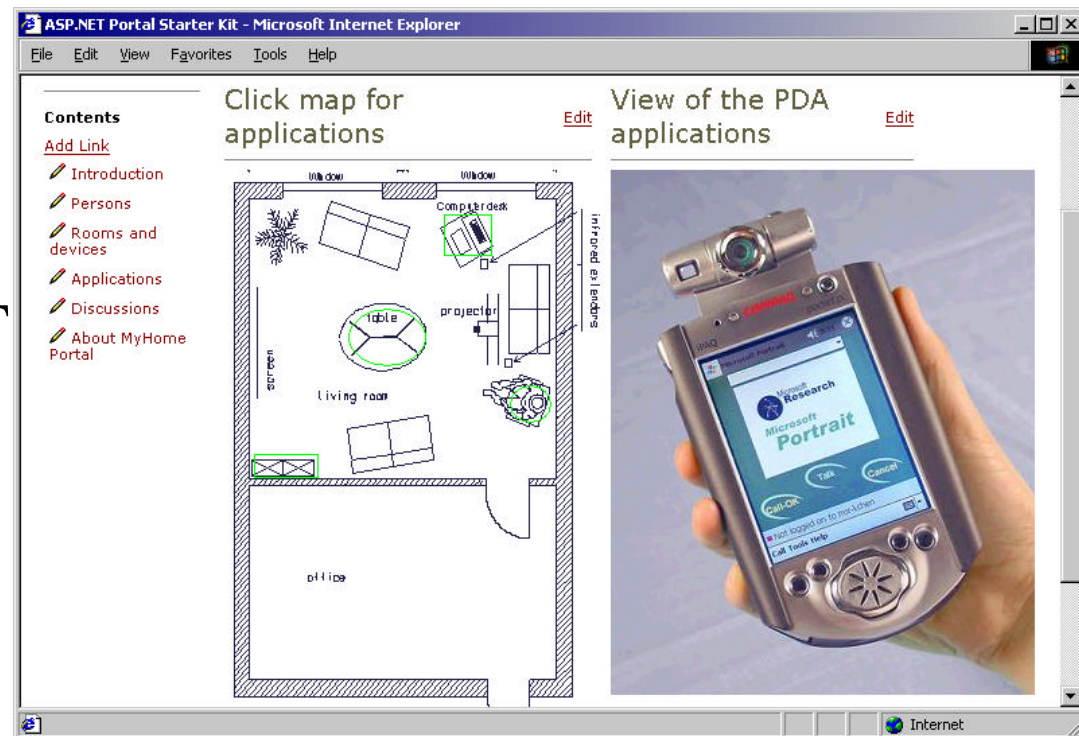


<http://www.asp.net/Default.aspx?tabindex=9&tabid=47>



# Digital living room laboratory

- Digital living room laboratory in Technobothnia
- Apply Portal Starter Kit of Microsoft .NET
- add web services for the database administration, automation of the application, device and user activities

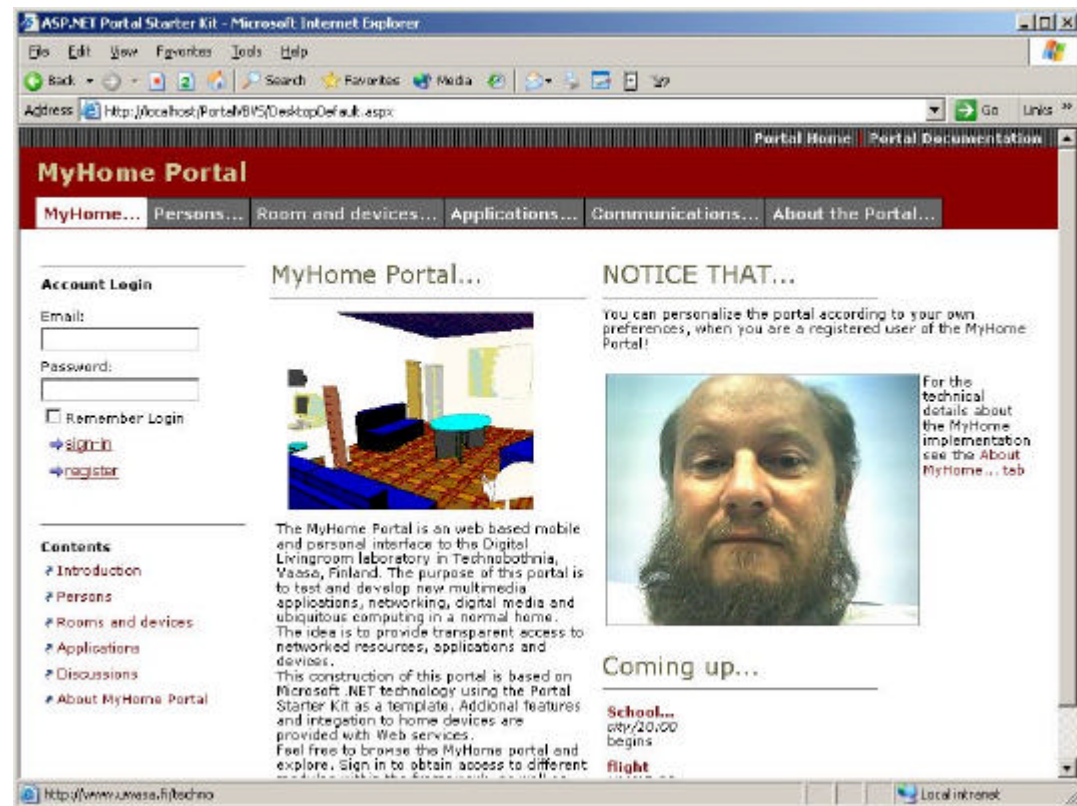




# MyHome Portal

Content adapted to

- DLR space
- users:  
communication  
and applications
- contains both  
desktop and  
mobile access

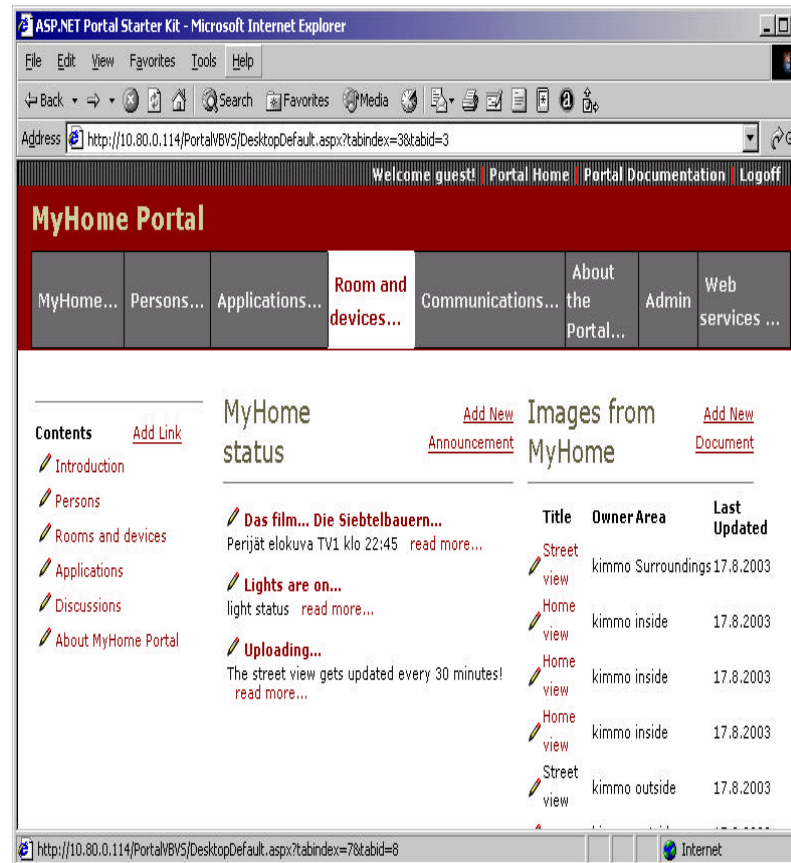


**<http://193.166.112.94/portalvbvs/DesktopDefault.aspx>**



# DLR space

- networks and end devices
- applications







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# MyHome portal users

- users with registration
- communication and applications

Welcome guest! | [Portal Home](#) | [Portal Documentation](#) | [Logoff](#)

## MyHome Portal

MyHome... Persons... Applications... Room and devices... **Communications...** About the Portal... Admin Web services ...

**Contents** [Add Link](#)

- [Introduction](#)
- [Persons](#)
- [Rooms and devices](#)
- [Applications](#)
- [Discussions](#)
- [About MyHome Portal](#)

### At home... [Add New Document](#)

Title	Owner	Area	Last Updated
<a href="#">Test</a>	kimmo	work	17.8.2003
<a href="#">Web service local examples</a>	kimmo	work	17.8.2003
<a href="#">Ws online examples</a>	kimmo	work	17.8.2003
<a href="#">Recent URLs...</a>	kimmo	work	17.8.2003

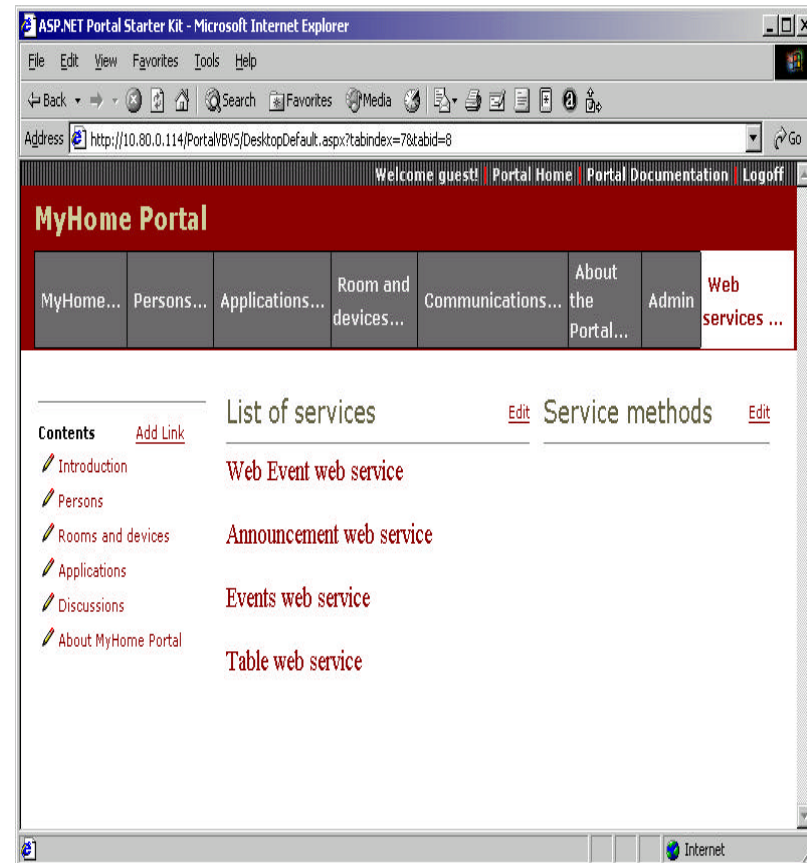
### At work... [Add New Thread](#)

- [Student work](#), from kimmo, posted 17.8.2003 18:03
- [Re: Student work](#), from kimmo, posted 17.8.2003 18:03



# Example web services

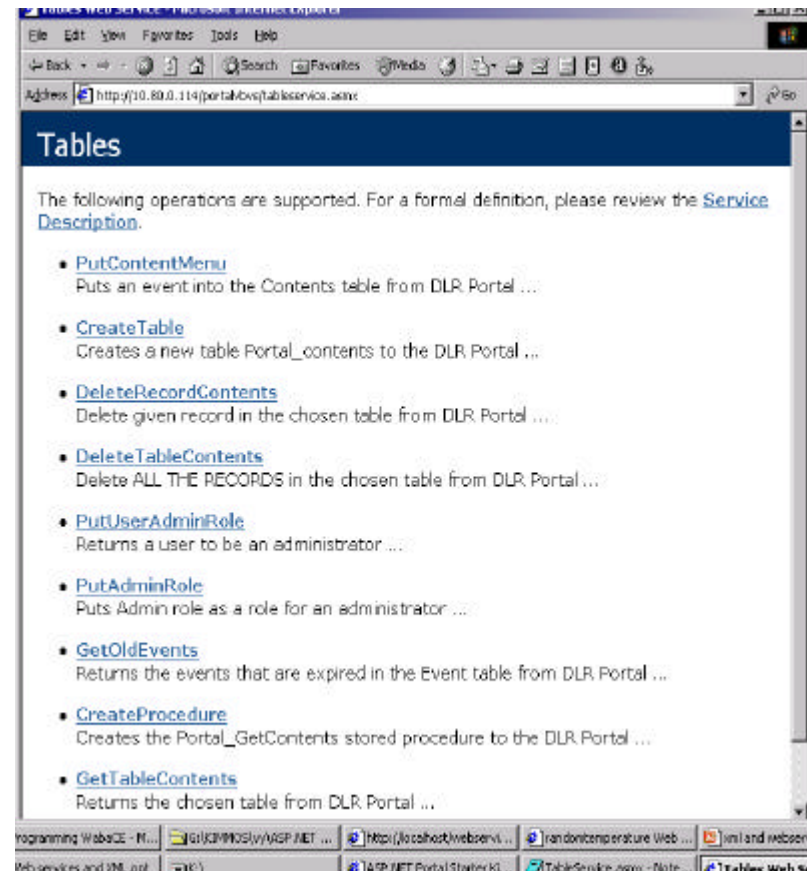
- TableService
- principles of MS.NET web services
- EventService





# TableService

- Automates Portal database management (without MS Enterprise Manager) from web
- program code only for the service tableservice.asmx (=class and methods via web)
- client, documentation, SOAP and WSDL automatically from .NET!!

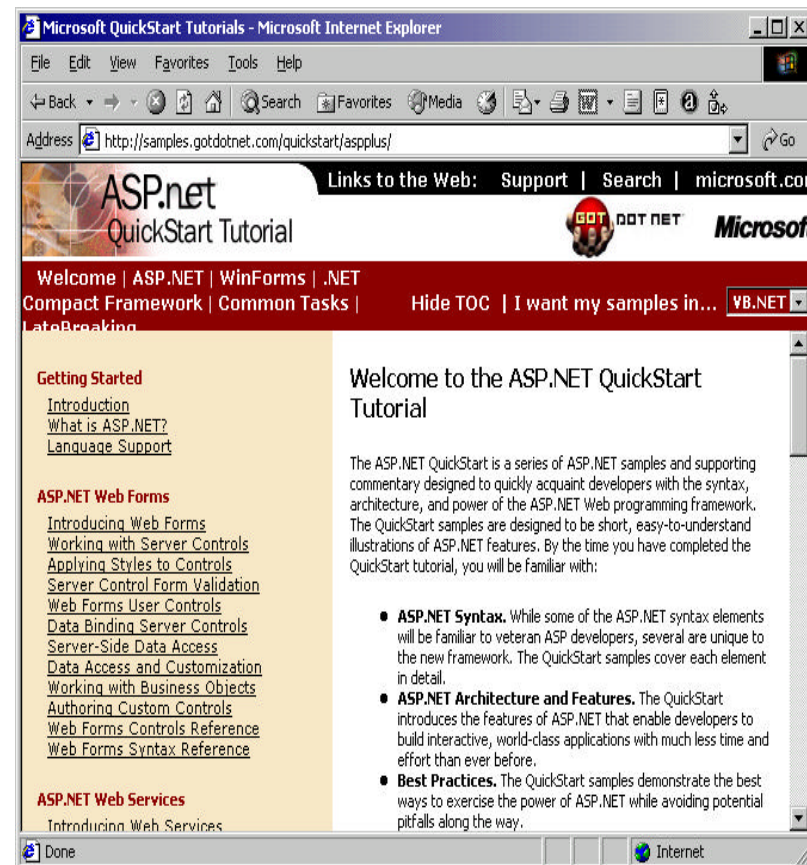


**<http://localhost/portalbvvs/tableservice.asmx>**



# Usage of MS.NET web services

- can be coded in Notepad (or Visual Studio.NET)
- compiles changes of the tableservice.asmx file automatically (intermediate language MSIL) via web
- easy (online!) debugging via .NET



<http://samples.gotdotnet.com/quickstart/aspplus/>



# EventService

- manipulates events in the Portal database that can also be manipulated via the portal
- with Visual Basic, using a class hierarchy of .NET classes
- communicates in SOAP

```
EventService.asmx - Notepad
File Edit Format Help
<%@ WebService Language="VB" Class="Events" %>

Imports System.Data
Imports System.Data.SqlClient
Imports System.Data.OleDb
Imports System.Web.Services

<WebService(Namespace:="http://www.aspnetbs.com/webservices/") > _
Public Class Events
    Inherits WebService

    <WebMethod(Description:="Returns the Events table from DLR Portal ...") > _
    Public Function GetEvents() As DataSet
        Dim Ur1s As New DataSet
        Dim SqlCommand As OleDbDataAdapter
        Dim myDS As New DataSet()
        Dim ConnStr As String
        ConnStr = "data source=TB-EBIZ14\NETSDK;"
        ConnStr &= "database=Portal;integrated security=true"
        Dim mySqlConnection As New SqlConnection(ConnStr)
        mySqlConnection.Open
        Dim SQLSelect As String = "SELECT * FROM Portal_events"

        Dim word
        Dim mySqlDA As New SqlDataAdapter (SQLSelect, mySqlConnection)

        mySqlDA.Fill(myDS)
        return myDS
    End Function

    <WebMethod(Description:="Returns the specific Event table from DLR Portal ...") > _
    Public Function GetEvent(Byval ItemID as String) As DataSet
```

<http://10.80.0.114/portalvbvs/eventservice.asmx>



# Call for a service:

Events Web Service - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Home Search Favorites Media

Address <http://localhost/portalvbvs/eventservice.asmx?op=GetEvents> Go Links

## Events

Click [here](#) for a complete list of operations.

---

### GetEvents

Returns the Events table from DLR Portal ...

#### Test

To test the operation using the HTTP POST protocol, click the 'Invoke' button.

#### SOAP

The following is a sample SOAP request and response. The **placeholders** shown need to be replaced with actual values.

```
POST /portalvbvs/eventservice.asmx HTTP/1.1
Host: localhost
Content-Type: text/xml; charset=utf-8
Content-Length: length
SOAPAction: "http://www.aspnetsbs.com/webservices/GetEvents"

<?xml version="1.0" encoding="utf-8"?>
<soap:Envelope xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:xsd="http://www.w3.org/2001.
  <soap:Body>
    <GetEvents xmlns="http://www.aspnetsbs.com/webservices/" />
  </soap:Body>
</soap:Envelope>
```

Done Local intranet



# Service reply:

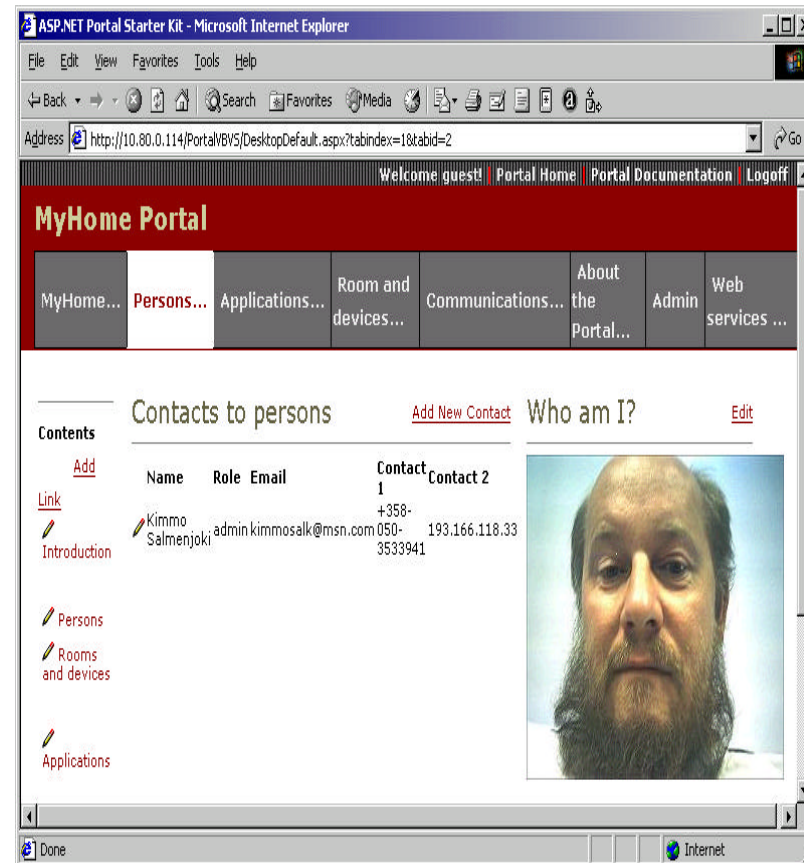
The screenshot shows a Microsoft Internet Explorer browser window displaying an XML response from a web service. The address bar shows the URL: `http://localhost/portalvbvs/eventservice.asmx/GetEvents`. The XML content is as follows:

```
<?xml version="1.0" encoding="utf-8" ?>
- <DataSet xmlns="http://www.aspnetsbs.com/webservices/">
- <xs:schema id="NewDataSet" xmlns="" xmlns:xs="http://www.w3.org/2001/XMLSchema"
  xmlns:msdata="urn:schemas-microsoft-com:xml-msdata">
  <xs:element name="NewDataSet" msdata:IsDataSet="true" msdata:Locale="fi-FI">
  </xs:schema>
- <diffgr:diffgram xmlns:msdata="urn:schemas-microsoft-com:xml-msdata" xmlns:diffgr="urn:schemas-
  microsoft-com:xml-diffgram-v1">
- <NewDataSet xmlns="">
- <Table diffgr:id="Table1" msdata:rowOrder="0">
  <ItemID>0</ItemID>
  <ModuleID>0</ModuleID>
</Table>
- <Table diffgr:id="Table2" msdata:rowOrder="1">
  <ItemID>1</ItemID>
  <ModuleID>4</ModuleID>
  <CreatedByUser>JennaJ@ibuyspy.com</CreatedByUser>
  <CreateDate>2001-12-19T15:46:25.0530000+02:00</CreateDate>
  <Title>Spy-o-Rama</Title>
  <WhereWhen>This Saturday, usual secret time and place...</WhereWhen>
  <Description>It's back! The premier regional swap meet for spy paraphernalia of every
  description. Shop early for some amazing bargains.</Description>
  <ExpireDate>2005-12-31T00:00:00.0000000+02:00</ExpireDate>
</Table>
- <Table diffgr:id="Table3" msdata:rowOrder="2">
  <ItemID>2</ItemID>
  <ModuleID>4</ModuleID>
  <CreatedByUser>JennaJ@ibuyspy.com</CreatedByUser>
  <CreateDate>2001-12-19T15:48:22.8130000+02:00</CreateDate>
  <Title>Dark Ops Sock Hon</Title>
```



# Next in MyHome Portal

- mobile access and devices...
- more devices...
- more embedded automation of applications...
- with interacting web services..
- much work in progress

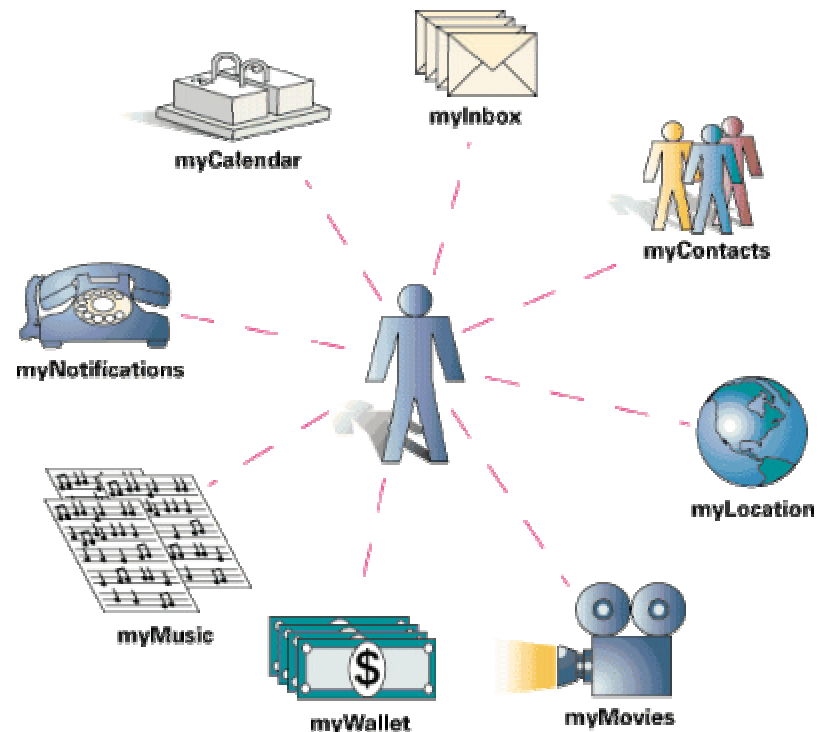






# MyServices

- For example, Microsoft's My Services is ultimately intended to be a person's single point of access to all online services



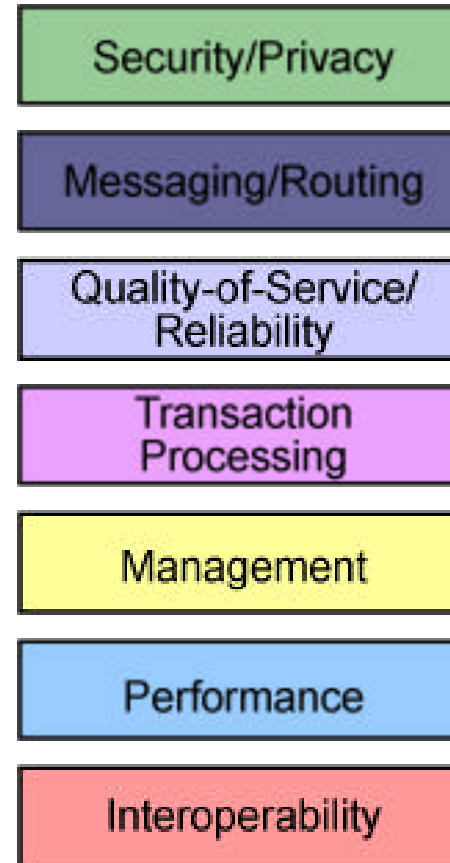
**XMLMag.com S. Johnston: Special report on pervasive computing**

<http://www.xmlmag.com/upload/free/features/xml/2001/09sep01/sj0109/sj0109.asp>



# Where do Web services "need improvement"?

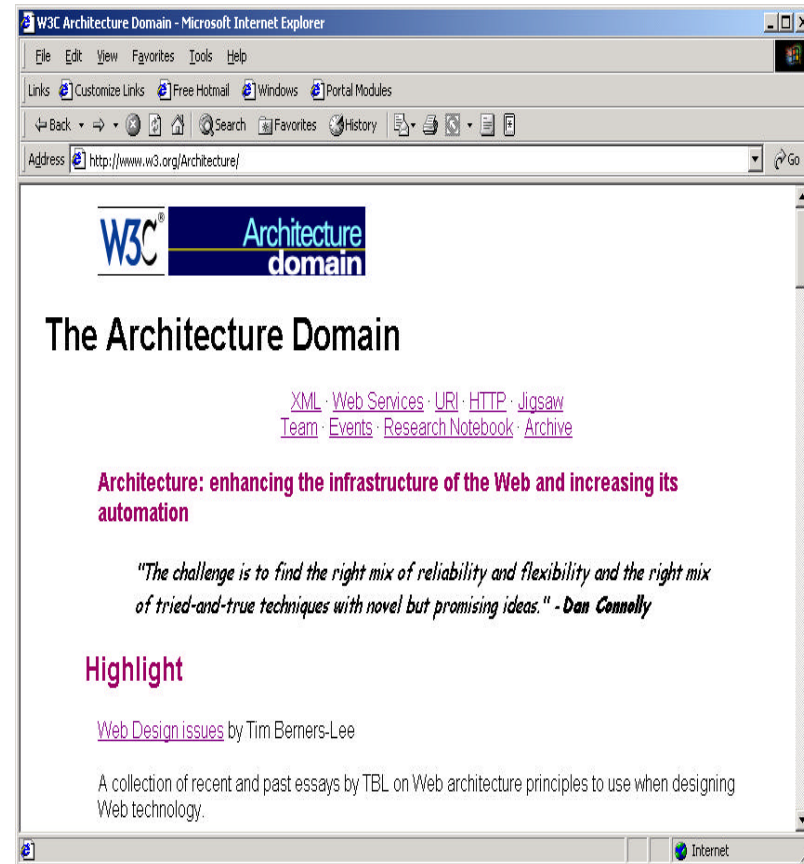
1. Security/privacy
2. Messaging/routing
3. Quality-of-service/reliability
4. Transaction processing
5. Management
6. Performance
7. Interoperability





# W3C work continues on ...

- *Architecture* -- the security framework in Web services architecture focuses on six elements: accessibility, authentication, authorization, confidentiality, integrity, and non-repudiation.





# Conclusions

- XML is a standard appreciated by many
- XML standards provide ways for data storage, management, manipulation and communication
- ...with web services one gets methods (and software components) on the web
- ...many implication for web usage



**"On the Internet, nobody knows you're a dog"**



# References for WS

- Web services by W3C,  
<http://www.w3c.org/2002/ws/>
- XML, Web Services and the Changing Face of Distributed Computing  
by Frank P. Coyle, ACM Ubiquity magazine online:  
[http://www.acm.org/ubiquity/views/f\\_coyle\\_1.html](http://www.acm.org/ubiquity/views/f_coyle_1.html)
- Daum, Merten: System Architecture with XML, 2003
- Diffuse project,  
<http://www.diffuse.org/WebServices.html>

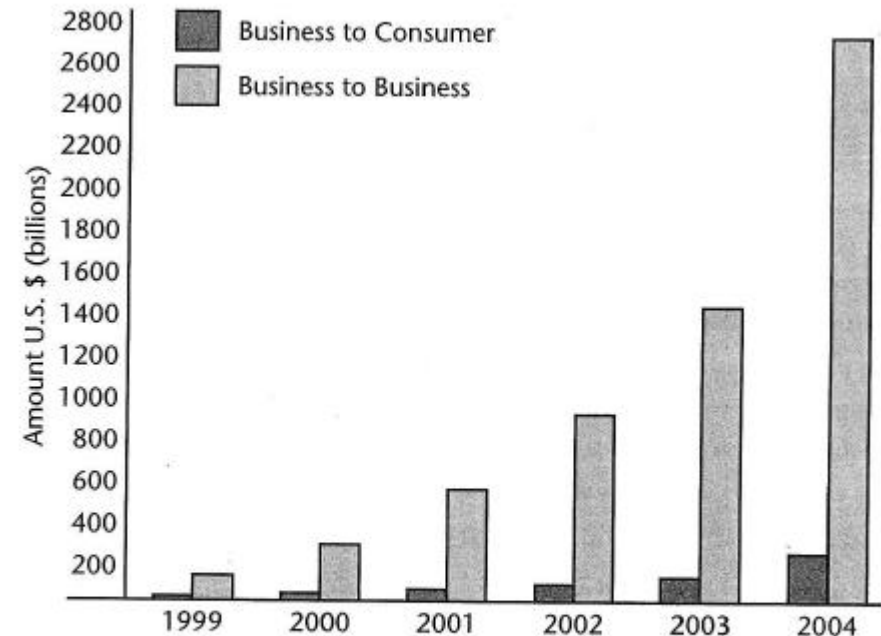


Figure P.2 A forecast showing the phenomenal growth of U.S. electronic business, especially in the area of business-to-business (B2B). (Source: Forrester Research.)

Daum, Merten: System architecture with XML book, 2003



# References for XML

1. The 11<sup>th</sup> WWW conference, with online presentations in <http://www2002.org/>, 7-11.5.2002, (<http://www10.org/>,...)
2. Ken Sall: XML Family of Specifications: A Practical Guide, Addison –Wesley, 31.5.2002
3. C. F. Goldfarb, P. Prescod: The XML handbook, 2001
4. Clive Finkelstein, Peter Aiken: Building Corporate Portals with XML, McGraw-Hill, 1999



# Middleware and WS

- Up to now, conventional wisdom suggests that organizations need to implement an "open middleware" to enable scalability and future-proofing and the businesses of large segments of the software industry are based on this premise

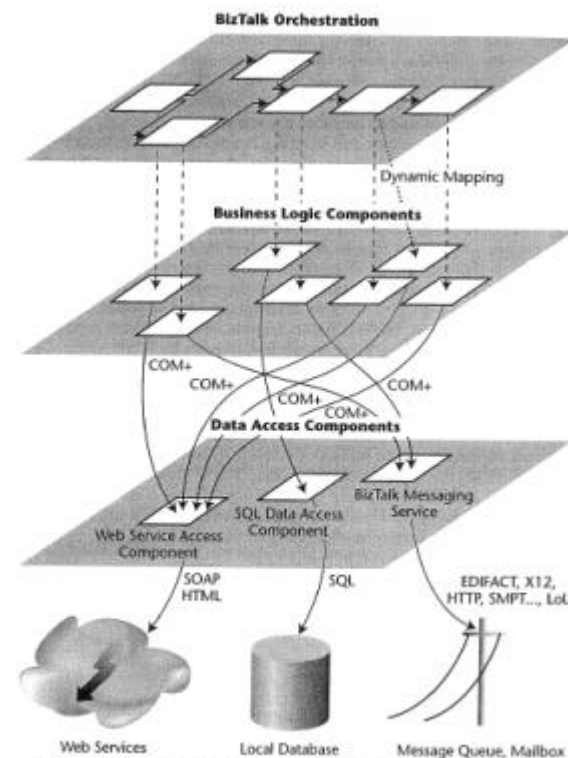
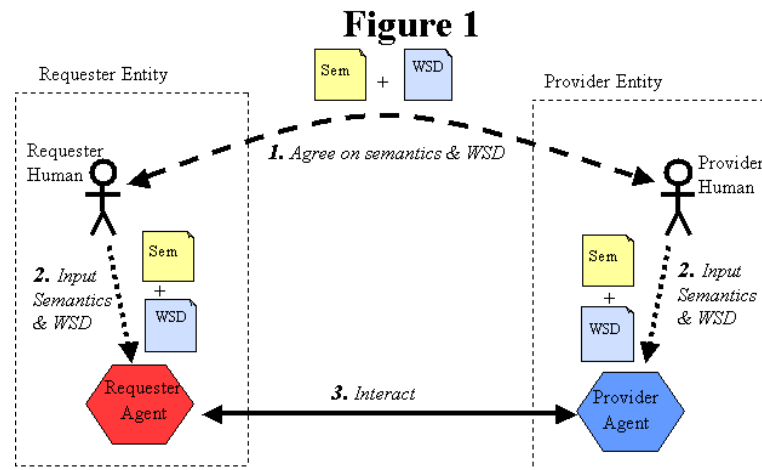


Figure 11.3 The layered architecture of BizTalk. Orchestration is defined on an abstract level. The abstract tasks are dynamically mapped onto concrete implementations—business logic components. These make use of data access components to access Web services, databases, and messaging services.

Daum, Merten: System architecture with XML book, 2003

# Publishing metadata

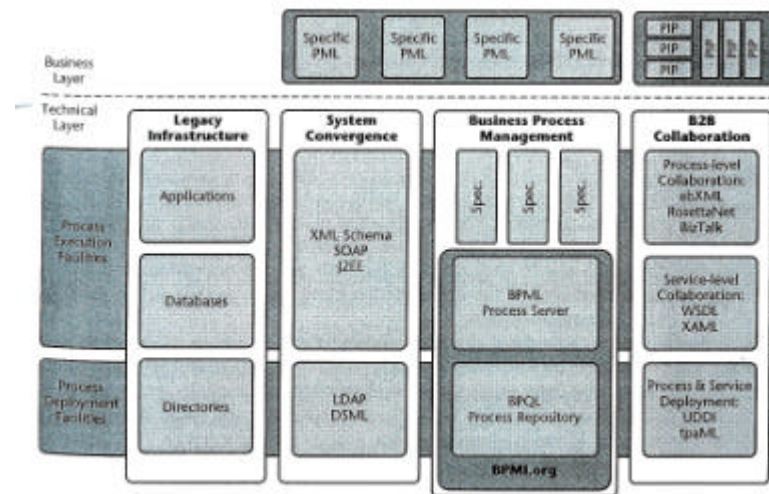
- Software agents and mediators can construct their own “mind map” of the information sources and to perform searches and transformations efficiently
- The relationship between information elements must be defined independently of the application.





# Process concepts

- Traditional intermediaries whose businesses were based on information are replaced by those who focus on advice and other more customer oriented services





# Horizontal and vertical businesses

- The Internet and the Web have already transformed vertical sectors such as travel and personal financial services

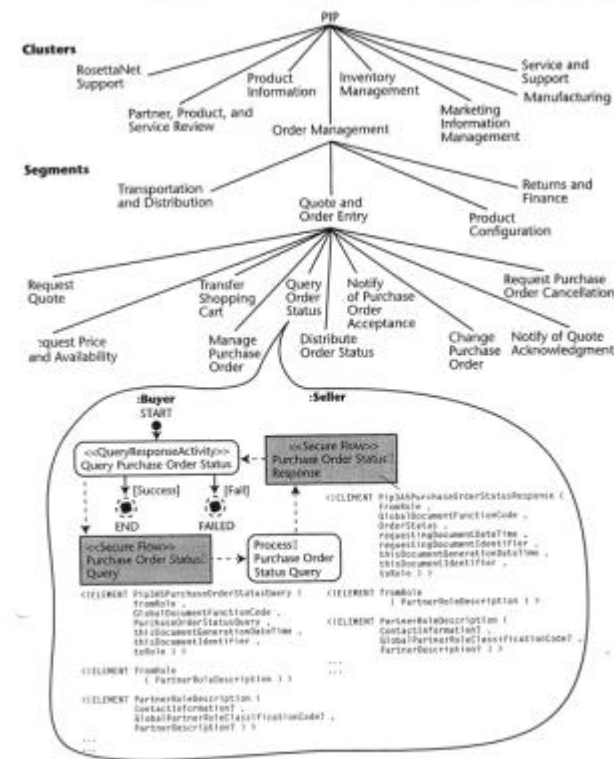


Figure 11.1 Hierarchy of predefined PIPs in RosettaNet (Version 2.0). Each PIP describes a specific collaborative process between partners. Here, we have drilled down into the basic object view of the PIP QueryOrderStatus. We have also listed the beginnings of the DTDs for the two business documents exchanged in this process: PurchaseOrderStatusQuery and PurchaseOrderStatusResponse.

Daum, Merten: System architecture with XML book, 2003



# Developing web service platforms

- XML Schemas and DTDs can be shared in XML repositories like XML.org or Biztalk.org
- Sun ONE and JAX Pack for Java from Sun
- Global XML web service architecture by Microsoft and IBM (vision presented in W3C)
- Global XML web service specifications: WS-Inspection, WS-Referral, WS-Routing, WS-Security
- RosettaNet combines three vertical industries: IT+Elec. Circ.+Semic. Man. (by DTDs and XDRs)