

Introduction to Digital Libraries

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“Web Services”

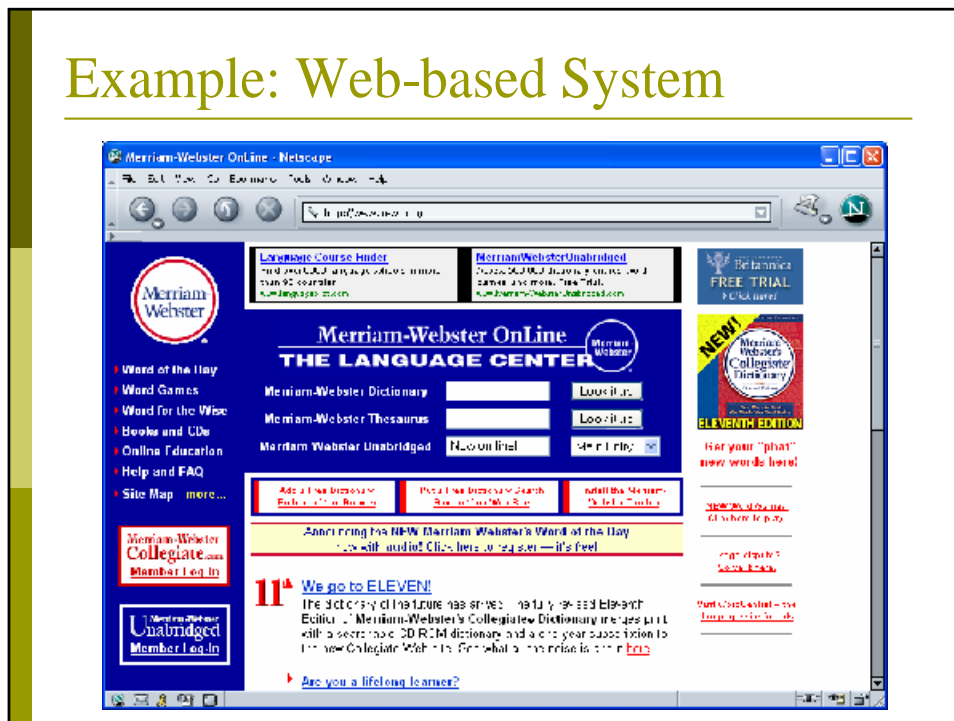
Definitions

- Web
 - = World Wide Web
 - = client-server hypermedia system layered over Internet.
- Web service
 - = Web-based Service (or service)
 - = service provided through the medium of the Web, beyond hypermedia.
- Web Service
 - = machine-to-machine communication based on interoperability standards defined by W3C.

Web-based Systems

- Modern digital libraries are largely Web-based services.
 - They provide higher-level services beyond just document delivery, e.g., searching.
- Greenstone, ODL, EPrints, etc. are Web-based.
- Web-based architectures provide a machine-independent service interface (HTTP) and user interface (HTML).
- A network is NOT required (e.g., Greenstone on a single machine).

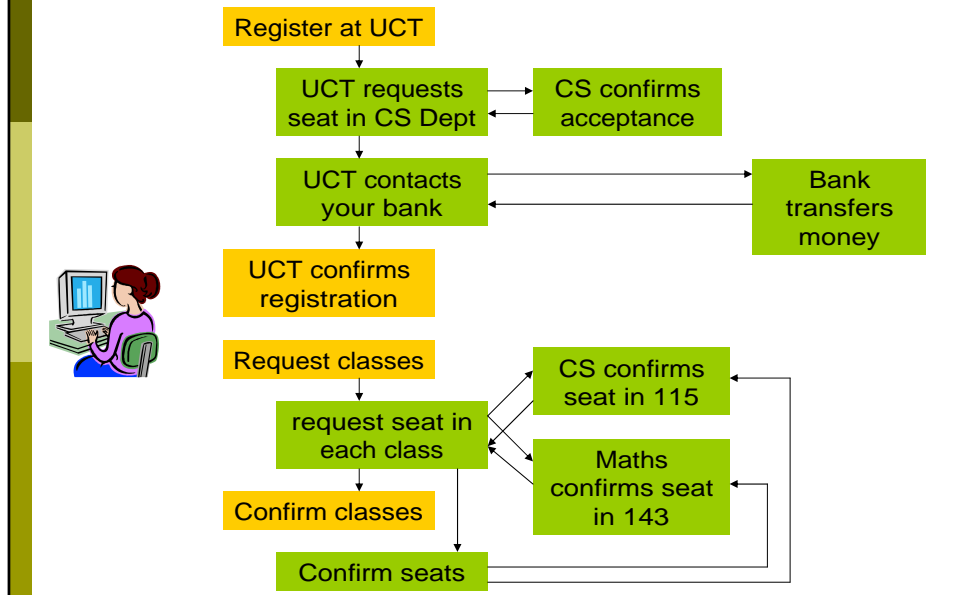
Example: Web-based System



Web Services

- Web Services are a specific set of standards for the description of machine-to-machine communication (possibly over the Web):
 - SOAP
 - WSDL
 - UDDI
 - WS-Choreography
 - WSFL
 - etc.

Use case: Registration



Mapping to Web Services

- SOAP
 - Transport protocol for message passing.
- WSDL
 - Service interface description for BANK, UCT, Dept1, Dept2, CS.
- UDDI
 - Central registry of all services e.g., CS's "did we accept you" service.
- WSFL, WS-Choreography, etc.
 - Description of sequence of operations to perform a task.
- Web-based services for user interaction!

SOAP

- Describes an XML format for messages to be exchanged among actors.
 - One-way information transfer.
 - Stateless.
 - Independent of lower-layer transport.
 - Specifies only syntax, not semantics.

- Used to be “Simple Object Access Protocol”.
- Currently the **ONLY** Web Services standard!

SOAP Example

```
<Envelope>
  <header>
    <origin>CS</origin>
  </header>
  <body>
    <requestSeat>
      <class>CSC115</class>
      <studentID>abc123</studentID>
    </requestSeat>
  </body>
</Envelope>
```

SOAP Actors and Roles

- Producer
 - Creates SOAP message.
- Consumer
 - Uses/interprets/understands SOAP message.
- Intermediary
 - Modifies message in transmission path between producer and consumer.

- Role attributes can specify if message block must be understood by next or final node.

SOAP headers and bodies

- Headers may contain control information that may be modified by intermediaries.
 - Can have multiple headers.
 - Headers can be modified, removed and inserted by intermediaries.
- Body contains application payload.
 - Only one body per message.

- Many simple use cases do not “need” headers.
- Both are defined using XML Schema.

SOAP RPC

- ❑ Remote Procedure Calls can be implemented using SOAP messages for the request and response.
- ❑ Procedures map to service names and parameters map to XML-encoded data structures.
- ❑ WSDL can be used to describe the interaction sequences more formally.

WSDL

- ❑ Web Services Description Language defines interactions among WS nodes in terms of:
 - corresponding message pairs or sequence of messages.
 - message types.
 - protocol binding (HTTP or SOAP).
 - network address of service.
- ❑ Using a WSDL definition, a client can determine how to use a Web Service (syntactically).

UDDI

- ❑ The Universal Description, Discovery and Integration of Web Services (UDDI) is a central/replicated clearinghouse for Web Services.
- ❑ UDDI is not machine-readable – needs human intervention to select services.

UDDI Example 1/4

The screenshot displays the UDDI Business Registry Version 2 website. The main heading is "UDDI Business Registry Version 2" with the tagline "Universal Description, Discovery and Integration". Below this, the "UDDI Find" section is active, featuring a "Simple Search" form. The form includes a "Search Term" field with "Service" entered, a "Search with" dropdown set to "operator", and a "Find" button. An "Advanced Search" section is also visible below the simple search form. The website has a blue header with navigation links like "Home", "Products & services", "Support & downloads", and "My account". A sidebar on the left contains "Related Links" and "IBM partners" with the wand logo.

UDDI Example 2/4

UDDI Business Registry

Home | Products & services | Support & downloads | My account

UDDI Business Registry Version 2
Universal Description, Discovery, and Integration

Find Service Results

View a complete list of results or go to the first or last page

Service Name	Description	Owning Business
Amazon Web Services 2.0	A Amazon.com web service Web Services work together to help you build applications that use Amazon.com's powerful services. The important thing to know is that you can use the services of multiple Amazon.com services in a single application. This means you can take advantage of the services of multiple Amazon.com services in a single application.	Amazon Web Services for UDDI
Amazon.com Web Services	Amazon.com Web Services is a set of web services that allow developers to create applications that consume Amazon.com's core features. When used in conjunction with the Amazon.com Associate program, developers can earn a percentage of each transaction that Amazon.com fulfills. These cases must have a link to the Amazon.com website.	amazon.com
AmazonLinkPrice	Amazon Link Price Service	REG-Test

New Search

UDDI Example 3/4

UDDI Business Registry

UDDI Business Registry Version 2
Universal Description, Discovery and Integration

Service Details

The details of the selected service are shown below. Please use your browser's Back button to return to the previous page or press the New Search button to search again.

Service Information	
Key	845DE2D0-EA3F-4285-8964-6E317E0410DB
Owning Business	Amazon.com
Owner Key	10E7FD02-D18D-437C-0077-0000021E00F5

Service Name(s)	
Name	Language
Amazon.com Web Services	en

Service Description(s)	
Description	Language
Set of web services that allow developers to create applications that consume Amazon.com's core features. When used in conjunction with the Amazon.com Associate program, developers can earn a percentage of each transaction that Amazon.com fulfills. These cases must have a link to the Amazon.com website.	en

Access Point(s)		
Protocol	Address	Description
http	http://309p.a.amazon.com/309p3sm/AmazonWebServices.wsdl	The WSDL file that allows developers to
		Details

UDDI Example 4/ 4 (WSDL)

```
<!--  
  interfaces are subject to  
-->  
<!--  
<definition name="AmazonSearch" targetNamespace="urn:FLDevCentral/SoapService">  
<!--  
  Data structures used in Amazon.com's Web Service calls and responses  
-->  
<types>  
  <xsd:schema targetNamespace="urn:FLDevCentral/SoapService">  
    <xsd:complexType name="ProductInfo">  
      <xsd:sequence>  
        <xsd:element name="Details" type="types:DetailsArray"/>  
      </xsd:sequence>  
    </xsd:complexType>  
    <xsd:complexType name="Product">  
      <xsd:sequence>  
        <xsd:element name="ID" type="xsd:string"/>  
        <xsd:element name="Title" type="xsd:string"/>  
        <xsd:element name="Product Name" type="xsd:string"/>  
        <xsd:element name="Category" type="xsd:string"/>  
        <xsd:element name="KeyPhrases" type="types:KeyPhraseArray"/>  
        <xsd:element name="Artists" type="types:ArtistArray"/>  
        <xsd:element name="Authors" type="types:AuthorArray"/>  
      </xsd:sequence>  
    </xsd:complexType>  
  </types>  
</definition>
```

WSFL / WS-Choreography

- Web Services Flow Languages defines composition of services based on sequencing and aggregation.
 - specifies relationships and dependencies among services.
- WS-Choreography is a standards activity that is still very new!

Web Services and Digital Libraries

- Web Services only provide syntax – semantics are application-specific.

- Digital library applications will migrate to Web Services technology after standardisation. For example:
 - ZING (Z39.50 International Next Generation) is defining the SRW protocol using SOAP.
 - OAI-PMHv2.0 was designed to easily migrate to SOAP (SOAP became a standard on 24 June 2003).

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