Announcements

- Lab 4 due back November 12th (Wednesday)
- Lab 5 will be handed out November 13th, due Nov. 26th (Wednesday)
  - Interaction with UDDI registries
  - Programmatic discovery of web services

(Review) Web Services Architecture – Standards

Web services allow programmatic interaction …
… by relying upon standard protocols for
- Discovering services with desired characteristics
  - UDDI (this lecture)
- Determining the operations offered by the service
  - WSDL (Lecture 14)
- Invoking the desired operation
  - SOAP (Lecture 13)

Universal Description, Discovery, and Integration

Two components
- Standards-based specifications for service description and discovery
  - Both of the information that is shared, and
  - The APIs that are used to access it
- Shared operation of a business registry on the web
  - UDDI registry itself implemented as a web service

Partnership among industry and business leaders
- Microsoft, IBM, HP, Oracle, SAP, Accenture, Ariba, Commerce One
  …
- OASIS Standards Group (www.uddi.org)

Versions
- Currently deployed: v2
- v3 specifications under review
What Problems Does UDDI Solve?

- Broader B2B: A mid-sized manufacturer needs to create 400 online relationships with customers, each with their own set of standard and protocols.
- Smarter Search: A flower shop in Australia wants to be "plugged in" to every marketplace in the world, but doesn’t know how.
- Easier Aggregation: A B2B marketplace cannot get catalog data for relevant suppliers in its industry, along with connections to shippers, insurers, etc.

UDDI v1 Implementation

- UDDI Business Registry: Programmatic descriptions of web services, programmatic descriptions of businesses and the services they support, programming model, schema, and platform agnostic, uses XML, HTTP, and SOAP, free on the Internet.

How UDDI v1 Works

1. SW companies, standards bodies, and programmers populate the registry with descriptions of different types of services.
2. Businesses populate the registry with descriptions of the services they support.
3. UBR assigns a programmatically unique identifier to each service and business registration.
4. Marketplaces, search engines, and business apps query the registry to discover services at other companies.
5. Business uses this data to facilitate easier integration with each other over the Web.

UDDI Registry Data

- Businesses register public information about themselves.
- Standards bodies, Programmers, Businesses register information about their Service Types.
White Pages

• Business Name
• Text Description
  – list of multi-language text strings
• Contact info
  – names, phone numbers, fax numbers, web sites…
• Known Identifiers
  – list of identifiers that a business may be known by - DUNS, Thomas, other

Yellow Pages

Business categories
• 3 standard taxonomies in V1
  – Industry: NAICS (Industry codes - US Govt.)
  – Product/Services: UN/SPSC (ECMA)
  – Location: Geographical taxonomy
• Many more in V2
• New ones can be created
• Implemented as name-value pairs to allow any valid taxonomy identifier to be attached to the business white page

Green Pages

New set of information businesses use to describe how to “do e-commerce” with them
• Allows programmatic discovery and interaction with web services

Nested model
• Business processes (Providers)
• Service descriptions
  – Owned by a business (provider)
  – A business (provider) can own multiple services
• Binding information
  – Refers to where a service is located, how to interact with it, …
  • For SOAP-based web services, the URL
  – A service can have multiple bindings
• Programming/platform/implementation agnostic
• Services can also be categorized

Service Type Registration

Information referred to in the UDDI specifications as a tModel
• Pointer to the namespace where service type is described
  – What programmers read to understand how to use the service
  – For XML web services, the WSDL file
• Identifier for who published the service type
• Identifier for the service type registration
  – called a tModelKey
    • A unique ID generated by the UDDI registry
  – Used as a signature by web sites that implement those services
UDDI Information Model

- Boxes correspond to XML element names

Example of an UDDI Registration

```
<table>
<thead>
<tr>
<th>businessEntity</th>
<th>Harbour Metals</th>
</tr>
</thead>
<tbody>
<tr>
<td>name</td>
<td><a href="http://www.harbourmetals.co.au">www.harbourmetals.co.au</a></td>
</tr>
<tr>
<td>description</td>
<td>Sydney Harbour for metals</td>
</tr>
<tr>
<td>businessServices</td>
<td>Harbour Metals Business Services</td>
</tr>
<tr>
<td>contactsbusinessServices</td>
<td>Peter Smythe</td>
</tr>
<tr>
<td>identifierBag</td>
<td><a href="mailto:Peter@harbourmetals.co.au">Peter@harbourmetals.co.au</a></td>
</tr>
<tr>
<td>categoryBag</td>
<td>872-6891</td>
</tr>
<tr>
<td>contactsbusinessServices</td>
<td>4281 King's Blvd, Sydney, NSW</td>
</tr>
<tr>
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Business Registry Operation

- Peer nodes (websites)
- Companies register with any node
- Registrations replicated on a daily basis
- Complete set of “registered” records available at all nodes
- Common set of SOAP APIs supported by all nodes
- Compliance enforced by business contract
Registry Access Using SOAP

UDDI Functionality in the .NET Framework

- “UDDI Services” component on Windows Server 2003 provides registry server functionality
  - A web service hosted on top of IIS 6.0/ASP.NET
  - Web-based and programmatic (SOAP) interaction
    - [http://<server name>/uddi](http://<server name>/uddi)
    - Integrated with the “Add Web Reference” tool in Visual Studio.NET
      - [http://<server name>/uddi/addwebreference](http://<server name>/uddi/addwebreference)

- Programmatic interaction through an optional SDK
  - Object-oriented interface to UDDI API using the `Microsoft.Uddi` namespace
    - Create a UddiConnection
    - Create a request object (Service, Business, TModel)
    - Send request to UddiConnection, receive Info objects in response
    - Request for basic and detailed info

Registry APIs (SOAP Messages)

Inquiry API
- Find things
  - find_business
  - find_service
  - find_binding
  - find_tModel
- Get Details about things
  - get_businessDetail
  - get_serviceDetail
  - get_bindingDetail
  - get_tModelDetail

Publishers API
- Save things
  - save_business
  - save_service
  - save_binding
  - save_tModel
- Delete things
  - delete_business
  - delete_service
  - delete_binding
  - delete_tModel
- Security…
  - get_authToken
  - discard_authToken