Web Service

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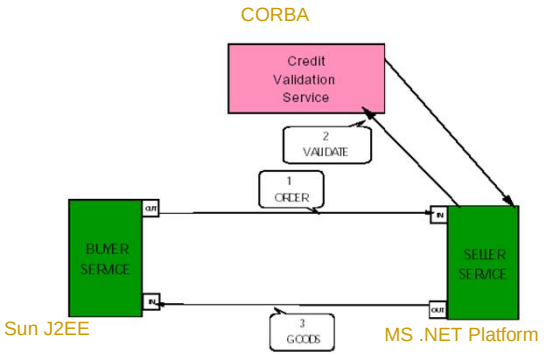
Need a common program-to-program communications model



Introduction

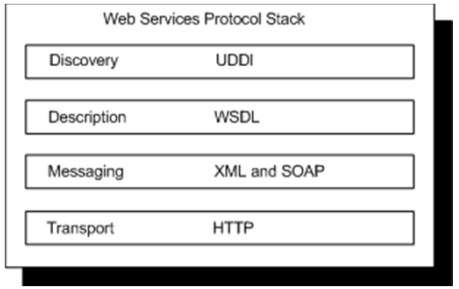
- The term *Web services* describes a standardized way of integrating Web-based applications using the XML, SOAP, WSDL and UDDI open standards over an Internet protocol backbone.
- XML is used to tag the data, SOAP is used to transfer the data, WSDL is used for describing the services available and UDDI is used for listing what services are available.
- Used primarily as a means for businesses to communicate with each other and with clients, Web services allow organizations to communicate data without intimate knowledge of each other's IT systems behind the firewall.

- Unlike traditional client/server models, such as a Web server/Web page system, Web services do not provide the user with a GUI. Web services instead share business logic, data and processes through a programmatic interface across a network. The applications interface, not the users. Developers can then add the Web service to a GUI (such as a Web page or an executable program) to offer specific functionality to users.
- Web services allow different applications from different sources to communicate with each other without time-consuming custom coding, and because all communication is in XML, Web services are not tied to any one operating system or programming language. For example, Java can talk with Perl, Windows applications can talk with UNIX applications.

W3C Definition

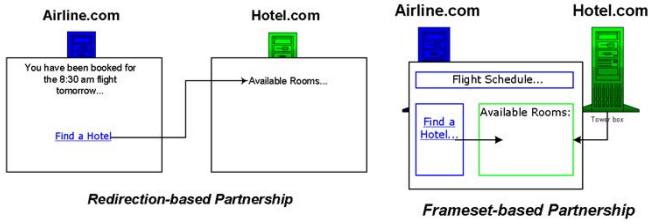
A Web service is a software system designed to support interoperable machine-to-machine interaction over a network. It has an interface described in a machine-processable format (specifically WSDL). Other systems interact with the Web service in a manner prescribed by its description using SOAP messages, typically conveyed using HTTP with an XML serialization in conjunction with other Web-related standards.

WS Protocol Stack



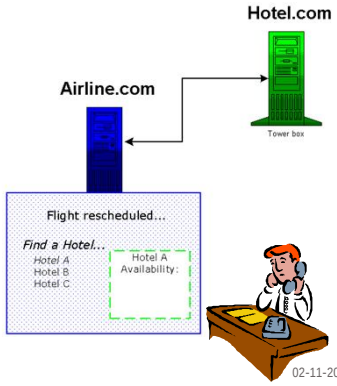
Sharing Applications

- Common Approaches via the Web
  - Hyper-links
  - Frames



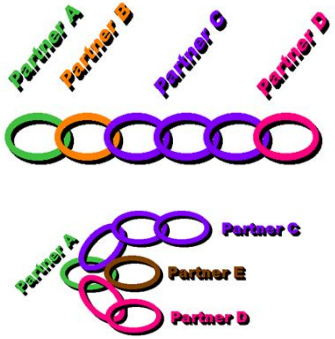
Web Service Based Integration

- Applications consuming processes on external systems
- Presenting one view to users



Web Service Aggregation

- Partners working together
- Service Aggregation / Composition
- Can work together in different ways
- Support workflow/business processes



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Order Placement

Order Placement

Discount Calculation

Tax Calculation

Shipping Calculation

Supporting services may reside somewhere else, provided by someone else

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Traditional RPC vs Web Services

Traditional RPC

- Within enterprise
- Tied to a set of programming languages
- Procedural
- Usually bound to a particular transport
- Tightly-coupled
- Firewall-unfriendly
- Efficient processing

Web Services

- Between enterprises
- Program language independent
- Message-driven
- Easily bound to different transports
- Loosely-coupled
- Firewall-friendly
- Relatively not efficient processing

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Web Applications vs Web Services

Web Application

- User-to-program interaction
- Static integration of components
- Monolithic service
- Ad hoc or proprietary protocol

Web Services

- Program-to-program interaction
- Dynamic integration of components
- Service aggregation
- Interoperability

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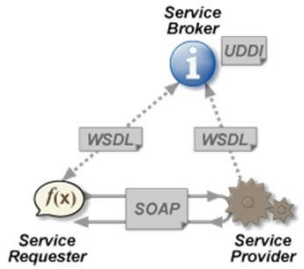
Web Services Architecture



Roles in Web Service architecture

- Service provider
  - Owner of the service
  - Platform that hosts access to the service
- Service requestor
  - Business that requires certain functions to be satisfied
  - Application looking for and invoking an interaction with a service
- Service registry
  - Searchable registry of service descriptions where service providers publish their service descriptions

Operations in a Web Service Architecture

- Publish
  - Service descriptions need to be published in order for service requestor to find them
- Find
  - Service requestor retrieves a service description directly or queries the service registry for the service required
- Bind
  - Service requestor invokes or initiates an interaction with the service at runtime

SOAP: Simple Object Access Protocol

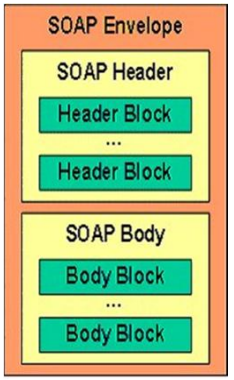
- SOAP is a **communication protocol**
- SOAP is for communication **between applications**
- SOAP is a format for **sending messages**
- SOAP is designed to communicate **via Internet**
- SOAP is **platform independent**
- SOAP is **language independent**
- SOAP is **based on XML**
- SOAP is **simple and extensible**
- SOAP will be developed as a **W3C standard**

Why SOAP?

- Other distributed technologies failed on the Internet
  - Unix RPC – requires binary-compatible Unix implementations at each endpoint
  - CORBA – requires compatible ORBs
  - RMI – requires Java at each endpoint
  - DCOM – requires Windows at each endpoint
- SOAP is the platform-neutral choice
  - Simply an XML wire format
  - Places no restrictions on the endpoint implementation technology choices

Soap Message Structure

- Envelope - defines an overall framework for expressing **what** is in a message; **who** should deal with it, and **whether** it is optional or mandatory
- Header (optional)
- Body - contains call and response information
- Fault element in body - provides information about errors that occurred while processing the message



Web Service Definition Language (WSDL)

WSDL is an XML document and used to describe Web services

- Describes three fundamental properties
  - What a service does
    - Operations (methods) provided by the service
  - How a service is accessed
    - Data format and protocol details
  - Where a service is located
    - Address (URL) details

WSDL Elements – An Example

```
<definitions>
  <types>  <!-- XML Schema --> </types>
  <message name="getQuoteRequest" />
  <message name="getQuoteResponse" />
  <portType name="StockQuoteServiceInterface">
    <operation name="getQuote">
      <input message="getQuoteRequest" />
      <output message="getQuoteResponse" />
    </operation>
  </portType>
  <binding name="StockQuoteServiceBinding" type="StockQuoteServiceInterface">
    <soap:binding transport="http://schemas.xmlsoap.org/soap/http" />
    ...
  </binding>
  <service name="StockQuoteService">
    <port name="StockQuoteServicePort" binding="StockQuoteServiceBinding">
      <soap:address location="http://www.acme.com/services/stockquote" />
    </port>
  </service></definitions>
```

Definition of data types

Definition of messages

Definition of port type

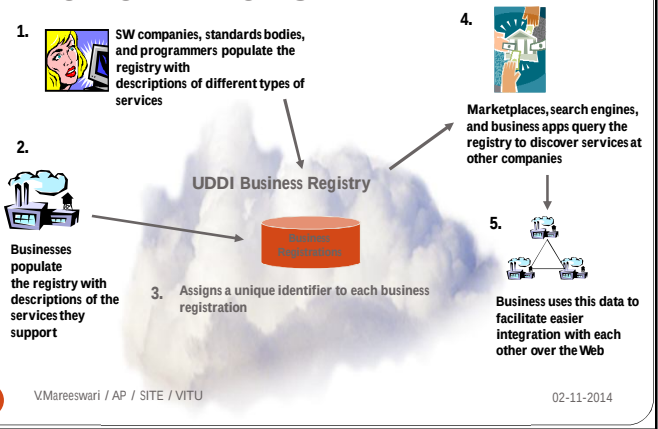
Definition of the bindings

Definition of the service

UDDI:Universal Description, Discovery and Integration

- Registry for Web services
- A registry where you find a Web service and its description (WSDL)
  - Search by business
  - Search by service type

How UDDI Works



UDDI Business Registration

- Businesses register public information about themselves
- " White pages"
  - including address, contact and known identifiers(IBM,HP,…)
- "Yellow pages"
  - including industry categories, based on standard taxonomies (NAICS, UN/SPSC)
- "Green pages"
  - technical information about the services exposed by the business