Introduction to Engineering Using Robotics Experiments

Lecture 15
Service-Oriented Computing and Web Software Development

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Outline

- Introduction
- Service-Oriented Computing
- Service Provider
- Service Broker
- Service Requester (Application Builder)
IoT and Web App

http://venus.eas.asu.edu/WSRepository/raas/hexcrawler/
IoT and Web App: With Programming Capacity

http://venus.eas.asu.edu/WSRepository/RaaS/MazeNav/
IoT Phone App: Change Maze and Drive
Component-Based Software Development

Bricks and Tiles

imperative

Component-based
Object-Oriented and Service-Oriented Software Development

Requirement analysis

Problem decomposition

Programmers

Services development

Services testing

Service repository

Object-oriented development

Class/Object library

Object testing

Programmers

Application builder

Application building

Testing

Deployment
Object-Oriented Software Development

Organization X: Component library

Organization Y: Component library
Service-Oriented Software Development

Organization X: Component library

Organization Y: Component library

Organization Z: Component library
Distributed Development: Separation of Responsibility

The Three-Party Model of Service-Oriented Software Development

Developers who understand database, ontology, and matching

End user

Software engineers who understand the application domain

Service requesters

Application Architect

Service brokers

Service repository

Internet

Service requesters

Service providers

Active Objects

White pages

Yellow pages

Green pages

Traditional object-oriented programmers, active objects hosting

End user

Software engineers who understand the application domain

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Traditional object-oriented programmers, active objects hosting
Service Broker

- Service brokers
- Registry
- Application builder
- Application
- Service providers
  - Service
  - Hosting
Register a new account

Account holders may publish services and/or clients on XMethods. You also need an account to post on the message boards.

Please note: we do not share account information with any third parties.

REQUIRED FIELDS

- **Account ID**
- **Email:**
- **Display email on public profile page?**
- **Password:**
- **Re-enter Password:**

OPTIONAL FIELDS

- **Name**
- **URL**
- **Logo URL**
- **Description**

You could implement the registration service to allow other people to submit services, and you automatically listed the service in your directory.
## Services Available at www.Xmethods.net

**Full Service List**

List is ordered by submission time, with most recent services listed first.

<table>
<thead>
<tr>
<th>Publisher</th>
<th>Style</th>
<th>Service Name</th>
<th>Description</th>
<th>Implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td>aandreu</td>
<td>RPC</td>
<td>Try It neuroFuzz Crypto Service</td>
<td>A simple demonstration of AES encryption and decryption via SOAP.</td>
<td>NuSOAP</td>
</tr>
<tr>
<td>XWebServices</td>
<td>DOC</td>
<td>Try It XWebBlog</td>
<td>XML/SOAP based Web Service which provides Content Management integration of a Weblog (Blog) to client applications.</td>
<td>MS .NET</td>
</tr>
<tr>
<td>kylehayes</td>
<td>RPC</td>
<td>Try It Amortization Calculator</td>
<td>Calculates amortization given principal, periodic interest rate, total number of payments</td>
<td></td>
</tr>
<tr>
<td>jbardin</td>
<td>RPC</td>
<td>Try It Interconnect</td>
<td>Initiates calls between one or more phones</td>
<td>SOAP4R</td>
</tr>
<tr>
<td>StrikeIron</td>
<td>DOC</td>
<td>Try It U.S. Yellow Pages</td>
<td>Access to yellow pages listings for 17 million U.S. businesses</td>
<td></td>
</tr>
<tr>
<td>7leapcom</td>
<td>RPC</td>
<td>Try It Conversão de IP para País</td>
<td>Converts an IP do it's country origin, retrieves not only country name, as well iso code, region, capital, and coin</td>
<td>NuSOAP</td>
</tr>
<tr>
<td>7leapcom</td>
<td>RPC</td>
<td>Try It Custo de Envio de Encomendas pelos CTT</td>
<td>Calculates shipping costs from Portugal via nacional CTT post offices</td>
<td>NuSOAP</td>
</tr>
<tr>
<td>agenteel</td>
<td>RPC</td>
<td>Try It Codigos Postales de Mexico</td>
<td>Codigos Postales de Mexico is a client/server implementation to lookup Postal Codes in Mexico.</td>
<td>gSOAP</td>
</tr>
<tr>
<td>Ignyte</td>
<td>DOC</td>
<td>Try It Ignyte's Retrieve Theaters and Movie Showtimes</td>
<td>Given a zip code and radius, this will return a list of theaters and movies currently playing.</td>
<td></td>
</tr>
</tbody>
</table>

View the [full list](#).
Amazon Web Services

• AWS Catalog:
  http://developer.amazonwebservices.com/
  http://solutions.amazonwebservices.com/connect/index.jspa

• The following link gives a tutorial on using AWS
  Another one:
  http://www.odetocode.com/Articles/158.aspx

Find more tutorials
Amazon Web Services

http://solutions.amazonwebservices.com/connect/index.jspa

Registration is required to use these services, but the services are free, yet

Solutions for

- Amazon Associates
- Developers
- Businesses
- Amazon Sellers
- Consumers

Browse by Services

- Amazon E-Commerce Service
- Amazon Elastic Compute Cloud
- Amazon Historical Pricing
- Amazon Mechanical Turk (Beta)
- Amazon Simple Queue Service
- Amazon Simple Storage Service
- Alexa Site Thumbnail
- Alexa Top Sites
- Alexa Web Information Service
- Alexa Web Search
Adding Web Services

http://webservices.amazon.com/AWSECommerceService/AWSECommerceService.wsdl
http://soap.amazon.com/schemas2/AmazonWebServices.wsdl

Methods
- ActorSearchRequest ()
- AddShoppingCartItemsRequest ()
- ArtistSearchRequest ()
- AsinSearchRequest ()
- AuthorSearchRequest ()
- BlendedSearchRequest ()
- BrowseNodeSearchRequest ()
- ClearShoppingCartRequest ()
- DirectorSearchRequest ()
- ExchangeSearchRequest ()
- GetShoppingCartRequest ()
- KeywordSearchRequest ()
- ListManiaSearchRequest ()
- ManufacturerSearchRequest ()
- MarketplaceSearchRequest ()
- ModifyShoppingCartItemsRequest ()
- PowerSearchRequest ()
- RemoveShoppingCartItemsRequest ()
- SellerProfileSearchRequest ()
- SellerSearchRequest ()
- SimilaritySearchRequest ()
- UpcSearchRequest ()
- WishlistSearchRequest ()

Web services found at this URL:
1 Service Found:
- AmazonWebServices
Google Service Links

• Google Web APIs
  http://code.google.com/
  http://code.google.com/more/

• Google Web API Forum
  http://groups.google.com/group/google.public.web-apis

• Google Web API FAQ
  http://www.google.com/apis/api_faq.html#gen6


<table>
<thead>
<tr>
<th>Service Name</th>
<th>Production Service Metadata URL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geocode Service</td>
<td><a href="http://dev.virtualearth.net/webservices/v1/geocodeservice/geocodeservice.svc">http://dev.virtualearth.net/webservices/v1/geocodeservice/geocodeservice.svc</a></td>
</tr>
<tr>
<td>Imagery Service</td>
<td><a href="http://dev.virtualearth.net/webservices/v1/imageryservice/imageryservice.svc">http://dev.virtualearth.net/webservices/v1/imageryservice/imageryservice.svc</a></td>
</tr>
<tr>
<td>Route Service</td>
<td><a href="http://dev.virtualearth.net/webservices/v1/routeservice/routeservice.svc">http://dev.virtualearth.net/webservices/v1/routeservice/routeservice.svc</a></td>
</tr>
<tr>
<td>Search Service</td>
<td><a href="http://dev.virtualearth.net/webservices/v1/searchservice/searchservice.svc">http://dev.virtualearth.net/webservices/v1/searchservice/searchservice.svc</a></td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>Service Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Locations API</td>
<td>Use the Locations API to geocode and reverse-geocode location data.</td>
</tr>
<tr>
<td>Imagery API</td>
<td>Use the Imagery API to get a static map and imagery data information such as map tiles and providers.</td>
</tr>
<tr>
<td>Routes API</td>
<td>Use the Routes API to get directions and route information for driving, walking or using transit.</td>
</tr>
<tr>
<td>Traffic API</td>
<td>Use the Traffic API to get information about traffic incidents and issues in a specified area.</td>
</tr>
<tr>
<td>Common Parameters and Types</td>
<td>Use common parameters and types to specify values such as culture and pushpin styles.</td>
</tr>
<tr>
<td>Common Response Description</td>
<td>Use this description to understand the results returned for a Bing Maps REST Services request.</td>
</tr>
<tr>
<td>Status Codes and Errors</td>
<td>Use the status and error code descriptions for troubleshooting.</td>
</tr>
</tbody>
</table>
A DataSet can be accessed as an XML file, or as table (2D-array) through indices.

```xml
<?xml version="1.0" encoding="utf-8" ?>
<NewDataSet>
  <Table>
    <CITY>Tempe</CITY>
    <STATE>AZ</STATE>
    <ZIP>85281</ZIP>
    <AREA_CODE>602</AREA_CODE>
    <TIME_ZONE>M</TIME_ZONE>
  </Table>
</NewDataSet>
```
Services from: http://www.remotemethods.com/
**FlightStats:**  [https://www.flightstats.com/developers/bin/view/Web+Services/WSDL](https://www.flightstats.com/developers/bin/view/Web+Services/WSDL)

### Standard and Premium Web Services

<table>
<thead>
<tr>
<th>Service Category</th>
<th>Web Services</th>
<th>WSDL Files</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airline</td>
<td>AirlineGetAirlinesService</td>
<td>AirlineService.wsdl</td>
</tr>
<tr>
<td>Airport</td>
<td>AirportGetAirportsService</td>
<td>AirportService.wsdl</td>
</tr>
<tr>
<td>Airport Delay</td>
<td>AirportDelayGetAirportsWithDelaysService</td>
<td>AirportDelayService.wsdl</td>
</tr>
<tr>
<td></td>
<td>AirportDelayGetDetailForAllDelaysService</td>
<td></td>
</tr>
<tr>
<td>Airport Status</td>
<td>AirportHistoryGetAirportHistoriesService</td>
<td>AirportHistoryService.wsdl</td>
</tr>
<tr>
<td>Flight Status</td>
<td>FlightHistoryGetRecordsService</td>
<td>FlightHistoryService.wsdl</td>
</tr>
<tr>
<td></td>
<td>FlightHistoryGetHistoryService</td>
<td></td>
</tr>
<tr>
<td>Performance</td>
<td>RatingGetFlightRatingService</td>
<td>RatingService.wsdl</td>
</tr>
<tr>
<td></td>
<td>RatingGetRouteRatingService</td>
<td></td>
</tr>
<tr>
<td>Weather</td>
<td>MetarGetCurrentConditionsForWeatherStationService</td>
<td>MetarService.wsdl</td>
</tr>
<tr>
<td>Weather</td>
<td>WeatherForecastGetForecastService</td>
<td>WeatherForecastService.wsdl</td>
</tr>
</tbody>
</table>

### Pathfinder-XML Web Services

<table>
<thead>
<tr>
<th>Service Category</th>
<th>Web Services</th>
<th>WSDL Files</th>
</tr>
</thead>
<tbody>
<tr>
<td>Timetables</td>
<td>TimetableGetTimetableEntriesService</td>
<td>TimetableService.wsdl</td>
</tr>
<tr>
<td></td>
<td>TimetableGetTimetableEntriesDecodedService</td>
<td></td>
</tr>
<tr>
<td>Flight Schedule</td>
<td>FlightScheduleGetFlightsService</td>
<td>FlightScheduleService.wsdl</td>
</tr>
<tr>
<td></td>
<td>FlightScheduleGetFlightsDecodedService</td>
<td></td>
</tr>
<tr>
<td>Flight Schedule</td>
<td>FlightScheduleAggregatorGetFlightsService</td>
<td>FlightScheduleAggregatorService.wsdl</td>
</tr>
<tr>
<td>Flight Route</td>
<td>FlightRouteGetFlightsService</td>
<td>FlightRouteService.wsdl</td>
</tr>
<tr>
<td></td>
<td>FlightRouteGetFlightsDecodedService</td>
<td></td>
</tr>
<tr>
<td>Flight Route</td>
<td>FlightRouteAggregatorGetFlightsService</td>
<td>FlightRouteAggregatorService.wsdl</td>
</tr>
</tbody>
</table>
As an Application Architect

Develop Windows Applications or Web Applications Using ASP.Net

A Web application is designed for end users, which requires human user interface, such as GUI.

A Web service is designed for application builders, which requires application programming interface (API) or service interface.

What is the difference between a Web application and a Web service?
A proxy is a “virtual” object that creates a channel to a (remote) service. A client accesses the operations of the services by calling the methods of the proxy.

An endpoint is a service interface exposed to outside, so that a client can access an operation of the service. It must include the address, name, parameters, return type, etc.
Where to Deploy Apps?

➤ Software development is the same;
➤ User Interface (UI) design is slightly different
  — Web Apps
  — Cell Phone Apps
  — Cloud Computing Apps
Impact of Service-Oriented Computing

- Explicit differentiation between software engineers and programmers
- Application architect (software engineers) do not have to focus on programming in the small
- Programmers do not have to understand application domain
- Tougher but equal competition
- Shorter development cycle
- Better and more reliable software from specialized providers
- Different skill requirements:
  - Few programmers-only may be needed, as reuses increase
  - More software engineers (CS/CSE graduates) will be needed, as applications increase
ASU Service Repository

http://venus.eas.asu.edu/WSRepository/

• SOAP/WSDL Services
• RESTful Services
• Workflow services
• Web applications
• Robot as Service:
  http://venus.eas.asu.edu/WSRepository/RaaS/main/