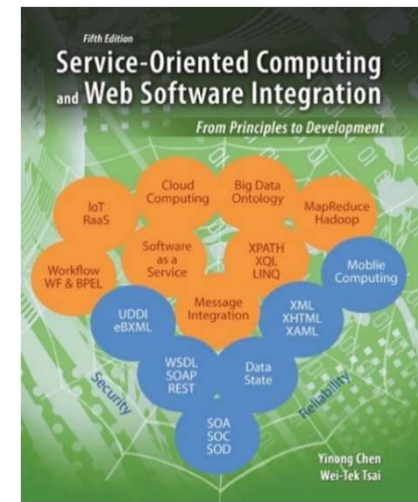


Introduction to Engineering Using Robotics Experiments

Lecture 15

Service-Oriented Computing and Web Software Development

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Tempe, Arizona, U.S.A.

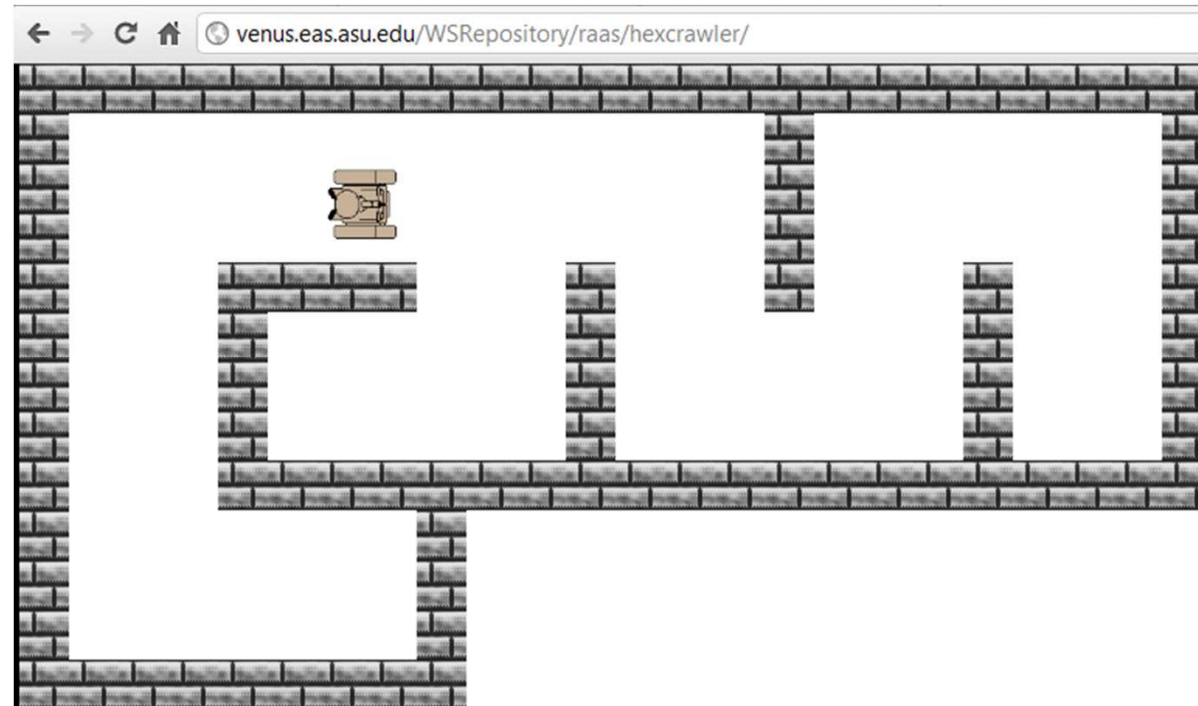


Outline

- Introduction
- Service-Oriented Computing
- Service Provider
- Service Broker
- Service Requester (Application Builder)

IoT and Web App

<http://venus.eas.asu.edu/WSRepository/raas/hexcrawler/>



Speed Slider

Testing...

HexCrawler Move:

tileEditMode: false

Collision:

Clicked:

Angle: 0

Collision Top: False

Collision Bottom: False

Collision Left: False

Collision Right: False

Number of Tiles: 93

isAutonomous = false

Front Sensor: 255 ☐ Follow Left Wall

Right Sensor: 37 ☐ Alternate Walls

Left Sensor: 60 ☐ Follow Right Wall

Back Sensor: NA ☒ Two-Distance

Maze: Generated ☐ Enable Sensor Lasers

Position: 193, 59

Slider Value: 2

W: Forward A: Rotate Left S: Backward D: Rotate Right

Q: Autonomous Mode E: Enable/Disable Edit Mode R: Reset Maze

P: Generate Preset Maze

Toggle Edit

Toggle Auto

Reset Maze

Generate Maze

IoT and Web App: With Programming Capacity

<http://venus.eas.asu.edu/WSRepository/RaaS/MazeNav/>

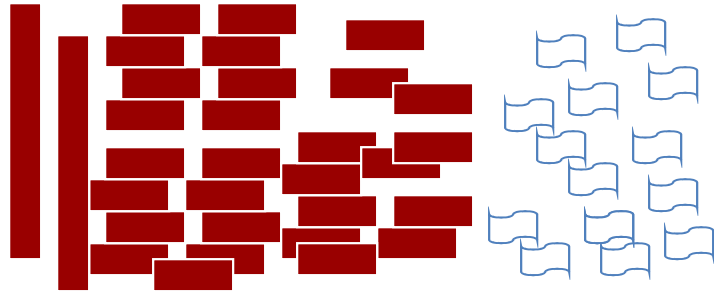
The screenshot shows a web browser window with the address bar displaying `http://venus.eas.asu.edu/WSRepository/RaaS/MazeNav/`. The main content area features a blue maze with a small robot icon at the entrance. To the right of the maze is a control panel titled "v1.1". The panel includes buttons for "Reset", "Forward", "Manual Control" (checked), "Left", "Stop", "Right", "Reverse", and "Autonomous". Below these buttons, numerical values are displayed: "123", "42", "270", "39", and "77". An "Execute" button is also present. At the bottom, there is a programming interface with a dropdown menu set to "Default: Forward", an "Add New Line" button, and a conditional statement: "if sensor.right > 120" followed by "delayed right 90", "else if sensor.forward < 60" followed by "left 90".

IoT Phone App: Change Maze and Drive

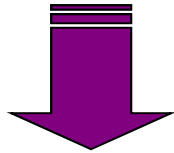
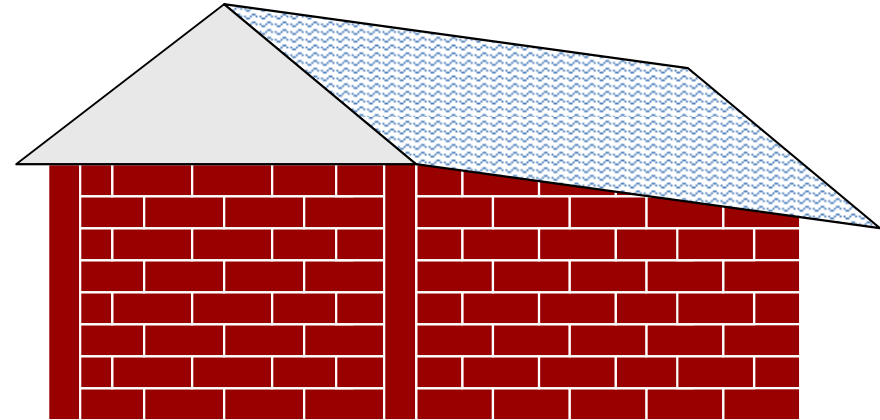
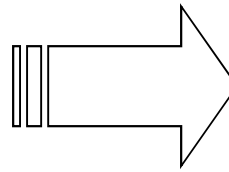


Component-Based Software Development

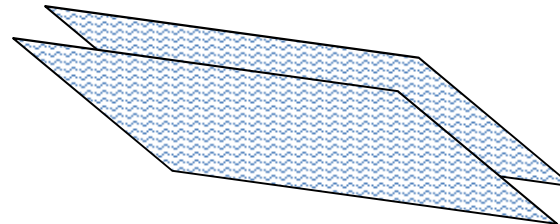
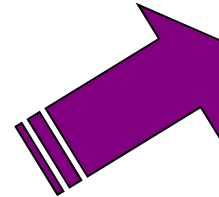
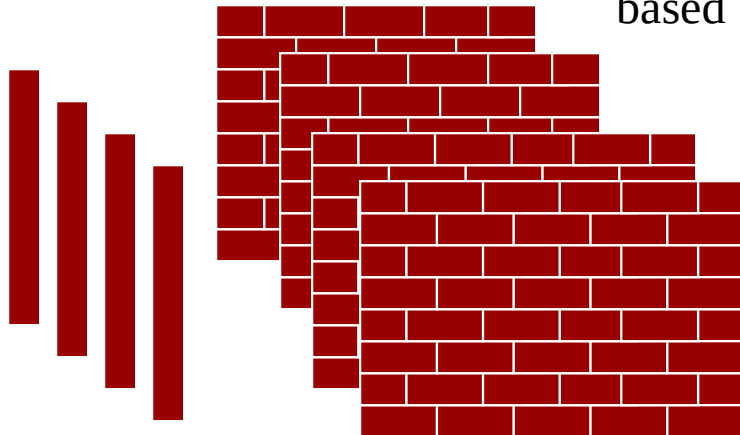
Bricks and Tiles



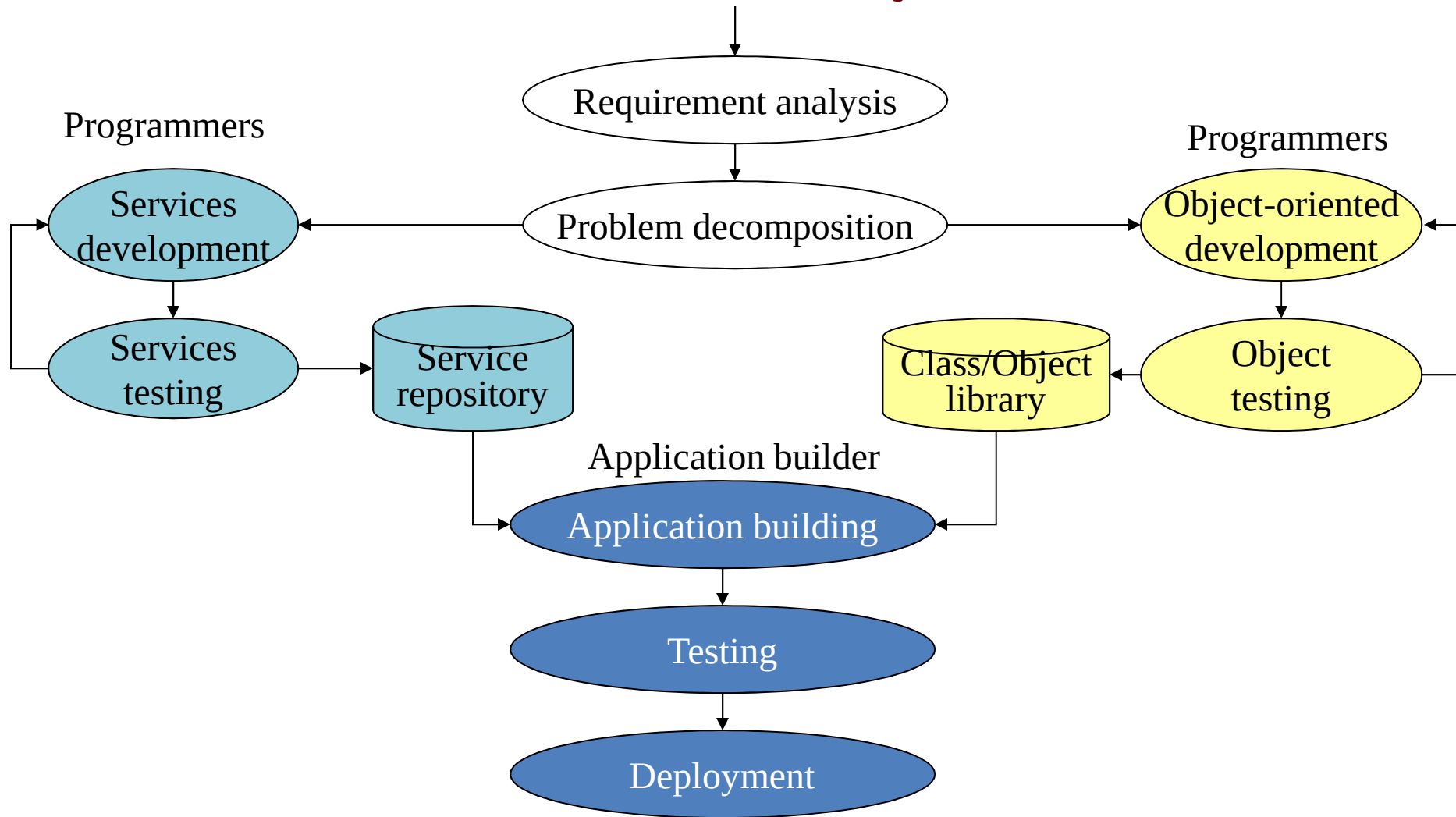
imperative



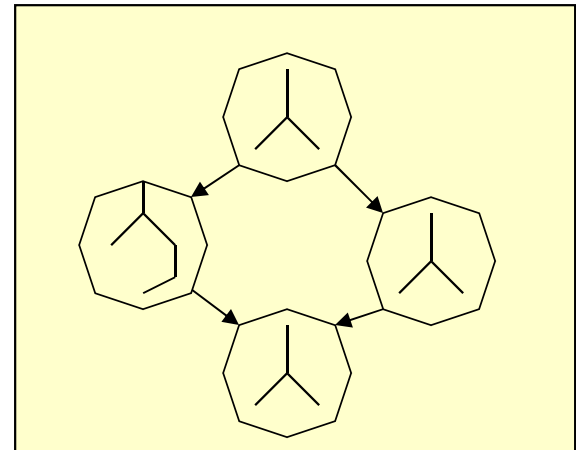
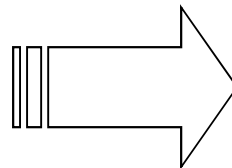
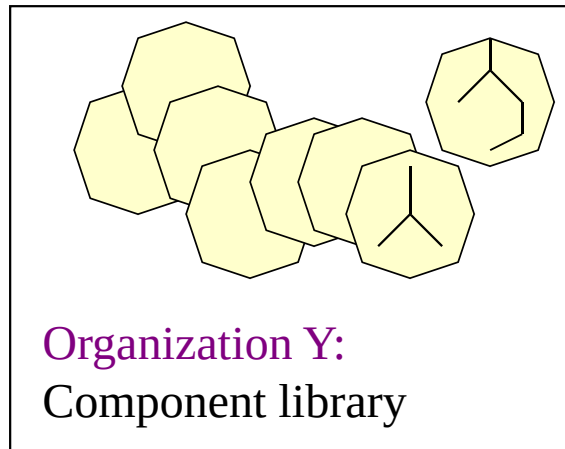
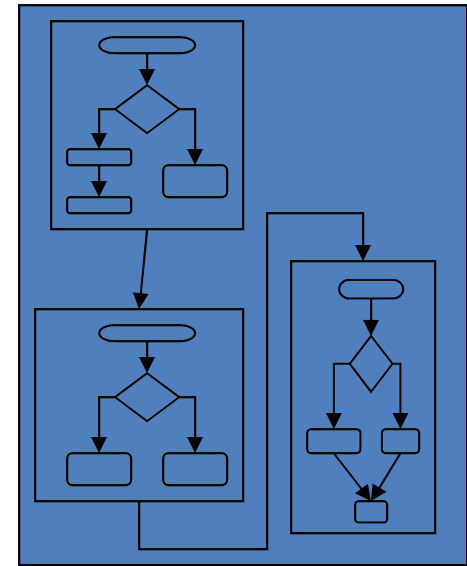
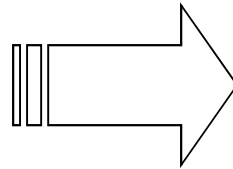
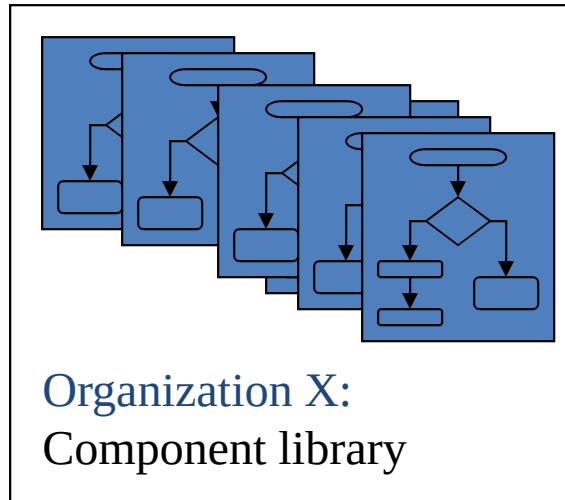
Component-based



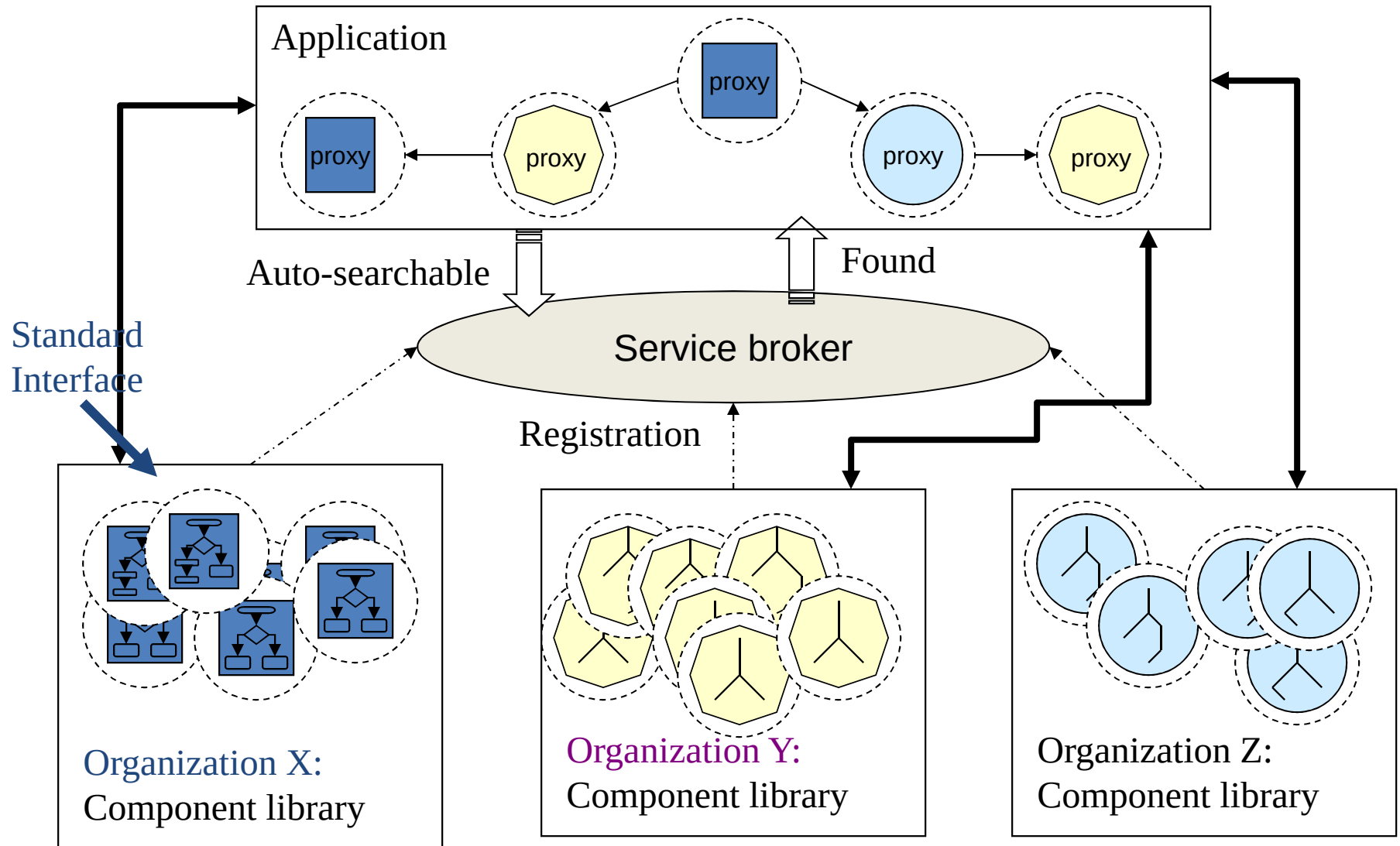
Object-Oriented and Service-Oriented Software Development



Object-Oriented Software Development



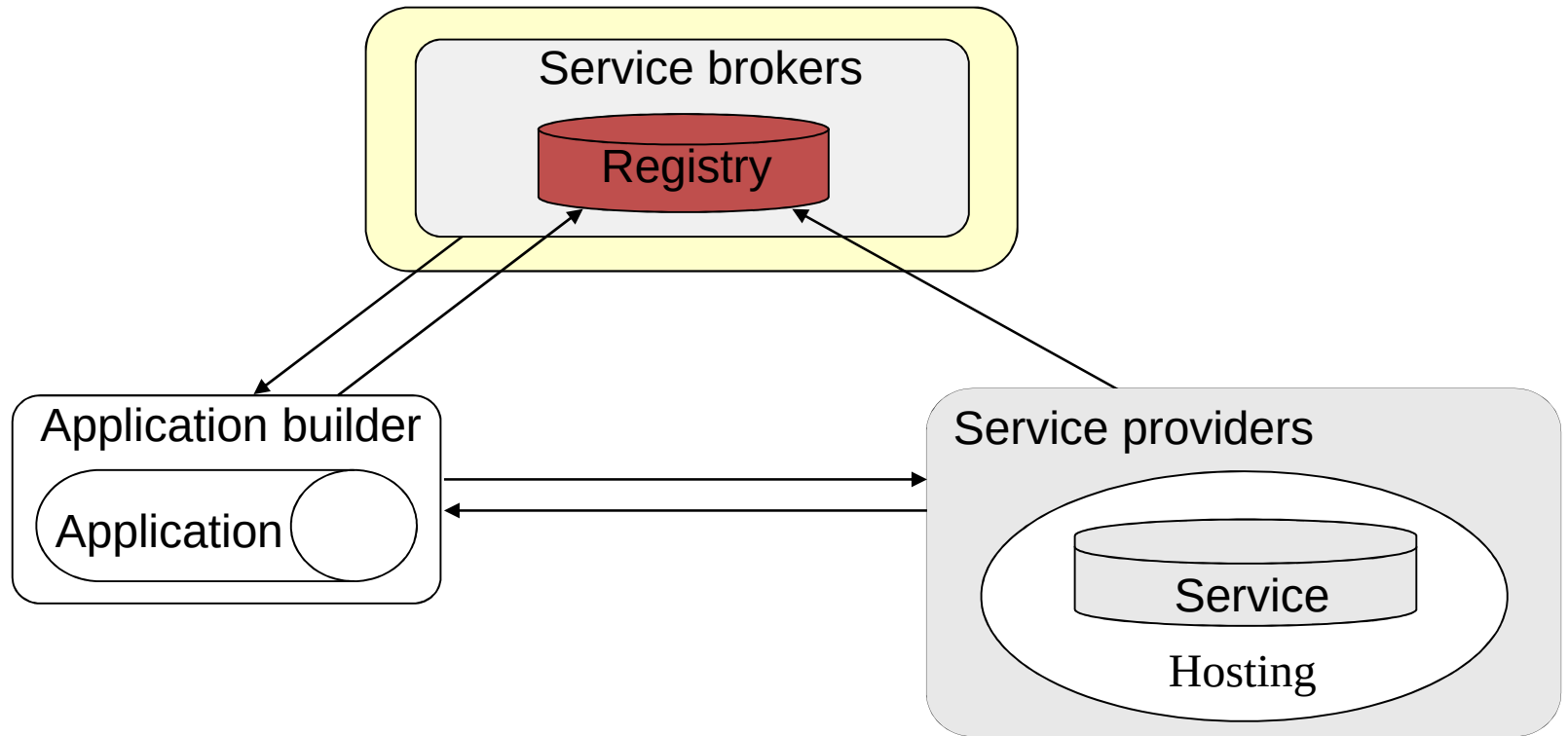
Service-Oriented Software Development



The Three-Party Model of Service-Oriented Software Development



Service Broker





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.

Create Account

Services Available at www.Xmethods.net

Full Service List

Also accessible via XML Interfaces: [DISCO](#) [WS-Inspection](#) [RSS](#)

See the [interfaces section](#) for more information.

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

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



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

<http://msdn.microsoft.com/coding4fun/web/services/article.aspx?articleid=912260>

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](#)

http://webservices.amazon.com/AWSECommerceService/AWSECommerceService.wsdl

Add Web Reference

Navigate to a web service URL and click Add Reference to add all the available services.



URL: Go

"AWSECommerceService" Description

Methods

- **BrowseNodeLookup** (*MarketplaceDomain* As string , *AWSAccessKeyId* As string , *SubscriptionId* As string , *AssociateTag* As string , *Validate* As string , *XMLEscaping* As string , *Shared* As BrowseNodeLookupRequest , *Request* As BrowseNodeLookupRequest)
- **CartAdd** (*MarketplaceDomain* As string , *AWSAccessKeyId* As string , *SubscriptionId* As string , *AssociateTag* As string , *Validate* As string , *XMLEscaping* As string , *Shared* As CartAddRequest , *Request* As CartAddRequest)
- **CartClear** (*MarketplaceDomain* As string , *AWSAccessKeyId* As string , *SubscriptionId* As string , *AssociateTag* As string , *Validate* As string , *XMLEscaping* As string , *Shared* As CartClearRequest , *Request* As CartClearRequest)
- **CartCreate** (*MarketplaceDomain* As string , *AWSAccessKeyId* As string , *SubscriptionId* As string , *AssociateTag* As string , *Validate* As string , *XMLEscaping* As string , *Shared* As CartCreateRequest , *Request* As CartCreateRequest)
- **CartGet** (*MarketplaceDomain* As string , *AWSAccessKeyId* As string , *SubscriptionId* As string , *AssociateTag* As string , *Validate* As string , *XMLEscaping* As string , *Shared* As CartGetRequest , *Request* As CartGetRequest)
- **CartModify** (*MarketplaceDomain* As string , *AWSAccessKeyId* As string , *SubscriptionId* As string , *AssociateTag* As string , *Validate* As string , *XMLEscaping* As string , *Shared* As CartModifyRequest , *Request* As CartModifyRequest)
- **CustomerContentLookup** (*MarketplaceDomain* As string , *AWSAccessKeyId* As string , *SubscriptionId* As string , *AssociateTag* As string , *Validate* As string , *XMLEscaping* As string , *Shared* As CustomerContentLookupRequest , *Request* As CustomerContentLookupRequest)

Web services found at this URL:

1 Service Found:

- AWSECommerceService

Web reference name:

com.amazon.webservices

Add Reference

Cancel

Add Web Reference



Navigate to a web service URL and click Add Reference to add all the available services.



Back



<http://soap.amazon.com/schemas2/AmazonWebServices.wsdl>

URL:  Go

"AmazonSearchService" Description

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

Web reference name:

com.amazon.soap

Add Reference

Cancel

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

Google AJAX Feed API

Easily mash up public feeds using JavaScript.
AJAX

Google AJAX Language API

Easily translate and detect multiple languages using JavaScript.
AJAX

Google AJAX Search API

Put a Google Search box and results on your own site.
AJAX, Search, Product APIs

Google Book Search APIs

Integrate Google Book Search content into your website or application.
AJAX, Product APIs, Search

Google Earth API

Embed Google Earth into your web page.
Product APIs, Geo, AJAX

Google Maps API

Integrate Google's interactive maps with data on your site.
AJAX, Product APIs, Geo

Google Visualization API

Create visualizations and reporting applications that access structured data in a common format.
AJAX

Google Web Toolkit

Build AJAX apps in the Java language.
AJAX, Browser

<http://msdn.microsoft.com/en-us/library/>

Bing SOAP Services: <http://msdn.microsoft.com/en-us/library/cc966738.aspx>

Service Name	Production Service Metadata URL
Geocode Service	http://dev.virtualsearth.net/webservices/v1/geocodeservice/geocodeservice.svc
Imagery Service	http://dev.virtualsearth.net/webservices/v1/imageryservice/imageryservice.svc
Route Service	http://dev.virtualsearth.net/webservices/v1/routeservice/routeservice.svc
Search Service	http://dev.virtualsearth.net/webservices/v1/searchservice/searchservice.svc

Bing RESTful Services: <http://msdn.microsoft.com/en-us/library/ff701713.aspx>

Bing APIs: <http://msdn.microsoft.com/en-us/library/ff701722.aspx>

Locations API	Use the Locations API to geocode and reverse-geocode location data.
Imagery API	Use the Imagery API to get a static map and imagery data information such as map tiles and providers.
Routes API	Use the Routes API to get directions and route information for driving, walking or using transit.
Traffic API	Use the Traffic API to get information about traffic incidents and issues in a specified area.
Common Parameters and Types	Use common parameters and types to specify values such as culture and pushpin styles.
Common Response Description	Use this description to understand the results returned for a Bing Maps REST Services request.
Status Codes and Errors	Use the status and error code descriptions for troubleshooting.

Services from: <http://www.webservices.net/>

Test the service at: <http://www.webservices.net/uszip.asmx>

USZip

The following operations are supported. For a formal definition, please review the [Service Description](#).

- [GetInfoByState](#)
Get State Code, City, Area Code, Time Zone, Zip Code by state
- [GetInfoByZIP](#)
Get State Code, City, Area Code, Time Zone, Zip Code by Zip Code
- [GetInfoByCity](#)
Get State Code, City, Area Code, Time Zone, Zip Code by City
- [GetInfoByAreaCode](#)
Get State Code, City, Area Code, Time Zone, Zip Code by Area Code

Try It

WSDL File

A DataSet can be accessed as an XML file, or as table (2D-array) through indices.

GetInfoByZIP

Get State Code, City, Area Code, Time Zone, Zip Code by Zip Code

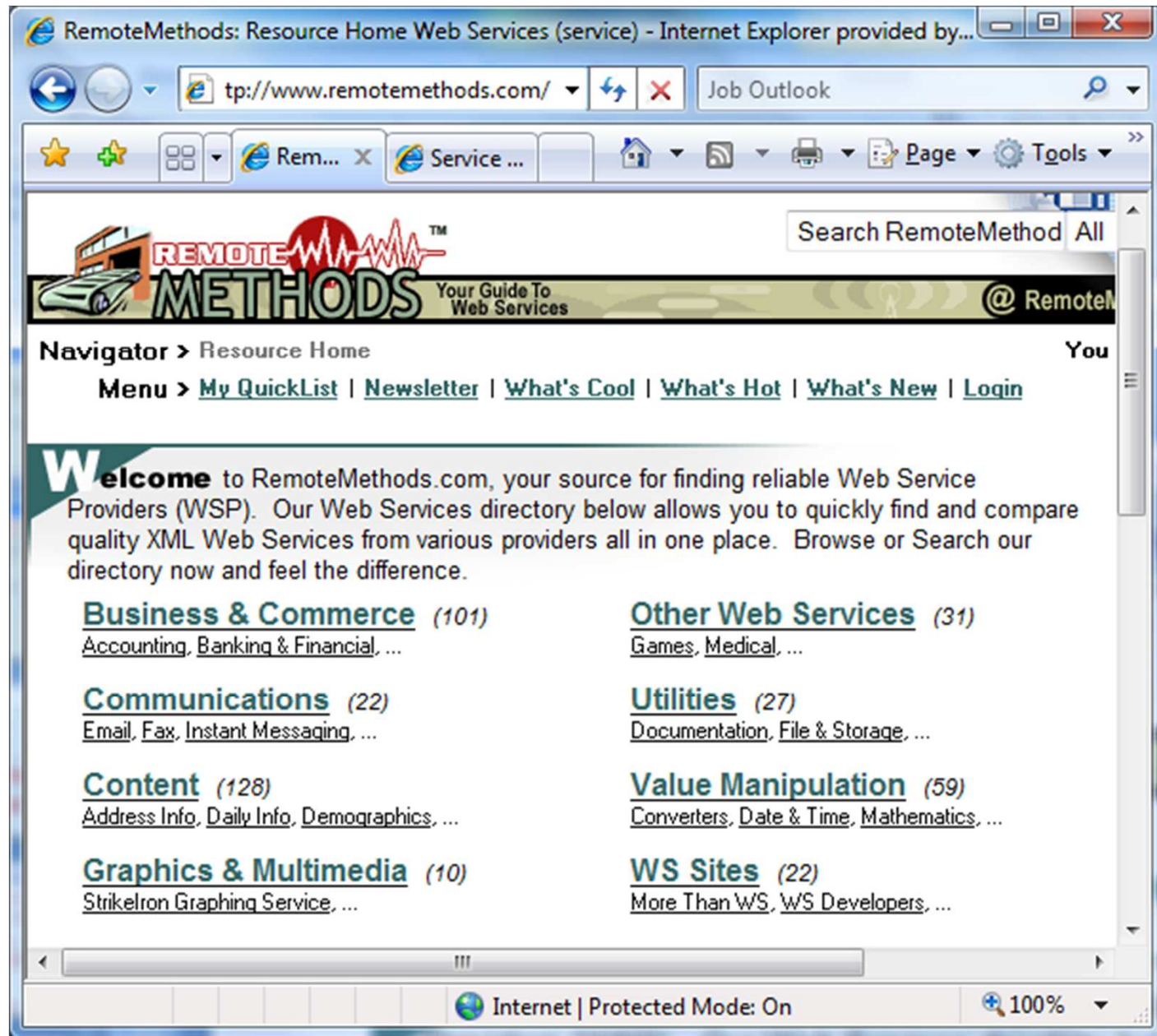
Test

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

Parameter	Value
USZip:	85281

```
<?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>

Standard and Premium Web Services

Service Category	Web Services	WSDL Files
Airline	AirlineGetAirlinesService	AirlineService.wsdl
Airport	AirportGetAirportsService	AirportService.wsdl
Airport Delay	AirportDelayGetAirportsWithDelaysService AirportDelayGetDetailForAllDelaysService	AirportDelayService.wsdl
Airport Status	AirportHistoryGetAirportHistoriesService	AirportHistoryService.wsdl
Flight Status	FlightHistoryGetRecordsService FlightHistoryGetHistoryService	FlightHistoryService.wsdl
Performance	RatingGetFlightRatingService RatingGetRouteRatingService	RatingService.wsdl
Weather	MetarGetCurrentConditionsForWeatherStationService	MetarService.wsdl
Weather	WeatherForecastGetForecastService	WeatherForecastService.wsdl

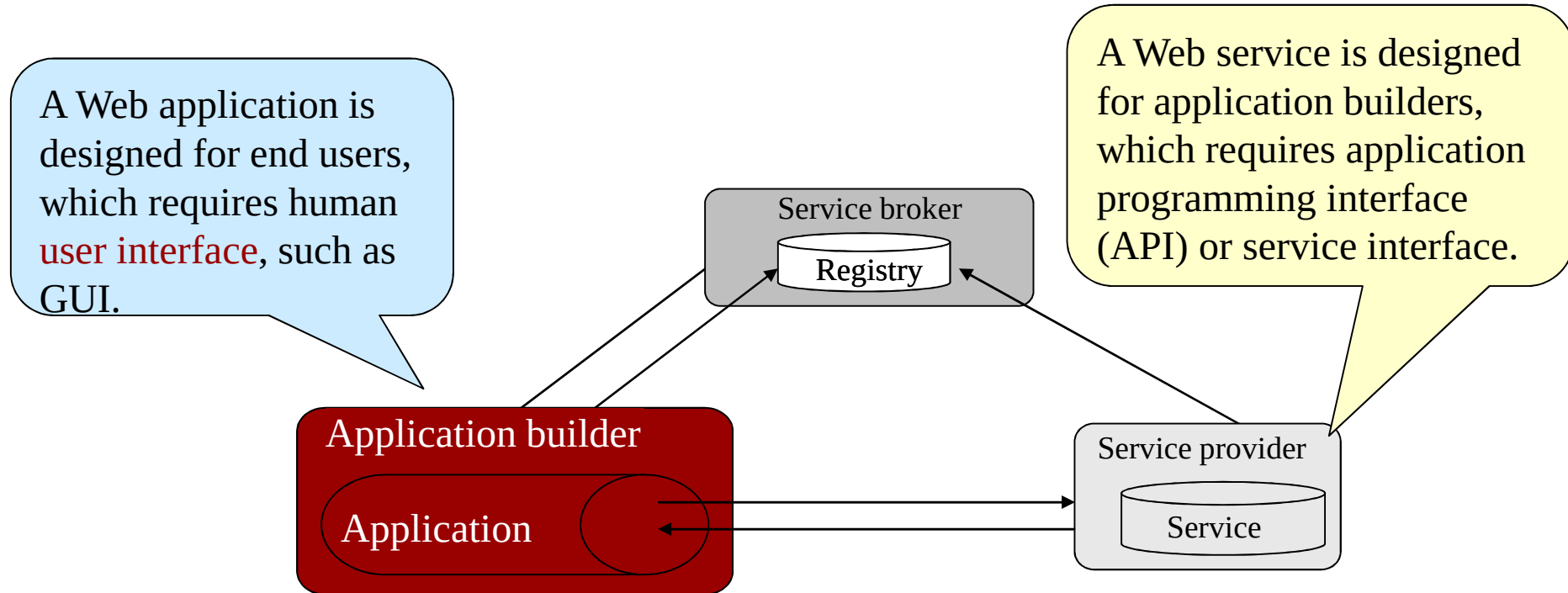
Pathfinder-XML Web Services

Service Category	Web Services	WSDL Files
Timetables	TimetableGetTimetableEntriesService TimetableGetTimetableEntriesDecodedService	TimetableService.wsdl
Flight Schedule	FlightScheduleGetFlightsService FlightScheduleGetFlightsDecodedService	FlightScheduleService.wsdl
Flight Schedule	FlightScheduleAggregatorGetFlightsService	FlightScheduleAggregatorService.wsdl
Flight Route	FlightRouteGetFlightsService FlightRouteGetFlightsDecodedService	FlightRouteService.wsdl
Flight Route	FlightRouteAggregatorGetFlightsService	FlightRouteAggregatorService.wsdl

As an Application Architect

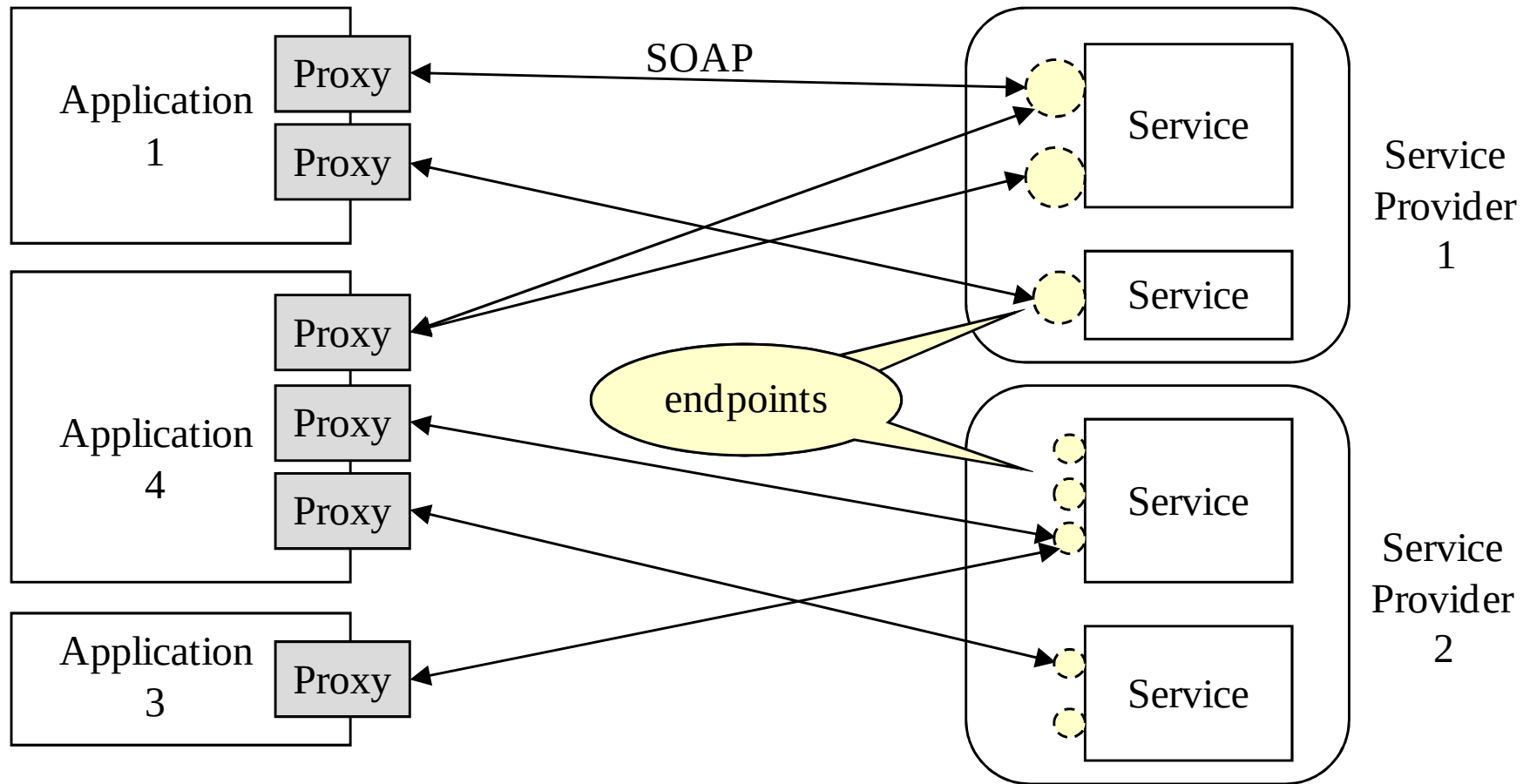
Develop Windows Applications or

Web Applications Using ASP .Net



What is the difference between a **Web application** and a **Web service**?

Applications Using Services Through Proxies



- 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/>