



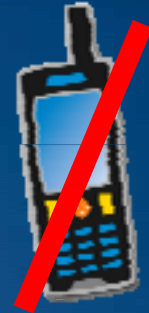
# A Developers Guide to ArcGIS Server

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*Antony Jayaprakash*



# Schedule

**Please!**  
Turn **OFF** cell phones  
and paging devices



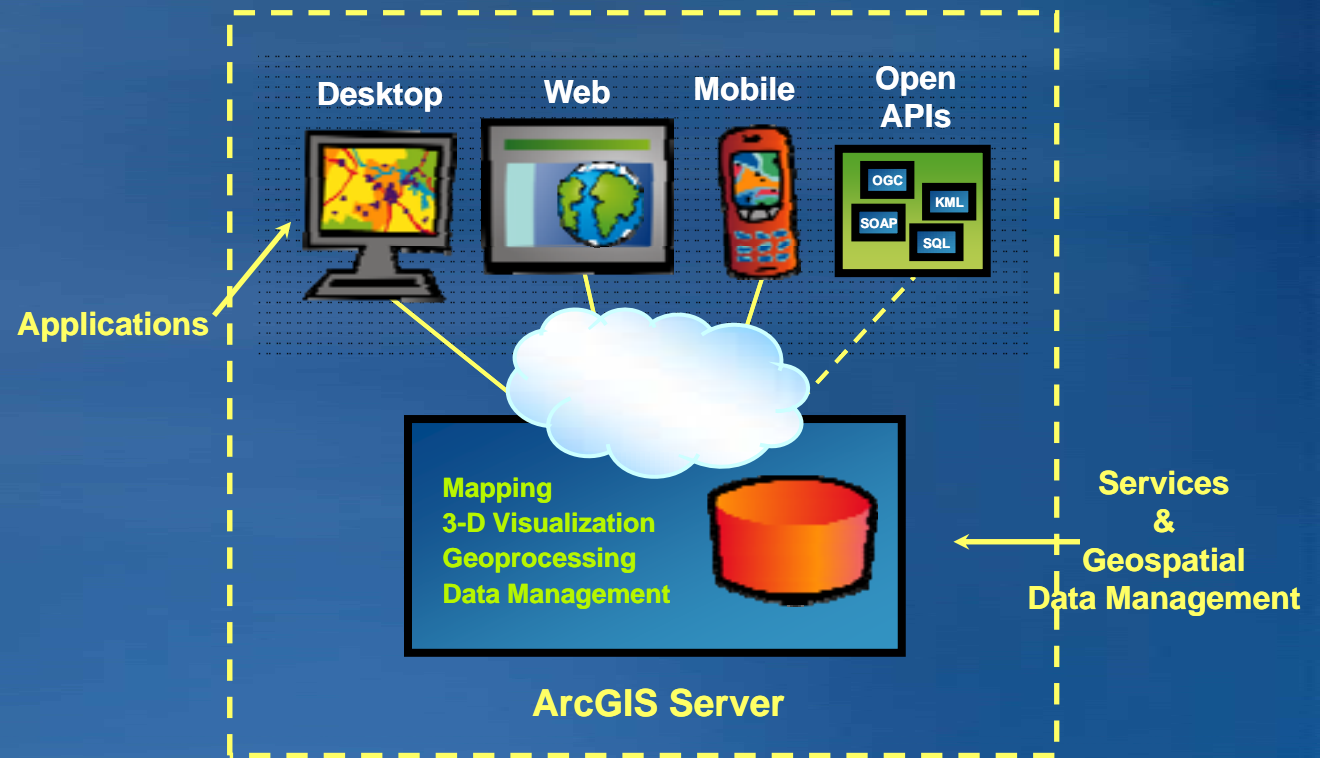
- Today we will cover
  - An overview of developer opportunities with ArcGIS Server
  - The Developer's view:
    - on ArcGIS Server Services
    - On ArcGIS Server applications
      - ArcGIS API's and Web ADFs
  
- We will answer questions at the end of the session

***Please complete the session survey!***

# ArcGIS Server is a powerful framework for Web Based GIS

*Empowering the Non-GIS Professional*

- Many capabilities
  - Mapping, Analysis, Geodata management
- Many clients
  - Desktop
  - Web Browsers
  - Mobile
  - ArcGIS Explorer
  - Third Party



# Developers have many opportunities... and choices

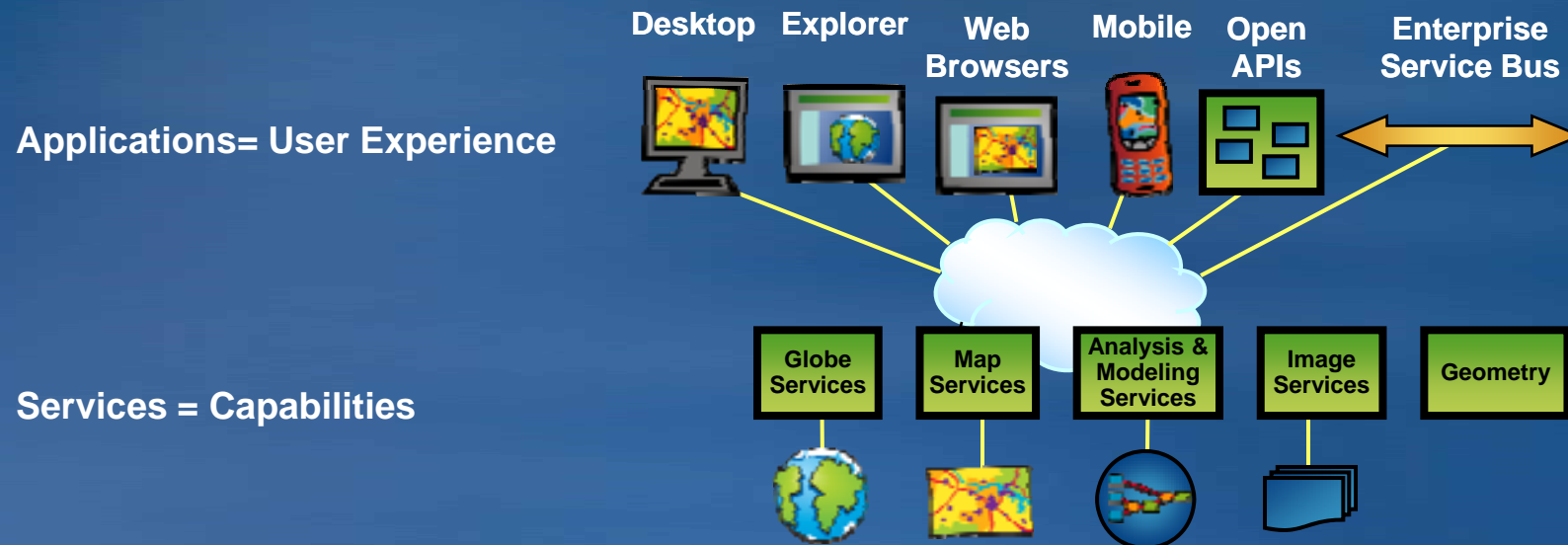
Mash-ups  
ArcGIS Explorer Tasks  
SOAP Desktop Clients  
.Net  
Adobe Flex  
JavaScript  
ASP.Net  
Server Object Extensions  
REST  
SAP Integration  
New Services  
Silverlight  
Java  
PHP

**This session will guide you through most of these options**

- **Understand when to use what**
- **Guide you through other sessions in this conference**

# ArcGIS Server has Services and Applications

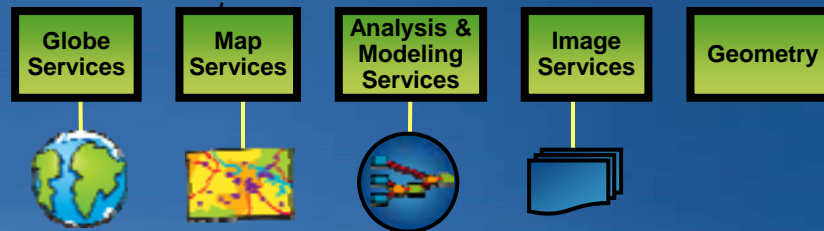
you can extend and develop against both



*...we will focus on services and web browser based apps*

# Developer's view on Services

- **Goal:** *Get server to do what you want*
- **How:**
  - *Understand 'out of the box services'*
  - *Create new ones if you need to*



# Understanding out of the box Services

	View	Query & Find	Edit & or Replication	Analysis	Comments
Map	X	X	X		Editing through WFS-T capability
Image	X	X			
Globe	X	X			
Geocode		X			
Geodata			X		
Geoprocessing				X	
Network				X	Capability of Map Service
Mobile	X	X	X		Capability of Map Service
Geometry					Geometry manipulation

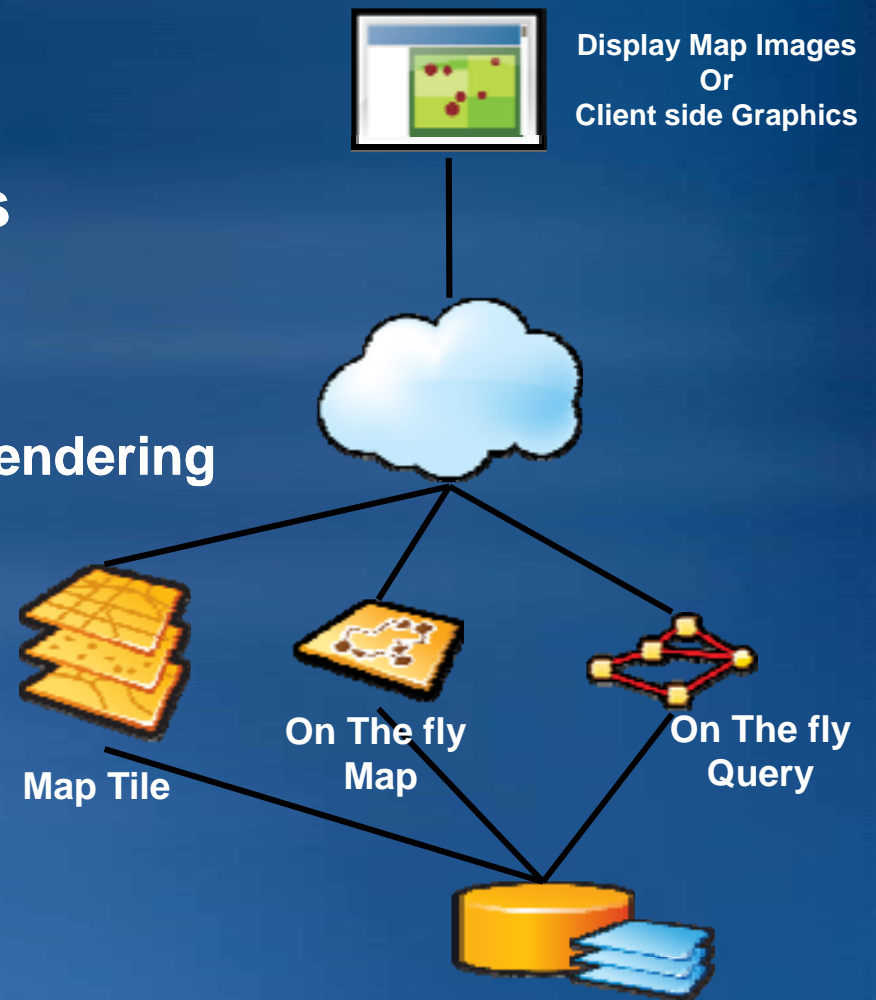
Access through REST and SOAP  
 Extended capabilities supported for OGC etc

**Demo**



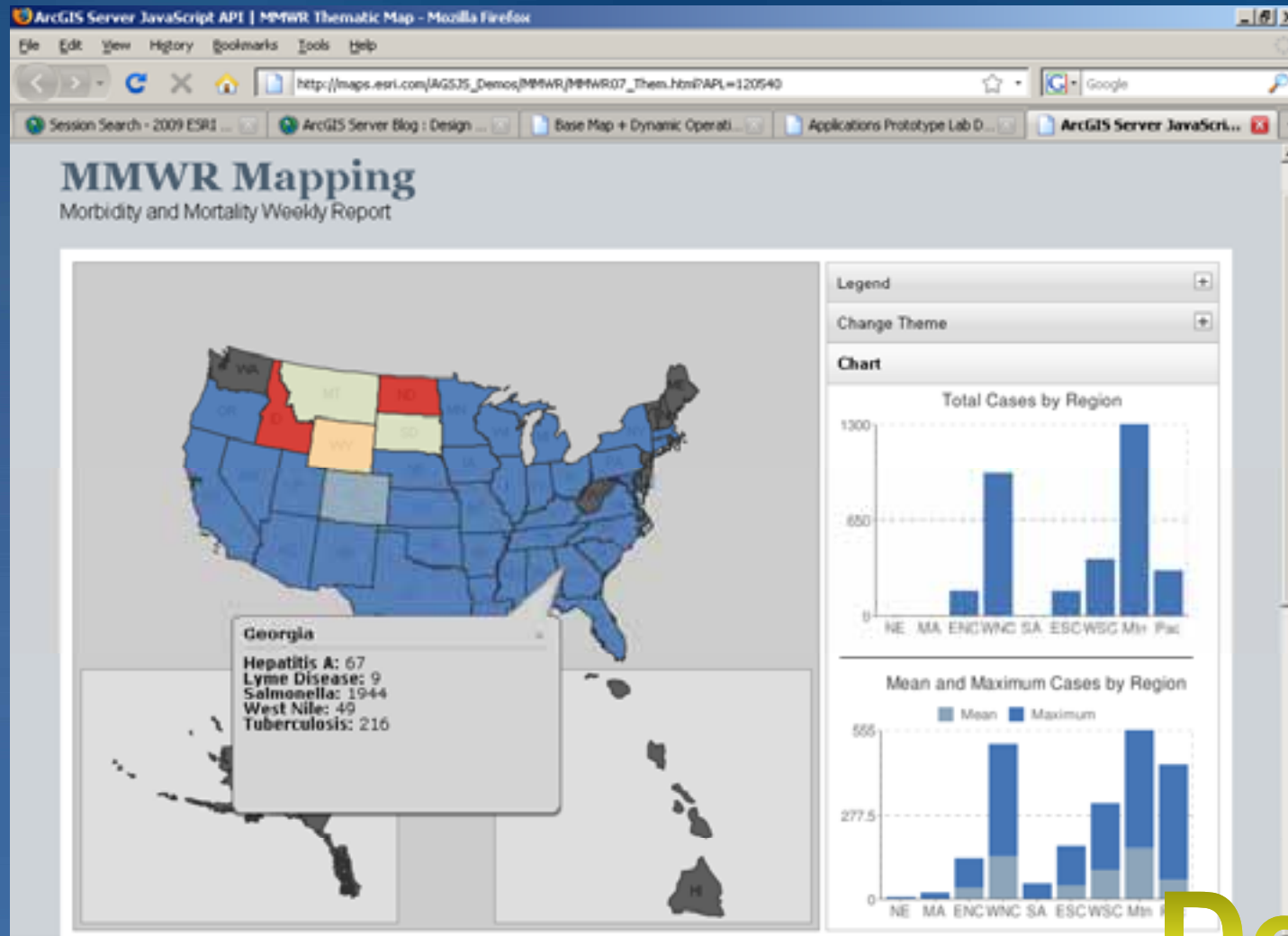
# A detailed view on Map Services

- Building-blocks of web maps
- Support mapping capabilities
  - Cached and Dynamic
- Powerful Query Capabilities
  - Go to, Map tips and client side rendering



# Using query capabilities to draw maps

...and map tips and more



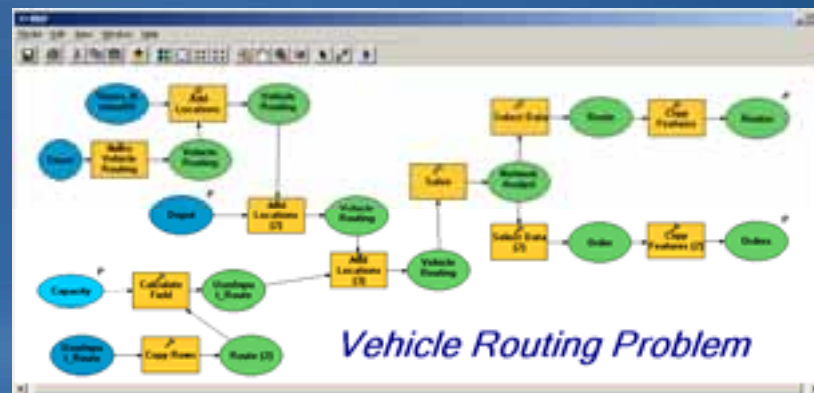
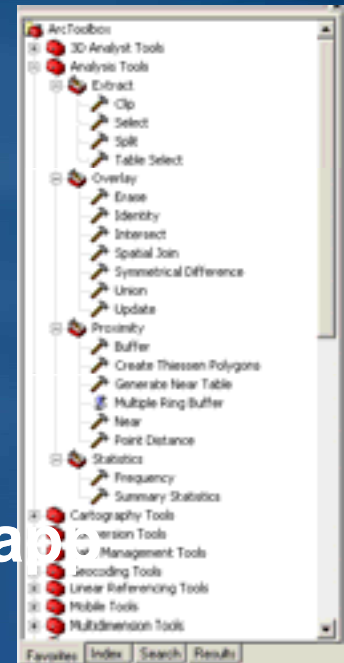
Demo

## Learning more...

- **Best Practices for Designing Effective Map Services**
  - Tuesday 4:30pm - Catalina/Madera (Wyndham)
- [www.esri.com/webmaps](http://www.esri.com/webmaps)

# A detailed view on Geoprocessing Services

- Provide advanced GIS functionality through web services
- Hundreds of out of the box tools
- Combine them into workflows (models)
- Execute
  - Synchronously
  - Asynchronously
- Use from Desktop, ArcGIS Explorer, custom applications



# Extending Geoprocessing with custom tools

- With Python, C#, VB.Net and Java

The screenshot shows a web browser window displaying the ArcGIS Geoprocessing Resource Center. The page is titled "Geoprocessing Resource Center" and is specifically for developers. The main content area is titled "Geoprocessing for developers" and contains a hierarchical menu structure. The top-level menu item is "Geoprocessing for developers", which branches into two sub-items: "Using geoprocessing tools and methods" and "Creating new geoprocessing tools".

**Geoprocessing for developers**

- Getting started** provides an overall guide to this site as well as a helpful guide to topics in the ArcGIS Desktop web help that pertain to developers using geoprocessing.
- Developer resources** provides links to object model diagrams (OMDs), the scripting diagram, geoprocessor methods, tool reference pages, and information on geoprocessing data types.

**Using geoprocessing tools and methods**

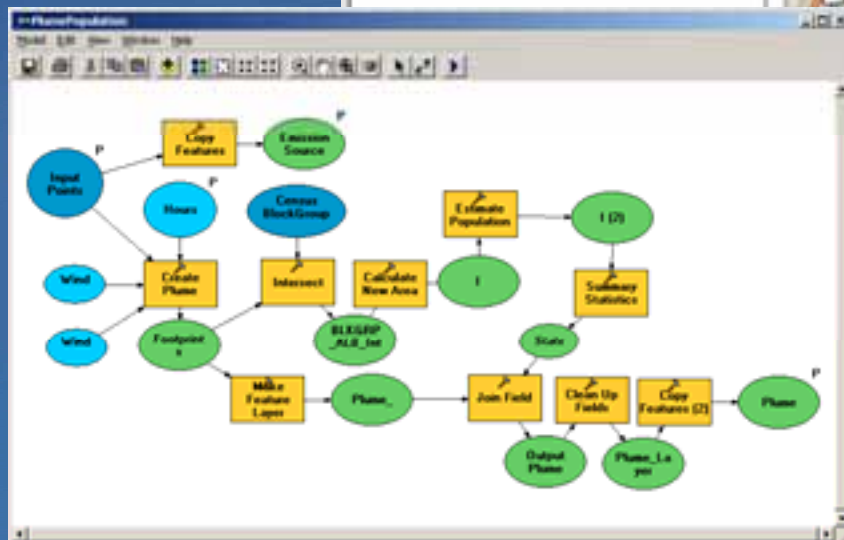
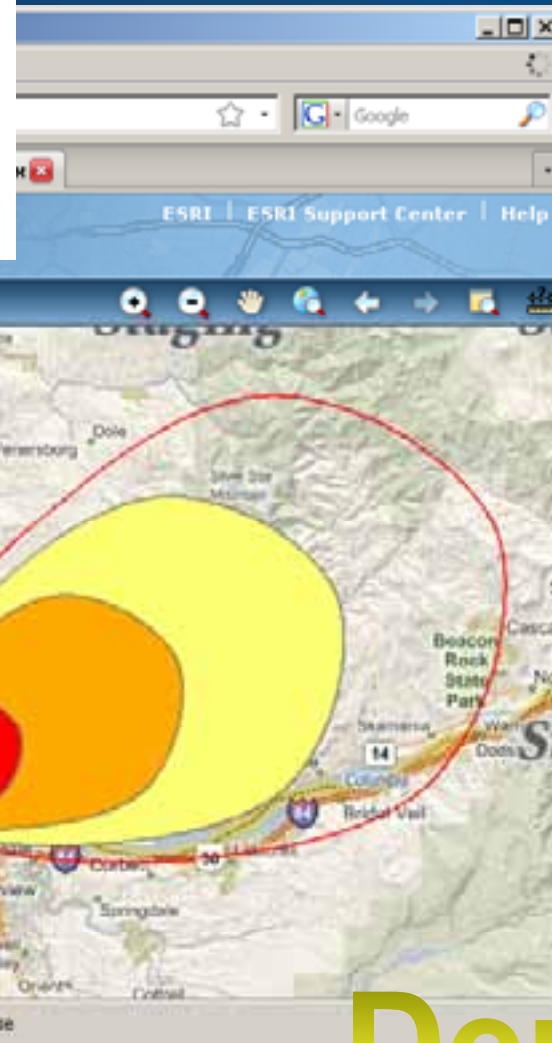
You can leverage the power of geoprocessing in your code. By using the Geoprocessor object, you can execute any of the existing built-in system tools (those developed

**Creating new geoprocessing tools**

You can easily create a new geoprocessing tool in ArcGIS Desktop using a scripting language such as Python. On occasion, you may have the need to create a tool using a

# Extending Geoprocessing Tools for use in ArcGIS Server

```
static public IGPPParameterEdit CreateParameterEdit(string name, str  
{  
    IGPPParameterEdit parameterEdit = new GPPParameterClass();  
  
    parameterEdit.DataType = gpDataType;  
    parameterEdit.Value = gpDataType.CreateValue("");  
    parameterEdit.ParameterType = paramType;  
    parameterEdit.Direction = paramDirection;  
    parameterEdit.DisplayName = displayName;  
    parameterEdit.Name = name;
```



Demo

## Learning more...

- **Building and Optimizing Geoprocessing Services for ArcGIS Server**
  - **Wednesday 1:00pm - Pasadena/Ventura/Sierra (Wyndham)**
- **Designing and Developing Geoprocessing Tools with ArcGIS**
  - **Monday 1:00pm - Pasadena/Ventura/Sierra (Wyndham)**

# Creating custom ArcGIS Server Services

- **Expose ArcObjects functionality over http**
  - Through custom web services (REST and SOAP)
- **Use from any ArcGIS Server client**
  - ArcGIS API's
  - Web ADFs
  - ArcGIS Explorer, Desktop etc

**An Advanced topic...**

**...we will get back to this later in this session**



# Developer's View on Applications

- **Goal: Build the user experience for ArcGIS Server services**
- **Two basic patterns:**
  - **Client-side only logic**
    - **ArcGIS API's:**
      - JavaScript
      - Flex
      - Silverlight
  - **Hybrid: Client-side plus server-side logic**
    - **WebADF's:**
      - .Net
      - Java

# Hybrid versus pure client side and language

What is right for me?

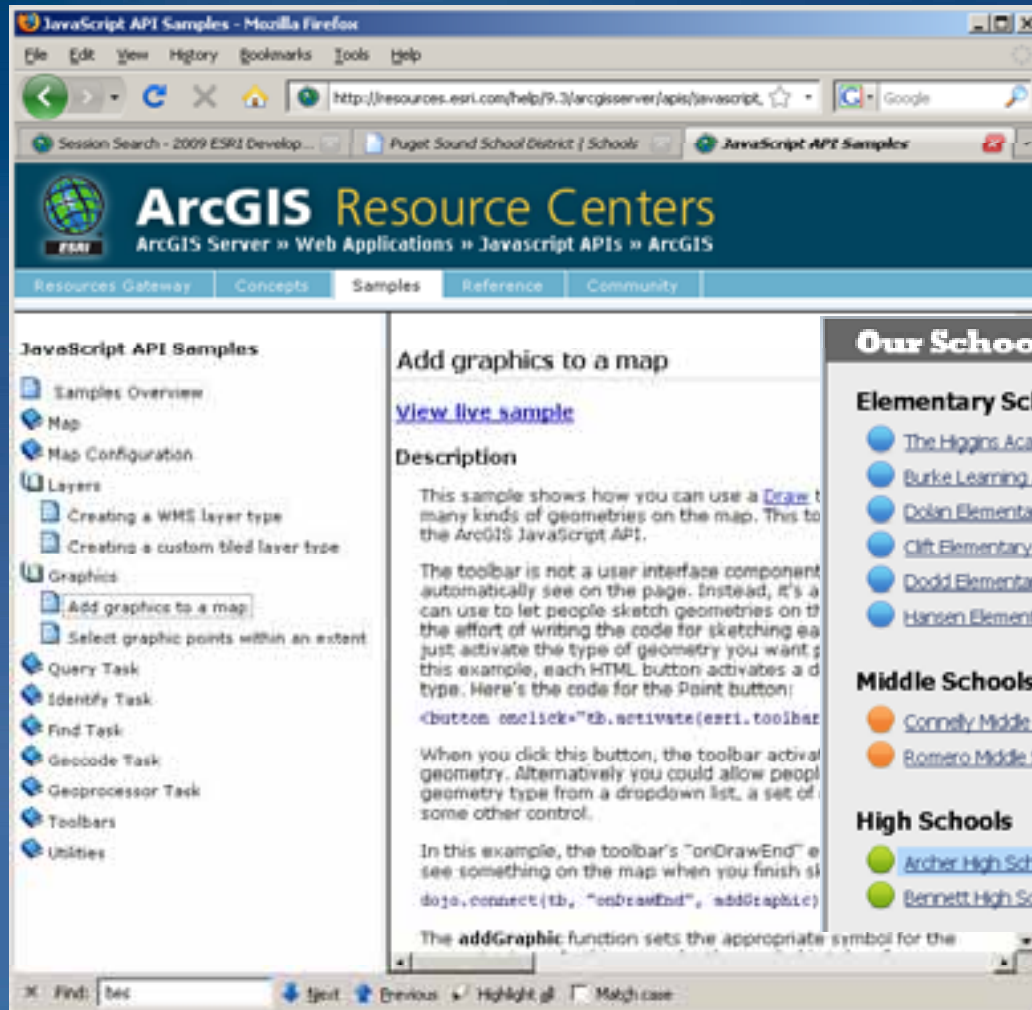
- **Considerations:**

- Your skills and passion
- Level of complexity
- Your constraints (corporate standard, legacy application...)
- Security
- Functionality

# Introducing the ArcGIS API for Javascript

- **Lightweight programming model**
- **Your most likely choice if you are not ‘a developer’**
  - Avenue style programming
  - Start right away with notepad
- **Easy transition for ArcIMS developers**
  
- **Simple but not just for simple stuff**
- **Many libraries to help you move fast**
- **Version 1.3 with great improvements**

# Web Mapping made easy with ArcGIS API for Javascript



The screenshot shows a web browser window displaying the ArcGIS Resource Centers website. The page title is "JavaScript API Samples - Mozilla Firefox". The address bar shows the URL: <http://resources.esri.com/help/9.3/arcgisserver/apis/javascript/>. The page content includes a navigation menu with "Resources Gateway", "Concepts", "Samples", "Reference", and "Community". The main content area is titled "JavaScript API Samples" and lists various sample categories. The "Graphics" category is selected, and the "Add graphics to a map" sample is highlighted. The sample description explains that the toolbar is not a user interface component and provides code for the "onDrawEnd" event.

**JavaScript API Samples**

- Samples Overview
- Map
- Map Configuration
- Layers
  - Creating a WMS layer type
  - Creating a custom tiled layer from
- Graphics
  - Add graphics to a map**
  - Select graphic points within an extent
- Query Task
- Identify Task
- Find Task
- Geocode Task
- Geoprocessor Task
- Toolbars
- Utilities

### Add graphics to a map

[View live sample](#)

#### Description

This sample shows how you can use a [Draw](#) toolbar to add many kinds of geometries on the map. This is done by using the ArcGIS JavaScript API.

The toolbar is not a user interface component that you can see on the page. Instead, it's a JavaScript object that you can use to let people sketch geometries on the map without the effort of writing the code for sketching each geometry. In this example, each HTML button activates a different type of geometry you want to draw. Here's the code for the Point button:

```
<button onclick="tb.activate(esri.toolbars.Draw.POINT)">Point</button>
```

When you click this button, the toolbar activates the Point geometry. Alternatively you could allow people to select a geometry type from a dropdown list, a set of radio buttons, or some other control.

In this example, the toolbar's "onDrawEnd" event is used to see something on the map when you finish sketching a geometry. Here's the code for the "onDrawEnd" event:

```
dojo.connect(tb, "onDrawEnd", addGraphic);
```

The `addGraphic` function sets the appropriate symbol for the geometry.

## Our Schools



### Elementary Schools

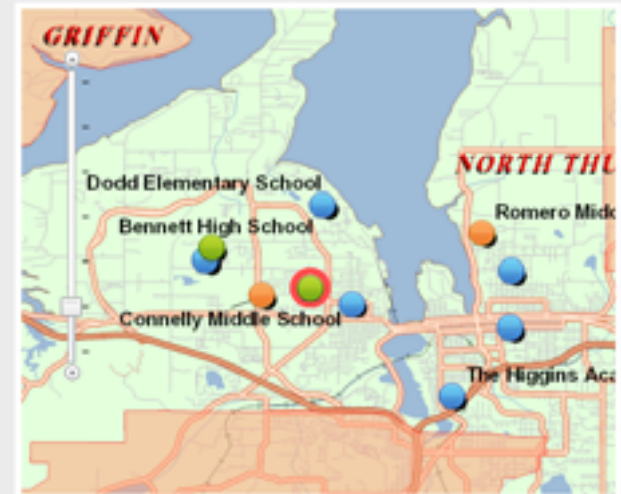
-  [The Higgins Academy](#)
-  [Burke Learning Academy](#)
-  [Dolan Elementary School](#)
-  [Clift Elementary School](#)
-  [Dodd Elementary School](#)
-  [Hansen Elementary School](#)

### Middle Schools

-  [Connelly Middle School](#)
-  [Romero Middle School](#)

### High Schools

-  [Archer High School](#)
-  [Bennett High School](#)



# Demo

# Advanced techniques with the ArcGIS API for JavaScript



Demo

## Learning more...

- **An overview of the ArcGIS JavaScript APIs**
  - Tuesday 2:45pm - Primrose B (PSCC)
  - Thursday 10:15 - Pasadena/Ventura/Sierra (Wyndham)
- **Developing Advanced Applications with the ArcGIS JavaScript API**
  - Wednesday 10:30am - Primrose A (PSCC)
  - Thursday 8:30am - Primrose B (PSCC)

# Introducing the ArcGIS API's for Flex and Silverlight

- **Similar in functionality to JavaScript**
- **Applications run on plug-ins**
  - Silverlight
  - Flash
- **Strong IDE's and Web Design environments**
- **Cross-browser, cross-platform**
- **Powerful graphic layers and 'componentry'**

# ArcGIS API for Flex apps



Demo



# Getting started with the ArcGIS API for Flex



Demo

## Learning more... (ArcGIS API for Flex)

- **Building Your First Rich Internet Applications with ArcGIS API for Flex**
  - **Tuesday 4:30pm - Primrose A (PSCC)**
- **Developing Advanced Applications with the ArcGIS API for Flex**
  - **Wednesday 10:30pm -Primrose B (PSCC)**
  - **Patterns and Best Practices for Building Applications with ArcGIS API for Flex**
    - **Wednesday 1:00pm -Primrose A (PSCC)**
- **Philadelphia Map Plug-in: Reusable Map Control with ArcGIS API for FLEX**
  - **Tuesday 2:00pm -Oasis 1 (PSCC)**

# ArcGIS API for Microsoft Silverlight

ArcGIS API for Microsoft Silverlight - Interactive Samples - Mozilla Firefox

http://resources.esri.com/help/9.3/arcgisserver/apic/silverlight/samples/start.htm

ArcGIS Resource Centers  
ArcGIS Server » Web Applications » Silverlight/WPF API

Customer Care | Support | Careers

Resources | Downloads | Concepts | **Samples** | References | Community

## ArcGIS API for Microsoft Silverlight - Interactive Samples

What do you want to do?

- Mapping
- Widgets
- Graphics
  - Add using XML
  - Add using code
  - Add interactively
  - Custom Symbols
  - Add MapTips
  - Thematic Rendering**
  - Feature Layer
- Query
- Address Matching
- Geoprocessing
- Utilities

Thematic Properties

2007 Population

<input type="checkbox"/>	Less than 1299555
<input type="checkbox"/>	1299555 to 2645277
<input type="checkbox"/>	2645277 to 4258899
<input type="checkbox"/>	4258899 to 5911718
<input type="checkbox"/>	5911718 to 9068106
<input type="checkbox"/>	9068106 and above

Min: 322179 (Wyoming)  
Max: 37483448 (California)

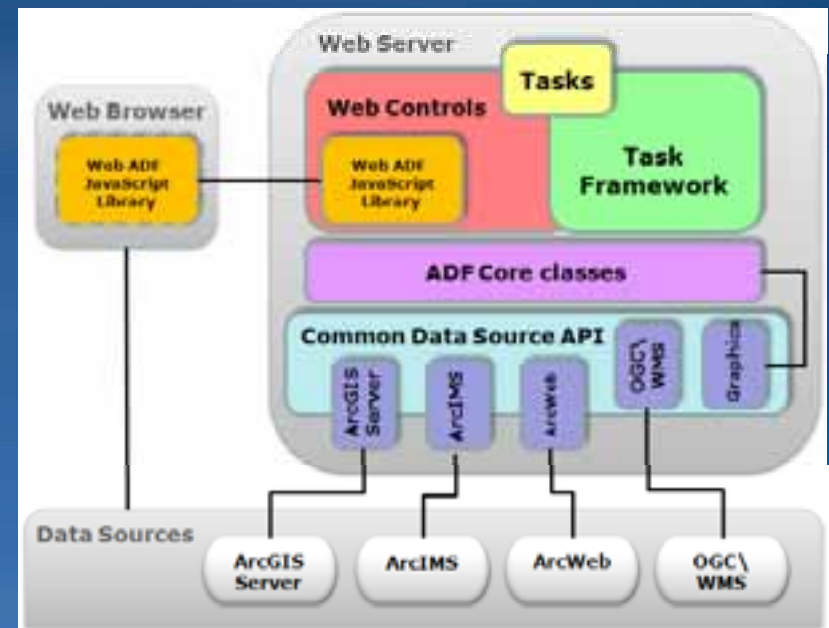
ESRI

## Learning more... (ArcGIS API for Microsoft Silverlight)

- Patterns and Best Practices for Building Applications with the ArcGIS API for Microsoft Silverlight
  - Thursday 10:15am - Catalina/Madera (Wyndham)
- Introduction to the ArcGIS API for Microsoft Silverlight
  - Wednesday 1:00pm -Primrose B (PSCC)

# ArcGIS Server Web ADFs (for Java and .Net)

- **Most complete developer environment for ArcGIS Server**
- **Leverages .Net and Java**
  - Hybrid model
  - Strong security model and IDE's
- **Comprehensive ADF:**
  - Tasks and Task Framework
  - Web Controls
  - Common Data Source API
  - Access to ArcObjects API



# Extending the Task Framework

The screenshot displays a web browser window with the following elements:

- Browser:** Mozilla Firefox, address bar showing `http://loan_247351/Riverside_Printing/default.aspx`.
- Page Header:** "Web Mapping Application" and "ESRI | ESRI Support Center | Help".
- Layout Printing Panel:** Shows "Results" with two entries for "Layout LandscapeRed", both marked as successful with a timestamp of "3/21/2009 1:09:22 PM".
- Map:** A street map with numerous colored markers (red, yellow, green, blue) and numerical labels such as -245093, -31910, -31908, -247776, -31907, -31912, -31913, -31914, -31905, -31904, -255696, -255752, -255751, -255140, -189377, -255130, -255112, and -255129.
- Thumbnail Window:** A smaller browser window in the foreground showing a similar map view.

Demo

## Learning more...

- **Building .Net Applications using the ArcGIS Server Web ADF**
- **Implementing Security for ArcGIS Server .Net Solutions**
- **Building and Extending Tasks for ArcGIS Server Java Web Applications**
- **Implementing Security for ArcGIS Server Java Solutions**
- **Customizing Editing Workflows with the Java Web ADF**
- **Building Sharepoint parts with the .Net Web ADF**
- **Integrating Microsoft Silverlight with the Web ADF**
- **Customizing Graphics and MapTips with the Java Web ADF**
- **Customizing Graphics and MapTips with the .Net Web ADF**
- ...

# Developing against ArcObjects with ArcGIS Server

- **Tips**

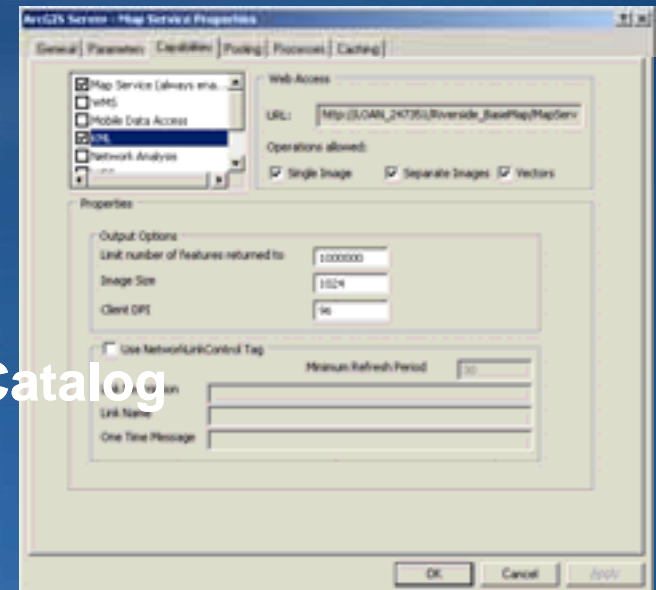
- Move your ArcObjects logic from the web tier into the SOC
  - Do not extensively use ArcObjects proxies
  - Create utility COM objects or Server Object Extensions
- Move your business logic away from the application
  - Create new web services



# Creating custom ArcGIS Server Services

## Introducing Server Object Extensions

- **Advanced topic**
- **Extend the functionality of core services**
- **Most performing approach**
  - For using the ArcObjects API on server
  - Caches connections to data sources
- **ArcObjects developer friendly**
  - No proxies
  - No server contexts (on your SOE)
- **Configurable**
  - From ArcGIS Server Manager and ArcCatalog
- **A gateway for ArcGIS API's**
  - To ArcObjects functionality



# Accessing fine grained ArcObjects

- **Pattern 1: Extensively using ArcObject proxies from the web tier**

```
//Connect to ArcGIS Server
```

```
Identity identity = new Identity(agsUser, pswd, domain);
```

```
AGSServerConnection agsconnection = new AGSServerConnection("SOM", identity);
```

```
agsconnection.Connect();
```

```
//Get a Server Context from an existing Server Object
```

```
IServerObjectManager som = agsconnection.ServerObjectManager;
```

```
IServerContext sc = som.CreateServerContext(_MapService, "MapServer");
```

```
//Instantiate and work with ArcObjects
```

```
IPoint pPoint = sc.CreateObject("esriGeometry.point") as IPoint;
```

```
pPoint.PutCoords(dX,dY);
```

```
<a bunch of ArcObjects code here...>
```

```
//Release context
```

```
sc.ReleaseContext();
```

# Accessing fine grained ArcObjects

- **Pattern 2: Consolidating ArcObjects logic in the Server Object Container with utility COM objects or Server Object Extensions**

```
//Connect to ArcGIS Server
```

```
Identity identity = new Identity(agsUser, pswd, domain);  
AGSServerConnection agsconnection = new AGSServerConnection("SOM", identity);  
agsconnection.Connect();
```

```
//Get a Server Context from an existing Server Object
```

```
IServerObjectManager som = agsconnection.ServerObjectManager;  
IServerContext sc = som.CreateServerContext(_MapService, "MapServer");  
IServerObject so = sc.ServerObject;
```

```
//Get the Server Object Extension
```

```
IServerObjectExtensionManager soexm = (IServerObjectExtensionManager)so;  
IServerObjectExtension soext = soexm.FindExtensionByTypeName("LayoutSOE");
```

```
//Cast to the Server Object Extension and invoke
```

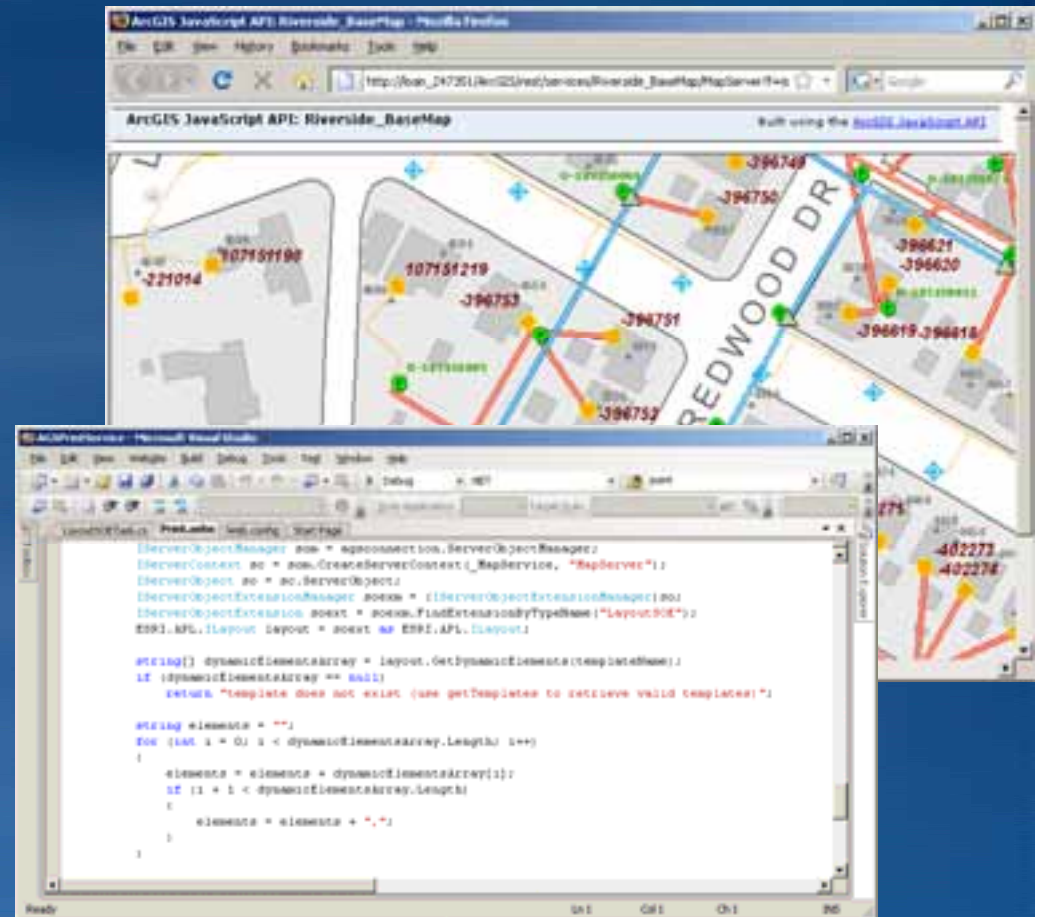
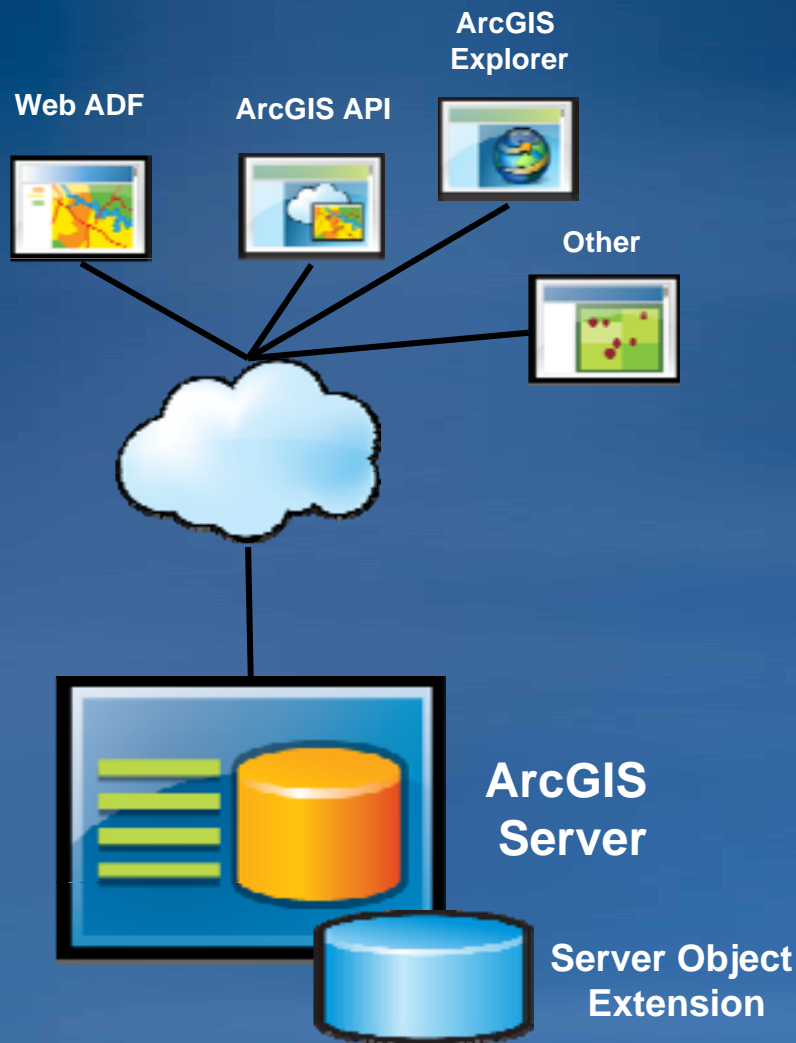
```
ESRI.APL.ILayout layout = soext as ESRI.APL.ILayout;  
string output = layout.ExportMapLayout(mapDesc, template, marginaliaElements, format, scale);
```

```
//Release context
```

```
sc.ReleaseContext();
```

# Creating custom ArcGIS Server Services

## Introducing Server Object Extensions



# Demo

## Learning more...

- **Extending ArcGIS Server with Java**
  - Wednesday 2:45pm - Primrose C/D (PSCC)
- **User Presentation:**
  - Print & Legend Web Services for the ArcGIS JS API or WebADF
  - Wednesday, March 25, 2009, 1:00pm, Oasis 1 (PSCC)

## At the end of the day... Common challenges

- **Design and develop for your audience**
  - Keep it simple and to the point
- **Take a holistic approach**
  - Focus on the business problem and the user experience
  - Get your services right, its not just about code
- **And Enjoy...**



**Questions?**