Introduction to ESRI’s Developer Technology

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Introductions

• Who are we?
  – First time to Palm Springs?
  – ArcGIS background?
  – GIS background?
Schedule

• Morning session
  – Lecture 8:30 to 9:45
    • Break 9:45 to 10:15
  – Lecture 10:15 to 11:45
    • 10 – 15 minutes Q & A following the lecture
  – Lunch

• Please complete the session survey – we take your feedback very seriously!
Topics

• Introduction to GIS
• ArcGIS Product Overview
• ArcGIS Developer Resources
• ArcGIS Desktop Development
  – Extend with custom components
• ArcGIS Engine Development
  – Build stand-alone Visualization or utility applications
• ArcGIS Server Development
  – Develop web applications and web services
• ArcGIS Explorer Development
  – Extend with custom tasks
Topics

• **Introduction to GIS**
• **ArcGIS Product Overview**
• **ArcGIS Developer Resources**
• **ArcGIS Desktop Development**
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  – Develop web applications and web services
• **ArcGIS Explorer Development**
  – Extend with custom tasks
Other events today

• Afternoon Seminars
  – Introduction to ArcGIS Desktop and Engine Development
  – Developer’s guide to the geodatabase
  – Developer’s guide to geoprocessing
  – Introduction to ArcGIS Server Development

• Evening social by the pool
What is GIS?

- Geographic Information System
- Hardware, people, procedures, data, and software
- ESRI makes the software

Developers
- Extend ESRI applications
- Make web and stand alone applications
- Implement unique procedures

Maps are the main component
Maps are one of three ways we Communicate

• **Written Text**

• **Speech**

• **Graphics**
  - Maps are a graphic representation of reality
  - Maps communicate
  - It’s more then just a map
Show Danger - Killer Bees 2005

http://nationalatlas.gov/natlas/Natlasstart.asp
Visualize reality

Sea Floor

Aeronautical Charts
Many organizations use GIS

- Map companies
- Business
- Healthcare
- Logistics
- Homeland security, police, fire
- Utilities, gas, electric
- Natural resources, forestry
- Federal, State, County, City, government units
- And more…
Reference Maps

National Geographic Maps

Nautical Charts
GIS in Business

- Insurance
- Competitive Analysis
- Retail Sales Analysis
- Customers
- Drive Times
- Site Selection
GIS in Healthcare

HIV

Smoking & Birth Weight

Cancer

Cholera Cases
GIS in Logistics

Real-time Vehicle Tracking
Transit Analysis
Routing
Service Areas
Traffic Modeling

Airport Logistics

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GIS in Defense and Homeland Security

Homeland Security

Military Cartography

Threat Analysis

Incident

Route

Facility

Threat Modeling/ Vehicle Routing
Baghdad, Iraq
Where does your organization fit in?

• May be it overlaps many areas
• Where do you fit in?
How does GIS work?

- Maps
- Features
- Layers
- Database tables
- Geodatabases
- Cartography
Paper maps vs. GIS maps

- **Paper maps**
  - What you see is what you get

- **GIS maps**
  - Dynamic
  - Interactive
Features

- Represent real things as shapes on map
- Use points, lines, and polygons (it’s geometry)
Layers

- Collection of features
- Group with something in common
- Have properties or characteristics
  - Name, visibility, symbology, and many more

Rivers layer turned ON

Rivers layer turned OFF
Feature organization

• Features organized into layers
• Layers organized into data frames for publishing

Parthenon Athens, Greece
Pyramid of Kukulkan Yucatan, Mexico
Stonehenge Wiltshire, UK

Historical sites
Rivers
Countries

3 features 3 layers 1 data frame
Layer attribute table

- Database or file containing information about features
- Attribute table structure:
  - Each row represents a feature
  - Each column represents a feature attribute

Yellowstone National Park campgrounds
Attribute table contents

- Characteristics about features
  - ID and shape
  - Additional fields
- Attribute values are useful
  - Labels
  - Symbols

<table>
<thead>
<tr>
<th>OBJECTID</th>
<th>Shape</th>
<th>Name</th>
<th>Showers</th>
<th>Elevation_FT</th>
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<tbody>
<tr>
<td>1</td>
<td>Point</td>
<td>Pebble Creek</td>
<td>yes</td>
<td>6846</td>
</tr>
<tr>
<td>2</td>
<td>Point</td>
<td>Canyon</td>
<td>yes</td>
<td>8047</td>
</tr>
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<td>3</td>
<td>Point</td>
<td>Bridge Bay</td>
<td>yes</td>
<td>7764</td>
</tr>
<tr>
<td>4</td>
<td>Point</td>
<td>Fishing Bridge RV</td>
<td>no</td>
<td>7755</td>
</tr>
<tr>
<td>5</td>
<td>Point</td>
<td>Slough Creek</td>
<td>no</td>
<td>6440</td>
</tr>
</tbody>
</table>

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Symbolize tabular values on a map

<table>
<thead>
<tr>
<th>OBJECTID</th>
<th>Shape</th>
<th>FIPS_CTRY</th>
<th>CTRY_NAME</th>
<th>POP_CTRY</th>
</tr>
</thead>
<tbody>
<tr>
<td>141</td>
<td>Polygon</td>
<td>DA</td>
<td>Denmark</td>
<td>4667750</td>
</tr>
<tr>
<td>92</td>
<td>Polygon</td>
<td>DJ</td>
<td>Djibouti</td>
<td>450751</td>
</tr>
<tr>
<td>35</td>
<td>Polygon</td>
<td>DO</td>
<td>Dominica</td>
<td>70671</td>
</tr>
<tr>
<td>44</td>
<td>Polygon</td>
<td>DR</td>
<td>Dominican Republic</td>
<td>7759957</td>
</tr>
<tr>
<td>23</td>
<td>Polygon</td>
<td>EC</td>
<td>Ecuador</td>
<td>10541820</td>
</tr>
<tr>
<td>133</td>
<td>Polygon</td>
<td>EG</td>
<td>Egypt</td>
<td>56133430</td>
</tr>
<tr>
<td>55</td>
<td>Polygon</td>
<td>ES</td>
<td>El Salvador</td>
<td>5752470</td>
</tr>
<tr>
<td>116</td>
<td>Polygon</td>
<td>EK</td>
<td>Equatorial Guinea</td>
<td>386373</td>
</tr>
</tbody>
</table>

Legend:
- POP_CTRY: 0.0 - 14045470
- 14045471 - 26959163
- 26959164 - 40393319
- 40393320 - 90466085
- 90466086 - 871479108
Many symbol options

- Single symbol
- Unique symbol
- Multiple attributes

Charts
- Stacked
- Pie
- Bar

Quantities
- Graduated symbol
- Graduated color
- Proportional symbol
How does GIS work

• Storage
  – Conceptual
  – Physical

• Query

• Analysis
Vector data

- Geography represented by shapes
  - Points, lines, polygons
- Good for discrete objects
  - Man-made features (political boundaries, roads, buildings)
  - Natural features (rivers, lakes, forests)

Electric poles and lines in a land parcel

Volcanoes and rivers in Iceland
Stored as a list of points

- **Point**: a pair of \(x,y\) coordinates
  - \(62053, 22848\)
  - \{62053,22848\}

- **Line**: a series of \(x,y\) coordinate pairs
  - \(62053, 22845\)
  - \(62061, 22846\)
  - \{62053,22845; 62056,22844; 62061,22846\}

- **Polygon**: a line that ends at its beginning
  - \(62054, 22841\)
  - \(62055, 22839\)
  - \(62059, 22842\)
  - \(62060, 22839\)
  - \(62061, 22846\)
  - \{62054,22841; 62059,22842; 62060,22839; 62055,22839; 62054,22841\}
Raster data

- Geography represented by matrix of cells
- Good for continuous phenomena
  - Elevation, rainfall, temperature
  - Air photos
  - Vegetation, soil type
Stored as numbers

- Matrix represents a patch of ground
- Each cell stores a number
- Numbers may be measurements, counts, or codes
Two representations of elevation

- Vector: elevation represented as lines
  - Each line stores a single elevation value
- Raster: elevation values represented as cells
  - Each cell stores a single elevation value
Data is stored in a geodatabase

• A collection of data on disk
  – Microsoft Access (mdb file)
  – ESRI File-based (a folder)
  – ArcSDE technology
    • SQLServer, Oracle, informix, DB2

  ■ vector data (feature class)
  ■ raster data
  ■ tables (no geometry)

• Capabilities for modeling relationships and behaviors
Feature classes and layers

**Feature class**
- Stored on disk
- Physical data

**Layer**
- Stored in a map
- Visual representation
- Many layers can reference a single feature class

South America

Geodatabase Feature Class
279.11 KB
Polygon
Getting information about features

• Go to the map → click a feature → get information
Making queries

- Attribute query

  Which cities are county seats?

<table>
<thead>
<tr>
<th>OBJECTID</th>
<th>Shape</th>
<th>FEATURE</th>
<th>NAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>42</td>
<td>Point</td>
<td>COUNTY SEAT</td>
<td>MACCLENNY</td>
</tr>
<tr>
<td>46</td>
<td>Point</td>
<td>POPULATED PLACE</td>
<td>LAUREL HILL</td>
</tr>
<tr>
<td>47</td>
<td>Point</td>
<td>POPULATED PLACE</td>
<td>GLEN SAINT MARY</td>
</tr>
<tr>
<td>50</td>
<td>Point</td>
<td>POPULATED PLACE</td>
<td>COTTONDALE</td>
</tr>
<tr>
<td>51</td>
<td>Point</td>
<td>COUNTY SEAT</td>
<td>MARIANNA</td>
</tr>
</tbody>
</table>

- Spatial Query

  Customers near a highway
  Students in a school district
  Roads in a State
  ZIP code next to mine
Why make spatial queries?

- Schools near railroad?
- Ecoregions that contain lakes?
- Which counties have a river that crosses their boundary?
- Which countries border Saudi Arabia?
Overlay

- Combine features and attributes in one layer with features and attributes in another layer
- Creates new features in a new feature class
Overlay

- Combine features and attributes in one layer with features and attributes in another layer
- Creates new features in a new feature class
Overlay

- Combine features and attributes in one layer with features and attributes in another layer
- Creates new features in a new feature class
Why use overlay?

- Define areas where multiple conditions exist
- Determine the amount of something in a specific area
Buffer

• Create zones around features using a distance
• Create new features in a new feature class

Schools before buffer

500-foot buffers around schools where billboards are prohibited
Why use buffer?

- Determine what is occurring within a set distance of a feature

- Streets inside 3-mile buffer around fire station
- Forested areas inside 100-foot stream buffers
- Land use inside 1-mile buffers around branch libraries
Hot Spot Analysis (Getis-Ord $G_{i}^{*}$)

- Identifies clusters of high and low values
- Calculates a z score for each feature
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What is ArcGIS?

• **ArcGIS Desktop** - A suite of desktop applications (Explorer, ArcGIS Engine, ArcView, ArcEditor, ArcInfo, and extensions)

• **ArcGIS Server** - An enterprise GIS data management and application server

• **ArcGIS Mobile** – Out-of-the-box applications and developer tools for mobile GIS

• **ArcGIS Online** - Online services that support the desktop and enterprise server applications with data and functionality
The ArcGIS System

**ArcGIS Desktop**
A suite of desktop applications (Explorer, Engine, Desktop and extensions)

**ArcGIS Mobile**
Out-of-the-box applications and developer tools for mobile GIS

**ArcGIS Server**
An enterprise GIS management and application server

**ArcGIS Online**
Online services that support the desktop and enterprise server applications with data and functionality
ArcGIS Desktop – 3 License Levels

- **ArcInfo** – Advanced analysis and geoprocessing
- **ArcEditor** – Create and manage GIS data
- **ArcView** – GIS user
- **ArcReader** – Free viewer
ArcGIS Desktop Applications

ArcGlobe

ArcCatalog

ArcMap

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ArcMap

- Primary display application
- Perform map-based tasks
  - Displaying
  - Editing
  - Querying
  - Analyzing
  - Charting
  - Reporting
ArcCatalog

• A window into your database
• Browse your data
• Manage your data
• Create and view data documentation (metadata)
• Publish Web service
Three ways to view data

- Contents
- Preview
- Metadata
ArcToolbox

- 4 of over 450 tools
  - Select, Buffer, Hot Spot, and Overlay
- Geographic processing functions
  - Data, analysis, and conversion
  - Tools vary between ArcGIS products
Models, tools, and geoprocessing

- Make your own tools graphically
  - Mix and match existing 450 tools
- Model your own workflows
ArcGIS Extensions

- Spatial
- Network
- 3D
- Geostatistics
- Survey
- Tracking
- Schematics
- Publishing
- Interoperability
- Job Tracking

- Developers make these too!
ArcGIS Engine

GIS Components for Desktop Developers

• Hundreds of Tools
• All Desktop Extensions
• Visual Controls

... Quick & Easy Application Development
ArcGIS Engine
GIS Components for Desktop Developers

Build

Custom Application

Deploy

... Embed GIS in Your Application

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ArcGIS Server Platform

*Serving Geographic Knowledge as Web Services*

**Rich Functionality**
- Data Management
- Mapping
- Visualization
- Geoprocessing
- Applications Development
- Mobile

Making GIS Knowledge Available To Anyone . . .

. . . Integrates With Other Systems Via Standards
ArcGIS Server

• ArcGIS Server meets two major GIS needs:
  • Data Management
  • Web Mapping Applications

• ArcGIS Server comes in three levels:

Three Levels of Functionality

- Geoprocessing & Editing
- Mapping & Visualization
- Data Management

Advanced
Standard
Basic
ArcGIS Server Supports Mobile “Smart” Clients
Empowering Non-GIS Experts

Focused Applications
- Lightweight
- Very Small Footprint
- Fast
- Download / Cache
- Occasionally Connected

Extending ArcGIS to Browsers and Mobile Devices

Browser  PDA  Tablet PC  Phone

ArcGIS Server

Downloading Simple Clients
ArcGIS Explorer – Desktop ArcGIS Server Client

- Fast
- Free download

...Developers create and publish new tasks
ArcGIS Image Server

New Paradigm for Processing and Serving Geoimagery

On-the-Fly
- Georeferencing
- Ortho Rectification
- Pan Sharpening
- Mosaicing
- ...

Any Desktop Client
(GIS / CAD / Imaging Processing / Web)

Near Instant Server
Processing
Reduces Time
Between Acquisition and Use

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ArcPad - Mobile GIS

Empowering the Mobile Work Force

Field-Based Geography
- Data Collection
- Editing
- Field Query
- Navigation
- Locating
ArcGIS Online

GIS Content and Services for ArcGIS Users

- Content Services
  - Maps and Globes
  - Data Downloads
  - Tasks
ArcWeb Services
A Wide Range of Geographic Information For Developers

For Building Web Applications
- Imagery
- Weather
- Geocoding
- Streets
- Mapping
- Routing
- Demographics
- Hazards
- Business Locations
- Traffic
- Hydrographic Maps
- Gazetteer

Providing Reliable GIS Services for ESRI Users and Developers
ArcGIS Online and ArcWeb Services

• Both
  – Offer online GIS content and capabilities
  – Share a common foundation

• ArcGIS Online
  – focused on the ArcGIS user
  – deeply integrated into ArcGIS

• ArcWeb Services
  – focused on the web application developer
  – ideal for custom application development
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ArcGIS Development options

- Extend and customize ArcGIS Desktop applications
- Embeddable GIS / A foundation for creating new products
  - GIS or Non-GIS Centric
- Developing Web Applications and Services
- Incorporation of hosted services
The ArcGIS System

**ArcObjects**

- ArcGIS is built from software components called ArcObjects

- ESRI uses ArcObjects to develop products

- You can use ArcObjects to customize the products and build custom applications
ArcGIS products share ArcObjects

ArcGIS Desktop

ArcGIS Engine

ArcGIS Server

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The ArcGIS System

Application Programming Interface

- ArcObjects can be accessed through different APIs
- One set of binaries, multiple APIs
- Access binaries in different ways
  - COM - type libraries
  - .NET - assemblies
  - Java - .jar files
  - C++ - .h files
The ArcGIS System

Supported ArcGIS Product APIs

• Desktop APIs (COM and .NET)
  – VBA (customize documents using MXDs and MXTs)
  – Custom components (commands, tools, windows, extensions)

• Engine APIs (COM, .NET, Java, and C++)
  – Build custom standalone applications
  – Embed into existing applications

• Server APIs (.NET, Java)
  – Build and deploy Web services and Web applications
ArcGIS Developer Resources

ESRI Developer Network

• Provides developers with tools and resources to build custom GIS solutions
  – Annual subscription-based program available
  – Reduces cost and complexity
  – Development and testing only
• The following ESRI software is included with EDN for developing and testing applications:
  – ArcGIS Server
  – ArcGIS Engine Developer Kit
  – ArcIMS
  – ArcGIS Image Server
  – ArcWeb Services
  – ArcGIS Desktop (optional)

http://edn.esri.com
Developer Resources

ESRI Development Blogs

Developer Resources

ESRI Support Center

• Online portal to technical information
  – Knowledge Base
    ◆ Technical articles
    ◆ White papers
    ◆ System requirements
  – Downloads
    ◆ Patches and service packs
    ◆ Data models
    ◆ ArcScripts and samples
  – User forums
    ◆ Discussion groups
    ◆ E-mail lists

• Contact ESRI
  ◆ Request technical support
  ◆ Report a bug
  ◆ Suggest a software enhancement

http://support.esri.com
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ArcGIS Desktop Development

When should I use Desktop?

Focused functions

Web Browser
GIS Logic Embedded in Application

ArcGIS Desktop

Custom Application
GIS Desktop

Full GIS function

… when VBA scripting is sufficient
… when users have experience with desktop GIS
ArcGIS Desktop Framework

The Basics

- ArcGIS Desktop Applications
  - ArcCatalog
  - ArcMap
  - ArcScene
  - ArcGlobe

- Generic common framework
  - Extensible and customizable
  - Documents and templates (MXD, MXT, etc)

- Customization options
  - Customize Dialog
  - Visual Basic for Applications (VBA)
  - Custom components (COM, .NET)
ArcGIS Desktop Framework Architecture

**Common Tasks**

- Buttons and tools to perform custom GIS tasks
- Toolbars and menus to contain buttons and tools
- Custom dialogs or windows
- Custom Geoprocessing Tools
- Package functionalities as an extension
- Deployed using Installer Packages
ArcGIS Desktop Framework

Framework Components

Visual Components (extending the user interface)

1) Commands and Tools
2) Menus and Toolbars
3) Embedded Windows
   • Dockable Windows, Contents Views, etc.

Non-visual Components

1) Application Extensions
2) Geodatabase Extensions
3) Undo/Redo Operations
4) Command keyboard shortcuts
ArcGIS Desktop Framework

Developing custom components

• Create a COM object and plug it into an application

• Steps
  1. Create a COM/.NET project
  2. Create a COM class
  3. Reference the ArcGIS libraries
  4. Implement an interface
  5. Compile
  6. Register in a component category
Component categories

- Folders in the registry
  - Used to efficiently find and load software components

- Desktop Component Categories
  - ESRI MxCommands
  - ESRI MxCommandBars
  - ESRI Mx Extensions

- View component categories with Categories.exe

- Can register your components in these categories
Desktop development tools

- New Project templates
- Base classes
- Add Class wizard
- Code Snippets
- Quickly adding Imports/Using statements
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ArcGIS Engine

When should I use Engine?

When focused applications are appropriate
... when users have little experience with desktop GIS

Focused functions

Full GIS function
What is ArcGIS Engine?

- A complete set of embeddable GIS components for application development
- Developers can consume and extend all part of system
- Two parts to the product:
  1. Deployment: ArcGIS Engine Runtime
  2. Development: ArcGIS Engine Developer kit
ArcGIS Engine Runtime: Product

- Set of ArcObjects libraries and components that make up ArcGIS Engine

- Two levels of product licensing available
  - Standard Runtime = ArcView
  - Geodatabase Update = ArcEditor

- Includes a number of ArcGIS extensions
  - 3D Analyst, Network Analyst, Spatial Analyst...

- Packaged as a redistributable setup.exe (.msi)
ArcGIS Engine Developer Kit: Product

- SDK for developers to build custom ArcGIS applications

- Includes the following:
  - ArcGIS Engine Runtime
  - Developer help system
  - Rich set of visual development components
  - Many pre-built commands, toolbars and menus
  - IDE integration
ArcGIS Engine Functionality

• Base Services
  – Core ArcObjects need by all applications
  – Feature Geometry and Display

• Data Access
  – Geodatabase, Vector and Raster

• Map Analysis
  – Select, Query, Identify, Spatial operators

• Map Presentation
  – Cartography, Layers, Maps, Layouts

• Developer Components
  – High-level controls and commands
Developer Controls

- MapControl
- PageLayoutControl
- ToolbarControl
- TOCControl
- ReaderControl
- SceneControl
- GlobeControl
- LicenseControl
Types of Engine Solutions

- **GUI-based - visual**
- **Console**
- **Embedded applications**
ArcGIS Engine Development

1. Start with the IDE integration tools

2. License the application

3. Add custom buttons and tools as necessary

4. Use code snippets where possible
Engine application licensing

• An Engine application runs with:
  – Existing ArcGIS Desktop 9 license
  – ArcGIS Engine Runtime license

• Application Developer has control over what license is required to run an application
ArcGIS Product Licensing

- Engine and Desktop are functionally similar
- Two levels of licensing
  - Product
    - ArcGIS Desktop
    - Engine standard
    - Engine GDB Update
  - Extension
    - Spatial, 3D, Network, etc.
ArcGIS Engine component categories

- Engine Component Categories
  - ESRI Controls Commands
  - ESRI Controls Menus
  - ESRI Controls Toolbars
  - ESRI Controls Palettes
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ArcGIS Server

When should I use Server?

... when there are many users
... when users are located in more than one location
... when app needs to be browser-based
ArcGIS Server

Out of the box Web based GIS

• Allows GIS Analysts to easily configure Web Applications
  – No programming required

• Includes out of the box Desktop Clients
  – ArcGIS Explorer
  – ArcGIS Desktop

• Allows analysts to publish rich GIS Services
  – 2D and 3D Mapping services
  – Geocoding, Geodata, Network Analysis, Geoprocessing services
  – SOAP, WMS, and KML based services
ArcGIS Server

Product Platforms

• ArcGIS Server for the Microsoft .Net Framework
  – Windows

• ArcGIS Server for the Java Platform
  – Windows, Linux, Solaris

• Platform specific install, documentation
  – SDK and IDE integration

• Both platforms have the same GIS functionality
  – Rich GIS Services
  – Management Applications
  – Web Mapping Applications
  – ArcGIS Explorer and Desktop clients
ArcGIS Server

Development Platforms

• Support for multiple platforms
  – .Net
  – Java

• Cross-platform development
  – Available on Windows, Linux, and Solaris

• Comprehensive SDKs for Application Development
  – Web ADF – for Web Applications and Web Services
  – Mobile ADF – for Mobile Applications (.Net only)
  – Enterprise ADF - for Enterprise JavaBeans (EJB) (Java only)
GIS on the Web in 3 steps

1. **Author** GIS content
   - Create GIS resources
   - ArcGIS Desktop applications

2. **Serve** content
   - Publish GIS resources as services
   - ArcCatalog and ArcGIS Server Manager

3. **Use** GIS services
   - Web mapping applications
   - ArcGIS Explorer
   - ArcGIS Desktop
   - Many others
GIS Services

• **GIS Services are the building blocks for**
  - Web applications
  - ArcGIS Explorer maps
  - Mobile applications

• **Types of GIS Services**
  - Map Service (2D)
  - Globe Service (3D)
  - Geocoding Service
  - Network Analysis Service
  - Geoprocessing Service
  - Geodata Service
  - Mobile Data Service
  - KML
  - WMS
Introducing the Web ADF

• Libraries used to build GIS Web applications
  – Web controls (ASP.NET, JSF)
    • AJAX enabled
    • Map image blending
    • Seamless navigation
  – Supports multiple data sources
    • ArcGIS Server, ArcIMS, ArcWeb, WMS
    • Web ADF graphics
  – Task Framework
    • Extensible Architecture

• ArcGIS Server Manager
  – Build Web Applications

• IDE integration
Creating Web ADF applications

1. Use ArcGIS Server Manager
   - Web site builder
   - Modify in Development IDE

2. Use a template
   - Same template used by ArcGIS Server Manager
   - Visual Studio, Eclipse

3. Create using Web controls
Web Mapping Application Template

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Web Mapping Application Template

Eclipse

Visual Studio

Eclipse

Web Mapping Application
Web ADF controls

- ASP.NET / JSF Web controls
- Expose server object functionality
- Types of controls:

Mapping

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Toolbar
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Java Server Faces in Eclipse

ASP.NET Web Controls in Visual Studio
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- Increasing complexity and functionality

Developer Paths

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Web Controls

Generic

Common Data Source API

Data Source Implementations

Data Source (GIS Server) Specific APIs

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The Common data source API

• All data sources implement a common set of interfaces
  – ArcGIS Server
  – ArcIMS
  – ArcWeb Services
  – Open Geospatial Consortium (OGC)
  – Graphics

• Provides a generic way for Web controls to access functionality
  – Draw a map, query a layer, geocode
Graphics layer

• Drawn on top of layers in the map
• Used to perform tasks such as:
  – Highlighting features (select)
  – Labeling text
  – Displaying buffers
  – Geocoding
  – Displaying dynamic data (GPS)
Defining ‘Tasks’

• Tasks perform a function, by
  – Asking the question
  – Displaying the answer (results window)

• Tasks are lightweight
  – Less code on the client
  – Use servers to get their job done
Web ADF Tasks

• Configurable from Manager

• Out of the box tasks
  – Navigation
  – Geoprocessing
  – Search by attributes
  – Editing
  – Find direction
  – Predefined query
  – Find place

• Custom tasks
  – ASP.NET Controls
  – Java Classes
ArcGIS Server APIs

• **SOAP**
  – XML-structured language for communicating with ArcGIS Server services based on the SOAP standard
    • Available for services and some server object extensions
      – KML, Mobile, etc
    • Designed for stateless interaction

• **ArcObjects**
  – Utilizes the ArcObjects libraries in web tier to work with ArcObjects “remotely” on the GIS Server
    • Designed for stateless and stateful interaction
      – Example: Web based editing
Using a SOAP service

- Work with raw SOAP XML
  -or-
- Create and utilize Value objects and proxies
  - Generated from a WSDL using a SOAP toolkit
  - Value objects “model” server objects
  - Proxies pass information from value objects to web service

Client Application

SOAP Toolkit

Server Application

Generate

Get WSDL

Value object

Proxy object

End Point

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Topics

- **Introduction to GIS**
- **ArcGIS Product Overview**
- **ArcGIS Developer Resources**
- **ArcGIS Desktop Development**
  - Extend with custom components
- **ArcGIS Engine Development**
  - Build stand-alone Visualization or utility applications
- **ArcGIS Server Development**
  - Develop web applications and web services
- **ArcGIS Explorer Development**
  - Extend with custom tasks
What’s ArcGIS Explorer?

- It’s a free, easy to use program available for download. It brings GIS to everyone!

- Spread access to geodatabases and enable corporate geoprocessing tasks

- ArcGIS Explorer can use maps/tasks served by ArcGIS Server as well as data stored locally.
Customizing ArcGIS Explorer

- Developers Create Custom Tasks to connect to new web services
- Can also
  - Refine existing user interface
  - Perform local operations
ArcGIS Explorer Object Model

• **Application classes**
  – what you can do to control / interact with the application

• **Task Framework**
  – how you incorporate your tasks into the Application

• **Task framework is the only customization point in Explorer**
The Software Developer Kit

- ArcGIS Explorer .NET SDK provides resource to create custom tasks
  - Conceptual Documentation
  - Component Help
  - Visual Studio 2005 Integration
  - Object Model Diagram
Wrap-up

• Questions

• Thanks for attending

• Please complete the *session survey* – we take your feedback very seriously!