Editing GeoDatabases over the Web using ArcGIS Server

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Schedule

Presentation: ~60 minutes.
Q&A: ~15 Minutes

Please ensure that your cell phones are switched off. Thanks!
Outline

• Editing over the Web

• Feature Service Architecture and APIs

• Feature Service Information Model

• Authoring and Publishing a Feature Service

• Other GeoDatabase Editing Solutions

• Conclusions
Editing over the Web

• Allows people to easily contribute and edit geographic information:
  – Volunteered Geographic Information (VGI)
  – User Generated Content (UGC)
  – Crowd sourcing of information

• Over the Internet using a web-browser or mobile device

• Applications include:
  – 311 applications to gather citizen reported incidents
  – Citizen Science
  – Emergency Response
  – …
Editing over the Web. (contd.)

- VGI Applications
  - Sketch point, line, and polygon features on a map
  - Provide an appropriate Description
  - Attach photos, videos

- Structured Editing
  - Authoritative Information Models
  - Edit features with
    - Predefined attribute schema
    - Restrictions on the attribute values

- Feature Service (new at 10) supports both types of information, including combinations
ArcGIS Server 10 - Web Editing

- Extends editing to all web clients
  - Javascript, Flex, Silverlight, iPhone, ...

- Ability to build light and intuitive user experiences for web users

- Scalable editing for large user communities
Web-Editing Architecture

Feature Service

ArcGIS Server

Geodatabase
[Oracle, Sql Server, Postgres, ...]

Internet

Mobile Devices

Web Browsers

ArcGIS Desktops
APIs for Web Editing

- Javascript API
- Flex API
- Silverlight API
- iPhone API

ArcGIS Server

HTTP

REST

Web Browser

Web Applications

iPhone Apps
Demo 1: Wild Fire Demo

- Quick intro of the whole process

- [http://jaladhi/ArcGIS/rest/services/Wildfire/FeatureServer](http://jaladhi/ArcGIS/rest/services/Wildfire/FeatureServer)
  - Re-run the Flex Sample
Feature Service Information Model

• Features are used to represent real world entities such as schools, parcels and valves.

• Features include symbology, attributes, relationships and attachments.

• Features are organized into Layers and Types.

• Each Layer has a set of Types.

• Each Type has a set of prototypical instances called Templates.
Feature Service Information Model

- Feature Service
  - Layer
    - Field
      - Domain
      - Type
        - Symbol
  - Type
    - Template
      - Attribute
        - Name
        - Value
  - Geometry
Demo 2: REST resource view of Layers
[ with Types, Templates, Domains ]

- Homeland operations

- http://jaladhi/ArcGIS/rest/services/HomelandOperations/FeatureServer/2
Operations on a Layer

- Query
- Query Related Records
- Add Features
- Delete Features
- Update Features
- Apply Edits
Feature

• Geometry

• Attributes

• Time attributes are supported
  – Time metadata is in Layer

• The feature can have
  – Attachments
  – Relationships with the features in other layers/tables

* ➔ composed of
  * ➔ many
Attachments

• Attachments can be used to attach media and documents to a feature
  – Picture, video, pdf, …
  – Stored in the geodatabase in an associated table

• A feature can have multiple attachments.
  – Attachments can be added and deleted
  – When the object is deleted, attachments are automatically removed
Attachments (contd.)

• A feature has a list of lightweight AttachmentInfos.

• Applications can fetch AttachmentInfos to obtain:
  – names, types and sizes of attachments to present to the user

• Full Attachment can be downloaded if the user decides to view or download it
Relationships

• A feature may be related to features in other layers
  – Related features are queried from the source layer by supplying the ids of the source features
  – The returned features belong to a target layer

• Information on available relationships is available at the layer/table level

• Relationships are maintained in the geodatabase

• Deleting features deletes applicable relationships
Table

- A Service has Tables, just like it has Layers

- A single layer / table resource in REST
  - Table does not have symbols.
  - Features/Objects queried out of a Table don’t have geometry.

- Tables can be queried for the objects

- Edits can be made via the standard operations

- Supports Attachments, Relationship, and Time
Time

- Time information is available in Layer properties
  - Start and End field, TimeExtent, TimeReference...
- Can query based on time.
- Can set time for the time fields and add/update time aware features.
Demo 3: Attachment, Relationship, Table, and Time

- Building Attachments,
  - Show the Attachment in ArcCatalog
  - REST view and
  - Flex Sample
- Oil Wells relationships with Fields and TOPS table
  - Relationship in ArcCatalog
  - Relationship on the REST page
  - Online Flex Sample: FeatureLayer/ Relationship samples in
- Earthquake Layer for Time
  - Layer’s Time properties in ArcMap
  - Time properties in REST resource view
  - Flex Sample for Earthquake animation
Publishing a Feature Service

- A Feature Service is defined by a Map and the Geodatabase that it references

- Author
  - Author the GeoDatabase
  - Author the Map

- Publish the map, enabling feature access

- Use resulting feature service in web/ mobile apps
Types of Geodatabases

• Enterprise Geodatabases
  - Stored in a spatially enabled enterprise RDBMS
  - Multiuser editing model
  - Extended with versioning, long transactions, historical archiving, replication

• File Geodatabases
  - Single user editing model
  - Used for GIS Project work
  - Supports large local datasets with high performance
Authoring the GeoDatabase

• Connect to an Enterprise GeoDatabase
  – Multi user transactional database
  – Oracle, MS SQL Server, PostgreSQL, Informix, DB2

• Define Geodatabase Schema:
  – Create Point, Line, and Polygon Feature Classes for the Layers and any non spatial Tables
  – To constrain a field’s value to valid ones, add Domains
  – To model Type specific domains and default values add Subtypes to your feature classes
  – To model Relationships, create Relationship Classes
  – To model Attachments add Attachments.
Authoring the GeoDatabase (contd.)

- Can use pre-existing Geodatabases
- Can start with Pre-existing features
Authoring the Map

- Add Feature Classes and Tables to ArcMap
- Set the field properties for each Layer
  - Visibility
  - Read-Only
  - Aliases
- Define time fields for Layers, if applicable
- Define Types for Layers by setting up a Unique Value Renderer (UVR) on a field with distinct values
  - UVR field will be the TypeID field for the layer
  - UVR field must be the geodatabase subtype field if present
Authoring the Map (contd.)

- If no types (i.e. a single type) then define a Simple Renderer for the Layer

- For line FeatureClasses
  - Use simple line symbols,
  - Other symbols will get converted to simple line symbols

- For polygon FeatureClasses, use simple or picture fill symbols,
  - others symbols will get converted to simple fill symbols
Authoring the Map (contd.)

- By Default a Template is created for each
  - Type
    - If the Layer has types / a Unique Value Render
  - Layer
    - if no types / a Simple Renderer
- Create additional templates for the type or layer, as needed
- Edit attribute values in templates as needed
Publishing the Map

- Publish the Map in ArcCatalog
- Enable the ‘Feature Access’ Capability for the Map Service
- Enable Query and Edit operations for this Capability
- Create the Service

- ArcGIS Server Security applies to Feature Services
  - Set permissions on the published service

- Browse REST Services folder and find the Service’ url
  - http://jaladhi/ArcGIS/rest/services/Buildings/FeatureServer

- Use REST url in Web Application/ iPhone Application
Creating your Web or Mobile Apps

• In this session we used Flex Samples from the beta Resource Center

• Focus of this session has been the feature service

• Attend Javascript, Flex, Silverlight and iPhone API sessions to learn more about Web and Mobile App Development

• Demo Apps in this session used
  – Feature Service REST URL
  – World street map’s REST URL pointing to ArcGIS Online
Editing using Desktop

- Scalable editing solution for web-browser
- Supports ArcMap as well
- Easy user interaction flow for Desktop users
- Same symbology and templates as in the map doc
- Advanced editing tools in ArcMap
Editing using Desktop: User Interaction

- Connect to ArcGIS Server
- Add a MapService to ArcMap.
- Zoom to the desired extent.
- Select the Layer(s) that you want to edit
Editing using Desktop: User Interaction (contd.)

- **Create Local Copy for Editing.** ArcMap
  - fetches the Layers and just the necessary data and
  - puts them in your local GeoDatabase

- Edit the data in ArcMap,
- Synchronize the edits with Feature Service.
Demo 4

- Create Local Copy in ArcMap
- Edit in ArcMap
- Synchronize
- Show the edits in a web-browser
## Editing Geodatabases – Different Approaches

<table>
<thead>
<tr>
<th>Solution</th>
<th>Connection Type</th>
<th>Symbology</th>
<th>Client</th>
</tr>
</thead>
<tbody>
<tr>
<td>Web ADF</td>
<td>Stateful</td>
<td>Yes</td>
<td>Web-Browser</td>
</tr>
<tr>
<td>WFS-T</td>
<td>Stateless</td>
<td>No</td>
<td>WFS clients</td>
</tr>
<tr>
<td>GeoData Service</td>
<td>Stateless</td>
<td>Yes (in 10)</td>
<td>ArcMap Engine Apps</td>
</tr>
<tr>
<td>Mobile Service</td>
<td>Stateless</td>
<td>Yes</td>
<td>ArcGIS Mobile</td>
</tr>
<tr>
<td>Feature Service</td>
<td>Stateless</td>
<td>Yes</td>
<td>Web-Browser iPhone ArcMap</td>
</tr>
</tbody>
</table>
Editing Geodatabases – Web ADF

• Web ADF

  – JSP (Java) or ASP.Net Application Development

  – ADF makes a server side, stateful connection to the Geodatabase

  – Uses remote ArcObject calls to edit the geodatabase

  – Large Server Side Session, expensive to Scale
Editing Geodatabases – Geodata and Mobile Services

- **GeoDataService**
  - Supports Server to Server Replication
  - Supports Server to Client Replication and Editing
  - Equivalent to Feature Service from an ArcMap editing client perspective

- **Mobile Service**
  - Supports editing and synchronization via ArcGIS Mobile (Windows)
Editing Geodatabases – WFS-T

- **WFS-T**
  - Supports editing based on the OGC specification
  - Uses GML Simple Features Profile
  - Edit features using a WFS client
Feature Service – Editing Model

• Direct Editing over the Web

• Simple Transaction Model
  – Each call to ApplyEdits is one transaction
  – Last In Wins
  – Can edit both short transaction (non versioned) and versioned data

• Can be combined with Versioning
  – Web Editors share a version
    • Default Version or “web” version
    • Back Office reconciles and posts “web” version
  – Use non-versioned for maximum scalability / very large scale web use
Feature Service – Editing Model (contd.)

• Can be combined with Disconnected Editing
  – Exposed to Desktop Clients (ArcMap) at this Release
  – Applications can checkout data
  – Periodically Synchronize
Conclusions

• ArcGIS 10 introduces a new Feature Service

• Designed for web editing and gathering of user generated content.

• Supports a rich feature information model including symbology, types, domains, relationships and attachments

• All edits flow into and can be managed in the back end GeoDatabase

• Exposed in a wide variety of clients via easy to use Web APIs
Sessions Related to the Presentation

- **WFS**: Tue, Mar 23, 1:00pm-2:15pm, Smoketree A - E (PSCC)
- **GeoDatabase Replication**:
  - Wed, Mar 24, 1:00pm-2:15pm, Catalina/Madera (RH)
- **ArcGIS Mobile**: Tue, Mar 23, 4:30pm-5:45pm, Primrose A (PSCC)
  - Thu, Mar 25, 8:30am-9:45am, Primrose A (PSCC)
  - Thu, Mar 25, 10:15am-11:30am, Catalina/Madera (Renais…)
- **ADF**:
  - .Net: Thu, Mar 25, 10:15am-11:30am, Primrose C/D (PSCC)
  - Java: Thu, Mar 25, 10:15am-11:30am, Smoketree A - E (PSCC)
- **ArcGIS Server Security**:
  - .Net: Wed, Mar 24, 2:45pm-4:00pm, Primrose C/D (PSCC)
  - Java: Wed, Mar 24, 2:45pm-4:00pm, Smoketree A - E (PSCC)
Sessions Related to the Presentation (contd.)

• REST: Tue, Mar 23, 1:00-2:15pm, Pasadena/Ventura/Sierra (R H)
• Javascript API
  – Wed., March 24, 4:30pm-5:45pm, Primrose B (PSCC)
  – Thu., March 25, 1:30pm-2:45pm, Primrose B (PSCC)
• Flex API
  – Wed, March 24, 10:30am-11:45am, Primrose A (PSCC)
  – Thu, March 25, 1:30pm-2:45pm, Pasadena/Ventura/Sierra (RH)
• Silverlight API
  – Wed, March 24, 2:45pm-4:00pm, Primrose B (PSCC)
  – Thu, March 25, 1:30pm-2:45pm, Catalina/Madera (RH)
• iPhone
  – Wed, March 24, 4:30pm-5:45pm, Pasadena/Ventura/Sierra (RH)
  – Thu, March 25, 1:30pm-2:45pm, Primrose C/D (PSCC)
Questions?

• Thanks for your attention!