Data Integration and Interoperability
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Agenda

- Seamless integration between GIS and CAD
  - CAD Support in ArcGIS
  - Using GIS Data in CAD
  - Editing GIS Data in CAD

Introduction to CAD Data
CAD in the Geospatial context

- CAD drawings are a large source of GIS data in 2D and 3D
  - Surveying
  - Cadastre
  - Civil Engineering
  - Architecture
  - Landscape Architecture
  - Planning

ArcGIS CAD Data Support

- Esri has long provided CAD support and integration tools
  - Out of the box and direct read
    - No extension required
    - Conversion not required
  - All CAD geoprocessing tools available at all license levels
  - Current version support:
    - AutoCAD DWG/DXF: Up to 2012
    - MicroStation DGN: Up to V8
CAD Drawings

- Geometry, text, and symbols comprise CAD entities/elements
- Organised into layers or levels
- Symbology represents information
- Can have data attached to entities

CAD Datasets in ArcGIS

<table>
<thead>
<tr>
<th>Geometry</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAD entity geometry organised into feature classes</td>
<td>CAD properties, tags, and database links are stored in attribute tables</td>
</tr>
</tbody>
</table>

Coordinate System

CAD data can be reprojected to overlay with other GIS layers
Contents of a CAD Dataset

- ***.dwg**
  - Annotation: Text, tags, and attribute definitions
  - Multipatch: Polygons and is useful for 3D representation
  - Point: Points, blocks, and cells
  - Polygon: Closed areas such as polygons, ellipses, and circles
  - Polyline: Lines, polylines, and arcs
- ***.prj**: Projection files define a coordinate system for a CAD dataset. They are recommended but not required.

DEMO: Using CAD Datasets in ArcMap and ArcScene
Loading CAD Data into the Geodatabase

- Add to Geodatabase feature classes or create new Geodatabase from CAD
  - As-built updates
  - Editing requirements
  - Advanced Geodatabase tasks (i.e., Geometric Networks, Topology, etc.)

- Conversion supported by the geoprocessing framework and ArcMap tools
CAD Conversion Tools

- ArcMap
  - Export Data
  - Copy & Paste (Edit session)

- ArcToolbox – Geoprocessing
  - Feature Class to Feature Class
  - Copy Features
  - Import CAD Annotation

CAD to Geodatabase

- New conversion tool introduced at ArcGIS 10

- Designed for bulk loading CAD datasets into a Geodatabase
  - Works at the dataset level

- Combines Copy Features, Merge and Import CAD Annotation into single tool
DEMO: Loading CAD Data into the Geodatabase

Exporting Geodatabase Features to CAD
Exporting Geodatabase Features to CAD

- Allows GIS users to share Geodatabase content with CAD users
  - Project collaboration
  - Contractual obligations

- Supported by Geoprocessing’s Export to CAD tool
  - Simply drag and drop layers into tool and export
  - Leverage Geodatabase information to control export

Export to CAD

- Output features to native CAD format
  - DGN V8
  - DWG/DXF Release 14 to 2012

- Supports appending to existing CAD drawings

- Available at all license levels (from ArcGIS 9.3.1 SP2)
Attribute Driven Export

- Use Fields and their attributes to control how elements and entities are generated
  - Export data based on selection

Mapping Specification for CAD

- Framework developed by Esri for coding information in DWGs to define:
  - GIS feature classes + attributes
  - Coordinate systems
- Leveraged by ArcGIS Desktop CAD tools
  - CAD direct read/import tools
  - Export to CAD – Solves the question ‘How do I export Geodatabase attributes to CAD drawings?’
10/13/2011

### CAD-Defined Feature Classes in CAD Dataset

- **.dwg**
  - Annotation: Text, tags, and attribute definitions
  - Multipatch: Polygons and is useful for 3D representation
  - Parcels: CAD-defined polygon feature class that represents parcels
  - Point: Points, blocks, and cells
  - Polygon: Closed areas such as polygons, ellipses, and circles
  - Polyline: Lines, polylines, and arcs
  - Roads: CAD-defined polyline feature class that represents roads

- **.prj**
  - Projection files define a coordinate system for a CAD dataset.
  - They are recommended but not required.

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### DEMO: Exporting Geodatabase features to CAD

Export to CAD
Using Map Services in CAD

ArcGIS Server & Map Services

- Share your GIS resources across an enterprise and across the Web

- A Map service is the way that you publish maps to the Web using ArcGIS

- Makes maps, features, and attribute data available inside many types of client applications
  - AutoCAD through ArcGIS for AutoCAD
  - MicroStation through WMS
**ArcGIS for AutoCAD**

- Plug-in application for AutoCAD
  - Currently supports AutoCAD format 2010 - 2012
  - Free download available at esri.com

- Provides ability for users to
  - Access Esri Map Services (including ArcGIS Online) in AutoCAD
  - View map service feature attributes
  - Organise and attribute CAD drawings for use in ArcGIS

**Maps & Imagery for Site Context**

- Basemaps
- Map Services
- CAD Drawings

AutoCAD

GIS content in AutoCAD
Adding Map Services

- Add map services from...
  - Favourite Maps
  - ArcGIS.com
  - Server URL

- Maps are projected to coordinate system defined in drawing

Map Service Palette

- Map service display and behaviour manager
  - Visibility
  - Dynamic

- Reports map and drawing’s coordinate system

- Map service layer display controls
DEMO: Using Map Services in CAD
ArcGIS for AutoCAD

Geodatabase Editing from CAD
ArcGIS for AutoCAD 300
Incremental technology, revolutionary functionality

- Feature Services
  - Editing Enterprise Geodatabases
  - ArcGIS Data as an External Reference
- Image Services
- Feature Extraction
  - Map Service
  - Feature Service

DEMO: Feature Editing in AutoCAD
Summary

- Seamless integration between GIS and CAD
  - CAD Support in ArcGIS
  - Using GIS Data in CAD
  - Editing GIS Data in CAD

Resources and Training

- CAD Integration Resource Centre & Help System
  - [http://resources.arcgis.com/content/cadintegration/10.0/about](http://resources.arcgis.com/content/cadintegration/10.0/about)
  - Help, Samples, Downloads, Blogs

- Working with CAD Data - Instructor Led Course

- Working with CAD in ArcGIS – Live Training Seminar
Thank you

Questions?