



**Ozri2011**  
Esri Australia User Conference

# Data Integration and Interoperability

Gordon Sumerling & Maree Wilson



**Ozri2011**  
Esri Australia User Conference

## Agenda

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

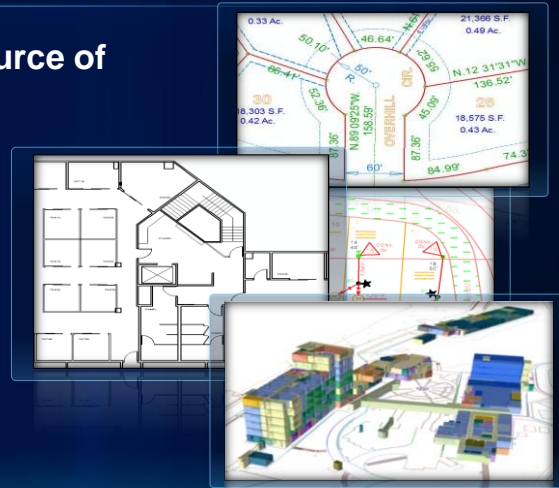


## Introduction to CAD Data



## 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



**Ozri2011**  
Esri Australia User Conference

## ArcGIS CAD Data Support

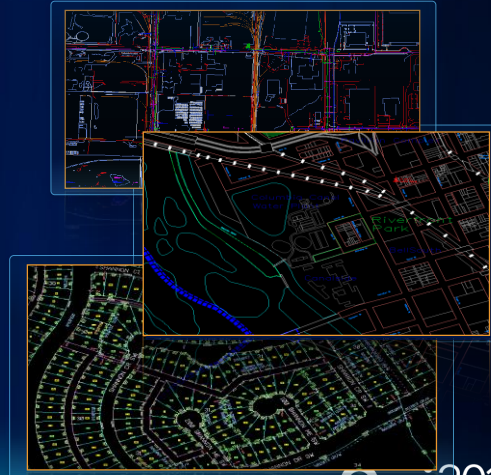
- Esri has long provided CAD support and integration tools
  - Out of the box and direct read
    - No extension required
    - Conversion not required
  - All CAD geoprocessing tools available at all license levels
  - Current version support:
    - AutoCAD DWG/DXF: Up to 2012
    - MicroStation DGN: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



**Ozri2011**  
Esri Australia User Conference

## 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

### Geometry



CAD entity geometry organised into feature classes

### Attributes

1				
2				
3				
4				
5				








CAD properties, tags, and database links are stored in attribute tables

### 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



## Loading CAD Data to 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.)

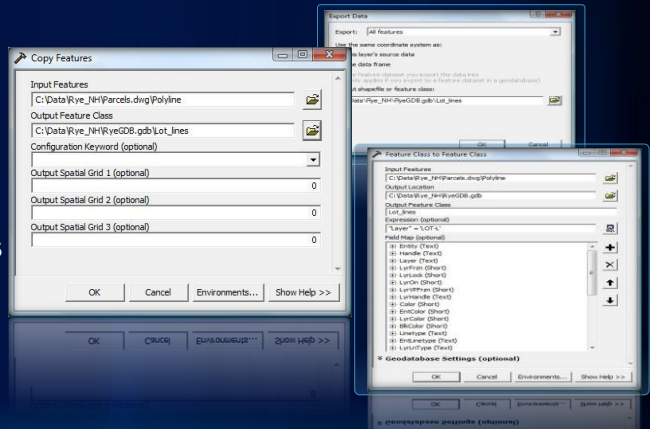


- Conversion supported by the geoprocessing framework and ArcMap tools



## CAD Conversion Tools

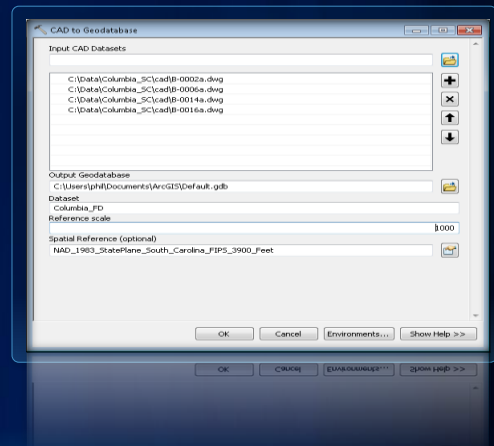
- **ArcMap**
  - Export Data
  - Copy & Paste (Edit session)
- **ArcToolbox – Geoprocessing**
  - Feature Class to Feature Class
  - Copy Features
  - Import CAD Annotation



**Ozri2011**  
Esri Australia User Conference

## 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**



**Ozri2011**  
Esri Australia User Conference

# DEMO: Loading CAD Data into the Geodatabase



# Exporting Geodatabase Features to CAD



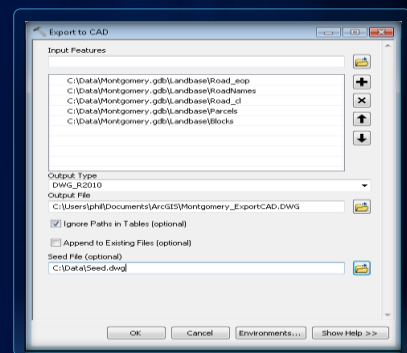
## Exporting Geodatabase Features to CAD

- **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

OBJECTID*	Shape*	Gazetted_Day	Gazetted_Month	Gazetted_Year	Gazetted_Page	Availability	Below_Ground	Docket_Year	Docket_Ref	Const
447	Polyline	20	12	1962	1	Available	True	0	0	0
448	Polyline	23	10	1941	5	Available	True	0	0	0
449	Polyline	23	10	1941	5	Available	True	0	0	0
450	Polyline	22	12	1960	2	Available	True	0	0	0
451	Polyline	22	12	1960	2	Available	True	0	0	0
452	Polyline	21	5	1964	100	Available	True	0	0	0
453	Polyline	21	5	1964	100	Available	True	0	0	0
454	Polyline	22	7	1965	100	Available	True	0	0	0
455	Polyline	22	7	1965	100	Available	True	0	0	0

## 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?’***

## CAD-Defined Feature Classes in CAD Dataset

 *.dwg	
 Annotation	Text, tags, and attribute definitions
 Multipatch	Polygons and is useful for 3D representation
 <b>Parcels</b>	<b>CAD-defined polygon feature class that represents parcels</b>
 Point	Points, blocks, and cells
 Polygon	Closed areas such as polygons, ellipses, and circles
 Polyline	Lines, polylines, and arcs
 <b>Roads</b>	<b>CAD-defined polyline feature class that represents roads</b>
 *.prj	
	Projection files define a coordinate system for a CAD dataset. They are recommended but not required.

## 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

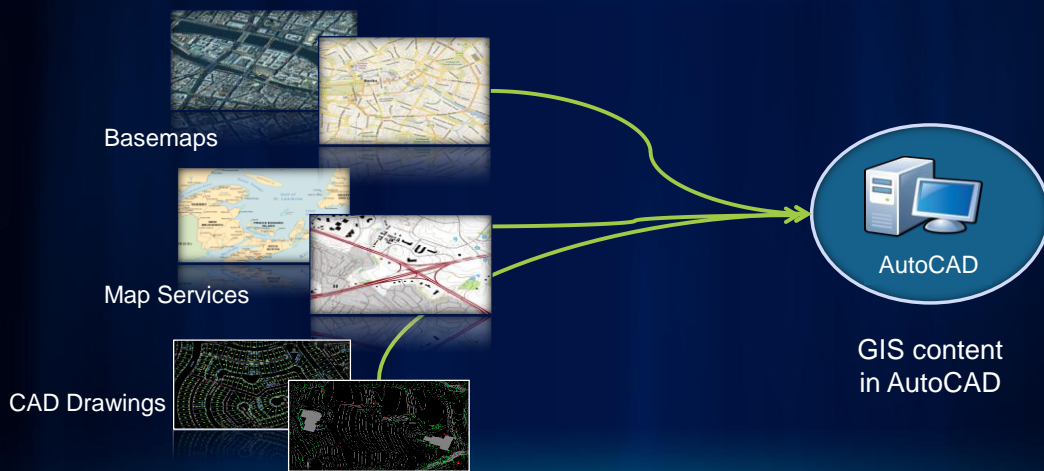


## ArcGIS for AutoCAD

- **Plug-in application for AutoCAD**
  - Currently supports AutoCAD format 2010 - 2012
  - Free download available at [esri.com](http://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

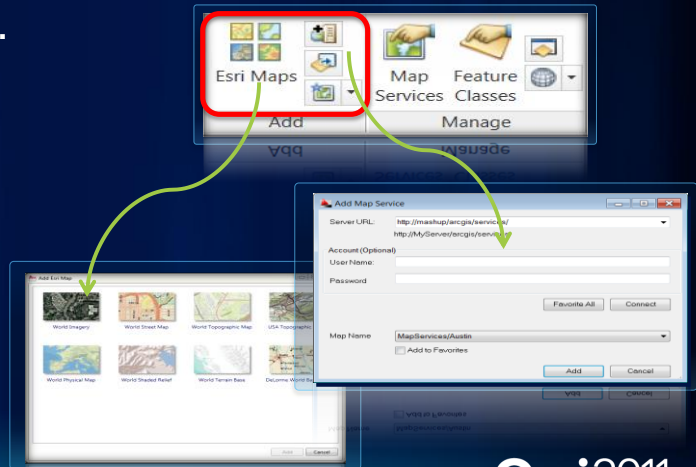


## Maps & Imagery for Site Context



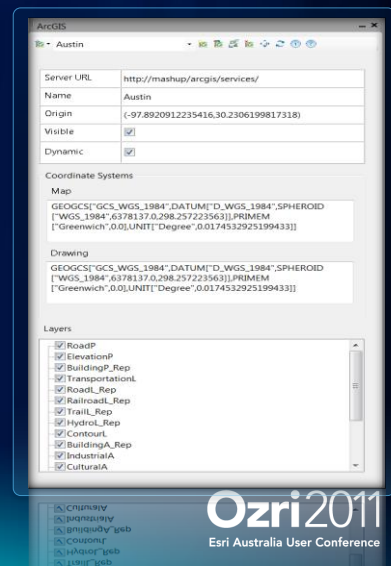
## Adding Map Services

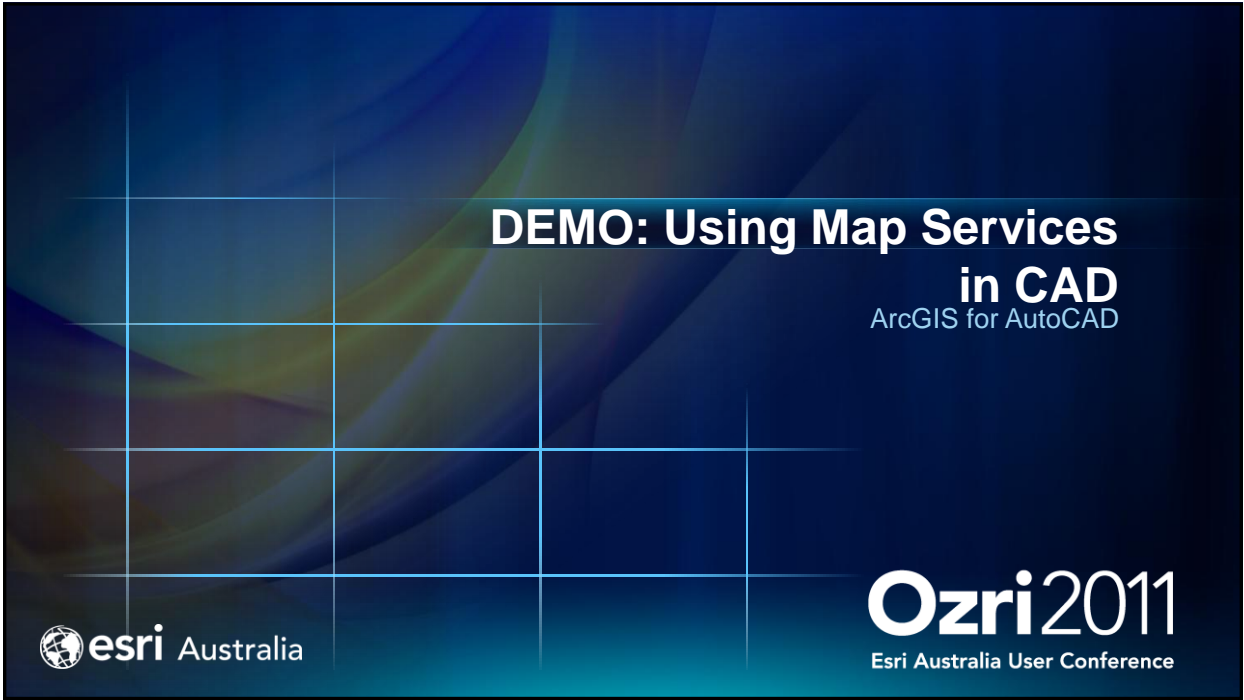
- Add map services from...
  - Favourite Maps
  - ArcGIS.com
  - Server URL
- Maps are projected to coordinate system defined in drawing



## 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

 **esri** Australia

**Ozri2011**  
Esri Australia User Conference

# Geodatabase Editing from CAD

 **esri** Australia

**Ozri2011**  
Esri Australia User Conference

## 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>
  - Help, Samples, Downloads, Blogs
- **Working with CAD Data - Instructor Led Course**
  - [http://training.esri.com/gateway/index.cfm?fa=catalog.courseDetail&CourseID=50120390\\_9.x](http://training.esri.com/gateway/index.cfm?fa=catalog.courseDetail&CourseID=50120390_9.x)
- **Working with CAD in ArcGIS – Live Training Seminar**
  - [http://training.esri.com/acb2000/showdetl.cfm?DID=6&Product\\_ID=887](http://training.esri.com/acb2000/showdetl.cfm?DID=6&Product_ID=887)



Thank you

Questions?



esri Australia

