

ArcGIS Desktop: CAD Integration with ArcGIS

February 2006

San Diego User Group



Outline

- **Working with CAD data in ArcGIS:**
 - Visualization
 - Integration
 - Translation
- **New Improvements for ArcGIS 9.2**
(currently Beta 1)

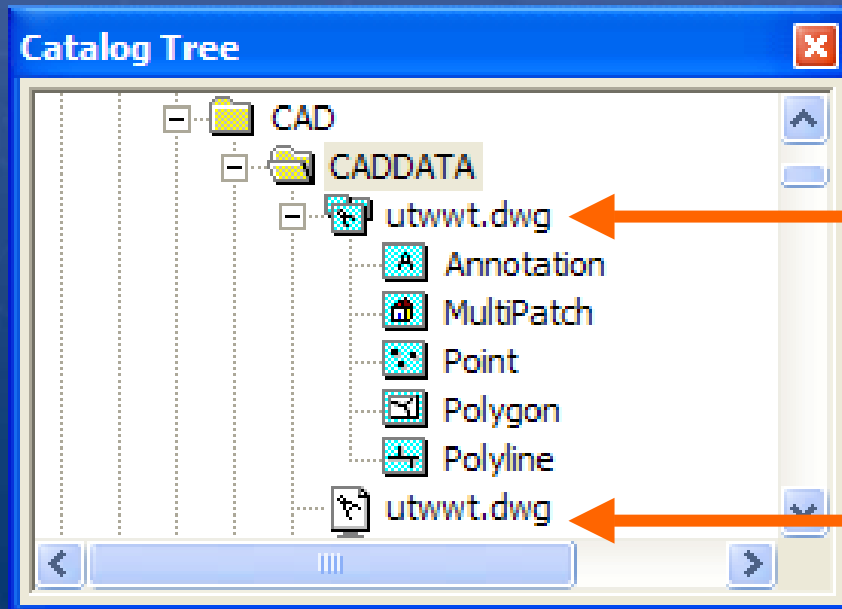
Supported Formats

- **DWG/DXF**
 - AutoCAD Release 12 to AutoCAD 2005
- **DGN**
 - MicroStation 5.x – MicroStation V8

No special "extension" to read CAD data!

CAD Visualization

- ArcGIS organizes CAD data in **two** ways
- Both reference **one** CAD file

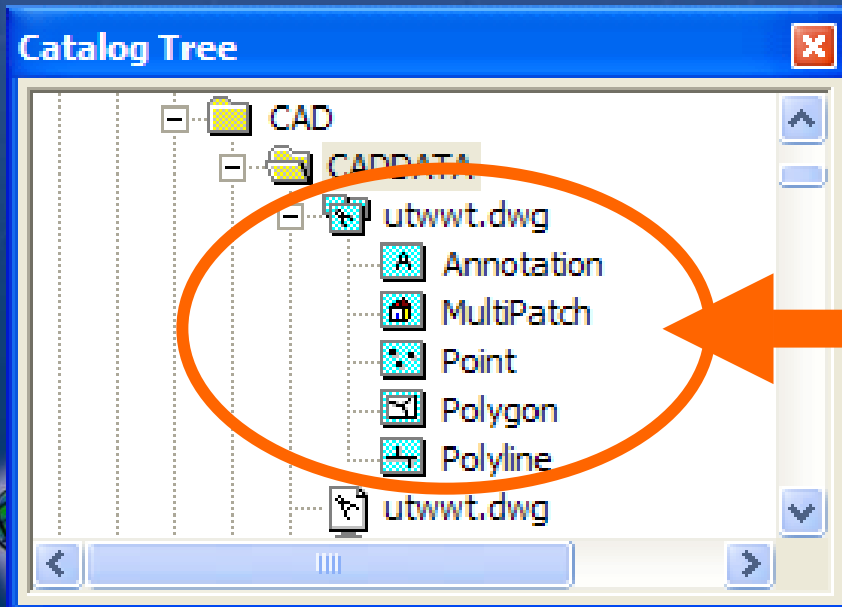


CAD Feature Datasets

CAD Drawing Datasets

CAD *Feature* Datasets

- Five *feature classes*:
 - Organized by geometry type:
 - Annotation (text), Point, Polyline, Polygon, and MultiPatch
 - Rendered as simple features; can change symbols

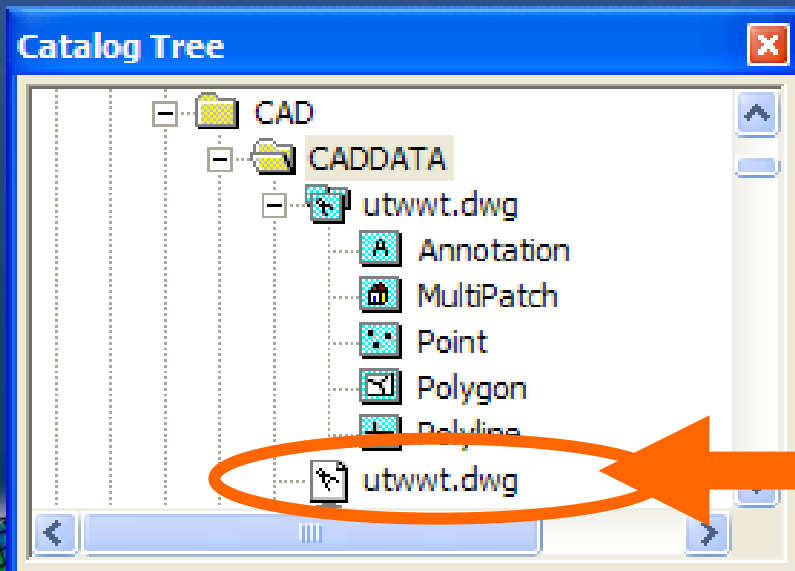


***Used for query, analysis,
and conversion operations***

***Add as individual layers to
maps***

CAD *Drawing* Dataset

- Represented as a single data source (white drawing icon)
- Display is similar to how the originating CAD program renders the drawing



Typically used for display purposes; background elements; reference layer

Where in the world is... that CAD file anyway?

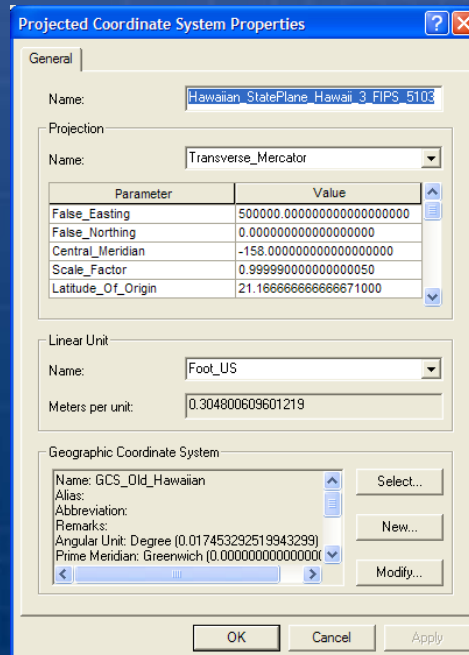
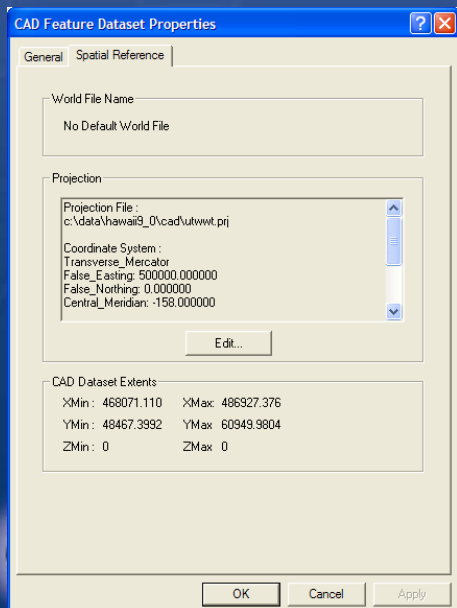
- **In “Page” Space?**
 - Referenced to 0,0 or inches (units) typically
 - Just b/c they told you “It’s in NAD83” doesn’t mean it’s in geographic space (relative v. absolute units)
- **Or Geographic or Planar Space?**
 - Coordinates are stored referenced to the real world

Referencing CAD data to GIS layers

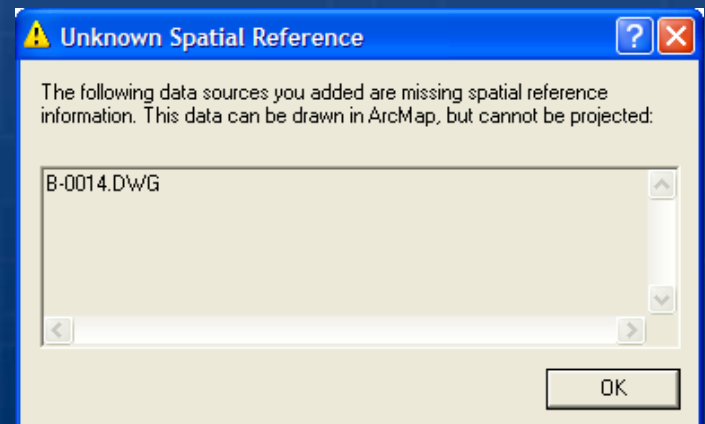
- **It “Just works”:**
 - If the CAD data is not in page units and was drafted in the same units as your GIS data
- **Else**
 - Define the coordinate system for the data
OR
 - Transform it dynamically to register with other GIS data

“The Real World”: CAD

- **Define the Spatial Reference (coordsys):**
 - Define and create the .prj file
 - Can project on the fly in ArcMap



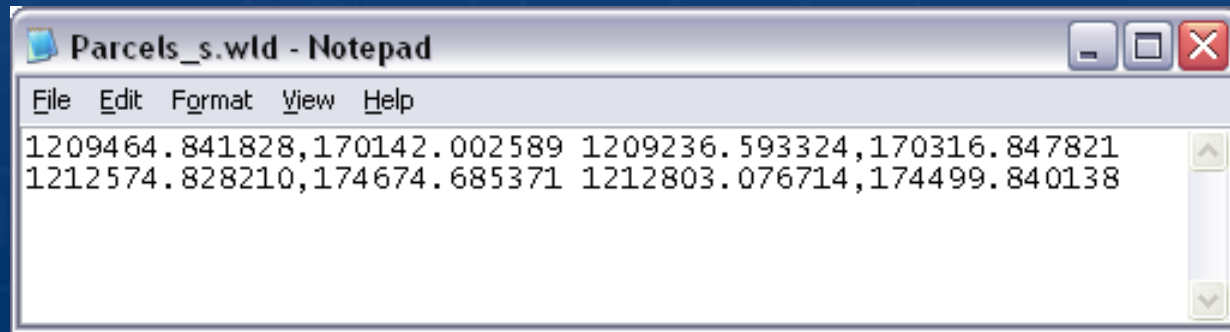
ArcMap Warning when CAD file has no .prj:



World Files

- 2 point **transformation** for CAD data
- Uses the .wld file extension
- Simple text file containing two lines:

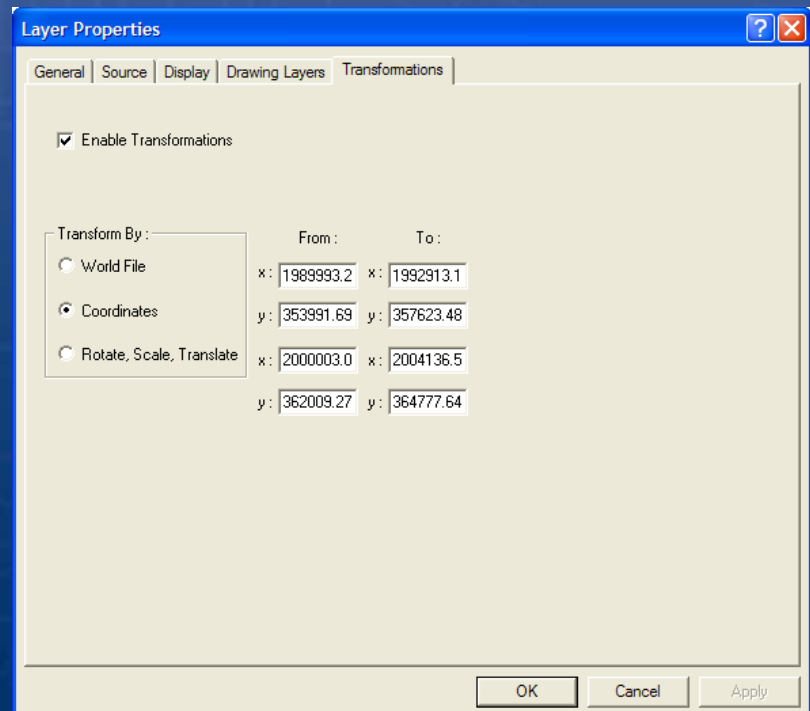
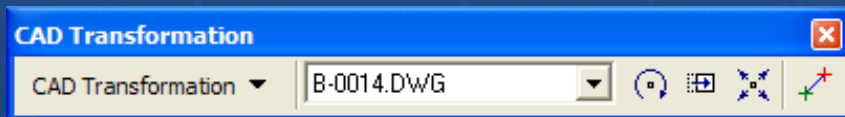
<From X1, From Y1> <To X1, To Y1>
<From X2, From Y2> <To X2, To Y2>



```
File Edit Format View Help
1209464.841828,170142.002589 1209236.593324,170316.847821
1212574.828210,174674.685371 1212803.076714,174499.840138
```

CAD Transformation Toolbar

- ArcGIS Developer Sample (Developer Kit Installation or online)
- Simple GUI for creating the CAD world file using georeferencing tools

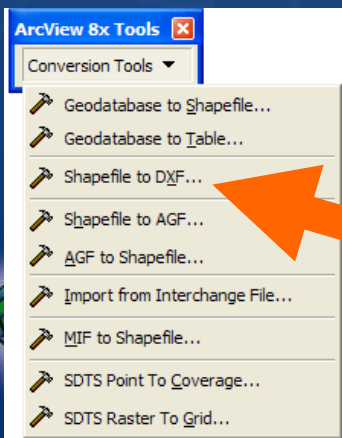


Conversion Methods

1) ArcMap Data Export, Editor Copy Features

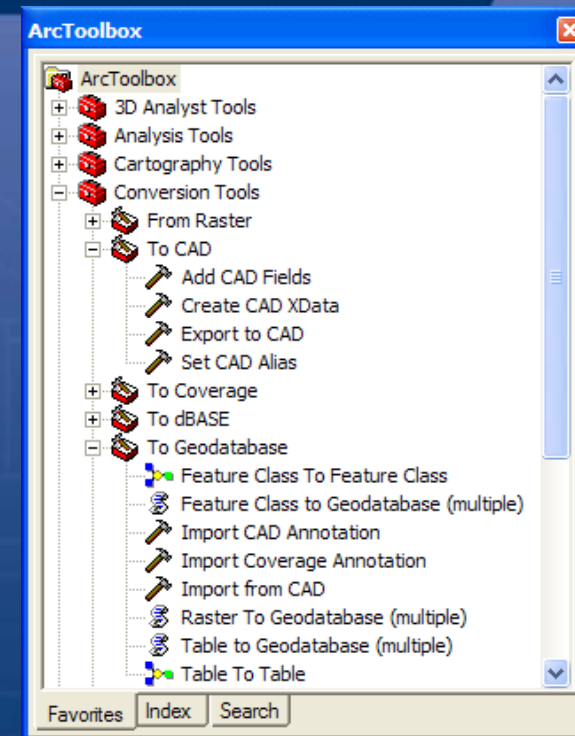
2) Geoprocessing Tools:

- **Import from CAD Tool (ArcInfo)**
- **Import CAD Annotation**
- **Copy Features (ArcView)**
- **Make feature Layer (ArcView)**
- **Select (ArcView)**



3. GIS to CAD:

- **Export to CAD tool (ArcInfo)**
- **ArcCatalog > ArcView 8x Tools toolbar > Shapefile to .dxf (ArcView)**



“Simple” feature conversion

- Select features from CAD layers, export to shapefile or geodatabase
- **Copy Features tool** in Edit session

ArcEditor & ArcInfo licensing



- Copy & paste feature selections to another target
- Then use established GIS editing workflows:
 - Topology rules?
 - Spatial Adjustment?
 - Snapping?
 - Attribution?
 - Annotation?

Demo time!

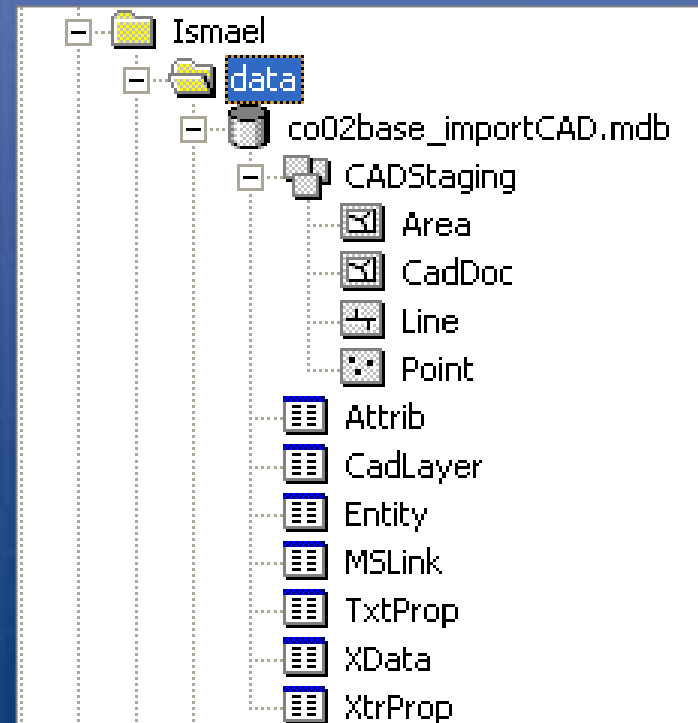
Geoprocessing Framework

- A single, unified framework for defining and implementing geoprocessing functions in ArcGIS
- CAD data fully participates:
 - Direct Read
 - Conversion to GIS features
 - Translation to native CAD formats
- Provides a framework for simple integration of CAD data to support **workflows**



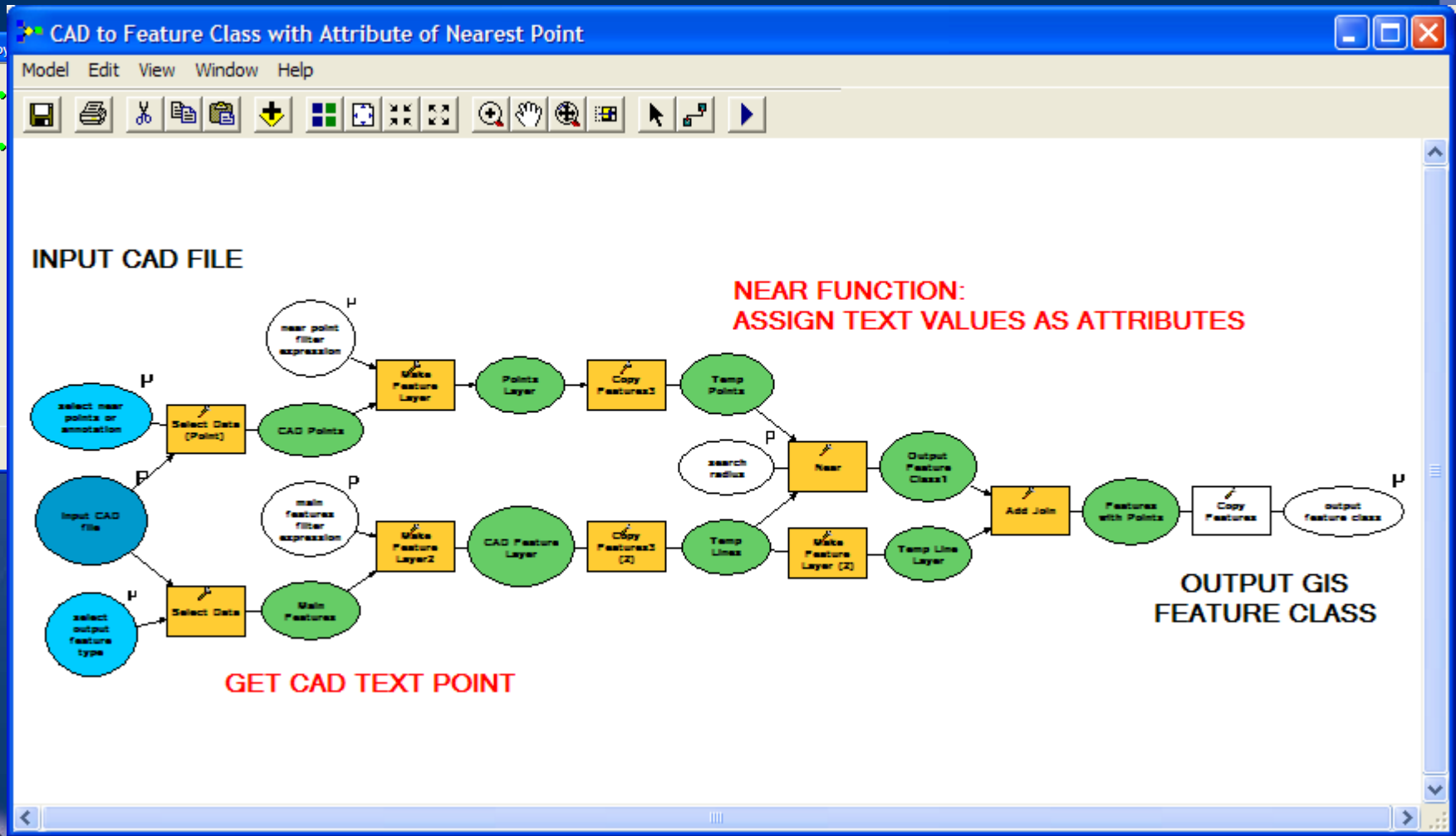
Import from CAD tool

- Creates a **Staging Geodatabase**
- Optimized representation of the CAD drawing file(s) as a Geodatabase
- Reformats into highly normalized tables and feature classes



**Staging Geodatabase
structure**

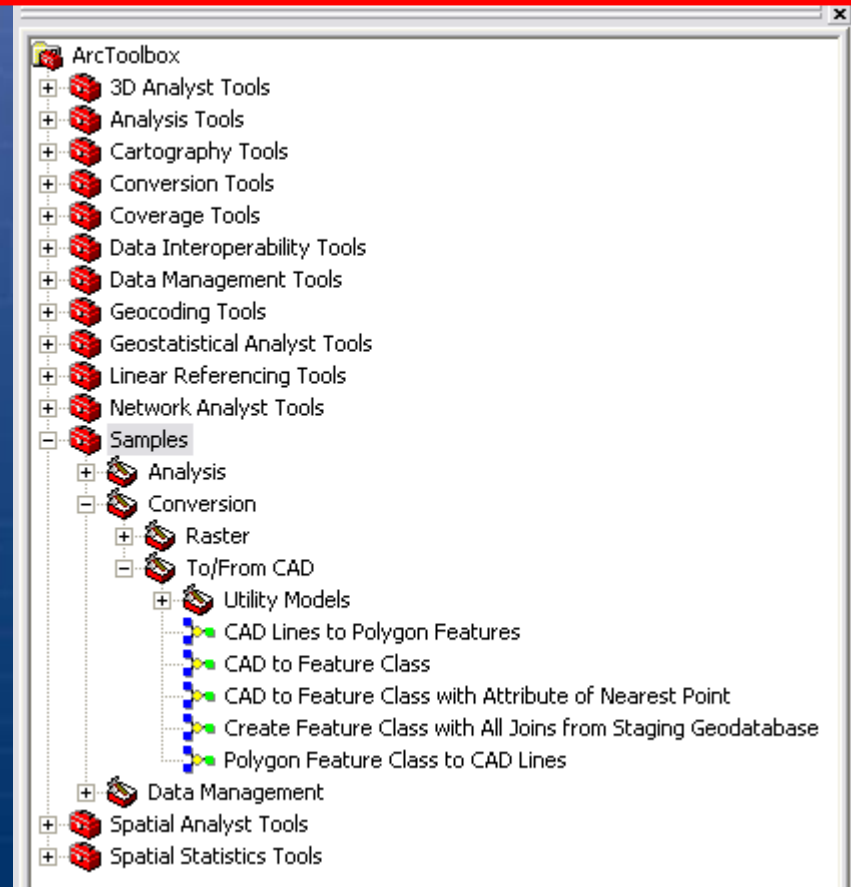
Workflow tools



Geoprocessing Workflows

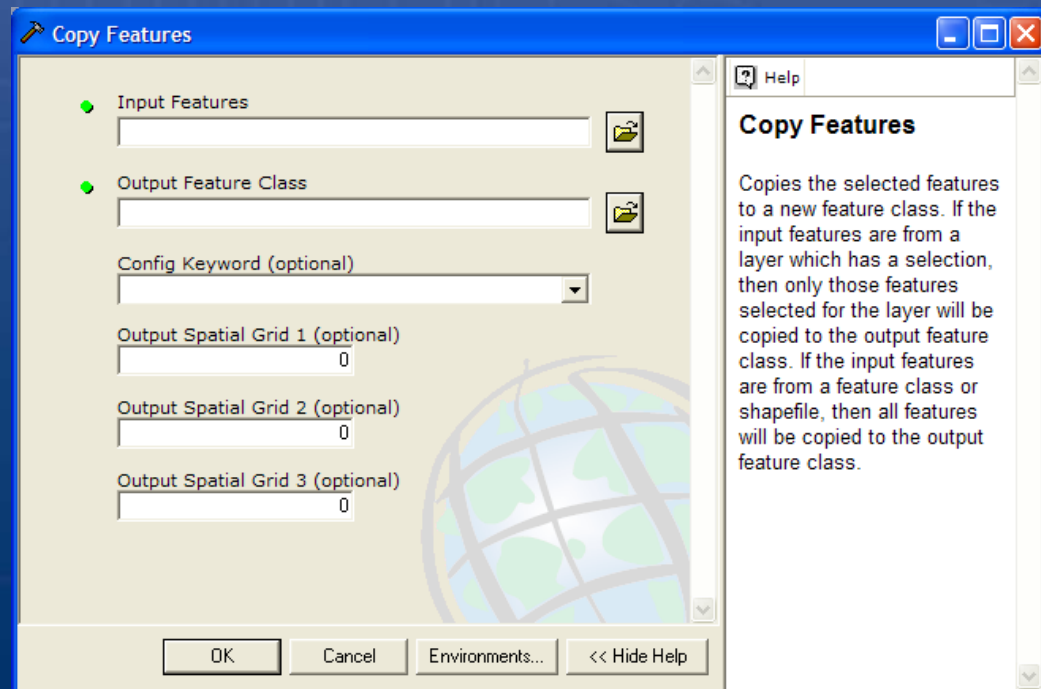
- Performs all joins on a Staging Geodatabase
- Text near lines as attributes of feature
- CAD Lines to Polygon Feature Class
- More samples at:
 - <http://support.esri.com>

ArcToolbox Samples toolbox: CAD Utility Models



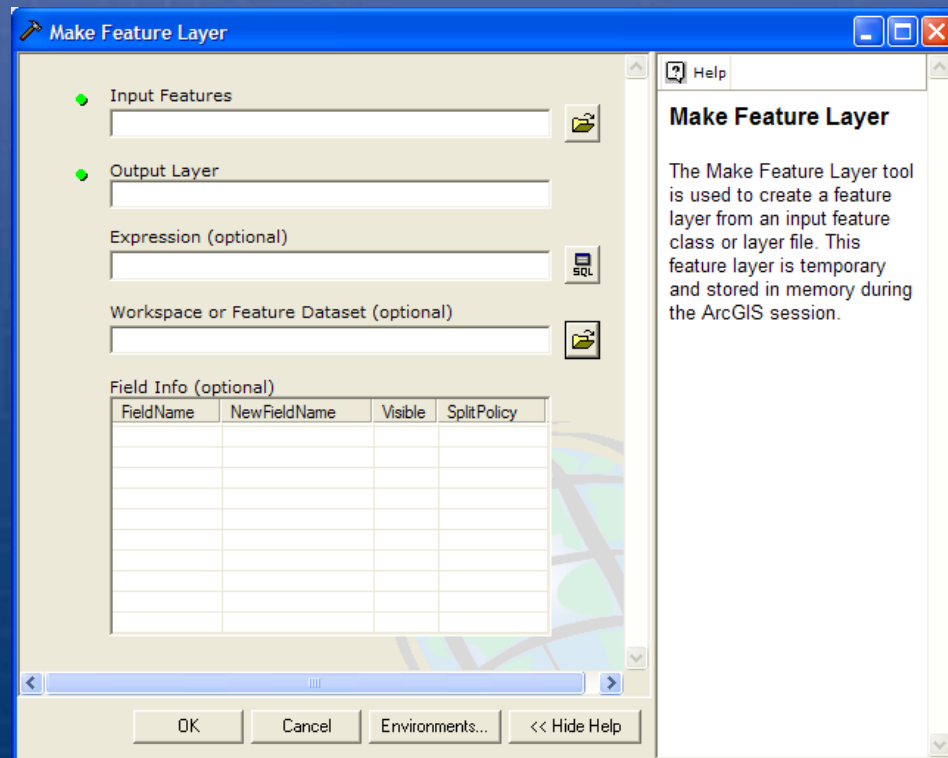
Copy Features tool

- Simplest way to perform CAD conversion
- Copies any feature class to a new feature class
- Works with selection sets
- GDBS or .shp



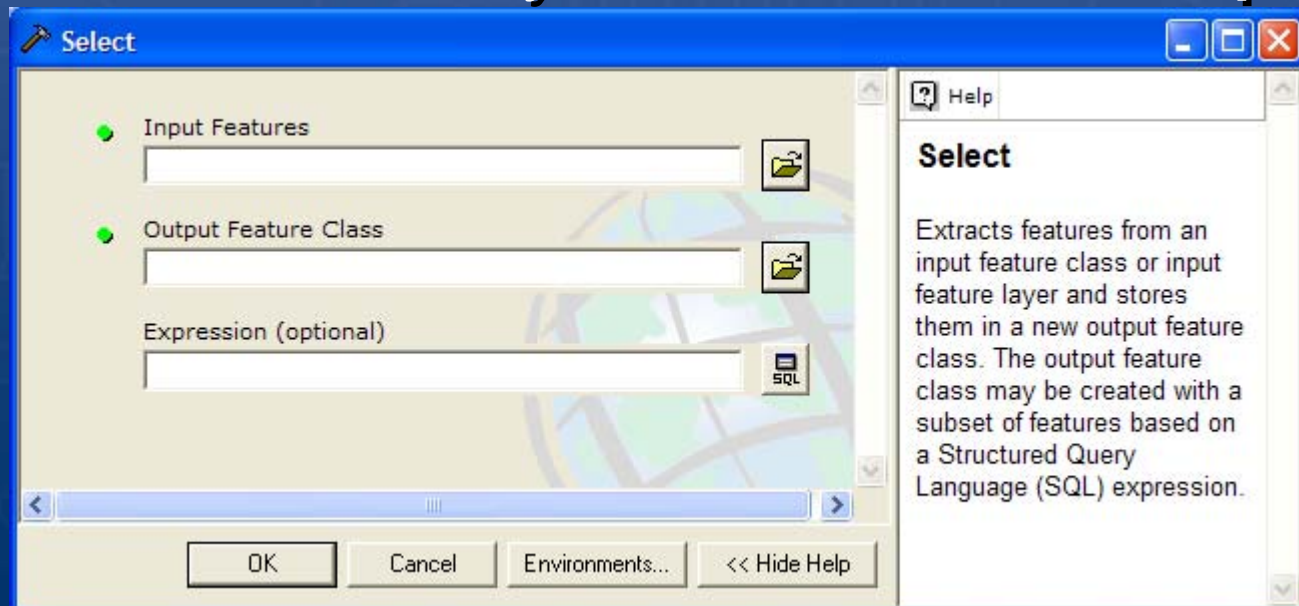
Make Feature Layer tool

- Similar to Select except
 - Has field info control
 - Output is not on disk
- Control output field names
- In memory; saves disk space
- Frequently used tool for CAD conversion workflows



Select Tool

- Extracts selected features from an input and stores them in a new output feature class
- Uses SQL expression parameter to define subset
- Similar to *Make Feature Layer* but creates new output

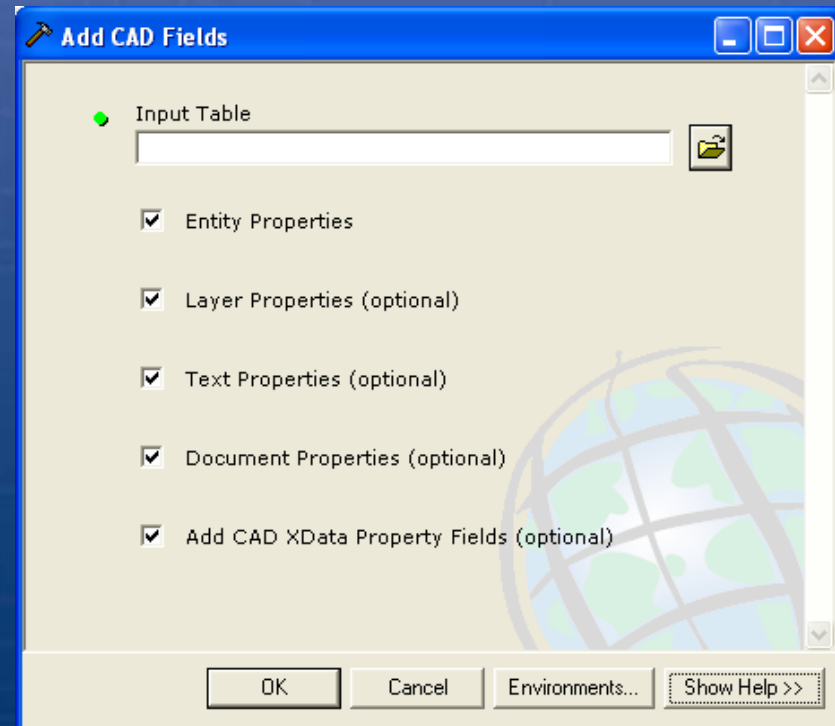


GIS to CAD

- Output feature to **native CAD format**
 - DGN V8, DWG/DXF R14 to R2005
- **Export to CAD** tool has various levels of complexity
 - Customizable to CAD standards that drive symbology, drawing document, and layer properties
 - Generates well formatted CAD drawings with explicit symbology according to attributes in the input feature layers

Add CAD Fields tool

- **Add CAD Fields** tool adds CAD specific fields to feature class
- Adds same fields that *Import from CAD* tool adds
- Prepares the feature class for export to a CAD file
- The new fields are then recognized by the *Export to CAD* tool



Seed files (for export)

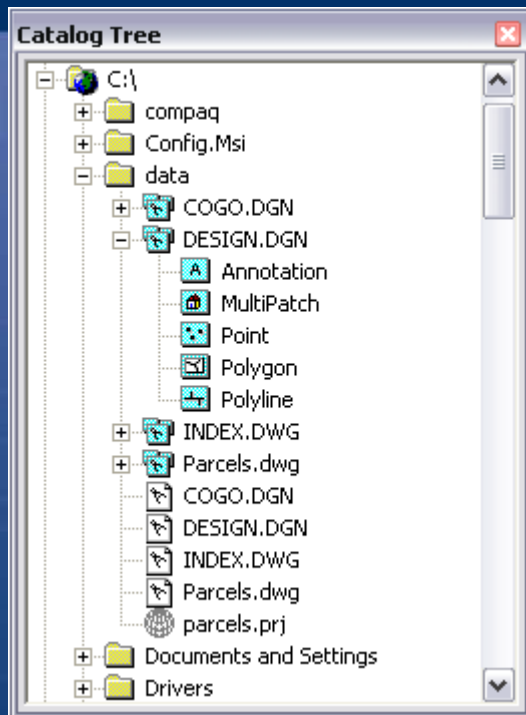
- **Seed file allows the default symbology of the seed drawing will be used**
- **Can generate Blocks and Cells contained in the seed drawing**
- **Microstation requires a seed file for design file creation**
- **Microstation seed file issues for Export to CAD**
 - **Knowledge Base article describes how to create a Microstation Seed File**
 - **Design plane, appropriate dimensions, units and origin**

Demo Time!

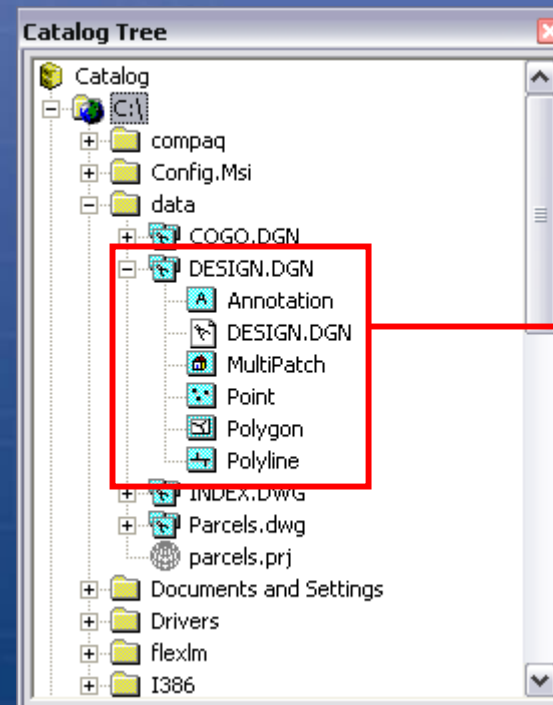
The Road Ahead: ArcGIS 9.2

- **New CAD dataset organization**
- **Expanded attribute support**
- **New Georeferencing tools**
- **Improved feature rendering**
- **Improved annotation export**
- **User interface standardization and improvement**
- **Bug fixes**
- **Improved documentation**

New CAD dataset organization



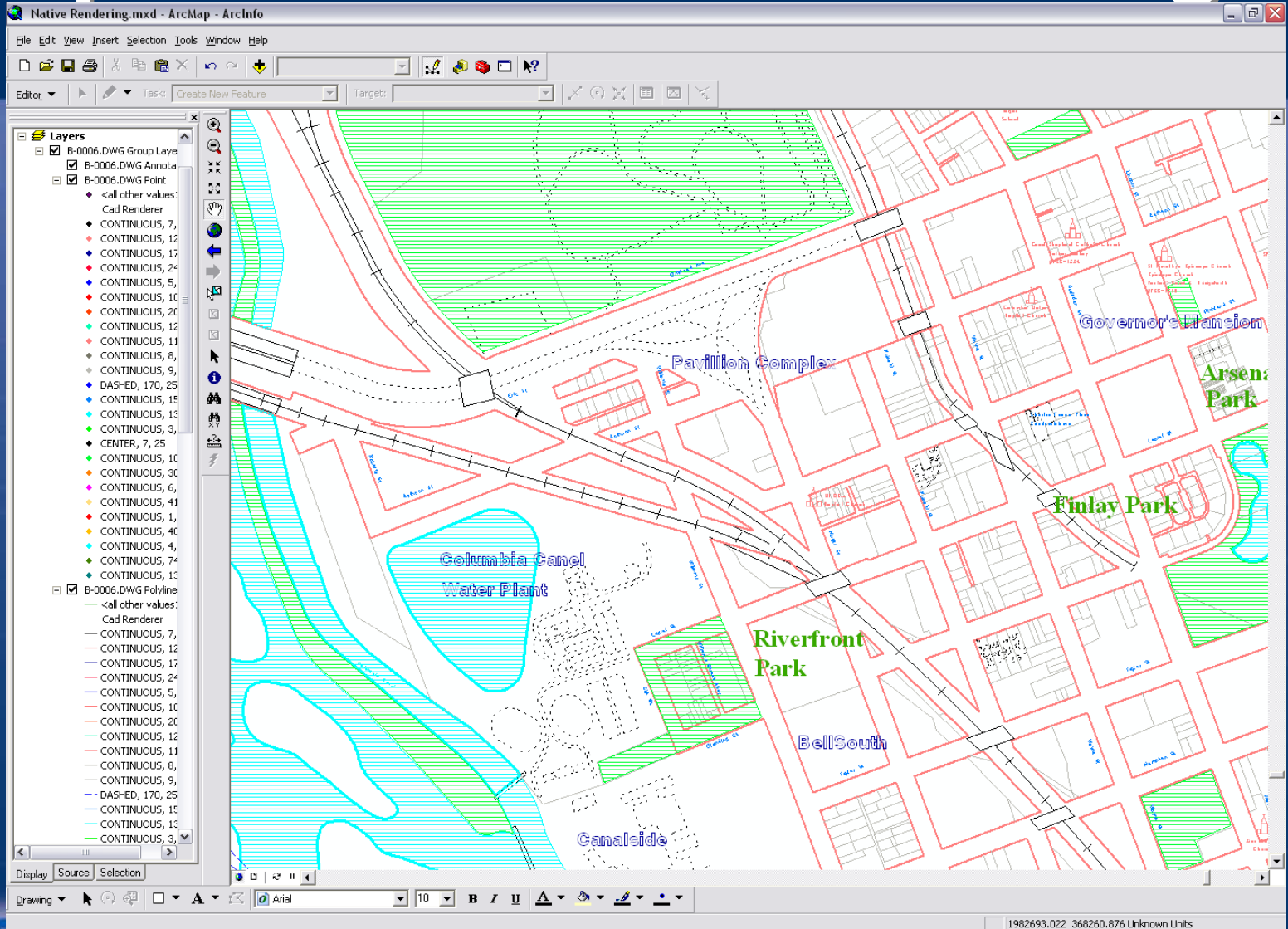
**CAD data representation
at ArcGIS 9.1**



**CAD data representation
at ArcGIS 9.2**

**CAD
Drawing
Dataset
now inside
CAD
Feature
Dataset**

Improved feature rendering



New CAD feature layer rendering at ArcGIS 9.2

Learning More

- **Virtual Campus:**
 - **Geoprocessing CAD data with ArcGIS (FREE)**
 - **Working with CAD Drawings in ArcGIS (\$30)**
- **ArcScripts**

ArcScripts downloads - ESRI Support - Microsoft Internet Explorer

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Address <http://arcscripts.esri.com/scripts.asp?pg=2&ob=1&ob=asc&eDate=&n=&stop=&eLang=&eProd=.> Go

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Scripts for: All languages AND All ESRI software AND CAD

scripts 21-40 of 77

Resort by	Title	Software	Language	Author
	CAD to Shapes 1.2	ArcView GIS	Avenue	Johannes Weigel
	CAD Translation using a Table Driven Geoprocessing Script	ArcGIS Desktop	Python	Don Kuehne
	CAD World File Creator	ManOhirts-	Visual	Alan Peters

Done Internet



Questions?