



# Sharing Data Between CAD and GIS Systems

Lien Alpert  
Phil Sanchez



ESRI®

Twentieth Annual ESRI International User Conference • June 26-30, 2000

# Session Overview

- **Discuss current CAD strategies**
- **Outline ESRI's CAD support**
- **Demonstrate techniques for working with CAD data**



**ESRI**

# CAD Strategies

- **Organizations must identify their data management requirements**
- **Evaluate levels of interoperability between CAD and GIS data**



**ESRI**

# Different Levels of Data Incorporation

- **Conversion**
  - ArcCAD, ArcView CAD Reader, ArcInfo
- **Direct Read**
  - ArcView CAD Reader, ArcInfo
- **Database Integration**
  - CAD Client, ArcInfo



**ESRI**

# ArcCAD Overview

- **Add-on utility to AutoCAD that provides GIS tools within the CAD environment.**
- **Provides means for creating coverages from AutoCAD drawings**
- **Takes advantage of AutoCAD's tools to create and display spatial data**



**ESRI**

# ArcCAD Data Organization

- **Data model based on the PC ARC/INFO data model**
- **ArcCAD uses themes to organize spatial and tabular data**
  - **Types of themes include: Point, Line, Polygon, Annotation, and Record**
- **Theme features are represented by AutoCAD entities**



**ESRI**

# ArcCAD Data Management

- **Topology manages relationships between geometric features**
- **Entity-Feature link maintains relationship to the database.**
- **ArcCAD stores attributes in dbase files**
- **Can connect to external databases via ODBC (read-only)**



**ESRI**

# ArcCAD Functionality

- **Data Automation**
- **Display and Query**
- **Spatial Analysis**
- **Utilities**



**ESRI**



# Features of ArcCAD

- **Stores AutoCAD entity properties when creating themes**
- **Can capture complex AutoCAD entity information in the database such as block attributes and extended entity data**
- **Utilizes AutoCAD's editing and display tools**



# Summary of ArcCAD

- **ArcCAD introduced the first bridge between GIS and CAD systems**
- **Affordable solution for data creation**
- **Utilizes familiar data model**
- **Easy to share data with other ESRI products**



**ESRI**

# CAD Reader Overview

- **Extension to ArcView that allows users to view CAD drawings as another feature data source**
- **Theme manipulation functions include thematic mapping & spatial queries**
- **Supports MicroStation design files as well as AutoCAD drawing and DXF files**



**ESRI**

# CAD Reader Data Organization

- In addition to general functionality associated with feature themes, allows users to:
  - Select CAD layers to be viewed
  - Select whether to include AutoCAD block entities
  - Set the coordinate transformation



ESRI

# CAD Reader Data Management

- **Associates a read-only theme table with each CAD drawing theme storing entity properties such as**
  - Color
  - Line type
  - Elevation
- **Fields are added for each block attribute, tag, or database linkage in the drawing**
- **Converts to shapefile**



**ESRI**

# Additional ArcView CAD Support

- **ShapeDXF**
  - Standalone utility converts ArcView shapefiles to AutoCAD ASCII Drawing Interchange (DXF) file
  - Allows precision of 9
  - Attribute information extracted from the shape DBF file includes layer, color, elevation, and thickness



# Summary of CAD Reader

- **CAD Reader allows ArcView users to access CAD data**
- **Utilizes familiar theme organization**



# CAD Client Overview

- **Add-on application to AutoCAD and MicroStation**
- **Provides connection to ArcSDE**
- **Enables CAD users to operate within an enterprise GIS**



**ESRI**



# CAD Client Data Management

- **CAD data can be stored both geometrically as CAD objects and geographically as SDE features**
  - CAD objects are the native CAD data as they were originally created in the CAD host
  - CAD objects are directly linked to their associated SDE feature
- **Also stores the CAD properties in ArcSDE attribute columns**



**ESRI**

# CAD Client Data Management

- **Data can also be retrieved back into the CAD host using**
  - **Spatial queries**
  - **Attribute queries**
- **Allows attribute and geometric editing of retrieved data**



**ESRI**

# CAD Client Features

- **Customizable through API**
- **Able to view layers inside ArcInfo 8.x**
- **Storage & retrieval of CAD and ArcSDE feature annotation**
- **Expanded support for AutoCAD 2000**



# Summary of CAD Client

- **Extends AutoCAD and MicroStation functionality**
- **Provides CAD users access to ArcSDE data**
- **Enables enterprise access to CAD data**



**ESRI**

# ArcInfo CAD Support Overview

- **Provides tools for converting CAD data into GIS formats**
- **Can directly read native CAD drawings**
- **Represents drawings as feature datasets and feature classes**



**ESRI**

# ArcInfo CAD Support - Workstation

- **Converts CAD interchange files to coverages**
  - DXFARC
  - IGDSARC
  - IGESARC
- **Converts coverages to CAD interchange files**
  - ARCDXF
  - ARCIIGDS
  - ARCIGES



**ESRI**

# ArcInfo CAD Support - Desktop

- **Represents a CAD file as two unique entries**
  - As a CAD Drawing
  - As a CAD Feature Dataset
- **Supported CAD formats**
  - AutoCAD drawing files (.dwg) up to Release 2000
  - MicroStation design files (.dgn) up to Version 7
  - All ASCII, binary, and partial drawing interchange files (.dxf)



ESRI

# ArcInfo CAD Data Management

- **CAD Drawings**
  - **Ability to view native CAD drawings**
    - Allows users to view CAD data as it was originally rendered.
    - Helpful for preserving the unique appearance of a CAD drawing for layouts.



**ESRI**



# ArcInfo CAD Data Management

- **CAD Feature Datasets**
  - **Each CAD Feature Dataset contains three Feature Classes**
    - **Point**
    - **Polyline**
    - **Polygon**



**ESRI**

# ArcInfo Desktop CAD Functionality

- **With CAD Feature Classes you can perform operations such as:**
  - spatial and attribute queries
  - custom symbolization
  - labeling
  - conversion



**ESRI**

# ArcInfo Desktop CAD Functionality

- **Complex entity information is stored in the CAD feature attribute table**
  - AutoCAD Insert Names
  - AutoCAD Block Attributes
  - MicroStation Tag Values
  - MicroStation MSLink and Catalog values



**ESRI**

# ArcInfo CAD Support Features

- **GeoTransformations and Spatial References and can be applied to CAD data**
- **Ability to read associated world files**
- **Ability to document data - Metadata**
- **CAD functions can be customized with the ArcObjects developer tools**



ESRI

# New ArcInfo Desktop CAD Tools

- **ArcToolbox**
  - **CAD to Geodatabase**
    - Utility that converts CAD feature classes into Geodatabase feature classes
    - Maintains CAD property fields (i.e., layer, color, elevation, etc.)
    - Maintains spatial references of CAD data
    - Supports batch processing



**ESRI**



ESRI