Sharing Data Between CAD and GIS Systems

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Session Overview

- Discuss current CAD strategies
- Outline ESRI’s CAD support
- Demonstrate techniques for working with CAD data
CAD Strategies

- Organizations must identify their data management requirements
- Evaluate levels of interoperability between CAD and GIS data
Different Levels of Data Incorporation

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

- Data Automation
- Display and Query
- Spatial Analysis
- Utilities
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
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
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
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
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
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
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
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
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
ArcInfo CAD Support - Workstation

- Converts CAD interchange files to coverages
  - DXFARC
  - IGDSARC
  - IGESARC
- Converts coverages to CAD interchange files
  - ARCDXF
  - ARCIGDS
  - ARCIGES
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)
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.
ArcInfo CAD Data Management

- CAD Feature Datasets
  - Each CAD Feature Dataset contains three Feature Classes
    - Point
    - Polyline
    - Polygon
ArcInfo Desktop CAD Functionality

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