GIS

The Geographic Approach for the Nation

ESRI Federal User Conference

Washington, D.C. • February 17–19, 2010

Facilities Management Data Input, Editing and Management

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Overview

- What is FM in GIS?
- Data input
- Data editing
- Data management

Supporting the Real Property Life-Cycle

GIS Integrates the Facility Management Enterprise

What is Facilities Management in GIS?

- Requires multiple data models
- All the problems of a local government
  - Addressing
  - Utilities
  - Emergency Services
- Plus specialized needs
  - Runways
  - Office space

What is Facilities Management in GIS?

- Integration with multiple systems
- Portability of data
- Specialized analysis
  - Interior space
  - Ingress/egress
  - Efficiency
  - Proximity to other facilities

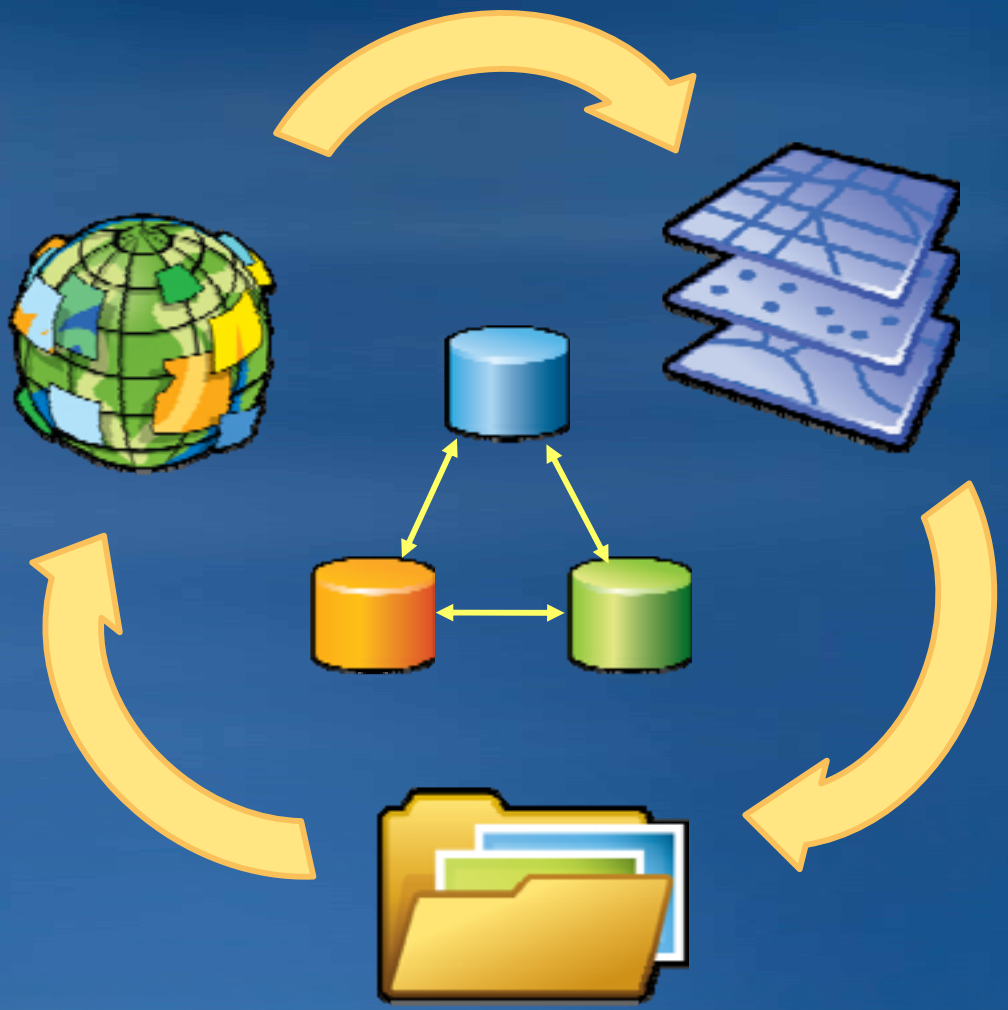
- Data input
  - Development area
  - Source data
  - Data model
  - Data capture

Data editing

- GIS vs. CAD
- Data integrity
- Data exchange
- What about 3D?

Data management

- Data storage
- Integration
- Export
- Analysis



Data Input

- Choose Functional Solution Areas
  - Master Planning
  - Real Estate Portfolio Mgmt
  - Maintenance Mgmt
  - Space Mgmt
  - Work Order/Project Mgmt
  - Asset Mgmt
  - Energy/Sustainability
  - Safety & Security
- Information often crosses functional areas

Data Input

- Identify your source data
  - Facilities with no data
  - Paper drawings
  - Non-standard CAD drawings
  - Standardized CAD drawings
  - BIM files
  - Data stored in external systems
  - Existing GIS data
- Each type of data requires its own handling method

Source Data

- Facilities with no data
  - Field data collection
  - Locate as-built drawings
  - Photographs
  - Automated collection (robots)
- All collection approaches are valid

Source Data

- Paper drawings
  - Scan and batch vectorize
  - Consider drafting individual layers
  - Manually digitize
- Spatial reference must be considered

Source Data

- Non-standard CAD drawings
  - Identify layers
  - Consider ETL tools
  - Can be very complex
- If CAD files provided by contractor, consider mandate for standardized data

Source Data

- Standardized CAD drawings
  - Map layers to GIS
  - One ETL to import all
- Consider benefits of importing vs. managing in CAD

Source Data

- BIM files
  - Consider the exchange format
  - Custom ETLs required to import to GIS
- Data loss is a great concern when going from BIM to GIS

Source Data

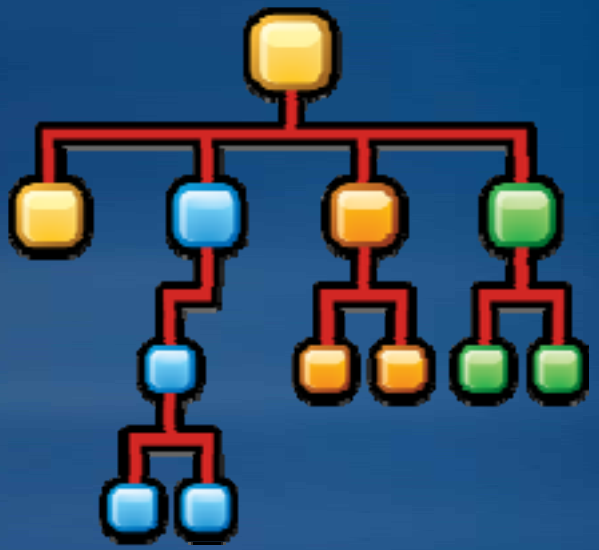
- Data stored in external systems
  - Interoperability issues
  - Data synchronization problems
  - Incompatible analysis models
- Consider whether to migrate or interoperate

Source Data

- Existing GIS data
  - General best case scenario
  - Security and access is easier to manage
- Remember that not all functional areas are GIS-aware

Data Input

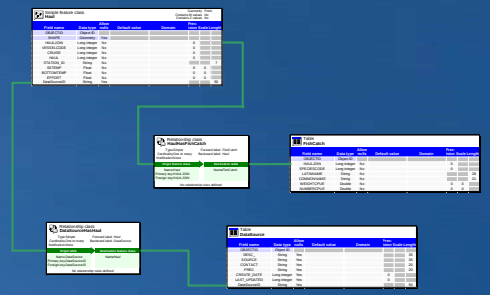
- Data model
  - Consider your target location
  - Database schema must support business rules
  - Support source data
  - Support application logic
- Leverage existing models
  - BISDM
  - Utilities
  - Parcels
  - Land management



GeoDatabase Data Models

Standardized Templates for Many Fields

- Address
- Agricultural
- Atmospheric
- Base Map
- Biodiversity
- Census-Admin
- Boundaries
- Defense-Intel
- Energy Utilities
- Environmental
- Forestry
- Geology
- Groundwater
- Health
- Historic Preservation & Archaeology
- Homeland Security
- Hydro
- IHO
- Land Parcels
- Local Government
- Marine
- National Cadastre
- Petroleum
- Pipeline
- Telecommunications
- Transportation
- Water Utilities
- **Building Interior Space**



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Geodatabase Entities

- Object Classes
  - Collection of attribute rows and columns
- Feature Classes
  - Collection of spatial features
- Feature Dataset
  - Collection of like feature classes
- Topology
- Relationship Classes
- Raster Dataset
- Annotation
  - Feature Linked and Stand-Alone

Object Classes

- Tables
- Stores non-spatial data
- Can have behavior
  - Subtypes
  - Domains
  - Default Values
- Examples:
  - Master Address File (MAF)
  - Street Name Dictionary (SND)
  - Special Address File (SAF)

Feature Classes

- Stores geographic data
- Stores geometry in SHAPE attribute
- Collection of similar features
  - Same geometry type
  - Same attributes
  - Same spatial reference
  - Same behavior
- Examples:
  - Centerline
  - Buildings
  - Administrative Boundaries

Feature Dataset

- Collection of feature classes that have
  - The same spatial reference
  - Explicit spatial relationships (i.e. topology, transportation network)
- Supports multiple geometry types
- *Not intended to be a container for logical organization of data with similar themes*

Topology

- Topology rules describe the spatial interaction between features
- Features participating in topology must be in the same feature dataset
- Topology rules are enforced during data validation and when editing using the topology editing tools
- Examples:
  - Election District boundaries must be coincident with centerlines
  - Intersection points must connect to centerline endpoints

Relationship Classes

- Persistent link between feature and object classes
- Stores:
  - Origin and destination tables
  - origin and foreign keys
  - Cardinality (1:1, 1:*, *:*)
- Differ from joins and relates in that they are not linked to an ArcMap document
- Traversed in ArcMap through the identify dialog
- Examples:
  - Streets have names
  - Common places have street centerline segments
  - Complexes have access points

Annotation Classes

- Support Annotation Classes
  - Different types of anno can have different properties
- Feature Linked
  - Related to a spatial feature class via relationship class
  - Dynamically updated
    - Annotation Value
    - Position
  - Can be created from labels
- Stand Alone
  - Independent from other entities

Subtypes

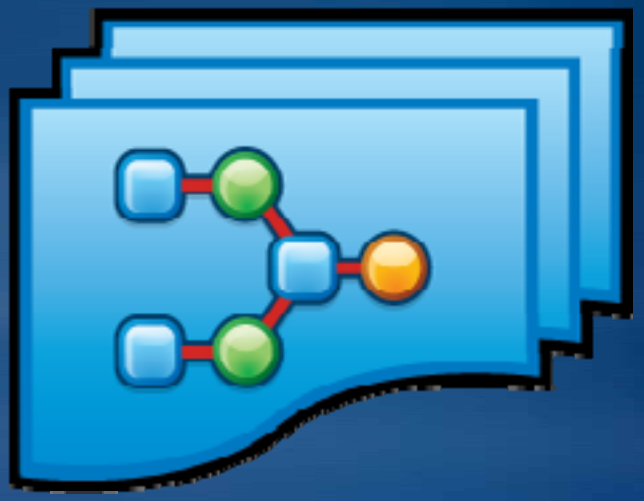
- A way of classifying features to a smaller level of granularity within a feature class
- Applicable to features that…
  - Share Attribution Scheme
  - Share Geometry Type
  - Differ in their specific characteristics
- Designing features to use subtypes is preferable to designing multiple feature classes (performance)
- Example:
  - Centerlines can be
    - Streets
    - Highways
    - Ramps
    - Bridges

Domains

- Valid value list similar to a look-up table
- Stored as a geodatabase property
- Applied to attribute columns
  - Can be applied to multiple fields
- Different subtypes can be assigned different domains
- Default domain values can be assigned
- Split / Merge Policies
- Examples:
  - True or False: Yes / No
  - Direction: N / S / E / W / NW / SW / NE / SE

Data Input

- Multiple data capture methods
  - Field collect
  - Digitize
  - Scan
  - Extract, Transform, Load (ETL)
  - Integrate
- Do what makes most sense
  - Field collect when nothing exists
  - Scan/digitize when GIS is primary target
  - Integrate when managed externally



Data Editing

- GIS vs. CAD
  - Sometimes easier to edit in CAD
  - ArcGIS for AutoCAD
  - Maintain in CAD
  - Analyze in ArcGIS
- Think about where the data normally lives

Data Editing

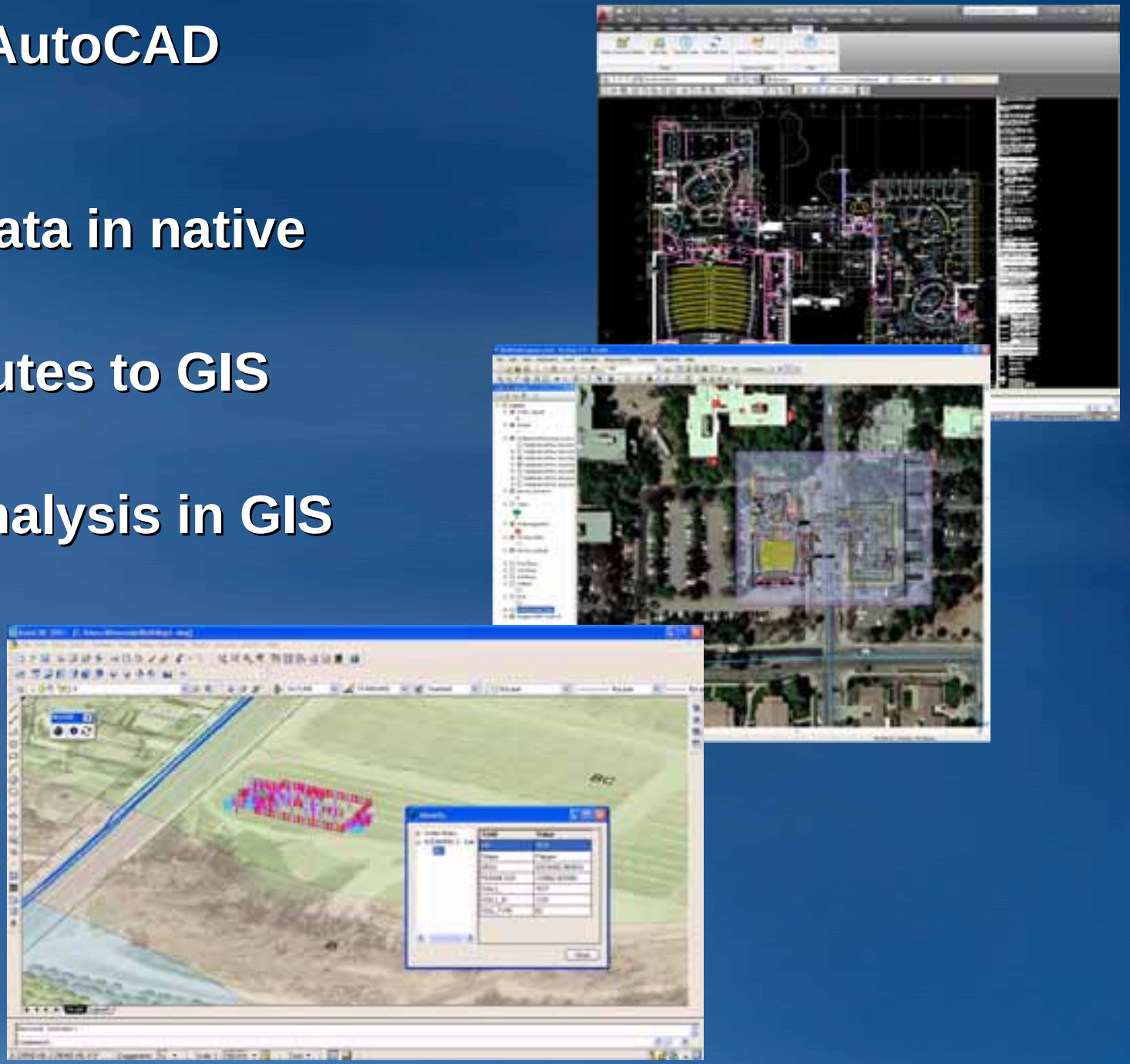
- Data integrity
  - Redundancy causes synch problems
  - Topology rules only work in GIS
  - Consider who is editing the data
  - Consider replication vs. export
- Data integrity is the responsibility of the most critical stakeholder

Data Editing

- Data exchange
  - Multiple exchange formats can be problematic
  - Integration with external systems requires management
- It is a general best practice to maintain data in its native system and leverage it in GIS
- You must decide which system is native

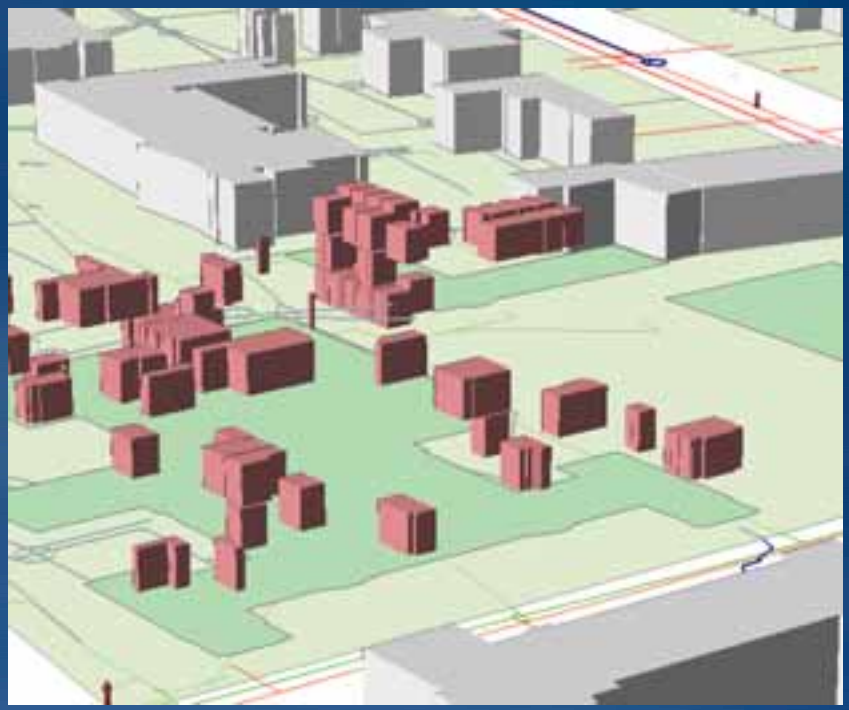
ArcGIS for AutoCAD

- Maintain data in native format
- Map attributes to GIS schema
- Perform analysis in GIS



Data Editing

- What about 3D?
  - Do you really need to store your data in 3D?
  - Extruded 2D is sufficient for most analysis
  - 3D editing tools are limited
  - 3D editing is difficult and time consuming
- Consider your 3D requirements
  - Is the exact height of a plug or switch needed?
  - Do you need to show windows, doors and other fixtures realistically?
  - Are you performing analysis based on real 3D?



Data Management

- Data storage
  - RDBMS
  - Replication
  - Users/Roles
  - Security

Data Management

- Export
  - Formats
  - Transformation
  - Analysis models
  - Potential data loss
  - Synchronization

Data Management

- Data Integration
  - External system requirements
  - Formats
  - Access
  - Synchronization

Data Management

- Analysis
  - Leverage external data
  - ArcGIS for AutoCAD
  - Model builder

Summary

- Data input
  - Consider your source
  - Consider your target
  - Develop a database schema that addresses your business rules
- Data editing
  - Maintain data where it makes the most sense
  - Leverage GIS where GIS power is crucial
  - Maintain non-spatial data in its native system
- Data Management
  - Think about how your users need to access the data
  - Work with providers of external systems they can play well with GIS

Links

- ESRI's Main Web Site:
  - http://www.esri.com
- ESRI Customer Support:
  - http://support.esri.com
- ESRI Services:
  - http://www.esri.com/services.html
- ESRI Training:
  - http://training.esri.com/gateway/index.cfm
- ESRI ArcGIS Resource Center:
  - http://resources.esri.com/gateway/index.cfm
- ESRI data models
  - http://support.esri.com/index.cfm?fa=downloads.dataModels.matrix
- Building Interior Space Data Model:
  - http://www.bisdm.org
- BISDM Download:
  - http://support.esri.com/index.cfm?fa=downloads.datamodels.filteredgateway&dmid=44

Questions?