GIS for Federal Buildings: BISDM Version 2

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Enterprise Real Property Management Track

PAPER SESSIONS

Managing Federal Real Property
Thursday, February 18 – 8:30-10:00 – Room 143C
Users from four different Federal agencies will explain some of their recent work in applying GIS to improve the management of their real property assets. Applications include supporting multiple sites, integrating with ArcGIS Web services and Google Earth, decision support solutions, and a facility data fusion solution.

Managing Real Property – Civilian Agency Applications
Thursday, February 18 – 10:30-12:00 – Room 143C
Users from various Federal civilian agencies will share their experiences in spatially enabling real property management applications. Examples will include a spatially enabled decision support solution, an application to optimize your interior space utilization, plus asset management and project management solutions.

Managing Real Property – Defense Agency Applications
Thursday, February 18 – 2:00-3:30 – Room 143C
Assets and services at Defense installations support numerous military missions and need to be managed in a cost-effective, safe, sustainable, and environmentally sound manner. In this session, you will hear from representatives of the Pentagon, Marine Corps, Navy, and Air Force on ways to improve the management of these vital assets.

Technical Workshops

GIS for Federal Buildings: BISDM Data Model Version 2
Thursday, February 18 – 4:00-5:30 – Room 156
This workshop will present recent revisions to the Building Interior Space Data Model (BISDM) version 2 template. The BISDM template has been successfully used and adapted in a number of real-world projects to meet a variety of enterprise integration and business application requirements in the past year.

GIS for Federal Buildings: 3D GIS for Facilities
Friday, February 19 – 8:30-10:00 – Room 156
New 3D GIS capabilities in ArcGIS provide facility managers with a set of tools to manage and assess existing facilities, as well as evaluate planned facilities. Attendees will be introduced to the different 3D display platforms and various spatial analysis tools.

GIS for Federal Buildings: Data Input, Editing and Management
Friday, February 19 – 10:30-12:00 – Room 156
As facilities managers consider implementing an enterprise solution, the most common issues are managing disparate data. How do I bring my paper drawings, spreadsheets, GIS, and CAD data into a common database to serve as the platform for an enterprise facilities management solution? This workshop will discuss the process, workflows, data models, and tools required to input, edit, and manage an enterprise facilities management database.

User Group Meeting

SIG – Buildings & Facilities Data Theme
Friday, February 19
2:30-4:00
Room 156

Topics

- Quick History of BISDM effort
- Layout of BISDM Version 2 and Supporting Resources
- Core Object Model and Attribute Enhancements
- New Support for Assets and BIM-GIS integration PTC's
- BISDM Version 3 Highlights (Late Summer 2010)
  - support for 3D objects and transportation networks

Quick History of BISDM Effort

GIS Is Core Technology
It is used to build Information Systems

Supporting Many Professions, Workflows and Application Domains

Cartographic Information System

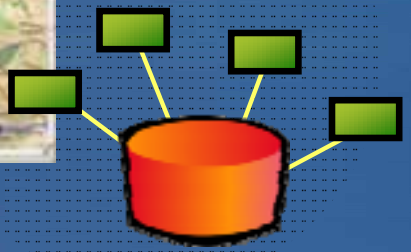
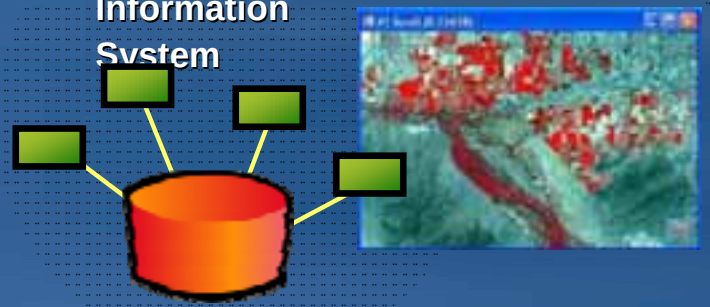
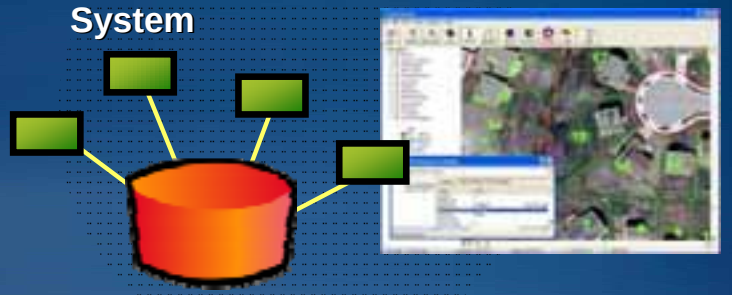


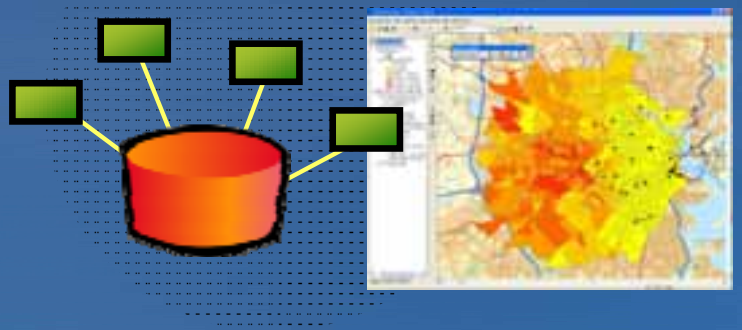
Image Information System



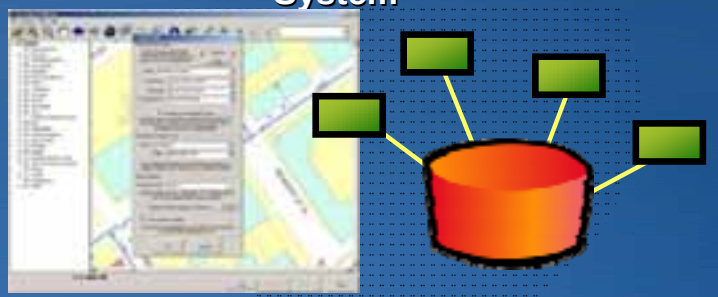
Cadastral Information System



Business Analysis System



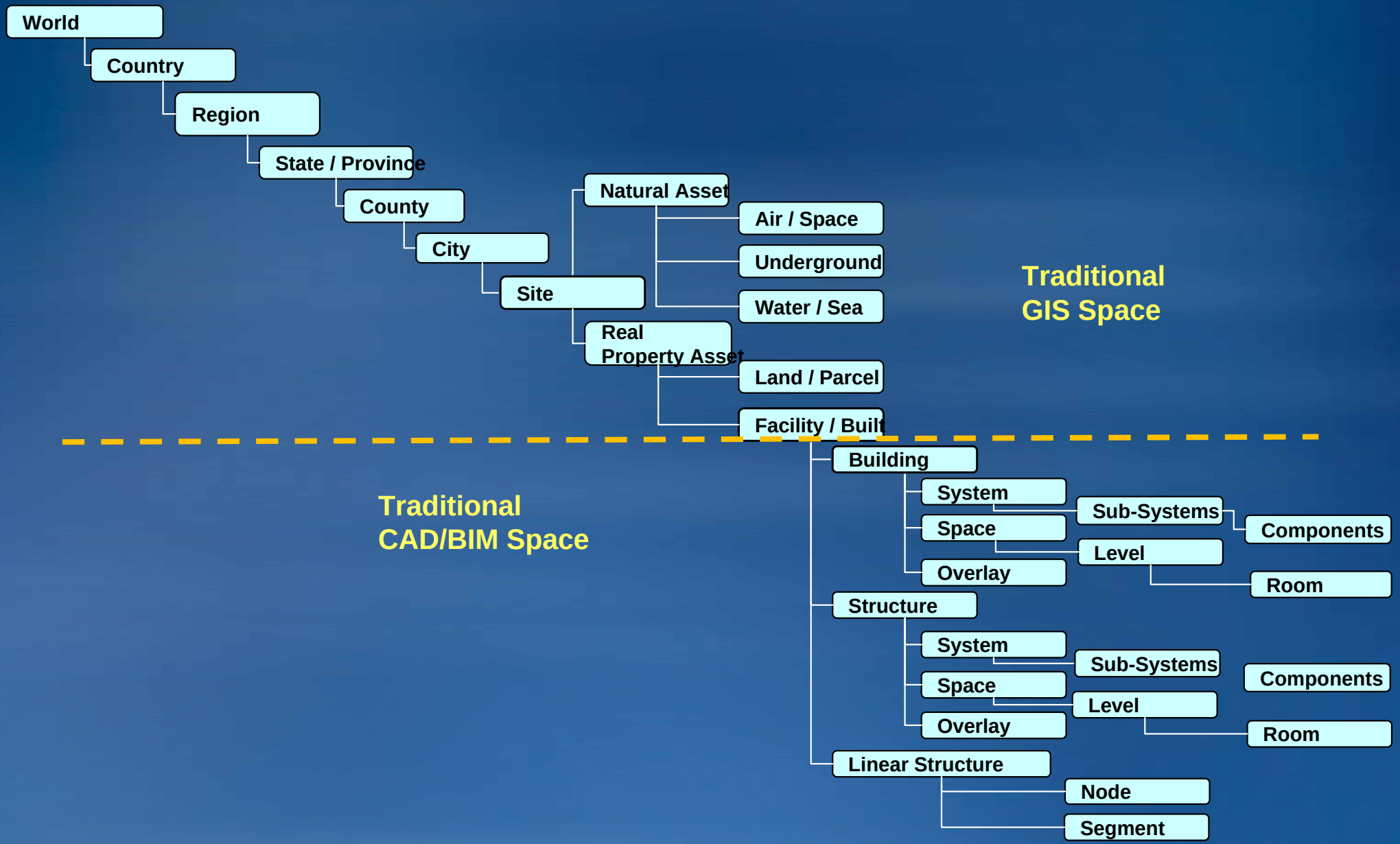
Facility Management System



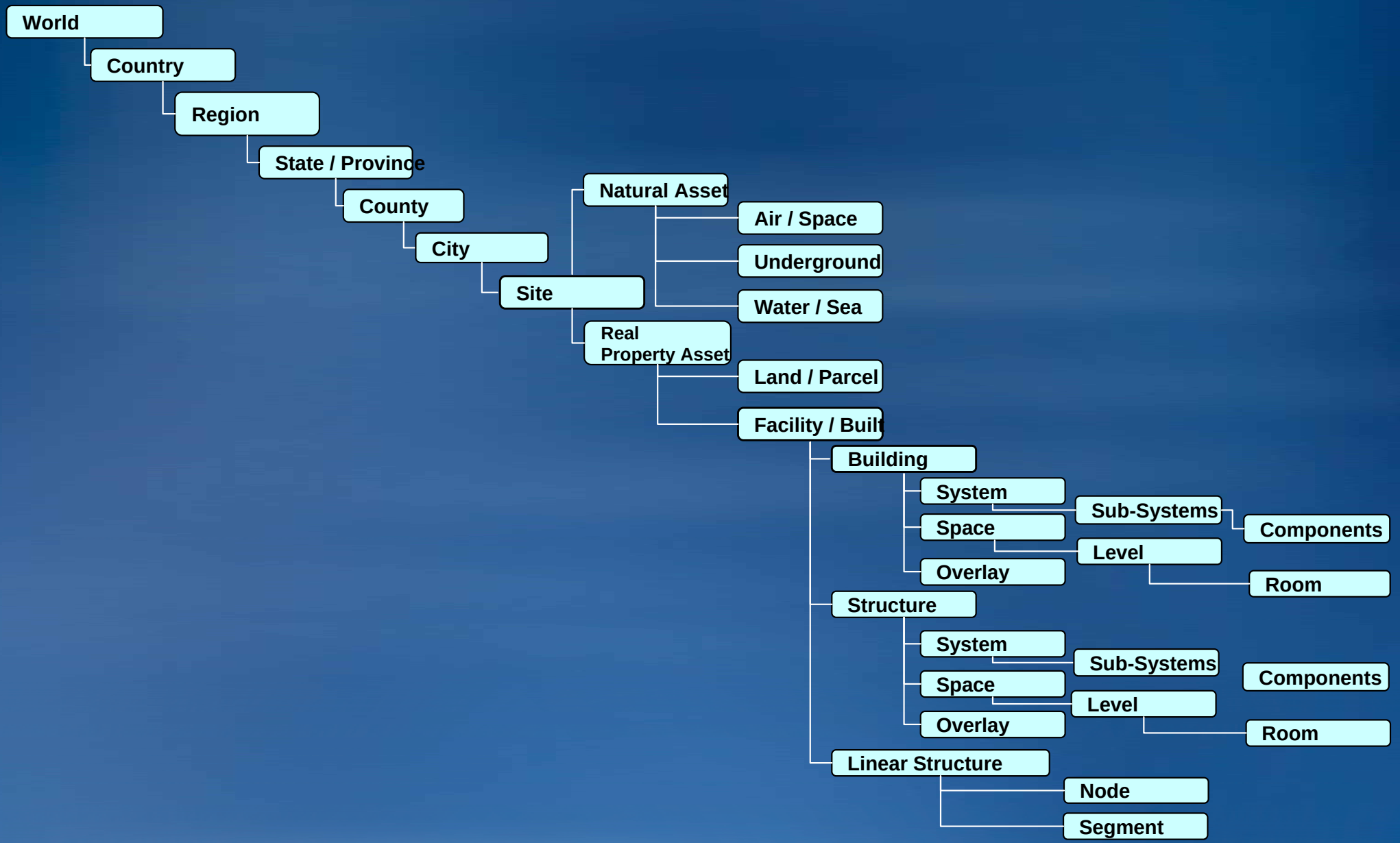
Information Systems for

- Natural Resources
- Land Use Planning
- Transportation
- Land Management
- Business Analysis
- Geospatial Intelligence
- Defense
- Visualization
- Scientific Analysis
- Public Safety
- Demographics
- Health Care
- Cartography
- Asset Management

Total Scalability Using GIS



Total Scalability Using GIS



Manage, Analyze, and Report building data at all scales

City

Campus

Building

Rooms
Equipment
Furniture

Building Attributes:

Owner / Occupant
Form / Function
Deferred Maintenance
Value (FRV) / Charge back
Asset Condition (CI)
Utilization/ Predominant Use
Sustainability / LEED

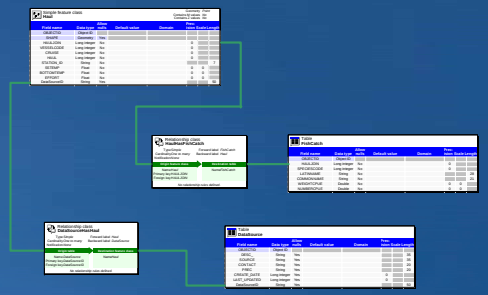
Building Systems:

Fiber / Telecom
Power / Water / HVAC
Emergency / Security
Environmental / Energy Star
Alternative Energy

ESRI Geodatabase Data Models

Standardized Templates for Many Fields

- Address
- Agricultural
- Atmospheric
- Base Map
- Biodiversity
- Carbon Footprint
- 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



ESRI's Building Interior Space Data Model (BISDM) for GIS

An user community effort

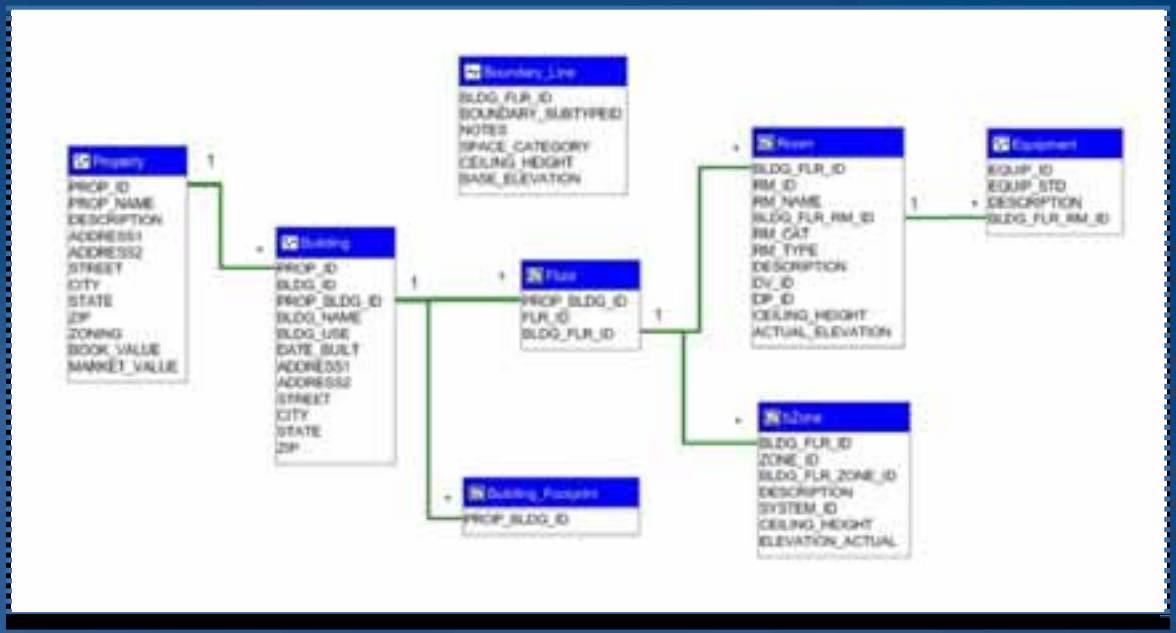
- Started in summer 2007
- Build template to serve many uses cases and compatible technologies
- Real-world project tested
- Support property, building, and asset objects
- Models, supporting documentation, data loading tools, and sample viewers at www.esri.com/datamodels

Geodatabases support Real Property Industry Specifications

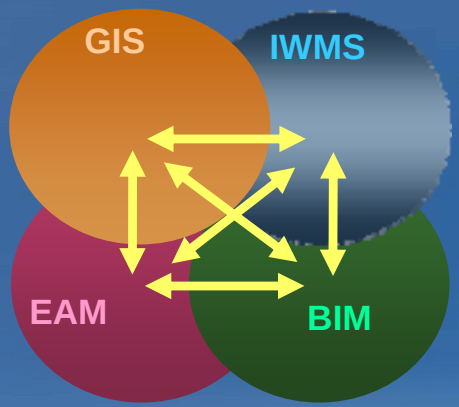
- Defining and measuring building space
  - BOMA and FICM
- Classifying building space -- form, function, assets
  - Open Standards Consortium for Real Estate (OSCRE)
  - OmniClass™
- Building information models (BIM)
  - NBIMS a buildSMART initiative
  - Industry Foundation Classes (IFC)
- Building object information exchange
  - Construction Operations Building Information Exchange (COBIE) a buildSMART initiative

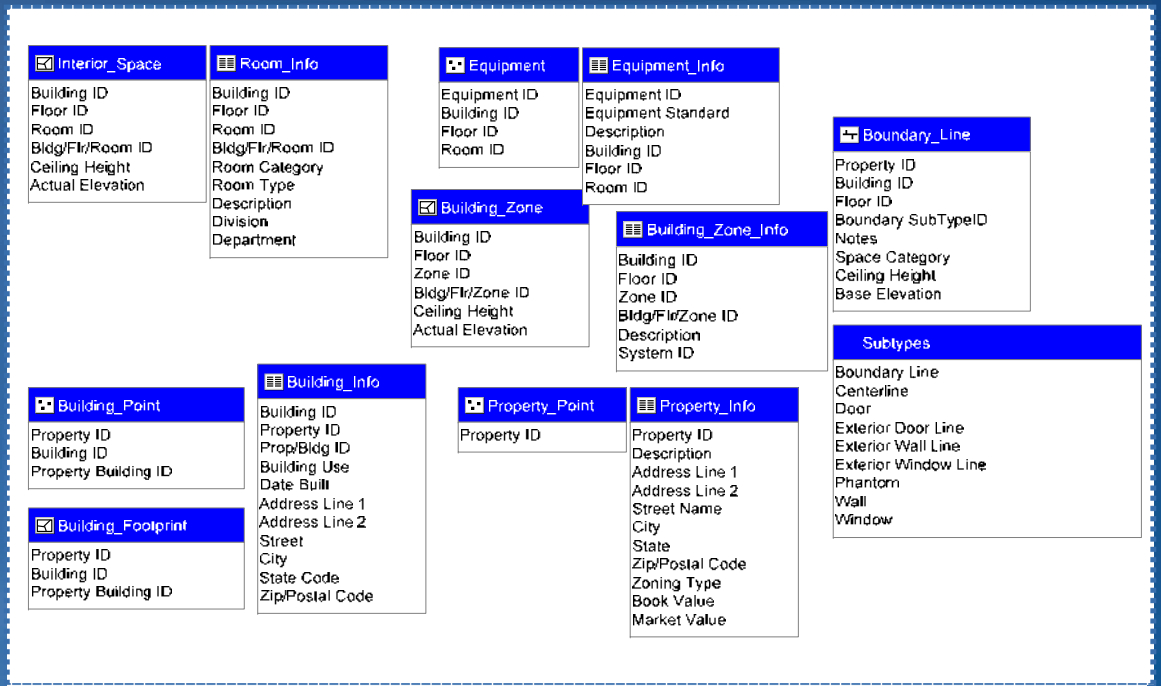
Split and Merged BISDM's

- **Merged**
  - **GIS only**



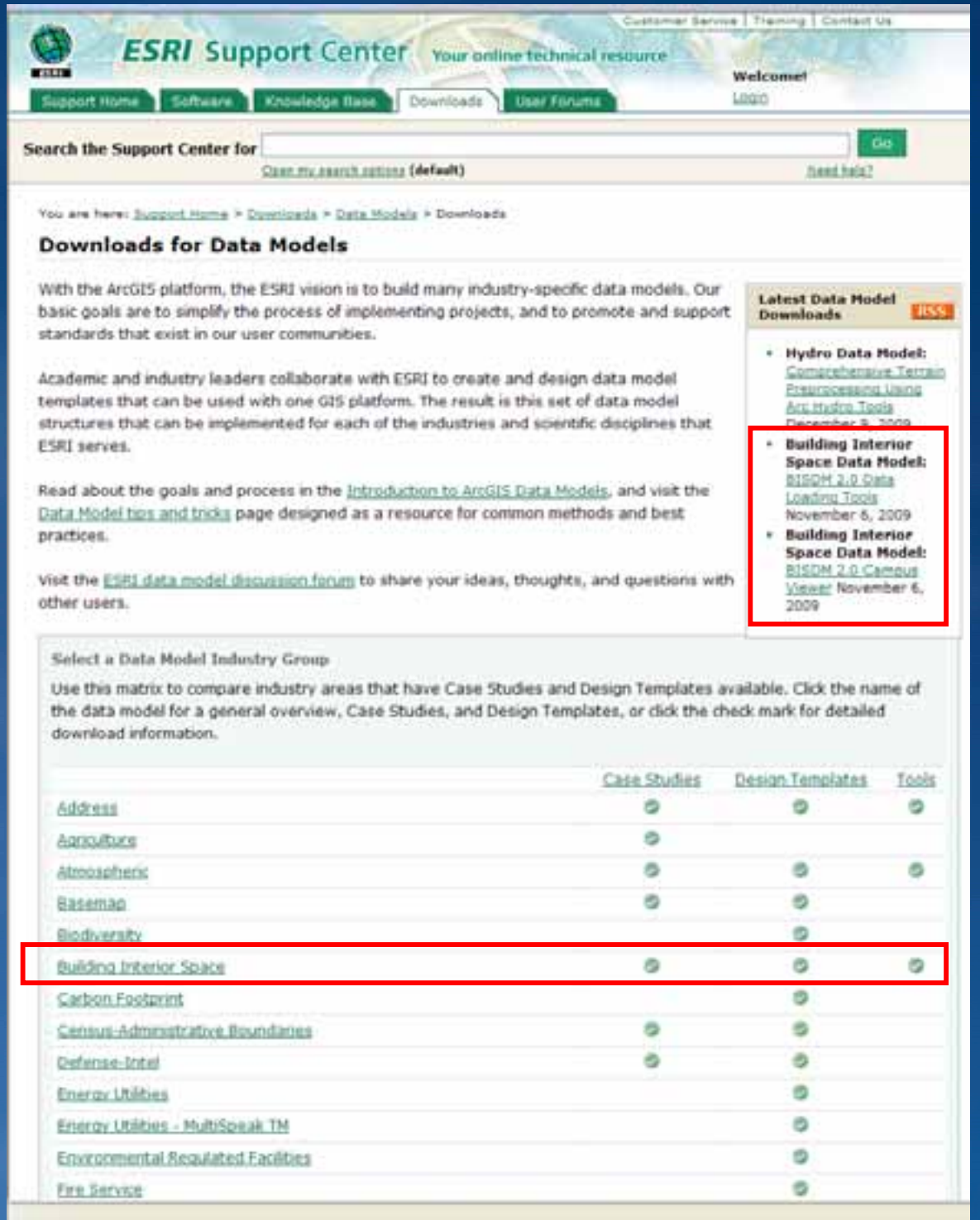
- **Split**
  - **GIS + BIM/EAM/IWMS**





ESRI Geodatabase Data Models

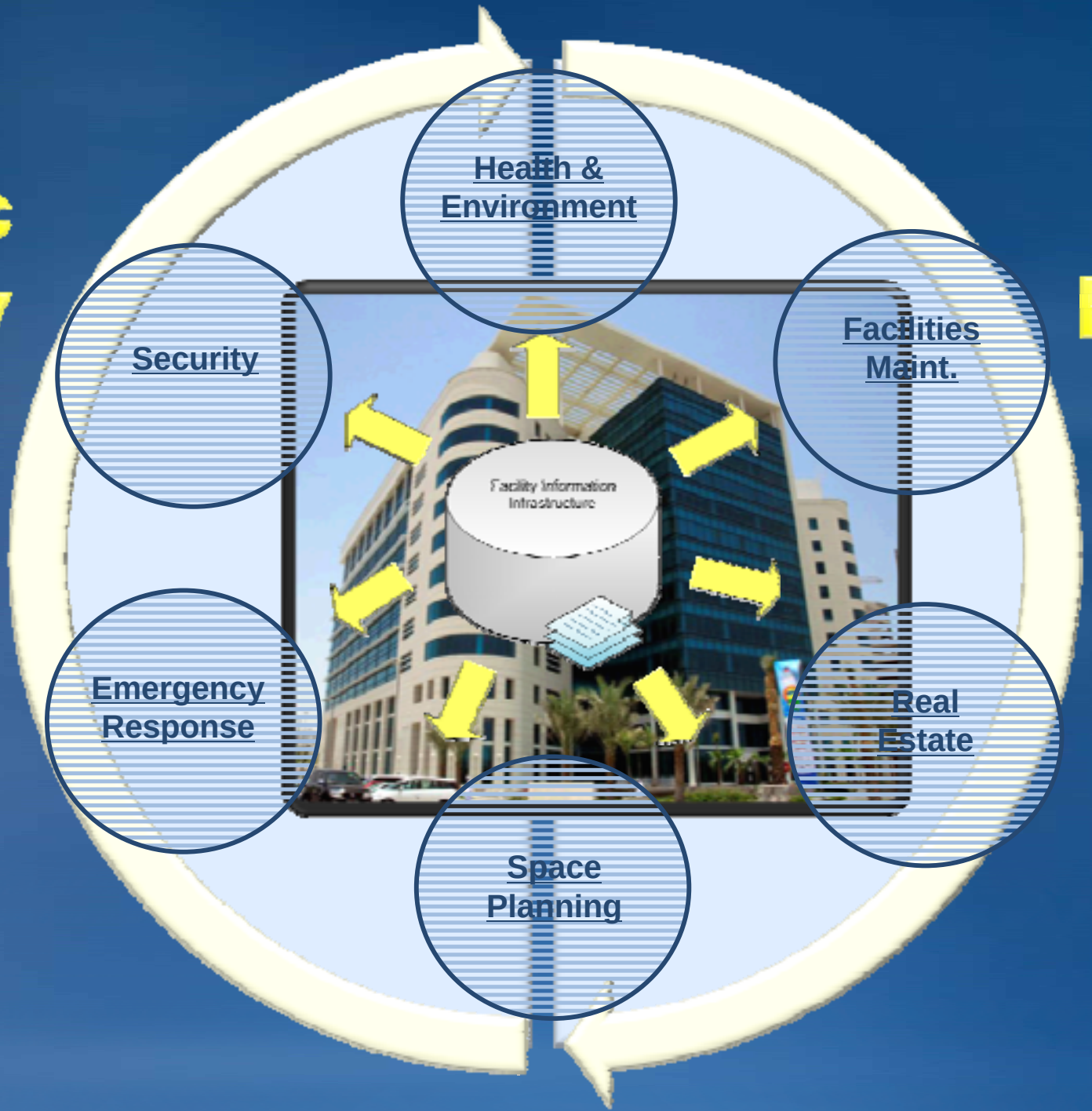
- Go to www.esri.com/datamodels



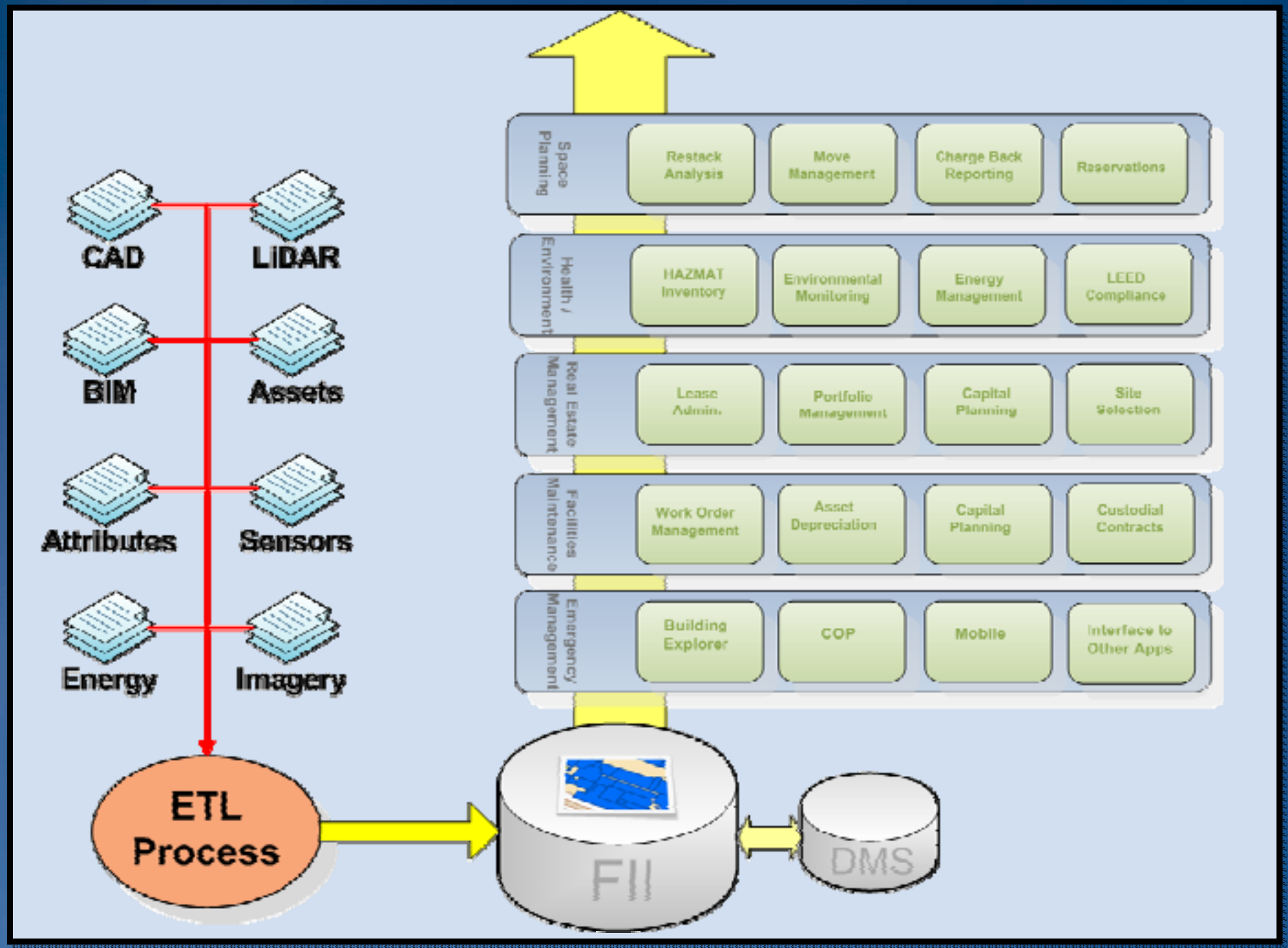
Layout of BISDM Version 2 and Supporting Resources

Core Object Model and Attribute Enhancements

Facilities GIS Serves Many Masters



BISDM is designed to be adapted to many purposes



BISDM 1.0

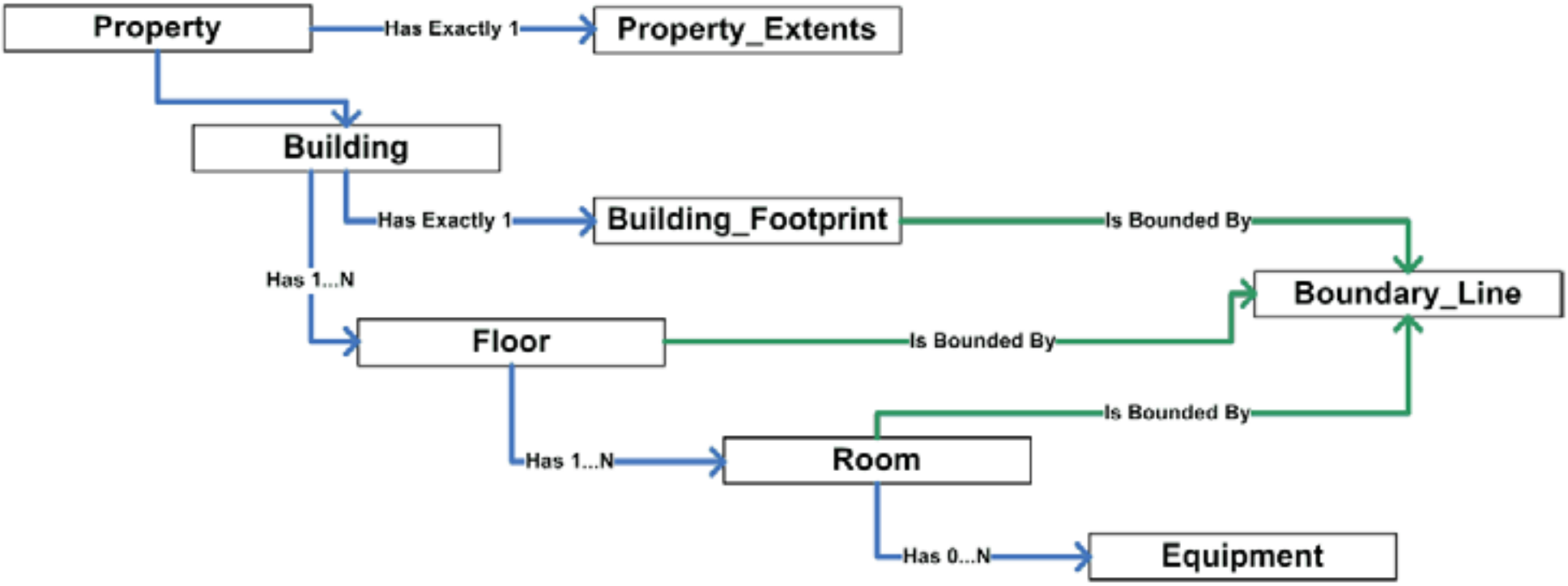
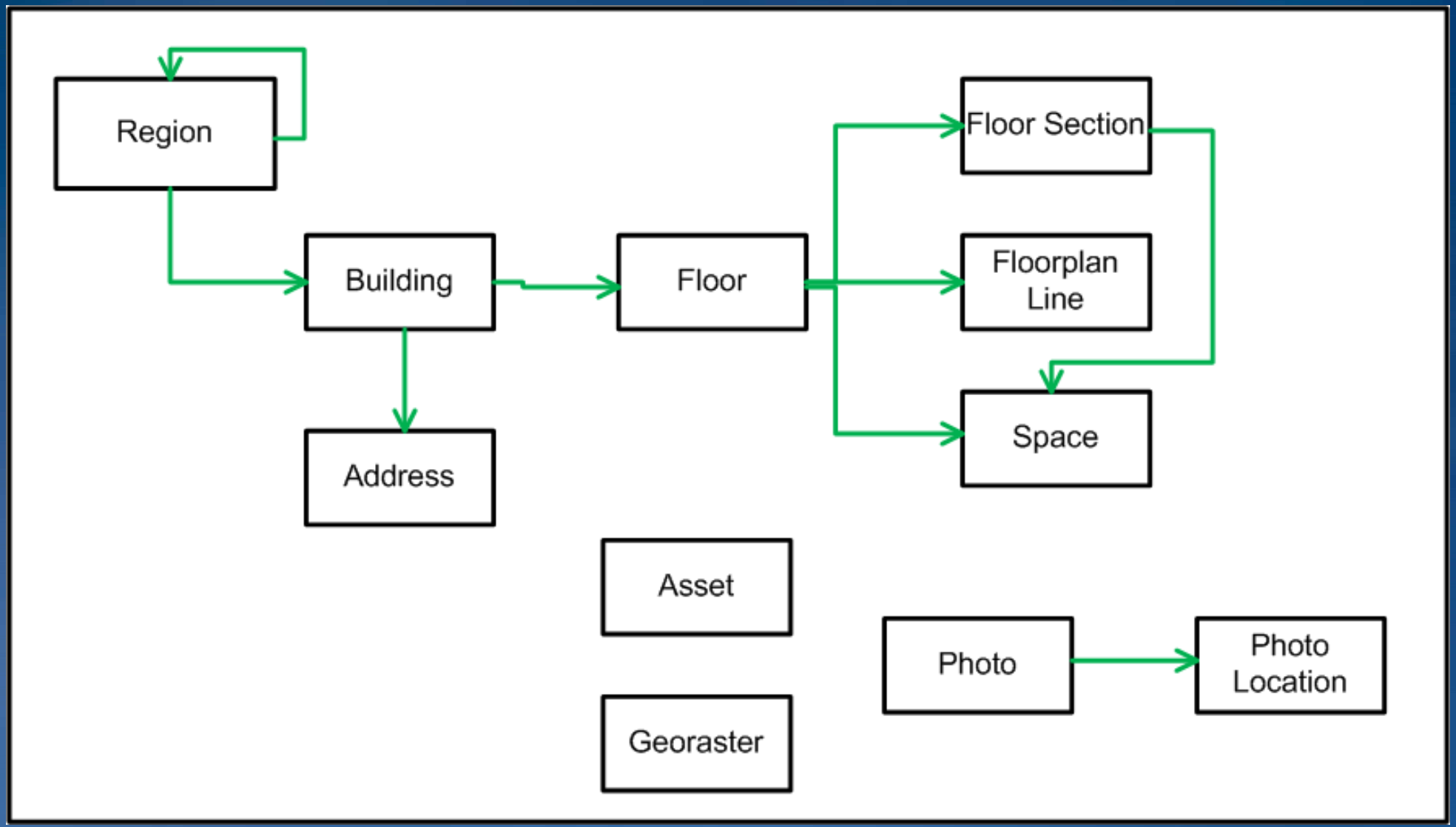


Figure 3. Data Model Hierarchical Structure Diagram

BISDM 2.0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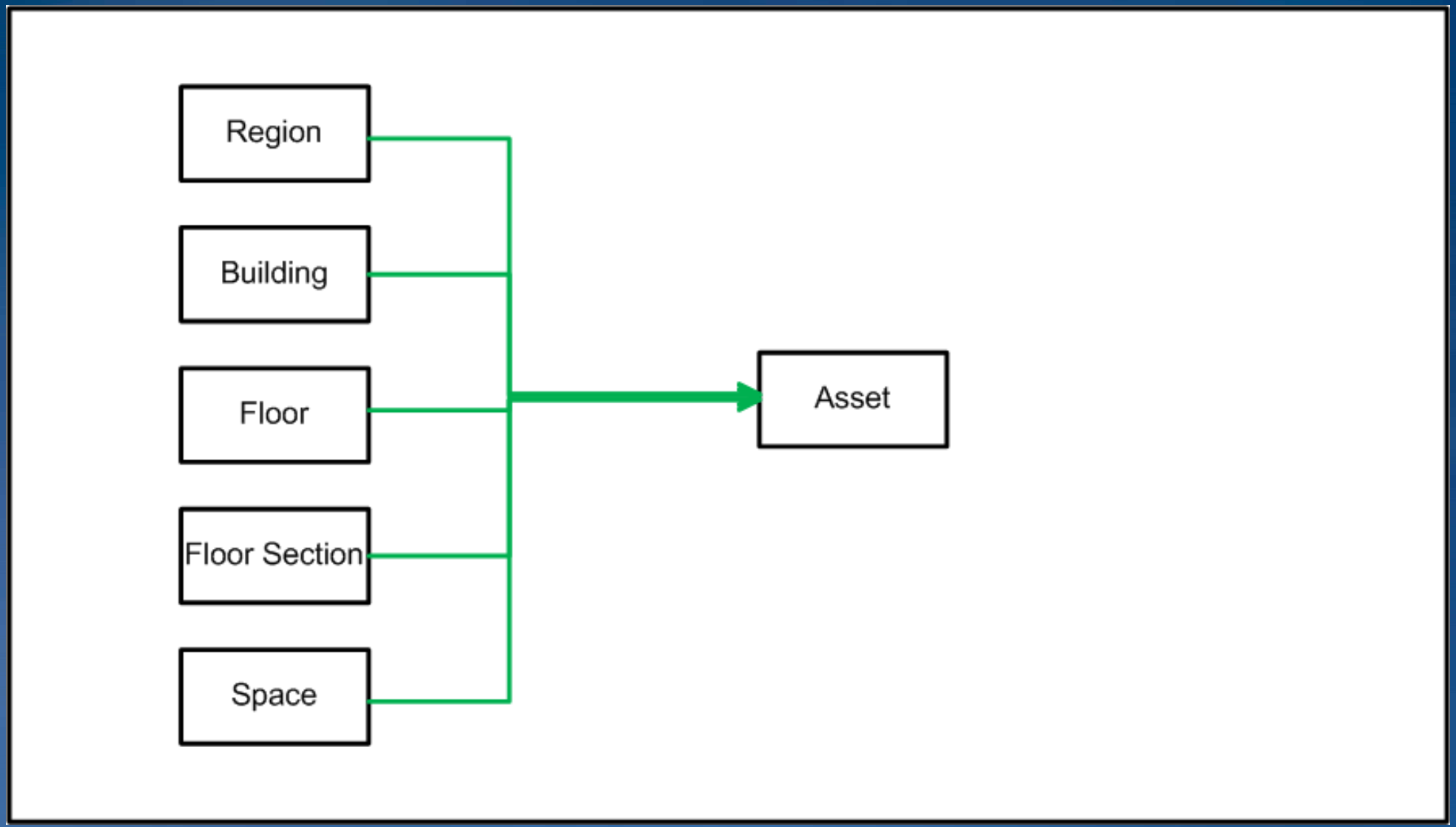
BISDM 2.0



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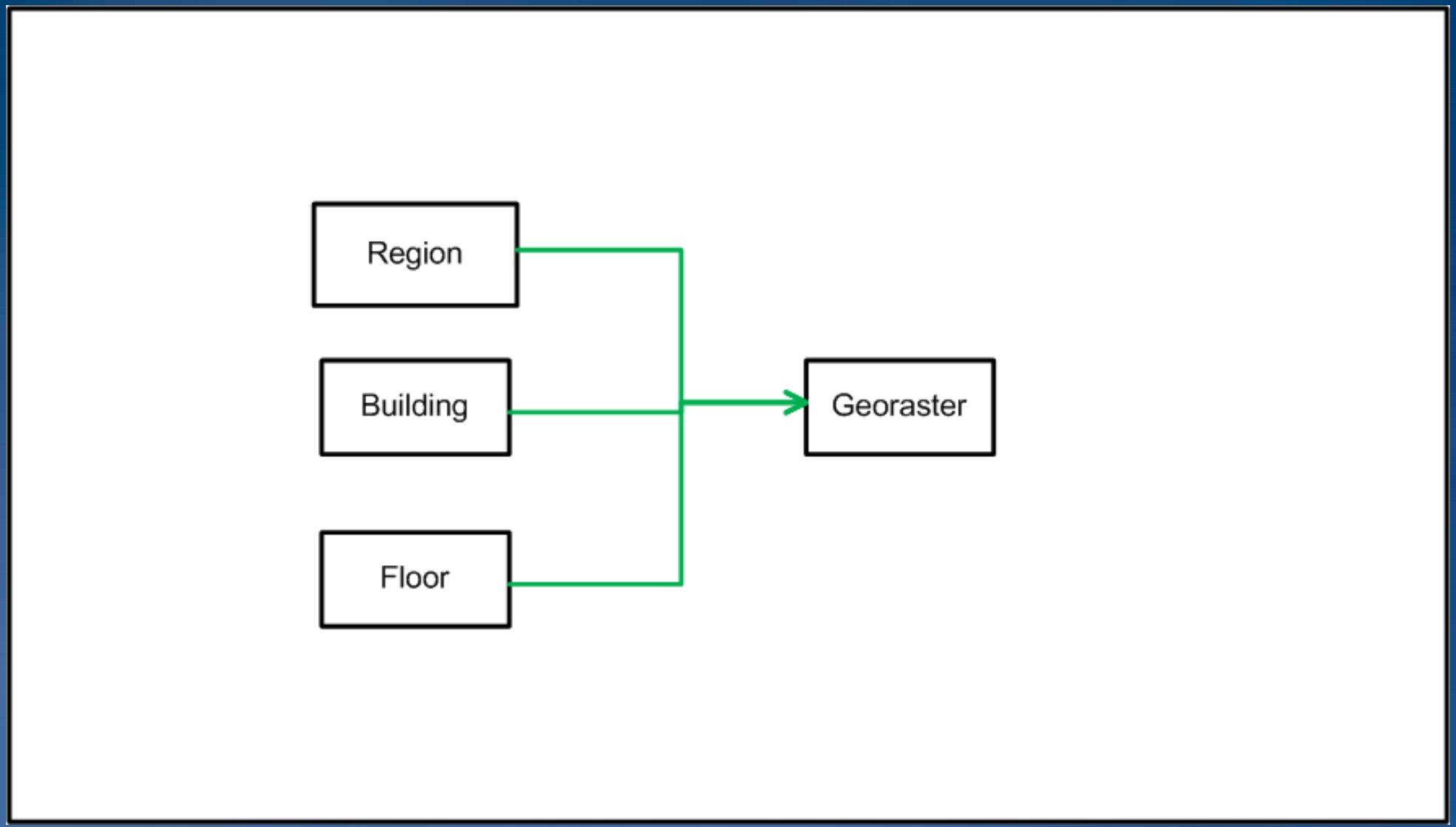
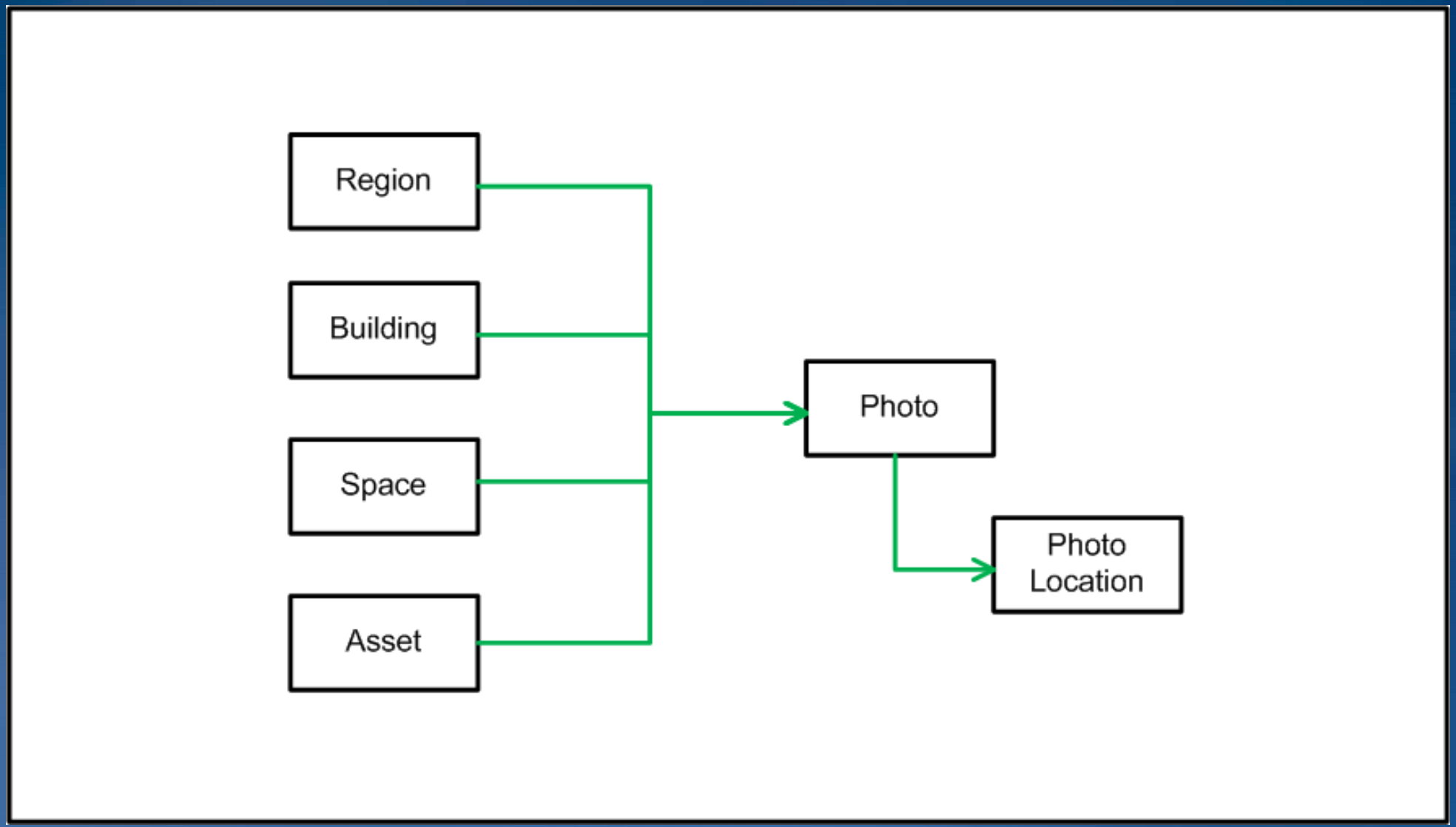


BISDM 2.0



BISDM 2.0

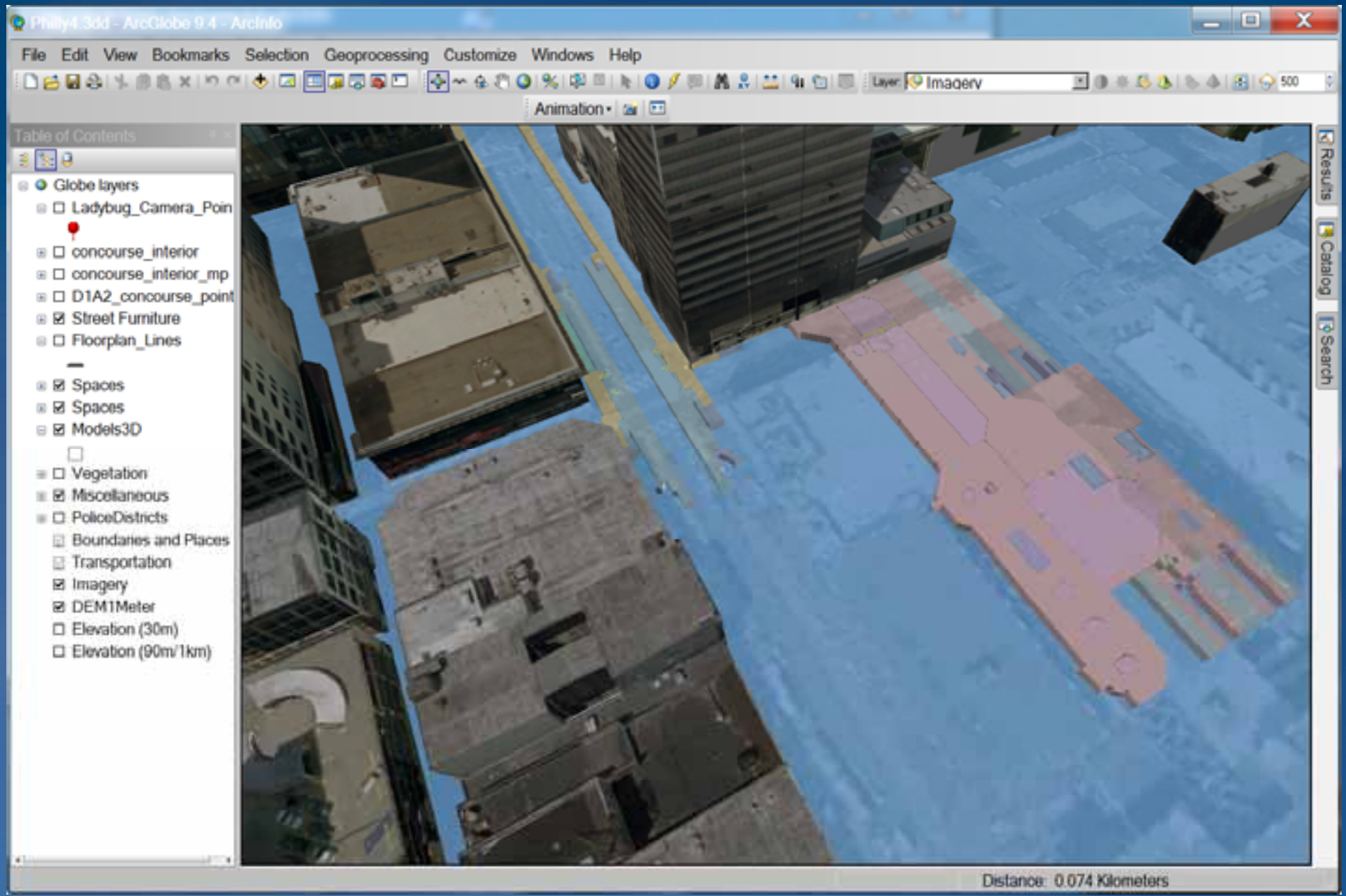
Floor	Represents the floors contained in a building.
FLOORID	The unique identifier for the floor.
BUILDINGID	Used to identify the building in which this floor is found.
SHORTNAME	The floor number if there is one (e.g. 1, 1B, 2), otherwise null.
VERTICALORDER	Used to reliably sort the floors by vertical order as base elevation is not always known.
BASEELEVATIONM	The base elevation of the floor in meters.
DESCRIPTION	A short description of the floor (e.g. 'Basement').
LASTUPDATE	The last date when this record was updated
LASTEDITOR	The user name of the person that made the last update

FloorSection	Represents a logical or physical division of a single floor. One or more floor sections define a wing, zone, etc.
SECTIONID	The unique identifier for the floor section.
FLOORID	Used to identify the floor to which the floor section belongs.
SHORTNAME	The name of the floor section (e.g. 'East Wing').
SECTIONTYPE	Type of floor section
DESCRIPTION	A short description for the floor section.
HIGHVERTORD	High vertical order for a path that spans multiple floors
LOWVERTORD	Low vertical order for a path that spans multiple floors
LASTUPDATE	The last date when this record was updated
LASTEDITOR	The user name of the person that made the last update

BISDM 2.0

InteriorSpace	Represents an interior space such as hallways, rooms, and stairwells.
SPACEID	The unique identifier for the space.
FLOORID	Used to identify the floor in which this space is found.
SECTIONID	Used to identify the floor section (e.g. wing, zone) in which the space is found.
SHORTNAME	The space name/number if there is one, otherwise null.
DESCRIPTION	A short description for the space.
SPACETYPE	Used to identify the space type if there is one, otherwise null.
LONGNAME	The space name if there is one, otherwise null.
MEASUREMENTSTD	The measurement standard to which the space boundaries are drawn (e.g. BOMA, FICM, etc). If null, no measurement standard can be assumed.
SPACECATEGORY	Used to identify the space category if there is one, otherwise null.
BASEELEVATION	The base elevation of the space if known, otherwise null.
CEILINGHEIGHT	The most common ceiling height for the space if known, otherwise null.
CEILINGMATERIAL	Used to identify the ceiling material for the space if known, otherwise null.
FLOORMATERIAL	Used to identify the floor material for the space if known, otherwise null.
DEPARTMENT	The department to which this space belongs (e.g. 'Engineering').
DIVISION	Company Division
NOTES	Used to store additional notes about the space.
ACCESSTYPE	Used to identify the access type for the space (e.g. private, public).
CAPACITY	The total number of occupants allowed in this space.
OCCUPANCY	The total number of occupants assigned to this space.
REPAREA	The reported area of the space in meters.
REPPERIMETER	The reported perimeter of this space.
REPWINDOWAREA	The reported window area for this space in meters.
STATUS	The status of the space (e.g. Closed for repair).
ORGANIZATION	Used to identify the organization assigned to the space.
LASTUPDATE	The last date when this record was updated
LASTEDITOR	The user name of the person that made the last update

BISDM 2.0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D1A2_concourse_point
Street Furniture
Floorplan_Lines
Spaces
Spaces
Models3D
Vegetation
Miscellaneous
PoliceDistricts
Boundaries and Places
Transportation
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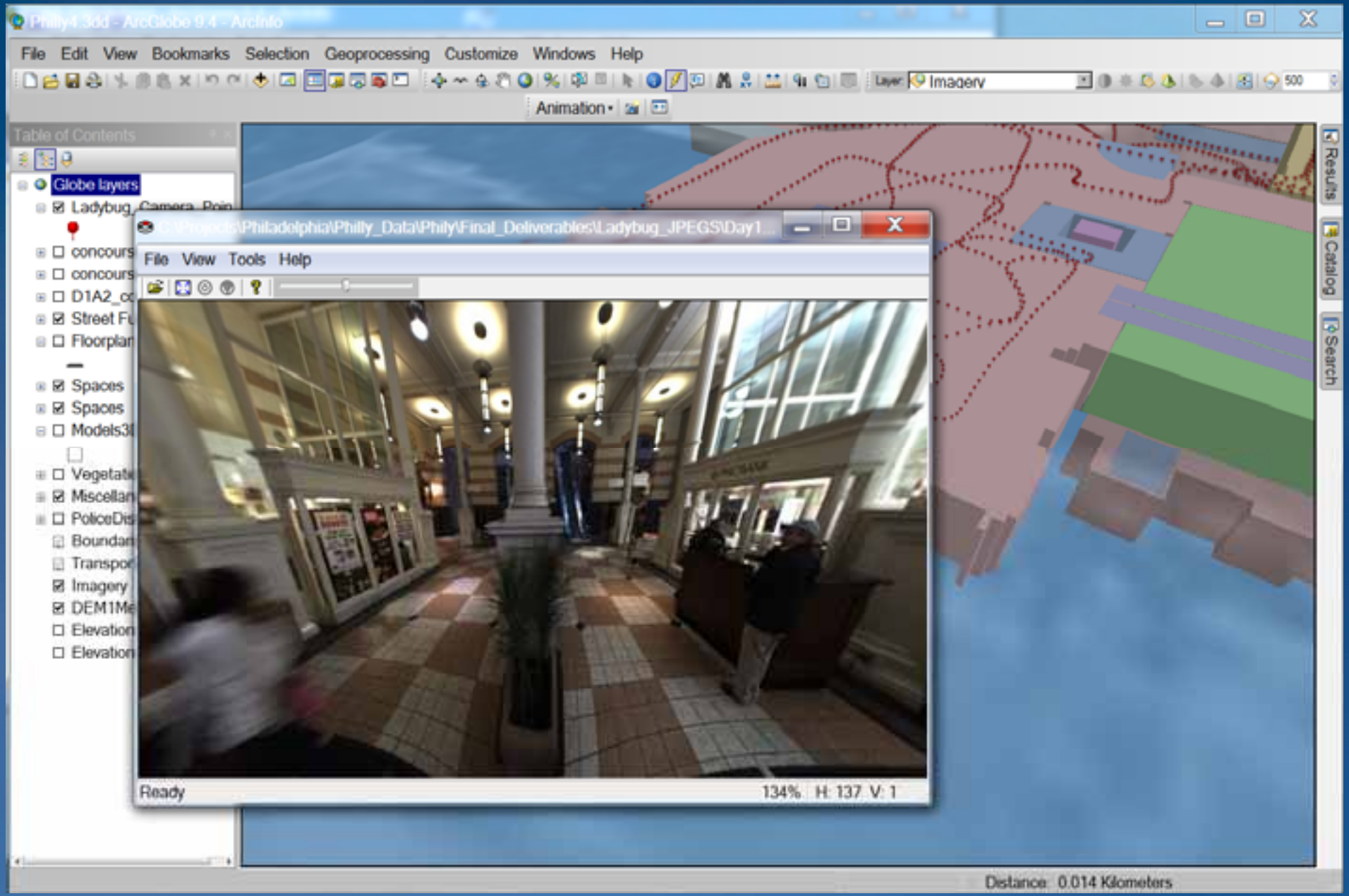
BISDM 2.0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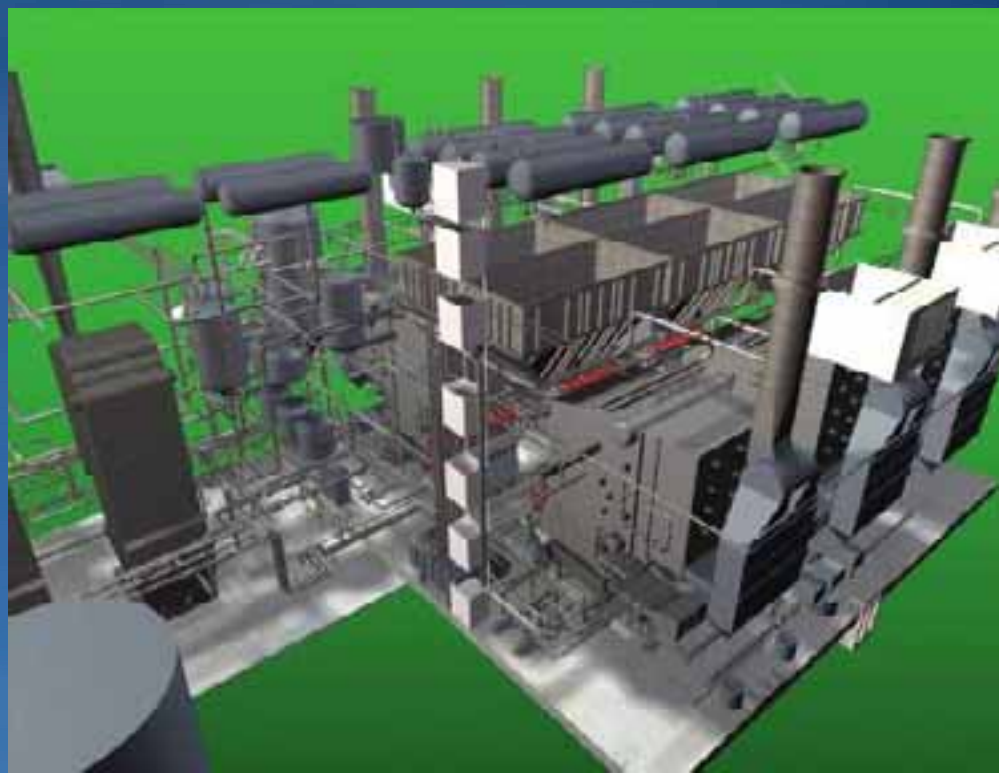
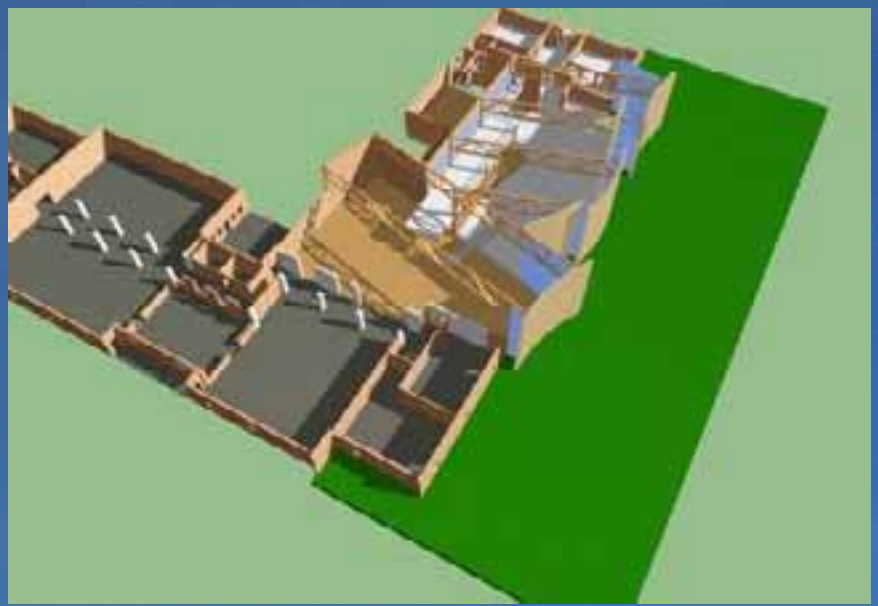
New Support for Assets and BIM IFC's

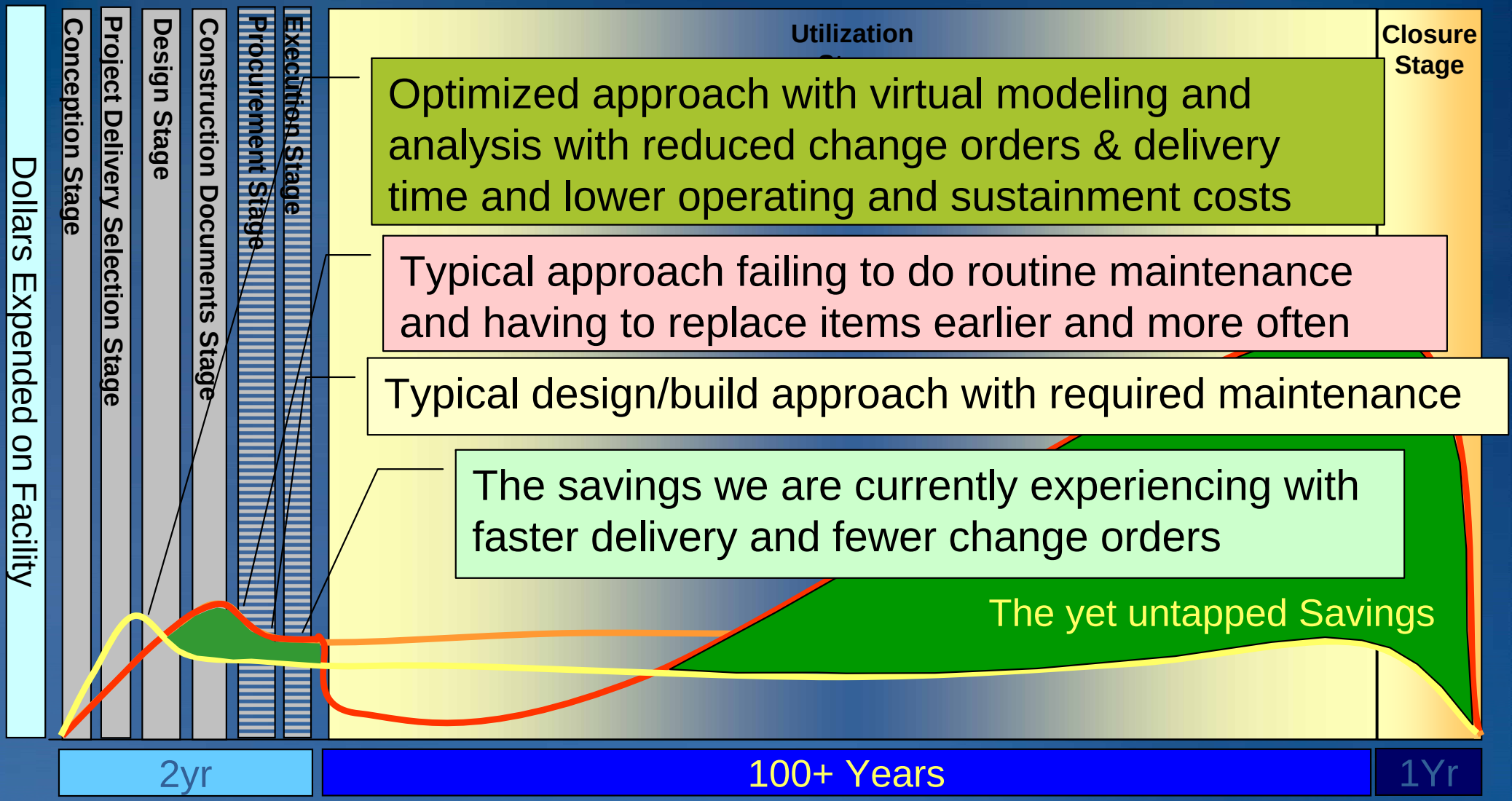
BIM Provides Benefits for Design and Construction

- Improved design process
- 3-D visualization for owner
- Coordination between disciplines
- Interference checking
- Facilitates energy efficiency and LEED
- Automated quantity take offs
- 4-D scheduling
- Improved documentation of design intent
- Potentially used for fabrication





BIM is Not being used for Lifecycle Asset Management



Courtesy of DKS Information Consulting, LLC

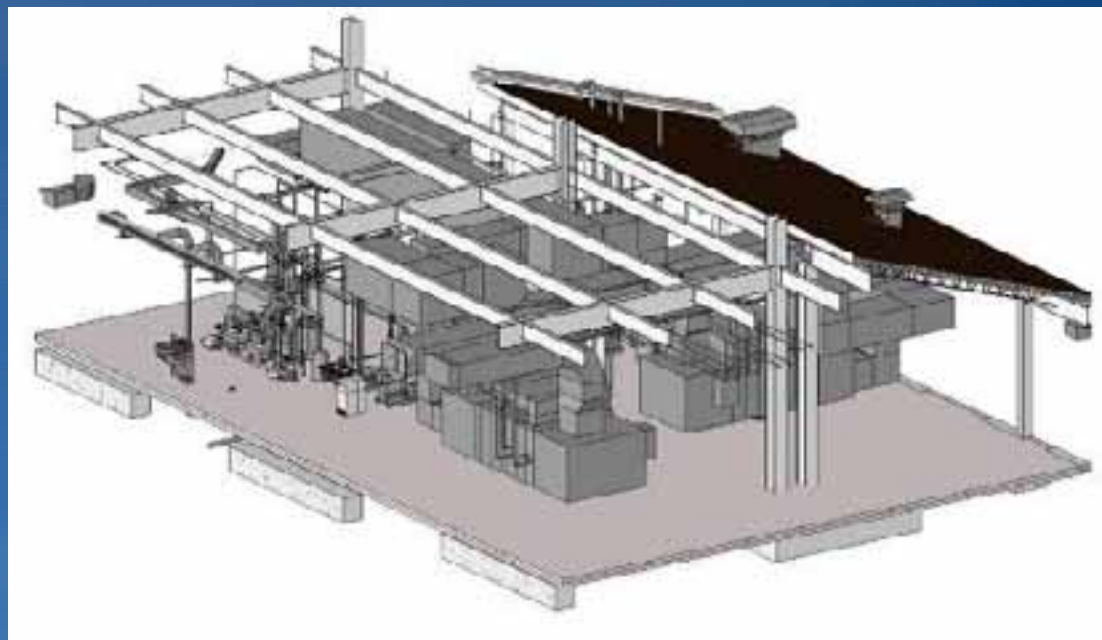
Should We Use BIM As a Spatial Data Repository?

- File-based
- Proprietary data formats
  - Exports to IFC not uniform
- Not easily query-able across multiple facilities
- Not scalable to large number of users
  - BIM Server technology limited to design focus
- Limited security
- No clustering, failover, etc.

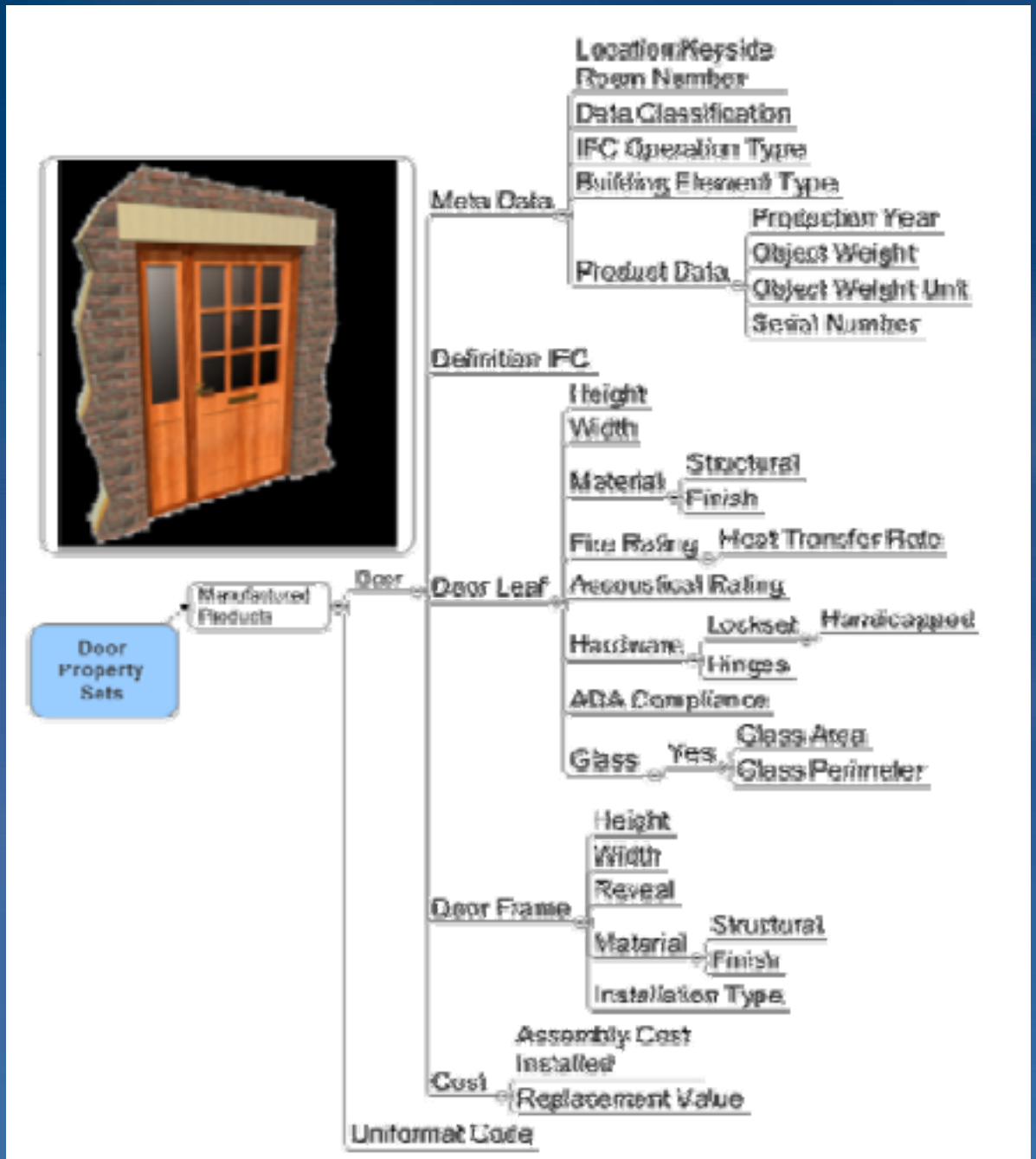
Not a Viable Solution –

The Spatial Repository

Should be GIS



Elements in BIM are Created at a High Level of Detail



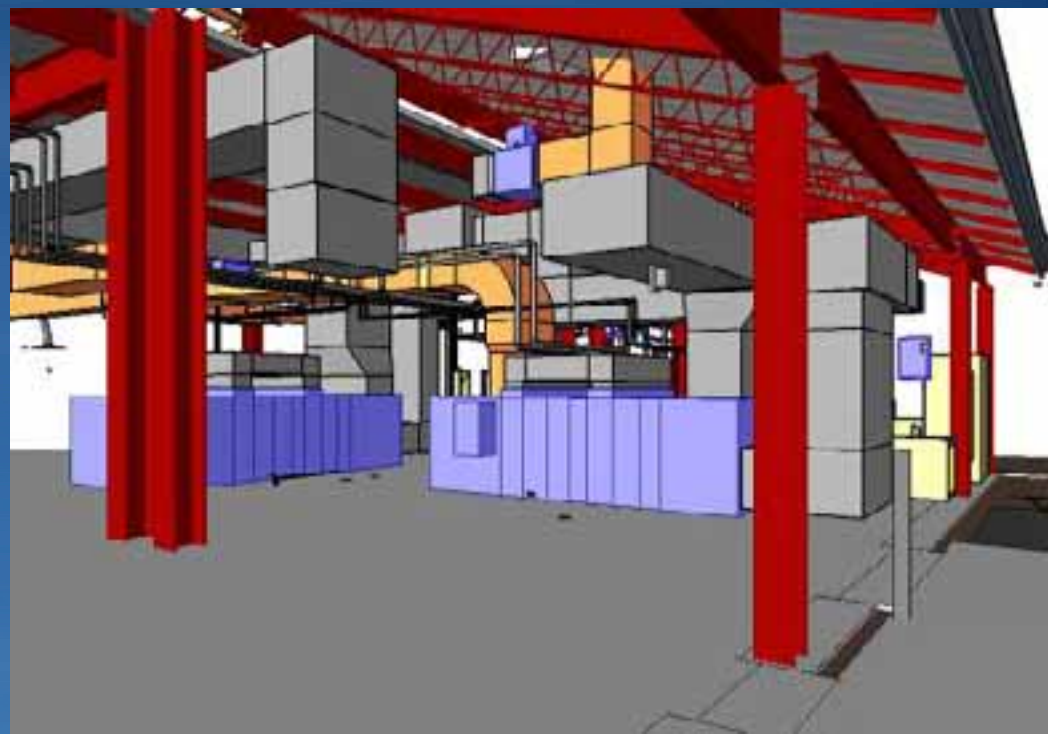
Door Data Property Sets Courtesy AEC Infosystems, Inc.

This data is required to convey the information needed to construct the facility.

All BIM products export BIM data to and Industry Foundation Classes (IFCs)

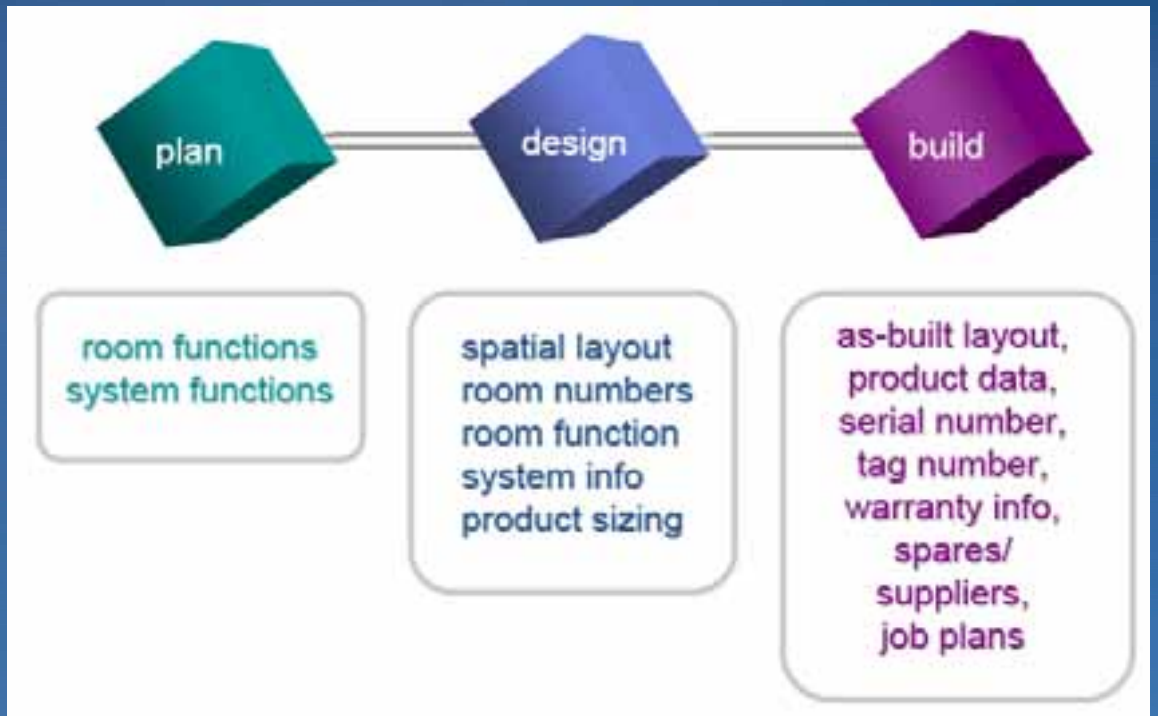
BIM to GIS Integration Issues

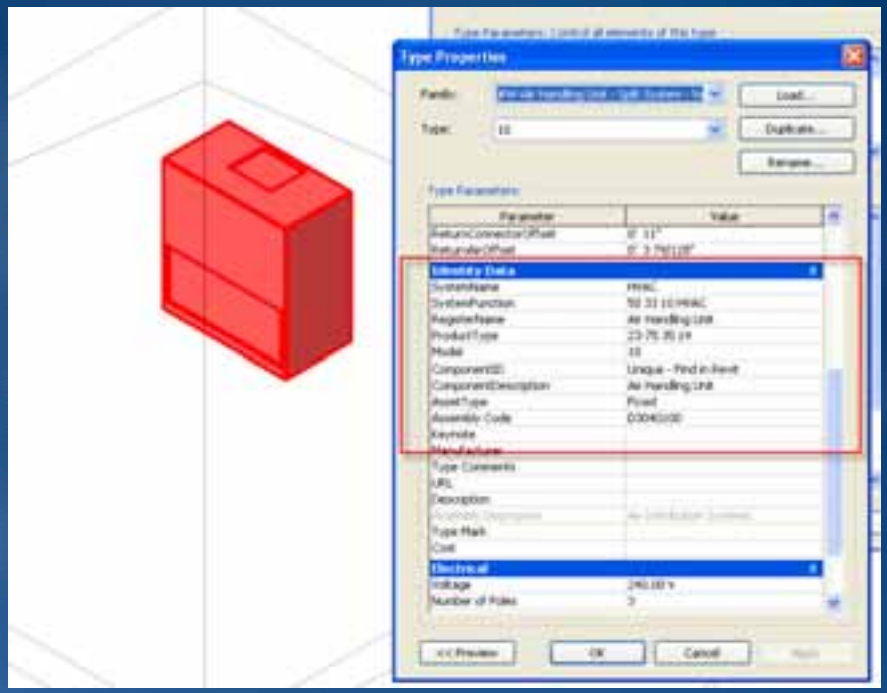
- BIM is MUCH richer in detail than a GIS database should be
- BIM contains all the information needed to construct a building, but not to manage it
  - Space polygons
  - Occupant information
  - Asset details (make, model, etc.)
  - Equipment maintenance data
- The missing data is supplied by COBie



Construction Operations Building Information Exchange (COBie) adds Tabular Information to BIM

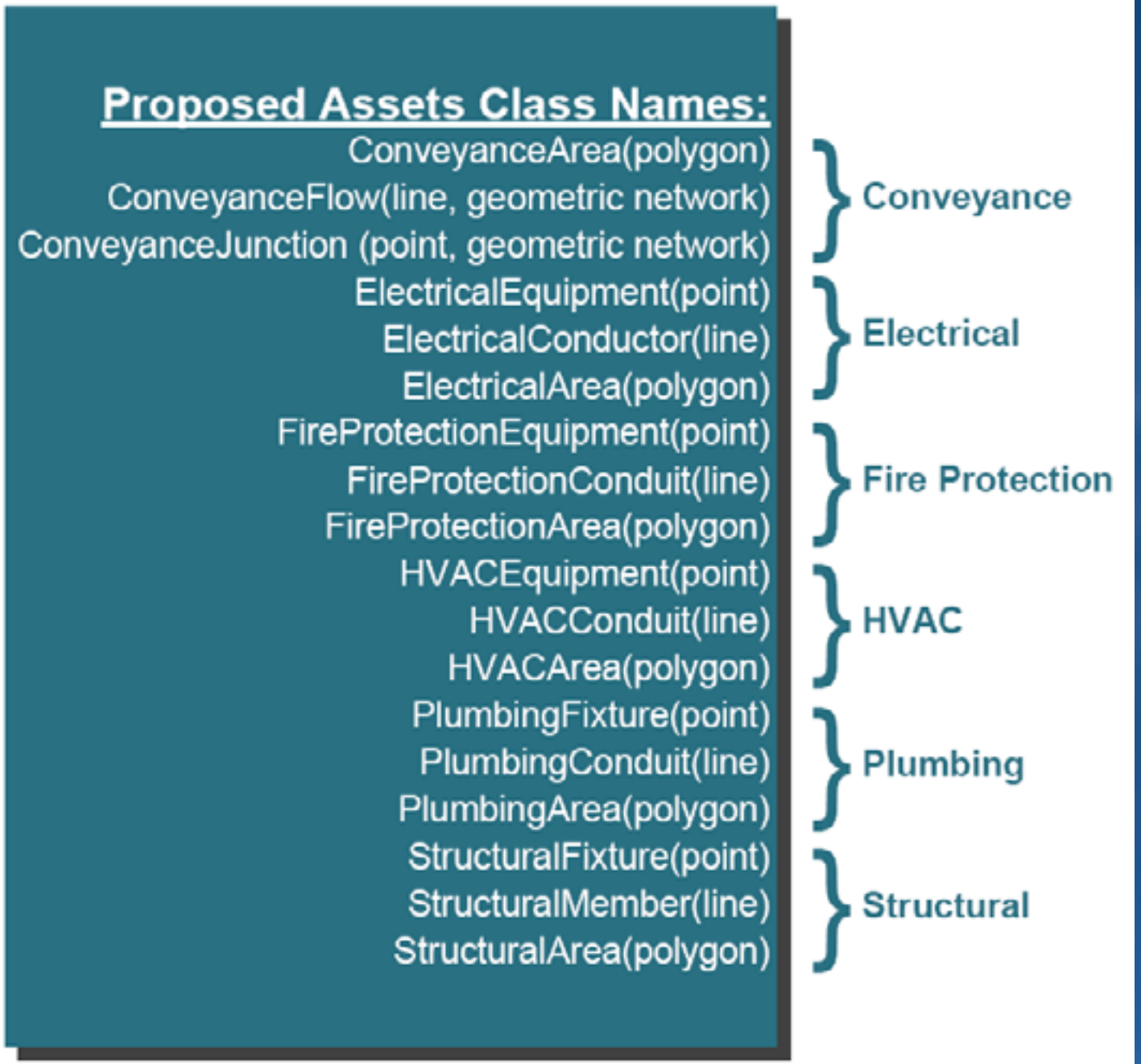
- Capture tabular data needed by the owner as it is created by
  - Designers
  - Constructors
  - Commissioning Agents
- Industry participation
  - BIM vendors now export to COBIE
  - CMMS/CAFM vendors import COBIE



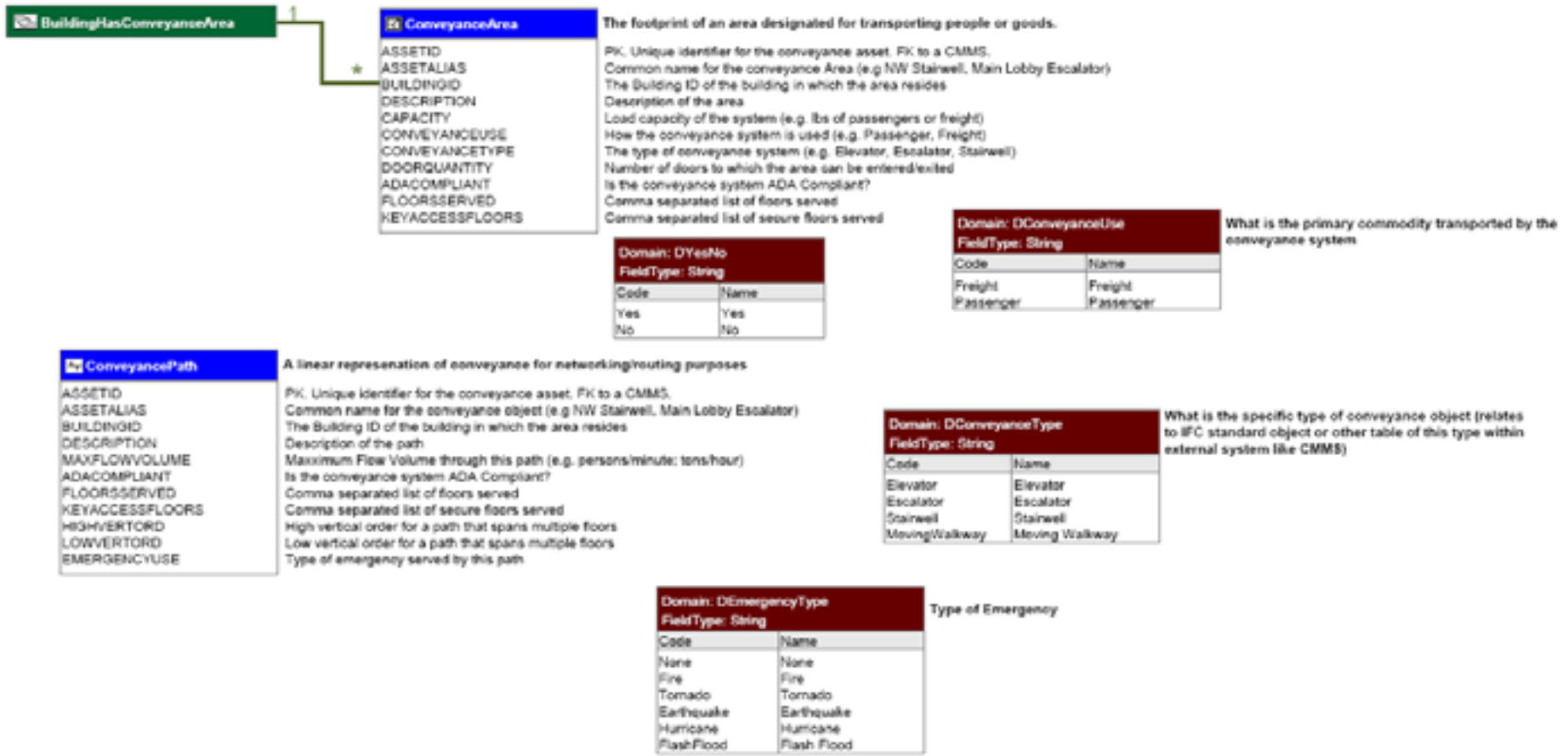


- Some of the COBie data belongs in GIS
- GIS Asset tables need to store a sufficient level of detail

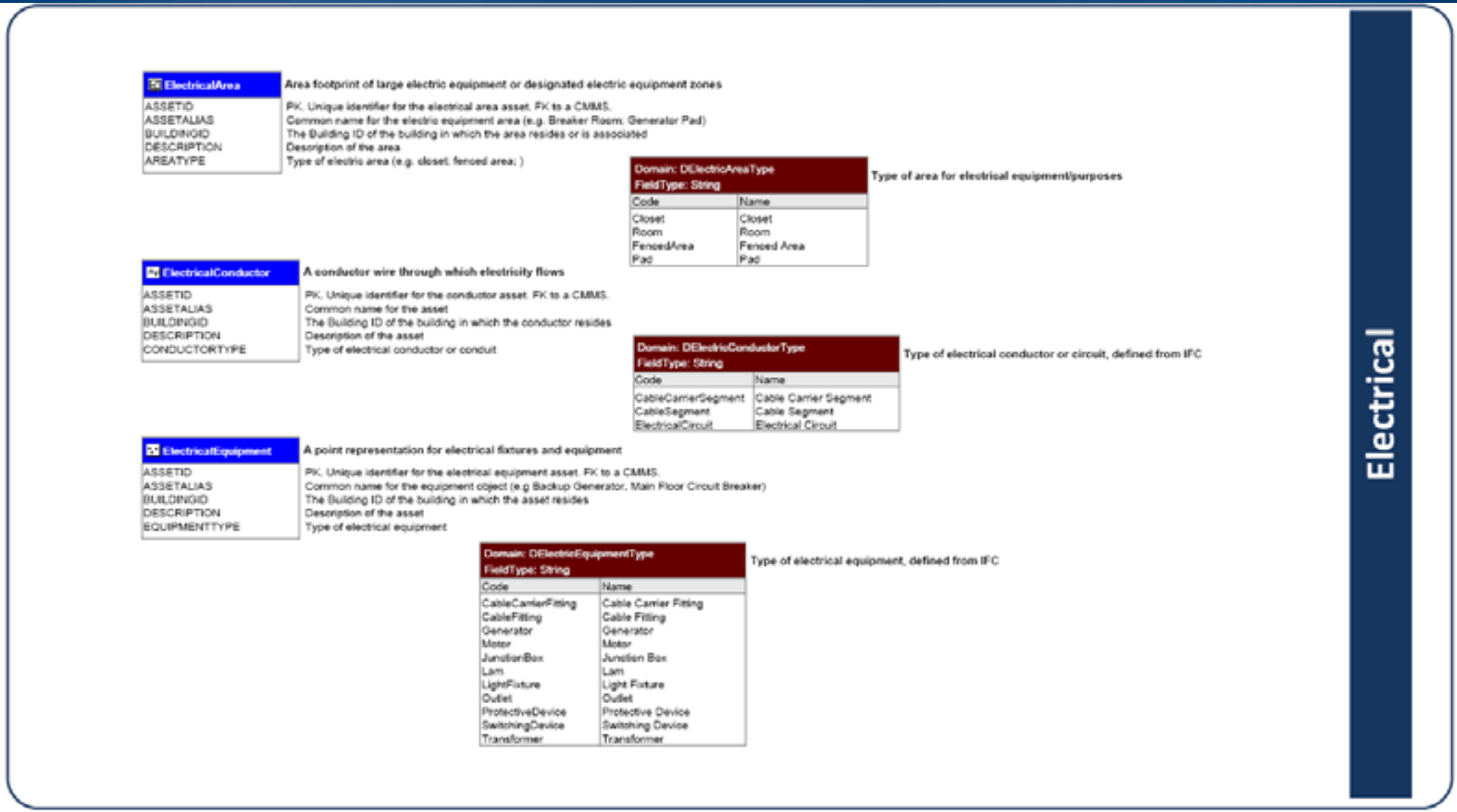
BISDM Asset Data Feature Classes



Conveyance Feature Classes

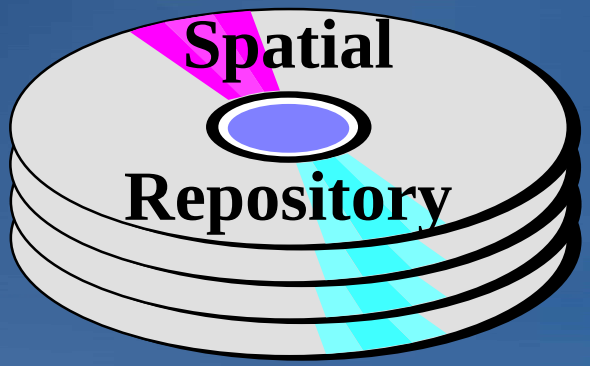


Electrical Feature Classes (Typical of Others)

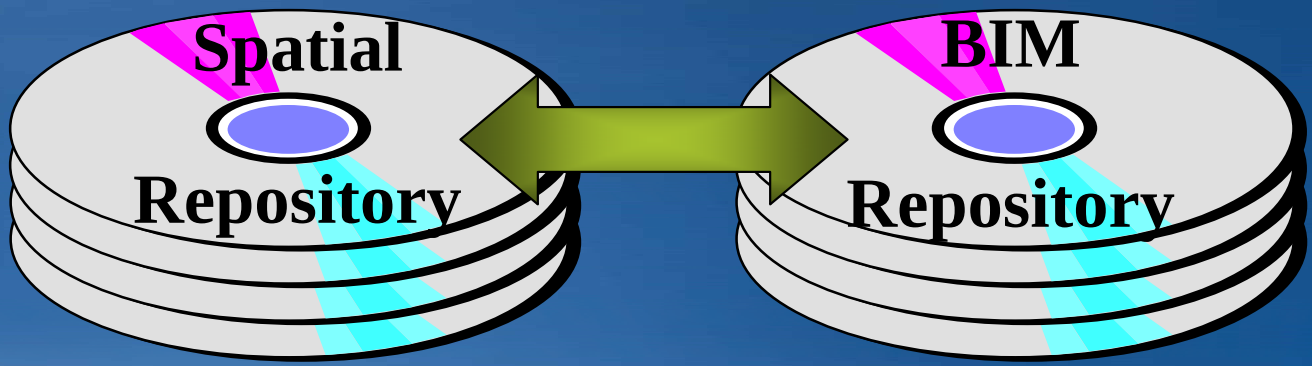


Two Scenarios for Managing Asset Data in GIS

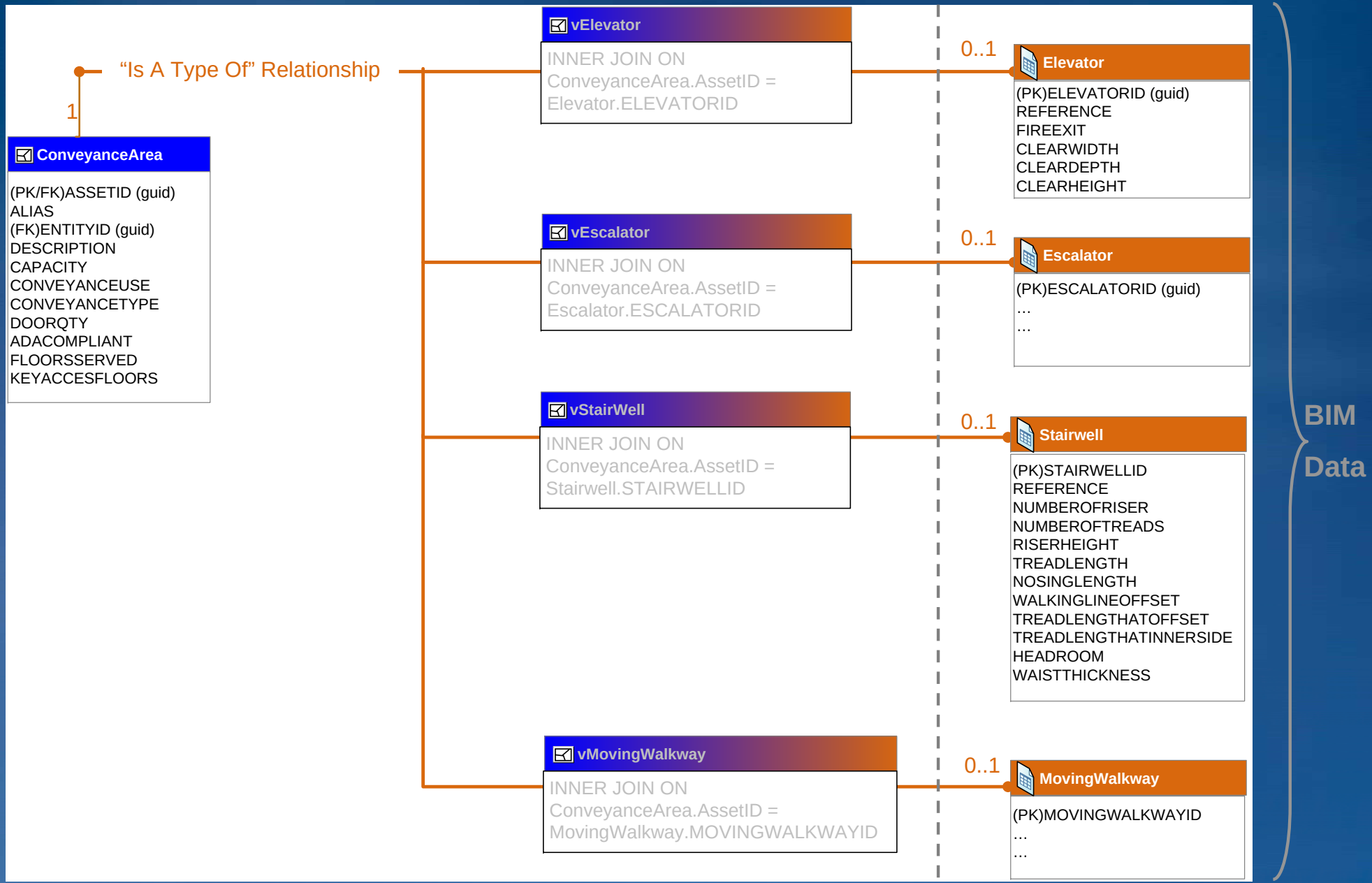
- **Limited asset detail available**
  - No BIM
- Attributes maintained in GIS
- Simple data model



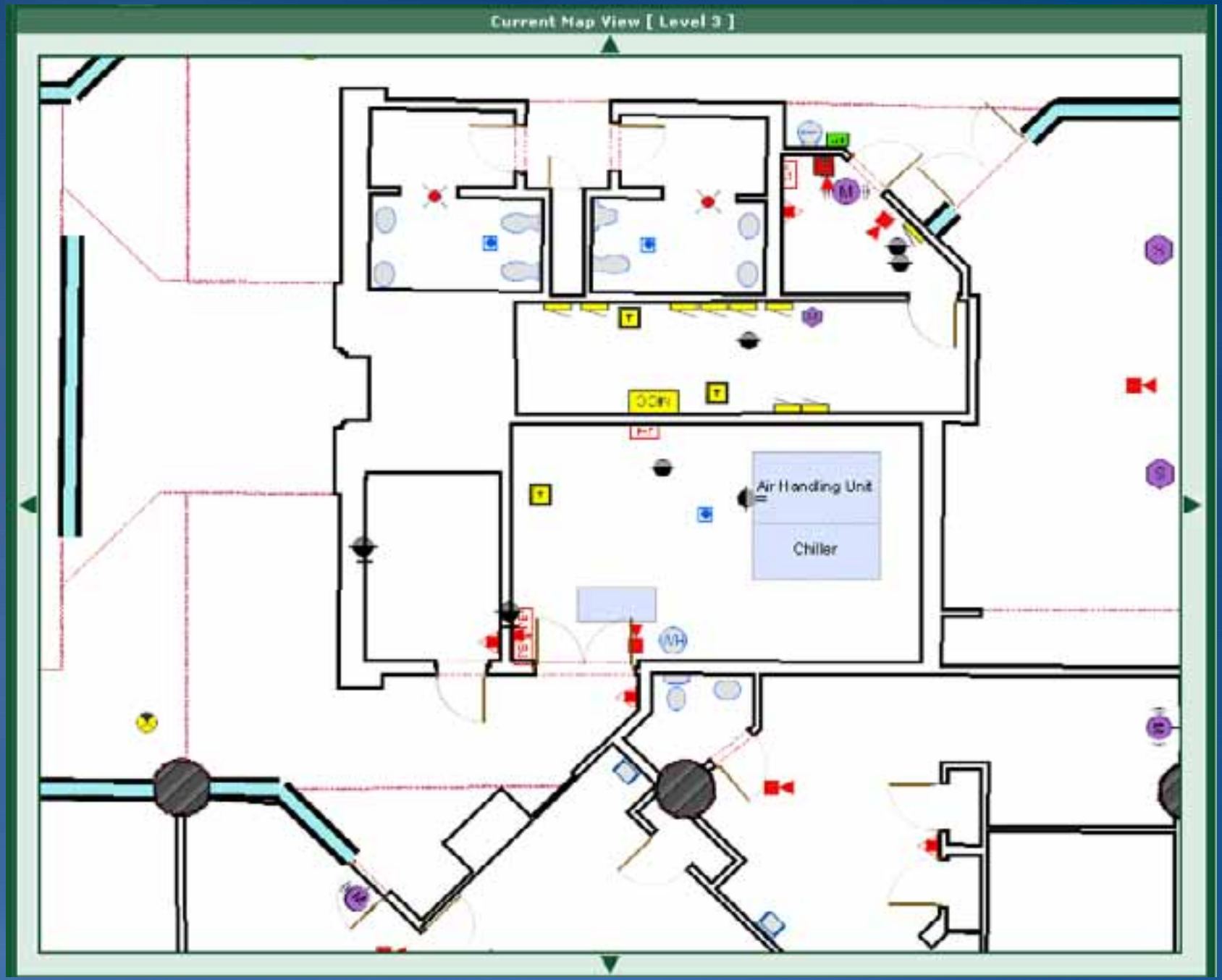
- **BIM detail available**
- Too much data to be maintained entirely within GIS
- BIM data stored in external database
  - RDBMS
  - BIM Server
  - CMMS (COBie data)
- Split data model



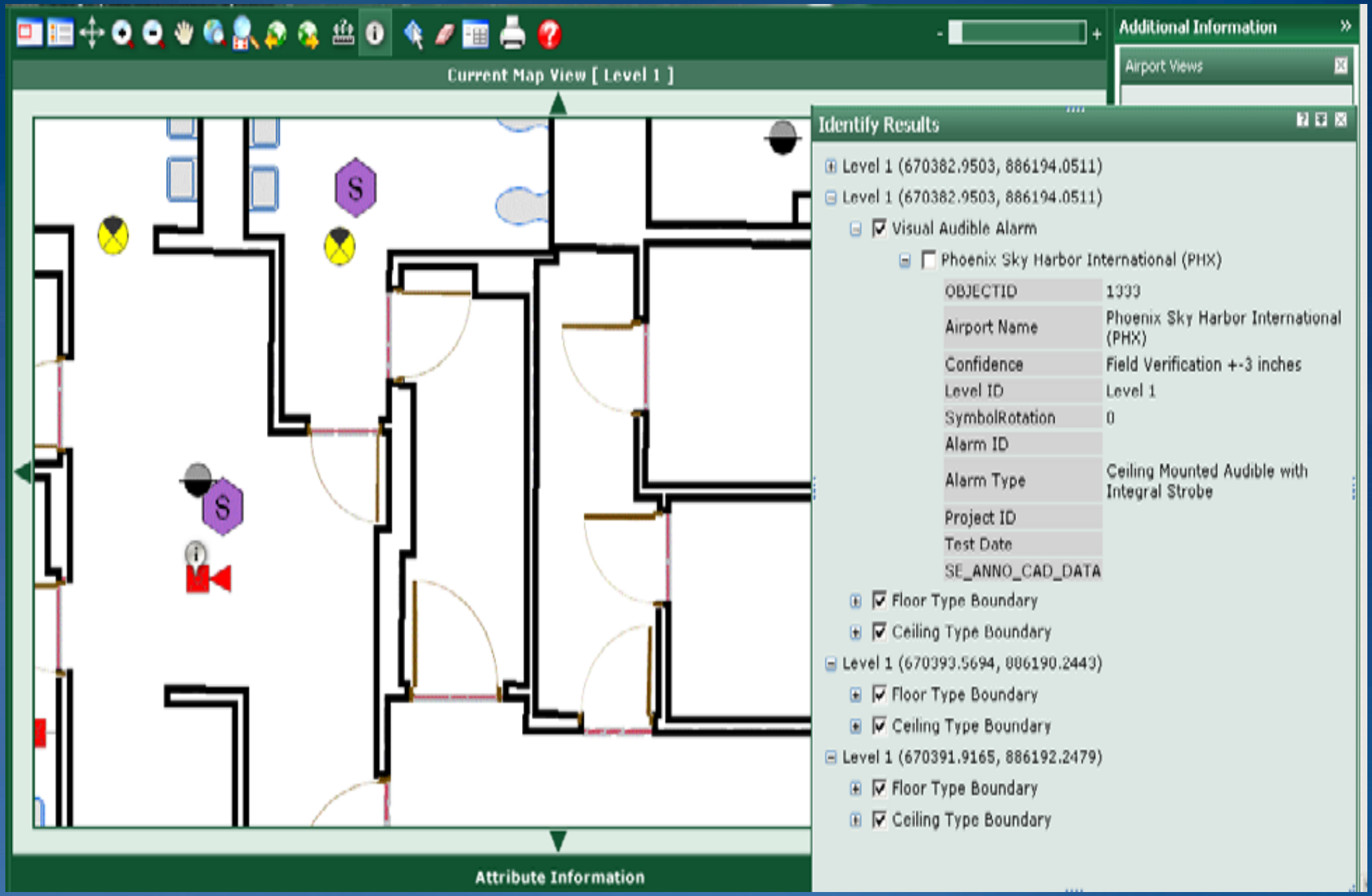
“Split” Data Model to Interface with External Database (or Future BIM Server)



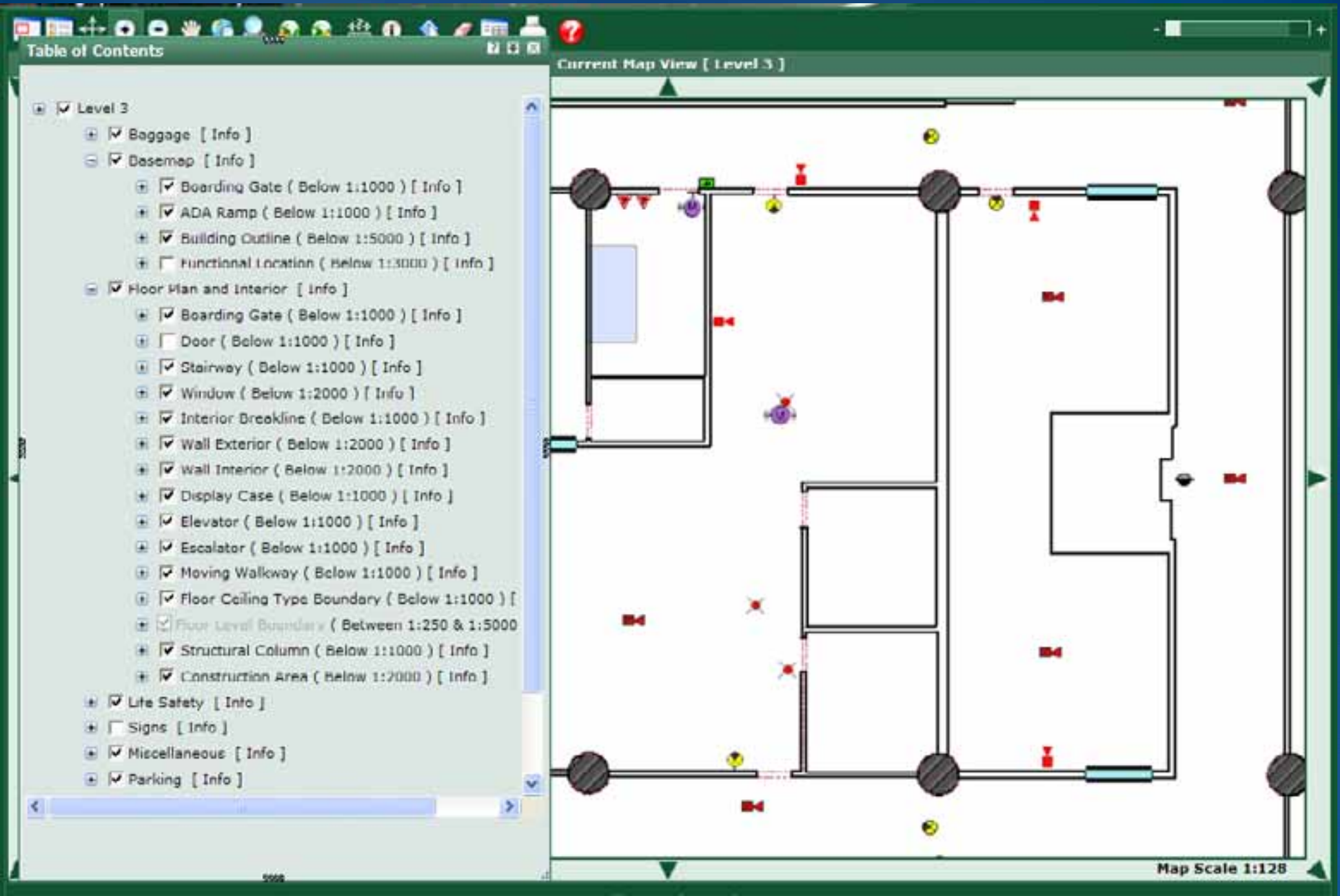
Asset Feature Classes in GIS



GIS Feature with Attribution



Interior Features In Table of Contents



BISDM Version 3 Highlights

3D Transportation Networks

Interior networks, integrated with exterior networks

- Can represent different modes of transportation
  - Hallways, stairs, escalators, elevators
- The ability to do route tracing
  - Ability to insert blocks in the network
  - Ability to block certain directions
- The ability to do transportation analysis
  - Nearest Facility
  - Travel distance and time analysis
  - Location/allocation
- Supported by new functionality available in 10
  - New Geometric support for vertical lines, including 3D length
  - New network solvers that produce 3D results

3D Transportation Networks

Basic Components

Simple feature class
FloorLines

Geometry Polyline
Contains M values Yes
Contains Z values Yes

Field name	Data type	Allow nulls	Default value	Domain	Prec-ision	Scale	Length
OBJECTID	Object ID						
SHAPE	Geometry	Yes					
Floor_Number	Long integer	Yes	1		0		
Building_ID	GUID	No					
Name	String	Yes					50
SLength	Double	No			0	0	
Wheelchair	Short integer	Yes	1	YesNo	0		
SHAPE_Length	Double	Yes			0	0	

Subtypes of FloorLines

Subtype field Floor_Number
Default subtype 1

List of defined default values and domains for subtypes in this class

Subtype Code	Subtype Description	Field name	Default value	Domain
1	First Floor	No values set		
2	Second Floor	No values set		
3	Third Floor	No values set		

Simple feature class
FloorTransitions

Geometry Polyline
Contains M values Yes
Contains Z values Yes

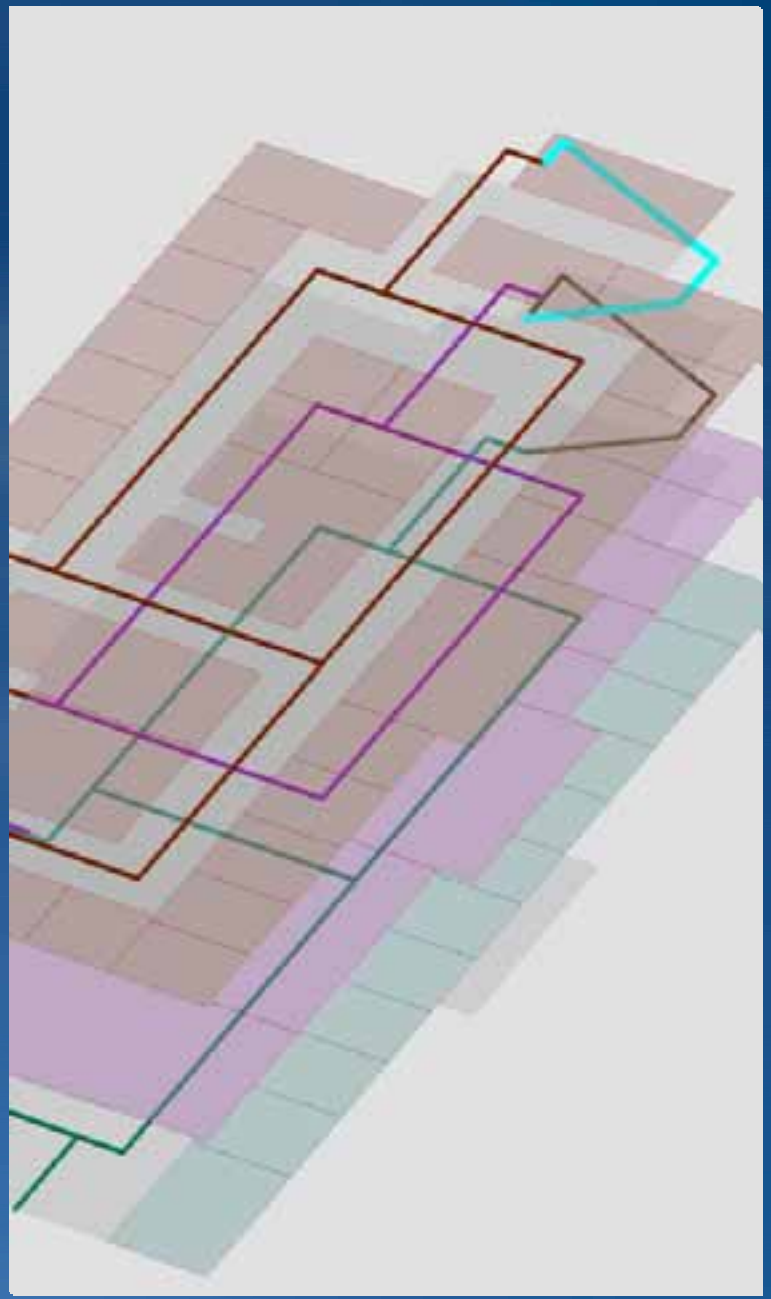
Field name	Data type	Allow nulls	Default value	Domain	Prec-ision	Scale	Length
OBJECTID	Object ID						
SHAPE	Geometry	Yes					
TYPE	Short integer	Yes	0		0		
FromZLev	Short integer	Yes			0		
ToZLev	Short integer	Yes			0		
Building_ID	GUID	No					
Name	String	Yes					50
SLength	Double	No			0	0	
WheelChair	Short integer	Yes	0	YesNo	0		
SHAPE_Length	Double	Yes			0	0	

Subtypes of FloorTransitions

Subtype field TYPE
Default subtype 0

List of defined default values and domains for subtypes in this class

Subtype Code	Subtype Description	Field name	Default value	Domain
1	Stairs	No values set		
2	Elevators	No values set		



3D Transportation Networks

Modifiers to network behavior, and core objects

Simple feature class
DelayTurns

Geometry Polyline
Contains M values No
Contains Z values Yes

Field name	Data type	Allow nulls	Default value	Domain	Prec-ision	Scale	Length
OBJECTID	Object ID						
SHAPE	Geometry	Yes					
Edge1End	String	Yes	N				1
Edge1FCID	Long integer	Yes			0		
Edge1FID	Long integer	Yes			0		
Edge1Pos	Double	Yes			0	0	
Edge2FCID	Long integer	Yes			0		
Edge2FID	Long integer	Yes			0		
Edge2Pos	Double	Yes			0	0	
Edge3FCID	Long integer	Yes			0		
Edge3FID	Long integer	Yes			0		
Edge3Pos	Double	Yes			0	0	
WalkTime	Double	No			0	0	
SHAPE_Length	Double	Yes			0	0	

Simple feature class
RestrictedTurns

Geometry Polyline
Contains M values No
Contains Z values Yes

Field name	Data type	Allow nulls	Default value	Domain	Prec-ision	Scale	Length
OBJECTID	Object ID						
SHAPE	Geometry	Yes					
Edge1End	String	Yes	N				1
Edge1FCID	Long integer	Yes			0		
Edge1FID	Long integer	Yes			0		
Edge1Pos	Double	Yes			0	0	
Edge2FCID	Long integer	Yes			0		
Edge2FID	Long integer	Yes			0		
Edge2Pos	Double	Yes			0	0	
Edge3FCID	Long integer	Yes			0		
Edge3FID	Long integer	Yes			0		
Edge3Pos	Double	Yes			0	0	
SHAPE_Length	Double	Yes			0	0	

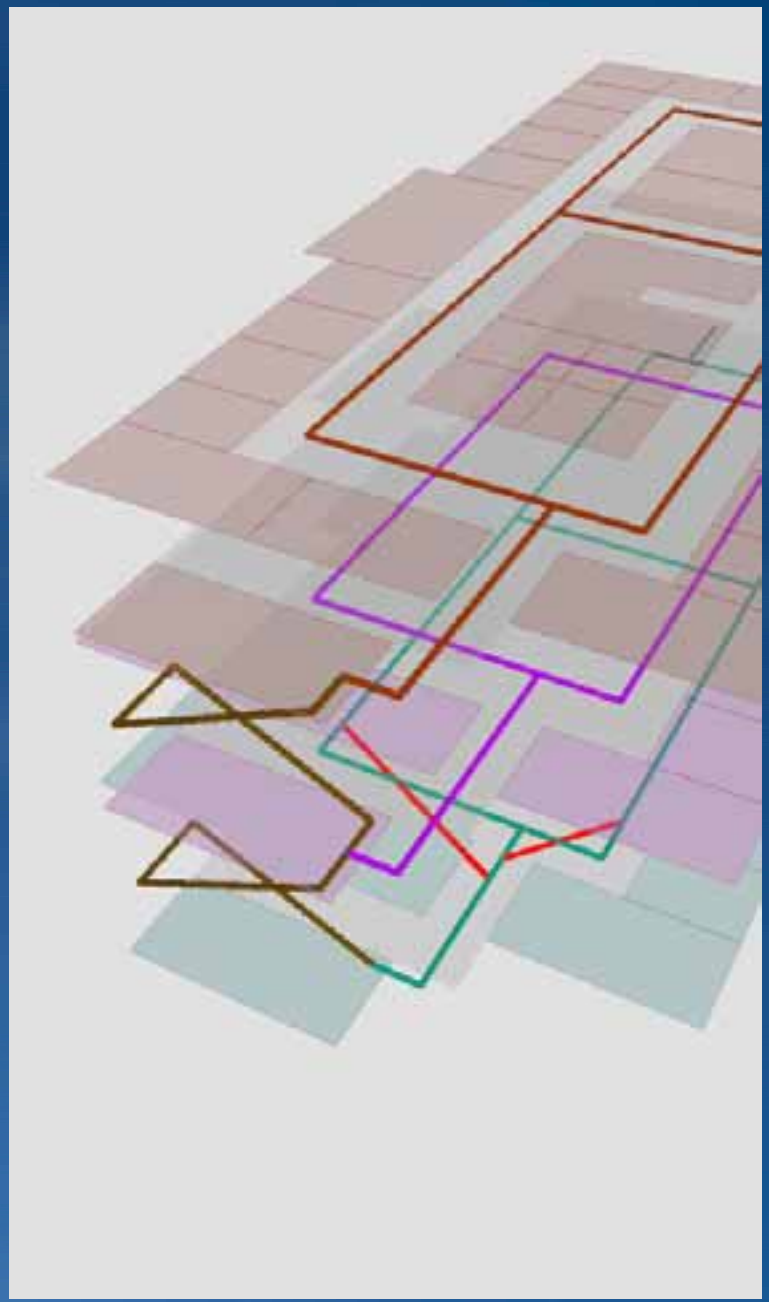
Simple feature class
Transportation_ND_Junctions

Geometry Point
Contains M values No
Contains Z values Yes

Simple feature class
StopsSchema

Geometry Point
Contains M values No
Contains Z values Yes

Field name	Data type	Allow nulls	Default value	Domain	Prec-ision	Scale	Length
OBJECTID	Object ID						
SHAPE	Geometry	Yes					
Name	String	Yes					50



3D Transportation Networks

Components used in specific network solvers

Simple feature class
OfficeCenters

Geometry Point
Contains M values No
Contains Z values Yes

Field name	Data type	Allow nulls	Default value	Domain	Prec-ision	Scale	Length
OBJECTID	Object ID						
Shape	Geometry	Yes					
Building_ID	GUID	No					
Floor_ID	GUID	No					
Space_ID	GUID	No					
WING	String	No					3
NAME	String	No					50
FLOOR_NUMBER	Short integer	Yes	1		0		

Subtypes of OfficeCenters

Subtype field FLOOR_NUMBER
Default subtype 1

List of defined default values and domains for subtypes in this class

Subtype Code	Subtype Description	Field name	Default value	Domain
1	First Floor	No values set		
2	Second Floor	No values set		
3	Third Floor	No values set		

Simple feature class
Electrical Panels

Geometry Point
Contains M values No
Contains Z values Yes

Field name	Data type	Allow nulls	Default value	Domain	Prec-ision	Scale	Length

Simple feature class
FireHydrants

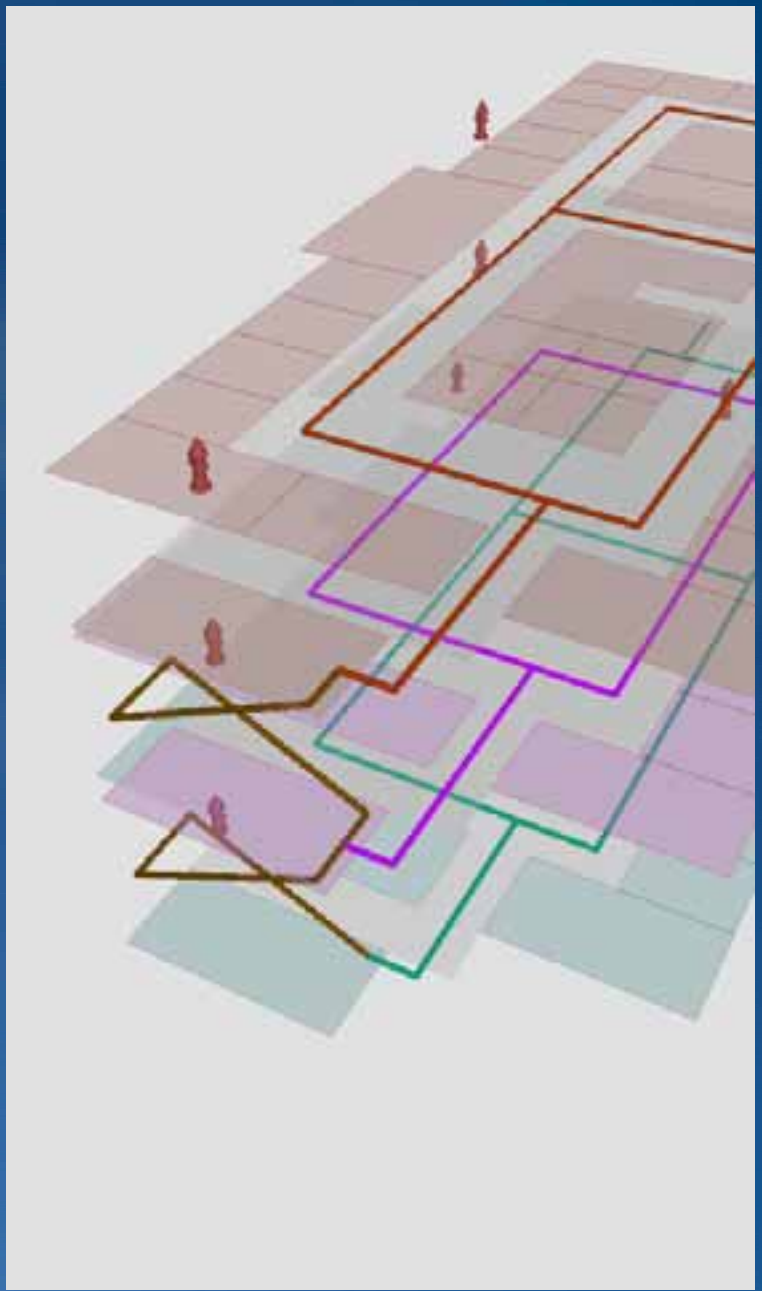
Geometry Point
Contains M values No
Contains Z values Yes

Field name	Data type	Allow nulls	Default value	Domain	Prec-ision	Scale	Length

Simple feature class
Vending Machines

Geometry Point
Contains M values No
Contains Z values Yes

Field name	Data type	Allow nulls	Default value	Domain	Prec-ision	Scale	Length
OBJECTID	Object ID						
Shape	Geometry	Yes					
Building_ID	GUID	No					
Floor_ID	GUID	No					
Space_ID	GUID	No					
WING	String	No					3
NAME	String	No					50
FLOOR_NUMBER	Short integer	Yes	1		0		



3D Transportation Networks

Interior networks, integrated with exterior networks

Basic components of the network

Simple feature class FloorLines
Geometry: Contains M values: Yes; Contains Z values: Yes; Polyline

Field name	Data type	Allow nulls	Default value	Domain	Precision	Scale	Length
OBJECTID	Object ID						
SHAPE	Geometry	Yes					
Floor_Number	Long integer	Yes	1		0		
Building_ID	GUID	No					
Name	String	Yes					50
SLength	Double	No			0	0	
Wheelchair	Short integer	Yes	1	YesNo	0		
SHAPE_Length	Double	Yes			0	0	

The basic network of hallways inside a building, as a collection of simple lines (no curves), with a separate subtype for each floor to aid in editing.

What Floor (should this be the floor_id GUID?)
Unique ID of the building
Name of the segment, if it has a unique name
3D Length, calculated using GP tool
Example of a restriction attribute

Subtypes of FloorLines
Subtype field: Floor_Number
Default subtype: 1
List of defined default values and domains for subtypes in this class

Subtype Code	Subtype Description	Field name	Default value	Domain
1	First Floor	No values set		
2	Second Floor	No values set		
3	Third Floor	No values set		

Simple feature class FloorTransitions
Geometry: Contains M values: Yes; Contains Z values: Yes; Polyline

Field name	Data type	Allow nulls	Default value	Domain	Precision	Scale	Length
OBJECTID	Object ID						
SHAPE	Geometry	Yes					
TYPE	Short integer	Yes	0		0		
FromZLev	Short integer	Yes			0		
ToZLev	Short integer	Yes			0		
Building_ID	GUID	No					
Name	String	Yes					50
SLength	Double	No			0	0	
WheelChair	Short integer	Yes	0	YesNo	0		
SHAPE_Length	Double	Yes			0	0	

The transitions between different floors of a building. Stored in a separate feature class to account for difference in times going up, or coming down.

Categories of transitions between levels
From lower floor (should this be the floor_id GUID?)
To upper floor (should this be the floor_id GUID?)
Unique ID of the building
Name of the segment, if it has a unique name
3D Length, calculated using GP tool
Example of a restriction attribute

Subtypes of FloorTransitions
Subtype field: TYPE
Default subtype: 0
List of defined default values and domains for subtypes in this class

Subtype Code	Subtype Description	Field name	Default value	Domain
1	Stairs	No values set		
2	Elevators	No values set		

Modifiers to network behavior

Simple feature class DelayTurns
Geometry: Contains M values: No; Contains Z values: Yes; Polyline

Field name	Data type	Allow nulls	Default value	Domain	Precision	Scale	Length
OBJECTID	Object ID						
SHAPE	Geometry	Yes					
Edge1End	String	Yes	N				1
Edge1FCID	Long integer	Yes			0		
Edge1FID	Long integer	Yes			0		
Edge1Pos	Double	Yes			0	0	
Edge2FCID	Long integer	Yes			0		
Edge2FID	Long integer	Yes			0		
Edge2Pos	Double	Yes			0	0	
Edge3FCID	Long integer	Yes			0		
Edge3FID	Long integer	Yes			0		
Edge3Pos	Double	Yes			0	0	
WalkTime	Double	No			0	0	
SHAPE_Length	Double	Yes			0	0	

Indicates delays on the network, for example wait times at elevators.

Length of delay

Simple feature class RestrictedTurns
Geometry: Contains M values: No; Contains Z values: Yes; Polyline

Field name	Data type	Allow nulls	Default value	Domain	Precision	Scale	Length
OBJECTID	Object ID						
SHAPE	Geometry	Yes					
Edge1End	String	Yes	N				1
Edge1FCID	Long integer	Yes			0		
Edge1FID	Long integer	Yes			0		
Edge1Pos	Double	Yes			0	0	
Edge2FCID	Long integer	Yes			0		
Edge2FID	Long integer	Yes			0		
Edge2Pos	Double	Yes			0	0	
Edge3FCID	Long integer	Yes			0		
Edge3FID	Long integer	Yes			0		
Edge3Pos	Double	Yes			0	0	
SHAPE_Length	Double	Yes			0	0	

Restricted turns are used to model one way exits, such as fire escapes and security doors.

Components created/required by Network Analyst

Simple feature class Transportation_ND_Junctions
Geometry: Contains M values: No; Contains Z values: Yes; Point

Field name	Data type	Allow nulls	Default value	Domain	Precision	Scale	Length
OBJECTID	Object ID						
SHAPE	Geometry	Yes					

Junctions generated by network analysts for purpose of processing.

Simple feature class StopsSchema
Geometry: Contains M values: No; Contains Z values: Yes; Point

Field name	Data type	Allow nulls	Default value	Domain	Precision	Scale	Length
OBJECTID	Object ID						
SHAPE	Geometry	Yes					
Name	String	Yes					50

Place holder feature class where stops along a route can be placed for use in geoprocessing.

Components used in specific network solvers

Simple feature class OfficeCenters
Geometry: Contains M values: No; Contains Z values: Yes; Point

Field name	Data type	Allow nulls	Default value	Domain	Precision	Scale	Length
OBJECTID	Object ID						
Shape	Geometry	Yes					
Building_ID	GUID	No					
Floor_ID	GUID	No					
Space_ID	GUID	No					
WING	String	No					3
NAME	String	No					50
FLOOR_NUMBER	Short integer	Yes	1		0		

This is an example of a feature you might want to route people to and from. However, it could be any point feature such as assets.

Unique ID of the building
Unique ID of the floor
Unique ID of the space
Name of the wing, for use in search
Name of the office, for use in search
What Floor (should this be the floor_id GUID?)

Subtypes of OfficeCenters
Subtype field: FLOOR_NUMBER
Default subtype: 1
List of defined default values and domains for subtypes in this class

Subtype Code	Subtype Description	Field name	Default value	Domain
1	First Floor	No values set		
2	Second Floor	No values set		
3	Third Floor	No values set		

Simple feature class Electrical Panels
Geometry: Contains M values: No; Contains Z values: Yes; Point

Field name	Data type	Allow nulls	Default value	Domain	Precision	Scale	Length

Simple feature class FireHydrants
Geometry: Contains M values: No; Contains Z values: Yes; Point

Field name	Data type	Allow nulls	Default value	Domain	Precision	Scale	Length

Simple feature class Vending Machines
Geometry: Contains M values: No; Contains Z values: Yes; Point

Field name	Data type	Allow nulls	Default value	Domain	Precision	Scale	Length
OBJECTID	Object ID						
Shape	Geometry	Yes					
Building_ID	GUID	No					
Floor_ID	GUID	No					
Space_ID	GUID	No					
WING	String	No					3
NAME	String	No					50
FLOOR_NUMBER	Short integer	Yes	1		0		

3D Transportation Networks

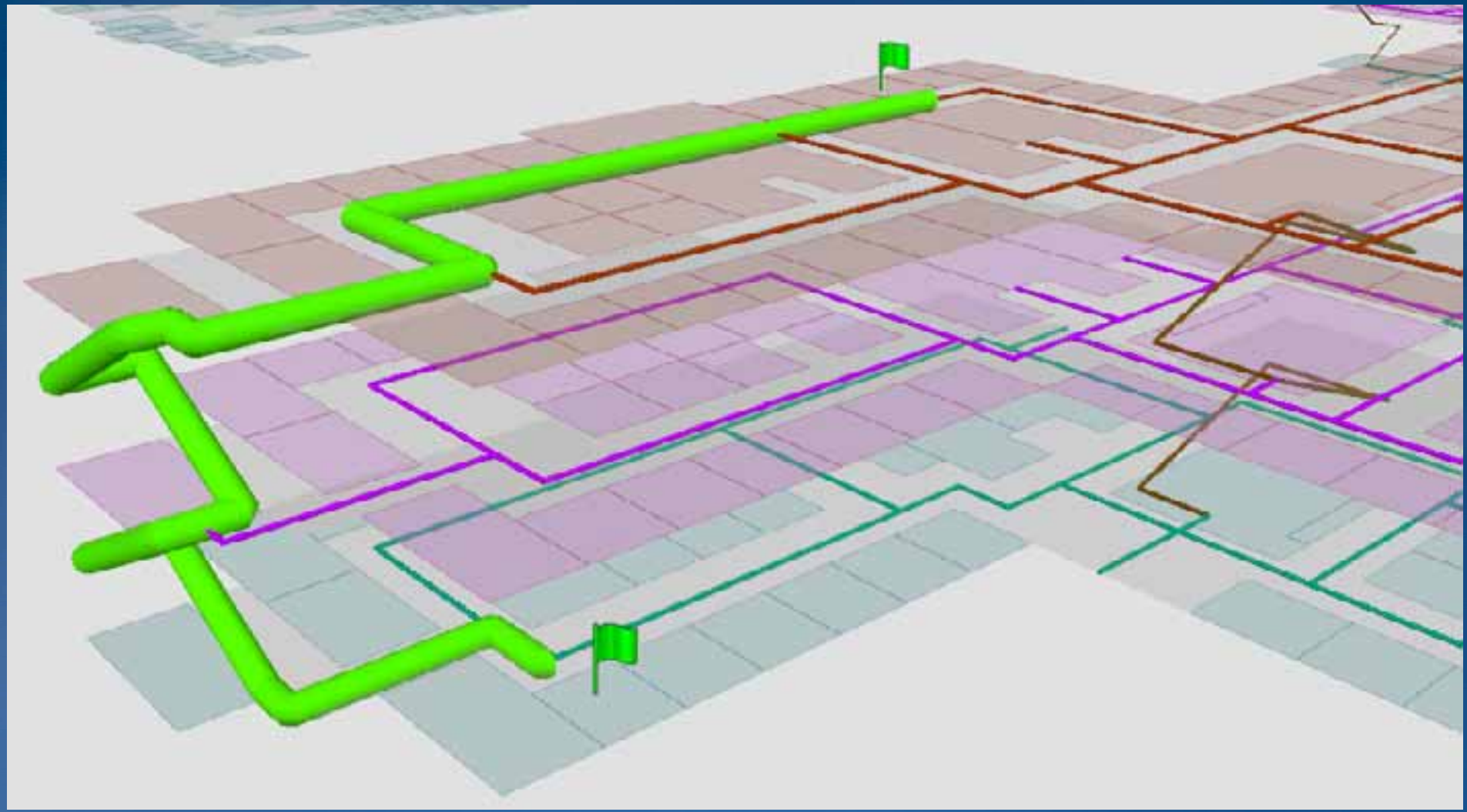
BISDM 3D Network Implementation

Demo

ArcGIS 10 - PreRelease

3D Transportation Networks

3D Network Analysis - Routing



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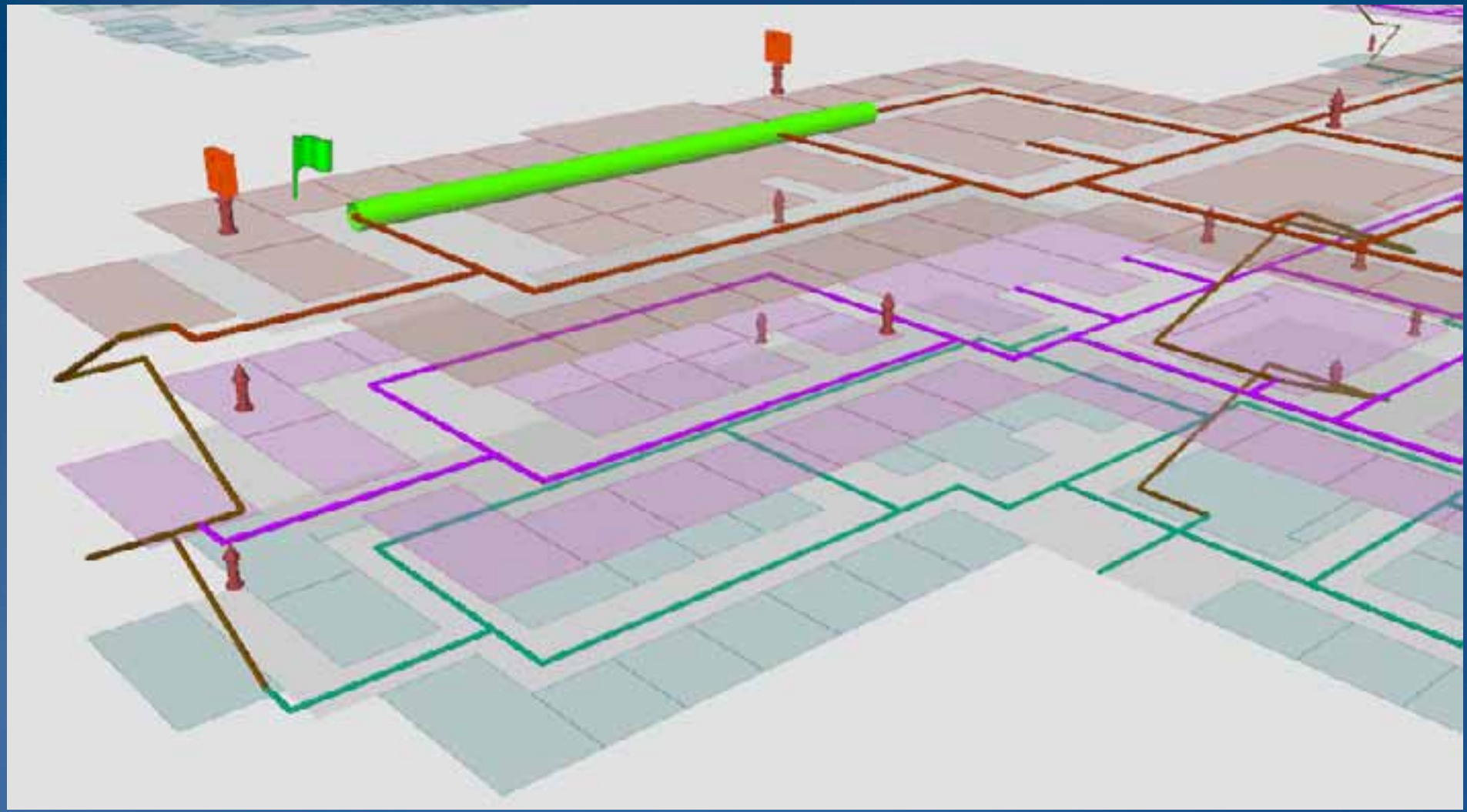
3D Transportation Networks

3D Network Analysis – Nearest Facility



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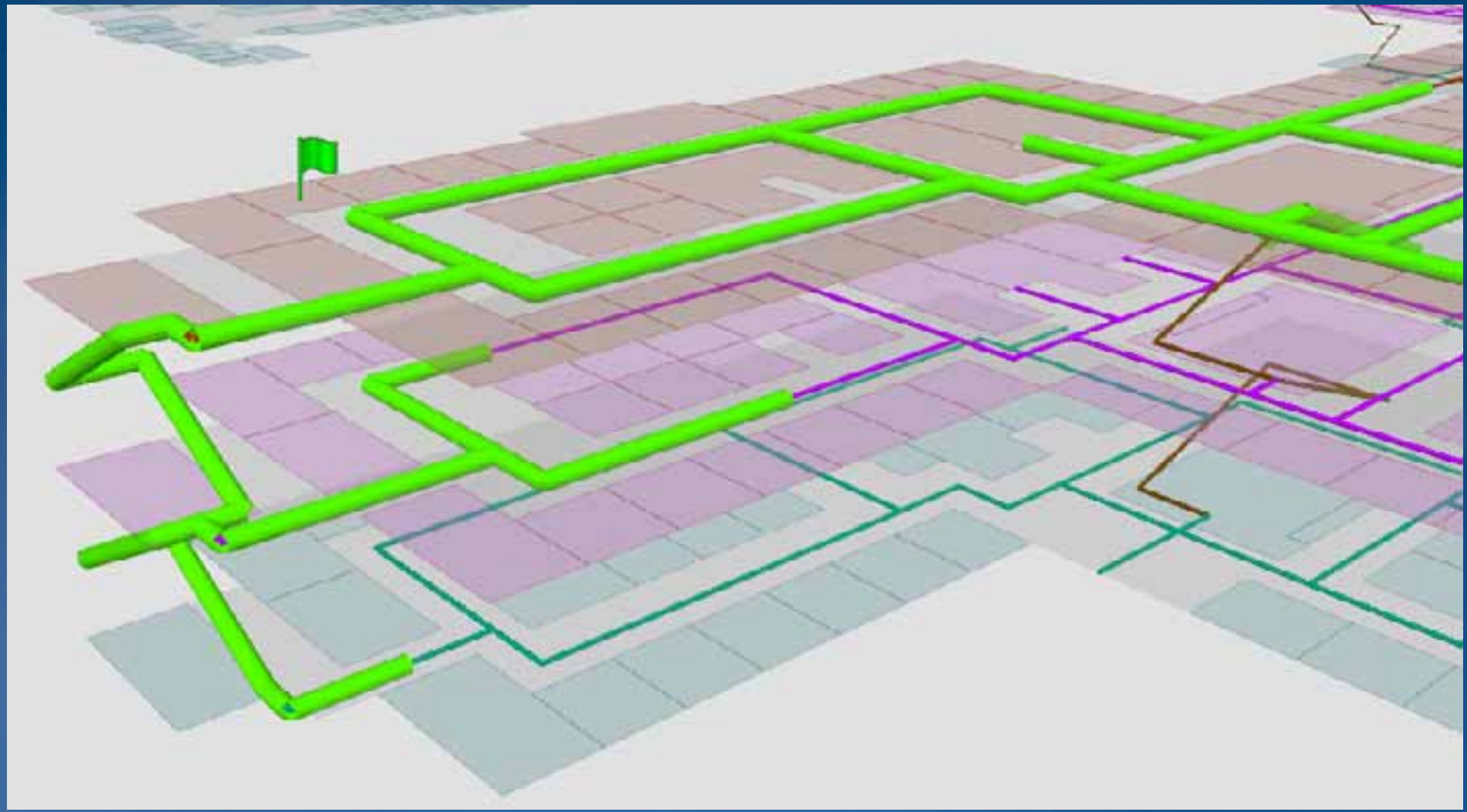
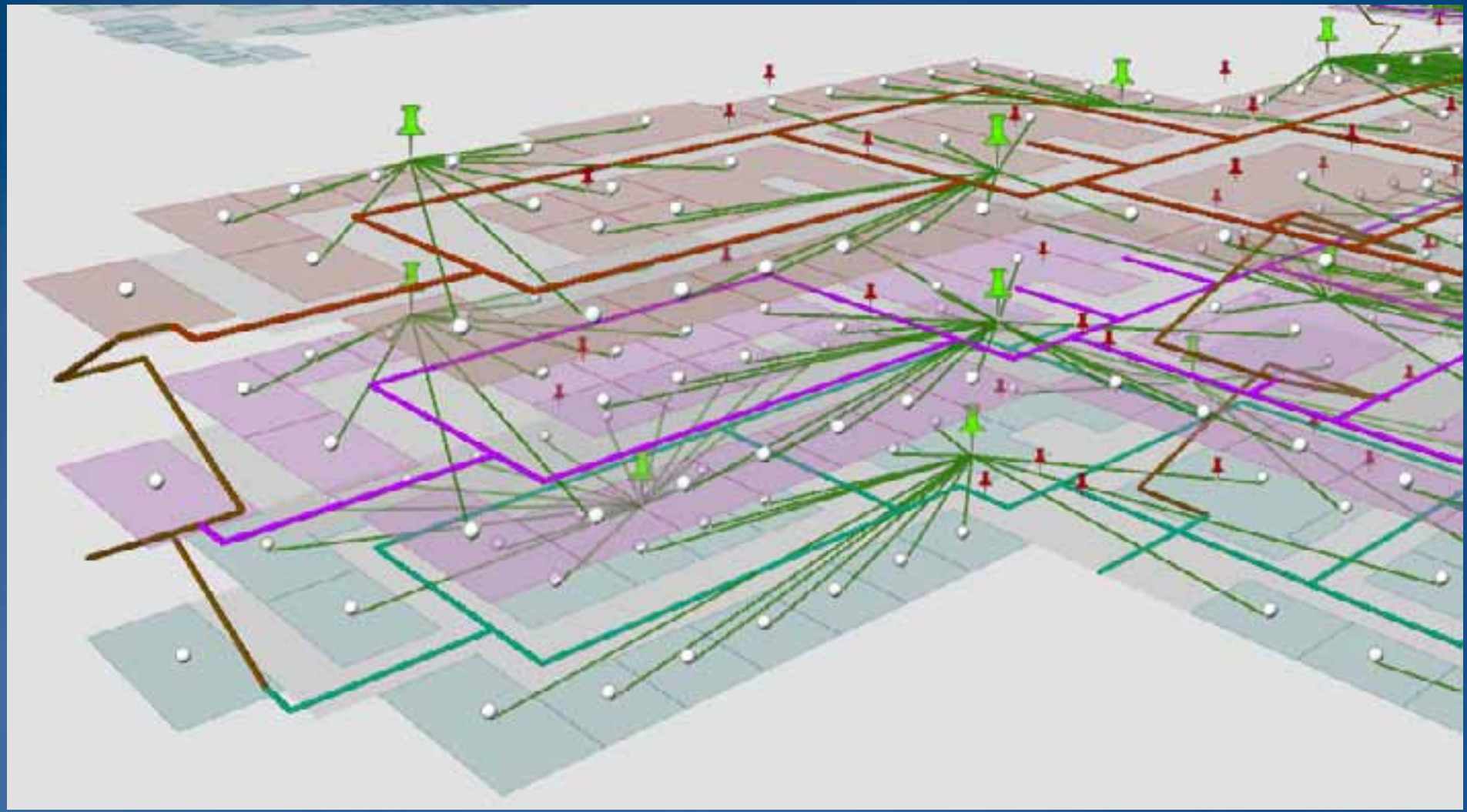
3D Transportation Networks

3D Network Analysis – Network Reach



3D Transportation Networks

3D Network Analysis - Allocation



ArcGIS 10 - PreRelease

3D Transportation Networks

Schedule and next steps

- Will be available with the next release of the BISDM model
  - Expected in the late Summer of 2010
- Dependant of the capabilities of ArcGIS 10
  - Requires Network Analyst
  - Does NOT require 3D Analyst
- Demonstration dataset will be available

- Next steps
  - Expansion of the network model to support 3D utilities
    - Starting with electrical and telecom
    - Followed with gas, water, waste-water
  - Currently possible by the creation of custom solvers
  - Generic “out of box” solution in development

For more information, go to www.bisdm.org

Expanding the core model from 2D to 3D

Method of representation, and creation

- Changes to methods of storing Z values
  - Storing Zs as part of the geometry
  - Only necessary for points, lines, and polygons
- Changes to geometric method of representation
  - Conversion of
    - Polygons to a multipatch volumes
    - Lines to a multipatch surfaces
  - Editing multipatches to create more complex volumes
  - Generating multipatches from lidar point clouds

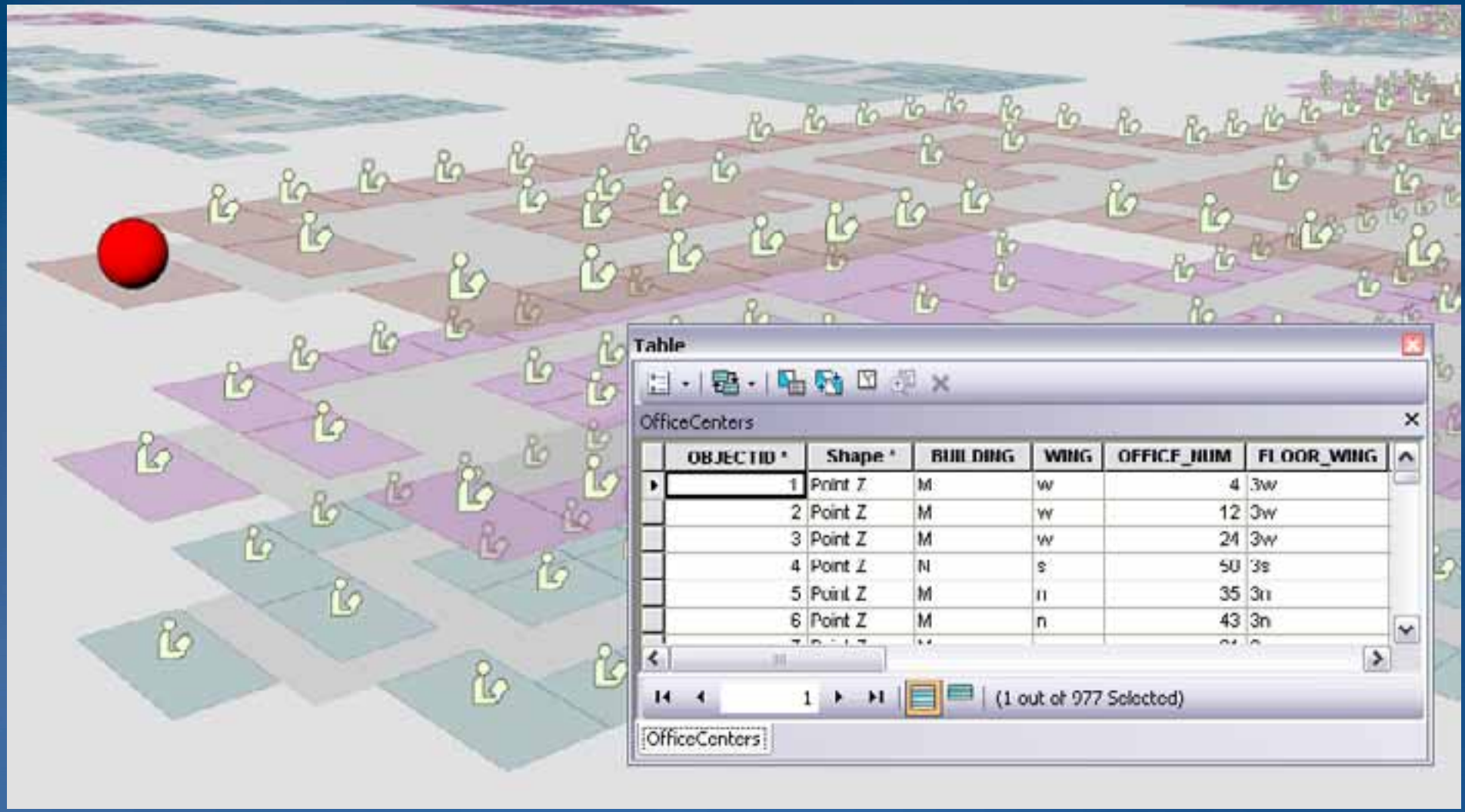
Expanding the core model from 2D to 3D

Changes to methods of storing Z values

- Can be done by
  - Creating a new feature class, Z enabled, based on old scheme
  - Loading old data into new feature class
  - Set z values based on an attribute via code
- Disadvantages
  - Harder to update elevations
  - Harder to select features by elevation
    - Can be mitigated by storing as attribute as well
  - Not as easy to do for features that have multiple Zs
- Advantages
  - Can use Feature Classes directly in geoprocessing
  - Consistent behavior between feature classes
  - Supports 3D Editing

Expanding the core model from 2D to 3D

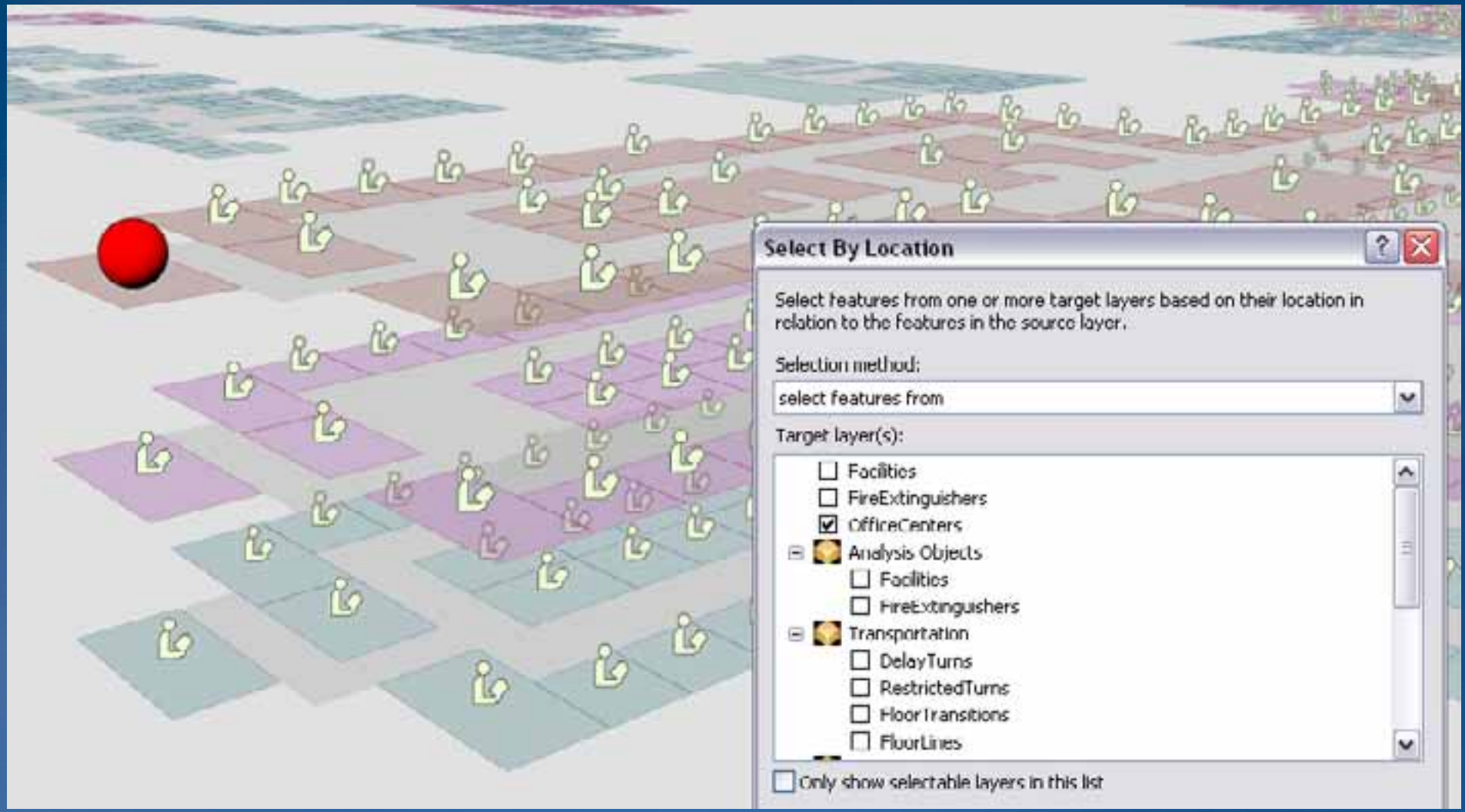
Changes to methods of storing Z values



ArcGIS 10 - PreRelease

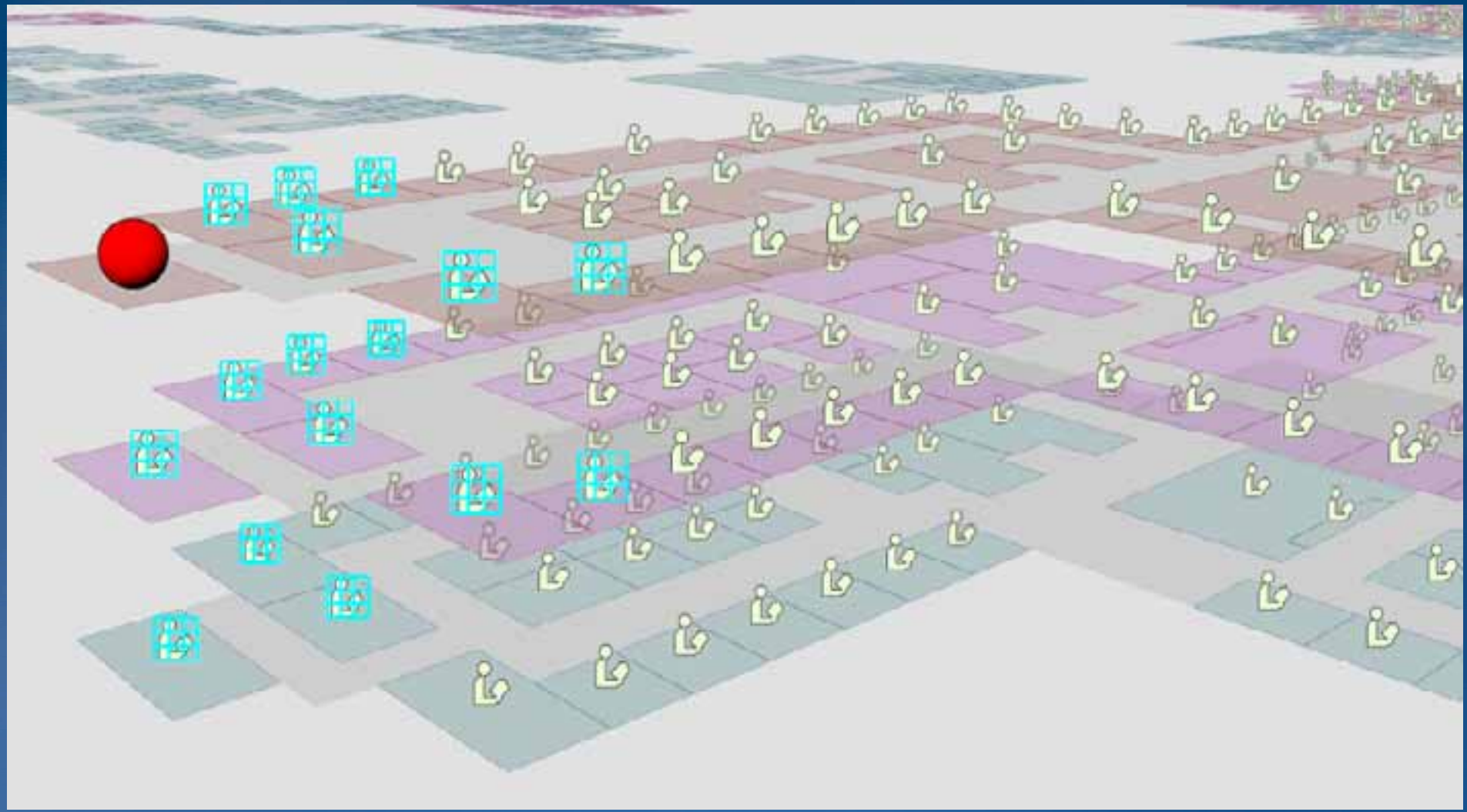
Expanding the core model from 2D to 3D

Changes to methods of storing Z values



Expanding the core model from 2D to 3D

Changes to methods of storing Z values



Expanding the core model from 2D to 3D

Changes to geometric method of representation

- Changes to geometric method of representation
  - Conversion of
    - Polygons to a multipatch volumes
    - Lines to a multipatch surfaces
  - Editing multipatches to create more complex volumes
  - Generating multipatches from lidar point clouds

Expanding the core model from 2D to 3D

Changes to geometric method of representation

- Can be done by
  - Extruding a space layer by room height
  - Use Layer 3D to Feature Class to convert them to Multipatches
  - If edits are required
    - Export the multipatch to a Collada model
    - Edit the model in SketchUp, or another detailed 3D editing program
    - Replace the original multipatch using 3D Editing
- Disadvantages
  - Harder to edit
- Advantages
  - Can be used to calculate room volumes
  - Can be used in 3D Set Operator Analysis

Questions / Feedback