ArcGIS Geodatabase Overview

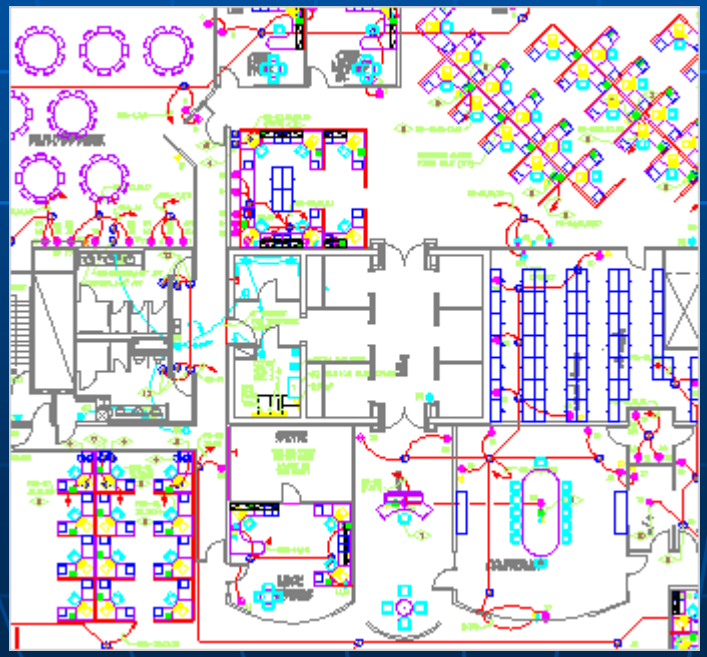
June 28, 2004

Outline

1. Geographic Data Formats
2. What is a Geodatabase?
3. Types of Geodatabase
4. Geodatabase Components
5. Demo

Geographic Data Formats

- CAD
- First computer mapping model/format
- Binary file format with little attribute information



Geographic Data Formats

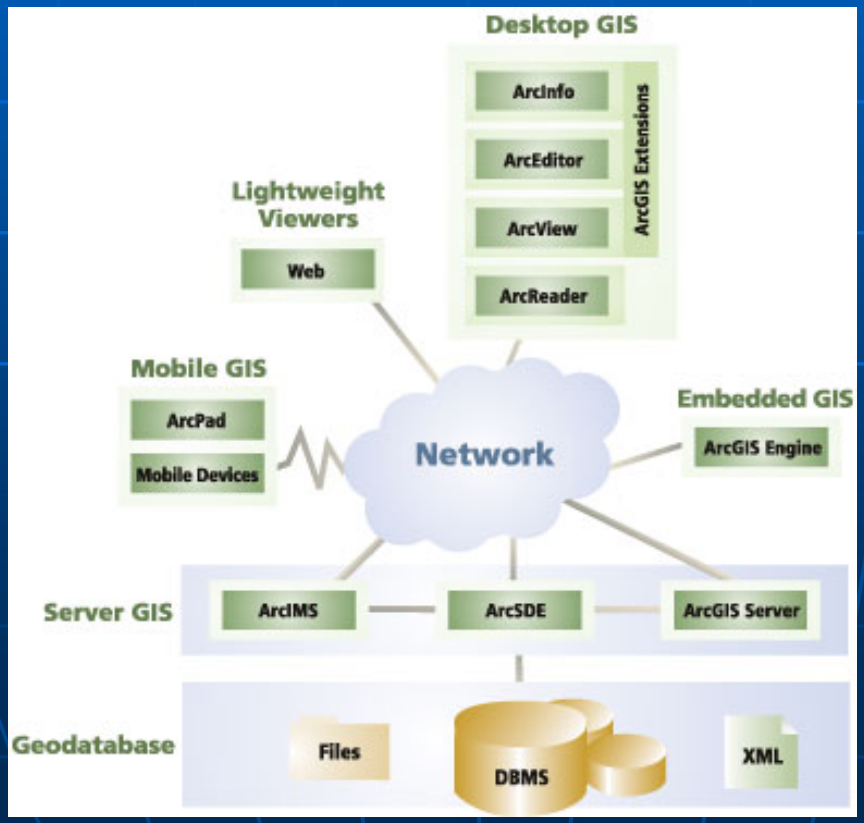
- Coverage
- Georelational data model
- Native ARC/INFO 7 format
- Vector data is linked to attribute tables by a common identifier
- Topological relationships are maintained
- Limitations – features aggregated into collections of points, lines, and polygons with generic behavior. The behavior of a line representing a road is the same as the behavior of a line representing a stream.

Geographic Data Formats

- Shapefile
- Introduced with ArcView
- Georelational data model – nontopological vector data format
- Consist of up to 7 files, require .shp, .shx, and .dbf files. ArcView creates index files of .sbx, .sbn, .ain, .aih
- Very common format – wide availability of GIS data in Shapefile format
- Do not store topological associations among different features and feature classes
- Lack of topology limits analysis capabilities

Geographic Data Formats

- Geodatabase
  - Introduced with ArcGIS 8…



What is a Geodatabase?

- A geodatabase is a relational database that contains spatial and non-spatial objects.
- The geodatabase supports the storage and management of geographic information in standard database management system tables. –ESRI Press

Types of Geodatabase

- Personal Geodatabase
- Microsoft Jet Engine database file structure.
- The files have a “.mdb” extension, and are the same as typical Microsoft Access database files.
- Browsable and editable with ArcGIS, or the files can be opened in Microsoft Access.
- Maximum file size of 2 gigabytes (GB)
- Freely available to all ArcGIS users. Microsoft Access is not required.
- Store only vector data and tabular data, cannot store raster data

Types of Geodatabase

- Personal Geodatabase
- Can be read by multiple users at the same time, but edited by only one user at a time.
- Ideal for working in small work groups. Typically, users will employ multiple personal geodatabases for their data collections and access these simultaneously for their GIS work.
- Generally, PGDB yield decent performance for datasets of 250,000 objects or less.
- Advantages of PGDB over shapefiles:

  Stores data in a single file

  Store multiple feature classes in a feature dataset

  Support for annotation

Types of Geodatabase

- Multi-user (Enterprise) Geodatabase
- Require ArcSDE and a DBMS (Database Management System)
- Compatible with SQL Server, Oracle, IBM's DB2 Universal, and Informix DBMS.
- Can be read and edited by multiple users at the same time
- Can store raster data
- Suitable for large workgroups, enterprise level production environments
- Requires ArcEditor or ArcInfo for data creation and editing

Types of Geodatabase

	ArcView/Map	ArcEditor	ArcInfo
Read, Display, Query, & Use	Any geodatabase	Any geodatabase	Any geodatabase
Editing	Edit simple personal geodatabases[1] Can edit simple feature classes, annotation, tables, and simple feature datasets	Edit all geodatabases Multiuser geodatabase editing requires ArcSDE™	Edit all geodatabases Multiuser geodatabase editing requires ArcSDE
Schema management and database design	Create simple schemas for personal geodatabases[1] Supports: points, lines, polygons, annotation, and tables No topology No geometric networks No relationship classes No feature-linked annotation No dimension classes No raster support No custom feature classes	Create all schemas for any geodatabase Multiuser geodatabase support requires ArcSDE	Create all schemas for any geodatabase Multiuser geodatabase support requires ArcSDE

[1] Simple personal geodatabases model spatial features that are very much like ESRI® shapefiles: points, lines, and polygons without topology. Personal geodatabases also allow you to store multiple feature classes together in a single feature dataset, as well as provide annotation support.

Geodatabase Components

- Object Class (Attribute Table)
- Collection of non-spatial objects in tabular format that have the same behavior and attributes.
- Stored at the geodatabase root level, not within a feature dataset.
- Unique identifier (ObjectID) for each record

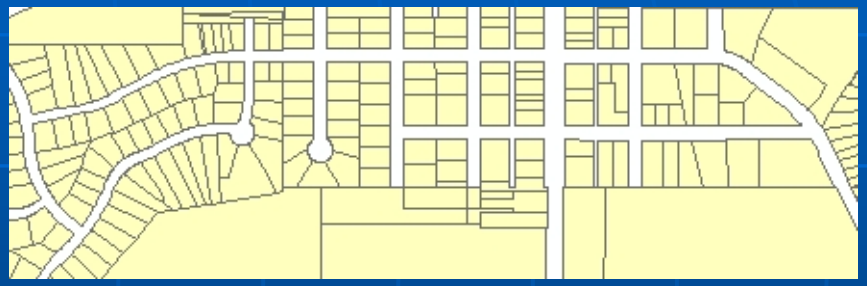
acsmain : Table

OBJECTID	N_NAME	N_NAME2	OWNERADDR	OWNERCITY	OWNERSTATE	OWNERZIP
1	WAYNE J HOOD JR		2909 N BAYSH	LA CROSSE	WI	54603
2	FLAVIAN J & MARY A GILES		24196 NATCHE	LAKEVILLE	MN	55044
3	LARRY L ELIT		22648 DAILY CI	RUSHFORD	MN	55971
4	STEPHEN A & LINDA S FRUECHTE		14011 STATE 4	CALEDONIA	MN	55921
5	PHILIP W & MARIETTE VIETH		1516 EDDY ST	HASTINGS	MN	55033
6	STEPHEN A & LINDA S FRUECHTE		14011 STATE 4	CALEDONIA	MN	55921
7	JOSEPH J & ANNE PELLOWSKI		18437 PELLOW	SPRING GROV	MN	55974
8	JOSEPH J & ANNE PELLOWSKI		18437 PELLOW	SPRING GROV	MN	55974

Record: 1 of 14902

Geodatabase Components

- Feature Class
  - Features are objects with required shape (points, lines, and polygons) that represent a real world object in a layer on a map
  - A Feature Class is a collection of features in tabular format that have the same behavior and the same attributes.
  - Feature Classes are stored at the geodatabase root or in a featured dataset.
  - Feature Class = Object Class + spatial coordinates
  - Feature Class Types: Point, Line, Polygon, Annotation



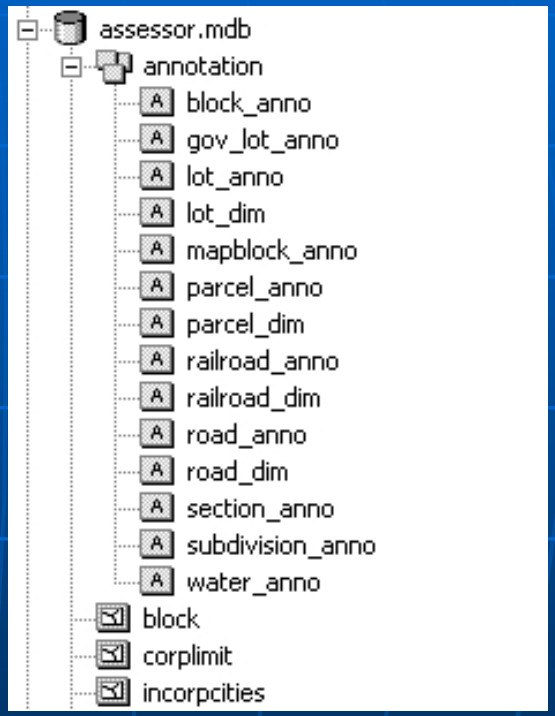
parcel : Table

OBJECTID_1	Shape	OBJECTID	PARCELID	SHAPE_LENG	GROSSACRES
1	.ong binary data	1	140331000	5267.71844104	40
2	.ong binary data	2	140699000	5282.1927761	40
3	.ong binary data	3	140818001	5279.30327806	40
4	.ong binary data	4	140818000	5248.63392961	40
5	.ong binary data	5	140936000	5263.21149467	40
6	.ong binary data	6	140924000	5280.80555496	40

Record: 1 of 25513

Geodatabase Components

- Feature Dataset
- A Feature Dataset is a collection of Feature Classes that share the same spatial reference frame
- Geodatabases store relationships based on *tabular information*. Feature Datasets store relationships based on *geographic information*.
- Example Feature Datasets: PLSS (Contains sections, townships, quarters, quarter-quarters); Annotation(Contains all anno classes)

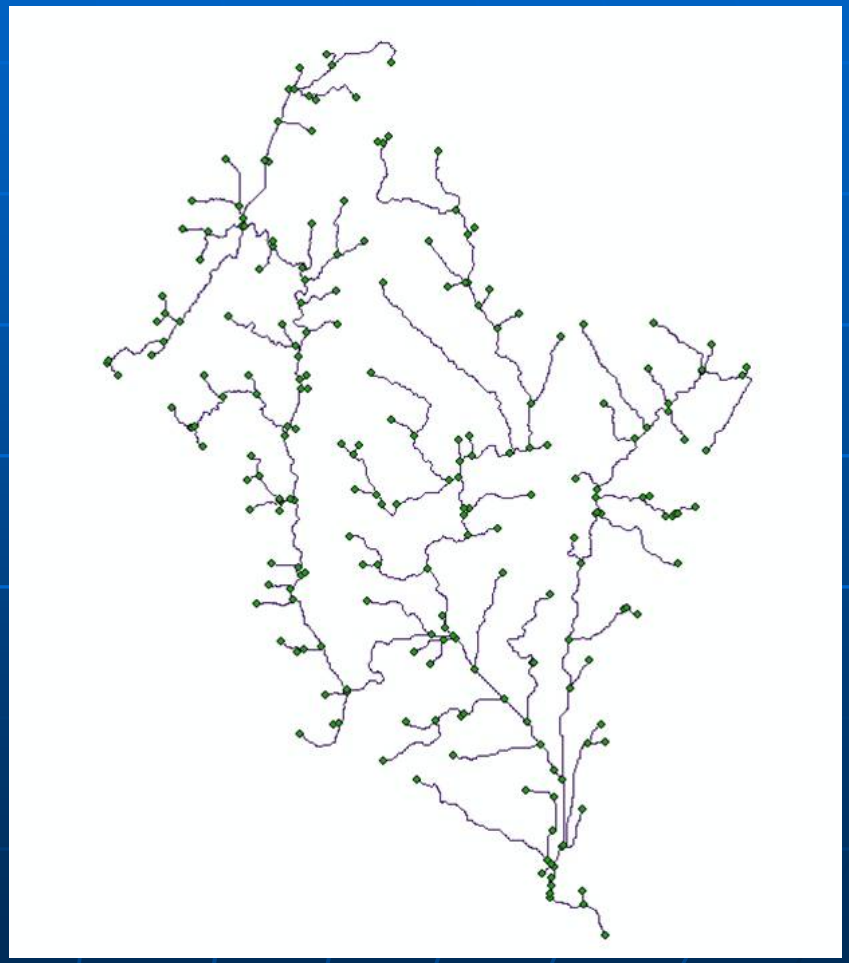


Geodatabase Components

- Relationships and Relationship Classes
- Relationships are an association or link between two or more objects in a geodatabase
- A relationship can exist between:
  - Spatial objects (features in feature classes)
  - Non-spatial objects (rows in tables)
  - Spatial and non-spatial objects
- Relationship Class relationships can be one-to-one, one-to-many, many-to-many
- Can be created and edited using ArcInfo or ArcEditor only, but can be accessed in ArcView

Geodatabase Components

- Network
- A Geographic Network is a set of edges (lines) and junctions (points) that are topologically connected to each other
- Each edge knows which junctions are at its endpoints
- Each junction knows which edges it connects to
- Can be created and edited using ArcInfo or ArcEditor only



Demo

PROMAP

GEOGRAPHIC INFORMATION SYSTEMS

Sources

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- ArcGIS 8: What is ArcGIS?, ESRI Press