

Introduction to Geodatabases

Introduction to Geodatabases

An organized, concise guide for beginners

1. What Is a Geodatabase?

Aspect	Description
Definition	A spatial data storage format that integrates geographic features, attributes, and relationships in a single, managed database.
Purpose	Provides efficient storage, retrieval, editing, and analysis of GIS data while enforcing data integrity and supporting multi-user workflows.
Typical Use Cases	- Municipal planning - Utility network management - Environmental monitoring - Transportation routing - Disaster response

2. Core Concepts

Concept	Key Points
Feature Class	Collection of similar geographic features (points, lines, polygons) sharing the same attributes.
Raster Dataset	Grid-based data (imagery, elevation, land cover) stored as a single object or a mosaic.
Table	Non-spatial attribute data; can be related to feature classes via joins/relates.
Topology	Rules that define spatial relationships (e.g., polygons must not overlap).
Domains & Subtypes	Controlled vocabularies and attribute groupings that enforce data consistency.
Relationship Class	Defines how two tables/feature classes are linked (one-to-one, one-to-many, many-to-many).
Versioning	Allows multiple users to edit the same dataset simultaneously while preserving historical states.

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3. Types of Geodatabases

Type	Characteristics	Typical Scale
File Geodatabase	• Stored as a folder of files • No need for a separate DBMS • Supports up to 1TB per dataset (practically 100GB is common) • Microsoft Access (.mdb)	Desktop, small to medium projects
Personal Geodatabase	• Limited to 2GB • Windows only	Small, single user projects
Enterprise (ArcSDE) Geodatabase	• Built on RDBMS (SQL Server, Oracle, PostgreSQL, etc.) • Supports multi user editing, versioning, replication • Scalable to terabytes	Large organizations, web services, enterprise GIS

4. Data Model Overview

Geodatabase

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?? Feature Datasets (optional containers)

? ?? Feature Classes (points, lines, polygons)

? ?? Annotation, Network, Terrain, etc.

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?? Raster Datasets / Raster Catalogs

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?? Tables (standalone or related)

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?? Relationship Classes

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?? Domains & Subtypes

Feature Datasets are useful for grouping related feature classes that share a common coordinate system and topology.

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5. Advantages Over Shapefiles

Feature	Shapefile	Geodatabase
File Management	Multiple files per layer (?3)	Single container (folder or DB)
Attribute Capacity	2?GB limit, 10?character field names	Large tables, 64?character field names
Topology	Not stored natively	Built?in topology rules
Versioning	Not supported	Full versioning & multi?user editing
Data Integrity	No domains, subtypes	Enforced domains, subtypes, relationship classes