① geodatabase & data management

i. Feature class & data set

example:

Scenario: A Geodatabase for a City's Infrastructure Planning

📁 **Geodatabase:** `City_Planning.gdb` → name of geodatabase

📁 **Feature Dataset:** `Infrastructure` *(Container for related feature classes sharing the same spatial reference)*

Feature Dataset: Infrastructure *(Container)*
Feature Class (Point): Fire_Hydrants 🔥 💧
Feature Class (Line): Roads 🚗
Feature Class (Polygon): Buildings 🏢
Feature Class (Annotation): Street_Names 📍
Feature Class (Dimension): Road_Widths 📏

} data set (Point, Line, Polygon, Annotation)

database — entity — attribute — staff id, sallary, gender, membership — staff list

1️⃣ **Feature Class (Point):** `Fire_Hydrants` → class

📌 **Purpose:** Stores locations of fire hydrants in the city.

🔹 **Geometry Type: Point**

🔹 **Example Data:**

OBJECTID	Hydrant_ID	Status	Pressure (psi)	Location (Lat, Long)
1	FH-001	Active	80	(3.1408, 101.6931)
2	FH-002	Inactive	50	(3.1450, 101.6975)

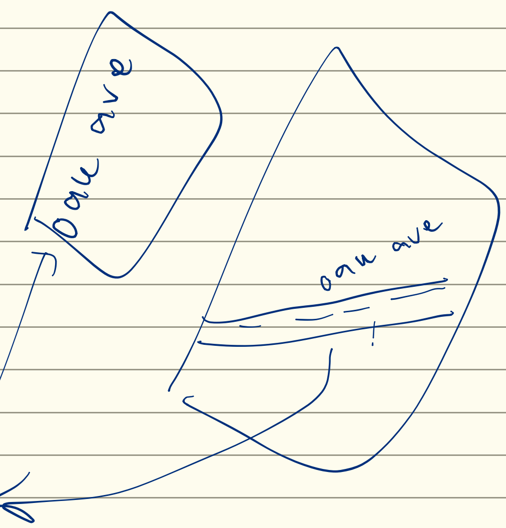
2️⃣ **Feature Class (Line):** `Roads` → class

🗺️ **Purpose:** Stores city road networks.

🔹 **Geometry Type: Line**

🔹 **Example Data:**

OBJECTID	Road_Name	Road_Type	Length_km
1	Main St	Highway	10.2
2	Oak Ave	Local Road	3.5



oak ave
main st

ii. Geodatabase design

example:-

1 Fields Example

alt as labels

Field Name	Data Type	Alias	Allow Nulls	Default Value	Domain
`Road_ID`	Long Integer	Road Identifier	No	Auto-generated	None
`Road_Name`	Text (50)	Road Name	No	None	None
`Road_Type`	Short Integer	Road Category	No	1 (Highway)	`RoadType_Domain`
`Lanes`	Short Integer	Number of Lanes	No	2	`LaneCount_Domain`
`Speed_Limit`	Float	Speed Limit (km/h)	No	50.0	`SpeedLimit_Domain`
`Pavement_Type`	Text (20)	Surface Type	No	Asphalt	`Pavement_Domain`

2 Domains Example

Domain Name	Domain Type	Code	Description
`RoadType_Domain`	Coded Value Domain	1	Highway
		2	Arterial Road
		3	Local Road
`LaneCount_Domain`	Coded Value Domain	1	Single Lane
		2	Double Lane
		3	Multi-Lane
`SpeedLimit_Domain`	Range Domain	Min: 30	Max: 110
`Pavement_Domain`	Coded Value Domain	ASP	Asphalt
		CON	Concrete
		GRAV	Gravel

3 Subtypes Example

Subtype Code	Subtype Name	Default Speed Limit	Pavement Type (Domain)	Lanes (Domain)
1	Highway	100	Asphalt (ASP)	Multi-Lane (3)
2	Arterial Road	70	Concrete (CON)	Double Lane (2)
3	Local Road	50	Gravel (GRAV)	Single Lane (1)

3 Tables (Non-Spatial Data)

doesn't contain spatial data → no geometry

Table Name	Example Fields
`Hospitals`	`Hospital_ID` , `Name` , `Location` , `Capacity`
`Fire_Stations`	`Station_ID` , `Station_Name` , `Address`

Example Data (Table: Hospitals)

Hospital_ID	Name	Location	Capacity
1	City Hospital	Downtown	250
2	Green Clinic	Westside	100

2 Feature Class (Spatial)

Feature Class Name: `Roads` (Stores road locations with spatial geometry).

Road_ID	Road_Name	Road_Type	Speed_Limit (km/h)	Geometry (Line)
101	Highway A	Highway	100	(Line feature)
102	Main St	Arterial Road	70	(Line feature)

Has geometry (Line), meaning it is a spatial dataset.

Hospital's no spatial data

Common Topology Rules & Examples

Rule Name	Applicable Geometry	Example Use Case
Must Not Have Gaps	Polygon	Land parcels should not have unintended gaps.
Must Not Overlap	Polygon	Parcels, zoning areas, or administrative boundaries should not overlap.
Must Be Covered By	Polygon & Line	Roads must be within the right-of-way boundary.
Must Not Self-Intersect	Line	Rivers and roads should not loop back on themselves.
Must Not Dangle	Line	Roads should not have dead-end segments unless intended (e.g., cul-de-sacs).
Must Be Covered By Boundary Of	Line within Polygon	Rivers must be within a watershed boundary.
Must Not Have Duplicates	Point, Line, Polygon	Prevents duplicate points or overlapping lines.
Must Not Overlap with Same Feature Class	Polygon	Ensures no duplicate land parcels in the same dataset.

Feature class

Defination:
A collection of geometry features that shares the same geometry type, spatial reference and attribute fields

purpose:
to store spatial data in structured way

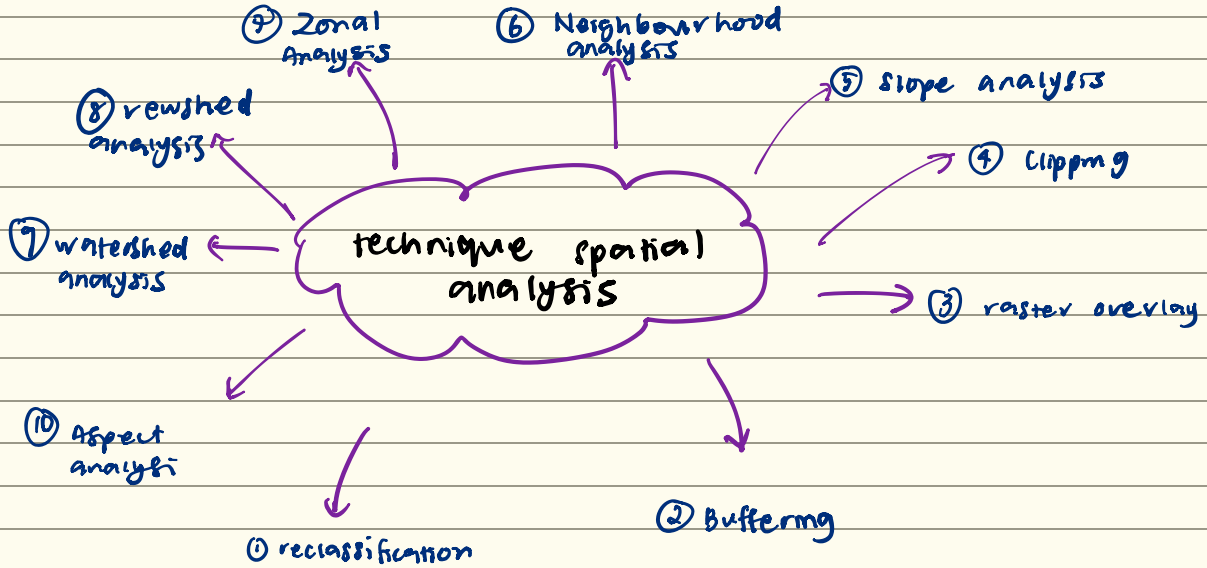
type
- points (house / hospital / school)
- lines (road, river)
- polygon (lake, administrative building)
- annotation (building name, road labels)
- dimension (special annotation for dese) — length, width, distance

Datasets

Defination:
A container that stores related feature class that shares the same spatial reference

Purpose:
- To organize feature class
- To make sure that datasets that are related able to work together

Properties
- Data type
- Field length
- alias
- Allow nulls
- Default value
- Domain


technique spatial analysis
① reclassification
② Buffering
③ raster overlay
④ Clipping
⑤ slope analysis
⑥ Neighbourhood analysis
⑦ Zonal Analysis
⑧ rewshed analysis
⑨ watershed analysis
⑩ Aspect analysis