جامـــــعة المـــــستـقبـل
AL MUSTAQBAL UNIVERSITY

كلية العلوم
قـســـــــم الانظمة الطبية الذكية

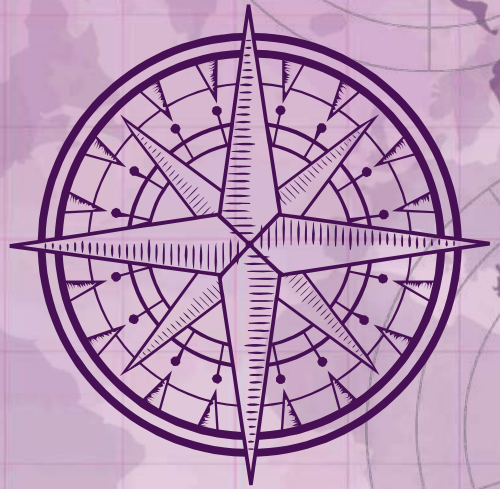
Lecture: (2)

Subject: GIS Spatial Data
Level: Third

Lecturer: MSc. Mustafa Yousif

01

GIS Spatial Data



What is spatial data contains?

1. Location
2. Description

   Arab academy, sheraton al-matar
3. Post Code A postal code is a series of letters or digits or both .

   114
4. Grid reference Grid lines on maps define the coordinate system

   51919.1 131518.1
5. longitude and latitude

   30.0817° N, 31.0179° E

Spatial Data Characteristics

1. Coordinates **Where each feature is located**
2 . Attributes **What each feature represent**
3. Topology **Relationships among features**
4 . Geometry **Physical shape of the feature**

Spatial Data Characteristics

Geometry

- A building Shape.
- county Shape.
- The course of a river.
- the route of a road.
- The landscape Shape.

Topology How

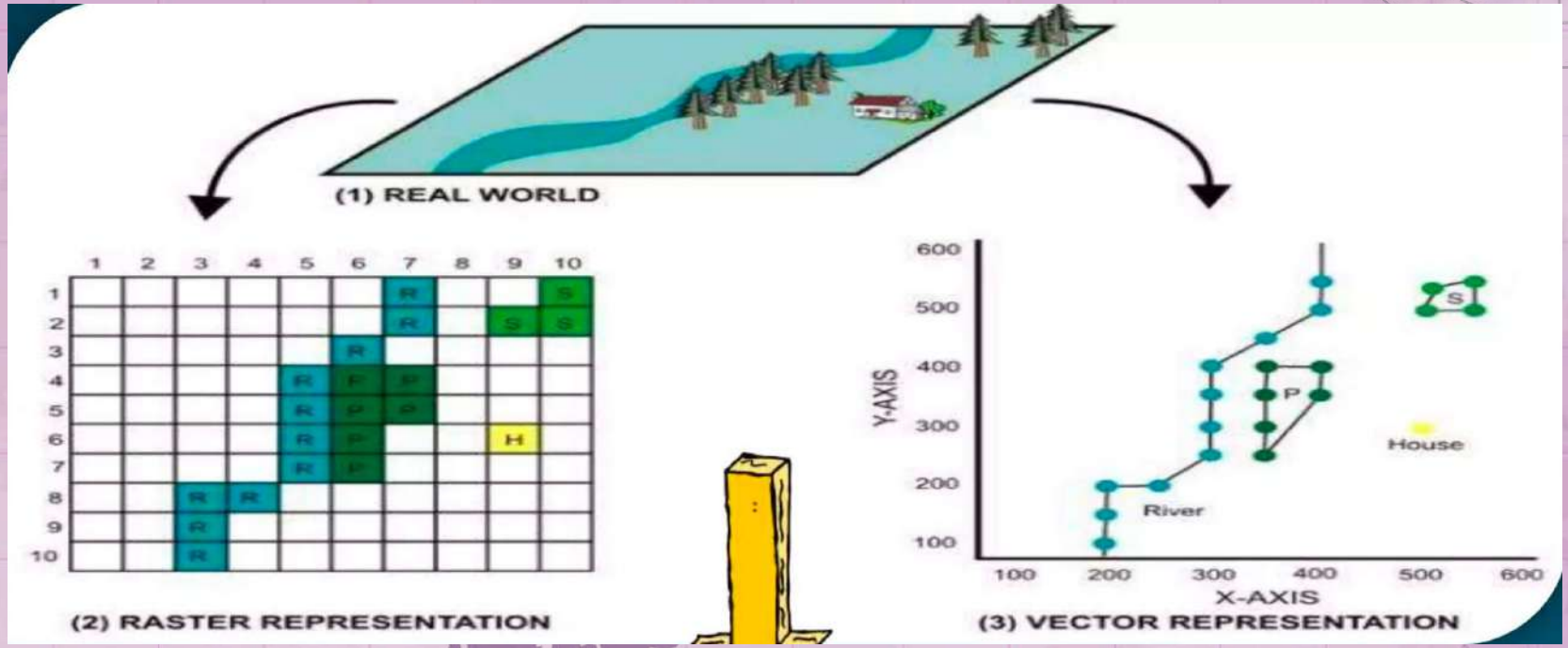
Geographical data related to other

- Connected to
- Within
- Adjacent to
- North of . . .

02

GIS Models

GIS Models


(1) REAL WORLD
(2) RASTER REPRESENTATION
(3) VECTOR REPRESENTATION
Y-AXIS
X-AXIS
River
House
P
S
H
R

GIS Models

- Data model is a conceptual description (mental model) of how spatial data are organized for use by the GIS.
- The data model represents a set of guidelines to convert the real world (called entity) to the digitally and logically represented spatial objects consisting of the attributes and geometry.
- The attributes are managed by thematic or semantic structure while the geometry is represented by geometric-topological structure.

GIS Models

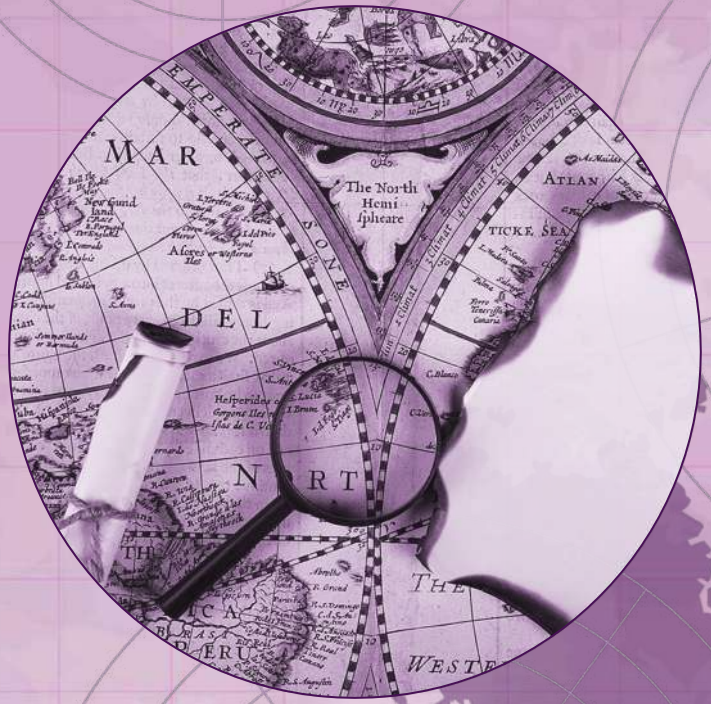
RASTER DATA MODEL

VECTOR DATA MODEL

DIGITAL ELEVATION MODEL (DEM)

NETWORK MODELS

RASTER DATA MODEL

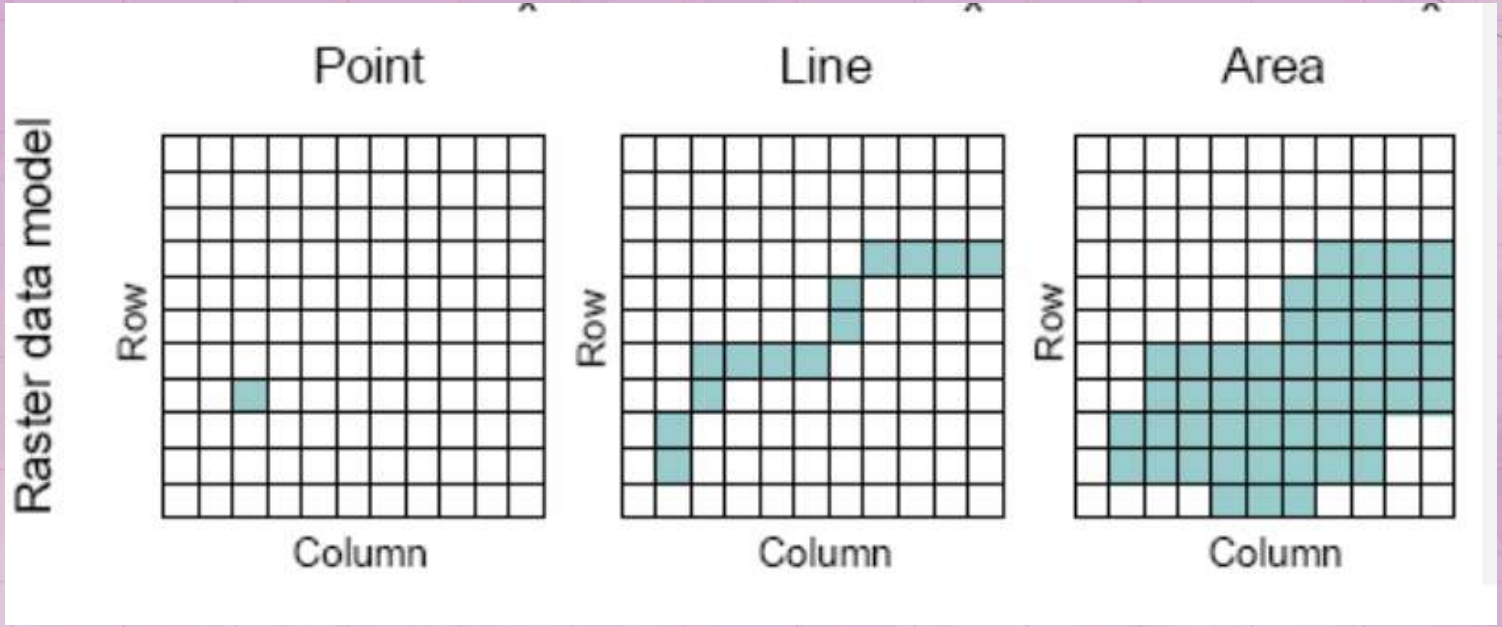


Raster Data Model

The term raster data consists of rows and columns of cells (or pixels). In this format a single value is stored against each cell. Raster data can represent a multiplicity of things including:

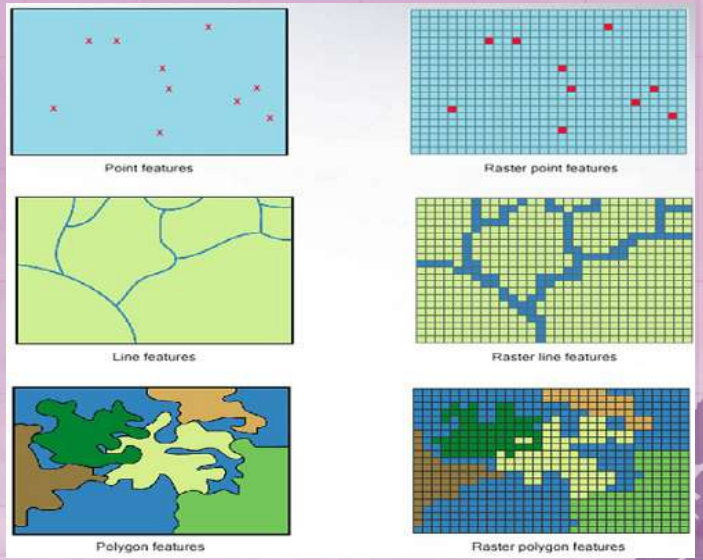
- Visual images (that is color and/or hue)
- Discrete value, such as land use
- Continuous value, such as rainfall
- Null values if no data is available.

Raster Data Model



Raster Data Model

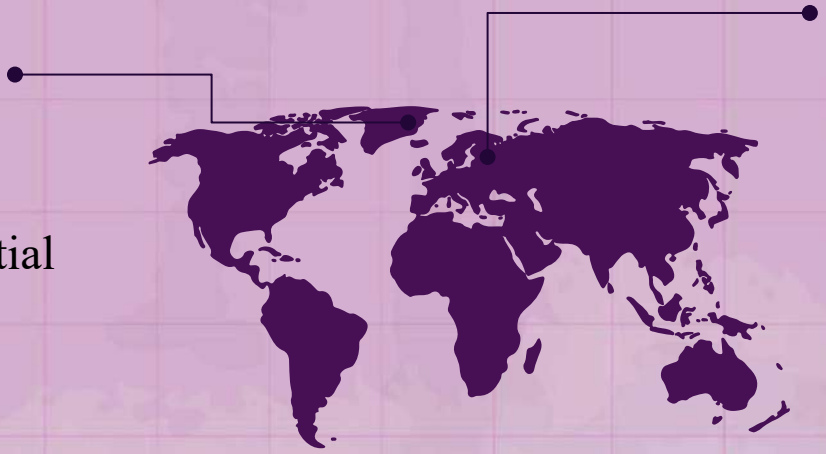
The level of detail represented by a raster is often dependent on the cell (pixel) size or spatial resolution of the raster. The cell must be small enough to capture the required detail but large enough so computer storage and analysis can be performed efficiently.



Cells of Raster Data Model

Smaller cell size

- Higher resolution
- Higher feature spatial accuracy.
- Slower display
- Slower processing
- Large file size



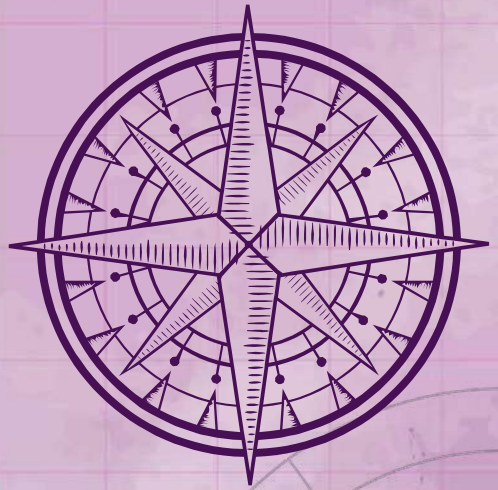
Larger cell size

- Lower resolution
- Lower feature spatial accuracy
- Faster display
- Faster processing
- Smaller file size

Advantages of Raster Model

- It is a simple data structure.
- It has the ability to represent continuous surfaces and perform surface analysis.
- The ability to uniformly store points, lines, polygons and surfaces.
- The ability to perform fast overlays with complex datasets.

VECTOR DATA MODEL

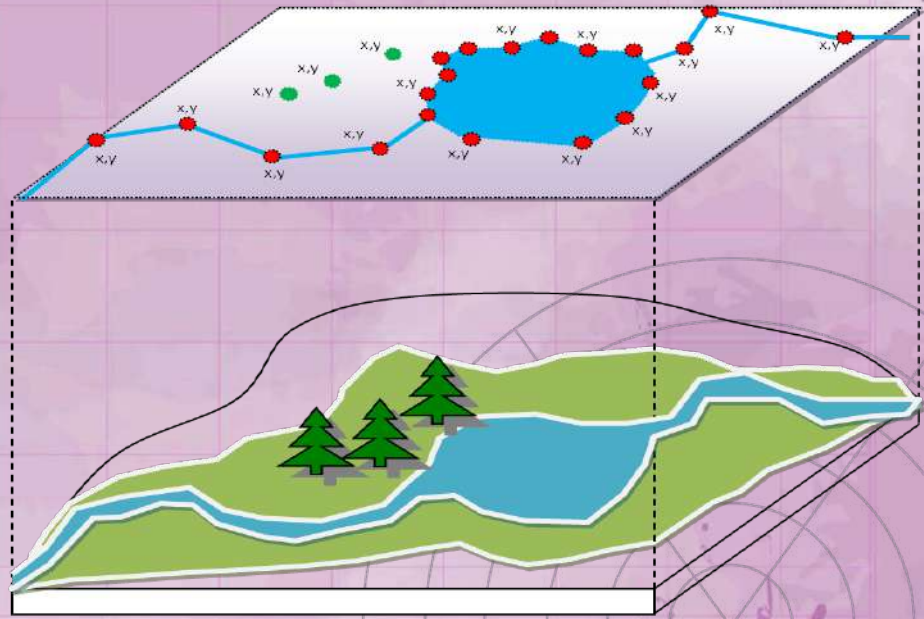


VECTOR DATA MODEL

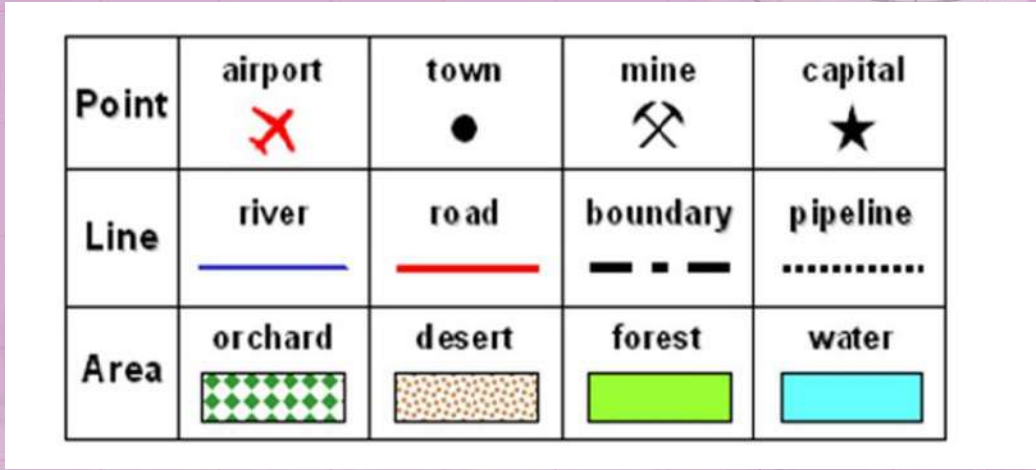
- Vectors are graphical objects that have geometrical primitives such as points, lines and polygons to represent geographical entities in the computer graphics.
- A vector refers to a geometrical space which has a accurate direction, length and shape
- Points, Lines and Polygons can be defined by the coordinate geometry.

VECTOR DATA MODEL

- A vector spatial data model uses two-dimensional Cartesian (x, y) coordinate system to store the shape of a spatial entity.

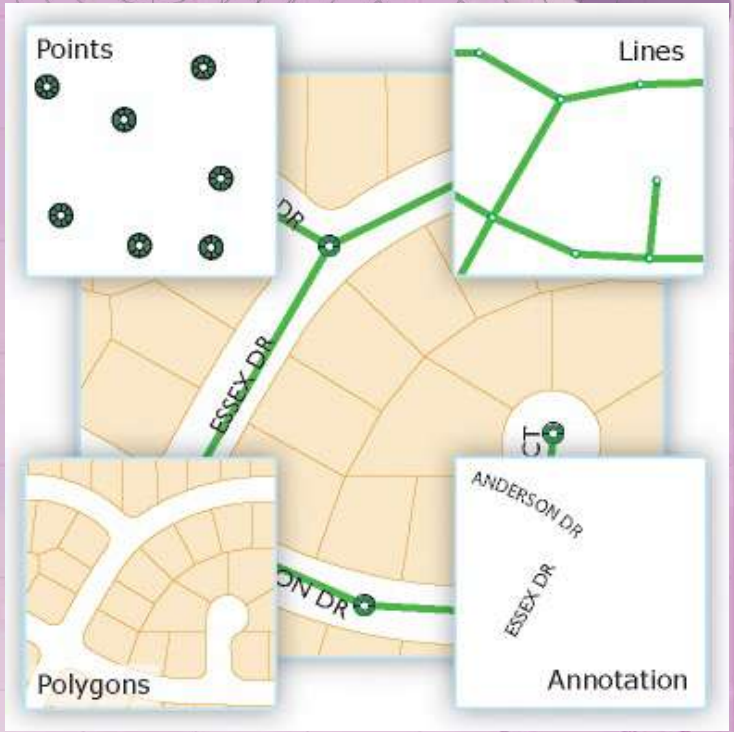


- In vector world the point is the basic building block from which all spatial entities are constructed.
- The simplest spatial entity, the point, is represented by a single (x, y) coordinate pair.
- Line and area entities are constructed by connecting a series of points into chains and polygons.



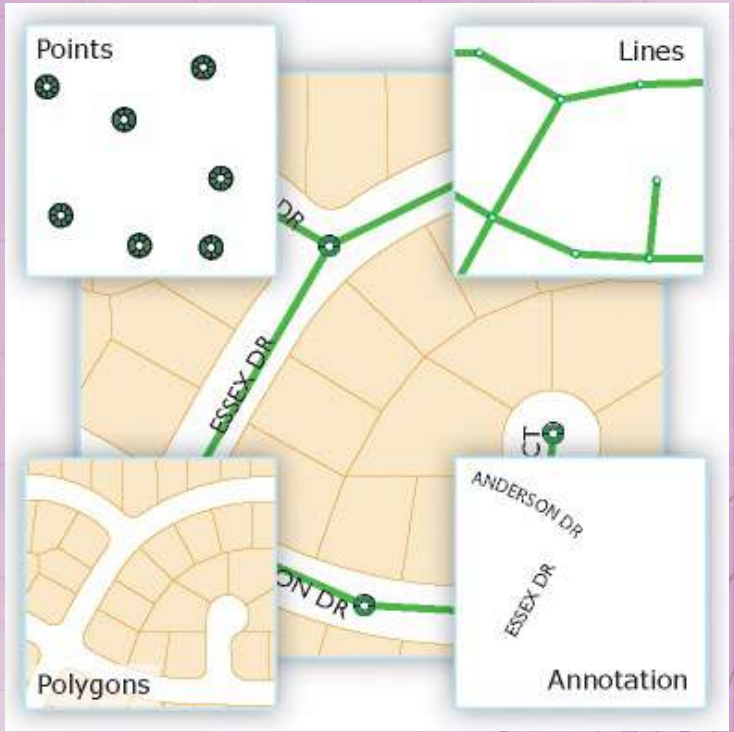
POINT

- A point is a dimensional object and has only the property of location (x,y)
- Points can be used to model features such as a well, building, power pole, sample location etc.
- Other names for a point are vertex, node



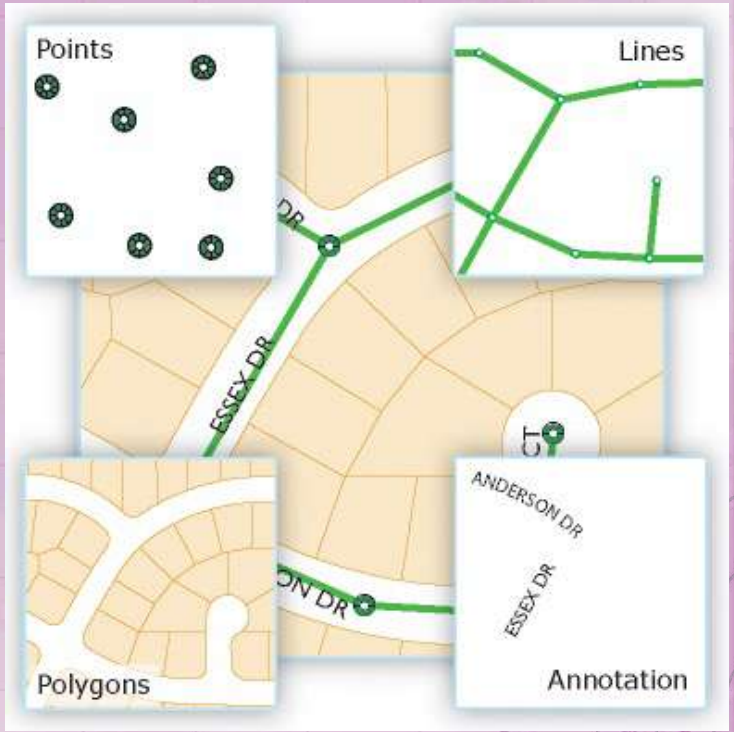
LINE

- A line is a one-dimensional object that has the property of Length.
- Lines can be used to represent road, streams, dams, boundary, contacts etc .
- Lines are also called an edge, link, chain, arc, Connected multiple lines are called polylines.



Polygon

- Polygon features are made of one or more lines that encloses an area.
- A polygon is a two-dimensional object with properties of area and perimeter represented by a closed sequence of lines.
- A polygon can represent a city, geologic formation, lake, river, etc.



Advantages of Vector

Requires less disk storage space.

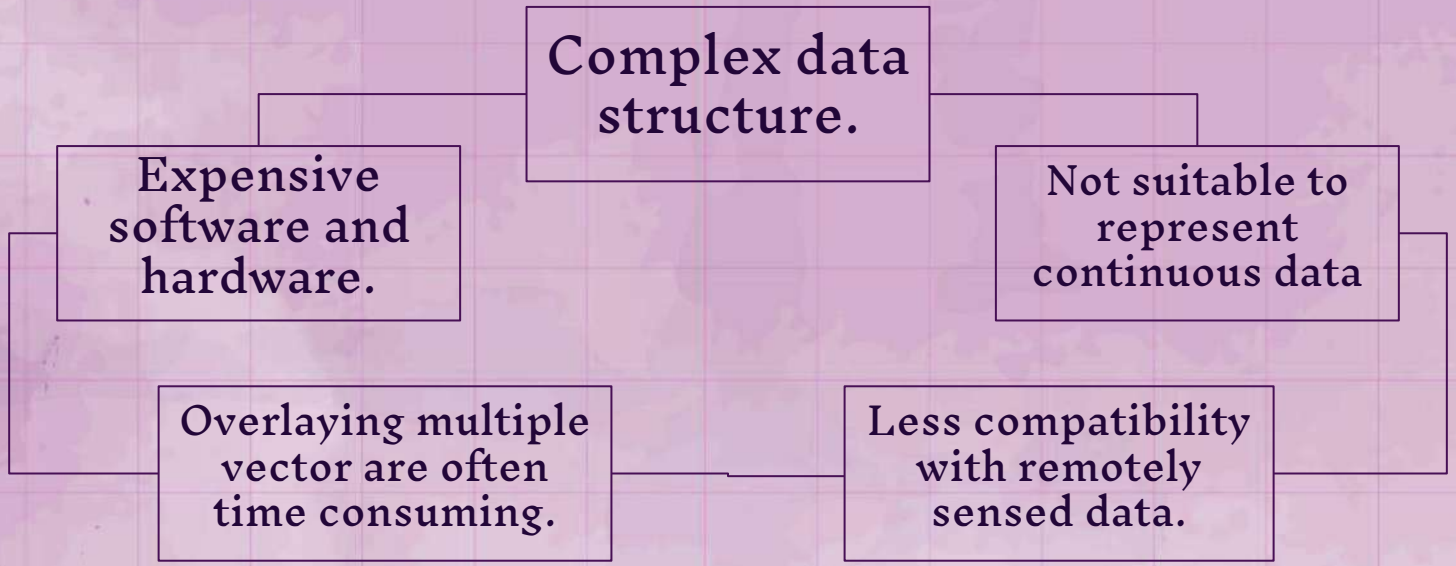
Efficient for topological relationship

Graphical output more closely resembles hand-drawn maps.

Accurate map output

Efficient projection transformation

Disadvantages of Vector



Difference between Raster and Vector

- It is a simple data structure.
- Overlay operations are easily and efficiently implemented.
- High spatial variability is efficiently represented in a raster format.
- The raster format is more or less required for efficient manipulation and enhancement of digital images.

RASTER

Difference between Raster and Vector

- More complex data structure.
- Overlay operations are more difficult to implement.
- The representation of high spatial variability is inefficient.
- Manipulation and enhancement of digital images cannot be effectively done in the vector domain.

VECTOR

GIS Process

Collect Data

- Data Acquisition
  - Location What is at ?
  - Patterns What spatial patterns exist ?

Data Process

- Pre -processing Data
- Data Management

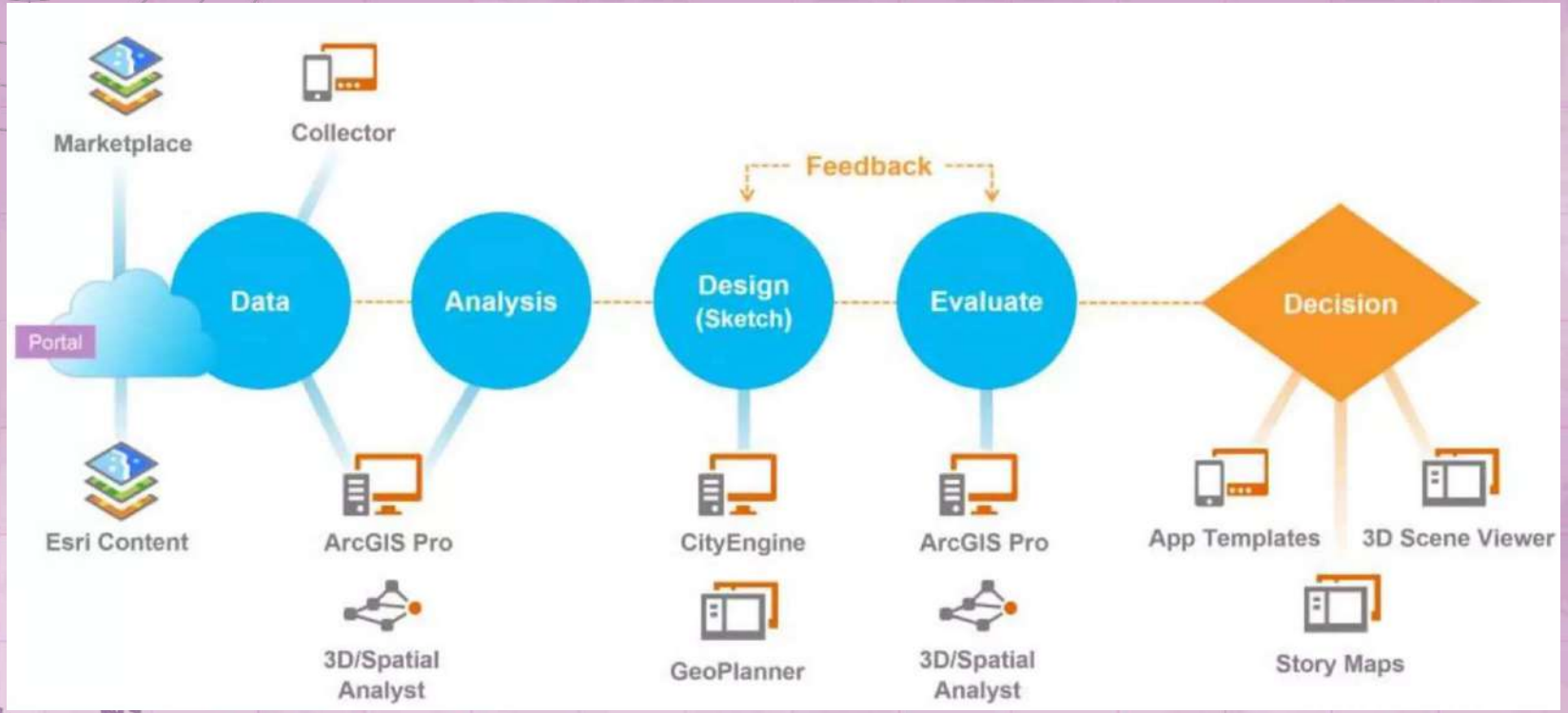
Analyze

- Processing Data

Result

- Product Generation
- Decision
- Report

GIS Process


Marketplace
Collector
Feedback
Data
Analysis
Design (Sketch)
Evaluate
Decision
Portal
Esri Content
ArcGIS Pro
CityEngine
ArcGIS Pro
App Templates
3D Scene Viewer
3D/Spatial Analyst
GeoPlanner
3D/Spatial Analyst
Story Maps


THANK YOU
Do you have any question?