Pemrosesan Data Spasial Dasar

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Outline

01 Sistem Pengelolaan Data (Input dan Export Data)

02 Konversi Data

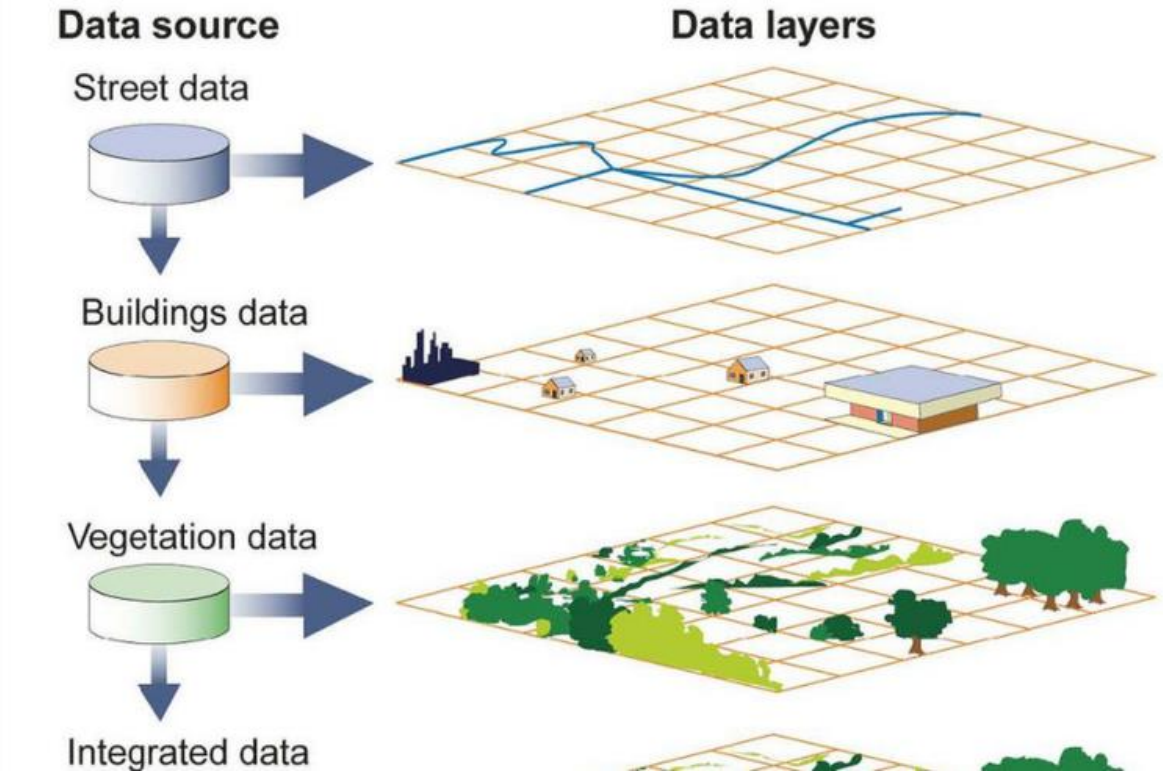
03 Georeferencing

04 Digitasi dan Pengisian Attribute

05 Basis Data SIG Dasar

Data

Referencing the location of objects on the Earth's surface

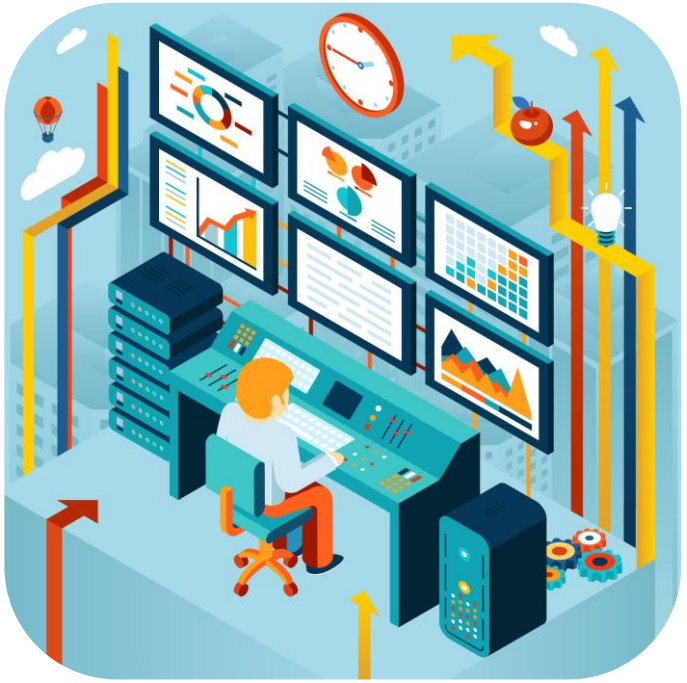


Definisi Data dan Informasi

- Data merupakan sebuah fakta mentah yang belom di olah (Coronel dan Morris, 2016).
- Informasi adalah hasil dari data mentah yang telah di olah sehingga mempunya makna (Coronel dan Morris, 2016).
- Sistem informasi adalah proses mengumpulkan, memproses, menganalisis, dan menyebarkan informasi untuk tujuan tertentu (Cegielski, 2014)

Sistem Informasi Geografis

Input Data



Manajemen Data

Analisa Data

Output Data

Fungsi dalam Input Data

- Perancangan data (Pendefinisian data input: jenis data, format data, struktur data, klasifikasi, tujuan)
- Digitasi
- Topologi
- Penyuntingan/ Editing
- Transformasi proyeksi
- Konversi format data
- Pemberian atribut dll

Format Data

- Vector Formats
  - Saving To a Vector Single File formats (*.SHP, *.GeoJSON)
  - Saving To an ESRI FileGeoDataBase (*.gdb)
  - Saving To a DataBase
  - Saving To a Layer in a Multiple Layers Database
- Raster Formats
  - Saving To a Single Raster File
  - Saving a Raster inside a Database
- Textfiles
  - .csv
  - .txt

Konversi Data

Tahapan untuk mengubah data analog menjadi digital atau mengubah data non-spasial menjadi spasial

- Excel toolset
- To CAD toolset
- To Collada toolset
- To Coverage toolset
- To dBASE toolset
- To Geodatabase toolset
- To KML toolset
- To Raster toolset
- To Vector toolset

Coordinate Reference Systems

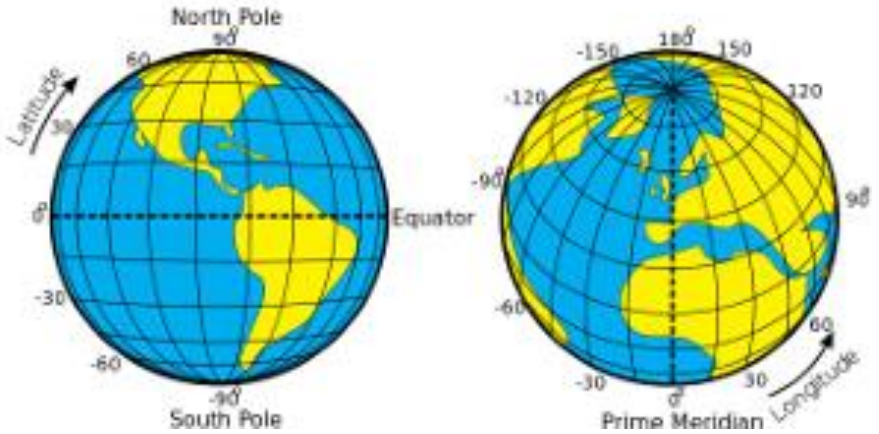
Referencing the location of objects on the Earth's surface

Coordinate Reference Systems (CRS)

- A means of expressing the absolute location of a feature
  - ➢ Geographic – expressed as angles (e.g. latitude, longitude)
  - ➢ Projected – expressed as distances from a reference point on a plane

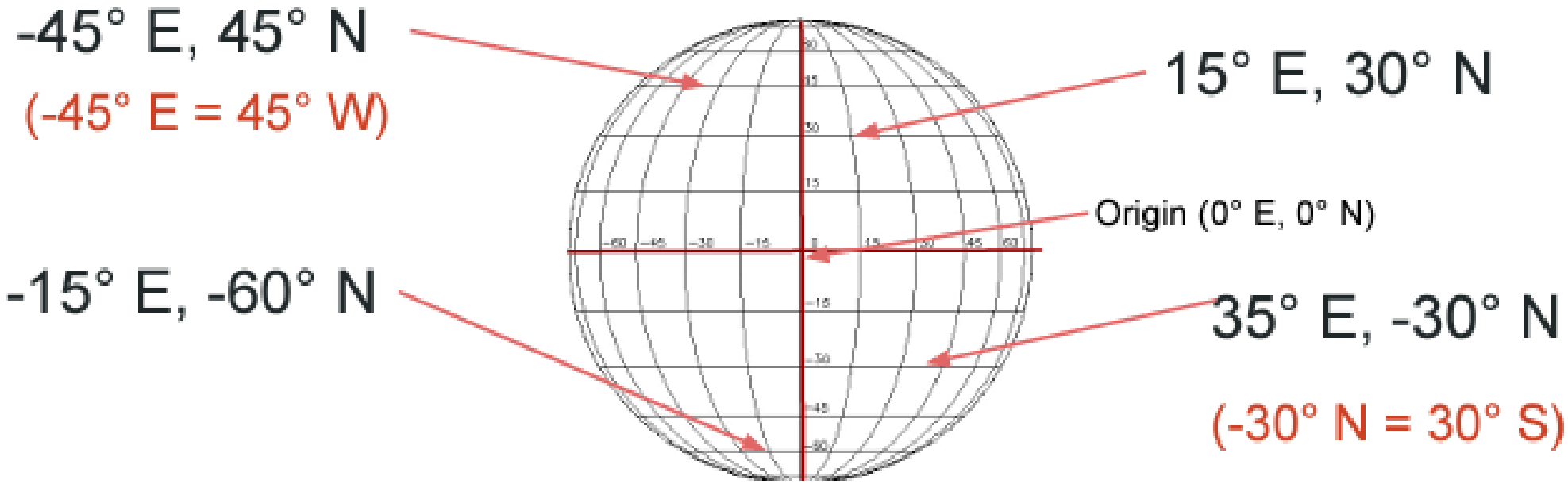
Geographic Coordinate Systems

- Locations expressed as angles from an anchor point
- Network of intersecting lines (e.g. latitude, longitude, elevation)
- Reference system for a curved Earth
- Mathematical operations on multiple points are complicated
- Based on a geodetic datum
  - MANY datums exist
  - World Geodetic System - WGS 84
  - North American Datum - NAD 83



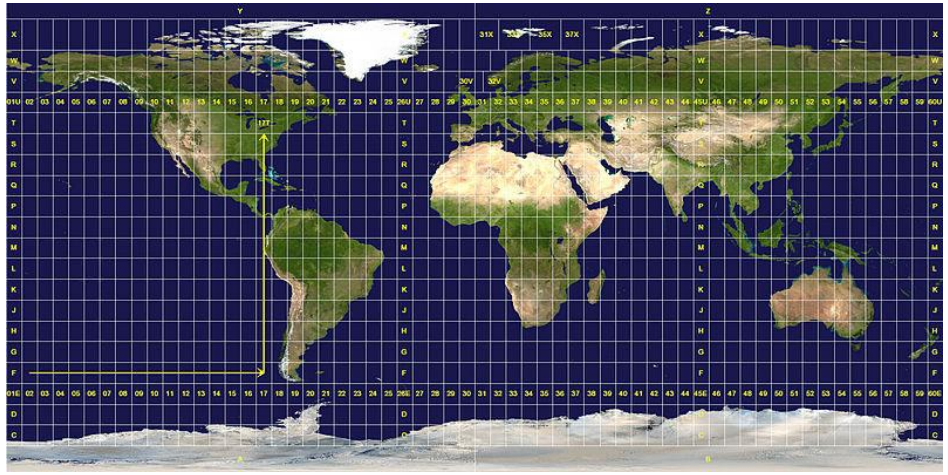
Geographic Coordinate Systems

1. Reference to a Geographic Coordinate System (lat / long)
   - ➢ Degrees East and North of (0°, 0°)

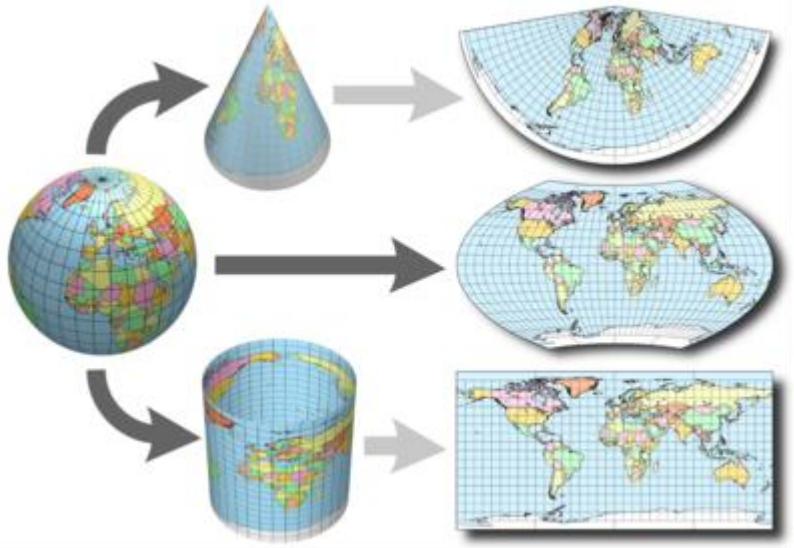


Projected Coordinate Systems

- ➢ Projections of the round Earth to a flat surface → Maps
- ➢ Express location as distance from an anchor point (origin) ◦ Also based on a datum
- ➢ All projections preserve and distort some surface features ◦ Area, shape, direction, bearing, distance, scale



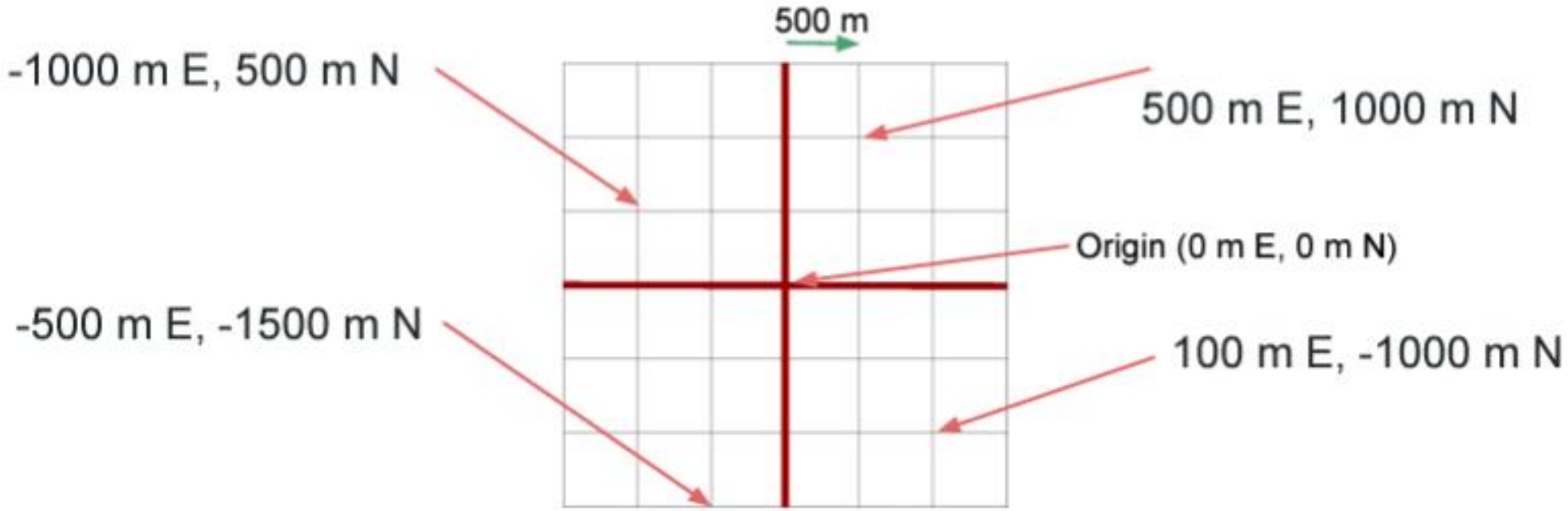
Universal Transverse Mercator (UTM)



Projection

Projected Coordinate Systems

- 2. Reference to a Projected Coordinate System
- ➢ Distance (e.g. metres) East and North of a selected origin



Georeferencing

Definition

- Georeference

Aligning geographic data to a known coordinate system so it can be viewed, queried, and analyzed with other geographic data. Georeferencing may involve shifting, rotating, scaling, skewing, and in some cases warping, rubber sheeting, or orthorectifying the data

ESRI GIS Dictionary http://support.esri.com/sitecore/content/support/Home/other-resources/gis-dictionary/term/georeferencing

- Georectification

The digital alignment of a satellite or aerial image with a map of the same area. In georectification, a number of corresponding control points, such as street intersections, are marked on both the image and the map. These locations become reference points in the subsequent processing of the image.

ESRI GIS Dictionary http://support.esri.com/sitecore/content/support/Home/other-resources/gis-dictionary/term/georectification

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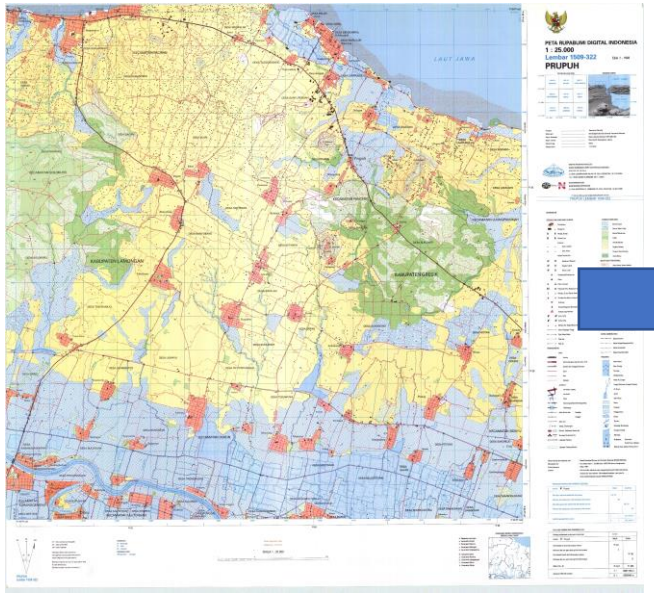
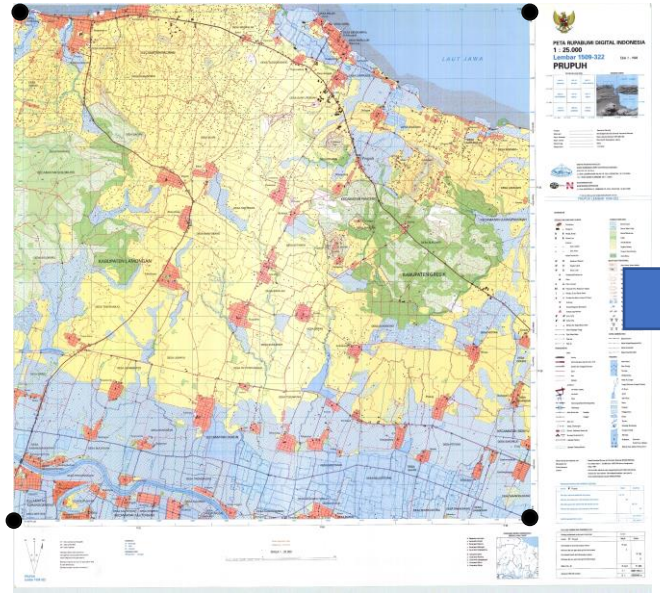
By Berkat Ecolestari Sejahtera

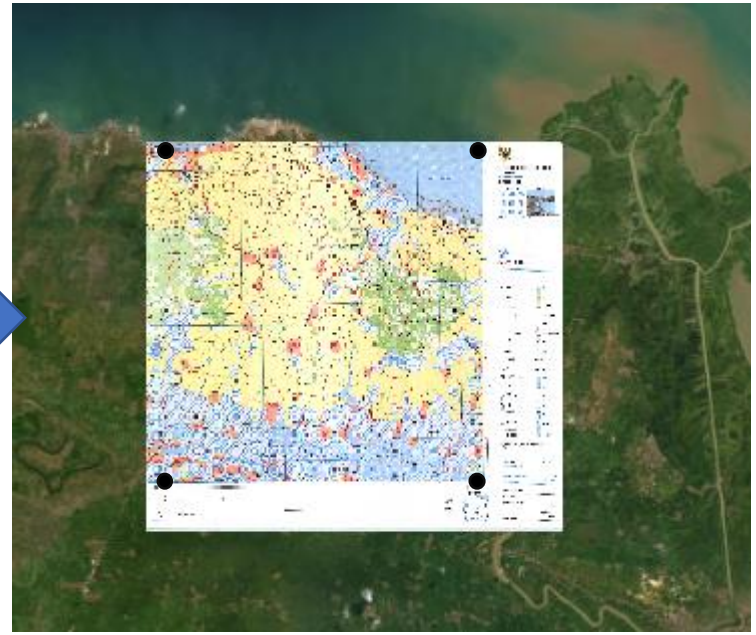
Target



Georeference image with GCP

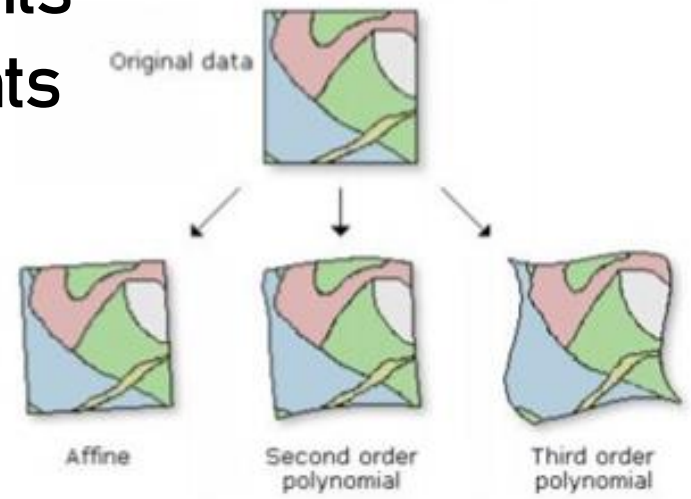


Georectified



Transformation Model of GCPs

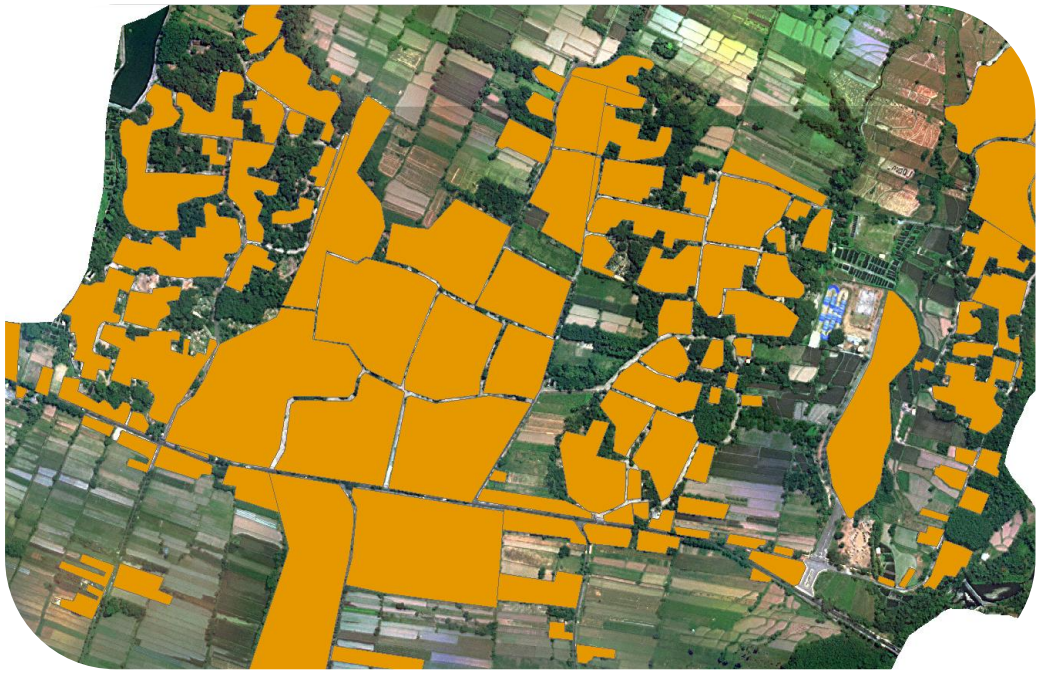
- The # of GCPs required depends on your need for accuracy and the transformation model (i.e. the flexibility for warping the map) You can use:
  - Polynomial 3 if you've found 10 or more control points
  - Polynomial 2 if you've found 6 or more control points
  - Polynomial 1 if you've found 3 or more control points



Why georeference/georectify maps and images?

- Analyze
  - ➢ Use GIS to evaluate spatial characteristics and relationships
  - ➢ e.g. land-use change; boundary mapping; image processing Visualize
  - ➢ Explore information in a spatial context
  - ➢ Explore & “mash-up” multiple information layers Generate new data
  - ➢ e.g. vectorizing georeferenced imagery

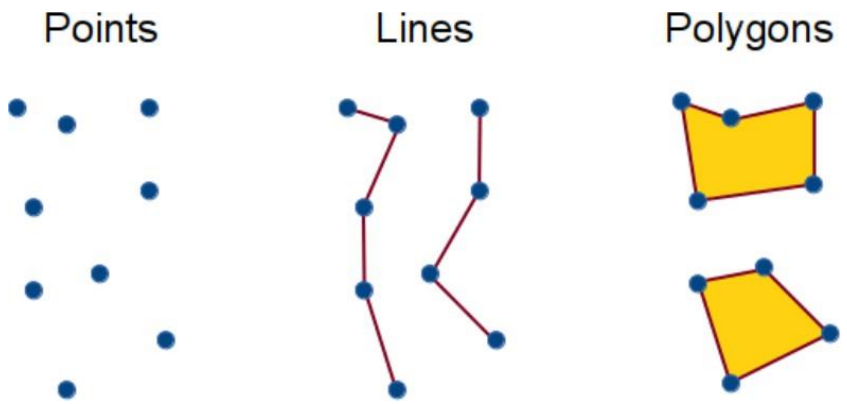
Digitasi



https://community.esri.com/t5/arcnesia-blog/pemetaan-kualitas-permukiman-pada-desa-tlogoadi/ba-p/885268

Digitasi

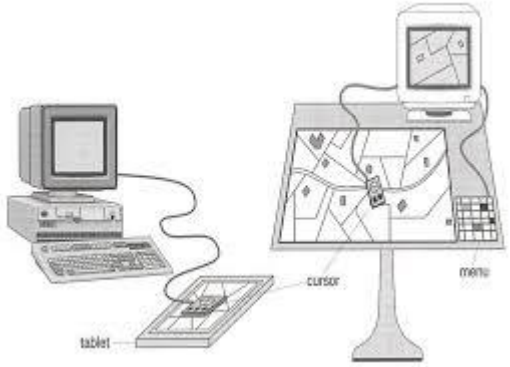
- Digitasi merupakan proses penggambaran peta yang dalam hal ini dilakukan secara on-screen pada layar monitor.
- Proses digitasi akan menghasilkan sebuah data vektor yang nantinya akan menjadi peta digital.
- Digitasi dapat dilakukan pada sebuah shapefile (bertipe titik, garis dan polygon).



Prosedur Digitasi

Image hasil scanning
JPEG, TIFF dll

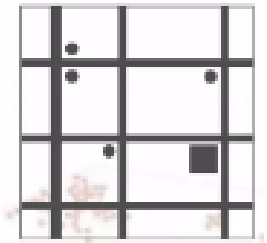
Koreksi Geometrik/ Georeferencing
(Pemberian koordinat)



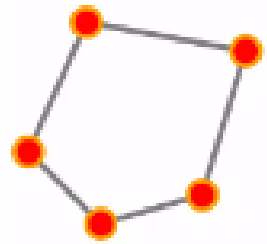
Digitazing/ Tracing

Peta, GPS

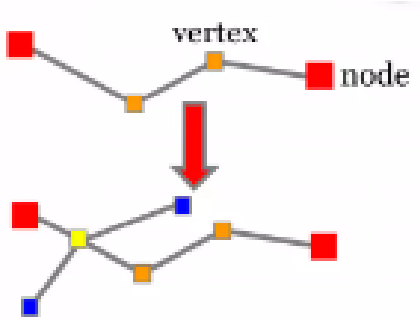
Prosedur Digitasi



Data hasil digitasi



Pembangunan Topologi



Editing features

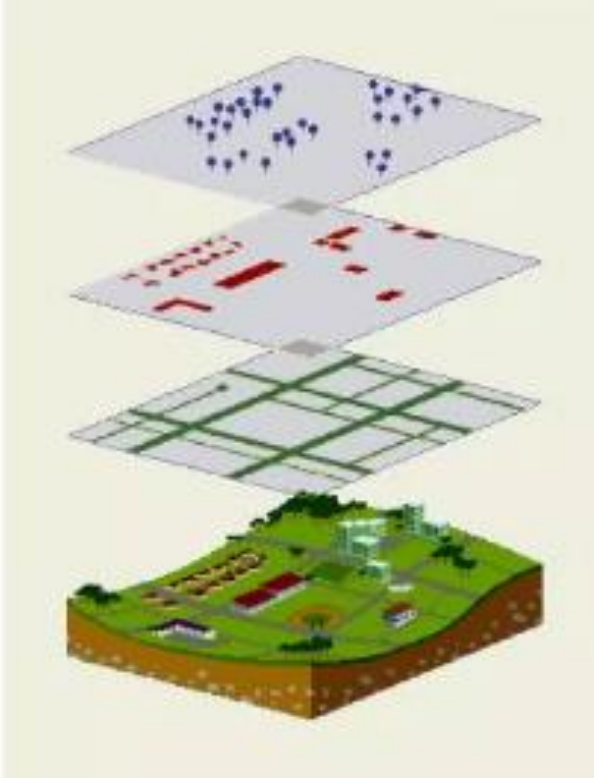
Shape	Id	Name
Line	4	A
Line	3	B
Line	2	C
Line	1	D

Pemberian atribut

Topologi :
Hubungan antara titik, garis, polygon

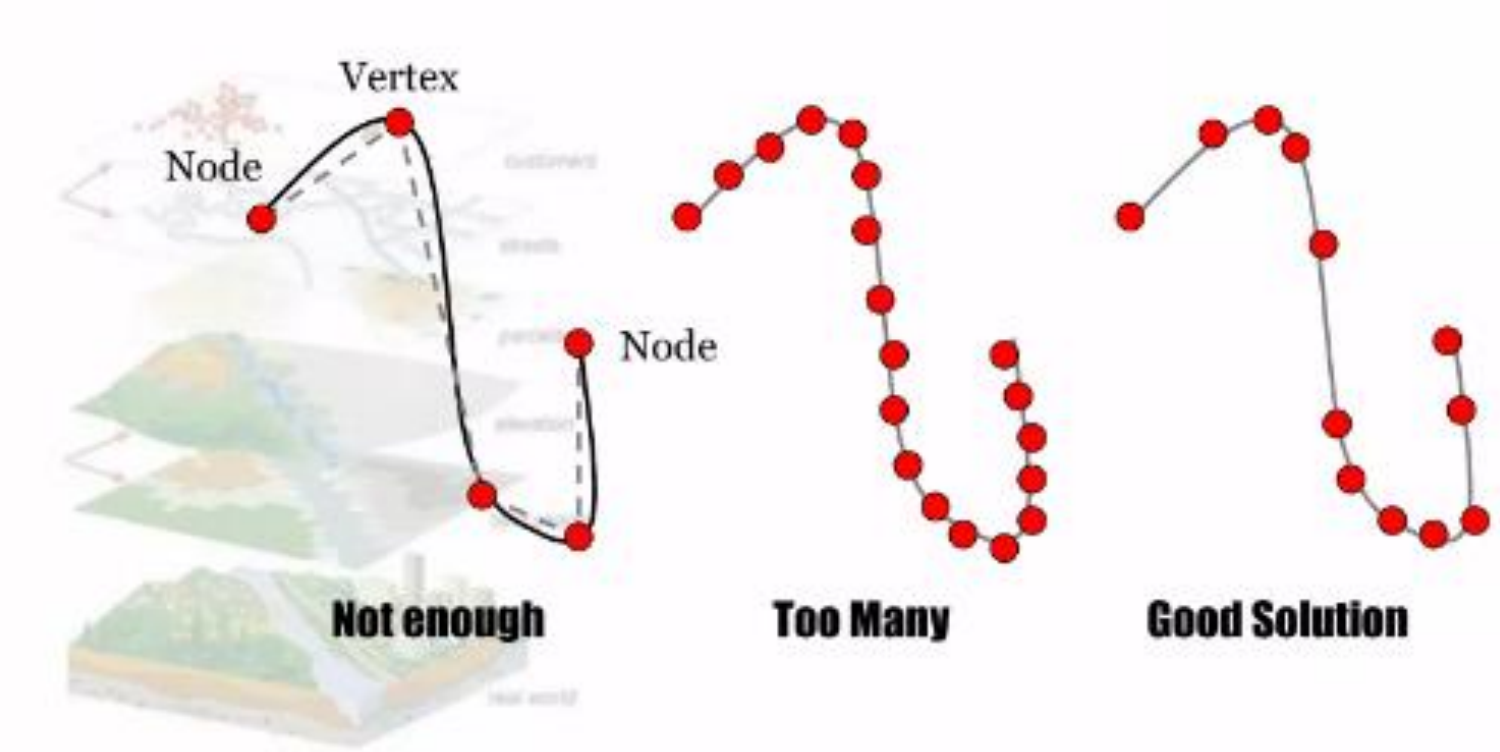
Aturan Digitasi

- Tentukan Tujuan
- Digitasi Informasi yang benar-benar dibutuhkan
- Pilih sumber input terpercaya
- Gunakan level akurasi yang sesuai



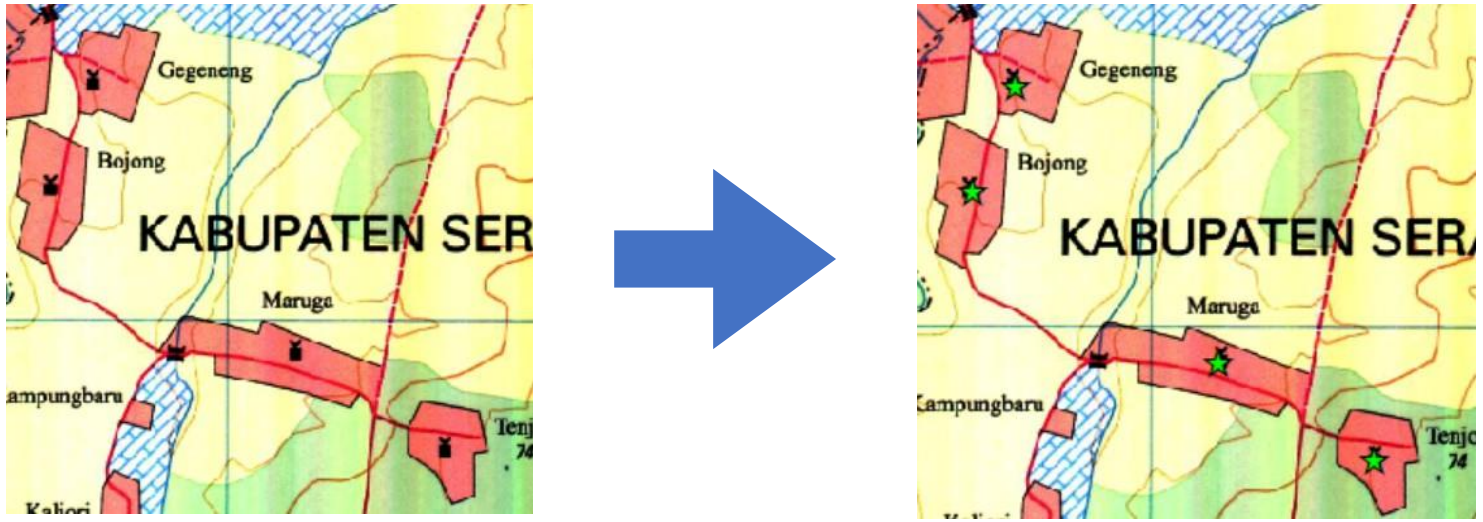
Level Akurasi

Seberapa besar akurasi yang diinginkan :



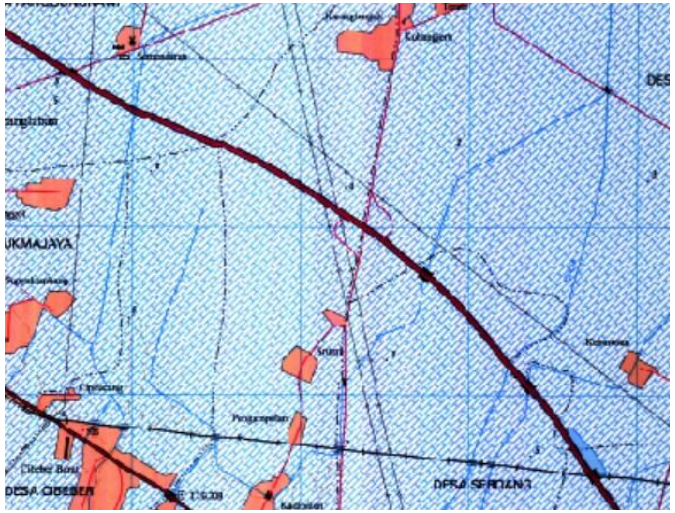
Digitasi Point

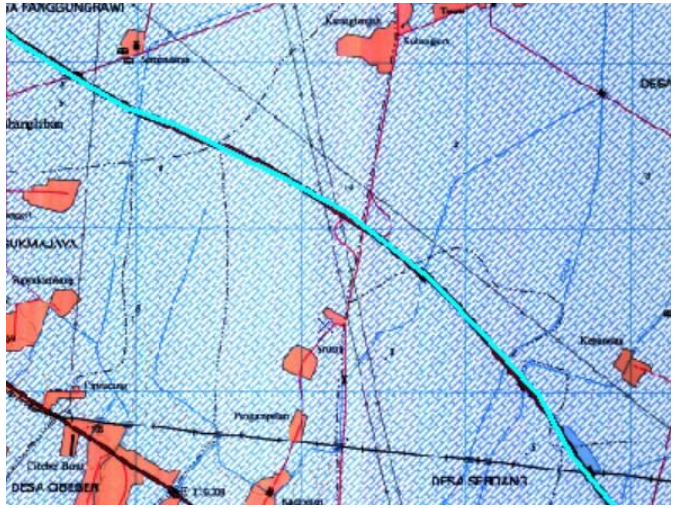
Digitasi point atau titik digunakan untuk menggambarkan lokasi suatu tempat. Tempat yang ditunjukkan melalui digitasi titik biasanya berupa tempat yang penting



Digitasi Lines

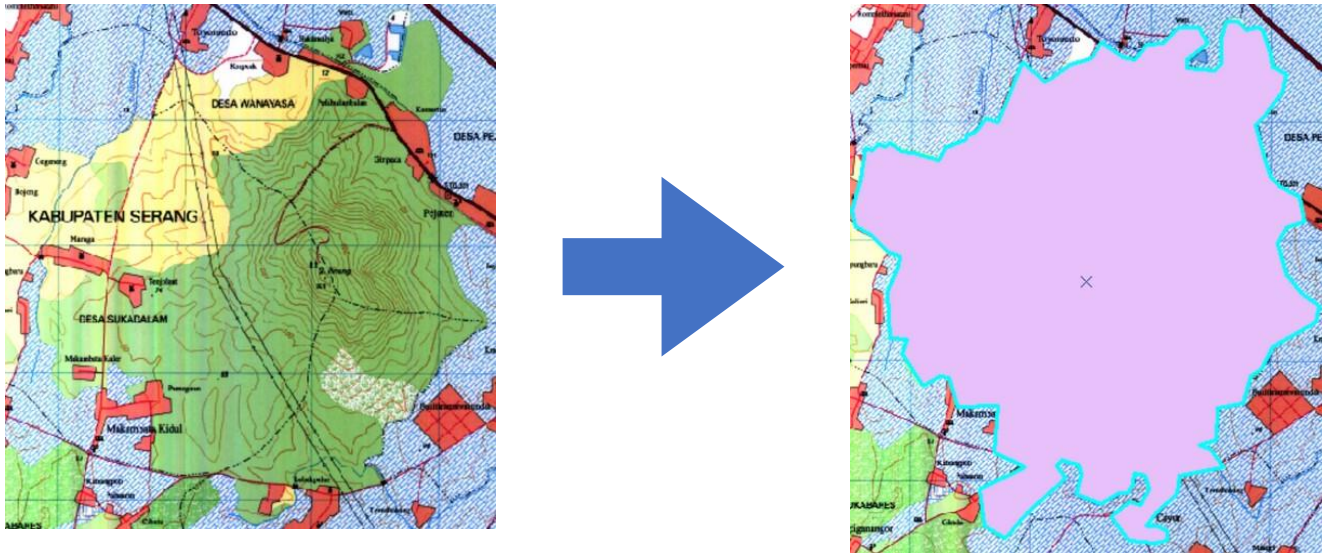
Digitasi polyline (garis) digunakan untuk menggambarkan suatu hal yang memiliki jalur dan panjang, bukan suatu area, misalnya garis kontur, jaringan jalan, sungai, listrik, kabel telepon, dsb.





Digitasi Polygon

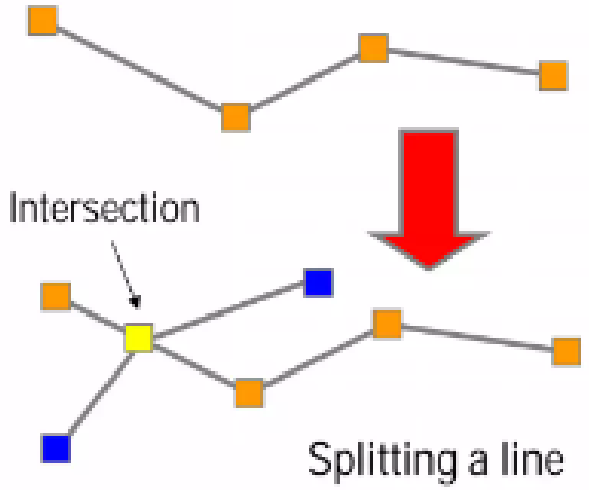
Digitasi polygon digunakan untuk menggambarkan suatu hal yang berupa area/ luasan digunakan untuk membuat Batas Administrasi, Landcover, Bangunan, dll

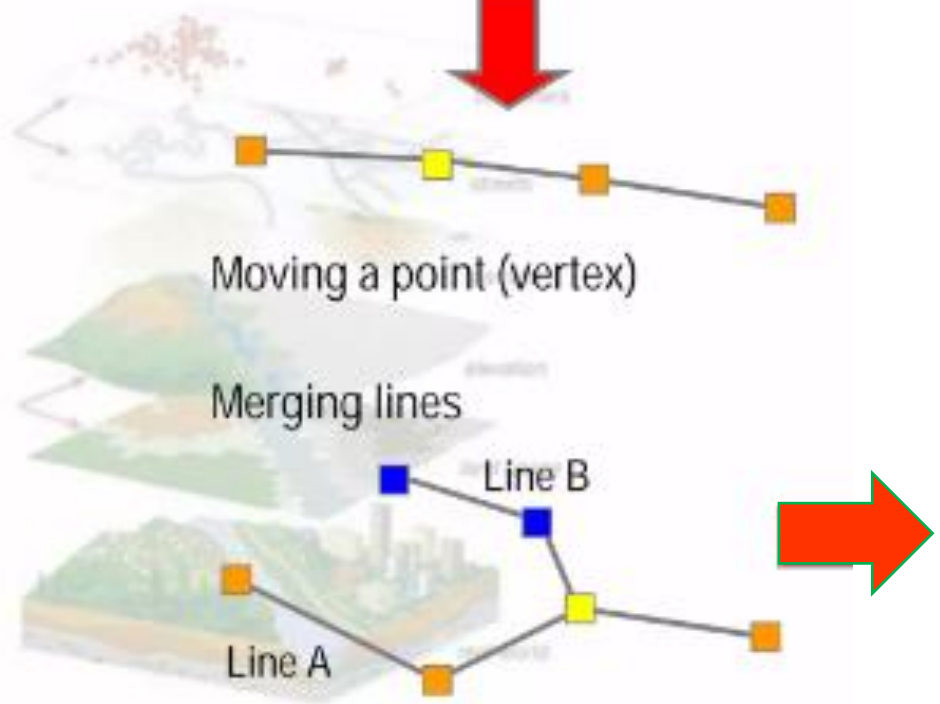


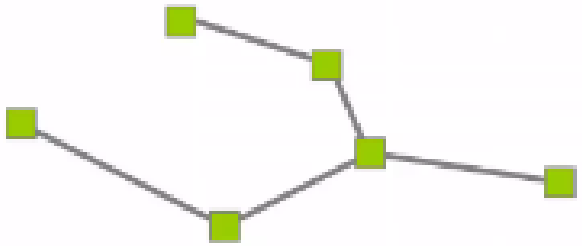
Editing Vector

- Points
  - Simply changing the coordinat
  - Dragging and dropping the most common
- Lines
  - Changing the coordinate of one or more points.
  - Splitting a line in two
  - Merging lines
- Polygons
  - Changing the coordinate of one or more points (the last points is also the first point)
  - Splitting a polygon in two
  - Using a boundary to draw another polygon
  - Merging polygons
  - Creating an island in a polygon
  - Creating an intersection

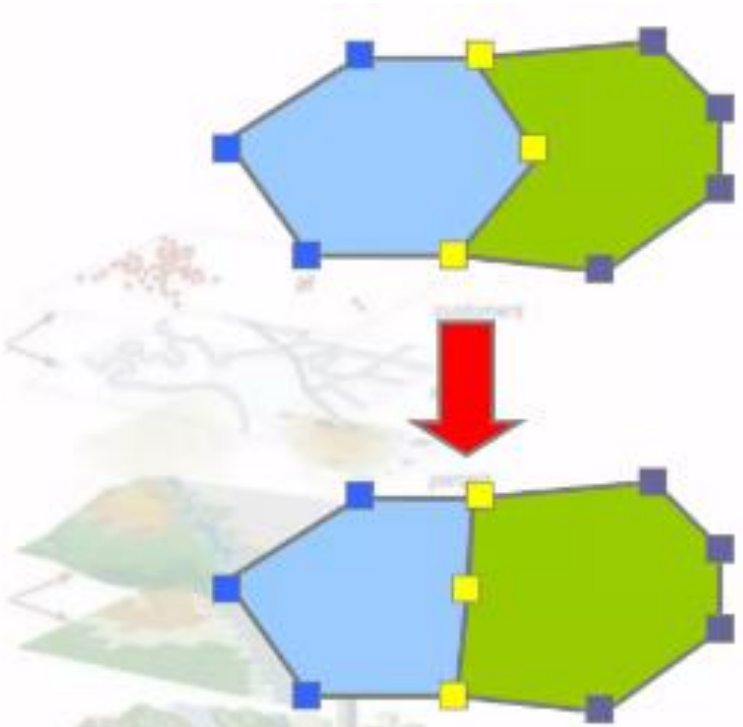
Editing Vector



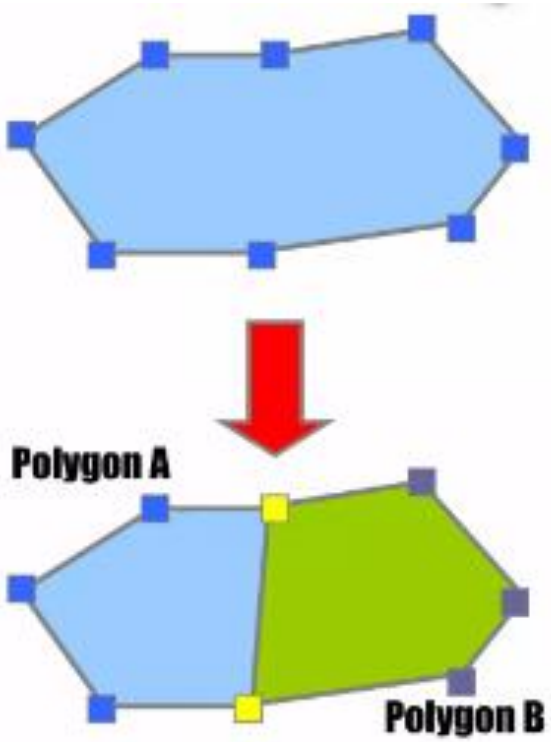




Editing Vector

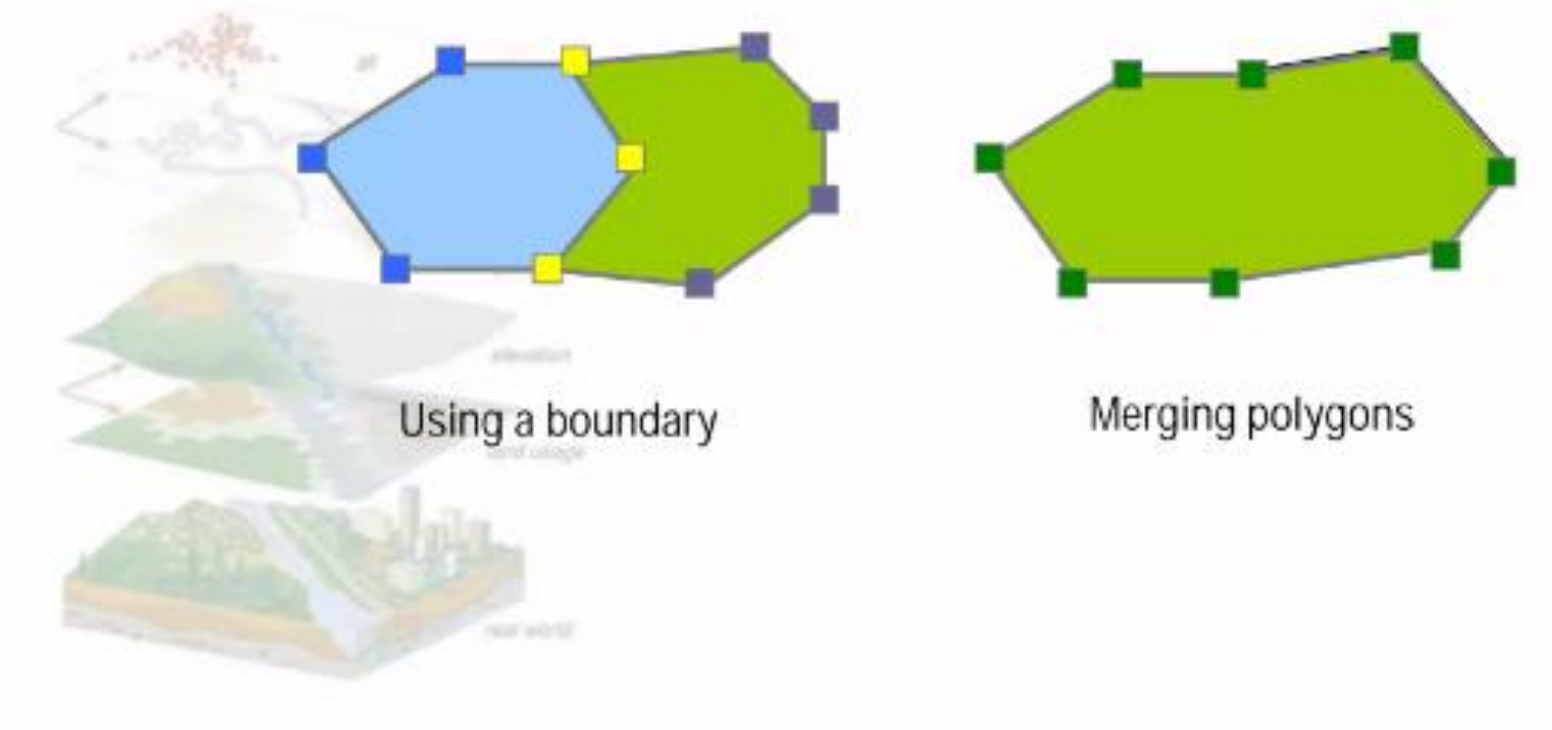


Moving a point (vertex)

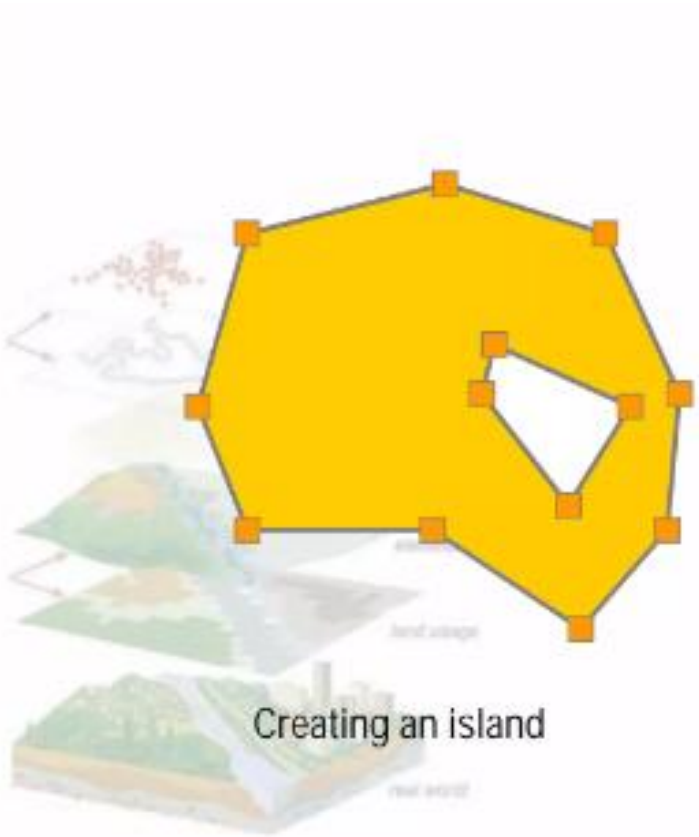


Splitting a polygon

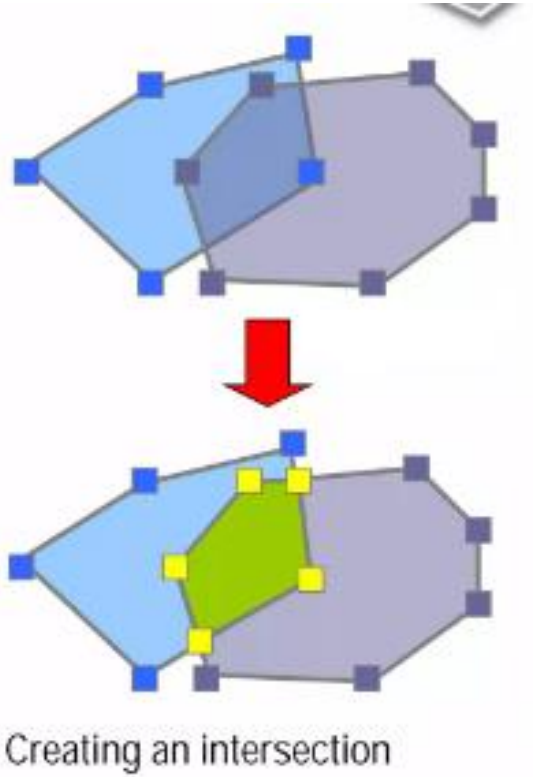
Editing Vector



Editing Vector



Creating an island

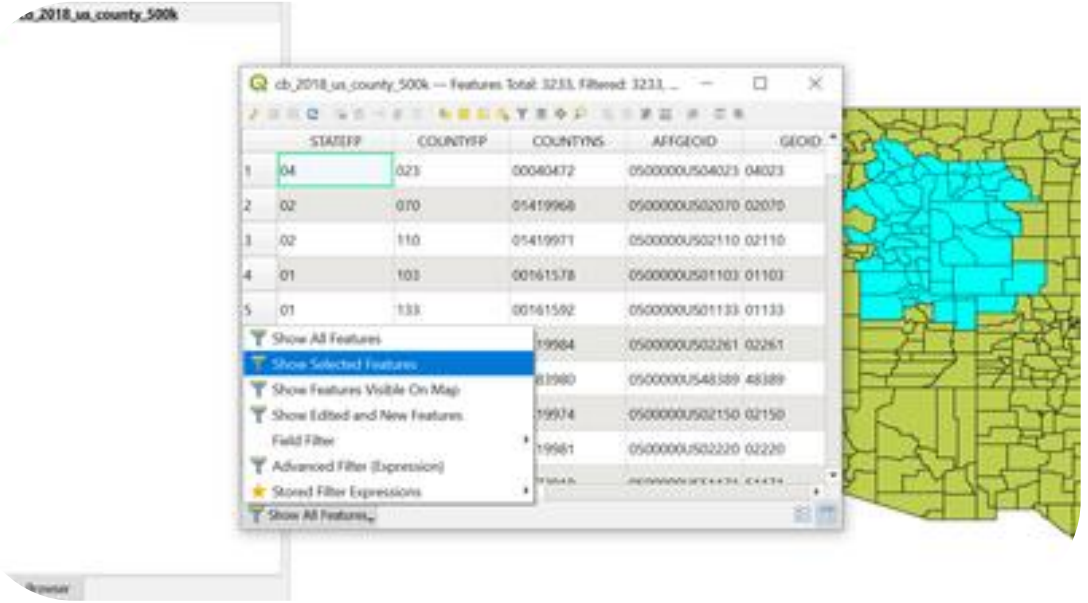


Creating an intersection

Editing Vector

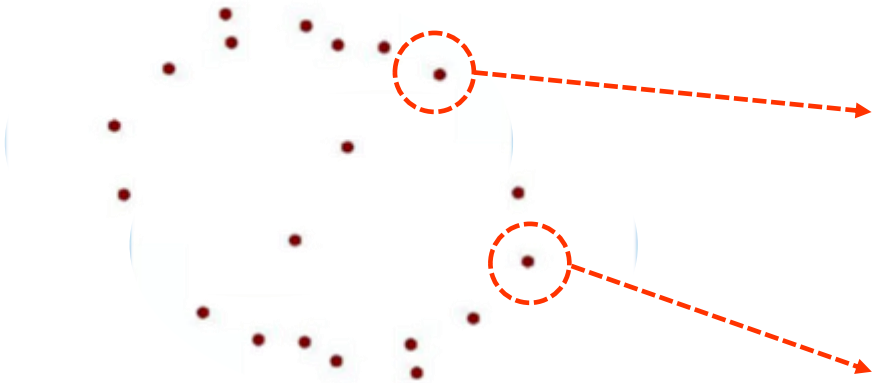
- Snapping
  - Make a vertex take the coordinates of a reference
  - Spanning tolerance defines the “search space”
  - Avoid Overshoots and undershoots for lines
  - Avoid gaps and overlaps for polygons.
- Snap to Vertex
  - Snaps the next vertex to the nearest vertex in an existing line or polygon.
- Snap to Boundary
  - Snaps the next vertex to the nearest line segment in an existing line or polygon boundary.
- Snap to the Intersection
  - Snaps the next vertex to the nearest node common to two or more lines or polygons.
- Snap to the Endpoint
  - Snaps the next vertex to the nearest endpoint of an existing line
  - For lines only.

Tabel Atribut



Contoh Data Titik

Data grafis



Data atribut

Shape	Point
Area	0.000000
Perimeter	0.000000
Ibkt_	106
Ibkt_id	3
Ket	IBUKOTA KECAMATAN

Shape	Point
Area	0.000000
Perimeter	0.000000
Ibkt_	221
Ibkt_id	1
Ket	IBUKOTA PROPINSI

Contoh Data Garis

Data grafis

Data atribut

Shape	PolyLine
Area	0
Perimeter	0
Length	432.329369
Jalan_	1183
Jalan_id	300
Keterangan	Jalan Lokal
Kode	300

Contoh Data Polygon

Data grafis

Data atribut

Shape	Polygon
Id	10
Area	744954.656250
Perimeter	4688.030763
Kelurahan	Demangan
Kecamatan	Gondokusuman
Kabupaten	Kodya

Shape	Polygon
Id	35
Area	1230110.343750
Perimeter	5497.034681
Kelurahan	Rejowinangun
Kecamatan	Kotagede
Kabupaten	Kodya


Thank You!

Reference

- ***Coronel, C., & Morris, S. (2015). Database Systems: Design, Implementation, & Management (Vol. 11th). Cengage Learning.***
- ***Cegielski, R. P. (2015). Introduction to Information System. John Wiley and Sons.***