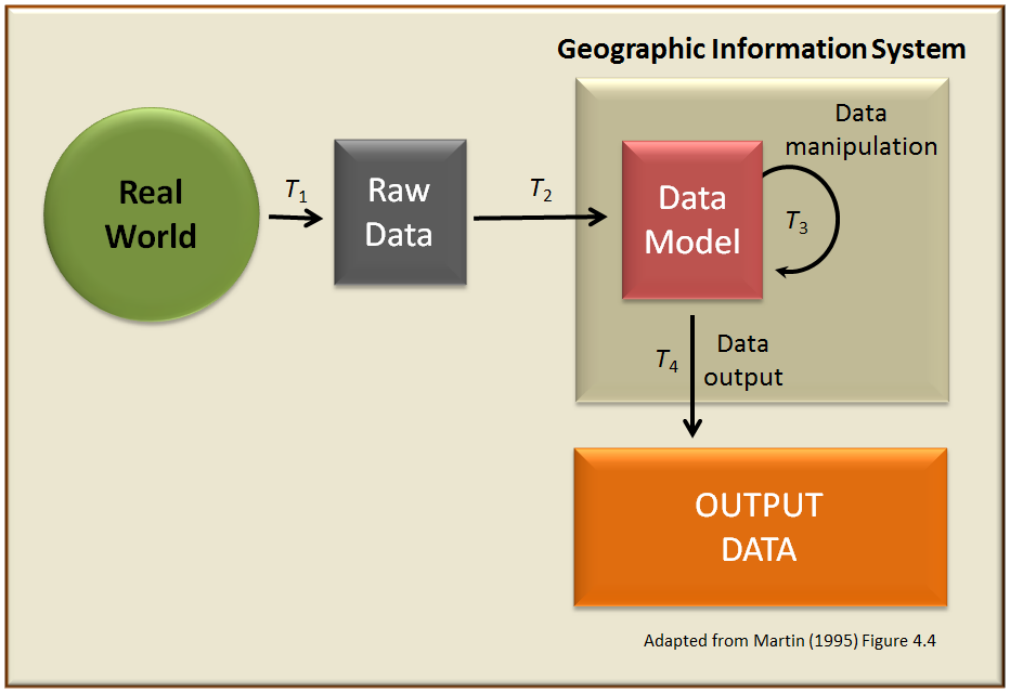
CASE STUDY: GEOSPATIAL DATA INTEGRATION

Let's apply the course concepts we have studied in a geospatial data integration application

Opening prompt / problem statement

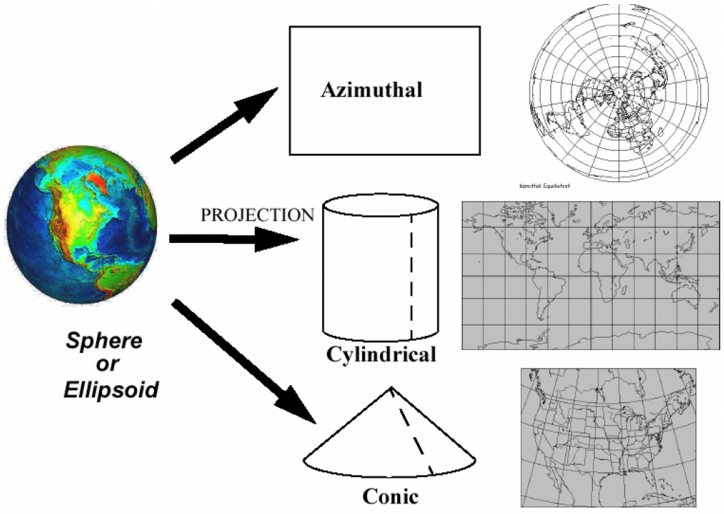
According to Wikipedia, geographic information systems (GIS) are conceptualized frameworks that provides the ability to capture and analyze spatial and geographic data. GIS applications (or GIS apps) are computer-based tools that allow the user to create interactive queries (user-created searches), store and edit spatial and non-spatial data, analyze spatial information output, and visually share the results of these operations by presenting them as maps. Geographic information systems are utilized in multiple technologies, processes, techniques and methods. They are attached to various operations and numerous applications, that relate to: engineering, planning, management, transport/logistics, insurance, telecommunications, and business. For this reason, GIS and location intelligence applications are at the foundation of location-enabled services, that rely on geographic analysis and visualization.



Preliminaries

Map Projections

- A transformation of the spherical or ellipsoidal earth onto a flat map is called a map projection.
- The map projection can be onto a flat surface or a surface that can be made flat by cutting, such as a cylinder or a cone.
- If the globe, after scaling, cuts the surface, the projection is called secant. Lines where the cuts take place or where the surface touches the globe have no projection distortion.



Coordinate Systems

- A coordinate system is a standardized method for assigning codes to locations so that locations can be found using the codes alone.
- Standardized coordinate systems use absolute locations.

- In a coordinate system, the x-direction value is the easting and the y-direction value is the northing.
- Most systems make both values positive.

Coordinate Systems for the US

- Some standard coordinate systems used in the United States are
  - geographic coordinates
  - universal transverse Mercator system
  - military grid/MGRS/National grid
  - state plane
- To compare or edge-match maps in a GIS, both maps MUST be in the same coordinate system.

Geospatial Data in RDF

- Lots of geospatial data available
  - Dbpedia
    - 1043 properties 1.5M typed instances
    - Contains Geospatial and other data (e.g. Music, Plants, etc.)
    - Example properties: *Type (City, Peak, Airport)*
  - LinkedGeoData
    - 5087 properties 11M instances
    - Contains points of interests like bars, restaurants, etc.
  - Geonames
    - 17 properties 6.9M instances
    - Example properties: *Type* (Feature), *FeatureClass* (Place, Building, Mountain, etc.), *FeatureCodes* (City, Country, Bridge, Airport, School, etc.)

Case Questions

1. Look up geospatial ontologies on the World Wide Web Consortium (W3C). What information does the report provide? What is your understanding of a geospatial ontology?

2. What is a GNIS?

3. Convert the query below to a natural language statement. Feel free to traverse the URLs, namespaces etc. below.

Query

Default Graph URI
http://cegis.usgs.gov/rdf/ontologytest/

```
PREFIX ogc: <http://www.opengis.net/rdf#>
PREFIX fid: <http://cegis.usgs.gov/rdf/nhd/featureID#>

SELECT ?feature ?type
WHERE {
fid:_102217454 ogc:hasGeometry ?geo1.
?geo1 ogc:touches ?geo2.
?feature ogc:hasGeometry ?geo2.
?feature a ?type }
```

4. What are some applications of GIS? Try to select one application each in insurance, business, logistics, and planning/management.

5. In developing a digital topographic database for a GIS, topographical maps are the main source, and aerial photography and satellite imagery are extra sources for collecting data and identifying attributes which can be mapped in layers over a location facsimile of scale. How could semantic web and data integration technologies help in reconciling these data sources?