

CSS 4200

Geographic Information Systems

Lecture 21:

- GIS Day 2008 (Mann Library)
 - Geocaching (12p)
 - Posters, Demos, and Refreshments (1:30p)
 - Keynote (2:30p)
 - Ann Forsyth, City and Regional Planning, Cornell
 - "The Built Environment, Food, and Physical Activity: GIS Measurement Issues"*
- Google Earth .kml and .kmz files
- Metadata
- Geocoding and Network Analysis (Bolstad, p. 362-370)

Google Earth .kml

ZhejiangU_Hangzhou_China.kml

Dhfarm.kmz

Metadata

- What is it?
 - Data about data
- Why is it important?
 - Find information
 - Understand information
 - Determine applicability
- Spatial and non-spatial implications

Issues in Metadata

- Critical factor in
 - Information sharing
 - Cost-effective information storing
- Issues
 - Metadata costs money
 - Legal implications

Issues in Metadata Cost

- **Formatting requirements**
 - Transition from paper to electronic data
 - Metadata can significantly impact system design and cost
- **Development expenses**
 - Require skilled input to develop metadata
 - Can take substantial amounts of time to develop

Issues in Metadata

Legal Implications

- Metadata can create legal trouble or avoid it
 - Find and understand information
 - Find potentially damaging information
- Legal standing
 - Courts declaring that metadata be:
 - Treated equally with information
 - Preserved with information
 - Laws are giving:
 - Third parties access to metadata
 - Evidentiary obligations on metadata

What Does Metadata Provide?

- Information:
 - Data content, source, extent, attributes, lineage
 - Data structure, coordinate system, spatial accuracy
 - Distribution, responsible organization
- Information updates:
 - Corrections
 - Changes

Levels of Metadata

- **Object level**
 - Description of a dataset
 - Generalize and abstract data
 - Satisfy many requirements
 - Facilitate searching
 - Understand utility
 - Understand data handling needs
- **Collection level**
 - Describe collections of data

Who Benefits From Metadata

- Organizations that create data
 - Maintain value of data set over time
 - Reduce repetition of work
- Users or potential users
 - Metadata helps find existing data
 - Enhanced search capabilities if metadata is:
 - Created according to metadata standards
 - Contributed to Clearinghouse

Benefits of Metadata

- Expected
 - Reduce duplication and data loss
 - Better sharing
 - New tools development
 - Increase public awareness
- Unexpected
 - Better internal organization
 - Self-evaluation of data storage
 - Enhance use of Internet/Intranet

Why Spatial Metadata is Important

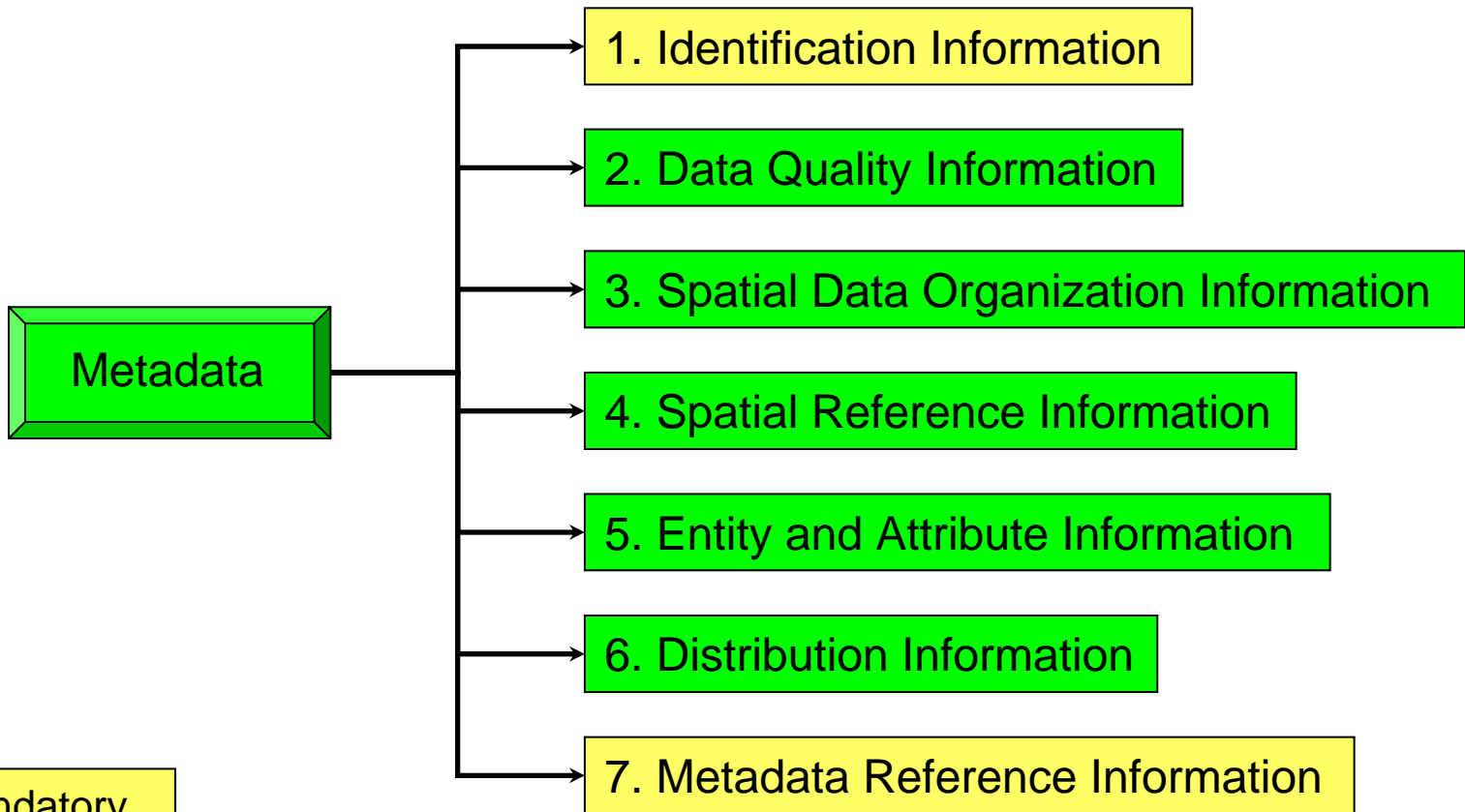
- Increased use of spatial data
 - Internal
 - External
- Increased integration of data
 - Enhanced computing environment
 - Increased networking
- Public expectation

Components of Metadata

- System level information
 - Particularly important to computer processing (e.g., file formats, data model and structures)
- Application level information
 - (e.g., collection procedures, post collection processing, definitions of terms)
- Administration level information
 - (e.g. cost, budget, schedules relating to data collection and/or analysis)

FGDC Standard

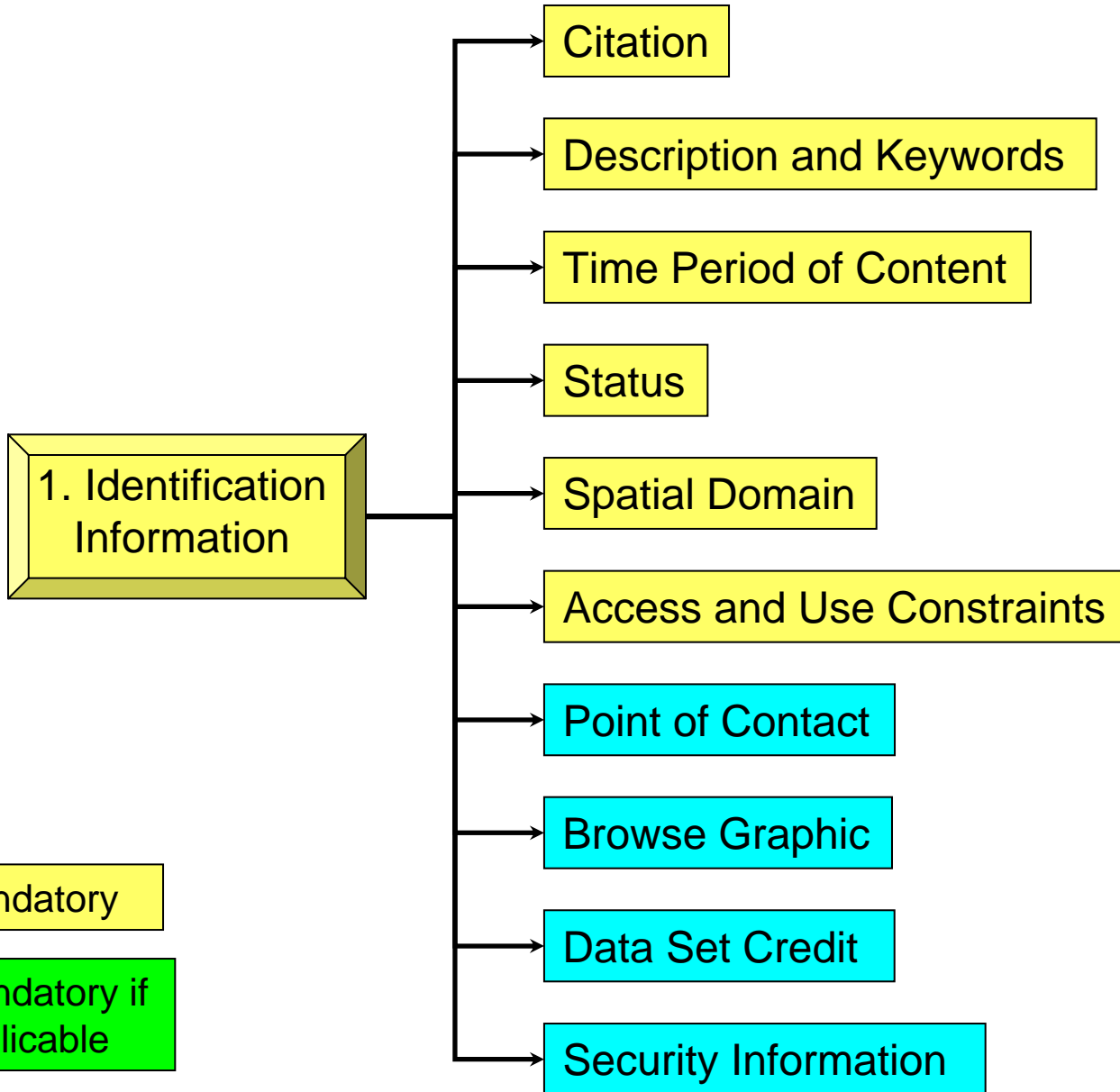
- Intent is to define information required by a user
 - Availability of geospatial data
 - Fitness of data for intended use
 - Means of accessing data set
 - Needs to transfer data set
- Issues
 - Need to coordinate many agencies
 - Considers vast amounts of data
- <http://www.fgdc.gov/metadata>



Mandatory

Mandatory if applicable

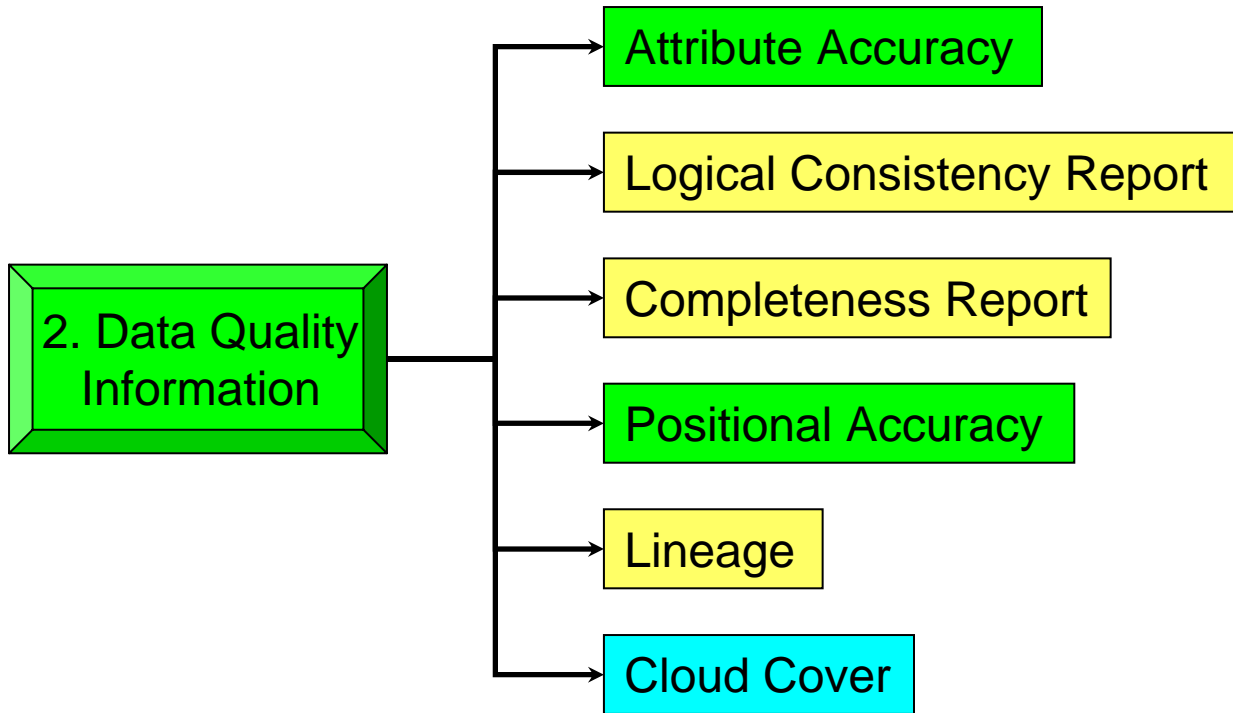
Optional



Mandatory

Mandatory if applicable

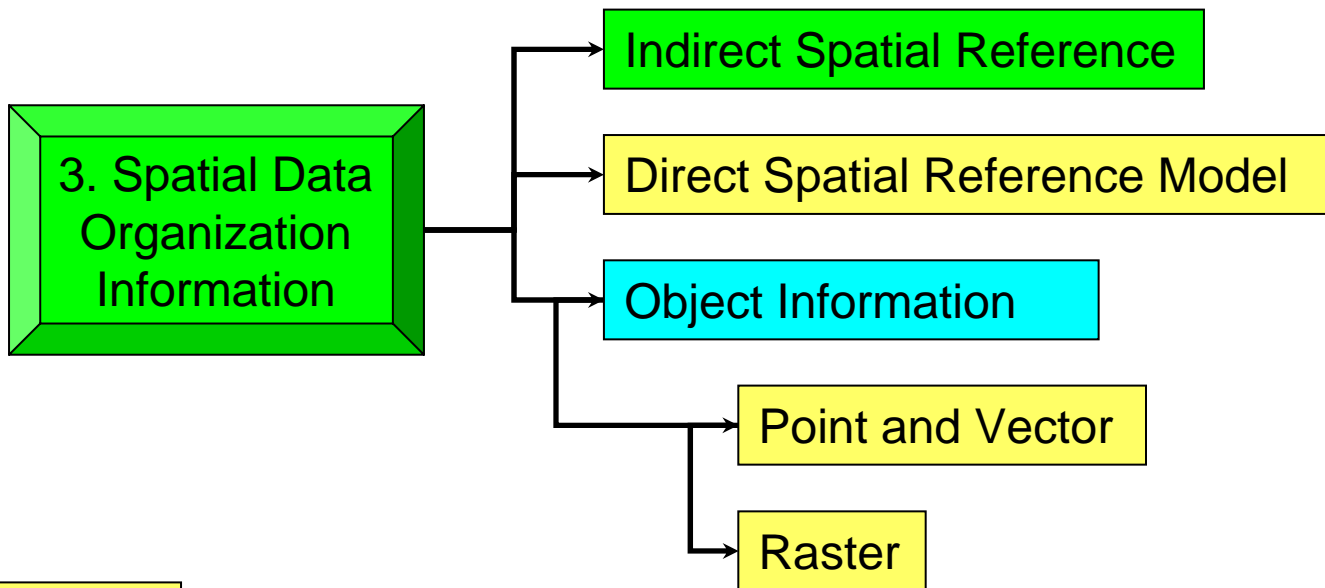
Optional



Mandatory

Mandatory if applicable

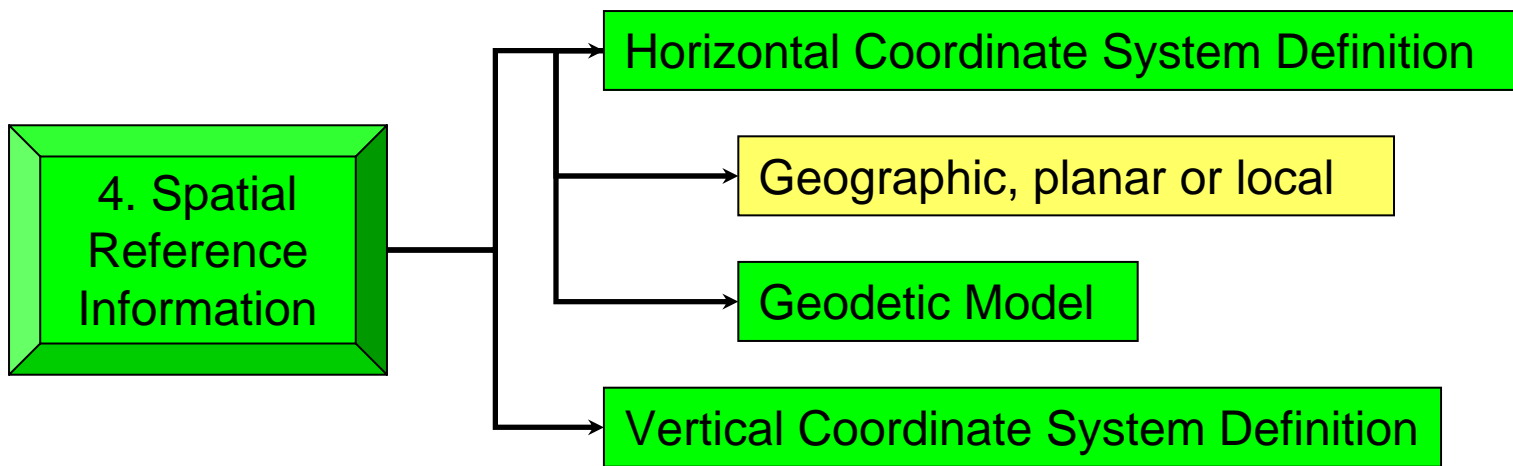
Optional



Mandatory

Mandatory if applicable

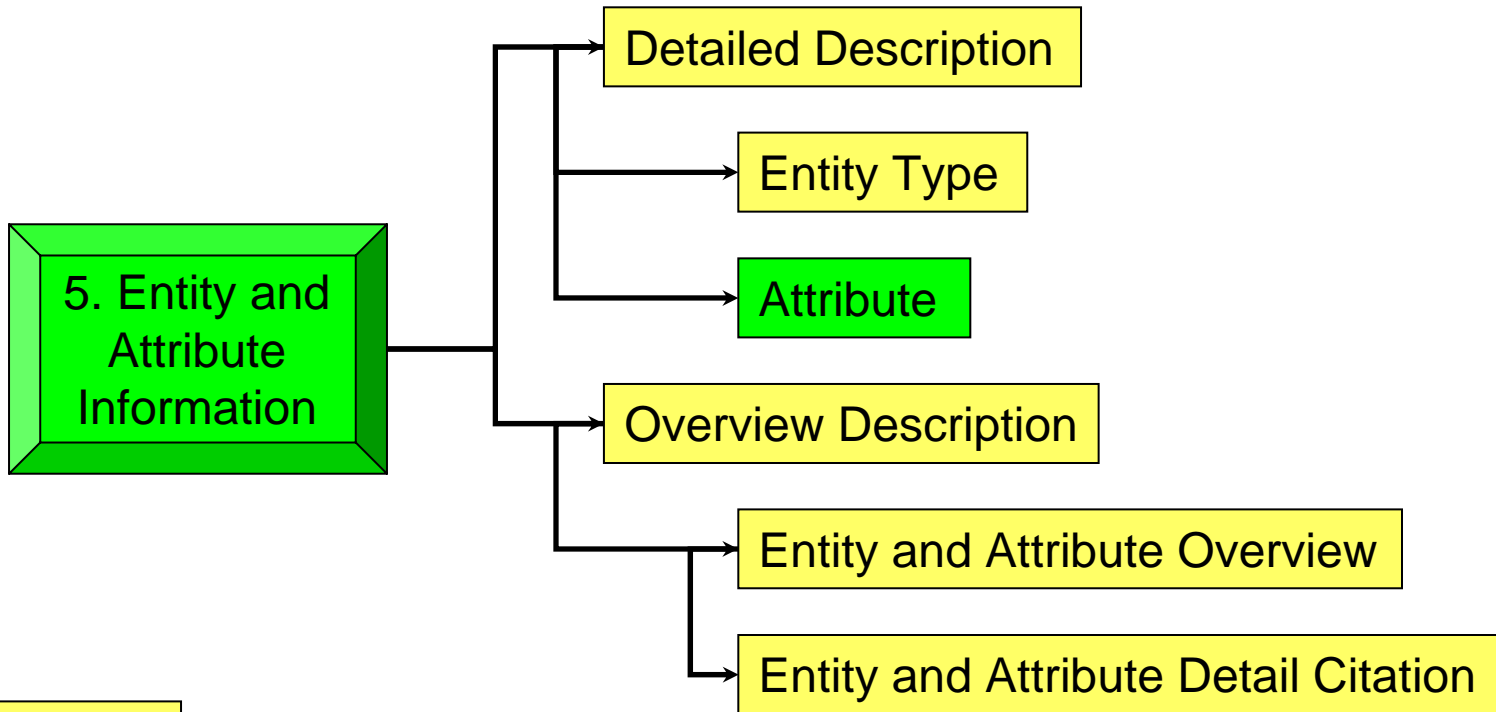
Optional



Mandatory

Mandatory if applicable

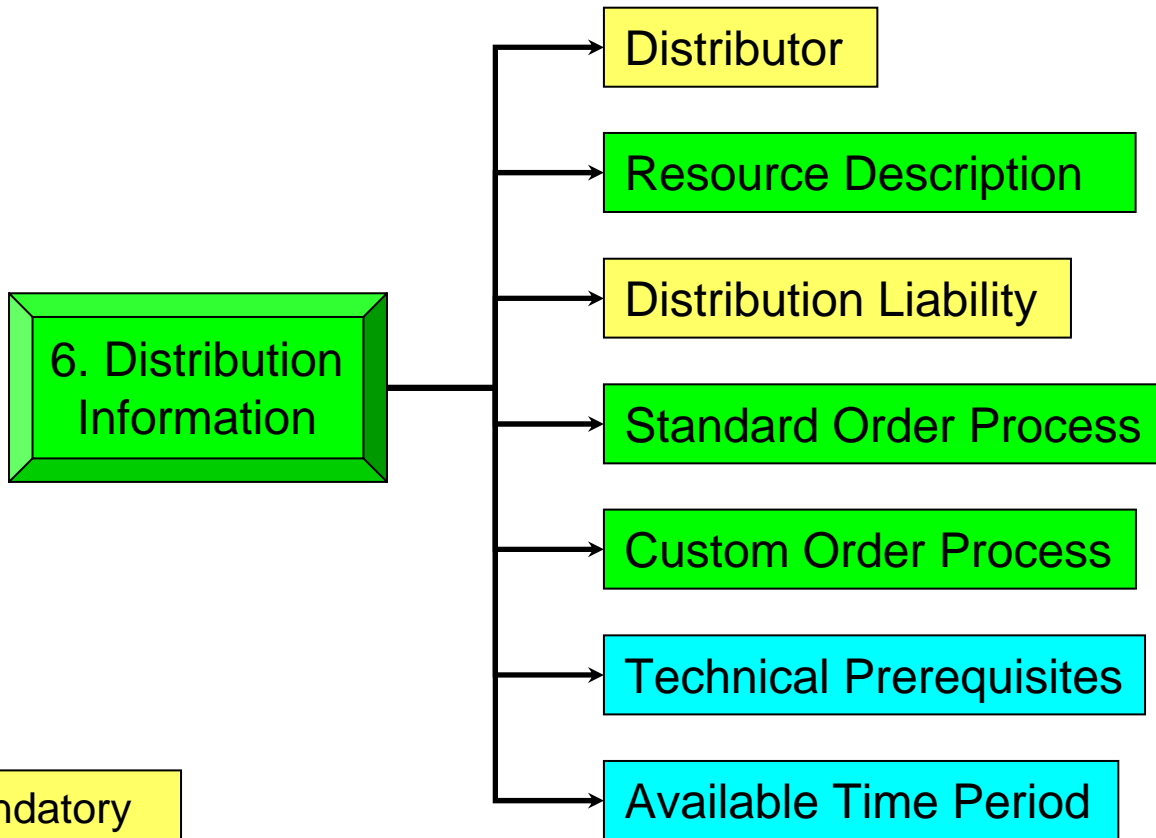
Optional



Mandatory

Mandatory if applicable

Optional



Mandatory

Mandatory if applicable

Optional

7. Metadata Reference Information

Metadata Date

Metadata Review Date

Metadata Future Review Date

Metadata Contact Information

Metadata Standard Name/Version

Metadata Time Convention

Metadata Access Constraints

Metadata Use Constraints

Metadata Security Information

Metadata Extensions

Mandatory

Mandatory if applicable

Optional

MINIMUM FOR FGDC COMPLIANT METADATA

Example:

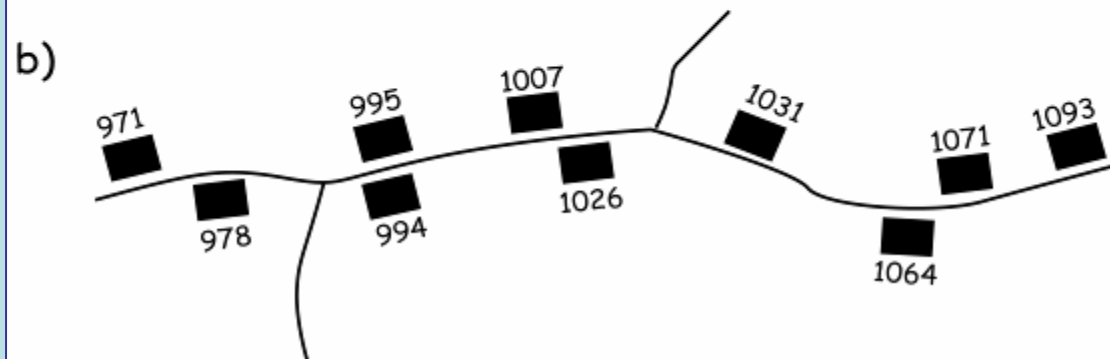
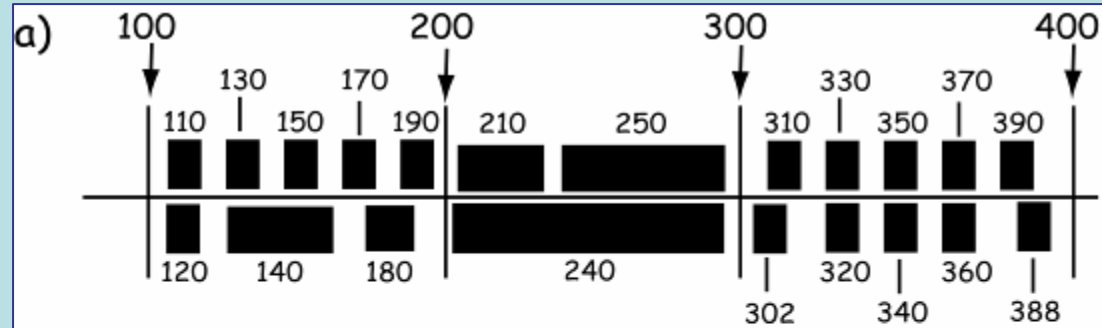
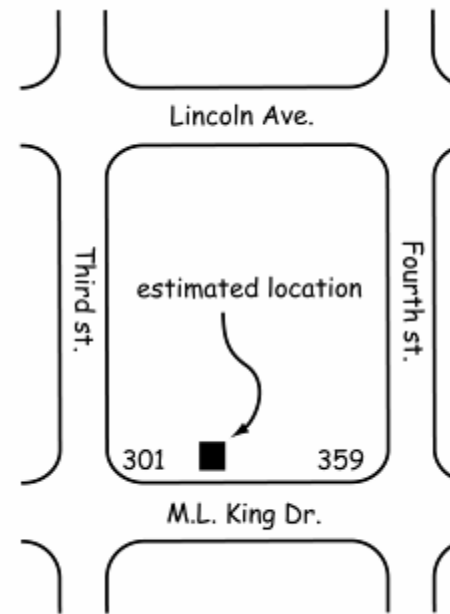
Geocoding and Network Analysis

Geocoding

Geocoding: the address 321 M.L. King Drive is placed at the location that is $(321-301)/(359-301) = 0.34$ of the distance from the 301 location toward the 359 location, between Third and Fourth streets. Coordinate values are estimated to be approximately

$$X_{321} = X_{301} + 0.34 \cdot (X_{359} - X_{301})$$

$$Y_{321} = Y_{301} + 0.34 \cdot (Y_{359} - Y_{301})$$



Geocoding Addresses

- Building a relationship between street addresses and physical features
- Physical features are typically road centerlines
- Typical attributes
 - Street address
 - City
 - Zip code

Geocoding Addresses

- Comparing addresses to street database
 - The addresses are often termed events or incident addresses.
- First specify addresses, then compare
 - Generally requires standardization

Geocoding: How it Works

- If the address is found to match one of the records in the street centerline database, the geographic file coordinates are accessed and a coordinate is computed for the address
- If the address does not match one of the records in the address database it can be used in an optional interactive program or written to an output address reject file

Geocoding Process

Address

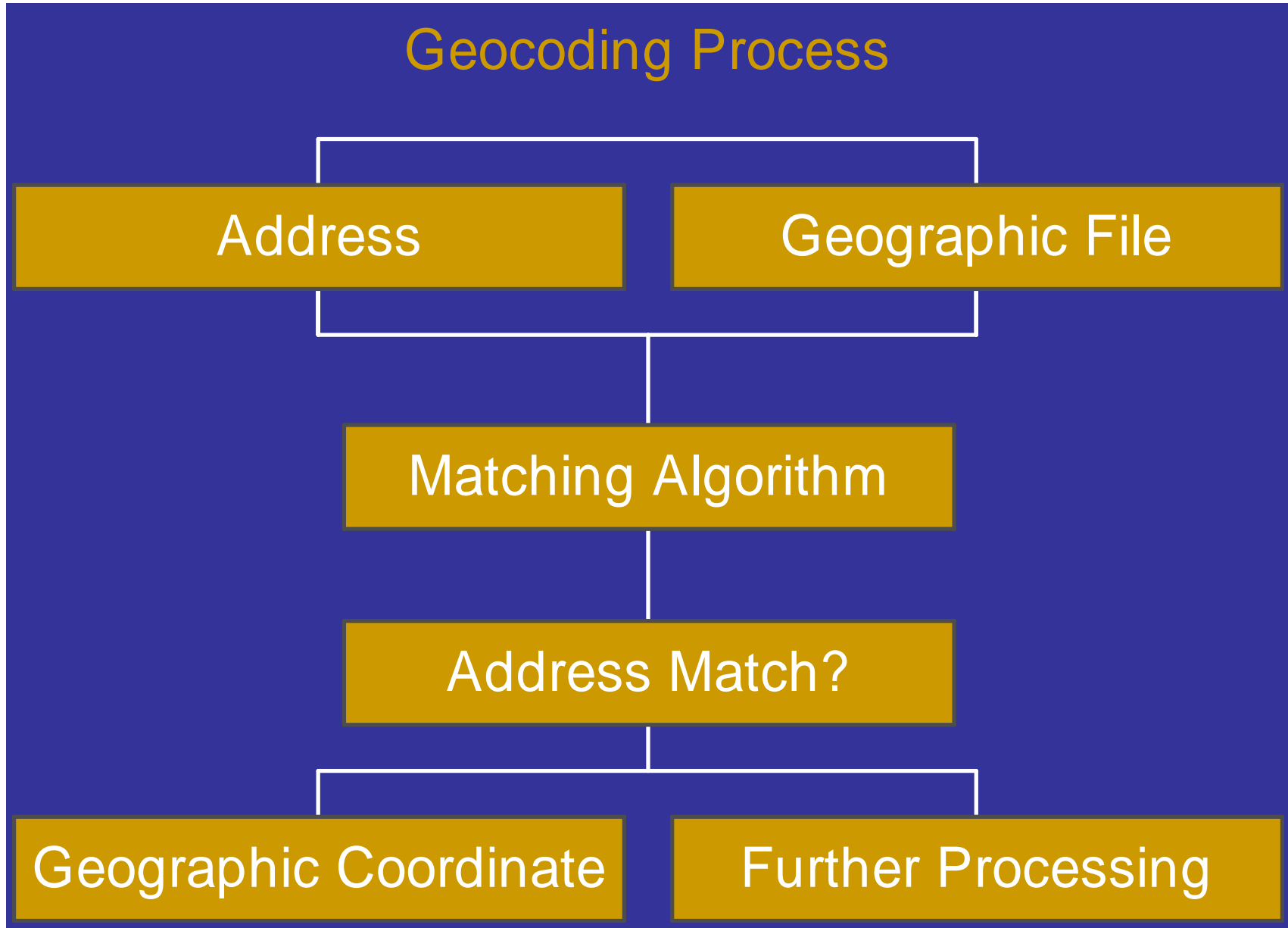
Geographic File

Matching Algorithm

Address Match?

Geographic Coordinate

Further Processing



- Example Scoring Session:
 - Do street names match?
 - Do street types match?
 - Do the prefix directions match?
 - Do the suffix directions match?
 - Do zones match?

Error Sources in Geocoding

- Street Name, Type, and Direction
- Address Issues
 - overlap
 - from/to
 - left/right
 - flip
 - Rural Delivery, P.O. Box
 - Site Address vs. Billing Address

Networks

