GES 678: Week 6

Data, Database, and System Design (Virtual)

2025-10-08

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Lecture

Data Design

- We're looking for a conceptual layout of our data
  - So much of the database isn't just the rows and columns, but the details help drive the programs
- Considerations
  - Is the data model representative of the project?
  - Does it limit or prohibit the project?
- Data Characteristics
  - Scale
  - Resolution
  - Projection
  - Error Tolerance
- Data Capabilities
  - Survey Capabilities, with very detailed coordinates
  - Topology
    - Spatial integrity
    - Dirty/Clean areas; validation
  - Temporal
    - Tracked over time
  - Cartography and graphics
    - Usability for display and map production
  - Spatial Analysis
  - Network Analysis
    - Routing, proximity, allocation
  - Terrain Modeling
  - Imagery
  - Mobile Technology
  - Interoperability
- Data Logistics
  - Digital Data Sources
  - Formats
    - Raster
    - Vector

  - Standards
  - Data conversion and interoperability
    * 80/20 rule: 80% of data represents 20% of the problems

Logical Data Model

- Relational
- Object-oriented
- Object relational
- Attention to organizational norms and standards

System Considerations

- Hardware
  - On-prem
  - Cloud
- Software
- System Requirements
- Interfaces
- Security
- Scoping Hardware Requirements
  - Data Handling
  - Workstation Requirements
  - Data hosting and user locations
  - Data storage and security
- Software
  - Preliminary software selection
  - Functional requirements
    * Consider IPD and MIDL needs
  - Classify system functions
    * Frequency of functions
    * Basic characteristics and core activities
  - Scorecard analysis
- Interface: communications
  - System interface
    * Distributed GIS and web services

        * Platform sizing and bandwidth
            - User workflows
            - Workflow technology choices
            - Baselines
            - Custom
    - Network communications
    - Client-server
        * Central file server
        * Central DBMS
        * Central application
        * Web transaction
    - General issue of network performance

- Security
    - Access control
    - Roles and responsibilities
    - Physical security

- Uncontrollables
    - Org policy, standards, practices
    - Costs
    - Technology lifecycles
    - External demands on network resources
    - Staging

- Controllables
    - Batch processing
    - Platform sizing
    - Response time and capacity testing
    - Knowing org policy and standards
    - Planning for tech lifecycles
    - Preliminary design documents