Roadmap Through Implementing and Integrating GIS and OMS

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Introduction

- Driving factors for implementing an OMS
  - Severe ice storm hits PEPCO System on January, 1999
    - » Affected 230,000 of 700,00 customers
  - Current system depicts a vague visual of current outages
  - Public Service Commission and local governments concern for extended outages
- An external and internal search to improve restoration methods and tools
  - Use existing Trouble Processing System (TPS)
  - Implement a custom Outage Management System
  - Different avenues to building an OMS model are explored
    - » From existing Microstation feeder maps
    - » From existing Distribution Connectivity File (DCF)
    - » From a GIS of Primary voltage levels (13 & 4kV)

Introduction

- PEPCO selected Centricity for its OMS and ArcGIS for its GIS
- GIS implementation is driven by OMS
  - Two systems are implemented simultaneously
- This paper outlines PEPCO's process to implement an OMS model based on GIS
  - OMS and GIS Data model design and testing
  - GIS data migration and validation
  - OMS and GIS integration
  - Roadblocks
  - Discussions

Background

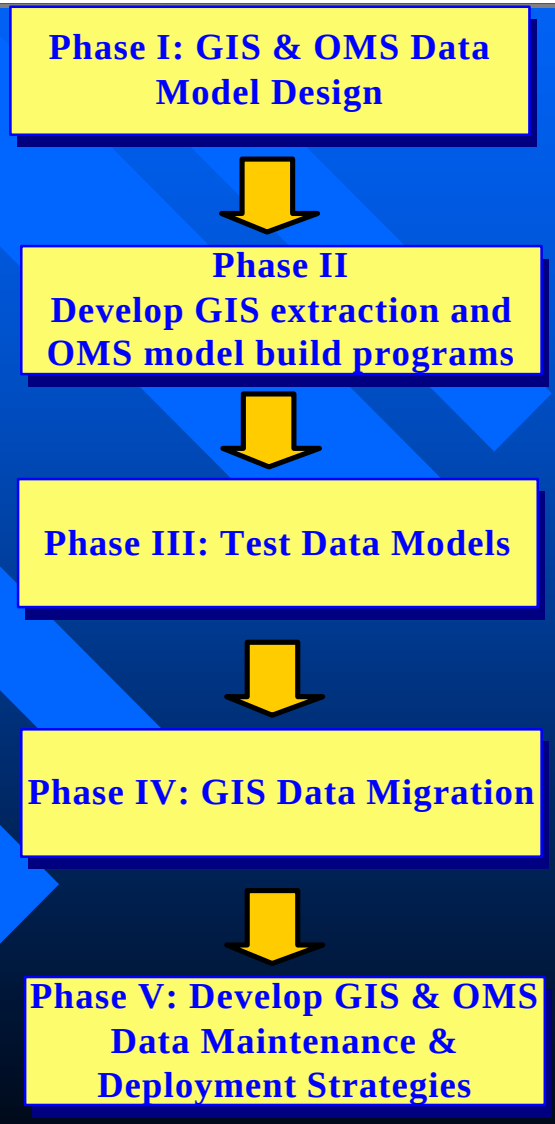
- History of GIS at PEPCO
  - Has been discussed for many years
  - Property plats and feeder maps are maintain separately in paper format
  - Implemented Mainframe CADAM
  - MicoCADAM for structural drawings
  - Microstation for map based drawings
    - » Tag values added to shared cells
    - » Rudimentary GIS
    - » AM/FM (Automated Mapping and Feeder Management)
- Decision to implement OMS leads to implementation GIS
  - Full connectivity and attribution
  - Data consistency
  - Easy to build OMS from GIS due to similar data structure

Background

- History of OMS
  - Home brewed mainframe Trouble Processing System (TPS)
  - Direct Interface with the Customer Information System
  - Complaint grouping algorithm based on distribution connectivity file (DCF)
- Implementing an OMS
  - Real-time network configuration
  - More flexibility for temporary configuration
  - GIS provides base configuration

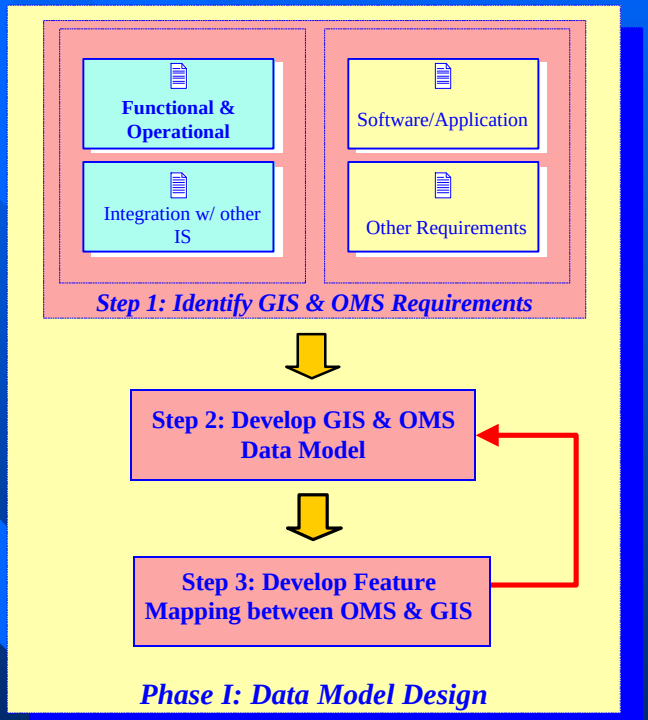
Outline

- GIS & OMS Data Model Design
  - Step 1: Collect User Requirements
  - Step 2: Build GIS and OMS Data Model
  - Step 3: Develop Feature Mapping between GIS and OMS
- Develop GIS Extractor and OMS Model Build Programs
- Data Model Testing
- GIS Data Migration
- Develop GIS & OMS Data Maintenance & Deployment Strategies



GIS and OMS Implementation & Integration

- Data Model Design
  - Step 1: Identify GIS and OMS Requirements
    - » Operational and functional requirements
      - Connectivity (2-port rule)
      - Attributes (e.g. SCADA related attributes for OMS)
      - Composite Features (3-way Switch, Loop Transformer, etc.)
      - Subtype and relationship between feature classes
    - » Software/Application requirements
    - » Integration with other IS
    - » Other requirements, such as data maintenance process, data migration, and symbol display



Tip: OMS shall involve in the GIS data modeling as early as possible.

Pay attention to OMS data configuration requirements.

GIS and OMS Implementation & Integration

- Data Model Design
  - Step 2: Develop OMS & GIS data model
    - » Customize OMS software - Centricity
    - » Build GIS data model from scratch or customize existing ArcGIS data model (ArcFM Electric)

  Tip: Using subtypes vs. using attributes for device type distinction

  - Step 3: Develop feature mapping between GIS & OMS data models
    - » Feature class level (e.g. definition of devices: switch, fuse, etc.)
    - » Attribute level (e.g. identify device status: current & present status)
    - » Relationships (for GIS data extraction: Transformer & Trans. Units)

  Tip: Focus on domain values and composite feature translation

GIS and OMS Implementation & Integration

- Develop GIS extractor and OMS model build program
  - Extract GIS connectivity and attributes in a Geodatabase to a common data file format (e.g. mp ASCII files)
  - Develop an OMS model build program

  Tips:Extract subset of GIS attributes

  Consider methods of extraction – by feeder vs. by tile

  Consider performance of the extractor and model build program

GIS and OMS Implementation & Integration

- Test the data models
  - Load data to test behavior of each feature class
    - » GIS functional test (attributes, connectivity, feature behavior, symbology, annotation, etc.)
    - » Extract GIS data & perform an OMS model build
    - » Conduct OMS functional test (attributes, topology validation, network modeling, symbology, annotation placement, etc.)
    - » Conduct OMS and GIS Integration Test
      - Incremental updates of OMS – versioning mechanism in GIS
      - Extract info from OMS to GIS

  Tip: Complete thorough pilot testing prior to full production

  Several iterations of testing are required, reserve enough time for testing

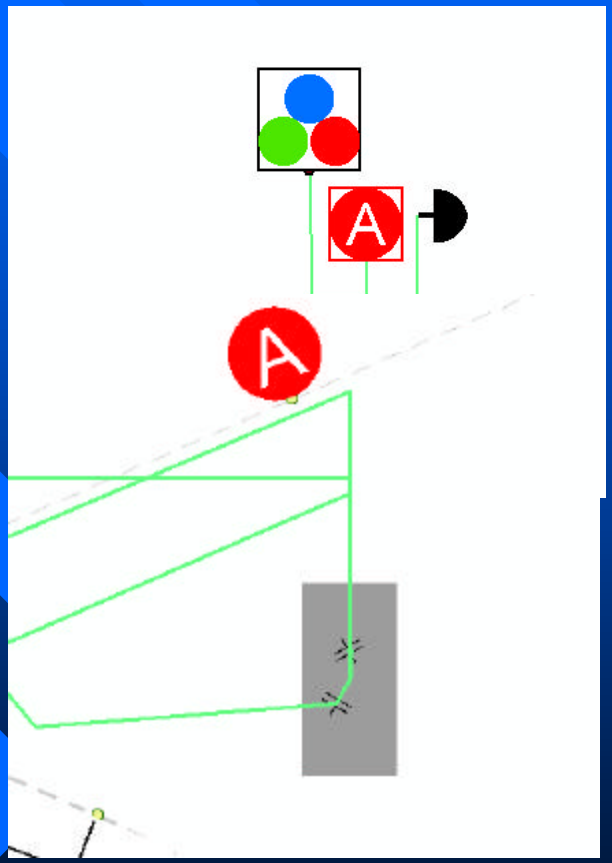
  Test symbology and annotation for user acceptance

GIS and OMS Implementation & Integration

- GIS Data Migration
  - Data acceptance by GIS and OMS
- Develop GIS & OMS Data Maintenance & Deployment Strategies
  - Develop a process to draft construction drawings and post work orders
    - » Start with existing CAD maintenance process
    - » Decentralize the data maintenance responsibilities to take advantage of multi-user GIS and maintain a centralized approval process
    - » Decide drafting construction drawing in CAD or in GIS
    - » GIS data extractor shall handle incremental updates through change detection
    - » Incremental OMS model build
  - Address system performance issues
  - Develop applications to streamline data update
  - Manage organizational changes
  - User training
  - Deploy GIS data to users

Road Blocks

- OMS Team does not review GIS data model until it is finalized
  - Unable to freeze the GIS data model
  - Delay GIS migration and increase costs
  - Starts blaming games
- "Unknown" OMS data configuration requirements
  - Coincident devices & conductors
  - 2-port rules requirements
  - Circuit/Feeder source identification
  - Substation one-line diagram
  - Multiple supply customer
- GIS and OMS System Configuration



Road Blocks

- Different System Requirements between GIS & OMS
  - Symbology
  - Annotation
  - System Integration with other IS
- Permanent Installation Cannot Be Done in OMS
- GIS Data Extraction and OMS Model Build Processes are Very Time-consuming (2-3 days for 1253 tiles)
- GIS Data Acceptance Depends on OMS Model Build
- Software & Hardware Upgrade during the Project

Discussions

- Build OMS from CAD vs. from GIS
  - GIS provides full network connectivity & comprehensive attributes, CAD does not
  - GIS does not exist in many organizations, but CAD does
  - GIS offers seamless dataset, CAD does not
- Extract GIS data by feeder vs. by tile
  - Network connectivity is better maintain by feeder
  - Extraction process is straightforward by tile
  - Extracting by feeder significantly reduces the requirements of boundary connecting points
- Migrating feeder maps vs. migrating secondary and primary together to support OMS

Questions Comments?