Enterprise GIS to Support ADMS
ESRI GeoConx – EGUG 2016

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Total accounts: 2,240,640

Electric accounts: 1,148,805

Electric distribution lines: 45,420 miles (Overhead: 22,210; Underground: 23,210)

Substations: 353

GIS – ADMS Integration Objectives

- Leverage enterprise GIS investment
- Deploy configurable GIS – ADMS interface
- Deploy ADMS network analysis applications
Enterprise GIS – ADMS Integration
What is Advanced Distribution Management System?

- Unbalanced Load Flow
- Short-Circuit Analysis / Fault Location
- Overload Reduction
- Restoration Switching Analysis
- Self-Healing (FLISR)
- Volt/VAR Optimization

SCADA
- Data acquisition
- Alarming
- Operational network model
- Integrated data engineering

Network Applications
- Trouble call, AMI, outage notifications
- Outage prediction
- Auto-creation and management of ETRs
- Crew management
- Reliability data & reporting
- Planned Work

Outage Management
Enterprise GIS – ADMS Integration
IT/OT Convergence

Information Technology
Using data for system automation and improved operations

1. Large volumes of data for visibility into condition and status
2. Improved decision-making and system optimization
3. Operational Technology
Monitors and controls critical assets

Technology Enablers

1. Data Produced By IED’s and Other Sources
2. Communications and Systems Integration
3. System Modeling, Advanced Applications, Analytics
Enterprise GIS – ADMS Integration
GIS vs. ADMS Data Modeling

- Data model definition
  - Feature Classes & attributes
  - Topology definition
- Detail Vs Speed
- Unique vs Consistent view
- Operational device modeling:
  - Energization Point, Elbows, Bypass switches etc.

Using GIS as the spatial data source enables “Single Source of Truth”
Deployed OMS in 1996
- Network created and maintained within OMS
- GIS/ADMS Integration
  - Planning started in 2015
  - Current Release: ArcGIS 10
- ADMS Enterprise Integration:
  - CIS, IVR, MWM, SCADA, AMI,

**Integration Issues to Consider**
- Multiple geodatabase
- Frequency of model and data changes
- Version management and Change detection
- New work order design process
- Goedatabase Details
  - Map projection
  - Geographic
  - Schematic
  - Level of network
- Power system data, name plating rating, impedances
- Standards? IEC 61968 or NRECA MultiSpeak
Enterprise GIS – ADMS Integration
ArcGIS Data Extract-Transform-Load

GIS Data Extraction & Transformation

ArcGIS Geo Database
- Electric
- Trace Feeders
- Landbase export as tiles

Object Transformation
- Data Transformation
- Data Enhancement

ADMS Database
- Data Loading
- Incremental Data Loading to a Case Study and verify OR
- Apply changes to production system

Model Update
Enterprise GIS – ADMS Integration
ArcGIS – ADMS Connectivity Comparison

Simple feeder conversion
Color indicates same objects before and after mapping
Enterprise GIS – ADMS Integration

Data Transformation

- Map GIS Objects to ADMS Objects
- Performs object transformation, giving ADMS identification
  - Network connectivity using GIS defined connectivity
  - Unique ID Assignment
  - Attribute Manipulation
- Expansion/Replacement of One Object by Multiple Objects
- Elimination of Unnecessary Objects
- Assign Area of Responsibility
Stop trace at feeder boundary points. Recommended Boundaries:

- Open switches
- Feeder heads separating distribution level from substation level
- Dead Span
Utilize ArcGIS coordinates, precision and map projection

Two sets of coordinates

The GIS and landbase must use the same projection
Enterprise GIS – ADMS Integration
Enhancing Geodatabase Schema

- ADMS Type or Catalog Data: Common characteristics for Devices, Lines, Transformers

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<thead>
<tr>
<th>GIS Data</th>
<th>Outage Analysis</th>
<th>Switching</th>
<th>Fault Location</th>
<th>Load Flow Analysis</th>
<th>Load Allocation</th>
<th>Volt-VAR Control</th>
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Enterprise GIS – ADMS Integration
Data Extraction & Transformation

- Development Environment
  - ArcObjects and .Net
- Extract data by a subset – Feeder or Substation
- Full Extract or Incremental Extract
- Changes identified by ArcGIS versioning
- Configurable options
  - Object and attribute mapping
Enterprise GIS – ADMS Integration

ADMS Data Verification

- De-energization
- Identify loops and parallels
- Missing loads (service transformers)
- Missing Device “Types”
- Isolated loads
- Planned vs In Service
# Enterprise GIS – ADMS Integration

## Benefits

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<th>Separate SCADA-OMS-DMS</th>
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Questions ?