LESSONS LEARNED FROM A $5 MILLION SCADA UPGRADE

Columbus Water Distribution System

Phil Schmidt, PE
John Gilmore
Overview of Distribution System

• Service to approximately 1.2 Million Population

• 135 MGD Average

• 3,500+ Miles of Water Lines Maintained by Division of Water

• 13 Primary Pressure Districts

• Franklin County and parts of Fairfield, Licking, Delaware, Union, Pickaway
Operations Control Center

Operates and Maintains:
• 35 Elevated Storage Tanks
• 3 Ground Tanks
• 28 Booster Stations
• 24 SCADA Controlled Valves
• Operate High Service Pumps at 3 water treatment plants

• 4 crews – Operators, Techs, Mechanics, Electricians
• Management/Support
• 40 staff
Need for Upgrades

• Obsolescence of Equipment
  – Replacement parts and technical support issues
• 18 years old – host system
• Pre-9/11 – Security concerns were different

• Risk
  – Longer term disruption to SCADA system would have likelihood of rolling losses to thousands of customers’ water service
Overview of Upgrades

- Radio Network Improvements
- Construct remote backup control center
- Renovation of existing main control center
- Upgrade all RTUs in the system
- Improved Security
Radio Network – Existing

Existing Network - 900 MHz
Entire system dependent on Control Center
900 MHz network remains in place
MCC, BCC and Master Repeaters are connected with a 5.8 GHz loop. If any site on the loop goes down, the data can still travel on the ring.
RTU Upgrades

• Schneider (Telvent) Sage 2400 boards

• Upgrade from Sage 2200 boards

• Purchased 85 through contract and they were installed at all remote locations by our control center staff

• Improved Security
Backup Control Center (BCC)

• Constructed in a secure remote location
• 2 operator stations
• Diesel standby generator
• HVAC system
• Dimmable LED lighting

• 30 day BCC operational demonstration before starting demolition/remodeling of MCC
Backup Control Center (BCC)
Main Control Center (MCC)

- Operator Console
  - Adjustable Height
  - 2 Operator Stations and 1 Engineering Station

- Video Wall Display – Four 55-inch monitors

- Incident Command Room – Conference Table and Wall-Mounted Monitors

- Lockable Wardrobe Style Lockers and File Cabinets for Each Operator

- Kitchenette

- New HVAC system

- Dimmable LED Lighting
Main Control Center – Construction
Main Control Center – Construction
Main Control Center – Construction
Main Control Center – Construction
Main Control Center – Construction
President’s Day Surprise – Water Damage

Newly installed plumbing fixture failed sometime over holiday weekend

Water sprayed into control room until discovered Tuesday morning after holiday

Items Destroyed:
• Carpet
• Kitchenette Casework
• Sink Faucet
• Wood Lockers
President’s Day Surprise – Water Damage
President’s Day Surprise – Water Damage
President’s Day Surprise – Water Damage
Challenges During Construction

Tower Variance
Graphics

- Graphics were converted to new format
- Conversion process compatibility issues
- Should have recreated them instead of convert
Electrical Issues

- Generator
- UPS
- Restrictions from existing variance
Self-Healing Radio Ring
Completed Control Room
Completed Control Room

Old

New
Project Details

• Construction Cost is $5.2 Million
  $4.6 Million + $600K Contingency

• Prime Contractor – Schneider Electric Buildings
  Subcontractors:
  Schneider Electric (Telvent)
  Corna Kokosing
  J&K Communications
  Mid City Electric

• Design Professional – CDM Smith
• Construction Administration - DLZ
Going Forward

Recreate Graphics

More Frequent Upgrade Cycle

More Nodes On Wireless Ring