Transmission – Distribution SCADA Separation
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SCADA for Electric Utility Operations

- The SCADA platform is at the heart of Electric Utility Operations, as the primary source of real-time telemetry for the different systems that support the Utility Control Center(s)
Evolution of the SCADA platform for Electric Utility Operations

- Many Utilities implemented their initial Distribution SCADA platform as an extension of the existing SCADA/EMS for Generation & Transmission operations.

- For those companies, the OMS & DMS Apps were initially implemented as separate platforms, loosely coupled with SCADA.

- This centralized SCADA architecture has a number of benefits, but also significant drawbacks for System Operations and Maintenance. The Pros and Cons of this architecture are itemized below.
Centralized SCADA Platform 1/3

Pros ...

- Lowest cost to acquire/upgrade, operate and maintain the consolidated SCADA platform for TSO and DSO (Single Vendor)
- Common FEPs, communications infrastructure and a common set of protocols for all T and D communications, including the stations across the T-D boundary
- Lowest SCADA training requirements for the T and D Operations and Support staff

Cons ...

- Changes to the Distribution portion of the SCADA DB cause frequent disruptions to Transmission Operations
- A failure of the common platform would impact both TSO and DSO → Lower overall system reliability by consolidating SCADA for T & D
- Higher cost to implement, operate and maintain the OMS and DMS Apps on separate platforms (e.g., different network model)
Centralized SCADA Platform 2/3

**Pros ...**
- Common GUI for T-SCADA and D-SCADA facilitates the interchange of resources between TSO and DSO

**Cons ...**
- D-SCADA consolidated on the T-SCADA/EMS platform prevents the implementation of an Integrated ADMS platform (D-SCADA + OMS + Advanced DMS Applications)
- Different databases and different GUIs across the D-SCADA, DMS Apps and OMS platforms
- Multiple GUIs degrade the DSO performance
- Centralized SCADA architecture doesn’t allow implementing a high fidelity OTS for DSO
  - Conventional OTS for Transmission is not designed to simulate the Distribution Network
Cons ...

- Higher difficulty and cost to comply with NERC CIP on the T-SCADA/EMS platform
- Higher impact in case of a cyber security event on the centralized SCADA platform
Emerging Trends

- Accenture has worked with major T&D companies to develop a business case for transitioning from a Centralized SCADA to Separate T-SCADA and D-SCADA platforms.

- Having a clear understanding of the Pros and Cons of the T-SCADA – D-SCADA separation is a key consideration when a Utility develops their business case and technology roadmap to improve the Transmission and Distribution operations. The Pros & Cons are itemized below.
Separate T-SCADA + D-SCADA Platforms 1/3

**Pros ...**

- Enables the acquisition of best-of-breed solutions for T-SCADA and D-SCADA, from the same or different Vendors
- Separate platforms allow for specialized GUIs for T and D operations, with special features for situational awareness and safety coordination
- The T-SCADA/EMS platform is not impacted by the frequent database changes in D-SCADA → Increased stability for Transmission Operations
- Facilitates the implementation of an integrated ADMS platform, with significant benefits for Distribution Operations

**Cons ...**

- Higher cost to acquire and upgrade two separate SCADA platforms: Additional Hardware + Software, Change Management, Training, Facilities, Business Continuity, Telecommunications
- Higher cost to operate and maintain two separate SCADA platforms (especially if different vendors are involved)
- Higher complexity and cost for the communications infrastructure, including additional RTUs, dual-ported RTUs, or digital/logical separation for the substations on the T-D boundary
Separate T-SCADA + D-SCADA Platforms 2/3

Pros ...

- A common DB for D-SCADA/DMS/OMS facilitates the maintenance of the DSO platforms
- A common GUI for D-SCADA/DMS/OMS enhances the DSO performance, especially under system restoration conditions
- An integrated ADMS platform facilitates the implementation of External Interfaces with other systems and corporate applications, including Asset Management, DERMS, Microgrid Control Systems, ...

Cons ...

- Possible impact to Distribution RTUs
- Potential realignment of the TSO and DSO staff and the respective maintenance and support personnel and associated facilities
- May require cross-training of the affected personnel
Separate T-SCADA + D-SCADA Platforms 3/3

**Pros ...**

- An integrated D-SCADA/DMS platform makes it possible to implement a high-fidelity OTS for Distribution, further enhancing the DSO performance.
- A separate T-SCADA/EMS platform (isolated from D-SCADA) aligns with NERC BES definition and makes it simpler to achieve and maintain CIP compliance.
- Lower overall impact in case of a cyber security event (compared with a Centralized SCADA).
A comparative analysis between the SCADA architectures should involve a reassessment of the Line of Demarcation between TSO and DSO, and the impact to the respective business processes.

At a minimum, the assessment must take into account the following considerations:

• Operating procedures, safety norms and regulations (Switching, Load Management, alignment with NERC BES definition, etc.)

• Organizational changes + Staff realignment across TSO & DSO:
  ✓ Transmission and Distribution control center personnel
  ✓ Control center real estate availability
  ✓ Field personnel

• Retraining of TSO and DSO personnel affected by the change

• Changes to the power system models for TSO and DSO, and their impact to the stability and performance of the EMS Apps (SE, CA, ...)

Line of Demarcation Reassessment
Other considerations when reassessing the SCADA Architecture

- Communication infrastructure and RTU connectivity for T-SCADA and D-SCADA:
  - Dual-ported RTUs or Separate RTUs for T and D. Probably just need digital/logical separation between T & D and connectivity to the respective control centers via same physical communication infrastructure (e.g., WiMAX, fiber, private LTE, etc.)
  - Remote FEPs that feed both T-SCADA and D-SCADA
  - Communication protocols

- EMS and ADMS system realignment:
  - Data Acquisition Front Ends
  - SCADA / Apps / Historian servers
  - SCADA and Applications databases
  - EMS–ADMS data exchange for the T–D boundary
  - Calculations / Macro Sequential Controls
  - Substation one-line Diagrams

- Transmission system model for the EMS Apps and the DTS
- Distribution system model for the DMS Apps
Operational implications

- Distribution & Transmission – Staffing and training for Dispatch, Outage Planning and Work Management need to be evaluated for adequacy.

- Distribution Operators will need to assume operation, switching, blocking and requests for work on distribution buses, capacitors, transformers and associated equipment.

- Communication of system conditions and actions required to maintain a stable system may change between TSO and DSO.

- Three separate lines of demarcation need to be defined for control, visibility, and network modeling. TSO and DSO need to continue monitoring equipment under the other’s authority.

- DSO will not assume responsibility for any ISO-reportable facilities.

- TSO will maintain responsibility for any facilities or actions that require certification by NERC or the ISO.

- DSO system operators will not require certification.

- Due to the complexities of dual ownership substations, options may need to be developed to minimize dual ownership.
Conclusions

- Each T&D Utility must first understand their short- and long-term Business Vision, Needs and Priorities, and how these business and IT requirements align with the benefits and costs of the SCADA architecture and related systems.

- The advantages & disadvantages of the SCADA architecture must be well understood to develop the business case and technology roadmap for the Control Center Modernization.

- The architecture selection and technology roadmap may have varying impacts on the Utility staffing, e.g.:
  - Operations
  - Business Analysts
  - Maintenance
  - Network Analysts (network planning and after-the-fact studies)
  - Support staff
  - Purchasing (Vendor contract management)

- The current industry trend follows the notion that partitioning the SCADA platform into separate T-SCADA and D-SCADA for T and D operations has significant business advantages that outweigh the benefits of a Centralized SCADA platform.

- Adopting independent SCADA platforms for T and D operations maximizes the Utility’s flexibility to expand their Smart Grid infrastructure, adapt to future industry changes, and keep improving the overall business operating model.
Thanks

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