GE
Digital Energy

PowerOn™ Control

Distribution Management System

Smart Distribution Management for Increased Operational Efficiency

With today's technology, a utility can derive greater benefits from a PowerOn Control Distribution Management System (DMS) than ever before. Examples of such advances are the installation of grid modernization technologies and the developments in telecommunications that provide better and broader communication with field devices. Using the PowerOn Control DMS to operate their distribution network permits utilities to obtain significant improvements in operational and financial efficiency.

As utilities invest in grid improvement solutions, including both modern communications infrastructure and Distribution Automation, PowerOn Control makes full use of these investments to improve customer reliability and reduce operational costs. Through its advanced applications, the PowerOn Control enables utilities to proactively manage their distribution networks, and at the same time, provides the tools and means to deal with unplanned events and outages. Smart Grid technology is heavily influencing operational systems and will continue to push technology limits as utilities gear up for more automation. The PowerOn Control product vision therefore targets ongoing evolution of tools to update and maintain network data, refinement and expansion of network operation applications and expanded interoperability.

Key Benefits

- **Significantly improved situational awareness and reliability:** The PowerOn Control core Distribution Network Analysis functions increase situational awareness of users and operators well beyond available SCADA telemetry, detecting potentially unsecure conditions and automatically warning the user of undesirable or dangerous effects of proposed switching actions via Pre-switching Validation.

- **Dramatically reduced outage restoration times:** The Fault Detection, Isolation and Service Restoration (FDIR) function automatically determines the location of faults using both fault data available from modern relays and fault detectors to recommend switching steps to isolate the fault and restore customers within seconds.

- **Reduced peak demand:** The Integrated Volt-Var Control (IVVC) application utilizes available telemetry, including flows and voltages, to accurately target voltage reduction to decrease load in periods of high demand or reduce energy consumption and losses around the clock.

- **Increased network efficiency:** PowerOn Control improves the utilization of network assets by providing recommendations on how to reconfigure the network to improve the network state.

- **Flexibility:** Platform independence adapts to specific corporate standards. Support for de-facto standards and legacy protocols ensure compatibility with existing systems.

- **Scalability:** The highly scalable architecture is designed for reliability and security. The PowerOn Control can support networks comprised of millions of devices, delivering the same exceptional performance regardless of the network size.

- **Cyber Security:** PowerOn Control provides the tools to perform system lock-down and a complete set of reporting capabilities required to demonstrate compliance to Cyber Security standards, such as NERC® CIP 002–009.

GE's Distribution Management Systems

With, PowerOn Control GE's Digital Energy business is pleased to present a powerful DMS solution that enables utilities to achieve their objectives. PowerOn Control has a complete set of applications and features that allow reliable and high-quality power delivery, while helping to ensure the safety of field crews and the public. This, plus operational efficiency and optimal asset utilization, results in improved customer satisfaction.

The PowerOn Control DMS system offers many key features:

- A single, fully integrated user interface environment with advanced and intuitive navigation designed to help users focus their attention where it is needed. This UI maximizes productivity by offering easy-to-use tools and interfaces.

- A field-proven, highly scalable SCADA able to interface to field equipment directly or to other SCADA systems already in place.

- Powerful modelling and analysis capabilities for distribution networks, including a smart grid-ready set of advanced applications to improve network reliability and optimal asset utilization.

- Fully integrated planned and emergency switching management capability created with safety and user efficiency as its principal design drivers.

- A sophisticated training environment allowing full simulation of realistic scenarios.

- A highly scalable architecture designed for reliability and security, including disaster recovery solutions with or without real-time data transfers.

imagination at work

PowerOn Control DMS Software Suite Overview

PowerOn Control is a complete software suite that addresses the operational and control needs of Distribution utilities. All PowerOn Control SCADA and DMS applications are fully integrated into a secure platform based on the most advanced technologies and as such offer features that assist users in meeting the utility's security, reliability and financial objectives.

PowerOn Control systems alert users to important events affecting the network. This allows users to react quickly to control the network, minimize outages, protect network assets and ensure public safety. The built-in decision support tools and automated control functions improve utility performance at all levels, reducing operating costs and meeting regulatory and corporate objectives.

PowerOn Control includes grid modernization applications that improve distribution reliability, reduce network operating costs and maximize the investments in measurement, metering, control and communication infrastructures.

PowerOn Control includes an advanced SCADA integrated platform that fits seamlessly into IT and control center infrastructures using any of the standard interfaces available today such as SOA, EAI, ICCP, DNP, IEC®, ODBC, SQL and others.

The PowerOn Control SCADA integrated platform is designed with the highest standards for reliability, security and performance, and is used in many of the world's largest and most secure utilities. Offering a throughput of 1 million-plus SCADA points with near zero data latency, this platform is a leader in the industry. With a wide selection of on- and off-site backup processes, any operational environment will be secure with reliability levels in excess of 99.98%.

The SCADA platform supports a wide range of standard and legacy protocols and will interface with any commercially-available RTU.

The PowerOn Control DMS provides utilities with a comprehensive suite of tools for efficient, reliable and cost-effective management of distribution networks. For this, the PowerOn Control includes one of the most comprehensive collections of modules available on the market today, including:

- Unbalanced three-phase Load Flow to add a high-level of visibility to the network state, even where there is no SCADA telemetry.
- Power Analysis tools to identify opportunities for network improvements, including Fault Level Calculations, Loss Calculations and Network Optimization.
- Distribution Automation tools to self-heal problematic network conditions, including FDIR, Contingency Load Transfer (Overload Reduction), IVVC and Load Shedding.
- Intelligent Switching Management tools and processes including automatic determination of optimum switching steps for effecting planned outages.
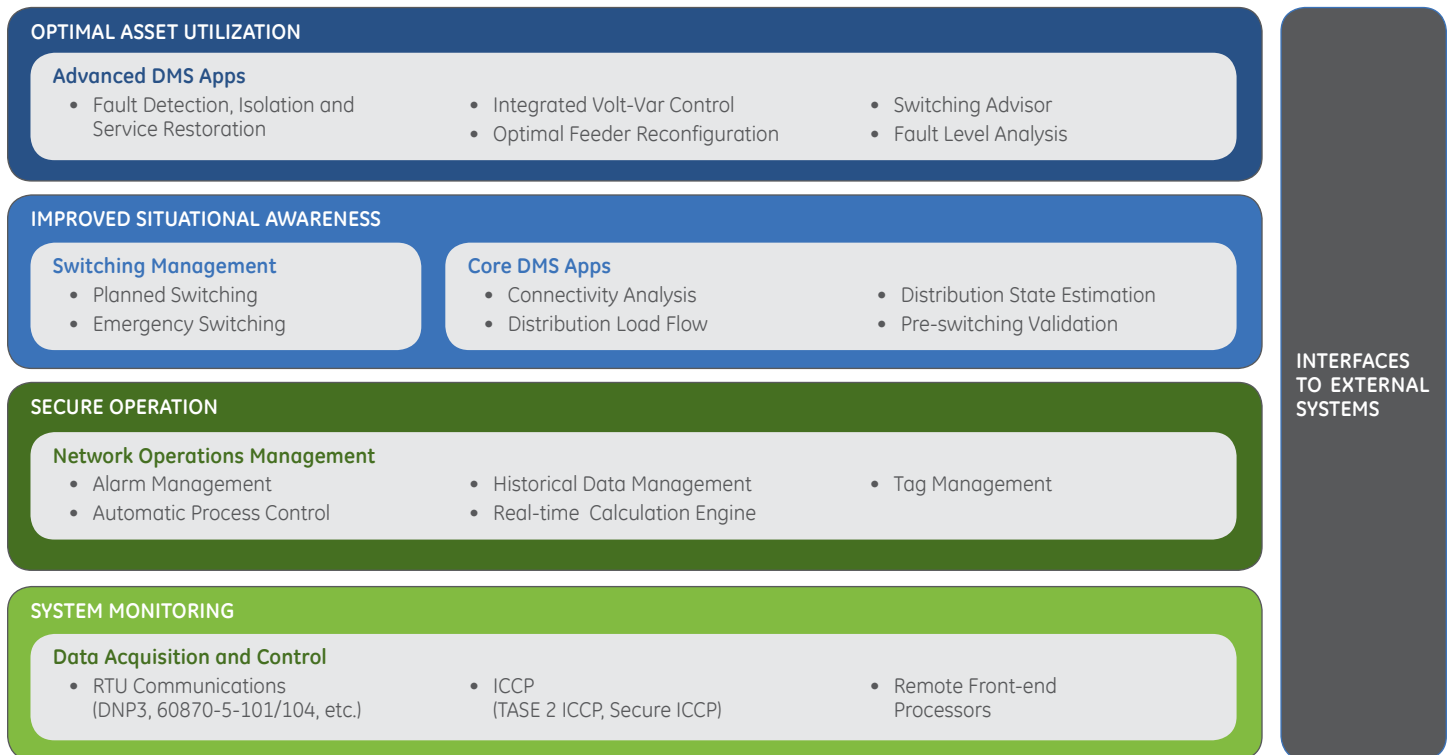
All of these SCADA and DMS modules are integrated into a common platform and work in a fully-synchronized manner. The DMS Model Management tools are a highlighted feature, supporting full and incremental model updates from commercial GIS products, ensuring that the DMS network model is always current.

The PowerOn Control DMS provides a complete Remote Access solution, from Web-based interfaces for read-only data access to fully privileged, secure remote consoles for standard operation, control and data interchange.

In addition to its functional capabilities, PowerOn Control provides standard interfaces to GE's PowerOn Restore OMS and Smallworld Electric Office™.

PowerOn Control also includes an Operator Training Simulator (OTS) for conducting tailored training using real network conditions, accurate network data and real RTU responses in a "safe mode" environment.

PowerOn Control Functional Components

OPTIMAL ASSET UTILIZATION

Advanced DMS Apps
- Fault Detection, Isolation and Service Restoration
- Integrated Volt-Var Control
- Optimal Feeder Reconfiguration
- Switching Advisor
- Fault Level Analysis

IMPROVED SITUATIONAL AWARENESS

Switching Management
- Planned Switching
- Emergency Switching

Core DMS Apps
- Connectivity Analysis
- Distribution Load Flow
- Distribution State Estimation
- Pre-switching Validation

SECURE OPERATION

Network Operations Management
- Alarm Management
- Automatic Process Control
- Historical Data Management
- Real-time Calculation Engine
- Tag Management

SYSTEM MONITORING

Data Acquisition and Control
- RTU Communications (DNP3, 60870-5-101/104, etc.)
- ICCP (TASE 2 ICCP, Secure ICCP)
- Remote Front-end Processors

INTERFACES TO EXTERNAL SYSTEMS

PowerOn Control SCADA

Utilities are continuously searching for a quality control system-something robust, reliable, secure; something easy-to-use and easy-to-maintain. The PowerOn Control SCADA is that quality choice.

The PowerOn Control SCADA derives from more than 40 years of experience in energy control systems. Users of the PowerOn Control SCADA agree that the product is unique in its features, allowing them a solid base for operations. This sophisticated base allows users to feel at ease in stormy weather and to gain and share information through flexible communication interfaces.

The PowerOn Control Active Alarm Browser.

The PowerOn Control SCADA protects assets with its advanced security features. Highly scalable, it runs on today's most popular platforms. Whatever the specific needs, its extreme flexibility can help utilities meet them. The PowerOn Control SCADA is seamlessly integrated with PowerOn Control DMS high-level applications to form a base for reliable and high-performance Distribution Management System.

The main strength of the PowerOn Control SCADA is that it is based on field-proven, standard features and is easily modifiable to accommodate particular configurations. Whenever a more complex arrangement is required, its open architecture facilitates low-impact, cost-effective customization, allowing utilities to take advantage of previous investments by using legacy assets.

Feature-rich, Flexible Solution

PowerOn Control SCADA includes an impressive array of features, designed to meet a wide variety of general and specific customer needs:

For RTU and field equipment communications, the PowerOn Control SCADA system supports a wide range of protocols, including the industry-standard DNP3 in both serial and TCP/IP versions, IEC®-60870-5-101/104, Telegyr® 8979, Conitel 2020/2025 and MODBUS®. A variety of legacy protocols are also supported. The PowerOn Control SCADA system can be configured to support the specific protocol needs of any utility. Front-end processors are LAN-based and can be geographically located anywhere on the corporate LAN/WAN.

Inter Control Center communications allow utilities to securely share data with other utilities. The PowerOn Control SCADA system supports several industry-standard data link protocols including ICCP and Secure ICCP.

As a result of its optimized Alarm Management functions, the PowerOn Control SCADA is perfectly equipped to handle hundreds of alarms per minute without affecting performance. It gives users the ability to set a virtually unlimited number of alarm summary windows with various contents, according to immediate needs and preferences. The summaries include active and historical data, and powerful re-configurable on-the-fly filters. Additionally, the entire layout can be saved for further reference on a user and console pair basis. Selected alarms, if so configured, are automatically sent to SMS or e-mail servers and from there, to pagers or targeted mailboxes. From the alarm summary to the one-line diagram and back, the user is just one click away with the advanced Locate feature that make operations more efficient and keep operators focused on the actual work.

The PowerOn Control SCADA features an Automatic Process Control functionality, allowing users to write complex, multi-step sequences of supervisory control commands including logical decisions based on the state and quality of other telemetered points. Designed to execute any coordinated sequence of operations, this package is typically used to implement sequential switching lists and automatic process control scripts. The execution of these sequences can be automatically triggered by a single event, by user request or as a remote procedure call from an application. Validation functions are available to verify that the script is error free and to ensure no invalid sequences are executed.

Through its Historical Data Management functions, PowerOn Control supports the collection, storage and calculation of time-dependent data and provides user-friendly tools to view and modify this data. Tools include tabular and graphical viewers and editors, Oracle® relational database technology, detection and storage of disturbance data and an account editor. For customers who are considering or who already have existing historical data management functionalities from OSISoft® Inc. PI Historian, PowerOn Control SCADA has a standard, fully functional interface with complete support of automatic tag creation, edit and deletion.

PowerOn Control SCADA's Real-time Calculation Engine fully supports a rich set of calculations based on other SCADA points. Both logic and mathematical calculations may be defined. Expressions that determine calculated point values as a function of other real-time point values may invoke complex relations between SCADA telemetry, user entered data, other calculation results, SCADA points quality status and numerical constants. Calculated points are processed conventionally and treated exactly as telemetered points in all respects. Calculated points provide the flexibility to both display and manipulate data in complex manners without the need to write software. PowerOn Control includes a package of pre-defined calculations and a powerful define-and-configure tool that allows a very large number of logical and mathematical operators.

PowerOn Control SCADA fully implements Role Based Access Control; this is enforced by assigning privileges (which globally define the actions that can be executed by defined user roles) and by the console's Area of Jurisdiction (AoJ), which defines the extent of data and functions available for visualization and execution on that console). PowerOn Control allows for the definition of thousands of AoJs for increased flexibility.

A fully configurable Tag Management function allows the definition, addition, modification and removal of device tags, also known as safety tags or work tags. Tags are normally used to notify users of safety conditions or work-in-progress on a device. Tag definition is fully configurable and allows PowerOn Control to adapt to the utility's current practices and procedures.

PowerOn Control Distribution Management

PowerOn Control DMS and the Smart Grid

GE is avant-garde in its implementation of Smart Grid principles in its applications. Our flagship FDIR application, first deployed in 2003, is a key component of a self-healing network. It includes an automatic detection and location of faults and an automatic execution of upstream and downstream restoration switching. This means that more customers are restored more rapidly, reducing outage minutes and improving Quality of Service Indices.

Another example of a Smart Grid solution within PowerOn Control include achieving network optimization via IVVC or load transfers and supporting distributed generation within PowerOn Control. At GE, we recognize the potential of grid improvement initiatives and are committed to providing its benefits to our customers.

Effective User Interface Maximizing Productivity

The PowerOn Control DMS user interface is designed to:

- Allow users to quickly assess the state of the network. This means different things to different types of users, but the unifying theme is to help focus their attention where needed.

- Give users the necessary feedback, for example in terms of potential consequences, ensuring that they can make intelligent and informed decisions.

- Assist users in performing daily tasks as quickly and efficiently as possible and automating routines, while still giving them the necessary control.

- Ensure that users can investigate emergency situations quickly to assess the extent of problems, evaluate options and take action.

The user interface offers very rich graphical display capabilities, including geographic displays and automatically generated schematics. These graphical displays can present results of Connectivity Analysis and Load Flow as well as for the advanced applications-including location and extent of faults-and identify the faulted device. These displays are complemented by a set of tabular displays that present application results in an intuitive fashion. PowerOn Control supports full navigation between tabular, graphical and schematic displays.
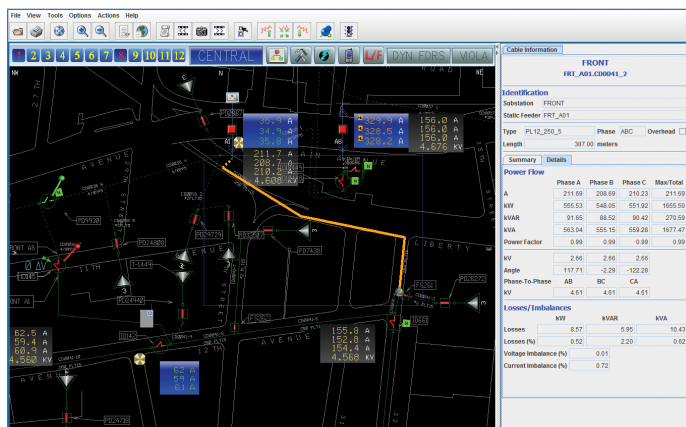
Load Flow and State Estimation: Distribution Network Visibility

The Load Flow and State Estimation application tremendously improves the users' visibility of the distribution network, allowing them to protect against critical performance, reliability and security risks, without extensive investment in expensive remote monitoring equipment.
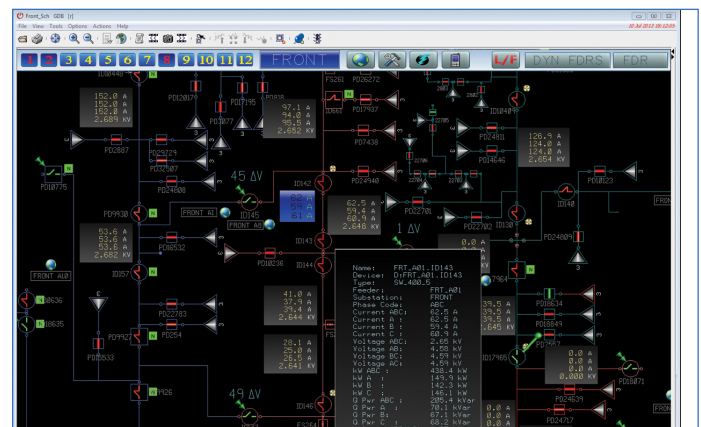
As a result of the high-infrastructure costs for remote monitoring, the network visibility offered to users by SCADA systems is generally limited to the equipment inside the substation and to selected locations on the feeders. The Load Flow and State Estimation calculation module significantly improves this visibility. These applications use the estimated load profiles at customer distribution points as well as voltages and flow SCADA measurements-within the substation and anywhere along the feeder-to compute individual phase voltages, currents and losses on the entire distribution network. The enhanced visibility offers benefits such as improved detection of system problems including voltage violations and accurate assessment of system losses. The advanced State Estimation algorithm will automatically correct the network state, and even network parameters, to match calculated and measured quantities.

Load Flow and State Estimation produces a real-time, unbalanced single-, two- and three-phase solution that is presented within system displays providing a high-level of visibility to the system beyond that normally available by SCADA. These accurate Load Flow calculations also provide the information needed by other PowerOn Control DMS advanced functions.

PowerOn Control supports a Pre-switching Validation (PSV) function that automatically evaluates in advance the consequences of every switching action initiated by a user that will open or close a switch or apply a cut or jumper. PSV determines the expected result of that action by automatically executing connectivity and load flow analyses in the background and advises the user of any undesirable consequences of the proposed action. The operator is given options to either cancel the attempted action or to proceed in spite of the existence of warning messages.

Examples of the determined conditions include:

- Number and priority of customers to be de-energized.

- Possible overloading of a device and/or voltage limit violations, or attempts to open a switch where the current flow exceeds its interruption capacity.

- Connection of an energized section of the network to a grounded section.

- Changes in network configuration such as introducing or removing abnormal network loop or parallel.

The PowerOn Control graphical user interface is capable of displaying information from a variety of real-time sources for enhanced situational awareness.

Load Flow calculations can be presented as permanent results on Feeder displays or by simply hovering over a selected device.

FDIR: Reduce Outage Impact

GE's FDIR application is a key building block for any utility's Smart Grid solution. FDIR enables utilities to significantly improve their distribution network reliability and reap economic benefits resulting in considerable cost savings.

This application automatically determines, within seconds of detecting a fault, the location of the fault using both fault data available from modern relays and fault detectors. It then proposes switching steps to isolate the fault and restore the distribution feeder upstream and downstream of the isolated fault thereby rapidly reducing the number of outaged customers and dropping the total outage minutes. On approval by the user, PowerOn Control translates these switching instructions into a full-fledged Emergency Switching Order that includes procedural steps such as issuing tags and safety documents, in order to meet the operating standards of the utility.

FDIR offers:

* Minimized outage areas: Intelligent algorithms restore the maximum number of customers after fault occurrences.

* Minimized outage duration: An optimized restoration algorithm ensures minimized outage periods as well as the efficient use of field crews.

* All safety precautions and rules are followed: For example, opened switches and grounding network sections under work are automatically tagged. As a result, FDIR promotes a safer working environment for field crews.

* All available equipment information and field data are considered when analyzing faults: FDIR can carry out complex network configurations that would be difficult to do manually.

* Feasible solutions: Implemented recommendations will not adversely affect the network, e.g., will not cause equipment overload or voltage violations.

The fault detection mechanism makes use of available SCADA circuit breaker and fault detector statuses. In addition, it accounts for any relevant devices along the fault path, such as reclosure relays, when evaluating network conditions. Suspect fault conditions are highlighted on graphical network displays.

Users can set configuration options directly impacting the proposed recommendations, such as specifying that only SCADA-controllable switches are to be considered in the proposed isolation and restoration steps.

IVVC: Integrated Volt-Var Control

The IVVC application recommends optimal control of shunt capacitor banks on feeders and in the substation, transformer and line regulator tap positions and/or their automatic voltage regulator set points.

IVVC's main objectives are the following:

* Conservation Voltage Reduction, which uses voltage reduction to minimize total energy consumption or to shave off the load peaks during periods of high demand. This minimization is achieved via feeder voltage reduction without violating customer voltage limits and other constraints such as maximum number of device operations per day. The application automatically takes into account abnormal network topologies.

* Loss Minimization minimizes technical losses by switching capacitors to minimize Var flows on feeders and respecting power factor limits set by transmission operations.

IVVC recommendations can be issued automatically and directly to control field equipment.
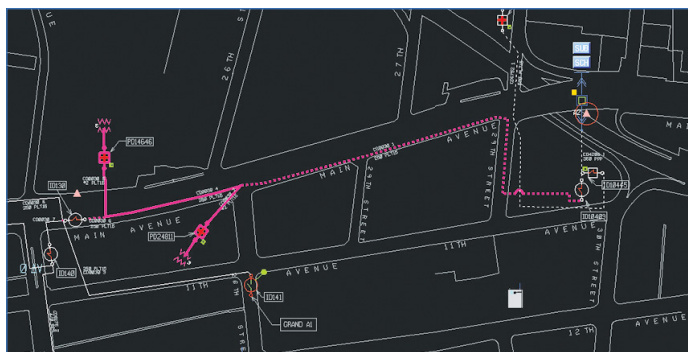
On-line Fault Level Analysis

The Fault Level Analysis application can interactively calculate fault currents at an operator's specified location in the network. This flexible and easy to use application is able to calculate the three-phase fault currents as well as the post-fault voltages. It can also compare the fault current magnitude against the interruption capacity of breakers in the fault current path and provides a display listing the breakers whose post-fault current flow is greater than their current-interrupting capacity of those switches, alerting the operator of potential problems before they occur.

The model used for this application is the same as for the rest of the DMS applications and computation can be done using the actual network state as pre-fault condition.

Optimal Feeder Reconfiguration:
Making Better Use of Distribution Network Assets

The Optimal Feeder Reconfiguration application analyzes the distribution network and proposes switching actions that will result in better utilization of the distribution assets. Its two modes of operation look to reduce system losses and improve voltage profiles or to reduce overloads.

* Loss Minimization through Feeder Reconfiguration: This mode seeks to minimize system losses by providing recommendations for branch exchange, i.e., closing one switch and opening another. It identifies what the optimal tie point is between feeders resulting in minimal losses and which avoids loading or voltage violation.

* Contingency Load Transfer (Overload Reduction): In this mode, the application provides the operator with switching recommendations for a network re-configuration-transferring load from one feeder to another-which will reduce overload on a particular device.

Graphical highlighting of affected equipment.

IVVC Recommendations Display

Switching Advisor and SMS: Planned Switching Made Easy

PowerOn Control's Planned Switching Advisor determines and proposes switching operations in order to safely isolate a piece of equipment or portion of the distribution network as part of a work order.

A typical context for a Work Order that requires switching involves the need to isolate field equipment for maintenance. The Switching Advisor is capable of proposed switching to completely isolate the device, while minimizing the number of de-energized customers, without affecting any if possible. Further, the proposed switching is validated so that it does not introduce any overload or under-voltage conditions. The Switching Advisor uses real-time connectivity information to trace through the network, so the network model is always up-to-date. It also makes use of the powerful Load Flow application as a means of checking the impact of the proposed actions. The user can review the list of proposed switching and view the affected switches highlighted on a graphical display.

Once the user is satisfied with the proposed switching, a single click initiates the translation of the proposed switching steps into the Switching Management Subsystem (SMS) for the creation of a Planned Switching Order. This automatically generated list of Switching Order instructions will include a number of additional steps, such as:

- Tagging (e.g., Do-Not-Operate tags are placed on the isolating switches).
- Actions, such as disabling of on-load tap changers, in the event that the proposed switching involves creating a temporary parallel.
- Tracing the affected circuits and locating and disabling reclosing relays.
- Procedural steps defined by the client and configured to correspond to the utility practices and processes.

The SMS provides users with an integrated environment for preparing, validating, approving and executing planned and emergency switching orders.

Emergency Switching: Fast and Secure

SMS also supports the definition and life cycle activities of Emergency Switching Orders, that in conjunction with FDIR dramatically improve the response to unplanned events and emergencies.

Switching Order steps can be created manually, recorded from graphical operations or created automatically by the advanced applications. The automated switching order method produced by the Switching Advisor ensures certain constraints, such as no resulting violations and proper tagging, are respected.

SMS supports the archival of completed switching orders, as well as the restoration and viewing of previously archived switching orders.

Access to all switching management functions is controlled via the mechanism of user roles and privileges. This approach enables individual utilities to assign responsibilities associated with the various functions to different user types.

SMS maintains a detailed chronological audit trail that records and highlights all changes made to a switching order after approval.

## Data Management: Critical to DMS Success

The single most important factor that determines that the utility is getting the most out of a DMS is effective and efficient data management. The GIS Gateway can interface to a wide variety of Geographic Information Systems, and will help streamline the process of keeping DMS data up-to-date, both during initial build of the DMS network and through highly optimized incremental imports. GE has a great deal of experience in helping utilities put practical data management systems in place.

Advanced Architecture: The Basis for Superior Performance

PowerOn Control has been designed to meet the functional, performance, availability and expandability requirements of modern utilities. As a result, PowerOn Control is based on a distributed client/server architecture designed to internationally recognized standards. The use of appropriate third-party hardware and software has been maximized in order to provide the most convenient means of system expansion and integration with corporate and legacy systems. System data is organized in databases managed by commercially available industry-standard relational database management systems (RDBMS). The data collected and processed by the system is easily accessed by corporate applications such as Microsoft® Excel®, Microsoft Access® or corporate web applications using standard ODBC drivers.
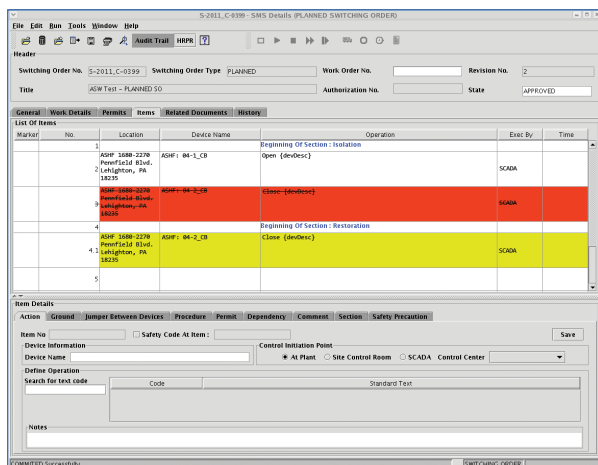
The Switching Order Editor showing the audit trail feature.
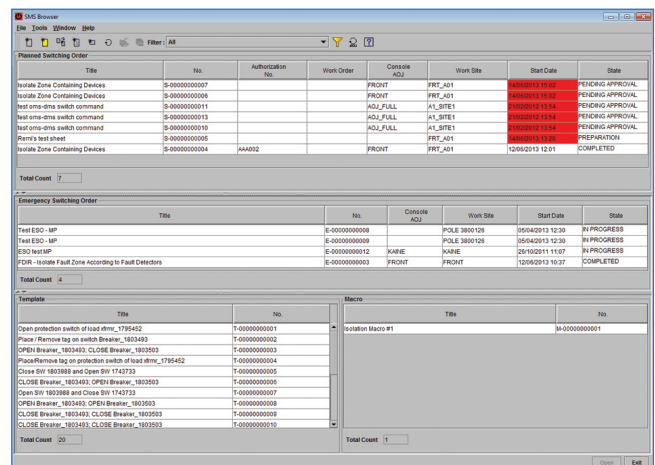
SMS Browser presenting a graphical overview of switching tasks.

By virtue of its distributed configuration, functions are allocated to processing units based on the function/data modularity principle that locates related groups of functions as closely as possible to the data they frequently access. This avoids communication bottlenecks in the process of distributing functionality.

In order to achieve the high availabilities required for any mission critical system, fully redundant system components are provided. Fast, user-transparent failovers give rise to an enhanced availability of critical functions-an essential property of a mission-critical system.

PowerOn Control is capable of increasing its computing power via the addition of further computing elements, such as additional memory, processors, servers or workstations. In addition, PowerOn Control is designed such that component failures are promptly detected and redundant components are brought into use without operator intervention and without causing degradation of functionality or performance.

Further, redundant elements are continuously monitored to avoid build-up of hidden faults. Remote devices are monitored for malfunction and can be readily removed from service when any such malfunction is detected.

PowerOn Control also supports a Hot-standby Backup Control Center with optional full redundancy. This allows operations to transfer to a remote location in the event of a disaster affecting the main control system.

PowerOn Control as Part of Your Utility's SmartGrid Strategy

GIS Interface: Leveraging Corporate Investments in GIS Technology

The PowerOn Control GIS-Gateway interfaces the utility's data residing in a corporate GIS system or similar asset management systems with PowerOn Control. This allows the integration between the GIS and PowerOn Control data management.

The GIS Gateway by default accepts data exported in CIM/XML format as defined by IEC 61968/61970 standard for network model data attributes, and GML format for network graphical representations. If the utility already has or is considering GE's Smallworld Electric Office GIS, a productized interface based on the same standards ensures seamless integration with minimal efforts.

Where the GIS product used by a utility does not offer the capability to export its data and graphics into CIM/XML and GML formats, specialized services can be offered to implement utility-specific GIS data extraction utilities compatible with the GIS-Gateway.

It is possible to categorize the incremental GIS network modifications based on the complexity of the change. PowerOn Control can then automatically apply changes categorized as simple all the way to the production system without requiring user intervention. For changes categorized as complex, PowerOn Control allows users to selectively review and approve changes before application.

External Database Access

PowerOn Control offers a uniform and user-transparent mechanism for accessing data stored in the various databases within the PowerOn Control product. An advanced Application Programming Interface (API) provides the client applications with a set of services to globally access data.

External applications can also access historical data through its standard ODBC interface, or through Oracle's standard SQL interface as well as through stored procedures.

The system supports various transfer protocols ranging from simple secure FTP file transfers or Web XML imports/exports to real-time Inter Control Center Protocols including 60870-6-TASE 2 ICCP, ELCOM-90 and IEC 60870-5-101/104 over serial or IP links respectively.

Typical PowerOn Control System
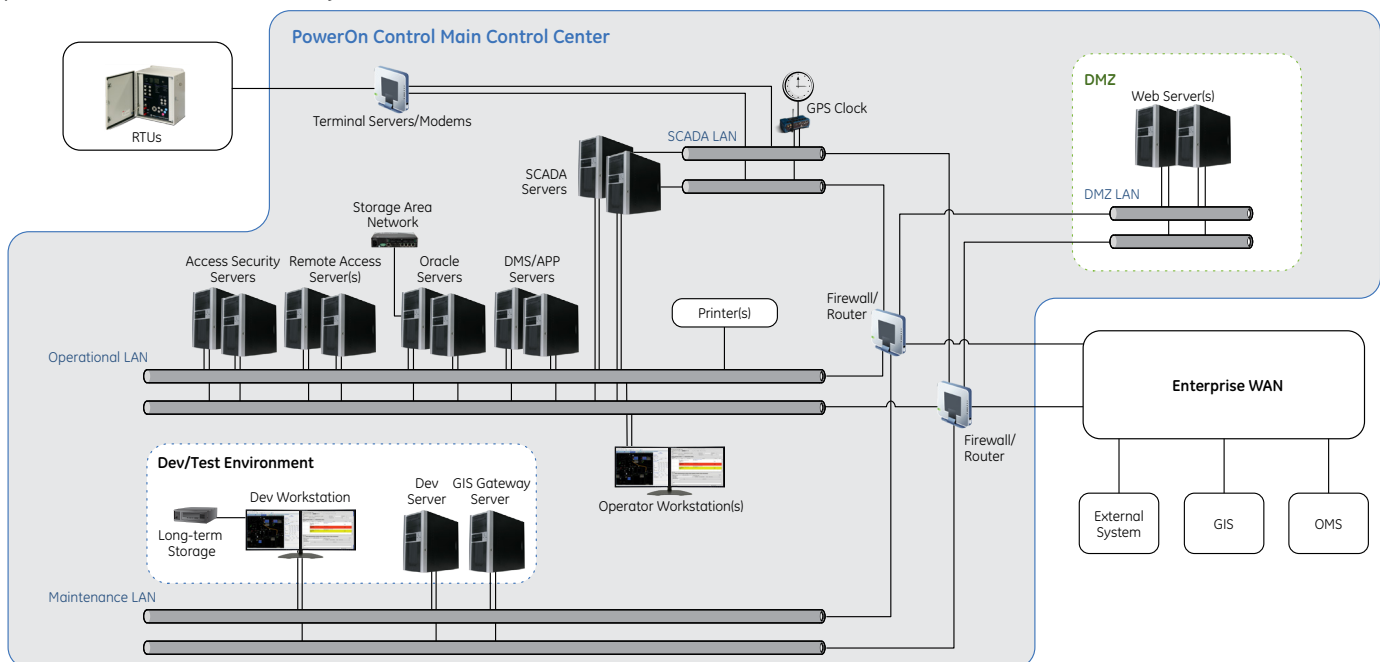
PowerOn Control Operator Training Simulator

The best defense for coping with difficult situations is preparedness. GE provides the "real case" simulation training with its state-of-the-art OTS. This environment provides models that emulate the real-world devices of the system. The OTS ensures that the team is sharp and ready, and well-versed in many real-life eventualities.

With the OTS utilities have an environment that is a functional replica of their DMS and distribution network, and is safe to use to develop best practices in keeping with today's quality assurance and cost efficiency demands.

In addition to acting as a Trainee/Instructor Simulator the OTS can also be used as a pre-production environment to pre-test software and database releases before integrating them into the live system.

The following applications are packaged with each OTS:

- **Training Monitor and Control:** This application enables the instructor to monitor and control the simulator's state at any point in time.

- **Scenario Manager:** The scenario manager is used to facilitate the manipulation of the scenario files. Through its menu, the instructor can define, edit and execute scenarios or put a scenario in a learning state. When in the learning state, all trainee/instructor actions affecting the simulation are automatically recorded in the scenario. This scenario can be later replayed to re-execute the sequence of actions.

- **Base Case/Snapshot Manager:** With this application the instructor can save and restore snapshots/base cases or initialize the OTS from a base case.

- **Audit Trail:** All activities in the OTS are recorded for review by the instructor in the Audit Trail application. Commands performed by the instructor and trainee, all scenario events, all alarms and events normally generated by the applications are recorded in the Audit Trail.

Scenarios representing real situations, such as bad weather, disasters or high-volume usage or peak period can be generated from the production historical database to create scenarios that will test the trainee to think and act on his feet under exceptional conditions. The OTS gives the user real-life situations in a perfectly safe environment.

Cyber Security

As control systems have become an integral part of tightly-integrated enterprise business applications, keeping control systems secure is a top priority for effective use of these advanced applications.

PowerOn Control Cyber Security is guided by North-American and International Security Standards, such as NERC CIP, NIST Security Checklists, NIST SP 800 Series (800-53, 800-82), ISA-TR99, ISO®/IEC-27002:2005, and CIS Guidelines. It is based on a Defense-in-Depth security approach which includes Network, Application and Host Security.

PowerOn Control - Secure: Lock-down and Demonstrate Cyber-Security Compliance

PowerOn Control - Secure provides a solution to gain control of, and confidence in, a mission-critical system's security posture. Secure has the ability to identify security, compliance and configuration issues that may compromise the system. Using Secure on a regular basis to audit mission-critical servers and workstations is a key policy in a sound self-assessment certification process.

Secure does much more than simply audit against certified configurations. It has the ability to perform the configuration changes required to lockdown and secure workstations and servers. In audit mode, Secure will execute a selected set of security controls and generate a conformance report. In lockdown mode, Secure will configure the workstation or server as per security best-practices conforming to industry standards such as the NERC-CIP and ISO-17799.

Reports are made available in both text and HTML formats. Using a standard web browser interface, Secure audit reports can be conveniently viewed by authorized personnel. A list of all available reports is presented and each one is easily and conveniently accessible from the Secure Cyber Security Dashboard. A quick glance at the dashboard can reveal security, compliance and configuration deviations in the system that require attention.

PowerOn Control - Advisor: Simplify and Optimize Patch Management

PowerOn Control - Advisor is an extension to the Secure utility. It provides PowerOn Control-specific value-added information on third-party advisories and patch updates. Whenever a third-party issues a patch update, Advisor instantly analyzes the impact on the PowerOn Control system, the authorized software and the management tools installed on a server or workstation. A preliminary patch management assessment report indicating the potential impact on the system is e-mailed to GE's customer support team and optionally, the utility's patch management team. The report from Advisor helps to focus the testing required for patch management certification and reduce turn-around time.