Advanced Distribution Management System

Increasing demand for reliable, safe, and efficient power network operation cause network operators to search for an efficient operational platform, gathering all applications and solutions in one integrated platform, model and user interface. Consequently, the electricity market moves in the direction of integrated sophisticated software products, which may unify operation technologies (OT) and information technologies (IT) in a single platform. Proven and award winning Advanced Distribution Management System is Schneider Electric’s response to these growing trends.
### Solution

Schneider Electric's Advanced Distribution Management System (ADMS) is a modern and comprehensive solution for electrical network management including but not limited to monitoring, control, outage and hazard management, planned work management, storm management, network conditions analysis, network optimization, operation planning, network development planning, what-if analysis, operators training, applicable on all voltage levels from low voltage up to the transmission.

**ADMS IS FULLY INTEGRATED SMART CONTROL SYSTEM FOR UTILITIES, INTEGRATING SIX COMPONENTS INTO A SINGLE PLATFORM FOR A SEAMLESS OPERATION OF POWER SYSTEMS**

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<tr>
<th>Component</th>
<th>Description</th>
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<tr>
<td>SCADA</td>
<td>New generation of supervisory control and data acquisition (SCADA)</td>
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<tr>
<td>DMS</td>
<td>Distribution management system to monitor, analyze, and optimize distribution network with more than 50 specialized power applications (DMS)</td>
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<td>EMS</td>
<td>Transmission management system to monitor, analyze, and optimize subtransmission and transmission networks (EMS)</td>
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<td>NetOps</td>
<td>Network operations to manage all unplanned outages with embedded FLISR, hazards, planned work, major storms including damage assessment (NetOps)</td>
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<td>PCS</td>
<td>Power control system to manage operation of islanded and connected Microgrids (PCS)</td>
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<td>DERMS</td>
<td>Distribution Energy Resource Management system to manage and optimize impact of DERs to distribution network (DERMS)</td>
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Advantages

**SINGLE PLATFORM**
that includes operating systems, cyber security, administration and configuration, data model, displays, user interface

**SINGLE STANDARD-BASED (CIM, IEC) INTEGRATION PLATFORM**
for streamlined integration to external utility systems

**ABILITY TO COMPLY**
with various security standards world-wide

**INCREASE NETWORK VISIBILITY**
by intelligent monitoring modules

**FULLY DIGITALIZED CONTROL ROOM**
that results in optimized operator workload and increased field safety

Improves

**GRID RESILIENCE, SCALABILITY AND CONTROLLABILITY**
by reduced outage times and proactive disturbance detection and notification

**CUSTOMER SATISFACTION**
by advanced outage management with embedded FLISR engine and demand reduction in emergency conditions

**NETWORK RELIABILITY (SAIDI, SAIFI, ENSI)**
by intelligent network operation optimization
According to Gartner:

**THE BEST SOFTWARE 7 YEARS IN A ROW**

significant advantage when compared with other vendors

- Minimized **total cost** of ownership
- Optimal **capital investments** in primary network
- Increased **utility revenue** by network optimization that results in minimized technical **power losses**
ADMS & Smart Grid Solutions

Solution

SCADA represents new generation of utility SCADA, designed for modern distribution and transmission network equipped with large number of monitored and controlled field devices. Highly scalable SCADA solution supports acquisition, processing, monitoring, and control of field devices including RTUs and IEDs via various standard protocols such as DNP 3.0, IEC 101/104, Modbus, IEC 61850. The platform is highly extendable to support a set of specific communication protocols as well. ICCP services support cost-effective integration to external SCADA or SCADA/EMS systems. Single and highly configurable user interface is provided to increase and improve operators situational awareness and operation approach. SCADA configuration module provides streamlined management of SCADA configuration and corresponding displays, through controllable model promotion process.

Functionalities

- Front end processors to efficiently poll and control RTUs and IEDs,
- ICCP services to communicate to external SCADA/EMS systems,
- Intelligent tagging to support day to day operators tagging activities,
- Smart alarm engine to efficiently manage all alarms in steady and high-activity cases,
- Generic calculation engine to support easy creation of various calculated points,
- SCADA configuration for streamlined and cost-effective SCADA commissioning,
- Load shedding, manual and rotational, with intelligence in shedding groups creation with respect to current network configuration,
- Emergency voltage reduction that supports substation and feeder voltage regulators,
- Operator logbook to efficiently log all either existing or scheduled operator activities.
Advantages

VERIFIES IMPACT
on the network before operation

SMART ALARMING ENGINE
combined SCADA alarms and DMS-calculated alarms

DESIGNED TO SUPPORT
multi-agent closed loop applications (VVO, Feeder Configuration, FLISR)

BUILT ON TOP OF SINGLE ADMS DATA MODEL AND USER INTERFACE

HIGHLY CONFIGURABLE DISPLAYS EDITOR

STREAMLINED CONFIGURATION
including RTU templates and faceplates

SUPPORTS 10 MILLION REMOTE POINTS

PROCESSES 1 MILLION VALUES PER SECOND
ADMS & Smart Grid Solutions

Solution

DMS solution represents the set of more than 50 power applications organized to support all activities in distribution network real-time management and operation planning. The DMS apps ensure enhanced network visibility including the unmonitored area that increases utility situational awareness and decision making. In addition, a set of apps is provided for continual optimization of network condition and fault level analysis in real-time mode. Prediction of the operation issues is ensured with intelligent state forecast application that provides preventive management of unexpected perturbations. All DMS applications are available in real-time and study mode, which provides a rich set of what-if analysis in a day-to-day operation.

Functionalities

- Monitoring apps
  - Load Flow and State Estimation
  - Equipment Rating

- Optimization apps
  - Volt/VAR Control and Volt/VAR/Watt Control
  - Network Reconfiguration

- Operation Planning
  - Near, Short, Medium Term Forecast
  - Load Scaling

- Analysis apps
  - Energy Losses,
  - Fault Level (Short Circuit) and Relay Protection Analysis
  - Harmonic and Contingency Analysis

- Development planning apps
  - Customer Connection
  - Network Automation
  - Voltage Regulator Placement and Capacitor Placement
  - Cable Reinforcement
Advantages

INCREASES UTILITY REVENUE by optimizing technical losses

ENSURES QUALITY OF POWER DELIVERED TO END CUSTOMERS

AVOIDS LOAD SHEDDING IN EMERGENCY CONDITIONS by intelligent demand reduction

EXTENDS ASSET LIFETIME by optimal operation of entire grid

MINIMIZES AND OPTIMIZES INVESTMENT IN PRIMARY NETWORK by optimal network development planning

RELIRES ON REAL-TIME DATA MODEL AND REAL-TIME HISTORICAL DATA THAT IS ESSENTIAL FOR ACCURATE NETWORK REPRESENTATION AND MODELLING

IN PRODUCTION AT OVER 180 CONTROL CENTERS WORLDWIDE
NetOps solution of ADMS provides efficient end-to-end management of all unplanned outages and works, hazards, planned outages and works, major storms and all other relevant operation activities in day-to-day work and field management, in both transmission and distribution networks. NetOps consists of the following components: Outage Management (legacy OMS), Switching Management, and Fault Location, Isolation and Supply Restoration (FLISR). Outage Management component is responsible for management of all unplanned outages, work and hazard activities, in blue sky and major storm days. Switching management supports full work flow of planned and emergency switching. FLISR component is embedded in Outage Management and ensures optimal and fast location and isolation of fault, as well as restoration of majority of customers on the feeder with appropriate level of SCADA controlled distribution automation.

### Functionalities

- **Outage Management**
  - Call taking and processing
  - Incident management, including predicted and confirmed, outage and non-outage incidents
  - ETR and prioritization management
  - Crew management with optimal crew dispatching
  - Distributed dispatching
  - Leveraging smart meter data (last gasp and power up events, status pings, voltage polls)
  - Storm management with Damage assessment
  - Reporting engine including standard-based reliability report
  - Standardized integration to legacy

- **Switching management**
  - Scheduling of switching within and without control center
  - Optimal writing of switching
  - Verification of switching with multi-level of approvals
  - Proactive notification to customers affected with scheduled switching

- **FLISR**
  - Fault location, localization and isolation
  - Supply restoration with look ahead mode
  - Return to normal
  - Large area restoration in distribution and transmission network
ADMS & Smart Grid Solutions

SCADA  DMS  NetOps  Historian  Field Client  DTS  DERMS  EMS  PCS

Advantages

- **IMPROVES CUSTOMER SATISFACTION**
  by communication and reduction of outage times

- **IMPROVES GRID RELIABILITY (SAIDI, SAIFI, ENSI)**

- **HIGHLY CONFIGURABLE**
  to adapt to specific utility business processes

- **OPTIMAL SWITCHING WITH EMBEDDED CONSIDERATION OF IMPACT ON THE GRID**, field crew safety, and field crew workload

- **IMPROVED RESPONSE AND DECISION MAKING ON MAJOR STORMS**
  by embedded storm management with damage assessment
Solution

ADMS historian is designed as highly available fault tolerant subsystem organized as a central place for collection of all relevant ADMS data, including but not limited to statuses, analogs, alarms, events, sequence of events, flow/state estimation results, outages, switching plans, etc. ADMS historian consists of multiple SQL databases, with highly configurable retention periods and archive logic, with proven high read/write performances. The rich set of out of the box reports is provided on top of ADMS historian, assisting to utility personnel in post-mortem and performance analysis, as well as decision making to improve network and utility performances. All historian data are additionally embedded in all ADMS modules which improves accuracy and performances of modules themselves. The data are exposed to utility warehouses systems which makes cost-efficient sending of ADMS data to warehouse systems to be combined in analytic modules.

Functionalities

- Collection of time series and relational data from all ADMS modules
- Set of historical tabular reports with historical calculations of statistic and performances on top
- Trending
- Snapshots and playbacks of dynamic data
- Analytical reports such as load and voltage condition analysis
- Element and device health and condition monitoring
- Sql Server Reporting Service (SSRS) as open reporting engine to provide extensive set of specific reports built by utility personnel and accessible via web browser
- Exporting of reports to standard formats
- Correction of load profiles based on estimated load history
- Out of the box PI interface
ADMS & Smart Grid Solutions

SCADA  DMS  NetOps  Historian  Field Client  DTS  DERMS  EMS  PCS

Advantages

**SINGLE HISTORIAN THAT STORES ALL NETWORK CHANGES**
SCADA changes, operator actions, application results, load/flow state estimation results

**FLEXIBLE REPORTING ENGINE**
which allows utilities to have arbitrary number of their specific reports

**HIGHLY CONFIGURABLE PLATFORM AND OPTIMIZED PERFORMANCES**
for large number of data

**HIGHLY AVAILABLE, REDUNDANT PLATFORM**
ensuring no loss of data continuity

**EXPOSED DATA TO EXTERNAL WAREHOUSE SYSTEMS**

**USE OF HISTORIAN DATA**
by multiple features such as learning ETR, load/generation forecast, load profile updates, device condition analysis and other analytical modules
Solution

Field Client is a web-based application specially designed for field personnel to be able to perform all relevant field operation for ADMS. The Field Client app makes communication between the crew and control room more structured and reliable. The application is supported on multiple various field devices such as Laptops, Tablets, Toughbooks, Toughpads, and all relevant operating systems Windows, iOS, Android.

Functionalities

- Viewing the real-time network status including topology, statuses, and analogs of all SCADA and manual points
- Multiple network views such as Substation, Schematic, and Geographic, with various configurable decluttering and coloring options
- Trace up/down or by specific trace rules
- Placing of tags, notes
- Placing of temporary elements
- Updates of manual points status
- Collaboration with control center on management of all incidents, outage and non-outage, predicted and confirmed
- Collaboration with control center during execution of switching plan
- Online/Offline mode
- Reporting damages via damage assessment process
- Administration and configuration of mutual aid crews
ADMS & Smart Grid Solutions

SCADA   DMS   NetOps   Historian   Field Client   DTS   DERMS   EMS   PCS

**Advantages**

- **Replaces paper maps, empowers field crews, and makes communication between crews and the control room more structured and reliable.**
- **Reduces significantly verbal radio link communication between field and control center.**
- **Provides real-time online view to field users** that essentially improves field safety.
- **Improves field access to current asset data.**
- **Provides field crews with access to work requests, switching plans, incidents, safety documents, and damages, all in one app.**
- **Provides access to SCADA statuses and analogs** that improves collaboration on substation works and makes field zones secure.
Solution

Dispatcher Training Simulator enables customers to efficiently train various ADMS users. DTS is designed to support specific behaviors of distribution and transmission networks. In addition, a rich set of training scenarios and events ensures training of different users such as operators, support engineers, system engineers, dispatchers, etc. Evaluation of training sessions gives trainers the ability to compare and report performances of trainees.

Functionalities

- Creation of training scenarios
- Transmission network and distribution networks events
- Advanced Network Simulator Service to simulate field behaviors (SCADA analogs, local automation, etc.)
- Creation of trouble calls, smart meter, and SCADA changes in a single scenario
- Adding on-fly events
- Recreation of training scenarios from production – replay major storms
- Creation of storm scenarios on fly
- Taking snapshots from production and placing them to training scenarios
- Controllable training scenario execution and monitoring of trainee actions
- Creation of evaluation reports
Advantages

**SINGLE TRAINING PLATFORM**
for distribution and transmission network

**RICH SET OF EVENTS USED TO CREATE A TRAINING SCENARIO**

**ADVANCED FIELD SIMULATOR BEHIND THE SCENE**
based on topology processor and load flow engines

**SIMPLE ADMINISTRATION**
of training sessions and scenarios

**ALL APPLICATIONS AVAILABLE IN DTS ENABLE TRAINED USERS TO REACT TO SCADA EVENTS, STORMS, OUTAGES, SCHEDULED SWITCHING, ETC.**

**SIMPLE ADMINISTRATION**
of data model and alignment with production
Solution

DERMS is a brand-new component specially designed to support distribution utilities in their day-to-day activities related to management of DERs impact on network conditions, leverage potential of DERs regarding services they can provide to the grid, and planning and management of new DERs connection. All types of DERs are supported, such as large DERs and individual customer owned small DERs. DERMS ensures efficient modeling and management of DERs, while all other ADMS components support their behaviors and consider their impact. The primary goal of DERMS within ADMS is to ensure efficient operation to distribution utilities with large number of DERs connected, as well as to optimize network performances to increase capacity for connection of new DERs.

Functionalities

- Modelling of all DERs
- Situational awareness via hidden load, voltage, load and generation profiles
- DER Monitoring
- DERs Aggregation
- DER Dispatching and Control
- Demand management with DER flexibility
- Hosting capacity heat-map
- New DER connection analysis
Advantages

**DERMS EMBEDDED IN ADMS** and tightly connected to other ADMS components and applications such as VVO, FLISR, Fault Level and Relay Protection Analysis.

**DESIGNED TO SUPPORT UTILITY ACTIVITIES IN DERS PLANNING AND MANAGEMENT**

**EVALUATES IMPACT OF DERS** on the network conditions such as protection miscoordination, abnormal fault levels, voltage issues, reverse flows.

**PROVIDES FLEXIBILITY OF AGGREGATED LARGE-SCALE DERS** while making sure constraints are satisfied at the grid edge.

**CONSIDERS ENTIRE NETWORK STATE IN ANALYSIS AND**

**DECISION MAKING PROCESSES**

**DESIGNED TO SUPPORT MONITORED AND UNMONITORED DERS INCLUDING CUSTOMER OWNED SMALL DERS**

**SUPPORTS NON-TELEMETERED INVERTER-BASED DERS VIA LOW/HIGH VOLTAGE RIDE-THROUGH CHARACTERISTIC, LOW/HIGH FREQUENCY RIDE-THROUGH CHARACTERISTIC, AND SOFT START**

**EMBEDDED ON LOAD**

generation forecast engine to precisely predict network conditions and potential operation issues.

**SUPPORTS USER**

easy DERs control via special communication protocols.
Solution

EMS provides an efficient analytic engine for sub transmission and transmission networks with a rich set of applications, designed to fit modern network behaviors and provide advanced system monitoring, security assessment, and optimization of operating conditions. EMS solution can be deployed to manage subtransmission and transmission networks owned by distribution utilities, or owned by large Transmission System Operators (RTO/ISO). Deployment flexibility is ensured in order to support options to deploy EMS together with DMS component, or to deploy it as separate instance, depending on utility business processes and regulator rules.

Functionalities

✅ Basic apps
- Topology Analyzer
- Network Exporter/Importer in all standard formats (CIM, PSSE, etc.)
- State Estimation, including topology and parameter estimation, which considers PMU measurements
- Load Flow, with multiple user selectable methodologies and algorithms available for analysis
- Contingency Analysis (N-1, N-X), including dynamic/cascade outages and modeling of remedial actions
- Network Sensitivity
- Reactive Reserve Monitoring

✅ Advanced apps
- Optimal Power Flow
- Optimal Topology Change
- Fault Level and Relay Protection Analysis
- Voltage Stability with real time alarming of possible voltage collapse or critical network violations

✅ Forecast apps
- Near-term State Forecast
- Short-term State Forecast
ADMS & Smart Grid Solutions

SCADA  DMS  NetOps  Historian  Field Client  DTS  DERMS  EMS  PCS

Advantages

TIGHTLY CONNECTED TO DMS
to efficiently support the case when utility owns and manages both distribution and transmission network

INTERACTS WITH NETOPS AND SCADA COMPONENTS
to make streamlined comprehensive transmission network management

IMPROVES SYSTEM SECURITY AND STABILITY
by continuous network state monitoring and verification of remedial actions

INCREASES UTILITY REVENUE
by minimizing transmission losses

ROBUST APPLICATIONS SUPPORT CASES
with both low and high SCADA measurement redundancy

SUPPORTS ALL MODERN DEVICES
in transmission network in basic and advanced applications
Solution

PCS is specially designed solution to support end-to-end management of Microgrids operation in network-connected or islanded mode, as well as the operation of large-scale generating units connected to (sub) transmission networks. The solution can be deployed as standalone to support management of a single Microgrid, or integrated with ADMS/EMS to coordinate management of multiple Microgrids and Distribution/Transmission grid operations.

Functionalities

- Automatic Generation Control
- Economic Dispatching
- Unit Commitment
- Interchange Transaction Scheduler
- Load Shedding
- Load Forecasting
- Renewables Forecasting
**Advantages**

- **IMPROVED POWER SUPPLY RELIABILITY**
  by preventing frequency and flow disturbances

- **OPTIMAL AND COST-EFFECTIVE OPERATION OF MICROGRID**
  within the Microgrid by single optimization of conventional and renewable resources

- **MINIMIZED GENERATION COSTS**
  and use of power reserves in large scale production systems

- **EFFICIENT EMERGENCY OPERATIONS LIKE PEAK DEMAND SHAVING**

- **ADVANCED FORECASTING ENGINE COMBINING CONVENTIONAL AND RENEWABLE RESOURCES**

- **STANDARDIZED INTEGRATION**
  with Weather Forecasting Systems

- **TIGHTLY CONNECTED TO SCADA, DMS AND EMS COMPONENTS**
  to support comprehensive management of entire network equipped with multiple Microgrids