PCS-9000
Distribution Management System

Keeping the path of smart grid moving forward, NR has developed innovative solutions for electric distribution networks based on state-of-the-art software and hardware technologies. PCS-9000 Distribution Management System (DMS) is designed for distribution control centers around the world. PCS-9000 DMS provides integrated functions and advanced applications for the control, management, analysis and optimization of day-to-day operations.

As a complete solutions provider, NR can undertake distribution network automation planning, system design, software/hardware installation and commissioning, project management, engineering, maintenance and after-sale services. NR provides customized services and professional technical support for global customers.

PCS-9000 DMS is a state-of-the-art distribution management system which fully complies with IEC 61970 and IEC 61968 standards. Furthermore, it provides a unified environment and the required functions to enhance the management efficiency of distribution network.

PCS-9000 DMS achieves a complete integrated solution for automation of dispatching by blending powerful operations and services with a real-time management system. In addition, practical application analysis features facilitate secure, efficient and effective day-to-day operations and enhance flexibility and profitability. PCS-9000 DMS uses SCADA data as the base data and implements Geographic Information System (GIS) as the display platform.
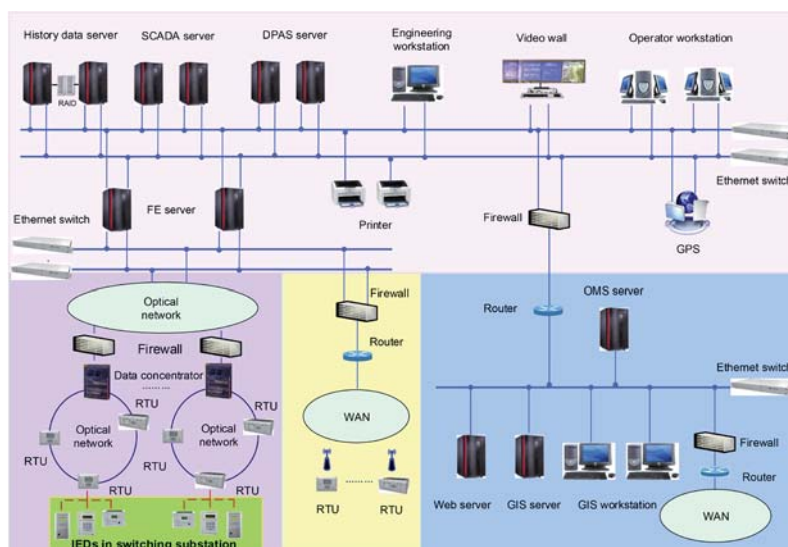

Figure 1 Typical system structure diagram of PCS-9000 DMS

Functions

SCADA

SCADA subsystem is the foundation of the DMS. Its main objective is monitoring real-time data and controlling distribution equipment such as: feeders, circuit breakers, ring main units, switching stations and distribution transformers. It accomplishes these tasks by analyzing basic real-time data and static data for the entire distribution system. The following functions are provided:

- Data acquisition
- Data processing
- Control and regulation
- Sequence of Events (SOE)
- Real-time data calculation and statistics assessment
- Network topology
- Historical data
- Device management
- Shift takeover management
- Clock synchronization
- Authority management
- System monitoring management

Fault Location, Isolation and Service Restoration (FLISR)

FLISR is also called as "Feeder Automation (FA)". In the event of an unexpected power system incident, the FLISR takes an overall view of the network to restore power and works to minimize consumer loss. FLISR acquires system data to find out the location of the fault. Once the location determined, the FLISR will issue controls by using SCADA commands to open circuit breakers and switches to isolate the faulty area. Then a plan will be created to operate circuit breakers and switches to restore power supply services for as many customers as possible.

Distribution Power Application Software (DPAS)

DPAS provides distribution power application software, which is based on distribution network topology. Complex software analysis and optimization functions designed for distribution networks provide unified grid modeling of the distribution network complying with IEC61970 CIM model and IEC61968 standard. The following functions are provided:

- Network modeling
- Network topological analysis
- Load transfer
- Load shedding

Outage Management System (OMS)

OMS is designed to be computerized and achieve paperless operational management. OMS is based on worksheets and is driven by the workflow engine. It is in favor of reducing the work intensity, improving the work efficiency and quality. OMS is used for daily work tasks, e.g.: outage maintenance, dispatch plan, log management and etc.
The following functions are provided:

- Workflow management
- Outage maintenance request management
- Outage plan management
- Outage analysis and indices
- Power supply assurance request management
- Emergency management
- Crew and resource management
- Shift management
- Dispatch log management

Trouble Call Management System (TCMS)

Trouble call management system is a customer information system designed to process/analyze customer trouble calls. The Customer Service Representative (CSR) can register/process customer trouble calls and retrieve customer information.
The following data can be acquired:

- Topology model data for power grid equipment
- Real-time SCADA data
- History trouble call data
- History records for equipment failures
- Equipment parameters

Based on all the above data, PCS-9000 trouble call management system can find out outage reasons, optimize trouble call processing, as well as determine outage locations. Therefore, outage duration can be minimized, excellent services can be achieved.

Dispatcher Training Simulator (DTS)

DTS is used for dispatcher training examinations, anti-fault exercises and operational analysis. It can simulate diverse power system hypothetical situations such as normal status, fault status, fault identification and restoration processes. DTS enables trainees to study and handle normal operation functions, fault handling and system restoration in an identical dispatching environment to the actual control center. The training simulator operation does not interfere real-time SCADA operations.
The following functions are provided:

- Simulated distribution power system

- Distribution operator training

- Anti-fault exercises

- Outage and restoration training

- Operation analysis and validation

Web

PCS-9000 provides web-based delivery of single line diagrams and other applications (e.g.: real-time/history alarm events and trending curve display, statistical report retrieval).

Single line diagrams are treated as SVG (Scalable Vector Graphics) files, they can be generated from existing displays automatically, i.e.: manual intervention is not required.

Moreover, it is unnecessary to install and maintain consoles for PCS-9000 web-based browser.

Cyber Security

With the development of energy management system, cyber security becomes more and more important. Conforming to relevant international standards (e.g.: NERC-CIP, ISO27001, IEEE1686 and etc.), PCS-9000 provides panoramic cyber security solution with excellent performance. Strong 2-factor authentication, Single Sign-On (SSO), Role-Based Access Control (RBAC), network security zones & encryption, necessary security hardening and etc. are integrated in this solution.

Moreover, PCS-9000 has passed security test performed by Experiment and Verification Center of SGEPRI (State Grid Electric Power Research Institute).

Features

- Complies with IEC 61970 and IEC 61968 standards
  It adopts open architecture and an integrated application platform to meet the expandable requirements of distribution functions.

- Hardware independence
  The application of hardware independent technology and middleware technology provides a convenient combination of different computer platforms on which to build a distribution management system.

- Enterprise Service Bus (ESB)
  PCS-9000 DMS adopts standard Enterprise Service Bus (ESB) to integrate DMS, CIS, GIS, AMR and etc.

  Graph-Model-Database Integration modeling technology Graph-Model-Database Integration modeling technology and the unified management system can quickly generate an array of graphs for the power grid, equipment properties and network topology models for SCADA, NAO and DTS applications.

- Seamless integration design with the GIS display platform GIS display platform is combined with the online real-time system data. Based on the unified data and graphic platform, the GIS and the SCADA graphic systems are integrated in order to provide a real-time display mode identical to the operation mode. All operations and job management can be executed with the assistance of GIS mapping.

- Worksheet/workflow aimed at day-to-day job management Worksheet orients towards improving day-to-day work efficiency. The worksheets are driven by workflow. Efficiency will be improved by creating a paperless and automatic management system. Users can customize the workflow and the worksheets. The management of day-to-day operations can be automated up to 90%.
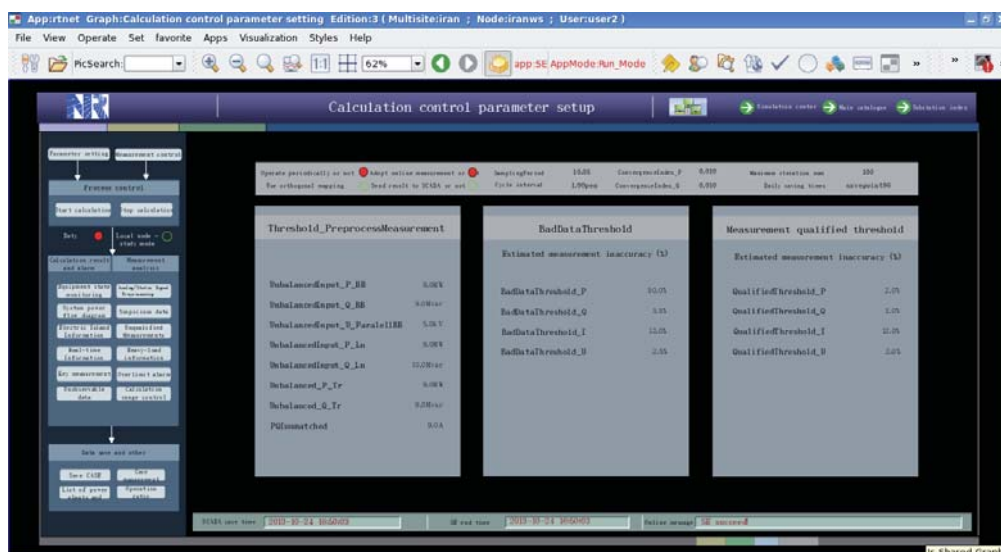

Figure 2 Typical diagram of PCS-9000 DMS

Power Grid Monitoring and Control System