



Integrated AMM System for Grid Management

Client/Project Background

Client:

Grid Management Company

Region:

Middle East Asia

Solutions

- Automated Meter Management System

Products

- SYNC 5000

Tools

Kalkitech SYNC 5000-MDAS,
Powel ELIN – MDMS, Jasper BI Suite



Abstract

The case study briefly describes the solution offered by Kalkitech for an Energy Management Company (Client) to implement an integrated Automated Meter Management (AMM) System to collect data from all energy exchange points, transmission and sub-transmission substations and power plants from all over the country. The system is capable of automatically reading and remote configuring, collecting load data, managing, processing, analyzing gathered data and producing the required reports and graphs. The AMM system gathers data from energy meters in an integrated system. Several features including web based reports and graphs introduced in the system has helped in achieving significant utility operational cost savings in the areas of outage management, revenue protection and asset management.

Introduction

The AMM project implemented for the Grid Management Company, aims at utilizing existing facilities available in the country's telecommunication infrastructure like PSTN, GSM, SDH and Satellite within the AMM system. The collected data from all meters in each station (transmission station, substation, power plants) is sent directly to the local data collection center via only one communication line (PSTN, GSM or Satellite) until complete installation of fiber optic network. Kalkitech solution included an interface to read DLMS/COSEM and non DLMS/COSEM meters via this line. The data from

Local Data Collection Centers is sent to the Main Control Center. It is desired that local centers and stations will be connected to the main center via fiber optic network in future. The utility plans to upgrade their existing MPLS/ADSL network with dedicated fiber optic network and therefore the system are designed to accommodate such changes in the future. The meters are connected to the local centers via dial-up (PSTN/GSM/Satellite).

The AMM system consists of 16 local data collection centers, controlling and reading data from 25,000 meters. Depending on the number of meters getting connected, local centers themselves are distinguished as:

- Small Local Centers (<3000 meters)
- Large Local Centers (>3000 meters)

Based on this criterion there are seven large local centers and nine small local centers. The entire AMM system is controlled from the Main Control Center. KALKITECH SYNC5000 is considered in all 16 local centers and Powel ELIN is used as the MDMS software in main control center.

Kalkitech has proposed to implement the following AMM system architecture in the project:

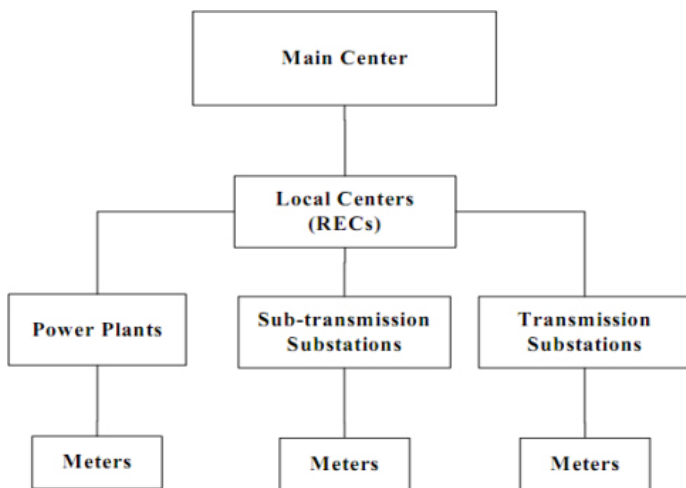


Fig 1: AMM System Hierarchy

The AMM system thus consisted of the following parts:

- Read data from meters installed at sites or stations (transmission station, substation, power plants) all over the country. It includes:
 - EDM I MK6E - 4300 Nos.
 - ACTARIS (ACE-6000 & SL-7000) - 45700 Nos.
 These meters are installed in approximately 1700 substations all over the country.
- 16 local data collection centers are considered for reading load data from the entire meters in their own zone. Local centers are only for data collection from meters and sending them to main control center.
- Main Data Collection Center is responsible to collect data from all local centers for data managing, processing, analyzing and providing graphs and reports.

Data is transferred to the main center via fiber optic network after this media gets ready. After direct connecting of the entire meters located in a local center zone to the main center, that local center is withdrawn. Our client expects that the project gets the most benefit of facilities available in their present telecommunication infrastructure, like PSTN/GSM/SDH/Satellite. Before establishing fiber optic network, PSTN or radio networks were used as telecommunication media between the meters and local centers. By establishing the fiber optic network, meters in the equipped stations sent their load data directly to the central office and ideally, the entire stations communicate with the central office via fiber optic network.

Kalkitech Solution

The AMM system consists of 16 local data collection centers. KALKITECH SYNC5000 in the local centers collects data from meters and sends data to the main control center. The communication between meters and local centers was established through PSTN/GSM/GPRS. Powel ELIN was considered as the core MDM (Meer Data Management) software in main control center for collecting, managing, processing and analyzing data. Jasper Business Intelligence Suit was the tool considered for generating web based reports and graphs.

Kalkitech SYNC 5000 was used to provide real time and bi-directional data flow between utilities and head end systems. It has a built in support for a variety of open metering protocols like DLMS/COSEM, MODBUS and meter-manufacturer specific custom implementation. Communication between meters and local center was established through PSTN/GSM/GPRS. ACTARIS meters supported DLMS/COSEM protocol and EDM I meters supported only their proprietary protocol for communication with local control center. CISCO routers were considered in all local centers and E1 cards/modem in the CISCO routers were used as the dial out modem for meter communication.

At meter locations, individual meter or a group of meters multi-dropped in an RS-485 loop gets connected to a modem for communicating to PSTN/GSM/GPRS networks. For each type of meter, a corresponding Meter Reading Module (MRM) was considered in SYNC5000 for communication with the meter. Each SYNC5000 in local center is a DLMS Server and Powel ELIN in main control center has a DLMS client adapter. After the fiber optic connectivity is established at a later stage, between meters and main control center, the local centers shall be withdrawn so that meters and main control center could communicate directly.

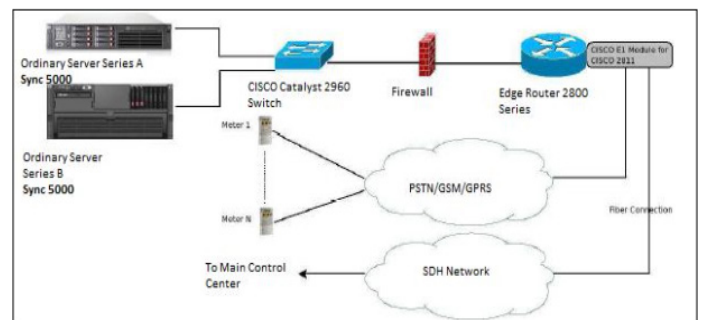


Fig 2: Communication Network

Features of AMM System

Automatic Meter Reading using Powel ELIN at Data Collection Center

Automatic meter reading is a generic process in Powel ELIN that uses adaptors for each specific vendor technology. The normal data collection is either scheduled or manually triggered. During normal data collection, the load profile, billing data and events are collected. If activated on the communication point, the time is also adjusted according to the server time. ELIN runs at the data collection centre and acquires the data from each local centre through the MDAS-SYNC 5000 present at each local centre.

Reading DLMS Meter Data using SYNC5000 at Local Center

Reading meters at the local center are done by SYNC5000. SYNC5000 publishes a DLMS interface used by the Powel ELIN SYNC5000 adaptor. Different DLMS meter models installed under the SYNC5000 are represented in Powel ELIN as different meter models.

Reading Proprietary Meter Data directly from meters

EDMI, ACTARIS SL7000 and ACTARIS ACE6000 adapters are activated for this project. The adapters represent the different meters as a communication point for acquiring data and use meter specific protocol format to transport via different communication mediums.

Data Validation and Estimation

Time Series Manager (TSM Service) is responsible for validation and estimation as well as the storage and reading in bulk of meter data. All validation and estimation methods are simple class extensions of the TSM. This enables simple add-on of new methods. The TSM also executes functional series calculations.

Automated Scheduling and Rescheduling

Depending on the type of schedule, a schedule in Main Center includes name, type, priority, period, module, execution time and number of retries. The following types of scheduling are available:

- Collection
- Round up of schedule
- Export
- Import

Processing of Energy Data

The system supports validation and estimation based on configurable series group rules and also supports functional series, possible to create based on other series and connects with an existing meter.

Manual Data Editing and Estimation

Main Center supports manual data edit and estimation based on rules of series. The methods used in Estimation are:

- Correct Single Values
- Interpolate Single Values
- Profile Estimation
- Interpolation
- Extrapolation

The figure below illustrates the architecture of Main center communication with the local centers. Each SYNC5000 at different local centers collects meter data as per requirements. Meters are represented as logical DLMS devices in SYNC5000. Powel ELIN's SYNC5000 adaptor executes multiple connections in parallel with each SYNC5000 (one connection is made per meter). Depending on the communication time required per meter the Main Center communication servers are configured with a flexible number of parallel threads.

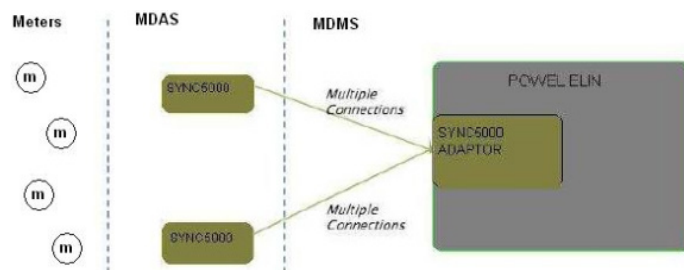


Fig 3: Powel ELIN – Meter Communication Architecture using SYNC 5000

Reporting

The proposed Automatic Meter Management System requires creating variety of web based graphical reports and charts. Robust reporting, report server and data analysis facilities are also provided.

Key features include:

- Flexible report layout
- Generation of reports in various formats
- Easy incorporation into existing work-spaces
- Flexible Data Sources
- Capability of generating sub reports and cross tabs
- Classification of report template into logical parts like Header, Footer and Detail area
- Custom Calculation and Variables

Reports generated are exported to a number of formats, including PDF, XLS, RTF, HTML, XML, CSV and plain text.

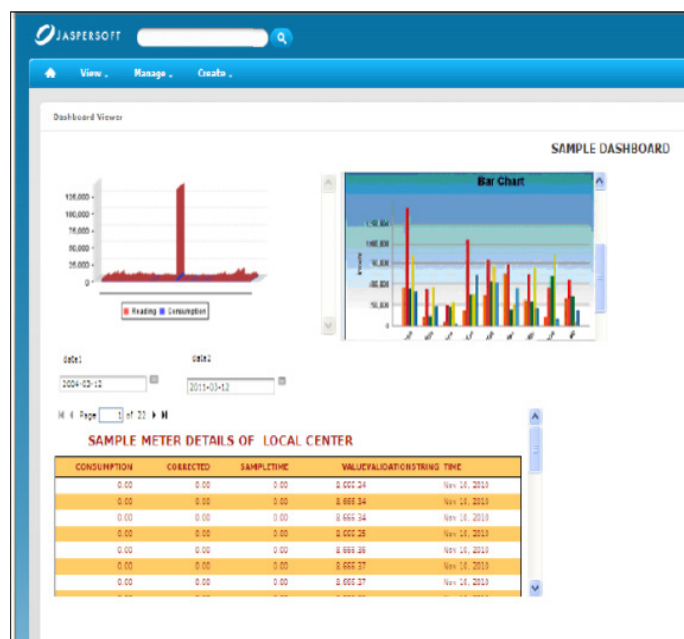


Fig 4: Reporting Illustration

Key Benefits

- Interoperability: The system is able to communicate in different protocols and could access different types of meters as per client requirement
- Scalability
- High Security Data Transfer
- High Security Data access
- User friendly Reports

Conclusion

Kalkitech has successfully implemented an AMM system for Grid management for the client. The AMM system collects data from the local centre meters through SYNC 5000 MDAS. Power ELIN at the central data collection center acquires this data from the local centers through SYNC 5000 adapters. ELIN then analyzes these data and prepares the required reports in a format desired by the client. The analysis helps the utility in better outage management, revenue protection and asset management. The fact that the solution is implemented on top of the existing infrastructure helps to minimize client costs. The current AMM system is also scalable for future requirements.