Meter Data Management System

HEXING

System Solution

Foreword

Utilities are regularly gathering huge amount of data. Gathering energy consumption data through reading electricity, water, gas and heat meters is just an example; that is done all along life time of a utility company. Although reading meters and gathering energy consumption data is costly job and takes a lot of time and resources from utilities but these data items are usually used for billing purpose only.

By rising smart metering systems this issue is even more highlighted. Utilities are facing several mild or serious challenges/problems which can be solved or at least eliminated by analyzing grid/energy data and detecting problematic points and then taking remedy actions.

MDM software systems are developed to helps utilities to solve these kinds of problems through analyzing existing data items which are already gathered from different sources; mostly from grid and customers' meters.

Solution Overview

Hexing MDM system unifies and streamlines total process of meter data collecting from different smart metering sources, validates, estimates and gives operator ability for editing data and finally converts data to useful information to be used by utilities' different subsystems.

One of the important role of MDM is to collect meters' data from different smart metering sources and from different vendors. Meter Data Collection systems may have special reading and calculation schedules. Hexing MDM system is designed with embedded Common Interface Model (CIM) service to ensure utilities about preserving future interoperability. One of the most important functions of MDM system is fast processing of huge amount of data comes from field device and subsystems.

Hexing MDM system's design is in such a way that it can process large volumes of data very quickly. Hexing MDM system not only prepares data for billing system but also handles storage and distribution of non-billing data and events, tamper alarms, outage management data and a lot more.

Functional Business Specification

Hexing MDM system fulfills following business requirements:

- Assets management for multi-vendor meters, data concentrators, remote terminal units, and SIM cards;
- Customer management, including post-paid and prepaid customers;
- Meter life-cycle management, including new installation, removal and replacement;
- Multi-vendor meter data collection system management;
- Validation, Estimation and Editing;
- STS based prepayment;
- Transformer monitoring;
- High voltage network monitoring
- Outage management data providing from smart metering system

Non-functional Business Specification

- High availability: Hexing MDM System satisfies 24*7 hours' operation without downtime, providing continuous and uninterrupted services.
- System's flexibility and scalability: Hexing MDM System's design is very flexible to adapt to existing and future rising business requirements according to smart grid concepts. When it comes to openness, Hexing MDM system adapts to various access methods, and provides interfaces for future applications. System can support different level scalability (horizontal expanding, lengthways expanding, mixed expanding) and load balancing mechanisms.
- Integration: MDM System integrates utilities' different kinds of application systems, satisfies seamless integration requirement to adapt to complicated system construction.
- Standardization: MDM System design in based on open technical standards and system structure, and complies with industrial standards to fit to future system expansion and integration requirements.

System Specification

Setting up and running of MDM system has many details worth to consider; details like: multiple layers of business requirements such as interface integration, data integration, process integration, etc. Hexing MDM system is not an isolated platform. It improves total availability and usefulness of information systems and make data more useful for utilities. Because of that; MDM system is designed with total integrative idea. This system supports and can be integrated with different communication technologies, different collecting and analyzing systems, smart metering solutions, customer information systems and so on.

Highlights

- **Data Management**
  - Data aggregation
  - Data versioning
  - Data audit
- **VEE**
  - Data validation
  - Data estimation
  - Data editing & reading
- **Asset Management**
  - Organization management
  - Grid management
  - Meter lifecycle management
  - Metering related asset Management
- **Customer Management**
  - Customer information
  - Energy consuming query & report
  - Help desk
- **Work Flow Management**
- **Task Management**

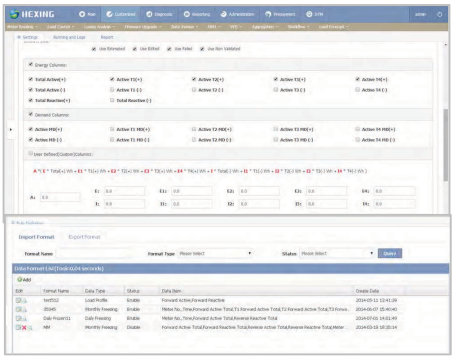
Highlights

- **Line Loss**
  - Line loss analysis
  - transformer loss analysis
  - Model design for loss analysis
- **Unified Events Management**
  - Event model standardization
  - Vendor defined event Mapping
  - Event storage
  - Event handling
  - User interface demonstration
- **Revenue Protection**
  - Tamper management
  - Consumption validation
  - Outage analysis
  - Power factor analysis
  - Overload analysis
  - Installation inspection
- **Load Management**
  - Load trend
  - Relay management
  - Remote control
- **Maintenance**
  - Abnormality management
  - Network and traffic monitor
  - Clock synchronize
  - Firmware update
  - Collection monitoring
  - Log and audit management and monitoring
- **Grid Security and Monitoring**
  - Overload analysis
  - Three phase unbalanced monitoring
  - Phase loss monitoring
  - Oil temperature monitoring
- **Operation Management**
  - Tariff management
  - Remote configuration
  - On-demand reading
  - Scheduled reading

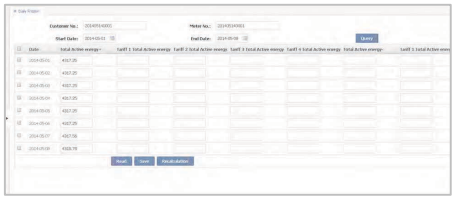
Main Functions

Aggregation

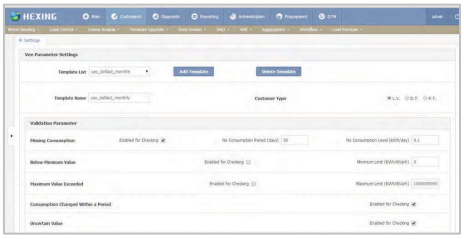
- Support complex aggregation requirements including meter summation and subtraction, making sure not to double-count meters aggregating data;



Aggregation module of Hexing's MDM qualifies and aggregates data which read from meters and possibly are checked by VEE module. Since different types of data are read from meters in different time periods and some portion of data could have overlapping, aggregation module selects most qualified data considering overlapping problems and aggregates them in both through time and device dimentions. Time domain aggregation means converting hourly or daily data to data with any arbitrary time periods (for example load data of each 6 hours). Device domain aggregation means calculating load of transformers, power utilities and customers based on load of meters.

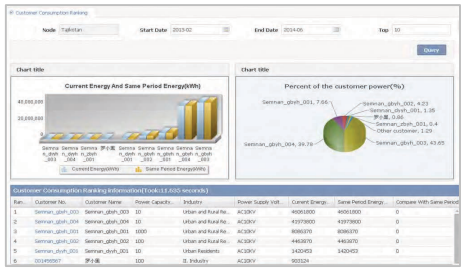


VEE



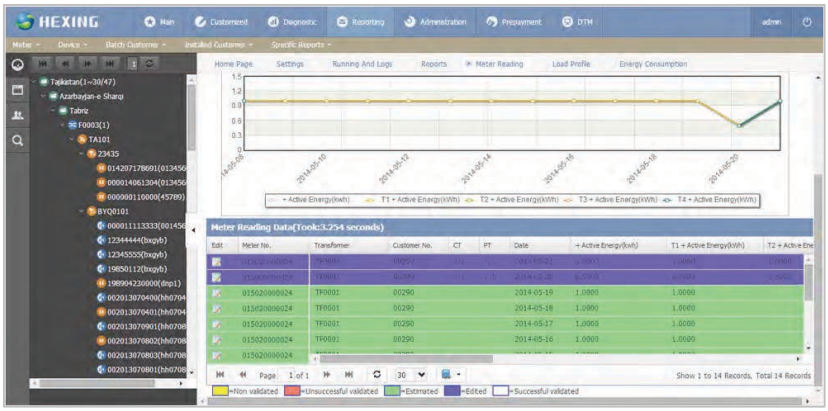
VEE stands for “Validation, Estimation and Editing”. It is a module of Hexing MDM system and is used:

- To check data reads from meters to see if they are correct or not. “Validity check” is sometimes also called “plausibility check”. Validity check is done on energy data. Validity check can be done on newly read data (data read from meters) or on data which is validated before (called re-validation).



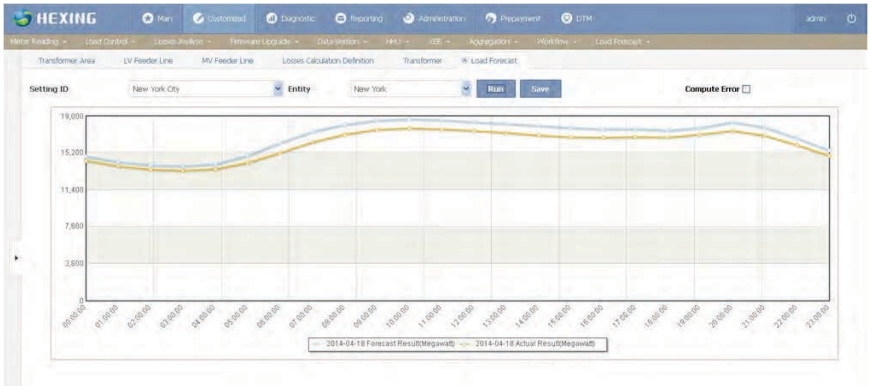
- To estimate missing values. When a meter is read, because of communication or other problems, it is possible that some data be missed. They are called “missing values”. In this case, VEE module can estimate and store missing values.

- To edit load data items which were read from meters. This action can be done directly by user from the user interface.



Short Term Load Forecast

Load forecast helps utilities to do unit commitment for power plants and to prevent under estimating or over estimating consumption of next few days. The applied method is “improved similar days” method that uses historical load data as well as historical and forecasted weather data such as minimum temperature, maximum temperature and weather type. Calendar related subjects like day type of week and holidays are also applied to achieve better accuracy. Convergence of this method is guaranteed in a very short time, so Hexing's load forecast module shows high efficiency with lowest usage of hardware resources.



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