Requirements for the Implementation of an Outage Management System (OMS) Whitepaper

03 January 2006

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1. Introduction

An OMS (Outage Management System) adds value for an electrical distribution utility by tying the utility's customer information to a model of the electrical network, allowing the utility to improve the quality of information given to customers, as well as improving response times by making better use of the outage information provided by customers & other sources, plus improving regulator KPI reporting.

The implementation of an OMS can be complex, as it is often integrated with several other systems and requires good quality data in order to operate correctly.

Utilities customers typically prefer to implement OMS systems in a phased manner, in order to reduce risk and complexity and to start producing business benefits as soon as possible after capital is invested in the system. In order to achieve this the system needs to be 'Best-of-bread', modular and stand-alone.

This document will briefly outline the basic requirements for the implementation of an OMS, and will look at the Data, Integration and Change Management and Training requirements, with prioritisation and phased implementation in mind.

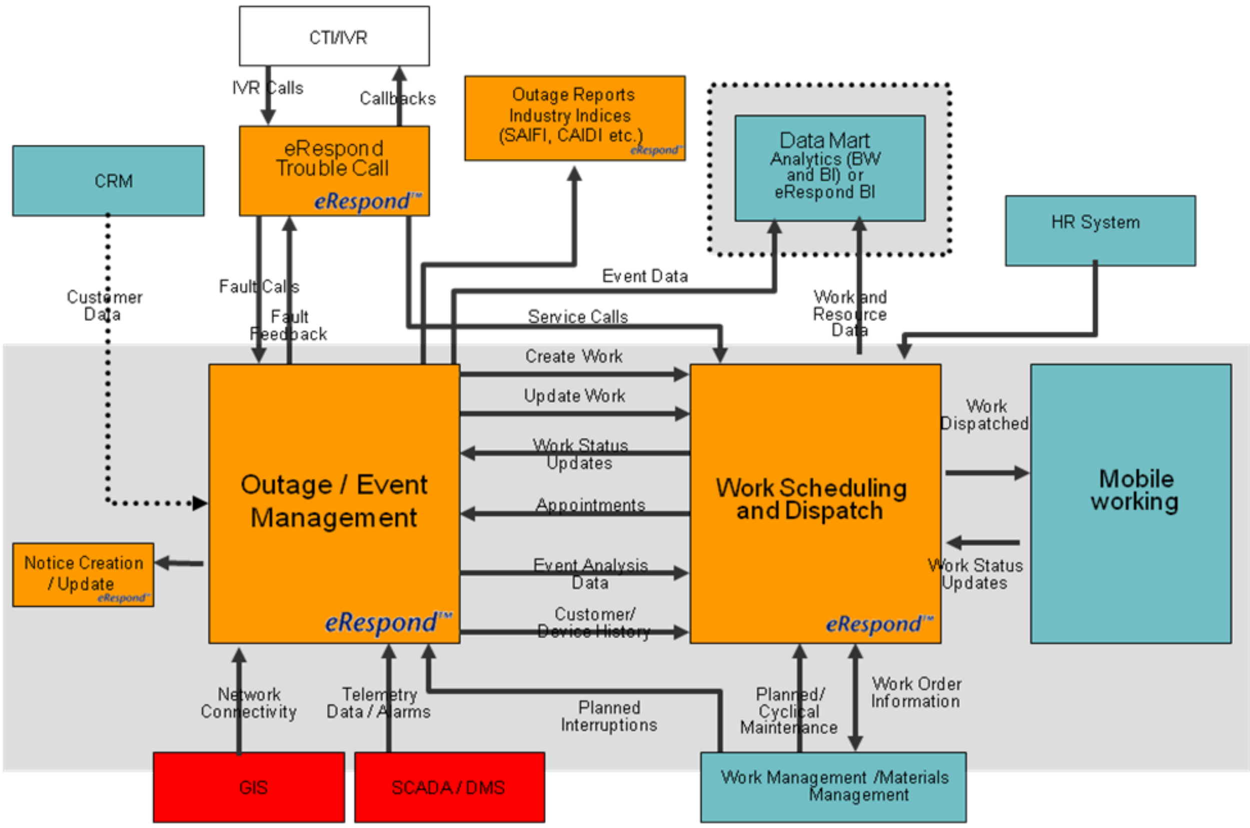
The purpose of this whitepaper is as a guide to utilities preparing to implement an OMS System.

2. Background

This section of the document outlines the importance of an OMS system, how it functions, and most important, it's dependencies on data and other systems.

An OMS system brings together Electrical Network data, HV to LV, and Customer data, from connection point to the network (CPNL – Customer Premise to Network Link), to day to day customer issue logging, in order to provide the utility with information on the present state of the network down to the LV level. With this information the OMS system is able to assist the operator with event management & prioritising plus work dispatching and regulator reporting. An OMS system is the only operational system that is capable of accomplishing this successfully.

In order for the OMS system to do this it needs to draw on data from several other key operational systems.



Best Practice Enterprise Asset Management Landscape

The diagram below indicates the typical interface points for an OMS..

The above diagram shows the perfect scenario where all of the operational systems are in place and contain all of the required data in them. This is never the case in most utilities and therefore a good OMS has to be able to function with minimum data from other systems. The following ranks these interfaces by order of importance:

1. Call Take with IVR (Trouble Calls from Customers)
2. Customer Billing (Customer Information)
3. GIS (Network Data)

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4. Work Management (Work Orders)
5. SCADA (HV Outages & Switching)
6. HR (HR Information)
7. DMS (Switch Planning)
8. Mobile (Work Force Management)
9. AMR (Automatic Meter Faults)

Call Take is the most important interface because it receives information from customers on faults at the LV network. At this level of the network the customers are the eyes and ears of the utilities. Some OMS systems have a call take module, which obviously means that this interface is no longer required.
Billing System, in the case where the OMS has a call take module, is the most important interface because it provides the OMS system with customer data that is required to link the customers to the network and to identify customers when they call in. This interface is the only must have interface to go live with an OMS system that has a call take module.

GIS interface is important to provide network information such as device and device connectivity. This interface is only important if the utility is using the GIS system for network planning, and if the data in the GIS is up to date and accurate. In a lot of utilities this is not the case and they end up building the network model, particularly LV, in the OMS system.

Work Management interface is important to pass work information to and from the WMS, plus to receive planned maintenance work orders which will impact supply to customers.

SCADA & DMS interfaces are important to provide the OMS with HV outage information and switching information which impacts the reporting KPIs in the OMS. In some cases the OMS is capable of recording and performing switching at the MV and LV level.

All other interfaces, although they will improve the accuracy of the data in the OMS, are not as important. It is important to note that a good OMS system, with the ability to handle calls and the ability to build the network model, is capable of functioning with only the customer billing interface. A good OMS system will learn from historical events in order to improve customer and network data.

With the above in mind, the utility is able to decide on a less risky, phased implementation approach that suits it’s current situation.

3. Data Requirements

3.1 Customer Data

Customer data is typically obtained from a billing system, and enables the OMS to identify the correct point of supply when a customer calls in to report an outage or to enquire on the progress of an outage repair. Typical attributes required in customer data are:

- Unique customer identifier (meter, customer or account number)
- Customer name
- Customer address
- Contact details
- Customer type (used for prioritization and reporting)
- Optional geographical co-ordinate for customer premise

The typical sources of this customer data are:

- Billing systems
- Call Centre systems
- GIS (where customer premises are available as a GIS layer)
- Commercial spatial data sets (for obtaining a premise co-ordinate based on a physical address)

3.2 Network Model Data

In order for the OMS to infer relationships between faults, it needs to analyse an electrical network model. The OMS can function with varying degrees of granularity of the network model, but the minimum requirements are:

- Unique device identifier/name
- Device type
- Connectivity (from device, to device)
- Optional geographical co-ordinates for devices
- As a minimum, the network model must contain the MV network from the distribution transformer to the feeder breaker

The typical sources of network data are:

- GIS (either full connectivity or just co-ordinates of devices)
- Drawings – schematic and spatial
- SCADA (HV and in some cases MV network data)

3.3 Customer Premise to Network link Data

CPNL (Consumer Premise to Network Link) is a set of data that links the utilitiy’s customers to the electrical network. This is done by linking a premise to the best known feeding device.

Once the Premise has been linked to a network device, it becomes possible to relate a call from the customer to known incidents on the network, or to infer incidents on the network based on information from customers. This link is also critical in being able to accurately measure the quality of supply delivered to a customer.
The effort to build a CPNL would be:

- General approach: Automated data mining, then manual data cleansing, then manual data collection.
- Effort is dependent on the types of existing data available – quality street mapping and customer address data can simplify CNL exercise significantly.
- Dependent on number of customers.
- Percentage required to go live - +-50%
- CP example – 55% CPNL at go-live, 80% 2 years later
- eRespond aids in the building of CPNL – as outages occur, customers not linked to the network who call to report a power loss are manually linked to an outage by the dispatcher. From this, eRespond stores a set of candidate devices that the customer could be fed from. Every time the customer is involved in an outage, the set of candidate devices is reduced, until the premise is linked to a single feeding device. Note that this approach can continue to improve the resolution down to the LV feeder or link box level.
- +-5% of unlinked premises can be auto-linked per year using the auto CPNL functionality in eRespond.

The typical sources of CPNL data are

- Network data : GIS, SCADA, Drawings – schematic and construction.
- Customer address data : Billing system
- Spatial data : GIS and commercial map data sets, including Surveyor General data.

3.4 Relative effort of data collection

In terms of numbers of records, Customer data and CPNL are much larger data sets than Network data. Due to the fact that the customer data is used for billing purposes, this is usually of a high quality and relatively easy to import.

The CPNL is the largest and most time consuming dataset to capture/generate and verify, and some guidelines of the process were given in 1.3.1 above.

Network data consists of far fewer records, and there are more options to vary the granularity of the model based on the data the customer has available. Due to the fact that network data is used daily for operational purposes, this is usually easily available, though often not as a useable electronic data set. The size of the network data set, especially in urban areas where the number of customers per distribution transformer is large, is usually small enough to make manual capture from paper drawings feasible.

The CPNL data is improved by day to day usage of the OMS. In other words, as faults occur on the network the operator is able to associate customers with faults and thereby improve the accuracy of the CPNL.

4. Integration Requirements

This section examines the common requirements for integration to an OMS, and the business benefits gained from each of these interfaces.

4.1. Key Master Data Interfaces

4.1.1. Customer Data interface

Due to the size of the customer data set, a customer data interface to the billing system is essential in order to maintain the customer data in the OMS without the need for dual entries and the risk of data mismatches.

The customer data interface does not require real-time data exchange, and is usually implemented as a batch interface.

4.1.2. Network Data interface

Due to the sensitivity of the network model data to errors, an interface to a source system for network data is essential in order to maintain the network data in the OMS without the need for dual entries and the risk of data mismatches. The source system is usually a GIS (Geographic Information System), but it could also be a SCADA system, network analysis package or modelling/drawing package.

Where the customer premise and the premise to network connection are modelled in a GIS system, the Network Model interface would also maintain the CNL in the OMS.

The network data interface does not require real-time data exchange, and is usually implemented as a batch interface.

In the case where the network data is not available in the GIS or SCADA system, the network data can be built and kept in the OMS system as the master.

4.2. Real-time interfaces

4.2.1. Work Management interface

One of the key business benefits of using an OMS together with Trouble Call handling is that it becomes possible to group trouble tickets from customers to a root cause workorder, and thus produce accurate costings for all unplanned work. Together with a CMMS package such as Maximo, Ellipse or SAP PM, which already provides all the facilities for tracking planned maintenance, this gives the business a detailed breakdown of all planned and unplanned maintenance costs, referenced to customers and the electrical network.

Typical data exchanged in an OMS/Work Management interface includes:

- Work orders
- Work addresses
- Labour costs
- Failure Causes
- Follow-up work requirements
- Materials information

The OMS/Work Management interface is normally near real-time, in order to allow realtime booking of materials to jobs.

Work Management interfaces are usually simple to implement and maintain as they are less sensitive to data problems caused by mismatches between systems, and there is no dependency between different interface messages or on their sequence.

4.2.2. Mobile Data interface

Significant improvements to response times, labour costs, work hours tracking and customer satisfaction can be obtained by integrating the OMS with a mobile data device for the purposes of job dispatch and job progress feedback.

The mobile data interface will typically exchange the following information:

- Job information
- Crew availability
- Crew location
- Job Progress feedback
- Fault cause feedback

4.2.3. SCADA interface

By receiving a real-time feed from the SCADA system for alarms, trips and switching operations, the OMS can create known events automatically, without the requirement for manual user entries for each known fault. This improves fault analysis and response times, and the accuracy of customer/network KPI's available from the OMS.

The real-time SCADA interface will exchange the following information:

- Alarms and trips
- Switching operations
- Planned switching orders

4.2.4. IVR interface

Customer service can be improved significantly by linking the Call Centre's IVR (Interactive Voice Response) system to the OMS. This provides the ability for customers to report faults, enquire on job progress and be notified pro-actively of known problems, without the need for long waiting times before talking to a Call Centre agent.

4.3. Recommended phased approach

Recommended

- Customer data interface

- Network Data interface
- Work Management interface

These interfaces will deliver all of the immediate benefits of the OMS, without requiring excessive manual data entry to support the system. These interfaces are recommended as the minimum for all OMS implementations.

Optional

- Mobile Data interface
- SCADA Interface
- IVR interface
- HR Interface
- AMR Interface

These are optional interfaces that deliver additional business benefits. As they are normally highly specific to the business processes of each utility, LeT usually recommends that these are considered during a second phase, once users have a thorough understanding of the Outage Management and other related processes.

5. Change Management and Training Requirements

The implementation of an OMS impacts several business processes and departments, and for the implementation to be successful, it is critical that all users of the system are thoroughly trained and that all the people involved in the business processes have a thorough knowledge of their roles and responsibilities in the processes. LeT Systems recommends a thorough change management and training program including:

- Project team selection
- As-is business process analysis
- To-be business process design
- Ongoing project communications
- System user and IT support skills assessment
- Data and system support training
- User training
- Process training
- Post go-live support and assessments

The people most affected by an OMS system implementation are:

- Call Take Agents,
- Dispatchers,
- System Control and
- Field Resources.

Involving a representative from each of these departments in the implementation project, to later become super users of the system, is critical to ensuring a successful implementation. Furthermore, communicating to all of the members of these departments throughout the critical stages/milestones of the project will facilitate acceptance of the system once it goes live.

6. Conclusions

In conclusion, the implementation of an OMS consists of the following activities: Data Capture and Migration, Integration, Training and Change Management. Integration can be phased in order to reduce the complexity of the initial implementation, but a thorough Data Migration strategy, Training and Change Management strategy are essential for a successful implementation.

Any consultant appointed to advice a utility on how to go about a OMS system implementation should understand the data and interface requirements of an OMS system, have a thorough understanding of the other critical operational systems such as, Customer Billing, GIS, SCADA, WM, etc, and an understanding of the operational business processes best practices for the Electricity Distribution Industry.