Integrated Outage Management: Leveraging Utility System Assets Including GIS and AMR for Optimum Outage Response

Utilities today are adopting improved metrics for measuring network reliability that can best be achieved by integrating their outage management systems with other system assets

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It was not that long ago that utility companies' outage management systems consisted of a call center, trouble ticket system and radio dispatcher, all working in harmony to summon a trouble crew and restore service for the occasional "no light" service call. This system actually worked quite well in an era when computers didn't dominate our society, manufacturing processes were far less sophisticated and the public was in general much more tolerant of occasional power outages. In those days, customers were more forgiving of their dependable home town utilities, in part because there was less dependence on electric service in the workplace and less reliance on the comforts and convenience of electric appliances in the home.

In today's world, however, demands for reliable electric service have grown to the point where a utility's primary goal is providing improved network reliability as measured through optimization of power delivery performance and reductions in the frequency and length of customer outages. This point was dramatically driven home recently, when a series of unexpected network transients and outages contributed to the August 14, 2003 blackout which placed a significant portion of the Northeastern U.S. and Canada into extended darkness.

While the key reliability measures are quite easy to monitor, identifying and implementing utility outage response process improvements is much more difficult to achieve. As utilities install outage management systems designed to improve performance in these areas, it has become increasingly apparent that stand alone outage systems cannot produce the more demanding results expected from top management and an increasingly more sophisticated customer base.

Organizational Changes Reflect Increased Public Scrutiny

Under the ever brightening light of increased public awareness including the growing dissatisfaction with "clock blinking" and other annoying symptoms of interrupted service, many utilities have begun taking some initial steps to address the problem, such as migrating to process based organizations that are better able to focus on the system oriented characteristics of outage analysis and response. Improving network reliability encompasses a significant number of variables that many believe are best addressed by adopting a system vs. departmental focus. While the key reliability metrics are easy to identify, relevant process inputs are less certain and may actually come from other processes located outside the outage management process organization.

A process based organization, for example, may have adopted an Enterprise Asset Management model as its corporate business strategy to manage overall utility assets and improve return on investment. The company's AM/FM/GIS systems, with their work management, supply chain and mapping capabilities, will typically fall under the EAM umbrella. Yet, the locational information of corporate assets provided via GIS can also make a valuable contribution to system reliability. Similarly, a utility's advanced metering (AMR) systems are typically found within its revenue cycle services business process. While traditionally held to be the utility's "cash register" with a primary purpose to support customer billing, many meter devices utilized in automated meter reading systems are also capable of providing outage alarms at the initial stage of a power outage. Frequently, these meters will eventually provide service restoration notification, which can be an invaluable benefit to system operators attempting to confirm that power has been restored without resorting to labor intensive site visits or customer callbacks.
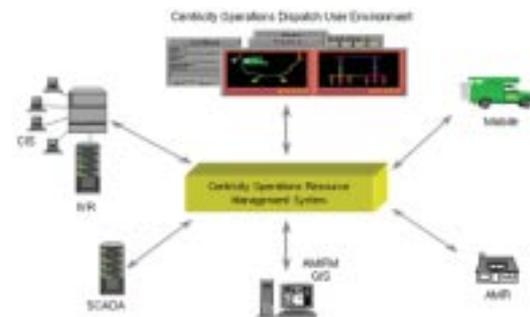
Courtesey: CES International

Leveraging Multiple System Inputs

Together, a utility company's mapping and AMR systems can provide the additional customer status and locational information necessary to advance outage management capability beyond the standard system inputs of SCADA systems and call center telephone activity. While these traditional methods of obtaining outage information are certainly valuable, they cannot provide sufficient granularity or the geographic visibility necessary to deploy work crews in the most efficient manner. The addition of real time outage information originating from the customer's location can provide the missing ingredient for efficient outage response, particularly during the occurrence of major outage events when outage management systems are needed the most.

Of course, the downside of providing this additional data is that a sophisticated system is needed to manage the large amount of information generated from so many diverse sources. A well designed, fully functioning interactive outage management system will provide several operational layers that perform essential tasks related to outage detection, analysis, diagnosis and restoration. Sophisticated knowledge based outage systems are capable of identifying the various types of inputs, evaluating them by reconciling

Schlumberger/CellNet MicroCell Controller

the divergent system, subsystem and endpoint sources, diagnosing the most likely causes(s) and current status, and then transferring this knowledge in a manner that efficiently utilizes the utility's available restoration resources. Outage management systems are all about the efficient transfer of actionable information concerning changing network status from a wide range of data inputs.

The ultimate focus of this process is of course the customer who, in addition to wanting power restored immediately, must be constantly updated with system status. "When will my power be restored" is the customer mantra most often heard by call center personnel during storm conditions. Intelligent analysis of meter data including integration of meter status with other sources of outage information, when augmented with field and system supplied restoration progress, can bring about the improved restoration diagnosis and prediction capabilities that enhance customer images of utility efficiency and dependability and improve customer satisfaction.

Vendors Are Getting the Message

Outage management system suppliers are beginning to recognize this need and are responding with newly developed or acquired integrated solutions. General Electric, for example, has formed GE Network Solutions and has augmented its Smallworld Design Manager GIS system with its PowerOn software used for monitoring network status and providing remote workforce dispatch. Together, these applications can provide a holistic approach to network design, infrastructure location and efficient workforce management that should significantly improve outage response time. à

Similarly, Intergraph has announced the availability of its InService outage management system, which should function closely with its FRAMME geospatial mapping software. The ability to support outage reporting and analysis functions through use of geospatial information, and then integrate them with workforce management should provide a powerful integrated platform for effective and more timely outage response. Detroit Edison has implemented Intergraph's InService solution and also hopes to use the system data generated for network preventative maintenance to improve overall system reliability.

By some accounts, CES International has also achieved significant success in penetrating the outage management system market, with its Centricity software solution gaining increased acceptance among utilities installing outage systems. The Centricity product suite is designed to integrate a variety of distributed information based systems, such as SCADA, AMR, GIS, workforce management and CIS, and its ability to support outage event tracking for future network analysis and reporting purposes should provide added utility benefits.

This year, Baltimore Gas & Electric was added to the list of Centricity users who hope to reduce outage restoration time and improve customer satisfaction, particularly during large storm events, by making effective use of its system status monitoring and predictive capabilities. CES's Operations Resource Management System was created to handle a complex array of system inputs from a utility's enterprise applications, and to efficiently process this data to optimize outage response. "Centricity is a powerful, integrated outage management solution with real time information management capabilities that set it apart from other systems", claims Don McDonnell, Chief Marketing Officer for CES International. "The Baltimore Gas & Electric implementation again demonstrates the value that utilities place on having accurate real time outage information for predicting restoration time and providing efficient workforce response."

Increasing Value of AMR

Perhaps no utility application possesses as much upside potential for improving outage response time as automated meter reading (AMR). For utilities fortunate enough to have a fixed network AMR system, the benefits of near real time communication of meter originated outage alarms can be significant, and could eventually dwarf the value of call center notification as the primary method of customer initiated outage reporting. The automatic notification capabilities inherent in many network AMR systems can greatly accelerate the customer notification process that, even with the advent of sophisticated IVR systems, often experience significant delays during periods of heavy call volume.

PECO Energy has begun experimenting with use of their Schlumberger CellNet AMR system for outage detection purposes, for example. Hurricane Isabel recently provided them with a significant storm-related opportunity to pilot their new outage notification capabilities, and information provided from this study has demonstrated that use of network AMR data can be especially helpful to PECO in responding to storm-related events when efficient workforce management is of utmost importance.

At Indianapolis Power & Light, The Schlumberger CellNet AMR system is already being used to augment their M3I outage system by processing incoming alarms initiated at the meter level for nearly 470,000 customers covered under their AMR fixed network. In addition to CellNet's Power Outage Application (POA) functionality that delivers timely meter initiated outage information to IPL's Operations Center, the network's Real Time Verification (RVA) application provides additional positive verification that power has been restored. Barry Feldman, IPL's Director of Distribution Operations, is pleased with the results so far. "We have just begun to tap the potential of AMR for expedited notification of customer service interruptions", claims Barry. "Clearly, the benefit of having near real time notification of power outages is huge when one considers the dramatic future impact meter outage alarms should have in shortening service restoration times."

As utilities continue to develop their AMR deployment strategies and prepare detailed business cases, it is appropriate to include outage detection as a key benefit of AMR. While admittedly the dollar saving benefits can be difficult to quantify, the overall contributions of AMR can be significant if a fixed network solution is implemented, both in terms of reducing outage related lost revenue and in improving customer satisfaction by shortening outage times. And the resulting improvements in CAIDI and SAIFI statistics, key metrics for measuring outage management performance, are the icing on the cake for operations managers striving to improve system performance.

Outage Management- The Ultimate Human-Machine Interface

Reorganizing the utility to better manage complicated processes such as outage management can be a good first step towards the goal of obtaining improved outage system performance, if an effective cross functional organization is created and the business processes and metrics are fully understood. No other system contains such a complicated mixture of human and equipment interfaces, that must function seamlessly at low levels (routine no light calls) while also being able to scale rapidly and efficiently to quickly redeploy utility assets in the event of storm conditions.

Successful outage management systems must be able to receive and manage large amounts of incoming data from multiple data sources, and then to translate this data into actionable work

Interactive Outage Management System with Multiple System Interfaces
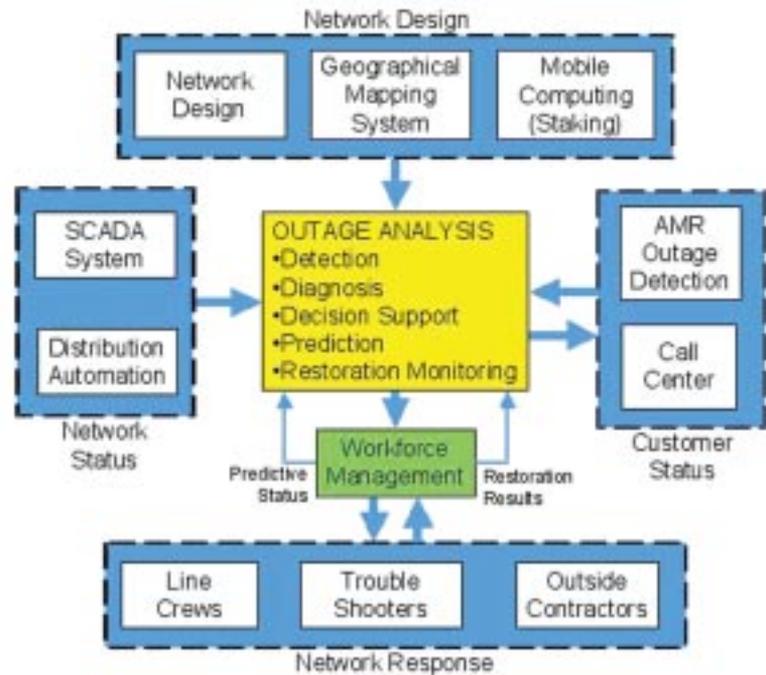
order information that is received at the front line by work crews, troubleshooters, line engineers and even outside contractors who are occasionally called on to provide additional support during periods of severe weather conditions. The results of their efforts must then be accurately reported back to the system operator to adjust and reschedule remaining work, and then to update the public on the changing status of utility restoration efforts. The ability to successfully manage many utility system inputs coming from other systems such as SCADA, GIS and AMR will ultimately determine the overall effectiveness of this virtual human-machine interface, and define its ability to produce the necessary outage management improvements required by company management.

Conclusion

As utilities come under increasing pressure to improve their outage response capabilities, it has become increasingly apparent that traditional stand alone methods of outage response will not get the job done. Organizational changes undertaken by some utilities are already beginning to reflect the commitment of top management to make significant improvements in this area, and sophisticated new interactive systems are being implemented to facilitate these improvements while at the same time protecting other key corporate financial metrics such as profitability and earnings per share.

The real way to accomplish these seemingly conflicting goals is, of course, through improvements in productivity. Optimization of utility assets and improvements in labor productivity can together bring about desired outage management performance gains without affecting performance in other areas if they are leveraged successfully and organized in a manner that produces synergies for the entire corporation. It is only in this manner that an optimum solution for outage response can be found that meets the high expectations of top management and satisfies the growing interests of state regulatory commissions reacting to increasing customer concerns. ◆

ABOUT THE AUTHOR

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