

# Simplifying M2M Communications Within Your Network...And Beyond

Machine-to-machine (M2M) communications are critical to the success of service providers and tower operators worldwide. When managing thousands of sites, real-time access to data within your network must be fast, easy, and reliable.

As wireless networks continue to grow rapidly, new challenges are arising. The core network has always had network management systems to monitor, troubleshoot, and correct problems with it. Service providers and tower operators must now extend those capabilities to all cell sites (new and existing) to manage the growing number of sites efficiently and securely. With the rapid increase in M2M networks and communications to personal devices used for work, the focus has shifted to "Intelligent Site Management".

As M2M network complexity continues to grow and expand, cell sites become larger capital investments than in the past. Moving these sites forward now requires intelligent management to reduce the number of physical visits for troubleshooting and maintenance.

To understand the complexity being faced when managing remote sites, it is important to understand what actually makes up the site itself. There are four major areas required for a fully functional cell site: the power infrastructure, environmental conditions, security/access, and network communications/traffic bearing electronics. A comprehensive M2M solution requires all four areas to be integrated and automated with intelligence to understand each in detail and their interdependencies.

Figure 1 displays some of the critical M2M components at a cell site that must be monitored and managed. While each site has its own "intelligence", it is important that all sites be managed and controlled remotely, from a common management platform that is integrated into the existing operations and other Operational Support Systems such as trouble ticketing, network management, and workforce management.

As shown in Figure 1, security at a site must encompass the entire site being secured and remotely monitored, managed, and in many cases, even controlled. A complete security solution must start with access control for the site including the ability for a user to remotely open and close the gate. Access control is imperative to ensure only authorized people enter the site and have access to the equipment and related infrastructure. For example, if the access control system is not leveraging an intelligent card system, one can still manage access with key locks.

Security management should include motion detection and video surveillance which is strongly recommended for high crime areas. Motion alarms can be automatically generated and video surveillance can be stored. This combination provides immediate notification of potential problems and a view into the cell site which can be used for troubleshooting and even providing authorities additional information for potential prosecution.

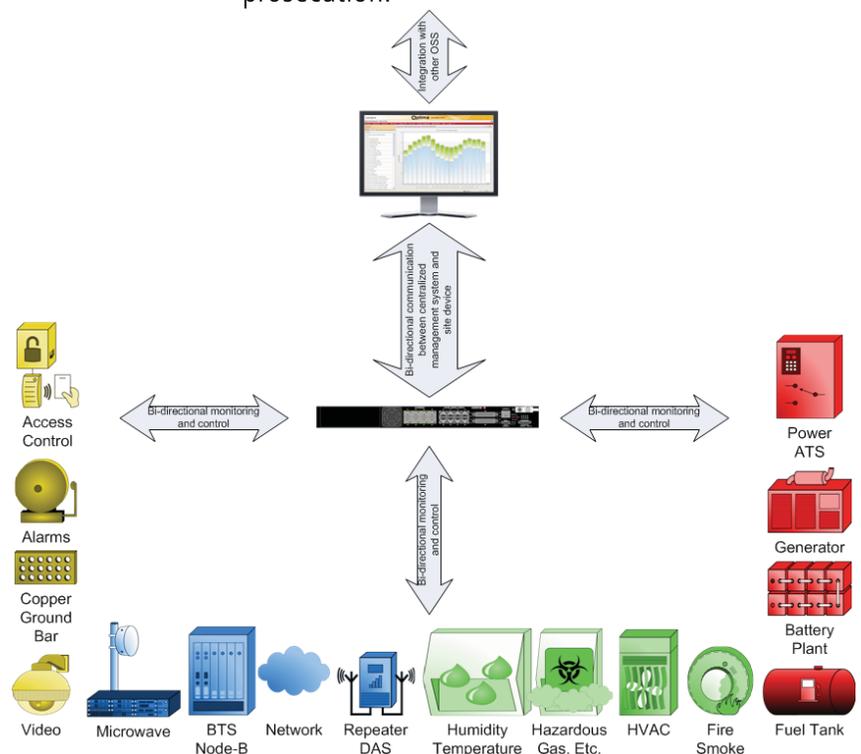


Figure 1: cell site components that must be intelligently monitored and managed

The actual traffic bearing electronics must be monitored. While this equipment tends to already be monitored, the integration of this data is critical to understanding the entire site and its health at any given time. For example, understanding authorized site access can help the Network Operations Centre to understand when a site's equipment may need to be down for repair or maintenance and when that visit has started and completed.

The environmental conditions at a cell site are integral in the performance of the traffic bearing electronics. Temperature at a cell site is important for determining a number of critical items and can result in damaged equipment, burned out boards, and more. Temperature can determine when the battery plant can be used. The site temperature can also have a very direct impact on monitoring fuel levels. For example, a fuel tank in direct sunlight will experience expansion and contraction which can significantly influence the fuel level readings. If the temperature and environmental impact are not understood in an intelligent way, the fuel levels will be inaccurate and will seem to indicate problems that do not actually exist.

Humidity can have the same impact but often has a more direct adverse physical effect on equipment where it can cause damage and equipment failures. High humidity conditions can impact network throughput and availability.

Monitoring the HVAC is critical. A complete cell site management solution will control the HVAC system(s), moving them into automated two stage cooling and leveraging economizers when they are available. This not only helps to improve the site conditions but can also reduce energy consumption at the site. This is important because in many cases, the HVAC can account for up to 48% of the total site operating costs.

Hazardous conditions must also be monitored, including fire, smoke, water intrusion, potentially hazardous gas and more. Not only is monitoring for these conditions important, the integration to other systems and personnel is critical for the service provider to avoid network downtime and damages. For example, fire and smoke detection should alert the provider/operator and automatically notify the nearest fire department for immediate dispatch.

Power is the final component of a complete M2M site management solution that is critical and must be viewed, monitored, and managed with a holistic approach encapsulating the entire infrastructure. As shown in Figure 2, the detailed power infrastructure is the most complex aspect of the total site. In addition to monitoring power, the infrastructure must also be controlled to gain efficiencies and limit the number of physical site visits required.

Power management reduces the need for physical site visits and becomes a key solution in meeting compliance initiatives and avoiding costly fines. The ability to monitor, manage, and control the power infrastructure at a cell site enables an automated solution that reduces operational costs significantly. For example, sites that are running without commercial power will often cost the service provider up to \$75,000 USD per year in fuel alone, and that does not include the cost for fuel theft.

Generators are the primary backup solution for failed commercial power to critical sites, and in emerging markets, they are often the primary source of site power. By monitoring the generator, a service provider can remotely understand the generator's performance, health, maintenance needs, lifespan, etc. Using remote and automated control, the generator can be exercised remotely for maintenance or test purposes and be cycled on and off as needed.

Fuel is one of the most common areas for theft, so fuel levels must be monitored intelligently. When the typical generator consumption rate is greater than its baseline, the solution must immediately send an automated alarm to the relevant personnel. Greater consumption usually indicates siphoning of fuel which is a very common problem. The theft could be just five to ten gallons or a full truckload. Similarly, personnel must be automatically notified when a site is being refueled and on how much fuel was delivered. The amount can be compared with the

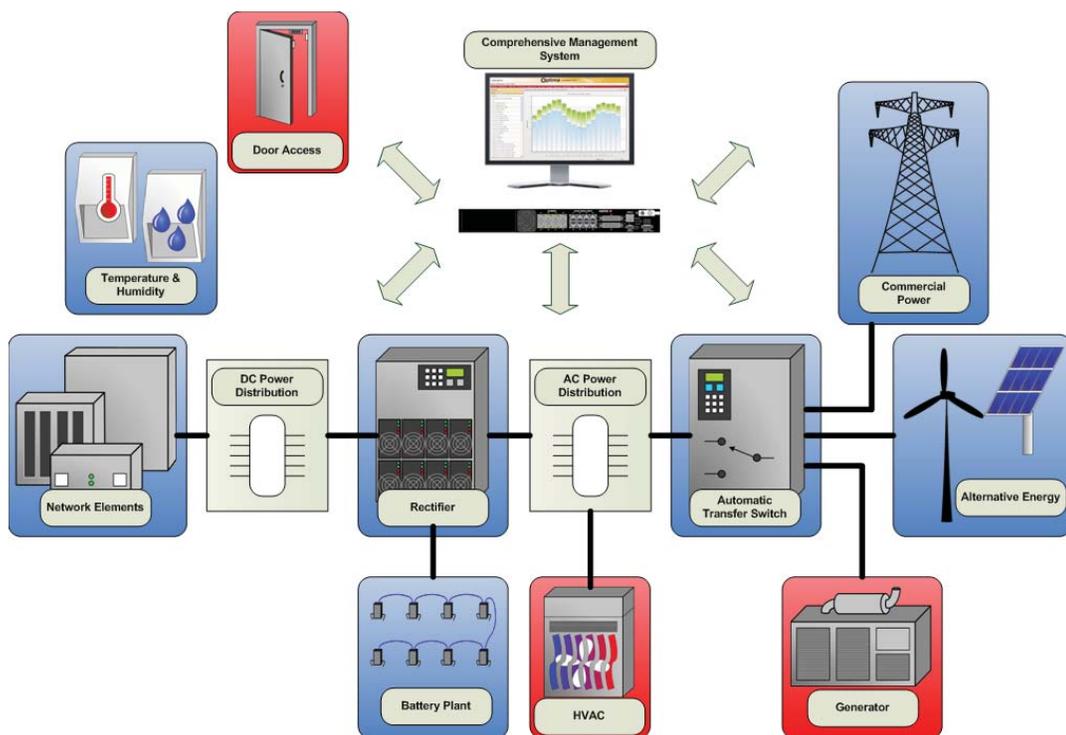


Figure 2: the power management landscape

fuel invoice to ensure the proper amount has been billed (a common area for discrepancies). A complete intelligent site management solution will even have the ability to monitor the fuel for water intrusion which can occur when a refueling truck decides to reduce their diesel costs by adding water to the fuel – saving the fuel company but drastically affecting the service provider or tower operator.

A hybrid power management solution at cell sites will make 'intelligent' decisions in situations where commercial power has failed, is unreliable, or does not exist. Traditional solutions momentarily revert to discharging site batteries when a commercial power outage occurs. Subsequently, an Automatic Transfer Switch engages and the generator is started. However, an intelligent hybrid solution continues to discharge the batteries until voltage levels reach a configured end-of-discharge limit. When the limit is reached, the generator starts and will continue to run until the batteries have been recharged and the generator may again be cycled off. The application's intelligent logic

optimizes generator run time, but it also provides significant operational and maintenance savings.

Combining the monitoring and management of the entire M2M infrastructure at cell sites provides a complete solution for service providers and tower operators to remotely and automatically manage the most critical part of their network: the sites. While understanding just one aspect is beneficial, the combined benefits are significantly greater. Being able to manage everything from a central and remotely accessible platform reduces troubleshooting time, removes false dispatches, and reduces maintenance visits.

With the rapid development and growth in emerging markets, environmental conditions, and the increasing demands to improve operational efficiency, taking a comprehensive approach to managing M2M networks remotely and the ability to incorporate automated functionality will improve network availability and reduce costs, ultimately improving customer satisfaction and enhancing their position in the market.

For decades, Kentrox has been connecting machines to ensure site availability, security, environmental conditions, and quality of networks and equipment. Obtaining real-time site data and providing it in an easy-to-understand format enables service providers to intelligently monitor, manage, and control these often remote sites. This improves network quality and availability, reduces truck rolls, and allows easy control of assets while minimizing operating and capital costs.

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