GE
Digital Energy

MDS™ Orbit Platform

Converged Communications for Hybrid Networks

Today's environment requires that utilities develop comprehensive communication networks to meet demanding and evolving user, geographic and regulatory requirements. This ever-changing landscape often forces utilities to work with a variety of technologies to reach their infrastructure assets. Multiple communication platforms and suppliers are usually needed to obtain adequate coverage for the broad range of application requirements.

GE has addressed this challenge with the MDS Orbit platform. This next generation wireless communications solution integrates a range of technologies, from cellular to private, and licensed to unlicensed, supporting customers' needs for secure private, public and hybrid communications networks.

The MDS Orbit platform provides a comprehensive security framework to support three unique facets of enterprise requirements: device, user and network security. Meeting the needs for functional and application flexibility and ease of use, the MDS Orbit platform of products offers multiple interface options in a compact robust package which adapts freely to indoor and outdoor environments.

Key Benefits

- Comprehensive security enables customers to meet their current and future requirements
- Networking capabilities extend and simplify the communications infrastructure
- Consistent packaging and configuration streamlines engineering, operations, supply chain and support

Applications

Distribution Substation Communications

- Protection and control
- Automation, monitoring, diagnostics and field workforce information delivery
- Video monitoring and VoIP/IP of substations and remote assets for physical security

Distribution Automation

- Fault Location, Isolation and Service Restoration (FLISR) communications
- Distribution asset monitoring of key assets including transformer regulators, capacitor controllers and primary transformers
- Distributed generation integration and enablement

Advanced Metering Infrastructure (AMI)

- Stranded meters from mesh network
- AMI communication backhaul via Cellular (4G/3G)
- AMI communication backhaul via unlicensed 900 MHz

imagination at work

Comprehensive Security

- Security capabilities include firewall, IPsec VPN, and certificate management
- Secure boot cryptographic signature of firmware to prevent compromising the device
- X.509 digital certificate management to simplify provisioning and lifecycle management
- Integration with enterprise security systems (RADIUS, AAA, SCEP, and Syslog)

Advanced System Performance

- Deterministic application performance enabled through advanced Quality of Service (QoS)
- Hardware accelerated switching and high performance processors minimize latency
- Designed for harsh, rugged environments
- Electro static discharge (ESD) protection
- Extended temperature range (-40°C to + 70°C)
- IEEE® 1613, and Class 1/Div 2 conformance

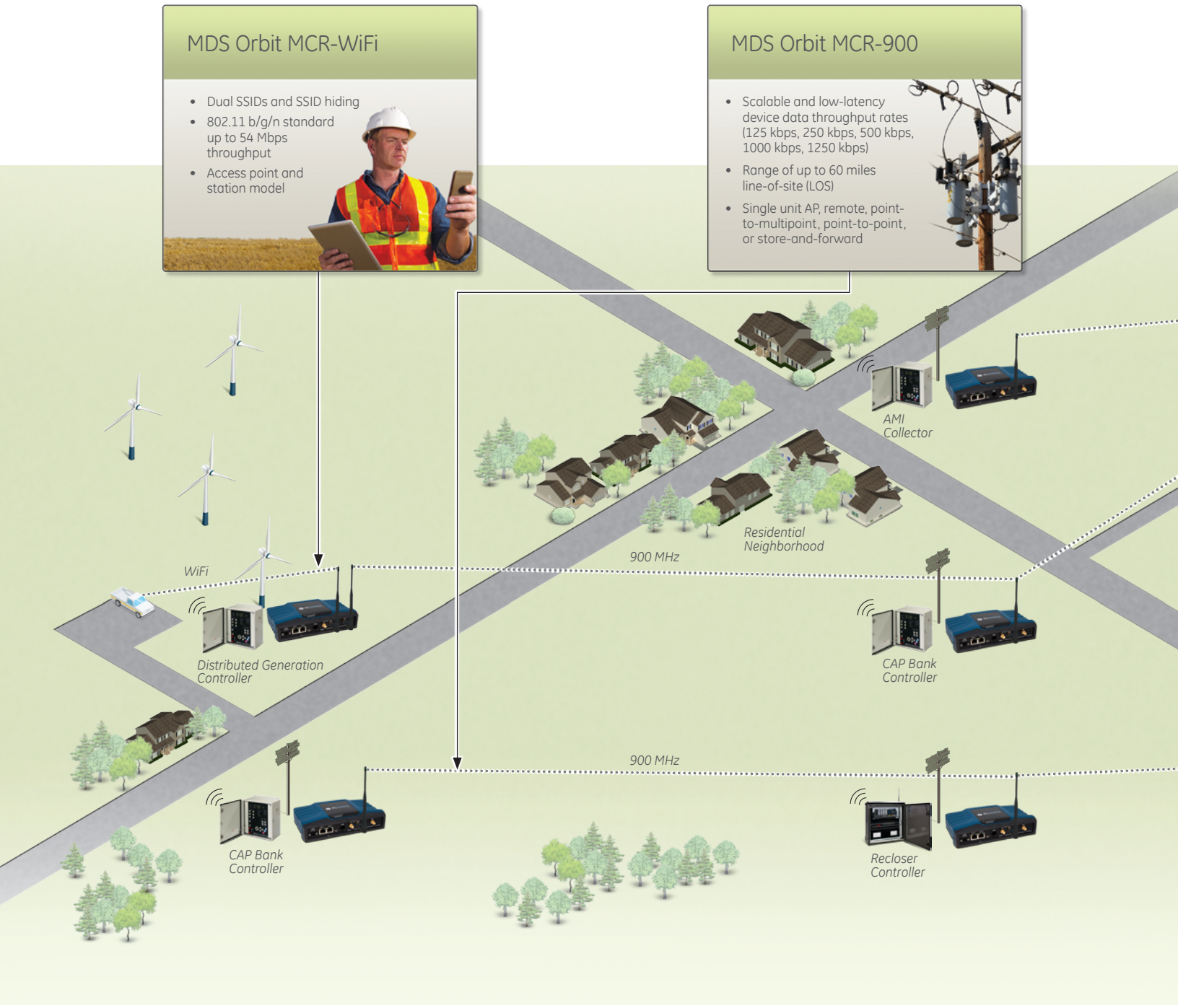
Ease of Use & Integration

- Interface options for application flexibility including 10/100 Ethernet and RS232/485 serial ports
- Easy to use interface reduces complexity of provisioning, maintenance, training, support
- Wide input voltage at 10-60 V DC offers flexibility in power distribution
- Command Line Interface (CLI) programming for advanced provisioning and operation
- USB console provides local, secure single point connection for device provisioning, configuration management and status monitoring

MDS Orbit Platform Overview

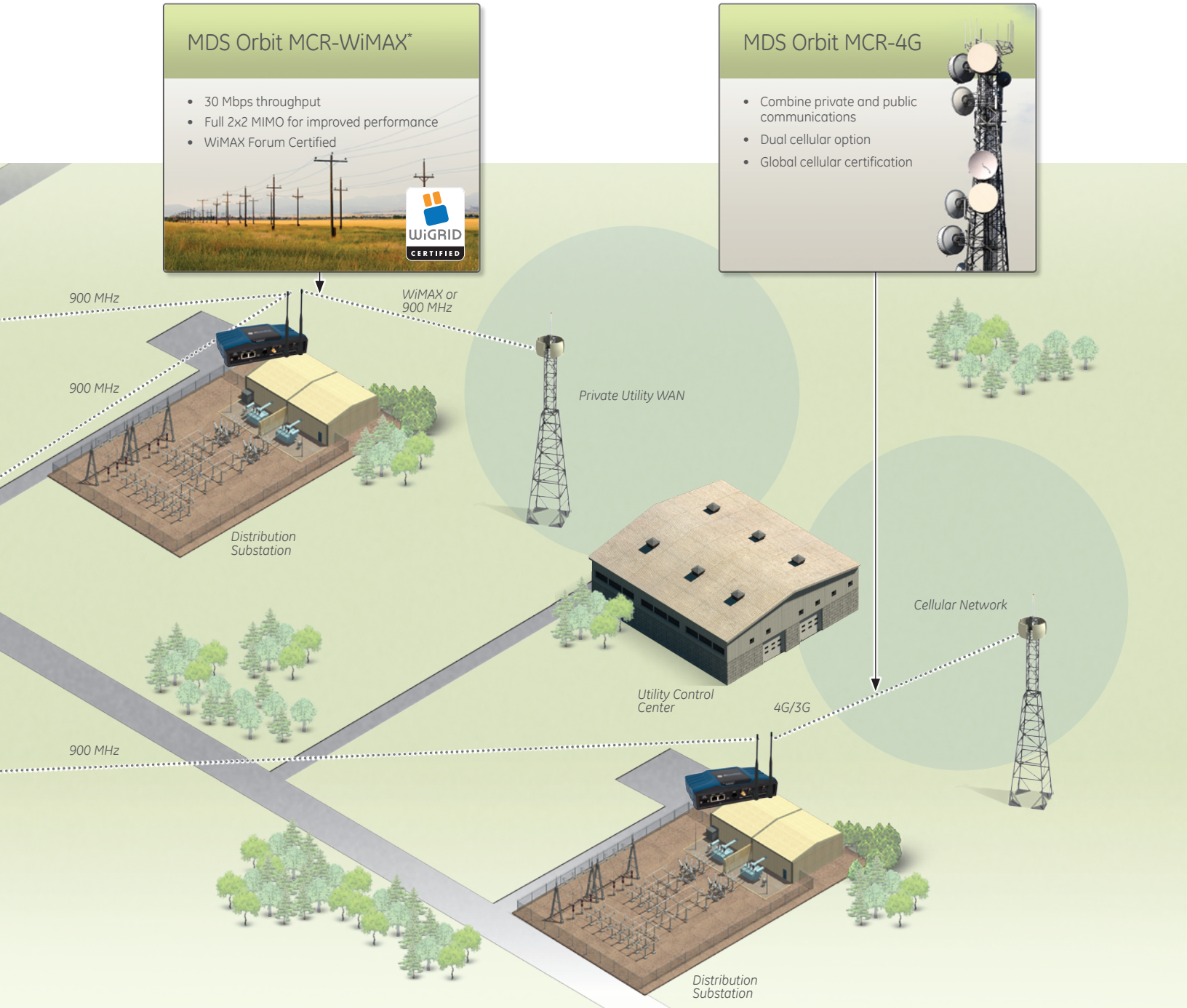
Today, utilities install and manage communication networks that are purpose-built for each application due to networking technology limitations. With the MDS Orbit platform of products and software, utilities now have the opportunity to capitalize on uniform security to converge disparate applications within one network and reduce personnel training time. The platform uses a three tiered approach to security, covering the user, device and network. Disparate applications are easily managed across the platform through its ability to converge public, private and hybrid communication networks. Personnel need to learn only the Orbit device manager to configure and manage any of the networking technologies available on the Orbit platform. Wizards assist deployment to easily configure the most common applications of the product and online learning is available for 24 hour support.

MDS Orbit - Driving Communication Possibilities



MDS Orbit Application Example

As seen in the application example below, MDS Orbit is a highly versatile industrial wireless platform that empowers utilities to converge all of their distribution automation applications over a single platform and single network with multiple wireless access technologies depending on terrain, customer concentrations and economy. The unlicensed 900 MHz MDS Orbit MCR-900 can be used in situations where assets are extended over large distances and terrains. The frequency hopping and spread spectrum technologies of the MDS Orbit MCR-900 radio enable it to overcome interference. In settings where assets are more concentrated such as in urban or suburban, or for assets that require higher bandwidths, the WiMAX version can be deployed. In settings where cellular access is available and economical, the MDS Orbit MCR with cellular may be used.

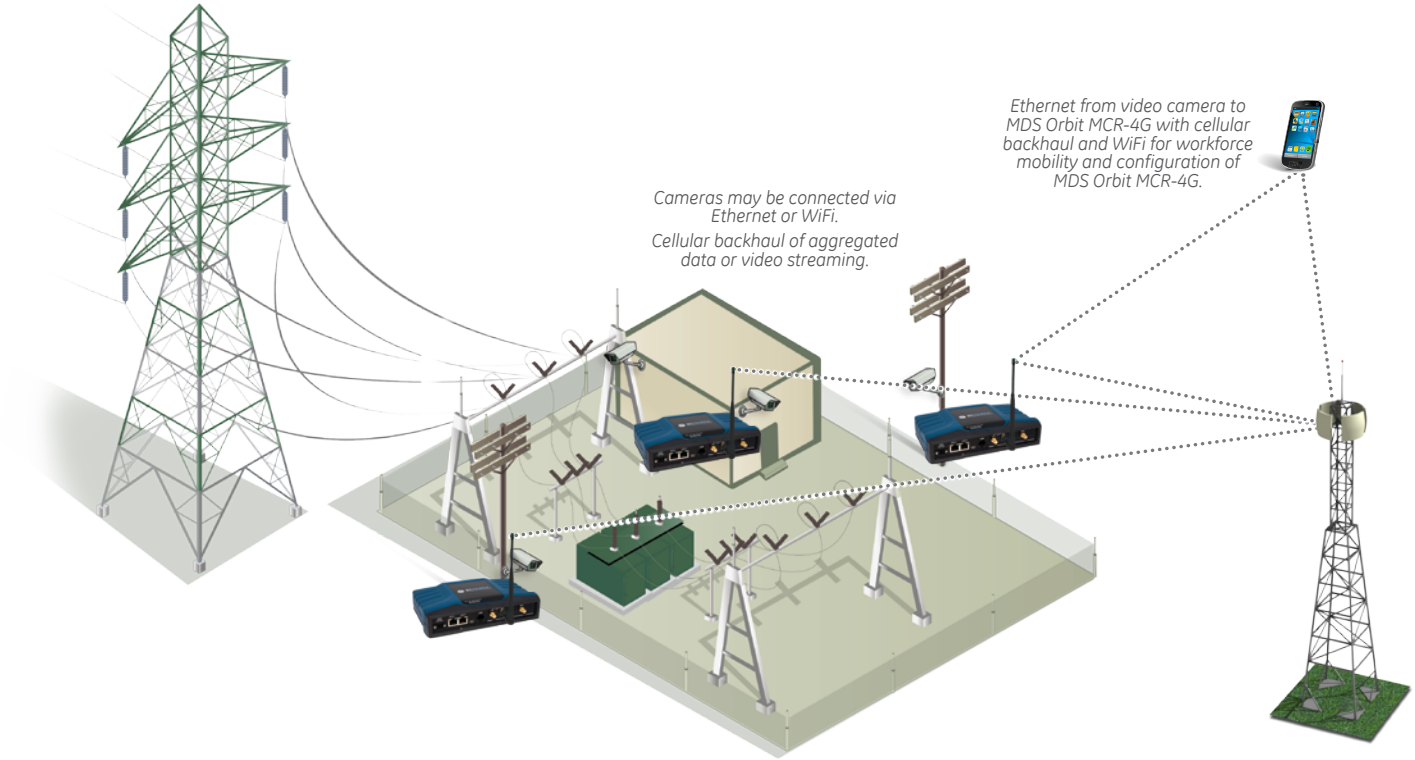


* MDS Orbit MCR-WiMAX will be available in late 2014.

Substation Communications: 3G/4G Cellular Solution

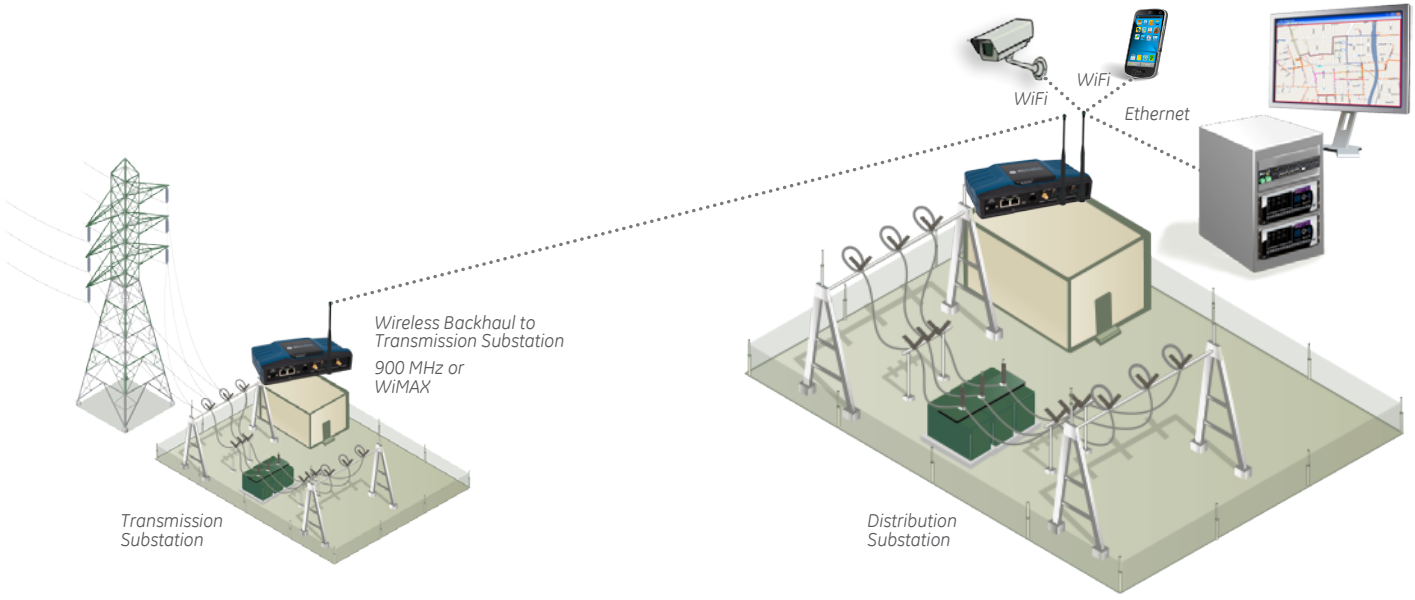
Utilities have distribution substations in remote areas of their franchise territory. Cellular coverage is often available at remote substations that may be outside of the utility's established private network.

These substations benefit from video surveillance to monitor for theft and equipment failure. Within the substation, the MDS Orbit MCR-WiFi stations communicate with the surveillance cameras and the MDS Orbit MCR-WiFi access point. The MDS Orbit MCR-4G with WiFi provides the aggregated data back to the control center over the cellular network.



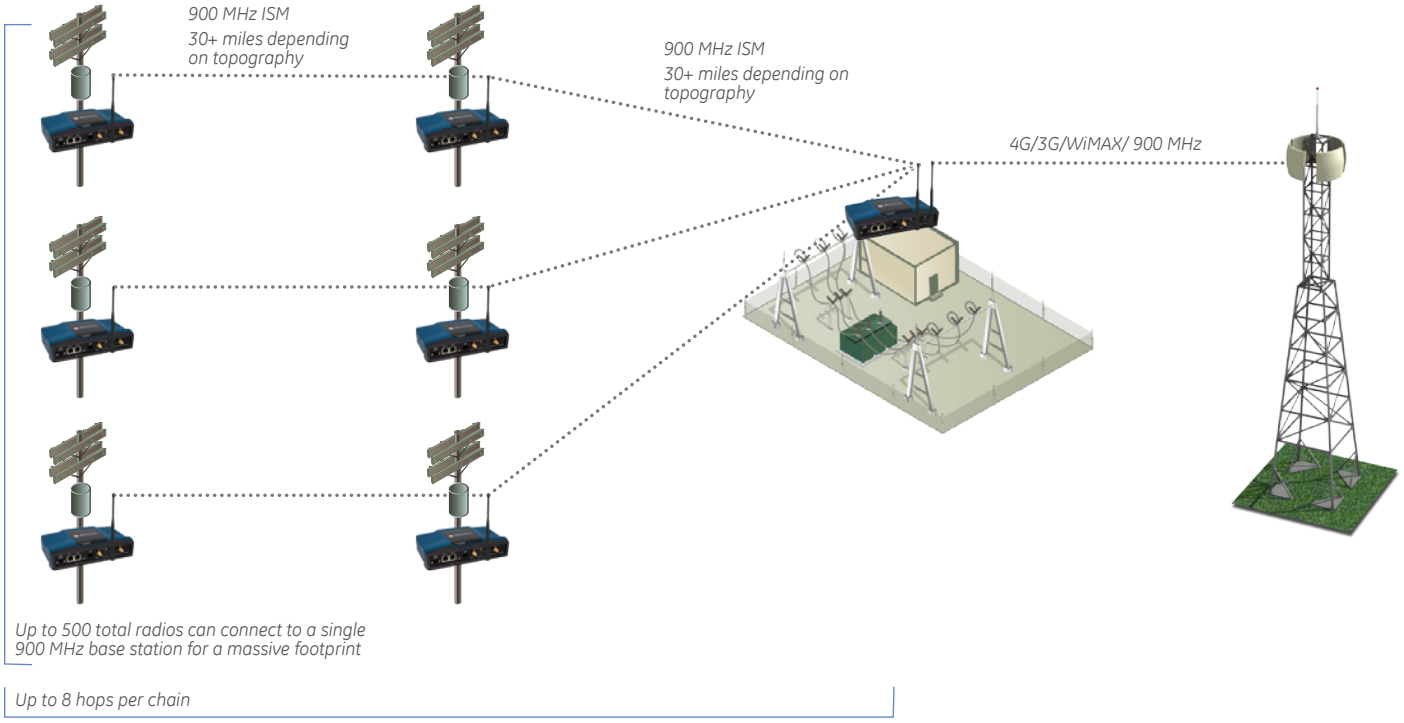
Substation Communications: Private 900 MHz or WiMAX Solution

The application shows an MDS Orbit with private communications and WiFi, addressing disparate applications within the substation. VoIP, SCADA and relay switching data may be connected through Ethernet via a switch. The MDS Orbit also provides WiFi connectivity within the substation. The MDS Orbit aggregates and backhauls the data to a transmission station either through a private WiMAX or unlicensed 900 MHz network.



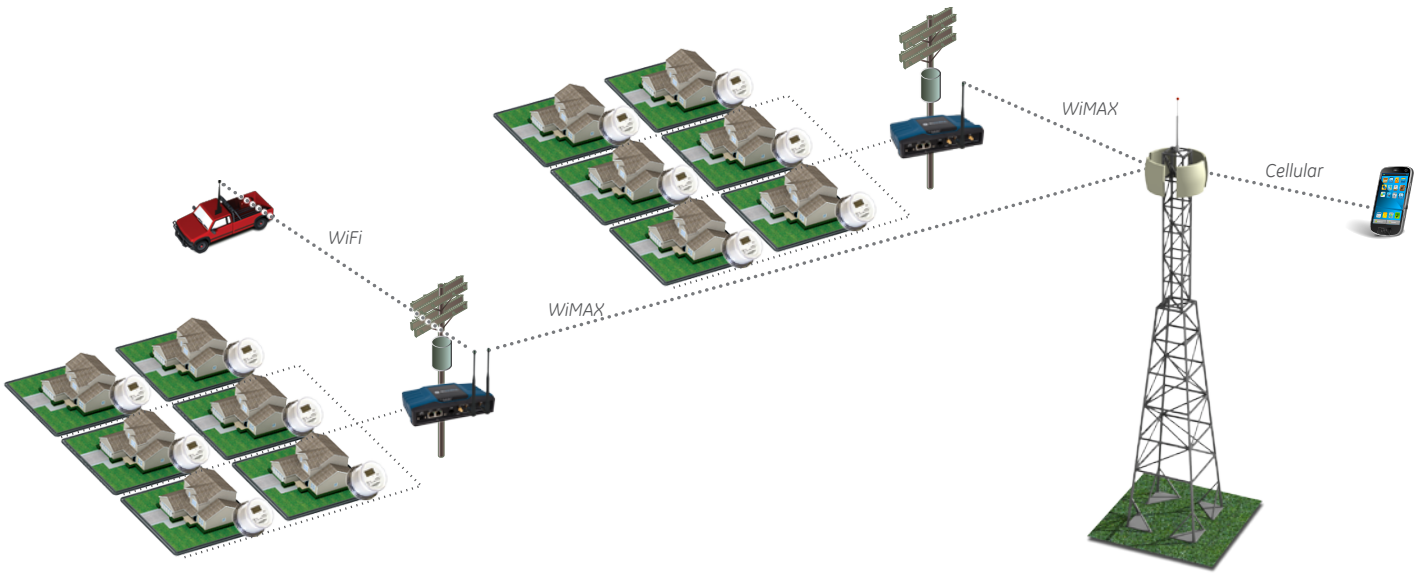
Distribution Automation: Private Unlicensed 900 MHz Solution

This application shows the MDS Orbit MCR-900 store-and-forward capability. Store-and-forward allows the data to move from one MDS Orbit MCR-900 to another up to eight hops. This makes the product ideal for geographically challenged and rural areas with long-range data transfer requirements.



AMI Backhaul Communications: Private Unlicensed 900 MHz or WiMAX Solution

The application shows an MDS Orbit with WiMAX and WiFi addressing AMI aggregated data transfer and workforce mobility applications. Future MDS Orbit products may include private communications for collector functions of the AMI network in addition to the aggregated date transfer.



MDS Orbit's Comprehensive Security Framework

A foundational building block for the MDS Orbit platform is security, a core competency area for GE and both a critical consideration and requirement for evaluating wireless communications systems for customers across all industry types and geographies.

Customers typically face similar challenges and concerns when considering security for their wireless communications network assets. Those challenges include keeping up with changing standards, managing the network and device configuration, maintaining the appropriate level of availability, integrity and confidentially across the network, and providing the right documentation for auditing and reporting purposes.

Implementing a common security framework for a platform has to be well thought out and goes beyond the common security checklists and features to which most have become accustomed. Additionally, in order to meet the newer security standards, stricter design and manufacturing processes have to be considered and implemented early in the manufacturing phase. Finally, and most importantly, security as an "entity" needs to be de-mystified for customers, easy to implement and managed on an on-going basis in order to ensure that critical infrastructure is truly secure.

GE has engendered a culture of security throughout its comprehensive framework from design to implementation and manufacturing to installation and operation.

Key Highlights of MDS Orbit's Security Design to Installation Process

Design

Standards, requirements, component selection and product features

Security is a core and critical design element for the MDS Orbit platform and was analyzed at length in the initial phases of design and will continue to be an area of continual evaluation as standards advance over time.

The design process started by analyzing the existing security standards including NERC CIP, NIST IR7628, SP800-82, SP800-53 and FIPS 140-2 in order to properly assess what security controls needed to be built into the MDS Orbit platform. This analysis was done to ensure that the MDS Orbit platform evolves with industry guidelines.

After the analysis was complete, the decision was made to develop the platform using open standards extensively used in the IT community, such as AES and RSA encryption, RADIUS authentication, IPsec VPN, and X.509 certificates, versus proprietary algorithms. This decision was made in order to allow for easier integration with existing security infrastructure and corporate IT security policies.

Once standards and requirements were decided, the next phase was design. The MDS Orbit platform's core security board was designed with firmware components to meet security requirements now and in the future.

The security features in the MDS Orbit platform of products are architected for easy, over-the-air or remote upgrades as security features continue to be released in line with industry standards.

Implementation & Manufacturing

Component development, design verification, and device manufacturing

Throughout the hardware and firmware development and the manufacturing of the MDS Orbit platform of products, great care is taken to correctly implement and deliver the security controls that have been selected and designed into the platform.

The firmware coding practices and design verification utilized during the development phase include defensive coding and fuzz testing in order to minimize and detect product vulnerabilities that could be leveraged by an attacker.

The hardware components selected for the MDS Orbit products enable boot security which ensures that the device runs authentic firmware resulting in tamper resistance. This is accomplished by the MDS factory who, during manufacturing, embeds in each MDS Orbit product a cryptographic key in the device which is used to authenticate the firmware.

Extensive testing is performed by MDS as well as by third-parties to exercise the security controls of the MDS Orbit platform. This testing includes user interface testing, penetration testing, web interface testing, and network vulnerability assessments.

This unique approach to development and manufacturing makes cyber security core to the platform and minimizes the potential for the device to be compromised.

Installation & Operation

Provisioning, deployment, maintenance

The MDS Orbit platform of products are designed to drive a simplified user experience making it easier to install, operate and manage for customers.

As just one example, certificate management is the creation and maintenance of X.509 certificates which are required for device identity during entry to the network. The device proves its identity to the network by providing a certificate that the network then validates.

Today, certificate management is done manually, requiring the user to run several commands and then download the certificates to the unit prior to entry to the network.

GE has simplified this process of certificate management through the use of Simple Certificate Enrollment Protocol (SCEP), allowing devices to be provisioned in an automated, on-line fashion rather than a manual process.

Additionally, other security controls that allow for easier integration with enterprise Security Network Systems include RADIUS, IPsec VPN, and Syslog. The Orbit platform allows integration of Syslog over UDP and TLS connections so that event management can be performed through a central service.

GE approached the development of its comprehensive security framework from three different perspectives including:

- **Securing the device** – ensuring that the device isn't compromised by tampering or alterations
- **Securing the user** – ensuring that only the right users have access to prevent inappropriate device, network configuration and status entry
- **Securing the network** – ensuring that only the right devices are on the network by preventing unauthenticated access to the network/services

By securing the device, the user, and the network with open standards-based algorithms and protocols, the MDS Orbit platform provides the necessary functions and tools to enable utilities to meet cyber security requirements and regulations.

Security Features Embedded in the MDS Orbit Platform

Device

- Boot security
- Cryptographically signed firmware
- Remote firmware download via SFTP
- Integrated tamper detection
- Tamper seal on enclosure
- Enable/disable logical and physical ports

User

- Username/password login
- RADIUS/LDAP user authentication
- Secure device management with HTTPS, NETCONF, SSH, and SNMPv3
- Extensive audit logging of events
- Audit log forwarding via syslog-over-TLS

Network

- Device authentication through EAP
- Certificate management with SCEP
- Automatic certificate renewal
- 128-bit and 256-bit AES encryption
- Firewall and Stateful Packet Inspection

Advanced System Performance

Match Performance to Application

GE's MDS Orbit platform has been designed with flexibility to allow use of different communication technologies to meet specific bandwidth, range, frequency, and geographic requirements of industrial applications.

The CPU horsepower of an MDS Orbit device can be scaled to meet the application, network, and security performance requirements of a broad range of utility applications.

Quickly Create and Scale Hybrid Networks

A portfolio of wired and wireless technologies are available to create hybrid networks that meet application, regional, topography, and capacity needs.

Wireless interfaces provide long range connectivity over public and private infrastructure. Ethernet, serial, and WiFi interfaces provide connectivity to an array of utility equipment including PLCs, RTUs, cap bank controllers, and voltage regulators.

Standards Based Technology

A wealth of wired, wireless, networking, and security features are supported allowing the device to be integrated into existing systems, thus future proofing the network investment. These include standard Ethernet bridging, IP routing, 802.1Q VLAN support, IPsec VPN, WiFi, and WiMAX.

Quality of Service

MDS Orbit's Quality of Service (QoS) features empower utilities to enable the convergence of distribution substation applications over a common network.

Important incoming traffic is classified based on priority fields that have been previously set by the application, or can be classified and have the priority fields overridden based on the administrator's policies. Such classification policies can identify traffic based on packet header information and fields which provide context on the service or application the packet is carrying.

Once incoming traffic has been classified, packets with a higher priority are then given precedence to exit the router on the wireless link first, thus minimizing its latency. Packets with lower priority are routed next, and so forth.

MDS Orbit ensures that during periods of network congestion, high priority traffic gets precedence and associated applications will be least impacted. Additionally, low priority traffic is not allowed to take the bandwidth away from higher priority traffic.

Ruggedized Die-Cast Aluminum Enclosure

The rugged enclosure made from die-cast aluminum will withstand harsh industrial environments and the shock and vibration that is common in these environments.

MDS Orbit Platform – An Interior View

Superior Reliability

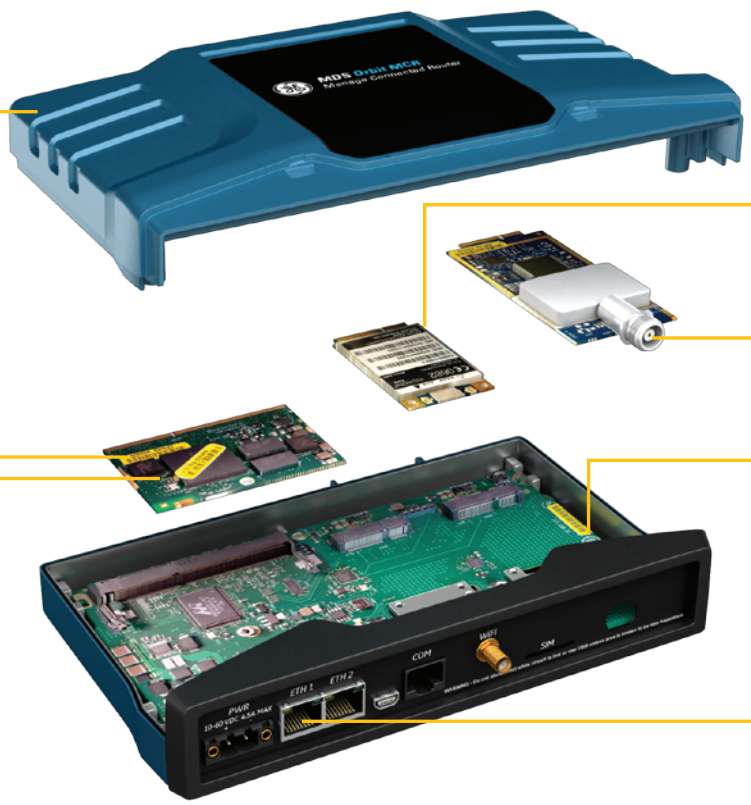
Ruggedized die-cast aluminum enclosure provides enhanced thermal dissipation for extended reliability

Comprehensive Security

Industry leading, standards-based security controls provide authentication, integrity, and confidentiality through strong cryptographic algorithms

Powerful Networking

Adaptable to different network designs and topologies by providing bridging, routing, firewall and VLAN capabilities lowering cost of network installation and maintenance



Multiple Communication Technologies

Designed to support global private and public communication networks enabling hybrid wireless solutions

Advanced System Performance

QoS through traffic prioritization minimizes latency and provides deterministic application performance

Flexible Interface Combinations

Multiple interface options (Ethernet, serial) provide flexibility to match specific application needs and equipment

Industrial Temperature Range

Full performance operation across the industrial environments ranging from -40°C to +70°C allows for operation when snow is falling or when the sun is baking the pavement.

IP Routing

Native Layer 3 routing supports multiple applications, reduces system cost, and allows for advanced network architectures. The MDS Orbit devices are capable of routing across any of its network interfaces including the local Ethernet ports, WiFi, WiMAX, cellular, and 900MHz ISM. This allows for a well-designed network minimizing collision domains and avoiding broadcast storms.

Port Forwarding and Network Address Translation

The MDS Orbit device applies port forwarding and Network Address Translation (NAT) to its cellular interface creating a local, private Local Area Network (LAN) behind the MDS Orbit device. This provides a level of isolation between networks and allows for careful control of traffic.

These features can be applied to any network interface to create more advanced architectures such as using one local Ethernet port as a WAN interface isolated from the other local Ethernet port acting as a LAN interface.

Serial Terminal Server

Serial traffic from SCADA and telemetry data can be encapsulated in TCP (Transmission Control Protocol) and UDP (User Datagram Protocol) for transport across MDS Orbit's wired and wireless networks.

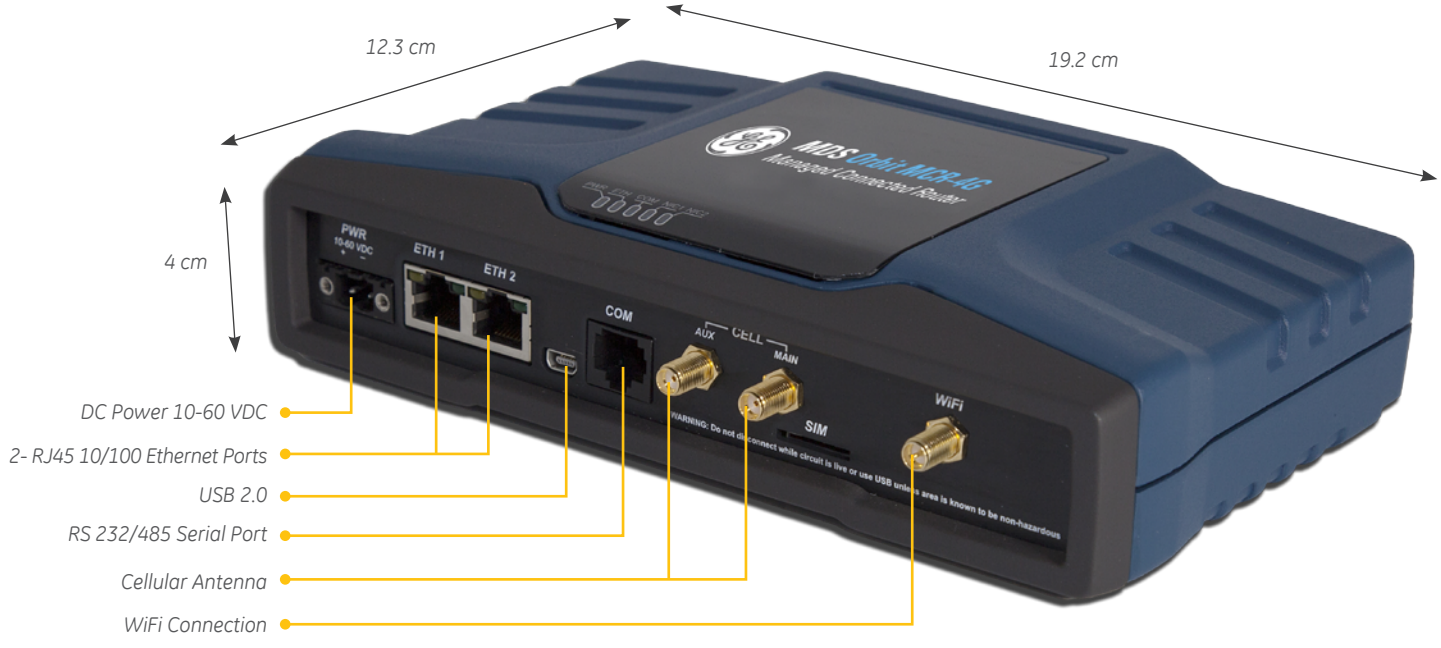
Serial protocols, such as Modbus and DNPv3, are fully supported in order to provide connectivity to legacy devices such as older model PLCs, RTUs, and line sensors.

GE's Best-in-Class Quality and Testing Procedures

To provide the highest level of reliability and performance, GE has incorporated its best-in-class quality standards and testing procedures across all the design and implementation phases of the MDS Orbit platform. Product design is qualified by Highly Accelerated Life Test (HALT) practices employing up to 60C/min. with 100 GRMS mechanical stress and Highly Accelerated Stress Screen (HASS) audits conducted on all manufactured products prior to shipment.

Providing best-in-class reliability with over two million shipped units, GE's MDS products support low return rates and an average of 500 years of mean time before failure (MTBF) rates.

MDS Orbit Platform – An Exterior View



Ease of Use and Integration

User Interface and Configuration Management

Common web pages and command line interface provide consistency in configuration and status monitoring across the MDS Orbit product variants reducing the learning curve for users and ultimately the deployment and troubleshooting time of networks.

Communications products often contain features and functions specific to the communication technology or standard on which they are developed. The MDS Orbit platform user interface is agnostic to the communication technology and presents the user with a common nomenclature, process and Wizards for configuring the product and network.

Customers can utilize the web based MDS Orbit Device Manager for easy configuration of all MDS Orbit parameters including transmit and receive frequencies, channel size and modem speed. GE MDS Orbit Device Manager is also used to access important performance and maintenance information.

USB Console

The MDS Orbit has a USB console so users can locally connect to devices and provision, configure, and monitor status. The customer does not need to set up a terminal console and can easily configure and manage the technologies within the MDS Orbit through a single USB point.

The Orbit Device Manager overview page provides critical information at-a-glance such as active alarms and high-level interface status.

The Orbit Device Manager logging page allows for easy viewing and filtering of the system event logs. It is also used for configuring rules for custom handling of specific events such as creating SNMP traps or alarming the system.

Multiple Interface Options for Flexible Design

Multiple 10/100 Ethernet and RS232/485 serial ports are included to allow for connection to PLCs, RTUs, controllers, and other end devices. The enclosure design of the MDS Orbit products allows customers to select two (2) Ethernet and one (1) serial or two (2) Serial and one (1) Ethernet to best fit the mix of legacy equipment within their network.

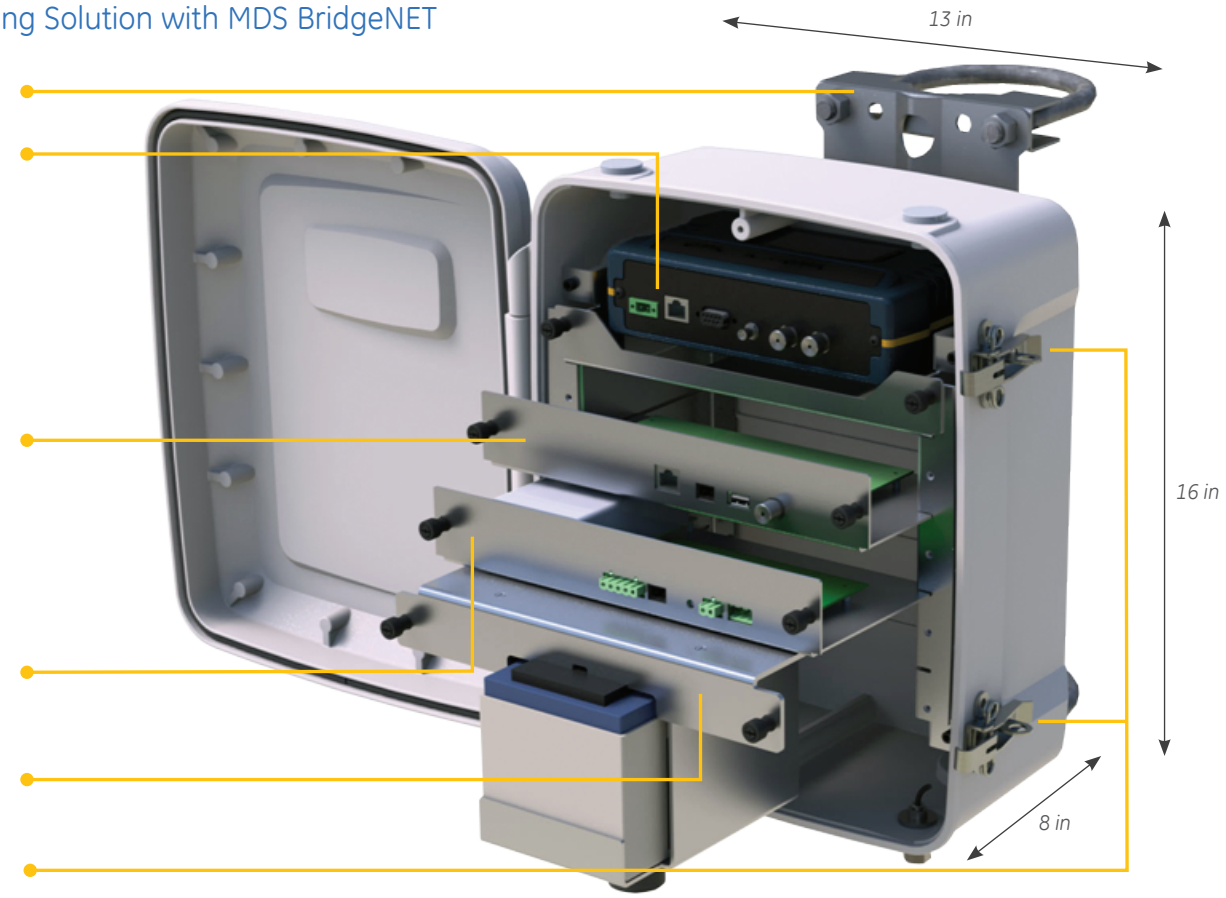
Standard Threaded Neill–Concelman (TNC) and SubMiniature version A (SMA) connectors allow for quick connection of antennas and cables. The external SIM on the cellular product allows for changes for service or on the dual carrier option, service providers. A USB interface provides single-point configuration and management of the communications technologies.

Mounting Brackets and Integrated DIN Rail Mount

Wall mount and DIN rail mount options allow flexibility in cabinet and enclosure installations. The integrated DIN rail mount provides durable rugged connection to cabinets.

The mounting bracket is a standard three-hole pattern established by previous MDS communications products such as the MDS SD Series. Either option is available when ordering the product and included in the base price of the unit.

Flexible Packaging Solution with MDS BridgeNET



Mounting hardware

Either of the top two bays may be used for communications technologies

Third party collector board

Delivers Smart Grid connectivity to end devices such as meters and Distribution Automation devices

Power supply board

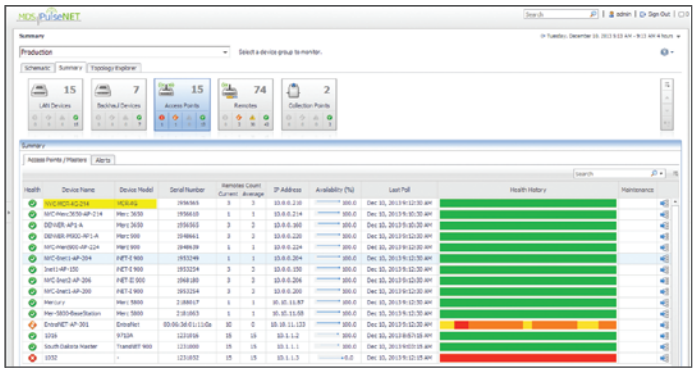
120 / 240 VAC

Integrated backup battery provides up to 8 hours of operation

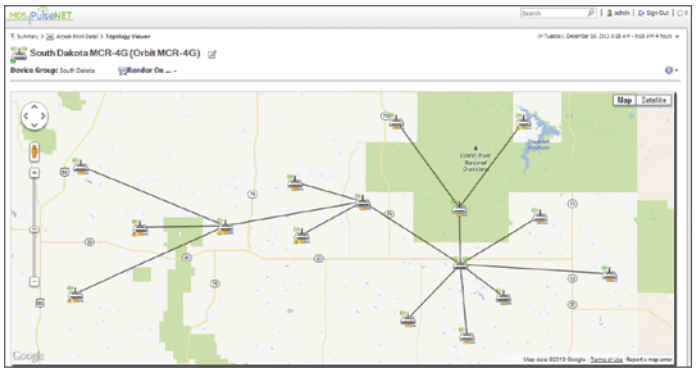
Lockable stainless steel latches deter physical tampering

Network Management with MDS PulseNET

Monitoring and managing the health of your network is a critical and up-front consideration when designing, purchasing, and deploying equipment for your communications system. MDS PulseNET Network Management Software was purpose built for industrial communication systems and satisfies the real-time needs of customers who are responsible for managing them. MDS PulseNET software is unique, as it requires no customization to get started – offering true, out-of-the box functionality. MDS PulseNET software provides the insight and detailed system performance allowing you to intelligently and proactively manage your radio communications network.



The "Summary View" shown here is an example of one of the high level display options available with MDS PulseNET. It provides detailed, real-time data on a specific group of devices. Displayed are all the Access Point/ Master radios in a single view so an operator can monitor the devices' real-time health and performance in a single pane. Each row shows the device name, model, IP address, and serial number along with signal performance, availability, current health state, and last poll time.



One of the high level display options within MDS PulseNET is the Topology View displayed in the GIS format. This view provides the ability to overlay device icons on top of a Google map with the connections shown between the devices that MDS PulseNET has discovered. Device GPS coordinates can either be added to the device configuration within MDS PulseNET or the device icons can be pinned directly onto the map in a typical Google style.

For more information about
GE Industrial Communications products visit

GEDigitalEnergy.com/Communications

Scan 2 Tweet

@GEModernGrid #GEDTECH #DTECH

youtube.com/gedigitalenergy

GE Digital Energy

175 Science Parkway
Rochester, NY 14620
Tel: +1-585-242-9600
Email: gedigitalenergy@ge.com

GEDigitalEnergy.com

imagination at work

GEA-12781A(E)
English
140123