

# MDS™ Orbit MCR-900

## A Flexible 900MHz Unlicensed Router for Cost Effective Industrial Deployments

GE's MDS Orbit MCR-900 is a high performing 900MHz unlicensed wireless router. It is built on GE's MDS extensive experience in wireless industrial communications and uses proprietary state-of-the-art Frequency Hopping Spread Spectrum (FHSS) algorithms to offer low latency networking in the 900MHz unlicensed spectrum with effective interference avoidance.

The MDS Orbit MCR-900 allows for traditional point to multipoint deployments for SCADA and other industrial applications. In addition, its integrated routing, switching, Quality of Service (QoS) and security as well as the support for a variety of wireless technologies and topologies position it as a true convergence and OPEX-saving platform in industrial M2M networks.

The MDS Orbit MCR-900 supports additional wireless technologies including global 3G (AT&T), 4G LTE, and Wi-Fi to allow for compatibility in a variety of design scenarios.

### Key Benefits

- High performance interference avoidance and very low latency 900MHz technologies along with advanced Quality of Service functionalities enable determinism for critical and industrial applications
- Support for a variety of network topologies, integrated routing and switching in addition to simultaneous cellular uplinks effectively extend industrial networks into rural and Field Area Networks
- A holistic cyber security framework protects the users, the network and assets and allows operators to meet stringent government and corporate cyber security requirements
- Rugged durable design, wide temperature range and low power consumption provide deployment life extension in the harshest of environments while protecting CAPEX investment

### Applications



#### Oil & Gas

- Well Head and Production Pad Automation
- Pipeline Monitoring and Control
- WiFi for Field Operations



#### Water & Wastewater

- Level, Pressure and Flow Monitoring
- Pipeline Monitoring and Control



#### Utility

- DA & AMI convergence
- Renewables Protection & Control with IEC® 61850
- Substation Device Monitoring and Video Surveillance



#### Heavy Industrial

- Heavy Machinery Monitoring
- Excavation Machine Control
- Facility Wide Network Extension to Offsite Areas



## Optimum Flexibility

- Point to Point, Multipoint, Store & Forward and self-healing topologies allow for flexible deployment
- Integrated routing and switching enable support for a variety of design scenarios
- Scalable data rates from 125Kbps to 1.25Mbps with varying sensitivity
- Multiple interface options include Ethernet, Serial, USB, Cellular and Wi-Fi

## Comprehensive Security

- Advanced firewall protects users and network assets against intrusion
- IPSec VPN enables secure enterprise-class encrypted communication
- Secure Boot protects integrity of firmware
- Extensive X.509 digital certificate management simplifies provisioning
- Integration with enterprise systems via RADIUS, AAA, SCEP, SNMPv3 and Syslog

## Deterministic Performance

- High performing 900MHz unlicensed FHSS router
- Low latency for critical and demanding protection applications
- Advanced Quality of Service ensures deterministic application performance
- Designed to endure harsh environments:
  - Enhanced ESD protection
  - Extended temperature (-40 to +70 C)
  - Class 1/Div 2 & IEEE® 1613 compliance



# GE's MDS Orbit MCR-900 Deployment Examples

## MDS Orbit as Enabler for Classic Multipoint Communication with Coverage Extension Into Rural Areas



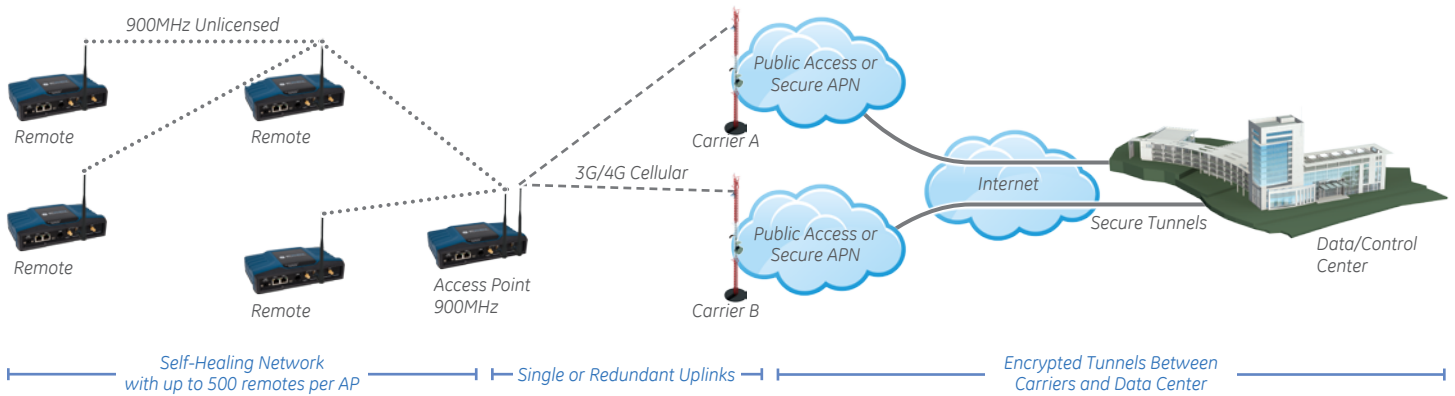
### Features

- MDS Orbit's flexible 900MHz unlicensed deployment architectures as well as support of > 30 miles per segment with effective FHSS interference avoidance make it an ideal enabler for the expansion of network coverage into remote and rural areas
- A large scalability of remotes per Access Point expands network coverage into massive footprints
- High performance Store and Forward technology allows repeaters to be daisy chained for up to 8 hops in series to extend network range through mountainous or rugged terrain
- Stateful firewalling as well as RF and IPsec encryption ensure protection of data, users and network assets from intrusion

### Application Examples

Oil & gas production fields, oil pipeline monitoring & control, Distribution Automation Field Area Networks, water & waste water, municipalities

## MDS Orbit as 900MHz Unlicensed Gateway with Multiple Encrypted Uplinks Through Public Carriers



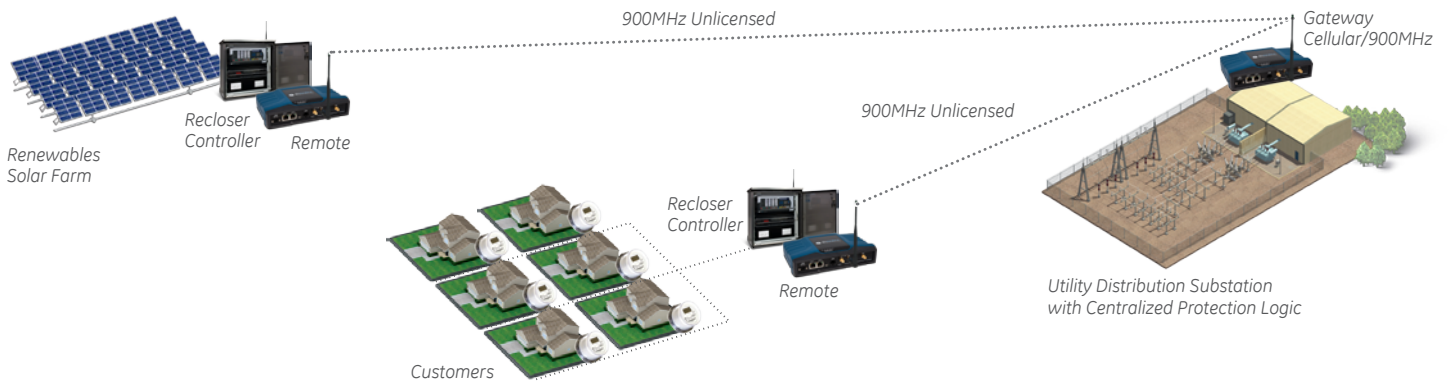
### Features

- MDS Orbit MCR-900 supports a second wireless card which could be 4G LTE or 3G Global, with the latter supporting dual SIMs
- The large remotes scalability of MDS Orbit MCR-900 allows to cost-effectively expand network coverage to hundreds of sites with a single cellular uplink thus saving on OPEX by eliminating recurring per-site cellular subscription fees
- Stateful firewalling as well as IPsec encryption can be applied on 900MHz or Cellular links to augment network security for critical applications and protect against intrusions

### Application Examples

Advanced Metering Infrastructure (AMI) gateways, Distribution Automation Field Area Networks, water & waste water, municipalities, oil & gas production fields

## Implementing Renewables Protection & Control with the IEC 61850 Protocol using MDS Orbit



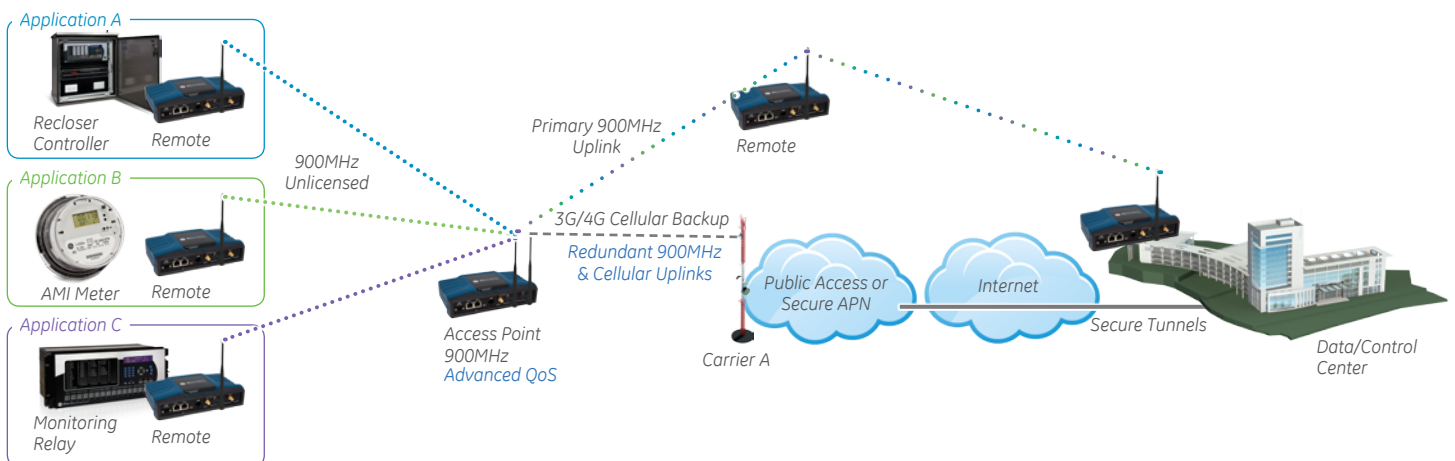
### Features

- MDS Orbit's high performance 900MHz unlicensed technology can transport IEC 61850 GOOSE Ethernet frames natively. It allows for data rates of up to 1.25Mbps with a latency tunable to as low as 5msec. This along with advanced Quality of Service facilitate advanced Distribution Automation applications such as Renewables/Distributed generation Protection & Control which demand low latency and network determinism
- A large scalability of remote enables cost-effective coverage of large customer and asset footprints
- Stateful firewalling as well as RF and IPsec encryption enable network operators to meet NERC® CIP / EPCIP and other stringent cyber security requirements by encrypting communication links and protecting network assets and users against intrusion

### Application Examples

Distributed Generation/Renewables Protection & Control, Distribution Automation, critical infrastructure control, other protection applications

## MDS Orbit as a Network Convergence Enabler for Multiple Simultaneous Applications



### Features

- MDS Orbit supports advanced QoS functionality which allow it to prioritize egress traffic based on Layer 2- Layer 4 classifications. In this fashion, critical applications are assigned to the priority queue and are switched first to meet application requirements.
- Orbit is capable of up to 5 site-to-site IPsec VPN tunnels per device which give it flexibility to secure critical application paths as needed. Furthermore, Orbit supports a stateful firewall to protect the network and assets against intrusion.
- Orbit's support of multiple wireless technologies, including 4G LTE, 3G Global, 900MHz unlicensed and Wi-Fi in addition to its simultaneous support for bridging and routing make it an ideal network convergence platform.

### Application Examples

Converged Distribution Automation (Protection, Control, SCADA, Metering, AMI etc.), Oil & Gas production fields (SCADA, control, Workforce, Video Monitoring)

# MDS Orbit MCR-900 Specifications

## 900MHZ UNLICENSED

- Operating Modes: Access Point, Remote, Store & Forward
- Technology: Point-to-Point, Point-to-multipoint,
- Data Rates/Sensitivity:
  - 125 Kbps/-105 dBm
  - 250 Kbps/-103 dBm
  - 500 Kbps/-99 dBm
  - 1.0 Mbps/-95 dBm
  - 1.25 Mbps/-95 dBm
- Latency: tunable to <5 msec one-way
- Output Impedance: 50 Ohms
- Frequency: 902-928 MHz
- Frequency Masks: 16 masks, up to 5 channels per mask
- Spreading method: FHSS, DTS
- Occupied Bandwidth 152 to 1320 kHz, up to 80 channels
- Modulation 2, 4-level GFSK, Dwell Time 10-300 msec
- Carrier Power 100 mW – 1W, Range > 30 miles
- Media Access: Patent pending proprietary design, advanced interference avoidance, error detection, retransmission, auto repeat guaranteed collision free data, and dynamic fragmentation

## CELLULAR 3G OPTION

- GSM, GPRS, EDGE, HSPA+ 850/900/1800/1900 MHz
- UMTS, HSPA, HSPA+ 800/850/900/1700/1900/2100
- Region/Carrier: Global PTCRB, GCF certification, /AT&T, Vodafone, Claro\*, Rogers\*, Telus\*, Bell\*,
- Max Throughput: 21 Mbps downlink/5 Mbps uplink
- Typical Throughput: 5.5 Mbps downlink/0.3 Mbps uplink

## CELLULAR 4G OPTION

- LTE Release 8 700MHz
- CDMA Band class 0 (850 MHz) & class1 (1900 MHz)
- Region/Carrier: U.S. /Verizon
- Max Throughput: 50 Mbps downlink/25 Mbps uplink
- Typical Throughput: 21 Mbps downlink/10 Mbps uplink

## WI-FI OPTION

- Standard IEEE 802.11 b/g/n
- Operating Modes: Access Point, Station
- AP Networking: Dual SSID with VLAN mapping
- Security: WPA/WPA2 PSK, Enterprise, SSID hiding

## CYBER SECURITY

- Tunneling: IPSec VPN compatible with Enterprise VPN concentrators
- Firewall: Stateful Packet Inspection Layer 2-4, Access Control Lists, NAT
- 900 unlicensed Encryption: AES-CCM 128/256 bit with auto key rotation
- Authentication: RADIUS, PSK, EAP/TLS, PKI
- Certificates: X.509, SCEP, PEM, DER
- Boot Security: Digitally signed firmware

## NETWORKING TECHNOLOGIES

- Full IEEE 802.3 Layer 2 switching with Spanning Tree, VLANs, IGMP
- Layer 3 static routing
- Routing and Bridging from/to any interface (as applicable)
- Advanced L2-L4 Quality of Service
- Protocols: NAT, DHCP, ICMP, UDP, TCP, ARP, NTP, FTP, SFTP, TFTP, DNS
- Serial: TCP server, Modbus/TCP, Modbus RTU, TCP client, UDP Unicast and Multicast, BSAP, and DNP3

## MANAGEMENT

- HTTP, HTTPS, SSH, NETCONF, local console
- SNMPv1/v2/v3, MIB-II, Enterprise MIB
- Syslog and Syslog-over-TLS, MDS PulseNET compatible

## ENVIRONMENTAL & AGENCY APPROVALS

- Voltage: 10-60VDC
- Maximum Power Consumption: 4.3W (4G), 3.2W (3G), ~5.3W (900MHz)
- Typical Power Consumption: 4.0W (4G), 2.5W (3G), 3.2W (900MHz)
- Operating Temperature: -40° to 70° C (-40° to 158° F) 900MHz modem
- Humidity: 95% at 60° C (140° F) non-condensing
- Case: Die Cast Aluminum
- Dimensions: (1.75 H x 8.0 W x 4.8 D in.) | Weight: 2 lbs
- Mounting Options: Integrated DIN Rail mount, Standard bracket
- FCC Part 15, IC, ETSI / CE (3G and WiFi models)
- CSA Class 1, Div. 2, IEEE 1613
- UL as it is in process and will be complete by time of publication also required for GE2GE opportunities

## Ordering

### Orbit MCR Platform – Radio Configuration Options

MX -	*	*	*	*	*	*	*	*	*	Description
Choose Media 1	C									Carrier Interoperable Proprietary
	T									Carrier Interoperable
	N									Carrier None
Choose Media 2		T								Carrier Interoperable
		C								Carrier None
		X								Carrier None
Choose Media Type 1			E4V							3G/4G LTE US Verizon
			W51							WiFi b/g/n
			U91							Unlicensed 900 MHz
			3G1							3G GSM World
Choose Media Type 2				W51						WiFi b/g/n
				E4V						3G/4G LTE US Verizon
				3G1						3G GSM World
				N						None
Choose Platform					1					2 Ethernet 1 Serial
					2					1 Ethernet 2 Serial
Choose Regulatory/Country						F				F - FCC/IC
						E				E - ETSI
						B				B - Brazil
						A				A - Australia
						M				M - Mexico
Choose Mounting							D			DIN
							S			Standard Indoor
							N			None
Safety								U		UL/CSA Class 1 Div 2
								E		CE/ETSI
Option Set									N	None
									D	Dual SIM Support

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