

MDS PulseNET

Network Management Software

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. Equally important is ensuring that you maximize your network's return on investments by increasing system throughput and uptime, improving the utilization of networked devices, and finally, supporting the deployment of maintenance resources when problems surface.

MDS™ PulseNET Network Management Software was designed specifically for MDS 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.

Key Benefits – Return on Network Investments

- **Driving Resource Efficiency**
Notify and deploy maintenance resources with the intelligent data required to quickly resolve equipment and radio issues
- **Improving Network Performance**
Access historical network and equipment performance trending to optimize availability through predictive maintenance
- **Leveraging MDS Expertise**
Purpose built and pre-loaded with recommended performance thresholds, eliminating guesswork



Purpose Built

- Designed to provide out-of-the-box functionality for MDS devices
- Pre-loaded MDS devices performance rules and thresholds to eliminate customer guess work

Rapid Deployment

- Intuitive installation and administrative set-up
- Automatic devices discovery
- Out-of-box, pre-defined and manageable number of alerts

Robust Monitoring

Provides historical performance data and trending of:

- Received Signal Strength Indicator (RSSI)
- Signal Noise Ratio (SNR)
- Error Rate
- Data throughput
- Round trip delay time
- Transmitter power
- Changes in Modulation scheme
- Changes in GPS satellite connectivity and coordinate tracking

Easy to Use

- Management by exception
- Pre-built, intuitive work flows
- Navigation user configurable hyperlinks
- Multiple pre-defined report options

Purpose Built for MDS Devices

With over a million and a half devices installed around the world and Thirty years of experience, GE is aware of the challenges our customers face when it comes to effectively managing their communication networks. MDS PulseNET software provides the insight and detailed system performance allowing you to intelligently and proactively manage your radio communications network.

Integrated with GE's MDS wireless product portfolio, MDS PulseNET is capable of creating, storing and software trending derived metrics using built-in program logic. The raw metrics collected from network devices must be correctly manipulated into meaningful data before the information can be presented to the end-user.

Easy Installation & Rapid Deployment

MDS PulseNET software requires minimal effort to install and operate, provides pre-built specific device warning thresholds to eliminate the guesswork, and provides visibility into communications that have historically been unmanaged.

MDS PulseNET software provides multiple, concurrent, role-based logins through a web interface so that each user is able to see exactly what they need to fulfill their individual responsibilities. MDS PulseNET also provides the operator with immediate access to performance trending graphs through the same simple navigation scheme. It normalizes the views for disparate technologies into simplistic and easy-to-use dashboards. The main dashboard provides a high level status of each set of functional components being monitored.

Once your system is properly configured, it can automatically discover your network devices, assign licenses to the devices and begin monitoring the network.

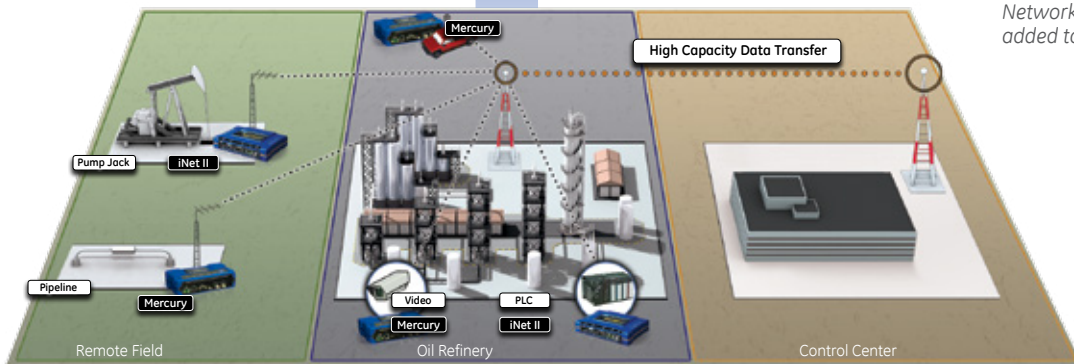
Below is an example of MDS PulseNET's device auto discovery screen which separates network devices into two groups - devices that MDS PulseNET can communicate with and devices that are currently ineligible. MDS PulseNET can auto discover devices by either entering a specific IP address or by providing a search range of IP addresses. In this example, MDS PulseNET has auto discovered several MDS iNETs and MDS Intrepid devices.

The screenshot displays the MDS PulseNET interface. On the left, a table titled 'Discovered Devices: Selected 0 (remaining capacity 498...)' lists various devices. On the right, a 'Discovery Progress' window shows 'Pinging Devices' at 99% and 'SNMP Query' at 8%. Below the progress window is a table of 'Ineligible Devices'.

IP	Model	Role	Serial Number	Vendor
10.0.1.14	Intrepid	n/a	128P423600528	GE MDS
10.0.1.237	Intrepid	n/a	128P423600528	GE MDS
10.0.1.204	MDS iNET 900	Access Point	3001202	GE MDS
10.0.1.85	MDS iNET-El 900	Remote	3002084	GE MDS
10.0.1.87	MDS iNET-El 900	Access Point	3002083	GE MDS
10.0.1.39	MDS iNET-El 900	Remote	3002035	GE MDS
10.0.1.47	Intrepid	n/a	128P423600527	GE MDS
10.0.1.17	MDS iNET 900	Access Point	3001177	GE MDS
10.0.1.86	MDS iNET-El 900	Remote	3002085	GE MDS
10.0.1.94	MDS iNET-El 900	Remote	3002086	GE MDS
10.0.1.23	MDS iNET 900	Remote	3001203	GE MDS
10.0.1.46	MDS iNET 900	Remote	3002004	GE MDS
10.0.1.56	MDS iNET-El 900	Remote	3001361	GE MDS
10.0.1.137	MDS iNET 900	Access Point	3001131	GE MDS
10.0.1.154	MDS iNET 900	Remote	3001257	GE MDS
10.0.1.14	MDS iNET 900	Remote	3001304	GE MDS
10.0.1.532	MDS iNET 900	Remote	3002033	GE MDS
10.0.1.18	MDS iNET 900	Remote	3001182	GE MDS
10.0.1.228	Intrepid	n/a	128P423600528	GE MDS
10.0.1.19	Intrepid	n/a	128P423600528	GE MDS
10.0.1.17	Intrepid	n/a	128P423600527	GE MDS
10.0.1.20	MDS iNET 900	Remote	3001204	GE MDS
10.0.1.175	MDS iNET 900	Remote	3001178	GE MDS
10.0.1.88	MDS iNET 900	Access Point	3002081	GE MDS
10.0.1.13	MDS iNET 900	Remote	3001309	GE MDS
10.0.1.42	Intrepid	n/a	128P423600528	GE MDS
10.0.1.32	Intrepid	n/a	128P423600527	GE MDS
10.0.1.94	Intrepid	n/a	128P423600528	GE MDS
10.0.1.35	MDS iNET 900	Remote	3001305	GE MDS

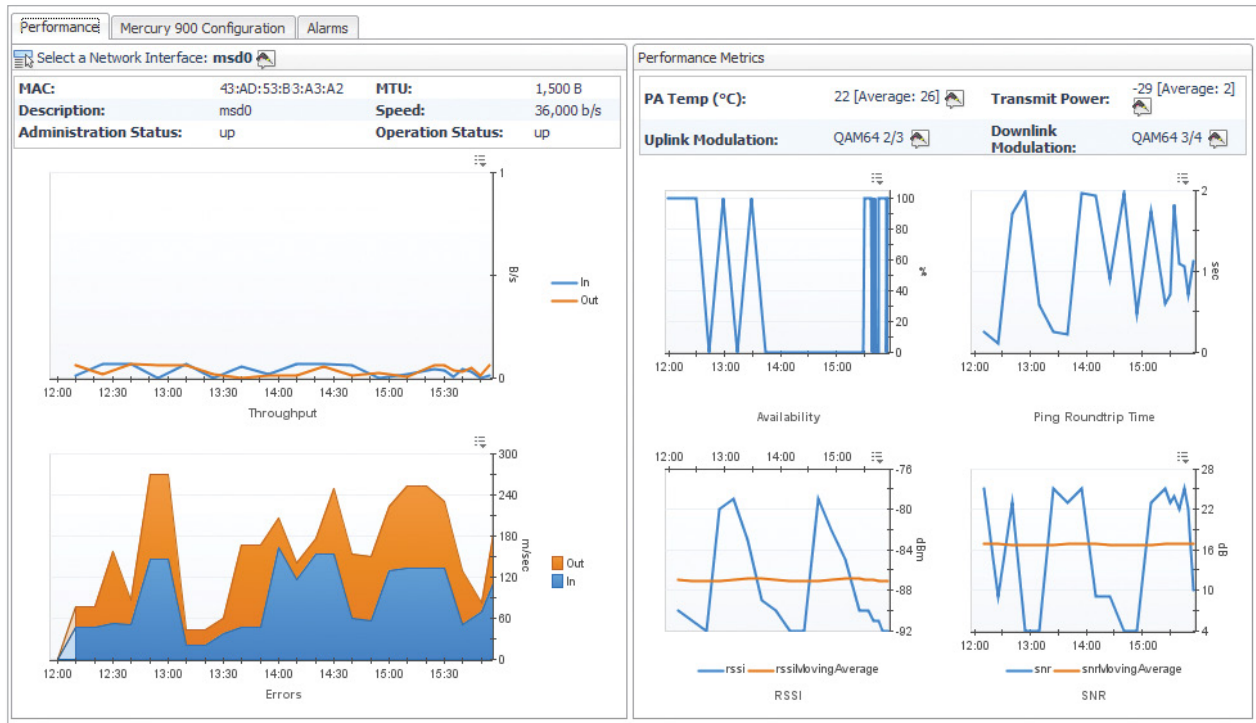
IP	Name	Device Description	Serial Number
10.0.1.255	AMG Device 1	n/a	n/a
10.0.1.50	AMG Device 2	AMG Device	n/a
10.0.1.57	Comms Switch-1	Comms Switch	n/a
10.0.1.17	AMG Device 3	AMG Device	n/a
10.0.1.15	Comms Switch-2	Comms Switch	n/a
10.0.1.11	Comms Switch-3	Comms Switch	n/a
10.0.1.23	AMG Device 4	AMG Device	n/a
10.0.1.190	AMG Device 5	AMG Device	n/a
10.0.1.790	AMG Device 6	AMG Device	n/a
10.0.1.56	AMG Device 7	AMG Device	n/a
10.0.1.75	Comms Switch-4	Comms Switch	n/a
10.0.1.251	Comms Switch-5	Comms Switch	n/a
10.0.1.12	Comms Switch-6	Comms Switch	n/a
10.0.1.25	Comms Switch-7	Comms Switch	n/a
10.0.1.251	Comms Switch-8	Comms Switch	n/a
10.0.1.225	Comms Switch-9	Comms Switch	n/a
10.0.1.25	AMG Device 8	AMG Device	n/a
10.0.1.125	Comms Switch-10	Comms Switch	n/a
10.0.1.725	AMG Device 9	AMG Device	n/a
10.0.1.526	Comms Switch-11	Comms Switch	n/a
10.0.1.20	AMG Device 10	AMG Device	n/a

Network devices are discovered and added to the tables



Robust Monitoring of Important MDS Performance Parameters

MDS PulseNET software is designed to monitor the critical elements of a communications network, from RSSI to SNR to device communication status. With vast amounts of raw data created and stored over time, it can be difficult to prioritize corrective actions. MDS PulseNET software provides warning performance thresholds that can trigger exception events, which in turn can trigger specific actions, such as sending messages to trouble ticketing systems or other management systems. Additionally, these event-triggering thresholds can be easily changed within the software to meet unique customer requirements.



MDS PulseNET provides easy to review device performance screens showing the critical radio parameters such as: RSSI, SNR, Throughput, and Availability. This example shows the performance screen for an MDS Mercury 900

Summary > Remotes / Repeaters

Wednesday, July 14, 2010 8:25 AM - 8:25 AM 24 hours

Health	Device Name	Device Model	IP Address	Roundtrip Time (ms)		RSSI (dBm)		SNR (dB)		Uplink Modulation	Downlink Modulation	Availability (%)	Last Poll	Health History
				Current	Average	Current	Average	Current	Average					
✓	ARCADI-1391Net-R	INET-II 900	10.0.141.54	23	48	-90.0	-85.1	4.0	18	QAM64 3/4	QPSK 1/2	100	Jul 15, 2010 8:25:03 AM	Green
✓	ARCADI-1714Net-R	INET-II 900	10.0.142.88	23	48	-90.0	-85.1	4.0	18	QPSK 3/4	QAM16 3/4	100	Jul 15, 2010 8:25:03 AM	Green
✗	ARCADI-3246Net-R	INET-II 900	10.0.140.27	23	48	-90.0	-85.1	4.0	18	BPSK 1/2	QAM64 2/3	100	Jul 15, 2010 8:25:03 AM	Red
✓	ARCADI-3393Net-R	INET-II 900	10.0.142.24	23	48	-90.0	-85.1	4.0	18	QAM64 1/2	BPSK 1/2	100	Jul 15, 2010 8:25:03 AM	Green
✓	ARCADI-4551Net-R	INET-II 900	10.0.143.83	23	48	-90.0	-85.1	4.0	18	QAM16 1/2	QPSK 3/4	100	Jul 15, 2010 8:25:03 AM	Green
✓	ARCADI-4662Net-R	INET-II 900	10.0.140.90	23	48	-90.0	-85.1	4.0	18	QAM64 2/3	QAM 16 1/2	100	Jul 15, 2010 8:25:03 AM	Green
✗	ARCADI-5149Net-R	INET-II 900	10.0.142.171	23	48	-90.0	-85.1	4.0	18	QPSK 3/4	QPSK 1/2	100	Jul 15, 2010 8:25:03 AM	Red
✓	ARCADI-5247Net-R	INET-II 900	10.0.141.14	23	48	-90.0	-85.1	4.0	18	QAM64 3/4	QPSK 1/2	100	Jul 15, 2010 8:25:03 AM	Green
✓	ARCADI-7845Net-R	INET-II 900	10.0.143.47	23	48	-90.0	-85.1	4.0	18	QPSK 3/4	QAM16 3/4	100	Jul 15, 2010 8:25:03 AM	Green
✗	ARCADI-9636Net-R	INET-II 900	10.0.140.134	23	48	-90.0	-85.1	4.0	18	BPSK 1/2	QAM64 2/3	100	Jul 15, 2010 8:25:03 AM	Red
⚠	BURSON-1476MR-R	Mercury 1800	10.0.142.92	134	804	-90.0	-85.1	4.0	18	QAM64 2/3	BPSK 1/2	100	Jul 15, 2010 8:25:04 AM	Yellow
⚠	BURSON-2257MR-R	Mercury 1800	10.0.140.45	192	895	-90.0	-85.1	4.0	18	QAM16 1/2	QPSK 3/4	100	Jul 15, 2010 8:25:04 AM	Yellow
✓	BURSON-2848MR-R	Mercury 1800	10.0.141.141	1163	1225	-90.0	-85.1	4.0	18	QAM64 2/3	QAM 16 1/2	100	Jul 15, 2010 8:25:04 AM	Green
✓	BURSON-4219MR-R	Mercury 1800	10.0.140.122	1304	1126	-90.0	-85.1	4.0	18	QPSK 3/4	QPSK 1/2	100	Jul 15, 2010 8:25:04 AM	Green
✓	BURSON-5463MR-R	Mercury 1800	10.0.143.233	1153	1176	-90.0	-85.1	4.0	18	QAM64 3/4	QPSK 1/2	100	Jul 15, 2010 8:25:04 AM	Green
✓	BURSON-5904MR-R	Mercury 1800	10.0.143.213	809	856	-90.0	-85.1	4.0	18	QPSK 3/4	QAM16 3/4	100	Jul 15, 2010 8:25:04 AM	Green
✓	BURSON-6357MR-R	Mercury 1800	10.0.143.143	956	978	-90.0	-85.1	4.0	18	BPSK 3/4	QAM64 2/3	100	Jul 15, 2010 8:25:04 AM	Green
✓	BURSON-6873MR-R	Mercury 1800	10.0.142.152	1114	891	-90.0	-85.1	4.0	18	QAM64 2/3	BPSK 1/2	100	Jul 15, 2010 8:25:04 AM	Green

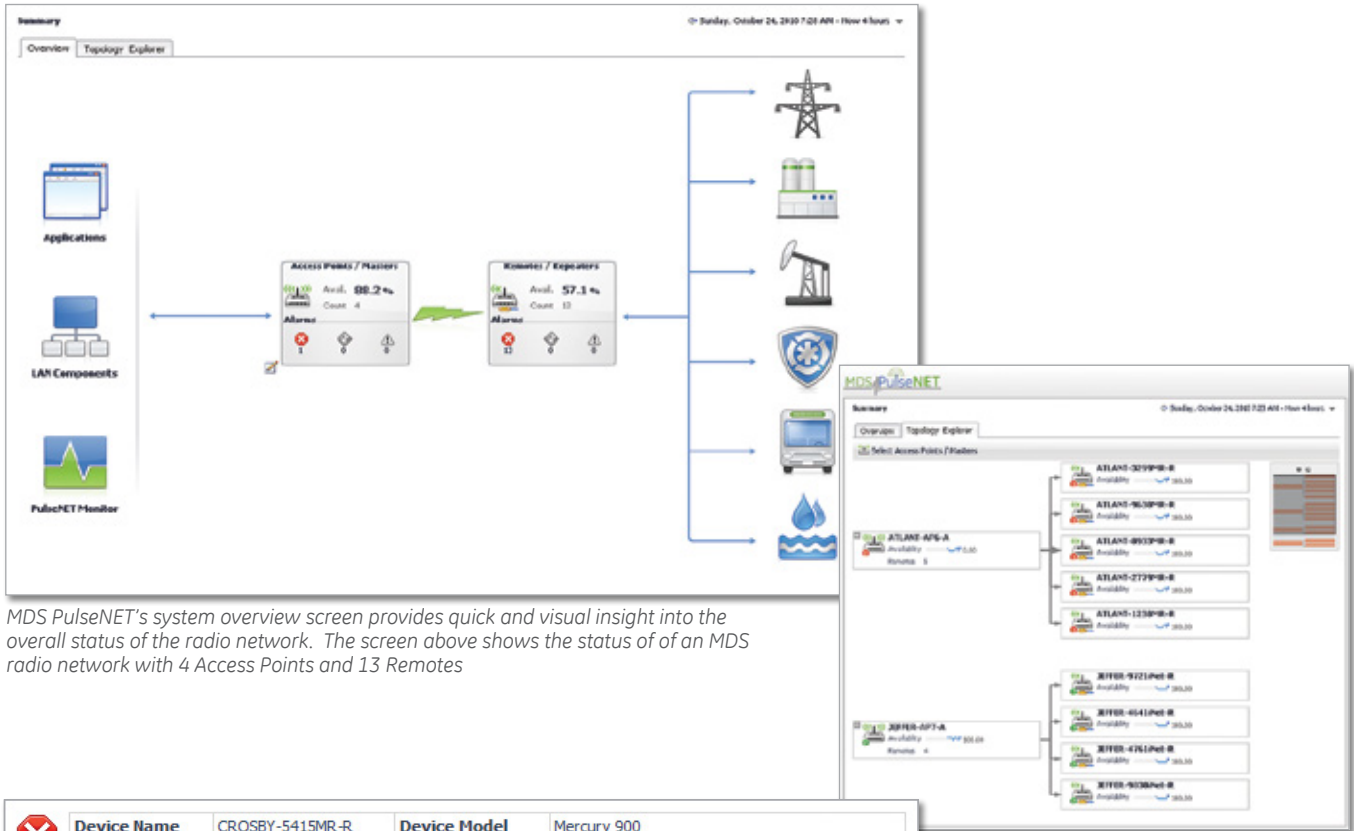
Legend: No Alerts (Green), Warning Alert (Yellow), Critical Alert (Orange), Fatal Alert (Red)

For comparing and contrasting radio performance, MDS PulseNET provides the ability to quickly monitor the radio health for radio remotes including RSSI, SNR, and Roundtrip delay. In one view this table shows the current and historical performance for network remotes

Designed as an Easy to Use, Day-to Day Operational Tool

MDS PulseNET was designed with operator-intuitive screens and operational ease-of-use workflows in mind. This design provides the ability to view a comprehensive system overview while at the same time have the ability to drill-down from the network layer to the device level. This gives operation personnel the opportunity to enhance corrective business processes and improve productivity.

MDS PulseNET's main dashboard provides a high level status of each set of functional components being monitored by MDS PulseNET. With a quick glance, the operator can see which functional area is having availability and/or performance problems. Workflows allow the operator to either click on the alert to see more details or drill into the functional dashboard and see the operational status of the device(s) itself.



MDS PulseNET's system overview screen provides quick and visual insight into the overall status of the radio network. The screen above shows the status of an MDS radio network with 4 Access Points and 13 Remotes

MDS PulseNET's Topology overview screen allows the operator to drill-down and view the status of the individual Access Points with their associated Remotes

	Device Name	CROSBY-5415MR-R	Device Model	Mercury 900
	IP Address	10.0.140.31	Origin (By Rule)	Device Unavailable, Mercury900Remote

Message and Help
 The Mercury 900 Remote CROSBY-5415MR-R is currently unavailable. This may be due to a performance issue, or could result from a configuration change. Confirm that the device has not experienced an IP change.

History

Created Time	Sev	Dur	Ack'd Info			Clearing Info	
			Status	By User	Status	By	
9/29/10 3:56 PM		46 sec	Not Ack'd		No		
9/29/10 3:55 PM		55 sec	Not Ack'd		Yes	Rule: Device Unavailable, Mercury900Remote	
9/29/10 3:54 PM		1.0 min	Not Ack'd		Yes	Rule: Device Unavailable, Mercury900Remote	

Buttons: Acknowledge, Acknowledge Until Normal, Clear, Find Historic Occurrences, Cancel

From any of the MDS PulseNET status screens, the operator can quickly access individual device performance as well as the alert history. Above is an example of the alert history provided by MDS PulseNET for a MDS Mercury 900 remote

PulseNET and PulseNET Enterprise

The MDS PulseNET platform was developed in two versions – MDS PulseNET and MDS PulseNET Enterprise in order to serve a wide variety of customer needs and environments. Both versions incorporate important performance parameters including management by exception, intuitive work flows and MDS network expertise.

PulseNET

MDS PulseNET provides for the fundamental system needs of device discovery, proactive monitoring and early warning for radio networks consisting of less than 500 MDS radios.

PulseNET Enterprise

MDS PulseNET Enterprise (PNE) version is designed for enterprise type networks with greater than 500 devices and which require more robust monitoring, including third-party devices.*

MDS PNE simplifies work-flows by utilizing configuration information to automate radio maintenance. Configuration changes become a point and click user interface for bulk provisioning firmware upgrades. MDS PulseNET Enterprise can also apply its work flows and warning capabilities to non-MDS equipment. Through MDS PulseNET Enterprise, a complete end-to-end view of network performance is available from the field location to the operations facility including attached meters and Remote Terminal Units (RTUs). This provides a consistent view for management and operations to understand the root cause of current incidents, and allows proactive avoidance of potential new incidents.

Common Platform Capabilities

PulseNET and PulseNET Enterprise

Capabilities

- Supports Orbit, SD, X790/x710, iNET, Mercury, EntraNET, and TransNet series wireless radios*
- Out-Of-The-Box pre-loaded data collection settings with recommended alert levels.
- Exception-Based Alert System via Color Coded Icons
 - Warns when out-of-bounds alert levels are exceeded
 - Intuitive and color-based icons provides rapid evaluation of alert

Ease-of-Use

- Single User Interface Installation Program Download
 - Simplifies installation and reduces level of technical expertise
- Upgrade Wizard for Configuration, Diagnostic and Firmware
 - Use device groups to roll out configuration or firmware upgrades to a large group of devices
 - Ease of configuration, device software & firmware upgrade
- Consolidates Performance Metrics and Displays Via Device Dashboards
 - Intuitive graphical presentation of data and alerts
 - Automatic system discovery based on range of IP addresses
 - Simplifies network deployment

Security

- User ID and Password logins
- User forced out when inactive for extended periods
- Multiple Levels of User Access Control
 - Limits screen and configuration access by user type

Communication

- Supports Polling of SNMP Version 1, 2c and 3
- Network-wide Diagnostics – current and most legacy MDS devices
 - Built-in support for GE MDS proprietary communication protocol
- Forward Alerts to 3rd Parties – SNMP Traps, API & Email
- Capability to communicate alerts via multiple mediums
- Remote Access Via Telnet, SSH and HTTPS
- Several options to communicate remotely to network and devices

Advanced Platform Capabilities

PulseNET Enterprise

Enterprise Operations Capable

- Federation
 - Allows multiple PulseNET Enterprise to operate as one regionally deployed network and for central console roll up
- External Databases
 - Allows use of customer database or PulseNET supplied database
- Self Monitoring
 - Self monitoring - providing complete end to end support

Security

- Supports Remote Authentication Dial In User Service (RADIUS) Protocol
- Provides centralized Authentication, Authorization, and Accounting (AAA) management for network services

Configuration Management

- Centralized Configuration Management
 - Streamline security, auditing, storage and controls
- Track and document changes to configurations

3rd Party Integrations

- Allows customers to manage non MDS devices
 - GE will continue to incorporate additional Out-Of-The-Box 3rd party device as requested by customer
 - Customers can opt to incorporate non-MDS devices as a generic devices type for collections and reporting
- Notification Application Programming Interface (API) to 3rd party manager of managers, i.e. HP, Quest, IBM, etc*
- Software communications via standard interface
- Flexibility to use and interface with other manager of managers

Out of the box capability for monitoring 3rd party devices is enhanced in each release. Please consult with MDS to determine if a specific 3rd party devices is supported by the current version of PulseNET Enterprise.

** These features are planned for the next release of PulseNET and PulseNET Enterprise*

Product Function - PulseNET vs PulseNET Enterprise		
Function	PulseNET	
System	Standard	Enterprise
Web based platform for easy user access	✓	✓
Windows & Linux installations supported	✓	✓
Single graphical user interface installation program	✓	✓
Downloadable software and updates	✓	✓
Automated discovery of IP based devices	✓	✓
Automated network topology maps	✓	✓
Purpose built work flows for mission critical networks	✓	✓
Supports SNMP versions 1, 2c and 3	✓	✓
Integrated database supplied with installation	✓	✓
Predefined best practices management for MDS devices	✓	✓
Scalable network management via federation (parent/child installs)	500 Device Limit	✓
Can leverage external database repositories for storage vs. integrated		✓
Predefined best practices management for 3rd parties (i.e. Itron)		✓
Custom Integrations for 3rd parties onsite that are not yet available		✓
High availability server installation capable		✓
GPS aware mapping - Automatic or manually located on GPS aware maps		✓
LAN Monitoring - basic fault/performance monitoring of network devices		✓
Custom rules, dashboards and collections capable		✓
Fault	Standard	Enterprise
Automated & intelligent alerting for MDS devices	✓	✓
Real-time & historical display of exception alerts with severity indicators	✓	✓
Alert notation capability for searchable historical notes		✓
Configurable filtering based on criteria, i.e. severity, status, location, etc.	✓	✓
Configurable notification alerts - email/SMS & SNMP	email/sms	✓

Product Function - PulseNET vs PulseNET Enterprise		
Function	PulseNET	
Fault (Continued)	Standard	Enterprise
Root cause correlation based on network dependencies	✓	✓
Alert integration of 3rd party Out-of-the-box (OOTB) & customizable		✓
Notification API to 3rd party manager of managers, i.e. HP, Quest, IBM, etc		✓
Fully integrated graphical interface for SNMP trap receiving*		✓
Configuration	Standard	Enterprise
Installation wizard for configuration and firmware per MDS device basis*	✓	✓
Scheduling of updates within graphical user interface*	✓	✓
Configuration dashboard for central repository and controls	✓	✓
Full audit of configuration changes		✓
Deploy updates to MDS devices on a global basis		✓
Performance	Standard	Enterprise
Performance dashboard with purpose built prescriptive diagnostic work flows	✓	✓
Inherited performance collections based on vendor / model / configuration	✓	✓
Performance collections for diagnostics (i.e. RSSI, SNR, bandwidth, etc)	✓	✓
Scheduled reporting of availability, lowest performers, etc.	✓	✓
Retains collections for comparison year over year	45 Day Limit	✓
Performance dashboards for 3rd parties OOTB		✓
Self monitoring of PulseNET Enterprise system		✓
Security	Standard	Enterprise
Tracking of configuration and firmware for MDS devices	✓	✓
User forced out when inactive for extended periods	✓	✓
Remote access shortcuts to devices for Telnet, SSH and HTTP(s)	✓	✓
Centralized management - to streamline security and control	✓	✓
User level accounting	✓	✓
Role based security (admin vs. operator)	✓	✓
Radius support*		✓

Out of the box capability for monitoring 3rd party devices is enhanced in each release. Please consult with MDS to determine if a specific 3rd party devices is supported by the current version of PulseNET Enterprise.

* These features are planned for the next release of PulseNET and PulseNET Enterprise

PulseNET System Requirements

Recommended System:

- Dual Core CPU at 1.6 GHZ
- 4 GB of RAM available
- 30 GB of Disk

Supported Operating Systems:

- Windows 7
- Windows Server 2003, 2008, and 2012
- Red Hat Linux AS/ES 5.x, SuSE9 and 10, CentOS AS/ES 5.3/5.4
- Virtualized environments supported

PulseNET Enterprise System Requirements

Recommended System:

- Quad Core CPU at 2.2 GHz
- 16 GB of RAM available
- 160 GB of Disk

Supported Operating Systems:

- Windows Server 2003, 2008, and 2012
- Red Hat Linux AS/ES 5.x, SuSE9 and 10, CentOS AS/ES 5.3/5.4
- Virtualized environments supported

Supported Web Browsers

- Microsoft Internet Explorer - 8.x+
- Mozilla Firefox 16.x+
- Google Chrome 22.x+
- Apple Safari 6.x+

Ordering

Software & Device License 1 Device

PulseNET	PN-1
PulseNET Enterprise	PNE-1

Maintenance (1 year) 1 Device

PulseNET	PNM-1
PulseNET Enterprise	PNEM-1

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