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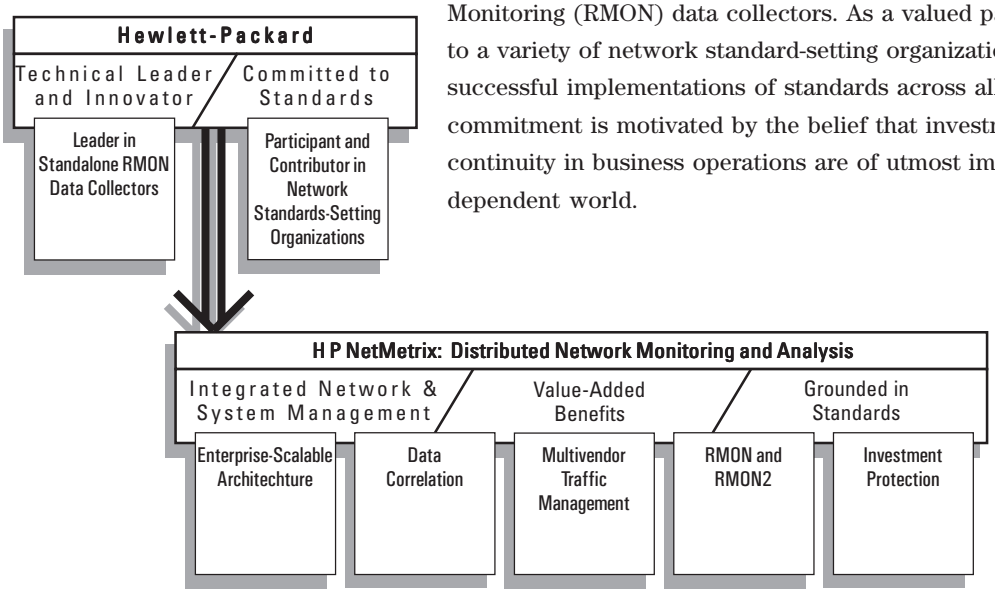
HP NetMetrix RMON2 Delivered through HP NetMetrix Solutions

Application Note 1283

HP NetMetrix empowers IT to measure and report in the networked environment for accountability to the business and end users.

Executive summary

Hewlett-Packard has long been recognized as a technical leader and innovator in computing, networking, and network management. HP leveraged its expertise in these areas to become the industry leader in standalone Remote Monitoring (RMON) data collectors. As a valued participant and contributor to a variety of network standard-setting organizations, HP is committed to successful implementations of standards across all product lines. This commitment is motivated by the belief that investment protection and continuity in business operations are of utmost importance in our network-dependent world.



HP NetMetrix is HP's premiere offering for distributed network monitoring and analysis. Grounded in standards, it provides many valued-added benefits that make it the compelling choice for network monitoring and analysis. More important is the role it plays in delivering integrated network and systems management within HP OpenView. Centralized management of all components of network management is the key to delivering and exceeding the network expectations of end users and the objectives of your business.

A few of the key benefits you can expect from HP NetMetrix are:

- Increase corporate intranet visibility via RMON2.
- Reveal and analyze network interrelationships with unique HP NetMetrix data correlation capability.
- Enable network traffic management for multivendor intranets.
- Emphasize and realize efficient use of network resources through enterprise-scaleable architecture.
- Protect your network investment with assurance of smooth, strategic migration paths for evolving standards and technologies.

Value-added benefits of HP NetMetrix

Data correlation

Much like RMON, the intent of RMON2 is to provide (and build on) a common set of much-needed standards to address explosive growth in enterprise network implementations. RMON2 is a collection of MIB definitions that extends the set of data to be pulled from the network beyond the definitions within the RMON standard. Together, these standards will comprise the building blocks around which network monitoring and analysis is architected to meet the needs of endless, unique network configurations deployed throughout the global business community. It is the nature of the network implementation, the way it is architected, that dictates the need for scalability and requires distributed information consolidation and analysis. It should be noted that HP NetMetrix adds further value to both RMON and RMON2 with the ability to provide data correlation over time - past or present. This invaluable capability is an application-driven benefit that provides the thread of meaning between all the separate pieces of data that RMON and RMON2 define.

To demonstrate the powerful capabilities of HP NetMetrix's data correlation, consider the visibility provided by a zoom sequence of four linked views into an intranet web on a corporate network. The HP NetMetrix zoom feature lets you select and view the 'http' protocol use of the network; then choose to view the density of http protocol usage over a period of time; next, select a point in time for the displayed history to show the web servers responsible for impacting your network load profile with http traffic; the final choice in the sequence of four correlations would be choosing the most significant web server to reveal the origin of the web browsers that were querying the server. The flexibility of zoom lets you define sequences of correlation to assist you in investigating network usage from any angle you choose. The result is that you have the ability to investigate activity on your network proactively and reactively.

Scalable architecture

The enterprise infrastructure typically consists of shared-media Local Area Networks (LANs), switched LANs, and internetwork links. The HP NetMetrix approach provides traffic management independent of underlying technology and grounded on standards-based data from a variety of different data sources, as well as extensions. HP NetMetrix adds value to the RMON2 standard by consolidating information through its implementation of HP NetMetrix's Mid-level Manager architecture and applications. The HP NetMetrix scaleable implementation supports the auto tracking of protocols and the predefining of table entries for each network and application-layer protocol to be tracked. Another advantage is that it does not impact performance typically caused by managing enormous data structures on the data collector. In a phased implementation, this scaleable architecture will be enhanced to support any standards-based RMON2 data source, like hubs, routers, and switches; RMON2 is implemented now in HP LanProbes. Restricting traffic flow data to a local management domain minimizes network management traffic while providing a holistic view of internetwork traffic. The bottom line translates to increased ability to focus on delivering consistent service and reliable networks to the business and the end users.

HP's commitment to standards

HP embraces standards, evidenced by the active role that HP has played in establishing RMON and the more recent RMON2 remote network monitoring standards. Standards have proven to be extremely important to the network monitoring and analysis industry. HP is committed to aligning with industry because of the value customers receive by adopting standards-based implementations. HP NetMetrix recognizes that industry standards protect customer investments and we strive to provide smooth migration strategies to incorporate industry standards. This focus on leading-edge standards integration with existing HP NetMetrix advantages will allow network managers to continue to deliver timely, consistent levels of network service to their business and end users.

Migration path

RMON2 functionality has long been available from HP NetMetrix as extensions to the RMON MIB. All of the host, conversation matrix, and protocol distribution features are already available to users via several application areas offered through the HP NetMetrix/UX Enterprise Manager and Domain Manager. The “user history” capability is readily accessible through the Load Monitor application. The HP LanProbe, HP Power Agent, and HP Mid-Level Manager architecture all provide MAC-to-IP address mapping. RMON2 has been implemented in the HP LanProbes. The RMON2 standard will continue to be phased into HP NetMetrix. HP will continue to incorporate the RMON2 standard such that the advanced features of HP NetMetrix will process any standards-based RMON2 data source.

Overview

HP NetMetrix has provided the capabilities of the Remote Monitoring 2 (RMON2) Management Information Base (MIB) since 1993, building on the capabilities of RMON by enabling the statistical monitoring of end-to-end network traffic. So, HP NetMetrix has offered visibility of network traffic up through the application layer well in advance of the availability of this information via RMON2. Over time, it became apparent that the existing RMON standard provided limited network information up through the Media Access Control (MAC) or data link layer. The RMON2 standard now gives network managers the ability to distinguish between major network and application layer protocols and to identify which applications generate the most traffic. The RMON2 MIB as defined in two standalone RFCs, (RFC 2021 and 2074), offers the same information capability that HP NetMetrix has historically and continually provided, but in a standards-based format.

RMON2 supplements, but does not replace, existing RMON capabilities. The principal focus of RMON2 is on higher-layer statistics with segment protocol distribution, host, matrix, and MatrixTopN tables. This extends the information available via the current RMON standard beyond traffic at the Media Access Control (MAC) or data link layer (layer 2 of the Open Systems Interconnect (OSI) stack). RMON2 provides the ability to see beyond a routed boundary and identify the protocol mix of network activity up through the application layer (layer 7 of the OSI stack).

The RMON2 standard also includes a definition of methods for remotely maintaining and configuring probes, improving a network manager's ability to configure and gather information from multivendor probes. This allows for standard methods to upgrade probes, set network parameters such as IP addresses, and configure SLIP or PPP connections.

Finally, a "user defined history" capability has been added that allows an RMON2 agent to maintain historical studies on arbitrary objects supported by the agent.

RMON2 Definition

RMON2 MIB specifications are as follows:

Description	MIB Object Identifier
Protocol Directory	protocolDir
Protocol Distribution	protocolDist
MAC to IP mapping	addressMap
Network Layer Host	nlHost
Network Layer Matrix	nlMatrix
Network Layer MatrixTopN	nlMatrixTopN
Application Layer Host	alHost
Application Layer Matrix	alMatrix
Application Layer MatrixTopN	alMatrixTopN
User History	usrHistory
Agent Administration	probeConfig

Task	Focus of Information	RMON/RMON2 Data Structures		Alarms & Events	Token Ring
Monitoring	Segment	Live Statistics		Alarms & Events	Token Ring
		History	Segment		
			User (2)		
		Protocol Distribution (2)			
	Host	Host	MAC		
			Network Layer (2)		
			Application Layer (2)		
		Top N	Host MAC		
			Matrix Network Layer (2)		
			Matrix Application Layer (2)		
		Traffic Matrix	MAC		
			Network Layer (2)		
			Application Layer (2)		
		Address Mapping (2)			
Analysis	Packet	Filter			
		Capture	Buffer		
			Count		
Configure	Device	Protocol Directory (2)			
		Probe Configuration (2)			

Figure 1. This table provides a mapping of standards-based data available for network management tasks that include monitoring, analysis, and configuration. This clearly shows the added focus of information available from RMON2 (designated by (2)) for segment, host, packet, and device visibility and control within the three arenas of monitoring and analysis activity.

RMON2 and HP NetMetrix Detailed Definition

Following is a brief description of each MIB component of RFC 2021 for RMON2. (RFC 2074 describes the algorithms required to identify different protocol encapsulations managed with RMON2). Each description contains a brief section on the comparable HP NetMetrix capability. Refer to Figure 1 for a simple visual explanation of where this data proves useful for network monitoring and analysis activities. In figure 1, RMON2-specific information is denoted by (2).

Protocol Directory (protocolDir)

With RMON2, the Protocol Directory table allows agents to advertise which protocols are understood by a probe. This is the mechanism by which management applications will control, or activate, tracking of higher layer statistics. This table is used internally to a probe to provide mapping from specific protocol stack combinations (e.g. Ethernet/IP/UDP/SNMP) to a local protocol index for use by all the statistics tables.

HP NetMetrix Solution: With full support of RMON2, the HP NetMetrix Mid-Level Manager architecture takes advantage of these mapping techniques for protocol identification. It automatically provides protocol stack mapping without the need to know in advance what the mapping needs to be.

Protocol Distribution (protocolDist)

With RMON2, Protocol Distribution may be tracked for each data source in the agent. These could be unique physical interfaces or some sort of logical interface. Protocol Distribution will accommodate multiport agents as well.

HP NetMetrix Solution: The HP NetMetrix Mid-Level Manager implementation scales to the size of an intranet with a design to support hundreds of simultaneous protocol distribution tables. In addition, HP NetMetrix provides the ability to define correlations of network metrics over time, including protocol statistics. It presents the information in easy-to-read graphs so that selected protocols and their distribution for each segment are clearly and quickly understood. This powerful capability lets the user specify the order in which metrics are correlated for countless views into network interrelationships. This is a value-added benefit of HP NetMetrix that goes beyond the availability of standards-based information made possible through RMON and RMON2.

Address mapping (addressMap)

The address mapping group indicates MAC-to-network layer address bindings. This means that statistics can be aggregated by network address as well as MAC address. Protocols must first be listed and enabled for address tracking in the Protocol Directory.

HP NetMetrix Solution: The HP LanProbes automatically provide a MAC-to-IP address mapping capability.

Network layer host and matrix data (nlHost and nlMatrix)

With RMON2, layer 3 protocols advertised by agents in the protocol directory table are available for network layer tracking. Information for every protocol at the network layer made available for probes to monitor is tracked if properly and accurately defined as table entries in advance. If a protocol has not been precisely specified in the protocol directory table, it cannot be tracked. The RMON2 network-layer tables run counters for packets and octets with both in and out metrics tracked for host entries. The availability of this data through RMON2 allows source and destination traffic to be tracked outside the broadcast domain (outside the router boundary).

HP NetMetrix Solution: HP NetMetrix offers acquisition, storage, correlation, and presentation of this information with the added benefit of its scalable Mid-Level Manager architecture. The HP NetMetrix system auto tracks protocols and precisely defines table entries, for each protocol to be tracked, in a protocol directory table. HP NetMetrix also provides the ability to define correlations of network metrics over time, including statistics by network-layer protocol for hosts and conversation pairs. This powerful capability lets the user specify the order in which metrics are correlated for countless views into network interrelationships. This is a value-added benefit of HP NetMetrix that goes beyond the availability of standards-based information made possible through RMON and RMON2.

Application layer host and matrix data (alHost and alMatrix)

With RMON2, layer 7 protocols advertised by agents in the protocol directory table are available for application layer tracking. This means that the information for every protocol at the application layer made available for probes to monitor will be tracked if properly and accurately defined as table entries in advance. If a protocol has not been precisely specified in the protocol directory table, it cannot be tracked. The RMON2 application-layer tables run counters for packets and octets with both in and out metrics tracked for host entries.

HP NetMetrix Solution: HP NetMetrix offers acquisition, storage, correlation, and presentation of this information today with the added benefit of its scalable Mid-Level Manager architecture. The HP NetMetrix system auto tracks protocols and precisely defines table entries, for each protocol to be tracked, in a protocol directory table. HP NetMetrix also provides the ability to define correlations of network metrics over time, including statistics by application-layer protocol for hosts and conversation pairs. This powerful capability lets the user specify the order in which metrics are correlated for countless views into network interrelationships. This is a value-added benefit of HP NetMetrix that goes beyond the availability of standards-based information made possible through RMON and RMON2.

MatrixTopN data (alMatrixTopN and nlMatrixTopN)

With RMON2, protocols advertised by agents in the protocol directory table are available for higher-layer tracking. This means that the information for every protocol at the application and network layer will be tracked if properly and accurately defined as table entries in advance If a protocol has not been precisely specified in the protocol directory table, it cannot be tracked. The RMON2 MatrixTopN tables provide TopN, aggregate, interval-based counters for base value (source-to-destination octets), source-to-destination addresses, and protocol for network or application-layer activity.

HP NetMetrix Solution: HP NetMetrix offers acquisition, storage, correlation, and presentation of this information today with the scalable Mid-Level Manager architecture. The HP NetMetrix system auto tracks protocols and precisely defines table entries, for each protocol to be tracked, in the protocol directory table. It automatically tracks conversation pairs at the network and application layers. HP NetMetrix also provides the ability to define correlations of network metrics over time, including TopN statistics for application-layer and network-layer information. This powerful capability lets the user specify the order in which metrics are correlated for countless views into network interrelationships. This is a value-added benefit of HP NetMetrix that goes beyond the availability of standards-based information made possible through RMON and RMON2.

User History (usrHistory)

With RMON2, User History provides a general history collection mechanism that enables the RMON2 agent to keep historical information on any statistical data available within the probe. This is an efficient method of local acquisition and storage that may contain a variety of different interval granularities and storage durations.

HP NetMetrix Solution: The HP NetMetrix Mid-Level Manager implementation automatically stores history of all counters. This information is then accumulated and correlated through the Load Monitor application of HP NetMetrix/UX offered in Enterprise Manager and Domain Manager. The Load Monitor application reveals network interrelationships through its powerful and flexible zoom correlation feature. The toolset can be applied to archived, historical information as easily as information captured for a current time period.

Agent Administration (probeConfig)

RMON2 allows management stations to set a probe's IP address and subnet mask, upgrade agent software, configure trap destinations based on event communities, and manipulate serial ports for use with SLIP.

HP NetMetrix Solution: HP defined the defacto standard for configuring data collectors, originally referred to as the “ASPEN” MIB. This configuration capability is now included in the RMON2 standard and continues to ship with all HP LanProbes. HP NetMetrix provides complete accessibility to the probe functions as itemized above. As an on-going commitment to standards-based network monitoring, upcoming HP NetMetrix software releases will support the RMON2 probeConfig MIB structure to ensure configuration and control of standards-based RMON2 agents.

For more information

HP NetMetrix applications:

HP NetMetrix/UX Product Brief
HP NetMetrix/UX Technical Specifications
HP NetMetrix/Win Product Brief
HP NetMetrix/Win Technical Specifications
HP NetMetrix WAN Monitoring

HP NetMetrix data collectors and intelligent agents:

HP NetMetrix/UX Technical Specifications

Individual Technical Specifications are available on the following:

HP Token-Ring LanProbe
HP LanProbe III/Ethernet monitor
HP LanProbe III Plus/Ethernet monitor
HP LanProbe III Plus/Ethernet-AUI monitor
HP Quad Ethernet LanProbe
HP NetMetrix Probe
HP FDDI LanProbe Family
HP NetMetrix WanProbe Family

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