

Integrated Network Monitoring

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Overview

- ❖ What is R*TIME's Integrated Network Monitoring function?
- ❖ What is covered by this presentation?

*R*TIME Integrated Network Monitoring*

- ❖ Provides the ability to:
 - ❖ acquire operational parameters and data from PPC system components via SNMP
 - ❖ save the acquired data to database points (analog and digital)

*R*TIME Integrated Network Monitoring*

- ❖ Acquired data can be used for:
 - ❖ determine the operational status of health of the monitored system component
 - ❖ monitor system performance metrics
 - ❖ provide feedback on system performance or health to system administrator personnel

*R*TIME Integrated Network Monitoring*

❖ Availability:

- ❖ R*TIME Server V 12.3 Unix / Windows
- ❖ R*TIME Server V 12.2 Windows (PINGP only – system demonstration)
- ❖ Can be added to other R*TIME Server versions as an add-on

SNMP

- ❖ R*TIME Integrated Network Monitoring uses SNMP as the communication protocol
- ❖ **ANY** PPC system component that has a network connection and provides an SNMP interface can be monitored
- ❖ Not limited to just system networking components (can be used to monitor servers, workstations, printers, etc.)

Commissioning Details

- ❖ What system components will be monitored?
 - ❖ Servers
 - ❖ Workstations
 - ❖ Printers
 - ❖ Switches
 - ❖ Serial Hubs
 - ❖ Network Transceivers

Commissioning Details

- ❖ What parameters will be monitored for each system component?
 - ❖ Parameters that indicate component or equipment degradation that indicates a possible pending failure BEFORE it becomes an equipment failure
 - ❖ Parameters that indicate loss of system redundancy BEFORE there is a lost of system functionality

Commissioning Details

- ❖ What parameters will be monitored for each system component?
 - ❖ Servers
 - ❖ CPU Utilization
 - ❖ Memory Utilization
 - ❖ Disk Space Utilization
 - ❖ Temperature
 - ❖ Power Supply Status
 - ❖ Fan Status
 - ❖ RAID Drive Status
 - ❖ NIC Performance and Status

Commissioning Details

- ❖ What parameters will be monitored for each system component?
 - ❖ Workstations
 - ❖ CPU Utilization
 - ❖ Memory Utilization
 - ❖ Disk Space Utilization
 - ❖ NIC Performance and Status

Commissioning Details

- ❖ What parameters will be monitored for each system component?
 - ❖ Switches
 - ❖ Port status, throughput and errors
 - ❖ Switch status and health
 - ❖ Link status and health

Commissioning Details

- ❖ What parameters will be monitored for each system component?
 - ❖ Printers
 - ❖ Printer status and health
 - ❖ Other Components
 - ❖ Component status and health

Commissioning Details

- ❖ What additional parameters will be derived from raw parameters received from the monitored components?
- ❖ Derived parameters that summarize a type of equipment performance or health

Commissioning Details

- ❖ What additional parameters will be derived from raw parameters for each system component?
 - ❖ Servers
 - ❖ Average CPU Utilization
 - ❖ Average Temperature
 - ❖ Composite Power Supply Status
 - ❖ Composite Fan Status

Commissioning Details

- ❖ What additional parameters will be derived from raw parameters for each system component?
 - ❖ Switches
 - ❖ Port throughput and errors
 - ❖ Switch status and health
 - ❖ Link status and health

Commissioning Details

- ❖ What additional parameters will be derived from raw parameters for each system component?
 - ❖ Printers
 - ❖ Printer status and health
 - ❖ Other Components
 - ❖ Component status and health

Commissioning Details

- ❖ How will abnormal component performance or health be indicated?
 - ❖ PPC Alarm Display?
 - ❖ Provides immediate feedback to plant personnel
 - ❖ Does not require E mail or pager access like Notification Monitoring
 - ❖ Requires monitoring be performed on the PPC servers or a downlink from the PSS

Commissioning Details

- ❖ How will abnormal component performance or health be indicated?
 - ❖ R*TIME Notification Monitor?
 - ❖ Does not require operations personnel action. Can be targeted directly to the PPC system support or administrator personnel
 - ❖ Requires E mail or pager access
 - ❖ Normally requires monitoring be performed on the PSS

*R*TIME Integrated Network Monitoring Fundamentals*

- ❖ Network Visibility
 - ❖ Component being monitored must be “network visible” from the computer doing the monitoring (direct network attachments or non routable subnets can reduce network visibility)
- ❖ Single Program Implementation
 - ❖ Supports single or multiple instances (monitoring can be segregated if desired)
- ❖ INI File Definition
- ❖ SNMP Parameters
 - ❖ SNMP Version
 - ❖ OIDs
 - ❖ Parameter scaling and conversion

INI File Parameters

❖ [CONFIG]

- ❖ One section per file
- ❖ NUM_DEVICES
 - ❖ specifies the number of detail devices sections
 - ❖ normally the number of devices to monitor unless a device is described in more than one section
- ❖ DEVICE_{xx}
 - ❖ one entry per NUM_DEVICES
 - ❖ specifies device detail section name
- ❖ FREQUENCY
 - ❖ monitoring frequency in number of seconds
 - ❖ SNMP request send to the devices at this rate
 - ❖ devices queried in device order
 - ❖ not exact, timing can be affected by unresponsive devices
- ❖ MILLISECONDS_PER_READ
 - ❖ rate in milliseconds that SYSMON looks for device SNMP responses
- ❖ MAX_READ_RETRIES
 - ❖ number of SNMP response timeouts before the device is declared non responsive
- ❖ MAX_READ_FAILS
 - ❖ Number of consecutive device non responses before a message is logged

INI File Parameters

- ❖ [DEVICENAME]
- ❖ One section per NUM_DEVICES specified in the [CONFIG] section
- ❖ Section linkage is via the DEVICExx parameter in the [CONFIG] section
- ❖ Device_Name
 - ❖ Logical device description
- ❖ Device_Status
 - ❖ Digital data point name where the device communication status is recorded
- ❖ SNMP_Version
 - ❖ SNMP version supported by the device (1 or 2)
- ❖ Community
 - ❖ SNMP community name required to communicate with the device

INI File Parameters

- ❖ [DEVICEname] (cont.)
 - ❖ StatusOnly
 - ❖ Device status flag. If non zero, only record the device status into the Device_Status point (no detail OIDs defined)
 - ❖ NUM_OIDS
 - ❖ Number of device parameters to acquire
 - ❖ OID_{xx}
 - ❖ OID to the information on the device you want to retrieve
 - ❖ POINT_NAME
 - ❖ Analog or Digital Point name to store the device information into
 - ❖ MULT_FACT
 - ❖ Device data multiplication factor
 - ❖ SHIFT_FACT
 - ❖ Device data shift factor

SNMP Parameters

- ❖ SNMP Version
 - ❖ Specified for each device in the device detail section in the INI file
- ❖ OIDs
 - ❖ Numerical number that specifies the device parameter that is being retrieved
 - ❖ Determined by reviewing the MIB file or using a tool like GETIFS
- ❖ Parameter scaling and conversion
 - ❖ Specified in the INI file and used to convert device data to different units or to convert the returned data value to acceptable ranges (i.e. convert state values from 1-4 to 0-3 for digital points)

Integrated Network Monitoring Implementation

❖ Prairie Island ERCS Background

- ❖ Unit 1 Systems
- ❖ Unit 2 Systems
- ❖ Simulator Systems
- ❖ Development Systems
- ❖ Plant Server Systems (two, each containing Unit 1 and Unit 2)
- ❖ Integrated Network (all systems connected into a single integrated network)

Integrated Network Monitoring Implementation

❖ Prairie Island ERCS Implementation

- ❖ Monitoring performed on PSS-A and PSS-B
- ❖ All other systems monitored
- ❖ Each PSS system monitors all other systems (dual monitoring)
- ❖ Monitored data stored into a separate System Monitoring database containing data for all systems (database not separated by unit like plant systems)
- ❖ System Monitoring database resident on both PSS systems (requires multiple database updates)

Integrated Network Monitoring Implementation

❖ Equipment Monitored

- ❖ Compaq DL380 server computers (14 devices total)
- ❖ Compaq D530 workstation computers (16 devices total)
- ❖ HP ColorLaser Jet 3550 printers (8 devices total)
- ❖ Cisco 3750 switches (22 devices total)
- ❖ Equinox Serial Hubs (7 devices total)

Integrated Network Monitoring Implementation

❖ Parameters Monitored

- ❖ Compaq DL-380 server computers
 - ❖ Chassis Temperature
 - ❖ 5 values per server
 - ❖ Analog values (deg F)
 - ❖ Celsius value converted to Fahrenheit
 - ❖ Fan Status
 - ❖ 8 per server
 - ❖ Digital values
 - ❖ Power Supply Status
 - ❖ 2 per server
 - ❖ Digital values
 - ❖ RAID Drive Status
 - ❖ 2 per server
 - ❖ State values (saved as analog points)

Integrated Network Monitoring Implementation

❖ Parameters Computed

- ❖ Compaq DL-380 server computers
 - ❖ Average Chassis Temperature
 - ❖ Composite Fan Status
 - ❖ Power Supply Status
 - ❖ 2 per server
 - ❖ Digital values
 - ❖ RAID Drive Status
 - ❖ 2 per server
 - ❖ State values (saved as analog points)

Integrated Network Monitoring Implementation

❖ Parameters Monitored

- ❖ Compaq D530 workstation computers

 - ❖ NIC Throughput

 - ❖ 2 ports per workstation

 - ❖ Analog values

Integrated Network Monitoring Implementation

❖ Parameters Monitored

- ❖ HP ColorLaser Jet 3550 printers
 - ❖ Black Cartridge
 - ❖ Cyan Cartridge
 - ❖ Magenta Cartridge
 - ❖ Yellow Cartridge
 - ❖ Transfer Kit
 - ❖ Fuser Kit
 - ❖ Percent Remaining
 - ❖ Analog values

Integrated Network Monitoring Implementation

❖ Parameters Monitored

❖ Cisco 3750 switches

- ❖ Port Bandwidth

- ❖ Input and Output Errors

- ❖ Input and Output Throughput

 - ❖ 28 ports per switch

 - ❖ Analog values

Integrated Network Monitoring Implementation

❖ Parameters Computed

- ❖ Cisco 3750 switches

 - ❖ Total Throughput

 - ❖ 28 ports per switch

 - ❖ Analog values

Integrated Network Monitoring Implementation

❖ Parameters Monitored

❖ Equinox Serial Hubs

❖ Network Bandwidth

❖ Network Input and Output Throughput

❖ Network Input and Output Errors

❖ Analog values

Integrated Network Monitoring Implementation

❖ Prairie Island Implementation Details

- ❖ Total Components Monitored = 105
- ❖ Total Number of Data Points = 4153
 - ❖ Analog points = 3792
 - ❖ Digital points = 361
- ❖ Total Number of Computed Points = 754
- ❖ Total Number of Alarmed Points = 416
- ❖ Total Number of INI File Lines = 16430

Integrated Network Monitoring Implementation

❖ Implementation Issues

❖ Monitored Parameters

- ❖ Parameters available depend upon the OEMs implementation of the SNMP interface. Can vary widely from manufacturer to manufacturer
- ❖ MIB files not always provided and sometimes are not standards compliant
- ❖ Many times must monitor detailed information to verify equipment health

❖ OID numbering

- ❖ Not standardized from server manufacturer to server manufacturer, even for identical parameters
- ❖ Can differ depending upon OEM model or software / firmware version

Integrated Network Monitoring Implementation

❖ Implementation Issues

❖ Lots of Configuration Required

- ❖ Cut and Paste of INI files and Database points can be error prone

- ❖ INI file becomes large very fast

- ❖ Notification Monitoring required for maximum benefit – brings firewall configuration issues in play

Version 2.0 Implementation

- ❖ GUI interface for:
 - ❖ OID selection
 - ❖ database point selection / creation
 - ❖ INI file entry definition
 - ❖ Notification Monitoring interface
- ❖ Named equipment library (define one, reuse many)
- ❖ Others?