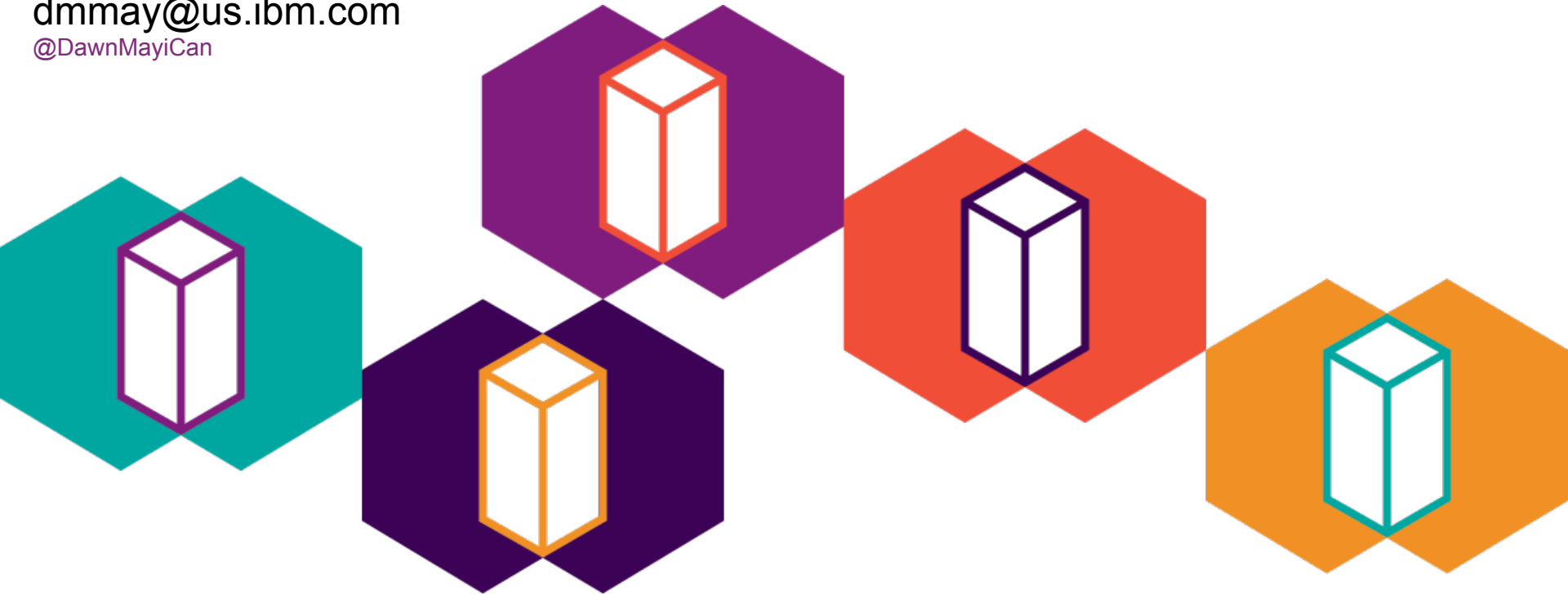


Predictive Performance Management

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@DawnMayiCan





Predictive Performance Management

Session Abstract

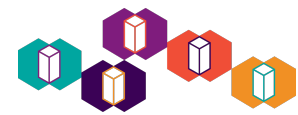
Can the past predict the future? What about the present - right here and now? And if you know the past, and can predict the future, how can you determine the impact to your applications?

Performance management on IBM i has proactive monitoring features and historical data capabilities, as well as application performance modeling. Attend this session to learn how you can use monitoring to identify and resolve potential issues before they become actual problems, learn about historical performance data and how you can use the past trends to plan for the future, and application modeling to understand what hardware changes will mean to your applications.

Learning Objectives:

In this presentation, you will learn about the following:

- Real time performance monitoring to identify potential problems before they become real problems
- Historical data and how you can understand your performance trends over time and predict future needs
- Batch modeling to understand the impact of hardware changes on your batch applications



Why Predictive Performance Management?



Who wants to react to **unexpected situations**?



Being **proactive** can help you prevent small problems from becoming big ones



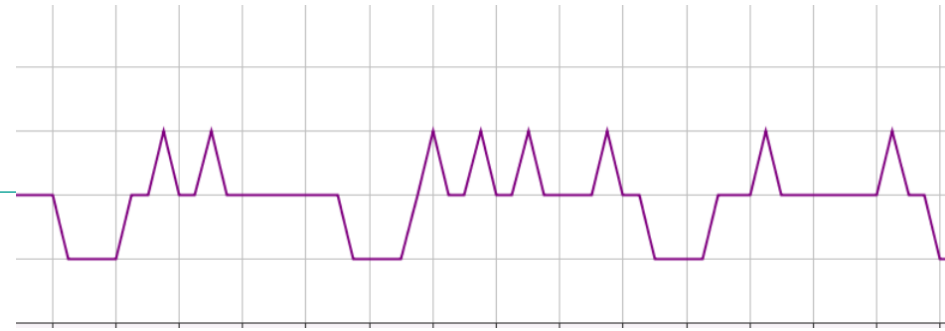
Being **predictive** can help you prevent even small problems

Proactive versus Reactive

- Prevent *potential* problems before they become real problems
 - Understand system performance in **real-time**
 - What is consuming CPU, memory, or disk?
 - **Automatically** notify an operator when a condition is detected
 - Know **immediately** when a message is sent
 - Understand past **trends** to predict the future



Agenda



- **Proactive Monitoring**

- Dashboard
- System Monitors with Navigator for i
- Performance Tasks - Performance Data Investigator
 - Health Indicators
- Watches
- Monitor system limits with IBM i Services

- **Historical Trending** with Graph History

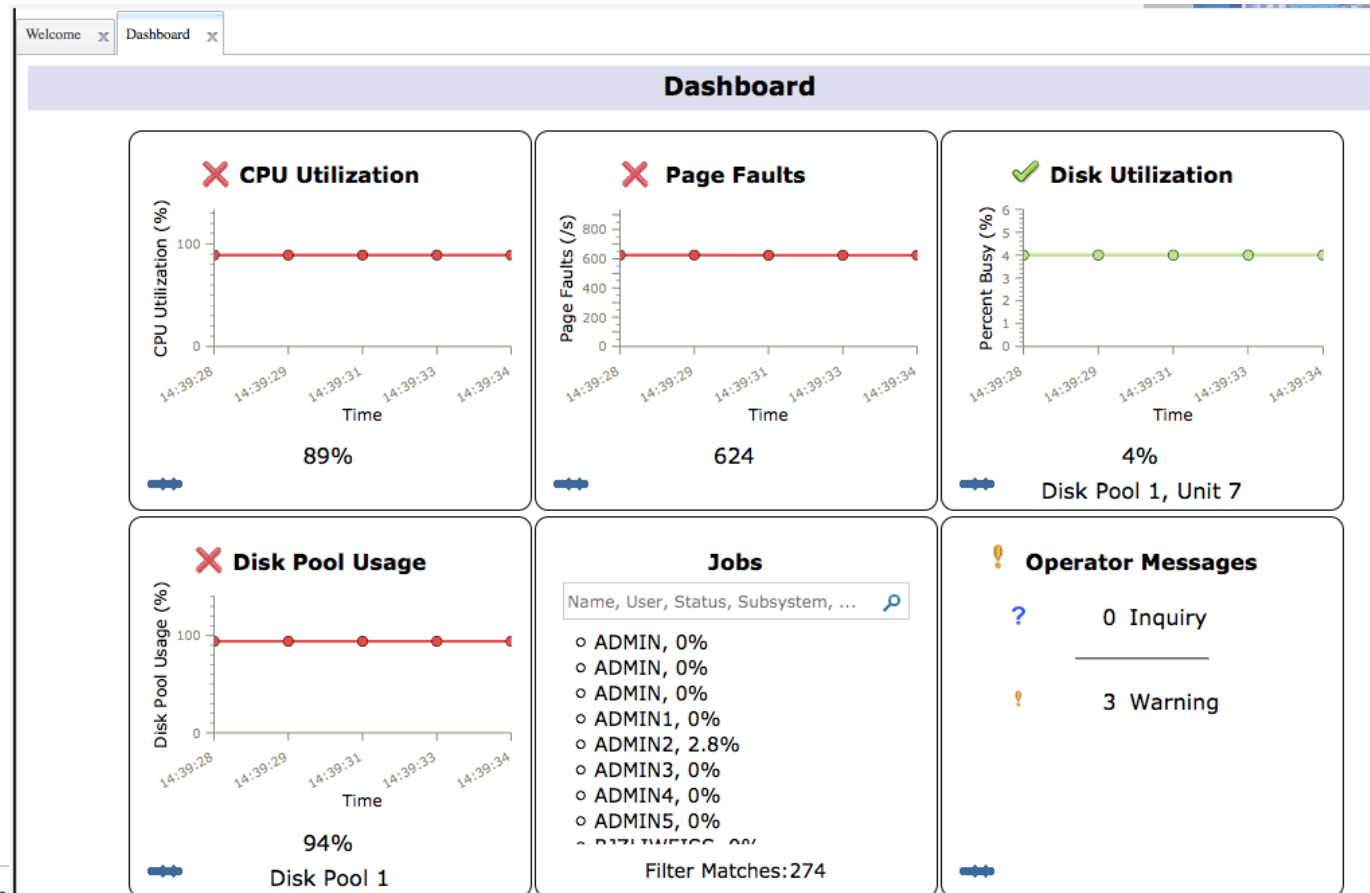
- **Application modeling** with Batch Model

Dashboard

Dashboard

- Initial display when you sign in with Navigator (*until March 2017*)
- Also available with iAccess Mobile

- Key metrics updated in real time
- Set thresholds to *visualize* potential issues



Configurable intervals and thresholds

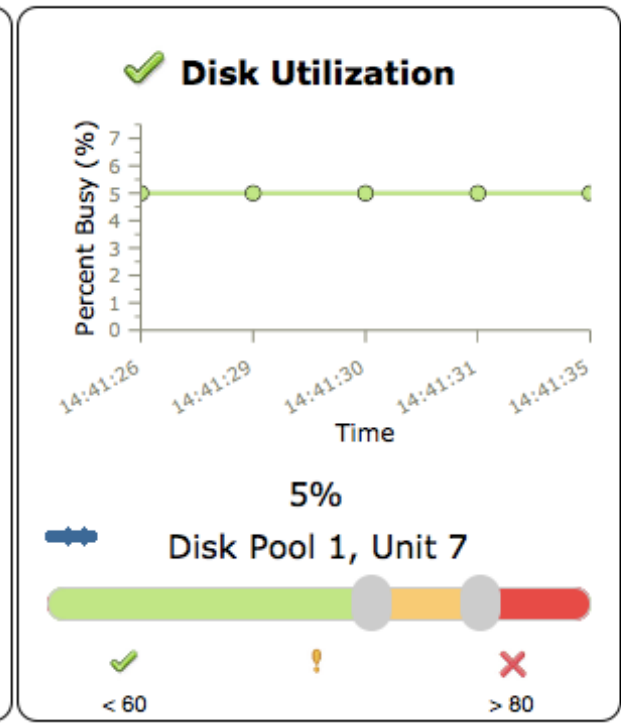
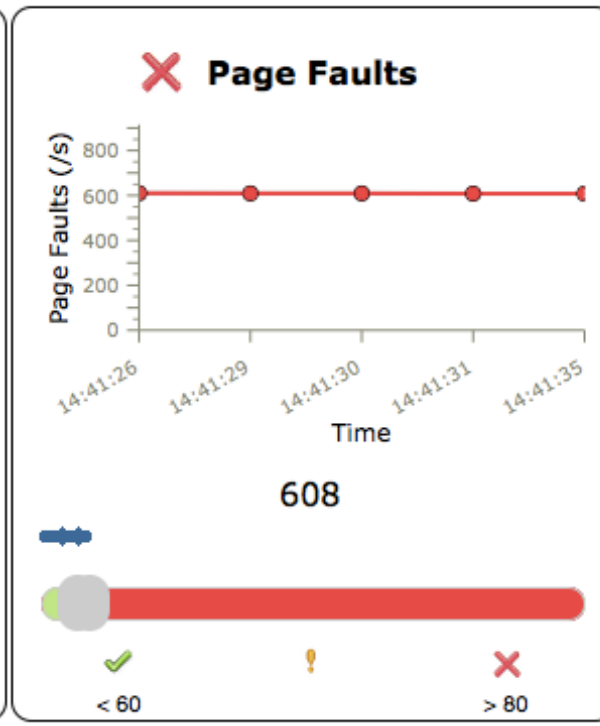
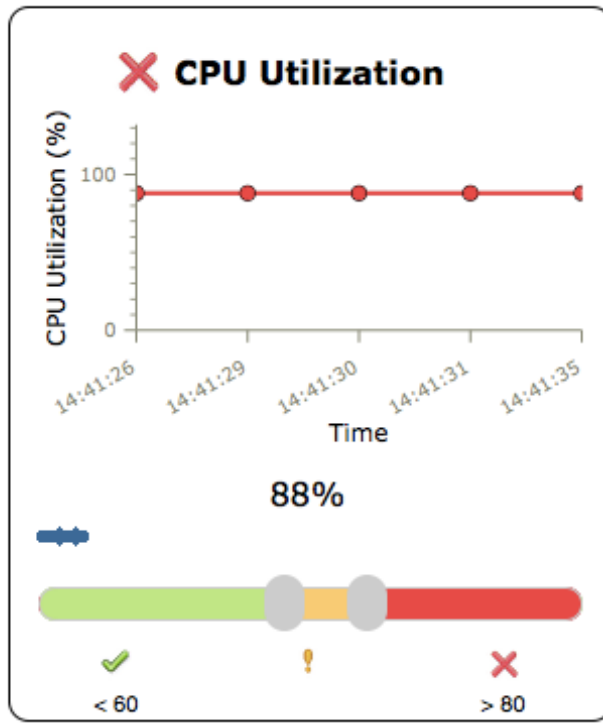
Welcome x Dashboard x

Dashboard ▼

Auto

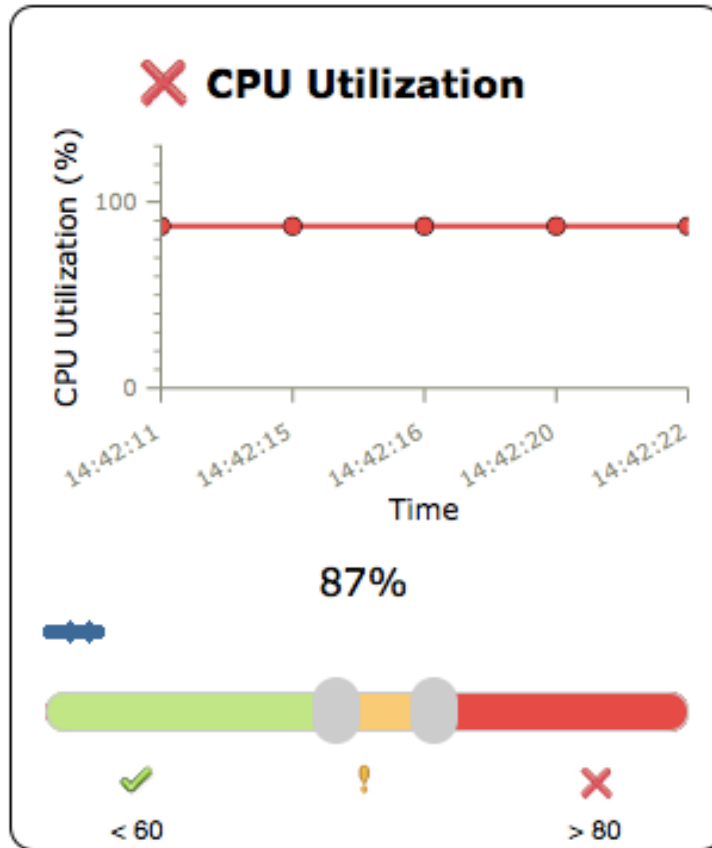
Interval: Duration:

Stop Reset





Basic drill-down - CPU Utilization



Top Jobs

1. TESTPACK, 38.1%	▼
Job: TESTPACK	
User: DFL	
Number: 025336	
Status: RUN	
Function: PGM-TESTPACK	
Current User: DFL	
Subsystem: QINTER	
2. QZRCRVS, 24%	>
3. ADMIN2, 2.8%	>
4. CRTPFRTA2, 0.6%	>
5. QZRCRVS, 0.6%	>
6. QZLSFILET, 0.4%	>

Jobs - search and drill-down

Jobs

dawnmay 🔍

- QZDASOINIT, 0%
- QZDASOINIT, 0%
- QZDASOINIT, 0%
- QZRCSRVS, 0.6%

Filter Matches:4

Jobs

Filter: dawnmay

- QZDASOINIT, 0% ➤
- QZDASOINIT, 0% ➤
- QZDASOINIT, 0% ➤
- QZRCSRVS, 0.6% ▼

Job: QZRCSRVS

User: QUSER

Number: 041924

Status: RUN

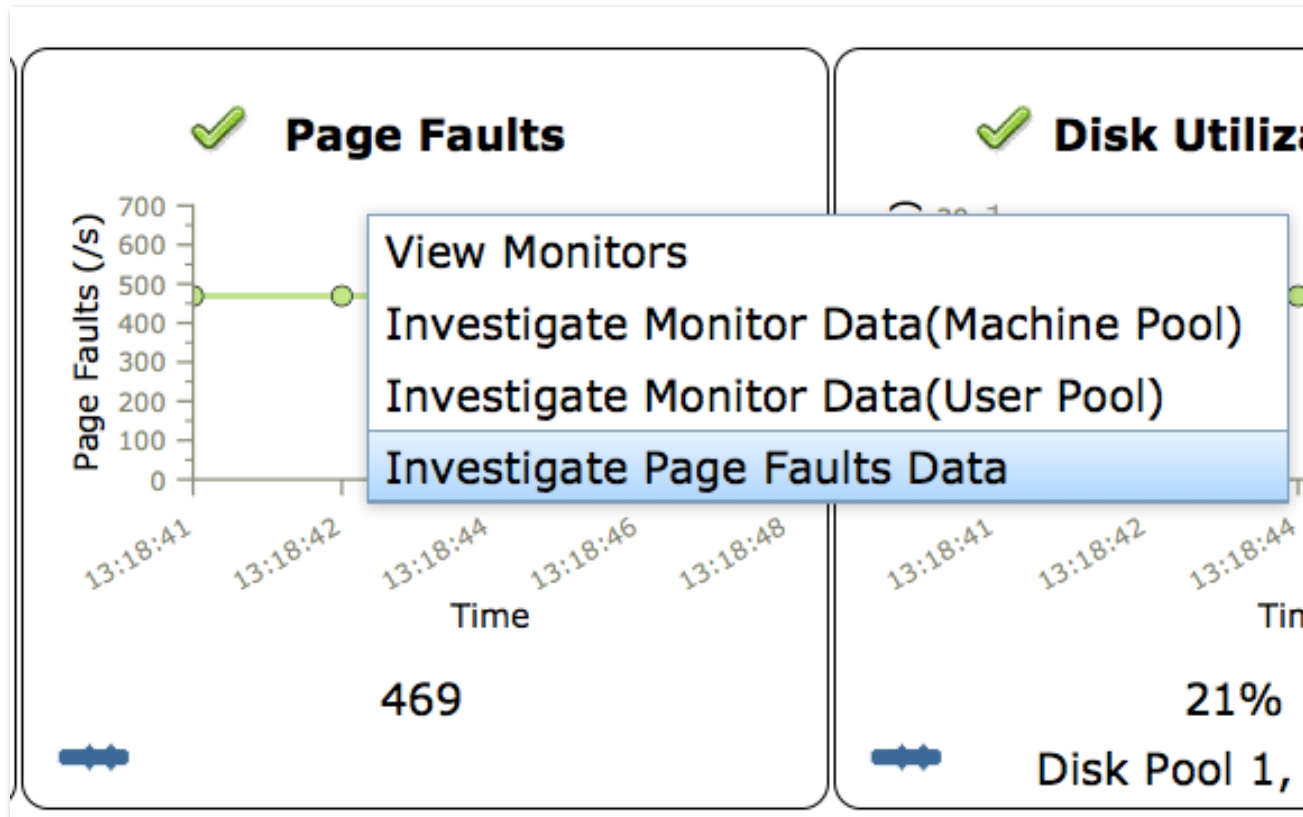
Function:

Current User: DAWNMA Y

Subsystem: QUSRWRK

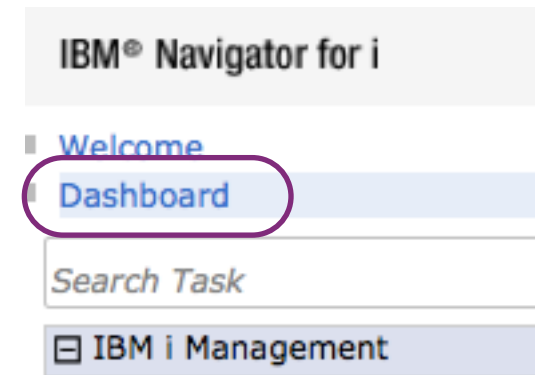


Drill-down to System Monitors and Investigate Data



Dashboard - Recent Changes

- December 2016 Update
 - Changed the defaults to minimize overhead
 - **Interval** - the frequency at which a snapshot of system activity is reported
 - **60s**
 - **Duration** - length of time data is collected during the interval
 - **5s**
- March PTF coming soon....
 - Default will be to NOT show the dashboard
 - Performance improvements

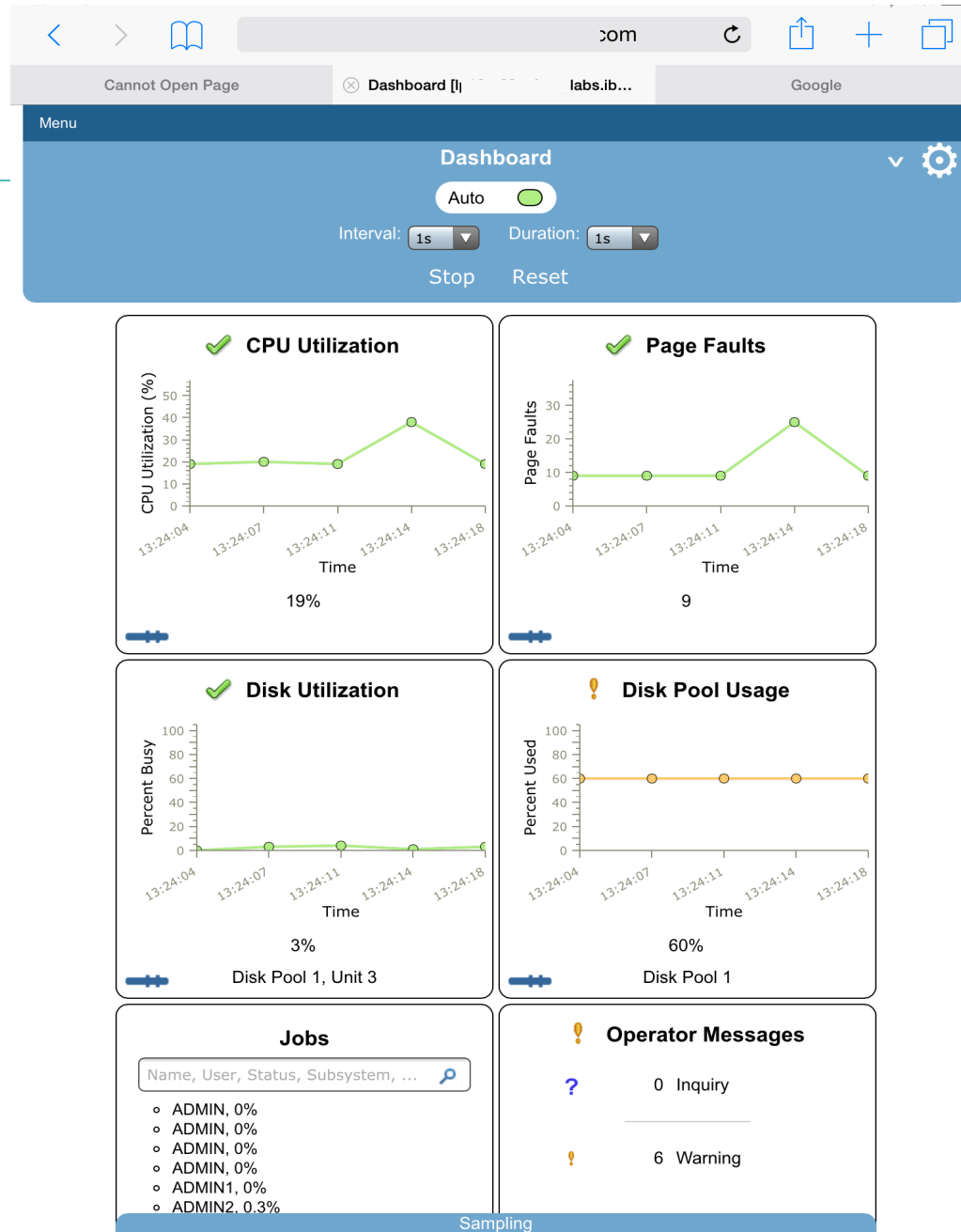


iAccess Mobile Dashboard

View from your favorite mobile device

- Phone
- Tablet

<http://system.name:2001/iamobile>



Navigator Monitors

Navigator Monitors

- Monitors
 - System Monitors
 - Message Monitors

- System Monitors
- Message Monitors
- Single partition only**
- Custom event actions

Configure Metric

CPU Utilization (Average)

Collection Interval: 60 Seconds

Threshold1

Enable Threshold

Trigger: \geq 20 Percent

Duration: 5 Intervals

Operating System Command: SNDMSG MSG('Thresh Prompt...

Reset: < 0 Percent

Duration: 1 Intervals

Add A Message Set

Add a predefined set of messages:
 Add a user defined set of messages:

Message ID: All

Message Type: All

Severity: \geq 0

Reply With: Use entry from bel

OK Cancel

Create New System Monitor

Metrics

Available Metrics:

- Metrics
- Transaction Rate (Interactive)
- Spool File Creation Rate
- Machine Pool Faults Rate
- User Pool Faults Rate (Average)
- User Pool Faults Rate (Maximum)
- CPU Utilization (Average)
- CPU Utilization (SQL)
- Shared Processor Pool Utilization (Physical)
- Shared Processor Pool Utilization (Virtual)
- Temporary Storage Utilization
- CPU Utilization (Uncapped)

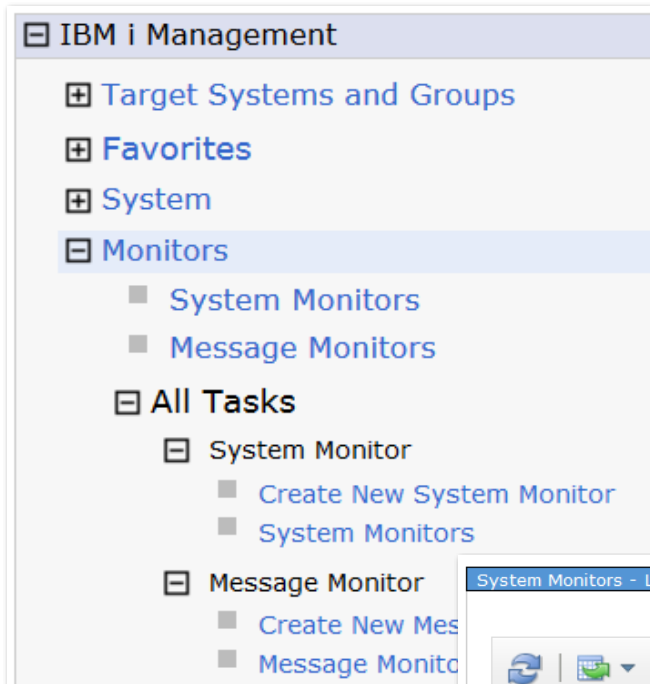
Metrics to monitor:

- Metrics
- Disk Response Time (Read)
- Disk Response Time (Write)

Add > < Remove

< Back Next > Finish Cancel

Monitors with IBM Navigator for i



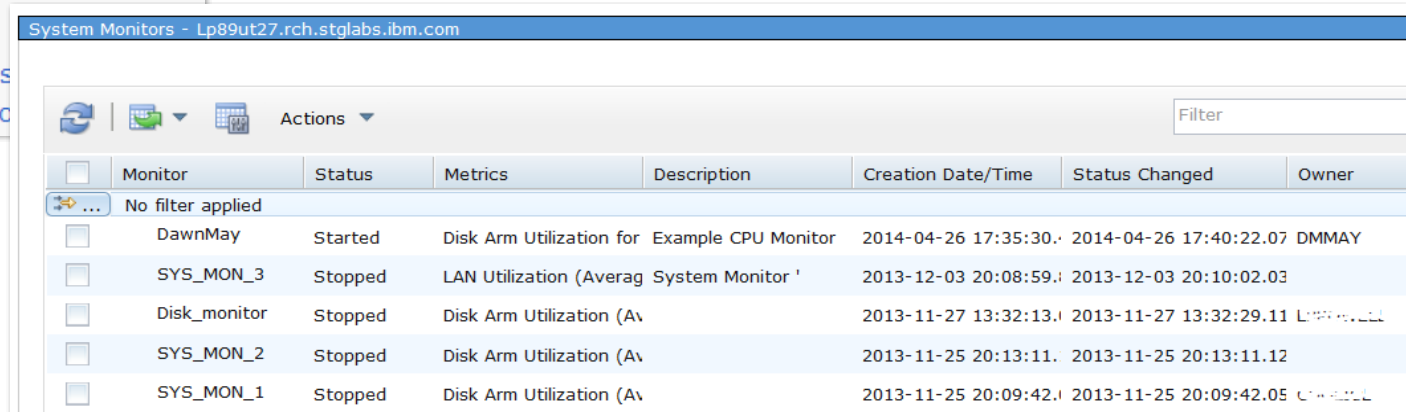
Select **what** you want to monitor

Set monitoring **intervals**

Set **thresholds**

Define **actions** taken when a threshold is reached

Manage **event logs**



Monitor	Status	Metrics	Description	Creation Date/Time	Status Changed	Owner
No filter applied						
DawnMay	Started	Disk Arm Utilization for	Example CPU Monitor	2014-04-26 17:35:30.0	2014-04-26 17:40:22.07	DMMAY
SYS_MON_3	Stopped	LAN Utilization (Averag	System Monitor '	2013-12-03 20:08:59.0	2013-12-03 20:10:02.03	
Disk_monitor	Stopped	Disk Arm Utilization (Av		2013-11-27 13:32:13.0	2013-11-27 13:32:29.11	LP89UT27
SYS_MON_2	Stopped	Disk Arm Utilization (Av		2013-11-25 20:13:11.0	2013-11-25 20:13:11.12	
SYS_MON_1	Stopped	Disk Arm Utilization (Av		2013-11-25 20:09:42.0	2013-11-25 20:09:42.05	LP89UT27

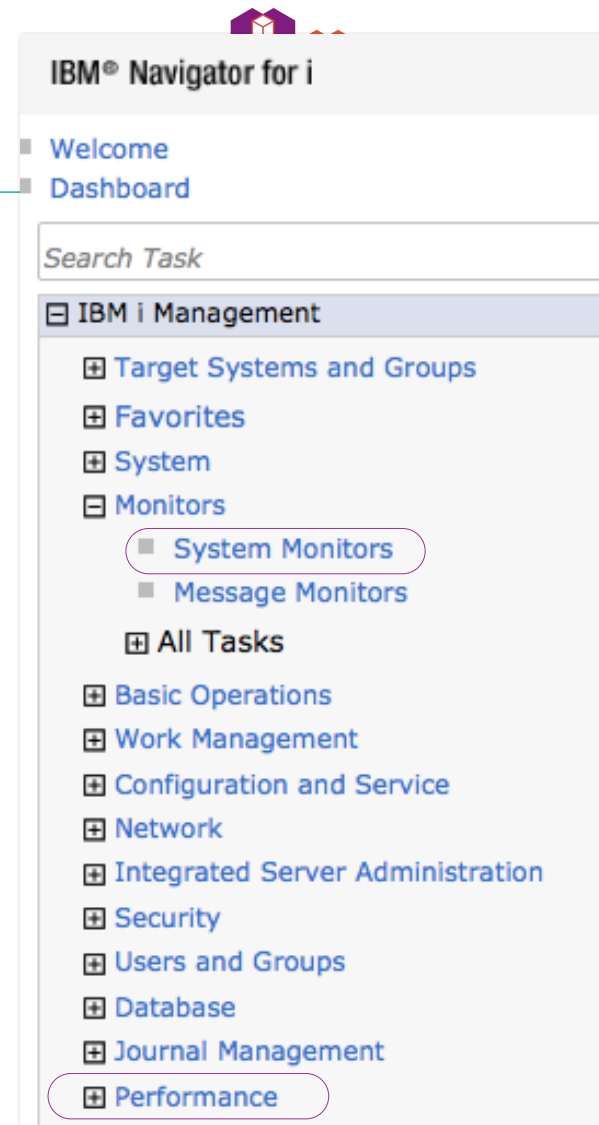
List of system monitors on the system

Monitoring with System Monitors

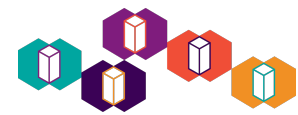
- System Monitors gather and present **real-time performance** data
 - Monitor the health of your system
 - Identify *potential* performance problems before they become *serious* issues
- System Monitors show **high-level** performance information
 - Navigator's System Monitors use the Performance Data Investigator to visualize and provide drill-down capabilities
 - Management Central System Monitors have basic levels of detail
- **Thresholds** can be defined to trigger an **action** when a system wide performance metric exceeds the defined “comfort level”
 - For example, when CPU Utilization exceeds 80%, send a message to notify the operator
- System Monitors provide powerful capabilities to monitor what is happening on your system
 - BUT finding out what caused the problem often requires other performance analysis tools

System Monitors

- System Monitor support in **IBM Navigator for i**
 - Configure and Manage Monitors
 - New Monitors task
 - System Monitors subtask
 - Display System Monitor Metrics
 - In Performance Data Investigator
 - Configure Collection Services GUI support
 - under Performance task



Start IBM Navigator for i - Point your browser to <http://systemName:2001>



System Monitors with IBM Navigator for i

Functions

- Configure a new system monitor
- Change a system monitor configuration
- Delete a system monitor
- Start/Stop a system monitor
- Create a new monitor based on an existing monitor
- Capture events and trigger actions when a threshold is reached
- List an event log of a selected system monitor
- List all event logs of all system monitors
- Display an event log properties
- Delete an event log
- Investigate monitor data using PDI
- Visualize monitor data (added in 7.3, now available on 7.2 as well)



Authority Needed to Manage Monitors

Authority for Navigator

- *ALLOBJ or QINAVMNTR authorization list with *ALL authority is required to:
 - Configure a new monitor
 - Create new based on an existing monitor
 - Change a monitor configuration - and must also be the owner of the monitor
 - Delete a monitor - and must also be the owner of the monitor
 - Start/Stop a monitor - and must also be the owner of the monitor
- View an existing monitor configuration - anyone
- List an event log of a selected system monitor - anyone
- List all event logs of all system monitors - anyone
- Display an event log properties - anyone
- Delete an event log entry - owner of the monitor
- Investigate system monitor data using PDI
 - *ALLOBJ or QPMCCDATA authorization list with *USE authority
- Visualize system monitor data (added in 7.3, now available on 7.2 as well)
 - *ALLOBJ or QPMCCDATA authorization list with *USE authority



Create New System Monitor

- Monitors
 - System Monitors
 - Message Monitors
- All Tasks
 - System Monitor
 - Create New System Monitor
 - System Monitors
 - Message Monitor

System Monitors - Lp8 s.ibm.com

Actions

- Create New System Monitor...
- Event Log
- Save as Favorite
- Refresh
- Advanced Filter
- Export
- Configure Options

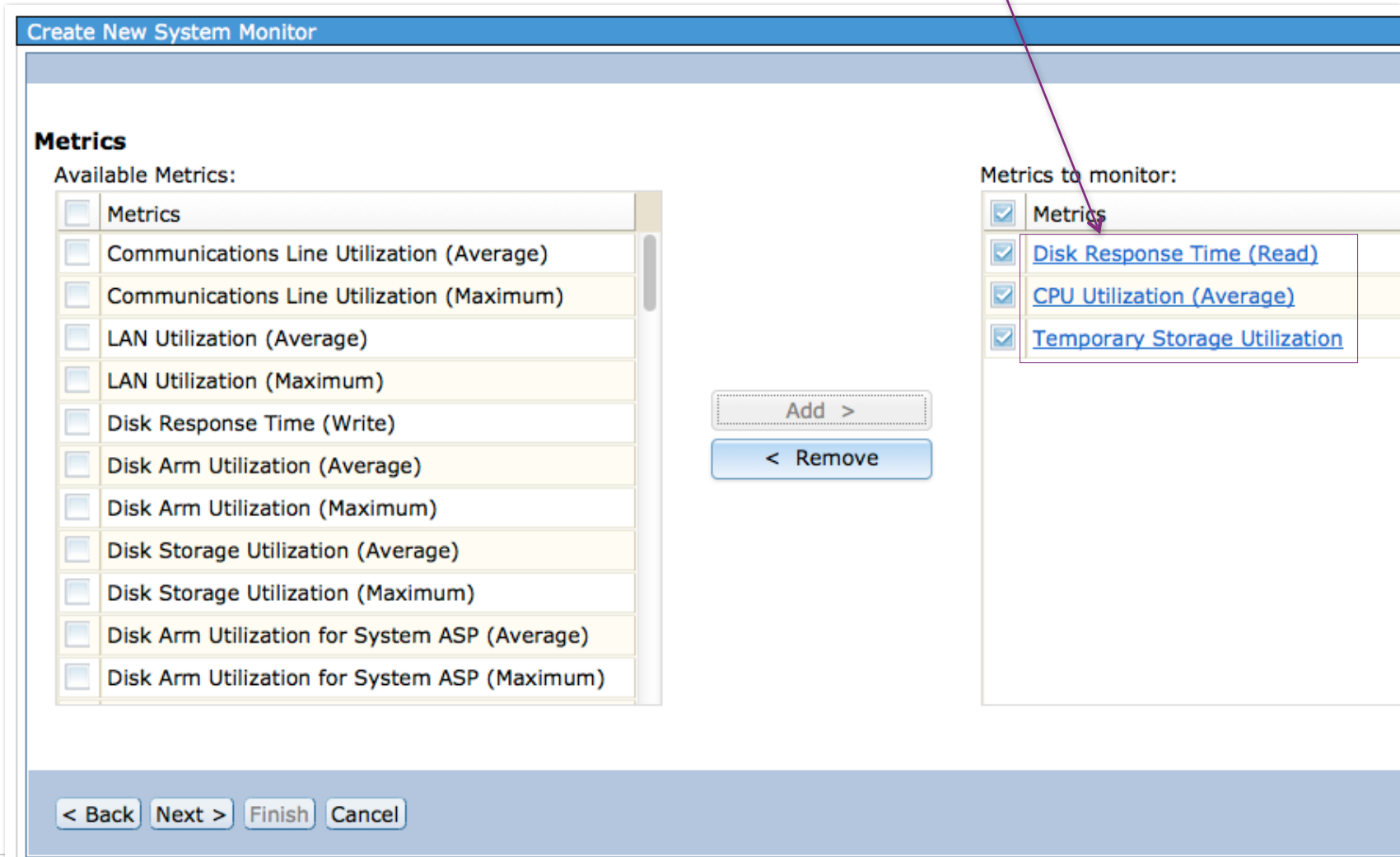
Monitor
No filter applied
<input type="checkbox"/> SYS_MON_3
<input type="checkbox"/> Disk_monitor
<input type="checkbox"/> SYS_MON_2
<input type="checkbox"/> SYS_MON_1

Set Monitor General Information

*General	*Name	DawnMay
Metrics	Description	Example System Monitor
Summary		

Metrics to Monitor

Links to configure thresholds and actions



The screenshot shows the 'Create New System Monitor' interface. It is divided into two main sections: 'Available Metrics' on the left and 'Metrics to monitor' on the right. In the center, there are 'Add >' and '< Remove' buttons. At the bottom, there are navigation buttons: '< Back', 'Next >', 'Finish', and 'Cancel'. A callout box with an arrow points to the 'Disk Response Time (Read)' link in the 'Metrics to monitor' list.

Available Metrics:	Metrics to monitor:
<input type="checkbox"/> Metrics	<input checked="" type="checkbox"/> Metrics
<input type="checkbox"/> Communications Line Utilization (Average)	<input checked="" type="checkbox"/> Disk Response Time (Read)
<input type="checkbox"/> Communications Line Utilization (Maximum)	<input checked="" type="checkbox"/> CPU Utilization (Average)
<input type="checkbox"/> LAN Utilization (Average)	<input checked="" type="checkbox"/> Temporary Storage Utilization
<input type="checkbox"/> LAN Utilization (Maximum)	
<input type="checkbox"/> Disk Response Time (Write)	
<input type="checkbox"/> Disk Arm Utilization (Average)	
<input type="checkbox"/> Disk Arm Utilization (Maximum)	
<input type="checkbox"/> Disk Storage Utilization (Average)	
<input type="checkbox"/> Disk Storage Utilization (Maximum)	
<input type="checkbox"/> Disk Arm Utilization for System ASP (Average)	
<input type="checkbox"/> Disk Arm Utilization for System ASP (Maximum)	

Navigator - System Monitor Metrics

- CPU Utilization (Average)
- CPU Utilization (Interactive Jobs)
- CPU Utilization(Uncapped)
- CPU Utilization(SQL)
- Interactive Response Time (Average and Maximum)
- Transaction Rate (Interactive)
- Batch Logical Database I/O
- Disk Response Time (Read)
- Disk Response Time (Write)
- Disk Arm Utilization (Average and Maximum)
- Disk Arm Utilization for User/System/Independent ASP (Average and Maximum)
- Disk Storage Utilization (Average and Maximum)
- Disk Storage Utilization for User/System/Independent ASP (Average and Maximum)
- Communications Line Utilization (Average and Maximum)
- LAN Utilization (Maximum and Average)
- Machine Pool Faults
- User Pool Faults (Maximum and Average)
- Spool File Creation Rate
- Shared Processor Pool Utilization (Virtual and Physical)
- Temporary Storage Utilization
- HTTP Server Metrics
 - HTTP Requests Received Rate
 - HTTP Requests Received (Maximum)
 - HTTP Responses Sent Rate
 - HTTP Responses Sent (Maximum)
 - HTTP Non-Cached Requests Processed (Average and Maximum)
 - HTTP Error Responses Sent (Average and Maximum)
 - HTTP Non-Cached Requests Processing Time (Total and Highest Average)
 - HTTP Cached Requests Processing Time (Total and Highest Average)



System Monitor Metrics – page 1

Metric Groups	Metric Description
CPU Utilization	<p>The percentage of available processing unit time consumed by jobs on your system. Choose from the following types of CPU Utilization metrics for use in your monitors:</p> <ul style="list-style-type: none">• CPU Utilization (Average)• CPU Utilization (Interactive Jobs)• CPU Utilization(Uncapped)• CPU Utilization(SQL)
Interactive Response Time (Average and Maximum)	<p>The response time that interactive jobs experience on your system.</p>
Transaction Rate (Interactive)	<p>The number of transactions per second completed on your system by interactive (Job type = 'I') jobs.</p>
Batch Logical Database I/O	<p>The average number of logical database input/output (I/O) operations currently performed by batch (Job type = 'B') jobs on the system.</p>
Disk Arm Utilization (Average, Maximum and System ASP)	<p>The disk unit busy percent.</p>
Disk Storage (Average, Maximum and System ASP)	<p>The percentage of disk arm storage that is full on your system during the time you collect the data.</p>
Communications Line Utilization (Average and Maximum)	<p>The amount of data that was actually sent and received on all your system communication lines.</p>
LAN Utilization (Average and Maximum)	<p>The amount of data that was actually sent and received on all your local area network (LAN) communication lines.</p>



System Monitor Metrics – page 2

Metric Groups	Metric Description
Machine Pool Faults	The number of faults per second occurring in the machine pool on the system.
User Pool Faults (Average and Maximum)	The total amount of temporary storage (megabytes) in use within the system. This includes both system and user temporary storage.
Spool File Creation Rate	The number of spool files being created per second.
Temporary Storage Utilization	The utilization percent of temporary storage by the system.
Shared Processor Pool Utilization (Virtual and Physical)	<p>Virtual shared pool CPU percent. The amount of CPU consumed in the virtual shared pool by all part ions using the pool relative to the CPU available within the pool.</p> <p>Physical shared pool CPU percent. The amount of CPU consumed in the physical shared pool by all part ions using the pool relative to the CPU available within the pool.</p>



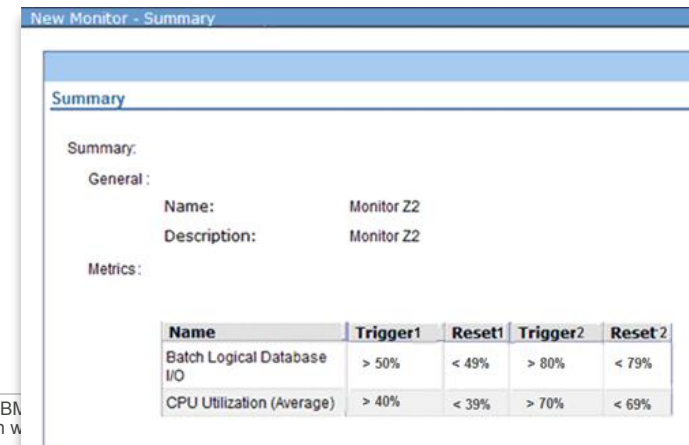
System Monitor Metrics – page 3

Metric Groups	Metric Description
Disk Response Time (Read and Write)	The response time that disk units experienced on your system.
HTTP Requests Received Rate	The number of requests received per second for all HTTP servers.
HTTP Requests Received (Maximum)	The largest number of HTTP requests received by a single server.
HTTP Responses Sent Rate	The number of responses sent per second for all HTTP servers.
HTTP Responses Sent (Maximum)	The largest number of HTTP responses sent by a single server.
HTTP Non-Cached Requests Processed (Average and Maximum)	The number of non-cached requests processed for HTTP servers.
HTTP Error Responses Sent (Average and Maximum)	The number of error responses sent for HTTP servers.
HTTP Non-Cached Requests Processing Time (Total and Highest Average)	The processing time for non-cached requests for HTTP servers.
HTTP Cached Requests Processing Time (Total and Highest Average)	The processing time for cached requests for HTTP servers.

Configure Metric - Thresholds

- **Threshold** - A setting for a metric that is being collected by a monitor
 - Allows you to specify **actions** to be taken when:
 - a specified value (called the **trigger** value) is reached
 - a second value (called the **reset** value) is reached
 - Up to two **thresholds** may be defined for each metric that the monitor is collecting
 - For example, warning and critical levels
 - An **event** is added to the Event Log whenever the trigger value or the reset value is reached.
- **Trigger**
 - Bad condition (usually high but can be low)
- **Reset**
 - Good condition (opposite of trigger)

When a threshold is reached, IBM Navigator for i captures the event and executes actions.



The screenshot shows the 'New Monitor - Summary' window. It displays the following configuration:

Summary

Summary:

General:

Name: Monitor Z2
Description: Monitor Z2

Metrics:

Name	Trigger1	Reset1	Trigger2	Reset 2
Batch Logical Database I/O	> 50%	< 49%	> 80%	< 79%
CPU Utilization (Average)	> 40%	< 39%	> 70%	< 69%

Configure Metric - Thresholds

- **Threshold** - settings, continued...
 - **Duration**
 - Specify how long (in terms of collection intervals) the condition must occur before the action is taken
 - Operating System **Command**
 - This is the **action** to be taken when the threshold is hit
 - Can be any command that can run in batch
 - There's a command named CALL where you can call a program to take whatever action you wish
 - The command is run in a job under the **user profile that created the monitor**

Configure Metric

Configure Metric

Configure Metric

CPU Utilization (Average)

Collection Interval: 60 Seconds

Threshold1

Enable Threshold

Trigger: >= 50 Percent

Duration: 10 Intervals

Operating System Command: tor &MON exceeded th Prompt...

Reset: < 49 Percent

Duration: 1 Intervals

Operating System Command: Prompt...

Threshold2

Enable Threshold

Trigger: >= 80 Percent

Duration: 5 Intervals

Operating System Command: ded threshold &TVAL f Prompt...

Reset: < 79 Percent

Duration: 1 Intervals

Operating System Command: Prompt..

Metric name

Collection Interval

Threshold 1 & 2

Collection Interval Considerations

- The default collection interval on 7.3 is 60 seconds
 - SI59042 & SI59043
- The default collection interval on 7.2 was **15 seconds**
 - **Be careful!!!**
 - 15 second intervals will generate **large monitor collections**
 - 2GB daily on relatively inactive partition
 - Recommend using **60 second** intervals
 - **7.2 update in June 2016 changed the default to 60 seconds**
 - Manual steps to recover if you used 15 second intervals



Configure Metric		
CPU Utilization (Average)		
Collection Interval	60	Seconds



Cleaning up too small system monitor intervals

- Once the 15 second interval is used, system monitor data will always be collected at 15 seconds
- Manual cleanup / reconfiguration to recover
 1. Change the system monitor properties to use a larger collection interval
 2. Configure collection services to change the intervals

Configure Collection Services

General
Data to Collect
Data Retention
System Monitor Categories
Historical Data

System Monitor Categories

Use default system monitor categories
 Customize system monitor categories

Available categories:

- Category
- APPN
- Communications (station)
- Communications (SAP)
- IBM Domino for i
- Data port services
- External storage
- Input/output processors (base)
- Network server
- Java
- Local response time
- Logical partition

Add >
< Remove
Add Defaults >>
<< Remove All

Categories to collect:

Category	Frequency
<input type="checkbox"/> Memory pool	Every 15 seconds
<input type="checkbox"/> Jobs (operating system)	Every 15 seconds
<input type="checkbox"/> Disk storage	Every 30 seconds
<input type="checkbox"/> Communications (base)	Every 1 minute
<input type="checkbox"/> System-level data	Every 5 minutes
<input type="checkbox"/> Jobs (MI tasks and threads)	Every 15 seconds
<input type="checkbox"/> IBM HTTP Server for i (powered by Apache)	Every 1 minute
<input type="checkbox"/>	Every 15 seconds

Double-click in the Frequency column to edit the interval

IBM i Navigator System Monitors: Collection Interval

Configure Metric Examples

Configure Metric

Machine Pool Faults Rate

Collection Interval: Seconds

Threshold1

Enable Threshold

Trigger: Faults per Second

Duration: Intervals

Operating System Command:

Reset: Faults per Second

Duration: Intervals

Operating System Command:

Threshold2

Enable Threshold

Trigger: Faults per Second

Duration: Intervals

Operating System Command:

Reset: Faults per Second

Duration: Intervals

Operating System Command:

Configure Metric

Temporary Storage Utilization

Collection Interval: Seconds

Threshold1

Enable Threshold

Trigger: Percent

Duration: Intervals

Operating System Command:

Reset: Percent

Duration: Intervals

Operating System Command:

Threshold2

Enable Threshold

Trigger: Percent

Duration: Intervals

Operating System Command:

Reset: Percent

Duration: Intervals

Operating System Command:

Command Prompt

Basic

Send Message (SNDMSG)

File View Help

Message text: Character value

To user profile: Name

Advanced

Send Message (SNDMSG)

File View Help

Message text: Character value

To user profile: Name

Advanced Parameters

To message queue: Name

Library: Name

Message type:

Message queue to get reply: Name

Library: Name

System Monitor Replacement Variables

- Replacement variables are available to customize your actions to the specific metric and values
 - These replacement variables can be used on the IBM i command

- Rather than just

```
SNDMSG MSG("Threshold triggered") TOUSR(*SYSOPR)
```

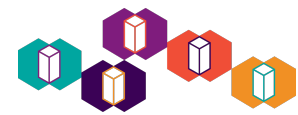
```
IBM Tivoli Directory Server Instance Q0SRDIR started
From . . . : DMMAY 04/13/15 20:42:16
Threshold triggered
```

- You can use replacement variables

```
SNDMSG
```

```
MSG('Monitor &MON exceeded threshold &TVAL for &TDUR interval(s); current
value is &VAL.') TOUSR(*SYSOPR)
```

```
current value is 20.40. ) ;TOUSR(*SYSOPR)
From . . . : DMMAY 04/13/15 20:49:15
'Monitor DawnMayDemo exceeded threshold 1 for 1 interval(s); current
value is 3.15.'
```



System Monitor Replacement Variables

System Monitor Replacement Variables:

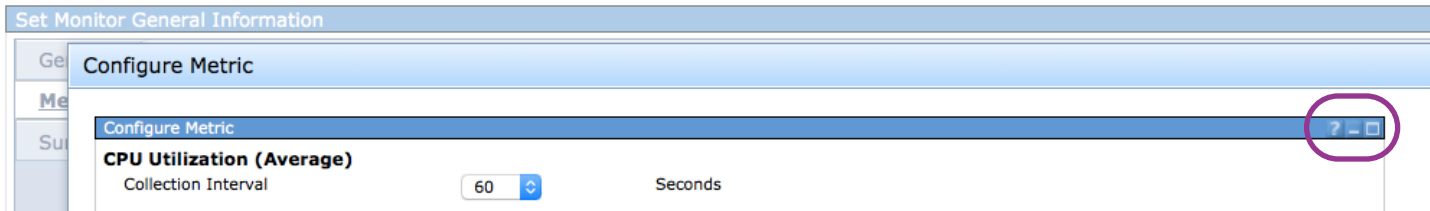
Parameter	Passed Data
&DATE	The Date the monitor triggered or reset
&INTVL	Collection interval: How often the monitor collected data (in seconds)
&MON	The Monitor name
&RDUR	Reset duration: How many intervals does the reset value have to be met before the monitor resets.
&RVAL	Reset value: The value that the metric was monitoring for when the monitor reset
&SEQ	Sequence number: A unique, incrementing number assigned to each collection interval. Can be used in a program to compare when triggers happened and in what sequence.
&TDUR	Trigger duration: How many intervals does the trigger value have to be met before the monitor triggers
&TIME	The time the monitor triggered or reset
&TVAL	Trigger value: The value that the metric was monitoring for when the monitor triggered
&VAL	Current value: The actual value of the metric when the monitor triggered (2)

(2)

- Batch I/O is shown as I/O operations rather than transactions per second
- Transaction rates are shown as transactions rather than transactions per second
- Interactive response times (both average and maximum) are shown in milliseconds rather than seconds

Documentation on Replacement Variables

- Replacement variables are documented in the Navigator help, not in the Knowledge Center
- From the **Configure Metric** panel, click the question mark



- Drill down:
Threshold trigger and Threshold reset → Parameters for operating system command

Parameters for operating system command

You can use the following parameters for the operating system command:

Parameter	Passed Data
&DATE	Date
&ENDPOINT	Endpoint system name
&INTVL	Collection interval
&MON	Monitor name
&RDUR	Reset duration
&RVAL	Reset value
&SEQ	Sequence number
&TDUR	Trigger duration
&TIME	Time
&TVAL	Trigger value
&VAL	Current value(See note 4)

Notes:

Send email as a monitor action



- It is very easy to send email from IBM i
- Add the sending user profile name to the SMTP Local Mailbox Directory
 - ADDUSRSMTMP
- Use SNDSMTPEMM command to send the email
- `SNDSMTPEMM RCP(dmmy@us.ibm.com) SUBJECT('Monitor &MON triggered.') NOTE('Monitor &MON has CPU Utilization under the low value of &TVAL for &TDUR interval(s). Current value is &VAL.')`



Monitor DawnMay triggered.

dmmy to: Dawn May

Monitor DawnMay has CPU Utilization under the low value of 5 for 1 interval(s). Current value is 2.3.



System Monitor Summary

Set Monitor General Information

General	General				
Metrics	Name: DawnMay Description: Example System Monitor				
<u>Summary</u>	Metrics				
	Name	Trigger1	Reset1	Trigger2	Reset2
	Disk Arm Utilization for System ASP (Average)				
	Machine Pool Faults Rate	>= 10	< 9		
	User Pool Faults Rate (Maximum)				
	CPU Utilization (Average)	>= 5	< 4	>= 3	< 2
	Temporary Storage Utilization				
	CPU Utilization (Uncapped)				



Threshold Triggered




System Monitors - LpE jlabs.ibm.com

Filter



















Monitor	Status	Metrics	Description	Creation Date/Time	Status Changed	Owner
No filter applied						
DawnMay	1 threshold triggered		Disk Arm Utilization for Example System Monit	2014-04-26 17:35:30.	2014-04-29 09:55:21.	DMMAY

```
From . . . : DMMAY 04/29/14 09:56:41  
CPU Utilization High Threshold Hit  
From . . . : DMMAY 04/29/14 09:57:56  
CPU Utilization High Threshold Resolved
```

Event Log

-  Trigger with no command run
-  Trigger and a command was run
-  Reset

Show events for one monitor or all monitors

Event Logs						
Owner: DMMAY Metrics: Disk Arm Utilization for System ASP (Average),Machine Pool Faults Rate,User Pool Faults Rate (Maximum),CPU Utilization (Average),Temporary Storage Utilization,CPU Utilization (Uncapped)						
   Actions Filter						
<input type="checkbox"/>	Event	Logged	Metrics	Monitor	Owner	
	No filter applied					
<input type="checkbox"/>	 Automatically reset	2014-04-27 00:37:12.161	CPU Utilization (Average)	DawnMay	DMMAY	
<input type="checkbox"/>	 Trigger with command	2014-04-28 00:02:27.178	CPU Utilization (Average)	DawnMay	DMMAY	
<input type="checkbox"/>	 Automatically reset	2014-04-28 00:05:57.183	CPU Utilization (Average)	DawnMay	DMMAY	
<input type="checkbox"/>	 Trigger with command	2014-04-28 00:27:57.188	CPU Utilization (Average)	DawnMay	DMMAY	
<input type="checkbox"/>	 Automatically reset	2014-04-28 00:29:57.191	CPU Utilization (Average)	DawnMay	DMMAY	
<input type="checkbox"/>	 Trigger with command	2014-04-28 00:30:57.187	CPU Utilization (Average)	DawnMay	DMMAY	
<input type="checkbox"/>	 Automatically reset	2014-04-28 00:32:27.188	CPU Utilization (Average)	DawnMay	DMMAY	
<input type="checkbox"/>	 Trigger with command	2014-04-28 09:24:27.197	CPU Utilization (Average)	DawnMay	DMMAY	
<input type="checkbox"/>	 Automatically reset	2014-04-28 09:25:27.198	CPU Utilization (Average)	DawnMay	DMMAY	
<input type="checkbox"/>	 Trigger with command	2014-04-29 09:55:27.065	CPU Utilization (Average)	DawnMay	DMMAY	
<input type="checkbox"/>	 Trigger with command	2014-04-29 09:56:41.790	CPU Utilization (Average)	DawnMay	DMMAY	
<input type="checkbox"/>	 Automatically reset	2014-04-29 09:57:56.763	CPU Utilization (Average)	DawnMay	DMMAY	
<input type="checkbox"/>	 Automatically reset	2014-04-29 09:59:41.756	CPU Utilization (Average)	DawnMay	DMMAY	
<input type="checkbox"/>	 Trigger with command	2014-04-29 10:00:41.744	CPU Utilization (Average)	DawnMay	DMMAY	



Event Properties

Event Properties	
General	Event Type: Trigger with command
Trigger	Date: 2014-04-28
	Time: 00:02:27
	Metric: CPU Utilization (Average)
	Monitor: DawnMay

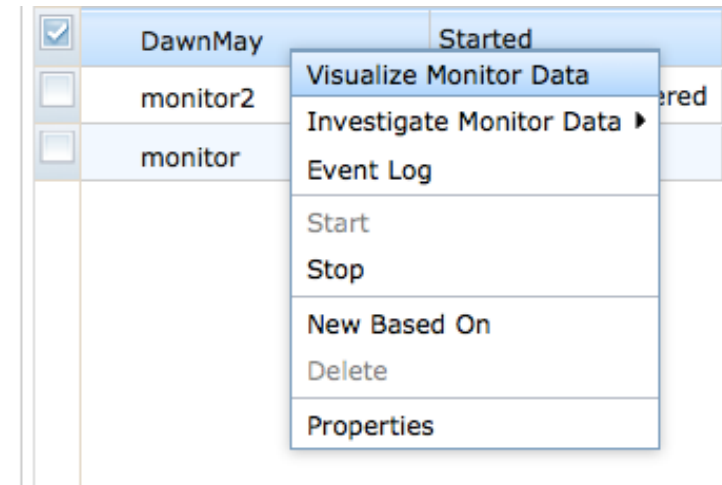
Event Properties	
General	Trigger value: 5
Trigger	Actual value: 5.26
	Trigger duration: 2
	Operating system command: SNDMSG MSG('CPU Utilization Threshold Hit') TOUSR(*SYSOPR)



System Monitors with IBM Navigator for i

Actions for each system monitor you own

- **Visualize Monitor Data** - Display real-time monitor data with all metrics
- **Investigate Monitor Data** - Display the selected metric with PDI
- **Event Log** - Show the Event Log List of this monitor on the system
- **Start** - Start this system monitor
- **Stop** - Stop this system monitor
- **New Based on** - Create a new system monitor based on this system monitor
- **Delete** - Delete this system monitor
- **Properties** – Display or change the attributes of the system monitor

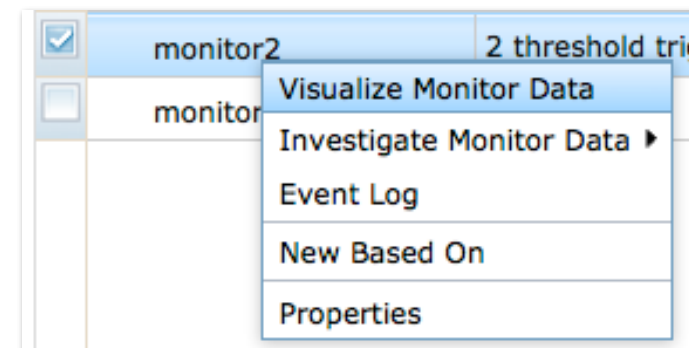




System Monitors with IBM Navigator for i

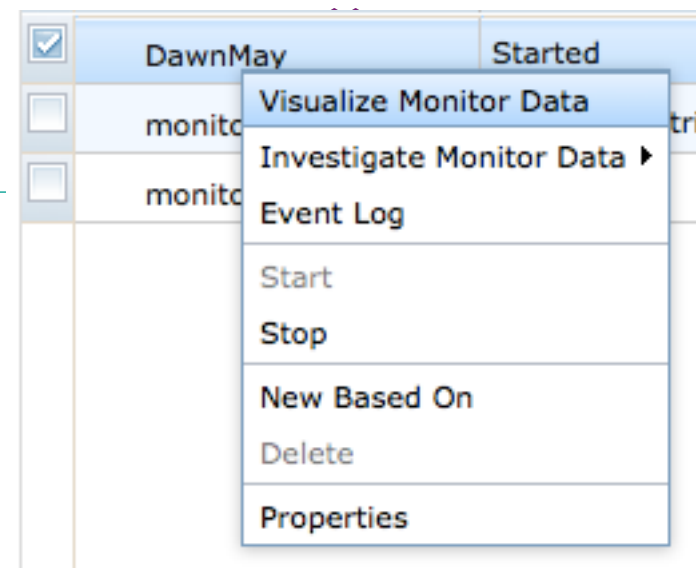
Actions for each system monitor you do NOT own

- **Visualize Monitor Data** - Display real-time monitor data with all metrics
- **Investigate Monitor Data** - Display the selected metric with PDI
- **Event Log** - Show the Event Log List of this monitor on the system
- **New Based on** - Create a new system monitor based on this system monitor
- **Properties** – Display or change the attributes of the system monitor

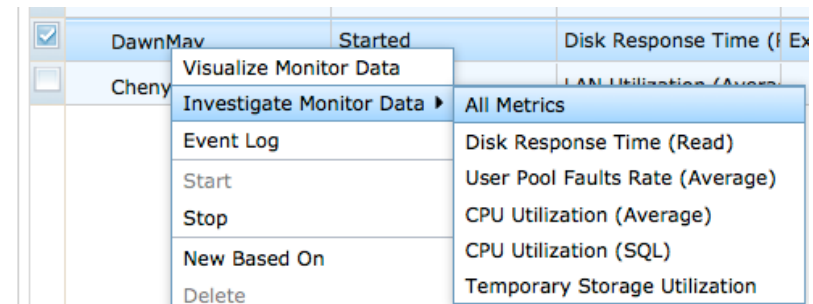


Visualize Monitor Data

- Real-time visualization of monitor data
- Multiple metrics graphed together
- Automatic refresh
- Coordinated scrolling across graphs



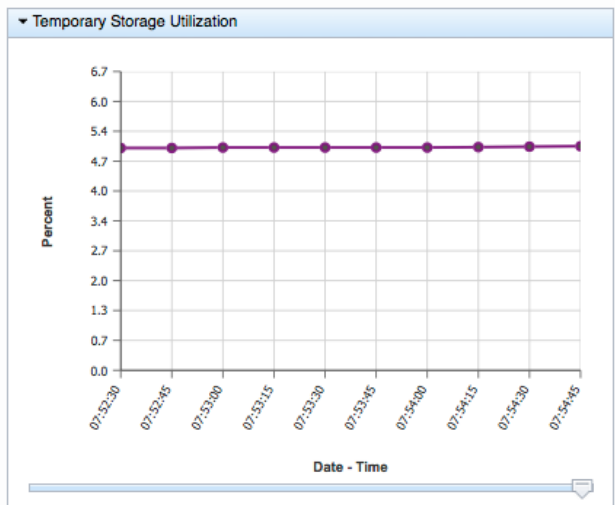
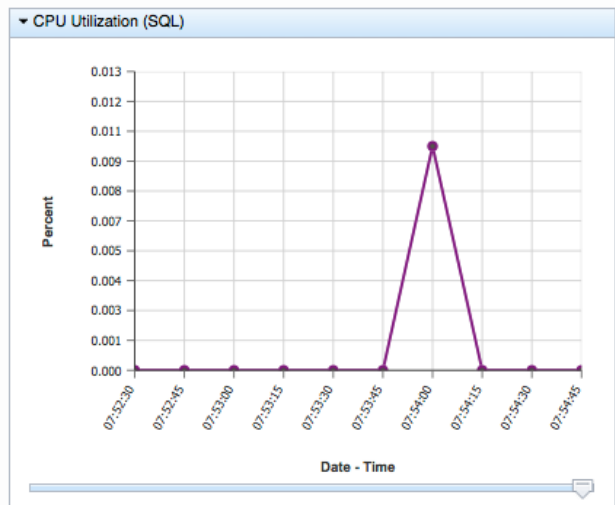
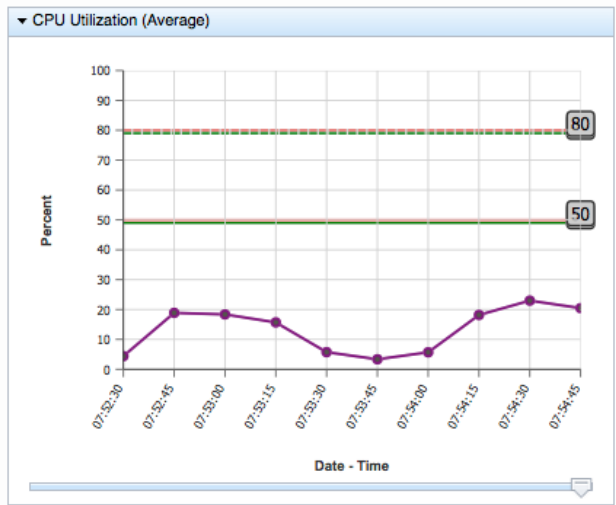
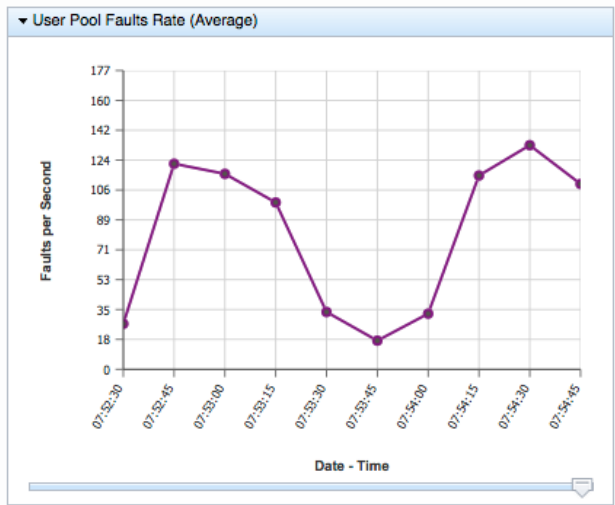
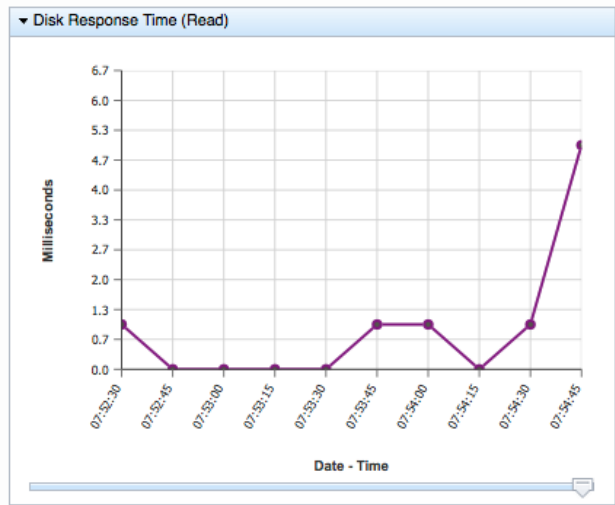
added to 7.2 with December 2016 update



Context

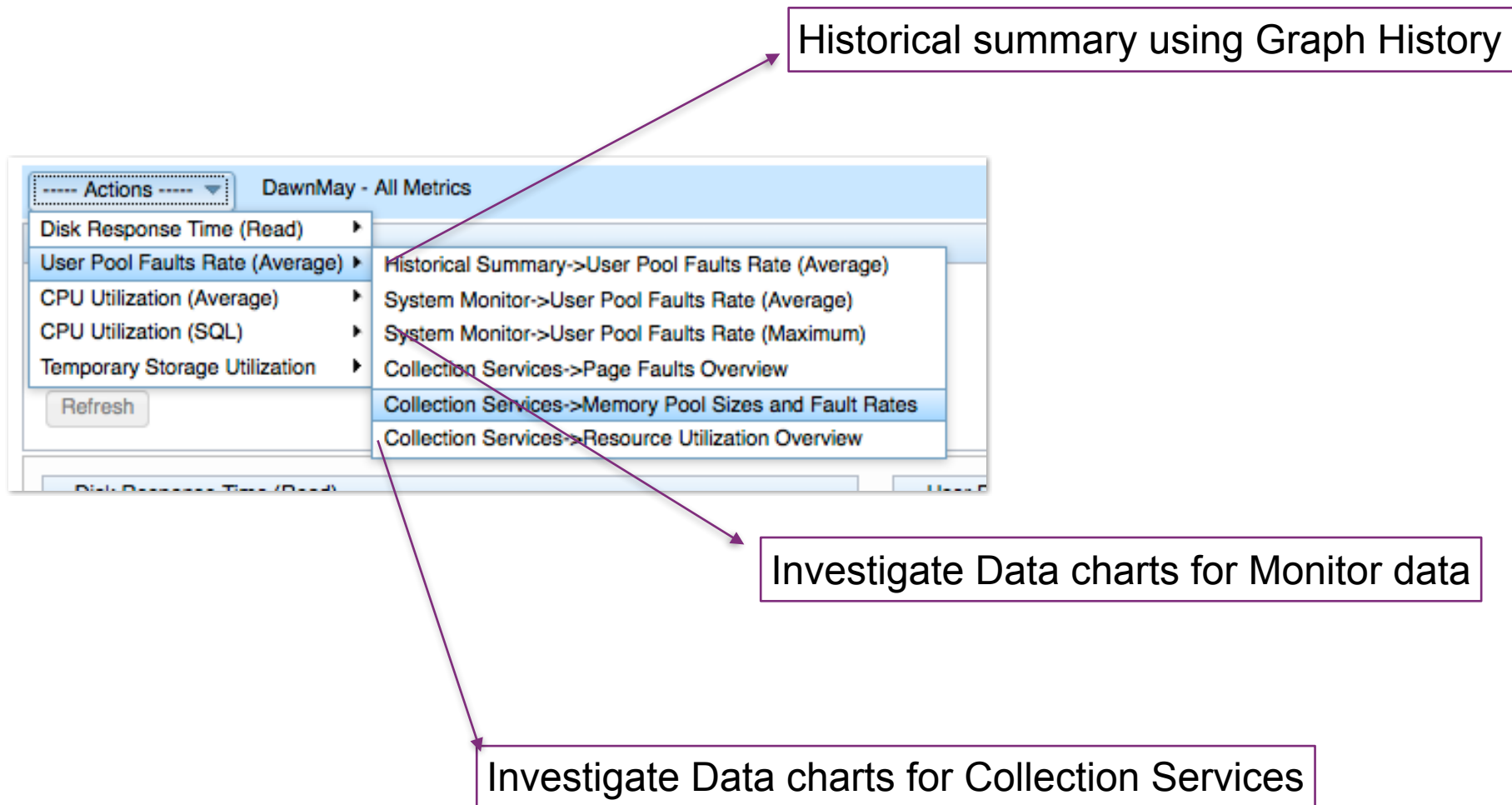
Collection Name: R113000004 Collection Date: 2016-04-22 Collection Type: *CSFILE
 Library: QPFRDATA Coordinate Scrolling Show Thresholds
 Layout(columns): 3 Automatic Refresh

- Coordinate scrolling
- Show thresholds - display trigger and reset values
- Adjust layout - columns



Actions when Visualizing All Metrics

Each of these actions will open a new tab and display the charts for the metric selected



The screenshot shows a software interface with a menu titled "DawnMay - All Metrics". The menu is open, showing a list of actions. Three callout boxes with arrows point to specific items in the menu:

- Historical summary using Graph History**: Points to the "Historical Summary->User Pool Faults Rate (Average)" option.
- Investigate Data charts for Monitor data**: Points to the "System Monitor->User Pool Faults Rate (Average)" option.
- Investigate Data charts for Collection Services**: Points to the "Collection Services->Memory Pool Sizes and Fault Rates" option.

Other visible options in the menu include "System Monitor->User Pool Faults Rate (Maximum)", "Collection Services->Page Faults Overview", and "Collection Services->Resource Utilization Overview". A "Refresh" button is also visible at the bottom of the menu.



Investigate Monitor Data

- Investigate Monitor Data starting from the monitor
- View the metric with the Performance Data Investigator
- Use PDI to drill into more detailed Collection Services data for basic analysis

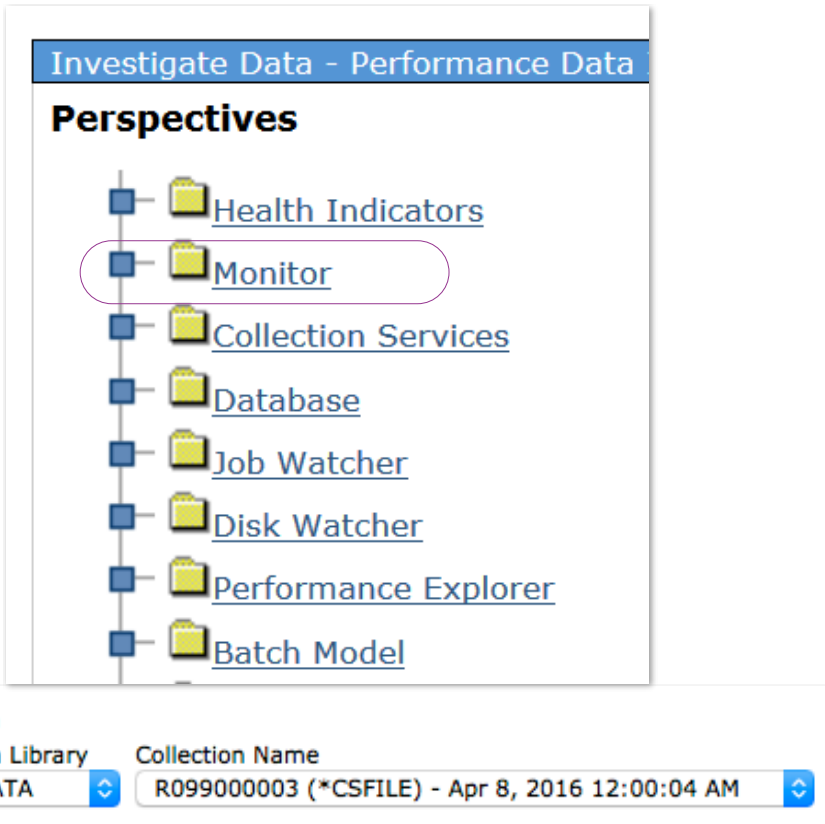
<input checked="" type="checkbox"/>	DawnMay	Stopped	Disk Response Time (f Example System Moni	2
<input type="checkbox"/>	monitor2	2 th		2
<input type="checkbox"/>	monitor	Sta		2

Visualize Monitor Data
Investigate Monitor Data ▶
Event Log
Start
Stop
New Based On
Delete
Properties

All Metrics
Disk Response Time (Read)
User Pool Faults Rate (Average)
CPU Utilization (Average)
CPU Utilization (SQL)
Temporary Storage Utilization

Investigate Data - Monitor

- Investigate Monitor Data via the Performance Data Investigator



Be sure to select an "R" collection to view monitor data





System Monitor Graphs in PDI

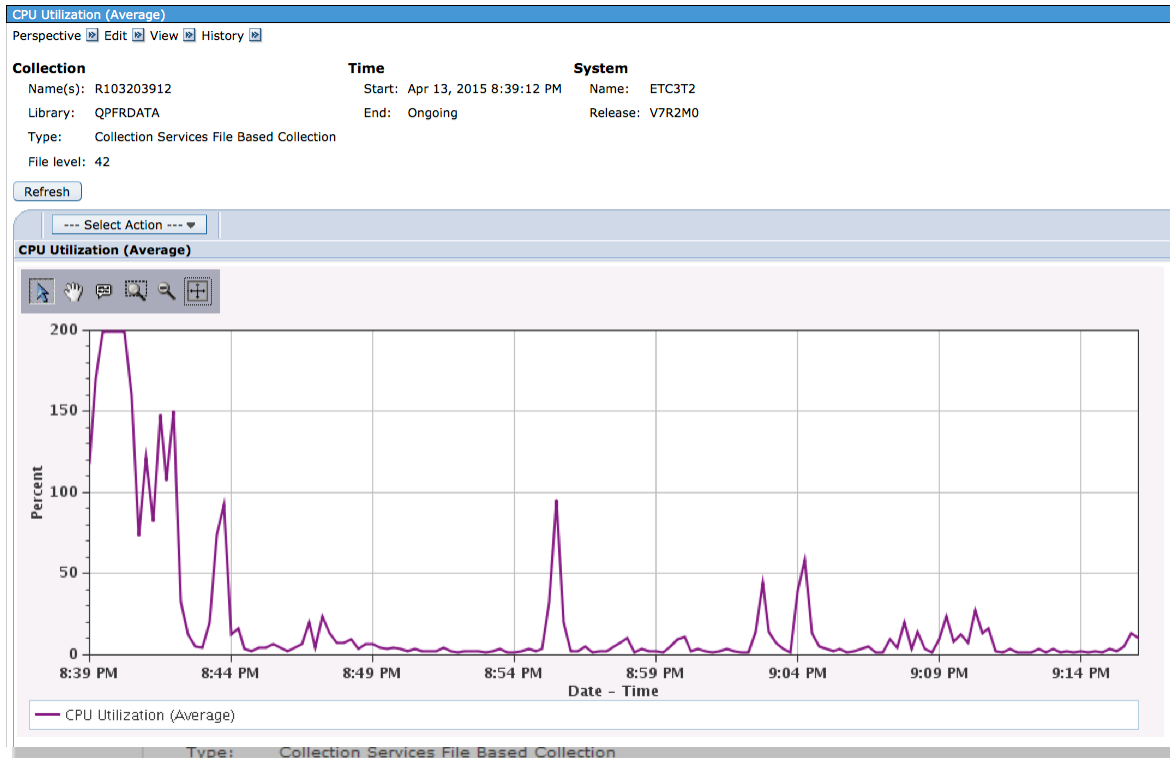


Table data behind the chart

Type: Collection Services File Based Collection
 File level: 36

Refresh

Select	Interval Number	Date - Time	CPU Utilization (Interactive Jobs)
<input type="checkbox"/>	1	Jan 28, 2013 1:24:00 PM	2
<input type="checkbox"/>	3	Jan 28, 2013 1:24:30 PM	0.5
<input type="checkbox"/>	34	Jan 28, 2013 1:32:15 PM	0.5

Investigate Monitor Data

Monitor collections begin with "R".
No automatic refresh.

CPU Utilization (Average)

Perspective Edit View History

Collection

Name(s): R103203912

Library: QPFRDATA

Type: Collection Services File Based Collection

File level: 42

Time

Start: Apr 13, 2015 8:39:12 PM

End: Ongoing

System

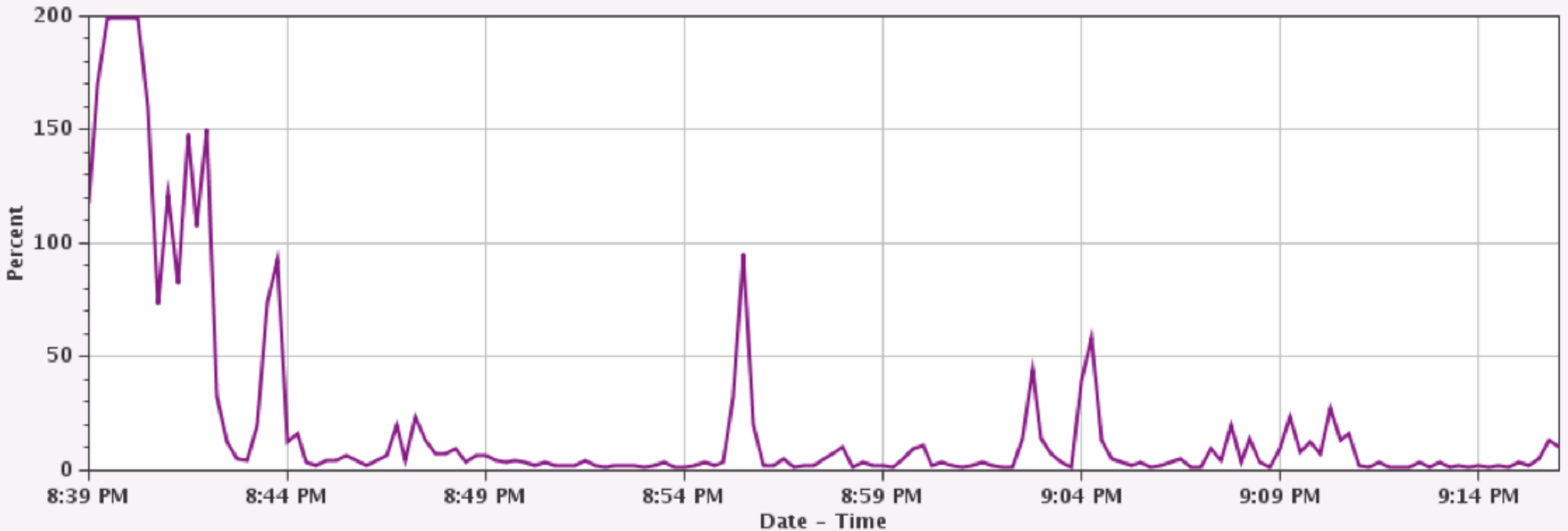
Name: ETC3T2

Release: V7R2M0

Refresh

--- Select Action ---

CPU Utilization (Average)



— CPU Utilization (Average)

Monitor Drill-down Actions

With Navigator System Monitors, you use the Performance Data Investigator to view the graphs. Use the drill-down to find contributing jobs

Refresh

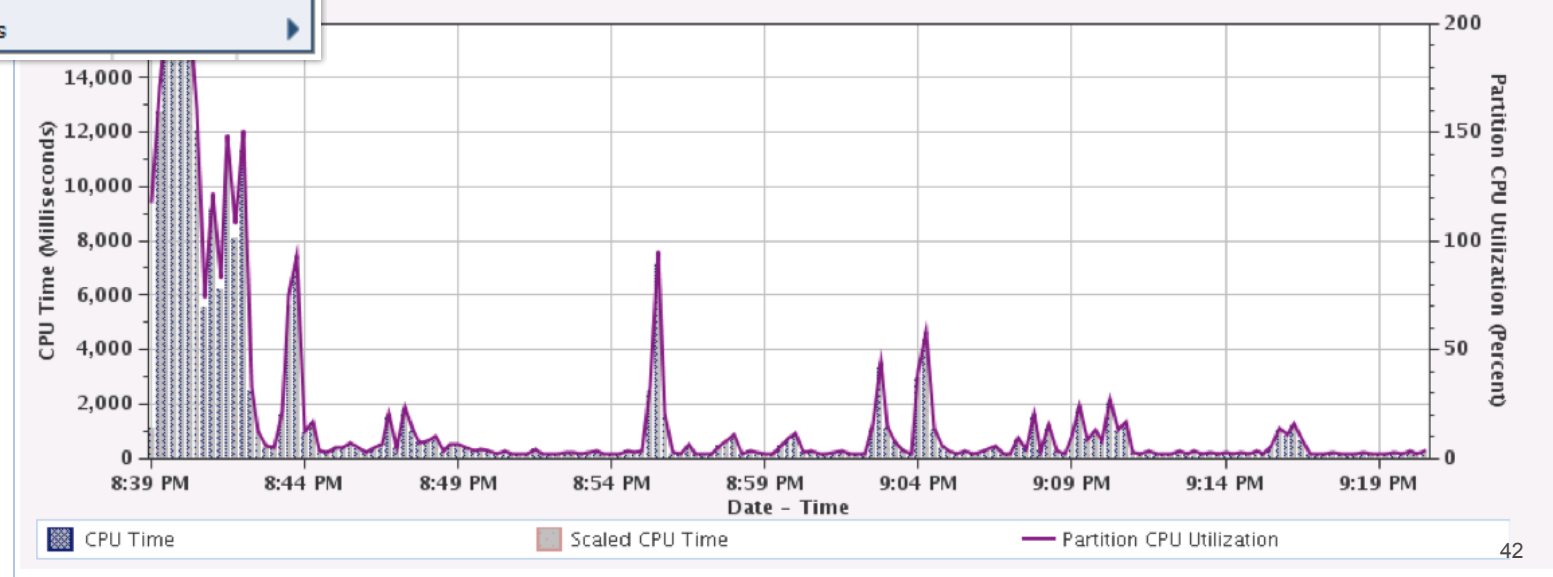
--- Select Action ---

CPU

- CPU Utilization (Uncapped)
- CPU Utilization (SQL)
- CPU Utilization (Interactive Jobs)
- CPU Utilization Overview**
- Resource Utilization Overview
- System Monitors
- Export
- Modify SQL
- Size next upgrade
- Change Context
- Show as table
- Table Actions

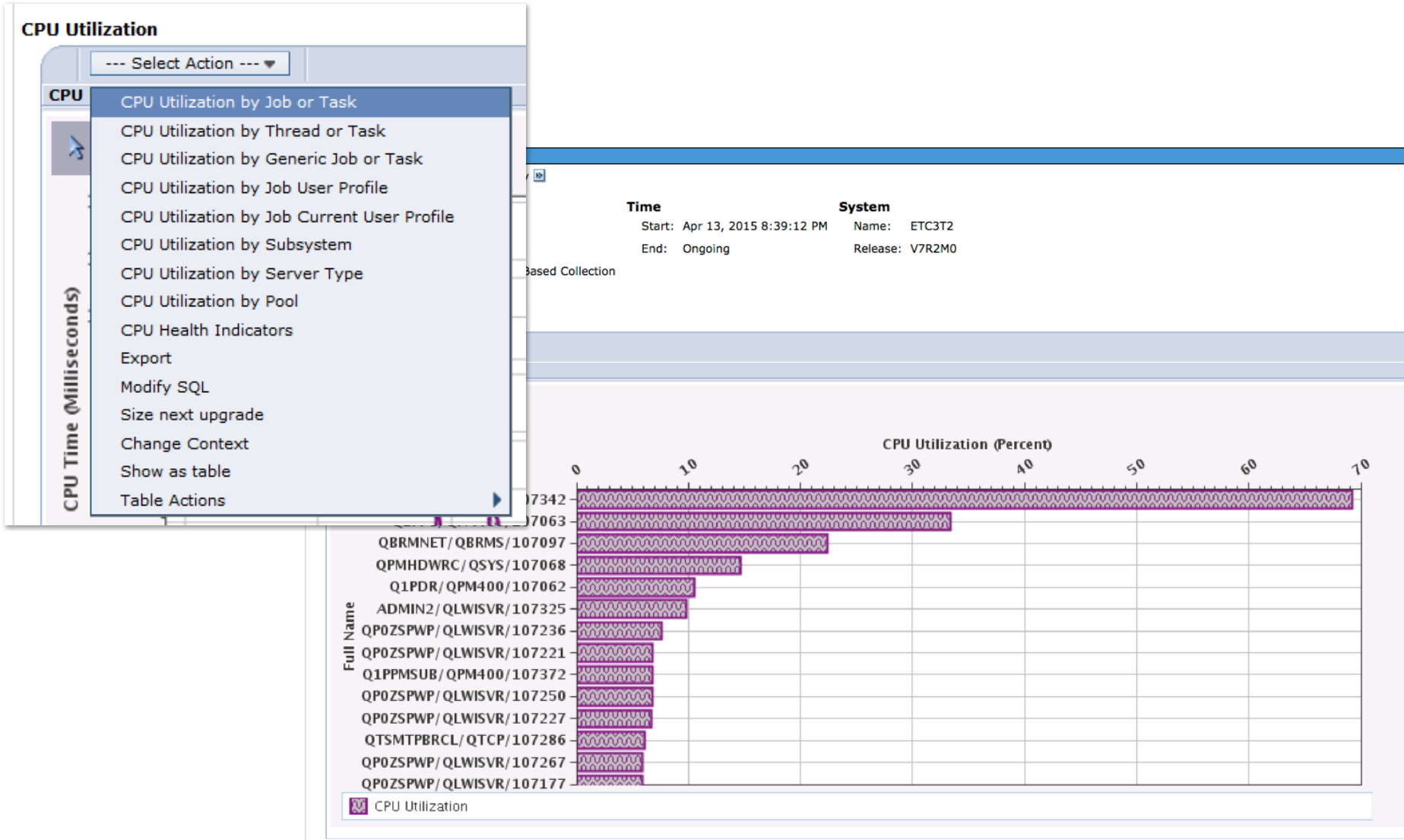
Percent

Time	System
Start: Apr 13, 2015 8:39:12 PM	Name: ETC3T2
End: Ongoing	Release: V7R2M0





Drill down to contributing jobs

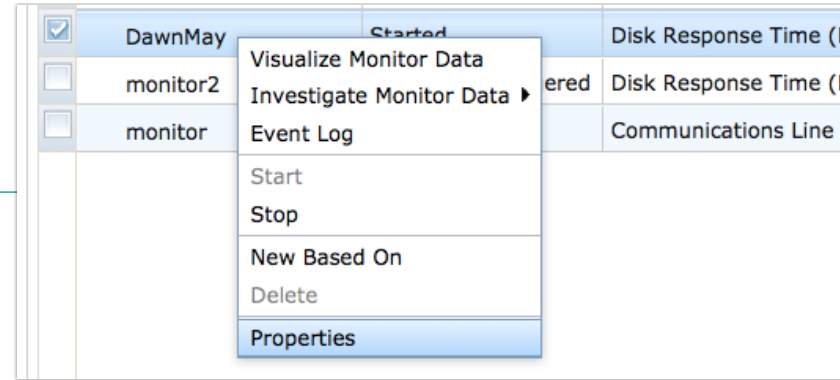


Change a Monitor's Properties

Properties allows you to modify monitors you created

You can change the properties of an active system monitor

Monitors are automatically started at IPL



Set Monitor General Information

The 'Set Monitor General Information' dialog box is shown. It has a left sidebar with 'General', 'Metrics', and 'Summary' tabs. The 'Metrics' tab is active, displaying a list of 'Available Metrics' with checkboxes. The 'Metrics to monitor' list on the right contains 'Disk Arm Utilization for System ASP (Average)' and 'CPU Utilization (Average)'. 'Add >' and '< Remove' buttons are positioned between the two lists.

Available Metrics:	Metrics to monitor
<input type="checkbox"/> Metrics	<input type="checkbox"/> Metrics
<input type="checkbox"/> Communications Line Utilization (Average)	<input type="checkbox"/> Disk Arm Utilization for System ASP (Average)
<input type="checkbox"/> Communications Line Utilization (Maximum)	<input type="checkbox"/> CPU Utilization (Average)
<input type="checkbox"/> LAN Utilization (Average)	
<input type="checkbox"/> LAN Utilization (Maximum)	
<input type="checkbox"/> Disk Arm Utilization (Average)	
<input type="checkbox"/> Disk Arm Utilization (Maximum)	
<input type="checkbox"/> Disk Storage Utilization (Average)	
<input type="checkbox"/> Disk Storage Utilization (Maximum)	
<input type="checkbox"/> Disk Arm Utilization for System ASP (Maximum)	
<input type="checkbox"/> Disk Storage Utilization for System ASP (Average)	
<input type="checkbox"/> Disk Storage Utilization for System ASP (Maximum)	
<input type="checkbox"/> Disk Arm Utilization for User ASP (Average)	

Collection Services and System Monitor Data

Collection Services can be configured to collect system monitor data 24x7.

(System policy for “real-time” data collection)

- Data to support system monitoring can be available **without depending on a monitor function**
 - Collection Services starts at IPL, data is available at IPL
- Similar to Management Central, a monitor can tell Collection Services what data it needs and that data is collected and stored in the *MGTCOL

```

Configure Perf Collection (CFGPFRCOL)
Type choices, press Enter.

Default interval . . . . . 15.00      *SAME, .25, .50, 1.0, 5.0...
Collection library . . . . . QPFRDATA  Name, *SAME
Default collection profile . . . *STANDARDP *SAME, *MINIMUM, *STANDARD...
Cycle time . . . . . 000000      Time, *SAME
Cycle interval . . . . . 24        *SAME, 1-24 hours
*MGTCOL retention period:
Number of units . . . . . 00120    *SAME, 1-720, *PERM
Unit of time . . . . . *HOURS    *HOURS, *DAYS
Enable system monitoring . . . . > *YES    *SAME, *YES, *NO
Create standard database files  *YES    *SAME, *YES, *NO

Bottom
F3=Exit  F4=Prompt  F5=Refresh  F10=Additional parameters  F12=Cancel
F13=How to use this display  F24=More keys
    
```

```

Configure Perf Collection (CFGPFRCOL)
Type choices, press Enter.

System monitor categories:
Categories to process . . . . > *SYSLVL    Name, *SAME, *SYSMONDFT...
Time interval (in minutes) . . > .25      0.25, 0.5, 1, 5

Categories to process . . . . > *POOL      Name, *APPN, *CMNBASE...
Time interval (in minutes) . . > .5        0.25, 0.5, 1, 5

Categories to process . . . . > *DISK      Name, *APPN, *CMNBASE...
Time interval (in minutes) . . > 1.00     0.25, 0.5, 1, 5

Categories to process . . . . > *CMNBASE   Name, *APPN, *CMNBASE...
Time interval (in minutes) . . > 1.00     0.25, 0.5, 1, 5
+ for more values -
***
***

Bottom
F3=Exit  F4=Prompt  F5=Refresh  F12=Cancel  F13=How to use this display
F24=More keys
    
```



Collection Services and System Monitor Data Considerations

- **System Monitor data is exported to database files** (not private as with Management Central system monitors)
 - Data is shared between the monitoring function and visualization (Performance Investigator).
 - Data is available to any consumer and can be used for more in depth analysis as necessary.
- **System Monitor support creates a second database file collection**
 - Independent of the Standard database file collection (CRTPFDRDTA).
 - If enabled, a CRTPFDRDTA 2 job is submitted to produce this “System Monitor” collection
 - Only contains data (files) related to categories selected for system monitoring.
 - Database file interval is 15 seconds. Data will be present based on category collection interval.
 - Has its own retention period (expiration similar to standard file collections)
 - Existing PDI perspectives can be used with this collection providing all needed data is present.
- **System Monitor metrics are derived** (do not exist in base performance data).
 - Are a function of selection, grouping, and other calculations (rates, percents, max)
- **System Monitor metrics are now produced by Collection Services**
 - Existing CS files are used for drill down and detail data
 - New files contain metrics defined for system monitoring along with other supporting data
 - CRTPFDRDTA option to produce these files if run manually
 - CFGPFCOL option to produce in standard data collection
 - Includes metrics supported by Management Central and more.



Collection Services Files for System Monitors

- **QAPMSMCMN (*CMNBASE)** : Line and LAN metrics
 - Breakdown: Lines and LANs
 - Still have ability to exclude unwanted lines
 - Line count, avg / max utilization, avg kilobits received and sent, line with highest utilization
- **QAPMSMDSK (*DISK)** : Disk metrics
 - Breakdown: all units, system ASP, user ASPs, IASPs
 - Number of entries in data, avg / max busy & device name, avg & max capacity used & device name
 - Total capacity available and used
 - For both reads and writes: Ops, avg response & service time, max response time, max device name
- **QAPMSMJMI (*JOBMI)** : Job metrics dependent on the MI
 - Breakdown: Interactive and Batch
 - Job count, total and max unscaled CPU consumed and percent and job, Interactive transaction rate
- **QAPMSMJOS (*JOBOS)** : Job metrics dependent on the OS
 - Job count, Batch LIO rate, avg/max interactive response time & job,
 - Spool file creation rate, count and name of job creating most.
- **QAPMSMPOL (*POOL)** : Pool metrics
 - Machine pool fault rate, count of user pools, avg / max user pool fault rate and pool
- **QAPMSMSYS (*SYSLVL)** : System metrics
 - Scaled and unscaled: Configured, uncapped, and virtual CPU percent
 - Speed percent, virtual & physical shared pool percent
 - Temp storage used and percent, unscaled SQL CPU percent
- **QAPMSMHTP (*HTTP)** : HTTP metrics **7.3**



Collection Services - Configuration for System Monitor Data

Configure Collection Services GUI for the System Monitor support

7.2 screen captures below

- Performance
 - Investigate Data
 - Manage Collections
 - Configure Collection Services
 - Graph History
 - All Tasks

Configure Collection Services

General

Library: QPFRDATA

Default collection interval: 15 seconds 5 minutes

Cycling

Cycle every day at: 12:00 AM Example: 12:30 PM

Cycle every: 24 hours

System options

- Enable system monitoring
- Create database files during collection

Configure Collection Services

General

Data Retention

Collection object

Save data for: 5 days Make permanent

Standard data

Save data for: 10 days Make permanent

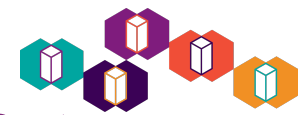
System monitor data

Save data for: 2 days Make permanent

Configure Collection Services

System Monitor Categories

- Use default system monitor categories
- Customize system monitor categories



Collection Services - Customize System Monitor Data

Customize System Monitor categories

Click in the frequency cell to change the default

7.3 screen capture below

Configure Collection Services

General
Data to Collect
Data Retention
System Monitor Categories
Historical Data

System Monitor Categories

Use default system monitor categories
 Customize system monitor categories

Available categories:

<input type="checkbox"/>	Category
<input type="checkbox"/>	APPN
<input type="checkbox"/>	Communications (station)
<input type="checkbox"/>	Communications (SAP)
<input type="checkbox"/>	IBM Domino for i
<input type="checkbox"/>	Data port services
<input type="checkbox"/>	External storage
<input type="checkbox"/>	Input/output processors (base)
<input type="checkbox"/>	Network server
<input type="checkbox"/>	Java
<input type="checkbox"/>	Local response time
<input type="checkbox"/>	Logical partition

Add >
< Remove
Add Defaults >>
<< Remove All




Categories to collect:

Category	Frequency	
<input type="checkbox"/>	Memory pool	Every 1 minute
<input type="checkbox"/>	Jobs (operating system)	Every 1 minute
<input type="checkbox"/>	Disk storage	Every 1 minute
<input type="checkbox"/>	Communications (base)	Every 1 minute
<input type="checkbox"/>	System-level data	Every 1 minute
<input type="checkbox"/>	Jobs (MI tasks and threads)	Every 1 minute
<input type="checkbox"/>	IBM HTTP Server for i (powered by Apache)	Every 1 minute

Frequency dropdown menu:
Every 1 minute
Every 15 seconds
Every 30 seconds
Every 1 minute
Every 5 minutes

Collections when Monitoring

- You will see three collections when you start monitoring on 7.2 or later:
 - The management collection object
 - Two file-based collections
 - Q* - the traditional collection services collection
 - R* - the system monitors collection

 Q069000002	QPFRDATA	Collection Services *MGTCOL Obj Based Collection	Active	3/10/17 12:00:02 AM
 R072000002	QPFRDATA	Collection Services File Based Collection	Active	3/13/17 12:00:02 AM
 Q072000002	QPFRDATA	Collection Services File Based Collection	Active	3/13/17 12:00:02 AM



System Monitor Best Practices

- Choose metrics important to your environment
- Set thresholds (and be alerted) **before** a potential problem occurs
- 60 second or longer collection intervals
 - Avoid very short intervals
- Clean up data regularly (R* collections)
 - Review / set the System Monitor data retention setting
- Don't use your browser refresh - use the auto refresh or the refresh button
- Keep current on PTFs - HTTP Server Group
 - 7.2 SF99713
 - 7.3 SF99722

<https://www.ibm.com/developerworks/community/wikis/home?lang=en#!/wiki/IBM%20i%20Technology%20Updates/page/PTF%20Groups>

NOTE: For PTFs related to monitors, you should end the QINAVMNSRV job before applying:

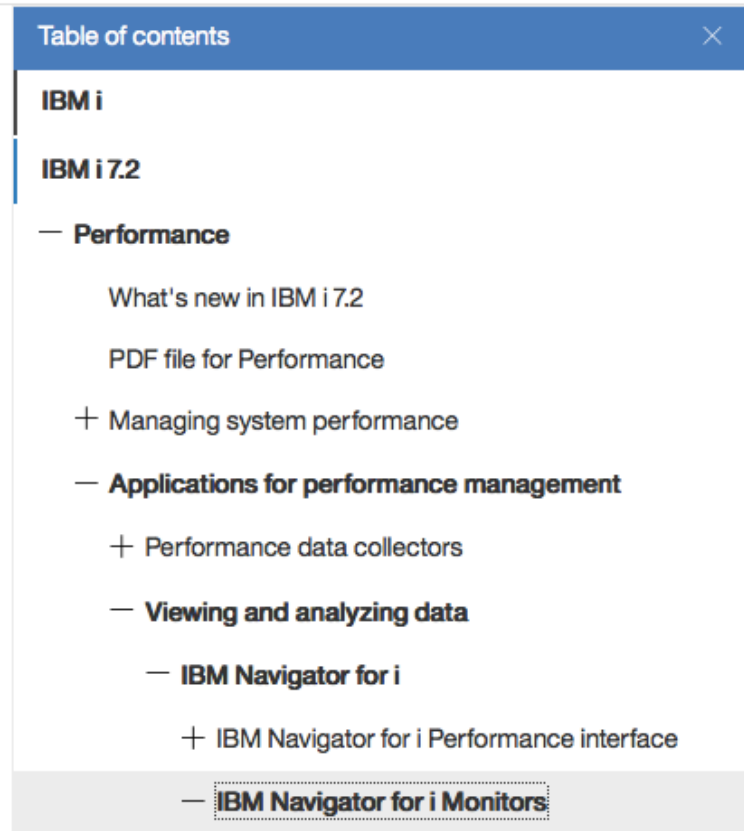
CALL PGM(QSYSDIR/QINAVMNSRV) PARM(*STOP)



Documentation and Help

Knowledge Center

IBM Knowledge Center



The screenshot shows a 'Table of contents' window with a blue header and a close button. The content is organized into a tree structure:

- IBM i
 - IBM i 7.2
 - Performance
 - What's new in IBM i 7.2
 - PDF file for Performance
 - + Managing system performance
 - Applications for performance management
 - + Performance data collectors
 - Viewing and analyzing data
 - IBM Navigator for i
 - + IBM Navigator for i Performance interface
 - IBM Navigator for i Monitors

For 7.3 Knowledge Center:

http://www.ibm.com/support/knowledgecenter/ssw_ibm_i_73/rzahg/welcome.htm



Navigator Message Monitors

Monitor Message Queues

- [-] Monitors
 - System Monitors
 - Message Monitors
- [-] All Tasks
 - + System Monitor
 - [-] Message Monitor
 - Create New Message Monitor
 - Message Monitors

Create New Message Monitor - Set Monitor General Information

General

*Monitor Name

Description

< Back Next > Finish Cancel

Create New Message Monitor - Set Monitor Message Queue Information

Message Queue

*Message Queue to Monitor *

*Library *

< Back Next > Finish Cancel

Message Set

Message Set 1

Message Set 2

Message Set 1:

Select	Message ID	Type	Serverity	Reply With
None				

Page 1 of 1 | 1 | Go | Rows 0 | Total: 0 Selected: 0

Add...
Remove

- No action
- Permanently remove monitored messages from message queue
- Set the message trigger and reset:

Trigger at the following message count: 1,2,3...100 messages

IBM i trigger command:

Prompt...

Automatically reset after trigger command has run

IBM i reset command:

Prompt...

Add A Message Set

Add a predefined set of messages:
 Add a user defined set of messages:

Message ID:

Message Type:

Severity: 0 - 99

Reply With:

ASP threshold exceeded
 ASP threshold exceeded
 Communication link problem
 Impending DASD failure
 Mirror disk suspended
 Probable cabling or hardware problem
 Probable modern problem
 RAID disk not operational

Add A Message Set

Add a predefined set of messages:
 Add a user defined set of messages:

*Message ID:

Message Type:

Severity: 0 - 99

Reply With:

Actions

Actions for all monitored messages

Trigger: Reset:

Log event Run Command

Apply thresholds and actions

 Apply Always Apply The whole day on The specify time slot onFrom: Example: 12:30:00 PMTo: Example: 12:30:00 PM Monday Tuesday Wednesday Thursday Friday Saturday Sunday

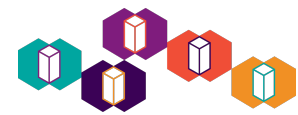
Notes: Replying to messages and removing messages will occur when thresholds and actions are applied.

< Back

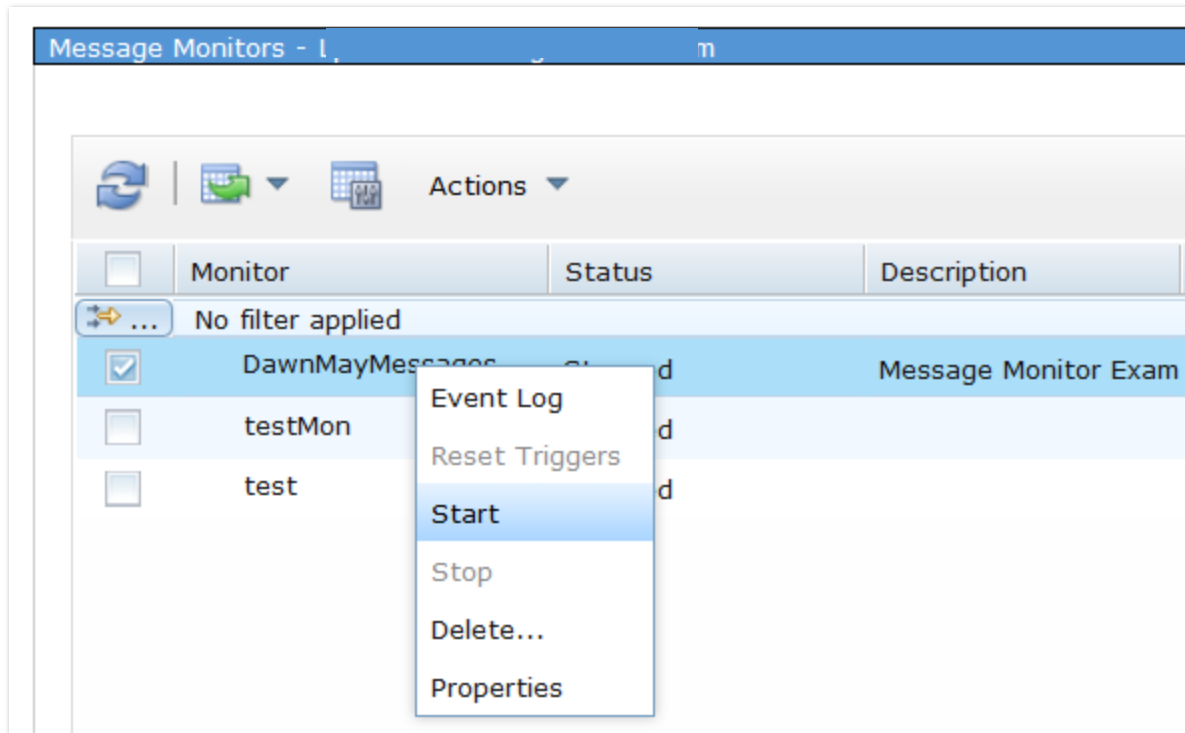
Next >

Finish

Cancel






Start the Monitor



Triggers and Event Log




Message Monitors - Lpl | labs.ibm.com





 Actions ▾
 Filter

Monitor	Status	Description	Creation Date/Time	Status Changed	Owner
No filter applied					
DownMayDemo	1 threshold triggered	Example	2014-04-26 19:24:1	2014-04-26 19:24:3	PDITEST0

Event Logs




Owner: PDITEST0 Monitor:





 Actions ▾

Event	Logged	Metrics	Monitor	Owner
No filter applied				
	2014-04-26 19:25:36.648	Message Coun	DownMayDemc	PDITEST0

Event Logs

Owner: PDITEST0 Monitor:




 Actions ▾

<input checked="" type="checkbox"/>	Event	Logged	Metrics	Monitor	Owner
No filter applied					
<input checked="" type="checkbox"/>		2014-04-26 19:25:36.648	Message Coun	DownMayDemc	PDITEST0

Delete...
 Properties



Trigger

Properties

General	Event type: Trigger with command
Trigger	Date: 2014-04-26
	Time: 19:25:36.648
	System: localhost
	Metric type: Message Queue
	Monitor: DawnMayDemo
	Monitor type: Message Monitor

Properties

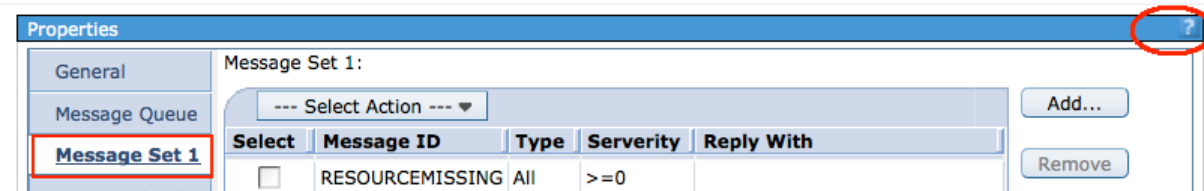
General	Message queue: QSYSOPR								
Trigger	Library: QSYS								
	Trigger messages:								
	<table><thead><tr><th>Message ID</th><th>Type</th><th>Severity</th><th>Reply With</th></tr></thead><tbody><tr><td>All</td><td>All</td><td>>=0</td><td></td></tr></tbody></table>	Message ID	Type	Severity	Reply With	All	All	>=0	
Message ID	Type	Severity	Reply With						
All	All	>=0							
	Page 1 of 1	<input type="text" value="1"/> Go	Rows <input type="text" value="1"/> Total: 1						
	Actual message ID:								
	Type:		Informational						
	Severity:		80						
	IBM i command:								
	SNDMSG MSG('This is the message monitor trigger') TOUSR(*SYSOPR)								
	Sent from:								
	Job name:		QPADEV0002						
	User name:		PDITEST0						
	Job number:		168125						

Replacement variables are also available for message monitors.

Message Monitor Replacement Variables

- Like system monitors, you can also use replacement variables with message monitors
- Like system monitors, the documentation for message monitors is in the Navigator help.

Start with help from a **Message Set** panel



Drill down: **IBM i trigger command**
 → **IBM i trigger or reset commands**

IBM i trigger or reset commands

Specifies the command to be run on the endpoint system when a threshold is triggered or reset. The command runs on the server when the threshold for an event is reached. You can click Prompt when at least one character is entered in the field, for assistance in entering or selecting a command.

For a detailed usage example and sample configuration, see Scenario: Message Monitor in the IBM i Information Center .

Parameters on IBM i command

You can use the following parameters with operating system commands when any threshold for a message monitor is triggered or reset. The parameters must be entered in uppercase exactly as shown.

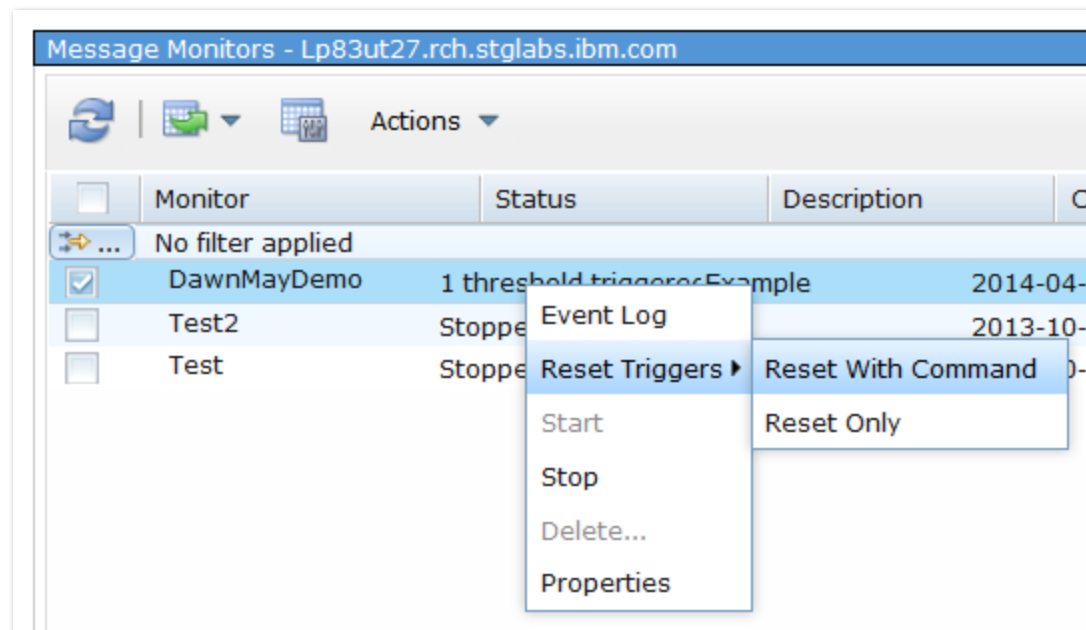
Parameters valid for all messages

Parameter	Passed Data
&DATE	Date (format MMDDYYYY)
&ENDPOINT	Date (format MMDDYYYY)
&EVENTTYPE	Event type (See note)
&FRMJOBNAME	The name of the job that sent the message
&FRMJOBNUMBER	The number of the job that sent the message
&FRMPROGRAM	The name of the program that sent the message
&FRMUSER	The name of the user that sent the message
&INTVL	Collection interval in seconds



Trigger Example

```
From . . . : PDITEST0      04/26/14   19:25:10
testing message monitors
From . . . : PDITEST0      04/26/14   19:25:36
This is the message monitor trigger
```





Message Monitor Observations

- You can change an active monitor
- Monitors are automatically restarted at IPL
- You cannot monitor the history log with message monitors
 - Use watches



Health Indicators

Navigator for i - Performance Tasks

- Target Systems and Groups
- Favorites
- System
- Monitors
- Basic Operations
- Work Management
- Configuration and Service
- Network
- Integrated Server Administration
- Security
- Users and Groups
- Database
- Journal Management

- Performance
 - Investigate Data
 - Manage Collections
 - Configure Collection Services
 - Graph History
 - All Tasks

Welcome X Performance X

Performance - Z1 m.com

IBM i Performance tools allows you to collect and investigate performance data on your system.

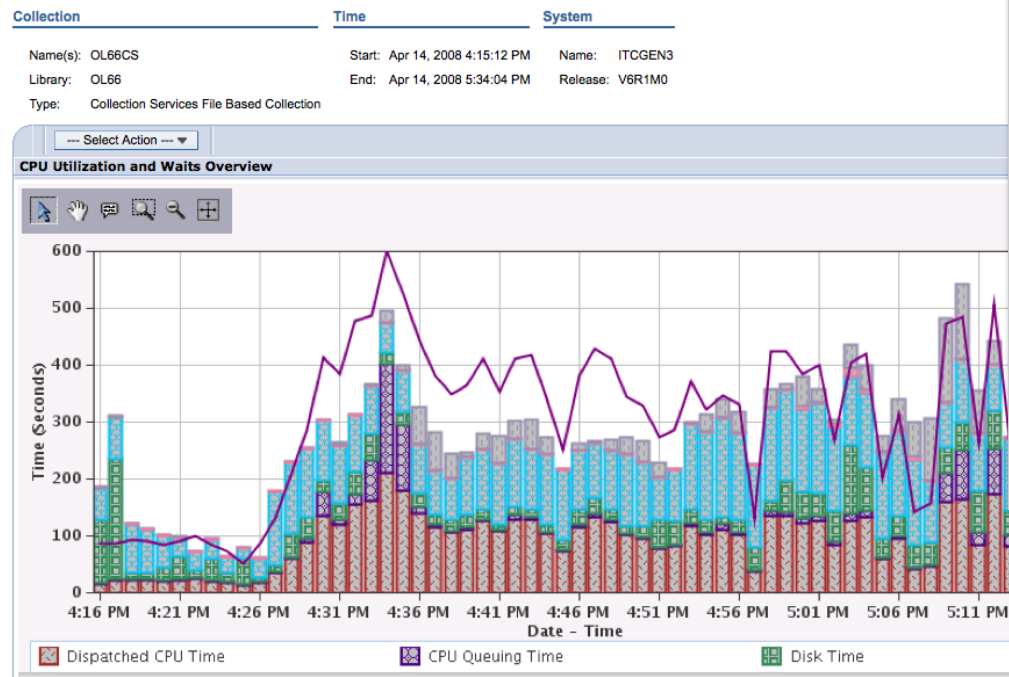
[Investigate Data](#)

Performance Data Investigator allows you to investigate previously collected performance data on your system

[Manage Collections](#)

Collection Manager allows you to manage your performance data collections

Close



Health Indicators

Manually Monitor your System Performance

Performance

Investigate Data

Investigate Data Search

Health Indicators

- System Resources Health Indicators
- CPU Health Indicators
- Disk Health Indicators
- Memory Pools Health Indicators
- Response Time Health Indicators
- Database Health Indicators

Collection

Name(s): Q118000005

Library: QPFRDATA

Type: Collection Services File Based Collection

File level: 48

Time

Start: Apr 27, 2016 12:00:05 AM

End: Ongoing

System

Name: Z1432BP2

Release: V7R3M0

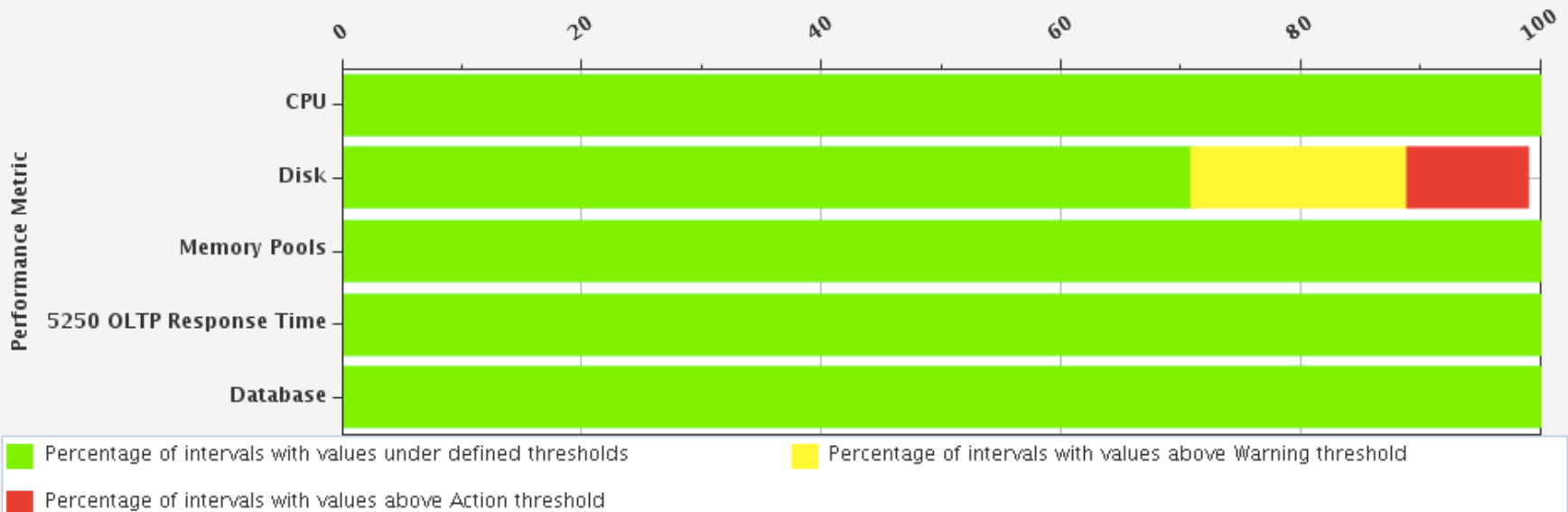
System Resources Health Indicators (7.2+)

--- Select Action ---

System Resources Health Indicators (7.2+)

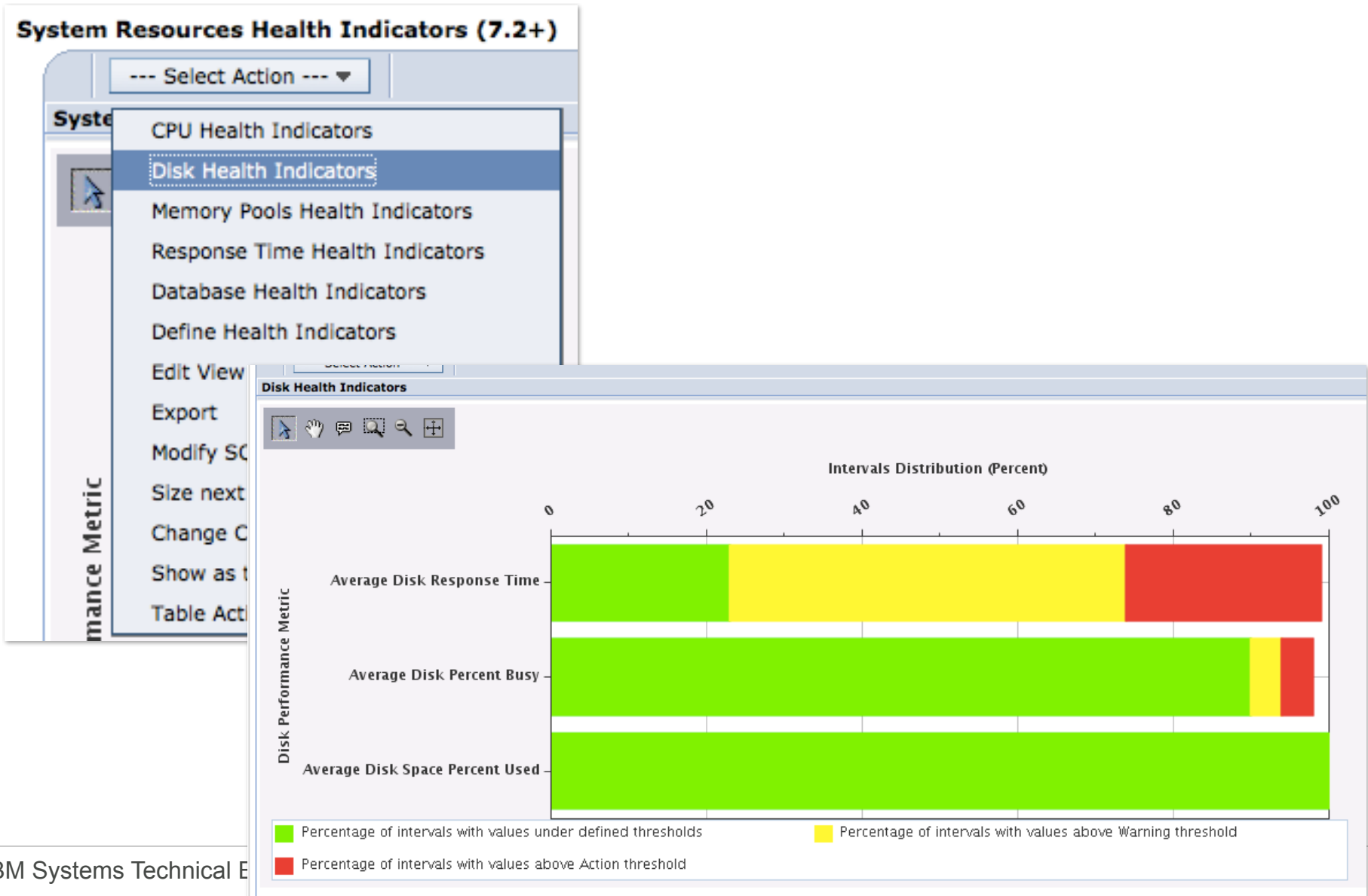


Intervals Distribution (Percent)





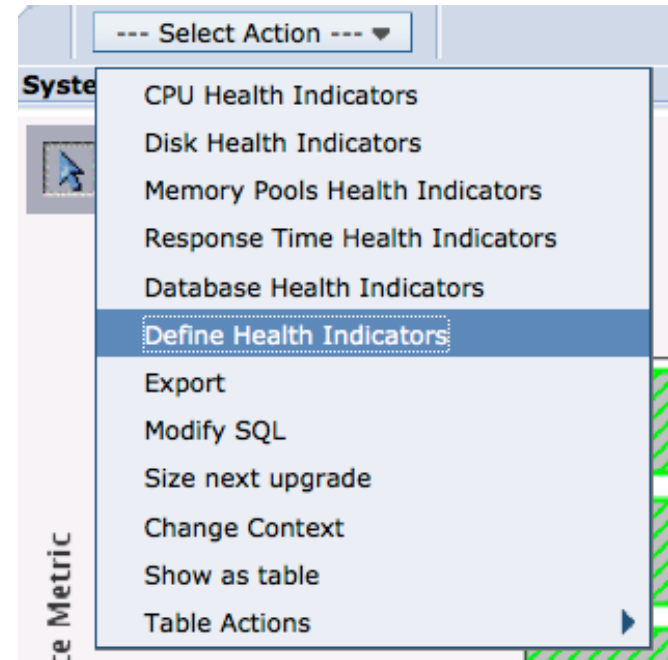
Example Drill-down to Disk Health Indicators





Health Indicators

Customize Health Indicator Thresholds



Define Health Indicators

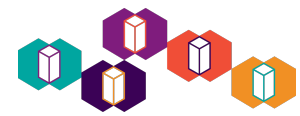
System Resources Health Indicators (7.2+)	Available Indicators		Selected Indicators	Current Threshold Values
CPU	[Empty]	Add >>	Database	Warning <input type="text" value="0"/>
Disk		Remove <<	Memory Pools	Action <input type="text" value="0"/>
Memory Pools			Disk	
5250 OLTP Response Time			CPU	
Database			5250 OLTP Response Time	

Accessing IBM i Health Indicators Using Performance Data Investigator



Justin C. Haase

Accessing IBM i Health Indicators by Using Performance Data Investigator



Watches



Monitoring with Watches

- Watches can be used to automate the actions taken when the following occur:
 - Message
 - Licensed Internal Code Log (LIC Log)
 - Problem Activity Log Entry (PAL entry)
- Start Watch (STRWCH) command or API ([QSCSWCH](#))
- End Watch (ENDWCH) command or API ([QSCEWCH](#))
- Work with Watches (WRKWCH) command to display watches
- When the condition being watched occurs, your program gets control and you can take any action you want



http://ibmsystemsmag.blogs.com/i_can/2010/01/i-can-automate-monitoring-with-watches.html

http://www-01.ibm.com/support/knowledgecenter/ssw_ibm_i_72/rzahb/rzahb_eventfunction.htm?lang=en

<https://www-01.ibm.com/support/docview.wss?uid=nas8N1020191>



Watches

- Low Overhead
 - Watches are an exit program
 - Minimal overhead until the watched condition occurs
 - Your program gets control to determine what action to take
 - Your program runs *out-of-band*
 - For message watches
 - Can watch for messages sent to any message queue, including
 - QSYSOPR, History Log
 - Can watch for messages sent to any job log
 - Can specify generic job name
 - Can specify *ALL to watch for a message to all job logs



Start Watch Command

```

                                Start Watch (STRWCH)

Type choices, press Enter.

Session ID . . . . . Name, *GEN
Watch program . . . . . Name
  Library . . . . . *LIBL Name, *LIBL, *CURLIB
Call watch program . . . . . *WCHEVT *WCHEVT *STRWCH *ENDWCH

Watch for message:
  Message to watch . . . . . *NONE Name, generic*, *NONE...
  Comparison data . . . . .

  Compare against . . . . . *MSGDTA, *FROMPGM, *TOPGM
  Message type . . . . . *ALL, *COMP, *DIAG...
  Relational operator . . . . . *GE, *EQ, *GT, *LT, *LE
  Severity code . . . . . 0-99
      + for more values

                                Bottom
F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
F24=More keys

```



Start Watch Command

Start Watch (STRWCH)

Type choices, press Enter.

Watched message queue:

Message queue	*SYSOPR	Name, *SYSOPR, *JOBLOG...
Library	*LIBL	Name, *LIBL
	+ for more values	

Watched job:

Job name	*	Name, generic*, *, *ALL
User		Name, generic*, *ALL
Number		000001-999999, *ALL
	+ for more values	

Watch for LIC log entry:

Major code	*NONE	0000-FFFF, *ALL, *NONE
Minor code		0000-FFFF, *ALL
Comparison data		

Compare against		*ALL, *TDENBR, *TASKNAME...
	+ for more values	

More...

F3=Exit F4=Prompt F5=Refresh F12=Cancel F13=How to use this display
 F24=More keys



Start Watch Command

Start Watch (STRWCH)

Type choices, press Enter.

Watch for PAL entry:

System reference code	*NONE	Character value, *NONE, *ALL
Comparison data		Character value, *NONE
Compare against		*RSCNAME, *RSCTYPE, *RSCMODEL
+ for more values		
Run priority	25	1-99

Bottom

F3=Exit F4=Prompt F5=Refresh F12=Cancel F13=How to use this display
 F24=More keys

Work with Watches

```

Work with Watches (WRKWCH)

Type choices, press Enter.

Watch . . . . . > *ALL          *ALL, *SRVMON, *STRWCH...
      + for more values
  
```

Single Values

*ALL

Other Values

*SRVMON

*STRWCH

*TRCCMD

***ALL** will display all watches

***SRVMON** - watches started by service monitor

***STRWCH** - watches started by Start Watch

***TRCCMD** - watches started by specifying watch criteria on trace commands

Watch Exit Program

- The power with watches is in the exit program
- You must create this program and it can do anything you want
- Any overhead associated with watches is the logic in this program
- Sample exit program is in the Knowledge Center
http://www-01.ibm.com/support/knowledgecenter/ssw_ibm_i_72/rzahb/rzahb_exitprogramexample.htm?lang=en
- IBM Support article
[“STRWCH - Watch Exit Programs Explained with CL Example”](#)



Historical Data and Graph History

<https://www.ibm.com/developerworks/community/wikis/home?lang=en#!/wiki/IBM%20i%20Technology%20Updates/page/Graph%20History>



Graph History

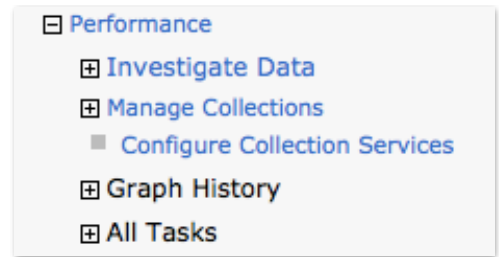
- **Graph History** allows you to view performance data over.....
 - Days, weeks, or months

- **Graph History with *System i Navigator* (7.1 and 7.2)**

- If PM for Power Systems is not active, you can keep up to 7 days of detail data and 0 months of summary data.
- If PM for Power Systems is active, then you can keep up to 30 days of detail data and 99 years of summary data.

- **Graph History is now available in *Navigator for i* with 7.3!**

- If PM for Power Systems is not active, you can keep up to
 - 7 days of detail data and 1 month of summary data.
- If PM for Power Systems is active, then you can keep up to
 - 60 days of detail data and 50 years of summary data.





Historical Data

- There are two types of historical data:
 - **Summary**
 - System level or summarized metrics
Useful in identifying trends or detecting changes in a system over a long period of time
 - **Detail**
 - Data from which the summarized metrics are derived and other relevant supplementary data.
This data is used when looking deeper into a problem identified while looking at summary historical data.
Only the top contributors for each metric will be stored as historical detail data.

Enabling Historical Data

- Historical data is **OFF** by default
- Enable historical data in Collection Services Properties
- Historical data is created at collection cycle time

Configure Collection Services

General

Library: QPFRDATA

Default collection interval: 15 seconds 5 minutes

Cycling

Cycle every day at: 12:00 AM Example: 12:30 PM

Cycle every: 24 hours

System options

- Enable system monitoring
- Create historical data when collection is cycled
- Create database files during collection
- Create performance summary data when collection is cycled



Historical Data Retention

- Retention period for summary and detail data depends on PM Agent status
 - Radio buttons will show whether PM Agent status is *ACTIVE or *INACTIVE
 - Select PM Agent On or Off to Start or Stop

Configure Collection Services

General

Data to Collect

Data Retention

System Monitor Categories

Historical Data

Collection object
Save data for: 30 days Make permanent

Standard data
Save data for: 10 days Make permanent

System monitor data
Save data for: 2 days Make permanent

Historical data

PM Agent on PM Agent off

Save summary data for: year(s) Save summary data for: month

Save detail data for: days (1-60) Save detail data for: days (1-7)

[View disclaimer](#)

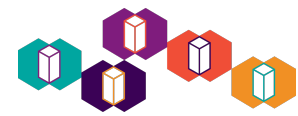


Collection Services - Historical Data Properties

- **Interval**
Summary and detail historical data will be saved at this interval.
The default is 60 minutes
- **Create historical detail data**
The default is to create historical detail data when summary historical data creation has been selected

Configure Collection Services

General	Historical Data Historical summary data Library: QPFRHIST Interval: 30 Minutes Historical detail data <input checked="" type="checkbox"/> Create historical detail data Filter: ALL Save this many top contributors of each detailed metric
Data to Collect	
Data Retention	
System Monitor Categories	
Historical Data	



Completing Historical Data Configuration

- After you enable historical data, you must cycle Collection Services to create the historical data
- Historical data will be created for all the existing management collection objects in the configured library



Viewing Historical Data - 7.3

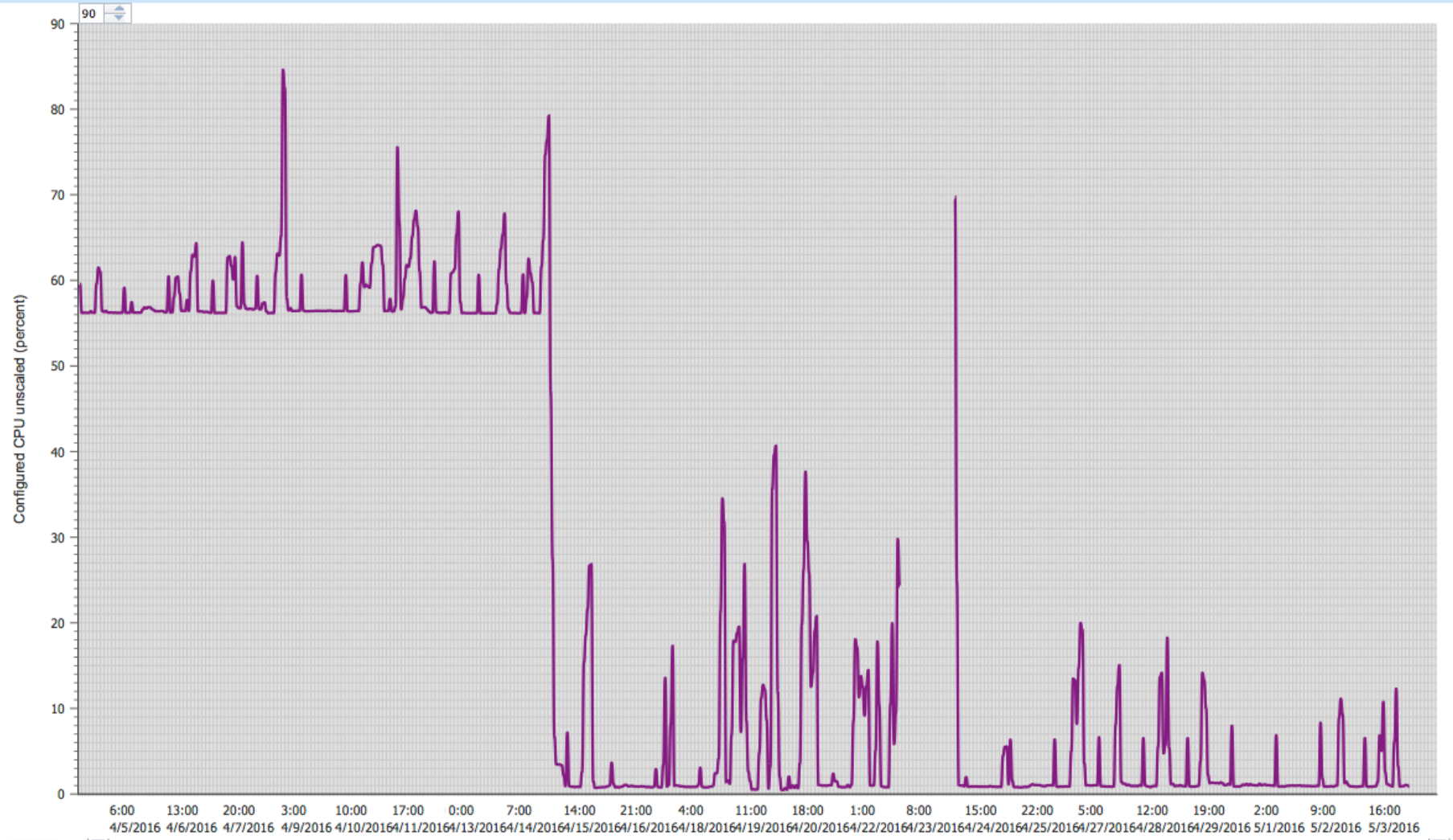
- [-] Performance
 - [+] Investigate Data
 - [+] Manage Collections
 - Configure Collection Services
- [-] Graph History
 - Summary
 - Composite

----- Actions----- ▾

CPU Utilization (Average)

► Context

CPU Utilization (Average)



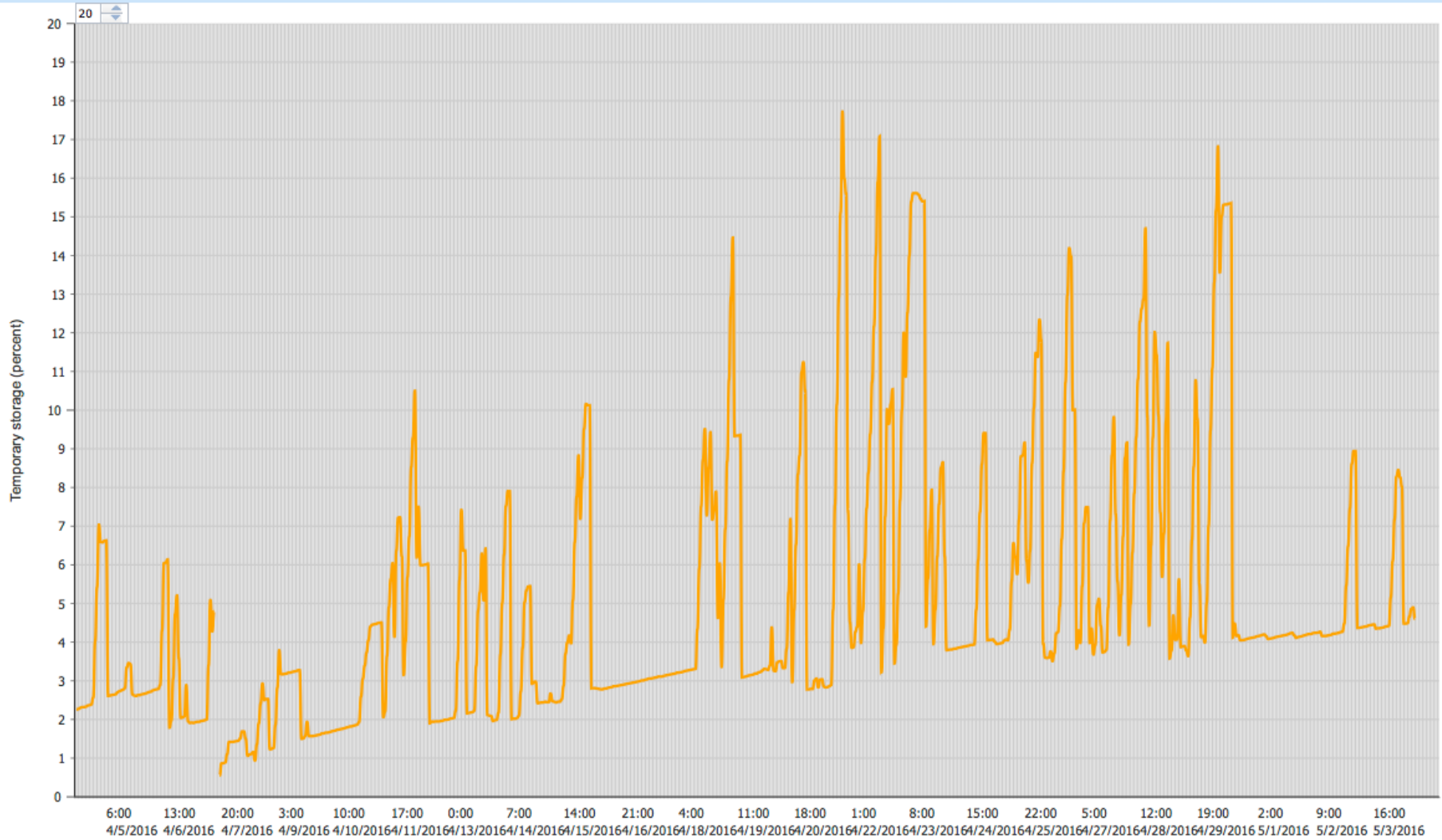
Reset

— Configured CPU unscaled (percent)



Temporary Storage for the past month

Temporary Storage Utilization



Reset

Temporary storage (percent)

From: 4/4/2016 0:00; To: 5/4/2016 13:00



Context

- Context is initially collapsed
- Expand it to select the metric and timeframe you wish to view

----- Actions----- ▼ Temporary Storage Utilization

▼ Context

Metric:	Temporary Storage Utilization ▼		
Collection Type:	*HSTFILE	From Date:	2/13/2017 ▼
Library:	QPFRHIST	Time:	00:00 ▼
Report Dates:	1 month ▼	To Date:	3/13/2017 ▼
Graph Interval:	1 hour ▼	Time:	13:07 ▼

Refresh

Metrics

▼ Context

Metric: CPU Utilization (Average)

Collection Type: Batch Logical Database I/O Rate

Library: CPU Utilization (Average)

Report Dates: CPU Utilization (Interactive Jobs)

Graph Interval: CPU Utilization (SQL)

Refresh

CPU Utilization (Average)

Configured CPU unscaled (percent)

90

80

70

60

50

40

30

20

10

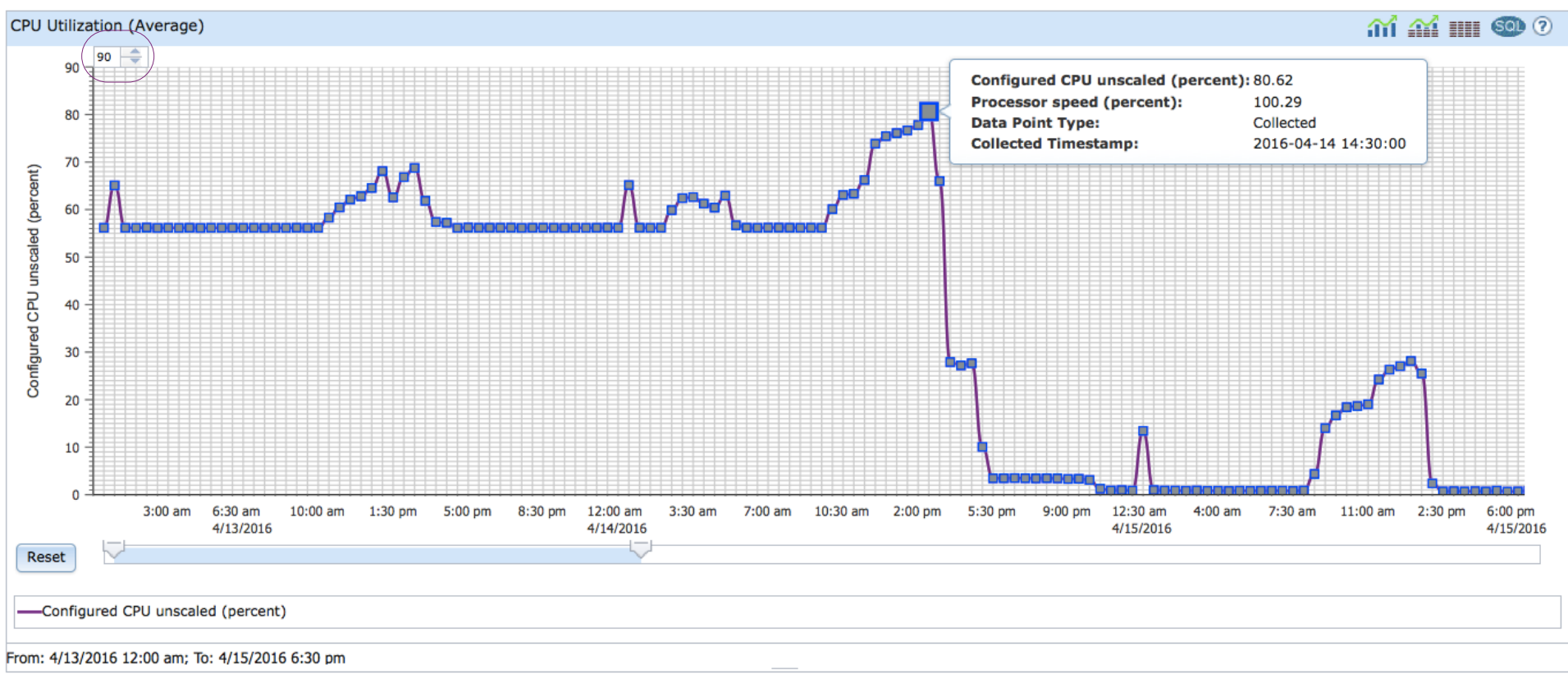
0

6:00
4/5/20

- Disk Arm Utilization (Average)
- Disk Arm Utilization (Maximum)
- Disk Arm Utilization for Independent ASP(s) (Average)
- Disk Arm Utilization for Independent ASP(s) (Maximum)
- Disk Arm Utilization for System ASP (Average)
- Disk Arm Utilization for System ASP (Maximum)
- Disk Arm Utilization for User ASP(s) (Average)
- Disk Arm Utilization for User ASP(s) (Maximum)
- Disk Response Time - Read
- Disk Response Time - Write
- Disk Storage Utilization (Average)
- Disk Storage Utilization (Maximum)
- Disk Storage Utilization for Independent ASP(s) (Average)
- Disk Storage Utilization for Independent ASP(s) (Maximum)
- Disk Storage Utilization for System ASP (Average)
- Disk Storage Utilization for System ASP (Maximum)
- Disk Storage Utilization for User ASP(s) (Average)
- Disk Storage Utilization for User ASP(s) (Maximum)
- Interactive Response Time (Average)
- Interactive Response Time (Maximum)
- Interactive Transaction Rate
- LAN Utilization (Average)
- LAN Utilization (Maximum)
- Machine Pool Faults Rate
- Shared Processor Pool Utilization (Physical)
- Shared Processor Pool Utilization (Virtual)
- Spool File Creation Rate
- Temporary Storage Utilization
- User Pool Faults Rate (Average)
- User Pool Faults Rate (Maximum)

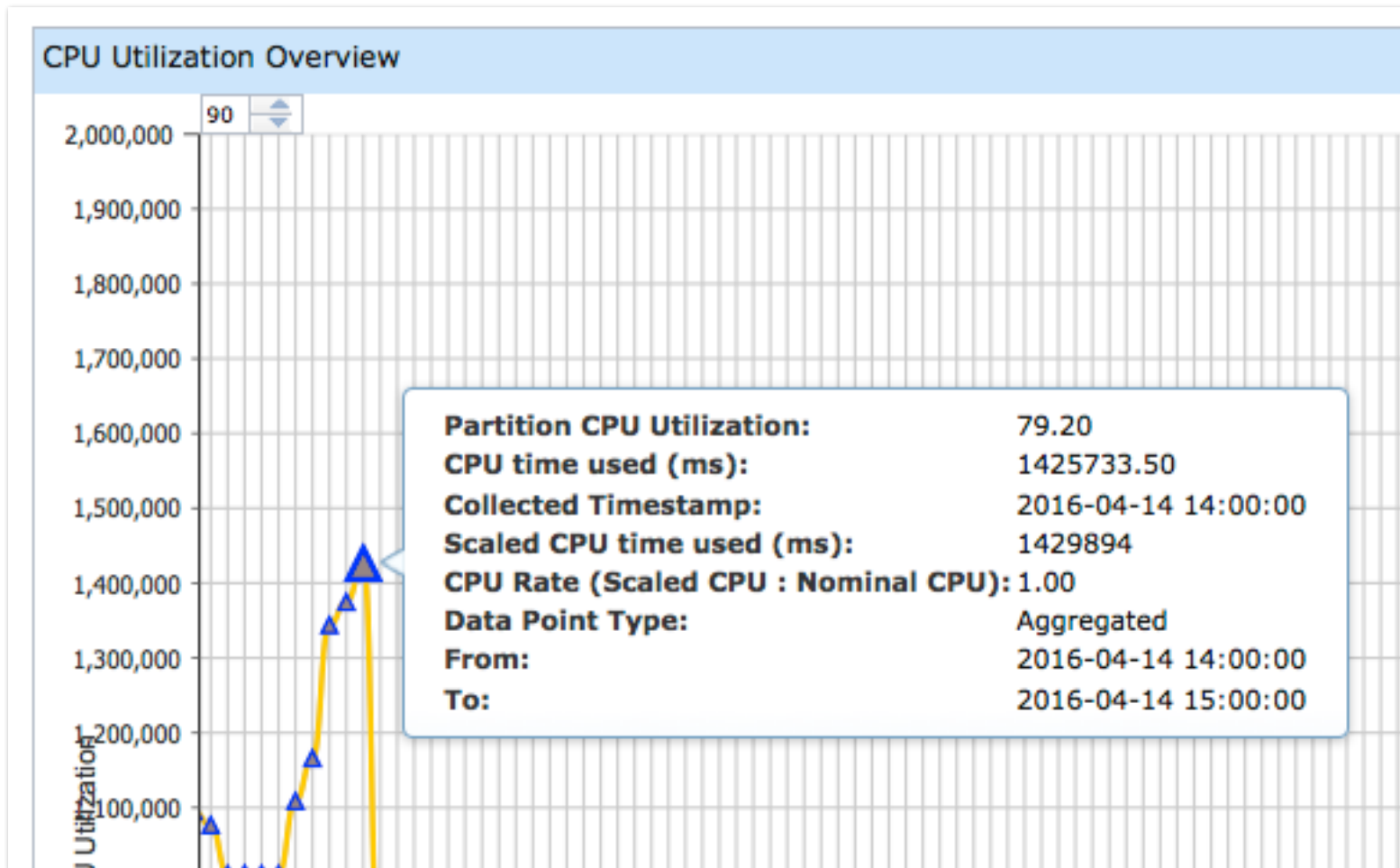


Zoom in for Details





Hover Over Data Points for more Information





----- Actions-----

CPU Utilization (Average)



▼ Context

Metric: CPU Utilization (Average)

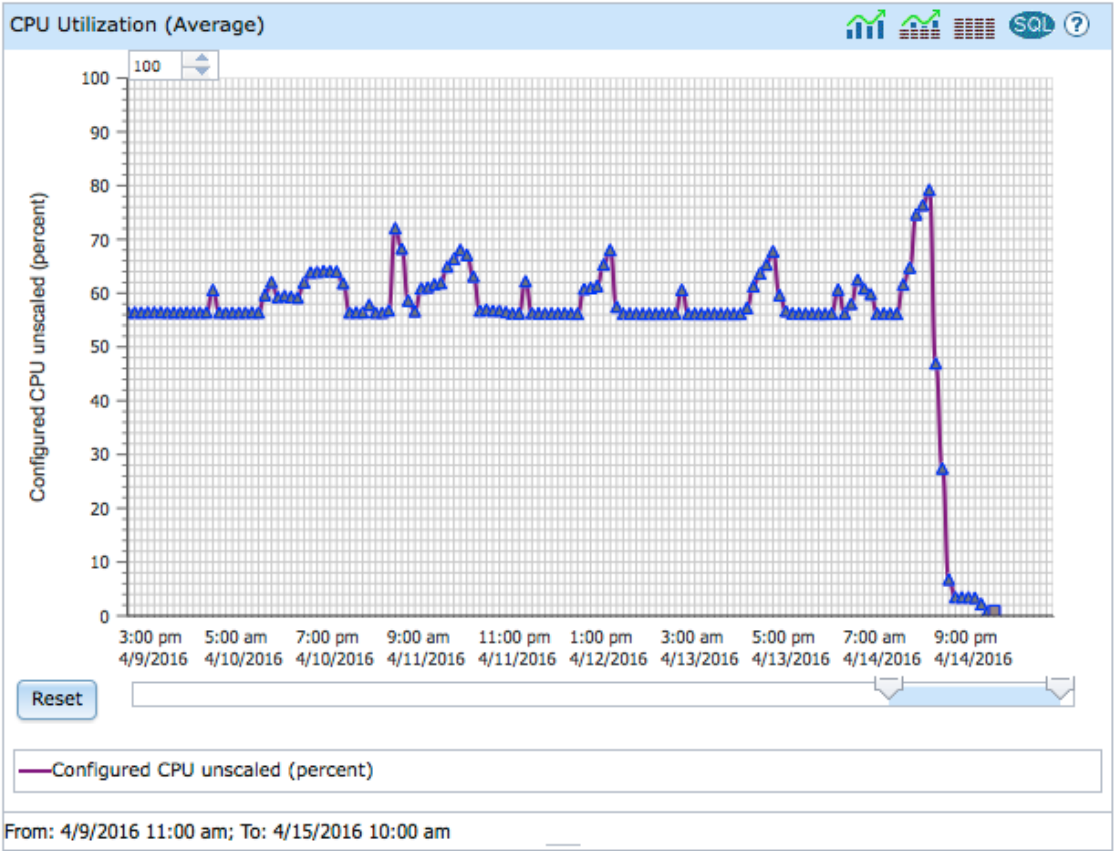
Collection Type: *HSTFILE From: 3/15/2016

Library: QPFRHIST (HH:MM) 12:00 AM

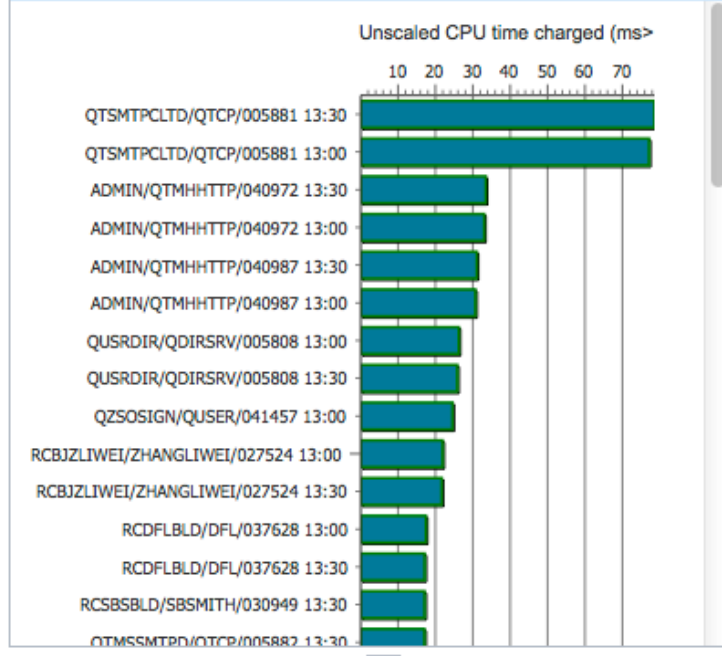
Report Dates: 1 month To: 4/15/2016

Graph Interval: 1 hour (HH:MM) 9:26 AM

Refresh



Top Contributors (04/12/2016 01:00:00 PM - 04/12/2016 02:00:00 PM) [SQL](#) [?](#)



Properties (04/12/2016 01:30:00 PM)

Field	Value
Job name	QTSMTPLTD
Job user	QTCP
Job number	005881
Collected Timestamp	2016-04-12 13:30:00.000000
Current user	QTCP
Job type	B
Job subtype	D
System task identifier	00000000000008AC
Subsystem name	QSYSWRK

Select interval to view **top contributors**
 Select top contributor to view **properties** panel



7.3

The screenshot displays the IBM Performance Explorer interface. On the left, the 'Context' panel shows the metric 'CPU Utilization (Average)' with various filters. Below it is a line chart titled 'CPU Utilization (Average)' showing 'Configured CPU unshared (percent)' over time. A callout box labeled 'Level 1 detail' points to the chart. On the right, the 'Top Contributors' panel shows a horizontal bar chart of 'Unscaled CPU time charged (ms)' for various jobs. A callout box labeled 'Level 2 detail Top Contributors' points to this chart. Below the bar chart is a 'Properties' panel for the selected job, showing fields like Job name, Job user, Job number, etc. A callout box labeled 'Level 3 detail Properties' points to this panel.

Level 2 detail
Top Contributors

Level 3 detail
Properties

Slider allows customization of chart



7.3

If you have a large display.....

IBM® Navigator for i Welcome dawnmay Target system: ut30p08.rch.stglabs.ibm.com Help | Logout

Welcome
Dashboard

Search Task

IBM i Management

- Target Systems and Groups
- Favorites
- System
- Monitors
- Basic Operations
- Work Management
- Configuration and Service
- Network
- Integrated Server Administration
- Security
- Users and Groups
- Database
- Journal Management
- Performance
 - Investigate Data
 - Manage Collections
 - Configure Collection Services
 - Graph History
 - Summary
 - Detail
- All Tasks
- File Systems
 - Internet Configurations
- Settings

----- Actions----- CPU Utilization (Average)

Context

Metric: CPU Utilization (Average)

Collection Type: *HSTFILE From: 3/15/2016

Library: QPFRHIST (HH:MM) 12:00 AM

Report Dates: 1 month To: 4/15/2016

Graph Interval: 1 hour (HH:MM) 9:26 AM

CPU Utilization (Average)

From: 4/13/2016 7:00 am; To: 4/15/2016 10:00 am

Top Contributors (04/12/2016 01:00:00 PM - 04/12/2016 02:00:00 PM)

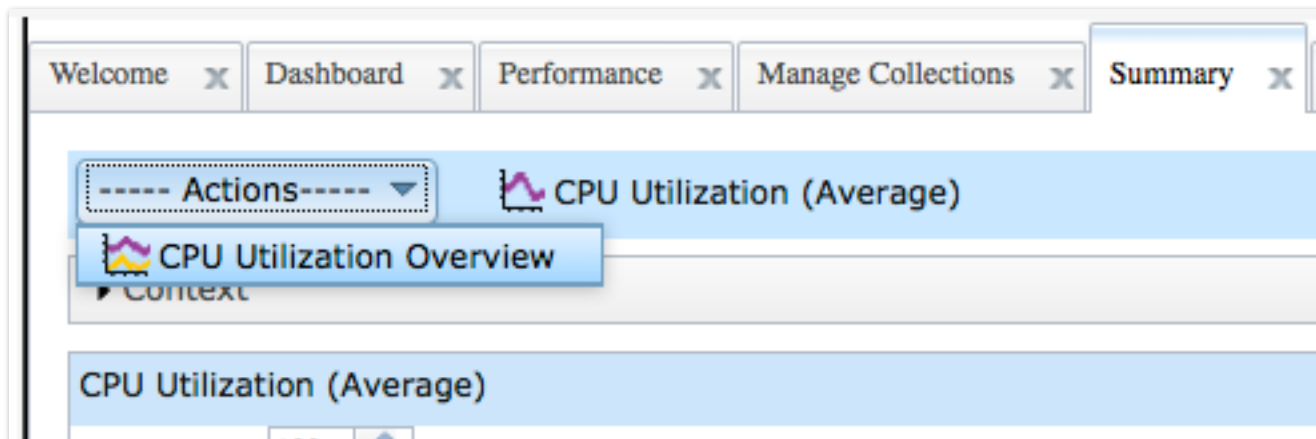
Properties (04/12/2016 01:30:00 PM)

Field	Value
Job name	QTSMTPLTD
Job user	QTCP
Job number	005881
Collected Timestamp	2016-04-12 13:30:00.000000
Current user	QTCP
Job type	B
Job subtype	D
System task identifier	0000000000008AC
Subsystem name	QSYSWRK



Actions

- From historical summary data, **Actions** allows you to launch Graph History detail charts
- At this time, there is only one detail chart
- CPU Utilization Overview



Historical Data - Composite

- [-] Performance
 - [+] Investigate Data
 - [+] Manage Collections
 - [-] Configure Collection Services
- [-] Graph History
 - [-] Summary
 - [-] Composite**

Welcome x Dashboard x Composite x

----- Actions-----
CPU Utilization Overview

Context

CPU Utilization Overview

Reset
From: 4/14/2016 5:00; To: 4/17/2016 9:00

Top Contributors (04/15/2016 13:00:00 - 04/15/2016 14:00:00)

Unscaled CPU time charged (ms)

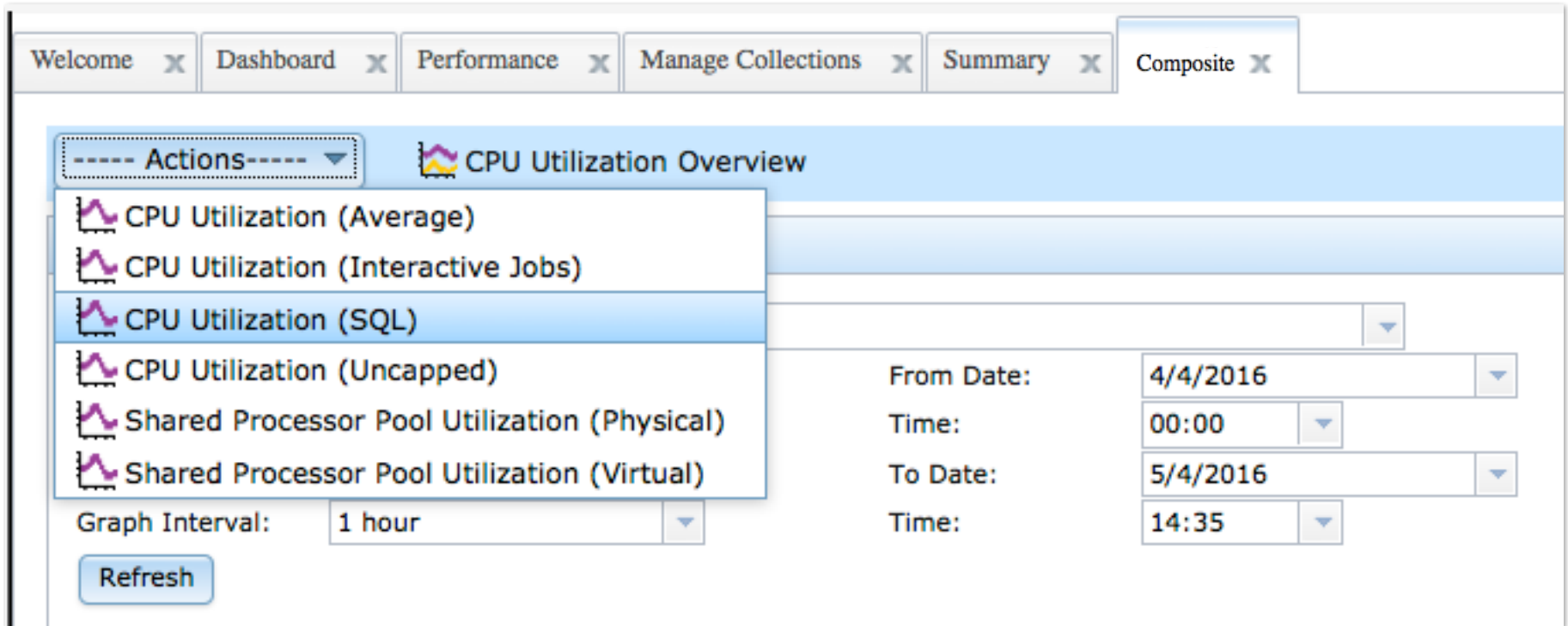
Job Name	Time	Unscaled CPU time charged (ms)
QSLPSVR/QSYS/005871	13:30	~1,850,000
QTSMP SRVD/QTCP/005872	13:30	~1,800,000
QSLPSVR/QSYS/005871	13:00	~1,750,000
QZRC SRVS/QUSER/041019	13:30	~1,650,000
QZDASOINIT/QUSER/040956	13:30	~1,600,000
QYPSJSVR/QYPSJSVR/005822	13:30	~1,550,000
QZRC SRVS/QUSER/041019	13:00	~1,500,000
QZDASOINIT/QUSER/040956	13:00	~1,450,000
QTMSSMTPD/QTCP/005880	13:30	~1,350,000
QUMEPRVAGT/QSECOFR/042130	13:00	~1,300,000
QTMSSMTPD/QTCP/005880	13:00	~1,250,000
QTSMPCLTD/QTCP/005881	13:30	~1,200,000
QTSMPCLTD/QTCP/005881	13:00	~1,150,000
QUMEPRVAGT/QSECOFR/042131	13:00	~1,100,000
QUMEPRVAGT/QSECOFR/042129	13:00	~1,050,000
QUMEPRVAGT/QSECOFR/042127	13:00	~1,000,000
QUMEPRVAGT/QSECOFR/042128	13:00	~950,000
ADMIN/QTMHHTTP/040972	13:30	~850,000

Properties (04/15/2016 13:30:00)

Field	Value
Job name	QSLPSVR
Job user	QSYS
Job number	005871
Collected Timestamp	2016-04-15 13:30:00.000000
Current user	QSYS
Job type	B
Job subtype	
System task identifier	000000000000087D
Subsystem name	QSYSWRK
Job flag	0000
Server type	QIBM_SLP_SERVER
Job priority	010

Historical Detail Data - Actions

- Actions allow you to review historical summary data for additional metrics

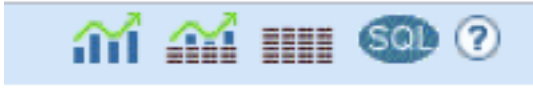


The screenshot shows a dashboard interface with a breadcrumb trail: Welcome x Dashboard x Performance x Manage Collections x Summary x Composite x. The main content area is titled 'CPU Utilization Overview' and features a dropdown menu labeled '---- Actions ----'. The menu is open, displaying the following options:

- CPU Utilization (Average)
- CPU Utilization (Interactive Jobs)
- CPU Utilization (SQL)
- CPU Utilization (Uncapped)
- Shared Processor Pool Utilization (Physical)
- Shared Processor Pool Utilization (Virtual)

Below the menu, there are several controls:

- Graph Interval: 1 hour
- Refresh button
- From Date: 4/4/2016
- Time: 00:00
- To Date: 5/4/2016
- Time: 14:35



The five icons at the top right of the summary chart are as follows:

Chart only – Select the chart icon to visualize the data on the chart. This is the default.

Chart & Table – Select the combined chart and table icon to split the screen between the graph and the table.

Table only – Select the table icon to show the dataset only in table format.

Display SQL – Select the SQL icon to display the query used to obtain the dataset charted on the graph.

Help – Select the ‘?’ icon for help text

Maximum graph value - You can specify the maximum value for the height of the y-axis

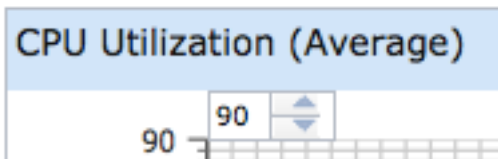
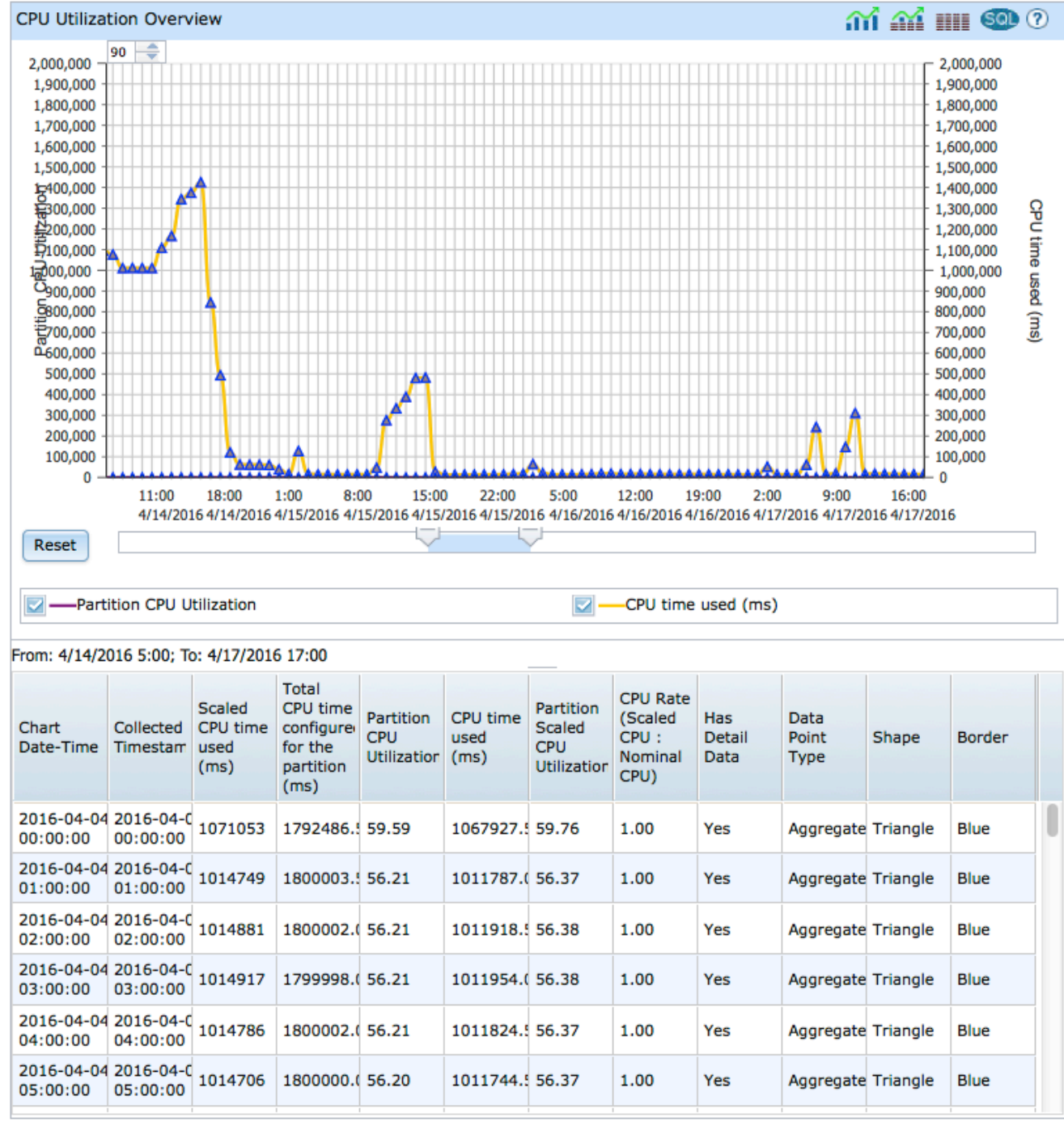
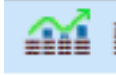


Chart and Table



7.3

SQL



7.3

SQL Statement

```
/** CPU Utilization (Overview) */
SELECT QSYS.DATETIME AS DATETIME,
       SYSSPTU,
       SYSCTA,
       COLPCTCPU,
       SYSPTU,
       COLPCTSCPU,
       SPURR_PURR_RATIO,
       CASE
         WHEN QSYS.NUM_DATA_POINTS > 1
           THEN 'NO'
         ELSE 'YES'
       END AS "IS_SINGLE_POINT",
       CASE
         WHEN QSYSDET.DATETIME2 IS NULL
           THEN 'NO'
         ELSE 'YES'
       END AS "HAS_DETAILED_DATA"
FROM (
  SELECT MIN(DATETIME) DATETIME,
         AVG(SYSSPTU) AS SYSSPTU,
         AVG(SYSCTA) AS SYSCTA,
         AVG(SYSSPTU / DOUBLE (SYSCTA) * 100) AS COLPCTCPU,
         AVG(SYSSPTU) AS SYSPTU,
         AVG(SYSSPTU / DOUBLE (SYSCTA) * 100) AS COLPCTSCPU,
         AVG(DOUBLE (SYSSPTU / SYSPTU)) AS SPURR_PURR_RATIO,
         COUNT(*) AS NUM_DATA_POINTS
  FROM QPFRHIST.qapmhmsyst
  WHERE DATETIME >= '2016-04-04 00:00:00'
        AND DATETIME <= '2016-05-04 14:25:02'
        GROUP BY YEAR(DATETIME),MONTH(DATETIME),DAY(DATETIME),HOUR(DATETIME)
) QSYS
LEFT JOIN (
  SELECT DISTINCT j.DATETIME AS DATETIME2
  FROM QPFRHIST.QAPMHDJOBM j,
       QPFRHIST.QAPMHMSYST s
  WHERE s.DATETIME = j.DATETIME
) QSYSDET ON QSYS.DATETIME = QSYSDET.DATETIME2
ORDER BY DATETIME
```

OK

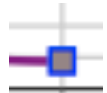
Understanding the data points



CIRCLE represents a data collection point that only has historical **summary data** available.

SQUARE and TRIANGLE both represent data collection points that have historical **detail data** available.

Click on these to see the Top Contributors data for that interval. The top contributors chart will appear in the upper right hand pane of the Graph History window.



SQUARE represents a collected* or extended*** data point.



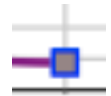
TRIANGLE represents an aggregated** data point.

Understanding the data points - the details



- CIRCLE represents a data collection point that only has historical **summary data** available.
- Blue border around the CIRCLE indicates that the summary data is collected* or aggregated**.
 - White border around the CIRCLE indicates that the summary data is extended***.

SQUARE and TRIANGLE both represent data collection points that have historical **detail data** available. Click on these to see the Top Contributors data for that interval. The top contributors chart will appear in the upper right hand pane of the Graph History window.



- SQUARE represents a collected* or extended*** data point.
- Blue border around the SQUARE indicates that this is a collected data point. The value charted can be found in the historical database file.
 - White border around the SQUARE means that this is an extended data point.



TRIANGLE represents an aggregated** data point.

*Collected means that the value charted was taken from a historical database file.

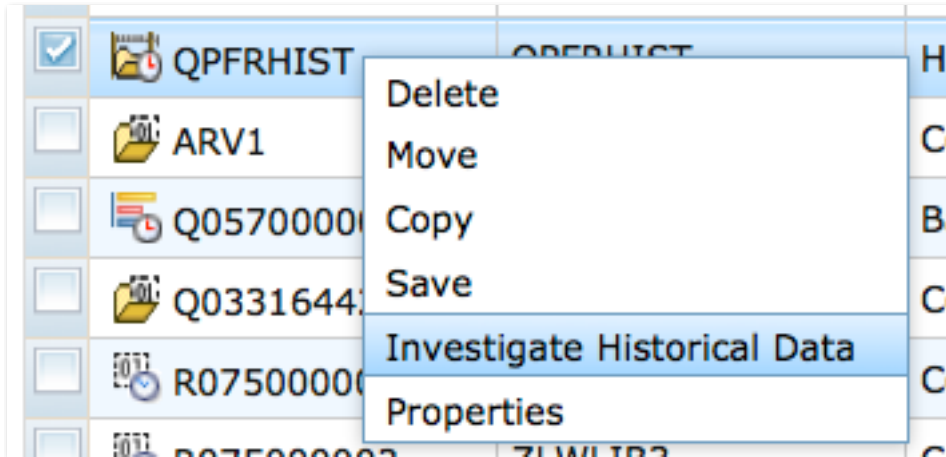
**Aggregated means that the value charted is calculated from multiple intervals in the historical database files. For example, if data is collected at 15 minute intervals and the chart is showing 1 hour graph intervals, the data point will be an aggregate of 4 time intervals combined.

***Extended means that the value charted for that time interval is not available in the historical database file, so the data point is extended from the next earlier interval value. For example, if data is collected at 30 minute intervals and the chart is showing 5 minute graph intervals, the data points between the collected intervals will be extended.

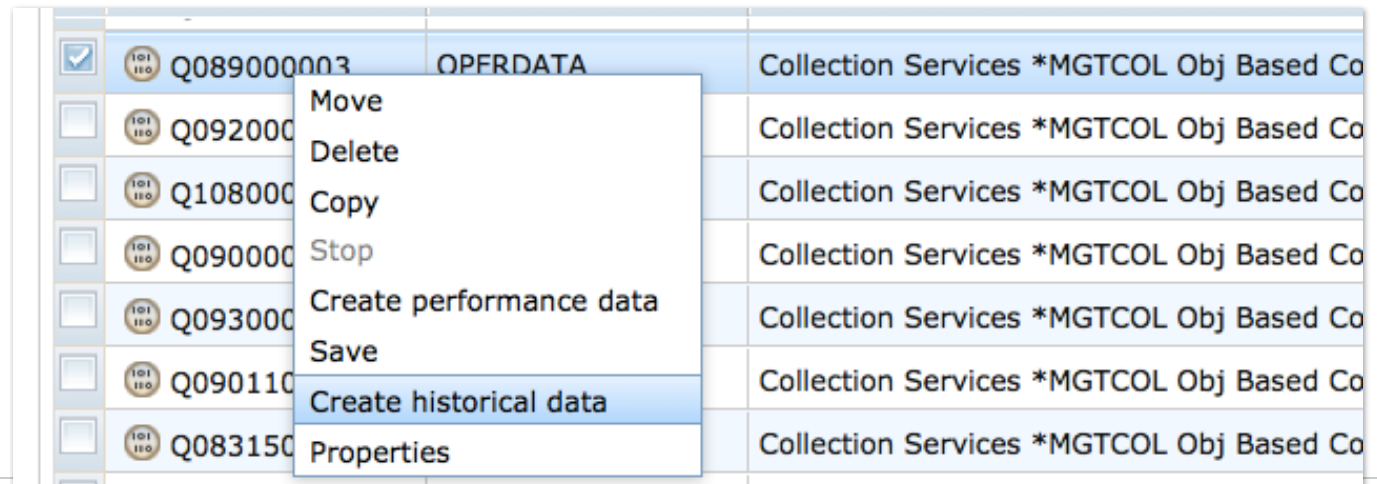
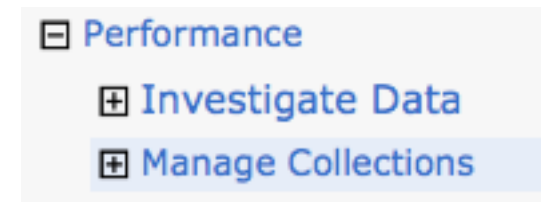


Historical Data in Collection Manager

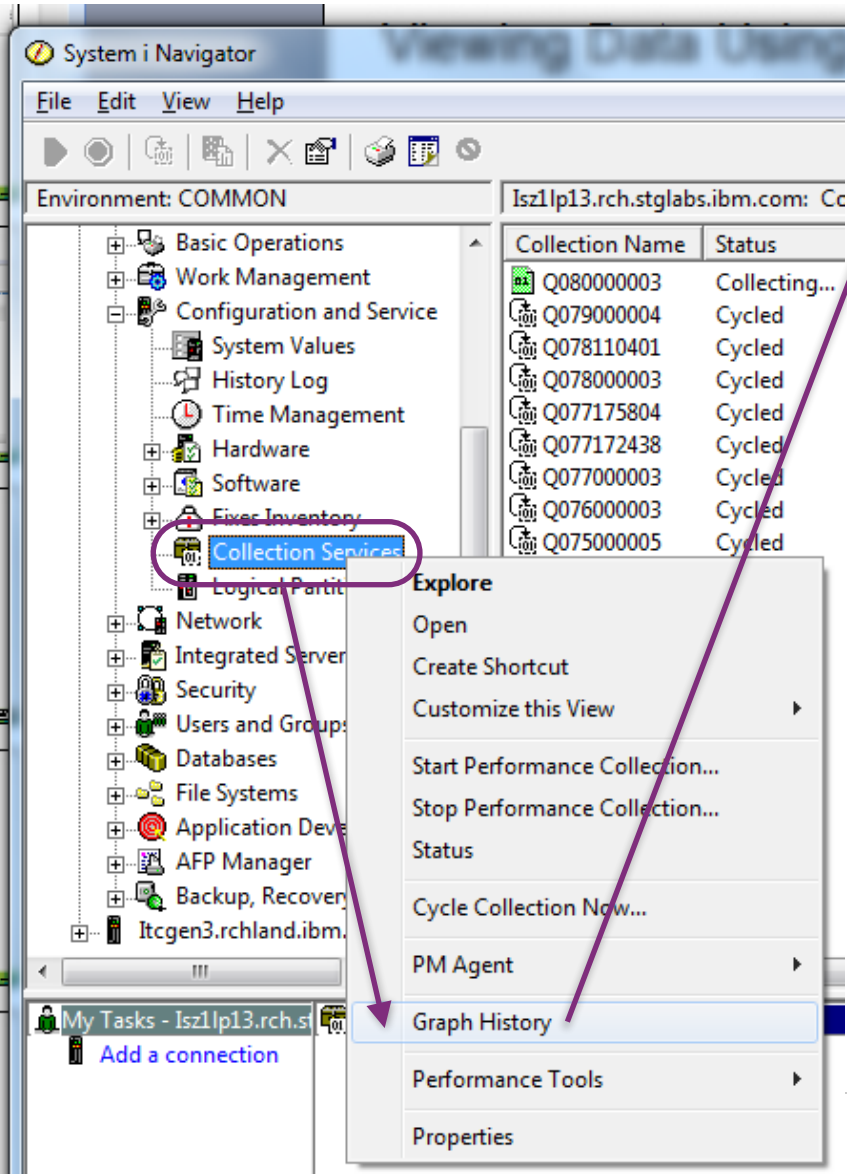
Historical data is stored in library QPFRHIST



To see the historical data collection, view all collections via “Manage Collections”



Viewing Historical Data - 7.1 and 7.2



System i Navigator

File Edit View Help

Environment: COMMON Isz1lp13.rch.stglabs.ibm.com: Co

Collection Name	Status
Q08000003	Collecting...
Q07900004	Cycled
Q078110401	Cycled
Q07800003	Cycled
Q077175804	Cycled
Q077172438	Cycled
Q07700003	Cycled
Q07600003	Cycled
Q07500005	Cycled

Basic Operations

Work Management

Configuration and Service

System Values

History Log

Time Management

Hardware

Software

Fixes Inventory

Collection Services

Logical Partit

Network

Integrated Server

Security

Users and Groups

Databases

File Systems

Application Dev

AFP Manager

Backup, Recover

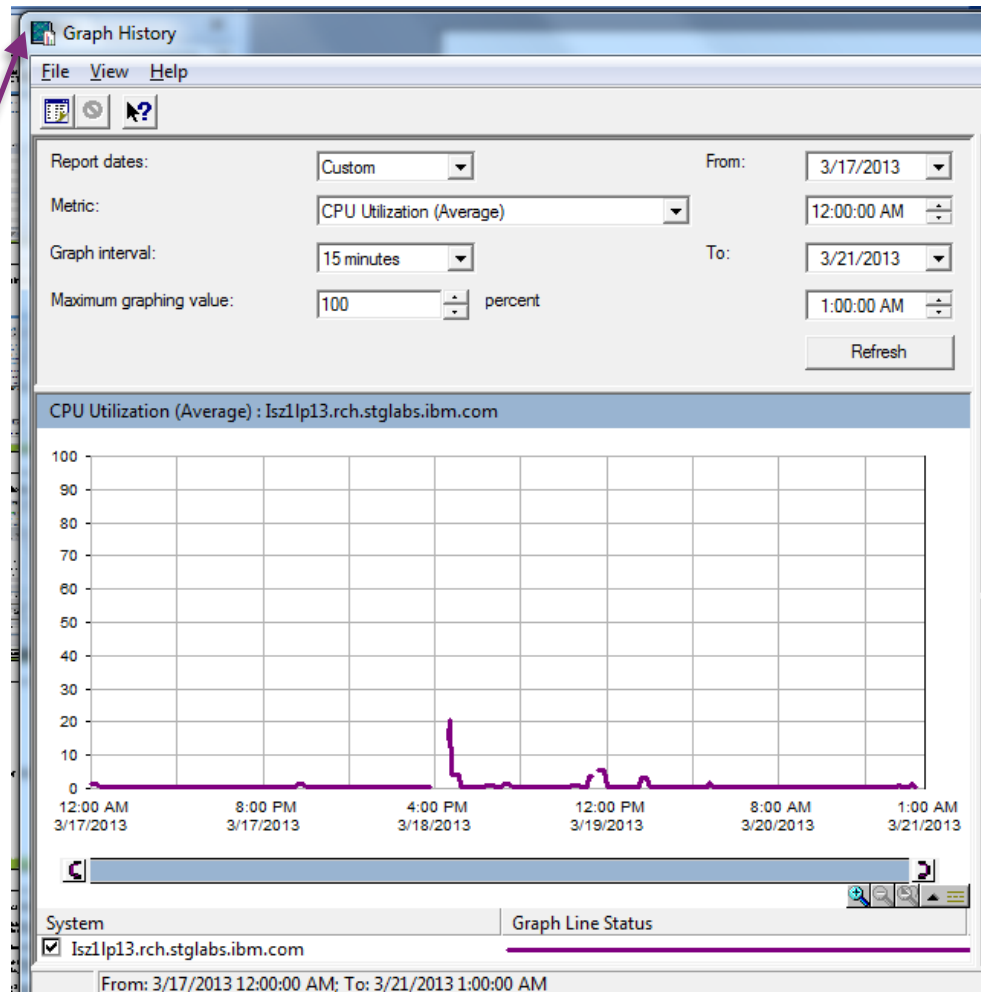
Itcgen3.rchland.ibm.

My Tasks - Isz1lp13.rch.s

Add a connection

Explore

- Open
- Create Shortcut
- Customize this View
- Start Performance Collection...
- Stop Performance Collection...
- Status
- Cycle Collection Now...
- PM Agent
- Graph History
- Performance Tools
- Properties



Graph History

File View Help

Report dates: Custom From: 3/17/2013

Metric: CPU Utilization (Average) To: 12:00:00 AM

Graph interval: 15 minutes

Maximum graphing value: 100 percent To: 3/21/2013

Refresh

CPU Utilization (Average) : Isz1lp13.rch.stglabs.ibm.com

100

90

80

70

60

50

40

30

20

10

0

12:00 AM 8:00 PM 4:00 PM 12:00 PM 8:00 AM 1:00 AM

3/17/2013 3/17/2013 3/18/2013 3/19/2013 3/20/2013 3/21/2013

System Graph Line Status

Isz1lp13.rch.stglabs.ibm.com

From: 3/17/2013 12:00:00 AM; To: 3/21/2013 1:00:00 AM



Batch Model

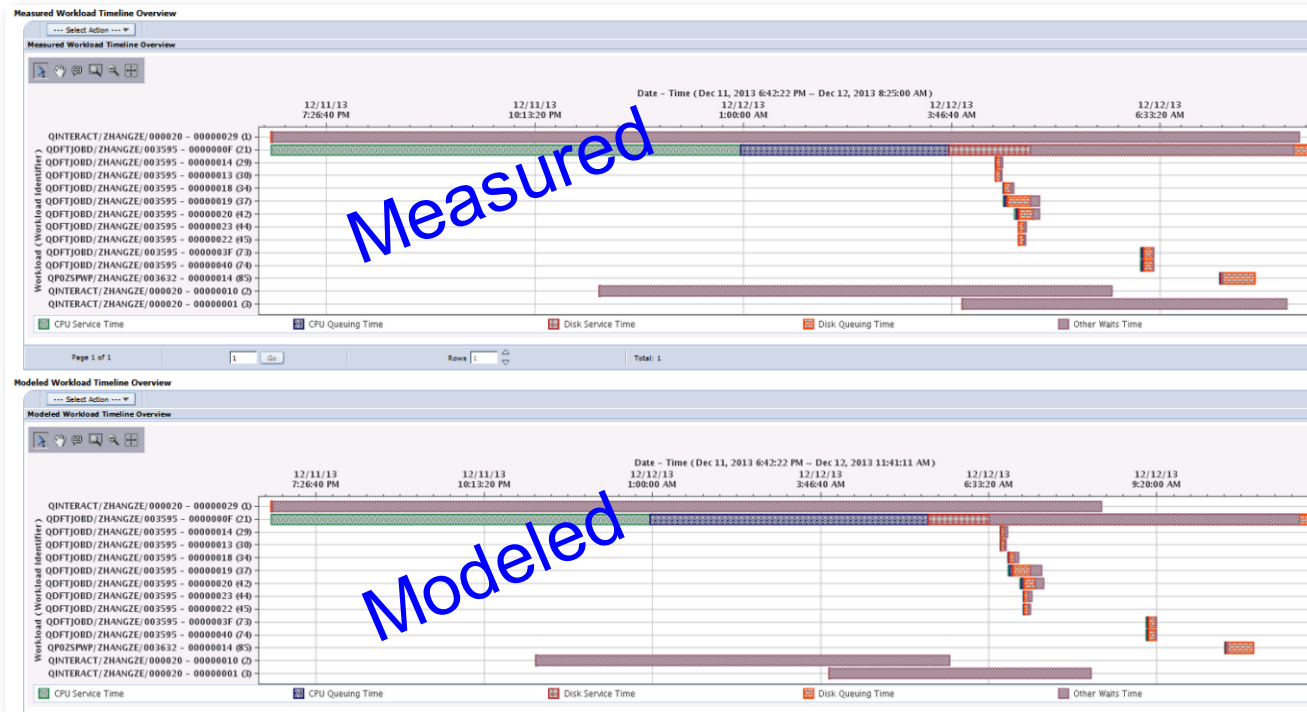
Predict application impacts to
hardware changes

[How to use the Batch Model performance tool](#)

Batch Model

Measure a batch workload

- Adjust hardware, processor, storage (SSD), system settings
- Model how these changes effect the Workload performance



- Performance
 - Investigate Data
 - Manage Collections
 - Configure Collection Services
 - Graph History
 - All Tasks
 - Active Jobs
 - Disk Status
 - Investigate Data Search
 - Investigate Data
 - Manage Collections
 - Performance Management for Power Systems
 - System Status
 - Collections
 - Performance Data Reports
 - Collectors
 - Graph History
 - Sizing
 - Batch Model
 - Analyze Batch Model
 - Batch Models
 - Calibrate Batch Model
 - Change Batch Model Calibration
 - Change Batch Model
 - Create Batch Model
 - Merge Batch Model
 - Reset Batch Model

Batch Model functions and content package require the installation of IBM Performance Tools for i (5770-PT1) Option 1 - Manager Feature

Batch Model Functions

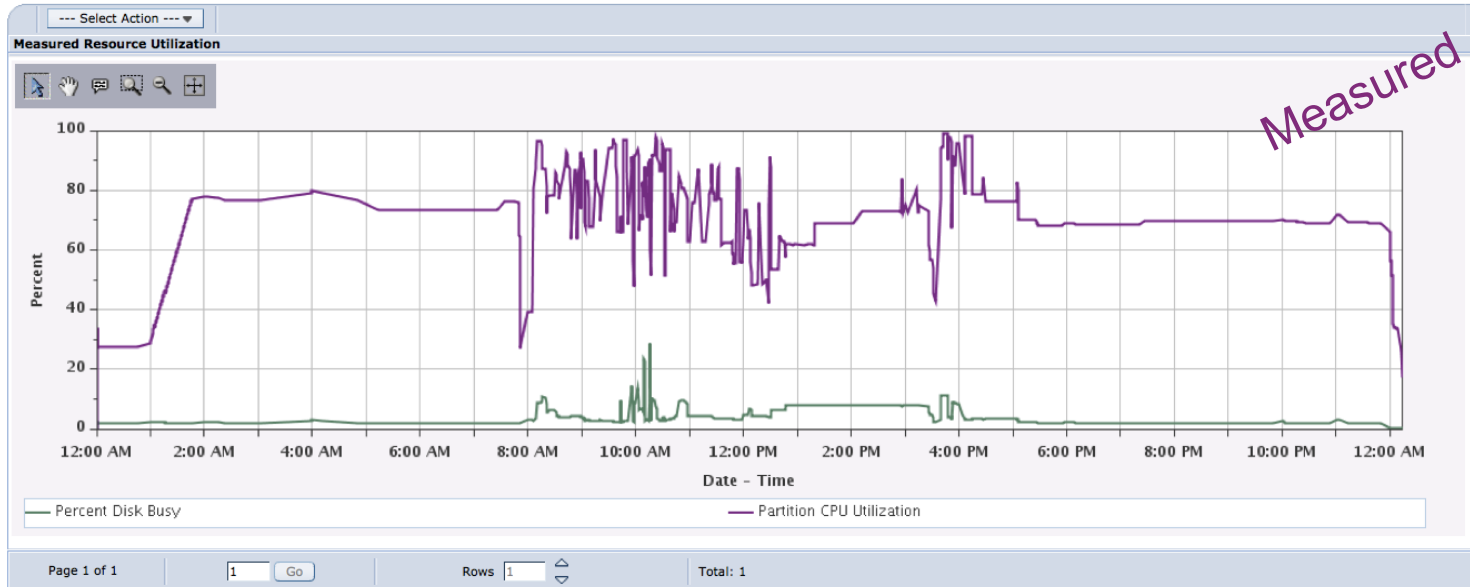
- **Create Batch Model** – Create a model from Collection Services data
- **Change Batch Model Calibration** – Adjust workload characteristics and disk configuration for a more accurate model
- **Calibrate Batch Model** – Re-create the model results after making changes to the calibration
- **Change Batch Model** – Set the properties for the scenario you want to model - workload growth, processor upgrade, disk upgrade, and changes to workloads
- **Analyze Batch Model** – Run the iterative analytic model to create model results
- **Investigate Results** – View the modeled results: workload start/stop times, dependencies between workloads, and amount of resources used
- **Merge Batch Model** – Merge two different Batch Model collections into one. This function allows you to merge batch models created from measured data collected on multiple different systems. This is useful if you want to model consolidating workloads from multiple systems into one.
- **Reset Batch Model** – Set the status of a Batch Model collection to Reset



Measured vs Modeled Resource Utilization Overview

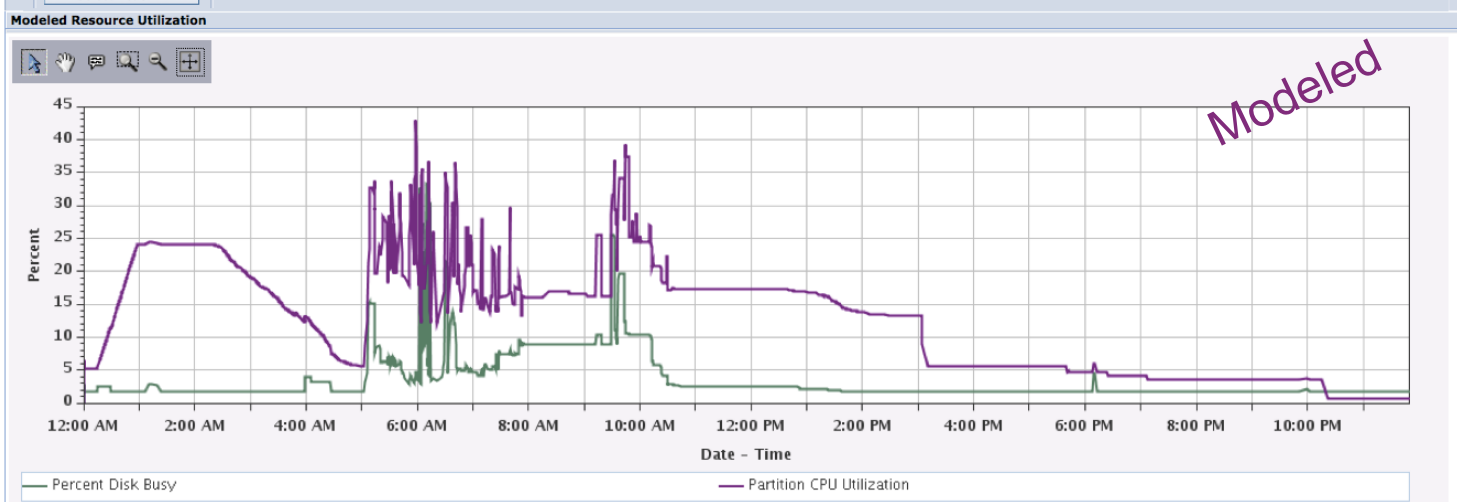
Compare the Measured vs Modeled Resource Utilization

Measured Resource Utilization



i570 9406
4 PPUs and 4 VPUs

Modeled Resource Utilization



E880
8 PPUs and 8 VPUs

Monitor with IBM i System Health Services

IBM i Services to Monitor System Health

- IBM i Services allow you to use SQL to access system information
- An extensive set of IBM i services are available
- System Health Services provide automatic tracking of system limits which enables you to:
 - Understand when an application is trending towards a failure
 - Gain insight regarding application or system outages
 - Identify applications which are operating inefficiently
 - Establish a general use mechanism for communicating limit information



IBM i Services to Monitor System Limits

- System Limits - examples of what you can track
 - Largest IFS files, DB2 files
 - Maximum number of jobs
 - Maximum number of spooled files
 - Temporary storage use
 - System Status
- You can use triggers for automation



System Limits - Table and View

- Tracking information is registered in a DB2 for i system table
 - [QSYS2/SYSLIMTBL](#)
- A view - [QSYS2/SYSLIMITS](#) - is built over the SYSLIMTBL physical file
 - Provides a wealth of contextual information regarding the rows in the table
- Generally work with the view rather than the underlying table

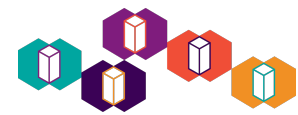


Example: Find the largest IFS file

- ```
SELECT "LAST_CHANGE_TIMESTAMP", "USER_NAME",
"CURRENT_VALUE", "JOB_NAME", "IFS_PATH_NAME",
"ASP_NUMBER" FROM "QSYS2"."SYSLIMITS" WHERE
(("LIMIT_ID" = 18409)) ORDER BY
"CURRENT_VALUE" DESC
```
- Limit\_ID of 18409 is the maximum number of bytes in a stream file

### SQL Output

| LAST_CHANGE_TIMESTAMP      | USER_NAME | CURRENT_VALUE | JOB_NAME                 | IFS_PATH_NAME                                                              | ASP_NUMBER |
|----------------------------|-----------|---------------|--------------------------|----------------------------------------------------------------------------|------------|
| 2015-03-06 08:34:12.181302 | DMMAY     | 3290918742    | 102018/ DMMAY/QPADEV0002 | /v7r2_3_6_15/B_GROUP3_02.ISO                                               | 1          |
| 2015-03-06 08:34:12.086414 | DMMAY     | 3289837464    | 102018/ DMMAY/QPADEV0002 | /v7r2_3_6_15/B_GROUP3_02.ISO                                               | 1          |
| 2015-03-06 08:34:11.997061 | DMMAY     | 3288756186    | 102018/ DMMAY/QPADEV0002 | /v7r2_3_6_15/B_GROUP3_02.ISO                                               | 1          |
| 2015-03-06 08:34:11.902135 | DMMAY     | 3287674908    | 102018/ DMMAY/QPADEV0002 | /v7r2_3_6_15/B_GROUP3_02.ISO                                               | 1          |
| 2015-03-06 08:34:11.615124 | DMMAY     | 3286593630    | 102018/ DMMAY/QPADEV0002 | /v7r2_3_6_15/B_GROUP3_02.ISO                                               | 1          |
| 2015-07-08 09:03:00.674687 | QSYS      | 73786746      | 117637/QLWISVR/QP0ZSPWP  | /QIBM/ProdData/OS400/DirSrv/com.ibm.i5os.idswebapp/WEB-INF/lib/IDSHelp.jar | 1          |
| 2015-07-08 09:03:00.664424 | QSYS      | 72700819      | 117637/QLWISVR/QP0ZSPWP  | /QIBM/ProdData/OS400/DirSrv/com.ibm.i5os.idswebapp/WEB-INF/lib/IDSHelp.jar | 1          |



## Near the Maximum Number of Jobs?

---

- QMAXJOB is the maximum number of jobs on a partition
  - Maximum value is 970,000
  - Default (shipped) setting is 163,520
- If you near the maximum number of jobs on your partition bad things happen

CPI1468 - **System job tables nearing capacity**

is sent to the QSYSOPR message queue.

- DSPJOB\_TBL will show you how many jobs are in the system
- And now have another way.....



## Query to determine how close you are to the Max Jobs

```

WITH TT (JOB_MAXIMUM)
 AS (SELECT CURRENT_NUMERIC_VALUE
 FROM QSYS2.SYSTEM_VALUE_INFO
 WHERE SYSTEM_VALUE_NAME = 'QMAXJOB')
SELECT LAST_CHANGE_TIMESTAMP
 AS INCREMENT_TIME, CURRENT_VALUE AS JOB_COUNT, TT.JOB_MAXIMUM,
 DEC (DEC (CURRENT_VALUE, 19, 2) / DEC (TT.JOB_MAXIMUM, 19, 2) *
100, 19, 2) AS PERCENT_CONSUMED
 FROM QSYS2.SYSLIMITS, TT
 WHERE LIMIT_ID = 19000 ORDER BY CURRENT_VALUE DESC;

```

| INCREMENT_TIME             | JOB_COUNT | JOB_MAXIMUM | PERCENT_CONSUMED |
|----------------------------|-----------|-------------|------------------|
| 2015-05-18 00:33:25.439414 | 71408     | 163520      | 43.66            |
| 2015-05-16 08:00:13.560947 | 71008     | 163520      | 43.42            |
| 2015-05-18 01:00:23.118807 | 70031     | 163520      | 42.82            |
| 2015-05-12 22:42:48.345298 | 69008     | 163520      | 42.20            |
| 2015-05-12 22:42:33.200108 | 68608     | 163520      | 41.95            |
| 2015-05-12 22:31:28.636105 | 68208     | 163520      | 41.71            |
| 2015-05-18 01:01:01.333811 | 68140     | 163520      | 41.67            |
| 2015-05-18 01:02:01.376725 | 65246     | 163520      | 39.90            |
| 2015-05-18 01:07:04.412267 | 54952     | 163520      | 33.60            |
| 2015-05-12 21:47:34.281314 | 49808     | 163520      | 30.45            |



# SQL Statement to review the limits you can track

```
SELECT SIZING_ID, SUPPORTED_VALUE, SIZING_NAME,
COMMENTS
FROM QSYS2.SQL_SIZING ORDER BY SIZING_ID DESC
```

| SIZING_ID | SUPPORTED_VALUE    | SIZING_NAME                                                              | COMMENTS                                                                 |
|-----------|--------------------|--------------------------------------------------------------------------|--------------------------------------------------------------------------|
| 25005     | 10                 | MAXIMUM SYSTEM USER LENGTH                                               | Maximum length of a system authorization ID                              |
| 25004     | 10                 | MAXIMUM SESSION USER LENGTH                                              | Maximum length of a session authorization ID                             |
| 25003     | -                  | MAXIMUM CURRENT ROLE LENGTH                                              | -                                                                        |
| 25002     | 8843               | MAXIMUM CURRENT PATH LENGTH                                              | Maximum length of an SQL path                                            |
| 25001     | -                  | MAXIMUM CURRENT TRANSFORM GROUP LENGTH                                   | -                                                                        |
| 25000     | -                  | MAXIMUM CURRENT DEFAULT TRANSFORM GROUP LENGTH                           | -                                                                        |
| 20004     | 32718              | MAXIMUM DATALINK LENGTH                                                  | Maximum length of a datalink                                             |
| 20002     | 2097151            | MAXIMUM STATEMENT OCTETS SCHEMA                                          | Maximum length of an SQL data definition language (DDL) statement        |
| 20001     | 2097151            | MAXIMUM STATEMENT OCTETS DATA                                            | Maximum length of an SQL data manipulation language (DML) statement      |
| 20000     | 2097151            | MAXIMUM STATEMENT OCTETS                                                 | Maximum length of an SQL statement                                       |
| 19003     | 10000000           | MAXIMUM NUMBER OF SPOOLED FILES IN EACH INDEPENDENT ASP                  | Maximum number of spooled files in each independent ASP                  |
| 19002     | 2610000            | MAXIMUM NUMBER OF SPOOLED FILES IN THE SYSTEM AND BASIC USER ASPs        | Maximum number of spooled files in the system and basic user ASPs        |
| 19001     | 999999             | MAXIMUM NUMBER OF SPOOLED FILES PER JOB                                  | Maximum number of spooled files per job                                  |
| 19000     | 970000             | MAXIMUM NUMBER OF JOBS                                                   | Maximum number of jobs                                                   |
| 18410     | 2147483647         | MAXIMUM NUMBER OF BYTES IN A DOCUMENT                                    | Maximum number of bytes in a document                                    |
| 18409     | 1099511627776      | MAXIMUM NUMBER OF BYTES IN A STREAM FILE                                 | Maximum number of bytes in a stream file                                 |
| 18408     | 1000000            | MAXIMUM NUMBER OF DOCUMENT LIBRARY OBJECTS IN A USER ASP                 | Maximum number of document library objects in a basic user ASP           |
| 18407     | 0                  | TOTAL DOCUMENT LIBRARY OBJECTS IN THE SYSTEM ASP                         | Total document library objects in the system ASP                         |
| 18406     | 65510              | MAXIMUM NUMBER OF DOCUMENT LIBRARY OBJECTS IN A FOLDER                   | Maximum number of document library objects in a folder                   |
| 18405     | 2147483647         | MAXIMUM NUMBER OF FILE SYSTEM OBJECTS IN AN INDEPENDENT ASP              | Maximum number of file system objects in an independent ASP              |
| 18404     | 2147483647         | MAXIMUM NUMBER OF FILE SYSTEM OBJECTS IN THE SYSTEM AND BASIC USER ASPs  | Maximum number of file system objects in the system and basic user ASPs  |
| 18403     | 1000000            | MAXIMUM NUMBER OF DIRECTORIES LINKED IN A DIRECTORY                      | Maximum number of directories linked in a directory                      |
| 18402     | 0                  | TOTAL OBJECTS LINKED IN A DIRECTORY                                      | Total objects linked in a directory                                      |
| 18401     | 0                  | MAXIMUM NUMBER OF OBJECTS IN A LIBRARY                                   | Maximum number of objects in a library                                   |
| 18400     | 1000000            | MAXIMUM NUMBER OF OBJECT DESCRIPTION ENTRIES IN A LIBRARY                | Maximum number of object description entries in a library                |
| 18304     | 9999999999         | MAXIMUM SEQUENCE NUMBER FOR A *MAXOPT1 OR *MAXOPT2 JOURNAL               | Maximum sequence number for a *MAXOPT1 or *MAXOPT2 journal               |
| 18303     | 184467440737095... | MAXIMUM SEQUENCE NUMBER FOR A *MAXOPT3 JOURNAL                           | Maximum sequence number for a *MAXOPT3 journal                           |
| 18302     | 250000             | MAXIMUM NUMBER OF OBJECTS THAT CAN BE ASSOCIATED WITH A *MAX250K JOURNAL | Maximum number of objects that can be associated with a *MAX250K journal |
| 18301     | 10000000           | MAXIMUM NUMBER OF OBJECTS THAT CAN BE ASSOCIATED WITH A *MAX10M JOURNAL  | Maximum number of objects that can be associated with a *MAX10M journal  |
| 18300     | 1099511627776      | MAXIMUM JOURNAL RECEIVER SIZE                                            | Maximum size of a journal receiver                                       |
| 18207     | 2097152            | MAXIMUM LENGTH OF SQL STATEMENT                                          | Maximum length of SQL statement per job                                  |
| 18206     | 0                  | MAXIMUM NUMBER OF SQL PSEUDO OPEN CURSORS                                | Maximum number of pseudo closed SQL cursors per job                      |
| 18205     | 20966              | MAXIMUM NUMBER OF SQL OPEN CURSORS                                       | Maximum number of open SQL cursors per job                               |
| 18204     | 160000             | MAXIMUM NUMBER OF CLI HANDLES                                            | Maximum number of CLI handles per job                                    |
| 18203     | 0                  | MAXIMUM NUMBER OF DESCRIPTORS                                            | Maximum number of active descriptors per job                             |
| 18202     | 0                  | MAXIMUM NUMBER OF ACTIVATION GROUPS                                      | Maximum number of activation groups to use SQL per job                   |
| 18201     | 209000             | MAXIMUM NUMBER OF LOB AND XML LOCATORS PER SERVER JOB                    | Maximum number of LOB and XML locators per server job                    |
| 18200     | 16000000           | MAXIMUM NUMBER OF LOB AND XML LOCATORS PER JOB                           | Maximum number of LOB and XML locators per job                           |
| 18119     | 0                  | SEQUENTIAL READS                                                         | Sequential reads                                                         |
| 18118     | 0                  | RANDOM READS                                                             | Random reads                                                             |



# Reference Information to System Limits Tracking

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- Blogs
  - [Introduction to IBM i System Limits and Maximum Capacities](#)
  - [Tracking IBM i System Limits, Part 2](#)
- Articles (Registration required to access these articles)
  - [OnDemand Tracking of Important System Limits on IBM i](#)
  - [Gain Big Insights into DB2 for i with System Limits, Phase 2](#)



**i**thankyou

[www.ibm.com/power/i](http://www.ibm.com/power/i)

# Knowledge Center

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- IBM i Knowledge Center

[http://www.ibm.com/support/knowledgecenter/ssw\\_ibm\\_i/welcome](http://www.ibm.com/support/knowledgecenter/ssw_ibm_i/welcome)

- [7.1](#)
- [7.2](#)
- [7.3](#)

- Monitors in 7.3 Knowledge Center:

- [https://www.ibm.com/support/knowledgecenter/ssw\\_ibm\\_i\\_73/rzahx/rzahxmonparent.htm](https://www.ibm.com/support/knowledgecenter/ssw_ibm_i_73/rzahx/rzahxmonparent.htm)





# developerWorks



developerWorks®

- [developerWorks](#)



IBM i

Technical resources for IBM i developers and users

- [Navigator for i](#) on developerWorks

- ▼ **Navigator**
  - ▼ IBM Navigator for i
    - ▶ **PTFs**
    - ▶ **Enhancements list**
    - ▶ **Service Availability**
    - ▼ **System Monitors**
      - Event log does not show triggered events wh...
      - System Monitor Best Practices
      - System Monitor Replacement Variables
      - Send email as a monitor action
    - ▼ **Dashboards**
      - Dashboard Best Practices
      - Creating a Certificate on Chrome for IBM Navig...
    - ▶ **Disk Management**
    - ▶ **Integrated file system**
      - DB2 for i - Navigator enhancements in IBM i 7.1...
      - Cool for V7R2
      - How to Disable IPv6 for Improving IBM Navigat...
    - ▶ **December 2014 Navigator PTFs**
      - IBM Navigator for i - V7R2 Content
      - IBM Navigator for i - V7R2 Changes

## developerWorks Articles

<https://www.ibm.com/developerworks/develop/ibmi/>

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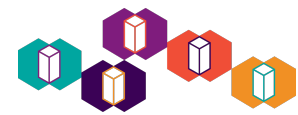
- Improving Navigator for i Performance
  - <https://www.ibm.com/developerworks/community/wikis/home?lang=en#!/wiki/IBM%20i%20Technology%20Updates/page/Improving%20IBM%20Navigator%20for%20i%20Performance>
- Browser Support and Tips
  - <https://www.ibm.com/developerworks/community/wikis/home?lang=en#!/wiki/IBM%20i%20Technology%20Updates/page/Browser%20tips>
- System Monitors
  - <https://www.ibm.com/developerworks/community/wikis/home?lang=en#!/wiki/IBM%20i%20Technology%20Updates/page/System%20Monitors>
- System Monitor Best Practices
  - <https://www.ibm.com/developerworks/community/wikis/home?lang=en#!/wiki/IBM%20i%20Technology%20Updates/page/System%20Monitor%20Best%20Practices>
- System Monitor Replacement Variables
  - <https://www.ibm.com/developerworks/community/wikis/home?lang=en#!/wiki/IBM%20i%20Technology%20Updates/page/System%20Monitor%20Replacement%20Variables>
- How to Use the Batch Model Performance Tool
  - <https://www.ibm.com/developerworks/ibmi/library/i-how-to-use-the-batch-model-performance-tool/i-how-to-use-the-batch-model-performance-tool-pdf.pdf>

IBM wiki

### IBM i Technology Updates

IBM i operating system (OS) levels and related software products are frequently enhanced via Program Temporary Fixes (PTFs). This wiki contains a centralized list of all enhancements for IBM i.

[Find updates](#)



# QINAVMNSRV Daemon Job

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- Daemon job QINAVMNSRV provides a monitor service for IBM Navigator for i which includes data collection and a programmable interface for accessing the data.
  - Directory: /QIBM/ProdData/OS400/iSeriesNavigator/config/MONITOR
  - This directory includes several jar files, log and trace files for job QINAVMNSRV
- The job QINAVMNSRV job runs under user profile QSECOFR. This service program is called in the job to swap to the QSECOFR profile. The following requirements need to be met:
  - QSECOFR is enabled
  - QSECOFR's password is set to not expire
  - QSECOFR's password expiration of interval is set to \*NOMAX, or it is set to \*SYSVAL and the system value QPWDEXPITV is set to \*NOMAX
- /QSYS.LIB/QSYSDIR.LIB/QINAVMNSRV.PGM
  - This program is used to start and stop QINAVMNSRV. Normally, this job is started automatically when IBM Navigator for i is started.  
The job will continue running if IBM Navigator is stopped. It can be stopped explicitly with the following command:  
  
**CALL PGM(QSYSDIR/QINAVMNSRV) PARM(\*STOP)**  
  
Note: You should call this command to end the job QINAVMNSRV before applying a new PTF
- IBM Support document: [The QINAVMNSRV job](#)



# Debugging Monitor Problems

---

/QIBM/UserData/OS/ADMININST/admin2/wlp/usr/servers/admin2/logs

messages.log is the file to look at for Navigator errors

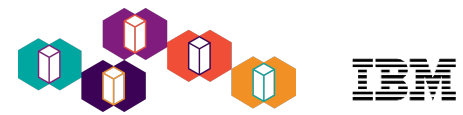
And also the following

/QIBM/ProdData/OS400/iSeriesNavigator/config/MONITOR

or

/QIBM/ProdData/OS400/Navigator/config/MONITOR

monitor.log and \*.txt are log files for monitors



# Special notices

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Revised September 26, 2006



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Revised December 2, 2010