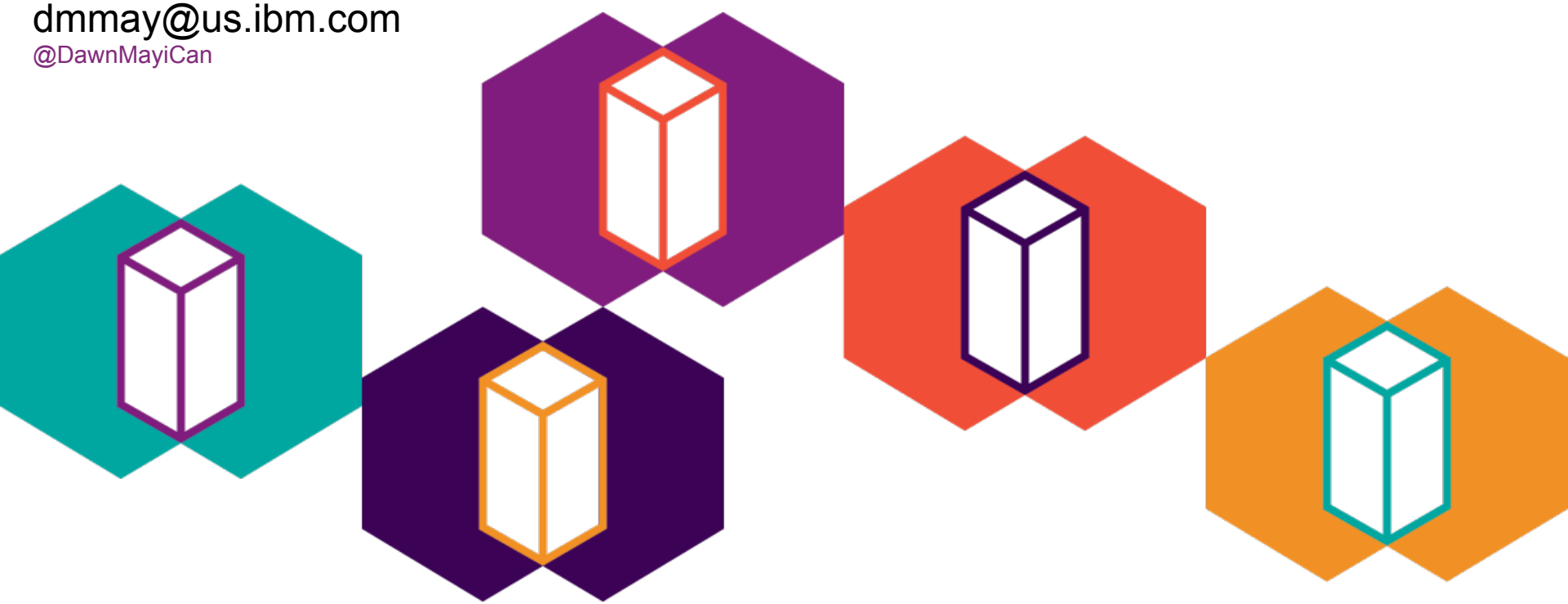
Predictive Performance Management

Dawn May
dmmay@us.ibm.com
@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**?

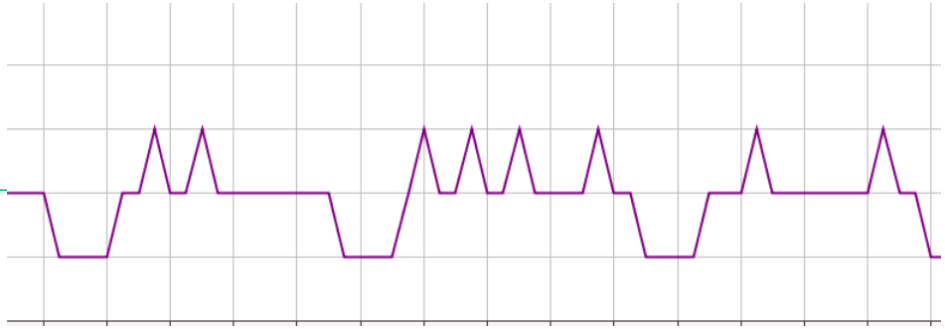
Being **proactive** can help you prevent small problems from becoming big ones

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



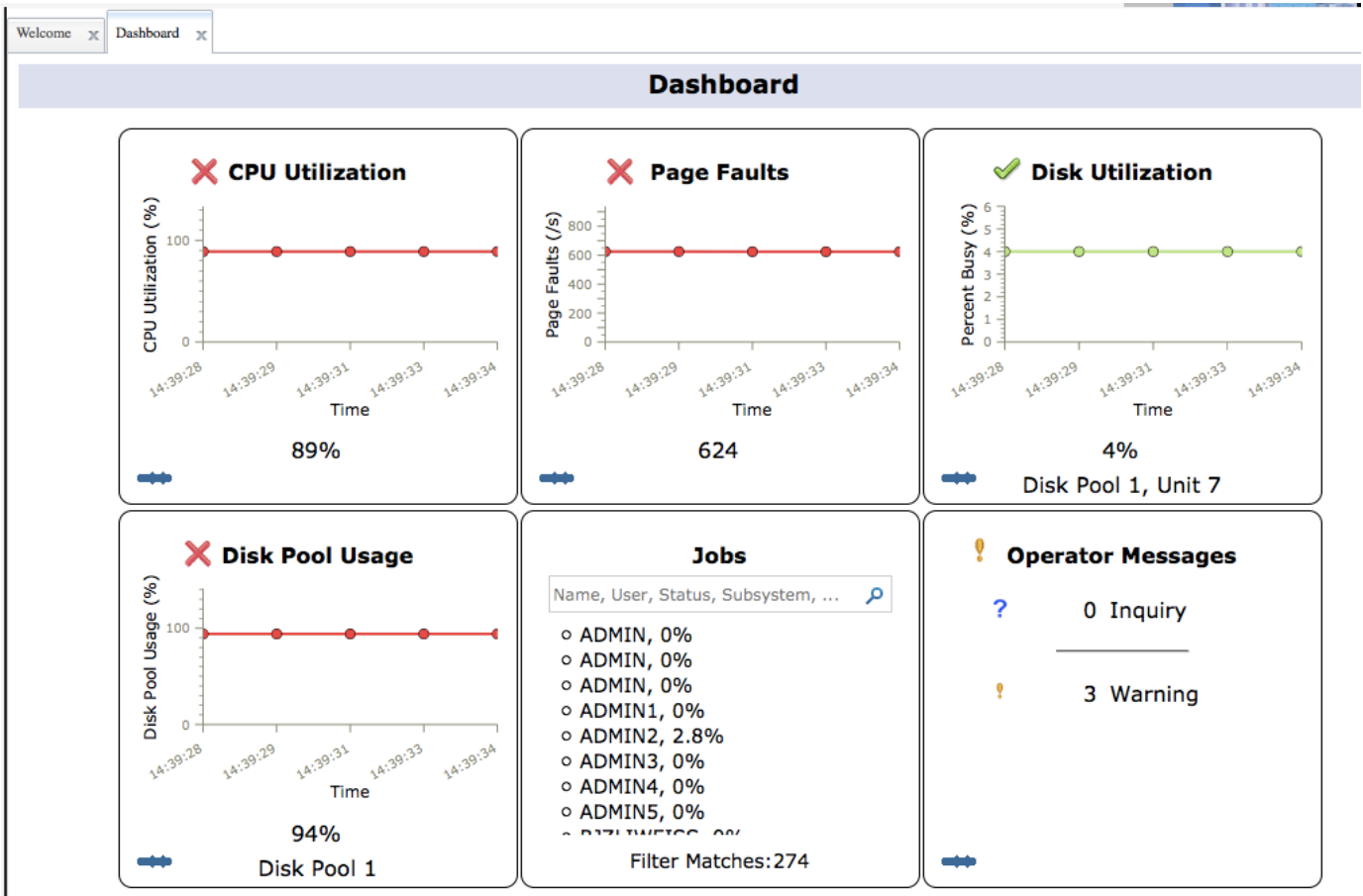
- **Proactive Monitoring**
  - Dashboard
  - System Monitors with Navigator for i
  - Performance Tasks - Performance Data Investigator
    - Health Indicators
  - Watches
  - Monitor system limits with IBM i Services
- **Historical Trending** with Graph History
- **Application modeling** with Batch Model

Dashboard

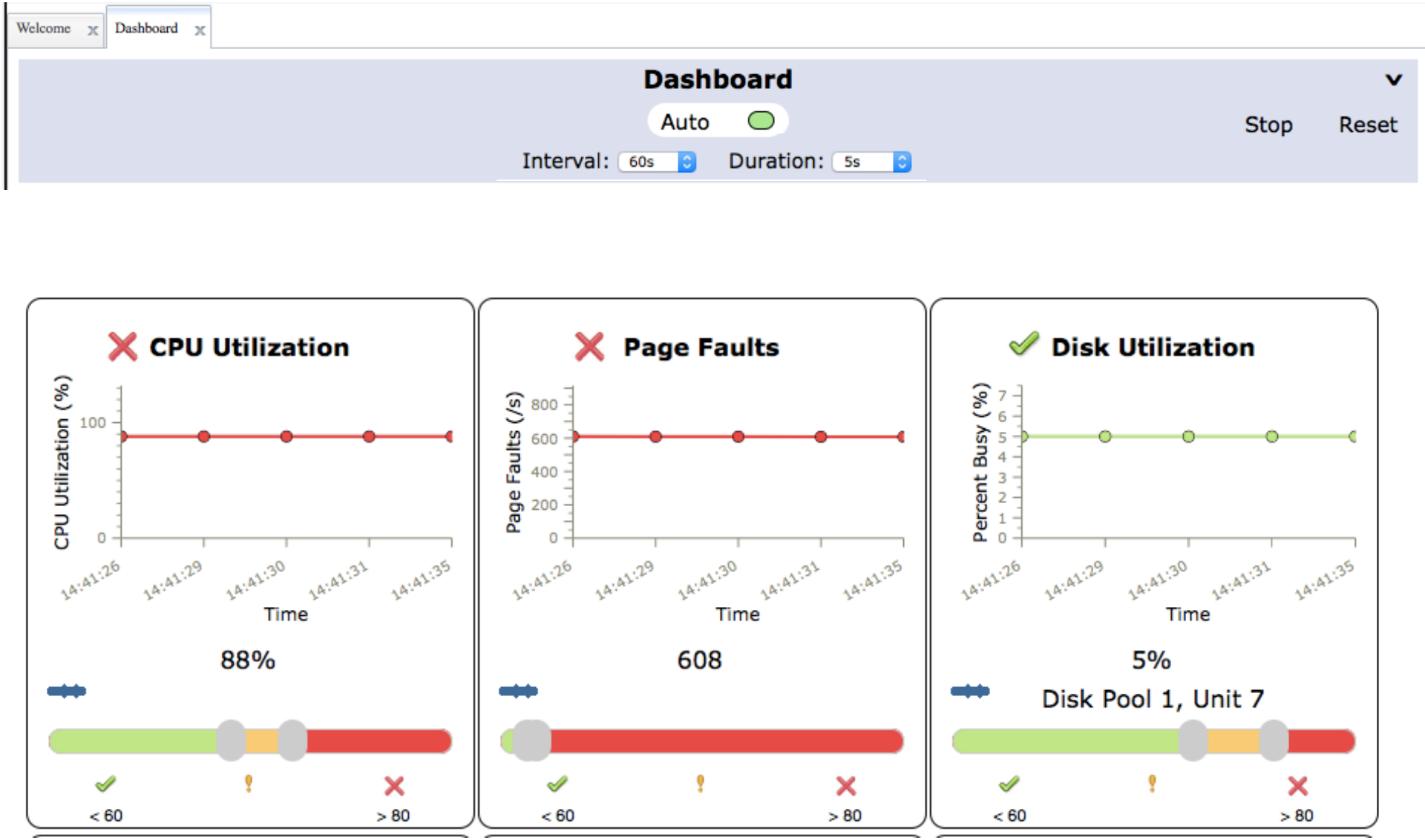
Dashboard

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

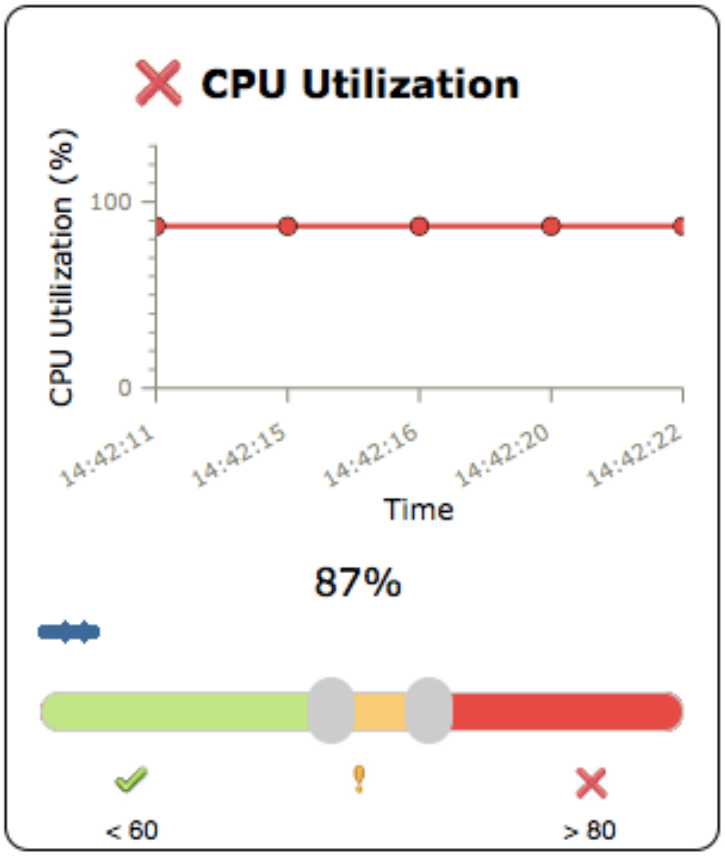
- Key metrics updated in real time
- Set thresholds to *visualize* potential issues



Configurable intervals and thresholds



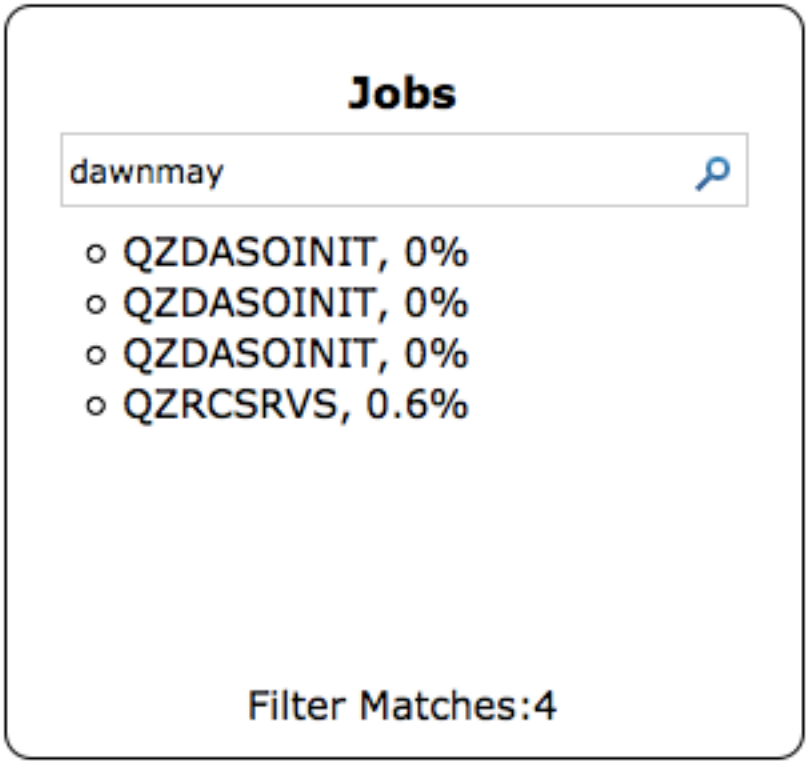
Basic drill-down - CPU Utilization

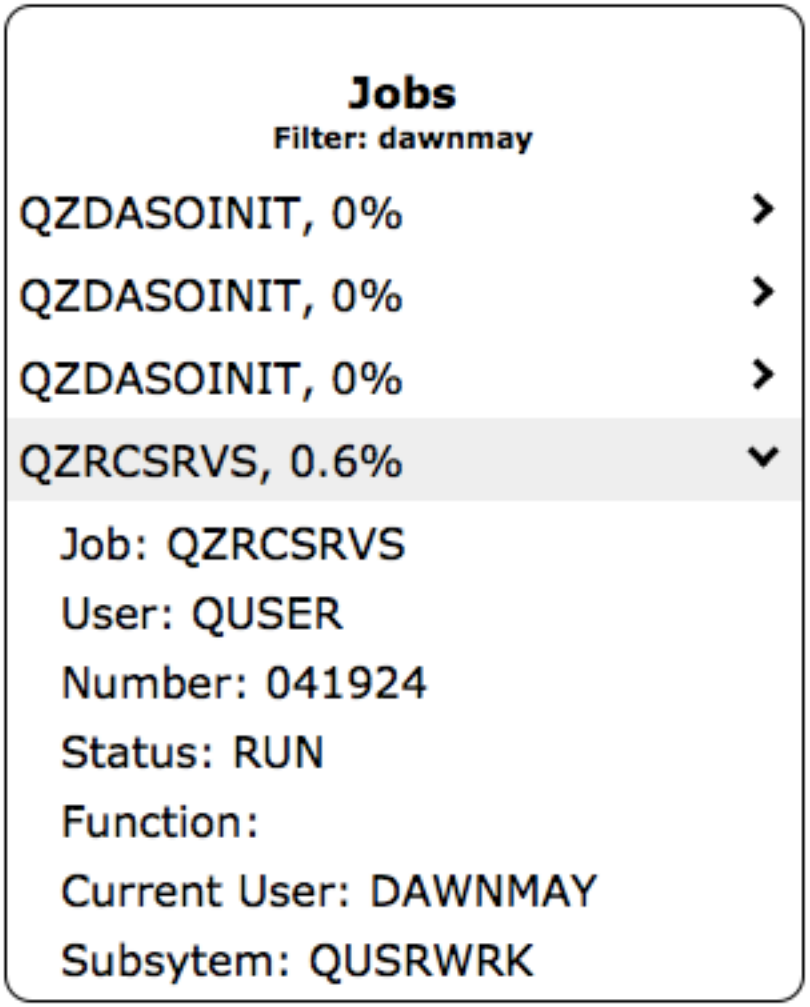


Top Jobs

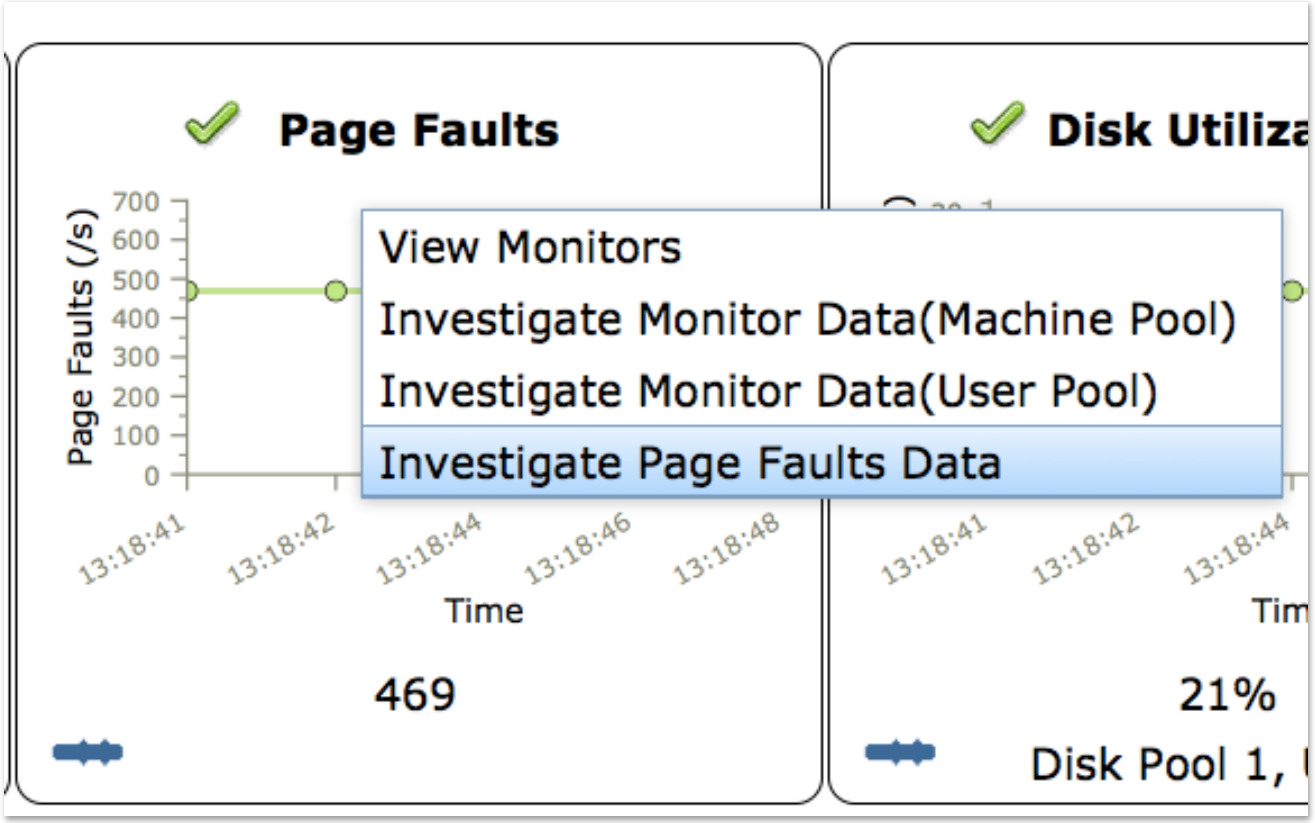
1. TESTPACK, 38.1%
   - Job: TESTPACK
   - User: DFL
   - Number: 025336
   - Status: RUN
   - Function: PGM-TESTPACK
   - Current User: DFL
   - Subsytem: QINTER
2. QZRCSRVS, 24%
3. ADMIN2, 2.8%
4. CRTPFRDTA2, 0.6%
5. QZRCSRVS, 0.6%
6. QZLSFILET, 0.4%

Jobs - search and drill-down





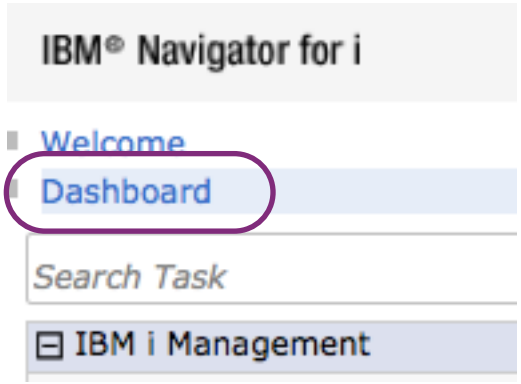
Drill-down to System Monitors and Investigate Data



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 PTF coming soon….
  - Default will be to NOT show the dashboard
  - Performance improvements



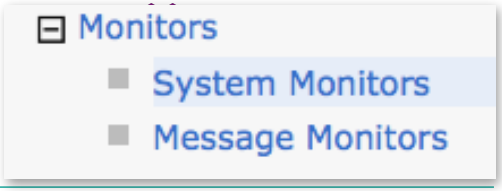
iAccess Mobile Dashboard

View from your favorite mobile device
- Phone
- Tablet

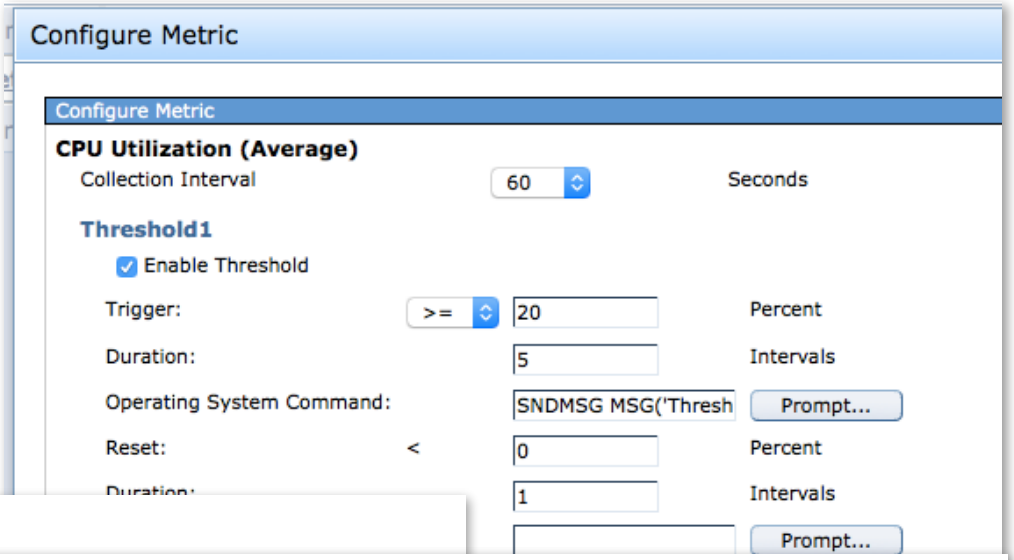
http://system.name:2001/iamobile

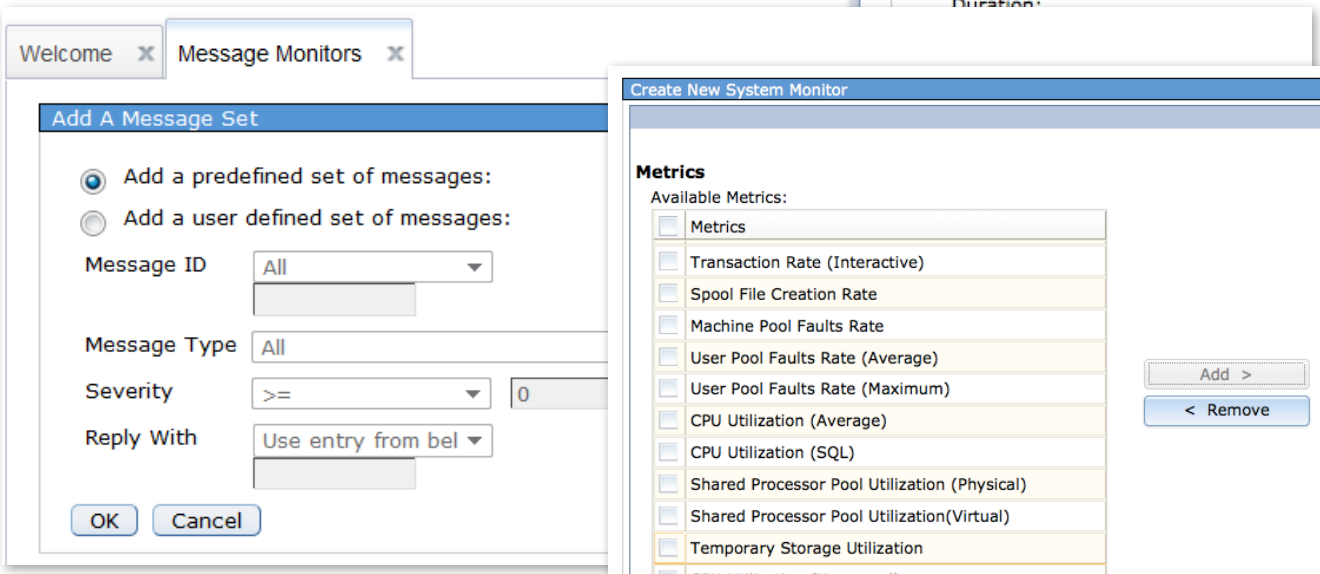
Navigator Monitors

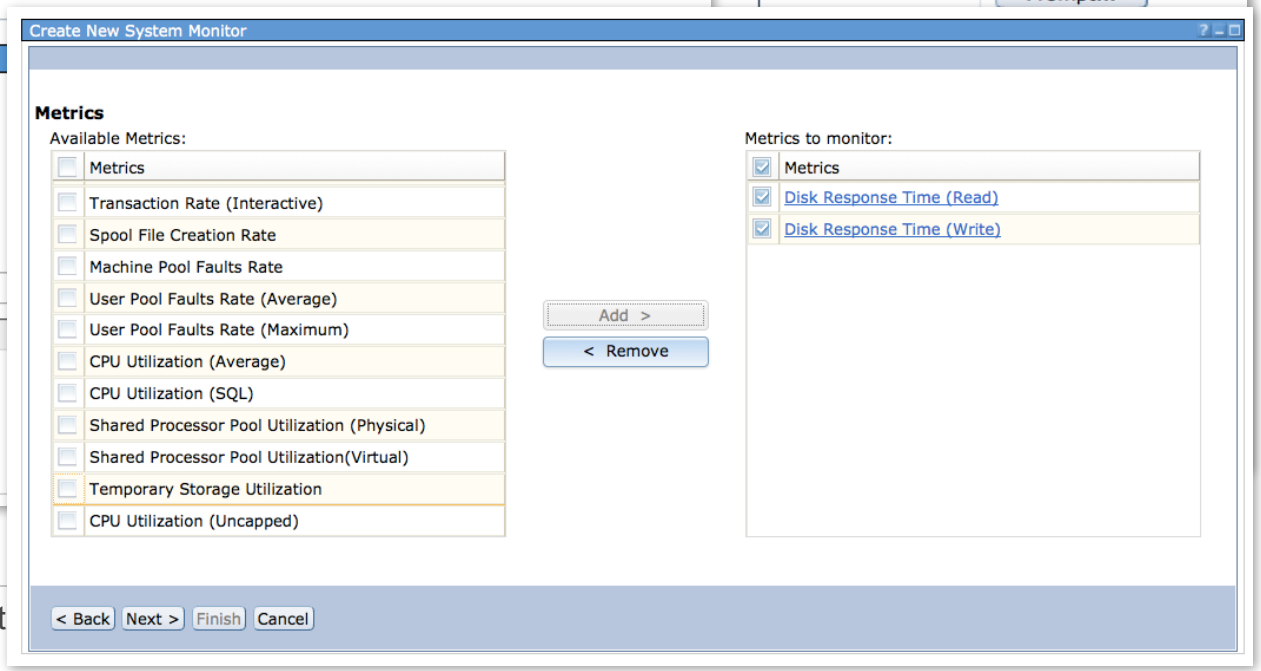
Navigator Monitors



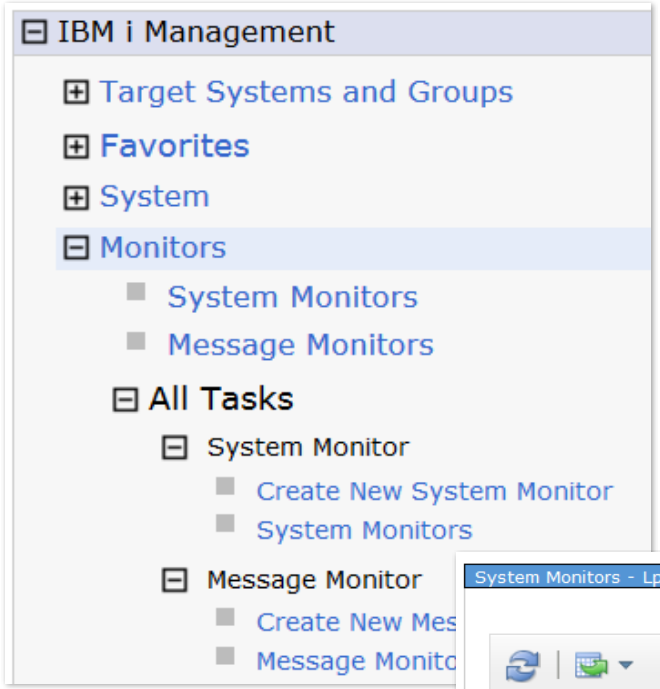
- System Monitors
- Message Monitors
- **Single partition only**
- Custom event actions



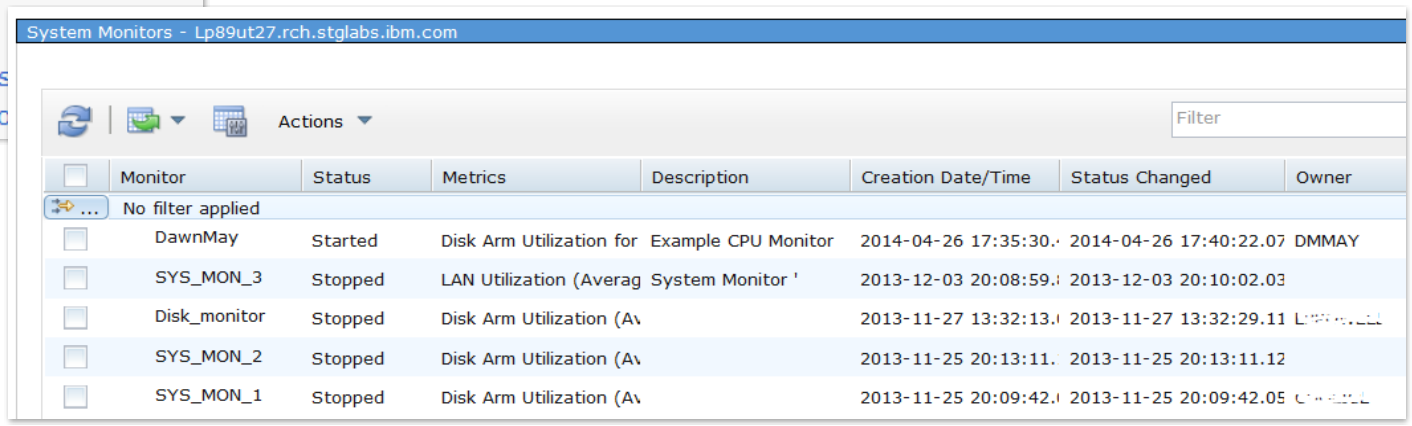




Monitors with IBM Navigator for i



- Select **what** you want to monitor
- Set monitoring **intervals**
- Set **thresholds**
- Define **actions** taken when a threshold is reached
- Manage **event logs**



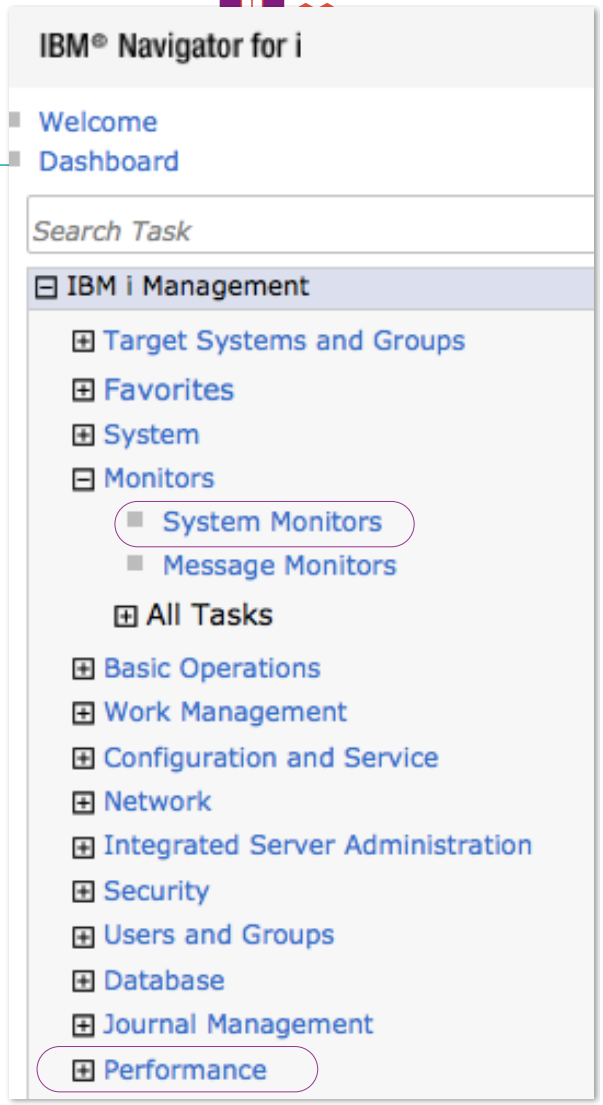
List of system monitors on the system

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

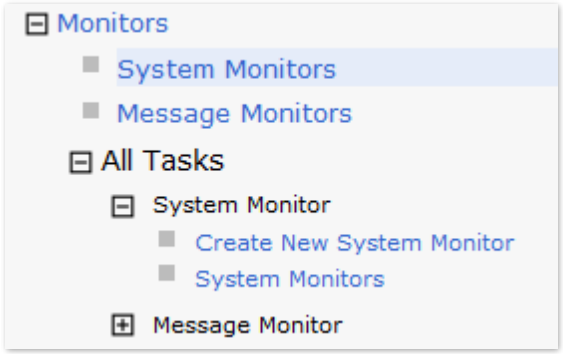
- Configure a new system monitor
- Change a system monitor configuration
- Delete a system monitor
- Start/Stop a system monitor
- Create a new monitor based on an existing monitor
- Capture events and trigger actions when a threshold is reached
- List an event log of a selected system monitor
- List 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)

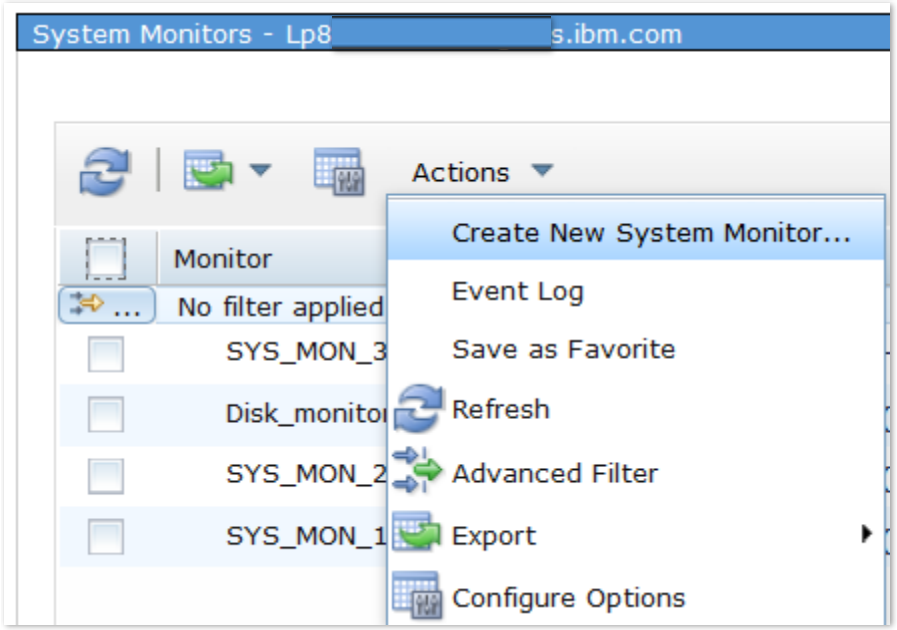
Authority Needed to Manage Monitors

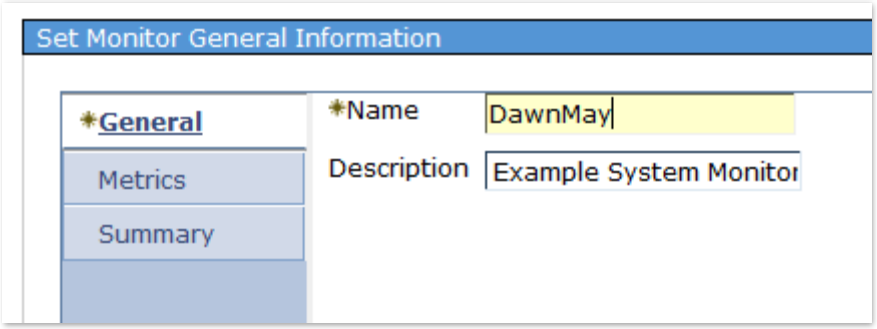
Authority for Navigator

- *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

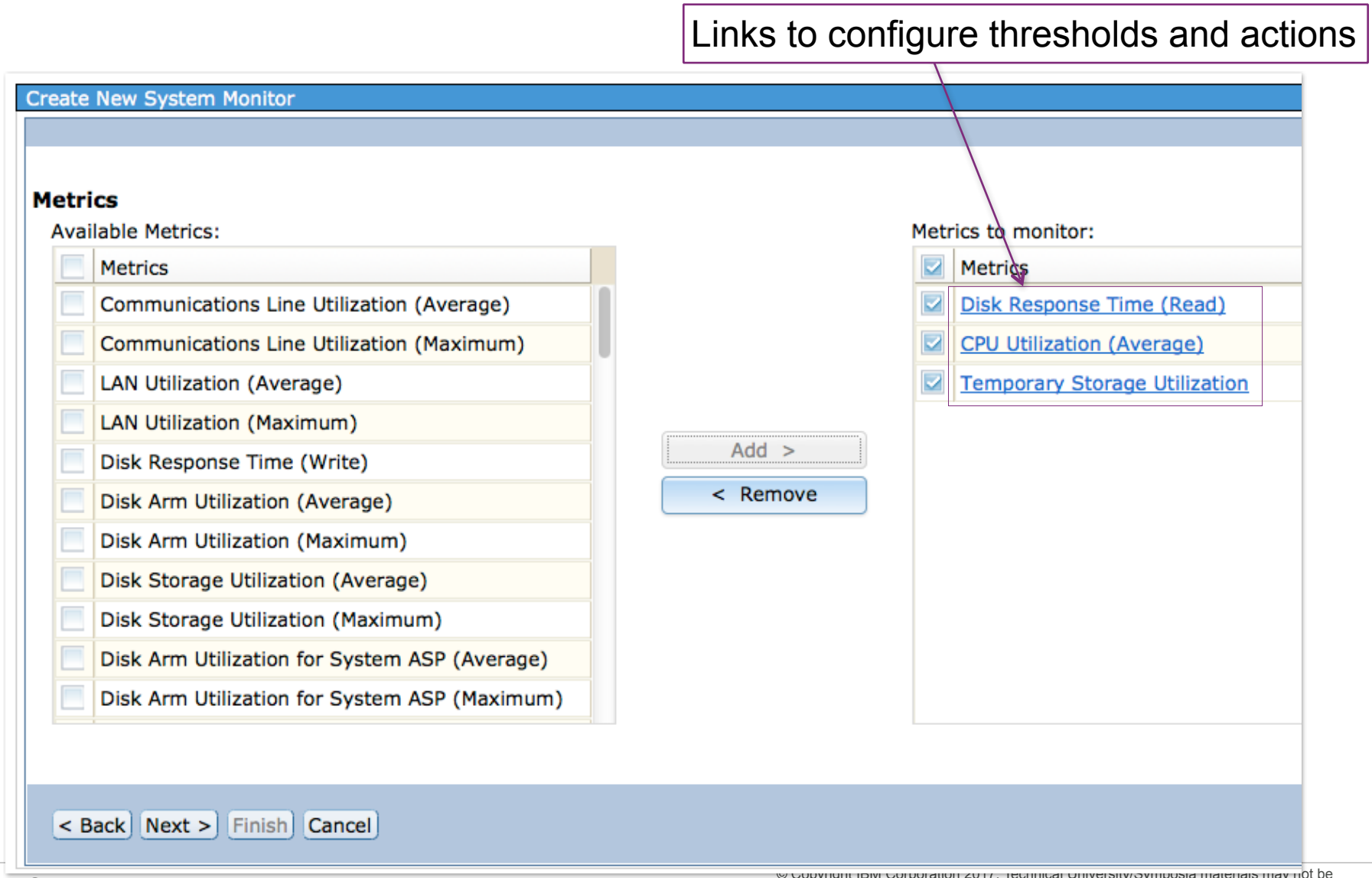
Create New System Monitor







Metrics to Monitor



Red were new with 7.2 Navigator Monitors
Blue were new with 7.3

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	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: • CPU Utilization (Average) • CPU Utilization (Interactive Jobs) • CPU Utilization(Uncapped) • CPU Utilization(SQL)
Interactive Response Time (Average and Maximum)	The response time that interactive jobs experience on your system.
Transaction Rate (Interactive)	The number of transactions per second completed on your system by interactive (Job type = 'I') jobs.
Batch Logical Database I/O	The average number of logical database input/output (I/O) operations currently performed by batch (Job type = 'B') jobs on the system.
Disk Arm Utilization (Average, Maximum and System ASP)	The disk unit busy percent.
Disk Storage (Average, Maximum and System ASP)	The percentage of disk arm storage that is full on your system during the time you collect the data.
Communications Line Utilization (Average and Maximum)	The amount of data that was actually sent and received on all your system communication lines.
LAN Utilization (Average and Maximum)	The amount of data that was actually sent and received on all your local area network (LAN) communication lines.

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)	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. 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.

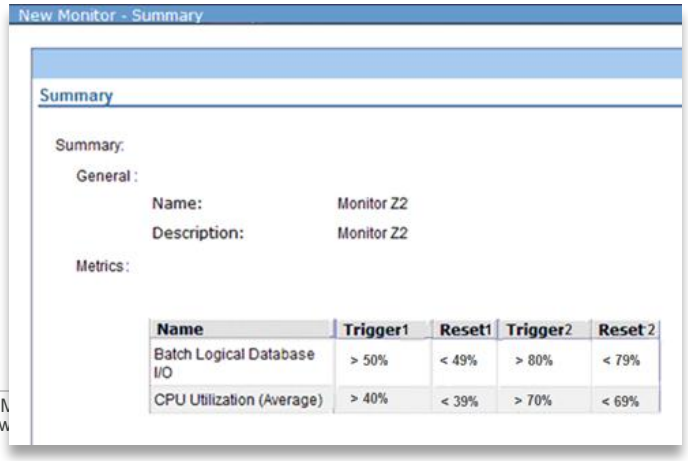
System Monitor Metrics – page 3

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.



Configure Metric - Thresholds

- **Threshold** - settings, continued…

  - **Duration**
    - Specify how long (in terms of collection intervals) the condition must occur before the action is taken

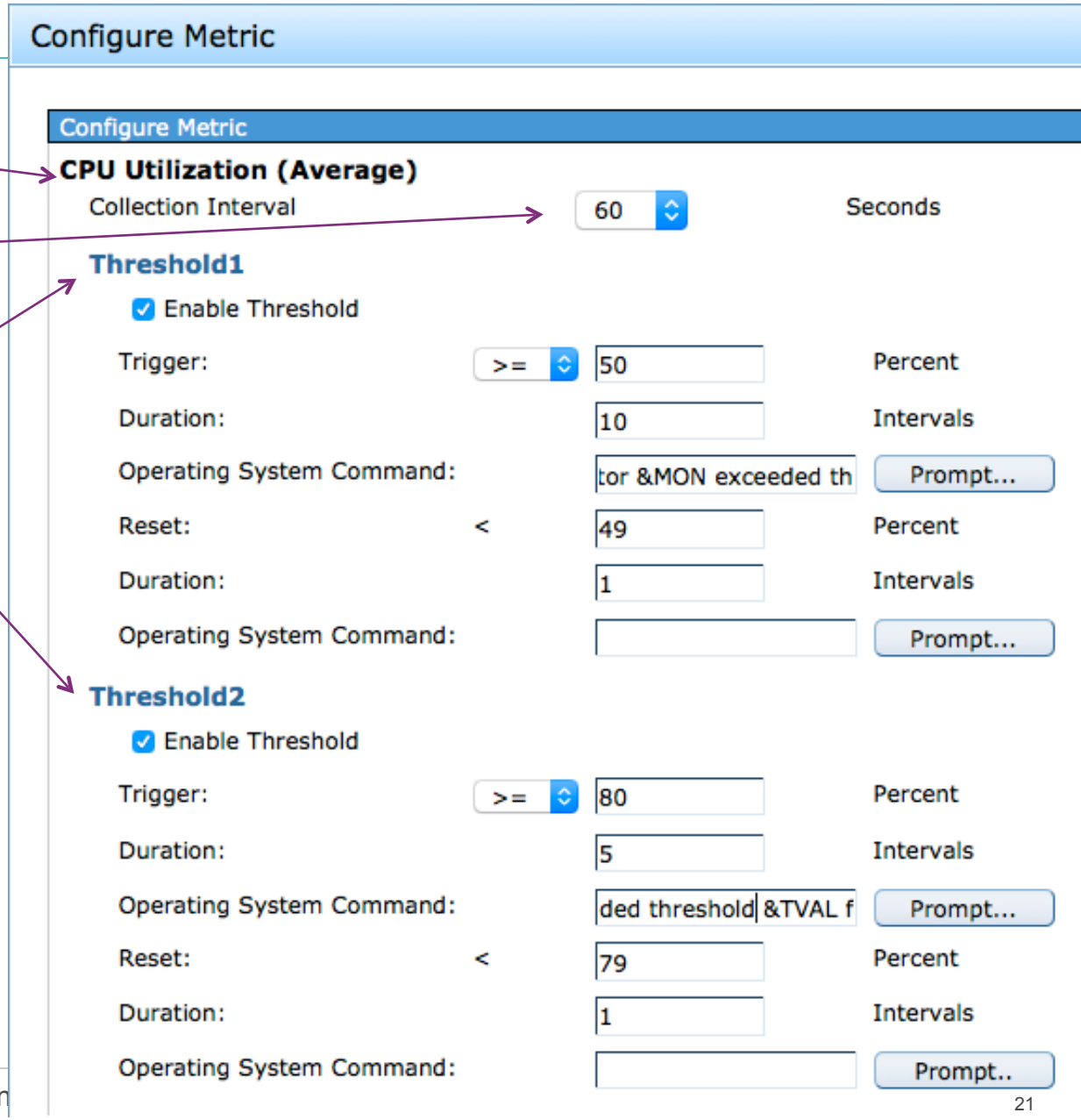
  - Operating System **Command**
    - This is the **action** to be taken when the threshold is hit
    - Can be any command that can run in batch
    - There's a command named CALL where you can call a program to take whatever action you wish
    - The command is run in a job under the **user profile that created the monitor**

Configure Metric

Metric name

Collection Interval

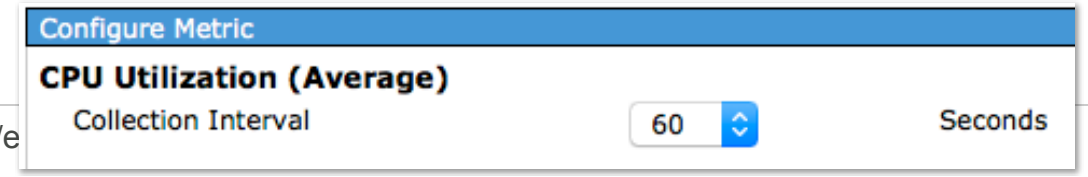
Threshold 1 & 2



Collection Interval Considerations

- The default collection interval on 7.3 is 60 seconds
  - SI59042 & SI59043

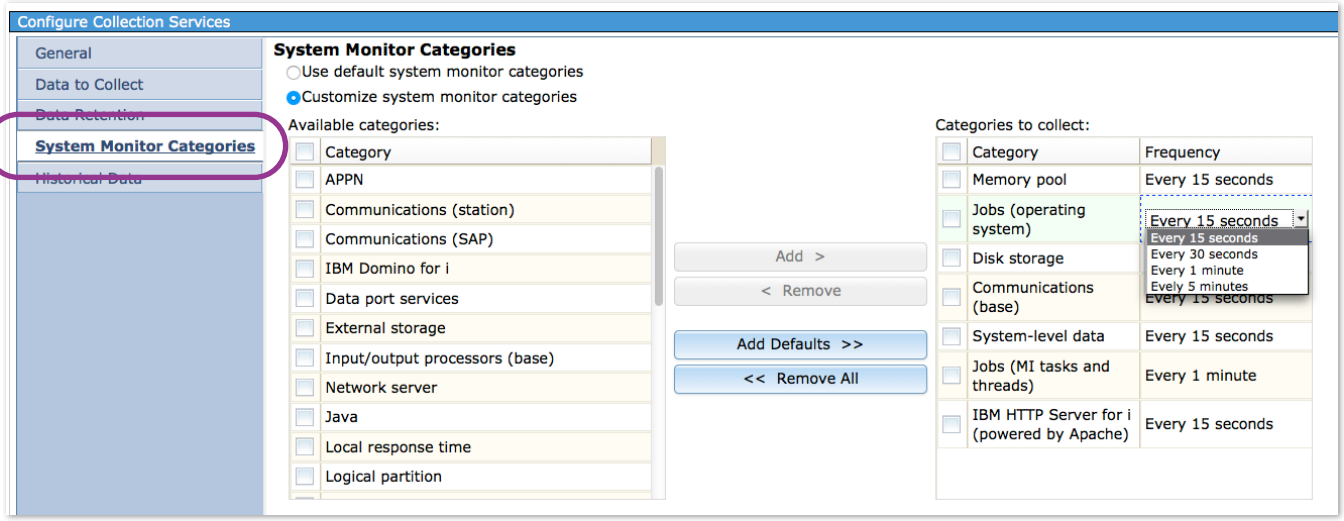
- The default collection interval on 7.2 was **15 seconds**
  - **Be careful!!!**
  - 15 second intervals will generate **large monitor collections**
    - 2GB daily on relatively inactive partition
  - Recommend using **60 second** intervals
    - **7.2 update in June 2016 changed the default to 60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



Cleaning up too small system monitor intervals

- Once the 15 second interval is used, system monitor data will always be collected at 15 seconds

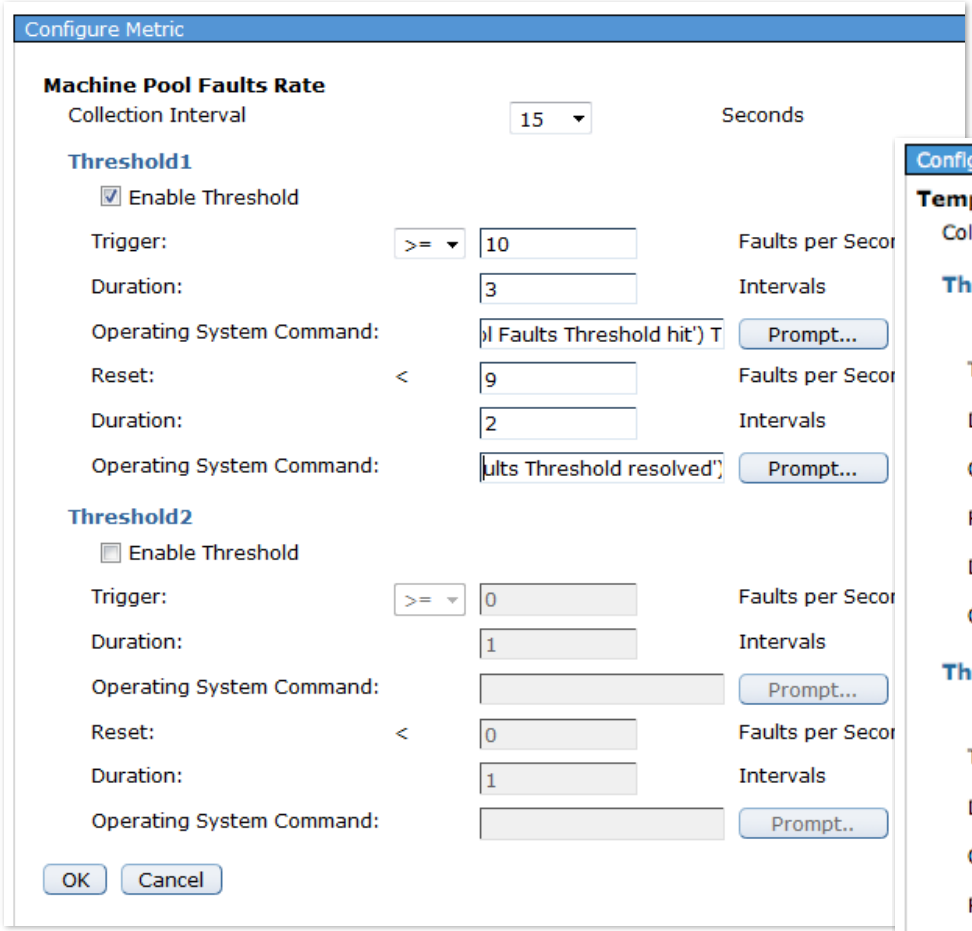
- Manual cleanup / reconfiguration to recover
  1. Change the system monitor properties to use a larger collection interval
  2. Configure collection services to change the intervals

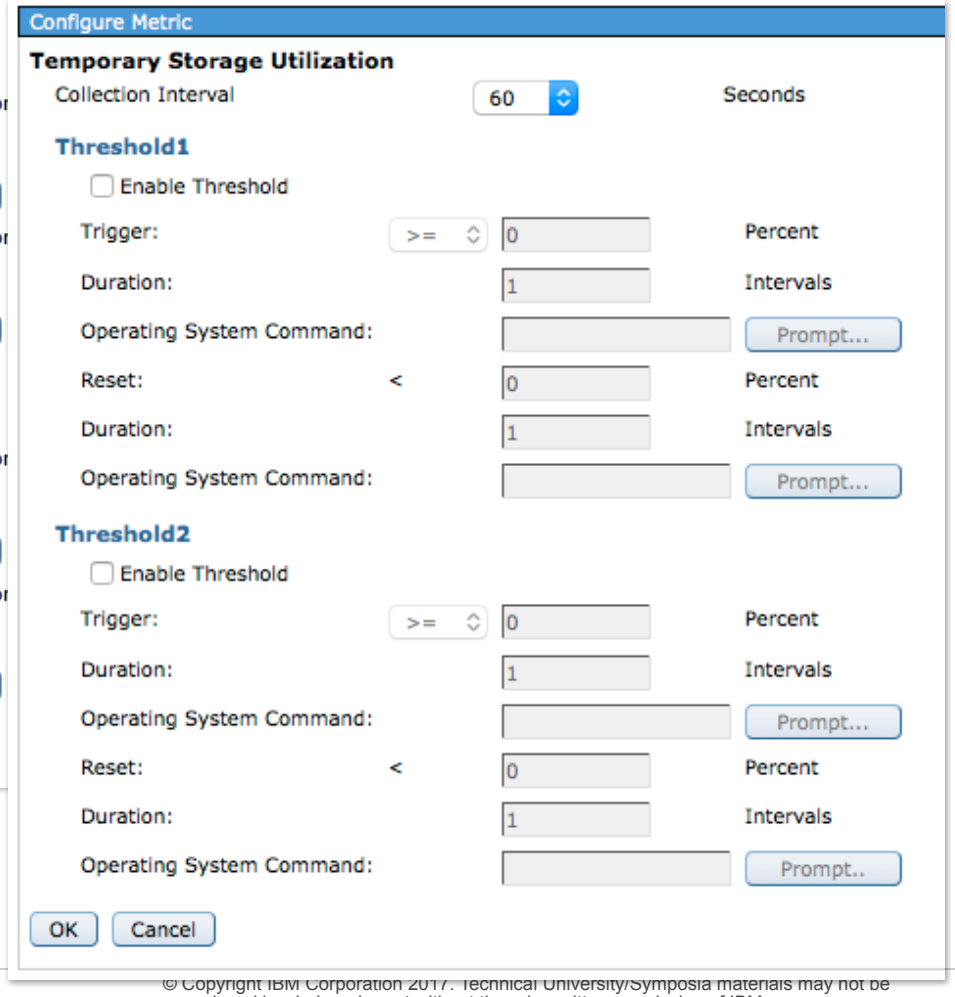


Double-click in the Frequency column to edit the interval

[IBM i Navigator System Monitors: Collection Interval]

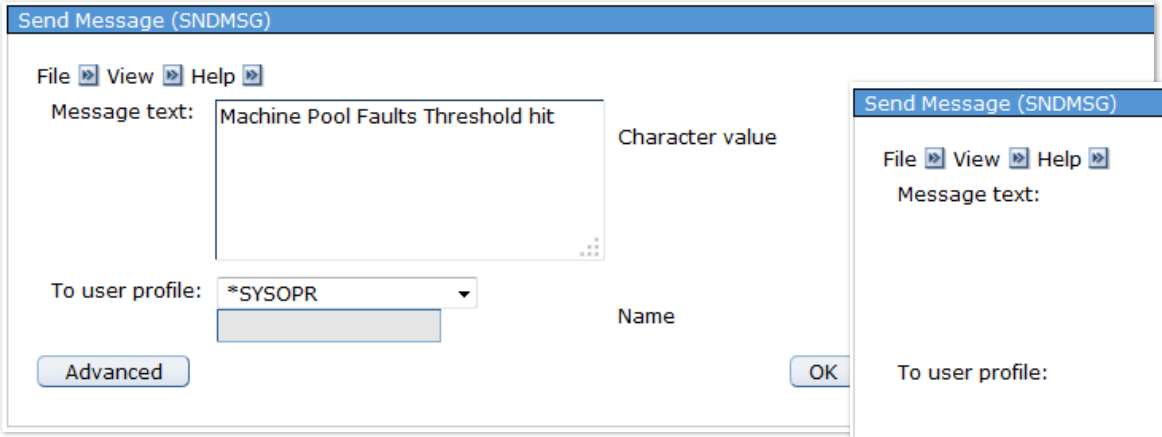
Configure Metric Examples



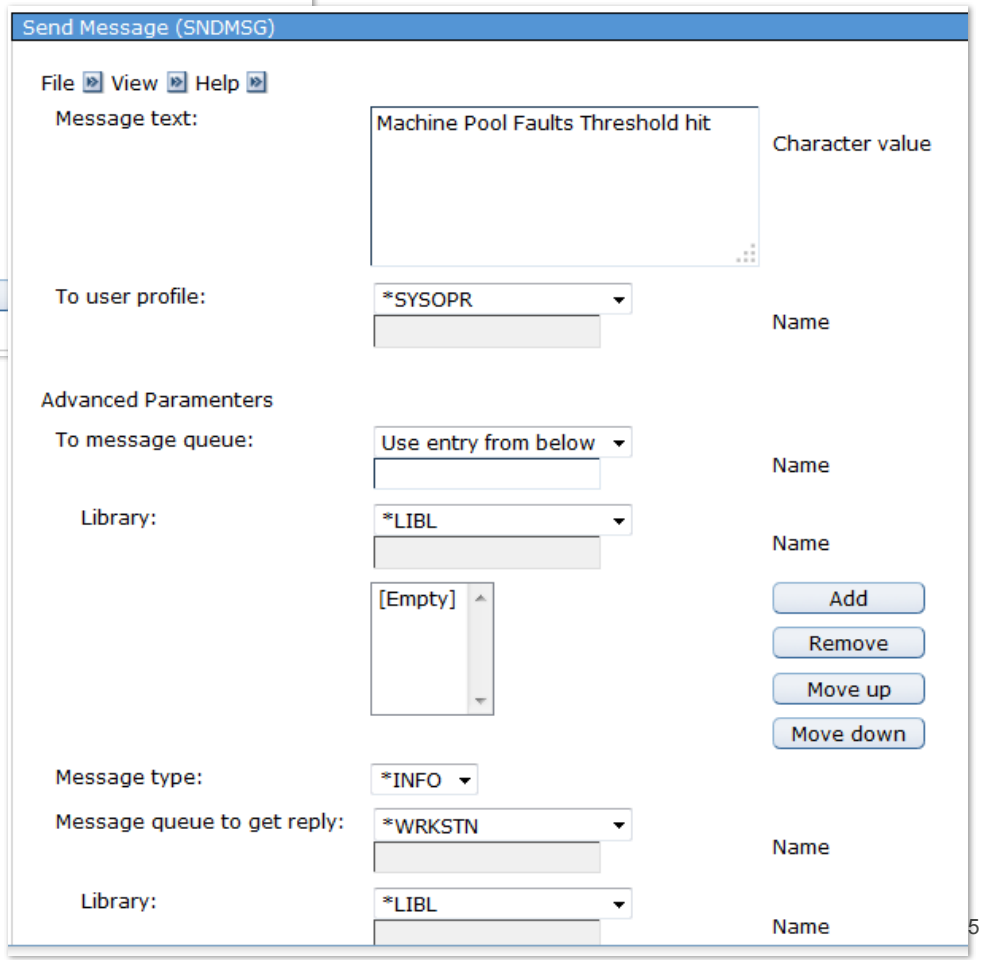


Command Prompt

Basic



Advanced



System Monitor Replacement Variables

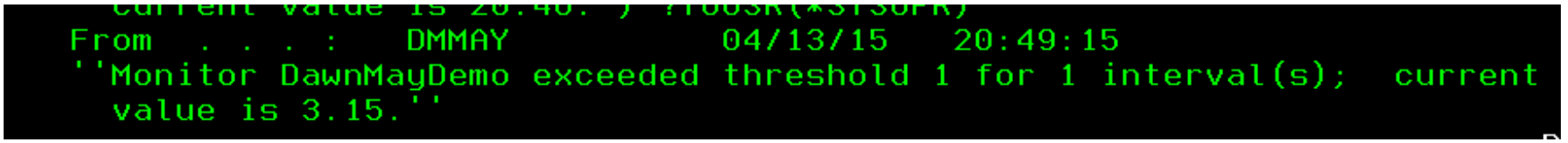
- Replacement variables are available to customize your actions to the specific metric and values
  - These replacement variables can be used on the IBM i command

- Rather than just

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

- You can use replacement variables

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



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)

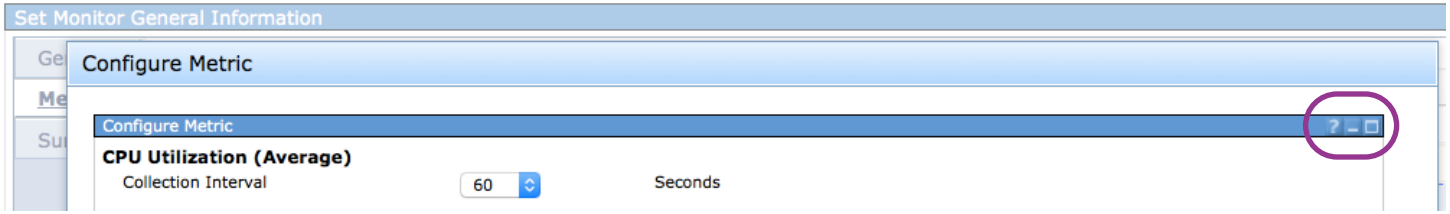
(2)

- 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

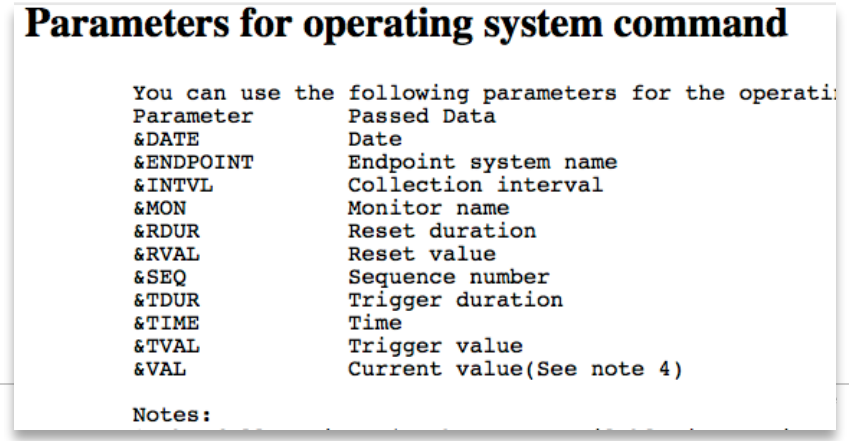
Documentation on Replacement Variables

- 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 operati

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:

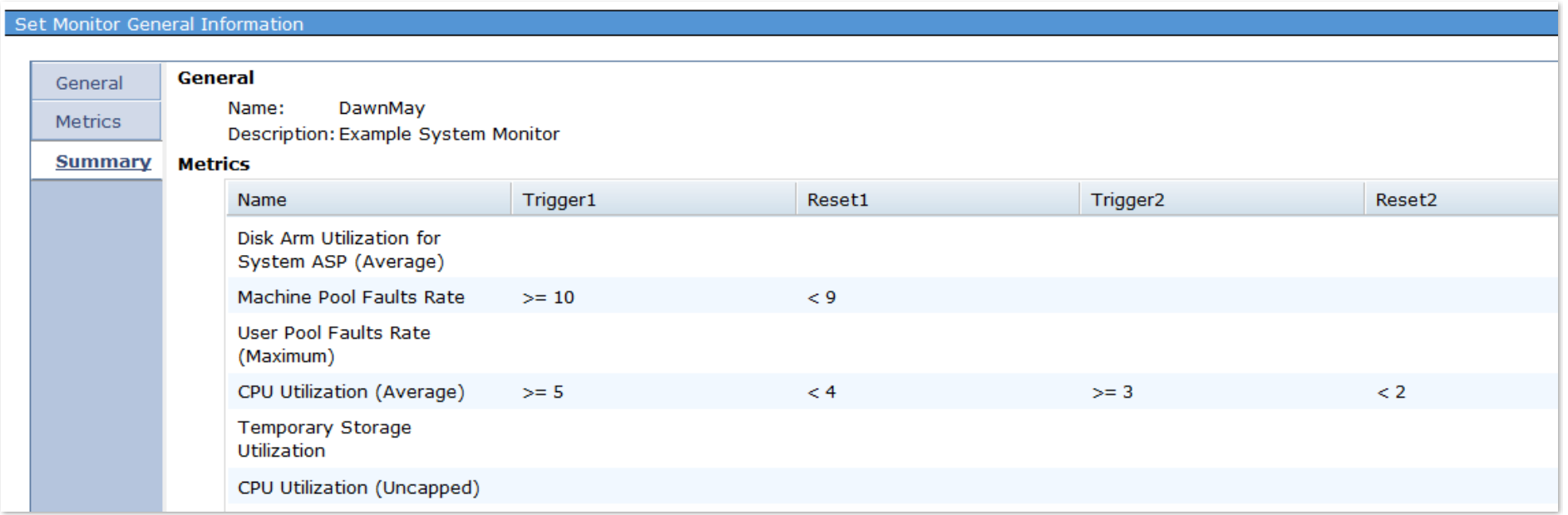
Send email as a monitor action

- It is very easy to send email from IBM i
- Add the sending user profile name to the SMTP Local Mailbox Directory
  - ADDUSRSMTP
- Use SNDSMPTEMM command to send the email
- **SNDSMTPEMM RCP(dmmay@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.')**

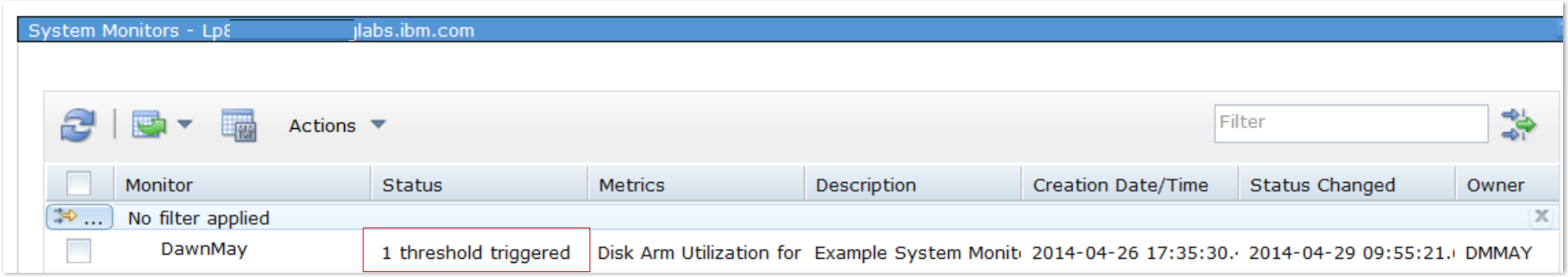
Monitor DawnMay triggered.
dmmay to: Dawn May

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

System Monitor Summary

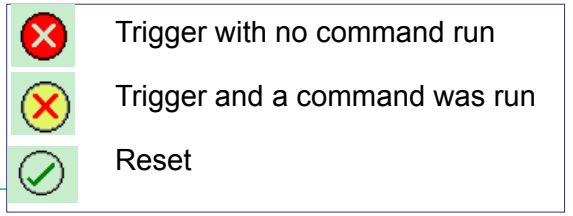


Threshold Triggered




```
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



Show events for one monitor or all monitors

Event Logs

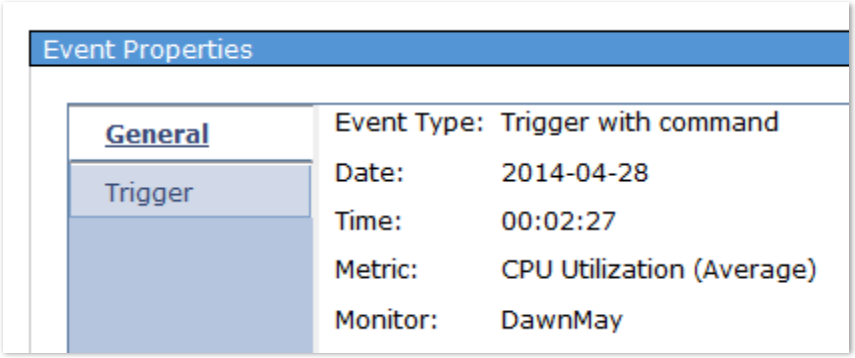
Owner: DMMAY Metrics: Disk Arm Utilization for System ASP (Average),Machine Pool Faults Rate,User Pool Faults Rate (Maximum),CPU Utilization (Average),Temporary Storage Utilization,CPU Utilization (Uncapped)

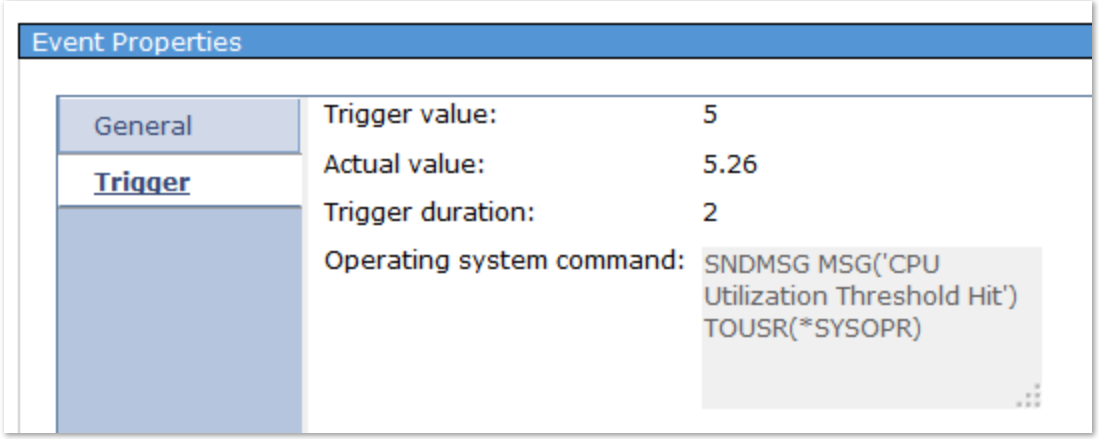
Actions

Filter

Event	Logged	Metrics	Monitor	Owner
No filter applied				
Automatically reset	2014-04-27 00:37:12.161	CPU Utilization (Average)	DawnMay	DMMAY
Trigger with command	2014-04-28 00:02:27.178	CPU Utilization (Average)	DawnMay	DMMAY
Automatically reset	2014-04-28 00:05:57.183	CPU Utilization (Average)	DawnMay	DMMAY
Trigger with command	2014-04-28 00:27:57.188	CPU Utilization (Average)	DawnMay	DMMAY
Automatically reset	2014-04-28 00:29:57.191	CPU Utilization (Average)	DawnMay	DMMAY
Trigger with command	2014-04-28 00:30:57.187	CPU Utilization (Average)	DawnMay	DMMAY
Automatically reset	2014-04-28 00:32:27.188	CPU Utilization (Average)	DawnMay	DMMAY
Trigger with command	2014-04-28 09:24:27.197	CPU Utilization (Average)	DawnMay	DMMAY
Automatically reset	2014-04-28 09:25:27.198	CPU Utilization (Average)	DawnMay	DMMAY
Trigger with command	2014-04-29 09:55:27.065	CPU Utilization (Average)	DawnMay	DMMAY
Trigger with command	2014-04-29 09:56:41.790	CPU Utilization (Average)	DawnMay	DMMAY
Automatically reset	2014-04-29 09:57:56.763	CPU Utilization (Average)	DawnMay	DMMAY
Automatically reset	2014-04-29 09:59:41.756	CPU Utilization (Average)	DawnMay	DMMAY
Trigger with command	2014-04-29 10:00:41.744	CPU Utilization (Average)	DawnMay	DMMAY

Event Properties

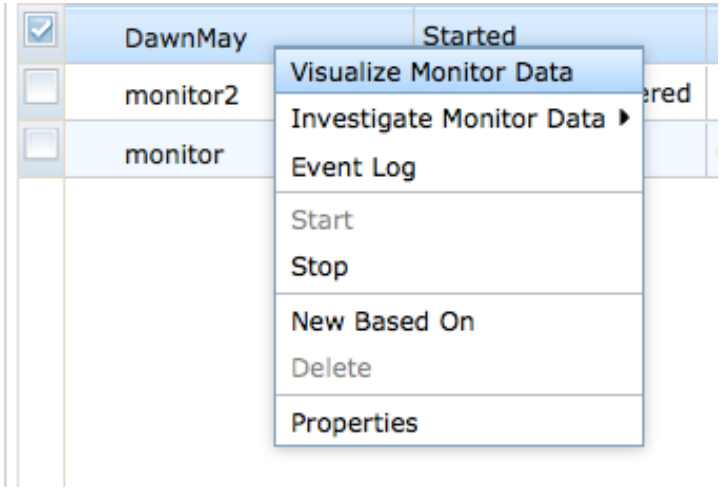




System Monitors with IBM Navigator for i

Actions for each system monitor you own

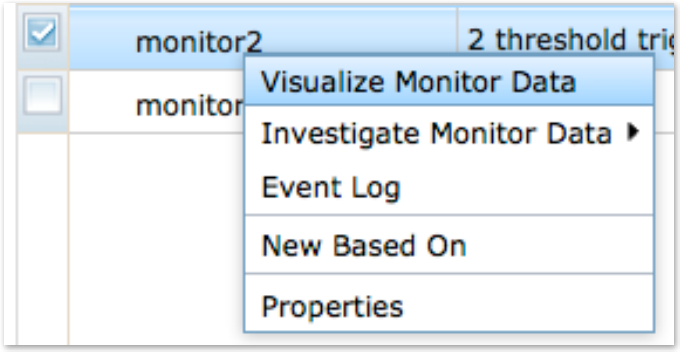
- **Visualize Monitor Data** - Display real-time monitor data with all metrics
- **Investigate Monitor Data** - Display the selected metric with PDI
- **Event Log** - Show the Event Log List of this monitor on the system
- **Start** - Start this system monitor
- **Stop** - Stop this system monitor
- **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

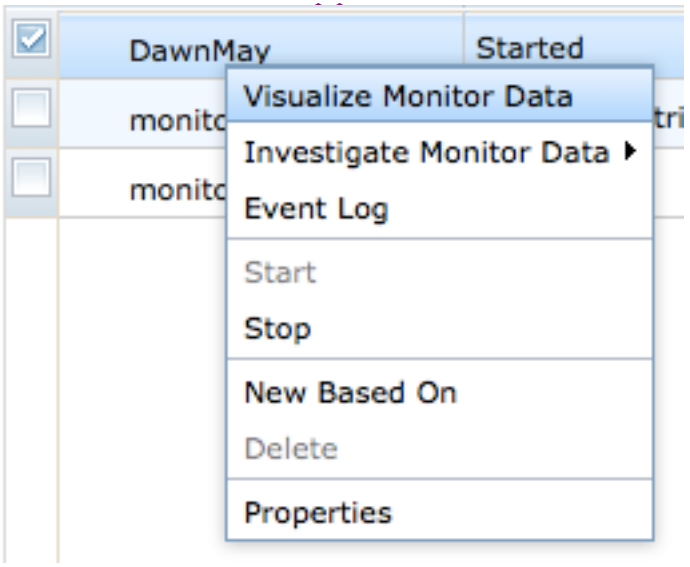
- **Visualize Monitor Data** - Display real-time monitor data with all metrics
- **Investigate Monitor Data** - Display the selected metric with PDI
- **Event Log** - Show the Event Log List of this monitor on the system
- **New Based on** - Create a new system monitor based on this system monitor
-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

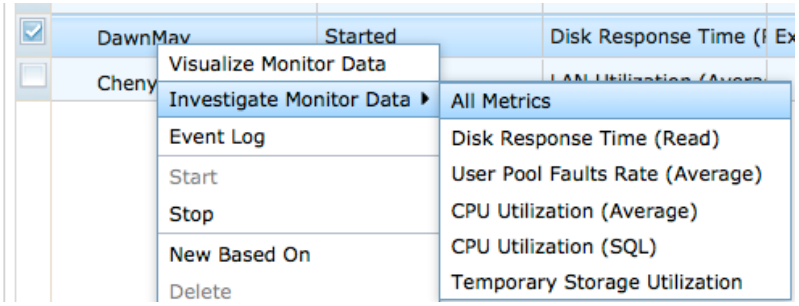


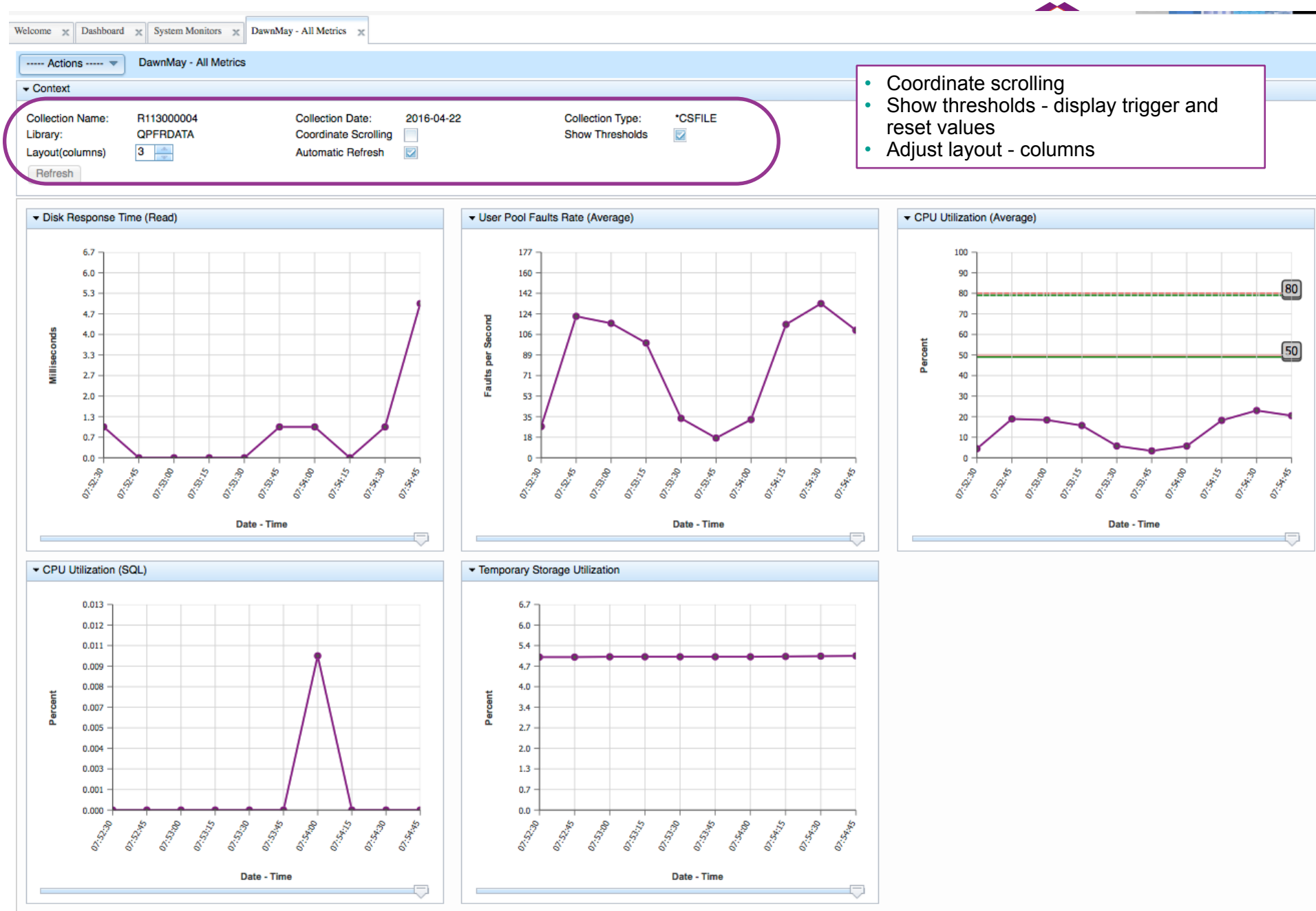
Visualize Monitor Data

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

added to 7.2 with December 2016 update



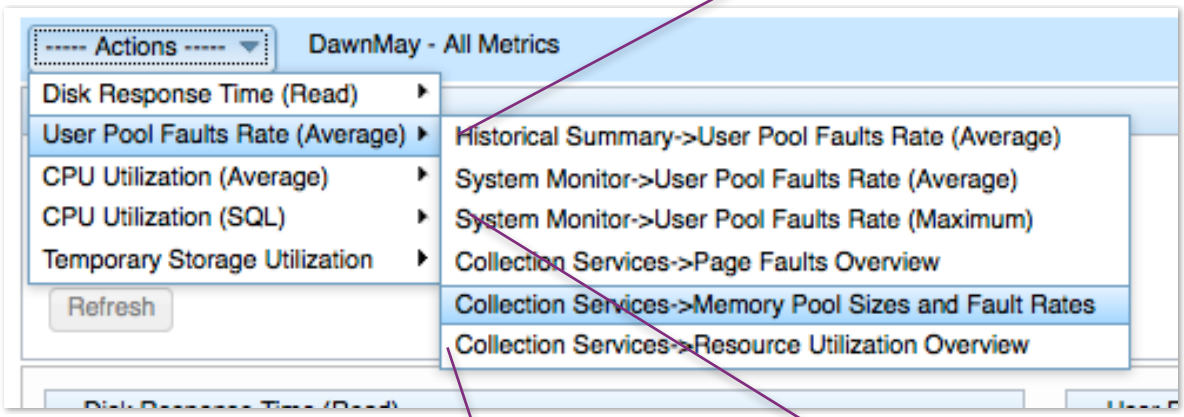




Actions when Visualizing All Metrics

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

Historical summary using Graph History



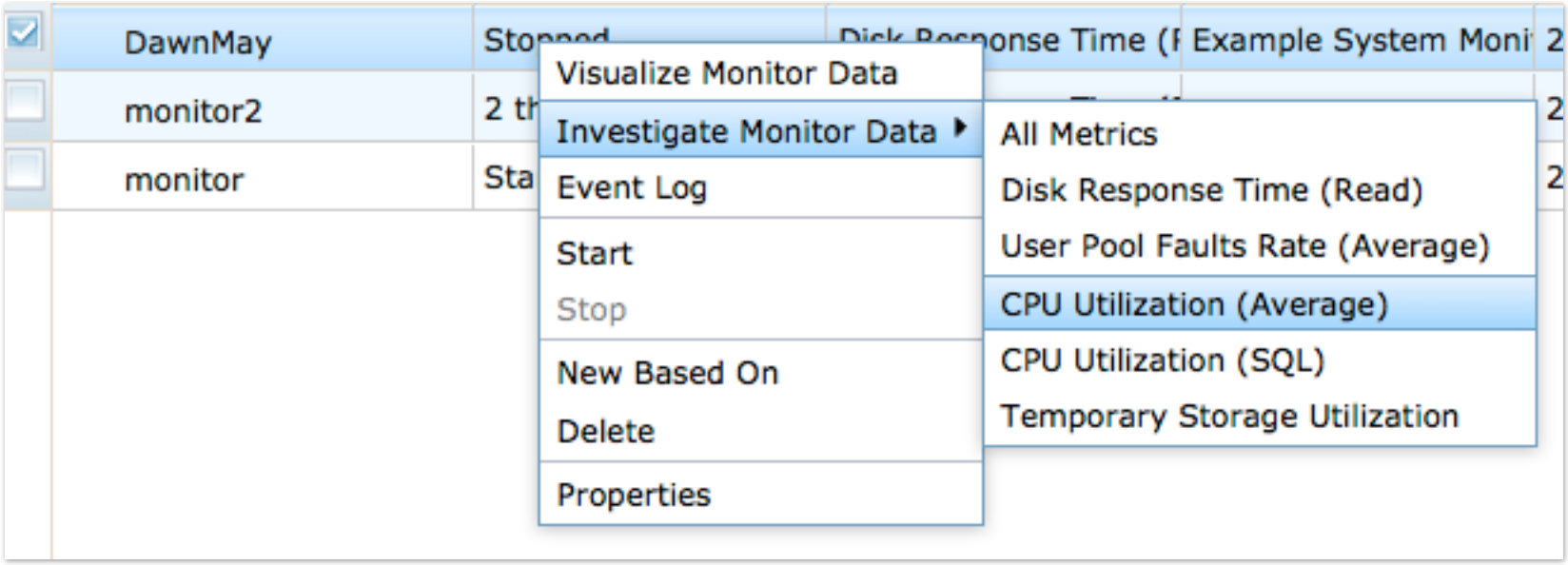
Investigate Data charts for Monitor data

Investigate Data charts for Collection Services

Investigate Monitor Data

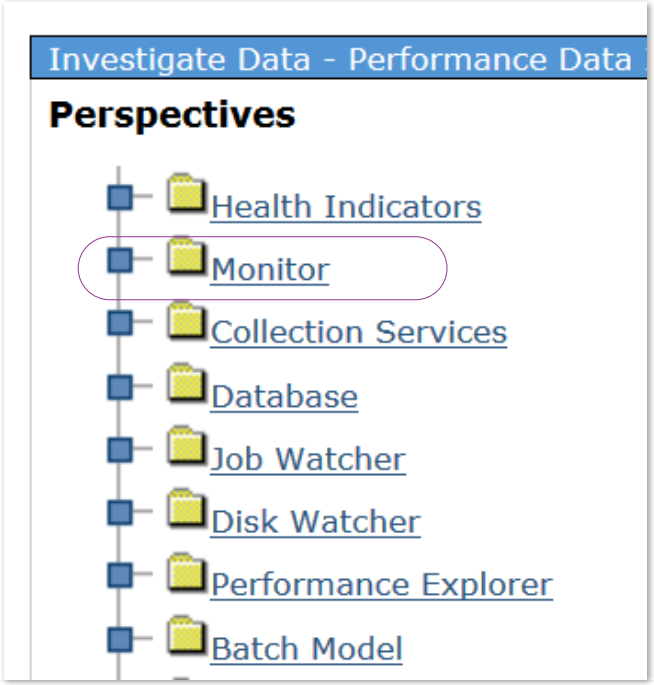
- Investigate Monitor Data starting from the monitor

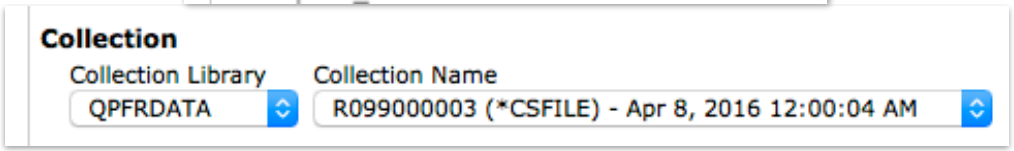
- View the metric with the Performance Data Investigator
- Use PDI to drill into more detailed Collection Services data for basic analysis



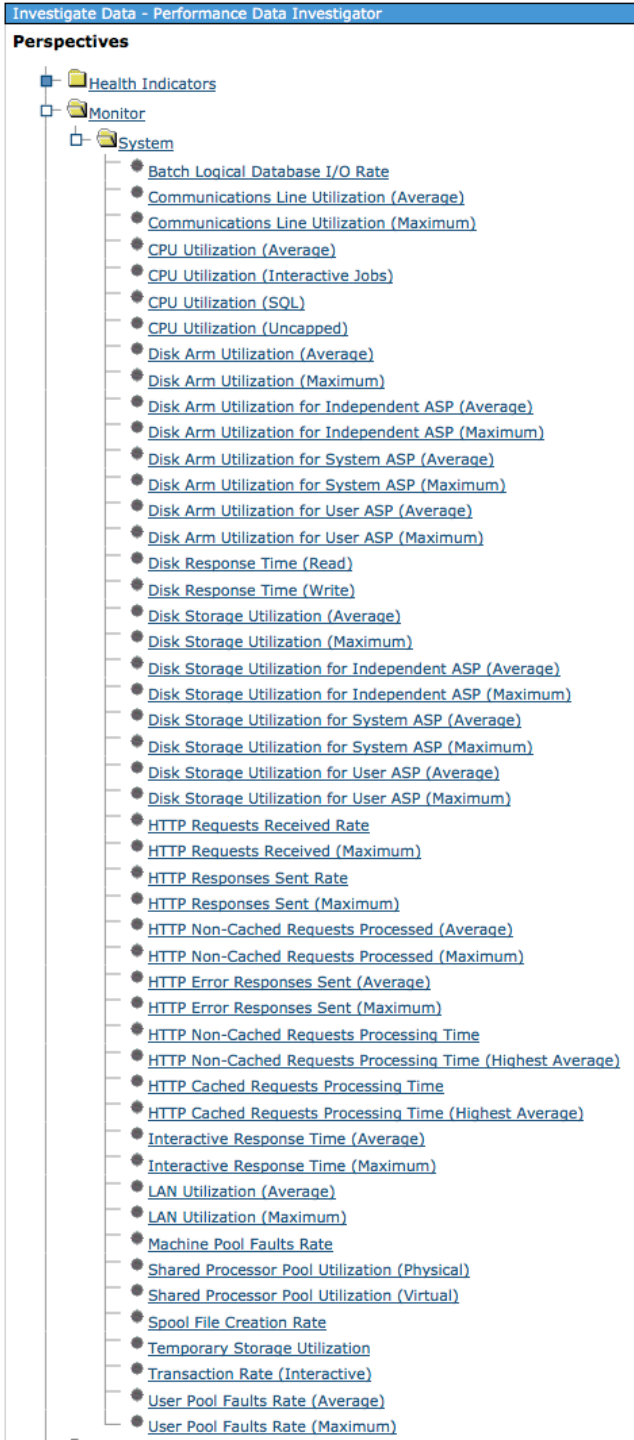
Investigate Data - Monitor

- Investigate Monitor Data via the Performance Data Investigator





Be sure to select an “R” collection to view monitor data



System Monitor Graphs in PDI

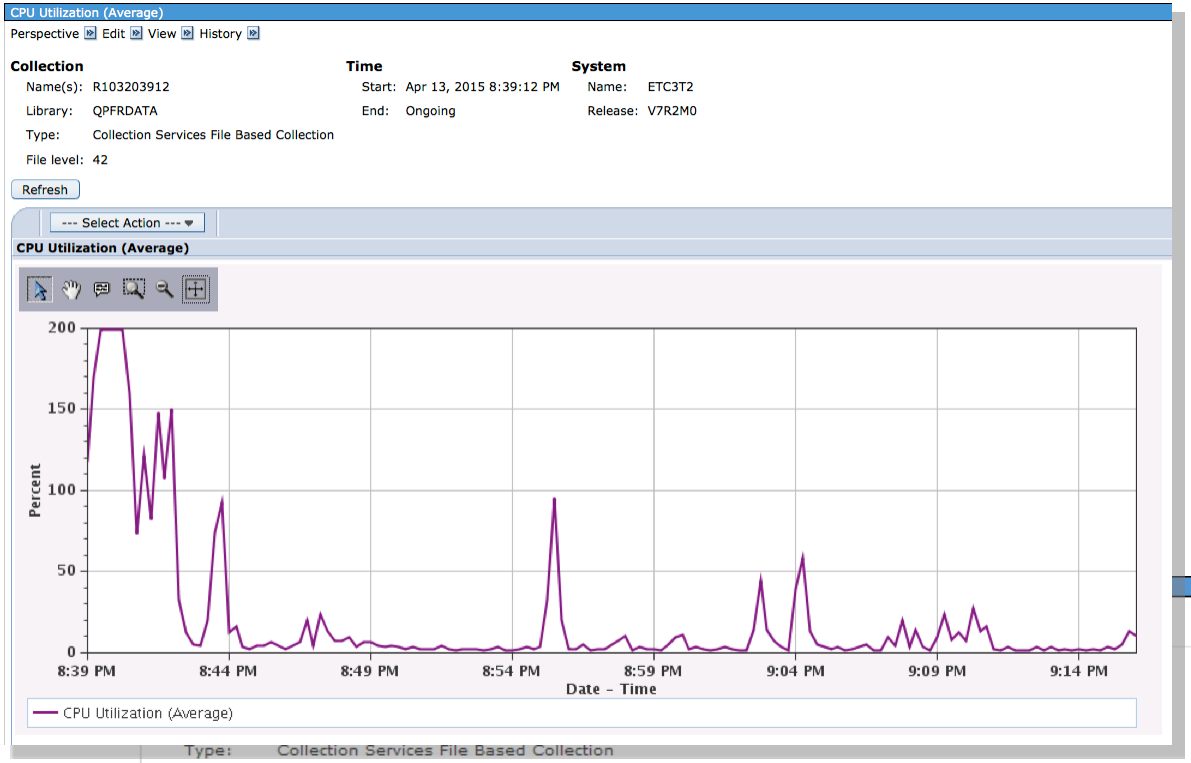
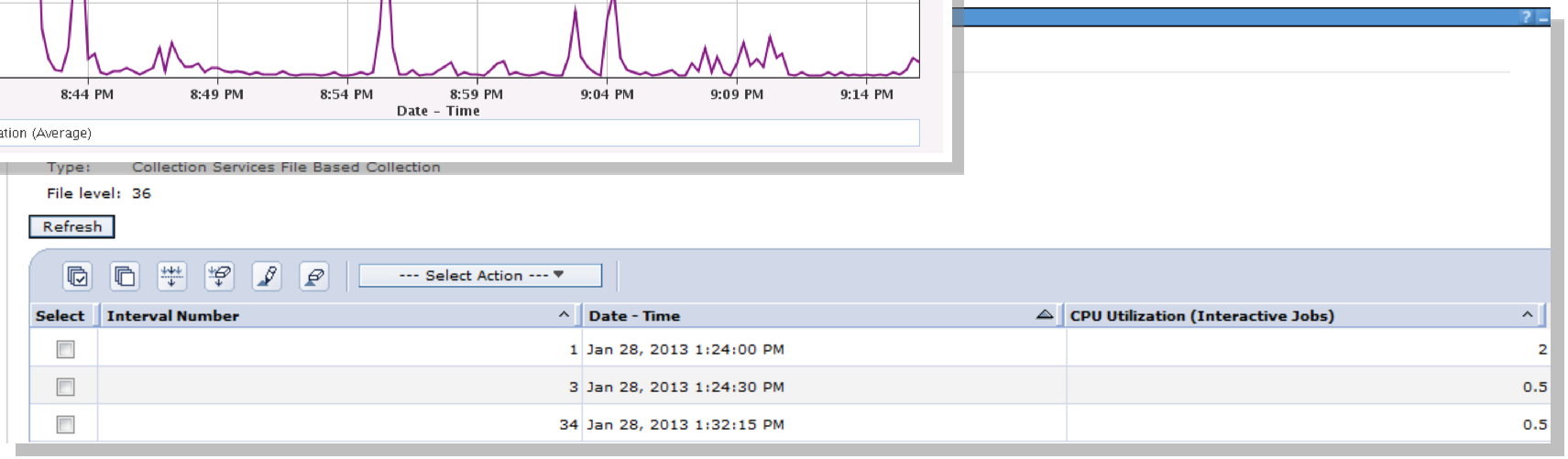


Table data behind the chart



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

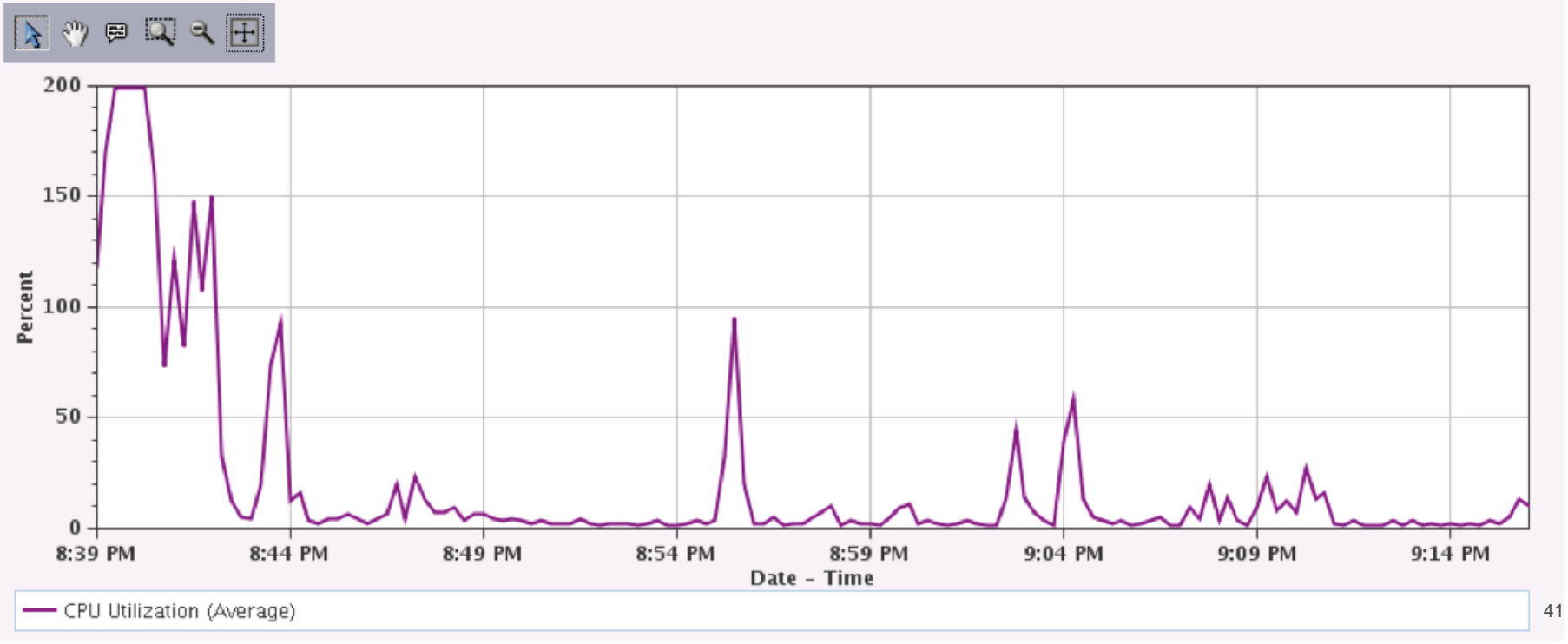
Time
Start: Apr 13, 2015 8:39:12 PM
End: Ongoing

System
Name: ETC3T2
Release: V7R2M0

Refresh

--- Select Action ---

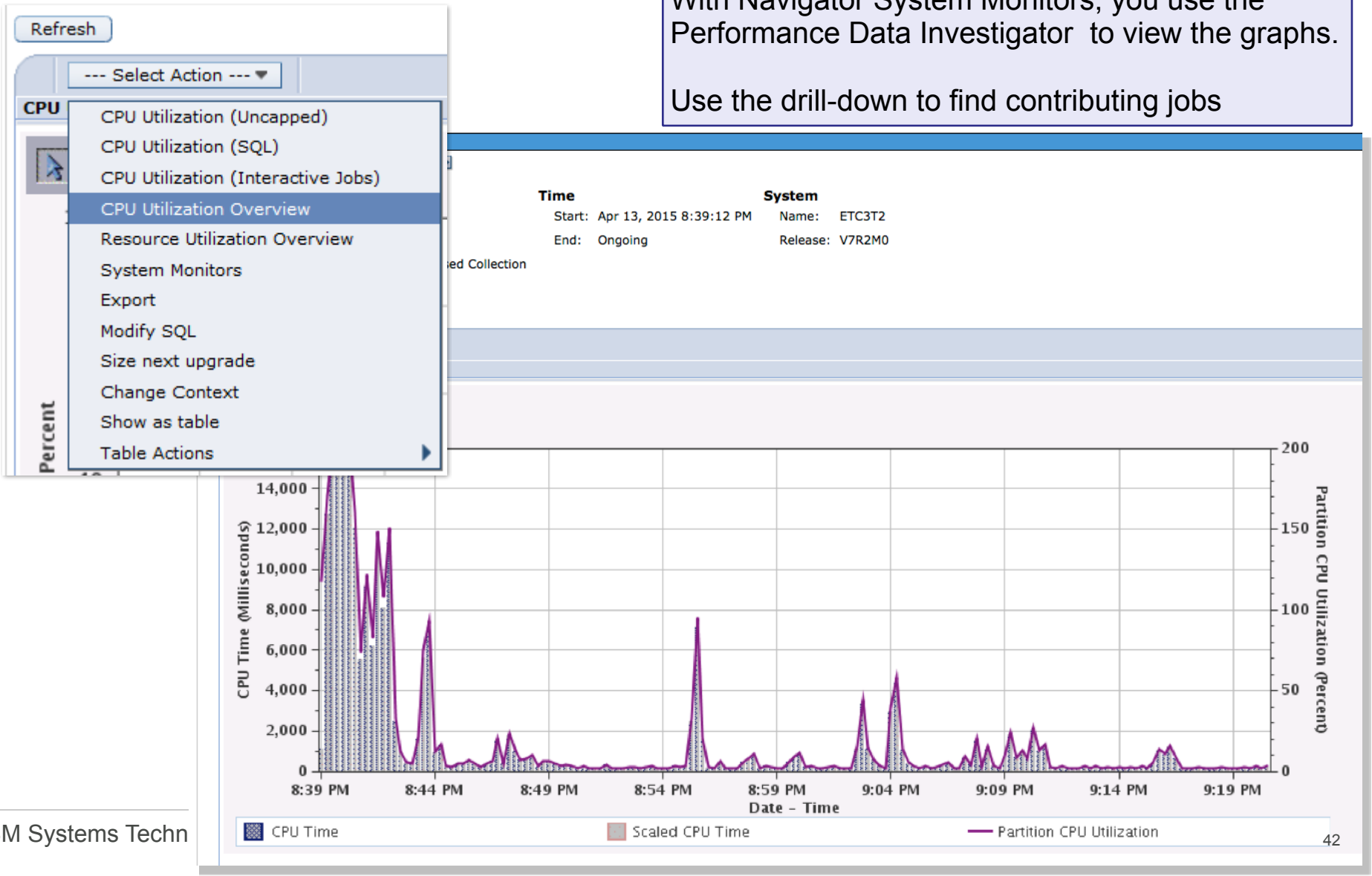
CPU Utilization (Average)



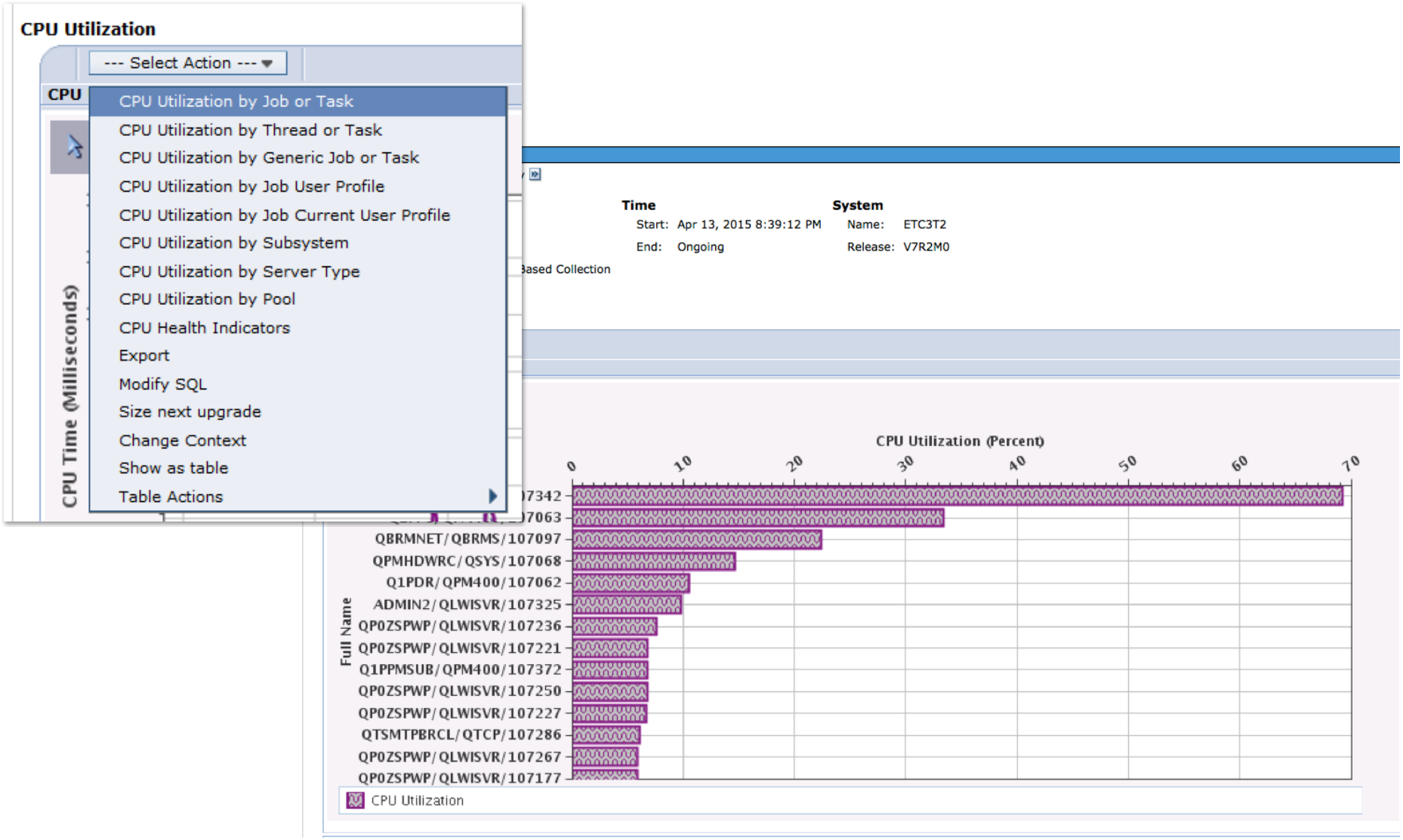
Monitor Drill-down Actions

With Navigator System Monitors, you use the Performance Data Investigator to view the graphs.

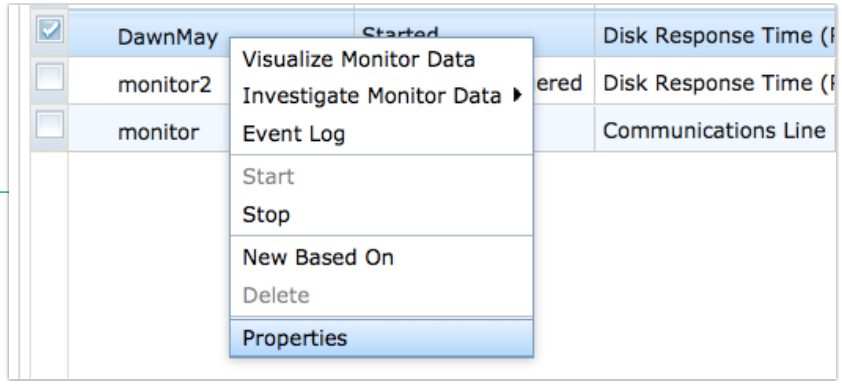
Use the drill-down to find contributing jobs



Drill down to contributing jobs



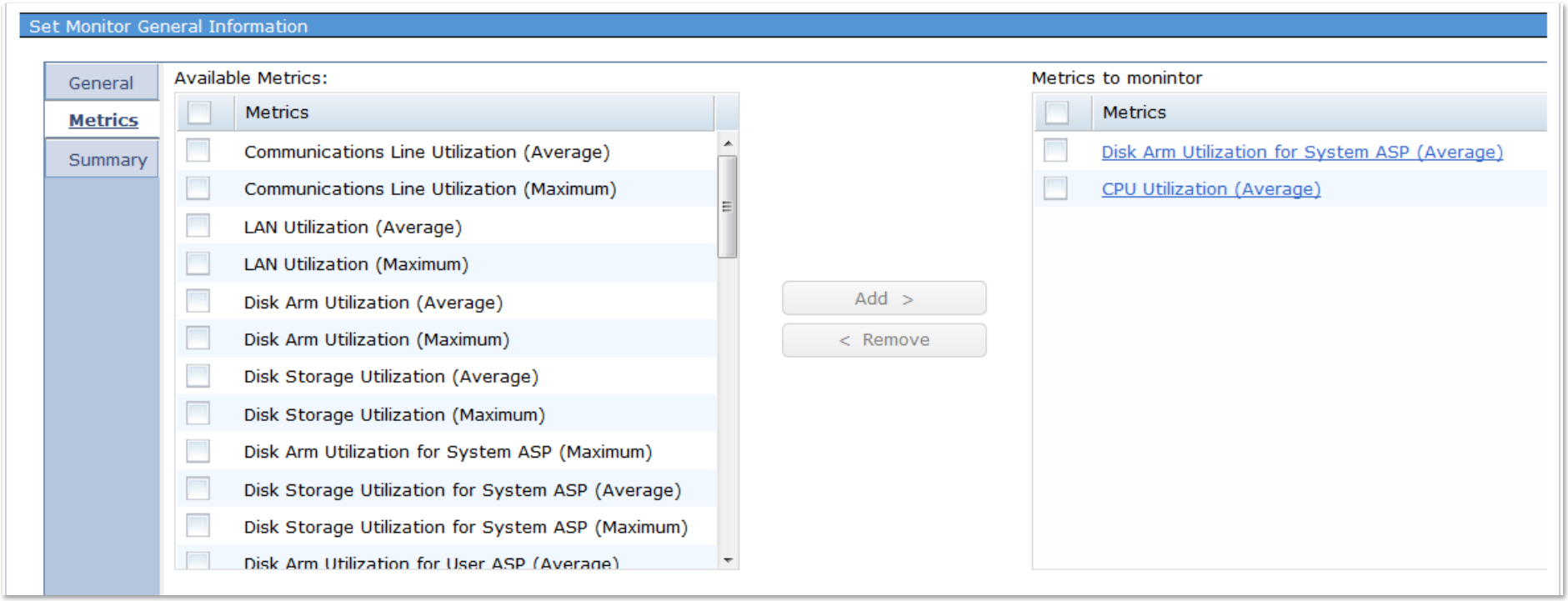
Change a Monitor's Properties



Properties allows you to modify monitors you created

You can change the properties of an active system monitor

Monitors are automatically started at IPL

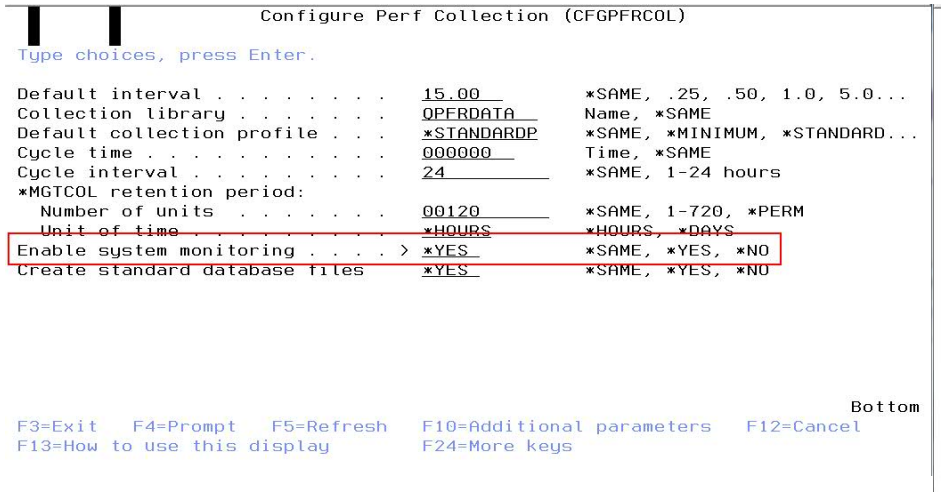


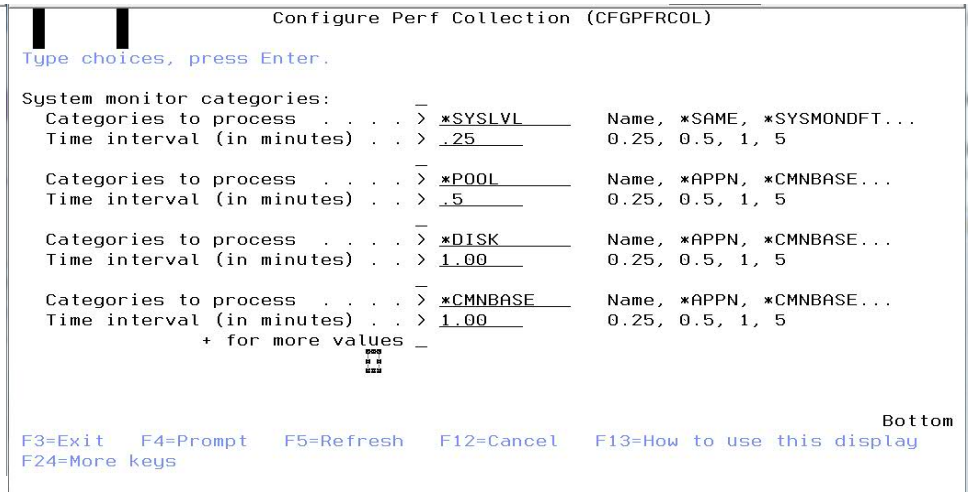
Collection Services and System Monitor Data

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





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 (CRTPFRDTA).
  - If enabled, a CRTPFRDTA 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
  - CRTPFRDTA option to produce these files if run manually
  - CFGPFRCOL option to produce in standard data collection
  - Includes metrics supported by Management Central and more.

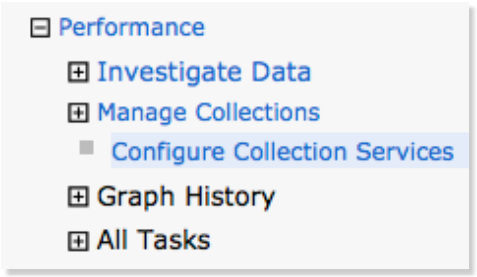
Collection Services Files for System Monitors

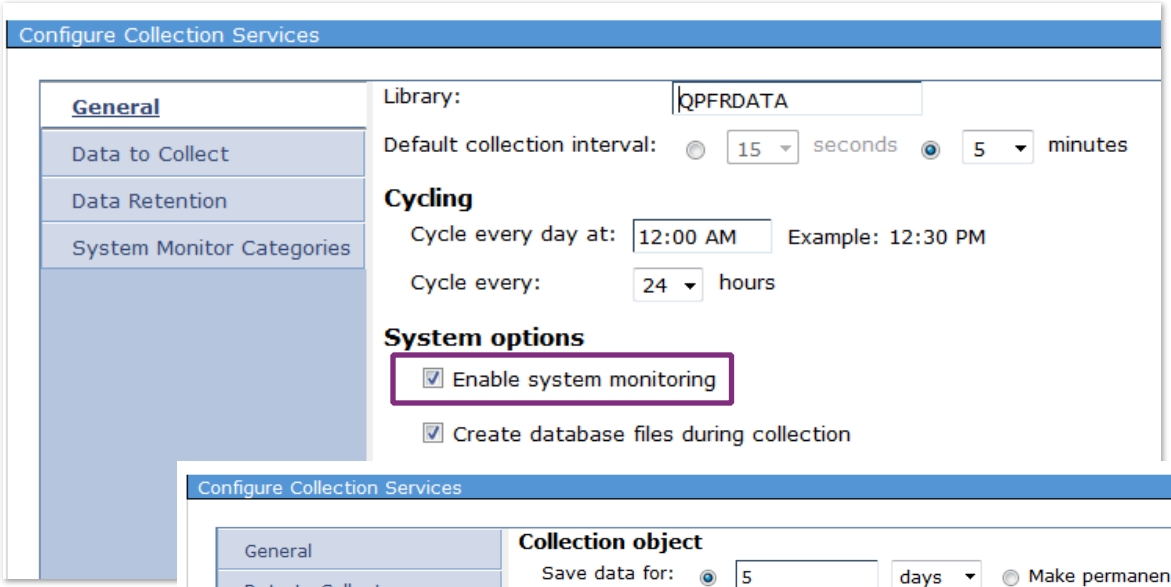
- **QAPMSMCMN** (*CMNBASE) : Line and LAN metrics
  - Breakdown: Lines and LANs
  - Still have ability to exclude unwanted lines
  - Line count, avg / max utilization, avg kilobits received and sent, line with highest utilization
- **QAPMSMDSK** (*DISK) : Disk metrics
  - Breakdown: all units, system 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



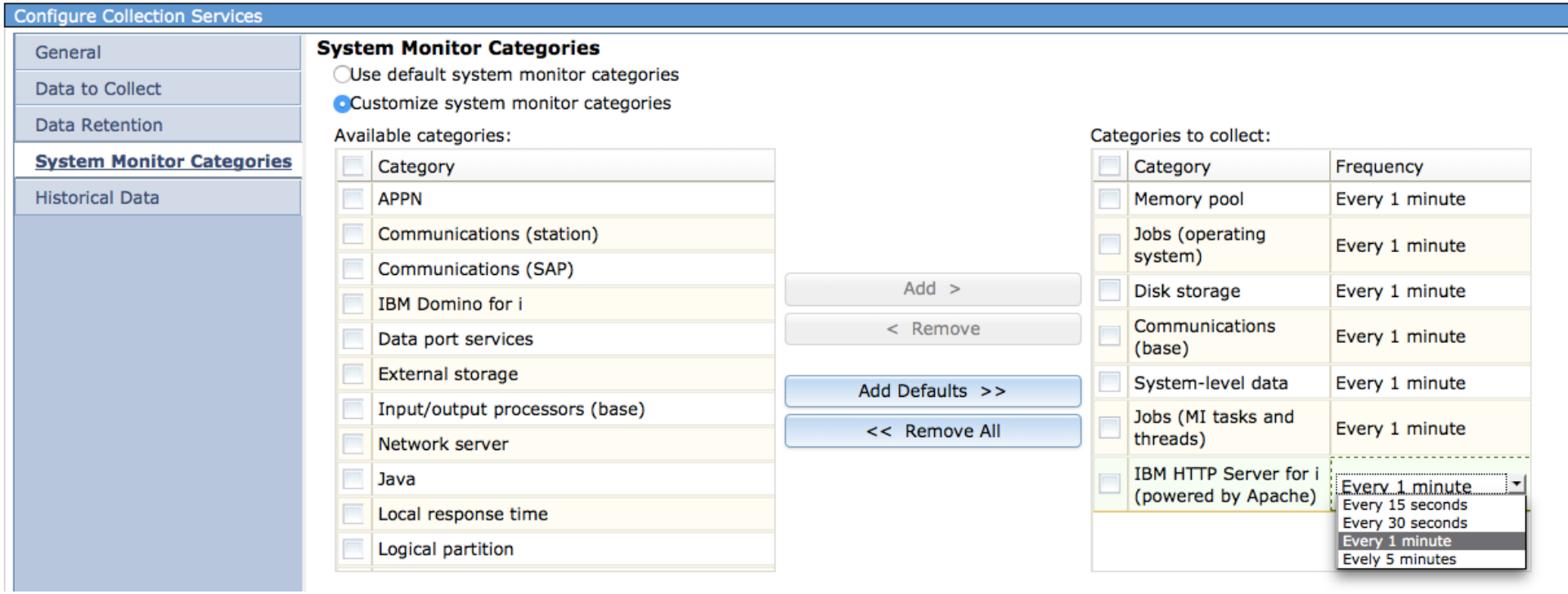


Collection Services - Customize System Monitor Data

Customize System Monitor categories

Click in the frequency cell to change the default

7.3 screen capture below



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

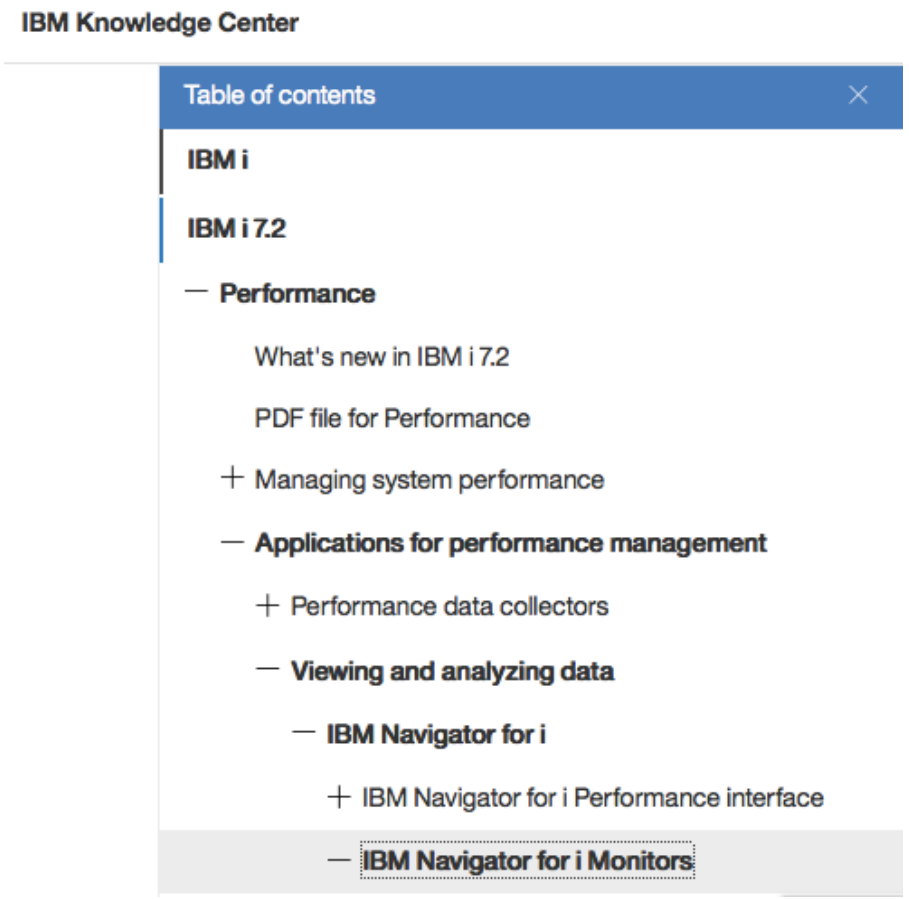
https://www.ibm.com/developerworks/community/wikis/home?lang=en#!/wiki/IBM%20i%20Technology%20Updates/page/PTF%20Groups

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

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

Documentation and Help

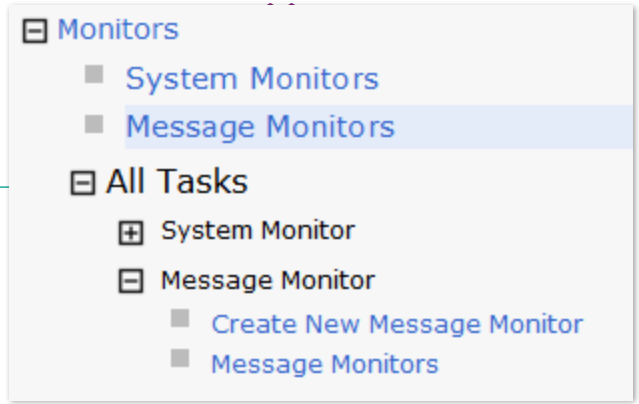
Knowledge Center

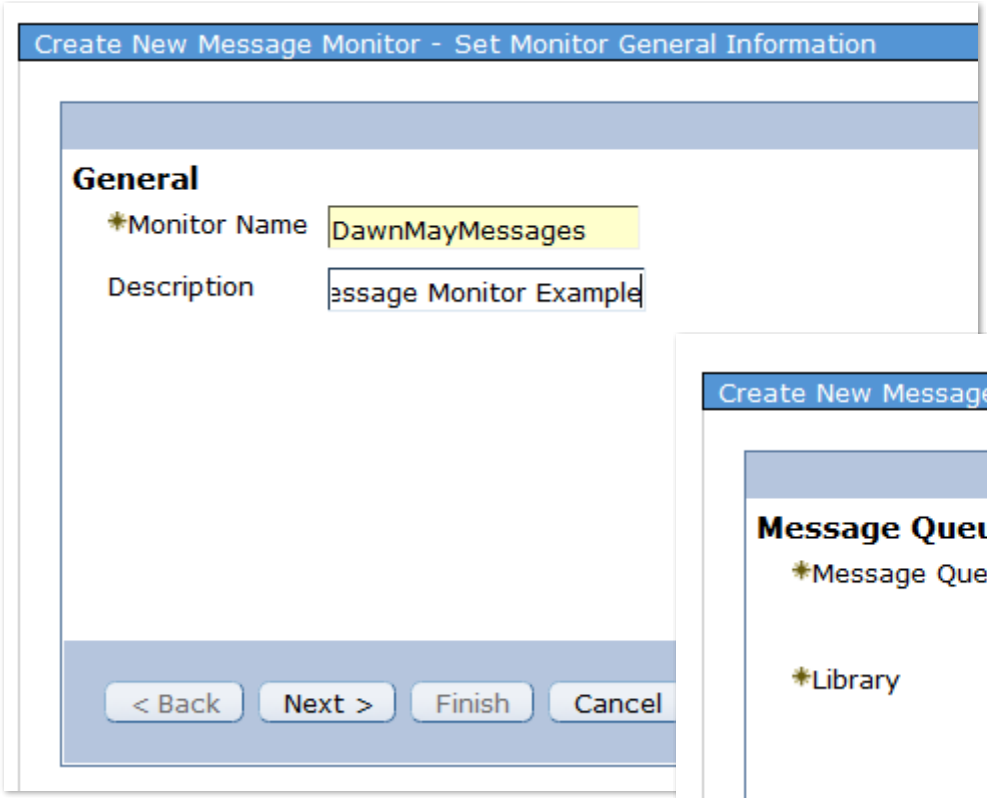


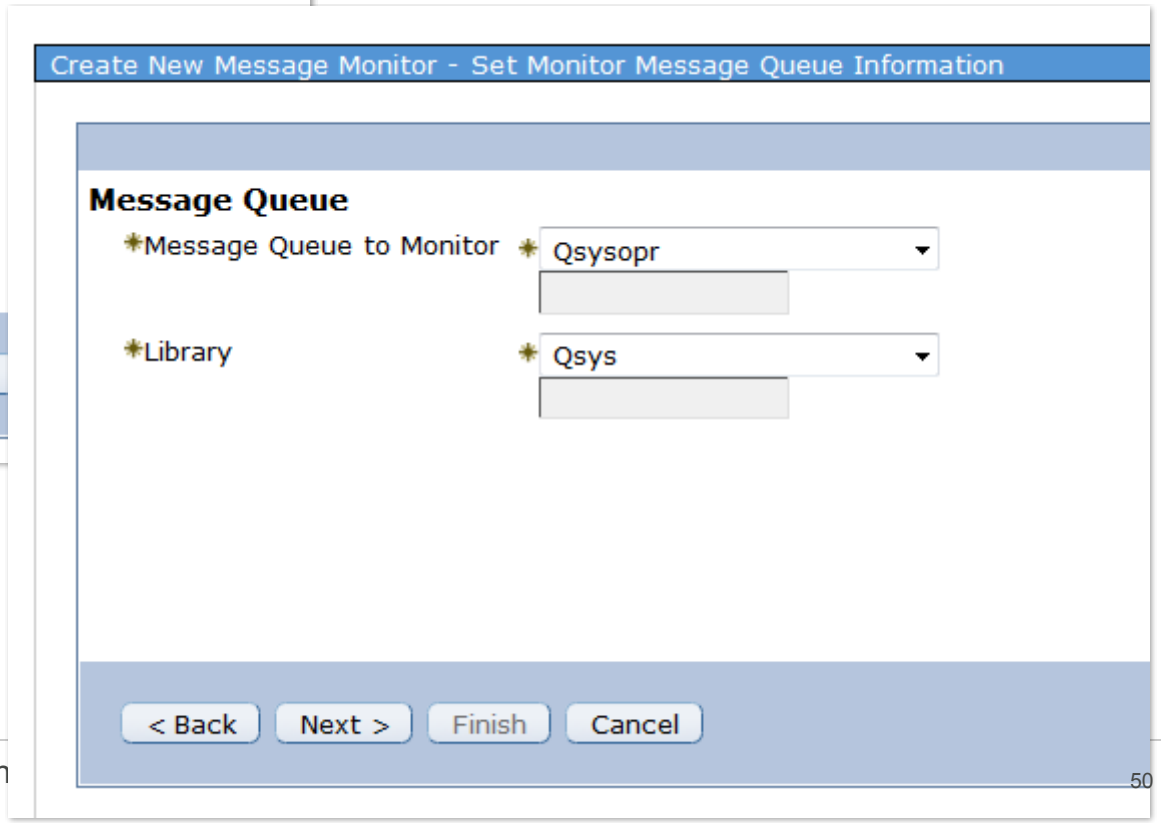
For 7.3 Knowledge Center:
http://www.ibm.com/support/knowledgecenter/ssw_ibm_i_73/rzahg/welcome.htm

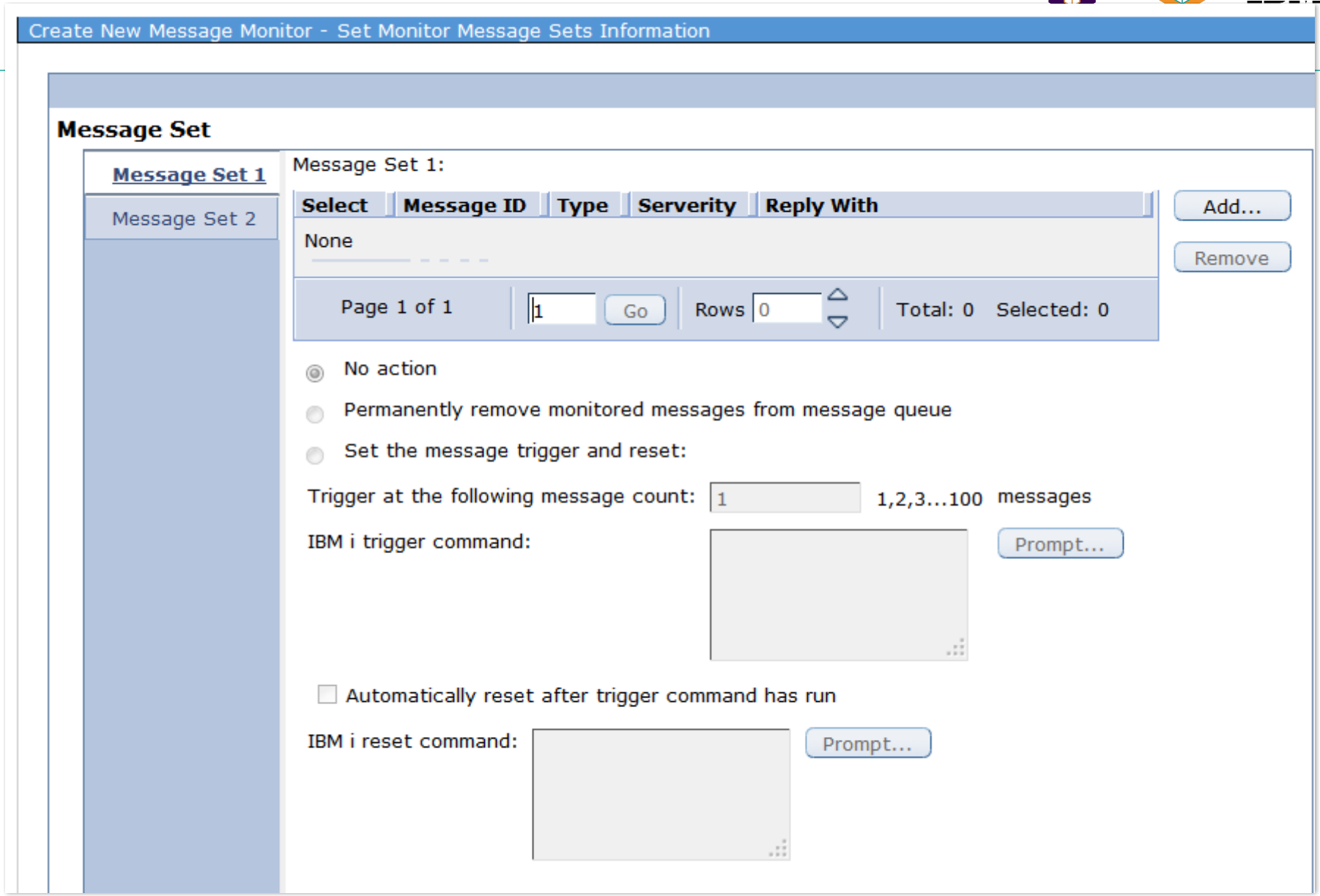
Navigator Message Monitors

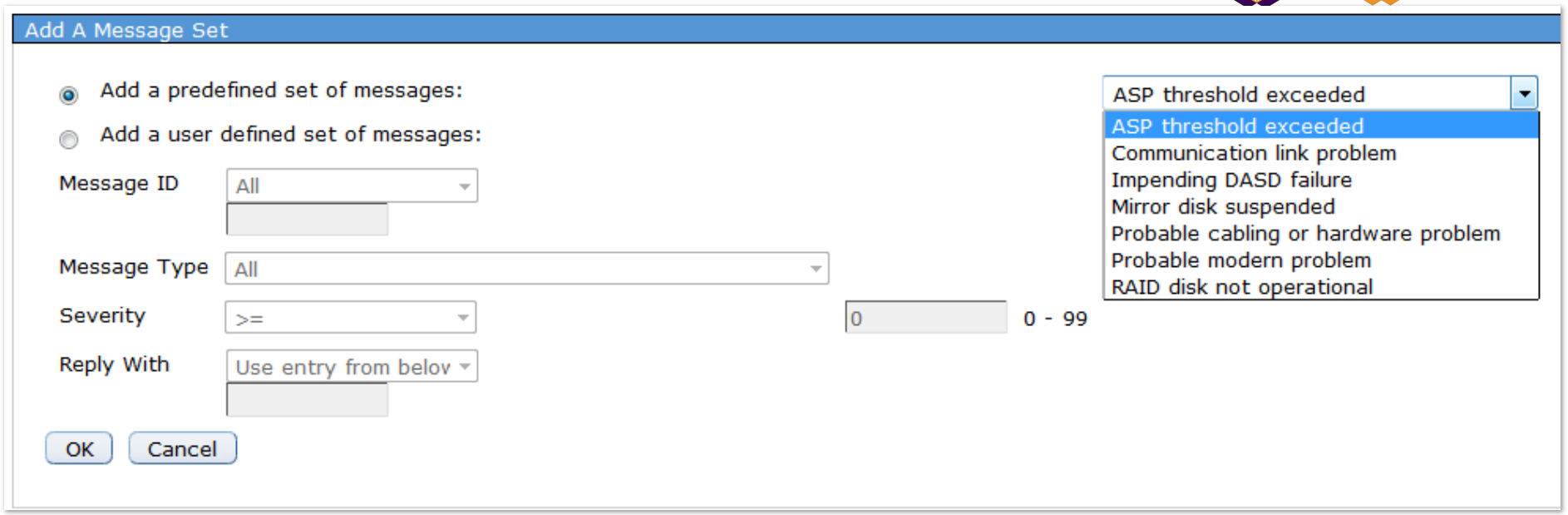
Monitor Message Queues

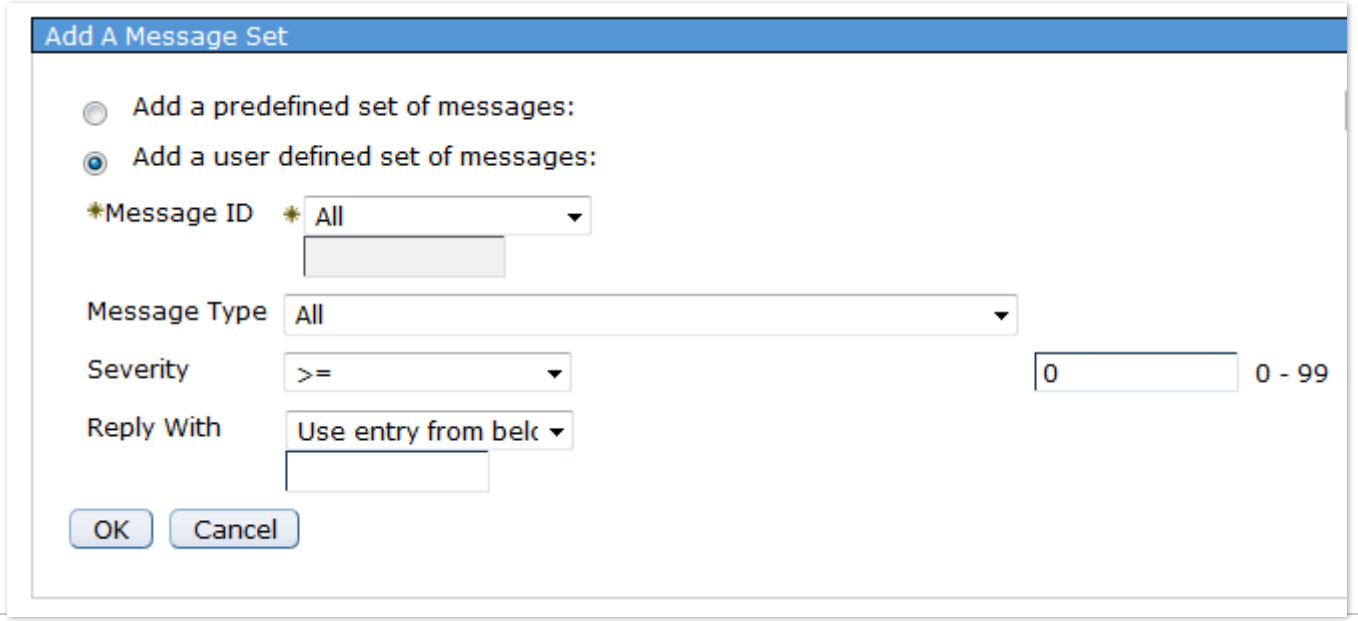


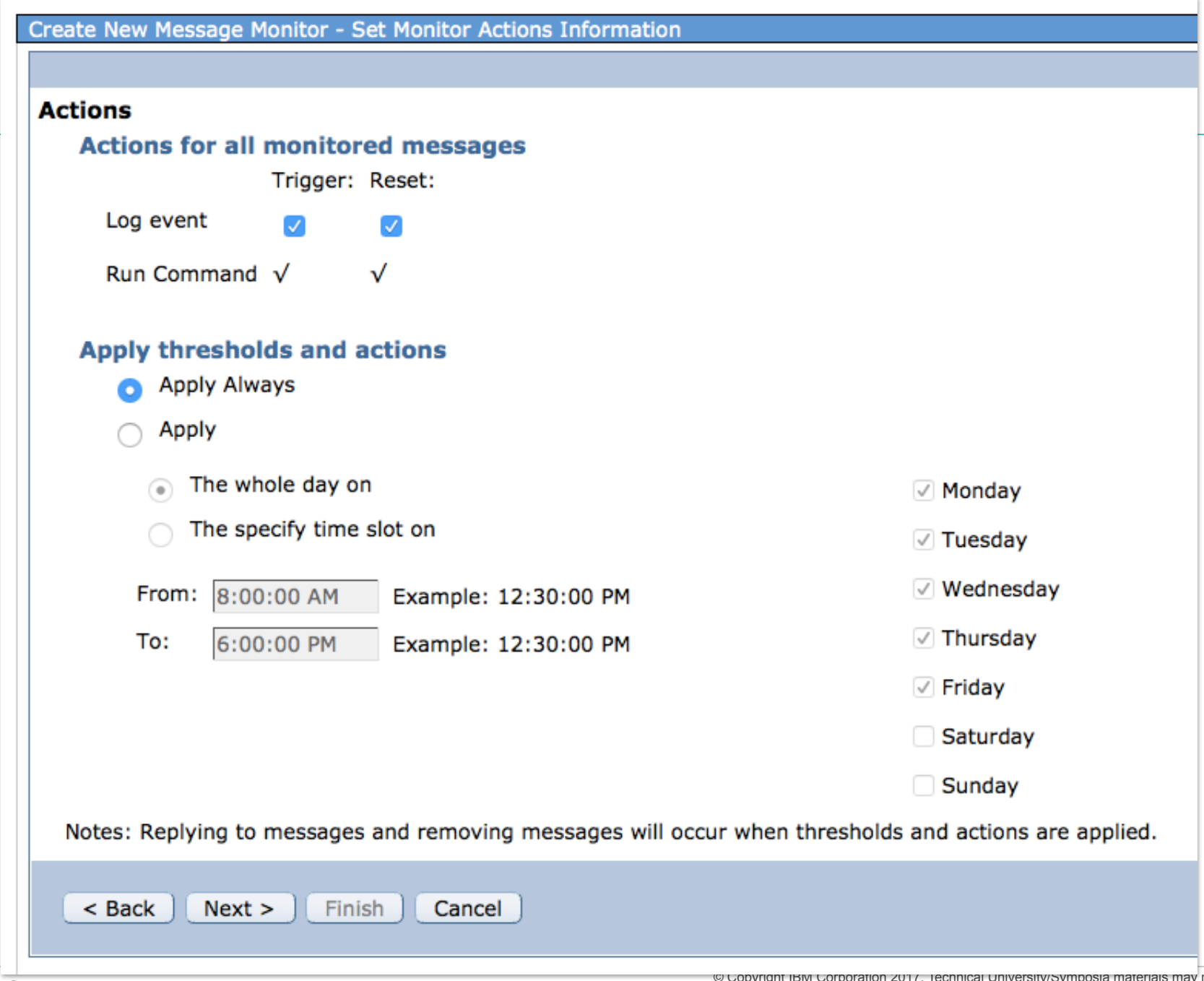




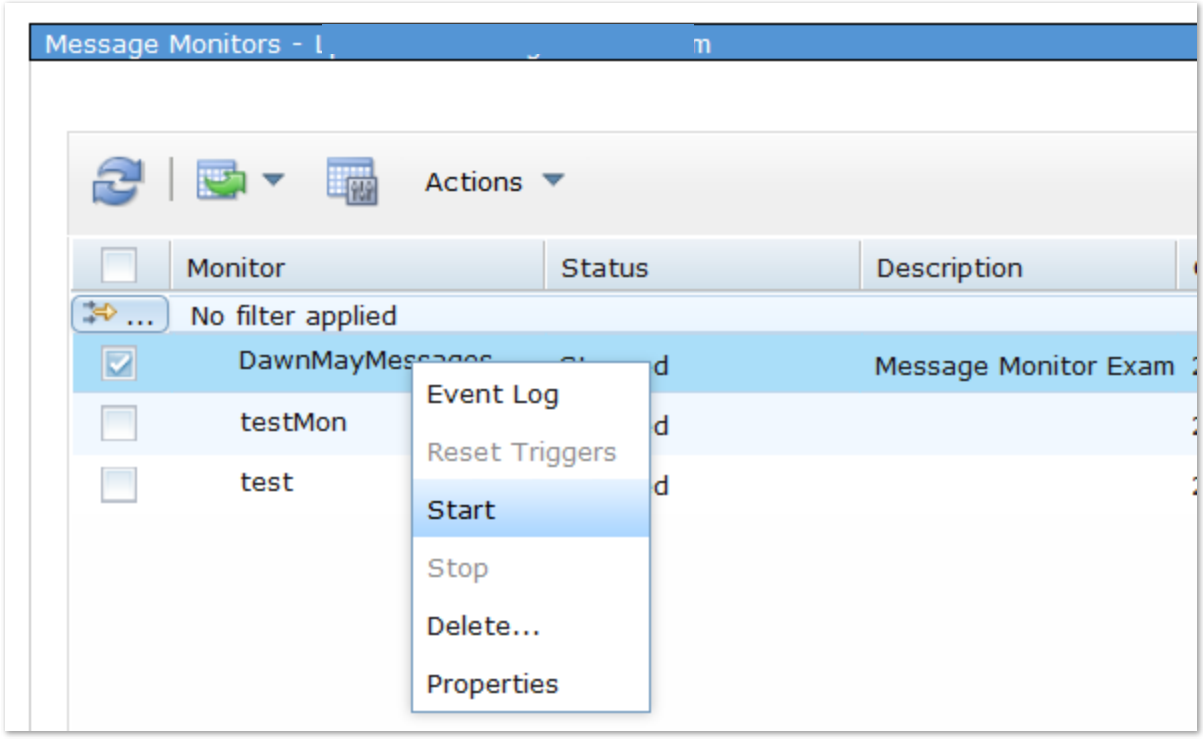




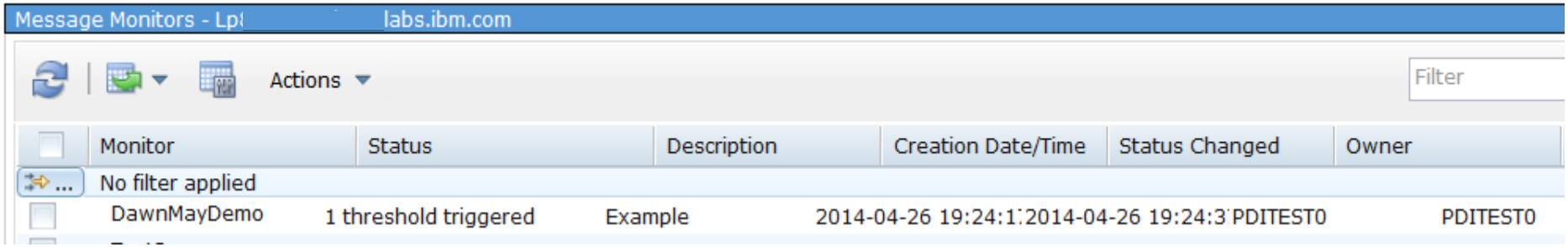


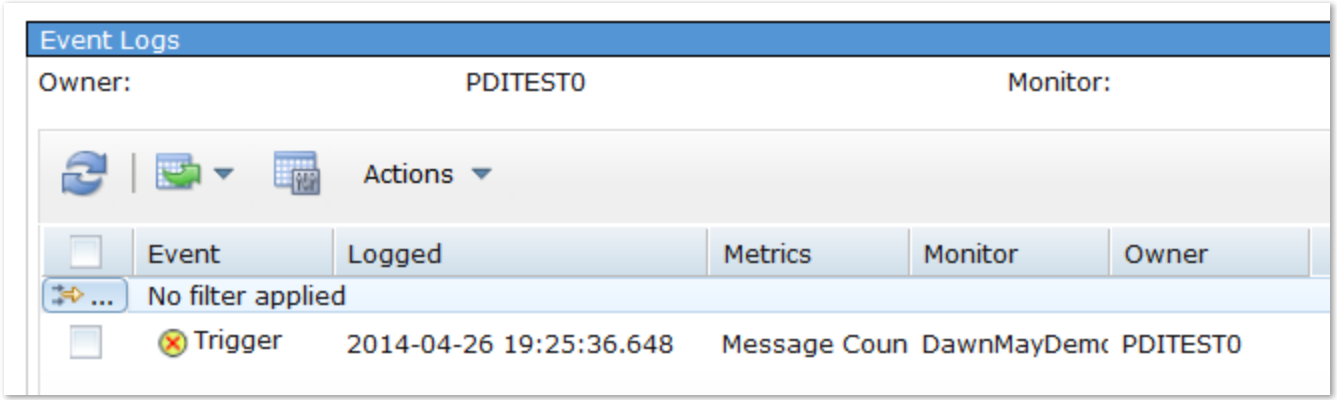


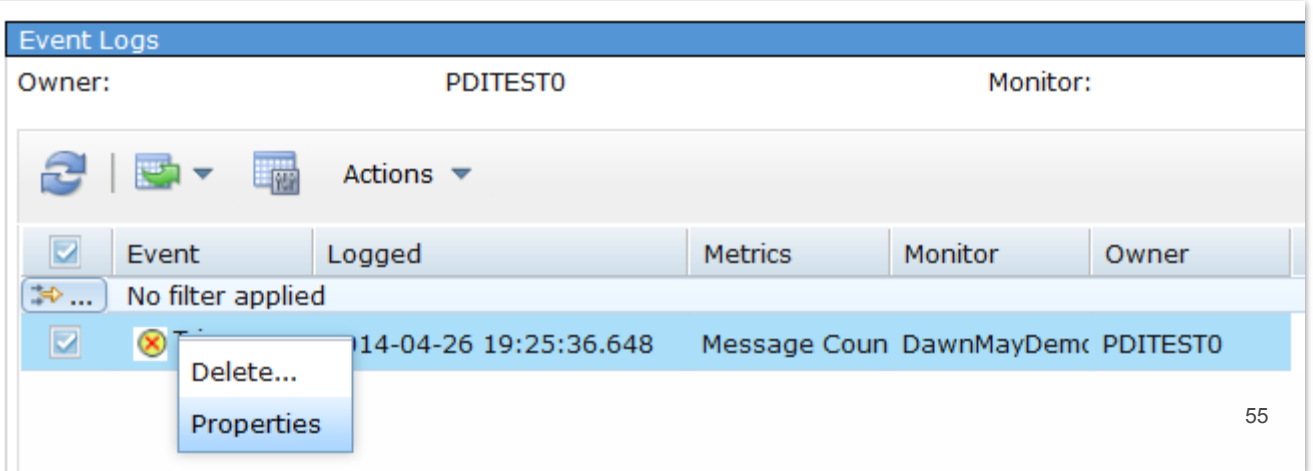
Start the Monitor



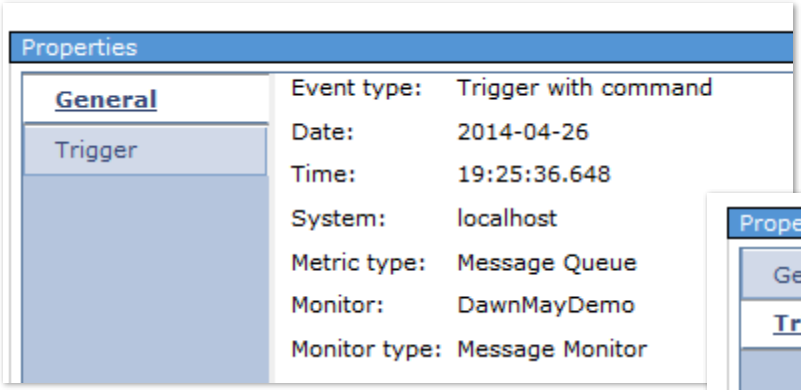
Triggers and Event Log

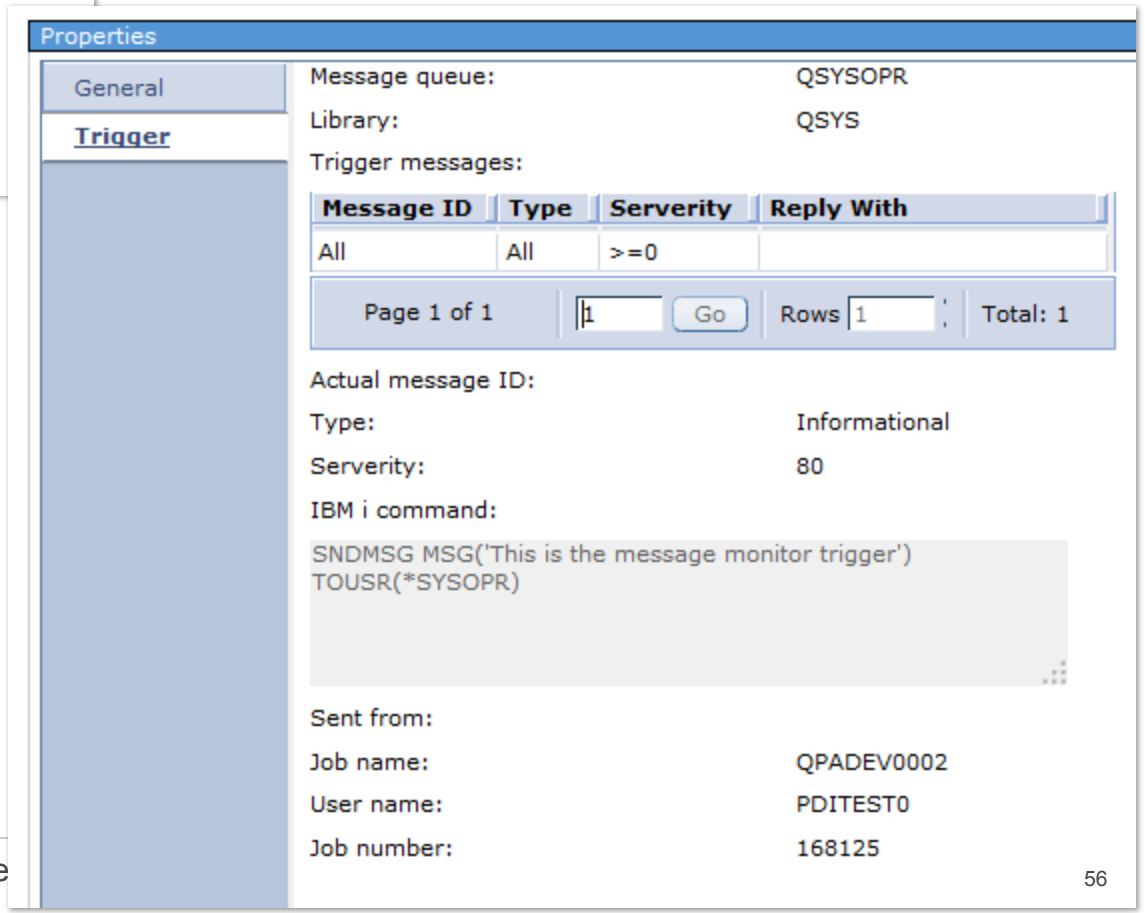






Trigger





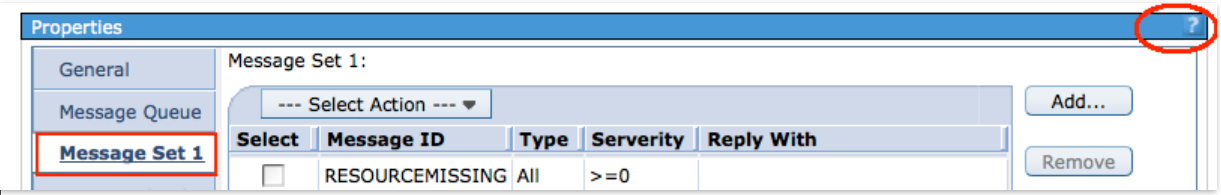
Replacement variables are also available for message monitors.

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

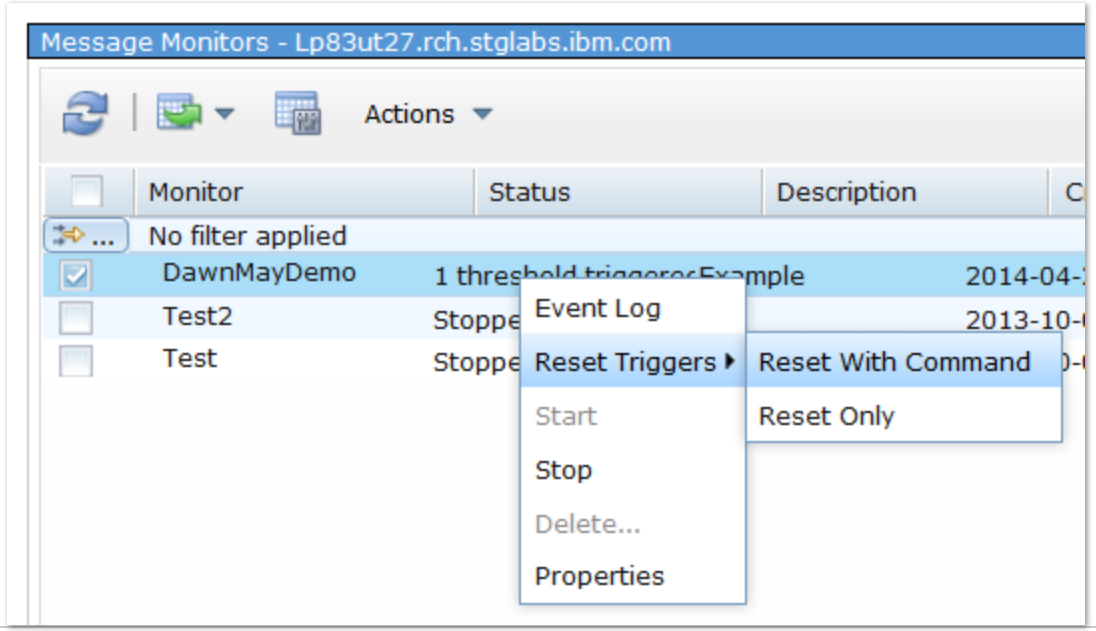
You can use the following parameters with operating system commands when any threshold for a message monitor is triggered or reset. The parameters must be entered in uppercase exactly as shown.

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
```

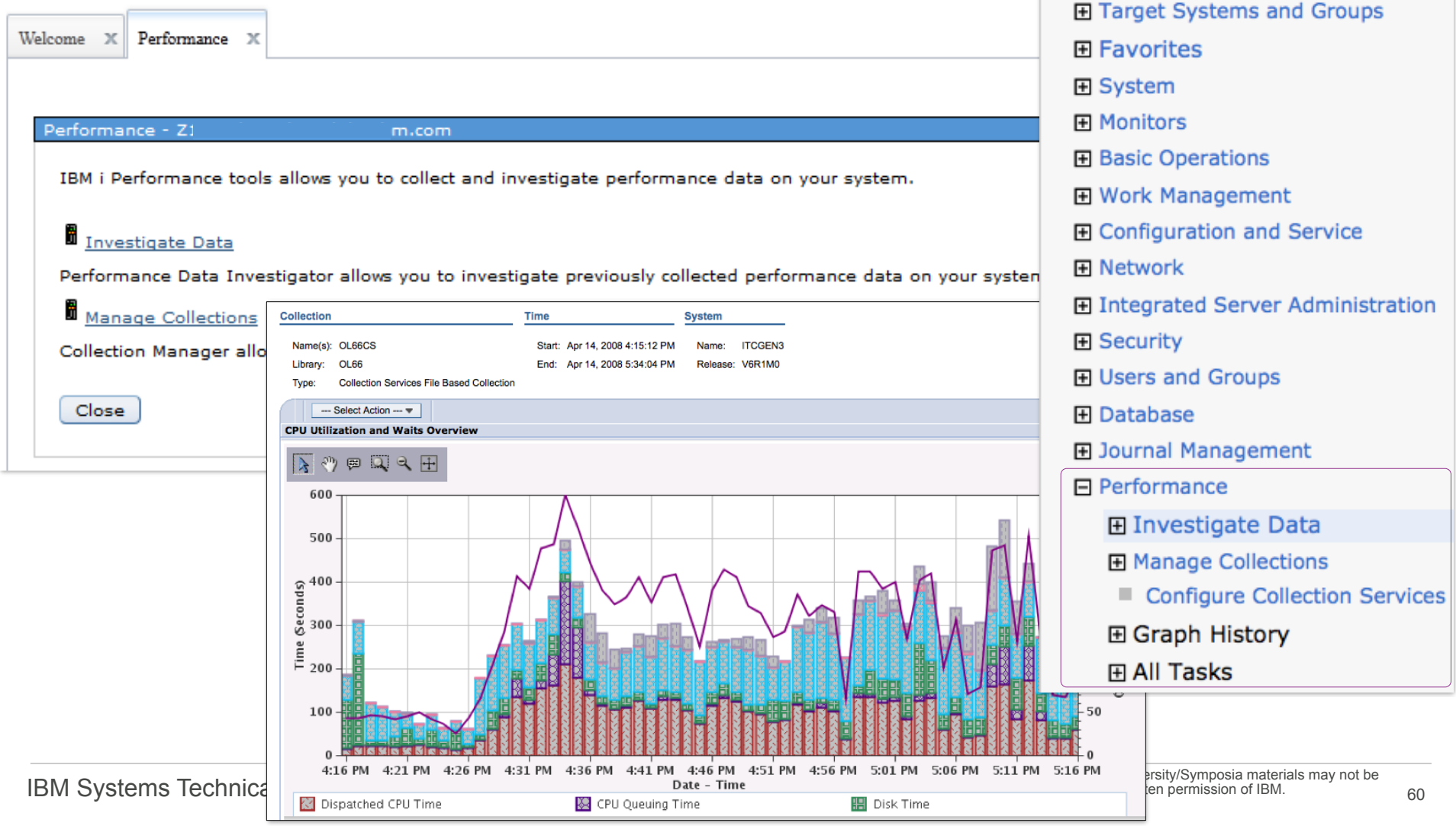


Message Monitor Observations

- 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



Health Indicators

Manually Monitor your System Performance

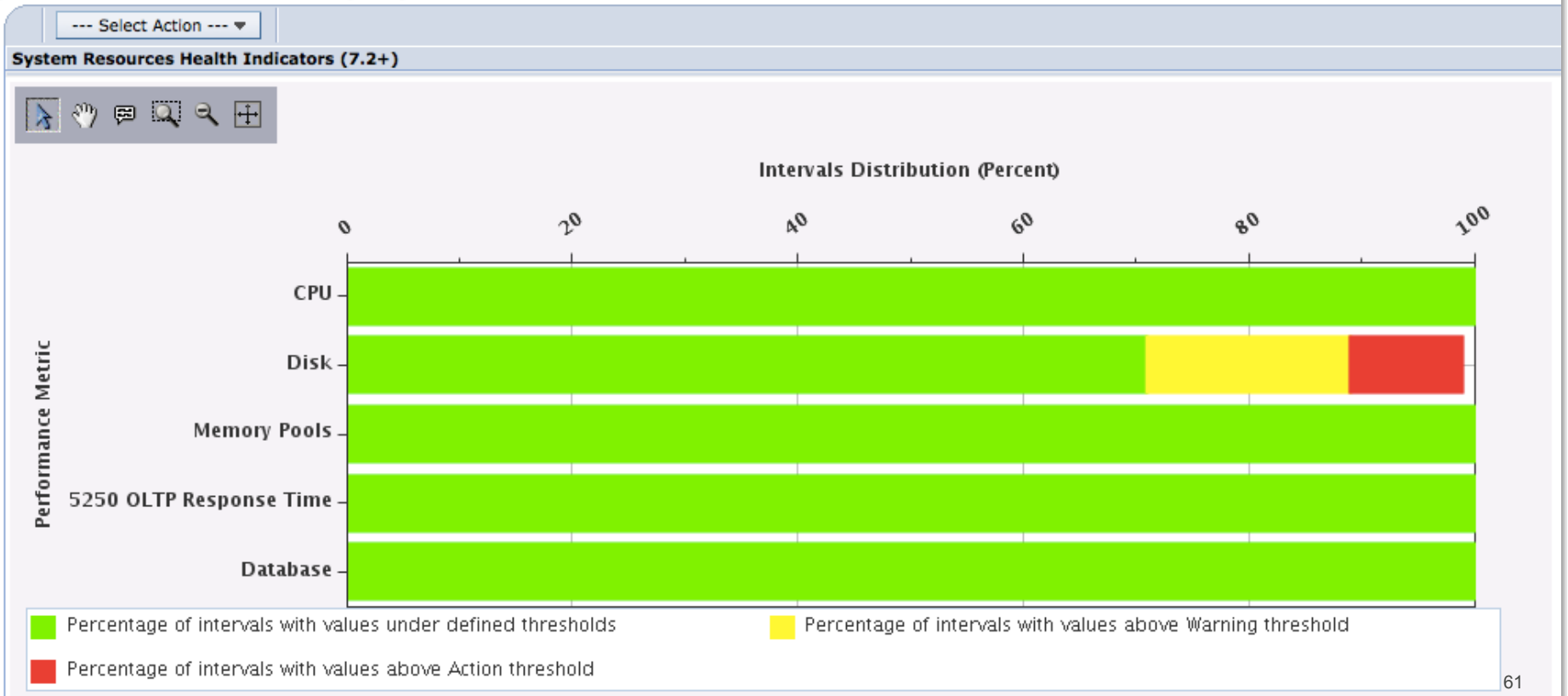
- Performance
  - Investigate Data
    - Investigate Data Search
    - Health Indicators
      - System Resources Health Indicators
      - CPU Health Indicators
      - Disk Health Indicators
      - Memory Pools Health Indicators
      - Response Time Health Indicators
      - Database Health Indicators

Collection
Name(s): Q118000005
Library: QPFRDATA
Type: Collection Services File Based Collection
File level: 48

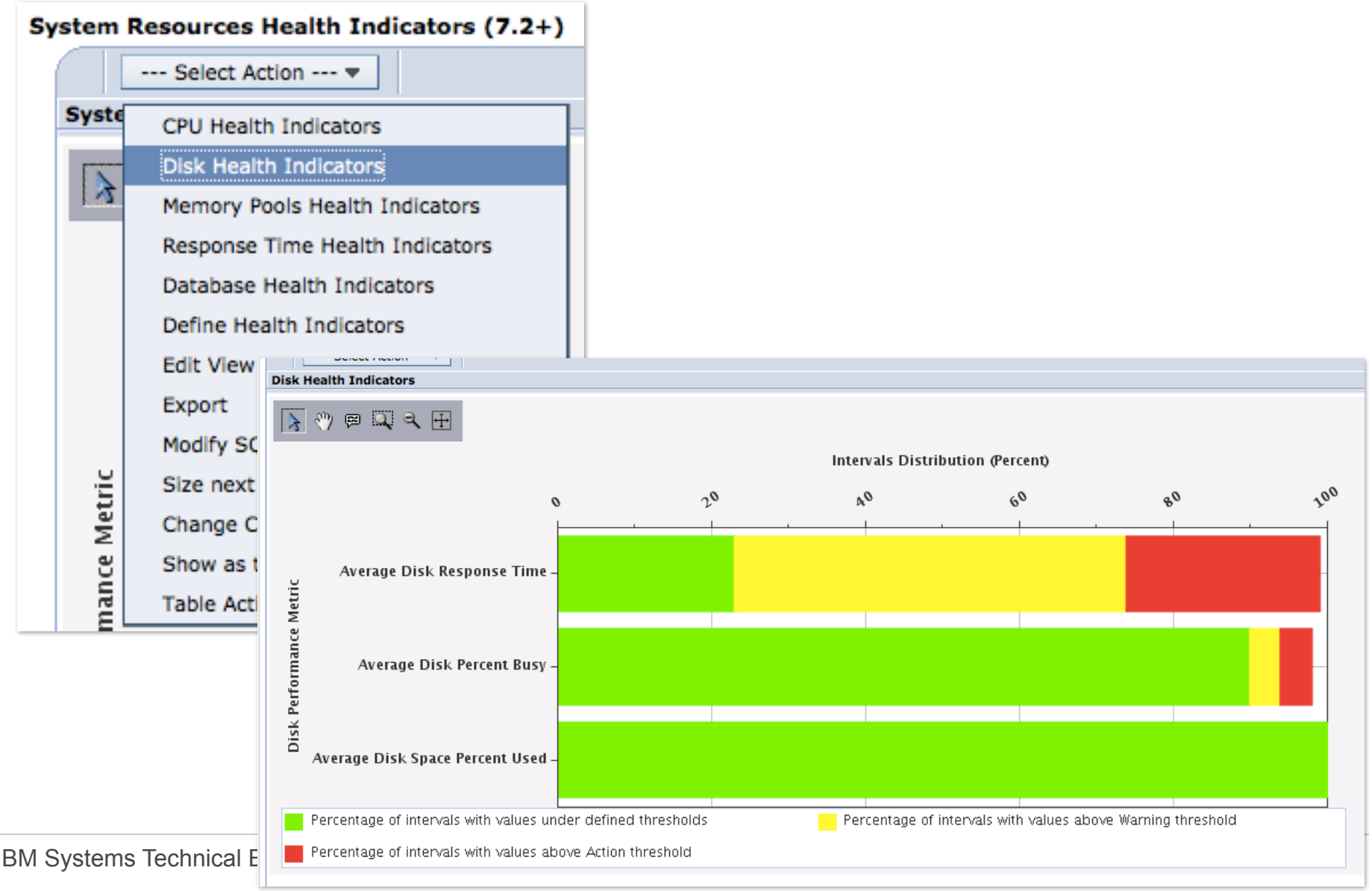
Time
Start: Apr 27, 2016 12:00:05 AM
End: Ongoing

System
Name: Z1432BP2
Release: V7R3M0

System Resources Health Indicators (7.2+)

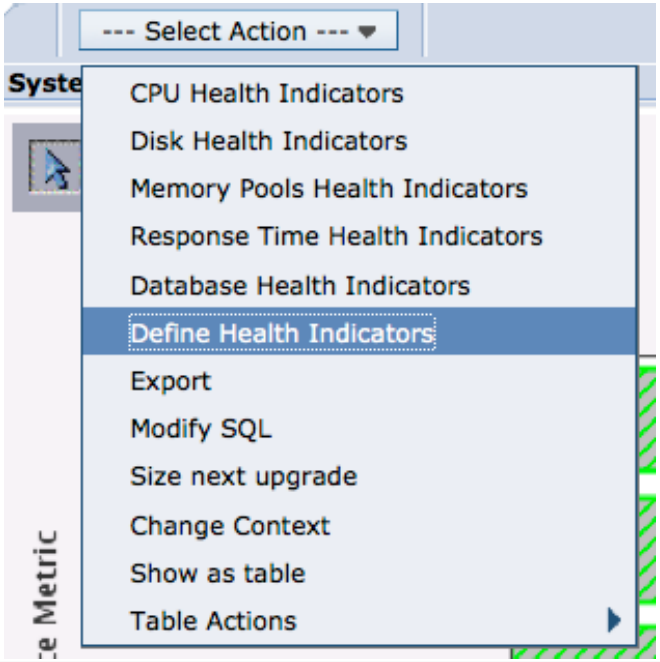


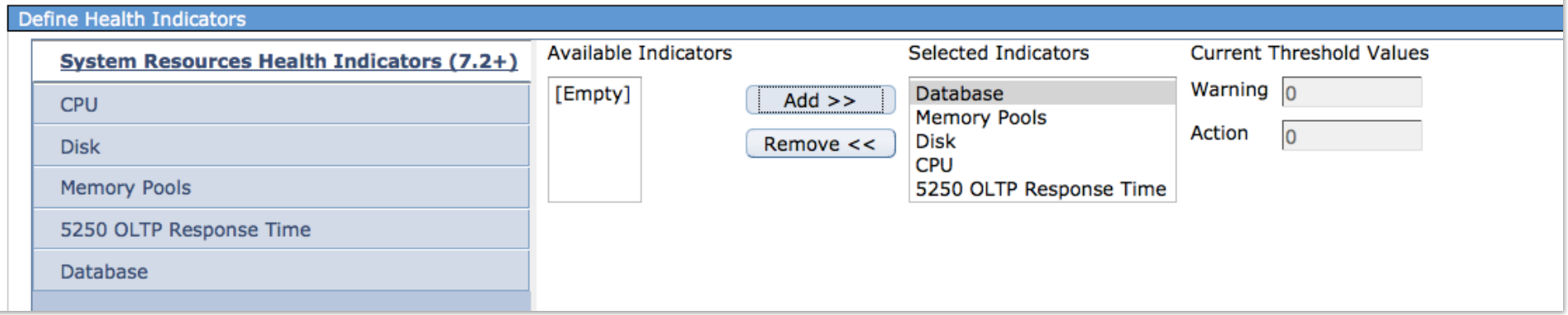
Example Drill-down to Disk Health Indicators



Health Indicators

Customize Health Indicator Thresholds





Accessing IBM i Health Indicators Using Performance Data Investigator

Watches

Monitoring with Watches

- Watches can be use 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

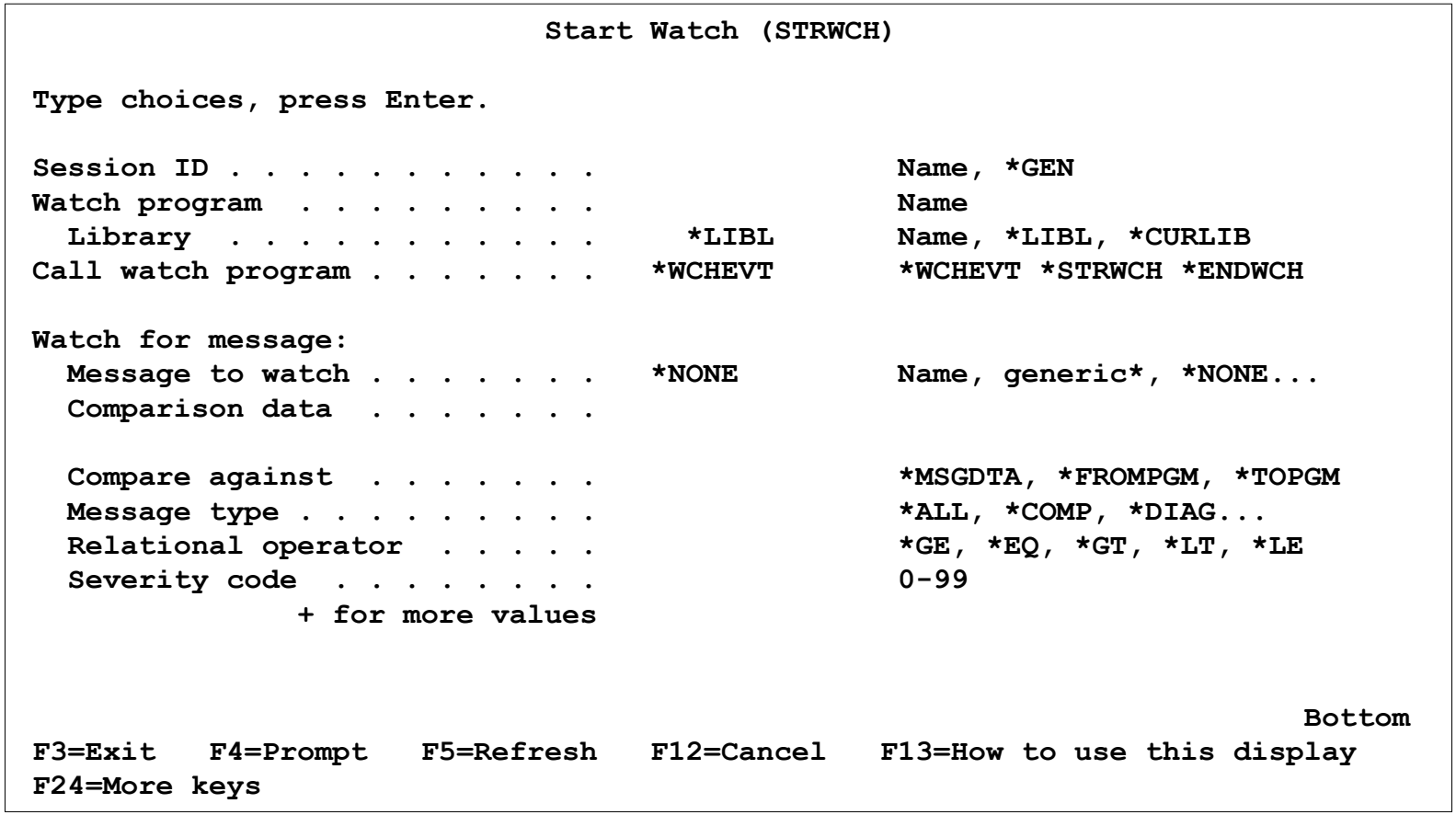
- Low Overhead
  - Watches are an exit program
  - Minimal overhead until the watched condition occurs

  - 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

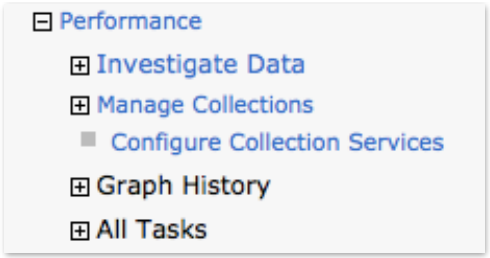
https://www.ibm.com/developerworks/community/wikis/home?lang=en#!/wiki/IBM%20i%20Technology%20Updates/page/Graph%20History

Graph History

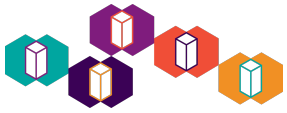
- **Graph History** allows you to view performance data over…..
  - Days, weeks, or months

- **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



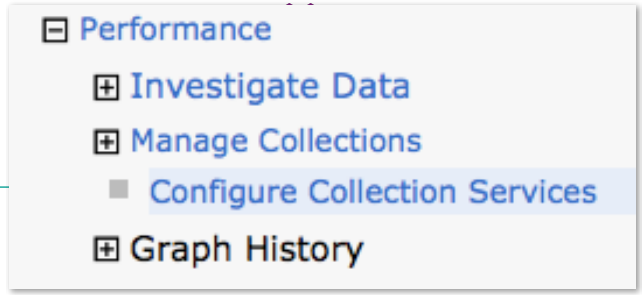
IBM

7.3

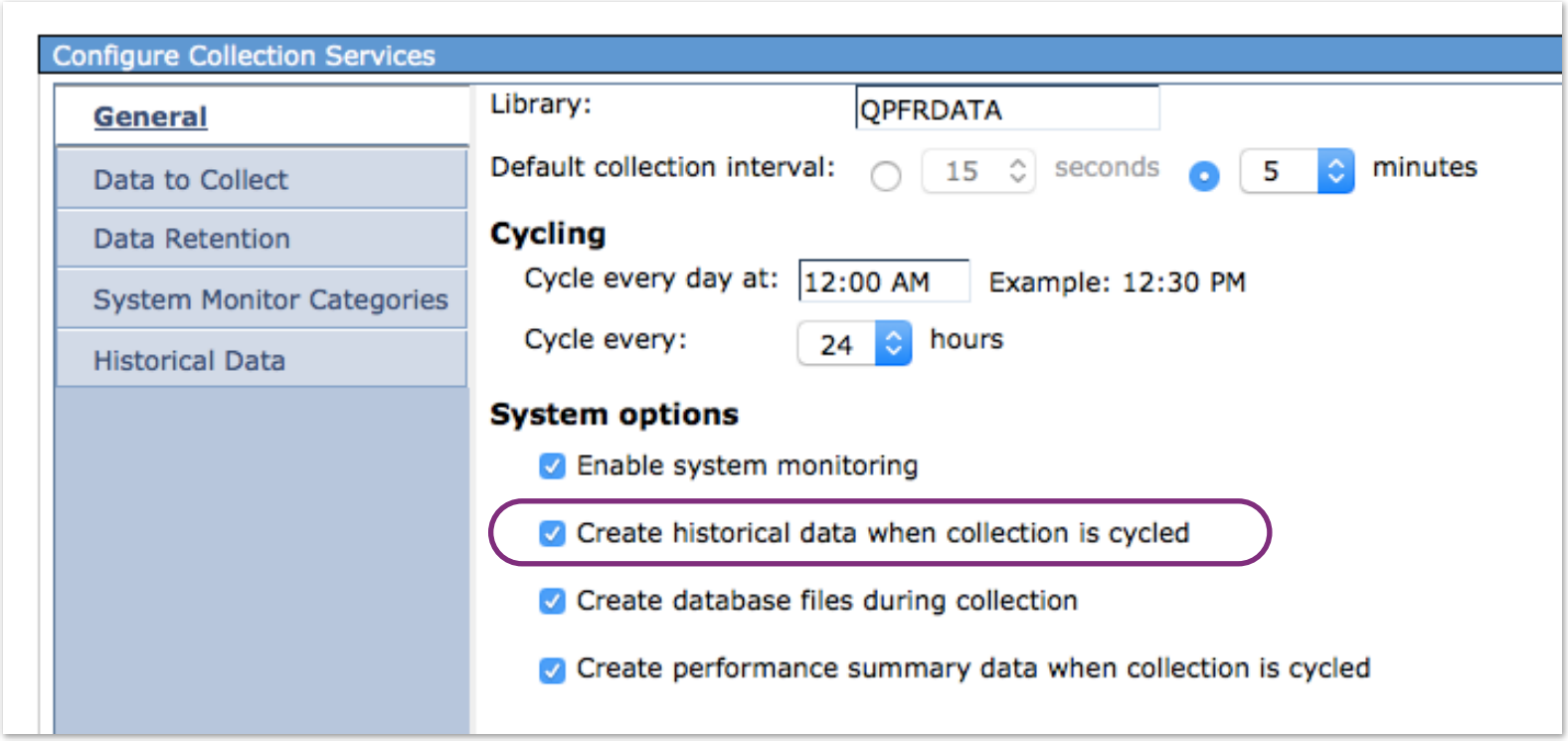
- There are two types of historical data:
  - **Summary**
    - System level or summarized metrics
      Useful in identifying trends or detecting changes in a system over a long period of time
  - **Detail**
    - Data from which the summarized metrics are derived and other relevant supplementary data.
      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.

7.3

Enabling Historical Data

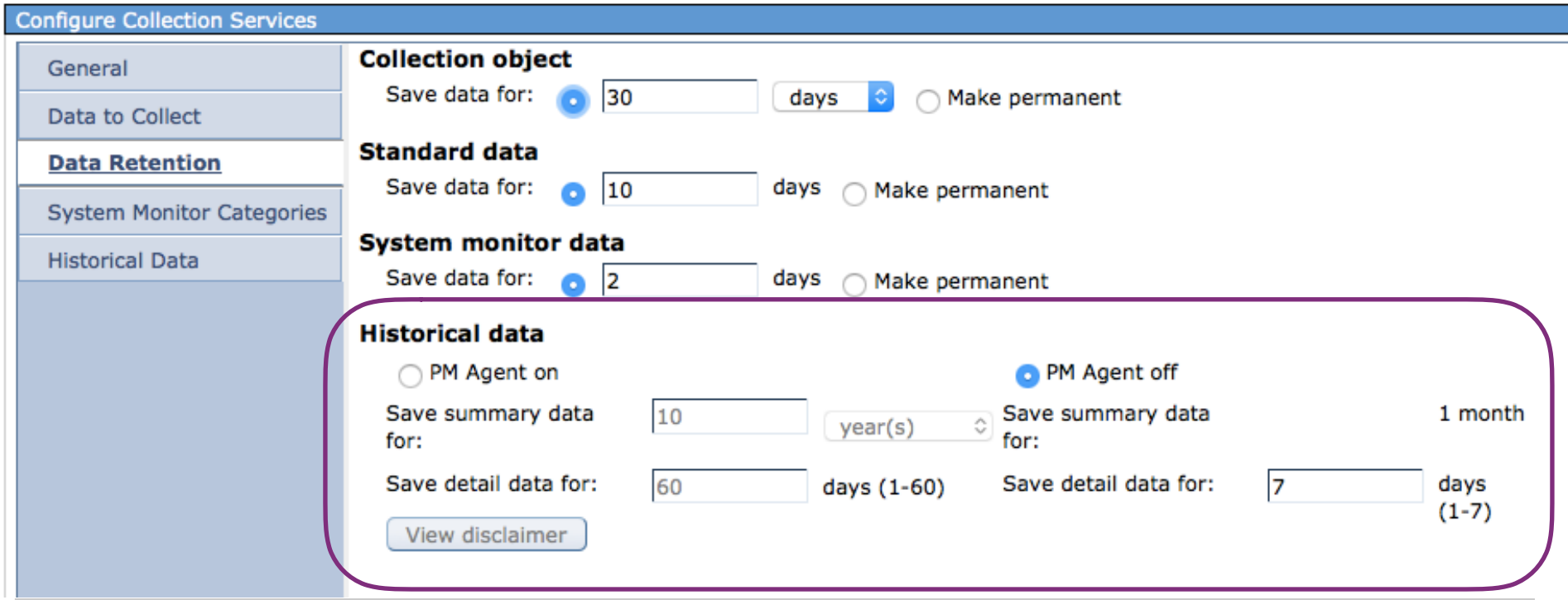


- Historical data is **OFF** by default
- Enable historical data in Collection Services Properties
  - Historical data is created at collection cycle time



Historical Data Retention

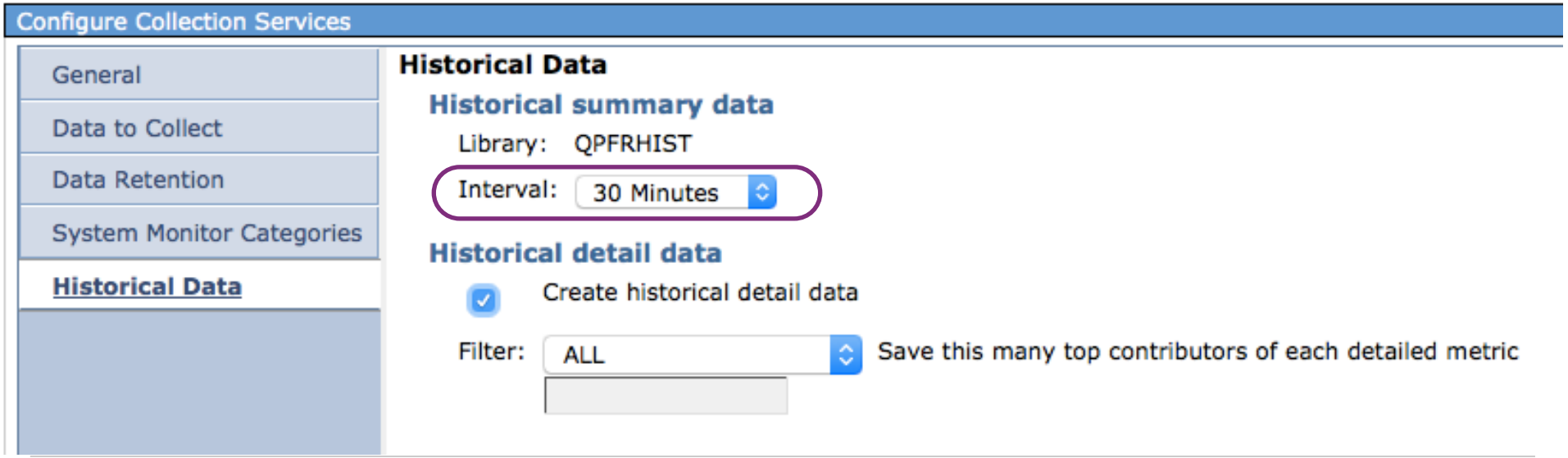
- Retention period for summary and detail data depends on PM Agent status
  - Radio buttons will show whether PM Agent status is *ACTIVE or *INACTIVE
  - Select PM Agent On or Off to Start or Stop



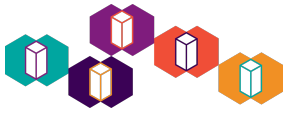
Collection Services - Historical Data Properties

- 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



Completing Historical Data Configuration

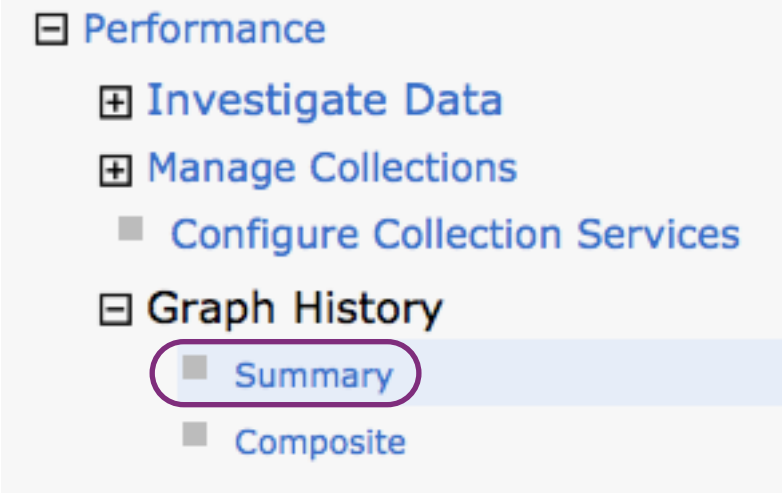


IBM

7.3

- 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

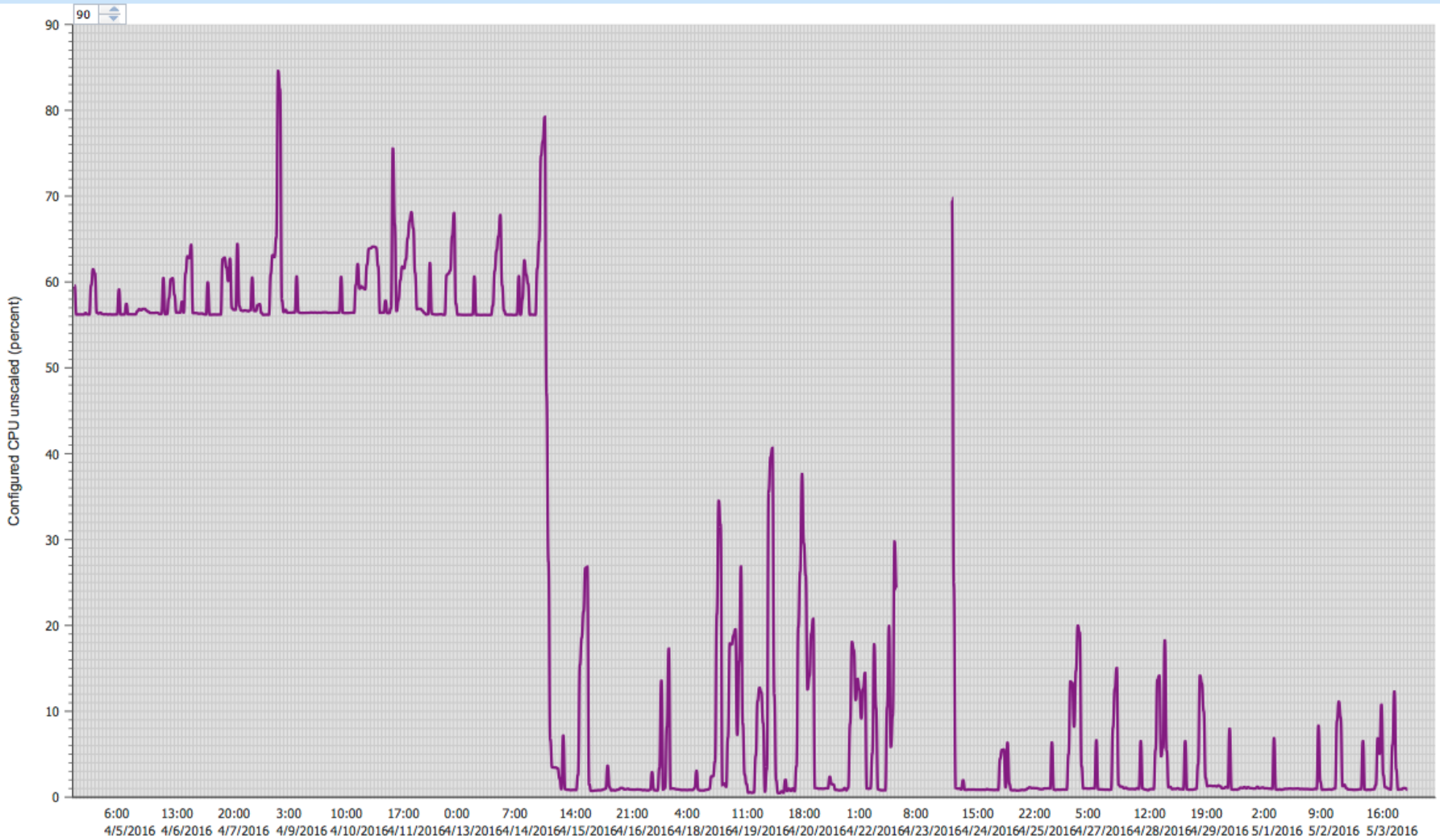


Welcome | Dashboard | Summary

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

Context

CPU Utilization (Average)

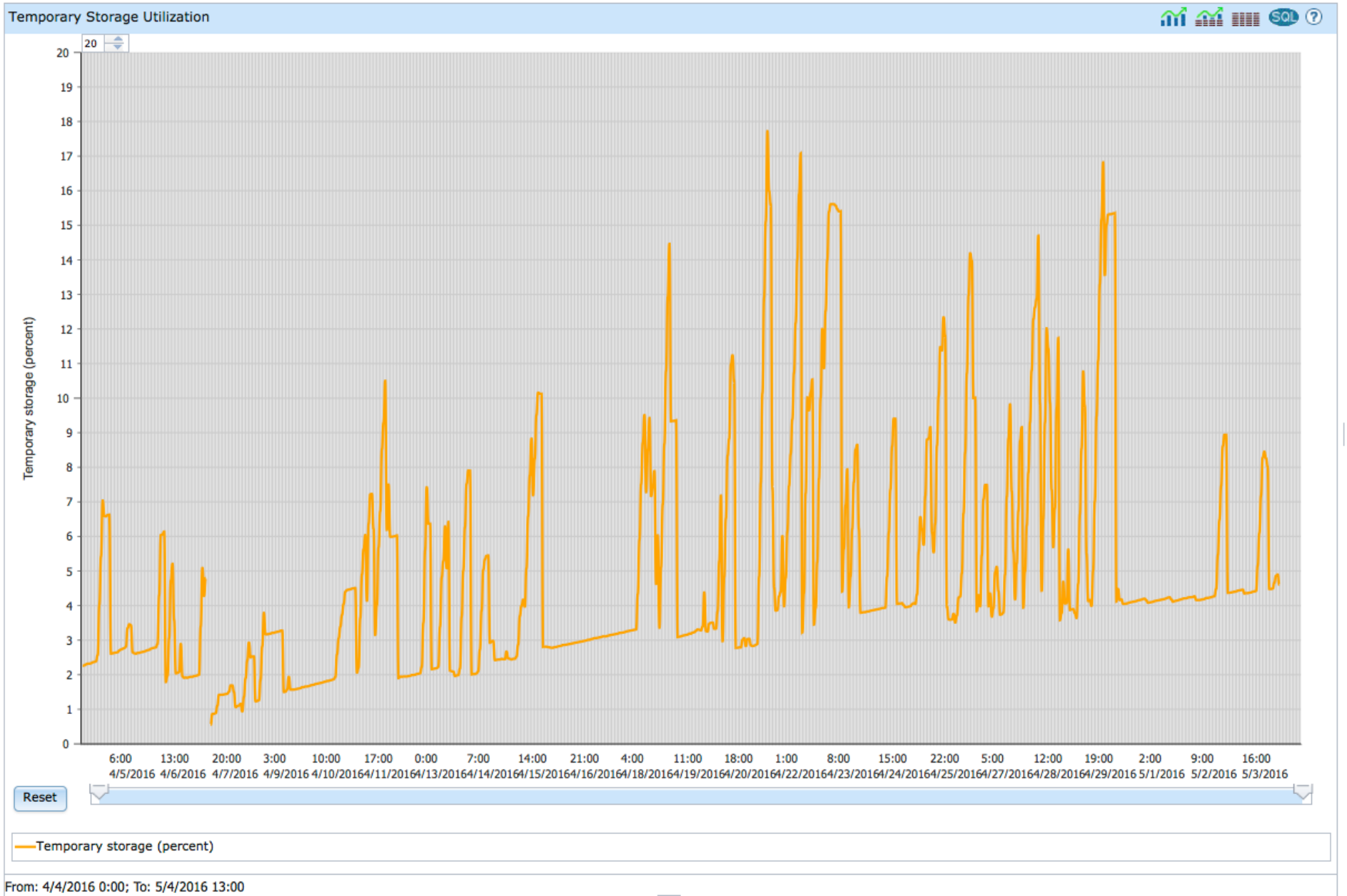


Reset

Configured CPU unscaled (percent)

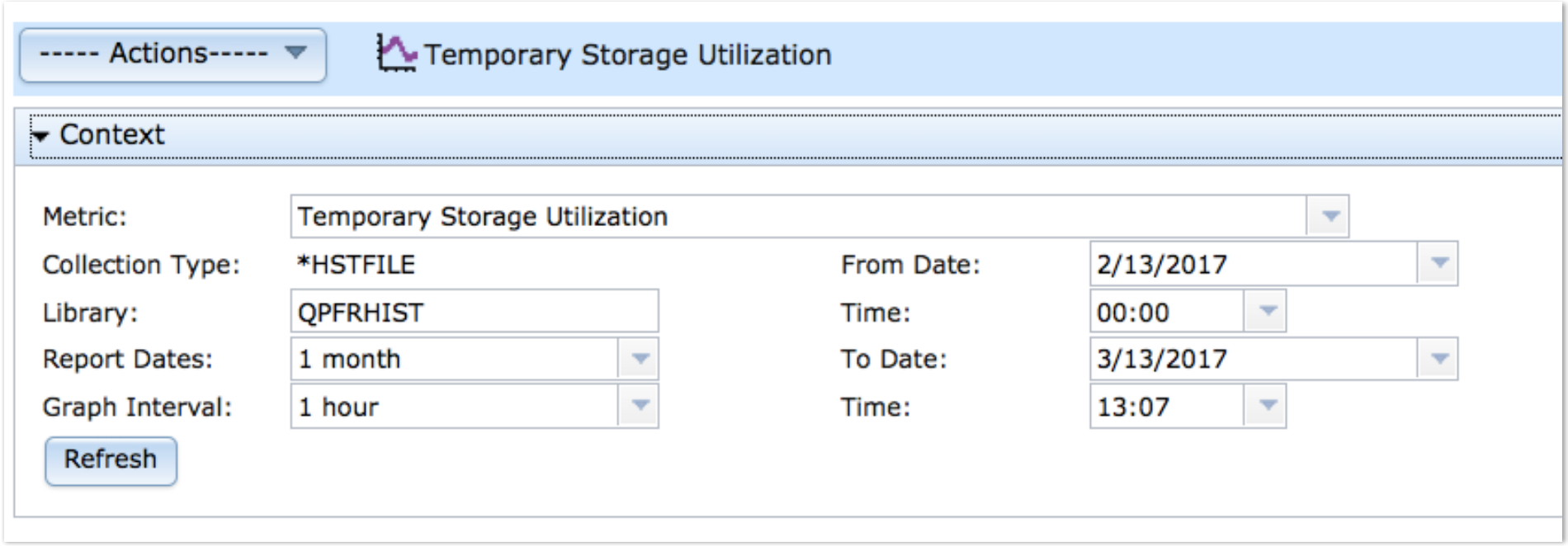
From: 4/4/2016 0:00; To: 5/4/2016 15:00

Temporary Storage for the past month

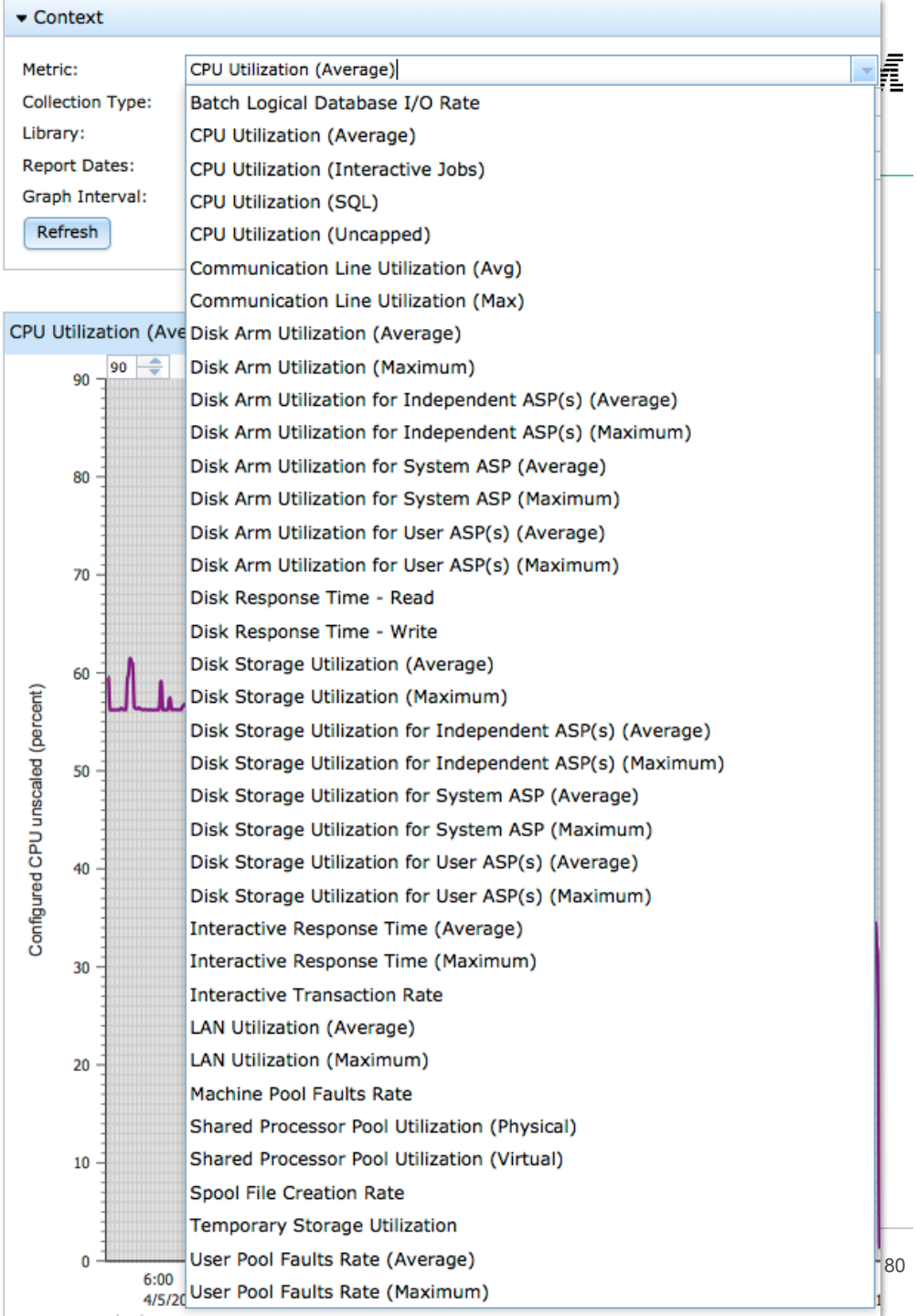


Context

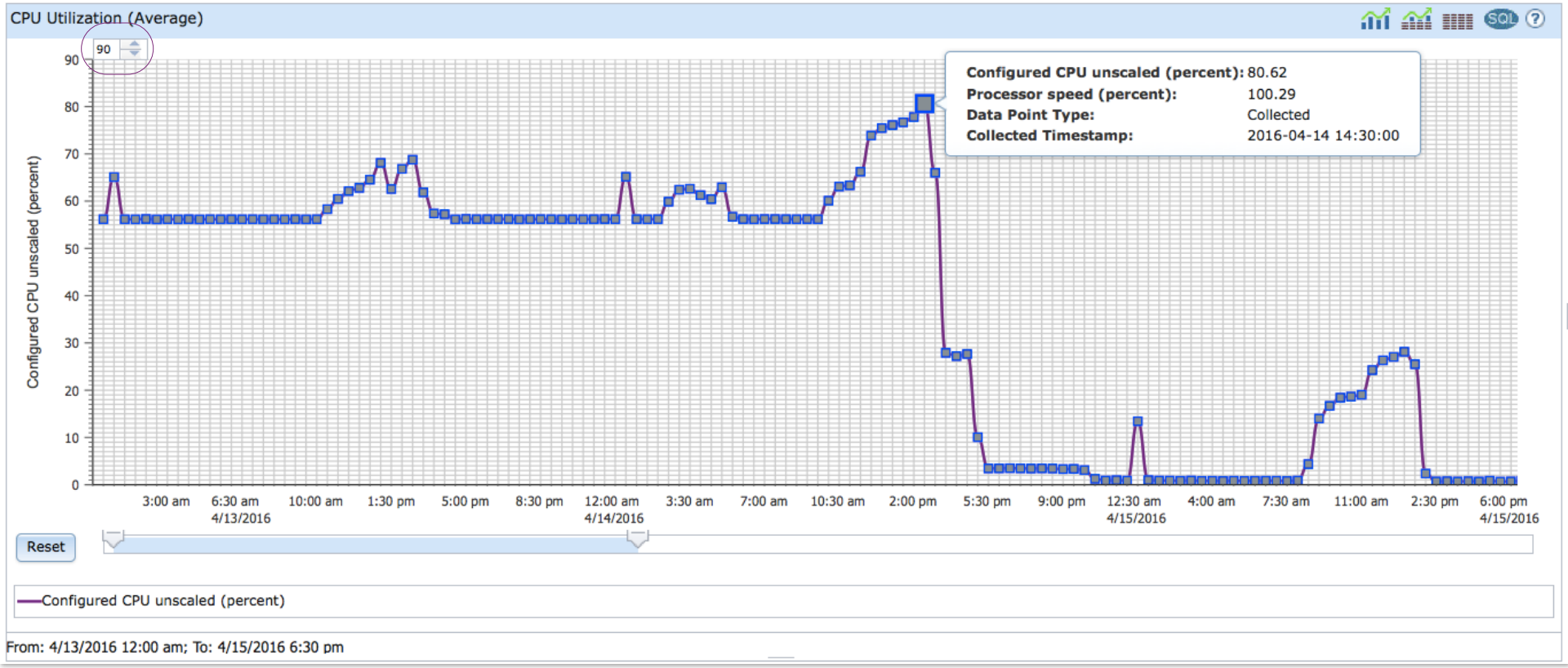
- Context is initially collapsed
- Expand it to select the metric and timeframe you wish to view



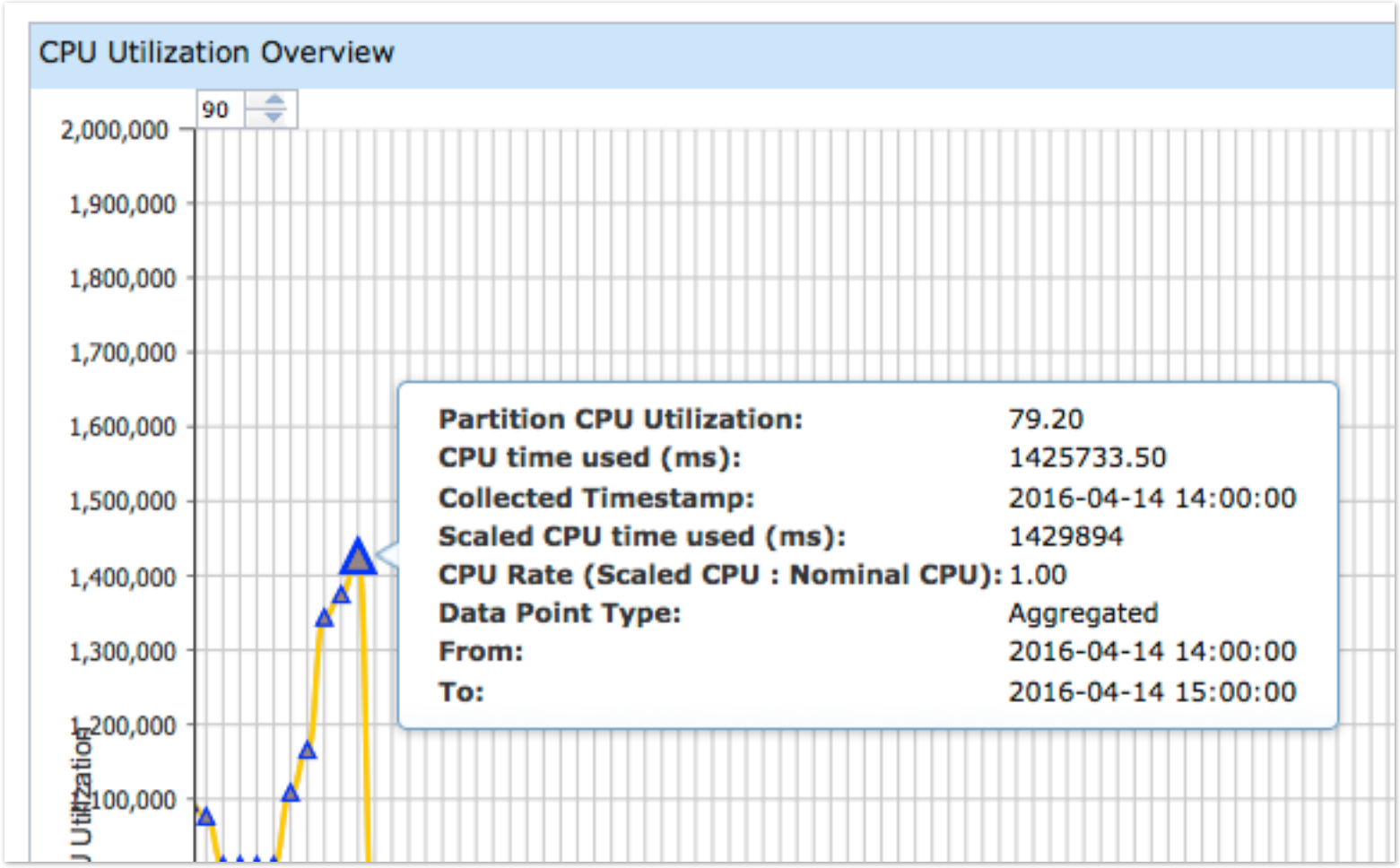
Metrics


Context
Metric:
CPU Utilization (Average)
Collection Type:
Library:
Report Dates:
Graph Interval:
Refresh
Batch Logical Database I/O Rate
CPU Utilization (Average)
CPU Utilization (Interactive Jobs)
CPU Utilization (SQL)
CPU Utilization (Uncapped)
Communication Line Utilization (Avg)
Communication Line Utilization (Max)
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)
CPU Utilization (Ave
90
Configured CPU unscaled (percent)
0
10
20
30
40
50
60
70
80
90
6:00
4/5/20

Zoom in for Details



Hover Over Data Points for more Information



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

Context

Metric: CPU Utilization (Average)

Collection Type: *HSTFILE

Library: QPFRHIST

Report Dates: 1 month

Graph Interval: 1 hour

From: 3/15/2016

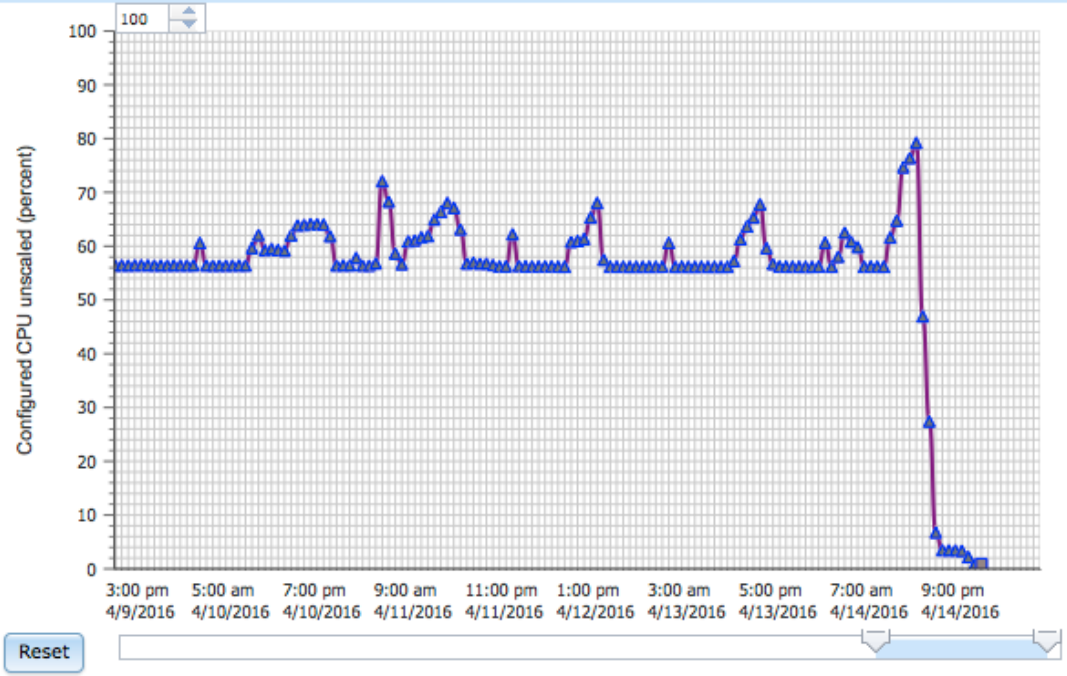
(HH:MM) 12:00 AM

To: 4/15/2016

(HH:MM) 9:26 AM

Refresh

CPU Utilization (Average)

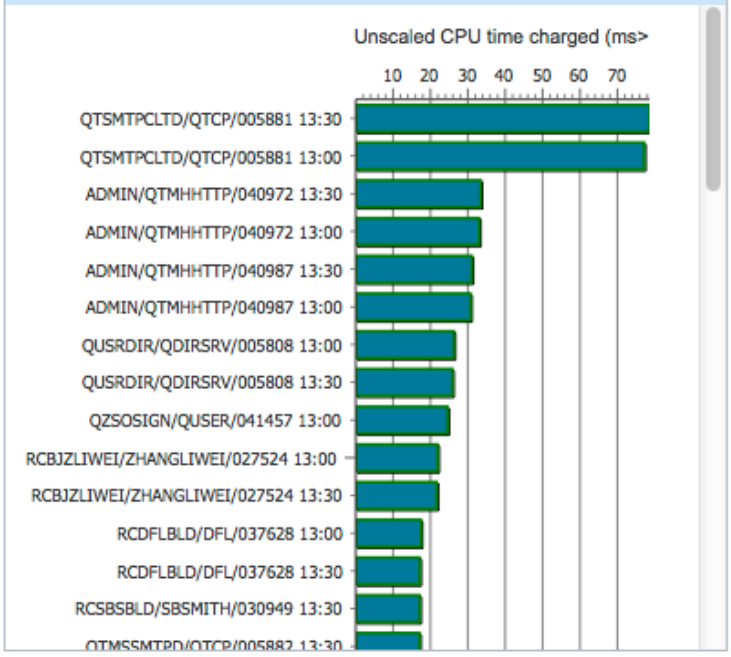


Reset

Configured CPU unscaled (percent)

From: 4/9/2016 11:00 am; To: 4/15/2016 10:00 am

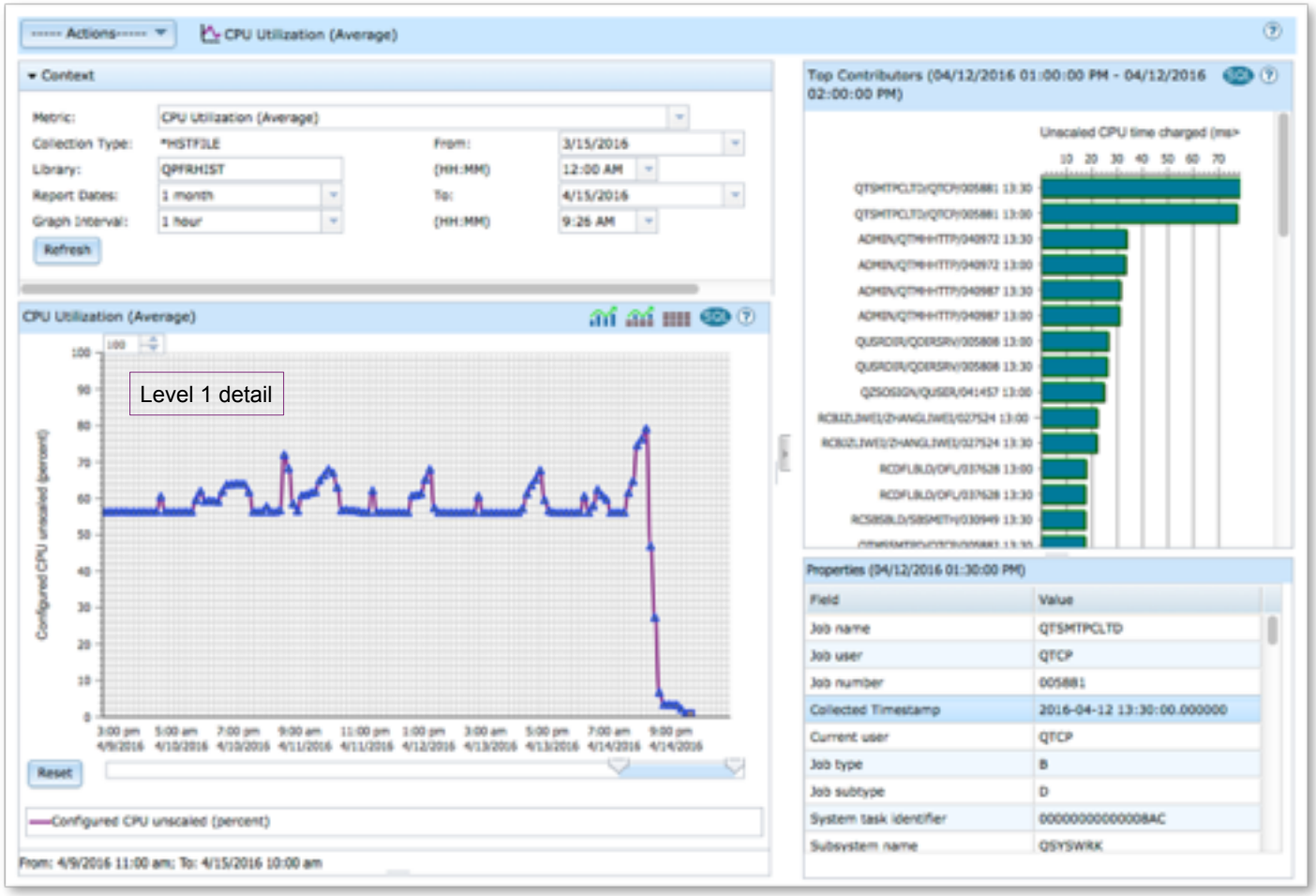
Top Contributors (04/12/2016 01:00:00 PM - 04/12/2016 02:00:00 PM)



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

Field	Value
Job name	QTSMTPCLTD
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

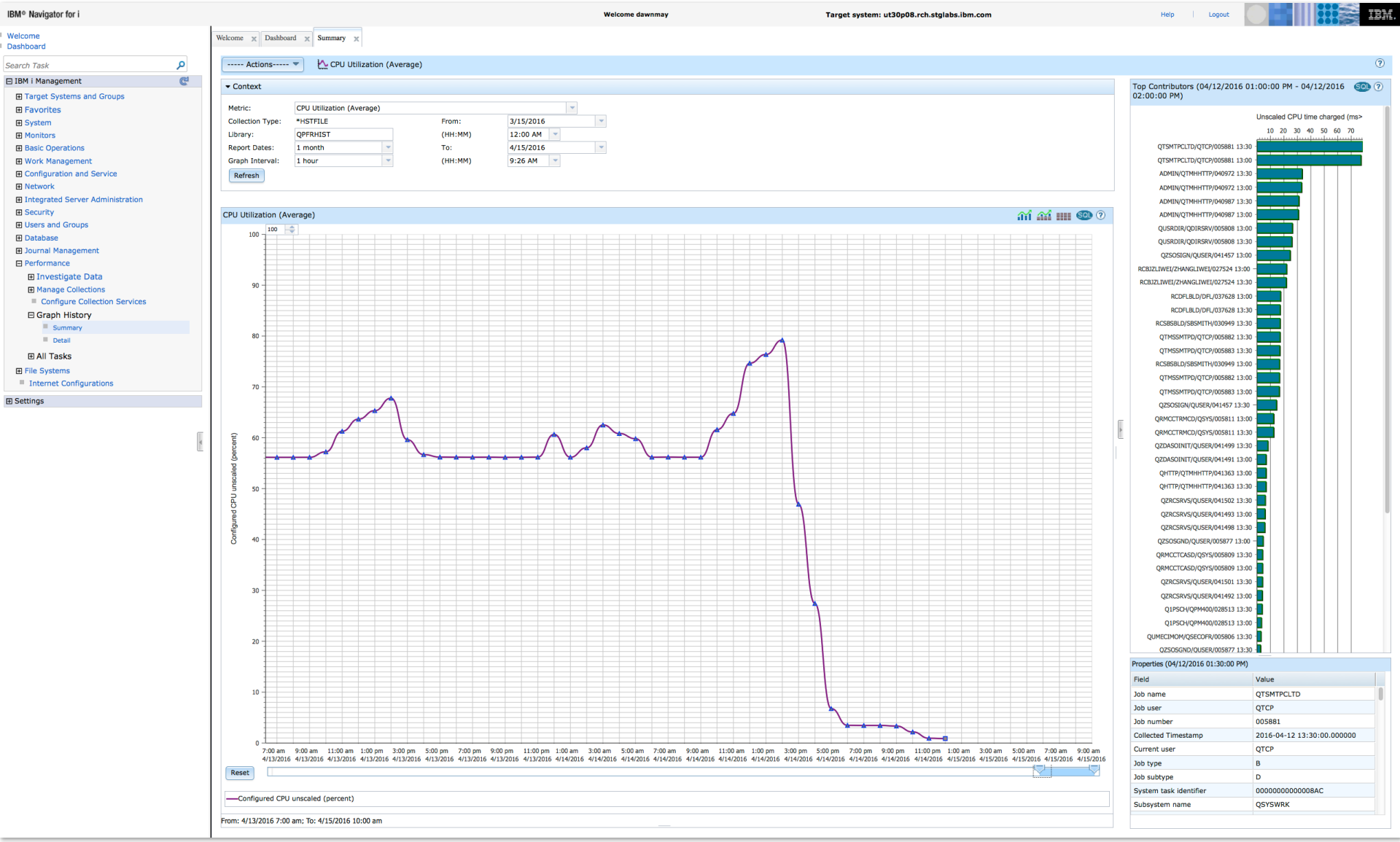


Level 2 detail
Top Contributors

Level 3 detail
Properties

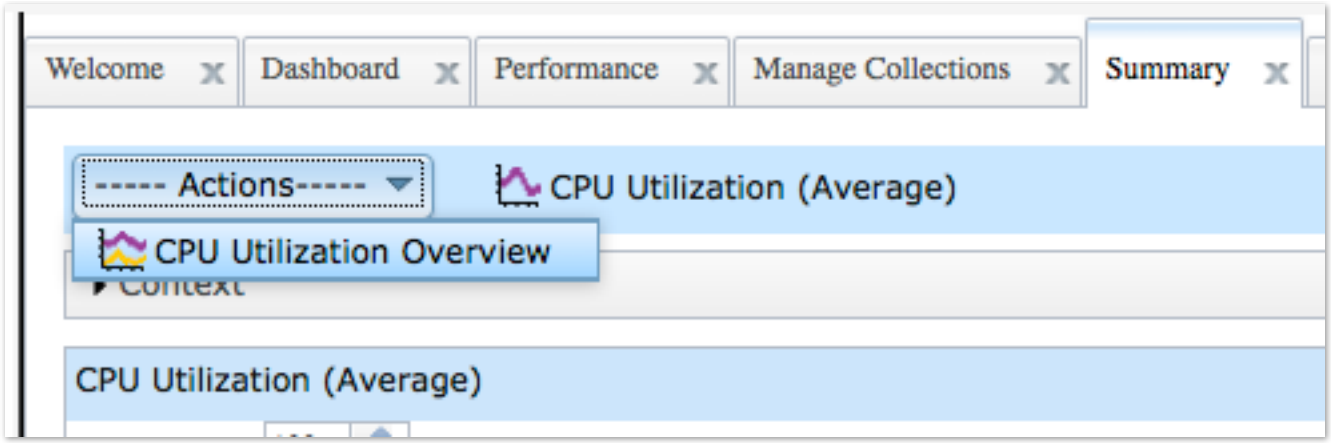
Slider allows customization of chart

If you have a large display…..

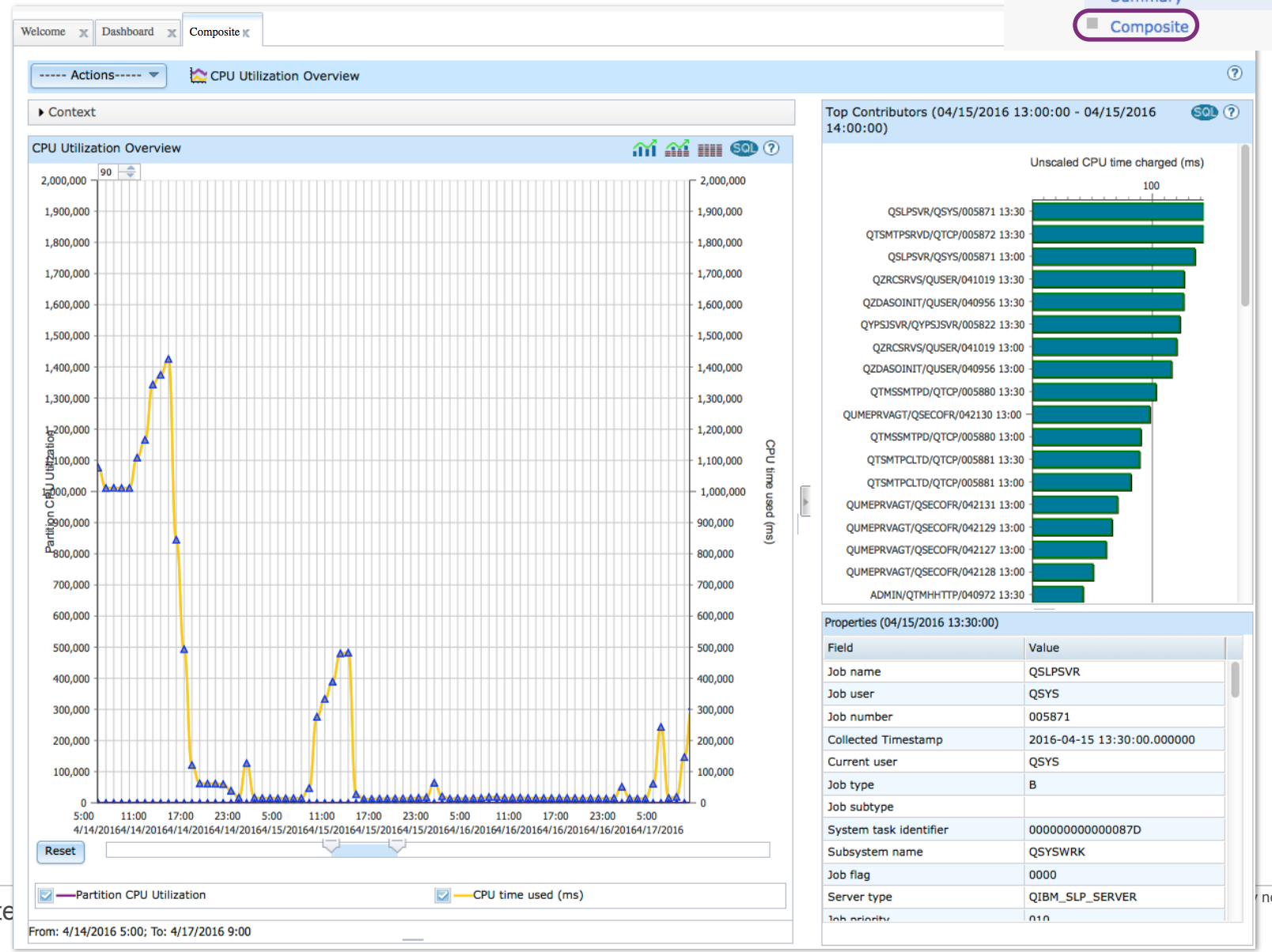


Actions

- 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

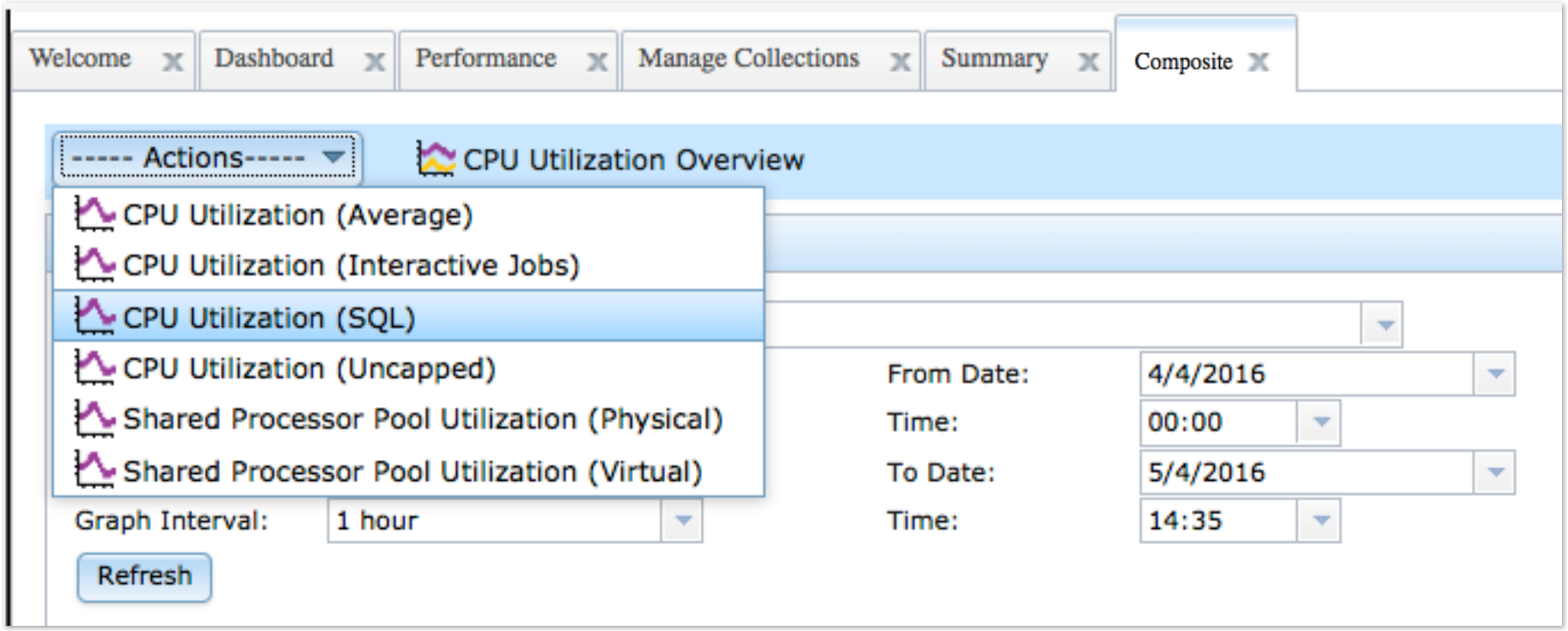


Historical Data - Composite

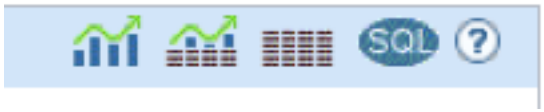


Historical Detail Data - Actions

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



Icons



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 tal
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

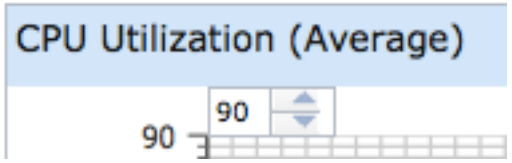
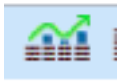
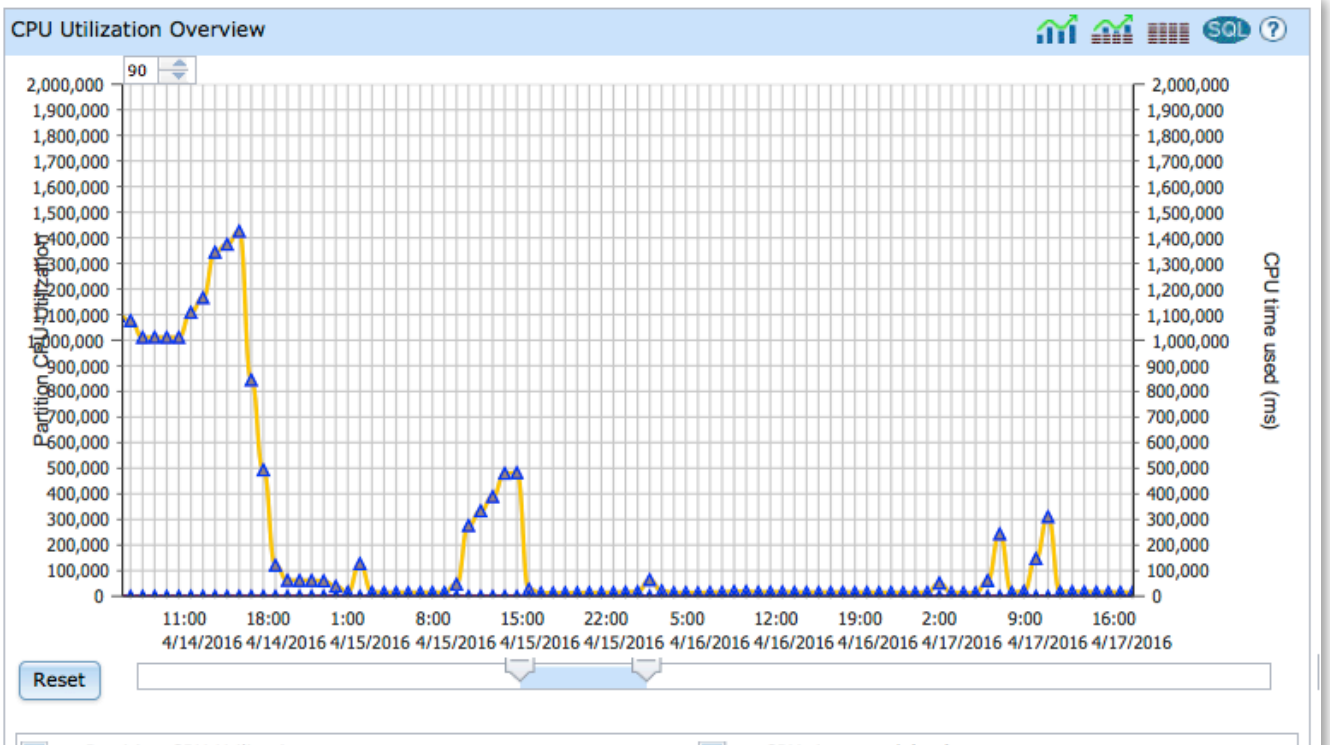


Chart and Table





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

Chart Date-Time	Collected Timestam	Scaled CPU time used (ms)	Total CPU time configure for the partition (ms)	Partition CPU Utilizatior	CPU time used (ms)	Partition Scaled CPU Utilizatior	CPU Rate (Scaled CPU : Nominal CPU)	Has Detail Data	Data Point Type	Shape	Border
2016-04-04 00:00:00	2016-04-0 00:00:00	1071053	1792486.5	59.59	1067927.5	59.76	1.00	Yes	Aggregate	Triangle	Blue
2016-04-04 01:00:00	2016-04-0 01:00:00	1014749	1800003.5	56.21	1011787.(	56.37	1.00	Yes	Aggregate	Triangle	Blue
2016-04-04 02:00:00	2016-04-0 02:00:00	1014881	1800002.(	56.21	1011918.5	56.38	1.00	Yes	Aggregate	Triangle	Blue
2016-04-04 03:00:00	2016-04-0 03:00:00	1014917	1799998.(	56.21	1011954.(	56.38	1.00	Yes	Aggregate	Triangle	Blue
2016-04-04 04:00:00	2016-04-0 04:00:00	1014786	1800002.(	56.21	1011824.5	56.37	1.00	Yes	Aggregate	Triangle	Blue
2016-04-04 05:00:00	2016-04-0 05:00:00	1014706	1800000.(	56.20	1011744.5	56.37	1.00	Yes	Aggregate	Triangle	Blue

SQL

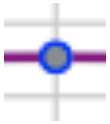
SQL Statement

```
/** 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(SYSPTU / DOUBLE (SYSCTA) * 100) AS COLPCTCPU,
             AVG(SYSPTU) 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

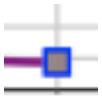
7.3

Understanding the data points



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

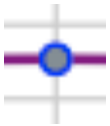
SQUARE and TRIANGLE both represent data collection points that have historical **detail data** available.
Click on these to see the Top Contributors data for that interval. The top contributors chart will appear in the upper right hand pane of the Graph History window.



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

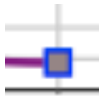
TRIANGLE represents an aggregated** data point.

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 the 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 a aggregated** data point.

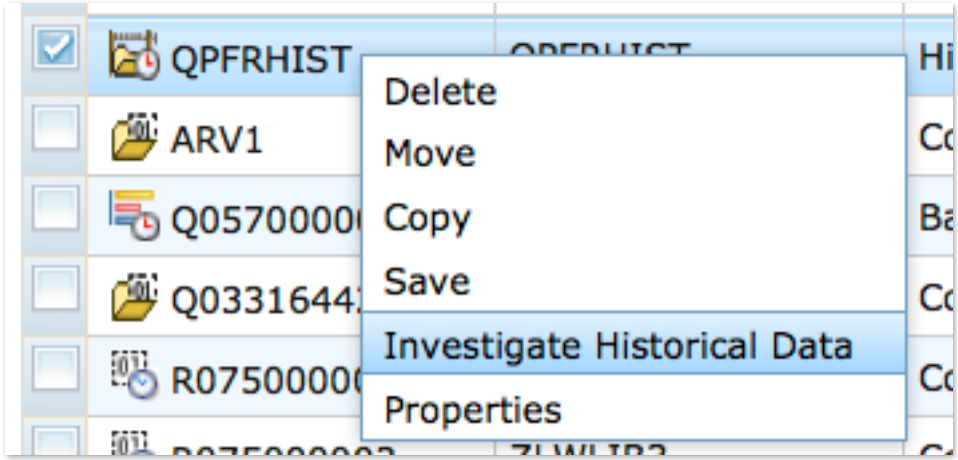
*Collected means that the value charted was taken from a historical database file.

**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.

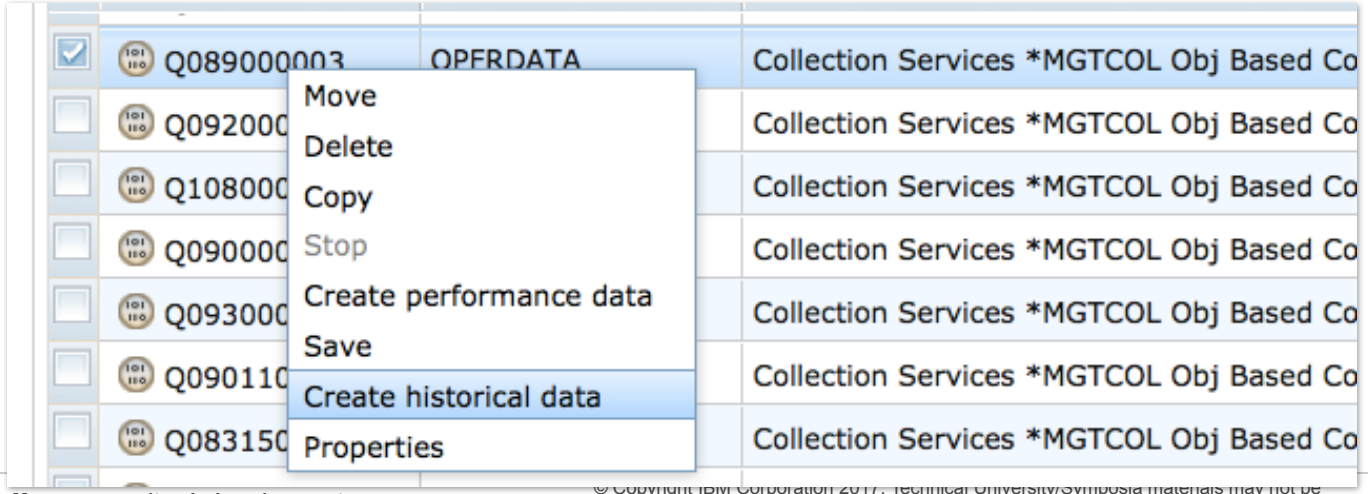
***Extended means that the value charted for that time interval is not available in the historical database file, so the data point is extended from the next earlier interval value.
For example, if data is collected at 30 minute intervals and the chart is showing 5 minute graph intervals, the data points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

Historical Data in Collection Manager

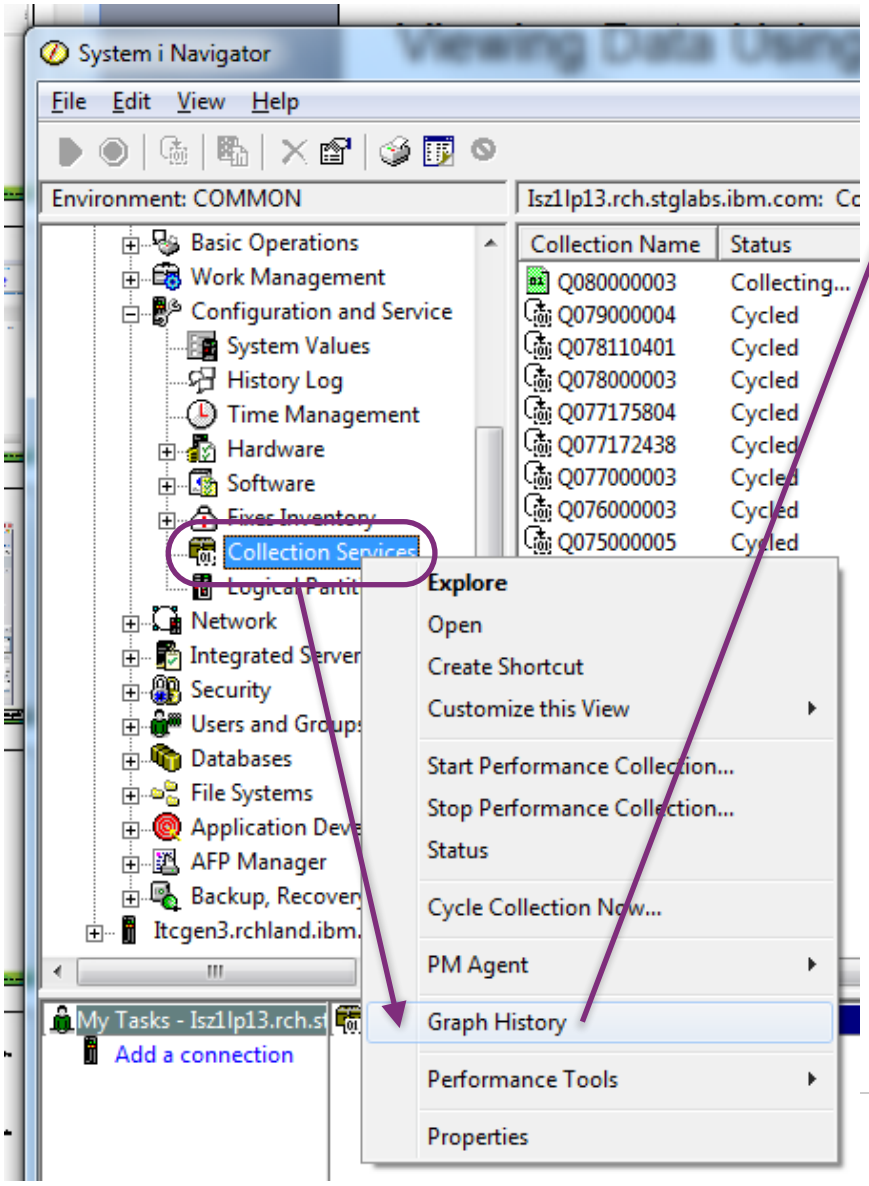
Historical data is stored in library QPFRHIST

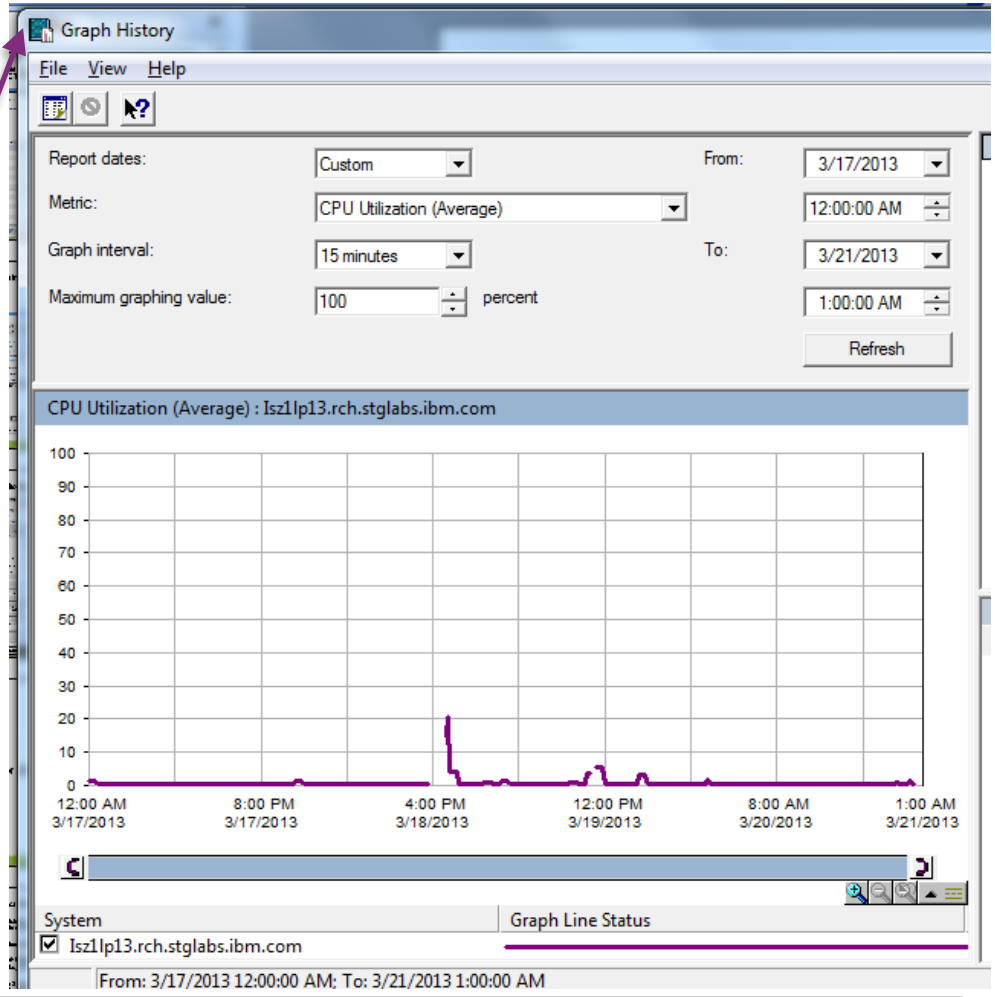


To see the historical data collection, view all collections via "Manage Collections"



Viewing Historical Data - 7.1 and 7.2





Batch Model

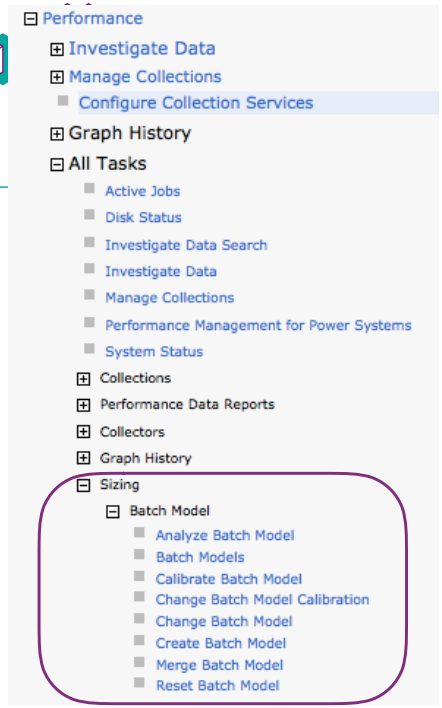
Predict application impacts to hardware changes

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



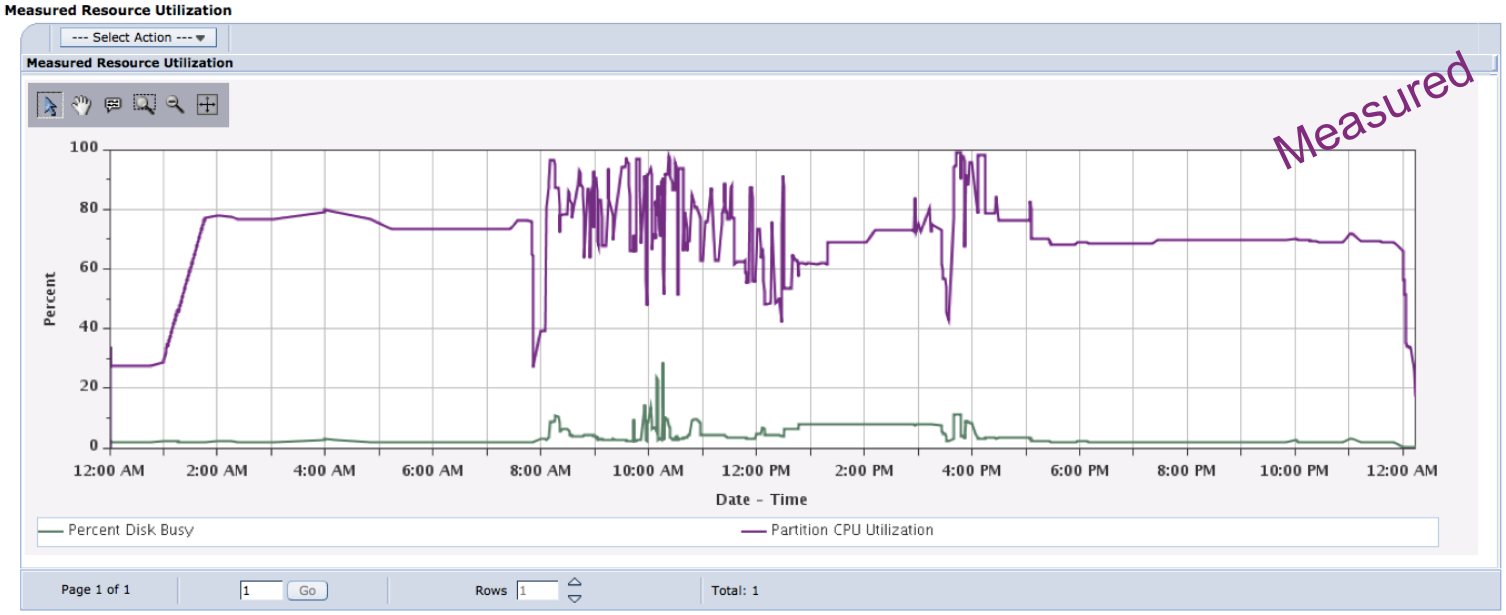
Batch Model functions and content package require the installation of IBM Performance Tools for i (5770-PT1) Option 1 - Manager Feature

Batch Model Functions

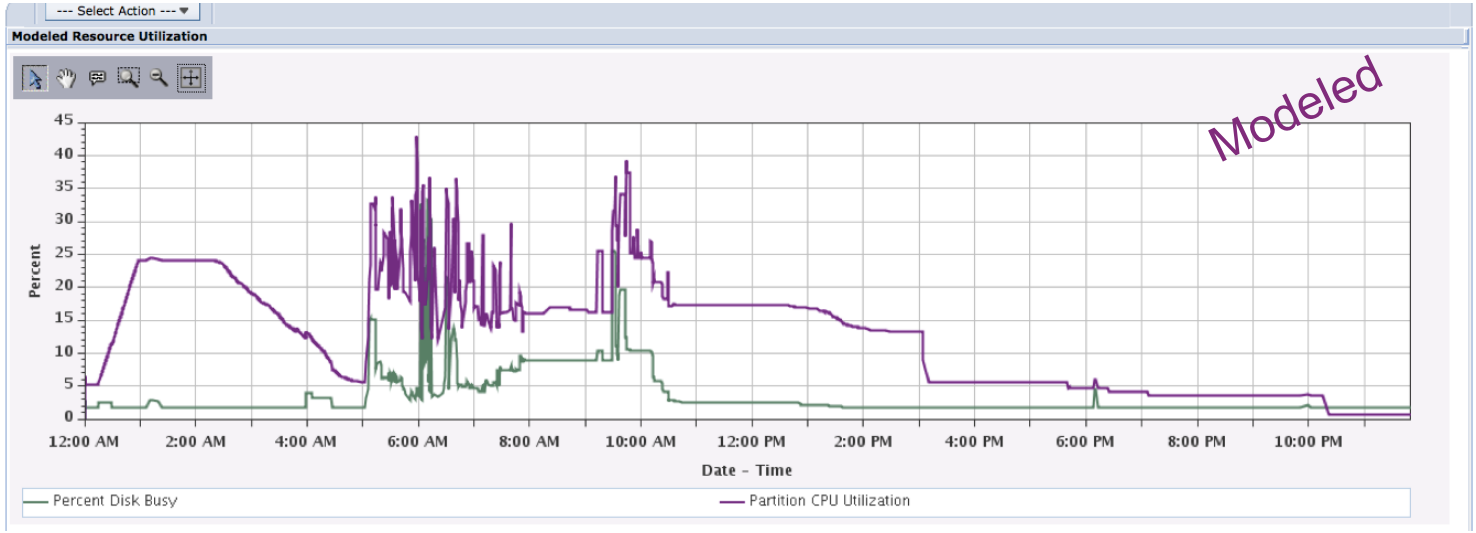
- **Create Batch Model** – Create a model from Collection Services data
- **Change Batch Model Calibration** – Adjust workload characteristics and disk configuration for a more accurate model
- **Calibrate Batch Model** – Re-create the model results after making changes to the calibration
- **Change 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



i570 9406
4 PPs and 4 VPs



E880
8 PPs and 8 VPs

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

Filter on page

Page 1 of 1 Jump to page: 1 Total: 185

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.

- DSPJOBTBL will show you how many jobs are in the system

- And now have another way…..

Special "Thanks" to Scott Forstie for creating the SQL statement

IBM

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

- 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

ithankyou

www.ibm.com/power/i

Knowledge Center

- IBM i Knowledge Center

  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

developerWorks

- developerWorks

IBM

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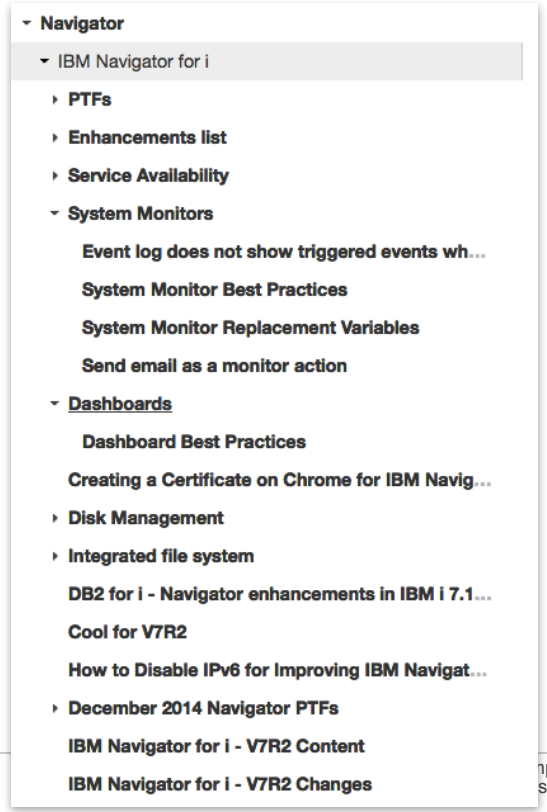
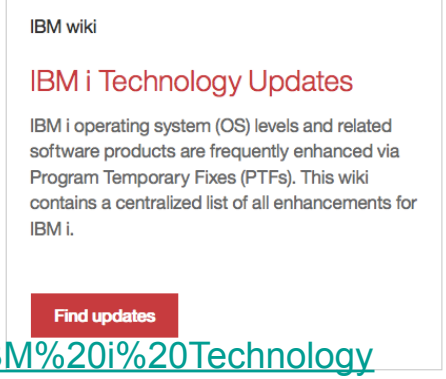
IBM i

Technical resources for IBM i developers and users

- Navigator for i on developerWorks



developerWorks Articles
https://www.ibm.com/developerworks/develop/ibmi/



- 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

QINAVMNSRV Daemon Job

- 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

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