Introduction to the IBM i Performance Data Investigator

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IBM

Session Abstract

This session will review the Performance Data Investigator. It will cover where you find it, prerequisites you need to use it, and the basics on how you use it. The presentation will also show some simple examples of the types of charts you can find within this easy-to-use performance tool.

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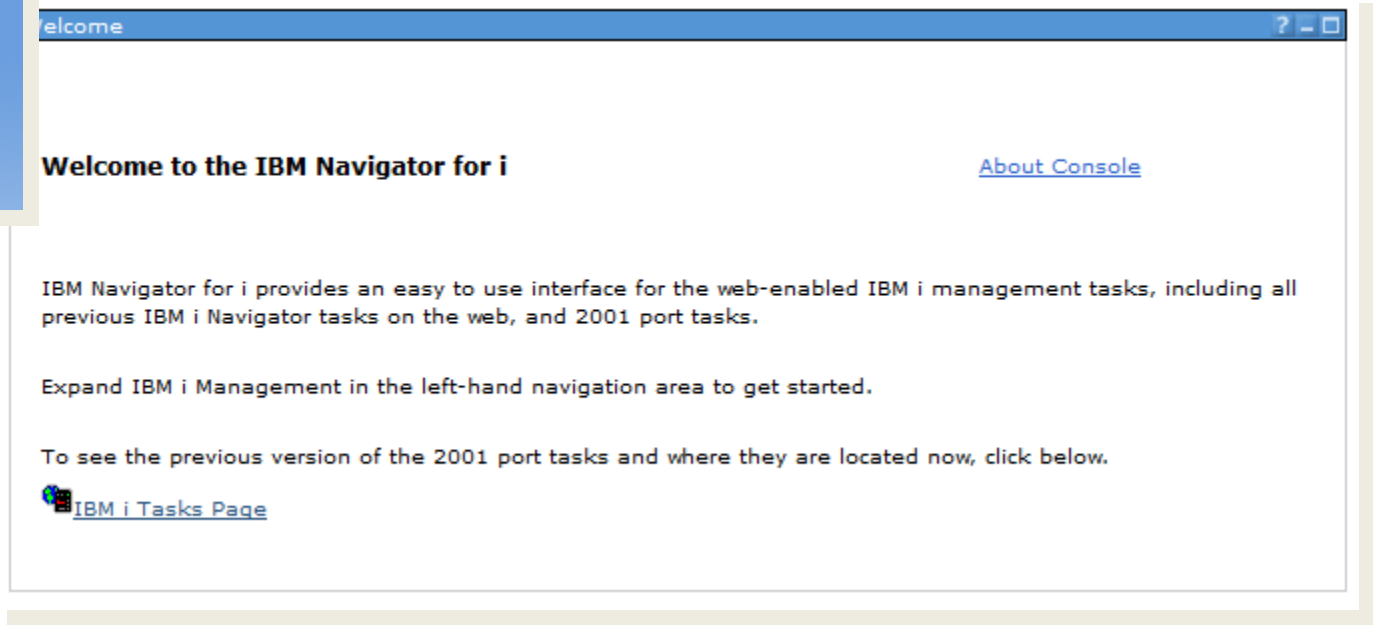
IBM Navigator for i

- IBM Navigator for i is the Web console for managing IBM i
  - Has much of the function as System i Navigator
    - but with a browser user interface
  - Simply point your browser to http://systemname:2001



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Updates to the Performance Data Investigator - PTFs

- Major enhancements have been made to Navigator for i and the Performance Data Investigator

  - For 7.1 - install the latest level of:
    - HTTP Server group PTF SF99368
    - Java group – PTF SF99572
    - Database group PTF SF99701
    - Performance Tools group PTF SF99145

  - For 6.1 - install the latest level of:
    - HTTP Server group PTF SF99115
    - Java group – PTF SF99562
    - Database group PTF SF99601
    - Performance Tools group PTF SF99114

http://ibmsystemsmag.blogs.com/i_can/2009/10/i-can-investigate-performance-data.html

http://ibmsystemsmag.blogs.com/i_can/2011/05/new-systems-director-navigator-service-packs.html

http://ibmsystemsmag.blogs.com/i_can/2012/10/performance-data-investigatorbetter-than-ever.html

http://ibmsystemsmag.blogs.com/i_can/2013/03/navigator-for-i-enhancements.html

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Browser Support

- Supported Browsers for the latest Navigator enhancements:
  - Internet Explorer 9
  - FireFox 10 ESR

- Browser tips:
  - Unexpected results could be browser related. Example problems are….
    - Hung charts
    - Empty tables

- Clear your browser cache after installing the PTFs
- Review your browser security settings

- For details see the following web page:
  https://www.ibm.com/developerworks/mydeveloperworks/wikis/home?lang=en#/wiki/IBM%20i%20Technology%20Updates/page/Browser%20Tips

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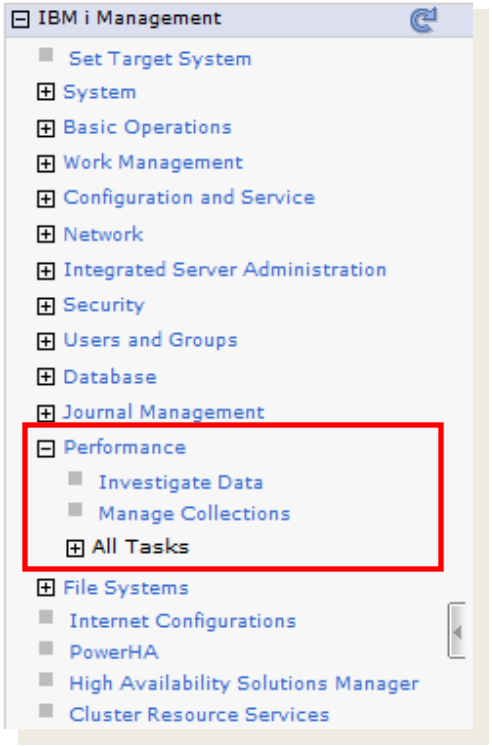
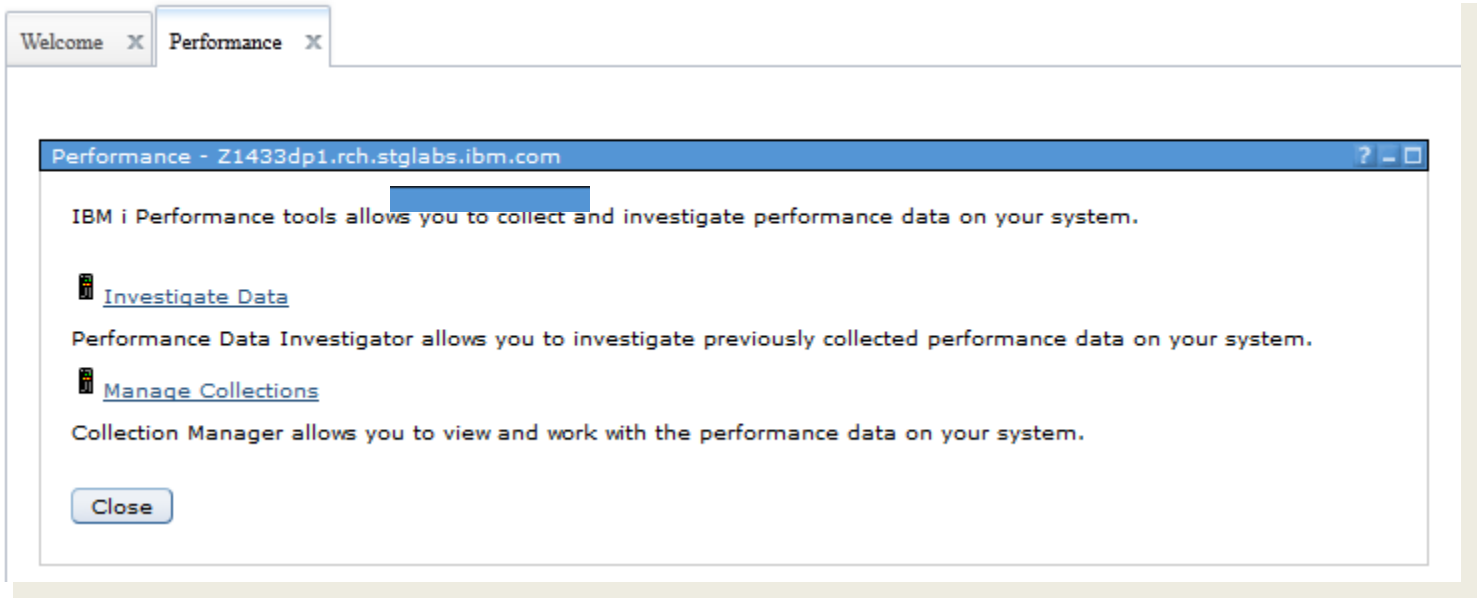
Performance Tasks

- "Performance" is a major function in Navigator for i
  - Investigate Data
  - Manage Collections





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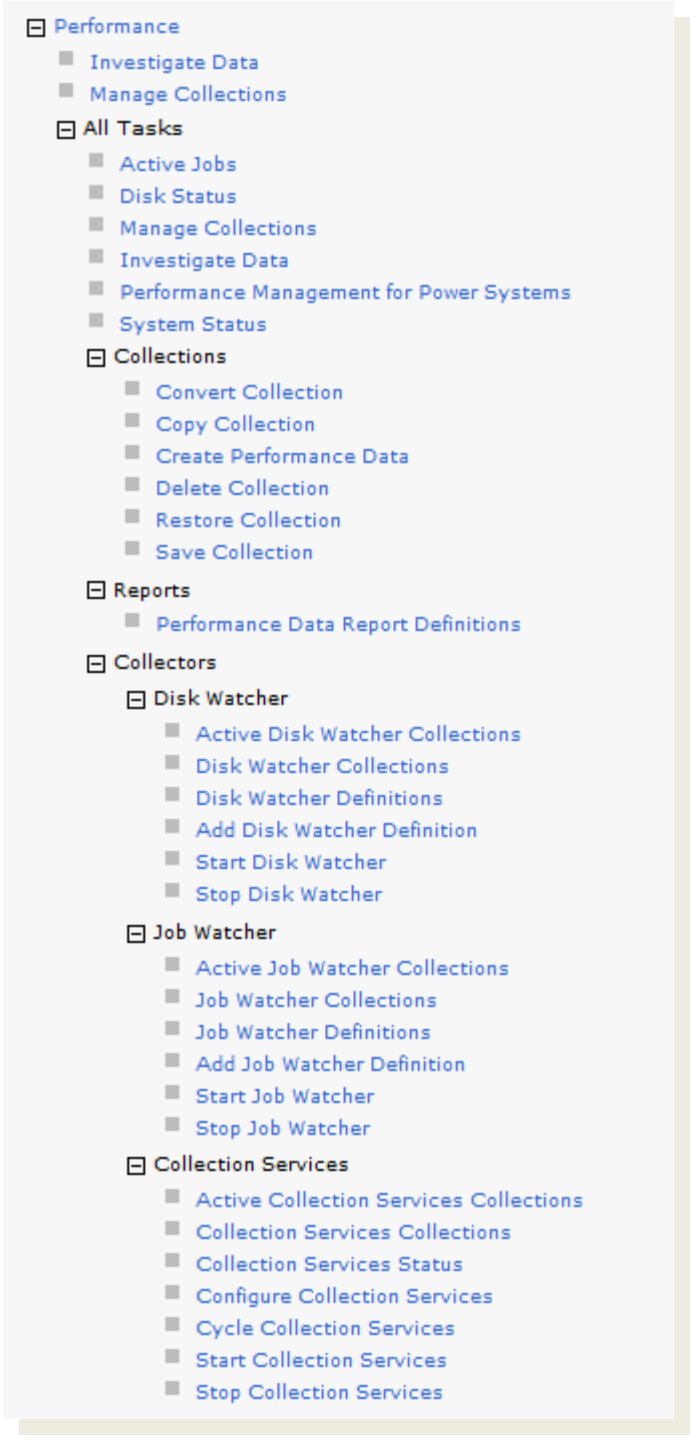
Performance Tasks

- All Performance Tasks
  - Active Jobs
  - Disk Status
  - System Status
  - Collections
  - Reports
  - Define, start, stop and manage performance data collectors
    - Collection Services
    - Disk Watcher
    - Job Watcher



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Prerequisites

- IBM i for Collection Services, Health Indicators
- Performance Tools Licensed Program Product
  - 5761PT1 for 6.1
  - 5770PT1 for 7.1
    - **Performance Tools - Manager Feature**
      - Disk Watcher, Performance Explorer, Database
    - Performance Tools - Agent Feature
    - **Performance Tools -** Job Watcher

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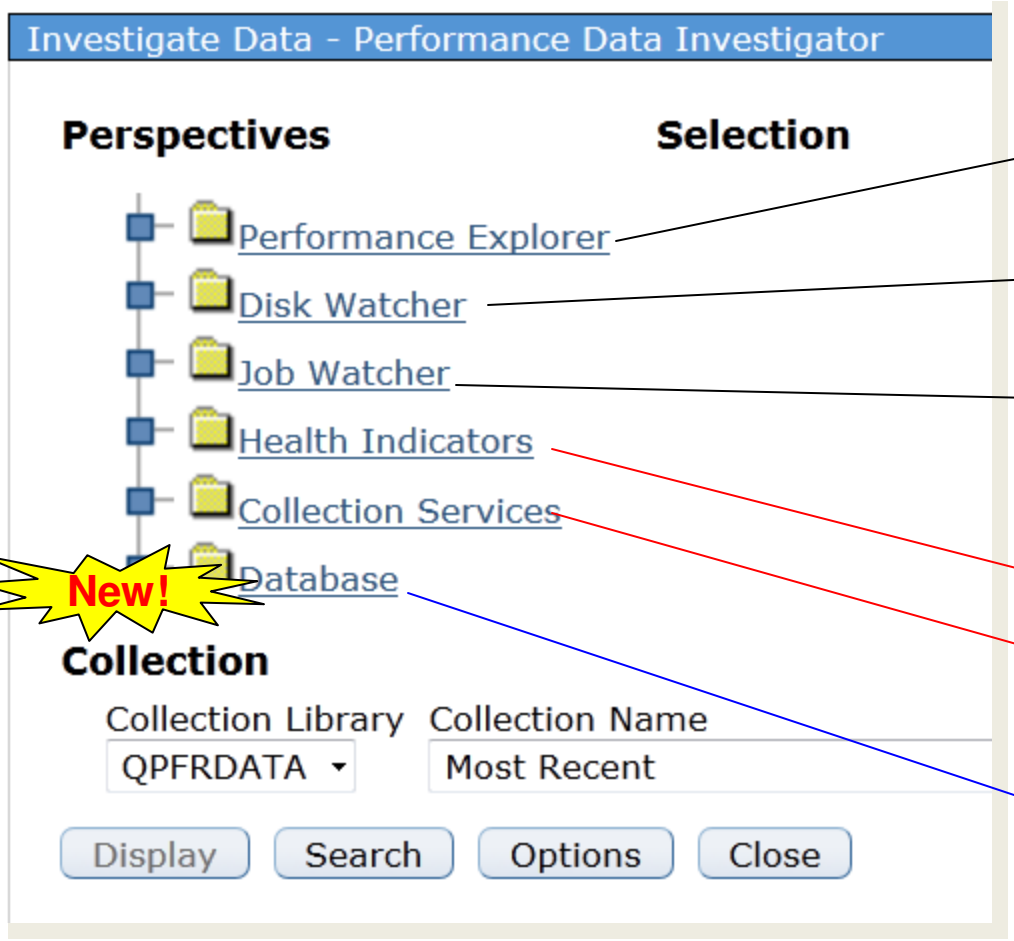
Prerequisites:
Performance Tools Licensed Program Product



IBM Performance Tools – Manager feature

IBM Performance Tools – Manager feature

IBM Performance Tools – Job Watcher feature

IBM i 6.1 or later – Included with the base operating system

IBM Performance Tools – Manager feature and latest PTFs

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Prerequisites: Authorizing Users to PDI

- Users need to be authorized to use the investigate data and collection manager performance tasks
- Include users on the QPMCCDATA authorization list

```
                          Edit Authorization List

Object . . . . . :   QPMCCDATA       Owner  . . . . . :   QSYS
  Library  . . . . :     QSYS         Primary group  . . :   *NONE

Type changes to current authorities, press Enter.

             Object    List
User        Authority  Mgt
*PUBLIC     *EXCLUDE
QSYS        *ALL        X
PDI01       *USE
PDI02       *USE
PDI03       *USE
PDI04       *USE
PDI05       *USE
PDI06       *USE
PDI07       *USE
PDI08       *USE
PDI09       *USE
                                                                More...
```


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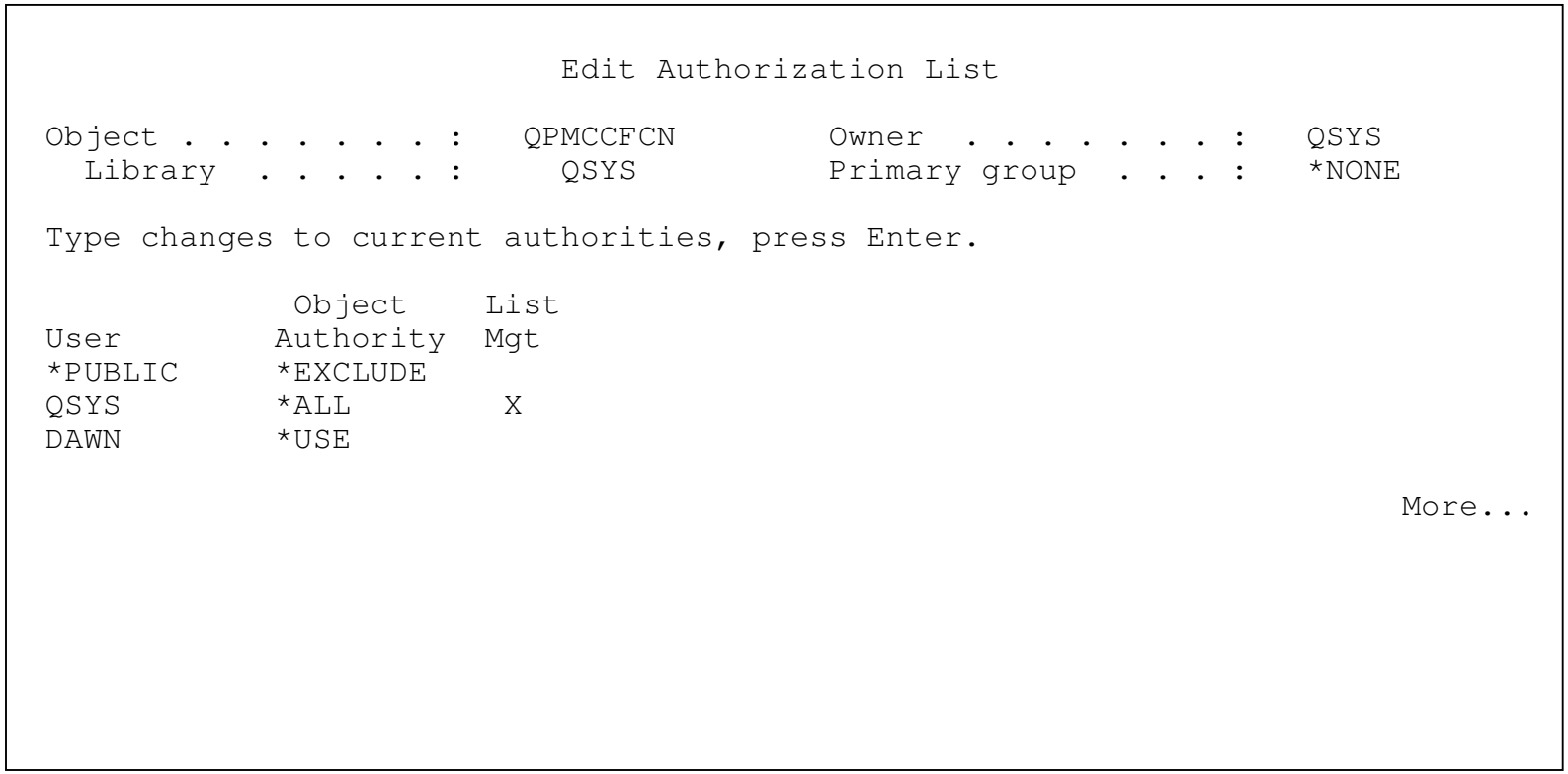
Prerequisites:
Authorizing Users to the Collector Commands

- The collector commands (xxxPFRCOL) are shipped with *PUBLIC *EXCLUDE
- QPMCCFCN authorization list can be used to grant authority to all the collector commands



```
                          Edit Authorization List

Object . . . . . :   QPMCCFCN        Owner  . . . . . :   QSYS
  Library  . . . . :     QSYS          Primary group  . . . :   *NONE

Type changes to current authorities, press Enter.

             Object    List
User        Authority  Mgt
*PUBLIC     *EXCLUDE
QSYS        *ALL        X
DAWN        *USE

                                                                  More...
```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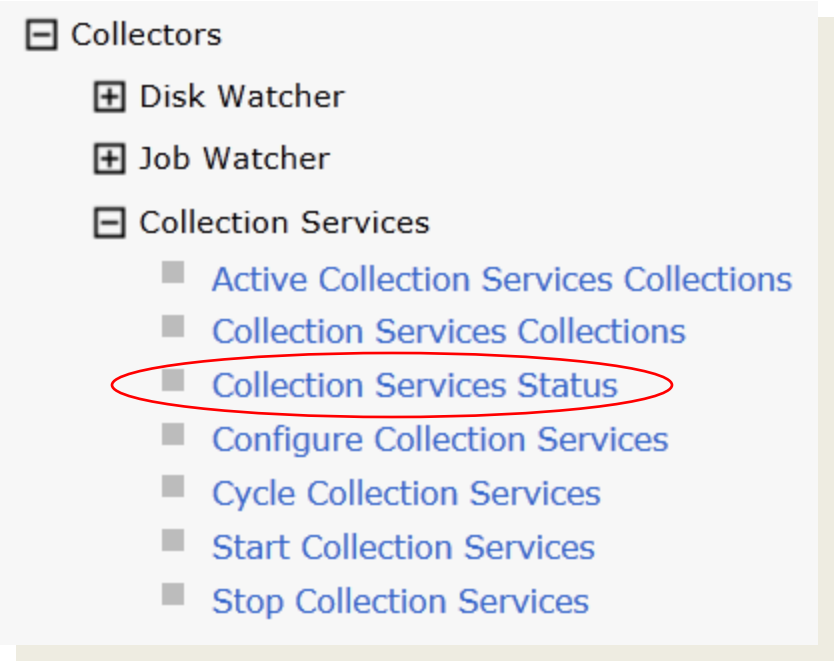
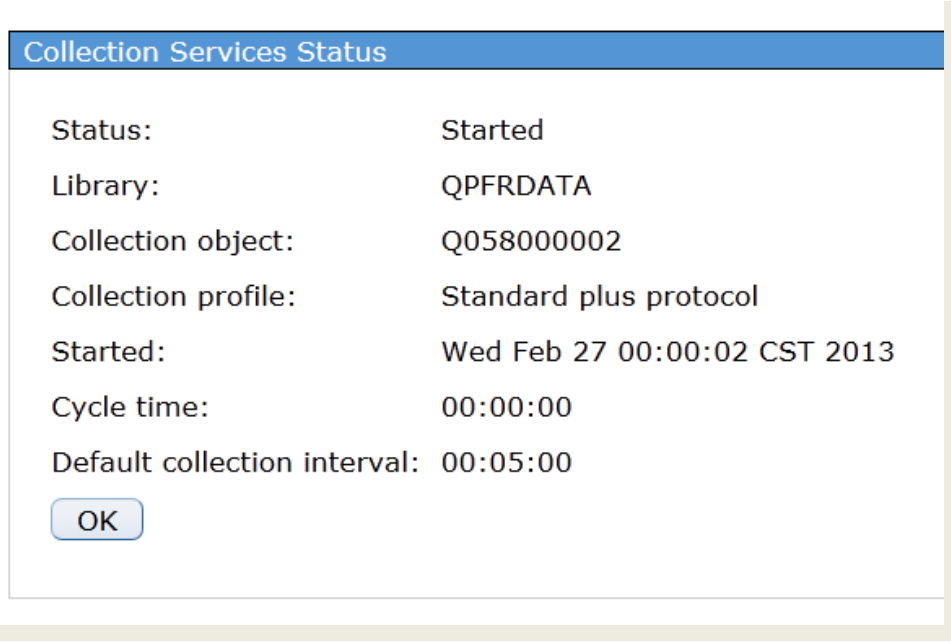
Verify Collection Services is Active

- Collection Services is the foundation for many performance tasks
  - Make sure Collection Services is active
    - Started by default with 6.1 and later





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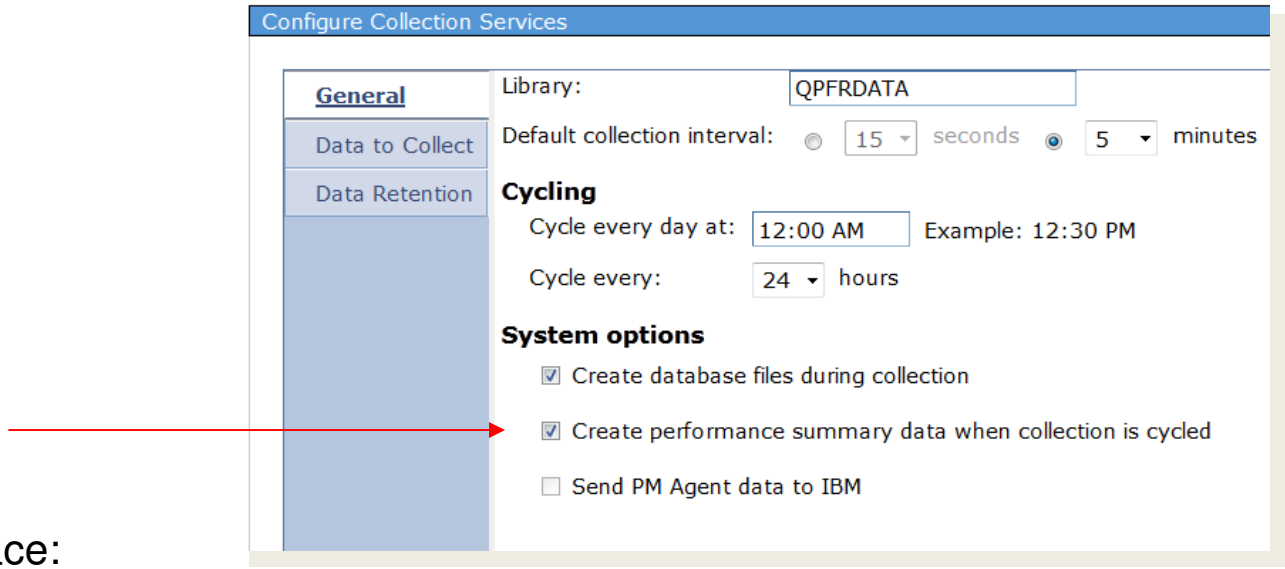
Performance Summary Data

- **Performance summary data may help the performance of PDI**
  - Underlying queries may run faster with performance summary data
  - Graphical interface
    - Check the “Create performance summary data...” option within Configure Collection Services



Command interface:

Change the “Create Performance Summary” option for the performance collection

`CFGPFRCOL` command - `CRTPFRSUM(*YES)`

Or use the Create Performance Summary command - `CRTPFRSUM`

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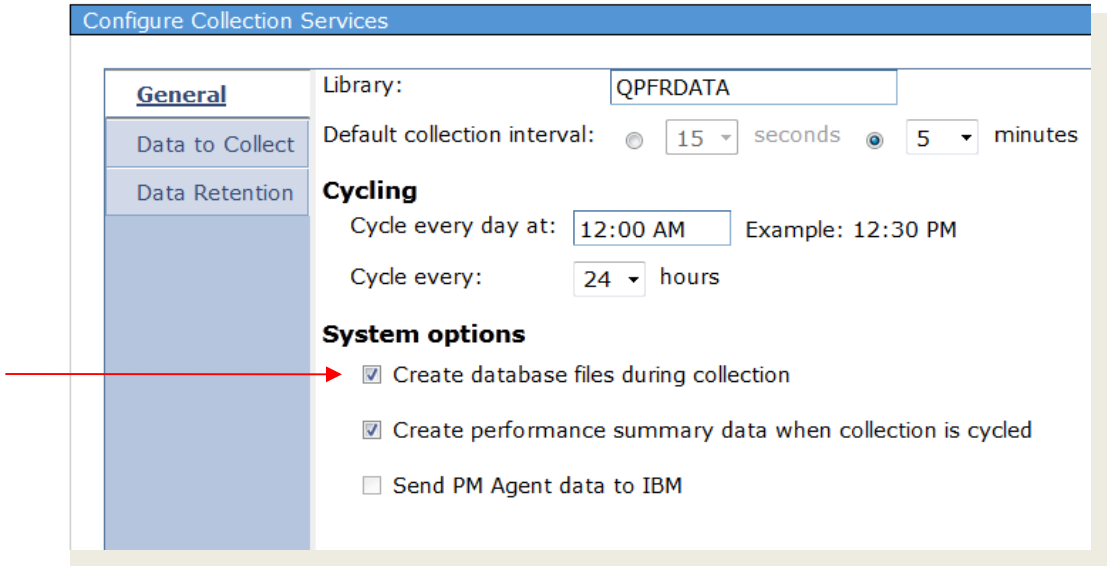
Prerequisites – Create Database Files During Collection

- **PDI requires data in the Collection Services DB2 files**
  - Beginning with 6.1, the default is to create the database files during performance data collection
  - If you have turned this off, you will not be able to view performance data with PDI until the data is created in the files
  - Recommended to leave this setting at the default



Command interface:

The “Create Database files” option for the performance collection should be *YES

`CFGPFRCOL` command - `CRTDBF(*YES)`

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Tips for Best Performance (of your Performance tasks)

- **Good system tuning practices are essential**
  - CPU
  - Memory
  - Disk

Power5	Single User	Multiple Users
CPU	.5 processors uncapped	2 processors uncapped
Memory	2 GB in *BASE	6-8 GB in *BASE
Disk Arms	3	6

- Navigator tasks run primarily in the ADMIN2 job in the QHTTPSVR subsystem
- Ensure no bad DNS entries on the system
  - http://www-912.ibm.com/s_dir/slkbase.nsf/1ac66549a21402188625680b0002037e/b9e677063f24f859862575ee006b1881
- Use Application Runtime Expert to validate your environment
  - http://www.ibm.com/developerworks/ibmi/library/i-applicationruntime/index.html
  - **Network health checker** can be run from QShell: /QIBM/ProdData/OS/OSGi/templates/bin/areVerify.sh –network http://ibmsystemsmag.blogs.com/i_can/2013/09/application-runtime-expert-network-health-checker.html
- Use the Web Performance Advisor to validate your Web Performance
  - http://pic.dhe.ibm.com/infocenter/iseries/v7r1m0/topic/rzaie/rzaieconwebperfadvisor.htm
- PDI makes extensive use of SQL to gather data for charts and tables

Terminology

Collection Services is the mechanism used to gather performance data with little or no observable impact on the system performance. It allows you to control what data is collected and how that data is used.

Collection services data was generally analyzed by the Performance Tools LPP and Management Central Monitors in prior releases.

Collection Services data is available for performance analysis through the Web user interface and is the data used for initial analysis.

Standard Data is data from Collection Services which is normally collected on a 24 x 7 basis.

Wait Accounting is the technology used to collect wait time statistics.

Wait points throughout the system are identified and categorized into groups, or 'buckets'. These wait statistics can then be analyzed to determine what a thread was doing when it was running as well as when it was not running.

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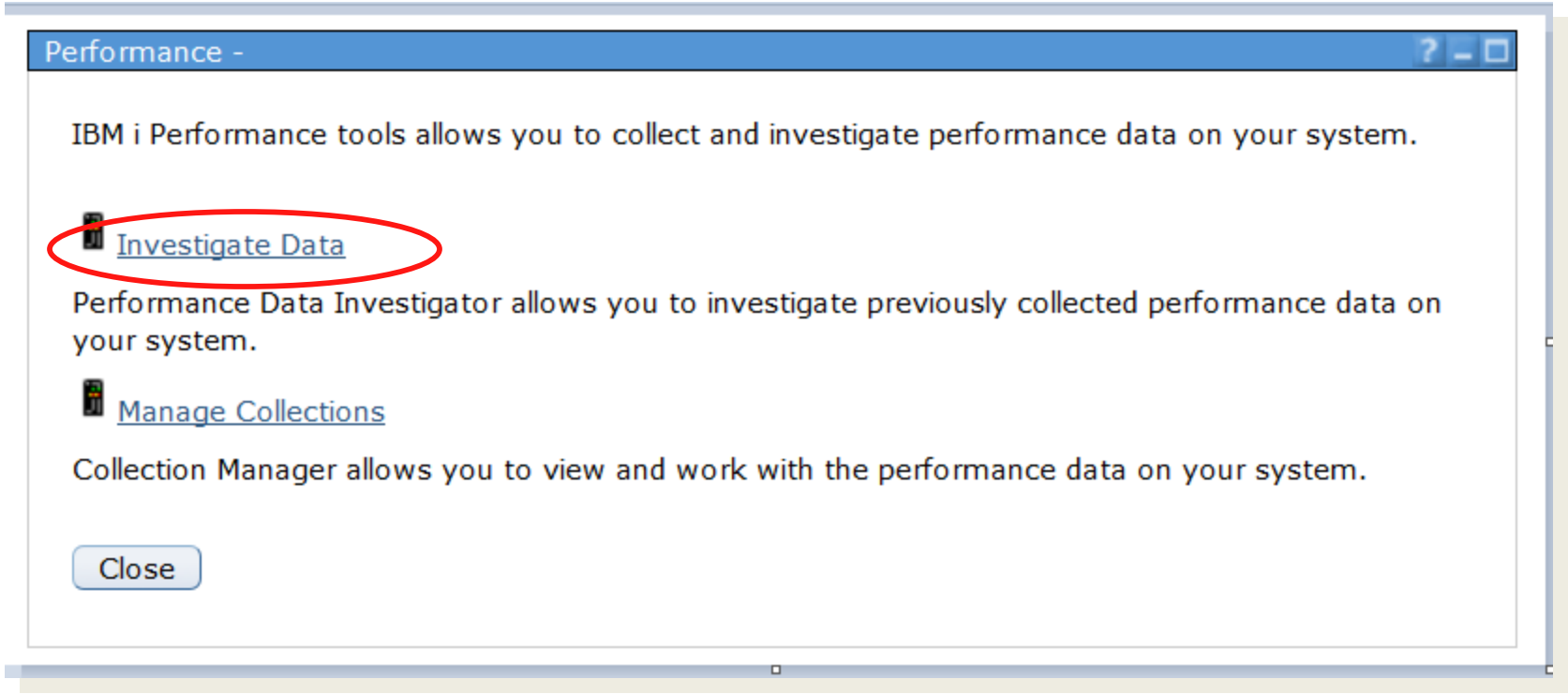
IBM Navigator for i
Performance
Investigate Data



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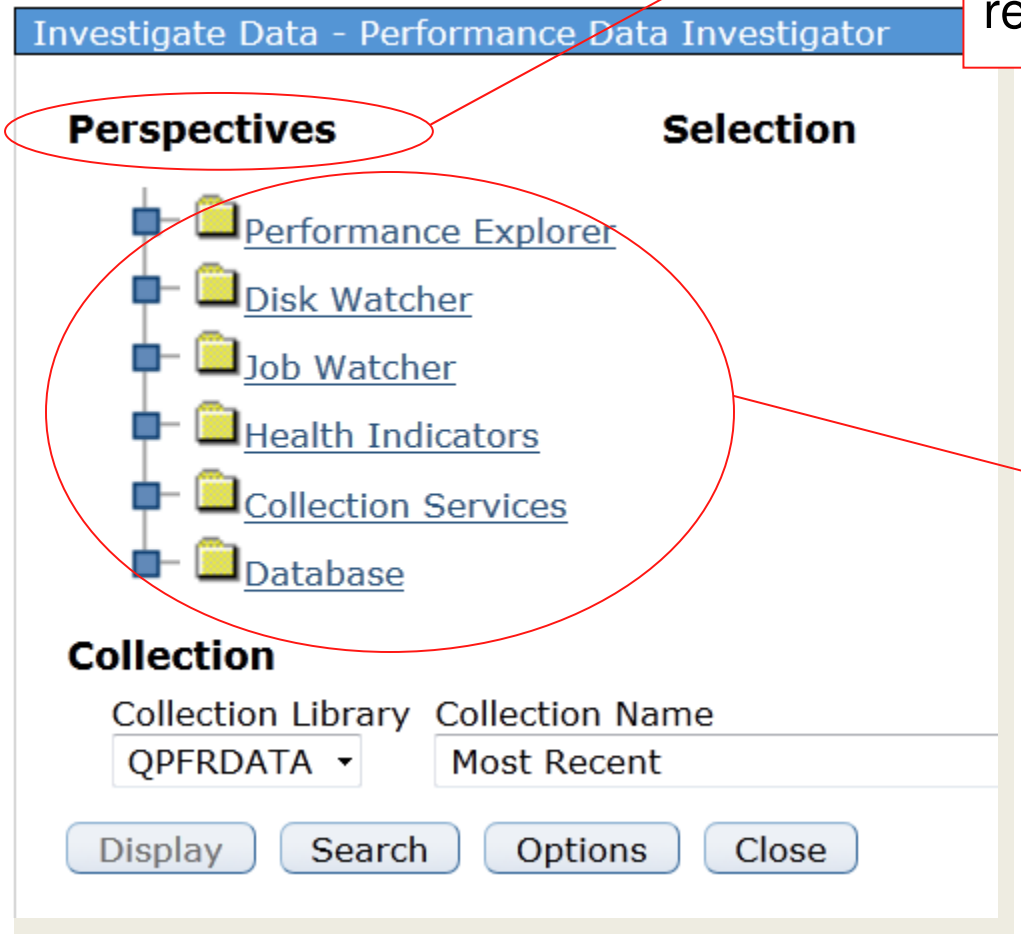
Investigate Data

Perspectives are a logical grouping of similar or related views that benefit from being rendered side-by-side for reference or context.



Content Package is a set of perspectives that share a commonality (major theme).

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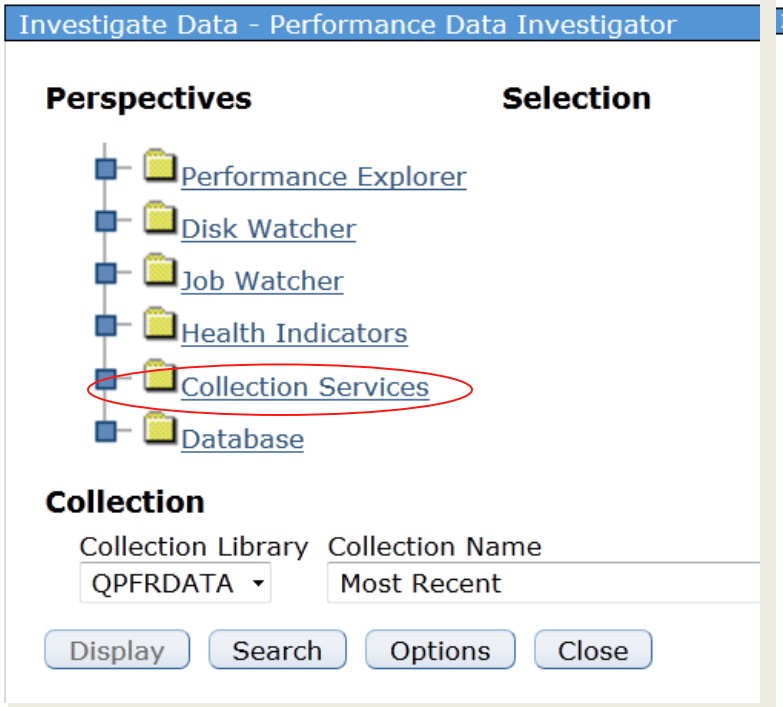
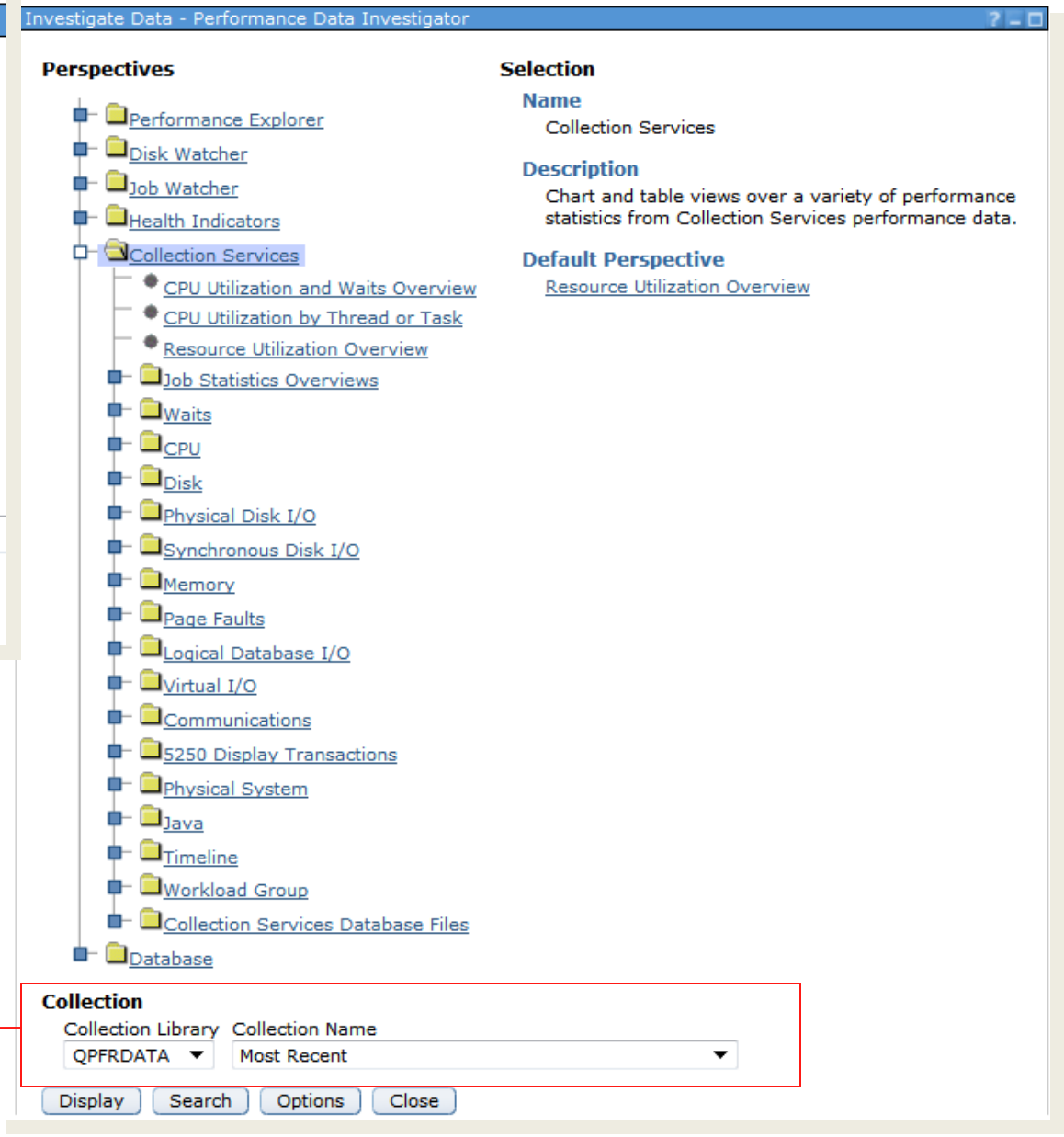
Investigate Data – Select Collection





The Collection boxes allow you to specify which collection you want to work with. Only collections valid for the type of chart you select will be displayed.

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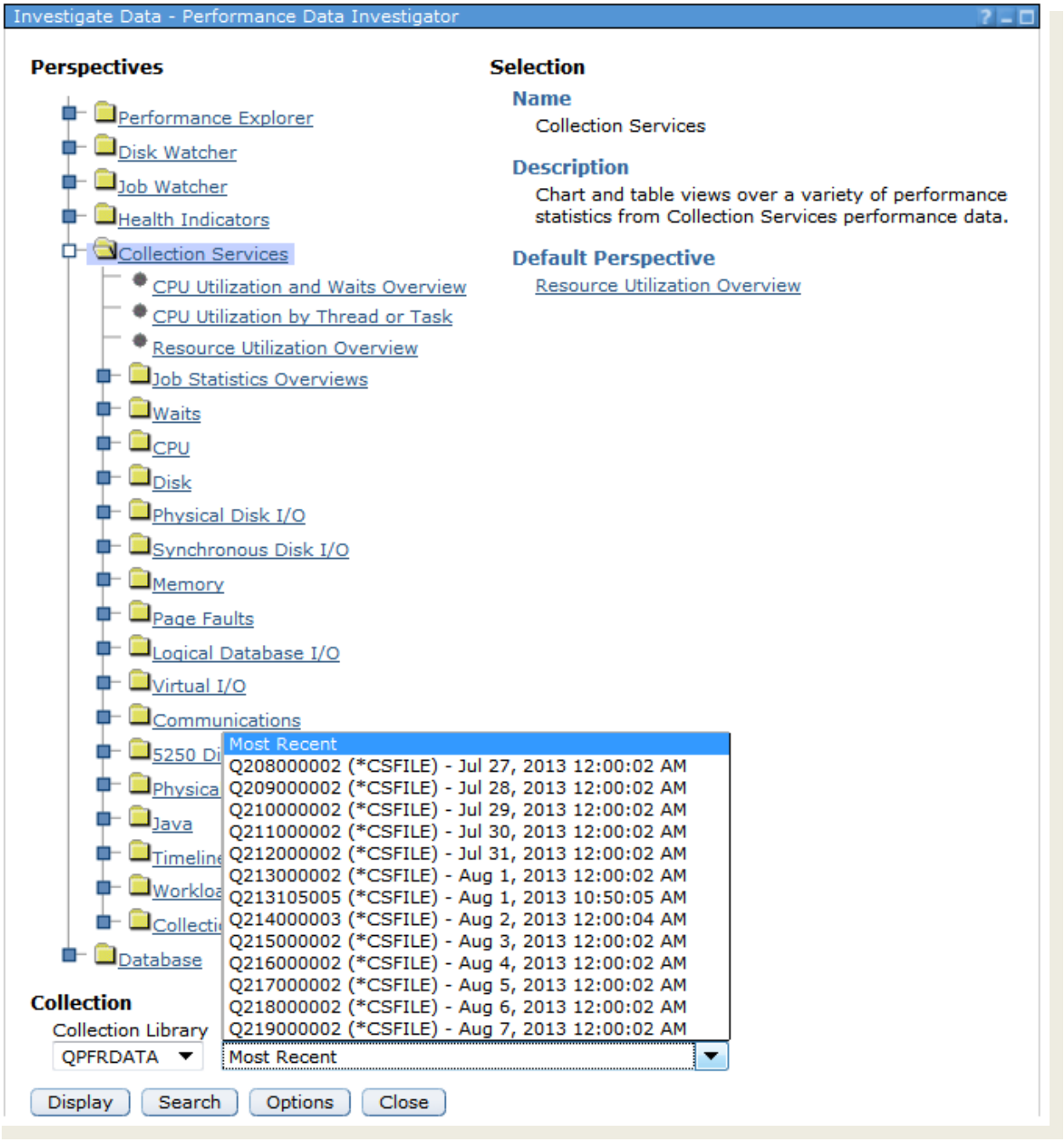
Selecting a Collection

The latest PTFs provide support to see the date/time of the collections as well as additional perspectives.



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Resource Utilization Overview

Summary for general overall health:
- **CPU Utilization**
- **Disk Utilization**
- **Disk Busy**
- **5250 Transactions**
- **I/Os per Second**
- **Page Faults**

Resource Utilization Overview

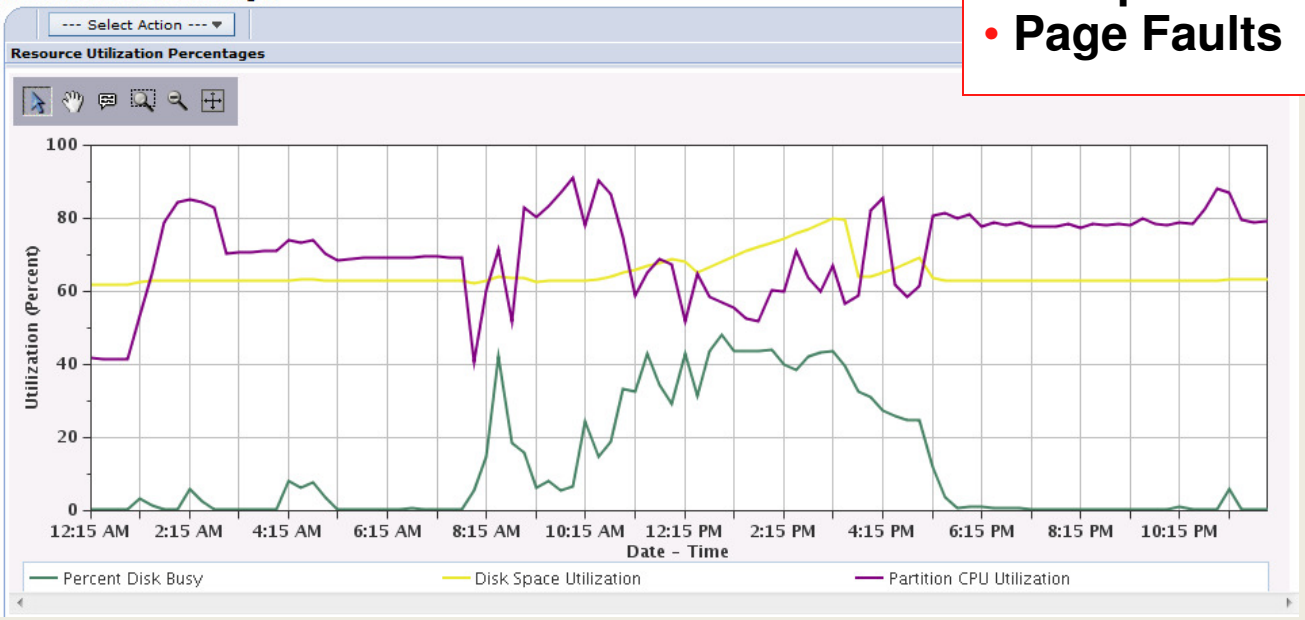
Perspective Edit View History

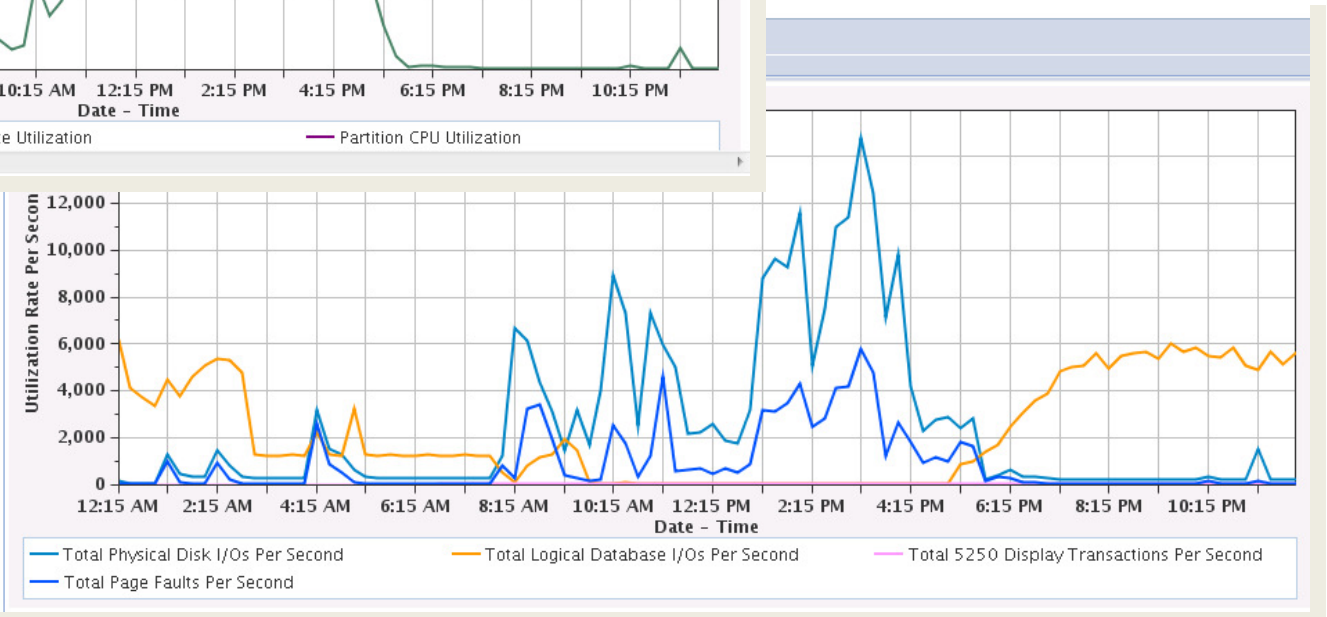
Collection
Name(s): CS228229ND
Library: COMMON
Type: Collection Services File Based Collection
File level: 28

Time
Start: Feb 28, 2008 12:00:02 AM
End: Feb 29, 2008 12:00:00 AM

System
Name: RCHASTND
Release: V6R1M0

Resource Utilization Percentages





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Resource Utilization Overview - Percentages

Resource Utilization Overview

Perspective Edit View History

Collection

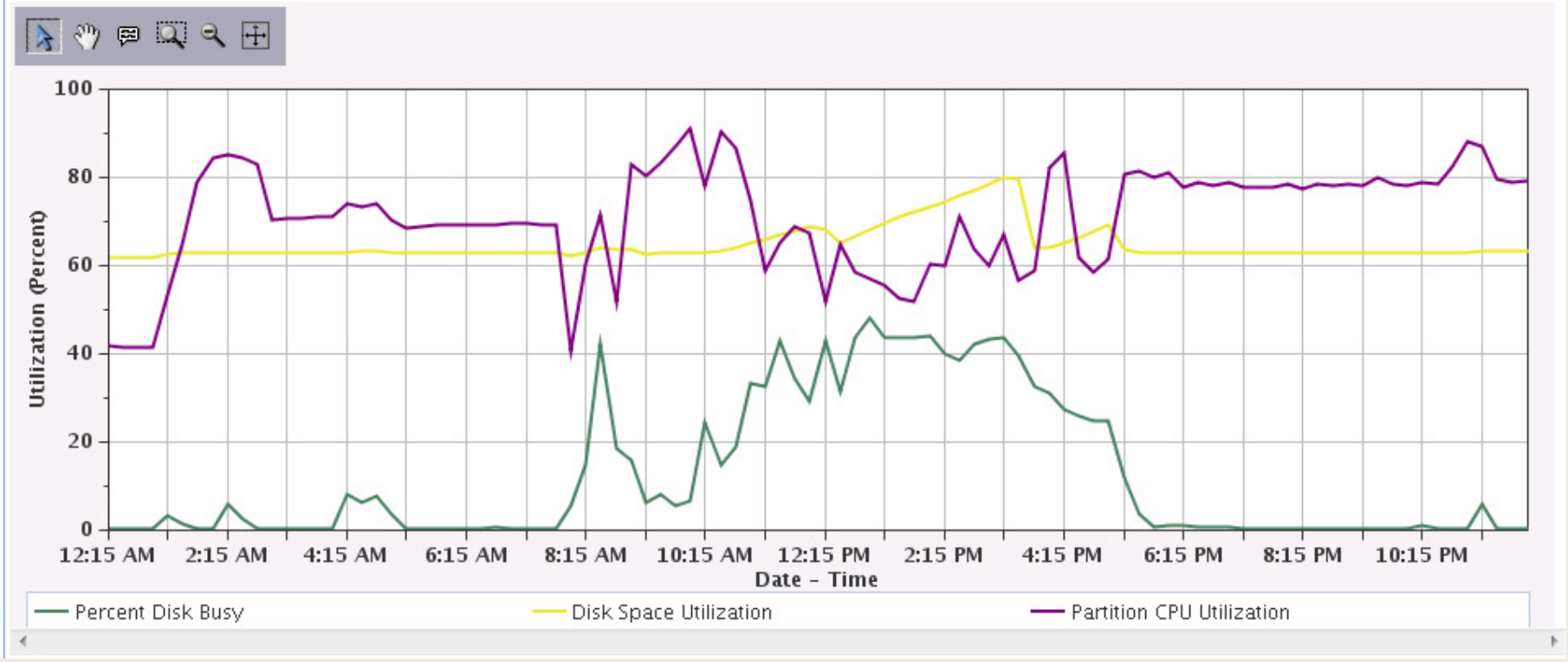
Name(s): CS228229ND
Library: COMMON
Type: Collection Services File Based Collection
File level: 28

Time

Start: Feb 28, 2008 12:00
End: Feb 29, 2008 12:00

Resource Utilization Percentages

--- Select Action ---



Summary for general overall health:

- **CPU Utilization**
- **Disk Utilization**
- **Disk Busy**

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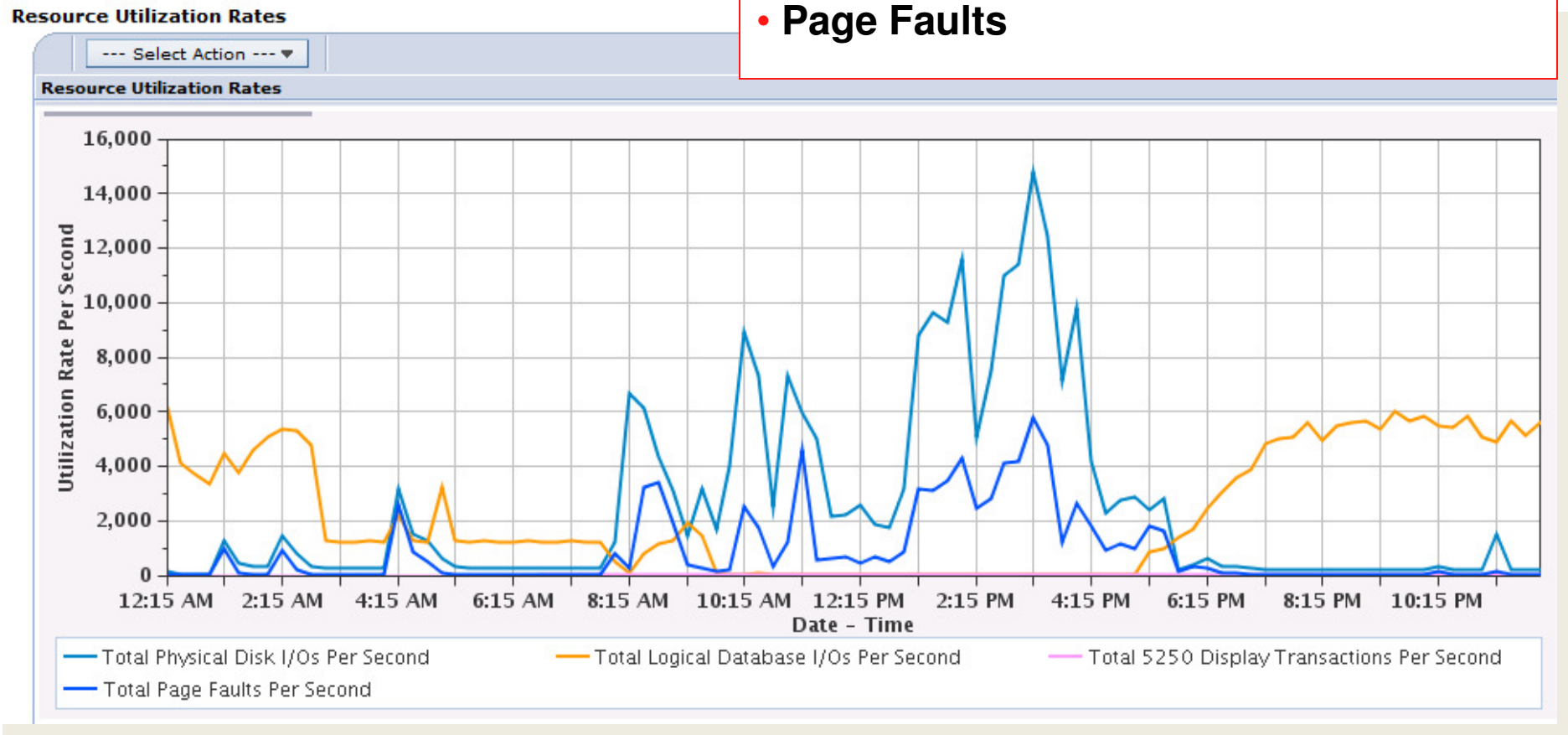
Resource Utilization Overview - Rates

Summary for general overall health:
- **5250 Transactions**
- **I/Os per Second**
- **Page Faults**



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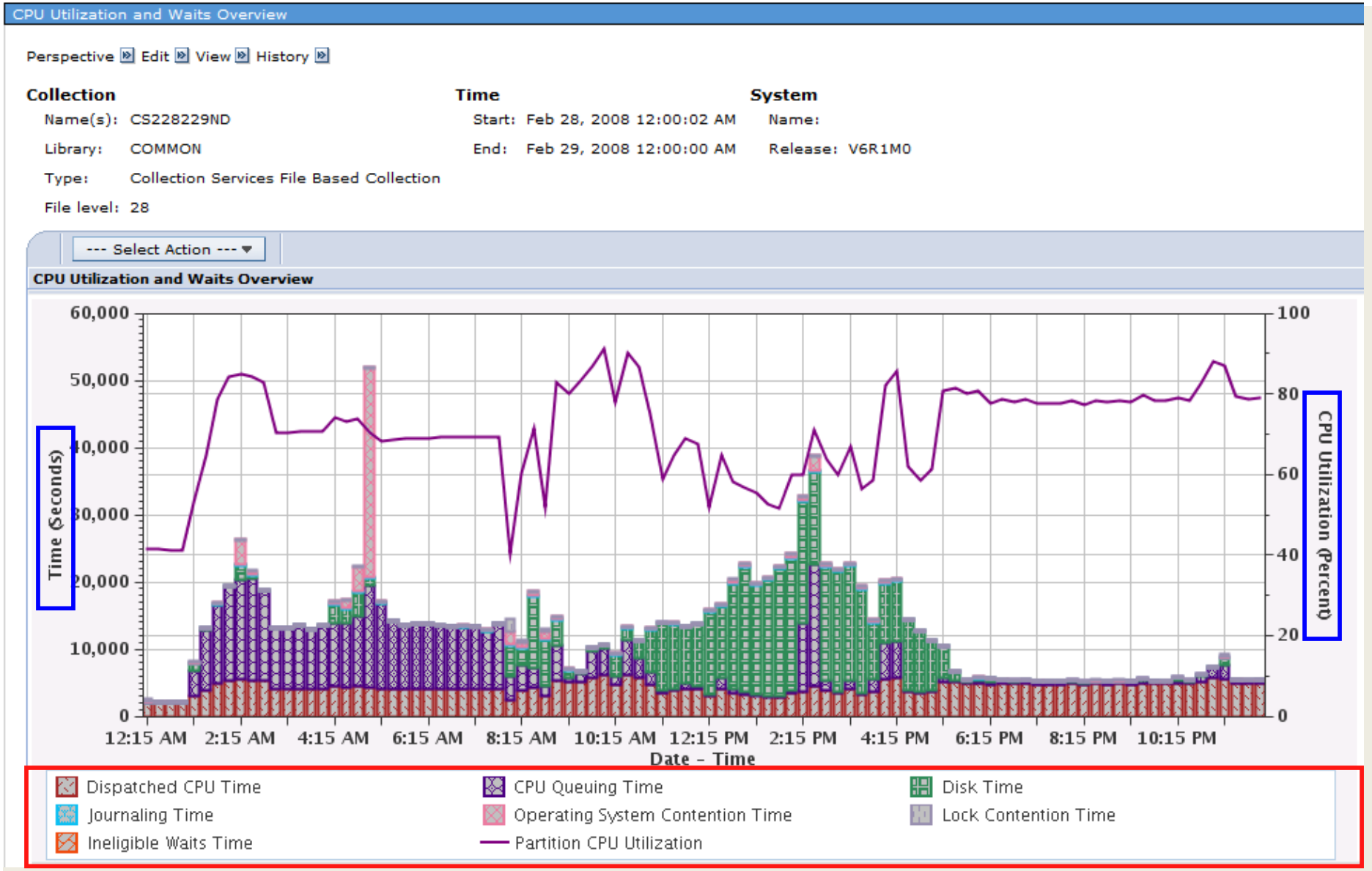
CPU Utilization and Waits Overview



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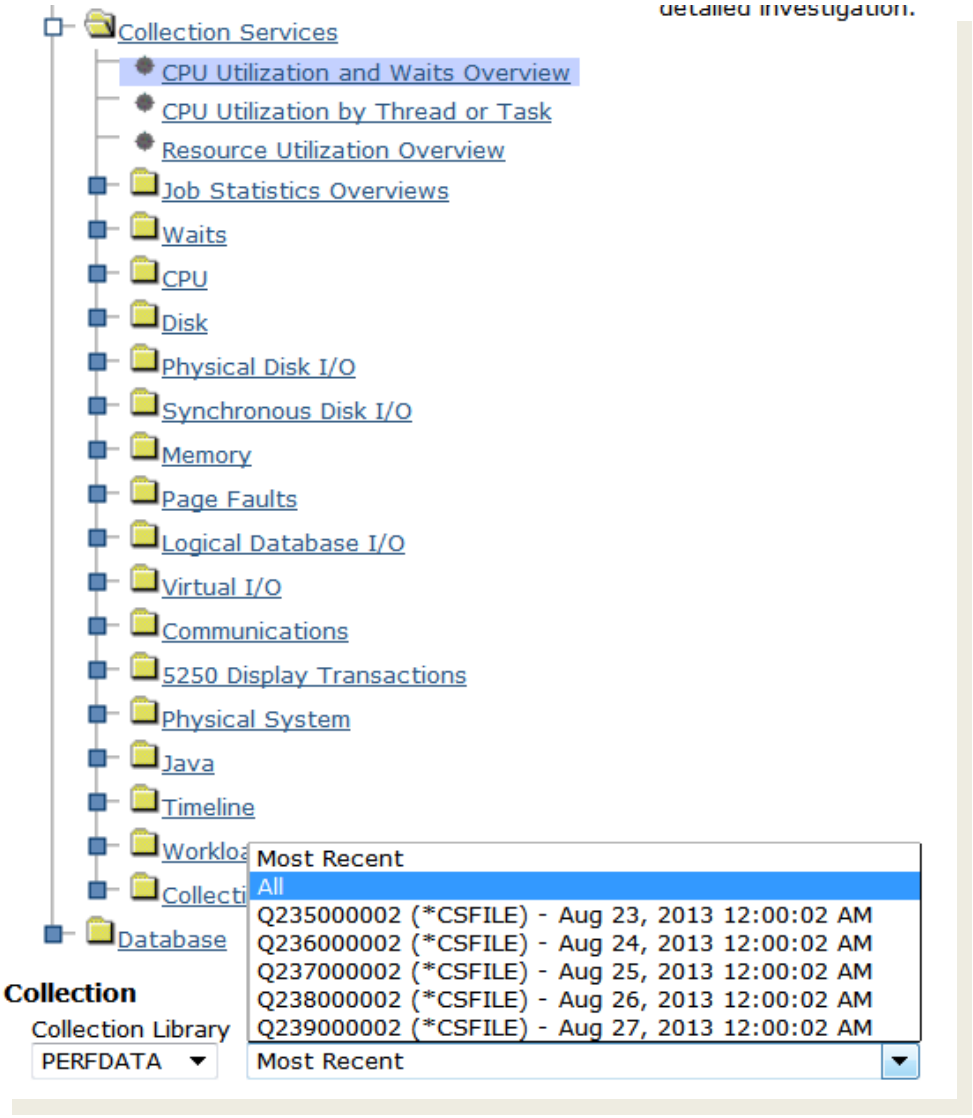
Graphing Multiple Collections

- If your collection library has 5 or fewer collections, an **All** option is available to display all the collections in one graph
- It will take longer to display the graph
  - Multiple collections means larger queries!
- **Hint**: when the graph appears, you need to use the “reset zoom” tool to display all the data.



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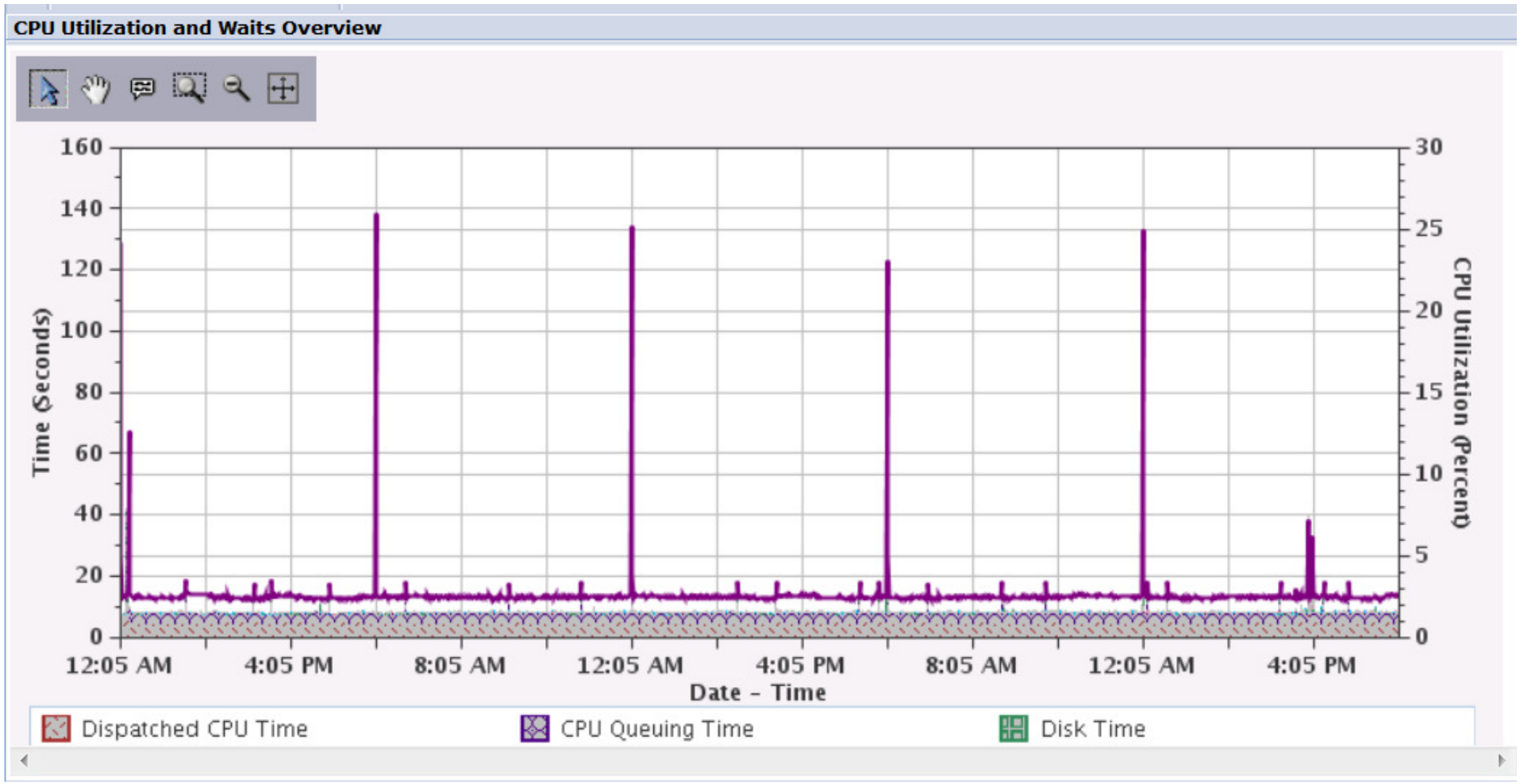
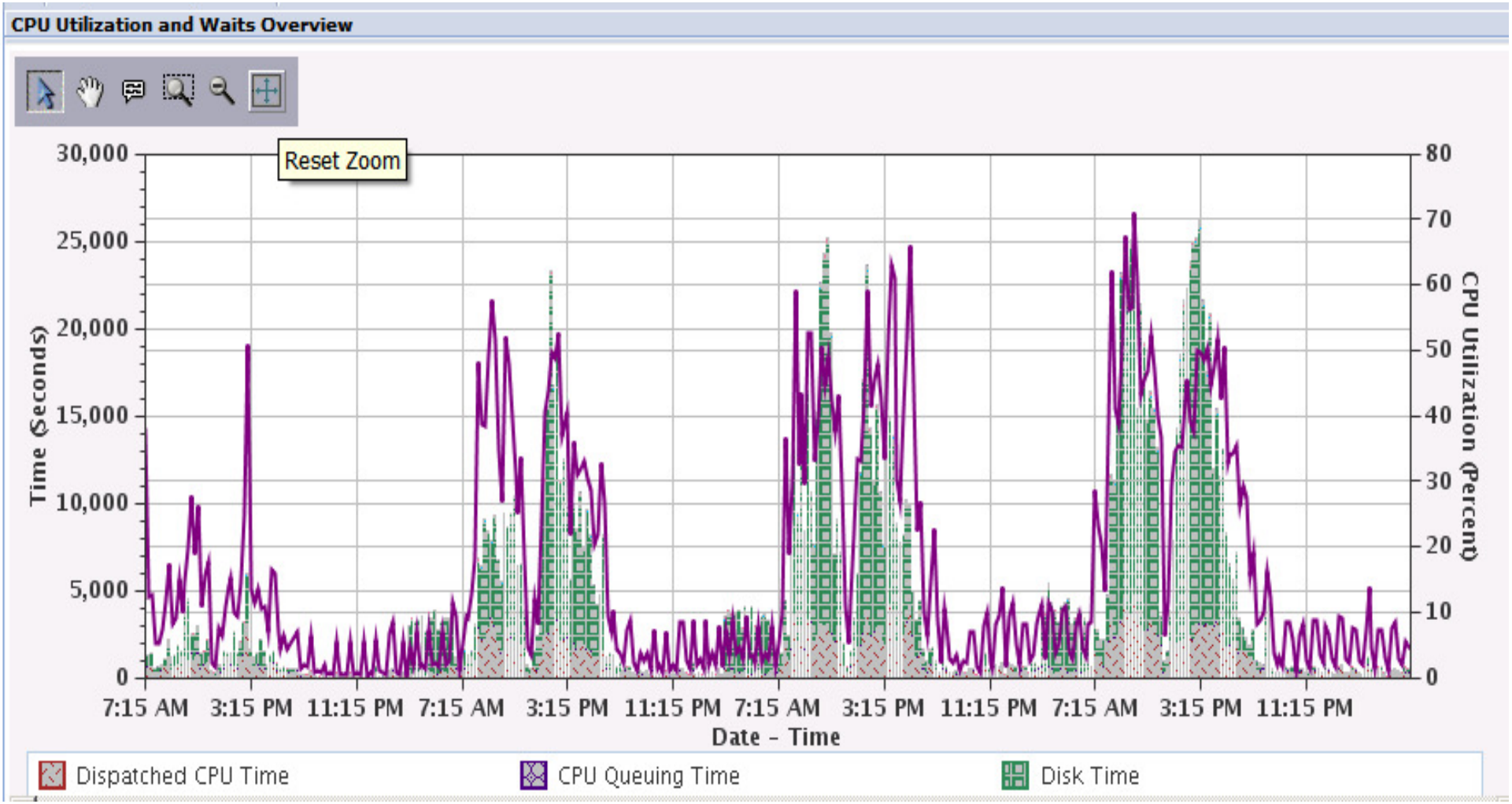
Graphing Multiple Collections

- This example shows five days of (uninteresting) collection services data
  - Do you know what ran each day at midnight?



A More Interesting Example

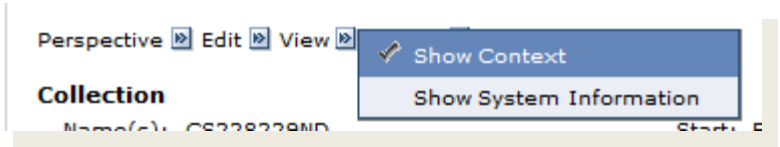
- 4 days of more interesting performance data.
  Observe the pattern…



View Collection or System Details

Toggle on/off the detailed information regarding the collection or the system from which the collection originated

Provides quick access to primary system information on CS collections
From QAPMCONF file for the Collection Services Collection being viewed



Show/hide Context

Show/hide System Information

CPU Utilization and Waits Overview

Perspective Edit View History

Collection		Time		System	
Name(s):	Q234000002	Start:	Aug 22, 2013 12:00:02 AM	Name:	ETC3T1
Library:	QPFRDATA	End:	Ongoing	Release:	V7R1M0
Type:	Collection Services File Based Collection				
File level:	36				

System Information

Name:	ETC3T1	Total Processors:	Not Available	Interactive Threshold:	100%
Release:	V7R1M0	Processors / Cores Active:	4	System ASP Capacity	88.89 GB
Type:	7998	Available Processors:	Not Available	Hypervisor Memory:	1,152 MB
Model:	61X	Virtual Processors:	1	Primary Partition:	0
Serial Number:	10-065FA	Installed Processor Count:	4	Partition ID:	21
Processor Feature Code:	52BE	Processor Units (allocated to partition):	0.5	Partition Count:	3
Processor Feature:	8400	Processor Sharing/Capped:	Yes / No	Partition Memory:	8 GB
Generated On:	ETC3T1				

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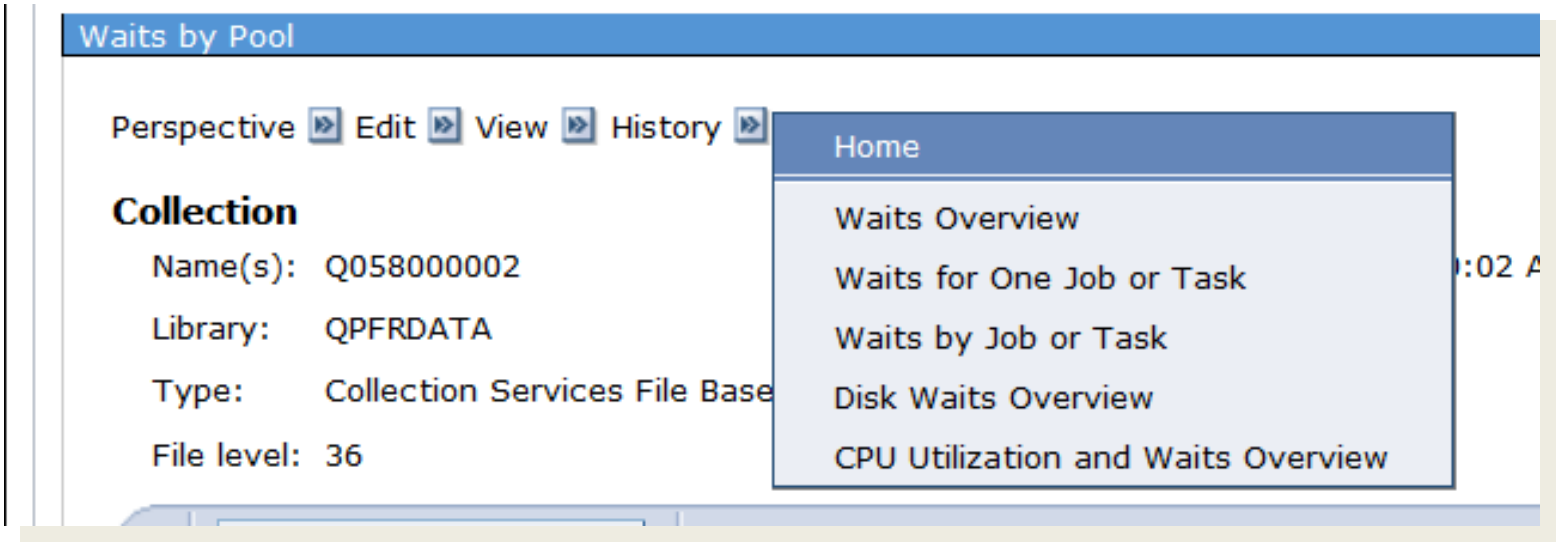
History – **Navigation history and other easily-accessible options**



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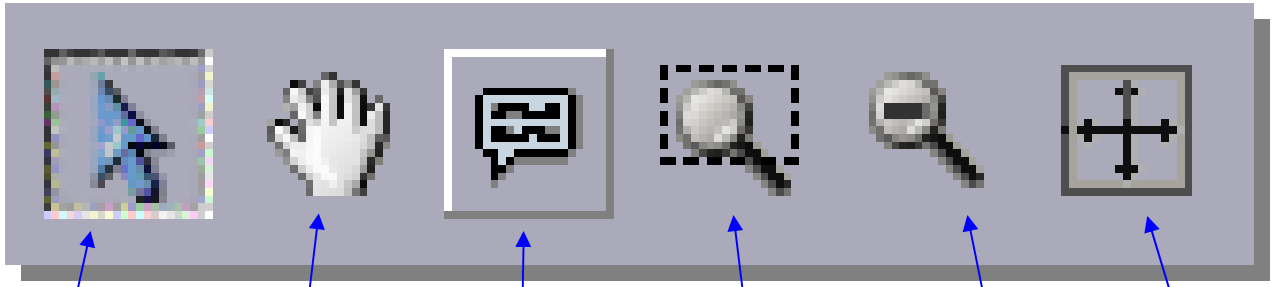
Tools – Interact with the Charts



Select

Pan

Show Tooltips

Zoom Region

Zoom out

Reset Zoom

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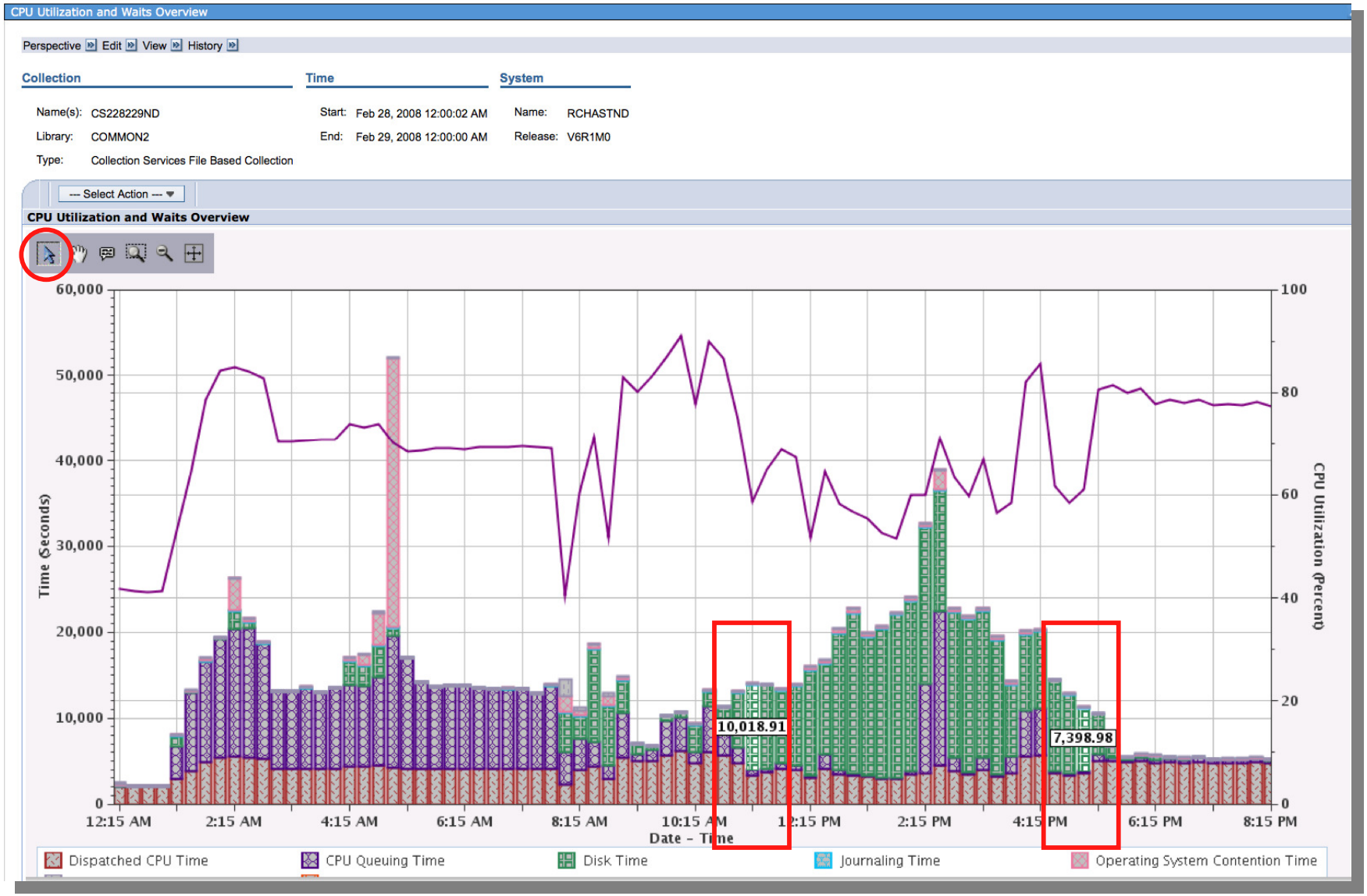
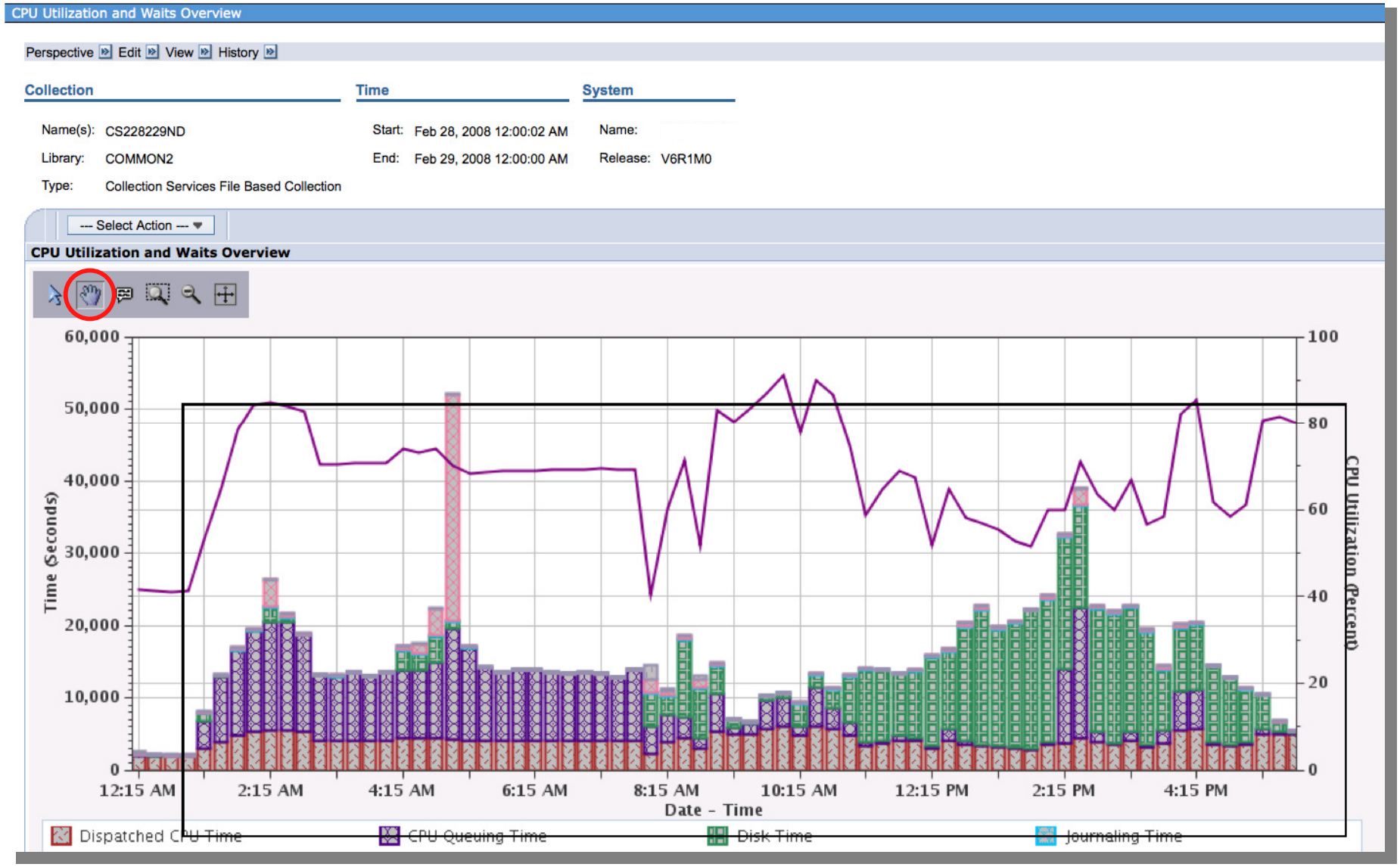
Selection


CPU Utilization and Waits Overview
Perspective
Edit
View
History
Collection
Time
System
Name(s): CS228229ND
Library: COMMON2
Type: Collection Services File Based Collection
Start: Feb 28, 2008 12:00:02 AM
End: Feb 29, 2008 12:00:00 AM
Name: RCHASTND
Release: V6R1M0
--- Select Action ---
CPU Utilization and Waits Overview
Time (Seconds)
CPU Utilization (Percent)
60,000
50,000
40,000
30,000
20,000
10,000
0
100
80
60
40
20
0
12:15 AM
2:15 AM
4:15 AM
6:15 AM
8:15 AM
10:15 AM
12:15 PM
2:15 PM
4:15 PM
6:15 PM
8:15 PM
Date - Time
10,018.91
7,398.98
Dispatched CPU Time
CPU Queuing Time
Disk Time
Journaling Time
Operating System Contention Time

Pan



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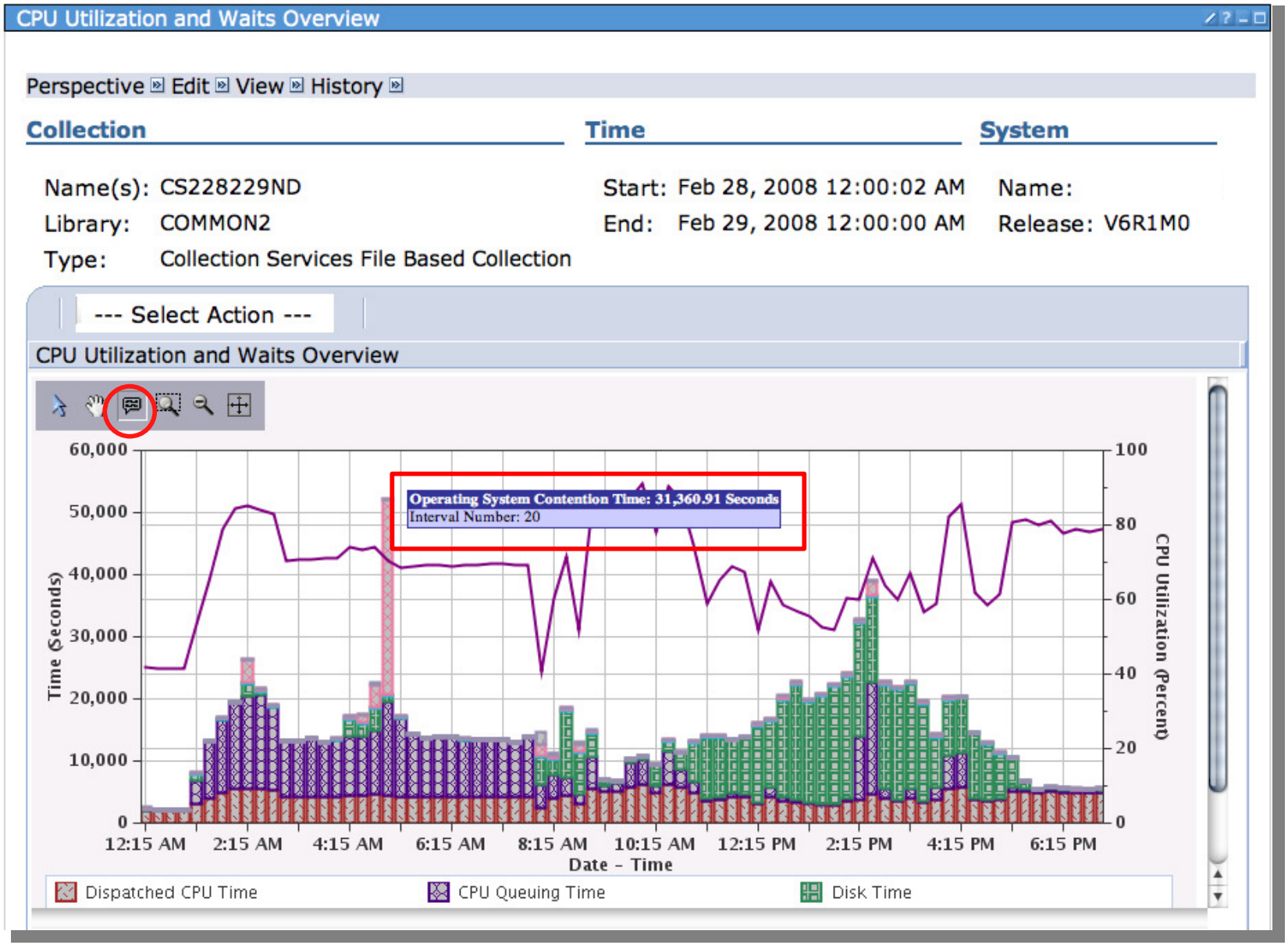
Tool Tips



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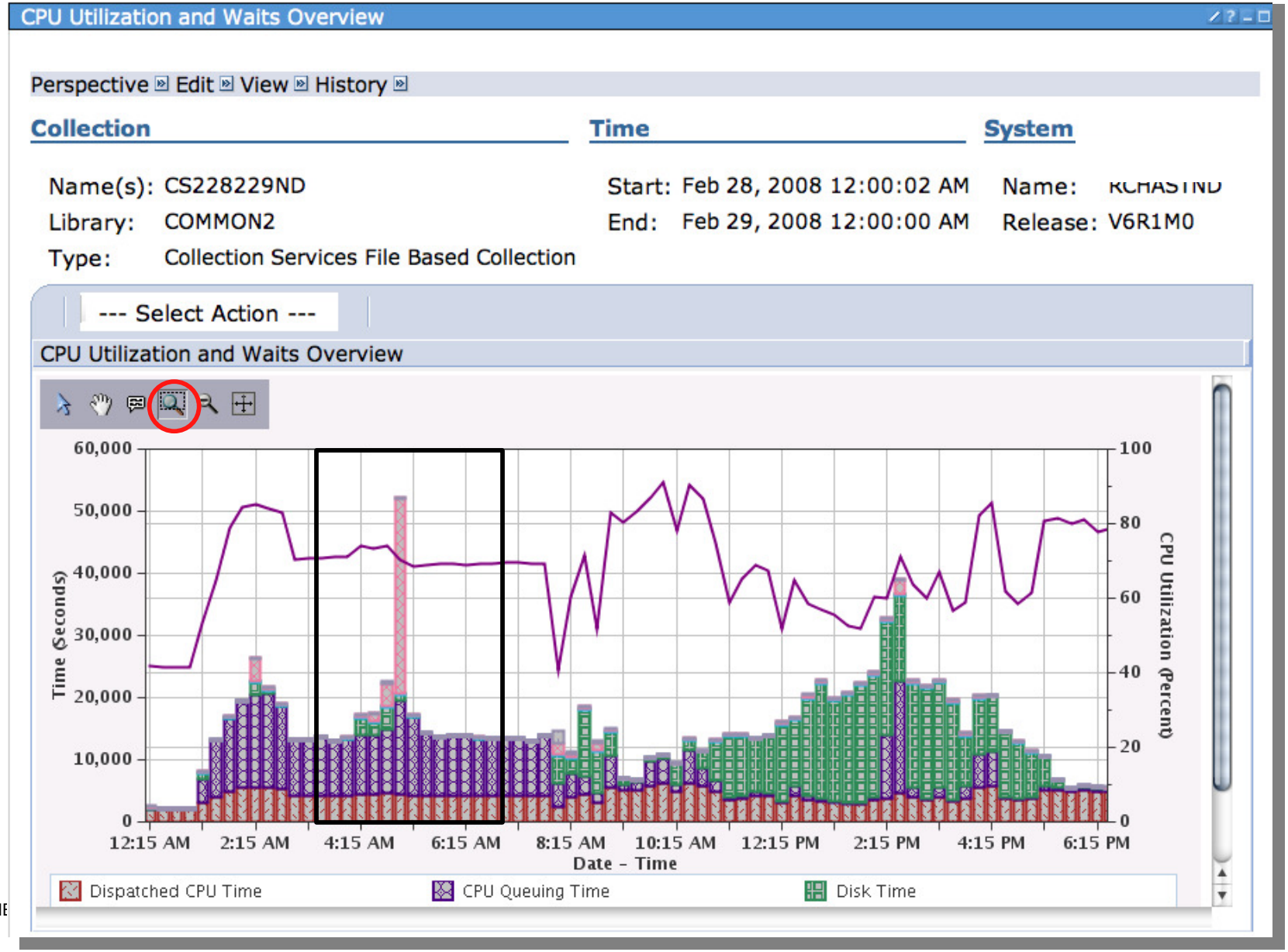
Zoom Region



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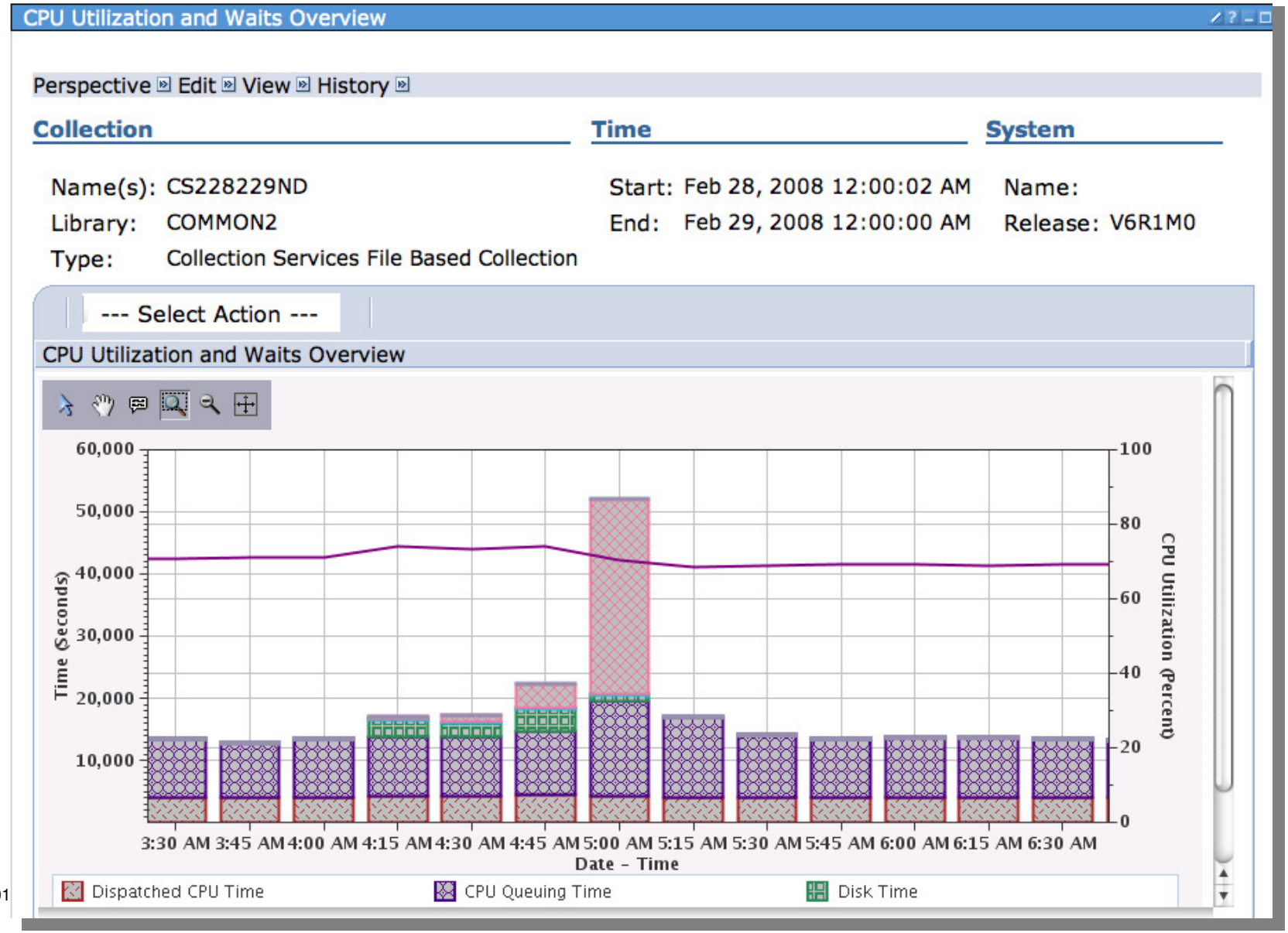
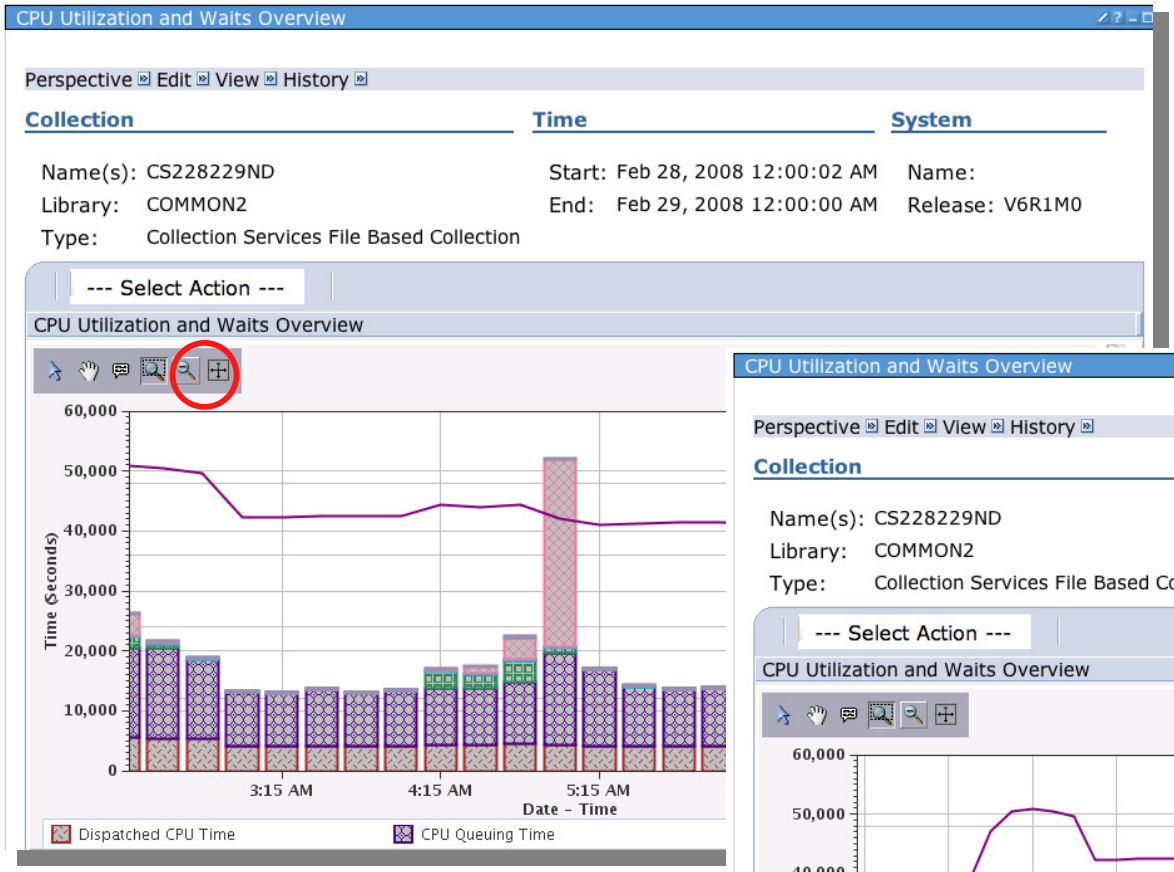
Zoom Region Results

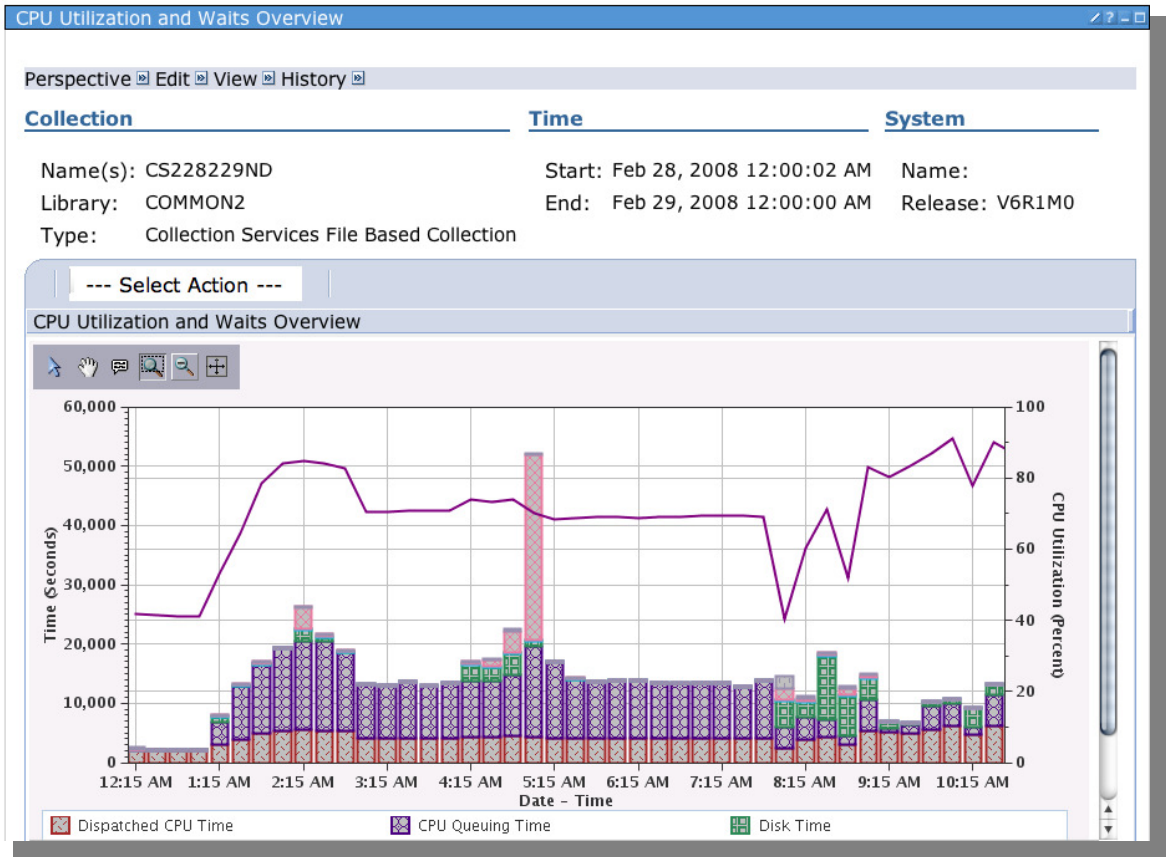


© 201

Zoom Out



Zoom out expands the graph each time it is clicked



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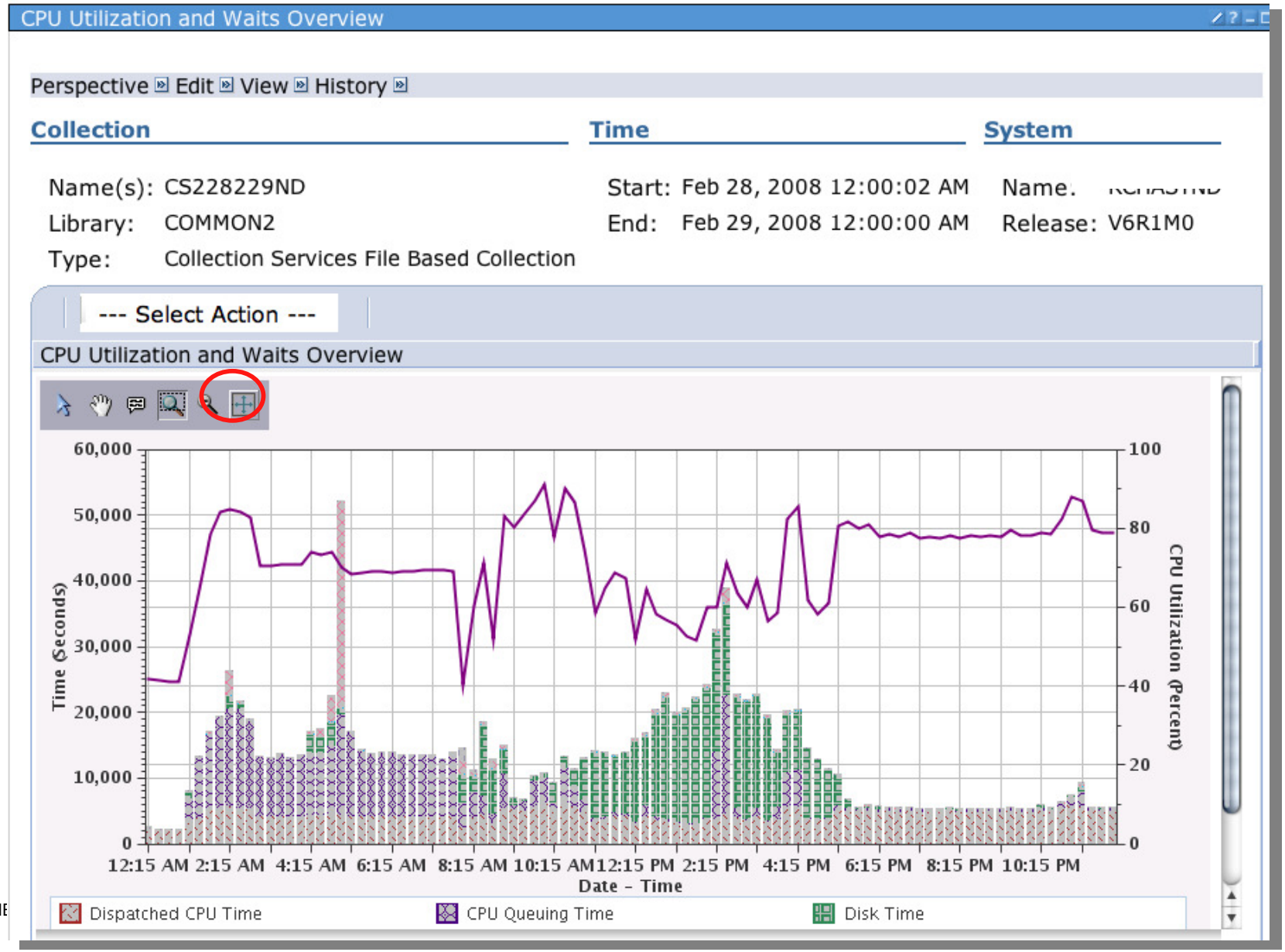
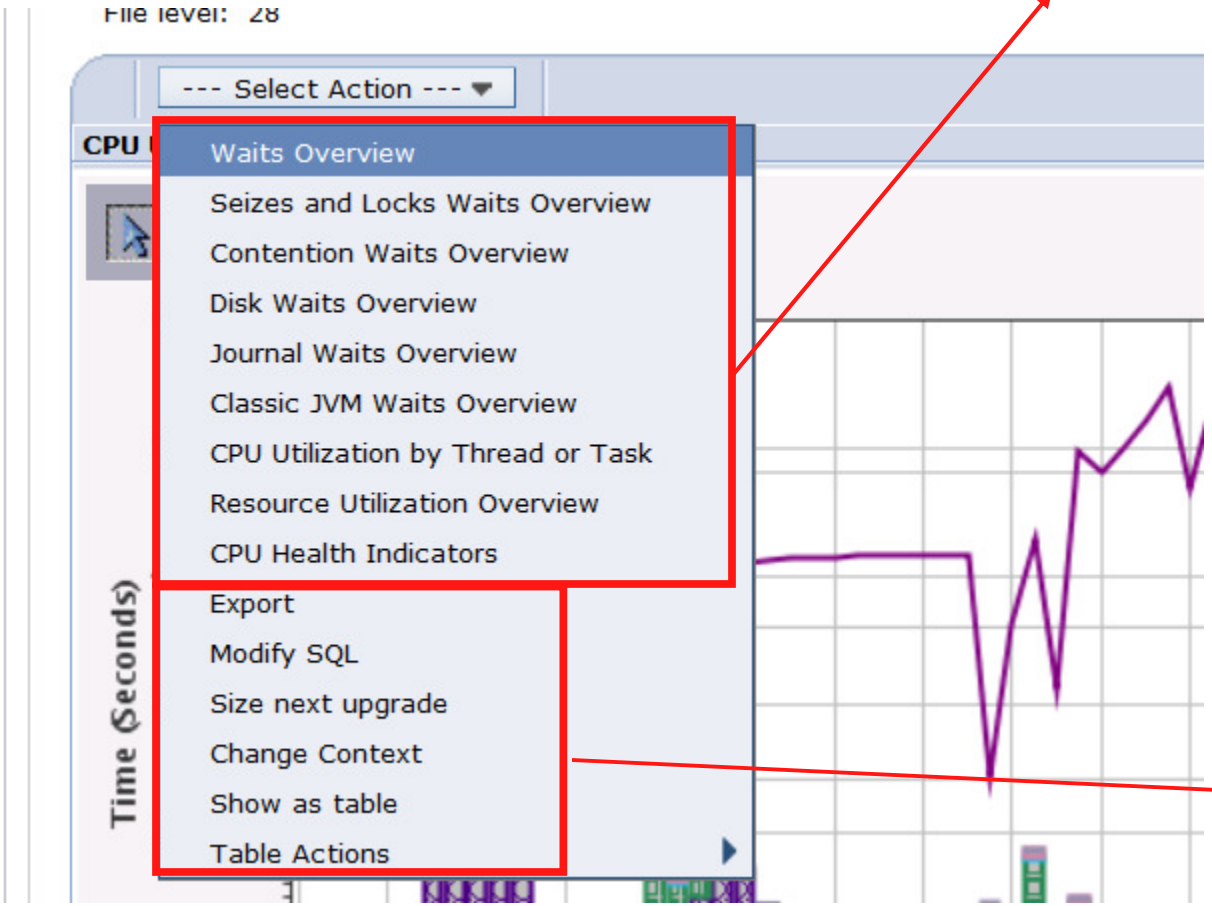
Reset Zoom



© 2013 IB

Drill-down



Graph options for next step in analysis

Other options to work with data or refine graphs

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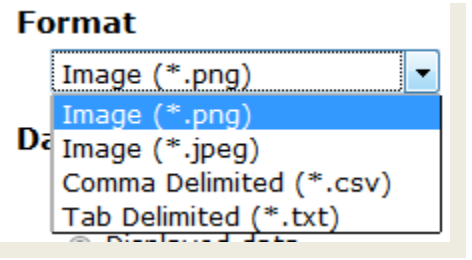
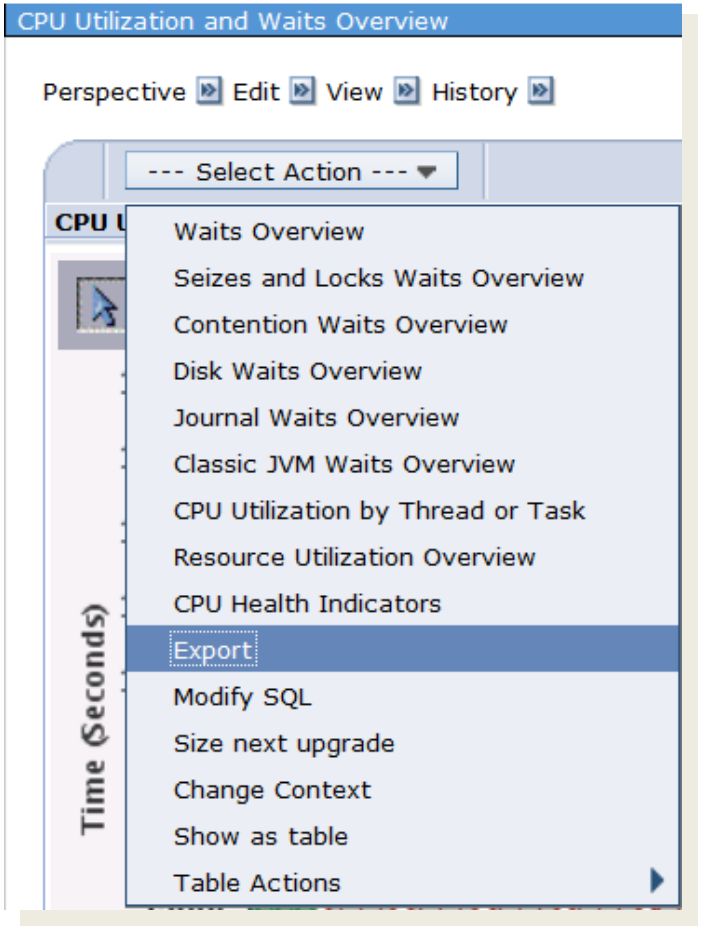
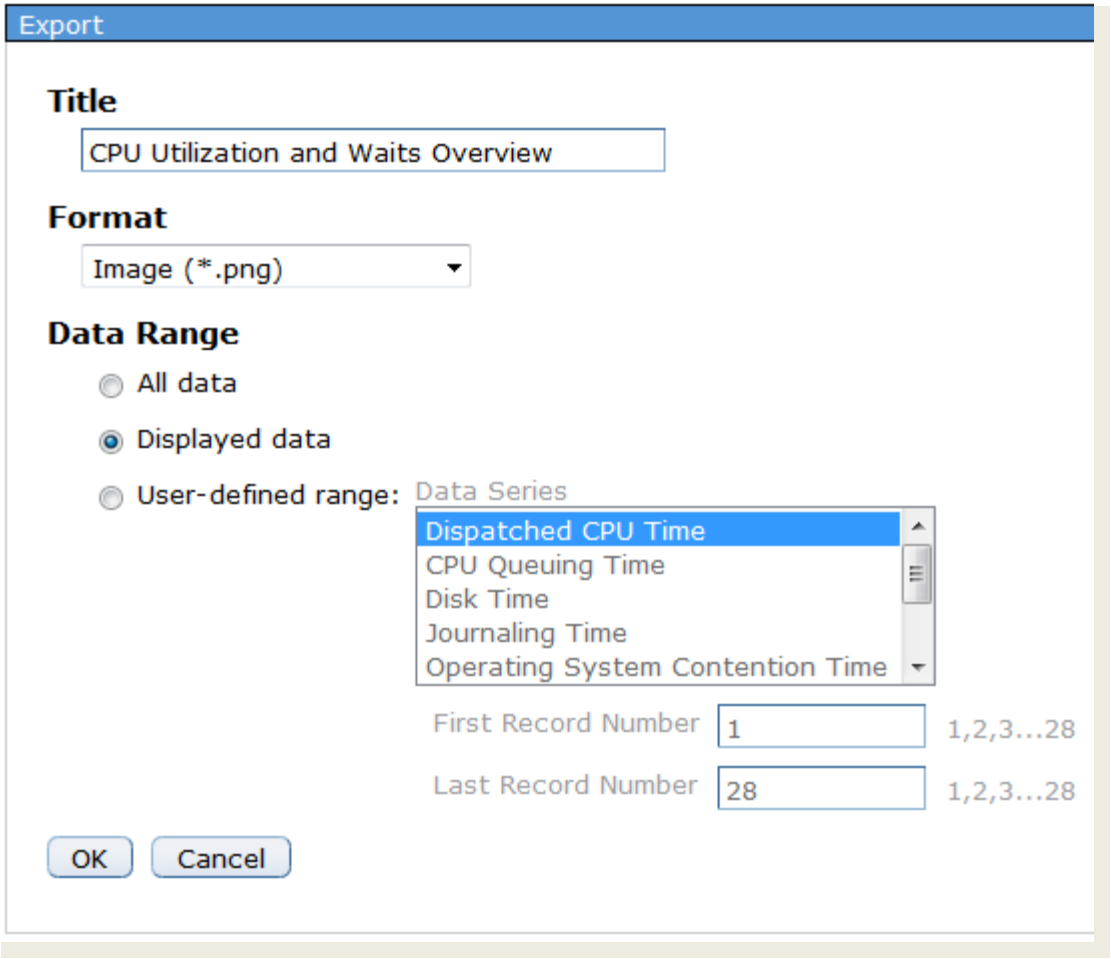
Export - *.png, *.jpeg, *.csv, *.txt







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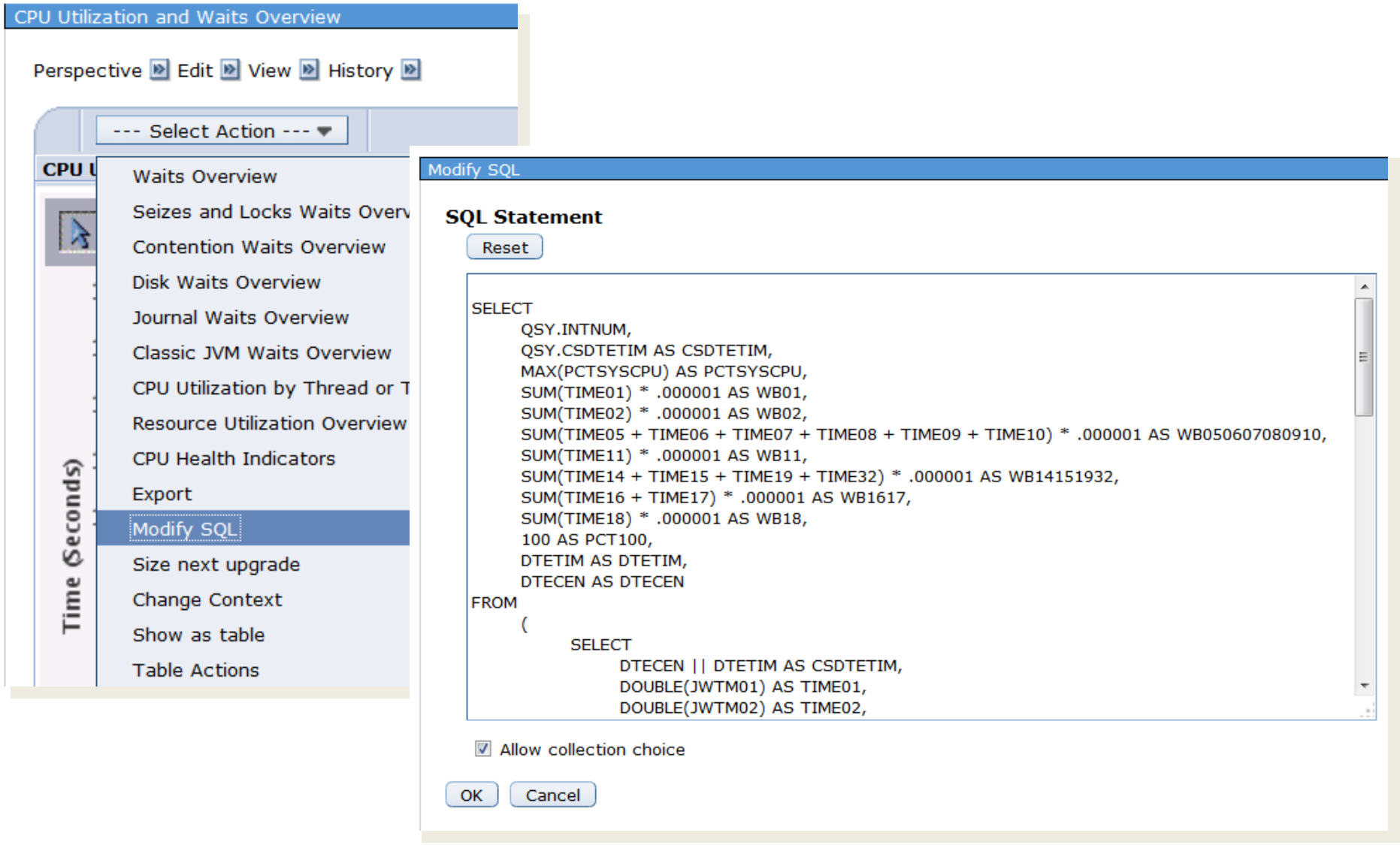
Modify SQL – customize the queries



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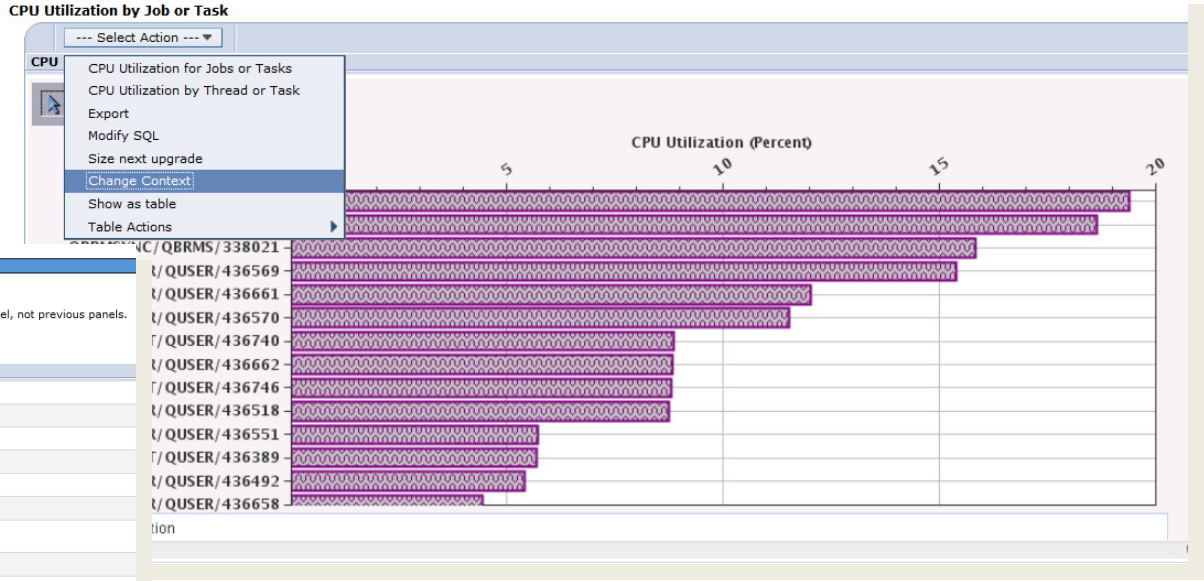
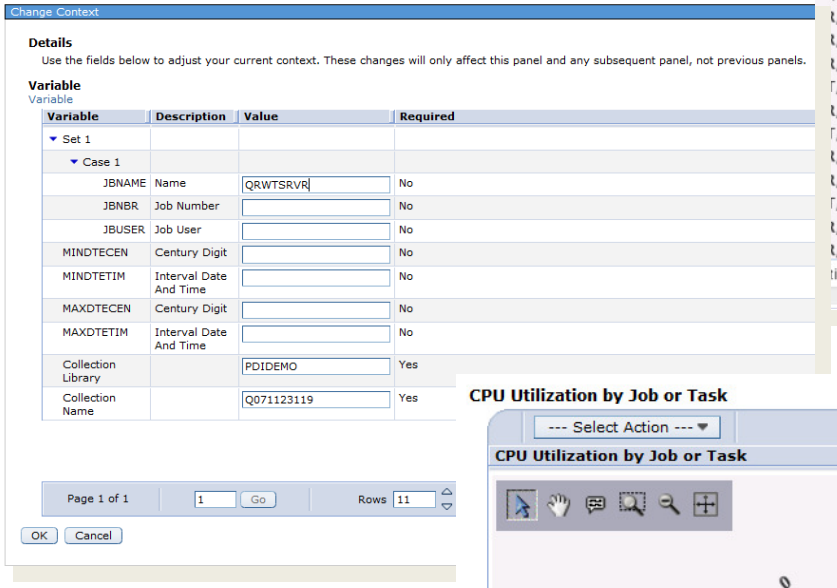
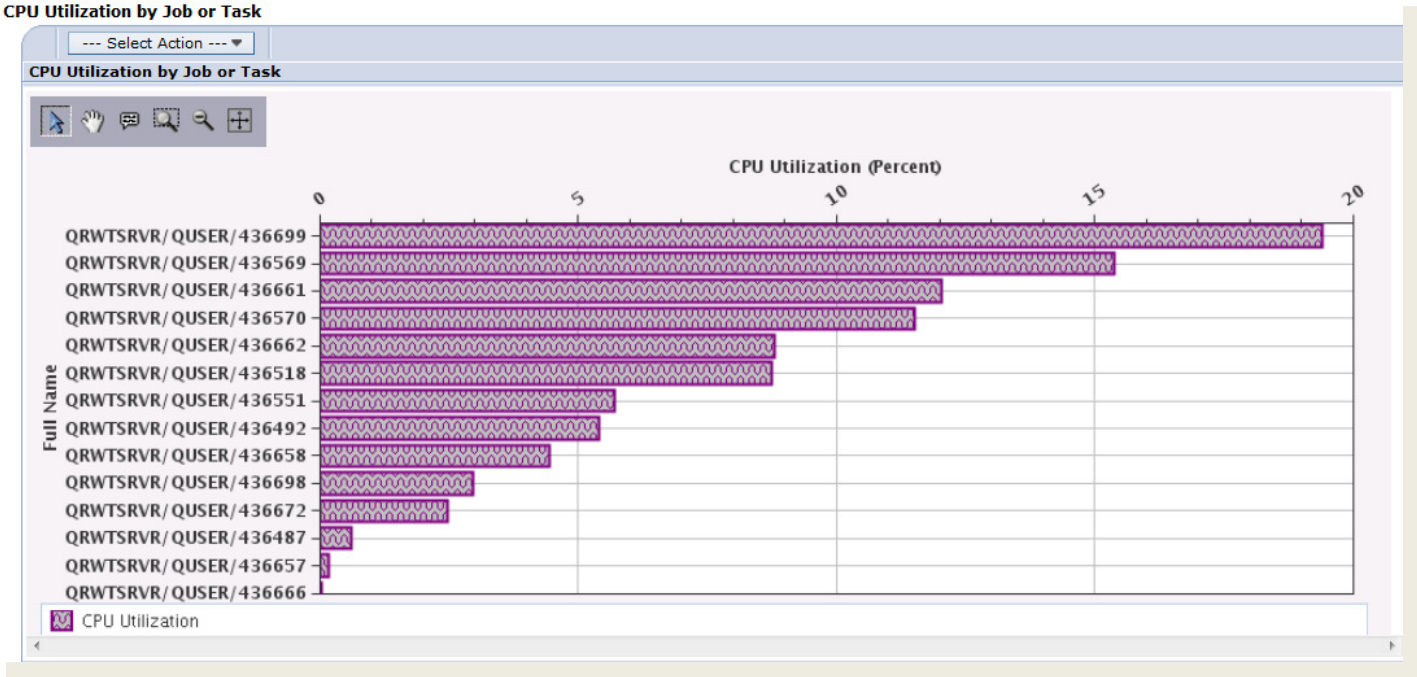
Change Context







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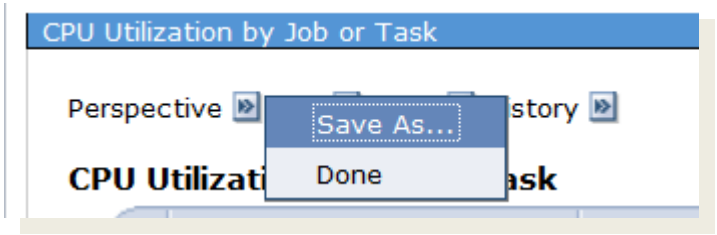
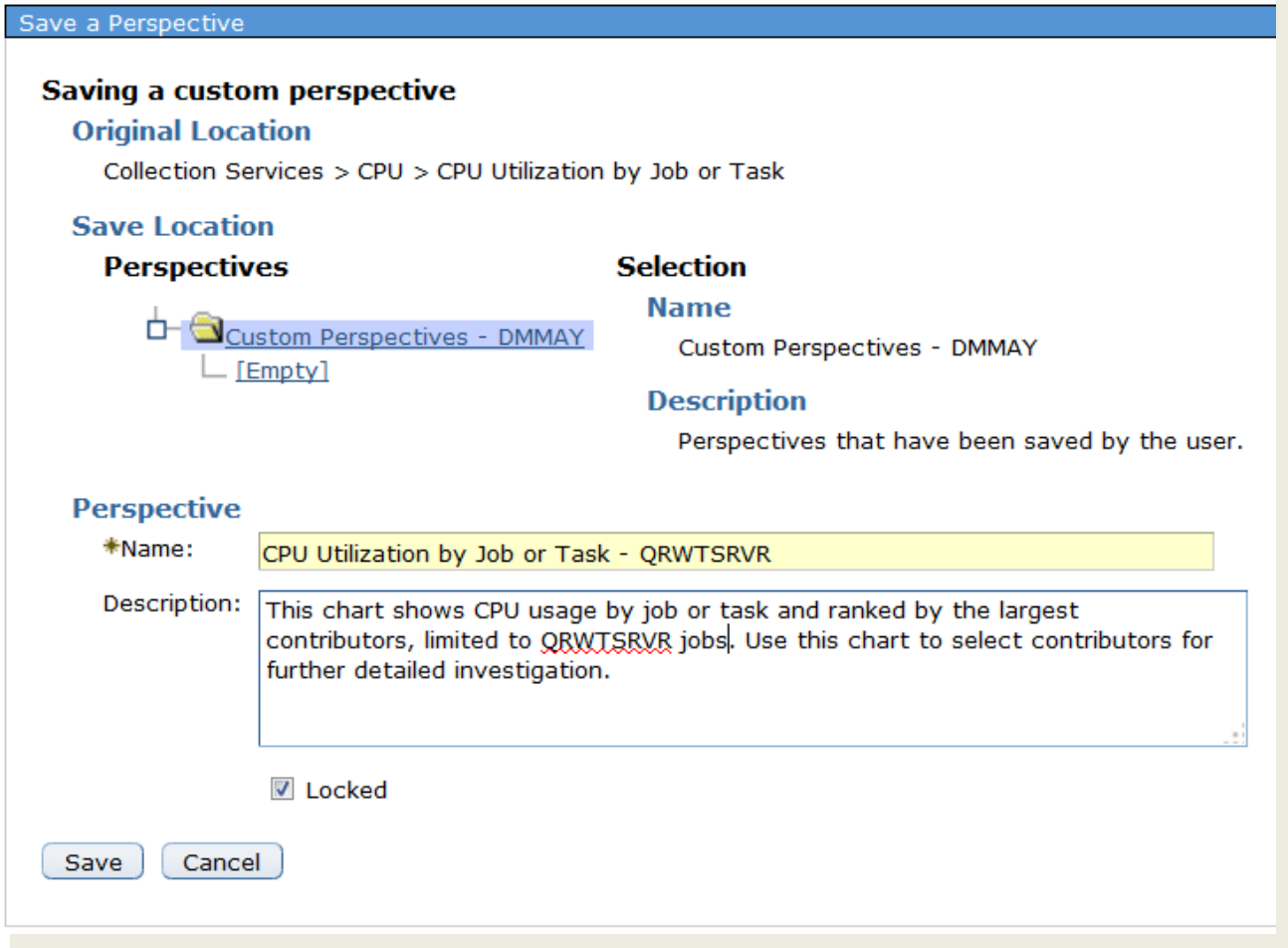
Perspective → Save As



When a table or chart is modified, you can save that table or chart for your own custom perspective using "Save As..."



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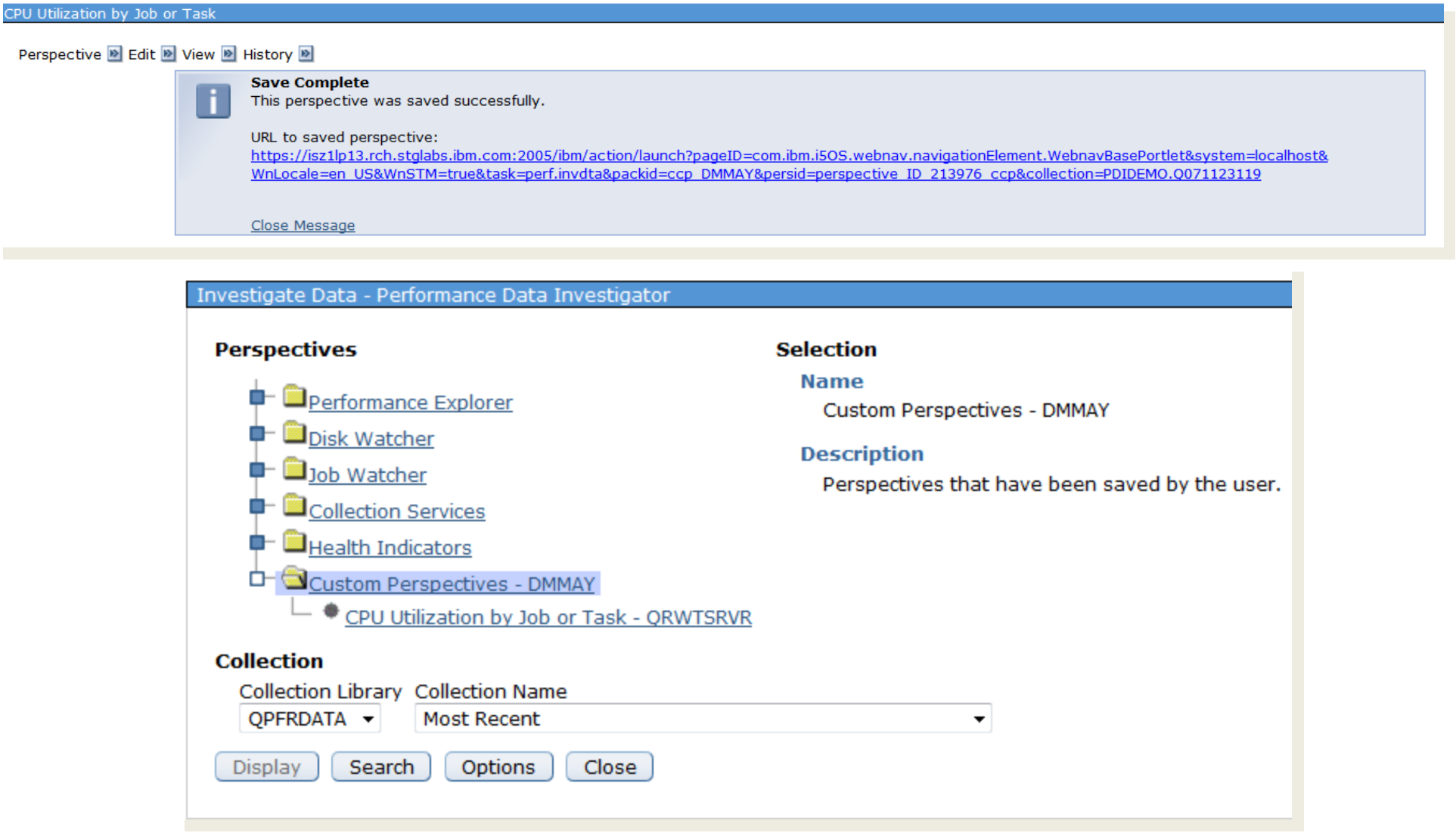
Perspective → Save As



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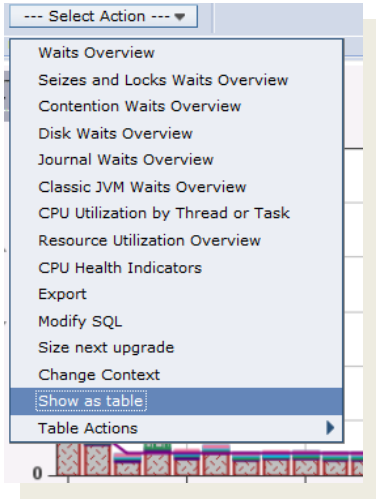
Show as Table



CPU Utilization and Waits Overview

Perspective | Edit | View | History

--- Select Action ---

Select	Interval Number	Date - Time	Partition CPU Utilization (Percent)	Dispatched CPU Time (Seconds)	CPU Queuing Time (Seconds)	Disk Time (Seconds)	Journaling Time (Seconds)	Operating System Contention Time (Seconds)
	1	Feb 28, 2008 12:15:00 AM	41.65	2125.7	12.25	64.4	35.71	22.6
	2	Feb 28, 2008 12:30:00 AM	41.4	2110.42	12.16	10.72	34.68	3.62
	3	Feb 28, 2008 12:45:00 AM	41.14	2096.73	12.38	5.32	35.3	3.5
	4	Feb 28, 2008 1:00:00 AM	41.23	2104.27	11.71	5.67	35.35	3.29
	5	Feb 28, 2008 1:15:00 AM	52.99	2959.23	3759.2	1180.33	47.49	141.01
	6	Feb 28, 2008 1:30:00 AM	64.62	3847.86	9061.6	217.47	32.11	113.34
	7	Feb 28, 2008 1:45:00 AM	78.58	4853.43	11796.74	41.63	41.27	308.02
	8	Feb 28, 2008 2:00:00 AM	84.22	5367.69	13984.72	23.12	52.58	35.85
	9	Feb 28, 2008 2:15:00 AM	84.89	5469.88	14931.39	2163.59	69.93	3686.04
	10	Feb 28, 2008 2:30:00 AM	84.07	5406.56	15063.64	697.16	72.47	399.18
	11	Feb 28, 2008 2:45:00 AM	82.82	5272.46	13472.69	57.49	48.64	46.06
	12	Feb 28, 2008 3:00:00 AM	70.36	4141.47	9068.85	20.63	1.19	22.3

Total: 96 Filtered: 96

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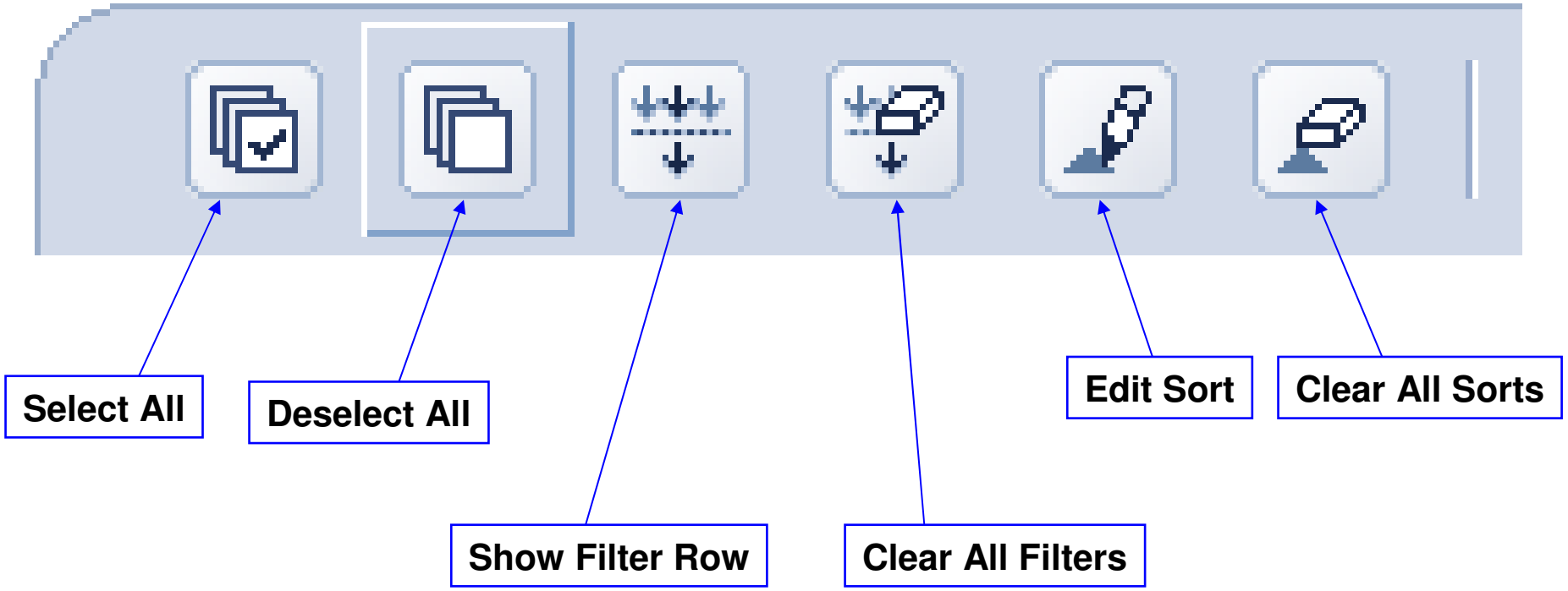
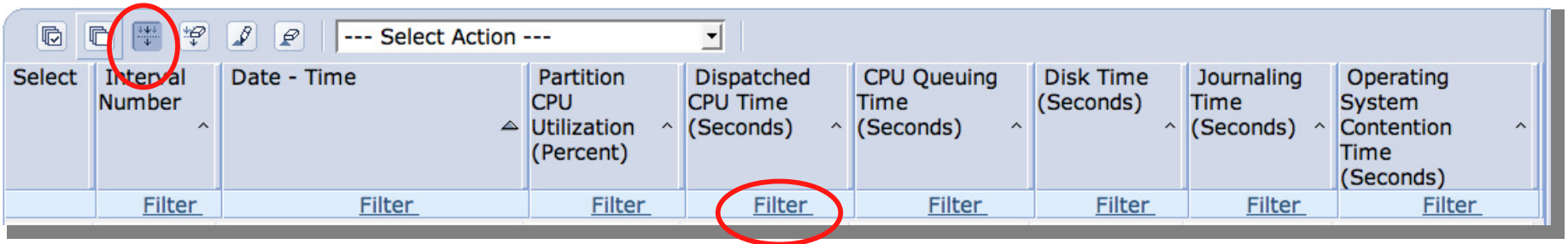
Table Features

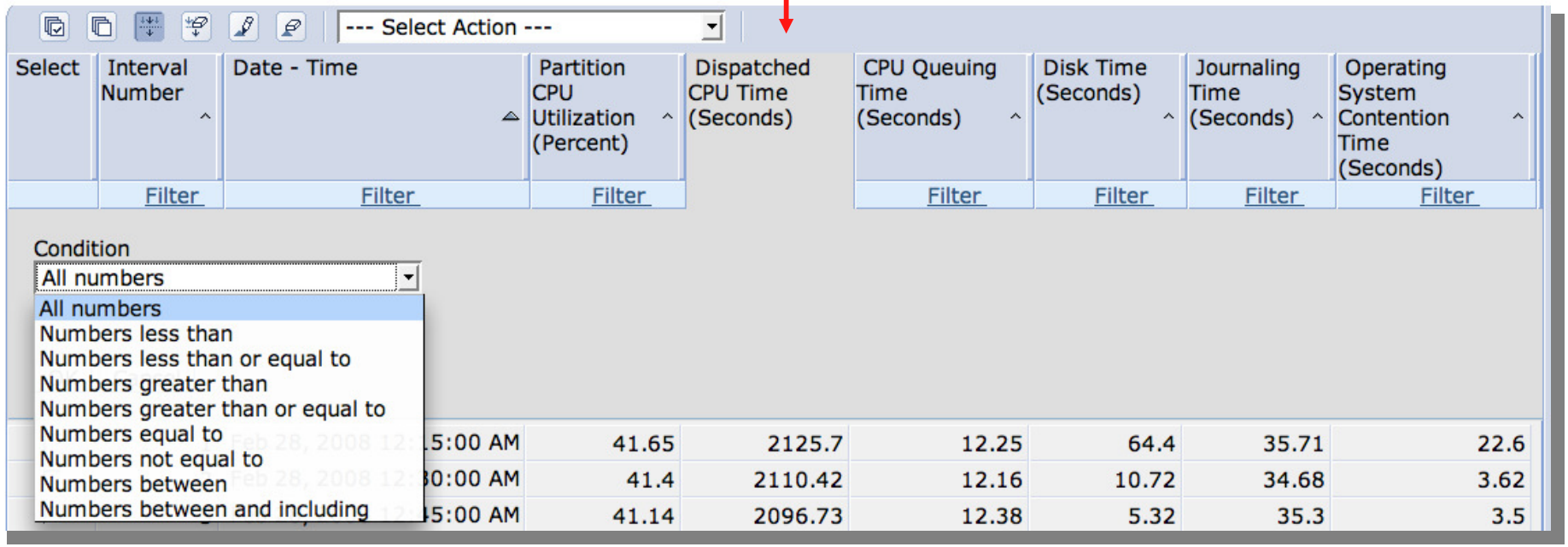


© 2013 IBM Corporation

Filtering

Show Filter Row





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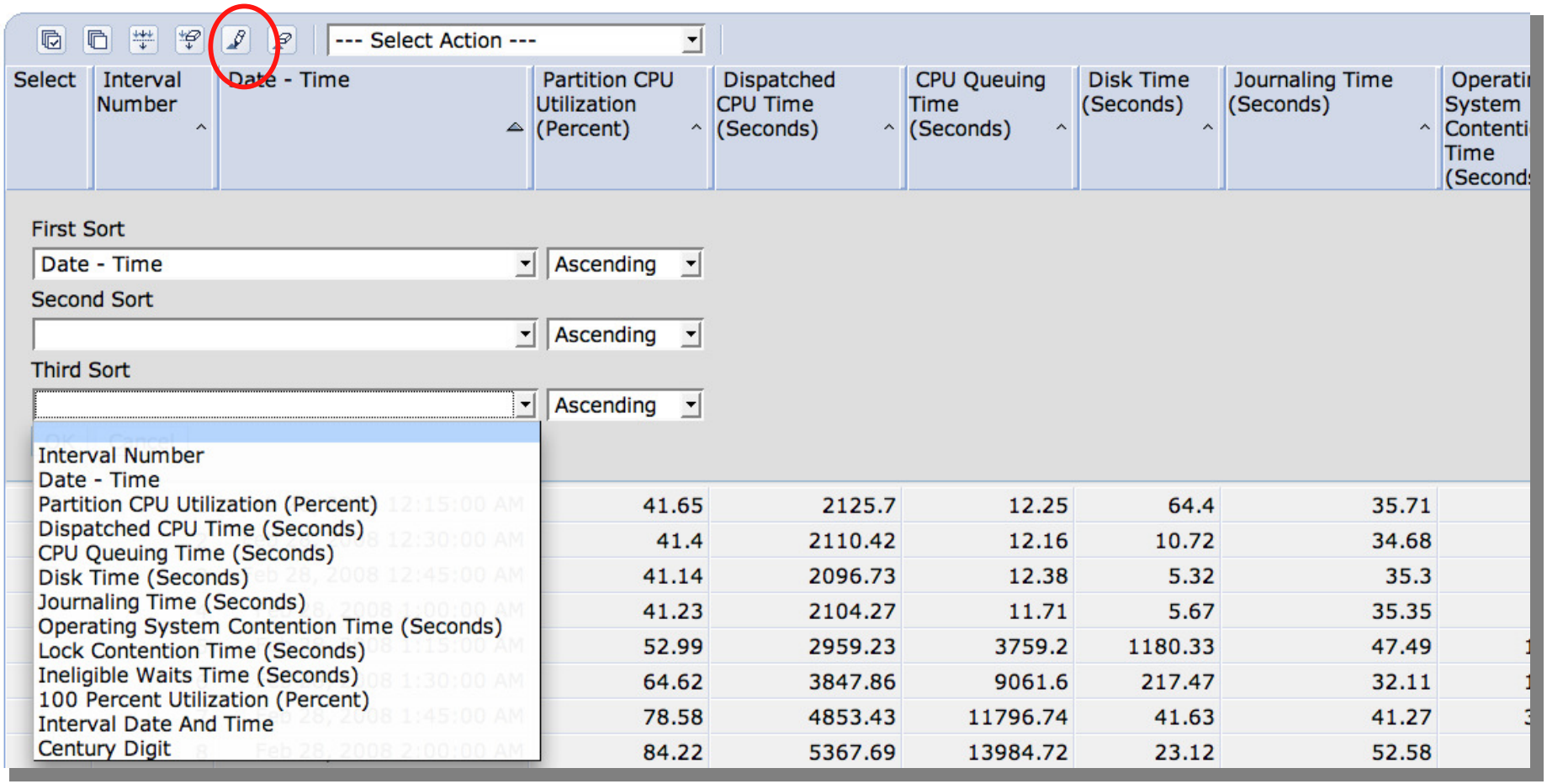
Sorting



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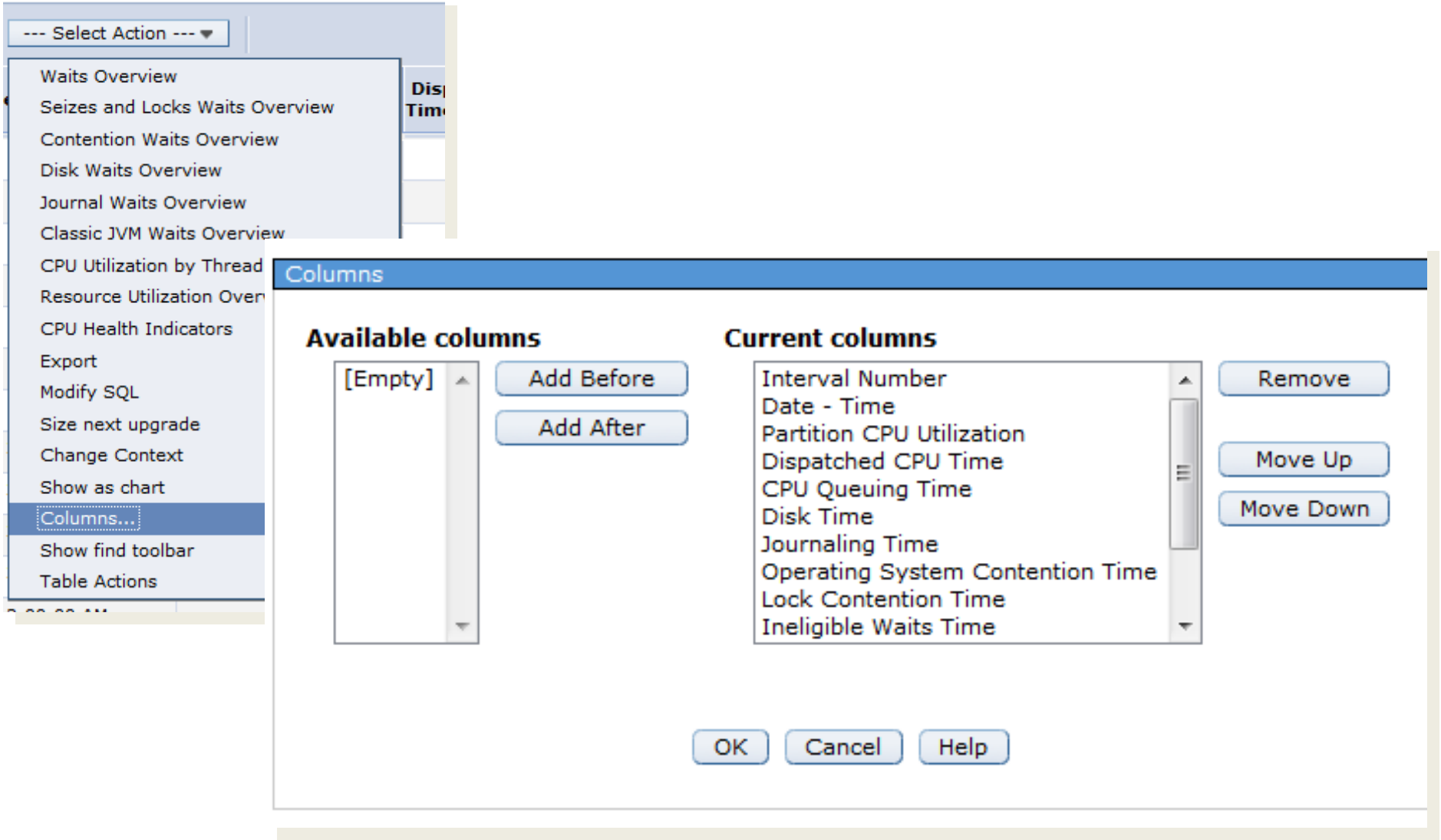
Columns …



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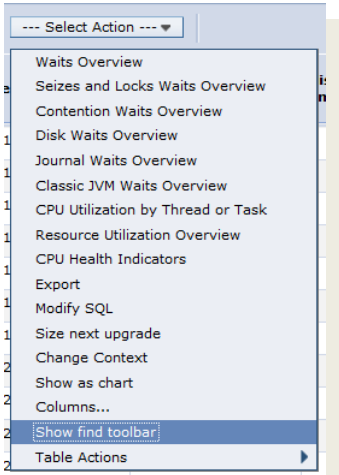
Show find toolbar / Hide find toolbar

Search the table



CPU Utilization and Waits Overview

Perspective | Edit | View | History

Collection
Name(s): Q067000002
Library: QPFRDATA
Type: Collection Services File Based Collection
File level: 36

Time
Start: Mar 8, 2013 12:00:02 AM
End: Ongoing

System
Name:
Release: V7R1M0

Search for: | Condition: Contains | Column: All columns | Direction: Down

Find | Match case

--- Select Action ---

Select	Interval Number	Date - Time	Partition CPU Utilization (Percent)	Dispatched CPU Time (Seconds)	CPU Q Time (
	1	Mar 8, 2013 12:15:00 AM	0.13	32.95	
	2	Mar 8, 2013 12:30:00 AM	0.02	5.61	

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New Table Support

- The latest PTFs enable improved table support
  - Collection manager and PDI Reports use the new table support
  - “Show as table” still uses the old table support

Manage Collections - Etc3t1.rchland.ibm.com

Actions | Filter

Name	Library	Type	Status	Started	Ended	Size MB	System
No filter applied							
Q081000002	QPFRDATA	Collection Services File Based Collection	Complete	3/22/13 1:00:02 AM	3/23/13 1:00:00 AM	218.023	ETC3
Q082000002	QPFRDATA	Collection Services *MGTCOL Obj Based Cc	Complete	3/23/13 1:00:02 AM	3/24/13 1:00:02 AM	151.332	ETC3
Q082000002	QPFRDATA	Collection Services File Based Collection	Complete	3/23/13 1:00:02 AM	3/24/13 1:00:00 AM	217.023	ETC3
Q083000002	QPFRDATA	Collection Services *MGTCOL Obj Based Cc	Complete	3/24/13 1:00:02 AM	3/25/13 1:00:02 AM	156.332	ETC3
Q083000002	QPFRDATA	Collection Services File Based Collection	Complete	3/24/13 1:00:02 AM	3/25/13 1:00:00 AM	220.023	ETC3
Q084000002	QPFRDATA	Collection Services *MGTCOL Obj Based Cc	Complete	3/25/13 1:00:02 AM	3/26/13 1:00:02 AM	156.332	ETC3
Q084000002	QPFRDATA	Collection Services File Based Collection	Complete	3/25/13 1:00:02 AM	3/26/13 1:00:00 AM	219.523	ETC3
Q066000002	QPFRDATA	Collection Services File Based Collection	Complete	3/7/13 12:00:02 AM	3/8/13 12:00:00 AM	233.281	ETC3
Q085000002	QPFRDATA	Collection Services *MGTCOL Obj Based Cc	Complete	3/26/13 1:00:02 AM	3/27/13 1:00:02 AM	160.332	ETC3
Q085000002	QPFRDATA	Collection Services File Based Collection	Complete	3/26/13 1:00:02 AM	3/27/13 1:00:00 AM	225.652	ETC3
Q086000002	QPFRDATA	Collection Services *MGTCOL Obj Based Cc	Complete	3/27/13 1:00:02 AM	3/28/13 1:00:02 AM	158.332	ETC3
Q086000002	QPFRDATA	Collection Services File Based Collection	Complete	3/27/13 1:00:02 AM	3/28/13 1:00:00 AM	225.523	ETC3
Q087000002	QPFRDATA	Collection Services *MGTCOL Obj Based Cc	Active	3/28/13 1:00:02 AM		2.094	ETC3
Q087000002	QPFRDATA	Collection Services File Based Collection	Active	3/28/13 1:00:02 AM		3.602	ETC3
Q073000002	QPFRDATA	Collection Services File Based Collection	Complete	3/14/13 1:00:02 AM	3/15/13 1:00:00 AM	220.515	ETC3

1 - 22 of 22 items 5 | 10 | 25 | 50 | **100** | All 1

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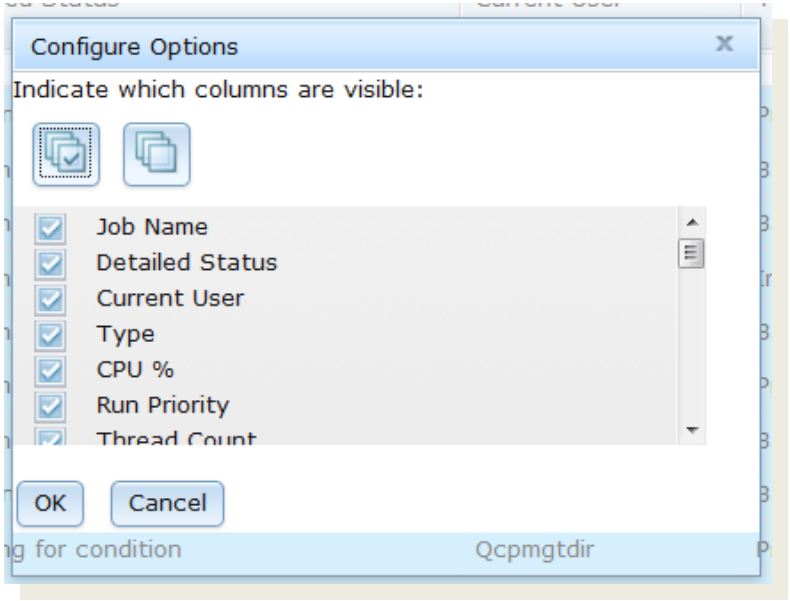
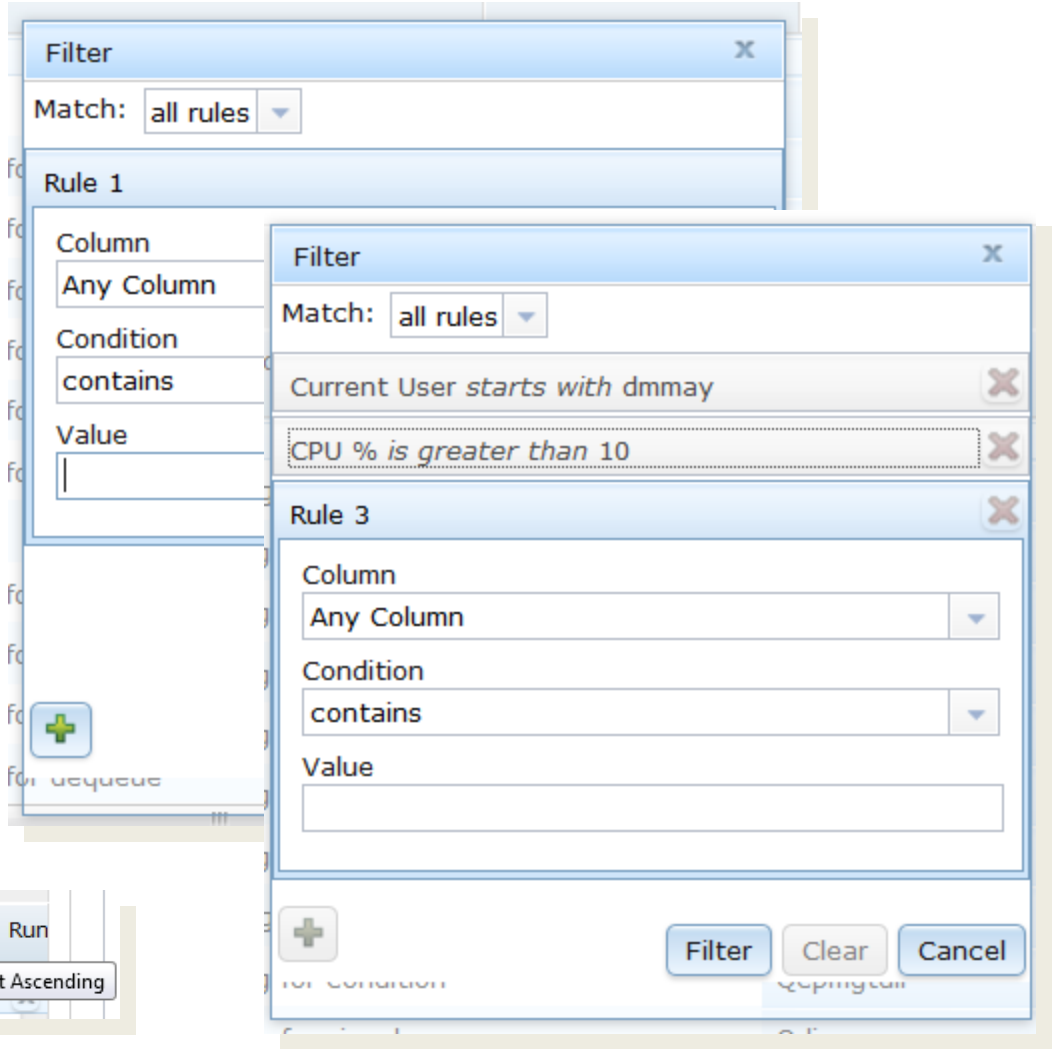
New Table Support – Same Features, New UI

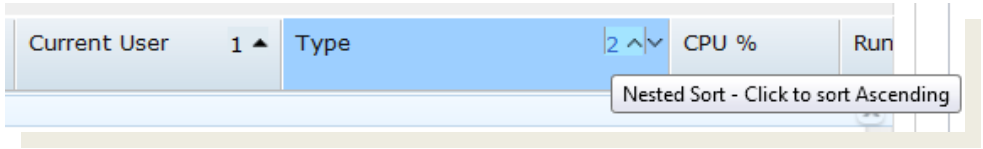
Configure Options for Columns



Filter column data



Sort Columns



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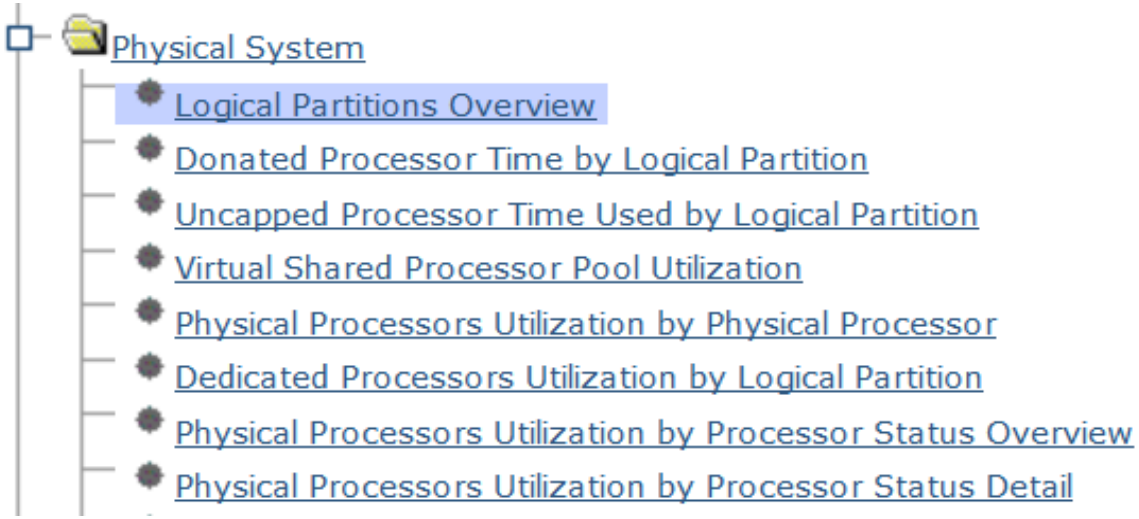
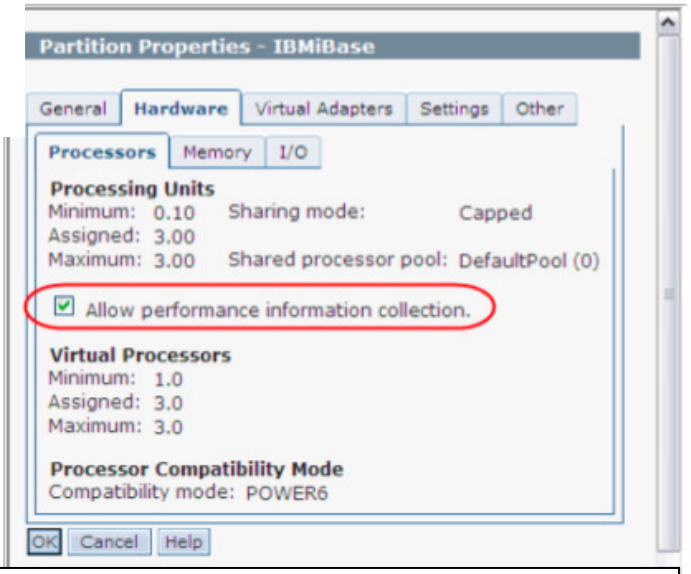
Physical System Charts – Frame view of Performance!

Collection Services has the ability to collect certain high-level cross-partition processor performance metrics for all logical partitions on the same single physical server regardless of operating system. This is available on Power 6 and above servers, with a minimum firmware level xx340_061. When this data is available, it can be viewed via several perspectives found under "Physical System".



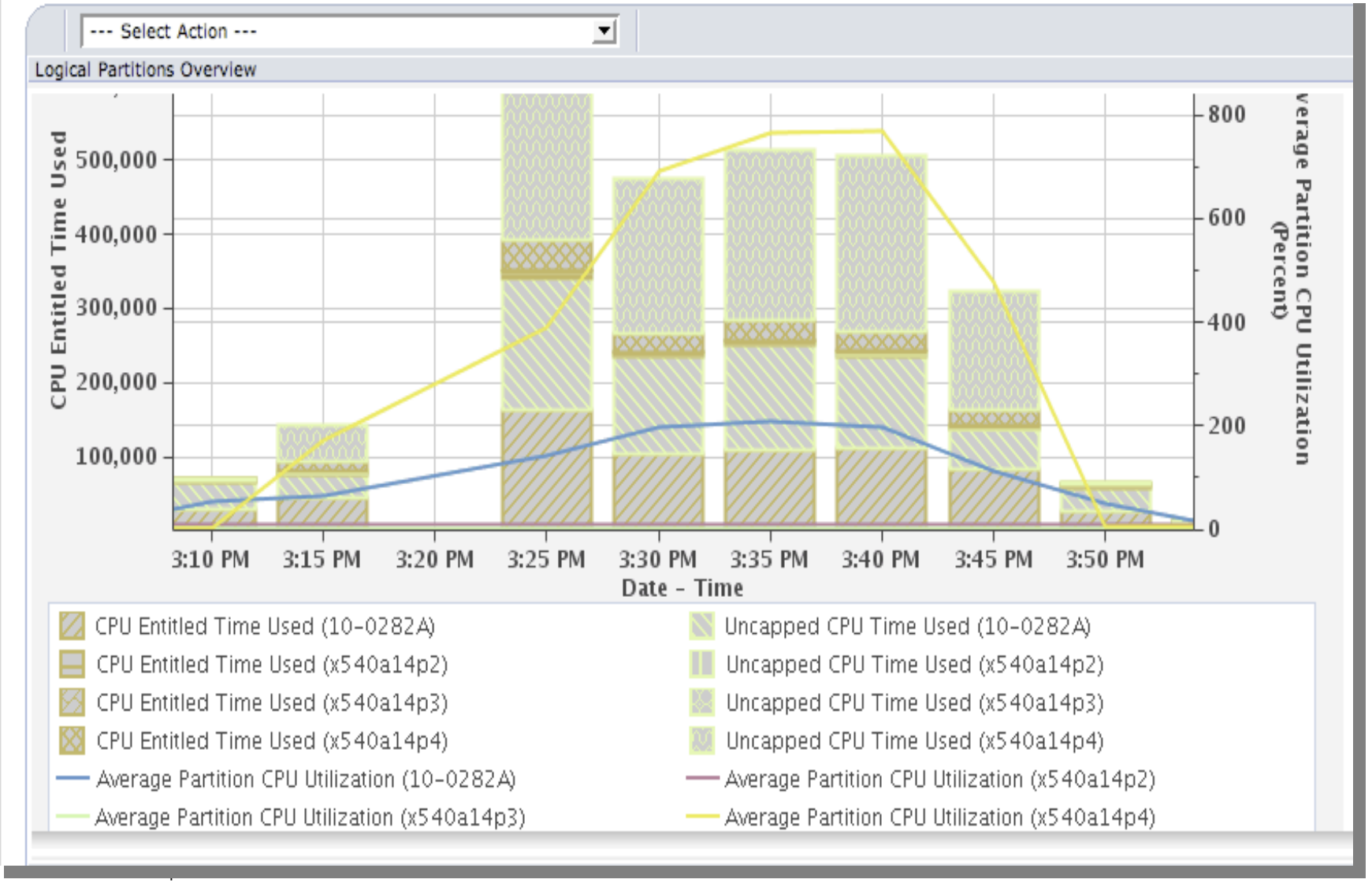


HMC option to enable performance collection must be turned on for the IBM i partition to collect the data

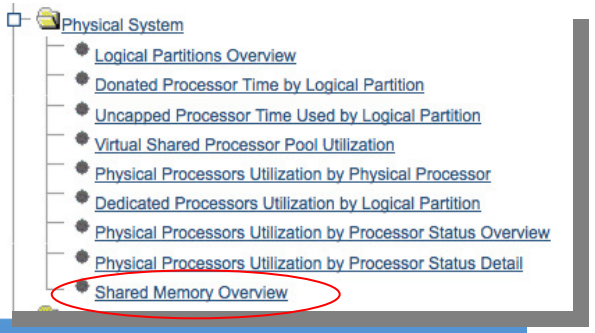
http://ibmsystemsmag.blogs.com/i_can/2009/10/i-can-display-cpu-utilization-for-all-partitions.html

Logical Partitions Overview

Requires Power 6 and IBM i 6.1 or later



Shared Memory Overview



Shared Memory Overview

Perspective | Edit | View | History

Collection

Name(s): AMS1
Library: AMSD
Type: Collection Services File Based Collection

Time

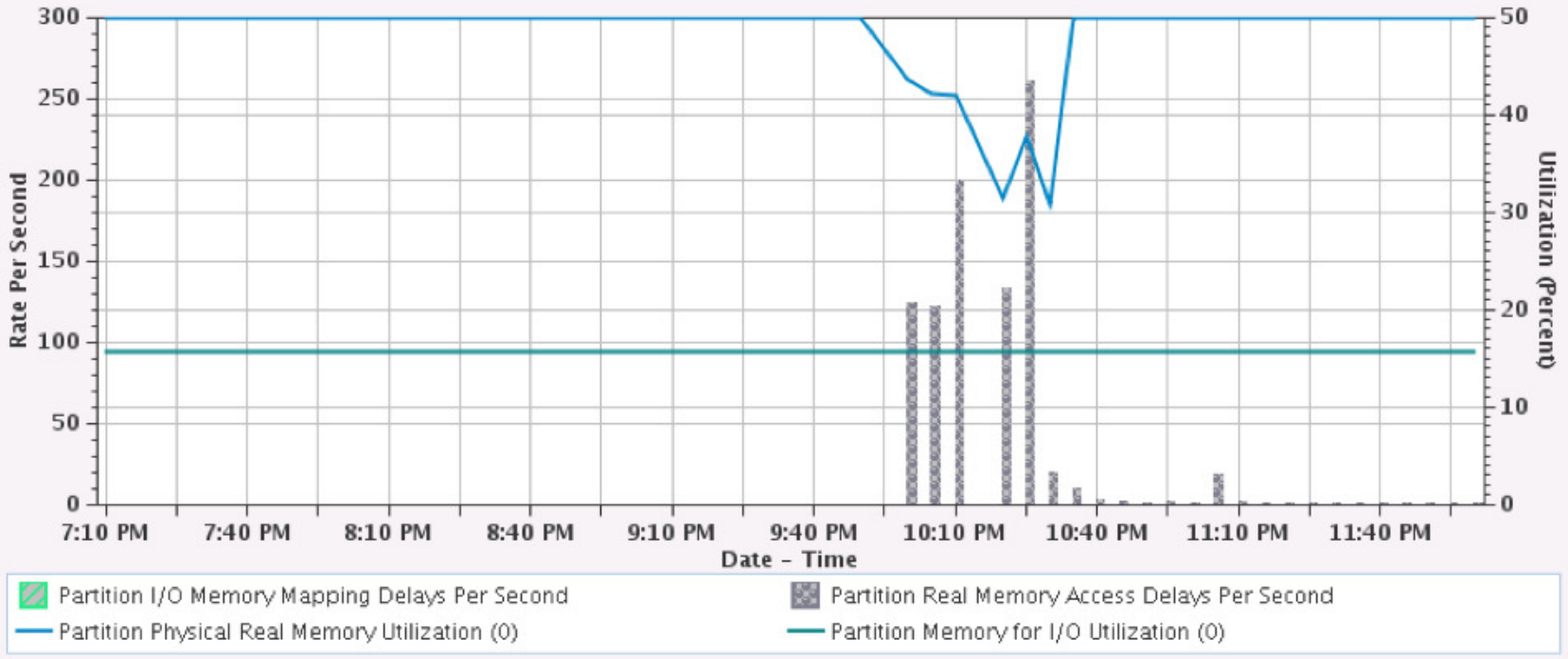
Start: Aug 11, 2008 7:06:22 PM
End: Aug 12, 2008 12:00:05 AM

System

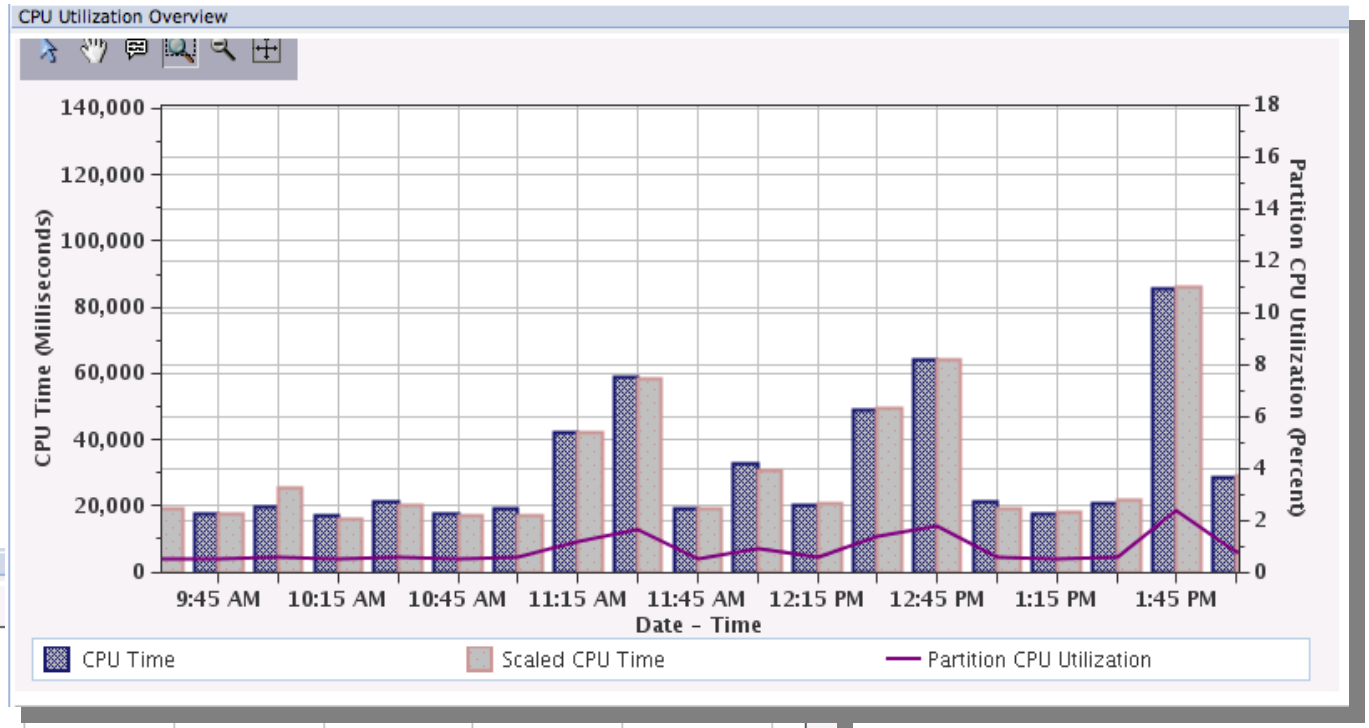
Name: A
Release: V6R1M0

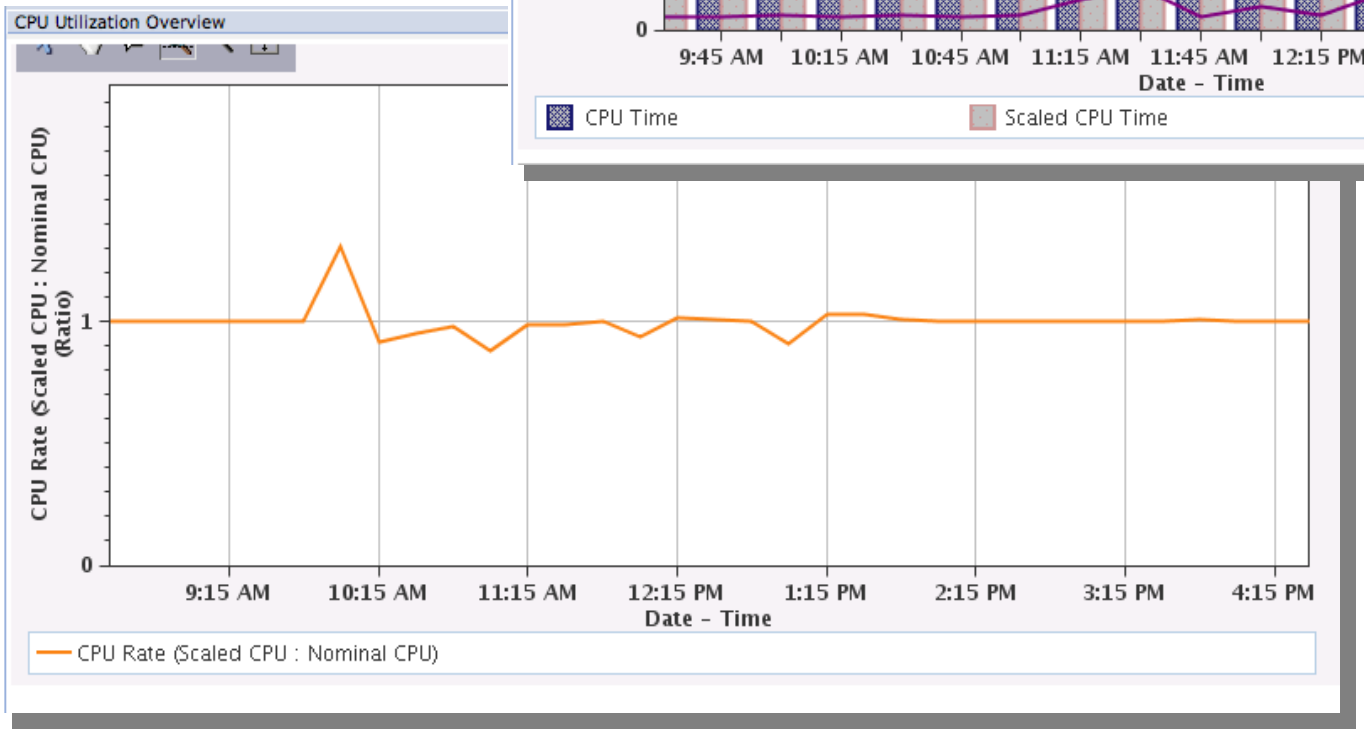
--- Select Action ---

Shared Memory Overview



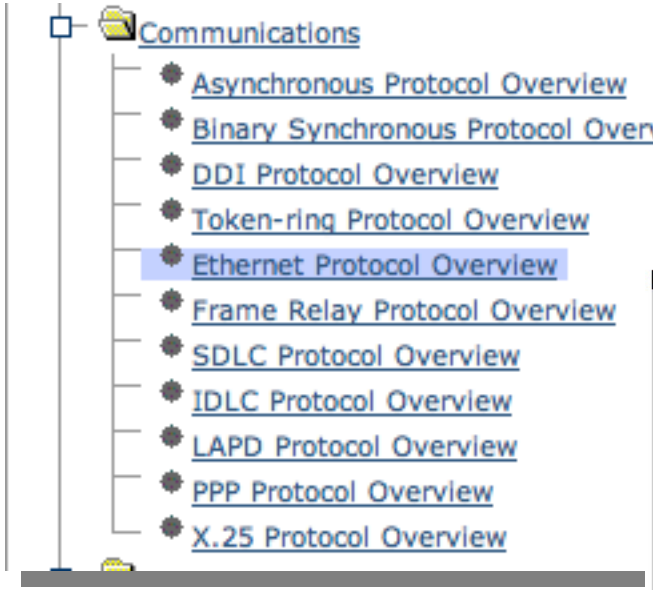
Scaled CPU

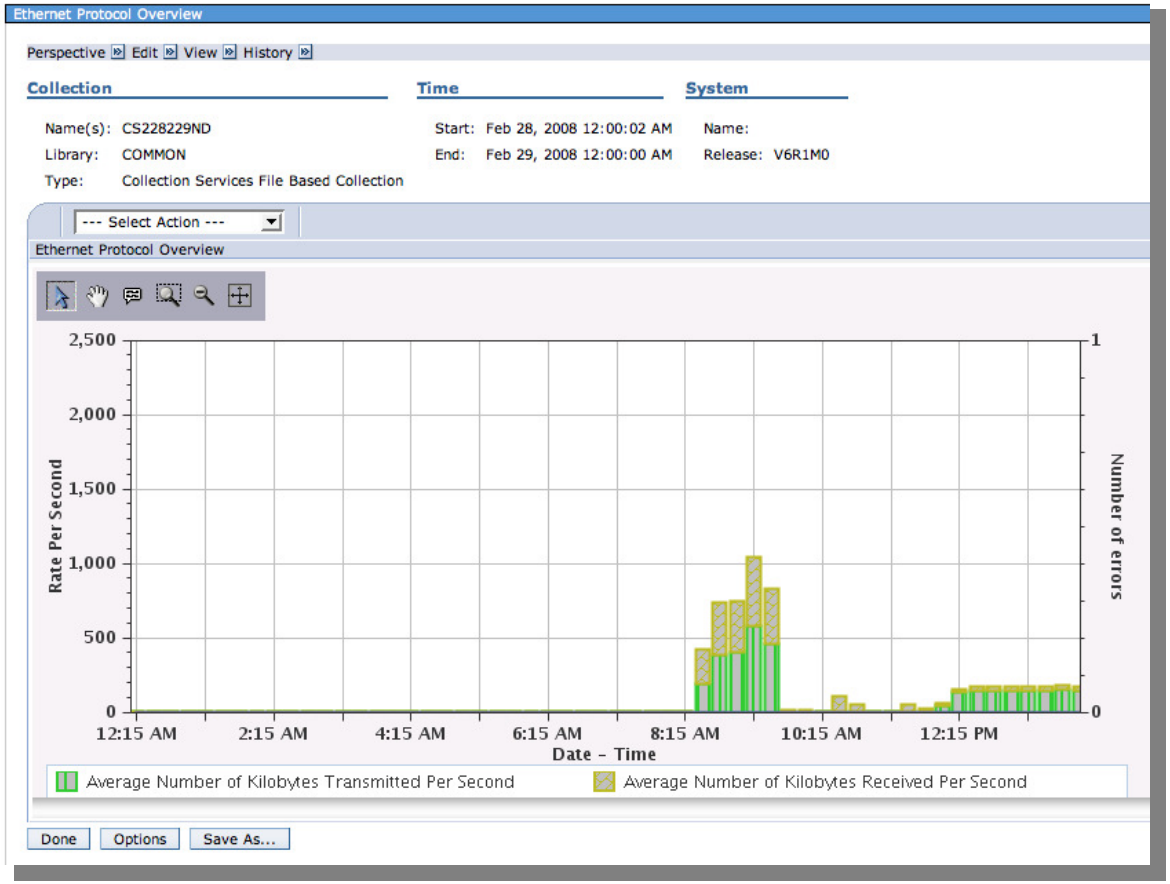




http://ibmsystemsmag.blogs.com/i_can/2010/03/i-can-understand-scaled-cpu-time.html

Communications Perspectives





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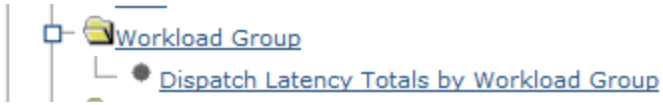
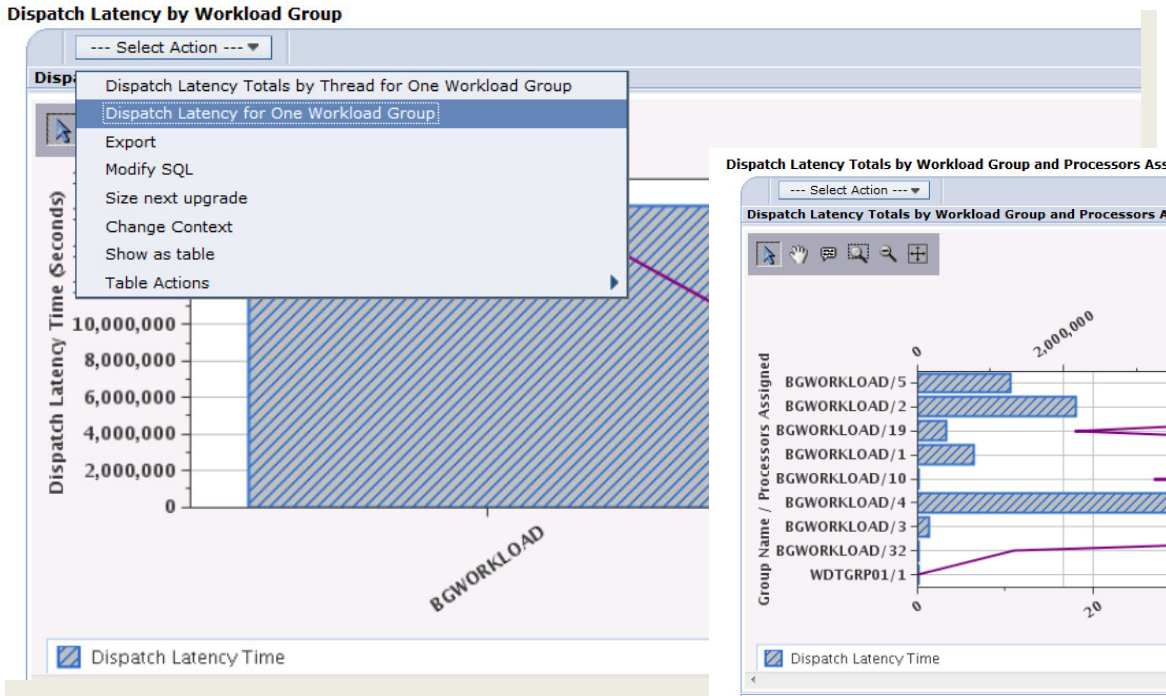
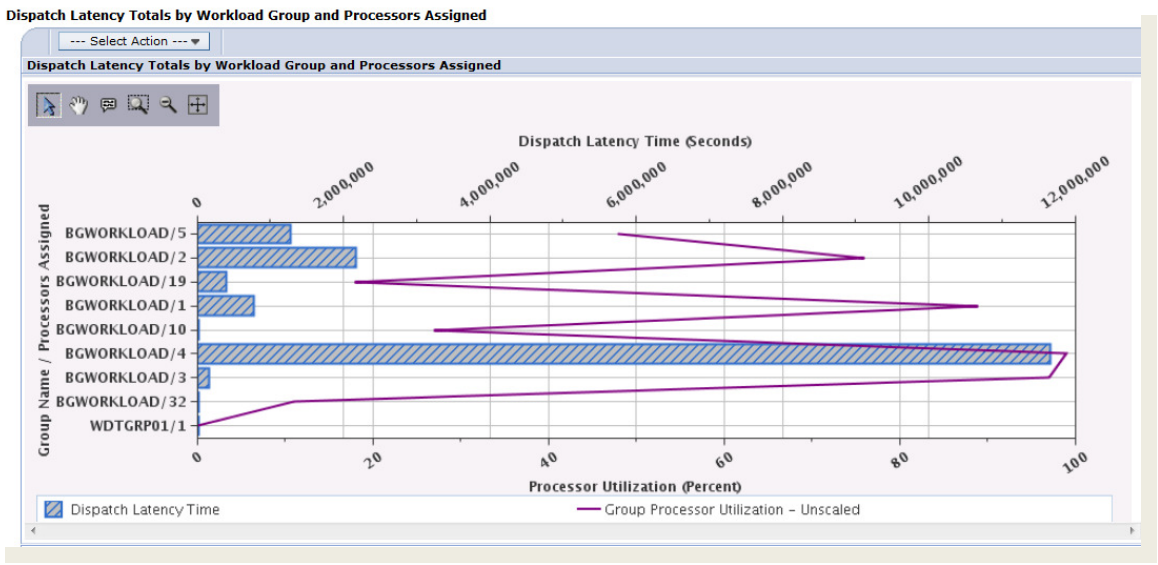
Workload Group Perspectives



- Workload group performance metrics are collected by Collection Services in the QAPMSYSWLC file
  http://pic.dhe.ibm.com/infocenter/iseries/v7r1m0/topic/rzahx/rzahxqapmsyswlc.htm
- PDI has some graphs to display workload group dispatch latency





Description

This chart shows an overview of workload group dispatch latency. It shows the total delay time for each workload group. This is the amount of time threads that were ready to run could not be dispatched due to the group's maximum concurrent processor limit.

Integrated Workload group data

Added Workload Delay and Group information to some charts on job data

Workload group delay time

- The amount of time this thread could not be dispatched due to workload group.

Workload group

- The identifier for the workload group this thread belonged to at the time this data was sampled.

CPU Utilization by Job or Task

--- Select Action ---

Select	Job Number	CPU Utilization (Percent)	CPU Time (Milliseconds)	Scaled CPU Utilization (Percent)	Scaled CPU Time (Milliseconds)	Workload Group Delay Time (Milliseconds)	Job Type	Job Subtype
	392352	0	1826	0	1826	2509313	B	
	394767	0	1826	0	1826	2514772	B	
	393796	0	1826	0	1826	2511459	B	
	393955	0	1826	0	1826	2515482	B	

CPU → CPU Utilization by Job or Task

CPU Utilization by Thread or Task

Perspective Edit View History

Collection
Name(s): Q341000005
Library: WLCTEST
Type: Collection Services File Based Collection
File level: 36

Time
Start: Dec 7, 2010 12:00:05 AM
End: Dec 8, 2010 12:01:26 AM

System
Name: RCHPOST3
Release: V6R1M0

--- Select Action ---

Select	Scaled CPU Utilization (Percent)	Scaled CPU Time (Milliseconds)	Workload Group Delay Time (Milliseconds)	Workload Group ID	Job Type	Job Subtype	Minimum Job Pool	Maximum Job Pool
	0	1822	2517868	1	B		02	02
	0	1822	2519859	1	B		02	02
	0	1822	2515353	1	B		02	02

CPU → CPU Utilization by Thread or Task

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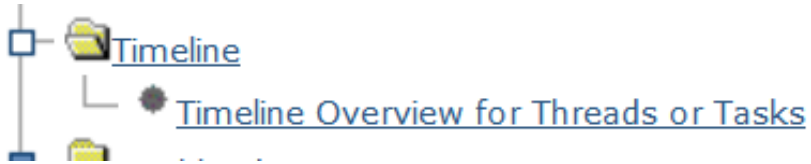
Timeline



- New Timeline perspective

  The timeline bars on the chart represent the elapsed time of threads or tasks
  - Dispatched CPU Time
  - CPU Queuing Time
  - Other Waits Time

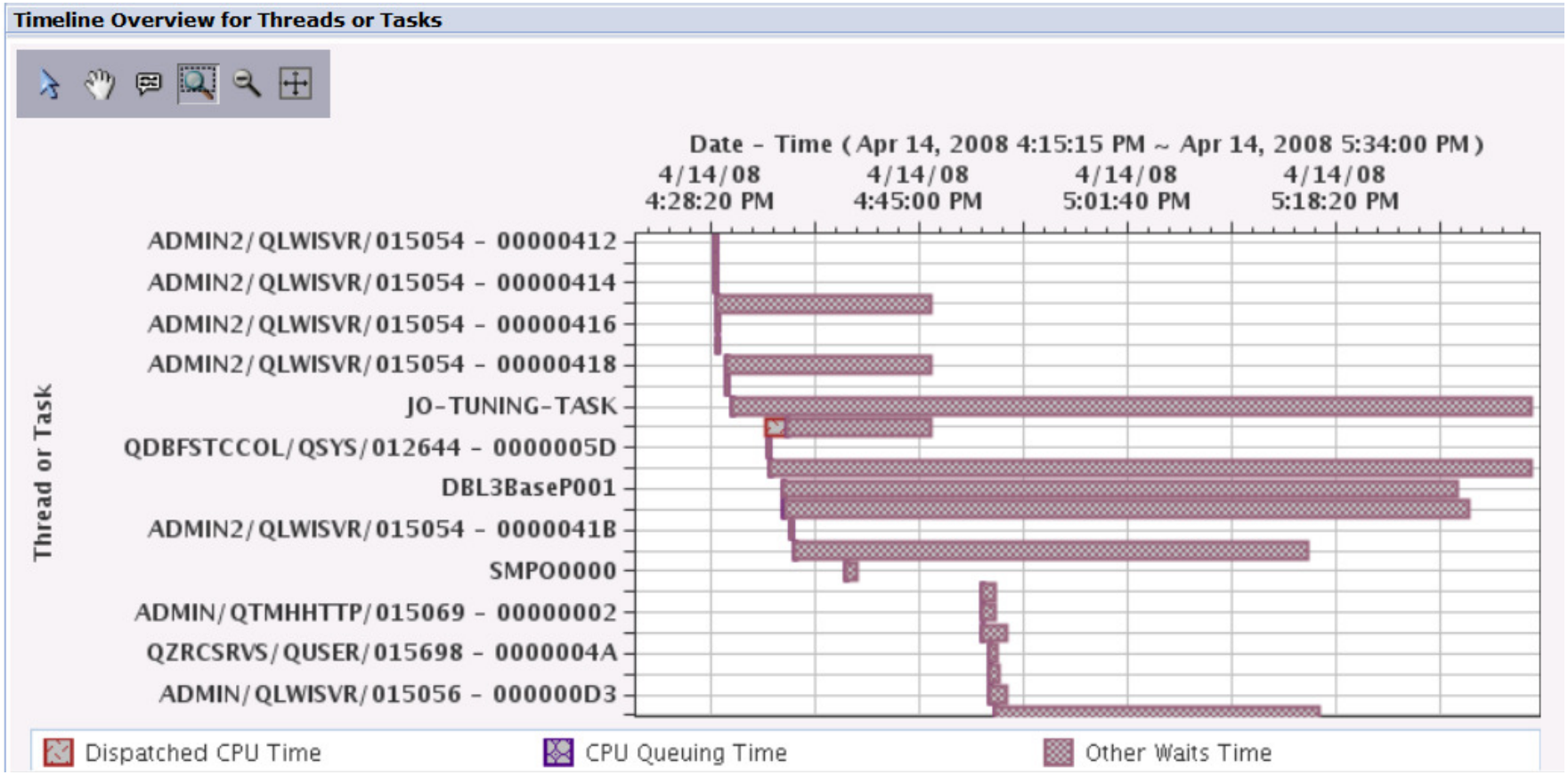
Selection

Name

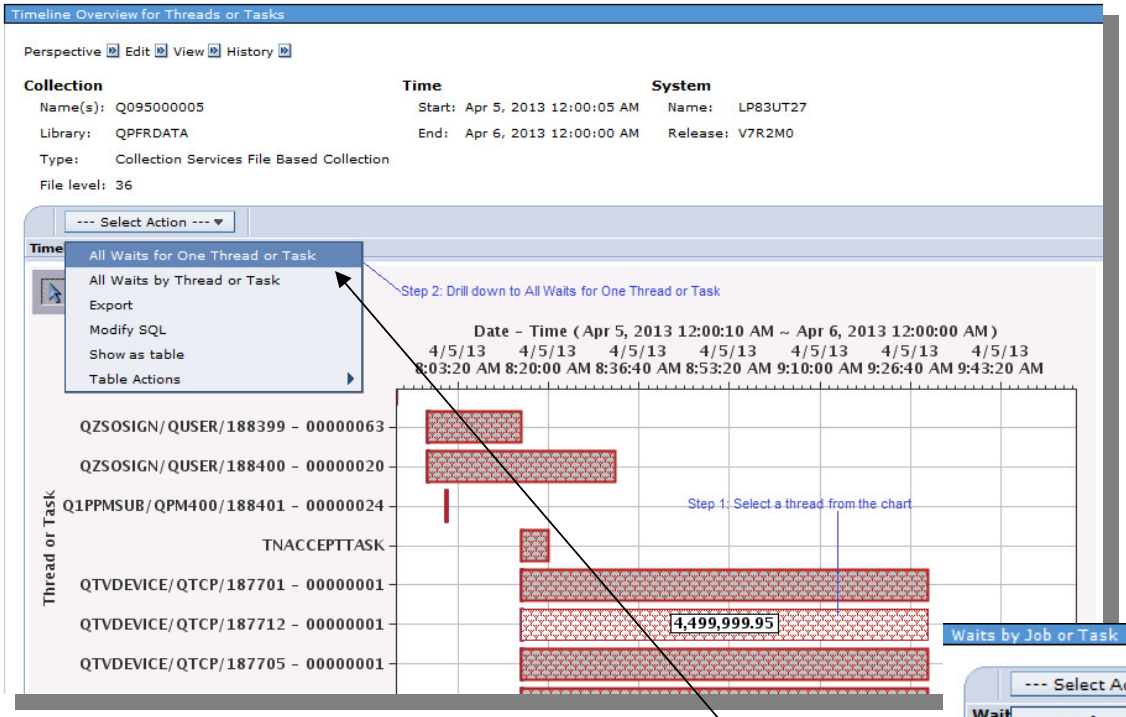
Timeline Overview for Threads or Tasks

Description

This chart shows the timeline overview for threads or tasks. Use this chart to select a thread or task for viewing its detailed run and wait contributions.



Timeline Overview for Threads or Tasks



Drilldown to this new chart from existing charts

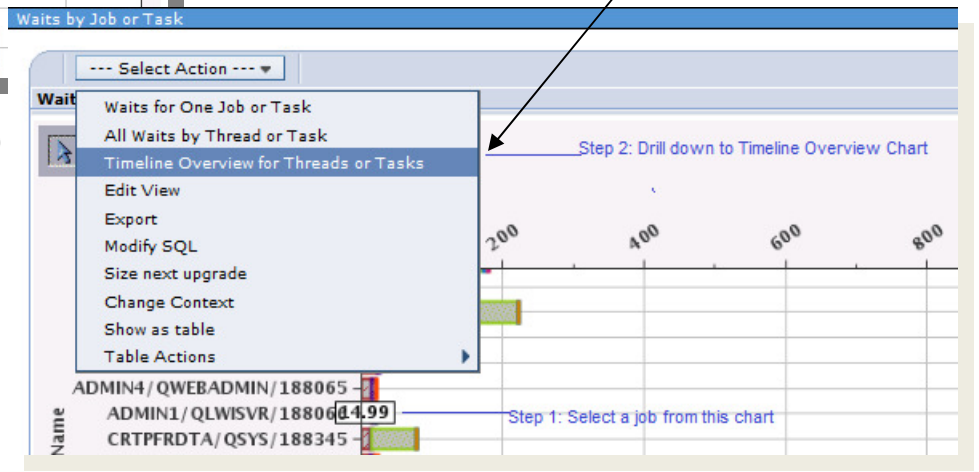
- Waits by Job or Task
- All Waits by Thread or Task

Select one thread or task and drill down to

"All Waits for One Thread or Task"

or

"All Waits by Thread or Task"



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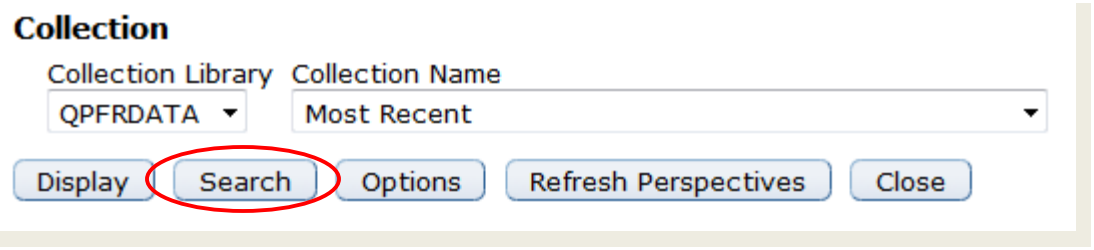
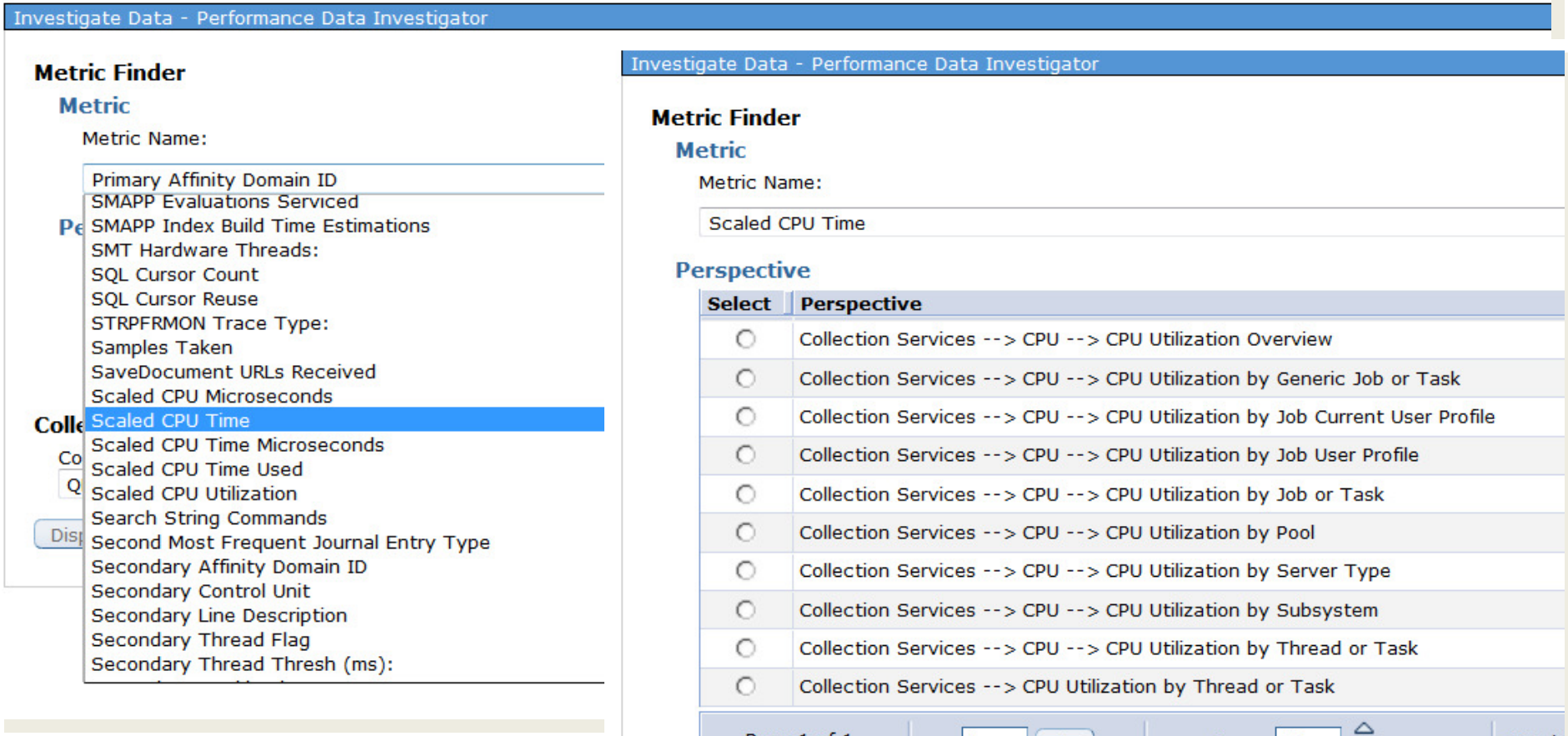
Metric Finder





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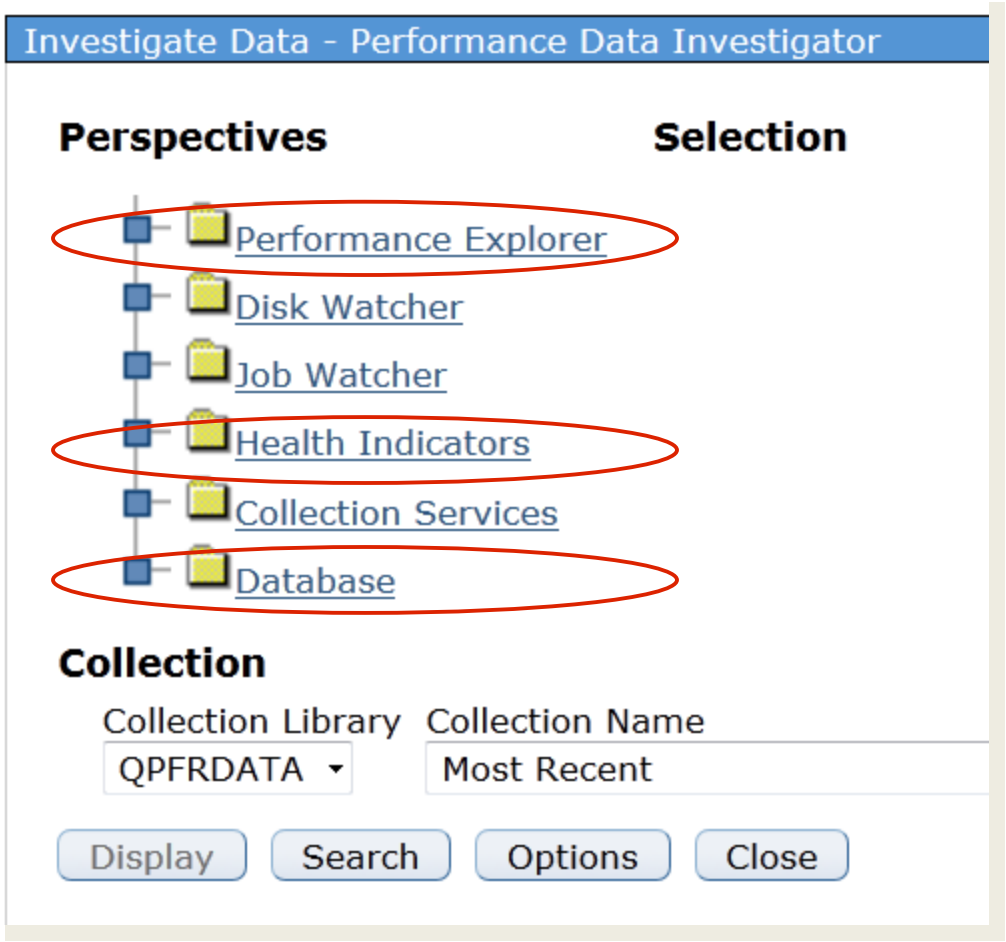
Additional Content Packages



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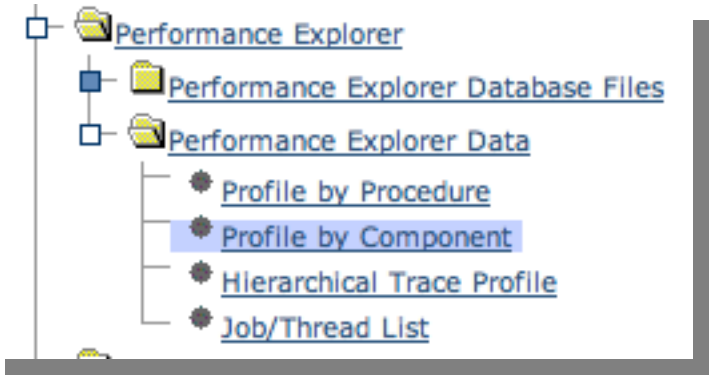
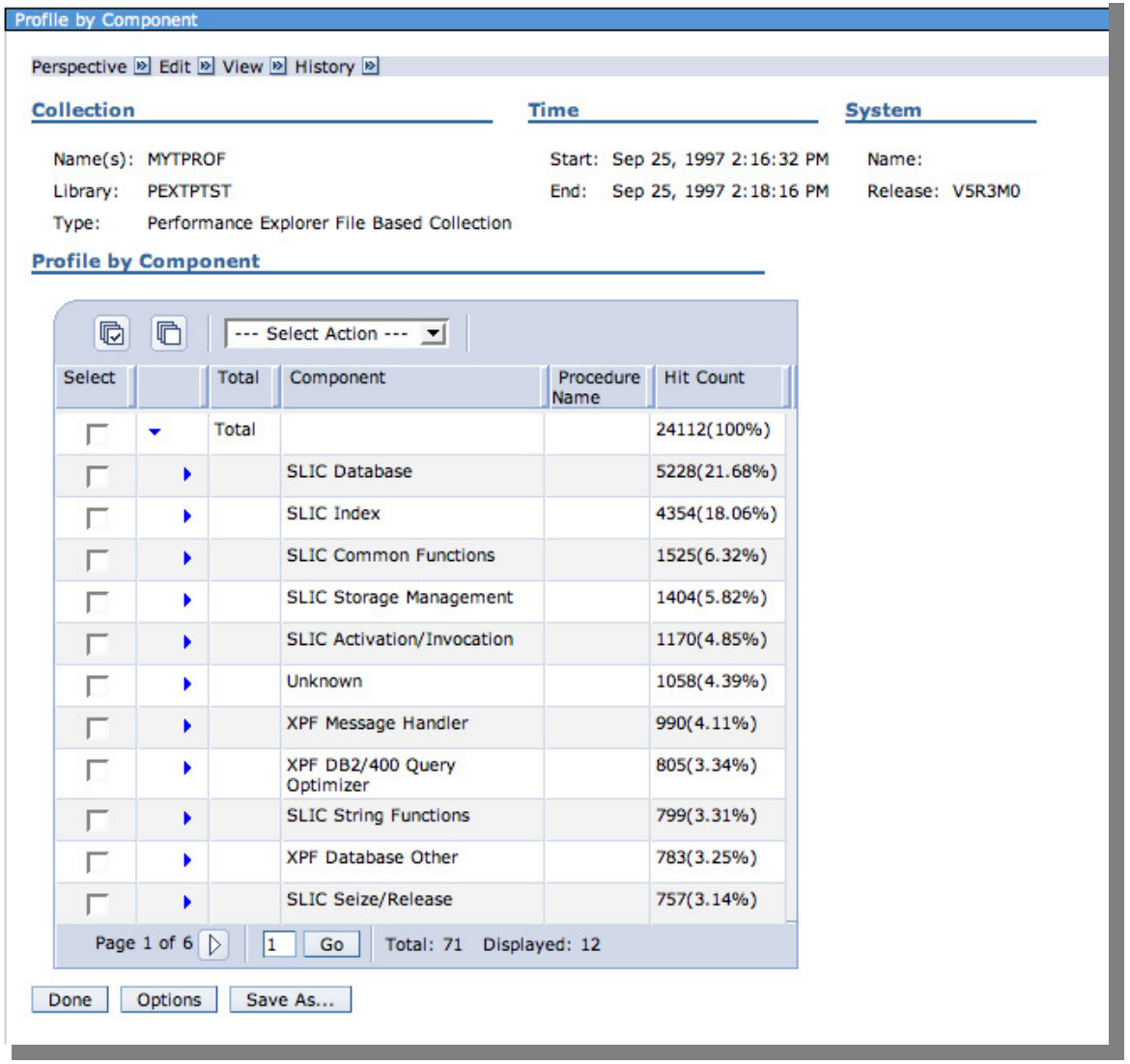
Performance Explorer





The Profile Perspectives provide function similar to what Performance Data Trace Visualizer offers

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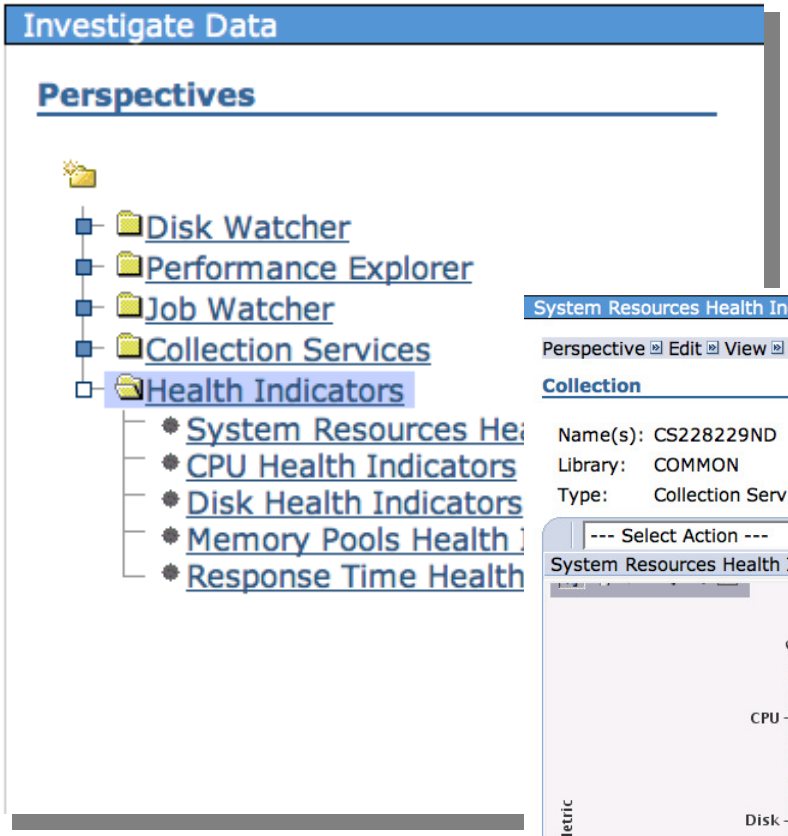
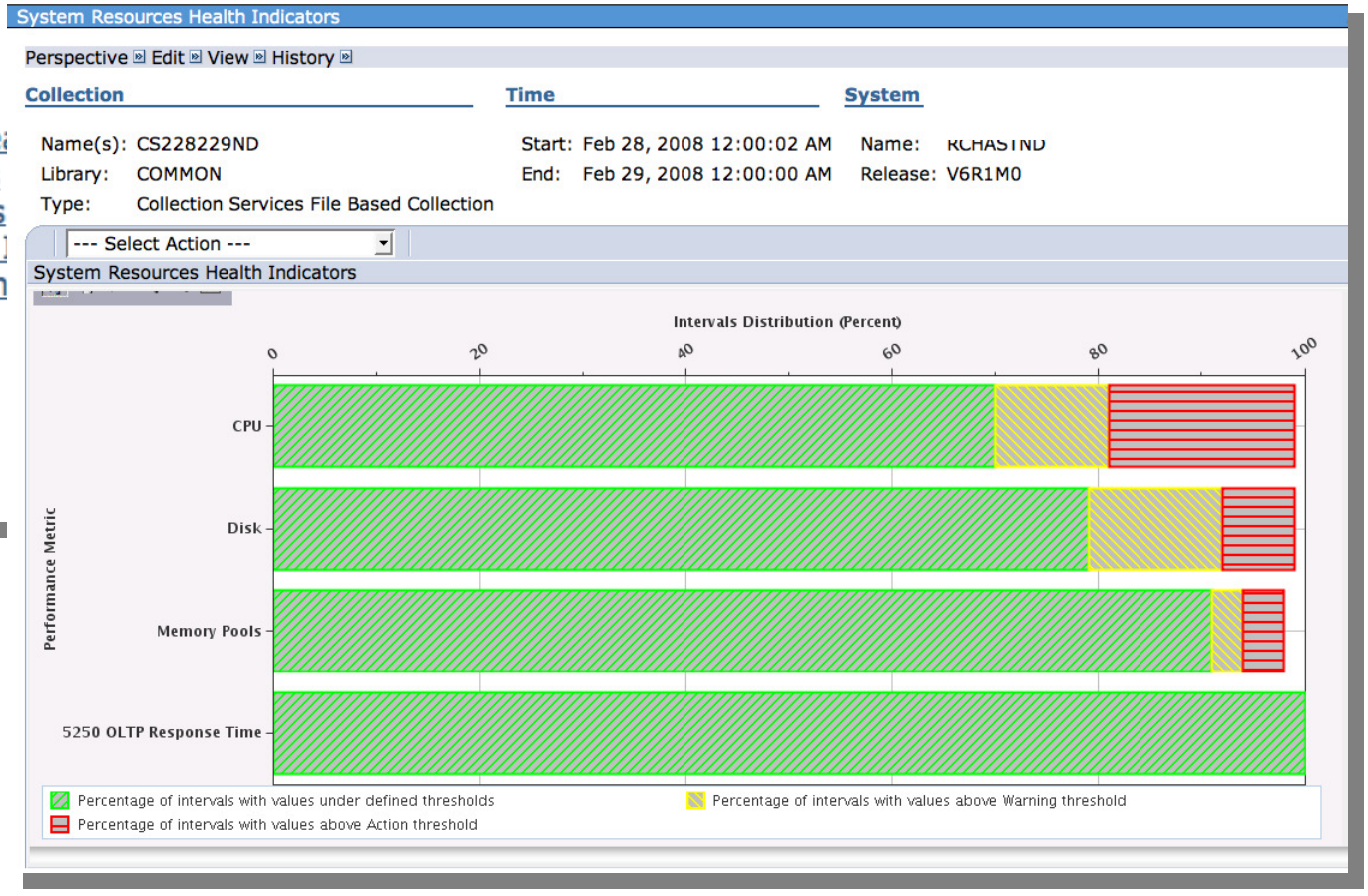
Health Indicators



System Resource Health Indicators



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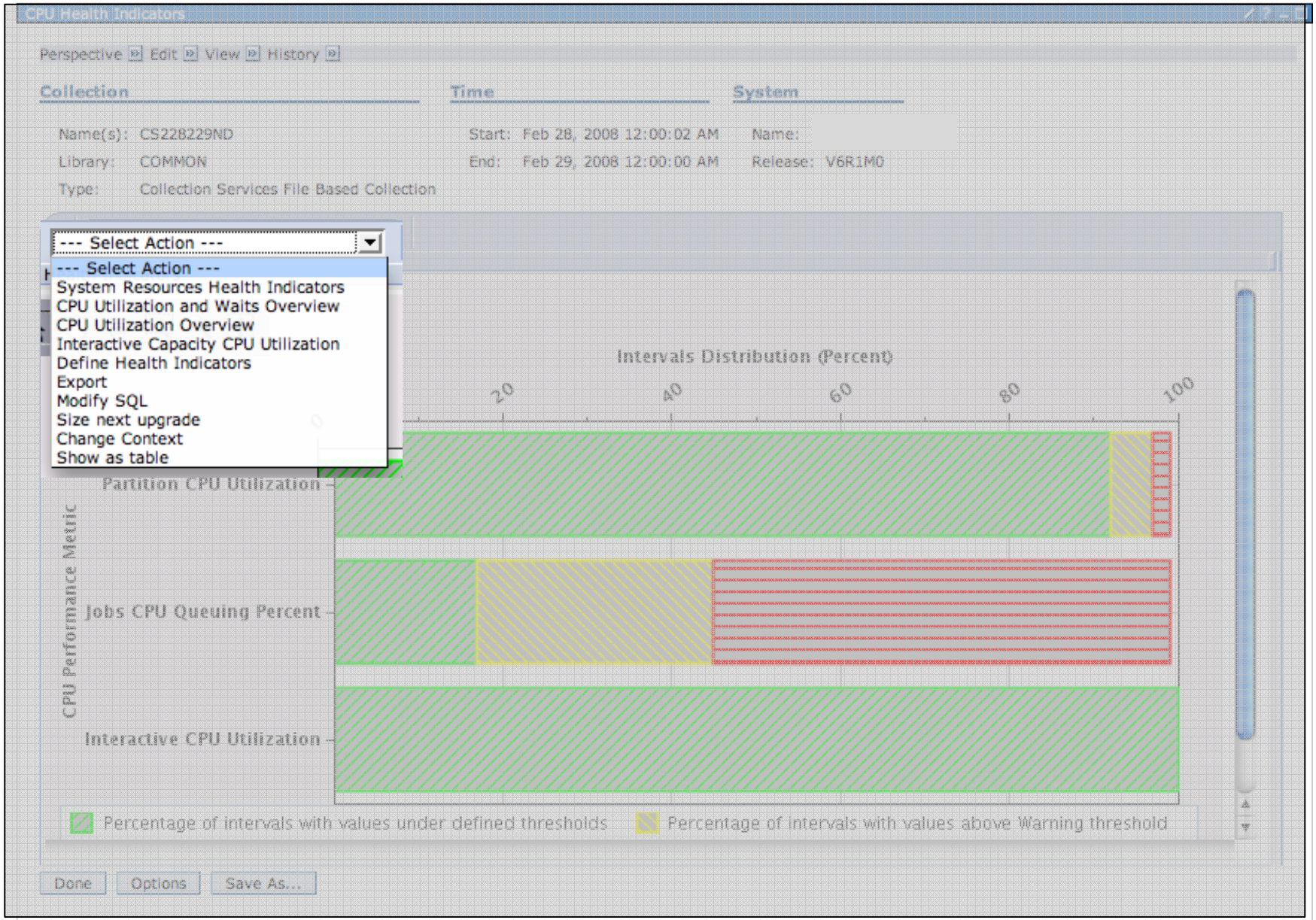
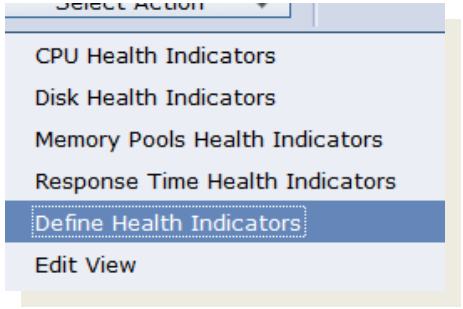
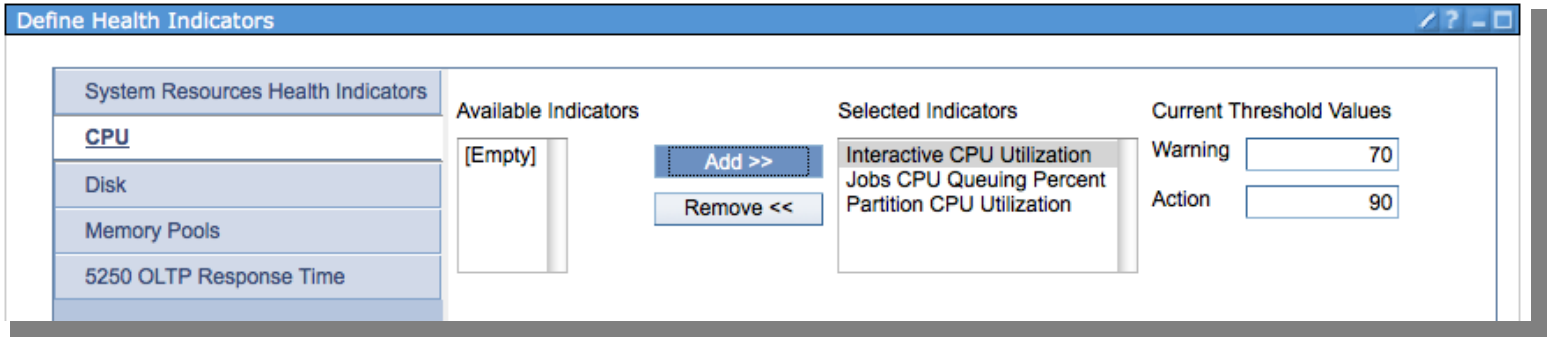
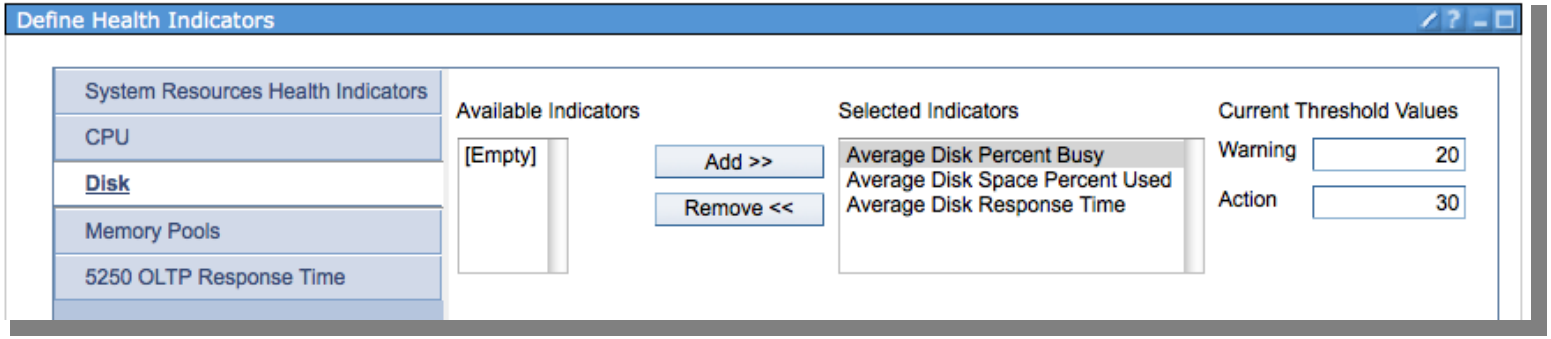
CPU Health Indicators

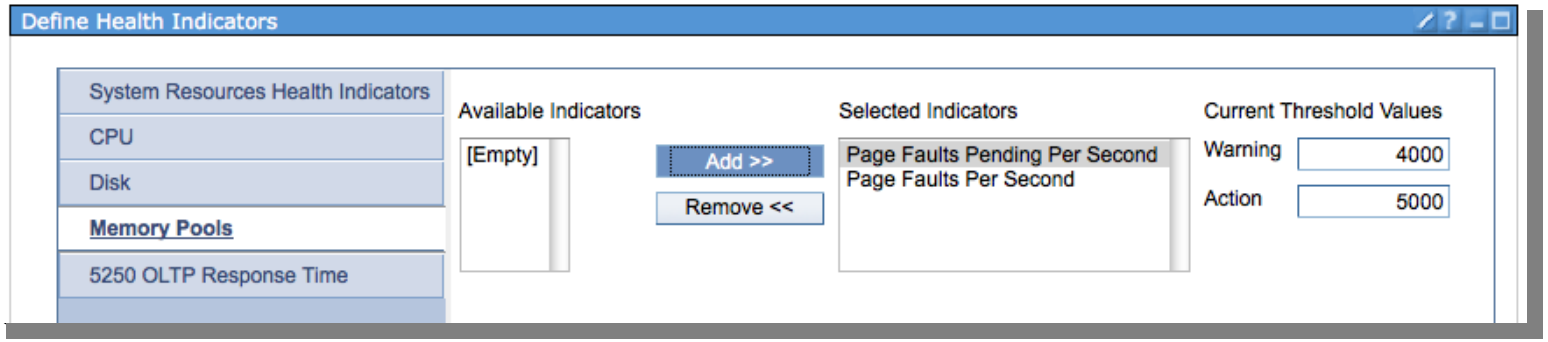


Define Health Indicators









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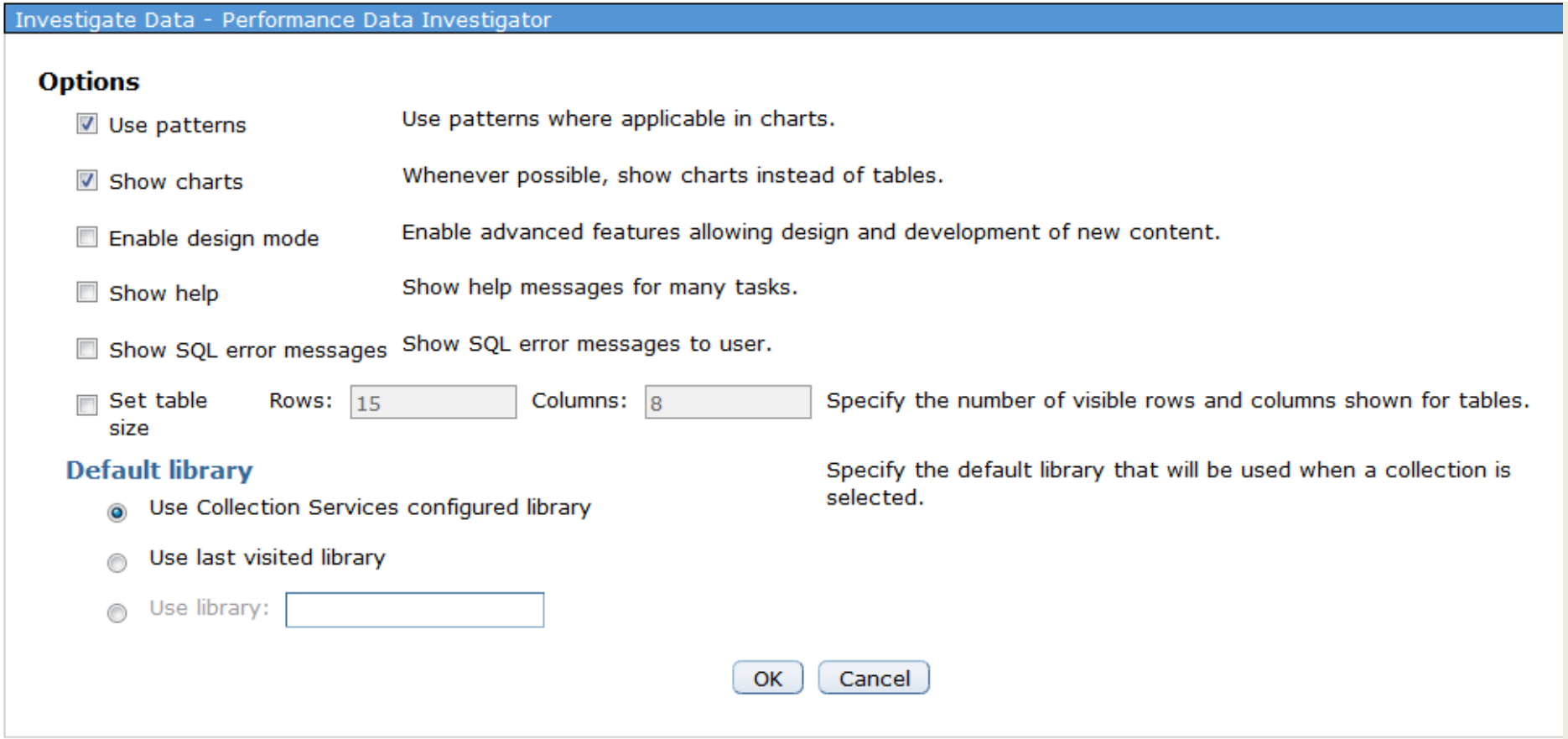
Options



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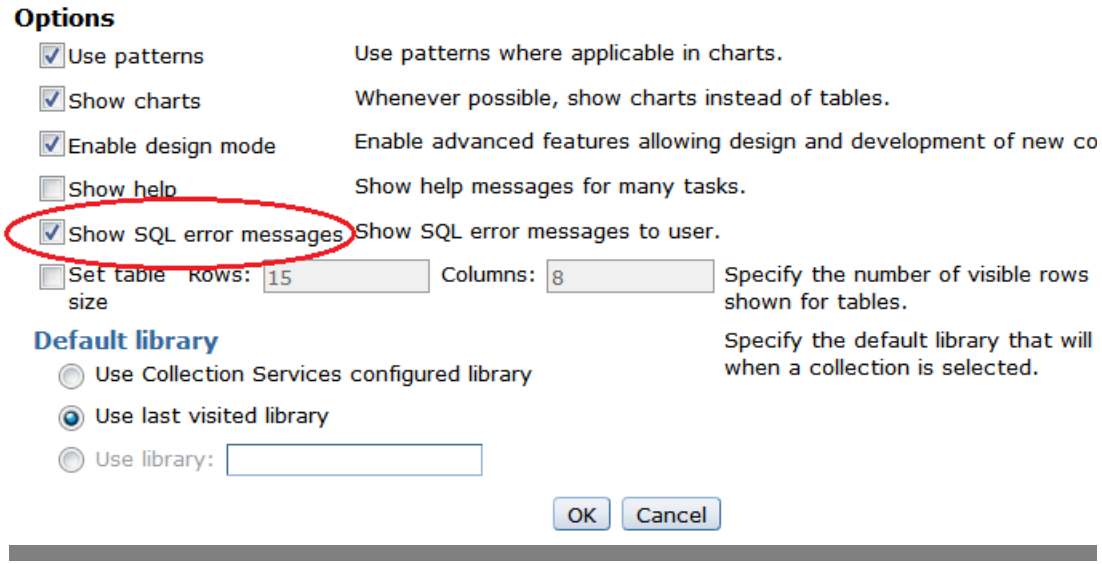
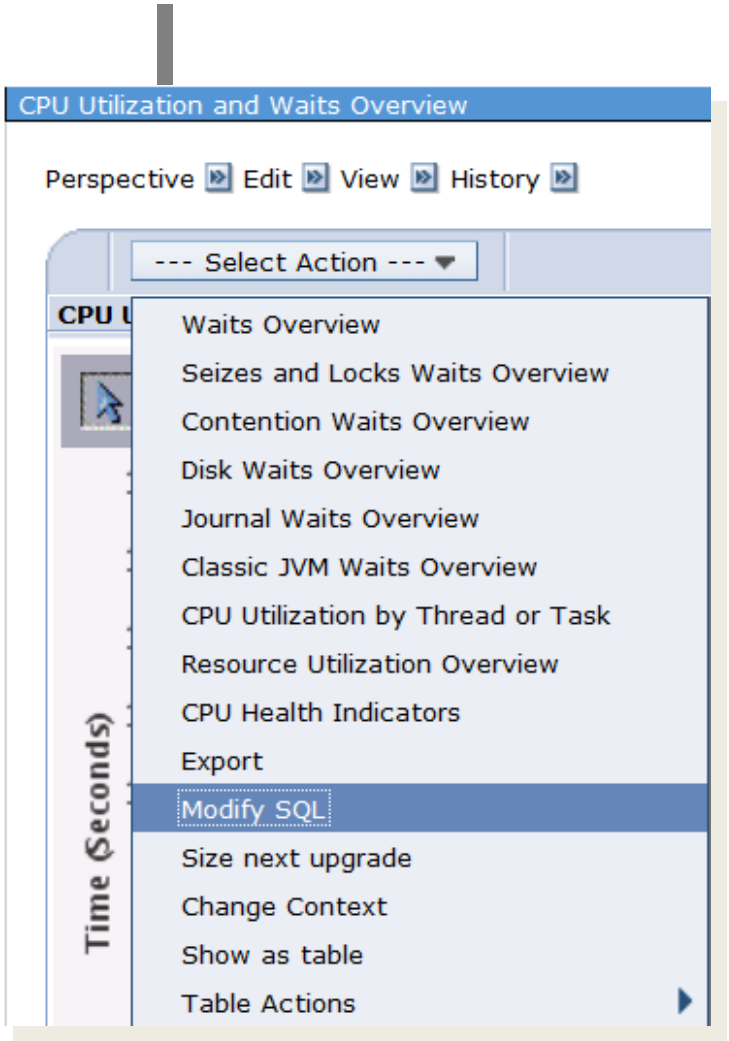
Option – Show SQL Error Messages





Check this Option

Modify SQL window will provide error message to help solve SQL errors.

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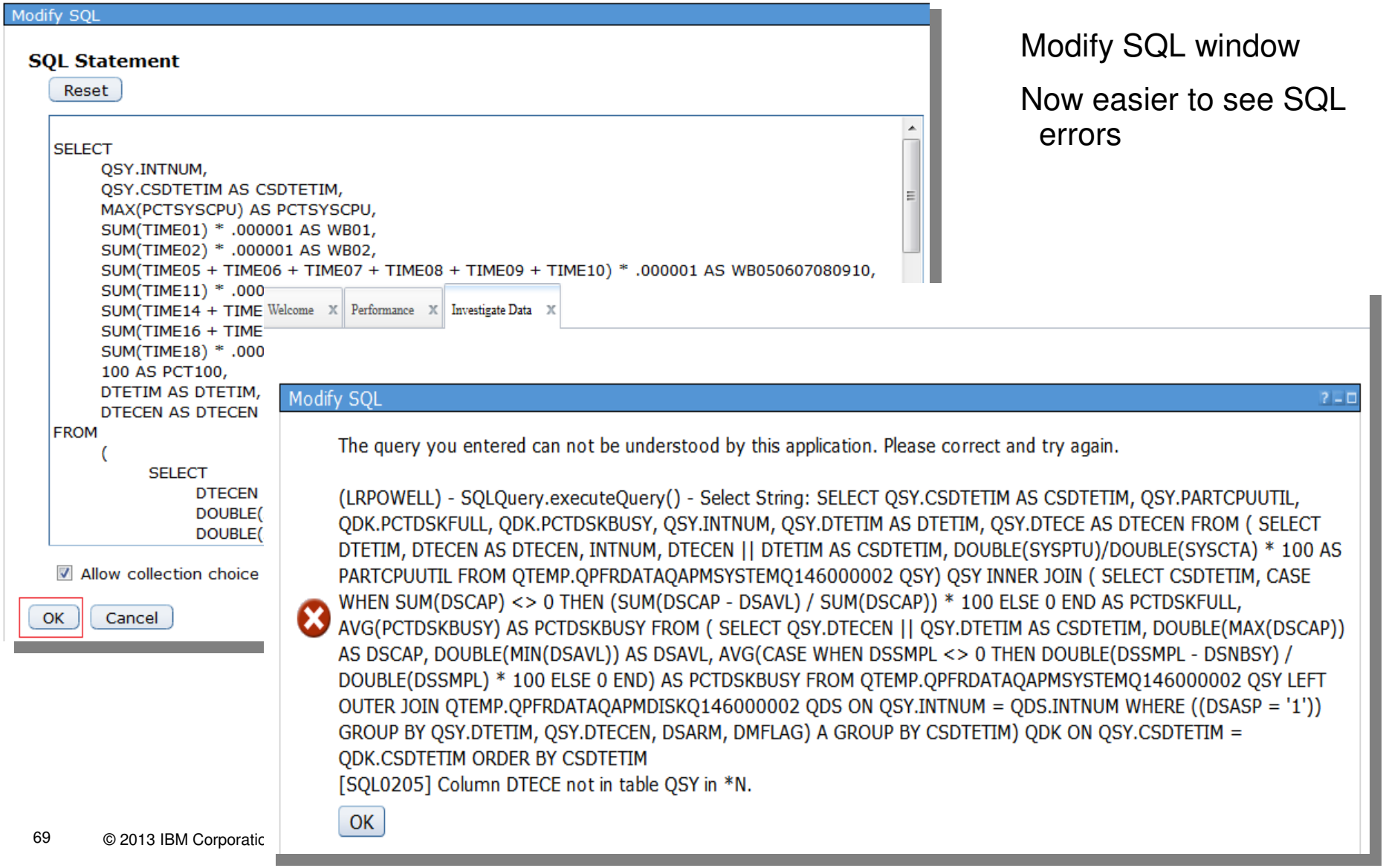
Show SQL Error Messages



- Modify SQL window
- Now easier to see SQL errors

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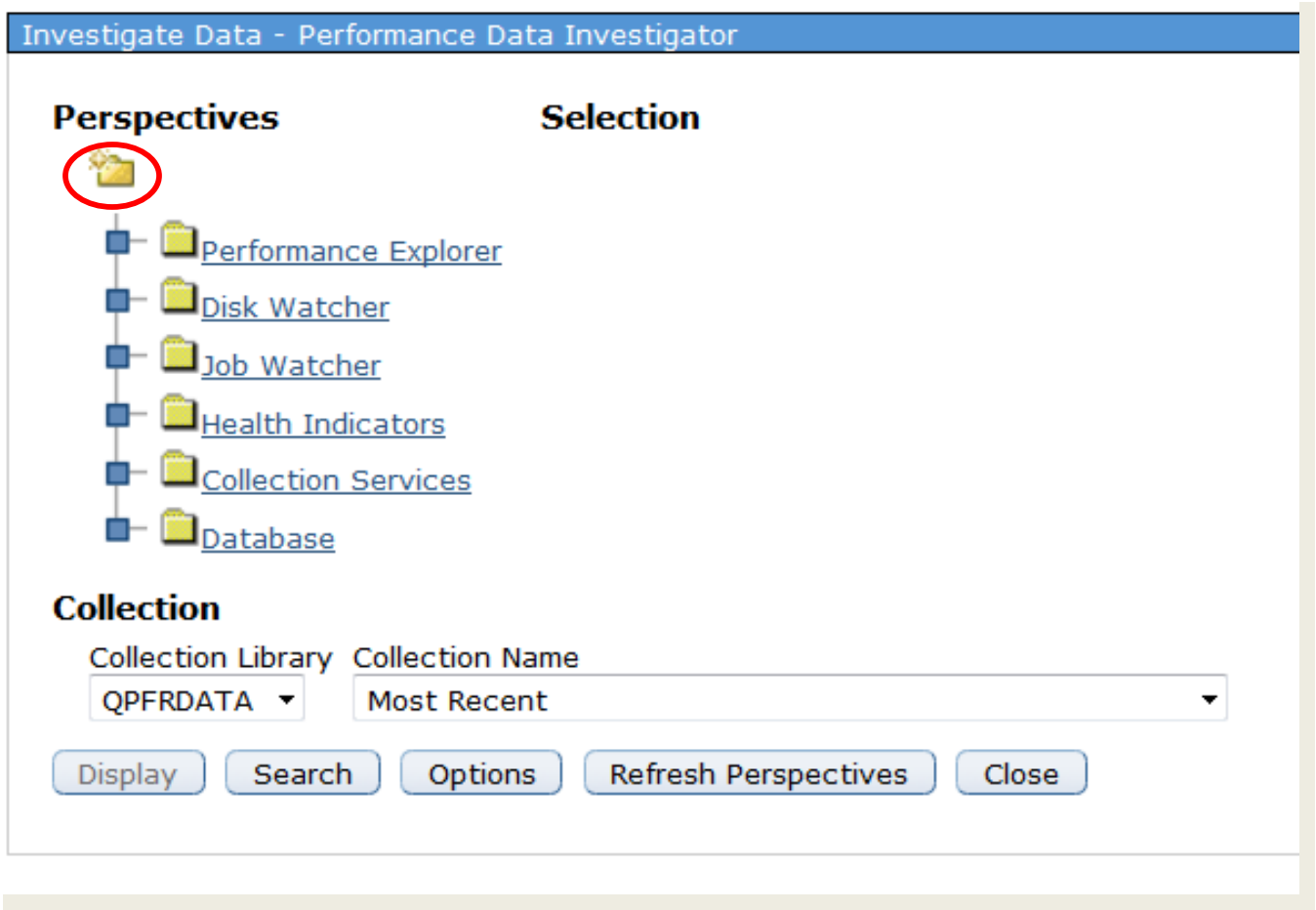
Design Mode

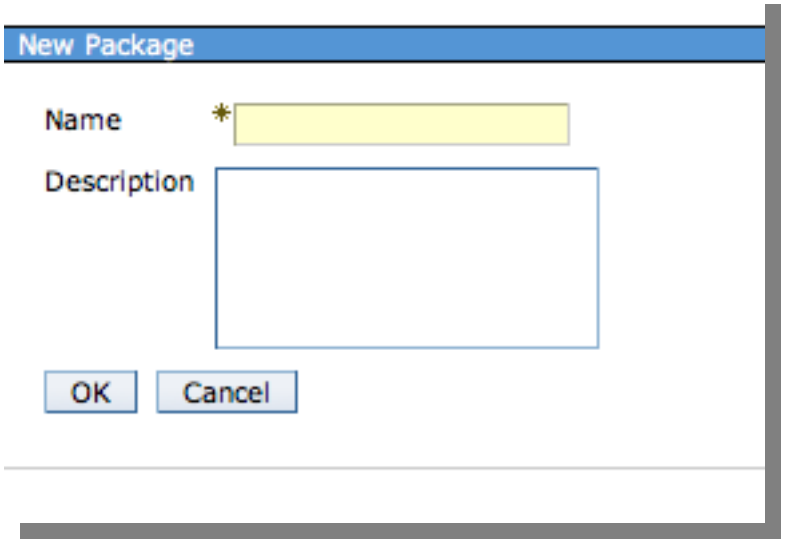
Once you “Enable Design Mode” additional options become available to create and edit your own charts and tables.

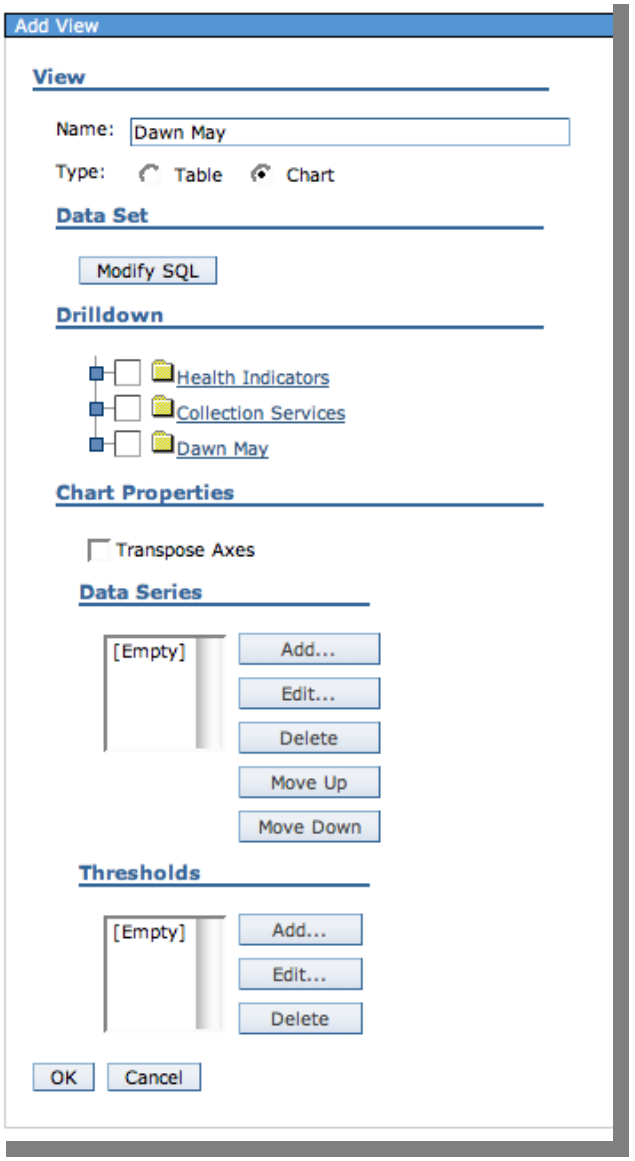


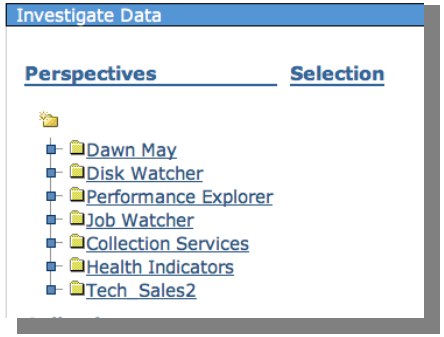
http://ibmsystemsmag.blogs.com/i_can/2011/08/customizing-a-perspective-in-pdi.html

©

Creating Custom Content Packages







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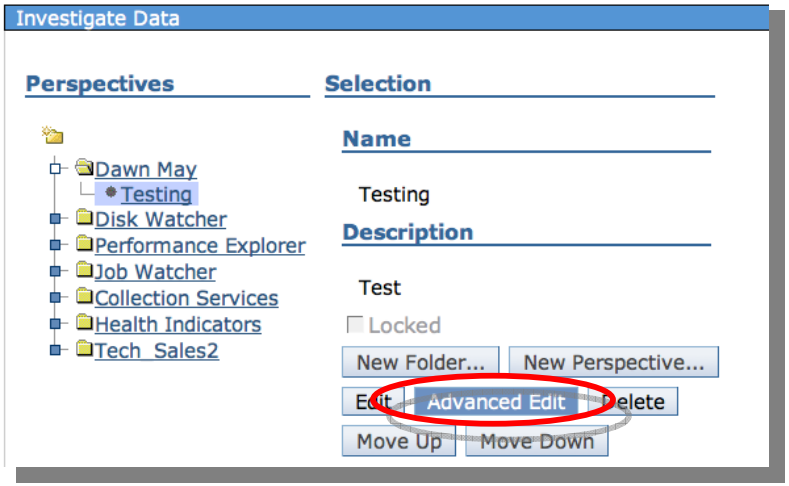
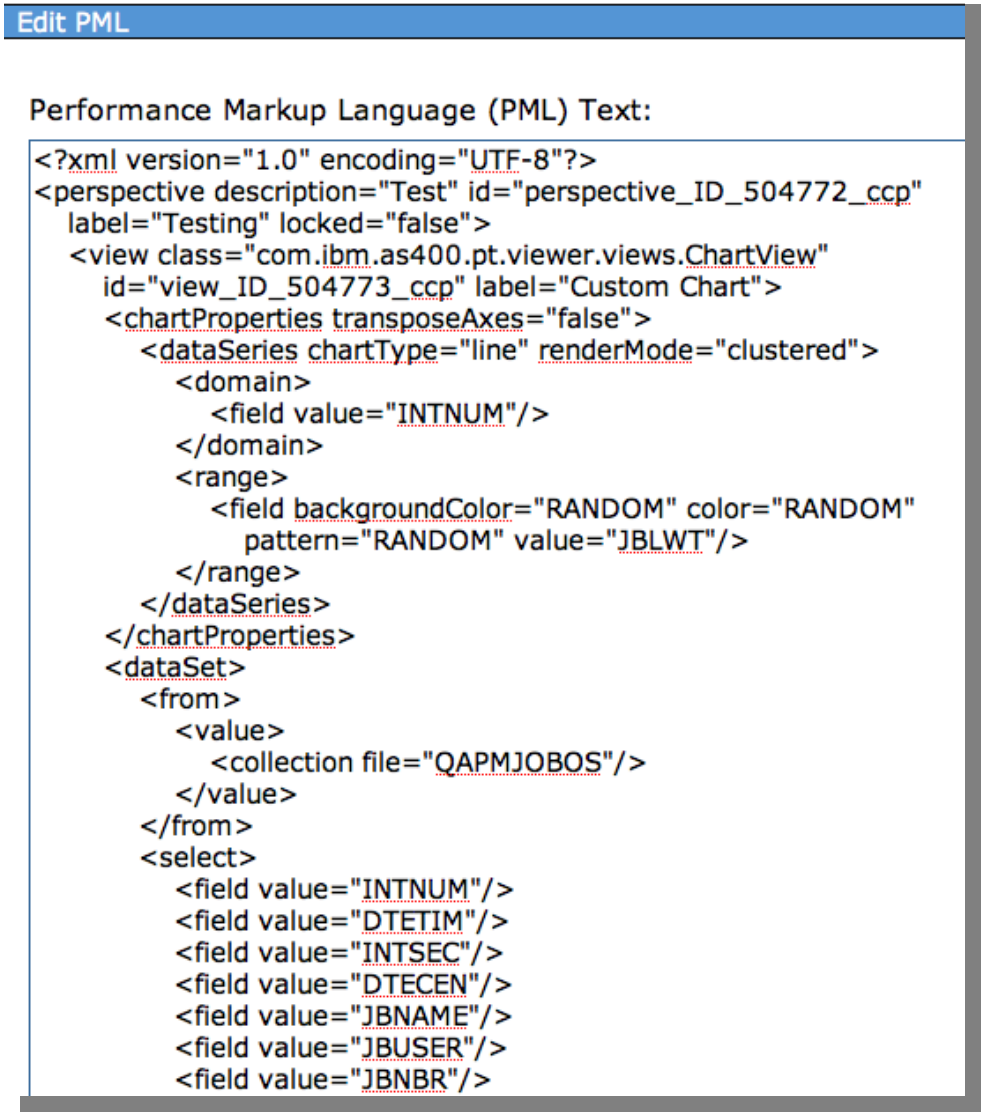
Advanced Edit – Edit the markup language directly





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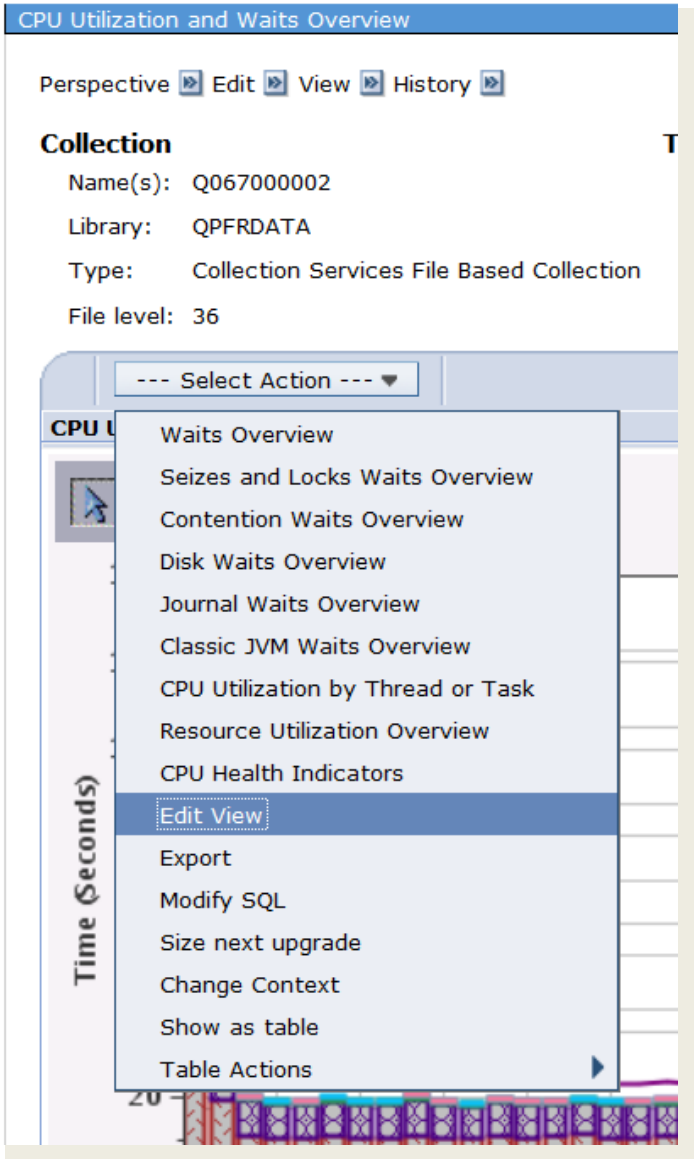
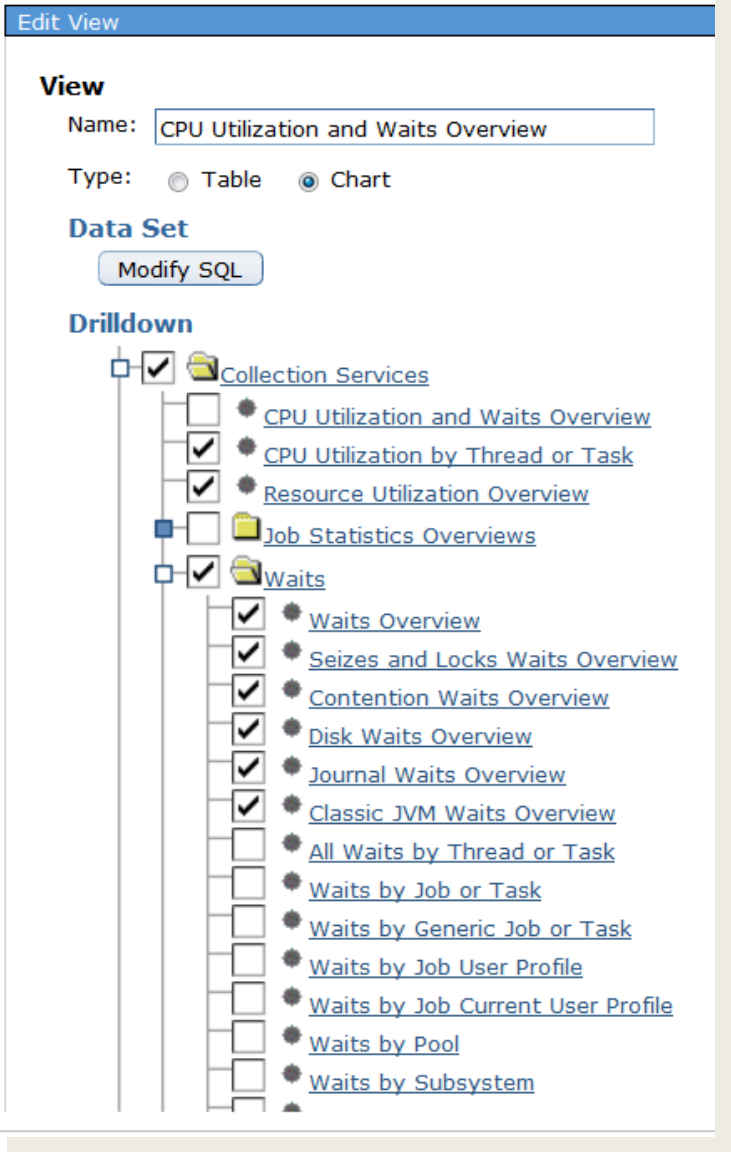
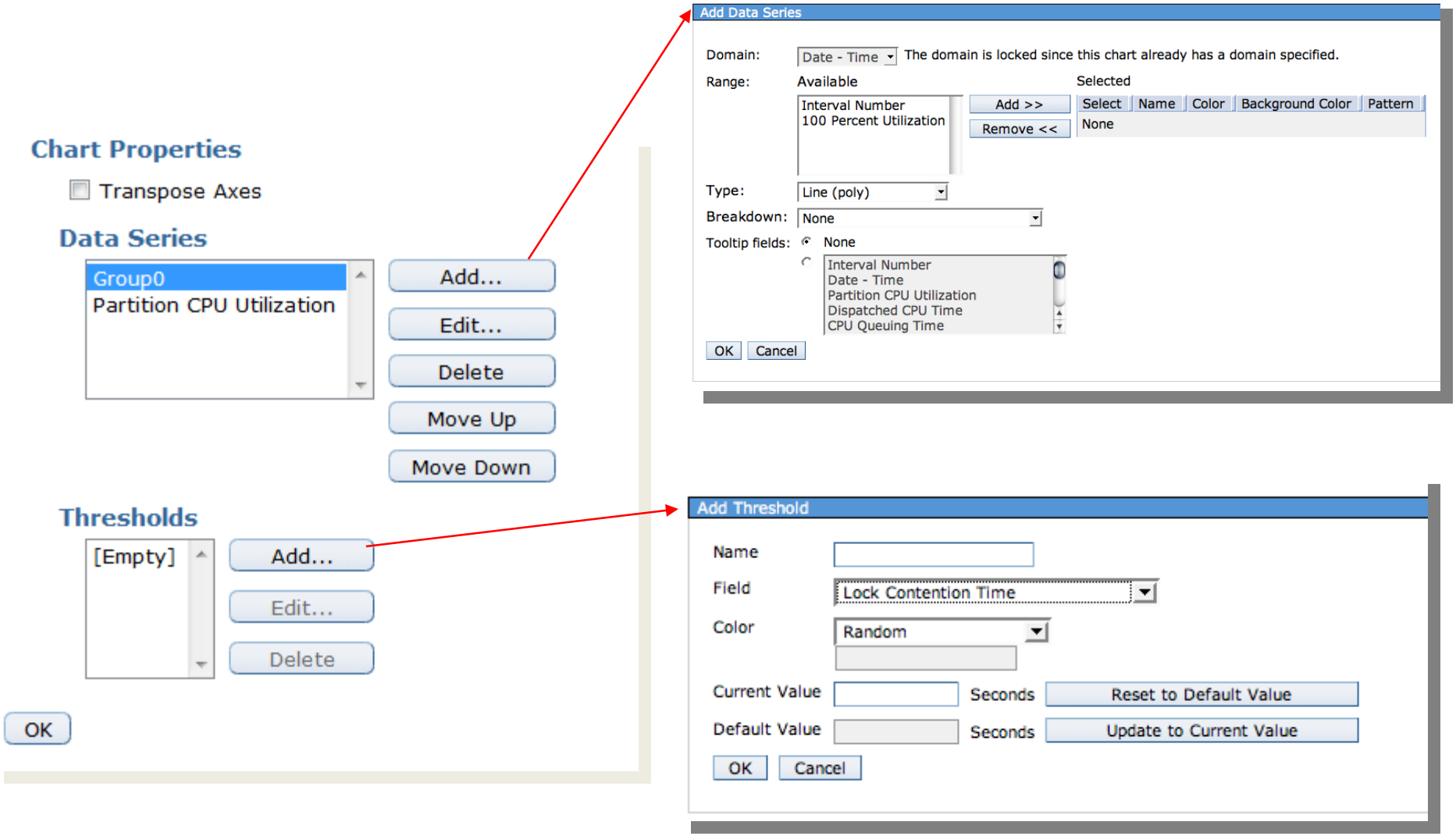
Design Mode – Edit View





Design Mode – Edit View



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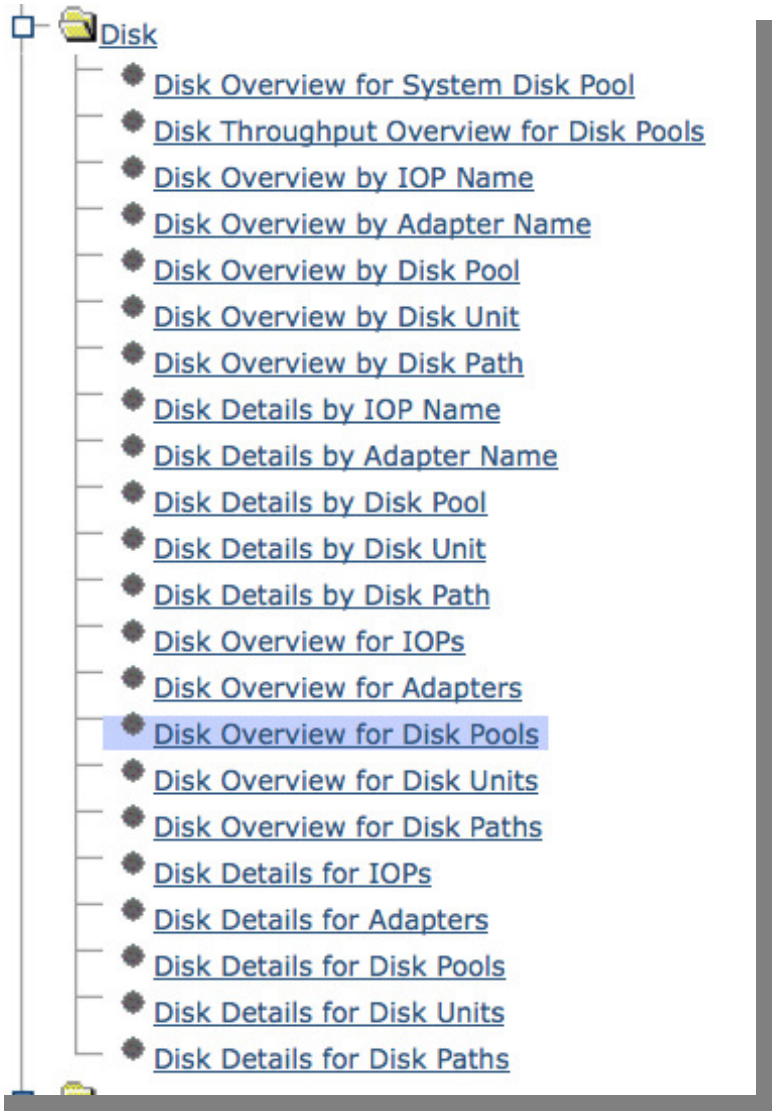
Design Mode - Add Data Series

- The Add Data Series option allows you to add additional data to your graphs for customization

- Example: Use Design Mode for Edit View actions
  - Start with ...

  Disk → Disk Overview for Disk Pools

- We can combine the Average Response Time and Percent Disk Busy metrics to be on one chart



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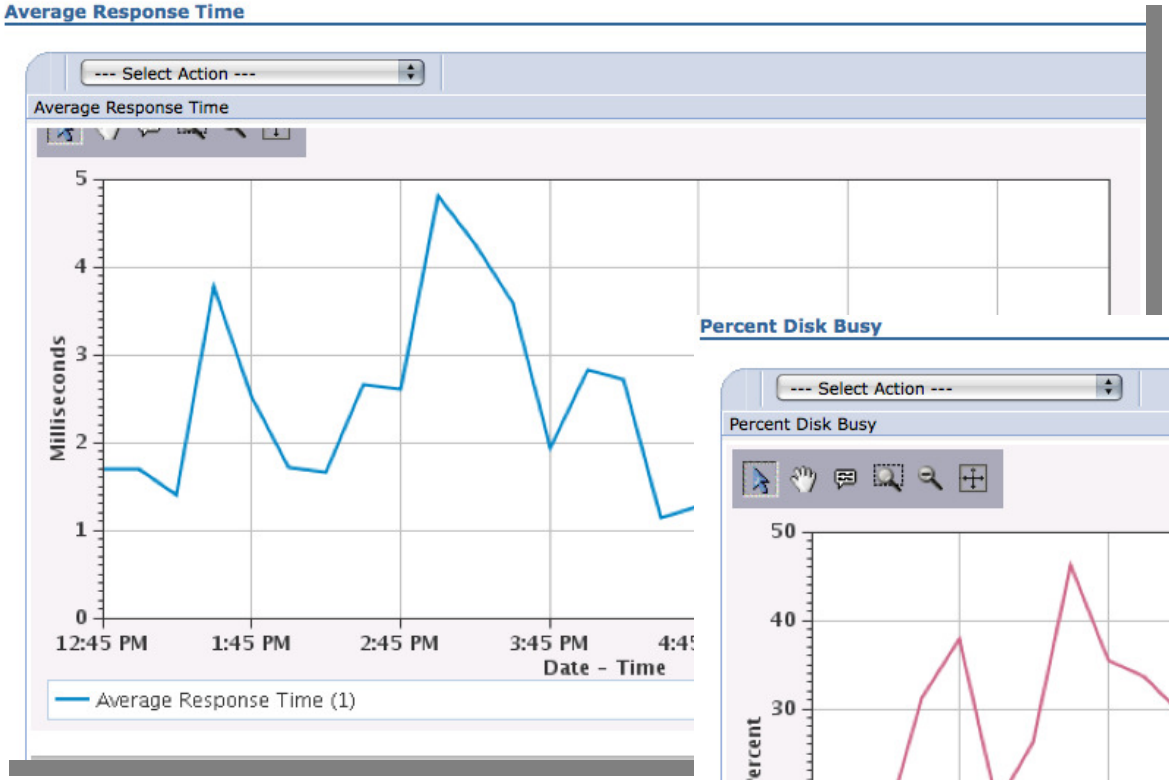
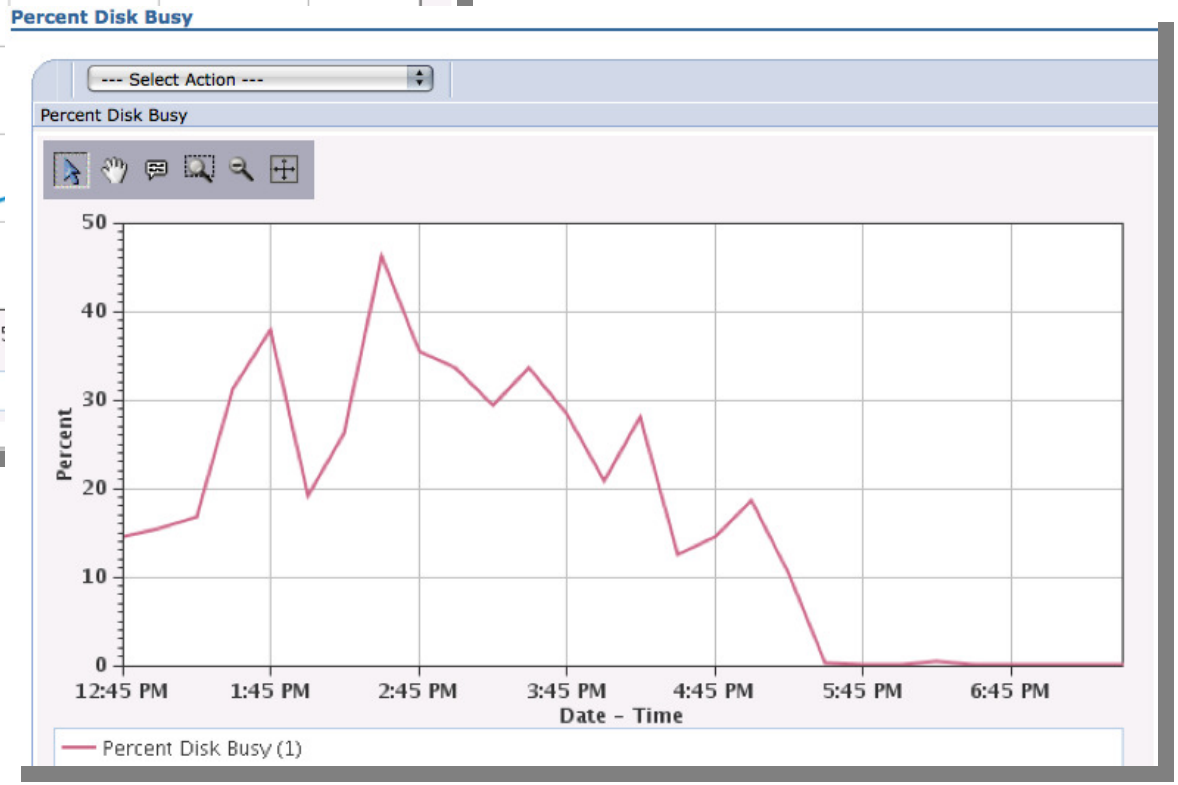
Disk Overview for Disk Pools gives us two charts we want this in one...





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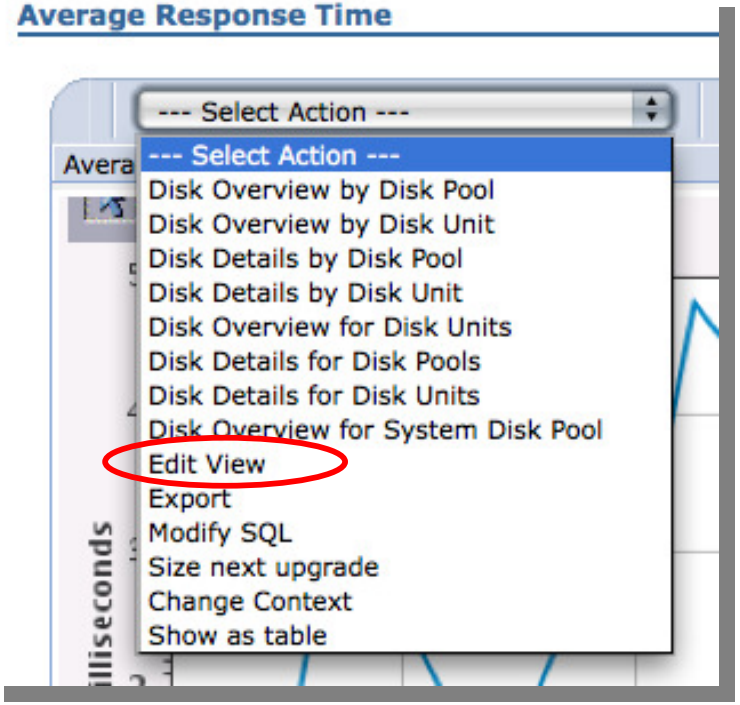
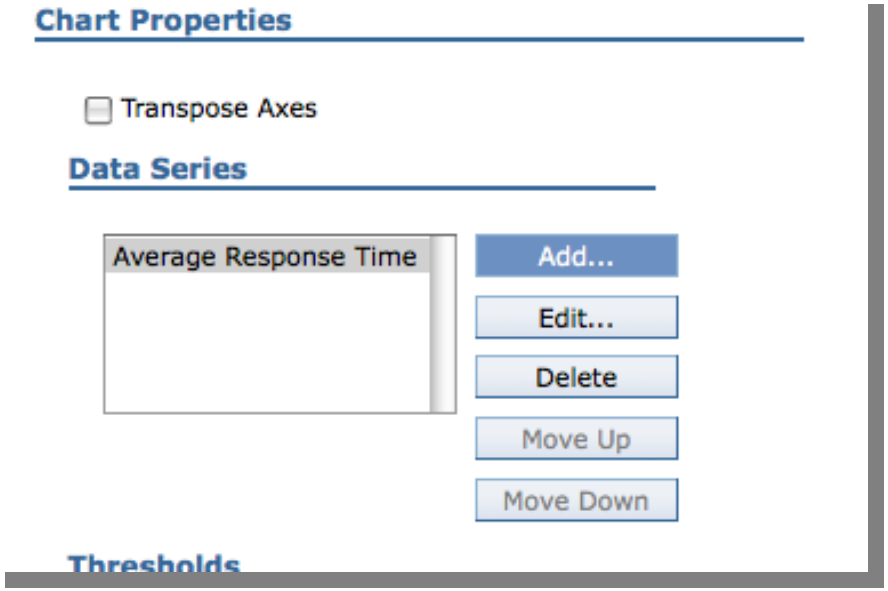
Select Edit View from the Average Response Time chart's action drop-down



Scroll down and find the “Data Series” Box and take “Add...”



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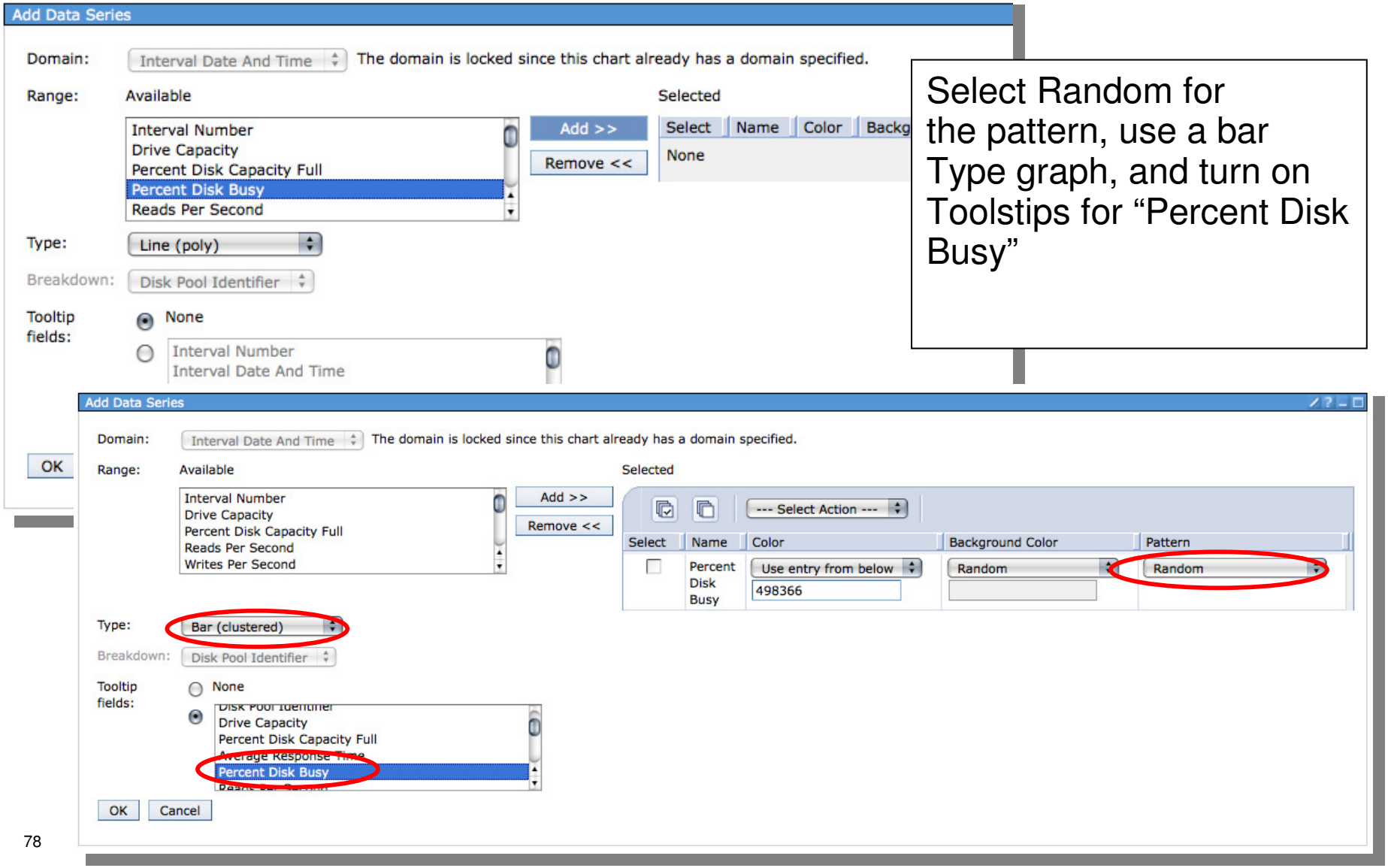
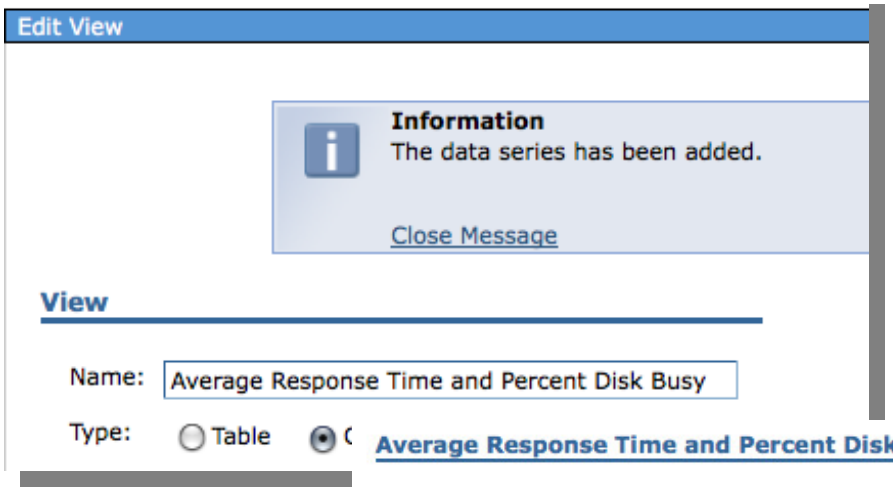
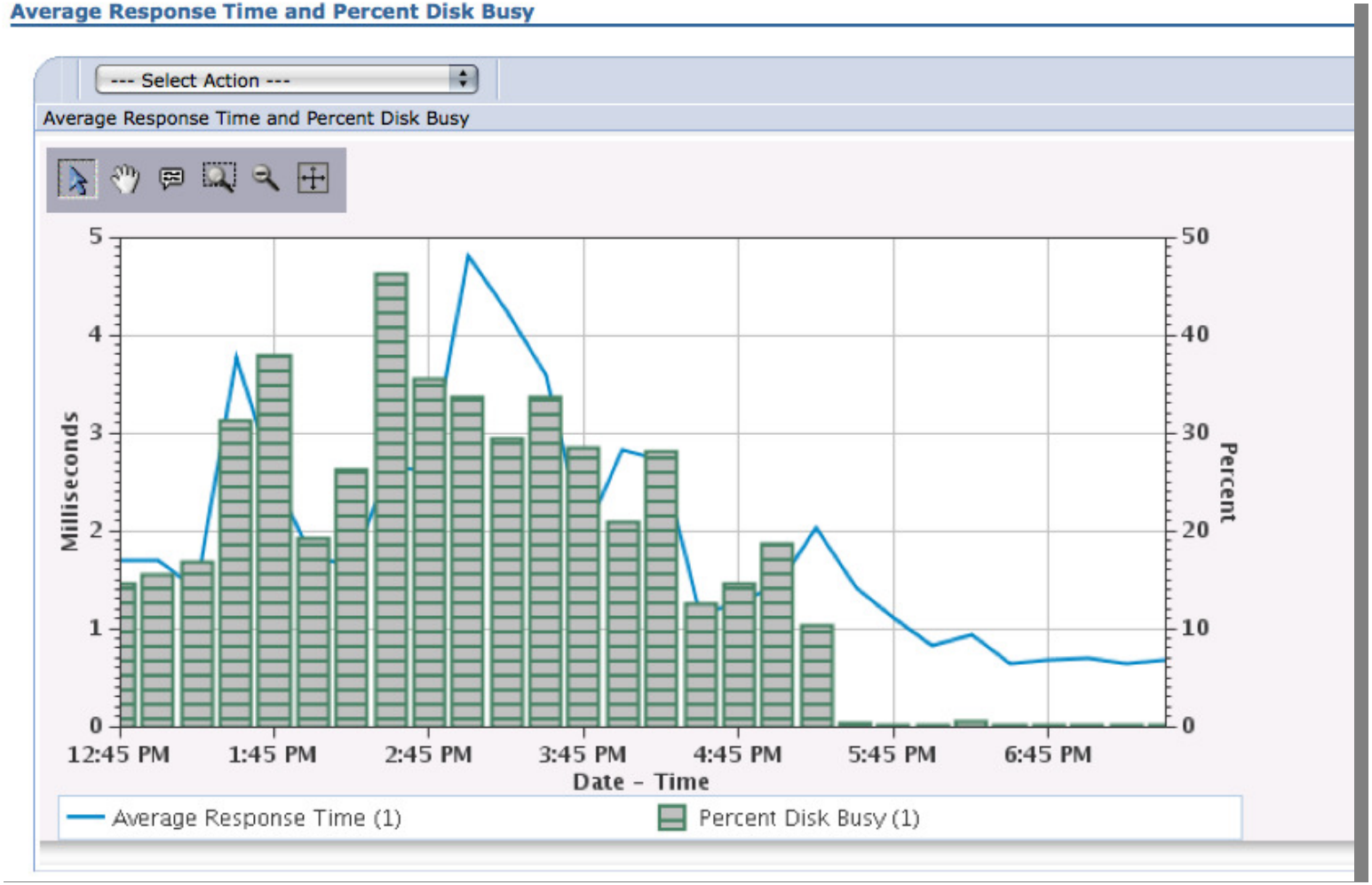
Select the new Range “Percent Disk Busy” then click on “Add”





Modify the View title and click Ok

You now have the customized chart



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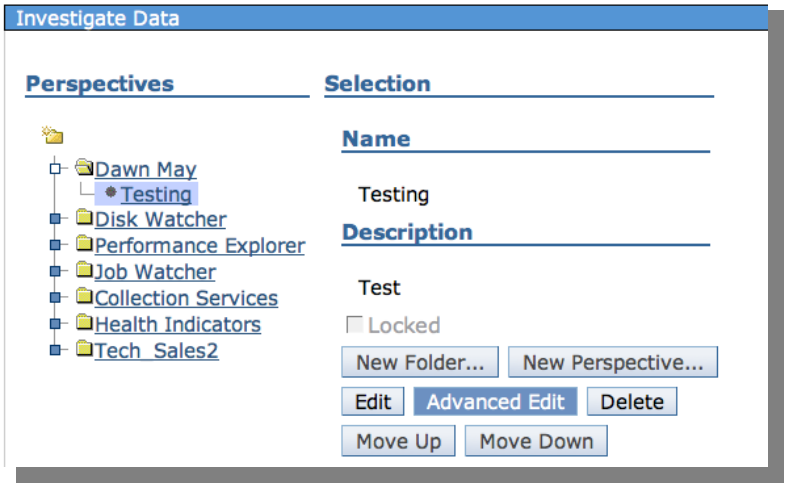
Custom Content Packages – PML Location

- Custom content packages are stored in the following directory:

  \QIBM\UserData\OS400\iSeriesNavigator\config\PML\CCP



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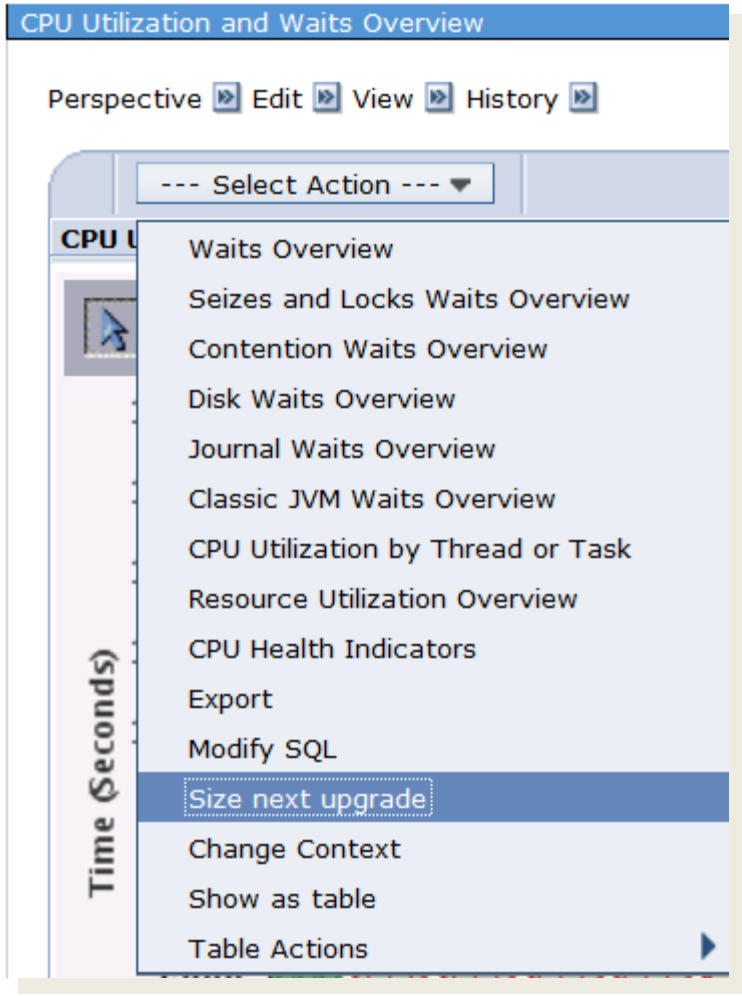
Size Next Upgrade
Send data directly to the IBM Workload Estimator

Takes the measured data from Collection Services and inputs it to the IBM Workload Estimator (WLE)

Intended for a one-time sizing activity



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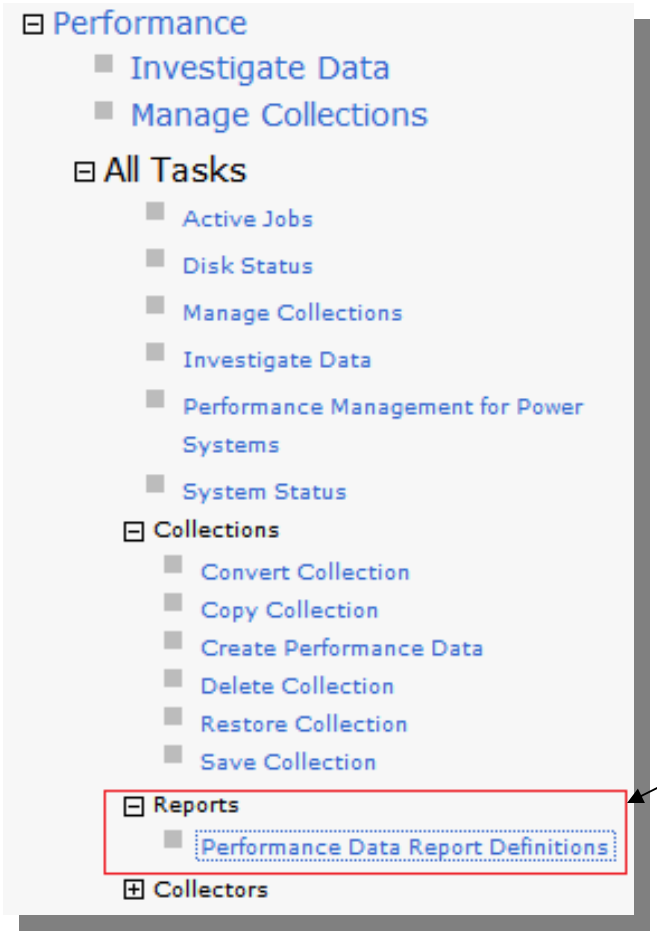
Performance Data Reports

"Executive" Reports



- Create a group of printed or online graphs of performance perspectives.
- Generate a PDF or zip file containing the requested graphs for the collection
- Use for weekly reports

Start here with Reports ->

Performance Data Report Definitions

http://ibmsystemsmag.blogs.com/i_can/2013/05/performance-reports-with-the-performance-data-investigator.html

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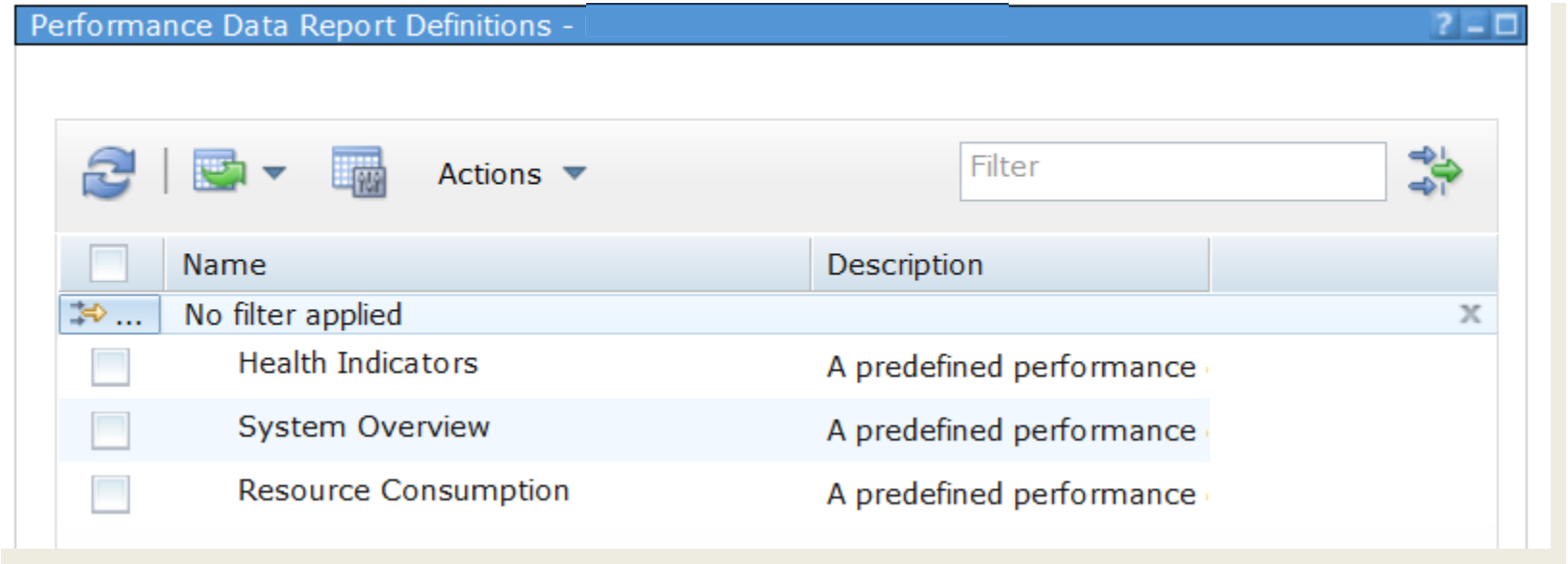
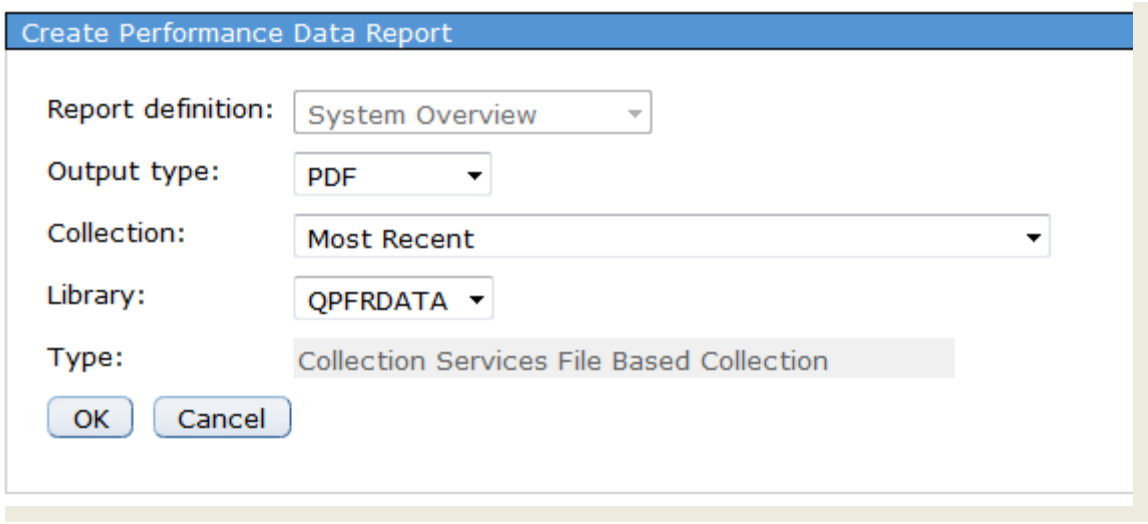
Report Definitions





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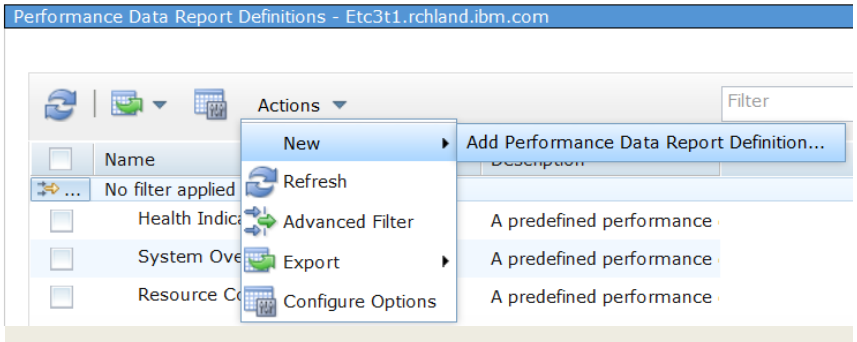
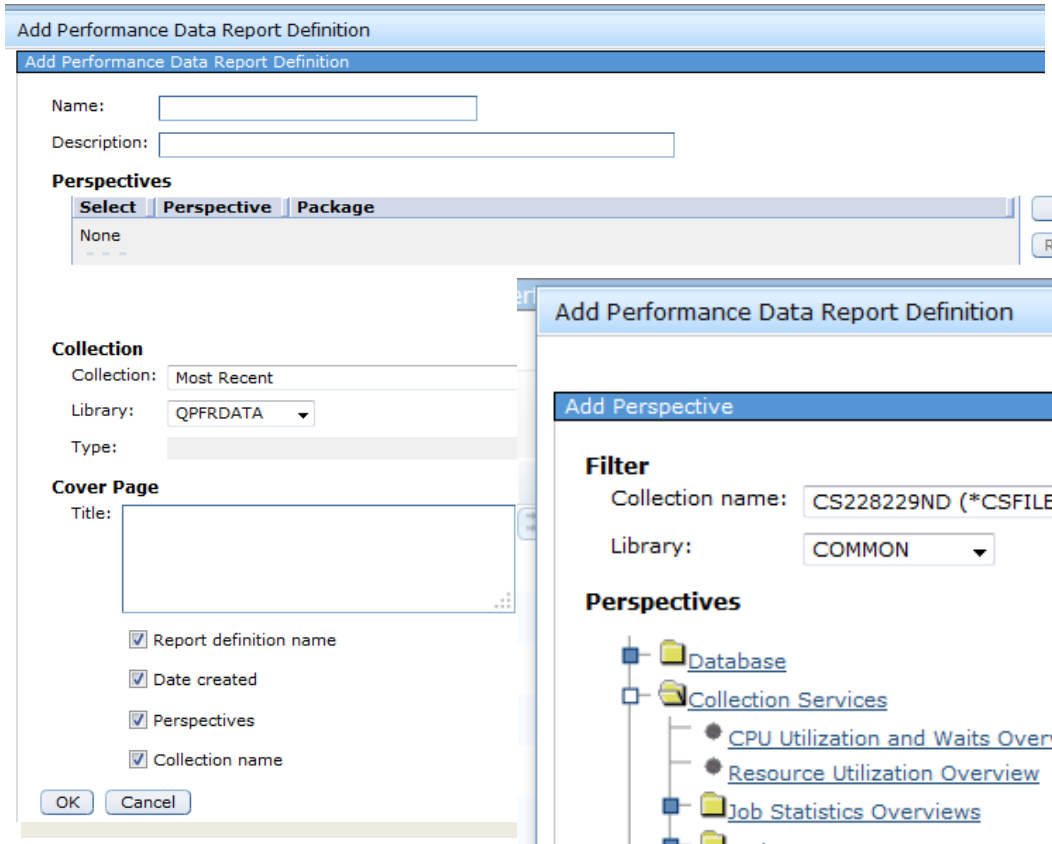
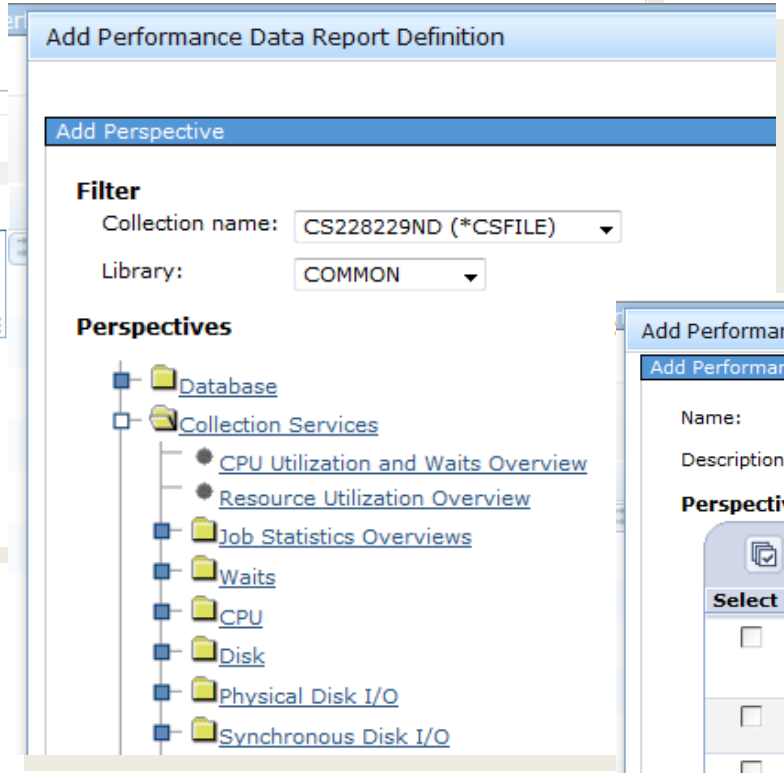
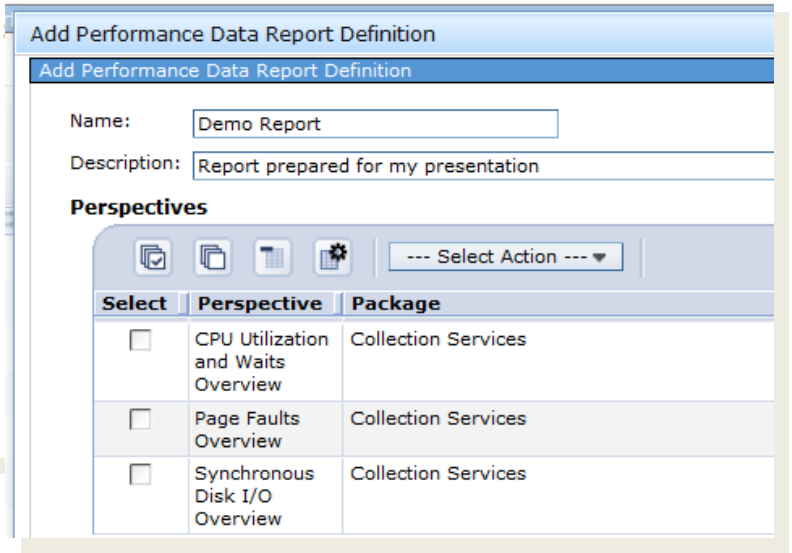
Create your own Report Definition









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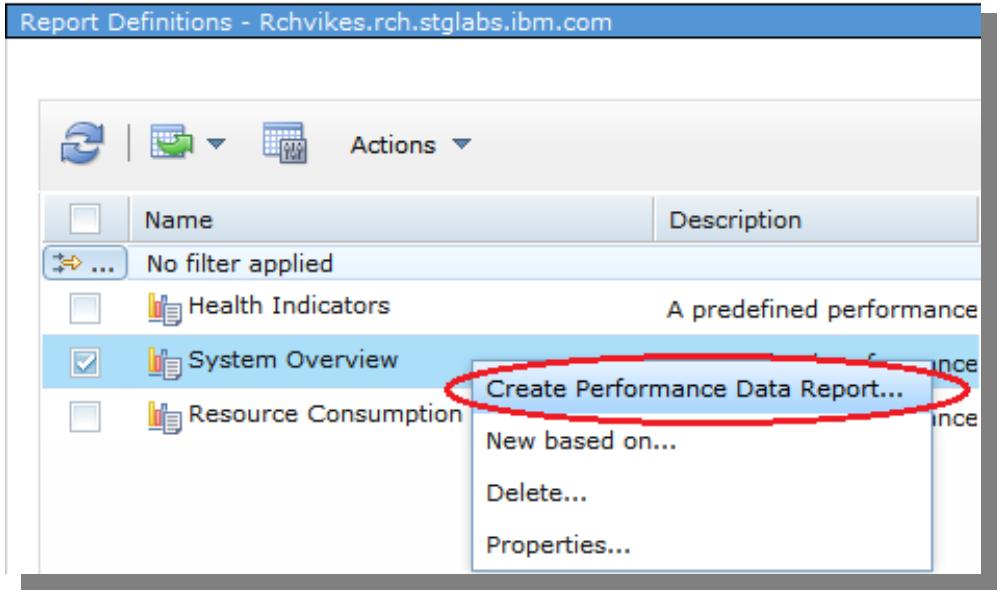
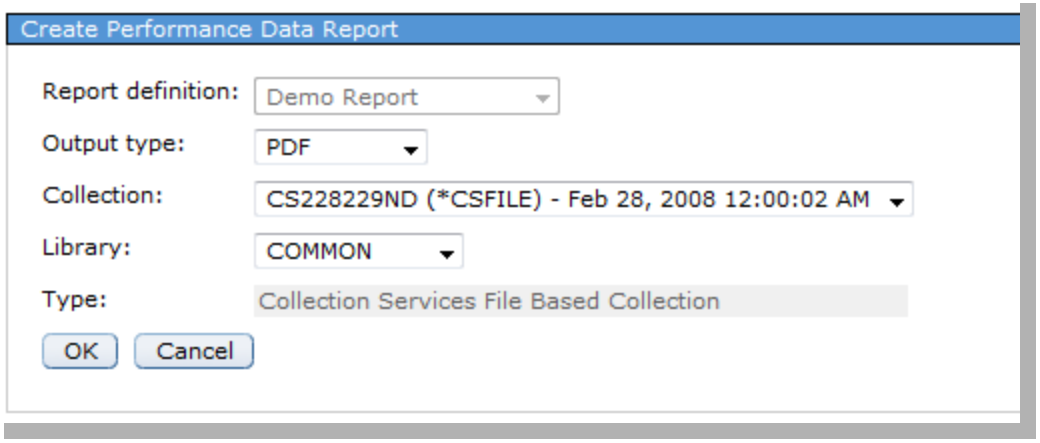
Create Performance Data Report





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Resulting Report (PDF example)

Feb 28, 2013 10:03:43 AM

Performance data report definition:

Demo Report

Report title:

Example Report based upon COMMON performance collection

Perspectives included in report:

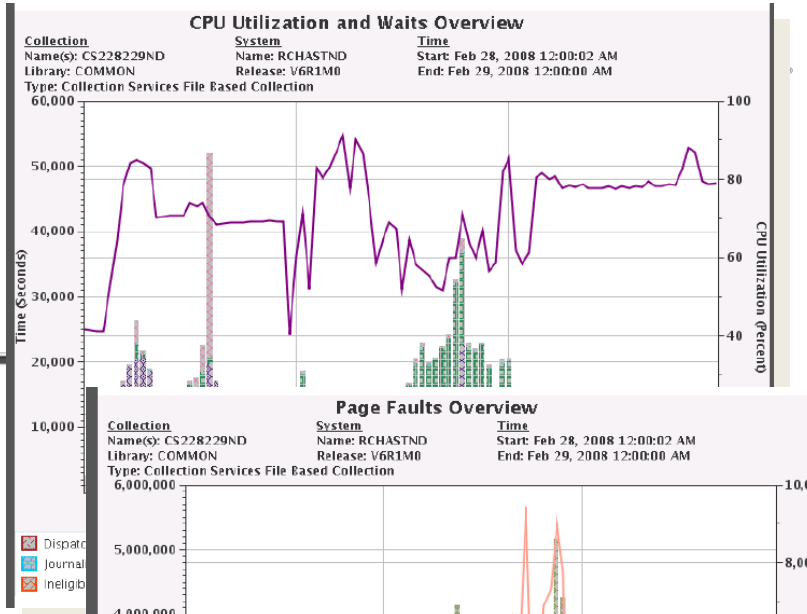
CPU Utilization and Waits Overview

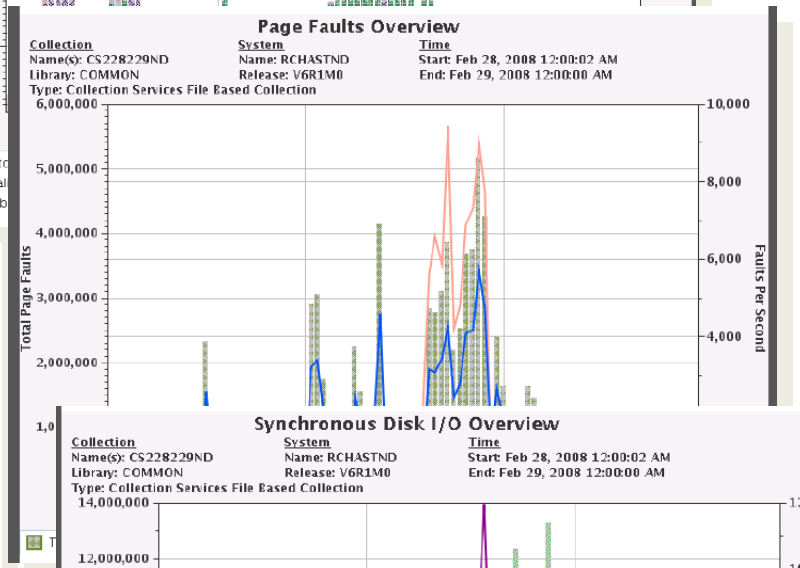
Page Faults Overview

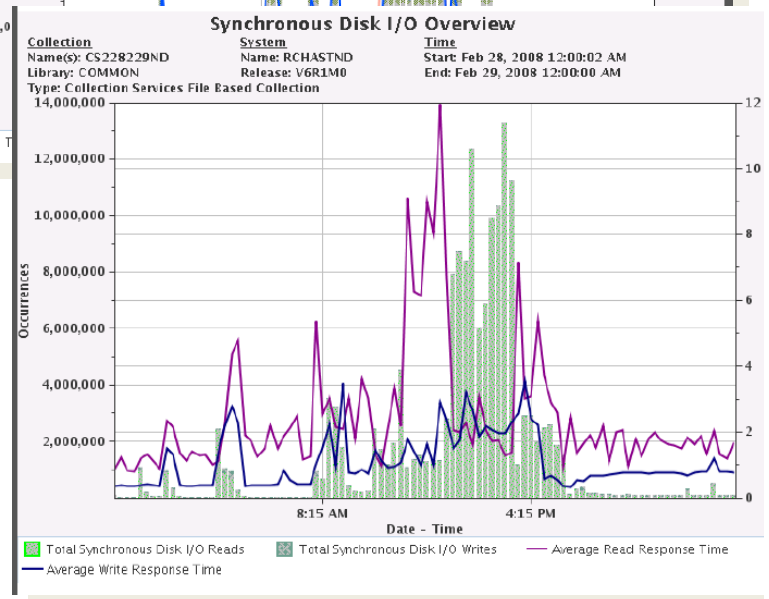
Synchronous Disk I/O Overview

Library/Collection used for report:

Common/Cs228229nd







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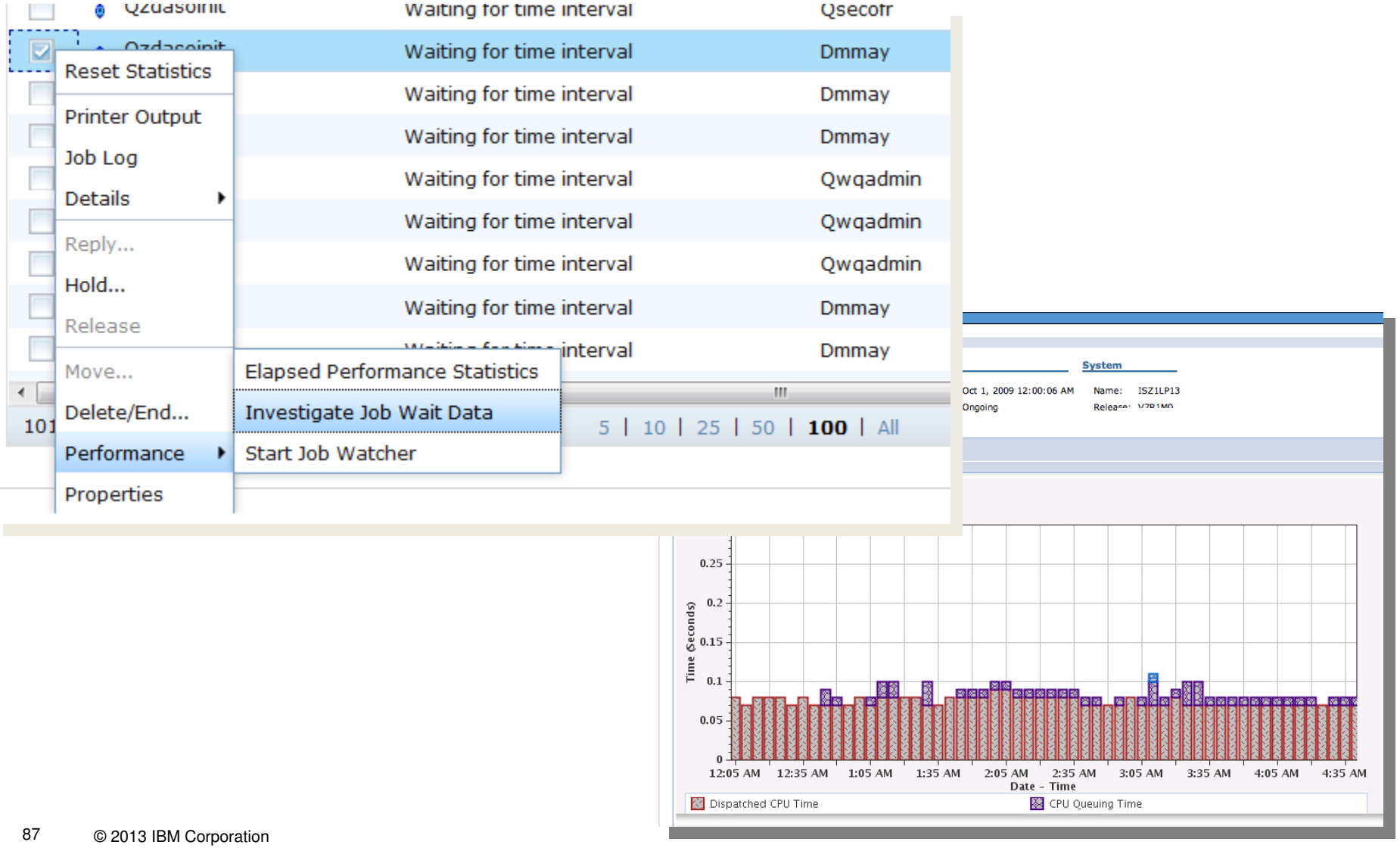
Integration with Active Jobs



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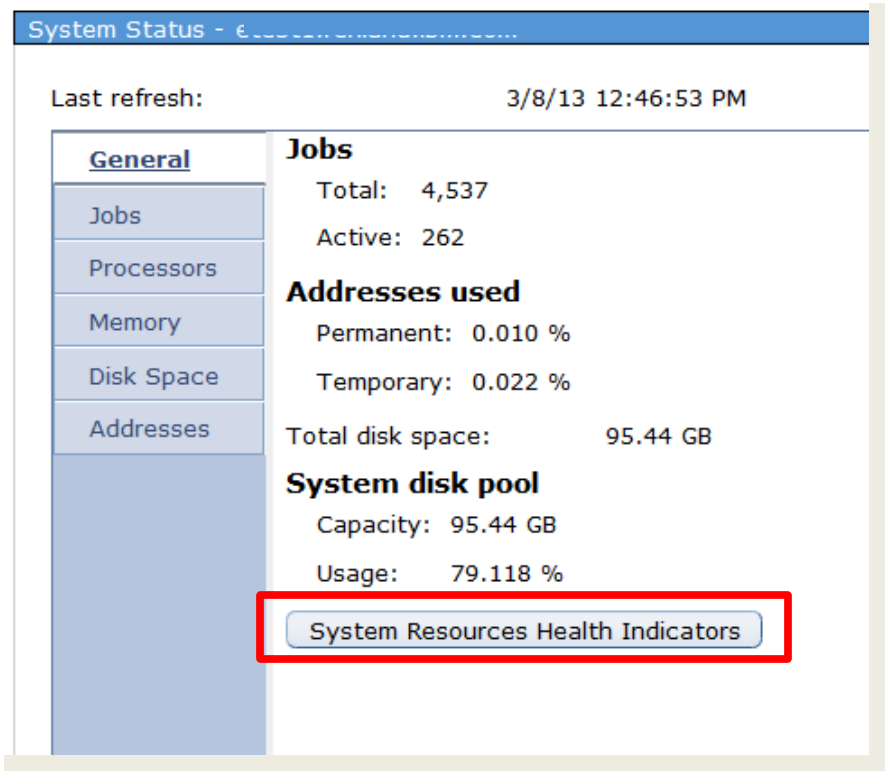
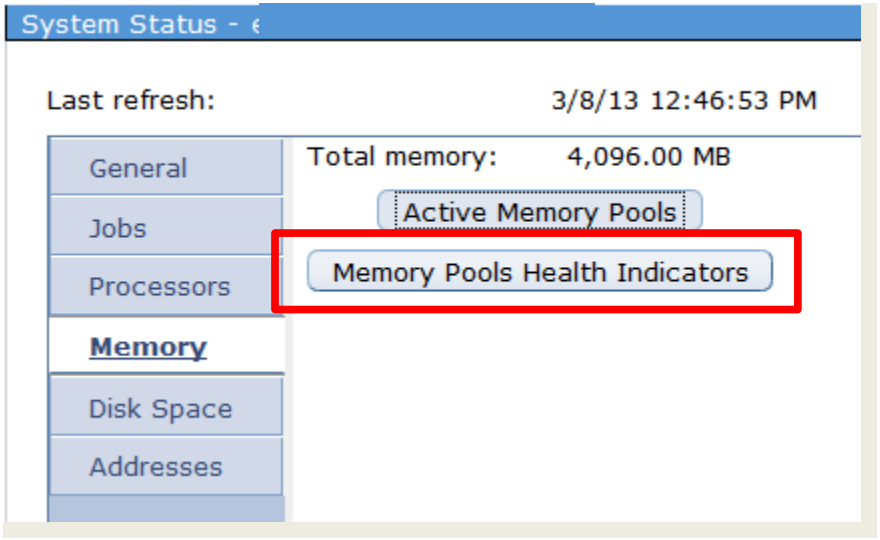
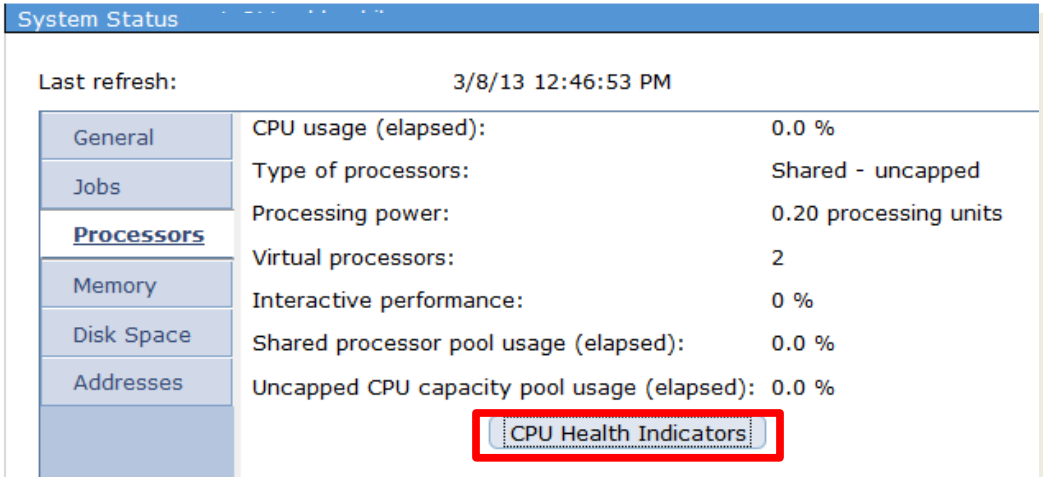
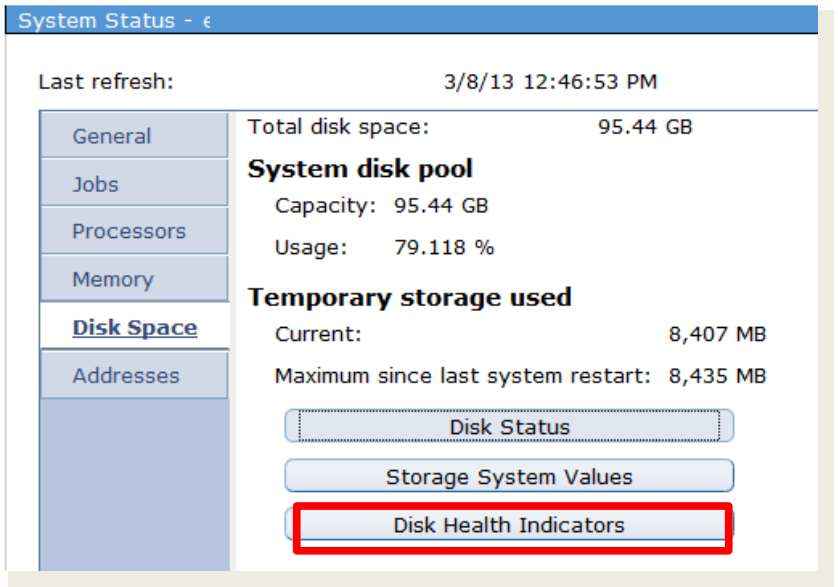
Integration with System Status

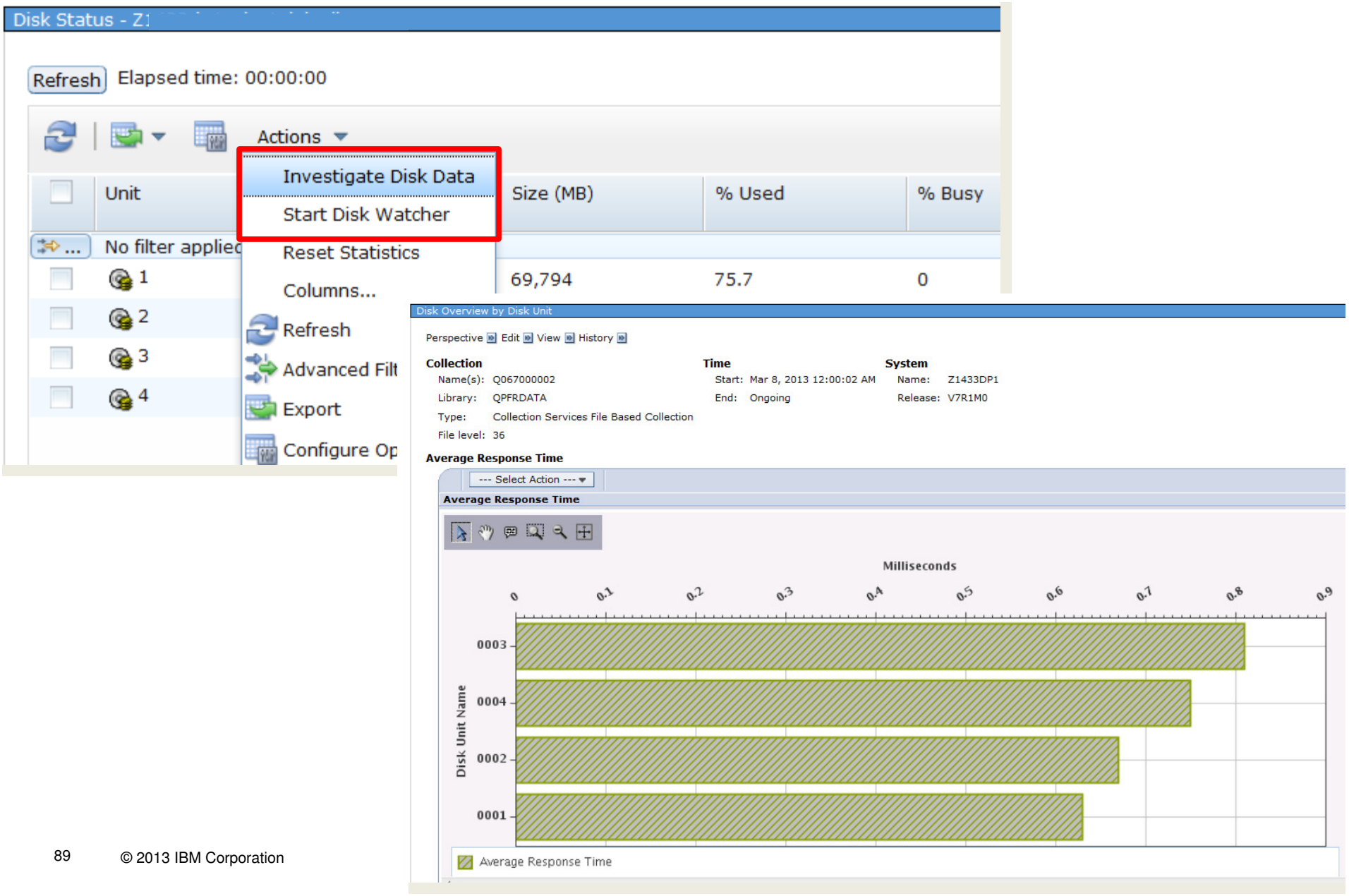








Integration with Disk Status



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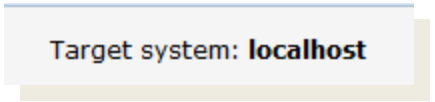
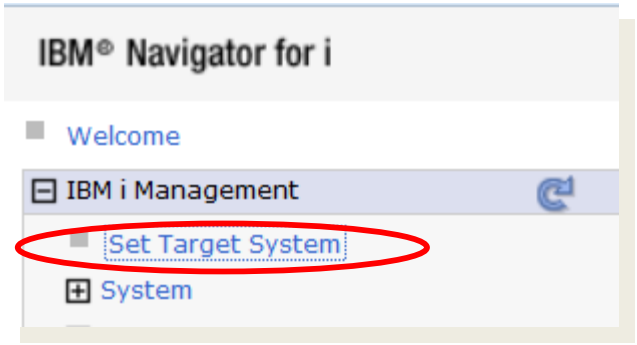
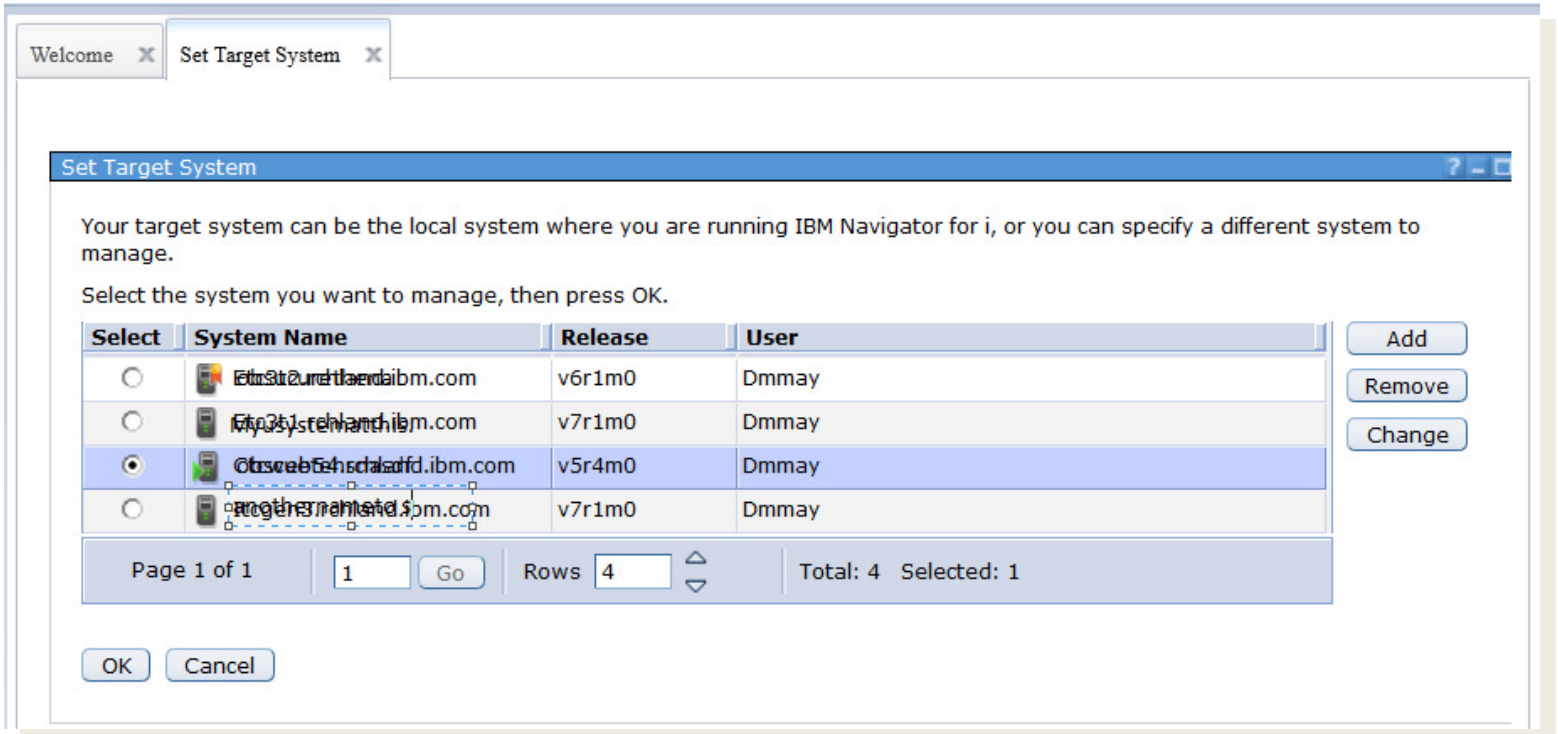
Set Target System





You can now connect to one partition, but manage a different partition.

Allows you to manage 5.4 and 6.1 partitions.



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Investigate Data

Database

Need latest PTF groups, including the database group, for this support
Must have the Performance Tools LPP, Manager feature, Installed

Available on both IBM i 6.1 and 7.1

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Integration with Database

- Leverage the capabilities of PDI with valuable data gathered from database
  - PDI charting of
    - SQL Plan Cache Snapshots and Event Monitors
    - SQL Performance Monitor files
- Collection Services added collection of job-level SQL metrics
- Visual charts and/or tables in PDI that are focused on database related metrics
- Navigation between database and performance tasks

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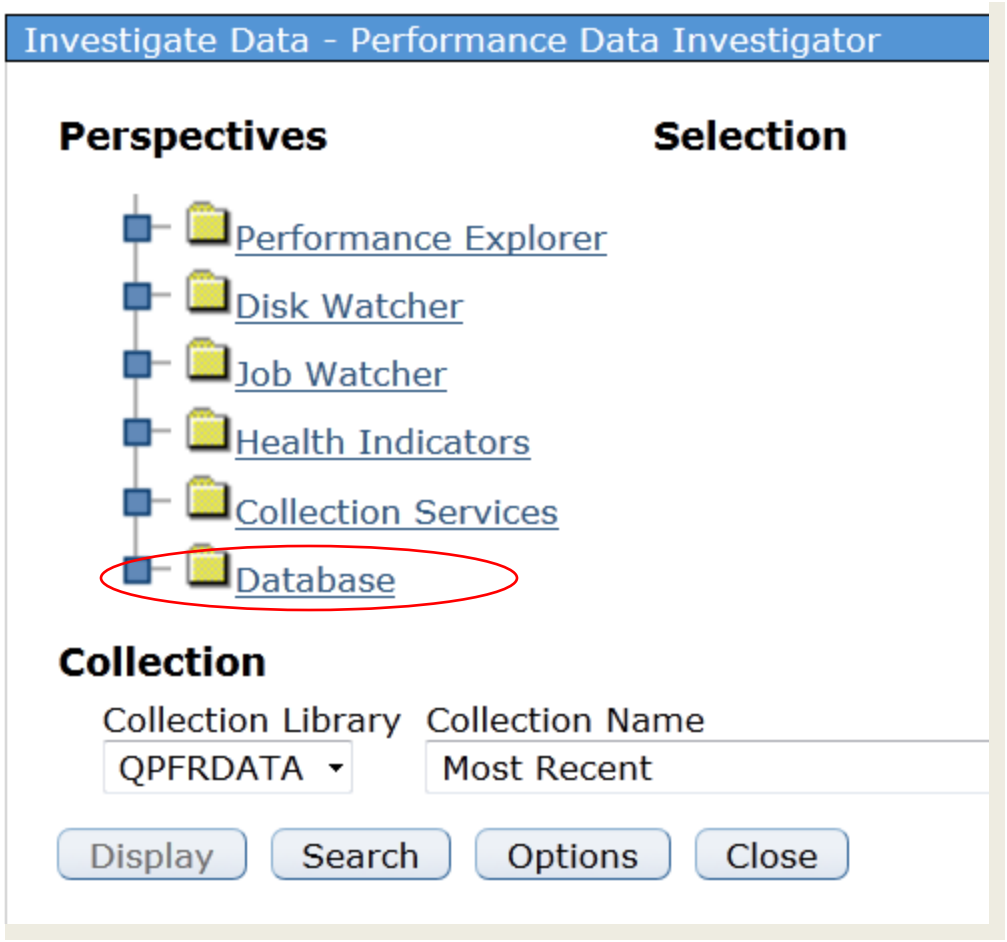
Database Perspectives



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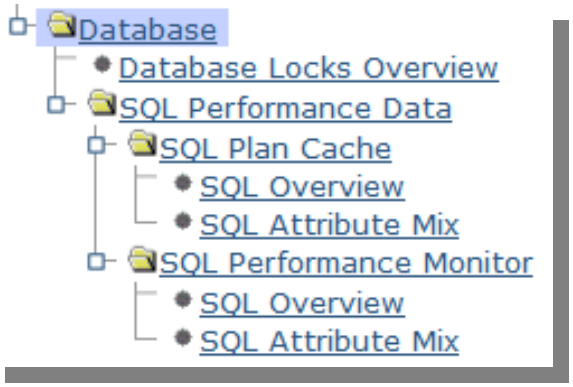
Integration with Database – package overview

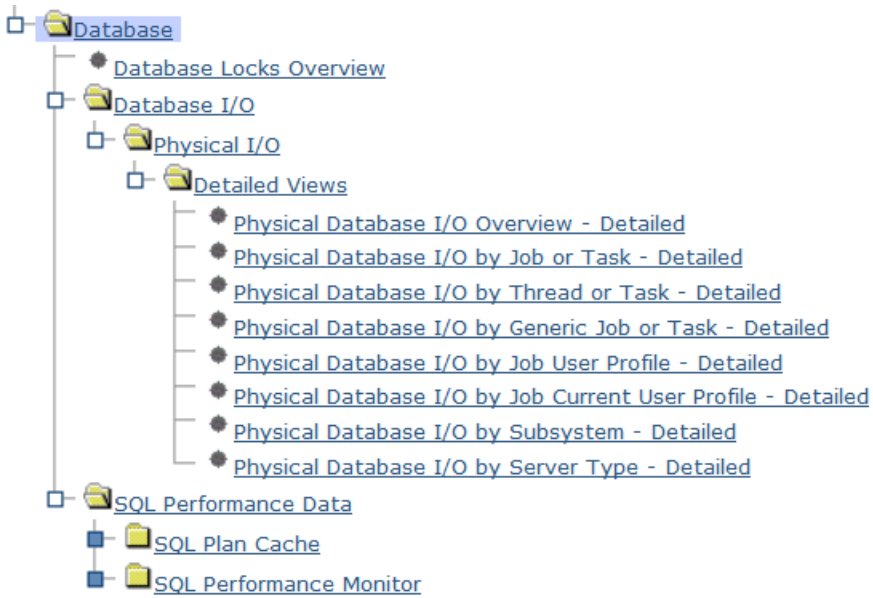
Database Package for 6.1

- Database Locks Overview
- SQL Performance Data
  - SQL Plan Cache Snapshots and Event Monitors
  - SQL Performance Monitor



Database Package for 7.1

- Database Locks Overview
- Physical Database I/O
  - Utilizes Job Level SQL Metrics
- SQL Performance Data
  - SQL Plan Cache Snapshots and Event Monitors
  - SQL Performance Monitor



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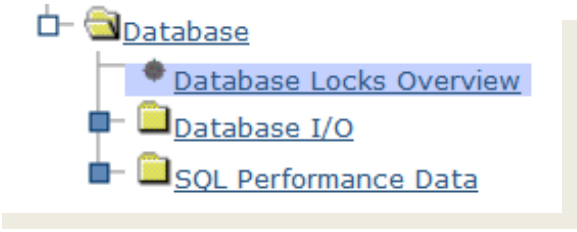
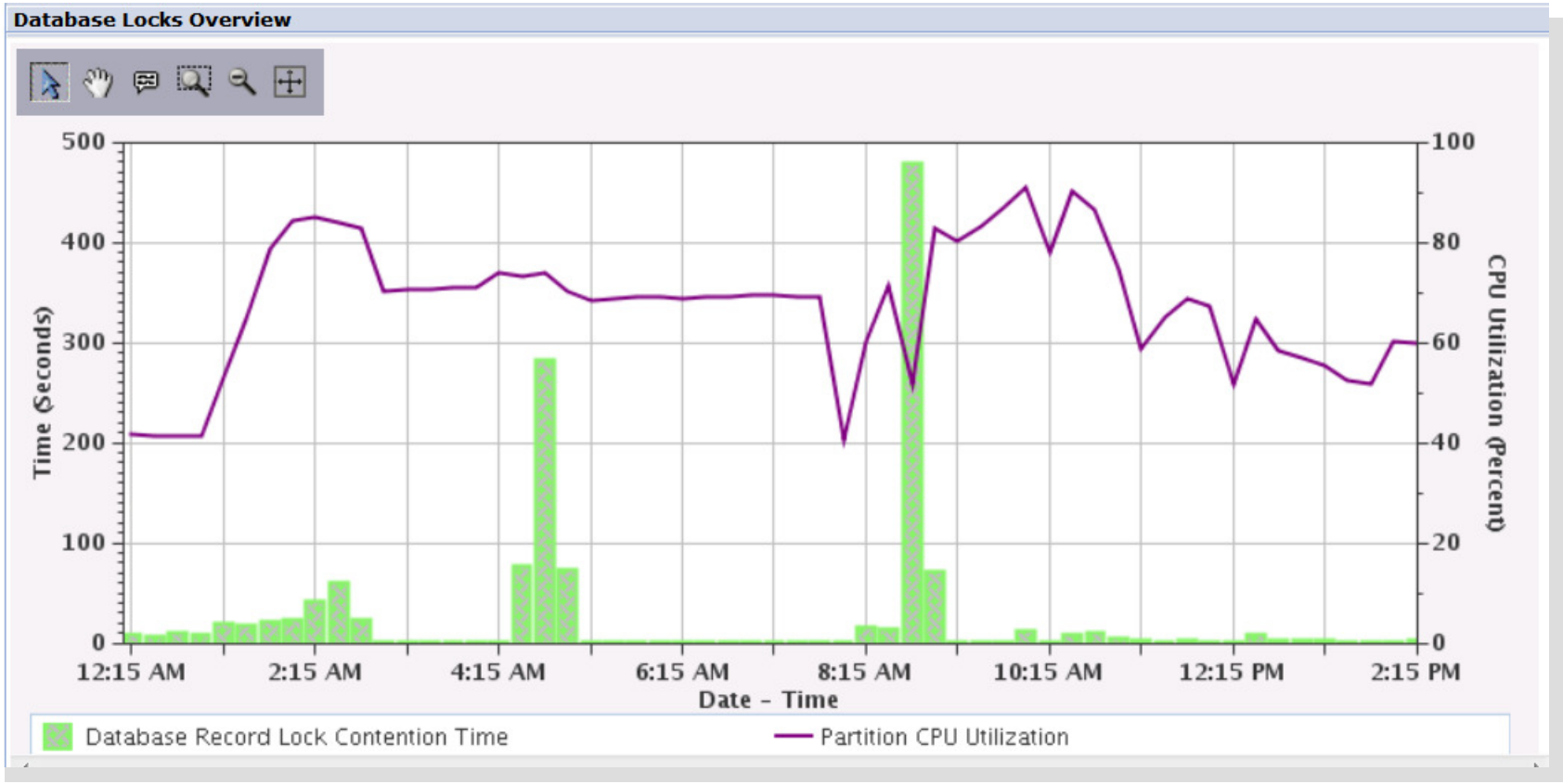
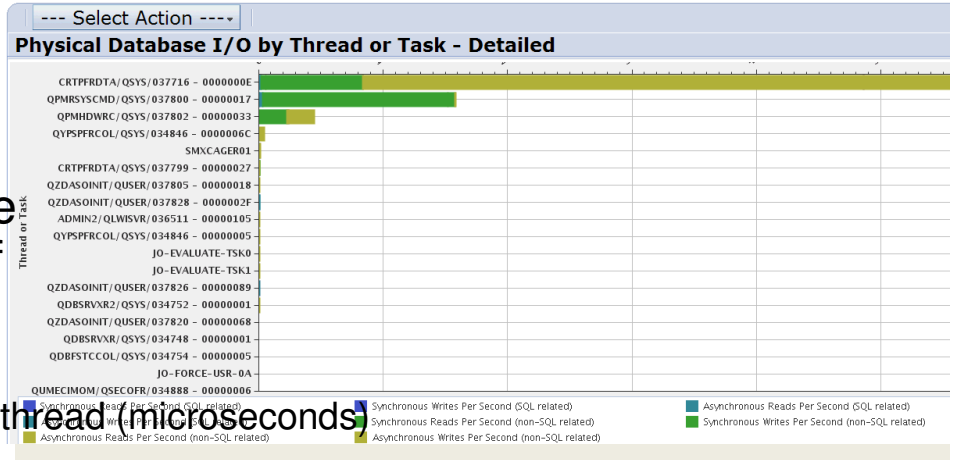
Database Locks Overview



- The database locks overview gives you a graph of database record lock contention
- It is based on Collection Services data



Job-Level Database Statistics

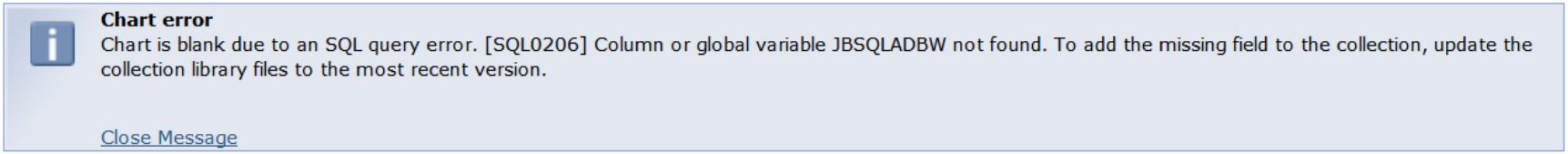


The following metrics have been added to the job performance data *JOBMI category of Collection Services in 7.1

- SQL clock time (total time in SQ and below) per thread (microseconds)
- SQL unscaled CPU per thread (microseconds)
- SQL scaled CPU per thread (microseconds)
- SQL synchronous database reads per thread
- SQL synchronous nondatabase reads per thread
- SQL synchronous database writes per thread
- SQL synchronous nondatabase writes per thread
- SQL asynchronous database reads per thread
- SQL asynchronous nondatabase reads per thread
- SQL asynchronous database writes per thread
- SQL asynchronous nondatabase writes per thread
- Number of high level SQL statements per thread

- Special instructions to activate the support https://www.ibm.com/developerworks/mydeveloperworks/wikis/home?lang=en#/wiki/IBM%20i%20Technology%20Updates/page/Job%20Level%20SQL%20Metrics

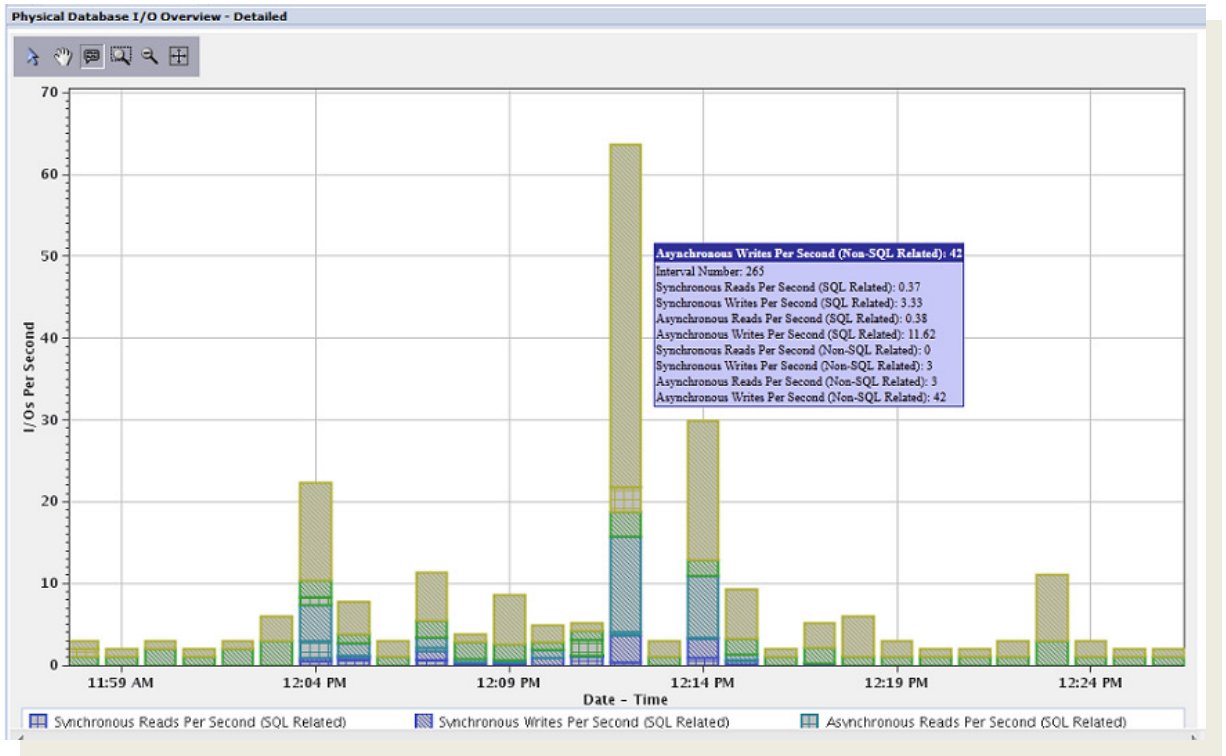
- Error if you try to display one of these charts but have not activated the support:



Database – Physical Database I/O

Available on 7.1 only

- Database
  - Database I/O
    - Physical I/O
      - Detailed Views
        - Physical Database I/O Overview - Detailed
        - Physical Database I/O by Job or Task - Detailed
        - Physical Database I/O by Thread or Task - Detailed
        - Physical Database I/O by Generic Job or Task - Detailed
        - Physical Database I/O by Job User Profile - Detailed
        - Physical Database I/O by Job Current User Profile - Detailed
        - Physical Database I/O by Subsystem - Detailed
        - Physical Database I/O by Server Type - Detailed



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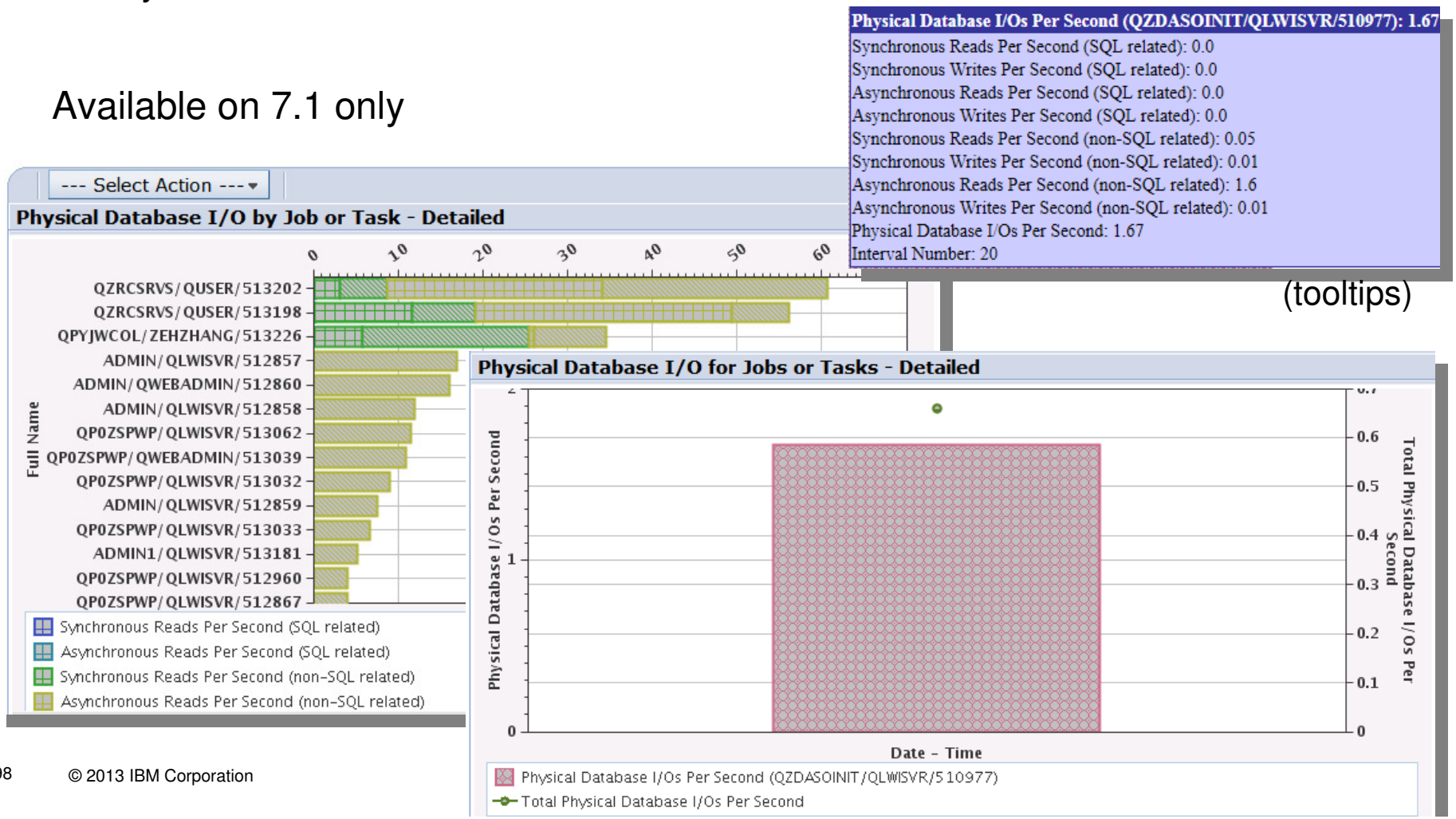
Job-Level Database Statistics

- Ten new perspectives (8 on perspective list plus 2 drilldowns)
  - Physical Database I/O for Jobs or Tasks - Detailed
  - Physical Database I/O for One Job or Task - Detailed

Available on 7.1 only



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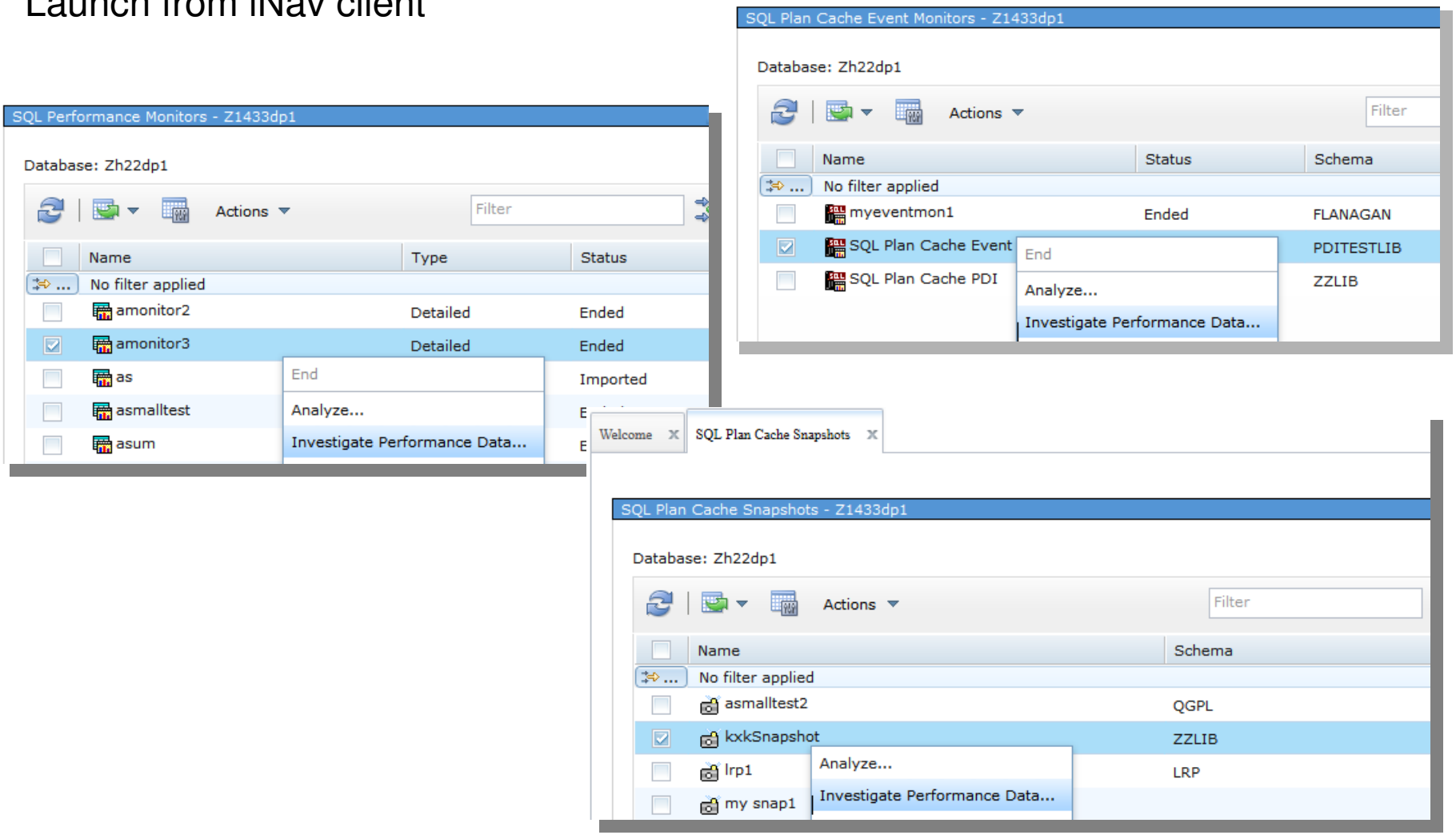
Integration with Database

Launch from the Database list with Investigate Performance Data

Launch from iNav client



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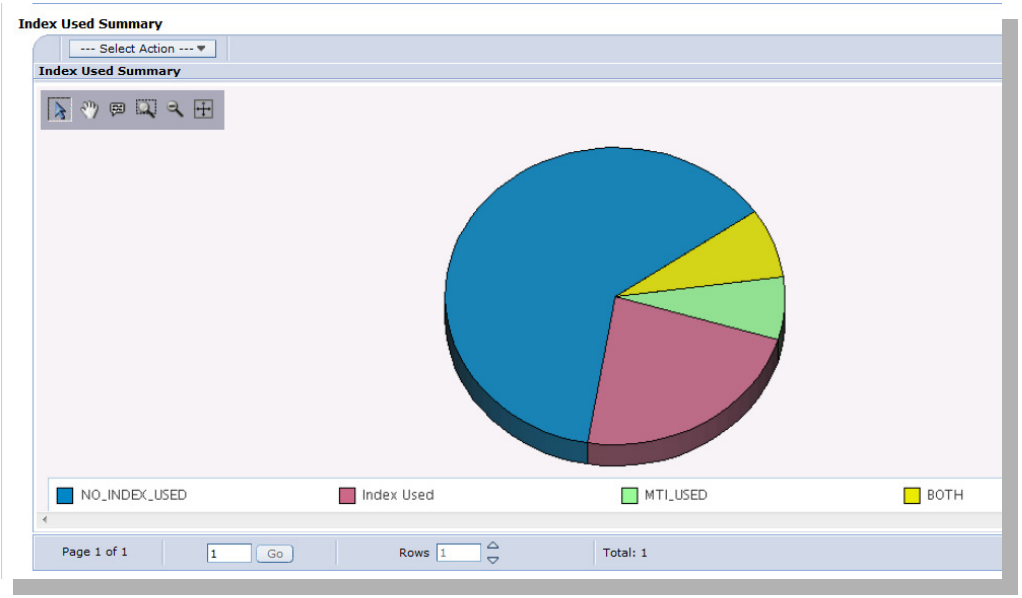
SQL Overview

Several graphs:

- Query time summary
- Open summary
- Open type summary
- Statement usage summary
- Index used summary
- Index create summary
- Index advised
- Statistics advised
- MQT use
- Access plan use
- Parallel degree usage



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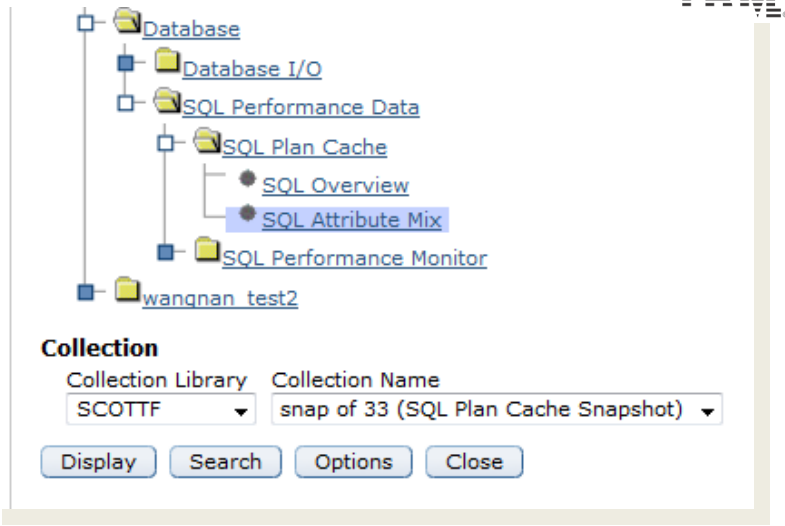
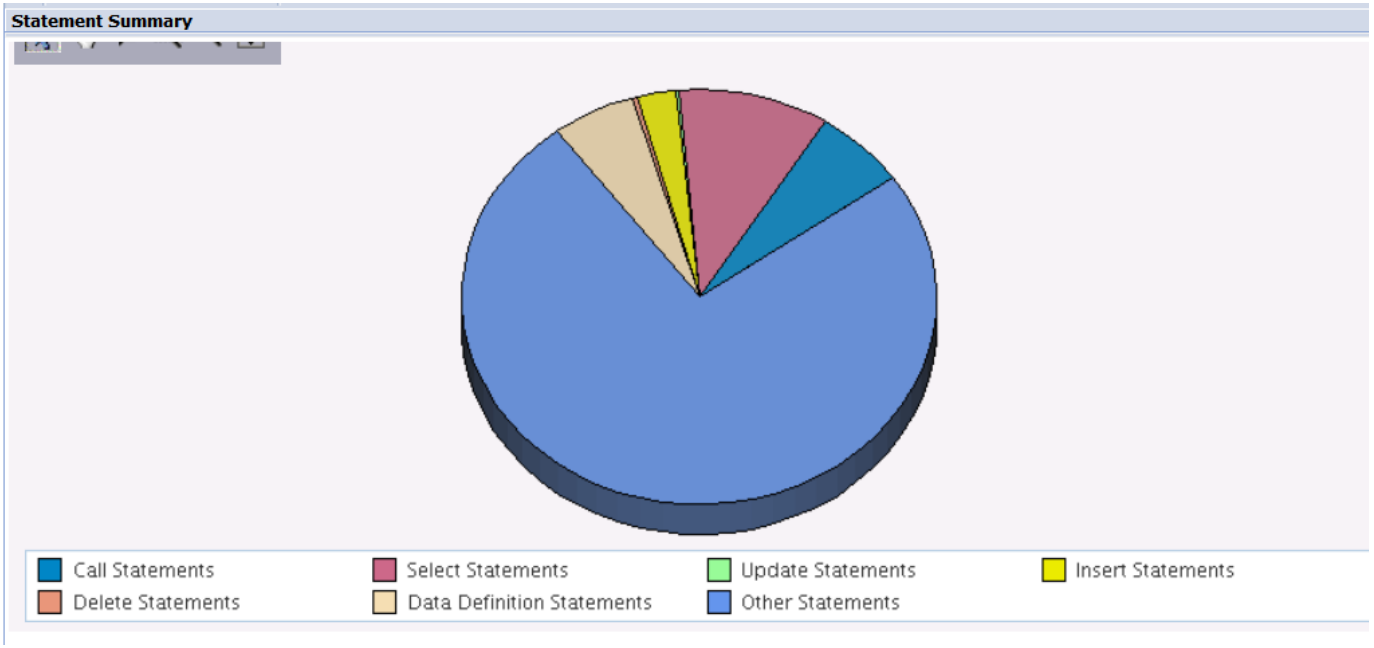
SQL Attribute Mix



Several graphs:

- Statement summary
- Statement type summary
- Isolation level summary
- Allow copy data summary
- Sort sequence summary
- Close cursor summary
- Naming summary
- Optimization goal
- Blocking summary



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Investigate Data

7.1 Features (not available on 6.1)

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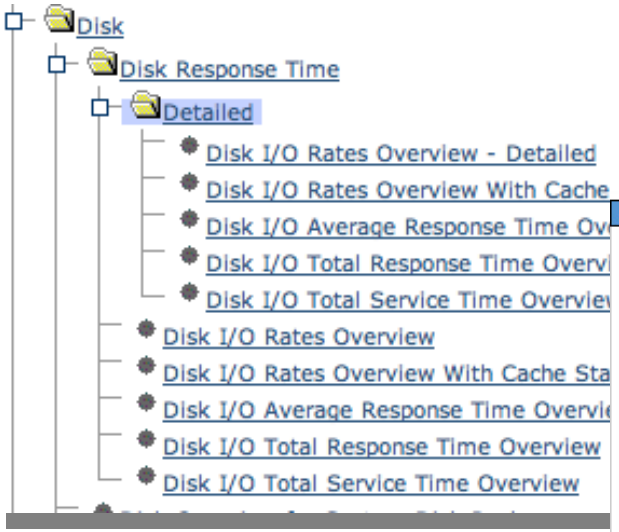
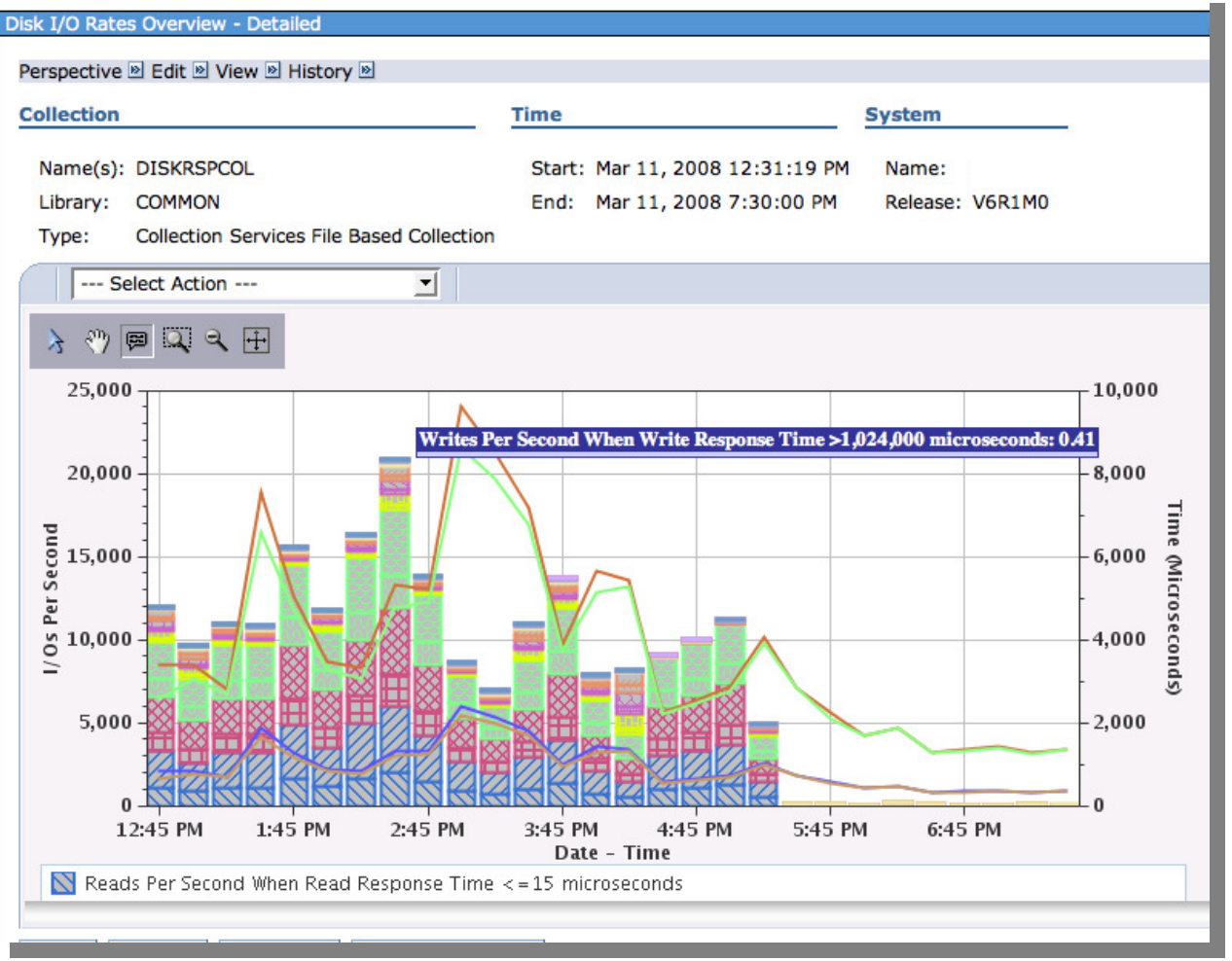
Disk Response Time Charts



A very easy interface to see if you have slow disk operations



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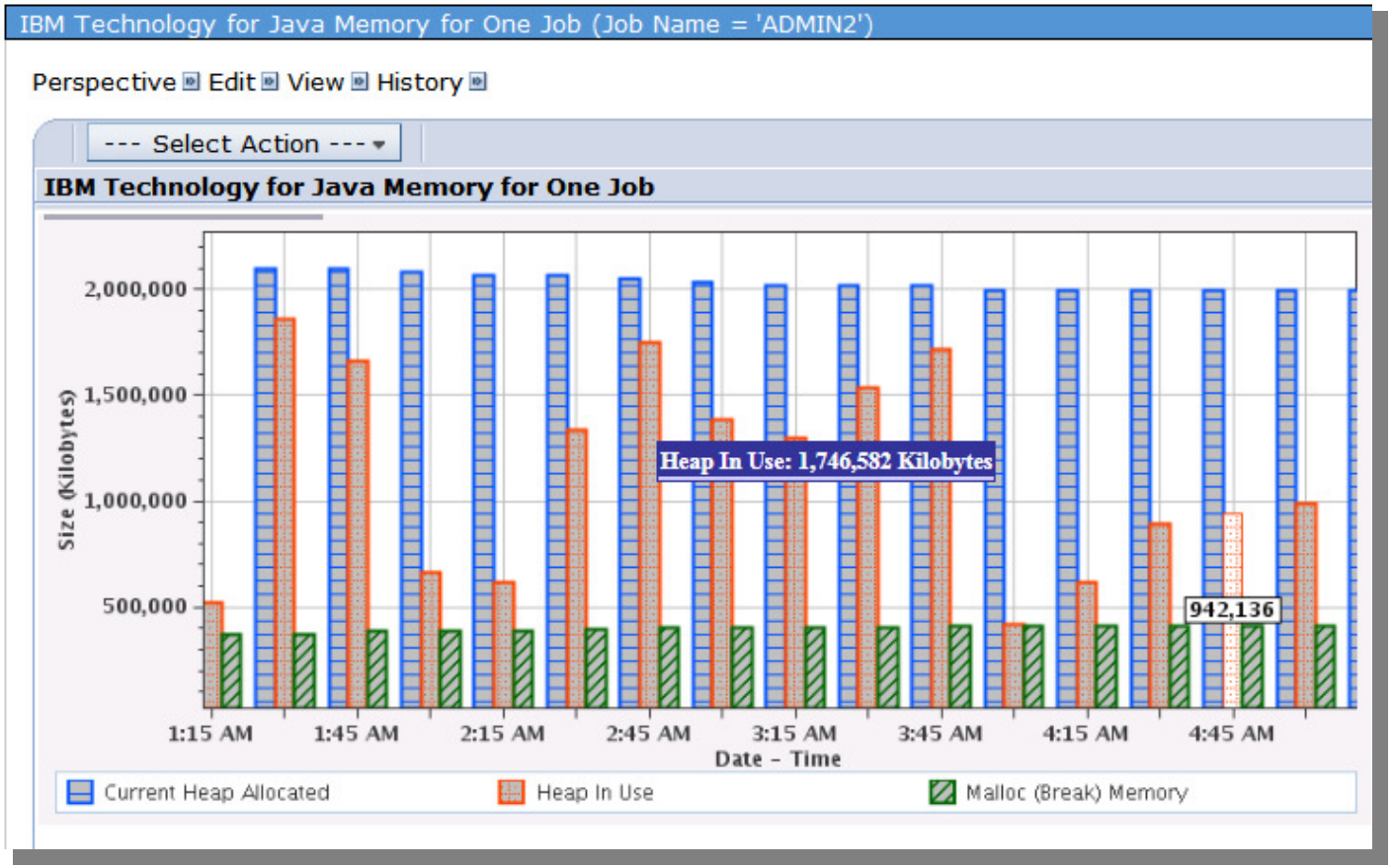
Java Perspectives

Drilldown for one job - Look at the heap and memory usage over time for one selected job.



IBM Technology for Java Memory for One Job

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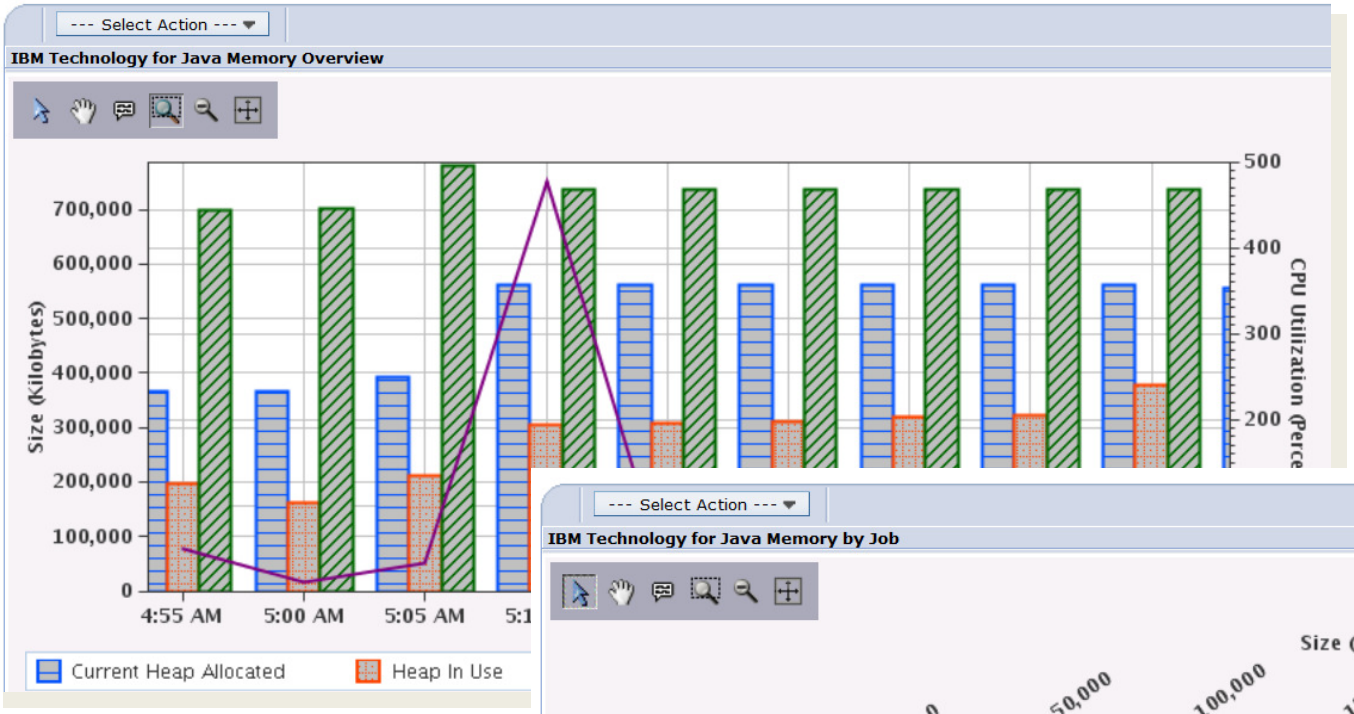
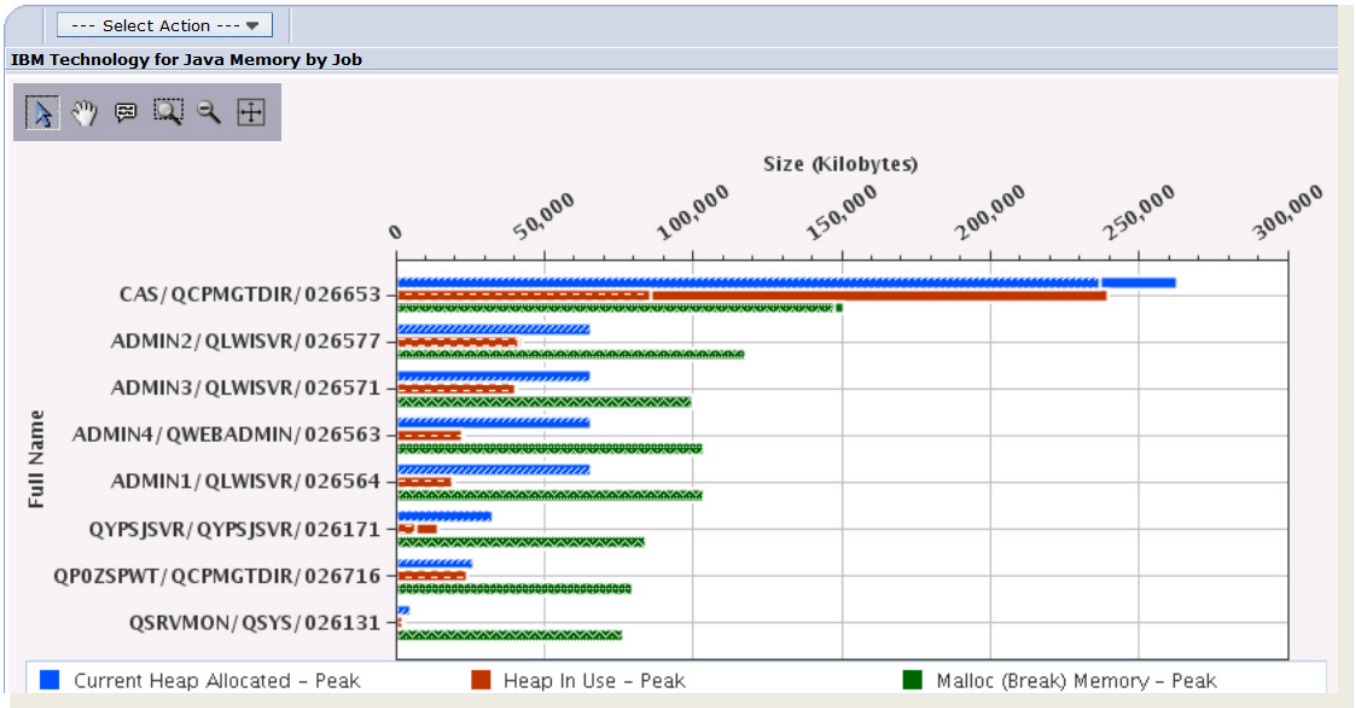
Java Perspectives





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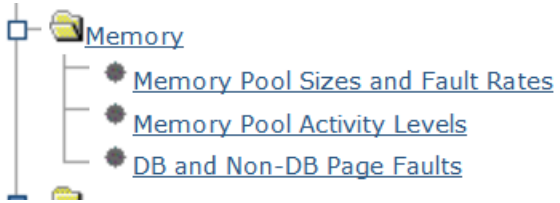
Memory



- Memory perspectives are now available
- Similar information from what you get on WRKSYSSTS….

System Pool	Pool Size (M)	Reserved Size (M)	Max Active	-----DB----- Fault	Pages	---Non-DB--- Fault	Pages
1	490.59	247.83	+++++	.0	.0	.0	.0
2	5344.71	6.07	149	.0	.0	.0	.0
3	2283.44	.00	203	.0	.0	12.3	29.0
4	.25	.00	5	.0	.0	.0	.0

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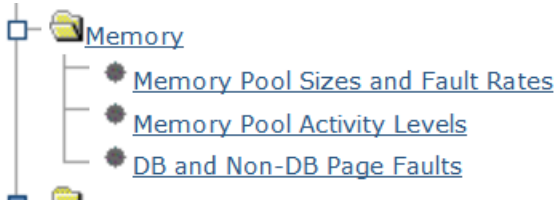
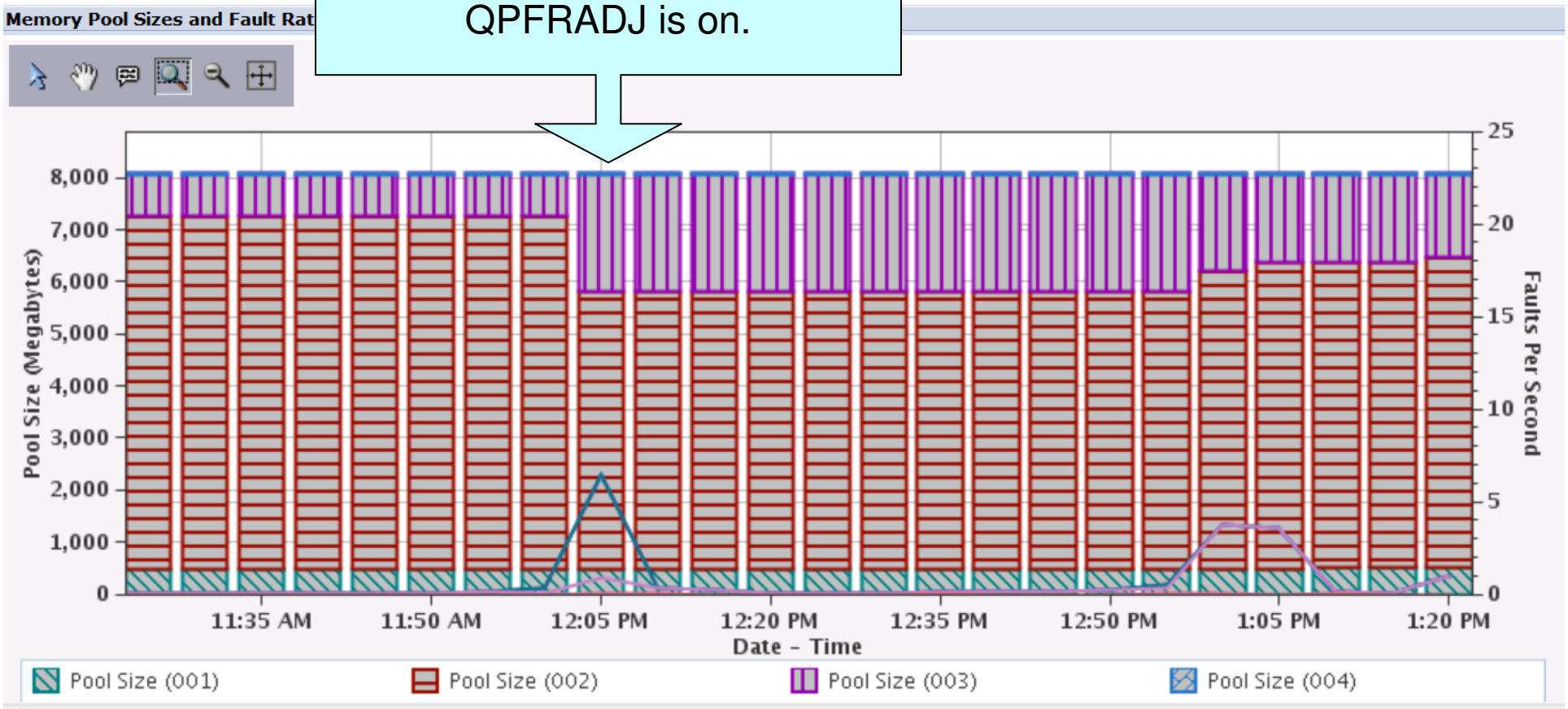
Memory

New!



- In a graphical view!

Note the change in pool sizes.
QPFRADJ is on.



Memory Charts

3 views or charts in each perspective

- **Memory Pool Sizes and Fault Rates**
  View 1: Memory Pool Sizes and Fault Rates (001-004)
  View 2: Memory Pool Sizes (All Pools)
  View 3: Fault Rates (All Pools)

- **Memory Pool Activity Levels**
  View 1: Memory Pool Activity Levels and Ineligible Transitions Per Second (001-004)
  View 2: Memory Pool Activity Levels (All Pools)
  View 3: Ineligible Transitions Per Second (All Pools)

- **DB and Non-DB Page Faults**
  View 1: DB and Non-DB Page Faults Overview (All Pools)
  View 2: DB Page Faults (All Pools)
  View 3: Non-DB Page Faults (All Pools)

- Drilldown:
  - **Memory Metrics for One Pool**
    View 1: Memory Metrics Overview for One Pool
    View 2: DB and Non-DB Page Faults for One Pool
    View 3: DB and Non-DB Pages Read/Written for One Pool

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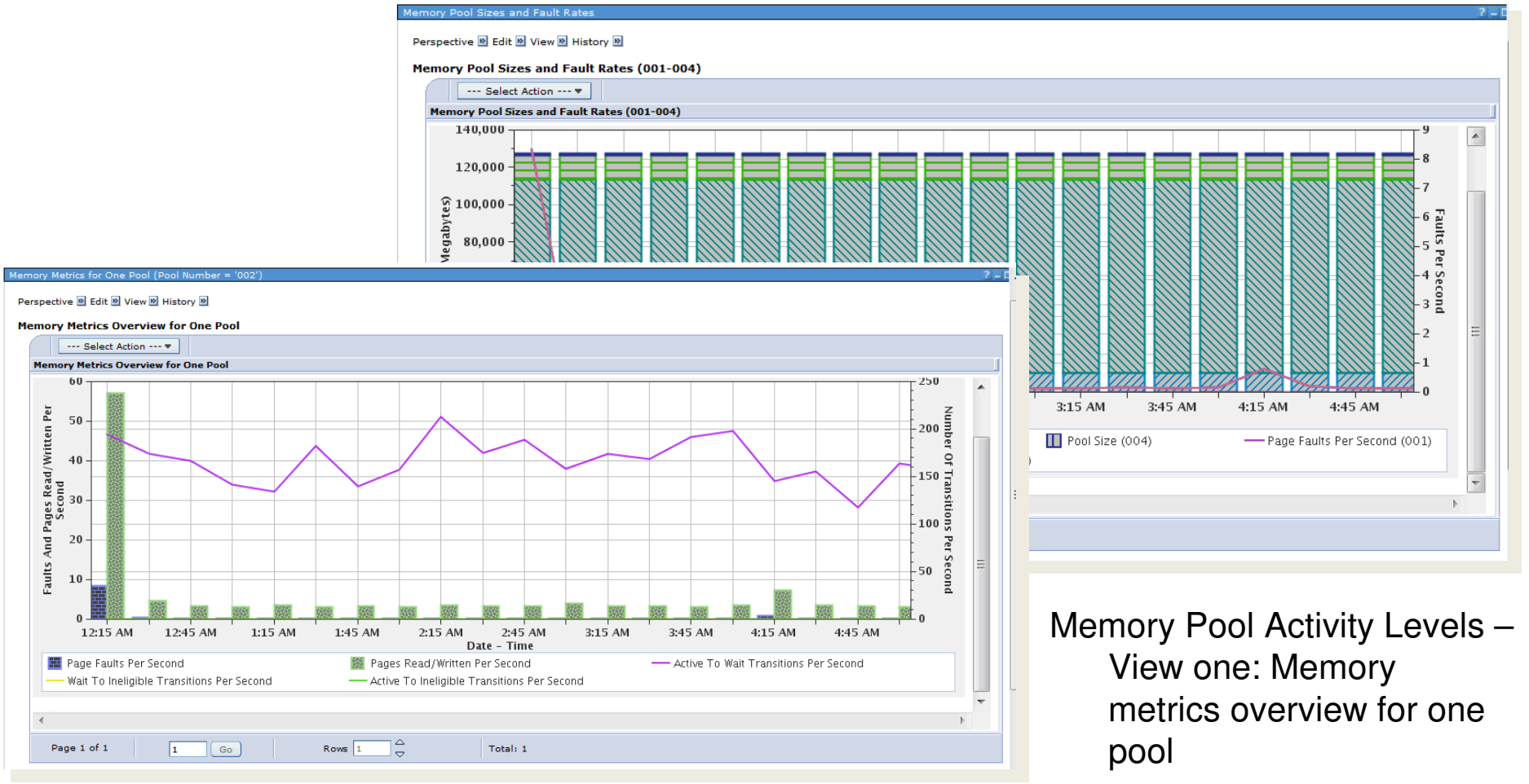
Memory Perspectives

Memory Pool Sizes and Fault Rates – View one: (Pools 001-004)



Memory Pool Activity Levels – View one: Memory metrics overview for one pool

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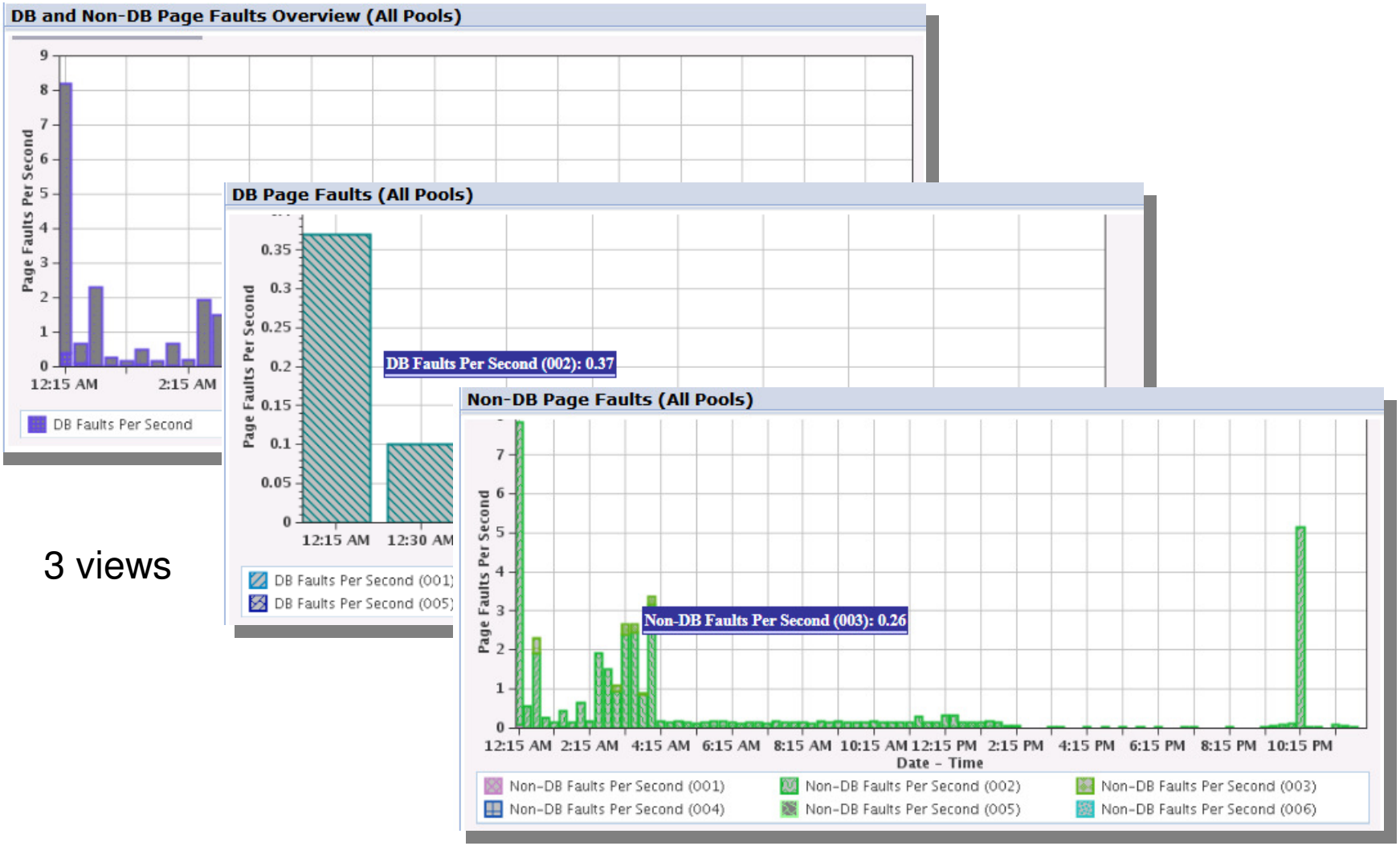
Memory Perspectives – DB and non-DB Page Faults



3 views

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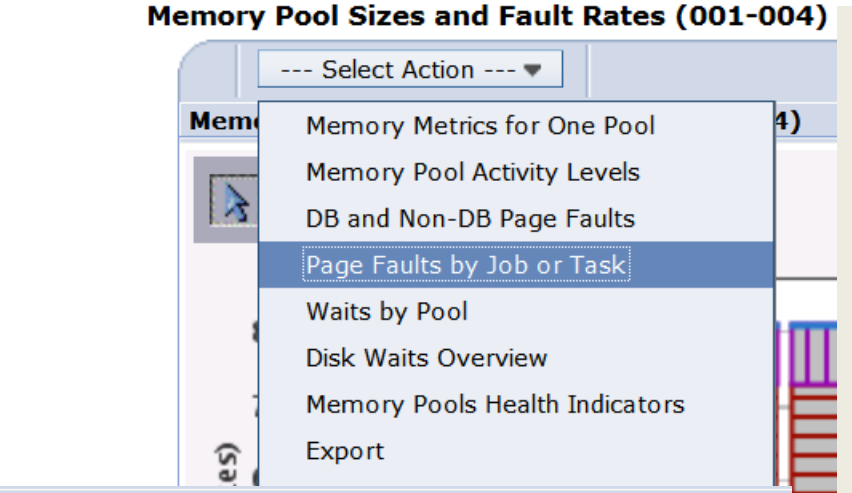
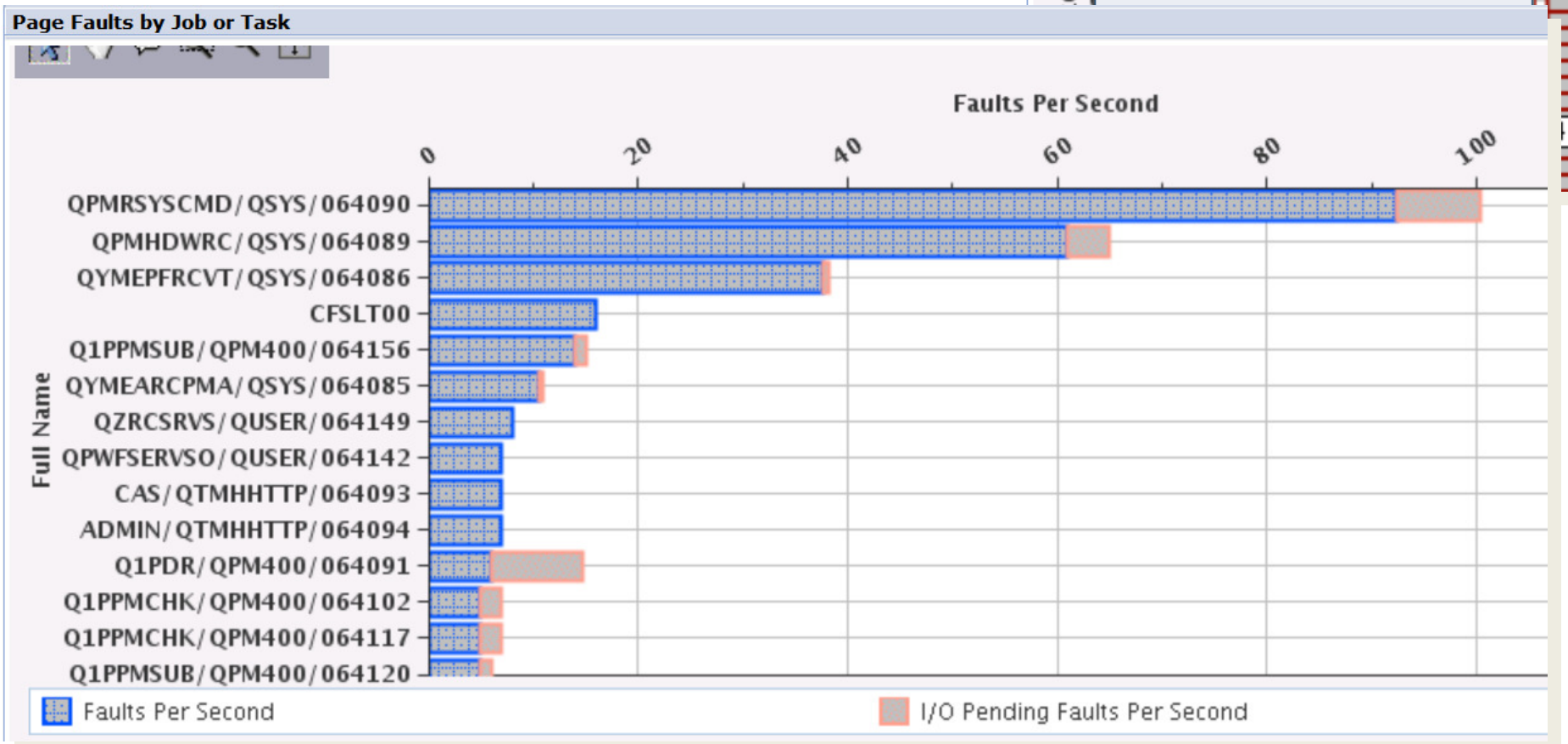
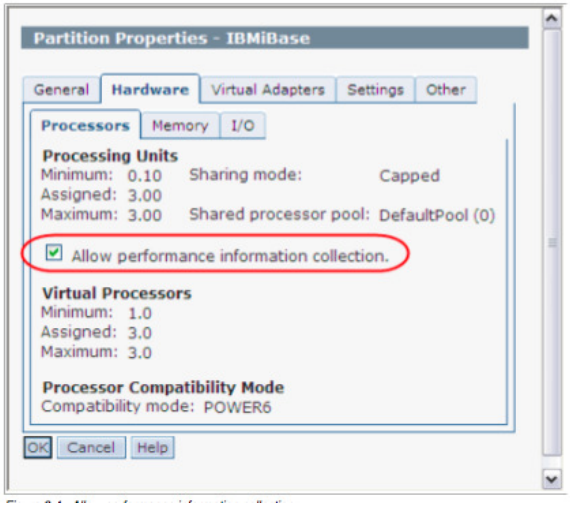
Memory - Drilldown





12X Bus Utilization

- Collection Services collects utilization data for 12X buses
  - QAPMBUSINT file
    http://pic.dhe.ibm.com/infocenter/iseries/v7r1m0/topic/rzahx/rzahxqapmbusint.htm
  - There are currently no graphs shipped with PDI to view this data
  - But you can extend PDI with a custom content package to view this data
    http://www-03.ibm.com/support/techdocs/atsmastr.nsf/WebIndex/PRS4957
  - Enable Performance information collection on the HMC
  - Install the custom content package to enable additional graphs on the 12X utilization data



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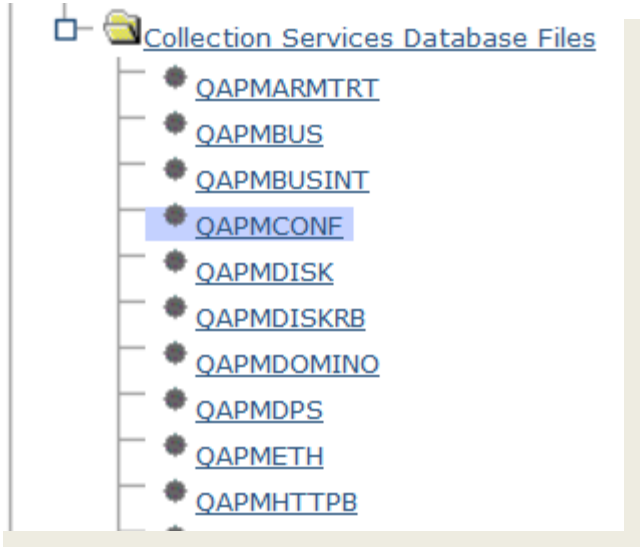
Display Collection Services DB Files

.... QAPMCONF



QAPMCONF

Perspective » Edit » View » History »

Collection
Name(s): Q067000002
Library: QPFRDATA
Type: Collection Services File Based Collection
File level: 36

Time
Start: Mar 8, 2013 12:00:02 AM
End: Ongoing

System
Name: ETC3T1
Release: V7R1M0

QAPMCONF Panel View

Library Name:	QPFRDATA	Processor Firmware Time:	No
Member Name:	Q067000002	Task Threshold Value (ms):	1,000
Start Time:	Mar 8, 2013 12:00:02 AM	Secondary Thread Thresh (ms):	1,000
Model Number:	61X	Disk Response Time Boundary 1 (us):	15
System Type:	7998	Disk Response Time Boundary 2 (us):	250
Partition Memory (KB):	4194304	Disk Response Time Boundary 3 (us):	1,000
Comm Data Collected:	Y	Disk Response Time Boundary 4 (us):	4,000
Machine Serial Number:	10-065FA	Disk Response Time Boundary 5 (us):	8,000
Response Time Boundary 1 (ms):	1000	Disk Response Time Boundary 6 (us):	16,000
Response Time Boundary 2 (ms):	2000	Disk Response Time Boundary 7 (us):	64,000
Response Time Boundary 3 (ms):	4000	Disk Response Time Boundary 8 (us):	256,000
Response Time Boundary 4 (ms):	8000	Disk Response Time Boundary 9 (us):	500,000
System ASP Capacity (KB):	93,206,752	Disk Response Time Boundary 10 (us):	1,024,000
Checksum Protection On:	N	Hypervisor Memory (MB):	640
Virtual Processors:	2	SMT Hardware Threads:	0
Installed Processors:	4	Time Interval (minutes):	5
Remote Response Boundary 1 (ms):	-	Interactive Limit (%):	100.00
Remote Response Boundary 2 (ms):	-	Time Interval (seconds):	300
Remote Response Boundary 3 (ms):	-	Interactive Threshold (%):	100.00
System ASP Capacity (KB):	93,206,752	Processor Multi-tasking Capability:	System Controlled
Perm 16MB Addr Remaining:	274,848,547,584	Output File System:	ETC3T1
Temp 16MB Addr Remaining	274,814,995,200	Partition Count:	3
Disk Resp Time Boundary 1 (ms):	1	Processor Folding Support:	No
Disk Resp Time Boundary 2 (ms):	16	Partition ID:	2
Disk Resp Time Boundary 3 (ms):	64	Primary Partition ID:	0
Disk Resp Time Boundary 4 (ms):	256	Processor Units:	0.2
Disk Resp Time Boundary 5 (ms):	1,024	System Version:	7
Collection Data:	Consistent with *SYS	System Release:	1.0
Collect Internal Data:	N	System Name:	ETC3T1
*CSMGTCOL Collection Library:	QPFRDATA	Performance Monitor Select Job:	
*CSMGTCOL Collection Name:	Q067000002	Shared Processor Pool:	Yes
Database Consistency:		Partition Sharing Capped:	Uncapped
Database Limit (% of CPU):	100.0	Variable Processor Speed Capability:	1
		QPFRADJ System Value:	2

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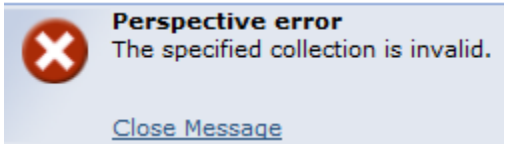
Considerations for Viewing Prior Release Performance data

- Performance data from earlier releases can be viewed with the Performance Data Investigator at the latest release
  - **Note**: Not all graphs and charts will be available after conversion due to changes in data content and format

- If prior release data has not been converted, you may get errors when trying to display charts



- Use the Convert Performance Collection (CVTPFRCOL) command
  - Collection Services data from 5.4 can be converted and viewed with PDI on 6.1 or 7.1
  - Collection Services data from 6.1 can be converted and viewed with PDI on 7.1
  - Performance Explorer data from 6.1 can be converted and viewed with PDI on 7.1
  - Job Watcher data from 6.1 can be converted and viewed with PDI on 7.1
  - Disk Watcher data from 6.1 can be converted and viewed with PDI on 7.1

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Considerations for Viewing Prior Release Performance data

- Convert the performance data to the current release format (commands)
  - For Collection Services data
    - The preferred approach is to save the Management Collection object to a save file
      - `SAVOBJ OBJ(MYMGTCOL) LIB(MYLIB) DEV(*SAVF) SAVF(MYLIB/MYSAVF)`
      - FTP the save file to the 6.1 or 7.1 partition
      - Use the Restore Performance Collection command (RSTPFRCOL) to restore the *CSMGTCOL collection
      - Use the Create Performance Data (CRTPFRDTA) command to get the data into database files
      - Create Performance Data will create the data at the current release format
    - Note: the library in which the performance data is restored into needs to be at the current release level
  - For Job Watcher, Disk Watcher, or Performance Explorer collections
    - Save the performance data using the Save Performance Collection (SAVPFRCOL) command
    - FTP the save file to the 6.1 or 7.1 partition
    - Use the Restore Performance Collection (RSTPFRCOL) command to restore the data on the 6.1 or 7.1 partition. The TYPE parameter will vary between 6.1 and 7.1 releases.
    - Use the Convert Performance Collection (CVTPFRCOL) command to convert the prior release database files to the current release.

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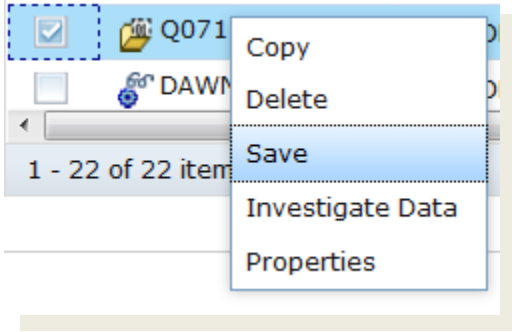
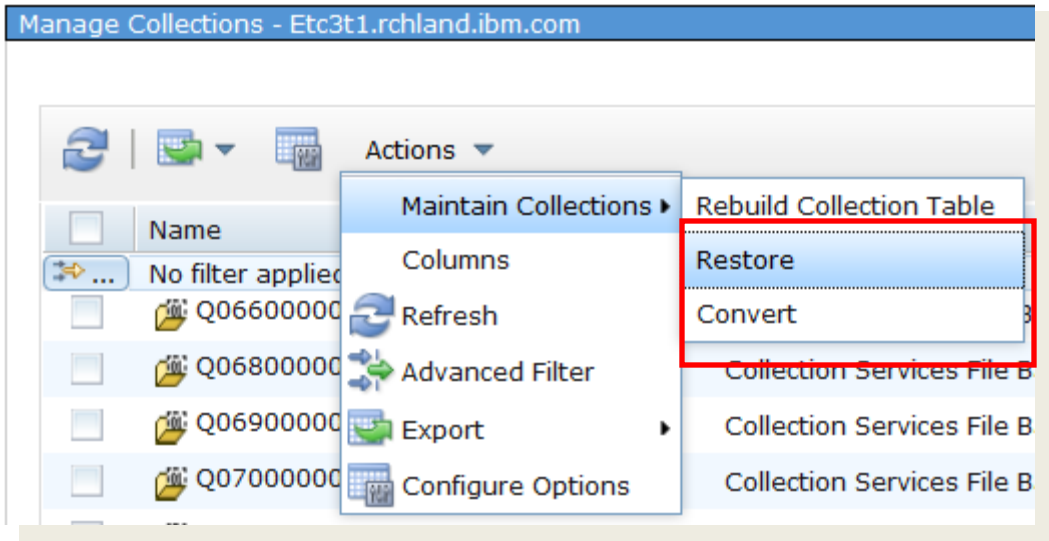
Considerations for Viewing Prior Release Performance data

- Convert the performance data to the current release format via the GUI
  - The steps are similar to the prior slide:
    - Save the performance collection
    - FTP the save file to the desired 6.1 or 7.1 partition
    - Restore the collection via the Collection Manager
    - Convert the collection to the current release format





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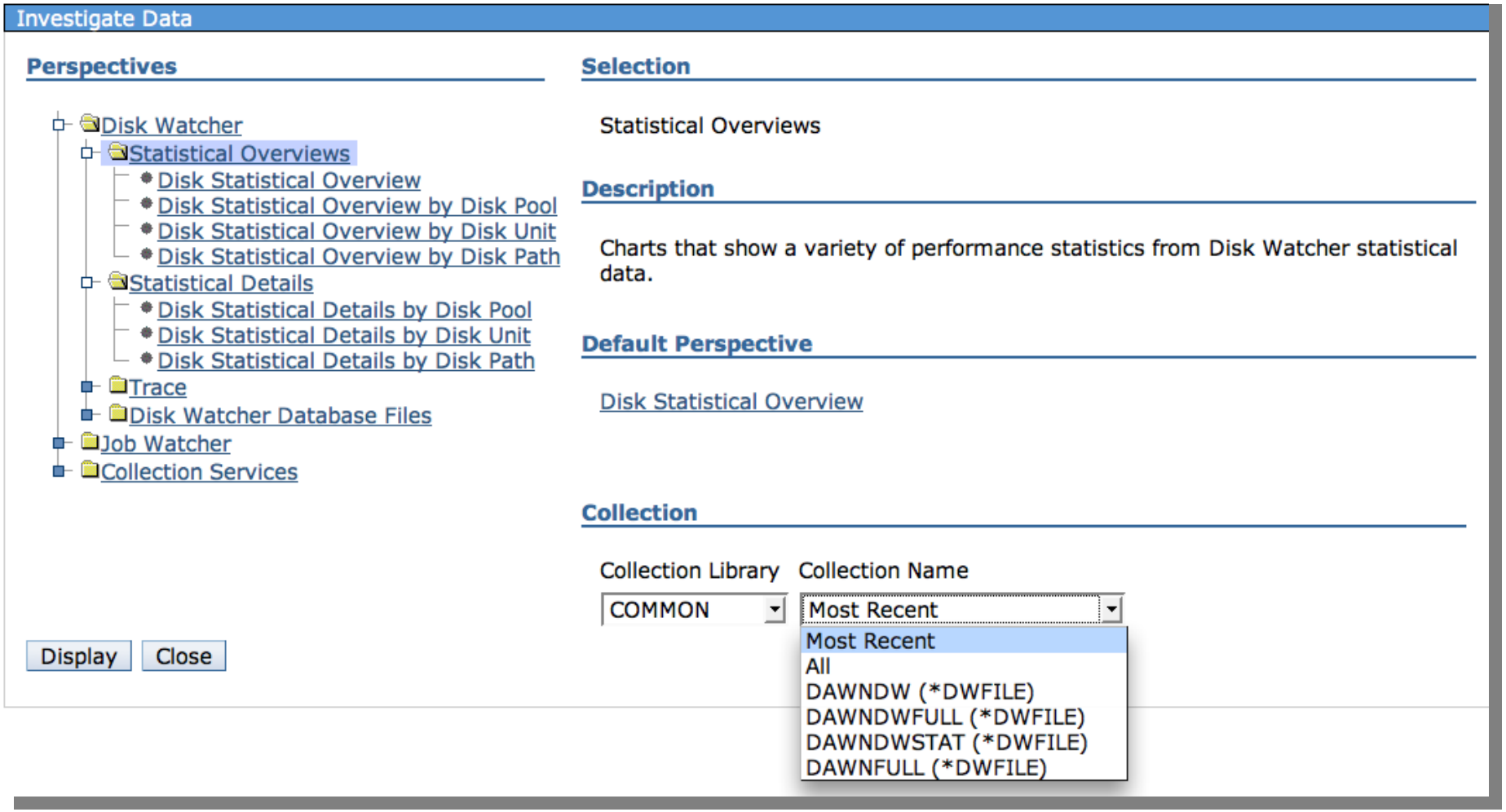
Disk Watcher



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Disk Watcher – Statistical Overviews

Disk Statistical Overview

Perspective Edit View History

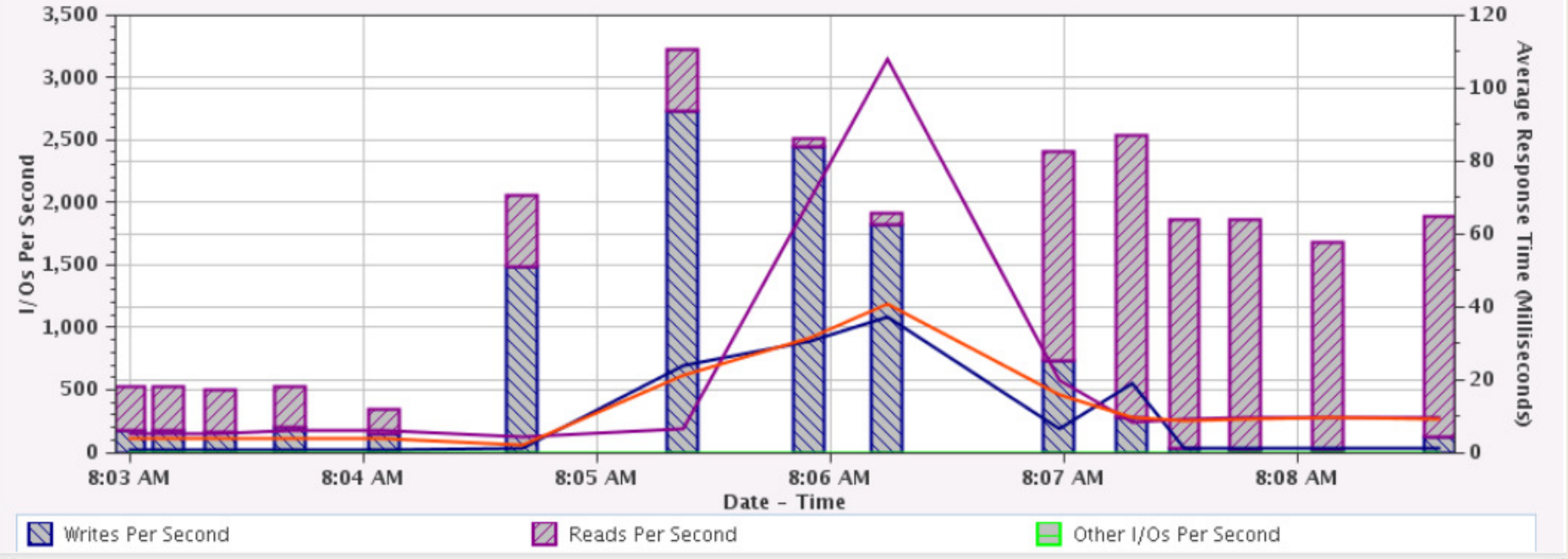
Collection
Name(s): DAWNFULL
Library: COMMON
Type: Disk Watcher File Based Collection
File level: 1

Time
Start: Mar 12, 2008 8:02:48 AM
End: Mar 12, 2008 8:08:36 AM

System
Name:
Release: V6R1M0

--- Select Action ---

Disk Statistical Overview



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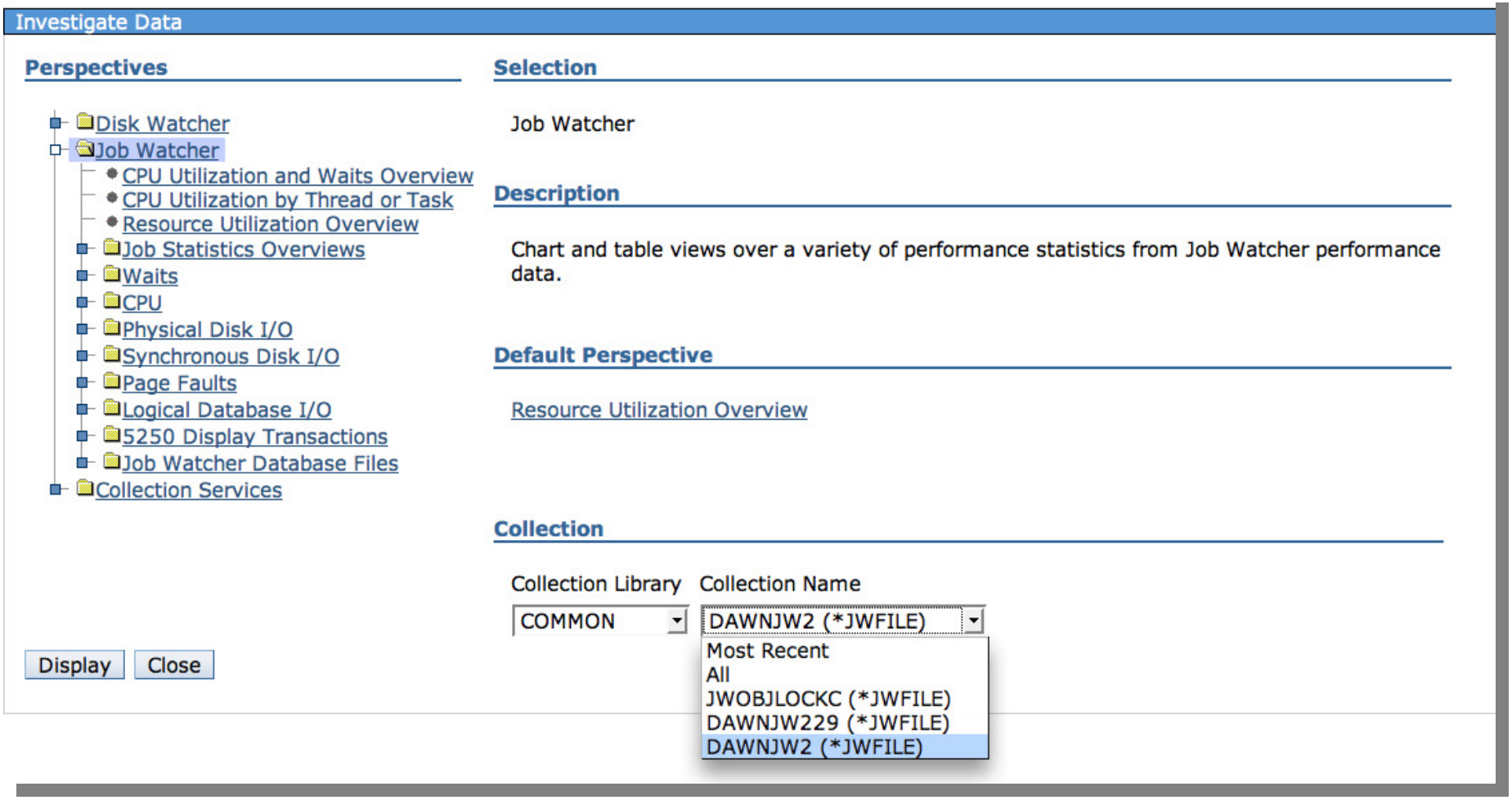
Job Watcher



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Job Watcher - CPU Utilization and Waits Overview

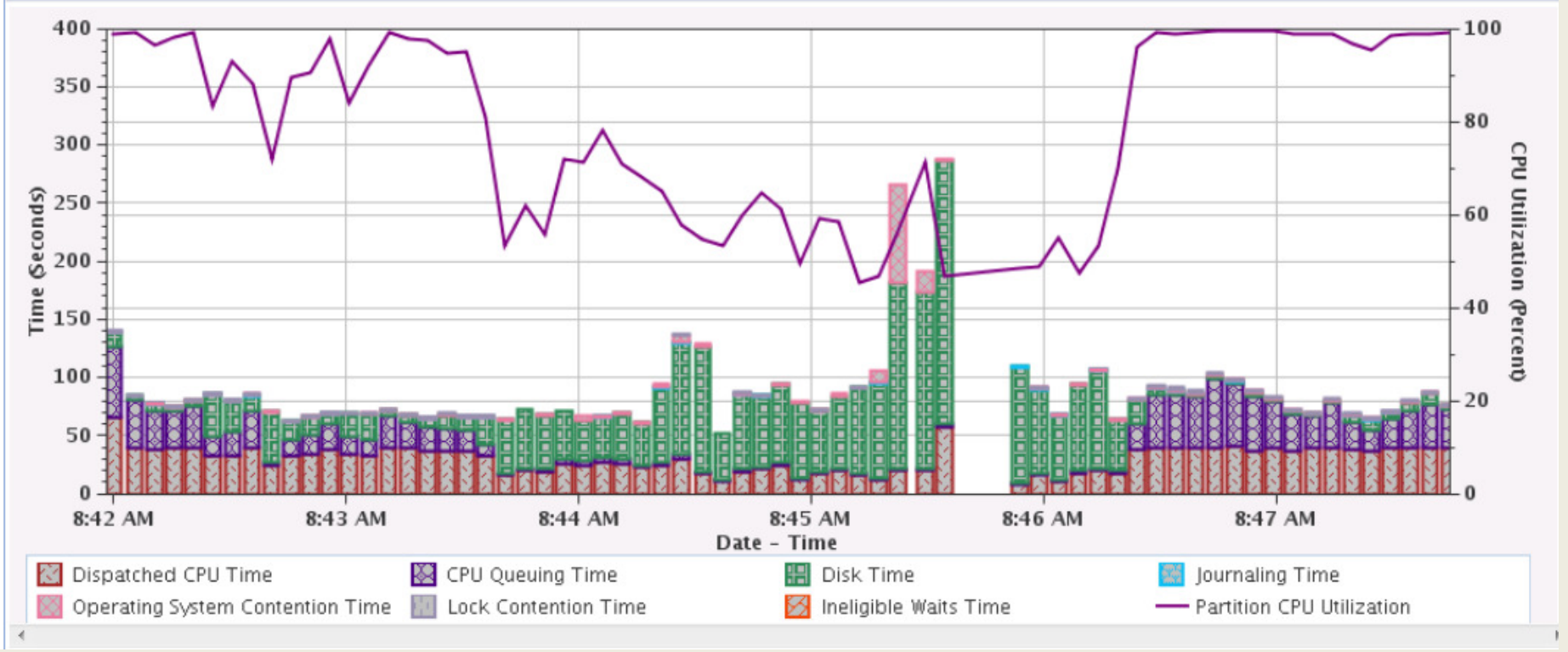
Collection
Name(s): DAWNJW2
Library: COMMON
Type: Job Watcher File Based Collection
File level: 3

Time
Start: Mar 12, 2008 8:42:26 AM
End: Mar 12, 2008 9:42:33 AM

System
Name:
Release: V6R1M0

--- Select Action ---

CPU Utilization and Waits Overview



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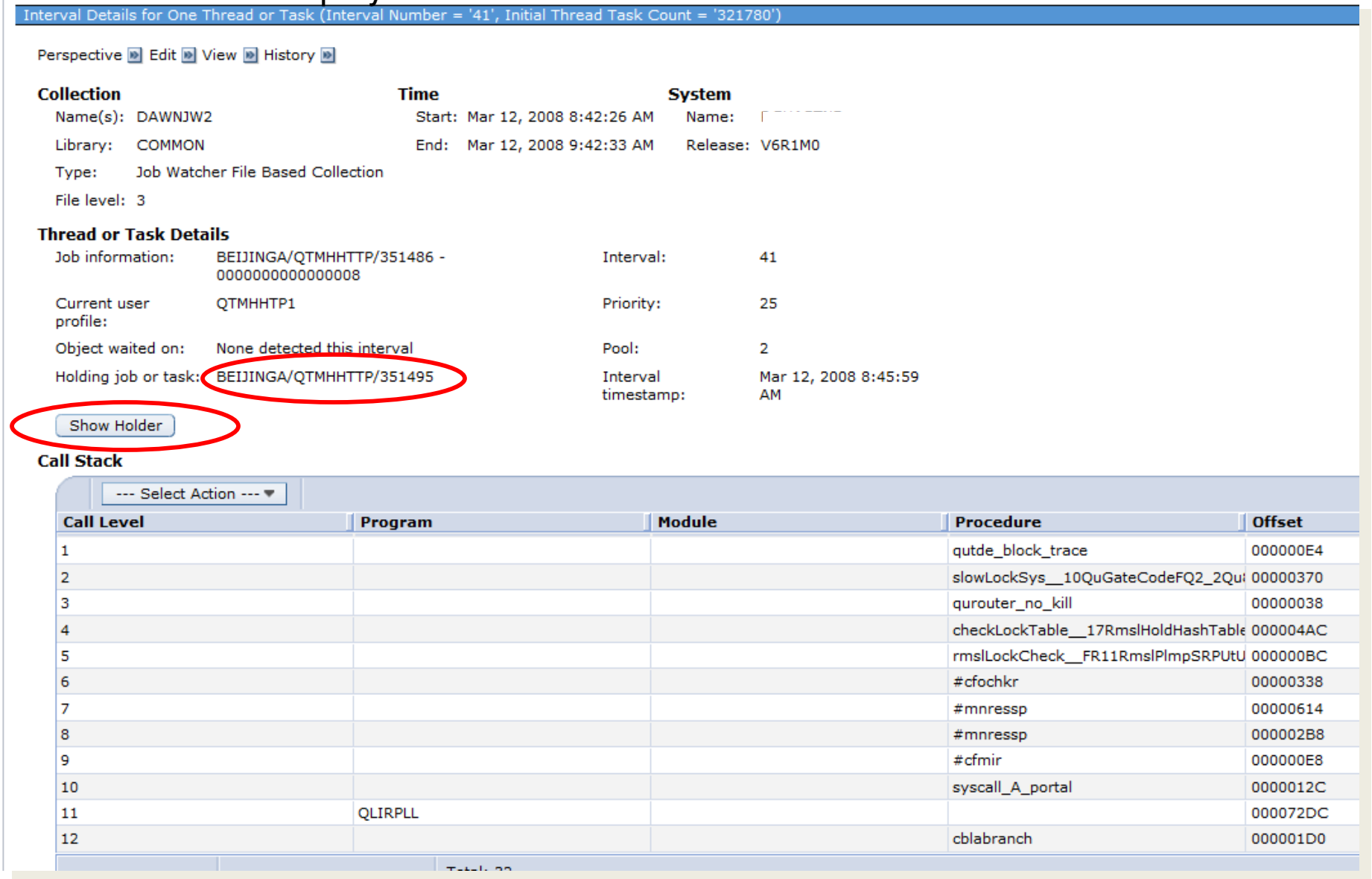
Job Watcher – Show Holder

- If there is a holding job or task for the current thread or task, the “Show Holder” button will be displayed



Interval Details for One Thread or Task (Interval Number = '41', Initial Thread Task Count = '321780')

Perspective » Edit » View » History »

Collection

Name(s): DAWNJW2
Library: COMMON
Type: Job Watcher File Based Collection
File level: 3

Time

Start: Mar 12, 2008 8:42:26 AM
End: Mar 12, 2008 9:42:33 AM

System

Name:
Release: V6R1M0

Thread or Task Details

Job information:	BEIJINGA/QTMHHTTP/351486 - 0000000000000008	Interval:	41
Current user profile:	QTMHHTP1	Priority:	25
Object waited on:	None detected this interval	Pool:	2
Holding job or task:	BEIJINGA/QTMHHTTP/351495	Interval timestamp:	Mar 12, 2008 8:45:59 AM

Show Holder

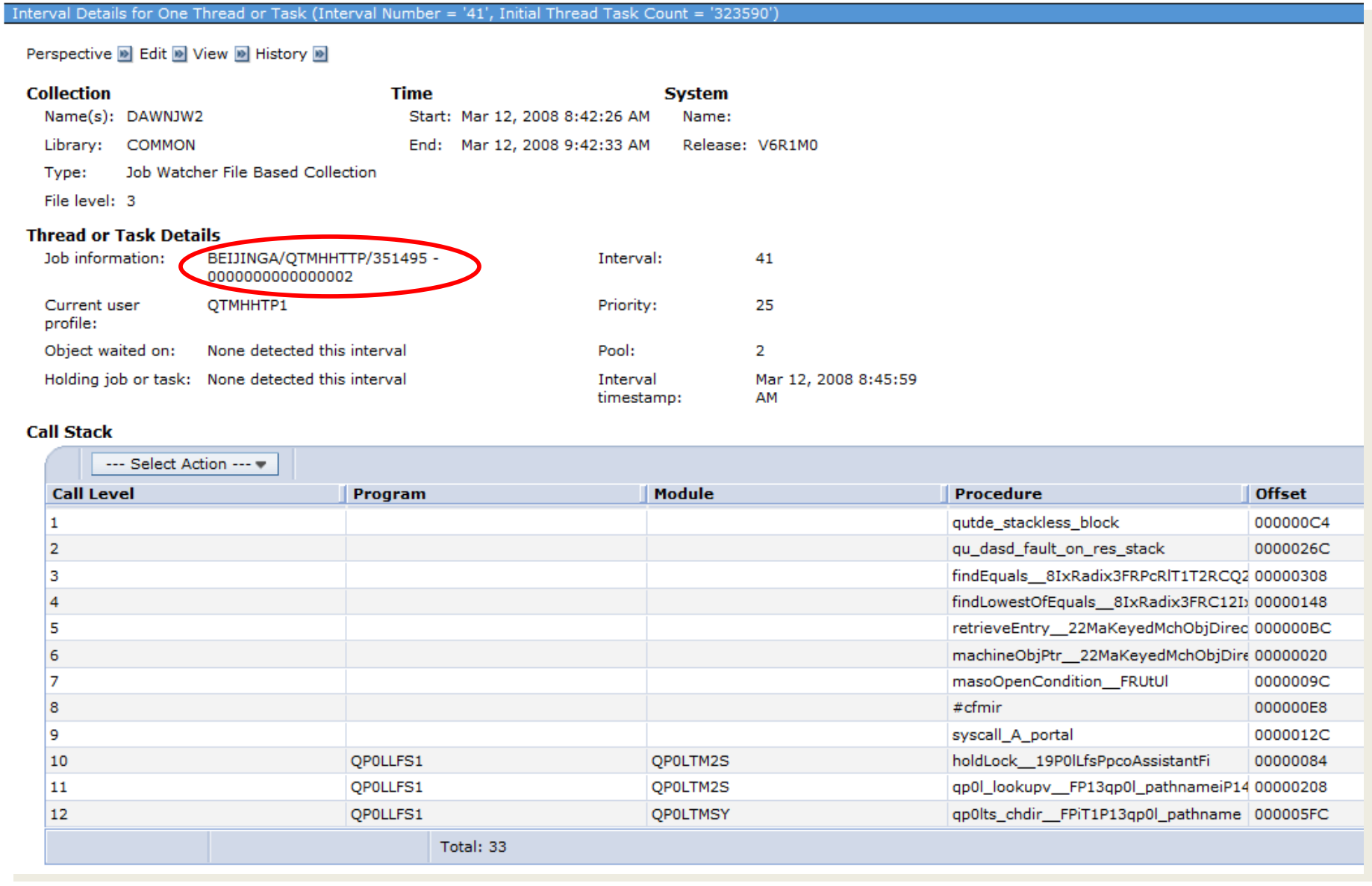
Call Stack

--- Select Action ---

Call Level	Program	Module	Procedure	Offset
1			qutde_block_trace	000000E4
2			slowLockSys__10QuGateCodeFQ2_2Qu	00000370
3			qurouter_no_kill	00000038
4			checkLockTable__17RmslHoldHashTable	000004AC
5			rmslLockCheck__FR11RmslPlmpSRPUtU	000000BC
6			#cfochkr	00000338
7			#mnressp	00000614
8			#mnressp	000002B8
9			#cfmir	000000E8
10			syscall_A_portal	0000012C
11	QLIRPLL			000072DC
12			cblabranch	000001D0

Job Watcher – Show Holder

- When clicking the “Show Holder” button, the holding job or task info will be



Interval Details for One Thread or Task (Interval Number = '41', Initial Thread Task Count = '323590')

Perspective » Edit » View » History »

Collection
Name(s): DAWNJW2
Library: COMMON
Type: Job Watcher File Based Collection
File level: 3

Time
Start: Mar 12, 2008 8:42:26 AM
End: Mar 12, 2008 9:42:33 AM

System
Name:
Release: V6R1M0

Thread or Task Details

Job information:	BEIJINGA/QTMHHTTP/351495 - 0000000000000002	Interval:	41
Current user profile:	QTMHHTP1	Priority:	25
Object waited on:	None detected this interval	Pool:	2
Holding job or task:	None detected this interval	Interval timestamp:	Mar 12, 2008 8:45:59 AM

Call Stack

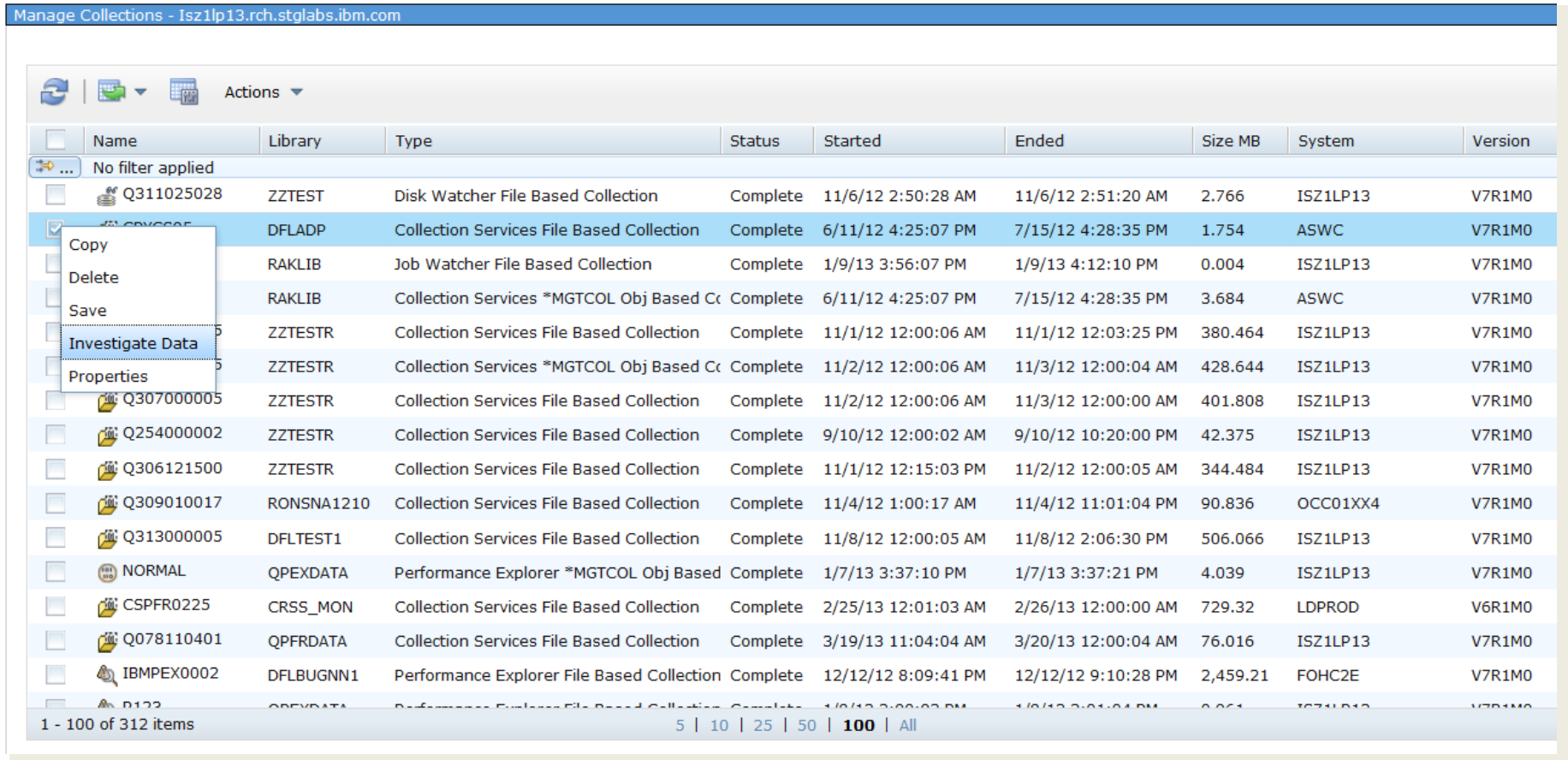
--- Select Action ---

Call Level	Program	Module	Procedure	Offset
1			qutde_stackless_block	000000C4
2			qu_dasd_fault_on_res_stack	0000026C
3			findEquals__8IxRadix3FRPcRlT1T2RCQ2	00000308
4			findLowestOfEquals__8IxRadix3FRC12I	00000148
5			retrieveEntry__22MaKeyedMchObjDirec	000000BC
6			machineObjPtr__22MaKeyedMchObjDire	00000020
7			masoOpenCondition__FRUtUl	0000009C
8			#cfmir	000000E8
9			syscall_A_portal	0000012C
10	QP0LLFS1	QP0LTM2S	holdLock__19P0lLfsPpcoAssistantFi	00000084
11	QP0LLFS1	QP0LTM2S	qp0l_lookupv__FP13qp0l_pathnameiP14	00000208
12	QP0LLFS1	QP0LTMSY	qp0lts_chdir__FPiT1P13qp0l_pathname	000005FC

Total: 33

Manage Collections

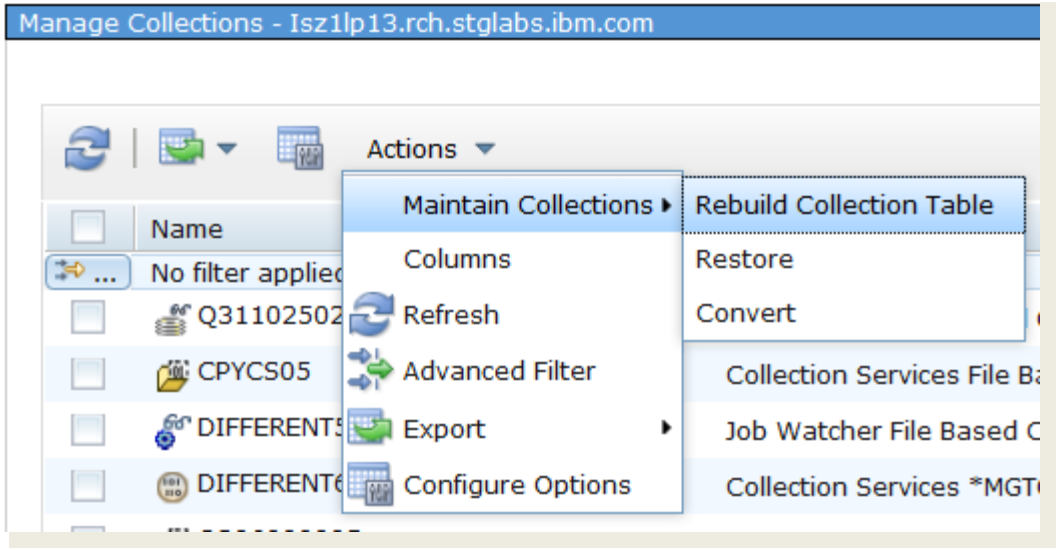
- The Manager Collections tasks allows you to see and manage all of your performance data from one central location
- Various tasks can be launched from the Manage Collections task, including the Performance Data Investigator



Manage Collections

- If you restore performance data without using the Restore Performance Collection interface, collections may not display in the Manage Collections view.

- The “Rebuild Collection Table” option will rebuild the meta-data used for the Manage Collections task and then your performance data should be visible.



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Performance Data - Analysis

Art of Performance Diagnostics with the Performance Data Investigator

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Analyzing Performance Data Using PDI

- Now that you know all that PDI can do….
  - How do you really use it to analyze performance data?
  - There are no specific steps – it all depends upon what you see in the performance data
  - If you look at your performance data on a regular basis, you will learn your “normal” pattern which makes it easier to identify something unusual
  - Experience is the best teacher.

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Analyzing Performance Data Using PDI

- Start by asking some questions:
  - What was the symptom of the problem?
  - Who reported the problem?
  - What time did it occur?
  - How long did it last?
  - Have there been any recent changes?
    - New or changed workload?
    - Any application changes?
    - Any recent hardware configuration changes?
  - What was the scope?
    - Did it impact the entire system?
    - Did it impact some subset of work?
      - Specific users?
      - Specific applications?

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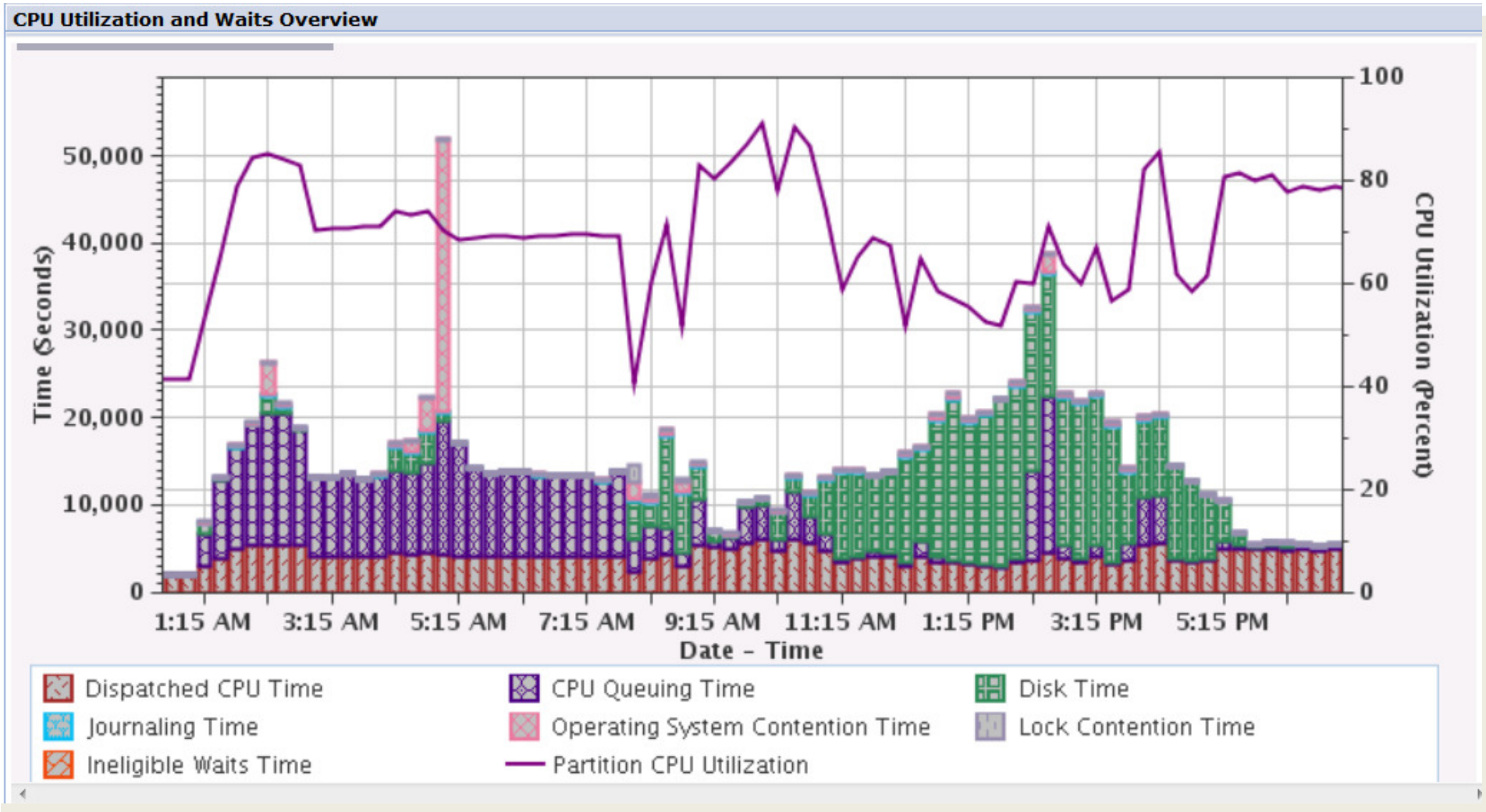
CPU Utilization and Waits Overview

I generally start with CPU Utilization and Waits Overview and look for *interesting* points
Next steps will depend upon the answer to the prior questions, along with what you see.



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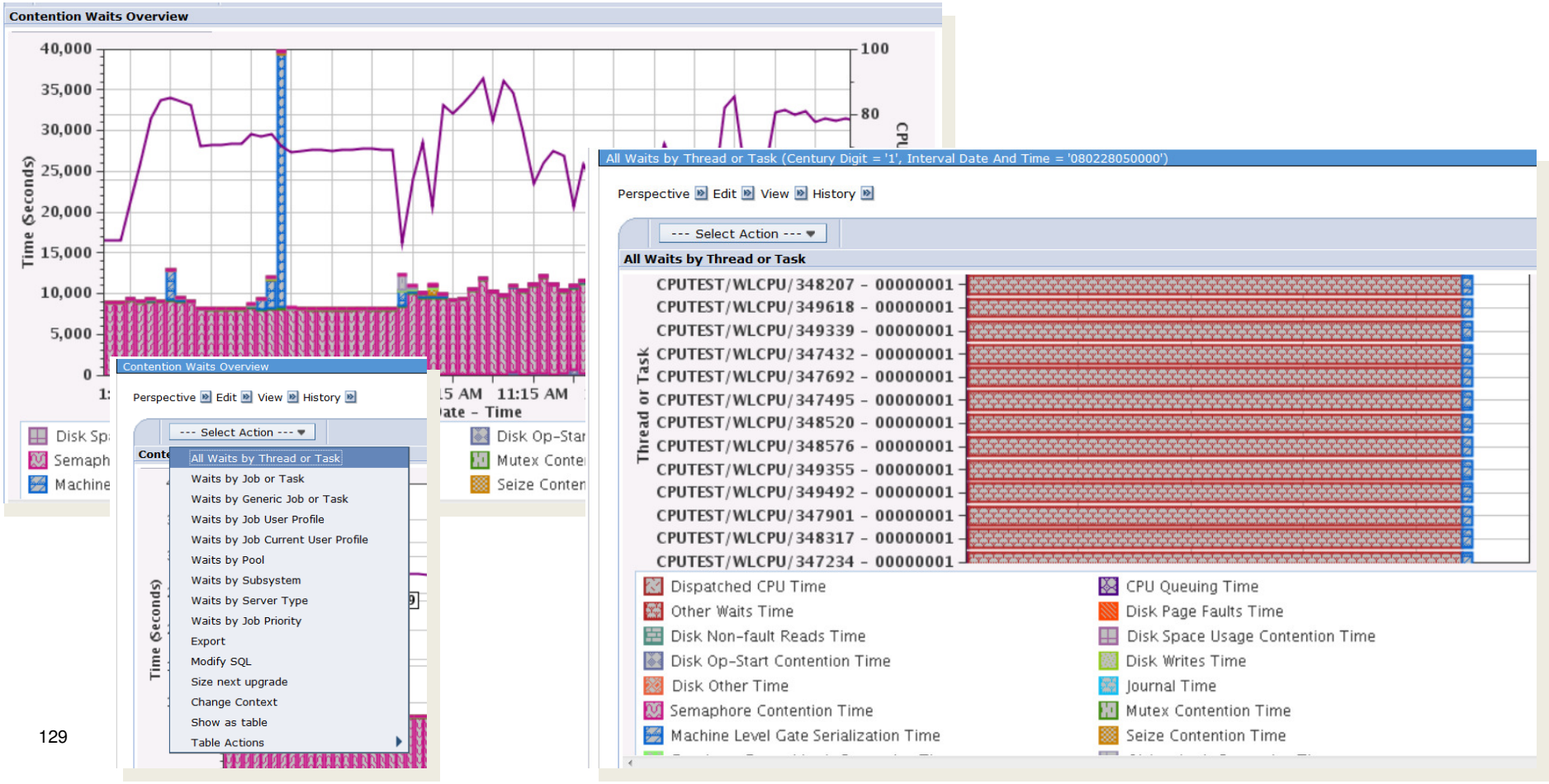
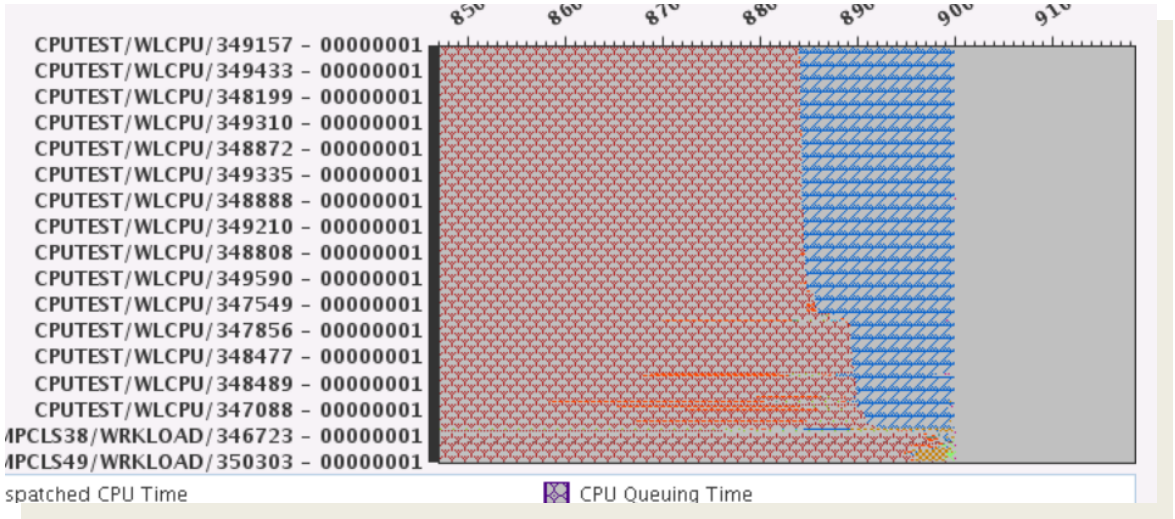
Using PDI, you can learn how to navigate through your data

- Collection Services data may not be able to resolve your problem, but it may very well help to identify areas where more detailed analysis is needed.



Drill-down based upon what you see

- While no one job was causing the spike in contention, we can find out many jobs were affected during that interval.
- This is an example where Collection Services can show us something is going on, but Job Watcher data is necessary to identify the root cause.



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What is causing disk wait time?

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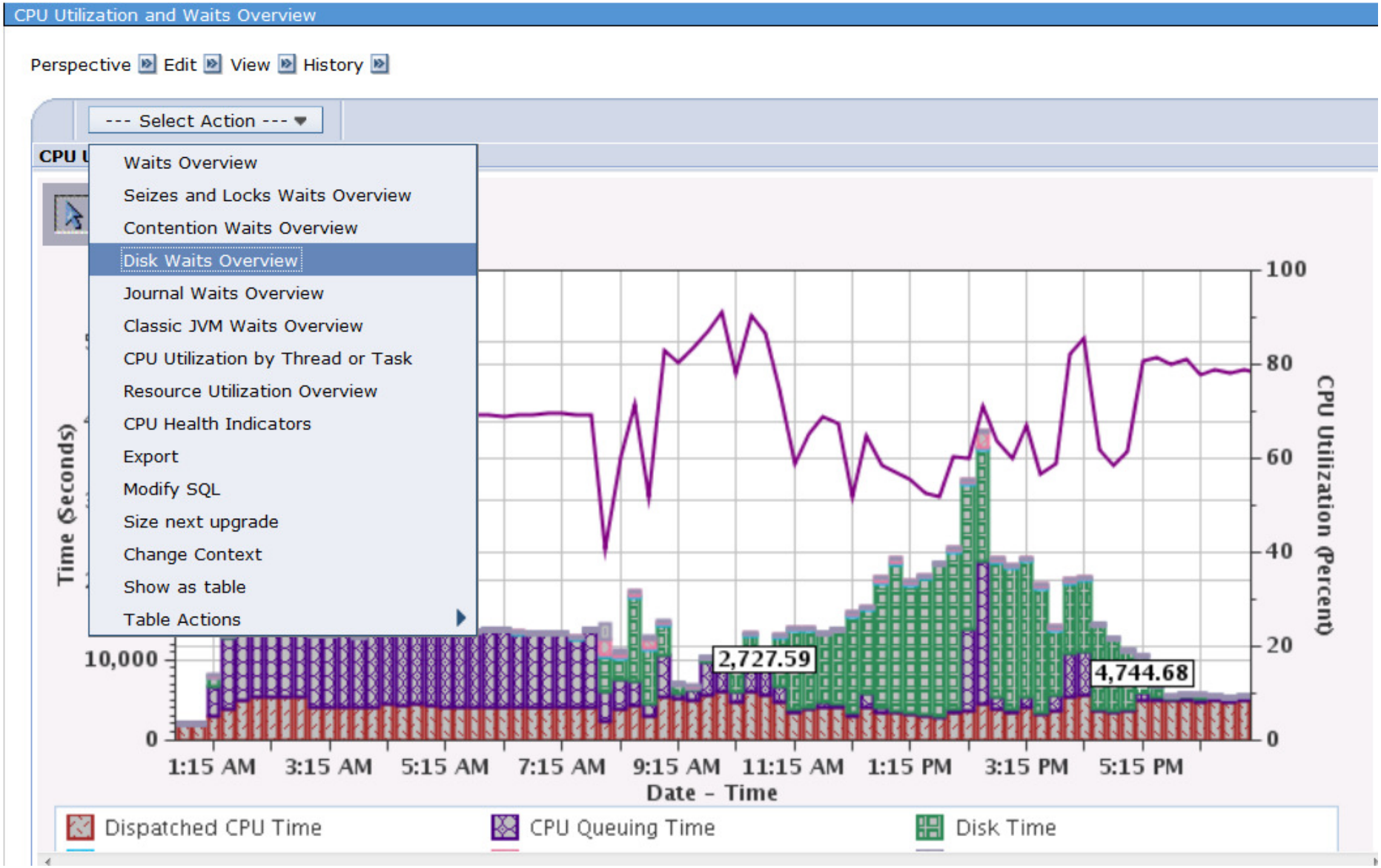
Now Let's Look at the Disk Waits



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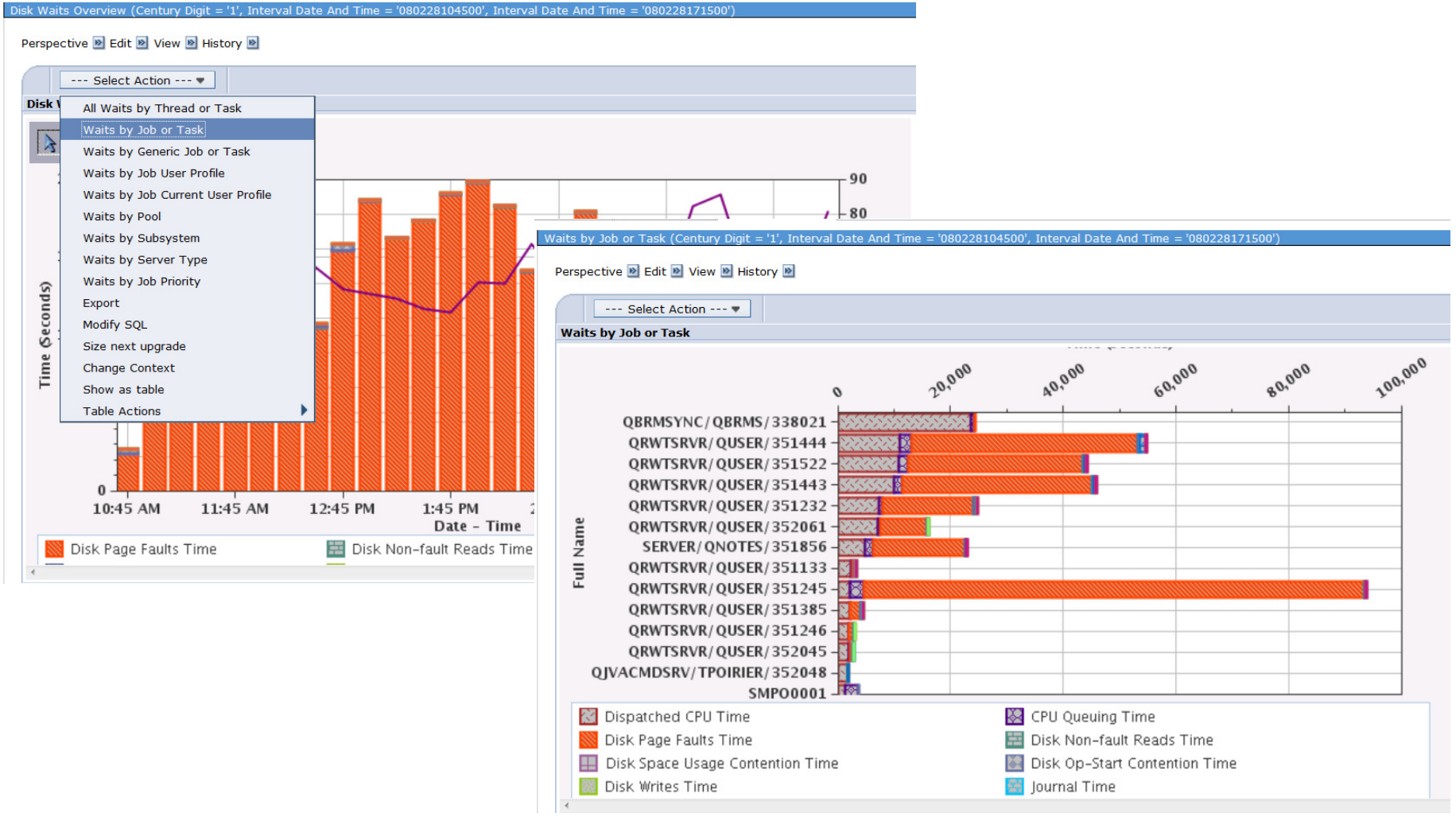
We see it's faulting…. So let's view Waits by Job or Task



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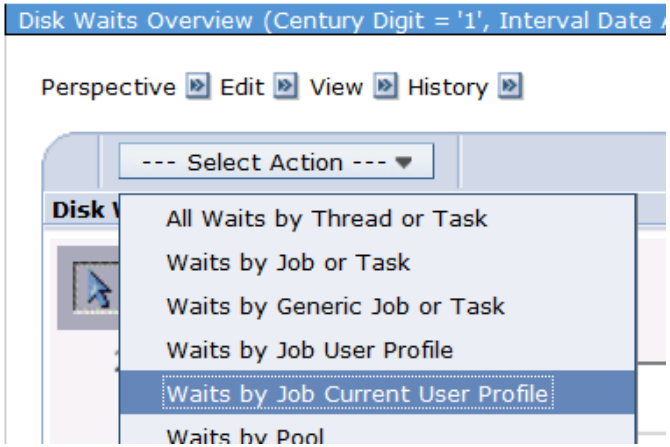
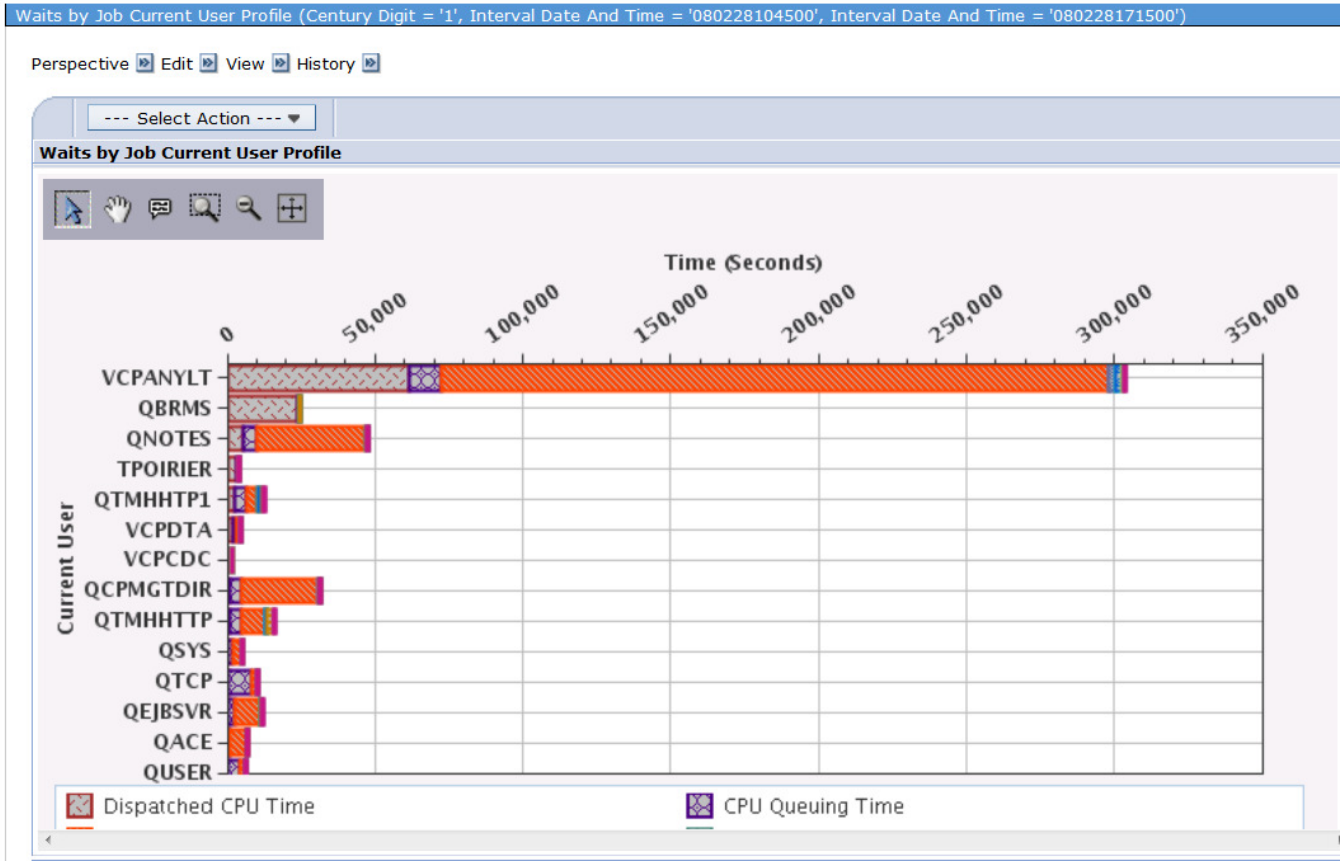
So let's find out who the user is…

We now have several clues:

We know the jobs
We know the time
We know the user profile





©

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How do I analyze Job Watcher data?

- Scope the problem
  - What time?
  - What users or jobs?
- Look for trends in the data
- Look for presence of waits
  - Drill down into wait details
- Display call stacks for running or waiting jobs

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Machine Gate Serialization

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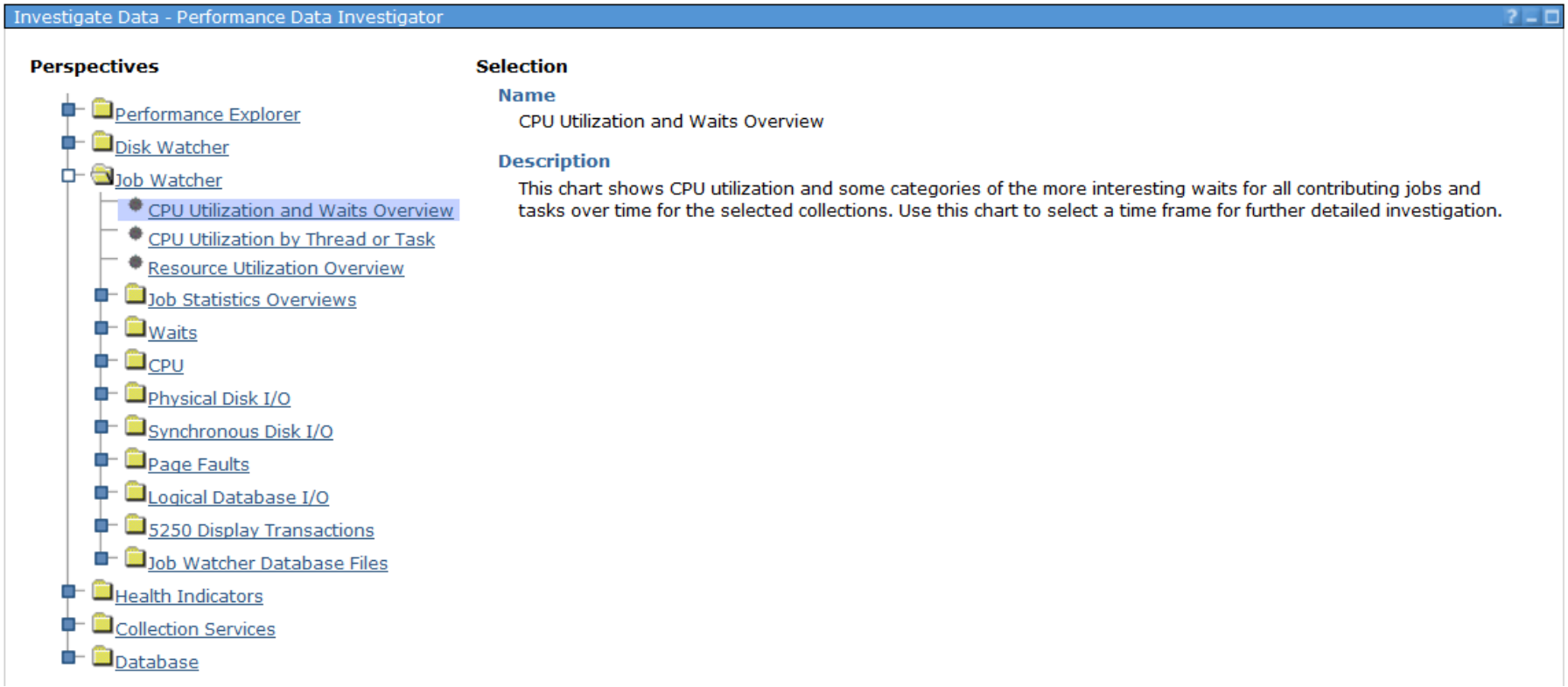
Investigate Data - Job Watcher



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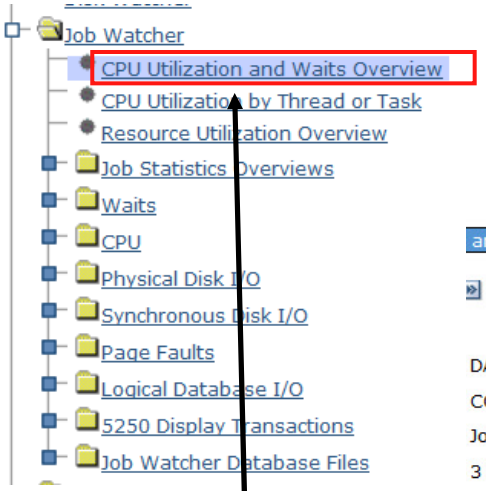
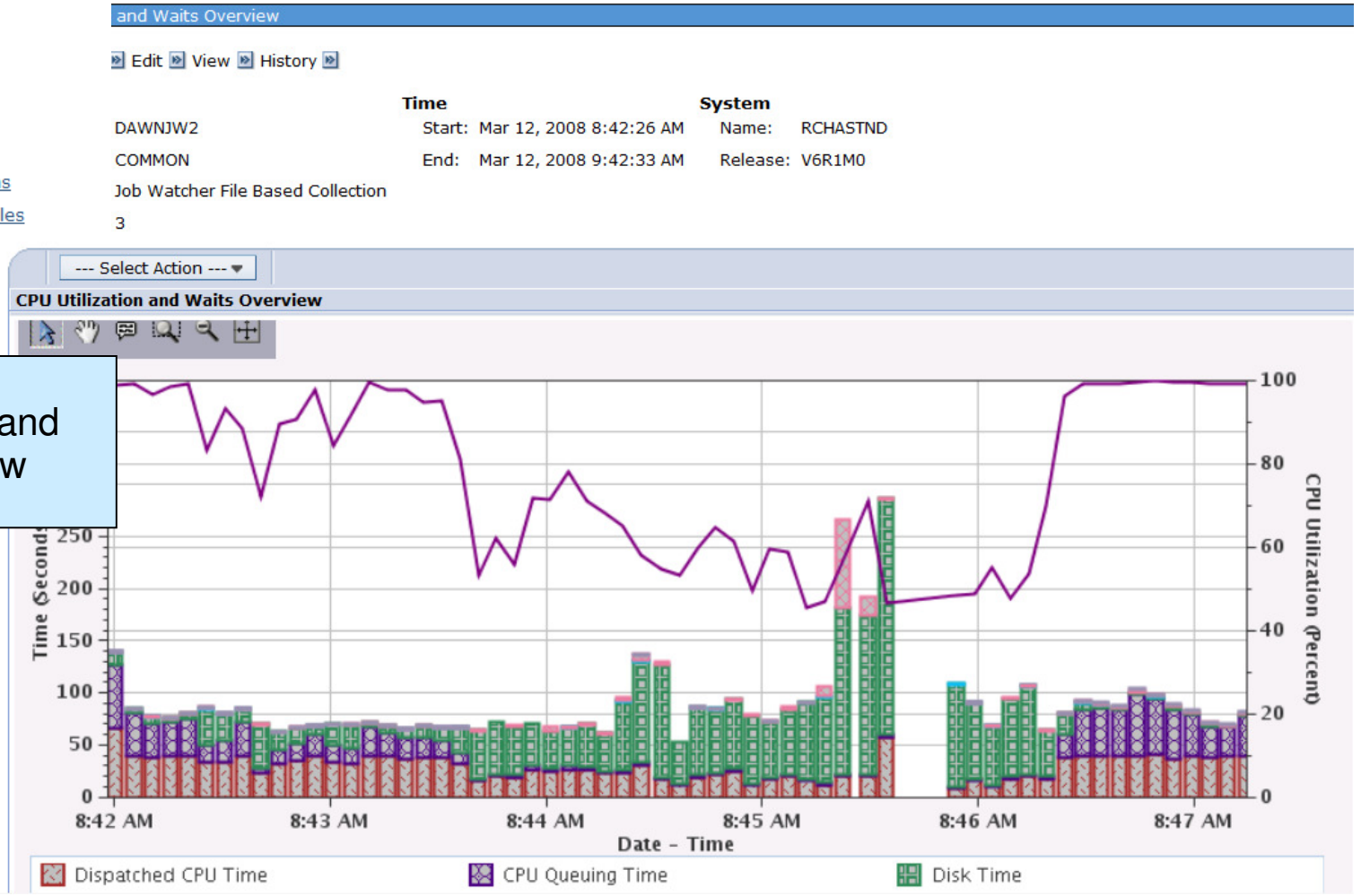
CPU Utilization and Waits Overview



Both Collection Services and Job Watcher have a “CPU Utilization and Waits Overview” graph as a general starting point for wait analysis

CPU Utilization and Waits Overview



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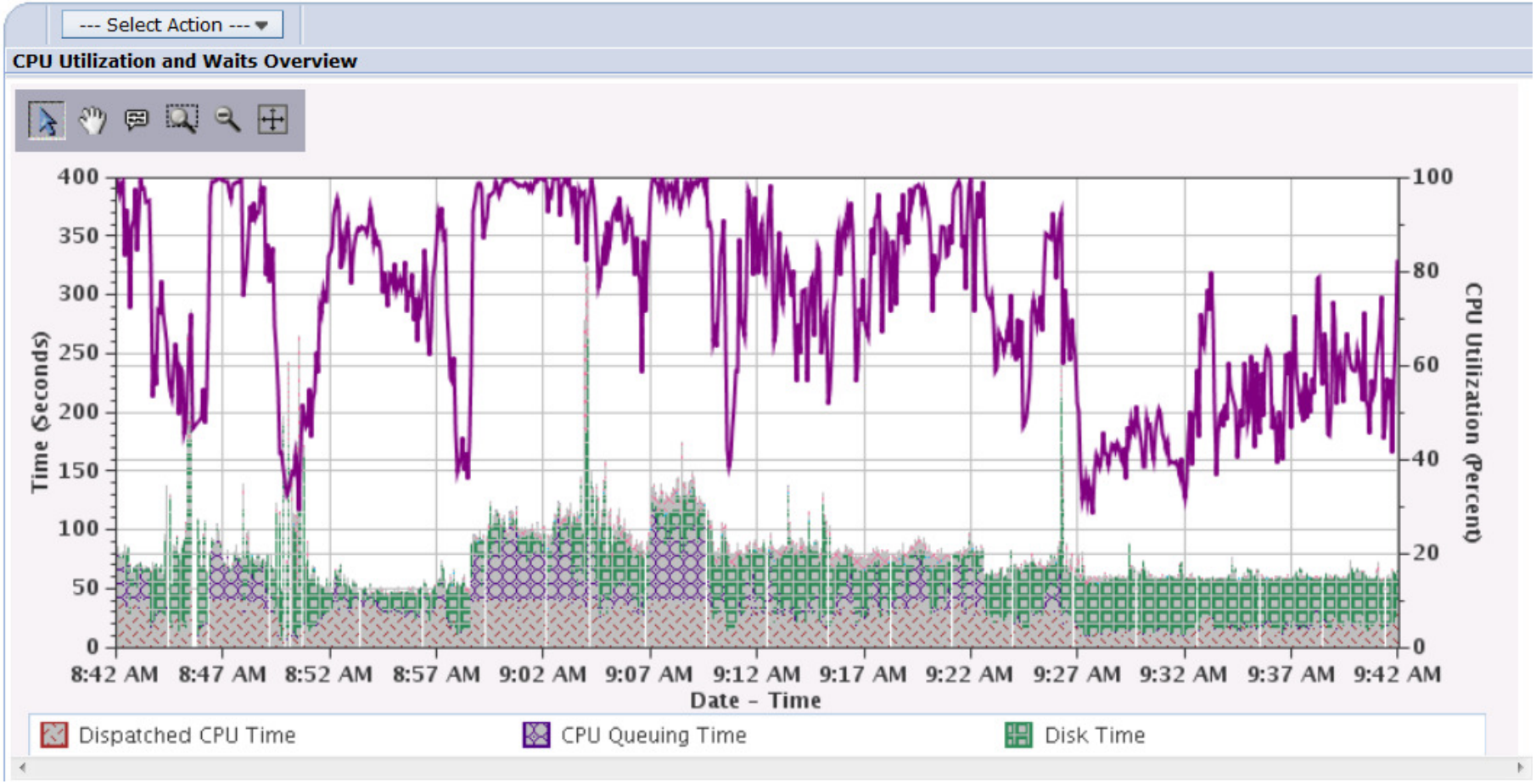
Let's look at the entire collection. Full zoom out…

- There are a lot of interesting things to investigate here…..



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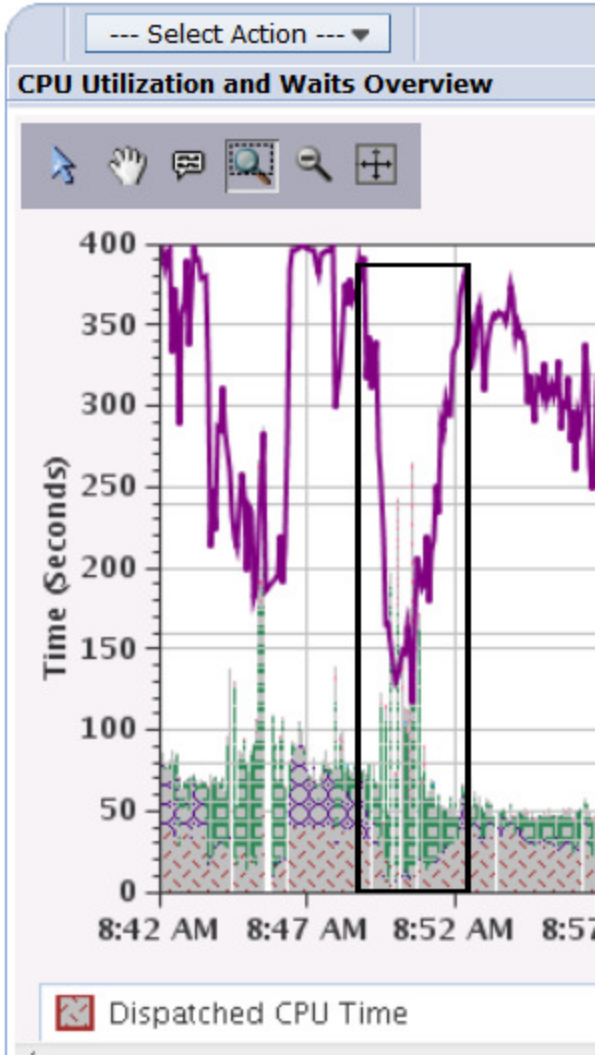
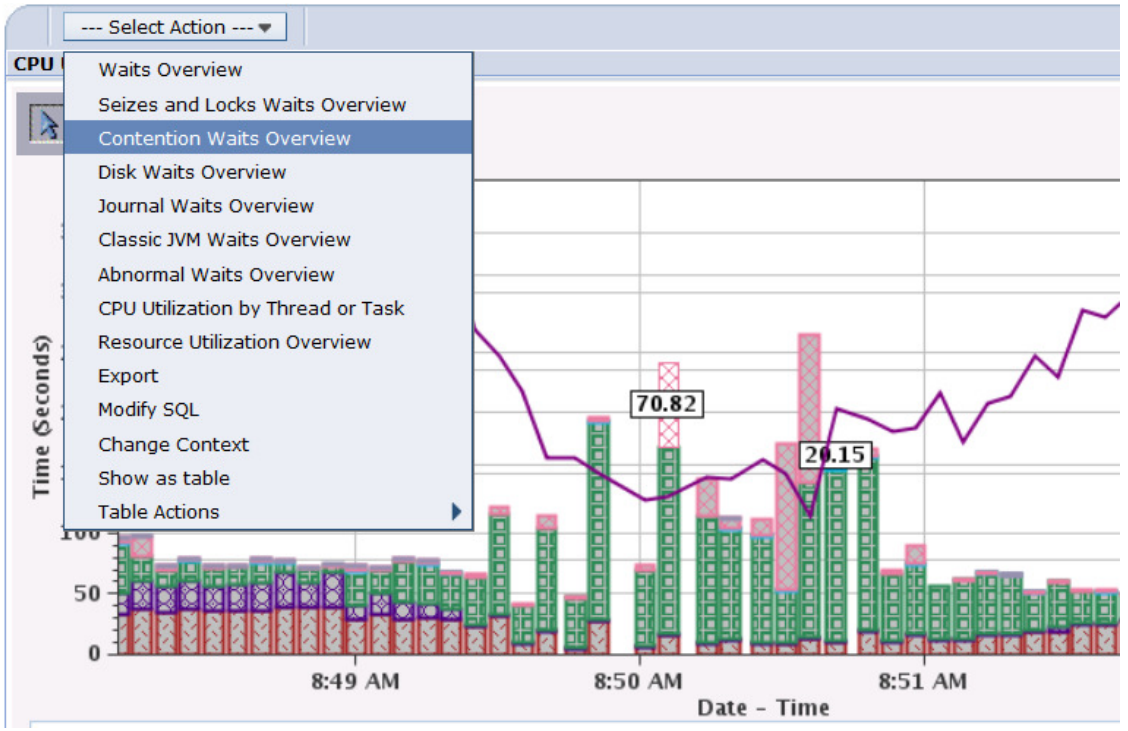
Let's zoom into the time where we see the large drop in CPU



We can see operating system contention occurred during the time when the CPU Utilization dropped.

Select the beginning and ending intervals to investigate and then drill into Contention Waits Overview



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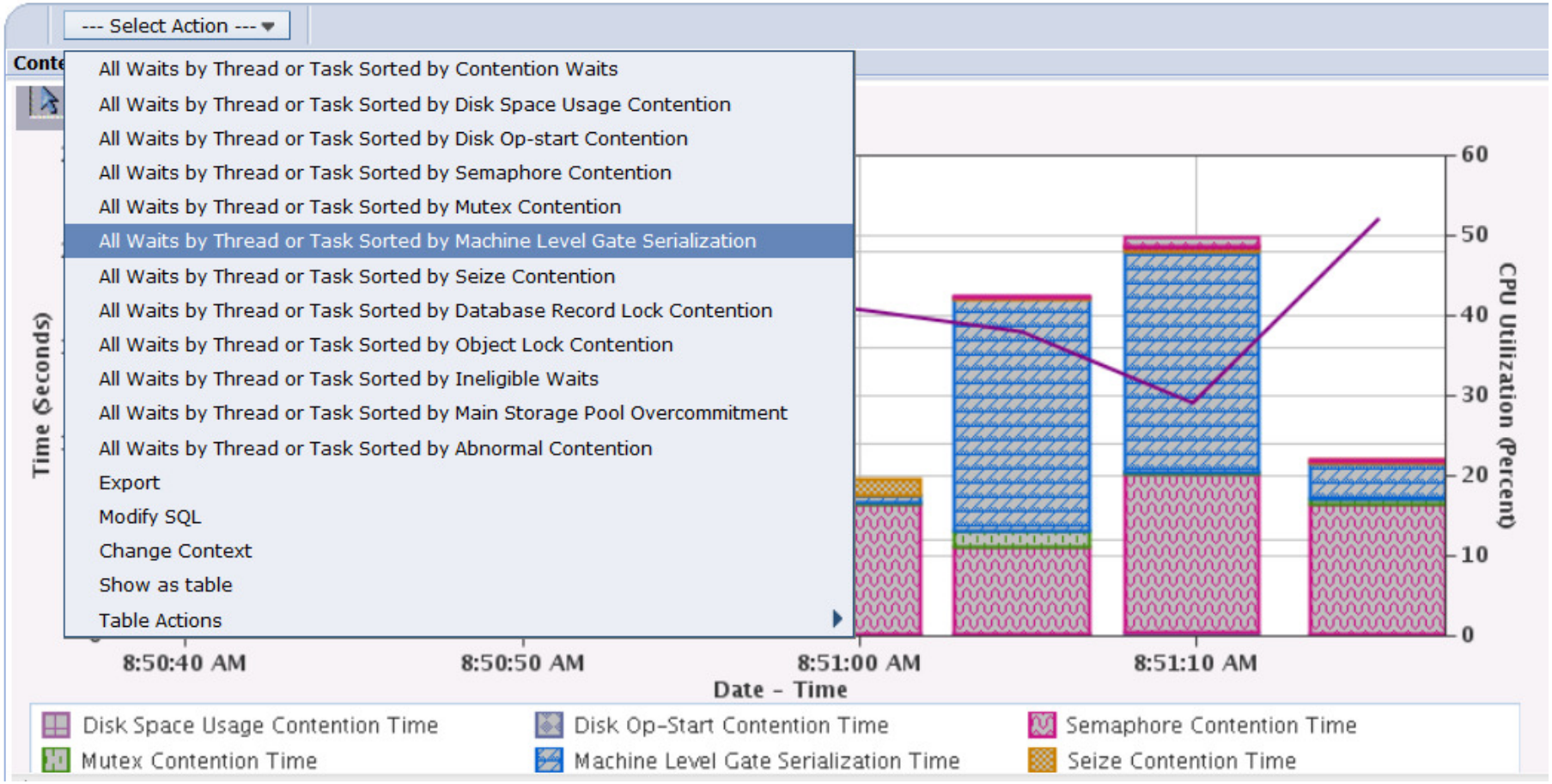
Machine level gate serialization **is a major reason for the contention waits.**

We want to see if we can figure out who might be causing the contention. Drill into All Waits by Thread or Task Sorted by Machine Level Gate Serialization **so we can see the jobs/threads/tasks that are all waiting.**

Note: Drilling into waits by thread or task can take some time…. be patient.

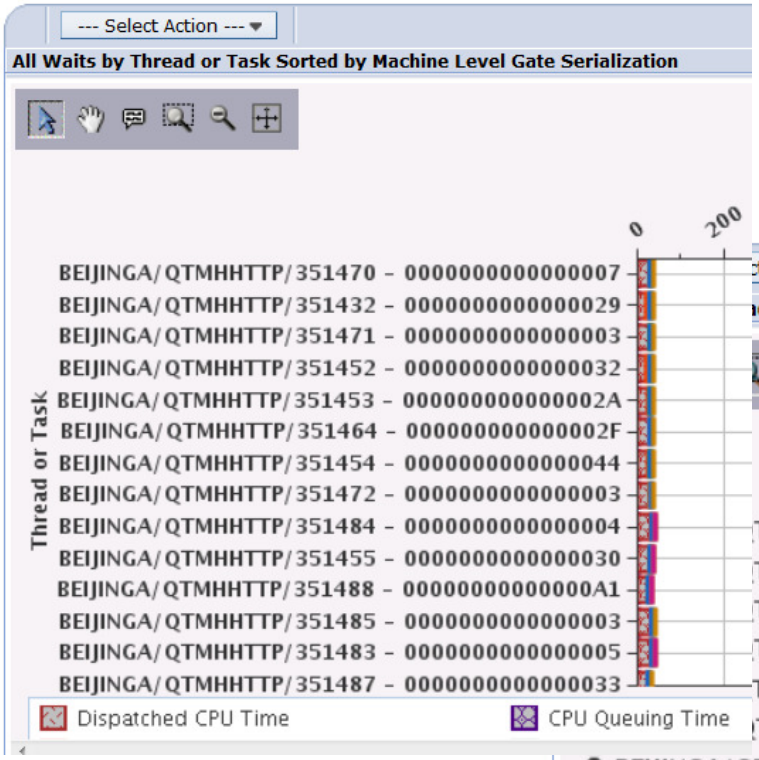


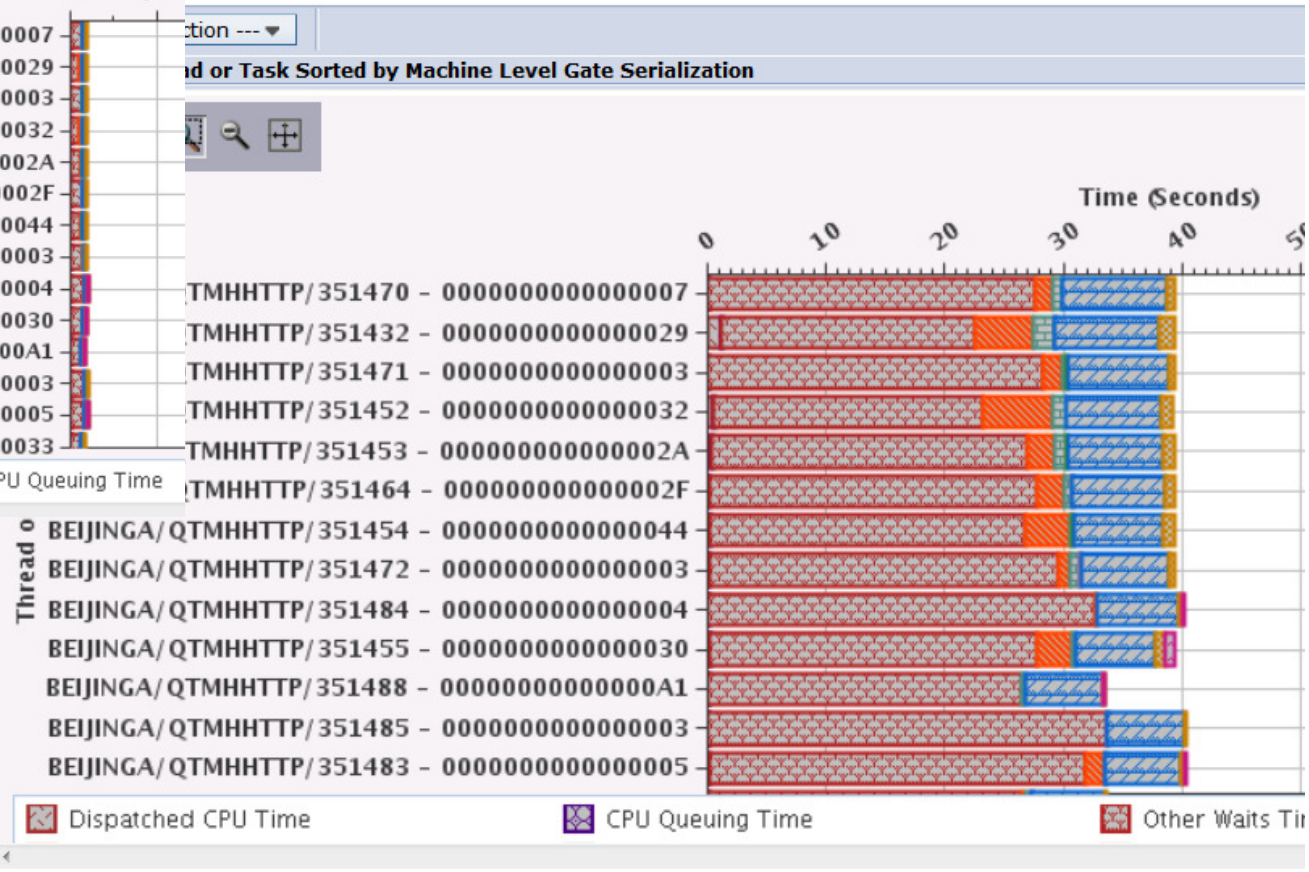
Zoom into see more detail

We can't see the machine level gate serialization details at first;

Zoom in and we can see it appear in many threads. This tells us many threads were waiting.

But why?





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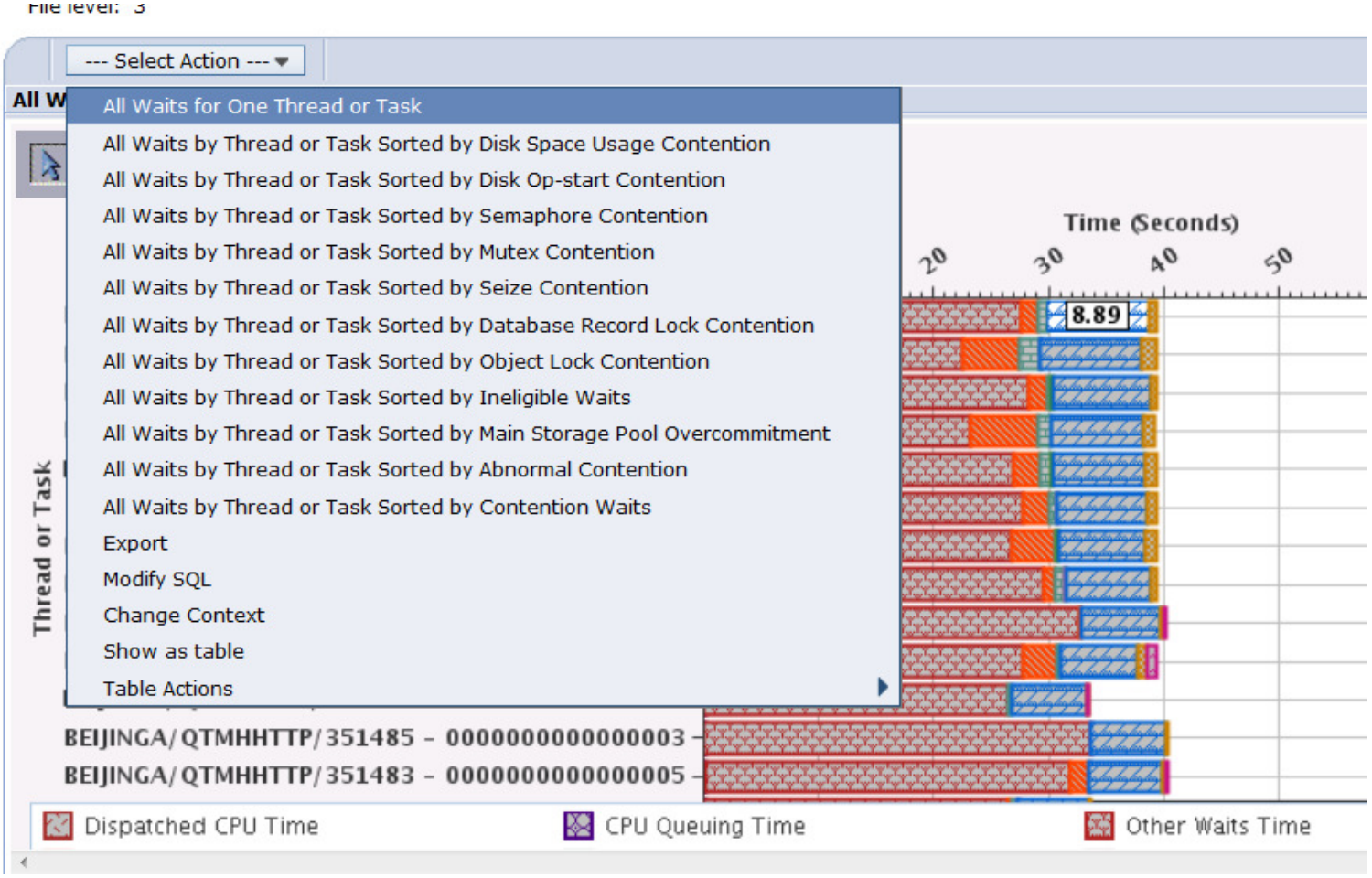
Select a thread and look at the waits for that one thread.

It may be necessary to drill down into **interval details** for several threads to find the one with the information we need…



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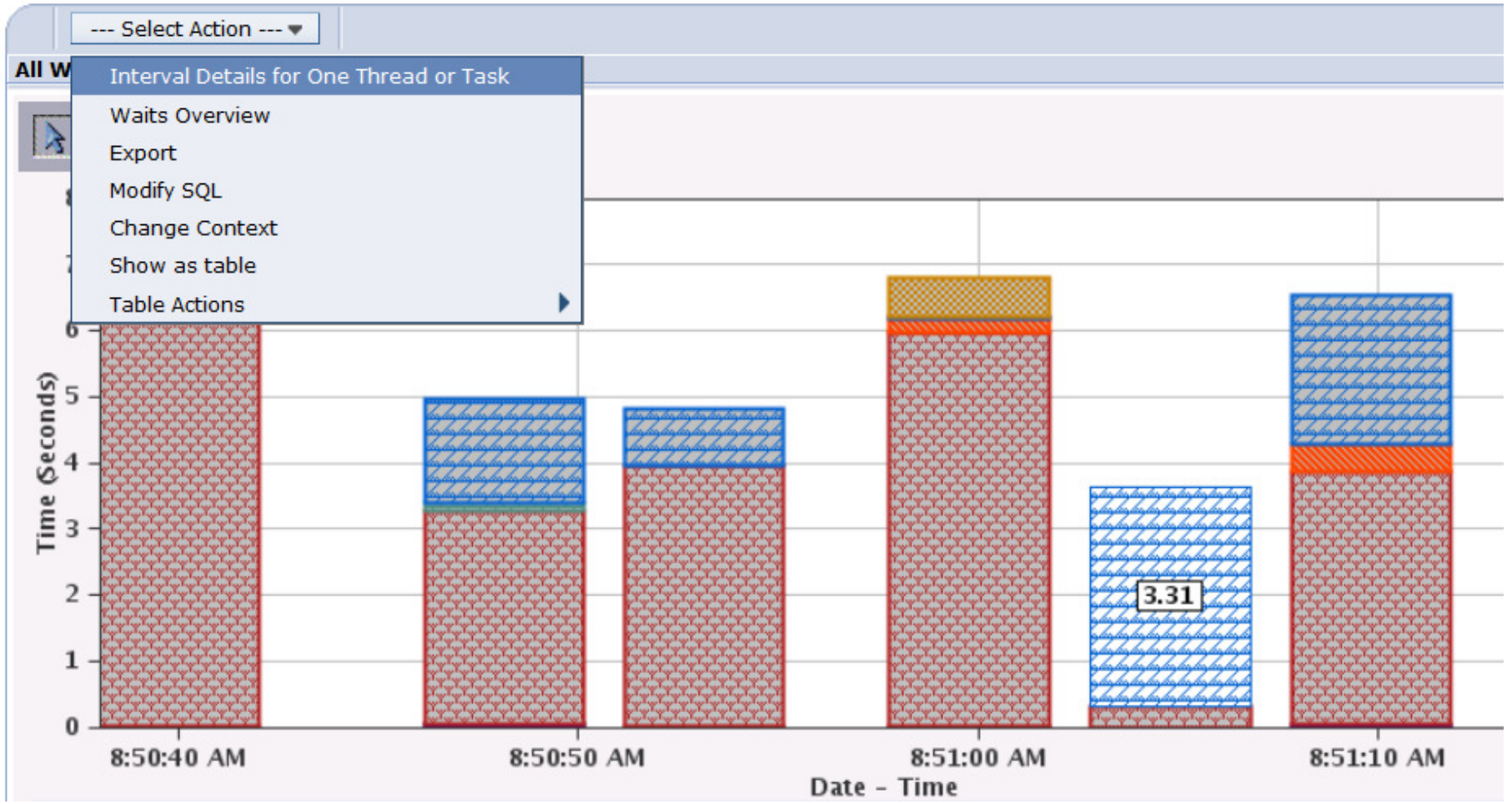
Select an interval

View Interval details for one thread or task



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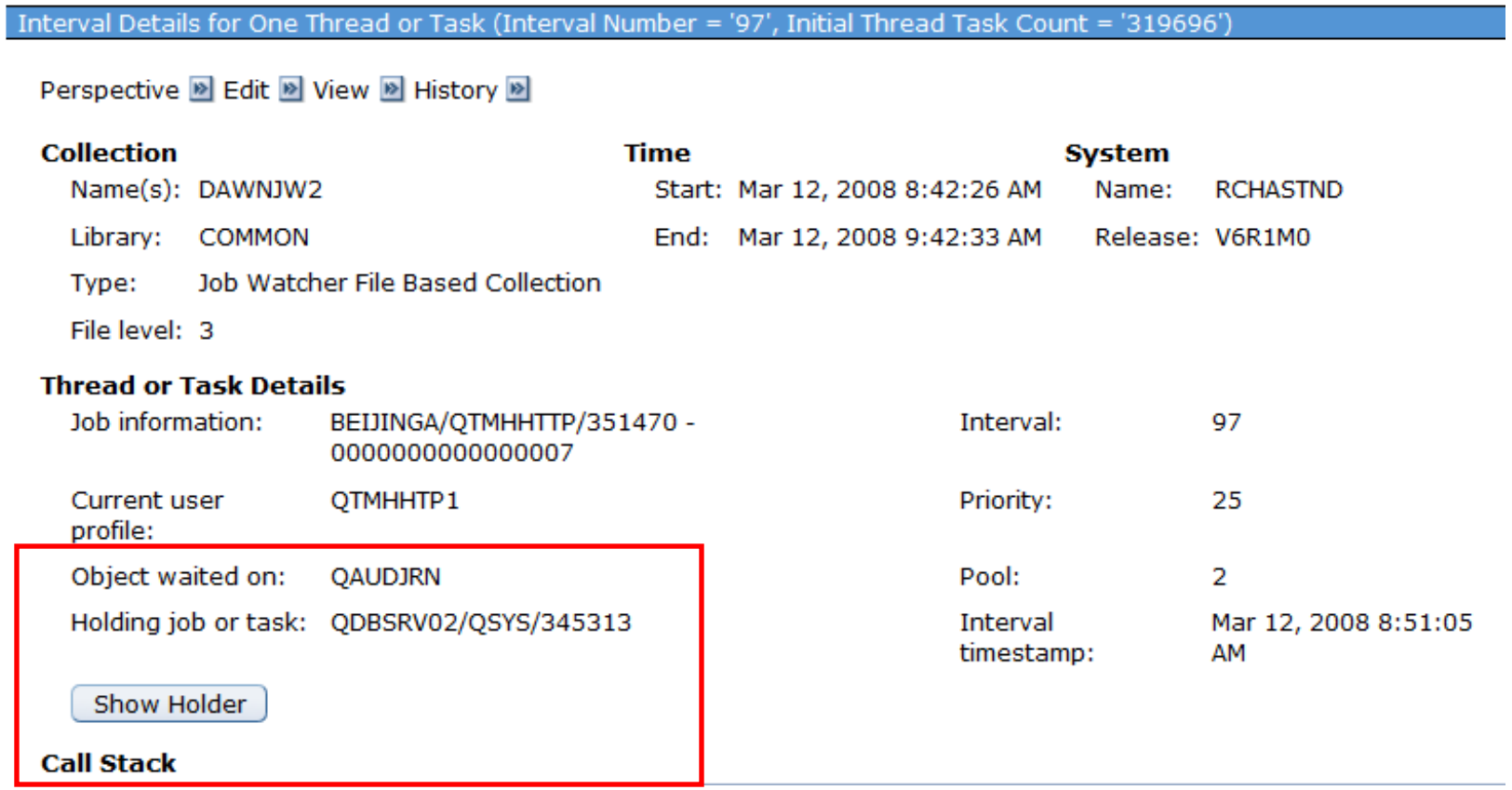
And here is where we discover Job Watcher's power….



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We can see the call stack to see how we got to this wait point

This thread is waiting for the QAUDJRN journal at 8:51:05.

In the call stack you will see an entry that shows the job is creating an audit journal entry.

Note that access to the audit journal is serialized by a “gate”. So why is this job blocked and waiting to create the audit record?

Procedure	Offset
qutde_block_trace	000000E4
slowLock__10QuGateCodeFQ2_2Qu8LockModeUlN32Q2_8TDQSEnu	000003F0
#journal	0000066C
auditIt__19CfCreateAuditRecordFv	00000444
validateDescQueue__11LoDescEntryFRtPt	00000390
recvDescriptors__12LoSocketUnixFR15LoSocketManagerRtPtt	000002B8
recv__19LoReceiveStreamUnixFR15LoSocketManagerRiP6msghdrtPt	000006A0
recvmsg__8LoSocketFR15LoSocketManagerP6msghdrtPtUl	0000018C
recvmsg__FtP6msghdrT1PtP7timeval15LoAddressFormat	00000680
recvMsgHandler__FP19LoSocketRecvMsgData	00000448
LoSocketOp__FUtP13LoSocketOpHdr	00000254
socketop	000001DC

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We can easily go look at the thread that is holding the resource

Show Holder

Thread or Task Details

Job information:	QDBSRV02/QSYS/345313 - 0000000000000001	Interval:	97
Current user profile:	QSYS	Priority:	16
Object waited on:	QAUDJRN	Pool:	2
Holding job or task:	None detected this interval	Interval timestamp:	Mar 12, 2008 8:51:06 AM

Call Stack

--- Select Action ---

Call Level	Program	Module	Procedure	Offset
1			qutde_stackless_block	000000C4
2			qu_dasd_fault_on_res_stack	0000026C
3			#jomodjp	00009944
4			#cfmir	000000E8
5			syscall_A_portal	0000012C
6	QJOCHGJN			00009238
7			cblabranch	000001D0
8			aiuser_program_call_portal	000000C4
9	QJORETRY			00004188
10			cblabranch	000001D0
11			aiuser_program_call_portal	000000C4
12	QDBSERVE			000009BC

Total: 15

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If the audit journal information was still available, you could look at it.

This screen capture shows the audit journal entries from the matching time period.

NR is Next Receiver
PR is Previous Receiver

```
                          Display Journal Entries

Journal  . . . . . :   QAUDJRN          Library  . . . . . :   QSYS
Largest sequence number on this screen  . . . . . : 00000000000088885894
Type options, press Enter.
  5=Display entire entry


Opt     Sequence  Code  Type  Object      Library     Job          Time
        88885883   T     GS                          BEIJINGA     8:51:02
        88885884   T     SK                          QSYSARB      8:51:02
        88885885   J     NR                          QDBSRV02     8:51:02
        88885886   J     PR                          QDBSRV02     8:51:06
        88885887   T     GS                          BEIJINGA     8:51:07
        88885888   T     GS                          BEIJINGA     8:51:07
        88885889   T     GS                          BEIJINGA     8:51:07
        88885890   T     SK                          QSYSARB      8:51:07
        88885891   T     GS                          BEIJINGA     8:51:07
        88885892   T     GS                          BEIJINGA     8:51:07
        88885893   T     GS                          BEIJINGA     8:51:07
        88885894   T     GS                          BEIJINGA     8:51:07
                                                                      More...
F3=Exit    F12=Cancel
```

ithankyou

www.ibm.com/power/i

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References

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iDoctor versus Performance Data Investigator

There are two graphical interfaces for performance data analysis…which should you use?

Feature	iDoctor	PDI
Interface	Windows client	Browser
Wait Analysis	Yes	Yes
Collection Services	Yes	Yes
Job Watcher	Yes	Yes
Disk Watcher	Yes	Yes
Performance Explorer	Yes	Profile collections only
Database	Yes	Yes
Job Watcher Monitors	Yes	No
Customizable	Yes	Yes
User Defined graphs and queries	Yes	Yes
Update Frequency	Monthly Experimental features	Twice Yearly
Support	Defect only	Standard SWMA
Chargeable	Yearly license	•Collection Services at no additional charge with i •Disk Watcher, Database, and Performance Explorer included with base PT1 product •Job Watcher is an additional option of PT1 and has an additional charge
Experimental Features	Yes (e.g., VIOS Investigator)	No
Multinational language support	No	Yes

IBM i Performance on developerWorks

developerWorks®

- developerWorks - http://www.ibm.com/developerworks/ibmi/
- Performance Tools
  https://www.ibm.com/developerworks/mydeveloperworks/wikis/home?lang=en#/wiki/IBM%20i%20Technology%20Updates/page/Performance%20Tools
  - Additional performance tools resources
    https://www.ibm.com/developerworks/mydeveloperworks/wikis/home/wiki/IBM%20i%20Technology%20Updates/page/Resources
  - Performance on the Web
    https://www.ibm.com/developerworks/mydeveloperworks/wikis/home/wiki/IBM%20i%20Technology%20Updates/page/Performance%20on%20the%20web
  - Performance Data Collectors
    https://www.ibm.com/developerworks/mydeveloperworks/wikis/home/wiki/IBM%20i%20Technology%20Updates/page/Performance%20Data%20Collectors
- Forum
  https://www.ibm.com/developerworks/forums/forum.jspa?forumID=2751
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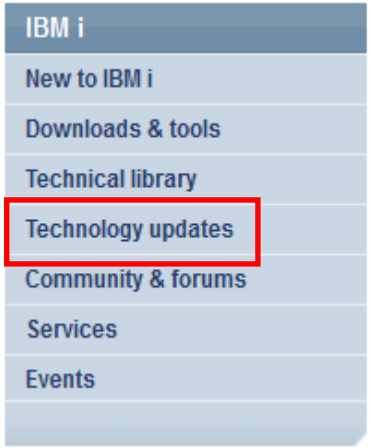
- IBM i Wait Accounting
  http://www.ibm.com/developerworks/ibmi/library/i-ibmi-wait-accounting/



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IBM i Performance FAQ – a "Must Read"

http://www.ibm.com/common/ssi/cgi-bin/ssialias?subtype=WH&infotype=SA&appname=STGE_PO_PO_USEN&htmlfid=POW03102USEN&attachment=POW03102USEN.PDF

IBM i on Power - Performance FAQ

February 5, 2013

Updated version available in October 2013

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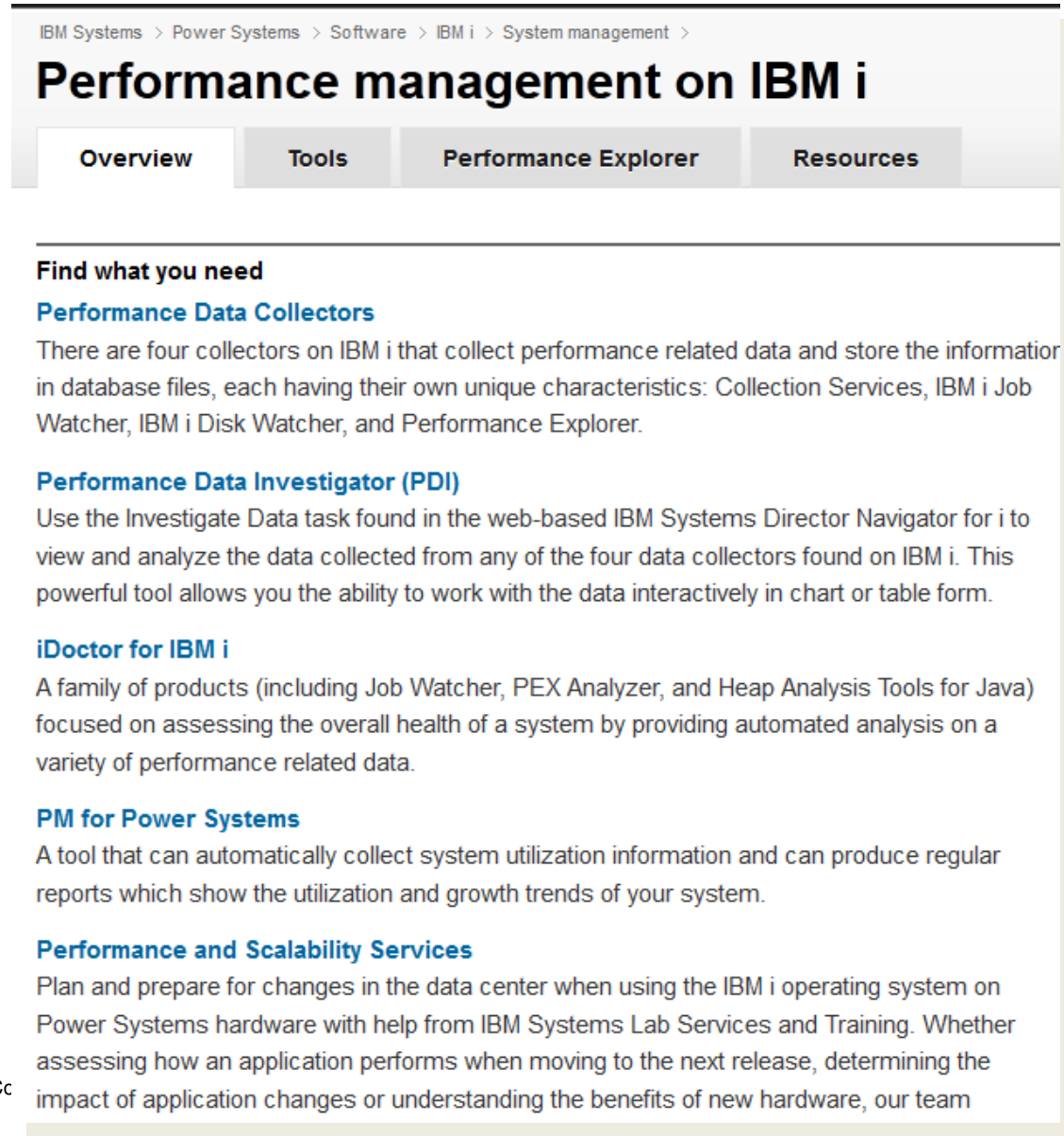
Performance Management Web Page

http://www-03.ibm.com/systems/power/software/i/management/performance/index.html



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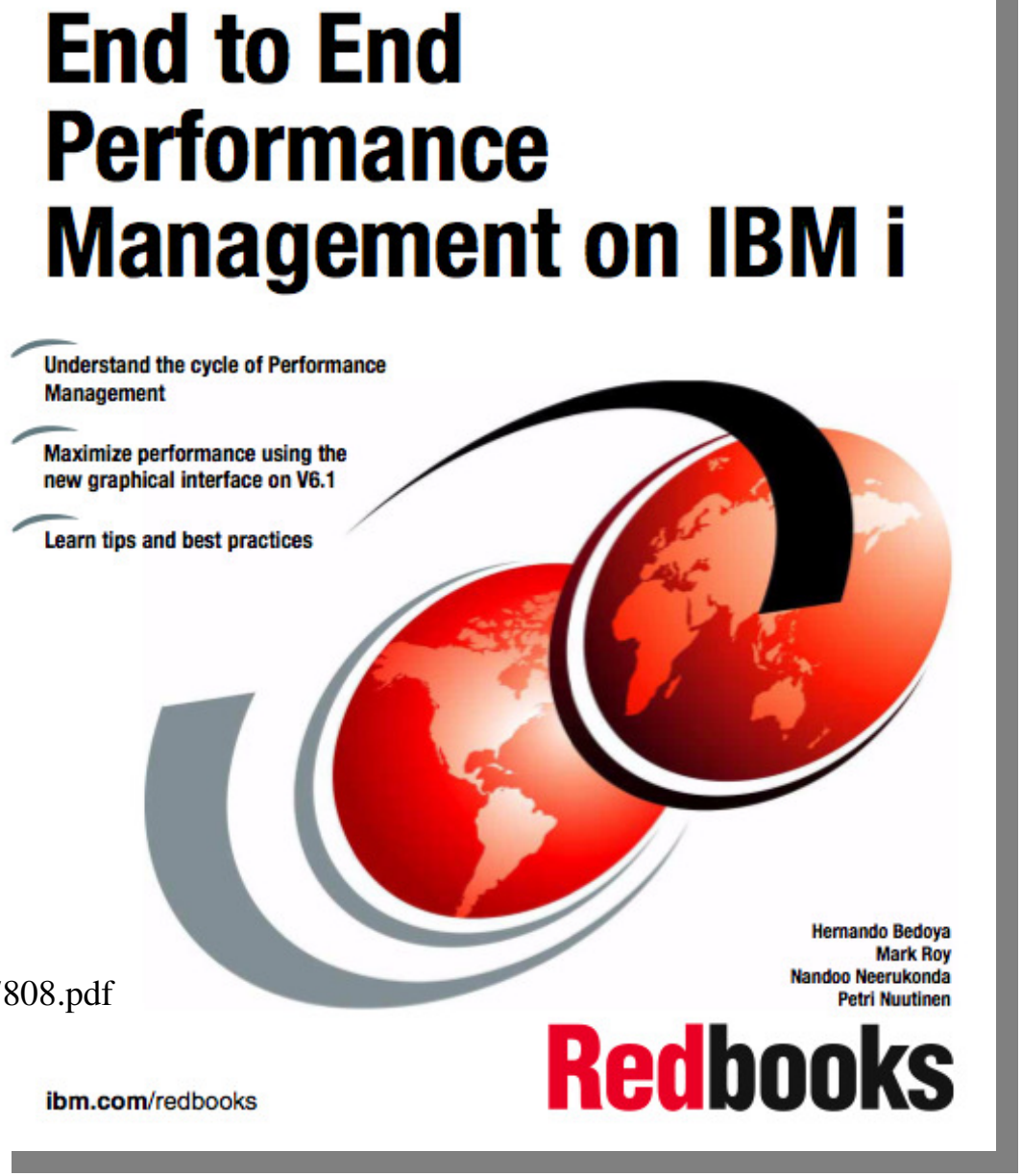
A Redbooks **publication!**



http://www.redbooks.ibm.com/redbooks/pdfs/sg247808.pdf

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www.ibm.com/power/i

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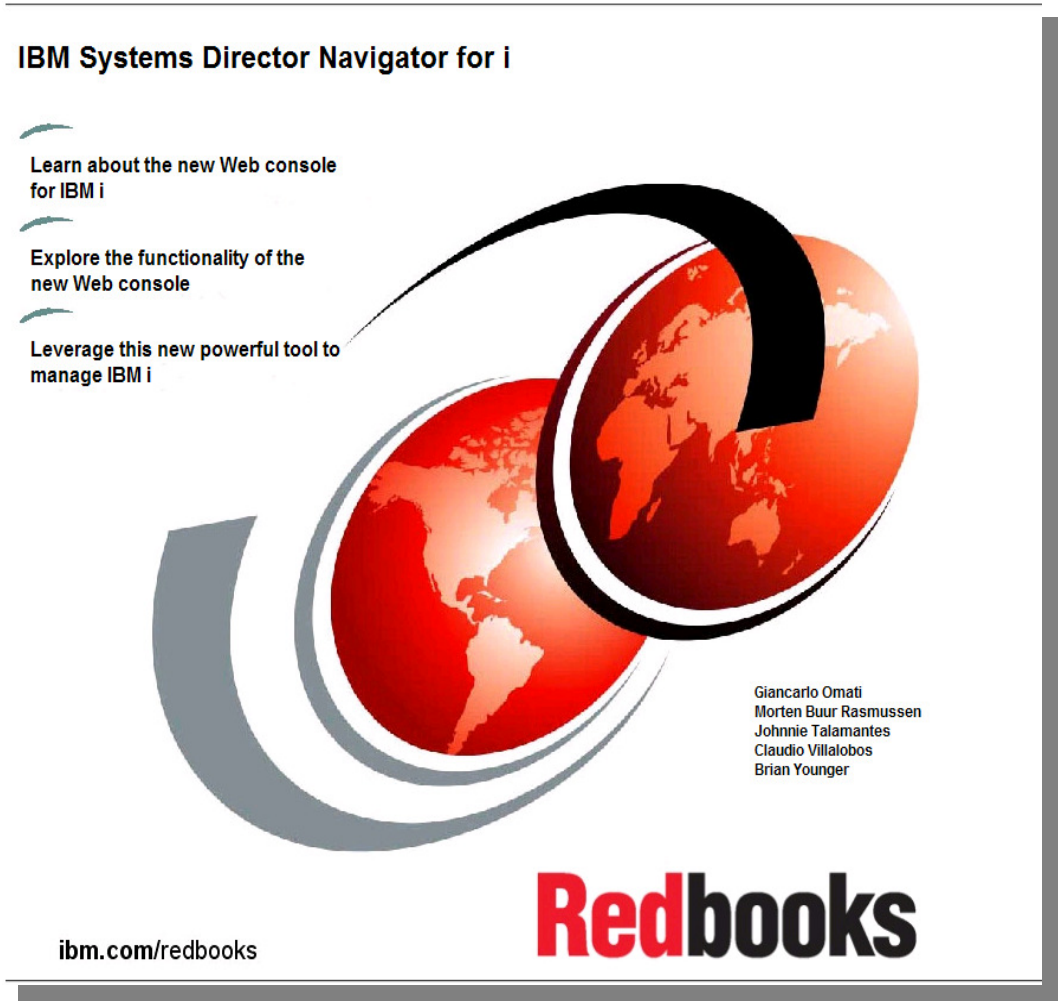
IBM Navigator for i Redbook

- Released December 2009
- Chapter 9 focuses on Performance tasks
- Redbook number: SG24-7789-00
- *This Redbook is a bit outdated with all the enhancements over the past two years.*



http://www.redbooks.ibm.com/abstracts/sg247789.html

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- Resolving memory leaks, temporary storage growth problems, etc.
- Tuning memory pools, disk subsystems, system values, and LPAR settings for best performance
- Optimizing Solid State Drive (SSD) performance
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  - Release-to-release upgrades
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  - Determine impact of application changes
  - Proofs of Concept (e.g. HA alternatives; SSD analysis, external storage, etc.)
  - Evaluate application scalability
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Evaluate the benefits of SSD technologies with IBM i based applications

Features

- Three options to best meet client needs:
  1. Data collection on the client system with analytical services to determine the benefit SSDs will provide. The analysis also identifies which specific objects should be stored on SSDs to optimize benefits.
  2. Remote access to a fixed Power IBM i configuration to load and test client workloads on both SSDs and traditional disk drives (HDDs). Assessment is made of the delta between workload performance on SSDs and HDDs.
  3. Hardware configured to client specifications with client workloads run on a system in the Performance and Scalability Services Center in Rochester, MN. Client has onsite access to state of the art test center. Optimal SSD configuration for current and future workload requirements is determined from analysis of workload runs.

Typical Benefits

- "Real data" available to assess if SSDs are for you.
- Multiple offerings provide flexibility in the scope and depth of the analysis you choose to perform.
- With the assistance of our Lab Services experts, clients will learn how to optimize the use of SSDs to meet their processing and business requirements.

Contact

- To initiate these services, submit a request form at url:

http://www.ibm.com/systems/services/labservices/psscontact.html

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IBM i Web Sites with Performance Information

- IBM i Information Center
  http://publib.boulder.ibm.com/iseries/
  - Systems Management → Performance

- IBM i Performance Management
  This web site has a lot of GREAT references and papers – see the resources tab
  http://www-03.ibm.com/systems/power/software/i/management/performance/index.html

  Performance Capabilities Reference
  http://www-03.ibm.com/systems/resources/systems_power_software_i_perfmgmt_pcrm_feb2013.pdf

- Performance Management for Power Systems
  http://www-03.ibm.com/systems/power/support/pm/index.html
- IBM Workload Estimator
  http://www.ibm.com/systems/support/tools/estimator

- iDoctor
  http://www-912.ibm.com/i_dir/idoctor.nsf
- Job Waits Whitepaper
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Redbooks and Redpapers on IBM i Performance Tools

- IBM i 7.1 Technical Overview with Technology Refresh Updates
  http://publib-b.boulder.ibm.com/abstracts/sg247858.html?Open
- IBM Systems Director Navigator for IBM i (Chapter 9)
  http://www.redbooks.ibm.com/abstracts/sg247789.html?Open
- IBM eServer iSeries Performance Management Tools
  http://www.redbooks.ibm.com/Redbooks.nsf/RedbookAbstracts/redp4026.html?Open
- A Systems Management Guide to Performance Management for System i and System p servers
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- Sizing IBM i5/OS Work on IBM System i5 Partitions
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- Application and Program Performance Analysis Using PEX Statistics
  http://www.redbooks.ibm.com/abstracts/sg247457.html?Open
- Managing OS/400 with Operations Navigator V5R1 Volume 5: Performance Management
  http://www.redbooks.ibm.com/abstracts/sg246565.html?Open
- IBM iDoctor iSeries Job Watcher: Advanced Performance Tool (this is a bit outdated)
  http://www.redbooks.ibm.com/abstracts/sg246474.html?Open
- Best Practices for Managing IBM i Jobs and Output (and a few other special tips)
  http://www.redbooks.ibm.com/Redbooks.nsf/RedbookAbstracts/redp4454.html?Open
- i5/OS Diagnostic Tools for System Administrators: An A to Z Reference for Problem Determination
  http://www.redbooks.ibm.com/Redbooks.nsf/RedbookAbstracts/sg248253.html?Open
- IBM eServer iSeries Systems Management Handbook
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- IBM Systems Magazine, IBM i - “Mission: Performance Management”, Nov 2006
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- “Web Power”
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  http://www.ibmsystemsmag.com/i5/november08/tipstechniques/22521p1.aspx
- Top 10 Hidden iDoctor Gems
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- Using iDoctor for iSeries Job Watcher to Determine Why Jobs Wait
  http://www.ibmsystemsmag.com/ibmi/october05/technicalcorner/8896p1.aspx

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Articles on Disk Performance

- A New Way to Look at Disk Performance
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- Analyzing Disk Watcher Data
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- A Look at System i Integrated DASD Configuration and Performance under i5/OS
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