

Dive into Performance Data Investigator

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Sponsors of International i-Power 2019



FALCONSTOR



Agenda

- IBM i Performance Tools
- Introduction to wait accounting
- Using PDI (and Tips)
- Suggested starting points
- PDI Navigation and Features
- Introduction to performance analysis using PDI
- References

 **IBM i is an industry leader in the area of performance management and tools**

- Unparalleled performance metrics
- Data Collection Services that are constantly active
- Rich graphical viewing of performance data

Performance Instrumentation

▪ The IBM i Advantage



- IBM develops the [OS software stack](#), top to bottom
 - Ability to instrument the software to maintain performance metrics
 - Performance metrics are component-specific
- IBM develops the [performance data collectors](#) that harvest those performance metrics
- IBM i has an [integrated database](#) – Db2
 - Performance data is stored in the database automatically
- [Analysis tools](#) mine the performance data in the Db2 files using SQL and present data in a meaningful fashion
 - PDI, iDoctor
- [Strong connections](#) between support, service and development teams
 - Customers and Business Partners as well!



Performance Data Collectors



- IBM i has four primary system/job level data collectors:
 - **Collection Services**
 - **Job Watcher**
 - **Disk Watcher**
 - **Performance Explorer (PEX)**

All collectors included in base operating system!



IBM provides two powerful tools to aid in making your analysis **more efficient and productive**:

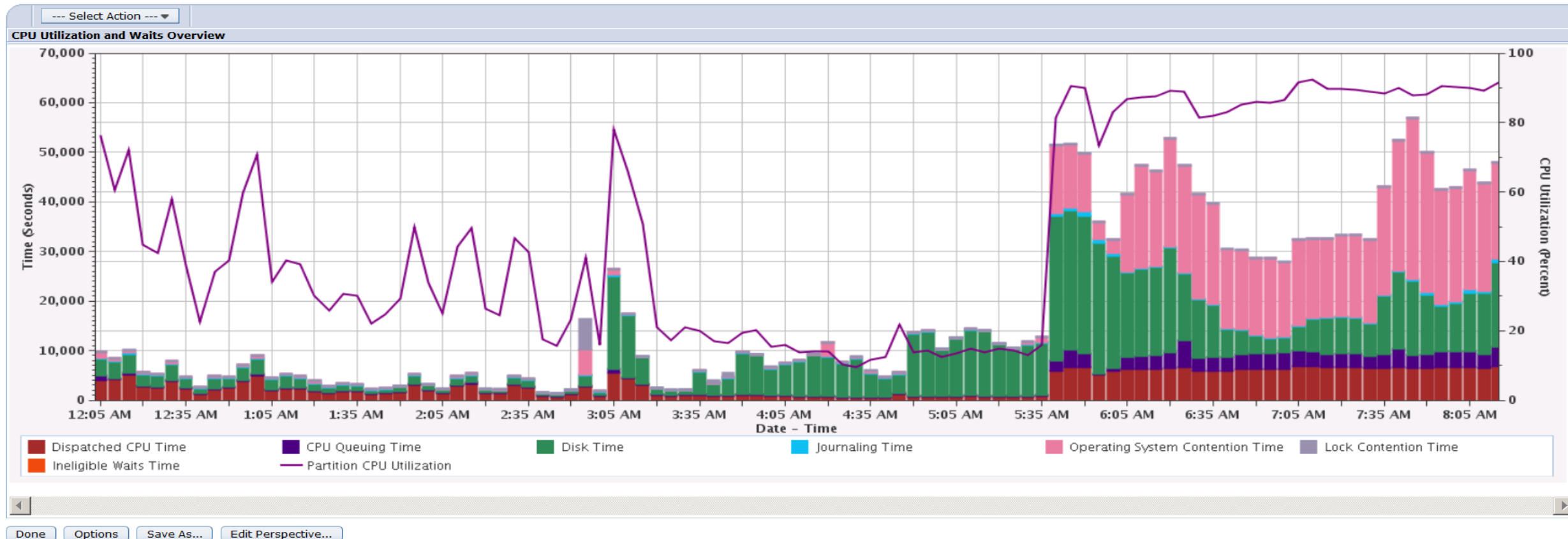
- **Performance Data Investigator**
- **IBM iDoctor for IBM i**

Both solutions support data analysis (varying degrees) for the 4 collectors:

- Collection Services
- Job Watcher
- Disk Watcher
- Performance Explorer (PEX)

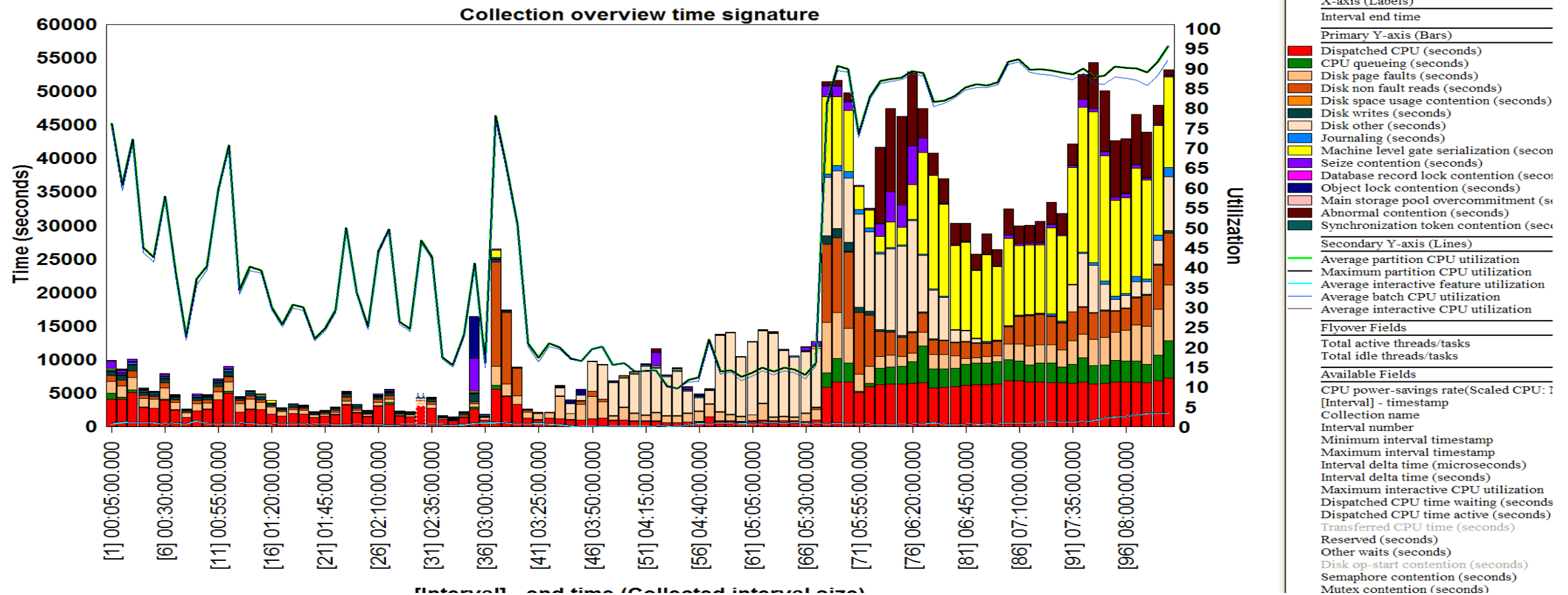
Performance Data Investigator (PDI)

- Browser (web) based solution
- Integrated as part of IBM i OS
- Included in IBM i Systems Management console “IBM Navigator for i” (6.1)



IBM iDoctor for IBM i

- Microsoft Windows based client
- Service/Support offering
- Deep Job Watcher and PEX analysis capability



Graphical Analysis Tools

- Tools are similar in nature, but are not equivalent in function.
- Both tools built on top of the rich instrumentation of metrics that IBM i has available
- Both tools continue to be enhanced by IBM
- Both tools valuable to customers and IBM'ers worldwide for performance management as well as aiding with solving performance problems.

Graphical Analysis Tools

- You have two graphical interfaces for performance data analysis...
 - Which is right for you?

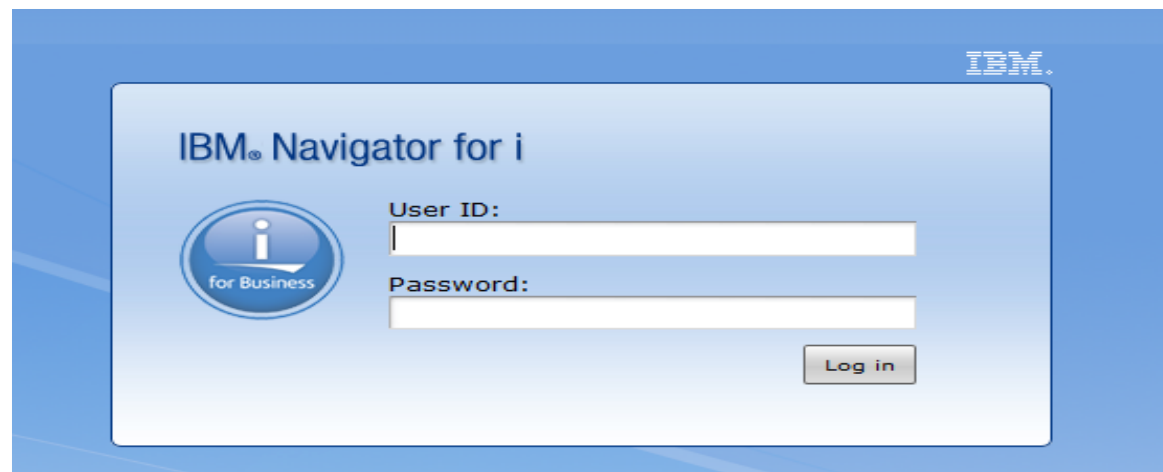
Feature	iDoctor	PDI
Interface	Windows client	Browser
Wait Analysis	Yes	Yes
Collection Services	Yes	Yes
Job Watcher	Yes (In-depth)	Yes
Disk Watcher	Yes	Yes
Performance Explorer	Yes (In-depth)	Profile collections only
Level of analysis provided	Deep	Basic to Medium
Job Watcher Monitors (Built –in)	Yes	No
User Defined graphs and queries	Yes	Yes
Update Frequency	Quarterly	Twice Yearly
Support	Email idoctor@us.ibm.com	Standard SWMA
Chargeable	Yearly license for each component (by serial number) <ul style="list-style-type: none"> ▪Job Watcher –Includes Job Watcher, Collection Services Investigator, and Disk Watcher ▪PEX Analyzer 	<ul style="list-style-type: none"> ▪Collection Services & Health Indicators at no additional charge with i ▪Disk Watcher, Database, and Performance Explorer included with base PT1 (Performance Tools LPP) product – Option 1 Manager feature ▪Job Watcher is an additional option of PT1 and has an additional charge - Option 3 Job Watcher
DS8K graphs & VIOS Investigator	Yes	No
Multinational language support	No	Yes

Let's get started using PDI.....



PDI is found in IBM Navigator for i

- IBM Navigator for i is the strategic console for managing IBM i
 - Has much of the function as System i Navigator **+ more**
 - But with a browser user interface
 - Integrated
 - Part of Base Operating System (SS1 Option 3)
 - Simply point your browser to <http://systemname:2001>



IBM Navigator for i – Browser support

Latest versions of:

- Mozilla Firefox 
- Google Chrome 
- Apple Safari 
- Microsoft Edge 

Note: Internet Explorer no longer supported

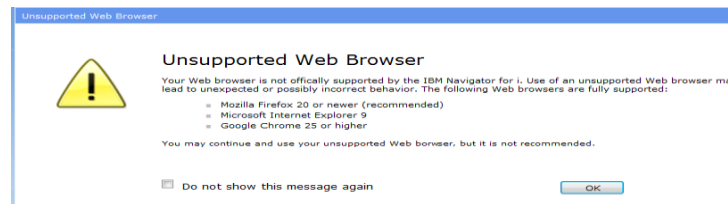
For additional browser information, refer to:

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



Unexpected results could be browser related. Example problems are....

- Hung charts
- Empty tables
- Clear your browser cache after installing the PTFs
 - Then close/restart browser
- Review your browser security settings to allow pop-up exceptions
 - 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>
- In 7.2, a warning will appear if using unsupported browser:

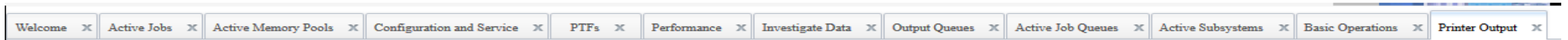




Browser Support tips

(2 of 2)

- Close unneeded tabs in Navigator session
 - Tasks in tabs consume resources and may cause performance degradation if too many are open



- Do **not** use PF-5 to Refresh a panel, instead use Refresh button found on Navigator panels



Pre-requisites for Navigator (1 of 2)

Everything is included on the V6R1 and later IBM i operating system!



✓ Product install requirements:

	IBM i 7.3	IBM i 7.2	IBM i 7.1	IBM i 6.1
HTTP Server	5770DG1	5770DG1	5770DG1	5761DG1
- JDK	5770JV1	5770JV1	5770JV132 bit	5761JV1 option 8
Java ** Note new requirement for 64-bit JDK (Spring 2016) - JSE	5770JV1 option 15 (Java SE 7 64-bit) - not Java SE 8 at this time	5761JV1 option 12 (Java SE 6 64-bit) or 5761JV1 option 15 (Java SE 7 64-bit)		
- IBM Toolbox for Java		5770SS1 option 3	5770SS1 option 3	5761JC1
Performance Tools group	5770PT1	5770PT1	5770PT1	5761PT1
Database				
Host Servers	5770SS1 option 12	5770SS1 option 12	5770SS1 option 12	5761SS1 option 12
Qshell	5770SS1 option 30	5770SS1 option 30	5770SS1 option 30	5761SS1 option 30
PASE (Portable App Solutions Env)	5760SS1 option 33	5760SS1 option 33	5770SS1 option 33	5761SS1 option 33
Domain Name System	5770SS1 option 31	5770SS1 option 31	5770SS1 option 31	
Digital Certificate Manager	5770SS1 option 34	5770SS1 option 34	5770SS1 option 34	

Note: Other products required for certain functions within IBM Navigator for i

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

Pre-requisites for Navigator (2 of 2)

- ✓ Ensure the HTTP Admin server is running (Qhttpsvr subsystem) :
 Navigator runs in Admin2 server job
 (STRTCPSVR SERVER(*HTTP) HTTPSVR(*ADMIN))

Active Jobs

Refresh Subsystem: Qhttpsvr Elapsed time: 00:00:00

Actions

<input type="checkbox"/>	Job Name	Detailed Status	Current User	Type
<input type="checkbox"/>	Qhttpsvr	Waiting for dequeue	Qsys	Subsystem
<input type="checkbox"/>	Admin	Waiting for signal	Qtmhhttp	Batch - Server
<input type="checkbox"/>	Admin	Waiting for signal	Qtmhhttp	Batch immediate - Server
<input type="checkbox"/>	Admin	Waiting for signal	Qtmhhttp	Batch immediate - Server
<input type="checkbox"/>	Admin1	Waiting for thread	Qlwisvr	Batch immediate
<input type="checkbox"/>	Admin2	Waiting for thread	Qlwisvr	Batch immediate
<input type="checkbox"/>	Admin3	Waiting for thread	Qlwisvr	Batch immediate - Server
<input type="checkbox"/>	Admin4	Waiting for thread	Qwebadmin	Batch immediate
<input type="checkbox"/>	Admin5	Waiting for thread	Qlwisvr	Batch immediate

- ✓ Recent HTTP Group PTF
 - PTFs for all components in Navigator are packaged and delivered as part of the HTTP PTF Groups.
 - In addition there are a number of other groups that are needed to ensure that all parts of the navigator interface function properly.

Navigator related Group PTFs

- Fixes and major enhancements to **Navigator for i** are available in:

- IBM i **7.3**

- HTTP Server group - SF99722
- Java group - SF99725
- Database group - SF99703
- Performance Tools group - SF99723

- IBM i **7.2**

- HTTP Server group - SF99713
- Java group - SF99716
- Database group - SF99702
- Performance Tools group - SF99714

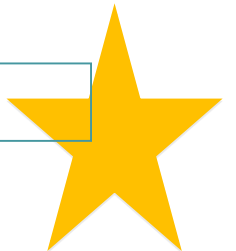
- IBM i **7.1**

- HTTP Server group - SF99368
- Java group - SF99572
- Database group - SF99701
- Performance Tools group - SF99145



Navigator Enhancements are often taken back to previous releases via PTFs

7.4 is GA on June 21. 2019

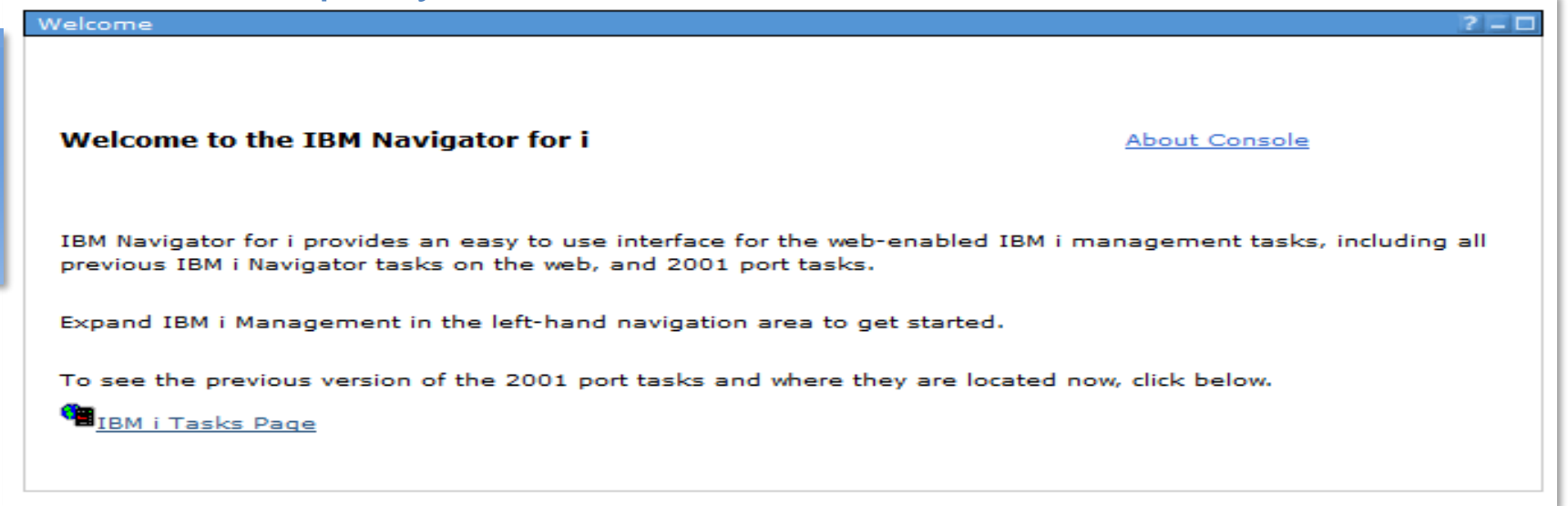
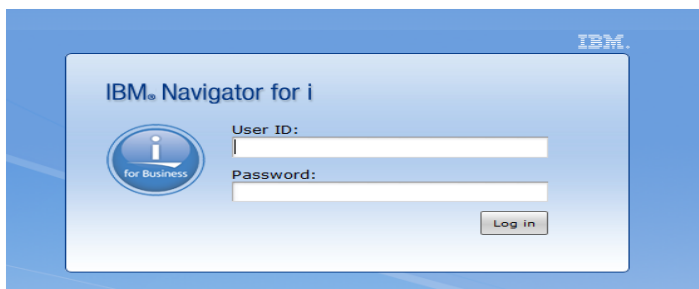


Tips for Best Performance for Navigator

Note: Navigator will not run fast on a system that is already slow!

- ✓ Ensure no bad DNS entries on the system
 - http://www-912.ibm.com/s_dir/slkbases/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/iseriess/v7r1m0/topic/rzaie/rzaieconwebperfadvisor.htm>
- ✓ Keep current on Group PTFs

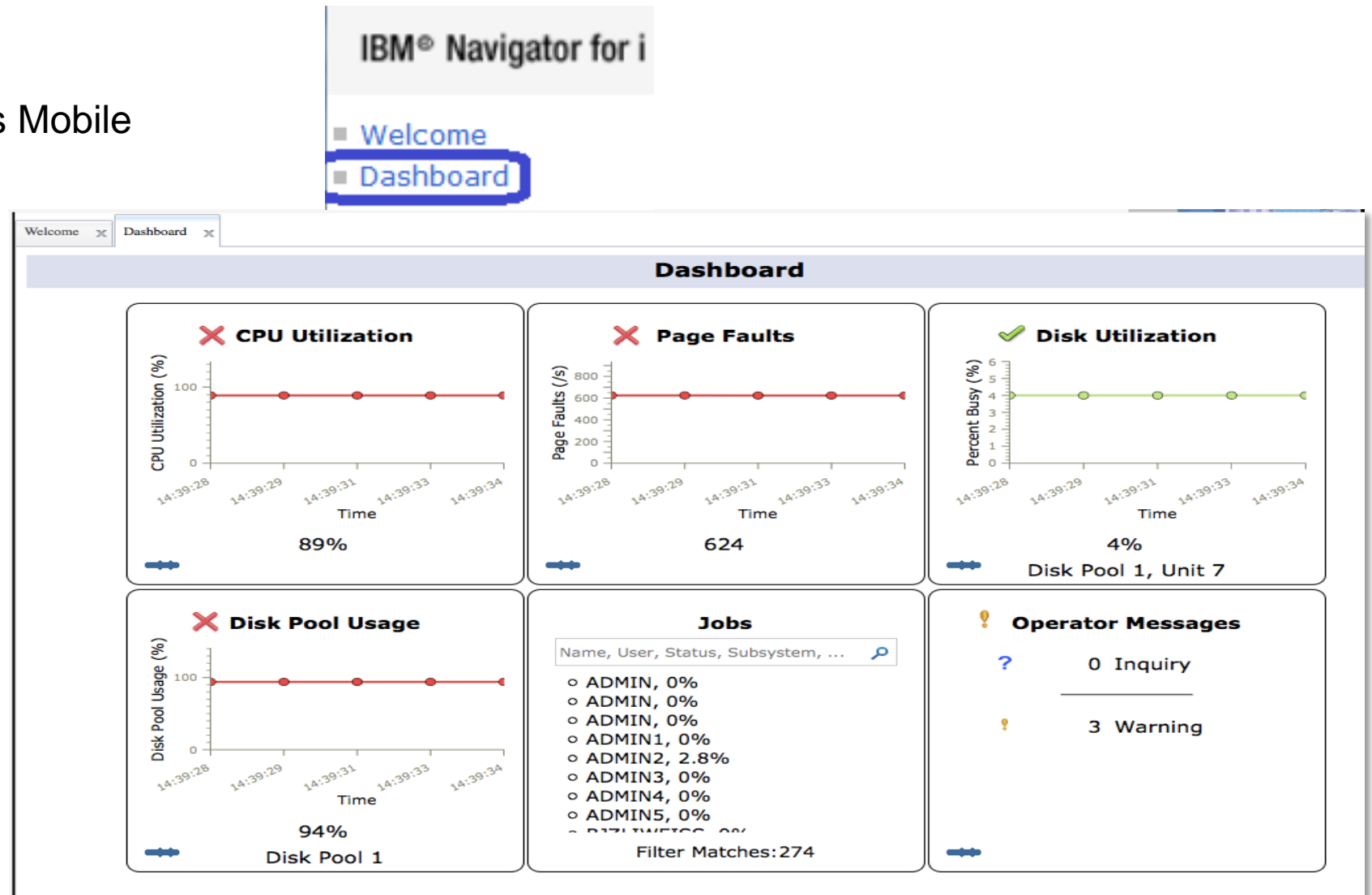
- IBM Navigator for i is the Web console for managing IBM i
 - Has much of the function as System i Navigator
 - but with a browser user interface
 - Simply point your browser to <http://systemname:2001>



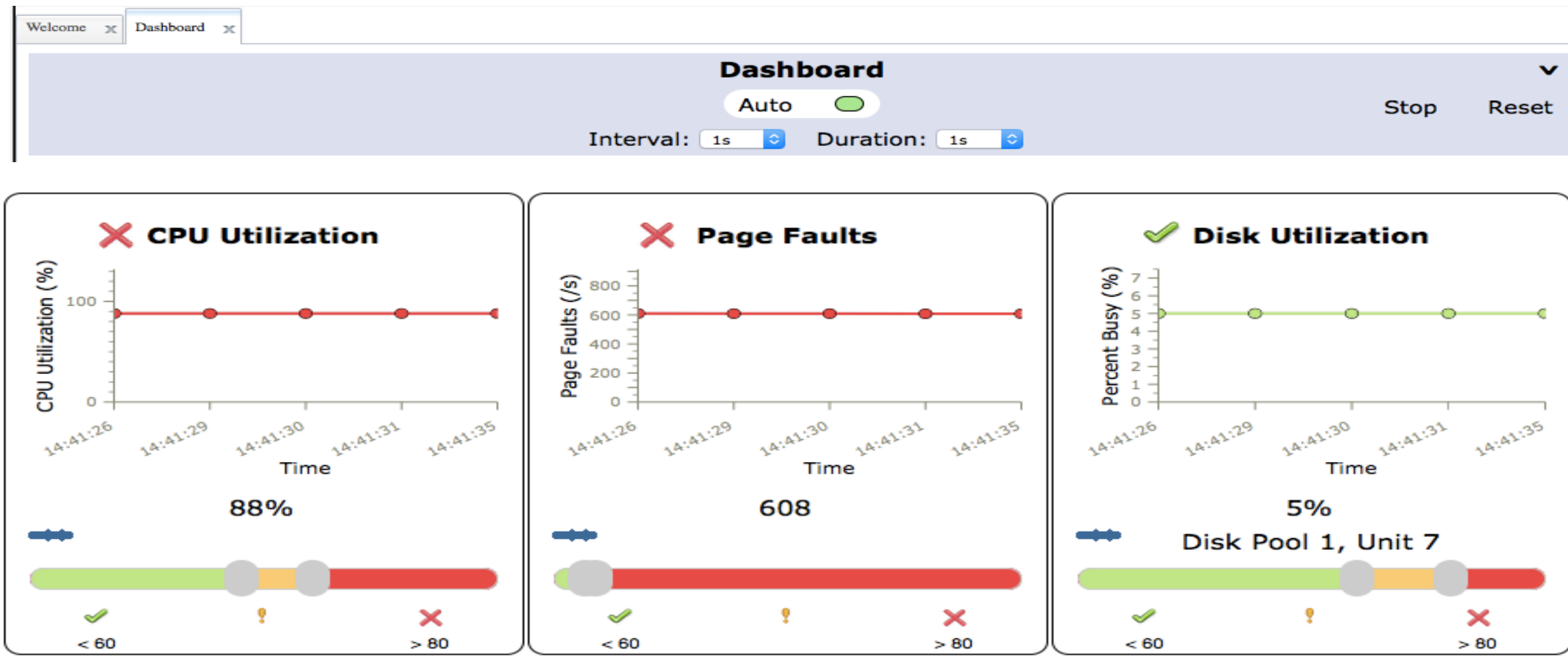
Note: After the release of the **December 2016 HTTP Group PTF** the 2001 port is no longer redirecting to port 2005 by default. Instead 2001 will now only redirect to the **non-secure 2004 port**.

Dashboard

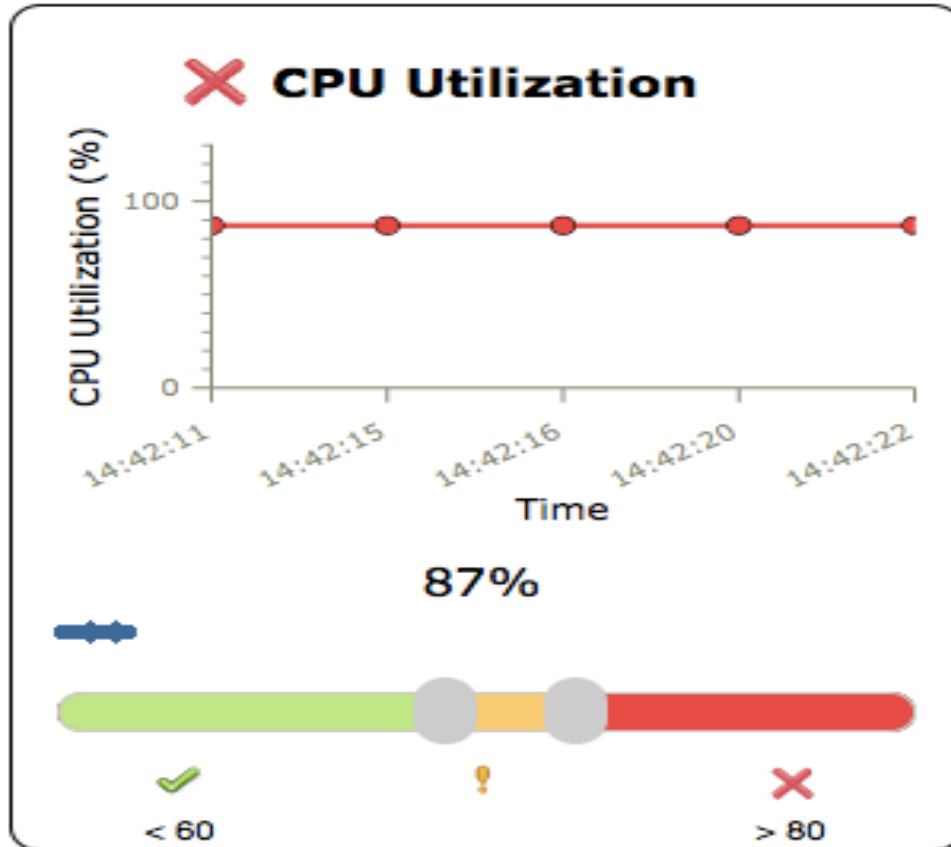
- Task in Navigator
- Also available with iAccess Mobile
- Key metrics updated in real time
- Set thresholds to visualize potential issues



Configurable intervals and thresholds



Basic drill-down - CPU Utilization



Top Jobs

1. TESTPACK, 38.1%



Job: TESTPACK

User: DFL

Number: 025336

Status: RUN

Function: PGM-TESTPACK

Current User: DFL

Subsystem: QINTER

2. QZRCSRVS, 24%



3. ADMIN2, 2.8%



4. CRTPFRTDTA2, 0.6%



5. QZRCSRVS, 0.6%



6. QZLSFILET, 0.4%



Jobs - search and drill-down

Jobs

dawn

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

Filter Matches:4

Jobs

Filter: dawn

- QZDASOINIT, 0% >
- QZDASOINIT, 0% >
- QZDASOINIT, 0% >
- QZRCSRVS, 0.6% v

Job: QZRCSRVS

User: QUSER

Number: 041924

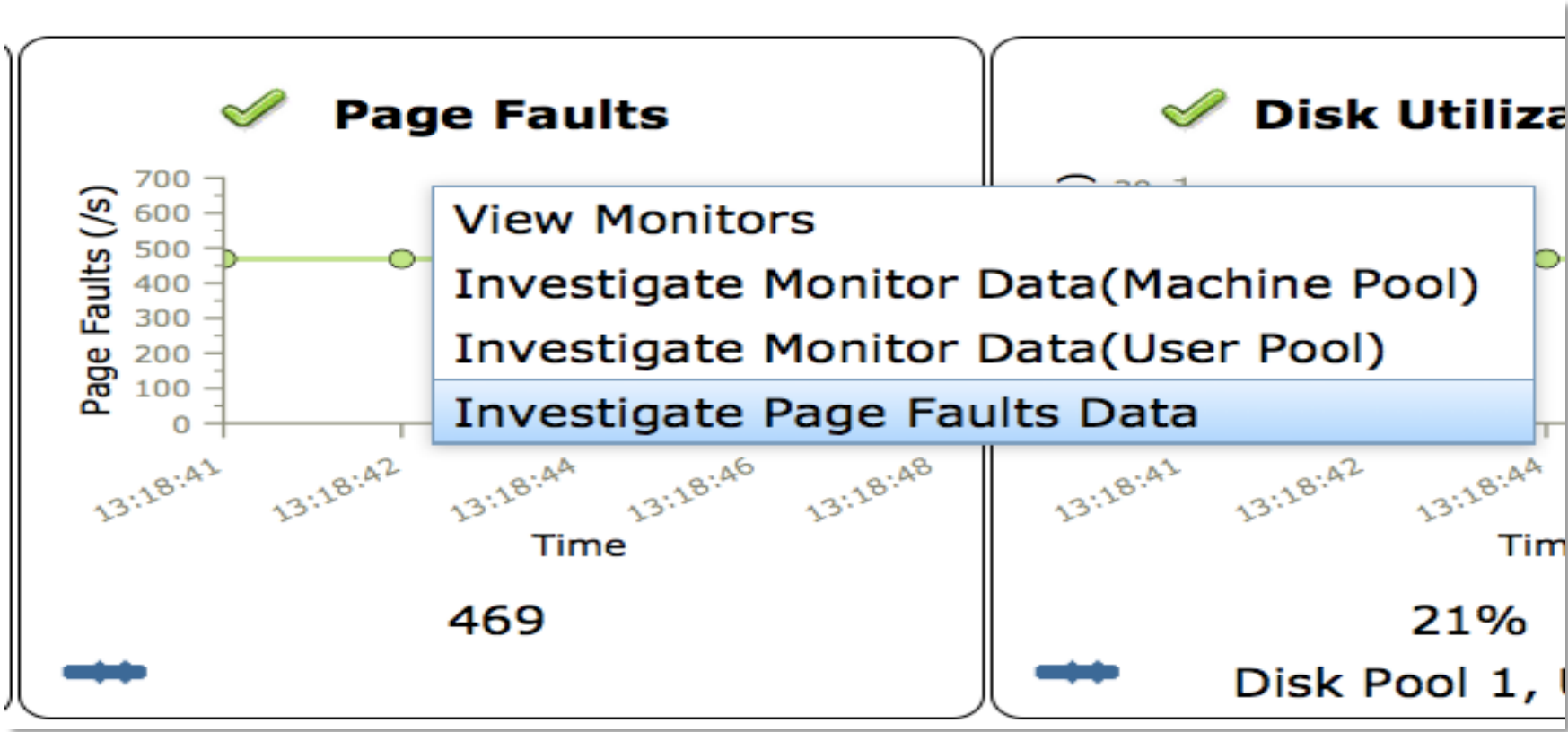
Status: RUN

Function:

Current User: DAWN

Subsystem: QUSRWRK

Drill-down to System Monitors and Investigate Data



iAccess Mobile Dashboard

View from your favorite mobile device

- Phone
- Tablet

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



Introduction to Wait Accounting

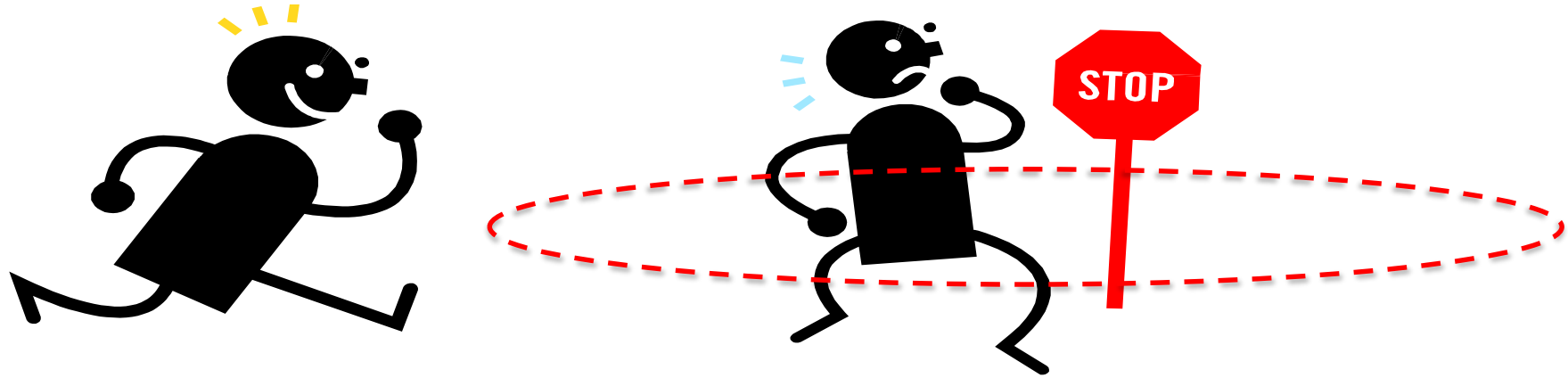
Performance **Fact:**

“All computers wait at the same speed”



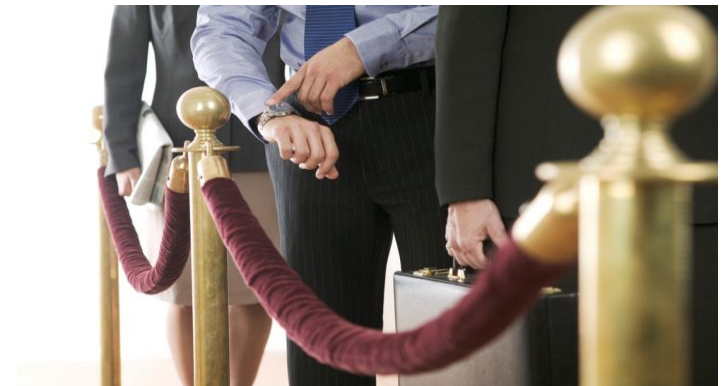
What is Wait Accounting?

Wait Accounting = the ability to determine what a job is doing when it is not running



- xclusive!! Patented IBM i technology built into IBM i

- When a job is not running (using CPU), it is waiting
 - *But why is it waiting? How long is it waiting? And what is it waiting for?*
- Waits may be normal, some waits are not normal
 - Wait Accounting helps to determine what the wait is and if it is a problem
- IBM i has instrumented most of the key wait conditions
 - Wait information is automatically collected by **Collection Services** and **Job Watcher**



- Wait information is tracked (automatically!) for each **job, thread and task** on system
- A job/thread/task is in one of three states:

Using CPU

- “Dispatched CPU” – Assigned to a virtual processor so it can begin execution of instructions

Waiting for CPU

- “CPU Queuing” – Ready to use processor, but waiting for it to become available

Waiting for something else...

- Idle waits
- **Blocked waits**

These waits are typically the most interesting waits to focus on

Wait Accounting - Buckets

Wait Buckets = “Wait condition groups” instrumented in the operating system.

- Buckets can then be **analyzed** to determine where a job is spending its time (running or waiting)
- Categorized into **32** buckets
- Buckets found in both **Collection Services** and **Job Watcher** data
- Waits can be viewed at a **system-level** or at an **individual job/thread/task level**
 - Can also be grouped by generic job name, subsystem, current user profile, pool ID, etc.



32 Wait Buckets (6.1 and beyond)

1. Time dispatched on a CPU
2. CPU queuing
3. Reserved
4. Other waits
5. Disk page faults
6. Disk non-fault reads
7. Disk space usage contention
8. Disk operation start contention
9. Disk writes
10. Disk other
11. Journaling
12. Semaphore contention
13. Mutex contention
14. Machine level gate serialization
15. Seize contention
16. Database record lock contention
17. Object lock contention
18. Ineligible waits
19. Main storage pool contention
20. Classic Java™ user including locks (to 6.1)
→ (7.2) Journal save while active
21. Classic Java JVM (up to 6.1)
22. Classic Java other (up to 6.1)
23. Reserved
24. Socket transmits
25. Socket receives
26. Socket other
27. IFS
28. PASE
29. Data queue receives
30. Idle/waiting for work
31. Synchronization Token contention
32. Abnormal contention

RED = Blocked Waits

Common Waits that Applications use

- **Disk Waits**
- **Journaling**
- **Database record locks**
- **Object locks**
- Sockets
- Semaphores, Mutexes, Synchronization Tokens

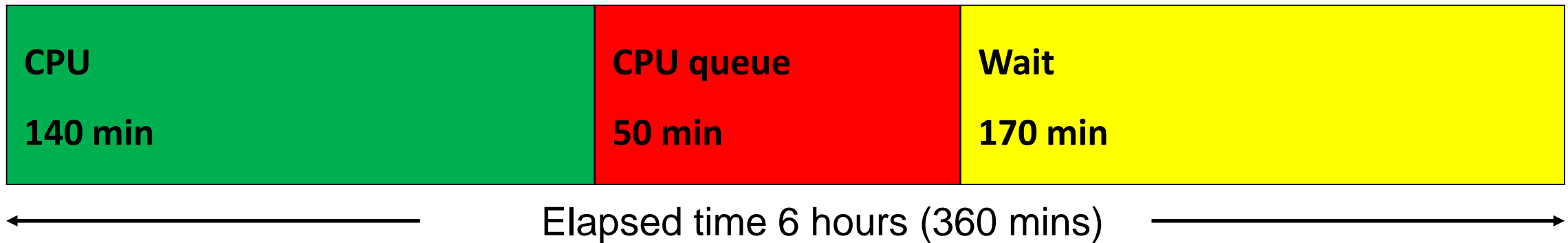
Wait Accounting – “Run-wait” signature

Applying the concepts of wait accounting, we are now able to identify the amount of time the thread/task was running and the time the thread/task was waiting.

Consider the following:

Batch job with total run time of 6 hours

Run-wait signature



Wait Accounting – “Run-wait” signature

Wait breakdown

170 minutes



Potential for job to run faster if waits can be eliminated

Disk Page Fault Time 100 mins	Disk Writes 30 mins	Journal 15 mins	DB Record Locking 15 mins	Object Lock 10 mins
----------------------------------	------------------------	--------------------	---------------------------------	---------------------------

Now you can start asking questions such as:

- Are my pool sizes appropriate? What object(s) is the faulting occurring on?
- Is the write cache being overrun? Is the application forcing writes out synchronously? Excessive database file (opens)/closes?
- Are all the journals optimally configured? Are unnecessary objects being journaled?
- Am I locking records or objects unnecessarily?



Why you should leverage Wait Accounting!!

- Helps you understand both system and application characteristics
 - Is it CPU bound? I/O bound?
- Helps you to understand where to focus your effort and investment
 - Is there a bottleneck on CPU, memory, I/O, or contention time?
 - Invest resources where greatest benefit will be
 - Fixing application vs. adding hardware
- Can offer insight into potential performance issues before end-users are affected
 - Can leverage aspects of wait accounting in test environment
 - Eliminate surprises
 - Identify bottlenecks that prevent scaling
- Provides valuable clues to help analyze performance issues as they arise
- Instrumentation part of base IBM i operating system, IBM tools available to help you analyze

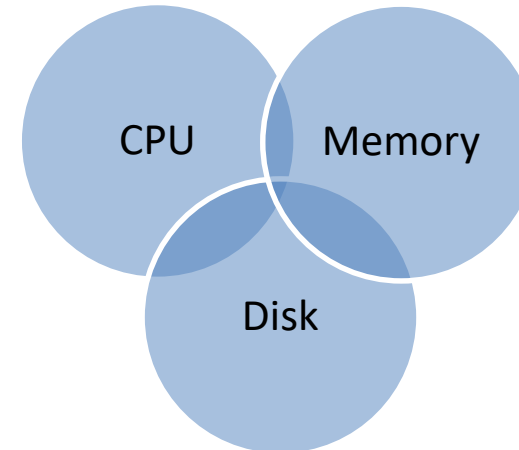


\$\$\$ £££

Goals.....

✓ **Maintain a balanced system**

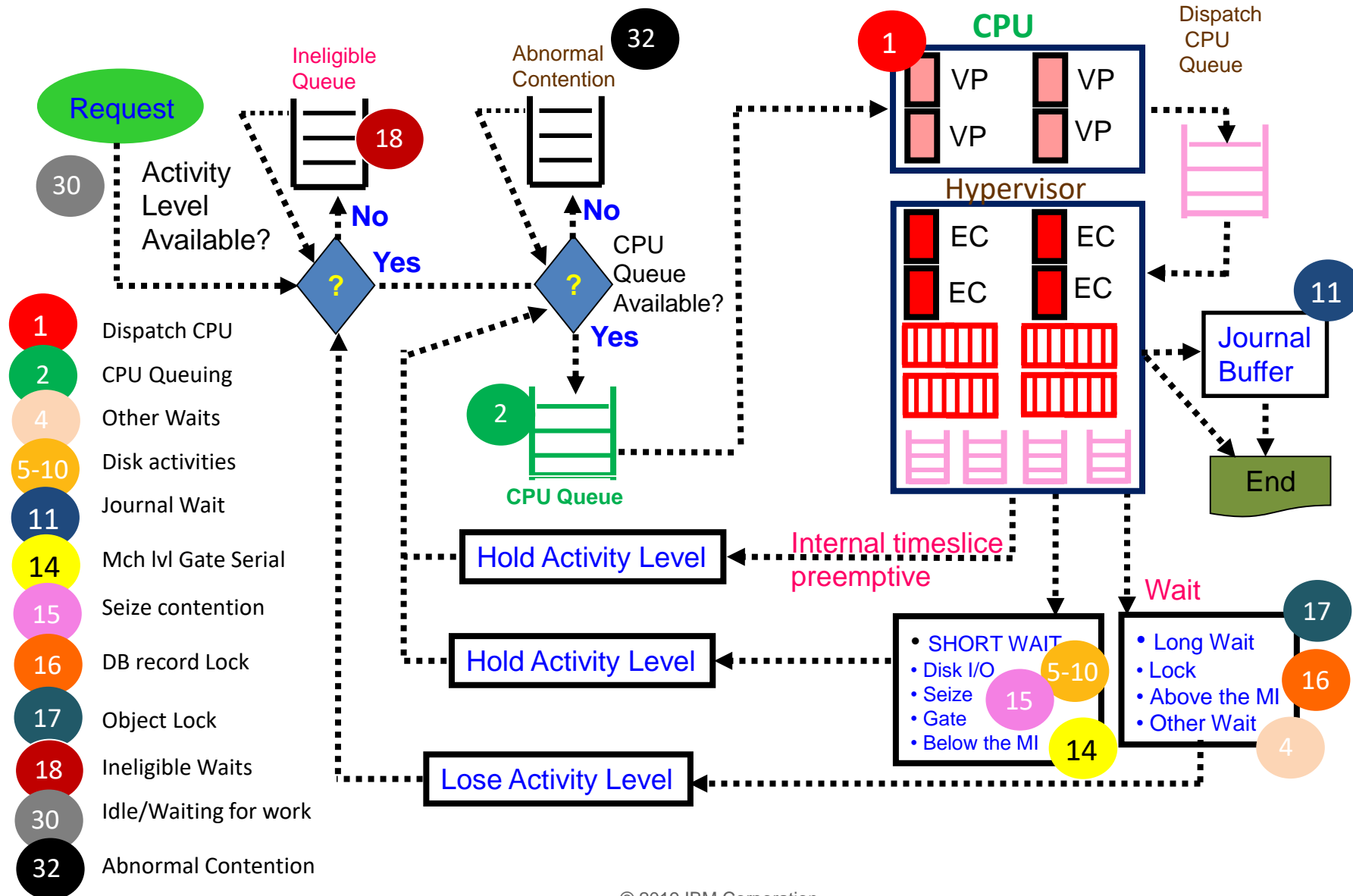
- Adequate processor, memory, and I/O allocated for workload(s)
- Jobs aren't waiting to use resource
- Don't focus on one and neglect others!



✓ **Minimize contention times**

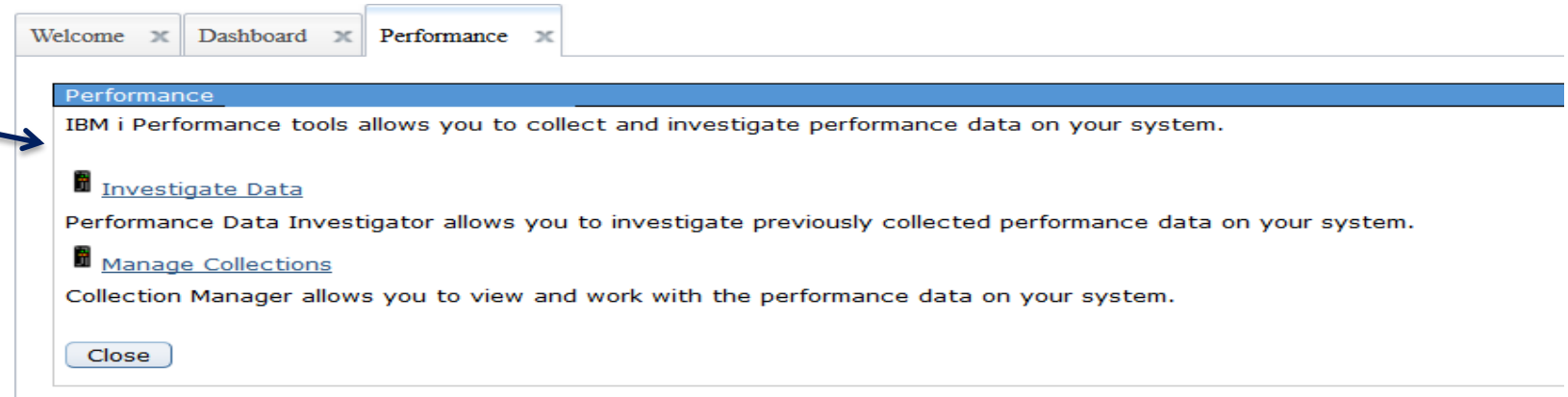
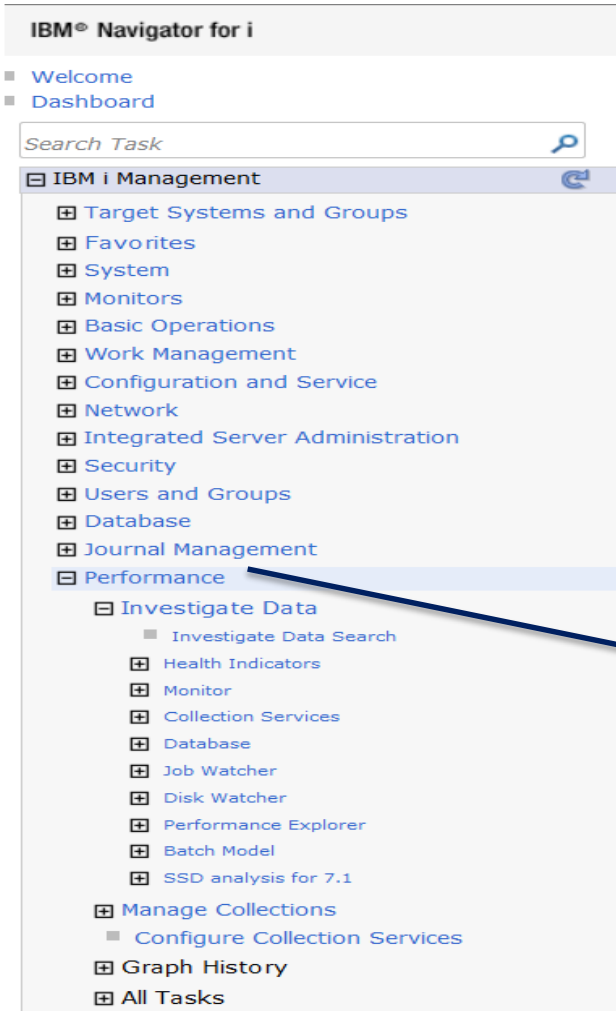
- Reduce time jobs spend waiting on database record locks, object locks, etc.

Processing Overview



Performance Tasks

- **“Performance”** is a major function in Navigator
 - Investigate Data = *“Performance Data Investigator”*
 - Manage Collections
 - And much more!







Packaging: Performance Tools Licensed Program Product



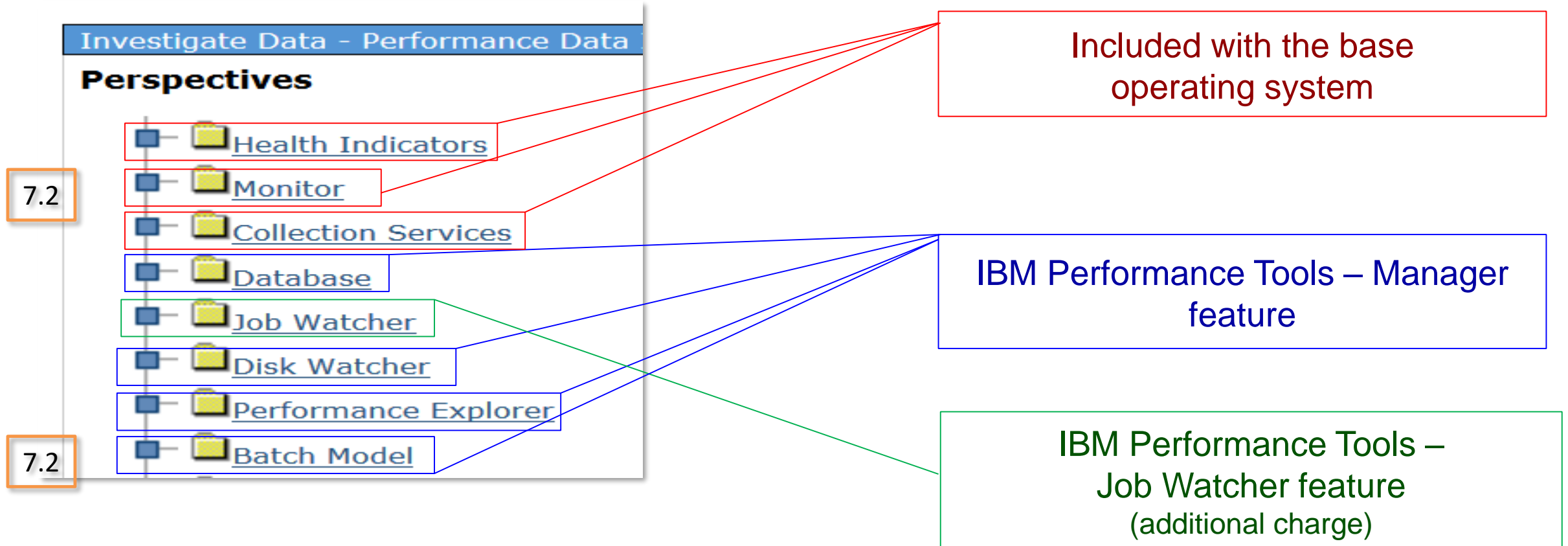
7.2

7.3

- IBM i for [Collection Services](#), [Health Indicators](#), [Monitors](#), [Graph History](#)
- Performance Tools Licensed Program Product
(5770PT1 for 7.1, 7.2, 7.3, 7.4)
 - **Performance Tools - Manager Feature (option 1)** 7.2
 - [Disk Watcher](#), [Performance Explorer](#), [Database](#), [Batch Model](#)
 - Performance Tools - Agent Feature
 - **Performance Tools - Job Watcher (option 3)**
 - [Job Watcher](#)

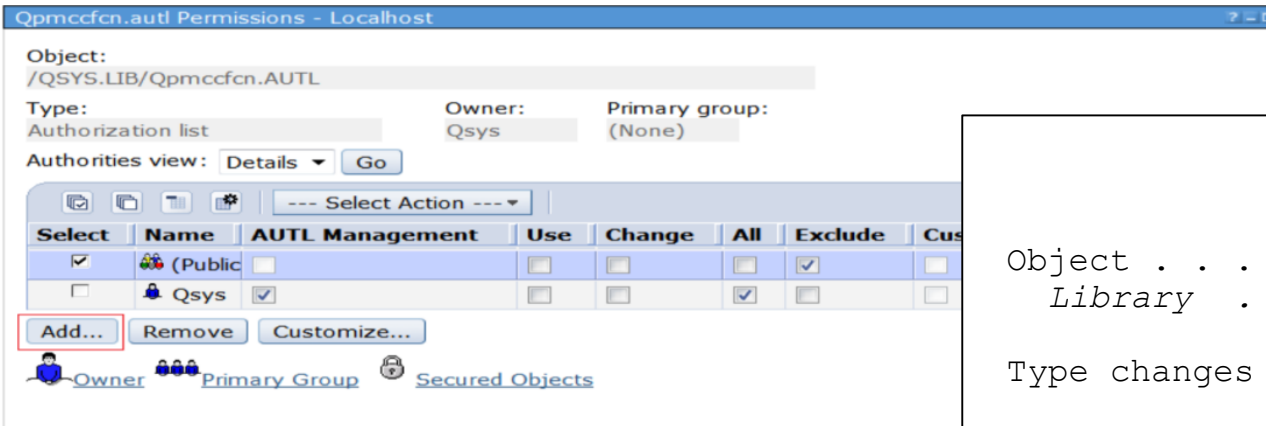
<input type="checkbox"/>	Product ID	Product Option	Release	Description
<input type="checkbox"/>	 5770PT1	0000	V7R3M0	IBM Performance Tools for i - Base
<input type="checkbox"/>	 5770PT1	0001	V7R3M0	Performance Tools - Manager Feature
<input type="checkbox"/>	 5770PT1	0002	V7R3M0	Performance Tools - Agent Feature
<input type="checkbox"/>	 5770PT1	0003	V7R3M0	Performance Tools - Job Watcher

Packaging view in PDI - 7.2 & 7.3



Prerequisites: Authority

- Users need to be authorized to use the Investigate Data and Manage Collections performance tasks
- Include users on the **QPMCCDATA** and **QPMCCFCN** authorization lists
 - *Can be done via GUI or green screen*



Edit Authorization List

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

Type changes to current authorities, press Enter.

User	Object Authority	List Mgt
*PUBLIC	*EXCLUDE	
QSYS	*ALL	X
PDI01	*USE	
PDI02	*USE	
PDI03	*USE	
More...		

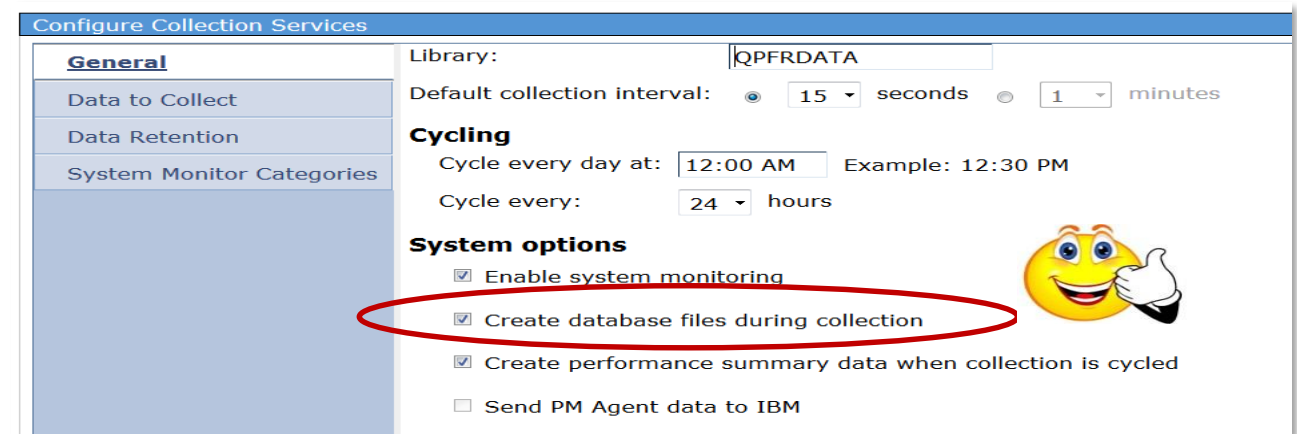
Prerequisites: Create Database Files

- **PDI requires data in the Collection Services DB2 files**
 - 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)



Configure Collection Services

General

Library: QPFRDATA

Default collection interval: 15 seconds 1 minutes

Cycling

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

Cycle every: 24 hours

System options

- ☒ Enable system monitoring
- ☒ Create database files during collection
- ☒ Create performance summary data when collection is cycled
- ☐ Send PM Agent data to IBM

Prerequisites: Verify Collection Services is Active

- Collection Services is the foundation for many performance tasks
 - Make sure Collection Services is active (Started by default)

Collectors

+ Disk Watcher

+ Job Watcher

Collection Services

- Active Collection Services Collections
- Collection Services Collections
- Collection Services Status**
- Configure Collection Services
- Cycle Collection Services
- Start Collection Services
- Stop Collection Services

Collection Services Status

Status:	Started
Library:	QPFRDATA
Collection object:	Q058000002
Collection profile:	Standard plus protocol
Started:	Wed Feb 27 00:00:02 CST 2013
Cycle time:	00:00:00
Default collection interval:	00:05:00



OK

Investigate Data – Navigation Example

The screenshot illustrates the navigation process within the IBM Navigator for i interface. On the left, the 'Performance' menu item is highlighted in the main navigation pane. A blue box highlights the 'Performance' menu item, and a blue arrow points from it to the 'Investigate Data' sub-menu item. Another blue arrow points from the 'Investigate Data' sub-menu item to the 'Investigate Data' sub-menu in the right-hand pane. The right-hand pane shows the 'Performance' section with the 'Investigate Data' sub-menu expanded, displaying a list of options: 'Investigate Data Search', 'Health Indicators', 'Monitor', 'Collection Services', 'Database', 'Job Watcher', 'Disk Watcher', 'Performance Explorer', and 'Batch Model'.

IBM® Navigator for i

- Welcome
- Dashboard

Search Task

IBM i Management

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

Performance

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

- Investigate Data**
Performance Data Investigator allows you to investigate previously collected performance data on your system.
- Manage Collections**
Collection Manager allows you to view and work with

Close

Performance

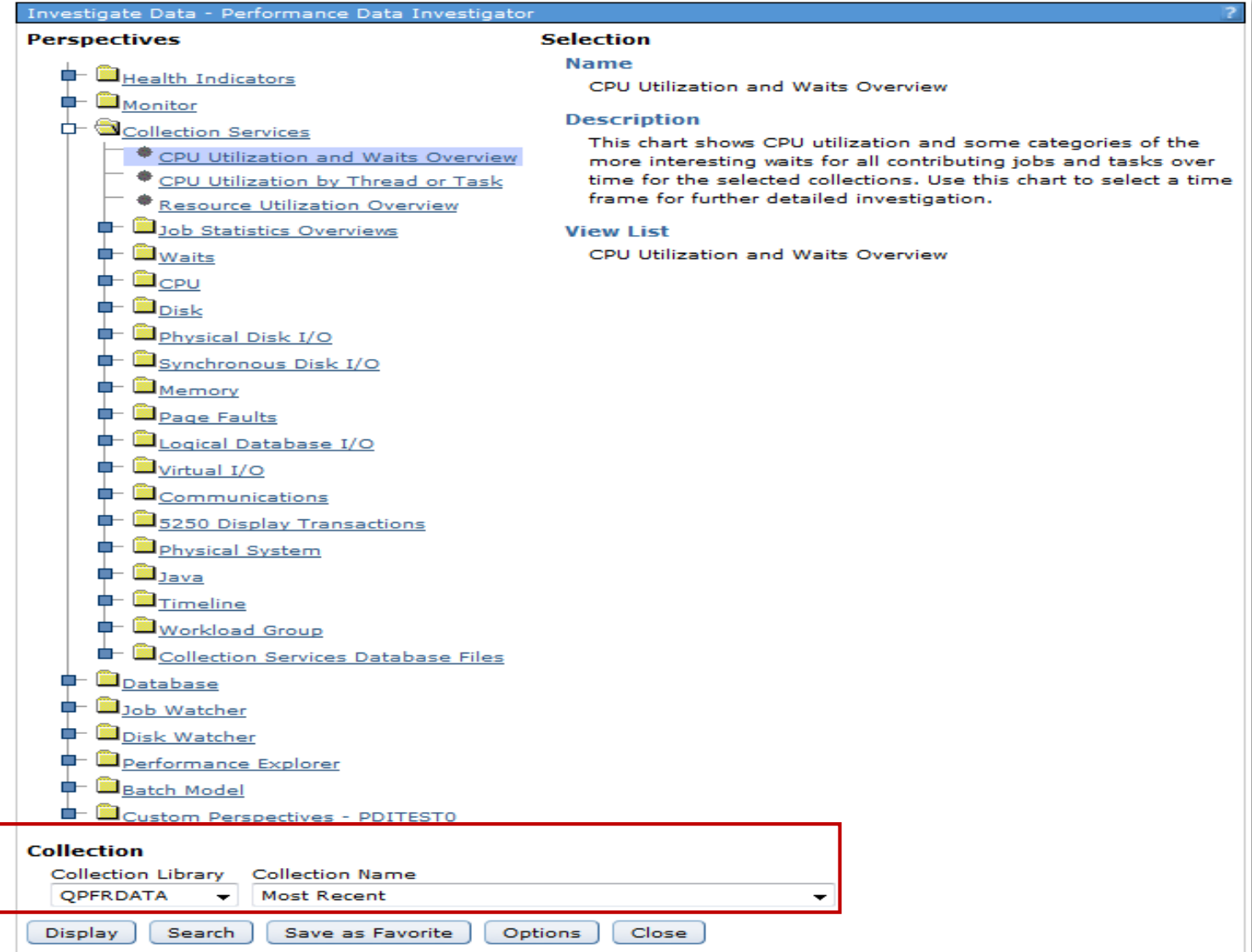
- Investigate Data**
 - Investigate Data Search
 - Health Indicators
 - Monitor
 - Collection Services
 - Database
 - Job Watcher
 - Disk Watcher
 - Performance Explorer
 - Batch Model

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.



Selecting a Collection

- Collections have the date and time to help you identify the one you are interested in
- Note Q* and R* collections
 - R* collections are **new** in 7.2
 - System monitor data

Collection

Collection Library	Collection Name
QPFRDATA	Most Recent

Display Search

Most Recent

Q122180002 (*CSMGTCOL) - May 2, 2018 6:00:02 PM
R122180002 (*CSFILE) - May 2, 2018 6:00:02 PM
Q121180002 (*CSMGTCOL) - May 1, 2018 6:00:02 PM
Q121180002 (*CSFILE) - May 1, 2018 6:00:02 PM
R121180002 (*CSFILE) - May 1, 2018 6:00:02 PM
Q120180002 (*CSMGTCOL) - Apr 30, 2018 6:00:02 PM
Q120180002 (*CSFILE) - Apr 30, 2018 6:00:02 PM
R120180002 (*CSFILE) - Apr 30, 2018 6:00:02 PM
Q119180002 (*CSMGTCOL) - Apr 29, 2018 6:00:02 PM
Q119180002 (*CSFILE) - Apr 29, 2018 6:00:02 PM
R119180002 (*CSFILE) - Apr 29, 2018 6:00:02 PM
Q118180002 (*CSMGTCOL) - Apr 28, 2018 6:00:02 PM
Q118180002 (*CSFILE) - Apr 28, 2018 6:00:02 PM
Q117180002 (*CSMGTCOL) - Apr 27, 2018 6:00:02 PM
Q117180002 (*CSFILE) - Apr 27, 2018 6:00:02 PM
Q116180002 (*CSFILE) - Apr 26, 2018 6:00:02 PM
Q115180002 (*CSFILE) - Apr 25, 2018 6:00:02 PM

Suggested Starting Points

The image displays three sequential screenshots of the 'Investigate Data - Performance Data Investigator' application, illustrating different starting points for performance analysis. Each screenshot shows a left-hand navigation pane with a tree structure and a main content area with details for the selected perspective.

Screenshot 1: Resource Utilization Overview

- Perspectives:** Health Indicators, Monitor, Collection Services (expanded), CPU Utilization and Waits Overview, CPU Utilization by Thread or Task, **Resource Utilization Overview** (selected), Job Statistics Overviews, Waits.
- Selection:**
 - Name:** Resource Utilization Overview
 - Description:** Charts that show utilizations and rates for some of the more common collection metrics on an interval by interval basis. Use this information to find and compare relationships and select a time frame for more detailed investigation.
 - View List:** Resource Utilization Percentages, Resource Utilization Rates

Screenshot 2: CPU Utilization and Waits Overview

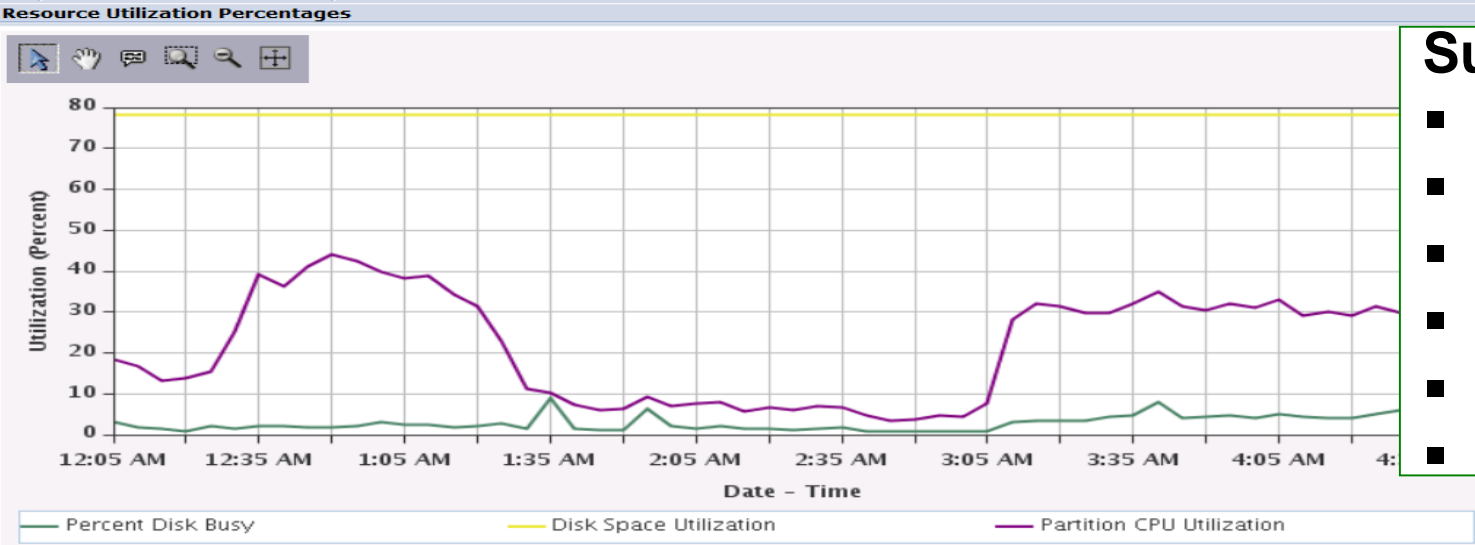
- Perspectives:** Health Indicators, Monitor, Collection Services (expanded), **CPU Utilization and Waits Overview** (selected), CPU Utilization by Thread or Task, Resource Utilization Overview.
- Selection:**
 - Name:** CPU Utilization and Waits Overview
 - Description:** This chart shows CPU utilization and some categories of the more interesting waits for all contributing jobs and tasks over time for the selected collections. Use this chart to select a time frame for further detailed investigation.
 - View List:** (Empty)

Screenshot 3: CPU Utilization by Thread or Task

- Perspectives:** Health Indicators, Monitor, Collection Services (expanded), CPU Utilization and Waits Overview, **CPU Utilization by Thread or Task** (selected), Resource Utilization Overview.
- Selection:**
 - Name:** CPU Utilization by Thread or Task
 - Description:** Charts that show CPU usage by thread or task and ranked by the largest contributors. Use this chart to select contributors for further detailed investigation.
 - View List:** CPU Utilization by Thread or Task

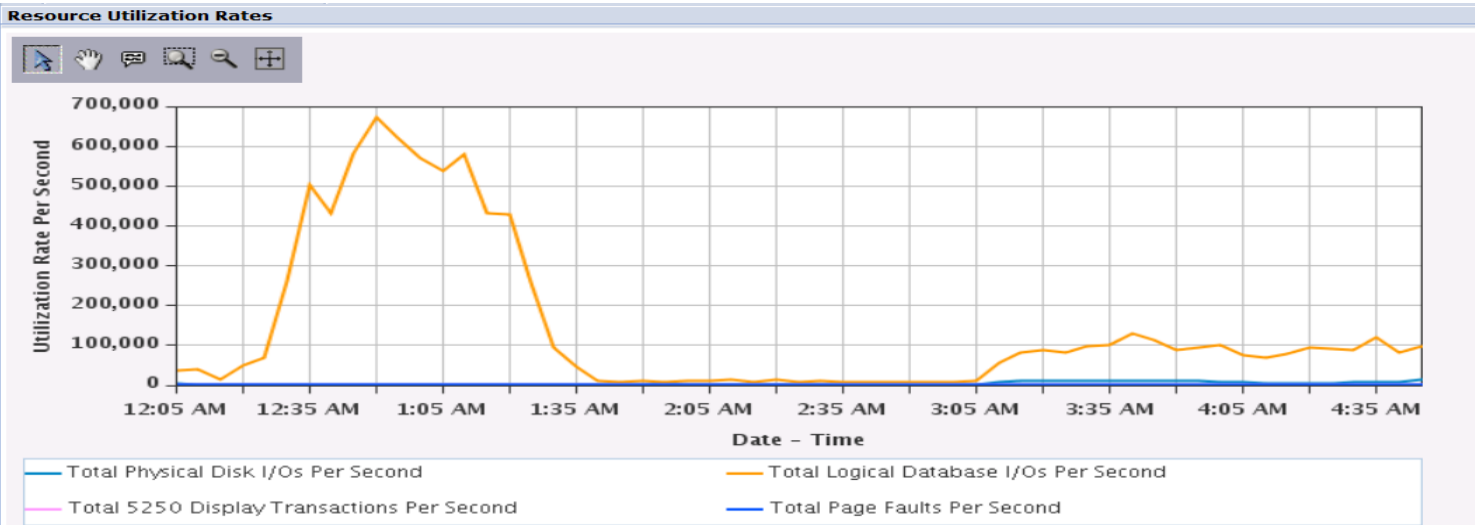
Starting points can depend on goal (monitoring versus problem determination...)

Resource Utilization Overview

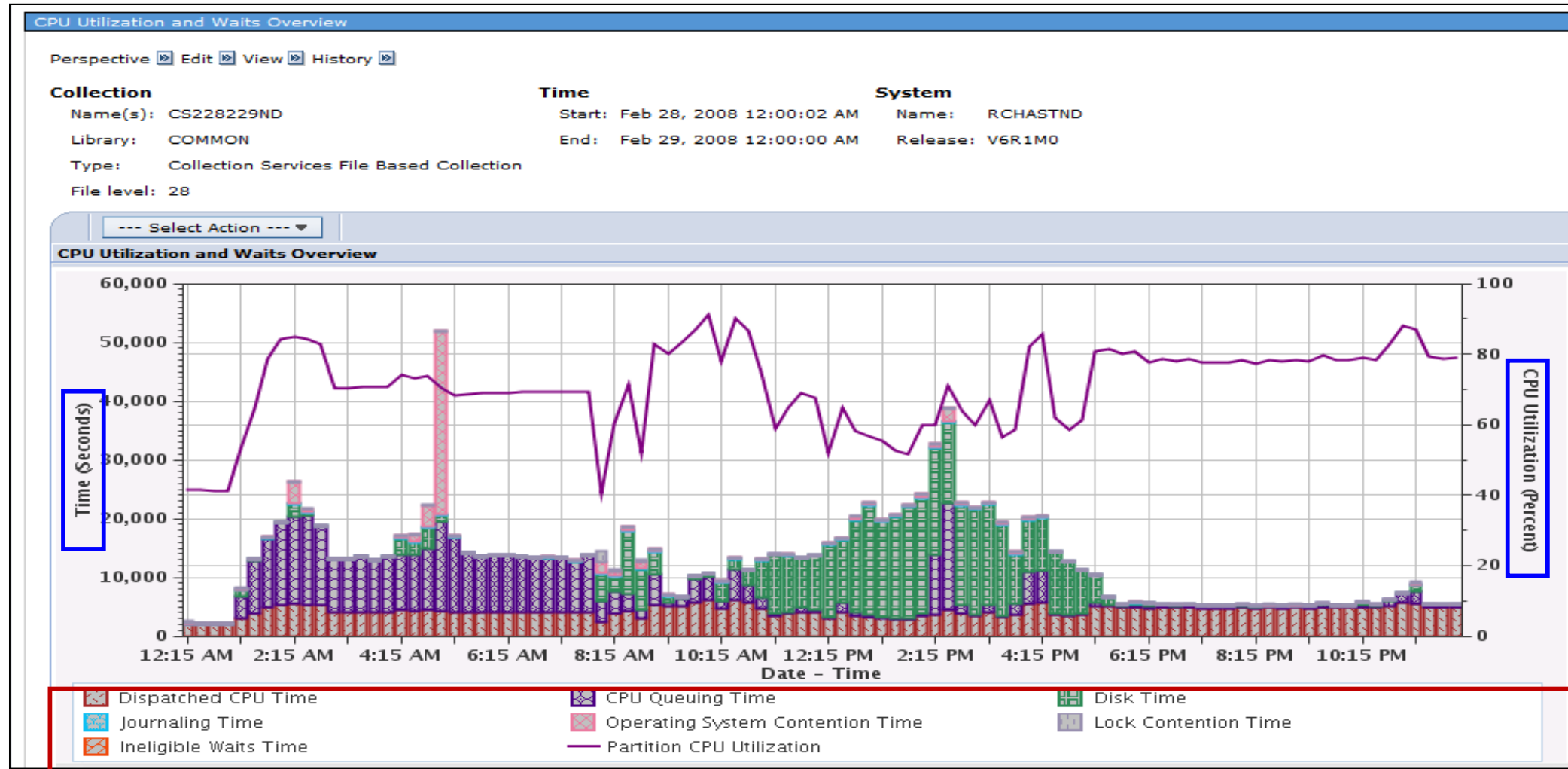


Summary for general overall health:

- CPU Utilization
- Disk Space Utilization
- Disk Busy
- 5250 Transactions per second
- I/Os per Second (logical and physical)
- Page Faults per second

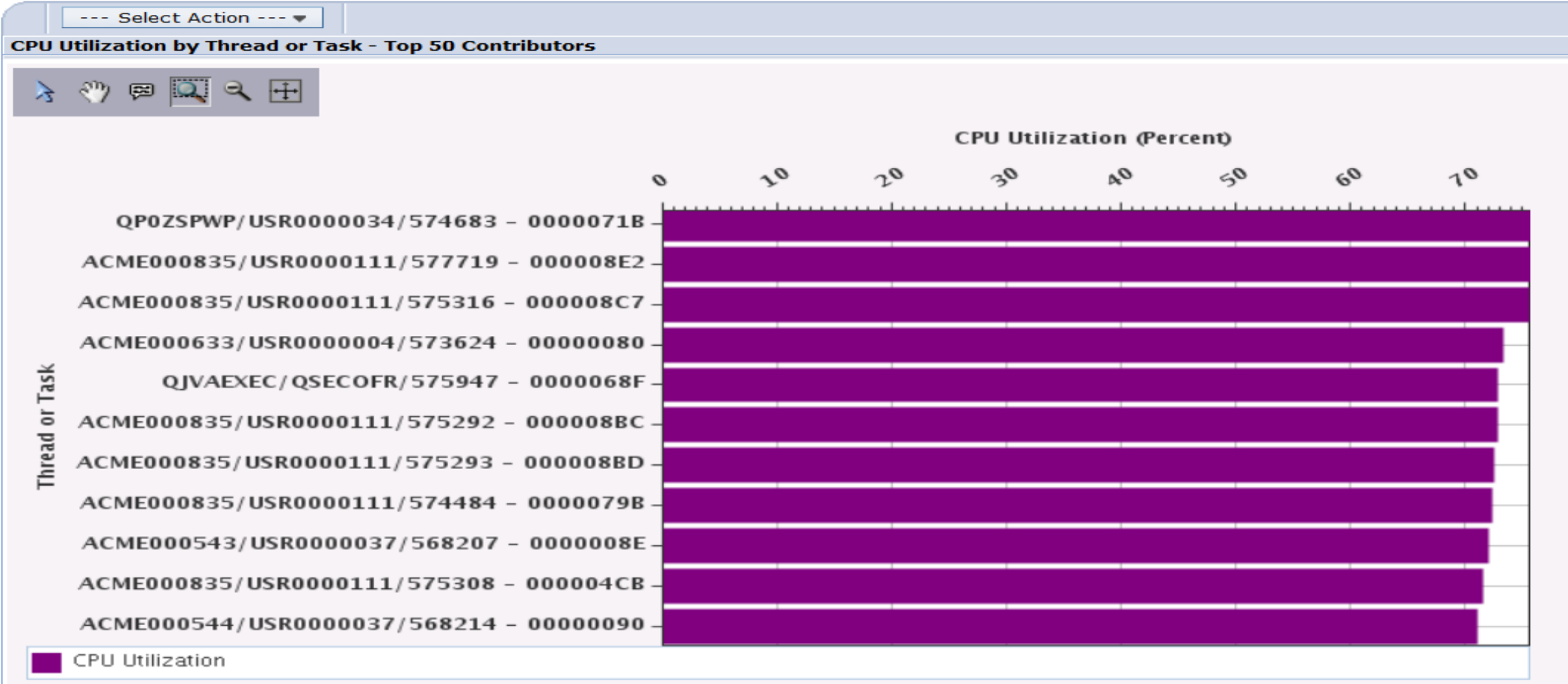


CPU Utilization and Waits Overview



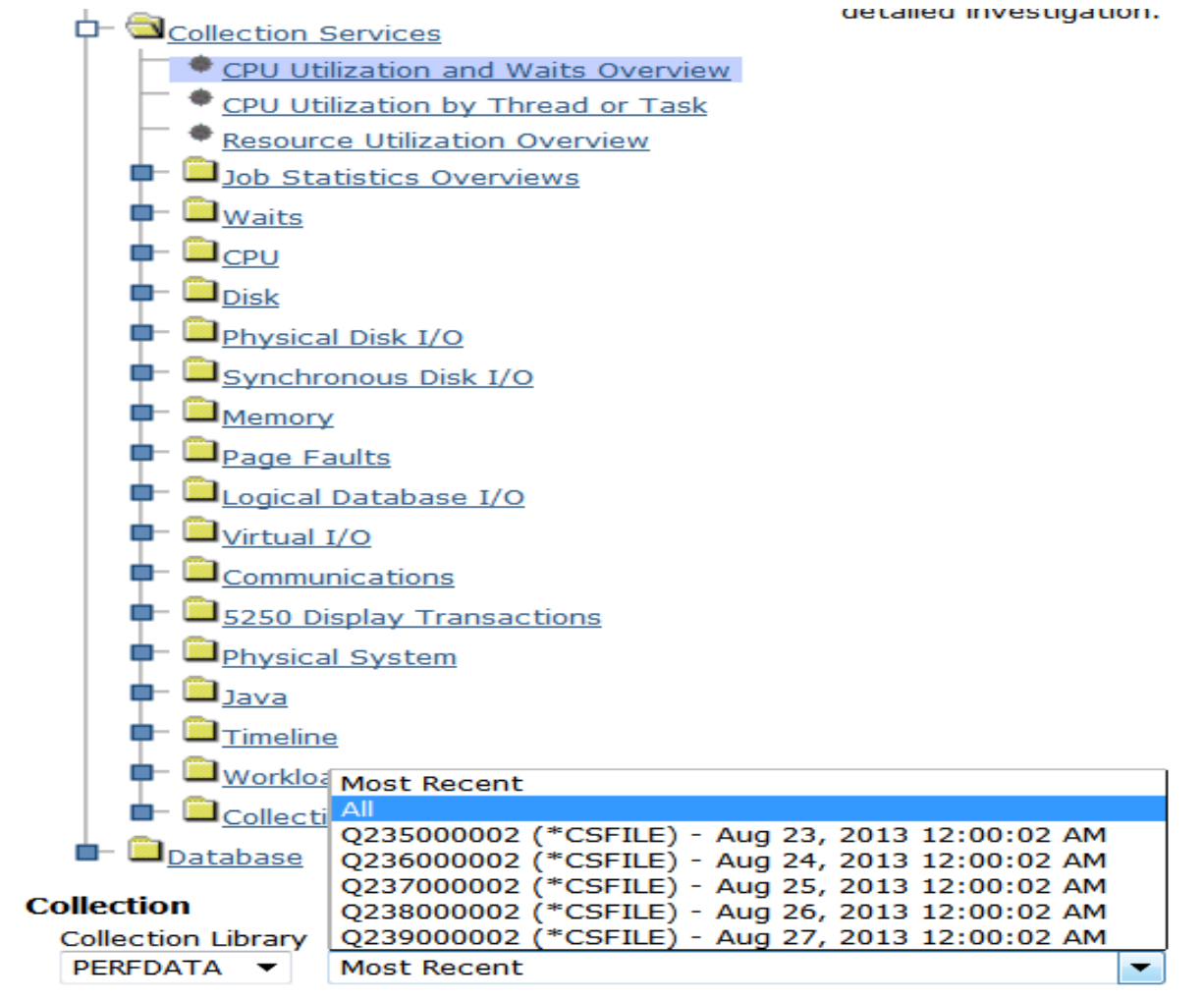
CPU Utilization by Thread or Task

CPU Utilization by Thread or Task - Top 50 Contributors



Graphing Multiple Collections

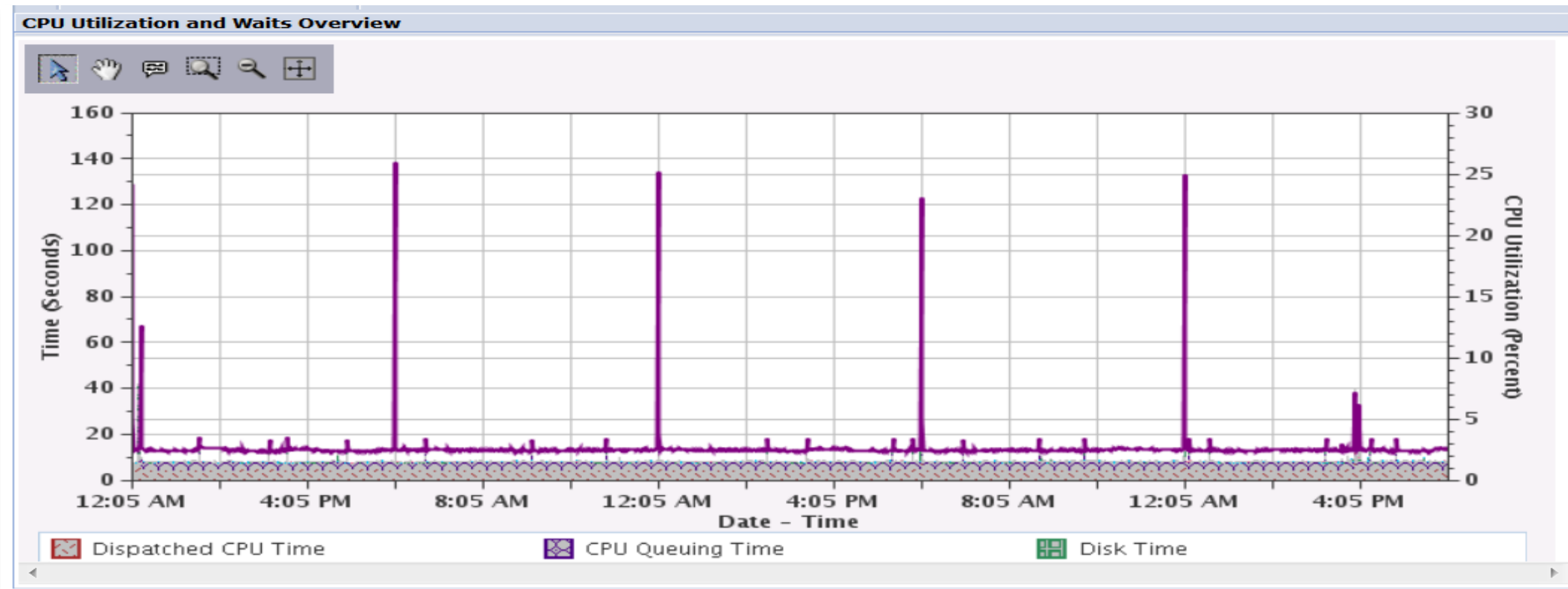
- If your collection library has **5 or fewer** collections, an **All** option is available to display all the collections in one graph
- It will take longer to display the graph
 - Multiple collections means larger queries!
- **Hint:** when the graph appears, you need to use the “reset zoom” tool to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



Graphing Multiple Collections

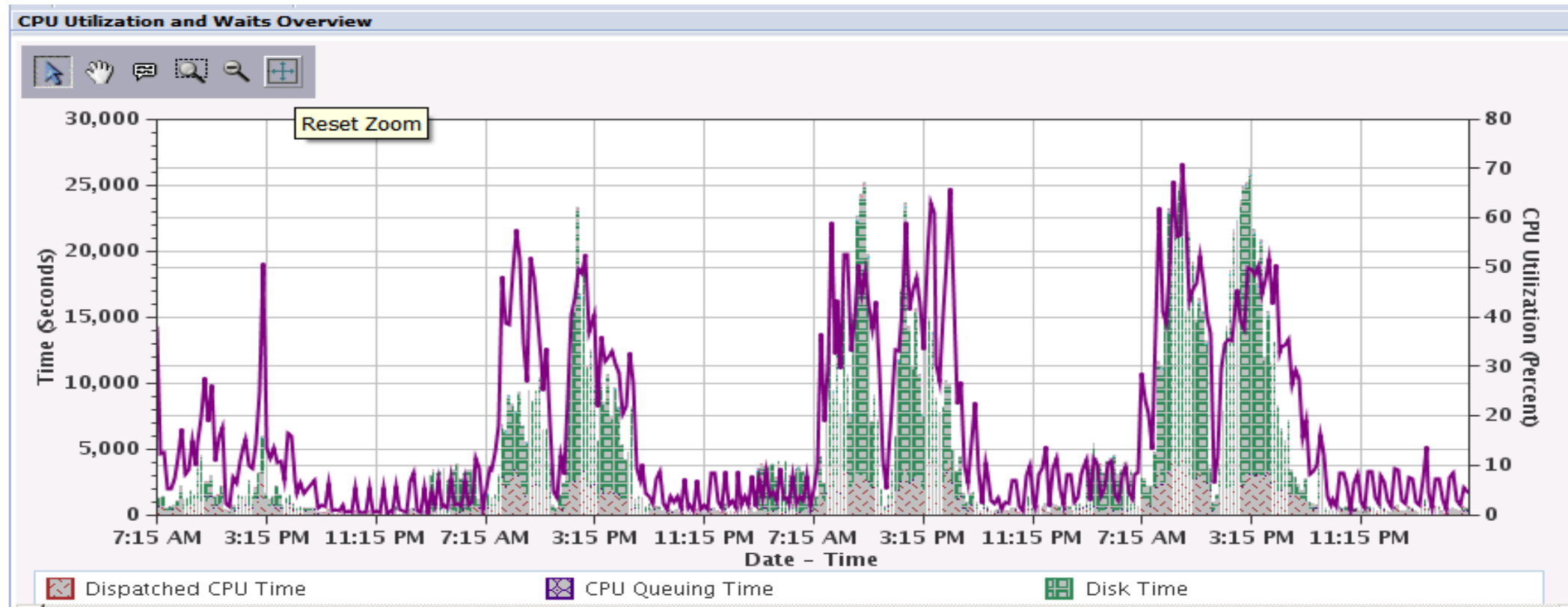
This example shows five days of (fairly uninteresting) Collection Services data

- *Do you know what ran each day at midnight?*



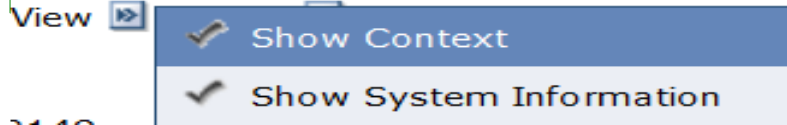
A More Interesting Example...

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



View Collection and System Details

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



Show/hide
Context

Show/hide
System
Information

Collection

Name(s): Q016000149
Library: PMR17037
Type: Collection Services File Based Collection
File level: 36

Time

Start: Jan 16, 2013 12:01:49 AM
End: Jan 17, 2013 12:01:57 AM

System

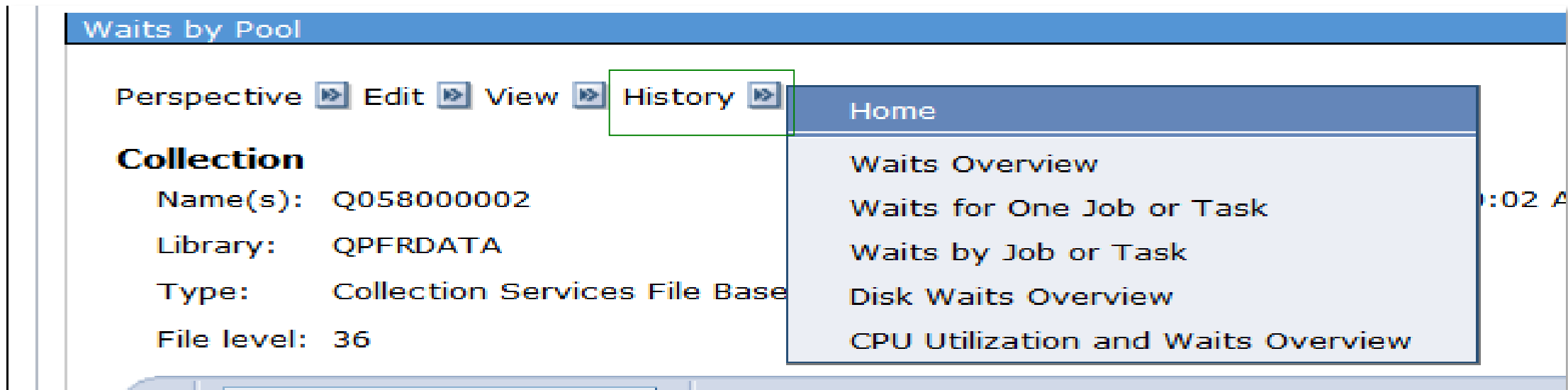
Name: ROCHMN
Release: V7R1M0

System Information

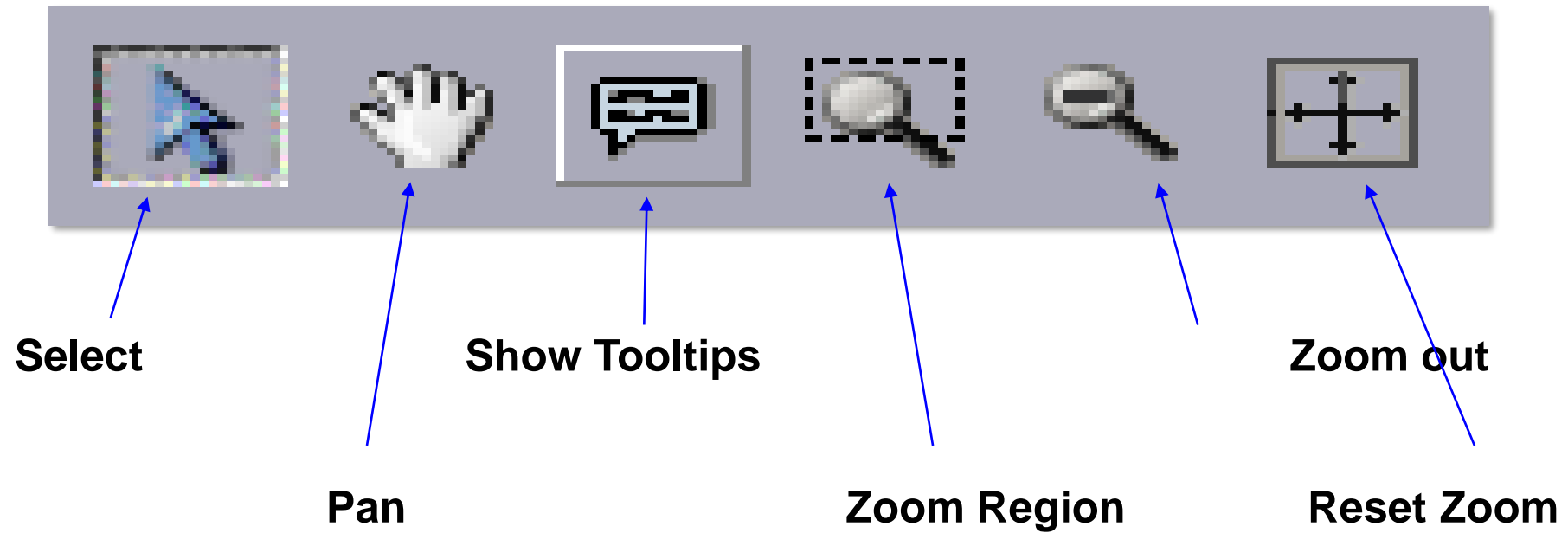
Name:	ROCHMN	Total Processors:	16	Interactive Threshold:	100%
Release:	V7R1M0	Processors / Cores Active:	10	System ASP Capacity	4,680 GB
Type:	9117	Available Processors:	6	Hypervisor Memory:	9,728 MB
Model:	MMA	Virtual Processors:	10	Primary Partition:	0
Serial Number:	10-3709C	Installed Processor Count:	12	Partition ID:	15
Processor Feature Code:	7380	Processor Units (allocated to partition):	3.05	Partition Count:	15
Processor Feature:	7380	Processor Sharing/Capped:	Yes / No	Partition Memory:	100 GB
Generated On:	ROCHMN	QPFRAJ System Value:	3		

Provides quick access to system information from Collection Services QAPMCONF file for the Collection being viewed

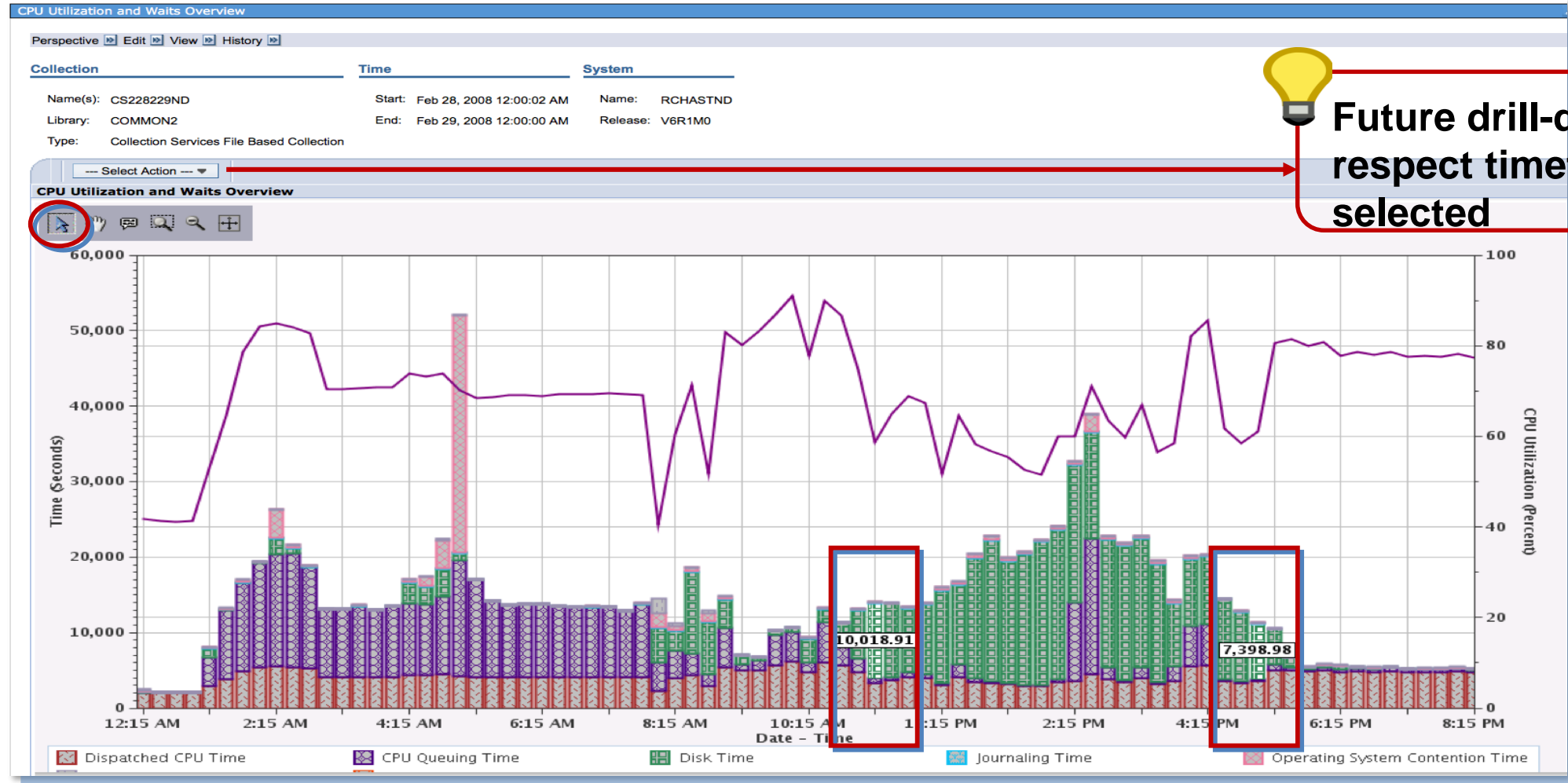
- Keeps track of where you have visited, easy to “back-track”
- Quick way to get back to “Home” (main navigation tree)



Tools to Interact with the Charts

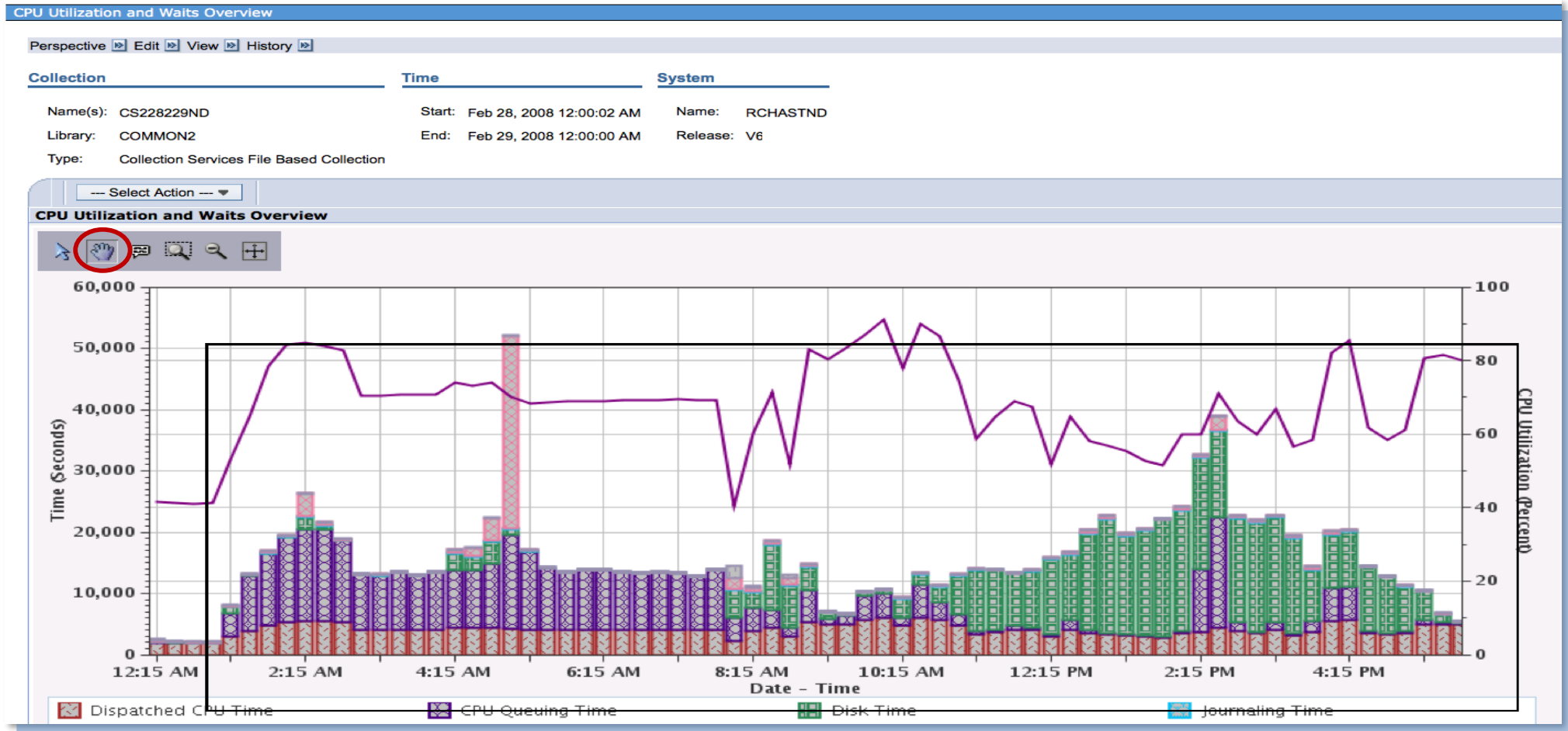


Selection

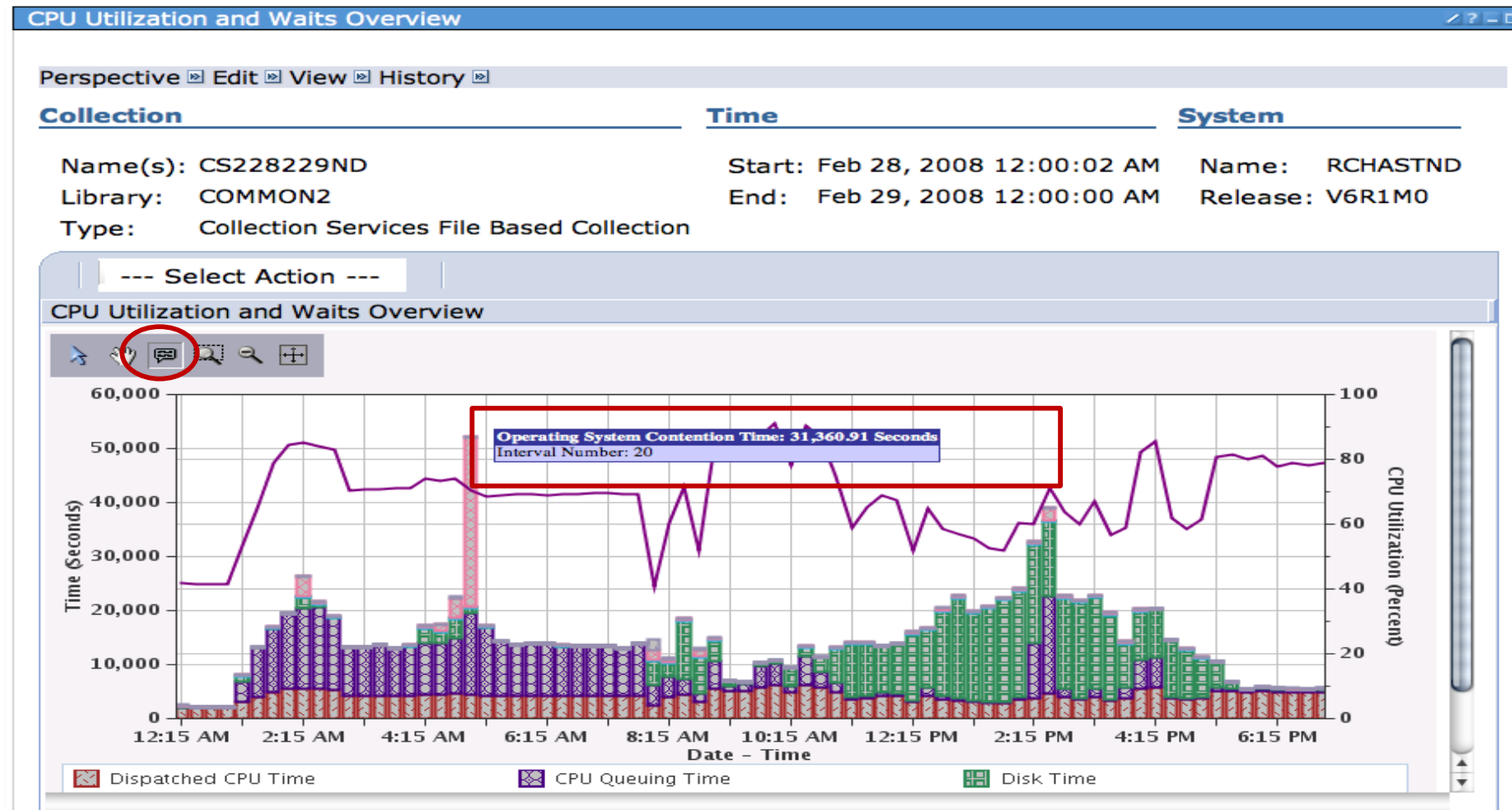


Future drill-downs will respect timeframe selected

Use to select data point(s).

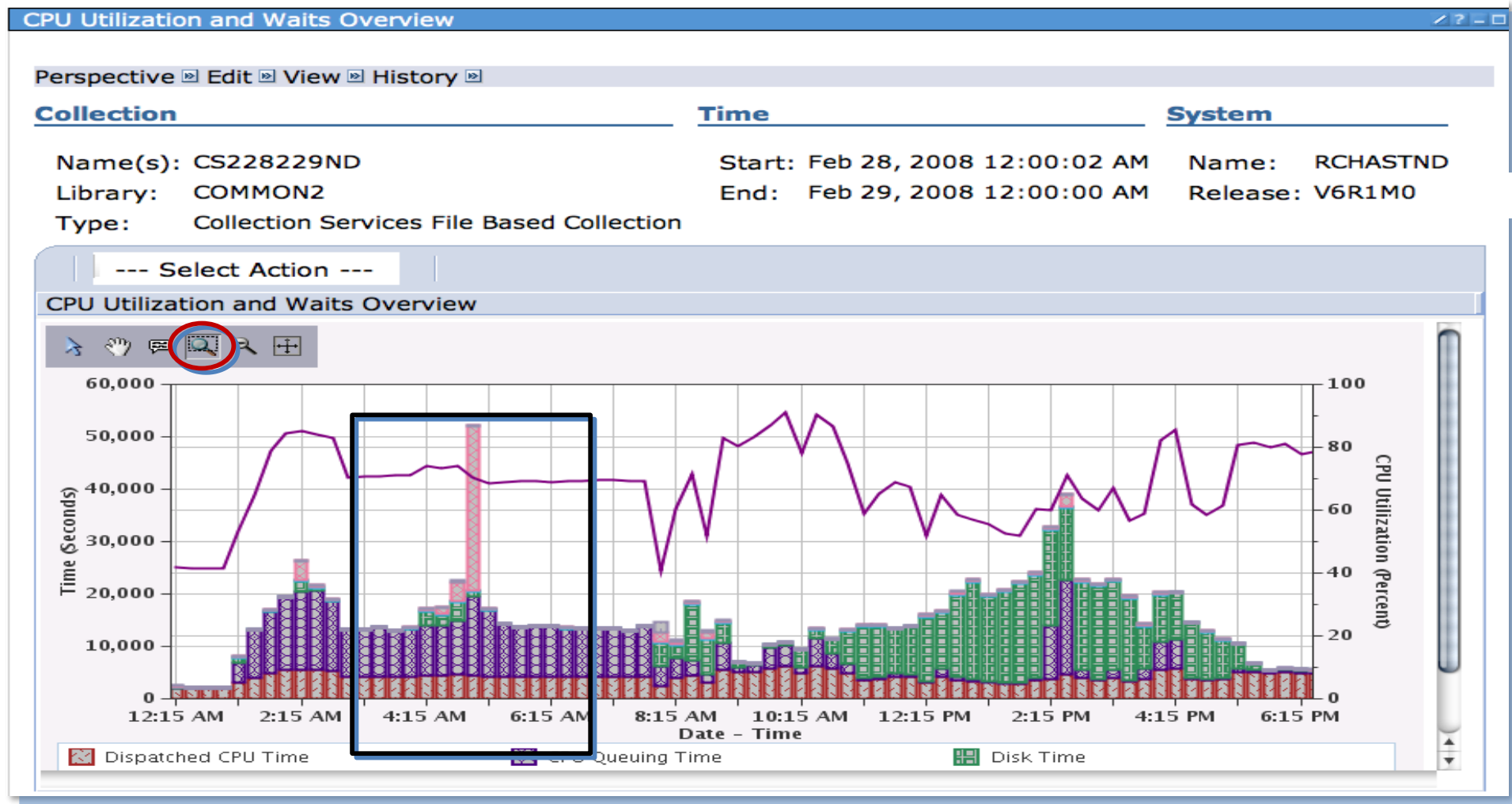


Use to shift chart right or left, up or down.



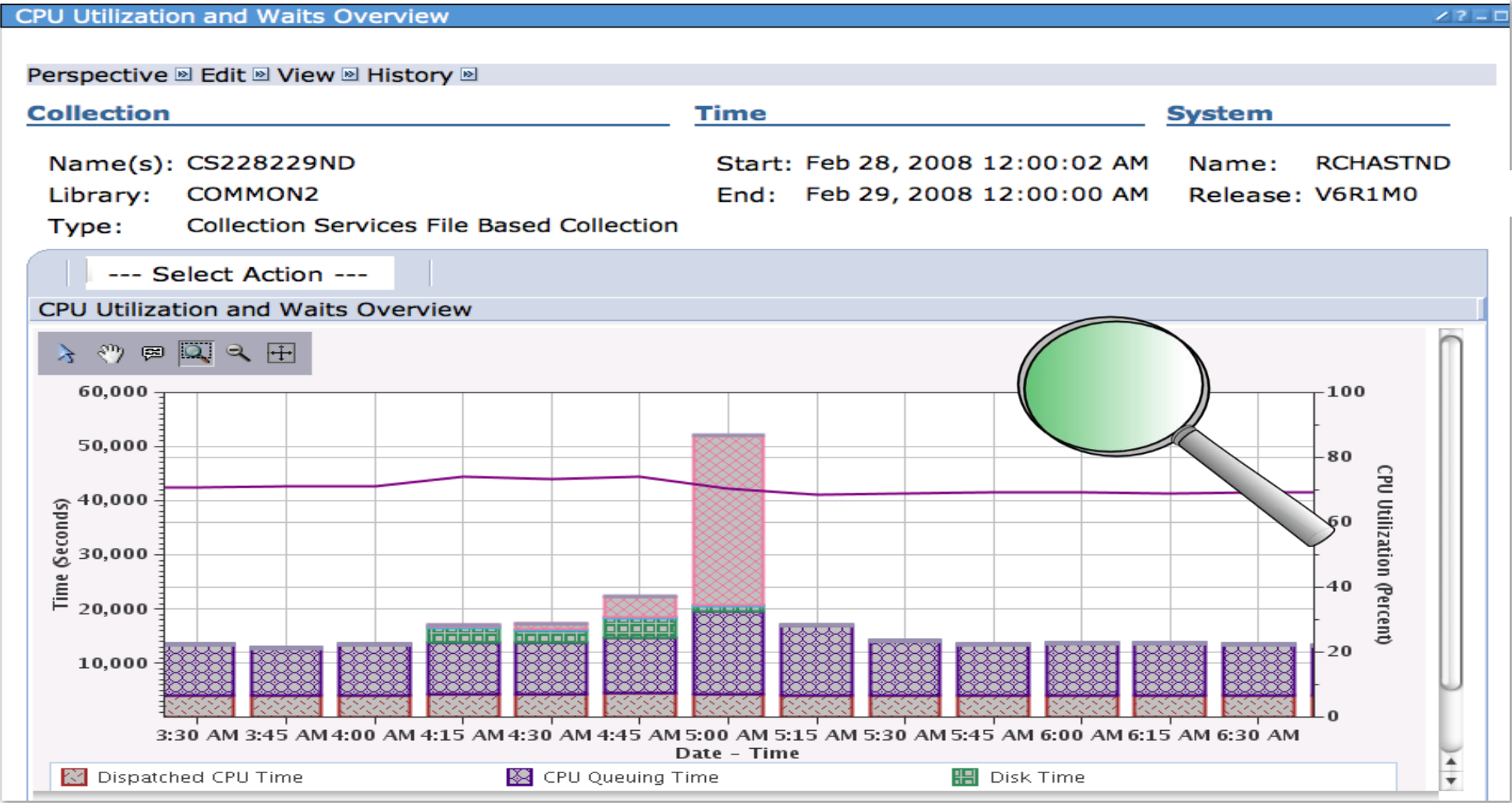
Use to see metric details for interval.

Zoom Region

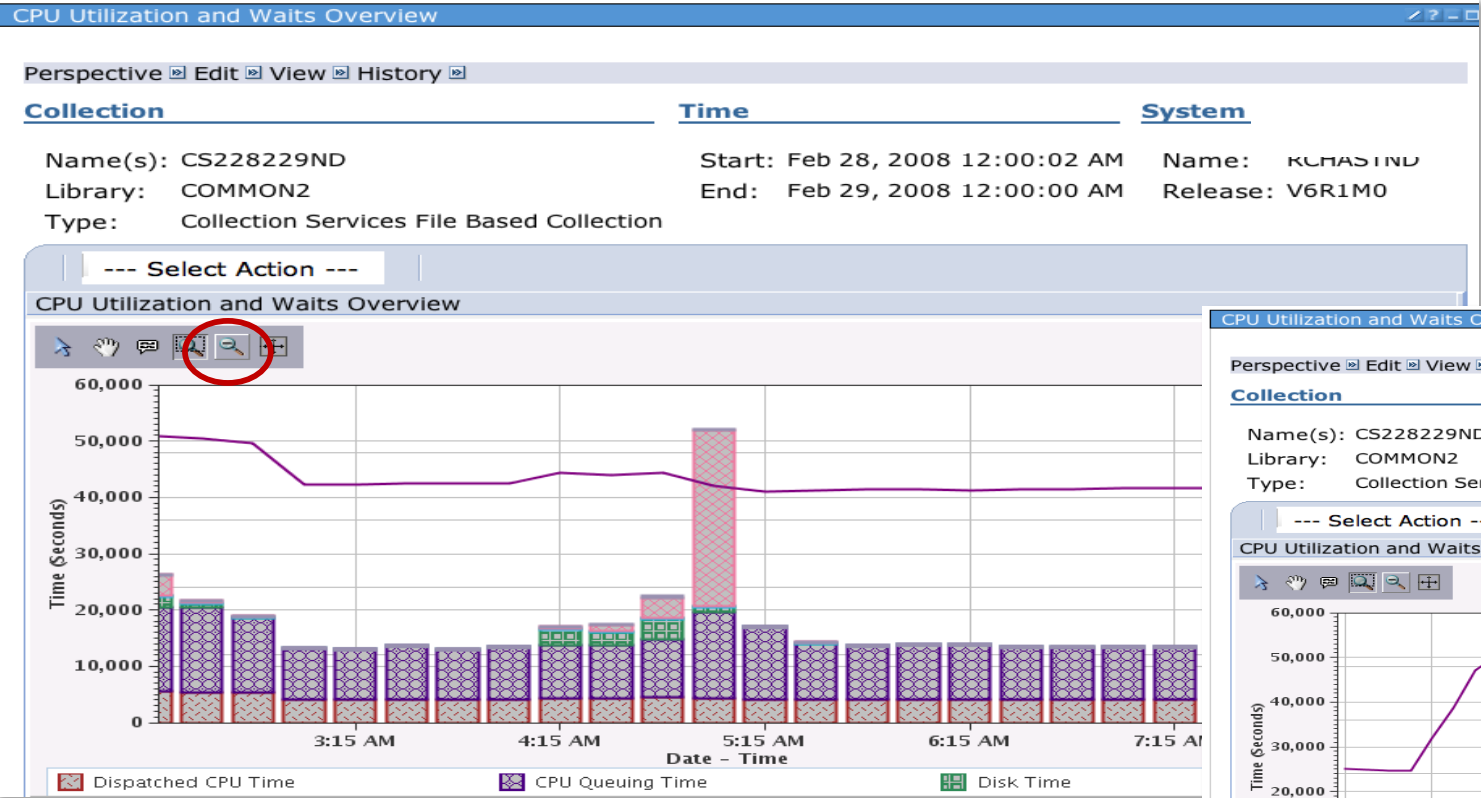


Use to zoom in on a range of data.

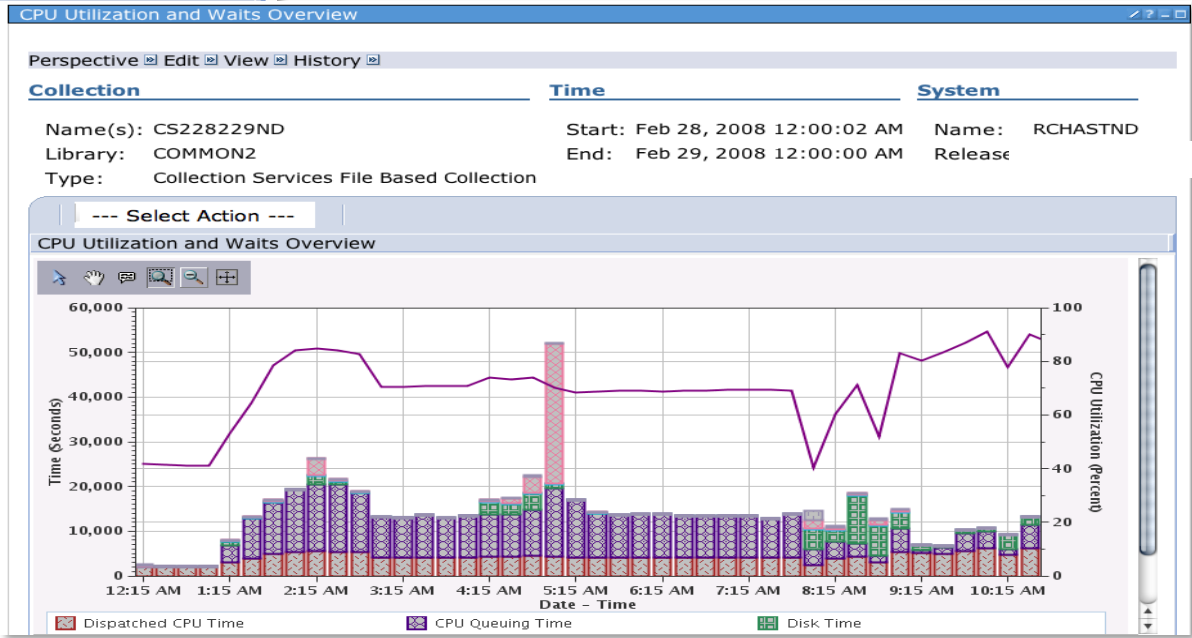
Zoom Region Results



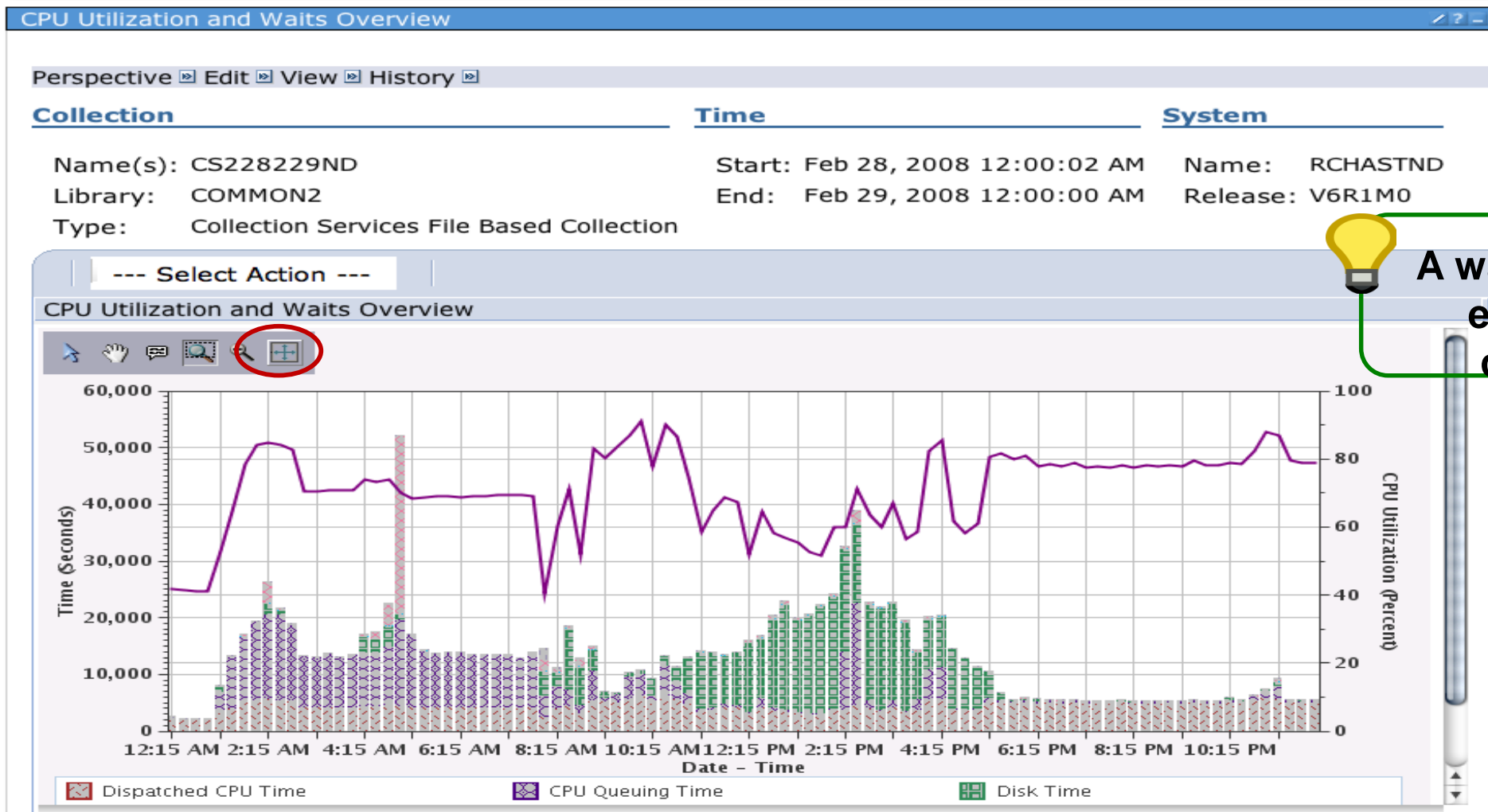
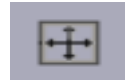
Zoom Out



Zoom out expands the graph each time it is clicked

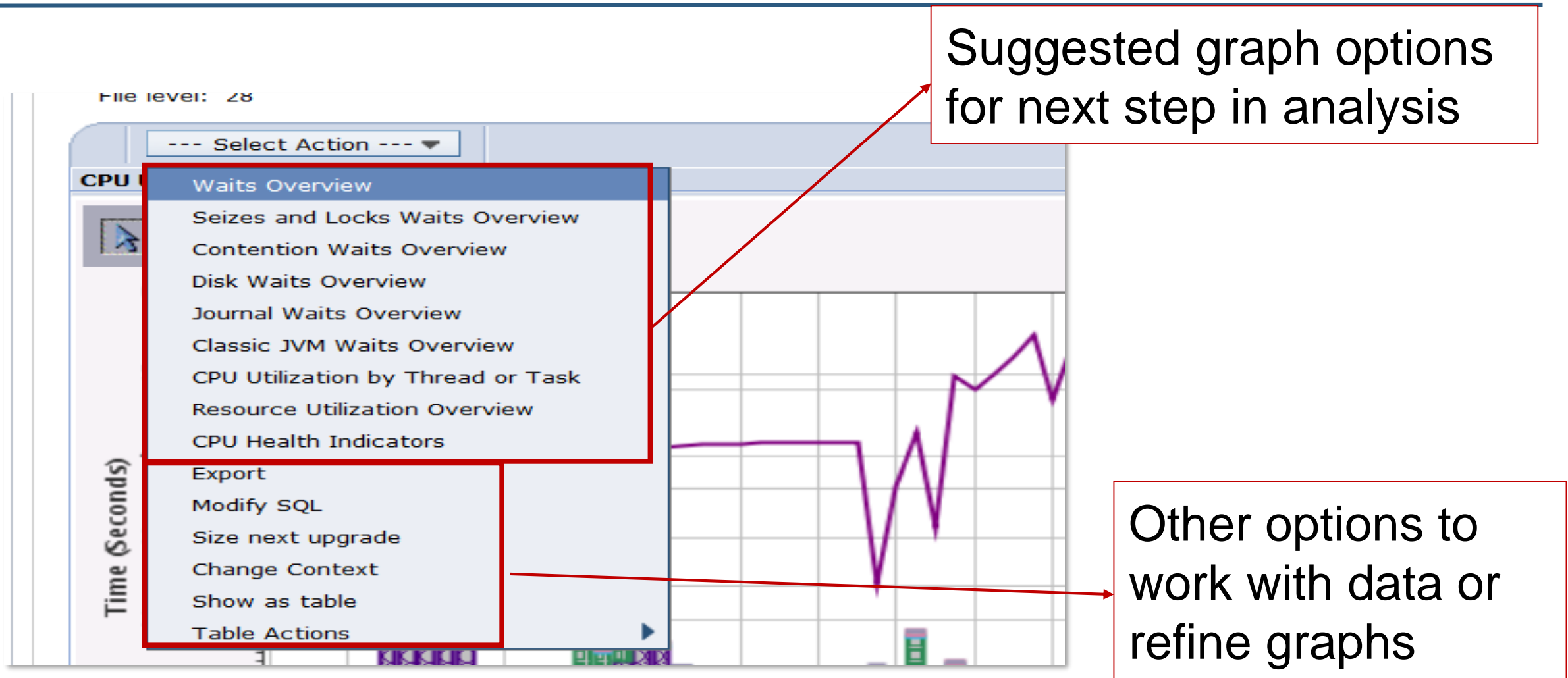


Full Zoom Out

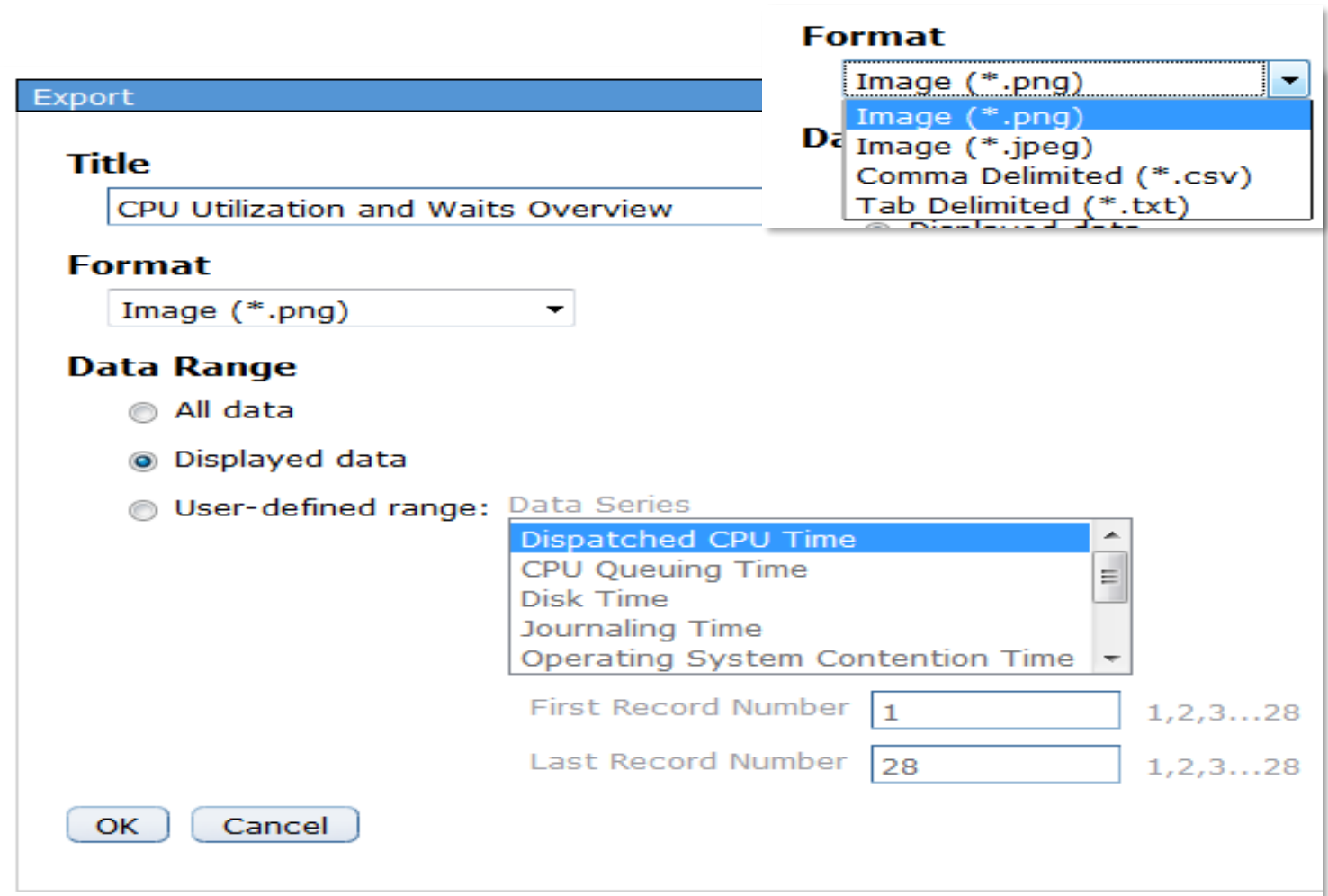
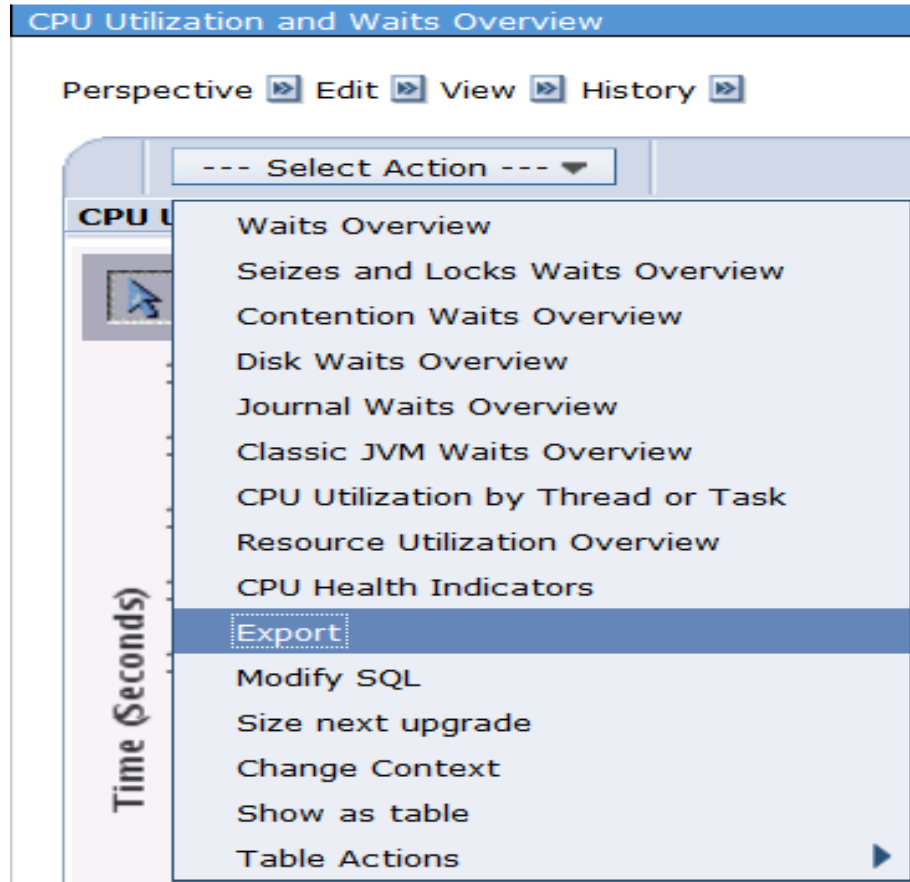


A way to quickly view
entire collection
characteristics

Drill-down



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



Modify SQL – customize the queries

The screenshot shows the 'CPU Utilization and Waits Overview' window. The 'Perspective' tab is active, and the 'Select Action' dropdown menu is open, displaying various options. The 'Modify SQL' option is highlighted. The 'Time (Seconds)' axis is visible on the left. The 'Modify SQL' dialog box is open, showing the following SQL statement:

```
SQL Statement
Reset

SELECT
  QSY.INTNUM,
  QSY.CSDTETIM AS CSDTETIM,
  MAX(PCTSYSCPU) AS PCTSYSCPU,
  SUM(TIME01) * .000001 AS WB01,
  SUM(TIME02) * .000001 AS WB02,
  SUM(TIME05 + TIME06 + TIME07 + TIME08 + TIME09 + TIME10) * .000001 AS WB050607080910,
  SUM(TIME11) * .000001 AS WB11,
  SUM(TIME14 + TIME15 + TIME19 + TIME32) * .000001 AS WB14151932,
  SUM(TIME16 + TIME17) * .000001 AS WB1617,
  SUM(TIME18) * .000001 AS WB18,
  100 AS PCT100,
  DTETIM AS DTETIM,
  DTECEN AS DTECEN
FROM
(
  SELECT
    DTECEN || DTETIM AS CSDTETIM,
    DOUBLE(JWTM01) AS TIME01,
    DOUBLE(JWTM02) AS TIME02,
```

Below the SQL statement, there is a checkbox labeled 'Allow collection choice' which is checked. At the bottom of the dialog are 'OK' and 'Cancel' buttons.

The screenshot displays two panels from the IBM i Performance Explorer, both showing CPU Utilization by Job or Task. The top panel has a context menu open, highlighting the 'Change Context' option. The bottom panel shows a different set of jobs and their CPU utilization percentages.

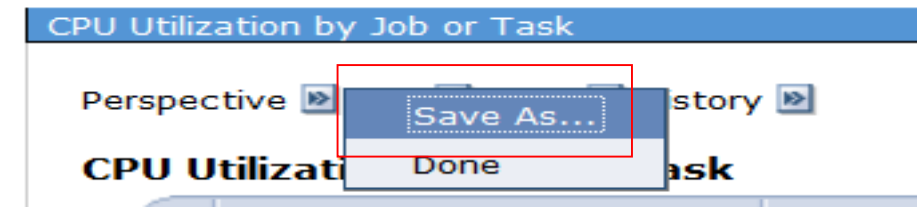
Top Panel: CPU Utilization by Job or Task

Full Name	CPU Utilization (Percent)
QBRMSYNC/QBRMS/338021	~18.5
QRWTSRVR/QUSER/436569	~17.5
QRWTSRVR/QUSER/436661	~15.5
QRWTSRVR/QUSER/436570	~14.5
QZDASOINIT/QUSER/436740	~13.5
QRWTSRVR/QUSER/436662	~13.5
QZDASOINIT/QUSER/436746	~13.5
QRWTSRVR/QUSER/436518	~13.5
QRWTSRVR/QUSER/436551	~12.5
QZDASOINIT/QUSER/436389	~12.5
QRWTSRVR/QUSER/436492	~12.5
QRWTSRVR/QUSER/436658	~12.5

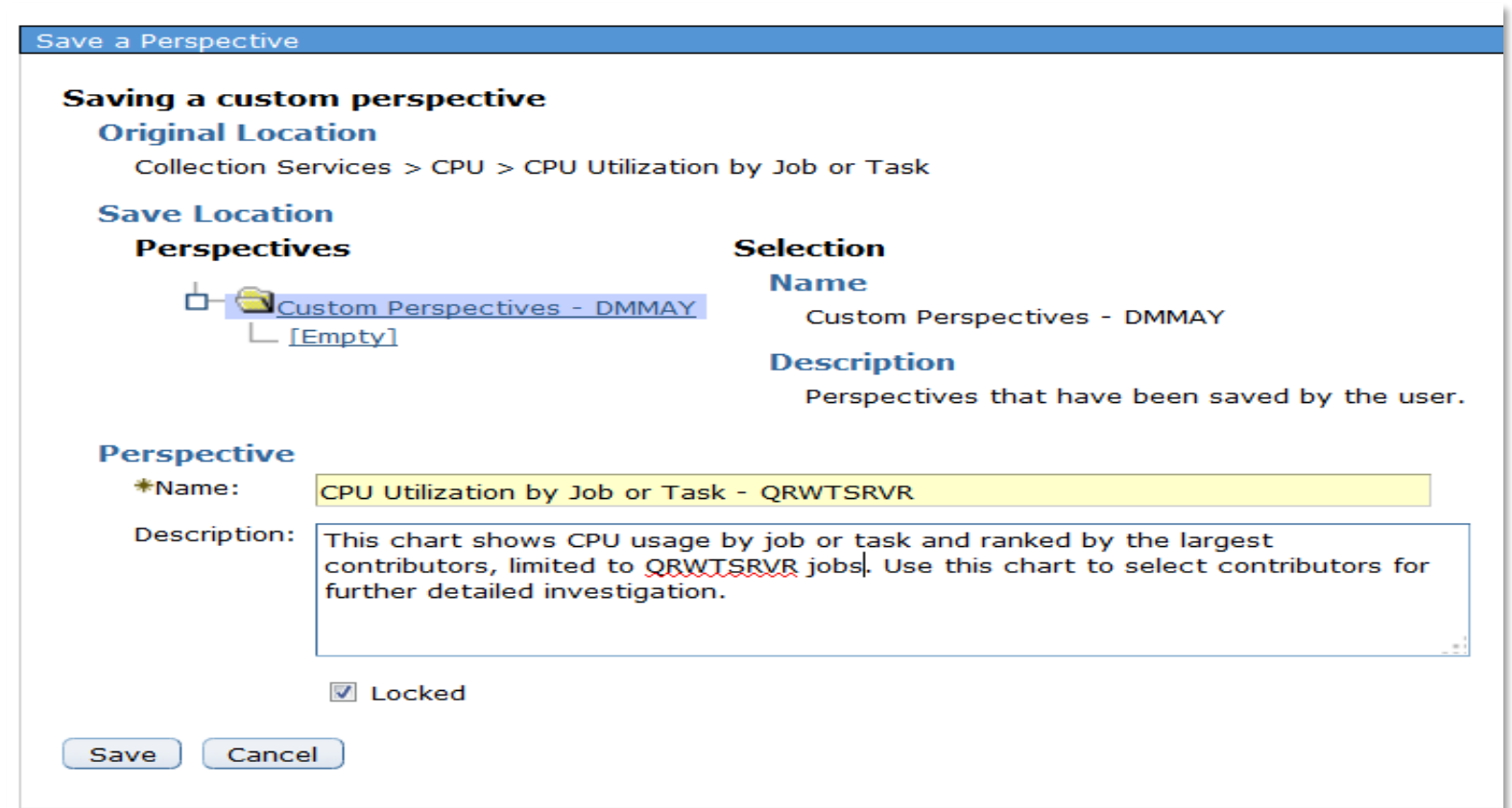
Bottom Panel: CPU Utilization by Job or Task

Full Name	CPU Utilization (Percent)
QRWTSRVR/QUSER/436699	~18.5
QRWTSRVR/QUSER/436569	~17.5
QRWTSRVR/QUSER/436661	~15.5
QRWTSRVR/QUSER/436570	~14.5
QRWTSRVR/QUSER/436662	~13.5
QRWTSRVR/QUSER/436518	~13.5
QRWTSRVR/QUSER/436551	~12.5
QRWTSRVR/QUSER/436492	~12.5
QRWTSRVR/QUSER/436658	~12.5
QRWTSRVR/QUSER/436698	~12.5
QRWTSRVR/QUSER/436672	~12.5
QRWTSRVR/QUSER/436487	~12.5
QRWTSRVR/QUSER/436657	~12.5
QRWTSRVR/QUSER/436666	~12.5

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...”**

A screenshot of a "Save a Perspective" dialog box. The dialog has a title bar "Save a Perspective". Inside, it says "Saving a custom perspective". Under "Original Location", it shows "Collection Services > CPU > CPU Utilization by Job or Task". Under "Save Location", there is a tree view with "Perspectives" containing "Custom Perspectives - DMMAY" and "[Empty]". To the right, under "Selection", there are fields for "Name" (Custom Perspectives - DMMAY) and "Description" (Perspectives that have been saved by the user.). Under "Perspective", there is a field for "Name" (CPU Utilization by Job or Task - QRWTSRVR) and a "Description" text area containing "This chart shows CPU usage by job or task and ranked by the largest contributors, limited to QRWTSRVR jobs. Use this chart to select contributors for further detailed investigation." There is a "Locked" checkbox which is checked. At the bottom are "Save" and "Cancel" buttons.

Perspective → Save As

CPU Utilization by Job or Task


Perspective ▶ Edit ▶ View ▶ History ▶

Save Complete
This perspective was saved successfully.

URL to saved perspective:
https://isz1p13.rch.stglabs.ibm.com:2005/ibm/action/launch?pageID=com.ibm.i5OS.webnav.navigationElement.WebnavBasePortlet&system=localhost&WnLocale=en_US&WnSTM=true&task=perf.invdta&packid=ccp_DMMAY&persid=perspective_ID_213976_ccp&collection=PDIDEMO.Q071123119

[Close Message](#)

Bookmark!



Investigate Data - Performance Data Investigator

Perspectives

- Performance Explorer
- Disk Watcher
- Job Watcher
- Collection Services
- Health Indicators
- Custom Perspectives - DMMAY**
 - CPU Utilization by Job or Task - QRWTSRVR

Selection

Name
Custom Perspectives - DMMAY

Description
Perspectives that have been saved by the user.

Collection

Collection Library: QPFRDATA
Collection Name: Most Recent

[Display](#) [Search](#) [Options](#) [Close](#)

Show as Table

CPU Utilization and Waits Overview

Perspective Edit View History

--- Select Action ---

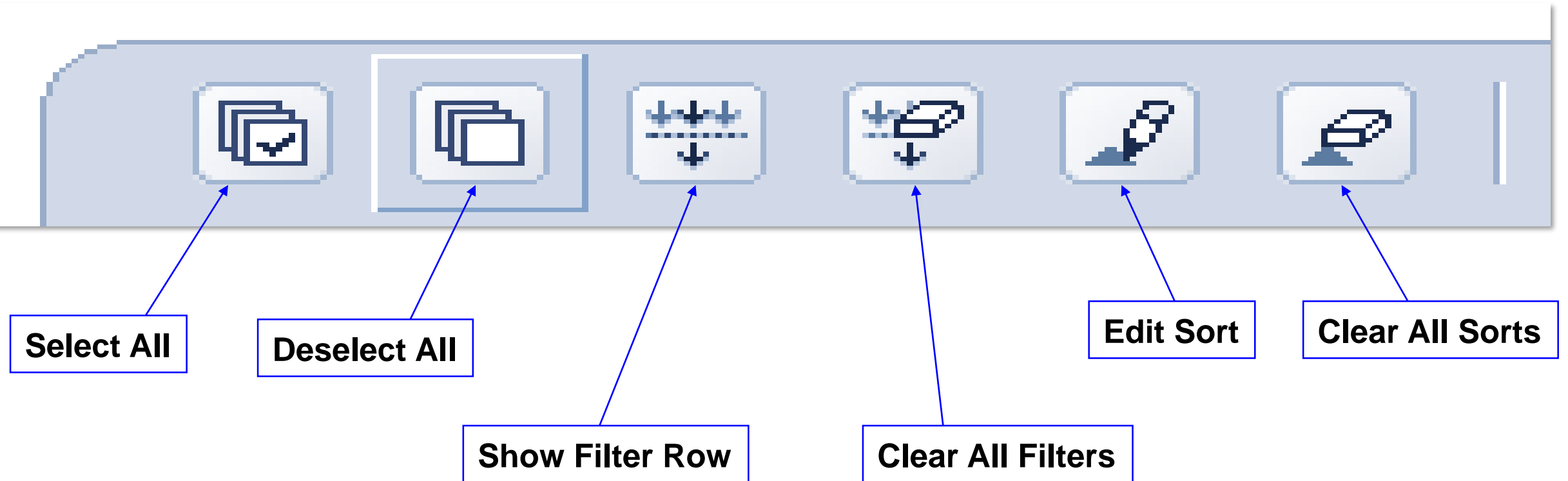
Select	Interval Number ^	Date - Time ^	Partition CPU Utilization (Percent) ^	Dispatched CPU Time (Seconds) ^	CPU Queuing Time (Seconds) ^	Disk Time (Seconds) ^	Journaling Time (Seconds) ^	Operating System Contention Time (Seconds) ^
<input type="checkbox"/>	1	Feb 28, 2008 12:15:00 AM	41.65	2125.7	12.25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

Total: 96 Filtered: 96

--- Select Action ---

- Waits Overview
- Seizes and Locks Waits Overview
- Contention Waits Overview
- Disk Waits Overview
- Journal Waits Overview
- Classic JVM Waits Overview
- CPU Utilization by Thread or Task
- Resource Utilization Overview
- CPU Health Indicators
- Export
- Modify SQL
- Size next upgrade
- Change Context
- Show as table
- Table Actions

Table Features



Show Filter Row

--- 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) ^
	<u>Filter</u>	<u>Filter</u>	<u>Filter</u>		<u>Filter</u>	<u>Filter</u>	<u>Filter</u>	<u>Filter</u>

Condition
All numbers

- All numbers
- Numbers less than
- Numbers less than or equal to
- Numbers greater than
- Numbers greater than or equal to
- Numbers equal to
- Numbers not equal to
- Numbers between
- Numbers between and including

Feb 28, 2008 12:15:00 AM		41.65	2125.7	12.25	64.4	35.71	22.6
Feb 28, 2008 12:30:00 AM		41.4	2110.42	12.16	10.72	34.68	3.62
Feb 28, 2008 12:45:00 AM		41.14	2096.73	12.38	5.32	35.3	3.5

i-UG

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)
Lock Contention Time (Seconds)
Ineligible Waits Time (Seconds)
100 Percent Utilization (Percent)
Interval Date And Time
Century Digit

Columns....

--- Select Action --- ▼

- Waits Overview
- Seizes and Locks Waits Overview
- Contention Waits Overview
- Disk Waits Overview
- Journal Waits Overview
- Classic JVM Waits Overview
- CPU Utilization by Thread or Task
- Resource Utilization Overview
- CPU Health Indicators
- Export
- Modify SQL
- Size next upgrade
- Change Context
- Show as chart
- Columns...**
- Show find toolbar
- Table Actions

Columns

Available Columns:

<input checked="" type="checkbox"/>	Title
<input checked="" type="checkbox"/>	100 Percent Utilization
<input checked="" type="checkbox"/>	Interval Date And Time
<input checked="" type="checkbox"/>	Century Digit

Add >

< Remove

Add All >>

Move Up

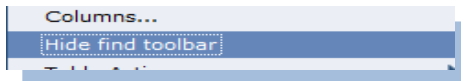
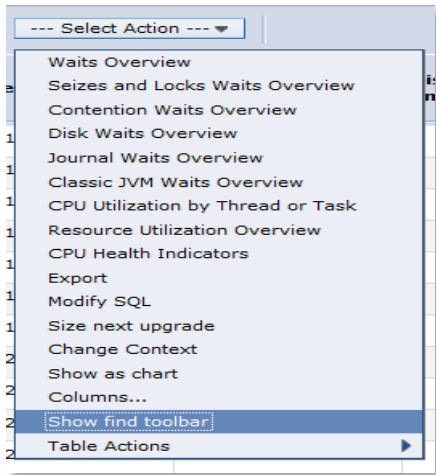
Move Down

Current Columns:

<input type="checkbox"/>	Title
<input type="checkbox"/>	Interval Number
<input type="checkbox"/>	Date - Time
<input type="checkbox"/>	Partition CPU Utilization
<input type="checkbox"/>	Dispatched CPU Time
<input type="checkbox"/>	CPU Queuing Time
<input type="checkbox"/>	Disk Time
<input type="checkbox"/>	Journal Time
<input type="checkbox"/>	Operating System Contention Time
<input type="checkbox"/>	Lock Contention Time
<input type="checkbox"/>	Ineligible Waits Time

OK Cancel Help

Show find toolbar / Hide find toolbar & Search the table



Waits by Job Current User Profile

Perspective Edit View History

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

Find Match case
















Select	Current User	Dispatched CPU Active Time (Seconds)	Dispatched CPU Waiting Time (Seconds)	Dispatched CPU Transferred Time (Seconds)	Dispatched CPU Time (Seconds)
<input type="checkbox"/>	QEJBSVR	343.26	297.91	0	641.17
<input type="checkbox"/>	WEAVE	312.5	239.11	0	551.61
<input type="checkbox"/>	QSYS	48.97	41.96	0	90.94
<input type="checkbox"/>	QLWISVR	41.47	45.95	0	87.42
<input type="checkbox"/>	QBRMS	32.67	25.78	0	58.45
<input type="checkbox"/>	QSECOFR	23.31	21.57	0	44.88
<input type="checkbox"/>	QPM400	20	15.75	0	35.75
<input type="checkbox"/>	QTCP	8.47	7.8	0	16.27
<input type="checkbox"/>	HOSTPUB	3.37	3.64	0	7.02
<input type="checkbox"/>	QTMHHTTP	1.66	2.52	0	4.17
<input type="checkbox"/>	QWEBADMIN	1.52	2.26	0	3.78
<input type="checkbox"/>	QYPSJSVR	1.47	2.21	0	3.68
<input type="checkbox"/>	QDIRSRV	0.86	1.17	0	2.03
<input type="checkbox"/>	QIJS	0.55	0.43	0	0.98
<input type="checkbox"/>	QUSER	0.43	0.35	0	0.77
<input type="checkbox"/>	DRLEWIS	0.21	0.16	0	0.37
<input type="checkbox"/>	QSVMS	0.15	0.13	0	0.28
<input type="checkbox"/>	GIBBONS	0.05	0.04	0	0.09
<input type="checkbox"/>	STACYB	0.04	0.03	0	0.08

New Table Support

- Improved table support (7.2 and PTF'ed back to 6.1)
 - 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

Filter

	Name	Library	Type	Status	Started	Ended	Size MB	System
...	No filter applied							
<input type="checkbox"/>	 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
<input type="checkbox"/>	 Q082000002	QPFRDATA	Collection Services *MGTCOL Obj Based Co	Complete	3/23/13 1:00:02 AM	3/24/13 1:00:02 AM	151.332	ETC3
<input type="checkbox"/>	 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
<input type="checkbox"/>	 Q083000002	QPFRDATA	Collection Services *MGTCOL Obj Based Co	Complete	3/24/13 1:00:02 AM	3/25/13 1:00:02 AM	156.332	ETC3
<input type="checkbox"/>	 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
<input type="checkbox"/>	 Q084000002	QPFRDATA	Collection Services *MGTCOL Obj Based Co	Complete	3/25/13 1:00:02 AM	3/26/13 1:00:02 AM	156.332	ETC3
<input type="checkbox"/>	 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
<input type="checkbox"/>	 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
<input type="checkbox"/>	 Q085000002	QPFRDATA	Collection Services *MGTCOL Obj Based Co	Complete	3/26/13 1:00:02 AM	3/27/13 1:00:02 AM	160.332	ETC3
<input type="checkbox"/>	 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
<input type="checkbox"/>	 Q086000002	QPFRDATA	Collection Services *MGTCOL Obj Based Co	Complete	3/27/13 1:00:02 AM	3/28/13 1:00:02 AM	158.332	ETC3
<input type="checkbox"/>	 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
<input type="checkbox"/>	 Q087000002	QPFRDATA	Collection Services *MGTCOL Obj Based Co	Active	3/28/13 1:00:02 AM		2.094	ETC3
<input type="checkbox"/>	 Q087000002	QPFRDATA	Collection Services File Based Collection	Active	3/28/13 1:00:02 AM		3.602	ETC3
<input type="checkbox"/>	 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

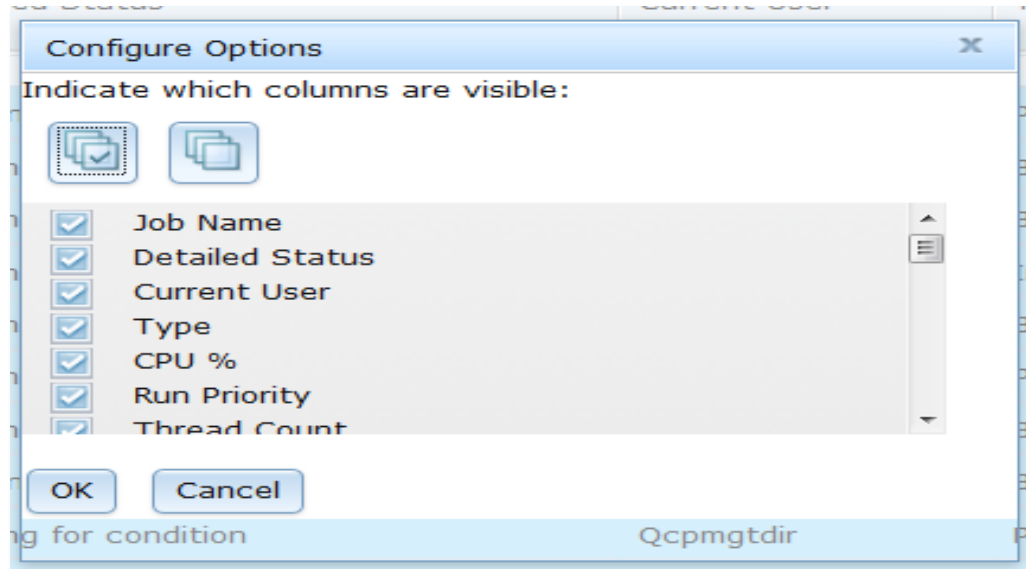
1 - 22 of 22 items

5 | 10 | 25 | 50 | 100 | All

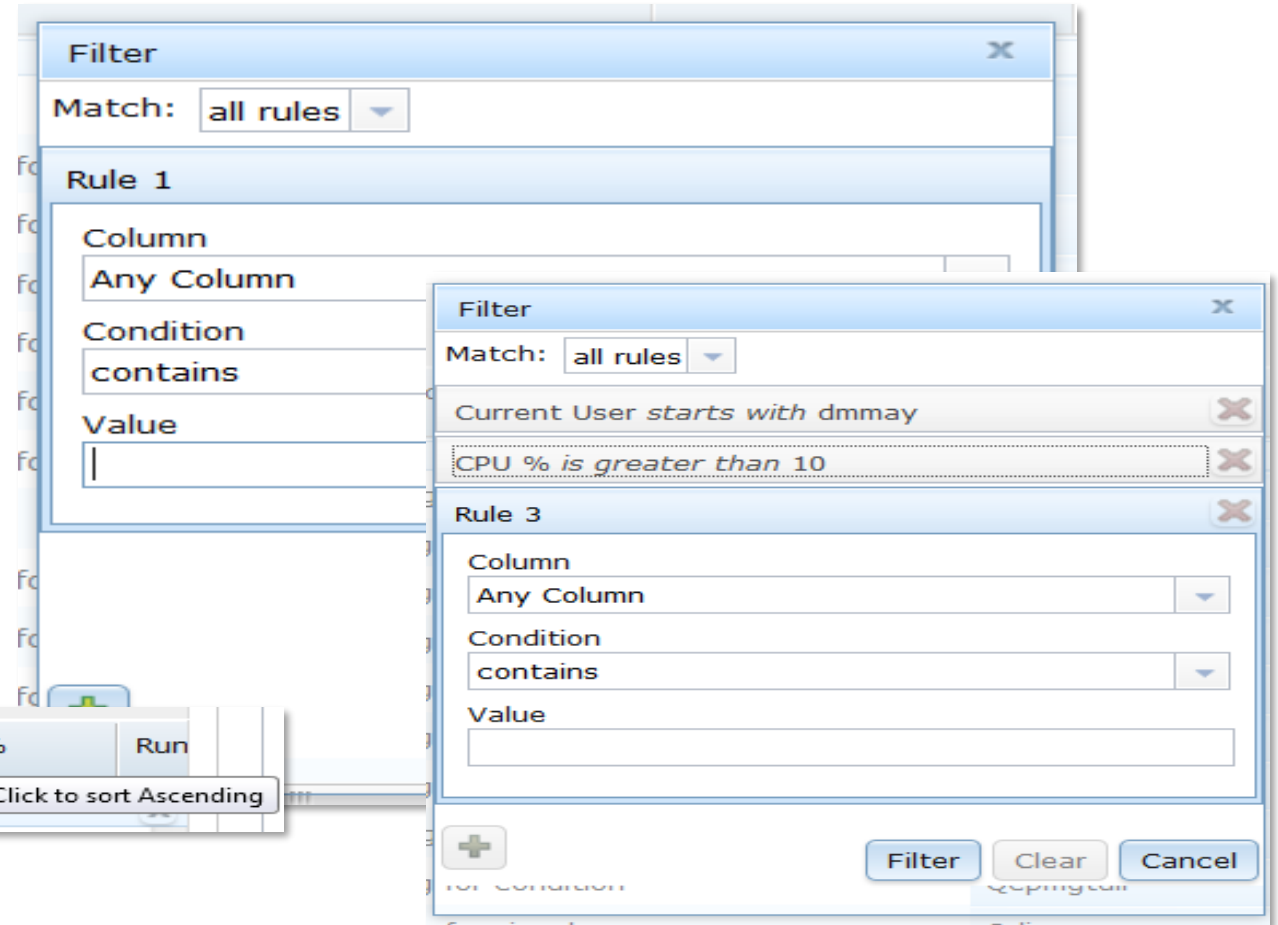
1

New Table Support – Same Features, New UI

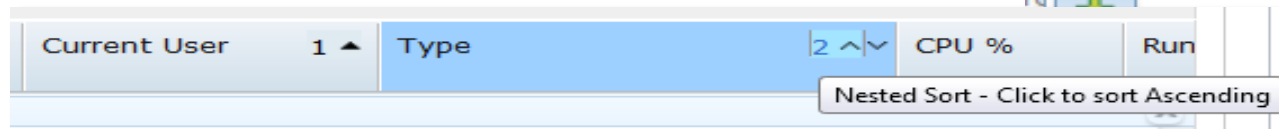
Configure Options for Columns



Filter column data



Sort Columns



Size Next Upgrade

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

Intended for a one-time sizing activity

IBM Workload Estimator v2015.3

Solution Overview | Workload Questions | **Server Consolidation** | Sizing Report

← Back → Continue

PDI IPAW_CS/CS1

PDI Workload Definition

Note: The partition information specified above reflects the target partition, in the same manner as the other workload definitions within the Estimator. Please ensure that the target partition is what is desired (name, type, OS level); this can be changed by clicking on the partition name.

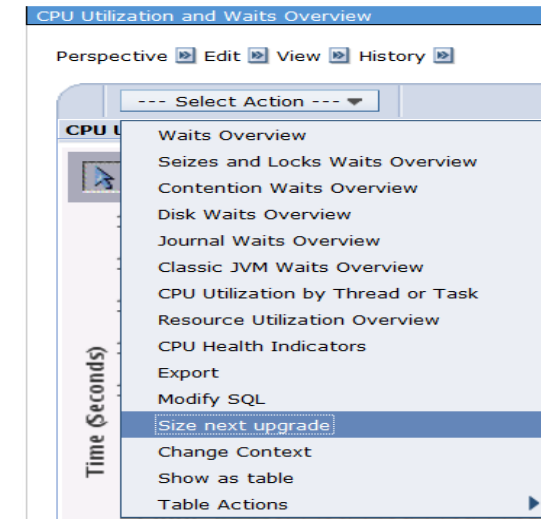
The data below is a summary of the data passed to the Estimator from PDI. Please see the [help text](#) for more best practices for using PDI data in a WLE sizing.

Model: 520-8327/7734
Feature: 7734
Clock Speed: 1900 MHz

1. Total CPU Utilization	54.32
2. Processor cores activated	
3. Assigned Processor Cores	
4. Memory (MB)	
5. Disk Configuration	

Group Name	Used(GB) Consumed	Read Ops	Read IOPS (bytes)	Write Ops	Write IOPS (bytes)	Attachment	Protection	Type	Disk unit type
Group 1	56	35	53,016.0	17	10,424.0	POWER6 Cached DAS	RAID-5	15,000 RPM	4326
Group 2	173	82	93,838.0	35	19,697.0	POWER6 Cached DAS	RAID-5	15,000 RPM	4327
Group 3	207	164	61,874.0	58	17,333.0	POWER6 Cached DAS	RAID-5	15,000 RPM	4328

← Back → Continue



Investigate Data Search

“Investigate Data Search” added in 7.2

Performance

Investigate Data

Investigate Data Search

Investigate Data Search

Storage

Type at least 3 non-empty characters

☐ Case Sensitive

☐ Whole Words Only

Search In:

☐ Package Name

☐ Description

☐ Metrics

☒ Perspective

☒ View

☐ SQL

Show Columns:

☐ Metrics

☐ SQL

Package Name	Perspective	Description	View
Collection Services	Storage Allocation/Deallocation by Thread or Task	This chart shows allocation and deallocation of the temporary and permanent storage, net frames requested by thread or task. Use this chart to select a thread or task for viewing its storage statistics over time.	Storage Allocation/Deallocation by Thread or Task Sorted by Allocation
Collection Services	Storage Allocation/Deallocation Overview	This chart shows allocation and deallocation of the temporary and permanent storage for all contributors over time for the selected collections. Use this chart to select a time frame for further detailed investigation.	Storage Allocation/Deallocation Overview
Monitor	Disk Storage Utilization (Average)	Charts show the disk storage utilization (average) metric of the performance data monitored, as well as the metric breakdown details by ASP.	Disk Storage Utilization (Average)

Metric Finder

Investigate Data - Performance Data Investigator

Metric Finder

Metric

Metric Name:

- Primary Affinity Domain ID
- SMAPP Evaluations Serviced
- SMAPP Index Build Time Estimations
- SMT Hardware Threads:
- SQL Cursor Count
- SQL Cursor Reuse
- STRPFRMON Trace Type:
- Samples Taken
- SaveDocument URLs Received
- Scaled CPU Microseconds
- Scaled CPU Time**
- Scaled CPU Time Microseconds
- Scaled CPU Time Used
- Scaled CPU Utilization
- Search String Commands
- Second Most Frequent Journal Entry Type
- Secondary Affinity Domain ID
- Secondary Control Unit
- Secondary Line Description
- Secondary Thread Flag
- Secondary Thread Thresh (ms):

Collection Library: QPFRDATA

Display

Collection

Collection Library: QPFRDATA Collection Name: Most Recent

Display Search Options Refresh Perspectives Close

Investigate Data - Performance Data Investigator

Metric Finder

Metric

Metric Name: Scaled CPU Time

Perspective

Select	Perspective
<input type="radio"/>	Collection Services --> CPU --> CPU Utilization Overview
<input type="radio"/>	Collection Services --> CPU --> CPU Utilization by Generic Job or Task
<input type="radio"/>	Collection Services --> CPU --> CPU Utilization by Job Current User Profile
<input type="radio"/>	Collection Services --> CPU --> CPU Utilization by Job User Profile
<input type="radio"/>	Collection Services --> CPU --> CPU Utilization by Job or Task
<input type="radio"/>	Collection Services --> CPU --> CPU Utilization by Pool
<input type="radio"/>	Collection Services --> CPU --> CPU Utilization by Server Type
<input type="radio"/>	Collection Services --> CPU --> CPU Utilization by Subsystem
<input type="radio"/>	Collection Services --> CPU --> CPU Utilization by Thread or Task
<input type="radio"/>	Collection Services --> CPU Utilization by Thread or Task

Page 1 of 1 | 1 Go | Rows 10 | Total:

Collection

Collection Library: QPFRDATA Collection Name: Most Recent

Display List Options Refresh Perspectives Close

Collection

Collection Library: QPFRDATA Collection Name: Most Recent

Display Search Save as Favorite **Options** Close

Options

- ☒ Use patterns Use patterns where applicable in charts.
- ☒ Show charts Whenever possible, show charts instead of tables.
- ☐ Enable design mode Enable advanced features allowing design and development of new content.
- ☐ Show help Show help messages for many tasks.
- ☒ Show SQL error messages Show SQL error messages to user.
- ☐ Set table size Rows: 15 Columns: 8 Specify the number of visible rows and columns shown for tables.

Default library Specify the default library that will be used when a collection is selected.

- ☒ Use Collection Services configured library
- ☐ Use last visited library
- ☐ Use library:

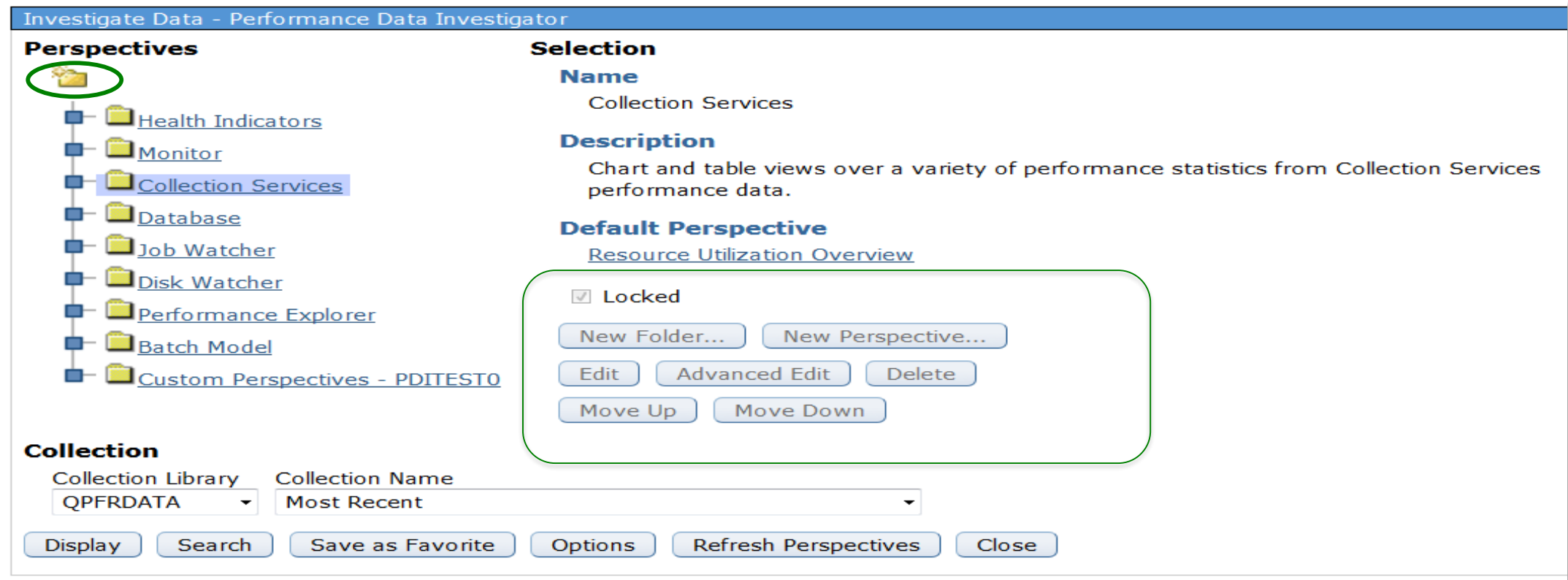
System Monitor 7.2

- ☐ Show thresholds Show thresholds in system monitor charts.

OK Cancel

Design Mode

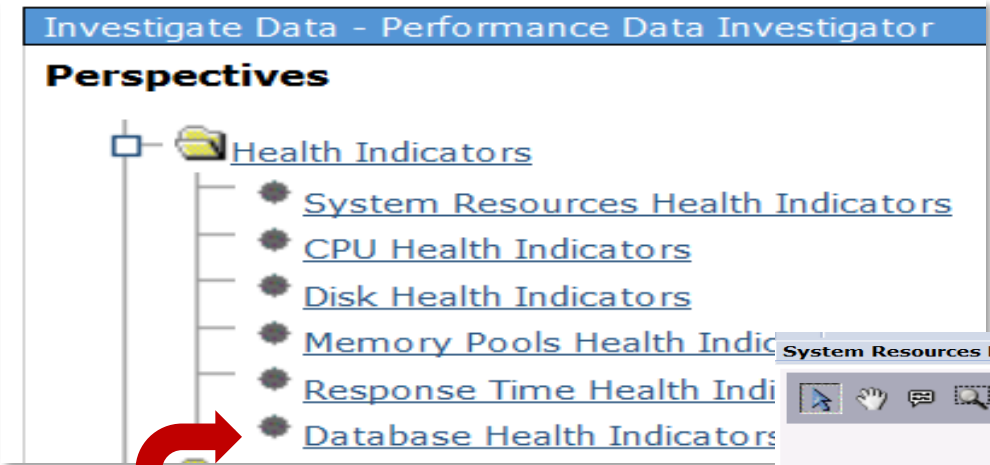
Once you “Enable Design Mode” - additional options become available to create and edit your own charts and tables.



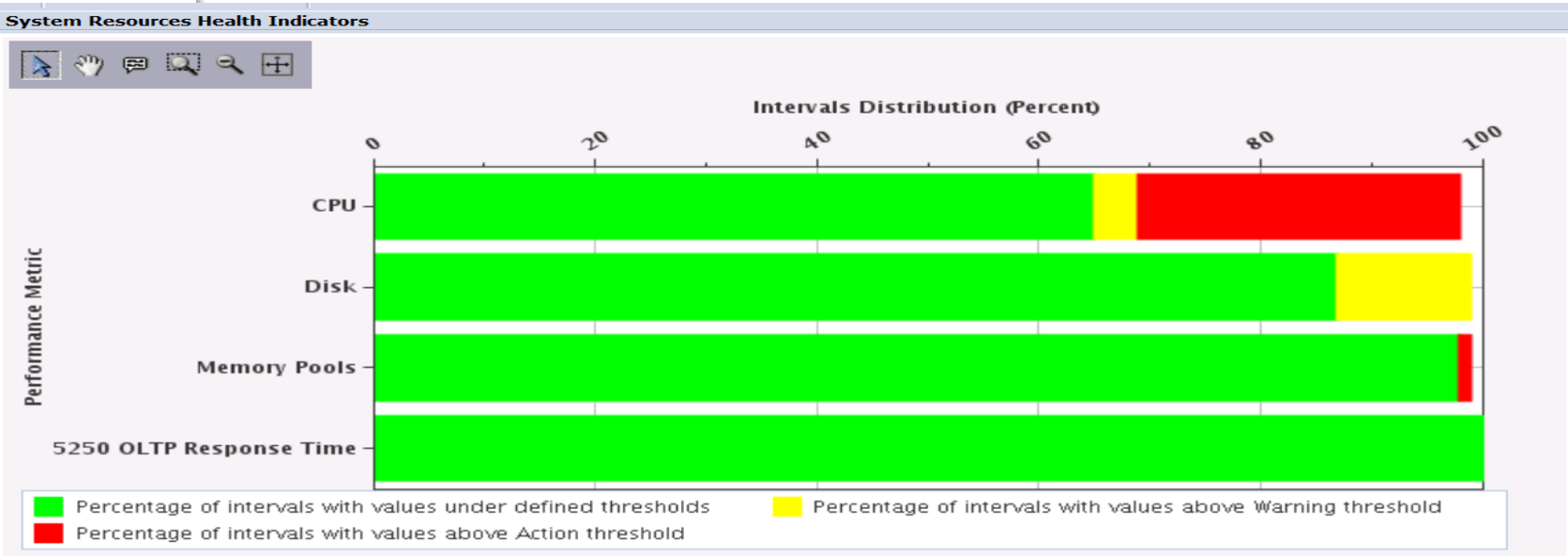
http://ibmsystemsmag.blogs.com/i_can/2011/08/customizing-a-perspective-in-pdi.html



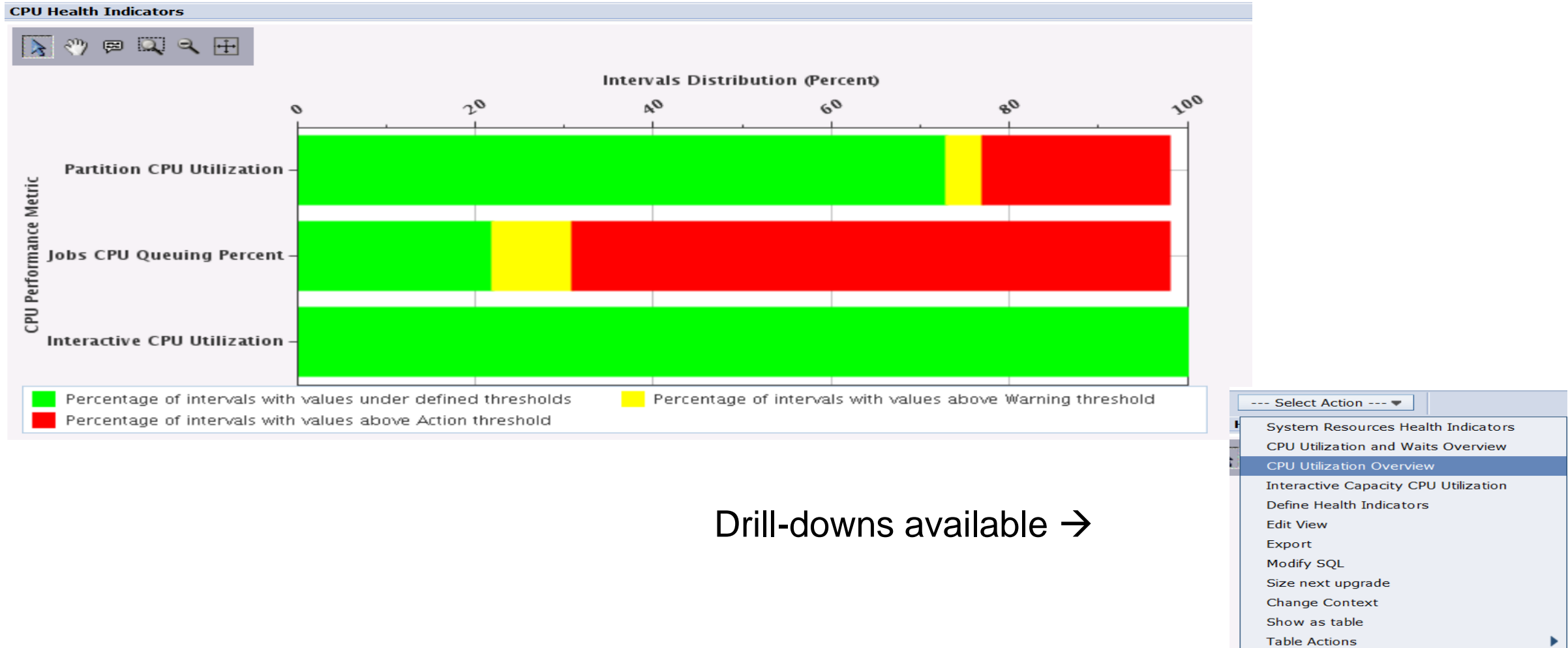
System Resource Health Indicators



Database Health Indicators 7.2



CPU Health Indicators



Drill-downs available →

Define Health Indicators

System Resources Health Indicators

CPU

Disk

Memory Pools

5250 OLTP Response Time

Available Indicators

Add >>

Remove <<

Interactive CPU Utilization

Jobs CPU Queuing Percent

Partition CPU Utilization

Warning

70

Action

90

Define Health Indicators

System Resources Health Indicators

CPU

Disk

Memory Pools

5250 OLTP Response Time

Available Indicators

Add >>

Remove <<

Average Disk Percent Busy

Average Disk Space Percent Used

Average Disk Response Time

Warning

20

Action

30

Define Health Indicators

System Resources Health Indicators

CPU

Disk

Memory Pools

5250 OLTP Response Time

Available Indicators

Add >>

Remove <<

Page Faults Pending Per Second

Page Faults Per Second

Warning

4000

Action

5000

- Select Action
- CPU Health Indicators
 - Disk Health Indicators
 - Memory Pools Health Indicators
 - Response Time Health Indicators
 - Define Health Indicators
 - Edit View

Important to evaluate shipped threshold values with specific business environment and goals

Investigate Data

Perspectives

- [-] [Disk Watcher](#)
- [+] [Job Watcher](#)
 - [CPU Utilization and Waits Overview](#)
 - [CPU Utilization by Thread or Task](#)
 - [Resource Utilization Overview](#)
- [-] [Job Statistics Overviews](#)
- [-] [Waits](#)
- [-] [CPU](#)
- [-] [Physical Disk I/O](#)
- [-] [Synchronous Disk I/O](#)
- [-] [Page Faults](#)
- [-] [Logical Database I/O](#)
- [-] [5250 Display Transactions](#)
- [-] [Job Watcher Database Files](#)
- [-] [Collection Services](#)

Display

Close

Selection

Job Watcher

Description

Chart and table views over a variety of performance statistics from Job Watcher performance data.

Default Perspective

[Resource Utilization Overview](#)

Collection

Collection Library Collection Name

COMMON

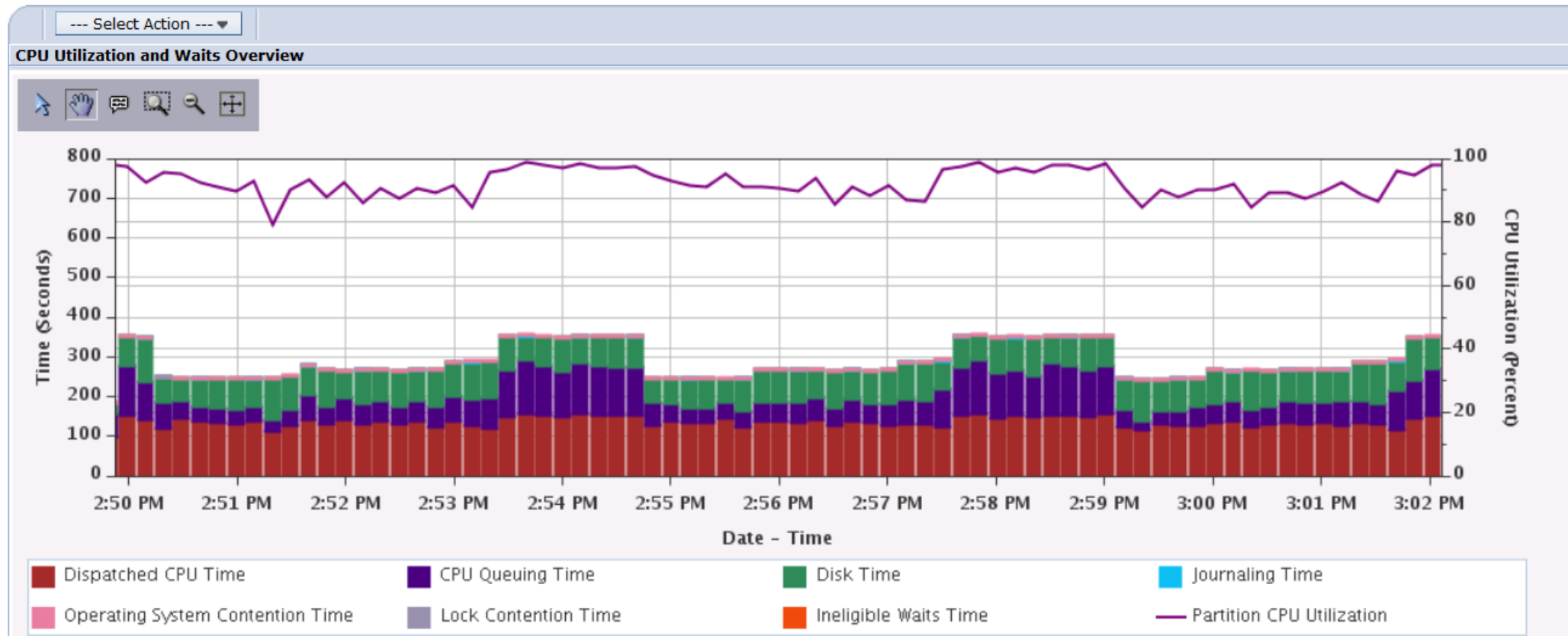
- DAWNJW2 (*JWFILE)
- Most Recent
- All
- JWOBJLOCKC (*JWFILE)
- DAWNJW229 (*JWFILE)
- DAWNJW2 (*JWFILE)

Job Watcher - CPU Utilization and Waits Overview

CPU Utilization and Waits Overview

Perspective Edit View History

CPU Utilization and Waits Overview



Job Watcher – Interval Details

- Object level information, holder information, call stacks, sql statement (if applicable)
- Can move to the next interval or specify an interval number

Thread or Task Details

Job information: QZDASOINIT/QUSER/128962 - 0000000000000005

Current user profile: LISAW

Object waited on: INVENTORY INVENTORY

Wait duration: 581 milliseconds

Current or last wait: DB record lock: update

Holding job or task: QZDASOINIT/QUSER/128890

SQL client job: None detected this interval

[Show Holder](#)

Call Stack

Call Level	Program	Module	Procedure
1			qutde_block_tra
2			longWaitReceive__9QuCounterFR12RmprReceiverP
3			DBLockConflict__15RmsIDBHashClassFR11RmsIPIm
4			rmsIDBHLLock__FR11RmsIPImpLad
5			getLockWithWait__18DbpmUpdateResource
6			getLock__18DbpmUpdateResource
7			getRowLock__18DbpmUpdateResourceFCUIRC9Dbp
8			execute__18DbpmUpdateLockNodeFR13DbpmQuer
9			vPositionNextAndExecute__18DbpmUpdateLockNod
10			positionNextEntryAndFetchOutline__17DbpmReadO

SQL Statement

☒ Include Host Variables

```
SELECT QUANTITY FROM WAREHSE42.INVENTORY WHERE ID=*DATA FORMAT ERROR
TITY FROM WAREHSE42.INVENTORY WHERE ID=? FOR UPDATE
```

Interval Details

Priority: 20

Pool: 2

Type description: PHYSICAL FILE MBR - DATA PART

Segment type description: DB PHYSICAL FILE MEMBER RECORDS

Wait object library: None detected this interval

Interval timestamp: Jan 3, 2014 2:36:28 PM

Interval (1 to 684): < 174 >

Job Watcher – Show Holder

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

Interval Details for One Thread or Task (Interval Number = '9', Initial Thread Task Count = '42663')

Perspective Edit View

Thread or Task Details

Job information: QZDASOINIT/QUSER/128963 - 000000000000000004

Current user profile: CISA

Object waited on: None detected this interval

Wait duration: 542 milliseconds

Holding job or task: None detected this interval

Priority: 20

Pool: 2

Type description: None detected this interval

Segment type description: LIC HEAP (MWS) AREA DATA

Interval timestamp: Jan 3, 2014 2:33:38 PM

Interval Number (1 to 684):

Call Stack

--- Select Action --- ▼

Call Level	Program	Module	Procedure
1			qutde_block_tra
2			longWaitBlock__23QuSingleTaskBlockerCodeFP2
3			sleep__17LoMiThreadSleeperFQ2_4Rmpr18Interr
4			sleep__14LoSleepManagerFiQ2_4Rmpr18Interrup
5			
6			recv__8LoSocketFR15LoSocketManagerPctT3
7			recv__FtPcN21P7timeval15LoAddressForm
8			recvHandler__FP16LoSocketRecvDa
9			socket
10			#cfm
11			syscall_A_port
12	QSOSRV1	QSOSYS	re
		Total: 20	

Investigate Data

Perspectives

Disk Watcher

Statistical Overviews

Disk Statistical Overview

Disk Statistical Overview by Disk Pool

Disk Statistical Overview by Disk Unit

Disk Statistical Overview by Disk Path

Statistical Details

Disk Statistical Details by Disk Pool

Disk Statistical Details by Disk Unit

Disk Statistical Details by Disk Path

Trace

Disk Watcher Database Files

Job Watcher

Collection Services

Display

Close

Selection

Statistical Overviews

Description

Charts that show a variety of performance statistics from Disk Watcher statistical data.

Default Perspective

Disk Statistical Overview

Collection

Collection Library

COMMON

Collection Name

Most Recent

Most Recent

All

DAWNDW (*DWFILE)

DAWNDWFULL (*DWFILE)

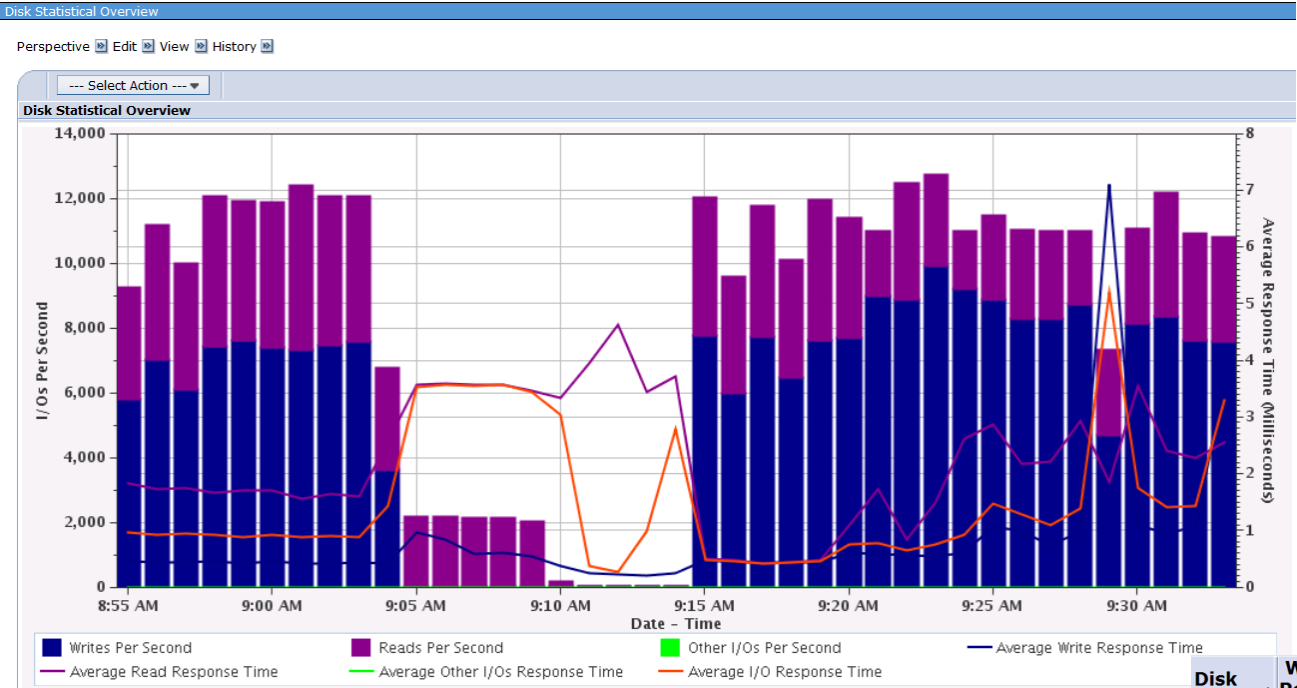
DAWNDWSTAT (*DWFILE)

DAWNFULL (*DWFILE)

© 2019 IBM Corporation

93

Disk Watcher – Statistical Overviews



Disk Statistical Details by Disk Unit →

Disk Unit	Writes Per Second	Total Writes Time (Microseconds)	Total Writes	Average Write Response Time (Milliseconds)	Reads Per Second	Total Reads Time (Microseconds)	Total Reads
20	80.56	175950662	185018	0.95	49.71	282724690	114151
17	89.22	191215563	204939	0.93	40.68	264619450	93431
13	81.02	179679328	186452	0.96	48.84	274793662	112391
19	80.7	167715597	185126	0.91	49.57	284330764	113711
23	82.14	171587291	188592	0.91	49.25	282287097	113081
14	81.32	174688160	186611	0.94	48.63	271365018	111601
18	86.36	183961541	198247	0.93	43.92	263163367	100821
24	77.6	166812672	178266	0.94	53.79	280611909	123561
21	86.23	182932893	198541	0.92	44.63	263267334	102771
15	75.49	169810668	173437	0.98	53.44	264217243	122791
22	83.29	182276882	191257	0.95	47.69	241121731	109501
16	81.63	168328084	186885	0.9	48.91	248662038	111981
5	75.44	169945071	173097	0.98	52.43	232447562	120291
12	81.86	177664449	187639	0.95	47.6	211450426	109101
6	74.9	161260837	171746	0.94	52.59	221205441	120581

Disk Watcher – Trace Data

I/O Counts by IOP, I/O Type, Pool, Object, Object Type, Module, Procedure

Perspective Edit View History

Select	Total I/Os	IOP Name	I/O Type	Pool Number	Object Name	Object Type	Object Subtype	Module Name
<input type="checkbox"/>	1401057	CMB01	SRd		3 CUSTO0000B		90	#dbbring
<input type="checkbox"/>	564279	CMB01	SRd		2 DAILY0000B		90	DbpmDspAcco
<input type="checkbox"/>	251838	CMB01	SFt		3 CUSTO0000B		90	DbDsCursor
<input type="checkbox"/>	142494	CMB01	SFt		3 CUSTO0000B		90	stringHighUse
<input type="checkbox"/>	110125	CMB01	SRd		3 DAILY0000B			
<input type="checkbox"/>	107883	CMB01	SWt		3 Q04079N0B			
<input type="checkbox"/>	107111	CMB01	SWt		3 Q04079N0B			
<input type="checkbox"/>	106897	CMB01	SWt		3 Q04079N0B			
<input type="checkbox"/>	106614	CMB01	SWt		3 Q04079N0B			
<input type="checkbox"/>	106074	CMB01	SWt		3 Q04079N0B			
<input type="checkbox"/>	89348	CMB01	SWt		3 Q04079N0B			
<input type="checkbox"/>	89031	CMB01	SWt		3 Q04079N0B			
<input type="checkbox"/>	88506	CMB01	SWt		3 Q04079N0B			
<input type="checkbox"/>	88149	CMB01	SWt		3 Q04079N0B			
<input type="checkbox"/>	87653	CMB01	SWt		3 Q04079N0B			
<input type="checkbox"/>	86029	CMB01	SWt		3 Q04079N0B			
<input type="checkbox"/>	85626	CMB01	SWt		3 Q04079N0B			
<input type="checkbox"/>	85401	CMB01	SWt		3 Q04079N0B			

← Total I/O Counts - what object the I/O is for, along with the module and procedure that did the I/O on that object.

Total Page Faults

Page Faults by IOP, Job, I/O Type, Pool, Object, Module, Procedure

Perspective Edit View History

Select	Total Page Faults	IOP Name	Qualified Job Name or Task Name	I/O Type	Pool Number	Object Name	Object Type	Object Sub
<input type="checkbox"/>	5978	CMB01	USRJOB002AEDGE 045406	SFt	3	CUSTO00001CUSTO00001	OB	90
<input type="checkbox"/>	5937	CMB01	USRJOB001AEDGE 045405	SFt	3	CUSTO00001CUSTO00001	OB	90
<input type="checkbox"/>	5871	CMB01	USRJOB005AEDGE 045409	SFt	3	CUSTO00001CUSTO00001	OB	90
<input type="checkbox"/>	5870	CMB01	USRJOB004AEDGE 045408	SFt	3	CUSTO00001CUSTO00001	OB	90
<input type="checkbox"/>	5800	CMB01	USRJOB003AEDGE 045407	SFt	3	CUSTO00001CUSTO00001	OB	90
<input type="checkbox"/>	5755	CMB01	USRJOB010BEDGE 045414	SFt	3	CUSTO00001CUSTO00001	OB	90
<input type="checkbox"/>	5691	CMB01	USRJOB009BEDGE 045413	SFt	3	CUSTO00001CUSTO00001	OB	90
<input type="checkbox"/>	5629	CMB01	USRJOB008BEDGE 045412	SFt	3	CUSTO00001CUSTO00001	OB	90
<input type="checkbox"/>	5623	CMB01	USRJOB007BEDGE 045411	SFt	3	CUSTO00001CUSTO00001	OB	90

I/O type

- **SFt = Segment address range fault**
- **SRd = Segment address range read**
- **SWt = Segment address range write**

External Object Types:

<http://pic.dhe.ibm.com/infocenter/iserics/v7r1m0/topic/rbam6/rbam6objecttypes.htm>

Performance Explorer

Performance Explorer

Performance Explorer Database Files

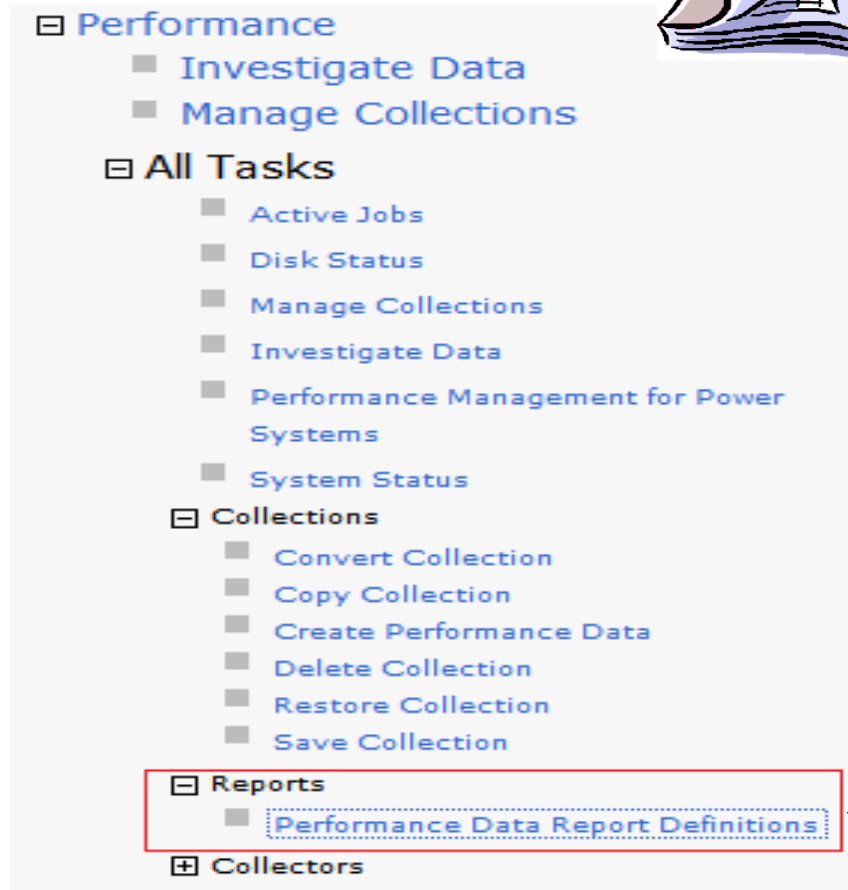
Performance Explorer Data

- Profile by Procedure
- Profile by Component
- Hierarchical Trace Profile
- Job/Thread List

Profile by Component					
--- Select Action ---					
Select		Total	Component	Procedure Name	Hit Count
<input type="checkbox"/>	▼	Total			683(100%)
<input type="checkbox"/>	▶		SLIC Common Functions		335(49.05%)
<input type="checkbox"/>	▼		SLIC Database		118(17.28%)
<input type="checkbox"/>				#dbrsqmn.#dbrsqmn	85(12.45%)
<input type="checkbox"/>				sExecute__42VariableLeng16	6(0.88%)
<input type="checkbox"/>				sExecute__14HashOperatic3	0(0.44%)
<input type="checkbox"/>				sExecute__17PackedDivide2	0(0.29%)
<input type="checkbox"/>				sSad__19VariableLengthFie2	0(0.29%)
<input type="checkbox"/>				vPositionNextAndExecute__2	0(0.29%)

Profile by Procedure				
Perspective Edit View History				
--- Select Action ---				
Program Name	Module Name	Procedure Name	Component	Hit Count
CFTSMPI		#cftsmapi	SLIC Common Functions	332(48.61%)
STRHU		do_copyMemoryLarge	SLIC String Functions	94(13.76%)
DBRSQMN		#dbrsqmn	SLIC Database	85(12.45%)
CUSTOMER CUSTOMER		#DBXFMP2	MI Other	45(6.59%)
READER	READER	READER	MI Other	27(3.95%)
DBPM2010		sExecute__42VariableLeng	SLIC Database	6(0.88%)
SMMUTLH		trimRangeForRead__14Sn	SLIC Storage Management	6(0.88%)
HvString		HvString	SLIC Hypervisor	4(0.59%)
SMMSSUBH		findStealablePage__20Sm	SLIC Storage Management	4(0.59%)
QDBGETM	QDBGETM	QDBGETM	XPF Database Other	4(0.59%)

“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

Create Performance Data Report




Start here with Reports ->
Performance Data Report Definitions

<http://www.ibmssystemsmag.com/Blogs/i-Can/Archive/performance-reports-with-the-performance-data-inve/>

Report Definitions


- Performance Data Reports
 - Add Definition
 - Delete Definition
 - New Based On
 - Report Definitions


Performance Data Report Definitions - Etc3t1.rchland.ibm.com



Actions

Filter



<input type="checkbox"/>	Name	Description
	No filter applied	
<input type="checkbox"/>	Health Indicators	A predefined performance
<input type="checkbox"/>	System Overview	A predefined performance
<input type="checkbox"/>	Resource Consumption	A predefined performance

Create Performance Data Report

Report definition:

System Overview

Output type:

PDF

Collection:

Most Recent

Library:

QPFRDATA

Type:

Collection Services File Based Collection

OK

Cancel

Create your own Report Definition

Add Performance Data Report Definition

Name:

Description:

Perspectives

Select Perspective Package

None

Collection

Collection: Most Recent

Library: QPFRDATA

Type:

Cover Page

Title:

☒ Report definition name

☒ Date created

☒ Perspectives

☒ Collection name

Add Performance Data Report Definition

Add Perspective

Filter

Collection name: CS228229ND (*CSFILE)

Library: COMMON

Perspectives

- Database
- Collection Services
 - CPU Utilization and Waits Overview
 - Resource Utilization Overview
 - Job Statistics Overviews
 - Waits
 - CPU
 - Disk
 - Physical Disk I/O
 - Synchronous Disk I/O

Performance Data Report Definitions - Etc3t1.rchland.ibm.com

Actions

- New
- Refresh
- Advanced Filter
- Export
- Configure Options

Add Performance Data Report Definition

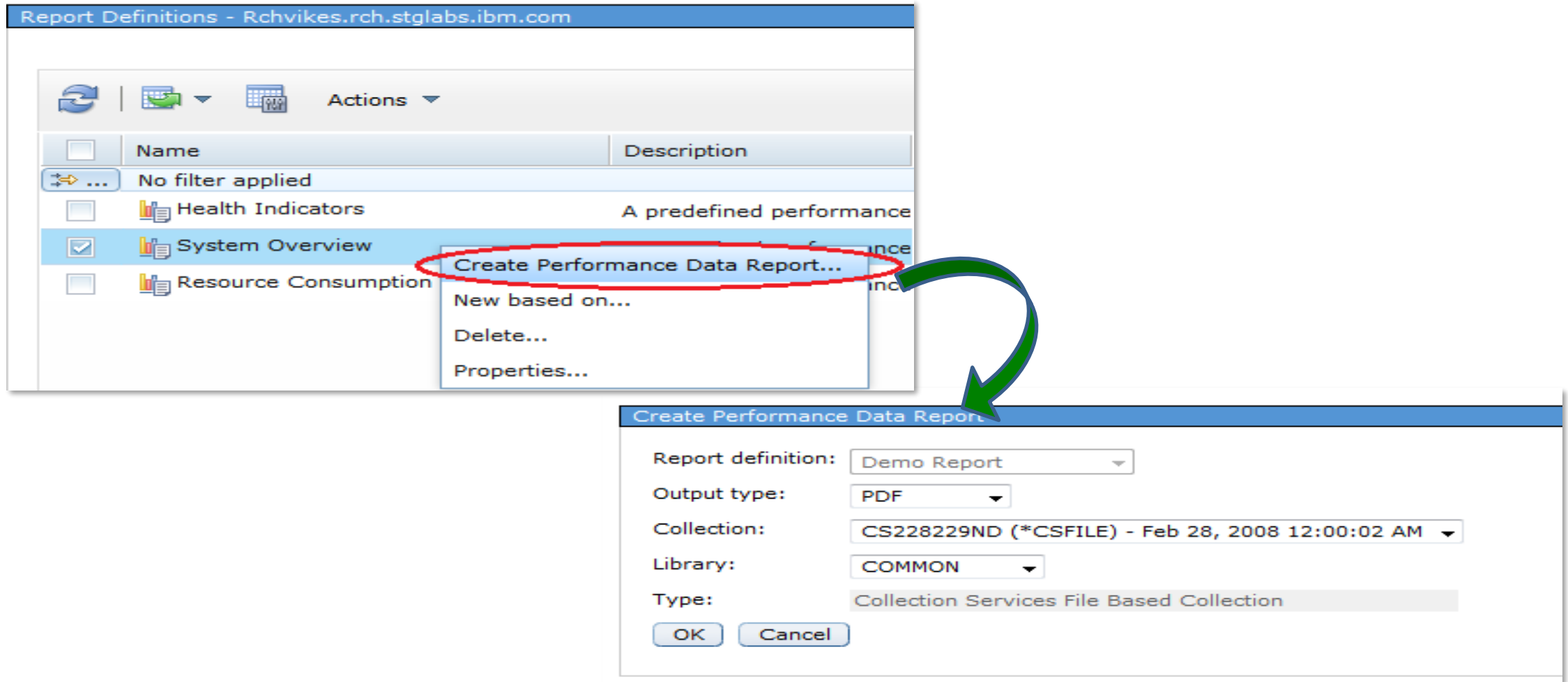
Name: Demo Report

Description: Report prepared for my presentation

Perspectives

Select	Perspective	Package
<input type="checkbox"/>	CPU Utilization and Waits Overview	Collection Services
<input type="checkbox"/>	Page Faults Overview	Collection Services
<input type="checkbox"/>	Synchronous Disk I/O Overview	Collection Services

Create Performance Data Report



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:

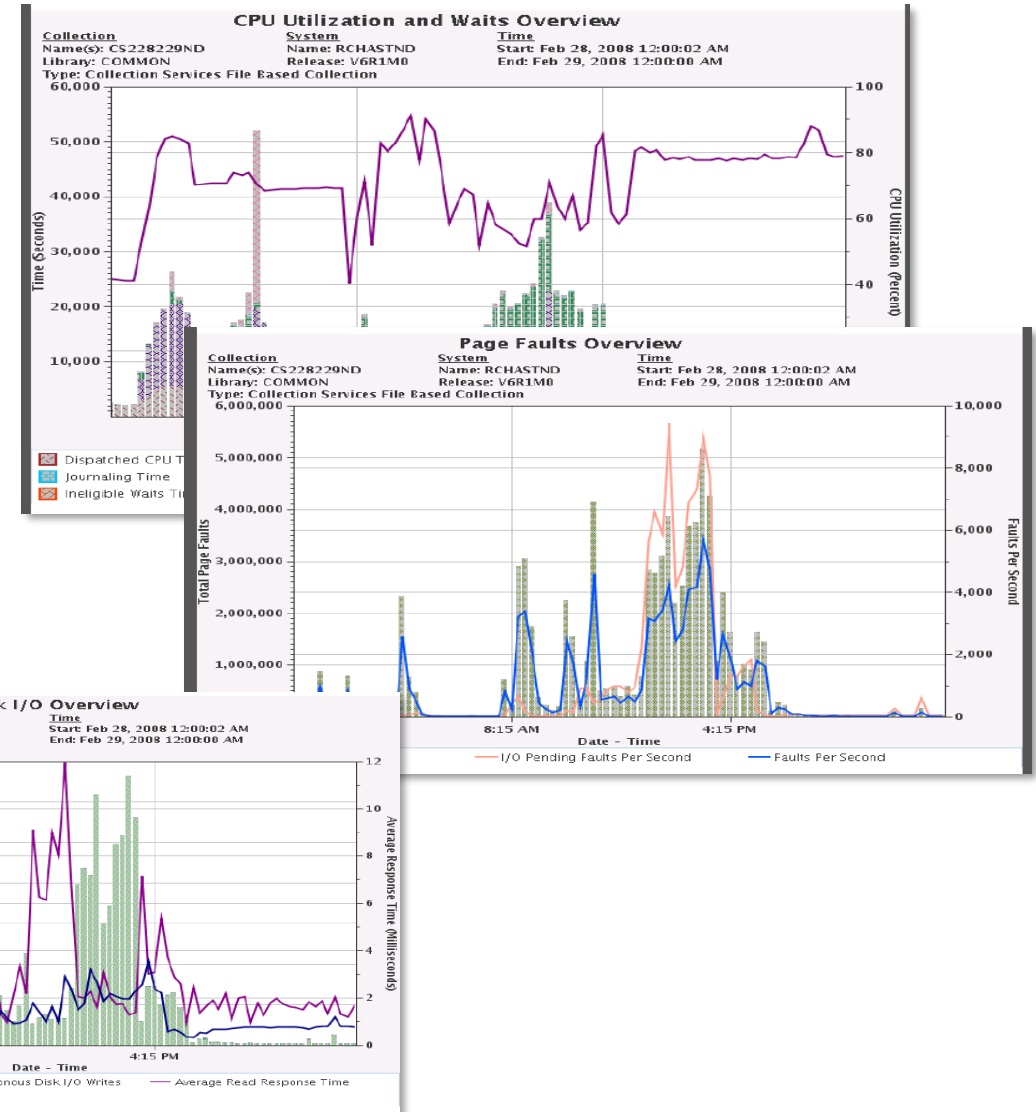
CPU Utilization and Waits Overview

Page Faults Overview

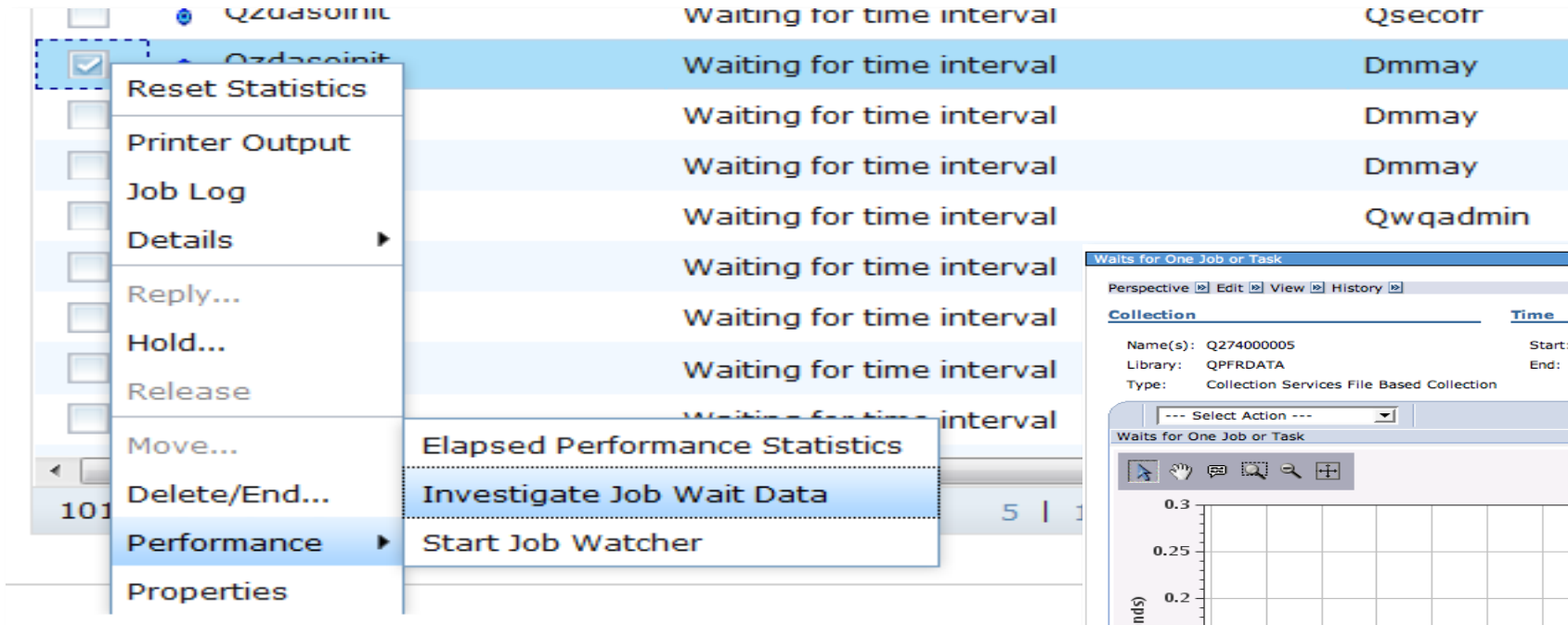
Synchronous Disk I/O Overview

Library/Collection used for report:

Common/Cs228229nd

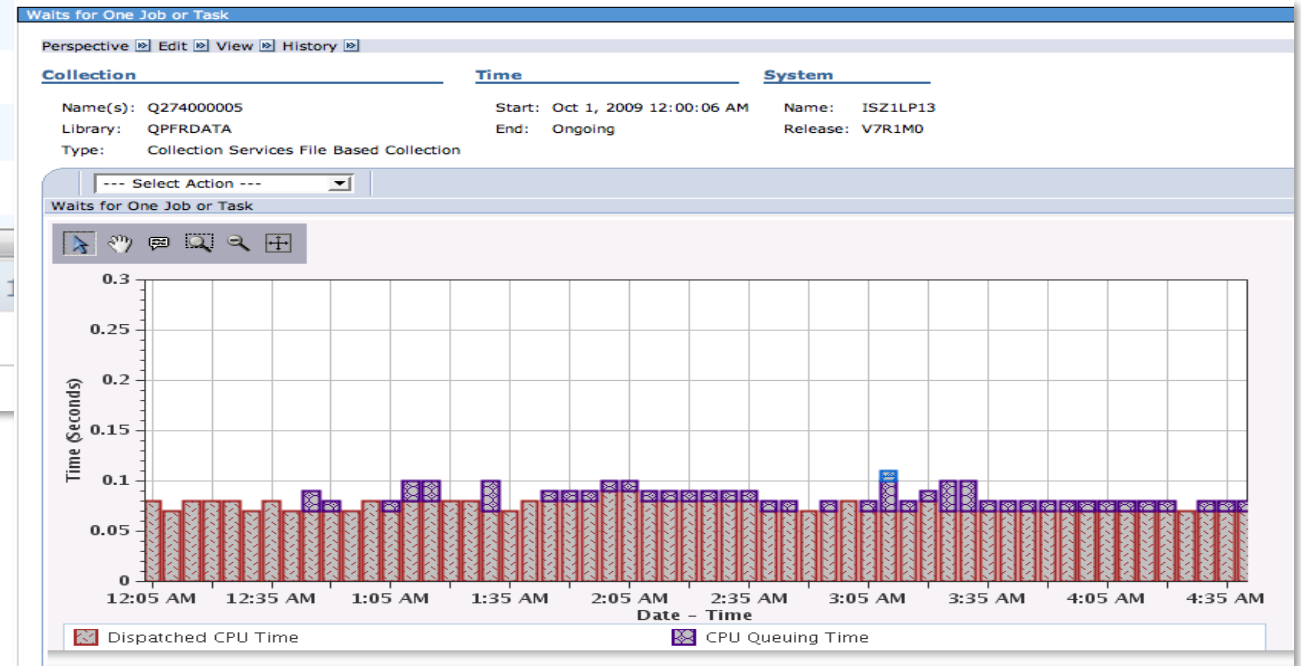


Integration with Active Jobs



Active jobs – what's happening *right now*

Collection Services data → Job wait data – what happened *up to now*



Integration with System Status

System Status -

Last refresh: 3/8/13 12:46:53 PM

General	Jobs
Jobs	Total: 4,537
Processors	Active: 262
Memory	Addresses used
Disk Space	Permanent: 0.010 %
Addresses	Temporary: 0.022 %
	Total disk space: 95.44 GB
	System disk pool
	Capacity: 95.44 GB
	Usage: 79.118 %

System Resources Health Indicators

System Status -

Last refresh: 3/8/13 12:46:53 PM

General	Total memory: 4,096.00 MB
Jobs	Active Memory Pools
Processors	Memory Pools Health Indicators
Memory	
Disk Space	
Addresses	

System Status -

Last refresh: 3/8/13 12:46:53 PM

General	CPU usage (elapsed):	0.0 %
Jobs	Type of processors:	Shared - uncapped
Processors	Processing power:	0.20 processing units
Memory	Virtual processors:	2
Disk Space	Interactive performance:	0 %
Addresses	Shared processor pool usage (elapsed):	0.0 %
	Uncapped CPU capacity pool usage (elapsed):	0.0 %

CPU Health Indicators

System Status - etc3t1.rchland.ibm.com

Last refresh: 3/8/13 12:46:53 PM

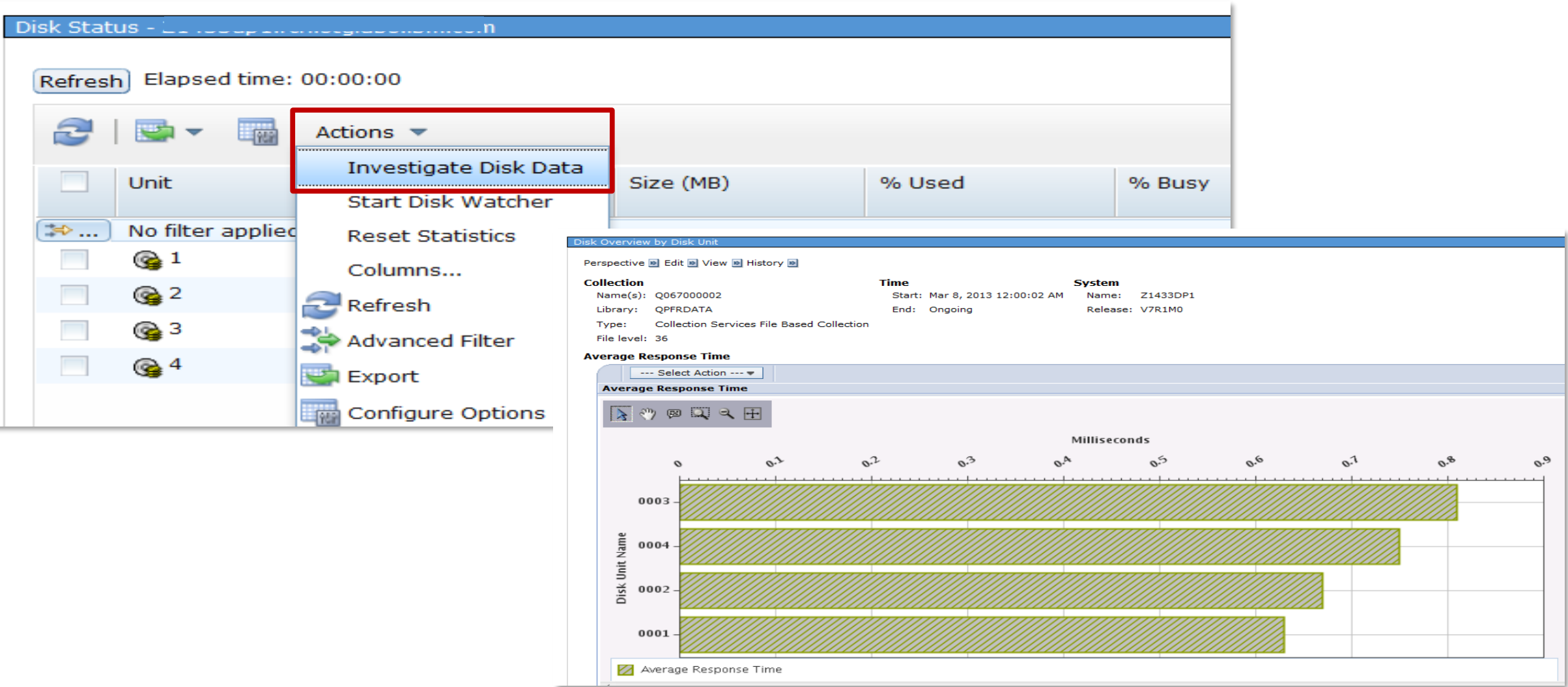
General	Total disk space: 95.44 GB
Jobs	System disk pool
Processors	Capacity: 95.44 GB
Memory	Usage: 79.118 %
Disk Space	Temporary storage used
Addresses	Current: 8,407 MB
	Maximum since last system restart: 8,435 MB

Disk Status

Storage System Values

Disk Health Indicators

Integration with Disk Status



Investigate Data Database

- ✓ Requires 2015 PTF groups, including the database group
- ✓ Must have the Performance Tools LPP **Manager** feature installed
- ✓ Available on IBM i 6.1 and 7.1 with PTFs
 - Included with IBM i 7.2/7.3

Integration with Database

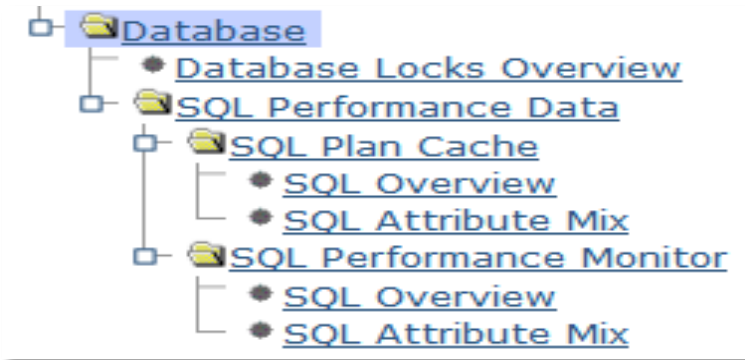
- Leverage the capabilities of PDI with valuable data gathered from database
- PDI charting of
 - SQL Plan Cache Snapshots
 - SQL Performance Monitor files
- Collection Services collection of job-level SQL metrics
- Visual charts and/or tables in PDI that are focused on database related metrics
- Navigation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



Integration with Database – package overview

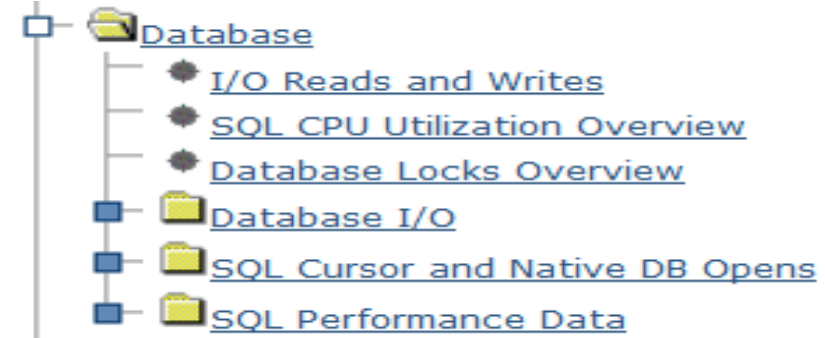
Database Package for 6.1

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



Database Package for 7.1+

- I/O Reads and Writes
- SQL CPU Utilization Overview
- Database Locks Overview
- Database I/O
 - Utilizes Job Level SQL Metrics
- SQL Cursor and Native DB Opens
- SQL Performance Data



monitors

Integration with Database

Launch “Investigate Performance Data” from various Database tasks

SQL Performance Monitors - Z1433dp1

Database: Zh22dp1

Actions

Name	Type	Status
No filter applied		
amonitor2	Detailed	Ended
amonitor3	Detailed	
as		End
asmalltest		Analyze...
asum		Investigate Performance Data...

SQL Plan Cache Event Monitors - Z1433dp1

Database: Zh22dp1

Actions

Name	Status	Schema
No filter applied		
myeventmon1	Ended	FLANAGAN
SQL Plan Cache Event		PDITESTLIB
SQL Plan Cache PDI		ZZLIB

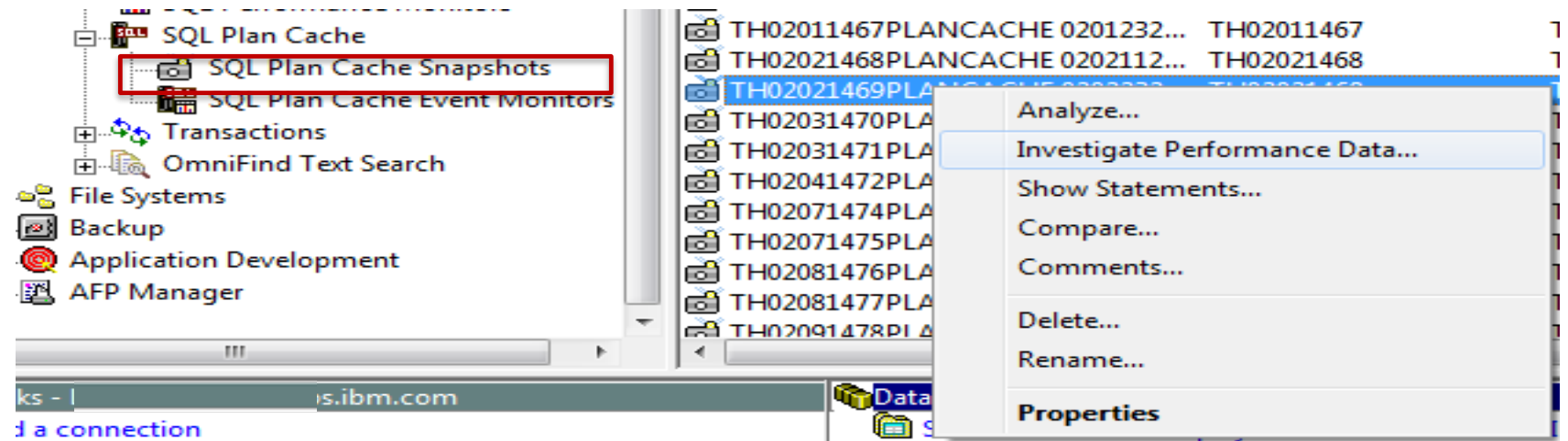
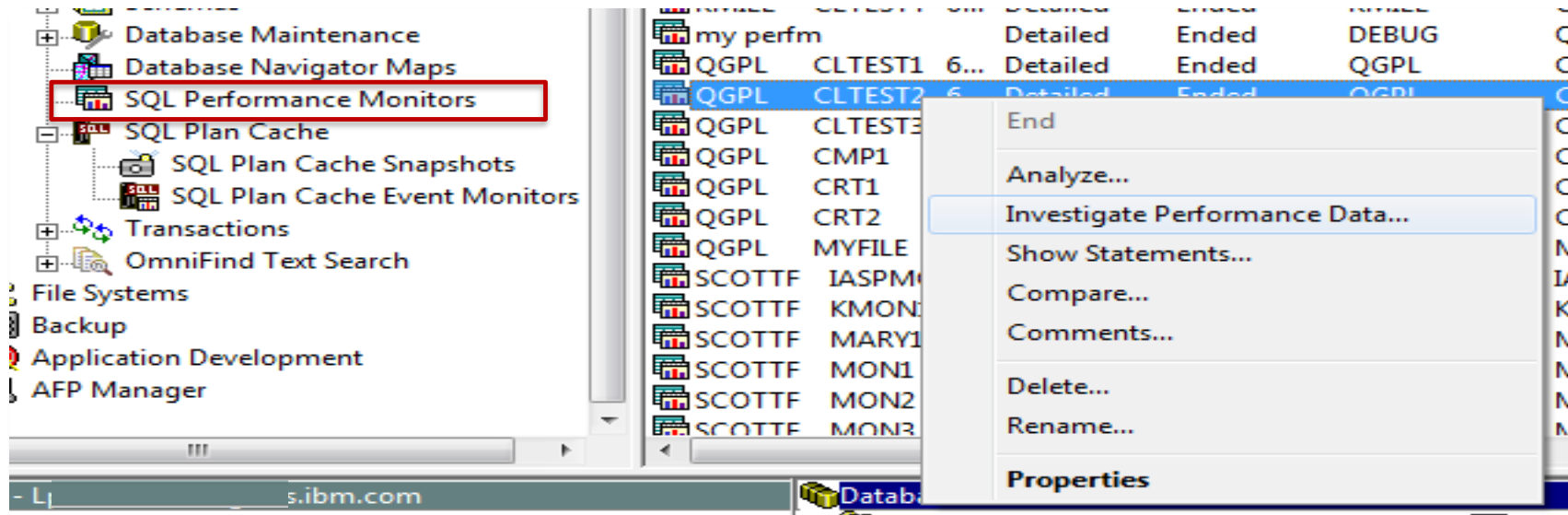
SQL Plan Cache Snapshots - Z1433dp1

Database: Zh22dp1

Actions

Name	Schema
No filter applied	
asmalltest2	QGPL
kxkSnapshot	ZZLIB
lrp1	LRP
my snap1	

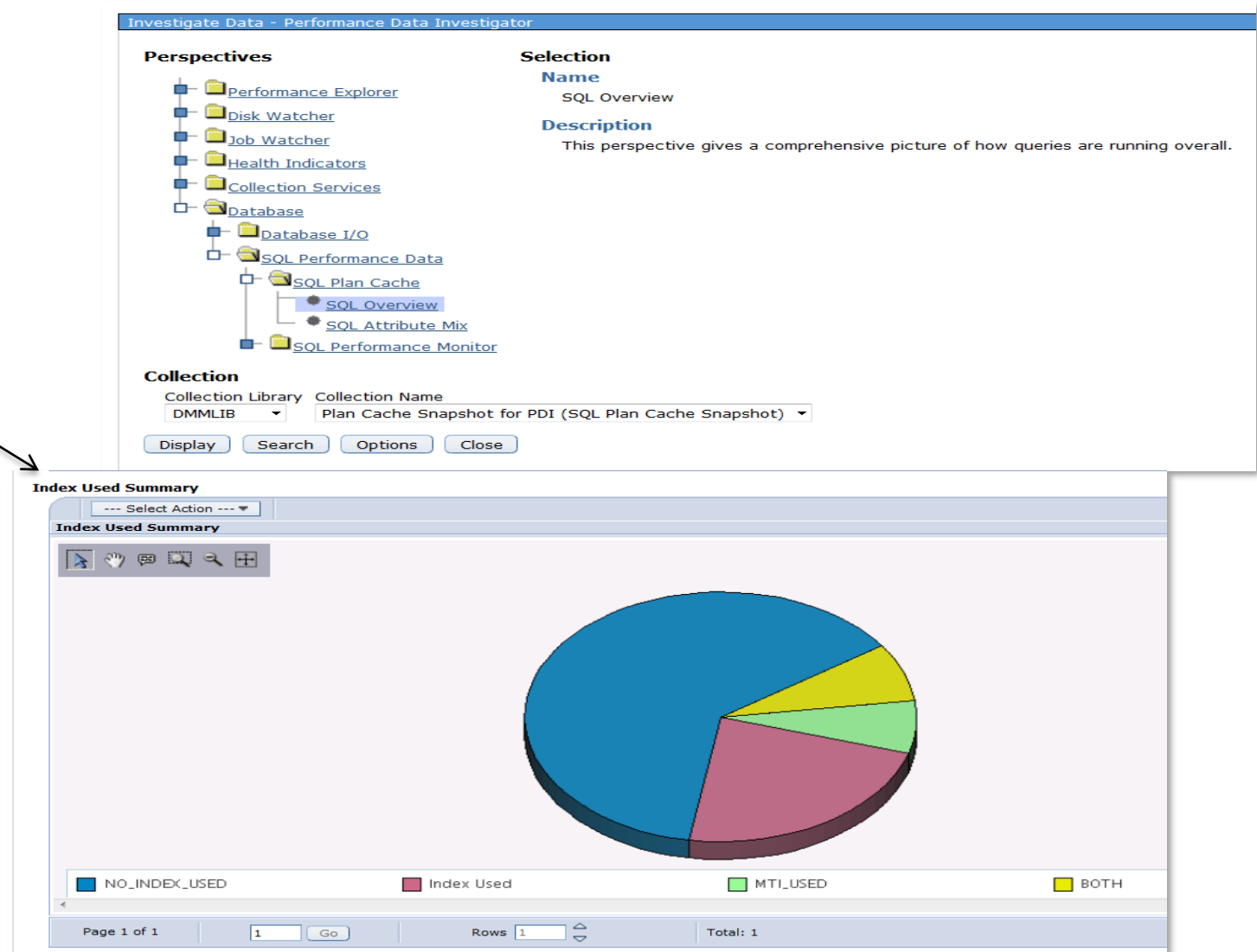
Launch PDI from System i Navigator client



SQL Overview

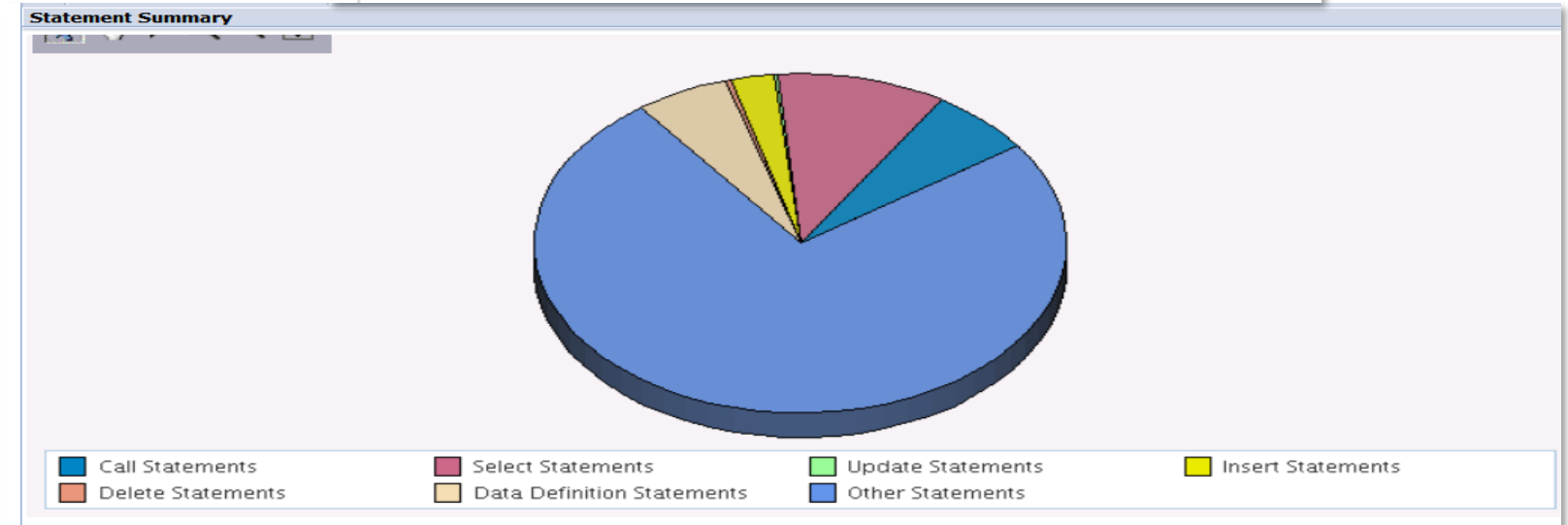
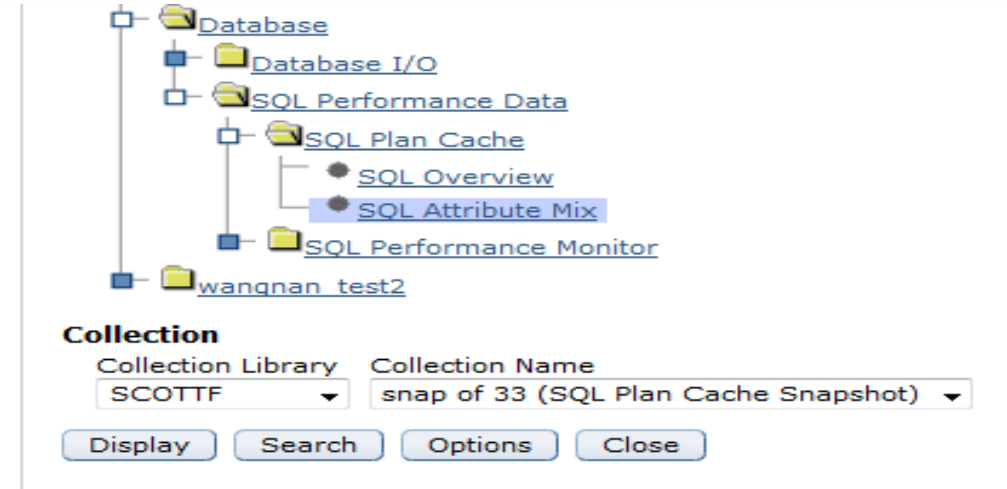
Several graphs:

- 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



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



Investigate Data



PDI Fan Club Favorites

(some not available on 6.1 & 7.1)



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. When this data is available, it can be viewed via several perspectives found under "Physical System".

The screenshot shows the 'Physical System' menu in the HMC interface. The menu items are:

- Physical System
 - Logical Partitions Overview
 - Donated Processor Time by Logical Partition
 - Uncapped Processor Time Used by Logical Partition
 - Virtual Shared Processor Pool Utilization
 - Physical Processors Utilization by Physical Processor
 - Dedicated Processors Utilization by Logical Partition
 - Physical Processors Utilization by Processor Status Overview
 - Physical Processors Utilization by Processor Status Detail

To the right, the 'Partition Properties' dialog is open for partition *MNPART1. The 'General' tab is selected, showing the following information:

Partition Properties	
General Hardware Virtual Adapters SR-IOV Logical Ports Settings Other	
Name:	*MNPART1
ID:	20
Environment:	IBM i
State:	Running
Attention LED:	On
Resource configuration:	Configured
OS version:	IBM i Licensed Internal Code 7.2.0 3060 0
Current profile:	CTCLPMDS
System:	9179-MHD*1016B3P
<input checked="" type="checkbox"/> Allow performance information collection	
<input type="checkbox"/> Allow this partition to be suspended.	
<input checked="" type="checkbox"/> RestrictedIO Partition	
Sync current configuration Capability	Sync turned OFF

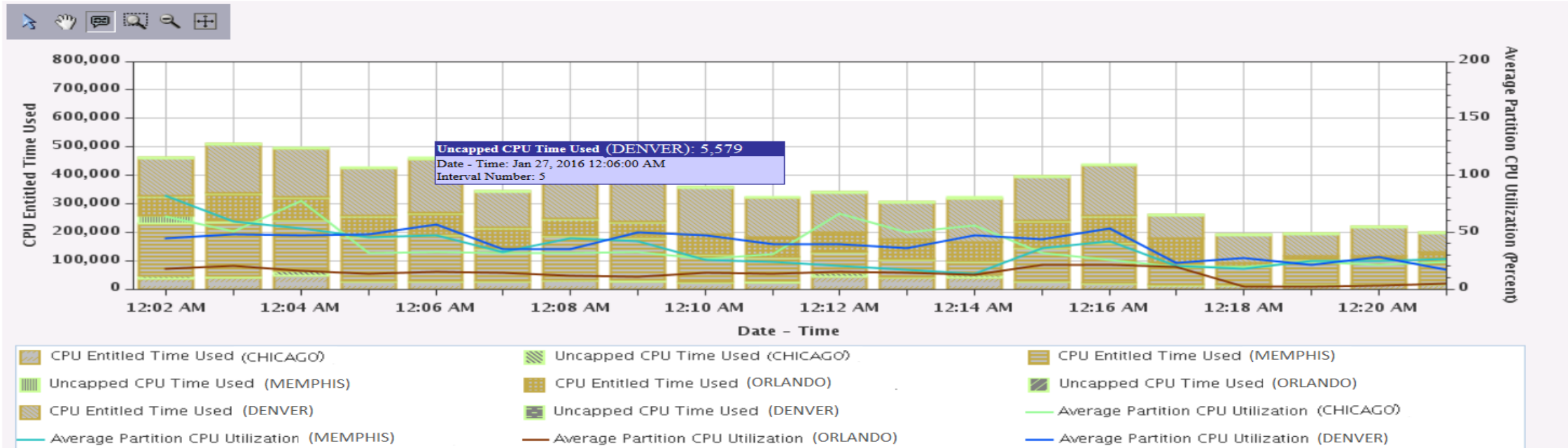
At the bottom of the dialog are buttons for OK, Cancel, and Help.

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

Logical Partitions Overview



- 4 IBM partitions on system - all running IBM i (shared/uncapped)
- On a single chart, we can see:
 - Average CPU utilization for each partition
 - CPU Entitled Time Used
 - Uncapped CPU Time Used
 - Leverage tooltips and Table data

Logical Partition Operating System	Virtual Processors	Current Processing Capacity	Current Configured Memory	Average Partition CPU Utilization (Percent)	CPU Entitled Time Used	Uncapped CPU Time Used	Donated Processor Time
iS/OS	2	1	36864	63.4	37431	9440	0
iS/OS	6	4	77824	81.67	185079	24971	0
iS/OS	6	5	55296	17.44	70026	205	0
iS/OS	5	4	116736	44.31	133502	1352	0
iS/OS	2	1	36864	50.45	39497	6295	0
iS/OS	6	4	77824	59.62	188516	7904	0
iS/OS	6	5	55296	20.5	96609	355	0
iS/OS	5	4	116736	47.66	170108	1665	0

12X Bus Utilization

- (Spring 2014) PDI now has integrated charts that show views of how resources at the **bus level** like 12X loops and PCIe cards are performing

Physical System

- Logical Partitions Overview
- Donated Processor Time by Logical Partition
- Uncapped Processor Time Used by Logical Partition
- Virtual Shared Processor Pool Utilization
- Physical Processors Utilization by Physical Processor
- Dedicated Processors Utilization by Logical Partition
- Physical Processors Utilization by Processor Status Overview
- Physical Processors Utilization by Processor Status Detail
- Shared Memory Overview
- Full System I/O Architecture
- All 12X Loops
- All PCIe Gen2

Partition Properties					
General	Hardware	Virtual Adapters	SR-IOV Logical Ports	Settings	Other
Name:	*MNPART1				
ID:	20				
Environment:	IBM i				
State:	Running				
Attention LED:	On				
Resource configuration:	Configured				
OS version:	IBM i Licensed Internal Code 7.2.0 3060 0				
Current profile:	CTCLPMDS				
System:	9179-MHD*1016B3P				
<input checked="" type="checkbox"/> Allow performance information collection					
<input type="checkbox"/> Allow this partition to be suspended.					
<input checked="" type="checkbox"/> RestrictedIO Partition					
Sync current configuration Capability Sync turned OFF					
OK Cancel Help					

Collection Services - Disk Reads and Writes Detail

Disk

Disk Response Time

Detailed

Disk I/O Rates Overview

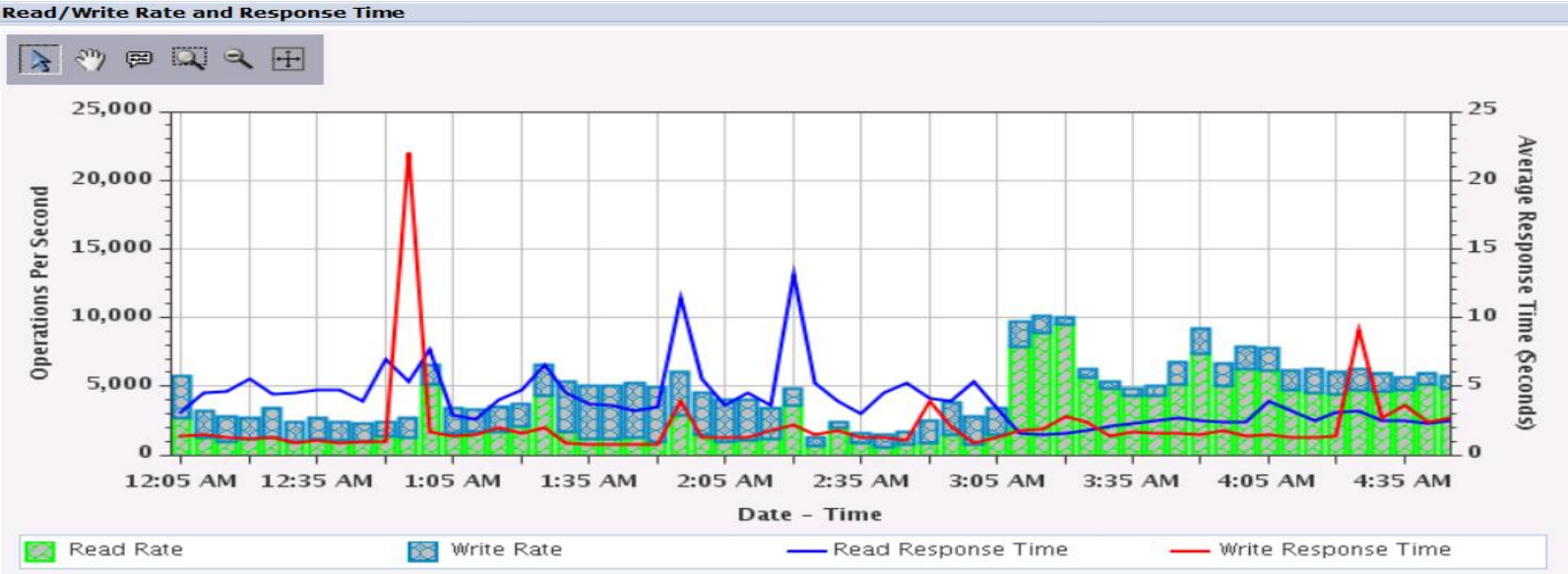
Disk I/O Rates Overview With Cache S

Disk I/O Average Response Time Overv

Disk I/O Total Response Time Overview

Disk I/O Total Service Time Overview

Disk Reads and Writes Detail



- One perspective with several key charts, such as:
- Read and Write response times and rates
 - Disk hardware information

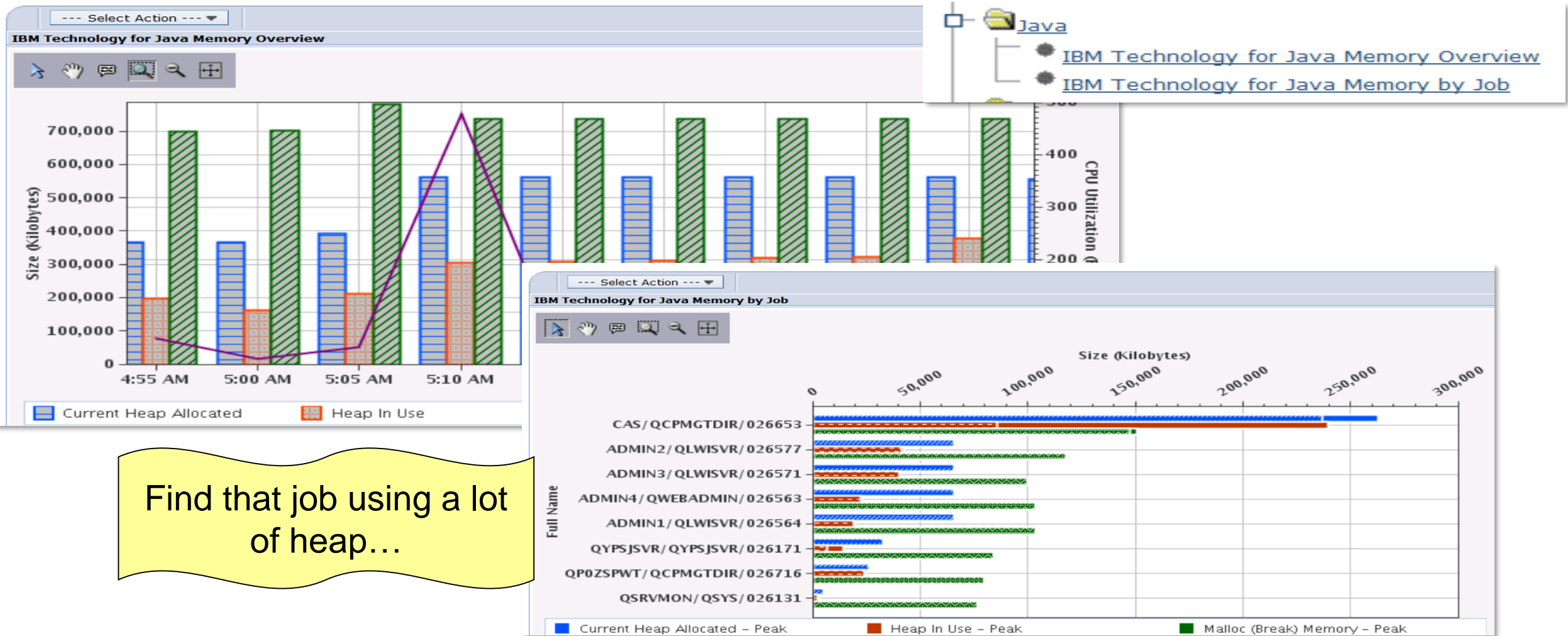
Performance Data Investigator IBM I Model DSS

Select	Serial	SmfModel	ServerType	LogicalCapacity (GB)	LunCount	MeasureDateTime
<input type="checkbox"/>	Internal	433A	i	2837	11	2016/10/12 00:05:00
<input type="checkbox"/>	Internal	433A	i	2837	11	2016/10/12 00:10:00
<input type="checkbox"/>	Internal	433A	i	2837	11	2016/10/12 00:15:00
<input type="checkbox"/>	Internal	433A	i	2837	11	2016/10/12 00:20:00
<input type="checkbox"/>	Internal	433A	i	2837	11	2016/10/12 00:25:00

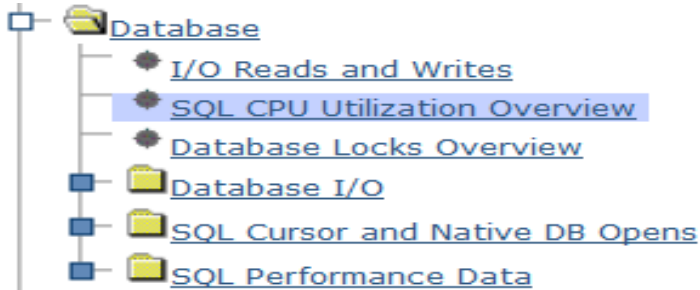
Installed Disk Hardware

Select	ASP Number	Disk Unit Type	Feature Code	RAID Type	Unit Count	ASP Capacity (GB)	Disk Used	Average Unit Size
<input type="checkbox"/>	1	15K SAS HDD	N/A	RAID-5	11	2837.4	54.21	257.9

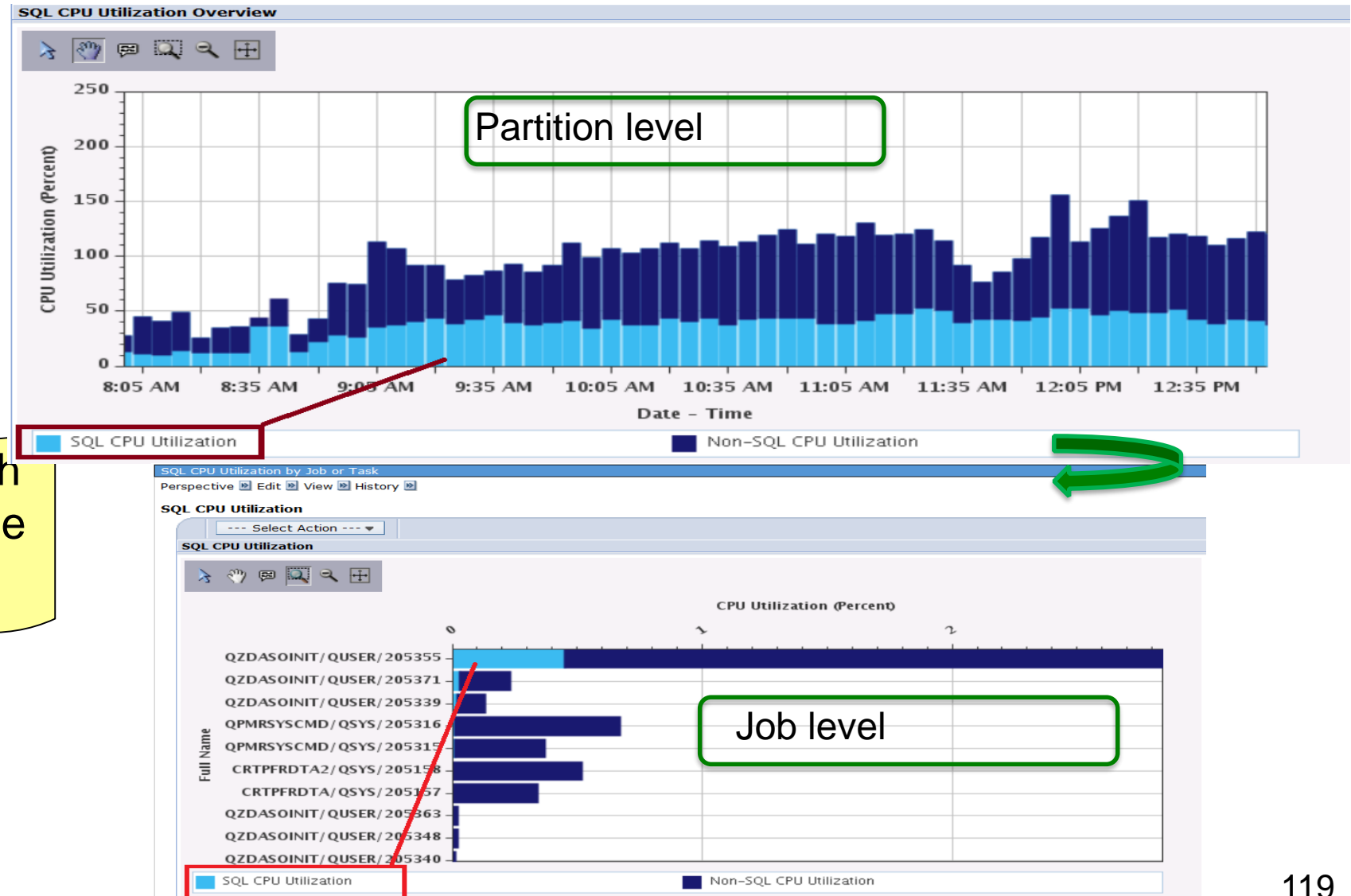
Collection Services - Java Perspectives



Database - SQL CPU Utilization Overview



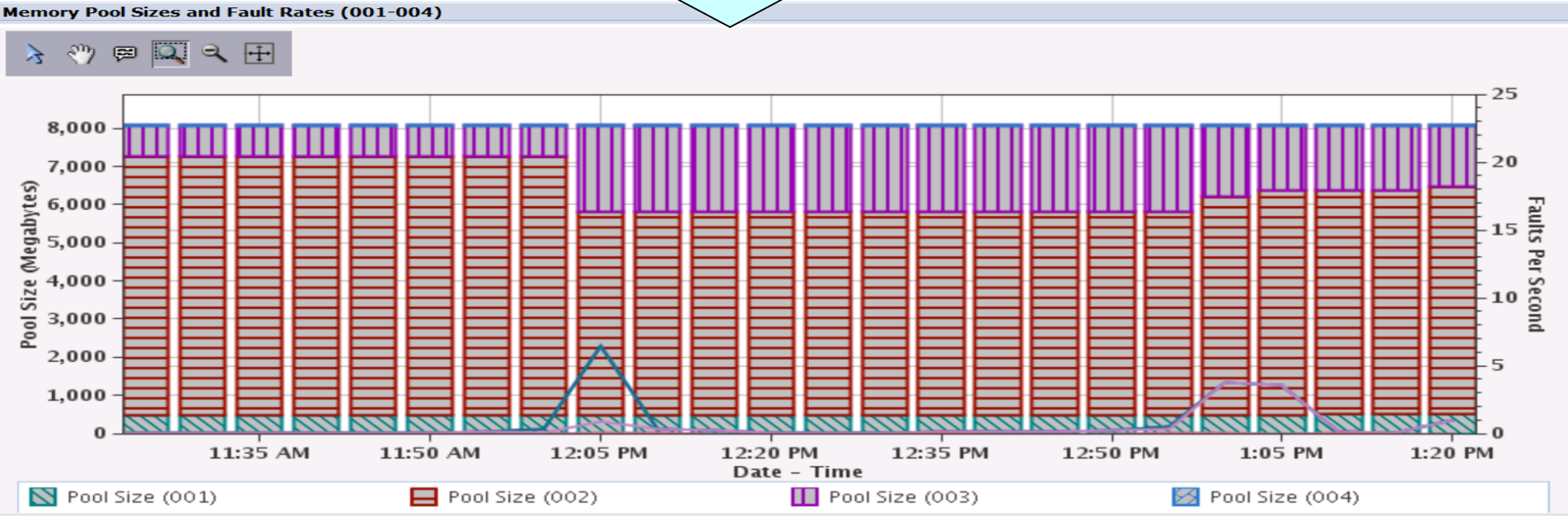
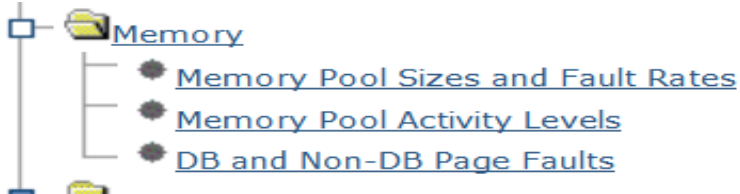
Allows you to see how much of your CPU utilization is due to SQL work



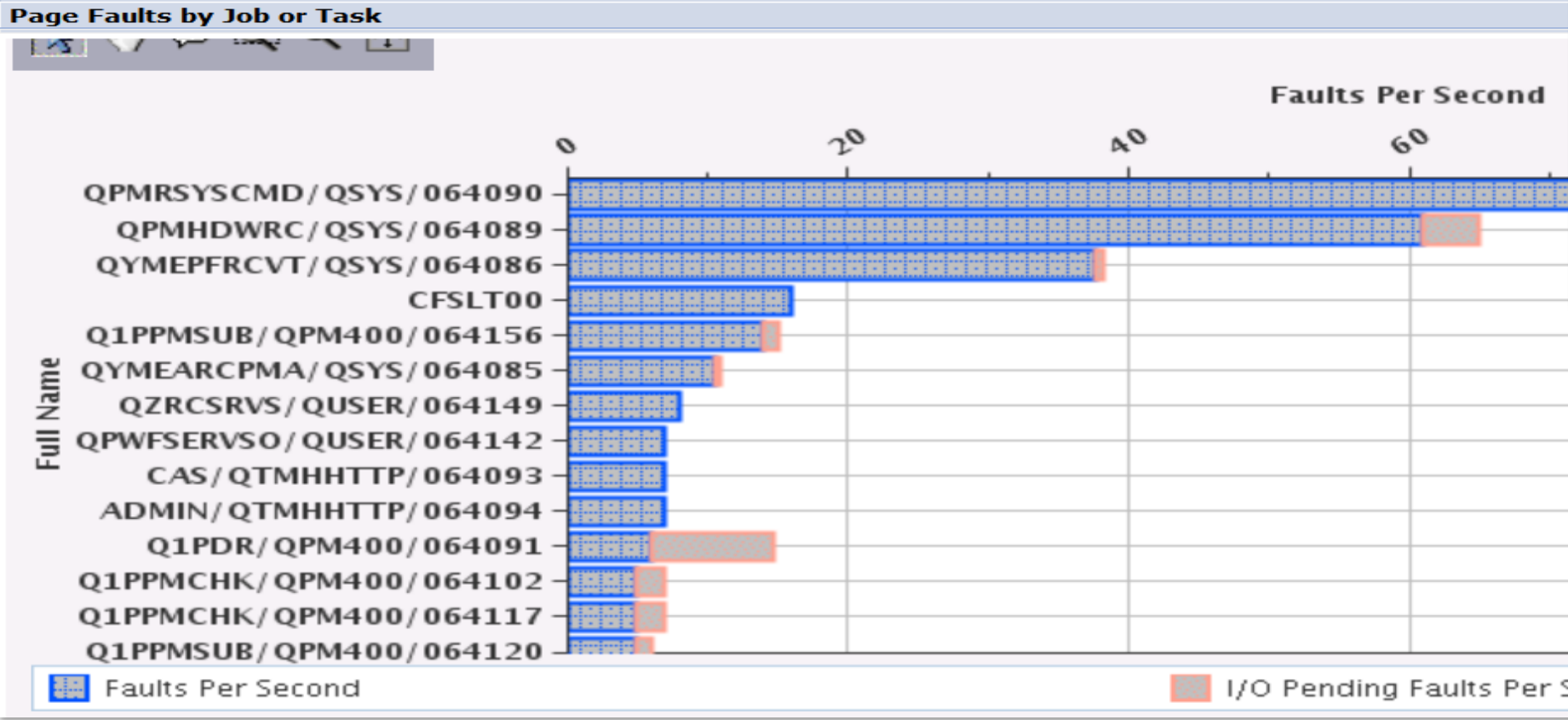
Collection Services - Memory

Pool size changes over time in a graphical view!

Note the change in pool sizes.
QPFRADJ is on.



Collection Services - Memory → Drilldown



Memory Pool Sizes and Fault Rates (001-004)

--- Select Action ---

- Memory Metrics for One Pool
- Memory Pool Activity Levels
- DB and Non-DB Page Faults
- Page Faults by Job or Task
- Waits by Pool
- Disk Waits Overview
- Memory Pools Health Indicators
- Export
- Modify SQL
- Size next upgrade
- Change Context
- Show as table
- Table Actions

Collection Services - Storage Allocation Perspectives

Disk

Disk Response Time

Storage Allocation

Storage Allocation/Deallocation Overview

Storage Allocation/Deallocation by Thread or Task

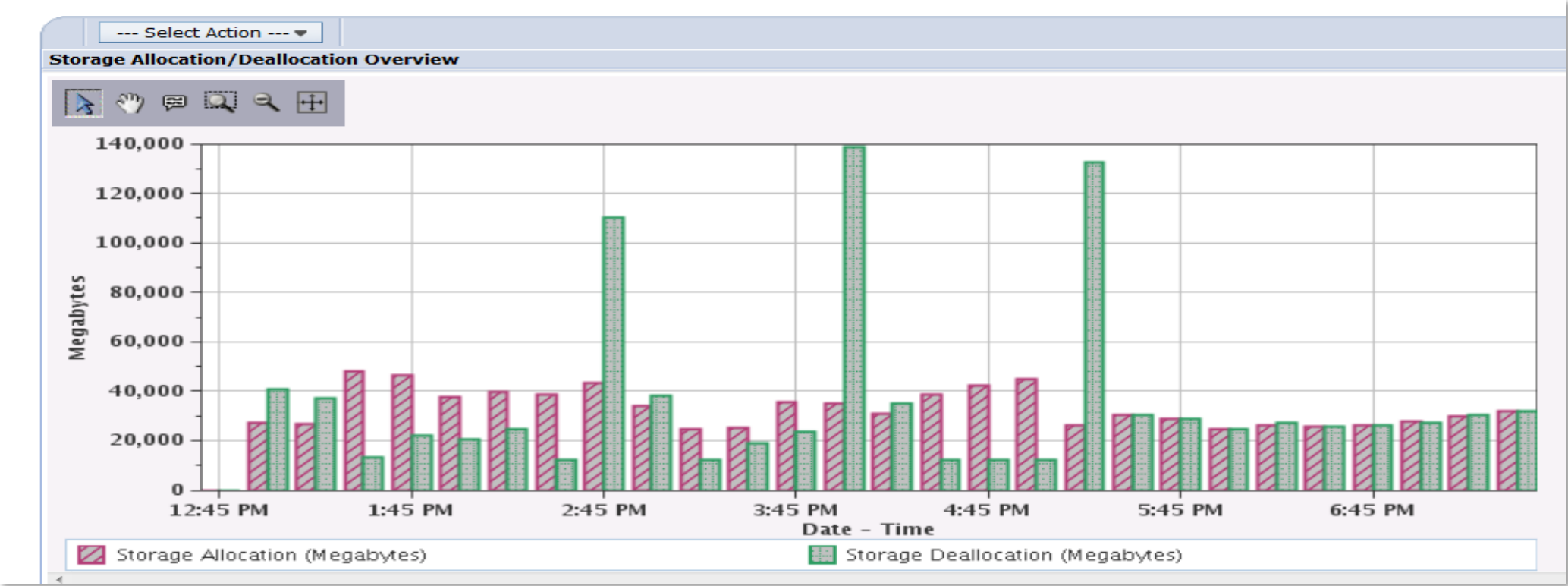
Selection

Name

Storage Allocation/Deallocation Overview

Description

This chart shows allocation and deallocation of the temporary and permanent storage for all contributors over time for the selected collections. Use this chart to select a time frame for further detailed investigation.



Collection Services - Storage Allocation by Thread or Task

Selection

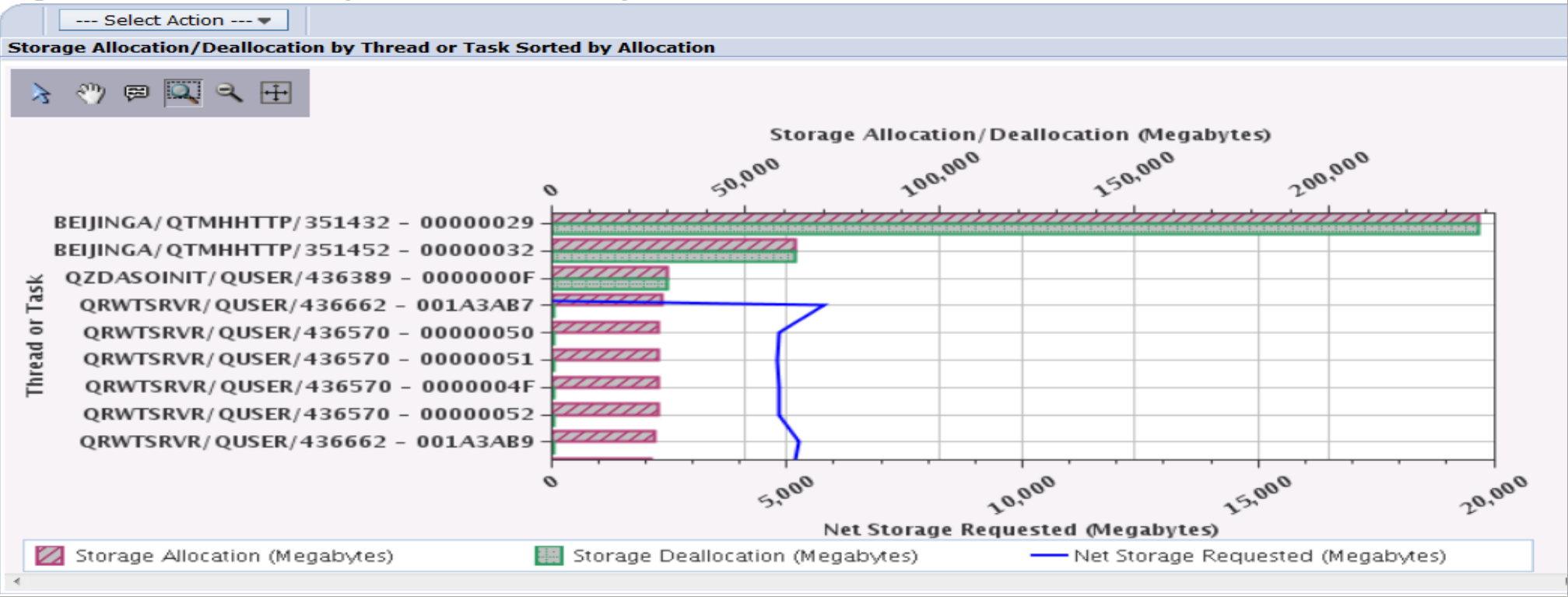
Name

Storage Allocation/Deallocation by Thread or Task

Description

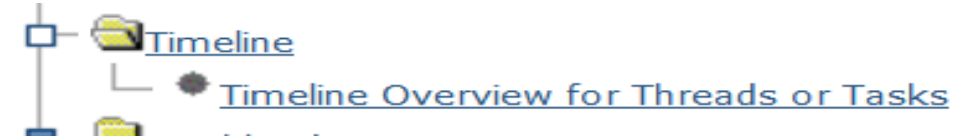
This chart shows allocation and deallocation of the temporary and permanent storage, net frames requested by thread or task. Use this chart to select a thread or task for viewing its storage statistics over time.

Storage Allocation/Deallocation by Thread or Task Sorted by Allocation



Collection Services - 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



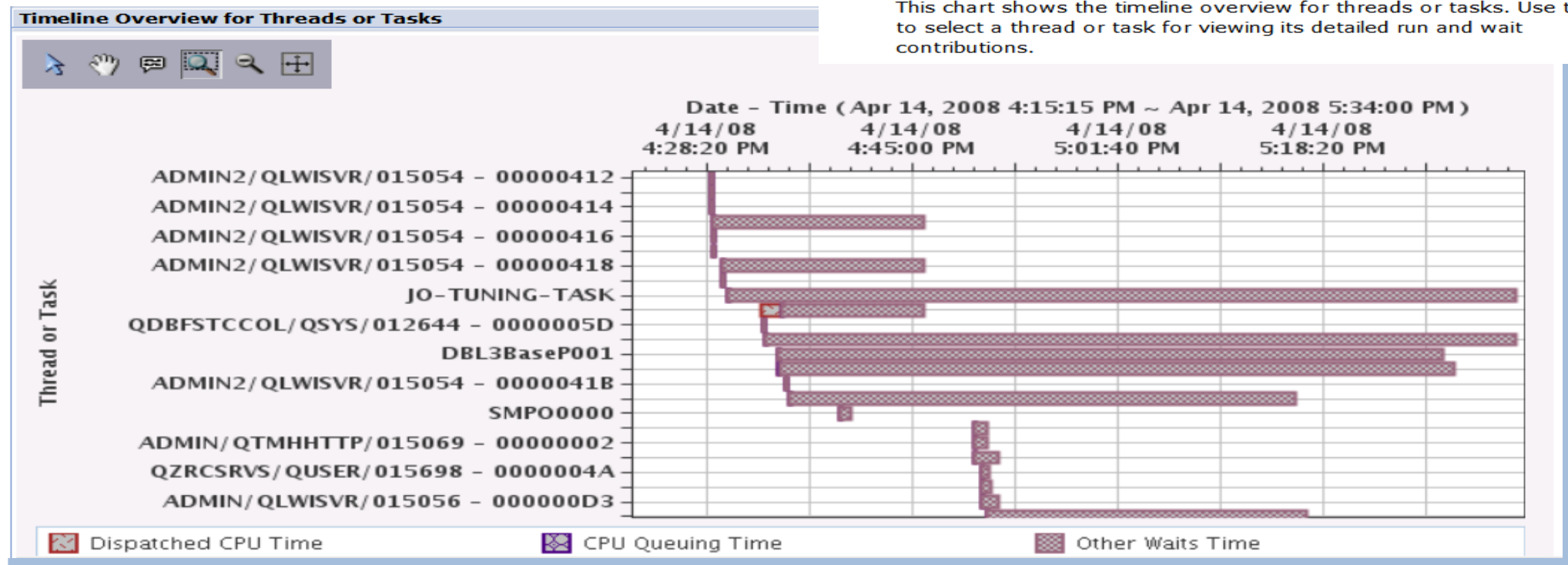
Selection

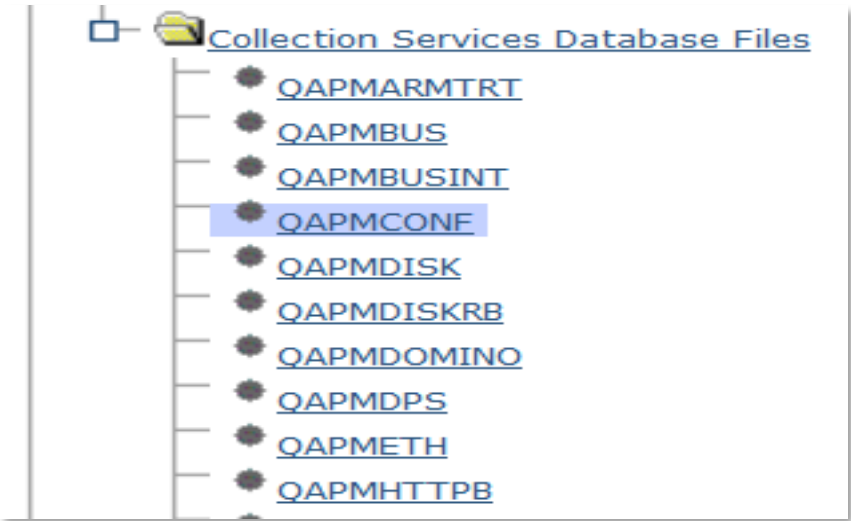
Name

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.





QAPMCONF			
Perspective Edit View History			
Collection		Time	System
Name(s): Q067000002		Start: Mar 8, 2013 12:00:02 AM	Name: ETC3T1
Library: QPFRDATA		End: Ongoing	Release: V7R1M0
Type: Collection Services File Based Collection			
File level: 36			
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



Key Information
about your system

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 - Isz1lp13.rch.stglabs.ibm.com

	Name	Library	Type	Status	Started	Ended	Size MB	System	Version
No filter applied									
<input type="checkbox"/>	Q311025028	ZZTEST	Disk Watcher File Based Collection	Complete	11/6/12 2:50:28 AM	11/6/12 2:51:20 AM	2.766	ISZ1LP13	V7R1M0
<input checked="" type="checkbox"/>	Q311025028	DFLADP	Collection Services File Based Collection	Complete	6/11/12 4:25:07 PM	7/15/12 4:28:35 PM	1.754	ASWC	V7R1M0
<input type="checkbox"/>	Q311025028	RAKLIB	Job Watcher File Based Collection	Complete	1/9/13 3:56:07 PM	1/9/13 4:12:10 PM	0.004	ISZ1LP13	V7R1M0
<input type="checkbox"/>	Q311025028	RAKLIB	Collection Services *MGTCOL Obj Based C	Complete	6/11/12 4:25:07 PM	7/15/12 4:28:35 PM	3.684	ASWC	V7R1M0
<input type="checkbox"/>	Q311025028	ZZTESTR	Collection Services File Based Collection	Complete	11/1/12 12:00:06 AM	11/1/12 12:03:25 PM	380.464	ISZ1LP13	V7R1M0
<input type="checkbox"/>	Q311025028	ZZTESTR	Collection Services *MGTCOL Obj Based C	Complete	11/2/12 12:00:06 AM	11/3/12 12:00:04 AM	428.644	ISZ1LP13	V7R1M0
<input type="checkbox"/>	Q307000005	ZZTESTR	Collection Services File Based Collection	Complete	11/2/12 12:00:06 AM	11/3/12 12:00:00 AM	401.808	ISZ1LP13	V7R1M0
<input type="checkbox"/>	Q254000002	ZZTESTR	Collection Services File Based Collection	Complete	9/10/12 12:00:02 AM	9/10/12 10:20:00 PM	42.375	ISZ1LP13	V7R1M0
<input type="checkbox"/>	Q306121500	ZZTESTR	Collection Services File Based Collection	Complete	11/1/12 12:15:03 PM	11/2/12 12:00:05 AM	344.484	ISZ1LP13	V7R1M0
<input type="checkbox"/>	Q309010017	RONNSA1210	Collection Services File Based Collection	Complete	11/4/12 1:00:17 AM	11/4/12 11:01:04 PM	90.836	OCC01XX4	V7R1M0
<input type="checkbox"/>	Q313000005	DFLTEST1	Collection Services File Based Collection	Complete	11/8/12 12:00:05 AM	11/8/12 2:06:30 PM	506.066	ISZ1LP13	V7R1M0
<input type="checkbox"/>	NORMAL	QPEXDATA	Performance Explorer *MGTCOL Obj Based	Complete	1/7/13 3:37:10 PM	1/7/13 3:37:21 PM	4.039	ISZ1LP13	V7R1M0
<input type="checkbox"/>	CSPFR0225	CRSS_MON	Collection Services File Based Collection	Complete	2/25/13 12:01:03 AM	2/26/13 12:00:00 AM	729.32	LDPROD	V6R1M0
<input type="checkbox"/>	Q078110401	QPFDRDATA	Collection Services File Based Collection	Complete	3/19/13 11:04:04 AM	3/20/13 12:00:04 AM	76.016	ISZ1LP13	V7R1M0
<input type="checkbox"/>	IBMPEX0002	DFLBUGNN1	Performance Explorer File Based Collection	Complete	12/12/12 8:09:41 PM	12/12/12 9:10:28 PM	2,459.21	FOHC2E	V7R1M0
<input type="checkbox"/>	Q1122	QPEXDATA	Performance Explorer File Based Collection	Complete	1/8/13 3:37:10 PM	1/8/13 3:37:21 PM	4.039	ISZ1LP13	V7R1M0

1 - 100 of 312 items

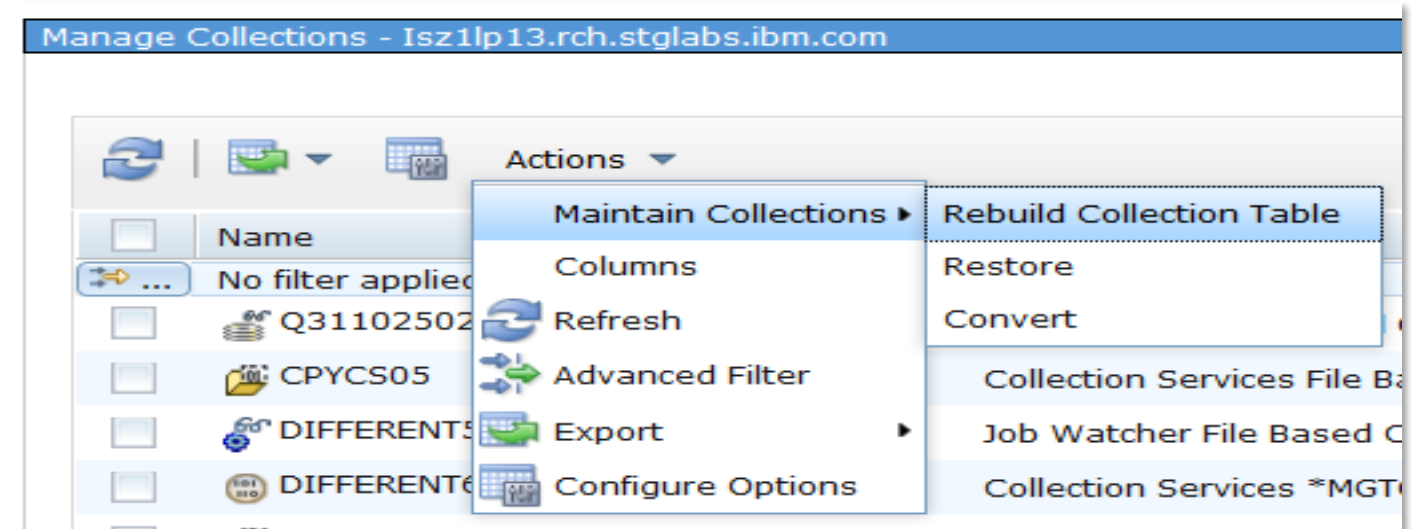
5 | 10 | 25 | 50 | 100 | All

Manage Collections

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

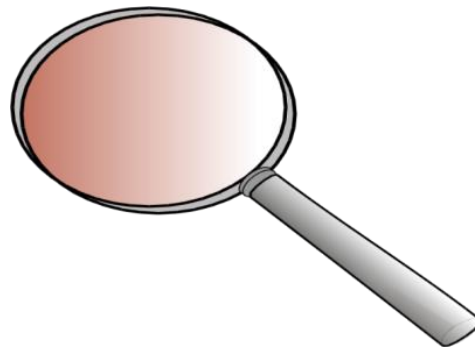


The “Rebuild Collection Table” option will rebuild the meta-data used for the Manage Collections task and then your performance data should be visible.



Performance Data – Analysis

Performance Diagnostics with the Performance Data Investigator



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!

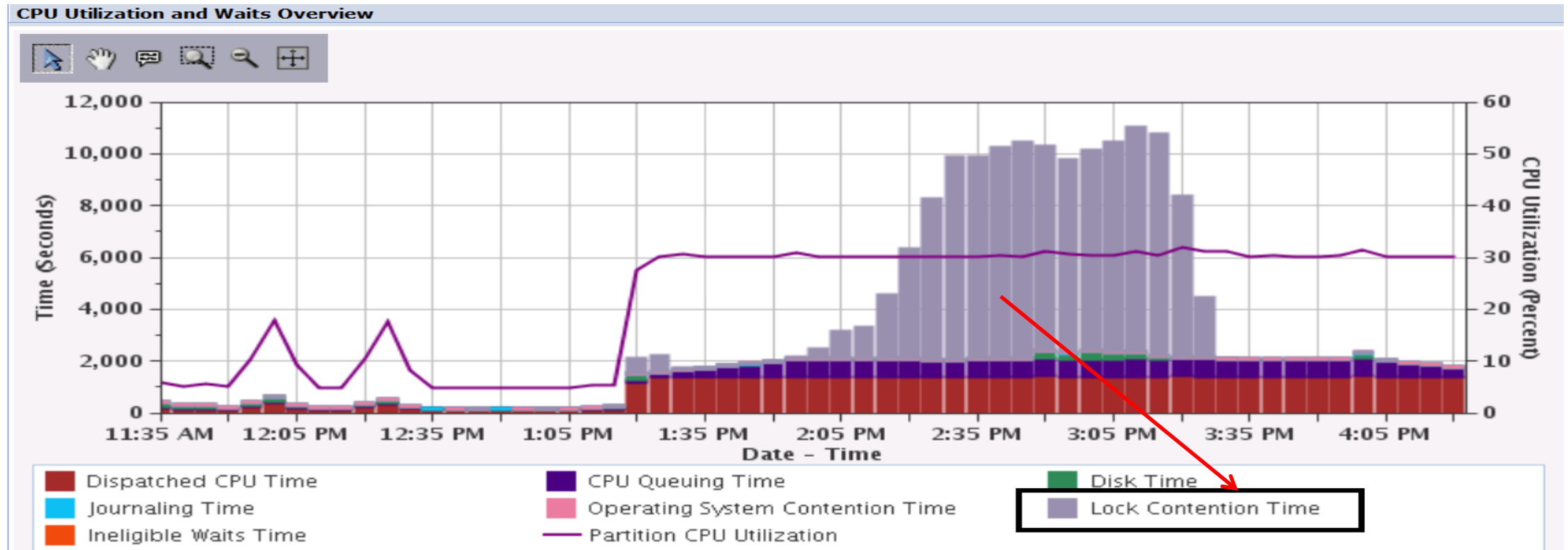
Analyzing Performance Data Using PDI

- Start by asking 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?



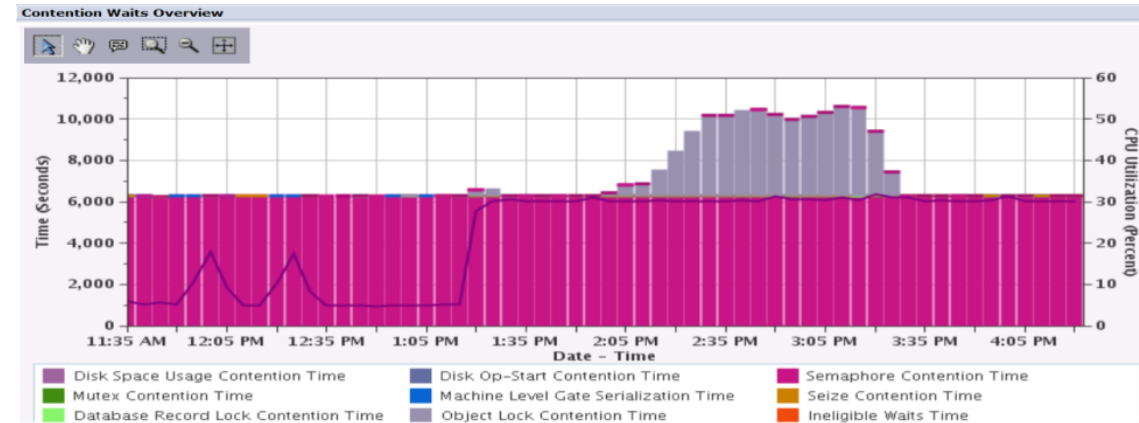
CPU Utilization and Waits Overview

CPU Utilization and Waits Overview is an excellent starting place. Look for *interesting* points
Next steps will depend upon the answer to the prior questions, along with what you see.

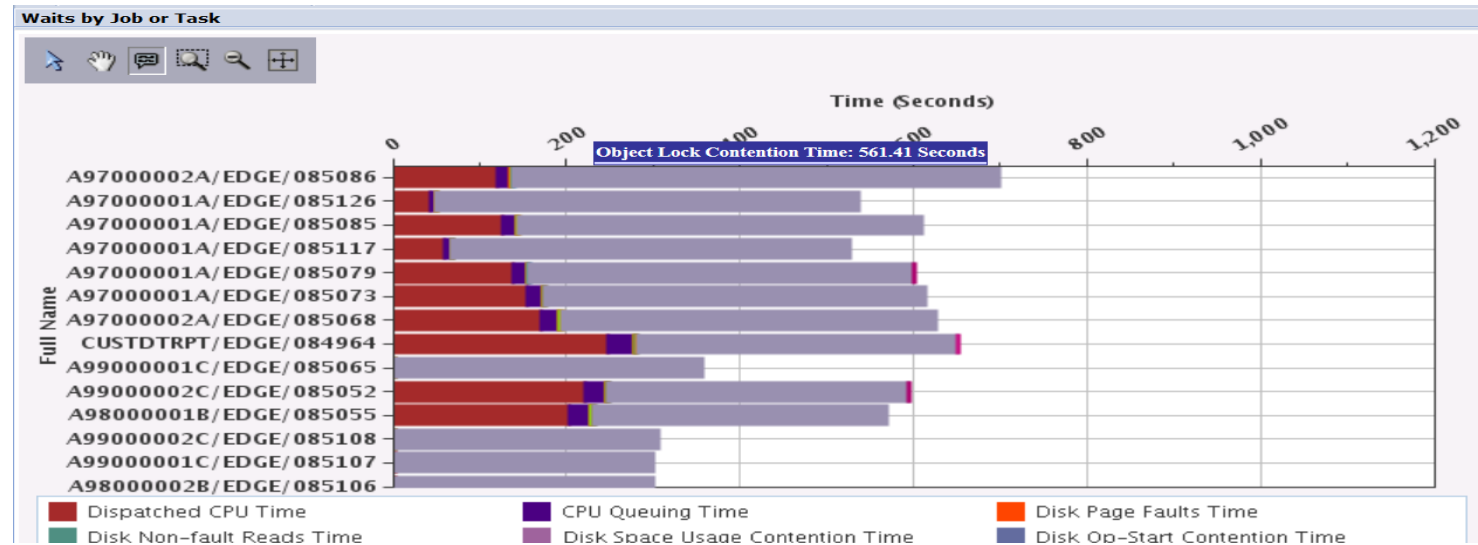
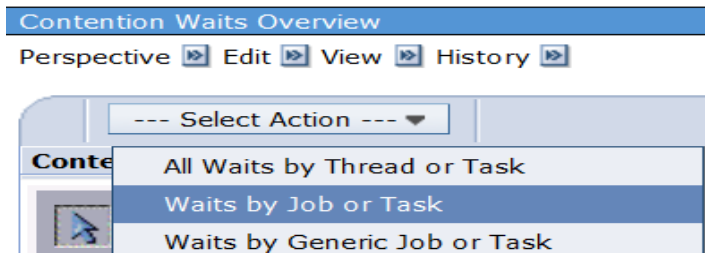


Using PDI, you can learn how to navigate through your data


Take a closer look at what type of contention waits are occurring:

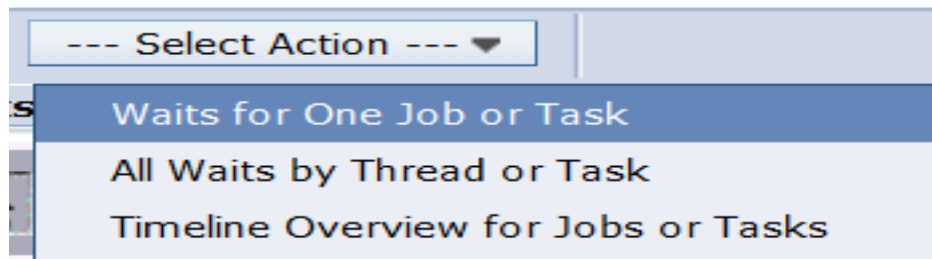


Which jobs/threads/tasks are affected by the wait time?

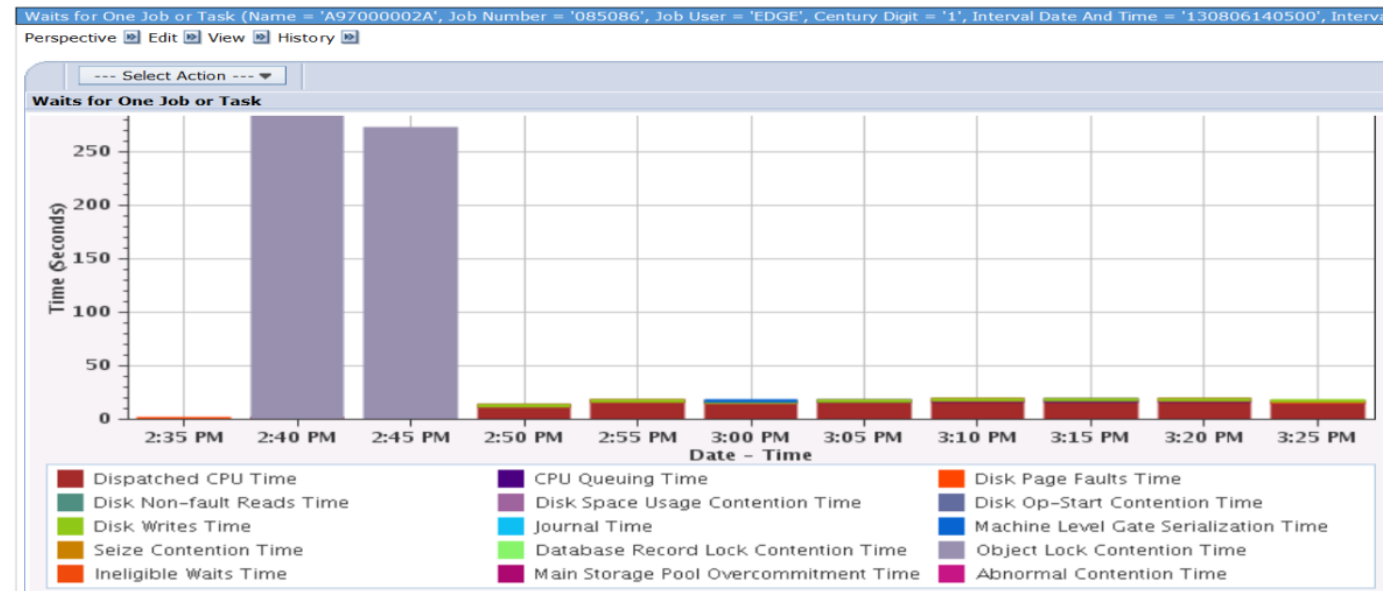


Drill-down based upon what you see

- Next, it may be interesting to see if the object lock wait time for a specific job occurred over several intervals, or just a few. Using select interactor , click on a job of interest, then select Waits for One Job or Task.



You may not be able to solve all performance problems with Collection Services data. However, you likely will gain valuable clues. Job Watcher is a good next step for this issue.



Recommendations

- If you are not using PDI, give it a try!

Remember, all partitions IBM i 6.1 and later can access the majority of the charts shown in this presentation – without installing/purchasing anything additional!!

- Stay current on PTFs
- Become familiar with your system's performance "signature" – it will make it easier to spot changes
- Keep baseline performance data

References



IBM i Performance FAQ a MUST read!

- *Spring 2019 update:*

<https://www-01.ibm.com/common/ssi/cgi-bin/ssialias?htmlfid=POW03102USEN>

IBM Power Systems Performance



IBM i on Power - Performance FAQ
May 6, 2019

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- IBM Knowledge Center:
 - [7.2 Performance](#)
 - [7.3 Performance](#)
- IBM i Performance Management:
 - [i Performance Management](#)
- developerWorks:
 - IBM i Performance Tools: [developerWorks Performance Tools](#)
 - IBM i Performance Data Investigator: [developerWorks PDI](#)
- IBM iDoctor for IBM i: [iDoctor](#)
- IBM i Wait Accounting information:
 - [Job Waits Whitepaper](#)
 - [KnowledgeCenter: The basics of Wait Accounting](#)
 - [developerWorks: IBM i Wait Accounting](#)

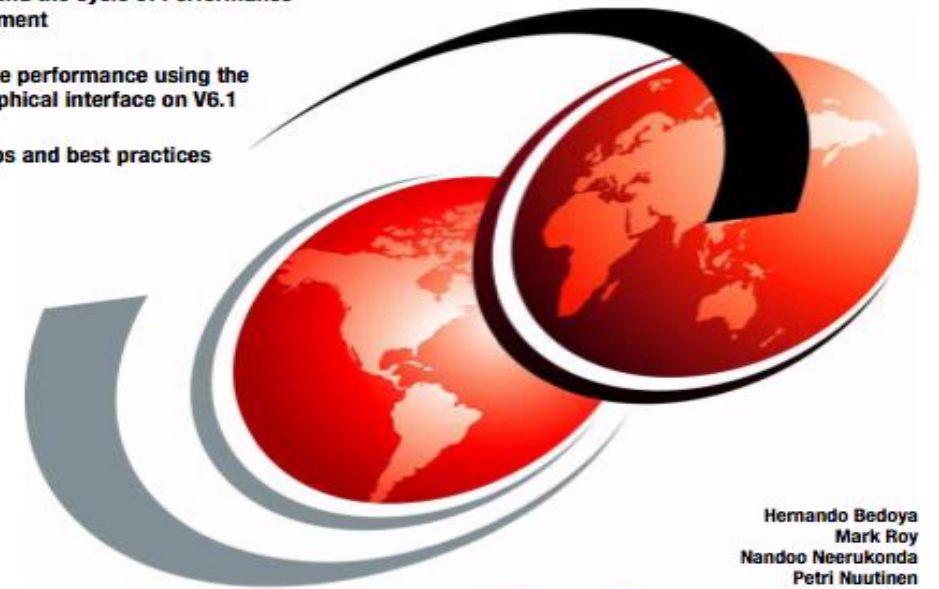
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End to End Performance Management on IBM i

Understand the cycle of Performance
Management

Maximize performance using the
new graphical interface on V6.1

Learn tips and best practices



Hernando Bedoya
Mark Roy
Nandoo Neerukonda
Petri Nuutinen

Redbooks

ibm.com/redbooks

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

IBM i 7.2 Technology Refresh Updates

**Covers the 7.2 content through
Technology Refresh 1**

Section 2.8 – Performance

**Section 8.6.7 – Job level SQL stats in
Collection Services**

Draft Document for Review December 10, 2014 2:51 pm

IBM
SG24-8249-00

IBM i 7.2 Technical Overview with Technology Refresh Updates

Covers new functions and enhancements
through IBM i 7.2 TR1

Easy to use web-based system
management

Integrated Data-Centric
approach



IBM i Performance Analysis Workshop



Learn the science and art of performance analysis, methodology and problem solving

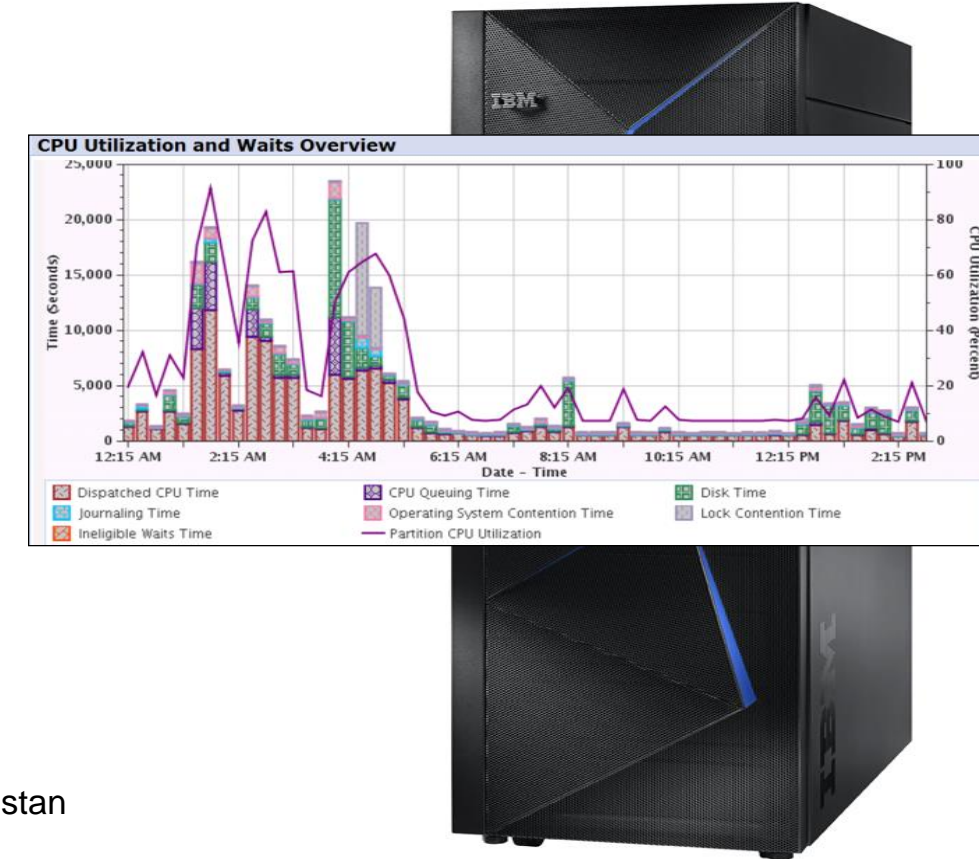
Managing and analyzing the data can be quite complex. During this workshop, the IBM Systems Lab Services IBM i team will share useful techniques for analyzing performance data on key IBM i resources, and will cover strategies for solving performance problems. It will aid in building a future foundation of performance methodology you can apply in your environment.

Overview:

- Topics covered include:
 - Key performance analysis concepts
 - Performance tools
 - Performance data collectors (Collection Services, Job Watcher, Disk Watcher, and Performance Explorer)
 - Wait accounting
- Core methodology and analysis of:
 - Locks
 - Memory
 - I/O subsystem
 - CPU
- Concept reinforcement through case studies and lab exercises
- Discussions on theory, problem solving, prevention and best practices

Workshop details:

- Intermediate IBM i skill level
- 3-4 day workshop, public or private (on-site)
 - For general public workshop availability and enrollment:
[IBM i Performance Analysis Workshop](#)
 - For additional information, including private workshops, please contact Claude Roustan at claudio.roustan@fr.ibm.com - Opportunity Manager at Systems Lab Services



The IBM i Performance and Optimization team specializes in resolving a wide variety of performance problems. Our team of experts can help you tune your partition and applications, including:

- Reducing batch processing times
- Resolving SQL query and native IO performance problems
- Tuning RPG, COBOL, C, and Java (including WebSphere Application Server) programs
- Removing bottlenecks, resolving intermittent issues
- 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
- Tuning client interfaces such as ODBC, JDBC, .Net and more

Skills transfer and training for performance tools and analysis also available!

Contact Claude Roustan at claudio.roustan@fr.ibm.com for more details.

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And finally.....





ithankyou

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