IBM i Performance Management and Performance Data Collectors

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Agenda

- Wait Accounting
- IBM i Performance Data Collectors
- Performance Data Investigator
What is Wait Accounting?

- Wait Accounting is the ability to determine what a job is doing when it is *not* running
  - When a job is not running, it is waiting
    - But what is it waiting for?
  - Waits may be normal, some waits are not normal
    - Wait Accounting helps to determine if a wait condition is a problem

- IBM i has instrumented most of the wait conditions
  - Wait information is collected by Collection Services and Job Watcher

- *i  Exclusive!*
What is Wait Accounting?

- Wait Accounting is used to understand what is happening when a job is waiting
  - Wait information is tracked for each job, thread and task on system

- A job spends its time in one of three states
  - CPU
    - Time spent dispatched to the processor, active/running
  - CPU queuing
    - Ready to be processed, waiting for a processor to become available
  - Wait
    - Waiting for something or someone, blocked or idle

Basics of Waiting

- **Two basic types of waits**
  - **Idle**: waiting for a work request
    - Typically not indicative of a problem
      - E.g., waiting for the “Enter” key to be pressed on a 5250 display session
    - If a problem, usually external to the machine
      - E.g., slow arrival of work requests due to communications problem
    - Possible, but not typical in batch jobs
      - E.g., waiting for an entry to be placed on a data queue
  - **Blocked**: waits that occur while performing a work request

- **Blocked** waits are the ones we want to take a closer look at
  - “Outside of CPU usage and CPU queue time, blocked waits are the reason jobs/threads take as long as they do to complete their work”
Holders and Waiters

- IBM i keeps track of who is holding a resource, and if applicable, who is waiting to access that resource
  - A **Holder** is the job/thread/task that is holding the serialized resource
  - A **Waiter** is the job/thread/task that wants to access the serialized resource

- IBM i maintains call stacks for every job/thread/task

- The combination of
  - wait accounting - the resource being waited for
  - holders and waiters - who has the resource and who is waiting for it
  - call stacks - how we got there

  provides a very powerful solution for analyzing wait conditions
Factors that Affect Performance

- User expectations
- Hardware capabilities and configuration
- Software
- Workload
- Network
Patterns in Performance Data

- Performance data typically has patterns
  - Daily, weekly, monthly, yearly
  - Understand your typical patterns
  - Recognize change
IBM i Performance Data Collectors

- There are four performance data collectors
  - Collection Services
  - Job Watcher
  - Disk Watcher
  - Performance Explorer

- All are included in the base OS as of 6.1
Collection Services

- Collection Services is an IBM i function that samples system and job level performance data

- IBM recommends you always run Collection Services
  - Collects performance data 24x7 with minimal overhead

- Collects data from many system resources

- Collects data at regular intervals from 15 seconds to 1 hour (default is 15 minutes)
  - Data initially stored in a management collection object
    - Can hold large quantities of performance data with minimal overhead

- Performance data is copied into database files
Why Collect Sample Data?

- Low overhead monitoring of system activity
  - How much of a resource is being consumed
  - By whom / when
  - Relationships between monitored data
- Problem analysis - indicators of what to look at
  - Identify job (using too much CPU, too much time waiting, high I/O counts)
  - Disk contention
- Trending
  - When will system run out of: CPU, disk, ....
- Capacity planning
Considerations – data impacts

- Busy system x Short interval = a lot of data

- Job data (*JOBMI and *JOBOS categories) are most likely to generate a lot of data

- System i Navigator monitors are often used with short interval

- Collector manages *MGTCOL objects (attribute *PFR only)

- However, with automatic CRTPFRDTA - watch for database files growth due to size or number of members
Manually Managing the Collector

- There are many ways to start the collector and manage the data that it collects
  - IBM Systems Director Navigator for i
  - System i Navigator
    - Need to install the “Configuration and Service” component on your client
  - Performance Tools Menu
    - Option 2 on GO PERFORM or STRPFRT
  - APIs
    - http://publib.boulder.ibm.com/infocenter/iseries/v6r1m0/topic/apis/perfmgmt_colsvc.htm
  - Commands
    - STRPFRCOL – Start Performance Collection
    - ENDPFRCOL – End Performance Collection
    - CFGPFRCOL – Configure Performance Collection
    - CHKPFRCOL – Check Performance Collection
Performance Data Management

- Collection Services will automatically expire data – but you should keep important collections for comparison
  - Past seven to ten days
    - Keeping the management collection objects is more important than the DB2 files
    - Key time periods & events, such as end-of-month or end-of-year processing, baseline prior to installing a new release
    - Back up key Collection Services data as you would business data

- Copy collection management objects to a separate library to prevent them from being automatically expired

- Review your Collection Services collection interval
  - Default is 15 minutes
  - Smaller intervals == more data

- Review your Collection Services cycle interval
  - Default is once daily at midnight
  - Select a time that will have minimal impact on critical business functions
Job Watcher

- Job Watcher returns real-time information about a selected set of jobs, threads, or LIC tasks

- Job Watcher collects different types of data than Collection Services, and more frequent intervals
  - Job Watcher has more overhead than Collection Services

- Data collected by Job Watcher includes
  - Wait times
  - CPU
  - I/O activity
  - Call Stacks
  - SQL statements
  - Communications statistics
  - Activation Group statistics

Run Job Watcher when you need detailed performance data for diagnostic purposes.

There are clients that run Job Watcher 24x7 to always have diagnostic data available.

Need to manage the data carefully.
Why use of Job Watcher?

- Most performance problems can be identified and resolved with Job Watcher
  - Job Watcher is the “tool of choice” for IBM Support and Lab Services consultants for IBM i performance analysis

- Identify and resolve performance problems due to wait conditions
  - Wait information, holders and waiters, call stacks

- Call stacks to identify program flow

- Identify issues with SQL performance
  - SQL statement details

- Shorter intervals for data collection
  - “As fast as possible” option

- More granular data collection specifications
  - One job to all jobs on the system
  - Many different ways to identify what data to collect
How Do I Run Job Watcher?

- **CL Commands available beginning with 6.1**
  - Add Job Watcher Definition (ADDJWDFN) to define the collection
    - Identifies the performance data that is to be collected
  - Remove Job Watcher Definition (RMVJWDFN) to remove a definition
  - Start Job Watcher (STRJW) to start the collection
  - End Job Watcher (ENDJW) to end the collection (optionally)

- Prior to 6.1, the iDoctor product is required to collect Job Watcher data

- Performance Tools Product, Option 3 (Job Watcher), is required for the Job Watcher GUI in IBM Systems Director Navigator
IBM-Supplied Job Watcher Definitions

- Several pre-defined Job Watcher definitions are available
  - The main difference is the sample intervals
    - Q1SEC* – 1 second intervals with call stacks, another to include SQL
    - Q10SEC* – 10 second intervals with call stacks, another to include SQL
    - Q5SEC* – 5 second intervals with call stacks
Disk Watcher

- Disk Watcher is a performance data collector for detailed disk performance
  - Near real-time diagnosis of disk performance issues
  - Statistical and Trace data
  - Data is written to DB2 files

- Data beyond that available in tools such as Work with Disk Status (WRKDSKSTS), Work with System Status (WRKSYSSTS), and Work with System Activity (WRKSYSACT)
  - These tools do provide information concerning: disk I/O, paging rates, CPU usage, and temporary storage usage

- Disk Watcher goes further by providing information related to the Task Dispatching Elements (TDEs), objects, and programs involved in the I/O operation

Run Disk Watcher when you need detailed performance data for disk I/O analysis.
Potential uses of Disk Watcher

- Evaluating the I/O performance of programs or workloads
  - Which jobs, threads and/or tasks cause the most I/O operations?
  - Which programs cause the most I/O operations?
  - Which objects are the target of I/O operations?

- Evaluating the performance of I/O operations on multi-path disk units

- Evaluating the performance of I/O queuing

- Determining how performance may be improved by re-spreadng data across units

- Determining the optimal placement of devices, IOAs, or buses
How Do I Run Disk Watcher

- Start Disk Watcher (STRDW) command on 5.4 via PTFs

- CL Commands available beginning with 6.1
  - Add Disk Watcher Definition (ADDDWDFN) to define the collection
    • Identifies the performance data that is to be collected
  - Remove Disk Watcher Definition (RMVDWDFN) to remove a definition
  - Start Disk Watcher (STRDW) to start the collection
  - End Disk Watcher (ENDDW) to end the collection (optionally)

- Performance Tools Product, Option 1 (Manager), is required for the Disk Watcher GUI in IBM Systems Director Navigator
Several pre-defined Disk Watcher definitions are available

- Start by looking at statistics and use a trace only if very detailed analysis is required
- QSTATS – collects statistical data (summarized into counts and times)
- QTRC – collects trace data (very detailed I/O information)
- QFULL – collects both statistical and trace data
Performance Explorer

- Performance Explorer help identify the causes of performance problems that cannot be resolved using one of the other performance data collectors
  - Collects more detailed information about a specific application, program, or resource

Performance Explorer is typically used for two main reasons:
- Detailed performance trace data is needed to identify the performance problem
- Analyzing the performance of applications
How Do I Run Performance Explorer?

- Start Performance Explorer (STRPEX) command

- CL Commands
  - Add Performance Explorer Definition (ADDPEXDFN) to define the collection
    - Identifies the performance data that is to be collected
  - Remove Performance Explorer Definition (RMVPEXDFN) to remove a definition
  - Start Performance Explorer (STRPEX) to start the collection
  - End Performance Explorer (ENDPEX) to end the collection (optionally)

- Print PEX Report command to print out the report
  - In the base operating system starting with IBM i 6.1

- PEX Analyzer is part of the IBM iDoctor product
## Performance Data Collectors - Positioning

<table>
<thead>
<tr>
<th>Collection Services</th>
<th>Disk Watcher</th>
<th>Job Watcher</th>
<th>Performance Explorer (PEX)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Sample data</td>
<td>• Statistics as well as Trace data</td>
<td>• Sample data</td>
<td>• Trace data</td>
</tr>
<tr>
<td>• Collected every 15 minutes (default)</td>
<td>• Focus on disk data</td>
<td>• Support for very small intervals</td>
<td>• Information collected for every I/O event</td>
</tr>
<tr>
<td>• No information concerning specific I/O operations</td>
<td></td>
<td>• Focus on job data</td>
<td>• Collection and analysis complex</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Call Stacks</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• SQL Statements</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Wait buckets</td>
<td></td>
</tr>
</tbody>
</table>

- **Less detail**
- **more detail**
Analyze Performance Data

- **Start with Collection Services data.**
  - Whether investigating a reported problem, monitoring how your system is running, or looking for improvement candidates, it can help
  - Use it to understand resource usage, what is or is not being used, how did it change, when did it happen, what is affected etc. Basically scope the problem

- **Where to start**
  - Health Indicators perspectives - Are any resources constrained?
  - Collection Services perspectives:
    - CPU Utilization and Waits Overview
      Any periods of high CPU or wait time? Does any type of wait stand out?
    - CPU utilization by Thread or Task – See who is using CPU time.
    - Resource Utilization Overview – time based comparison of disk busy, physical I/O, faulting, CPU, logical DB I/O and 5250 transactions. Does anything stand out here?

- Use drill downs and other perspectives based on what you found above and want to investigate further.
Analyze Performance Data (continued)

- Using the Collection Services data you should know what you need to investigate further
  - excessive CPU consumption, locking issues, disk utilization, …
  - when it happened
  - what resources were involved (jobs, disk units, ….)

- Collection Services cannot tell you details like what programs, instructions were running, objects, files, records, SQL statements being used, who is holding locks and who is waiting …

- You need to use tools like Job watcher, Disk Watcher and/or PEX for this in depth information.
  - Based on the Collection Services information you can focus these tools to collect only the data you need.
  - Generally, Job Watcher is used when you cannot identify the root cause with Collection Services
Understanding “Time Dispatched on a CPU”

Time dispatched on a CPU (Wait Bucket 1)
- Thread or task has been assigned to a processor and is NOT waiting
- Complicated by certain features
  - Hardware Multi Threading (HMT)
    - Allows multiple threads/tasks to be assigned to a single physical processor
    - Causes bucket 1 time to be greater than actual CPU time
  - Background assisting tasks
    - Promote their CPU usage back into the client job/thread
    - Causes client thread’s bucket 1 time to be smaller than measured CPU time
  - LPAR shared/partial processors
    - Bucket 1 records time dispatched to the virtual processor
    - Bucket 1 time may be greater than CPU time because it may include time the thread/task is waiting for the physical processor behind the virtual processor

Wait Bucket 1 does NOT equal CPU Time
Understanding “CPU Queuing”

CPU Queuing (Wait Bucket 2)

– Thread or task has been assigned to a processor and is waiting for the CPU to become available

  • Too much work on the partition causing threads to need to wait for the processors

    Spikey workloads

  • Shared processors

    Latency due to hypervisor is sharing the physical processors among multiple partitions
Disk Response Time

Disk Response Time may be the most important component in overall system performance in today's system

- Very fast processor technology, while disk performance has not yet made as much progress
  - Solid State Devices will have some impact here

- Rules of thumb for categories:
  - Good: Average response time less than 5 milliseconds
  - Normal: Average response time between 5 and 10 milliseconds
  - Requires analysis: anything over 10 milliseconds

- Alternatively - Establish disk response time objectives for a given application
  - This becomes your benchmark
  - Dividing the total disk response time per transaction by the average number of synchronous disk I/Os per transaction
  - Online Transaction Processing (OLTP) objectives will vary from batch processing because it may be more disk I/O intensive

http://ibmsystemsmagblogs.com/i_can/2010/05/-i-can-measure-disk-response-times.html
Disk Response Time Groups

- Disk Response Time Groups were added in 6.1, enhanced in 7.1
  - Response time *measured* at the I/O Device Driver level
  - Counts are incremented in the appropriate response time group
  - Can get a histogram of the disk response times and easily identify if you have slow disk operations
  - 7.1
    - Time is in microseconds instead of milliseconds
    - Read and write times into separate groups
    - Data is stored in separate file, QAPMDISKRB
Disk Response Time Groups - comparison

6.1

Range 1:  0  <  1ms;
Range 2:  1ms  <  16ms;
Range 3:  16ms  <  64ms;
Range 4:  64ms  <  256ms;
Range 5:  256ms  <  1,024ms;
Range 6:  >=  1,024ms;

7.1

Range 1:  0  <  15us;
Range 2:  15us  <  250us;
Range 3:  250us  <  1,000us;
Range 4:  1,000us  <  4,000us;
Range 5:  4,000us  <  8,000us;
Range 6:  8,000us  <  16,000us;
Range 7:  16,000us  <  64,000us;
Range 8:  64,000us  <  256,000us;
Range 9:  256,000us  <  500,000us;
Range 10: 500,000us  <  1,024,000us;
Range 11:  >=  1,024,000us;
IBM i Systems Director Navigator
Performance Tasks
IBM Systems Director Navigator for i

- IBM Systems Director Navigator for i is the Web console for managing IBM i
  - Much of the function that exists in System i Navigator, but with a browser user interface
    - Simply point your browser to http://systemname:2001
Updates to the Performance Data Investigator

- Major enhancements have been made to the Performance Data Investigator
  - For the latest 7.1 support
    • install the latest level of group PTF SF99368
  - For the latest 6.1 support
    • Install the latest level of group PTF SF99115


http://ibmsystemsmagblogs.com/i_can/2011/05/new-systems-director-navigator-service-packs.html
Performance Tasks

- “Performance” is a major function within this Web console
  - Investigate Data
  - Collections
  - All Performance Tasks
    - Active Jobs
    - Disk Status
    - System Status
    - Define, start, stop and manage performance data collectors
Managing Performance Collections

Allows you to manage the performance data of your system.

### Collections

<table>
<thead>
<tr>
<th>Select</th>
<th>Name</th>
<th>Library</th>
<th>Type</th>
<th>Status</th>
<th>Started</th>
<th>Ended</th>
<th>Size MB</th>
<th>System</th>
<th>Version</th>
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<td>Q023093321</td>
<td>FORMANPT</td>
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</table>

### Copy Options
- Copy
- Delete
- Save
- Investigate Data
- Properties
Investigate Data Prerequisites

- IBM i for Collection Services, Health Indicators

- Performance Tools product for Disk Watcher, Performance Explorer, Job Watcher features
  - 5761PT1 for 6.1
  - 5770PT1 for 7.1

- IBM Performance Tools for i
- Performance Tools - Manager Feature
  - Disk Watcher, Performance Explorer
- Performance Tools - Agent Feature
- Performance Tools - Job Watcher
Prerequisites

IBM Performance Tools – Manager feature

IBM Performance Tools – Manager feature

IBM Performance Tools – Job Watcher feature

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

- Users need to be authorized to use the investigate data and collection manager performance tasks

- Include users on the QPMCCDATA authorization list

```
Edit Authorization List

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

Type changes to current authorities, press Enter.

<table>
<thead>
<tr>
<th>Object</th>
<th>Authority</th>
<th>Mgt</th>
</tr>
</thead>
<tbody>
<tr>
<td>*PUBLIC</td>
<td>*EXCLUDE</td>
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<td>QSYS</td>
<td>*ALL</td>
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<td>*USE</td>
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<tr>
<td>PDI09</td>
<td>*USE</td>
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</table>
```

More...
Prerequisites, continued

- To see the Disk Watcher definitions through the GUI, users need authority to the QAPYDWDFN file in QUSR SYS
  - File is shipped with *PUBLIC *EXCLUDE

- To see the Job Watcher definitions through the GUI, users need authority to the QAPYJWDFN file in QUSR SYS
  - File is shipped with *PUBLIC *EXCLUDE

- It is recommended to change the “Create Performance Summary” (CRTPFRSUM) option on CFGPFRCOL to *YES
  - Or use the Create Performance Summary (CRTPFRSUM) command to create this summary data for existing collections

  - The performance summary data can help the queries used by the Performance Data Investigator run faster
Investigate Data

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

Content Package is a set of perspectives that share a commonality (major theme).
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.
CPU Utilization and Waits Overview

Collection

Name(s): CS228229ND
Library: COMMON2
Type: Collection Services File Based Collection

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

System
Name: Release: V6R1M0

--- Select Action ---

CPU Utilization and Waits Overview

- Dispatched CPU Time
- CPU Queuing Time
- Operating System Contention Time
- Lock Contention Time
- Disk Time
- Ineligible Waits Time
- Journaling Time
- Partition CPU Utilization

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Optionally View Collection Information Details

Toggle on/off the detailed information regarding the collection:
- Collection name, library and type
- Start and end time
- Name of the system the data was collected on
- The release level of the collection

<table>
<thead>
<tr>
<th>Collection</th>
<th>Time</th>
<th>System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name(s): CS228229ND</td>
<td>Start: Feb 28, 2008 12:00:02 AM</td>
<td>Name:</td>
</tr>
<tr>
<td>Library: COMMON2</td>
<td>End: Feb 29, 2008 12:00:00 AM</td>
<td>Release: V6R1M0</td>
</tr>
<tr>
<td>Type: Collection Services File Based Collection</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

--- Select Action ---
Physical System Charts

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

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

http://ibmsystemsmagblogs.com/i_can/2009/10/i-can-display-cpu-utilization-for-all-partitions.html
Logical Partitions Overview
Requires Power 6 and IBM i 6.1 or later
Performance Explorer

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

System Resource Health Indicators

Investigate Data
Perspectives
- Disk Watcher
- Performance Explorer
- Job Watcher
- Collection Services
- Health Indicators
- System Resources Health Indicators
- CPU Health Indicators
- Disk Health Indicators
- Memory Pools Health Indicators
- Response Time Health Indicators

--- Select Action ---

System Resources Health Indicators

- Perspective Edit View History

Collection
Name(s): CS28229ND
Library: COMMON
Type: Collection Services File Based Collection

Time
Start: Feb 28, 2008 12:00:02 AM
End: Feb 29, 2008 12:00:00 AM
Release: V6R1M0

Intervals Distribution (Percent)

Performance Metric:
- CPU
- Disk
- Memory Pools
- S250 OLTP Response Time

Percentage of intervals with values under defined thresholds
Percentage of intervals with values above Action threshold
Percentage of intervals with values above Warning threshold
Scaled CPU

http://ibmsystemsmagblogs.com/i_can/2010/03/i-can-understand-scaled-cpu-time.html
Design Mode

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

### Investigate Data

#### Perspectives

- Disk Watcher
- Performance Explorer
- Job Watcher
- Collection Services
- Health Indicators

#### Selection

**Name**

Disk Watcher

**Description**

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

- Locked
- New Folder...
- New Perspective...
- Edit
- Advanced Edit
- Delete
- Move Up
- Move Down

#### Collection

**Collection Library**

- COMMON

**Collection Name**

- Most Recent

- Display
- Search
- Options
- Refresh Perspectives
- Close
Creating Custom Content Packages
Advanced Edit – Edit the markup language directly

Performance Markup Language (PML) Text:

```xml
<?xml version="1.0" encoding="UTF-8"?>
<perspective description="Test" id="perspective_ID_504772_ccp" label="Testing" locked="false">
  <view class="com.ibm.as400.pt.viewer.views.ChartView"
        id="view_ID_504773_ccp" label="Custom Chart">
    <chartProperties transposeAxes="false">
      <dataSeries chartType="line" renderMode="clustered">
        <domain>
          <field value="INTNUM"/>
        </domain>
        <range>
          <field backgroundColor="RANDOM" color="RANDOM" pattern="RANDOM" value="#B8F"/>
        </range>
      </dataSeries>
    </chartProperties>
    <dataSet>
      <from>
        <field value="QAPMJOBOS"/>
      </from>
      <select>
        <field value="INTNUM"/>
        <field value="DTETIM"/>
        <field value="INTSEC"/>
        <field value="DTECEN"/>
        <field value="JBNNAME"/>
        <field value="JBUSER"/>
        <field value="JBNBR"/>
      </select>
    </dataSet>
  </view>
</perspective>
```
Design Mode – Edit View

CPU Utilization and Waits Overview

Perspective: Edit View History

Collection

Name(s): Q071123119
Library: COMMON2
Type: Collection Services File Based Collection

--- 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

Edit View

Export
Modify SQL
Size next upgrade
Change Context
Show as table

Time (Seconds)

View

Name: CPU Utilization and Waits Overview
Type: Table Chart

Data Set

Modify SQL

Drilldown

Tech_Sales2
Health Indicators
System Resources Health Indicators
CPU Health Indicators
Disk Health Indicators
Memory Pools Health Indicators
Response Time Health Indicators
Collection Services
CPU Utilization and Waits Overview
CPU Utilization by Thread or Task
Resource Utilization Overview
Job Statistics Overviews
Waits
Waits Overview
Seizes and Locks Waits Overview
Contention Waits Overview
Disk Waits Overview
Journal Waits Overview
Classic JVM Waits Overview
All Waits by Thread or Task

IBM Power Systems
Design Mode – Edit View

Chart Properties

- Transpose Axes

Data Series

- Group0 Partition CPU Utilization
  - Add...
  - Edit...
  - Delete
  - Move Up
  - Move Down

Thresholds

- [Empty]
  - Add...
  - Edit...
  - Delete

Add Data Series

- Domain: Date - Time
- Range: Available
  - Interval Number
  - 100 Percent Utilization
- Selected
  - Add >>
  - Remove <<

- Type: Line (poly)
- Breakdown: None
- Tooltip fields: None
  - Interval Number
  - Date - Time
  - Partition CPU Utilization
  - Dispatched CPU Time
  - CPU Queuing Time

Add Threshold

- Name
- Field: Lock Contention Time
- Color: Random
- Current Value: Seconds
- Default Value: Seconds
- Reset to Default Value
- Update to Current Value

OK
Cancel
Modify SQL – customize the queries

```sql
SELECT QSY.INTNUM, QSY.CSDTETIM AS CSDTETIM, MAX(PCTSYSCPU) AS PCTSYSCPU, SUM(TIME01) * .000001 AS W01, SUM(TIME02) * .000001 AS W02, SUM(TIME03 + TIME06 + TIME07 + TIME08 + TIME09 + TIME10) * .000001 AS W0350607080910, SUM(TIME11) * .000001 AS W11, SUM(TIME14 + TIME15 + TIME19 + TIME32) * .000001 AS W14151932, SUM(TIME16 + TIME17) * .000001 AS W1617, SUM(TIME18) * .000001 AS W18, 100 AS PCT100, DTETIM AS DTETIM, DTCECN AS DTCECN
FROM (SELECT DTCECN || DTETIM AS CSDTETIM, DOUBLE(JWTM01) AS TIME01, DOUBLE(JWTM02) AS TIME02, DOUBLE(JWTM05) AS TIME05, DOUBLE(JWTM06) AS TIME06, DOUBLE(JWTM07) AS TIME07, DOUBLE(JWTM08) AS TIME08, DOUBLE(JWTM09) AS TIME09, DOUBLE(JWTM10) AS TIME10, DOUBLE(JWTM11) AS TIME11, DOUBLE(JWTM14) AS TIME14, DOUBLE(JWTM15) AS TIME15, DOUBLE(JWTM16) AS TIME16, DOUBLE(JWTM17) AS TIME17, DOUBLE(JWTM18) AS TIME18, DOUBLE(JWTM19) AS TIME19, DOUBLE(JWTM32) AS TIME32
FROM QTEMP.COMMON2QAPMSYSQ001123119) WAITS INNER JOIN (SELECT INTNUM, DTCECN || DTETIM AS CSDTETIM, INTSEC, DEC(SYSTOU.DOUBLE(SYSCTA) * 100, 28, 2) AS PCTSYSCPU
FROM QTEMP.COMMON2QAPMSYSQ001123119 QSY) QSY ON QSY.CSDTETIM = WAITS.CSDTETIM
GROUP BY QSY.INTNUM, QSY.CSDTETIM, DTETIM, DTCECN
ORDER BY CSDTETIM
```
Size Next Upgrade
Send data directly to the IBM Workload Estimator

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

Intended for a one-time sizing activity
Disk Watcher

**Investigate Data**

**Perspectives**
- Disk Watcher
  - Statistical Overview
    - 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

**Selection**

**Statistical Overviews**

**Description**

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

**Default Perspective**

Disk Statistical Overview

**Collection**

<table>
<thead>
<tr>
<th>Collection Library</th>
<th>Collection Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMMON</td>
<td>Most Recent</td>
</tr>
<tr>
<td></td>
<td>All</td>
</tr>
<tr>
<td></td>
<td>DAWNDW (*DWFIL)</td>
</tr>
<tr>
<td></td>
<td>DAWNDWFULL (*DWFIL)</td>
</tr>
<tr>
<td></td>
<td>DAWNDWSTAT (*DWFIL)</td>
</tr>
<tr>
<td></td>
<td>DAWNFULL (*DWFIL)</td>
</tr>
</tbody>
</table>
Disk Watcher – Statistical Overviews

Investigate Data

Perspectives > Disk Statistical Overview

Disk Statistical Overview

--- Select Action ---

Disk Statistical Overview

![Graph showing disk performance metrics over time]

- Other I/Os Per Second
- Writes Per Second
- Reads Per Second
- Average Write Response Time

**Date – Time**

8:03:00-04:28 AM  8:04:00-04:28 AM  8:05:00-04:28 AM  8:06:00-04:28 AM  8:07:00-04:28 AM  8:08:00-04:28 AM
Session 540006
Improve Your Job Performance Using Run-Wait Analysis
Job Watcher - CPU Utilization and Waits Overview

The graph shows the CPU utilization and waits overview over a period of time. The x-axis represents the date and time, while the y-axis represents the time in seconds. The graph includes different types of waits such as disk time, CPU queuing time, ineligible waits time, and journaling time. The data is presented in a time series format, allowing for the analysis of CPU performance and wait times over a specific period.
Investigate Data Enhancements

7.1 Enhancements
Disk Response Time Charts
Improved Integration with Active Jobs
Improved Integration with System and Disk Status

System Status -

Last refresh: 10/8/09 8:23:16 AM

<table>
<thead>
<tr>
<th>General</th>
<th>Total memory: 4,051.50 MB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jobs</td>
<td>Active Memory Pools</td>
</tr>
<tr>
<td>Processors</td>
<td></td>
</tr>
<tr>
<td>Memory</td>
<td>Memory Pools Health Indicators</td>
</tr>
<tr>
<td>Disk Space</td>
<td></td>
</tr>
<tr>
<td>Addresses</td>
<td></td>
</tr>
</tbody>
</table>

System disk pool

Capacity: 176.30 GB
Usage: 89.587 %

System Resources Health Indicators

Disk Status -

Refresh Elapsed time: 00:00:00

<table>
<thead>
<tr>
<th>Select</th>
<th>Unit</th>
<th>Type</th>
<th>Size (MB)</th>
<th>Select Action</th>
<th>Go</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 4326</td>
<td></td>
<td>35166</td>
<td>Investigate Disk Data</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 4327</td>
<td></td>
<td>70565</td>
<td>Start Disk Watcher</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3 4327</td>
<td></td>
<td>70565</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Page 1 of 1

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Performance Management Life-cycle

- Set Performance Objectives and Create a Baseline
- Collect Performance Data
- Real-time Monitoring
- Analyze Performance Data
- Tuning
- Historical Trending
- Capacity Planning
Performance Management Redbook

Focuses on 6.1 tools with Oct 2009 enhancements

Redbook number - SG24-7808
IBM Power Systems

IBM Systems Lab Services and Training Power Services

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- High Availability Services on Power Systems (including Advanced Copy Services for PowerHA™ on IBM i)
- Systems Director Services
- PowerCare Services
- Performance and Scalability services (including system, application, and database tuning)
- Virtualization Services for AIX® on Power Systems™
- Application and database modernization consulting (SOA implementation)
- Linux® on Power consulting, custom application development, implementation, and optimization services
- Security on Power consulting and implementation services
- System consolidation and migration service
- High Performance Computing consulting and implementation services
- SAP® on IBM i consulting
- Power Blades on BladeCenter (including VIOS on i and blades running IBM i implementation)
- Smart Analytics services (including DB2® Web Query implementation and consulting)
- Public, private, customized and self-paced virtual training
- Power Systems Technical University

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IBM i Solid State Drive Performance Services

Evaluate the benefits of SSD technologies with IBM i based applications

Features

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

Typical Benefits

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

Contact

- To initiate these services, submit a request form at url: http://www.ibm.com/systems/services/labservices/psscontact.html

Why IBM® Rochester?

- Deep skills in IBM i implementation and integration
- Experience in system, database, and application performance gleaned from hundreds of engagements with clients across most industries
- Ability to deliver skills transfer as part of your service engagement

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IBM i Web Sites with Performance Information

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

- IBM i Performance Management
  http://www-03.ibm.com/systems/i/advantages/perfmgmt/

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

- IBM Workload Estimator
  http://www.ibm.com/systems/support/tools/estimator

  - IBM i Performance Data Investigator
  - IBM i Performance Data Investigator – Edit Perspectives

- Job Waits Whitepaper

- IBM Systems Director

- IBM Tivoli Monitoring

- IBM Tivoli Monitoring Agent for i5/OS
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