Monitoring DB2 for z/OS Performance Using RMF

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RMF product structure

Windows 9x / 2K / XP

Linux

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RMF Monitoring of DB2

- WLM Goal Reporting for DB2 Workloads
  - DB2 Started Task Address Spaces
  - DDF Work

- Utilization of zIIPs and zAAPs

- Blocked Workload Reporting

- Using RMF Mon III

WLM workload adjustment overview

- WLM adjustment policies try to meet workload goals
- WLM compares periods, SRM adjusts address spaces!
- SMF records can show the information input to WLM
Performance index

- Separate PI is calculated for each service class period, across all sysplex hosts
- Different calculations produce a comparable value from different goal types

Performance Index (PI)

- Ratio of goal performance to actual performance

Policy adjustment cycle

- Receiver: Service class period not meeting goal by: Importance and Highest PI
- Donor: Service Class period meeting goal by: Lowest PI
- Fix Routines: Give Resource from Donor to Receiver
- Look for discretionary donor by: PI < 0.7, Goal: vel less or 30% or Resp > 1 Min
- Receiver was selected. Go ahead for discretionary goal.

- Stop
- Adjustment is made on the basis of selected service class periods

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### Enclave services: Additional dispatching units

- **Standard dispatching**
  - **Dispatchable units (DUs)** are the TCB and the SRB
    - TCB runs at dispatching priority of address space and is pre-emptible
    - SRB runs at supervisory priority and is non-pre-emptible
  - **Advanced dispatching units**
    - **Enclave**
      - Anchor for an address space-independent transaction managed by WLM
      - Can comprise multiple DUs (TCBs and Enclave SRBs) executing across multiple address spaces
  - **Client SRB**
    - Created and executed like an ordinary SRB but runs with client (scheduler) dispatching priority and is pre-emptible
  - **Enclave SRB**
    - Created and executed like an ordinary SRB but runs with Enclave dispatching priority and is pre-emptible
  - **Enclave Services** enable a workload manager to create and control enclaves
Enclave reporting: RMF monitor III

- Displays Enclaves active at the end of the reporting interval
- Statistics provided
  - Recent and total CPU consumption
  - Using / delay data

<table>
<thead>
<tr>
<th>Enclave</th>
<th>Attribute</th>
<th>CLS/GRF</th>
<th>P Goal</th>
<th>% D</th>
<th>EAppl%</th>
<th>TCPU</th>
<th>USG</th>
<th>DLY</th>
<th>IDL</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENC00002</td>
<td>DDF</td>
<td>DDFWORK</td>
<td>1</td>
<td>70</td>
<td>12.60</td>
<td>1.260</td>
<td>50</td>
<td>50</td>
<td>0.0</td>
</tr>
<tr>
<td>ENC00001</td>
<td>IWEB</td>
<td>WEBMISC</td>
<td>1</td>
<td>20.0</td>
<td>9.181</td>
<td>0.918</td>
<td>13</td>
<td>88</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Enclave reporting: SDSF ENC panel

- Snapshot reporting
  - Shows Enclave attributes (subsystem type, SC, Owner, ...)
  - Shows total CPU time since Enclave transaction started
- Reset capability
  - Reset to new service class
  - Quesce the Enclave
  - Resume (reclassify) the Enclave
Enclave Transaction Service Class

System z virtualization via PR/SM technology

- 1 to 60 LPARs per CEC
- 1 to 54 PUs per CEC
- Operating Systems don’t know they are not running directly on the hardware
- PR/SM™ is managing the resource allocations based on installation controls
  - PUs can be defined as shared among the LPARs or dedicated to a specific LPAR

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Specialty CP Overview

- Specialty engines for the mainframe designed to help:
  - Customers integrate data across the enterprise
  - Improve resource optimization and lower the cost of ownership for eligible workloads
  - Attractively priced, much lower than standard CPs
  - Significantly lower maintenance costs than standard CPs
  - Traditional IBM System z software charges unaffected
  - Sub-capacity eligible software charges can reduce

- z/OS manages and directs work between the general purpose processors and the Specialty CPs
  - Number of zAAP CPs not to exceed number of general CPs
  - Number of zIIP CPs not to exceed number of general CPs

IBM System z Application Assist Processor (zAAP)

- Available on IBM System z10, IBM System z9 and zSeries z990 and z890

- Used by any workload with Java cycles, e.g. WebSphere, CICS, Batch, DB2

- Executes Java code with no changes to applications

- Objective: Enable integration of new Java based Web applications with core z/OS backend database environment for high performance, reliability, availability, security, and lower total cost of ownership
How work is dispatched to zAAPs

- IBM JVM, parts of LE runtime, and z/OS Supervisor are needed to support JVM execution on zAAPs
- IBM JVM communicates to z/OS dispatcher when Java code is to be executed
- When Java is to be executed, the work unit is “eligible” to be dispatched on a zAAP
- zAAP ineligible work is only dispatched on general purpose processors

IBM System z Integrated Information Processor (zIIP)

- Speciality engine for the IBM System z9 and IBM System z10 mainframe
- Requires work to be run as an enclave SRB
- Exploiters work with z/OS to determine how much capacity should be redirected to a zIIP
- Exploiters must use licensed interface to enable exploitation
DB2 Exploitation of zIIP

• DB2 for z/OS V8 was the first IBM exploiter of the zIIP but requires:
  – IBM System z9 processor
  – z/OS 1.6 or later
  – DB2 for z/OS V8 (either compat mode or full-function mode)

• Portions of the following DB2 for z/OS workloads may benefit from zIIP*
  – Via DRDA over a TCP/IP connection
    • ERP, CRM, Business Intelligence or other enterprise applications
  – Requests that utilize DB2 complex parallel queries
    • Data warehousing applications*
  – DB2 for z/OS V8 utilities*
    • Internal DB2 utility functions used to maintain index maintenance structures

* The zIIP is designed so that a program can work with z/OS to have all or a portion of its enclave Service Request Block (SRB) work directed to the zIIP. The above types of DB2 work are those executing in enclave SRBs, of which portions can be sent to the zIIP.

DDF and enclave SRBs

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DB2 Parallel Query and zIIP

- Query CP Parallelism
  - Starts as Client SRB, then switches to enclave SRB to become zIIP eligible
  - Complex query originates here

- Sysplex Query Parallelism
  - Portions of complex query arrive on participant systems, classified under "DB2" rules, and run in enclave SRBs, so zIIP eligible

DB2 parallelism, WLM, and zIIPs

- DB2 Parallelism and zIIPs
  - Controlled by a CPU threshold. Once the threshold is met all child tasks are zIIP eligible
  - Parents are not zIIP eligible
  - Parent and child CPU time contribute to the CPU Threshold
  - Can see any kind of work, CICS, IMS, TSO, batch using zIIP resources
DB2 Stored Procedures and zIIP

- Task
  - Listens for requests coming from outside the system
  - Creates independent enclave
  - Schedules enclave SRB

- Task
  - Creates dependent enclave
  - Continuation of transaction CHARLIE

- Stored Procedure runs under a TCB, which joins the enclave of the caller.

zIIP Processor Workflow Characteristics

- Enclave SRBs are used to:
  - Schedule pre-emptable work
  - Associate multiple threads with same work unit and WLM policy
- DB2 runs work under:
  - Tasks
  - Client SRBs
  - Enclave SRBs
- Some DB2 enclave SRB work is zIIP capable
  - Complex parallel query processing
  - DRDA requests over TCP/IP
  - Index maintenance for some utilities
- When DB2 schedules an enclave SRB, it identifies to z/OS dispatcher which eSRBs are zIIP capable

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IEAOPT Specialty CP Parameters

- What to do when zIIP or zAAP needs help (ready work is waiting on the zIIP or zAAP dispatching queue)

<table>
<thead>
<tr>
<th>IFAHONORPRIORITY</th>
<th>GCP</th>
<th>zAAP</th>
</tr>
</thead>
<tbody>
<tr>
<td>YES</td>
<td>Process non-zAAP work in priority order including zAAP work in priority order when the zAAP needs help</td>
<td>Process only zAAP work in priority order</td>
</tr>
<tr>
<td>NO</td>
<td>Process no zAAP work. Do not process zAAP work even if the zAAP needs help</td>
<td>Process only zAAP work in priority order</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>IPHONORPRIORITY</th>
<th>GCP</th>
<th>zIIP</th>
</tr>
</thead>
<tbody>
<tr>
<td>YES</td>
<td>Process non-zIIP work in priority order including zIIP work in priority order when the zIIP needs help</td>
<td>Process only zIIP work in priority order</td>
</tr>
<tr>
<td>NO</td>
<td>Process no zIIP work. Do not process zIIP work even if the zIIP needs help</td>
<td>Process only zIIP work in priority order</td>
</tr>
</tbody>
</table>

Management of Work – HONORPRIORITY = YES

GCPs will help in priority order

Bucket captures GCP time spent providing help AAPCP, or IIPCP

All zAAPs Busy? zAAP work waiting? YES: Signal GCP for help

All zIIPs Busy? zIIP work waiting? YES: Signal GCP for help
Management of Work – HONORPRIORITY = NO

GCPs will never help

CPU Activity Report for Special CPs

CPU Activity

29 EC/BC
### CPU Activity Report for Special CPs

#### z9 EC/BC

**CPU 2094**
**Model 750**
**H/W Model S54**

<table>
<thead>
<tr>
<th>CPU Type</th>
<th>Percentage Time</th>
<th>Time Percentage</th>
<th>CPU Time</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>CP 0</td>
<td>100.00%</td>
<td>2.50</td>
<td>2.41</td>
<td>04B1</td>
</tr>
<tr>
<td>CP 1</td>
<td>100.00%</td>
<td>1.99</td>
<td>1.92</td>
<td>04B1</td>
</tr>
<tr>
<td>CP 2</td>
<td>100.00%</td>
<td>1.85</td>
<td>1.77</td>
<td>04B1</td>
</tr>
<tr>
<td>CP 3</td>
<td>100.00%</td>
<td>1.68</td>
<td>1.58</td>
<td>04B1</td>
</tr>
</tbody>
</table>

**CP TOTAL/AVERAGE**

| Time Percentage | 2.01 | 1.92 |

**AAP**
<table>
<thead>
<tr>
<th>Percentage Time</th>
<th>Time Percentage</th>
<th>AAP Time</th>
<th>AAP Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>100.00%</td>
<td>40.19</td>
<td>40.96</td>
<td>04B1</td>
</tr>
</tbody>
</table>

**AAP AVERAGE**

| Time Percentage | 20.25 | 20.63 |

**IIP**
<table>
<thead>
<tr>
<th>Percentage Time</th>
<th>Time Percentage</th>
<th>IIP Time</th>
<th>IIP Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>100.00%</td>
<td>0.29</td>
<td>0.17</td>
<td>04B1</td>
</tr>
</tbody>
</table>

**IIP AVERAGE**

| Time Percentage | 0.15 | 0.08 |

### z9 Partition Data Report with Special CPs

#### z/OS V1R7

**System ID** SYSD

**RPT VERSION** V1R7 RMF

---CPU---

<table>
<thead>
<tr>
<th>Partition Name</th>
<th>Number of Physical Processors</th>
<th>Image Capacity</th>
<th>CP</th>
<th>Number of Configured Partitions</th>
<th>Wait Completion</th>
<th>Dispatch Interval</th>
<th>ICF</th>
<th>IIP</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOSP4</td>
<td>12</td>
<td>1069</td>
<td>8</td>
<td>12</td>
<td>No</td>
<td>Dynamic</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>SOSP15</td>
<td>10</td>
<td>1069</td>
<td>2</td>
<td>1</td>
<td>No</td>
<td>Dynamic</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>SOSP16</td>
<td>10</td>
<td>1069</td>
<td>2</td>
<td>1</td>
<td>No</td>
<td>Dynamic</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>SOSP17</td>
<td>10</td>
<td>1069</td>
<td>2</td>
<td>1</td>
<td>No</td>
<td>Dynamic</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

**Average Processor Utilization Percentages**

<table>
<thead>
<tr>
<th>Partition Name</th>
<th>Number of Physical Processors</th>
<th>AAP Time</th>
<th>AAP Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOSP4</td>
<td>2</td>
<td>20.10</td>
<td>20.10</td>
</tr>
<tr>
<td>SOSP15</td>
<td>1</td>
<td>0.59</td>
<td>0.29</td>
</tr>
<tr>
<td>SOSP16</td>
<td>1</td>
<td>2.95</td>
<td>1.48</td>
</tr>
<tr>
<td>SOSP17</td>
<td>1</td>
<td>2.26</td>
<td>1.13</td>
</tr>
</tbody>
</table>

**IIP Time**

<table>
<thead>
<tr>
<th>Partition Name</th>
<th>Number of Physical Processors</th>
<th>AAP Time</th>
<th>AAP Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOSP4</td>
<td>2</td>
<td>0.55</td>
<td>0.05</td>
</tr>
<tr>
<td>SOSP15</td>
<td>1</td>
<td>0.06</td>
<td>0.05</td>
</tr>
<tr>
<td>SOSP16</td>
<td>1</td>
<td>0.24</td>
<td>0.13</td>
</tr>
<tr>
<td>SOSP17</td>
<td>1</td>
<td>0.24</td>
<td>0.13</td>
</tr>
</tbody>
</table>

**TOTAL**

<table>
<thead>
<tr>
<th>AAP Time</th>
<th>AAP Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.05</td>
<td>0.05</td>
</tr>
</tbody>
</table>

**IIP Time**

<table>
<thead>
<tr>
<th>Partition Name</th>
<th>Number of Physical Processors</th>
<th>IIP Time</th>
<th>IIP Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOSP4</td>
<td>2</td>
<td>0.55</td>
<td>0.05</td>
</tr>
</tbody>
</table>

**TOTAL**

<table>
<thead>
<tr>
<th>IIP Time</th>
<th>IIP Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.05</td>
<td>0.05</td>
</tr>
</tbody>
</table>
### z9 Partition Data Report with Special CPs

<table>
<thead>
<tr>
<th>MVS PARTITION NAME</th>
<th>SOSP4</th>
<th>NUMBER OF PHYSICAL PROCESSORS</th>
</tr>
</thead>
<tbody>
<tr>
<td>IMAGE CAPACITY</td>
<td>1069</td>
<td>CP</td>
</tr>
<tr>
<td>NUMBER OF CONFIGURED PARTITIONS</td>
<td>12</td>
<td>AAP</td>
</tr>
<tr>
<td>WAIT COMPLETION</td>
<td>NO</td>
<td>IFL</td>
</tr>
<tr>
<td>DISPATCH INTERVAL</td>
<td>DYNAMIC</td>
<td>ICF</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NAME</th>
<th>S</th>
<th>WGT</th>
<th>DEF</th>
<th>ACT</th>
<th>NUM</th>
<th>TYPE</th>
<th>EFFECTIVE</th>
<th>TO</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOSP4</td>
<td>A</td>
<td>500</td>
<td>0</td>
<td>4</td>
<td>4</td>
<td>CP</td>
<td>00.00.04.349</td>
<td>00.00.04.814</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NAME</th>
<th>S</th>
<th>WGT</th>
<th>DEF</th>
<th>ACT</th>
<th>NUM</th>
<th>TYPE</th>
<th>EFFECTIVE</th>
<th>TO</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOSP15</td>
<td>A</td>
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<td>0</td>
<td>2</td>
<td>2</td>
<td>CP</td>
<td>00.00.01.593</td>
<td>00.00.02.541</td>
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<tr>
<td>SOSP16</td>
<td>A</td>
<td>10</td>
<td>0</td>
<td>4</td>
<td>2</td>
<td>CP</td>
<td>00.00.04.305</td>
<td>00.00.05.208</td>
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<tr>
<td>SOSP17</td>
<td>A</td>
<td>10</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>CP</td>
<td>00.00.02.671</td>
<td>00.00.03.614</td>
</tr>
</tbody>
</table>

### Specialty CP Work Running in a WLM Service Class

**REPORT BY:** POLICY=WLMPOL  WORKLOAD=BAT_WKL  SERVICE CLASS=BATSPEC  RESOURCE GROUP=BATMAXRG

**TRANSACTIONS**

- AVG 0.98 ACTUAL
- MPL 0.98 EXECUTION
- ENDED 10 QUEUED
- END/S 0.17 R/U AFFIN
- EXCTD 0 CONVERSION
- AVG ENC 0.00 STD DEV

**GOAL:** EXECUTION VELOCITY 35.0%  VEL% INDX ADRSP  CPU

**SYSTEMS**

- SYSD --N/A--

**SYSD GROUPS**

- NAME-- DESCRIPTION-- -SERVICE- ACTUAL --CAPACITY--
- --CLASS CONSUMED  MIN  MAX
- BATMAXRG 11K 6000

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## Specialty CP Work Running in a WLM Service Class

<table>
<thead>
<tr>
<th>WORKLOAD</th>
<th>SERVICE CLASS</th>
<th>RESOURCE GROUP</th>
</tr>
</thead>
<tbody>
<tr>
<td>BAT_WKL</td>
<td>BATSPEC</td>
<td>BATMAXRG</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TIME</th>
<th>MM.SS.MS.TTT</th>
<th>--DASD I/O--</th>
<th>---SERVICE----</th>
<th>SERVICE TIMES</th>
<th>---APPL %---</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.520</td>
<td>11.5</td>
<td>8326</td>
<td>CPU 24.7</td>
<td>CP 0.97</td>
<td></td>
</tr>
<tr>
<td>6.128</td>
<td>7.0</td>
<td>CPU 662386</td>
<td>SRB 0.0</td>
<td>AAPCP 0.01</td>
<td></td>
</tr>
<tr>
<td>391</td>
<td>6.9</td>
<td>MEO 0</td>
<td>RCT 0.0</td>
<td>IIPCP 0.00</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>DISC 0.0</td>
<td>SRB 965</td>
<td>IIT 0.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>Q+PEND 0.1</td>
<td>TOT 671677</td>
<td>HST 0.0</td>
<td>AAP 40.27</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>IOSQ 0.0</td>
<td>/SEC 11195</td>
<td>AAP 24.2</td>
<td>IIP 0.00</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

0% VELOCITY MIGRATION: I/O MGMT 99.2% INIT MGMT 92.2%

## Projecting zAAP and zIIP Usage with RMF

- Enabled with PROJECTCPU Parm in IEAOPTxx

<table>
<thead>
<tr>
<th>SERVICE TIMES</th>
<th>---APPL %---</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU 1905.9</td>
<td>CP 232.70</td>
</tr>
<tr>
<td>SRB 0.0</td>
<td>AAPCP 0.00</td>
</tr>
<tr>
<td>RCT 0.0</td>
<td>IIPCP 83.26</td>
</tr>
<tr>
<td>IIT 0.0</td>
<td></td>
</tr>
<tr>
<td>HST 0.0</td>
<td>AAP 0.00</td>
</tr>
<tr>
<td>AAP 0.0</td>
<td>IIP 0.00</td>
</tr>
<tr>
<td>IIP 509.7</td>
<td></td>
</tr>
</tbody>
</table>

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Blocked Workload Support Objectives

• Problem
  – Work competes for resources, serialized by locks and latches
    • Low import work may hold a resource and high important work may have to wait for it
• Solution
  – Resource Manager monitor the resource and detect lock and latch contention
    • Use WLM interfaces (SYSEVENT ENQHOLD/ENQRLSE) to promote the lock holder in order to resolve the contention quick
• But
  – Not all resources can be monitored
• System Assistance (WLM): Blocked Workload Support
  – Recognizes blocked work
    • Work which doesn’t show any progress for an elongated period of time
  – Allows this work to use a small amount of CPU periodically
    • With the hope to resolve existing (potential) resource contentions

Blocked Workload Support: IEAOPTxx

<table>
<thead>
<tr>
<th>BLWLTRPCT</th>
<th>Percentage of the CPU capacity of the LPAR to be used for promotion</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Specified in units of 0.1%</td>
</tr>
<tr>
<td></td>
<td>Default is 5 (=0.5%)</td>
</tr>
<tr>
<td></td>
<td>Maximum is 200 (=20%)</td>
</tr>
<tr>
<td></td>
<td>Would only be spent when enough units of work exist which need promotion</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BLWLINTHD</th>
<th>Specifies threshold time interval for which a blocked address space or enclave must wait before being considered for promotion.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Minimum is 5 seconds. Maximum is 65535 seconds.</td>
</tr>
<tr>
<td></td>
<td>• Default is 20 seconds.</td>
</tr>
</tbody>
</table>
Blocked Workload Support: RMF

- Extensions of RMF Postprocessor CPU Activity and WLMGL reports with information about blocked workloads and the temporary promotion of their dispatching priority

- SMF record 70-1 (CPU activity) and SMF 72-3 (Workload activity)

```
CPU ACTIVITY

BLOCKED WORKLOAD ANALYSIS

OPT PARAMETERS: BLWLTRPCT (%) 0.5 PROMOTE RATE: DEFINED 50000 WAITERS FOR PROMOTE: AVG 0.001

BLWLINTHD 60 USED (%) 95

PEAK 15
```

RMF Real-time reporting

- Covers all Sysplex related aspects
- Two monitors and a workstation extension
  - Monitor III, best suited for
    - Short-term real-time and historical reporting
    - Online performance analysis
    - Goal attainment supervision
    - Sysplex-wide and single-system reporting
    - Monitoring of exceptional conditions
  - Monitor II, best suited for
    - Snapshot reporting
    - Single job and resource monitoring
- RMF PM / Data Portal
  - Enterprise-wide reporting of z/OS systems
  - Based on RMF Monitor III data
RMF Monitor III reporting

- Monitor III Delay Monitoring
  - Processor
  - Storage
  - Device
  - Enqueue
  - Operator
    - Message
    - Tape Mount
    - Subsystem
      - HSM - JES - XCF
  - Monitor III Activity Monitoring
    - Common Storage
    - Page/Swap Data Sets
    - Storage Frames
    - Device
    - Data Set Level by Job and Volume
    - Cache
    - Coupling Facility
    - Goal Attainment
    - VSAM RLS
    - UNIX System Services
    - Enclaves

- Monitor III Features
  - Cursor-Sensitive Navigation
  - Workflow/Exceptions Monitoring
  - Support of WTO Messages
  - Automatic Customization
  - Continuous Monitoring
  - Hardcopy Reports
  - On-Line Tutorial
  - On-Line Help
  - Adaptive Reports
  - User Reports
  - GDDM Graphic
  - Sysplex-wide Reports
  - Remote Reporting

Monitor III: States of a job

\[ \text{Using}(\%) = \frac{\text{using samples}}{\text{number of samples}} \times 100 \]

\[ \text{Delay}(\%) = \frac{\text{delay samples}}{\text{number of samples}} \times 100 \]

\[ \text{Workflow}(\%) = \frac{\text{using samples} + \text{delay samples}}{\text{using samples} + \text{delay samples}} \times 100 \]
Monitor III: Job delays

Monitor III: Workflow/exceptions

Address Space Performance at a Glance!
- sorted by ascending Workflow
- Delay Type Breakdown
- Delay Reason Information

Bottleneck Detection at a Glance!
- Workflow for Groups and Resources
- Exception Lines for individual Conditions
## Monitor III: Goal attainment

### WLM Samples: 240 Systems: 3 Date: 05/15/02 Time: 13.00.00 Range: 60 Sec

### Service Definition: RMF Installed at: 12/06/00, 10.07.24

### Active Policy: STANDARD Activated at: 12/06/00, 10.07.33

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Sysplex Performance at a Glance!
- 80 Intervals in GO Mode
- Colored Indication for PI > 1
  * Importance = 1
  * Importance > 1

### RMF Monitoring of DB2

- **WLM Goal Reporting for DB2 Workloads**
  - DB2 Started Task Address Spaces
  - DDF Work

- **Utilization of zIIPs and zAAPs**

- **Blocked Workload Reporting**

- **Using RMF Mon III**