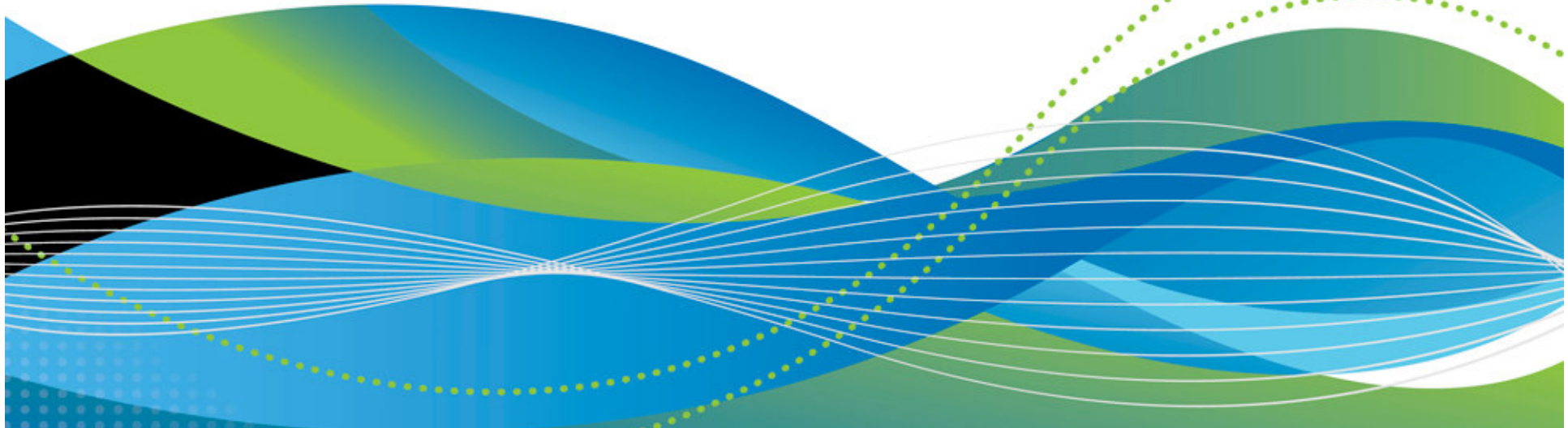


z/OS Workload Management Update for z/OS V1.13 and V1.12

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Agenda

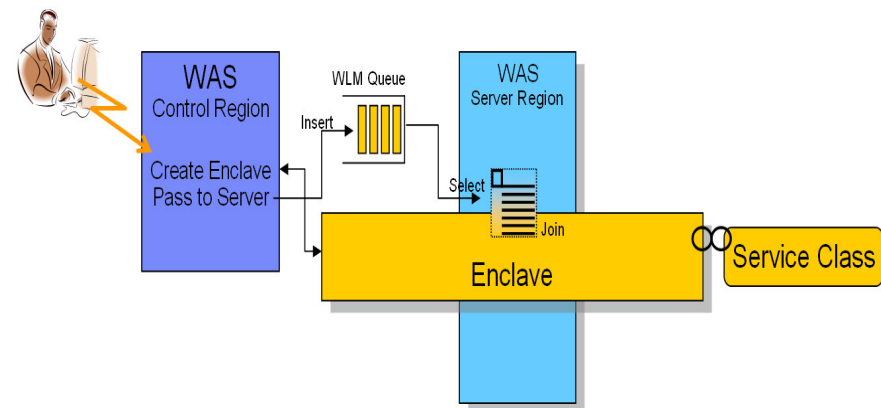
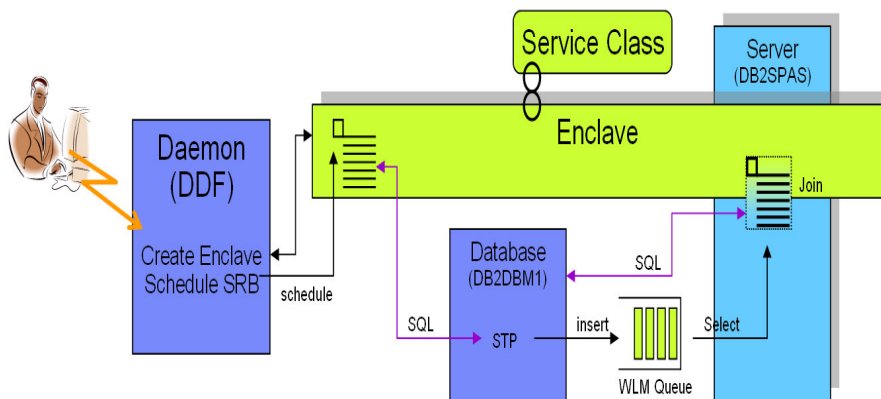


- Transaction Management Enhancements
 - Non Shell Enclave Server Management
 - CICS Region / Response Time Management
 - Response Time Distribution for Execution Velocity Goals
- Hiperdispatch APARs
- WLM Support for I/O Priority Manager in DS8K Series
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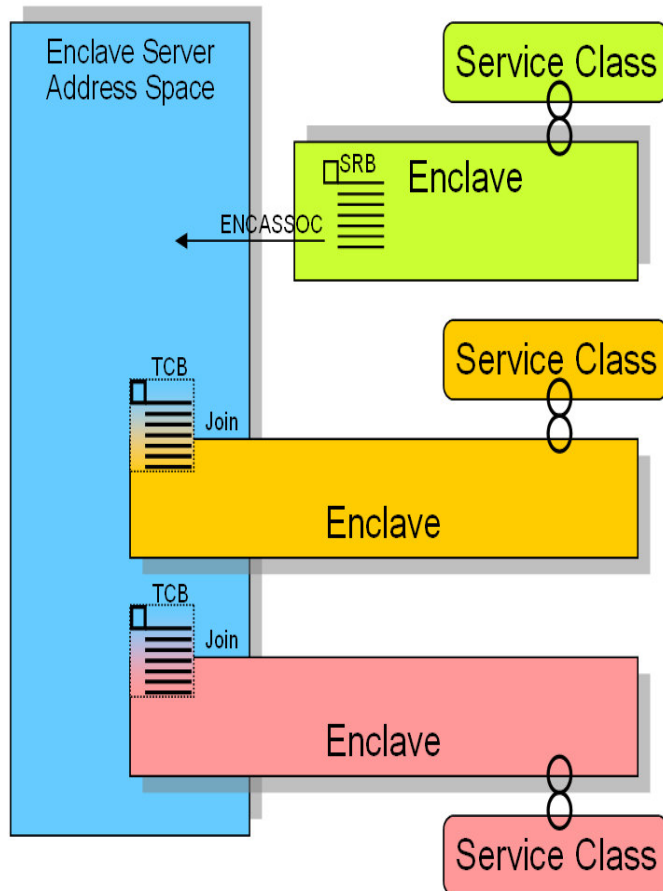
WLM Enclaves: A short review



- An **enclave** is a transaction that can span multiple dispatchable units (SRBs and tasks) in one or several address spaces and is reported on and managed as one unit
- The enclave is managed separately from the address spaces it runs in
 - CPU and I/O resources associated with processing the transaction represented by the enclave are managed by the transaction's performance goal
 - Storage (MPL level, paging) of the address space is managed to meet the goals of the enclaves it serves (if enclave server address space) or to the performance goal of the address space (if no server address space)
- Typical exploitation through DB2 and Websphere



WLM Enclave Server Management: A short review

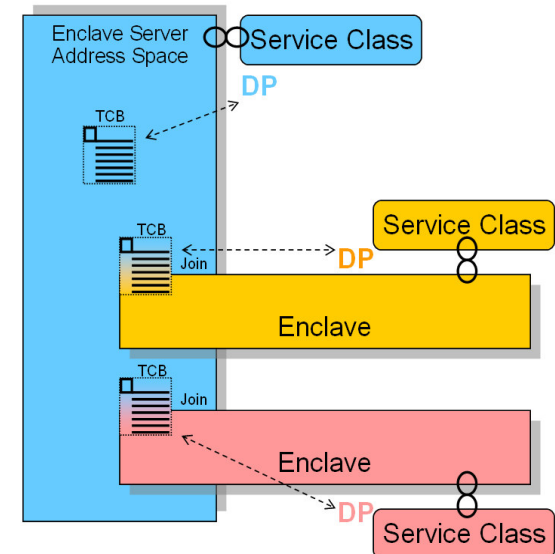


- An address space becomes an enclave server when
 - An enclave SRB issues SYSEVENT ENCASSOC
 - A TCB of the address space joins an enclave, and does not specify ENCLAVESERVER=NO (which is typically not the case)
- **Original** implementation assumed:
 - All work being executed within the address space is related to enclaves
 - Therefore no significant amount of work (TCBs) executing in such address spaces unrelated to enclaves
 - Enclave Server Management (old)
 - CPU and I/O DP is derived from service class of most important enclave
 - Hence no CPU and I/O management exists for these server address spaces
 - Storage management is done to meet the served enclave's goals

WLM Enclave Server Management Rationale and Changes with z/OS 1.12



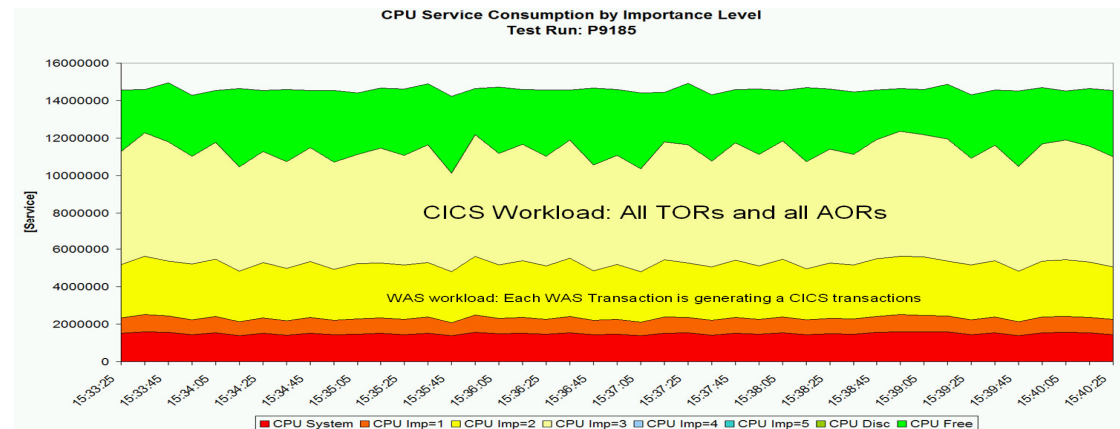
- However the original assumptions did not always hold true - there **are** examples of significant work unrelated to an enclave:
 - Garbage collection for a JVM (WAS)
 - Common routines which provide service for the enclave TCBs
- Problems exist when no enclaves are running in server address spaces and the address space is swapped out
- Solution by new capability for managing non-enclave-related work controlled by new IEAOPT Parameter
 - **ManageNonEnclaveWork = {No|Yes}**
 - Yes: Work in the address space not associated to an enclave is managed towards the goals of the external service class to which the address space has been classified to
 - No: Non enclave work is managed based on the most important enclave
- Notes:
 - Queue server address spaces in which no enclave is running will be managed as regular address spaces
 - With ManageNonEnclaveWork=Yes the importance and goal of the service class for the address space is more important than it used to be.
- Recommendation: Verify goal settings for server address spaces and specify ManageNonEnclaveWork = Yes



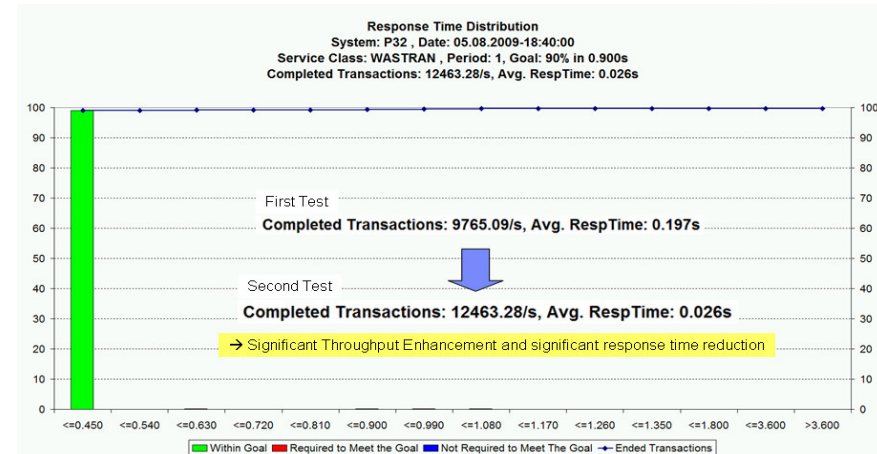
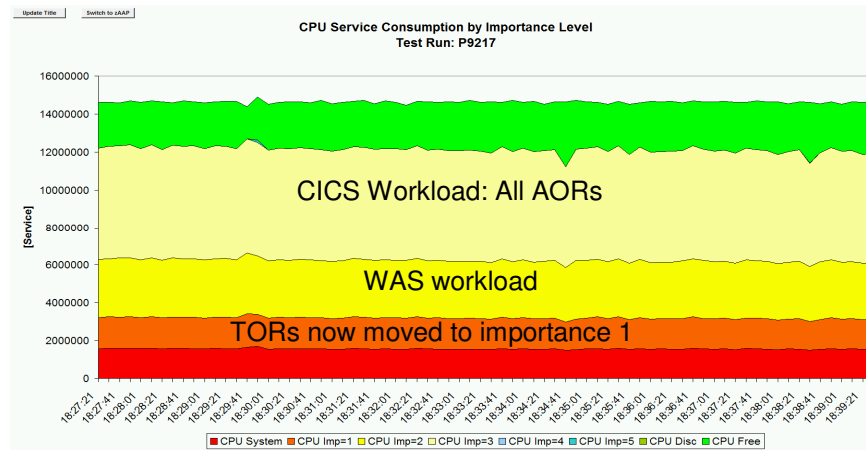
OA35428: New management option for CICS environments – Problem scenario and analysis



- Problem can show up when a workload predominantly consists of a CICS workload with little displaceable other work
- Sample environment:
 - System: 2097-764, 1 LPAR only → 8 nodes with 4 High processors each
 - Workload: Websphere → CICS → DB2
 - Websphere receives work, sends it to CICS TORs which send it to AORs which execute DB2 calls
 - Classification: Websphere Imp=2 and all CICS Imp=3, managed towards response time goals
- Problem: **Low system throughput; relatively high response times. System utilization did not exceed 80%**
- Note: In this scenario, the presence of Websphere is not important because Websphere feeds only CICS
- Problem Analysis
 - TORs and AORs run at the same dispatch priority
 - AORs heavily consumes CPU. TORs need to wait too long to receive work and return results to the caller
 - Hiperdispatch can amplify the situation because it runs the work at higher utilization on nodes with typically 4 processors



OA35428: Two possible circumventions



- **Circumvention:**

- Move TORs to a service class with higher importance than AORs

- Option 1: Exempt **all** regions from being managed by response time goals and classify TORs to a service class with higher importance than AORs.

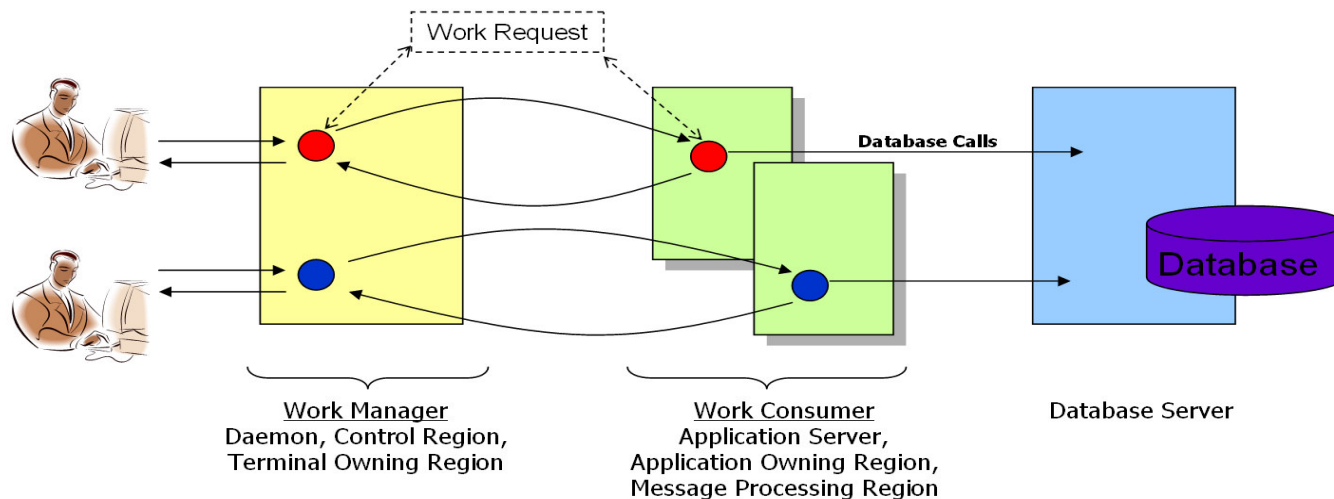
Disadvantage: No response time data present

- Option 2: Exempt only AORs and move them to a service class with lower importance than the CICS service classes with response time goals.

Disadvantage: Response time data cover only a small portion of the execution path because AORs consume much more than TORs.



OA35428: Solution concept



- Adjust WLM CICS management to follow “Work Manager/Consumer” model
 - A TOR is a region which consumes typically little CPU and just functions as a work receiver and result sender.
 - This is the work manager - needs quick access to CPU
 - An AOR is a server region which typically is much more resource intensive.
 - This is the work consumer. An AOR doesn't require the same instantaneous access to CPU than TORs
- WLM already has experience with that model:
 - Websphere Application Server and DB2/DDF work
 - The control regions are managed towards execution velocity goals
 - The work is managed towards response time goals (via enclaves and the servers processing the enclaves are tight to their goals)

OA35428: Enhancement of WLM Management Implementation of the Work Manager/Consumer Model



- New “Manage Regions by Goals Of” option in WLM service definition: “BOTH”
 - Use option “BOTH” for TORs
 - Define a STC service class for TORs which has a higher importance than the CICS service class with response time goals for the CICS work and AORs
 - Stay with “Manage Regions by Goals Of” TRANSACTION (the default) for AORs.
- Result:
 - WLM will manage the TORs towards the goals of the STC service class
 - And WLM will ensure bookkeeping of transaction completions to the correct CICS response time service class
 - The CICS transactions are managed towards CICS response time goals and the AORs are also managed towards these goals like today

```

Subsystem-Type  Xref  Notes  Options  Help
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                Modify Rules for the Subsystem Type                Row 1 to 3 of 3
Command ==> _____ Scroll ==> PAGE

Subsystem Type . : JES                Fold qualifier names?  Y (Y or N)
Description . . . Batch Work

Action codes:   A=After      C=Copy      M=Move      I=Insert rule
                B=Before      D=Delete row R=Repeat    IS=Insert Sub-rule
                <=== More

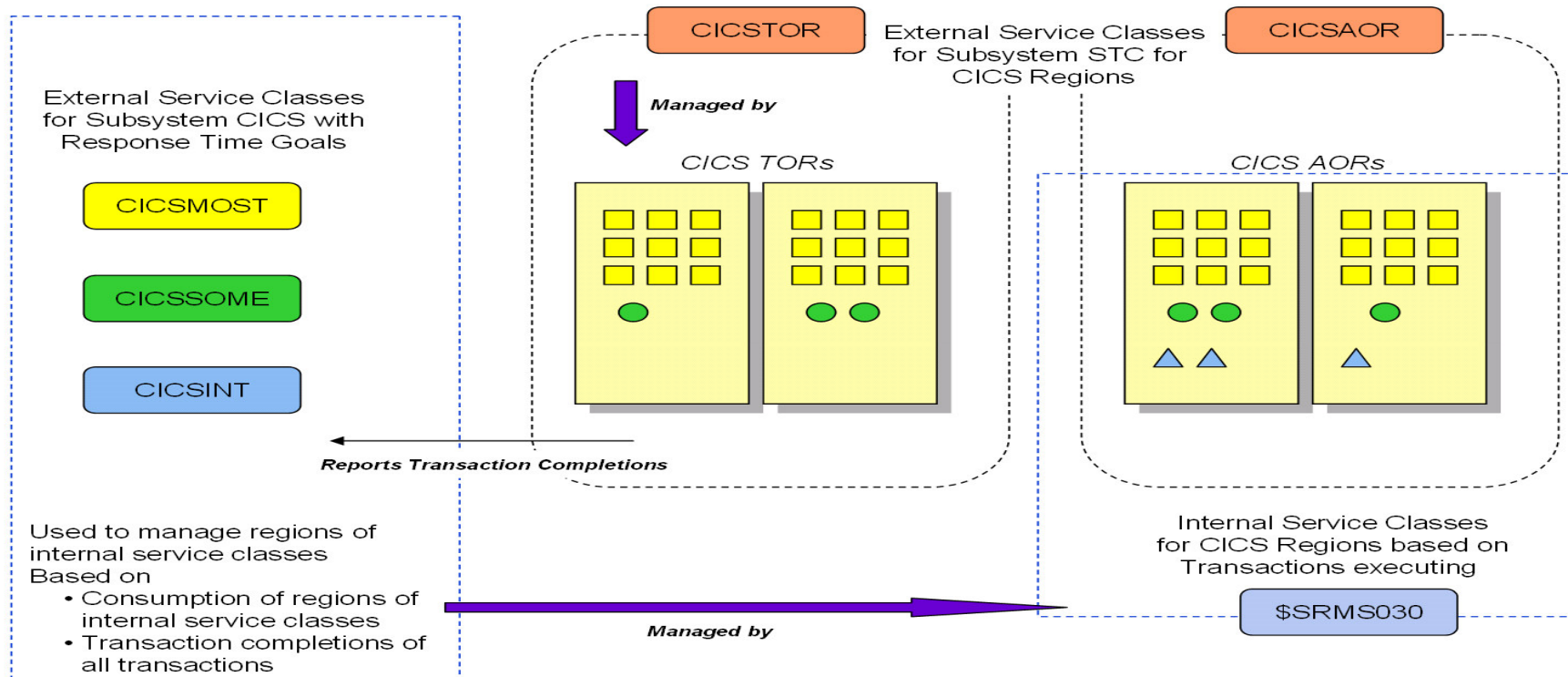
Action          -----Qualifier-----      Storage      Manage Region
Type           Name      Start        Critical     Using Goals Of

_____ 1 TN      CICSTOR*    _____ NO          BOTH
_____ 1 TN      CICSAOR*    _____ NO          TRANSACTION
_____ 1 TN      CICS*       _____ NO          TRANSACTION

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OA35428: New WLM Management Option

Structure of Service Classes



- TORs are now managed towards the goal of the service class CICSTOR
 - They still report their transaction completions for management
- AORs are still managed towards the goals of the CICS service classes and the consumption of the internal service class for the region
- Recommendation: CICSTOR should be defined at a higher importance than the CICS service classes

Background: WLM CICS Management Summary

Options for managing CICS work



1. CICS managed by Response Time Goals

- All Regions defined as managed towards TRANSACTION goals
 - Existing Method
 - Works well for most environments
 - *All environments which are not exclusively CICS workload or don't have any problem*

2. CICS managed by Region Goals

- If response time goals have not been defined all CICS regions are managed towards REGION goals (exempted from transaction management)
 - Existing Method
 - Works also well for most environments
 - *But: Execution velocity goals are more sensitive to hardware and software changes*
 - *Usually no transaction reporting available*
 - *This can be enabled for report classes but requires additional definitions*

3. CICS managed by Region and Response Time Goals

- CICS TORs defined as managed towards BOTH goals
- CICS AORs defined as managed towards TRANSACTION goals
 - [New Method introduced with OA35428](#)
 - Works well for most environments too. Avoids disadvantages of method 2

Response Time Distribution for Velocity Goals (z/OS V1.13)



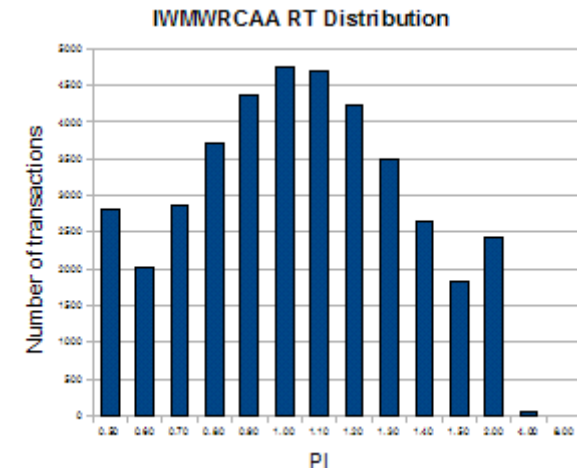
- Currently WLM reporting does not provide a response time distribution (ended transactions) for workloads with velocity goals
- Sometimes it is desirable to have a response time distribution for all transactional workloads, even if they have a velocity goal
 - More data to analyze workload behavior and to detect problems
 - Better support for migration of goal definitions to response time goals
- With z/OS V1.13
 - the IWMRCOLL answer area IWMWRCAA provides also a response time distribution for service class periods with an execution velocity goal,
 - the RMF Postprocessor Workload Activity report (WLMGL) displays the new response time distributions
 - Response Time distributions also added to SMF 99 subtype 2 data

Response Time Distribution for Velocity Goals

The Mid-Point Change Algorithm



- Rationale
 - Velocity goals do not have a „reference“ response time
 - The mid-point (MP) should be set to values which matches the current workload conditions
 - Mid point may change drastically from time to time, but WLM expects them to be consistent for a time long enough, so that it can compute sensible mid-point (MP) values
- Algorithm
 - The model behind the algorithm is a gaussian RT distribution, with $d = M/3$ (M is the mean, d is the standard deviation). Ideal would be $MP = M$
 - If a trx response time fulfills $MP/3 \leq RT \leq MP*3$ counter C is decreased by a value that reflects the distance of RT to the MP
 - If a trx response time does not fulfill $MP/3 \leq RT \leq MP*3$ counter C is increased by a value that reflects the distance of RT to the MP
 - If counter C becomes greater than a threshold, a new mid-point is calculated



This is the ideal case:

The mid-point set by WLM is strictly equal to the average response time (M) of the transactions, so we get a recognizable gaussian distribution

Response Time Distribution for Velocity Goals

RMF WLMGL Enhancement



REPORT BY: POLICY=POLICY01 WORKLOAD=STC SERVICE CLASS=STCDEF RESOURCE GROUP=*NONE PERIOD=1 IMPORTANCE=5
 CRITICAL =NONE

-TRANSACTIONS-	TRANS-TIME	HHH.MM.SS.TTT	--DASD I/O--	---SERVICE---	SERVICE TIME	---APPL %---	--PROMOTED--	----STORAGE----
AVG 28.04	ACTUAL	16.629	SSCHRT 89.0	IOC 524944	CPU 1.453	CP 0.22	BLK 0.000	AVG 1143.34
MPL 28.04	EXECUTION	15.724	RESP 0.2	CPU 649332	SRB 0.277	AAPCP 0.00	ENQ 0.000	TOTAL 32056.00
ENDED 2	QUEUED	904	CONN 0.1	MSO 14840	RCT 0.010	IIPCP 0.00	CRM 0.000	SHARED 200.56
END/S 0.00	R/S AFFIN	0	DISC 0.0	SRB 123890	IIT 0.197		LCK 0.000	
#SWAPS 100	INELIGIBLE	0	Q+PEND 0.1	TOT 1313K	HST 0.000	AAP 0.00		-PAGE-IN RATES-
EXCTD 0	CONVERSION	0	IOSQ 0.0	/SEC 1459	AAP 0.000	IIP 0.00		SINGLE 0.0
AVG ENC 0.00	STD DEV	0			IIP 0.000			BLOCK 0.0
REM ENC 0.00				ABSRPTN 52				SHARED 0.0
MS ENC 0.00				TRX SERV 52				HSP 0.0

GOAL: EXECUTION VELOCITY 20.0% VELOCITY MIGRATION: I/O MGMT 88.2% INIT MGMT 88.2%

...

-----RESPONSE TIME DISTRIBUTIONS-----									
SYSTEM: SYSD		-----INTERVAL: 14.59.998	-----MRT CHANGES: 0	---	SYSTEM: SYSE		-----INTERVAL: 01.22.123	-----MRT CHANGES: 1	---
---TIME---	-NUMBER OF TRANSACTIONS-	-----PERCENT-----		---	---TIME---	-NUMBER OF TRANSACTIONS-	-----PERCENT-----		---
HH.MM.SS.TTT	CUM TOTAL	IN BUCKET	CUM TOTAL	IN BUCKET	HH.MM.SS.TTT	CUM TOTAL	IN BUCKET	CUM TOTAL	IN BUCKET
< 00.00.00.200	581	581	94.2	94.2	< 00.00.00.300	581	581	94.2	94.2
<= 00.00.00.240	584	3	94.7	0.5	<= 00.00.00.360	584	3	94.7	0.5
<= 00.00.00.280	586	2	95.0	0.3	<= 00.00.00.420	586	2	95.0	0.3
<= 00.00.00.320	586	0	95.0	0.0	<= 00.00.00.480	586	0	95.0	0.0
<= 00.00.00.360	588	2	95.3	0.3	<= 00.00.00.640	588	2	95.3	0.3
<= 00.00.00.400	591	3	95.8	0.5	<= 00.00.00.600	591	3	95.8	0.5
<= 00.00.00.440	592	1	95.9	0.2	<= 00.00.00.660	592	1	95.9	0.2
<= 00.00.00.480	592	0	95.9	0.0	<= 00.00.00.720	592	0	95.9	0.0
<= 00.00.00.520	593	1	96.1	0.2	<= 00.00.00.780	593	1	96.1	0.2
<= 00.00.00.560	596	3	96.6	0.5	<= 00.00.00.840	596	3	96.6	0.5
<= 00.00.00.600	596	0	96.6	0.0	<= 00.00.00.900	596	0	96.6	0.0
<= 00.00.00.800	599	3	97.1	0.5	<= 00.00.01.200	599	3	97.1	0.5
<= 00.00.01.600	604	5	97.9	0.8	<= 00.00.02.400	604	5	97.9	0.8
> 00.00.01.600	617	13	100	2.1	> 00.00.02.400	617	13	100	2.1

Response Time Distribution for Velocity Goals

IWMRCOLL enhancements for Service and Report Class Periods



Section	Field	Response time goals	Execution velocity goals
RCAEIHDR (RCAE period header)	RCAEIMID (mid-point in milliseconds)	Same as goal value (milliseconds)	0 after policy activation/refresh/IPL New value computed when WLM detects that current workload distribution deviates too much from RCAEIMID for a too long time
	RCAEIRCT (running count)	N/A (value always 0)	Total number of RCAEIMID changes since last policy activation
	RCAEITST (timestamp of last change)	Policy activation time	Time of last RCAEIMID change or time of last policy activation
RCAEDIST	RCAEDENT	No change Distribution centered around goal value	Centered around RCAEIMID Reset after each RCAEIMID change

- **RCAEIRCT**
 - Is reset to 0 after each policy activation/refresh/IPL
 - Is incremented each time the report class period becomes heterogeneous (when RCAEPLSC and RCAEPMCI are updated)
 - Is incremented each time a transaction is reported with a new mid-point/timestamp
- The 14 buckets of the report class period's response time distribution are reset to 0 when RCAEIRCT is updated
- RCAEIMID is copied from the current service class period's RCAEIMID each time the report class period's RCAEIRCT is incremented
- RCAEITST is copied from the current service class period's RCAEITST each time the report class period's RCAEIRCT is incremented

Transaction Management Enhancements: Availability



Function	z/OS V1.13	z/OS V1.12	z/OS V1.11	z/OS V1.10
OA38320: Reduce Sampling Overhead (WLM address space utilization)	OA38320	OA38320	OA38320	
Enclave Server Management (Non Shell Server Management)	+	+		
CICS Region/RT Management	+	OA35428	OA35428	OA35428
RT Distribution for Execution Velocity Goals	+			

- OA23320: DB2 and CICS subsystems can create many PB/PBDE control blocks for monitoring environments. Code reduces WLM CPU consumption on z196 and z114 when many such control block exists
- Enclave Server Management
 - Is enabled via OPT parameter ENCLAVESERVER=YES
- CICS Region/RT Management
 - OA35248 supersedes OA34801
 - OA34801 was a temporary solution introduced for a customer to maintain response time reporting while temporarily moving from response time to region management
 - OA34801 introduced a new OPT parameter REPORTCOMPLETIONS={YES|NO}
 - *With OA35428 and with z/OS 1.13 WLM will still accept the new OPT parameter but the reporting functionality introduced by OA34801 is no longer supported.*



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- WLM Support for I/O Priority Manager in DS8K Series
- WLM Support for IBM zEnterprise 196
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OA37736: HiperDispatch Enhancements for “Unused Capacity”

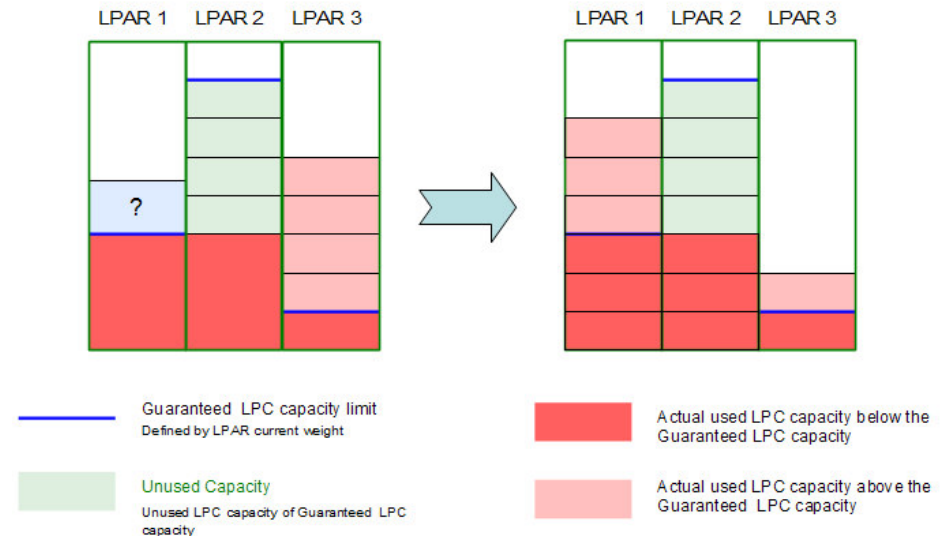


- Problem addressed:
 - If a large LPAR consumes below its weight-entitlement it is possible that a low-weight LPAR un parks many VerticalLow (VL) processors
 - Therefore small LPAR could “dominate” larger LPARs because those could not un park their VLs
 - Additional VL would appear to be inefficient

• Solution:

- HiperDispatch considers now also the “unused” capacity share for a partition to un park VLs.
 - This share is calculated by dividing the unused capacity (guaranteed but not used) of all partitions in the CEC by the share of the partitions which can use more capacity.

Consideration of Unused Capacity



• Availability

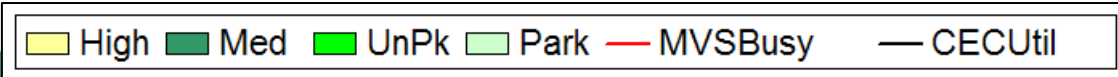
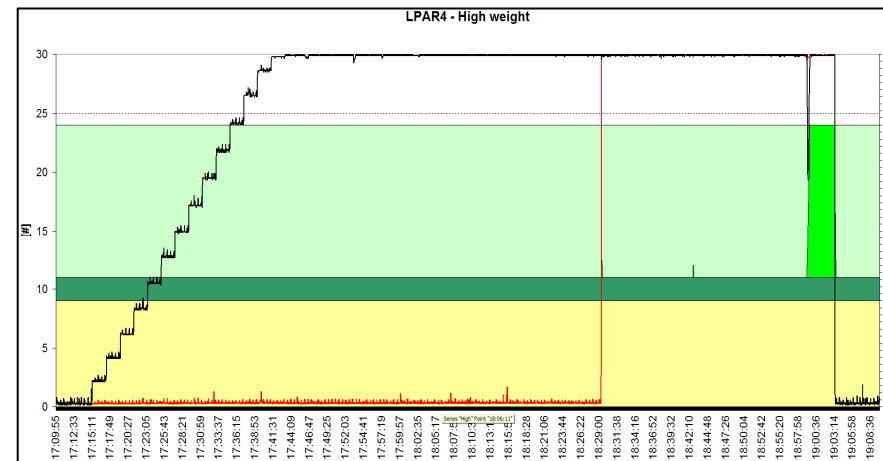
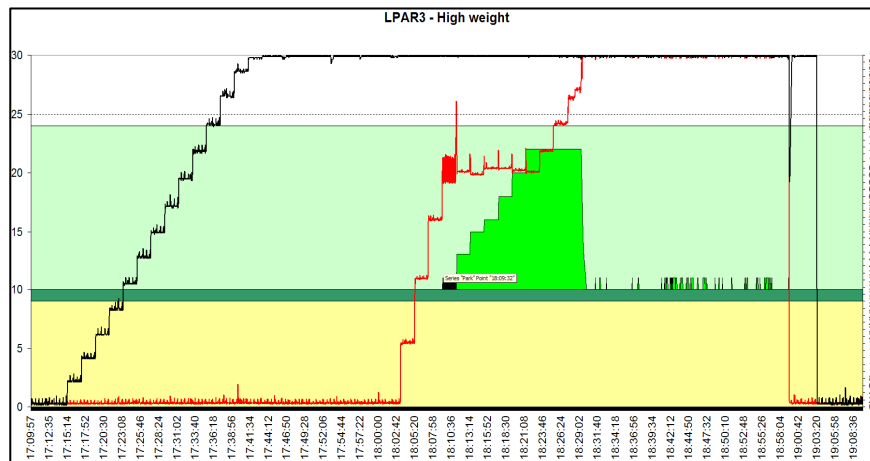
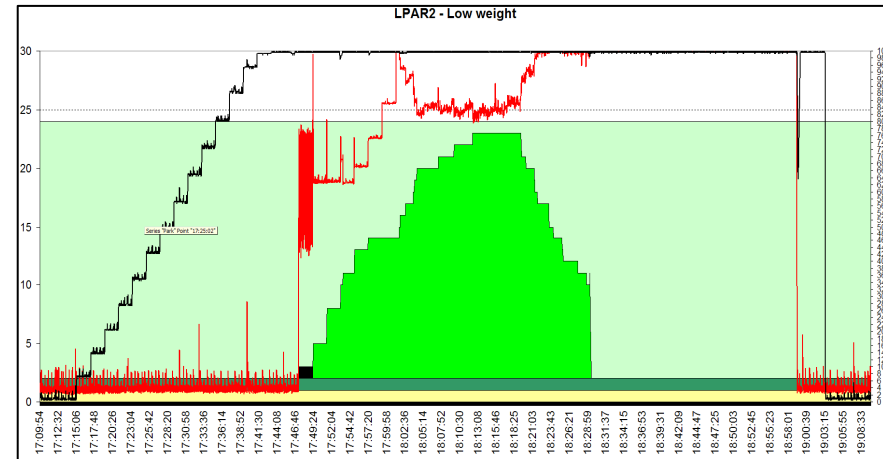
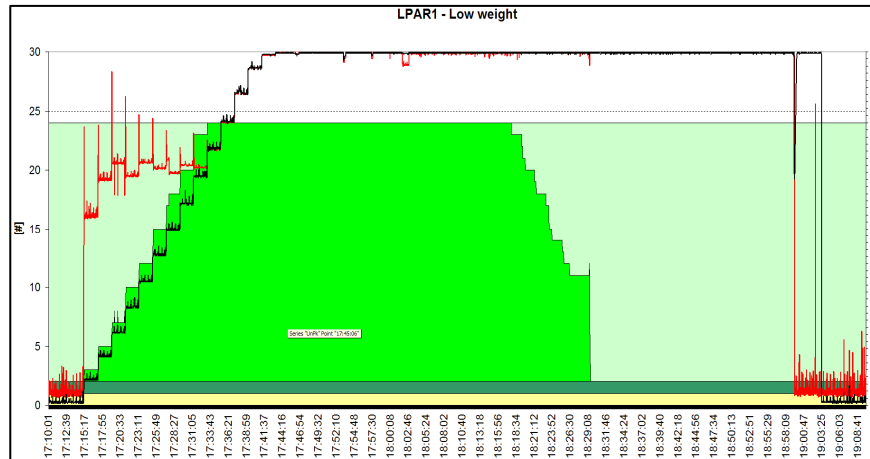
- OA37737 z/OS V1.12, V1.13 expected 6/2012



OA37736 Test Scenario



- z196 with 24 CPs; 4 LPARs with 24 logical CPs
- LPAR1/2: low weight (1 VH + 1 VM); LPAR2/3: high weight (9 VH + 1 VM)
- Start work on LPAR1 first, then LPAR2, LPAR3, LPAR4
- Result shows that unparked VLs are reduced as high weight LPARs have demand



Hiperdispatch related WLM APARs



APAR	Description	Close Date	Affects
OA37736	Unused capacity enhancements	6/2012	Small plus large partitions with unused capacity.
OA36459	Modify PARK/UNPARK algorithm to become more sensitive for smaller partitions	10/2011	Smaller partitions at low CEC utilizations
OA35428	Introduces new option to manage CICS environments in a work receiver/consumer model	09/2011	Installation running CICS- only workloads Can be amplified by Hiperdispatch
OA35860	Correct calculation of CEC free capacity. The CPU consumption of the *PHYSICAL* partition was not included. This can lead to too many “unpark” operations under rare cases.	06/2011	Systems with high *PHYSICAL* time
OA35989	Correct overflow condition of CEC free capacity	05/2011	Small systems running on big CECs with very high unused capacity

- **HIPERDISPATCH=YES is the default when running z/OS 1.13 on z196 or above**
- Older releases will still have NO as default - even on z196



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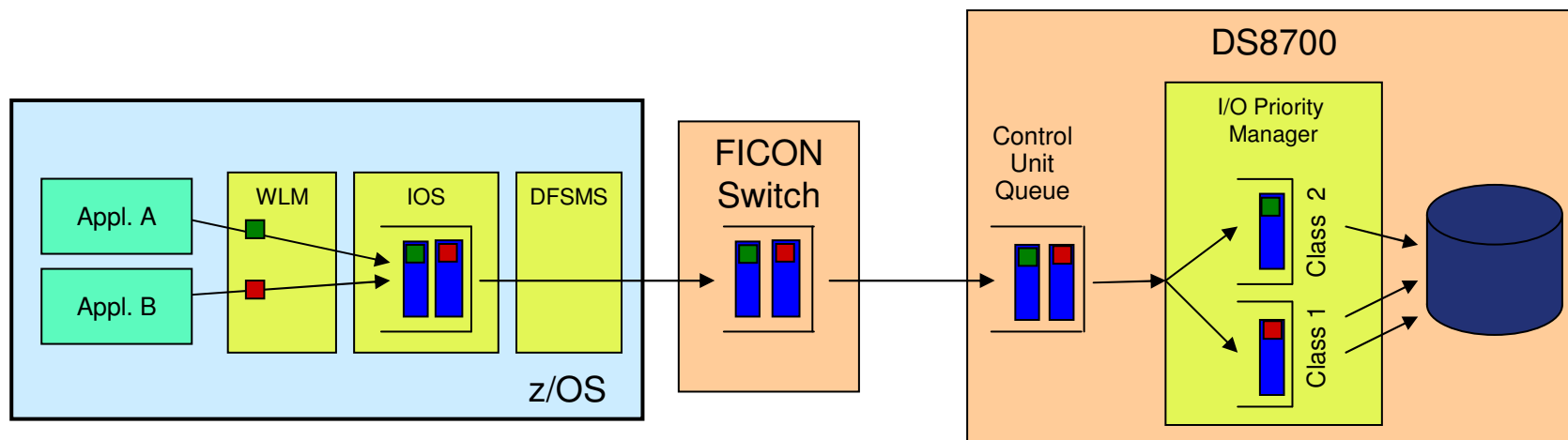


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WLM Support for I/O Priority Manager in DS8K Series



- WLM collaborates with the I/O Priority Manager in DS8700 & DS8800 storage servers.
- WLM sends I/O Priority Manager information about the goal fulfillment and importance of z/OS workloads (service classes).
- Passing these performance parameters to the storage server enables the I/O Priority Manager to determine which I/O requests are more important than others and which I/O requests need to be processed faster to fulfill the performance goals defined for the corresponding workload in z/OS.
- Using the passed information from WLM, the I/O Priority Manager throttles I/O requests of workloads which exceed their goals to help I/O requests of workloads which do not fulfill their goals.
- New IEAOPT parameter **STORAGESERVERMGT={YES|NO}**

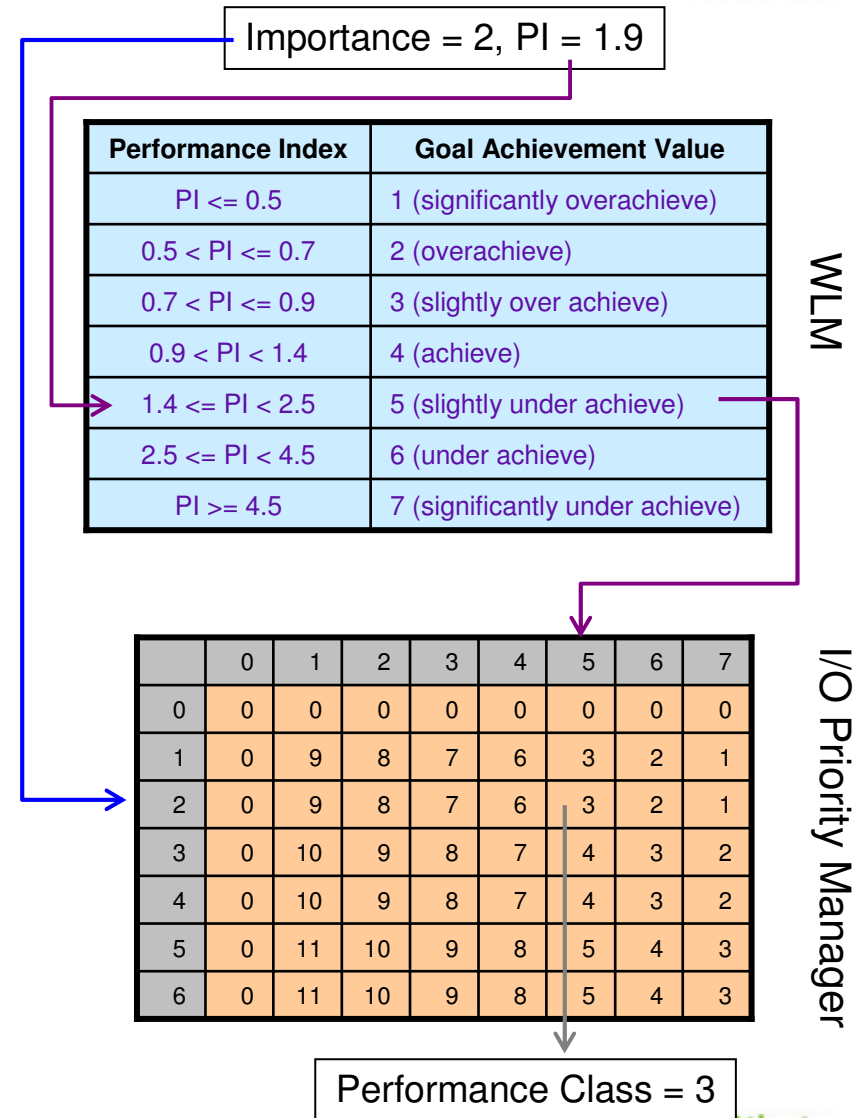


WLM Support for I/O Priority Manager in DS8K Series

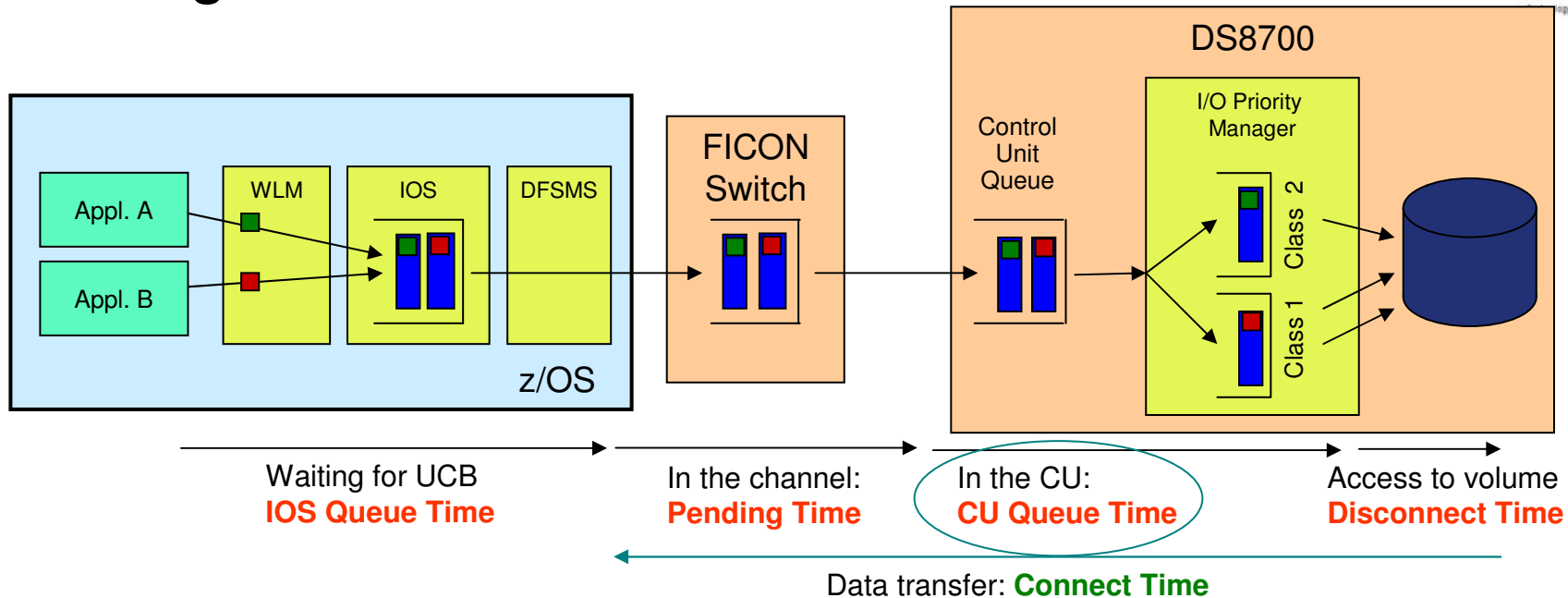
Goal Achievement Data



- WLM derives goal achievement data for service class periods as follows
 - Response Time goal:
 - Importance of period
 - Goal Achievement Value is derived from Performance Index (PI)
 - Dynamic management considering goal achievement of service class
 - Velocity goal:
 - Importance of period
 - Velocity level
 - Static management considering specified goal of service class
 - System service classes
 - Importance: 0
 - Goal Achievement Value: 0 (no monitor)
 - No management
 - Discretionary goal:
 - Importance: 6
 - Goal Achievement Value: 1
 - Static management considering goal type
- I/O Priority Manager assigns I/O request a Performance Class corresponding to the passed Goal Achievement Data
- Each Performance Class is associated with a certain maximum throttling level



WLM Support for I/O Priority Manager in DS8K Series Throttling



- I/O Priority Manager
 - impacts how long an I/O request has to wait for access to the **volume**
 - does **not** impact an I/O request **if it is served from the storage server cache**
 - induced throttling delays are reported as **CU Queue Time**
- WLM excludes CU Queue Time when calculating I/O delays for service class periods with velocity goal to avoid oscillations of the performance index
 - If WLM support for I/O Priority Manager is turned on, you may have to adjust the velocity goals if you have significant CU Queue Times in your environment

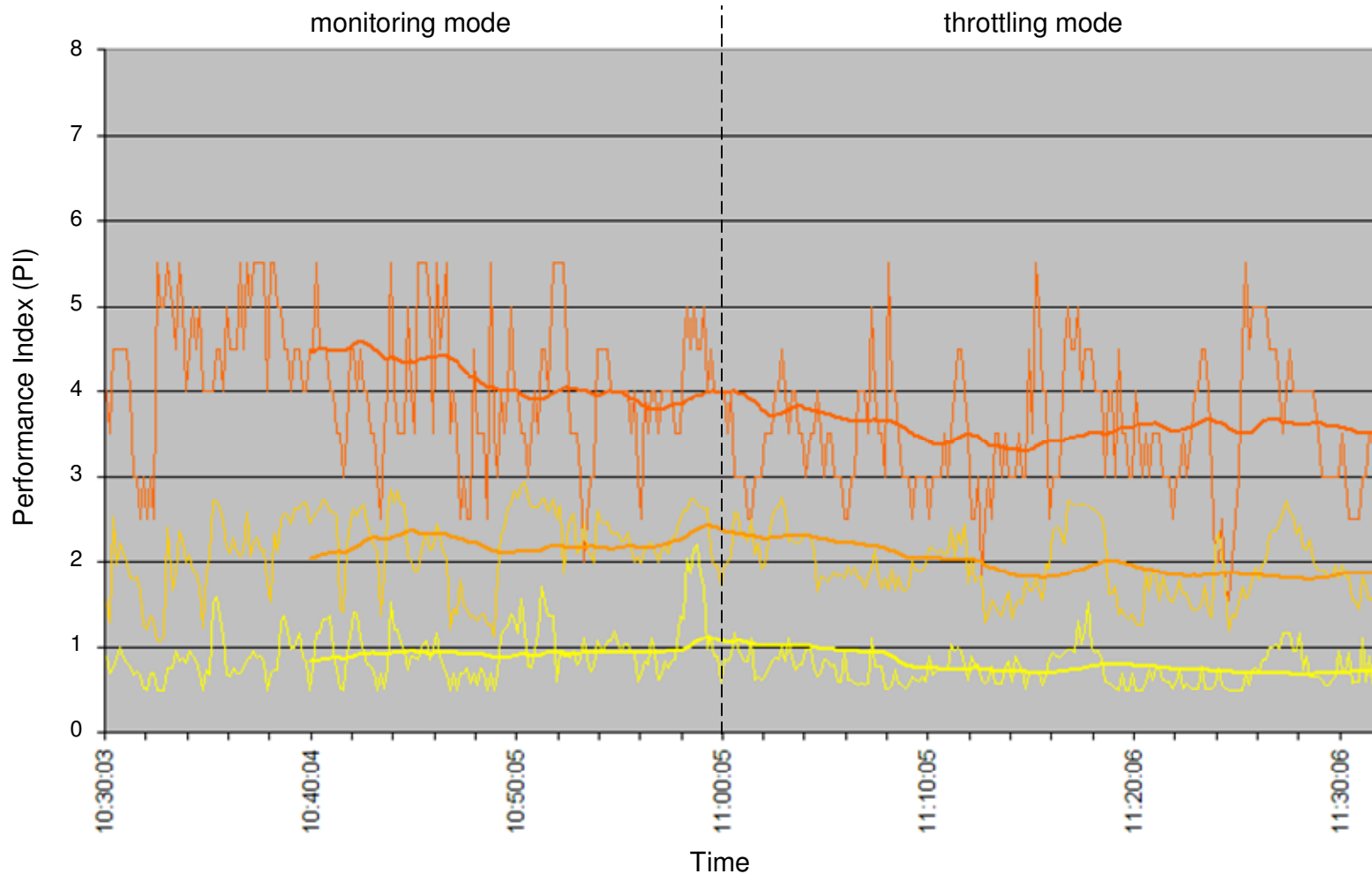
WLM Support for I/O Priority Manager in DS8K Series Test Results



- Test Environment
 - Five CPCs running z/OS V1.13 in nine LPARs
 - DS8000
 - Workloads running simultaneously
 - ATM transaction workload (CICS, IMS, DB2)
 - Middleware OLTP workloads (CICS, IMS, VSAM, DB2)
 - IMS data sharing workloads
 - CICS VSAM/RLS data sharing workload
 - CICS VSAM/NRLS workload
 - DB2 data sharing workloads
 - DB2 large storage utilization workload
- Test results were described in a white paper:
<http://www-03.ibm.com/support/techdocs/atmastr.nsf/WebIndex/WP102074>

WLM Support for I/O Priority Manager in DS8K Series

Test Results



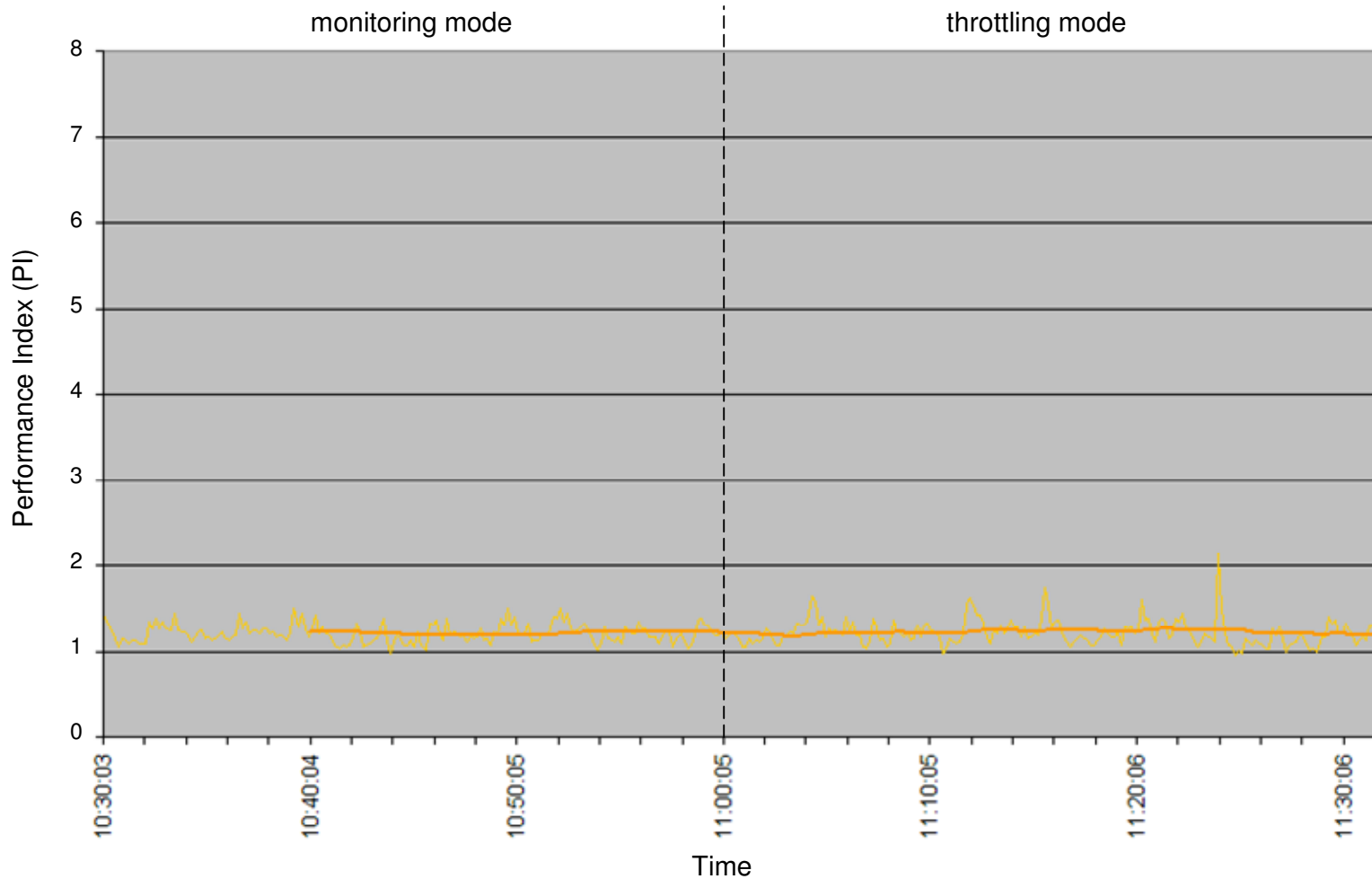
- PI of Imp 1 RT service classes improved by 10%
- PI of Imp 2 RT service classes improved by 22%
- PI of Imp 3 RT service classes improved by 23%

— Importance 1 — Importance 2 — Importance 3 — 10 min rolling average



WLM Support for I/O Priority Manager in DS8K Series

Test Results



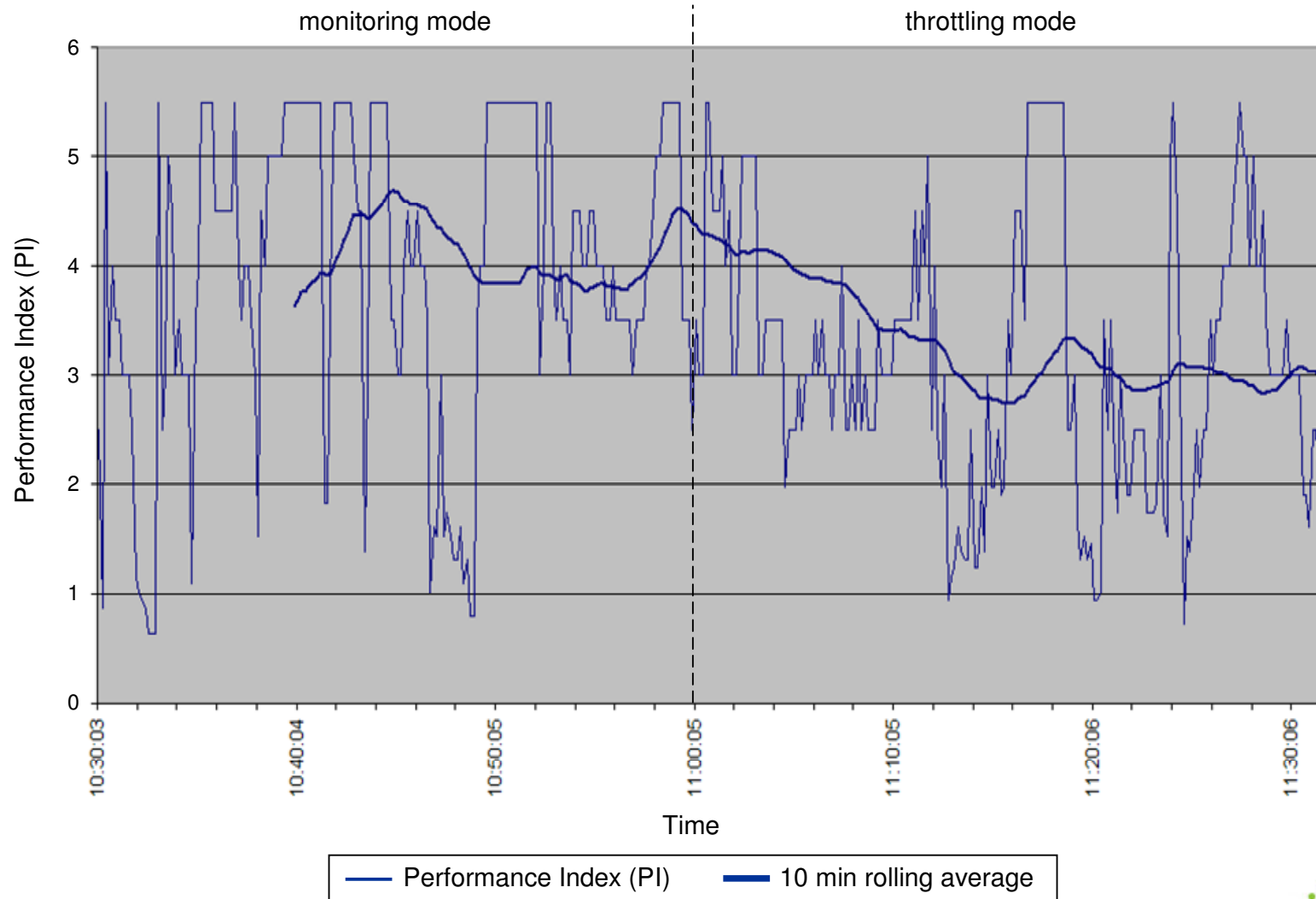
- PI of Imp 2 Velocity service classes increased by 4%
- We had only Imp 2 Velocity service classes

— Importance 1 — Importance 2 — Importance 3 — 10 min rolling average



WLM Support for I/O Priority Manager in DS8K Series

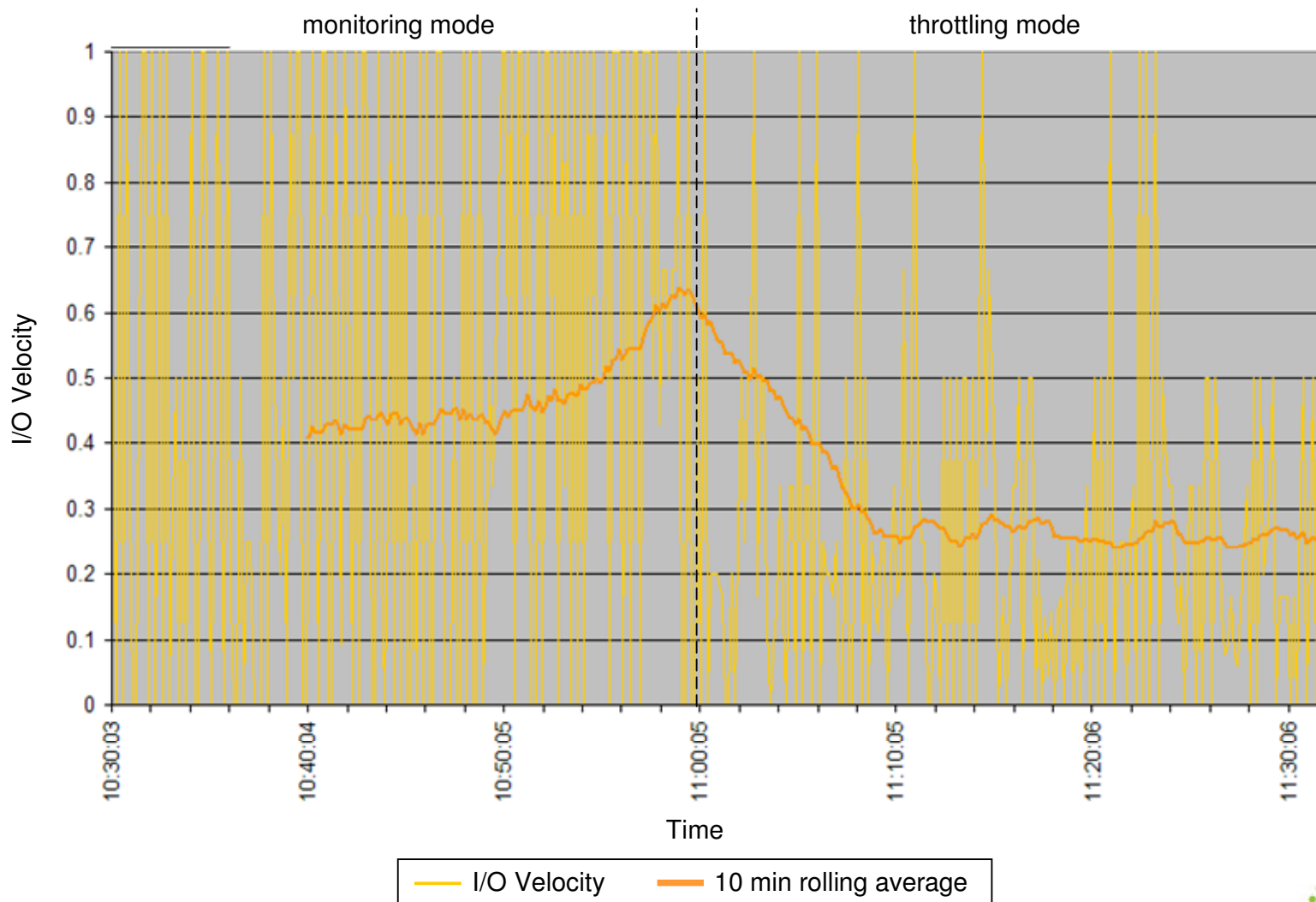
Test Results



- PI of CICS service class improved from 4.3 to 3.0
- Achieved response time reduced from 800ms to 570ms

WLM Support for I/O Priority Manager in DS8K Series

Test Results



- PI of Velocity service class STCI2V40 stayed in same range
- But the I/O velocity decreased from 0.63 to 0.27

WLM Support for I/O Priority Manager in DS8K Series Availability



Function	z/OS V1.13	z/OS V1.12	z/OS V1.11	Older Releases
WLM Support for I/O Priority Manager in DS8000 series	OA32298	OA32298	OA32298	

- WLM Support for I/O Priority Manager
 - Has to be enabled via OPT parameter STORAGESERVERMGT=YES
 - Default is STORAGESERVERMGT=NO
 - Only active when WLM policy specifies I/O Priority Management = YES
- The I/O Priority Manager feature is associated with DS8K R6.1.5

Agenda



- Transaction Management Enhancements
 - Non Shell Enclave Server Management
 - CICS Region / Response Time Management
 - Response Time Distribution for Execution Velocity Goals
- Hiperdispatch APARs
- WLM Support for I/O Priority Manager in DS8K Series
- WLM Support for IBM zEnterprise 196
- Temporary Capacity Reporting via SYSEVENT REQLPDAT
- z/OSMF Workload Management
- WLM support for Unified Resource Manager
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- WLM Tools Overview

WLM Support for IBM zEnterprise 196



- IBM zEnterprise 196 (z196)
 - STSI instruction no longer returns the alternate CPU capability
 - CPU adjustment factors are now calculated based on the Model Capacity Ratings by the machine
 - Supplies additional information about speed change
 - Speed changes may occur due to model changes (*capacity level*), or to physical processor tact (*cycle steering*)
- WLM
 - uses the new MSU values to calculate pricing adjustment factors
 - introduces message IWM064I to explain the reason for a processor speed change
 - makes new HW information available via public data areas IRARCT, IRARMCT, IRARMCTZ and via SYSEVENT QVS

WLM Support for IBM zEnterprise 196

New Message IWM064I



- Existing Message:

IWM063I WLM POLICY WAS REFRESHED DUE TO A PROCESSOR SPEED CHANGE

- Depending on the reason for the speed change one of the following messages will be issued on *when running on z196 or later* hardware:

- IWM064I THE SYSTEM IS RUNNING AT NOMINAL CAPACITY.
- IWM064I THE SYSTEM IS RUNNING AT NOMINAL CAPACITY; MODEL CONVERSION OCCURRED.
- IWM064I THE SYSTEM IS RUNNING WITH REDUCED CAPACITY BECAUSE OF A MANUAL CONTROL SETTING.
- IMM064I THE SYSTEM IS RUNNING WITH REDUCED CAPACITY BECAUSE OF A MACHINE EXCEPTION CONDITION.
- IWM064I THE SYSTEM IS RUNNING WITH REDUCED CAPACITY BECAUSE OF A NON-EXCEPTION MACHINE CONDITION.
- IWM064I THE SYSTEM IS RUNNING WITH REDUCED CAPACITY BECAUSE OF AN EXCEPTION CONDITION EXTERNAL TO THE MACHINE.

WLM Support for IBM zEnterprise 196

Speed Values and MSU calculation



- RCTPCPUA
 - Existing adjustment factor for software pricing
 - Based on STSI alternate capacity value and alternate capacity MP factor table
 - Only valid value for all systems prior to z196 (z10, z9, etc...)
 - Does not allow to depict all possible MSU values precise enough
 - Still contained and updated for compatibility reasons for newer processors
- RCTPCPUA_actual and RCTPCPUA_scaling
 - New adjustment factor for software pricing
 - Based on new STSI information for software pricing
 - Only valid for all new systems (z196 and future)
 - Allows to depict any possible MSU value
- RCTPCPU_nominal and RCTPCPUA_scaling
 - Represents the capacity the system may have
 - If this deviates from RCTPCPUA_actual/RCTPCPUA_scaling then the actual system runs with reduced capacity

$$MSU(\text{old}) = \frac{57600 \cdot \# \text{cps}}{RCTPCPUA}; \quad MSU(\text{new}) = \frac{57600 \cdot \# \text{cps} \cdot RCTPCPUA_scaling}{RCTPCPUA_actual}$$

WLM Support for IBM zEnterprise 196

Extended Data Areas



- IRARCT
 - RCTPCPUA; RCTPCPUA_actual; RCTPCPUA_nominal; RCTPCPUA_scaling
 - See previous chart

- IRARMCTZ
 - RMCTZ_Capacity_Change_Time
 - Time when the capacity was last changed
 - RMCTZ_Capacity_Adjustment_Indication
 - When zero, the indication is not reported. When in the range 1-99, some amount of reduction is indicated. When 100, the machine is operating at its normal capacity. Primary CPUs and all secondary-type CPUs are similarly affected
 - RMCTZ_Capacity_Change_Reason
 - Indicates the reason which is associated with the present value contained in RMCTZ_Capacity_Adjustment_Indication
 - RMCTZ_CAI_IPL
 - Capacity adjustment indication at IPL
 - RMCTZ_CCR_IPL
 - Capacity change reason at IPL
 - RMCTZ_nominal_CPMP
 - Nominal CPU adjustment factor (similar to RMCTCPMP but for nominal speed)

WLM Support for IBM zEnterprise 196 Changed APIs



- Sysevent QVS: (IRAQVS and IWMQVS.H)
QVSCECCapacityStatus possible values:

Constant	Mnemonic	Description
0	QvsCecCapStatUndef	QvsCecCapacityStatus is undefined (not supported by hardware)
1	QvsCecCapStatNominal	Machine is running at nominal capacity
2	QvsCecCapStatRedIntentional	Machine is running with reduced capacity due to a manual control setting. (e.g. power saving mode, customer initiated)
3	QvsCecCapStatRedMachEx	Machine is running with reduced capacity due to a machine exception condition (e.g. cooling problem)
4	QvsCecCapStatRed MachNonEx	Machine is running with reduced capacity due to a machine non-exception condition (e.g. firmware update)
5	QvsCecCapStatRed EnvCond	Machine is running with reduced capacity due to an exception condition external to the machine (e.g. ambient temperature exceeded specified maximum)

- IWMRCOLL

- IWMWRCAA

- RCAAADJCCPU
 - RCAAADJCCPUNOM
 - RCAAADJCCEC

CPU adjustment factor
Nominal CPU adjustment factor
CEC adjustment factor

WLM Support for IBM zEnterprise 196 SMF70 Enhancements



SMF record type 70 subtype 1 (CPU Activity) – CPU control section				
Offset	Name	Length	Format	Description
204 xCC	SMF70NCR	4	Binary	Nominal model-capacity rating in MSU/hour. When non-zero, this value is associated with the nominal model capacity as identified in field SMF70MDL. When field SMF70CAI contains a value of 100, this value equals the value in field SMF70MCR.
208 xD0	SMF70NPR	4	Binary	Nominal permanent model-capacity rating. When non-zero, this value is associated with the nominal permanent model capacity as identified in field SMF70MPC. When field SMF70CAI contains a value of 100, this value equals the value in field SMF70MPR.
212 xD4	SMF70NTR	4	Binary	Nominal temporary model-capacity rating. When non-zero, this value is associated with the nominal temporary model capacity as identified in field SMF70MTC. When field SMF70CAI contains a value of 100, this value equals the value in field SMF70MTR.
216 xD8	SMF70CAI	1	Binary	Capacity-adjustment indication. When zero, the indication is not reported. When in the range from 1 to 99, some amount of reduction is indicated. When 100, the machine is operating at its normal capacity. Temporary capacity changes that affect machine performance (for example, CBU or OOCoD) are not included.
217 xD9	SMF70CCR	1	Binary	Capacity-change reason. Valid if SMF70CAI is non-zero. When 0, no capacity change took place. When 1, the capacity change is due to the setting of a manual control. When greater than 1, the capacity change is due to an internal machine condition or due to an external machine exception.

WLM Support for IBM zEnterprise 196 SMF72 Enhancements



SMF record type 72 subtype 3 (Workload Activity) – Workload manager control section				
Offset	Name	Length	Format	Description
172 xAC	R723MADJ	4	Binary	Adjustment factor for CPU rate
248 xF8	R723NADJ	4	Binary	Nominal adjustment factor for CPU rate

WLM Support for IBM zEnterprise 196

SMF 30 Enhancements



194	C2	SMF30_Capacity_Change_Cnt	2	binary	The number of processor capacity changes that occurred since the previous interval or event interval. This number will be greater than 1 when the number of processor capacity changes exceeded the number specified in the MAXEVENTINTRECS parmlib option.
196	C4	SMF30_RCTPCPUA_Actual	4	binary	Physical CPU adjustment factor (this is the adjustment factor for converting CPU time to equivalent service, in basic-mode with all processors online). Based on model capacity rating.
200	C8	SMF30_RCTPCPUA_Nominal	4	binary	Physical CPU adjustment factor (this is the adjustment factor for converting CPU time to equivalent service in basic-mode with all processors online). Based on nominal model capacity rating.
204	CC	SMF30_RCTPCPUA_scaling_factor	4	binary	Scaling factor for SMF30_RCTPCPUA_actual and SMF30_RCTPCPUA_nominal.
208	D0	SMF30_Capacity_Adjustment_Ind	1	binary	When: 0 The indication is not reported. 1-99 Some amount of reduction is indicated. 100 The machine is operating in normal capacity. Primary CPUs and all secondary-type CPUs are similarly affected.
209	D1	SMF30_Capacity_Change_Rsn	1	binary	Indicates the reason that is associated with the present value contained in SMF30_Capacity_Adjustment_Ind. The bit values of this field correspond to those described in RMCTZ_Capacity_Adjustment_Indication of the IRARMCTZ mapping macro. (See <i>MVS Data Areas</i> .)
210	D2	SMF30_Capacity_Flags	1	binary	Processor capacity flags. Bit Meaning When Set 0 SMF30_Event_Driven_Intvl_Rec Meaning: When on, indicates that the current interval record was generated as a result of an event, rather than as a result of standard interval expiration based on time. 1 SMF30_RQSVSUS_Err Meaning: When on, indicates that an error occurred while collecting the data for SMF30SUS following a change in processor capacity. If this bit is found to be on when the record is being written, an additional attempt to collect the data from SRM is made. If that attempt is successful, the data is filled in at that time and the SMF30PIN error bit will be off. 2 SMF30_Capacity_Data_err Meaning: When on, indicates that error occurred while collecting the processor capacity data, therefore the following fields are unreliable: <ul style="list-style-type: none"> • SMF30_RCTPCPUA_Actual • SMF30_RCTPCPUA_Nominal • SMF30_RCTPCPUA_scaling_factor • SMF30_Capacity_Adjustment_Ind • SMF30_Capacity_Change_Rsn 3 SMF30_PCD_Rsvd_Exists Meaning: When on, indicates records generated on systems running z/OS V1R7 through z/OS V1R9. When off, this bit indicates records generated on systems running z/OS V1R10 and later.



WLM Support for IBM zEnterprise 196

SMF 89 Enhancements



178	B2	SMF89_Capacity_Change_Cnt	2	binary	The number of processor capacity changes that occurred since the previous interval or event interval. This number will be greater than 1 when the number of processor capacity changes exceeded the number specified in the MAXEVENTINTRECS parmib option.								
180	B4	SMF89_RCTPCPUA_Actual	4	binary	Physical CPU adjustment factor (this is the adjustment factor for converting CPU time to equivalent service in basic-mode with all processors online). Based on model capacity rating.								
184	B8	SMF89_RCTPCPUA_Nominal	4	binary	Physical CPU adjustment factor (this is the adjustment factor for converting CPU time to equivalent service in basic-mode with all processors online). Based on nominal model capacity rating.								
188	BC	SMF89_RCTPCPUA_scaling_factor	4	binary	Scaling factor for SMF89_RCTPCPUA_Actual and SMF89_RCTPCPUA_Nominal.								
192	C0	SMF89_Capacity_Adjustment_Ind	1	binary	When: 0 The indication is not reported. 1-99 Some amount of reduction is indicated. 100 The machine is operating in normal capacity. Primary CPUs and all secondary-type CPUs are similarly affected								
193	C1	SMF89_Capacity_Change_Rsn	1	binary	Indicates the reason that is associated with the present value contained in SMF89_Capacity_Adjustment_Ind. The bit values of this field correspond to those described in RMCTZ_Capacity_Adjustment_Indication of the IRARMCTZ mapping macro. (See <i>MVS Data Areas</i> .)								
194	C2	SMF89_Capacity_Flags	1	binary	Processor capacity flags. <table border="0"> <tr> <td>Bit</td> <td>Meaning When Set</td> </tr> <tr> <td>0</td> <td>SMF89_Event_Driven_Interval_Rec Meaning: When on, indicates that the current record was generated as a result of an event, rather than as a result of a standard interval expiration based on time.</td> </tr> <tr> <td>1</td> <td>SMF89_Capacity_Data_err Meaning: When on, indicates that error occurred while collecting the processor capacity data, therefore the following fields are unreliable: <ul style="list-style-type: none"> • SMF89_RCTPCPUA_Actual • SMF89_RCTPCPUA_Nominal • SMF89_RCTPCPUA_scaling_factor • SMF89_Capacity_Adjustment_Ind • SMF89_Capacity_Change_Rsn </td> </tr> <tr> <td>2</td> <td>SMF89_PCD_Rsvd_Exists Meaning: When on, indicates records generated on systems running z/OS V1R7 through z/OS V1R9. When off, indicates records generated on systems running z/OS V1R10 and later.</td> </tr> </table>	Bit	Meaning When Set	0	SMF89_Event_Driven_Interval_Rec Meaning: When on, indicates that the current record was generated as a result of an event, rather than as a result of a standard interval expiration based on time.	1	SMF89_Capacity_Data_err Meaning: When on, indicates that error occurred while collecting the processor capacity data, therefore the following fields are unreliable: <ul style="list-style-type: none"> • SMF89_RCTPCPUA_Actual • SMF89_RCTPCPUA_Nominal • SMF89_RCTPCPUA_scaling_factor • SMF89_Capacity_Adjustment_Ind • SMF89_Capacity_Change_Rsn 	2	SMF89_PCD_Rsvd_Exists Meaning: When on, indicates records generated on systems running z/OS V1R7 through z/OS V1R9. When off, indicates records generated on systems running z/OS V1R10 and later.
Bit	Meaning When Set												
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1	SMF89_Capacity_Data_err Meaning: When on, indicates that error occurred while collecting the processor capacity data, therefore the following fields are unreliable: <ul style="list-style-type: none"> • SMF89_RCTPCPUA_Actual • SMF89_RCTPCPUA_Nominal • SMF89_RCTPCPUA_scaling_factor • SMF89_Capacity_Adjustment_Ind • SMF89_Capacity_Change_Rsn 												
2	SMF89_PCD_Rsvd_Exists Meaning: When on, indicates records generated on systems running z/OS V1R7 through z/OS V1R9. When off, indicates records generated on systems running z/OS V1R10 and later.												

WLM Support for IBM zEnterprise 196: Availability



Function	z/OS V1.13	z/OS V1.12	z/OS V1.11	z/OS V1.10	z/OS V1.9
New message IWM064I API enhancements	+	OA30968	OA30968	OA30968	
New MSU computation	+	OA30968	OA30968	OA30968	OA30968

Agenda



- Transaction Management Enhancements
 - Non Shell Enclave Server Management
 - CICS Region / Response Time Management
 - Response Time Distribution for Execution Velocity Goals
- Hiperdispatch APARs
- WLM Support for I/O Priority Manager in DS8K Series
- WLM Support for IBM zEnterprise 196
- Temporary Capacity Reporting via SYSEVENT REQLPDAT
- z/OSMF Workload Management
- WLM support for Unified Resource Manager
- Capacity Provisioning Update Summary
- WLM Tools Overview

Temporary Capacity Reporting via SYSEVENT REQLPDAT



- **SYSEVENT REQLPDAT** was changed to return capacity information about IBM z10 (and later) capacity settings:
 - permanent capacity information
 - *The base capacity of the machine*
 - temporary capacity data
 - *Replacement Capacity: Capacity Backup (CBU), or Planned Event (CPE)*
 - *Additional Capacity: On/Off Capacity on Demand (OOCoD)*
 - *The differentiation is relevant for potential license cost or entitlement impact*

Temporary Capacity Reporting via SYSEVENT REQLPDAT



- **IRALPDAT new data fields**

- **LPDATMODELCAPIIDENT**
 - The 16-character EBCDIC model-capacity identifier of the configuration.
- **LPDATMODEL**
 - The 16-character EBCDIC model identifier of the configuration. If not valid, field LPDatModelCapIdent represents both the model-capacity identifier and the model.
- **LPDATMODELPERMCAPIIDENT**
 - The 16-character EBCDIC model-permanent capacity identifier of the configuration.
- **LPDATMODELTEMPCAPIIDENT**
 - The 16-character EBCDIC model-temporary capacity identifier of the configuration.

Permanent+OOCoD + (CUBU+PE)

H/W model

Permanent configuration

Permanent + OOCoD

Temporary Capacity Reporting via SYSEVENT REQLPDAT



- **IRALPDAT new data fields**

- LPDATMODELCAPRATING

- When non-zero, an unsigned integer (“MSU rating”) as identified by the model-capacity identifier. There is no formal description of the algorithm used to generate this integer.

← Permanent+OOCoD + (CBU+PE)

- LPDATMODELPERMCAPRATING

- When non-zero, an unsigned integer (“MSU rating”) as identified by the model-permanent-capacity identifier

← Permanent configuration

- LPDATMODELTEMPCAPRATING

- When non-zero, an unsigned integer (“MSU rating”) as identified by the model-temporary-capacity identifier.

← Permanent + OOCoD

REQLPDAT Sample with Active Temporary Capacity



- **Example output**


```
LPDatModelCapIdent      : 714
LPDatModel              : E26
LPDatModelPermCapIdent  : 709
LPDatModelTempCapIdent  : 711
LPDatModelCapRating     : 00000473
LPDatModelPermCapRating : 00000324
LPDatModelTempCapRating : 000003B0
```

- **Meaning**

- The base model is 709
- This model has active OOCoD capacity
 - It temporarily has a capacity like a model 711
- This model also has active CBU capacity
 - In total it temporarily has a capacity like a model 714

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z/OSMF Workload Management

The new WLM Control Center in z/OSMF V1.12



- Policy editor
 - Simplified creation and editing of WLM policies supported by **best practice checks**
 - Support for review and investigation of WLM policies
- Policy repository
 - WLM policies are stored in a repository integrated in the z/OSMF file system
 - Policies can be exported to the local workstation or a host data set as well as imported from a file or a host data set
 - Policies or best-practice recommendations can be printed for further study
 - Integrated operation history makes manual tracking superfluous
- Installation and activation of WLM policies
- Monitoring of the WLM status in the sysplex
- Administration and operation tasks can be performed simultaneously
 - Simplified migration: Policy elements can be copied from one service definition to another
 - Simplified operation: You can start to edit a policy, interrupt the editing to activate a policy, and then continue with the editing without losing the context
- z/OSMF Workload Management synchronizes automatically with z/OS WLM
- Different authorization levels: View, Install, Modify (V1.13)

z/OSMF Workload Management Service Definition Repository



- Integrated repository for service definitions
- Service definitions can be
 - Imported
 - Exported
 - Printed
 - Viewed or edited
 - Created or Copied
 - Installed on the sysplex
- Indications
 - If service definition is installed and active
 - If service definitions are being viewed or edited
 - If messages exist for a service definition

Store all service definitions in one repository

Name	Description	Activity	Sysplex	Messages	Last Modified (GMT)	Modified By
R12RGRP2	D10 WLM ZOSMF.POLICY.R12RGRF			Error	Feb 23 2010 2:30:24 PM	bmor
RTDST3	Copy of RTDST3				Mar 21 2001 8:23:19 PM	bmair
RTDST3	SDS1 copy 5			Warning	Jan 31 2010 10:49:38 PM	wirag
SampleF	Sample WLM Service Definition 62				Sep 24 2007 8:48:22 AM	tblatt
SampleF (Installed & Active)	Sample WLM Service Definition 57		WLMMPLEX	Information	Feb 1 2010 8:52:56 PM	wirag
SPMinTst				Information	Jan 26 2010 3:50:46 PM	wirag
T13DEC07	add/remove SAP DB2s				Dec 13 2007 9:01:59 PM	ks56551
TEST15				Information	Jan 12 2010 12:43:29 PM	wirag
TESTFIX1					Oct 3 2008 11:40:35 AM	sig011
TESTSD1				Error	Dec 30 2009 6:42:37 PM	wirag
WLM_BOF1	Large			Error	Feb 19 2010 5:12:08 PM	debug22
WLM_BOF2						
WLM_DESC	WL De					
WLM001	Service					
WLM000						
WLM700						
wImpol01	policy					
WLMPOL03				Warning	Jan 13 2010 9:19:00 AM	wirag
WLMPOL04				Warning	Feb 2 2010 12:09:54 AM	wirag
WLMSTT	AVT R10+R11RAS				Jul 8 2008 10:38:57 AM	bmor
WSCVLMDE	WSC Sample WLMServiceDefinition			Error	Jan 27 2010 4:05:01 AM	p3asru

Total: 58, Selected: 1

Refresh Last refresh: Mar 1, 2010 4:09:04 PM local time (Mar 1, 2010 3:09:04 PM GMT)

Click to view, edit, print, install a service definition

z/OSMF Workload Management Editing Service Definitions



- Simplified creation, modification and review of service definitions
 - Policy elements are presented in tables
 - Tables can be filtered and sorted
 - Direct editing of policy elements within tables
 - Best-practice hints are displayed automatically while specifying policy elements
 - Several service definitions can be opened simultaneously
 - Cut, Copy, Paste of policy elements between service definitions

The screenshot shows the IBM z/OSMF Workload Management interface. The main content area displays a table of Service Classes. A context menu is open over the selected row (STTCL7), showing options like 'New Period', 'Expand', 'Collapse', 'Cut to Clipboard', 'Copy to Clipboard', 'Paste Periods', 'Move Periods', 'Delete...', and 'View Cross References'. Three callout boxes provide instructions: 'Best-practice hints help to optimize service definitions' (pointing to a warning icon in the Velocity column), 'Click to copy element on clipboard for insertion into another service definition' (pointing to the 'Copy to Clipboard' option), and 'Click to check where the element is used' (pointing to the 'View Cross References' option).

Name	Period	Importance	Duration	Goal Type	Response Time	Percentile	Velocity	CPU Critical	Resource Group
*STTCL3	1	*3		*Velocity			*91	*No	
*STTCL4	1	*2		*Average Response Time	*00:00:03.000			*No	
*STTCL5	1	*2		*Average Response Time	*00:00:30.000			*No	
*STTCL6	1	*2		*Average Response Time	*00:02:00.000			*No	
*STTCL7	1	*3	*3000	*Vel					
*STTCL8	1	*3	*3000	*Vel					
*STTCL8	2	*3		*Vel					

Agenda



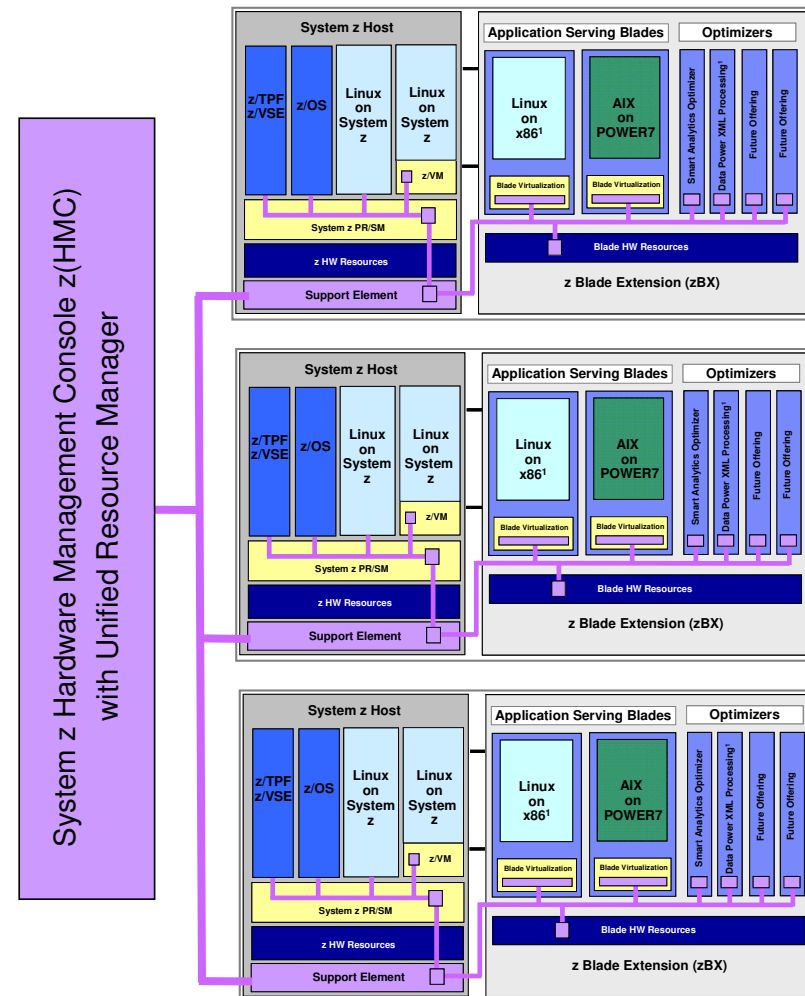
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- WLM support for Unified Resource Manager
- Capacity Provisioning Update Summary
- WLM Tools Overview



zEnterprise Ensembles



- Ensemble
 - A zEnterprise Ensemble is a collection of zEnterprise Nodes managed as a single virtualized pool of server resources
 - Native LPAR and z/VM Virtual Images
 - Power VM Virtual images
 - IBM Smart Analytics Optimizer for DB2
 - A zEnterprise Node can be a member of at most one Ensemble
- zEnterprise Unified Resource Manager
 - allows for the management and optimization of a zEnterprise Ensemble as a single resource pool
 - System z Hardware Management Console (HMC) is management console
 - Ensemble-wide scope of responsibility



zEnterprise Platform Performance Manager

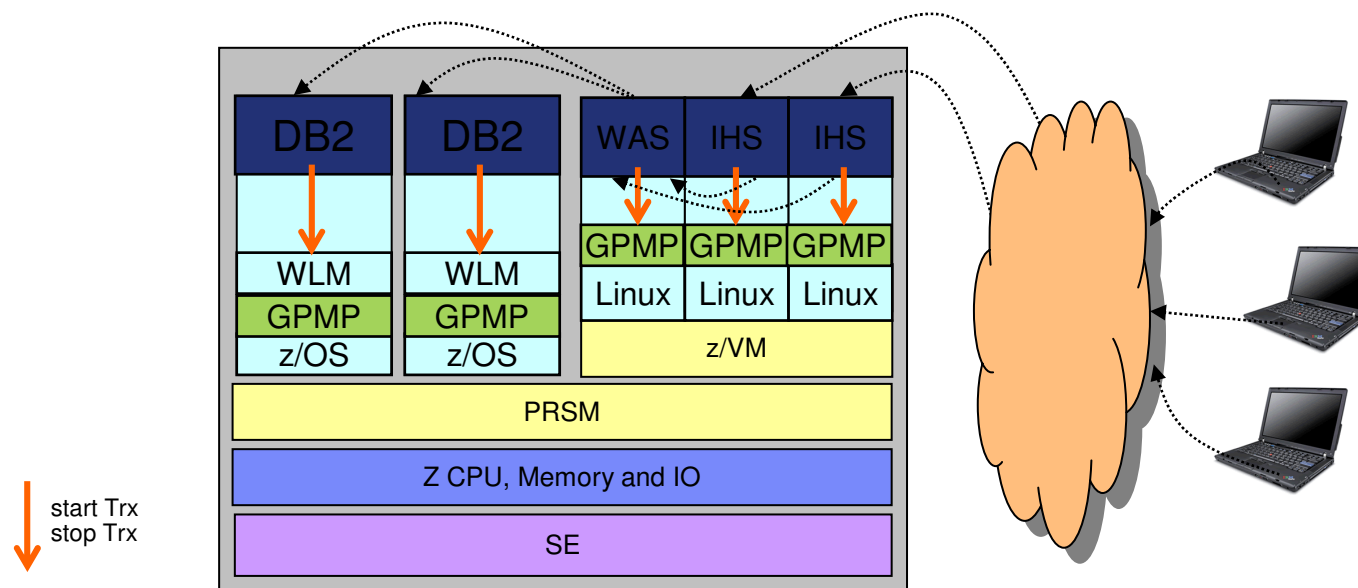


- Platform management component responsible for goal-oriented resource monitoring, management, and reporting across the zEnterprise Ensemble
 - Core component responsible for definition and implementation of goal-oriented management policy
 - Workload monitoring and reporting based on management policy
 - Extend goal oriented approach of z/OS WLM to platform managed resources
 - Orchestration of autonomic management of resources across virtual servers
 - Provide Intelligent Resource Director like function across the zEnterprise
 - Management functions will evolve over time
 - Pushes management directives to the Support Element, Hypervisors, and OS agents as required across the zEnterprise
- Integration of HMC console support
 - Integrated UI for monitoring, display of workload topology relationships, status alerts, etc.
 - Definition of Performance Management Goals and Policy Administration
- Functionality integrated into the zEnterprise Unified Resource Manager
 - Code structured and packaged as System z firmware
 - Inter-Component communication over trusted internal platform management network



zEnterprise Platform Performance Manager

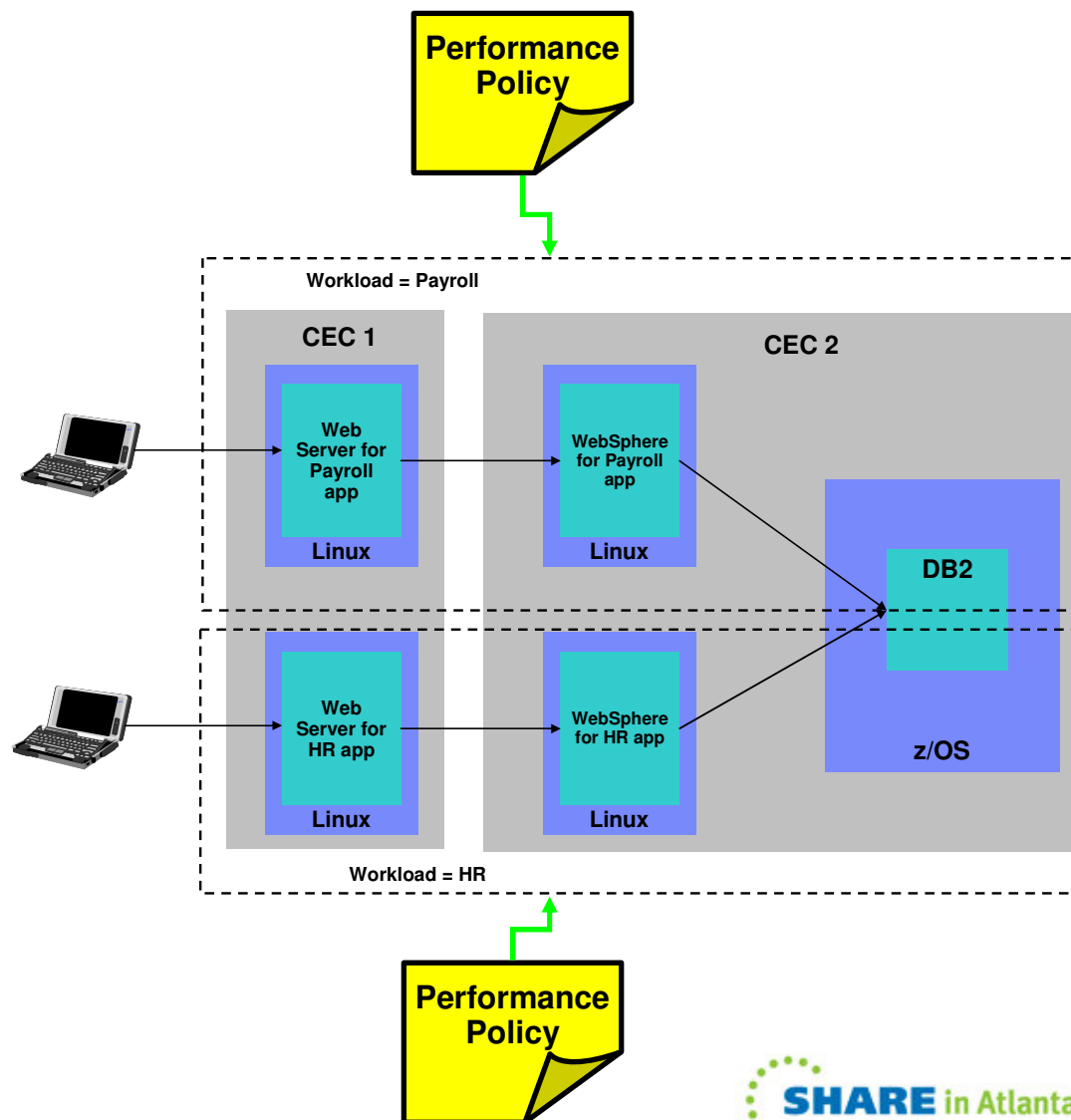
Resource management based on understanding of overall workload flow



- Applications / middleware has to be instrumented with ARM – Application Response Measurement (Open Group Standard) to collect transaction statistics
 - Enables to monitor the flow of transactions
 - Enables to monitor transaction response times and processing statistics
- OS Agent – guest platform management provider (GPMP)
 - is required to identify individual units of work
 - collects data about processes / address spaces and transactions
 - passes data to Platform Performance Manager
 - On z/OS the data is collected by WLM

Unified Resource Manager – Platform Workload Definition

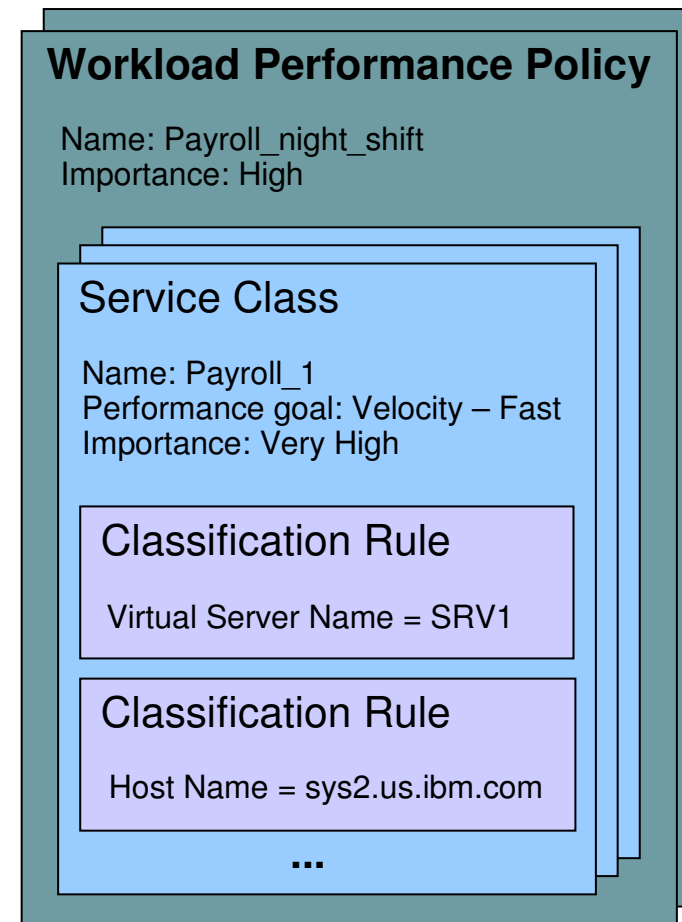
- A Platform Workload is a grouping mechanism and “management view” of virtual servers and optimizers supporting a business application
- Provides the context within which associated platform resources are presented, monitored, reported, and managed
- Management policies are associated to Platform Workload
 - Currently supports Performance Policy



Unified Resource Manager – Workload Performance Policy



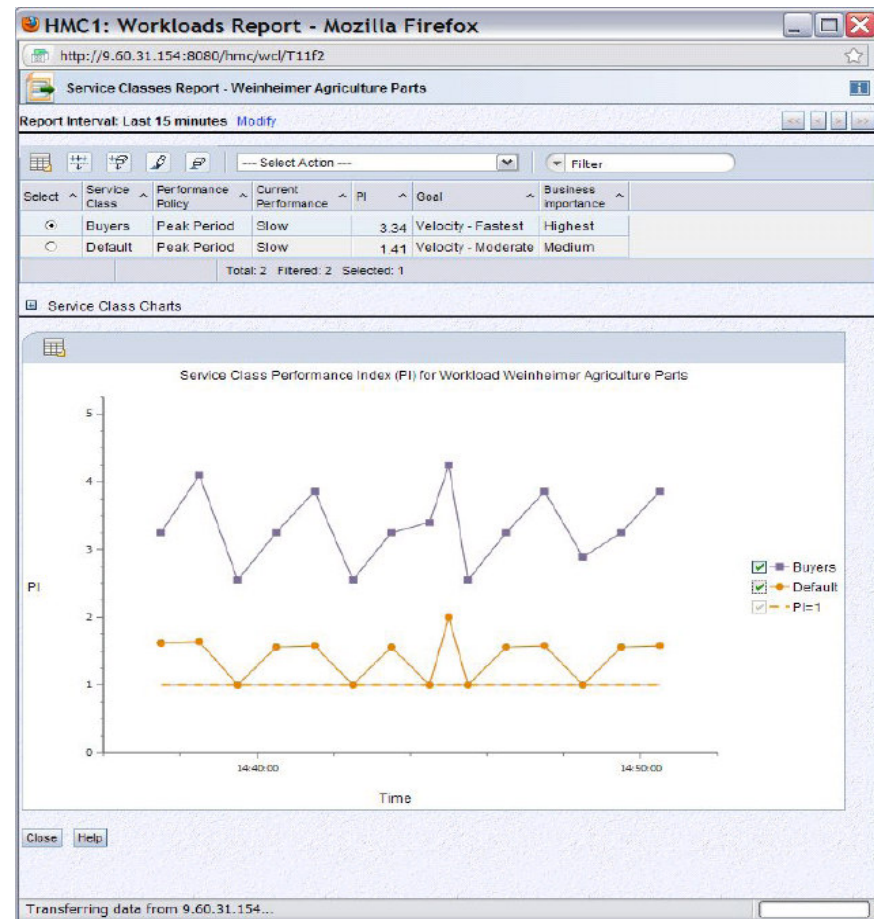
- Defines performance goals for virtual servers in a workload
 - Conceptually similar to simplified z/OS WLM Policy
- Provides basis for monitoring and management of platform resources used by virtual servers in a Workload
- Workload to performance policy relationship:
 - A Workload can have multiple performance policies associated with it
 - Single policy is active at a given time
 - Can dynamically change the policy that is active
 - Through the UI
 - Through a timed based schedule
 - *Example: Day shift policy / night shift policy*



Unified Resource Manager – Workload Based Monitoring and Reporting



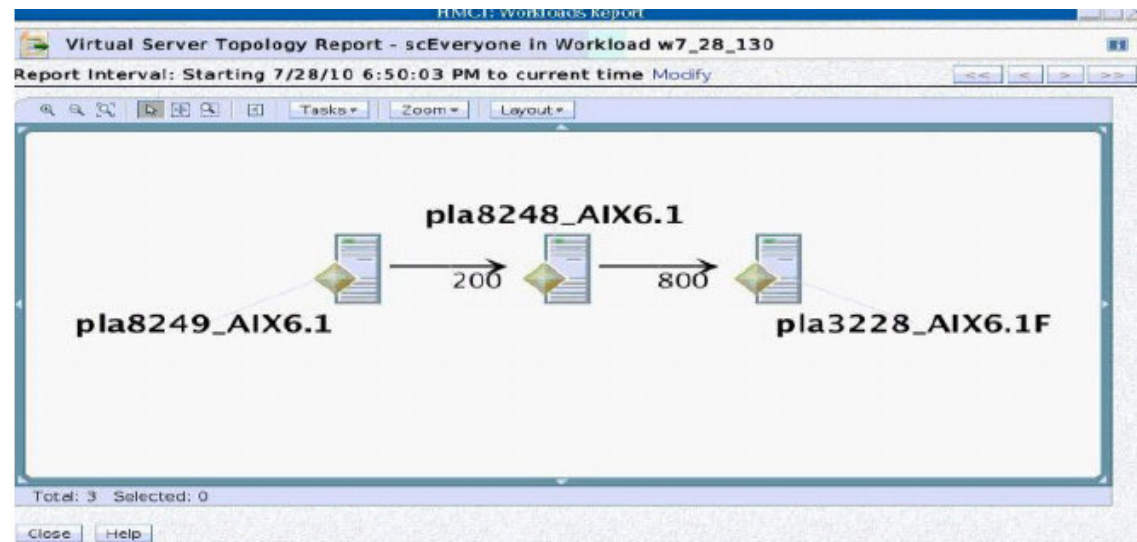
- Provide reporting capability that shows usage of platform resources in a Workload context with a zEnterprise Ensemble scope
 - Across virtual servers and optimizers supporting the Workload
- Workload goal vs. actual reporting
- Drill down from overall Workload “performance health” view to contributions of individual virtual server / optimizers
- Graphical views
 - Topology, trending graphs, etc.
- Links to system activity displays to show hardware utilization views
- Reporting limited to platform level resources, not trying to replace tools that report on intra-OS resources and performance



Unified Resource Manager – Transaction Topology and Hops Report



- Topology of virtual servers
- Transaction statistics
- Requires ARM-instrumented middleware
 - E.g. IBM HTTP server, WebSphere Application Server, DB2 on all supported platforms



Hops Report - scEveryone in Workload w7_28_130
 Report Interval: Starting 7/28/10 6:50:03 PM to current time

Details for scEveryone

Workload: w7_28_130 Performance policy: p1
 Performance goal: Velocity - Moderate Business Importance: Medium
 PI: 0.40 Performance: Fastest

Name	Hop Number	Group Name	Successful Transactions	Failed Transactions	Stopped Transactions	Inflight Transactions	Queue Time (s)	Execution Time (s)	Successful Average Response Time (s)
Hop 0	0		200	0	0	0	2	0.000	0.000
IBM DB2 Universal Database	0	db2inst1	0	0	0	0	0	0.000	0.000
IBM Webserving Plugn	0	IBM_HTTP_Server	200	0	0	0	0	0.000	0.014
pla8249_AIX6.1	0		200	0	0	0	0	0.000	0.014
WebSphere:APPLICATION_SERVER	0	server1	0	0	0	1	0.000	0.000	0.000
pla8248_AIX6.1	0		0	0	0	1	0.000	0.000	0.000
HelloWorld	0	Examples	0	0	0	1	0.000	0.000	0.000
Hop 1	1		200	0	0	0	0	0.000	0.006
WebSphere:APPLICATION_SERVER	1	server1	200	0	0	0	0	0.000	0.006
pla8248_AIX6.1	1		200	0	0	0	0	0.000	0.006
Hop 2	2		800	0	0	0	0	0.000	0.000
IBM DB2 Universal Database	2	db2inst1	800	0	0	0	0	0.000	0.000

WLM support for Unified Resource Manager



- The *guest platform management provider* (GPMP) is the interface between the Unified Resource Manager and the z/OS Workload Manager
- GPMP
 - passes to WLM information about the platform wide performance goals of workloads in which the z/OS is participating
 - sends data provided by WLM to the HMC for platform performance monitoring
 - Server configuration and high level performance statistics collected on z/OS
 - Aggregated transaction response time and resource data for the ARM-instrumented applications
- WLM
 - supports GPMP configuration and management by new WLM service definition options, commands, and messages
 - manages the GPMP address space (start, stop, and restart)
 - displays GPMP status information
 - collects and aggregates performance measurements for GPMP



WLM support for Unified Resource Manager Service Definition Enhancements for GPMP



- z/OS V1R12 introduces WLM functionality level LEVEL025 to support Unified Resource Manager and GPMP
- Unified Resource Manager Service Classes can be classified to WLM service and report classes by specifying classification rules for subsystem EWLM
 - Work qualifier ETC (EWLM transaction class name) is no longer supported
 - Work qualifier type ESC (EWLM service class name) is used to correlate Unified Resource Manager service classes with WLM service or report classes

Action	-----Qualifier-----			-----Class-----	
	Type	Name	Start	Service	Report
_____ 1	ESC	Booking	_____	_____	_____
_____ 2	ESC	System	9	_____	_____
_____ 3	ESC	GoldServ	15	_____	_____
_____ 4	ESC	ice	23	SERVCLS3	_____

DEFAULTS:

- Although z/OS V1R12 simply disregards ETC classification rules, you have to delete them the next time you modify the EWLM subsystem type classification rules
 - Message **IWMAM726 ETC is not a recognized qualifier type** is displayed when pressing F3=Exit
 - Rows with ETC rules have to be deleted before F3 becomes successful

WLM support for Unified Resource Manager Service Definition Enhancements for GPMP



To configure GPMP

- 1) Select option 11 on the Definition Menu
- 2) Specify Guest Platform Management Provider settings

```

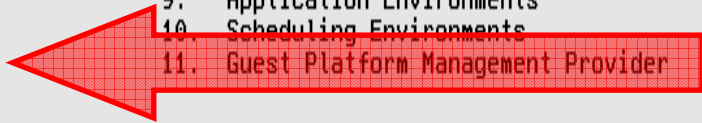
File Utilities Notes Optio
-----
Functionality LEVEL025 Def... WLM Appl LEVEL025
Command ==>

Definition data set . . . : none

Definition name . . . . . MYDEF01 (Required)
Description . . . . . Production 01

Select one of the
following options. . . . . 11
1. Policies
2. Workloads
3. Resource Groups
4. Service Classes
5. Classification Groups
6. Classification Rules
7. Report Classes
8. Service Coefficients/Options
9. Application Environments
10. Scheduling Environments
11. Guest Platform Management Provider
    
```

After GPMP settings defined, functionality level changes to 25



```

GPMP-Settings Notes Options Help
-----
Guest Platform Management Provider (GPMP) Settings
Command ==>

Guest Platform Management Provider activation: 2 1. NO
                                                    2. YES

Names of systems to be excluded:

SYS04  SYS09  _____
_____
_____
_____
_____
_____
    
```

Specifies the systems in the sysplex on which the GPMP should not be started automatically

Specifies whether you want to start the GPMP address space automatically when a WLM policy is activated

WLM support for Unified Resource Manager GPMP Configuration and Management



- On **policy activation**
 - WLM checks whether the service definition has valid GPMP settings
 - If activate=yes and system name not specified on excluded-list, GPMP is started automatically
- Also, you can use the **MODIFY WLM** command
 - To start the GPMP on a system
 - To stop the GPMP on a system
 - Intended for recovery actions. Recommended is to manage GPMP through WLM
- Once you stopped the GPMP manually, the GPMP switches into “manual mode”. It is not automatically restarted even if a WLM policy with a valid GPMP configuration gets activated
 - Status maintained until next IPL

WLM support for Unified Resource Manager GPMP related Commands



- Use the **MODIFY WLM,GPMP** command to start, stop, and modify the guest platform management provider:

- **F WLM,GPMP,START**

- Indicates that you want to start the GPMP

```
16.55.59 WLMG                f wlm, gpmp, start
16.55.59 WLMG STC00752      $HASP373 HVEMCA    STARTED
16.55.59 WLMG STC00752      IEF403I HVEMCA -  STARTED - TIME=16.55.59
```

- **F WLM,GPMP,STOP**

- Indicates that WLM stops the currently active GPMP instance

```
17.03.39 WLMG                f wlm, gpmp, stop
17.03.39 WLMG STC00753      IEF404I HVEMCA -  ENDED - TIME=17.03.39
17.03.39 WLMG STC00753      $HASP395 HVEMCA    ENDED
```

- **F WLM,GPMP,TRACE=NONE|LOW|MEDIUM|HIGH,DEST=FILE| MEMORY**

- Enables you to change the GPMP internal tracing level “on the fly” and to change the destination of the trace (file or memory)

WLM support for Unified Resource Manager GPMP related Commands



- DISPLAY WLM command extensions:

```
IWM025I 11.42.45 WLM DISPLAY 231
ACTIVE WORKLOAD MANAGEMENT SERVICE POLICY NAME: BASEPOL
ACTIVATED: 2010/02/18 AT: 12:57:55 BY: BMAI FROM: TRX2
DESCRIPTION: Base policy for system test
RELATED SERVICE DEFINITION NAME: Ra1fp01
INSTALLED: 2010/02/18 AT: 12:57:48 BY: BMAI FROM: TRX2
WLM VERSION LEVEL: LEVEL025
WLM FUNCTIONALITY LEVEL: LEVEL025
WLM CDS FORMAT LEVEL: FORMAT 3
STRUCTURE SYSZWLM_WORKUNIT STATUS: CONNECTED
STRUCTURE SYSZWLM_EBAE2097 STATUS: CONNECTED
```

```
STATE OF GUEST PLATFORM MANAGEMENT PROVIDER (GPMP): ACTIVE
```

SYSNAME	*MODE*	*POLICY*	*WORKLOAD MANAGEMENT STATUS*
TRX1	GOAL	BASEPOL	ACTIVE
TRX2	GOAL	BASEPOL	ACTIVE

SYSNAME	*GPMP STATUS*
TRX1	INACTIVE
TRX2	ACTIVE

To display system and GPMP status information, enter:

D WLM,SYSTEMS,GPMP

```
IWM075I 11.45.43 WLM DISPLAY 233
ARM SERVICES ARE ENABLED
GUEST PLATFORM MANAGEMENT PROVIDER JOBNAME=HUEMCA ASID=0032
GPMP POLICY IS ACTIVE
NUMBER OF REGISTERED PROCESSES=3, APPLICATIONS=1
```

To display whether ARM is enabled or disabled, enter:

D WLM,AM

WLM support for Unified Resource Manager

GPMP related Commands



- The existing **MODIFY WLM,AM=DISABLE|ENABLE** command is not changed, but the logic for DISABLE/ENABLE changed in the following way:
 - Disabling ARM (Application Response Measurement) will terminate a running GPMP
 - Manually starting the GPMP (using the **MODIFY WLM,GPMP,START** command) when ARM is disabled will result in message IWM078E
 - Activating a WLM policy that contains valid GPMP settings will not result in the start of a GPMP instance, if ARM is disabled
 - The state of the GPMP will be displayed as “DISABLED”, if ARM is disabled
 - If ARM is enabled again, the state of the GPMP will change to “STOPPED”. To start the GPMP again, it has to be started manually

WLM support for Unified Resource Manager GPMP Installation



- GPMP must be authorized to run as a trusted started task
- Sample job HVEENV provided in SYS1.SAMPLIB to
 - define the GPMP security setup (see STEP01)
 - configure the execution environment for the GPMP (see STEP02)
- Modify following variables according to your specific environment:

Variable	Description
DATA_ROOT	Directory on UNIX where the GPMP stores the configuration and diagnostics data
JREBIN_ROOT	Directory on UNIX where the Java executable is located
LOGFILE_ROOT	Directory where the GPMP startup related diagnostics messages will be stored
MCA_USER	The user created in STEP01 of the JCL. It is recommended to keep HVEMCA1 as the user name.
MCA_GROUP	The group created in STEP01 of the JCL. It is recommended to keep HVEMCA as the group name.
MCA_JAVADUMPS	Optional USS directory where GPMP Java, Heap, SNAP, CEE dumps will be created
ENV_PROFILE	The UNIX profile to be used by the GPMP. This should contain environmental information, for example, TimeZone, Locale.

- Run the JCL from an authorized user with UID=0
- STEP01 must be modified when running GPMP in a SECLABEL environment
 - Example provided in Chapter 15 of the WLM Planning Guide

WLM support for Unified Resource Manager Prerequisites



- Hardware
 - z196 with zEnterprise Unified Resource Manager
 - Guest platform management provider on z/OS cannot be started on pre-z196 servers
 - If started on pre-z196 servers, message **IWM078E GUEST PLATFORM MANAGEMENT PROVIDER CANNOT BE STARTED, FUNCTION NOT AVAILABLE** is issued on the console
- Software
 - z/OS V1R12 and OA30928
 - For z/OS V1R10 and V1R11: OA30928

Agenda



- Transaction Management Enhancements
 - Non Shell Enclave Server Management
 - CICS Region / Response Time Management
 - Response Time Distribution for Execution Velocity Goals
- Hiperdispatch APARs
- WLM Support for I/O Priority Manager in DS8K Series
- WLM Support for IBM zEnterprise 196
- Temporary Capacity Reporting via SYSEVENT REQLPDAT
- z/OSMF Workload Management
- WLM support for Unified Resource Manager
- Capacity Provisioning Update Summary
- WLM Tools Overview



Capacity Provisioning Enhancements in z/OS V1.13



- Capacity Provisioning management enhancements
 - **Provisioning increments** allow for faster or more aggressive provisioning
 - **Recurring time condition** support allows to define recurring time windows
 - Allows to avoid ENABLE and DISABLE commands
 - Statement of Direction to withdraw support for the SNMP
 - z/OS BCPii is the recommend protocol
- Control Center Enhancements
 - Support the 32- and 64-bit versions of Microsoft Windows 7 Professional Edition
- **New with z/OSMF V1.13:**
 - Capacity Provisioning monitoring task



z/OS V1.13: Primary and secondary capacity quantum



- Previously CPM increased capacity in small increments
 - On full speed models it would have usually added one processor at a time
- Now CPM supports primary and secondary activation quantum
 - Primary quantum added for first activation on a given CPC
 - Secondary added on subsequent activations
 - Definition is made on “Maximum Provisioning Scope” Panels.
 - Only general purpose capacity supports primary and secondary quantum at this time.
- Rolled-back to z/OS V1.11, V1.12

z/OS Capacity Provisioning Control Center - Domain GUI

File Options Help

Workspace

- Provisioning Manager
- Configurations
- Policies
 - SAMPTD
 - SAMPWLD1
 - SAMPWLD2
 - Policy Timeline
 - Logical Processor Scope
 - Max. Provisioning Scope
- Rules
 - EndOfOct_DB
 - Conditions
 - EndOfOct_DB
 - EndOfOct_WEB
 - Conditions
 - EndOfOct_WEB

Maximum Provisioning Scope

Policy: SAMPWLD2

Maximum Provisioning Scope

Add Limit Delete Limit Apply Cancel

CPC	Max. MSU	Max. zAAP Processors	Max. zIIP Processors	Primary Activation (MSU)	Secondary Activations (MSU)
H05	2500	2	1	1500	500
R35	300	0	0	1000	100

z/OS V1.13: Recurring time conditions



- Previously the CPM policy supported only fixed time intervals
 - Defined by start date/time and end date/time
- Starting with z/OS 1.13 CPM plans to support (weekly) recurring time conditions
 - Defined by start date, end date, start time, end time and day of week to which it applies
 - Rolled-back to z/OS V1.11, V1.12

The screenshot displays the 'z/OS Capacity Provisioning Control Center - Domain GUI2' interface. The left pane shows a tree view with 'Configurations' expanded to 'Policies' and then 'SAMPWLD2'. The right pane shows the 'Time Conditions' configuration for 'SAMPWLD2'. The 'Time Conditions Properties' section shows: Policy: SAMPWLD2, Rule: EndOfOct_DB, Condition: EndOfOct_DB, and Times displayed in Time Zone: UTC. Below this, there are tabs for 'Nonrecurring' and 'Recurring', with 'Recurring' selected. A table below the tabs shows the configuration for a recurring condition named 'November'.

Name	Start Date	End Date	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Start Time	Deadline	End Time
November	Nov 1, 2010	Nov 30, 2010	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	11:00 AM	8:00 AM	10:00 AM

Capacity Provisioning Support of zEnterprise 196 Static Power Save Mode



- Commands to disable or enable static power save mode:

Syntax



- Existing reports are extended to report on power-save capability, and whether power-save mode can currently be enabled

```
CPC R35 with record * is enabled (default enabled)
CPC is matched with serial 000020089F25 since 07/23/2010 13:32:13
Hardware is of type 2817 with model M49
Current model is 722 with 2119 MSU, 1 zAAPs, and 1 zIIPs
No usable 00CoD record available
Power save mode is enabled
```

- If power-save mode cannot be re-enabled in current period: “Power save mode is disabled and not allowed”
- For CPCs supporting static power save mode the Provisioning Manager will not consider adding capacity based on the active policy while in power save mode
 - Already activated temporary capacity may be deactivated
 - ACTIVATE RESOURCE and DEACTIVATE RESOURCE commands are not affected by power save mode.
- Requires Automate version of the zEnterprise Unified Resource Management suite
 - CPC Power Saving setting must be “Custom”
 - Also see “Controlling IBM zEnterprise 196 Static Power Save Mode via MVS Capacity Provisioning Manager (CPM)” at

<http://www.ibm.com/support/techdocs/atsmastr.nsf/WebIndex/WP101869>



Capacity Provisioning New Function Overview

<i>z/OS (CPM) release</i> Function	V1.13	V1.12	V1.11	V1.10	V1.9
<i>Capacity increments Recurring time conditions</i>	+	OA35284	OA35284	OA35284 Toleration- only	
<i>CPC Windows 7 support</i>	+				
<i>z196 Static Power Save Mode</i>	+	OA30433	OA30433	OA30433	OA30433 Toleration- only
<i>Samples for security definitions (CIM, CPM, z/OSMF)</i>	+	+	(OA32854)		
<i>Control Center reporting enhancements, Windows Vista™ support</i>	+	+			
<i>CICS/IMS transaction classes support</i>	+	+	OA29641	OA29641	
<i>RMF provider can locate DDS dynamically</i>	+	+	OA31118	OA31118	
<i>z/OS BCPii Support and Logical Processor Mgmt</i>	+	+	+	OA25426 OA24945	
<i>CPM Status Monitoring in z/OSMF</i>	+				

+ : Support integrated into release base

WLM Tools: A Summary



Tool	Name	Description	Content	Status
SVDEF	Service Definition Formatter	Uses output from WLM Administrative Administration to display content of service definition in a workstation spreadsheet	Excel/workstation	Available, not updated anymore (→ z/OSMF)
WSE	Service Definition Editor	Allows to create, modify, and analyze WLM service definitions	Java program on workstation	Available, not updated anymore (→ z/OSMF)
WLMQUE	Application Environment Viewer	Allows to monitor WLM Application Environments	ISPF Tool	Available
WLMOPT	OPT Display	Display WLM/SRM OPT Parameters	IPF Tool	Obsoleted by RMF in z/OS V1.11

<http://www-03.ibm.com/servers/eserver/zseries/zos/wlm/tools/>

WLM Tools

Service Definition Editor



WLM Service Definition Editor - D:\SAMPLESD.xml

File Edit Options Help

local

Classification Groups		Classifications		Service Parameter		Application Environments		Scheduling Environments		Report Classes	
Service Definition			Resource Groups			Workloads		Service Policies		Report Classes	
Name	ServiceClasses	Period	Goal	Im...	Duration	ResponseTime	Perce...	Level	ResourceGr...	CPU...	Description
WKLDASC											ALL APPC Transaction
WKLDASC	A3V30STD								GBATCH20	No	ASCH default Service Class
WKLDASC	A3V30STD	1	Velocity		2 500						
WKLDASC	A3V30STD	2	Velocity		2 -						
WKLTK											All Batch Jobs
WKLTK	B4V10STD									No	Batch Standard VEL 10 IMP 4
WKLTK	B4V10STD		Velocity		4 -						
WKLTK	B4V20STD		Velocity		4 -					No	Batch Standard VEL 20 IMP 4
WKLTK	B4V20STD	1	Velocity		4 1000						
WKLTK	B4V20STD	2	Velocity		-						
WKLDTSO											ALL TSO USERIDS
WKLDTSO	T2335DEV									No	Developer (Standard) TSO
WKLDTSO	T23		PercentileResponseTime		2 2500	00:00:02.000	98				
WKLDTSO	T23		AverageResponseTime		3 300000	00:00:20.000	95				
WKLDTSO	T23		PercentileResponseTime		5 -		10				
WKLDTSO	T23									No	Production TSO Helpers
WKLDTSO	T23		PercentileResponseTime		2 2000	00:00:01.000	99				
WKLDTSO	T23		PercentileResponseTime		2 10000	00:00:00.000	99				

used by:
Classification: JES

Insert
Insert Before
Insert After
Replace by
Copy
Cut
Delete

No	Description	Element
1	Importance value can not be null	Workload "WKLTK"/ServiceClass "B4V20STD"/Velocity (#1)
2	WLM may not distinguish between periods with equal importance and only slightly different velocity levels	Workload "WKLDASC"/ServiceClass "A3V30STD"

Help Error

Ok

WLM Tools

Display WLM/SRM OPT Parameter (WLM Tool, supported up to R10)



```
Command ==>                               Scroll ==> PAGE                               >SAVE<
.
.                                     WLM OPT Settings
. System: A0FT                          Version: z/OS 011100  OPT: FT  Time: not issued
. OPT-Parameter:                        Value:             Description:
.
. ABNORMALTERM                          Yes  Abnormal term. used in routing rec.
. BLWLTRPCT                              5    CPU cap. to promote blocked work
. BLWLINTHD                              20   Time blocked work waits for help
. CCCAWMT                                3200,3200  AWM time value (defined, used)
. ZAAPAWMT                                3200,3200  AWM time value for zAAPs (def, used)
. ZIIPAWMT                                3200,3200  AWM time value for zIIPs (def, used)
. CNTCLIST                               No    Clist commands count individually
. CPENABLE                                10,30  LOW,HI thresh for % TPI int. x 100
. DVIO                                    Yes   Specifies w/ directed VIO is active
. ERV                                    1000,E6  Eng res. CPU Service and DP
. HIPERDISPATCH                         Yes,Yes Hiperdispatch value(inOPT, Running)
. IFAHONORPRIORITY                       Yes    Specifies if CPs may help zAAPs
. IIPHONORPRIORITY                       Yes    Specifies if CPs may help zIIPs
. INITIMP                                 0,FE    INITIMP value and DP for initiators
. MCCAFC TH                               400,800  LOW,HIGH central threshold
. MCCFXEPR                                92    % of storage fixed within first 16MB
. MCCFXTPR                                80    % of online storage fixed
. PROJECTCPU                              No    CPU projection for zAAPs and zIIPs
. RCCFXTT                                 66,72  Low,High Logical MPL threshold
. RCCFXET                                 82,88  Low,High Physical MPL threshold
. RMPTTOM                                 1000   SRM invocation interval
. STORAGENS DP                            Yes    Set Non-swappable AS non dispatchable
. STORAGEW TOR                            Yes    Issue IRA221D and IRA421D
. IRA405I                                 46,32,32  IRA405I warning level: 16M,2G,Tot
. VARYCPU                                 No    VARYCPU is enabled
. VARYCPUMIN                             1    VARYCPUMIN value
. WASROUTINGLEVEL                         0    WebSphere Routing Level
.
```

WLM Tools

Display WLM/SRM OPT Parameter (RMF Monitor II OPT Report)



```

boewlm1 - wc3270
RMF - OPT Settings
Line 1 of 29
Command ==>
Scroll ==> PAGE
CPU= 4      UIC= 65K PR= 0      System= WLM1 Total

OPT: 00      Time: N/A
-- Parameter -- - Default - -- Value -- Unit ----- Description -----
ABNORMALTERM      Yes      Yes Y/N  Abnormal terminations in routing
BLWLINTHD         20      20 sec  Time blocked work waits for help
BLWLTRPCT         5        5 0/00  CPU cap. to promote blocked work
CCCAWMT          12000    12000 usec  Alternate wait management time
ZAAPAWMT         12000    12000 usec  AWM time value for zAAPs
ZIIPAWMT         12000    12000 usec  AWM time value for zIIPs
CNTCLIST          No       No Y/N  Clist commands count individually
CPENABLE          10,30|0,0  10,30 %  Threshold for TPI (low,high)
DVIO              Yes      Yes Y/N  Directed VIO is active
ERV              500      500/CB  SU      Enqueue residency CPU Service/DP
HIPERDISPATCH    No       No/No Y/N  Hiperdispatch is desired/active
IFAHONORPRIORITY Yes      Yes Y/N  Allows CPs to help zAAPs
IIPHONORPRIORITY Yes      Yes Y/N  Allows CPs to help zIIPs
INITIMP           0        0/FE #   INITIMP value/DP for initiators
IRA405I           70,50,50  70,50,50 %  Fixed storage of <16M,16M-2G,tot
MAXPROMOTETIME    6        6 *10s  Holder allowed to run promoted
VCCAFACTH         400,800   400,800 #   Threshold for storage (low,ok)
MCCFXEPR          92        92 %    Fixed storage threshold < 16 MB
MCCFXTPR          80        80 %    Fixed online storage threshold
PROJECTCPU        No       No Y/N  CPU projection for zAAPs, zIIPs
RCCFXET           82,88     82,88 %  Physical MPL threshold (low,high)
RCCFXTT           66,72     66,72 %  Logical MPL threshold (low,high)
RMPPTOM          1000|3000  3000 msec  SRM invocation interval
RTPIFACTOR        100       100 %    PI affects server routing weights
STORAGE$SWDP      Yes      Yes Y/N  Sets non-swap. ASID non-dispatch.
STORAGE$WTOR      Yes      Yes Y/N  WTOR to cancel AS in shortage
VARYCPU           Yes      Yes Y/N  VARYCPU is enabled
VARYCPUMIN        1        1 #     VARYCPUMIN value
#ASROUTINGLEVEL    0        0 #     WebSphere routing level

F1=HELP      F2=SPLIT      F3=END      F4=RETURN      F5=RFIND      F6=SORT
F7=UP        F8=DOWN       F9=SWAP lis F10=LEFT      F11=RIGHT     F12=RETRIEVE
4B          X          T          IPY$1C09      002/015
    
```



WLM Tools

WLMOPT – WLM Application Environment Viewer



```
Command ==>                               Scroll ==> PAGE
Application Environment Monitor
Selection: >HELP< >SAVE< >OVW< >ALL< \AE=SYSBATCH
System: AQFT      Sysplex: MCLXCF01  Version: z/OS 011100  Time: 06:22:27

ApplEnv_ Type SubName_ WMAS Del Dyn NQ QLen Str Hav Unb Trm Min_ Max_ ICnt
SYSBATCH JES  JES2      0031 No No  3   0  0 12  0  0  0  0  0

WorkQue_ Del Wnt Hav ICnt QueIn_ QueOut QueLen QueTot_ Act_ Idl_
WLMLONG  No  7  7  0  0  0  0  0  0  4  3
WLMSHORT No  3  3  0  0  0  0  0  0  2  0
COMBUILD No  2  2  0  0  0  0  0  0  1  1

SvAS Binding_ Ter Opr Btc Dem Have Jobname
0043 WLMLONG  No No Yes No  1 BCNDEV
0175 WLMLONG  No No Yes No  1 ALLAEBS.2.SEAS.2.JBNI
0166 WLMLONG  No No Yes No  1 SERV9956
0165 WLMLONG  No No Yes No  1 SERV9955
015A COMBUILD No No Yes No  1 C90SPACE
0150 WLMLONG  No No Yes No  1 INIT
0202 WLMLONG  No No Yes No  1 INIT
0152 COMBUILD No No Yes No  1 INIT
0229 WLMSHORT No No Yes No  1 BMGX1$
0119 WLMLONG  No No Yes No  1 INIT
0050 WLMSHORT No No Yes No  1 ALLAEBS.2.SEAS.11.JBNI
01A5 WLMSHORT No No Yes No  1 INIT
```