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WLM Enhancements and Subcapacity Pricing

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New SCRT Support for z/VM Guests

❏ Provide a 4 hour rolling average for z/OS z/VM guests
  ➢ If z/VM is running in LPAR mode
❏ Provide a 4 hour rolling average for guests that reflects:
  ➢ The actual CPU time consumed without the wait time and independent of the LPAR configuration
  ➢ Provides z/OS changes that enables the SCRT tool to produce reports with actual 4 hour rolling averages for sub-capacity products running under a z/OS guest
❏ Benefit: Previously product MSUs for a sub-capacity product were based on the maximum capacity of the LPAR in which the z/OS guest ran
  ➢ Can result in lower software bills for sub-capacity customers that run with z/OS guests

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Single LPAR with Mix of Guests at z/OS V1R6 and z/OS V1R7

2086-470 @ 208 MSUs
Max Capacity = 208 MSUs

Problem: One Guest running a pre-z/OS V1R7

VM Guest1	VM Guest2
4HRA = 75 MSUs	4HRA = 80 MSUs
z/OS 1.6 DB2 CICS	z/OS 1.7 DB2 WAS
z/VM	
LPAR1	

	LPAR1 VM Guest1 MSUs	LPAR1 VM Guest2 MSUs	Product MSUs
DB2	Max capacity of LPAR1 (208)		208
CICS	Max capacity of LPAR1 (208)	-	208
WAS	-	Max capacity of LPAR1 (208)	208
z/OS	Max capacity of LPAR1 (208)		208

4HRA = Four hour rolling average

Single LPAR with all Guests at z/OS V1R7

2086-470 @ 208 MSUs
Max Capacity = 208 MSUs

VM Guest1	VM Guest2
4HRA = 75 MSUs	4HRA = 80 MSUs
z/OS 1.7 DB2 CICS	z/OS 1.7 DB2 WAS
z/VM	
LPAR1	

	LPAR1 VM Guest1 MSUs	LPAR1 VM Guest2 MSUs	Product MSUs
DB2	75	80	155
CICS	75	-	75
WAS	-	80	80
z/OS	75	80	155

4HRA = Four hour rolling average

Summary of MSUs

❑ CICS ran only in z/VM Guest, therefore the product MSUs for CICS is based on the 4HRA for z/VM Guest1 or 75 MSUs

❑ WAS ran only on z/VM Guest 2, therefore the product MSUs for WAS is based on the 4HRA for z/VM Guest 2 or 80 MSUs

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WLM and Processor Speed Changes for z890

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Processor Speed Enhancement

❏ Currently the performance of a system can be changed by changing the number of processors (CPs)

❏ This enhancement provides another new way of changing the performance of a system by changing the speed of the processors

  ➢ Speed of CPs is changed to increase or decrease system performance

    – zAAPs are not affected by speed change

    – Speed is changed by applying a new LICCC record

  ➢ Supported by z/VM 5.1

z890 processors

WLM Support with z/OS V1R7

❏ When a speed change is signaled to z/OS, SRM/WLM does the following:

  ➢ Adjust all timing and performance related numbers

  ➢ Initiates a WLM policy reactivation

  ➢ Issues a new message

    – IWM063I WLM POLICY WAS REFRESHED DUE TO A PROCESSOR SPEED CHANGE

❏ For z/OS V1R4 and above:

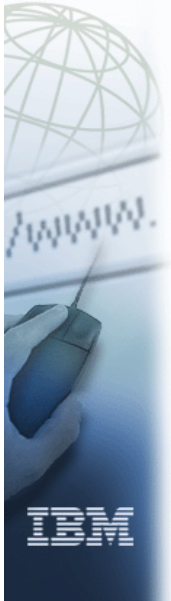 ➢ APAR OA07510 is provided - available 11/04

❏ Install on z/OS on all LPARs

WLM Server Specific Load Balancing Services for Communication Server and DB2

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Workload Balancing Enhancement

❏ Workload balancing by using old routing service took only the behaviour of the whole system into account

❏ New routing services takes server specific behaviour into account

❏ Additional indicators for routing recommendations:

  ➢ Performance index, Importance of server, Queue Time of owned Enclaves

❏ The sysplex routing services provide two main functions:

  ➢ IWMSRSRG macro lets a caller register as a server

  ➢ IWMSRSRS macro provides a caller with a list of registered servers and the number of requests that should be routed to each server
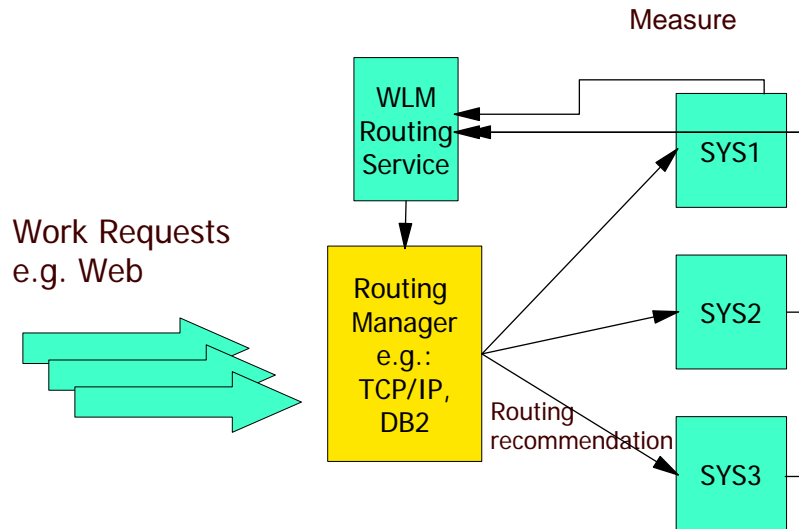
Sysplex Routing

Communication Server and DB2

Measure

WLM
Routing
Service

Work Requests
e.g. Web

Routing
Manager
e.g.:
TCP/IP,
DB2
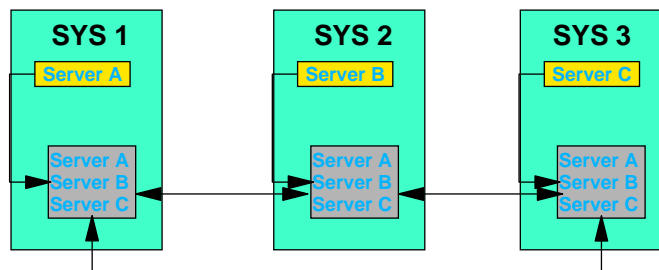
Routing
recommendation

SYS1

SYS2

SYS3

Caller Registers as a Server

WLM Routing Service Today

Step 1: Registration of Servers by IWMSRSRG service

Register each Server on its local system as routing candidate

SYS 1	SYS 2	SYS 3
Server A	Server B	Server C
Server A Server B Server C	Server A Server B Server C	Server A Server B Server C

WLM communicates registered servers and capacity data between systems

WLM - 11-12

Obtain Routing Recommendation

WLM Routing Service Today

SYS 1
Server A

IWMSRSRS

Server A
Server B
Server C

Server	System	Weight
A	SYS 1	50
B	SYS 2	30
C	SYS 3	20

SYS1: avail. Capacities
SYS2: avail. Capacities
SYS3: avail. Capacities

SYS 2
Server B

Server A
Server B
Server C

SYS 3
Server C

Server A
Server B
Server C

30%

20%

50%

Routing Manager
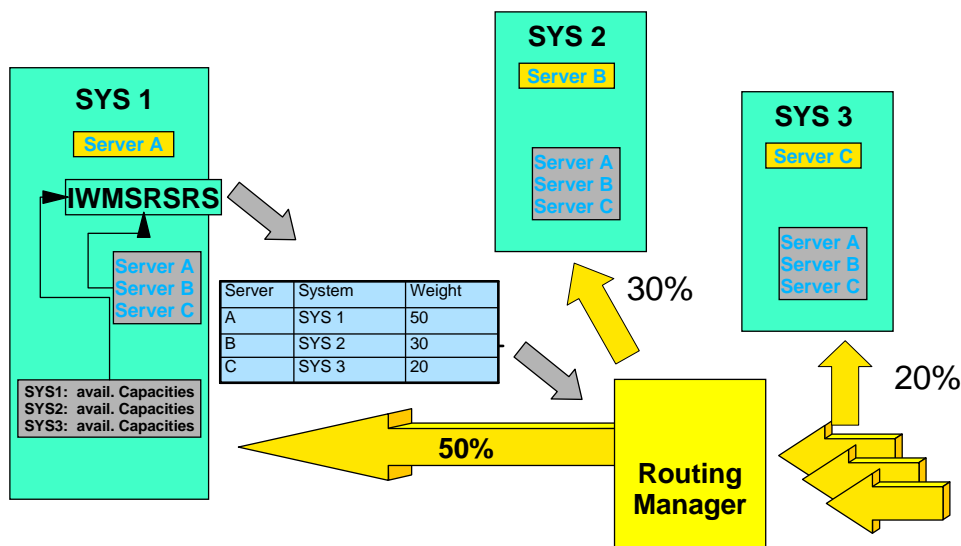
Routing Recommendations

- ❏ To get a routing recommendation, you can call the IWMSRSRS service with a LOCATION parameter on any system of the sysplex

- ❏ It will return recommendations, called weights – which are numbers beween 1 and 64 – for each server, that was registered under that LOCATION id

- ❏ Then you would use those weights to distribute the incoming request between the servers according to the size of their weights

Pre-z/OS V1R7 WLM Routing Service

❏ The routing recommendation – the weight – for a server is only based on the available capacity of the LPAR

❏ This can result in unexpected results:

➤ If the LPAR is loaded with low important work, but the server has high importance

– –> weight too low

➤ If the LPAR is low utilized, but the server has a bad performance index or is waiting for resources

– –> weight too high

New Routing Service IWM4SRSC - V1R7

❏ Input: STOKEN identifies the address space of a server

❏ Output: Weight - The relative number of requests to be sent to that server

❏ A value between 1 and 64

❏ Weight calculation: Product of two factors, scaled by 64

➤ The PI factor (Performance Indicator Factor)

– This gives an indication of how good this server, respective the work that is related to this server, is achieving its goals as defined in the active WLM policy

➤ The Importance factor

– This is a measurement of how much CPU capacity is displaceable by work of the server's importance, respective the work that is related to this server

New Function code "SPECIFIC" in Routing Service IWMSRSRS

❏ Weight calculation: Product of three factors

  ➤ 1.) System utilization factor:

  – Same as resulting system weight for old "SELECT" function

  ➤ 2.) PI factor

  – This gives an indication of how good this server, respective the work that is related to this server, is achieving its goals as defined in the active WLM policy

  ➤ 3.) Queue time ratio:

  – If the server owns independent enclaves, the ratio of queue time to elapsed time of those enclaves

If more than one server is registered on the same system, the weight is divided by the number of those servers

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New Routing Services of WLM

❏ Using the New Routing Services of WLM

  ➤ The subsystems can do more precise workload balancing

  ➤ The routing decisions are dependent on the server specific behaviour, not only System specific

  ➤ There is a choice to obtain routing recommendations system by system or sysplex wide at once

❏ Value is:

  ➤ Performance Improvements

  ➤ Communication Server improvements for TCP/IP applications

  ➤ DB2 improvements - if a DB2 server runs out of DBATs, its enclave queue time goes up The new service realizes that and reduces its routing recommendation for that server

New Routing Service IWM4SRSC

❏ Returns routing recommendation for one given server

❏ LPAR scope

❏ Used by Communication Server for z/OS V1R7

❏ No registration of servers necessary

❏ New function code "SPECIFIC" in old routing service IWMSRSRS

➤ Returns routing recommendations for all registered servers

➤ Each recommendation is server specific

➤ Syplex scope

➤ Used by DB2 V.8 (thru APAR to be announced)

WLM Support in V1R7

❏ IMW4SRSC can be used on any system with z/OS V1R7

❏ IWMSRSRS with function SPECIFIC can be called when all servers registered under the given LOCATION run on systems with z/OS V1R7

❏ The services can be called as assembler macros by any application program

❏ Current exploiters are Communication Server for z/OS V1R7 and DB2 V.8

❏ Old functions of IWMSRSRS routing service

➤ Function = SELECT and Function = QUERY

– Still can be used and are not modified

Routing Service Summary

- ❏ Workload Balancing by using old routing service took only the behaviour of the whole system into account

- ❏ New routing services take server specific behaviour into account

- ❏ Additional indicators for routing recommendations: Performance index, Importance of server, Queue Time of owned Enclaves

- ❏ One service to get recommenation for one server, IWM4SRSC

- ❏ One service for sysplex wide registered servers, IWMSRSRS with function=SPECIFIC

- ❏ More precise workload balancing, less unexpected results