# Container Pricing for IBM Z
## *The WLM View*
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**IBM Z**

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# Agenda

**Container Pricing**

**More Granular Resource Controls (Review)**

# Container Pricing for IBM Z – Overview

- **Announcement** excerpt:
  IBM is introducing Container Pricing for IBM Z for qualified solutions running on IBM z13 and z14 servers. Container Pricing will provide simplified software pricing for qualified solutions, combining flexible deployment options with competitive economics that are directly relevant to those solutions.

- Container Pricing can scale from collocated solutions within existing LPARs, through to separate LPARs, up to multiple-LPAR solutions, without directly impacting the cost of unrelated workloads. Additionally, Container Pricing will simplify pricing and billing on the IBM Z platform, by superseding a number of existing price offerings and by fully automating the billing process.

- IBM initially announces three solutions that will be enabled with Container Pricing:
  - The New Application Solution will provide a highly competitive stand-alone priced offering for new z/OS applications, such as CICS® TS or WebSphere applications. The New Application Solution is the strategic replacement for the current zWPC and IWP priced offerings.
  - The Application Development and Test Solution will provide highly competitive stand-alone pricing for z/OS based development and test workloads. Modern DevOps tooling can be optionally added at uniquely discounted prices.
  - The Payments Solution will provide a "per payment" pricing option for IBM Financial Transaction Manager for z/OS deployments. This new offering directly ties operational cost to business value by basing the price on the number of payments processed, rather than capacity used to process them.

- Container Pricing for IBM Z is available by year end 2017 and enabled in z/OS V2.2 and z/OS V2.3. z/OS will enhance both the Workload Manager capability of z/OS (z/OS WLM) and the Sub-Capacity Reporting Tool (SCRT) to support Container Pricing. This includes:
  - The introduction of a new Tenant Resource Group capability within z/OS WLM to allow the metering and optional capping of workloads, along with the ability to map those workloads directly to Container Pricing.
  - Enhancements to SCRT to capture eligible Container Pricing workloads, allowing for the billing of those solutions independently of traditional Sub-Capacity pricing.

- For more information, see
  - Whitepaper www.ibm.com/support/techdocs/atsmastr.nsf/WebIndex/WP102719 , and
  -  www.ibm.com/it-infrastructure/z/software/pricing

# Why two new z/OS service definition objects?

Ubiquitous Cloud paradigm asks for new ways of metering workloads in multi-tenant environments

IBM Z business asks for an infrastructure to support novel pricing options

- A Tenant Report Class (TRC) is similar to a WLM Report Class.
  TRCs are assigned through WLM classification and are always associated with a Tenant Resource Group.

- A Tenant Resource Group (TRG) is somewhat similar to a WLM Resource Group and can be associated with tenants or solutions.

- TRGs aggregate consumption data and can optionally be used to apply consumption limits.
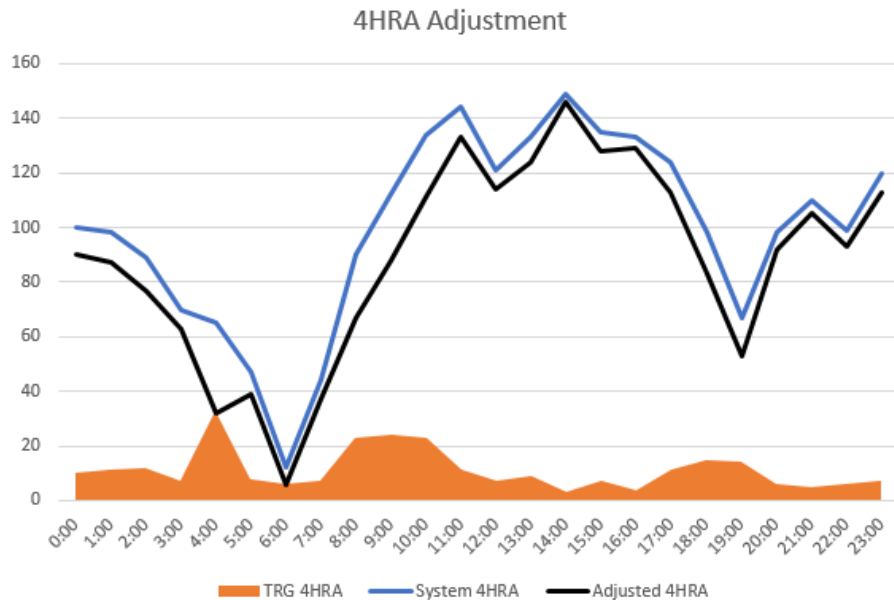
WLM TRG technology is intended for collocated Pricing Container solutions, and tenant implementations.

They are not used for non-collocated pricing container (LPAR level) solutions.

### 4HRA Adjustment



Legend: TRG 4HRA — System 4HRA — Adjusted 4HRA

# Container Pricing workflow overview

- For an eligible solution, IBM provides customers with a "Solution ID" (key)

- In your WLM service definition
  - Define one or more TRGs. Paste the Solution ID into the definition.
    - Dummy solution IDs for test/education will be documented.
  - Define one or more TRCs associated with the TRG(s)
  - Change or add classification rules to classify eligible work and assign service class and TRC(s)
  - Only eligible work must be classified into solution TRGs
  - Install and activate WLM service definition
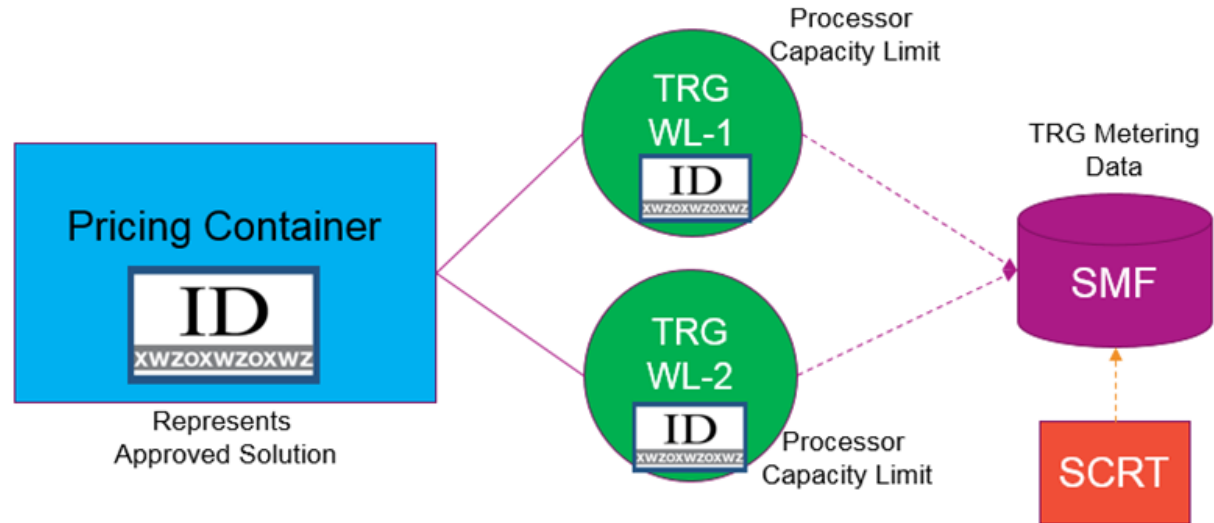
- Monitoring products query WLM and write new SMF70.1 data sections for TRGs
  - In addition, the TRC and TRG data will be reported via the existing report class and resource group mechanism in the WLMGL report (SMF72.3)

- SCRT consumes SMF70 and SMF89 data for billing
  - Verifies solution ID, applies pricing rules

Pricing Container

**ID**
XWZOXWZOXWZ

Represents Approved Solution

TRG WL-1

**ID**
XWZOXWZOXWZ

Processor Capacity Limit

TRG WL-2

**ID**
XWZOXWZOXWZ

Processor Capacity Limit

TRG Metering Data

SMF

SCRT

# Overview of Enhancements for Container Pricing for IBM Z

- New WLM service definition panels (z/OSMF and ISPF)
  - for defining and modifying Tenant Resource Groups
  - for defining and modifying Tenant Report Classes
  Summary of WLM changes in  http://publibz.boulder.ibm.com/zoslib/pdf/OA52312.pdf


- Resource Group (RG) and Tenant Resource Group (TRG) enhancements
  - New Sysplex-wide Type 4 limit expressed at a scale of "MSU"
  - Optionally, specialty processor consumption can be counted towards the limit

- A new service definition option that allows to disable "Discretionary Goal Management" globally

- WLM/SRM programming services are enhanced
  - A new IWM4QTNT service allows monitoring products to retrieve TRG-level consumption data
  - Various APIs provide TRC and TRG indications

- *WLM TRG level data will be reported by monitoring products, such as RMF*
  - *Including reporting in SMF type 70.1 record*

- *SMF70 TRG data can be consumed in SCRT.*
  - *Depending on business rules (solution ID), SCRT may reduce the system 4HRA by TRG level 4HRA partially or entirely. Optionally, other charge models may apply.*
  - *Product usage information (SMF89) may be evaluated*

- *Various other components updated (SMF, SDSF, z/OSMF, …)*
  - *z/OSMF Workflows simplify solution implementation*
  - *Comprehensive Knowledge Center Content Collection*

# Support for IBM Container Pricing for IBM Z

| z/OS release / Function | z/OS V2.3 | z/OS V2.2 | z/OS V2.1 |
|---|---|---|---|
| WLM | *OA52312* OA54590 | *OA52312* OA54590 | **Coexistence only: OA52312** |
| RMF | OA52694 | OA52694 | |
| z/OSMF WLM | PI89361 | PI89361 | |
| z/OSMF RMF | PI89935 | PI89935 | |
| SMF | OA53033 | OA53033 | |
| SDSF | PI82528 | PI82528 | |
| SCRT and Billing System Support | OA53047 | *SCRT V25 R2* | |

Container Pricing FIXCAT category: Keyword:

Content collection (Knowledge center)
IBM.Function.PricingInfrastructure
PRICINGINFR/K

# TRG and TRC Definition

- The WLM Administrative Application Level is increased to 32.

- Tenant Resource Groups and Tenant Report Classes can be defined via new menu items.

- Specification of these new objects will increase the functionality level of the service definition to 32.

```
Functionality LEVEL032        Definition Menu         WLM Appl LEVEL032


--------------------------------------------------------------


Definition data set  . . : 'WLM.DEMO.SRVDEF.XML'
Definition name  . . . . . PROD01     (Required)
Description  . . . . . . . Production service definition


Select one of the following options.

__      1.  Policies                  12. Tenant Resource Groups
        2.  Workloads                 13. Tenant Report Classes
        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 Mgmt Provider
```

# Tenant Resource Group (TRG) Definition

- The TRG name is mandatory (8 char)

- Description, Tenant ID, Tenant Name are optional and are expected to be used in a z/OS cloud context

- For qualified offerings, a 64 char Solution ID needs to be provided.

```
                   Create a Tenant Resource Group
Enter or change the following information:

Tenant Resource Group Name  TRGDEM01
Description . . . . . . . . Sample TRG
Tenant ID . . . . . . . . . _____
Tenant Name . . . . . . . . Solution Newapp
Solution ID . . . . . . . .
        Z194E15-F1078F4-CEBBF9F075-099853BF-60EF-4A05-A0D1-EF925B-992C90

Define Capacity: __  1.  In Service Units (Sysplex Scope)
                     2.  As Percentage of the LPAR share (System Scope)
                     3.  As a Number of CPs times 100 (System Scope)
                     4.  In accounted workload MSU (Sysplex Scope)
Maximum Capacity  . . . . . . . . . . _____
Include Specialty Processor Consumption NO      (YES or NO)
```

- **Exactly enter (paste) the IBM provided Solution ID string.**
    - WLM user interfaces perform sanity check on the ID. Solution IDs failing that check are rejected.
    - Attributes encoded into the ID may change (or not) how the system processes the work.
    - The Solution ID is acted upon during SCRT processing.
    - Multiple TRGs may specify same Solution ID

- **Optionally, a consumption limit can be specified. TRG capacity limits (see there) should not be specified unless there is a need to limit processor consumption.**
    - The "Include Specialty Processor Consumption" switch indicates whether the combined CP and specialty processor consumption determines the cap limit.

- Unlike standard resource groups there is **no minimum consumption** limit and  **no memory limit**

# Tenant Report Class (TRC) Definition

- The TRC name is mandatory (8 char)
  - Name must be unique (also across report classes)
  - In total, up to 2047 Report Classes and Tenant Report Classes can be defined

```
           Create a Tenant Report Class
------------------------------------------------
Enter or change the following information:

Tenant Report Class Name . . . T_CDC     (Required)
Description  . . . . . . . . . TRC including CDC region

Tenant Resource Group Name . . TRGDEM01  (Required; name or ?)
```

- **The TRG name is required, i.e. any TRC must be associated with a TRG**

- **Monitoring interfaces and monitors report on TRC as on standard report classes**

# TRC related classification rules considerations

- Reporting Attributes MOBILE, CATEGORYA and CATEGORYB must not be used with a Tenant Report Classes in the same classification rule

- A Tenant Report Class must not be used with a service class that is associated with a Resource Group in the same classification rule

- If a Tenant Report Class is used in classification rules that assign different service classes, the Tenant Report Class might become heterogeneous

  - This means that work may run in different service classes but reported altogether in this one Tenant Report Class
  - WLM validation issues a warning panel and message, such as
    `IWMAM916W Tenant Report Class T_CDC might become heterogeneous by combining work running in service classes VEL80 VEL50`
  - **Strong recommendation is to use only homogeneous TRCs**:
    Create different Tenant Report Classes for each service class, and connect them all to the same Tenant Resource Group
    - Helps to receive meaningful performance data.

# Comparison of TRG and RG Capping Types

All RGs and TRGs are Sysplex-wide defined, but the limit may be evaluated either on the Sysplex level or on each system.
For **all** (T)RG types only captured TCB and SRB times are counted towards the limit.
The limit is enforced based on a one minute average (i.e., no 4HRA).

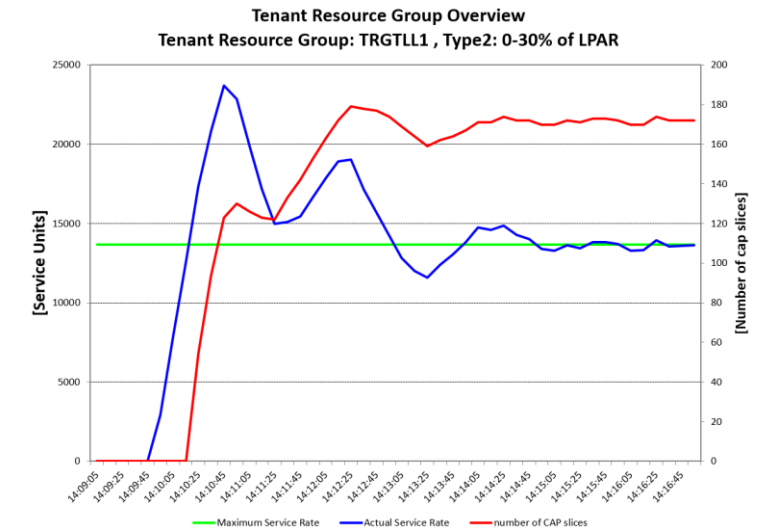| Type 1 | Type 2 | Type 3 | Type 4 |
|--------|--------|--------|--------|
| Raw CPU+SRB service units ("Raw" meaning that Service Definition Coefficients are not applied). | Percent of CP LPAR share (even if specialty processor consumption included). May exceed 100%. | Percent of one CP processor (even if specialty processor consumption included). | Processor consumption expressed in "accounted workload MSU" – see RG and TRG "MSU" limits. |
| Limit applies to Sysplex. | Limit applies to each System. | Limit applies to each system. | Limit applies to Sysplex |

Up to 32 RGs **plus 32 TRGs** may be defined.

# TRG Capping

- TRG capping is based on Resource Group capping and inherits its characteristics.

- Time is divided into 256 "slices". In any slice the whole (T)RG can be set
  -dispatchable (called awake slice)
  -non-dispatchable (cap slice)

- Work will be not dispatchable during a cap slice on any processor type

- The cap pattern is adjusted every 10 sec based on the average of the last minute

- (T)RG may be comprised of work at different priority. Cap pattern applies to entire (T)RG, i.e. during awake slices higher priority work will be dispatched ahead of lower priority work.

- (T)RG consumption will vary based on demand, mix of dispatch priorities, number of dispatchable units and number of processors.
  - The system will attempt to over-cap the work, i.e., the consumption will be throttled to remain below the limit. Depending on the characteristics of the work this may not always be possible.
  - Usually, consumption levels in within (few) minutes

- Very latency sensitive work not a good candidate for capping.
  Multiple TRGs with same Solution ID may be used when needed.

Sample cap pattern showing work that is capped 50% of time.



Tenant Resource Group Overview
Tenant Resource Group: TRGTLL1 , Type2: 0-30% of LPAR

# New IWM4QTNT Programming Service

- Returns TRG related data in the return area mapped by IWMWQTAA.

- Primarily intended for use by monitoring products.

- Information returned:

  - TRG description data

  - For each TRG, IWM4QTNT returns increasing aggregated values.
    Monitoring products can derive interval values by computing deltas, e.g. for reporting in SMF type 70.1 records
    - Long term average (**4HRA**) of CP consumption in **MSU**.
      The captured TRG consumption is extrapolated to the LPAR consumption, i.e., **apportioned uncaptured time** is included.
    - Consumption in unweighted Service Units (SU) on each processor type

# RG and TRG limits
## ...especially "accounted MSU" limits

- Background: Technical and pricing related performance/capacity numbers are based on different views. This remains unchanged.
  - The adjustment factor for service units (technical view) is based on the logical configuration (number of CP s online to the LPAR) on the respective CPC. Refer to Processor version codes and SRM constants
  - The adjustment factor for pricing purposes (MSU) is based on the physical configuration (CPC model capacity rating). Refer to Large Systems Performance Reference for IBM Z

- Every 10 sec, WLM converts type 2, 3, and 4 (T)RG limits into a SU/sec service rate based on current configuration.
  - Therefore, a type 4 (MSU) limit will be converted using the CEC and LPAR adjustment factors.
  - A type 4 limit is intended to simplify the specification of a limit expressed in MSU, **but:**

- **It cannot be expected that RG and TRG limits will closely match the resulting 4HRA TRG contribution:**
  - The (T)RG limit applies only to the accounted (captured) TCB and SRB times. System management time (uncaptured time) is not included.
  - The (T)RG limit is managed to a short interval (~ 1 min) vs. 4 hour rolling average.

# Use of Include Specialty Processor Consumption

▪ In the past, resource group limits were only based on the general purpose processor consumption

▪ Now, if "`Include Specialty Processor Consumption=YES`" is specified, also the specialty processor consumption counts towards the limit
  – Available in RG and TRG definitions

▪ Primary use case:

  – When used with a service class that specifies "<u>Honor Priority = No</u>" it is possible to limit such work to a specific consumption level.

  – Fine grain control for SPARK or Java batch workloads

# When to use resource groups or tenant resource groups

- **Only or preferentially use standard resource groups...**

  - When a resource group minimum or memory limit is required

  - When it is required to use WLM managed initiators as part for the RG

- **Only or preferentially use tenant resource groups...**

  - For authorized pricing container solutions

  - For all functions when the group just serves aggregation (i.e. no limits)

# New service definition option to deactivate DGM

Discretionary Goal Management (DGM) can improve throughput of discretionary work by throttling certain vastly over-achieving non-discretionary work

It "throttles" through dynamically created internal resource groups.

- Service Coefficient/Service Definition Options
  _____

- Enter or change the Service Coefficients:

- CPU  . . . . . . . . . . . . . . 1.0      (0.1-99.9)
  IOC  . . . . . . . . . . . . . . 0.5      (0.0-99.9)
  MSO  . . . . . . . . . . . . . . 0.0000   (0.0000-99.9999)
  SRB  . . . . . . . . . . . . . . 1.0      (0.0-99.9)

- Enter or change the service definition options:

- I/O priority management  . . . . . . . . . NO   (Yes or No)
  Enable I/O priority groups . . . . . . . . NO   (Yes or No)
  Dynamic alias tuning management  . . . . . NO   (Yes or No)
  Deactivate Discretionary Goal Management   Yes  (Yes or No)

**The effect on non-discretionary workload can be unexpected and many installation try to avoid DGM by defining dummy resource groups, or particular goals.**

**With this support, DGM can optionally be disabled.**

# (T)RG Capping and LPAR Capping

- All LPAR and LPAR group level capping flavors are based on the LPAR consumption as seen by the PR/SM hipervisor
    - includes z/OS uncaptured time,
    - LPAR capping is not aware of intra-system (RG and TRG) capping

- Adjustment for TRG consumption is done as SCRT time
    - Only viable option!

- Therefore installations may wish to adjust LPAR capping limits when adding collocated solutions, though the solution pricing is different from the non-solution pricing

- When using non-collocated container it may be desired to reserve capacity for the LPAR container.
    - The subsequent charts summarize what capping options are available.

# Comparison of capping types

| Type of capping | Scope | Specification unit | Proc types | Suitable to isolate LPAR(s), or to enforce hard consumption limit | Manage-able by CPM** | Control point |
|---|---|---|---|---|---|---|
| Initial (hard) capping | LPAR | LPAR share of CPC capacity | Any | Yes | No | SE/HMC |
| LPAR Absolute capping (zEC12 GA2 and later) | LPAR | Fractional #processors | Any | Yes | No | SE/HMC |
| LPAR Group Absolute Capping (z13 GA2 and later) | Group of LPARs | Fractional #processors | Any | Yes | No | SE/HMC |
| Defined capacity (DC, soft capping) | LPAR | MSU (4HRA) | CP | No | Yes | SE/HMC |
| LPAR group capacity (GC, soft capping) | Group of LPARs | MSU (4HRA) | CP | No | Yes | SE/HMC |
| Absolute MSU Capping | LPAR or Group | MSU | CP | Yes –Only for CPs– | No | SE/HMC + IEAOPT |
| Resource group or Tenant Resource Group (*) capping | Groups of service classes or Tenant Report Classes in Sysplex or per LPAR | Unweighted CPU SU/sec, fraction of LPAR share, fractional #CPs, or accounted MSU | CP or combined | N/A | No | WLM Service Definition |
| Logical configuration | LPAR | Integer #processors | Any | Yes | (Yes) | HMC+OS |

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■ PR/SM controlled & enforced   ■ WLM controlled, PR/SM enforced   ■ WLM controlled, OS enforced

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# Which capping techniques may be combined?

−See next chart for legend−

| Type of capping ➜ | Initial (hard capping) | LPAR Absolute capping | LPAR Absolute group capping [2] | Defined capacity [1] | LPAR group capacity [1,2] | Resource group capping | Tenant Resource Group capping [*] |
|---|---|---|---|---|---|---|---|
| Initial (hard capping) | | + | + | – [3] | – [3] | + | + |
| LPAR Absolute capping | | | + | + | + | + | + |
| LPAR Group Absolute capping [2] | | | | + | + [2] | + | + |
| Defined capacity [1] | | | | | + | + | + |
| LPAR group capacity [1,2] | | | | | | + | + |
| Resource group capping | | | | | | | + [4] |
| Tenant Resource Group capping[*] | | | | | | | |

# Legend for *Which capping techniques may be combined?*

1) Includes ABSMSUCAPPING=NO and ABSMSUCAPPING=YES

2) An LPAR can be defined to one group at most:
   Therefore, the group used for LPAR absolute group is the same as the group capping group


3) When initial capping is in effect, WLM cannot control capping:
   - Any defined capacity limit, if specified, will be ignored
   - The LPAR will not join a capacity group, or leave it, respectively.

4) Resource group and Tenant Resource Group capping may be combined within a service definition, but
   - A service class that is associated with a resource group cannot be assigned a Tenant Report Class. In other words:
     Any work unit may be capped through a resource group, or tenant resource group, but never both.

# Agenda

**Container Pricing**

**More Granular Resource Controls** (Review)

* Statements regarding IBM future direction and intent are subject to change or withdrawal, and represent goals and objectives only.

# More granular resource controls

- **Purpose:** provide more granular control over CPU and memory consumption by workload

- Initial focus on demanding workloads that run only on specialty engines like Java batch, SPARK and other analytics, and zCloud workloads

- New controls:
  - ➢ Honor Priority by service class
  - ➢ Memory Limit for resource groups

# More granular resource controls
# Honor Priority by Service Class

```
------------------------------------------------------------------------
                        Modify a Service Class              Row 1 to 4 of 4
Command ===>  _____

Service Class Name  .  .  .  .  . :  FAST
Description  .  .  .  .  .  .  .  .  Velocity=80 goal
Workload Name  .  .  .  .  .  .  .  STCWORK      (name or ?)
Base Resource Group  .  .  .  .  .  _____     (name or ?)
Cpu Critical .  .  .  .  .  .  .  .  NO           (YES or NO)
I/O Priority Group .  .  .  .  .     NORMAL       (NORMAL or HIGH)
Honor Priority .  .  .  .  .  .  .   NO           (DEFAULT or NO)

Specify BASE GOAL information. Action Codes: I=Insert new period,
E=Edit period, D=Delete period.

            -- Period --  ------------------- Goal -------------------
Action      #  Duration   Imp.  Description

  __        1  2000000     2     Average response time of 00:00:01.000
  __        2  2000000     3     Average response time of 00:00:10.000
  __        3  _____    4     Execution velocity of 80
******************************** Bottom of data **************************
```

- Specifies whether work in this service class is exempted from default IFAHONORPRIORITY and IIPHONORPRIORITY processing

- Also for Service Class Overrides

- Enforcement collaboratively with z/OS dispatcher

# Recommendations for HonorPriority

- Some zIIP work may be very latency sensitive and require to be dispatched quickly .
  - Namely some DB2 work, such as prefetch SRBs.
  - zIIP capacity may be constrained but CP capacity might be available to help


- **Recommendation:**

  - At the system level (IEAOPTxx) specify or default to IIPHonorPriority=Yes to allow CPs to help zIIP work.

  - Use the service class specific HonorPriority=No to selectively exclude work from receiving help.
    - Examples could be SPARK or Java batch that you do not want to be processed on general purpose processors

# More granular resource controls:
# Memory Limit for Resource Groups

```
-------------------------------------------------------------------------
                        Modify a Resource Group
Command ===>  _____

Enter or change the following information:

Resource Group Name  .  .  .  .  :  MEMLIMIT
Description  .  .  .  .  .  .  .  .  Provide a memory limit for work

Define Capacity:
__     1.    In Service Units (Sysplex Scope)
       2.    As Percentage of the LPAR share (System Scope)
       3.    As a Number of CPs times 100 (System Scope)
Minimum Capacity .  .  .  .  .  .  .  _____
Maximum Capacity .  .  .  .  .  .  .  _____

Memory Limit (System Scope)        24_____   GB
```

- Specifies the maximum amount of memory that address spaces associated with the resource group through classification may consume on the local system (System Scope)

- The attribute is specified as absolute value in GB in the range 1 – 99,999,999.

- ➔ IBM recommends that you use memory pools when it is required to limit memory consumption for new workloads such as Apache SPARK that provided guidance on how to operate them in a memory pool.

* Statements regarding IBM future direction and intent are subject to change or withdrawal, and represent goals and objectives only.

# How do memory pools work?

- A Resource Group definition, as part of the WLM service definition, has Sysplex scope.

- All address spaces get classified by WLM and get a Service Class assigned
  - **If** the assigned Service Class is associated to a resource group **and** the resource group specifies a memory limit, WLM notifies RSM to connect the address space to a memory pool

- When the first address space connects to a memory pool, RSM creates that pool. The pool name is equal to the resource group name.

- An RSM memory pool represents only a logical pool (=upper limit).
  It is **not** dedicating or reserving real storage.
  → A memory pool can specify a size exceeding the real storage of a given system

- All work in the system is managed towards the global pool (total real storage).
  Address spaces connected to a memory pool are also subject to the pool limit.
  - When the pool limit is approached self-stealing is initiated to keep the number of frames within the limit.

- Address spaces may be temporarily deferred, if the pool limit would be exceeded by adding the space.

- It is recommended that systems are configured to NOT page under normal circumstances.
  Likewise, memory pools should be "reasonably" sized.

# Memory pools - Enhancements via OA52611 (11/2017)

▪ The following initial restrictions were lifted via OA52611 and the associated RSM Support. Currently, the recommendation remains in place.

  – An active address space cannot be reclassified to another defined memory pool
    ▪ The address space has to terminate in order to be reclassified, or it must be reclassified to the global pool and then reclassified again to the new pool.
    ▪ Exception: initiator address spaces for a new job

  – Resource Group memory pool limits cannot be *decreased* while it is defined into a policy.
    ▪ The only way to decrease the limit is to activate a policy that does not have the resource group defined and then activate a policy that defines the pool with a smaller limit.
    ▪ However, a pool can be dynamically *increased* via a new policy activation.

  – Memory related Sysevents (such as STGTEST) are not memory pool aware

  ➔ IBM recommends that you use memory pools only when it is required to limit memory consumption for workloads and for applications which provide guidance on how to operate them in a memory pool.

# Enablement of More granular resource controls

| Function \ z/OS Release | z/OS V2.3 | z/OS V2.2 | z/OS V2.1 |
|---|---|---|---|
| WLM/SRM Support | | OA50845 | OA50845 |
| WLM/SRM Support II | OA52611 | OA52611 | OA52611 |
| RMF Reporting Enhancements | | OA50760 | OA50760 |
| z/OS Supervisor Support | | OA50953 | OA50953 |
| z/OS RSM (Real Storage Manager) | | OA51171 | OA51171 |
| z/OSMF Reporting Enhancements | | PI71118 | PI71084 |