Performance Infrastructure Improvements in z/OS V2.5 WLM

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IBM Germany Research & Development, 2021

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Agenda

- IBM z/OS V2.5 Batch Initiator Enhancements for Job Placement and Initiator Management
- IBM z/OS V2.5 Service Coefficient Removal
- IBM z15 System Recovery Boost
- Other Enhancements and Important Information

WLM Batch Initiator Enhancements

WLM Batch Initiator Management

Policy adjustment:

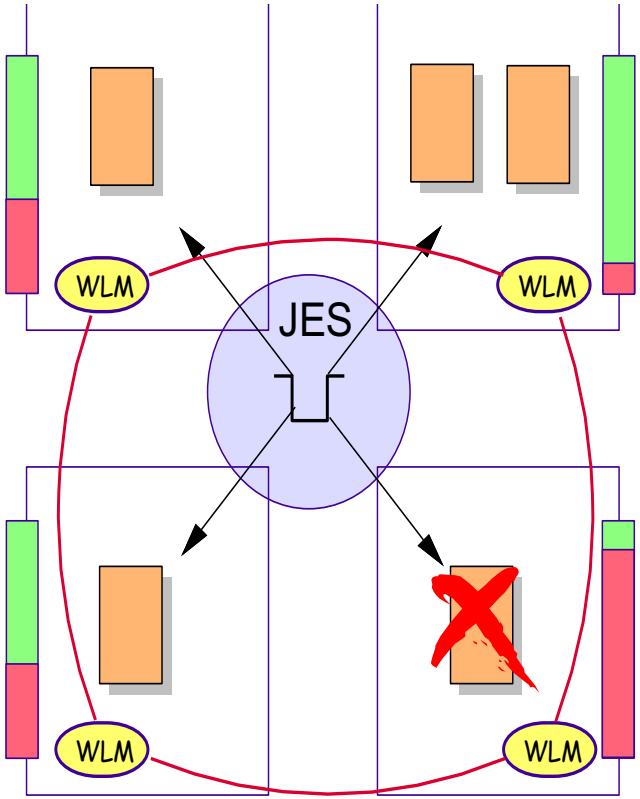
- Initiators are dynamically started by WLM to meet service class period goals by reduction of batch queue delays
- WLM selects the system considering available system resources based on the job's importance

Resource adjustment:

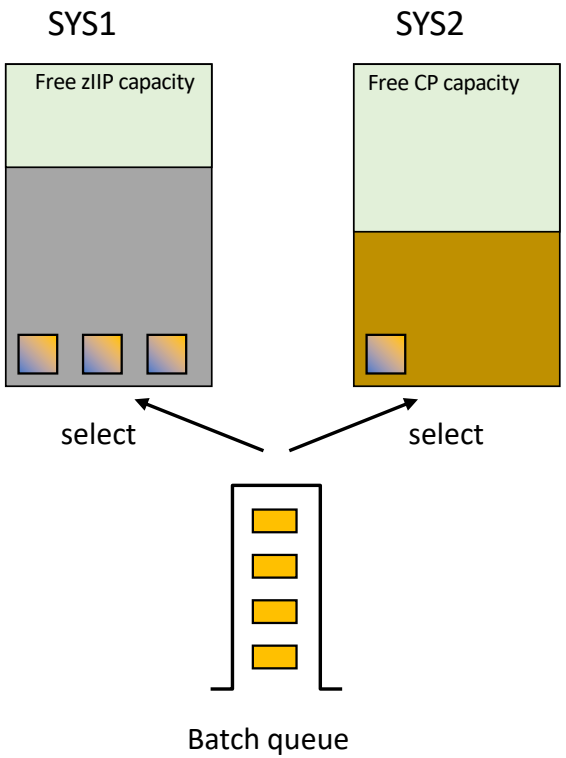
- Start additional initiators if jobs are waiting and unused capacity is available
  - Based on service class history
  - Up to 5 at a time

Problem:

Initiator placement is determined based on the available or displaceable capacity of ***general purpose processors***. As the capacity of specialty processors is increasing, as does the demand for such workloads, it is important to consider the workload specific capacity demand for placement routines



IBM z/OS V2R5 Batch Initiator Enhancements



Starting with IBM z/OS V2R5, WLM Batch Initiator takes the service class consumption of specialty processors into account.

Initiators for batch jobs classified into a service class of which the first period executes primarily on zIIP will tend to be added on systems with spare zIIP capacity.

Initiators for batch jobs classified into a service class of which the first period executes primarily on CP will tend to be added on systems with spare CP capacity.

This enhancement will help to remove the need of manual management of zIIP eligible batch jobs such that the z/OS system automatically selects to best suited system.

Mixed Service Classes

- **Mixed service classes:**
  - Initiators running CP workload and initiators running zIIP workload are classified into the same service class. WLM then must assume that on such system each initiator consumes processor capacity on both processor types. Initiators will only be started if there is sufficient available capacity for all checked processor types.

- To allow the customer some control with “mixed” service classes, WLM does the following:
  - The available CP capacity is always checked.
  - If OPT parameter “IIPHONORPRIORITY = NO” is in effect, the available zIIP capacity is always checked.
  - If OPT parameter “IIPHONORPRIORITY = YES” is in effect (the default), zIIP capacity is only checked if the service class’ consumed amount of zIIP capacity is at least ten percent of the consumed service units on CPs

Batch Initiator Enhancements Recommendation

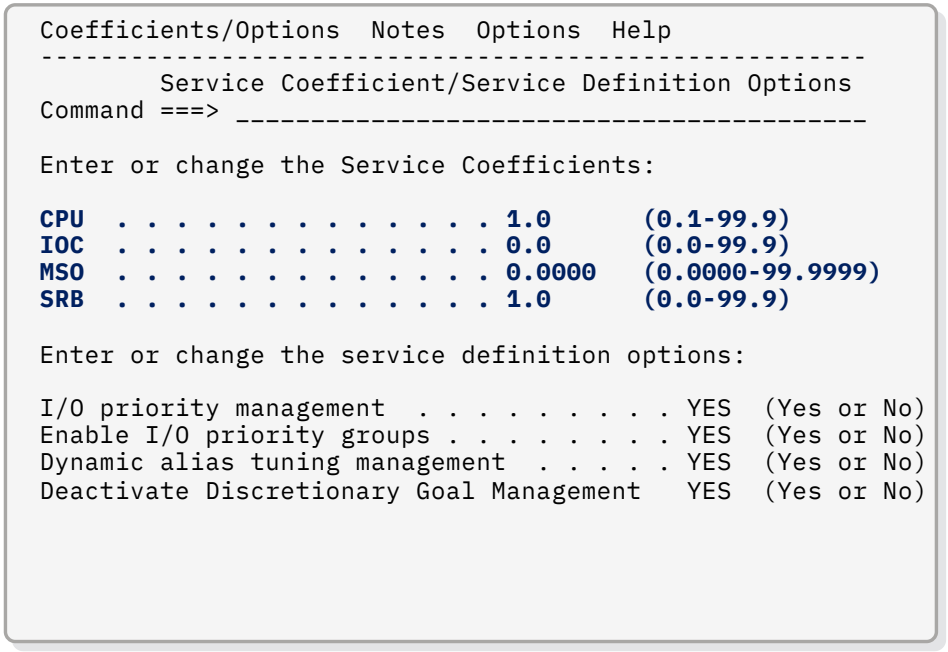
- Use separate sets of service classes for initiators running on specialty processors and initiators executing on standard CPs such that all initiators running in the same service class either execute on standard CPs or on specialty processors. This is no mandatory requirement, but it allows for a more accurate management of the initiators.

- If back-level systems and IBM z/OS V2R5 systems in a SYSPLEX/MAS have WLM managed initiators running in the same service class and on either system the initiators execute on specialty processors, balancing these initiators across the SYSPLEX/MAS will not be optimal. Neither system would be aware of the other system's consumption of specialty processor capacity.

- You mcan use one set of service classes for initiators executing zIIP workloads on IBM z/OS V2R5 systems and another set of service classes for initiators executing zIIP workloads on back-level systems.

IBM z/OS V2.5 Workload Management
Service Coefficient Removal

Removal of Service Coefficients



- Starting with z/OS V2.5 the IBM recommended values

  CPU=1
  MSO=0
  IOC=0
  SRB=1

  will be the predefined values.

- IBM recommends that you adjust your service coefficients before upgrading to a later release.

New health checks ZOSMIGV2R4_NEXT_WLM_ServCoeff and ZOSMIGV2R3_NEXT2_WLM_ServCoeff are provided to check the WLM service coefficients being specified in the currently installed WLM service definition.

Migration Health Check

- **OA59066** provides two health checks
  - ZOSMIGV2R3_NEXT2_WLM_ServCoeff at z/OS 2.3
  - ZOSMIGV2R4_NEXT_WLM_ServCoeff at z/OS 2.4
  - As is customary with migration health check, they are inactive and must be activated by the customer explicitly
- If the health check is activated and the recommended WLM service coefficients are already in use, information message **IWMH101I THE RECOMMENDED WLM SERVICE COEFFICIENTS ARE BEING USED** is issued.
- If the health check is activated and one or more of the WLM service coefficients currently in use have a different value than CPU=1, SRB=1, IOC=0, MSO=0, exception message **IWMH102E THE RECOMMENDED WLM SERVICE COEFFICIENTS ARE NOT BEING USED** is issued.

Overview – Migration Health Check

- If exception message IWMH102E is issued, the customer should consider changing the service coefficients in the WLM service definition to the recommended values and review the durations for any multi-period service classes and adjust them accordingly.
- Information how to adjust the durations is provided in the APAR text
- z/OS MVS Planning: Workload Management Chapter 13 (Defining service coefficients and options) is updated accordingly

```
Duration (DUR) is currently calculated as:

DUR = (CPU * CPU service units) +
      (SRB * SRB service units) +
      (IOC * I/O service units) +
      (MSO * storage service units)

where CPU, SRB, IOC, and MSO are the installation defined
WLM service coefficients. With CPU=1, SRB=1, IOC=0, MSO=0
the new duration is simply calculated as:

NEW DUR = CPU service units + SRB service units

Converting DUR into NEW DUR is calculated as:

NEW DUR = DUR / Total service units
          * ( CPU service units / CPU +
              SRB service units / SRB )

where CPU and SRB are the old service cofficients and Total
service units is the sum of CPU, SRB, IOC, and MSO service
units. These values should be collected for a peak period
interval from, for example, the RMF Postprocessor Workload
Activity (WLMGL) report.

EXAMPLE:

- Old DUR is 90000
- Old default service coefficients used (CPU=10, SRB=10)
- Values from RMF WLMGL peak period interval:
  TOTAL_SU =  6218K
  CPU_SU   =  5877K
  SRB_SU   =  95667

NEW DUR = 90000/6218K * (5877K/10 + 95667/10) = 8645
```

SDSF Health Checker Display (SDSF CK)

The initial state of the migration health check is **INACTIVE.**

```
SDSF HEALTH CHECKER DISPLAY  SYS1                          LINE 1-1 (1)
COMMAND INPUT ===>                                           SCROLL ===>
PREFIX=IS*  DEST=(ALL)  OWNER=*  SORT=ModName/A  SYSNAME=SYS1  FILTERS=1
NP   NAME                              CheckOwner        State
     ZOSMIGV2R4_NEXT_WLM_SERVCOEFF     IBMWLM            INACTIVE(ENABLED)
```

Check is activated by line command **A** in CK display (**H** would deactivate the check).

```
SDSF HEALTH CHECKER DISPLAY  SYS1                          LINE 1-1 (1)
COMMAND INPUT ===>                                           SCROLL ===>
PREFIX=IS*  DEST=(ALL)  OWNER=*  SORT=ModName/A  SYSNAME=SYS1  FILTERS=1
NP   NAME                              CheckOwner        State
     ZOSMIGV2R4_NEXT_WLM_SERVCOEFF     IBMWLM            ACTIVE(ENABLED)
```

```
CHECK(IBMWLM,ZOSMIGV2R4_NEXT_WLM_SERVCOEFF)
SYSPLEX:    PLEX1     SYSTEM: SYS1
START TIME: 12/15/2020 06:12:47.798322
CHECK DATE: 20200101  CHECK SEVERITY: LOW

* Low Severity Exception *

IWMH102E The recommended WLM service coefficients are not being used.

  Explanation:  z/OS V2R4 is the last release to allow specifying
    service coefficients in the WLM service definition. With the release
    after z/OS V2R4, the coefficients are pre-set to CPU=1, IOC=0,
    MSO=0, and SRB=1; and cannot be changed.

    One or more of the WLM service coefficients currently in use have a
    different value and will be ignored after z/OS V2R4:

    CPU=10.0 IOC=5.00 MSO=3.0000 SRB=10.0

    These values are different because you have specified them in your
    currently installed WLM service definition or defaults are taken if
    you did not define them.

  System Action:  Processing continues.

  Operator Response:  Report this problem to the system programmer.

  System Programmer Response:  Change the service coefficients in your
    WLM service definition (CPU=1, IOC=0, MSO=0, SRB=1) and review the
    durations for any multi-period service classes and adjust them
    accordingly. Also, you might need to adjust your accounting
    procedures.
```

Line command **SB** displays the result of the check.

The WLM service coefficients currently in use are part of the message explanation.

z/OS Console

Check can also be activated by MODIFY console command:

f hzsproc,activate,check=(ibmwlm,*)

Important note:

Customers typically don’t need to care about activating migration health checks. When doing an upgrade, the **z/OSMF Upgrade Workflow** will run the migration health checks for the customers automatically.

Coexistence with z/OS V2.5

- z/OS V2.5 uses pre-set WLM service coefficients. They can no longer be defined in the WLM ISPF Application and the z/OSMF WLM task.
- WLM must take care that all systems in the sysplex use identical service coefficients.
  - When the WLM service definition installed has no service coefficients defined, defaults (CPU=10, SRB=10, IOC=5, MSO=0) are used, or when the service definition specifies other coefficients than the recommended ones, the V2.5 systems would use other coefficients than the pre-V2.5 systems.
  - Of course, this should not happen when the customer properly prepared the V2.5 migration. But it could happen, so we must deal with it…
  - Thus, coexistence logic is available which checks for a mismatch of the service coefficients and internally applies identical values.

Adapt Your Multiperiod Durations

- If the customer did not prepare his WLM service definition for the removal of the service coefficients, following steps should be taken because the calculation of DURATION for multi-period service classes changes:

  Before z/OS V2.5 the DURATION is calculated as:

```
OLD DUR = (CPU * CPU service units) + (SRB * SRB service units) + (IOC * I/O service units) + (MSO * storage service units)
```

  where CPU, SRB, IOC, and MSO are the installation defined WLM service coefficients. With CPU=1, SRB=1, IOC=0, MSO=0 the new duration is simply calculated as:

```
NEW DUR = CPU service units + SRB service units
```

  Converting OLD DUR into NEW DUR is calculated as:

```
NEW DUR = OLD DUR / Total service units * ( CPU service units / CPU + SRB service units / SRB )
```

  where CPU and SRB are the old service coefficients and Total service units is the sum of CPU, SRB, IOC, and MSO service units. CPU, SRB, and Total service unit values should be collected for a peak period interval from, for example, the RMF Postprocessor Workload Activity (WLMGL) report.

```
EXAMPLE:      OLD DUR = 90000          - Old default service coefficients used (CPU=10, SRB=10)
                                       - Values from RMF WLMGL peak period interval:
                                            TOTAL_SU = 6218K
                                            CPU_SU   = 5877K
                                            SRB_SU   = 95667

              NEW DUR = 90000/6218K * (5877K/10 + 95667/10) = 8645
```

IBM z15
System Recovery Boost

Introduction

- Part of the IBM Z Instant Recovery offering
- Minimizes impact and duration of downtimes
- No additional MSU consumption or IBM software licensing costs

Technical Overview

Speed Boost

- Subcapacity CPC Boost
- Upgrade to full capacity on activate
- Affects **only** active LPAR

zIIP Boost

- Enables zIIPs to process non-system CP workload
- Activates additional zIIPs to the LPAR
- **May** affect LPARs on same CPC

Technical Overview

- Intelligent Resource Director (IRD) weight management is deactivated
- (Tenant) Resource Group Capping and Discretionary Goal Management (DGM) are deactivated
- Routing changes
  - Routing recommendations change according to boosted capacity (**IPL only**)
  - Deactivated (**Shutdown only**)

How to benefit from System Recovery Boost

- IBM z15
- IEASYSxx **BOOST** parameter

  BOOST=SYSTEM | ZIIP | SPEED | NONE

- **HIPERDISPATCH=YES** (zIIP Boost only)

  with at least 1 shared zIIP

IPL Boost Processing

1. Automatically started during IPL
   - Signaled via console message and ENF signal (84)
   - Ends current and starts new SMF interval

2. Boost Processing Phase
   - Possible offline zIIPs are configured online
   - Non-system work is balanced between zIIPs and CPs (**zIIP Boost**)
   - CPs are configured full capacity (**Speed Boost**)
   - IRD weight management, (T)RG capping and DGM are deactivated
   - Routing weights changes until 3 min before end (configurable via OPT **RTBELeadTime**)
3. Boost End (after **60 min** or **PROC IEABE**)
   - Signaled via console message and ENF signal (84)
   - Ends current and starts new SMF interval
   - Return to normal system behavior

Shutdown Boost Processing

1. Started via **PROC IEASDBS**
   - …

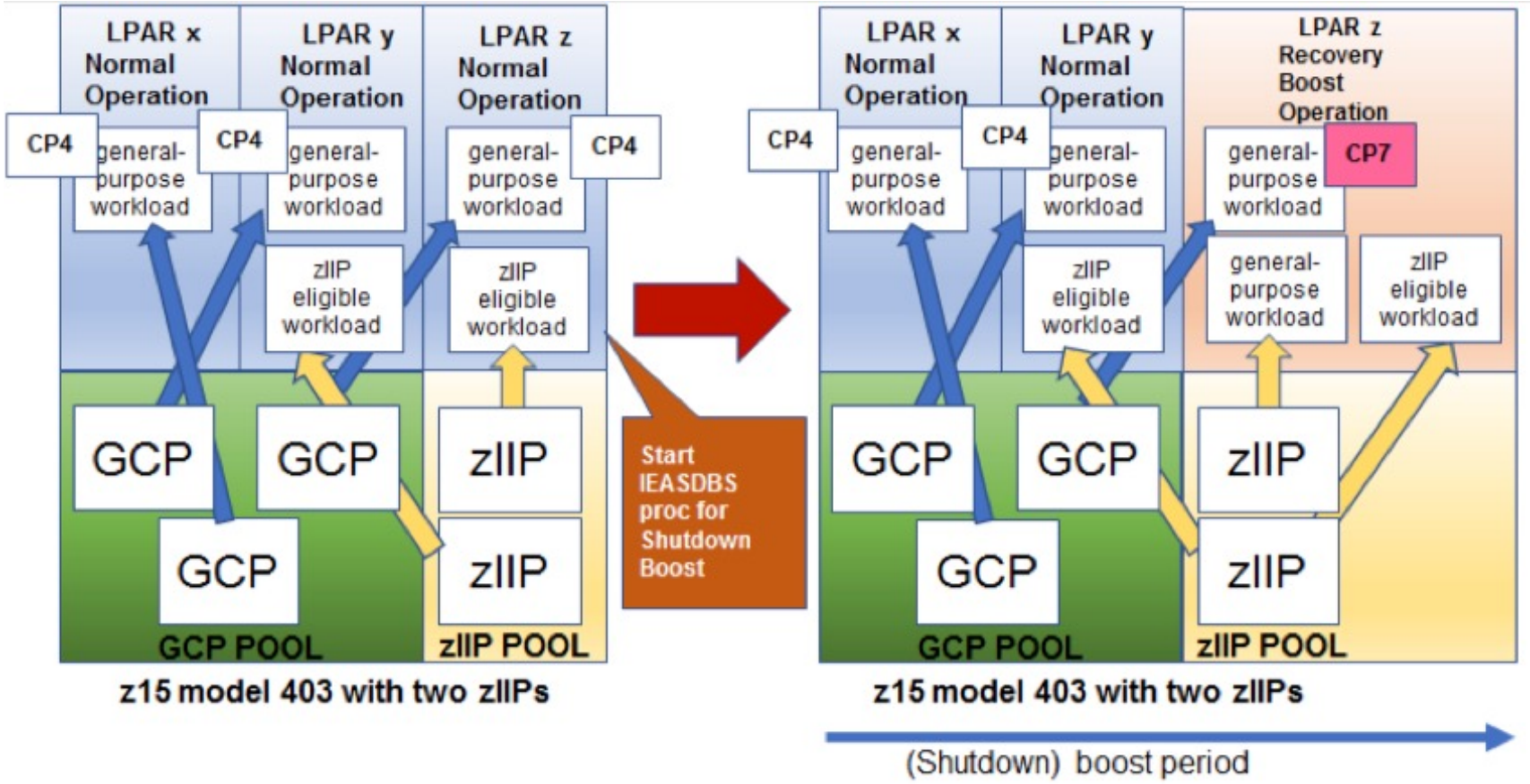
```
SYS1   $HASP100 IEASDBS   ON STCINRDR
SYS1   $HASP373 IEASDBS   STARTED
SYS1   IEA681I Shutdown speed boost is active
SYS1   IEA675I Shutdown zIIP boost is active with 0 transient zIIP cores
SYS1   $HASP395 IEASDBS   ENDED - RC=0000
SYS1   IWM063I WLM POLICY WAS REFRESHED.
SYS1   IWM064I BOOST ACTIVATED.
```

2. Boost Processing Phase
   - …
   - **Routing reports no free capacity**
3. Boost End (after **30 min** or **PROC IEABE**)
   - …

```
SYS1   $HASP100 IEABE     ON STCINRDR
SYS1   $HASP373 IEABE     STARTED
SYS1   IEA678I All shutdown boosts have ended
SYS1   $HASP395 IEABE     ENDED - RC=0000
SYS1   IWM063I WLM POLICY WAS REFRESHED.
SYS1   IWM064I BOOST ENDED.
```

   - Return to normal system behavior **except WLM routing**

CPC illustration



Capping

Capping Type	CP Type	Interactions with Speed Boost	Interactions with zIIP Boost
LPAR Absolute	CP	Cap Respected	N/A
LPAR Absolute	zIIP	N/A	Cap Ignored
Group Absolute	CP	Cap Respected	N/A
Group Absolute	zIIP	N/A	Cap Ignored
Initial	CP	Cap Respected	N/A
Initial	zIIP	N/A	Cap Ignored
Defined Capacity	CP	Cap Respected	Work running on zIIPs due to blurring doesn't count toward CP Cap; CP Cap respected
Defined Capacity	zIIP	N/A	N/A
LPAR Group Capacity	CP	Cap Respected	Work running on zIIPs due to blurring doesn't count toward CP Cap; CP Cap respected
LPAR Group Capacity	zIIP	N/A	N/A
Resource Group/Tenant Resource Group	CP	Caps Ignored	Caps Ignored
Resource Group/Tenant Resource Group	zIIP	N/A	Caps Ignored

Monitoring

WLM

- IWMWSYSQ WLM service

  SYSI_BoostInfo

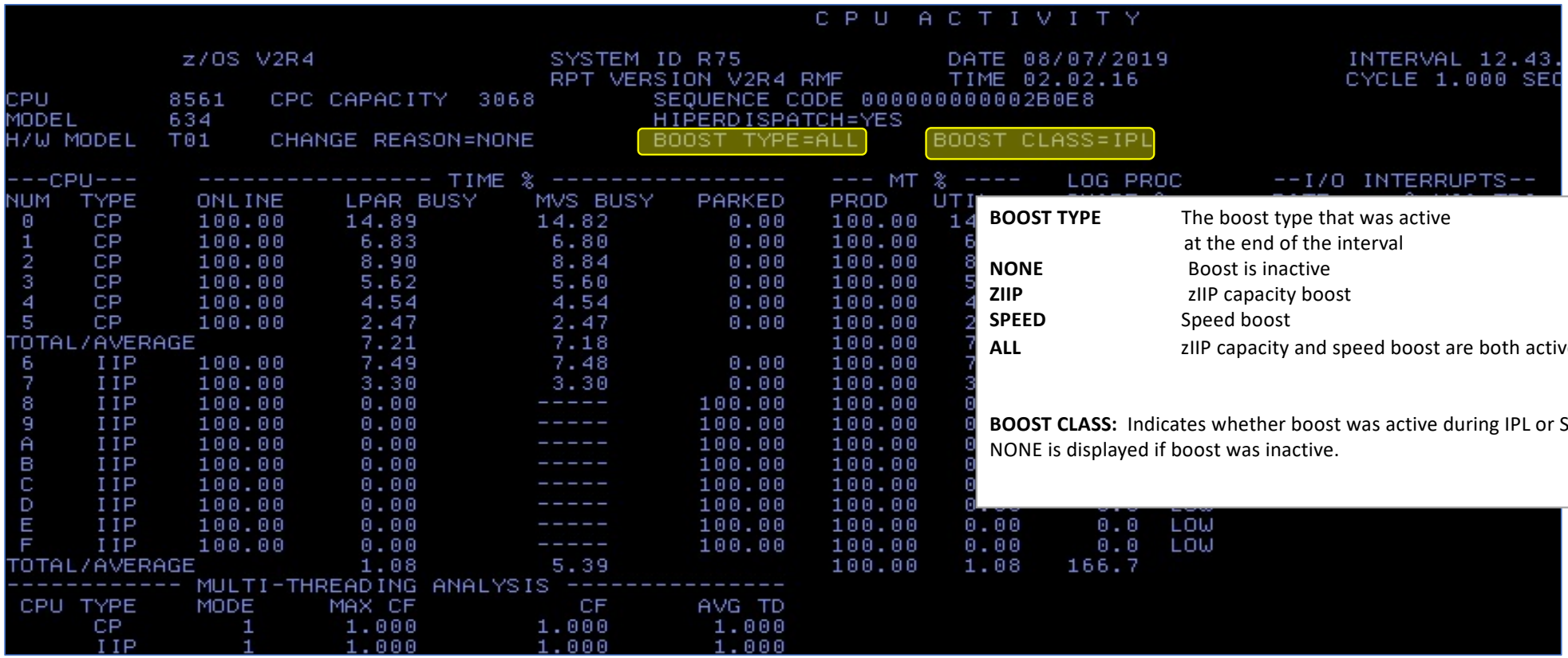
- QVS Sysevent

  QVSBoostInfo

RMF

- Postprocessor CPU Activity and Workload Activity reports (current LPAR)
- Monitor II CPC and Postprocessor Partition Data reports (LPARs in CPC)

RMF Postprocessor CPU Activity Report

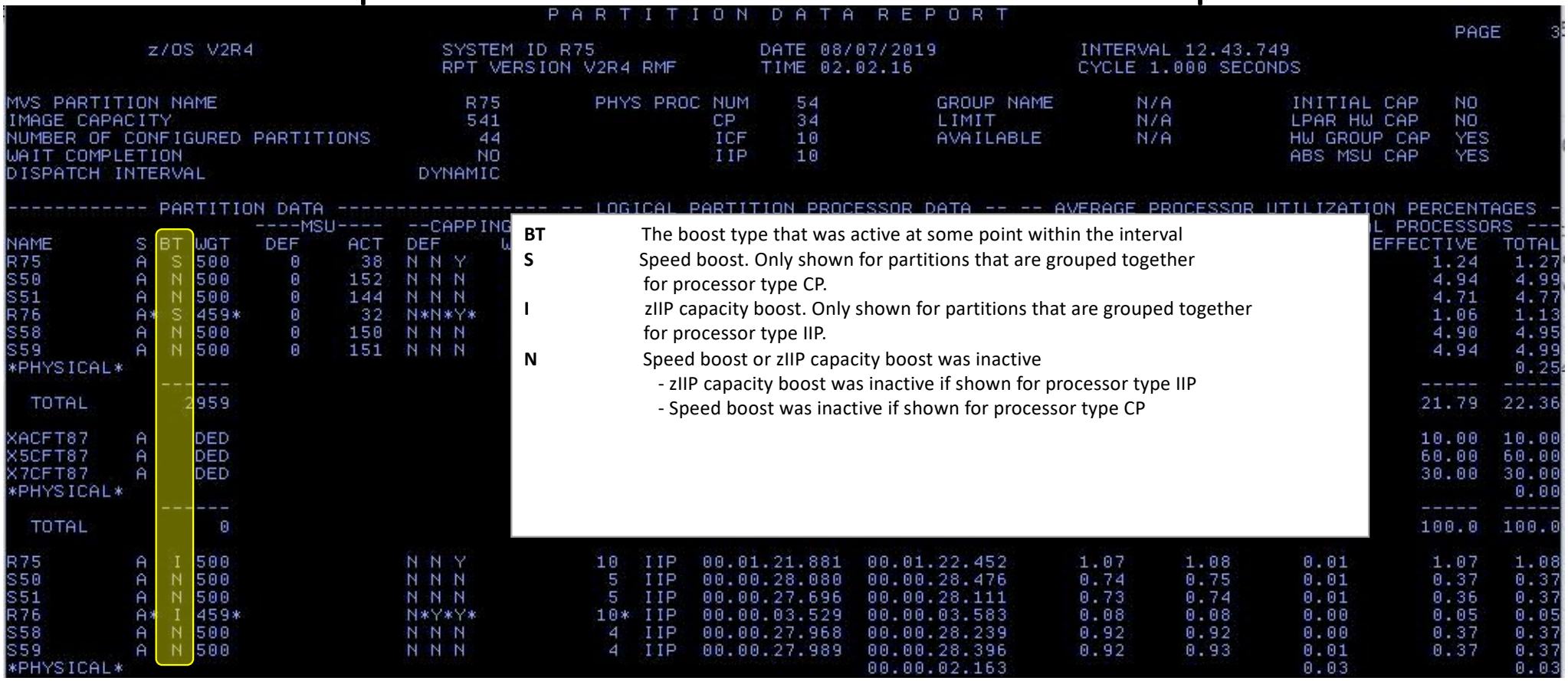


```
                                                C P U  A C T I V I T Y

           z/OS V2R4                    SYSTEM ID R75                DATE 08/07/2019              INTERVAL 12.43.
                                        RPT VERSION V2R4 RMF         TIME 02.02.16                CYCLE 1.000 SEC
CPU         8561   CPC CAPACITY  3068          SEQUENCE CODE 000000000002B0E8
MODEL       634                                HIPERDISPATCH=YES
H/W MODEL   T01    CHANGE REASON=NONE           BOOST TYPE=ALL       BOOST CLASS=IPL

---CPU---    ---------------- TIME %  ----------------    --- MT % ----    LOG PROC       --I/O INTERRUPTS--
NUM   TYPE     ONLINE     LPAR BUSY    MVS BUSY   PARKED    PROD    UTI
 0     CP      100.00      14.89        14.82       0.00    100.00   14
 1     CP      100.00       6.83         6.80       0.00    100.00    6
 2     CP      100.00       8.90         8.84       0.00    100.00    8
 3     CP      100.00       5.62         5.60       0.00    100.00    5
 4     CP      100.00       4.54         4.54       0.00    100.00    4
 5     CP      100.00       2.47         2.47       0.00    100.00    2
TOTAL/AVERAGE               7.21         7.18                100.00    7
 6     IIP     100.00       7.49         7.48       0.00    100.00    7
 7     IIP     100.00       3.30         3.30       0.00    100.00    3
 8     IIP     100.00       0.00        -----     100.00    100.00    0
 9     IIP     100.00       0.00        -----     100.00    100.00    0
 A     IIP     100.00       0.00        -----     100.00    100.00    0
 B     IIP     100.00       0.00        -----     100.00    100.00    0
 C     IIP     100.00       0.00        -----     100.00    100.00    0
 D     IIP     100.00       0.00        -----     100.00    100.00    0
 E     IIP     100.00       0.00        -----     100.00    100.00    0.00       0.0   LOW
 F     IIP     100.00       0.00        -----     100.00    100.00    0.00       0.0   LOW
TOTAL/AVERAGE               1.08         5.39                100.00    1.08     166.7
------------ MULTI-THREADING ANALYSIS ---------------
 CPU TYPE     MODE      MAX CF            CF       AVG TD
      CP         1       1.000         1.000        1.000
      IIP        1       1.000         1.000        1.000
```

BOOST TYPE	The boost type that was active at the end of the interval
NONE	Boost is inactive
ZIIP	zIIP capacity boost
SPEED	Speed boost
ALL	zIIP capacity and speed boost are both active

BOOST CLASS: Indicates whether boost was active during IPL or Shutdown. NONE is displayed if boost was inactive.

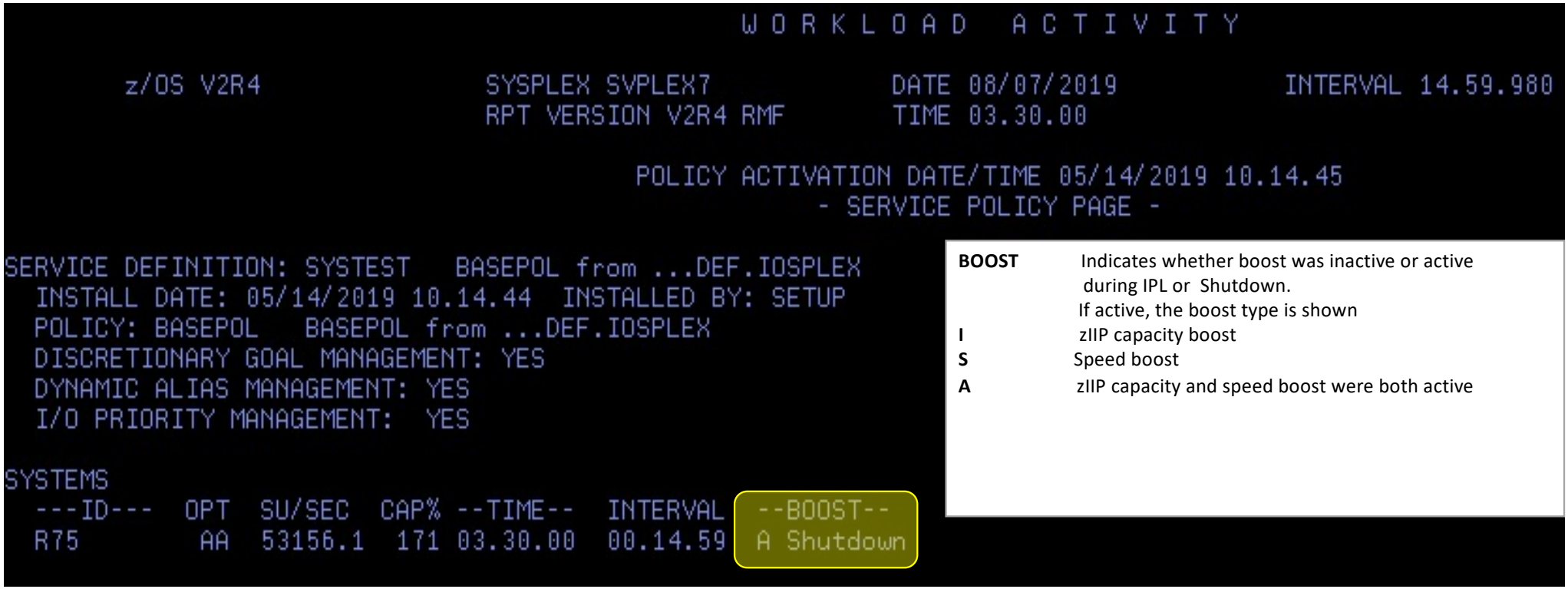
RMF Postprocessor Partition Data Report



```
                                P A R T I T I O N   D A T A   R E P O R T                                  PAGE     3
          z/OS V2R4                    SYSTEM ID R75              DATE 08/07/2019          INTERVAL 12.43.749
                                       RPT VERSION V2R4 RMF       TIME 02.02.16            CYCLE 1.000 SECONDS

MVS PARTITION NAME                        R75       PHYS PROC NUM    54          GROUP NAME       N/A          INITIAL CAP   NO
IMAGE CAPACITY                            541                 CP     34          LIMIT            N/A          LPAR HW CAP   NO
NUMBER OF CONFIGURED PARTITIONS            44                 ICF    10          AVAILABLE        N/A          HW GROUP CAP  YES
WAIT COMPLETION                            NO                 IIP    10                                       ABS MSU CAP   YES
DISPATCH INTERVAL                     DYNAMIC

------------ PARTITION DATA ------------------ -- LOGICAL PARTITION PROCESSOR DATA -- -- AVERAGE PROCESSOR UTILIZATION PERCENTAGES -
                    ----MSU----   --CAPPING                                                                  L PROCESSORS ---
NAME       S  BT  WGT   DEF     ACT   DEF     W                                                            EFFECTIVE   TOTAL
R75        A   S  500     0      38   N N Y                                                                     1.24    1.27
S50        A   N  500     0     152   N N N                                                                     4.94    4.99
S51        A   N  500     0     144   N N N                                                                     4.71    4.77
R76        A*  S  459*    0      32   N*N*Y*                                                                    1.06    1.13
S58        A   N  500     0     150   N N N                                                                     4.90    4.95
S59        A   N  500     0     151   N N N                                                                     4.94    4.99
*PHYSICAL*                                                                                                             0.25
                -------                                                                                          -----   -----
  TOTAL           2959                                                                                          21.79   22.36

XACFT87    A       DED                                                                                           10.00   10.00
X5CFT87    A       DED                                                                                           60.00   60.00
X7CFT87    A       DED                                                                                           30.00   30.00
*PHYSICAL*                                                                                                             0.00
                -------                                                                                          -----   -----
  TOTAL             0                                                                                          100.0   100.0

R75        A   I  500          N N Y          10  IIP  00.01.21.881  00.01.22.452   1.07   1.08   0.01      1.07    1.08
S50        A   N  500          N N N           5  IIP  00.00.28.080  00.00.28.476   0.74   0.75   0.01      0.37    0.37
S51        A   N  500          N N N           5  IIP  00.00.27.696  00.00.28.111   0.73   0.74   0.01      0.36    0.37
R76        A*  I  459*         N*Y*Y*         10* IIP  00.00.03.529  00.00.03.583   0.08   0.08   0.00      0.05    0.05
S58        A   N  500          N N N           4  IIP  00.00.27.968  00.00.28.239   0.92   0.92   0.00      0.37    0.37
S59        A   N  500          N N N           4  IIP  00.00.27.989  00.00.28.396   0.92   0.93   0.01      0.37    0.37
*PHYSICAL*                                                            00.00.02.163                 0.03              0.03
```

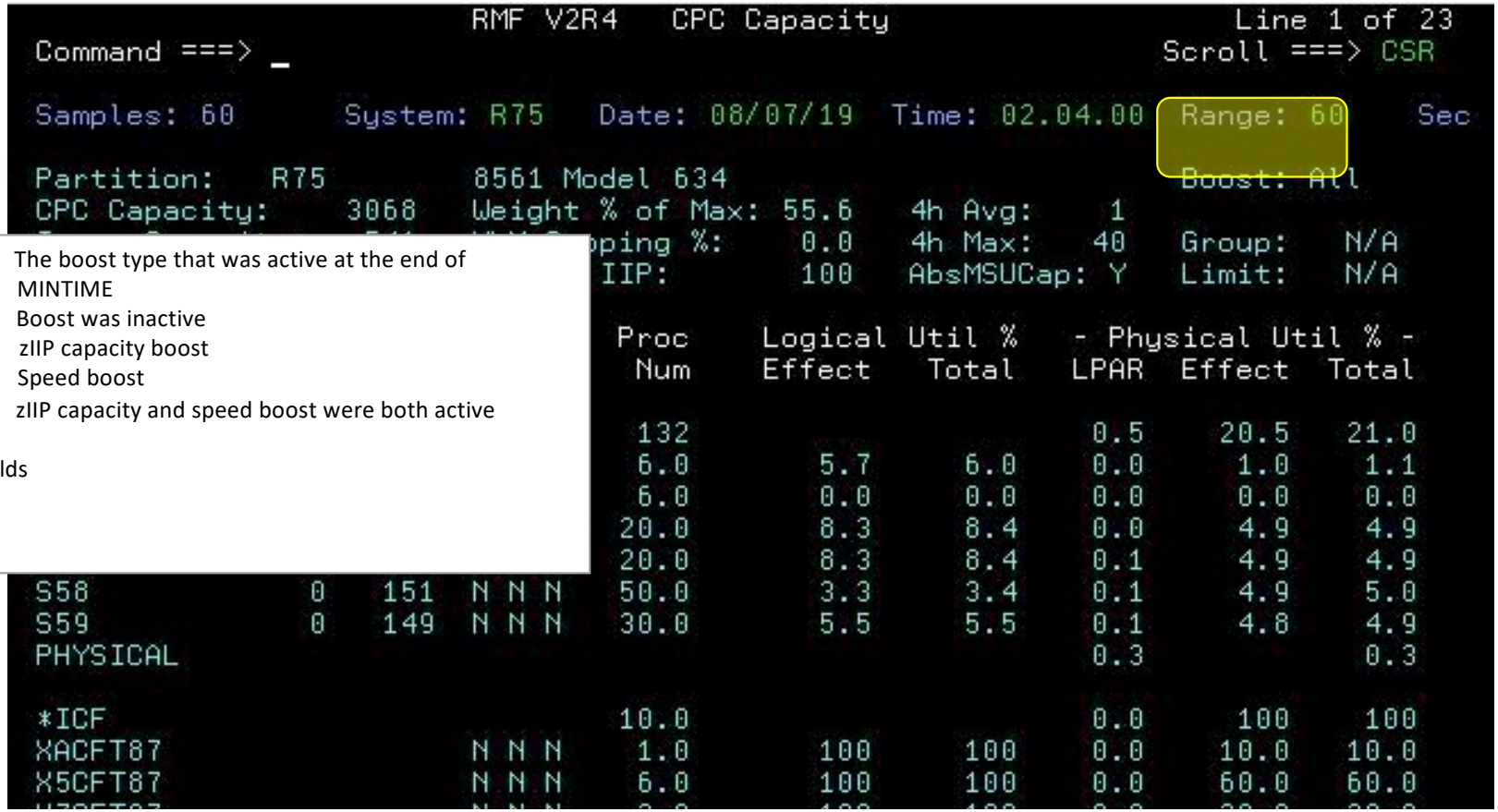
BT	The boost type that was active at some point within the interval
S	Speed boost. Only shown for partitions that are grouped together for processor type CP.
I	zIIP capacity boost. Only shown for partitions that are grouped together for processor type IIP.
N	Speed boost or zIIP capacity boost was inactive - zIIP capacity boost was inactive if shown for processor type IIP - Speed boost was inactive if shown for processor type CP

RMF Postprocessor Workload Activity Report



BOOST	Indicates whether boost was inactive or active during IPL or Shutdown. If active, the boost type is shown
I	zIIP capacity boost
S	Speed boost
A	zIIP capacity and speed boost were both active

RMF Monitor III CPC Report Postprocessor Workload Activity Report



BOOST	The boost type that was active at the end of MINTIME
N	Boost was inactive
zIIP	zIIP capacity boost
Speed	Speed boost
All	zIIP capacity and speed boost were both active

+ hidden fields

IBM Hardware Announcement 120-050 – August 4th 2020

- **IBM z15 Model T01 and IBM z15 Model T02 are enhanced to provide increased security, resiliency, performance, and flexibility for mission-critical workloads in a hybrid cloud**

- …
- Enhanced System Recovery Boost capabilities enable clients to leverage a new class of boost that can be applied to a range of sysplex recovery processes, including sysplex partitioning, CF structure recovery, CF data sharing member recovery, and IBM HyperSwap® recovery
- …

System Recovery Boost Stage 2

- **Recovery Process Boost** is a boost class that can help accelerate system recovery.
- Recovery Process boost periods are restricted to 5 minute durations and are limited to 30 total minutes per partition per 24 hour period.
- Recovery Process boost periods are started and ended solely by z/OS operating system controlled events. The applicable events for Recovery Process boosts are limited to:
- HyperSwap™
- Coupling Facility data-sharing member recovery
- Coupling Facility structure recovery
- Sysplex partitioning

System Recovery Boost Stage 2 — WLM Support

- In contrast to shutdown boost, the boosted system will NOT be eliminated from the sysplex routing recommendation
- In contrast to startup boost, WLM's sysplex routing weight calculation will NOT be honor any additional capacity on the boosted system, and thus does not route additional work to the boosted system
- During RP boost, the algorithms of the sysplex routing services will handle the boosted system like not being boosted. This prevents additional work from other systems being attracted for a short period of time to the boosting system, while the recovery processing takes place – allowing the extra capacity to be applied meaningfully to recovery acceleration, not handling more workload

Other Enhancements and Important Information

OA558303 V2R4 / OA59890 V2R3
SRM ENHANCEMENT TO HANDLE DIAG 204 BUSY CONDITION

- In certain configurations, such as a low weighted LPAR or when an LPAR is being capped, it may take a considerable amount of time for PR/SM to complete a configuration change.
- This might delay SRM's request to PR/SM to obtain logical CPU utilization because PR/SM is busy.
- SRM is enhanced to handle PR/SM busy conditions when obtaining information on logical CPU utilization.

z/OS V2R5 SRM Contention Relief OA61240

- Timed algorithms are processed as an extension of any sysevent whenever they are due. In case the sysevent triggering the algorithm is running on a vertical low processor, the algorithm might not be executed and the SRM lock is held until the processor is dispatched again.
- SRM timed algorithms are only requested during a timer pop sysevent. This prevents SRM locks being held by vertical low processors.
- Added check if running under timer pop when requesting timed algorithms and skip the execution of algorithms that are due as an extension of a non-timer-DIE Sysevent
- No SRM locks are held due to algorithms requested that can not be executed. This leads to an overall better performance of the system.

XML Format WLM Service Definitions Recommendation

- Avoids particular problems in contrast to ISPF tables
- Since z/OS V2.3 XML-format is the default for "Save" and "Save as"
- Performance improvements in z/OS V2.4
- Recommendation:
  Use the XML-format for your WLM service definition data sets

z/OS Workload Management
More Information

- z/OS WLM Homepage: https://www.ibm.com/it-infrastructure/z/zos-workload-management
- z/OS WLM GitHub: https://github.com/IBM/IBM-Z-zOS/tree/master/zOS-WLM
- z/OS MVS documentation
  - z/OS MVS Planning: Workload Management: https://www-01.ibm.com/servers/resourcelink/svc00100.nsf/pages/zOSV2R3sc342662/$file/ieaw100_v2r3.pdf
  - z/OS MVS Programming: Workload Management Services: https://www-01.ibm.com/servers/resourcelink/svc00100.nsf/pages/zOSV2R3sc342663/$file/ieaw200_v2r3.pdf
- IBM Redbooks publications:
  - System Programmer's Guide to: Workload Manager: http://www.redbooks.ibm.com/abstracts/sg246472.html?Open
  - Effective zSeries Performance Monitoring Using RMF: http://www.redbooks.ibm.com/abstracts/sg246645.html?Open
  - ABCs of z/OS System Programming Volume 12 http://www.redbooks.ibm.com/abstracts/sg247621.html?Open

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