# zAAP - What it Can Do for You!

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**Session: 2825**
**Project: MVS CP**

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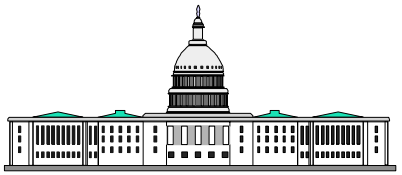

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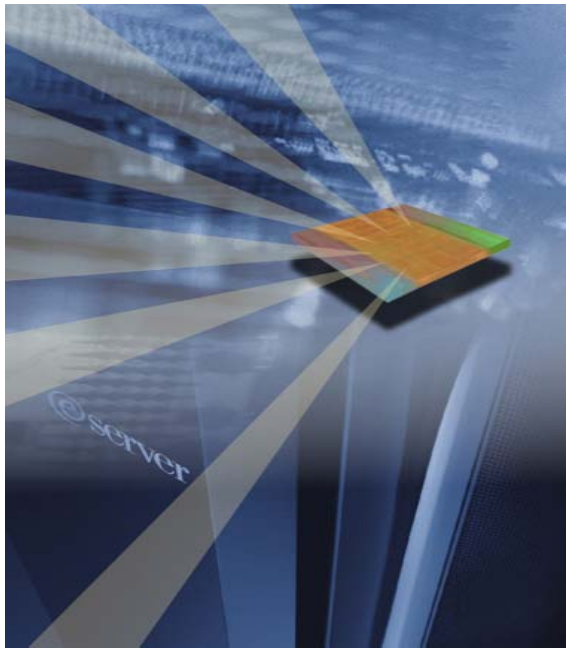
# Agenda

- Introducing the zAAP
- Technical Overview
- Capacity Planning Information
- WSC Experiences

# The New zSeries Application Assist Processor (zAAP)

***New specialty assist processor dedicated exclusively to execution of Java workloads under z/OS® – e.g. WebSphere®, CICS, IMS, DB2***

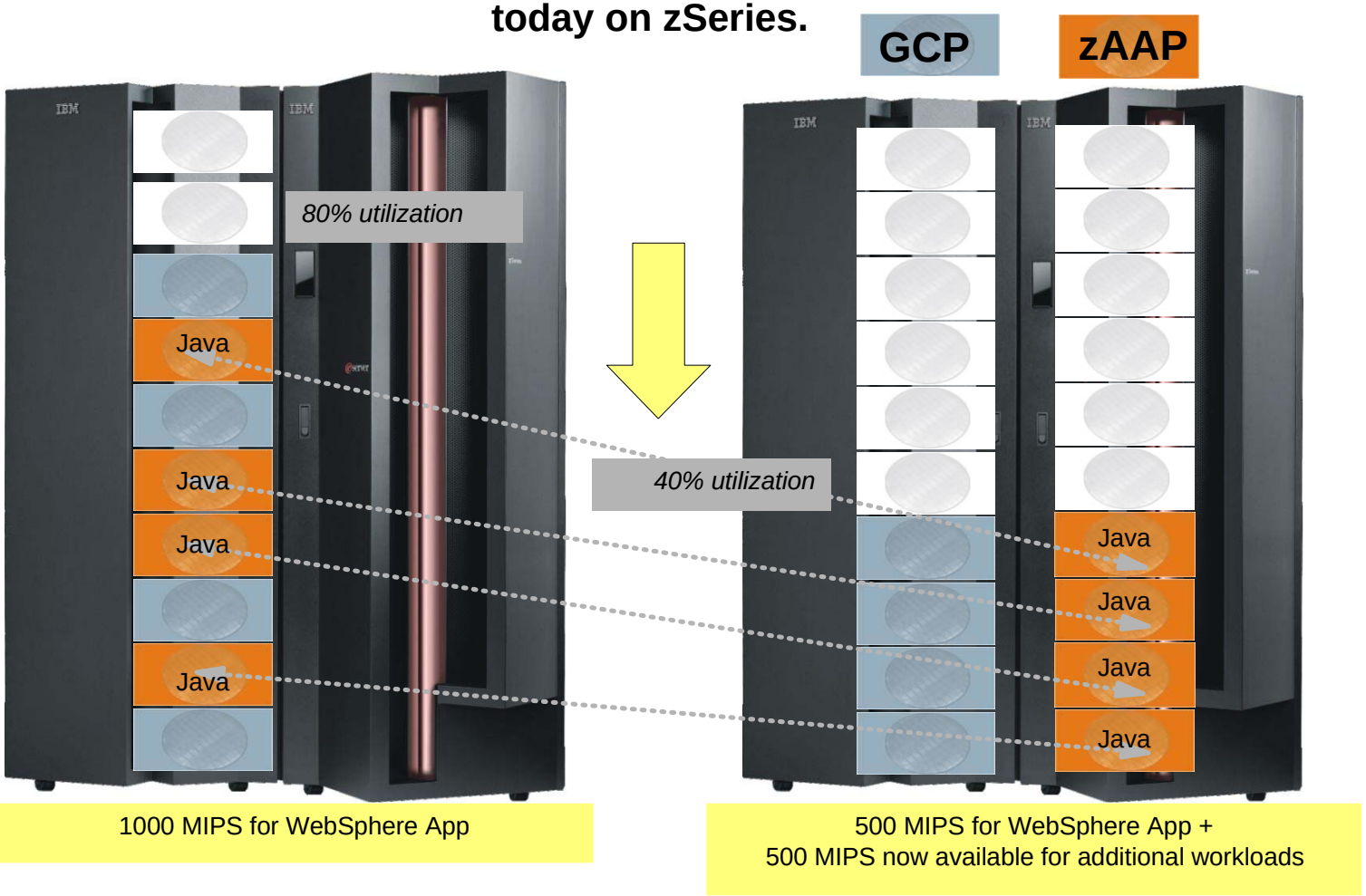
- Available on IBM System z9 and @server zSeries z990 and z890
- Used by workloads with Java cycles, e.g. WebSphere, DB2®
  - Executes Java code with no changes to applications
- Attractively priced, much lower than standard CPs
- Significantly lower maintenance costs than standard CPs
- Traditional IBM zSeries software charges unaffected
- Sub-capacity eligible IBM software charges can be reduced
- Up to 1 zAAP per general purpose processor in a CEC




***Objective: Enable integration of new Java based Web applications with core z/OS backend database environment for high performance, reliability, availability, security, and lower total cost of ownership***

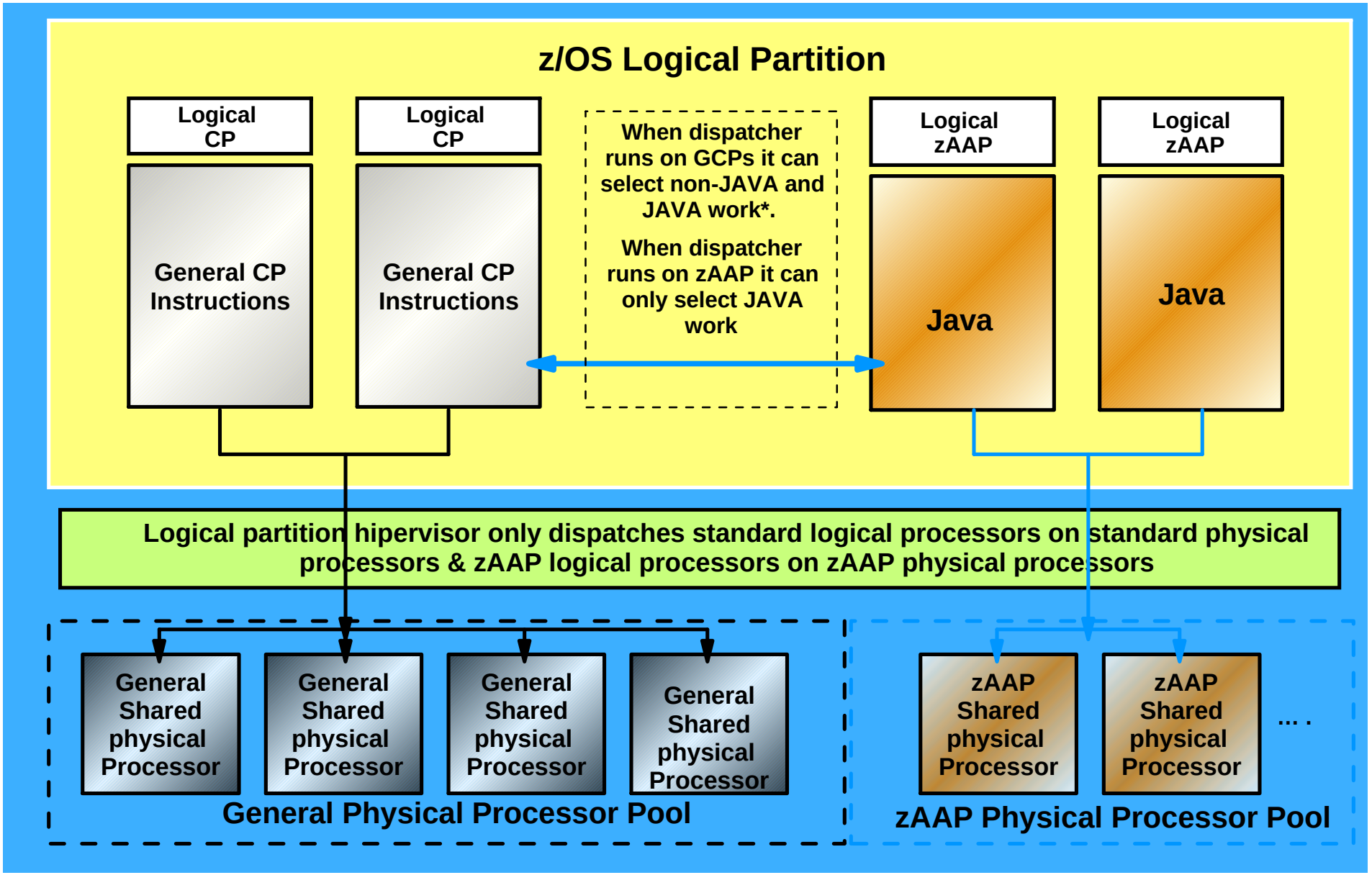
# zAAP Overview: A Simplified Example…

**Consider a WebSphere Application that is transactional in nature and requires 1000 MIPS today on zSeries.**




***In this example, with zAAP, we can reduce the standard CP capacity requirement for the Application to 500 MIPS or a 50% reduction.*** ** For illustrative purposes only*

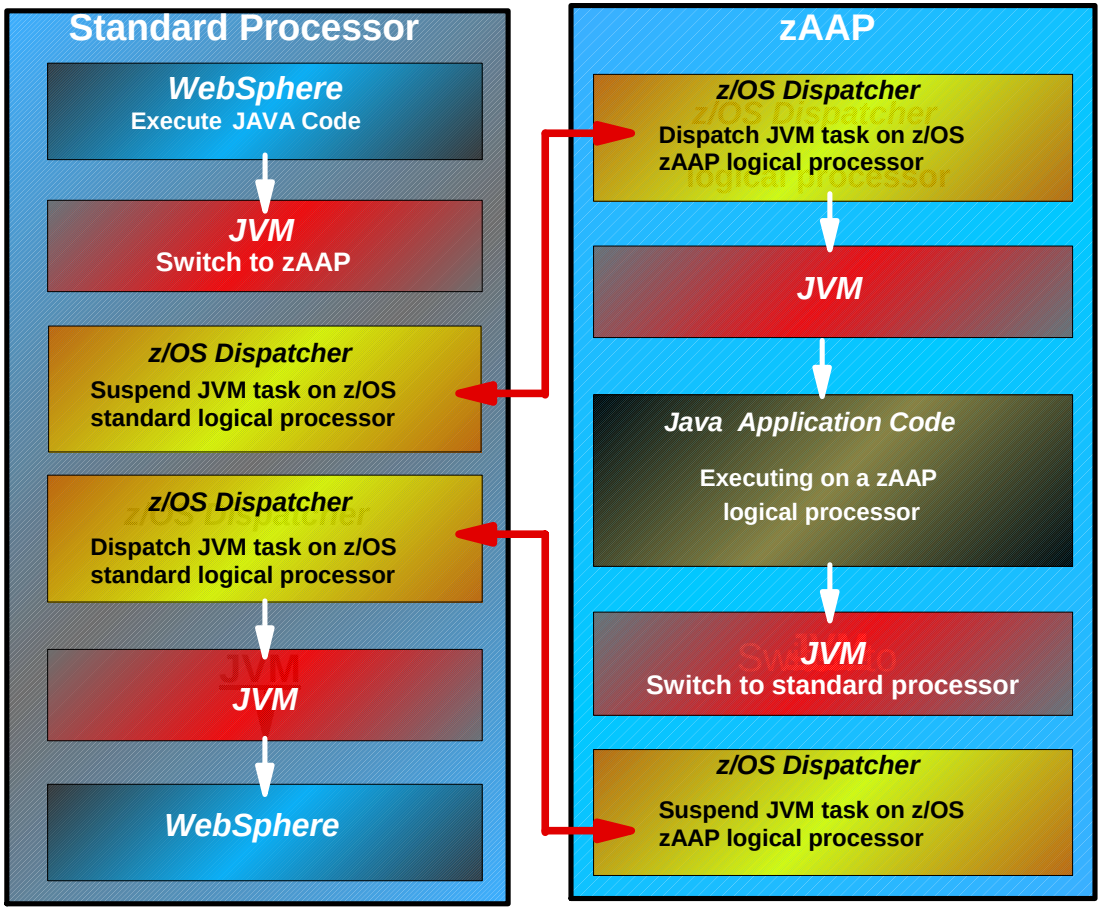
# zAAP Technical Overview: *z/OS zAAP Partition*



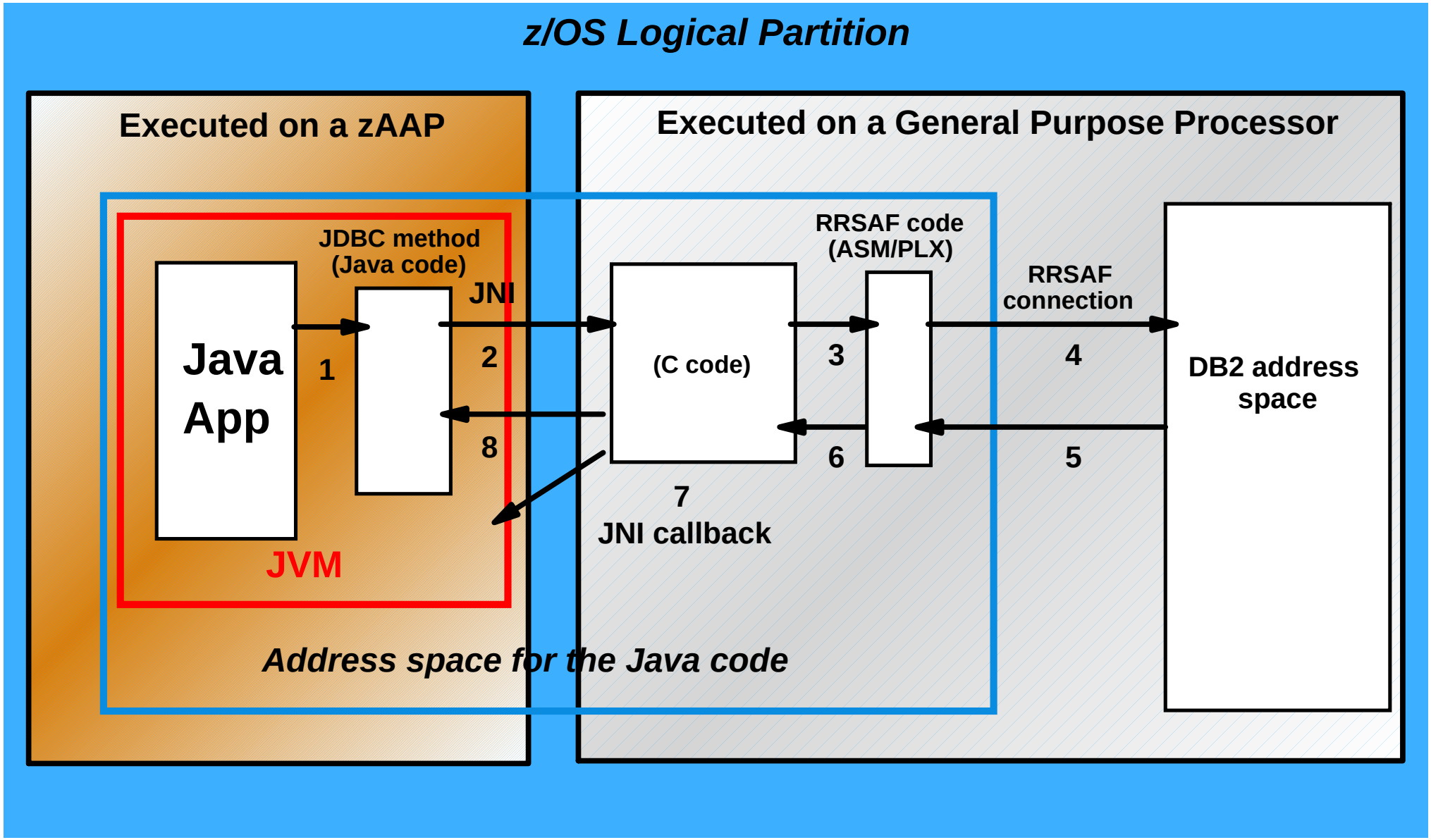

* Subject to installation controls

# zAAP Workflow: Executing Java under IBM JVM control

- IBM JVM, parts of LE runtime, and z/OS Supervisor are needed to support JVM execution on zAAPs
- IBM JVM communicates to z/OS dispatcher when Java code is to be executed
  - When Java is to be executed, the work unit is "eligible" to be dispatched on a zAAP
  - zAAP ineligible work is only dispatched on standard processors
  - There are installation controls to limit the use of standard processors to execute zAAP eligible work

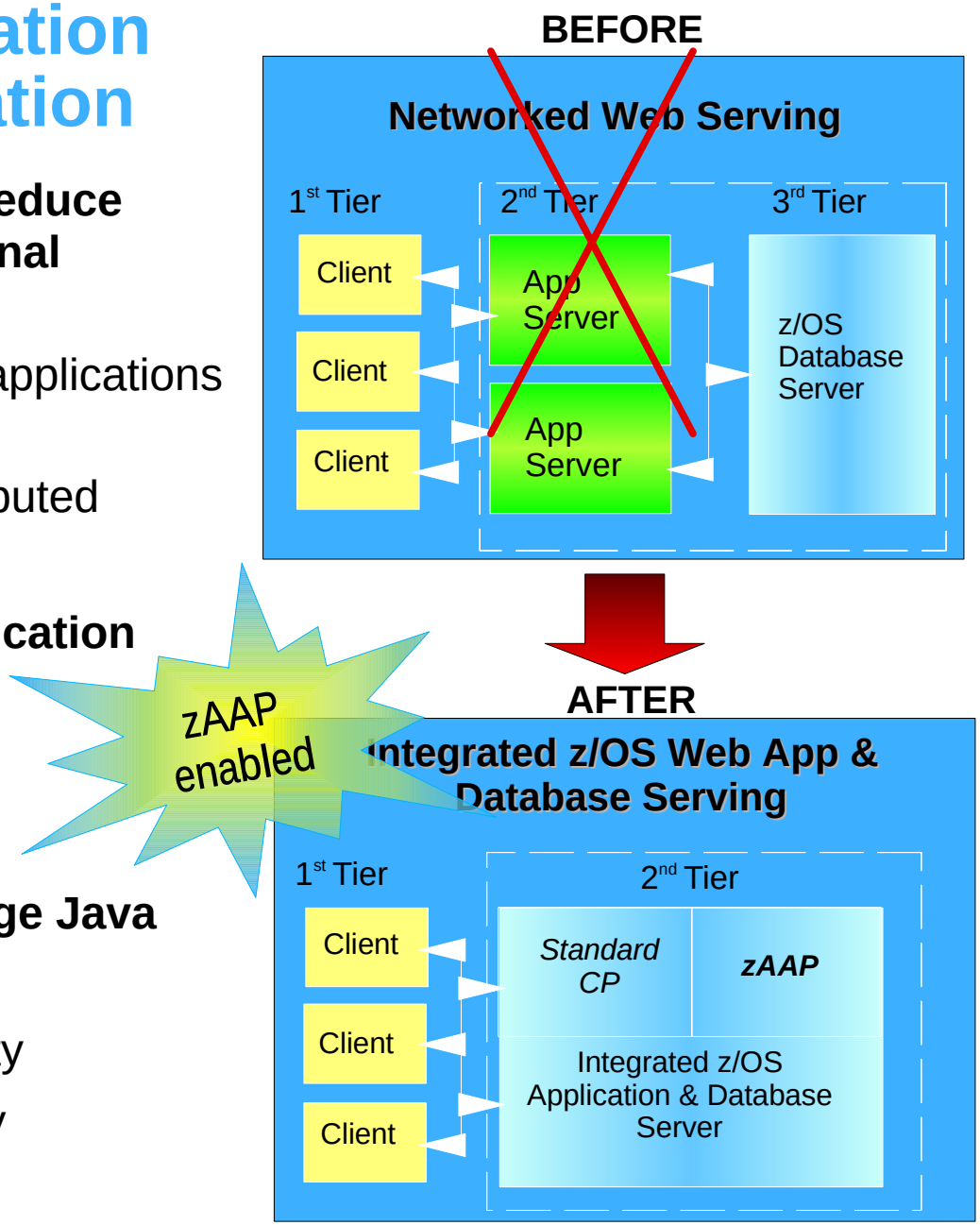


# zAAP Integration at Work: Java App calling DB2



# Increased e-business Integration and Infrastructure Simplification

- **zAAPs can help consolidate, simplify and reduce server infrastructure and improve operational efficiencies.**
  - Enables strategic integration of e-business applications with mission-critical database workloads
  - Potential operational advantages over distributed multi-tier solutions
- **Can eliminates separate tier to handle application server workload**
  - Remove one hardware tier
  - Remove one TCP/IP stack
- **Leverage core zSeries strengths and manage Java Workloads automatically with z/OS**
  - Security
  - Workload Manager (WLM)
  - Availability
  - Scalability
  - Flexibility



# How zAAPs Differ from General Purpose Processors

- **Some zAAPs Limitations**
  - zAAPs cannot be IPLed
  - zAAPs only execute z/Architecture™ mode instructions
  - zAAPs do not support all manual operator controls
    - No: PSW Restart, LOAD or LOAD derivatives (load from file, CDROM, Server)
  - zAAPs don't respond to SIGP requests unless enabled by a z/OS which supports zAAPs
  - Additional architecture differences are anticipated in future implementations
    - e.g., Java specific performance enhancements
- **The z/OS design accommodates processor differences for zAAPs:**
  - No I/O interrupts
  - No Clock Comparator interrupts
  - No affinity scheduling

# Requirements for zAAP Exploitation

- **Available on z990, z890, IBM System z9 and follow-on models only**
- **z/OS and z/OS.e exclusive**
- **Prerequisites:**
  - z/OS 1.6 (or z/OS.e 1.6)
  - IBM SDK for z/OS, Java 2 Technology Edition, V1.4 with PTF for APAR PQ86689
  - Processor Resource/Systems Manager (PR/SM) must be enabled
- **Subsystems and Apps using SDK 1.4 exploit zAAPs automatically:**
  - WAS 5.1
  - CICS® /TS 2.3
  - DB2 V7, DB2 V8
  - IMS™ V7, IMS™ V8, IMS™ V9
  - WebSphere WBI for z/OS
- **zAAPs must be jointly configured with general purpose processors within z/OS LPARs**
  - Number of zAAPs may not exceed the number of permanently purchased CPs (including z990 unassigned CPs or z890 Downgrade - Record Only CPs) on a given machine model.

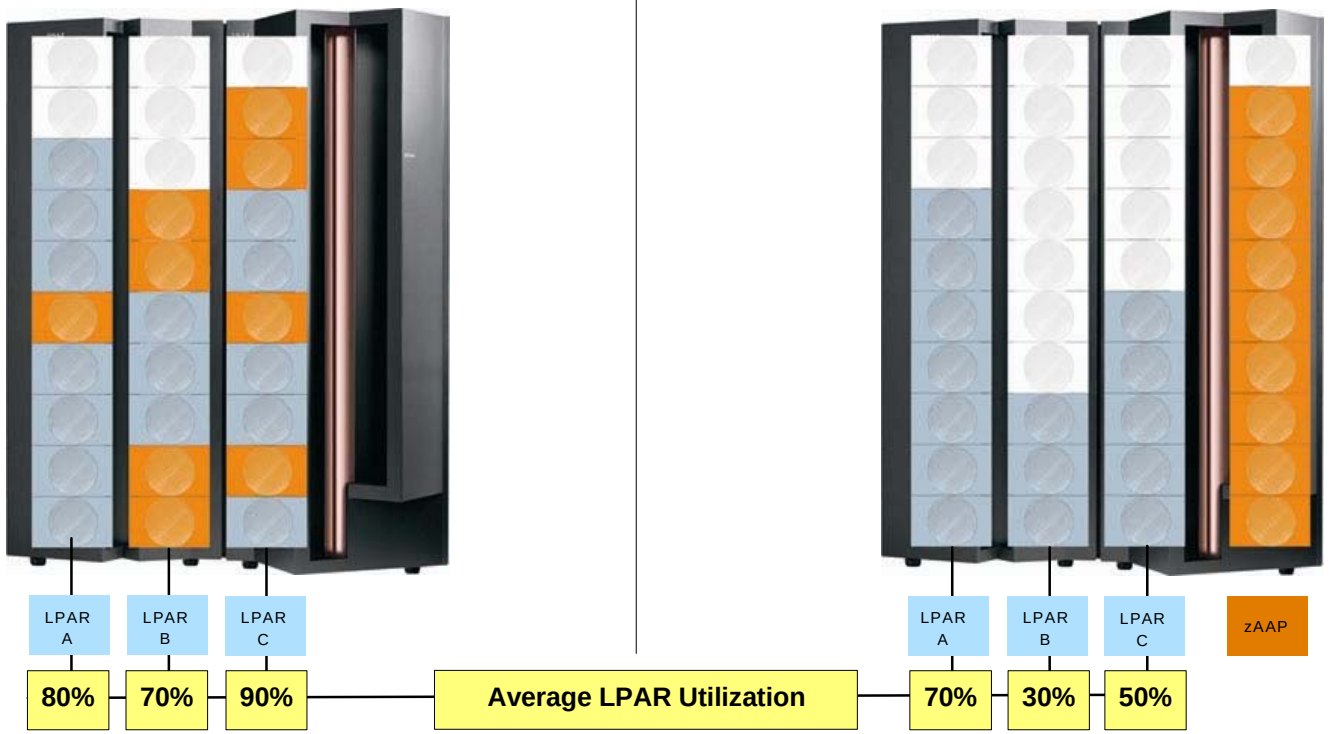
# Potential zAAP Impact on Full Capacity Pricing Scheme

***BEFORE zAAP:***

- Machine Type: 2084-B16
- Rated @ 647 MSUs
- Full-Capacity EWLC @ 647 MSUs
- Average Prime Shift Machine Utilization = 80%

***AFTER zAAP:***

- Machine Type: 2084-B16
- Rated @ 647 MSUs
- Java cycles executed on zAAPs
- Full Capacity EWLC remains @ 647 MSUs
- Average Prime Shift Machine Utilization = 50%



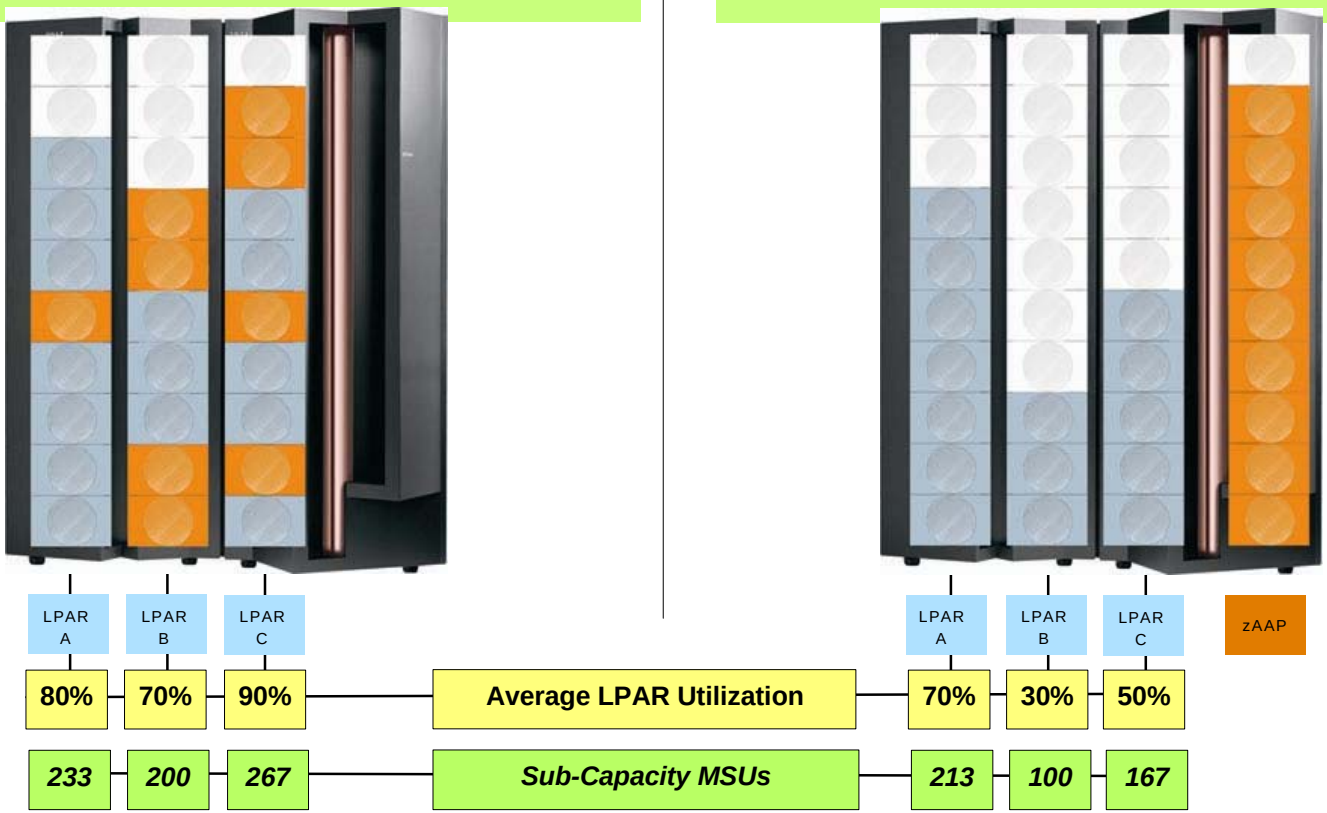
# Potential zAAP Impact on Sub-Capacity Pricing Scheme

***BEFORE zAAP:***

- Machine Type: 2084-B16
- Rated @ 647 MSUs
- Sub-Capacity Pricing based on;
  - LPAR A rolling 4hr avg @ 233 MSUs
  - LPAR B rolling 4hr avg @200 MSUs
  - LPAR C rolling 4hr avg @ 267 MSUs
- Rolling 4hr avg of Machine = 547 MSUs
- Average Prime Shift Machine Utilization = 80%

***AFTER zAAP:***

- Machine Type: 2084-B16
- Rated @ 647 MSUs
- Java cycles executed on zAAPs
- New Sub-Capacity Pricing on *reduced* rolling 4hr avg
  - LPAR A rolling 4hr avg @ 213 MSUs
  - LPAR B rolling 4hr avg @ 100 MSUs
  - LPAR C rolling 4hr avg @ 167 MSUs
- New Rolling 4hr avg of Machine = 480 MSUs
- Average Prime Shift Machine Utilization = 50%



# How Do I Know if zAAP is Right for My Workloads?

- **Instrumented in IBM SDK 1.3.1 and IBM SDK 1.4.1**
  - Available with Excel Summary Workbook
  - Runs in test environment
  - Gathers usage information on % of Java workload which can execute on a zAAP
  - Useful in predicting number of zAAPs necessary for optimum configuration
- ***z/OS Performance: Capacity Planning Considerations for zAAP* White Paper**
  - Describes the zAAP Projection Tool
  - Describes the prototype measurements
  - Describes Capacity Planning Methodology
- **Size 390**
  - Provides special assistance for the sizing methodology described in White Paper
  - May help with sizing consolidation of distributed Java workloads onto zSeries and zAAPs
- **Information is on the web**
  - http://www-1.ibm.com/servers/eserver/zseries/zaap/gettingstarted/

# Subsystem and Minimum Java Levels for zAAP Estimation

| Subsystem Version | IBM SDK for OS/390, Java 2 Technology Edition, V1.3.1 at PTF level UQ94379 (SR24 or later) | IBM SDK for z/OS, Java 2 Technology Edition, V1.4, at PTF level UQ88783 or later |
|---|---|---|
| WAS V4*, WAS V5.0* | X | |
| **WAS 5.1**** | | X |
| **IMS™ V7**** | X | X |
| **IMS V8**** | X | X |
| **IMS V9**** | | X |
| CICS® 2.2* | X | |
| **CICS 2.3**** | | X |
| **DB2® V7**** | X | X |
| **DB2 V8**** | X | X |

*** Configurations which support zAAPs**

**** zAAP projection tool can be used to assist in capacity planning**

# Technical Overview

# Enabling the zAAP

- **Enable zAAP processing at the JVM level through use of the -Xifa: options**
- **If there is no zAAP hardware present at the first call all additional JVM / zAAP calls will be stopped**
  - Use the -Xifa:force option to prevent this
- **To activate the projection tool, the -Xifa:project keyword must be specified in the JVM profile**
  - The output is directed to STDERR

| Keyword | Explanation |
|---|---|
| -Xifa:on | Default - allows Java work to run on zAAPs if available |
| -Xifa:force | JVM is to continue issuing switch calls even when zAAPs are unavailable |
| -Xifa:off | Disable switching support |
| -Xifa:projectn | Creates the zAAP projection tool data. n is the number of minutes in the projection interval |

# For IBM System z9 Processors
## Multiple ICF Pools Managed Independently

- **PU Pool - Physical PUs to dispatch to online logical PUs**
- **z9-109 with 10 CPs, 1 ICF, 2 IFLs, and 3 zAAPs online**
  - CP Pool contains 10 engines
  - ICF pool contains 1 ICF
  - IFL pool contains 2 IFLs
  - zAAP pool contains 3 zAAPs
    - zAAP weight can be independently set
- **z990 with 10 CPs, 1 ICF, 2 IFLs, and 3 zAAPs**
  - CP Pool contains 10 engines
  - **Specialty pool** contains 6 engines - ICFs, IFLs, zAAPs
  - zAAP LPAR weight is set equal to the initial z/OS LPAR weight
- **z890 with 2 CPs, and 1 zAAP and either ICF or IFL**
  - CP Pool contains 2 engines
  - Speciality pool contains 2 engines - zAAP and a ICF/IFL
  - zAAP LPAR weight is set equal to the initial z/OS LPAR weight

# For @server zSeries z890 and z990 processors

## Single Shared ICF Pool Considerations

- **zAAPs, CFs, and Linux partitions all use ICF CPs which are managed out of a single pool of capacity**
  - Managed independently from the General CP pool
- **zAAPs will acquire their characteristics from the z/OS partitions using the zAAPs**
  - If z/OS uses dedicated CPs, the zAAPs defined to the partition will be dedicated
  - If z/OS uses shared CPs, the zAAPs defined to the partition will use shared CPs and the weight given to the zAPPs will be equal to the z/OS partitions weight
- **The ICF pool partition weights need to be updated to reflect the introduction of the zAAP**

# Updating CF and Linux Partition Weights with a zAAP

| | Base Case | | Add a zAAP | | | |
|---|---|---|---|---|---|---|
| **Hardware** | **Partition** | **4 GCPs, 1 ICF** | **Partition** | **4 GCPs, 1 ICF, 1 zAAP** | **Partition** | **4 GCPs, 1 ICF, 1 zAAP** |
| **GCP Pool** | MVSA | 750 | MVSA | 750 | MVSA | 750 |
| | MVSB | 250 GCP pool = 1000 | MVSB | 250 GCP pool = 1000 | MVSB | 250 GCP pool = 1000 |
| **ICF Pool** | ICF1 | 95 | ICF1 | 95 | ICF1 | 712 |
| | ICF2 | 5 | ICF2 | 5 | ICF2 | 38 |
| | | ICF pool = 100 | MVSA | 750 ICF pool = 850 | MVSA | 750 ICF pool = 1500 |
| **LPAR Weights** | MVSA | 75% | MVSA | 75% | MVSA | 75% |
| | MVSB | 25% | MVSB | 25% | MVSB | 25% |
| **Allowed Resource** | ICF1 | 95% | ICF1 | 22% | ICF1 | 95% |
| | ICF2 | 5% | ICF2 | 1% | ICF2 | 5% |
| | | | MVSA | 176% (100%) | MVSA | 100% |

# Setting zAAP Weights

- **Always start with the zAAP weight (fixed value, with no direct installation control)**
- **Sum up the partitions which will have shared zAAPs**
- **Total share / # of shared zAAPs gives the weight of 1 CP in the ICF pool**
- **Use this value to reset the weight of the others to the same ratio you had before the zAAP**

| 2 SHARED zAAPs in the ICF Pool, and 1 IFL in the ICF Pool | | | | | |
|---|---|---|---|---|---|
| | Weight | Shared zAAP /IFLs | Fair Share | New Weight | Share of zAAP / IFLs |
| ZOS1 | 300 | 2 | | | 75% (1.5 zAAPs) |
| ZOS2 | 300 | 0 | | | 0% |
| ZOS3 | 100 | 1 | | | 25% (0.5 zAAPs) |
| IFL1 | 25 | 1 | 50% | 100 | 50% |
| IFL2 | 25 | 1 | 50% | 100 | 50% |

**zAAP weight = 400**
**shared zAAPs = 2**
**IFL CPs = 1**

**1 CP of weight = 400 / 2 = 200**
**IFL1 = 200 (1 CP share) * 50% (previous share) = 100**
**IFL2 = 200 (1 CP share) * 50% (previous share) = 100**

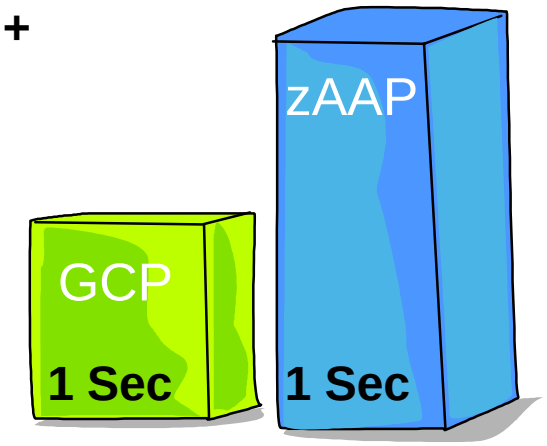
# z890 Considerations

- **z890s have 28 different capacity settings**
- **z890 have 4 PUs characterizable as GCP, IFL, ICF, and now zAAPs**
- **zAAPs on z890 run at full speed of the appropriate n-way**
- **Will need to understand CPU normalization**

Example: zAAP is 2 times the speed of the GCP

**Execution Time = GCP seconds + (zAAP seconds * normalization factor / 256)**

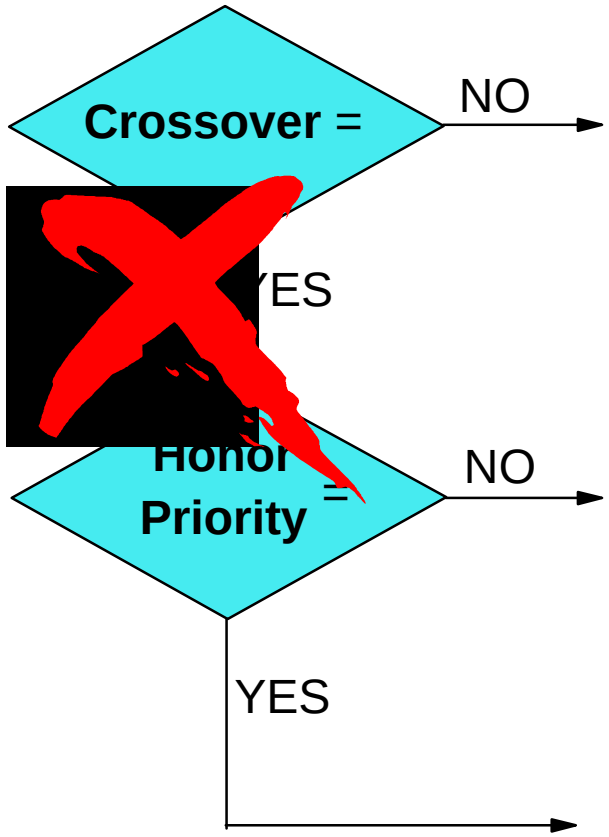
**Execution Time = 1 second + (1 second * (2)) = 3 seconds**




- **Normalization factor used is in RMF 72 subtype 3 record, R723NFFI**
- **If zAAP and GCP are the same speed the normalization factor is 1**

# New SYS1.PARMLIB Options

- IFACROSSOVER = YES | NO
- IFAHONORPRIORITY = YES | NO




No zAAP eligible work can run on a GCP
**Done when software license charges are paramount**
**HonorPriority setting is irrelevant when zAAP are online**
**HonorPriority setting used when last zAAP goes offline**

Have the GCP select zAAP eligible work when the GCP is not busy
**JAVA work runs below non-JAVA discretionary work on GCP**
**JAVA work runs at priority on zAAP**

Have the GCP select GCP work and zAAP eligible work in dispatch priority order
**GCPs and zAAPs will compete to process the JAVA work**
**Default Setting**

GCP - General CP
IFA - zAAP CPs

# zAAP IEAOPTxx parameters change with OA14131

## ★ Why the change?

- **Java eligible work tends to be high priority (e.g. Websphere, CICS)**
- **GCPs tend to outnumber zAAPs (3:1 or 4:1)**
  - With Crossover=YES, GCP tend to take most of the zAAP work hurting the effectiveness of the solution
  - With Crossover=NO, spikes in Java workloads can saturate the zAAP, introducing response time issues when available GCP capacity exists
- **Need to provide a change which allows zAAPs to process all available work, and indicate to GCP when "they need help"**

# IFA IEAOPTxx Planned Changes

| XO | HP | IFA NH | Description |
|---|---|---|---|
| **Y** | **Y** | **Y** | Standard processors run both zAAP eligible and non zAAP eligible work in priority order |
| **Y** | **Y** | N | Standard processors run only non-zAAP eligible work in priority order and run zAAP eligible work as if it has a priority less than non zaap eligible discretionary work |
| **Y** | **N** | **Y** | Standard processors run non zAAP eligible work in priority order and run zAAP eligible work as if it has a priority less than non zaap eligible discretionary work |
| **Y** | **N** | **N** | Standard processors run non zAAP eligible work in priority order and run zAAP eligible work as if it has a priority less than non zaap eligible discretionary work |
| **N** | **Y** | **Y** | Standard processors run both zAAP eligible and non zAAP eligible work in priority order |
| **N** | **N** | **Y** | Standard processors do not run zAAP eligible workloads |
| **N** | **Y** | **N** | Standard processors do not run zAAP eligible workloads |
| **N** | **N** | **N** | Standard processors do not run zAAP eligible workloads |

**XO: Crossover**

**HP: HonorPriority**

**IFA NH: IFA Needs Help (determined by Alternate Wait State Mgmt)**

*** zAAP Processors run all work in priority order**

# RMF Support for zAAPs

- **In RMF and SMF documentation zAAPs are called IFAs**
- **RMF support described in APAR OA05731**
- **RMF Monitor I**
  - CPU Activity, Including Partition Report
  - Workload Activity Report
- **RMF Monitor III**
  - Meaning of CPU UTIL% in Sysinfo and Workflow/Exception report changes: Only regular CPs are included and no IFAs
  - CPC Capacity Report
  - Enclave Report
- **All RMF reports where CPU activity or delay is measured, or CPU activity and delay influences job workflow, the zAAP CPU activity is included**
- **New fields in the RMF product section is added to indicate the presence of zAAPs**
  - SMFxxPRF, bit 4 indicates IFA processors are available

# zAAP CPU Time Reporting

```
              z/OS V1R6                SYSTEM ID SYSD              DATE 09/09/2004
                                     RPT VERSION V1R5 RMF        TIME 18.55.00

CPU  2084   MODEL  314
---CPU---  ONLINE TIME   LPAR BUSY       MVS BUSY      CPU SERIAL  I/O TOTAL
NUM  TYPE  PERCENTAGE    TIME PERC       TIME PERC     NUMBER      INTERRUPT RATE
 0   CP    100.00         61.07           61.30         043A6A       4.04
 1   CP    100.00         77.84           78.20         043A6A       5.51
CP   TOTAL/AVERAGE        69.45           69.75                      9.55
 2   IFA   100.00         24.75           24.86         043A6A
 3   IFA    33.23         13.73           14.64         043A6A
IFA  AVERAGE               22.00           22.31
```

```
                                P A R T I T I O N  D A T A  R E P O R T
MVS PARTITION NAME                    OOSP4          NUMBER OF PHYSICAL PROCESSORS          16
IMAGE CAPACITY                          497                        CP                        14
NUMBER OF CONFIGURED PARTITIONS          30                        ICF                        2
--------- PARTITION DATA ----------------  -- LOGICAL  -- AVERAGE PROCESSOR UTILIZATION PERCENTAGES --
                  ----MSU----  -CAPPING--  PROCESSOR-    LOGICAL PROCESSORS  --- PHYSICAL PROCESSORS ---
NAME       S   WGT  DEF   ACT  DEF   WLM%  NUM   TYPE    EFFECTIVE   TOTAL  LPAR MGMT  EFFECTIVE  TOTAL
OOSP4      A    30    0    69  NO     0.0  2.0   CP        69.07     69.45      0.05       9.87   9.92
OOSPA      A    10    0     3  NO     0.0    2   CP         2.40      2.67      0.04       0.34   0.38
*PHYSICAL*                                                                     4.34                4.34
                                                                             ------     ------ ------
  TOTAL                                                                        5.27      31.07  36.34

OOSP4      A    30                        2   ICF       21.79     22.00      0.14      14.52  14.66
*PHYSICAL*                                                                     2.56                2.56
                                                                             ------     ------ ------
  TOTAL                                                                        2.71      14.52  17.22
```

# zAAP CPU Times - RMF 72 Workload Activity

| TRANSACTIONS | | TRANS.-TIME | | SS.TTT | --DASD I/O-- | | ---SERVICE---- | | --SERVICE TIMES-- | |
|---|---|---|---|---|---|---|---|---|---|---|
| AVG | 1.00 | ACTUAL | | 0 | SSCHRT | 0.1 | IOC | 3 | TCB | 532.9 |
| MPL | 1.00 | EXECUTION | | 0 | RESP | 1.3 | CPU | 11059K | SRB | 0.0 |
| ENDED | 0 | QUEUED | | 0 | CONN | 0.8 | MSO | 1252M | RCT | 0.0 |
| END/S | 0.00 | R/S AFFINITY | | 0 | DISC | 0.3 | SRB | 219 | IIT | 0.0 |
| #SWAPS | 0 | INELIGIBLE | | 0 | Q+PEND | 0.1 | TOT | 1263M | HST | 0.0 |
| EXCTD | 0 | CONVERSION | | 0 | IOSQ | 0.0 | /SEC | 4210K | IFA | 57.6 |
| AVG ENC | 0.00 | STD DEV | | 0 | | | | | APPL% CP | 158.4 |
| REM ENC | 0.00 | | | | | | ABSRPTN | 4210K | APPL% IFACP | 0.0 |
| MS ENC | 0.00 | | | | | | TRX SERV | 4210K | APPL% IFA | 19.2 |

| | RESP TIME | EX | PERF | AVG | --- USING% --- | | ----- | ----- | EXECUTION DELAYS % | |
|---|---|---|---|---|---|---|---|---|---|---|
| SYSTEM | | VEL% | INDX | ADRSP | CPU | IFA | I/O | TOT | CPU | IFA |
| SYSD | N/A | 89.0 | 0.6 | 1.0 | 79.5 | 9.5 | 0.0 | 11.0 | 7.6 | 3.4 |

| | |
|---|---|
| TCB | - Includes GCP seconds and normalized IFA seconds |
| SRB | - Includes GCP seconds and normalized IFA seconds |
| IFA | - Includes only IFA seconds |
| APPL% CP | - Includes only non-IFA (GCP) time |
| APPL% IFACP | - Time spent on a GCP which was IFA eligible (Subset of APPL% CP) |
| APPL% IFA | - Time spent on the IFA |

# zAAP CPU Times - SMF 30 records

- **zAAP CPU time is not included in SMF30CPT**
- **New fields for zAAP timings**

| FIELD | Description |
|---|---|
| SMF30_TIME_ON_IFA | CPU time spent on IFA |
| SMF30_ENCLAVE_TIME_ON_IFA | Enclave time spent on IFA |
| SMF30_DEP_ENCLAVE_TIME_ON_IFA | Dependent enclave time spent on IFA |
| SMF30_TIME_IFA_ON_CP | CPU time spent running IFA eligible work on a GCP (already in SMF30CPT) |
| SMF30_ENCLAVE_TIME_IFA_ON_CP | IFA Enclave time spent on a GCP (already included in SMF30CPT) |
| SMF30_DEP_ENCLAVE_TIME_ON_CP | IFA dependent enclave time spent on a GCP (already in SMF30CPT) |

- **Done to ensure proper billing for new Java workloads**
  - zAAPs are assist processors and have different cost structures, (lower cost, don't carry IBM software charges, and have lower maintenance costs)
  - If zAAP time was in SMF30CPT you would mix CPU seconds with different cost structures
  - Current billing programs do not have to be changed

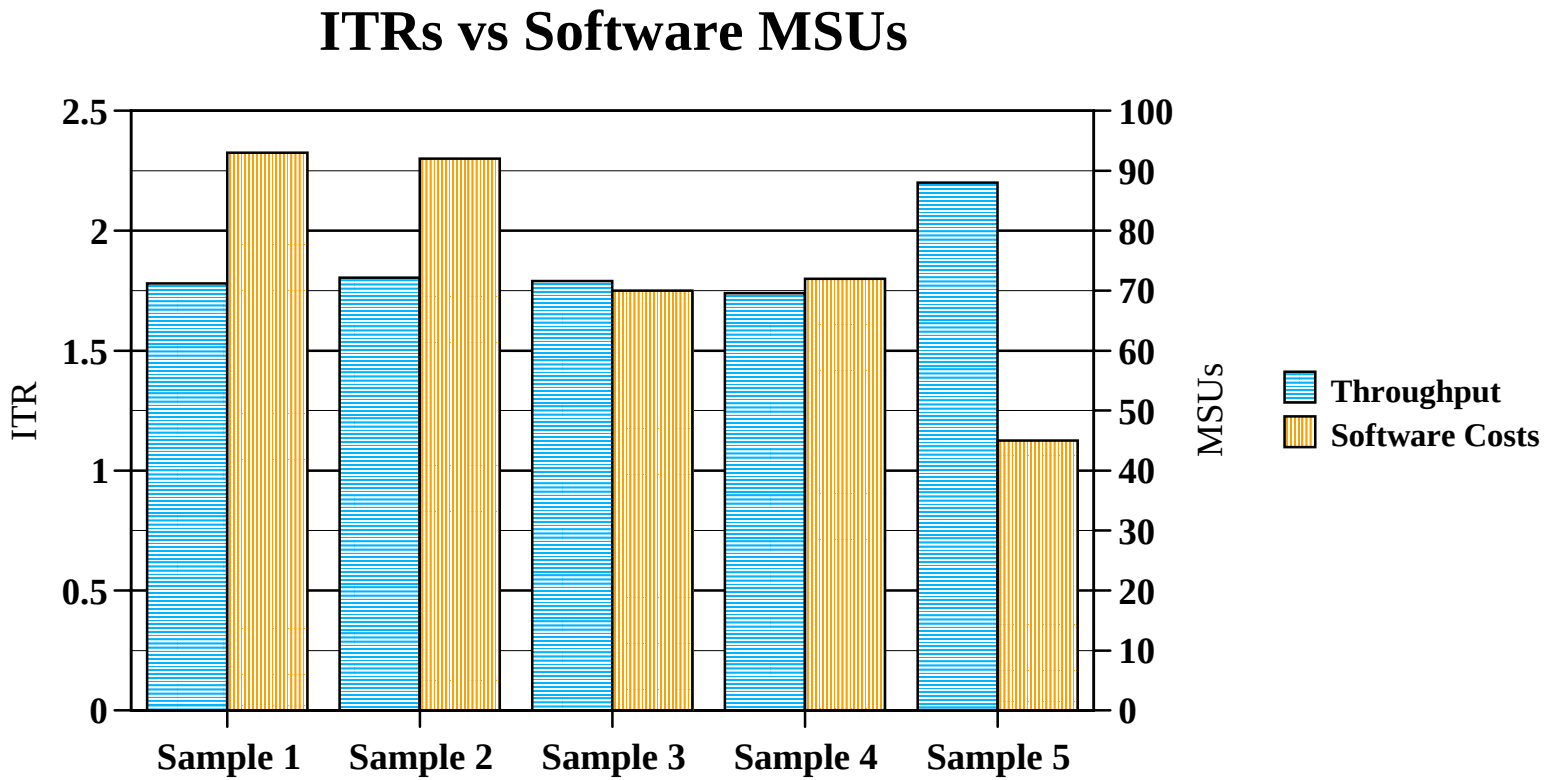
# WSC Experiences

# WSC Experiences

- **Installed z/OS 1.6 as part of the ESP**
- **Ordered and installed 1 zAAP**
  - 2084-315 and 1 zAAP (Eventually added a second zAAP)
- **Series of benchmarks**
  - Ran a Java program (JSP) which calculated Pi to user defined positions (it was used as a soaker program for the zAAP
  - Ran CICS 2.3, with Java transactions which called a DB2 V7 database
  - Ran USS Java workload which called DB2
- **Methodology**
  - Ran the workloads with SDK 1.3 and z/OS 1.5 to get a baseline and create the trace data needed for the estimation tool
  - Ran the workloads on z/OS 1.6 varying the IEAOPTxx parameters for IFACROSSOVER and IFAHONORPRIORITY
  - Measured:
    - Response Time
    - CPU per tran
    - Transaction Count
    - Various RMF Appl% values
    - zAAP busy

# CICS Results

| Test Case | GCPs | zAAPs | JVMs | CrossOver | HonorPriority | Other |
|---|---|---|---|---|---|---|
| Sample 1 | 2 | 0 | 2 | NO | YES | |
| Sample 2 | 2 | 1 | 2 | YES | YES | |
| Sample 3 | 2 | 1 | 2 | NO | YES | |
| Sample 4 | 2 | 2 | 2 | NO | YES | |
| Sample 5 | 2 | 2 | 2 | NO | YES | changed app to reduce EXEC CICS LINKS, and increase business logic |



# WSC Results

- **Importance of switch rate on performance and throughput**
  - **CICS workload had an extremely high switching rate due to the method of calling DB2 and using the result set**
    - **JNI call backs to set variables in the JVM environment**
  - **Highlighted the need to review the switch rate when evaluating applications**
    - **Introduction of a new metric - Microseconds per switch**
    - **Amount of Java execution time per switch**
  - **Updated the jni call back functions to identify additional switch points which were not productive**
    - **May reduce the need for microseconds per switch metric**
  - **High switch rates can influence the accuracy of the estimation tool**
    - **On each switch 2 TIMEUSED macros are used to get the CPU time**
    - **One of the macro invocations is included in the zAAP offloadable time**

# WSC Results

- **Original results have been invalidated by changes introduced via APAR OA14131**
- **See WSC FLASH for more information**
  **http://www-03.ibm.com/support/techdocs/atsmastr.nsf/WebIndex/FLASH10432**

# WSC Results

- **Need to review and understand the impact of zAAP CPs on monitor's utilization numbers**

```
SDSF DA SYSD  SYSD     PAG    0 SIO   147 CPU  68/ 66  LINE 1-10 (10)
COMMAND INPUT ===>                                     SCROLL ===> CSR
NP   JOBNAME  SrvClass DP C StepName Workload JobID      CPU%    SIO Server
     KMWDL    BATLOW   F3 L STEP1    BAT_WKL  JOB27402   0.00   0.00 NO
     KMW7L    BATLOW   F3 L STEP1    BAT_WKL  JOB27405   0.00   0.00 NO
     KMW8L    BATLOW   F3 L STEP1    BAT_WKL  JOB27406   0.00   0.00 NO
     KMW9L    BATLOW   F3 L STEP1    BAT_WKL  JOB27407   0.00   0.00 NO
```

  - **System had 2 GCPs and 1 zAAP, system was 66% busy but work was not running.... why**
  - **SDSF incorporated the zAAP CP into CPU% field. So 2GCPs were 100% busy and the zAAP was 0% busy so the CPU% was 200% / 300% = 66%**
  - **New Support: SDSF took APAR PQ93310 to add additional zAAP CPU timing fields**

```
GCP-Time zAAP-Time zACP-Time GCP-Use% zAAP-Use%
    7.17      5.69      0.00    99.42    100.00
```

# WSC Results

- **IFAHONORPRIORITY and IFACROSSOVER parmlib settings are recorded in the field R723MFLG, offset 1**
  - **If Bit 0 is ON, CROSSOVER=YES is set**
  - **If Bit 1 is ON, HONORPRIORITY=YES is set**
- **New CICS support for Garbage Collection**
  - **PQ94293**
  - **Externalizes the MAX_RESETS_TO_GC= parm**
  - **Set in the JVM profile, and allows the setting of a value of something other than 100 uses before CICS issues the SystemGC() call**
- **New SMF Support**
  - **OA09118**
    - **Provides the SRM Coefficients in SMF 30 records to allow Service Units to be used to calculate CPU time**
  - **OA10901**
    - **Provides the zAAP normalization factor, scaled by 256, in the SMF 30 record**

# WSC Results

- **OA09113 - HIPER**
  - **CICS/Java transactions experienced increased response times and reduced throughput when running with zAAP processors as compared to no zAAP environment**
  - **CICS performance statistics indicate higher DISPWAIT time. Delays occurred dispatching CICS tasks on general purpose CPs after POST was issued on zAAP and all CPs were in NO WORK WAITs**
- **IFACrossover=No specified but APPL% IFACP time recorded**
  - **Due to significant local lock contention in application**
  - **Lock processing is not JAVA execution so the work ran on the GCP**
- **Update IEFACTRT exit to add information on zAAP time**
- **Message IEF374I and IEF376I includes normalized IFA time**

**IEF374I STEP/CICS /STOP 2004224.1105 CPU 238MIN 13.05SEC**

  - **CPU times should be the same if the work runs on a system with or without zAAPs**
  - **Can't use messages to determine how much CPU time was spent on the zAAP**

# WSC Results

- **Need to evaluate and update any performance management reports which report utilization**
- **Update capacity planning methods for zAAPs**
- **Update capture ratio calculations to include zAAP times**

$$\text{System CR} = \frac{(\Sigma \text{ Service Class APPL\%}) / \#\text{ Logical CPs} + (\Sigma \text{ Service Class APPL\% IFA}) / \#\text{ Logical IFAs}}{\text{LPAR Busy} + \text{IFA Busy}}$$

$$\text{zAAP CR} = \frac{(\Sigma \text{ Service Class APPL\% IFA}) / \#\text{ Logical IFAs}}{\text{IFA Busy}}$$

$$\text{GCP CR} = \frac{(\Sigma \text{ Service Class APPL\%}) / \#\text{ Logical CPs}}{\text{LPAR Busy}}$$

# zAAP Summary

- **zAAP …an industry first**
  - Only specialized processing units for Java Code today
  - Supported by IBM Middleware such as WebSphere, CICS, DB2…
  - Helps reduce demands on general purpose processors – make them available for other work
- **zAAPs for e-business Integration and Infrastructure Simplification**
  - Integrate Java technology-based applications with mission-critical data
  - Helps reduce infrastructure complexity for multi-tier applications
- **zAAPs Provide Investment Flexibility**
  - Extend the value of existing zSeries investments and lowers total cost of ownership
  - Cost-effective, specialized Java execution environment
  - Low Total Cost of Acquisition ($125K USD per zAAP)
  - Helps reduce Total Cost of Ownership (software and maintenance Savings)