

Planning Considerations for Running zAAP Work on zIIPs (ZAAPZIIP)



Kathy Walsh
IBM

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Overview

z/OS 1.11 provided improved resource optimization and economics with the introduction of the capability to run System z Application Assist Processor (zAAP) eligible workloads on System z Integrated Information Processors (zIIPs). This new support allows an installation to run zIIP and zAAP eligible workloads on installed zIIP processors. This document will review the functions, features and restrictions involved with successfully using this support, hereafter called ZAAPZIIP support.

This new capability is ideal for customers without enough zAAP or zIIP eligible workloads to justify a specialty engine today; the combined eligible TCB and enclave SRB workloads might make the acquisition of a zIIP cost effective. This new capability is also of value to customers who have only a zIIP processor by making it possible to have existing JAVA and XML based workloads run on the existing zIIPs.

The ZAAPZIIP support is available on z/OS 1.11 and beyond and the support is also provided for z/OS 1.9 and z/OS 1.10 with the PTFs for APAR OA27495. The supported operating systems must be running on any System z9®, System z10, System z196, System z114 and System zEC12 server.

System Set-Up

ZAAPZIIP support is enabled through the use of a new keyword in the IEASYSxx member of SYS1.Parmlib. The allowed syntax and defaults differ based on the z/OS release levels.

z/OS 1.9 and z/OS 1.10

ZZ=YES | **NO**

- YES - zAAP eligible work is able to run on an available zIIP processor when no zAAP processors are present.
- NO - zAAP eligible work cannot run on an available zIIP processor when no zAAP processors are present.

z/OS 1.11 and beyond

ZAAPZIIP=YES | **NO**

- YES - zAAP eligible work is able to run on an available zIIP processor when no zAAP processors are present.
- NO - zAAP eligible work cannot run on an available zIIP processor when no zAAP processors are present.

ZZ=YES | **NO**

ZZ is defined as an alias for ZAAPZIIP.

System Requirements

Certain hardware configuration requirements must be met in order to use the ZAAPZIIP support. The support is active only when the following list of conditions is met. The LPAR must be IPLed in order for the support to work. At the time of the IPL all of the conditions must be met. Later configuration changes to make the hardware condition be met are not sufficient.

1. ZAAPZIIP=YES is specified or defaulted. ZZ syntax is also acceptable.
2. There are (or could be, via dynamic CPU addition) zIIPs defined to this LPAR.
3. No zAAPs are defined to this LPAR, whether online, offline, or in the reserved state.
4. No zAAPs in the configured state are installed on the processor. With the PTFs released with APAR OA38829 changes were made to allow zAAP processors to be installed on the processor but not in any LPAR where ZAAPZIIP support is active.
5. The Global Performance Data Control setting is set for the LPAR. This allows a given LPAR to determine the status of zAAPs on the entire processor.
6. The ZAAPZIIP support does not remove the requirement to purchase and maintain one or more general purpose processors (GCP) for every zIIP processor on the server.

The following information should be understood for each condition:

1. ZAAPZIIP Specified

If there is a mistake in the IEASYSxx specification for ZAAPZIIP the IPL will be halted and a WTOR issued to allow the operator to correct the specification. See message IEA341A for more information. In z/OS 1.11 if the operator is going to use the WTOR reply to correct the specification error then the keyword ZAAPZIIP must be used and not the alias ZZ. Specifying the alias of ZZ is not supported even if the ZZ alias was used in the parmlib definition. For earlier releases only the ZZ syntax is supported and can be used to reply to the WTOR.

2. zIIP defined to the LPAR (potentially).

If a zIIP processor is online in the LPAR and all of the other ZAAPZIIP conditions are met then all the previously zAAP eligible workloads will be reported as zIIP time. There is no external method to determine in the ZAAPZIIP environment how much of the zIIP busy is due to previously zAAP eligible workloads.

If ZAAPZIIP is active (defined as being specified as YES in the IEASYSxx member used for the current IPL and all other hardware conditions were met at the time of the IPL), but there is no zIIP processor currently online then the zAAP eligible workloads will still be reported as zIIP eligible and be reported as zIIP time, (IIPCP time in RMF terms.) If a zIIP processor is dynamically added to the LPAR the zAAP eligible workloads will run on the zIIP processor automatically.

3. No zAAPs are Defined to the LPAR

The quickest method to test for this condition is to issue a Display M=CPU command and ensure there are no zAAPs online or offline to the LPAR. It is also necessary to look at the LPAR definition panel for the LPAR to ensure the RESERVED fields are set to zero for zAAPs. See an example of the LPAR panel below.

CP Type	Number of Initial CPs	Number of Reserved CPs	Capping	Dedicated	Initial Weight	Minimum Weight	Maximum Weight
CP	3	2	☒	☐	105		
zAAP	0	3	☐	☐			
zIIP	0	2	☐	☐			

Save to Profiles Change Running System Save and Change Reset Cancel Help

In this example the specification of 3 reserved zAAPs would cause the disablement of the ZAAPZIIP function. This reserved field must be set to 0 to enable the support.

4. No zAAPs Configured on the CEC.

In order for ZAAPZIIP support to work there cannot be any zAAPs installed on the server. This restriction applies to active OnDemand records which may specify, among other things, a zAAP. In order to permit the ZAAPZIIP support to work the active OnDemand record would have to be changed to not specify zAAPs and then the record reactivated.

z/OS, on either an IBM z10 Server or a IBM z196 Server, allows the dynamic activation of a zAAP even if the RESERVED field is 0. DYNCPADD must be specified as ENABLE (the default) in LOADxx. In the situation where ZAAPZIIP support is active on an IBM z10 server or an IBM Z196 server, if a zAAP processor is dynamically added to the server configuration the ZAAPZIIP support will be stopped. Any zAAP eligible work will no longer be able to run on the zIIP and will instead have to be run by the general purpose CPs. If the newly configured zAAP is brought online to the z/OS partition the zAAP eligible work would run on the available zAAP.

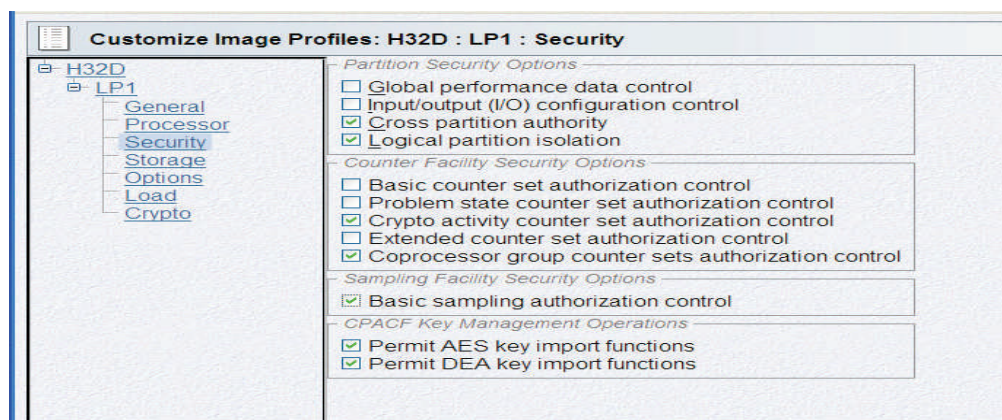
There is an exception to this requirement and this is for a z/VM environment. For testing purposes it is possible to have a z/VM partition and IPL a z/OS guest which specifies ZAAPZIIP=YES and have the support work even if the processor has zAAPs installed and being used by other partitions. Of course for the support to work the z/OS guest must still be defined without any zAAP processors. A zIIP processor would also be needed in the z/OS guest to actually experience the zAAP eligible work moving to the zIIP. Without a zIIP defined to the z/OS guest the testing could only verify the IPL process changes.

The restriction of no zAAPs installed on the processor is removed for z/OS 1.12 and later releases once the support provided by APAR OA38829 is installed. It is now possible for

LPARs running these releases to have a zAAP be installed on the processor and in use by **other** LPARs. The LPAR where the ZAAPZIIP support is to be used cannot have any zAAP assigned to the processor. This new enhancement allows more flexibility in testing the ZAAPZIIP function.

5. Global Performance Data Control must be set.

Global Performance Data Control is a PR/SM parameter which is set on the PR/SM Image Security panel. See the PR/SM Planning Guide, SB10-7153-xx for more information. Except for LPARs which require a highly trusted environment most environments run with this option turned on. This same option is required, for instance, for HiperDispatch support to work in z/OS. Below is an example of the panel where this option must be set.



6. Required to have 1 GCP for each zIIP

The ZAAPZIIP support does not change the requirement for every purchased zIIP to be paired with a purchased general purpose CP. Installations looking at converting zAAPs to zIIPs, or who will have a large combined zAAP and zIIP requirement need to be aware of this continuing restriction.

One of the most common questions asked about this support concerns installations which already have both zAAPs and zIIPs and neither of the processor engines are very busy. In this case it is possible to re-characterize a zAAP to a zIIP but the requirements to allow this re-characterization will have to be discussed with the local IBM Account team. There would be no performance penalty involved for running zAAP work on a zIIP.

Installations should look at their long term specialty engine requirements to decide what combination of zIIPs and zAAPs are best for them. It should also be noted with the introduction of the IBM zEnterprise EC12 processor a statement of direction was published stating the IBM zEnterprise EC12 is planned to be the last high-end System z server to offer support for zAAP specialty engine processors. With this announcement there was no change announced changing the T&C condition requiring one purchased general purpose CP to be paired with 1 zIIP processor.

Operations

The LPAR must be re-IPLed in order for the support to work. At IPL time all of the hardware conditions must be met. Configuration changes made after the IPL intended to make the hardware condition be met are not sufficient to allow the function to be enabled.

Until z/OS 1.12 there is no display command available to determine if the LPAR is running in a ZAAPZIIP environment. Introduced in z/OS 1.12, there is a new command which will display the status of the ZAAPZIIP support and potentially help explain why the environment cannot support ZAAPZIIP functionality. To issue the command specify:

D IPLINFO,ZAAPZIIP,STATE

This is the command display response:

IEE256I ZAAPZIIP STATE: state

In the message text, ***state*** is one of the following

ACTIVE: zAAP on zIIP is active

INACTIVE – ZAAPZIIP SYSTEM PARAMETER IS 'NO'

INACTIVE – NO ZIIP(S) DEFINED TO THIS LPAR

INACTIVE – ZAAP(S) DEFINED TO THIS LPAR

INACTIVE – ZAAP(S) INSTALLED ON THE MACHINE

(deleted with APAR OA38829)

INACTIVE – TOO MANY ZAAPS+ZIIPS INSTALLED ON THE MACHINE

(added with APAR OA38829)

INACTIVE – GLOBAL MACHINE DATA IS NOT AVAILABLE TO THIS LPAR

The message text for the newly added ZAAPZIIP state may be confusing to some. This message is not stating the sum of zAAPs and zIIPs installed on the processor are too high. Rather, this message is indicating there are “too many” zAAPs (as in a non-zero value) AND zIIPs installed on the processor. Even with the support provided with APAR OA38829 an LPAR cannot have zAAPs online and have the ZAAPZIIP support work.

There is no operator command to turn the ZAAPZIIP function on or off. The best test to determine if ZAAPZIIP support is working is to identify a workload which is zAAP eligible, a small test JAVA job is one example, and watch if the work is run on the zIIP or if a GCP runs the work. If the zIIP processors are over-committed then the zIIP processor can request “help” from the general purpose CPs. If the ZAAPZIIP support is working then the time spent on the GCP giving “help” will be recorded as IIPCP time in RMF or SMF30 records and not as AAPCP time. If it is being recorded in the zIIP CPU fields then it is working. If not, then one of the hardware conditions, previously discussed, has not been met.

zAAP Eligible Workloads

With the ZAAPZIIP support enabled, and if the LPAR has a zIIP processor, z/OS will treat all zAAP eligible work instead as zIIP eligible work. Selection of which specific

workload will run on the zIIP in this combined environment is based on the WLM set dispatch priority of the workloads. Hence, higher priority zAAP workloads could run in front of zIIP workloads, and vice versa. zAAP eligible workloads will lose their “zAAP eligible” designation once the ZAAPZIIP support is enabled but will gain a “zIIP eligible” designation. From an RMF reporting perspective all of the previously eligible zAAP work will be reported as zIIP time.

The specification of the zAAP related keywords IFAHONORPRIORITY and ZAAPAWMT in the IEAOPTxx parmlib member are ignored and do not apply to the previously zAAP eligible workloads when ZAAPZIIP is active. To provide the same controls it is necessary to use the equivalent zIIP parameters IIPHONORPRIORITY and ZIIPAWMT.

The use of PROJECTCPU does not change. If ZAAPZIIP=NO is specified then a zAAP eligible workload would still be measured for how much zAAP eligible work there is and it would be reported via the AAPCP RMF fields. If ZAAPZIIP is enabled but there is no zIIP processor online to the LPAR the zAAP eligible work would be reported as IIPCP time. Below is a table which describes how zAAP eligible work would be recorded in RMF for different scenarios of ZAAPZIIP support given different specialty CP configurations. The ZAAPZIIP function is considered ON only when all of the conditions are met.

Function	zAAP online	zIIP online	No zAAP, No zIIP online
ON	N/A	IIP	IIPCP
OFF	AAP	AAPCP	AAPCP

RMF reporting, and by extension, performance reporting, capacity planning, and chargebacks will all be impacted by the use of ZAAPZIIP support. Those systems management processes created when workloads ran on zAAPs will have to be updated to use the appropriate zIIP fields out of the RMF 70, 72, and 30 records when ZAAPZIIP support is enabled.

Summary

The ZAAPZIIP support provides installation more capability and flexibility by allowing zAAP eligible work to now run on a zIIP. This is especially valuable to installations which had both types of work but insufficient workload to keep two different types of processors busy. Enhancements in z/OS 1.12 also provide additional operational flexibility to improve testing and to display the ZAAPZIIP environment. Installations will need to update performance and capacity planning reporting to replace zAAP metrics with zIIP metrics once this support is enabled.

Special Notices

The information contained in this document provides only general descriptions of the types and portions of workloads that are eligible for execution on Specialty Engines (e.g, zIIPs, zAAPs, and IFLs) ("SEs"). IBM authorizes customers to use IBM SEs only to execute the processing of Eligible Workloads of specific Programs expressly authorized by IBM as specified in the "Authorized Use Table for IBM Machines" provided at:

www.ibm.com/systems/support/machine_warranties/machine_code/aut.html ("AUT")

No other workload processing is authorized for execution on an SE.

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