

Adabas Review

Adabas Review for zIIP

Version 5.1.1

August 2020

This document applies to Adabas Review Version 5.1.1 and all subsequent releases.

Specifications contained herein are subject to change and these changes will be reported in subsequent release notes or new editions.

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Preface

This document provides information on Adabas Review for zIIP, a selectable unit of Adabas Review that enables Adabas Review to make use of IBM's zIIP engine. Whether running Adabas Review in Hub mode or local, Adabas Review for zIIP enables Adabas Review on z/OS to offload part of its workload from the mainframe's general processors (GP) to System z Integrated Information Processors (zIIP).

Offloading work from the GPs will free up some of their capacity. This helps decrease the total cost of operation (TCO) of the GPs and makes room for running additional workload on them. Furthermore, the use of Adabas Review for zIIP may result in performance benefits by increasing the throughput for certain workloads.

Prerequisites	Requirements for zIIP support by Adabas Review for zIIP.
Current Limitations	Currently limited functionality.
General Information on zIIP Processing	Brief description of zIIP processing.
Adabas Review for zIIP Processing: Concepts	Explanations of the TCB and SRB processes and the WLM enclaves Adabas Review for zIIP requires for zIIP processing.
Monitoring zIIP Usage	System information, reports and statistics available for controlling and evaluating zIIP-enabled Adabas Review for zIIP sessions.



Notes:

1. The parameters mentioned in this documentation are described in the *Parameter Reference* documentation, unless otherwise noted.
2. Since version 4.9.1. Adabas Review offers the field ZIIP for monitoring whether an Adabas command runs on a zIIP processor.

1 About this Documentation

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Document Conventions

Convention	Description
Bold	Identifies elements on a screen.
Monospace font	Identifies service names and locations in the format <i>folder.subfolder.service</i> , APIs, Java classes, methods, properties.
<i>Italic</i>	Identifies: Variables for which you must supply values specific to your own situation or environment. New terms the first time they occur in the text. References to other documentation sources.
Monospace font	Identifies: Text you must type in. Messages displayed by the system. Program code.
{ }	Indicates a set of choices from which you must choose one. Type only the information inside the curly braces. Do not type the { } symbols.
	Separates two mutually exclusive choices in a syntax line. Type one of these choices. Do not type the symbol.
[]	Indicates one or more options. Type only the information inside the square brackets. Do not type the [] symbols.
...	Indicates that you can type multiple options of the same type. Type only the information. Do not type the ellipsis (...).

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Software AG products provide functionality with respect to processing of personal data according to the EU General Data Protection Regulation (GDPR). Where applicable, appropriate steps are documented in the respective administration documentation.

2 Prerequisites

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Prerequisites for Installation

All prerequisites for installation are described in *Installing Adabas Review for zIIP* in the *Installation and Operations for z/OS* documentation.

The AZPAD license is necessary to start Adabas Review with ZIIP=YES.

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Current Limitations

There are functional limitations for Adabas Review for zIIP. The following module is not yet zIIP enabled:

- ACITMZ (i.e. CICS zIIP enablement for Adabas Review)

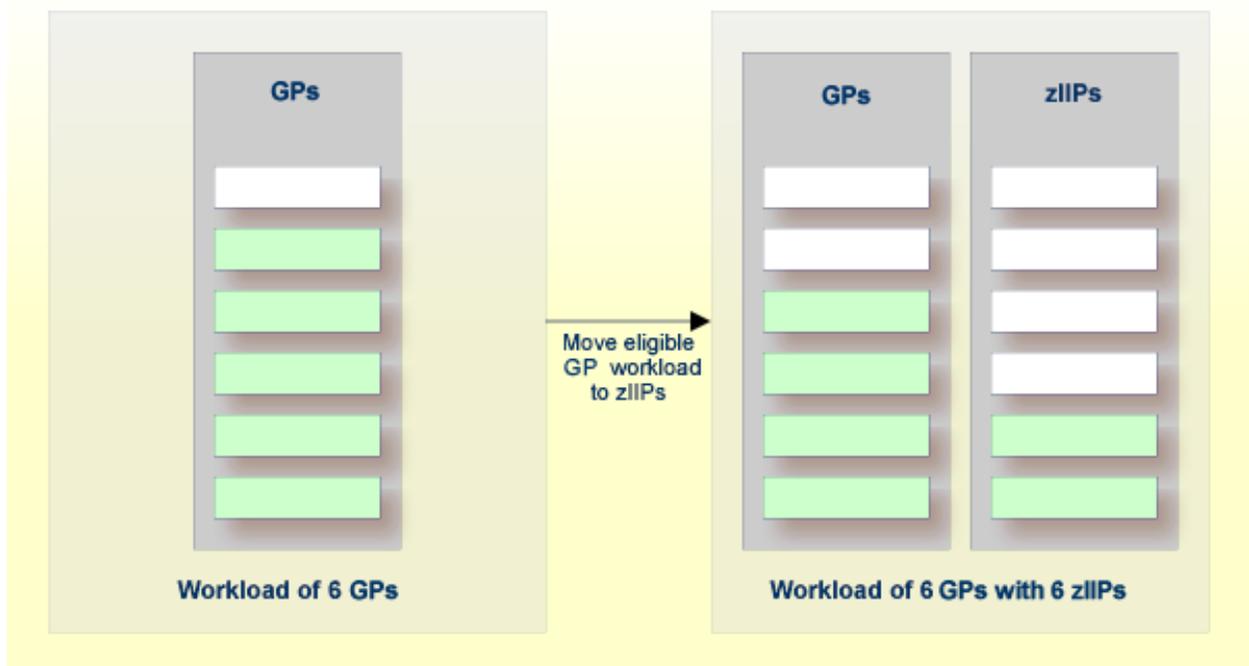
4 General Information on zIIP Processing

The IBM System z Integrated Information Processor (zIIP) is a specialty engine designed to offload eligible workload from a GP (general processor) to a zIIP.

Offloading workload to a zIIP helps optimize resource capacities and free up part of the GPs for new workloads, while lowering the mainframe TCO (total cost of ownership). GPs are more expensive than zIIPs, both in their direct cost and in their impact on software license costs. Also, GPs may run throttled, whereas zIIPs always run at full speed.

For detailed information on the zIIP, refer to the appropriate IBM literature.

The simple graphic below illustrates the purpose of the zIIP:



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Adabas Review for zIIP Processing: Concepts

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This chapter provides information on how Adabas Review enables zIIP support.

In general, a z/OS application runs as a dispatchable unit managed using a TCB (task control block). It is said to run "under a TCB" or "in TCB mode". Running an application on a zIIP requires a dispatchable unit managed using an SRB (service request block). SRB code is said to run "under an SRB" or "in SRB mode".

To become eligible for running on a zIIP, an SRB must be assigned to an "enclave" managed by the z/OS Workload Manager (WLM). An enclave is a WLM transaction that can span multiple dispatchable units (TCBs and SRBs) in one or more address spaces and that WLM reports on and manages as a unit. When Adabas Review for zIIP starts, it creates an enclave consisting of its main TCB and an SRB and configures the SRB to be eligible for running on a zIIP. Generally, Adabas Review for zIIP runs in SRB mode (eligible for execution on a zIIP) whenever possible and in TCB mode whenever necessary.

The WLM enclave created and used by Adabas Review for zIIP processing is bound to the Adabas Review nucleus or utility address space. It is deleted when the Adabas Review nucleus or utility job step terminates.

TCB/SRB Switches

When an Adabas Review nucleus or utility is started with the ADARUN parameter ZIIP set to YES, the nucleus or utility starts an SRB in parallel to its main TCB, places the TCB in a wait state, and continues processing in the SRB. The SRB may run on a zIIP, as directed by the Workload Manager, and executes the bulk of the Adabas Review logic. The SRB cannot perform all operations that the TCB can do, though. Broadly, there are two categories of operations that Adabas Review for zIIP cannot perform in SRB mode:

- Certain system services, in particular those that perform input/output operations
- Code not owned by Software AG (supplied by the installation or a third party)

Whenever the SRB cannot perform an operation, it may "pass the baton" to the TCB by taking the TCB out of its wait and putting itself into a wait state. The TCB then proceeds at the point where the SRB left off and performs the operation. When the operation has finished, the TCB takes the SRB out of its wait and puts itself into a wait state again. These steps are called "switch to TCB mode" and "switch to SRB mode", respectively.

Adabas Review for zIIP performs an operation in TCB mode either by switching to TCB mode before and back to SRB mode after the operation or by issuing a request to the TCB to perform the operation in parallel while the SRB continues other processing (see also [Parallel Requests](#) below).

Parallel Requests

As described in *TCB/SRB Switches* above, Adabas Review for zIIP may switch to TCB mode to perform an operation that it cannot do in SRB mode, and switch back to SRB mode after the operation. Alternatively, the SRB may issue a request to the TCB to perform the operation in parallel while the SRB continues processing other work. Roughly, the procedure to use parallel requests functions as follows:

1. The SRB needs to perform an operation that requires TCB mode.
2. The SRB issues a request to the TCB to perform the operation in parallel and takes the TCB out of its wait state.
3. If necessary, the SRB puts the current nucleus thread into a wait state.
4. The SRB looks for other work to do - other threads or new commands.
5. At the same time, the TCB, coming out of its wait state, processes the parallel request given to it.
6. When the TCB has finished processing a parallel request, it checks whether the SRB has meanwhile issued another request. If so, it processes that request too, and repeats this step.
7. When the TCB has processed all parallel requests and the SRB has not requested a switch to TCB mode, the TCB enters a wait state again.

Whether Adabas Review performs a TCB-mode operation via a mode switch or a parallel request depends on the type of operation. Generally, operations that may occur very frequently are performed via parallel requests. This is more efficient than mode switches if (and only if) the workload given to Adabas Review is high and allows for sufficient parallelism in its processing. The choice between mode switches and parallel requests is made by Adabas Review; it cannot be controlled via configuration parameters.

6 Monitoring zIIP Usage

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The purpose of Adabas Review for zIIP is to reduce the Adabas Review CPU consumption on general processors (GP) by offloading part of the processing to System z Integrated Information Processors (zIIP). Adabas Review for zIIP offers statistics about how much CPU time it has consumed on GPs and zIIPs and for which reasons it has executed on GPs. This chapter provides information on how to view and understand these zIIP-related statistics.

zIIP-Related Statistics

Adabas Review for zIIP shows zIIP-related statistics

- in the Adabas Review session statistics that are printed when the nucleus terminates; REVIEWB (=REVB) statistics will be output in RVUPRT00; REVHUB (=MAIN, hub mode only), REVHIST (=HIST) and REVAUTO (=AUTO) will be output in JESMSGGLG,
- in SYSREVDDB after entering the command `ZIIP [REVB|MAIN|HIST|AUTO]`.



Note: In local mode the Review main task (MAIN) is running as an Adabas task. The statistic values in Review are 0 since the task belongs to Adabas.

See [Understanding the zIIP-Related Statistics](#) below for information on how to interpret these statistics.

Understanding the zIIP-Related Statistics

When Adabas Review has been started with ADARUN parameter ZIIP=YES, session statistics are available which inform about the performance of Adabas Review for zIIP. These statistics are the same as the zIIP statistics for Adabas or for Adabas Online System.

zIIP statistics in Adabas Review have been setup so that the 4 subtasks (REVIEWB/REVB, REVHUB/MAIN, REVHIST/HIST and REVAUTO/AUTO) can be monitored separately from each other. To achieve this, an enclave has been defined for each subtask. The zIIP statistics for the whole Adabas Review address space apply to all subtasks/enclaves and thus show the same values. They will be displayed at the start and at the end of the zIIP statistics.

The values are sorted so that the most important values are output first. The values "All enclave zIIP times (%)" and "Enclave zIIP time (%)" are good, when they are as near as possible to 100%. If these values are low (usage of the zIIP processor(s) is low), "Extended statistics" and the values under "SRB/TCB scheduling by type of work" may show why.

Statistic	Description
zIIP-related statistics for Adabas Review address space	
Total CPU time	The total CPU time (GP plus zIIP) consumed by any dispatchable unit (TCB or SRB) running in the Adabas Review address space, comprising the non-enclave GP times and all enclave GP times and zIIP times
Non-enclave GP times	The total CPU time (on general processors) consumed by any TCB in the Adabas Review address space that was not a member of a Workload Manager (WLM) enclave
All enclave GP times	The total CPU time on general processors consumed by any dispatchable unit (TCB or SRB) in the Adabas Review address space that was a member of a WLM enclave
All enclave zIIP times	The total CPU time on zIIPs consumed by any SRB in the Adabas Review address space that was a member of a WLM enclave, normalized to GP speed
All enclave zIIP times (%)	The percentage of the total CPU time that the Adabas Review address space consumed on zIIPs, calculated as: All enclave zIIP times / Total CPU time * 100
zIIP-related statistics for Adabas Review enclave (REVB MAIN HIST AUTO)	
Total enclave CPU time ^[*]	The total CPU time consumed by the WLM enclave created by Adabas Review for its entire session, comprising the CPU times consumed on GPs and on zIIPs
Enclave GP time	The CPU time of the WLM enclave created by Adabas Review that was consumed on general processors
Enclave zIIP time	The CPU time of the WLM enclave created by Adabas Review that was consumed on zIIPs, normalized to GP speed
Enclave zIIP time (%) ^[*]	The percentage of the enclave CPU time that Adabas Review consumed on zIIPs, calculated as: Enclave zIIP time / Total enclave CPU time * 100
Eligible zIIP CPU time ^[*]	The CPU time that Adabas Review was eligible to execute on zIIPs, comprising the actual Enclave zIIP CPU time and the Eligible zIIP CPU time on GP
Enclave zIIP time	The CPU time of the enclave that Adabas Review consumed on zIIPs (same as the 'Enclave zIIP CPU time' under 'Total enclave CPU time')
Eligible zIIP time on GP	The CPU time of the enclave that Adabas Review was eligible to execute on zIIPs but instead consumed on GPs because no zIIP was available
Eligible zIIP time on GP (%) ^[*]	The percentage of the eligible zIIP CPU time that instead consumed on GPs, calculated as: Eligible zIIP CPU time on GP / Eligible zIIP CPU time * 100
Mode switches ^[**]	The number of times Adabas Review switched into SRB mode to become eligible for execution on a zIIP or switched into TCB mode to perform operations that were incompatible with SRB mode
Parallel requests ^[*]	The number of times Adabas Review requested that the TCB perform an operation in parallel to its own processing in SRB mode

Statistic	Description
No free element for request	The number of times the SRB had to wait for a free request element until it could issue a parallel request to the TCB
Parallel requests per TCB pause [*]	The average number of parallel requests processed by the TCB until it had to pause and wait for more work, calculated as: Parallel requests / Pause TCB (below)
Extended statistics (REVB/MAIN/HIST/AUTO)	
The following extended statistics were introduced for internal reporting and may be changed or removed in future releases.	
Pause SRB	The number of times the SRB was waiting for work
Release SRB	The number of times the SRB was released to continue processing
Pause TCB	The number of times the TCB was waiting for work
Release TCB	The number of times the TCB was released to continue processing
Pause for wait [*]	The number of times Adabas Review had no work to do (i.e., was waiting for I/Os, new commands, or other events)
Release from wait	The number of times Adabas Review was released to continue processing after an event had occurred
SRB/TCB scheduling by type of work (REVB/MAIN/HIST/AUTO)	
The following statistics "by type of work" show why the processing mode (SRB or TCB mode) was switched or a parallel request was issued. They indicate the reasons for the "Mode Switches" and "Parallel requests" reported above. Only categories with nonzero counts are shown. A selection of typical categories follows:	
Miscellaneous	The number of other, infrequent operations that required execution in TCB mode, performed via switches to TCB mode and back to SRB mode
Operator commands	The number of operator commands whose processing required execution in TCB mode, performed via switches to TCB mode and back to SRB mode
Sequential writes	The number of writes to a sequential dataset (e.g., DDPRINT), in most cases issued via parallel requests to the TCB
Timer services	The number of timer operations that required execution in TCB mode, performed via switches to TCB mode and back to SRB mode
User exit N	The number of times user exit N was called. User exits (including hyperexits and collation descriptor exits) are always called in TCB mode. User exits that may be called frequently are invoked via parallel requests; others, via switches to TCB mode and back to SRB mode
Log Switch Exit	The number of times the REVIEW log switch exit is invoked
Summary Report Exit	The number of times the REVIEW summary report exit is invoked
Detail Report Exit	The number of times the REVIEW detail report exit is invoked
zIIP Statistics	The number of times the zIIP statistics are taken for the enclave
ZIIP=NO	The number of times the ZIIP=NO command is performed in the enclave
ZIIP=YES	The number of times the ZIIP=YES command is performed in the enclave
...	(Other types of work that must be performed in TCB mode are reported if they occurred in the Adabas Review session.)

Statistic	Description
Enclave GP service units	The GP CPU service units accumulated by the enclave created by Adabas Review (at nucleus termination only)
Enclave zIIP service units	The zIIP CPU service units accumulated by the enclave created by Adabas Review, normalized to GP speed (at nucleus termination only)
zIIP-related statistics for Adabas Review address space (cont.)	
GPs	The number of general processors (GP) managed by the operating system
zIIPs	The number of System z Integrated Information Processors (zIIP) managed by the operating system
zIIP SMT threads	The number of simultaneous multithreading (SMT) threads per zIIP core
zIIP normalization factor	The factor by which zIIP CPU times have been multiplied by z/OS to be comparable with the CPU times of the GPs, if the GPs are throttled

[*] These numbers are also included in the regular SYNS-60 Nucleus statistic and SYNS-5B Session end / session interval statistics checkpoints.

[**] The number of switches into TCB mode is also included in the regular SYNS-60 Nucleus statistic and SYNS-5B Session end / session interval statistics checkpoints. It typically is half of the total number of mode switches.



Notes:

1. The "All enclave zIIP times (%)" figure shows in a nutshell how much of the CPU consumption by Adabas Review was actually offloaded to zIIPs.
2. Adabas Review creates a Workload Manager enclave for its main task TCB and its companion SRB. It reports the CPU times on zIIPs and general processors consumed in this enclave under "Total enclave CPU time". Other tasks in the Adabas Review address space — such as system SRBs used for asynchronous event processing (I/O completion, cross-memory posts, XCF/XES exits used in Adabas Cluster Services, etc.) run outside this enclave. The CPU times for all enclaves, tasks and SRBs running in the Adabas Review address space are shown under "Total CPU time" at the top of these statistics.
3. Take into account that the TCB/SRB mode switches and parallel requests generate overhead that is also attributed to the GP and zIIP CPU times of Adabas Review for zIIP. For a more accurate assessment how much CPU time Adabas Review for zIIP saves on GPs, run the same, representative test workload both with ZIIP=YES and ZIIP=NO and compare the GP CPU times consumed in both scenarios. The GP CPU time savings will typically depend on the type of workload processed by .
4. If the "Eligible zIIP CPU time on GP (%)" is non-negligible, it suggests that the available zIIPs in the host system are over-allocated. If their free capacity was higher, Adabas Review for zIIP could offload more of its work to the zIIPs.
5. The number of "Parallel requests per TCB pause" indicates the level of parallelism that Adabas Review for zIIP could utilize by stringing TCB-mode operations together. A number close to 1

indicates low parallelism; a greater number, higher parallelism and a greater reduction of overhead.

6. The "Pause for wait" count, relative to the number of I/Os (reported in the zIIP-related statistics under "EXCPs") and Adabas Review commands (reported higher up in the session statistics), indicates the level of parallelism that Adabas Review could utilize to process multiple commands concurrently. The higher the ratio of commands plus I/Os over "pauses for wait", the more work Adabas Review was able to do without pause (such as waiting for I/O completion or for the arrival of a new command).
7. The counts of mode switches and parallel requests depend on the workload processed by Adabas Review - in particular, the number of system service calls that require TCB mode, the number of user exit calls, and the inherent parallelism of the workload. Aside from changing these aspects, little can be done in the configuration of Adabas Review for zIIP to influence the interplay between the SRB and the TCB.
8. If the ZIIP parameter is changed to NO during an Adabas Review session, requesting that Adabas Review continue to run in TCB mode and not use zIIPs anymore, the then following processing will be charged to the TCB and counted under "All enclave GP times" and "Enclave GP CPU time". The proportions of "All enclave zIIP times (%)" and "Enclave zIIP CPU time (%)" will decrease correspondingly. These percentages show how much of the Adabas Review workload was actually executed on zIIPs, not how much could have been executed on zIIPs under other circumstances.

Example zIIP-Related Statistics

The following example output illustrates the zIIP-related statistics in the Adabas Review session statistics:

```

zIIP-related statistics for REVHUB address space

Total CPU time                0:06:59.082
  Non-enclave GP times         0:00:22.485
  All enclave GP times         0:00:52.084
  All enclave zIIP times       0:05:44.512
  All enclave zIIP times (%)   82.20

zIIP-related statistics for REVHUB enclave

Total enclave CPU time        0:06:36.596
  Enclave GP time              0:00:52.083
  Enclave zIIP time            0:05:44.512
  Enclave zIIP time (%)       86.86

Eligible zIIP CPU time       0:05:46.943
  Enclave zIIP time            0:05:44.512
  Eligible zIIP time on GP     0:00:02.430
  Eligible zIIP time on GP (%) 0.70
    
```

Mode switches	200
Parallel requests	1,584,491
No free element for request	0
Parallel requests per TCB pause	4.21
Extended statistics	
Pause SRB	40
Release SRB	1
Pause TCB	375,750
Release TCB	375,789
Pause for wait	1,076,264
Release from wait	1,569,671
SRB/TCB scheduling by type of work	
EXCPs	1,584,555
Miscellaneous	18
Operator commands	2
Sequential writes	18
Timer services	62
User exit 8	36
Enclave GP service units	2,486,134
Enclave zIIP service units	2,159,636
GPs	2
zIIPs	1
zIIP SMT threads	2
zIIP normalization factor	10.97

See [Understanding the zIIP-Related Statistics](#) above for information and advice on how to interpret these statistics.

