

VitalSigns SIEM Agent™ for z/OS

VSA 4.3 Benchmark Tests

zIIP Eligibility and zIIP Offload

Tests were run on a z16 (IBM 3931 Model A01) with one CP and one zIIP. Two sets of tests were run:

1. Performance while processing SMF events was tested using the VSA batch utility to queue a mixed workload of SMF records to the agent. SMF exits and the EMCS console were disabled to reduce the number of variables.
2. Performance while processing console messages was tested using a REXX exec to generate WTO messages. All messages generated by the exec were selected for processing, formatted, and sent to the server. Incidental console messages received during the test period were not selected.

SMF Event Processing

A mixed workload of 2,589,597 SMF records (see *Note 1*) was queued to the agent. Three separate batch runs were submitted in sequence, each sending 863,199 records at a rate of approximately 70,000 records per minute. All SMF records were formatted into event messages in the CEF format and transmitted to a single TCP server. The agent completed receiving the records and formatting SIEM event messages in 22 minutes 19 seconds. All event messages were fully processed and transmitted to the server within 24 minutes and 17 seconds.

CPU time was recorded at run time by each component's TCB and SRB using TIMEUSED. Actual zIIP offload data was retrieved from z/OS Workload Manager (WLM) using IWMEQTME.

Summary:

The agent recorded zIIP eligibility (that is, the percent of CPU time run on enclave SRBs) between 99.77% and 99.97% during and immediately following the test.

Actual zIIP offload during the test was consistently recorded at 92% to 93%.

Here is the mix of records received:

VSA0892I Rcd	Received
VSA0805I Type	from batch
VSA0806I	=====
VSA0807I 14	37572
VSA0807I 15	6888
VSA0807I 17	669
VSA0807I 18	3
VSA0807I 30	85485
VSA0807I 32	318
VSA0807I 42	4389
VSA0807I 62	1956
VSA0807I 80	55923
VSA0807I 92	2380092
VSA0807I 119	16302
VSA0808I	=====
VSA0809I Total	2589597

Several CPU snapshots were taken during the test, as follows.

After 422,174 records had been received and 116,797 SIEM event messages had been transmitted, the agent had used 47.88 CPU seconds with a zIIP eligibility rate of 99.83%:

VSA1537I	VSA1532I Task	Events	Total TCB time	Enclave SRB time	CPU per event	zIIP elig
VSA1533I	====	=====	=====	=====	=====	=====
VSA1528I	SCI		0.01248			
VSA1528I	SCR		0.01144			
VSA1528I	SCD		0.00249			
VSA1528I	SCT		0.00108			
VSA1528I	DI		0.00651			
VSA1528I	NR		0.00039			
VSA1528I	XM		0.00010			
VSA1528I	MC		0.00080			
VSA1528I	SM	422174	0.04208	43.06	0.00010	99.90%
VSA1528I	MS		0.00004	0.00		62.55%
VSA1528I	PM	422154	0.00005	0.22		99.97%
VSA1528I	AM	422154	0.00003	0.35		99.98%
VSA1528I	FS	116795	0.00004	3.67	0.00003	99.99%
VSA1528I	UD		0.00011	0.00		52.96%
VSA1528I	T1		0.00008	0.00		61.64%
VSA1528I	T2	116797	0.00009	0.49	0.00000	99.97%
VSA1536I			=====	=====		=====
VSA1528I	Total		0.07788	47.80		99.83%

After 2,317,946 records received and 1,925,432 messages transmitted, the agent had used 580.02 CPU seconds and zIIP eligibility was measured at 99.97%:

VSA1537I	VSA1532I Task	Events	Total TCB time	Enclave SRB time	CPU per event	zIIP elig
VSA1533I	====	=====	=====	=====	=====	=====
VSA1528I	SCI		0.01248			
VSA1528I	SCR		0.03443			
VSA1528I	SCD		0.01125			
VSA1528I	SCT		0.01687			
VSA1528I	DI		0.00708			
VSA1528I	NR		0.00039			
VSA1528I	XM		0.00010			
VSA1528I	MC		0.00080			
VSA1528I	SM	2317946	0.04208	458.67	0.00019	99.99%
VSA1528I	MS		0.00004	0.00		62.55%
VSA1528I	PM	2317942	0.00005	1.60		99.99%
VSA1528I	AM	2317942	0.00003	2.00		99.99%
VSA1528I	FS	1925430	0.00004	108.13	0.00005	99.99%
VSA1528I	UD		0.00011	0.00		52.96%
VSA1528I	T1		0.00008	0.00		61.64%
VSA1528I	T2	1925432	0.00009	9.47	0.00000	99.99%
VSA1536I			=====	=====		=====
VSA1528I	Total		0.12599	579.89		99.97%

After all records had been received, formatted, and transmitted to the TCP destination, 747.27 CPU seconds had been used with a reported 99.77% zIIP eligibility (see Note 2):

VSA1532I Task	Events	Total TCB time	Enclave SRB time	CPU per event	zIIP elig
VSA1533I =====	=====	=====	=====	=====	=====
VSA1528I SCI		0.01248			
VSA1528I SCR		0.04739			
VSA1528I SCD		0.01263			
VSA1528I SCT		0.03442			
VSA1528I DI		1.54710			
VSA1528I NR		0.00039			
VSA1528I XM		0.00010			
VSA1528I MC		0.00080			
VSA1528I SM	2589603	0.04208	565.26	0.00021	99.99%
VSA1528I MS		0.00004	0.00		62.55%
VSA1528I PM	2589600	0.00005	2.07		99.99%
VSA1528I AM	2589600	0.00003	2.23		99.99%
VSA1528I FS	2589600	0.00004	163.29	0.00006	99.99%
VSA1528I UD		0.00011	0.00		52.96%
VSA1528I T1		0.00008	0.00		61.64%
VSA1528I T2	2589597	0.00009	12.69	0.00000	99.99%
VSA1536I		=====	=====		=====
VSA1528I Total					99.77%

Notes:

1. Each batch run includes a pair of marker records that are counted by the agent as received events but are not formatted or transmitted. This accounts for the difference between the event counts shown by the SM (receiver) task and the T2 (TCP server) task.
2. By the end of the test, the continued high event arrival rate drove cell pool contraction processing in the DI (Director) task, which increased the total TCB time and consequently slightly reduced the overall zIIP eligibility calculation.
3. SMF exit processing time, which is counted and reported separately by the agent, is not shown here, since all records were queued directly from batch. The SMF exits and the batch utility use the same technique to queue records to the agent.

Six times during and immediately following the test, WLM was queried for actual zIIP time vs. CP time within the enclave. One query reported actual zIIP offload of 92% and five reported 93%:

VSA1539I Enclave name:	3C00000016
VSA1540I Started:	06/12/2023 11:02:19
VSA1541I Service class:	BATMDM Report class:
VSA0011I	
VSA1542I Period:	1
VSA1543I Performance Index:	66
VSA1544I Importance:	3
VSA0011I	
VSA1545I zIIP eligible time:	744.77
VSA1546I zIIP time:	694.78
VSA1547I CP time:	49.98
VSA1548I Offload:	93%

Console Message Event Processing

A REXX exec was used to issue 6,000 WTO (Write to Operator) calls. All messages sent by the REXX exec were formatted into event messages in the CEF format and transmitted to a single TCP server. In addition to the 6,000 messages issued by the exec, the agent received 37 “naturally occurring” messages from the console during the course of the test. None of these messages was formatted or transmitted.

During the test, the agent used 0.55 CPU seconds and measured 67.01% zIIP eligibility (see Note 1):

VSA1537I						zIIP
VSA1532I Task	Events	Total TCB time	Enclave SRB time	CPU per event		elig
VSA1533I	=====	=====	=====	=====		=====
VSA1528I SCI		0.01161				
VSA1528I SCR		0.01428				
VSA1528I SCD		0.00311				
VSA1528I SCT		0.00498				
VSA1528I DI		0.00632				
VSA1528I NR		0.00033				
VSA1528I XM		0.00009				
VSA1528I MC	6037	0.14257		0.00002		
VSA1528I SM		0.00027	0.00			17.58%
VSA1528I MS	6000	0.00004	0.05	0.00000		99.92%
VSA1528I PM	6000	0.00003	0.07	0.00001		99.95%
VSA1528I AM	6000	0.00005	0.01	0.00000		99.50%
VSA1528I FS	6000	0.00005	0.15	0.00002		99.96%
VSA1528I UD		0.00009	0.00			57.61%
VSA1528I T1		0.00008	0.00			63.14%
VSA1528I T2	6000	0.00008	0.07	0.00001		99.87%
VSA1536I		=====	=====			=====
VSA1528I Total		0.18404	0.37			67.01%

Note:

1. Since EMCS console services must be called in task mode, console messages are received and primary filtering done on the MC task's TCB, which is not zIIP eligible. Any messages selected for further processing are queued to the MS task enclave SRB. Processing from that point is generally 100% zIIP eligible. The higher the proportion of selected to excluded messages, then, the greater will be the total CPU consumption, but the higher will be the zIIP eligibility ratio.

After conclusion of the test, WLM was queried for actual zIIP time vs. CP time within the enclave. The query reported 99% zIIP offload of eligible CPU:

```
VSA1539I Enclave name:      3C0000000E
VSA1540I Started:          08/16/2023 15:08:33
VSA1541I Service class:    SYSSTC      Report class:
VSA0011I
VSA1542I Period:           1
VSA1543I Performance Index: 0
VSA1544I Importance:       0
VSA0011I
VSA1545I zIIP eligible time: 0.37
VSA1546I zIIP time:        0.37
VSA1547I CP time:          0.00
VSA1548I Offload:          99%
```

Glossary

zIIP-eligible CPU	CPU time measured internally while running on an enclave SRB.
zIIP-eligible percent	zIIP-eligible CPU time as a percentage of total CPU consumed.
zIIP offload percentage	zIIP offload time as a percentage of total zIIP-eligible CPU time.
zIIP offload time	CPU time measured by WLM while running on a zIIP processor.



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