

# z/OS 3.2 IBM Education Assistant

Solution Name: Workload Classification Pricing (WCP)

Solution Element(s): Supervisor, Memory (RSM), Binder, Contents Supervisor, Data Gatherer, zCX Virtualization

July 2025



# Agenda

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- Trademarks
- Objectives
- Overview
- Usage & Invocation
- Interactions & Dependencies
- Upgrade & Coexistence Considerations
- Installation & Configuration
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# Trademarks

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- See URL <http://www.ibm.com/legal/copytrade.shtml> for a list of trademarks.
- Additional Trademarks:
  - None

# Objectives

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- Understand what workload classification pricing
- Learn about workload classification pricing
  - how to enable and disable data collection
  - The data collection process
  - SMF records
  - SCRT reporting
- Find out where to learn more about workload classification pricing

# Overview – Business Challenge

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- When it comes to running new work on z/OS, several challenges exist
  - High costs regardless of the value of the workload
    - Both software and hardware pricing
    - New workloads can be CPU intensive ( like AI Inferencing)
    - Large upfront hardware costs to try out new workloads
  - Lack of price flexibility
    - zIIP enablement is one of the few options
    - Lack of granularity in pricing
  - Planning and operational complexity

# Overview

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- Who (Audience)
  - IBM z installations with z/OS and z17
- What (Solution)
  - Leveraging
    - Workload marking and measurement in z17 and
    - Tailored Fit Pricing for Hardware on zIIPs
  - Clients can receive reduced zIIP costs on targeted workloads
    - AI Inferencing
    - zCX for Linux containers
    - zCX for OpenShift
- Wow (Benefit / Value, Need Addressed)
  - With limited configuration changes
  - Low upfront cost
  - No long-term commitment

# Usage & Invocation – Enablement

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- **Enablement**
  - Requirements
    - IEASYSxx WORKINST parameter
    - `DISPLAY IPLINFO,WORKINST,STATE` command
- Classification
- Collection
- Reporting

# Usage & Invocation – Enablement (requirements)

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- Workload instrumentation infrastructure enabled by default on z17 with z/OS 3.2 or exploitation PTFs on 3.1 or 2.5
- Work with your IBM sales representative to take advantage of TFP zIIPs with workload classification pricing
  - TFP software not required
  - TFP hardware for CPs not required



# Usage & Invocation – IEASYSxx

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- New IEASYSxx parameter WORKINST
- WORKINST – Identifies the processing state for workload instrumentation.
  - WORKINST=SYSTEM – default, use the system's capabilities
    - YES – when supported
    - NO – when not supported
    - Invoke command `DISPLAY IPLINFO,WORKINST,STATE` to determine if workload instrumentation data is being collected
  - WORKINST=YES – can be specified when the system supports workload instrumentation. Workload instrumentation data is collected
  - WORKINST=NO – The system does not collect workload instrumentation data regardless of the machines capabilities
- IEA983I issued at IPL if WORKINST=YES specified but not available
  - IEA983I WORKINST=YES is not available
  - Response: Reply to IEA341A **without** specifying WORKINST=YES

# Usage & Invocation – DISPLAY IPLINFO

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- Use the `DISPLAY IPLINFO,WORKINST,STATE` command to display the state of workload instrumentation according to the:
  - `WORKINST` system parameter
  - System's ability to use workload instrumentation
- `IEE262I WORKINST State: state`
- `state` -- The current state of workload instrumentation data collection is based on the system's capability and the `WORKINST` system parameter. `state` is one of the following values:
  - `Active` – The system supports workload instrumentation data collection, and the system is collecting workload instrumentation data.
  - `Inactive` – The system supports workload instrumentation data collection, and the system is not collecting workload instrumentation data.
  - `Not Available` – The system does not support workload instrumentation data collection, and the system is not collecting workload instrumentation data.

# Usage & Invocation – Classification

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- Enablement
- **Classification**
  - Classification details for awareness
  - Installation Actions
- Collection
- Reporting

# Usage & Invocation – Classification details

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- The new z17 technology allows executables to be marked with a workload class both on disk and in memory
- Classification of executables is a business decision like zIIP enablement
  - IBM and vendor products are allowed to be classified on a use case basis
  - Clients are not expected to classify executables
- Binder information
  - A new binder parameter allows IBM and ISVs to mark a program object with a workload class designation via a UUID (universally unique ID)
  - This information becomes part of the program object
  - Load modules not supported
  - Program objects with UUIDs are fully compatible
- Contents Supervisor information
  - Program fetch (load) processing can recognize if the program object has a workload class
  - Will obtain storage such that the memory metadata contains the workload class
    - The metadata is available for sampling when associated instructions execute
  - SMF record type 1156 produced when workload classified module loaded
- Memory information
  - Subpools 242, 243 and 246 available for use by contents supervisor program fetch processing only
  - Metadata associated with the memory contains the workload class designation
- zCX Virtualization Information
  - Instructions executed as a guest of z/OS are counted without executable marking, no additional classification needed

# Usage & Invocation – SMF type 1156

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- Mapped by CSVS1156 (IFASMFR 1156)
- Record type 1156 (X'484') — Module Fetch
  - contains information collected on every fetch event when a module has a workload classification
  - Each record contains a header and a data section
  - Each data section has a base and a path or non-path section
- SMF1156T1 (type 1 header)
- SMF1156T1D (Data) –
  - Workload classification
  - UUID
  - JobnameS, JobnameI, JobID
- SMF1156T1DMVD (Data for non-path) – module name, volume, DSN
- SMF1156T1DP (Data for path) – path token, path name

# Usage & Invocation – SMF type 1156 (1)

- Mapped by CSVS1156 (IFASMFR 1156)
- Record type 1156 (X'484') — Module Fetch
  - Standard SMF header type 1 mapped by IFASMFH

Offsets	Name	Len	Format	Description
64 40	SMF1156T1_Triplet0	8	Binary	Data triplet
64 40	SMF1156T1_DOffset	4	Binary	Offset from start of SMF1156T1 to SMF1156T1D section, mapped by SMF1156T1D.
68 44	SMF1156T1_DLength	2	Binary	Length of data section
70 46	SMF1156T1_DNum	2	Binary	Number of data sections. Will always be 1.

# Usage & Invocation – SMF type 1156 (2)

- Data section for subtype 1
- Located by adding to the address of the SMF record the value in SMF1156T1\_DOffset

Offset (Dec)	Offset (Hex)	Name	Len	Format	Description
0	0	SMF1156T1D	48	Binary	Data section
0	0	SMF1156T1D_Version	1	Binary	Version of data section
1	1	SMF1156T1D_Flags	1	Binary	Flag byte. Bit Meaning when set: 0-1 result – exactly one of these two bits will be on 0 Success – module fetch was successful 1 NotSuccess – module fetch was not successful, there was a mismatch related to workload classification. For example, the UUID is not valid 2-3 by – exactly one of these two bits will be on 2 ByVoldSN -- This was a fetch from a data set, so the SMF1156T1DMVD section is present 3 ByPath -- This was a fetch by path from the file system, so the SMF1156T1DP section is 4 Pathname_Truncated -- Applies only when ByPath, this indicates that the path name was longer than the maximum indicated by equate SMF1156T1DP_PathName_MaxLen. The last MaxLen characters are placed in the SMF record.
2	2	*	1		Reserved
3	3	SMF1156T1D_WC	1	Binary	When not 0, workload classification
4	4	SMF1156T1D_MVD_or_P_Offset	2	Binary	Offset from start of record to the SMF1156T1DMVD or SMF1156T1DP section, whichever applies
6	6	SMF1156T1D_NotSuccess_Reason	2	Binary	IBM-only -- reason, when NotSuccess is on.
8	8	SMF1156T1D_JobnameS	8	EBCDIC	Jobname for the START/MOUNT/LOGON that is associated with this address space. If the first byte is x'00', then none is associated. Source: ASSBJBNS
16	10	SMF1156T1D_JobnameI	8	EBCDIC	Jobname for the initiated program that is associated with this address space. If the first byte is x'00', then none is associated. Source: ASSBJBNI
24	18	SMF1156T1D_JobID	8	EBCDIC	The Job ID if available, otherwise hex zeros
32	20	SMF1156T1D_UUID	16	Binary	When not all 0's, the UUID associated with the module. When all 0's, the UUID is not available
48	30	SMF1156T1D_Base_End	0		End of base

# Usage & Invocation – SMF type 1156 (3)

- The Mod/Vol/DSN section is present when SMF1156T1D\_ByVolDSN is on
- Located by adding SMF1156T1D\_MVD\_or\_P\_Offset to the address of the start of the SMF record

Offset (Dec)	Offset (Hex)	Name	Len	Format	Description
0	0	SMF1156T1DMVD	58	Binary	Mod/Vol/DSN section
0	0	SMF1156T1DMVD_Modname	8	EBCDIC	The module name
8	8	SMF1156T1DMVD_VolDsn	50	EBCDIC	Volume and DS name
8	8	SMF1156T1DMVD_Vol	6	EBCDIC	When the first character is not x'00', the volume from which the module was fetched, padded on the right with EBCDIC blanks if the volume name is shorter than 6 characters
14	A	SMF1156T1DMVD_Dsname	44	EBCDIC	When the first character is not x'00', the data set from which the module was fetched, padded on the right with EBCDIC blanks if the data set name is shorter than 44 characters
58	3A	*	0	-	End of SMF1156T1DMVD
0	0	SMF1156T1DMVD	58	Binary	Mod/Vol/DSN section
0	0	SMF1156T1DMVD_Modname	8	EBCDIC	The module name
8	8	SMF1156T1DMVD_VolDsn	50	EBCDIC	Volume and DS name
8	8	SMF1156T1DMVD_Vol	6	EBCDIC	When the first character is not x'00', the volume from which the module was fetched, padded on the right with EBCDIC blanks if the volume name is shorter than 6 characters
14	A	SMF1156T1DMVD_Dsname	44	EBCDIC	When the first character is not x'00', the data set from which the module was fetched, padded on the right with EBCDIC blanks if the data set name is shorter than 44 characters
58	3A	*	0	-	End of SMF1156T1DMVD



# Usage & Invocation – SMF type 1156 (4)

- The Path section is present when SMF1156T1D\_ByPath is on
- Located by adding SMF1156T1D\_MVD\_or\_P\_Offset to the address of the start of the SMF record

Offset (Dec)	Offset (Hex)	Name	Len	Format	Description
0	0	SMF1156T1DP	*	Binary	Path section
0	0	SMF1156T1DP_Header	16	Binary	Path header
0	0	SMF1156T1DP_PathToken	12	Binary	A path uniqueness token provided by USS
12	C	SMF1156T1DP_LenPath	2	Binary	The length of the path name in the next field (PathName). Only the number of characters indicated by this length field are set in the PathName field.
14	E	SMF1156T1DP_TotalLenPath	2	Binary	When the "truncated" bit is off, this matches LenPath. Otherwise, it is the length known to the system (but it still remains the case that no more than 64 characters are provided within the SMF record)
16	10	SMF1156T1DP_PathName	*	EBCDIC	The path name (which could be a relative path name) provided as input to identify the file. If that path name's length <= 64, the whole path name is in the SMF record. If that path name's length > 64, the last 64 characters are used and bit SMF1156T1D_Pathname_Truncated is set
58	3A	*	0	-	End of SMF1156T1DP
		Constant	Value		
		SMF1156T1DP_PathName_MaxLen	64		

# Usage & Invocation – Installation actions

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- Install vendor and IBM provided classified program objects
  - Look for keyword PRICINGINFR/K

# Usage & Invocation – Collection

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- Enablement
- Classification
- **Collection**
  - IBM z17 hardware and millicode enable instruction sampling containing the workload class from memory metadata
  - Supervisor processing obtains and counts samples by workload class
  - zCX processing counts samples for guest operating systems
- Reporting

# Usage & Invocation – Reporting

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- Enablement
- Classification
- Collection
- **Reporting**
  - Data Gatherer reads counts and reports data in SMF type 70 subtype 1 records
  - SCRT report contains data on workload classification usage percentages

# Usage & Invocation – SMF type 70 subtype 1

- **Workload Classification data section**
- Contains counts of processed samples per processor type and per workload class.  
There is one Workload Classification data section per processor type.
  - Individual header extension for subtype 1:

Offsets	Name	Len	Format	Description
100 64	SMF70WCS	4	binary	Offset to Workload Classification data section from RDW.
104 68	SMF70WCL	2	binary	Length of Workload Classification data section.
106 6A	SMF70WCN	2	binary	Number of Workload Classification data sections.

# Usage & Invocation – SMF type 70 subtype 1 (1)

- OA66812 Support for Workload Classification Pricing sets SRL to x'94'
- RMF Product Section

Offsets	Name	Len	Format	Description
51 33	SMF70SRL	1	binary	<p>SMF record level change number. This field enables processing of SMF record level changes in an existing release.</p> <p>SMF type 70 record levels for the current z/OS release:</p> <p>Subtypes   Record level</p> <p>1                      X'94' (APAR OA66812)</p> <p>..</p>

# Usage & Invocation – SMF type 70 subtype 1 (2)

- **Workload Classification Data Section**
- One for each processor type.
- SMF70WC\_Samples (SMF70WC\_Sample\_Array) exists for the number of workload classes defined in SMF70WC\_Classes\_Num and each sample is indexed by workload class 0-n

Offsets	Name	Len	Format	Description
0 0	SMF70WC_Header_Len	2	binary	Length of self-describing header section of the Workload Classification Data Section
2 2	SMF70WC_Classes_Num	2	binary	Number of workload classes in the samples array
4 4	SMF70WC_CPU_Type	1	binary	CPU type corresponding to the definition in SMF70TYP
5 5	*	3		Reserved
8 8	*			End of self-describing header section
8 8	SMF70WC_Samples	8	binary	Samples attributed to the indexed workload class

# Usage & Invocation – Reporting SCRT

- SCRT output contains a new report on workload classification usage
- Report contains for output for both CPs and zIIPs
  - Overall processor usage
  - Percentage of usage attributed to the workload classes
- For the initial TFP for zIIP offering, provide this report to resource link
- Title: ===== WORKLOAD CLASSIFICATION SUPPLEMENT =====

Type-Serial	Interval Start	Interval End	Perm Model	Temp Model	Active Model	CP Dispatch Time	CP Pct Util	CL0 CP	CL1 CP	CL2 CP	CL3 CP	CL4 CP	CL5 CP	CL6 CP	CL7 CP	zIIP Dispatch Time	zIIP Pct Util	CL0 zIIP	CL1 zIIP	CL2 zIIP	CL3 zIIP	CL4 zIIP	CL5 zIIP	CL6 zIIP	CL7 zIIP
8561-77777	03 Jan 2022 - 00:00	03 Jan 2022 - 00:15	8561-725	8561-725	8561-725	7265.77	32.29%	0.42%	0.78%	1.57%	3.14%	6.27%	12.55%	25.09%	50.18%	1804.37	20.05%	0.14%	1.36%	13.64%	0.27%	2.73%	27.29%	0.00%	54.57%
8561-77777	03 Jan 2022 - 00:15	03 Jan 2022 - 00:30	8561-725	8561-725	8561-725	7247.66	32.21%	0.42%	0.78%	1.57%	3.14%	6.27%	12.55%	25.09%	50.18%	2741.79	30.46%	0.14%	1.36%	13.64%	0.27%	2.73%	27.29%	0.00%	54.57%
8561-77777	03 Jan 2022 - 00:30	03 Jan 2022 - 00:45	8561-725	8561-725	8561-725	7761.89	34.50%	0.42%	0.78%	1.57%	3.14%	6.27%	12.55%	25.09%	50.18%	2441.39	27.13%	0.14%	1.36%	13.64%	0.27%	2.73%	27.29%	0.00%	54.57%
8561-77777	03 Jan 2022 - 00:45	03 Jan 2022 - 01:00	8561-725	8561-725	8561-725	4625.74	20.56%	0.43%	0.78%	1.57%	3.14%	6.27%	12.54%	25.09%	50.18%	1387.04	15.41%	0.14%	1.36%	13.64%	0.27%	2.73%	27.29%	0.00%	54.57%
8561-77777	03 Jan 2022 - 01:00	03 Jan 2022 - 01:15	8561-725	8561-725	8561-725	5462.83	24.28%	0.43%	0.78%	1.57%	3.14%	6.27%	12.54%	25.09%	50.18%	5698.23	63.31%	0.14%	1.36%	13.64%	0.27%	2.73%	27.29%	0.00%	54.57%
8561-77777	03 Jan 2022 - 01:15	03 Jan 2022 - 01:30	8561-725	8561-725	8561-725	4427.82	19.68%	0.43%	0.78%	1.57%	3.14%	6.27%	12.54%	25.09%	50.18%	6000.1	66.67%	0.14%	1.36%	13.64%	0.27%	2.73%	27.29%	0.00%	54.57%
8561-77777	03 Jan 2022 - 01:30	03 Jan 2022 - 01:45	8561-725	8561-725	8561-725	4875.61	21.67%	0.42%	0.78%	1.57%	3.14%	6.27%	12.54%	25.09%	50.18%	2187.06	24.30%	0.14%	1.36%	13.64%	0.27%	2.73%	27.29%	0.00%	54.57%
8561-77777	03 Jan 2022 - 01:45	03 Jan 2022 - 02:00	8561-725	8561-725	8561-725	3937.59	17.50%	0.43%	0.78%	1.57%	3.14%	6.27%	12.54%	25.09%	50.18%	1563.44	17.37%	0.14%	1.36%	13.64%	0.27%	2.73%	27.29%	0.00%	54.57%
8561-77777	03 Jan 2022 - 02:00	03 Jan 2022 - 02:15	8561-725	8561-725	8561-725	6257.08	27.81%	0.42%	0.78%	1.57%	3.14%	6.27%	12.55%	25.09%	50.18%	1126.27	12.51%	0.14%	1.36%	13.64%	0.27%	2.73%	27.29%	0.00%	54.57%
8561-77777	03 Jan 2022 - 02:15	03 Jan 2022 - 02:30	8561-725	8561-725	8561-725	4769.01	21.20%	0.43%	0.78%	1.57%	3.14%	6.27%	12.54%	25.09%	50.18%	737.51	8.19%	0.14%	1.36%	13.64%	0.27%	2.73%	27.29%	0.00%	54.57%



# Interactions & Dependencies

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- Software Dependencies
  - Exploitation PTFs for z17
- Hardware Dependencies
  - z17
- Exploiters
  - AI Inferencing – portions of executables that are zIIP enabled today
    - zADE, zAIO, zDNN
    - MLZ
    - Python AI toolkit
  - zCX
    - zCX containers, both Linux and OpenShift

# Upgrade & Coexistence Considerations

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- To exploit this solution, all systems in the Plex must be at the new z/OS level: No
- No Concerns
- Workload classification pricing will only be effective on supported IBM z Machines (z17)
- z17 Exploitation FIXCAT PTFs required on z/OS 2.5 and 3.1

# Installation & Configuration

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- Must install all exploitation PTFs for z17
- Incomplete setup might result in lack of data, no functional issues expected

# Summary

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- New capabilities in z17 and z/OS enable greater differentiation in pricing
- On z17 with TFP Hardware for zIIPs, reduced pricing for zIIPs is offered when executing work labeled as
  - AI Inferencing
  - zCX running virtualized Linux
- Data collection is enabled by default
- Aspects of the enhancement involve enablement, classification, collection, and reporting
- New data is available for workload class usage in SMF type 70 subtype 1 records and SCRT reports

# Appendix

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- Publications
  - z/OS MVS System Management Facilities (SMF), SA38-0667
  - z/OS MVS System Commands, (SA38-0666)
  - z/OS MVS Initialization and Tuning Reference, (SA23-1380)
  - z/OS MVS System Messages, Vol 6 (GOS-IEA), (SA38-0673)
  - z/OS MVS System Messages, Vol 7 (IEB-IEE), (SA38-0674)
  - SCRT: Using the Sub-Capacity Reporting Tool, (SC23-6845)