Introduction to
Batch Measurement Analysis

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Abstract and Reports Offer

☐ **Abstract**

- In a z/OS environment, batch is a fundamental workload, and of all batch processing nighttime / window job stream batch is the most important to firmly understand. That is, it is important to understand the job flows, the job and job step timings, and resource consumption of the jobs and job steps, and to develop an basic understanding of the job stream itself.

- During this session, Peter Enrico will introduce these concepts and associated measurements that he uses to firmly grasp and understand a batch job stream.

☐ **Report Offer**

- To help you get the most out of this presentation, please contact Peter Enrico to take advantage of his report offer. If you send Peter your own SMF data, Peter will generate an extensive set of reports directly related to this presentation topic.

- You can then use these reports to see how your data measures up to the topic of this presentation.

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Current 2011 Class Schedule

- WLM Performance and Re-evaluating of Goals
  - Instructor: Peter Enrico
  - September 12 – 16, 2011   Baltimore, Maryland, USA

- Essential z/OS Performance Tuning
  - Instructor: Peter Enrico and Tom Beretvas

- Parallel Sysplex and z/OS Performance Tuning
  - Instructor: Peter Enrico
  - September 19 – 23, 2011   Dallas, Texas, USA

- z/OS Capacity Planning and Performance Analysis
  - Instructor: Ray Wicks
  - August 15 – 17, 2011   Columbus, Ohio, USA

Presentation Overview

- This is (mostly) a 'back to basics' presentation
  - Sure... there are lots of z/OS facilities to help with batch performance
    - z/OS Storage Enhancements
    - WLM Service Policy Overrides
    - Intelligent Resource Director
    - WLM-managed Batch Initiators
    - Scheduling Environments
    - WLM Critical Controls

  - Sure... there are great scheduling packages
  - Sure... there are batch modernization techniques.

- This presentation takes us back to the fundamental measurements for evaluating batch
  - And provides some suggestions on how to look at batch workloads

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Overview of Standard Measurements
for Batch Workloads

Batch Workload Analysis Discovery Questions

- Background questions for analyzing batch
  - What is the workload?
  - What is the performance objective of the workload?
  - What type of address space is used by this workload?
  - What is the definition of the workload's transaction?
  - Why does this workload exist?
  - Who / what make up this workload?
  - When does the workload run?
  - Where does the workload run?
  - What are the performance challenges of the workload?

- Also when analyzing batch performance understand the difference between:
  - Analyzing the batch scheduling
  - Analyzing the actual execution of the jobs

- Airport Analogy:
  - Batch scheduling is similar to managing runway of an airport.
  - Batch execution is similar to the actual flying of the airplanes

Types of Batch

- Normal Production Jobs submitted by a Job Scheduler

- Critical Path Jobs submitted through a Job Scheduler

- Ad-hoc Jobs (possibly submitted by a Job Scheduler)

- Development Jobs

- Normal System Support Jobs

- High-Priority System Support Jobs

- Logs, Archival, Backup, and D/R Jobs (possibly submitted by a Job Scheduler or an appropriate Subsystem)

- Quick Utility Jobs

- Emergency or Hot Jobs

Some Batch Workload Considerations

- Jobs requiring setup include
  - Batch jobs that require input from media that is not normally online to a system

  - Batch jobs that require offline media to generate output have setup requirements that involve operator intervention

- May Include:
  - Manual tape mounts (reels or cartridges)

  - ATL/Silo Mounts- normally very quick unless media is not in the ATL

  - Virtual Tape Servers (VTS)- normally very quick unless data is not staged in the disc Cache

  - Direct SYSOUT Writers (not used much)- not normally quick if forms or print trains need to be inserted, or device is particularly slow

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Approach to Analyzing Batch Execution Measurements

- The focus of this presentation is understanding batch execution measurements

- Utilizing basic batch execution measurements
  - Identification measurements
    - To help identify and qualify the batch workload of interest

  - Event Date and Time
    - To help understand the timeline of the jobs

  - Execution and Queuing measurements
    - To gain insight into how long the jobs ran
    - To gain insight into the state of the jobs before they executed

  - CPU, I/O, Storage resource consumption measurements
    - To gain insight into the resource consumption components of the batch workload

Approaches to Analyzing Batch

☐ Depending on the type of batch workload being analyzed, there are a variety of ways of analyzing batch

- **Vertical Analysis**
  - ☐ Analyze the job stream and flow from beginning to end
  - ☐ Example: Looking at the timeline of a particular job or job stream

- **Horizontal Analysis**
  - ☐ If a particular job or job stream run on a regular basis, then compare multiple days against each other to gain insights to regular patterns, outliers, etc.
  - ☐ Example: Comparing how a particular job or job stream ran from one day to another

- **Drill Down Analysis**
  - ☐ Starting at a high level (such as CEC CPU Busy %) drill down to LPAR, workload, and then specific job and file
  - ☐ Example: Analysis CPU%, then WLM CPU% for Service Class, The CPU consumed by Job and Job step

- **Cross Relationship Analysis**
  - ☐ Many times batch jobs utilize work managers, application servers, utilities, database managers, etc. Understand the impact the performance of these entities have on batch (and visa versa).
  - ☐ Example: Looking at CPU dispatching priorities, cross CPU accounting, etc.

Quick Review of Standard SMF Records Most Commonly Used During a Batch Analysis

SMF 72.3 Summary

- ☐ SMF 72.3
  - ■ Contain z/OS WLM Workload Activity measurements for analysis of the following:
    - ☐ Workload and Workload manager definition information
    - ☐ Goals versus actual data
      - ■ Velocity, response time, discretionary, system goals
    - ☐ Throughput data (such as MPL, enclaves, ended transactions, etc.)
    - ☐ Response time and response time distribution data
    - ☐ Resource consumption data (CPU, I/O, Storage)
    - ☐ Execution state data

- ☐ Since batch workloads are typically placed into their own service classes and report classes, these measurements can be used to gain a high level understanding of batch workload performance

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SMF 30 Summary

- ☐ SMF 30
  - ■ ... measurements available at address space, so for batch workloads we can use SMF 30 measurements to gain insight into measurements at the batch address space level
  - ■ ... since enclaves do not generate SMF 30 records, records include zIIP and zAAP time for enclaves created by the address space

- ☐ SMF 30.2 (and SMF 30.3) for interval recording (to match up to SMF 72.3)
  - ■ Useful when need to understand I/O during specific periods of time
  - ■ Also useful for looking at measurements over a period of time

- ☐ SMF 30.4 for step end for understanding resources consumed by job step
  - ■ Useful for understanding I/O measurement on job step basis
    - ☐ By Step / Program
    - ☐ By DD
  - ■ If summed, then useful for looking at I/O measurement for the entire job

- ☐ SMF 30.5 for job end for understanding resources consumed by completed jobs
  - ■ Useful for understanding I/O measurement for a completed job

Identification Measurements

Understanding dimensional data is the foundation of producing any performance reports. Without dimensional data, most other measurements are worthless.

SMF 30 Job Identification/Grouping Information

❑ SMF 30 job / address space identification information

Name	Description
SMF30JBN	Job or session name.
SMF30PGM	Program name (taken from PGM= parameter on EXEC card).
SMF30STM	Step name (taken from name on EXEC card).
SMF30UIF	User-defined identification field
SMF30JNM	JES job identifier.
SMF30STN	Step number (first step = 1, etc.).
SMF30CLS	Job class (blank for TSO/E session or started tasks)
SMF30SSN	Substep number. This field is set to zero for non-z/OS UNIX System Services steps. When the z/OS UNIX System Services exec function is requested, a new substep is begun and this value is incremented.
SMF30EXN	Program name. For a z/OS UNIX program, this contains the UNIX program that was run or the 8 character name of an MVS program that was run.
SMF30ASI	Address Space identifier

SMF 30 Measurements to Correlate to SMF 72.3

☐ Can also use SMF 30 WLM information to correlate measurements to the SMF 72.3 records

Name	Description
SMF30TRS	Number of system resources manager (SRM) transactions.
SMF30WLM	Workload name.
SMF30SCN	Service class name.
SMF30GRN	Resource group name.
SMF30RCN	Report class name.
SMF30ETC	Independent enclave transaction count.

☐ Use Service Class name and Report Class name to correlate measurements to the SMF 72.3 records

Great Exercise (for Any Workload)

☐ Using the SMF 30 and SMF 72.3 measurements, it is easy to create a cross reference spreadsheet to gain insights into the following:

■ Mapping of which address spaces were active on which system and how many intervals of time

■ Mapping of what programs ran
  ☐ z/OS programs
  ☐ Unix System Services programs
  ☐ Etc.

■ Mapping of address spaces to WLM Service Classes and Report Classes
  ☐ Helps with review and verification of WLM classification rules

☐ See following slides for some examples.

Create a SMF30.2 to WLM Mapping

Example:
Investigate Address Spaces in PS_BATHI

Example:
Investigate Address Spaces in STCDEF

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Example:
Investigate Address Space Names Ending in MSTR

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Understanding OMVS Programs

- A common problem faced by WLM administrators is the proper classification of UNIX System Services transactions via the OMVS rules
  - This is not just a batch problem, but a general problem

- Helpful SMF 30 dimensional fields include:

Name	Description
SMF30JBN	Job or session name.
SMF30PGM	Program name (taken from PGM= parameter on EXEC card).
SMF30STM	Step name (taken from name on EXEC card).
SMF30UIF	User-defined identification field
SMF30JNM	JES job identifier.
SMF30STN	Step number (first step = 1, etc.).
SMF30CLS	Job class (blank for TSO/E session or started tasks)
SMF30SSN	Substep number. This field is set to zero for non-z/OS UNIX System Services steps. When the z/OS UNIX System Services exec function is requested, a new substep is begun and this value is incremented.
SMF30EXN	Program name. For a z/OS UNIX program, this contains the UNIX program that was run or the 8 character name of an MVS program that was run.
SMF30ASI	Address Space identifier

Using SMF 30 USS Fields

Init_Select_Date	Init_Select_Time	Job_Name	Job_Num	SYSTEM	Step_Name	Step_Num	Substep	Pgm_Name	OMVS_Pgm
8/1/2011	18:03:28	M0377431	8932	SYSG	RMS@20	1	0	U11RMS	
8/1/2011	18:03:28	M0377431	8932	SYSG	STEPA1	2	0	IKJEFT01	
8/1/2011	18:03:28	M0377431	8932	SYSG	STEPA2	3	0	BPXBATCH	
8/1/2011	18:15:04	M0377431	8932	SYSG	*OMVSEX	4	1	BPXPRECP	login
8/1/2011	18:15:04	M0377431	8932	SYSG	*OMVSEX	4	2	BPXPRECP	SH
8/1/2011	18:15:04	M0377431	8932	SYSG	STEPA3	4	0	BPXBATCH	
8/1/2011	18:15:04	M0377431	8932	SYSG	STEPA4	5	0	IKJEFT01	
8/1/2011	18:15:04	M0377431	8932	SYSG	STEPA5	6	0	IEBGENER	
8/1/2011	18:15:04	M0377431	8932	SYSG	STEPA6	7	0	ABENDING	

Init_Select_Date	Init_Select_Time	Job_Name	Job_Num	SYSTEM	Step_Name	Step_Num	Substep	Pgm_Name	OMVS_Pgm
8/1/2011	18:02:44	M0377441	7374	SYSG	STEP1	1	0	BPXPRFC	env
8/1/2011	18:02:44	M0377441	7374	SYSG	STEP1	1	0	BPXPRFC	tty
8/1/2011	18:02:45	M0377441	7374	SYSG	*OMVSEX	1	1	BPXPRECP	SH
8/1/2011	18:02:45	M0377441	7374	SYSG	STEP1	1	0	BPXPRFC	psae
8/1/2011	18:02:46	M0377441	7374	SYSG	*OMVSEX	1	1	BPXPRECP	SH
8/1/2011	18:02:46	M0377441	7374	SYSG	STEP1	1	0	BPXPRFC	psae

Using SMF 30 USS Fields With WLM Classes

Init Select Date	Init Select Time	Job Name	Job Number	SC_Name	RC_Name	Step_Name	Step Number	Substep	Pgm_Name	OMVS Pgm	Execution Time
8/1/2011	18:02:44	M0377441	8898	BATCHMD	JESFIP	RMS@20	1	0	U11RMS		0.14
8/1/2011	18:02:44	M0377441	8898	BATCHMD	JESFIP	STEPA1	2	0	IKJEFT01		0.11
8/1/2011	18:02:44	M0377441	8898	BATCHMD	JESFIP	STEPA2	3	0	BPXBATCH		28.53
8/1/2011	18:02:45	M0377441	7374	BATCHHI	OMVSFIP	*OMVSEX	1	1	BPXPRECP	SH	0.08
8/1/2011	18:02:45	M0377441	7374	BATCHHI	OMVSFIP	STEP1	1	0	BPXPRFC	psae	0.11
8/1/2011	18:02:45	M0377441	7534	BATCHHI	OMVSFIP	*OMVSEX	1	1	BPXPRECP	psae	28.32
8/1/2011	18:02:45	M0377441	7534	BATCHHI	OMVSFIP	STEP1	1	0	BPXPRFC	nohup	0.03
8/1/2011	18:02:45	M0377441	7541	BATCHHI	OMVSFIP	STEP1	1	0	BPXPRFC	ps	0.04
8/1/2011	18:02:46	M0377441	7374	BATCHHI	OMVSFIP	*OMVSEX	1	1	BPXPRECP	SH	0.07
8/1/2011	18:02:46	M0377441	7374	BATCHHI	OMVSFIP	STEP1	1	0	BPXPRFC	psae	0.1
8/1/2011	18:02:46	M0377441	7541	BATCHHI	OMVSFIP	STEP1	1	0	BPXPRFC	ps	0.04
8/1/2011	18:03:13	M0377441	7534	BATCHHI	OMVSFIP	STEP1	1	0	BPXPRFC	SH	0.01
8/1/2011	18:03:13	M0377441	7534	BATCHHI	OMVSFIP	STEP1	1	0	BPXPRFC	tty	0.01
8/1/2011	18:03:13	M0377441	7576	BATCHHI	OMVSFIP	STEP1	1	0	BPXPRFC	fold	0.01
8/1/2011	18:03:13	M0377441	8898	BATCHMD	JESFIP	*OMVSEX	4	1	BPXPRECP	login	0.01
8/1/2011	18:03:13	M0377441	8898	BATCHMD	JESFIP	*OMVSEX	4	2	BPXPRECP	SH	0.06
8/1/2011	18:03:13	M0377441	8898	BATCHMD	JESFIP	STEPA3	4	0	BPXBATCH		0.03
8/1/2011	18:03:13	M0377441	8898	BATCHMD	JESFIP	STEPA4	5	0	IKJEFT01		0.04
8/1/2011	18:03:13	M0377441	8898	BATCHMD	JESFIP	STEPA5	6	0	IEBGENER		0.03
8/1/2011	18:03:13	M0377441	8898	BATCHMD	JESFIP	STEPA6	7	0	ABENDING		0

Event Date and Timestamp

Event date and timestamp values are dimensional data that help to construct timelines of when things ran, and the sequence of what ran.

SMF 30
Event Date and Timestamp Measurements Boiled Down

☐ When processed and boiled down by your SMF data processing programs, the SMF 30 measurements provide the following date and time (seconds) values

- Along with identification measurements, these date and time measurements can be used to help deconstruct
  - ☐ A job's timeline
  - ☐ A job step timeline

☐ Examples of *some* of the Event Date and Timestamp measurements include:

Name	Description
SMF30TME	Time record was cut
SMF30DTE	Date record was cut
SMF30SIT	Time since midnight, in hundredths of a second, that the initiator selected this step or job.
SMF30STD	Date that the initiator selected this step
SMF30RST	Time since midnight that the reader recognized the JOB card (for this job).
SMF30RSD	Date that the reader recognized the JOB card (for this job)
SMF30RET	Time since midnight that the reader recognized the end of the job or started task (reader stop time).
SMF30RED	Date that the reader recognized the end of the batch job or started task (reader stop date)
SMF30ISS	Time and date that the interval started for subtype 2 and 3 records
SMF30IET	Time and date that the interval ended for subtype 2 and 3

Example: Looking at Event Date and Timestamps

☐ Step 1 Date and Time for all jobs in a particular job stream

PSIA Batch - Start Time of Jobs and Sub

Init_Select_Date	Init_Select_Time	Job_Name	Job_Number	SYSTEM	R
2011-08-01	09:21:27	M0377499	07922	SYSG	
	09:27:36	M0377499	08006	SYSG	
	09:30:32	M0377499	08057	SYSG	
	09:37:54	M0377499	08262	SYSG	
	09:51:56	M03774SP	08547	SYSG	
	09:55:06	M0377499	08588	SYSG	
	10:12:40	M03774SP	09075	SYSG	
	18:02:44	M0377441	07374	SYSG	
			07576	SYSG	
			08898	SYSG	
	18:02:45	M0377441	07374	SYSG	
			07534	SYSG	
			07541	SYSG	
	18:02:46	M0377441	07374	SYSG	
			07541	SYSG	
	18:03:13	M0377441	07534	SYSG	
			07576	SYSG	
	18:03:28	M0377431	07374	SYSG	
			07534	SYSG	
			07576	SYSG	
			08932	SYSG	
	18:03:29	M0377431	07374	SYSG	
	18:03:30	M0377431	07519	SYSG	

Example: Looking at Event Date and Time

☐ Step 1 Date and Time for all jobs in a particular job stream
   ■ But also shows sub-steps for OMVS

PSIA Batch - Start Time of Jobs and Substeps with Queue Times; Sum of Various

Init_Select_Date	Init_Select_Time	Job_Name	Job_Number	SYSTEM	Step_Name	Step_Number	Substep	Pgm_Name	OMVS_Pgm
2011-08-01	09:21:27	M0377499	07922	SYSG	RMS@20	1	0	U11RMS	
	09:27:36	M0377499	08006	SYSG	RMS@20	1	0	U11RMS	
	09:30:32	M0377499	08057	SYSG	RMS@20	1	0	U11RMS	
	09:37:54	M0377499	08262	SYSG	RMS@20	1	0	U11RMS	
	09:51:56	M03774SP	08547	SYSG	RMS@20	1	0	U11RMS	
	09:55:06	M0377499	08588	SYSG	RMS@20	1	0	U11RMS	
	10:12:40	M03774SP	09075	SYSG	RMS@20	1	0	U11RMS	
	18:02:44	M0377441	07374	SYSG	STEP1	1	0	BPXPRFC	env
									tty
			07576	SYSG	*OMVSEX	1	1	BPXPRECP	SH
					STEP1	1	0	BPXPRFC	login
			08898	SYSG	RMS@20	1	0	U11RMS	
	18:02:45	M0377441	07374	SYSG	*OMVSEX	1	1	BPXPRECP	SH
					STEP1	1	0	BPXPRFC	psae
			07534	SYSG	*OMVSEX	1	1	BPXPRECP	psae
					STEP1	1	0	BPXPRFC	nohup
			07541	SYSG	STEP1	1	0	BPXPRFC	ps
	18:02:46	M0377441	07374	SYSG	*OMVSEX	1	1	BPXPRECP	SH
					STEP1	1	0	BPXPRFC	psae
			07541	SYSG	STEP1	1	0	BPXPRFC	ps
	18:03:13	M0377441	07534	SYSG	STEP1	1	0	BPXPRFC	SH
									tty

Queuing Measurements

To understand what might have delayed the job.

SMF 30
Delay Time Measurements

❑   Certain delay times are also recorded in the SMF 30 measurement

Name	Description
SMF30JQT	Job preparation time. This is the elapsed time before the job was first queued for execution.
SMF30RQT	Time following job preparation when the job was ineligible for execution due to either the job's eligible systems being inactive or the job's scheduling environment not being available
SMF30HQT	Time following job preparation when the job was ineligible for execution for reasons not included in SMF30RQT
SMF30SQT	Time the job was eligible for execution.

❑   Common names for these four measurements are as follows:

Derived Measurement	Description
Conversion Wait	Job preparation seconds
RS Affinity Wait	Seconds job was ineligible due to waiting for a resource affinity
Ineligible Wait	Seconds job was ineligible but not due to resource affinity
Initiator Wait	Seconds job was eligible for execution

SMF 30
Event Date and Time Measurements Boiled Down

❑   When processed and boiled down by your SMF data processing programs, the SMF 30 measurements provide the following date and time values
- Along with identification measurements, these date and time measurements can be used to help construct
  - ❑ A job step timeline
  - ❑ A job timeline

Derived Measurement	Description
Initiator Select Time	Time when job started
Initiator Select Date	Date when job started
Reader Start Time	Time on reader
Reader Start Date	Date on reader
Reader End Time	Time reader ended
Reader End Date	Date reader ended
Reader Seconds	Reader seconds
Execution Time	Execution seconds (program start to program end)
Step Execution Time	Step execution seconds (step start to program end)
Conversion Wait	Job preparation seconds
RS Affinity Wait	Seconds job was ineligible due to waiting for a resource affinity
Ineligible Wait	Seconds job was ineligible but not due to resource affinity
Initiator Wait	Seconds job was eligible for execution

Example: Looking at Queue Times For Jobs
(Vertical Analysis)

□ Queue time values for Step 1 of jobs for job stream

.... PSIA Batch - Start Time of Jobs and Substeps; Sum of Various Data Fields; Primary Report

Init_Select_Date	Init_Select_Time	Job_Name	Job_Number	SYSTEM	Reader_Seconds	Initiator_Wait	Conversion_Wait	RS_Affinity_Wai
2011-08-01	09:21:27	M0377499	07922	SYSG	0.040	0.864	0.000	6.29
	09:27:36	M0377499	08006	SYSG	0.030	0.444	0.000	0.00
	09:30:32	M0377499	08057	SYSG	0.960	0.554	0.000	0.00
	09:37:54	M0377499	08262	SYSG	0.040	0.862	0.000	0.00
	09:51:56	M03774SP	08547	SYSG	0.050	0.231	0.000	15.72
	09:55:06	M0377499	08588	SYSG	1.010	0.871	0.000	0.00
	10:12:40	M03774SP	09075	SYSG	0.970	0.505	0.000	1.04
	18:02:44	M0377441	07374	SYSG	0.000	0.002	0.000	0.00
			07576	SYSG	0.000	0.002	0.000	0.00
			08898	SYSG	0.930	0.174	0.000	9.43
	18:02:45	M0377441	07374	SYSG	0.000	0.002	0.000	0.00
			07534	SYSG	0.000	0.002	0.000	0.00
			07541	SYSG	0.000	0.001	0.000	0.00
	18:02:46	M0377441	07374	SYSG	0.000	0.002	0.000	0.00
			07541	SYSG	0.000	0.001	0.000	0.00
	18:03:13	M0377441	07534	SYSG	0.000	0.002	0.000	0.00
			07576	SYSG	0.000	0.001	0.000	0.00
	18:03:28	M0377431	07374	SYSG	0.000	0.001	0.000	0.00
			07534	SYSG	0.000	0.002	0.000	0.00
			07576	SYSG	0.000	0.002	0.000	0.00
			08932	SYSG	0.070	0.981	1.049	10.48
	18:03:29	M0377431	07374	SYSG	0.000	0.001	0.000	0.00
	18:03:30	M0377431	07519	SYSG	0.000	0.001	0.000	0.00

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Example: Execution Time for Job Step
(Vertical Analysis)

□ Execution Time for all Jobs (By job name and job number)

PSIA Batch - Job I/O Count for Job Steps (See HTML or CSV); Sum of Various Data Fields; M0377415

Window	Init_Select_Date	Init_Select_Time	Job_Prefix	Job_Number	SYSTEM	Step_Number	Step_Name	Substep	Pgm_Name	OMVS_Pgm	Step_Execution_Time
2011-06-29	2011-06-29	20:59:07	M03	08607	SYSG	1	RMS@20	0	U11RMS	null	0.30
						2	STEPA	0	BPXBATCH	null	600.09
				08900	SYSG	1	STEP1	0	BPXPRFC	login	0.01
							*OMVSEX	1	BPXPRECP	SH	600.05
				09633	SYSG	1	STEP1	0	BPXPRFC	tty	0.01
		20:59:08	M03	09633	SYSG	1	STEP1	0	BPXPRFC	sleep	600.04
		21:09:08	M03	08607	SYSG	3	DB2DSNUT	0	IKJEFT01	null	40.95
		21:09:49	M03	08607	SYSG	4	STEPB2	0	ABENDING	null	0.01
						5	DB2DSNUT	0	IKJEFT01	null	3.09
		21:09:52	M03	08607	SYSG	6	STEPC00	0	ABENDING	null	0.00
						7	STEPC1	0	IKJEFT01	null	0.05
				06725	SYSG	1	STEP1	0	BPXPRFC	login	0.01
				08900	SYSG	1	STEP1	0	BPXPRFC	tty	0.06
									env	0.03
				09633	SYSG	1	STEP1	0	BPXPRFC	nohup	0.04
		21:09:55	M03	08900	SYSG	1	STEP1	0	BPXPRFC	psae	0.17
							*OMVSEX	1	BPXPRECP	SH	0.11
				07628	SYSG	1	STEP1	0	BPXPRFC	ps	0.05
		21:09:56	M03	08900	SYSG	1	STEP1	0	BPXPRFC	psae	0.12
							*OMVSEX	1	BPXPRECP	SH	0.07
		21:09:57	M03	07628	SYSG	1	STEP1	0	BPXPRFC	ps	0.03
	2011-06-30	01:53:44	M03	08607	SYSG	9	STEPC3	0	BPXBATCH	null	0.05
							*OMVSEX	1	BPXPRECP	login	0.00
								2	BPXPRECP	SH	0.11
				09633	SYSG	1	STEP1	0	BPXPRFC	tty	0.01
									SH	0.08
				06725	SYSG	1	STEP1	0	BPXPRFC	fold	0.09

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Example: Horizontal Analysis
Entire Window – Execution Time Year to Date

PSIA Batch – Batch Window Compare – Summed Job Elapsed Seconds for Date
Primary Report

Sum of Step_Execution_Time

Legend: Step_Execution_Time

Window

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Example: Horizontal Analysis
Entire Window – Top Jobs Execution Time Year to Date

**PSIA Batch – Batch Window Compare – Summed Job CPU Seconds for Date
Broken Down by Top Jobs**
Primary Report

Sum of CPU_Time

Window

Legend: Other ■ M0377415 ■ M8441234 ■ M0377407 ■ M0377412 ■ M0377436 ■ M8439802 ■ M0377418 ■ Q0377490
■ M03774SP ■ M0377448

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Example: Execution Time for Particular Job (Vertical Analysis)

☐ M0377407

MMM PSIA Batch - Job Step Execution Time for Job Steps; Sum of Step_Execution_Time; M0377407

Window	Init Select Date	Init Select Time	Job Prefix	Job Number	SYSTEM	Step Number	Step Name	Substep	Pgm Name	OMVS Pgm	Step Execution Time
011-01-03	2011-01-03	21:57:31	M03	05129	SYSG	1	RMS@20	0	U11RMS	null	0.1
						2	STEPA1	0	IKJEFT01	null	0.0
						3	STEPA2	0	BPXBATCH	null	334.9
				03370	SYSG	1	STEP1	0	BPXPRFC	login	0.7
		21:57:32	M03	03370	SYSG	1	*OMVSEX	1	BPXPRECP	SH	334.0
				08513	SYSG	1	STEP1	0	BPXPRFC	tty	0.0
										env	0.0
				08524	SYSG	1	STEP1	0	BPXPRFC	nohup	0.0
							*OMVSEX	1	BPXPRECP	psae	333.9
		21:57:33	M03	08513	SYSG	1	STEP1	0	BPXPRFC	psae	0.1
							*OMVSEX	1	BPXPRECP	SH	0.0
				02761	SYSG	1	STEP1	0	BPXPRFC	ps	0.0
		21:57:35	M03	08513	SYSG	1	STEP1	0	BPXPRFC	psae	0.1
							*OMVSEX	1	BPXPRECP	SH	0.0
				02761	SYSG	1	STEP1	0	BPXPRFC	ps	0.0
		22:03:06	M03	05129	SYSG	4	STEPA3	0	BPXBATCH	null	0.0
							*OMVSEX	1	BPXPRECP	login	0.8
		22:03:07	M03	05129	SYSG	4	*OMVSEX	2	BPXPRECP	SH	0.0
				08524	SYSG	1	STEP1	0	BPXPRFC	tty	0.0
										SH	0.0
				03370	SYSG	1	STEP1	0	BPXPRFC	fold	0.0
				05129	SYSG	5	STEPA4	0	IKJEFT01	null	0.0
						6	STEPA5	0	IEBGENER	null	0.0
						7	STEPA6	0	ABENDING	null	0.0
						8	STEPB	0	IKJEFT01	null	1,145.8

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Example: Execution Time for Particular Job (Horizontal Analysis)

☐ M0377407 – Examining start time and execution time of step 1

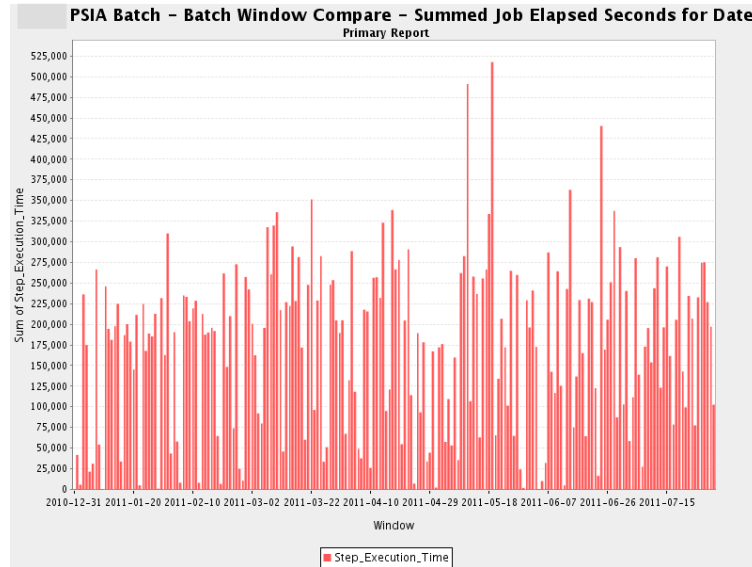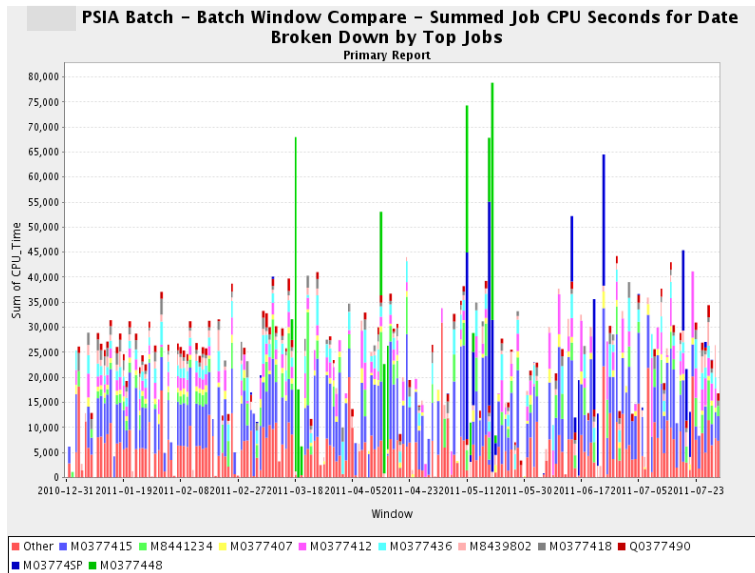| Window	Init_Select_Date	Init_Select_Time	Job_Number	SYSTEM	Step_Number	Step_Name	Pgm_Name	Step_Execution_Time
6/1/2011	6/2/2011	6:43:35	4460	SYSG	1	RMS@20	U11RMS	0.14
6/1/2011	6/2/2011	12:26:11	1376	SYSG	1	RMS@20	U11RMS	0.22
6/7/2011	6/8/2011	0:47:54	2334	SYSG	1	RMS@20	U11RMS	0.14
6/10/2011	6/11/2011	0:42:24	4328	SYSG	1	RMS@20	U11RMS	0.1
6/13/2011	6/13/2011	23:02:15	85	SYSG	1	RMS@20	U11RMS	0.12
6/14/2011	6/15/2011	1:04:14	9331	SYSG	1	RMS@20	U11RMS	0.23
6/17/2011	6/18/2011	0:21:21	609	SYSG	1	RMS@20	U11RMS	0.23
6/20/2011	6/21/2011	0:45:14	8426	SYSG	1	RMS@20	U11RMS	0.1
6/24/2011	6/25/2011	7:45:52	2003	SYSG	1	RMS@20	U11RMS	0.09
6/27/2011	6/27/2011	22:10:36	3738	SYSG	1	RMS@20	U11RMS	0.11
6/28/2011	6/29/2011	0:11:51	3422	SYSG	1	RMS@20	U11RMS	0.2
6/30/2011	6/30/2011	23:08:51	9469	SYSG	1	RMS@20	U11RMS	0.11
7/1/2011	7/2/2011	14:08:04	6229	SYSG	1	RMS@20	U11RMS	0.11
7/4/2011	7/5/2011	2:44:55	977	SYSG	1	RMS@20	U11RMS	0.12
7/8/2011	7/8/2011	23:55:12	210	SYSG	1	RMS@20	U11RMS	0.12
7/11/2011	7/11/2011	22:16:40	162	SYSG	1	RMS@20	U11RMS	0.15
7/12/2011	7/13/2011	0:37:57	343	SYSG	1	RMS@20	U11RMS	0.14
7/12/2011	7/13/2011	1:37:56	2214	SYSG	1	RMS@20	U11RMS	0.13
7/14/2011	7/14/2011	23:08:53	7258	SYSG	1	RMS@20	U11RMS	0.12
7/15/2011	7/16/2011	15:56:01	9569	SYSG	1	RMS@20	U11RMS	0.21
7/18/2011	7/18/2011	20:15:11	8160	SYSG	1	RMS@20	U11RMS	0.29
7/19/2011	7/19/2011	20:24:21	6766	SYSG	1	RMS@20	U11RMS	0.13
7/19/2011	7/19/2011	21:31:10	8065	SYSG	1	RMS@20	U11RMS	0.18
7/22/2011	7/22/2011	23:22:42	5285	SYSG	1	RMS@20	U11RMS	0.15
7/25/2011	7/25/2011	20:34:22	2890	SYSG	1	RMS@20	U11RMS	0.36
7/26/2011	7/26/2011	21:26:13	1239	SYSG	1	RMS@20	U11RMS	0.19
7/27/2011	7/27/2011	20:53:13	9717	SYSG	1	RMS@20	U11RMS	0.15
7/28/2011	7/28/2011	21:07:25	9759	SYSG	1	RMS@20	U11RMS	0.21
7/29/2011	7/29/2011	20:48:15	8786	SYSG	1	RMS@20	U11RMS	0.26

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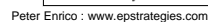
Example: Horizontal Analysis
MO377407 – Job Execution Time Year to Date

PSIA Batch – Batch Window Compare – Summed Job Execution Seconds for Job Name
MO377407

Example: Horizontal Analysis
MO377407 – Step Execution Time Year to Date

PSIA Batch – Daily Compare – Summed Job Execution Seconds for Job Step
MO377407

Resource Consumption Measurements
CPU

Common Product CPU Measurement Questions

- ☐ **At an address space and transaction level**
  - ■ How much GP, zIIP, and zAAP processor capacity was consumed for each work unit
    - ☐ Total CPU time
    - ☐ Independent Enclave CPU time
    - ☐ Dependent Enclave CPU time
    - ☐ zIIP and zAAP CPU time

  - ■ Also need to know to what address space in the flow of a transaction are the CPU times accumulated

  - ■ Usual Dispatching priority of the address space

- ☐ **It is also interesting to determine**
  - ■ If sum CPU times for all address spaces equates to total CPU time for all service class periods
  - ■ If sum of CPU time for all service classes equates to total CPU time used by the LPAR
  - ■ If total CPU time used by all LPARs equates to total CPU time consumed on the machine

SMF 30 General Purpose CPU Time Values

❑ SMF 30 Processor Accounting Section of SMF 30 contains key CPU time values of interest

Name	Description
SMF30PTY	Address space dispatching priority.
SMF30CPT	All standard CPU step time. Includes enclave time, preemptable class SRB time, client SRB time. Also includes time consumed by zAAP or zIIP eligible work running on a standard processor.
SMF30CPS	CPU time under non-preemptible SRBs
SMF30IIP	Amount of CPU time used to process I/O interrupts.
SMF30RCT	Amount of CPU time used by the region control task (RCT).
SMF30HPT	Amount of CPU time used for hiperspace transfers (HST).
SMF30ASR	Additional CPU time accumulated by the preemptable SRBs and client SRBs for this job. This value is also included in the value in SMF30CPT.
SMF30ENC	CPU time used by the enclaves created by this address space. This value is also included in the value in SMF30CPT.
SMF30DET	Dependent enclave CPU time. This value is also contained in SMF30CPT.
SMF30ICU	Initiator CPU time under the task control block (TCB), in hundredths of a second. This field is set at step termination. SMF30ICU = SMF30ICU_STEP_INIT (for this step) + SMF30ICU_STEP_TERM (from the previous step)

New Fields for CPU Time

❑ New CPU time values
- ■ Replace the older SMF30ICU field

- ■ Previously SMF30ICU was the CPU time for a step termination of previous step and step initiation of this step

- ■ New fields add more granularity to this older measurement

Name	Description
SMF30ICU_Step_Term	CPU TCB time spent by the Initiator during job step termination processing. This field is the step termination portion of SMF30ICU that is reported in the next step end record.
SMF30ICU_Step_Init	CPU TCB time spent by the Initiator during job step initialization processing. This field is the step initialization portion of SMF30ICU for this step end record.
SMF30ISB_Step_Term	CPU SRB time spent by the Initiator during job step termination processing. This field is the step termination portion of SMF30ISB that is reported in the next step end record.
SMF30ISB_Step_Init	CPU SRB time spent by the Initiator during job step initialization processing. This field is the step initialization portion of SMF30ISB for this step end record.

SMF 30 zAAP CPU Time Values

☐ SMF 30 Processor Accounting Section of SMF 30 contains key IFA CPU time values of interest

| Name	Description
SMF30_TIME_ON_IFA	CPU time spent on IFA. Includes enclave time
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 standard CP. Includes enclave time
SMF30_ENCLAVE_TIME_IFA_ON_CP	IFA Enclave time spent on a standard CP.
SMF30_DEP_ENCLAVE_TIME_IFA_ON_CP	FA Dependent enclave time spent on a standard CP

Example Transaction Flow

☐ Note that in this particular example, all transactions enter through a single controller region but get placed on two different application environment queues
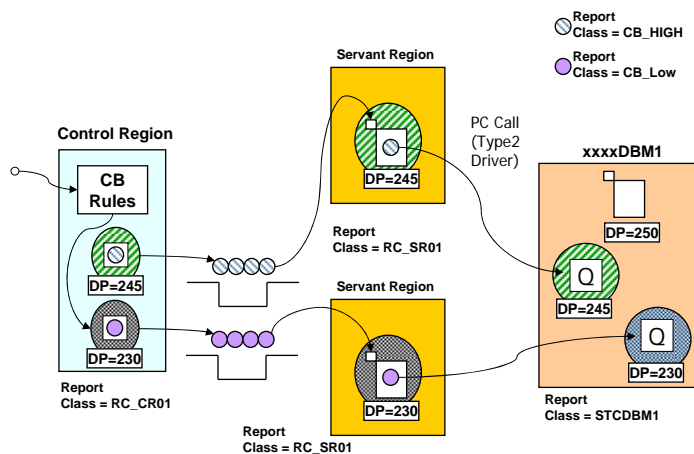
zAAP SMF 30 Measurements

- ☐ Work running on zAAPs may be running in an enclave SRB or address space task

- ☐ Examples:
  - Batch address space, TSO user, OMVS forked process may be running Java
    - ☐ zAAP time will be charge back to these address spaces
    - ☐ Would include Java code, garbage collection, heap processing, and JIT processing

  - WebSphere Application Server environment
    - ☐ Transactions run in enclaves created by the Controller Region but run in the Servant regions
      - Transaction CPU time is thus charged to the Controller Region's SMF 30 record

    - ☐ Garbage collection, Heap processing, and JITing are address space functions
      - CPU time for these would be charged to the address space SMF 30 record (such as the Servant Region)
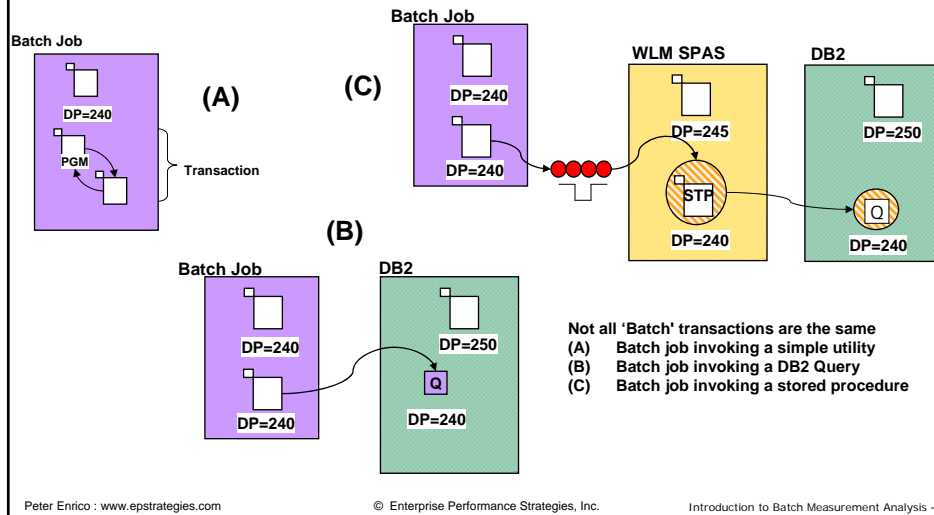
SMF 30 zIIP CPU Time Values

- ☐ SMF 30 Processor Accounting Section of SMF 30 contains key zIIP CPU time values of interest

| Name	Description
SMF30_TIME_ON_zIIP	Time spent on zIIP in hundredths of a second (including enclave time).
SMF30_ENCLAVE_TIME_ON_zIIP	Enclave time spent on zIIP in hundredths of a second.
SMF30_DEPENC_TIME_ON_zIIP	Dependent enclave time spent on zIIP in hundredths of a second.
SMF30_TIME_zIIP_ON_CP	CPU time spent on CP in hundredths of a second (including enclave time).
SMF30_ENCLAVE_TIME_zIIP_ON_CP	zIIP enclave time spent on CP in hundredths of a second.
SMF30_DEPENC_TIME_zIIP_ON_CP	zIIP dependent enclave time spent on CP in hundredths of a second.
SMF30_ENCLAVE_TIME_zIIP_QUAL	Normalized enclave time spent on zIIP in hundredths of a second.
SMF30_DEPENC_TIME_zIIP_QUAL	Normalized dependent enclave time spent on zIIP in hundredths of a second.

Batch Transactions

□ The life of a Batch transaction is not always straight forward

Batch Job

DP=240

PGM

Transaction

(A)

(C)

Batch Job

DP=240

DP=240

WLM SPAS

DP=245

STP

DP=240

DB2

DP=250

Q

DP=240

(B)

Batch Job

DP=240

DP=240

DB2

DP=250

Q

DP=240

Not all 'Batch' transactions are the same
(A) Batch job invoking a simple utility
(B) Batch job invoking a DB2 Query
(C) Batch job invoking a stored procedure

Summary of Monitoring & Chargeback

□ Highlights of SMF Type 30 Records
- CPU time for non-preemptible SRBs is reported back to the home address space
  - □ Included in SMF30CPS

- CPU time and service for client SRBs are reported back to the address space on whose behalf they are running
  - □ Included in SMF30ASR (for client or preemptible SRBs)

- CPU time for enclaves TCBs and SRBs are reported back to the address space that created and owns the enclave
  - □ Included in SMF30ENC (for enclave TCBs and enclave SRBs)

- CPU time for standard TCBs is reported back to the home address space
  - □ Included in SMF30CPT
  - □ TCB time = SMF30CPT − ((SMF30ASR + SMF30ENC))

- Note: I/O service is attributed back to home address space

Example: Horizontal Analysis
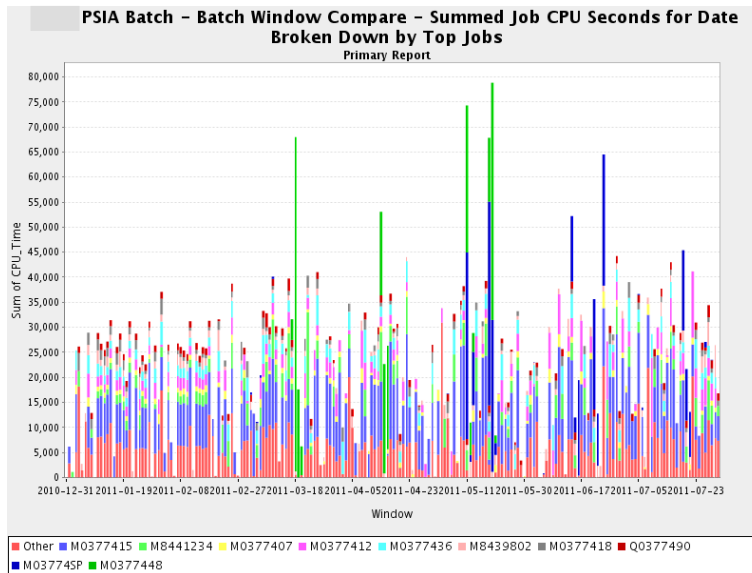Entire Window – Summed Jobs CPU Time Year to Date
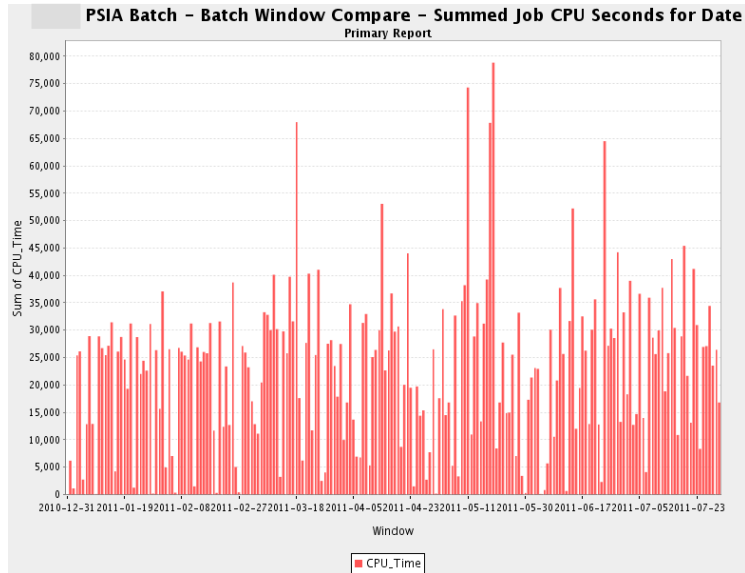
Example: Horizontal Analysis
Entire Window – Top Jobs CPU Time Year to Date

Example: CPU Time for Particular Job (Vertical Analysis)

☐ M0377407

Window	Init_Select_Date	Init_Select_Time	Job_Num	SYSTEM	Step	Step_Name	Substep	Pgm_Name	OMVS_Pgm	CPU_Time
6/30/2011	6/30/2011	23:08:51	9469	SYSG	1	RMS@20	0	U11RMS	null	0.02
6/30/2011	6/30/2011	23:08:51	9469	SYSG	2	STEPA1	0	IKJEFT01	null	0.02
6/30/2011	6/30/2011	23:08:51	9469	SYSG	3	STEPA2	0	BPXBATCH	null	0.02
6/30/2011	6/30/2011	23:08:51	9239	SYSG	1	STEP1	0	BPXPRFC	login	0
6/30/2011	6/30/2011	23:08:51	9225	SYSG	1	STEP1	0	BPXPRFC	tty	0.01
6/30/2011	6/30/2011	23:08:51	9239	SYSG	1	*OMVSEX	1	BPXPRECP	SH	0.01
6/30/2011	6/30/2011	23:08:51	9225	SYSG	1	STEP1	0	BPXPRFC	env	0.01
6/30/2011	6/30/2011	23:08:51	4354	SYSG	1	STEP1	0	BPXPRFC	nohup	0.01
6/30/2011	6/30/2011	23:08:52	4354	SYSG	1	*OMVSEX	1	BPXPRECP	psae	325.41
6/30/2011	6/30/2011	23:08:52	9225	SYSG	1	STEP1	0	BPXPRFC	psae	0.04
6/30/2011	6/30/2011	23:08:52	9225	SYSG	1	*OMVSEX	1	BPXPRECP	SH	0.01
6/30/2011	6/30/2011	23:08:52	9240	SYSG	1	STEP1	0	BPXPRFC	ps	0.01
6/30/2011	6/30/2011	23:08:52	9225	SYSG	1	STEP1	0	BPXPRFC	psae	0.05
6/30/2011	6/30/2011	23:08:53	9225	SYSG	1	*OMVSEX	1	BPXPRECP	SH	0.01
6/30/2011	6/30/2011	23:08:53	9240	SYSG	1	STEP1	0	BPXPRFC	ps	0.01
6/30/2011	6/30/2011	23:30:24	9469	SYSG	4	STEPA3	0	BPXBATCH	null	0.01
6/30/2011	6/30/2011	23:30:25	9469	SYSG	4	*OMVSEX	1	BPXPRECP	login	0
6/30/2011	6/30/2011	23:30:25	9469	SYSG	4	*OMVSEX	2	BPXPRECP	SH	0.01
6/30/2011	6/30/2011	23:30:25	4354	SYSG	1	STEP1	0	BPXPRFC	tty	0
6/30/2011	6/30/2011	23:30:25	4354	SYSG	1	STEP1	0	BPXPRFC	SH	0
6/30/2011	6/30/2011	23:30:25	9239	SYSG	1	STEP1	0	BPXPRFC	fold	0
6/30/2011	6/30/2011	23:30:25	9469	SYSG	5	STEPA4	0	IKJEFT01	null	0.01
6/30/2011	6/30/2011	23:30:25	9469	SYSG	6	STEPA5	0	IEBGENER	null	0
6/30/2011	6/30/2011	23:30:25	9469	SYSG	7	STEPA6	0	ABENDING	null	0
6/30/2011	7/1/2011	0:09:20	9469	SYSG	9	STEPB2	0	ABENDING	null	0
6/30/2011	7/1/2011	0:09:20	9469	SYSG	10	STEPC	0	IKJEFT01	null	775.71
6/30/2011	7/1/2011	1:27:14	9469	SYSG	11	STEPC2	0	ABENDING	null	0
6/30/2011	7/1/2011	1:27:14	9469	SYSG	12	DB2DSNUT	0	IKJEFT01	null	0.17
6/30/2011	7/1/2011	1:27:17	9469	SYSG	13	STEPD2	0	ABENDING	null	0

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Example: Horizontal Analysis
M0377407 – Job CPU Time Year to Date
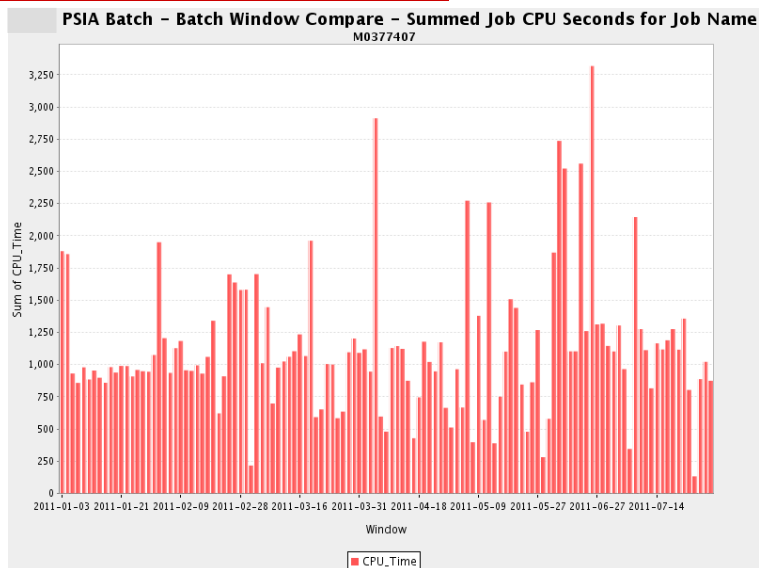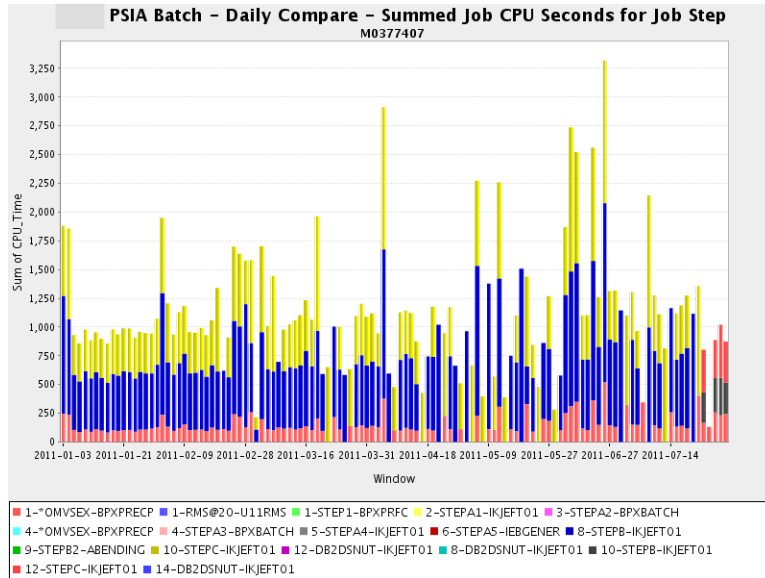

PSIA Batch – Batch Window Compare – Summed Job CPU Seconds for Job Name
M0377407

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Example: Horizontal Analysis
M0377407 – Step CPU Time Year to Date

PSIA Batch – Daily Compare – Summed Job CPU Seconds for Job Step
M0377407

Legend:
- 1-*OMVSEX-BPXPRECP
- 1-RMS@20-U11RMS
- 1-STEP1-BPXPRFC
- 2-STEPA1-IKJEFT01
- 3-STEPA2-BPXBATCH
- 4-*OMVSEX-BPXPRECP
- 4-STEPA3-BPXBATCH
- 5-STEPA4-IKJEFT01
- 6-STEPA5-IEBGENER
- 8-STEPB-IKJEFT01
- 9-STEPB2-ABENDING
- 10-STEPC-IKJEFT01
- 12-DB2DSNUT-IKJEFT01
- 8-DB2DSNUT-IKJEFT01
- 10-STEPB-IKJEFT01
- 12-STEPC-IKJEFT01
- 14-DB2DSNUT-IKJEFT01

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Example: Execution and CPU Time for Particular Job
(Horizontal Analysis)

☐ M0377407 – Examining Step Time and CPU time of *OMVSEX
   ■ USS program psae (PeopleSoft)

Init_Select_Date	Init_Select_Time	Job_Number	SYSTEM	Step	Step_Name	Substep	Pgm_Name	OMVS_Pgm	Step Time	CPU_Time
7/1/2011	0:09:20	9469	SYSG	10	STEPC	0	IKJEFT01	null	4673.61	775.7
7/2/2011	14:37:58	6229	SYSG	10	STEPC	0	IKJEFT01	null	1372.93	414.8
7/5/2011	3:10:40	977	SYSG	10	STEPC	0	IKJEFT01	null	1678.76	323.8
7/9/2011	0:56:21	210	SYSG	10	STEPC	0	IKJEFT01	null	3598.6	1147.6
7/11/2011	22:51:23	162	SYSG	10	STEPC	0	IKJEFT01	null	1872.22	480.9
7/13/2011	0:46:55	343	SYSG	10	STEPC	0	IKJEFT01	null	0	
7/13/2011	1:54:54	2214	SYSG	10	STEPC	0	IKJEFT01	null	1809.36	425.8
7/14/2011	23:54:46	7258	SYSG	10	STEPC	0	IKJEFT01	null	3491.12	815.3
7/16/2011	16:19:42	9569	SYSG	10	STEPC	0	IKJEFT01	null	1347.03	401.4
7/18/2011	21:08:24	8160	SYSG	10	STEPC	0	IKJEFT01	null	1873.84	418.
7/19/2011	20:49:28	6766	SYSG	10	STEPC	0	IKJEFT01	null	0	
7/19/2011	21:37:47	8065	SYSG	10	STEPC	0	IKJEFT01	null	1884.03	456.5
7/23/2011	0:27:20	5285	SYSG	10	STEPC	0	IKJEFT01	null	2680.86	952.
7/25/2011	21:05:24	2890	SYSG	12	STEPC	0	IKJEFT01	null	1773.2	368.7
7/26/2011	21:36:14	1239	SYSG	12	STEPC	0	IKJEFT01	null	0.26	0.
7/27/2011	21:27:34	9717	SYSG	12	STEPC	0	IKJEFT01	null	1380.6	330.6
7/28/2011	21:40:14	9759	SYSG	12	STEPC	0	IKJEFT01	null	2581.91	461.9
7/29/2011	21:29:32	8786	SYSG	12	STEPC	0	IKJEFT01	null	1608.44	356.5

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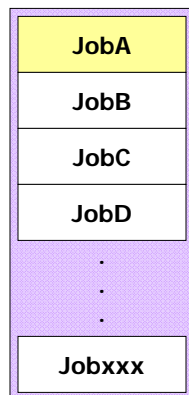
Resource Consumption Measurements
I/O

Ways of Looking at SMF 30 Data

Sum All SMF 30s Jobs for a Grouping (stream, service class, Prefix, time of day, etc)	**For Each Job Evaluate I/O Measurement To find big guys**	**For Each DD Associated with Job Evaluate Info**
JobA	**JobA**	**Each DD for JobA**

JobB	**Items of Interest**
	• **Sum of I/O time**
	   • CONN
	   • DISC
	   • PEND
	• **Number of I/Os**
	   • Start Subchannels
	• **Sum of I/O time**
	• **EXCP Counts**
	   • Total for DASD
	   • Total for TAPE
	   • Total for VIO
	   • Total for etc…
		Items of Interest
		• **DD Name**
		• **Device Class**
		   • DASD
		   • TAPE
		   • VIO
		   • CTC
		   • etc…
		• **Block counts**
		• **Device CONN**
		• **Block size**

JobC		
JobD		
. . .		
Jobxxx		

Looking at DASD I/O for Address Spaces

☐ After identifying the WLM workloads with the highest I/O intensity it is worth looking to see what address spaces are affected by poor I/O performance

☐ Main objective – understand the impact of I/O for jobs of interest

☐ Items of interest:
- DASD I/O performance response time components for each address space
- DASD I/O start sub-channel count and/or rates
- EXCP counts
  - ☐ Total EXCPs by dataset type (i.e. DASD, TAPE, VIO, etc)
  - ☐ For each of the DDs fo a job, the EXCPs and the device type

☐ What can be done with these values
- I/O component of elapsed time
- I/O intensity values for each address space
- DD information for each address space to understand breakdown of I/O by DD
- Interesting considerations for DB2

Jobs of I/O Interest

☐ After certain jobs have been identified and analyzed, then address I/O response time for these jobs

☐ Can be addressed by:
- Buffering techniques
- I/O elimination
- Caching
- Redistribution of data sets
- Device & path workload balancing
- Identify and treat contention by multiple concurrent tasks
- Improve tape technology
- Improve general I/O technology

☐ Be careful to note the following
- Select jobs that are run regularly
- Select jobs that are frequently
- Select jobs that are key to a job stream flow
- Select jobs that may be causing contention on particular files and delaying other jobs

SMF 30 DASD I/O Measurements

- ☐ Address space that created the enclaves gets the I/O measurements for the enclave

- ☐ SMF 30 I/O Activity Section of SMF 30 contains key values of interest

| Name	Description
SMF30AIC	DASD I/O connect time for address space plus dependent enclaves.
SMF30AID	DASD I/O disconnect time for address space plus dependent enclaves.
SMF30AIW	DASD I/O pending plus control unit queue time for address space plus dependent enclaves.
SMF30AIS	DASD I/O start subchannel count for address space plus dependent enclaves.
SMF30EIC	DASD I/O connect time for indpendent enclaves owned by the address space.
SMF30EID	DASD I/O disconnect time for independent enclaves owned by the address space.
SMF30EIW	DASD I/O pending plus control unit queue time for independent enclaves owned by the address space.
SMF30EIS	DASD I/O start subchannel count for independent enclaves.

SMF 30 DASD I/O Measurements Notes

- ☐ Address Space EXCP counts (SMF30TEX)

- ☐ Start Sub-channel count
    - ■ Divide by interval time to get (Start Sub-Channel Rate)

- ☐ I/O Processing Time = *Connect Time + Disconnect Time + Pend Time*

    - ■ Note: IOSQ Time is note included in the records

    - ■ Like Enclave CPU time, I/O processing time for independent enclaves will be recorded in the SMF 30 record of the address space that created the enclave
        - ☐ Example: Example, I/O measurements for WAS transactions are in Controller region

- ☐ Can calculate Address Space I/O intensity
    - ■ (Average I/O Processing Time) * (Start Sub-Channel Rate)

Example: Horizontal Analysis
Entire Window – Summed Jobs I/O Time Year to Date
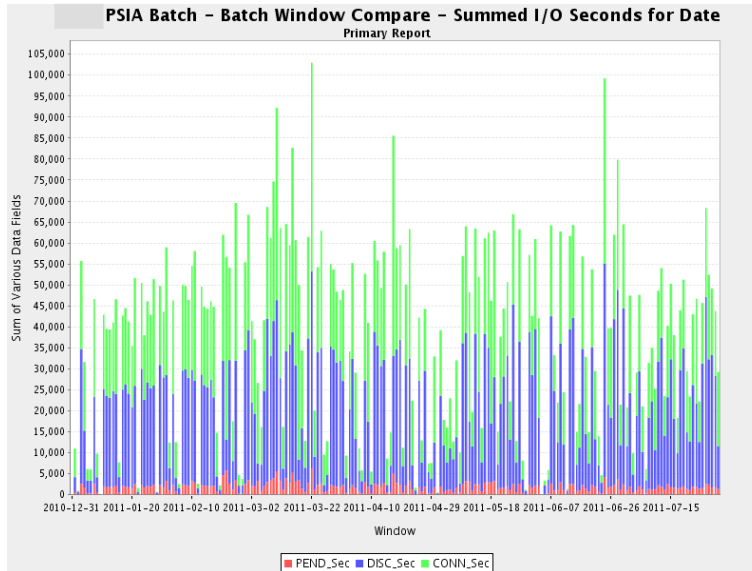
PSIA Batch – Batch Window Compare – Summed I/O Seconds for Date
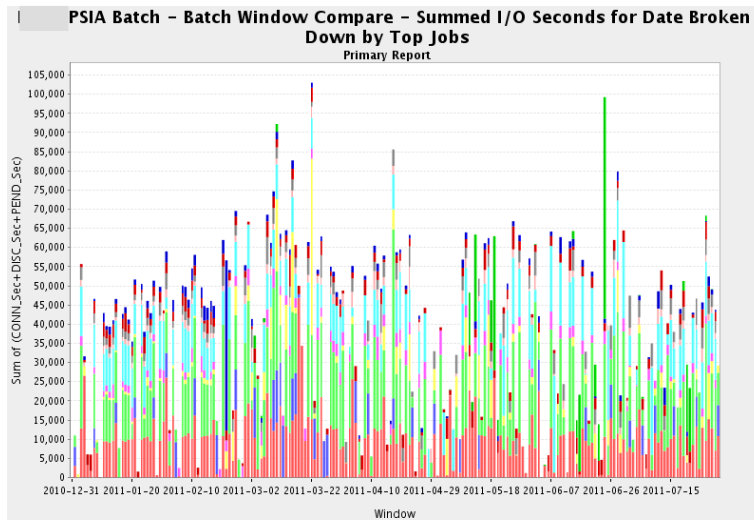Primary Report

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Example: Horizontal Analysis
Entire Window – Top Jobs I/O Time Year to Date

PSIA Batch – Batch Window Compare – Summed I/O Seconds for Date Broken Down by Top Jobs
Primary Report

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Example: I/O Time Time for Particular Job
(Vertical Analysis)

☐ M0377407 – Total I/O Time and count for a particular job step

Init Date	Init Time	Job_Num	SYSTEM	Step	Step_Name	Pgm_Name	CONN_Sec	DISC_Sec	PEND_Sec	Num_SSCH
7/1/2011	0:09:20	9469	SYSG	10	STEPC	IKJEFT01	370.41	1202.9	39.57	370412
7/2/2011	14:37:58	6229	SYSG	10	STEPC	IKJEFT01	234.1	628.06	18.86	234099
7/5/2011	3:10:40	977	SYSG	10	STEPC	IKJEFT01	266.93	793.68	26.23	266925
7/9/2011	0:56:21	210	SYSG	10	STEPC	IKJEFT01	414.62	1102.1	39.36	414622
7/11/2011	22:51:23	162	SYSG	10	STEPC	IKJEFT01	248.17	746.75	24.45	248173
7/13/2011	0:46:55	343	SYSG	10	STEPC	IKJEFT01	0	0	0	3
7/13/2011	1:54:54	2214	SYSG	10	STEPC	IKJEFT01	235.08	930.33	30	235078
7/14/2011	23:54:46	7258	SYSG	10	STEPC	IKJEFT01	355.79	1052.66	34.61	355794
7/16/2011	16:19:42	9569	SYSG	10	STEPC	IKJEFT01	230.65	616.46	21.74	230654
7/18/2011	21:08:24	8160	SYSG	10	STEPC	IKJEFT01	255.74	872.08	25.5	255741
7/19/2011	20:49:28	6766	SYSG	10	STEPC	IKJEFT01	0	0	0	3
7/19/2011	21:37:47	8065	SYSG	10	STEPC	IKJEFT01	253.45	897.85	25.56	253446
7/23/2011	0:27:20	5285	SYSG	10	STEPC	IKJEFT01	414.75	1097.81	37.02	414754
7/25/2011	21:05:24	2890	SYSG	12	STEPC	IKJEFT01	253.82	844.93	27.3	253824
7/26/2011	21:36:14	1239	SYSG	12	STEPC	IKJEFT01	0.09	0.07	0.01	94
7/27/2011	21:27:34	9717	SYSG	12	STEPC	IKJEFT01	270.35	800.23	25.18	270353
7/28/2011	21:40:14	9759	SYSG	12	STEPC	IKJEFT01	231.95	807.76	23.05	231952
7/29/2011	21:29:32	8786	SYSG	12	STEPC	IKJEFT01	223.3	912.07	25.2	223304

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Example: Horizontal Analysis
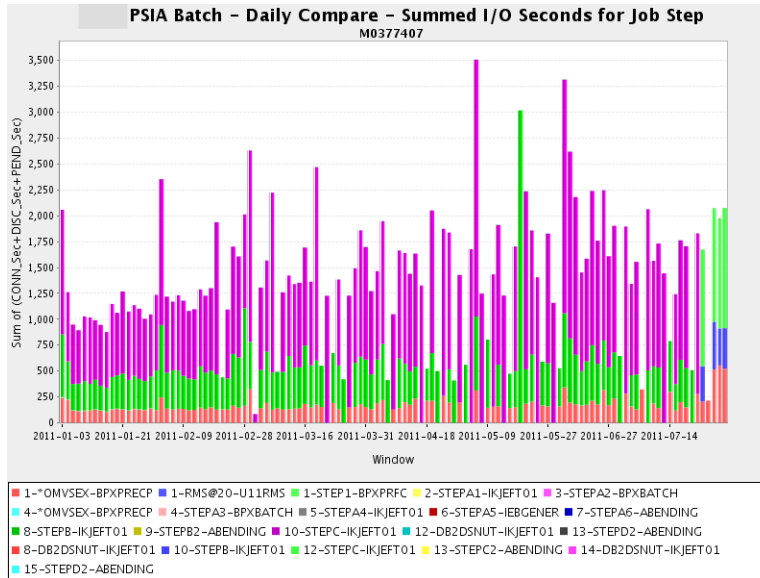## M0377407 – Job I/O Time Year to Date
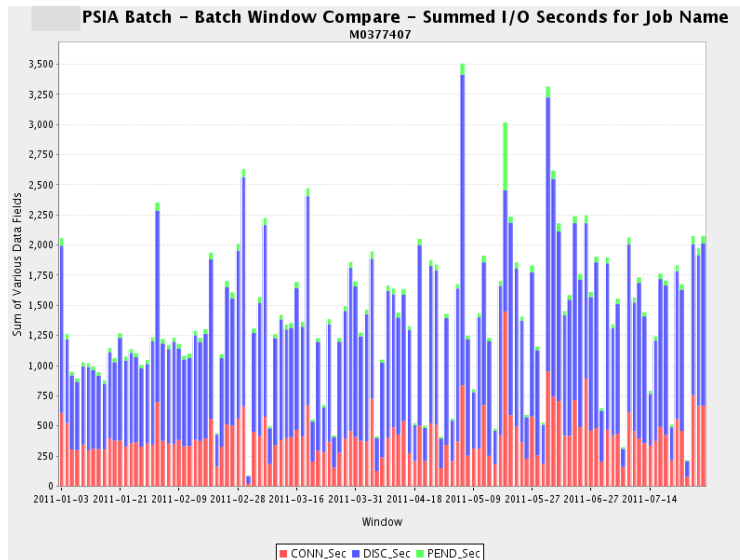
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Example: Horizontal Analysis
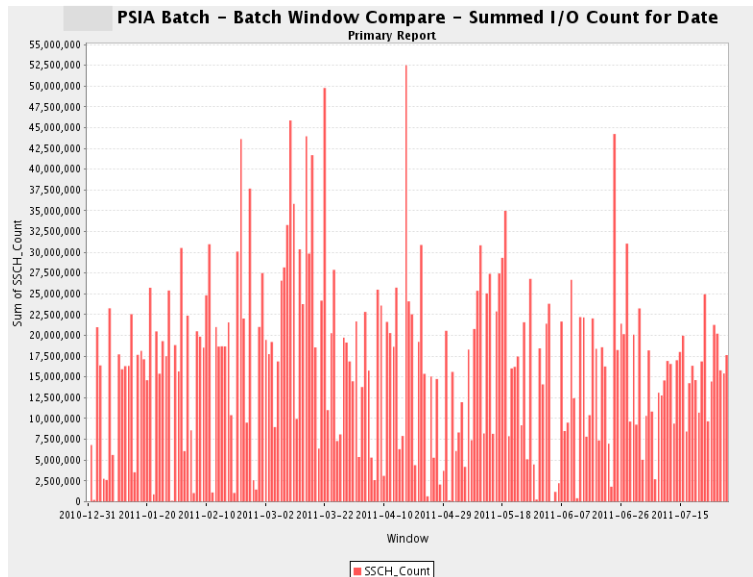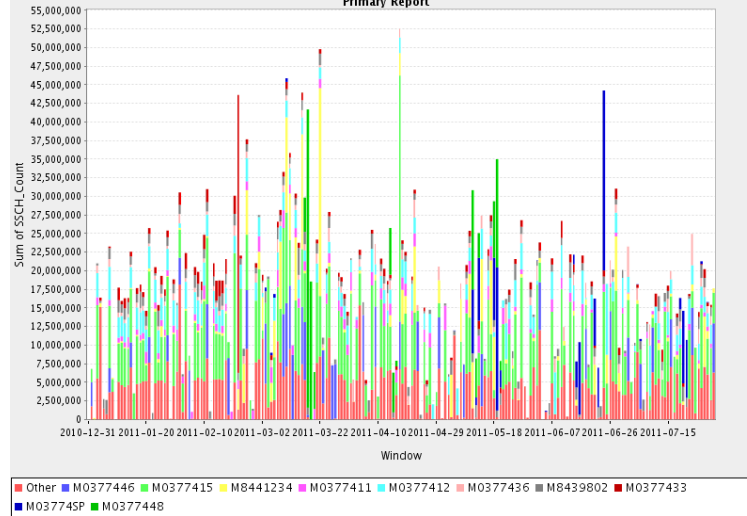M0377407 – Step I/O Time Year to Date

Example: Horizontal Analysis
Entire Window – Summed Jobs I/O Count Year to Date

Example: Horizontal Analysis
Entire Window – Top Jobs I/O Count Year to Date

PSIA Batch – Batch Window Compare – Summed I/O Count for Date Broken Down by Top Jobs
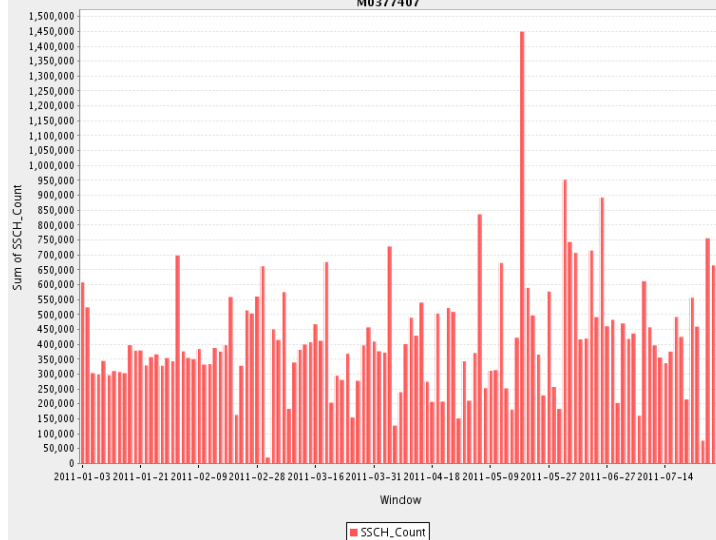Primary Report

Legend: Other, M0377446, M0377415, M8441234, M0377411, M0377412, M0377436, M8439802, M0377433, M03774SP, M0377448

Example: Horizontal Analysis
M0377407 – Job I/O Count Year to Date

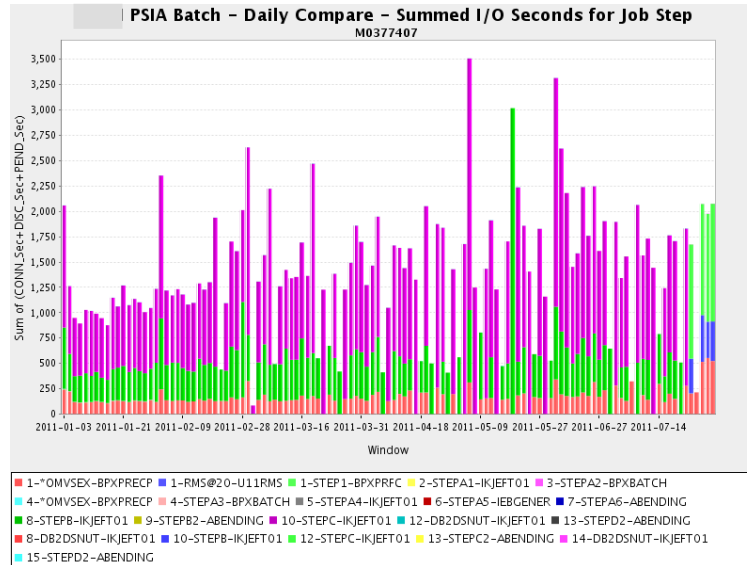**PSIA Batch – Batch Window Compare – Summed I/O Count for Job Name**
M0377407

Legend: SSCH_Count

Example: Horizontal Analysis
M0377407 – Step I/O Time Year to Date

PSIA Batch – Daily Compare – Summed I/O Seconds for Job Step
M0377407

Legend:
- 1-*OMVSEX-BPXPRECP
- 1-RMS@20-U11RMS
- 1-STEP1-BPXPRFC
- 2-STEPA1-IKJEFT01
- 3-STEPA2-BPXBATCH
- 4-*OMVSEX-BPXPRECP
- 4-STEPA3-BPXBATCH
- 5-STEPA4-IKJEFT01
- 6-STEPA5-IEBGENER
- 7-STEPA6-ABENDING
- 8-STEPB-IKJEFT01
- 9-STEPB2-ABENDING
- 10-STEPC-IKJEFT01
- 12-DB2DSNUT-IKJEFT01
- 13-STEPD2-ABENDING
- 8-DB2DSNUT-IKJEFT01
- 10-STEPB-IKJEFT01
- 12-STEPC-IKJEFT01
- 13-STEPC2-ABENDING
- 14-DB2DSNUT-IKJEFT01
- 15-STEPD2-ABENDING

Current 2011 Class Schedule

- ☐ WLM Performance and Re-evaluating of Goals
    - Instructor: Peter Enrico
    - September 12 – 16, 2011   Baltimore, Maryland, USA

- ☐ Essential z/OS Performance Tuning
    - Instructor: Peter Enrico and Tom Beretvas

- ☐ Parallel Sysplex and z/OS Performance Tuning
    - Instructor: Peter Enrico
    - September 19 – 23, 2011   Dallas, Texas, USA

- ☐ z/OS Capacity Planning and Performance Analysis
    - Instructor: Ray Wicks
    - August 15 – 17, 2011   Columbus, Ohio, USA

Presentation Summary

☐ **Report Offer**
- To help you get the most out of this presentation, please contact Peter Enrico to take advantage of his report offer. If you send Peter your own SMF data, Peter will generate an extensive set of reports directly related to this presentation topic.

- You can then use these reports to see how your data measures up to the topic of this presentation.

☐ This is (mostly) a 'back to basics' presentation
- Sure... there are lots of z/OS facilities to help with batch performance
  - ☐ z/OS Storage Enhancements
  - ☐ WLM Service Policy Overrides
  - ☐ Intelligent Resource Director
  - ☐ WLM-managed Batch Initiators
  - ☐ Scheduling Environments
  - ☐ WLM Critical Controls

- Sure... there are great scheduling packages
- Sure... there are batch modernization techniques.

☐ This presentation takes us back to the fundamental measurements for evaluating batch
- And provides some suggestions on how to look at batch workloads