

zIIP and zAAP Eligible Time Analysis w/Workload License Charge Impact

Based on Materials From:
**Al Sherkow's
Workload License Charges
Seminar©**

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Goals and Objectives

- Workload License Charges
- zIIP and zAAP Engines
 - Why Do We Have Specialty Engines?
- zIIP and zAAP Eligible Time
 - PROJECTCPU
- Analysis of Eligible Time
- Demand for Engines
- Impact On The 4 Hour Rolling Average
- Impact on Monthly Software Charges

ETVALUE: Value of Additional Specialty Engines

LCS: 04.02, LCS Extractor: 04.02, MXG: 25.02, Prepared: 12:20 Sunday, 09SEP2007

Currency is 'USD'

PricingPlex: 00011 2063-AG1 Machines: 2094#1111, 2094#1122									
LCS Unique Machine ID	Product ID	Product Name	Charge Per MSU	Current SCRT Billable MSUs (b)	Current SCRT Product Date/Time	Estimated S4HRA After Adding More zXXPs (c)	Date/Time With More zIIPs & zAAPs	Reduced MSUs With More zXXPs (b-c)	Estimated Value of More zXXPs
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2094#1111			226.00						\$2,852

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Workload License Charges

- How Did We Get Here?
 - Years Ago Machines Did Not Have Partitions and the Hardware was the Major Cost
 - The Software Cost was Related to the Hardware Capacity and Small
 - People Generally Agree It Is “Fair” to Pay for Software Based on What is Used
 - For Years the Hardware Size Better Matched What Sites Were Using
- Changes in the Data Center
 - LPARs
 - Different Partitions for Portions of the Workload
 - Tools Targeted to Specific Applications: CICS, DB2, Development
 - It Becomes Apparent That When Development Uses 30% of a Machine, and the Software Cost for Development Tools is 100% of a Machine That Something is Not Fair
 - Granularity of Hardware Increments is now 250+ MIPS
 - You Cannot Buy 10 MIPS of any zBox

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Workload License Charges

- Over the Last 20 Years the Correlation Between MIPS and Software Value Has Been Lost
- LPAR Allow for More Granular Capacities
- Software Must be More Granular Also
- So Now IBM Provides LPAR Based Pricing
 - Is LPAR Pricing Fair?
 - Perhaps Not, but it is Better than Charging for Software Based on the Whole “Machine”

Workload License Charges

- WLC is IBM's Attempt to:
 - Remove the Software Cost Obstacle that Holds Back Hardware Sales
 - Lower Total Cost of Ownership
- WLC Is Not Static – It is Evolving
- IBM Is Changing WLC at Least One Time Per Year
- WLC Started Simply in October 2000
- After Seven Years of Evolution WLC is Now Quite Complicated!

zSeries, z/OS and zWorkload zPricing

- January 2007 View of Alternative Pricing Metrics
- Includes z9BC and z9EC Hardware Announcement of April 2007 (ref S/W Pricing Ref Guide ZSO01378-USEN-13 {that's 'O' 'zero'})

Metric	Description	Sub-Capacity Allowed?	Aggregation Allowed?	Qualified Products											
				9672 & All Others	MP3K	z/800 Standalone	z/800 In a Qualified Sysplex	z/890 Standalone	z/890 In a Qualified Sysplex	z/900	z/990	z9.109 z9FC	z9BC Standalone	z9BC In Qualified Sysplex	
MLC	GOLC Growth and Opportunity License Charge - One of oldest models. Operates at a Group Level			Yes	Yes										
MLC	FLAT Much Older Fixed MLC			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MLC	PSLC Parallel Sysplex License Charge	No	Yes	Yes			Part of PSLC Sysplex		Part of PSLC Sysplex	Yes	Yes	Yes			Part of PSLC Sysplex
MLC	ULC S/390 Measured Usage License Charge	No (Pay for actual CPU usage by the product)	Yes	If PSLC	If GOLC		Part of PSLC Sysplex		Part of PSLC Sysplex	If PSLC	If PSLC	If PSLC			Part of PSLC Sysplex
MLC	zELC zSeries Entry License Charge	No, Model Based Only		or equivalent to z800		Yes		110 Model only	110 Model only					A01 Model Only	A01 Model Only
MLC	WLC Variable WorkLoad License Charge - Variable pricing based on MSU	Yes	Yes	z/OS, z/OS.e and zArch.		z/OS, z/OS.e and zArch.	Part of WLC Sysplex		Part of WLC Sysplex	z/OS, z/OS.e and zArch.	z/OS, z/OS.e and zArch.	z/OS, z/OS.e and zArch.	z/OS, z/OS.e and zArch.	z/OS, z/OS.e and zArch.	Part of WLC Sysplex
MLC	FWLC Workload License Charge - Fixed Price Per Footprint	Yes	Effectively NO			z/OS, z/OS.e and zArch.	Part of WLC Sysplex	z/OS, z/OS.e and zArch.	Part of WLC Sysplex	z/OS, z/OS.e and zArch.	z/OS, z/OS.e and zArch.	z/OS, z/OS.e and zArch.	z/OS, z/OS.e and zArch.	Yes	Yes
MLC	EWLC Sub Cap Entry Workload License Charge	Yes	No			Yes		z/OS, z/OS.e and zArch.	z/OS, z/OS.e and zArch.					z/OS, z/OS.e and zArch.	z/OS, z/OS.e and zArch.
MLC	EWLC Full Cap Entry Workload License Charge		No	OS/390 Allowed		OS/390 allowed, or not zArch		OS/390 allowed	OS/390 allowed					OS/390 allowed	OS/390 allowed
MLC	TWLC Tiered Workload License Charge		No					Yes (z/OS or OS/390)	Yes (z/OS or OS/390)					Yes (z/OS or OS/390)	Yes (z/OS or OS/390)
MLC	NALC New Application License Charge (not available after z/OS 1.0)	Yes w/WLC, No w/PSLC	No	w/PSLC		No, Use z/OS.e	No, Use z/OS.e	No, Use z/OS.e	Yes	Yes	Yes	Yes	Yes	No, Use z/OS.e	No, Use z/OS.e
MLC	zNALC System z New Application License Charges	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
OTC (S&S)	Value Unit Value Unit (Iivoli, Tools, etc)	Yes, Execution, Reference & z/OS Based	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

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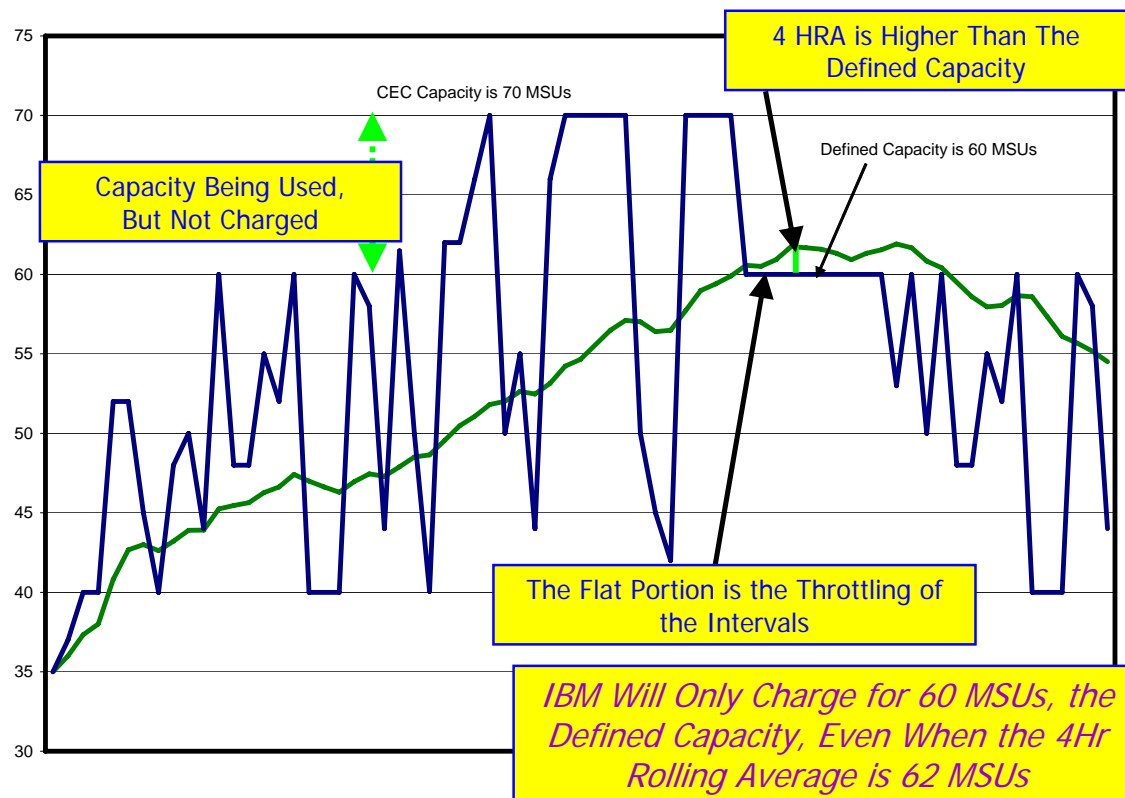
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4-Hour Rolling Average & Defined Capacity

- 4-Hour Rolling Average of an LPAR
 - Smoothes Spikes in Usage
 - A Number IBM Can Base Your Bill On That is Not Always the Size of the Machine, or the LPAR
 - Your IBM Software Charges for Sub-Capacity Products Are Based on Each Product's Simultaneous 4-Hour Rolling Averages
- Defined Capacity of an LPAR
 - WLM Uses the Defined Capacity as a Throttle on the 4-Hour Rolling Average
 - When an LPAR's 4HRA Exceeds the LPAR's Defined Capacity, then WLM Tells PR/SM to "Softcap" the LPAR
 - An LPAR with a "Softcap" has WLM "CPU-Delay"
 - An LPAR Will Never Be Charged More Than the Defined Capacity

4-Hour Rolling Average & Defined Capacity



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How Does IBM Implement WLC?

- Initially IBM Tried to Develop the “IBM License Manager” Which Would be Integrated into z/OS
 - Extremely Late
 - Eventually, Dropped After 15 Month Delay
 - Tivoli is working on a new zSeries License Manager
- The Sub-Capacity Reporting Tool (SCRT) Was Developed in the Interim
 - SCRT IS REQUIRED For WLC
 - Processes SMF70 data for Defined Capacity limits and 4-Hour Rolling Averages
 - Processes SMF89 to Determine Where Many Software Products Execute (Not All, Some Important Exceptions)
 - You Edit the Output in a Spreadsheet
 - Email to IBM or Recently Upload in a Web Application
- The IBM Machines “Call-Home” Periodically for Verification

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zIIP and zAAP Specialty Engines

- **zAAP Engines**
 - Run JAVA Workloads Under z/OS: WebSphere, CICS, IMS, DB2
 - z890, z990, z9-109, z9BC, z9EC processors
- **zIIP Engines**
 - DB2 V8 and V9 Can Redirect Some CPU Time to zIIPs
 - DRDA over TCP/IP, DB2 Complex Parallel Queries, and DB2 Utility Functions Related to Index Maintenance
- **Both**
 - Lower Initial Cost and Lower Ongoing Maintenance Costs Than General Purpose Engines
 - zXXP Capacity is *NOT* Included in the Announced MSU Value
 - zXXP CPU Time is *NOT* Included in the LPAR's 4 hr Rolling Averages
 - No Software Charges (\$€£¥) for zXXP Capacity
 - You Can Plan the Savings Without Having the Engines Installed

zIIP and zAAP Specialty Engines (Future)

- **zIIP Engines**
 - IPsec can use zIIPs in z/OS 1.9 and 1.8w/APARs
 - CA announced it would use the zIIP for encryption at Share during Feb 2007, also network packet analysis
- **Both**
 - z/OS XML to be Enabled for both zAAP and zIIP Specialty Engines (US Announcement 107-190)

Why Are There Specialty Engines?

- zAAP and zIIP Move Work Off Your “General-Purpose” Engines
- “Work” is CPU Usage
 - Java, as a More Modern Language Uses More CPU Resources Than COBOL
 - Generally WebSphere is 50% Java and 50% non-Java
- zAAP/zIIP CPU Usage is Not Included in the 4-Hour Rolling Average
 - There Is Some Additional Overhead to Determine Which Work is zAAP/zIIP Eligible and to Handle Dispatching
 - CPU Resources Moved Out of the **Maximum Simultaneous** 4-Hour Rolling Average May Reduce Your Software Charges
 - Your Maximum Simultaneous 4-Hour Rolling Average May Move to Another Hour of the Month

Why Are There Specialty Engines?

- When Does CPU Time Moving to a Specialty Engine Matter?
 - From a “Pricing” Point of View Only During the Hour (or the typical hours) of Your Peak Simultaneous 4HRA of Each Machine

IF (Your Billable MSUs are Driven by Overnight Batch Workload)
and
(Specialty Engines Would “Help” Daytime Online Workload)
THEN

There May Not be a Reduction In Monthly Charges!

Why Are There Specialty Engines?

- **Out of Capacity**
 - Traditionally, You Would Upgrade the Machine With General Purpose Engines (GPs)
 - New Capacity That Will Be Included in the Announced MSU Value
 - Adding GPs May Involve Upgrade Fees for “Capacity Based Licenses” (IBM and ISVs)
 - New Capacity May Lead to Higher Simultaneous 4HRAs, Leading to Higher Monthly Charges for Variable WLC Products (IBM and ISVs)
- **If You Have Eligible Work That Could Move to zXXP . . .**
 -
 - Same Installed GP MSU Capacity
 - Eligible Work Moved to zXXP Releases Some General Purpose Capacity
 - (which could be consumed by your latent demand!)
 - Improved Performance: Higher Trans Rates, Faster Response

zXXP is NOT a Performance Solution

- **zXXPs are Software Pricing Solutions**
- **There is Additional Overhead in z/OS to Dispatch the Work onto the Specialty Engine**
- **Certainly There Are Exceptions**
 - Adding zXXPs Without Removing GPs Will Provide More Computing Resources Than GPs Provided Alone
 - More Engines Could Lead to
 - Improved Performance
 - These are “real” engines, they are as powerful as the others
 - Except they can only executed a specific type of work
 - Reduced Cost

How Do I Analyze zXXPs?

- IBM Will Do This For You
- Do It Yourself
 - SAS, MXG, CA-NeuMICS
 - Other SMF and RMF Analysis Tools
- *Acquire a Tool To Help with WLC and zXXP Analysis 😊*

Objectives of zXXP Analysis

- Technical View
 - Can My Workloads Use zIIPs or zAAPs?
 - Which LPARs?
 - How Many Specialty Engines Are Needed?
 - A Machine May Not Have More zIIPs or zAAPs Than General Purpose Engines
 - LPARs Do Not Have This Rule
 - A LPAR May Have 1 GP, 2 zAAPs and 2 zIIPs
- Management View
 - What Does It Cost?
 - How Much Will My Software Charges Be Reduced?

Eligible Time, Key to Analysis

- RMF 72 and SMF 30 Record “Eligible” zXXP Time
- This is Time That Work Executed On a GP That Could Have Executed on a zXXP, “If” a zXXP Was Available
- Once You Have a zXXP Engine Installed - z/OS Records Eligible Time
- Even Without zXXPs Installed You Can Have z/OS Record Eligible Time with PROJECTCPU in IEAOPTxx

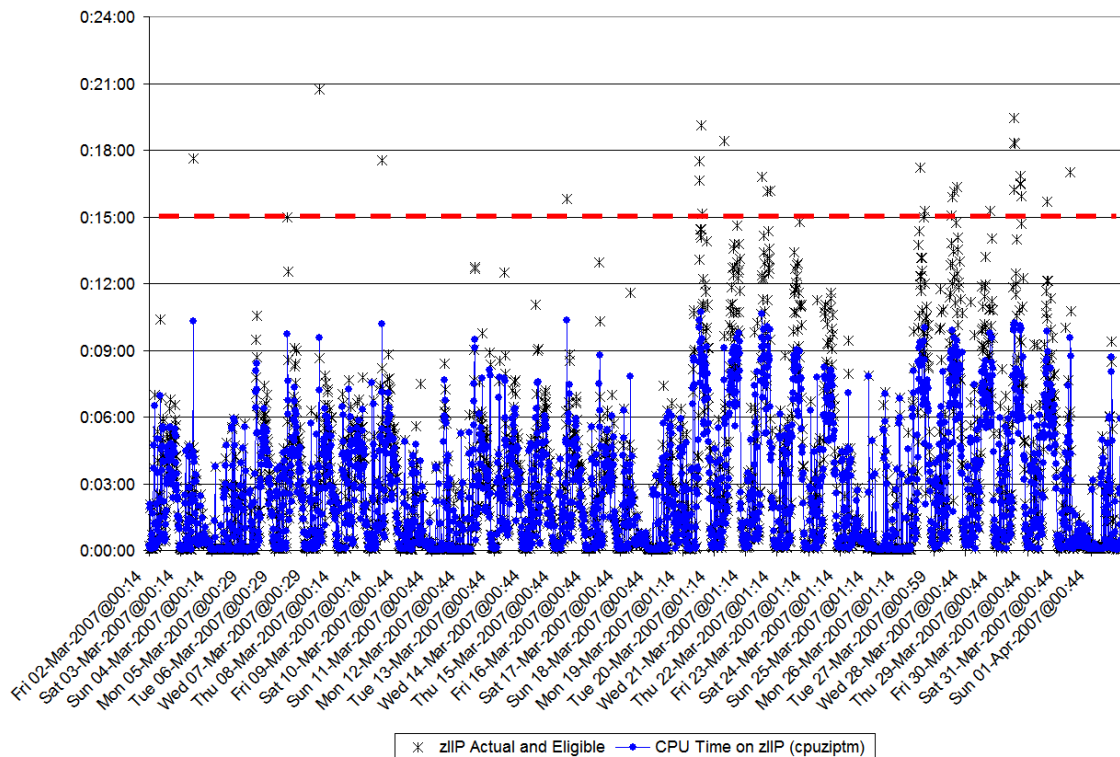
zXXP Measurement Actual and Eligible

- SMF30 has zIIP Information For Job Steps
- RMF70 has zXXP Executing, Available Time, Percent Busy and Number of Engines Installed
- RMF72 has Time Using the zXXPs and Time Eligible for zXXPs
- DB2 has Executing and Eligible Time
 - (APAR PK18454)

PROJECTCPU

- Recently Added IEAOPTxx Parameter
 - PROJECTCPU: Projects zAAP / zIIP Consumption When The zXXP Engines Are Not Actually Installed in the Machine
 - ZIIPAWMT: Specify zIIP Alternate Wait Management Threshold
 - ZAAPAWMT: Specify zAAP Alternate Wait Management Threshold
 - Available in z/OS 1.8 and z/OS 1.9
 - Available in z/OS 1.6 and z/OS 1.7 via the zIIP FMIDs
 - JBB77S9 (z/OS 1.6)
 - JBB772S (z/OS 1.7)
- With PROJECTCPU the JVM Application Level Options to Project CPU Usage Are Not Required
 - JAVA5 JVM Removed “-Xifa:projectn”

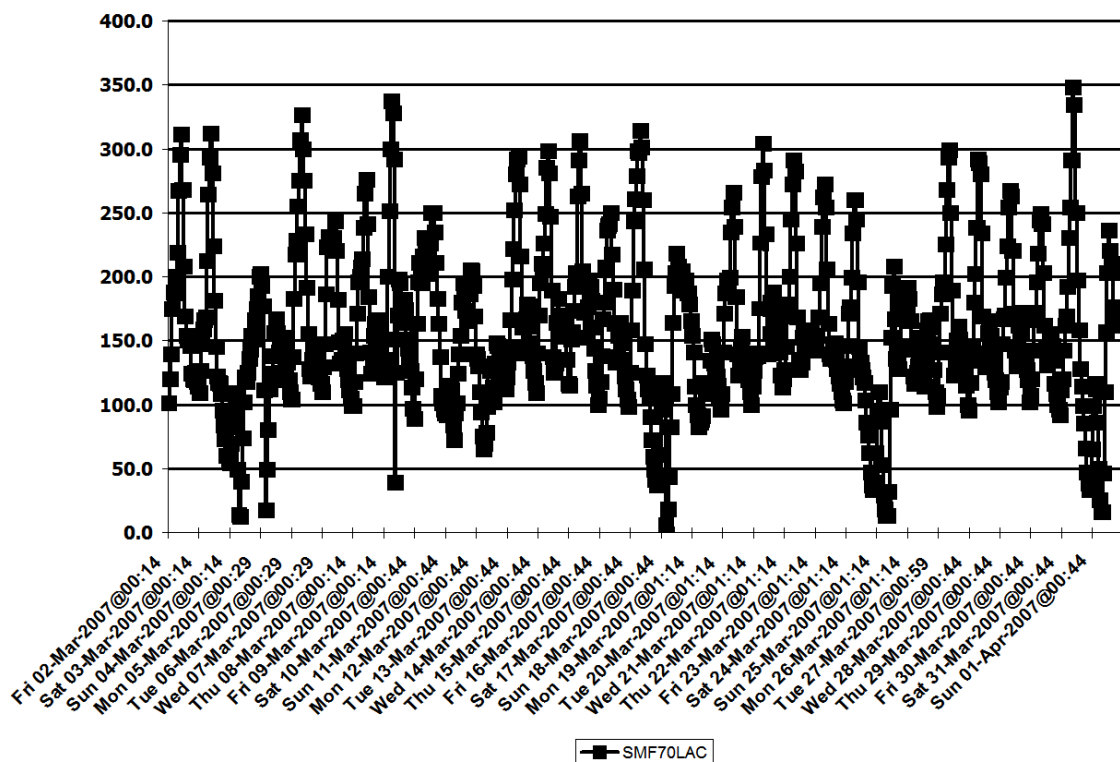
zIIP Demand



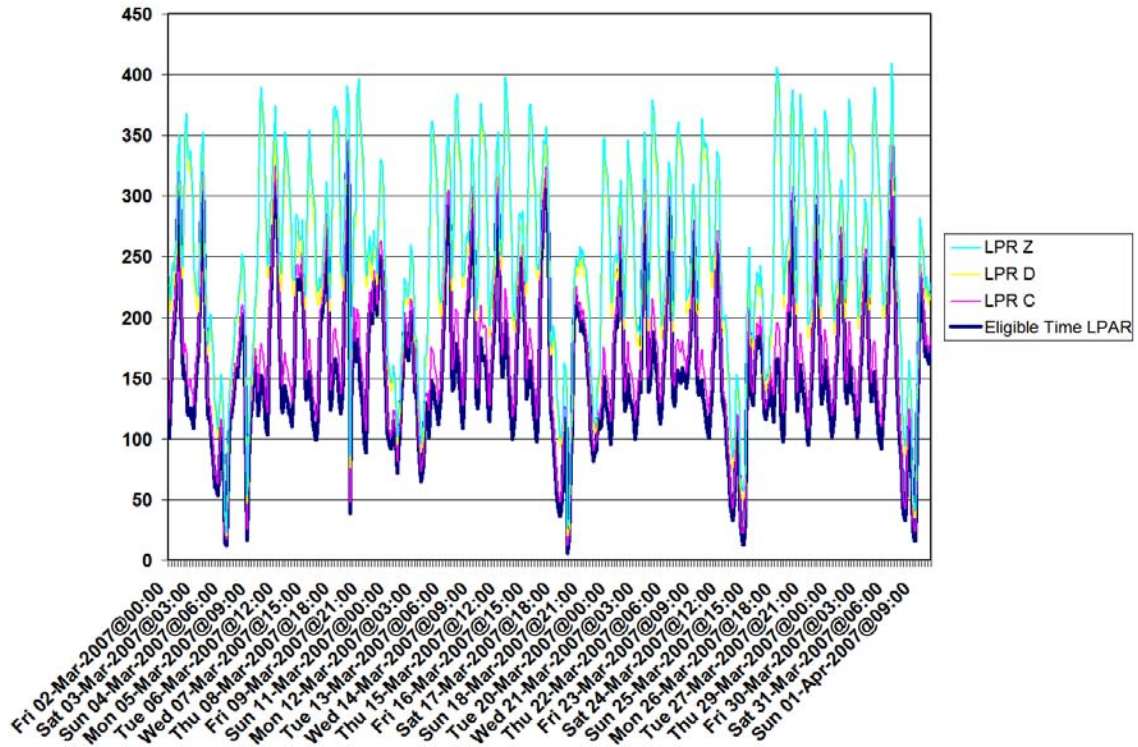
zIIP Demand

- Notice There Are Many '*'s Below 15 Minutes
 - In This Example 1 zIIP is Installed
 - If the zIIP is Busy Work May Wait,
 - Or With z/OS Alternate Wait Management May Execute on a GP
 - Only zIIP Work That Runs on a GP is Marked as "Eligible"
 - If It Waits and Eventually Runs on a zIIP, Then It Is CPU time On A zIIP, (not zIIP Eligible Time)
- A Few '*'s Above 15 Minutes
 - Two zIIPs Are Needed for This Workload
- Technically, If a zIIP Was Added To This LPAR
 - It Would Be Used
 - But, What Is the Value?

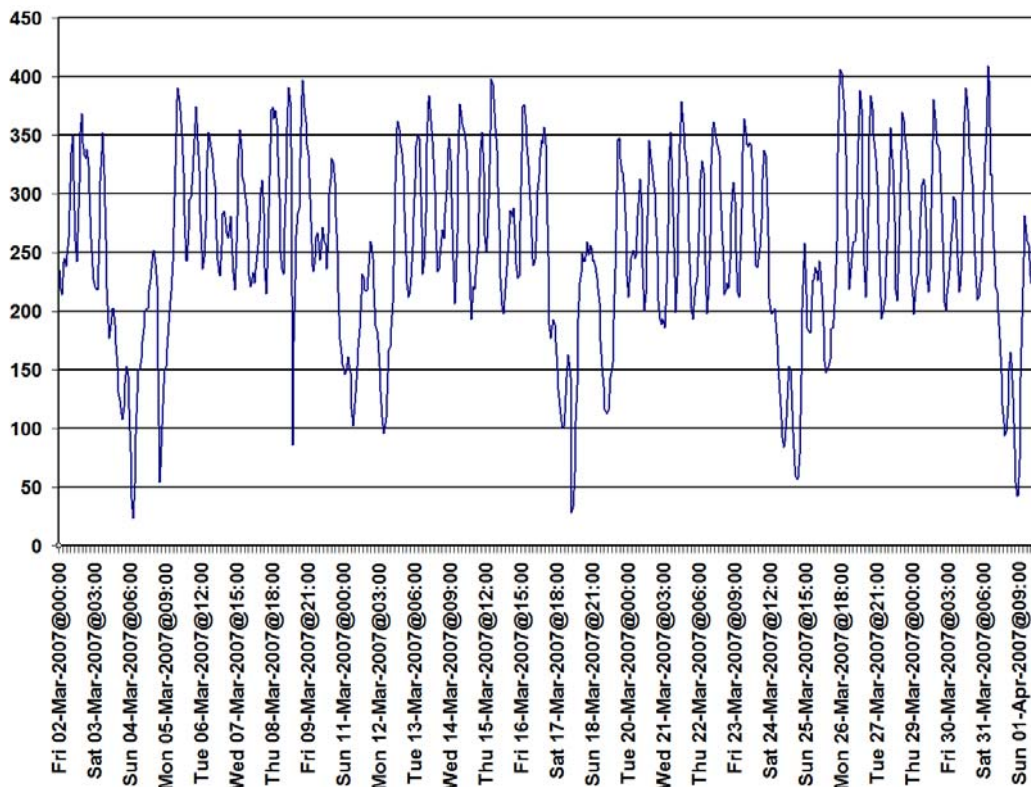
LPAR's 4 HR Rolling Average (Starting Point)



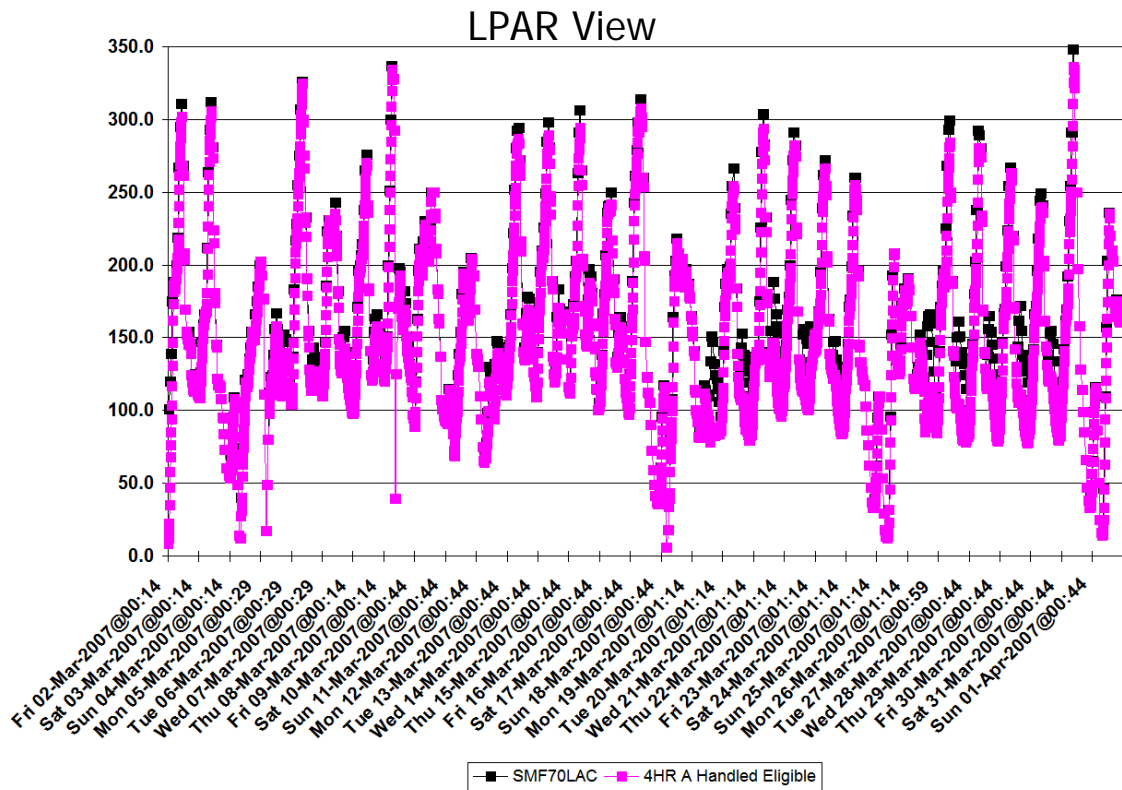
z/OS's Simultaneous 4hr Rolling Average



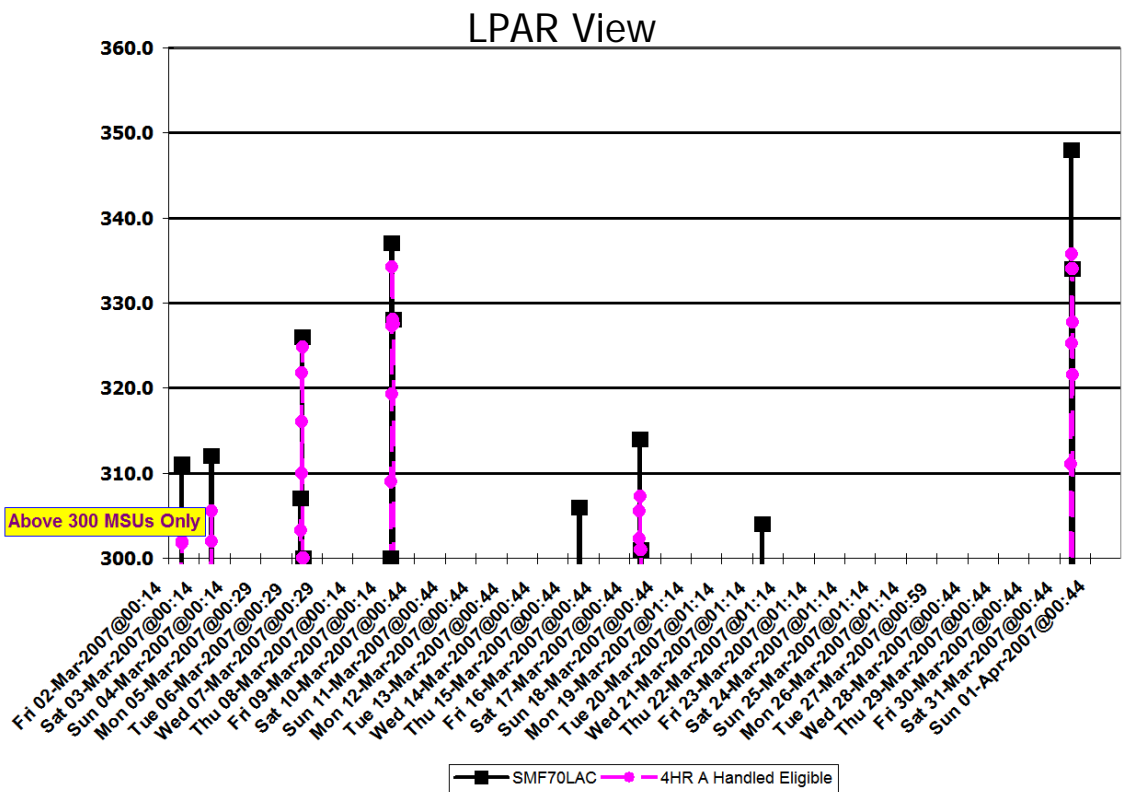
z/OS's Simultaneous 4hr Rolling Average



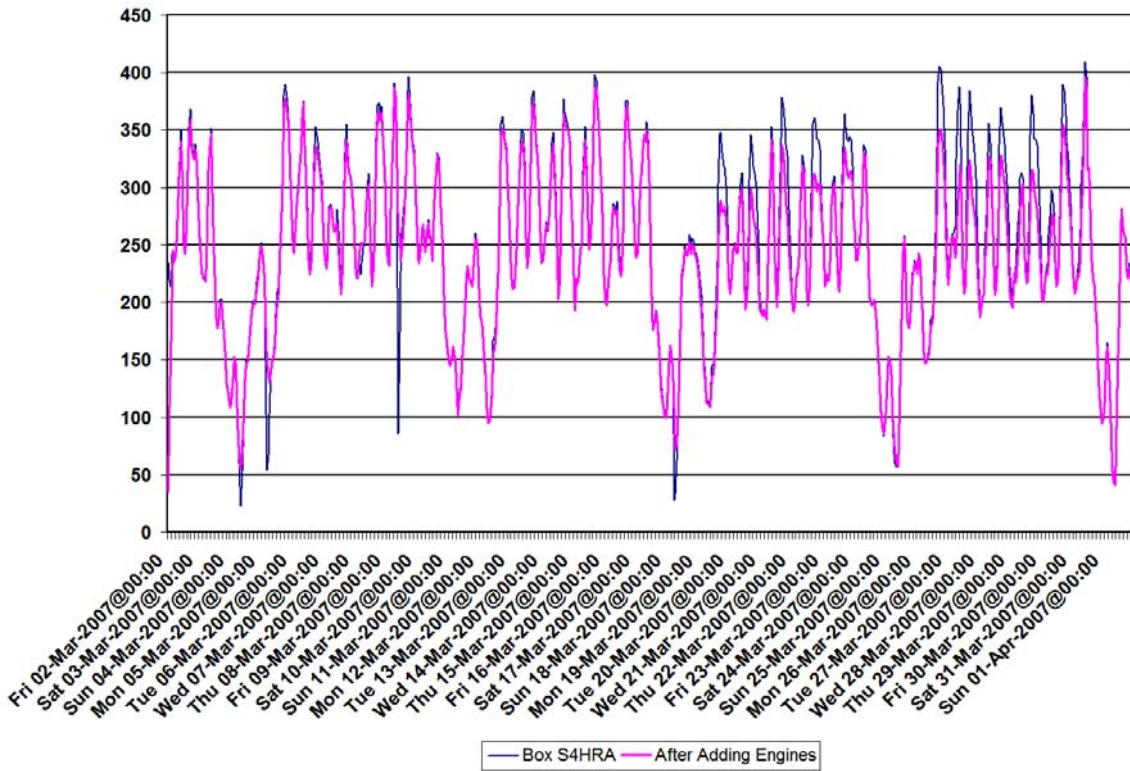
Add One zIIP to Handle All Eligible Time



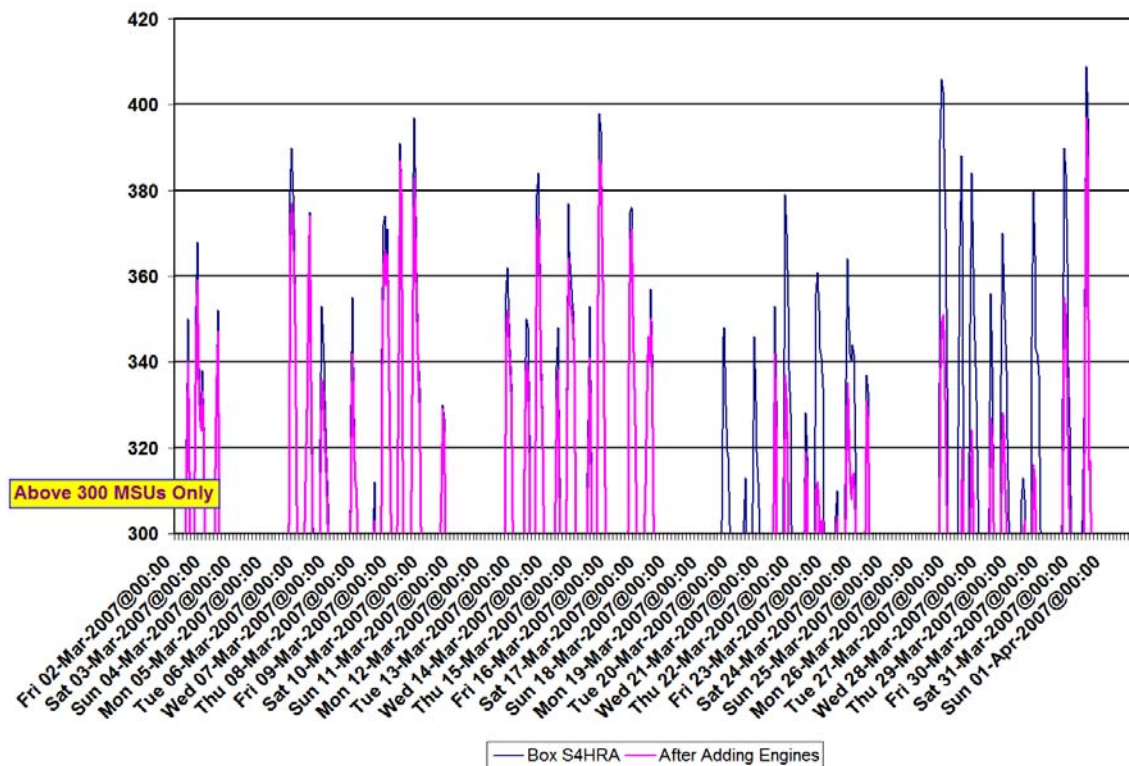
4 HR Rolling Average Impact



z/OS's Simultaneous 4hr Rolling Average



z/OS's Simultaneous 4hr Rolling Average



Financial Value

ETVALUE: Value of Additional Specialty Engines

LCS: 04.02, LCS Extractor: 04.02, MXG: 25.02, Prepared: 12:20 Sunday, 09SEP2007

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PricingPlex: 00011 2063-AG1 Machines: 2094#1111, 2094#1122									
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	5675-DB2	DB2 V7 (SVC)	0.00	337	09MAR2007:06	334	09MAR2007:06	3	\$0
	5655-M15	CICS TS	54.00	383	31MAR2007:09	371	31MAR2007:09	12	\$662
	5655-L82	MQSERIES	25.00	400	31MAR2007:09	388	31MAR2007:09	12	\$306
2094#1111			226.00						\$2,852

- The Workload Could Use 1 More zIIP Engine
 - Sep2006 Approx. Cost \$100-120K per engine. Mar2007 around \$75-80K. Recently I've Heard Quotes In The \$45-50K Range
 - Your Mileage May Vary
- For This Pricing Plex: z/OS, DB2 V8, CICS, MQ Reduced The Simultaneous 4hr Rolling Average by 12 MSUs
- Estimated Savings For This Analyzed Month: \$2,852

Financial Value 2nd Machine

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2094#1122	5694-A01	Z/OS V1	109.00	444	26MAR2007:18	438	02MAR2007:17	6	\$627
	5625-DB2	DB2 V8	47.00	410	26MAR2007:18	405	02MAR2007:17	5	\$247
	5675-DB2	DB2 V7 (SVC)	0.00	252	10MAR2007:07	252	10MAR2007:07	0	\$0
	5655-M15	CICS TS	54.00	410	26MAR2007:18	405	02MAR2007:17	5	\$284
	5655-L82	MQSERIES	25.00	426	26MAR2007:18	421	02MAR2007:17	5	\$119
2094#1122			235.00						\$1,276

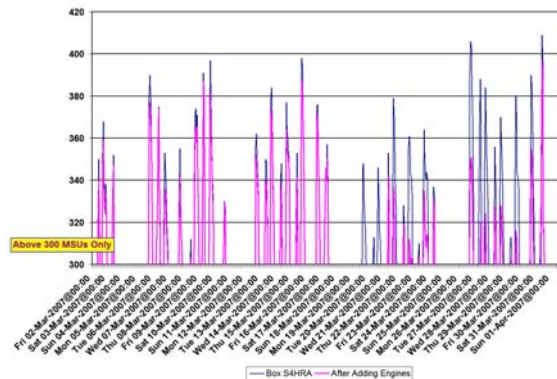
- This Workload Could Use 1 More zIIP Engine
- For This Pricing Plex:
 - z/OS Reduced by 6 MSUs
 - DB2, CICS, & MQ Reduced the Simultaneous 4hr Rolling Average by 5 MSUs
- Estimated Savings For This Analyzed Month: \$1,276
- Note: Adding the zIIP Moved the Machine's Peak Simultaneous 4HRA From 26MAR at 6PM to 2MAR at 5PM

Summary

- Eligible Time Can Be Analyzed to Determine If Adding zXXP Engines Are Applicable to Your Workloads
- These Engines Move CPU Time From the General Purpose Engines to the Specialty Engines
- Perhaps zXXP Engines Defer the Point Where A General Purpose Engine Capacity Increase Would Be Necessary
- LPAR Analysis is Not Adequate
 - You Need to Analyze the Whole Machine and the Simultaneous 4 Hour Rolling Averages
- May or May Not Reduce Your Simultaneous 4 Hour Rolling Averages

Summary

LCS Provides Analysis of Eligible Time and Recalculates Your Estimated Invoice To Demonstrate the Financial Value for Your Environment



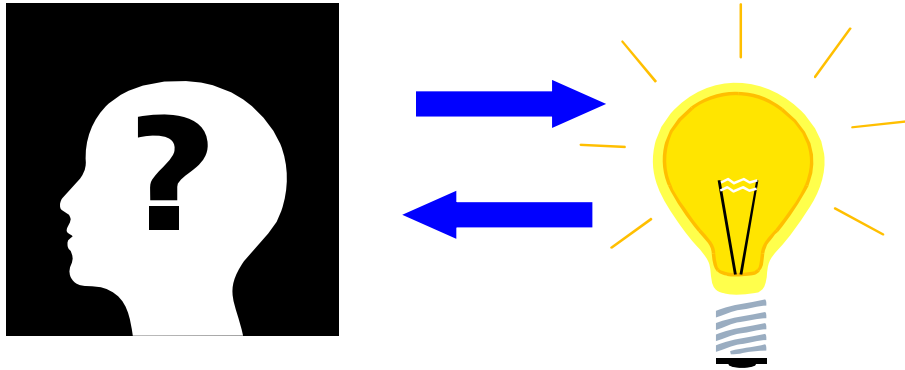
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2094#1111			226.00						\$2,852

Discussion, Questions?



Call for a 3-Day In-House Seminar on WLC and IRD.
This includes a 1/2 day Briefing for Your Executives, I/T
Management, Lawyers, and Contracting Agents

***All Examples Are From Our
LPAR Capacity and Software Usage
Analysis (LCS) Software!***