zPCR Capacity Sizing Lab

SHARE - Sessions 10001/9667

August 11, 2011

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Materials created by John Fitch and Jim Shaw

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zPCR Capacity Sizing Labs

- **Part 1 - Intro and Overview**
  - zPCR Introduction with C V7.4
  - Includes Advanced Mode Update
  - What's new in zPCR V7.4
- **Part 2 – Hands-on Lab**
  - 1 Exercise to demonstrate the use of Advanced Mode functions in zPCR
    - 6 Tasks
    - 2 optional specialty engine considerations
  - Use as a refresher

zPCR Capacity Sizing Lab – Part 1 Introduction and Overview

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Agenda

- **Introducing zPCR**
- **LSPR Background**
- **MIPS Tables Vs. zPCR LPAR Configuration Capacity Planning**
- **zPCR Basic Mode**
- **zPCR Advanced Mode**
- **Update on zPCR C V7.4**
- **Where to get more Information**
- **Summary**

Introducing zPCR

- **Provides capacity relationships for System z processors, considering**
  - LPAR configuration
  - SCP/workload environment
  - Use of specialty CPs (zAAP, zIIP, IFL, and ICF)
- **Based on IBM Large Systems Performance Reference (LSPR)**
- **The IBM tool to properly size mainframe upgrades**
  - Expected accuracy of ±5%
- **A PC based tool written in Java for Windows XP/Vista/7**
  - Available to customers since 10/2005
  - “As Is”, no charge tool available from the web
- **New Processor Announcements available in zPCR for:**
  - IBM Account Teams - at Announcement
  - Customers - generally within 30 days after Announcement

Introduction to LSPR

- **A set of representative SCP/workload environments**
  - SCPs: z/OS, z/VM, and Linux on System z
  - Workload categories: Low ←Relative Nest Intensity→ High
  - Current LSPR workload categories: Low, Average, High
  - zPCR extends published categories
    - Low-Avg
    - Avg-High
  - A methodology focused on processor capacity
  - No significant external constraints
  - Equivalent (reasonably high, e.g. >= 95%) processor utilization
- **A metric to communicate the results**
  - ITR: Internal Throughput Rate
  - Transactions or Jobs per processor busy second
- **Information stored on the web**
  - **https://www.ibm.com/servers/resourcelink/lib03060.nsf/pages/lsprindex?OpenDocument**

New LSPR Workload Categories

- Various combinations of prior workload primitives are measured on which the new workload categories are based
  - **Applications include CICS, DB2, IMS, OSAM, VSAM, WebSphere, COBOL, utilities**

- Low (relative nest intensity)
  - **Workload curve representing light use of the memory hierarchy**
  - **Similar to past high scaling workload primitives**

- Average (relative nest intensity)
  - **Workload curve expected to represent the majority of customer workloads**
  - **Similar to the past LoIO-mix curve**

- High (relative nest intensity)
  - **Workload curve representing heavy use of the memory hierarchy**
  - **Similar to the past DI-mix curve**

- zPCR extends published categories
  - **Low-Avg**
    - **50% Low and 50% Average**
  - **Avg-High**
    - **50% Average and 50% High**

RNI-based Workload "Hint" Decision Table

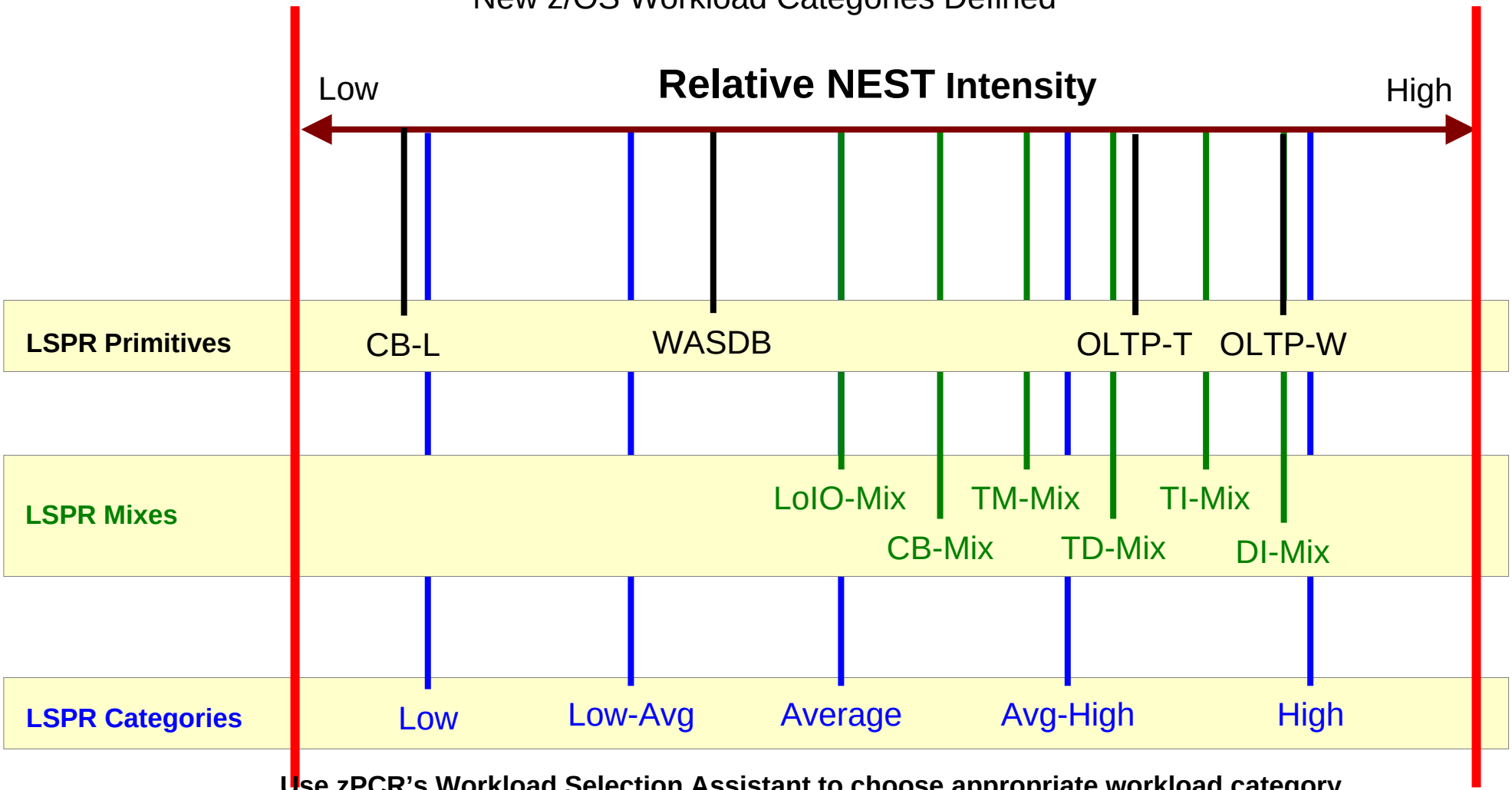
L1MP	RNI	Workload Hint
<3%	>= 0.75 < 0.75	AVERAGE LOW
3% to 6%	>1.0 0.6 to 1.0 < 0.6	HIGH AVERAGE LOW
>6%	>=0.75 < 0.75	HIGH AVERAGE

Notes: applies to z10 CPU MF data
table may change based on feedback

zPCR Workload Characterization for z/OS

"Scope of Work" Definition Change

New z/OS Workload Categories Defined



Use zPCR's Workload Selection Assistant to choose appropriate workload category

Automated with EDF input into zPCR

Note: Workload selection is automated in zCP3000

LSPR Data

- LSPR data is built from a set of benchmarks running representative workloads
- Over time, LSPR benchmarks are changed to reflect changes in processor architecture, operating system capabilities, and new patterns for production workloads
- Cannot directly compare relative processor capacity across different versions of LSPR benchmarks

LSPR Tables

- Multi-image (MI) Processor Capacity Ratio table
  - Median complex LPAR configuration for each model based on customer profiles
  - Most representative for vast majority of customers
  - Same workload assumed in every partition
  - z/OS only
  - Used for “high level” sizing
  - Used to develop the MSU rating
- Single-image (SI) Processor Capacity Ratio table
  - One z/OS partition equal in size to N-way of model (limit to max CPs supported by SCP version)
  - Representative for truly single image z/OS cases
  - Used as the base for zPCR LPAR Configuration Capacity Planning

MIPS Tables Vs zPCR

- **MIPS Tables**
  - Adequate for Business Planning
    - High level sizing for hardware and software budget planning
    - Based on “averages”
  - Must be referenced to a specific set of LSPR benchmarks or invalid
- **zPCR Sizing - LPAR Configuration Capacity Planning**
  - Detailed Capacity Sizing based on:
    - Specific LPAR configuration (number, weights, and logical processors)
    - Specific SCP/workload mix
    - Specific use of specialty engines (zAAP, zIIP, IFL, and ICF)
  - Built around concept of a Reference CPU

What is new in zPCR C V7.4

Available since July 22, 2011

- **New z114 Processors supported**
- **LPAR Configuration Capacity Planning**
  - New function provides the ability to test the effect on capacity for the entire LPAR configuration with various alternative LCP count settings for shared GP partitions. The possible settings include
    - *Unparked LCPs* only (as read from EDF or RMF),
    - *Moderate* or *Minimum* (based on partition weights), and
    - *User defined* overrides. Any single set of LCP settings may be committed to the LPAR configuration if desired.
- **Enhanced RMF support**
  - HiperDispatch parked logical CPs, when identified in the report, are now shown on the window prior to transfer into zPCR.
    - Note: that reports generated by z/OS 1.10 and above are supported
- **Basic Mode enhanced**
  - Capability has been added to display Specialty engine partitions beneath their associated GP partition in addition to the current Se*parate by Pool* order**.** The *Table View Controls* group box has been enhanced to provide this capability.
  - ***LCP:RCP Ratio*** information has been added to the *Capacity Summary by Pool* group box.

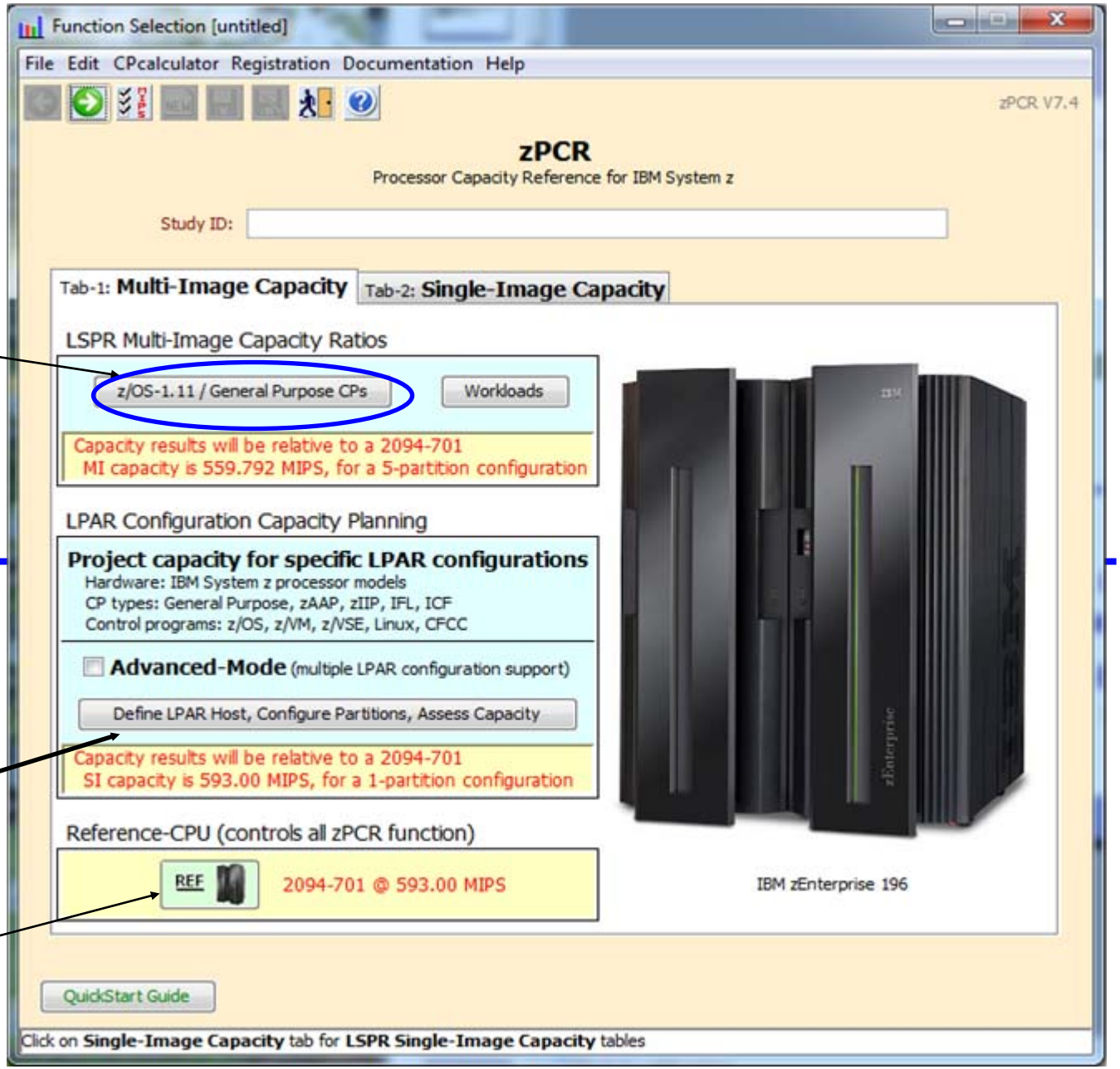
zPCR 7.4 “Basic Mode” Capacity Sizing Tool

MIPS Table

LSPR Multi-Image

zPCR LPAR Configuration Capacity Planning

Built on LSPR Single-Image MIPS Table

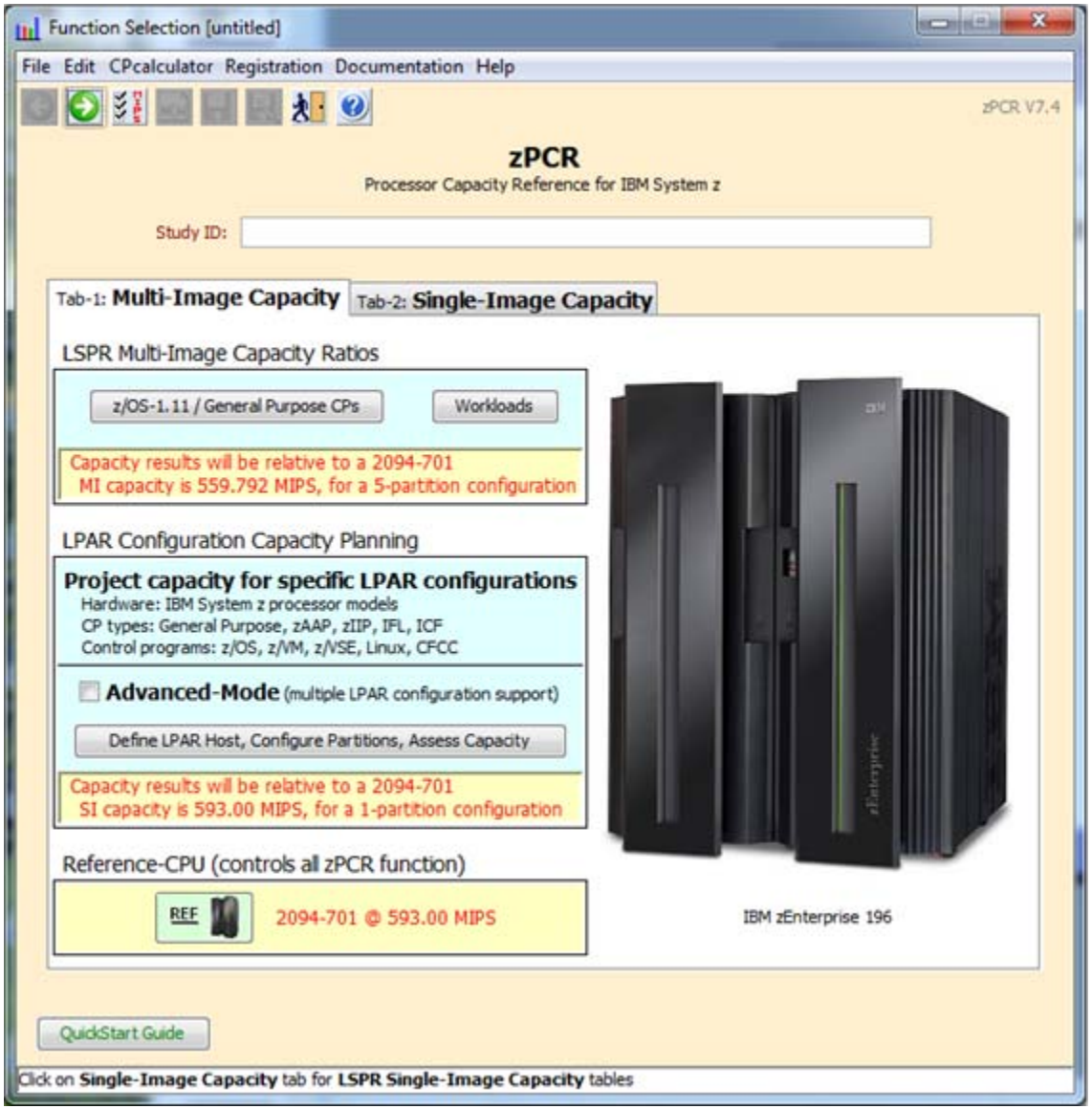


zPCR V7.4 Basic Mode …

- Operates on 1 LPAR configuration at a time.
- Operates the same as previous releases of zPCR
  - **v5.4 and before**
- All files created with zPCR 5.4 and before are “Basic Mode”.
- All files created with zPCR 6.x and beyond in “Basic Mode” are “Basic Mode”

Introducing zPCR C V7.4 – Advanced Mode

Available for Customers since July 26, 2011



zPCR Advanced Mode

- **Provides Capacity Comparisons between 2 LPAR configurations**
  - The "Current" Vs "Alternate" (Alt-1, Alt-2, Alt-3, Alt-4, Alt-5)
    - User can rename these to what ever they wish up to 20 characters
  - More efficient than running zPCR multiple times and manually comparing the results
  - Ability to drag & drop RMF partition reports, zPCR files and *EDF files onto "Current" & "Alternate"
- **Is recommended when comparing capacity changes that include:**
  - Changing the LPAR host processor family
  - Changing the LPAR host processor's CP configuration
  - Changing the way that one or more partitions are defined, (e.g. weights, LCPs, SEs)
  - Adding one or more new partitions
  - Deleting one or more current partitions.
- **For Capacity Comparisons to be useful, configurations being compared should both contain some or all of the same partitions**
  - (i.e., in terms of partition type, name, SCP, and workload).

Note: EDF (Enterprise data Files) are new with zPCR 7.x and are created using CP3KEXTR

Summary of Advanced Mode function

- **Multiple LPAR configurations (currently limited to six) can be defined**

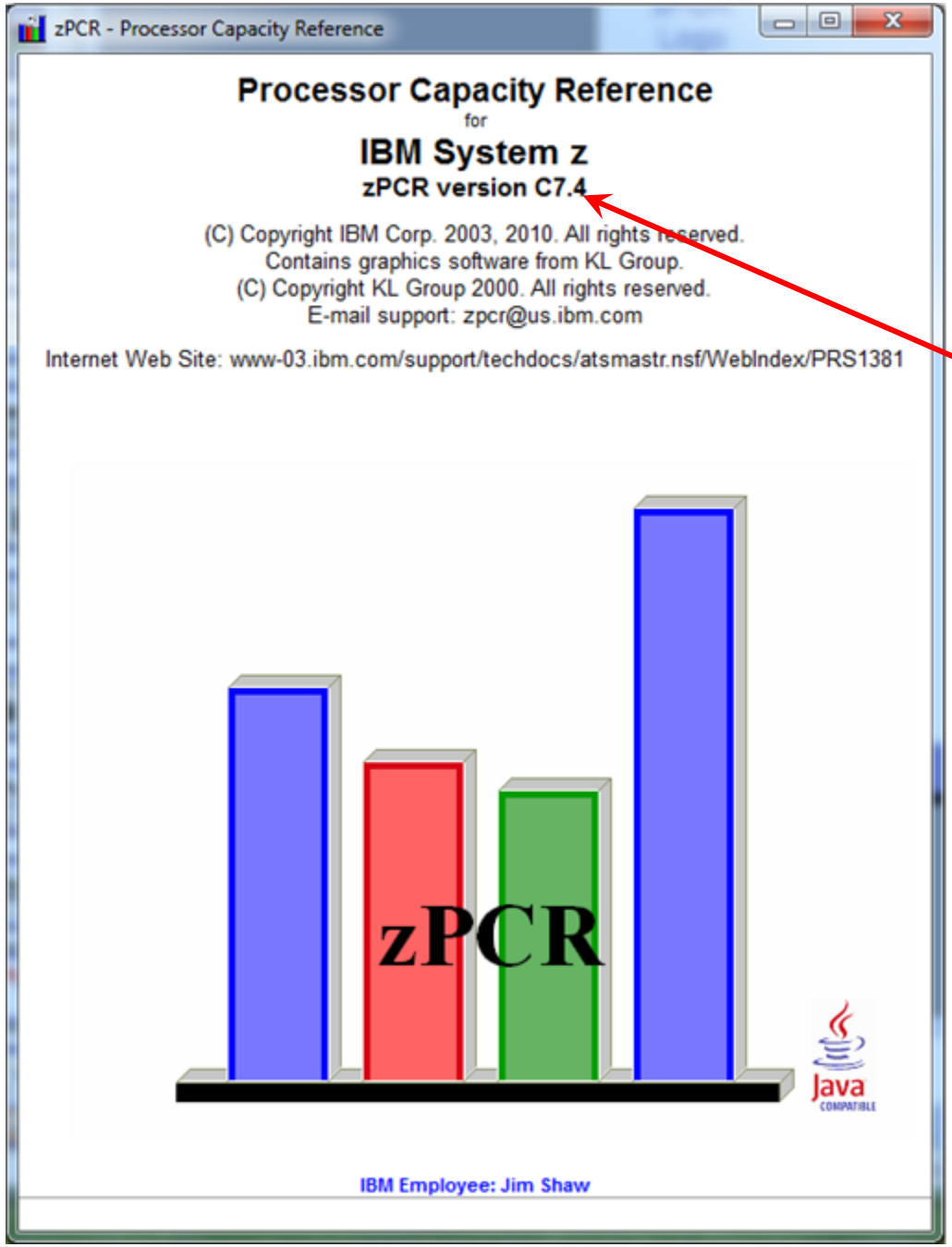
- **Several additional windows and functions are available**
  - *LPAR Host / Partition Comparison Reports*- To compare capacity results between LPAR configurations
  - *Margin of Error Consideration* - To show the effect on capacity when ±5% margin-of-error is applied
  - *Optimize SHR LCPs* – To optimize LCPs
  - *LPAR Host Capacity Summary* – To show summary of MIPS by pool type for Current and all Alternates

- **All capacity values are based on a single Reference-CPU setting**
  - The MI and SI tables will be viewed using Reference-CPU settings that are consistent between them
  - The MI Reference-CPU setting is based on the Reference-CPU setting as specified in the LSPR FAQ
  - 1-way processors only

- **The Reference-CPU can be calibrated for the first LPAR configuration only to produce a desired capacity result**

- **The Workloads window, used to customize the MI table view, must be accessed from either of the LSPR Processor Capacity Ratios tables,**
  - since the Function Selection window is no longer accessible

zPCR Logo Window



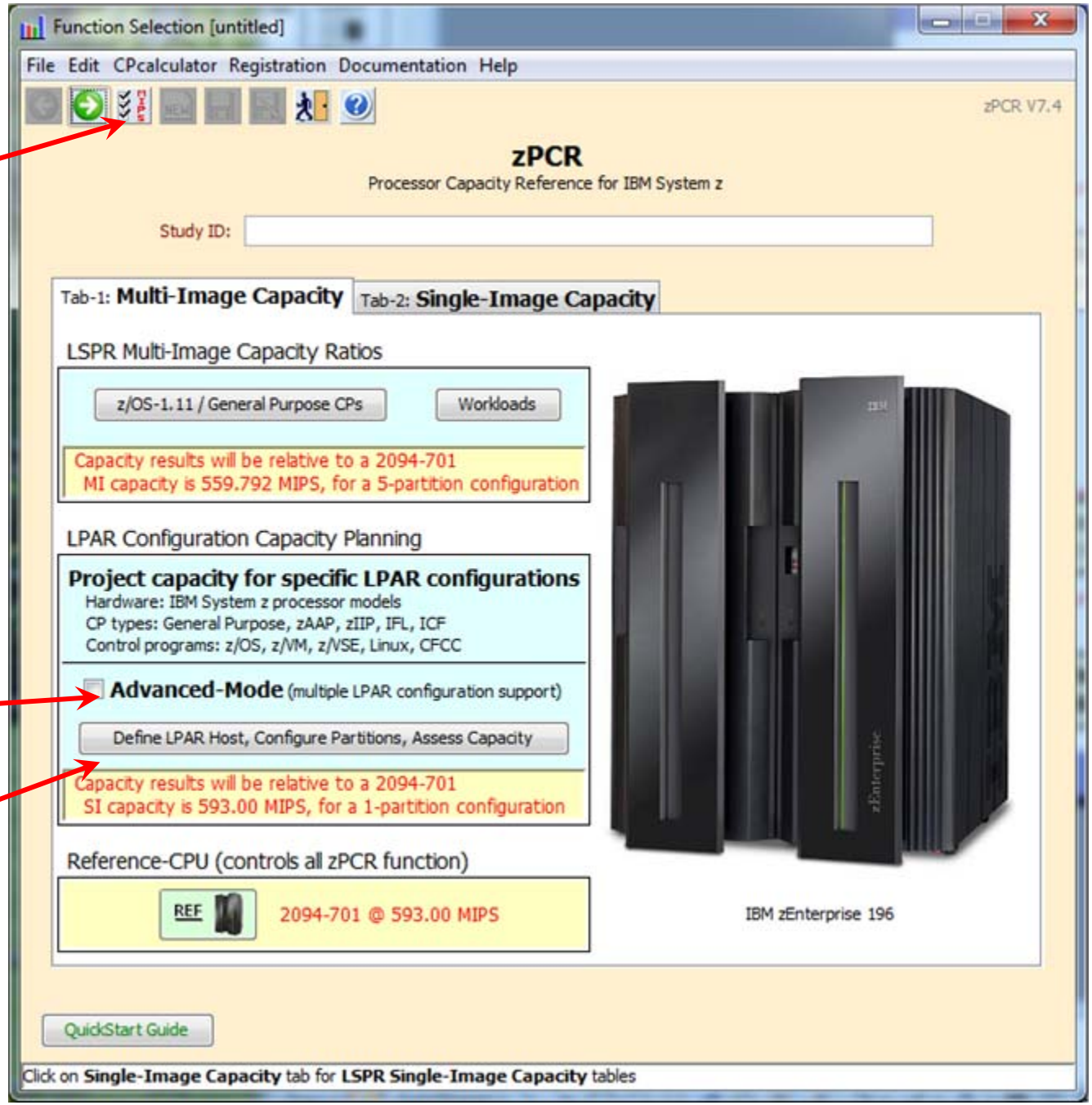
Version Identification

zPCR Function Selection Window

Set “Startup” preferences

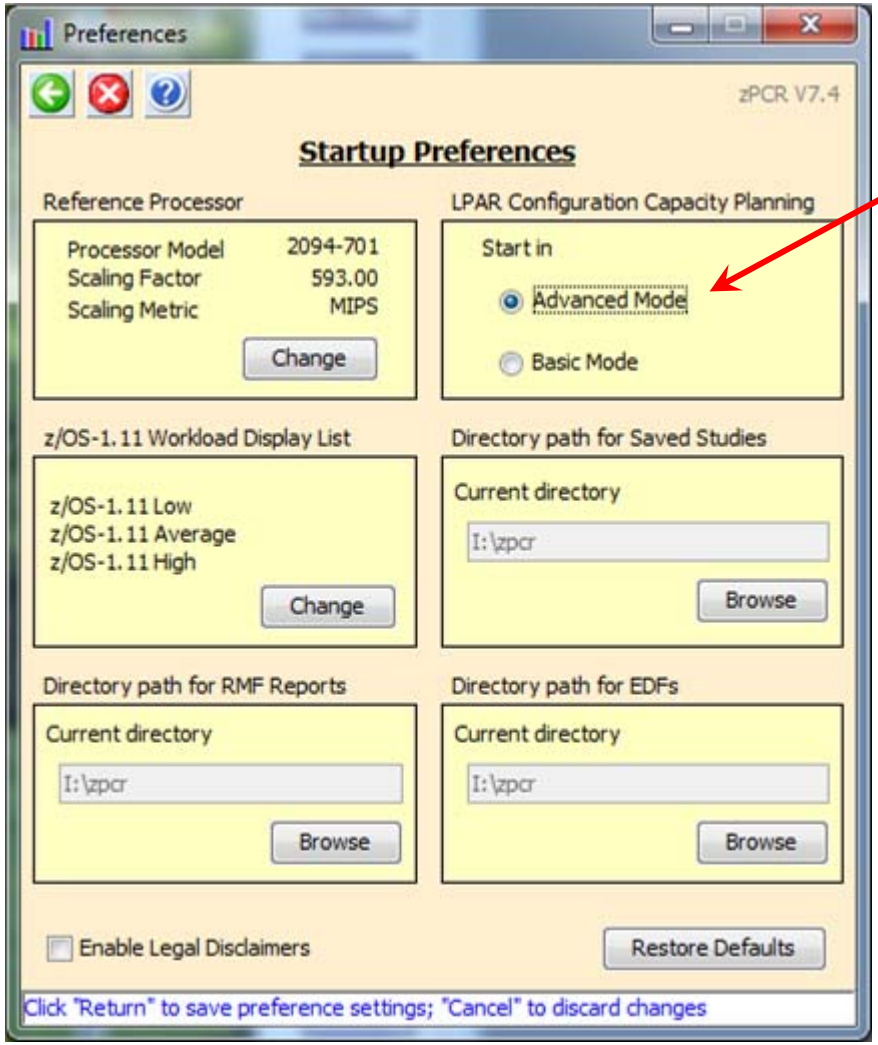
Select “Advanced-Mode” check box

Press **Enter** **Advanced-Mode**

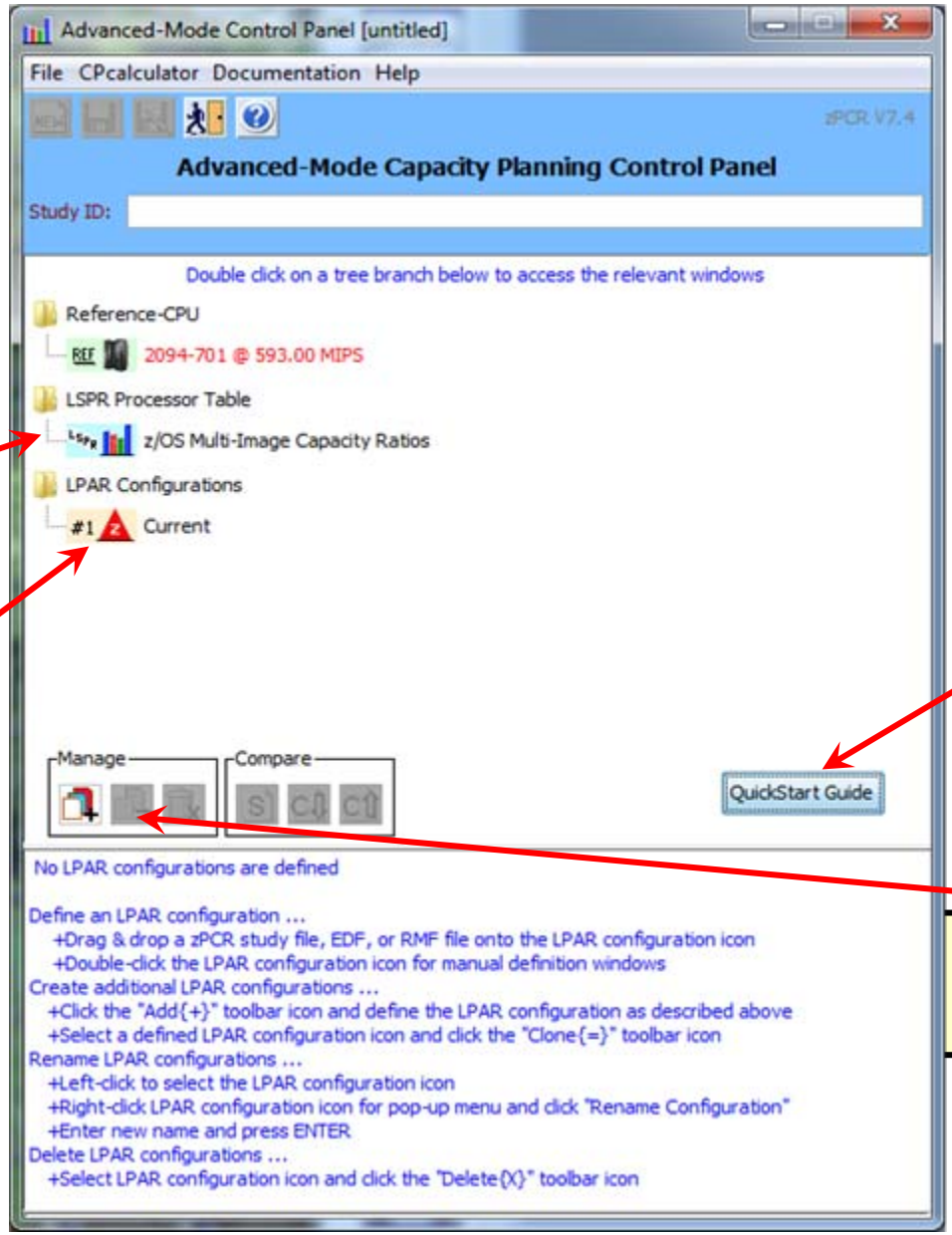


zPCR Startup Preferences

Set “Advanced Mode” as the default when starting zPCR



zPCR Advanced-Mode Capacity Planning Control Panel



View Muli-Image LSPR table

View "QuickStart" Guide

LPAR Configuration Planning Right "click" to rename up to 20 characters

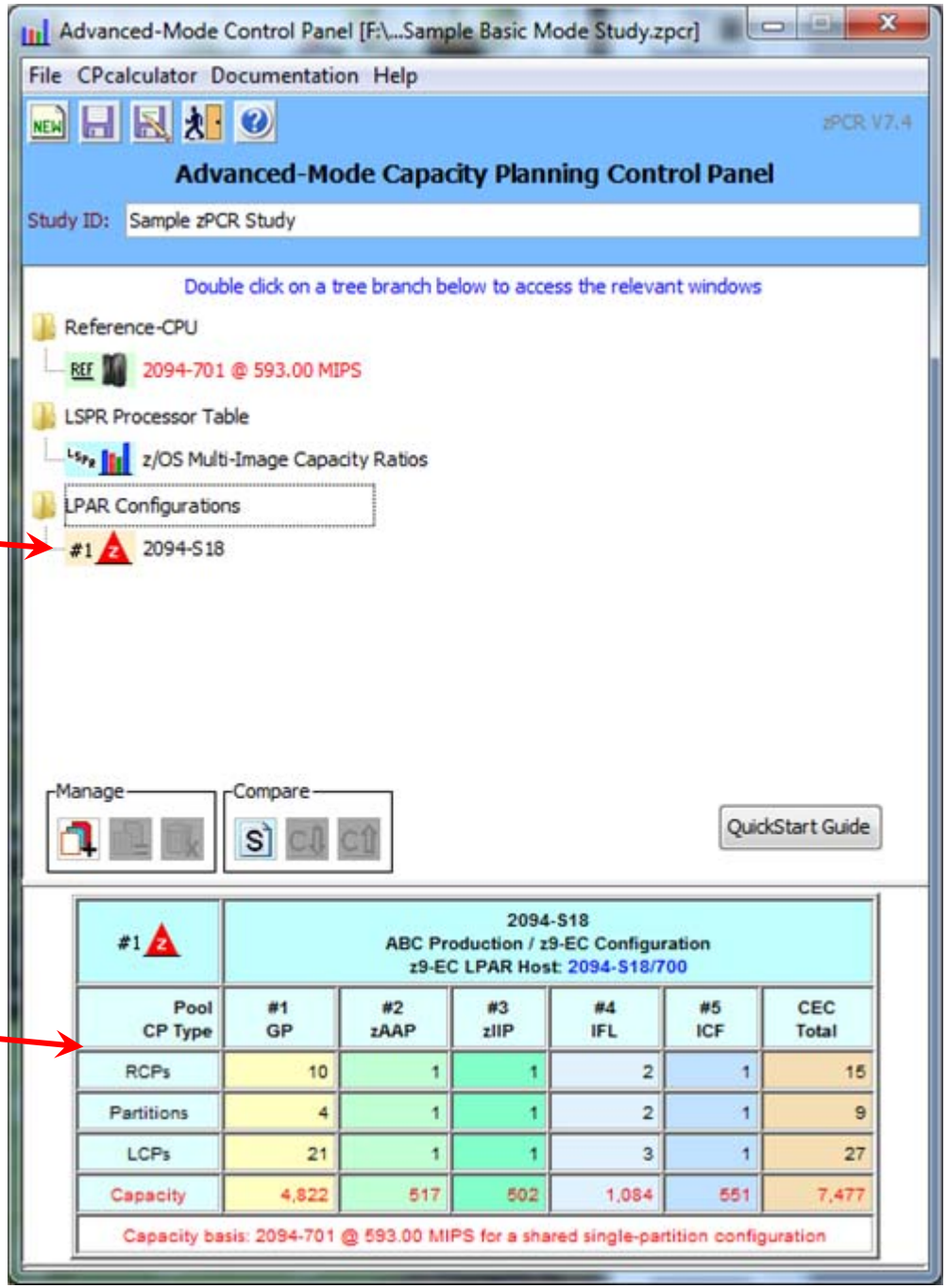
Manage Multiple Configurations

You may drag and drop zPCR study files, RMF reports or EDFs onto the LPAR Configurations planning area or use the file drop down to load zPCR study files.

zPCR Advanced-Mode Capacity Planning Control Panel

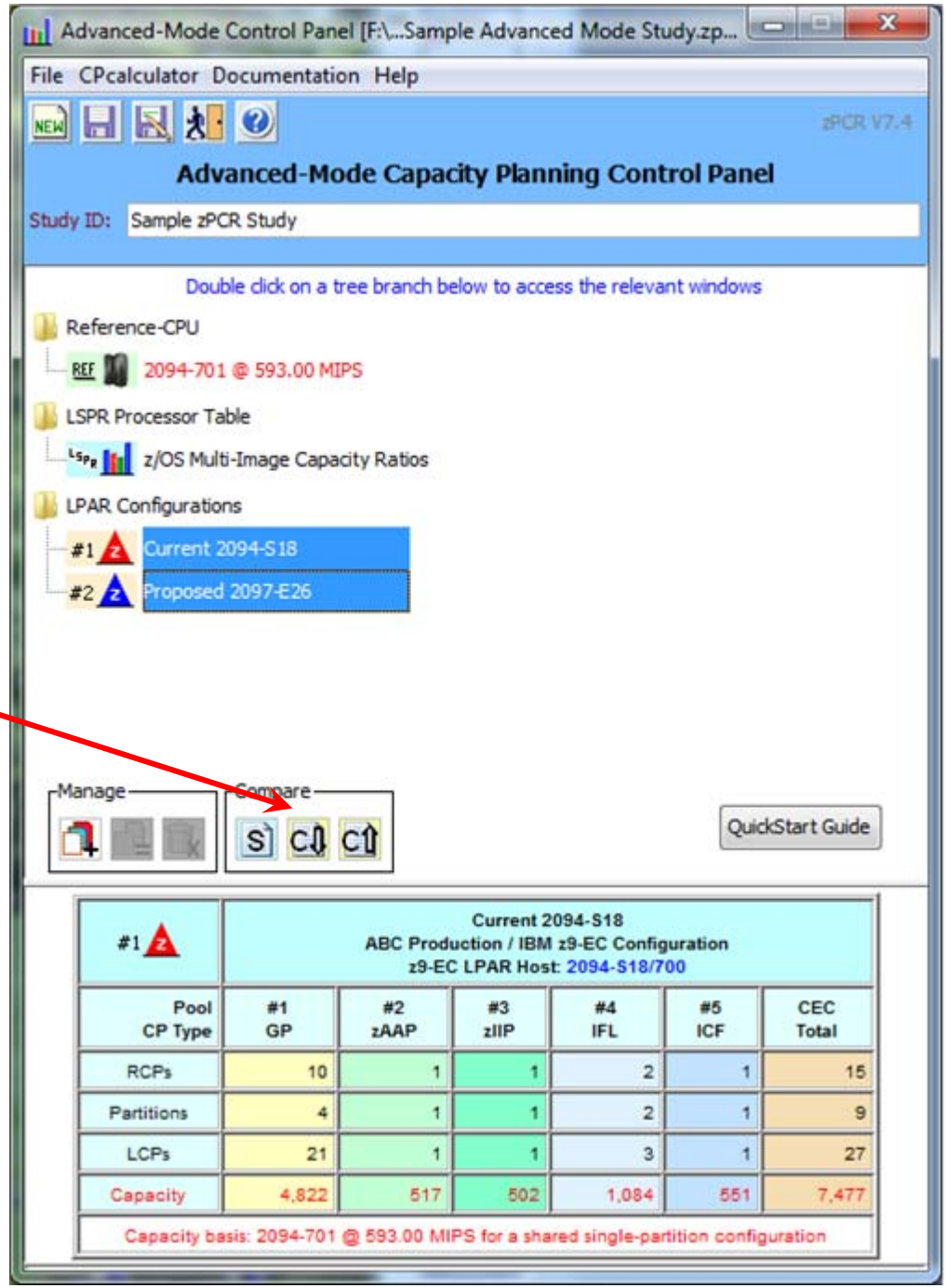
Configuration Renamed

Configuration Summary

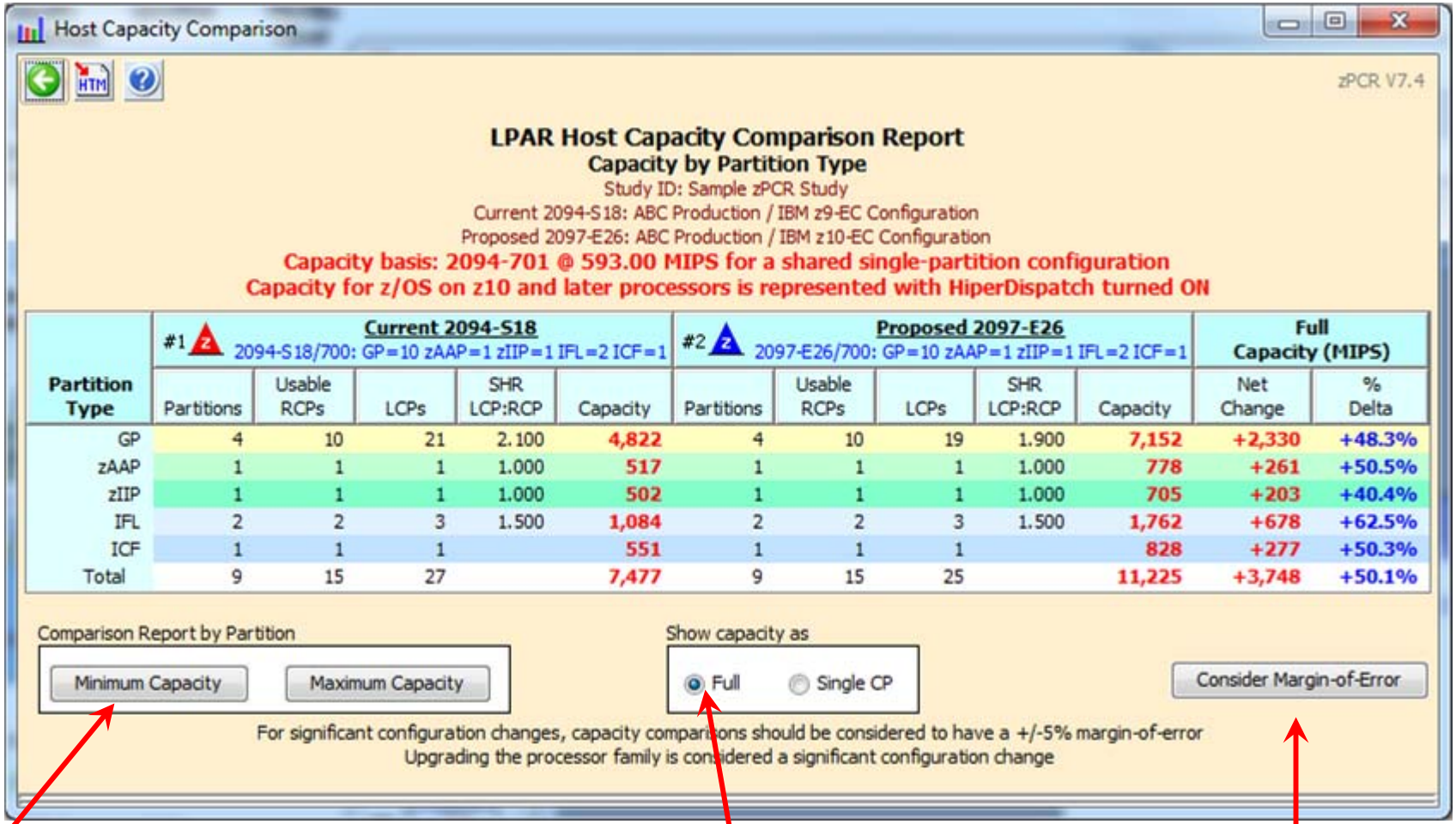


zPCR Advanced-Mode Capacity Planning Control Panel

Comparison Report



Host Capacity Comparison Report



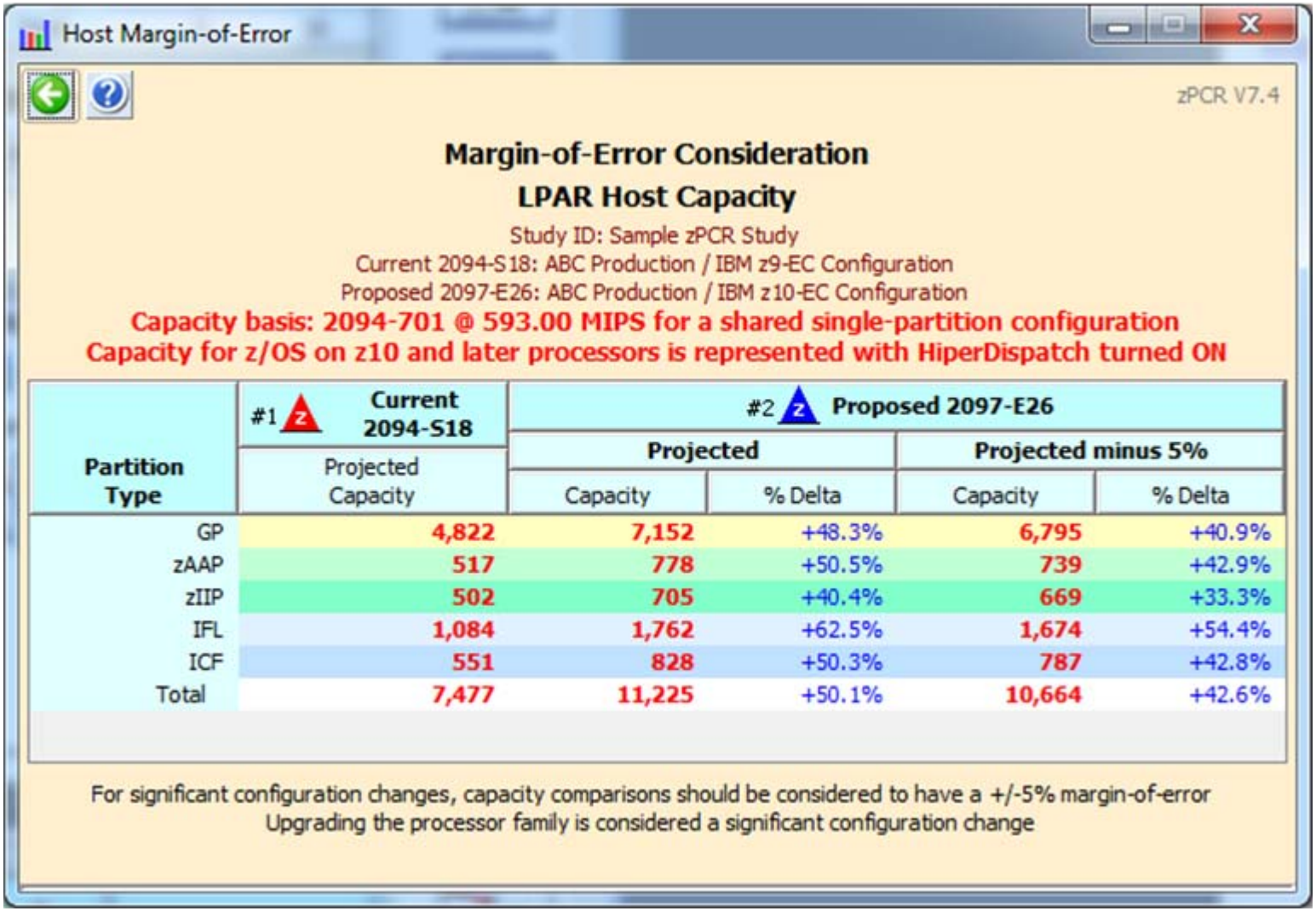
Partition Type	#1 Current 2094-S18 2094-S18/700: GP=10 zAAP=1 zIIP=1 IFL=2 ICF=1					#2 Proposed 2097-E26 2097-E26/700: GP=10 zAAP=1 zIIP=1 IFL=2 ICF=1					Full Capacity (MIPS)	
	Partitions	Usable RCPs	LCPs	SHR LCP:RCP	Capacity	Partitions	Usable RCPs	LCPs	SHR LCP:RCP	Capacity	Net Change	% Delta
GP	4	10	21	2.100	4,822	4	10	19	1.900	7,152	+2,330	+48.3%
zAAP	1	1	1	1.000	517	1	1	1	1.000	778	+261	+50.5%
zIIP	1	1	1	1.000	502	1	1	1	1.000	705	+203	+40.4%
IFL	2	2	3	1.500	1,084	2	2	3	1.500	1,762	+678	+62.5%
ICF	1	1	1		551	1	1	1		828	+277	+50.3%
Total	9	15	27		7,477	9	15	25		11,225	+3,748	+50.1%

Comparison Report by Partition

Show **Full** or **Single-CP** capacity

Margin-of-Error

Margin-of-Error Report



Host Margin-of-Error

zPCR V7.4

Margin-of-Error Consideration

LPAR Host Capacity

Study ID: Sample zPCR Study

Current 2094-S18: ABC Production / IBM z9-EC Configuration

Proposed 2097-E26: ABC Production / IBM z10-EC Configuration

Capacity basis: 2094-701 @ 593.00 MIPS for a shared single-partition configuration

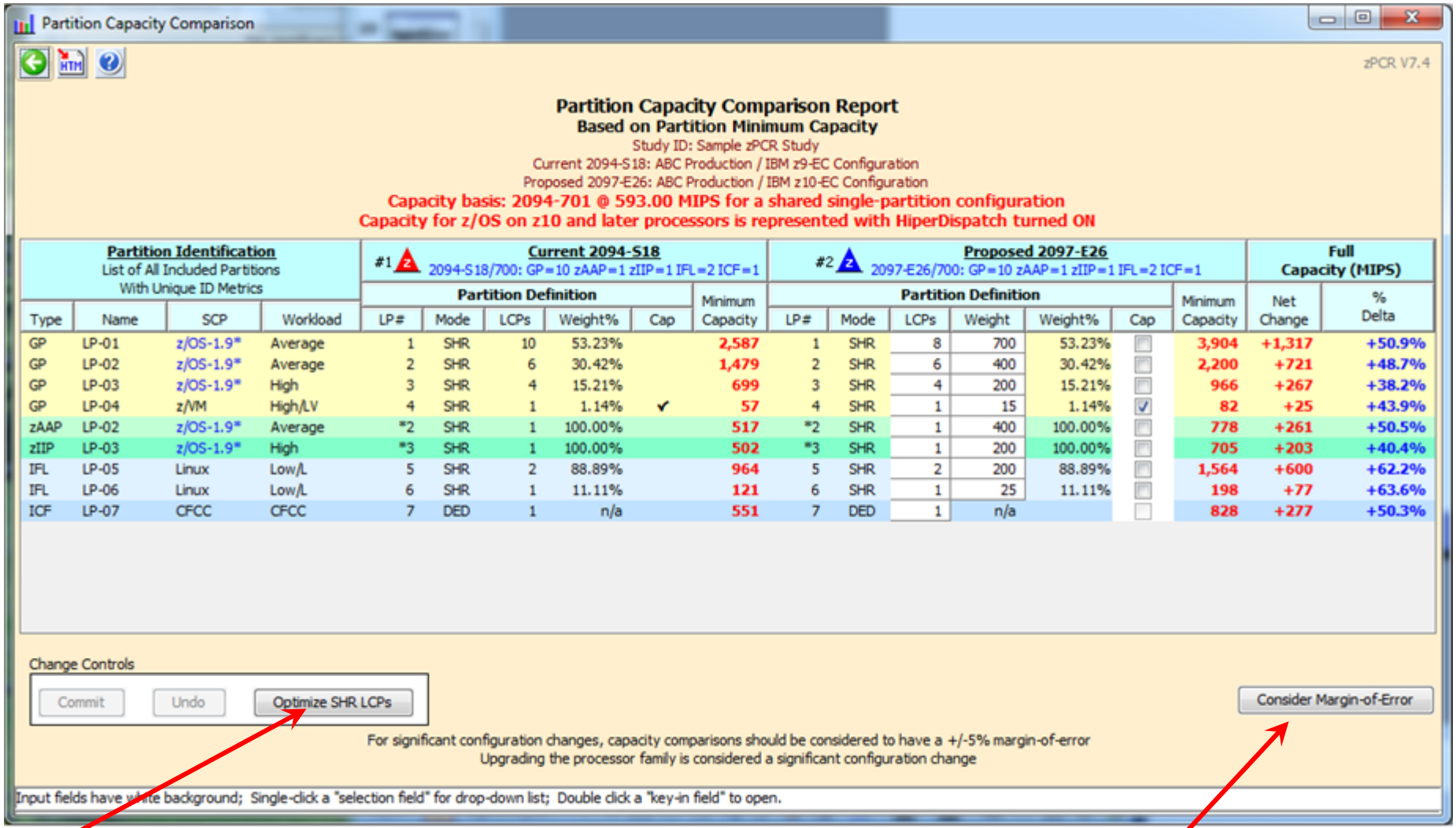
Capacity for z/OS on z10 and later processors is represented with HiperDispatch turned ON

Partition Type	#1 Current 2094-S18	#2 Proposed 2097-E26			
		Projected		Projected minus 5%	
	Projected Capacity	Capacity	% Delta	Capacity	% Delta
GP	4,822	7,152	+48.3%	6,795	+40.9%
zAAP	517	778	+50.5%	739	+42.9%
zIIP	502	705	+40.4%	669	+33.3%
IFL	1,084	1,762	+62.5%	1,674	+54.4%
ICF	551	828	+50.3%	787	+42.8%
Total	7,477	11,225	+50.1%	10,664	+42.6%

For significant configuration changes, capacity comparisons should be considered to have a +/-5% margin-of-error

Upgrading the processor family is considered a significant configuration change

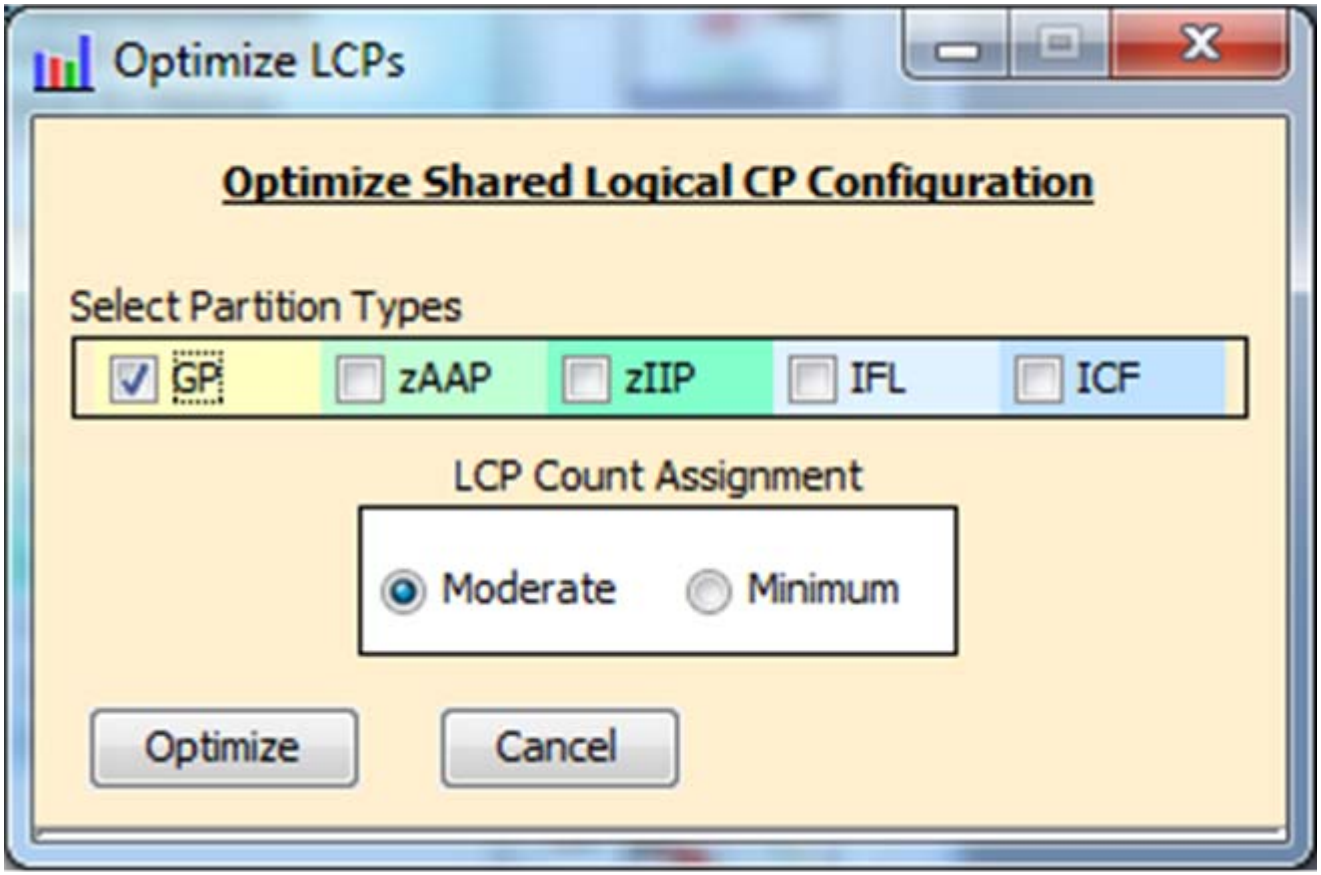
Partition Capacity Comparison Report



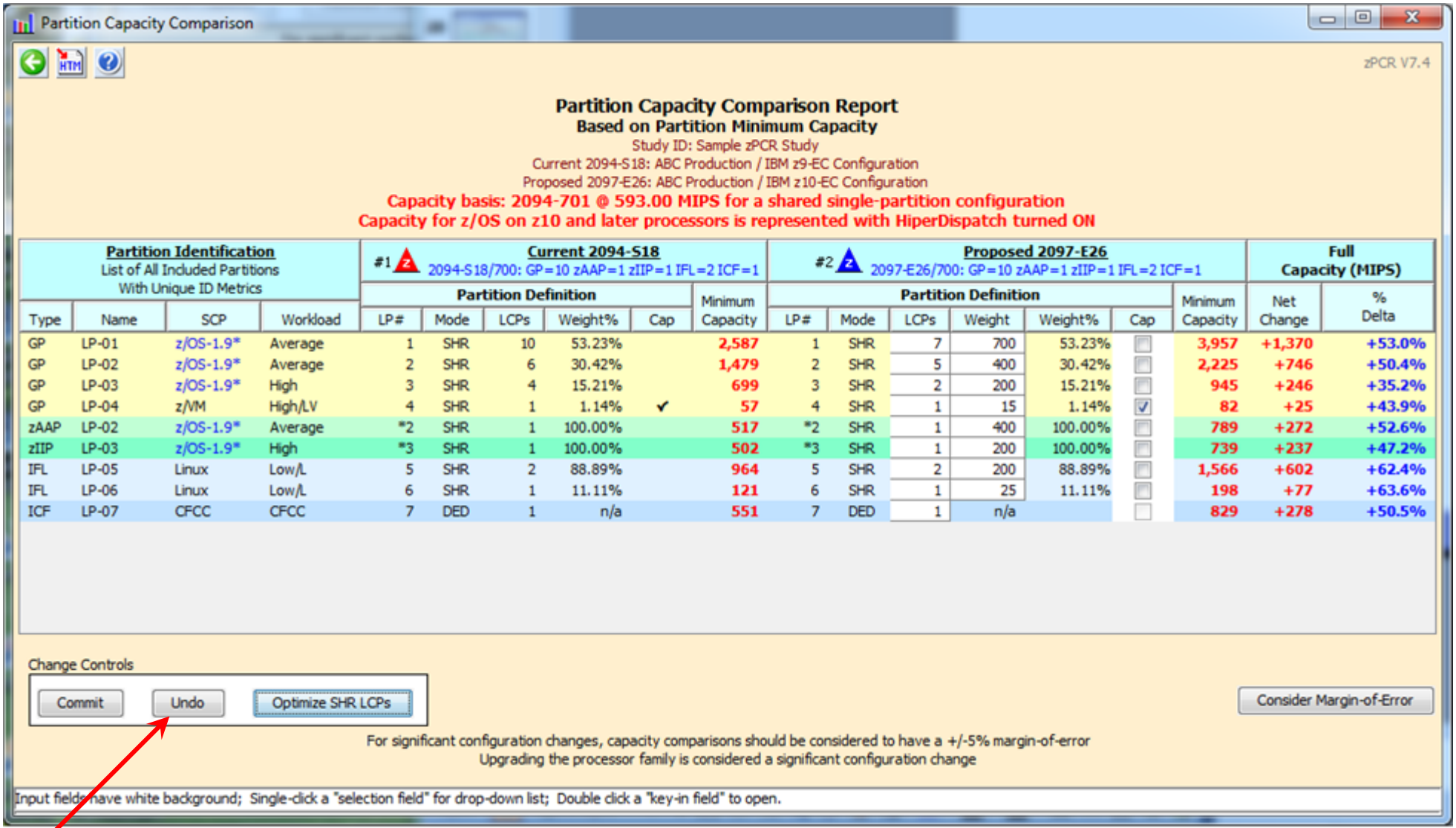
"Optimize" SHR LCPs

Margin-of-Error

Optimize Share LCP Configuration



Commit the Changes



Partition Capacity Comparison

zPCR V7.4

Partition Capacity Comparison Report
Based on Partition Minimum Capacity
Study ID: Sample zPCR Study
Current 2094-S18: ABC Production / IBM z9-EC Configuration
Proposed 2097-E26: ABC Production / IBM z10-EC Configuration
Capacity basis: 2094-701 @ 593.00 MIPS for a shared single-partition configuration
Capacity for z/OS on z10 and later processors is represented with HiperDispatch turned ON

Partition Identification (List of All Included Partitions With Unique ID Metrics)				#1 Current 2094-S18 2094-S18/700: GP=10 zAAP=1 zIIP=1 IFL=2 ICF=1						#2 Proposed 2097-E26 2097-E26/700: GP=10 zAAP=1 zIIP=1 IFL=2 ICF=1						Full Capacity (MIPS)		
				Partition Definition					Minimum	Partition Definition						Minimum	Net	%
Type	Name	SCP	Workload	LP#	Mode	LCPs	Weight%	Cap	Capacity	LP#	Mode	LCPs	Weight	Weight%	Cap	Capacity	Change	Delta
GP	LP-01	z/OS-1.9*	Average	1	SHR	10	53.23%		2,587	1	SHR	7	700	53.23%	☐	3,957	+1,370	+53.0%
GP	LP-02	z/OS-1.9*	Average	2	SHR	6	30.42%		1,479	2	SHR	5	400	30.42%	☐	2,225	+746	+50.4%
GP	LP-03	z/OS-1.9*	High	3	SHR	4	15.21%		699	3	SHR	2	200	15.21%	☐	945	+246	+35.2%
GP	LP-04	z/VM	High/LV	4	SHR	1	1.14%	✔	57	4	SHR	1	15	1.14%	☑	82	+25	+43.9%
zAAP	LP-02	z/OS-1.9*	Average	*2	SHR	1	100.00%		517	*2	SHR	1	400	100.00%	☐	789	+272	+52.6%
zIIP	LP-03	z/OS-1.9*	High	*3	SHR	1	100.00%		502	*3	SHR	1	200	100.00%	☐	739	+237	+47.2%
IFL	LP-05	Linux	Low/L	5	SHR	2	88.89%		964	5	SHR	2	200	88.89%	☐	1,566	+602	+62.4%
IFL	LP-06	Linux	Low/L	6	SHR	1	11.11%		121	6	SHR	1	25	11.11%	☐	198	+77	+63.6%
ICF	LP-07	CFCC	CFCC	7	DED	1	n/a		551	7	DED	1	n/a		☐	829	+278	+50.5%

Change Controls

Commit | Undo | Optimize SHR LCPs

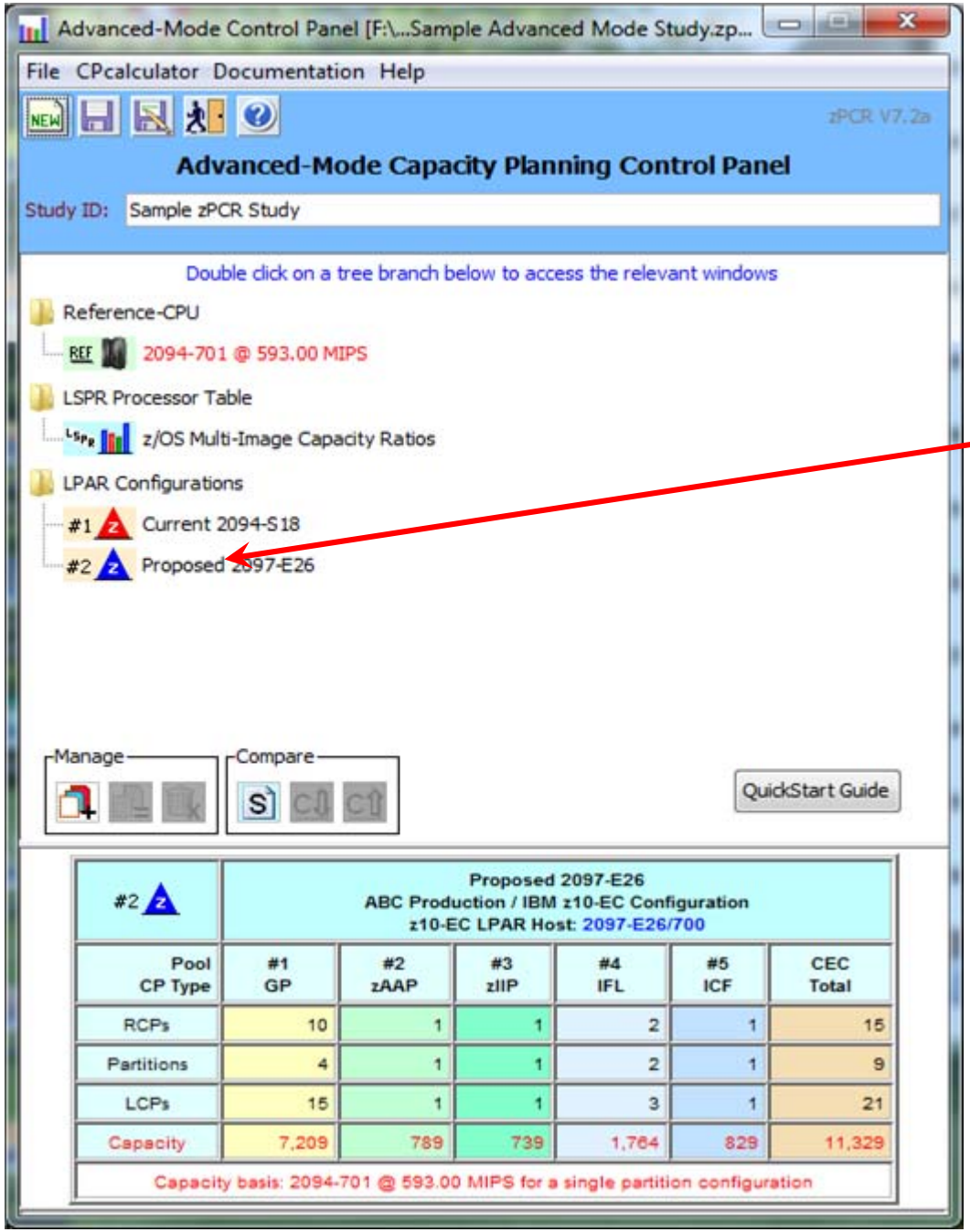
Consider Margin-of-Error

For significant configuration changes, capacity comparisons should be considered to have a +/-5% margin-of-error
Upgrading the processor family is considered a significant configuration change

Input fields have white background; Single-click a "selection field" for drop-down list; Double click a "key-in field" to open.

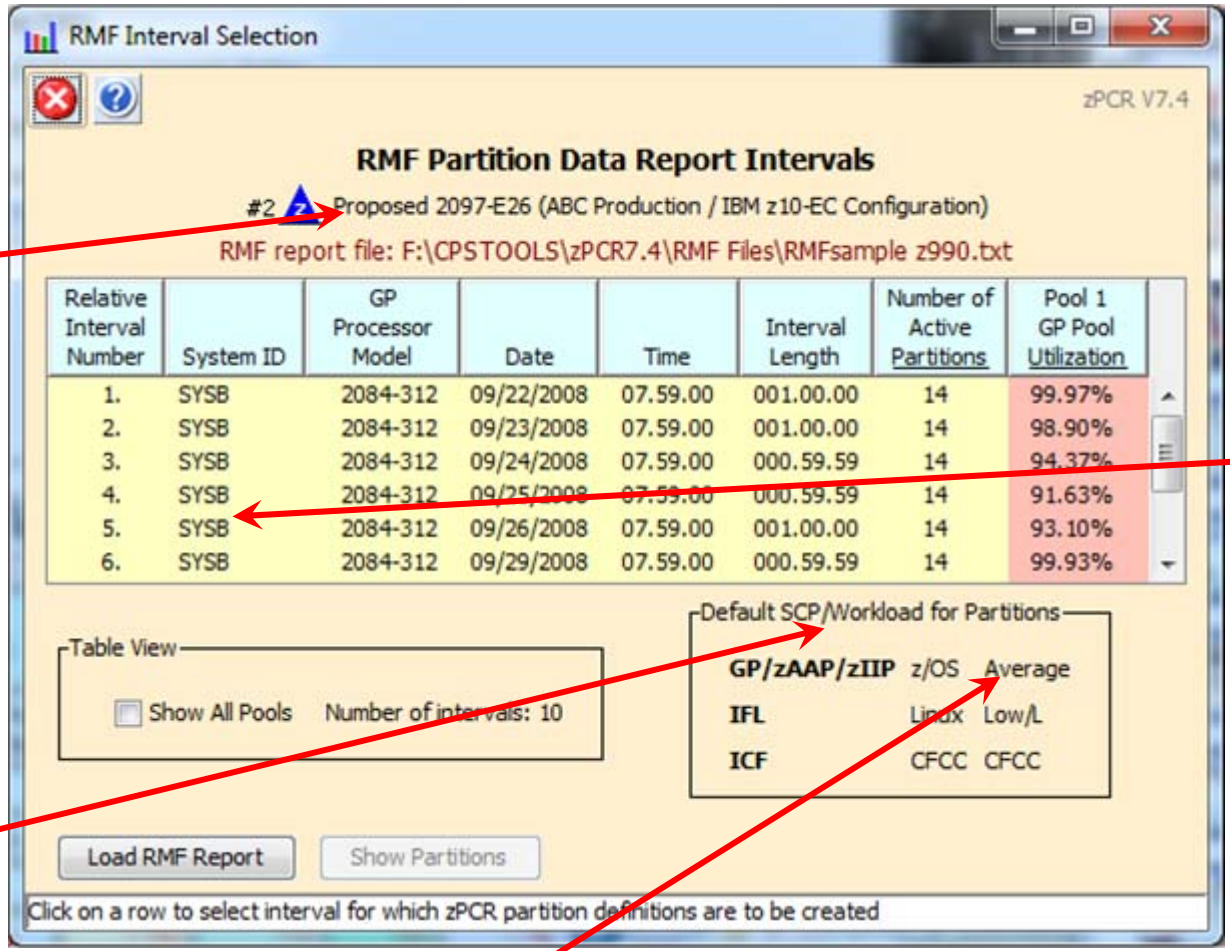
Commit or Undo Changes

Add additional partitions from RMF



Select “RMF” report and drag it onto the “Proposed 2097-E26” configuration

RMF Interval Selection



"Proposed 2097-E26" configuration

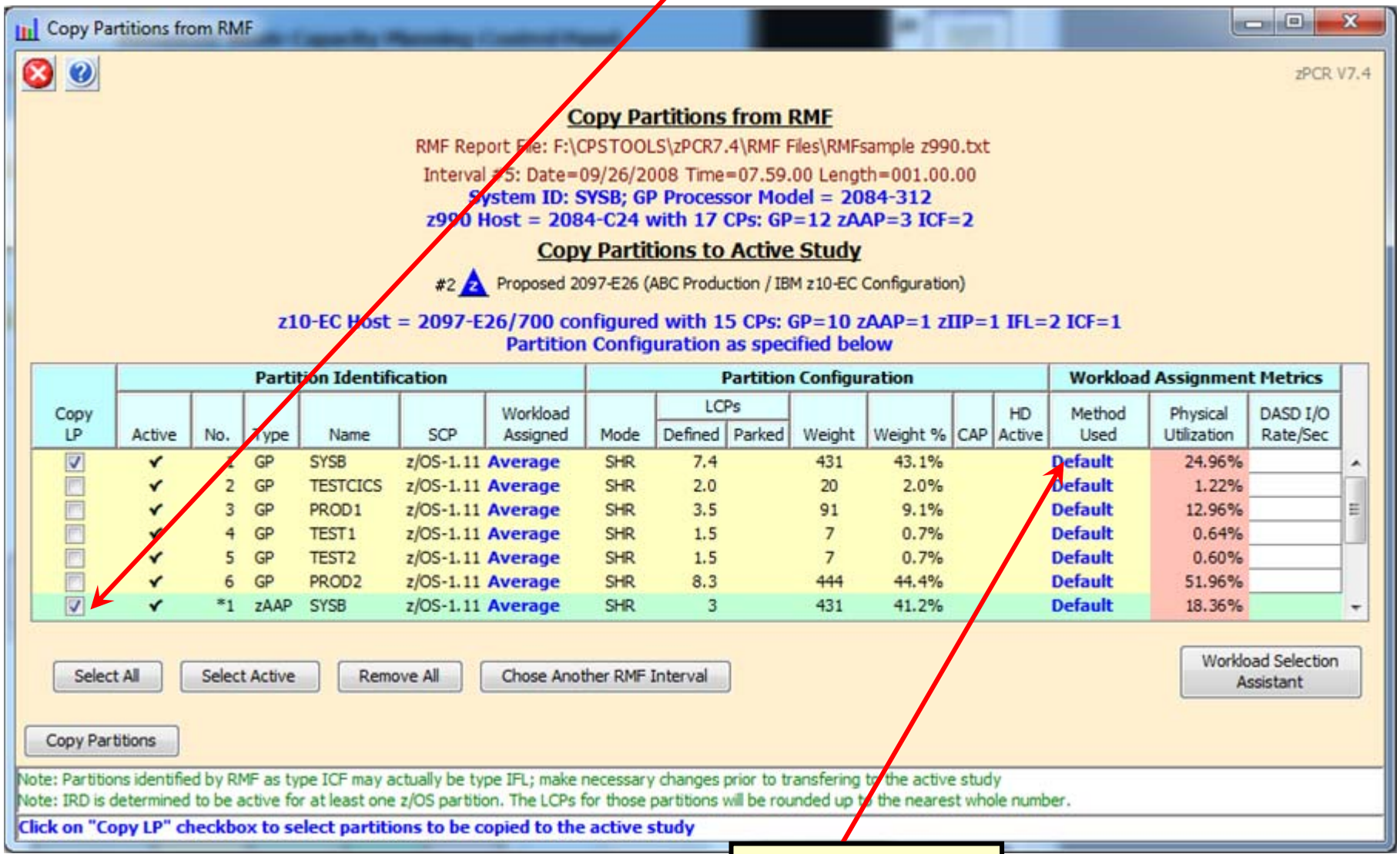
Select an interval

Default SCPs for Partitions

Default z/OS workload is Average

Get specific partitions from RMF

Select the partitions to be added. Note zAAP/zIIP partitions will always follow the GP partition.

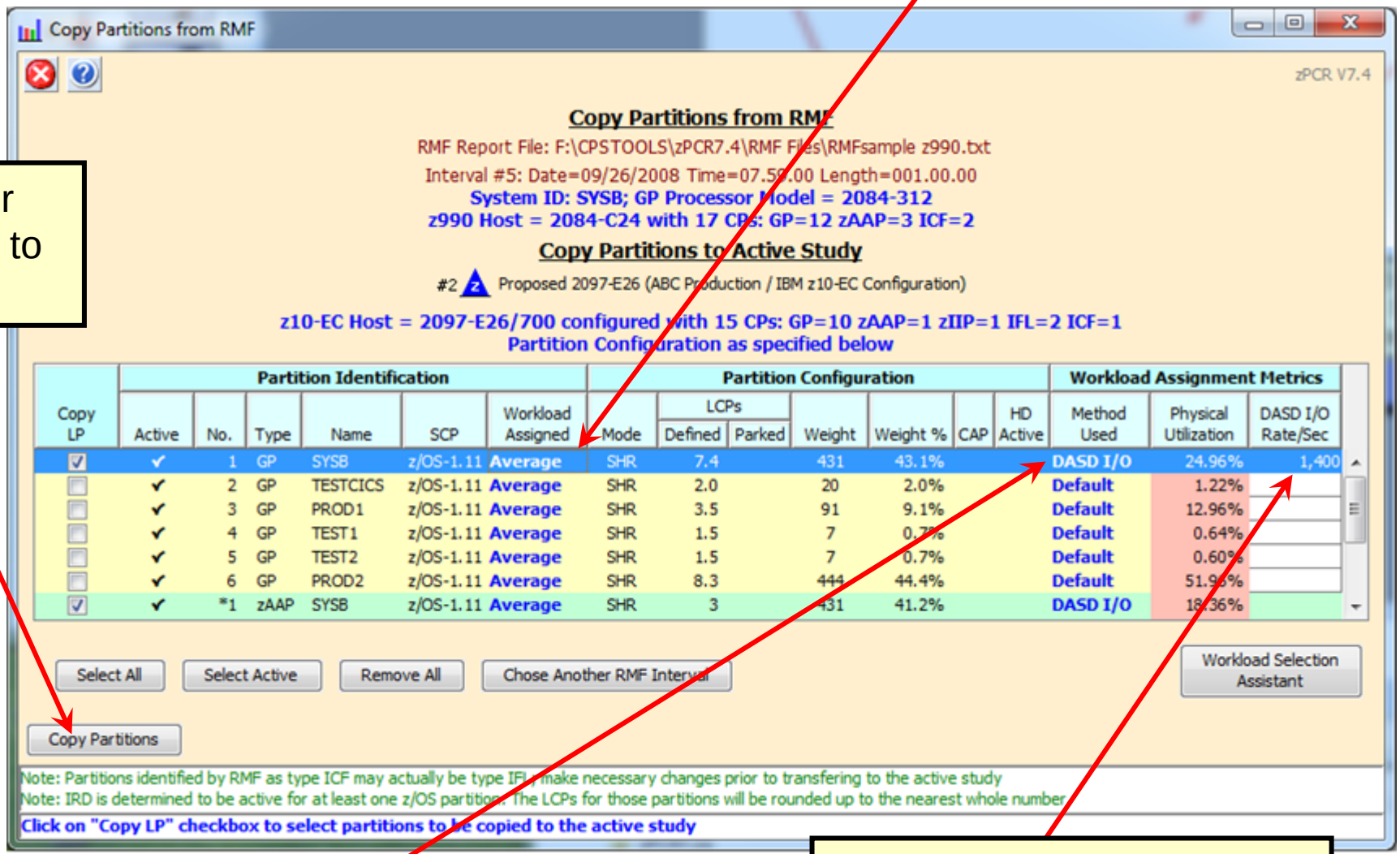


Determine the Workload

Determine the appropriate SCP/workloads

Workload assigned from the "Method" used

Transfer partitions to zPCR

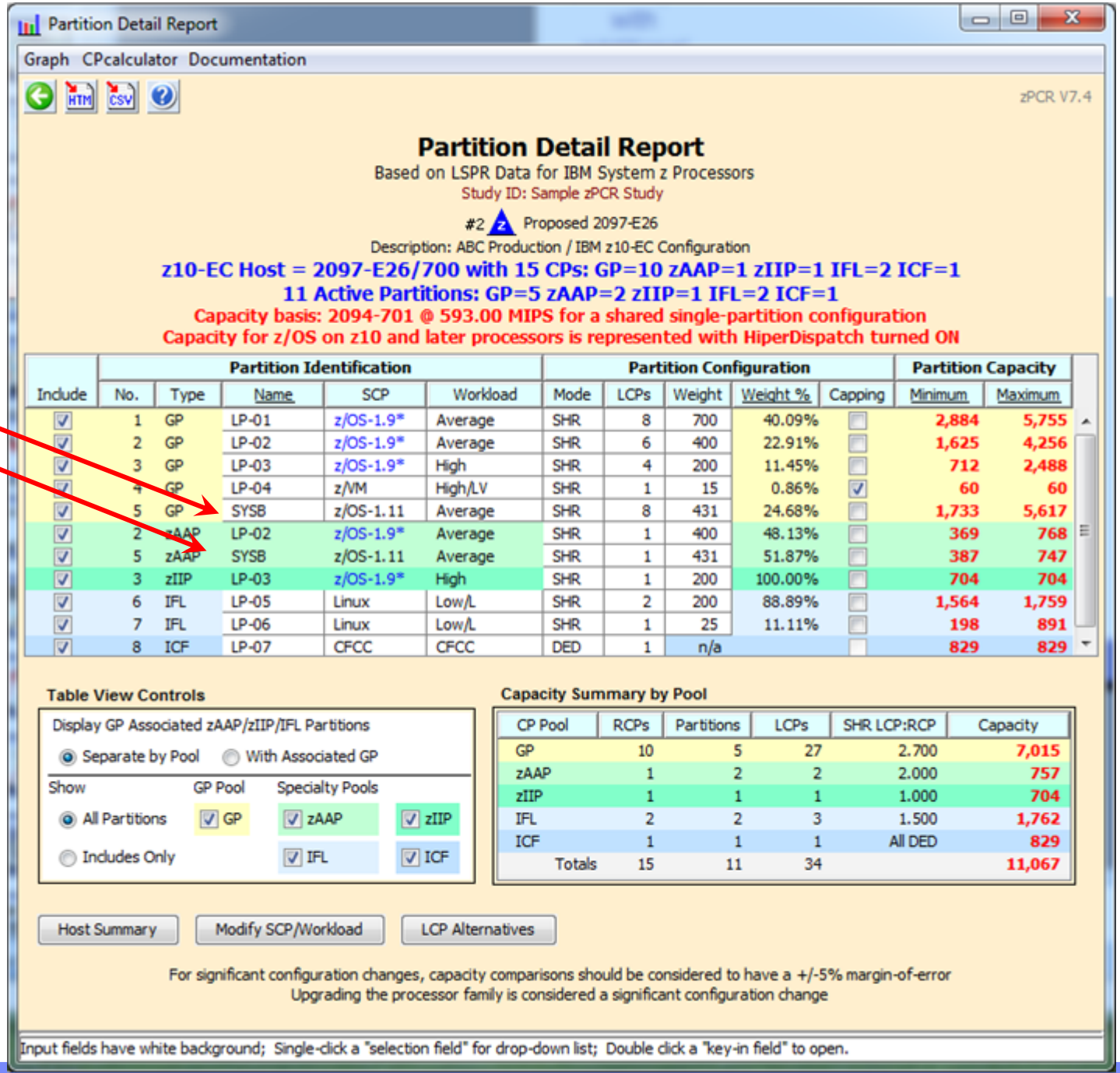


Method used is either "Default" or DASD I/O

Enter DASD I/Os per Second from RMF Workload Activity Report

Detail report with additional partitions added

Added partitions from RMF



Partition Detail Report

Graph CPcalculator Documentation

zPCR V7.4

Partition Detail Report

Based on LSPR Data for IBM System z Processors

Study ID: Sample zPCR Study

#2 Proposed 2097-E26

Description: ABC Production / IBM z10-EC Configuration

z10-EC Host = 2097-E26/700 with 15 CPs: GP=10 zAAP=1 zIIP=1 IFL=2 ICF=1

11 Active Partitions: GP=5 zAAP=2 zIIP=1 IFL=2 ICF=1

Capacity basis: 2094-701 @ 593.00 MIPS for a shared single-partition configuration

Capacity for z/OS on z10 and later processors is represented with HiperDispatch turned ON

Include	Partition Identification					Partition Configuration					Partition Capacity	
	No.	Type	Name	SCP	Workload	Mode	LCPs	Weight	Weight %	Capping	Minimum	Maximum
☑	1	GP	LP-01	z/OS-1.9*	Average	SHR	8	700	40.09%	☐	2,884	5,755
☑	2	GP	LP-02	z/OS-1.9*	Average	SHR	6	400	22.91%	☐	1,625	4,256
☑	3	GP	LP-03	z/OS-1.9*	High	SHR	4	200	11.45%	☐	712	2,488
☑	4	GP	LP-04	z/VM	High/LV	SHR	1	15	0.86%	☑	60	60
☑	5	GP	SYSB	z/OS-1.11	Average	SHR	8	431	24.68%	☐	1,733	5,617
☑	2	zAAP	LP-02	z/OS-1.9*	Average	SHR	1	400	48.13%	☐	369	768
☑	5	zAAP	SYSB	z/OS-1.11	Average	SHR	1	431	51.87%	☐	387	747
☑	3	zIIP	LP-03	z/OS-1.9*	High	SHR	1	200	100.00%	☐	704	704
☑	6	IFL	LP-05	Linux	Low/L	SHR	2	200	88.89%	☐	1,564	1,759
☑	7	IFL	LP-06	Linux	Low/L	SHR	1	25	11.11%	☐	198	891
☑	8	ICF	LP-07	CFCC	CFCC	DED	1	n/a		☐	829	829

Table View Controls

Display GP Associated zAAP/zIIP/IFL Partitions

Separate by Pool / With Associated GP

Show: All Partitions / Includes Only

GP Pool: ☑ GP

Specialty Pools: ☑ zAAP ☑ zIIP ☑ IFL ☑ ICF

Capacity Summary by Pool

CP Pool	RCPs	Partitions	LCPs	SHR LCP:RCP	Capacity
GP	10	5	27	2.700	7,015
zAAP	1	2	2	2.000	757
zIIP	1	1	1	1.000	704
IFL	2	2	3	1.500	1,762
ICF	1	1	1	All DED	829
Totals	15	11	34		11,067

Host Summary | Modify SCP/Workload | LCP Alternatives

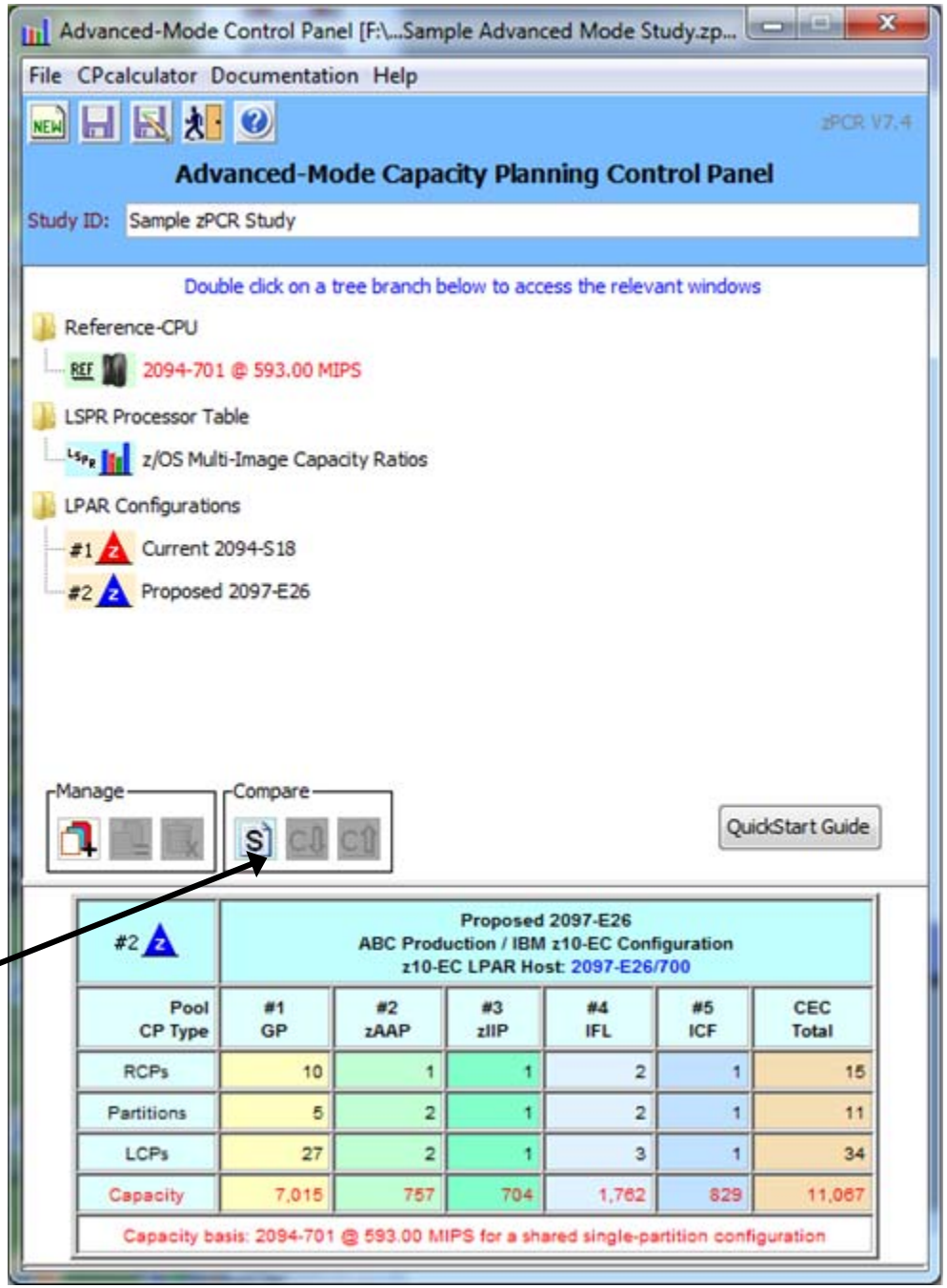
For significant configuration changes, capacity comparisons should be considered to have a +/-5% margin-of-error

Upgrading the processor family is considered a significant configuration change

Input fields have white background; Single-click a "selection field" for drop-down list; Double click a "key-in field" to open.

Show Host Capacity Summary

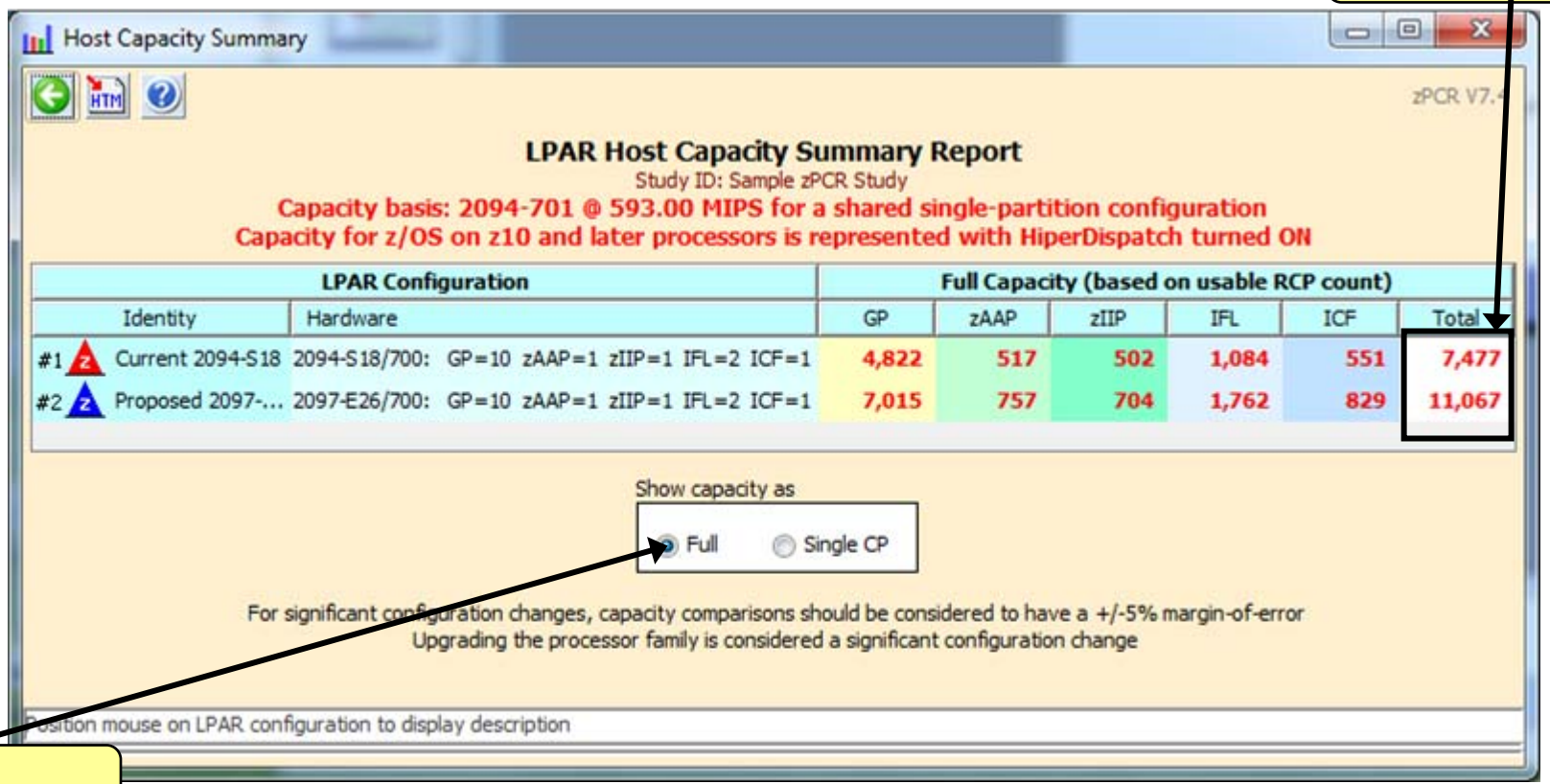
- Click on the ***Host Capacity Summary*** icon to view the report.

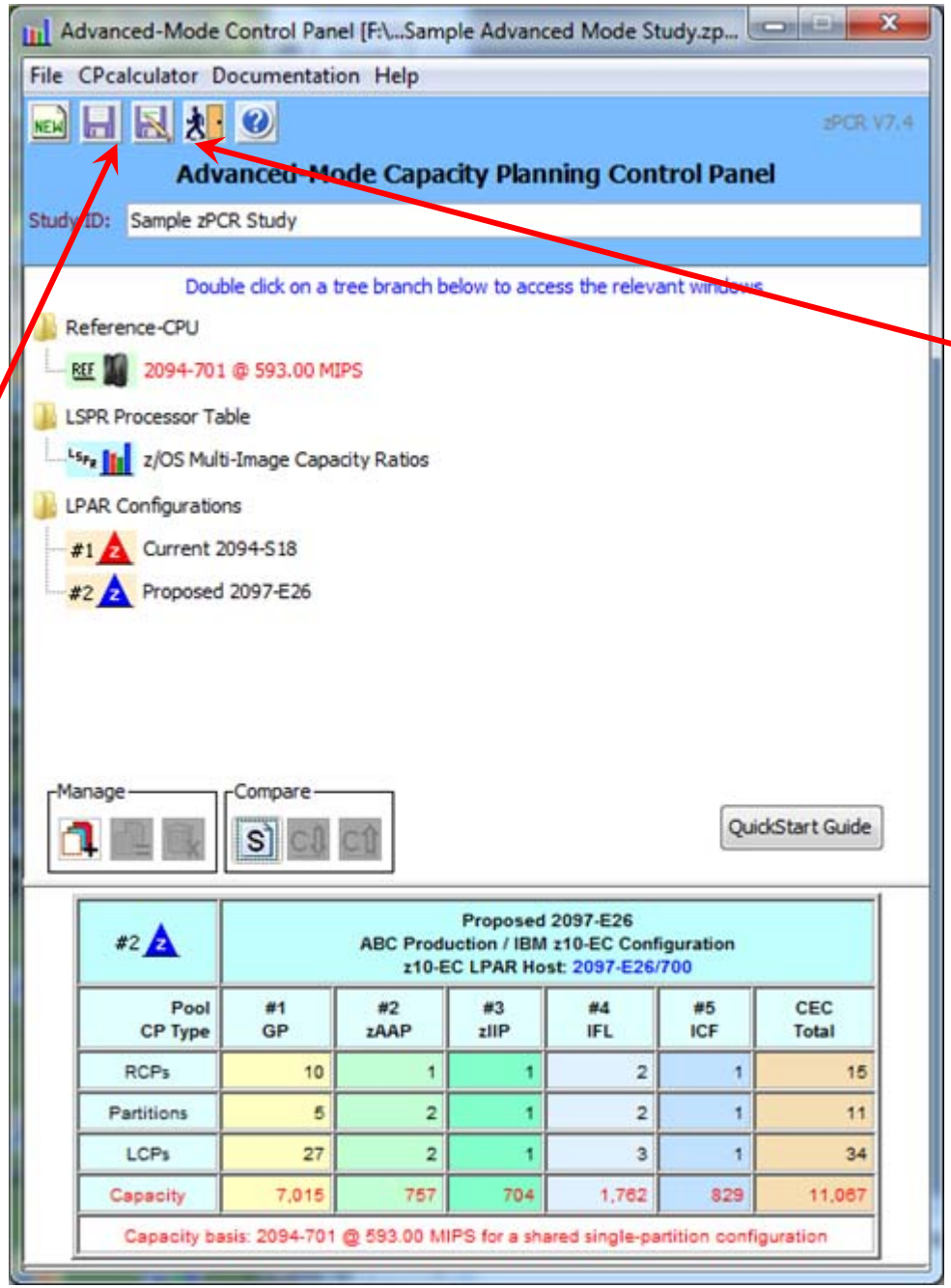


Click Host Capacity Summary

Host Capacity Summary

- For each defined LPAR configuration, its icon and name are provided, along with the processor model information and number of real CPs configured to each pool.
- To display the description field of any LPAR configuration, place the mouse pointer anywhere on that row.
- Capacity projections may be cycled between **Full** capacity and **Single-CP** capacity using the radio buttons. This is useful for revealing relative engine speed when comparing LPAR configurations where the host family is changed.
- Click on the **Return** to take you back at the **Advanced-Mode Control Panel**.



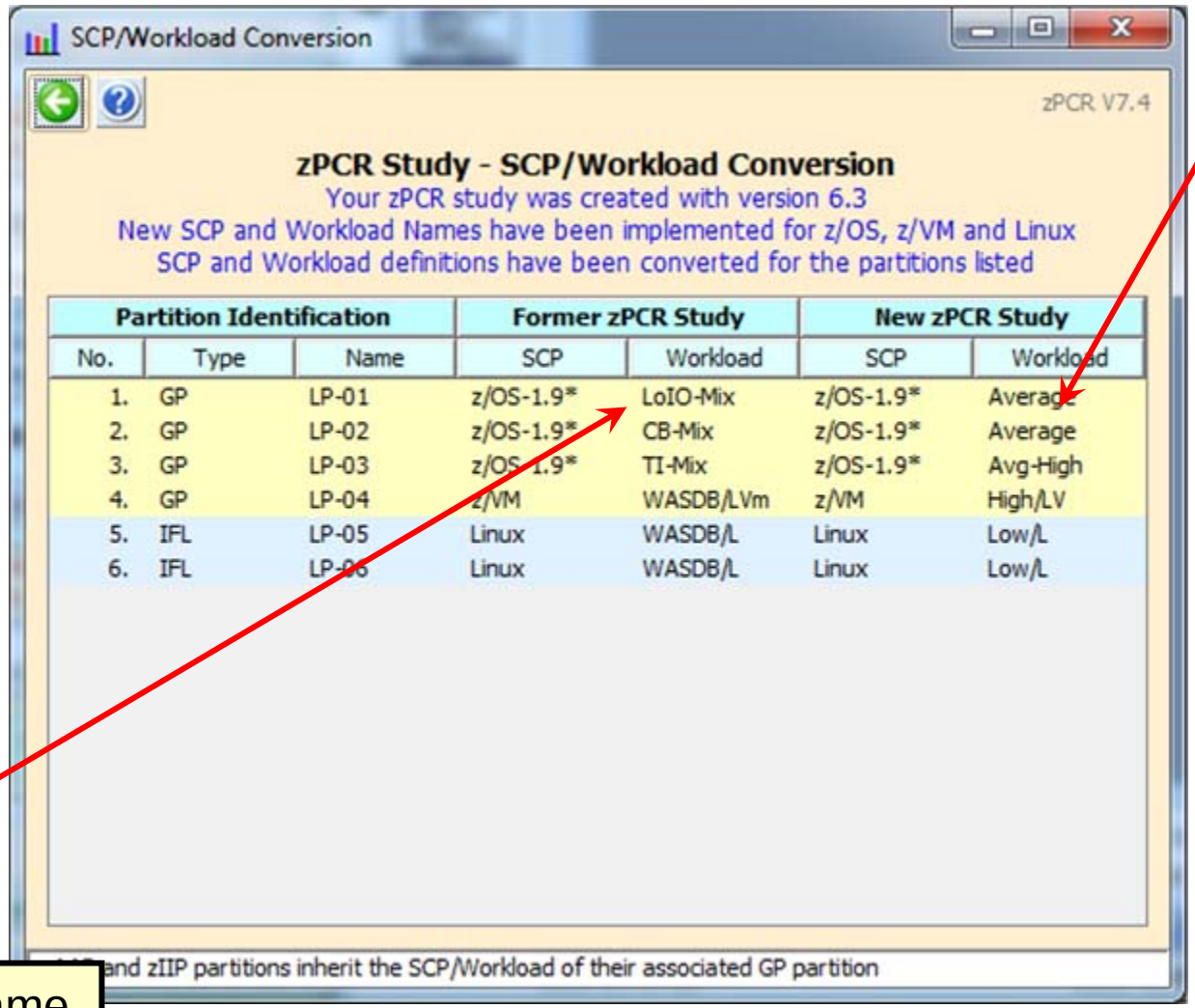


Exit zPCR

Save Study

Automated SCP/Workload conversion for previous zPCR study file…

New workload name



Previous workload name

EDF Input for zPCR

z/OS on System z

Turn on CPU MF to start SMF 113 recording (primary partitions)

Post process SMF data with CP3KEXTR to produce EDF

Get zPCR CP3KEXTR here: http://www.ibm.com/support/techdocs/atsmastr.nsf/WebIndex/PRS4229

Windows PC with zPCR installed

Download EDF (1 per partition) to PC

In zPCR, Get Host and Partitions from EDF

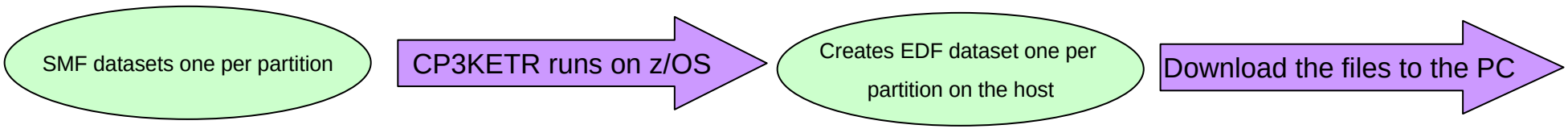
Load EDF(s)

Select a representative interval

Show LPAR Host and its partition configuration

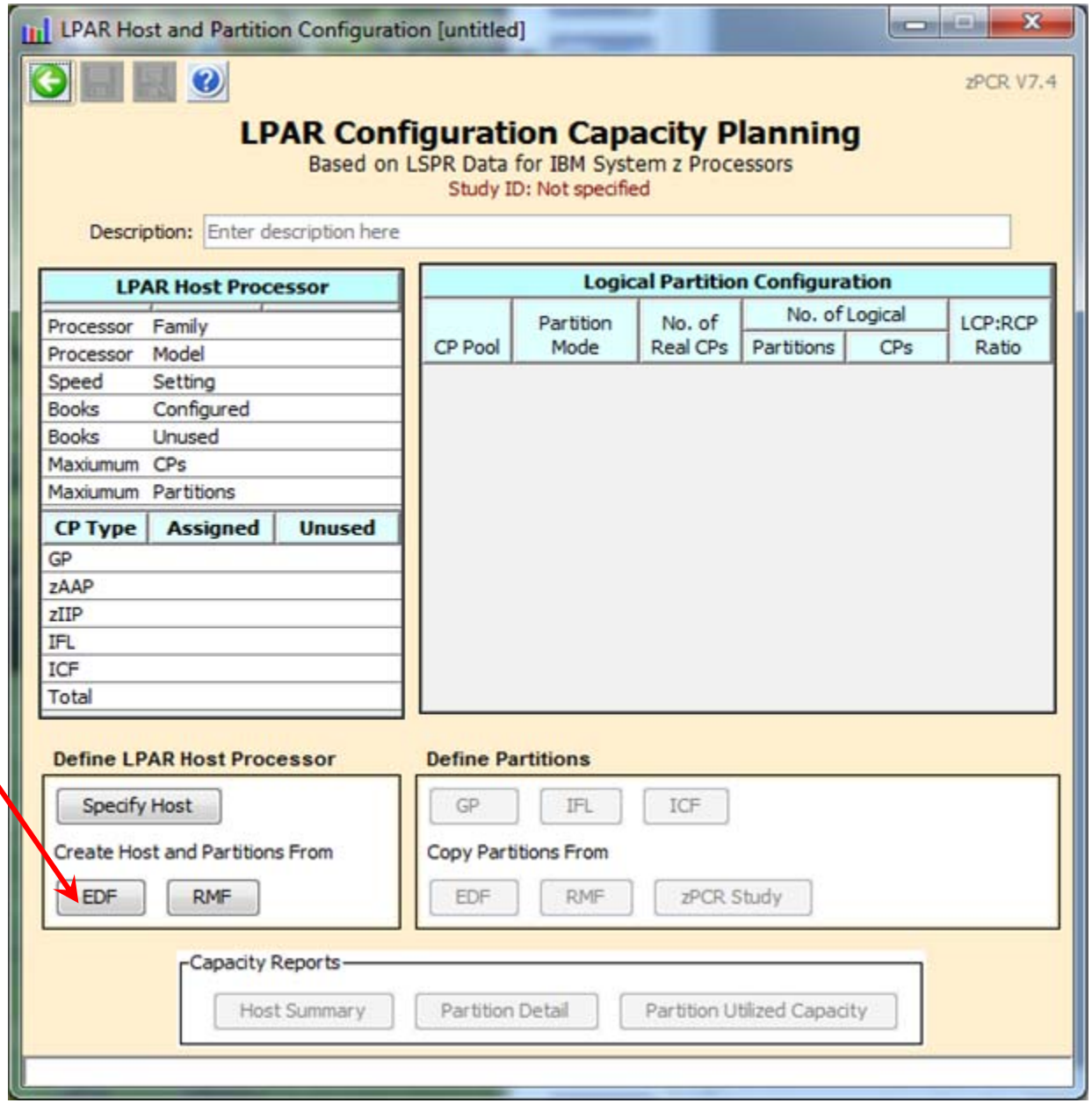
Create LPAR Configuration

- Partition workloads assigned based on DASD I/O or default
- Partitions with SMF 113 data will show “CPU MF Hint” workload



Load the EDF files into zPCR

Get host and partitions from EDF file



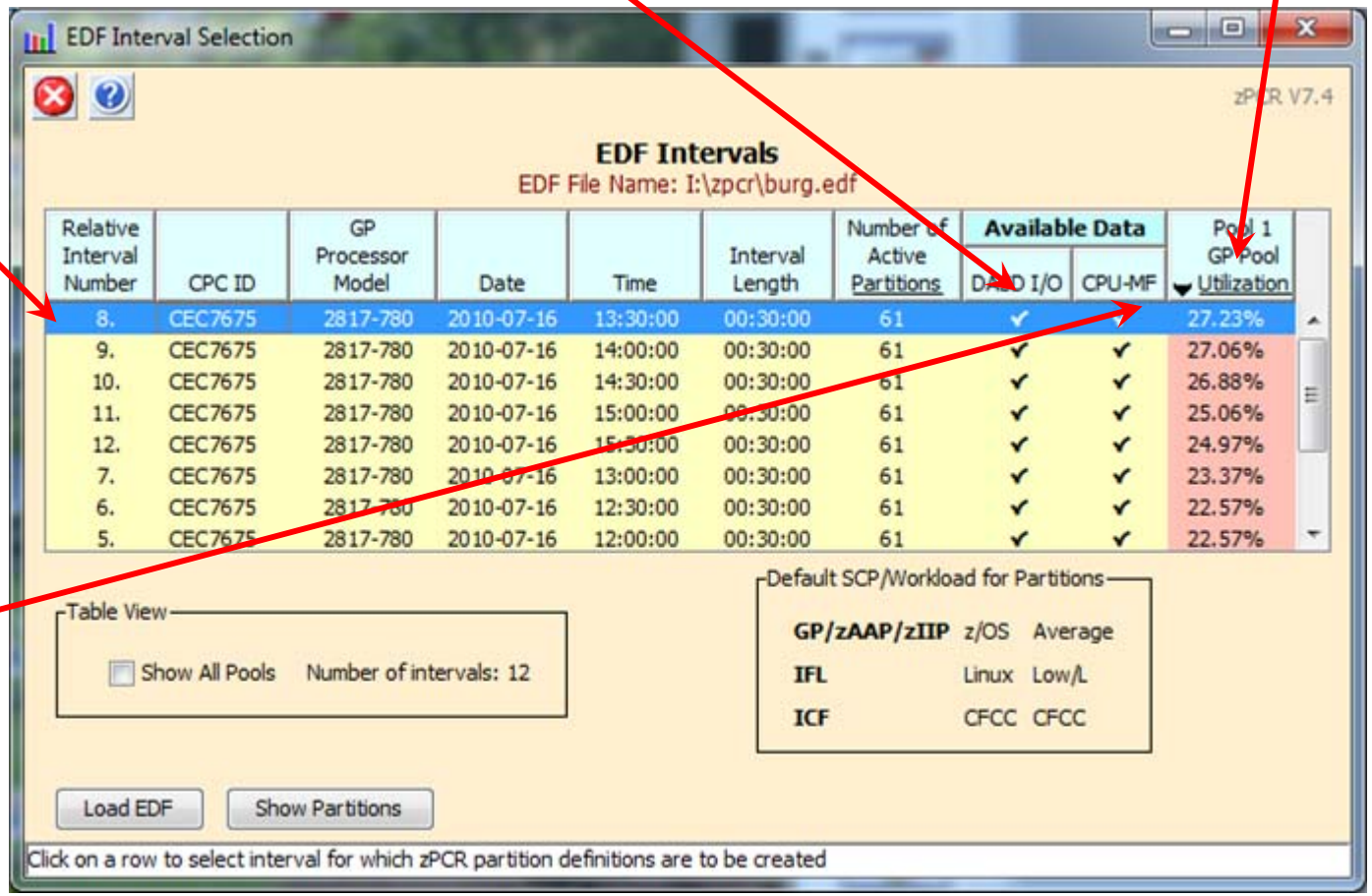
Load the EDF files into zPCR

Select an interval

DASD I/O data available

Sort on GP Pool Utilization

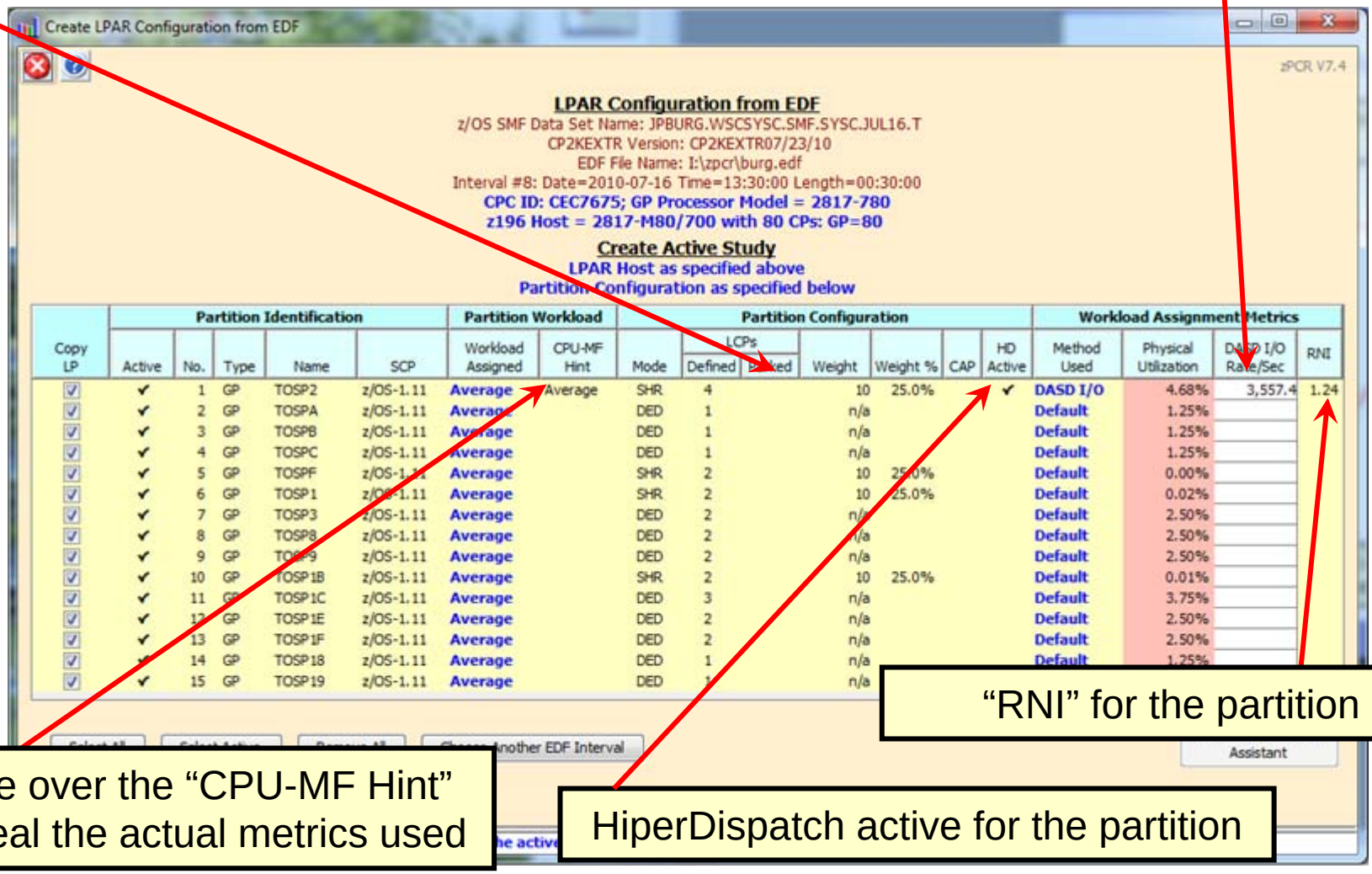
CPU MF (SMF 113) data available



Important Considerations when getting LPAR configuration metrics

Parked Engines for the partition.
None for this interval

DASD I/Os per second from RMF 74s



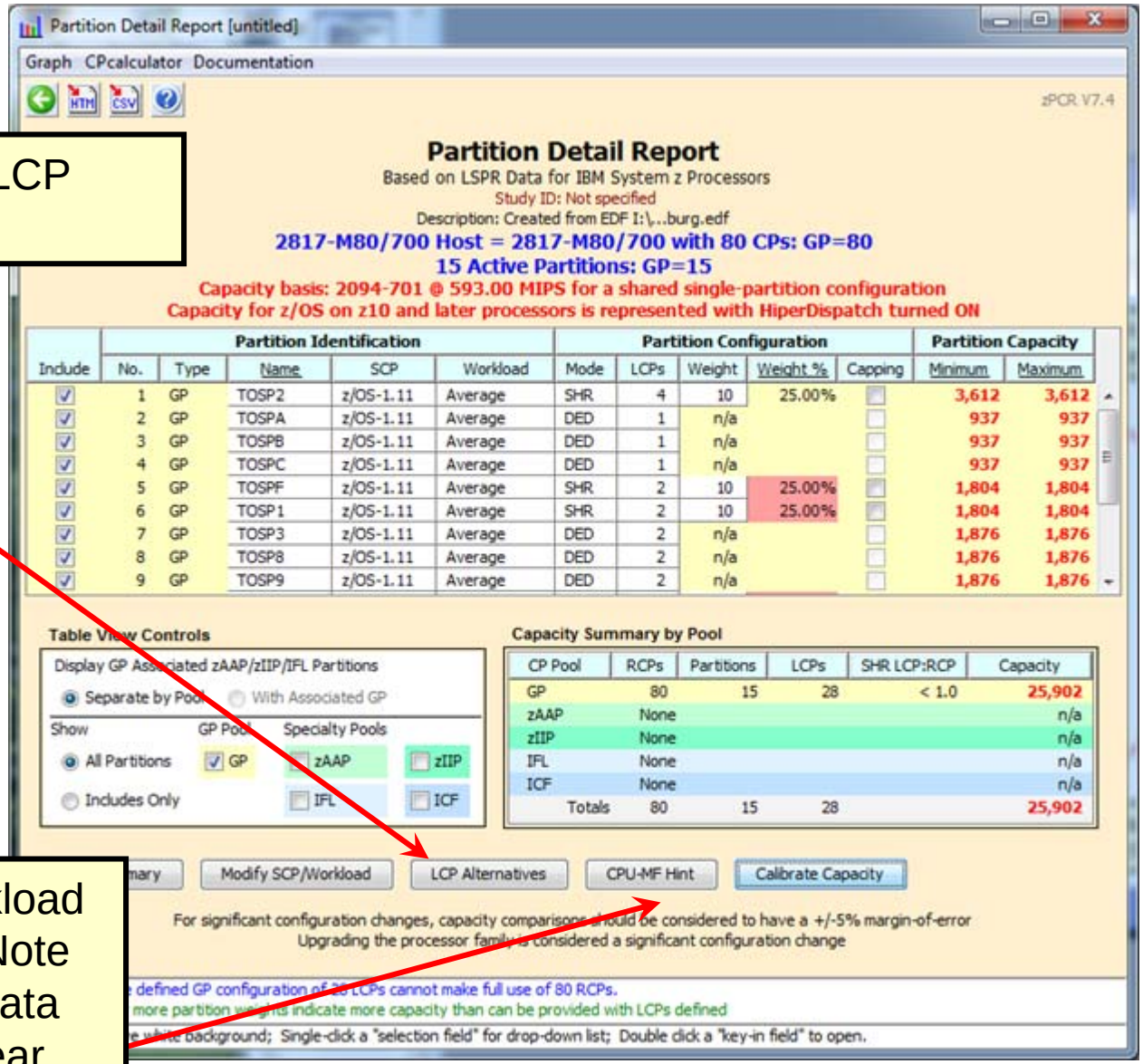
Pass the mouse over the "CPU-MF Hint" workload to reveal the actual metrics used

HiperDispatch active for the partition

"RNI" for the partition

Additional Functions

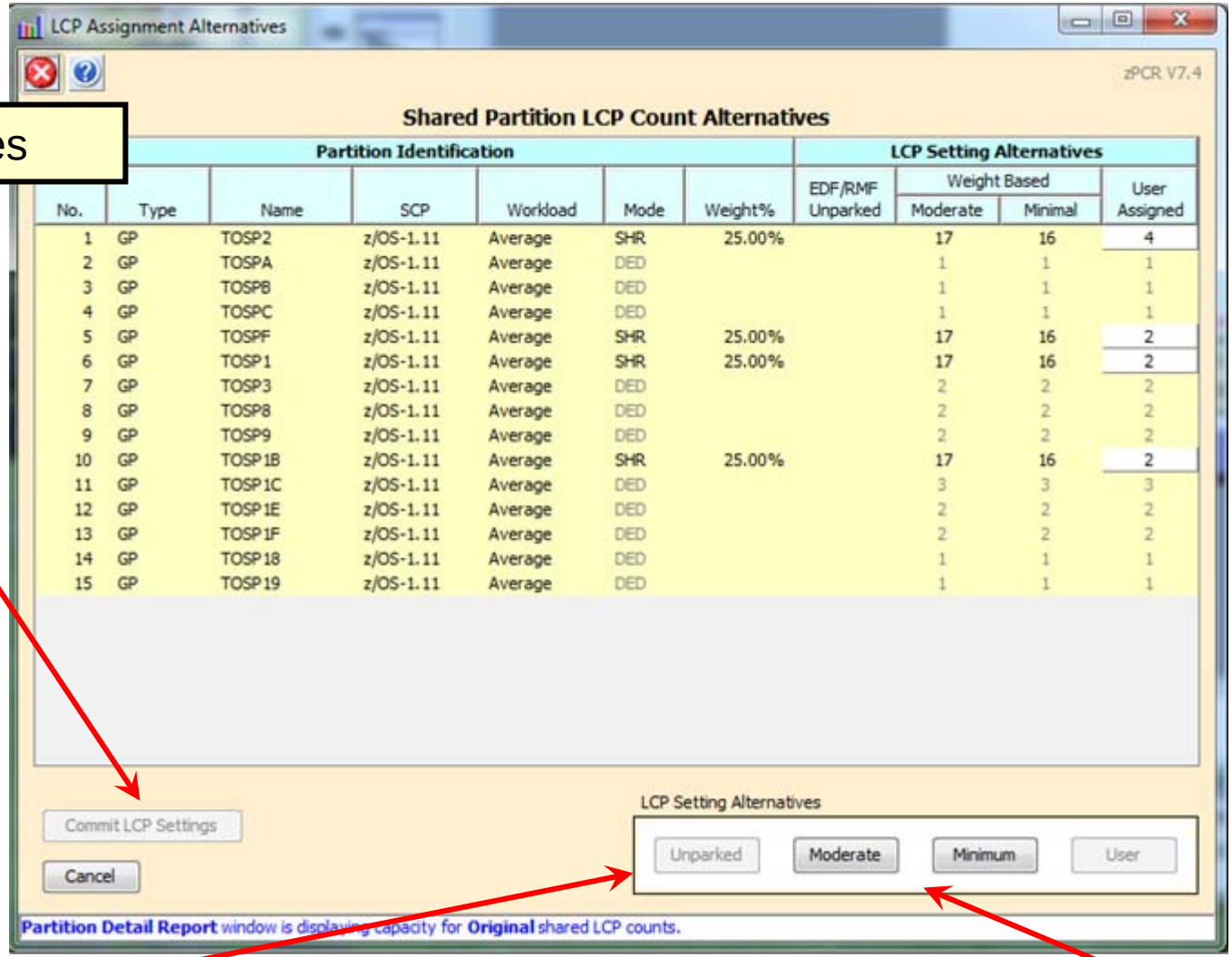
Asses the impact of different LCP configurations



Asses using CPU MF “Hint” workload when SMF 113 Data Available. Note that when there is no CPU MF data present this button will not appear

Asses the impact of different LCP Configurations

Commit changes

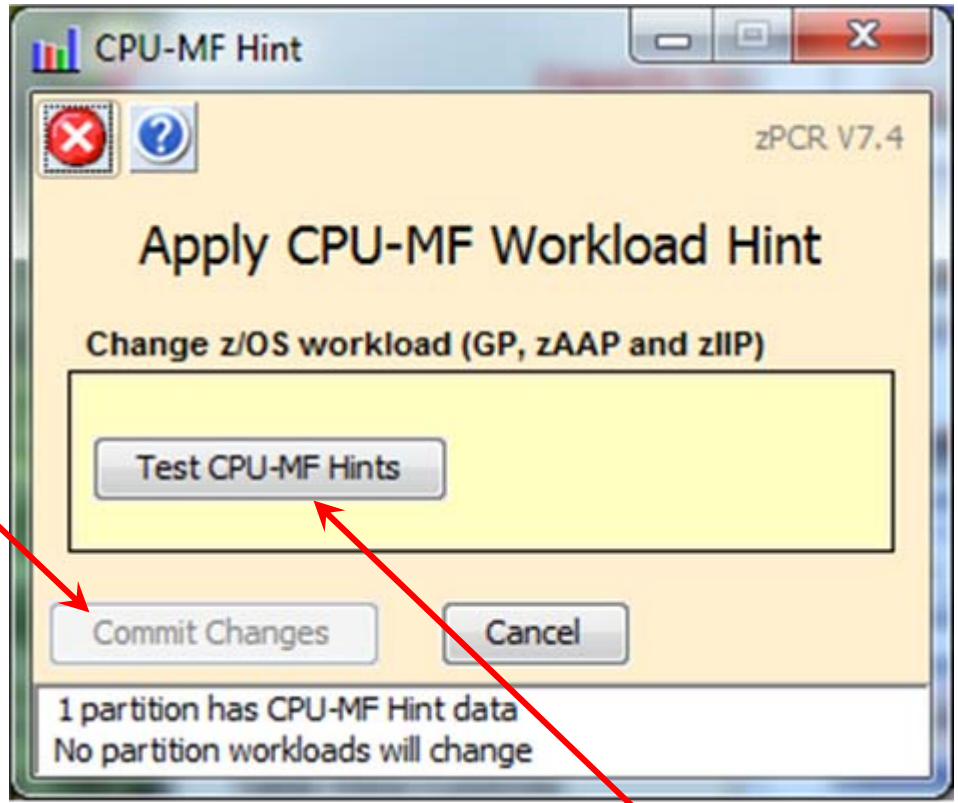


Apply “Parked” engines when available

Asses the impact of adjusting the LCPs based on weight

Asses the impact of using the “Hint” workload

Commit changes

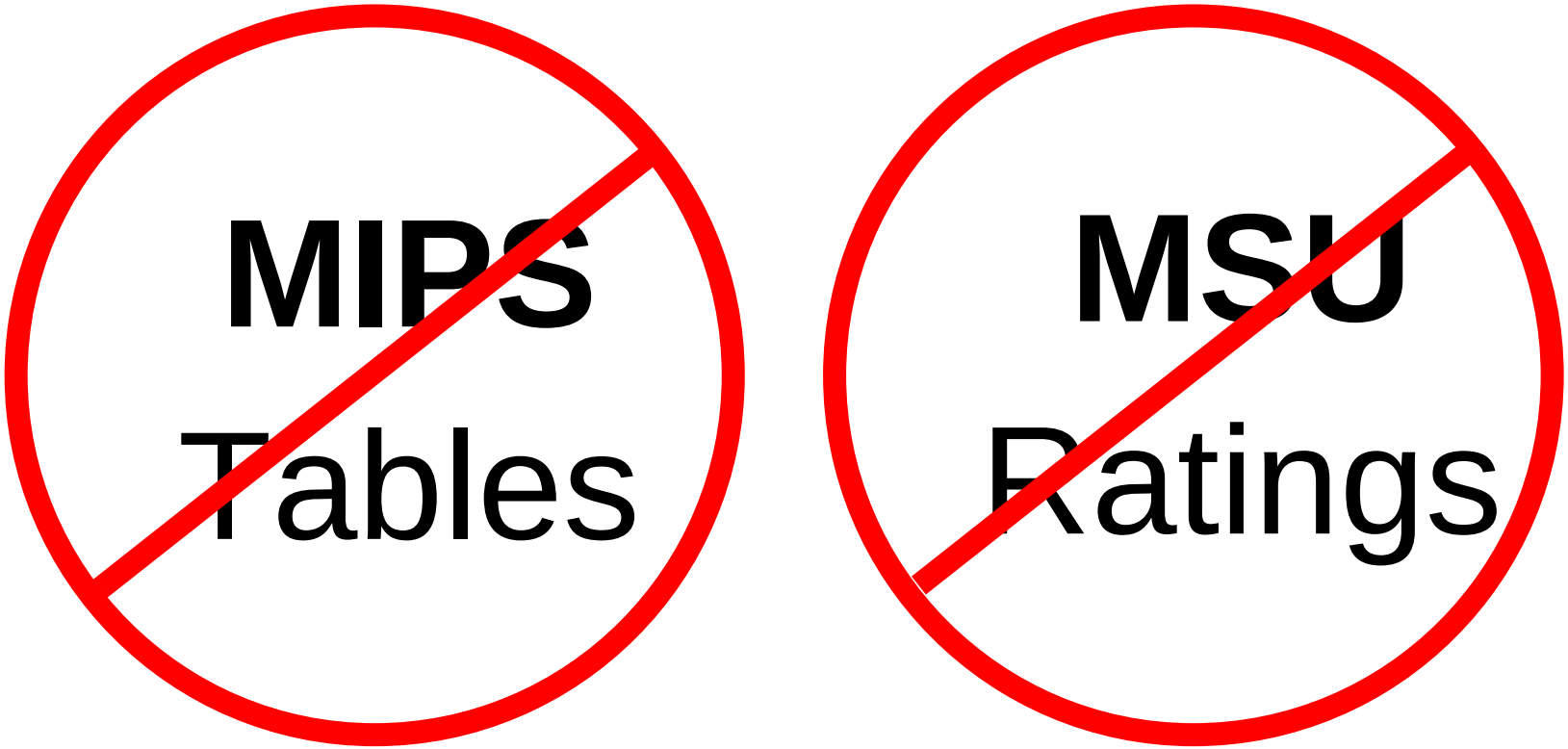


Asses the impact of using the “Hint” workload instead of the one currently assigned

Single Spot on the Web to Get More Information

- zPCR Getting Started Page
  http://www.ibm.com/support/techdocs/atsmastr.nsf/WebIndex/PRS1381
  - Contains:
    - Downloadable Code
    - zPCR Users Guide
    - External File Layout documentation
  - Technical Support Information
    - Training materials in .avi format (voice over foils)
    - Education Exercises
      - 1 new Advanced Mode Exercise for z10 to z196
    - Registration Information
    - Special Notices and FAQs
- **Q&A and defect support are available through email: zpcr@us.ibm.com**

IBM System z Capacity Planning in a nutshell

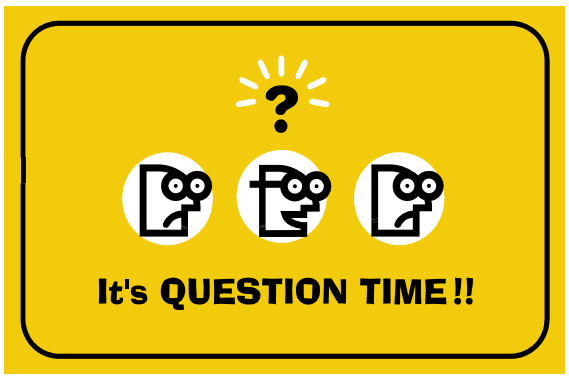


Don’t use “single-number tables” for capacity comparisons!

Use zPCR to model before and after configurations

Summary

- **zPCR models <u>your unique</u> Processor configuration**
  - Based on LPARS, weights, # of logical processors, workload mix and Specialty Engines
- **Built upon LSPR benchmarks**
- **Using zPCR is Easy**
- **Use zPCR to correctly size your processor**



Acknowledgements

- **Many people contributed to this presentation including:**

John Fitch

Gary King

Jim Shaw

Brad Snyder

Kathy Walsh

Thank You

for attending!

In Advanced-Mode, some zPCR functions are not available

- **You cannot return to the Function Selection window**
- **Basic-mode study files cannot be created**
  - Studies will be saved in Advanced-Mode format
- **The MI Reference-CPU cannot be set independently of the Reference-CPU**
  - While viewing the Multi-image table you may set a “temporary” Reference-CPU.
- **Older LSPR Processor Capacity Ratios tables cannot be viewed**,
  - Including z/OS-1.8, z/OS-1.6, z/OS-1.4
  - To access these tables, start a second zPCR invocation in “Basic Mode”
    - Be sure the Reference-CPU settings are as desired

zPCR Capacity Sizing Lab – Part 2 Hands-on Lab

SHARE - Session 9667

August 11, 2011

John Burg
Brad Snyder

Materials created by John Fitch and Jim Shaw

IBM

Agenda

- Lab Exercise Introduction
- Lab Exercise

Overview of Lab Exercise

- **XYZ Corporation Background**
  - Currently has System z10 EC
    - 2097-707 (7 way GCPs)
    - Customer views it as having 5100 MIPS
    - Machine averages 92% busy during peak

- **Plan being developed to replace with z196**
  - Must have at least 20%+ additional capacity
    - at least 6150 MIPS

Lab Exercise – Tasks to Complete

- Task 1 - Create a model of the current LPAR Configuration
- Task 2 - Calibrate the model to XYZ Company's capacity designation
- Task 3 - Save the current study in Advanced-Mode
- Task 4 - Find an appropriate z196 replacement processor
- Task 5 - Model the intended LPAR host using Advanced Mode
- Task 6 - Review the Capacity results and save the Study
- Additional
  - Model 1 IFL in the proposed configuration
  - Model 1 zAAP in the proposed configuration
- Review Rename function