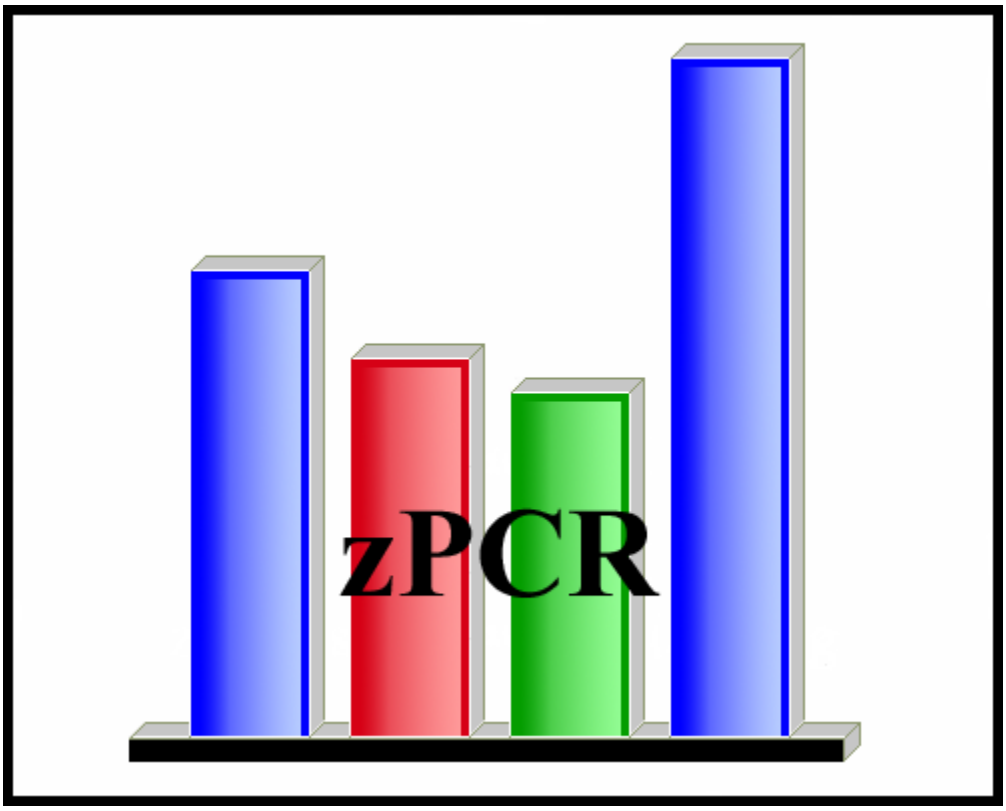
zPCR

Processor Capacity Reference

for

IBM System z

zPCR Familiarization Exercise



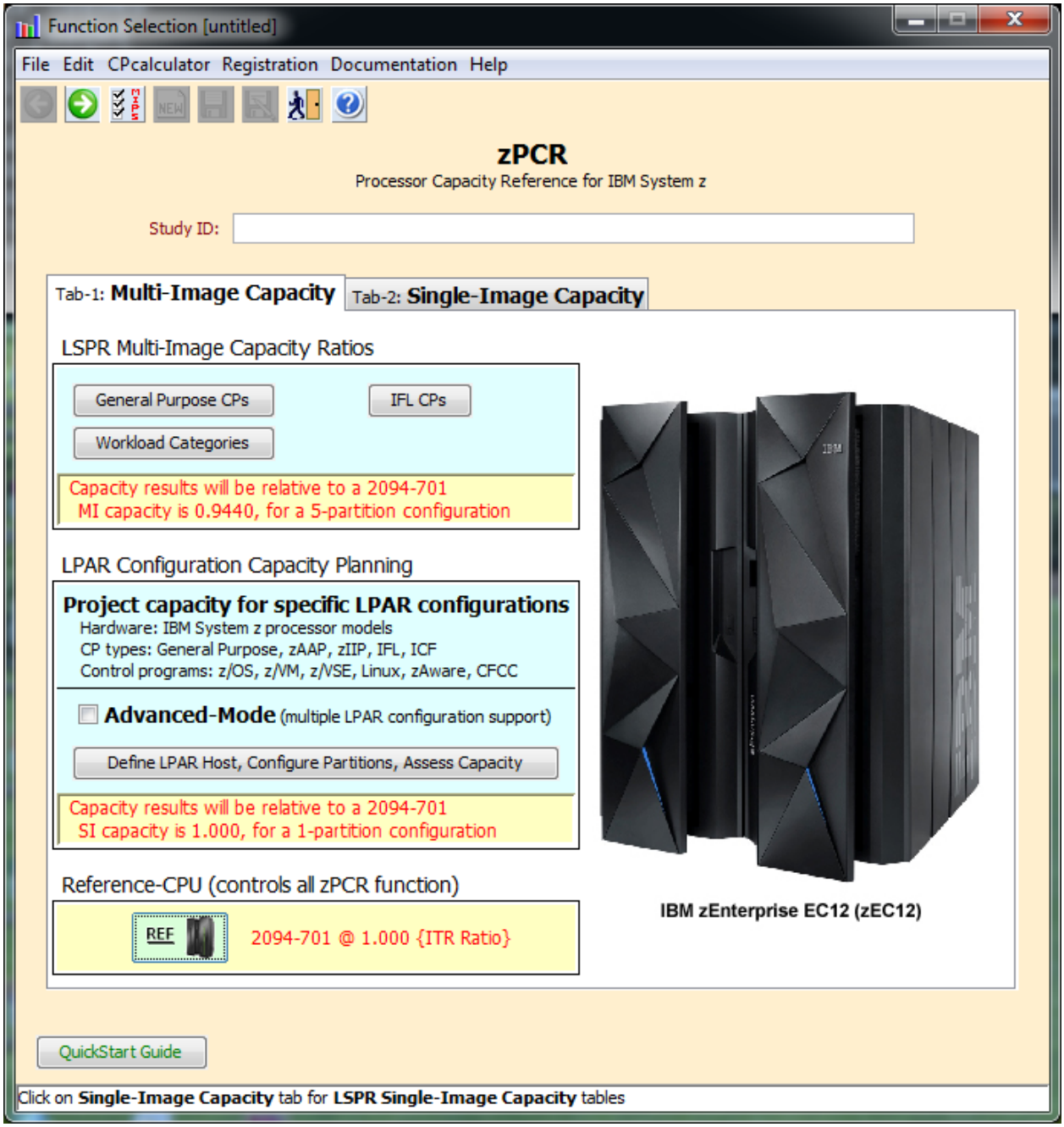
© IBM Corporation – 2013

Version 8.4a

zPCR Familiarization Exercise 2013a02.doc

October 2013

Function Selection Window



Objective

You will use **zPCR** (in Advanced Mode) to define a customer's current LPAR configuration and then project the capacity expectation for an upgrade to newer technology. The capacity results will then be used to determine if the upgrade model is adequate to support all of the work, and to determine if the amount of CP resource available to each partition is adequate to support that partition's workload with the anticipated growth applied.

Problem

XYZ Corporation currently has a **z196 2817-707** (7-way processor) installed, which based on their last zPCR study as having about **7,127 MIPS** of usable capacity. The 2817-707 is currently averaging **100% busy** during peak processing periods. The workload environment includes multiple logical partitions, all running on General Purpose CPs, as shown in the table below.

	Partition	LP-mode	LCPs	Weight	Capped	Workload Category
1	CICSA	Share	7	340	No	z/OS-1.13 Average
2	BATCHA	Share	7	195	No	z/OS-1.13 Average
3	BATCHB	Share	2	32	No	z/OS-1.13 Average
4	TESTB	Share	2	12	No	z/OS-1.13 Average
5	TESTIMS	Share	5	36	No	z/OS-1.13 Average
6	CICSB	Share	7	297	No	z/OS-1.13 Average
7	IMSA	Share	5	73	No	z/OS-1.13 Average
8	TESTCICS	Share	2	15	No	z/OS-1.13 Average

A plan is being developed to **replace the z196 2817-707 with a newer technology zEnterprise EC12 processor**. The specific model chosen must provide at least **20% additional capacity**, or at least **8,553 MIPS (7127 x 1.20)**. The current partitions are to be moved to the new processor with the partitions and their workloads as being run today. The customer has turned on CPU MF counters and has collected SMF 113 data. They ran CP3KEXTR and created an EDF file containing data from 9/15. The data spans from 8:00 am through 12:00 pm using 15 minute intervals. In addition the customer is looking at moving some work to Linux under System z.

Task Overview

Here are the 6 tasks that comprise this zPCR familiarization exercise, addressing the problem described above.

*** The actual Lab starts on the next page ***

- **Task 1** - Load the EDF containing the latest RMF/SMF data including SMF 113 data
- **Task 2** - Rename the configuration
- **Task 3** - Save the current study in Advanced-Mode (e.g. task2.zpcr)
- **Task 4** - Find an appropriate Enterprise EC12 (zEC12) 700 model replacement processor
- **Task 5** - Model the intended zEC12 processor
- **Task 6** - Review the Capacity results and save the Study (use a different file name than Task 3, e.g. task6.zpcr)
- **Additional Analysis To Try**
  - A. Model a zEC12 2827-600 as an alternative
  - B. Add 1 IFL partition running Linux for System z under z/VM to zEC12 700

Note: When instructed to **Return** the icon should be used

The **Double Return** icon may also be used to return two windows where available

Task 1: **Load the EDF with the RMF/SMF data**

In this task you will load the current LPAR configuration into zPCR from the file supplied.

Note: **zPCR**'s default Reference-CPU setting is the 2094-701 rated at 1.00. When this study was saved, the Reference-CPU was set to a 2094-701 rated at 593 MIPS, so we need to restore the **zPCR** Reference-CPU to that setting.

Analysis Steps

1. Start **zPCR**. After the Logo window stages, you will be viewing the ***Function Selection*** window, on the ***Multi-Image Capacity*** tab.
2. Select the ***Advanced-Mode*** check box if it is not already checked
3. Click the **Enter Advanced-Mode** button
4. On the ***Advanced-Mode Control Panel*** window, double click on the **Reference-CPU** icon

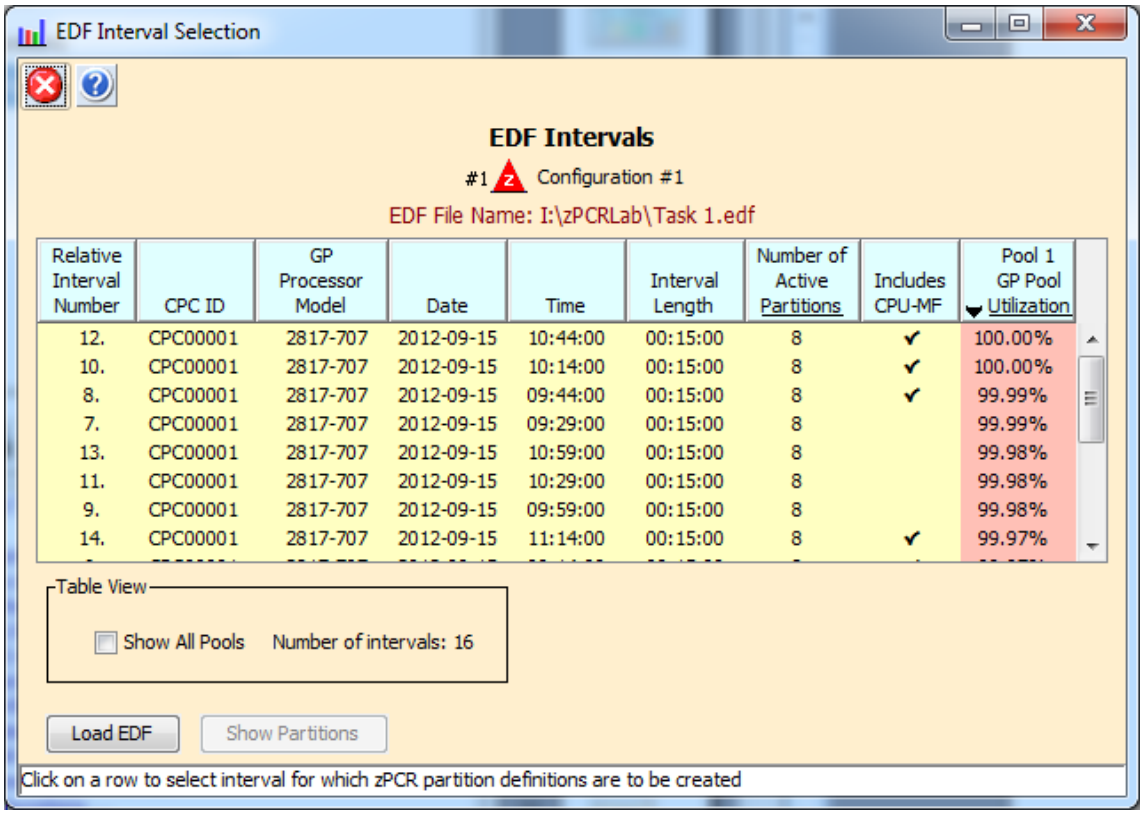
, currently tagged with "**2094-701 @ 1.000 {ITR Ratio}**". The ***Reference-CPU*** window will appear.
   a) Click **Typical** to set the Reference-CPU to the 2094-701 rated at 593 MIPS.
   b) Click **Return**
5. Open Windows Explorer (by clicking on "Start", "All Programs", "Accessories", "Windows Explorer"). Then using Windows Explorer (under My Computer/Local Disk (C:)) select to the **CPSTOOLS/zPCR/EDF Files** directory, where the **Task 1.edf** file is located and visible. You'll probably want to size the Windows Explorer window down, so that it can be visible with zPCR active.
6. Drag the "**Task 1.edf**" EDF file from the "**zPCR**" subdirectory underneath or on top of the "**Configuration #1**" icon

to open the ***EDF Interval Selection*** window.

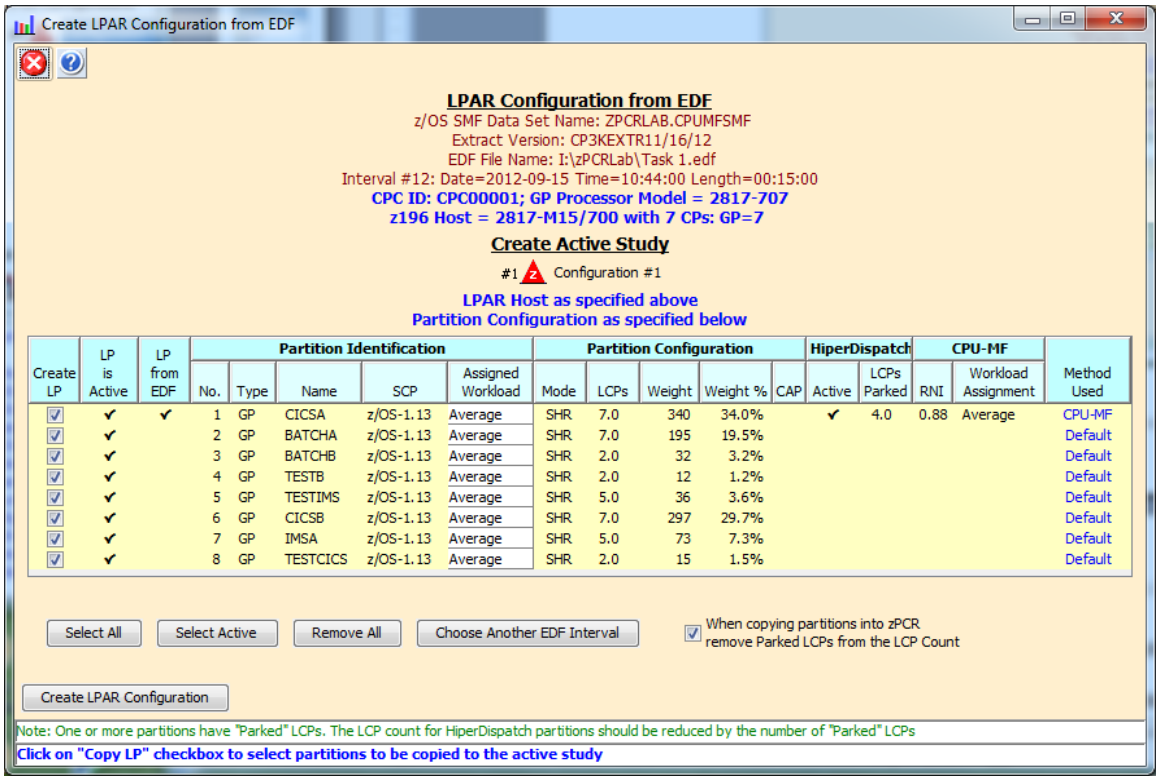
EDF Interval Selection Window

Analysis steps

1. Sort (Click) on the **Pool 1 GP Pool Utilization** column



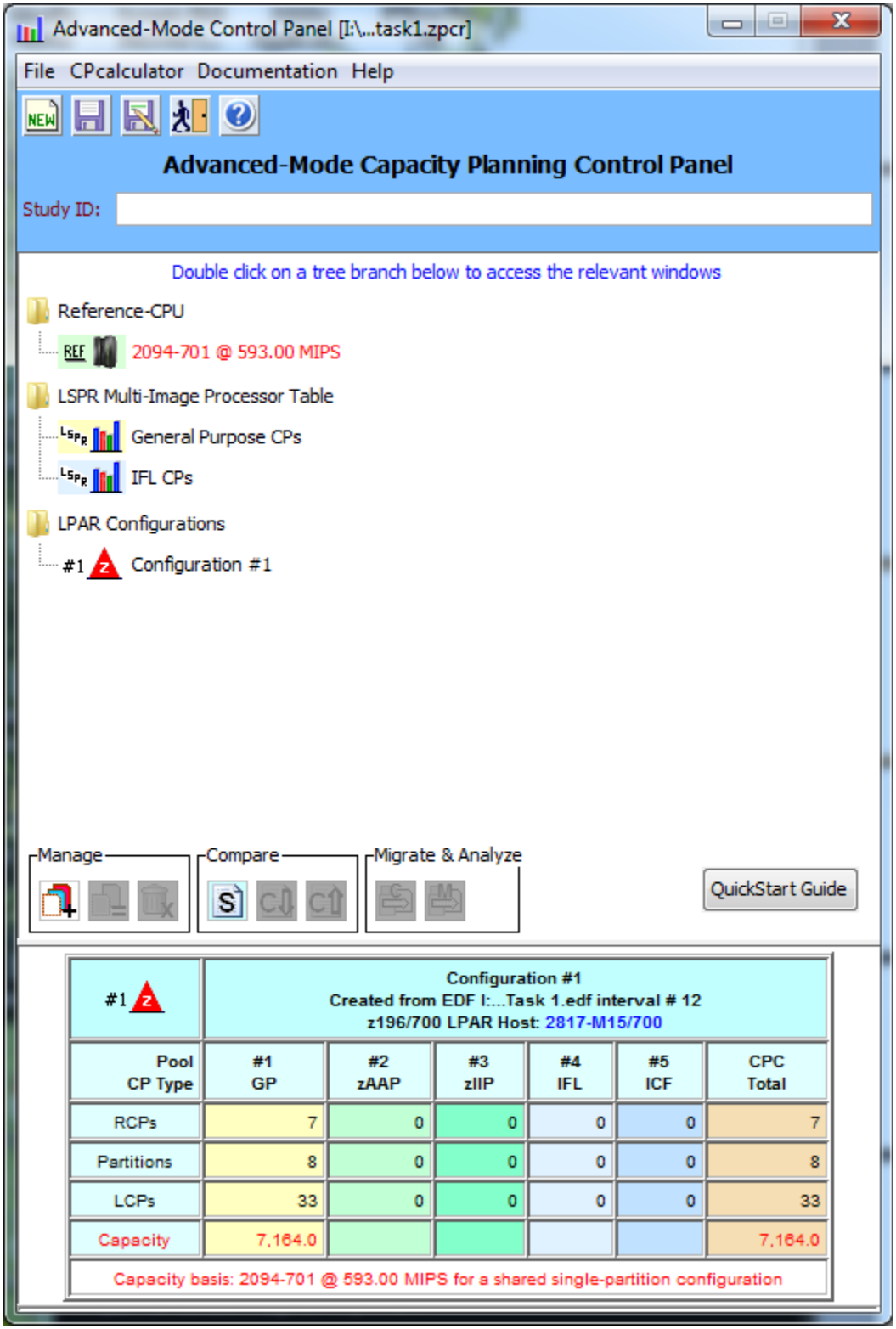
2. Select Interval #12 and double click to open the "Create LPAR Configuration from EDF" window.



3. Click on "Create LPAR Configuration" to transfer the LPAR Host and 8 partitions to the active zPCR study.

4. Click ok to dismiss the "zPCR EDF Copy Partitions" transfer message

Advanced-Mode Control Panel Window



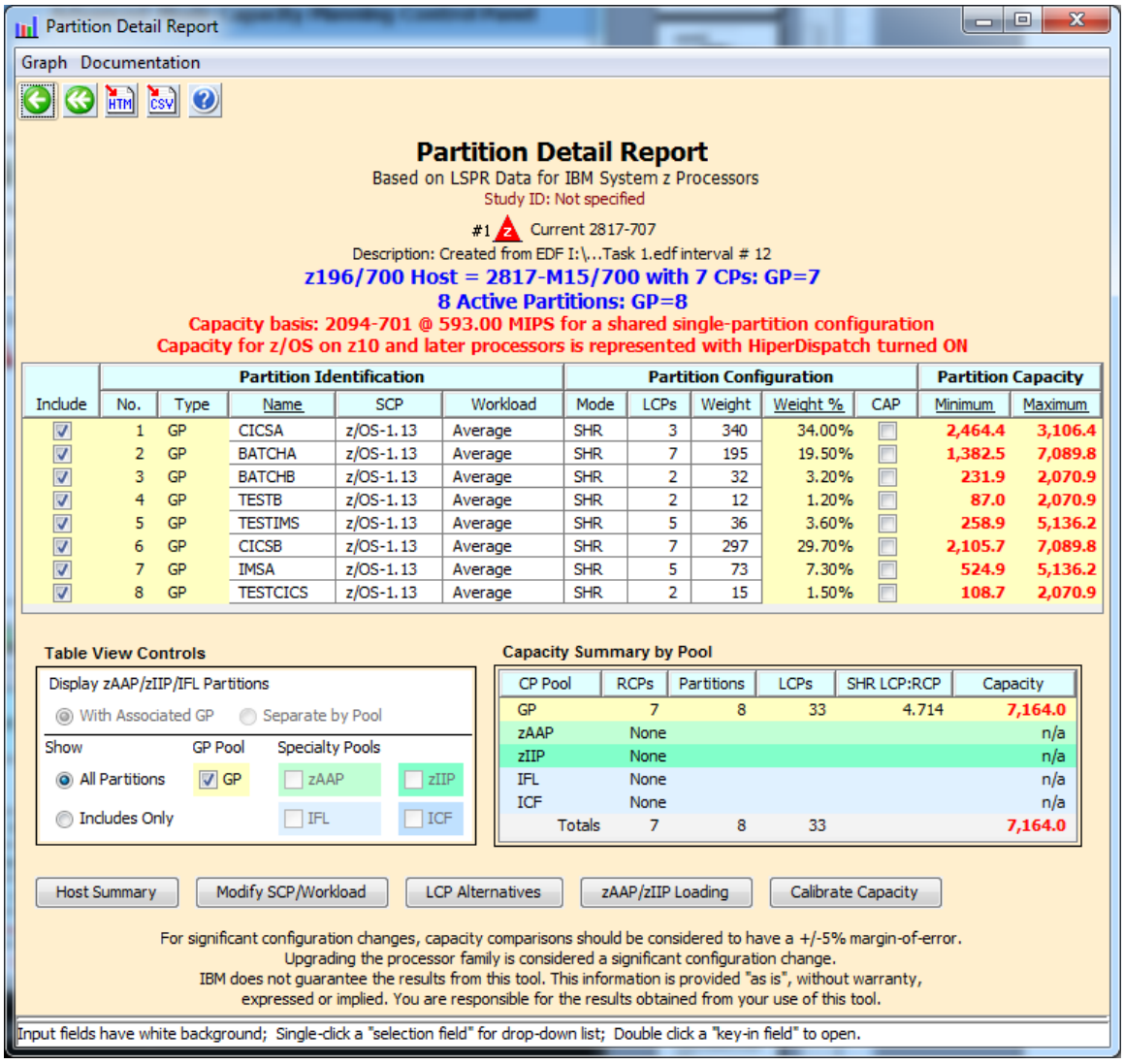
Task 2: **Rename the LPAR configuration**

Review the capacity assessment and rename the configuration.

Analysis Steps

1. Refer to the "**Renaming an LPAR Configuration**" at the end of this document to rename the configurations as shown in the lab.
2. Using the directions provided, rename "**Configuration #1**" to "**Current 2817-707**".
3. Double-click on the **Current 2817-707** LPAR configuration icon

to open the ***LPAR Host and Partition Configuration*** window for the **Current 2817-707** LPAR configuration.
4. Click **Partition Detail** in the **Capacity Reports** group box to open the ***Partition Detail Report*** window. This window will reveal the total GP capacity available as **7,164 MIPS**.



Task 3: **Save the study**

Analysis Steps

1. Click **Return** twice (or click the **Double Return**) to close the LPAR configuration windows.
2. From the menu-bar on the ***Advanced-Mode Control Panel*** window, click **File**→**Save as**, to save your LPAR definitions for the current LPAR host processor. (e.g. **task2.zpcr**)

Task 4: **Find an appropriate replacement processor**

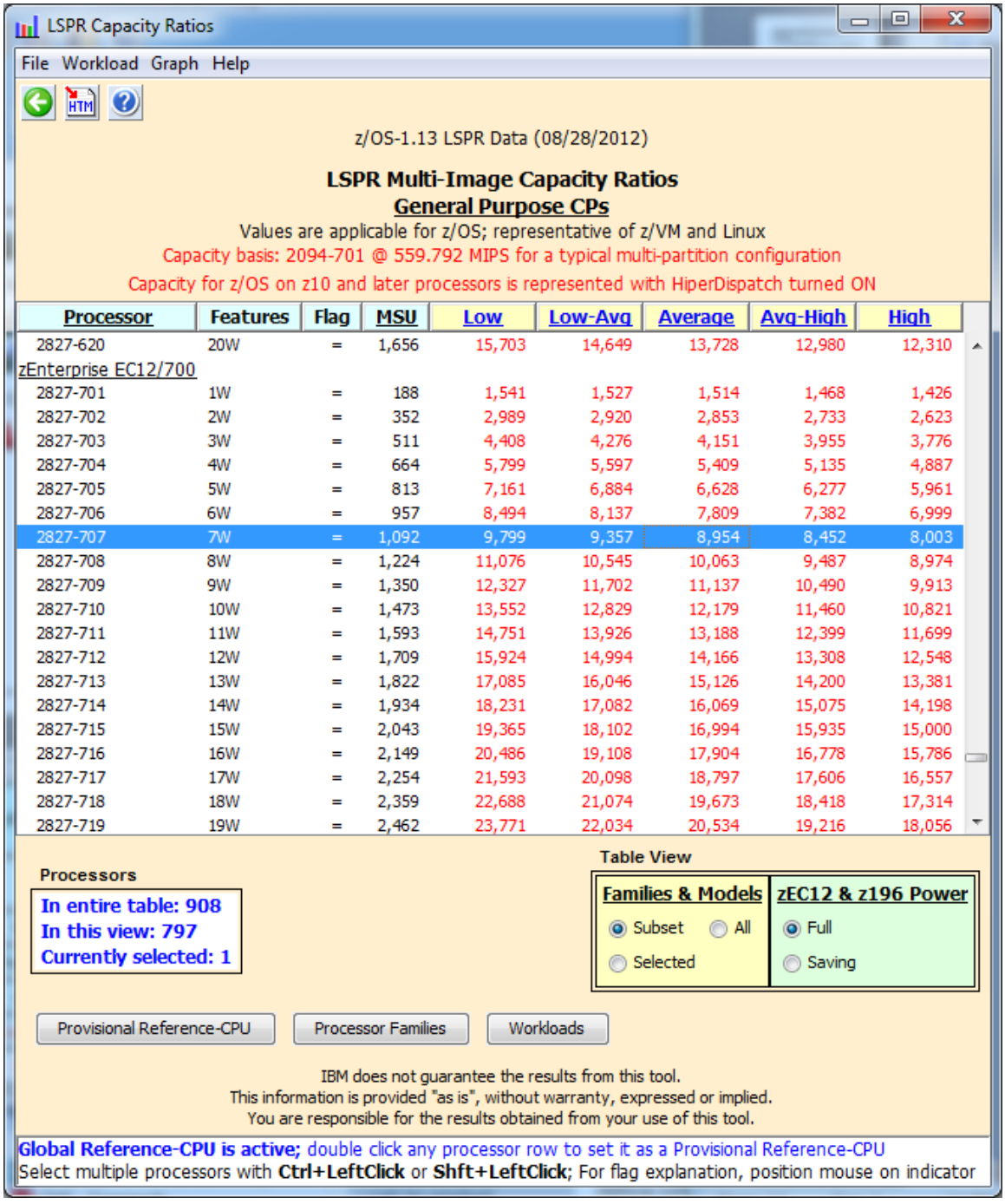
Browsing the ***z/OS-1.13 Multi-Image LSPR Capacity Ratios*** table, find the IBM zEC12 processor that can provide the required capacity increment using the z/OS Average workload

Analysis Steps

1. From the Advanced-Mode window, double click on **General Purpose CPs** to open the ***LSPR Multi-Image Processor Capacity Ratios*** table.
2. Find an IBM zEnterprise EC12 processor that can provide the required **8,553 MIPS**. (tip right click for a list of the Families, then select via scroll to IBM, then select zEC12/700)

   For the purposes of this exercise, choose the **2827-707**, which appears to have just a bit more capacity than we require (e.g. **8,954** for Average etc). **Remember that capacity values in the multi-image table represent typical (or average) partition configurations, and therefore can only generalize on capacity**.
3. Click **Return** to go back to the ***Advanced-Mode Control Panel*** window.

LSPR Multi-Image Capacity Ratios window

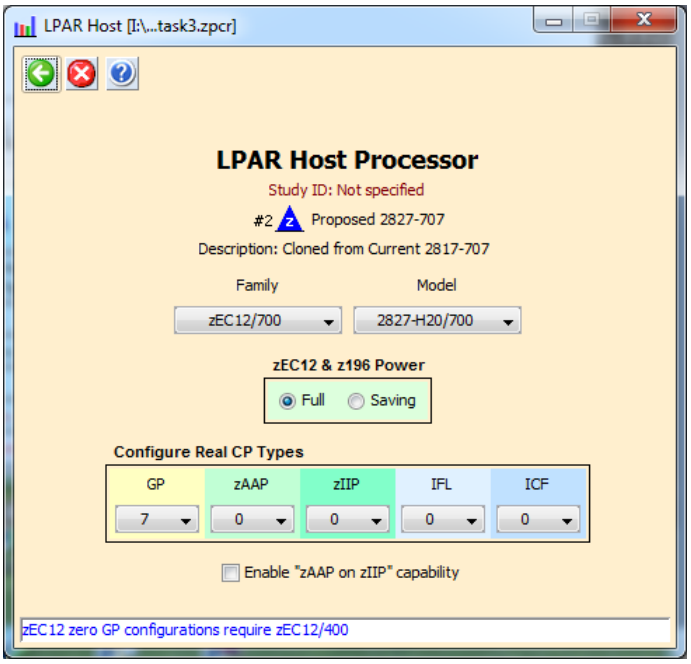


Task 5: **Model the intended LPAR host**

Using the current z196 LPAR configuration as a starting point, we will transfer it to the new IBM zEnterprise zEC12 processor, making any necessary adjustments to the partition definitions.

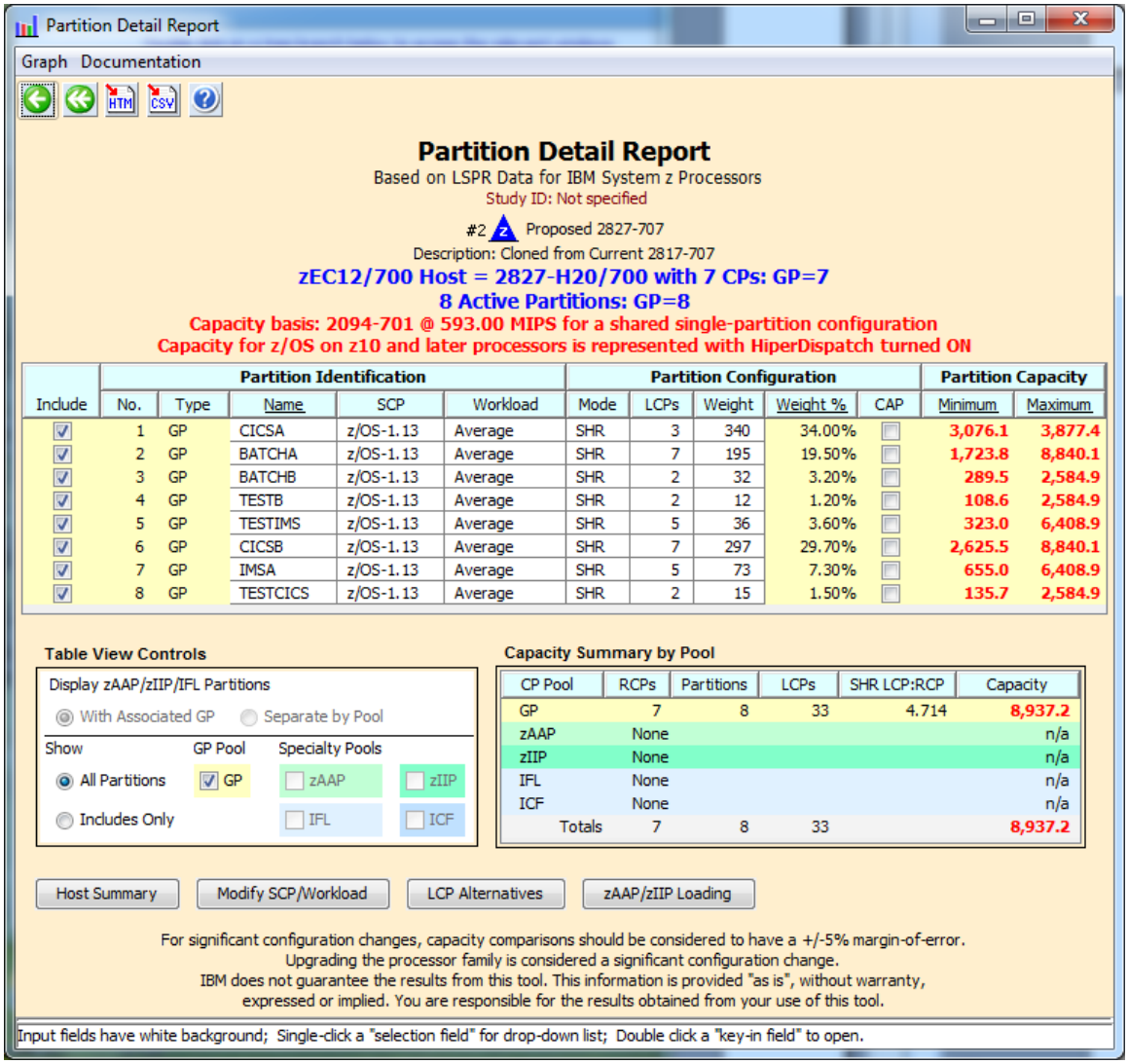
Analysis Steps

1. Single-click the **Current 2817-707** icon on the ***Advanced-Mode Control Panel*** window to select it.
2. Click the **Clone** toolbar button. A second LPAR configuration is created as an exact copy of the first. It is icon #2 , Rename it to **Proposed 2827-707**
3. Double-click the **Proposed 2827-707** icon #2 to open the ***LPAR Host and Partition Configuration*** window for the **Proposed 2827-707** LPAR configuration.
4. Click **Specify Host** to open the ***LPAR Host*** window.
   a) Set the ***Family*** to be **zEC12/700**.
   b) Set the ***Model*** to **2827-H20/700** (this model has a maximum total of 20 configurable GCPs).
   c) Leave zEC12 & z196 Power checked to Full
   d) Set ***General Purpose CPs*** to 7 (seen as a 2827-707). There are no other CP types planned at this time.



   e) Click **Return**.

5. Click **Partition Detail** in the **Capacity Reports** group box.

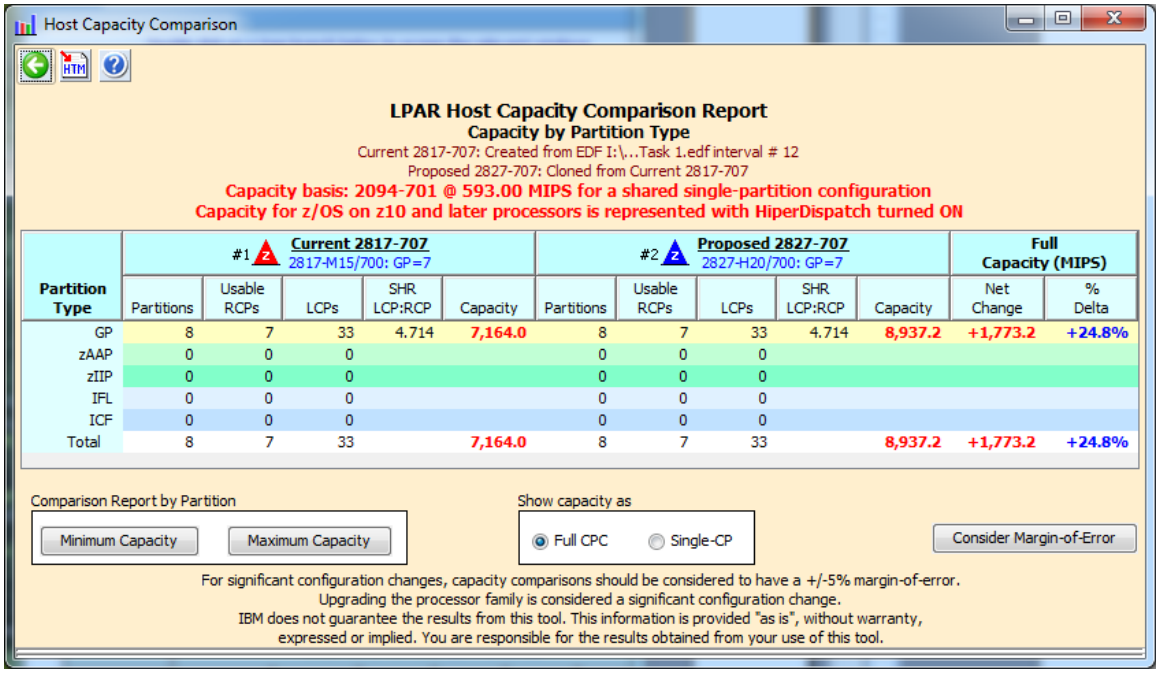


Task 6: **Review capacity results and save the study**

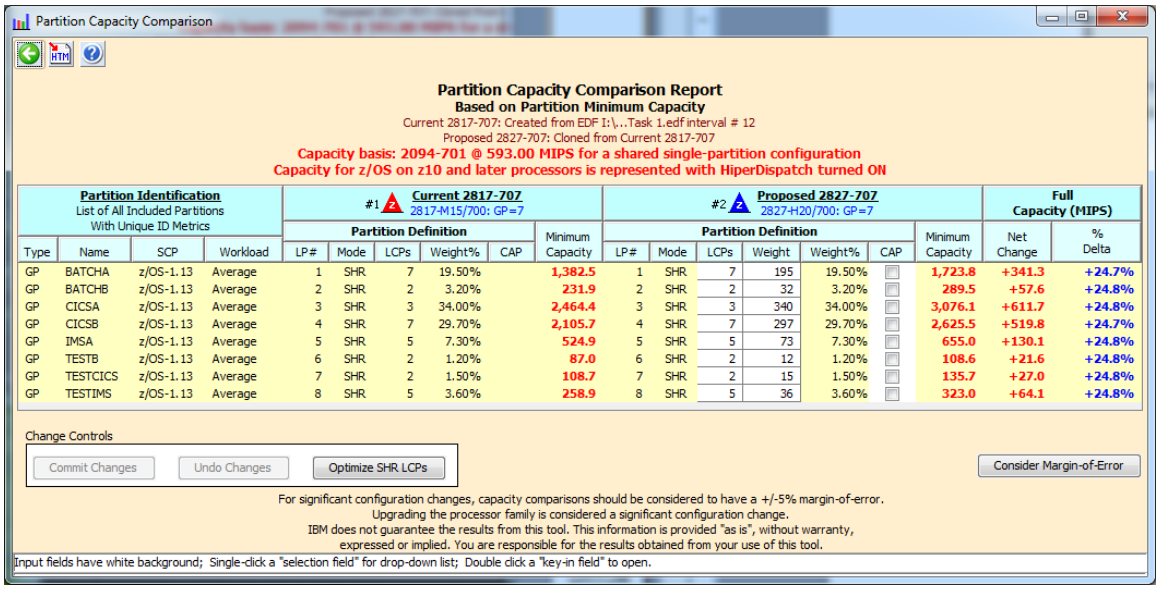
Using the capacity results for this new LPAR host, determine if we realized the desired 20% capacity increase (**8,553 MIPS**), for the overall host and for each individual partition.

Analysis Steps

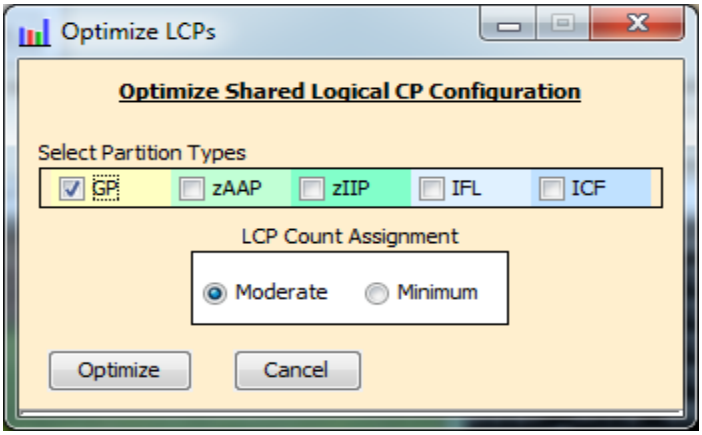
1. On the ***Partition Detail Report*** window, the overall effective capacity for the 2827-707 is **8,937 MIPS** for this LPAR configuration. The effective capacity for the 2817-707 was **7,164 MIPS.** (see page 10)
2. Click two **Return** buttons (or click the **Double Return** button) to close the LPAR configuration windows.
3. On the ***Advanced-Mode Control Panel*** window, select the two configurations (hold the **Ctrl** key and click on both) and click the **Compare** tool bar icon. The ***Host Capacity Comparison*** window presents a processor oriented summary of the two LPAR host configurations. The first LPAR configuration is shown on the left, and the second is shown on the right. The partition types are listed in separate rows; the metrics presented are their combined values representing the number of partitions, the number of RCPs, the number of LCPs and the resulting capacity.



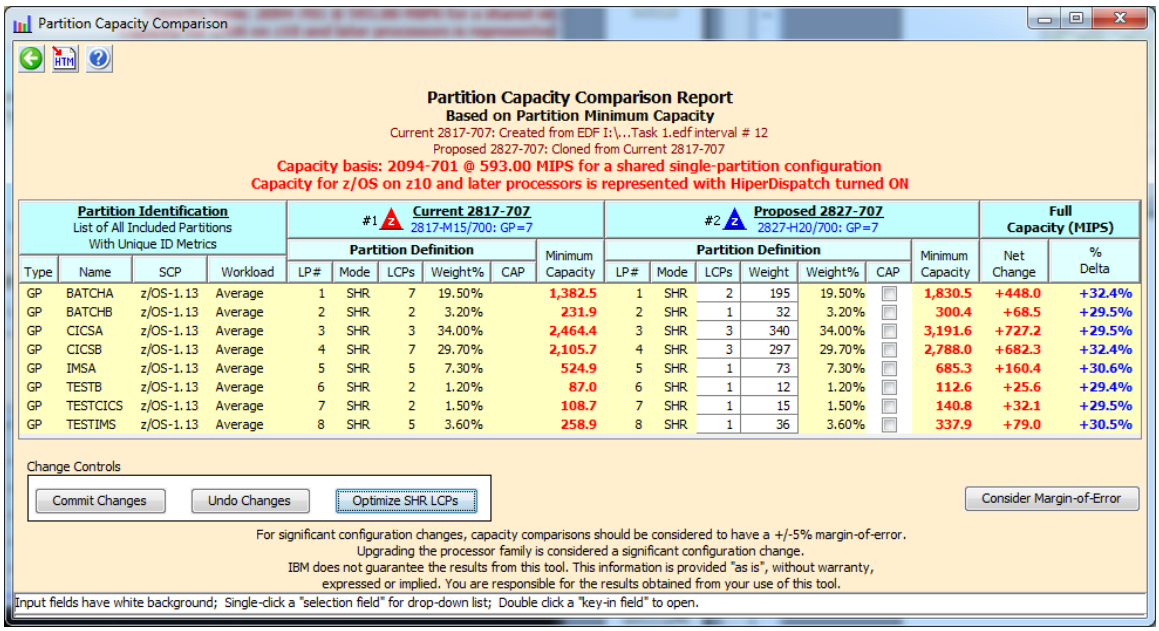
Click **Minimum Capacity** in the ***Comparison Report by Partition*** group box. Note that all of the partitions see an increase of approximately 20% or more.



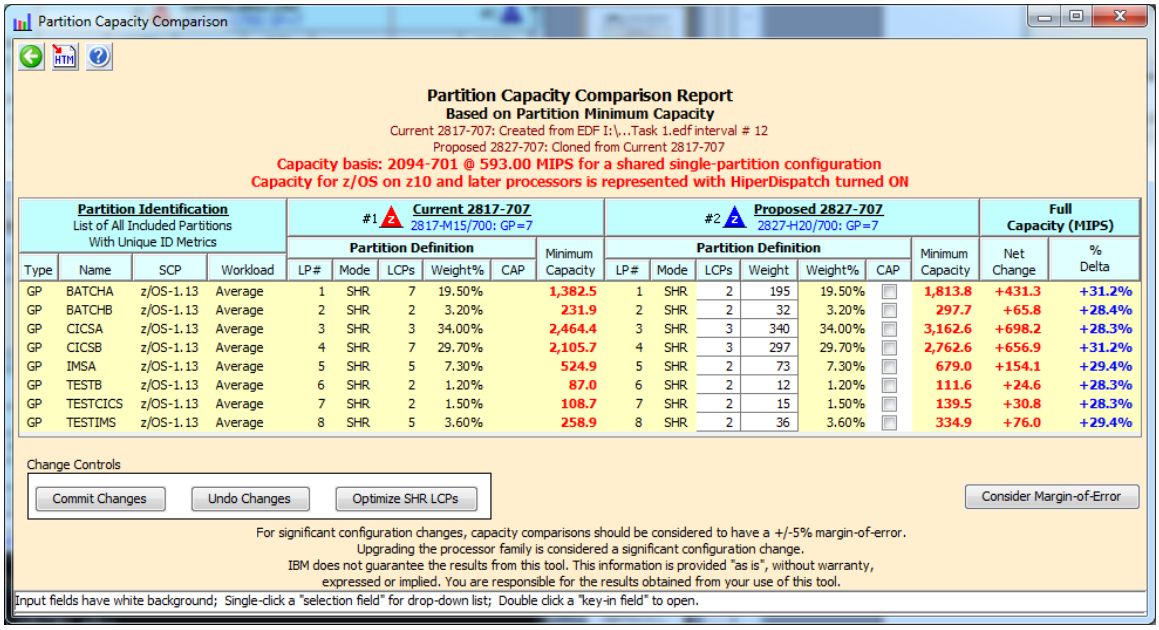
4. Click **Optimize SHR LCPs** for GPs in the ***Change Controls*** group box to see if you can improve the results by reducing the number of LCPs assign to each partition to that required to accommodate its weight.



5. Click **Optimize** using the default “Moderate” to see if you can improve the results by reducing the number of LCPs assign to each partition. Note: The weight percent is used to determine the exact number of LCPs (rounded up to the nearest whole number) to be assigned.

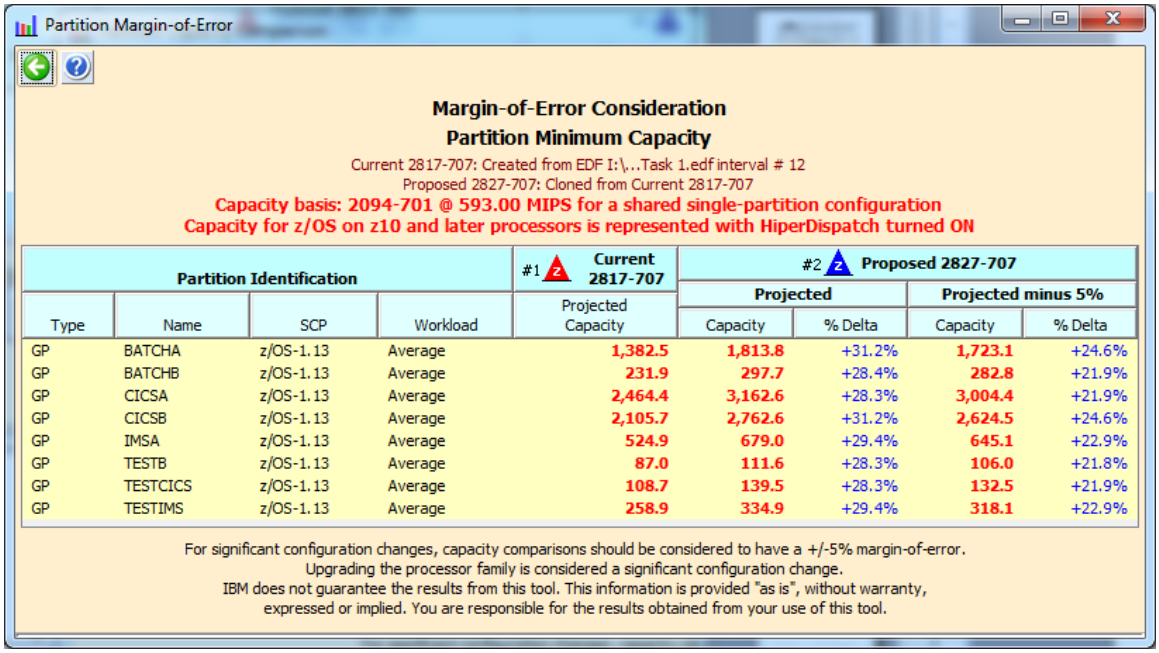


6. For availability reasons we will increase all of the partition LCPs (BATCHB, IMSA, TESTB, TESTCICS and TESTIMS) showing only 1 LCP to have 2 LCPs as shown below.

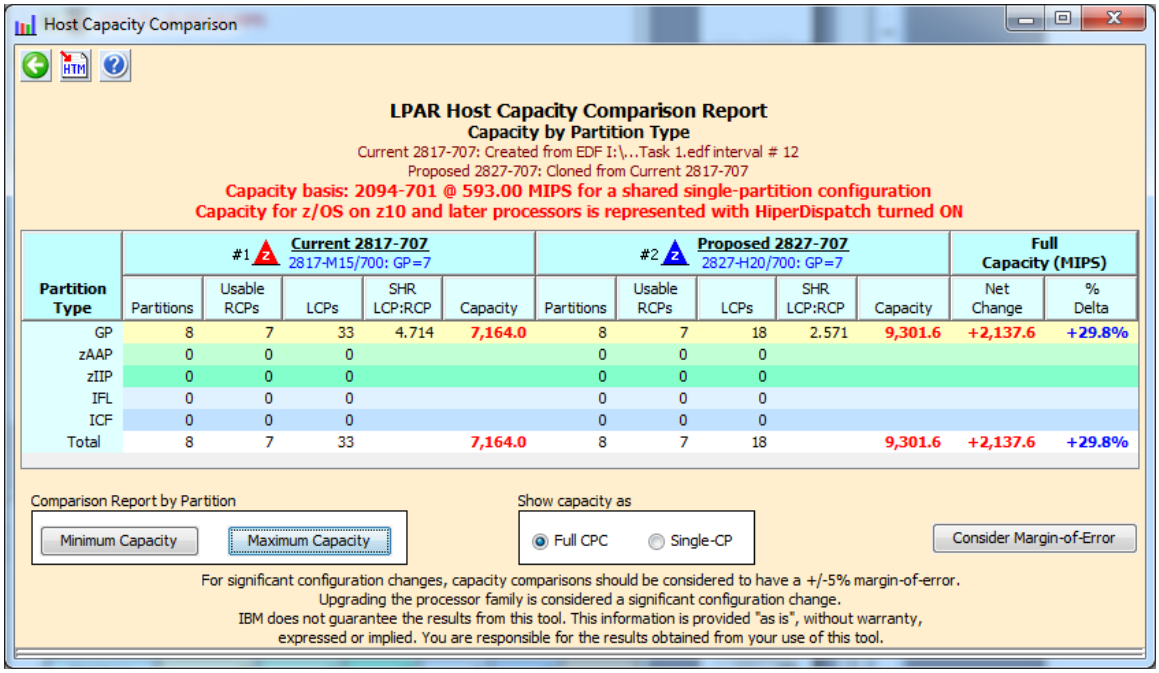


7. Click **Consider Margin-of-Error**

   The capacity expectation derived from **zPCR** for a new machine should normally be considered to have up to a ±5% margin-of-error. The full ±5% margin of error should be considered whenever the LPAR host processor family is changed, or when very significant changes are made to either the LPAR host CP configuration or to the partition configuration itself. At this point all of the partitions have met the 20% capacity increase when factoring in the -5% margin of error.



8. First close the ***Partition-Margin-of- Error*** window. Then click **Commit Changes** in the ***Change Controls*** group box to change the LPAR configuration to permanently include the modified metrics, (from the Optimize). Note that the ***Host Capacity Comparison*** window now shows we are delivering **9,301 MIPS**, which is more than the **8,553 MIPS** objective.



Partition Type	#1 Current 2817-707 2817-M15/700: GP=7					#2 Proposed 2827-707 2827-H20/700: GP=7					Full Capacity (MIPS)	
	Partitions	Usable RCPs	LCPs	SHR LCP:RCP	Capacity	Partitions	Usable RCPs	LCPs	SHR LCP:RCP	Capacity	Net Change	% Delta
GP	8	7	33	4.714	7,164.0	8	7	18	2.571	9,301.6	+2,137.6	+29.8%
zAAP	0	0	0			0	0	0				
zIIP	0	0	0			0	0	0				
IFL	0	0	0			0	0	0				
ICF	0	0	0			0	0	0				
Total	8	7	33		7,164.0	8	7	18		9,301.6	+2,137.6	+29.8%

9. Close all of the comparison windows by clicking the **Return** toolbar icon on the ***Host Capacity Comparison*** window.

10. From the menu bar on the ***Advanced-Mode Control Panel*** window click **File→Save as**, and save the complete study which will include both LPAR configurations. (Use a different file name than in Task 3, e.g. “Task6.zpcr”.)

At this point we have met the **8,553 MIPS** objective and 20% for each partition. In addition we also were able to meet the 20% with the -5% margin of error.

*** End of Primary Tasks ***

Additional Analysis To Try

Task A: **Evaluate a zEC12 2827-600 as an alternative**

Browsing the ***z/OS-1.13 Multi-Image LSPR Capacity Ratios*** table, find the IBM zEC12 processor that can provide the required capacity increment using the z/OS Average workload

1. From the Advanced-Mode window, double click on **General Purpose CPs** to open the ***LSPR Multi-Image Processor Capacity Ratios*** table.
2. Find an IBM zEnterprise EC12 600 processor that can provide the required **8,553 MIPS**. (tip right click for a list of the Families, then select via scroll to IBM, then select zEC12/600)

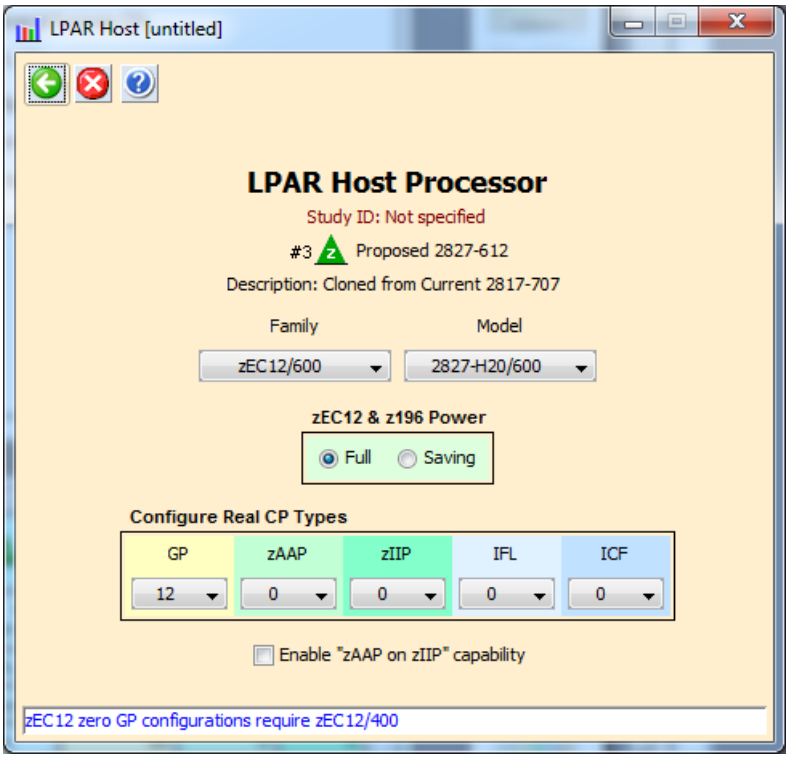
   For the purposes of this exercise, choose the **2827-612**, which appears to have a bit more capacity than we require, (e.g. **9,086** for Average etc) **Remember that capacity values in the multi-image table represent typical (or average) partition configurations, and therefore can only generalize on capacity**.

Processor	Features	Flag	MSU	Low	Low-Avg	Average	Avg-High	High
2827-604	4W	=	419	3,651	3,523	3,403	3,232	3,077
2827-605	5W	=	514	4,512	4,339	4,178	3,962	3,768
2827-606	6W	=	606	5,356	5,136	4,934	4,675	4,442
2827-607	7W	=	695	6,186	5,917	5,670	5,369	5,099
2827-608	8W	=	783	7,000	6,680	6,389	6,047	5,740
2827-609	9W	=	869	7,800	7,428	7,089	6,707	6,365
2827-610	10W	=	952	8,586	8,158	7,772	7,352	6,975
2827-611	11W	=	1,031	9,357	8,873	8,437	7,980	7,570
2827-612	12W	=	1,108	10,114	9,573	9,086	8,593	8,150
2827-613	13W	=	1,184	10,858	10,257	9,719	9,191	8,717
2827-614	14W	=	1,256	11,589	10,927	10,336	9,774	9,269
2827-615	15W	=	1,327	12,306	11,582	10,938	10,342	9,808
2827-616	16W	=	1,397	13,010	12,222	11,524	10,897	10,334
2827-617	17W	=	1,464	13,702	12,849	12,096	11,437	10,846
2827-618	18W	=	1,530	14,381	13,462	12,654	11,965	11,347
2827-619	19W	=	1,594	15,048	14,062	13,197	12,479	11,834
2827-620	20W	=	1,656	15,703	14,649	13,728	12,980	12,310
zEnterprise EC12/700								
2827-701	1W	=	188	1,541	1,527	1,514	1,468	1,426
2827-702	2W	=	352	2,989	2,920	2,853	2,733	2,623
2827-703	3W	=	511	4,408	4,276	4,151	3,955	3,776

3. Click **Return** to go back to the ***Advanced-Mode Control Panel*** window.

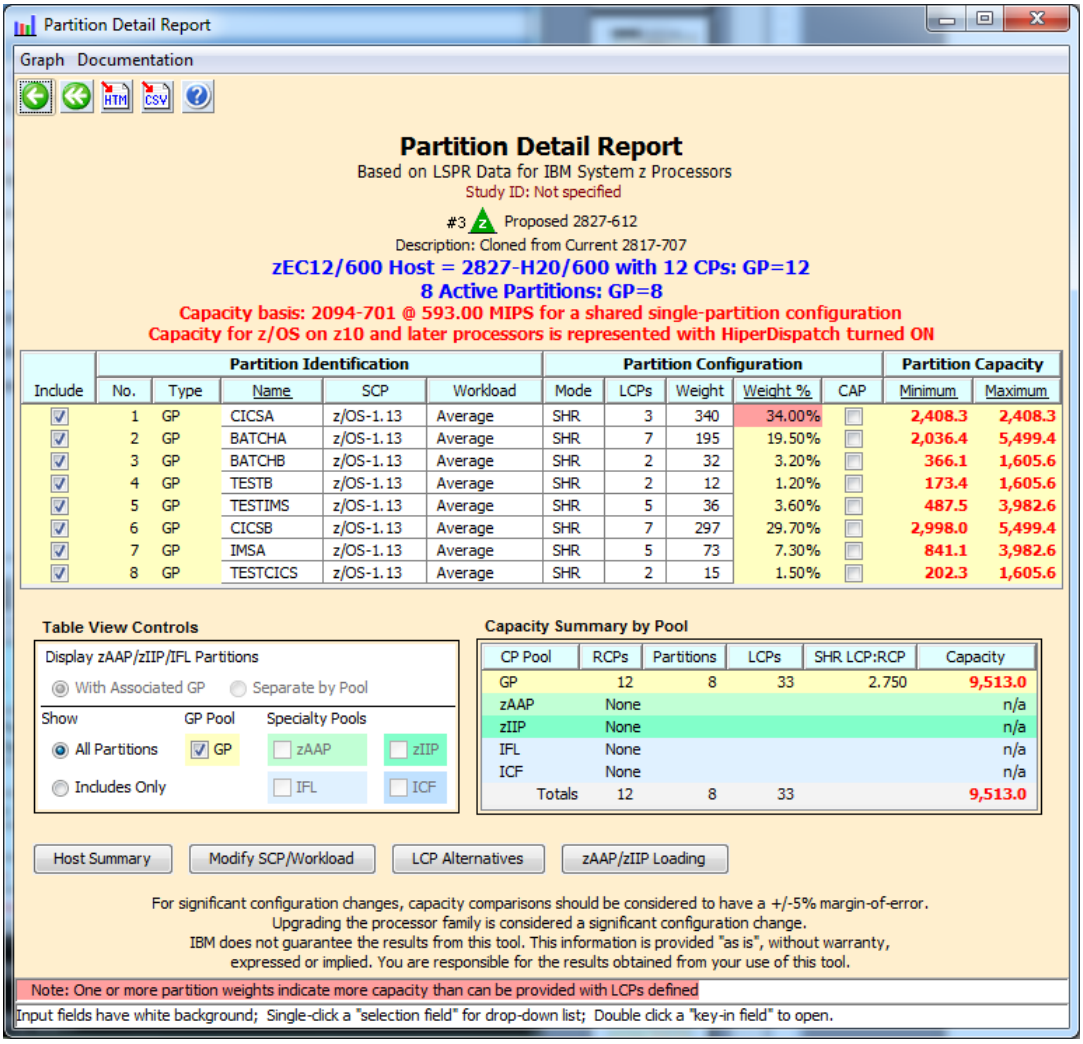
Analysis Steps

1. Single-click the **Current 2817-707** #1 on the ***Advanced-Mode Control Panel*** window to select it.
2. Click the **Clone** toolbar button. A third LPAR configuration is created as an exact copy of the second. Its icon #3 , Rename it **Proposed 2827-612**.
3. Double-click the **Proposed 2827-612** #3 icon to open the ***LPAR Host and Partition Configuration*** window for the **Proposed 2827-612** LPAR configuration.
4. Click **Specify Host**.
   a) Set the ***Family*** to be **zEC12/600**.
   b) Set the ***Model*** to **2827-H20/600** (this model has a maximum total of 20 configurable GCPs).
   c) Leave zEC12 & z196 Power checked to Full.
   d) Set ***General Purpose CPs*** to 12 (seen as a 2827-612).



2. **Click Return**.

3. Click **Partition Detail** in the **Capacity *Reports*** group box, and review the capacity picture.



a) Note the one partition CICSA doesn't have a sufficient number of LCPs to satisfy the weight assigned. We will fix this later

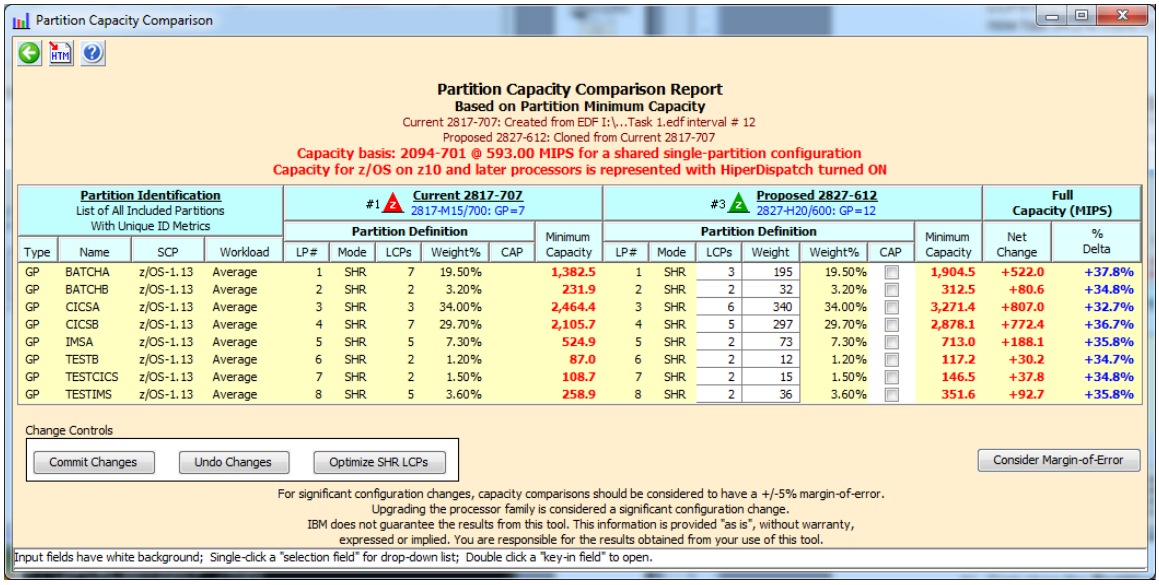
b) Note that Total capacity (**9,513** vs **8,553** requirement). Click **Return** 2 times (or click the **Double Return**) to get back to ***Advanced-Mode Control Panel*** window.

c) Select both the **2817-707** #1 and the **2827-612** #3 configurations and then click **Compare** icon on the ***Advanced-Mode Control Panel*** window.

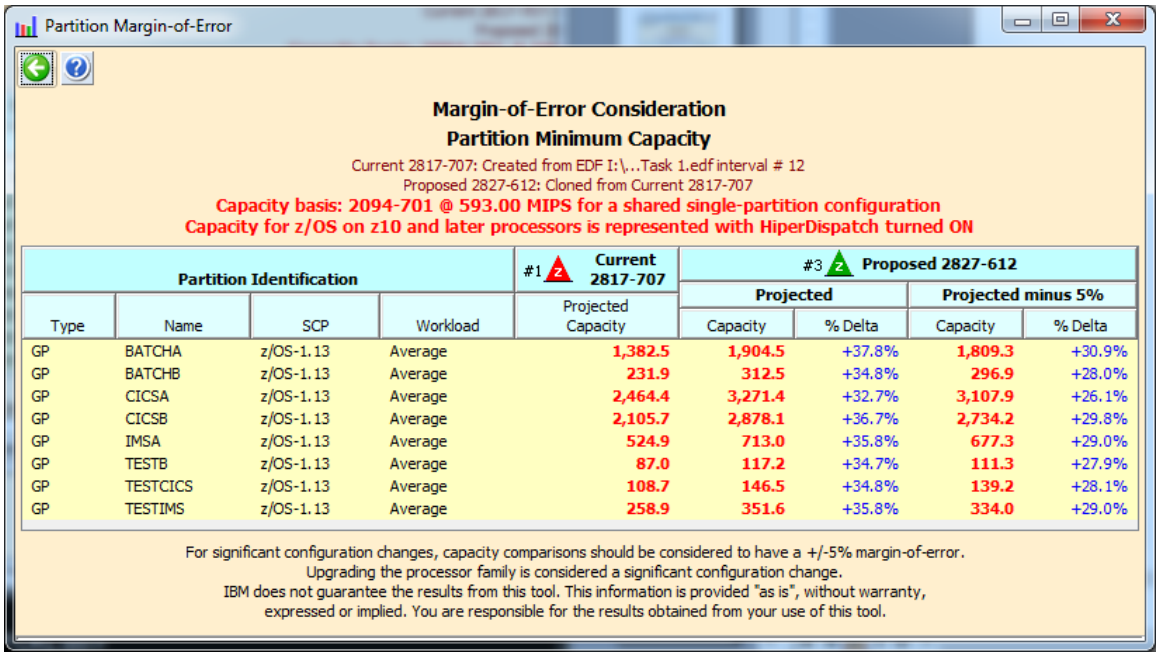
d) Click **Minimum Capacity**. Note that now all partitions are seeing more than the required 20% capacity increase over the old 2817-707 configuration except for CICSA.

e) Click **Optimize SHR LCPs** for GPs in the ***Change Controls*** group box to see if you can improve the results by reducing (increasing) the number of LCPs assign to each partition to that required to accommodate its weight. Click **Optimize** with the **Moderate** option.

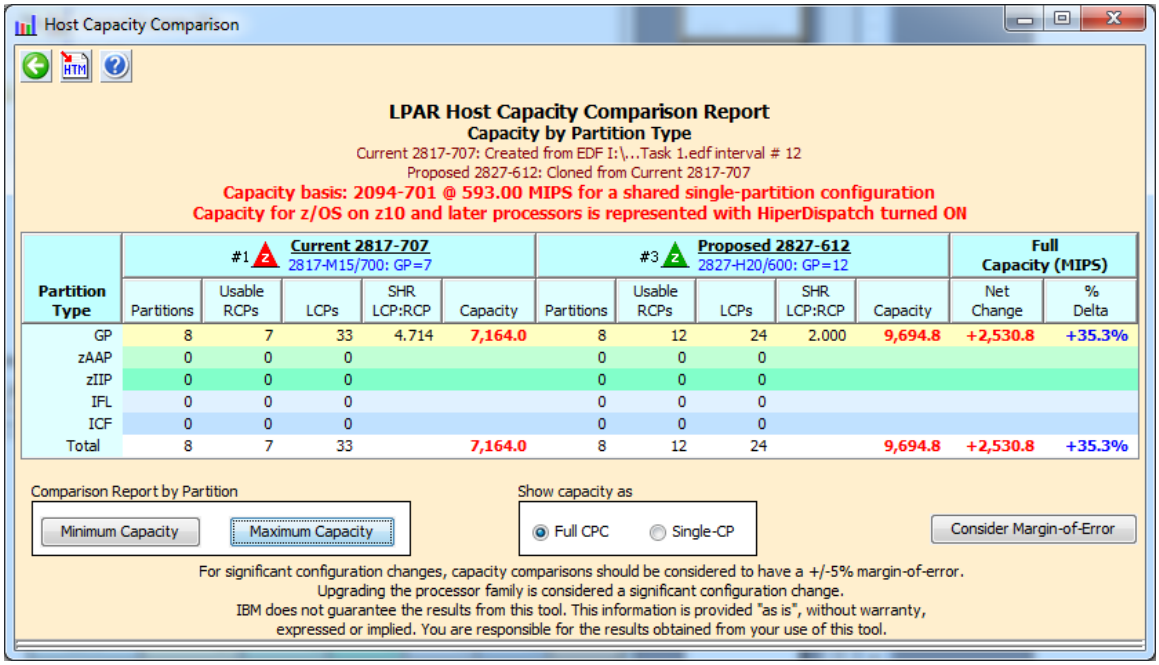
f) The CICSA partition has 33.8% more capacity and we have more than met our 20% objective for all partitions. We should also consider changing all of the partitions with only 1 LCP to have 2 LCPs for availability reasons as shown below. Increase the LCPs to 2 for partitions BATCHB, IMSA, TESTB, TESTCICS and TESTIMS. (CICSA now has 32.7% more capacity)



g) Click on **Consider Margin of Error** We also want to validate that all of the partitions have enough capacity to ensure they cover the -5% Margin-of-Error. We can see that all partitions are >20% delta on the projected minus 5%.



h) First close the ***Partition-Margin-of- Error*** window. Then click **Commit Changes** in the ***Change Controls*** group box to change the LPAR configuration to permanently include the modified metrics, (from the Optimize). Note that the ***Host Capacity Comparison*** window now shows we are delivering **9,694.8 MIPS**, which is more than the **8,553 MIPS** objective.



5. Click two **Return** buttons to close the windows

While we won't execute the following in this lab, there are some things to consider since this zEC12 612 has more capacity than is required. Perhaps a zEC12 611 may be an option?, although getting 20% more with a -5% margin of error is unlikely. If the partitions had zIIP/zAAP eligible workload perhaps their GCP requirement / weight could be reduced making a 611 an option closer to the GCP capacity requirement?

In addition, this sub-capacity model has "more slower" engines than the z196 and the zEC12-707 option (which will be shown and briefly discussed at the end of the lab).

In summary there are many additional "real world" considerations when utilizing zPCR to analyze System z capacity configuration alternatives.

*** End of Task A ***

Task B: **Add an IFL to the zEC12 2827-707**

We will update the LPAR configuration to accommodate a new Linux partition, running on IFL CPs.

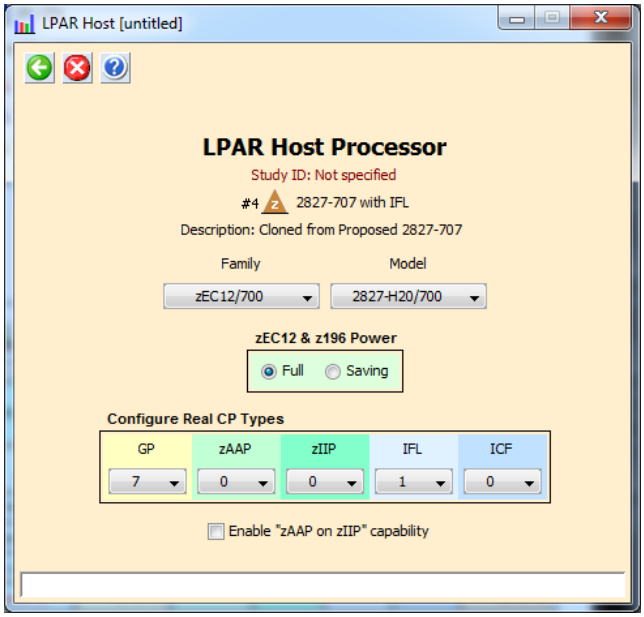
Analysis Steps

1. Single-click on the **Proposed 2827-707** icon

on the ***Advanced-Mode Control Panel*** window to select it.
2. Click the **Clone** toolbar button. A fourth LPAR configuration is created as an exact copy of the second. Its icon

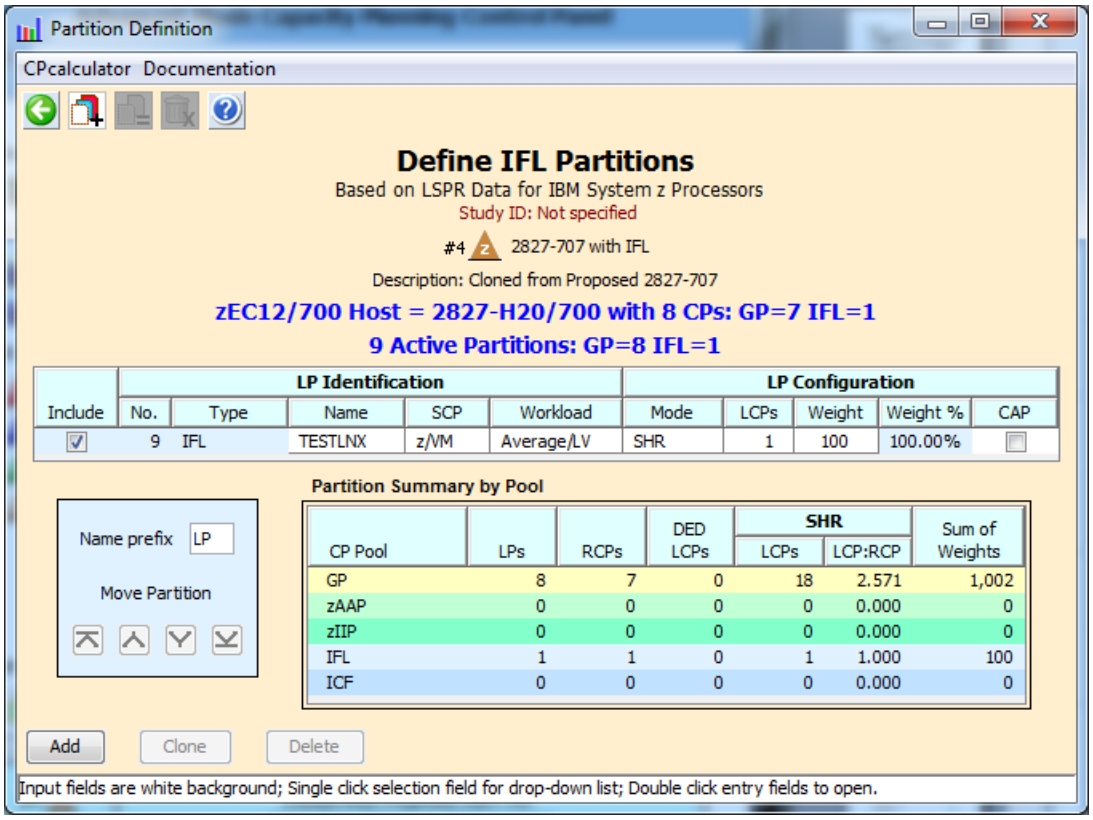
, Rename it **2827-707 with IFL**
3. Double-click the **2827-707 with IFL**

icon to open the ***LPAR Host and Partition Configuration*** window for the **2827-707 with IFL** LPAR configuration.
4. Click **Specify Host** and on the ***LPAR Host*** window, add 1 IFL CP.



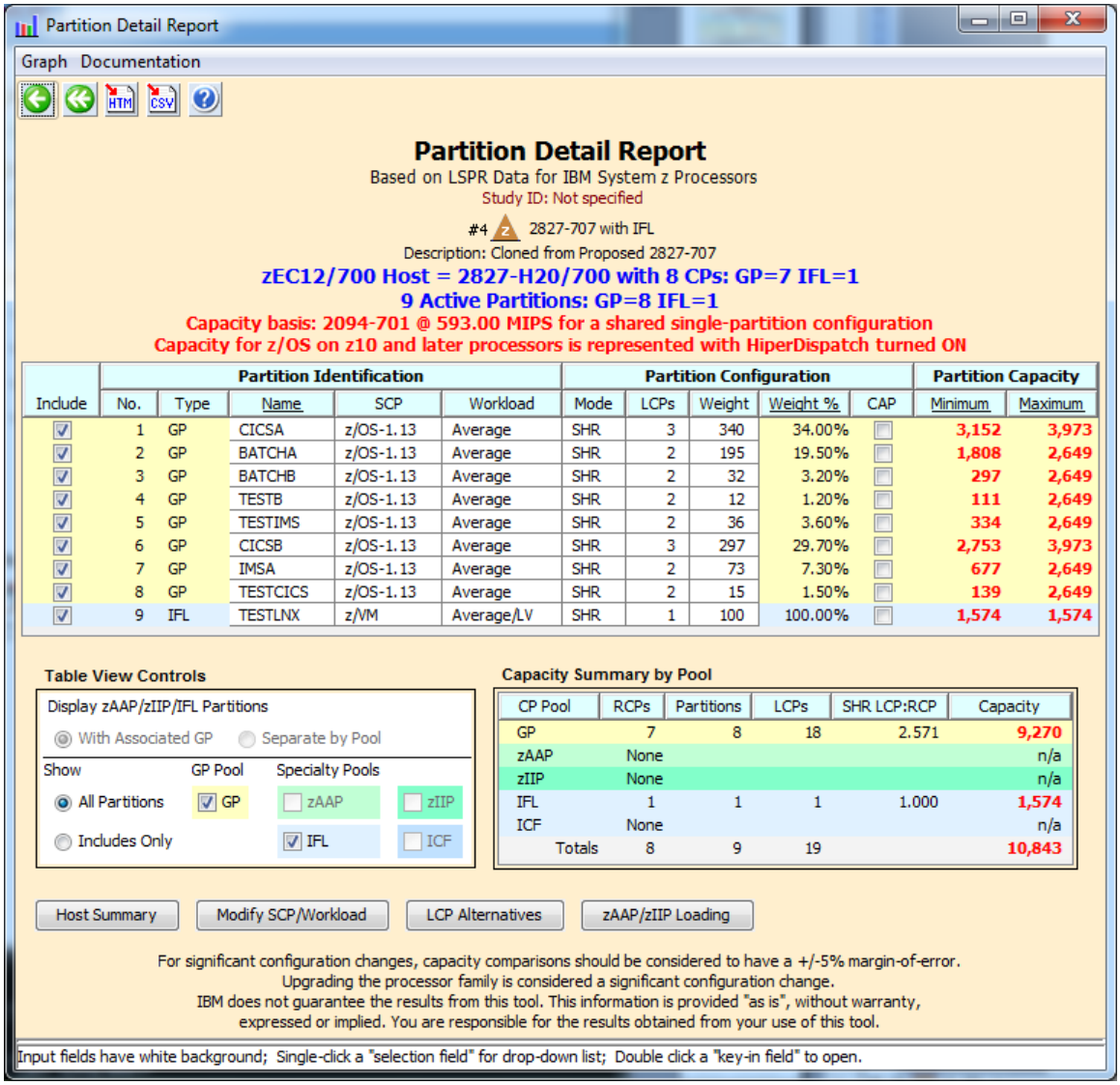
5. **Click Return.**
6. From the ***LPAR Host and Partition Configuration*** window, click **IFL** in the ***Define Partitions*** group box.

7. From the ***LPAR Partition Definition*** window, edit the partition name (from LP-09) by double-clicking the name field to open it and entering text to “TESTLNX", and hitting enter.



8. Click **Return**.

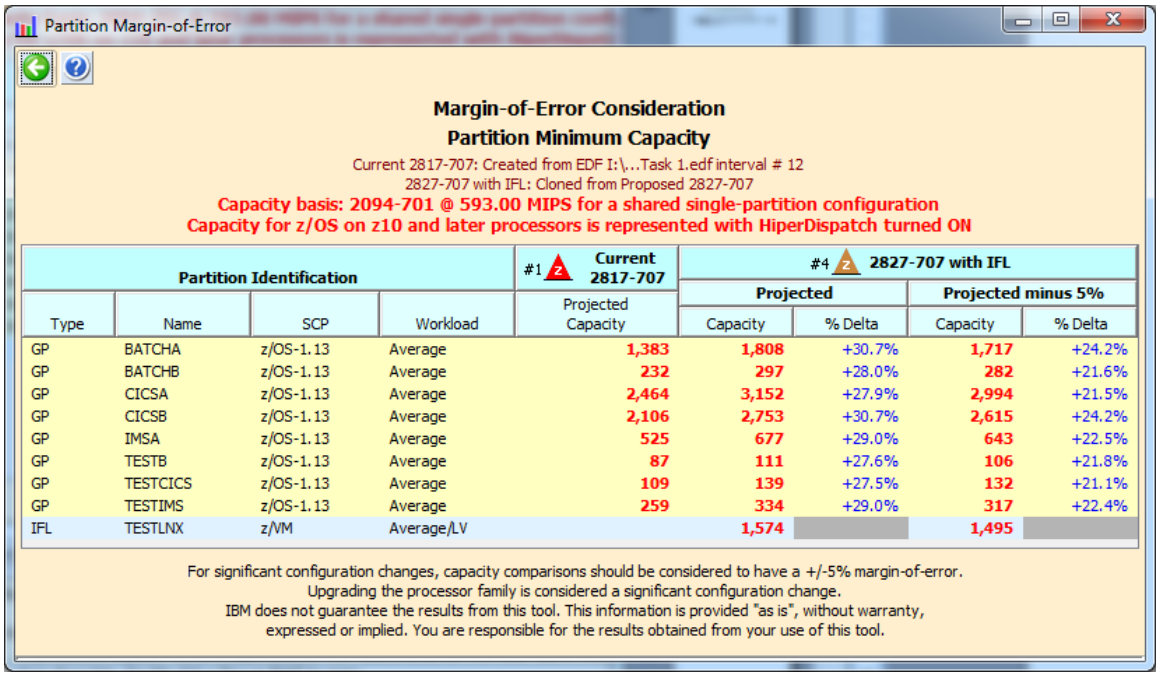
9. From the ***LPAR Host and Partition Configuration*** window, click **Partition Detail** in the **Capacity *Reports*** group box to open the **Partition *Detail Report*** window, revealing the updated capacity picture. The overall capacity increased to **10,843**.



Include	Partition Identification					Partition Configuration					Partition Capacity	
	No.	Type	Name	SCP	Workload	Mode	LCPs	Weight	Weight %	CAP	Minimum	Maximum
☑	1	GP	CICSA	z/OS-1.13	Average	SHR	3	340	34.00%	☐	3,152	3,973
☑	2	GP	BATCHA	z/OS-1.13	Average	SHR	2	195	19.50%	☐	1,808	2,649
☑	3	GP	BATCHB	z/OS-1.13	Average	SHR	2	32	3.20%	☐	297	2,649
☑	4	GP	TESTB	z/OS-1.13	Average	SHR	2	12	1.20%	☐	111	2,649
☑	5	GP	TESTIMS	z/OS-1.13	Average	SHR	2	36	3.60%	☐	334	2,649
☑	6	GP	CICSB	z/OS-1.13	Average	SHR	3	297	29.70%	☐	2,753	3,973
☑	7	GP	IMSA	z/OS-1.13	Average	SHR	2	73	7.30%	☐	677	2,649
☑	8	GP	TESTCICS	z/OS-1.13	Average	SHR	2	15	1.50%	☐	139	2,649
☑	9	IFL	TESTLNX	z/VM	Average/LV	SHR	1	100	100.00%	☐	1,574	1,574

CP Pool	RCPs	Partitions	LCPs	SHR LCP:RCP	Capacity
GP	7	8	18	2.571	9,270
zAAP	None				n/a
zIIP	None				n/a
IFL	1	1	1	1.000	1,574
ICF	None				n/a
Totals	8	9	19		10,843

10. Verify using the ***Margin of Error*** window, we see that all of our partitions will still meet our objective of > 20% with the addition of the IFL partition. Close all windows. On the ***Advanced-Mode Control Panel*** window, select the two configurations #1 and #4 (hold the cntl key and click on both) and click the **Compare** tool bar icon. Click on **Minimum Capacity**, and then click **Consider Margin-of-Error** to see the following.



Partition Margin-of-Error

Margin-of-Error Consideration

Partition Minimum Capacity

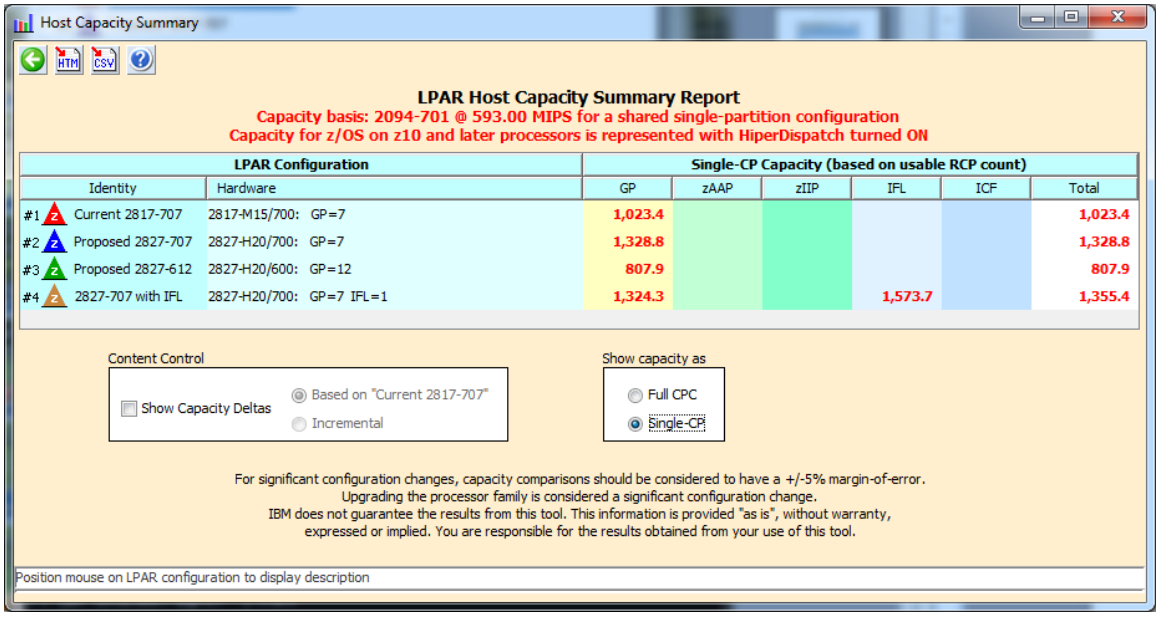
Current 2817-707: Created from EDF I:\...Task 1.edf interval # 12
2827-707 with IFL: Cloned from Proposed 2827-707

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				#1 Current 2817-707	#4 2827-707 with IFL			
					Projected		Projected minus 5%	
Type	Name	SCP	Workload	Projected Capacity	Capacity	% Delta	Capacity	% Delta
GP	BATCHA	z/OS-1.13	Average	1,383	1,808	+30.7%	1,717	+24.2%
GP	BATCHB	z/OS-1.13	Average	232	297	+28.0%	282	+21.6%
GP	CICSA	z/OS-1.13	Average	2,464	3,152	+27.9%	2,994	+21.5%
GP	CICSB	z/OS-1.13	Average	2,106	2,753	+30.7%	2,615	+24.2%
GP	IMSA	z/OS-1.13	Average	525	677	+29.0%	643	+22.5%
GP	TESTB	z/OS-1.13	Average	87	111	+27.6%	106	+21.8%
GP	TESTCICS	z/OS-1.13	Average	109	139	+27.5%	132	+21.1%
GP	TESTIMS	z/OS-1.13	Average	259	334	+29.0%	317	+22.4%
IFL	TESTLNX	z/VM	Average/LV		1,574		1,495	

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.
IBM does not guarantee the results from this tool. This information is provided "as is", without warranty, expressed or implied. You are responsible for the results obtained from your use of this tool.

11. Close all windows. From the ***Advanced-Mode Control Panel*** window, click ***LPAR Host Capacity Summary Report*** icon . This report relates the capacity projections by partition type (CP pool) for each LPAR configuration that is defined. The sum of the individual pool capacity values is shown as a total for the entire CPC on the right.



12. Change the view to the Single-CP. ***Single-CP*** capacity represents the average capacity of each CP (determined by dividing the full capacity by the number of CPs involved). ***Single-CP*** capacity can be useful for revealing relative engine speed when comparing LPAR configurations where the host processor family is changed

One use of the Single-CP option is to compare the zEC12 612 alternative. In this case it has “more slower” engines (12 engines with 807.9 MIPS relative capacity per GCP) than the zEC12 707 options and the z196 that it came from, but more total GCP capacity. This would be one consideration for a sub-capacity model, along with the type of work, number of partitions, dispatch points, CPU per Tran etc.

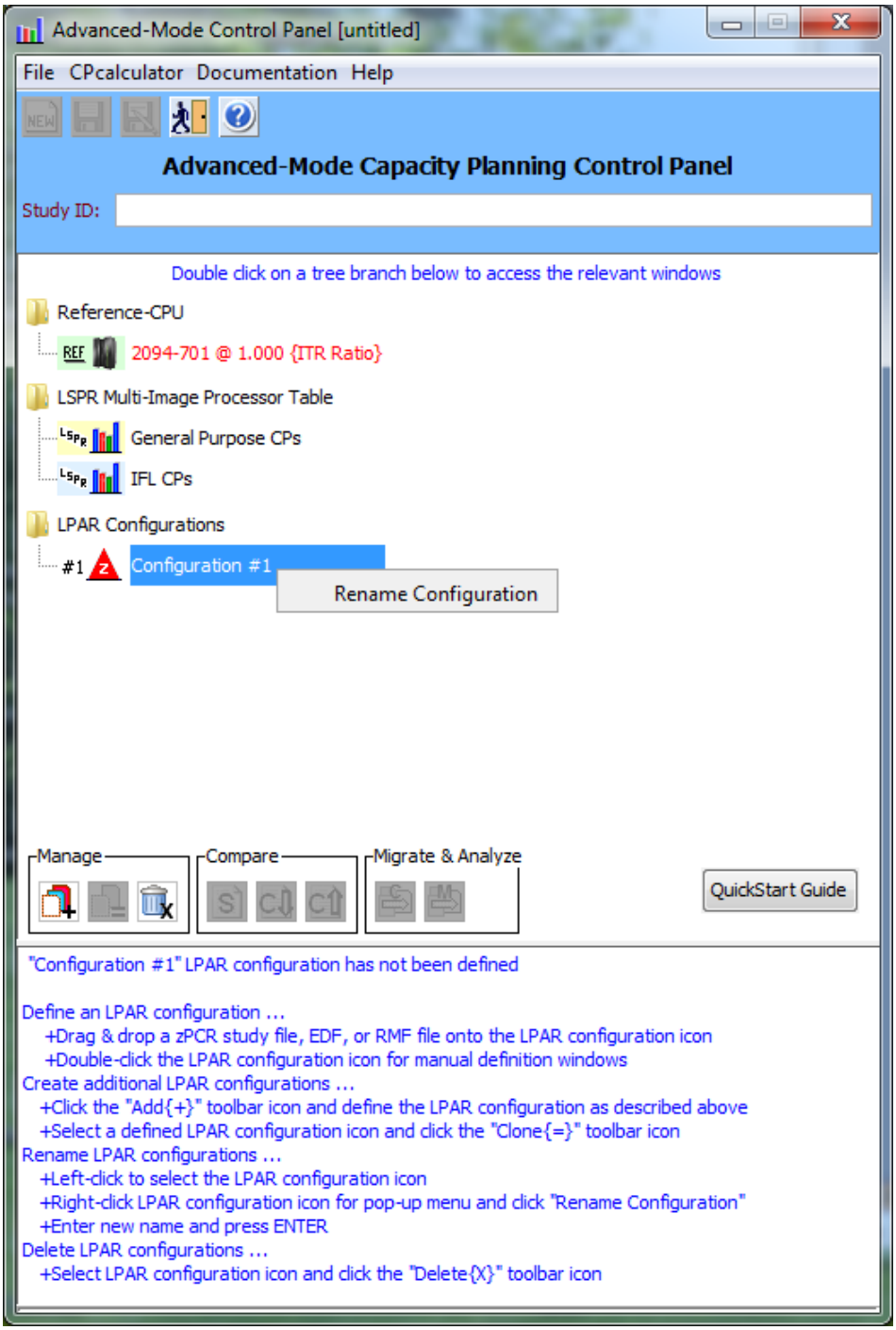
*** End of Task B ***

*** End of Exercise ***

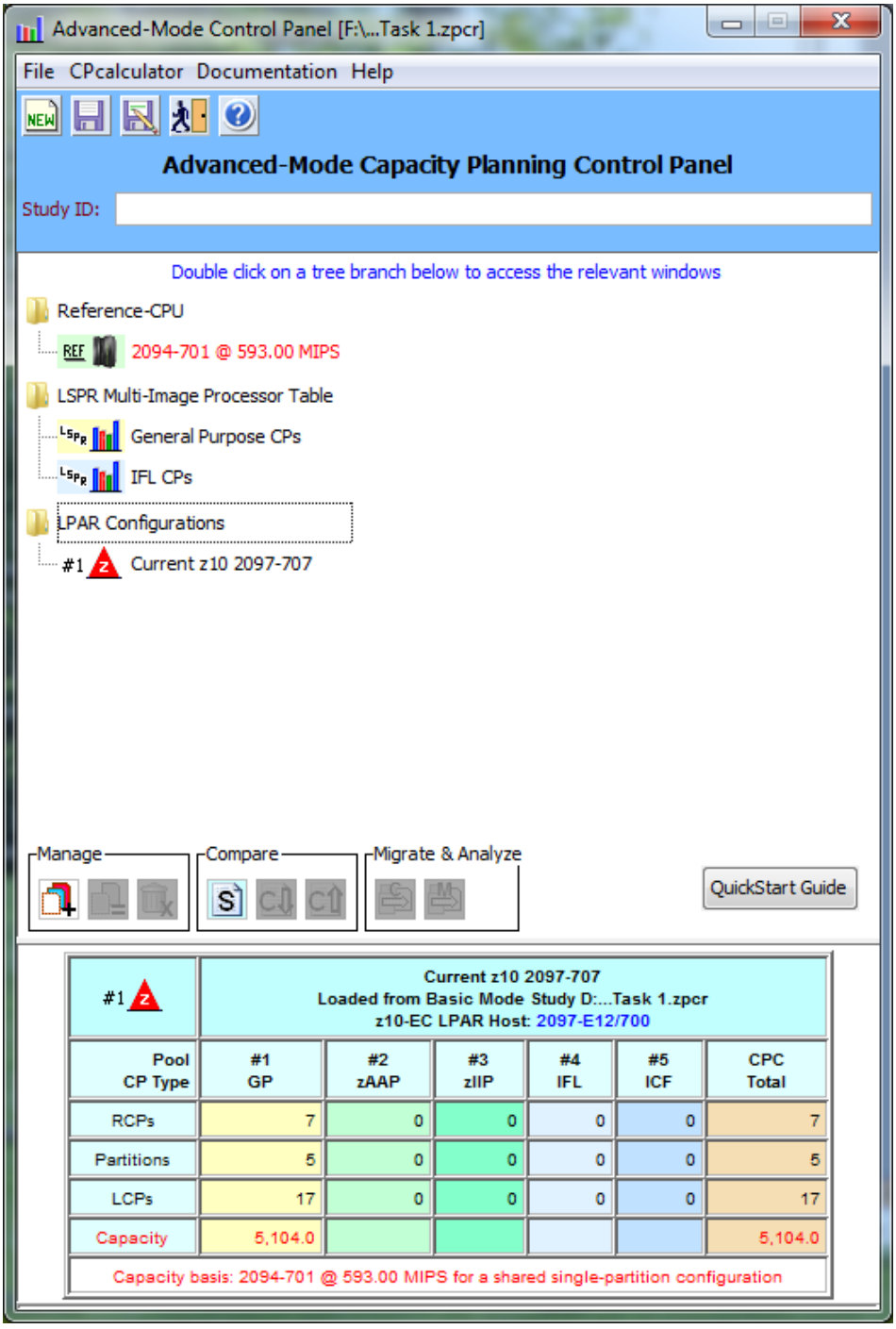
Renaming an LPAR Configuration

Procedure

1. On the ***Advanced-Mode Control Panel*** window, single-click the desired **LPAR Configuration** icon to select it.
2. Right click on the text field.



3. Key in the name that you wish to use and hit enter.



*** End of Document ***