zPCR Capacity Sizing Lab

SHARE - Sessions 10001/9667

August 11, 2011

John Burg
Brad Snyder

Materials created by John Fitch and Jim Shaw

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Notes:

Performance is in Internal Throughput Rate (ITR) ratio based on measurements and projections using standard IBM benchmarks in a controlled environment. The actual throughput that any user will experience will vary depending upon considerations such as the amount of multiprogramming in the user's job stream, the I/O configuration, the storage configuration, and the workload processed. Therefore, no assurance can be given that an individual user will achieve throughput improvements equivalent to the performance ratios stated here.

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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

SHARE - Session 10001

August 11, 2011

John Burg
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IBM
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**
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

<table>
<thead>
<tr>
<th>L1MP</th>
<th>RNI</th>
<th>Workload Hint</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;3%</td>
<td>&gt;= 0.75</td>
<td>AVERAGE</td>
</tr>
<tr>
<td></td>
<td>&lt; 0.75</td>
<td>LOW</td>
</tr>
<tr>
<td>3% to 6%</td>
<td>&gt;1.0</td>
<td>HIGH</td>
</tr>
<tr>
<td></td>
<td>0.6 to 1.0</td>
<td>AVERAGE</td>
</tr>
<tr>
<td></td>
<td>&lt; 0.6</td>
<td>LOW</td>
</tr>
<tr>
<td>&gt;6%</td>
<td>&gt;=0.75</td>
<td>HIGH</td>
</tr>
<tr>
<td></td>
<td>&lt; 0.75</td>
<td>AVERAGE</td>
</tr>
</tbody>
</table>

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 Separate 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 whatever 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

Processor Capacity Reference
for IBM System z
zPCR version C7.4

(C) Copyright IBM Corp. 2003, 2010. All rights reserved.
Contains graphics software from KL Group.
(C) Copyright KL Group 2000. All rights reserved.
E-mail support: zpcr@us.ibm.com

Internet Web Site: www-03.ibm.com/support/techdocs/atmastra.nsf/Weblink/PRS1381

Version Identification
Select “Advanced-Mode” check box

Press Enter Advanced-Mode

Set “Startup” preferences
Set “Advanced Mode” as the default when starting zPCR.
zPCR Advanced-Mode Capacity Planning Control Panel

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.

View Muli-Image LSPR table

Manage Multiple Configurations

View “QuickStart” Guide

LPAR Configuration Planning Right “click” to rename up to 20 characters
zPCR Advanced-Mode Capacity Planning Control Panel

Configuration Renamed

Configuration Summary
zPCR Advanced-Mode Capacity Planning Control Panel

Comparison Report
# Host Capacity Comparison Report

## Broadcasting Information

**Capacity:** 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.

## Comparison Report by Partition

<table>
<thead>
<tr>
<th>Partition Type</th>
<th>Current 2094-S18</th>
<th>Proposed 2007-E26</th>
<th>Full Capacity (MIPS)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Useable RCPs</td>
<td>LCPs</td>
<td>SHR LCP:RCP</td>
</tr>
<tr>
<td>GP</td>
<td>4</td>
<td>10</td>
<td>21</td>
</tr>
<tr>
<td>zAAP</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>zIIP</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>IFL</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>ICF</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>9</td>
<td>15</td>
<td>27</td>
</tr>
</tbody>
</table>

## Show Capacity as

- **Full**
- **Single CP**

## 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.
# Margin-of-Error Report

## 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.

<table>
<thead>
<tr>
<th>Partition Type</th>
<th>#1 Current 2094-S18</th>
<th>#2 Proposed 2097-E26</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Projected Capacity</td>
<td>Projected Capacity</td>
</tr>
<tr>
<td></td>
<td></td>
<td>% Delta</td>
</tr>
<tr>
<td>GP</td>
<td>4,822</td>
<td>7,152</td>
</tr>
<tr>
<td>zAAP</td>
<td>517</td>
<td>778</td>
</tr>
<tr>
<td>zIIP</td>
<td>502</td>
<td>705</td>
</tr>
<tr>
<td>IFL</td>
<td>1,084</td>
<td>1,762</td>
</tr>
<tr>
<td>ICF</td>
<td>551</td>
<td>828</td>
</tr>
<tr>
<td>Total</td>
<td>7,477</td>
<td>11,225</td>
</tr>
</tbody>
</table>

|                | Projected minus 5%  | Projected minus 5%   |
|                |                     | Capacity             |
|                |                     | % Delta              |
| GP             | 6,795               | +40.9%               |
| zAAP           | 739                 | +42.9%               |
| zIIP           | 669                 | +33.3%               |
| IFL            | 1,674               | +54.4%               |
| ICF            | 787                 | +42.8%               |
| Total          | 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

Select Partition Types

- GP
- zAAP
- zIIP
- IFL
- ICF

LCP Count Assignment

- Moderate
- Minimum

Optimize
Cancel
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

Default SCPs for Partitions

Default z/OS workload is Average

Select an interval

Default SCP/Workload for Partitions:
- GP/zAAP/zIIP: z/OS Average
- IFL: Linux Low/L
- ICF: CFCC CFCC
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

Transfer partitions to zPCR

Method used is either “Default” or DASD I/O

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

Workload assigned from the “Method” used
Detail report with additional partitions added

Added partitions from RMF
Click on the **Host Capacity Summary** icon to view the report.
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.
Automated SCP/Workload conversion for previous zPCR study file...

<table>
<thead>
<tr>
<th>No.</th>
<th>Type</th>
<th>Name</th>
<th>Former zPCR Study</th>
<th>New zPCR Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>GP</td>
<td>LP-01</td>
<td>z/OS-1.9*</td>
<td>z/OS-1.9*</td>
</tr>
<tr>
<td>2.</td>
<td>GP</td>
<td>LP-02</td>
<td>z/OS-1.9*</td>
<td>z/OS-1.9*</td>
</tr>
<tr>
<td>3.</td>
<td>GP</td>
<td>LP-03</td>
<td>z/OS-1.9*</td>
<td>z/OS-1.9*</td>
</tr>
<tr>
<td>4.</td>
<td>GP</td>
<td>LP-04</td>
<td>z/VM</td>
<td>z/VM</td>
</tr>
<tr>
<td>5.</td>
<td>IFL</td>
<td>LP-05</td>
<td>Linux</td>
<td>Linux</td>
</tr>
<tr>
<td>6.</td>
<td>IFL</td>
<td>LP-06</td>
<td>Linux</td>
<td>Linux</td>
</tr>
</tbody>
</table>

New SCP and Workload Names have been implemented for z/OS, z/VM and Linux. SCP and Workload definitions have been converted for the partitions listed.

zPCR Study - SCP/Workload Conversion

Your zPCR study was created with version 6.3

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

SMF datasets one per partition
CP3KETR runs on z/OS
Creates EDF dataset one per partition on the host
Download the files to the PC
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

- DASD I/Os per second from RMF 74s
- Parked Engines for the partition: None for this interval
- "RNI" for the partition
- Pass the mouse over the "CPU-MF Hint" workload to reveal the actual metrics used
- HiperDispatch active for the partition
Additional Functions

Assess the impact of different LCP configurations

Assess 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.
Assess the impact of different LCP Configurations

- Assess the impact of adjusting the LCPs based on weight
- Apply “Parked” engines when available
- Commit changes
Asses the impact of using the “Hint” workload instead of the one currently assigned

Commit changes
Single Spot on the Web to Get More Information

- **zPCR Getting Started Page**
  - 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](mailto: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 your unique 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**

It's QUESTION TIME!!
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

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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