Understanding MLC Cost Impact of Performance and Capacity Management

CMG Canada’s Winter Seminar
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BMC Software
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Topics

• Cost control - Traditional Capacity Planning
• Paradigm shift – Managing MLC Costs
  – Understanding MLC
  – MSU Reduction focus 4HRA
• Risk Avoidance – Ensuring SLAs
Survey #1 - Questions

CPC upgrades - Driven by;

a) Online,
b) Batch
c) Both
d) Don’t know

4HRA - Driven by;

a) Online,
b) Batch
c) Both
d) Don’t know
Performance & Availability Rules of Thumb

• Keep CEC & MVS 100% busy
  – An unused MIP is lost forever

• PR/SM Configuration
  – Ensure production can steal from test and visa-versa
  – Over configure logical to physical ratio so MIPS > guaranteed % can be used

• Upgrade thresholds
  – 70-80% of capacity used by OLTP

• Decrease Batch window
  – Start ASAP
  – Complete ASAP
    • for maximum window to recover from failures or schedule planned outages

Are you managing P&A using most of these rules?
Survey #2
What is important to reduce IT Costs

Hardware
a) MIPS / MSUs reduction?
b) Specialty Engines usage?
c) JIT Hardware upgrades?

Software
d) ISV SWLCs reduction?
e) MLC Cost reduction?

Hardware
a) Only if in 4HRA
b) 4HRA & not overflowing
c) Unlikely, increases 4HRA

Software
d) 10 % reduction = 0.7%
e) 10 % reduction = 3%+
What is important to reducing IT Costs?
CIO objectives and IT Budget Cost sources %

Meeting CIO objectives - With 80/20 Rule
Focus 20% of effort to get 80% of benefit of MF IT Cost reduction

Focus on 4HRA Costs

- IBM MLC 25-30%
  - Save 10% = 2.5%
- IBM VUE and OTC 4-9%
- ISVs 7-10%
  - Save 10% = 0.7%

Shift gaze - Hardware no longer $ issue
UNDERSTANDING 4HRA AND MLC
Goal of Usage (4HRA) based MLC

Buy extra capacity - meet SLAs, pay for less than used.

Billed 4HRA, not Peak MSUs
Sub-capacity Pricing – Example Scenario

Monthly MSU 4 Hour Rolling Average

Bill - z/OS, CICS, IMS: 1108 MSUs
Largest LPAR peak not what is billed

LPAR1 Peak 4HRA 550 MSUs
LPAR2 Peak 4HRA 400 MSUs
LPAR3 Peak 4HRA 450 MSUs
CPC Peak 4HRA 1108 MSUs

LPAR 1
- z/OS
- CICS
- DB2
- IMS
- Onlines

LPAR 2
- z/OS
- CICS
- DB2
- IMS
- Onlines

LPAR 3
- z/OS
- CICS
- IMS
- Batch
- MQ
MLC Tiered - Example

• Base Expensive
  – Payed every CPC unless Sysplex > 50% or CMP
  – Avg Cost > Incremental cost
    • Grow / Shrink cheapest

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<td>1976</td>
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<td>$45</td>
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Complexity different products on LPARs / CPCs

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<tr>
<th>MLC Product</th>
<th>CPC</th>
<th>4HRA MSU Utilization</th>
<th>4HRA First Peak Cost</th>
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<td>TEXAS</td>
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- CPCs peak at different times – Opportunity for LPAR workload balancing
- IMS MSUs – lower than z/OS not on all LPARs
LPAR contribution to CPC 4HRA

**SCRT report** insufficient to understand what caused CPC 4HRA peak for the month

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<th>Hour Count</th>
<th>Date/Time</th>
<th>2nd Highest</th>
<th>Hour Count</th>
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<tr>
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<td>165</td>
<td>1</td>
<td>24 Mar 2012 - 00:00</td>
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<tr>
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<td>24 Mar 2012 - 06:00</td>
<td>86</td>
<td>2</td>
<td>24 Mar 2012 - 04:00</td>
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<tr>
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<td>810</td>
<td>1</td>
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<tr>
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<td>989</td>
<td>1</td>
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z/OS MLC charges
- CPC based
- LPAR peaks - Different dates /times than CPC
"Indy, they're digging in the wrong place!"

When you have all of the information you can focus your efforts in the right place

SCRT report doesn't have enough information to Tune / Reduce

Need details from:

- Performance monitors,
- Capacity planning reports,
- Other tools.
REDUCING 4HRA / MLC
New Paradigm

**Hardware - Impact**

- Buy extra capacity
  - TUC Discount
  - RNI
- zIIP Capacity
  - Overflow & controls
  - Sub-cap boxes
- CF Stealing MSUs
  - External vs Internal
  - Link Speeds

**Tuning & Software for Benefit**

- What is benefit?
  - GCP or zIIP MSU reduction?
- Who benefits?
  - OLTPs or Batch?
- Will benefit help me?
  - Does it reduce CPC 4HRA peak?
  - Do I have spare zIIP capacity?
Spare MSUs = Lower MSUs from lower RNI

High RNI =
- Higher MSU for same workload.
- Increases 4HRA and MLC costs

Extra Capacity
- Maximize Vertical highs
- Buy more GCPs / books
## CPC Technology Discount (TUC)

Hardware discount – How many MSUs owned, not MSUs used (peak or 4HRA)

<table>
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<tr>
<th>MSU Owned</th>
<th>All CPCs same Type</th>
<th>Mixed Environment</th>
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<td>1316</td>
<td>15.00%</td>
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<td>2676</td>
<td>18.00%</td>
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<tr>
<td>5476</td>
<td>21.00%</td>
<td>14.00%</td>
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| z13       |     |     |     |     |     |
| 45        |     |     |     |     |     |
| 315       |     |     |     |     |     |
| 1315      |     |     |     |     |     |
| 2676      |     |     |     |     |     |
| 5476      |     |     |     |     |     |
| 999999    |     |     |     |     |     |

Buying 316 vs 315 MSUs gets
- Extra 2% MLC
- better RNI < MSUs used
zIIP Overflow = MLC $

**MLC Impact**: $250K – $750K per year ...per engine wasted

- **High $/ MSU**
  - At small sites
- **High # MSUs**
  - At large sites
- **MLC $372K / yr**
  - 77 MSUs @ $400 / MSU =

**More zIIP MSUs**
- Sub-cap CPC
- SMT2

14% or more overflow
Coupling Facility - SYNC
Spin Loop GCP MSUs in 4HRA Peak?

CF Performance Critical
• Higher MLC bills
• CPC upgrades
• SLAs Impacted

CF Impact reduction
• Internal vs External
• Faster CF Links
• Async Duplexing
• Sub-cap CPCs

Potential 4 Hour Peak Impact
1.5 GCPs

$\sum (\text{Sync Svce Time} \times \# \text{ of Req}) = \text{Total Spin Time}$
### Software Benefit - When

**zIIP Offload**
- DB2 Seq-Prefetch = Batch
- DB2 Utilities = Batch
- Sort = Batch
- Monitors
  - DB2 = OLTP & Batch
  - CICS = OLTP
  - MQ = typically batch

**Elapsed reductions**
- Batch Optimizers = batch
- Reorg while open = batch

Evaluate all proposed cost savings for impact to CPC peak

**White paper:** Deliver Better Results for Mainframe Cost Reduction Initiatives
Different CPC Peaks = LPAR and Workload balancing opportunity

- 2 LPARs peak at CPC777 peak
- LPARs on CEC888 with lower peaks
Understanding 4HRA Drivers

Investigate
- CPC billed MSUs time
- Which LPAR is contributing to CPC max
- What workload on the LPAR
- From a spike, necessary?

Start of online day

4HRA PEAK

Backup / ReOrgs

Online Peak 3pm

Batch 7:30PM

White space Consumed?

4HRA Risk From batch spike

CPC billed MSUs time
Which LPAR is contributing to CPC max
What workload on the LPAR
From a spike, necessary?
Typical ISSUEs – 4HRA not when expected

6pm to 10am - BATCH is usually source of problem
- Started too early – averages w/ end of online peak usage
- Finishes too late - averages w/ start of online peak usage
- Middle of batch - CPC 4HRA Peak
  - Finishes with hours to spare and is not either above condition
    - Needs to be controlled
  - Drops then peaks again barely finishes on time

Daytime Onlines
Peak 4HRA 56 MSUs

Onlines volume complete

10pm Why not started earlier?

Why not CAP to Online Peak?

3:00AM

MSUs to finish on time
Batch needs 100% capacity to complete on time

Need to
• Begin sooner
• Shorten Duration
  – Improve efficiency of (batch, sorts, back-ups, DB reorgs, etc.)
  – GCP Reductions
  – zIIP Offload
• Delay Subset
  – Find discretionary batch / work that can complete later

Batch starts 9pm finishes 7:30am
Onlines start 8am
Need all MSUs to complete
Resource limiting not an option
Batch Multiple Peaks

Need to smooth and CAP

• **Large Spike**
  – slowly to valley and repeat

• **Potential cause**
  – backup / reorg then regular batch or visa-versa.

• **Needed action**
  – eliminate idle time to reduce elapsed to allow for capping
Batch Window Issue vs 4hrs in 4HRA

4 hrs contributing to 4HRA Peak

4hrs preceding peak – not only focus
If batch window issue, any reduction in elapsed
creates capping opportunity

Old CEC Peak

New Cap

Online End
Business Batch Starts, BB End
Backup, reorgs Finish JIT Onlines

Start Reorg while Open
Faster reorg Elapsed Time Benefit

4 hrs preceding peak – not only focus
If batch window issue, any reduction in elapsed
creates capping opportunity
Avoid Batch SLA impact

Reduce Batch CPU
- Tune application and subsystems
  - DB2 V10 zIIP enabled sequential prefetch (batch, online)
    - Verify adequate zIIP capacity

Reduce Batch Elapsed time
- Convert serial processing to parallel processing
  - N-way data sharing (VSAM RLS)
  - Batch pipes or equivalent

Reduce Batch GCP CPU
- zIIP enabled Sorts, reorgs, etc.
- Delta / changed backups vs full
- Reorgs by need instead of all

Balance LPARs across CECs
- avoid simultaneous peaks
- Use scheduling environments

Reduce LPAR Software footprint
- Consider Batch only LPARs
  - eliminate non-essential software
Ease of identifying drivers of 4HA MSUs

Hard
- Heterogeneous software on LPARs
  - New work on z LPARs just WAS and / or DB2.
  - IMS, CICS not on all LPARs
  - DB2 not on all LPARs
  - DB2 only LPARs (SAP)
- Numerous LPARs with different time of day peaks and different application mixes typically from large customers / acquisitions
  - Banks
  - Insurance
  - Service Bureaus

Easier
- Homogeneous software on LPARs
- LPAR Simplicity
  - Very few LPARs
  - Very few LPARs / CEC
Monitor / Manage / Plan - 4hr Avg MSU

• Monitor demand and 4HRA MSUs
  – Catch loops and anomalies to exclude from SCRT report
  – Understand normal LPARs / CEC usage patterns
  – Track current against normal 4hr MSU patterns

• Manage potential SLA impact of capping
  – Max MSUs Consumed
  – Average MSUs Consumed

• Plan your corrective actions
  – Understand what to sacrifice to stay under expected max
    • What actions can be taken to allow sacrifice
Growth LPAR – Rolling and Using

Monitors 4HRA Alarm

Not enough Alarms –

- 4HRA - too late,
- MSU spikes – early warning

Actions –

- What on the fly actions are allowed?
- Impact SLAs?
CONTROLLING MSU CONSUMPTION
Capping types and Pro/Cons

Manage to current consumption

- Can’t exceed even if no impact to 4HRA
- PR/SM Initial Capping (aka – Hard Capping)
  - Relative to LPARs current weight, # of CPs worth, don’t take “white space”
- Absolute Capping – (hard cap new on EC12) – Not relative to share, specified in terms of 1/100ths of a processor
- WLM Resource Groups - CPU SU/SEC a Service class can use across the Sysplex
  - Sysplex scope may not be CPC and aligned with SCRT billing

Manage to 4hr MSU Average

- MSU > cap until 4HRA limit hit
  - Never caps lower than Defined capacity
  - 4HRA exceeds cap - not billed for it

Types

- Defined Capacity – Soft Capping # of MSUs to give LPAR in 1MSU increments
- Group Capacity – Set capacity for group of LPARs in a CEC to subset of CEC capacity but in PR/SM ration entitlements
Controlling 4HRA Monthly Max

- **Using PR/SM**
  - Capping
  - Max share via #LPs

- **Using WLM (w/ PR/SM)**
  - Capping
    - LPAR
    - Service class – for lower importance work
      - Discretionary can be source of 4HRA peak
**Logical / Physical – Guaranteed Minimum**

Does not create a maximum other than 100% of # of LPs

If no LPARs with work to compete with production batch, can exceed guaranteed share. And therefore easily exceed (2x) daytime 4HRA (3 vs 1.5 CPs)

Everyone's share < 10% of 16 CPs so guaranteed < 1.6 CPs

---

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<th>Rel</th>
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Using White Space / more than guaranteed share
Impacting 4HRA?
New Rules of Thumb

Manage 4 hour rolling average MSU consumption without impacting Service Level Agreements

- **Spare CEC Capacity** – Don’t use all if SLAs can be met
  - “Spare” MSUs - don’t always let unimportant workloads consume
    - Group CAP box to Production monthly peak +N% for SLA
      - Let others consume 100% of what the bill will be anyway
  - **Logical CP Overcommit** – Avoid for non-production as consume spare MSUs
  - **Balance LPARs & Workloads** - across CECs if peaking at different times

- **Batch is 4HRA peak by default** – Take action to avoid
  - **NO ASAP Batch** – make it complete with an acceptable window for recovery
    - Don’t start batch ASAP if it creates a 4HRA max
    - Don’t let batch finish late if creates a 4HRA max in online window before online peak

- **All software on all LPARs** - Don’t run if
  - **Unused / Unnecessary** - billed even if started and not used (hot standby, sandbox)
Discussion Topics

Mobile Workload Pricing

- **60% discount** on CICS, IMS, DB2, MQ, WAS MSUs
  - **Prove “mobile”** device (phone, tablet) – initiated request
  - **No Discount** - same URL is used for “mobile” and PC and you can’t tell the difference
- **Tracking** - Do you currently report “mobile” MSU consumption?
  - How do you do it?

Container Pricing

- **Test / Dev** – Up to 3x MSUs w/o MLC Impact
- **New workload on z** – considering vs zCAP or zNALC
Thank You

Dank u

Bring IT to Life.

Danke
Gratitude
Grazie
Gracias
Merci
Obrigado

Dzięki
Спасибо!
Tak
多謝
감사합니다

どうも ありがとう

बहुत धन्यवाद
مرسي