Can Capacity Planning and Finance Co-Exist?

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John Baker
z Performance Specialist
jbaker@mvssol.com
www.mvssol.com
About MVS Solutions

- Private, Canadian corporation
- In business for over 25 years
- Solid acceptance
  - broad, international installation base of around 200 customers
  - Long time IBM partner
- Sole focus: z/OS Batch Automation and enterprise software cost reduction via flagship technology – ThruPut Manager
  - Enhance WLM and JES2
  - Complements all job schedulers
About me

- 15 years at a large, international bank focusing on z/OS performance
  - z hardware and software tuning, WLM, GDPS... i.e. lots of SAS, RMF, Omegamon
- 6 years at IntelliMagic focusing on Enterprise I/O performance
- Joined MVS Solutions this year focusing on overall z performance and cost reduction
Managing Datacenter Costs

- Big issue, lots of pressure on management
- Can cut people
  - Many have, results not good, no slack left
- Can cut hardware costs
  - Risky. You want the capacity for peaks
  - Risks availability
- Can cut software costs
  - Many opportunities here
  - What ThruPut Manager brings to the table
Managing z/OS Software Costs

- IBM provides sub-capacity pricing option
- You need sufficient power to run your largest, most important loads of the year
- You don’t need it all the time
- Sub-capacity pricing charges on what you use
- Can restrict usage by setting a cap
IBM Software Charging

- Pay for software by usage of the LPAR or CEC, not capacity
- Based on highest usage of the month, as calculated by the average over a four-hour period (4HRA)
- Eligible software
  - Most IBM system software products – z/OS, CICS, IMS, DB2, MQ, WebSphere, Netview
  - Many other IBM products – compilers, ...
What’s the Benefit?

Typical Evening Usage

- Y-axis: MSU/hr
- Time: 16:00 to 00:00
What’s the Benefit?

The 4-hour Rolling Average

- MSU/hr
- 4HRA
Charging based on Month: LPAR vs CEC

**January 4HRA Peaks by LPAR and CEC**

- **LPAR1 peak:** 170 MSU/hr on Jan 27, 28, 31
- **LPAR2 peak:** 371 MSU/hr on Jan 12, 28
- **LPAR3 peak:** 85 MSU/hr on Jan 1, 27
- **Total of LPAR peaks:** 626 MSU/hr

- **CEC peak:** 609 MSU/hr on Jan 25
Capping Options

- **Hard capping**
  - Firm usage value - no more, no less

- **Soft capping**
  - Usage level may vary above or below cap
  - **Defined Capacity**
    - Used for LPAR
  - **LPAR Group Limit**
    - Used for CEC
Hard Capping

- “Sledgehammer” approach
- Useful for outsourcing environment to guarantee limited capacity
- Impractical for most environments
Defined Capacity

- Provides an MSU/hr charging limit for the 4HRA on an LPAR running z/OS native
- Works for products licensed on a small number of z/OS LPARs on this CEC
  - May minimize costs for those products
- Not ideal for consolidated environments
  - May leave cycles on the table
    - LPAR A busy but capped
    - LPAR B not busy
    - = CEC has available cycles and work is delayed
LPAR Group Limit

- Provides an MSU/hr charging limit for the 4HRA for a group of native z/OS LPARs on the same CEC
  - Hard-capped LPARs omitted
  - LPARs may be in different Sysplexes
- Most efficient option for products licensed on all z/OS LPARs
- Makes best use of the available cycles
- LPAR Group Limit may be combined with Defined Capacity
  - The lower capping level will be used
How Does LPAR Group Limit Work?

- Each LPAR gets a ‘Group Share’ when capping occurs
  - The Group Share is calculated by WLM in each LPAR independently, based on its weight and latent demand
- Each WLM is aware, in its LPAR Group calculation, of the usage of each other LPAR but not the type or importance of the work being run
- WLM donor-receiver model
  - If the LPAR does not need its cap level it may set a lower cap (be a donor)
  - If the LPAR has a lot of demand and some other LPAR has made cycles available, it may become a receiver
The Impact of Capping

- It depends ...
- ... on your weights
  - Are they what you need for your workload goals?
- ... on the difference between your weights and the cap
  - Keep them reasonably close to avoid dramatic swings
- ... on your Service Class goals
  - Goals must reflect real needs, especially when capped
CPU weights: Take what you need

- Your weights specify what proportion of the processing capacity each partition is usually entitled to.

- You can go over your weight while there are cycles available.

- But when constrained – all partitions busy, especially when capped – the weight has a major impact.

- Question: Can you meet the goals of your more important workloads while running at your weight?
WLM Goals: Ask for enough...

- Poorly set Service Class goals can hurt

- If your online goals are too easily attainable you may usually exceed them – PI may be as low as 0.5 - but meet them (PI 1.0) when capped
  - PI is still good – WLM has done its job - but service is not what the organization needs

- If your critical batch goals are too easy - especially for chains of jobs as in a Production application - you may miss due-out times while still meeting the Service Class goals
WLM Goals: but not too much

- If your Service Class goals are too aggressive – especially for lower importance work – higher importance work may become a donor

- Service may still be good but WLM statistics imply otherwise, because of poor PIs
ThruPut Manager: Batch Automation

- Automation Edition
  - Queueing, recalls, resource utilization and selection are managed based on selection thresholds and Batch Importance
  - Checks Service Class to be sure it’s receiving service before selecting a job in that class
  - Selection of lower importance work slows down when CPU resource less available
Queue Ordering Example: Development Job

- INVENTORY.DEVT
- Target: 5 minutes
- Acceptable: 15 minutes
- Batch Importance: 4
Queue Ordering Example: Production Job

- INVENTORY.PROD
- Target: 1 minute
- Acceptable: 3 minutes
- Critical: 7 minutes
- Batch Importance: 2
- Critical Level: C2
Queue Ordering

- **Critical**
  - by Importance
- **Acceptable**
  - by % of Acceptable
- **Target**
  - by % of target
Queue Ordering: Before Target

**INVENTORY.DEVT**
- T = 5
- A = 15
- C =
- I = 4

**INVENTORY.PROD**
- T = 1
- A = 3
- C = 7
- L = C2
- I = 2
Queue Ordering:
After Target but Before Acceptable

10 Minutes

Acceptable

2 Minutes

Ordered by % of Acceptable

75%

50%

25%

INVENTORY.DEVT
T=5
A=15
C=
I=4

INVENTORY.PROD
T=1
A=3
C=7
L=C2
I=2
Queue Ordering:
After Acceptable but Before Critical

Ordered by
Batch
Importance

4 Minutes

INVENTORY.DEVT
T=5
A=15
C=
I=4

INVENTORY.PROD
T=1
A=3
C=7
L=C2
I=2
Queue Ordering:
After Critical

Ordered by Level

INVENTORY.PROD
T=1
A=3
C=7  L=C2
I=2
ThruPut Manager: Reducing Monthly Software Costs

- Automated Capacity Management (ACM)
  - Designed to reduce costs while protecting loved ones
  - 4-hour rolling average is monitored and batch selection is adjusted, based on importance, as the 4HRA approaches the cap level

- With ACM you set a capacity limit
  - Defined Capacity
  - LPAR Group Limit or
  - TM AE “Target capacity”
    - Used when no capping is desired for non-batch workloads
    - Only restricts batch workload as target is neared
ThruPut Manager ACM: How it works

- You specify up to five percentage levels of that capacity at which TM AE will take one or more actions
  - Limit a category of batch to $n$ concurrent jobs,
  - Stop selecting a category of batch,
  - Change the Service Class of a category of batch to one that’s Discretionary with a low Resource Group maximum, until things get better
Initial Response

- “My costs are driven by online; batch is not an issue”
  - ALL workloads contribute – including discretionary batch

- “Management is afraid of the impact of capping on online so we don’t use soft-capping”
  - Valid concern – we can help!
Our Solution

- Capture SMF data for one month
- Analyze the make up of the total load in each RMF reporting interval and calculate the current 4HRA
- Determine the 4HRA for batch in each reporting period, by LPAR and across the physical machine
- Predict the impact on cost from reducing the batch load as the 4HRA peak load level approaches
Our MXG MSU program

- Reads MXG RMFINTRV to capture CPU and WLM (SMF 70, 72) stats for each interval
- Produces CSV files to be sent back to us
- We return a customizable report where you can
  - set the percentage of batch that may be deferred during peaks (based on business needs)
  - Set your monthly MSU $ rates based on your IBM contract
- Result is the estimated monthly savings by implementing ThruPut Manager’s Automated Capacity Management (ACM) feature
Observed Results

- We have found typical figures of anywhere between 18% and 37% of peak load was batch.
- Most large customers were around 30%.
- Typically 25% of that batch can be slowed/deferred during the peak.
- Using a reasonable cost figure of $300 per MSU/hr (to the best of our knowledge that’s typical for installations running z/OS, CICS, IMS, DB2, MQ...) we are seeing significant savings.
The Batch Component

CEC Usage - Weekdays 8am - 4pm

MSU/hr

Day

System  Online  Batch-HIGH  Batch-MED  Batch-Lo
A Customer Result with ACM

- One customer has been sending us data tracking their progress with ACM
- They’ve been able to lower their cap significantly
- The following chart from that customer shows the 4HRA climbing toward the cap but just skimming it
Results

Customer CEC Usage Jan. 7, 2013

MSU/hr

4HRA
Intvl
Limit
Other TM benefits

- Many products
  - Focus, SAS, Xpediter, Librarian, DYL280, ...

- Can often restrict to a small LPAR
  - Many products support LPAR pricing
  - Good use for hard capping

- Can be difficult to do
  - Security, local catalog, ...
Quick win: Isolate where possible

- License expensive ISV software to a small (low MSU) “penalty box” CEC
- Use TM Binding and Software Access Control to automatically restrict users and batch to LPAR’s on that CEC
- Simple setup – no JCL changes required
- Automatically routes work to an LPAR where the product is available
- Also prevents foreground TSO access from an unlicensed LPAR
JOB IMSCOMP
Binds to agent COMP.COBOL
Binds to agent IMSTEST.ACT

COMP.COBOL
IMSTEST.ACT

Agent IMSTEST.ACT active on SYS1, SYS3, & SYS5
Agent COMP.COBOL active on SYS1, SYS2, & SYS3

SYS1  SYS2  SYS3  SYS4  SYS5
Things to Remember

- Cost control must be balanced with meeting the needs of the organization
  - Set proper weights that reflect the importance, urgency and volume of the workloads
  - Make sure your Service Class goals and importance levels match organizational needs

WLM cannot manage your workloads well when constrained if these are poorly set
Things to Remember

- Batch on the same CEC as online but in a different LPAR can have a major impact
  - **All** workloads contribute to the 4-hour Rolling Average (even discretionary batch)
  - High batch workload on one LPAR may force the LPAR Group into capping, causing slowdowns to more important online workloads
  - **WLM is unaware of the importance of a load in another LPAR**

- Example: one site filled up a batch LPAR on a test SYSpex with discretionary work – caused the 4HRA for the CEC to be very high and cost them $$$$$
Summary

- You can buy hardware but software costs are higher and ongoing
- Sub-capacity pricing can save significant money on your monthly software bill – every month!
  - Soft capping works!
- Batch control is essential to protect Online
- Due diligence
  - Know your workloads and organizational needs
  - Understand the capabilities and limitations of your infrastructure
Thank You!

Questions?