Performance Measurement and Monitoring When Your Mainframe is a Managed Service

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Questions?

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Abstract

Performance Measurement and Monitoring When Your Mainframe is a Managed Service

- In the first part of this webinar series, Scott and Peter will discuss some performance management pitfalls outsourced customers need to be aware of to ensure they are being provided for optimally by their Mainframe Service Providers (MSPs).

- During this presentation, Scott and Peter will discuss some performance management reporting that should be monitored to help ensure the services they are being provided are to the greatest benefit to the client customer, and not just to the MSPs.

Sign up for our bi-weekly Performance Webinars!

- Free z/OS Performance Educational webinars!
  - These were the titles for our Spring/Summer 2022 webinars:
    - ✓ *SMF Recording Options to Improve Your Performance Analysis*
    - ✓ *SMF 98 and 99: Pinpointing Transient Performance Problems*
    - ✓ *Exploring z/OS Processor Storage Measurements*
    - ✓ *Exploring PR/SM Physical and Logical CPU Utilization Measurements*
    - ✓ *Exploring Locking and Locking Measurements on z/OS* (with Bob Rogers)
    - ✓ *Exploring z/OS SMF 30 Address Space CPU Measurements*
    - ✓ *More Details - Exploring z/OS SMF 30 Address Space CPU Measurements*
    - ✓ *Exploring z/OS WLM CPU Measurements: SUs vs CPU Secs vs APPL% vs Workload%*
    - ✓ *Exploring the Coupling Facility Lock Structure Measurements*
    - ✓ *Exploring z/OS SMF 14 / 15 Records for Tape and DASD File Activity*
    - ✓ *Mainframe as a Managed Service – Don't forget about Performance Management!*
    - ✓ *Performance Measurement and Monitoring When Your Mainframe is a Managed Service*

- We are currently working on the subjects of our Fall/Winter 2022/2023 webinars
  - Sign up!
  - Any suggestions or requests?

- Also, if you want a free cursory review of your environment, let us know!
  - We're always happy to process a day's worth of data and show you the results
  - See also: http://pivotor.com/cursoryReview.html

EPS: We do z/OS performance…

- Pivotor
  - Performance reporting and analysis of your z/OS measurements
  - Example: SMF, DCOLLECT, other, etc.
  - Not just reporting, but cost-effective analysis-based reporting based on our expertise

- Performance Educational Workshops (while analyzing your own data)
  - Essential z/OS Performance Tuning
  - Parallel Sysplex and z/OS Performance Tuning
  - WLM Performance and Re-evaluating Goals

- MSU reductions
  - Application and MSU reduction

- Information
  - We present around the world and participate in online forums
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z/OS Performance workshops available

During these workshops you will be analyzing your own data!

- Essential z/OS Performance Tuning
  - October 3-7, 2022

- WLM Performance and Re-evaluating Goals
  - September 12-16, 2022

- Parallel Sysplex and z/OS Performance Tuning
  - February 7 – 8, 2023

- Also… please make sure you are signed up for our free monthly z/OS educational webinars! (email contact@epstrategies.com)
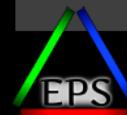
z/OS Performance reporting that fits every need and budget

	Cloud			On-Site
	FREE	Essentials	Prime	Enterprise
Major Reporting Areas				
Basic LPAR, service/report classes	✓	✓	✓	✓
Batch		✓	✓	✓
I/O subsystem & channels			✓	✓
Sysplex, XCF, System Logger			✓	✓
Sub-minute performance (SMF 98/99)			✓	✓
DCOLLECT			✓	✓
TCP/IP (SMF 119)			✓	✓
Hardware Instrumentation (SMF 113)		✓	✓	✓
Dataset I/O Details (SMF 14/15, 42)			Optional	✓
CICS, WAS			Optional	✓
DB2, IMS*			Optional	✓
Custom data sources			✓	✓
Application attribution			✓	✓
Other supported SMF records			✓	✓
Report Retention				
Daily report retention	7 days	2 years*	2 years*	Up to you
Weekly/Monthly/Yearly report retention		Unlimited*	Unlimited*	Up to you
Performance Assistance and Education				
EPS available to answer performance questions with your data	Limited	✓	✓	Limited
Annual review calls			✓	
Playlist-guided analysis	✓	✓	✓	✓
In-depth Report Help	✓	✓	✓	✓
Exceptions	✓	✓	✓	✓
Dashboards			✓	✓
Other				
Least effort: just send us data!	✓	✓	✓	
Complete control & database access				✓
Cost				
Starting price (per year)	$0	$10,000	$25,000	$50,000
Pricing metric	1 system only	Report plexes + systems + RMF interval	Report plexes + systems + RMF interval	CECs + z/OS LPARs

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Excellence in Mainframe Performance

* while service subscription maintained

- Pivotor pricing is clear and affordable

Like what you see?

- The z/OS Performance Graphs you see here come from Pivotor™

- If you just a free cursory review of your environment, let us know!
  - We're always happy to process a day's worth of data and show you the results
  - See also: http://pivotor.com/cursoryReview.html

- We also have a free Pivotor offering available as well
  - 1 System, SMF 70-72 only, 7 Day retention
  - That still encompasses over 100 reports!

All Charts (132 reports, 258 charts)
All charts in this reportset.

Charts Warranting Investigation Due to Exception Counts
Charts containing more than the threshold number of exceptions

All Charts with Exceptions (2 reports, 8 charts, more details)
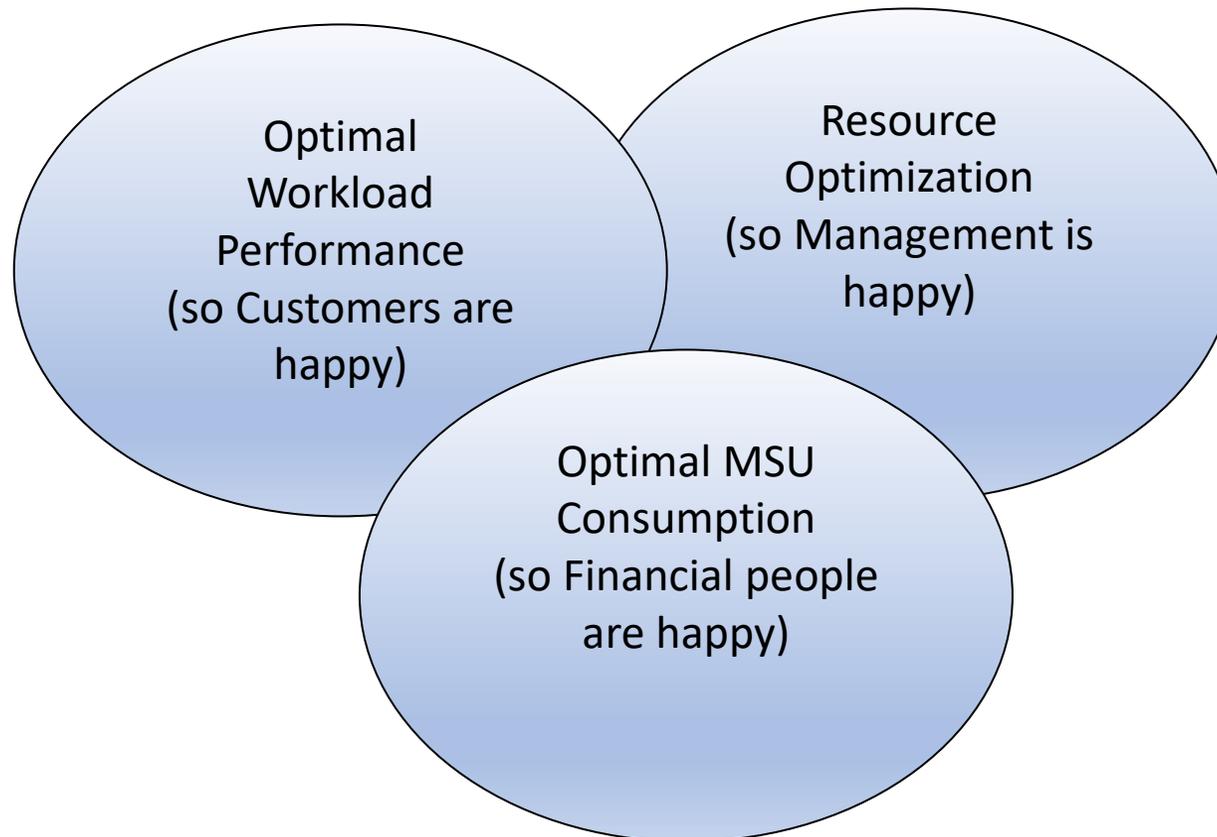Charts containing any number of exceptions

Evaluating WLM Velocity Goals (4 reports, 35 charts, more details)
This playlist walks through several reports that will be useful in while c...

The Performance Balancing Act

- Performance on z/OS is about finding an optimal balance of the following:

Optimal Workload Performance (so Customers are happy)

Resource Optimization (so Management is happy)

Optimal MSU Consumption (so Financial people are happy)

Mainframe Service Providers have the same performance objectives:

- For their clients

- For themselves

Naturally, choices need to be made, and contracts need to be followed.

Performance Management and MSPs

- Performance management responsibilities and expectations must be understood
  - Monitoring
  - Measurements
  - Analysis and tuning
  - Performance debug

- Who provides reporting?
  - Does the MSP client customer have access to all measurements and reports?

- Who has responsibility for these performance management responsibilities?
  - MSP may be responsible for some, and customer may be responsible for others

- Regardless, customer's IT is still usually responsible to make sure the business performance is adequate

- When evaluating service delivered, have common reports been agreed upon?

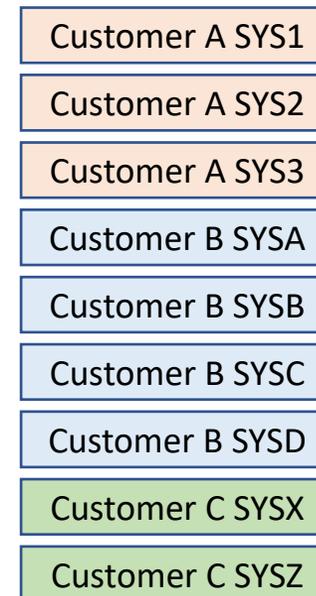# Big Question: Who owns your SMF data?

- We have seen instances where some MSPs have restricted customer's access to the SMF data for their systems
  - **We think this is wrong!**

- The SMF data is arguably metadata about your business processes
  - You own the business processes, so you should retain ownership of the metadata too

- The SMF data can help you audit your performance and capacity

- Relying on the MSP to provide you that reporting *may* be ok
  - MSPs generally do want your business to succeed!
  - … but you do need to trust, but you also need to be able to verify
  - Always ensure you have the ability to send the data to a third party if need be

One concern some MSPs have with SMF 70 data

- SMF 70 (CPU) is one of those records that contains data gathered from both hardware and from the z/OS operating system

- Say the MSP has a z Processor that is used to host customers A, B, C
  - This means that from a PR/SM measurement point-of-view, unless a particular HMC option is in place, PR/SM measurements for all LPARs can be seen

- Example: Customer A
  - Can see physical hardware CEC utilization broken down for all partitions
  - Can only see MVS measurements for systems SYS1, SYS2, SYS3

- If MSP restricts full view of machine, it may be harder to gain insights into level of service provided

| Customer A SYS1 |
| Customer A SYS2 |
| Customer A SYS3 |
| Customer B SYSA |
| Customer B SYSB |
| Customer B SYSC |
| Customer B SYSD |
| Customer C SYSX |
| Customer C SYSZ |

z/OS Systems   Hardware

CEC Utilization

CEC Physical Machine CP Busy% by CEC Serial Number

72E97

In this example, the machine is shared by multiple MSP client customers

Some LPARs are for customer A, others are for customer B, and still others are for customer C

Had certain HMC restrictions been in place, only LPARs belonging to Customer A would be seen. This would give an inaccurate view of the physical utilization of the box.

Question: What are the processor and LPAR configurations?

- Reminder: Typical Hardware Scenarios
  - MSP takes over, and manages, hardware in customer's datacenter

  - Customer migrates to dedicated machines in MSP's datacenter

  - Customer migrates to shared machine(s) in MSP's datacenter
    - May present some SMF 70 reporting restrictions

- Each of these scenarios have different performance, capacity, and cost implications

Hardware

CEC / LPAR configuration - Typical

- The typical CEC and LPAR configuration questions still apply
  - Example:
    - Machine type, ratings for LSPRs, MSUs, MIPS, etc.
    - For each partition, the number of logical processors, weights, HD pooling, etc.
    - For each partitions, what controls are in place that restrict or protect each customer?

- When in an MSP environment, additional configuration questions will arise
  - In a shared MSP environment
    - What is the configuration of customer environment versus other MSP customers on same machine?
    - Will any of the LPAR configuration settings pit one MSP customer against another?
    - Are there controls in place to help guarantee service to each customer?

- Recommendation:
  - Understand configuration and all controls for your systems
  - Is the MSP in total control, or can you request changes?
  - *What controls are protective?* Example: Hard cap of other partitions
  - *What controls are restrictive?* Example: Hard cap of your partitions

Resources – Some basic CPU reports

CEC Utilization
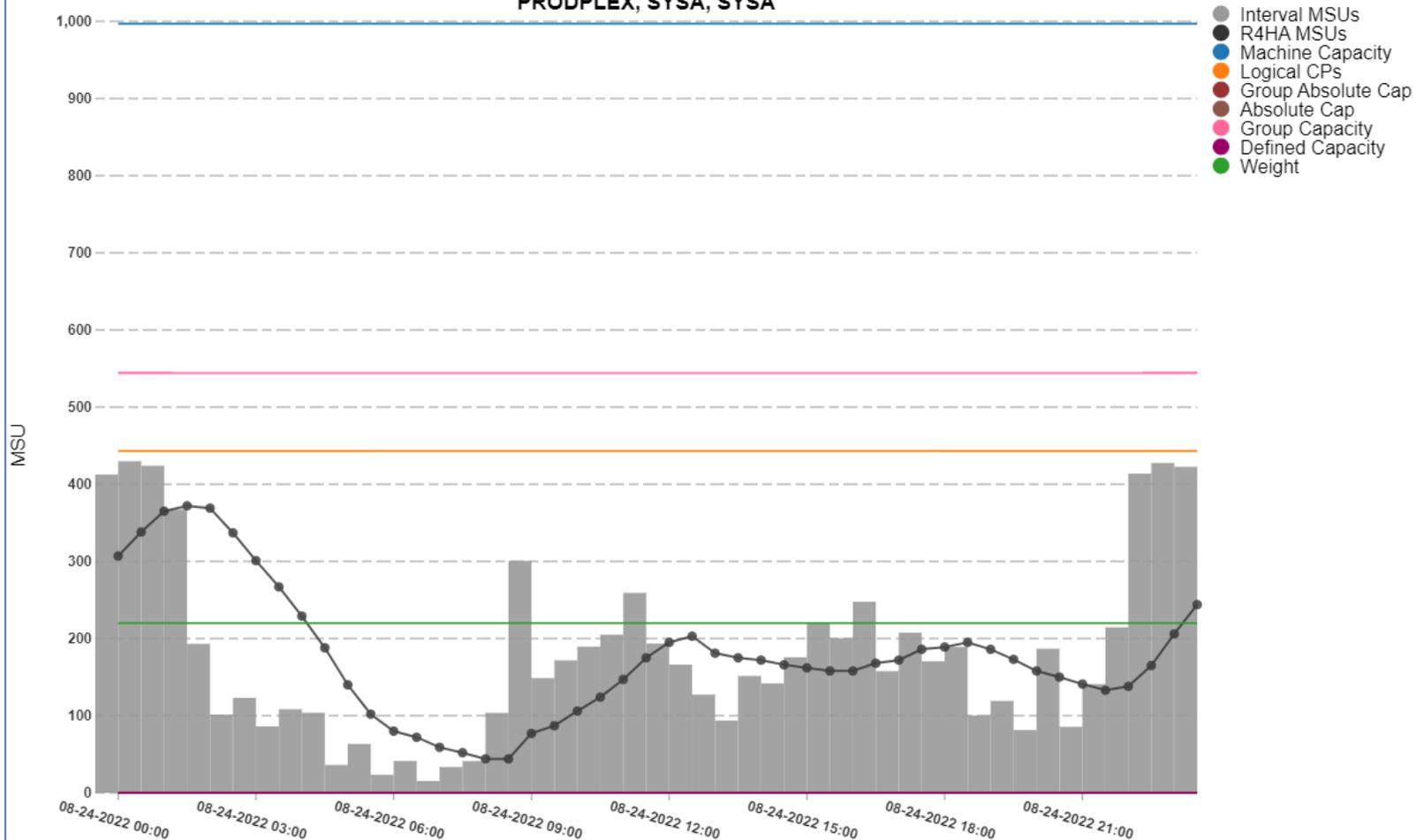

CEC Physical Machine CP Busy% by CEC Serial Number
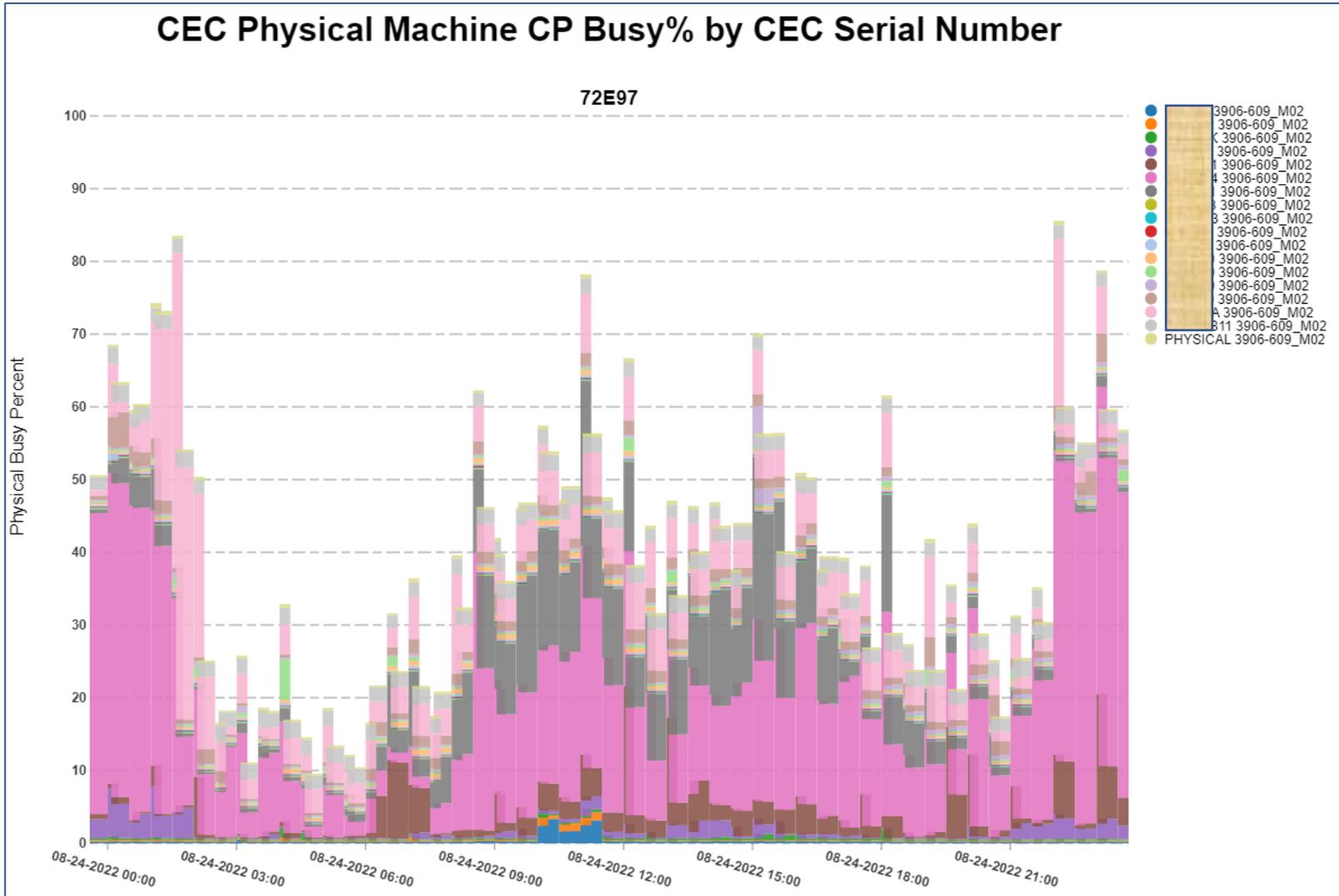
For both CP and zIIP engines:

- MSP has a z14 with 9 physical CP CPUs with 17 z/OS partitions of various number of logical processors and weights.

- The 17 partitions are composed on 4 MSP customers

- Are other customers peaking during a time period you need the processors the most?

What are the LPAR's MSU limits?

LPAR Limits and Utilization
Expressed as MSUs
PRODPLEX, SYSA, SYSA

Legend:
- Interval MSUs
- R4HA MSUs
- Machine Capacity
- Logical CPs
- Group Absolute Cap
- Absolute Cap
- Group Capacity
- Defined Capacity
- Weight

Understand your LPAR limits

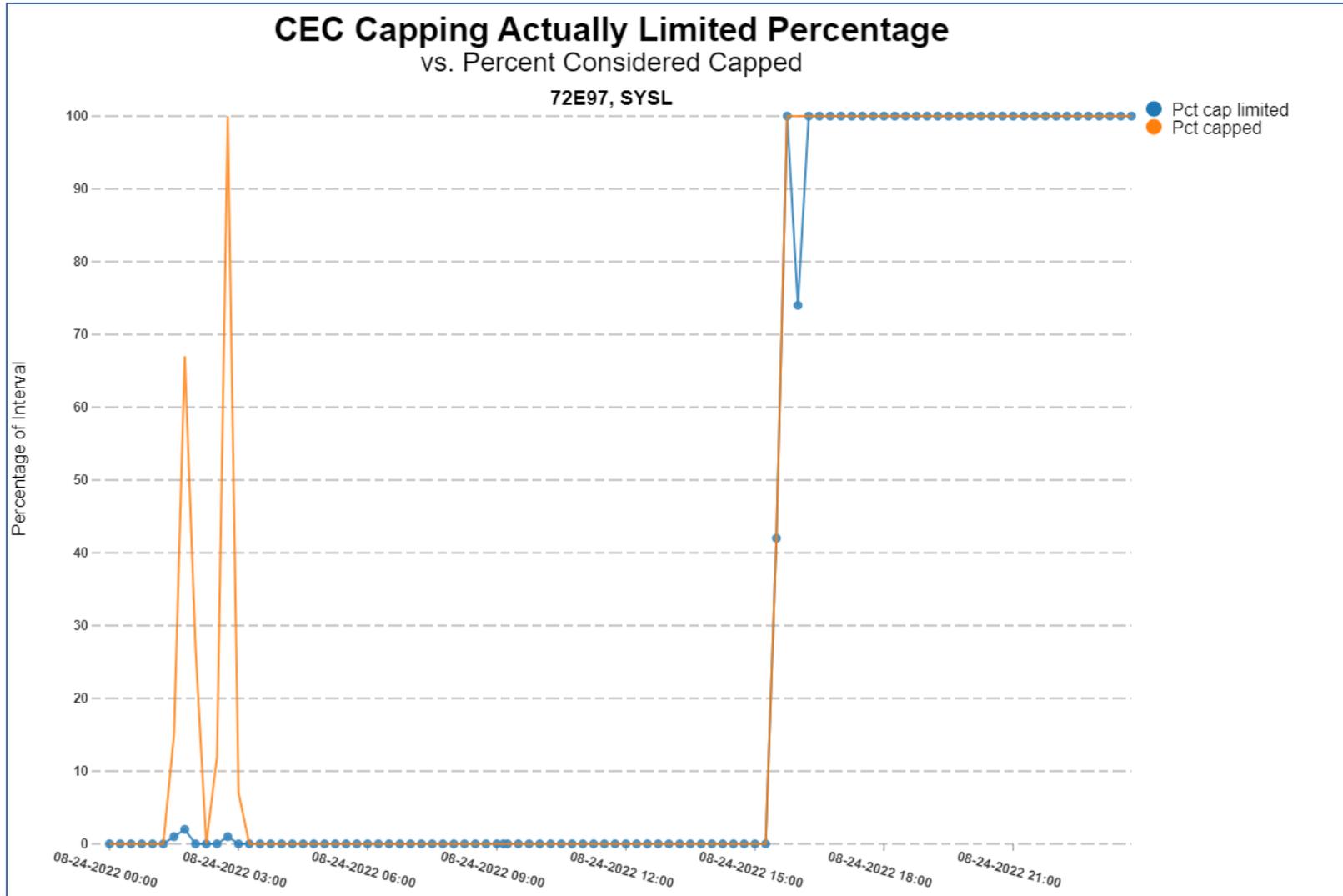Every LPAR is subject to multiple MSU restrictive limits

What are these limits?

Are they imposed by the MSP

- For management purposes?
- For restrictive purposes in a shared environment?

Are the limits being enforced?

LPAR weight is both a restrictive and protective control

CEC Assigned CP LPAR Weights

72E97

For both CP and zIIP engines:

- It is important to understand configuration options.

- Example:
  - Number of logical engines
  - Weights
  - Guaranteed shares
  - HiperDispatch pooling
  - Other controls

- Can you get MSP to change things if you want different?
  - It is tougher in shared environments

Weight Enforcement

CEC Percent CP Weight Used

For every partition, understand weight enforcement:

- What is the LPAR guaranteed share and HD pooling for each partition?

- Are weights enforced between two different customers?

- Is one partition enjoying more than its weight on a regular basis
  - Risky if another partition all of a sudden wants its weight

LPAR Capping – All Partitions shown

CEC WLM Capping Percentage
All LPARs

72E97

MSPs may use capping controls to restrict certain LPARs to help protect other LPARs.

Or they are used to enforce contractual MSU limits

LPAR Capping of a specific partition

CEC Capping Actually Limited Percentage
vs. Percent Considered Capped
72E97, SYSL

Here SYSL was capped for a long period of time from 15:00 to passed midnight

For nearly 100% of that time, the LPAR had demand for CPU beyond the cap.

This meant that the system incurred workload delays

How does this fit in with the MSPs contractual agreements?

Reminder: zIIP crossover can drive up costs - Amount of crossover

zIIP APPL% Crossover CPU by Importance
(GCP APPL% that could have run on a zIIP)

SYSPLX01 SYSD

Legend:
- Imp0(SYSSTC)
- Imp1
- Imp2
- Imp3
- Imp4
- Rule of Thumb
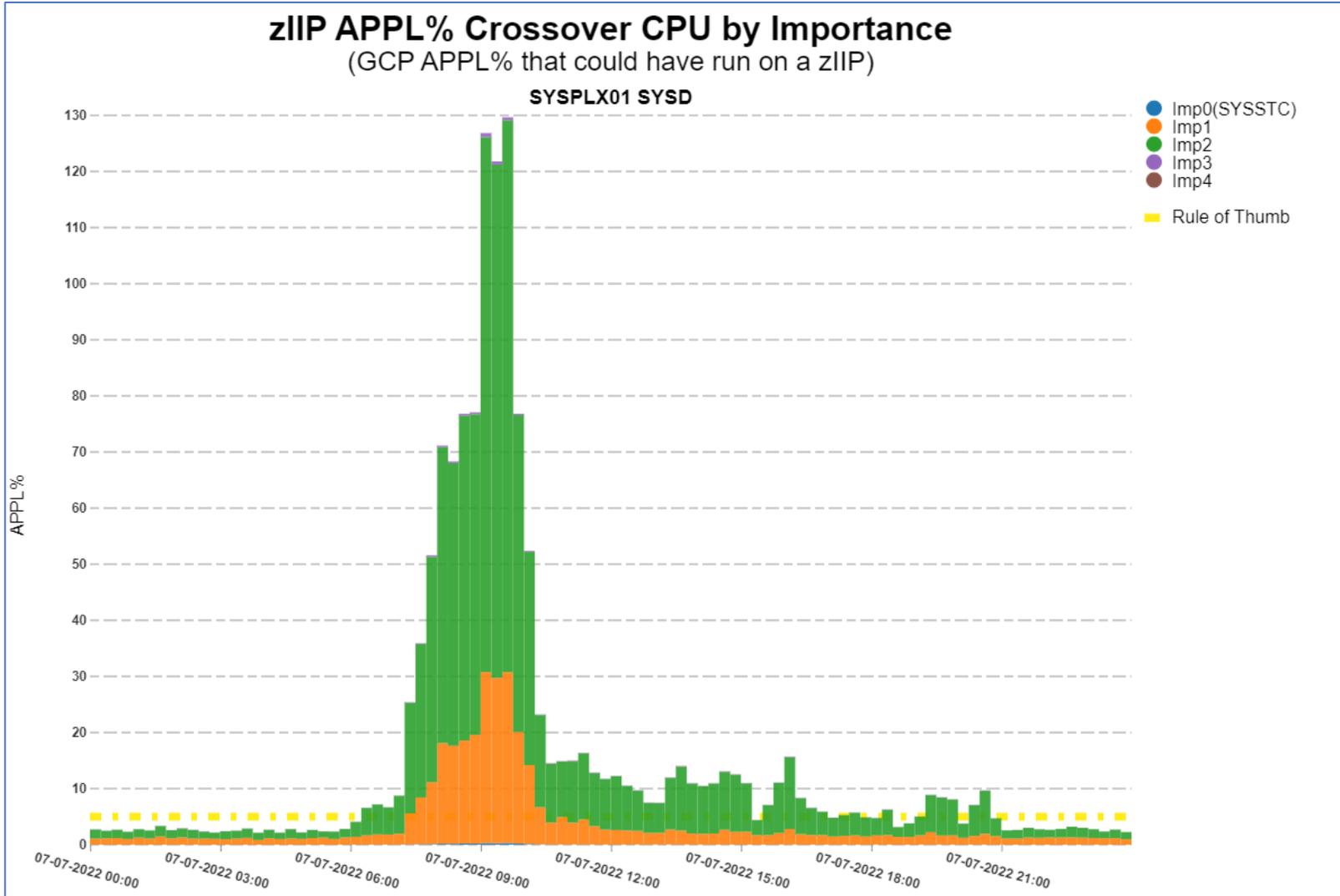
- When looking at zIIP crossover, we see that during peak periods, up to 1.3 CP CPUs of capacity are consumed with work that could have run on the zIIPs.

- When viewing the CEC utilization chart, we also need to know how much was crossover
  - Is any from another customer?
  - Is crossover occurring because of lack of zIIP capacity?

Reminder:
Does the MSP rely on SMT?

SMT Analysis - zIIP Multi-Threading Analysis
Key Values
PRODPLEX, SYSA, 72E97, 3906, 609, M02

Legend:
- Capacity Factor
- Max Capacity Factor
- Avg Thread Density
- Single Thread Throughput
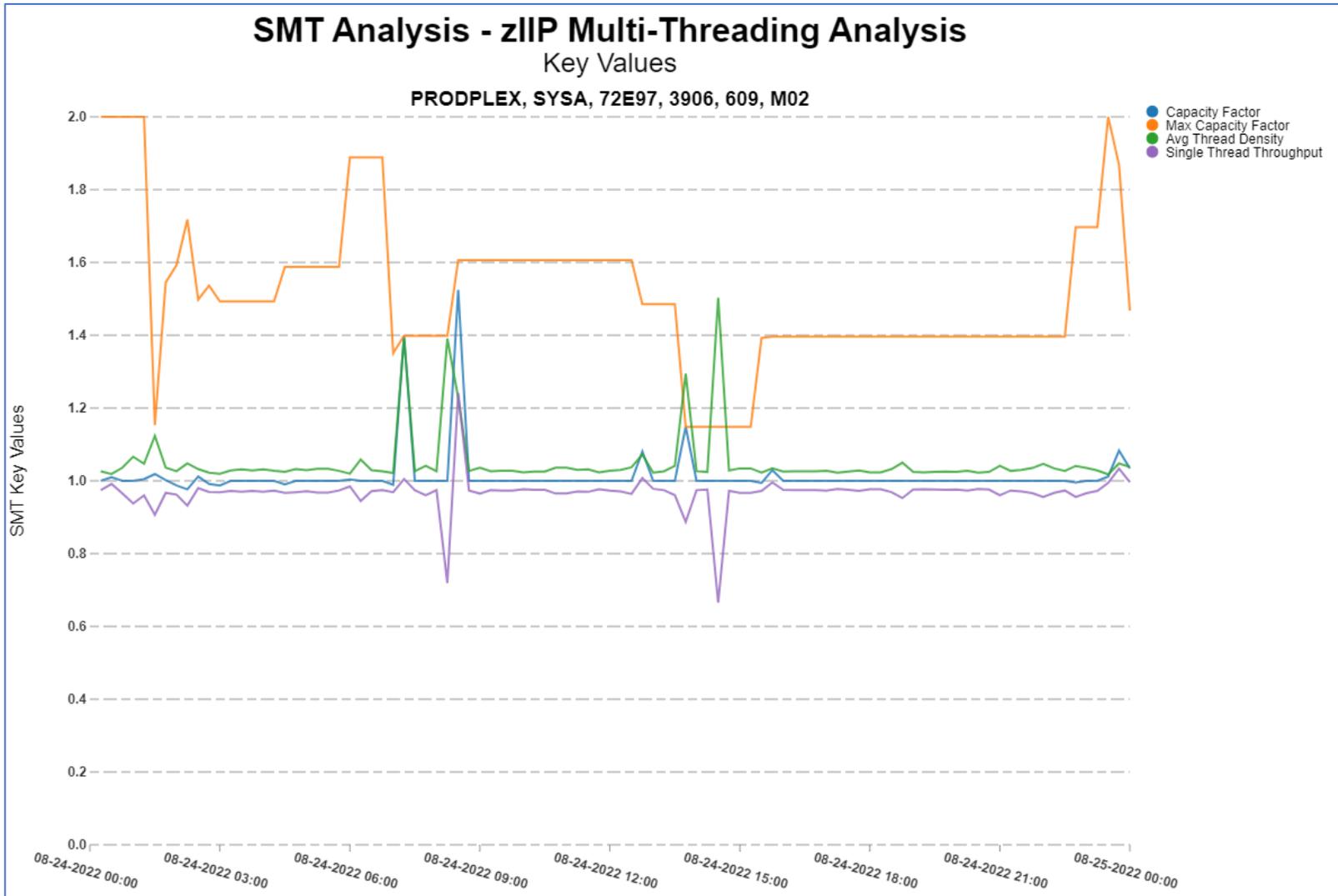
- Is SMT for zIIP engines enabled?

- Because no other option to purchase more zIIP capacity?

- Will the MSP allow other means to prevent crossover to CP CPUs?

- It is a means for the MSP to 'double' zIIP capacity

Software Licensing – Some basic MSU reports

Typical Software Scenarios
Who licenses the software?

- Customer still pays IBM/ISVs for their software; same as usual

- MSP licenses the software, and then charges Customer to use it
  - The license metric between the MSP and Customer may be new and different

- May be a mixture of both the previous 2 scenarios

In general, the following pricing agreements are common:
  - Tailor Fit Pricing (TFP)
  - R4HA
  - Monthly peak
  - Unlimited / Fixed price

Software

Monitoring R4HA

MSU Averages Comparison

GROUP, 72E97, CUSTA

- Set Capacity Limit
- R4HA Est Billable MSUs
- Actual R4HA MSUs
- One Hour Average Actual MSUs
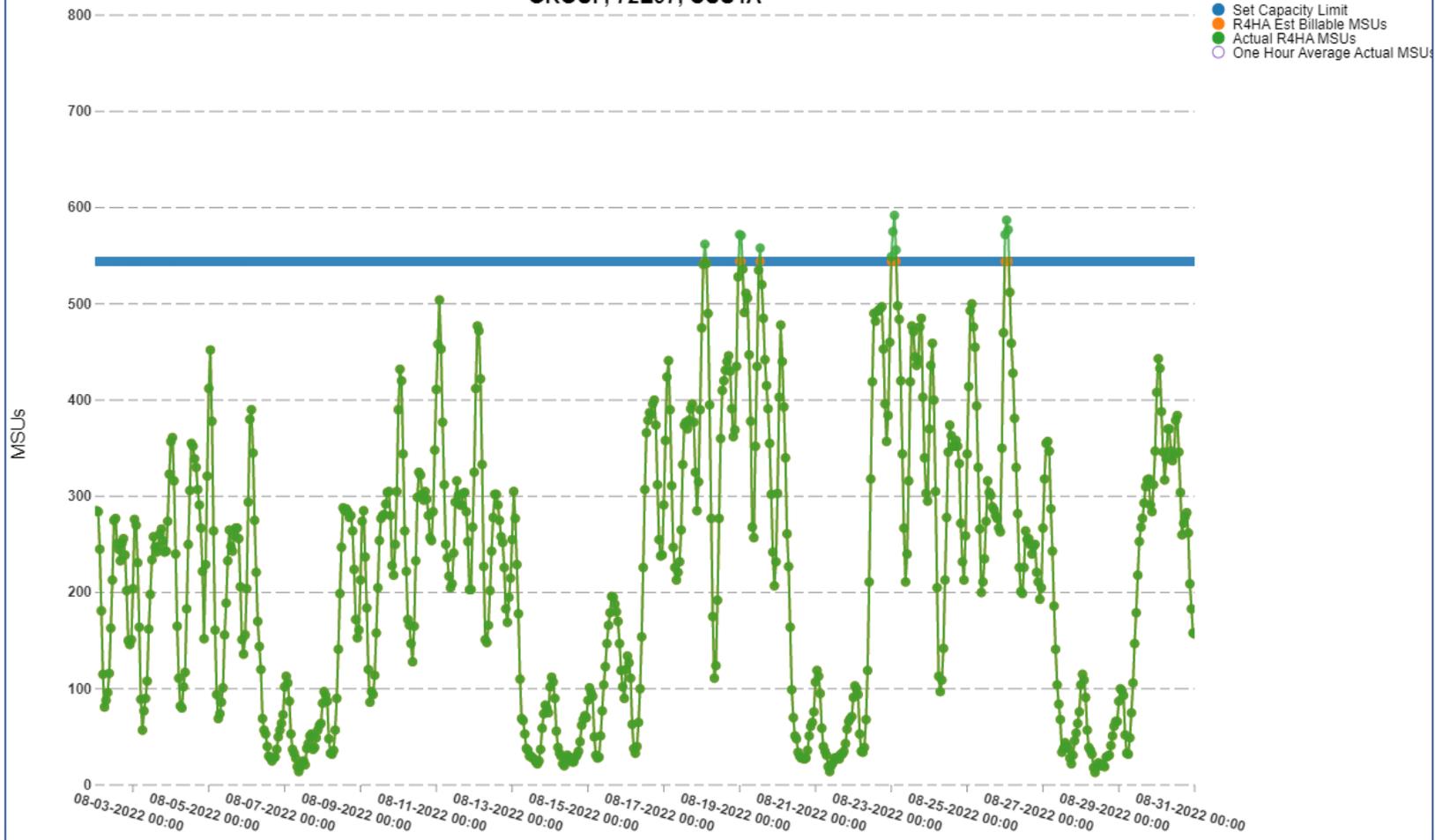
- This is a typical monthly analysis with R4HA workload license charges.

- This is for a group for CUSTA (Customer A)

- License cost based on peak billable R4HA hourly MSU consumption.

- Capping can be used to limit MSUs usage.

Monitoring Accumulated MSUs

LPAR MSU-hour Cumulative Totals
2021-08-02 - 2022-08-01
-alldata-
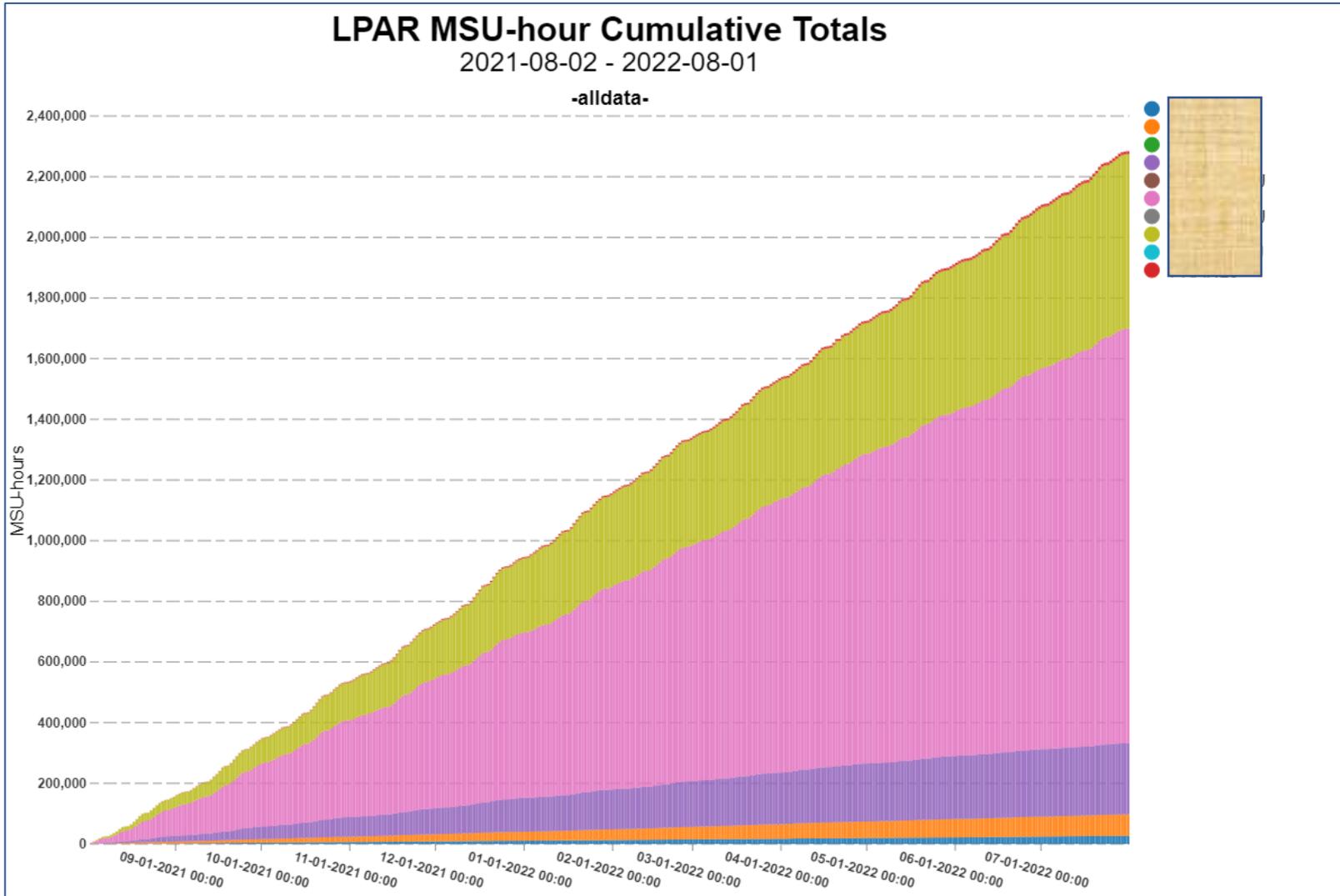
With TFP, all MSU consumption contributes to the software cost.

Monitoring both Accumulated MSUs and R4HA

MSU-hour Totals by MLC Month
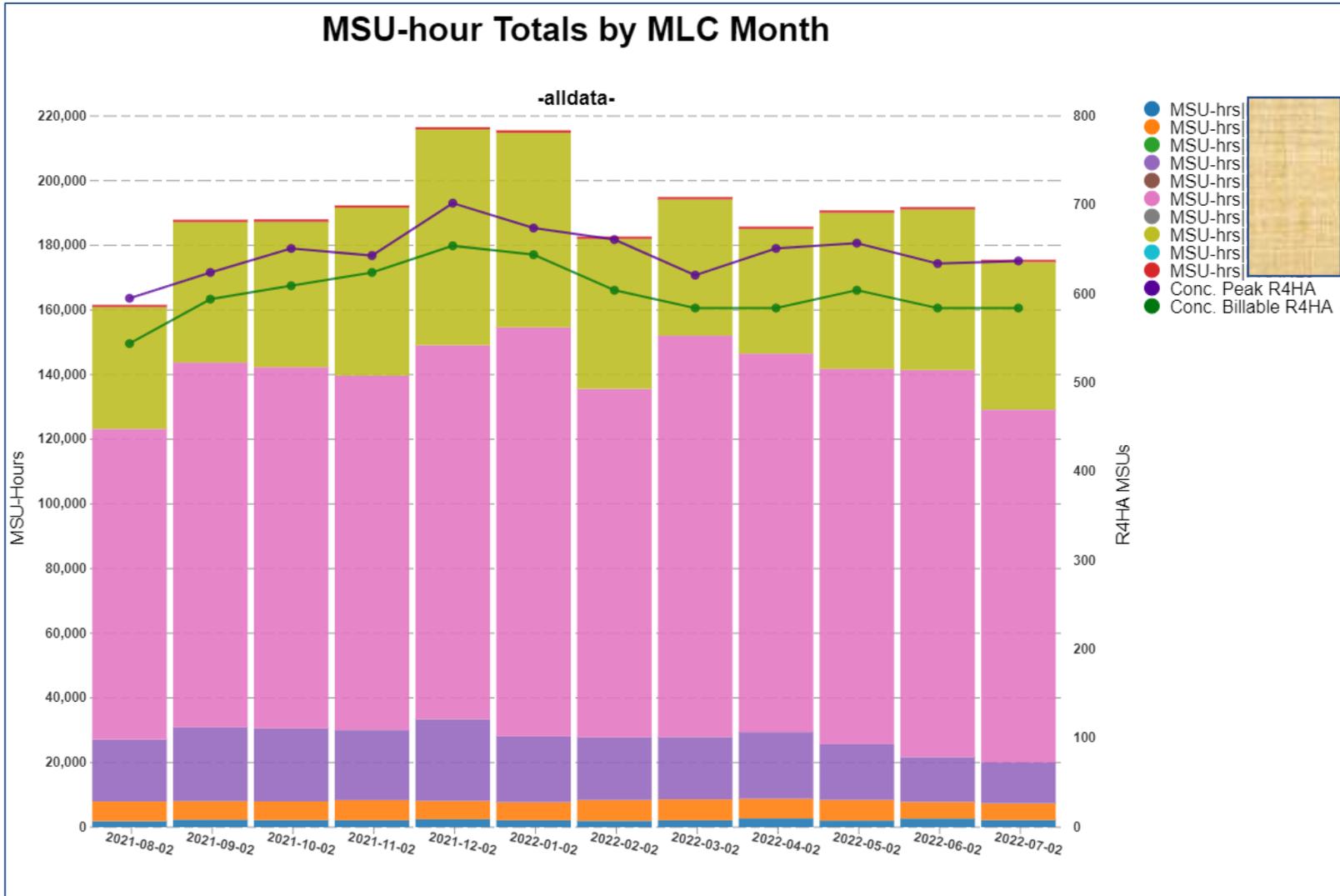
- Pattern of total usage per month is likely much different than the pattern of the R4HA and if capping is in place, billable R4HA usage may be even more different.

- Note: expect TFP billing to be level each month with annual true-up.

Workloads and customer satisfaction

Business / Workload Performance

- Business depends on a certain level of performance and availability
  - Also remember that performance also affects both hardware and software costs
  - Understand your business metrics, and how they correlate to performance metrics!

- Make sure performance satisfaction metrics are well-documented
  - What performance levels are expected?
    - Equal to, or better, performance should be in writing
  - What metrics are used measure performance satisfaction
  - What constitutes "available"?

- Track these metrics both before MSP and during
  - Don't forget to put in context of business metrics, as well

- Understand and agree to SLAs with MSPs
  - As well as potential penalties and remediations

WLM RT Goal - RTD% of Trans Met/Missed RT Goal with Number Trans
Percent met/missed goal and count
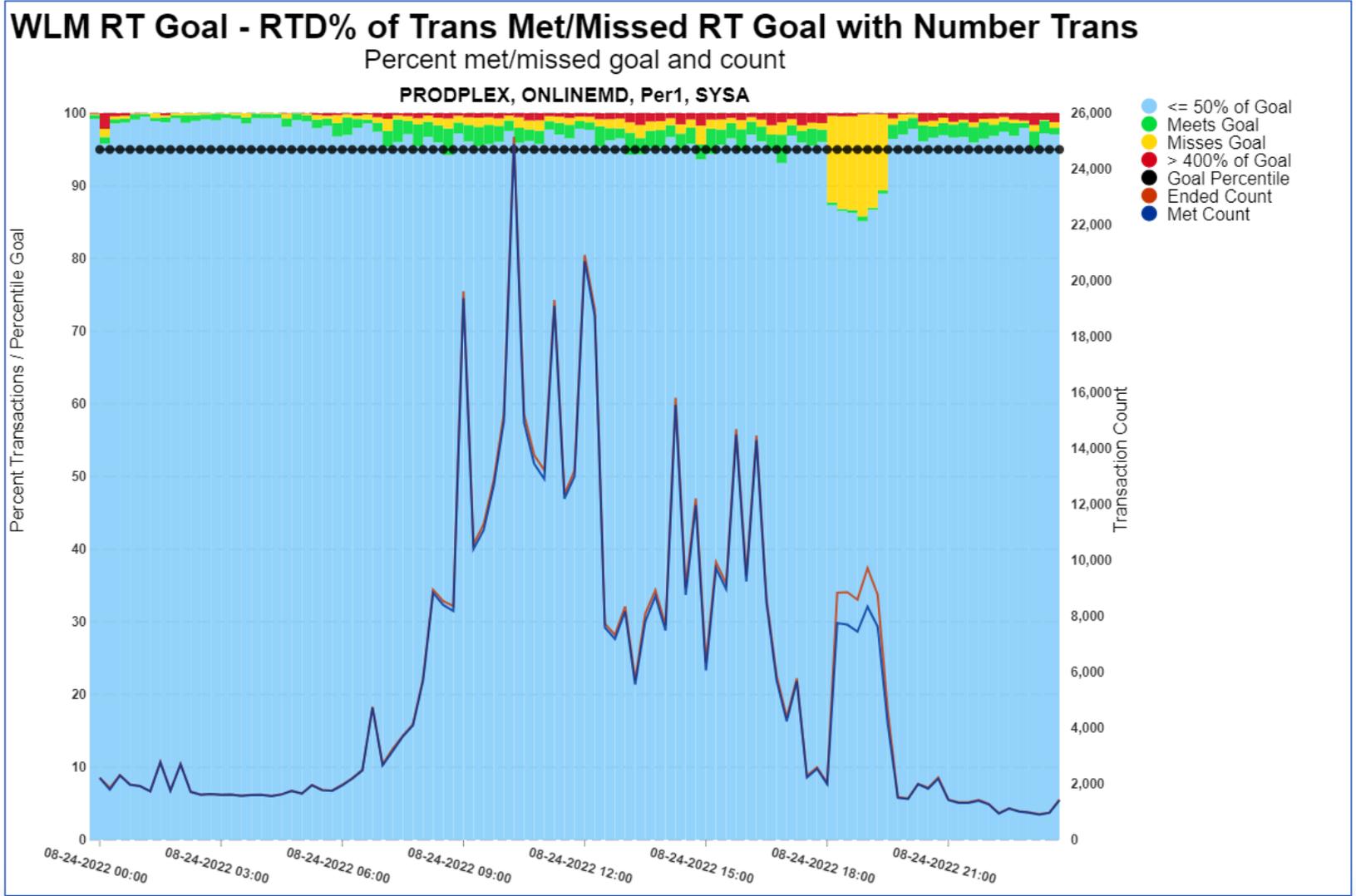PRODPLEX, ONLINEHI, Per1, SYSK
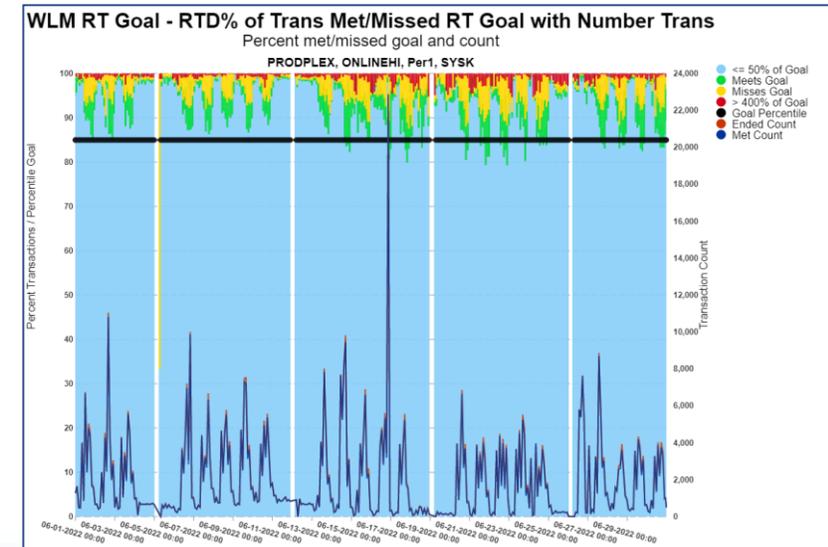
Workload Business metrics

- Who is providing performance support?
  - How much control / input can do you have with the MSP?

- Are the workloads performing as expected
  - Common metrics include
    - Throughput
    - Response times
    - CPU/Transaction
    - Batch window
    - MSU consumption by workloads

- Are there any business metrics that you can correlate to the service delivery and workload performance
  - In other words, are there business metrics to help explain performance?

Who has control over WLM and z/OS controls?

WLM RT Goal - RTD% of Trans Met/Missed RT Goal with Number Trans
Percent met/missed goal and count
PRODPLEX, ONLINEMD, Per1, SYSA

Legend:
- <= 50% of Goal
- Meets Goal
- Misses Goal
- > 400% of Goal
- Goal Percentile
- Ended Count
- Met Count

Who has control over the WLM service definition, goals, and other operating system controls?

Many MSPs like to maintain 'template' sets of controls so everyone is the same.

Such controls may not be correct for everyone

Workload performance – CICS CPU/tran
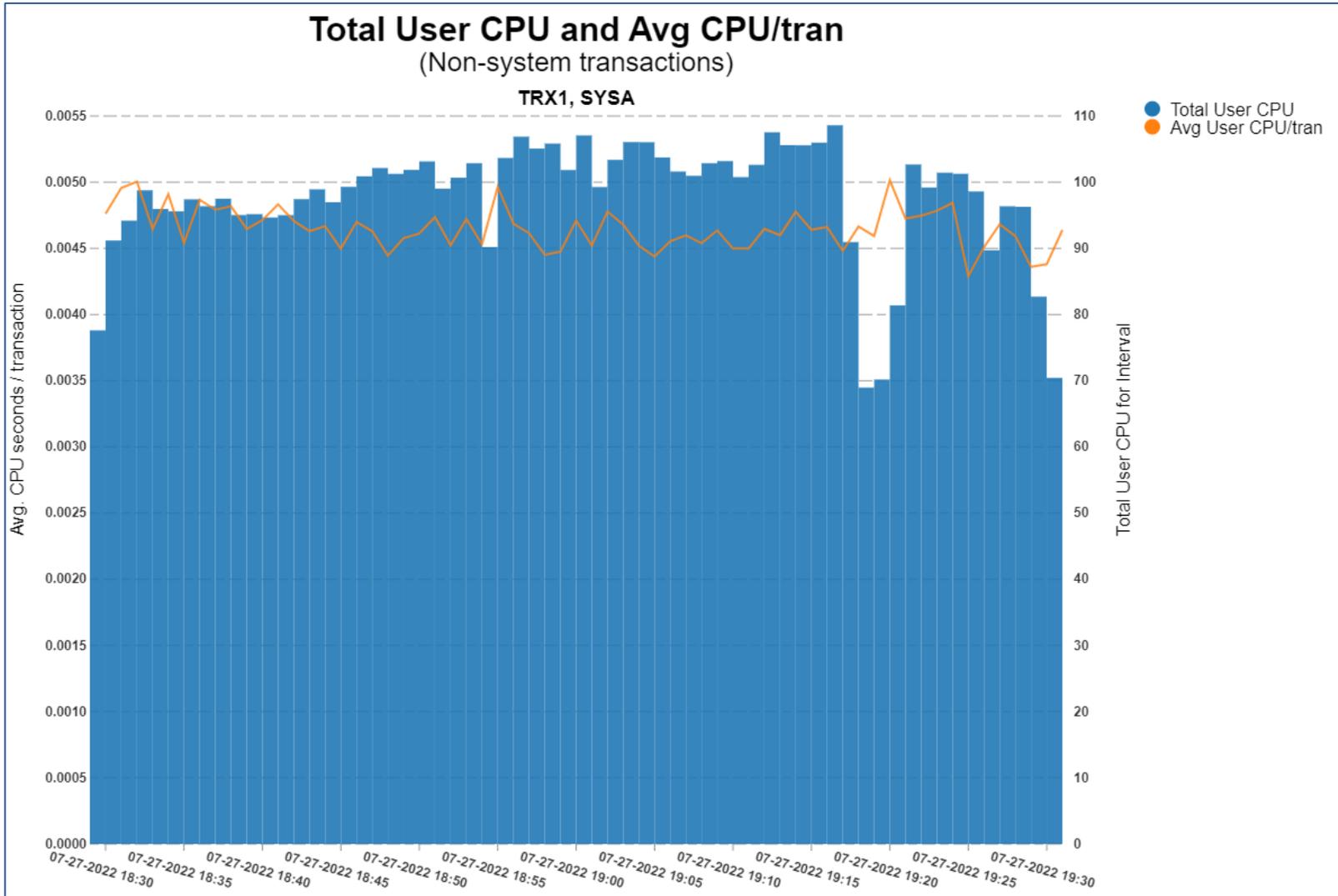
CPU per transaction can change based on the delivered service by the MSP.

It is always valuable to understand your CPU/transaction baseline, and then use this to help determine positive or negative changes to the environment.
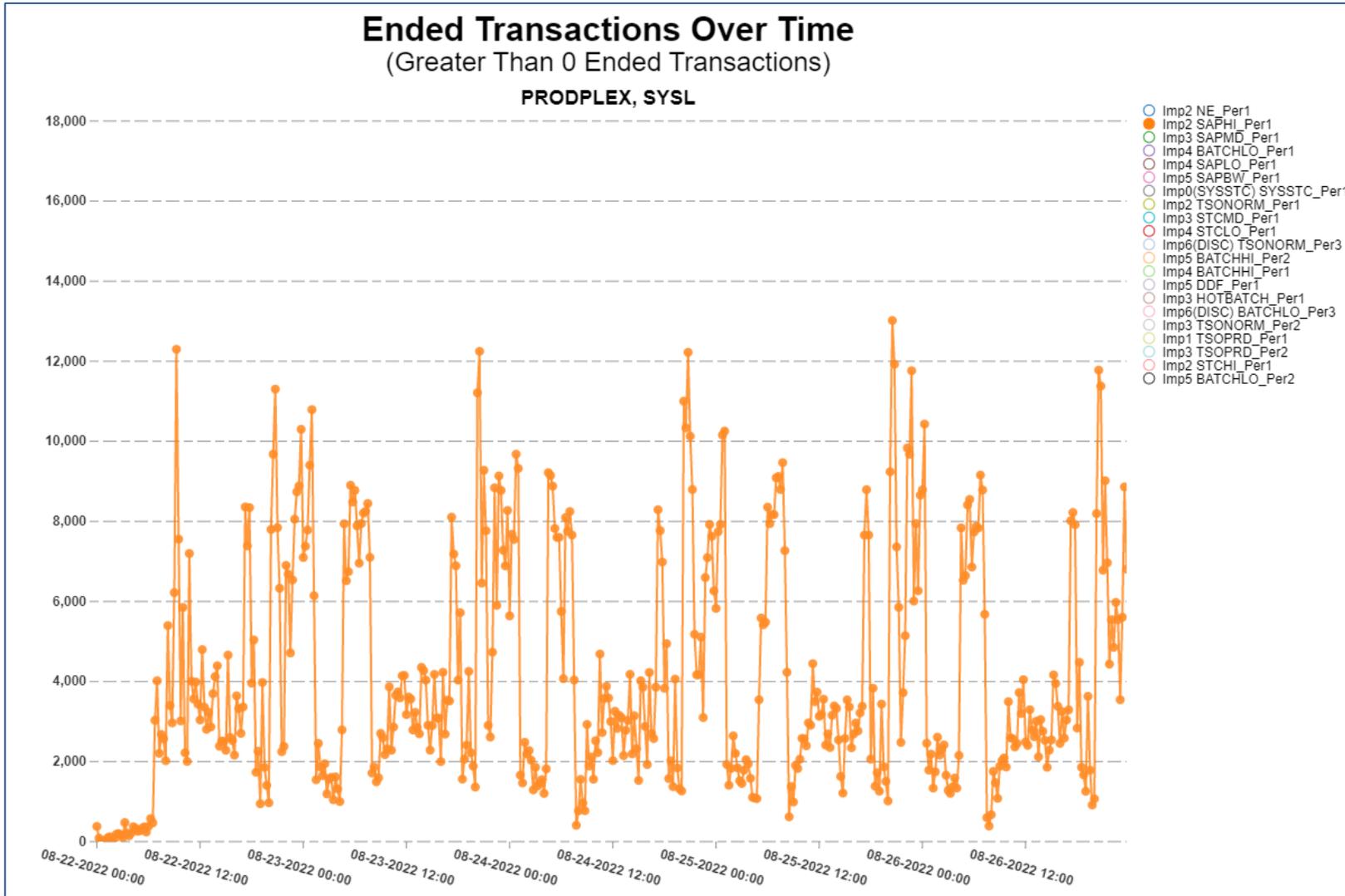
Workload performance – DDF CPU/tran
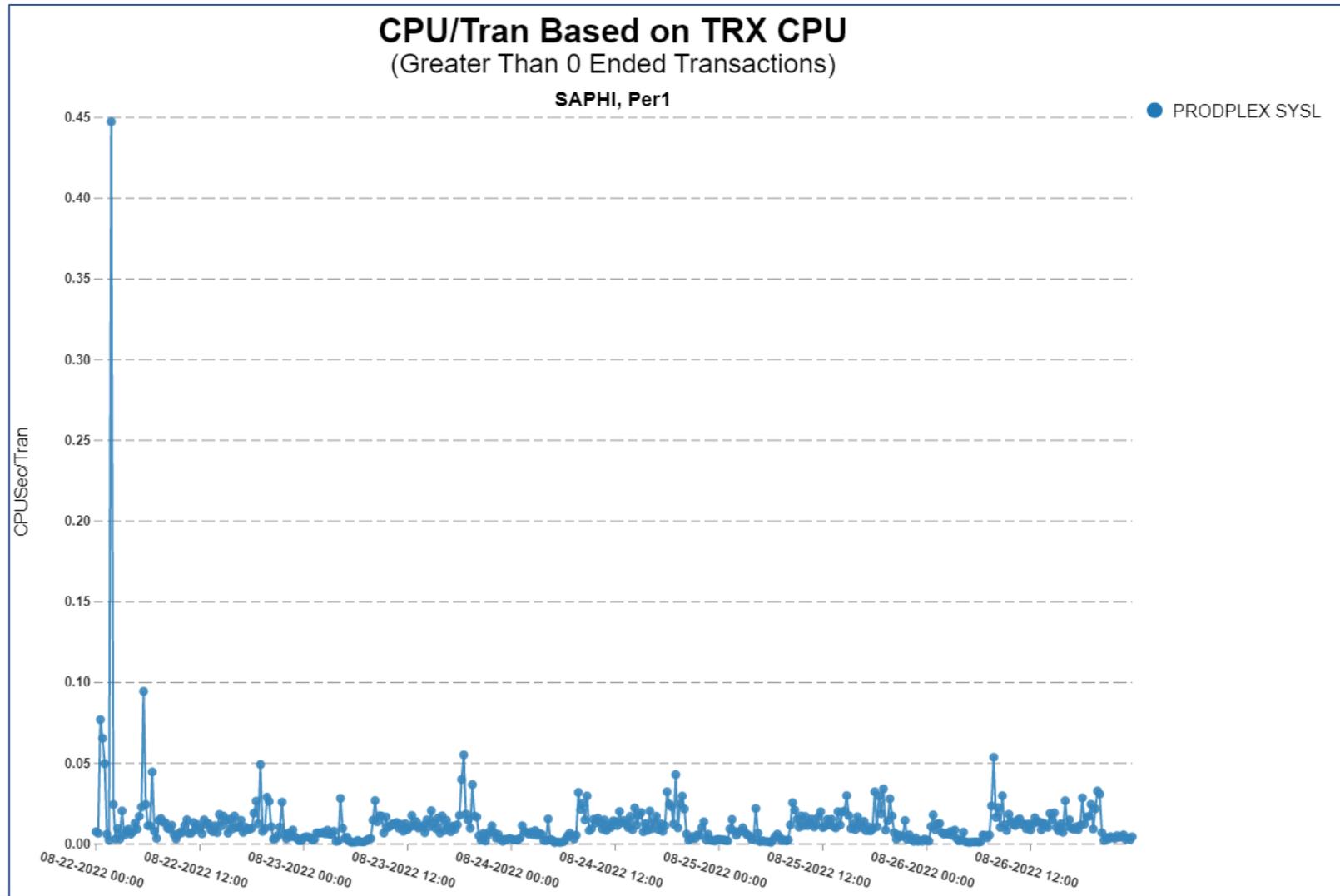
CPU per transaction can change based on the delivered service by the MSP.

It is always valuable to understand your CPU/transaction baseline, and then use this to help determine positive or negative changes to the environment.

Workload Throughputs

Ended Transactions Over Time (Greater Than 0 Ended Transactions) — PRODPLEX, SYSL

Workload throughput is always interesting to ensure transaction loads are as expected, and not being negatively influenced by the MSP's configuration options.
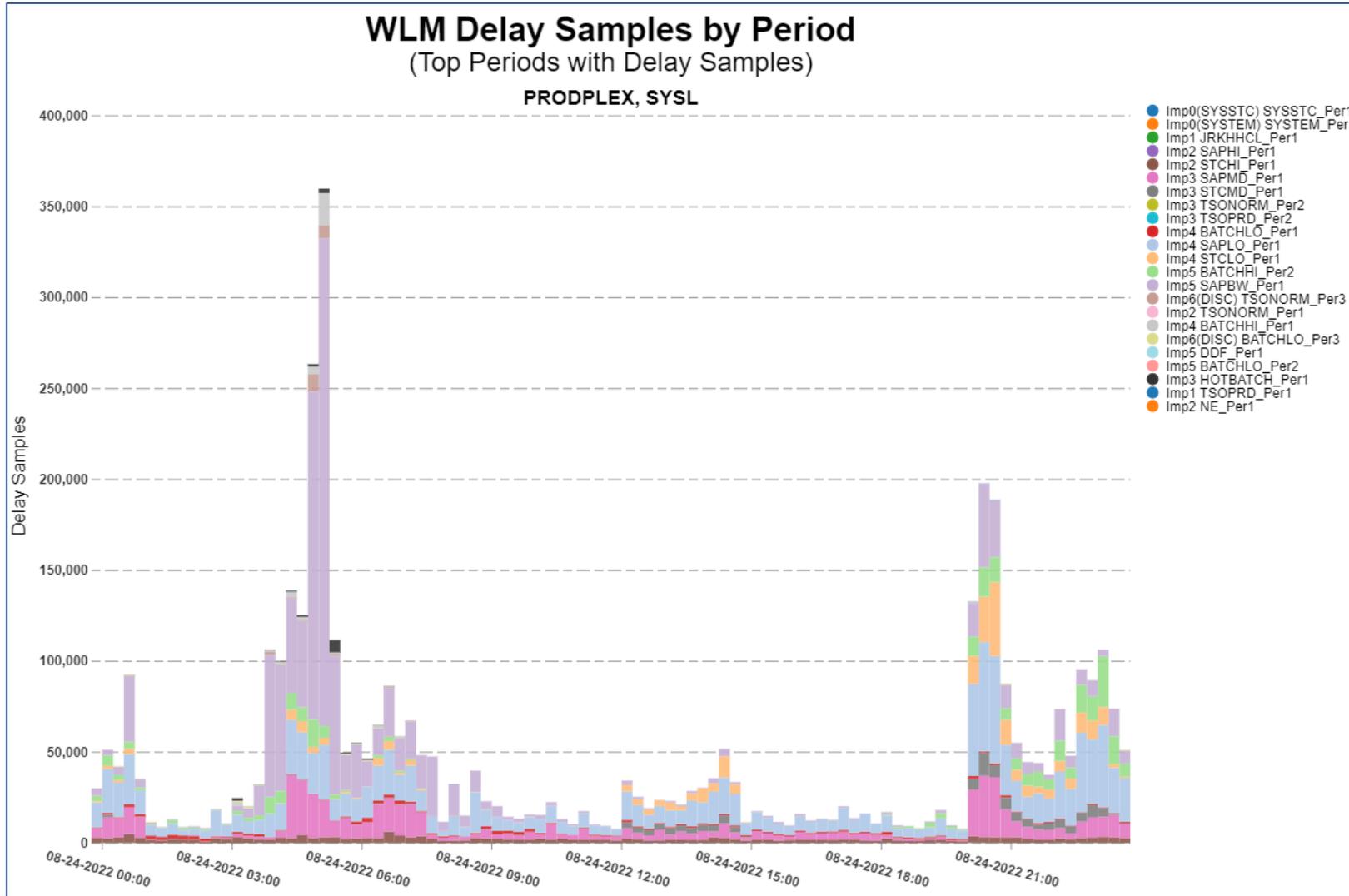
Workload MSU Usage
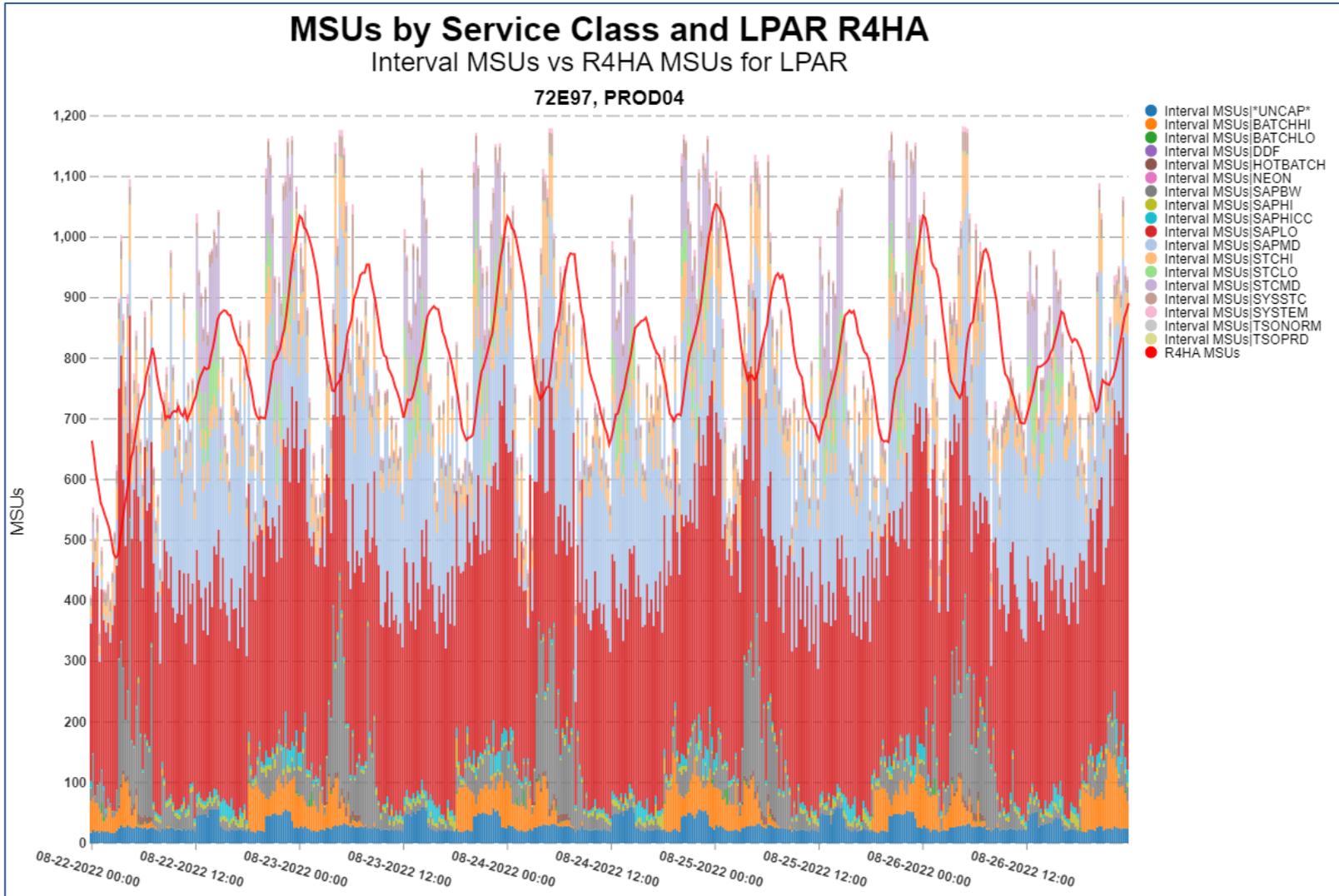
Of course, measure the MSU consumption by the workloads

This can change based on the machine, configuration options, etc.

Workload Delay Samples

WLM Delay Samples by Period
(Top Periods with Delay Samples)
PRODPLEX, SYSL

Monitor delay samples

Are you getting what you paid for?

Are the delays higher than expected?

Processor Capacity issues with MSPs

- Consider:
  - How much capacity you have access to will likely impact performance
  - How much capacity you use will likely determine your cost
  - Different issues between shared and dedicated environments
    - In shared environment, you may no longer have control over the processor capacity

- Ensure you can track capacity metrics (both before and after)
  - If your software cost metric is changing, ideally start tracking the new metric before you change to being charged based on that new metric

- Understand the process for acquiring more capacity?
  - How are hardware upgrades decided?
  - How are prices determined?
  - Is a hard cap part of the contract?
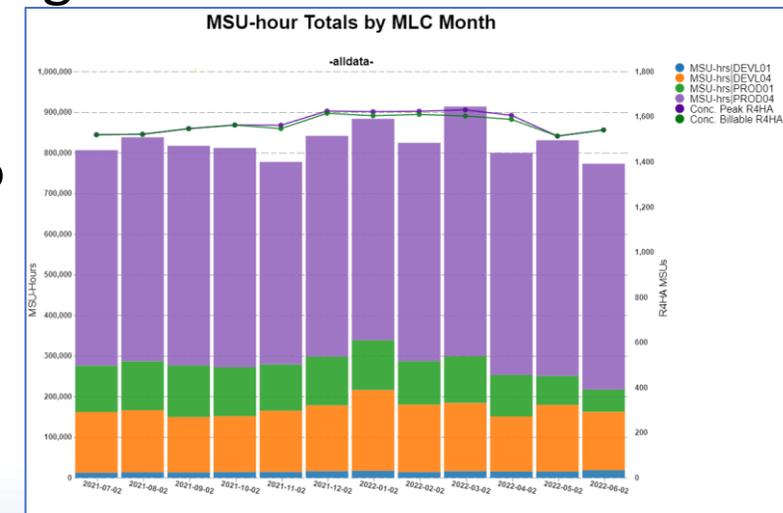
Some final recommendations…

- We always recommend that the client company stays fully engaged, and in some level of control, with the MSP with performance management.

- We also recommend that the client company engage in some third-party for advocacy to help represent the client company to the MSP to gauge performance satisfaction

Questions?