UNITE 2006

Managing Metering: How to Plan for, Tune and Monitor Your Metered Platform

Session MCP3040/OS3040

Guy Bonney & Bob Morrow, MGS, Inc.

Debi Ray, SightLine Systems Corporation

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MGS, Inc.

- Software Engineering, Product Development & Professional Services firm founded in 1986
- We solve business problems:
  - Software Engineering Services on ClearPath MCP, Windows, and UNIX platforms.
  - Professional Services
    - IT Management Support including IT Planning, Capacity Planning, and DR Planning
    - Consulting and Technical Services including Performance Management and Hardware-Software-Network Integration
    - Application Development Services from conception through deployment and including platform rehosting
    - Training Services
  - Product Development of SightLine for MCP, MGS Web Services, Deliver, CheckOut, C.A.T.T. and others.

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SightLine Systems Corporation

- Product Development and Professional Services
- SightLine Product Suite
  - SightLine Expert Advisor/Vision (EA/V)
  - SightLine for ClearPath OS2200 Systems
  - SightLine for Windows Systems
  - SightLine for UNIX Systems
    - HP-UX
    - Sun Solaris
    - IBM AIX
    - Tru64
    - Linux
  - SightLine for OpenVMS Systems
  - SightLine for Stratus VOS
- Torch for ClearPath OS2200
- ForSight
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Metering Concepts

- What is Metering?
  - A new way to buy computer capacity
  - Traditional: buy enough capacity for “peak” processing periods
  - Metering: buy enough capacity for “average” processing and pay additional for any overage
  - Not a technology change, rather an accounting change

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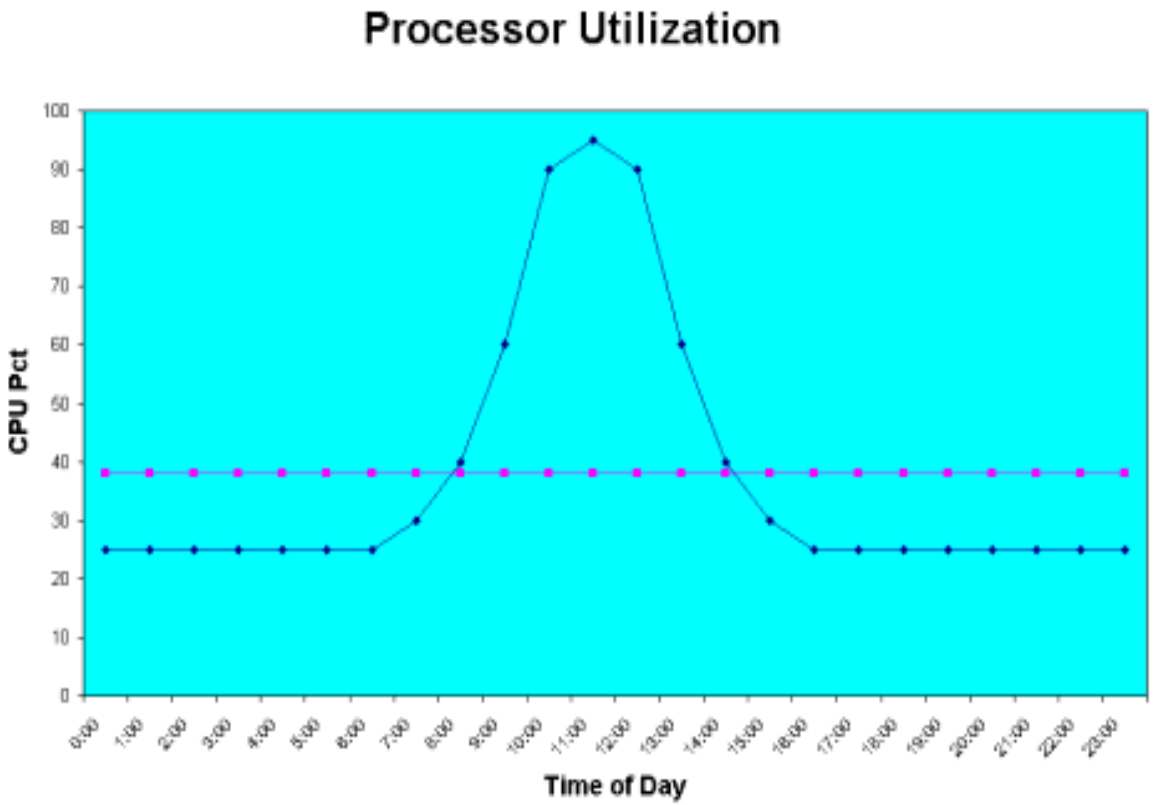
Metering Concepts

Traditional Purchase →

Metering Purchase →



Average CPU 37.9% **Peak CPU 95%**

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Metering Concepts

- The new way to license capacity
  - All mainframe software is available on the system
  - Processor speed is user selected based on need - changed at any time
  - MCP/OS Tracks capacity usage for everything run on the machine
  - Usage reported monthly to Unisys
  - Unit of capacity is the RPM-Second or the MIP-Month
  - Customer commits to pay for overages

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Metering Concepts

- MCP/OS control of capacity
  - Implemented using the KEY mechanism
  - Metering Key specifies:
    - Maximum number of CPUs
    - Max Power Level of CPUs
    - Max total system RPM/MIPS
    - Baseline RPM (Base-plus-usage)
    - Metering paradigm
      - Base-plus-usage
      - Pre-paid Performance

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Metering Concepts

- Base-plus-usage
  - Establish a monthly reporting period
  - Establish a baseline (average) monthly capacity usage
  - Baseline is expressed as MIPS and RPM
  - MCP tracks RPM-Seconds used in the reporting period, OS = MIPS Secs
  - End of month:
    - MCP subtracts Baseline*PeriodSecs from actual used RPM-Secs
    - Positive result indicates an overage
    - Report is e-mailed to Unisys
    - Customer billed for overage

Metering Concepts

- Pre-paid Performance
  - Phone card concept
  - Customer pre-pays an “average” capacity usage over the planned “lifetime” of the system
  - Capacity expressed as the average MIPS over a period of months
  - Customer can use the MIPS-Months as quickly or as slowly as he wants
  - When all MIPS-Months are consumed, more must be licensed from Unisys to continue use of the system

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Metering Concepts

- Pre-paid Performance
  - Establish a run rate (average) for the lifetime of the system
  - Run rate expressed as MIPS (24.3 RPM/MIP)
  - Establish the key lifetime in months
  - MCP accrues the MIPS-Months (RPM-Seconds) over the Key lifetime
  - Accrued MIPS-Months reported to Unisys monthly via e-mail
  - When licensed MIPS-Months are exceeded, more must be licensed
  - 2 month window to use excess at end

Metering Technology

- Built on the Capacity on Demand (CoD) capability to change processor speed
- Supported on the Libra 590/595/690 and equivalent Dorado models
- Limited metering CERs for the Libra 180/185
- Same hardware for metered and non-metered Libra 500/600 systems

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Metering Technology

- Controlled through the “KEY” mechanism
- IK command is used to install the metering key
- The key defines the system’s max RPM and baseline RPM
- The MCP/OS attempts to maintain target RPM/MIPS even if IPs are DOWNed

Metering Technology

- Default is for system to run at the “max” RPM/MIPS
- Governor
  - Allows the customer to request to artificially lower the system’s “max” RPM to a “requested” RPM
  - Actual RPM may be lower than requested RPM (granularity)
  - RPM-Seconds calculated based on the actual Governor RPM setting

Metering Technology

- Central Processor Accounting
  - “Effective” (or traditional) processor time tracks elapsed time a program spends using the CPU, ie, UTILIZATION
  - Changing RPM changes the amount of work done by 1 second of “effective” CPU time
  - MCP now also tracks “normalized” processor time
  - CPU time is normalized to a standard (PL-57)
  - “Normalized” processor time is available through Systemstatus 25 and in the SYSTEM/SUMLOG
  - “Normalized” processor time is provided for Processor, Init Pbit and Other Pbit CPU times

Collecting Metering Statistics

- Monitor the state of the current processor license Key (CoD or Metering)
- Monitor the MCP/OS metering system
- Cannot monitor MCPvm processor license keys

Metering Interface Agent

- Goals of SightLine Metering analysis (Unisys focus is monthly billing report)
  - Metering data reframed for monitoring of capacity consumption
  - Monitor at three levels:
    - Sample period
    - Current Unisys billing period
    - Key Lifetime
  - Elements tracked at each level
    - Interval elapsed
    - Raw capacity units used to date
    - Percentage of total capacity used
    - Percentage of “baseline” capacity used (including when greater than 100%)

Analyzing Metering Statistics

- "Capacity" versus "Utilization"
  - "Utilization" measures are relative to the capacity on the floor
  - "Capacity" measures are hardware independent
  - Unisys metering information allows "Capacity" usage to now be monitored
  - The processor "Capacity" can even be decomposed to the workload level.

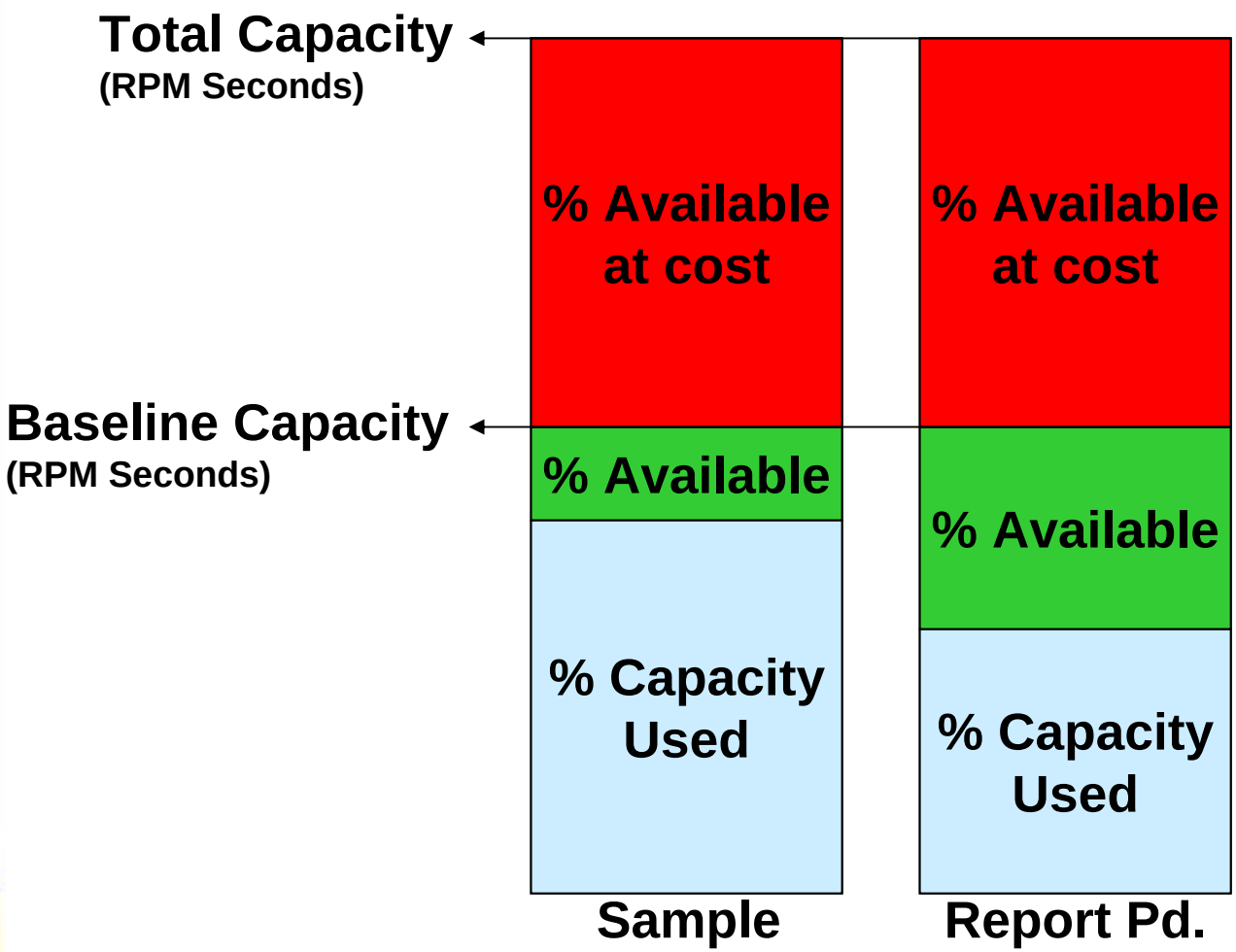
Analyzing Metering Statistics

- "Capacity Baseline"
  - Both "Base-plus-usage" and "Pre-paid" models have a "baseline"
  - "Baseline" is simply your "expected" capacity consumption level
  - Goal is to, on the average, stay within your "baseline"

Analyzing Metering Statistics

- "Capacity Baseline"
  - Base-plus-usage metering has a monthly "baseline" in RPM (defined in metering key)
  - Pre-paid Performance metering has a monthly "run rate" in MIPS
    (not defined in metering key)
  - SightLine treats both of these as a logical "baseline" for capacity consumption
  - Capacity consumption is reported as a percentage of this "baseline"
  - The reported percentage can be either smaller or greater than 100%
  - MCP Pre-paid "run rate" and license term must be manually defined to SightLine

Analyzing Metering Statistics



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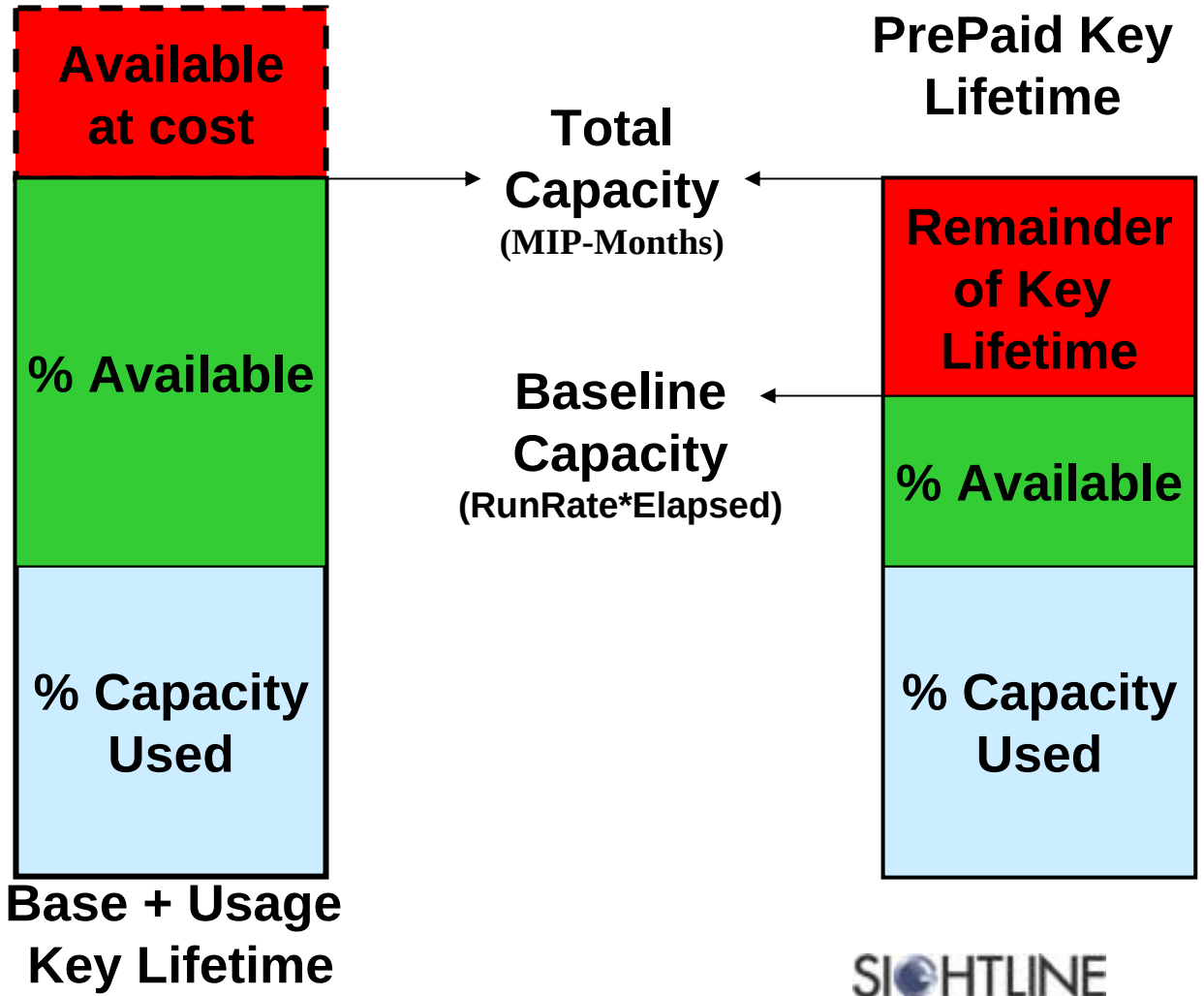
Analyzing Metering Statistics



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Analyzing Metering Statistics

- You Can Decompose Capacity Consumption
  - Unisys metering monitors only total system CPU usage
  - SightLine Metering Agent analyzes capacity consumption by:
    - USER
    - MCP
    - Individual workload

How to Plan for Metered Systems

- How to Plan for transition to a metered system?
  - Measure current resource utilization
  - Project capacity requirements
  - Determine best solution
    - Base-plus-usage (utility billed)
    - Pre-Paid (phone card)
  - Migration Considerations
    - IO infrastructure
    - Release levels

How to Plan for Metered Systems

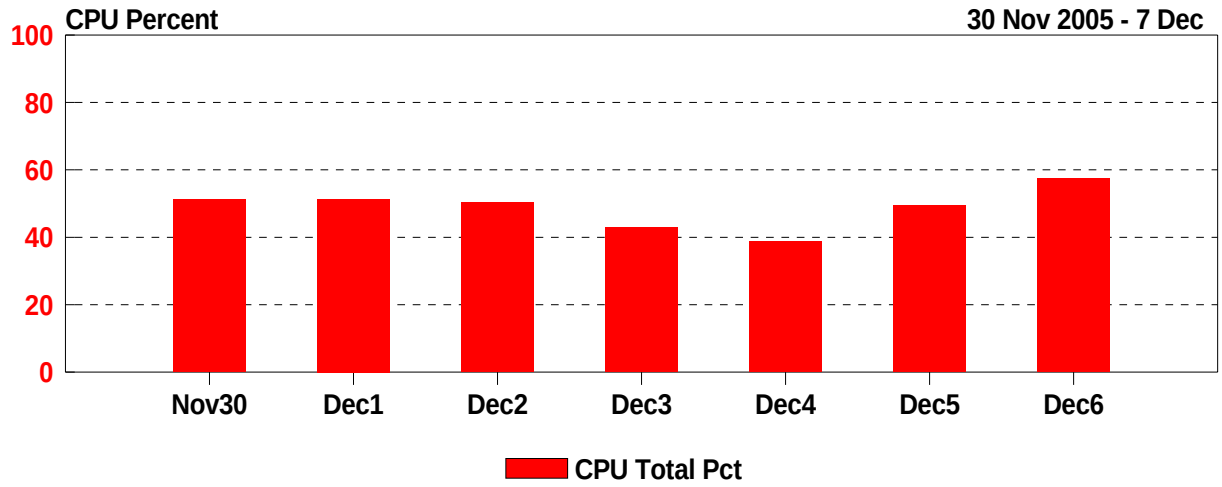
- Use SightLine Capacity Manager, Torch, or other similar product to measure current resource utilization
  - Average weekly/monthly CPU %
    - Workload level for growth estimates
  - IO utilization
    - Average weekly/monthly IO rates (IO/Sec)
    - Throughput (KB/Sec)
    - Service level (Sec/IO)
    - Space utilization
  - Memory utilization
    - Total capacity
    - Total percent in use
  - Pay attention to peaks (particularly I/O).

How to Plan for Metered Systems

- Convert average weekly/monthly CPU % to capacity metric
  - Rating from current system
    - On MCP systems, convert RPM to MIPS by dividing by 24.3
  - Calculate MIPS needed
    - Average weekly/monthly CPU% * MIPS rating
    - Can use weekly if week-to-week variations do not occur
    - Add standard deviation to average

How to Plan for Metered Systems

CPU User Defined RPM 800

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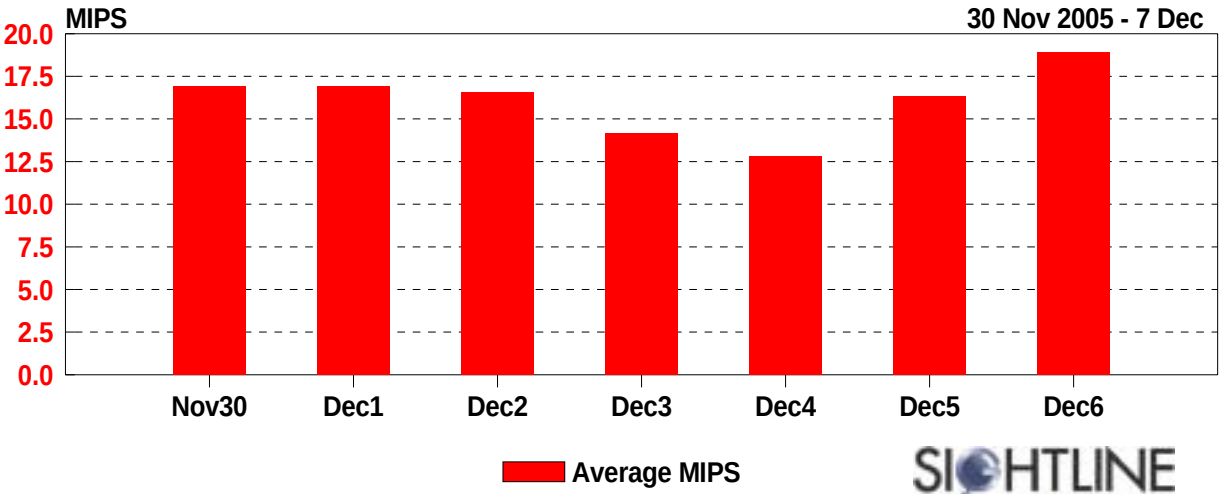
Average MIPS = ("CPU Total Pct"/100)*"CPU User Defined RPM"/24.3
```

Average MIPS 16.08



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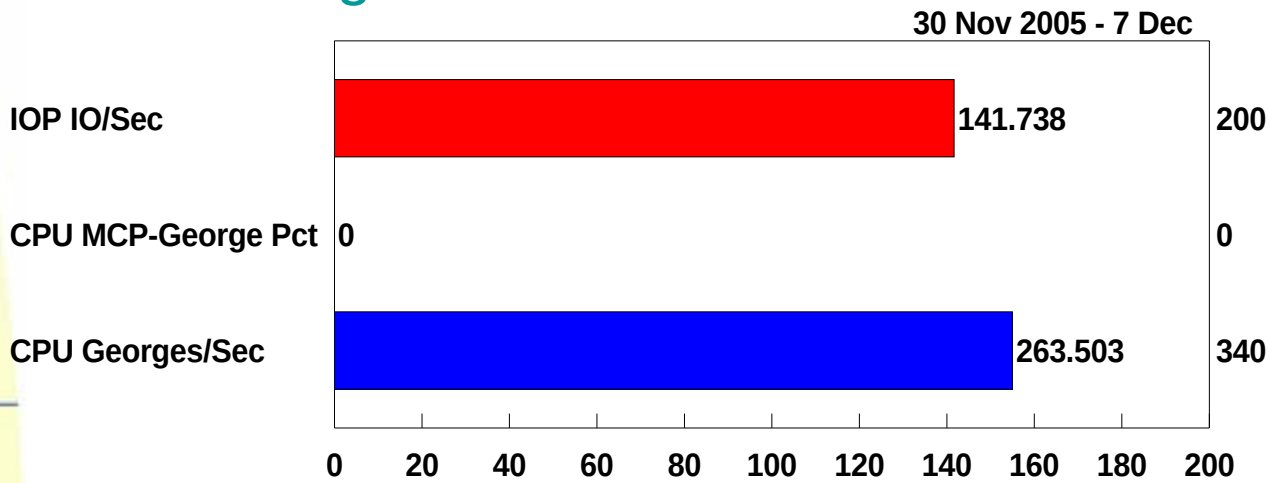
How to Plan for Metered Systems

- Average of 16.08 MIPS
- No TCP on newer Libra platforms
- Additional CPU overhead for:
  - MCP Answer-IO Finish
  - MCP George
- Correlation with IO/Sec and Georges/Sec



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How to Plan for Metered Systems

- MCP Answer-IO Finish may be estimated at a rate of 0.016 MIPS/IO

```
141.7 IO/Sec * 0.016 = 2.27 MIPS
```

- MCP George MIPS may be estimated at 0.004184 MIPS per Georges/Sec

```
263.5 Georges/Sec * 0.004184 = 1.10 MIPS
```

How to Plan for Metered Systems

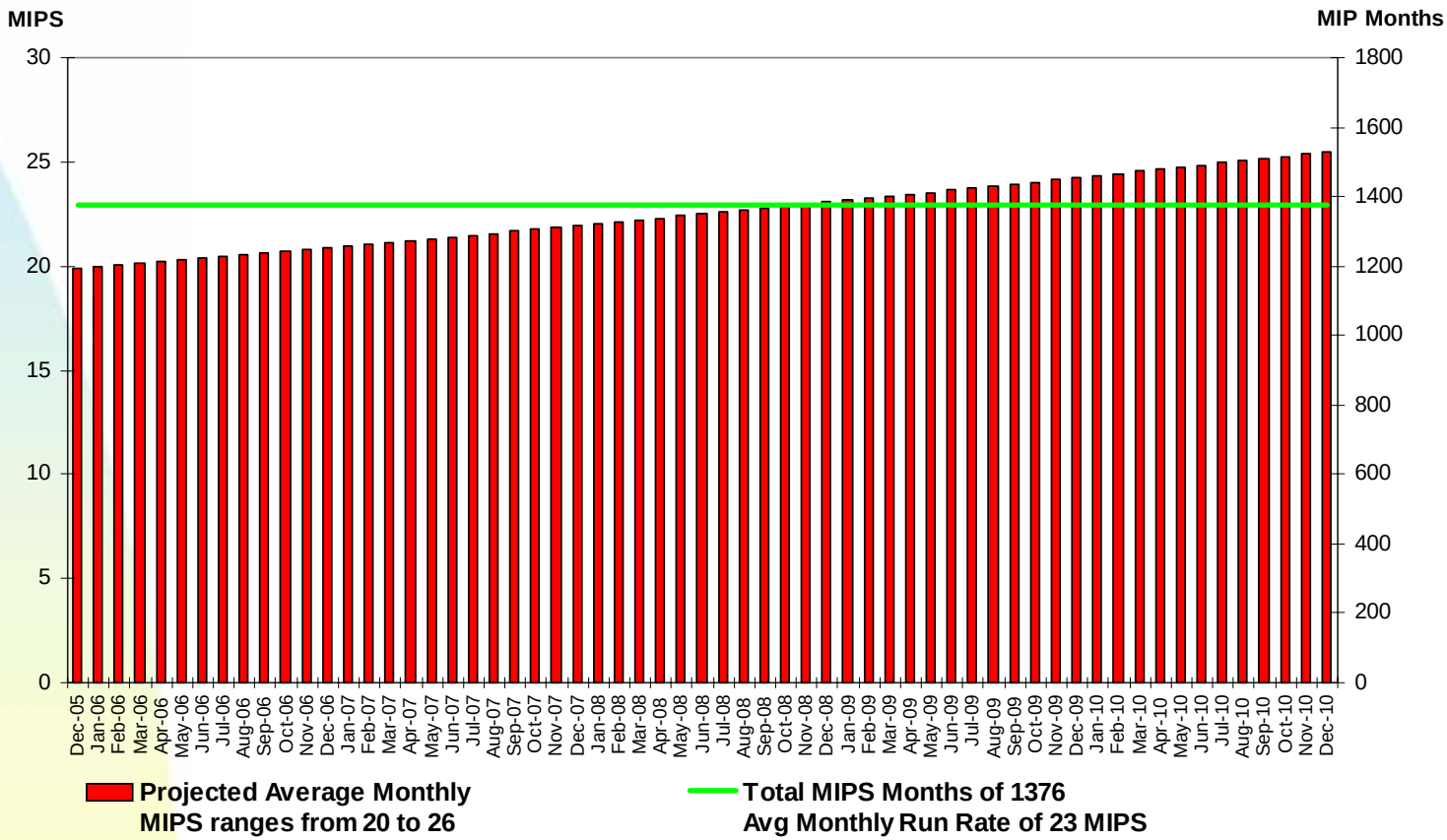
- Total projected MIPS for metered system

16.08	Current Average MIPS
0.40	Standard Deviation
2.27	MCP Answer-IO Finish MIPS
1.10	MCP Georges MIPS
19.85	Total projected MIPS

- Apply growth estimates
- Create multi-year forecast in Excel or similar tool

How to Plan for Metered Systems

Capacity Usage Projection



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How to Plan for Metered Systems

- Which is best Base-plus-usage or Pre-paid
- Base-plus-usage
  - Can be better for systems with
    - Little growth or
    - Full chargeback to users or
    - Operating expense accounting
  - Lose monthly MIPS under minimum purchase (use ‘em or lose ‘em)
  - Want to under buy to avoid monthly loss

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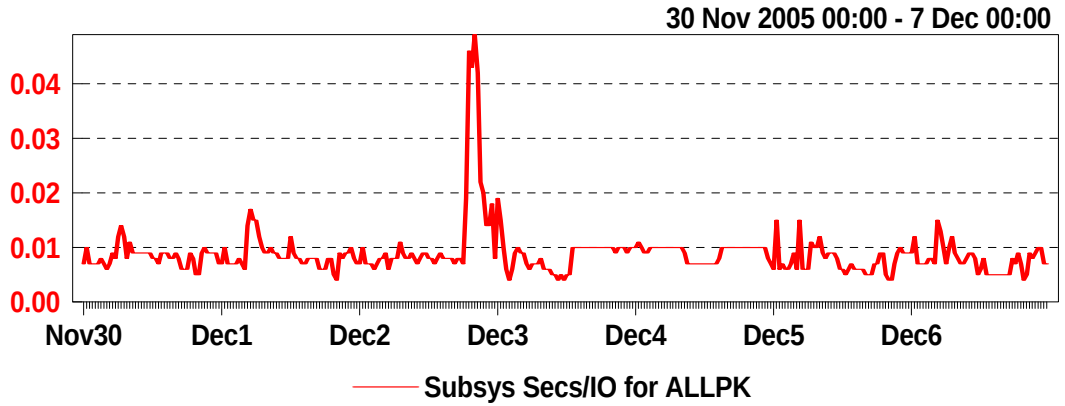
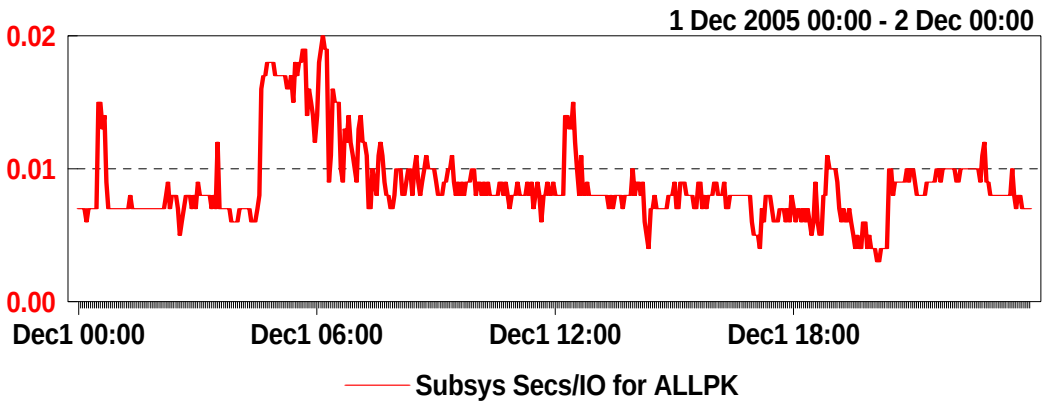
How to Plan for Metered Systems

- Pre-paid
  - Better for systems where variation in capacity needs is expected
  - Have entire license term to consume capacity purchase (no loss till end)
  - If growth exceeds estimates - buy more MIPS
  - If growth falls below estimates – have 2 months to use excess at the end of contract
- Pre-paid recommended for the MCP example due to anticipated growth

How to Plan for Metered Systems

- Processor contention reduced
- IO bottlenecks?





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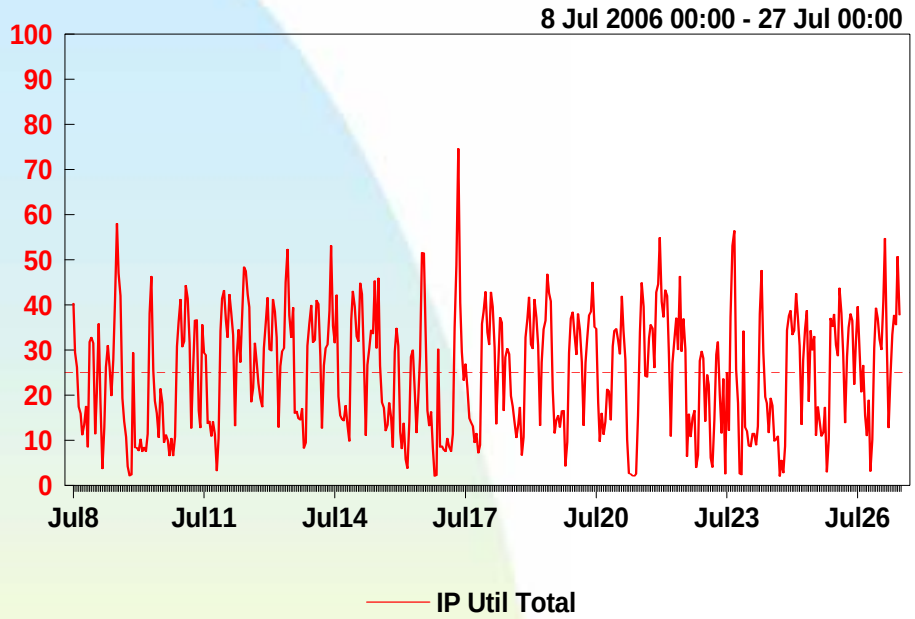
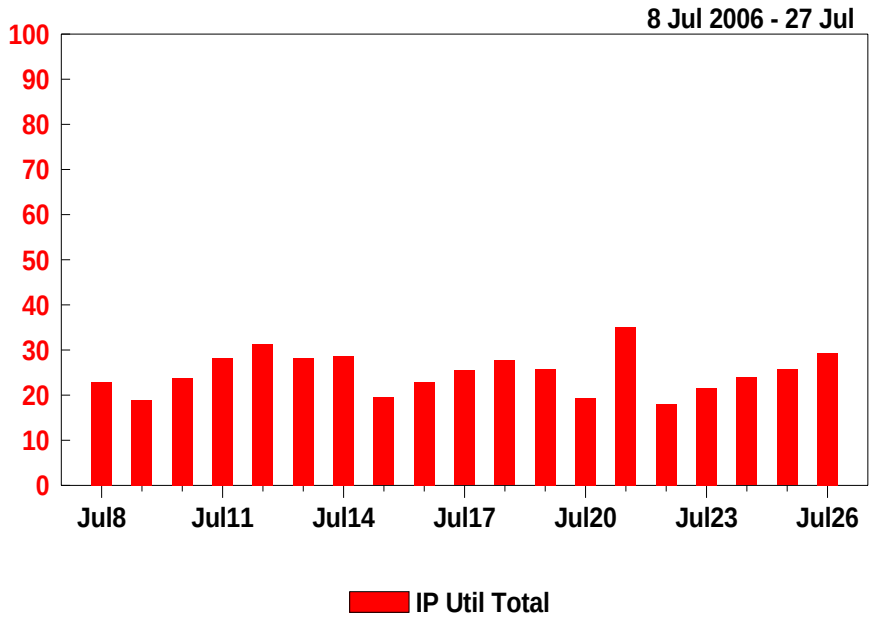
How to Plan for Metered Systems





Average MIPS = (“IP Util Total"/100) * Current MIPS

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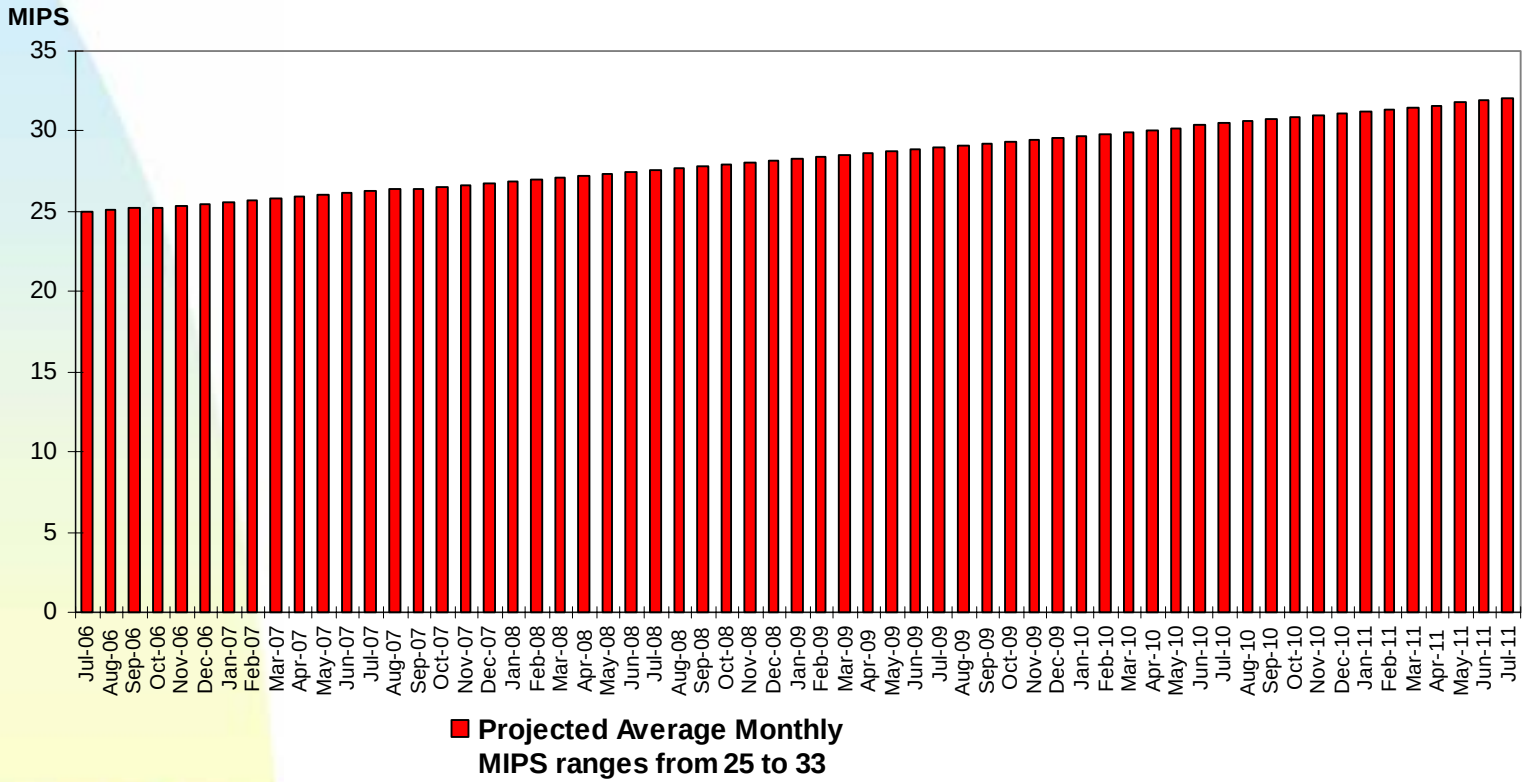
How to Plan for Metered Systems



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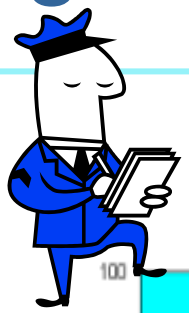
How to Plan for Metered Systems

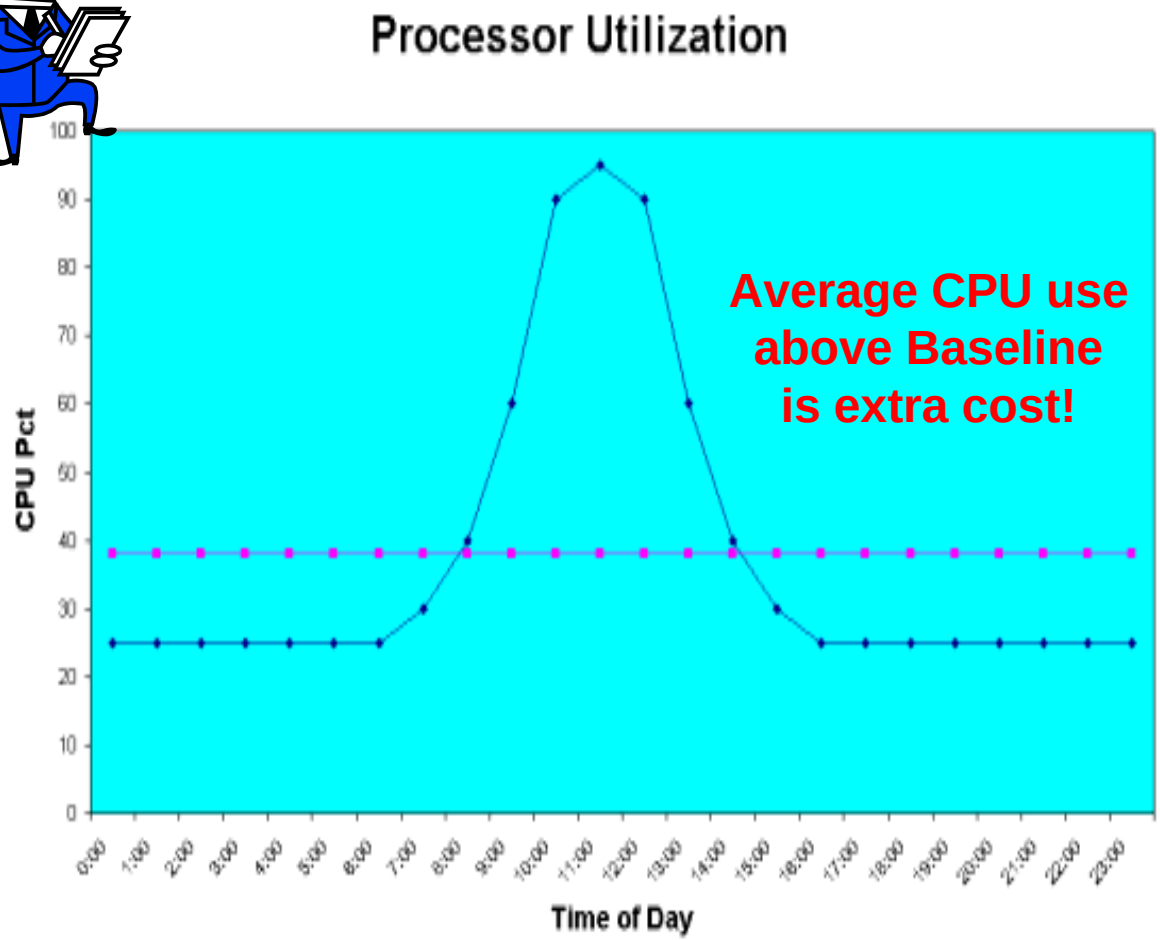
- Other considerations:
  - Memory Requirements
  - Disk Space
  - When migrating having both systems on the same release level if possible
  - Create a migration plan
  - Test the migration plan

Tuning & Managing Metering
Meter Key Status

- Why monitor metering data?
  - Manage RPM-Seconds above baseline
  - Understand actual individual workload capacity consumption
  - Identify wasted RPM-Seconds
  - Track system capacity usage (not just CPU usage)
  - Validate Unisys reports

Tuning & Managing Metering





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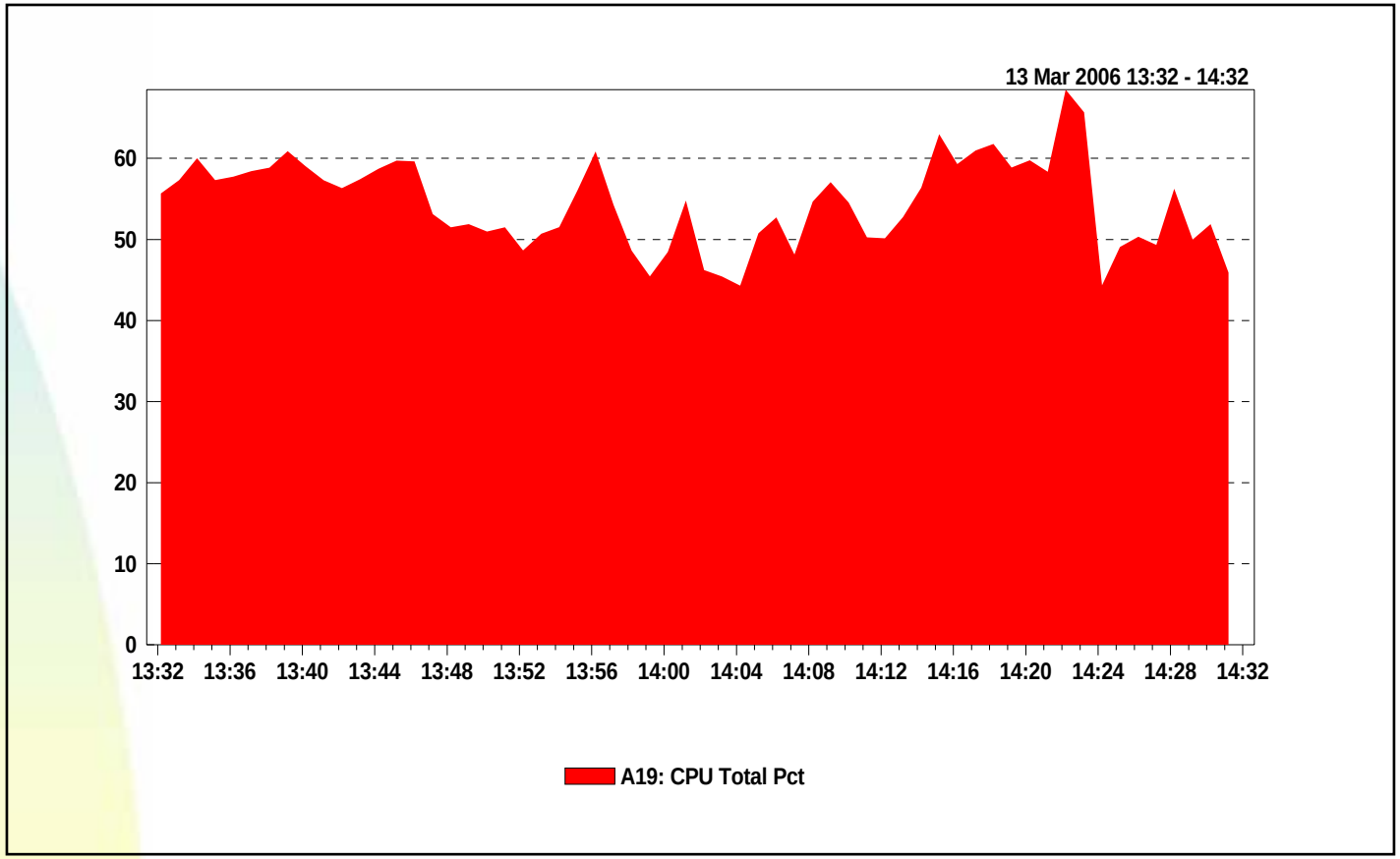
Tuning & Managing Metering

Traditional CPU Tracking



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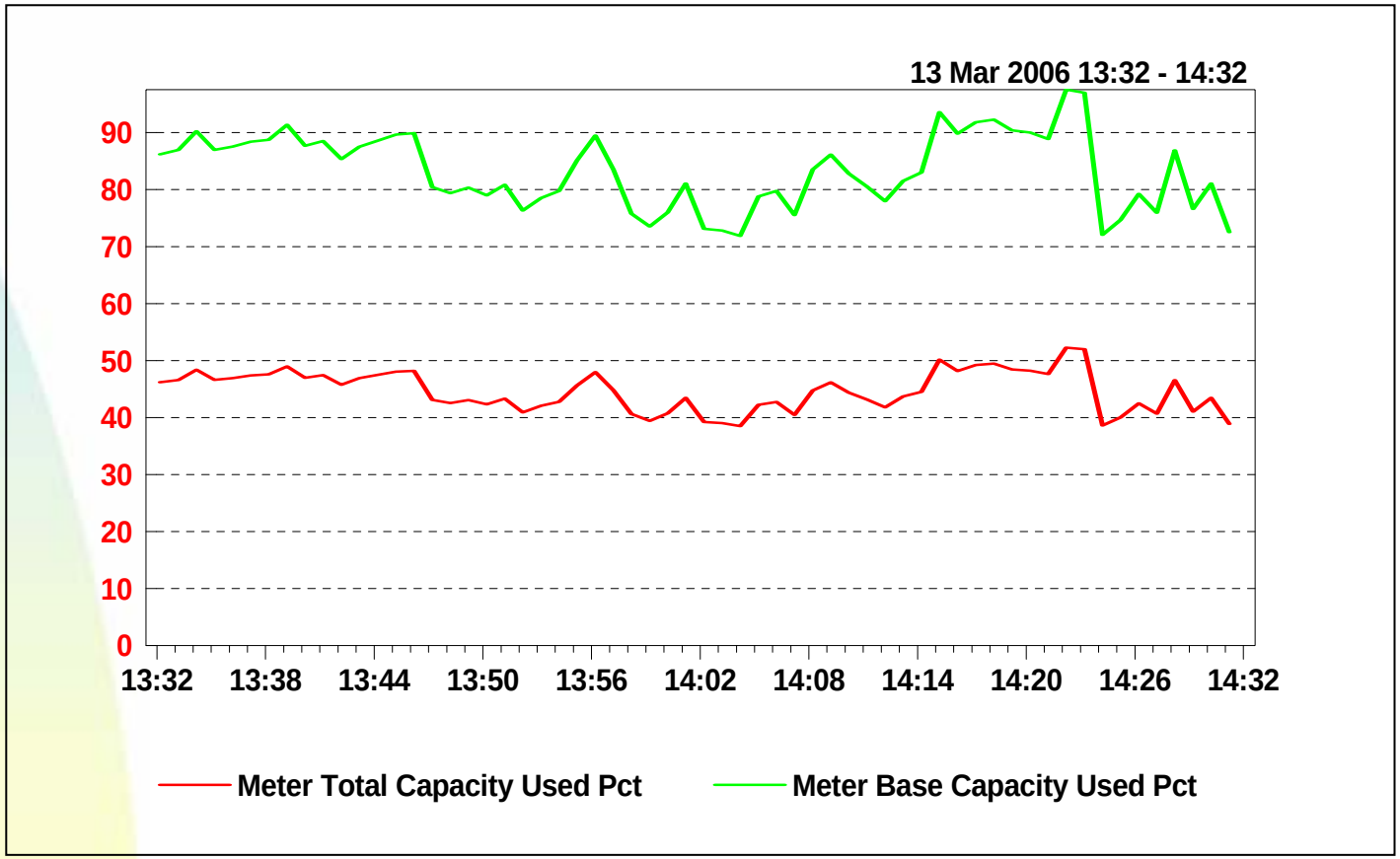
Tuning & Managing Metering

SightLine Capacity Usage



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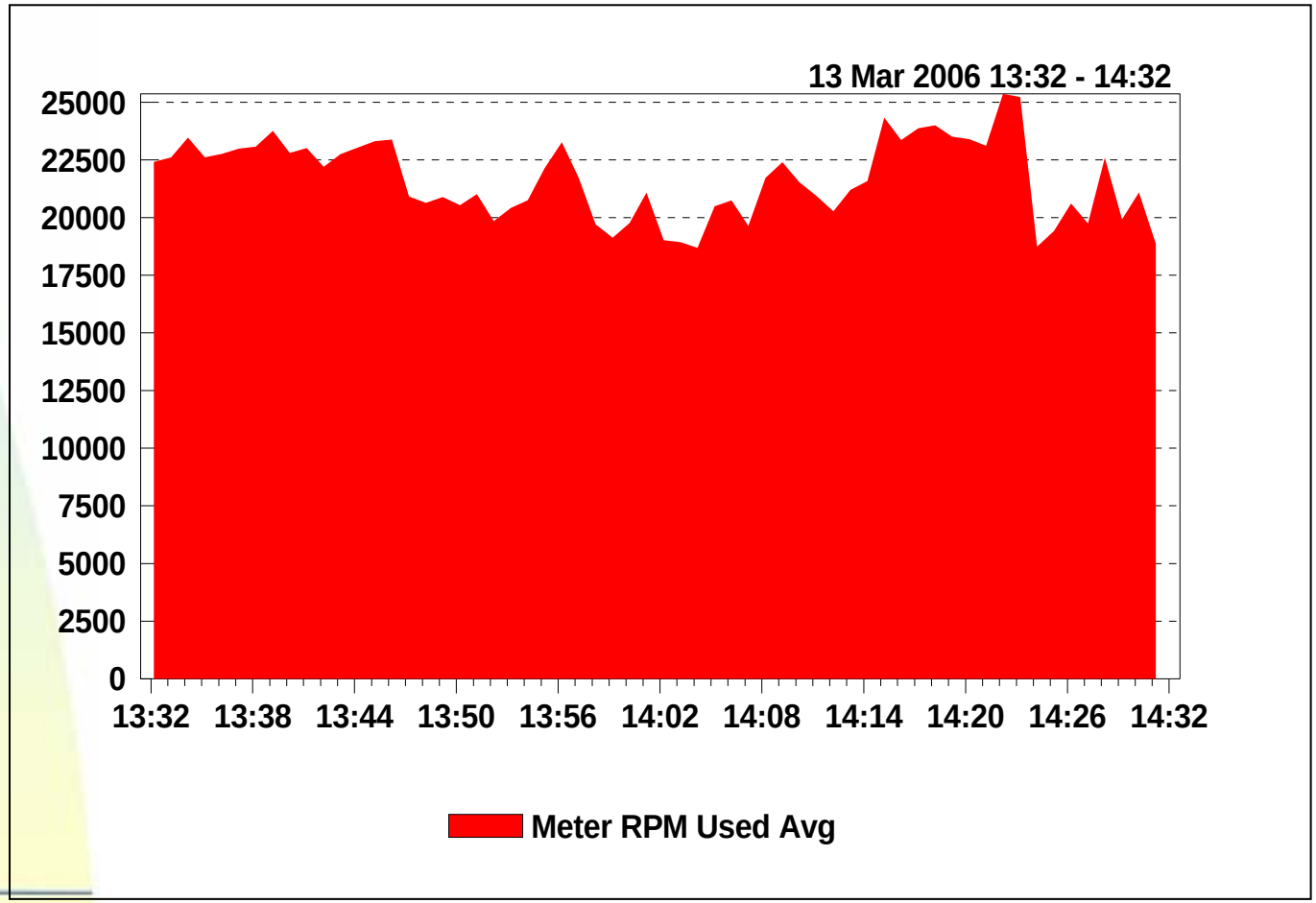
Metering RPM Delivery



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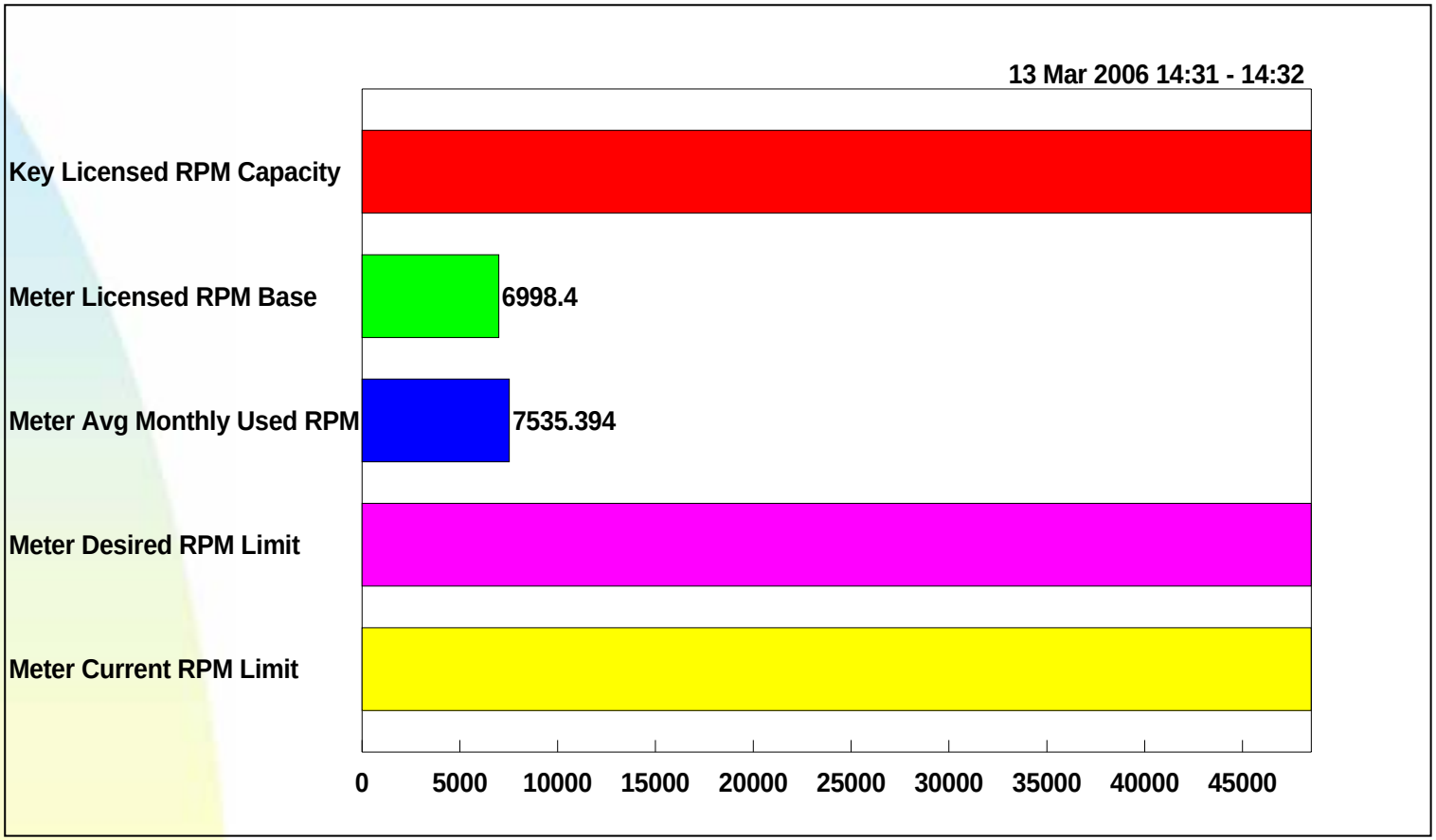
Tuning & Managing Metering

Meter Limits and Usage



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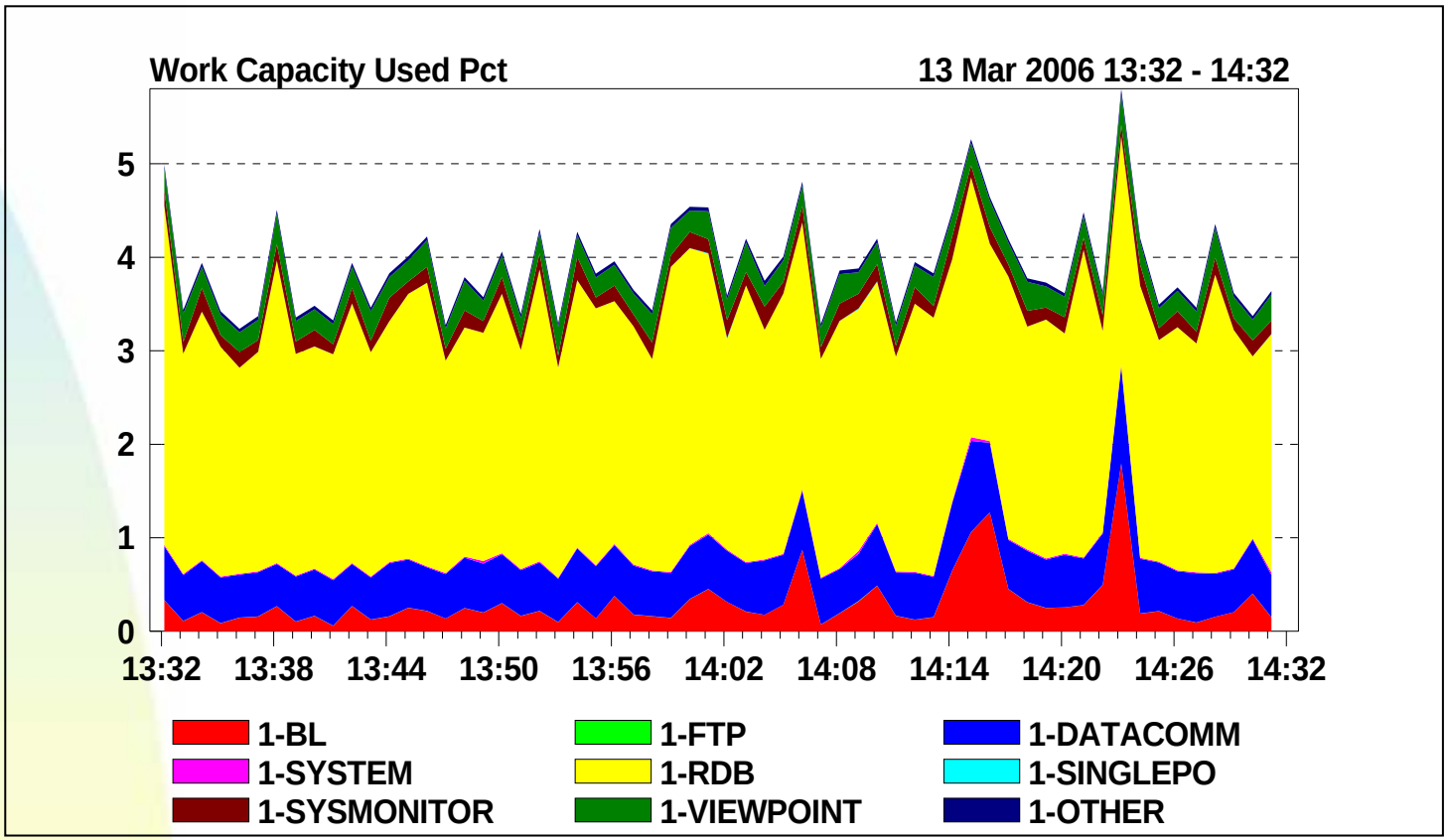
Tuning & Managing Metering

Workload Capacity as % of Total Available



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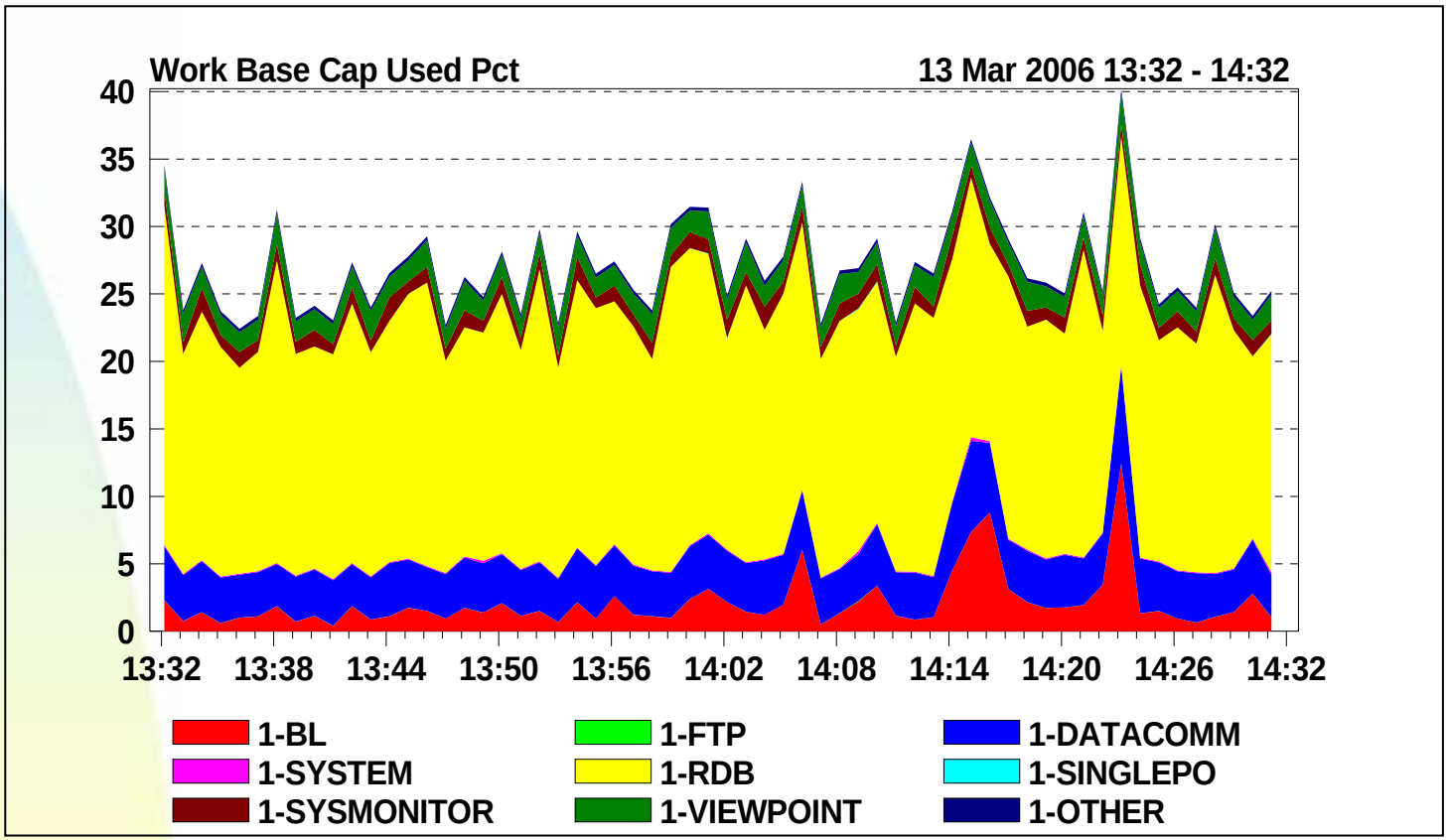
Workload Capacity Used



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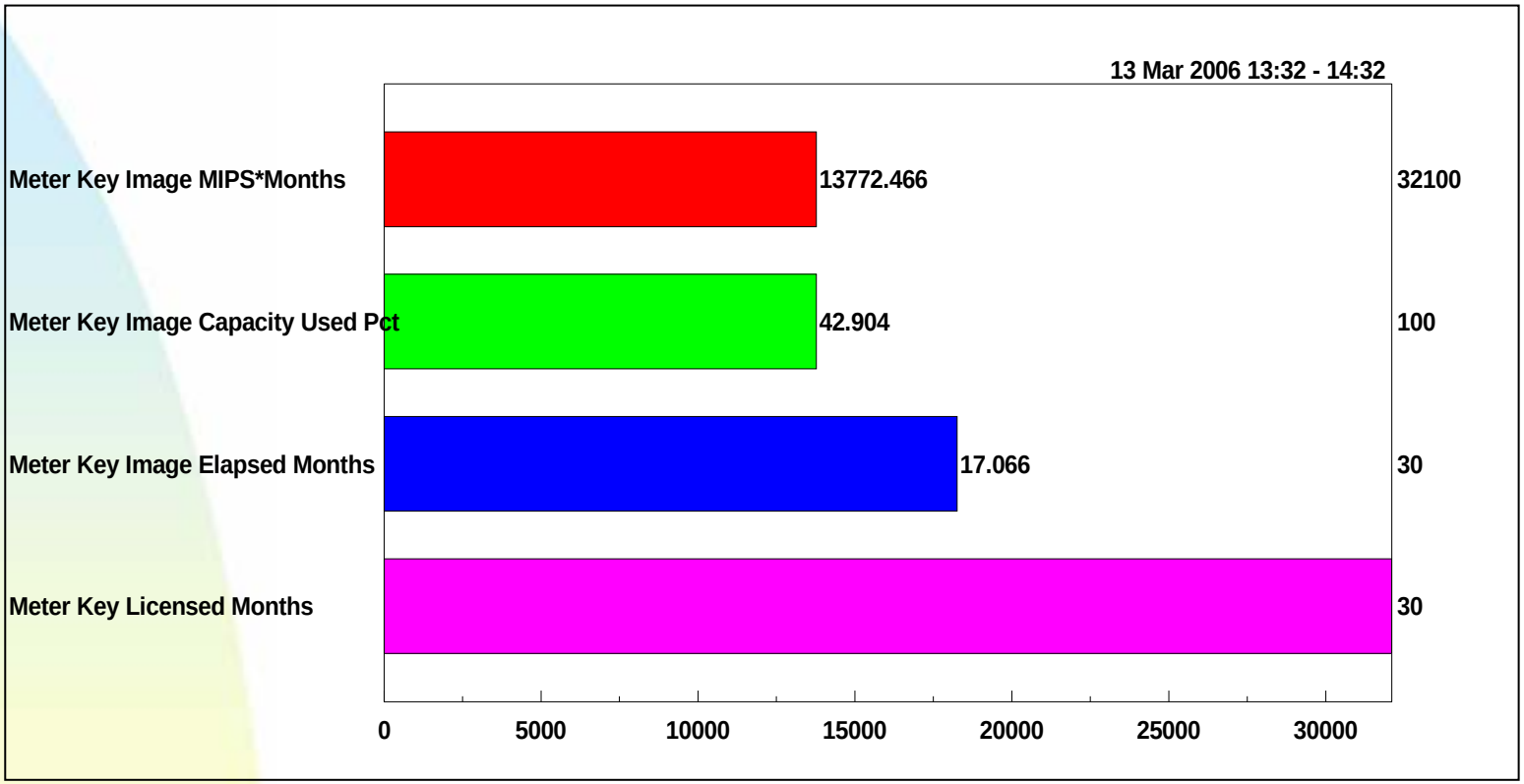
Tuning & Managing Metering

Meter Key Status



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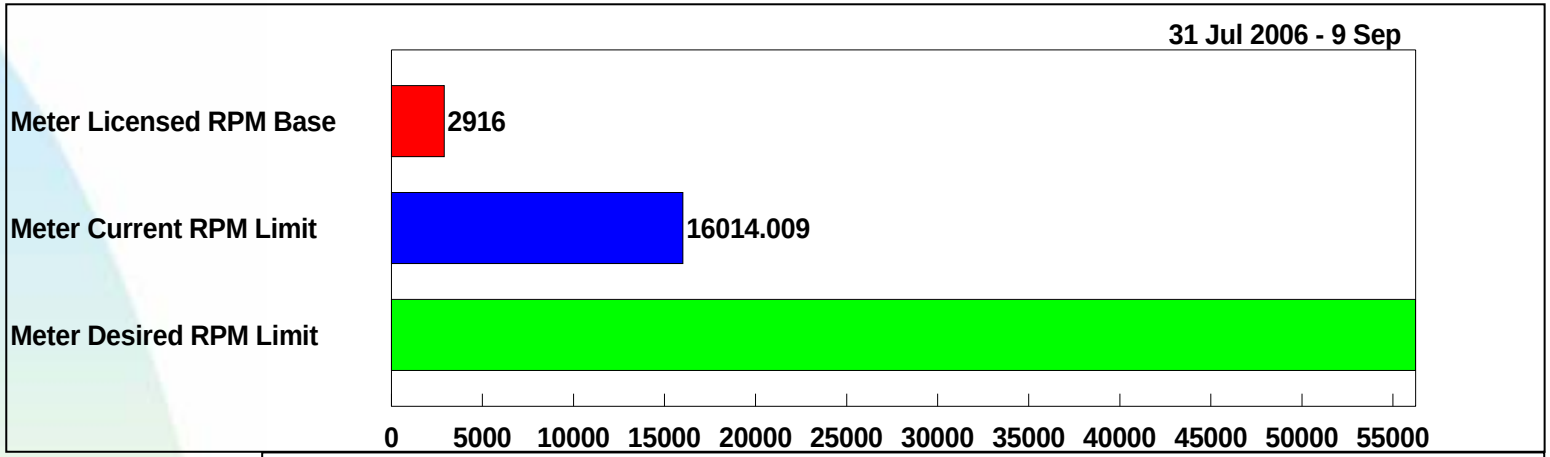
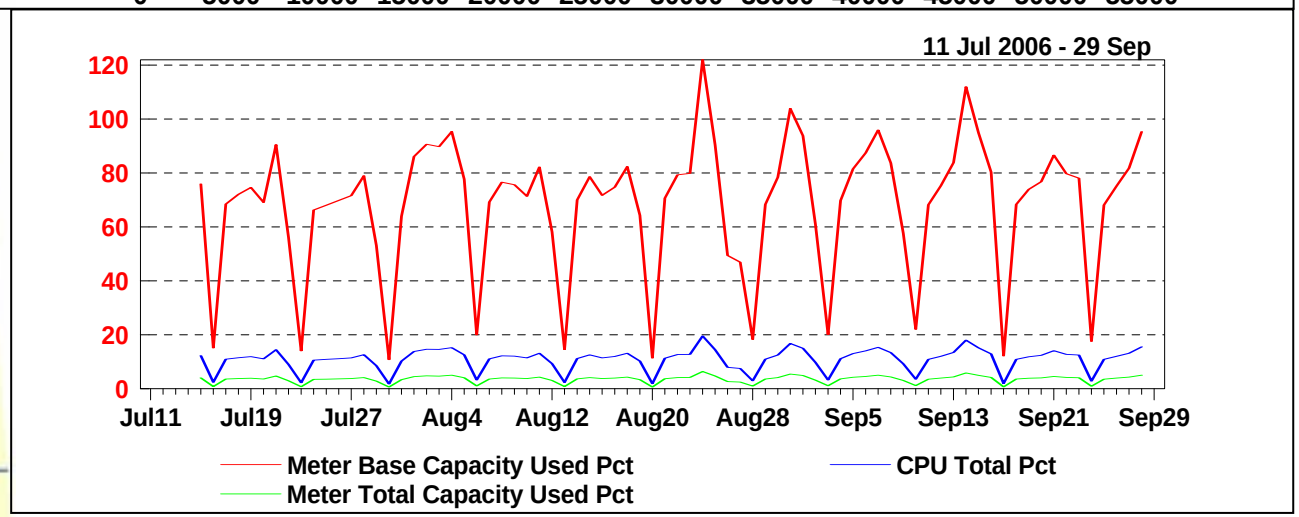
Tuning & Managing Metering

Capacity Usage Relationships





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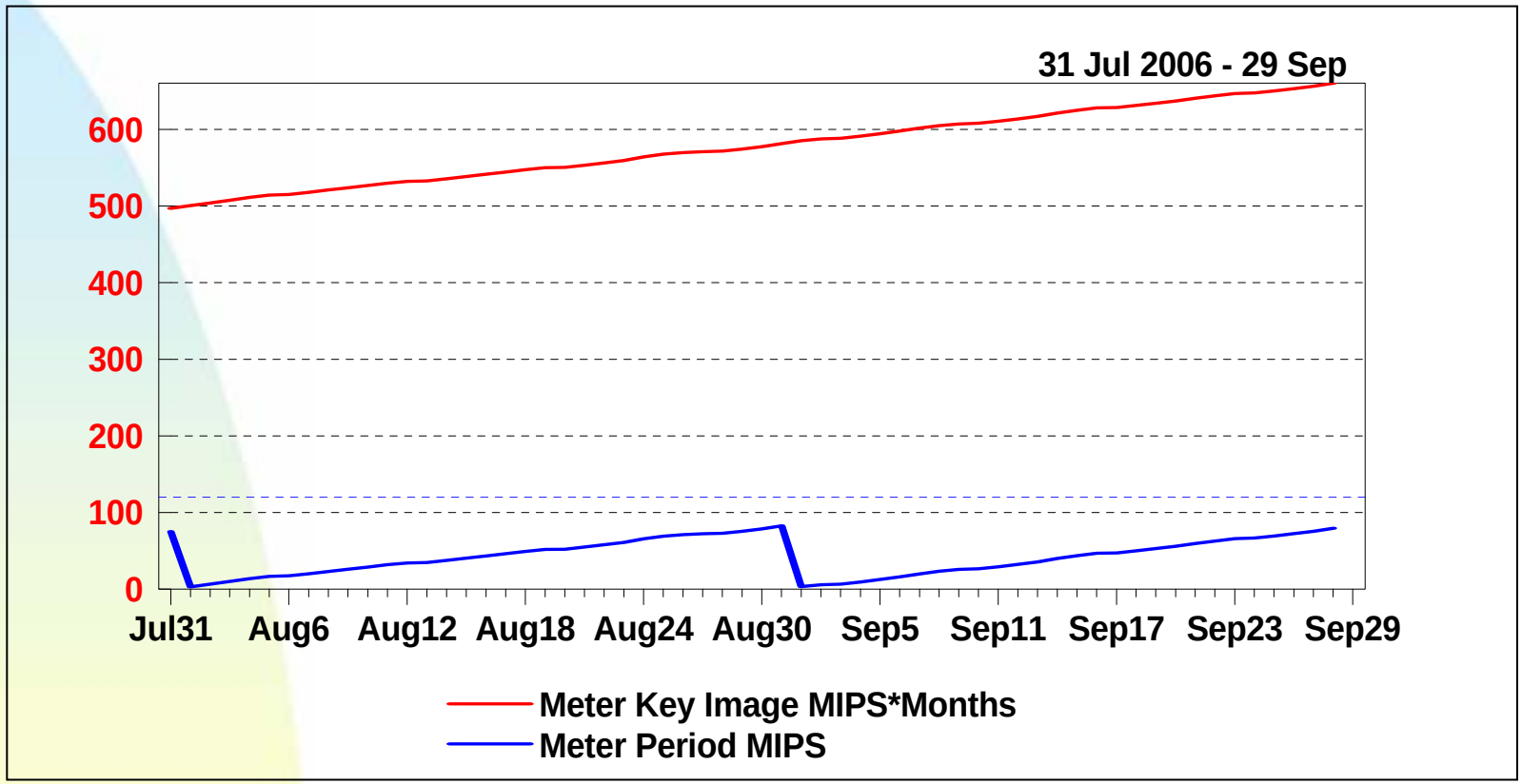
Cumulative Capacity Usage



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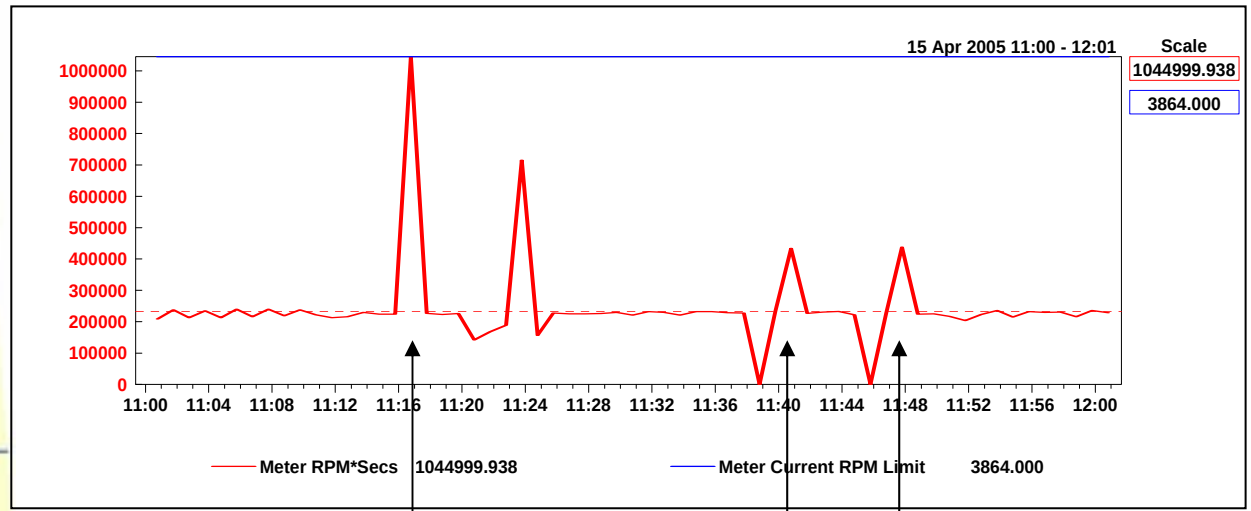
Tuning & Managing Metering
Problem Detection

- Example of a problem value
  - Governor at 3,864
  - Sampling at 60 seconds
  - Max possible RPM*Seconds is 231,840 per sample period
  - Systemstatus 31 shows > 1,000,000



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Tuning & Managing Metering

Problem Detection

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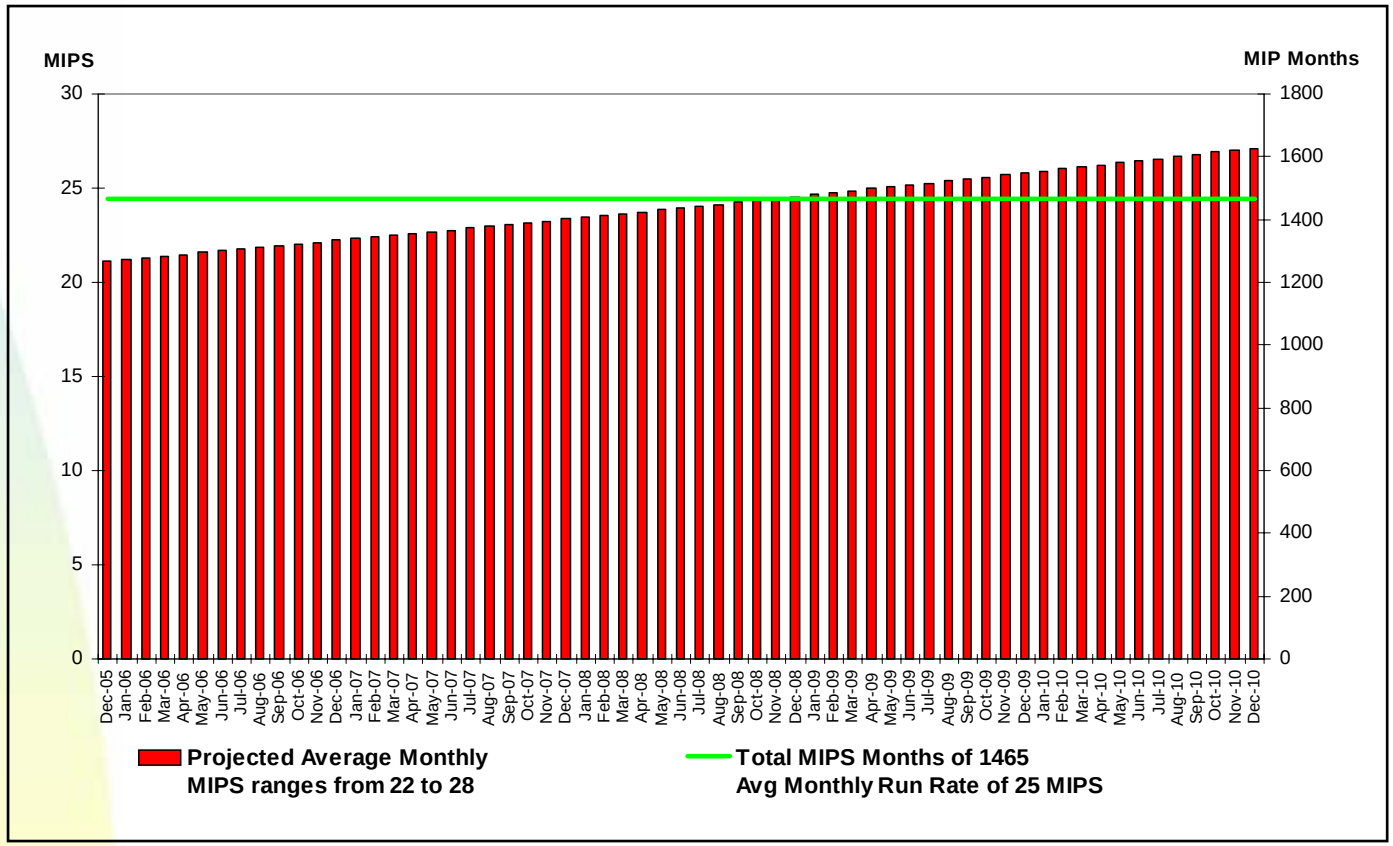
Capacity Usage Projection



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Monitoring OS2200 Metering

- Metering statistics are included in the SightLine Power Agent's MSB/System Log Interface Agent
- Type 551 log records

OS2200 Metering Metrics

If MSB_Utilization = on, the following metrics are reported:

CoD Booting Recs
CoD Meter Key Reg Recs
CoD Non-Meter Key Reg Recs
CoD Up IP Recs
CoD Down IP Recs
CoD Desired MIPS Chgd Recs
CoD MIPS Metering Recs
CoD Meter Prof Key Reg Recs
CoD Meter DR Key Reg Recs
CoD Meter DR Key Exp Recs
CoD Meter Prof Key Exp Recs
CoD Suspect Data Recs
CoD System Stop Recs
Other Part Key Recs
CoD Meter DR Key Reg Recs

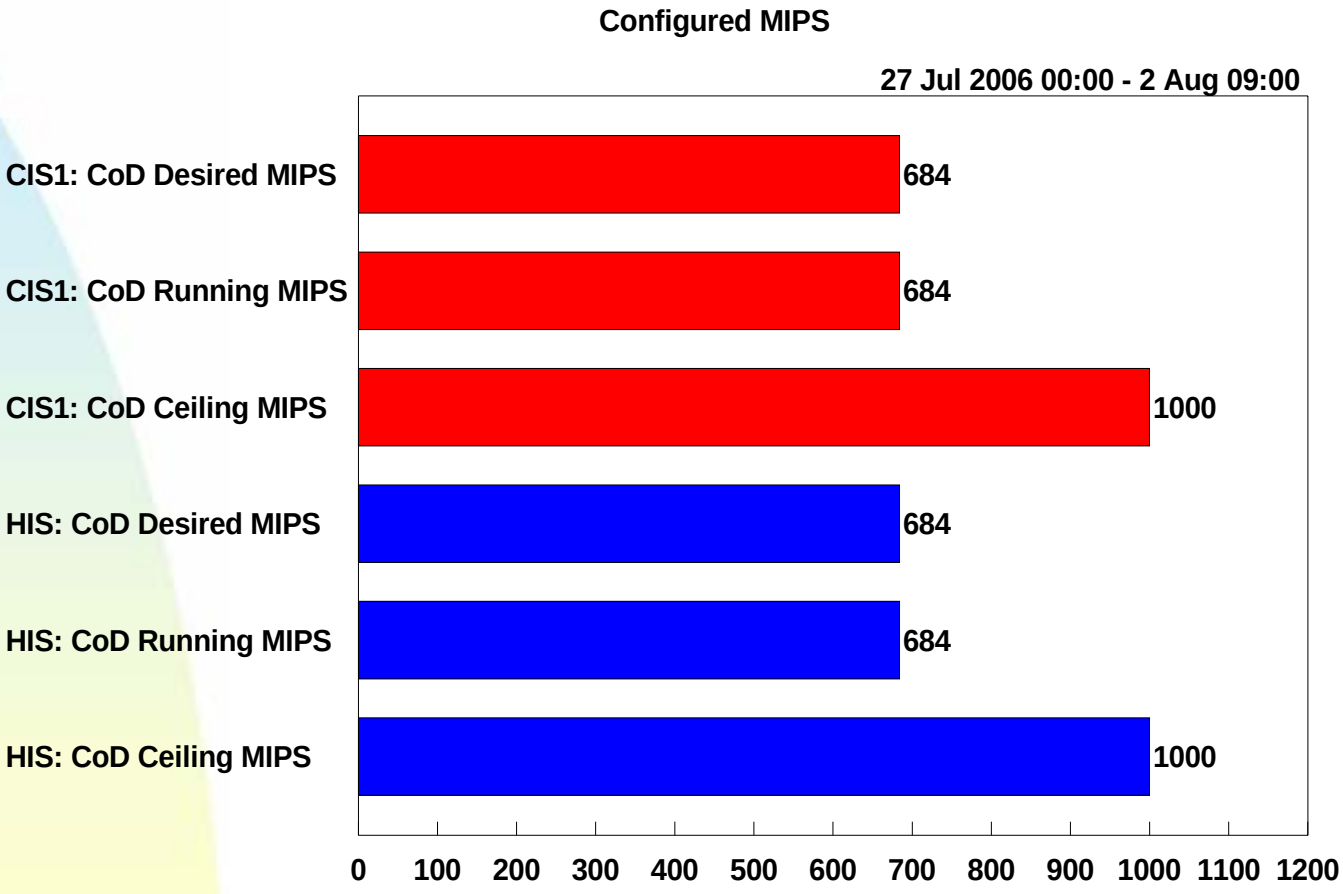
OS2200 Metering Metrics

If MSB_MIPS_Metered_Perf = on, the following metrics are reported:

COD Desired MIPS
CoD Period % Elapsed
CoD Period % Baseline Used
CoD Period MIPS-Months Total
CoD Running MIPS
CoD Baseline MIPS

CoD MIPS Used/Sec
CoD % Desired MIPS
CoD % Running MIPS
CoD % Ceiling MIPS
CoD % Baseline MIPS
CoD Period Days
CoD Period % Elapsed

OS2200 Metering Metrics
Configuration Information



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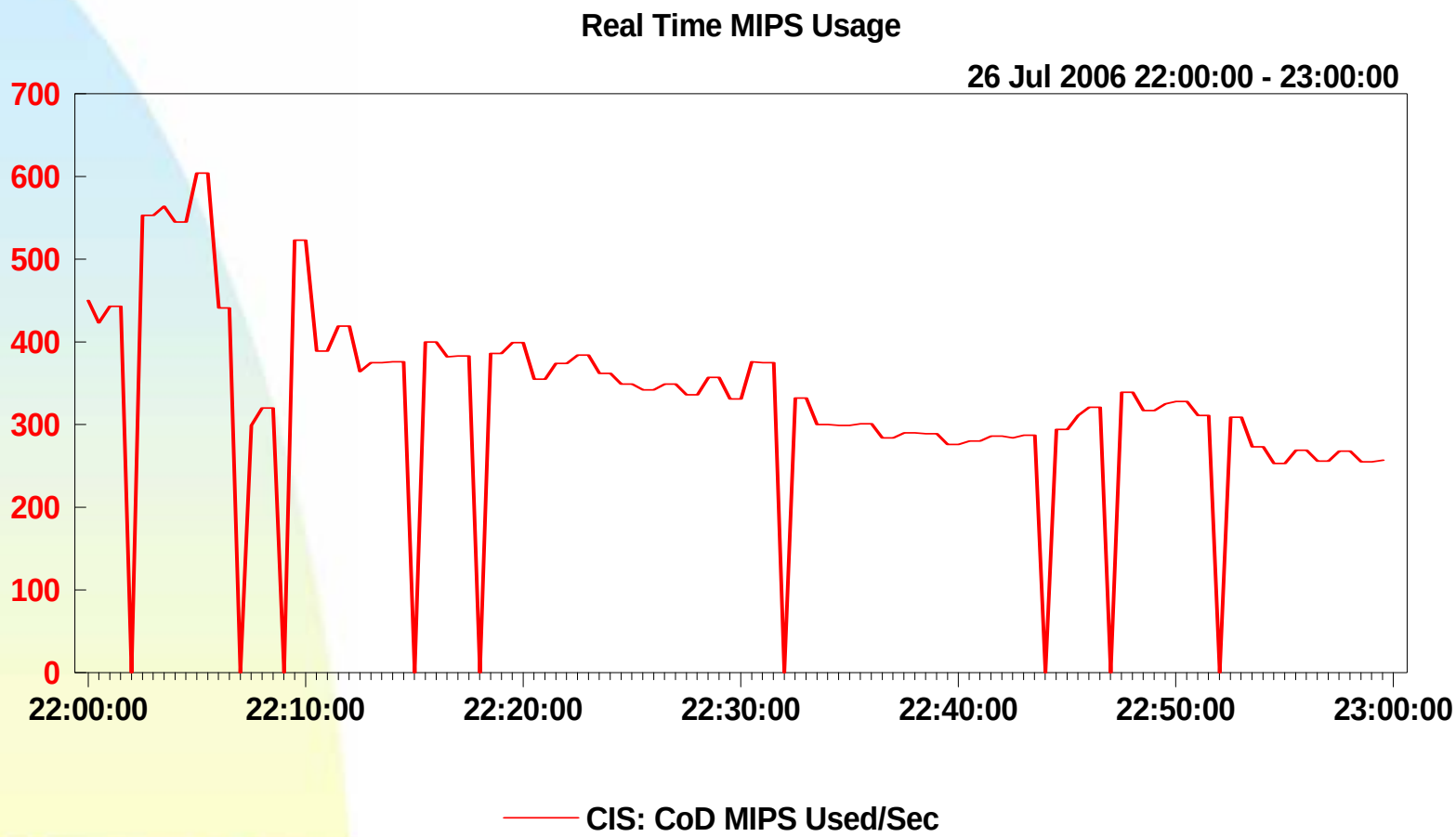
OS2200 Metering Metrics

CoD MIPS Used/Sec



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OS2200 Metering Metrics
Estimated MIPS Usage

- Calc MIPS per Second

  "CoD Running MIPS" * ("IP Util Total"/100)

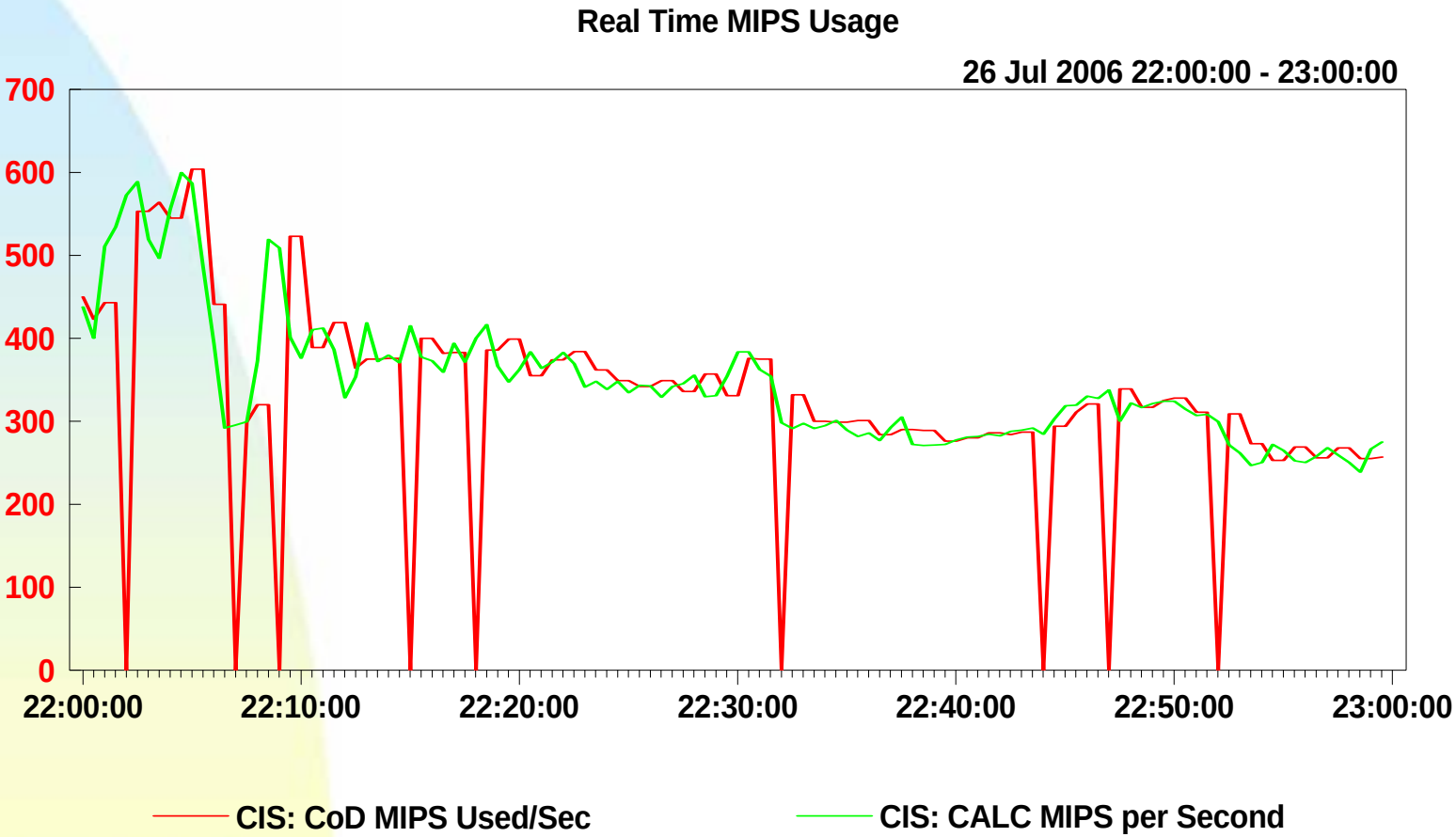
- Calc MIPS per Month

  ("Calc Mips per Sec" * "Elapsed Time")/2629800

  Note: 2,629,800 MIPS Seconds = 1 MIP Month

OS2200 Metering Metrics

Estimated MIPS Usage



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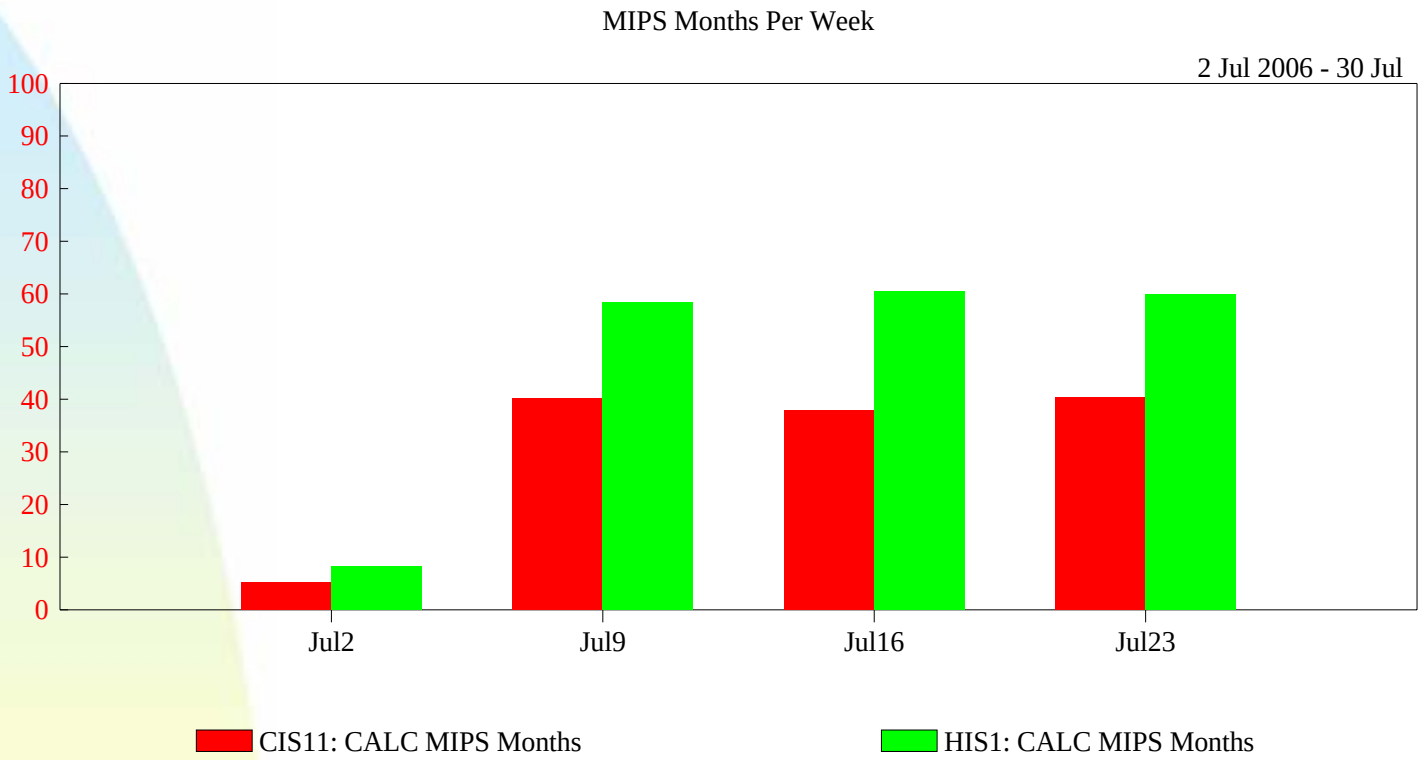
OS2200 Metering Metrics

Estimated MIPS Usage



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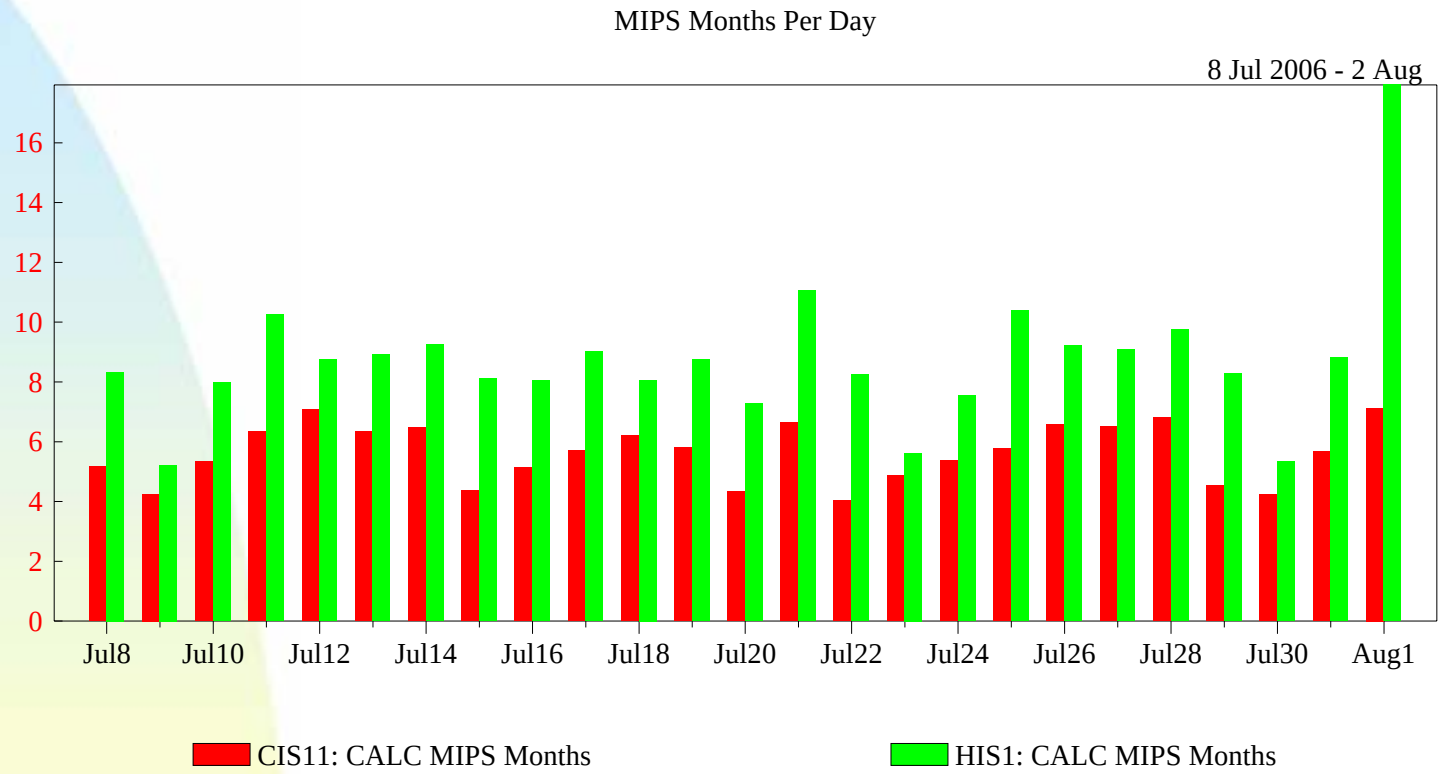
OS2200 Metering Metrics

Estimated MIPS Usage



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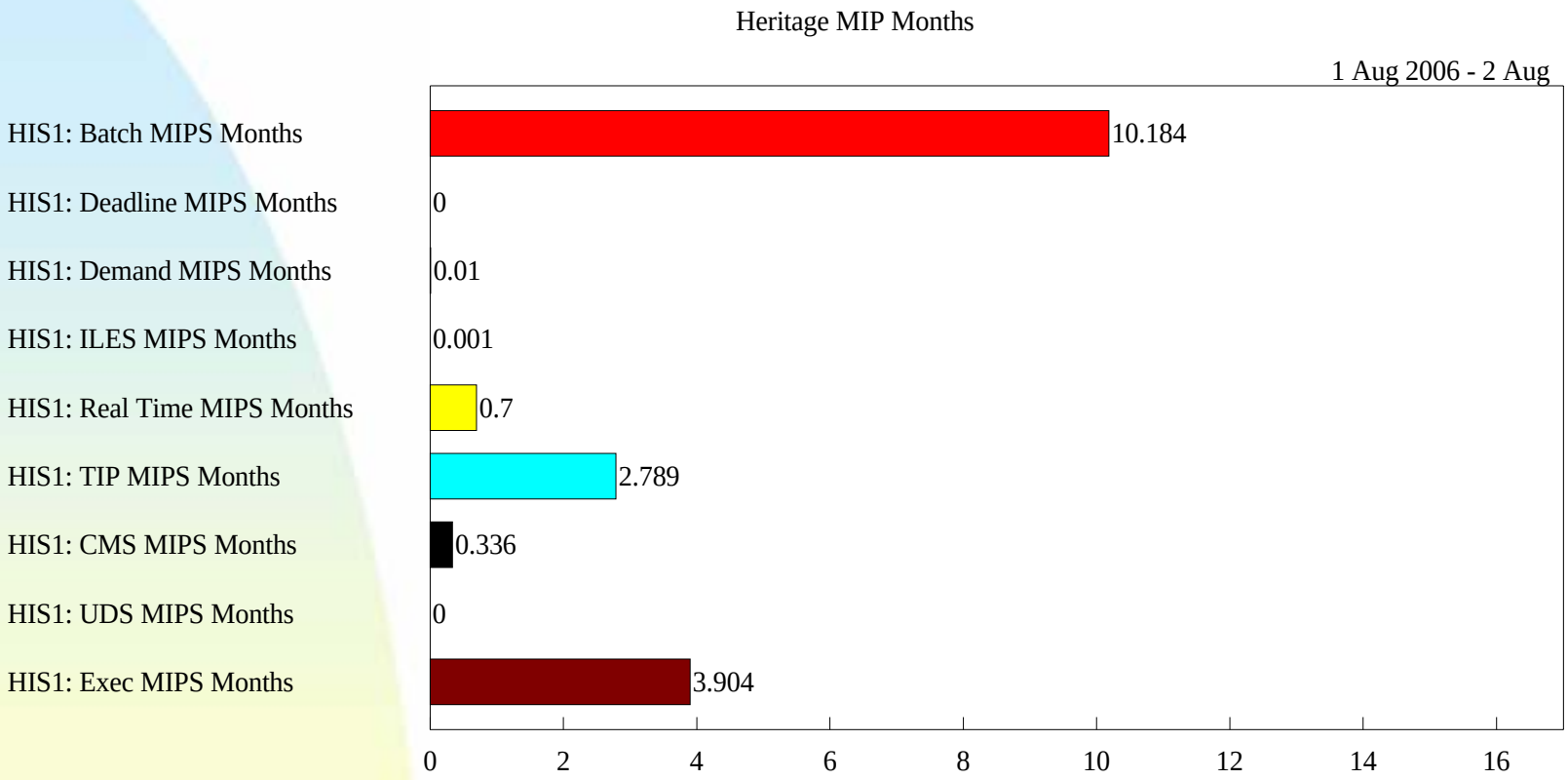
OS2200 Metering Metrics

Estimated MIPS Usage



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SightLine for ClearPath MCP

6.4 Metering Agent Update

- Improved Sampling – using new call with lower CPU overhead
- New excessive consumption analysis and alarms
- Libra 585/595 COD updates
  - Memory COD Keys
  - I/O COD Keys
  - Java Processor Keys
- Libra 6xx support

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SightLine for ClearPath OS2200

7R4 Power Agent Update

- Introduction of OLTP Interface Agent
- Support of SILAS log file
- Support of 67GB+ Disk Master Bit Table in CP-OS-2200 11.1
- Support of TFC Maintenance log entries in CP-OS-2200 11.1
- Support of version 3 of the MIPS metering log entry in CP-OS-2200 11.1

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Additional Questions?

Guy Bonney Guy.Bonney@mgsinc.com
Bob Morrow Bob.Morrow@mgsinc.com

MGS, Inc.
10901 Trade Road, Suite B
Richmond, VA 23236
Voice: (804)379-0230
Fax: (804)379-1299
Web: www.mgsinc.com

Debi Ray Debi.Ray@sightlinesystems.com

SightLine Systems Corporation
11130 Fairfax Boulevard
Suite 200
Fairfax, VA 22030
Voice: (703)563-3000
Fax: (703)563-4000
Web: www.sightlinesystems.com

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SIGHTLINE SYSTEMS

Managing Metering: How to Plan for, Tune and Monitor Your Metered Platform