



SOLUTIONS

# Environment Overview

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# About this Report


This document is an assessment of the server and storage workloads based on servers, server disk activity, and storage capacity as observed during the data collection. The data depicted in this report may be used to make recommendations on future configurations and solutions.

This report may be used to identify times of peak IO activity, and marks the critical 95th IOPS thresholds, a key metric used as a baseline for storage sizing. This report includes details on servers, CPU and memory usage, as well as free and used storage capacities.

If you have any questions regarding the information presented in this report, please contact your Dell team for immediate assistance.

# Performance Envelope

## CPU

Peak CPU	Net CPU	Cores
 72.75 GHz	427.40 GHz	172

## Capacity

Used GB	Free GB	Total GB
 13.34 TB	9.47 TB	22.82 TB

## Memory

Peak Memory Usage	Total Memory
 681.02 GB	2.00 TB

## Peak Aggregate Network Throughput

 9.96 gigabits/s

## IOPS at 95%

 1,971

## Average Daily Write

 843.38 GB



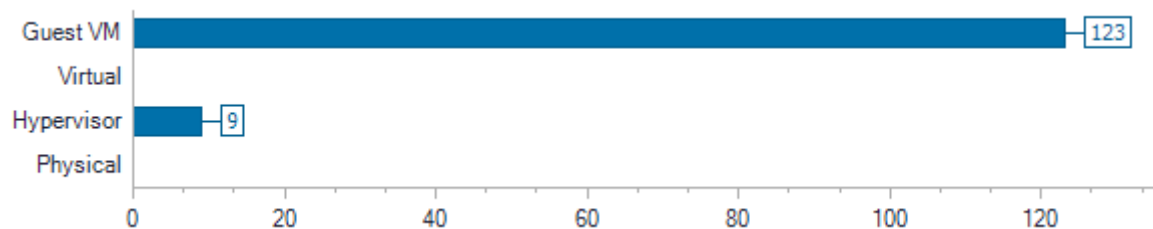
# Inventory Summary

# Inventory Summary

## SERVER ROLES

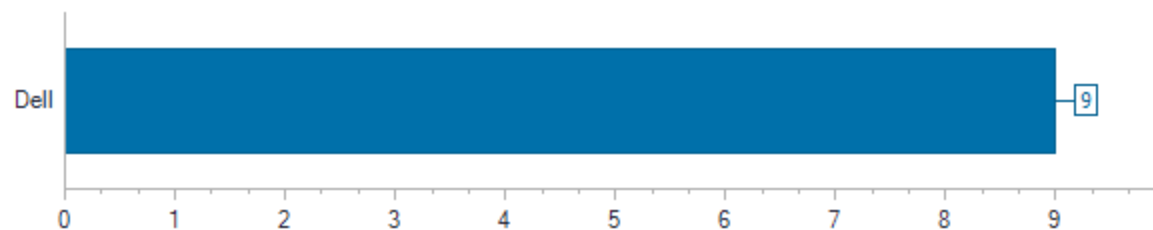
Total Servers: 9

Ratio: 13.7 VMs per Hypervisor



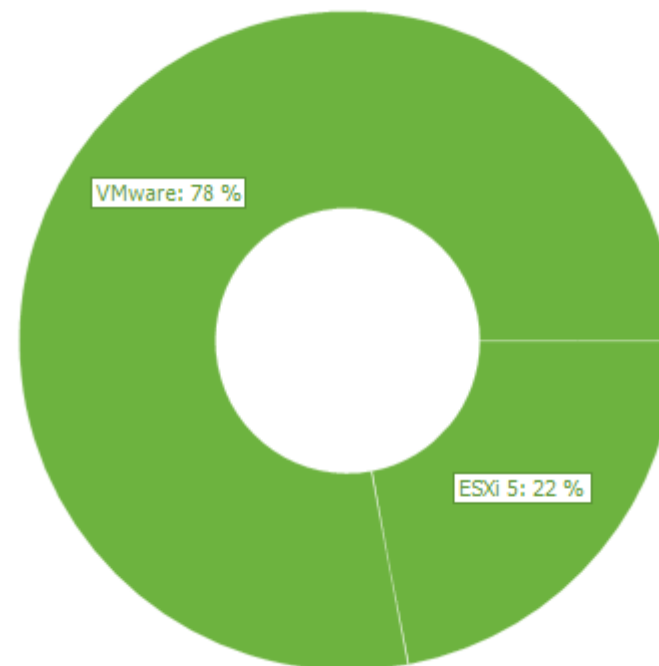
## TOP SERVER MANUFACTURERS

Total Manufacturers: 1



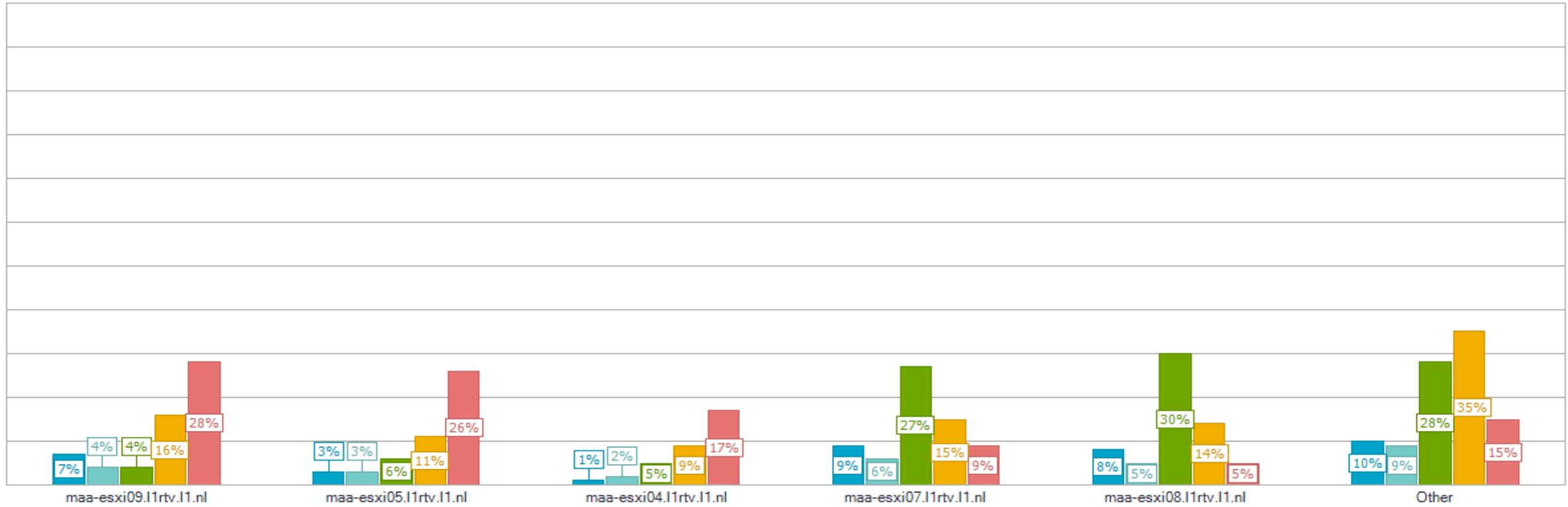
## TOP OPERATING SYSTEMS

 Windows  Linux/Unix  VMWare



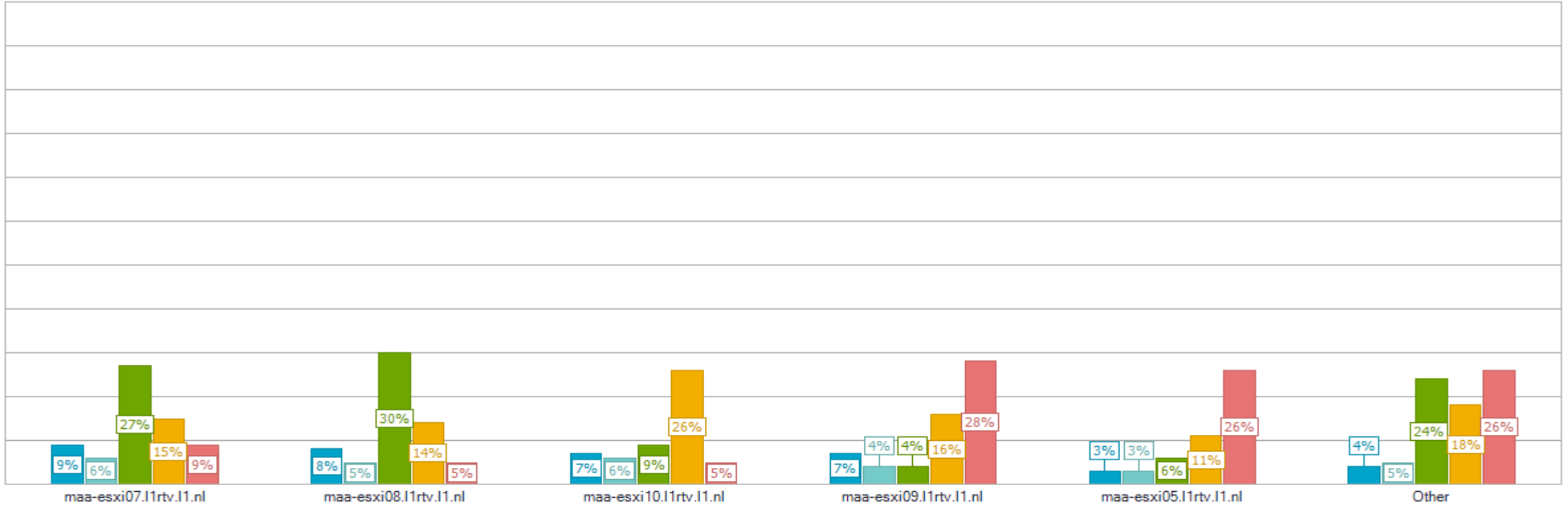
# Top 5 Servers by IOPS

■ Memory ■ CPU ■ Network Throughput ■ Latency ■ IOPS



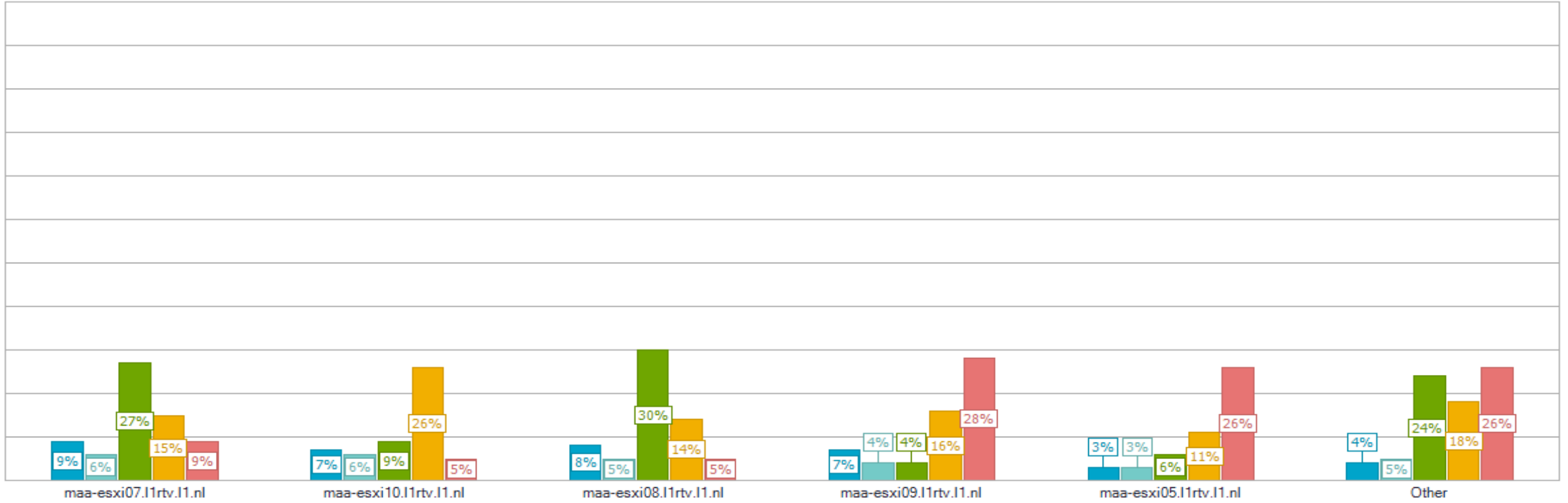
# Top 5 Servers by Memory

■ Memory ■ CPU ■ Network Throughput ■ Latency ■ IOPS



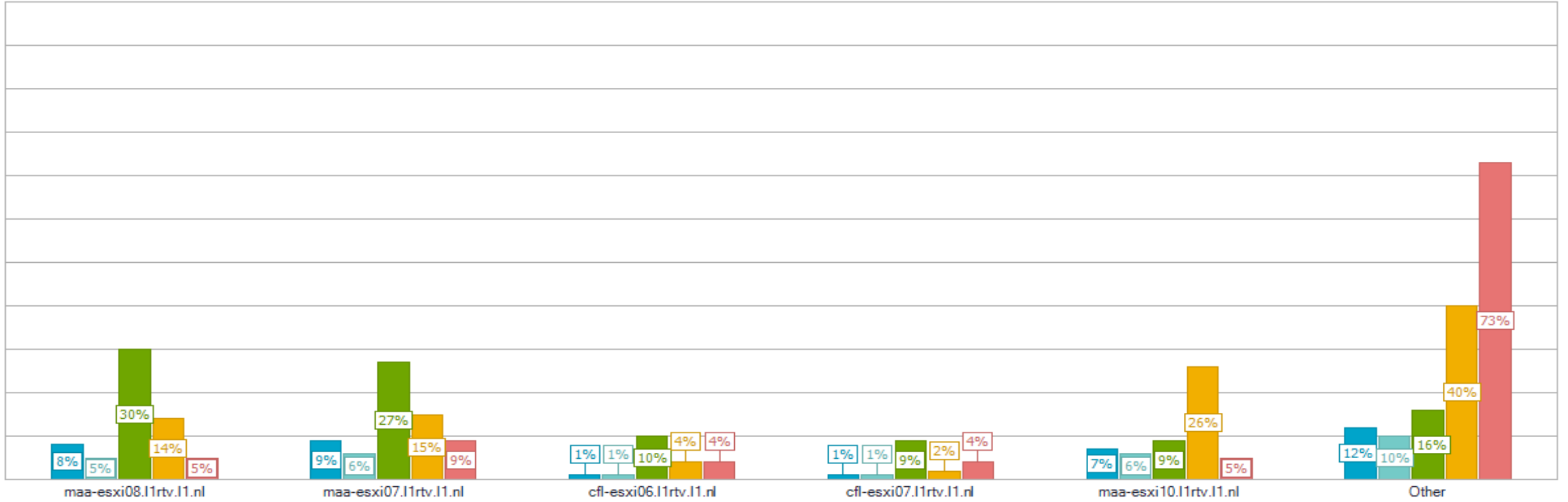
# Top 5 Servers by CPU

■ Memory ■ CPU ■ Network Throughput ■ Latency ■ IOPS



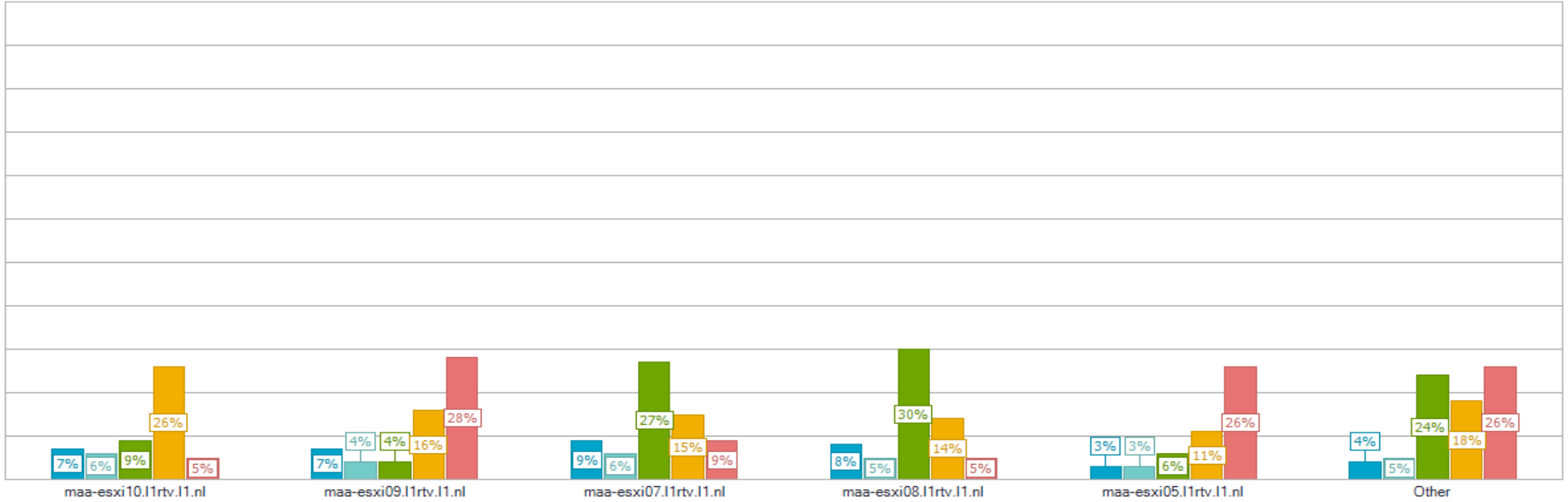
# Top 5 Servers by Network Throughput

■ Memory ■ CPU ■ Network Throughput ■ Latency ■ IOPS



# Top 5 Servers by Latency

■ Memory ■ CPU ■ Network Throughput ■ Latency ■ IOPS

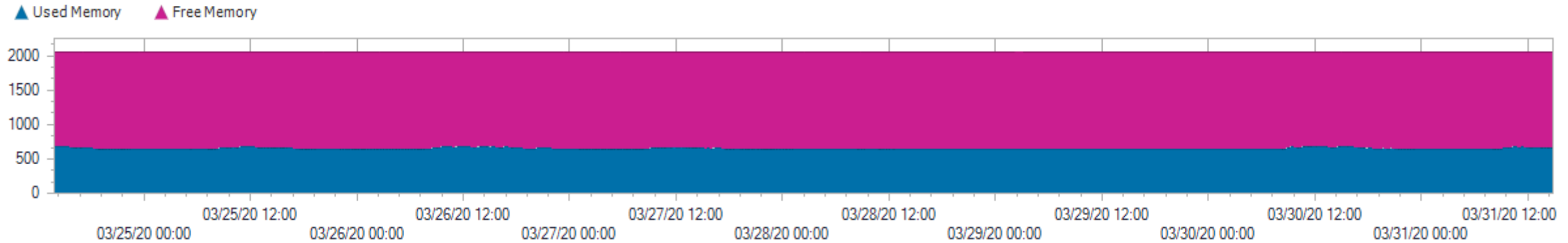
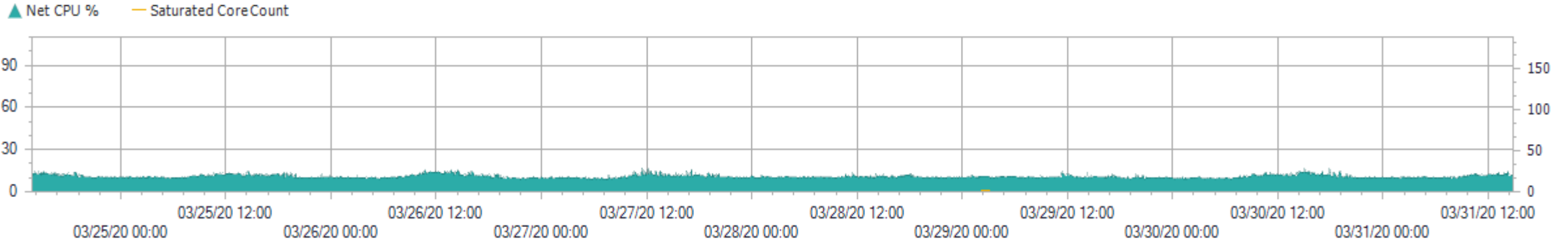




# CPU Performance

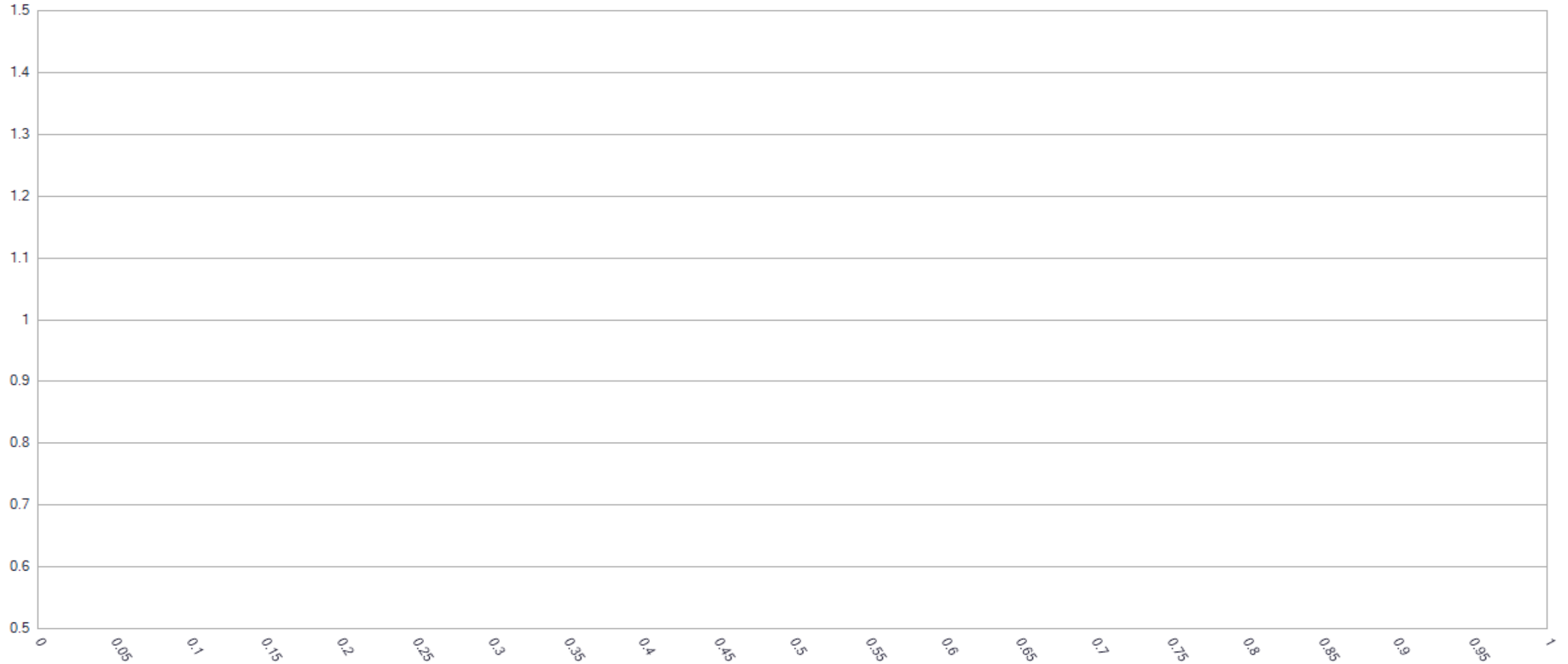


# CPU Performance





# CPU Performance





# CPU Performance

Total Cores	172
Total CPUs	18
Net Clockspeed	427 GHz
Peak CPU	73 GHz
Average CPU	45 GHz
Peak Memory Usage	681.02 GB of 2.00 TB Total Memory



# Storage Capacity

# Storage Capacity

Total Local Capacity

752.00 GB

Used Local Capacity

212.00 GB

Free Local Capacity

540.00 GB

Total Shared Capacity

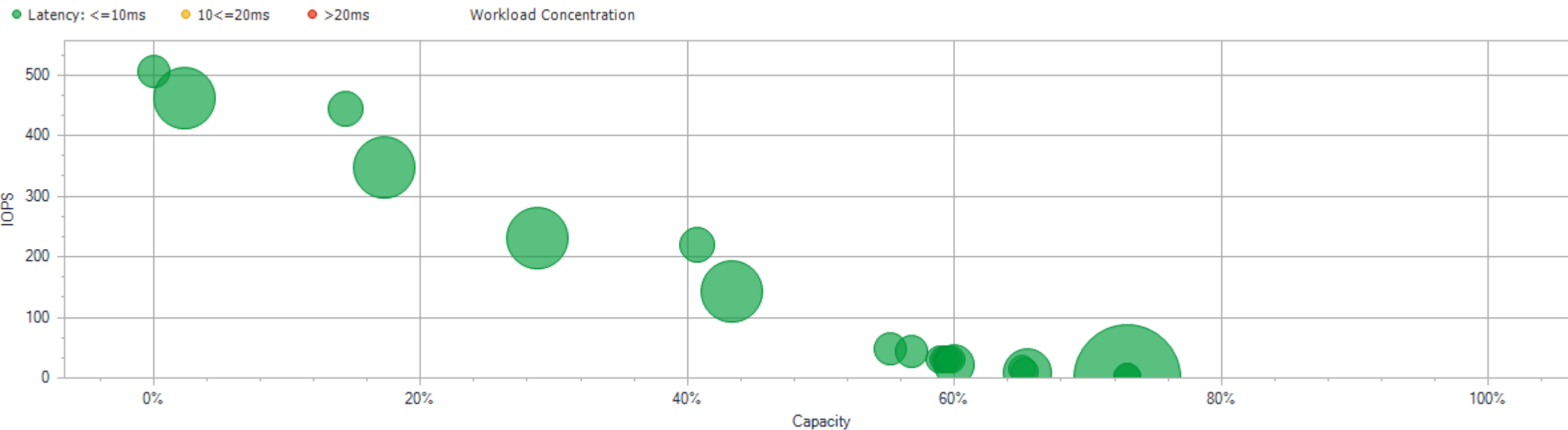
22.08 TB

Used Shared Capacity

13.13 TB

Free Shared Capacity

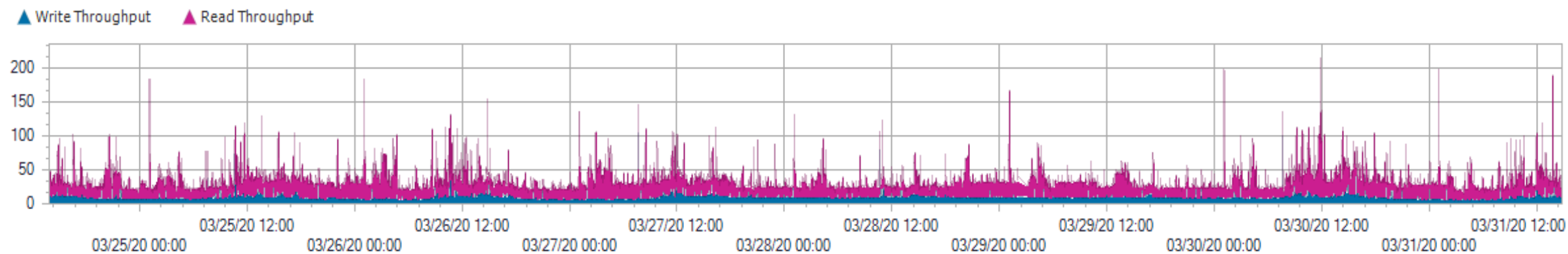
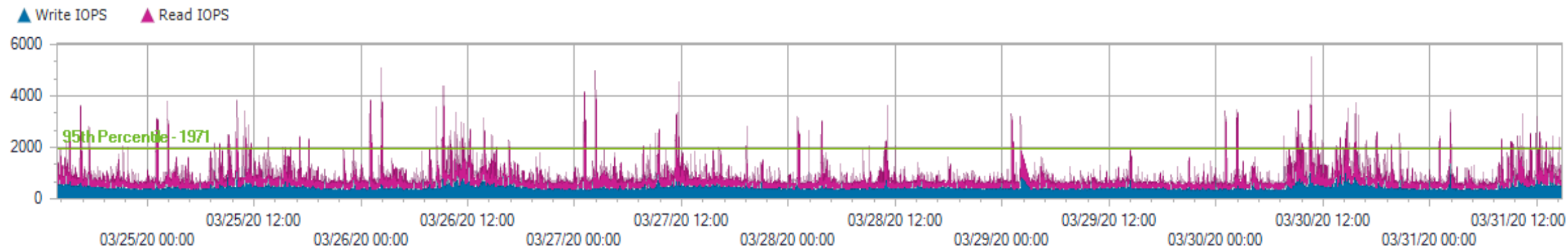
8.95 TB



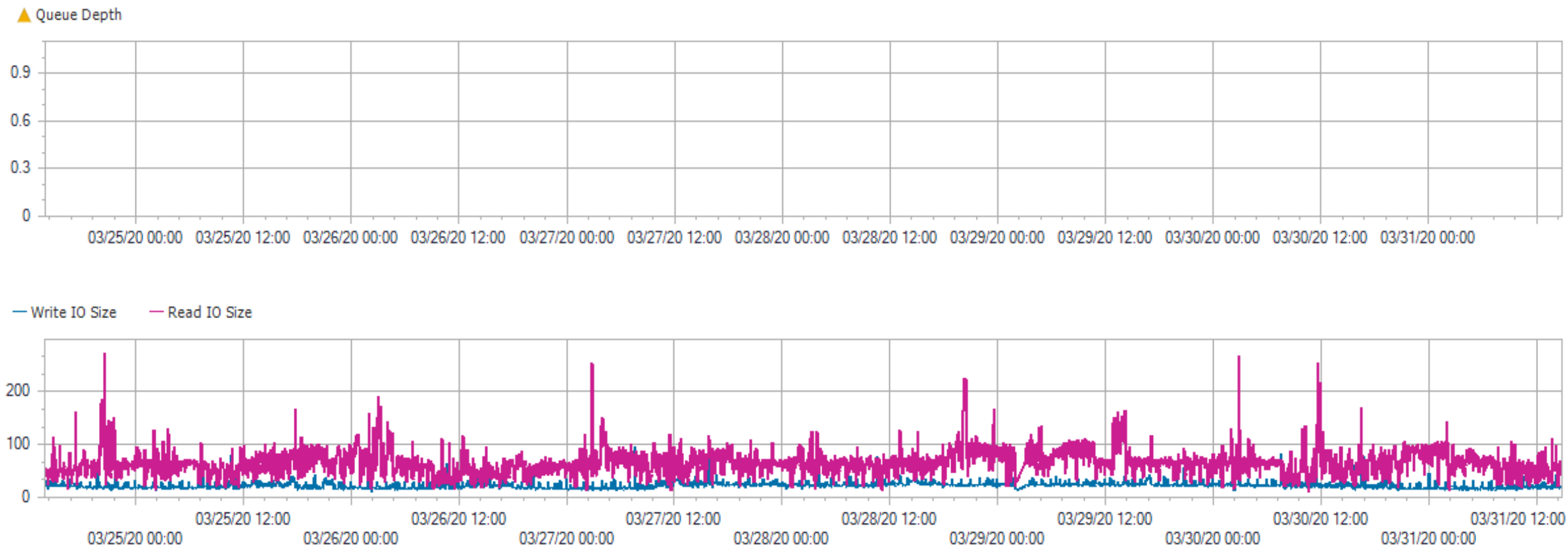


# IO Performance

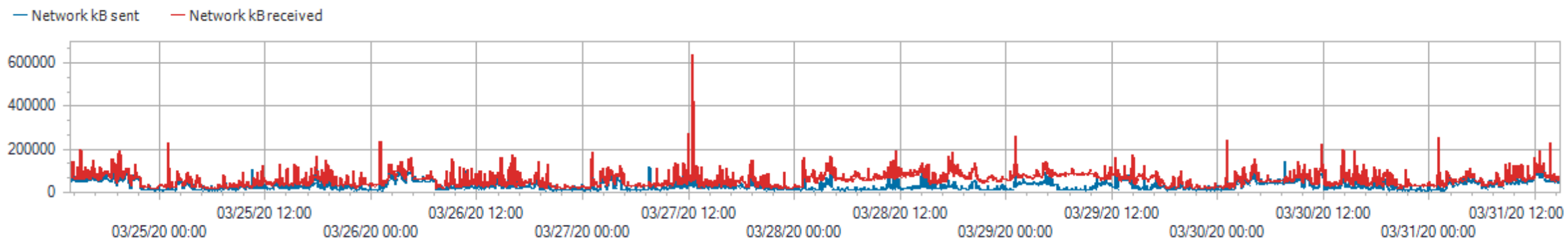
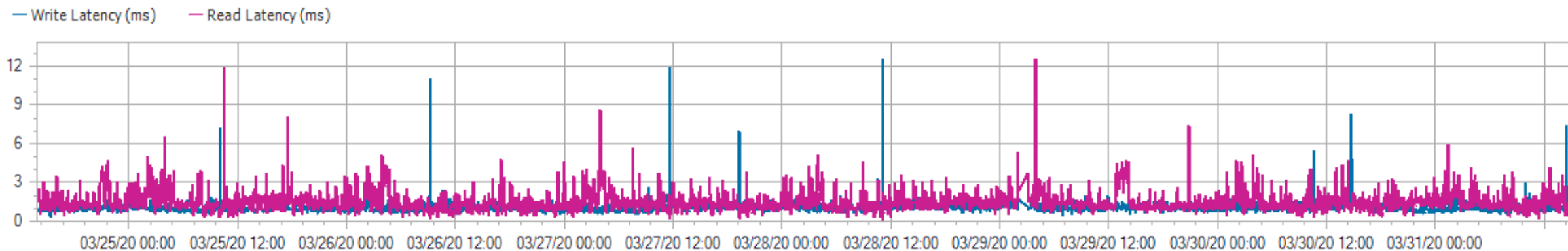
# IO Performance



# IO Performance



# IO Performance



# IO Performance

Peak IOPS	5503
IOPS at 95%	1971
Peak Disk Throughput	214 MB/s
Peak Aggregate Network Throughput	1245 MB/s
Average Daily Write	843.38 GB
Read/Write Ratio	65% / 35%
Average IO Read Size	35.30 KB
Average IO Write Size	21.64 KB

# Definitions

## CPU

The CPU shown in the individual server reports measures the utilization of the CPU as a percentage of the total available CPU clock cycles. When shown in the aggregate summary, the CPU aggregate represents the sum of the clock cycles utilized. The saturated core count shows the number of CPU cores that were observed to have a usage level of 90% or more during the sampling period. This count provides insight into how your CPU workloads are distributed across all the cores. If a core is saturated, the task that it is processing is bottlenecked on the CPU. By spreading tasks out over multiple threads (and thus multiple cores) the bottleneck may be removed. Live Optics supports saturated core counts for Windows and Linux hosts. Saturated core counts for other host operating systems are not supported.

## IOPS

Live Optics monitors the read and write operations at the block storage layer of the host operating system. IOPS are the Input / Output Operations per Second performed by a physical server host or a virtual machine.

# Definitions

## IO Transfer Size

This unit of measure records the average payload size of a given set of read or write operations. The average IO transfer size may be used to describe the nature of the IO workload and is an important factor in understanding the character of an IO workload.

## Latency

The average time required for the host to complete an IO operation is measured as its average latency. Live Optics monitors latency at the host level. Like queue depth, the host's latency will differ from latency reported by external storage arrays, and individual disks within RAID sets. Intermittent spikes in latency should not be a matter of concern. Also, average latency reported in Live Optics is only accurate when the sustained IOPS are over 100 IOs per second. High latencies reported during very low periods of IOPS should be discounted and often can be attributed to counter skew factors associated with the latency calculation. Latency is an important factor when investigating a storage solution that is demonstrating known problems at the application layer. Most applications will not tolerate abnormally high levels of latency on a sustained basis.

# Definitions

## MB/s

Megabytes per second represents the average rate of read and write IO transfers in terms of payload size per second. This measures the IO throughput of a given system and is an important factor in sizing storage network bandwidth requirements.

## Memory

The memory shown in the individual server reports measures the total available (free) and used memory for the server. When shown in the aggregate summary, the total memory shown represents the aggregate memory usage (and free memory) of all servers in the report.

## Participation

This simple chart shows the number of servers that were monitored for the given sampling period. If the connection between Live Optics and a server was lost, the participation chart will show a drop during the period when the server was out of communication with Live Optics.

# Definitions

## Queue Depth (QD)

The number of outstanding IO operations that the host is processing at any given time is the queue depth. Live Optics monitors queue depth at the host level. Host level queue depth will differ from the queue depth reported by external storage arrays, and individual disks within RAID sets. Storage devices tend to perform faster when queue depths are higher. However, high queue depths can also lead to higher than acceptable latencies.

## Page Faults

Page Faults per Second show the rate of hard page faults that required a virtual memory page to be read from disk. High hard page fault rates may suggest insufficient physical memory allocation to the OS and can be signs of application performance problems.

# Definitions

## Workload Concentration - Bubble

Workload Concentration plots a bubble chart of your disks and sorts them by their IO activity. The vertical placement of the bubble represents the amount of IO. The size of each bubble is proportional to the capacity of the disk. The horizontal axis demonstrates the total amount of IO that falls within a certain percentage of total capacity.

## Workload Concentration - Line

Workload Concentration plots the total used capacity of the project by disk along the X-axis and the IOPS activity of each disk along the Y-axis. The disks are sorted by IOPS with the disks with the highest IOPS being closest to the Y-axis on the left. The vertical line drawn splits the graph into two sections, with the section on the left indicating the region that comprising 20% of the total used capacity, and the region on the right showing the remaining 80% of the capacity. The label shows you the portion of IOPS that fall on either region. Note: the IOPS shown are observed only at the disk scope. Live Optics does not analyze IO activity at a block level based on the address of individual IOs on a given disk. Additional IO concentration may or may not be present at the block level within the individual disks.