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Executive Summary

Opus Interactive commissioned Cloud Spectator to evaluate the performance of virtual machines (VMs) in the Eastern United States on three different Cloud Service Providers (CSPs or providers): Amazon Web Services (AWS) in US-East-1 (Virginia), Microsoft Azure in East US 2 (Virginia), and Opus Interactive’s Manassas, VA data center (Virginia).

Cloud Spectator tested three VM sizes in two performance classifications to evaluate the CPU performance, Random Access Memory (RAM), storage and internal network performance of each provider’s VMs. The purpose of the study was to understand Cloud VM performance among major Cloud providers in the Eastern US with similarly sized VMs using a standardized, repeatable testing methodology.

Based on the analysis, Opus’ Eastern US VM performance was superior in all measured VM performance dimensions while achieving excellent price-performance. The primary drivers for Opus’ strong performance were threefold, and aligned with key performance dimensions evaluated during this engagement:

1. Opus’ impressive CPU and Memory performance
2. Opus’ superb storage random read and write performance
3. Opus’ excellent Price-Performance results

Key findings and observations from this analysis are highlighted below, with more detailed analysis following in the body of the report.

Key Findings and Observations

The following summary findings are noteworthy based on the benchmarking performed by Cloud Spectator during this engagement:

vCPU and Memory Performance

Compute and memory performance were tested using the GeekBench5 test suite. The following highlights emerged from these tests:

- All of Opus’s VMs outperformed rival offerings by at least 18% when running multi core workloads in both the standard and compute optimized classes, including Amazon’s latest c5 and m5 VMs and Azure’s latest Fsv2 and Dsv3 series machines.
- Within the Standard VM class, Opus 8 CPU VM showed significant performance advantages against the latest AWS M5.2XL and Microsoft Azure D8s V3 VMs. Opus offered 74% better multi core CPU performance compared to Azure in in this VM group.
Opus’s Standard VMs outperformed AWS and Azure VMs by the largest margin for multi core CPU performance. While Opus compute optimized VMs displayed the best performance in all cases the difference between the other providers was not quite as large.

Storage Speed

Storage performance was tested using the FIO tool to perform a variety of tests. The 4K random read and random write results are summarized below.

- Opus Block Storage displayed excellent 4K random read speeds, exceeding 18,000 IOPs for all VM offerings.
- Opus Block Storage achieved 61% more IOPS for random read than the runner up provider, Microsoft Azure.
- Opus offered 500% faster random write IOPS compared to the runner up, in this case AWS EBS.
- The highest random write IOPS observed were on the Opus 8CPU, 32GB RAM VM, achieving over 10,000 4K random write IOPS.

Price-Performance

Price-Performance, or the value, of a given Cloud service, is summarized below. Price-performance is calculated by simply dividing a benchmark result (such as IOPS) by the monthly price without long-term or committed discounts applied. This allows for determination of computational power or storage speed per dollar spent. Price-performance is a value metric that is similar to horsepower per dollar used with automobiles. The price-performance results are summarized below:

- When it comes to multi core CPU performance all 6 of Opus’ VMs (standard and compute optimized) achieved the highest price-performance value for each test performed, often by a significant margin.
- Opus offers 52% better CPU performance per dollar spent than the runner up provider (Azure).
- Opus offers ~7x better storage random read performance per dollar compared to Azure or AWS. Opus offers a whopping 2000% (20x) better random write performance per dollar spent. This makes Opus a great cloud to use if you run very storage intensive applications!
- Cloud Spectator’s synthetic benchmark analysis determined that Opus not only provided the highest price-performance for storage operations and CPU value within the compute-optimized class but achieved the highest raw values for each evaluated performance metric within their respective size categories and classes.

The details of the testing setup, design and methodology along with full results, are explained in the body of the report.
Introduction

Opus Interactive commissioned Cloud Spectator to assess the performance of virtual machines (VMs) from three different Cloud Service Providers (CSPs or providers) in the Eastern United States: Amazon Web Services (AWS), Microsoft Azure, and Opus Interactive (Opus). Cloud Spectator tested various VMs from these providers to evaluate the CPU performance, RAM, storage and internal network of each provider’s VMs. The purpose of the study was to understand the VM performance between Cloud providers with similarly-sized VMs using a standardized and repeatable testing methodology. Performance information for the specified 2, 4 and 8 vCPU VMs was gathered using Geekbench5, FIO and IPerf benchmarking tools for this analysis. Each VM type was provisioned with a duplicate VM to limit sampling error. Data was then collected during 100 iteration tests.

This project focused on the comparison of performance data for CPU, RAM, storage and internal network throughput. The CPU-Memory composite and storage scores were evaluated on their own, and then were used to calculate the price-performance value for all provider VM offerings. The price-performance value for each VM was calculated by dividing performance averages by monthly cost in USD, with separate scoring performed for storage read and write. This simple price-performance formula allows the comparison of VMs offered by the respective Cloud Service Providers included in this analysis.

Using this proven Cloud sampling and testing methodology, Cloud Spectator evaluated the Cloud services based on price-performance calculations, while detailing specific strengths and weakness of each provider’s VMs based on the objective performance results. Given the inherent variability of Cloud services, these methods are necessary to provide reliable and comparable analyses of Cloud-based infrastructure-as-a-Service (IaaS) services.
**VM Specs and Selection Methodology**

Virtual machines (VM) for this engagement focused on 2, 4 and 8 vCPU VMs. They were grouped and classified as small (2 vCPU), medium (4 vCPU) and large (8 vCPU) VM size groups. All machines were deployed with a current release of Ubuntu 18.04 LTS from the respective providers. Persistent block storage offerings were employed for all root volumes. Two VM classes were tested in addition to the small, medium and large VM size categories: standard and compute optimized. Standard VMs are targeted for general purpose workloads, and typically are configured with a 1:4 RAM to vCPU ratio. Compute-optimized VMs, on the other hand, are typically configured with a 1:2 RAM to vCPU ratio. The VMs selected for this engagement are listed in the tables below:

<table>
<thead>
<tr>
<th>Provider</th>
<th>VMs</th>
<th>VM Class</th>
<th>vCPU</th>
<th>RAM (GB)</th>
<th>Disk (GB)</th>
<th>Storage Type</th>
<th>Location</th>
<th>Hourly Price USD</th>
<th>Monthly Price USD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amazon Web Services</td>
<td>c5.Lg</td>
<td>Compute</td>
<td>2</td>
<td>4</td>
<td>32</td>
<td>EBS SSD - gp2</td>
<td>US-East-1</td>
<td>$0.09</td>
<td>$65.42</td>
</tr>
<tr>
<td>Microsoft Azure</td>
<td>F2sv2</td>
<td>Compute</td>
<td>2</td>
<td>4</td>
<td>32</td>
<td>Premium LRS</td>
<td>East US 2</td>
<td>$0.09</td>
<td>$67.04</td>
</tr>
<tr>
<td>OPUS</td>
<td>2CPU 4GB</td>
<td>Compute</td>
<td>2</td>
<td>4</td>
<td>32</td>
<td>SSD Block Storage</td>
<td>Manassas, VA</td>
<td>$0.07</td>
<td>$53.20</td>
</tr>
</tbody>
</table>

**Table 6.1 – Small Compute VMs**

<table>
<thead>
<tr>
<th>Provider</th>
<th>VMs</th>
<th>VM Class</th>
<th>vCPU</th>
<th>RAM (GB)</th>
<th>Disk (GB)</th>
<th>Storage Type</th>
<th>Location</th>
<th>Hourly Price USD</th>
<th>Monthly Price USD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amazon Web Services</td>
<td>m5.Lg</td>
<td>Standard</td>
<td>2</td>
<td>8</td>
<td>128</td>
<td>EBS SSD - gp2</td>
<td>US-East-1</td>
<td>$0.11</td>
<td>$83.08</td>
</tr>
<tr>
<td>Microsoft Azure</td>
<td>D2sv3</td>
<td>Standard</td>
<td>2</td>
<td>8</td>
<td>128</td>
<td>Premium LRS</td>
<td>East US 2</td>
<td>$0.12</td>
<td>$89.79</td>
</tr>
<tr>
<td>OPUS</td>
<td>2CPU 8GB</td>
<td>Standard</td>
<td>2</td>
<td>8</td>
<td>128</td>
<td>SSD Block Storage</td>
<td>Manassas, VA</td>
<td>$0.14</td>
<td>$98.80</td>
</tr>
</tbody>
</table>

**Table 6.2 – Small Standard VMs**

<table>
<thead>
<tr>
<th>Provider</th>
<th>VMs</th>
<th>VM Class</th>
<th>vCPU</th>
<th>RAM (GB)</th>
<th>Disk (GB)</th>
<th>Storage Type</th>
<th>Location</th>
<th>Hourly Price USD</th>
<th>Monthly Price USD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amazon Web Services</td>
<td>c5.2XLg</td>
<td>Compute</td>
<td>4</td>
<td>8</td>
<td>128</td>
<td>EBS SSD - gp2</td>
<td>US-East-1</td>
<td>$0.19</td>
<td>$137.24</td>
</tr>
<tr>
<td>Microsoft Azure</td>
<td>F4sv2</td>
<td>Compute</td>
<td>4</td>
<td>8</td>
<td>128</td>
<td>Premium LRS</td>
<td>East US 2</td>
<td>$0.20</td>
<td>$143.08</td>
</tr>
<tr>
<td>OPUS</td>
<td>4CPU 8GB</td>
<td>Compute</td>
<td>4</td>
<td>8</td>
<td>128</td>
<td>SSD Block Storage</td>
<td>Manassas, VA</td>
<td>$0.15</td>
<td>$112.80</td>
</tr>
</tbody>
</table>

**Table 6.3 – Medium Compute VMs**

<table>
<thead>
<tr>
<th>Provider</th>
<th>VMs</th>
<th>VM Class</th>
<th>vCPU</th>
<th>RAM (GB)</th>
<th>Disk (GB)</th>
<th>Storage Type</th>
<th>Location</th>
<th>Hourly Price USD</th>
<th>Monthly Price USD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amazon Web Services</td>
<td>m5.XLg</td>
<td>Standard</td>
<td>4</td>
<td>16</td>
<td>256</td>
<td>EBS SSD - gp2</td>
<td>US-East-1</td>
<td>$0.23</td>
<td>$166.15</td>
</tr>
<tr>
<td>Microsoft Azure</td>
<td>D4sv3</td>
<td>Standard</td>
<td>4</td>
<td>16</td>
<td>256</td>
<td>Premium LRS</td>
<td>East US 2</td>
<td>$0.24</td>
<td>$178.17</td>
</tr>
<tr>
<td>OPUS</td>
<td>4CPU 16GB</td>
<td>Standard</td>
<td>4</td>
<td>16</td>
<td>256</td>
<td>SSD Block Storage</td>
<td>Manassas, VA</td>
<td>$0.27</td>
<td>$197.60</td>
</tr>
</tbody>
</table>

**Table 6.4 – Medium Standard VMs**

<table>
<thead>
<tr>
<th>Provider</th>
<th>VMs</th>
<th>VM Class</th>
<th>vCPU</th>
<th>RAM (GB)</th>
<th>Disk (GB)</th>
<th>Storage Type</th>
<th>Location</th>
<th>Hourly Price USD</th>
<th>Monthly Price USD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amazon Web Services</td>
<td>c5.2XLg</td>
<td>Compute</td>
<td>8</td>
<td>16</td>
<td>256</td>
<td>EBS SSD - gp2</td>
<td>US-East-1</td>
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<td>$274.48</td>
</tr>
<tr>
<td>Microsoft Azure</td>
<td>F8sv2</td>
<td>Compute</td>
<td>8</td>
<td>16</td>
<td>256</td>
<td>Premium LRS</td>
<td>East US 2</td>
<td>$0.39</td>
<td>$284.75</td>
</tr>
<tr>
<td>OPUS</td>
<td>8CPU 16GB</td>
<td>Compute</td>
<td>8</td>
<td>16</td>
<td>256</td>
<td>SSD Block Storage</td>
<td>Manassas, VA</td>
<td>$0.31</td>
<td>$225.60</td>
</tr>
</tbody>
</table>

**Table 6.5 – Large Compute VMs**

<table>
<thead>
<tr>
<th>Provider</th>
<th>VMs</th>
<th>VM Class</th>
<th>vCPU</th>
<th>RAM (GB)</th>
<th>Disk (GB)</th>
<th>Storage Type</th>
<th>Location</th>
<th>Hourly Price USD</th>
<th>Monthly Price USD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amazon Web Services</td>
<td>m5.2XLg</td>
<td>Standard</td>
<td>8</td>
<td>32</td>
<td>512</td>
<td>EBS SSD - gp2</td>
<td>US-East-1</td>
<td>$0.46</td>
<td>$332.29</td>
</tr>
<tr>
<td>Microsoft Azure</td>
<td>D8sv3</td>
<td>Standard</td>
<td>8</td>
<td>32</td>
<td>512</td>
<td>Premium LRS</td>
<td>East US 2</td>
<td>$0.48</td>
<td>$353.54</td>
</tr>
<tr>
<td>OPUS</td>
<td>8CPU 32GB</td>
<td>Standard</td>
<td>8</td>
<td>32</td>
<td>512</td>
<td>SSD Block Storage</td>
<td>Manassas, VA</td>
<td>$0.54</td>
<td>$395.20</td>
</tr>
</tbody>
</table>

**Table 6.6 – Large Standard VMs**

The test design and methodology used in this analysis are described in the following sections.
Test Design and Methodology

The test design and methodology are described below for each of the VM performance dimensions evaluated: CPU and RAM, and storage random read/write. Synthetic Infrastructure benchmarking was performed on the selected VMs to enable objective comparisons of performance for these test dimensions.

**Synthetic Testing: CPU & Memory**

CPU and memory testing were conducted with the Geekbench5 benchmarking suite, which allows modern testing scenarios such as floating-point computations, encryption and decryption, as well as image encoding, life-science algorithms and other use cases.

**Synthetic Testing: Storage**

Storage results were obtained using FIO (Flexible I/O tester) using 4KB blocks and threads corresponding to vCPU count. Several thousand 60-second random iterations were conducted to compensate for the high variability often seen when stressing storage volumes. Results were gathered and represented in IOPs (input/output operations per second).

**Synthetic Testing: Internal Network**

Throughput was evaluated using IPerf for each provider over their private networks only. IPerf works using a server node and client node. All transport was conducted using the TCP protocol, measuring both upload and download bandwidth. Threading for transport was determined based on vCPU count of each virtual instance.

**Test Design Considerations**

Synthetic Infrastructure testing was conducted on specific VM types for each provider. Provider VM configurations may yield different results based on underlying infrastructure, time of day, number of tenants running other workloads on the same hardware, virtualization technology and settings (e.g. shared resources), and other technology factors. Furthermore, issues such as user contention or physical hardware malfunctions can also cause suboptimal performance. Cloud Spectator therefore provisioned multiple VMs with the same configuration to better sample the underlying hardware and enabling technology, as well as to improve testing accuracy and limit the effects of underlying environmental variables.

The VMs selected for this engagement were generally available specified offerings from the various providers. While better performance can often be attained from providers when additional features or support services are purchased, the selected VMs used in Cloud Spectator’s testing do not leverage such value-added services. This helps provide data and test results that are indicative of real-world customer choices from the tested CSPs.
Error Minimizing Considerations

Duplicate VMs were deployed during testing to minimize sources of error prevalent in a Cloud hosting environment. The most notable challenge is the Noisy Neighbor Effect. Testing duplicate VMs mitigates most non-specific errors that could be attributed to a singular parent instance or storage volume. By minimizing possible sources of error, more accurate and precise performance samples can be collected during testing.

Performance Summary

To emphasize the most relevant data, graphs are presented that compare true means (or averages) along with visual representations of data, as well as summary analysis of key findings based on the respective tests. The results of this engagement are presented in sections below.

CPU Performance

Single-core vs Multi-core Preface

Multi-core CPU benchmark averages tend to display larger differences based on vCPU count, as opposed to single-core benchmarks. Not all applications favor more cores over fast cores, therefore both single core and multi core workloads were benchmarked. Only the multi-core performance scores are used for price-performance analysis. The results section below provides an overview of both single-core and multi-core performance.

CPU Performance for all VMs

The chart below depicts the CPU single-core performance of all VMs evaluated in this study. The GeekBench5 single-core score represents the processing speed of one CPU (or core) processing a single stream of instructions rather than multiple parallel streams per core. Many consumer applications, although they are multi-threaded, rarely utilize more than one CPU thread at a time. Thus, the single-core CPU test is a reasonable real-world test for certain consumer workloads. The lighter shades of each respective color
represent the compute-optimized class of VMs, while the darker shades of each color represent the standard class VMs.

The single-core scores place Opus in the lower third of overall results as shown in the graph, with Azure’s and AWS’s compute-optimized VMs leading in this test. However, in most enterprise production scenarios, all vCPUs will be utilized in multi-core VMs if a workload or application is able to exploit them. Though not discussed in detail, single-core scores do provide a universal performance baseline that is useful for analysis. The multi-core score is more indicative of business or enterprise workloads.

**CPU Multi-core Overview**

The chart below depicts the CPU multi-core performance of all VMs covered in this study. As core count, or vCPU quantity, increases VMs generally produce higher scores as depicted in the graph below. Compute-optimized machines are shown below in lighter shades of each color, while standard VMs are displayed in darker shades. Below the graphs, Cloud Spectator’s summary findings are presented.
• Opus VMs outperformed AWS and Azure VMs in each size class and category.

• In addition, The Opus standard and compute 8 CPU VMs displayed CPU scores that were 19% higher than the runner up, in this case Azure.

• The trend continues for the 4 CPU and 2 CPU size groups, again Opus continues to show a noticeable difference in multi core CPU performance compared to similar spec’d VMs from both AWS and Azure.

### Storage Performance

Storage performance results are summarized in the sections below. Our testing methodology for benchmarking storage ensured that all machines were tested for a minimum of 100 iterations for read and write operations using FIO with a block size of 4KB, queue depth of 32 running at 1 thread per vCPU for random read and write.
Storage Performance for ALL VMs (Read)

Below, storage random read results for all providers and VM types are displayed. Summary details are provided below the graphs. The charts display compute optimized VMs in light shades of each color, while standard VMs are represented by the darker shades of each color.

- Opus’ block storage provided phenomenal random read speeds compared to AWS and Azure storage offerings, achieving over 60% more IOPS than AWS EBS or Azure LRS storage.
- Opus’s largest VM (8 CPU 32GB RAM) displayed the highest result, while the other Opus VMs come in not too far behind.
- Azure’s Premium LRS offerings bested AWS’s Elastic Block Storage (EBS) across almost every size regardless of class, although both CSP’s maximum scores were significantly lower than those achieved by any Opus VM.

VM class, defined by vCPU to RAM ratio, made little difference in storage random read performance as tested, although standard VMs generally exhibited marginal performance improvements. Below, random write results are presented.

Storage Performance for ALL VMs (Write)

When it comes to storage performance the most demanding operation is writing to a disk, reading from a disk happens a lot quicker due to caches, while many storage arrays have their own caches it usually takes longer for a write operation to complete compared to read operations. You will see this is the case in the chart below. The data compares all VM sizes and classes. For Opus, the charts display compute optimized VMs in dark shades of each color, while standard VMs are represented by the lighter shades of each color.
• Opus block storage write speeds were found to be superior to AWS and Azure offerings regardless of size or class.
• Opus’s 8 CPU, 32GB VM achieved 500% more write IOPS than the runner up provider, in this case that's AWS.
• Opus displayed some performance variability when block storage was attached to VMs with different vCPU counts, however the lowest result achieved by Opus is still 300% faster than the runner up.

To summarize, Opus performed exceptionally for 4K random read and write in comparison to Azure’s or AWS’S equivalent offerings.

**Network Performance**

Network performance data was collected using the IPerf utility in a client-server scenario. Threads were configured to match the number of vCPUs of the serving VM, with all VMs existing on the same private network. These tests compared providers to one another rather than specific VMs. Scores in the chart below are composed of unweighted average upload and download speeds.

• Opus achieved highest network throughput, achieving over 22,000 Mb/s, nearly 12x the network throughput as the other providers.
The data shown above includes aggregated network throughput for VMs with differing performance capabilities. This is paramount when replicating real-world production environments that are rarely homogenous, thus providing a fair representation of expected network performance for each CSP in their respective, tested locations.

**VM CPU Performance Per US Dollar (Price-Performance, or Value)**

This section focuses on the compute and memory price-performance, or value. The values shown are linear and unweighted, using the multi-core performance scores and monthly price. Higher scores indicate more value per USD spent by the tested VMs.

**Price-Performance Ratio**

Price-performance, or value, compares the performance of a given Cloud service to the price of that service. Thus, price-performance offers a universal metric for comparing service value. Price-performance is calculated from the average Geekbench5 multi-core score divided by the monthly price in US Dollars (USD). A higher price-performance score indicates higher value for a given VM configuration.

** Generally, smaller machines achieve higher price-performance values than larger machines, as large VMs are typically used for specific use cases and have increased cost-overhead.

**CPU Price-Performance ALL VMs**

The chart below summarizes all VM sizes evaluated for price-performance. Compute-optimized VMs are displayed in darker shades of the respective colors, while standard VMs are shown with a lighter shade of the respective colors. It’s worth noting that in the case of pure CPU performance per dollar spent the VMs with
lower CPU to RAM ratios will produce better scores in this specific context. This is true for Opus and the other two providers.

- Opus compute-optimized VMs achieved universally superior price-performance over standard VMs and all sizes from other providers.
- Opus’s smallest compute optimized VM took the top spot for CPU value, the other two Opus compute optimized VMs took 2nd and 3rd place.
- Opus offers 52% more CPU performance per dollar than the runner up provider, in this case Azure. This means if you have a CPU hungry application you will be able to serve more for less at Opus.

The chart below shows the hourly on-demand price of each VM tested. While the Opus 8 CPU 32GB RAM VM has the highest price it also offers more value than 6 of the VMs from Azure and AWS.
In summary the value advantage of OPUS’ compute-optimized offerings are derived from competitive pricing within this class, while both classes of VM achieved exceptional multi-core performance presented previously. In the following section, storage price-performance is analyzed.

Storage Performance Per USD (Price-Performance, or Value)

This section focuses on storage price-performance value. Storage performance can be a major bottleneck for certain applications, and often storage pricing can become a budgeting challenge for enterprises. The values shown in the sections below are linear and unweighted, using the average performance scores for random read, random write, as well as monthly. Higher scores indicate a better price-performance value per USD spent compared to competing VMs in the same size category.

Price-Performance ALL VMs (Read)

In the chart below, price-performance is compared for the specified VMs based on random read speed. This is most useful when considering read-intensive use-cases. Summary observations are provided below.

- Opus VMs delivered superior price-performance over all competing offerings.
- The 2 CPU 4GB RAM VM offers over 7.2x the random read IOPS per dollar spent than the next closest provider in the roundup, which was Azure LRS attached to the latest generation Fs VM.

To summarize, Opus displayed exceptional read performance across all sizes and categories along with competitive pricing when compared to AWS and Azure. This resulted in price-performance scores far superior to equivalent offerings from AWS and Azure.

Price-Performance ALL VMs (Write)

Write speed, irrespective of the drive type or configuration, has always been a technology challenge due to the additional overhead in allocating space and journaling data during write operations. The following summary
observations were extracted from the analysis. Opus Compute-optimized VMs are displayed in darker shades of each color, while the standard VMs are shown in the lighter shades of each color.

- Again, all the Opus VMs achieved significantly higher write IOPS per dollar spent than any of the AWS or Azure VMs.
- The top-ranking Opus VM offers more than 11x the random write performance per dollar spent as the runner up provider, in this case AWS.

Opus block storage significantly outpaced comparable offerings from AWS and Azure, which helped Opus offerings achieve much higher price-performance among equivalently sized VMs.

**Conclusion**

Opus VMs displayed excellent performance value in all observed performance and price-performance dimensions. To complement its CPU and Storage performance, Opus internal network also achieved significantly higher results than either Azure or AWS. Opus’ network performance ensures a strong backbone for business and enterprise workloads requiring bandwidth in excess of 10Gb/s.

The Cloud Spectator analysis revealed Opus as a very compelling and competitive alternative to Amazon Web Services and Microsoft Azure across the two VM classes and three sizes tested. Opus was found to provide tuned virtual infrastructure with exceptional performance and value, while displaying a well-rounded portfolio of VMs suited to a variety of use-cases. The careful planning and advanced technology used in development of its Cloud platform positions Opus as a world class Cloud Service Provider capable of meeting the demands of business and enterprise clients already working within or considering migration to the cloud.