Amazon Web Services vs. Horizon®

February 2016
Comparing Cloud Services

Every Cloud Service Provider (CSP) and every Cloud Service is different. Some CSPs focus on being price competitive and providing self-service, others focus on providing very secure resources, while still others focus on customer interactions and value-add services. **The CSP that represents the best business value to you will depend on your unique needs.**

Comparing CSPs in an “apples to apples” way is extremely difficult. Oftentimes, customers just end up comparing prices and go with the cheapest, hoping it’ll “just work out”. While a practical approach, comparing on price alone can be misleading when not considered in tandem with the other factors that make up a cloud service. Through our experience working in the cloud, **KPS has developed a methodology to create “CSP Profiles”, which can be used to make better decisions on which cloud is right for you.** The CSP Profile considers five (5) key factors:

- **Performance** – How well does the cloud service perform compared to others? How well does it perform at scale?
- **Price** – How much will it cost to use the cloud service for the functions I need? How much will it cost to use the cloud service for the functions I want?
- **Security** – How secure is the service?
- **Functionality** – What functionality does a cloud service provide? How do those functions align with what you need to do? How easy is it to use the cloud service?
- **Service Level** – What level of services do you get with a particular cloud service? Are there any guarantees?
In the comparison that follows, KPS has selected 4 IaaS Cloud options to analyze and review:

**Amazon Web Services (AWS):** The AWS EC2 and S3 services are the standard IaaS options available to customers. EC2 includes compute instances and “Elastic Block Storage” (EBS), while S3 offers cheaper, longer term storage. AWS IaaS options are also available in the “GovCloud” region, which is FedRAMP compliant and has an interim DoD PA at SRG Level 4. The “GovCloud” region is for Federal customer use only.

**KPS Horizon® Clouds:** Each of the Horizon® cloud options are built on KPS’s Cloudseed® technology and architecture, and are accessed through KPS’s Zeus tool, which provides visibility into all of your clouds.

- **Horizon® Public Cloud** – Knight Point’s standard cloud service available to both commercial and federal entities.
- **Horizon® Federal Community Cloud** – Intended for use by Federal customers only, this cloud meets all FedRAMP and DoD PA / SRG Level 5 standards and is currently in the process of receiving the official “compliance” stamp for both.
- **Horizon® On-Premise Private Cloud** – Intended for those wanting a private cloud that makes use of already available hardware, facilities, or other resources.
The performance characteristics of your cloud are driven by its underlying architecture. CSPs architect their cloud for specific strategic reasons – oftentimes to target specific customer segments, with specific workload needs. For this reason, cloud performance is a key factor for a vendor’s CSP Profile.
Benchmarking IaaS Resources

Overall Unix Benchmark Index Scores

<table>
<thead>
<tr>
<th></th>
<th>Azure</th>
<th>Google</th>
<th>Horizon®</th>
<th>AWS</th>
</tr>
</thead>
<tbody>
<tr>
<td>vCPU</td>
<td>1 vCPU</td>
<td>1 vCPU</td>
<td>1 vCPU</td>
<td>1 vCPU</td>
</tr>
<tr>
<td>RAM</td>
<td>1.75 Gb RAM</td>
<td>4 Gb RAM</td>
<td>1 Gb RAM</td>
<td>1 Gb RAM</td>
</tr>
<tr>
<td>Disk</td>
<td>30 Gb Disk</td>
<td>10 Gb Disk</td>
<td>10 Gb Disk</td>
<td>8 Gb Disk</td>
</tr>
</tbody>
</table>

**Performance Benchmarks:**

- **39%**
  - At the smallest VM sizes, Microsoft Azure benchmarks at 39% the performance of AWS

- **54%**
  - At the smallest VM sizes, Google Compute Engine benchmarks at 54% the performance of AWS

- **87%**
  - At the smallest VM sizes, Horizon's® Cloudseed® architecture benchmarks at 87% the performance of AWS

*Tests were conducted across small size VMs over the course of 1 month.*
As VM resource usage scales up and down, AWS VMs and Horizon® VMs using the CloudSeed® architecture scale in performance at approximately the same rate. In the graph above, performance is measured in “ECU”. According to AWS: “One EC2 Compute Unit (ECU) provides the equivalent CPU capacity of a 1.0-1.2 GHz 2007 Opteron or 2007 Xeon processor.”
The more CSPs limit a customer’s “access and use” of the cloud for the sake of security, the higher the price, and the narrower the “functionality”. For some customers with secure computing needs, the savings from a “pay as you go” model justifies the price tag. In either case, Security should be a prime consideration for any customer looking to utilize the cloud and is a key factor in determining a vendor’s CSP Profile.
Security Features

Security features are intended to prevent unauthorized access to your accounts, management interfaces, Virtual Machines, and data. These features can involve anything from having standard processes and procedures in place, to implementing highly technical data encryption techniques, to simply restricting access based on role permissions.

<table>
<thead>
<tr>
<th>Security Features</th>
<th>AWS EC2 &amp; S3</th>
<th>Horizon® Public</th>
<th>Horizon® Private</th>
<th>Horizon® Federal</th>
</tr>
</thead>
<tbody>
<tr>
<td>FedRAMP Compliant</td>
<td>(GovCloud Only)</td>
<td>X</td>
<td>X</td>
<td>(In Progress)</td>
</tr>
<tr>
<td>DoD Provisional Authority</td>
<td>(Interim Level 4 - GovCloud Only)</td>
<td>X</td>
<td>X</td>
<td>(Level 5 In Progress)</td>
</tr>
<tr>
<td>Data-at-Rest Encryption</td>
<td>(Customer Responsibility)</td>
<td>(VM by VM Basis)</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>LAN-to-LAN IPSec Tunnels</td>
<td>✓</td>
<td>✓</td>
<td>(Customer Responsibility)</td>
<td>✓</td>
</tr>
<tr>
<td>VPN Client into Tenant</td>
<td>X</td>
<td>✓</td>
<td>(Customer Responsibility)</td>
<td>✓</td>
</tr>
<tr>
<td>Client Cert (CAC/PIV) Login to Portal</td>
<td>X</td>
<td>X</td>
<td>(Customer Responsibility)</td>
<td>✓</td>
</tr>
<tr>
<td>Multiple User Roles / Permission Levels</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>
CSP Service Levels are broken into two categories: Support Service Levels and Cloud Uptime Levels. Support Service Levels refer to a CSP’s response time to inquiries and help requests and often take the form of formal support SLAs. The Cloud Uptime Levels refer to the expected availability of the cloud, along with any incentives or disincentives for not meeting that availability, and often come in the form of availability SLAs. Both of these are extremely important to establishing the CSP Profile.
# AWS Service Levels

<table>
<thead>
<tr>
<th>Level</th>
<th>Features</th>
<th>Pricing</th>
</tr>
</thead>
</table>
| **Basic**  | • 24/7 Access to customer service and technical support for system health issues that are detected by AWS  
             • Access to technical FAQs, best practice guides, the AWS Service Health Dashboard, and the AWS Developer Forums                                                                                   | Free                                         |
| **Developer** | • 1:1 support for any AWS question, enabling customers to leverage AWS Technical Support Engineers via email during local business hours to help configure, operate, and maintain core AWS services and features | $49.95 Per Month                             |
| **Business** | • 1 Hour Response time, 24/7 via email, chat, or phone  
             • AWS Trusted Advisor best practice suggestions to improve customer solution  
             • 3rd Party Software support for OS, web servers, databases, storage, FTP, and email                                                                                       | $100 or 10% Per Month*                       |
| **Enterprise** | • Critical Response time of 15 minutes  
             • Dedicated Technical Account Manager for periodic business reviews on infrastructure planning, report metrics, launches, and solutions architecting                                           | $15K or 10% Per Month*                       |

*Pricing on these service levels are the greater of either option, and can be subject to scale discounts.*

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### EC2 Uptime

- **99.0 - 99.5:** 10% Credit
- **<99.0:** 30% Credit

### S3 Uptime

- **99.0 – 99.9:** 10% Credit
- **<99.0:** 25% Credit
Horizon® Service Levels

**Cloud Uptime**

- **99.0 - 99.9**: 10% Credit
- **<99.0**: 30% Credit

**KPS Datacenter Uptime**

- **99.99**: 10% Credit

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01  **Response Time:**  Best Effort

**Silver**
- 24/7 Access to customer service and technical support via email and customer portal
- Access to technical FAQs, best practice guides,
- Ongoing Zeus feature request support

$1.5K Per Month

02  **Response Time:**  Within 1 business day

**Gold**
- All Silver Support functions and...
- Priority Zeus Feature Request Support
- Basic 3rd party vendor support for select software and hardware vendors
- Individual support for all “how to” questions on Horizon Cloud Management Suite (HCMS) tools

$5K Per Month

03  **Response Time:**  Within 1 hour

**Platinum**
- All Gold Support functions and...
- Dedicated Business and Technical POCs
- Ongoing Support and business analysis to optimize and plan cloud architecture to reduce costs
- Highest Priority feature request support for HCMS tools

$15K Per Month

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The Difference between “Managed Services” and “Support Levels”:

In cloud services, “Support Levels” typically refer to standard support included with any type of offering. This kind of support includes general technical help, inquiries, “how-to” help, basic requests, and is most often done through a “subscription” style plan. “Managed Service Levels” refers to specific system administration tasks where levels 1-3 refer to management of the infrastructure, OS/DB/MW, and application layers of the architecture stack, respectively. For CSP Profiling, Managed Services are considered part of the “Managed Functions” analysis.
CSPs build their offerings around allowing customers to accomplish specific tasks. In some cases the task is simple – e.g. store 1 Gb of photos. In others, it is very complicated – e.g. provide an integrated platform to build out an enterprise DevOps O&M model. Whether complicated or simple, customers need to evaluate whether or not that task provides value to them in the short and long term, as well as how easily users can do it.
“DIY” Functions refer to those functions that are configured, setup, or used by the customer without any engagement with the CSP or other CSP-offered services. DIY Functions are best utilized by users who have the prior experience and/or know-how to execute tasks with that function easily and correctly.

<table>
<thead>
<tr>
<th>DIY Functions</th>
<th>AWS EC2 &amp; S3</th>
<th>Horizon® Public</th>
<th>Horizon® Private</th>
<th>Horizon® Federal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create &amp; Manage VMs of set sizes</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Auto-scale and Load Balance VMs</td>
<td>✓</td>
<td>×</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td>IPv4 and IPv6 IP Allocation to VMs</td>
<td>×</td>
<td>✓</td>
<td>Customer Dependent</td>
<td>✓</td>
</tr>
<tr>
<td>Create IPSec LAN-to-LAN Tunnels</td>
<td>✓</td>
<td>×</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td>Apply CSP-maintained OS images</td>
<td>✓</td>
<td>✓</td>
<td>Customer Dependent</td>
<td>✓</td>
</tr>
<tr>
<td>Customize VMs with A-la-carte resources</td>
<td>×</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Utilize CSP-owned/managed OS Licensing</td>
<td>✓</td>
<td>✓</td>
<td>Customer Dependent</td>
<td>✓</td>
</tr>
<tr>
<td>Managed and Create VMs in other Clouds</td>
<td>×</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Snapshot Creation and Management</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Console Access to Created VMs</td>
<td>×</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Management of Security Groups / FW Rules</td>
<td>✓</td>
<td>×</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td>Self-Service New User/Tenant Creation</td>
<td>✓</td>
<td>×</td>
<td>×</td>
<td>×</td>
</tr>
</tbody>
</table>
“Managed Functions” refer to those functions that require engagement with the CSP or other CSP-offerings. These functions are often performed by the CSP on behalf of the customer, so that customers can make use of the CSP’s knowledge-base and expertise.

<table>
<thead>
<tr>
<th>Managed Functions</th>
<th>AWS EC2 &amp; S3</th>
<th>Horizon® Public</th>
<th>Horizon® Private</th>
<th>Horizon® Federal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Snapshot/Backup/DR Management</td>
<td>✗</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Full VM Resource Management*</td>
<td>✗</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Full OS Management (aaS)</td>
<td>✗</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Full Database Software Management (aaS)</td>
<td>✗</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Full Middleware Management (aaS)</td>
<td>✗</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Managed Services in Other Clouds</td>
<td>✗</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Monitoring Service – Alerts / Notifications</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Monitoring Service – Triage</td>
<td>✗</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Monitoring Service - Remediation</td>
<td>✗</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>LAN-to-LAN IPSec Tunnels</td>
<td>(Only DIY)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

*Full VM Resource Management includes managed auto-scaling and load balancing as well as (de)provisioning of machines as requested and/or needed.
Ease of Use

AWS Service Portal

Over years of refinement, the AWS portal serves as a “one stop shop” for the engagement of AWS services. It is very easy to quickly access and use a service if you know what you need. The quantity of available services provides great options for customers, though can make it hard for inexperienced users to locate and use the DIY Function they want. The AWS Billing page continues to serve as the standard for displaying cloud billing information in a convenient, and efficient way.

Zeus

Zeus focuses on IaaS service from an “asset” perspective. Zeus enables you to see, manage, and manipulate infrastructure (resource) assets across all off-prem clouds (Horizon® or others – including AWS), as well as on-prem clouds (Horizon® private clouds). Further, for the more business-minded users, Zeus has an easy-to-use billing page that aggregates your bills across clouds. Zeus gives previously unseen levels of visibility into your environments, and is developed on a “user request” model, giving customers the ability to drive the future of what Zeus needs to be and do.
Estimating the price of a cloud is extremely difficult. Even with the right tools to benchmark systems, you can never guarantee exactly how the system will be used over time. Cloud Service Providers know that it is difficult to estimate usage, and use it as a defense against direct comparison. For this reason, price should be considered only after all other factors. The Horizon® price model eases this burden by allowing customers to “pay for performance” wherever possible. Know what you want to get done in the Cloud, and do it.
### Sample Compute Pricing

<table>
<thead>
<tr>
<th>Service</th>
<th>Monthly Units</th>
<th>Hourly Units</th>
<th>Pricing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>KPS Federal Cloud</strong></td>
<td></td>
<td></td>
<td><strong>$27K</strong></td>
</tr>
<tr>
<td><strong>KPS Private Cloud</strong></td>
<td>Monthly Units</td>
<td></td>
<td><strong>$25K</strong></td>
</tr>
<tr>
<td><strong>KPS Public Cloud</strong></td>
<td></td>
<td></td>
<td><strong>$23K</strong></td>
</tr>
<tr>
<td><strong>AWS</strong></td>
<td></td>
<td></td>
<td><strong>$19K</strong></td>
</tr>
</tbody>
</table>

**Pricing includes costs associated with FedRAMP and DoD PA package maintenance, and continuous monitoring.**

**For all Provisioned VMs and Storage**

- **668 vCPU**
- **1.7 TB RAM**

For these compute resources, Amazon’s monthly pricing is cheapest, followed by the KPS Public Cloud, a KPS On-Prem Private Cloud, and lastly the KPS Federal Community Cloud.

**Sample Requirements:**

- **720 Hours** Assumed per Month
- **100% Utilization** Assumed per Month

VM sizing limitations inhibit ability to get to exact compute amounts desired.
Sample Storage Pricing

### KPS Federal Cloud

- **Monthly Units**: 55 TB
- **IOPS**: 5.5K
- **Price**: $13K per Month
- **Pricing includes the cost of “instant” triple storage redundancy based on Cloudseed® cloud architecture.**

### KPS Private Cloud

- **Monthly Units**: 55 TB
- **IOPS**: 5.5K
- **Price**: $20K per Month
- **Pricing includes the cost of “instant” triple storage redundancy based on Cloudseed® cloud architecture. Does not include customer facilities and power costs.**

### KPS Public Cloud

- **Monthly Units**: 55 TB
- **IOPS**: 5.5K
- **Price**: $8K per Month
- **Pricing includes the cost of “instant” triple storage redundancy based on Cloudseed® cloud architecture.**

### AWS

- **Monthly Units**: 55 TB
- **IOPS**: 5.5K
- **Price**: $7K per Month
- **Price includes “eventual” double redundancy based on AWS description.**

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Sample Requirements:

**55 TB**

**5.5K IOPS**

For all Provisioned VMs and Storage

For resources of this combined capacity and performance, Amazon’s monthly pricing is cheapest, followed by the KPS Public Cloud, the KPS Federal Community Cloud, and lastly a KPS On-Prem Private Cloud.

- **Provisioned IOPS**
  - Assumed for AWS

- **Triple Redundancy**
  - Assumed for KPS Clouds
Sample Network Pricing

KPS Federal Cloud

$0.1K per Month

KPS's "pay for performance" model results in low data transfer costs based solely on desired bandwidth.

KPS Private Cloud

$0K per Month

KPS does not charge for data transfer costs to/from on-premise private clouds.

KPS Public Cloud

$0.1K per Month

KPS's "pay for performance" model results in low data transfer costs based solely on desired bandwidth.

AWS

$1.4K per Month

Pricing is based on total data transferred in a monthly cycle.

16.2 TB In & Out

For entire environment

For data transfer capacity, a KPS On-Prem Private Cloud is cheapest, followed by the KPS Public Cloud and KPS Federal Community Cloud, and lastly Amazon.

Sample Requirements:

- AWS Data In: Assumed to be free
- AWS Data Out: Assumed standard out
$33K  KPS Federal Cloud
Monthly Units

KPS utilizes its internal service delivery / operations team to manage and maintain VMs for the customer 24/7.

$35K  KPS Private Cloud
Monthly Units

KPS also owns and maintains physical equipment, and conducts tech refreshes automatically at no additional cost to the customer.

$33K  KPS Public Cloud
Monthly Units

KPS utilizes its internal service delivery / operations team to manage and maintain VMs for the customer 24/7.

$42K  AWS
Hourly Professional Services

Integrators can be contracted for professional services with AWS, but, in turn, minimally add a small pass-through percentage (3-4%) on top of AWS's other IaaS resource prices.

110 VMs
Level 2
OS and Resource Management

Horizon® Managed Services take advantage of KPS' internal operations team. AWS usually requires FTEs, but through Horizon®, KPS offers managed services for AWS instances purchased through Zeus.

3 FTEs
Assumed for Integrator

4% Pass-Through
Assumed for Integrator

Sample Requirements:
Discounting the Cloud
All clouds offer discounts for reserved instances and longer contract terms. Horizon® cloud pricing represents “List” pricing from which discounts can be applied to make offerings more price-competitive based on your specific cloud needs!

Baseline
Lowest pricing of all options

+8.3%
Higher in price than the baseline

+14.0%
Higher in price than the baseline

+24.8%
Higher in price than baseline (plus customer responsibilities)

AWS
US East Region Cloud

$64.1K

Horizon®
Public Cloud

$69.4K

Horizon®
Federal Cloud

$73.1K

Horizon®
Private, On-Prem Cloud

$80K
Using the information gathered on CSPs and their various cloud services, customers can establish a CSP Profile that gives a visual representation of the overall cloud service. This can help set expectations and serves as an easy way to visually compare CSPs and their cloud service offerings, without having to rely on the “Apples to Apples” method that often times falls short of fully describing a cloud service’s value.
CSP Profiles

The final CSP Profiles take shape when we rank CSPs from best to worst (relatively) in each of the major categories reviewed. Through the use of CSP Profiling, customers are able to pick the handful of factors that matter to them, and ensure they get the best fit for them.

The methodology outlined here explains CSP profiling at a high level, but through much more in-depth profiling, KPS has found clear expectation standards across industries. This, combined with KPS’ methodology for knowing if the cloud is “right for you”, helps customers make the transition to cloud computing seamlessly. To request more information please email info@knightpoint.com or visit our cloud microsite: www.whatsyourhorizon.com.

Best

Worst

Compute Pricing  Storage Pricing  Network Pricing  Man. Service Pricing  Performance  Uptime  Service Level  DIY Functions  Ease of Use  Managed Functions  Security

AWS
AWS - GovCloud
HRZN Pub
HRZN Pri
HRZN Fed