

The Cost of Using the Public Cloud

An Evaluator Group TCO Analysis Comparing AWS and VxRail

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For many companies the appeal of the public cloud is very real. For tech startups, the cloud may be their only option, since many don't have the capital or expertise to build and operate the IT systems their businesses need. Existing companies with established data centers are also looking at public clouds, to increase IT agility while limiting risk. The idea of building-out their production capacity while possibly reducing the costs attached to that infrastructure can be attractive. For most companies the cloud isn't an "either-or" decision, but an operating model to be evaluated along with on-site infrastructure. And like most infrastructure decisions the question of cost is certainly a consideration.

In this report we will explore that question, comparing the cost of an on-site hyperconverged solution with a comparable set up in the cloud. The on-site infrastructure is a Dell EMC VxRail™ hyperconverged appliance cluster and the cloud solution is Amazon Web Services (AWS).

Backed by specific research, Evaluator Group helps IT end user clients with strategic infrastructure decisions regarding technology, economics, etc. Through this work we have developed tools, like TCO models, that can be applied to more general comparisons such as that featured in this report.

Note: Evaluator Group first conducted this TCO comparison in 2017. This report fully updates the original with a new cost comparison, using the latest model of VxRail HCI and current AWS pricing.

TCO Model

Total Cost of Ownership is a concept that is commonly used when making capital purchases. When you buy an iPad, tablet or other consumer product, the "sticker price" is essentially all you need to make a meaningful cost comparison. But figuring the comparable costs for IT infrastructures is more involved. The cost of owning these assets includes the costs of buying and running them, which TCO models are designed to provide.

For traditional infrastructures, Capital Expenses include all one-time costs, such as the acquisition cost, plus all the design, installation and training. Operational Expenses start after installation and include the on-going costs of running the data center and paying the people who operate the equipment, plus recurring maintenance. Hyperconverged Infrastructures (HCIs), like Dell EMC VxRail, have simplified the traditional compute environment to reduce both Capital and Operational Expenses.

HCI Benefits

A big part of the cost associated with capital purchases, like IT systems, is design and implementation. For a moderately sized compute environment this includes choosing servers, storage systems, a storage network and hiring the integration expertise to put the whole thing together and make it work. Hyperconverged Infrastructures greatly simplify this job by essentially reducing the decision to choosing which model of appliance or node to buy, unpacking the boxes and connecting them to the Ethernet network. The net effect of this simplification is a lower total cost of ownership, and one that's much easier to calculate.

With that established, let's look at the specifics of this TCO comparison. We started with a cluster of VxRail appliances designed with enough processing power and storage capacity to support a variety of workloads, from "tier 2 or tier 3" applications to some core IT services as well. Then we priced out a comparable configuration using Amazon Web Services (AWS).

The On-site Infrastructure

We configured a 6-node cluster of 1U VxRail E-Series appliances with enough resources to provide high availability. All VMs are distributed across all six nodes and each node can support up to 200 VMs, enabling the cluster to still support 650 VMs in the event of a node failure. This configuration provided two vCPUs, 4 GB of memory, ~100 GB of all-flash storage and 500 IOPS per VM. Storage capacity includes a 10% snapshot allocation. All-flash storage was chosen over a hybrid configuration (disk and flash) because flash provides more reliable, consistent performance and can support any workload, from a storage perspective. And, it allowed us to use deduplication (only available with all-flash) as well as erasure coding, (RAID 5) to gain space efficiency. Also included in this cluster are a pair of 10 Gb Ethernet switches, plus installation, cabling and support.

The 6-node cluster supports 650 VMs, each node with the resource configuration listed below:

- Dual Intel Xeon Scalable processors, 2.4GHz, 40 cores total (20 per CPU)
- 576 GB memory
- 800 GB cache SSD
- 10.2 TB capacity SSD storage

For the TCO comparison we calculated a cost per month using a 3-year simple amortization with no interest. The assumption was that companies making this kind of comparison would have their own funding framework and could easily add in the cost of capital from internal sources or through a commercially available lease.

Facilities costs were estimated at \$100 per month for each node of the hyperconverged cluster. For admin time it was assumed that the entire cluster would require 2 hours per week, a conservative estimate given the fact that VxRail systems are tightly integrated with VMware allowing admins to use the tools they're already familiar with. The cost was estimated with the following formula:

Hourly cost of a fully burdened employee (\$150,000 per year or \$75 per hour)

* 2 hours per week * 52 weeks * 3 years

TCO Calculations

Arriving at total cost was actually very simple. We totaled the purchase price for the VxRail hardware, VMware licenses and switches (net of typical discounts), plus implementation services, 3 years of hardware and software maintenance and ongoing overhead. The cost line items were:

• 6 x VxRail E-Series appliances (incl. VMware licenses)	\$327,906
• 2 x 10Gb Ethernet switches (including cables)	21,666
• Implementation services	20,037
• Prepaid hardware and software support for 3 years	126,401
• Facilities costs for 3 years (power, cooling, rack space)	21,600
• IT Administrator time	11,700
	<hr/>
Total cost for 6-node HCI cluster *	\$529,310

This brings the total monthly cost for this 6-node infrastructure, designed to support 650 VMs, to \$14,703.06 (\$529,310 / 36 months) or \$22.62 per VM.

* Note: In the 2017 comparison, a 7-node cluster was used with a total cost of \$550,161 or \$23.51 per VM per month, see "Results and Analysis".

The Cloud Infrastructure

The "elastic" economics of the public cloud can be great for workloads that scale in unknown or transient ways. Service providers, like AWS, offer different types of compute and storage to better support dynamic workloads and enable resources to be matched to demand. For web applications, as an example, this creates an opportunity for cost savings, making them a good fit for the cloud. For other workloads, it's a different story, as the IT Director at a mid-west medical testing company described it:

“For the core services piece, it was difficult to predict what the [cloud] pricing would be, and complicated to decipher. For burstable app delivery capacity, like web services, the cloud can’t be beat. But you need core services (the boring stuff) all the time and at more-or-less the same compute/memory/net consumption levels.”

Amazon Elastic Compute Cloud (EC2) is offered in dozens of different of compute instances, each providing different combinations of resources, different utilization profiles, different storage options, etc., to match variable workloads. But traditional IT applications were designed to be connected to *dedicated* resources, expecting storage capacity, CPU cores and memory to be available all the time. This means a cloud infrastructure that’s comparable to on-site infrastructure needs to be 100% utilized and dedicated. For this comparison, we chose the following ECS configuration:

Compute

“C4.large” EC2 instance, 100% utilized, providing 2 vCPUs and 3.75GB of memory

Storage

“EBS General Purpose SSD” was chosen, providing 300 IOPS* per 100GB of allocated storage. The VxRail configuration supplied 500 IOPS per VM, which would require either using AWS “Provisioned IOPS” storage or increasing the amount of General Purpose storage allocated per VM, both of which would have increased costs. It was determined to leave the storage at 100GB of EBS General Purpose SSD storage.

Snapshots

A 10% snapshot allocation per month was added, comparable with the VxRail configuration.

Data Transferred

AWS tracks the amount of data transferred **into** the EC2 instance from the internet, **out of** the EC2 instance to the internet and **between** EC2 instances, and charges for the second two. For this model we estimated that each VM would generate the following amount of data movement each month:

- 10GB of data transferred in
- 30GB of data transferred out
- 60GB of data transferred between EC2 instances

Financing

For this TCO comparison, we included the following four financing options from AWS. Each is represented by a different bar in Figure 1.

“On-Demand” refers to buying compute, storage and data transfers as needed. It requires the least commitment but charges the highest cost.

“1 yr, No Upfront” is like On-Demand but with a one-year commitment.

“1 yr All Upfront Rsvd” (Reserved) requires the costs for one year of compute and storage to be pre-paid.

“3 yr All Upfront, Rsvd” (Reserved) extends the 1-year plan to 3 years.

Results and Analysis

Figure 1 below shows the average monthly cost per VM for on-site infrastructure (green bar) that would be expected to support general IT applications and several cloud pricing options at the 650-VM level.

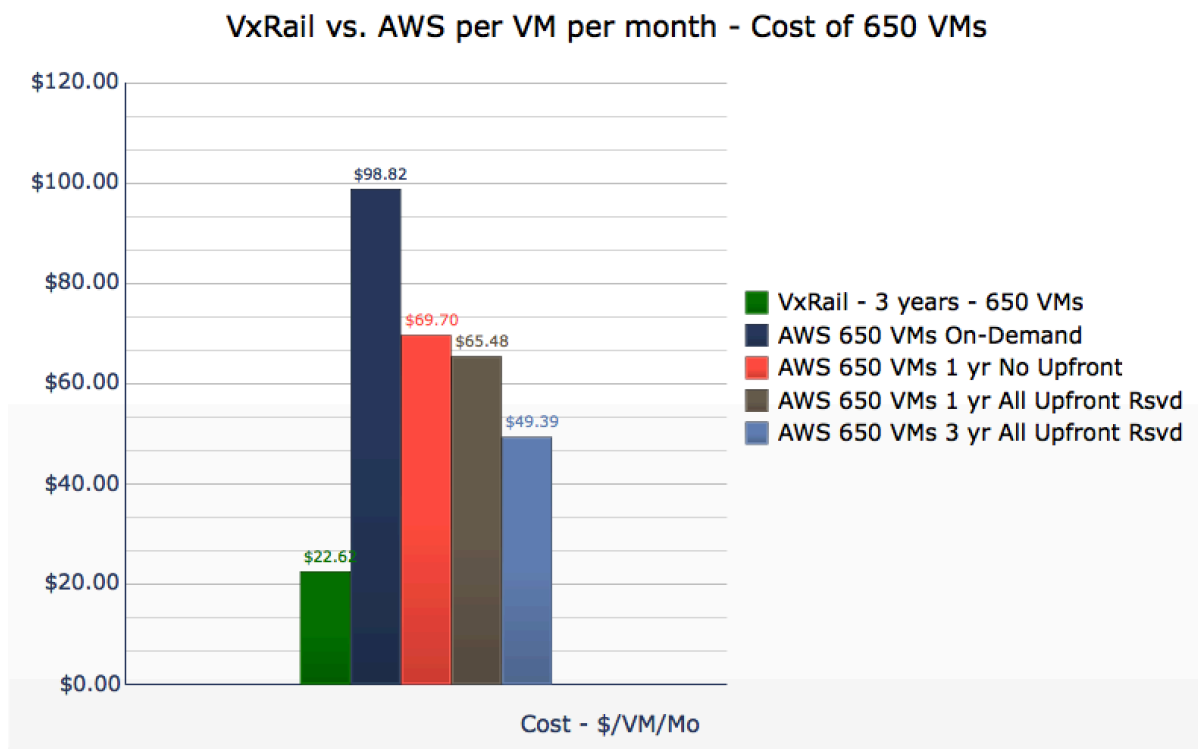


Figure 1: Monthly Cost per VM for On-site and Cloud Infrastructure (©2019 Evaluator Group)

Figure 2 shows the same monthly costs extended out for a 3-year term, typical for IT capital purchases.

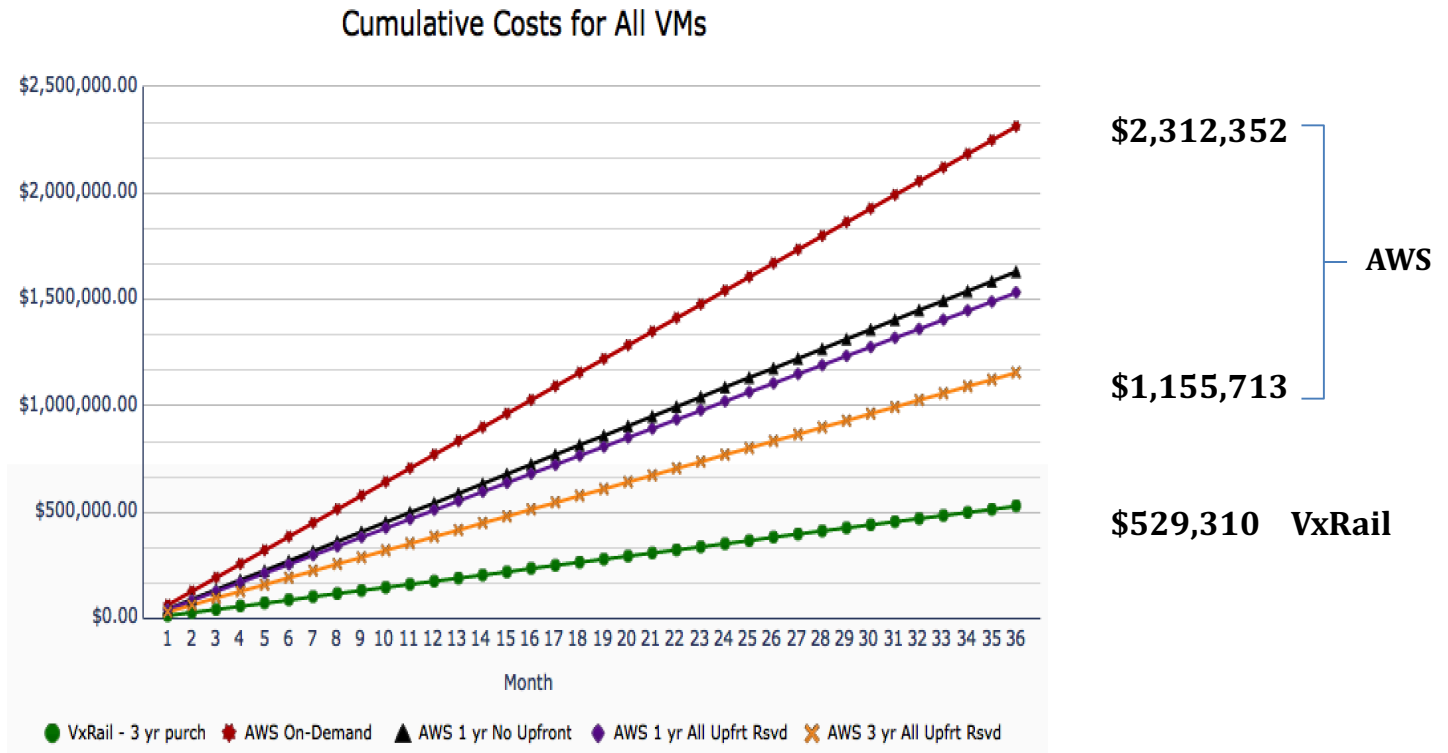


Figure 2: Total 3-Year Cost for On-site and Cloud Infrastructure (© 2019 Evaluator Group)

The Cloud Costs More – a Lot More

As the results show, running a given number of VMs in the cloud is more expensive than running them on a hyperconverged infrastructure cluster of VxRail appliances. The On-Demand option is over 4x the on-site solution and the next two options are about 3x. In a best-case comparison, the 3 yr All Upfront Rsvd AWS offering is still more than double the cost of a VxRail cluster, including switches, licensing and overhead.

For a three-year period, that difference is more dramatic. It comes to over \$2.3 million for AWS On-Demand. For VxRail the cost for 36 months is \$529,310. So why is HCI so much less than the public cloud?

The cost of server-SAN/NAS infrastructure, as well as the administrative overhead can be significant, compared with a hyperconverged solution. As detailed above, HCI technologies greatly simplify the

design and implementation processes compared with a traditional IT infrastructure. They can also reduce hardware costs by replacing proprietary storage systems with commodity storage devices in industry-standard server platforms.

The data services that have historically added significant cost to arrays are now implemented in the software-defined storage layer that's at the foundation of HCIs, improving the overall capability of these scale-out systems to deliver fast and efficient operations and further reduce the total cost of ownership. These factors speak to the overall cost-effectiveness of HCI systems, compared with traditional server-SAN/NAS system, but there's more to the story.

Hyperconverged Continues to Evolve

In the last couple of years, things have changed with hyperconverged infrastructures. As the market has matured HCI solutions have gotten more powerful. Intel's Xeon Scalable processors provide more CPU cores and storage has evolved to a point where all-flash is becoming the norm in HCI systems. Today, most vendors are offering NVMe drives and GPUs as well, making HCIs even more capable of handling the most performance-demanding applications.

These developments are helping drive this technology into enterprise data centers, a finding supported by the Evaluator Group 2018 study "CI and HCI in the Enterprise". When asked which use cases HCIs are NOT suitable for, the number one response was "none" (up from #4 in 2017) – meaning *a majority of enterprise IT respondents think HCI is suitable for any workload or use case*. Databases were the 3rd most common workload (up from 8th in 2017), showing that HCI use in the most critical applications is also growing.

More Performance means Less Cost

More performance also enables each HCI node to support more VMs, driving down the cost per VM. The VxRail nodes in this TCO study are an example this, with each node supporting up to 200 VMs. This enabled a 6-node cluster to support the 650 VMs used for this model, where 7 nodes were required with the previous generation.

And the cost of hardware keeps going down. Server manufacturers like Dell EMC have the ability to leverage significant cost advantages over others that must buy hardware from the manufacturer or sell their software through those same OEMs.

As hardware has gotten more powerful and less expensive, we've seen features and functionality go up as well. HCI solutions now routinely include multiple levels of data protection and availability, advanced data reduction and storage efficiency and policy-based management capabilities that make them easier and less expensive to operate.

About Dell EMC VxRail

Powered by VMware vSAN and offered on 14th generation Dell PowerEdge platforms, Dell EMC VxRail Appliances provide the flexibility to add capacity and performance on demand, enabling customers to easily extend use cases across the virtualized environment. VxRail delivers a hyperconverged solution using standard, enterprise-grade building blocks from known, trusted vendors and includes a single point of global 24x7 support for hardware and software. It's quickly and easily incorporated into existing VMware eco-systems, removing IT lifecycle complexity while simplifying deployment, administration and management. Fully integrated with vSphere, VxRail enables IT to expand on what is already known and proven in the environment, creating certainty in IT operations.

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