Building a Compelling TCO Model on the VMware Cloud Provider Platform

A Natural Partnership for Cloud and Service Providers

Gerrit Lehr
Cloud Solutions Strategist – VMware Worldwide Cloud Practice
July 2020
Table of Contents

Executive Summary ................................................................. 3
Example Partner Profile ......................................................... 3
Current Business .................................................................. 3
Goals and Strategy .................................................................. 3
The TCO Model ...................................................................... 4
Comparing Apples to Apples ............................................... 5
Analyzing the Cloud IaaS Market ........................................... 6
Quality and Service Level of IaaS VMs ................................. 7
The Competitive IaaS VM Offering ........................................ 8
Architecture and Sizing .......................................................... 8
Hosting Model TCO ............................................................... 8
Cloud Model TCO ................................................................ 9
Cost of Software vs. Total Costs ............................................. 11
Adding different VM Tiers and Capabilities ......................... 11
Compute-intensive VM ........................................................... 12
Network-capabilities VM ....................................................... 12
Storage-capabilities VM ......................................................... 13
Differentiating through Superior Capabilities and Services .... 13
Conclusion ............................................................................. 14
List of Figures ....................................................................... 15
Appendix ................................................................................ 16
Executive Summary

While cloud providers face increasing competition from large public clouds, they are uniquely positioned to deliver differentiated cloud services and capitalize on the high demand for cloud expertise. The ability to succeed in this market often starts with a strong foundation in cost-efficient Infrastructure-as-a-Service (IaaS). This whitepaper details how cloud providers can build a solid Total Cost of Ownership (TCO) model for IaaS offerings. IaaS provides the fundamental basis for generating revenue from cloud services and has a critical impact on a provider’s profit.

In this whitepaper, you will learn how to calculate different classes of IaaS services to address current and future customer requirements, ranging from the most price competitive offerings to highly differentiated value-add services. As you will see, all this is enabled through the VMware Cloud Provider platform, which allows providers to offer innovative services on a proven platform that can be both secure and competitively priced. We will build a comprehensive TCO model for different IaaS tiers that can allow providers to potentially achieve 30-40% margins while being price competitive against large hyperscale public cloud vendors and providing superior service levels.

The information delivered in this paper comes directly from the VMware Worldwide Cloud Practice team, a VMware organization that supports and enables cloud providers around the globe with strategy and architecture consulting services. They annually deliver hundreds of workshops and engagements, including detailed business case analysis and TCO models for partners.

Example Partner Profile

Current Business

This whitepaper is based on numbers and insights from a real-world provider as well as the VMware Worldwide Cloud Practice team’s combined experience from working with all kinds and sizes of cloud providers around the world. The example partner comes from a successful VMware vSphere hosting business, where they run approximately 2,700 Virtual Machines across 60 small and mid-size customers in total. Annual revenue added up to approximately 3.3 million USD in 2019 at a 20% gross margin target. The partner’s cloud service portfolio is currently limited to VM hosting, backup and dedicated network appliances. Value-add services are provided in the areas of IT service desk, management of operating systems on customer’s behalf as well as design, deployment and basic migration services. The architecture to enable these services consists of traditional servers, storage area networks and 3rd-party appliances for networking and security services.

Goals and Strategy

A major change in senior management led to a new strategy designed to allow the partner to achieve ambitious three-year goals. The partner found themselves challenged by larger cloud providers and hyperscalers entering their regional market. Therefore, they look to significantly increase and protect revenues of around 8.7 million USD annually by following two strategic approaches. Firstly, offering the most competitive platform for commodity and price sensitive workloads as a strong foundation for IaaS and future value-add services. Beyond that, the partner plans to address an additional market segment for SMB, mid-size and enterprise customers by broadening the portfolio with higher value-add services as a differentiator. The partner wants to add disaster recovery and application modernization as new use cases to the existing focus on cloud migration and data center expansion. The expansion will allow the partner to capture not just general-purpose workloads, but also mission critical, digital workspace, disaster recovery and cloud-native application workloads.
Building a Cloud Platform TCO – On the VMware Cloud Provider Platform

COST POSITIONS OVERVIEW

Server CAPEX, maintenance costs, setup, installation and customization

Full labor costs for all roles, loading factor for social benefits, training, vacation, sick leave, unproductive time etc.

Internal rates for shared infrastructure:

Networking: Routing, Switching, ISP, WAN, Load Balancing
Security: Firewalls, IDS/IPS, AV
Storage: SAN, Arrays, Backup
Facility: Racks, Power, Cooling, Physical Site Security

Operations costs for ITSM tools, monitoring tools, support, services, help desk and operations

Investments and costs for development, architecture, engineering etc.

These goals will require a range of improvements in the partner’s practice and operations, especially through automation and synergetic solutions. Catering for enterprise customers’ mission critical and distributed workloads also requires an expansion of the partners footprint away from a single datacenter region to an eventual global presence of locations to fulfill the offered services. Overall, the partner anticipates hosting more than 7,000 VMs and double the number of customers over the business term of three years. A critical component to financing the growth strategy is the target gross margin profile of 30-40%, which can only be achieved through higher value-add services in the advisory, security, managed application and DevOps space.

The TCO Model

The partner’s first strategic imperative—building the most price competitive IaaS offering—forms the essential foundation for all succeeding value-add services as differentiation. A solid TCO model becomes one of the first and most important aspects of executing on the given strategy. From experience, the VMware Worldwide Cloud Practice learned that no two TCO models are equal and arriving at a reliable number is a very iterative process between a variety of stakeholders in the provider’s organization. As a starting point, let’s look at the most important factors to include in the model, as well as important considerations:

- **Accounting Objectives**: Financing and accounting objectives impact the way a TCO analysis turns out and therefore need to be clarified. For our example cloud provider partner, the discussions lead to the conclusion that they want to calculate the TCO of an average VM per month. This is a very output focused approach, that makes most sense when using the TCO to achieve price competitiveness, instead of general cost leadership for the whole platform. It is in line with the strategy of building a federated platform to sell both, price competitive VMs and higher value-add services.

- **Procurement Objectives**: To factor in the different cost portions, we will first need to understand internal and external procurement and sourcing objectives and strategies. For most service providers, servers will be dedicated to the cloud platform. Their assets are directly accounted and depreciated as fixed costs accordingly. Other parts of the infrastructure, such as network, storage and facility, are shared with other services and departments. Therefore, the provider will need to calculate an internal rate for these services to get the VM TCO. Software components are for the most part consumed via a usage-based rental model, particularly the VMware Cloud Provider program. This means handling software as a monthly, variable OPEX.

- **Cost Positions**: This is one of the more obvious points in a TCO model. Providers need to get the numbers for all physical assets, including their intangible attachments like maintenance, full labor costs for different roles need to be calculated, internal rates, for example per network or SAN port, as well as all other operational cost positions like monitoring, help desk, support, engineering, development and more. It becomes obvious that finding and agreeing on all relevant cost positions takes some effort. The results of the TCO model are outlined in this paper’s Appendix for reference, including many recommended defaults based on the experience from the VMware Worldwide Cloud Practice team.

- **Utilization**: The business of providing cloud services is by its very nature particularly volatile in terms of utilization. It’s about selling flexibility to customers at its very core. Therefore, providers need to make assumptions about the numbers of customers using the platform, the number and size of workloads they will run and also the duration they are running these services for. From the described partner’s strategy, it is known that the platform should run about 7,000 VMs by the end of the three-year business term. From looking at the existing workloads and factoring in growth, the partner defined an average VM to consider in the model: 4 vCPU, 16 GB vRAM, 200 GB Storage.
Comparing Apples to Apples

Now that you have a strong understanding of the accounting objectives, procurement objectives, cost positions and utilization, you have a pretty comprehensive, while not fully exhaustive model to build the TCO for a VM. However, there is one very important aspect that is in almost every case overlooked. What exactly does a VM provide? The description of the TCO model components covered the average VM size. But it did not look into its capabilities. Knowing those capabilities is one of the most important exercises when comparing apples to apples with another offering and when selling an actual service and business value, and not just its price.

To clarify the importance in identifying the VMs capabilities when working with the example cloud provider, the team used the analogy of two different cars: A Trabant and a Ferrari. Everyone probably knows what a Ferrari is: a high-end sportscar with all the bells and whistles attached to it.

Figure 2: Car analogy for comparing apples to apples
Now, in case the reader doesn’t know what a Trabant is, let’s explain; it was a very famous car produced in former East Germany that took up to thirteen years to get delivered, was powered by a two-stroke engine, and had no tachometer, no indicators, no fuel gauge and no rear seat belts. And while the latter isn’t present in most Ferraris either, it should be very obvious that, while both are cars and both get a person from point A to point B while driving on the same roads, they are still nowhere near the same thing. Very few people would therefore compare their prices against each other. Yet with cloud VMs, that is exactly what happens most of the time. Let’s apply the same model to cloud VMs from Amazon Web Services (AWS), based on pricing for the partner’s defined average VM:

<table>
<thead>
<tr>
<th>AWS EC2 T3 Instances</th>
<th>AWS EC2 M5 Instances</th>
<th>AWS EC2 M5D Instances</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>VM Configuration</strong></td>
<td>T3.xlarge (16 GB, 4 vCPU, 200 GB gp2 EBS)</td>
<td>M5.xlarge (16 GB, 4 vCPU, 200 GB io2 EBS)</td>
</tr>
<tr>
<td><strong>VM Performance</strong></td>
<td>40% vCPU Credits</td>
<td>100% vCPU</td>
</tr>
<tr>
<td><strong>Storage Performance</strong></td>
<td>600 IOPS Baseline Credits / 250 Mbit/s limited</td>
<td>580 Provisioned IOPS</td>
</tr>
<tr>
<td><strong>Network Performance</strong></td>
<td>1 Gbps Baseline / 5 Gbps Burst</td>
<td>1.25 Gbps Baseline / 10 Gbps Burst</td>
</tr>
<tr>
<td><strong>On Demand List Price</strong></td>
<td>180.11 USD</td>
<td>244.16 USD</td>
</tr>
<tr>
<td><strong>1Y Reserved Instance List Price</strong></td>
<td>157.70 USD</td>
<td>221.53 USD</td>
</tr>
<tr>
<td><strong>3Y Reserved Instance List Price</strong></td>
<td>118.35 USD</td>
<td>176.27 USD</td>
</tr>
</tbody>
</table>

**Figure 3: Comparing Amazon Web Services EC2 instance options**

Pricing numbers are based on standard AWS EC2 list prices for the US West region (N. California), Linux OS, no network or support charges and monthly EBS snapshots with 5% of volume (10 GB). The table outlines three different VM type options, that a customer might choose for enterprise workloads:

- **T3 Instance**: Burstable CPU Credits, 600 Baseline EBS IOPS with Burst, 1-5 Gbps Network Bandwidth
- **M5 Instance**: Full CPU Performance, 580 Provisioned EBS IOPS, 1.25-10 Gbps Network Bandwidth
- **M5D Instance**: Full CPU Performance, 1,000 Provisioned EBS IOPS, NVMe, 1.25-10 Gbps Network Bandwidth

**Analyzing the Cloud IaaS Market**

Comparing between different AWS EC2 instances by themselves requires some research and needs to consider different factors. There are many types of VMs to choose from and they all have different characteristics and prices. Bringing in additional hyperscalers makes it even more complex to get an overview of the market competitive price. When trying to find more or less comparable on-demand instances in Google Cloud Platform (GCP) and Microsoft Azure, it becomes apparent that there are significant price differences between hyperscalers.

<table>
<thead>
<tr>
<th>Microsoft Azure VM D-Series: 190.22 USD</th>
<th>AWS EC2 M5 Instances: 194.24 USD</th>
<th>GCP GCE N2 Series: 122.99 USD</th>
</tr>
</thead>
<tbody>
<tr>
<td>D4 v3 (16 GB, 4 vCPU, 100 GB Temp., 256 GB Standard SSD Managed Disk)</td>
<td>M5.xlarge (16 GB, 4 vCPU, 256 GB gp2 EBS)</td>
<td>N2 Standard-4 (16 GB, 4 vCPU, 256 GB Standard Provisioned Disk)</td>
</tr>
</tbody>
</table>

**Figure 4: Hyperscale price comparison with 256 GB disk size for comparability**

---

1 Estimation from June 2020 using AWS Pricing Calculator https://calculator.aws/
2 https://docs.aws.amazon.com/AWSEC2/latest/UG/InstanceTypes.html
All of these instances qualify for general purpose and enterprise application workloads, as well as small and mid-sized databases. Yet looking at the list prices across on-demand and reserved options, there is a range from 118.35 USD all the way to 276.10 USD per month. There is no need to argue whether any of these are justified prices or not. The point here is: if providers want to build a price competitive VM offering against the market leaders, they can’t effectively work against a market price span where one option is 230% more expensive than the other.

Quality and Service Level of IaaS VMs

To make it easy for now, let’s assume the provider wants to compete with the lowest priced options of the competitor. This is what the example provider did with the AWS T3 instance at a three-year reserved price. But providers have more to consider for an apples to apples comparison: service levels and the technologies of the platform. Workloads in hyperscale VM services generally come with a credit-backed uptime SLA of 99.99%, which is what any reasonable enterprise offering should provide. Customers are unlikely to accept anything below that for business relevant workloads. There are however important and often overlooked exceptions to this.

In AWS EC2, single instance VMs only have an hourly uptime SLA of at least 90%:

“AWS will use commercially reasonable efforts to ensure that each individual Amazon EC2 instance ("Single EC2 Instance") has an Hourly Uptime Percentage of at least 90% of the time in which that Single EC2 Instance is deployed during each clock hour (the "Hourly Commitment").”

In Microsoft Azure Virtual Machines, single instance VM SLA is only available at 99.9% and for VMs using Ultra Disks and Premium SSD, which come at a higher price:

“For any Single Instance Virtual Machine using Premium SSD or Ultra Disk for all Operating System Disks and Data Disks, we guarantee you will have Virtual Machine Connectivity of at least 99.9%.”

For Google Compute Engine, single instance VMs have SLAs of 99.5%. In AWS EC2, single instance VMs have SLAs of 99.9%.

Overall, the 99.99% availability is only applicable when a workload is spread across two datacenters or zones. If a workload is only supported by one VM in one zone, i.e. the application is not clustered, there is always a significantly reduced SLA and other limitations. With enterprise applications, these SLA differences can be critical for meeting business requirements.

- 99.99%: 52 minutes and 32 seconds of downtime per year
- 99.9%: 8 hours, 45 minutes and 56 seconds of downtime per year
- 99.5%: 1 day, 19 hours, 49 minutes and 44 seconds of downtime per year
- 90%: 36 days, 12 hours, 34 minutes and 55 seconds of downtime per year

Designing and running a cloud platform for 90% service uptime compared to 99.99% service availability will of course have a significant impact on a cloud provider’s architecture. And therefore, on the TCO. It impacts the number of servers, failover capacities, failover mechanisms, downtimes, maintenance windows and more. The same is true for the performance guarantees that are provided with the VMs. Higher guaranteed CPU, storage and network performance mean more CPUs, less oversubscription, more network adaptors and ports, more disks and storage bandwidth and so on. And that’s why it is important to be aware of these differences, consider them in the TCO model and the target pricing, as well as messaging them in the sales and marketing process.

---

6 https://aws.amazon.com/compute/sla/
8 https://cloud.google.com/compute/sla
9 Calculations from https://uptime.is/
Building a Cloud Platform TCO – On the VMware Cloud Provider Platform

The current hosting operating model allows for the following FTE efficiency numbers, translated into costs using average US salaries and a loading factor of 1.05:

- Physical Server Units per FTE: 100
- VM Units per FTE: 400
- Network and Security Units (Ports) per FTE: 2,500
- Storage TB Units per FTE: 200

How do we arrive at these efficiency numbers?

The current model is based on hosting a VM platform with VMware vSphere Enterprise Plus and vCenter Standard.

It does not include self-service capabilities, cloud management portal, cloud orchestration, billing engine, an end-to-end software defined datacenter and many other capabilities a partner needs at scale.

The Competitive IaaS VM Offering

Does this suggest that the partner should design for only few guaranteed resources and low SLAs to achieve a true comparable offering and drive down cost as much as possible? Absolutely not. First of all, VMs are too much of a heterogenous product to realistically build and sell two truly similar offerings. As a customer, figuring out whether or not two competing offerings are truly similar is just too complicated and costly. In transactions cost economics theory\(^\text{10}\), this is called search and information costs, and it’s caused by an information asymmetry between the provider and the buyer of a good or service. Buyers are putting their focus mainly on explicit price differences, unless there are very obvious other differences between two seemingly similar products. Beyond that, many VMware cloud partners simply have access to other capabilities to build their platform than a large hyperscaler has. They are building their cloud platform on the VMware SDDC stack, which comes with all the enterprise-grade VMware vSphere features:

- **vMotion for VM live migration**: Prevents downtime and maintenance windows
- **VMware HA for high availability**: Enables higher single-instance VM SLAs
- **VMware FT for fault tolerance**: Supports critical single-instance workloads
- **VMware DRS for automatic resource scheduling**: Improves cloud utilization

And all of these features are not available from a non-VMware Hyperscale cloud offering. By levering these technologies, cloud provider partners can build a platform that is inherently more reliable and provides a higher SLA, while remaining price competitive.

Architecture and Sizing

Without going too much into the architecture and technical details of the platform, let’s look at the key aspects of the target platform:

- 7,000 – 7,500 VMs with 4 vCPU, 16 GB vRAM, 200 GB Storage (580 IOPS average), 1.5 Gbps Network bandwidth (average)
- 84 Production and 24 Failover Hosts (30% Failover Add-On) split into 6 clusters with 18 Hosts each to accommodate up to 1,250 VMs per cluster
- Each host comes with 2x 28 Core CPUs at 2.7 GHz, 1.5 TB Ram, 1x 1.6TB NVMe cache, 4x 3.84TB SAS SSD data and 4x 25 Gbps Network Interfaces
- 30,000 USD CAPEX costs per server including maintenance for a depreciation period of five years

Hosting Model TCO

First, let’s look at the TCO for the partner’s existing hosting model and the existing level of operational efficiency. The partners target price point, as seen in the above market analysis of hyperscale offerings, is 118.35 USD at a margin of 20% today. The only adjustment in this first model is the shift away from external storage area network to today’s state-of-the-art hyperconverged infrastructure using VMware vSAN in the Advanced Edition and direct attached disks. This already improves the Storage-FTE efficiency from 128 to 200 TB per storage FTE. Networking and security of the platform are entirely the responsibility of another team, which needs to charge 2,000 USD per 25 Gbps network port for routing, switching, IDS/IPS, firewalling, load balancing and ISP connectivity. With this TCO model, assuming only very average supplier discounts, the provider gets the following numbers:

\(^{10}\) https://journals.sagepub.com/doi/abs/10.1057/palgrave.jit.2000066
Applying the target margin of 20% leads to a very competitive price of 111.86 USD per VM per month. This is definitely a good start and proves that building a price competitive IaaS platform is very possible. However, a platform like this will hardly scale and does not provide the capabilities a customer would expect from a true cloud offering. This is due to the lack of self-service, automation and extensibility capabilities. Building and scaling higher value-add services on this kind of platform, which is the partner’s second strategic goal, will be an issue for the same reasons.

Cloud Model TCO

In the second iteration with the partner, the model got adjusted to a more automated, scalable cloud platform that supports value-add services and also meets the target margin of 30-40%. This is based on the VMware Cloud Provider program Flex Core 7-points bundle that partners use anyway:

<table>
<thead>
<tr>
<th>Month</th>
<th>Total</th>
<th>% of Total</th>
<th>Per Unit / Mo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cumulative Units</td>
<td>252,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Net New Units Sold</td>
<td>7,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VCPP Software MRC (Unit)</td>
<td>$6,800,976.00</td>
<td>28.9%</td>
<td>$26,99</td>
</tr>
<tr>
<td>Labor MRC (Unit)</td>
<td>$5,602,408.88</td>
<td>23.8%</td>
<td>$22,23</td>
</tr>
<tr>
<td>Other Variable MRC (Unit)</td>
<td>$630,000.00</td>
<td>2.68%</td>
<td>$2,50</td>
</tr>
<tr>
<td>Other Variable NRC (Unit)</td>
<td>0.00</td>
<td>0.00%</td>
<td>0.00</td>
</tr>
<tr>
<td>TOTAL COGS</td>
<td>$13,033,384.88</td>
<td>55.48%</td>
<td>$51,720</td>
</tr>
<tr>
<td>Depreciation MRC</td>
<td>$1,941,375.00</td>
<td>8.26%</td>
<td>$7,70</td>
</tr>
<tr>
<td>Infrastructure MRC</td>
<td>$5,411,509.62</td>
<td>23.04%</td>
<td>$21,47</td>
</tr>
<tr>
<td>Labor MRC</td>
<td>$2,943,734.71</td>
<td>12.53%</td>
<td>$11,68</td>
</tr>
<tr>
<td>Other Fixed MRC</td>
<td>0.00</td>
<td>0.00%</td>
<td>0.00</td>
</tr>
<tr>
<td>Other Fixed NRC</td>
<td>$160,379.15</td>
<td>0.68%</td>
<td>$0.00</td>
</tr>
<tr>
<td>OPERATING COST</td>
<td>$10,456,998.48</td>
<td>44.52%</td>
<td>$41,496</td>
</tr>
<tr>
<td>TOTAL COST</td>
<td>$23,490,383.35</td>
<td>100.00%</td>
<td>$93,22</td>
</tr>
</tbody>
</table>

Figure 5: Hosting TCO model

Applying the target margin of 20% leads to a very competitive price of 111.86 USD per VM per month. This is definitely a good start and proves that building a price competitive IaaS platform is very possible. However, a platform like this will hardly scale and does not provide the capabilities a customer would expect from a true cloud offering. This is due to the lack of self-service, automation and extensibility capabilities. Building and scaling higher value-add services on this kind of platform, which is the partner’s second strategic goal, will be an issue for the same reasons.

Add **VMware Cloud Director** as a self-service portal and cloud management platform, as well as **vRealize Orchestrator** for automation and **vRealize Log Insight** for federated log management and faster troubleshooting. This doubles the VMs per FTE ratio to 800 and increases storage FTE efficiency to 250 TB due to automation, self-service and multi-tenant capabilities for the platform.

Add **NSX Datacenter Base for Service Providers** for distributed routing, tenant edge services like firewall, load balancing, DHCP, VPN etc. as well as dynamic routing protocols. This reduces the network and security costs per port by 25% to 1,500 USD due to less physical appliances needed and software-defined flexibility.

Add **vRealize Operations Chargeback** and **VMware Usage Meter** as a metering and billing engine for automated customer resource billing and to improve backend processes.
All of these features are available to providers via the VMware Cloud Provider program Flex Core bundle. As such, there is no incremental cost for deploying and monetizing these additional features.

As such, there is no incremental cost for deploying and monetizing these additional features.

With these small changes, the partner significantly reduced manual labor, designed a truly scalable and automated cloud platform for current and future services, enabled a better customer self-service experience, and reduced overall costs by over 10 percent:

<table>
<thead>
<tr>
<th>Month</th>
<th>Total</th>
<th>% of Total</th>
<th>Per Unit / Mo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cumulative Units</td>
<td>252,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Net New Units Sold</td>
<td>7,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VCPP Software MRC (Unit)</td>
<td>$9,220,176.00</td>
<td>43.24%</td>
<td>$36.59</td>
</tr>
<tr>
<td>Labor MRC (Unit)</td>
<td>$2,801,204.44</td>
<td>13.14%</td>
<td>$11.12</td>
</tr>
<tr>
<td>Other Variable MRC (Unit)</td>
<td>$630,000.00</td>
<td>2.95%</td>
<td>$2.50</td>
</tr>
<tr>
<td>Other Variable NRC (Unit)</td>
<td>$0.00</td>
<td>0.00%</td>
<td></td>
</tr>
<tr>
<td>TOTAL COGS</td>
<td>$12,651,380.44</td>
<td>59.33%</td>
<td>$50,204</td>
</tr>
<tr>
<td>Depreciation MRC</td>
<td>$1,941,375.00</td>
<td>9.10%</td>
<td>$7,70</td>
</tr>
<tr>
<td>Infrastructure MRC</td>
<td>$4,100,343.68</td>
<td>19.23%</td>
<td>$16,27</td>
</tr>
<tr>
<td>Labor MRC</td>
<td>$2,470,040.64</td>
<td>11.58%</td>
<td>$9,80</td>
</tr>
<tr>
<td>Other Fixed MRC</td>
<td>$0.00</td>
<td>0.00%</td>
<td>$0.00</td>
</tr>
<tr>
<td>Other Fixed NRC</td>
<td>$160,379.15</td>
<td>0.75%</td>
<td></td>
</tr>
<tr>
<td>OPERATING COST</td>
<td>$8,672,138.47</td>
<td>40.67%</td>
<td>$34,413</td>
</tr>
<tr>
<td>TOTAL COST</td>
<td>$21,323,518.91</td>
<td>100.00%</td>
<td>$84,62</td>
</tr>
</tbody>
</table>

Reduced overall costs by over 10 percent

Adding the target margin of 40% leads to the still competitive price of 118.46 USD per VM per month

Cost of Software vs. Total Costs

A common discussion point at this time is the cost of VMware software as percentage of total cost. In the initial model, this was 28.95 percent. With the new model, there is an obvious increase to 43.24 percent. However, the software-defined data center design added a whole range of capabilities enabled by the VMware Cloud Provider platform. And as a result, efficiency improved, networking costs decreased, and labor costs dropped from 36.38 to 24.72 percent, leading to a lower overall TCO and doubled margin while freeing up resources for value-add activities. To build a price competitive and scalable platform, implementing superior software-defined capabilities is the way to go. And these are available to providers from the VMware Cloud Provider platform that is successfully used by over 5,000 partners. Freeing up resources through VMware software allows partners to build and deliver higher value, higher margin services where the overall VMware software cost is going to be a much smaller relative position of total costs. An example of such offerings is given later in this whitepaper.

Through the second iteration of the TCO model, the cloud provider partner achieved his first strategic priority of price competitiveness against the market leader – even at significantly increased margin targets.

The caveat here is, that this example considered more or less list prices with moderate discounts on the cost and price side of the equation. In the real world, end-customers will bargain for discounts with hyperscalers and VMware cloud providers alike. Likewise, cloud providers will negotiate optimal pricing from their suppliers like VMware, infrastructure manufacturers and others. This leaves the model very accurate as it is and the VMware Worldwide Cloud Practice team has built other real-world TCO models that were below 50 USD total costs for the example VM, with high supplier discounts, decreased labor costs from outsourcing and economies of scale.

However, partners still need to find ways of ensuring their target margin remains achievable when required to discount their offerings due to competition and customer bargaining power.

Adding different VM Tiers and Capabilities

Discounting and customer bargaining power are where higher tier VM classes and value-add services come in. Looking back at the different AWS EC2 instance types and price points, this model compared against the lowest tier offering. A key distinction between the described AWS EC2 T3 and M5 instances is the reserved vCPU performance. T3 are low cost burstable instances that provide a baseline level of CPU performance with the ability to burst CPU usage. Baseline vCPU performance can vary from five to 40 percent and each vCPU earns additional CPU credits per hour that it can use for computing resource. If the credits are burned down, CPU performance will be degraded in standard mode. Or additional charges apply in unlimited mode. M5 on the other hand provides full vCPU performance as part of the higher price point.

The first two TCO models assumed an oversubscription ratio of four vCPUs per physical CPU (25%). This is a value commonly seen in VMware vSphere deployments and comparable with the baseline vCPU performance of AWS EC2 T3, since small instances have as low as only five percent baseline vCPU performance. And the TCO model only used large 4 vCPU VMs as an assumption; there will be many smaller instances running in the real-world platform.

Compute-optimized VM

But how about building a TCO for a VM tier that’s more comparable to AWS EC2 M5 with 100% vCPU performance and no oversubscription? Without changing anything else in the model, the platform needs 288 physical hosts for production. At 30% failover capacity, a total of 374 hosts is needed and the following TCO is the result:

<table>
<thead>
<tr>
<th>Month</th>
<th>Total</th>
<th>% of Total</th>
<th>Per Unit / Mo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cumulative Units</td>
<td>252,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Net New Units Sold</td>
<td>7,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VCPP Software MRC (Unit)</td>
<td>$9,220,176.00</td>
<td>28.39%</td>
<td>$36,59</td>
</tr>
<tr>
<td>Labor MRC (Unit)</td>
<td>$2,801,204.44</td>
<td>8.62%</td>
<td>$11,12</td>
</tr>
<tr>
<td>Other Variable MRC (Unit)</td>
<td>$630,000.00</td>
<td>1.94%</td>
<td>$2,50</td>
</tr>
<tr>
<td>Other Variable NRC (Unit)</td>
<td>0.00</td>
<td>0.00%</td>
<td>0.00</td>
</tr>
<tr>
<td>TOTAL COGS</td>
<td>$12,651,380.44</td>
<td>38.95%</td>
<td>$50,204</td>
</tr>
<tr>
<td>Depreciation MRC</td>
<td>$6,723,000.00</td>
<td>20.70%</td>
<td>$26,68</td>
</tr>
<tr>
<td>Infrastructure MRC</td>
<td>$9,058,888.81</td>
<td>27.89%</td>
<td>$35,95</td>
</tr>
<tr>
<td>Labor MRC</td>
<td>$3,886,922.26</td>
<td>11.97%</td>
<td>$15,42</td>
</tr>
<tr>
<td>Other Fixed MRC</td>
<td>0.00</td>
<td>0.00%</td>
<td>0.00</td>
</tr>
<tr>
<td>Other Fixed NRC</td>
<td>$160,379.15</td>
<td>0.49%</td>
<td></td>
</tr>
<tr>
<td>OPERATING COST</td>
<td>$19,829,190.22</td>
<td>61.05%</td>
<td>$78,687</td>
</tr>
<tr>
<td>TOTAL COST</td>
<td>$32,480,570.66</td>
<td>100.00%</td>
<td>$128,89</td>
</tr>
<tr>
<td>Price at 35% Margin:</td>
<td></td>
<td></td>
<td>$174,00</td>
</tr>
</tbody>
</table>

Additional tiers can be built for networking or storage intensive VM types or by adding additional superior capabilities to the platform. The partner’s initial Cloud TCO model considered a minimum scope of VMware software capabilities available to VMware Cloud Provider partners, which includes VMware Cloud Director, vCenter Standard, vSphere Enterprise Plus, vSAN Advanced, NSX Datacenter for Service Providers Base and a couple of other tools.

Network-capabilities VM

A VM type with superior networking capabilities was designed using the VMware NSX Datacenter SP Professional Edition. These VMs can have Layer 2 VPN connectivity across sites and clouds, which is a requirement for certain clustered applications or workload mobility. And they can be protected by micro-segmentation that prevents malicious communication between VMs that are located in the same network (east-west firewalling). The TCO for this differentiated VM offering is $4.22 USD per VM per month. Using the Cloud VM mark-up of 40%, the list price for this VM would be $131.91 USD per month.

Adding 35% of margin and the partner is still competitive at 174.00 USD compared to 176.27 USD for AWS EC2 M5 three-year reserved instances. This compute-optimized VM tier gives the partner a second option to offer for compute-intensive and performance critical workloads at a higher price point, besides the lower cost general purpose VM.

Figure 9: Compute-intensive TCO model
Storage-capabilities VM

To provide superior storage capabilities, the partner designed another tier using VMware vSAN Enterprise. This enables capabilities like stretched clusters and nested fault domains for increased resiliency and storage encryption at rest. The TCO for this VM is 85.61 USD. Using the Cloud VM mark-up of 40%, the list price for this VM would be $119.85 USD per month.

Differentiating through Superior Capabilities and Services

By adding more features to the platform, it becomes easy to build VM tiers for specific compute, networking or storage use-cases. Providers can build a range of additional tiers and services, based on the capabilities available in the VMware Cloud Provider program and through add-ons to the Flex Core Bundle:

It becomes clear how the example partner was able to offer a broad range of different instance types and capabilities to serve different customer needs at different price points. And through the VMware Cloud Provider program, all partners get the full flexibility to mix these different VM tiers on one platform. They can even allow customers the flexibility to move from one instance type to another without application migration. A customer can start with a base general purpose VM, move to an advanced network-capability VM to enable micro-segmentation on the network layer, move the VM to another cluster without vCPU oversubscription for compute-intensive workloads or start using VMware vSAN Enterprise storage-capabilities along the way. The provider gets charged through VMware Usage Meter accordingly as the capabilities change. And through the included VMware vRealize Operations Chargeback, every partner gets a robust metering and billing engine that picks up a customer’s VMs features as they move from one tier to another and bill accordingly based on flexible policies.

No need to stop with different VM tiers. The same logic applies for value-add services that can be flexibly added by using additional VMware solutions:

- **VMware vRealize Operations** for Monitoring Services
- **VMware Cloud Director Availability** for Disaster Recovery and Migration Services
- **VMware NSX DC SP** Enterprise and Advanced for Networking Services
- And many more

We will discover the potentials for value-add services and their TCO model in follow-up whitepapers.
Building a Cloud Platform TCO – On the VMware Cloud Provider Platform

Conclusion

The VMware Cloud Provider platform gave the example partner the flexibility and cost efficiency to achieve two important goals: remaining price competitive with the largest global competitors and differentiating through VM service tiers and value-add services.

The platform enabled an overall cost reduction and efficiency improvements that can lead to a margin profile of 30-40% for different tiers of VMs. We have shown that partners can compete with and outperform larger scale competitors through software-defined capabilities and showcase the financial benefits through a comprehensive TCO model.

As a rule of thumb, the efficiency gains from the unique capabilities of VMware Cloud Director and the VMware Cloud Provider platform can lead to significant decrease in labor and infrastructure cost, resulting in double-digit reduction of TCO per VM. Instead of relying on error-prone manual tasks, providers can now build truly automated and scalable cloud offerings while focusing their high-skilled resources on the generation of value-add services.

The above example of a real-world partner provides the blueprint on how to conduct a comprehensive TCO analysis and achieve a true apples-to-apples comparison with common hyperscale offerings. Partners can flexibly use VMware software components to build differentiated services that can address a wide range of customer use cases on a shared and efficient platform. Through increased automation and self-service, cloud providers can reduce their labor costs and free up resources to provide higher value add services.

Figure 11: Multiple VM tiers on federated, evergreen Cloud Platform
List of Figures

Figure 1: Steps and considerations to building a TCO model ................................................................. 5
Figure 2: Car analogy for comparing apples to apples .................................................................................. 5
Figure 3: Comparing Amazon Web Services EC2 instance options .............................................................. 6
Figure 4: Hyperscale price comparison with 256 GB disk size for comparability .......................................... 6
Figure 5: Hosting TCO model ......................................................................................................................... 9
Figure 6: Flex Core 7-Points Bundle ............................................................................................................. 10
Figure 7: Cloud TCO model ............................................................................................................................. 10
Figure 8: TCO reduction through VMware Cloud Management Platform ...................................................... 11
Figure 9: Compute-intensive TCO model ........................................................................................................ 12
Figure 10: Flex Core Add-Ons for value-add services .................................................................................. 13
Figure 11: Multiple VM tiers on federated, evergreen Cloud Platform ............................................................ 14
Appendix

The following cost items were reflected in the Hosting VM TCO model:

- Term for business modelling: 36 months
- Depreciation of hardware: 60 months
- Network and security costs per physical network port: 2,000 USD
- Rack costs p.a.: 25,000 USD
- Rack units occupied by servers: 30
- FTE salaries per year:
  - Server Admin: 89,960 USD
  - VMware Admin: 101,631 USD
  - Storage Admin: 129,414 USD
  - Network and Security Admin: 105,923 USD
  - Software Engineer: 111,983 USD
  - Consultant: 245,000 USD
  - Product Manager: 150,000 USD
- Loading factor for FTEs: 1.05
- Labor Productivity:
  - Servers per FTE: 100
  - VMs per FTE: 400
  - Networking ports per FTE: 2,500
  - Storage GBs per FTE: 200,000
- Annual Working hours: 1,950
- Physical Server Profile:
  - CPU per Server: 2
  - Core per CPU: 28
  - GHz per Core: 2.7
  - Hyper-Threading: Enabled
  - Ram per Server: 1,536 GB
  - Network Port per Server: 4
  - Cost per Server: 30,000 USD
  - Rack Units per Server: 1
  - Other monthly Costs: 18.50 USD for ITSM management software
- Resource Management:
  - Oversubscription CPU Target: 4 vCPU per 1 pCPU
  - Oversubscription RAM Target: 1:1
  - Virtualization Overhead: 15%
  - Physical Storage Capacity Provisioned: 83%
  - Physical Storage Performance Provisioned: 60%
  - VSAN Failures to tolerate: 2
  - Fault Tolerance Method: Raid 6
- Average VM:
No. of vCPU: 4
vCPU Speed: 2.7 GHz
Memory Allocated: 16 GB
Storage Capacity per VM: 200 GB
Storage Performance per VM: 580 IOPS
Storage Workload Profile:
  • Access Pattern: Random
  • IO Size: 4 KB
  • IO Ratio: 70/30
  • Dedupe: 1.42
Avg. vNIC count per VM: 2
Uptime per VM: 100%
Additional Recurring Costs per VM: 2.5 USD for server management

• Shared Costs:
  DC Sites with Management Pods: 1
  VMs per Pod: 30
  Typical management VM:
    • Memory: 32 GB
    • Disk Size: 550 GB
    • VM Memory Reservation: 50%
    • VM Uptime: 100%
  Physical Storage Capacity Provisioned: 60%
  Servers per Management Pod: 6
  CPU Sockets per Server: 2
  Cores per CPU: 16
  RAM per Server: 256 GB
  Network Ports per Server: 2
  Cost per Server: 12,010 USD
  Rack Units per Server: 1
  Other monthly Costs: 18.50 USD for ITSM management software

• Solution Engineering Costs:
  No. Of Engineering FTEs: 3
  Engineering Duration: 4 Months
  Engineering Time Allocated to Project: 75%

• Development Costs:
  No. Of Development FTEs: 3
  Engineering Duration: 4 Months
  Engineering Time Allocated to Project: 75%

• Training Costs:
  No. of FTEs to train: 10
  Training Cost per FTE: 2,865 USD