



The Economic Benefits of the Dell Technologies Bare Metal Orchestrator

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Situation

Communication Service Providers CSPs are going through a major paradigm shift. Their networks are moving from fully integrated physical infrastructure designs to disaggregated, distributed virtual system infrastructures. The rollout of 5G networks is further accelerating this trend because 5G packet cores are virtualized and User Plane Function software is being disaggregated and distributed to edge networks. Additionally, many CSPs are deploying distributed virtual RANs. As networks become disaggregated and virtualized, traditional central offices are being converted to data centers. Servers are deployed in core, edge, far edge, and customers' premises data centers. Globally distributed virtualized networks are inherently more complex to operate than centralized hyperscale data centers, and therefore a new generation of management and orchestration tools is required for efficient and cost-effective operation of these networks.

As CSPs build out distributed telco clouds, Day 0/1/2 life-cycle operations are a major challenge consuming a large proportion of available labor hours. Some of the challenges include:

- Remotely discovering, deploying, and managing hundreds of thousands of bare metal servers across geographically dispersed locations
- Managing multiple vendors' technologies
- Operating a mix of virtual infrastructure stacks (different flavors of VIM and Kubernetes)
- Integrating and operating multiple NFV software stacks (packet core, IMS, etc.)

Orchestration of the bare metal layer in these deployments is a major challenge because multiple vendors' products are usually deployed using different configurations and versions of firmware; different approaches to maintenance, monitoring, and control of their nodes; and various approaches to integrating higher level stacks.

Solution

To address these challenges, Dell Technologies has developed a Bare Metal Orchestrator that provides a seamless software solution, allowing CSPs to build their bare metal hardware and operate their virtual network infrastructures across many diverse locations. This solution allows CSPs to:

- Identify bare metal servers and accelerate deployment of software across multiple locations
- Utilize a declarative automation approach with programmable infrastructure based on workload requirements
- Access a unified user interface for telemetry, metering, and life-cycle management of resources

The key benefits of the Bare Metal Orchestrator are:

- Reduces operational costs by orchestrating life-cycle management across hundreds of thousands of servers
- Minimizes errors, technical debt, and reliance on domain expertise
- Accelerates innovation and the ability to deliver differentiated services at scale

This results in both reduced network operations expense (OpEx) and faster time to revenue because of accelerated introduction of new services. The key areas of OpEx savings are:

- Server provisioning
- NFVI and VIM installation
- Security management
- Configuration management
- Fault management
- VIM software updates
- Kubernetes software updates
- NFVI engineering and planning

ACG Research has developed an economic model that quantifies the total cost of ownership (TCO), return on investment (RoI), and the benefits of faster time to revenue of the Bare Metal Orchestrator. The results and key assumptions used in the model are presented in the remaining sections of this paper.

Key Assumptions

ACG Research has developed a business model quantifying the TCO and revenue benefits of the Dell Bare Metal Orchestrator using the ACG Business Analytics Engine¹. The model analyzes three types of CSPs' networks: large, medium, and small. Each network consists of core, edge, far edge, and premises-based data centers with thousands of servers. We assume a heterogeneous, multivendor environment with multiple versions of hardware and software and multiple VIM and Kubernetes stacks. We model the growth of distributed data centers and servers over five years. The final number of data centers at the end of the five years for each network size is presented in Table 1.

¹ <https://www.acgbae.com/>

Data Centers	Small	Medium	Large
Core	2	2	5
Edge	50	500	1000
Far Edge	500	2000	10000
Premise	2000	10000	100000

Table 1. Data Center Quantity and Growth

The number of bare metal servers at each data center at the end of the modeling period is presented in Table 2. The cost of these servers is not included in the TCO model because these are servers the CSP has in the data center with or without the Bare Metal Orchestrator. The number of bare metal servers that exist at the data centers where the Bare Metal Orchestrator platform is deployed is modeled based on an average CSP’s expected growth. In addition to these servers bare metal orchestration servers are also needed. Two orchestration servers are required at core and edge data centers to provide for high availability, and far edge and premise data centers are managed by remote orchestration control servers.

Data Centers	Small	Medium	Large
Core	100	300	600
Edge	20	35	50
Far Edge	5	5	5
Premise	1	1	1

Table 2. Quantity and Growth of Servers

Bare Metal Orchestrator provides significant Day 0/1/2 OpEx savings. These are primarily labor savings on complex server management and operations tasks that without orchestration need to be done redundantly on multiple suppliers’ infrastructures and tools. The key areas of Day 0/1 (planning, design, and installation) savings are:

- Individual server provisioning: 99% savings in labor expense
- NFVI and VIM installation: 99% savings in labor expense

The key areas of Day 2 (on-going operations) savings are:

- Security management
- Configuration management
- Fault management
- VIM software updates
- Kubernetes software updates
- NFVI engineering and planning

We estimate 75% labor savings on all Day 2 tasks when using bare metal orchestration.

Our model also calculates time to revenue for introducing new services. We assume the same set of services is deployed but that the Dell Bare Metal Orchestrator provides a faster time to revenue, specifically a two-month speed advantage. This occurs based on having the physical hardware infrastructure in place at scale much more rapidly than is possible without orchestration and from accelerating the availability of software infrastructure stacks across the environment faster, allowing new revenue generating workloads to be placed into service rapidly.

Economic Model Results

Our economic model calculates the OpEx for a CSP's network deployed with and without Bare Metal Orchestrator. We also calculate the capital expense (CapEx) and software licensing expenses of deploying the Bare Metal Orchestrator. We do not include the CapEx of compute servers used in application support because these are the same for both scenarios. Return on investment is defined as the TCO savings/ Bare Metal Orchestrator expense. The key results are presented in Table 3.

Financial Metric	Small	Medium	Large
OpEx Savings	39%	49%	57%
TCO Savings	33%	42%	53%
Revenue Improvement	2%	2%	2%
ROI	88%	139%	255%

Table 3. Key Financial Results

Operations expense is focused on the labor savings. The TCO includes both server OpEx and Bare Metal Orchestration expenses, which include orchestration control servers, orchestration software licenses, and Dell professional services, and support expenses. The TCO does not include compute server expenses because these are the same for both scenarios (with and without the bare metal orchestrator). For the large network example year by year comparisons of OpEx and TCO incorporating the individual expense categories are presented in Figure 1 and Figure 2.

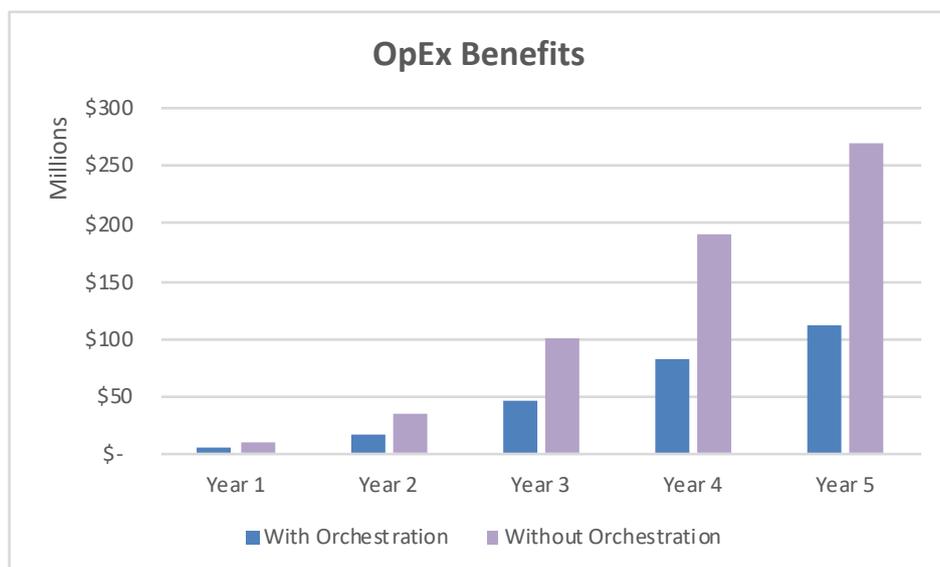


Figure 1. Bare Metal Orchestration OpEx Benefits

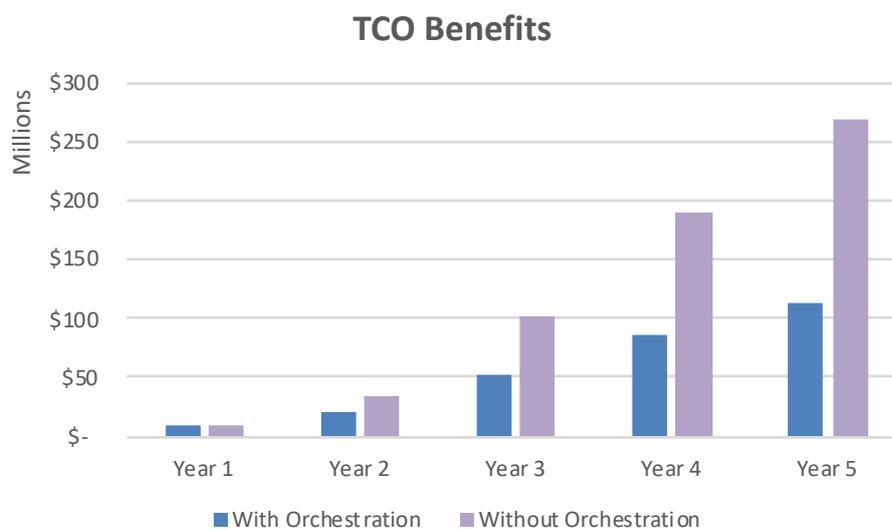


Figure 2. Bare Metal Orchestration TCO Benefits

Summary

Communication Service Providers are transforming their networks into large scale, disaggregated, virtual networks running on servers in a growing number of distributed data centers. Remotely discovering, deploying, and managing hundreds of thousands of bare metal servers across these geographically dispersed locations are a major challenge and have the potential to dramatically increase network OpEx. Dell Technologies Bare Metal Orchestrator provides an automated approach to deploying and operating a large and heterogeneous population of distributed servers across a wide variety of locations. ACG's TCO model has shown OpEx savings between 39% and 57% and ROI between 88% and 255% for CSPs deploying the Dell Technologies Bare Metal Orchestrator in their networks.

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