

Parallels® Virtuozzo Containers

White Paper

Total Cost of Ownership Analysis:

Parallels® Virtuozzo
Containers

VS

Traditional Hypervisor
Virtualization

www.parallels.com



“The ROI of just the hardware and software components, without considering reduced travel or administrative time costs, shows in excess of 900% for the first year alone.”

— *Brian Haugli,*
IT Manager ResolvIT IT and
Management Consultants

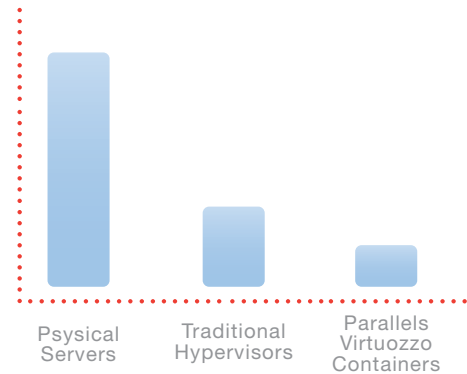
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Executive Summary

With the current economic climate, companies are looking for opportunities to control IT costs. Server consolidations have long been a source for great cost reductions, and using Parallels Virtuozzo Containers results in a much lower total cost of ownership than traditional hypervisor technologies. The lower total cost of ownership resulting with Parallels Virtuozzo Containers is largely derived from two key points: a higher consolidation ratio and better manageability.

A head to head total cost of ownership comparison was done using publicly available consolidation tools, and the results show that a consolidation using Parallels Virtuozzo Containers yields about a 50% lower total cost of ownership over a traditional hypervisor deployment. The cost savings achieved is so compelling that many companies that have already deployed a traditional hypervisor solution are identifying servers to migrate to Parallels Virtuozzo Containers to take advantage of these unique efficiencies.



Approach

The basis of this total cost of ownership evaluation is the online Alinean calculators openly published both on the Parallels and VMware websites. Visit the Parallels TCO calculator at: www.parallels.com/tco.

The cost considerations are largely determined by consolidation ratios which are established on the calculators. The ratios may be changed in the calculators to evaluate different results. The focus of this evaluation has been limited to the key cost components; additional cost components are included on the calculators to inflate the return on investment results.

There are two ways to do a server consolidation, with new hardware or reusing older hardware. New hardware drives a higher consolidation ratio so longer term the total cost of ownership will be lower; however, reusing hardware obviously has a lower entry cost. The calculations and conclusions in the evaluation are all based upon the new server consolidation because it yields the overall lowest total cost of ownership.

CONSOLIDATION RATIO:

The number of standalone servers that typically can be consolidated onto a virtualized server.

TEST CONSOLIDATION PROJECT:

100 single purpose, single application servers
Dual core, 2 CPU hardware
Windows Operating System

Key Findings

Server consolidations have proven very effective for reducing the IT total cost of ownership. Parallels Virtuozzo Containers is twice as efficient and has about half of the total cost of ownership seen using traditional hypervisor technologies for consolidations. The return on investment of a Parallels Virtuozzo Containers is also about half of what you would see in a traditional hypervisor consolidation, 6 months versus 10 months.

Cost Component	With Parallels Virtuozzo Containers
Hardware	54% lower
OS Software	35% lower
Virtualization Software	76% lower
System Management Software	53% lower
Storage	44% lower
Provisioning	81% lower
Facilities	54% lower
System Administration	35% lower

New server deployment TCO evaluated against traditional hypervisor costs

In the 100 server test deployment, there are significant to excessive savings in every cost category when using Parallels Virtuozzo Containers.

TCO Details

TEST CONSOLIDATION PROJECT:

100 single purpose, single application servers

Dual core, 2 CPU hardware

Windows Operating System

CONSOLIDATION RESULTS:

Traditional Hypervisor Consolidation Ratio 1:8 Requires 13 Servers

Parallels Virtuozzo Containers Consolidation Ratio 1:16 Requires 6 Servers

Here is the full total cost of ownership evaluation for a consolidation project of 100 servers, consolidating on new server hardware. The traditional hypervisor consolidation required 13 servers while the Parallels Virtuozzo Containers consolidation required 6.

Cost Component	Physical Servers	Traditional VMs	Parallels Virtuozzo Containers
Server Hardware Costs	\$517,500	\$67,275	\$31,050
OS Software Costs	\$639,840	\$124,758	\$81,542
Virtualization Software Costs	\$0	\$119,600	\$28,800
Systems Management Software Costs	\$40,000	\$10,400	\$4,800
Storage Costs	\$150,000	\$63,375	\$35,500
Network Equipment Costs	\$68,000	\$12,000	\$4,000
Facilities (Power, Cooling & Space)	\$355,614	\$46,233	\$21,342
Systems Administration Costs	\$1,069,340	\$536,275	\$356,447
Server Provisioning Costs	\$170,820	\$26,478	\$5,124
Training Costs	\$0	\$8,723	\$6,622
Total	\$3,011,114	\$1,015,117	\$575,227

Server Hardware Costs

Consolidation ratios are absolutely the most important factor contributing to hardware costs. Traditional hypervisor consolidations are infamous for high-end servers with lots of memory. Because of the patented innovations in Parallels Virtuozzo Containers, the server consolidation ratio is approximately double that is seen with the traditional hypervisor consolidations. The rule of thumb used on the consolidation calculators today is 8:1 for a dual core server with a traditional hypervisor technology. With Parallels Virtuozzo Containers, that same consolidation ratio is 16:1 — obviously cutting the hardware costs in half. Hardware does have ongoing costs, so minimizing the number of servers keeps the overall costs down incrementally.

HARDWARE COSTS:

54% LOWER with Parallels Virtuozzo Containers

Server Software Costs

Operating Systems vendors such as Microsoft have licensing that levels the playing field amongst virtualization vendors. For example, the data center license for Windows Servers, that allows unlimited virtual instances on a single server. Even with this equal footing, virtualization technologies that attain a higher consolidation ratio will have fewer overall licenses and leverage the data center license more fully. The cost of the OS per container is much lower — about a third less — than the cost of the OS per VM.

OS SOFTWARE COSTS:

35% LOWER with Parallels Virtuozzo Containers

Virtualization Software Costs

Virtualization software costs are not an insignificant part of the cost puzzle. Most software licenses are based upon servers and therefore density greatly affects the contribution to the costs. In addition to sheer numbers of licenses, some licenses are significantly more expensive. In the TCO analysis, the traditional hypervisor software accounted for 11% of the resulting TCO. The software cost of Parallels Virtuozzo Containers in the analysis only accounted for 5%, and that was from a much lower TCO. Parallels Virtuozzo Containers virtualization licensing costs are 76% lower than a traditional hypervisor in the total cost of ownership test case.

VIRTUALIZATION SOFTWARE COSTS:

76% LOWER with Parallels Virtuozzo Containers

Systems Management Software Costs

Because traditional hypervisors haven't provided this type of functionality, systems management software hasn't been a focus of total cost of ownership calculations. Parallels Virtuozzo Containers comes with a complete and mature backup software that can completely replace existing backup agents. The performance is superior because it is run on a host-level and it is designed to support containers. In addition to that, patch management and other systems level software is no longer necessary because updates are automated through template updates. For the purpose of this evaluation, very conservative numbers were used associated with the reduced number of required servers, but the cost savings could be as much as 100% lower for backup and patch management software.

SYSTEMS MANAGEMENT SOFTWARE COSTS:

53-100% LOWER with Parallels Virtuozzo Containers

Storage Costs

Storage is another component that is far more efficient and cost effective with Parallels Virtuozzo Containers. The storage footprint that represents the OS in a container is 1% of the storage required to store an entire OS in each VM. The copy-on-write technology enables this efficiency. The basic and common parts of the OS are maintained only once across the server, when a container has unique information, only that unique information is written locally. This copy-on-write innovation allows the flexibility of having unique differences between containers, yet the Containers are isolated as all differences are written only on a container basis. For example registry entries or a system directory. Secondly, this is also a facet of security isolation — it ensures that the main OS and other containers are not affected by an malicious writing on the container level.

STORAGE COSTS:

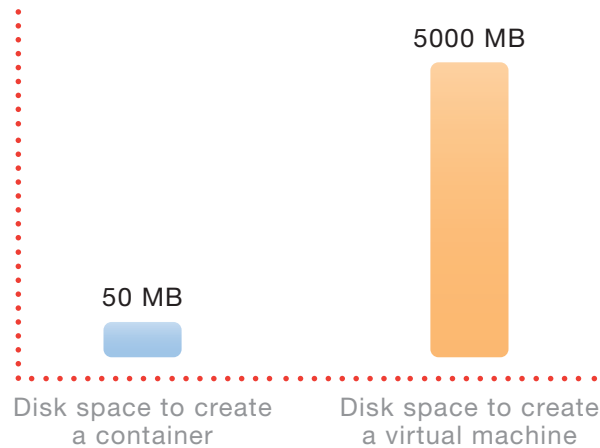
44% LOWER with Parallels Virtuozzo Containers

Network Equipment Costs

Network- the network infrastructure- switches, routers, etc all reduce dramatically with a consolidation. That also drives a lower cost of electricity. In the TCO analysis the Parallels Virtuozzo Containers consolidation only required a single switch, the traditional hypervisor deployment required three.

NETWORK COSTS:

66% LOWER with Parallels Virtuozzo Containers



Facilities (Power, Cooling and Space)

Data center floor space is now at a premium in data centers. The combined costs of data center floor space, racks and electricity are directly affected by the number of servers used in the consolidation. With less than half the servers used in the Parallels Virtuozzo Containers consolidation, the costs were less than half of those used in the traditional hypervisor consolidation.

FACILITIES COSTS:

54% LOWER with Parallels Virtuozzo Containers

Systems Administration Costs

The management tools and OS virtualization architecture both contribute to the administrative efficiencies seen with Parallels Virtuozzo Containers. Containers is the easiest and most efficient solution to manage. The single OS enables provisioning of fully functional containers in less than a minute. The single OS and associated templating functionality enable updating across containers, across servers with a single action, making it possible for administrators to manage in the hundreds of containers. For the purposes of this comparison, a very conservative number was used, based primarily on the lower number of servers. It's difficult to quantify, but the savings in administration time in some organizations have been as much as 85% when moving from a traditional hypervisor to a container consolidation. Administration ratios can be as high as one administrator to 300 or even 600 containers.

SYSTEMS ADMINISTRATION COSTS:

35% LOWER with Parallels Virtuozzo Containers

Server Provisioning Costs

Server provisioning costs are a small part of the ongoing costs as it happens once in a server lifetime. Containers are provisioned in seconds, about 90 seconds for a fully functional Windows container and about 60 for a Linux container. When adding the provisioning costs into a large consolidation projects, the costs become significant. In the total cost of comparison analysis, Parallels Virtuozzo Containers has a cost of provisioning 81% lower than a traditional hypervisor deployment.

PROVISIONING COSTS:

81% LOWER with Parallels Virtuozzo Containers

ROI

Keeping the total cost of ownership low is desirable, but how long does it typically take to recoup the investment in the project? In the 100 server analysis, the ROI for Parallels Virtuozzo Containers was half that of the traditional hypervisor ROI, the project yielded a return in month 4. The yearly costs for the Parallels Virtuozzo Containers deployment was about \$418K, saving over \$107K a month.

Cost Component	Physical Servers	Traditional VMs	Parallels Virtuozzo Containers
Server Hardware	\$77,625	\$10,091	\$4,658
OS Software	\$159,960	\$31,190	\$20,386
Virtualization Software	\$0	\$35,880	\$8,640
Systems Management Software	\$12,000	\$3,120	\$1,440
Storage	\$22,500	\$9,506	\$5,325
Network Equipment	\$10,200	\$1,800	\$600
Facilities (Power, Cooling & Space)	\$355,614	\$46,233	\$21,342
Systems Administration	\$1,069,340	\$536,275	\$356,447
Total	\$1,707,239	\$674,095	\$418,837
Monthly Costs	\$142,270	\$56,175	\$34,903
Monthly Savings		\$86,095	\$107,367
ROI in Months		8	4

Why is Parallels Virtuozzo Containers Better?

Parallels Virtuozzo Containers is the world's leading OS virtualization solution for Windows and Linux. Parallels Virtuozzo Containers creates isolated containers on a single physical server and OS instance. Compared to other virtualization technologies, Parallels Virtuozzo Containers offers the highest levels of density, performance and manageability.

There are really two basic drivers for the cost savings with Parallels Virtuozzo Containers: consolidation ratios and manageability.

CONSOLIDATION RATIOS

The high consolidation ratios attainable with Parallels Virtuozzo Containers affect almost every cost component. The consolidation ratios are high because of some key innovations:

- **Software Single Copy (template)** — Parallels Virtuozzo Containers virtualizes the Operating System. There is a single copy of the operating system on the server, and each container has links (template) to that main operating system. Paired with copy-on-write technology which allows custom data to be written in a single container, the Operating System is isolated and cannot be affected by the actions of a single user or container. The single software copy makes the most efficient use of storage, a template only takes about 1% of the storage needed to load an entire OS. More importantly, every operating system loaded on a server has a requirement for memory, and memory is always a bottleneck for virtualization deployments. Deploying homogeneous servers together can yield a tremendous savings in TCO. The same templating capability may also be used with applications.
- **Copy-on-write** — Copy-on-write ensures that all of the containers are isolated and customizable. A registry setting, or library or some other component can be customized on a container basis, and is written only to that particular container. A container only has the unique components, saving about 99% of the footprint used to create an entire OS.
- **Best memory use** — The single OS helps to maintain the best use of memory, additional enhancements optimize the use of memory page tables and other memory resources.
- **Little operational overhead** — using native server and OS technology enables near-native performance, allowing more containers to be running on a server before it hits a performance degradation.

MANAGEABILITY

Because of the management tools and OS virtualization architecture, Parallels Virtuozzo Containers is by far the easiest and most efficient solution to manage. The single OS enables provisioning of fully functional containers in less than a minute. The single OS and associated templating functionality enable updating across containers, across servers with a single action, making it possible for administrators to manage in the hundreds of containers.

Overall Carbon Footprint and Conclusion

The carbon footprint provides an overall summary of the savings involved with moving from not only a physical server infrastructure, but from a traditional hypervisor deployment to a Parallels Virtuozzo Containers consolidation.

The high consolidation ratios and manageability possible with Parallels Virtuozzo Containers produce the lowest TCO available for a server consolidation project. Some of our customers have shared their amazing results:

“The ROI of just the hardware and software components, without considering reduced travel or administrative time costs, shows in excess of 900% for the first year alone.”

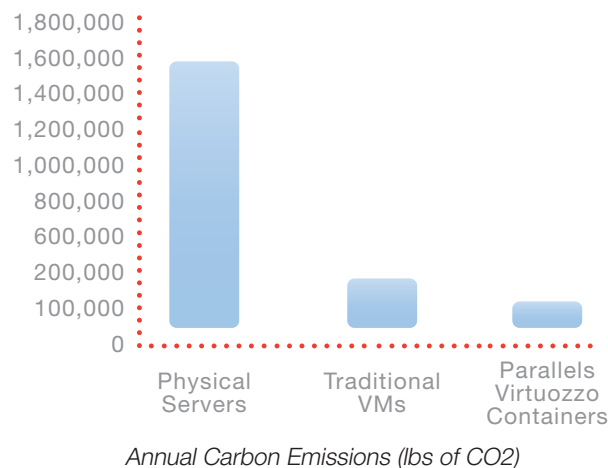
- Brian Haugli, IT Manager ResolvIT IT and Management Consultants

“Cox had an immediate return of 300%”.

- Keith Hubbard, Server Team Manager, Cox Communications

“If we consolidate 9 on a server, we’re breaking even. Today we’re consolidating 40, and we’re not even close to using the full resources on the server.”

- Ben Foxx, KV Pharmaceuticals



Visit our customer spotlights section to read the full stories:

www.parallels.com/products/virtuozzo/spotlights/

To do your own TCO calculations, please visit our online calculator at: www.parallels.com/tco

Or contact Parallels directly for more information:

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