Continental flies higher by saving millions with Microsoft® Hyper-V on HP BladeSystem

Virtualization avoids seven-figure data center overhaul while reducing planned downtime by 50 percent.

Continental Airlines

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HP customer case study: adaptive infrastructure virtualization

Industry: transportation

Objective

Increase compute capacity despite data center limits on power

Approach

Standardize on HP BladeSystem and Microsoft Windows® Server 2008 with Hyper-V to maximize CPU utilization and reduce the number of physical servers required

Business benefits

- Seven-figure cost avoidance by lengthening life of current data center
- Projected 50% lower licensing costs than VMware
- $490,000 saved through virtualization-based vs. traditional clustering
- 50% reduction in monthly planned downtime (5 hrs. vs. 10)
- 65% decrease in time to value on new projects

IT improvements

- 6-fold faster installation of physical server OS (30 mins. vs. 3 hrs.)
- 10-fold improvement in CPU utilization (50% vs. 5%)
- 18-fold faster server deployment (20 mins. virtual vs. 6 hrs. physical)

Flying to win

At number five, Continental may not be the world's biggest airline. But in a number of surveys, passengers say it's the best.

It was named the "Best Domestic Airline," "Best Airline for Customer Service," and "Best Airline for Flights to Mexico" in surveys for *Executive Travel* magazine's 2008 Leading Edge Awards. And passengers picked it as "Best Airline: North America" and "Best Cabin Staff: North America" in the Skytrax 2008 World Airline Awards.

This is not by chance. "Flying to win" is one of the goals of Continental's Go Forward Plan, which was first announced in 1995. Since then, the airline reports that teamwork and the Go Forward Plan have "catapulted the company to new heights of service excellence and record financial performance compared to its competitors."

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About Continental Airlines

Continental Airlines (www.continental.com) is the fifth largest airline in the world. With more than 42,000 employees operating 2,800 daily departures throughout the Americas, Europe, and Asia, Continental carries approximately 67 million passengers per year and consistently earns awards and critical acclaim for its operations and corporate culture.

Can Continental keep up this performance consistently? It's not easy, given fluctuating fuel prices and challenging economic conditions around the world. Technology needs to provide a major boost, according to the Go Forward Plan. Its role at Continental is to cut costs—and enhance service levels.

Headwinds: lack of power

Server virtualization became a possibility just in time, says Richard Wilson, manager, enterprise engineering at Continental Airlines.

The problem was that the airline's main data center in Houston had 1,100 servers and "has maxed out on power available for servers," Wilson explains. "Adding to our power capacity would cost the airline in the high six or low seven figures. Building out the data center or migrating to a co-located facility would cost millions of dollars. Meanwhile, almost all our physical servers had a CPU utilization of less than 5 percent."

That's expensive. Research shows that a typical x86 server consumes 30 to 40 percent of maximum power even when it's producing no work at all.[1]

Virtualization: 50 percent off

The team responded by virtualizing servers. Two years ago Continental chose Hyper-V technology from Microsoft as a virtualization platform over VMware. One reason is that the airline is a close partner and Technology Adoption Program (TAP) participant with Microsoft.

"As a result," Wilson explains, "our help desk and the rest of the IT staff have deep expertise in Microsoft solutions. We want a single source for support. Because Microsoft owns the hypervisor OS software and all the other pieces on it, things are simplified."

Hyper-V also delivers roughly 50 percent lower licensing costs than VMware, Wilson projects. Hyper-V technology can be freely deployed when purchasing Microsoft Windows Server 2008 Datacenter Edition. "That's three to four times the cost of the Standard Edition, without Hyper-V. But I can easily put 10 or more VMs on the Datacenter Edition without additional licenses. If we were to use VMware, we would have to license each VM, and its operating system."

Streamlining management with HP BladeSystem

To host Hyper-V, the team has standardized on HP BladeSystem. "We looked at blades from other vendors," Wilson says. "None had anywhere near the features we found with the HP BladeSystem c7000 Enclosure and the ProLiant BL460c server blades that go in it."

One of those features is the HP Onboard Administrator. "We can see everything that's going on with the server, from power to thermal to the serial number on the BIOS," Wilson notes. "We can pretty much manage everything from one central location, and get a deep-level view into all aspects of our infrastructure and even our software."

Using predefined images or scripts, the team provisions HP server blades faster. "With HP Rapid Deployment Pack (RDP), a component of the HP Insight Control Environment for BladeSystem, we can install a physical server OS in about 30 minutes," says Wilson. "Doing that manually would probably take three hours. RDP also ensures that our standards and settings are implemented across the board, for a higher level of accuracy in the build process."

The migration to virtualized servers is occurring in phases. "Our plan is to virtualize everything we possibly can," Wilson says. "We've reduced the number of physical servers by about 40. We've been able to add 60 more servers and they fit in the space of three physical servers. Our CPU utilization has increased 10-fold from 5 percent to over 50 percent. With Hyper-V on HP BladeSystem, we're now able to stay in our current data center, avoiding millions of dollars in capital investments, and getting much more return on our existing power infrastructure."

Compute capacity has been expanded 10-fold without a corresponding increase in power.

Continental is using HP Thermal Logic, which is the ability to monitor, pool, share, and match power use to demand; balance performance, power, and cooling according to the task at hand; and cap power and cooling levels at the most efficient level for the required level of performance.

[1] AllBusiness, a D&B Company. "10 Ways to Save Energy in Your Data Center", by Chris Loeffler, May 1, 2008.

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The team can set power and cooling thresholds for the highest level of performance or the most efficiency, or initiate cooling and control cooling levels automatically to react to and remove heat. Without this ability to have zoned cooling, Continental would have to pay for cooling the largest load all of the time.

Clustering saves $490,000 dollars more
Working with Microsoft, Continental is deploying HP ProLiant server blades in eight-node clusters for high availability. "If we lose one of the physical nodes, then all of the VMs on it would be able to failover to the other seven nodes in the cluster without causing any of them to become over-utilized," Wilson explains.

The team manages the clusters using Microsoft System Center Virtual Machine Manager (VMM) 2008. "VMM monitors the host state and the VM state," notes Wilson. "If the host server crashes, the VM is moved to another node. So we have highly available VMs."

As a next step, the team plans to cluster the VMs themselves. "That's another layer of high availability on top of clustered hosts," observes Wilson. "If a service stopped or was hung in one of the VMs, then that service would failover to the other VM—totally independent of the physical host."

The new architecture makes it easy to offer highly available services. "In the past, we would cluster two physical servers for a particular service out of fear of hardware failure," Wilson observes. "Now we don't have to. Project owners are okay with having just one VM instead of two physical servers because they know that it's a highly available VM."

Projected savings from the new clustering architecture are considerable. When deployment is complete, the team will have been able to avoid 20 hardware clusters and save $475,000 in hardware and software costs and an estimated $15,600 in annual server management costs.[2]

Reducing planned downtime 50 percent
Server management overall will be simpler, the team reports. One reason is that Hyper-V virtual servers are easier to take care of than physical servers. "The amount of time we take to patch servers has probably been cut in half," notes Wilson. "Usually when you patch a server, you have to reboot it, and that often takes longer than anything else—about four or five minutes. With the Hyper-V servers, a reboot takes 20 seconds or less."

Multiply that by hundreds of servers. "We've seen a big change in the window we need for monthly patches, software installations and things like that," Wilson adds. "Since deploying Hyper-V on HP BladeSystem, we've had a 50 percent reduction in monthly planned downtime for maintenance, from 10 hours to 5."

Deploying 18 times faster
Management is streamlined in other ways, says Wilson. "Systems Center Virtual Machine Manager has wizards in it that make it easy to do a physical-to-virtual (P-to-V) migration with our legacy physical servers," he notes. "And we can deploy a virtual machine in 20 minutes or less. Deploying a physical server takes six hours easily."

[2] 12 hours of annual management per 20 (2-node) clusters at estimated $65/hour = $15,600.

Customer solution at a glance

Hardware
- HP ProLiant BL460c G5 server blades with Quad-Core Intel® Xeon® Processor E5450
- HP BladeSystem c7000 Enclosures

Software
- HP Insight Control Environment for BladeSystem
- HP Onboard Administrator
- Microsoft System Center Virtual Machine Manager (VMM) 2008

Operating system
- Microsoft Windows Server 2008 Datacenter Edition with Hyper-V

Services from HP
- HP service and support

Reducing development time by 65 percent
Hyper-V on HP BladeSystem is shortening time to value on new development. "It makes it easier for developers to roll out code," Wilson says. "They can stand up a test environment faster and create snapshots of a point in time. Then it's easy to roll back to that snapshot and apply another build. The overall result is about a 65 percent decrease in development and QA time."

Overall lead time has been reduced as a result. "When we are fighting fires or need additional capacity and a new system real quick, it's easy to create VMs on the fly," Wilson observes. "We're more dynamic."

HP Insight Dynamics – VSE looks promising
Further improvements are being tested. The team is evaluating HP Insight Dynamics – VSE, the industry's first software solution to manage physical and virtual resources the same way. "It will help us virtualize the data center and dynamically allocate resources," Wilson says. "We're really excited about that."

The team is also evaluating the Insight Orchestration option of HP Insight Dynamics. It enables administrators to design templates that specify the infrastructure required to run different applications on servers, as well as associated storage and network resources. With the push of a button, physical and virtual infrastructure can be automatically assigned and configured to the exact template specifications.

"By pulling management of all key infrastructure pieces together across physical servers, virtualization, storage and network connectivity using Insight Dynamics – VSE with Orchestration, we will be able to further streamline operations and cut operating costs," Wilson says. "Continental Airlines' vision is to move toward an IT services model and to a dynamic data center model that is capacity-driven. This is the first product we've seen that will allow us to make our vision a reality."

The team is also evaluating HP Virtual Connect, a new class of blade interconnect that simplifies server connections by cleanly separating the server management from the LAN management.

"Virtual Connect will be one more tool set that will allow us to have a more dynamic data center and allow us to instantly add capacity, change networks and servers and add storage," Wilson says.

EDS, an HP company, is part of the team
For the past 18 years, data center operations at Continental have been provided by EDS, an HP company. Today EDS manages everything from the airline's reservations systems to its flight operations solution, and EDS technicians provide field support at each major hub.

EDS is also partnering with Continental to work with other airlines and develop a new standardized IT platform for the industry that incorporates a service-oriented architecture (SOA).

In other projects, EDS upgraded Continental's reservations system storage solution to improve performance by 28 percent, and enhanced the performance of a crew-scheduling application by 80 percent.

"It is often difficult to differentiate between EDS and Continental employees," says John Stelly, managing director of technology for Continental Airlines. "It's as if everyone is on the same team. They are truly committed to Continental."

Result: lean and agile
Continental's data center is different from what it was two years ago. "With virtualization on HP BladeSystem, we can react to change faster," Wilson sums up. "If Continental is offering a special and we see a spike in demand, we can quickly and easily add to capacity without purchasing anything. We have the flexibility to perform maintenance without downtime and begin projects we wouldn't otherwise have the funding to start. We can do more with less—and do it faster."

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