



Carnival Cruise Lines slashes server footprint by around 60 percent



Customer profile



Company	Carnival Cruise Lines
Industry	Travel, Hospitality and Tourism
Country	United States
Employees	43,000
Web site	www.carnival.com

Business need

Each Carnival Cruise Lines ship operates as a self-sufficient environment in which power and floor space are limited, making IT efficiency a critical requirement.

Solution

Carnival began virtualizing shipboard servers using VMware® vSphere™ running on Dell™ PowerEdge™ servers with Intel® Xeon® processors and Dell EqualLogic™ storage arrays.

Benefits

- Approximately 60% reduction in physical footprint of servers on ships
- 100% availability for shipboard virtual servers over past 6 months
- Shoreside management possible for storage arrays on ships at sea

Application areas

- Consolidation
- Dell Systems Management
- Green Computing
- Power & Cooling
- Services
- Storage
- Virtualization

“We do everything possible to ensure that our guests enjoy their vacations. By providing a highly reliable server environment, our virtual machines support that mission.”

John Staker, Senior Information Systems Manager, Carnival Dream

Customers of Carnival Cruise Lines want to get away from it all. Whether they choose to dance into the wee hours, play miniature golf with the kids or just read a great book by the pool, most are looking for a vacation from the complexities of everyday life. Paradoxically, the company's fun and carefree cruises rely on a cutting-edge and highly efficient IT infrastructure to run smoothly.

"Our ships carry as many as 4,500 guests at a time, so paper-and-pencil management doesn't cut it," says Doug Eney, vice president, information systems engineering for Carnival. "When guests come on board, we need to have their cabin prepared the way they want it. When they arrive at dinner, the wine they requested needs to be on their table. And when they disembark at a destination, their shoreside activities need to be exactly as their reservations specify. All the logistics that make a vacation go smoothly need to be transparent to our guests. Making that happen requires excellent, reliable technology."

Destination: efficient and effective IT

Every ship in the Carnival Cruise Lines fleet is its own floating island, which poses unique challenges for IT. "A cruise ship is completely self-contained," says Eney. "It carries its own water and generates its own electricity. The physical footprint of hardware devices is a huge issue on a ship. Reliability is also crucial. If something breaks on the ship, it has to be fixed on the ship; hardware vendors aren't going to send new parts by helicopter. Our systems must be both highly available and highly efficient."

A few years ago, each ship in the Carnival line required between 13 and 22 physical servers, with direct-attached storage, to run the various applications that support operations. "We had one server for each job, so those systems were taking up a lot of floor space," says Rodney Orange, supervisor of Wintel server engineering. "We needed to reduce the physical, power and cooling footprint of each ship's IT infrastructure."

60% smaller server footprint

Carnival engaged Dell Consulting Services to help evaluate its utilization of shipboard

servers and determine how it could use virtualization to meet its consolidation goals. Its 22 ships rotate through dry dock so that each gets a complete overhaul every few years or so. Starting with the ships that were on dry dock at the time, Carnival began implementing VMware vSphere server virtualization and Dell EqualLogic

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Technology at work

Services

Dell™ Consulting Services

Hardware

Dell EqualLogic™ PS6010XV, PS6010XVS, PS6000XV, PS6000E and PS5000XV storage arrays

Dell Latitude™ laptops with Intel® Core™2 Duo processors

Dell OptiPlex™ desktop computers with Intel processors

Dell PowerEdge™ R710, R900 and 2950 servers with Intel Xeon® processors

Dell Studio One 19 all-in-one desktop computers with Intel Core™2 Duo processors

Software

Dell EqualLogic SAN HeadQuarters

Oracle® 10g databases

Red Hat Linux

VMware® vSphere™

Windows Server® 2008 and 2003



virtual storage solutions. The first ships saw their server footprint consolidated to 22 virtual machines hosted on three Dell PowerEdge R900 servers supported by two EqualLogic PS5000XV SANs. More recently, ships have begun receiving Dell PowerEdge R710 servers with EqualLogic PS6000XV or PS6000E SANs.

"We initially selected the PowerEdge R900 servers because of their chipset," says Orange. "But we've found that although the PowerEdge R710 servers have a smaller footprint, they can hold as many virtual machines as the R900 servers, if not more." Fifteen of the company's ships now run a virtual environment; the entire fleet will be upgraded by the end of 2011.

On the upgraded ships, efficiencies abound. Now, the critical applications and services for the ship, including Microsoft Exchange, run on the virtualized, consolidated Dell platform. "Now that we've gone virtual, we're saving floor space, saving power and getting better air flow, which keeps the servers cooler," says John Staker, senior information systems manager on the new ship Carnival Dream. "We've reduced the physical footprint of our servers by 60 percent."

"Across our fleet, the combination of VMware running on efficient Dell servers with EqualLogic storage arrays is proving to be a green solution, while also greatly reducing the cost of running our ships' critical applications," says Eney.

Simplified IT management

IT staff are also saving time they previously spent on system administration. Driven by a combination of storage automation and intelligence of the EqualLogic SANs and advanced vStorage API integration with VMware vSphere, Carnival's virtualization solution is able to extend efficiency across the entire IT infrastructure.

"Management of our servers is greatly simplified," says Staker. "We no longer have to spend time going through logs for each server. VMware vCenter enables us to see, in one place, everything that's happening.

Plus, if a virtual server is running slowly, we can add another processor, double the RAM, add more disk space—do whatever we need to do—without physically opening up the box."

IT staff effectiveness has increased, as IS managers move between ships as frequently as every six months. Previously, when each ship had different hardware, an IS manager would require time to get up to speed after a transfer. In the virtual environment, management of virtual machines, as well as server and storage hardware, is very similar between ships. "When I come into a new situation, I can focus on what needs to be done without having to reinvent the wheel every time," says Staker. "It's fantastic."

Carnival uses EqualLogic SAN HeadQuarters software to monitor performance of the shipboard storage arrays from a data center in Miami. "We have roughly 60 EqualLogic SANs, most of which are in motion at any given time," says John Ashmore, manager of systems engineering. "But EqualLogic SAN HQ enables us to look at all our storage platforms from one centralized location."

From the shoreside data center, the IT staff monitors alerts and storage utilization. When necessary, they also plan capacity increases for the SANs. "One thing we particularly like about Dell EqualLogic storage is its ability to scale incrementally," says Ashmore. "We can add both storage capacity and controller capacity to generate additional I/O with a single unit."

High-availability data centers at sea

The virtualized server and storage platform also helps Carnival deliver high availability and redundancy for its isolated floating data centers. Using vSphere's vCompute and vStorage features backed up by an iSCSI SAN, Carnival can achieve highly reliable production environments. In addition, with EqualLogic auto-replication, the SANs have a local recovery option built in.

"We're also taking advantage of the software features that are included at

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*Doug Eney, Vice President,
Information Systems
Engineering,
Carnival Cruise Lines*



no extra cost with the Dell EqualLogic platform, including snapshotting and replication for disaster recovery,” says Ashmore. “Most of our ships have a third EqualLogic array, kept in a separate room, to which the primary SANs replicate data. If a virtual server were to fail, we could recover it from the replicated VMware virtual machines within a four-hour window or less.”

So far, the Dell-based virtual infrastructure has been extremely reliable. “The storage arrays have been rock-solid,” Staker says. “If servers on one of our ships went down, that would impact the whole guest experience. But the EqualLogic arrays just run. On Carnival Dream, we’ve had 100 percent availability of our servers since their launch six months ago. We’ve never had any problems with them. At Carnival Cruise Lines, we do everything possible to ensure that our guests enjoy their vacation. By providing a highly reliable server environment, our virtual machines on Dell servers and EqualLogic storage support that mission.”

38% performance improvement for data warehouse

Now Carnival is planning to move its shoreside Oracle 10g data warehouse onto a similar platform of Dell PowerEdge servers and Dell EqualLogic storage arrays. “Our data warehouse is very important to us,” says Garth Lyn, Supervisor, UNIX and Storage Engineering with Carnival. “We use business intelligence software to crunch information in our data warehouse, analyzing what’s happening on our cruises, how guests are spending their time and what’s going on in the travel industry. This helps us effectively price our cruises, so it gives us a distinct competitive advantage.”

The data warehouse has been running on a legacy Sun Solaris-based system supported by EMC Symmetrix storage, but the server

hardware is end-of-life and the disk array cannot support Carnival’s projected short-term growth. Dell Consulting Services performed a six-week proof-of-concept using PowerEdge R710 servers running Red Hat Linux with Dell EqualLogic storage.

First, Dell consultants tested a 10-gigabit iSCSI EqualLogic PS6010XV SAN. Performance was approximately 19 percent better than that of Carnival’s current production data warehouse. Then Dell repeated the tests using a Dell EqualLogic PS6010XVS hybrid array, which includes both solid-state drives and spinning disks. The hybrid array produced an additional 16 percent performance gain, for a total 38 percent performance improvement over the current environment.

“The Dell consultants helped us realize the advantage of the EqualLogic PS6010XVS SAN, which is that it hosts hot data on the solid-state drives while pushing cold data, the least-used data, to the slower spinning disks,” explains Lyn. “This ensures that the most frequently used data is served up fast, but we don’t have to manage the movement of data between the two types of storage. And the hybrid solution is much less expensive than a pure solid-state disk would be. The proof-of-concept showed us that the Dell solution can save us 60 to 80 percent compared with the high-end enterprise storage options we were considering, and 40 to 60 percent compared with our midrange enterprise options.”

The proof-of-concept sold Carnival on the benefits of moving to iSCSI even in a data center that already had Fibre Channel connectivity. “We already had Fibre Channel in our data center, but the cost of expanding the platform to increase our storage capacity drove us to use iSCSI,” says Ashmore. “What’s great about the Dell EqualLogic PS6010 series is that with 10-gigabit Ethernet as a standard, we actually have faster transport over an

iSCSI network than over our Fibre Channel.” Better yet, Eney adds: “Over the next five years, this data warehouse migration will save us hundreds of thousands of dollars that we would otherwise be spending on storage hardware and storage management software.”

Dell throughout the enterprise

In two data centers, an office in London and shipyards in Italy, Carnival runs a virtualization platform using Microsoft Hyper-V running on Dell PowerEdge 2950 servers and the efficient Dell EqualLogic PS5000 series SANs. These offices require Microsoft Exchange and SQL Server, but their computing requirements are more limited than those of the company’s data center. “The EqualLogic SANs fit very well in our remote offices,” says Eney. “Instead of a data center, we have a small wiring closet in these locations. The Dell and EqualLogic platform enables us to fit the needed storage and servers in a compact space.”

Carnival also uses Dell client solutions throughout its corporate environment, including Dell Latitude laptops and Dell OptiPlex desktop computers for employees and Dell Studio One 19 all-in-one desktop computers for passenger use in Carnival Dream’s Fun Hub, comprised of a ship-specific intranet and the cruise industry’s first shipboard social network.

Dell: a true partner

“We have a true partnership with Dell,” Eney concludes. “Many vendors have walked in here and said they’re our partner, but then we’ve had a problem when the presales period was over and the partnership went out the window. Dell delivers cost-effective and reliable solutions, and whenever we’ve brought up issues with the Dell team, they’ve determined the root cause and worked with us on the solution. They always show a commitment to actually being our partner.”

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