

HIGHLIGHTS

- » **Avoiding Death by Scale**
- » **Exchange on NetApp Performance**
- » **Case Study on Consolidating DAS**
- » **Resources:**
 - **Script: Simplify VMware Backups**
 - **Tech Paper: A 680,000-Mailbox POC**
 - **Webcast: All About Deduplication**

In the News: SearchStorage.com Interviews Jay Kidd from NetApp

Q&A with Jay Kidd,
Sr. VP and GM of Emerging Products, NetApp

NetApp talks candidly about network-attached storage, file virtualization, traction with Data ONTAP GX, and the company's brand identity.

**Full Article: NetApp VP Says
Storage Virtualization Overrated »**

BLOGGING WITH DAVE

Dave Hitz, NetApp Founder and EVP

"A customer recently asked, 'Is Data ONTAP® based on UNIX®?' Complicated question. Here's the answer ..."

» **Dave's Blog**

DRILL DOWN

- » **Webcast: Cut Storage Use up to 95% Without Affecting Performance**
Submit your questions live!
- » **Results: Your Favorite NetApp Brews!**
Check out the newest beers Tech OnTap is serving up.



ADMIN RESOURCES

- » **End-User Review: VMBKUP.vbs Script Simplifies VMware V13 Backups**
Supports VMs leveraging VMFS, RDM, or NFS via iSCSI or FCP on NetApp storage.
- » **A 680,000-Mailbox, iSCSI- Based Proof of Concept for Exchange 2003**
A 20-page technical summary of a full test configuration, process, and results.

TIPS FROM THE TRENCHES

NetApp Storage Arrays:

A Viable Solution for Exchange Server?

Q&A with Patrick Cimprich, Chief Architect, Avanade

A former NetApp skeptic shares the results of a nine-month eval involving 115 million e-mails; over 15 billion IOPs; and multiple server platforms, iSCSI transports, and FC SAN configurations.

More »

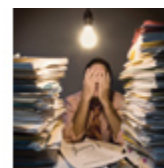
Death By Scale:

Three Secrets to Avoiding it

John Hanna, Product Engineer, NetApp

Ever wonder how IT teams manage thousands of terabytes of data with only a handful of people? See how NetApp is helping customers of all sizes succeed in the face of massive data growth.

More »



CUSTOMER SPOTLIGHT

Infosys Transforms IT from Cost Center to Center of Excellence

Pritam Kumar Sinha, Systems Manager, Infosys

See how one IT team cut backup windows from 12 hours to seconds, released 1,000 square feet of data center space, and saved over \$2 million.

More »

TECH ONTAP ARCHIVE



PATRICK CIMPRICH

Chief Architect—Infrastructure & Security Solutions, Avanade®

Patrick Cimprich has 17 years IT experience in systems consulting, software development, and IT operations, including extensive involvement with storage systems, large-scale application infrastructure environments, SAP systems, and application development in Microsoft® Windows®, UNIX®, and mainframe environments. At Avanade, a leading technology integrator specializing in the Microsoft enterprise platform, Patrick has global responsibility for designing and delivering tools used by Avanade customers and consultants to deliver infrastructure and security solutions.

NetApp Storage Arrays: A Viable Option for Exchange Server?

Avanade is a leading systems integrator that focuses on the Microsoft enterprise platform. Recently, Avanade undertook a comprehensive series of tests to validate the capabilities of NetApp storage systems for use in Microsoft Exchange environments. Tech OnTap caught up with Avanade Chief Architect Patrick Cimprich to learn more.

Q: Before we get into specifics about test setup and results, could you explain at a high level why storage is such a critical element of an Exchange infrastructure?

The way Exchange Server treats storage is atypical of any other application that's out there. Due to the small size of Exchange I/O transactions and the large number of them, Exchange is a poor storage citizen and back-end storage has to work very hard to keep up. The sizing and scaling limiter of any Exchange implementation has historically been storage, making it the key element of an Exchange deployment.

Q: What were the main motivations that drove Avanade to test NetApp storage with Exchange?

Over the years, Avanade has encountered NetApp a number of times in various projects. Recently, we've begun seeing NetApp storage more and more frequently, and our customers have been asking for our guidance on NetApp solutions.

We thought it was time to take another look at NetApp technologies, which have evolved significantly over the last few years, so that we would be better equipped to respond to user requests.

In our Avanade Test Center we developed a rigorous test plan and worked with NetApp to evaluate its products to test how they perform with Microsoft Exchange Server 2003.

Q: We understand you were skeptical about NetApp at the outset. Why was that?

To be frank, in the past, there were many within Avanade who kept NetApp at arm's length. This was largely due to the fact that our early experiences with NetApp occurred before NetApp offered Fibre Channel SAN and iSCSI. Trying to support Windows applications that require block I/O on a NAS platform was difficult at best.

When we started seeing more and more demand for NetApp from customers, we still thought of NetApp mostly as a NAS company. We didn't know if its SAN products were really capable of meeting the punishing I/O demands of Exchange Server 2003.

And, to be completely honest, my own attitude toward NetApp was lukewarm at best. I have over a decade of experience with various storage technologies and a very

Sneak Preview: A 680,000-Mailbox Proof of Concept



This report will be published in June; Tech OnTap members can [read the report now](#) and submit feedback to the authors.

RELATED INFORMATION

- [Avanade Test Center Evaluation Results \(pdf\)](#)
- [Backup, Recovery, and DR for Exchange Server 2007](#)
- [Sneak Preview: 680,000-Mailbox Exchange Server Proof of Concept](#)

Avanade Test Configurations

NetApp storage:

- FAS3050 (Active/Active)
- 168 x 144GB 15K RPM FC drives
- 8 x 2 Gbps FC SAN connections
- 8 x GBE connections
- Data ONTAP® 7.0.2

Exchange environment:

- Single server
- 6,000 seats
- Four Exchange storage groups, with five databases per group (20 total)
- One I/O per user per second
- Mailbox limit of 150MB per user

Overall, this was a simple Exchange implementation that included a domain controller, a separate Exchange server for public folders, an Exchange mailbox server, and various load-simulation clients.

Servers.

- IBM BladeCenter HS40 (four x single-core Intel® Xeon)
- Sun™ Fire V40z (rack mounted, four x dual-core AMD Opteron)

Read the full [Avanade Testing Center Evaluation of NetApp Storage Arrays](#).

comfortable understanding of EMC technology in particular. Given how different NetApp is from other storage technologies, I wasn't sure how the tests would turn out. I definitely came in with a healthy dose of skepticism, and I didn't expect this to be a complete success.

Q: And are you still skeptical?

No. Definitely not.

From a performance perspective, most of the results we saw were in line with similar configurations from other vendors. Latency was in an acceptable range, with disk reads and writes well below Exchange's 20-millisecond threshold in all of the configurations we tested.

In addition, NetApp has a great value-add in its ability to create and store multiple Snapshot™ copies without any performance hit. This was definitely one of the coolest things I've learned in this experience; NetApp Snapshot copies are great. Overall, I found NetApp storage much easier to learn and manage than any other storage environment I've worked with in the past 10 years.

Q: Let's talk more about the testing process and how a former skeptic became a believer in NetApp SAN solutions. Can you give us an overview of the tests you conducted?

One of the guiding principles that I established when we went into these tests is that whatever we test must be supported, "normal" configurations. We had to choose configurations that we could pick up the phone and call the vendors involved and get support for. That meant no beta or alpha code, only general availability hardware and software, and all configurations had to be on the Microsoft hardware compatibility list. In other words, we did exactly what most customers would do. We picked configurations that are supported and certified and that reflect what we're designing for customers out in the real world.

At a macro level, the testing that we did was to establish how NetApp performed as a storage target for Exchange Server 2003. To do that we ran through a whole host of tests, starting with a basic load test using **iometer**. This gave us a baseline and helped us ensure that we knew what we were doing since we were relatively new to NetApp.

Then we moved into a series of Exchange Server 2003 tests using Microsoft supplied tools, each targeted at different levels of the Exchange Server 2003 stack.

We looked at disk performance and how user response times correlated to disk latency in terms of reads and writes, how the data was read across NetApp volumes, and how the entire system reacted to load.

Our testing was executed over the course of nine months. Overall, there were on the order of 115 million e-mails sent and 15 to 20 billion IOPs. We did very thorough testing and collected performance data throughout, as well as all the analysis required to understand what the data meant.

We tested across a number of different server platforms—blades and traditional servers—and we also tested a variety of iSCSI transports (iSCSI cards, TOEs, built-in NICs, HBAs, and so on) and Fibre Channel SAN configurations.

Q: Could you talk about the first Exchange-specific test using Jetstress?

The first Exchange-specific test we ran used the Microsoft **Jetstress** utility. This test directly simulates Exchange patterned disk I/O. It's specifically designed to ensure that any storage subsystem you are planning to put in place for Exchange Server 2003 will meet the expected I/O demand, which in this case was 6,000+ IOPs.

We configured the NetApp storage system and our Exchange servers exactly as we would use them in a customer deployment. We used 64 drives for Exchange data and logs and configured four Exchange storage groups with five databases per group. Logs and databases were in separate aggregates. A separate LUN of 384GB was created for each storage group plus a corresponding 115GB LUN for logs.

Once again, the results of this test were in line with similar configurations from other vendors. The key number in this test is latency. Twenty milliseconds is considered the

**Avanade Testing Center
Eval: NetApp Storage
Arrays**



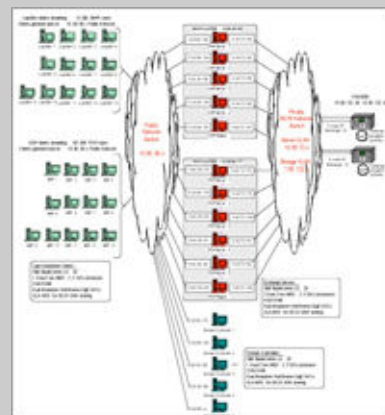
This 10-page white paper details the benchmarks and results of Avanade's in-depth lab study.

**Sneak Preview:
A 680,000-Mailbox, iSCSI-
Based Proof of Concept**

In June, NetApp will publish a new technical report describing the "proof of concept" test of a 680,000-user Microsoft Exchange Server 2003 hosted messaging solution for a large telecommunications and messaging service provider.

This 20-page paper details the full test configuration (including Exchange server, NetApp storage, domain controller, and load generation client configurations), testing process, and performance test results.

Tech OnTap members are invited to read the report now.



**Streamlining Storage for
Exchange Server 2007**

See how deploying Exchange Server on NetApp storage can help you ...

- Improve Exchange availability
- Streamline Exchange deployments
- Achieve granular retrievals of individual attachments, e-mails, and mailboxes
- Increase backup frequency without impacting end users or system performance

Watch the Webcast, [Streamlining Storage for Exchange Server 2007](#)

Additionally, new features in Exchange Server 2007 like LCR and CCR will affect some storage environments.

Read [Backup, Recovery, and DR for Exchange Server 2007](#)

ceiling. If latency exceeds 20 milliseconds, Exchange begins to fail. All FAS3050 configurations exceeded 6,000 IOPs and passed with an average response of 15.5 milliseconds, a very good result. [Ed note: This refers to reads.]

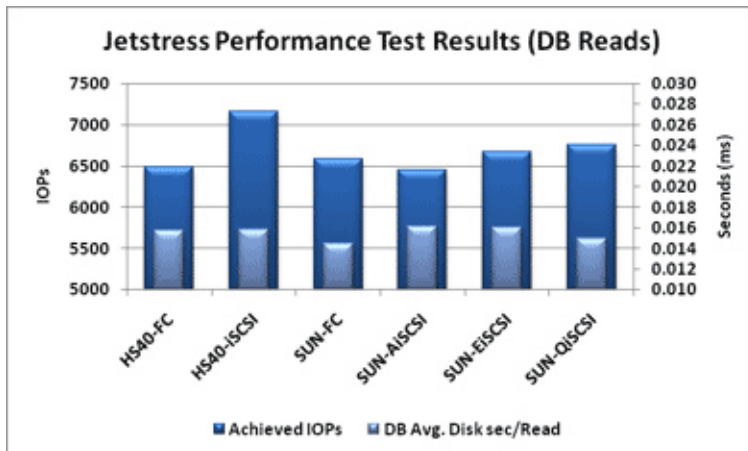


Figure 1. Jetstress test results. Shown on the chart are total IOPs as well as latency for Exchange database reads. Results are shown for the various server and storage transports used during the test. For example, HS40-FC is the code for the IBM HS-40 server using the Fibre Channel interface.

Q: What about the next Exchange-specific test using LoadSim?

Walking up the stack from an Exchange point of view, this test exercises the next layer of functionality in an Exchange system and tests the whole configuration from end to end. This test was executed using the same configuration as the Jetstress test with Exchange loaded on the servers. A simulation tool from Microsoft called **LoadSim** was used to actually transport mail messages within the Exchange system. In this test we're looking at the corresponding disk load on the tail end while keeping in mind the user response time.

LoadSim creates a score after weighing a whole series of factors such as how long it takes to send a message, how long it takes to read from disk, and how long it takes to write to disk. The scores are measured in milliseconds. Microsoft considers a score of 1,000 milliseconds (1 second) a passing score.

All NetApp scores were below 500 (half a second). These represent outstanding performance and once again are consistent with other vendors. Disk reads and writes were well below the 20-millisecond threshold in all cases.

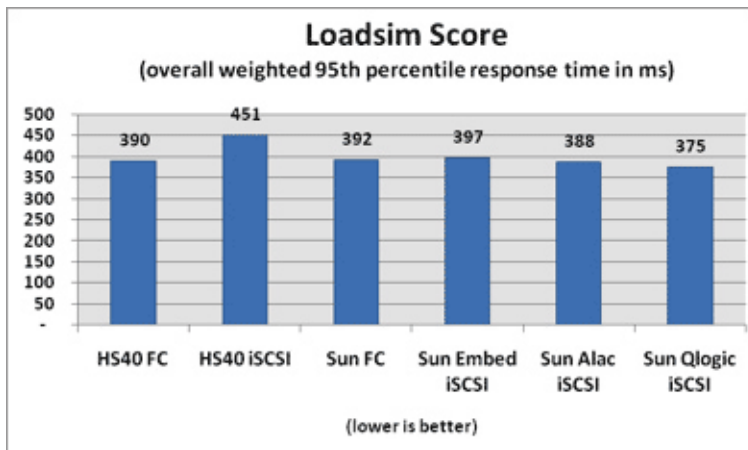


Figure 2. LoadSim scores for the various server and transport configurations used during the tests.

Q: Did you test NetApp capabilities for backup and recovery?

Yes. We specifically looked at storage-based backup and recovery for Exchange Server 2003—for NetApp that means Snapshot copies. We performed three backups a day under load: one at 7 a.m., one at noon, and one at 7 p.m.—a realistic scenario. We ran this test over a period of five days. When we started there were no saved backups. Over the course of the test, we added backups until we got to the point

where there were seven backups. Once we got to Snapshot number eight, we rolled off the earliest backup and maintained a set of seven rolling backups for the remainder of the test.

If you're interested in more specifics, check out the [white paper](#).

Throughout the entire duration of the test we measured end user response time, storage latency, disk latency, and so on. We saw no performance impact as additional Snapshot copies were added. Database latency stays flat at four milliseconds (20 milliseconds is the ceiling), and client latency averaged 167 milliseconds (1,000 milliseconds is considered the ceiling).

These results are outstanding and I believe are a significant differentiator for NetApp. Other storage vendors can typically only achieve similar results using full copies or clones of the disk, not snapshots. Full copies are obviously much more expensive in terms of disk space and the cost of maintaining multiple backups. If customers are new to NetApp, I believe you should definitely take the time to study and understand how NetApp Snapshot technology works versus snapshots from other vendors.

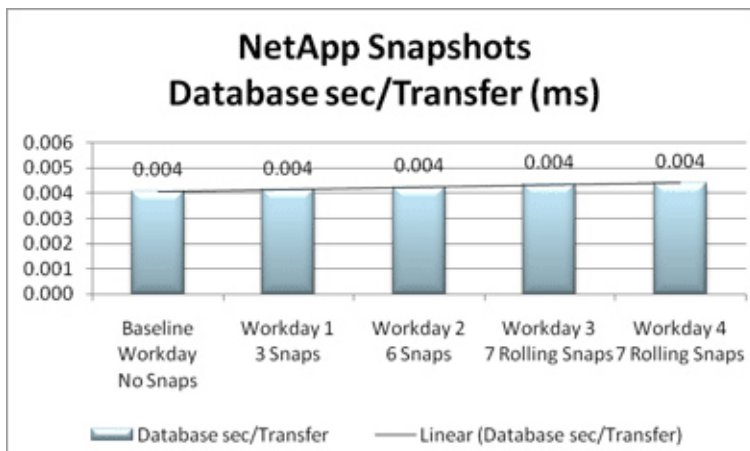


Figure 3. The performance impact of adding additional Snapshot copies was negligible.

Q: What about SnapManager® for Exchange and Single Mailbox Recovery?

We leveraged SnapManager for Exchange as the execution tool to coordinate and configure all the Snapshot copies that we did in our backup and recovery tests. I think that was another highlight of the testing. The ease of installation, the ease of use, and the fact that it just worked and wasn't complex were all clear advantages. The tool is targeted specifically at Snapshot backups for Exchange. Quite frankly, it was a pleasure to work with relative to other tools I've used.

We did not use Single Mailbox Recovery as part of this test, but I do have experience with it. I think this is another highlight for NetApp in the context of Exchange. A lot of vendors provide similar functionality, but the integration that NetApp provides again makes the tools simple, direct, straightforward, and easy to use versus single mailbox recovery tools from some other vendors.

Q: Disaster recovery can also be a critical element of Exchange infrastructures. Did you look at NetApp DR capabilities?

Not in these tests. That was beyond the scope of this evaluation.

However, I recently did a frame swap for the NetApp system I have in the lab. I used SnapMirror® to do the whole migration. I was able to migrate 10TB from one system to another in about 16 hours of execution. Three-quarters of that time was spent waiting for data to replicate. This was the first time I'd used SnapMirror, and I'd never done this type of migration on NetApp. I accomplished the whole thing with very little planning. I have years of experience with other storage platforms, and there's no way I would even have attempted this with any other storage array.

Q: How does NetApp storage compare with other storage systems you've configured for Exchange?

NetApp performed on par with other storage vendors. When it comes to Exchange, the most critical factor is the number of spindles, so I wouldn't expect any storage system to differentiate itself with significantly greater performance. Cache is always swamped; it does not matter. Barring a serious bottleneck to disk I/O in an implementation, it boils down to a wash from a performance perspective. So, the important question becomes "how easy is the system to install and manage?"

Implementation is where you really see the NetApp difference. It's in the way NetApp goes about combining the power of those disk drives in terms of virtualization and administration. The NetApp approach to Snapshot copies and Snapshot integration with applications is better than other storage vendors I've used. Speed of configuration, ease of configuration, day-to-day operations, and management give NetApp a leg up on the competition.

It took roughly 10 steps to configure NetApp for our 6,000-user Exchange configuration. It was so straightforward, I was able to train one of our interns to assist in the execution of these tests. He's a bright guy, but I would have been very nervous asking him to manage other storage platforms.



**OnDemand
TechTalk Webcast:**
Simplifying & Scaling
Storage for Exchange
Server 2007

Q: One question that comes up over and over is whether customers should choose Fibre Channel or iSCSI as the storage infrastructure with Exchange and other applications that require block-oriented storage. Did the Avanade Test Center review shed light on that question?

Apart from the NetApp performance, this in my opinion was one of the most interesting results we got from the test. I was an iSCSI skeptic going in, thinking that it wouldn't be able to perform as well as Fibre Channel. After billions of IOPs and millions of e-mails there was zero difference, and sometimes iSCSI actually beat Fibre Channel. Granted, when iSCSI "beat" Fibre Channel in these tests, it was really rounding error, but the point is for these tests with our Exchange load, there was no substantive difference between Fibre Channel and iSCSI. Based on this assessment, I am very comfortable encouraging customers to consider iSCSI as a viable solution for enterprise-class configurations.

Again, there's a lot more detail about these tests and the results in the [white paper](#). Additionally, I recently spoke with *ComputerWorld* about 10 Gigabit Ethernet and iSCSI. There's a lot of interest out there, and I think we'll all be hearing a lot more about this.

Q: Is there anything else you learned from this testing that you think would interest Tech OnTap readers?

Overall, I think it's really telling how NetApp evolution as a company translates into less complex hardware and software. NetApp started out providing solutions for smaller requirements—departmental needs and smaller divisions—and has grown up into the data center. The way NetApp approaches hardware and software is very much geared toward less complexity and less operational overhead. In the Avanade Test Center we found it to be easier to configure, easier to set up, and there's a single operating system across the entire line.

Some competitors offer management products that have a broader scope. They cover not just Exchange, but SQL Server, file service, and so on in a single product. This strategy does have advantages, but it's more difficult to install and maintain. NetApp gives you a set of products targeted to particular applications that are easier to configure and maintain and give you the functionality you care about.

Want to learn more about Avanade's testing? [View the full test report](#).

TECH ONTAP ARCHIVE



John Hanna

Product and Partner Engineer, NetApp

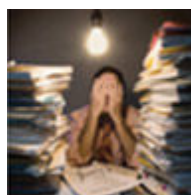
John has been with NetApp in various capacities for almost 7 years, including 2 years as a consulting systems engineer for the NetApp West Coast region. Since joining the Storage Management Group, John has focused exclusively on NetApp Operations Manager, associated plug-ins, and other related management products. As the subject matter expert for Operations Manager, John spends his time documenting best practices, developing training materials, and in the field being grilled by storage administrators.

Death by Scale: Three Secrets to Avoiding It

By John Hanna

NetApp has built its reputation on simplicity and ease of management. Despite this success, however, it is becoming obvious that modern IT is quite literally awash in data – a rising tide of information that threatens to overwhelm even the most disciplined and well-funded IT departments. Increasing complexity and management difficulty are the inevitable results of continued storage infrastructure growth.

So what happens when the five systems and 35TB you were initially managing become 100 systems supporting 1000TB? Many companies are experiencing annual data growth of over 50% plus increased retention requirements, which means that in just a few years your data could easily triple or quadruple. How are you going to manage an environment that is expanding exponentially?



You hear about companies managing petabytes of storage with just a few dedicated storage admins. One company that I can't name publicly had over 5,000TB of NetApp storage worldwide (5 petabytes!) across over 600 storage systems the last time I checked in with them. To make matters more complex, the footprint has at least doubled every 12 months.

This particular customer has eight people dedicated to storage at its HQ and various worldwide locations, and relies heavily on three dedicated NetApp support engineers. That's an average of just over 450TB per person!

How do companies manage that much storage??

In this case, the company has standardized on a minimum number of server, database, and storage vendors. The fact that NetApp uses a single operating system for its entire range of products – from entry-level systems to high-performance primary storage to near-line storage – is a significant advantage for them. But obviously these are not the only keys to their success.

In this article, I'm going to talk about three ways NetApp engineers are designing products that can help customers of all sizes succeed in the face of massive data growth:

- **Scalability Secret #1: Become a grouper**
- **Scalability Secret #2: Don't reinvent the wheel**
- **Scalability Secret #3: Delegate, delegate, delegate**

NetApp is developing a suite of management software that uses these secrets to best advantage to bring simplicity to the management of large amounts of storage. NetApp Operations Manager (Ops Mgr, formerly called DataFabric® Manager or DFM), is the

RELATED INFORMATION

- ✦ [NetApp Vision for Management: From Reactive to Proactive Admin](#)
- ✦ [Three Backup/Replication Management Challenges Solved](#)
- ✦ [Tech Report: Protecting Data with Policy-Driven Data Management \(pdf\)](#)

Manage More with NetApp Operations Manager

NetApp Operations Manager (Ops Mgr, formerly known as DataFabric Manager or DFM) is the foundation of the NetApp Manageability Software family.

Other NetApp manageability products, such as Protection Manager and upcoming products, run on top of Ops Mgr.

Ops Mgr offers rich functionality including:

- Auto-discovery
- Hierarchical grouping
- Event monitoring and alerting
- Data ONTAP configuration management
- Predefined and custom reporting
- Role-based access control to admin services
- Access audit log

Top technical reports:

- [MultiStore Discovery, Monitoring, and Reporting \(pdf\)](#)
- [Custom Reporting With Ops Mgr \(formerly DFM\) \(pdf\)](#)

foundation of this approach. In the following sections, I'll refer specifically to Operations Manager and related products.

Scalability Secret #1: Become a Grouper

NetApp Solution: Hierarchical groups can save you hundreds of hours every year, versus dealing directly with individual assets.



If you were hoping to find out how to become a large tropical fish in this section, sorry to disappoint you. (If anyone knows that secret, please get back to me.) The type of grouper I'm talking about is the kind that groups things to make them simpler. Any time you can group related storage assets together and operate or report on them as a whole, you can save a lot of time and manage more storage with fewer people.

The hierarchical grouping feature of NetApp Ops Mgr lets you create logical groups to significantly simplify management, monitoring, and reporting tasks. Ops Mgr allows sets of storage assets – storage systems, volumes, LUNs, etc. – to be organized into groups that match the way your organization uses the assets – by location, by project, by application, by department, etc. By establishing appropriate groupings you can do filtered reporting, maintain better control over sets of resources in less time, and target alerts specifically to resource owners so that problems are directed to the best people for quick resolution.

Each group is represented by an icon in Ops Mgr that allows you quickly monitor and manage the group or drill down to see historical trends or real-time information, or to access individual group assets. Each group icon is accompanied by an alert icon that lets you immediately see all alerts that are relevant to that group.

Assets can belong to more than one group, and one group can contain another. For instance, you might define a regional group that contains several data center groups. Each data center group might consist of primary and secondary storage groups, or groups based on application type, or both. You may also want different groupings for business purposes and reporting versus day-to-day management. Obviously, deciding the best way to define groups takes some thought, but the up-front work pays off.

Once groups are configured, you can quickly dive into filtered views of information that pertain only to the group you're interested in. For instance, you might define a group that contains all the storage assets used by a corporate database. By drilling into that group, you can see everything about the underlying assets, down to the level of a broken disk, while excluding everything that isn't of interest.

NetApp has also applied this approach to backup and disaster recovery. If you want to protect a group of storage assets using the same policy, you can simply group the storage assets into the same "dataset" using a tool called NetApp Protection Manager. On the back end, resource pools group secondary storage to simplify management and increase flexibility. Read [last month's article on Protection Manager](#) or watch the [demo](#) to learn more.



- [Ops Mgr \(formerly DFM\) Sizing Guide \(pdf\)](#)
- [Storage Performance Management \(pdf\)](#)

Or take a [guided tour of Ops Mgr](#).

Simplified Backup and Replication Management with NetApp Protection Manager

Protection Manager is an intuitive, policy-based management application for NetApp disk-based backup and replication technologies, including SnapMirror®, SnapVault, and Open Systems SnapVault.

This tool enables administrators to apply predefined policies to their data, thereby eliminating ambiguity and the potential for error inherent in manual management.

A new demo shows how Protection Manager solves three common management challenges:

- How do you make sure that everything is protected when data is distributed everywhere?
- How do you scale your data protection environment without spending all day on tedious manual tasks?
- How do you rapidly roll out global changes across all sites and systems?

[Watch the demo.](#)

Read [Three Backup and Replication Management Challenges Solved](#)

Scalability Secret #2: Don't Reinvent the Wheel

NetApp Solution: Avoid custom configuration whenever possible.

This one seems obvious enough, but in the absence of the right tools and the right planning, too many of us end up repeating the same time-consuming processes over and over again. To help avoid this type of problem with storage configuration, the customer I mentioned earlier worked closely with NetApp SupportEdge Services to track usage patterns in different organizations and geographies, and has developed processes to account for these differences during capacity planning and forecasting. They have established standard storage system configurations to meet the distinct requirements of a range of applications, eliminating the need to create a custom hardware and software configuration for each new storage system.

The Data ONTAP Configuration Management feature of Ops Mgr lets you maintain the same Data ONTAP software configuration across multiple systems. This includes all system configuration information such as administration options, audit, AutoSupport, and CIFS and NFS options, plus many of the standard system configuration files (for example usermap.cfg and hosts.equiv). After you install a new storage system, you can quickly apply a configuration, and you're ready to provision volumes or LUNs and go to work.

You can create a configuration template either by pulling it from an existing system or by creating it from scratch, and then assign the template to a configuration group. Configuration groups are also hierarchical – one group can contain another, enabling configuration templates to inherit the configuration details from the group above.

Whenever you add a new storage system, you can simply push the appropriate configuration to it, and all the appropriate options are set automatically, shortening the amount of effort needed to scale out your storage infrastructure.

Once a system is configured, you can monitor to ensure configuration compliance and receive alerts if the configuration on a system changes. If a configuration change has occurred, you can correct it by simply pushing the template out to the system again.

Again, NetApp has applied this approach in a similar way to simplify adding backup or disaster recovery for new data. Unless the data requires some unique protection policy that doesn't apply to anything else you've got, you can add protection with one or two clicks using Protection Manager. Even creating and applying a brand new policy only takes four steps.

NetApp Ops Mgr Guided Tour



Scalability Secret #3: Delegate, Delegate, Delegate

NetApp Solution: Role-based administration lets you grant the ability to perform specialized tasks to other admins without giving up control.

The only thing better than doing a job quickly and efficiently is getting someone else to do it. One of the trends that has occurred as IT infrastructures have become more complex is increased specialization. Today we have server admins, application admins, and storage admins. Within the storage admin category, there is a trend toward subspecialties such as backup, monitoring, and provisioning. Additionally, these roles are increasingly distributed across multiple locations and data centers.

Obviously, you would like each person to be able to carry out the specific operations they need to perform without necessarily giving everyone the keys to the kingdom. Ops Mgr uses role-based access control (RBAC) to allow you to delegate the ability to perform particular tasks on a particular set of assets to particular people. For instance,

a backup operator might be able to kick off jobs in the local data center, but not define or change what those jobs consist of or perform any other tasks for which he or she is not authorized. This provides protection from both mistakes and malfeasance. It also makes it possible to delegate particular, well-defined storage tasks to application or server admins so that they can perform limited storage tasks without always involving a storage admin.

Roles are assigned to users or groups based on defined responsibilities. Each role consists of one or more capabilities, or possible actions, plus resources such as storage systems or volumes that can be acted on.

With Global being the highest group in the hierarchy, the next level down (one level down from Global) can be defined as a resource available to a role. An example using the graphic in the previous section would be that a role defined for business report access and no management could be restricted to view data only in the Business Reports level of the hierarchy, completely locking that role from being able to view anything in the Storage Ops level. This restriction of access to groups, in roles, exists only for the first level down from Global in the hierarchical groups. The backup operator role discussed earlier can initiate or schedule backups only within a certain group. A backup administrator role might inherit the backup operator role plus include the ability to create backup relationships and perform restores across the enterprise. These capabilities make it easy to distribute administration tasks across the enterprise for improved scaling without sacrificing security or risking disaster.

What Is the Future of Data Management?

These are a few of the things that NetApp manageability tools do today to help keep your storage infrastructure manageable, even in the event of exponential growth. And, to deliver our ultimate vision for how storage environments should be managed, NetApp continues to build on the core functionality Ops Mgr and leverages an Integrated Data Management approach.

Integrated Data Management is about integrating the underlying data and storage management processes into the data administrators' (App admin, DBA, Exchange Admin, Server admin, backup admin etc.) view of the world. This enables the data administrator to carry out some of the data management tasks themselves within the confines set by the storage administrator. This not only increases the flexibility and productivity of data administrators but it also improves the productivity of storage administrators and allows the storage administrator to focus on high value tasks and at the same time have the necessary control over the infrastructure.

NetApp engineers are working on an additional suite of products that leverage and complement Ops Mgr to streamline particular tasks. Protection Manager, which was released earlier this year, is the first phase of this effort. This policy based management application simplifies the configuration, management, and monitoring of Snapshot copies, disk-based backup, and replication across your entire NetApp storage infrastructure, and can incorporate other servers and storage using Open Systems SnapVault (OSSV). In the future, NetApp will add additional tools to its manageability family including an enhanced version of the existing Performance Advisor as well as a tool to facilitate rapid provisioning.

Ultimately, NetApp believes that building more and more tools solely designed for storage administrators is a losing battle. Instead, NetApp is committed to removing the one-off requests barraging these folks (which have turned them into storage help desks), delegating administration tasks across the admin tiers in an organization and automating processes across the stack controlled by storage administration policy. And that's how we help our customers avoid death by scale.

TECH ONTAP ARCHIVE



Pritam Kumar Sinha

Senior Project Manager, IT, Infosys Technologies Limited

Pritam has nearly 10 years of experience in system integration, with broad exposure to all areas of modern IT infrastructure. He is currently responsible for IT infrastructure services in the Infosys Product Engineering division, and provides consultancy in IT and infrastructure consolidation to other internal business units. He was in charge of managing all phases of implementation and rollout for the consolidation project described in this article. Pritam and his group are recipients of a 2006 Innovation Award from NetApp.

Infosys Transforms IT from Cost Center to Center of Excellence

By Pritam Kumar Sinha

A few years ago, Infosys was faced with a serious infrastructure problem in its Offshore Development Center (ODC) in India. This data center supports a variety of product engineering projects focused on telecom. These projects were slated for a significant ramp-up, which required the Information Systems (IS) support team to significantly scale up the IT infrastructure. The constraints to scaling up were many: zero space availability, end-of-life (EOL) servers, and inefficient backup/recovery.

To make matters worse, the IS staff was under tremendous stress in terms of bandwidth to respond to end-user needs due to the wide range of services offered as well as the heterogeneous systems we were supporting. This resulted in a dip in our internal customer satisfaction, which we monitor regularly using a CSAT survey tool to collect feedback.

The procurement of new servers was costing a huge amount of money and impacting operating margins. In our project-oriented working environment, the traditional approach had been to add discrete servers to support specific projects rather than look at IT from a more strategic viewpoint. The existing IT infrastructure consisted exclusively of standalone servers connected to direct-attached storage. This included a heterogeneous assortment of HP, Dell, and Compaq servers running operating systems that included Windows® NT 4.0, Windows 2000, Windows 2003, HP-UX, Solaris™, RHEL, Fedora, etc. Up to 70% of the servers had reached their end of life, and the cost of simply replacing them was going to be huge.

This prompted my team (with support from senior management) to look for an innovative solution that would cater to all our needs using a technology that is future proof, low cost, robust, and scalable. We settled on a comprehensive server and storage consolidation strategy using NetApp to meet our storage, backup, and business continuity needs.

To achieve this vision, the IS team took a methodical and systematic approach to address these challenges, including:

- Gap analysis of the existing infrastructure
- Identification of areas of improvement and classification of focus areas
- Analysis of bandwidth availability within the support team

Infosys vision:
"To provide cost effective, best-in-class infrastructure by leveraging technology and excellence in operations in line with business requirements"

RELATED INFORMATION

- ✦ [A Case Study: How NetApp IT Achieved 60% Utilization While Saving 40,000 kWh per Month](#)
- ✦ [How One IT Team Is Evaluating a Backup Solution](#)

Infosys Overview

Infosys Technologies Ltd. (NASDAQ: INFY) was started in 1981 by seven people with \$250. Today, it is a global leader in the "next generation" of IT and consulting, with revenues of over \$2 billion.

Infosys defines, designs, and delivers IT-enabled business solutions that help Global 2000 companies win in a flat world. Infosys creates solutions for its clients by leveraging its domain and business expertise along with a complete range of services.

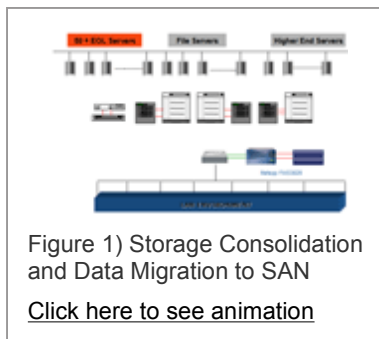
Infosys's services include business and technology consulting, application development, systems integration, product engineering, custom software development, maintenance, re-engineering, independent testing and validation services, IT infrastructure management services, and business process outsourcing.

Infosys has a global footprint with offices in 21 countries and development centers in India, China, Australia, the UK, Canada, and Japan. Infosys has over 72,241 employees covering 65 nationalities.

Four focus areas emerged from the initial evaluation:

- **Server infrastructure**
- **Storage infrastructure**
- **Improving backup**
- **Increasing efficiency/utilization**

As you'll see below, we have achieved dramatic improvements in every one of our focus areas. In fact, based on the measurable success this consolidation effort has achieved, we are now working with other departments to replicate this strategy throughout Infosys. Other development centers and our internal and external customers will benefit significantly from the combination of performance and simplified administration we've achieved through server consolidation and storage virtualization.



Key Result #1: Consolidation Enables 75% Server Reduction

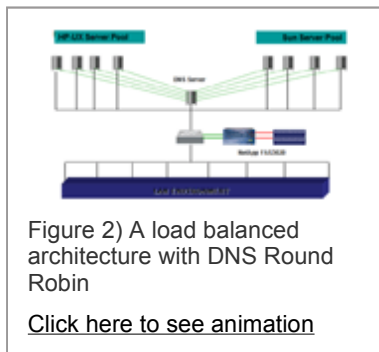
A concerted effort was made to replace multiple smaller servers with a few high-capacity servers to improve efficiencies in utilization as well as IT management bandwidth. The same approach was followed with our Product R&D applications, which were consolidated onto larger cluster-based servers.

When we started out, we had over 130 individual servers hosting more than 20 applications. Today, we have reduced the server count to 30 (a 75% reduction) while improving overall performance.

Key Result #2: Improved Efficiency through Storage Centralization

Multiple data repositories, used in various development environments, were combined into a single repository on a NetApp FAS3020 storage system with 8TB of capacity, yielding significant improvement in efficiency. NetApp Open Systems SnapVault software was used to help transfer and sync our existing 6TB of data from standalone servers to NetApp.

We chose the NetApp FAS3020 to ensure the solution is future proof in terms of technology. The storage system supports a variety of protocols, including Fibre Channel SAN, CIFS, NFS, and iSCSI. We serve files directly from the NetApp system using CIFS and NFS (eliminating the need for separate file servers). These protocols are used by design applications including ClearCase and other version control software as well as proprietary tools. At the same time, we were able to leverage our existing network infrastructure – including NICs and switches – and use iSCSI to support VMware, Exchange, our test environment, and our Web servers. This has been extremely cost effective, and required minimal additional training for our IT team.



We also use a DNS round-robin method across our server pools to provide load balancing and redundancy for in-house, proprietary applications as well as version control tools and development tools.

All servers in the pool are configured with a single fully qualified domain name (FQDN). Our DNS server resolves the name to the IP address of a server in the pool in a round-robin fashion. Since all the servers in the pool are connected to central storage, any server in the pool can access all the resources. Load is distributed among all servers with manual failover in case of disaster.

Key Result #3: Backup Windows Reduced 99%

To reduce backup time and stress on the LAN, we deployed Veritas NetBackup™ for centralized backup and monitoring combined with the NDMP option on the NetApp system and directly connected Quantum Autoloader with 16 LTO3 tape drives.

Using NetApp Snapshot™ technology, we can capture a stable, point-in-time copy of a file system in a few seconds. Then we use NDMP to back up the Snapshot copy to tape with no disruption to ongoing operations. We've effectively reduced our backup window from 12 hours to less than 10 minutes. The close integration of NetBackup and NetApp NDMP saves us two to three man-hours per day in administrative overhead versus our old backup solution. That's well over 500 hours a year.



**OnDemand
TechTalk Webcast:**
Increasing Backup
Efficiency with a
NetApp SnapVault®
Solution

We are currently plan to add NetApp storage at a remote site and implement asynchronous data replication from our existing storage system using NetApp SnapMirror® software. We believe this approach has the potential to further improve our business continuity and disaster recovery capability for critical data and applications.

Key Result #4: 70% Reduction in Data Center Footprint

Data center space was becoming a concern due to the large number of servers and old racks. This was leading to issues in managing growth. To address this, we moved from table-type racks to the latest shelf-type racks to optimize space. Between these changes and the reduction in server count, the overall data center footprint has been reduced from 1,500 to 500 square feet.

This represents a reduction of 70%.

Overall Impact

Each element of the solution has had a significant impact on operations in this data center, and Infosys has been extremely pleased with the outcome. The ODC is now considered a center of excellence in cost optimization. Significant results include:

Financial Benefits

- **Overall direct cost savings of \$2 million.** Primarily due to reduced hardware expenditures. This number excludes indirect cost savings such as electricity, AC, switch ports, etc.
- **Annual savings of \$41K on maintenance contracts,** a 45% reduction.
- **Recurring cost for business continuity planning reduced by 95%.** By switching to centralized backup on NetApp storage and using LTO3 tape, we've eliminated a huge number of existing low-capacity DLT and DAT drives. This in turn has reduced the number of tape cartridges necessary from 440 (various types) to 16 (LTO3s).
- **1,000 square feet of released data center space.** Over time we will utilize this freed space to meet growth requirements, significantly delaying the point at which we will need to add additional data center capacity, a significant cost savings.

Operational Benefits

- **Zero downtime and seamless migration to new infrastructure.** We leveraged NetApp Open Systems SnapVault to move data from servers to storage, which resulted in seamless migration without downtime. Once the data was transferred and fully synced, we simply changed our DNS server to point to the NetApp system instead of the existing file servers.
- **Backup time reduced from 12 hours to 10 minutes using NetApp Snapshot technology.** Plus we can restore a file from Snapshot copies in 30 seconds or in 10 minutes from tape.

- **Software build times reduced by 250%.** Improvements in both server and storage performance have significantly reduced build times, increasing developer productivity.
- **CSAT improved from 4.5 to 6.11 (out of 7 possible points).** More efficient support processes due to fewer, uniformly configured servers and centralized storage have allowed the IS team to spend more time on end-user requests to better meet end-user needs and improve satisfaction.

Congratulations

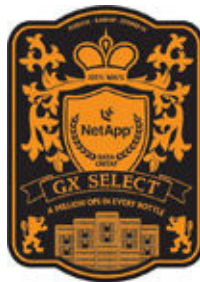
The NetApp Brand beer names flowed in, and your creativity spilled over.
After tallying the votes, we've identified the six winning names! ([Full list of nominations](#))



Tech OnTap
Insights for Simplifying Data Management
www.netapp.com/go/techtontap



Nominated by:
Rich Tolway, Solutions Architect



Tech OnTap
Insights for Simplifying Data Management
www.netapp.com/go/techtontap



Nominated by:
David Salisbury,
Storage Engineer



Tech OnTap
Insights for Simplifying Data Management
www.netapp.com/go/techtontap



Nominated by:
Darrin Droste, Storage Specialist



Tech OnTap
Insights for Simplifying Data Management
www.netapp.com/go/techtontap



Nominated by:
Darrin Droste, Storage Specialist



Nominated by:
John Smith, Anonymous IT Pro



Tech OnTap
Insights for Simplifying Data Management
www.netapp.com/go/techtontap

Nominated by:
John Smith, Anonymous IT Pro



Way To Go!

Last year, Tech OnTap sponsored the NetApp Brewing Company brewpub and invited members to suggest their own NetApp beer names.

Winning brews will be served at Tech OnTap events and showcased in the next Tech OnTap magazine. Brewmasters who created the winning names will receive a fabulous prize package, including a home brewing kit; Tech OnTap microbrew t-shirt; and much, much more.

