A NETAPP IT EBOOK FOR STORAGE MANAGERS

7 PERSPECTIVES ON THE FUTURE OF IT: THE DRIVE TOWARD BUSINESS AGILITY

NetApp

7 Perspectives on the Future of IT: The Drive Toward Business Agility

BLOGS

Introduction

The storage environment is undergoing rapid change as infrastructure delivery becomes both seamless and invisible in its support of business operations. Storage managers must be prepared to fully integrate storage into other areas of the stack, whether it's networking, compute, or database or application management. As IT budgets are flat or declining, the challenge is to meet these expanding IT goals using fewer resources.

A stable IT infrastructure environment that can assimilate frequent change is essential to meeting this goal. In the past, change translated directly to increased volatility. That paradigm is shifting as storage service levels and storage management software provide the structure and tools to deliver a predictable mode of operations that can accommodate frequent change. A stable infrastructure also fosters a more agile business application environment that enables IT work as to respond quickly to business demands.

The ability to support stability and agility is the result of a convergence of trends within IT. As the blogs contained in this eBook show, storage plays a key role in this IT evolution. Among the topics highlighted in the blogs:

- Mastering a strong, stable IT environment

- Trends affecting infrastructure delivery

- Using the data fabric to support the hybrid cloud

- New trends in data center power and capacity

- Streamlining business apps testing

- The DBA's changing role

We invite you to take the next step and meet with NetApp IT experts. They will share their real experiences using NetApp products and services, including All Flash FAS and OnCommand® Insight, in the NetApp production environment. Ask your NetApp sales team to arrange an interactive discussion with NetApp IT.

Mike Capener, CIO and VP Business Applications, NetApp IT

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Mastering a Strong, Stable IT Operation That Can Move as Fast as the Business Demands

MATT BROWN, CUSTOMER ENGAGEMENT AND NETAPP ON NETAPP PROGRAM, NETAPP IT

Remember those TV infomercials for Ginsu® knives that slice and dice but never need sharpening? Today's IT is a bit like a Ginsu knife. It faces an increased demand to operate in two modes. The "never needs sharpening" mode runs like a utility. It is transaction-based with an emphasis on maintaining operational stability and keeping the lights on. The second mode rapidly slices and dices, responding quickly to business demands with an agile time-to-market mindset and rapid application evolution.

Gartner Research refers to these two speeds as bimodal IT. It defines this as a form of IT "where slowly evolving, 'run-the-business' IT systems (Mode 1) need to coexist and interoperate with fast-changing and innovative 'transform the business' initiatives (Mode 2)."
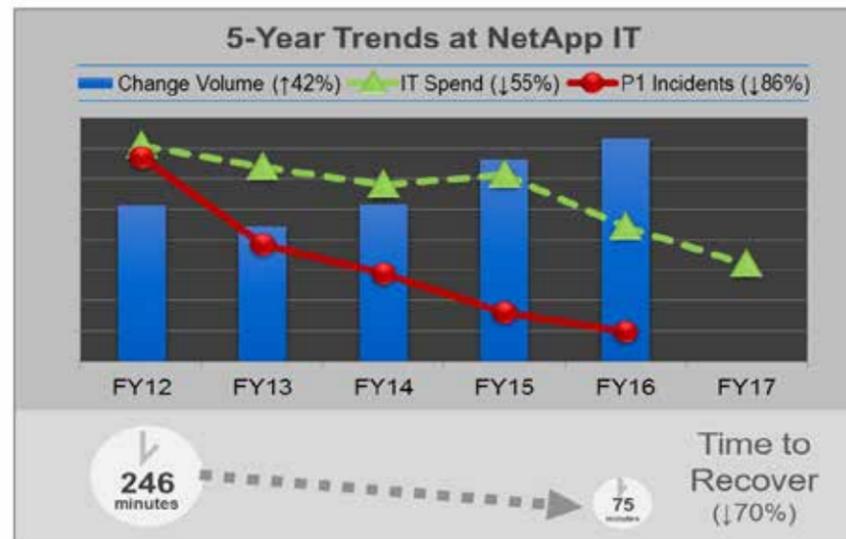
These two modes of IT could be viewed as counter intuitive and having conflicting goals—to provide stable operations, delivery, and support, but also to be agile, fast, and responsive. However, like the Ginsu knife, these are really compatible and complementary features. For most IT shops, becoming a true Ginsu knife takes time. It is a journey and stabilizing IT operations is the first step.

> *We saw success with a dramatic reduction in major P1 incidents and a faster return to service.*

Stabilizing IT

To get to an agile IT operating mode, we had to first create a stable environment capable of assimilating frequent and rapid changes. These changes include things like capacity upgrades, new technology introductions, and new features and capabilities. The goal was to provide a predictable, steady-state mode of operations regardless of the changes being introduced into the environment. Historically, we found that the more change introduced, the more volatile our IT environment became, and the more our teams behaved in a reactive manner.

To become really good at change management, we needed direct accountability. Key individual contributors were positioned into visible IT roles with accountability for end-to-end processes (or services). They were given clear responsibility for outcomes—both good and bad. With accountability, the individual assumes the responsibility to build and evolve processes and the flexibility to change things as the environment requires. By elevating key individuals with daily operational familiarity, we had both clear accountability and authority to enable the type of responsiveness we wanted from our IT operations. With this front line empowerment, the process and service owners did not have to stop and get permission; instead they acted quickly and delegated as necessary.

Evolution of the Change Management Process

5-Year Trends at NetApp IT

Change Volume (↑42%)   IT Spend (↓55%)   P1 Incidents (↓86%)

FY12 FY13 FY14 FY15 FY16 FY17

246 minutes ➞ 75 minutes   Time to Recover (↓70%)

Growing Change Volume, Declining P1s

With a goal to stabilize operations, we saw success with the dramatic reduction in major Priority 1 (P1) incidents, faster return to service, the ability to review and implement change quickly, and an overall shift from reactive to proactive mode. Over the past five years, our stabilization efforts have resulted in an 86 percent drop in P1 incidents and a 70 percent drop in the median P1 duration time to service recovery.

Along the journey, we adjusted our process to review and approve changes. Previously, the team met every two weeks to review more than 100 change requests in a meeting that took hours. By improving the process, we were able to do quick change reviews and approvals daily. In fact, we have been able to assimilate over 40 percent more changes into our IT operations while keeping major P1 incidents to a bare minimum. The time formerly spent on reactive activities, like change window negotiations, incident management, root cause analysis, and management follow-ups, has been redirected to proactive, value-added activities focused on creating better IT services.

Click here to learn how our IT infrastructure stability has improved the lives of our business apps teams.

In addition to improving the change process and assigning accountability to key people, we found NetApp technology contributed significantly to the stabilization of our IT operations.

Matt Brown, Customer Engagement and NetApp on NetApp Program, NetApp IT

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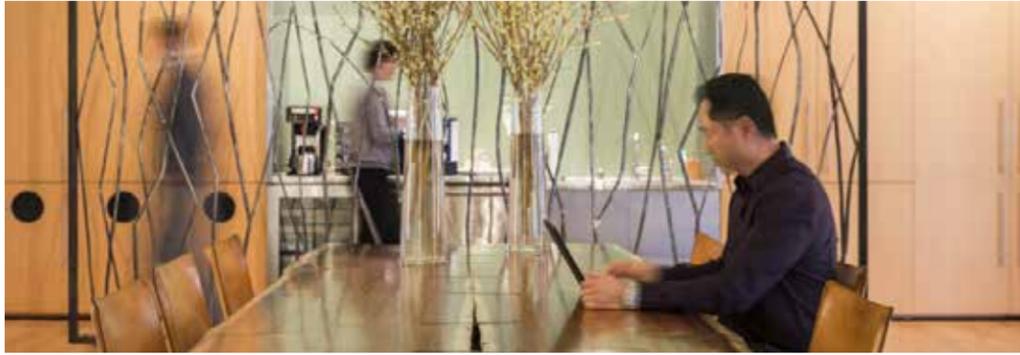
7 Lessons from NetApp IT's Journey to a Stable IT Infrastructure

MATT BROWN, CUSTOMER ENGAGEMENT AND NETAPP ON NETAPP PROGRAM, NETAPP IT

To be successful in today's fast-paced business world, IT must develop the ability to consume change at the rate of business while providing stable operations 24x7. Achieving this is more easily said than done, as I discussed in my first blog on why mastering a strong, stable IT operation is critical to becoming agile.

The first step is to stabilize IT operations. That means gaining the ability to quickly enable operational change while mitigating as much risk as possible. To do this effectively requires greater visibility into how the business is consuming IT assets and services. A mature configuration management database (CMDB) is the secret to unearthing this visibility. The CMDB serves as a single source of truth to manage the relationships between IT assets—from data center, network, virtual storage, etc., all the way up through business capabilities.

But like everything in IT, the move to a stable environment involves more than deploying new tools. We had to develop a new culture, improve skills, embrace automation, and create new policies and processes. We had to move from a reactionary mindset to one focused on proactive, non-disruptive service delivery.

Below are seven lessons NetApp IT learned as it transformed its approach and methodology to enable infrastructure operational stability:

1. Adopt an integrated IT workflow management platform. NetApp IT had separate workflows for incident management, root cause analysis, change management, infrastructure delivery, etc. Each process varied in maturity and was managed as a silo. To solve this, we adopted a central platform that integrated the separate processes into a single holistic workflow. Productivity improved as the time spent coordinating the hand-off of tasks between silos was eliminated. IT took a huge step forward in delivering IT as a service.

2. Evolve the use of the configuration management database (CMDB) to serve as a business relationship management tool. An accurate CMDB is essential to understanding an entire IT environment. Our CMDB has evolved from a simple system for infrastructure asset tracking (physical and virtual) into a tool that provides visibility all the way up to business use. We integrated OnCommand® Insight (OCI) with the CMDB to map virtual storage to its corresponding business services. This approach enables us to analyze consumption and then adjust operations as needed to meet service-level agreements (SLAs). Business relationship managers use the data to help business customers understand how they use IT services in business terms. The CMDB is the single source of truth for managing our IT environment.

Evolution of the CMDB

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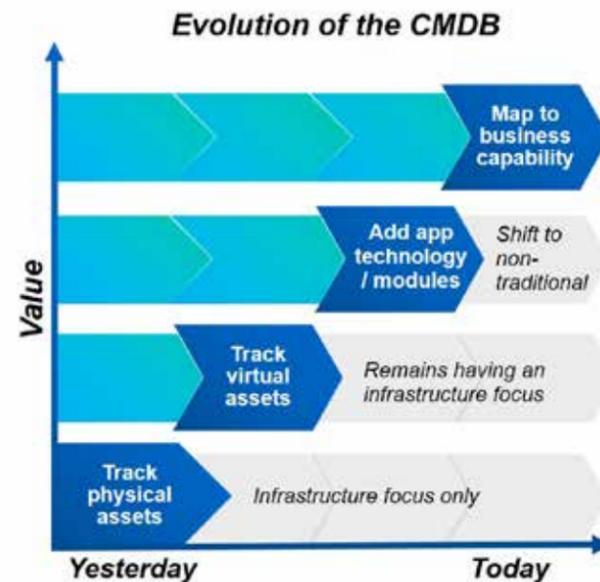
3. Embrace a rigorous change management process. IT's challenge is to facilitate change as fast as the business requires, without disruption. To do this we had to focus on three areas: people, process, and technology.

- *People.* We named a person to be accountable for change management (process, governance, adherence, etc.). Then we identified the right level of people to be part of the standing approval process. This ensures the right people are involved in the process at the right time, all changes requests are centrally managed, and the process remains efficient.

- *Process.* We developed a process that is supported by our workflow management platform. Our approval cadence is governed by a clear policy that is driven by business needs. By enabling a process that was integrated into our daily IT operations, we were able to move from a 10-day review cycle to a daily review.

- *Technology.* We used technology and tools to support this streamlined process. The CMDB delivers end-to-end visibility by serving as our single source of truth. OnCommand Insight updates the CMDB with daily discovery information about our virtual storage layer, keeping the data in sync.

With visibility and understanding of our IT environment from top to bottom and availability of the most current information in one place, we can perform risk assessments and system implementations, and make other decisions with minimal risk to daily business operations. More importantly, we significantly increased the rate at which we can consume change while

> *Customer success and business value are achieved when we put our business customers first.*

remaining operationally stable. Over time, we proved we could handle more change with minimal impact even as our budget shrank.

4. Use monitoring to manage and maintain a proactive operation. We have embraced a combination of proactive monitoring and reactive alerts to help maintain operational stability.

- *Proactive*: We define and manage thresholds with pre-set operational tolerances, then use a series of dashboards to manage those thresholds at an aggregate level. Our Help Desk/Command Center monitors the thresholds and proactively addresses potential issues before they generate a reactive alert and impact the business.

- *Reactive*: Because most potential performance issues are addressed through proactive monitoring, we have relatively few reactionary alerts. Administrators do not receive informational alerting. This creates a higher level of confidence in alert notifications with the admin team. They now know when they receive an alert that it is both urgent and requires immediate action.

5. Automate, automate, automate! In order for us to do more with less we have to rely on automation to remove people from repeatable daily activities or processes. The more we remove manual involvement from repetitive activities, the more our groups can focus on proactive activities that add value. First and foremost, automation delivers predictability by removing the risks of human error. It also offers other advantages: faster time to delivery, process consistency, a common user experience, and smoother hand-offs of tasks between groups. We have found that automation isn't a one-time deal; we are continually analyzing all our processes for that opportunity.

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6. Embrace standards over customization. One of NetApp IT's big mantras is standardization. Not just of physical and virtual assets, but of configurations and processes. Standards are applied to all aspects of how we run IT, including:

- Desiging and planned use of physical environments, like data centers

- Configuring, installing, and deploying virtual/physical assets

- Monitoring criteria of daily operations (in both the public and the private clouds)

- Administering lifecycle management

- Developing and testing business applications

- Implementing business continuity/disaster recovery plans

Having standards for our entire operations is the foundational cornerstone for operational stability. By adopting standardized practices, we are able to address about 90% of the technology delivery requirements and have provided 99+% stability on the operational side.

7. Look beyond infrastructure. As we began our drive toward greater IT stability, we focused on automating our infrastructure elements, including compute, storage, and network assets. Today we are pursuing development of the application layers of IT, including Platform as a Service (PaaS), a push-button service that will encompass the network layer through the application technology layer. Automating the entire stack will enable a faster delivery of business capabilities and add a new level of agility for IT.

Agility Builds on Stability
Operational stability, especially in infrastructure, is a big first step to achieving business agility and delivering IT as a service. NetApp IT has achieved a new level of stability by adopting its best practices and maturing the organization. This required moving from a reactive to a proactive mindset and a willingness to look at new ways to leverage technology, standards, and automation to support business needs.

These seven lessons helped NetApp IT gain the ability to stop worrying about our infrastructure and look for new ways to consume change at the rate of business. This trend should continue as we face our future challenges, including adoption of the hybrid cloud and PaaS. It will also help IT face its biggest challenge: recognizing that customer success and business value are achieved when we put our business customers first.

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Why the Data Fabric is Critical to Adopting the Hybrid Cloud

KAMAL VYAS, SENIOR IT SERVICE ARCHITECT, NETAPP IT

The Data Fabric is the foundation of NetApp IT's hybrid cloud data management strategy.

Data management is critical to any successful hybrid cloud strategy, especially when using multiple clouds. In a true hybrid environment, enterprises should have the flexibility to move applications across different public and private environments based on their business requirements and cost considerations.

Business applications are relatively stateless and can be easily brought up and down in various environments. However, data must be managed differently because it has its own unique characteristics:

- Life – Data needs to be maintained, synchronized, audited, archived, etc., throughout its lifecycle.

- Value – Data is a corporate asset that must be protected.

- Mass – Data requires time to move in/out of environments.

Cloud companies (such as Amazon Web Services (AWS) and Microsoft Azure) are aware of the demands of data management. They entice enterprises with a variety of perks (including free data uploads) to gain control of their data. The more data that cloud providers can control, the more they lock in their customers for the long term and the more revenue they generate. Our primary goal is to use the Data Fabric —NetApp's

vision for the future of data management—to control our data and avoid the vendor lock-in, among other things.

Data Management Considerations

Where data is hosted is critical to an enterprise data management strategy. It defines what type of choices and options an enterprise such as NetApp has as its cloud footprint grows. To provide IT with the maximum benefit of cloud services, a data management strategy should address the following five key areas:

- Secure control and governance of data regardless of its location, and guaranteed data privacy, as mandated by government policies and in-country laws such as Privacy Shield (previously Safe Harbor) laws.

- Access to data where and when applications need it to satisfy business use cases, including disaster recovery, business continuity, and archiving.

- Flexibility to migrate data and applications between different cloud providers, locations, etc., to avoid vendor lock-in.

- Data compliance with company requirements and the ability to satisfy audit and other governance processes, such as Sarbanes Oxley (SOX), HIPPA, IRS, etc.

• Lower total cost of ownership, including storage costs, personnel costs, storage efficiencies, lower data transfer costs, etc.

NetApp IT Data Fabric Overview

NetApp IT's Customer-1 program is the first adopter of NetApp products and services into our IT production environment. Customer-1's goal is to provide feedback to Product Engineering on a product's performance so that a more stable product can be delivered to customers.

Customer-1 implemented the Data Fabric as the underlying architecture of our hybrid cloud strategy. The Data Fabric enables IT to manage data across multiple environments using standard tools, processes, and governance methodologies, independent of cloud providers or locations.

The Data Fabric delivers three major benefits to NetApp IT:

Data storage. NetApp® ONTAP® is the foundation of our Data Fabric, including management of all our public and private cloud data. Our private cloud leverages ONTAP-enabled FAS systems. As mentioned in my previous blog, we leverage NetApp Private Storage (NPS for Cloud) and ONTAP Cloud (a software-only version of ONTAP) for our public cloud workloads. NPS takes advantage of high-speed direct connections from a nearby colocation provider to leading cloud providers such as AWS and Azure. It also provides private storage options to augment elastic compute capabilities from these cloud providers. ONTAP Cloud delivers the same enterprise class data management as on-premises storage. This enables NetApp IT to retain full control of our enterprise data at all times, irrespective of the data location or cloud provider

Data replication. Within the Data Fabric, we use the SnapMirror® replication and SnapVault® backup feature of ONTAP to move data between end-points. This seamless transfer of bulk data provides the underlying transport for our data across various public and private clouds to deliver a variety of business use cases such as application migration, data replication, disaster recovery, etc.

Data archiving. We use NetApp's AltaVault® and StorageGRID® storage solutions for hybrid cloud data protection and archiving. AltaVault integrates with our NPS and FAS storage systems to back up data to a multi-site StorageGRID object data store. This combination provides us a truly scalable and tapeless backup solution to meet our data archiving and compliancy requirements.

Data Fabric in Action

The Data Fabric enables the Customer-1 program to use the cloud as a flexible component in its integrated IT environment. We can choose the cloud that offers the right service level at the right price for that business customer. This framework opens up many benefits in how we manage our production environment:

• We have complete control of data at all times, irrespective of the application location/cloud. The same on-premises data governance, security, privacy, and compliance methodologies are applied to cloud workloads as well, enforcing consistency across our IT environment and minimizing risk.

• We can map the right workloads to the right clouds. When requirements change, due to performance or cost, we can easily move workloads in and out of a cloud without worrying about data
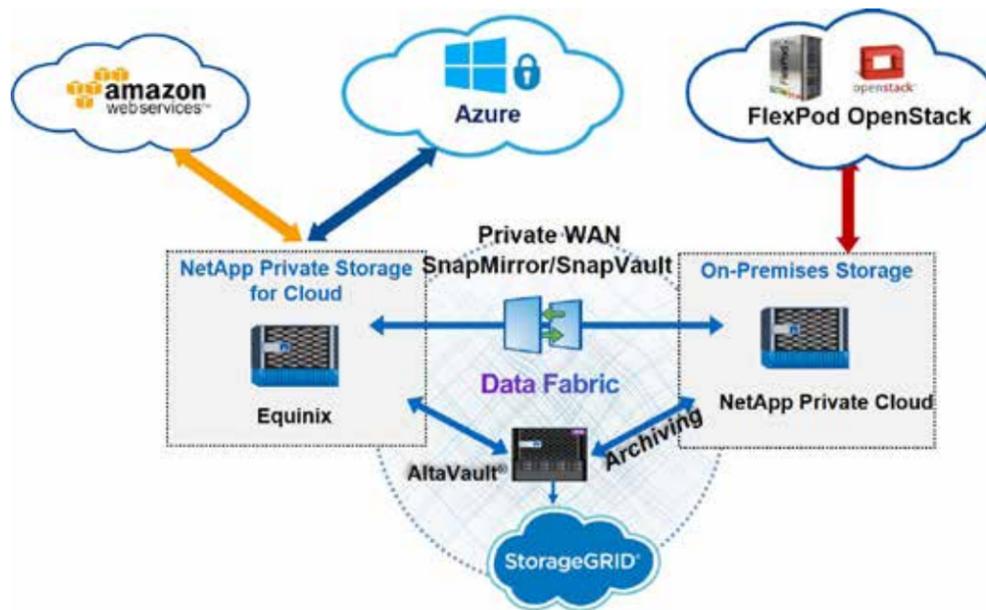
migrations. This helps us avoid vendor lock-in, cloud data transfer delays, and extra charges.

- We support a variety of cost-saving use cases. For example, the Data Fabric has enabled us to migrate our disaster recovery (DR) applications to the cloud and remove rarely used and costly compute from our on-premises data centers. We synchronize the data between our on-premises data center and our public cloud through NPS. Compute from public cloud providers is only used during a DR or testing event.

- The Data Fabric allows us to use consistent storage standards and policies across various cloud stacks. By providing a homogeneous storage layer we can easily expand to meet data management capabilities across various technologies and cloud stacks, including AWS, Azure, and OpenStack among others.

- Finally, the NetApp Data Fabric/NPS provide a rich set of enterprise features and capabilities that are not available in public storage. This allows us to standardize data management across all the platforms

and eliminate the need for application re-design, new storage skills, new process development, etc., as technology changes.

The landscape of enterprise IT is changing rapidly with the rise of the cloud. Data management is a critical factor to consider in this journey. As Customer-1 for NetApp's hybrid cloud strategy, we are using the Data Fabric to gain greater visibility and control over our enterprise data, regardless of where it physically sits. The Data Fabric enables us to combine on-premises capabilities with cloud provider resources to take advantage of a whole new level of compute power and automation for our business customers. More importantly, it supports the evolution of our data management strategy to meet the demands of the future.

This is the third blog in a series on NetApp IT and the hybrid cloud. To read previous blogs, click on these links:

Blog 1: How to Define Your Hybrid Cloud Strategy with These Six Goals

Blog 2: Improving the User Experience When Adopting the Hybrid Cloud

Kamal Vyas, Senior IT Service Architect, NetApp IT

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The Drive to Improve the User Experience When Adopting the Hybrid Cloud

Kamal Vyas, Senior IT Service Architect, NetApp IT

A one-stop portal enables users to manage their cloud services in just one place.

Cloud is a major industry disruptor that is forcing IT to rapidly shift from its old operating models to acting as a value-added service provider for the business. The cloud is also generating a huge change in user expectations versus what the traditional IT shops used to deliver.

NetApp IT's vision is to excel at service delivery, including leveraging a hybrid cloud strategy. We want to empower our business and development communities to deliver on their goals as easily and quickly as possible. (See my previous blog on our hybrid cloud strategy.)

An early consideration for us when delivering hybrid cloud architectures was to ascertain what user experience we were trying to deliver before we designed the solution. A great example of this approach is the iPhone; the design of the device started with the user experience, and the technology followed. Our focus on the user experience of hybrid cloud solutions led us to define the following considerations;

• What services and use cases do we want to deliver?

• How do we prioritize the services we deliver? How do we handle the tradeoffs between features and quality?

• How do we want our users to consume and track these services as well as perform lifecycle management?

• How do we deliver a consistent user experience across different public and private clouds?

Our vision is for IT to be a one-stop shop for all our users, irrespective of the service delivery platform—public cloud or private cloud (data centers). We visualized a process where our users would log into a central self-service portal, pick an item from the services catalog, and then get it delivered across any of the clouds we orchestrate. Throughout the process, the user experience would be at the center.

Central Self-Service Portal

We designed a single user Interface for user interaction. Users can consume and manage (start, stop, terminate, modify, etc.) their cloud services in this one-stop portal. The interface abstracts or masks all clouds and service providers from our users.

It works like this. First, users pick a catalog item and populate the corresponding form (metadata fields). An automated workflow/blueprint uses this metadata to automatically select the right cloud (private or public) and then provision it. Metadata fields are designed

to be business and application centric, not technology oriented. The metadata information is used for:

• Service provisioning (required for right sizing—e.g., S, M, L, XL, etc.);

• Services routing (required for selecting the right cloud—e.g., Amazon Web Services (AWS), private, etc.); and

• Service tracking (required for service support and lifecycle management—e.g., chargeback, CMDB, etc.).

Unified Services Catalog

A well-defined services catalog is the key to any successful self-service model. We have built a range of service categories over time as part of our catalog. We offer Infrastructure-as-a-Service (IaaS) and Platform-as-a-Service (PaaS) services across our cloud portfolio. Users can consume individual IaaS components (compute, network, storage) or they can choose a three-tier application stack (web, application, and database layers) from the AppStacks catalog.

We developed a unified services catalog, which means we have common service definitions across all cloud providers. For example, users ordering a Medium-Windows-2012 compute system don't need to learn the AWS or Azure catalog/naming for that service. Our orchestration

engine maps the specification to the correct catalog item. All back-end mappings and updates are transparent to our users.

Consistent User Experience

With a central self-service portal and a unified services catalog, we have been able to build a hybrid cloud platform based on our desired user experience. Automation allows us to integrate governance, streamline the delivery process, and minimize user touch points. Since we've implemented the portal, we've seen a 98 percent faster service delivery on average—from 24 hours to less than 30 minutes. Our users are more satisfied, and IT has more time to focus on other new projects. In this way, everyone wins.

This is the second blog in a series on NetApp IT and the hybrid cloud. To read previous blogs, click on these links:

Blog 1: How to Define Your Hybrid Cloud Strategy with These Six Goals

Blog 3: Using the Data Fabric to Manage Data in the Hybrid Cloud

Kamal Vyas, Senior IT Service Architect, NetApp IT

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5 Trends Changing the Face of Infrastructure Delivery

STAN COX, DIRECTOR, CUSTOMER-1 PROGRAM, NETAPP IT

After 20-plus years as an IT practitioner, I see a rapid pace of change in our infrastructure operations that presents more challenges and opportunities than I ever saw in the past. As the director of the NetApp IT Customer-1 program—which serves as a first adopter of NetApp products and services in our production environment—I'm amazed at what we can do today that we couldn't do in the past. I've seen an upsurge in new technologies that I wouldn't have dreamed of even five years ago.

Long gone are the days when we solved a problem by throwing bodies at the issue. We pre-provisioned our hardware in anticipation of future demands. We installed two physical pieces of hardware per application to support redundancy and failover in our large data centers. That's an expensive cost model to sustain. The new model requires us to mentally change the way we operate. We need to use automation and change processes to speed service delivery. We are moving from reactive to proactive mode. We look for ways to eliminate the red tape. Here are some other trends that I see in today's infrastructure environment:

Virtualization · Cloud · Open Source · Security · Data Protection

Virtualization saves the day. Remember the days of dedicated hosts and the 1:1 environments that took up multiple racks and gobbled up lots of power? Those days are no more. We now have the ability to deploy hundreds of hosts within a single rack, consuming less power while offering more flexibility. Tools and technologies, along with simple form factors that have doubled the compute power, allow us to become creative in our best practices.

With this creativity comes cost savings: lower power requirements, less cabling, fewer network connections, and a much smaller footprint to manage. We use software like OnCommand® Insight (OCI) and ONTAP® to manage more devices with fewer people. In the next 18 to 24 months, we anticipate that our hardware footprint will shrink by more than 50% because of virtualization, the cloud, and our adoption of flash over spinning disk for storage. The era of huge Tier-4 data centers is going away.

Cloudy skies are in the forecast. There's no doubt that the cloud has forced us to look at infrastructure in a new way. Certain business scenarios require a private cloud environment, while others make public cloud offerings more desirable. By offering a flexible hybrid solution we

don't paint ourselves into a corner. With OpenStack technologies and a cloud management platform, the sky's the limit. The pay-as-you-go/utility model is more cost efficient than capital investment.

NetApp Private Storage (NPS) for Cloud and the Data Fabric allow us to pivot in and out of the cloud, or between clouds, while retaining control of our data and not getting locked into one vendor. NPS provides a single, standard software platform to accommodate changing compute demands and the capability to manage information regardless if it's on premises or off. Moving forward, application development will need to think hybrid cloud rather than investing in hardware with redundant resources. They will need to configure their processes using Platform-as-a-Service (PaaS), Infrastructure-as-a-Service (IaaS), and Software-as-a-Service (SaaS) methodologies that will operationalize and scale as demand grows.

We use automation and change processes to speed service delivery.

Open source creates new opportunities. Open source has entered the mainstream. It is stable enough to use in a large IT environment. It puts the control back into the hands of engineers and architects. We can customize the code internally to our needs and provide internal support, bypassing expensive maintenance agreements. Open source offers faster procurement and implementation cycles. We can avoid licensing fees. Open source also opens the door to a new level of standardization that allows us to refocus our priorities. Moving from proprietary to modular, open source solutions will be a big battle because of the costs associated with exiting proprietary vendor relationships. Our challenge will be to demonstrate that the long-term savings are worth it.

Security remains a top priority. As we continue to grow in the public cloud and hybrid model, security is our No.1 threat. How do we monitor

our network when it's partly on premises in our private cloud and partly off-site in the public cloud? While the ecosystem is becoming simplified, monitoring and keeping the bad guys out is not. Cyber-defense will be one of the next big challenges of IT. Cyber solutions increasingly include cloud-based solutions which continue to improve at a rapid pace.

IT is about solving real business problems. Customer-1 is the first adopter of NetApp products. But, like any IT shop, we only install products with a real business case. ONTAP and OCI have added tremendous value in improving the efficiency and stability of our production environment. I'd like to add AltaVault® and StorageGRID®, NetApp's data backup and protection solutions, to the list. We will reduce our operating expenses and support costs by moving from tape backup to the cloud for data archiving (blog). These products solve a real business problem, are easily integrated, and fall in line with our product roadmap for the future.

We are facing change at an unprecedented level with our infrastructure environment. Customer-1 has the opportunity to be at the forefront in providing a stable infrastructure foundation that supports a hybrid cloud strategy where we manage and control our data. Open source, virtualization, and NetApp technologies are all contributing to our success on this journey where the end goal of delivering excellent IT service will help our business grow and prosper.

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5 Trends Changing the Role of the Database Administrator

JASON SINGLETON, SENIOR DATABASE MANAGER, NETAPP IT

The DBA's skill set is evolving rapidly.

As manager of the database team in NetApp IT, I manage more than 400 databases, some of which are business-critical to the company's operations. As a 25-year industry veteran, I'm seeing huge changes in the way I do my job that I would not have anticipated even 10 years ago.

What's behind this change? The rules around IT service delivery are changing. We are entering a world where IT stability is a given. IT infrastructure is becoming a utility that serves as an electrical outlet for applications and databases to plug into as needed. At the same time, the database team needs to be able to respond quickly to the business. Add in the hybrid cloud, and IT service delivery quickly becomes complicated for database administrators (DBAs).

Five Trends to Watch

I see five trends that are affecting how the database team operates going forward:

Databases are a utility, just like infrastructure. Business customers are typically chomping at the bit to secure their technology quickly and easily. Gone are the days where decisions about which database to use took weeks or months. Multi-tenant database environments are replacing shared environments because they share resources on a scalable database platform that works with the cloud. Multi-tenant or plug-and-play mini-databases can be set up (and taken down) quickly and automatically work with the cloud. They help consolidate and manage multiple databases as one, resulting in improved efficiency, simplified management, and maximum uptime. Applications can easily share compute power based on differing peak load times. Not only are the licensing costs lower, but server utilization database management is streamlined and database performance can be isolated. That isn't to say that on-premises, standalone databases for critical applications will go away. Databases related to NetApp's core competencies will always have a place in our operations.

Database-as-a-Service (DBaaS) is closer than you think. The days are gone when users asked for a specific or customized database technology. Administrators have to be prepared to provide Database-as-a-Service as part of the application development lifecycle. That means offering a menu of standard database solutions tailored to different business requirements. Users will be able to self-provision database technology from a catalog of solutions that offers tradeoffs in flexibility, cost, and performance. Self-provisioning brings with it a wide array of benefits: automatic creation of databases in the cloud or on premises,

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scheduling of start and end dates, automatic integration with CMDB for asset tracking, and even database creation in advance of actual use.

Mongo is challenging the traditional database model. One of the issues that application developers face is choosing their database schema before they start any project. As the decisions around what data will or will not be collected today and tomorrow are hard to predict, this becomes very difficult. Many developers are turning from traditional relational database structure to a dynamic structure like MongoDB because data integration is easier and faster for some applications. The dynamic structure allows users to store data in a single document, easily perform ad-hoc queries, and add fields later on the fly. It's also free; its open source roots only add to its appeal. The rise of MongoDB has significantly affected the database landscape, making the choice of database at the outset even more important.

Skill sets are changing to reflect the new landscape. Along with the proliferation of data and database types, the database administrator skill set is rapidly changing. Database administrators have historically specialized by database platform—Oracle, SQL Server, etc. Now administrators have to be generalists who are familiar with different database platforms and the ability to recommend the right fit for an application. But they also have to be specialists that can support a database to meet business application requirements. In addition, customers are requiring more data services that are

> *IT collaboration is a necessity thanks to the popularity of the cloud and non-relational databases.*

not necessarily tied to a traditional database platform. Decisions get even more complicated when you add in cloud-aware applications and databases. Database administrators have to understand the database as part of a full stack view. Their view of the world has broadened.

The cloud demands better IT collaboration. As IT increasingly leverages the cloud, the push is for database administrators to be data-center agnostic. They have to be ready to support databases for applications that are hosted both on premises (private cloud) and in the public cloud. But delivery and support in the cloud demands a new approach. Database administrators can no longer operate in a silo; the cloud requires collaboration with all the teams supporting the application stack. That makes the support and delivery model much more complex than with on-premises applications. Having a team that provides a set of database services across data centers and database platforms is critical to realizing the efficiencies of the hybrid cloud.

Improving IT Service Delivery

The role of the database administrator is evolving quickly. Skill sets are changing and IT collaboration is a necessity. The most obvious factors driving this change are the rise of the cloud and non-relational databases. But underlying these factors is an even bigger impetus—finding new ways to deliver and support data and database services faster to the business community.

Jason Singleton, Senior Database Manager, NetApp IT

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Enabling Test Automation for the Enterprise

LARA BRISCO, DIRECTOR SERVICE QUALITY & ENABLEMENT, BUSINESS APPLICATIONS, NETAPP IT

As a service provider to the NetApp enterprise, we continually review and improve the quality of IT services we deliver. Using both statistical and anecdotal evidence, we focus on quality, cost, and speed of delivery. Driving innovative improvements that increase our efficiency and effectiveness is a primary concern.

Automating the regression test suite is an opportunity to positively influence quality, time, and cost. Regression testing verifies that software previously developed and tested still performs correctly after being changed and has not introduced new faults. With automation, existing application features and functionality are tested with minimal test team involvement. Scripts can be programmed to radically increase parallelism in test cases and scenarios. This results in reduced test-cycle duration, reduced dependency on human resources, and therefore reduced cost, all without compromising quality.

As an enterprise IT organization, we recognize the depth and breadth of both our responsibility and potential. Our ability to predictably deliver new solutions, features, and functionality into the hands of NetApp leaders, internal users, and external customers and partners is critical to:

- Enable strategic innovation

- Anticipate and adjust as macro business climates change

> *Automating regression testing is an opportunity to positively influence quality, time and cost.*

- Differentiate NetApp in the market place and facilitate successful business outcomes

Automating Best Practices
Test automation had been attempted in pockets of IT before with varying degrees of success. A different approach was needed to ensure sustained success on a broad scale. Key areas to be addressed were accountability, standards, and resources.

In launching this new approach, we anointed a small team within Service Quality & Enablement—a move we deemed critical to a successful and lasting effort. Of particular importance was the team's leader, who would have ownership and accountability. This team's charter is to monitor, measure, and improve Service Quality. Its members display varied breadth and depth of techno-functional expertise. With test automation recognized as such a high-impact opportunity, building the practice was the team's first focus.

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The development of guidelines and standards was also a key area of focus. In test automation, just as in any development effort, adherence to best practice concepts such as simplicity, portability, and reusability is expected. Making use of the same version control tool used by the broader IT organization, the team put in place a mature source code control strategy. The team summarily raised the bar and expectations around test automation scripting.

Finally, working with NetApp IT's Strategic Innovation Lab, the team used enterprise PaaS (platform-as-a-service) concepts to create a stable, predictable platform. This platform hosted test-related tools and software in order to enable focus and maturity in test automation practices. Recently, the team completed the migration of the NetApp Test Automation Center (NTAC) from the Innovation Lab to the non-production data center. NTAC is now in use as a fully integrated and key component of the continuous integration/deployment (CI/CD) strategy within NetApp IT.

Executing an end-to-end automation strategy, multiple regression suite automation efforts are now underway for some of NetApp IT's Tier-1 applications supporting critical business capabilities. We're learning and adjusting as we go, knowing we'll continually evolve as we traverse the maturity curve. Well beyond proof of concept at this point, our real-world evidence is extremely positive.

For example, scripts written to perform regression testing of the first module within our customer relationship management (CRM) system reduced manual human effort by 96% and test execution duration by 77%. Scripting of the second module is nearly complete. We expect similar results from that module.

Another highly valuable use case we've been able to address is the application sanity test. Typically, after the build and deployment of a non-production application environment, a human from the team (developer, technologist, or tester) was required to validate the integrity of the system. This took resources away from other activities and could potentially delay the use of an environment until someone was available to confirm it. Now, as part of a unified CI/CD strategy, the sanity testing via NTAC happens automatically and immediately. This allows delivery teams to proceed with increased speed and agility.

Using NetApp IT standards, enabling an end-to-end automation strategy, and ensuring clarity and accountability have been paramount to our early success. As NetApp IT's Business Application Delivery organization traverses a very deliberate path toward the hybrid cloud, delivery velocity is increasing and application location is no longer static. These shifts are creating new challenges with test consistency and conformance. While our immediate focus is to introduce test automation for our business applications suite, we are already looking ahead at how NetApp's Data Fabric will help manage and innovate through the challenges.

Going forward, improving the quality, cost, and speed of delivery of IT Services will be enabled by the NetApp Test Automation Center.

Lara Brisco, Director Service Quality & Enablement, Business Applications, NetApp IT

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7 Perspectives on the Future of IT: The Drive Toward Business Agility

The NetApp on NetApp Program shares its real-world IT experiences in using NetApp products and services in a global enterprise IT environment. Our subject matter experts speak with representatives from other IT organizations about common IT challenges and best pratices and the business cases driving product adoption.

To learn about NetApp IT or to speak with one of our subject matter experts, talk to your NetApp sales representative or visit our web site: www.NetAppIT.com.

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