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- Recognize data challenges in the cloud
- Seamlessly move data throughout the hybrid cloud with a data fabric

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Larry Freeman
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by **Larry Freeman and
Lawrence C. Miller, CISSP**

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Hybrid Cloud & Data Fabric For Dummies®, NetApp Special Edition

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Introduction



As cloud deployments evolve and fragment into an era of interconnected clouds, the changing role of information technology (IT) as the architect and broker of services is more critical than ever before. To harness the hybrid cloud, IT organizations need the right tools and technologies to make hybrid cloud strategies a flexible and efficient reality for their organizations.

About This Book

Hybrid Cloud & Data Fabric For Dummies, NetApp Special Edition, consists of four short chapters that explore challenges in the hybrid cloud model and innovative solutions that a data fabric brings in addressing those challenges.

Foolish Assumptions

It's been said that most assumptions have outlived their usefulness, but we assume a few things nonetheless! First, we assume that you know a little something about cloud computing trends and models. As such, this book is written primarily for IT executives and managers such as Chief Information Officers (CIOs), Chief Technology Officers (CTOs), IT directors, and technical managers.

Icons Used in This Book

Throughout this book, you occasionally see icons that call attention to important information that's particularly worth noting. Here's what to expect:



This icon points out information that may well be worth committing to your nonvolatile memory, your gray matter, or your noggin — along with anniversaries and birthdays.



Thank you for reading, hope you enjoy the book, please take care of your writers. Seriously, this icon points out helpful suggestions and useful nuggets of information.



Proceed at your own risk . . . *well, okay* — it's actually nothing *that* hazardous. These helpful alerts offer practical advice to help you avoid making potentially costly mistakes.

Beyond the Book

You can learn more about NetApp's hybrid cloud data fabric solutions at www.netapp.com/datafabric.

Where to Go from Here

It's been said that a journey of a thousand miles begins with a single step. Your journey to the cloud probably isn't quite a thousand miles, and it begins with a turn of the page.

Chapter 1

Moving to a Hybrid Cloud Business Model

In This Chapter

- ▶ Looking to the cloud for business solutions
 - ▶ Getting past cloud adoption hurdles
 - ▶ Transforming IT into a service broker
 - ▶ Defining public, private, and hybrid clouds
-

This chapter explores some of the business challenges that CIOs are addressing with cloud computing models, some of the barriers to adoption, the evolving role of IT as a service broker, and the different cloud models.

Recognizing the Need

Today, Chief Information Officers (CIOs) must address a range of challenges to meet increasingly demanding business and operational objectives, as businesses strive to remain competitive and look for new market opportunities. CIOs are looking to new IT service

delivery models like hybrid cloud (we explain the different cloud models later in this chapter) to do the following:

- ✓ Keep up with technology and innovation changes while driving down the costs of relentless data growth and aligning capabilities across the company.
- ✓ Reduce overhead costs while growing the business and attracting and retaining skilled employees.
- ✓ Lower risk when deploying new mission-critical applications by ensuring that data is kept secure and business disruptions are minimized.
- ✓ Manage complexity across the data center.
- ✓ Improve IT responsiveness and increase service levels for business applications to meet rapidly evolving business demands.
- ✓ Achieve regulatory compliance to avoid stiff penalties and maintain public trust and confidence.



A cloud-based IT delivery model can speed up application deployment and provide flexible environments to accommodate the dynamic and unpredictable needs of organizations and customers.

Understanding the Inhibitors

Why are CIOs looking to the cloud to help solve complex business and technology challenges? The cloud promises to create better operational efficiencies, speed application deployment, and provide the flexibility that you need to respond quickly to changing business requirements. However, when it comes to moving to a cloud model, many risks are perceived.

Deploying a cloud model can be very challenging. At the top of the list, keeping your data secure is a key concern. For example, can you protect your vital data from getting into the wrong hands, and also protect it from viruses? But security isn't the only inhibitor to deploying to the cloud. Other inhibitors include the following:

- ✔ **Complexity:** With the explosion of web services, mobile devices, and new technologies to reach more customers anywhere and across various channels, managing the complexity of your expanding data center environment across multiple clouds is a significant challenge. Selecting the right service offerings at the right service levels on different data management frameworks across a blend of cloud resources can be a daunting task.
- ✔ **IT agility:** IT service delivery is about meeting the needs of the business. As those needs change, IT must adapt and respond quickly. For years, IT organizations have been working toward delivering agility within the data center. And now, as the public cloud is folded into IT strategy, the capability to move applications, workloads, and data among cloud resources requires connections between those resources — a cloud data fabric — to extend this agility to the cloud.
- ✔ **Data control:** Building your own virtualized data centers and private cloud means that your organization can retain control of its data. Extending your environment to the public cloud necessitates giving up some control of infrastructure and applications, but you can never give up the responsibility you have to control your business data. Your hybrid cloud strategy must support the business and provide the right levels of data performance, cost, security, access, protection, and governance.



If a skills gap exists in your IT organization, you might be reluctant to move to the cloud. Selecting the right consulting services partner to help you design, deploy, and manage your cloud environment can help you address such a gap.



Although choosing a cloud service provider to complement a set of IT services is indeed a means to deliver a flexible, dynamic environment, it doesn't necessarily mean ongoing flexibility among different cloud providers. For many organizations, cloud provider lock-in can be a significant hurdle to adopting a public cloud strategy, but the right set of management tools can help address this hurdle.

The Changing Role of IT

In the past, CIOs have viewed their IT organizations as builders of services for the business. But CIOs are dealing with more complexity than ever before, and this complexity is driving them to rethink the role of IT.

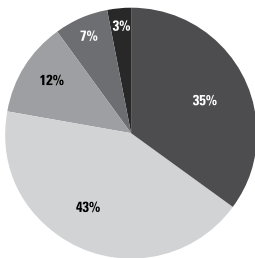
Today, CIOs are moving from being builders of apps and operators of data centers to becoming *brokers* of information services to the business. They are embracing new technologies and new service models that allow them to deliver IT faster, cheaper, and smarter, and to make their companies more competitive.



Enterprise IT organizations don't want to build and run data centers. Instead, they are transforming into brokers of services that span on- and off-premise resources with a cloud-first strategy to manage data, not data centers.

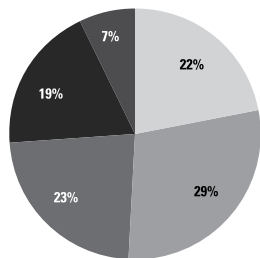
The rapid transformation to service broker, however, highlights a key problem that the hybrid cloud brings. A recent IDG Research survey shows that while 78 percent of enterprise IT organizations viewed the capability to manage data across multiple clouds as critical or very important, only 29 percent viewed their capability to do so as excellent or good (see Figure 1-1).

Importance of Managing Data
Across Multiple Clouds



- Critical
- Very important
- Somewhat important
- Not very important
- Not at all important

Ability to Move Data
Across Multiple Clouds



- Excellent
- Good
- Fair
- Poor
- Not applicable

Figure 1-1: Moving data across multiple clouds.

Source: Market Pulse: Data Fabric: A Must-Have in a Hybrid Cloud.

Differentiating Cloud Models

In this section, we discuss the various types of clouds. Cloud computing models are broadly defined as public, private, and hybrid.

A *public* cloud is an on-demand IT service in which computing resources are delivered over the Internet by an external cloud service provider. These resources (such as infrastructure, platform, and software) are shared by the service provider's various customers. The public cloud includes hundreds of cloud service providers, as well as hyperscale cloud providers such as Amazon Web Services (AWS) and Microsoft Azure.



A *hyperscale* cloud is a type of public cloud that offers a distributed computing environment that can scale exponentially in terms of compute and storage.

A *private* cloud is one that is built and maintained by corporate IT and enterprise provides on-demand IT services as an internal resource pool that is shared within the organization.

A *hybrid* cloud leverages both public and private cloud models to provide an enterprise with an efficient, customized solution to meet its particular business needs. Hybrid cloud requires significant integration and/or coordination among the organization's internal and external environments to properly address data, process, management, and security requirements.

Chapter 2

Data Management in the Hybrid Cloud

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In This Chapter

- ▶ Connecting cloud resources
 - ▶ Dealing with data challenges
 - ▶ Maintaining data stewardship
-

This chapter talks about the need for seamless cloud services, the difficult nature of data, and the importance of managing and controlling your organization's data assets.

Addressing the Need for Seamless Cloud Services

The attraction of the cloud — infinite, flexible, and inexpensive compute and storage — is too great to ignore. Inevitably, organizations are moving toward a cloud strategy that consists of private or public (including hyperscale) cloud, or some hybrid combination of these cloud models.

At the same time, organizations must be able to choose where their data resides while maintaining data stewardship with control over how their data is used. Organizations need control and flexibility. Moving to the cloud therefore requires the capability to seamlessly connect multiple cloud resources that span public and private cloud architectures. Managing these cloud resources is critical for organizations.



Broad adoption of cloud computing might seem like a distant panacea, but the reality is that most organizations will soon be consuming IT from all three cloud resources — private, public (including hyperscale), and hybrid — and for the foreseeable future.

Acknowledging the Difficult Nature of Data

By its nature, data is persistent and stateful. Data must be stored continuously and made rapidly accessible to support business applications and analytics — but it doesn't move easily. In comparison, cloud compute and networking resources are stateless and can be dialed up or completely turned off, as needed.

The distance between compute and data also creates latency, which lowers performance. Thus, for many applications, having the data close to the compute is important. Compute resources can be leveraged from many sources in the cloud, but to effectively use these resources, data must be moved close to compute.

But data doesn't like to be moved. Migrating large amounts of data throughout the cloud can take hours, days, or even weeks, and every move risks data corruption. Sending data over a network requires expensive bandwidth connections, and many cloud providers charge dearly for this network usage, further increasing the costs of data movement. Therefore, any movement of data between clouds requires the utmost in efficiency.

Finally, data services that are common in the enterprise, such as data protection, QoS (Quality of Service), deduplication, compression, and cloning, frequently aren't available or easily managed across disparate cloud services. This limits the types of applications that can move to these resources.



Most importantly, data has significant value — to both the organization and potential attackers. Data protection — the confidentiality, integrity, and availability of data — is a constant challenge for all organizations.

Managing and Controlling Data

Data is the most complex, critical, and valuable element of all the components in any data center. And for an IT service broker, managing and controlling data across a hybrid cloud model isn't easy.

Hybrid data center inhibitors include the following:

- ✓ Inconsistent data containers
- ✓ Inefficient transport
- ✓ Inability to address data governance

Although enterprise organizations are embracing a hybrid data center model that spans private and public cloud resources, they still need to maintain control of data governance, access, performance, availability, protection, and security, while maintaining or improving operational efficiency.

Chapter 3

Connecting Hybrid Clouds with a Data Fabric

In This Chapter

- ▶ Managing hybrid cloud data
- ▶ Moving data between points in the hybrid cloud
- ▶ Protecting data within and outside the corporate walls

NetApp's approach to hybrid cloud facilitates the seamless connection of cloud resources, with a highly efficient transport between systems and clouds and a single purview of data management over a cloud data fabric. This chapter takes a look at NetApp's data fabric vision, which combines technologies to deliver cloud solutions based on one guiding principle: the efficient management, movement, and protection of data within hybrid clouds.

Managing Hybrid Cloud Data

Just as it takes a village to raise a child, it takes a broad ecosystem of cloud providers, application vendors,

and technology partner options to support diverse customer needs.



From a cloud management perspective, NetApp partners with the leading orchestration and automation providers, including VMware, Microsoft, Citrix, HP, IBM, BMC, CA, and Cisco, and works with open-source initiatives, including OpenStack and CloudStack. As organizations consider where and with whom to leverage in the cloud, they can choose from more than 400 NetApp-based cloud services delivered by more than 300 service providers around the globe.

The common thread that laces this ecosystem together is NetApp's storage operating system, Data ONTAP, a widely used storage OS throughout the world.

Data ONTAP has evolved from humble beginnings to become a data framework that simultaneously manages multiple hybrid cloud endpoints through its four variations:

- ✔ **Data ONTAP**, NetApp's flagship storage OS, offers an adaptable, always-on storage infrastructure for enterprise applications and private clouds.
- ✔ **NetApp Private Storage for Cloud** extends the reach of Data ONTAP by placing application data next to, but not inside of, public clouds — allowing enterprises to build hybrid clouds that offer the speed and control of private clouds.
- ✔ **Cloud ONTAP** is a software-only version of Data ONTAP that can be run on top of cloud services, such as Amazon AWS, bringing unified data management to the public cloud.

- ✓ **Data ONTAP Edge** is a virtual, VMware-ready version of Data ONTAP designed for remote offices that don't require dedicated storage systems.



Each variant of Data ONTAP can operate independently or in conjunction with the other variants, creating a data fabric with common storage commands and the combined intelligence to universally apply data management policies across an entire hybrid cloud ecosystem.



The idea of a data fabric, which uncouples storage hardware and software into a common framework, is the basis of a popular trend toward *software-defined storage*.

Moving Data between Points in the Hybrid Cloud

Having a fabric means that data is free to move dynamically across all private and public cloud resources. Businesses realize greater efficiencies by pairing workload requirements with cloud economic models in real time, without disruption.

NetApp developed its *SnapMirror* technology for on-the-fly migration between clouds. With SnapMirror, users can quickly and efficiently move data throughout the hybrid cloud. This gives them the flexibility to maintain choice among best-in-class cloud providers and to balance workloads across any cloud resource.

To handle large data transfers, SnapMirror reduces the size of datasets through deduplication and compression and then transfers a reduced amount of bytes.

This reduction can result in capacity and bandwidth savings of ten times or greater.



If you want to impress your friends, mention *LRSE* — that's the term that NetApp's engineers use to describe SnapMirror migration between clouds and it stands for *logical replication with storage efficiency*.



With a data fabric, NetApp gives customers the capability to shift between capital and operating expenditures (CAPEX and OPEX). With NetApp, organizations can use on-premise private cloud storage in a CAPEX model and easily shift to and from an OPEX model as data is moved, leveraging the flexibility and economics of public cloud compute and applications.

With NetApp's universal data platform and data portability, organizations can remove barriers between private and public clouds, creating a reliable data fabric that enables data stewardship to be maintained across all resources.

Protecting Data Within and Outside the Corporate Walls

You probably agree that corporate data is a very important asset that needs special protection.

Therein lies a problem with the hybrid cloud. When you send data to a cloud provider, you give it full responsibility to store and protect that data. You trust that your cloud provider will always protect your data in any situation — including network breaches,

equipment outages, and data viruses. Many organizations don't feel they should put that much trust in a cloud provider.

The good news is that a well-constructed data fabric allows organizations to easily copy data between private or public cloud resources for complete data protection or disaster recovery.

In NetApp's case, SnapMirror (yes, the same SnapMirror that migrates data between clouds) can also copy and synchronize enterprise applications between data centers and cloud providers, or between two different cloud providers. Your business is no longer at the mercy of a particular public cloud provider. Instead, you can spread your risk by automatically maintaining multiple data copies both inside and outside the corporate walls.

A similar quandary exists for data backups. If you choose to back up your data using cloud provider A, what happens if cloud provider B gives you a better deal and you switch over to B? Or, worse, provider A decides to exit the cloud marketplace altogether. Are your backups stuck in a data prison with no chance of escape?

No, not with a data fabric. NetApp AltaVault Cloud Integrated Storage, for instance, lets you instantly change cloud destination points, and moves existing backups over to the new provider.



NetApp AltaVault works with all popular backup software products and supports a wide variety of public cloud service providers. Cloud-to-cloud transfers are done using a high-speed integrated replication engine that doesn't require any data ingesting or queuing.

Chapter 4

Top Seven Benefits of a Hybrid Cloud Data Fabric

In This Chapter

- ▶ Benefitting from a NetApp-powered data fabric

This book discusses some of the immediate benefits in implementing a data fabric.

After you read this book and understand the value of hybrid cloud data fabrics, we hope that you never make the mistake of purchasing traditional siloed storage again and that you stay on the lookout for ways to connect all the data points on your hybrid cloud.

Freedom in Choosing Cloud Providers

Hundreds (or maybe thousands) of cloud service providers are competing for your storage dollars. A provider that's a great choice today might not work at all for you in a year. Wouldn't it be nice to know that you can change providers in a flash when business requirements change? A data fabric gives you that freedom.

Seamless Data Flow

The capability to change cloud providers is great, but being disruptive to users during the change isn't. A robust data fabric, such as one built on NetApp and Data ONTAP, not only gives you freedom of choice, but also allows you to make cloud changes on-the-fly without disruption to applications or users.

Predictable Performance

Enterprise applications, like people, move through various life cycle stages, where performance needs are likely to change. Just because an application was born in the cloud doesn't necessarily mean it should live in the cloud during peak activity cycles.

Also, that mission-critical app you depend on today is destined to become the legacy app of tomorrow. Throughout the life cycle, therefore, applications should be able to move fluidly between high-performance storage and low-cost economy storage — in other words, from flash to disk to cloud. A data fabric built on NetApp not only can enable this movement, but also analyze and automate the retiring of applications.

Secure Data Governance

A big concern for potential hybrid cloud users is the loss of data governance. When you send data to a public cloud, you're essentially handing over the keys to the corporate castle, and giving up control of prized data. Unless, of course, your data fabric is powered by NetApp. NetApp Private Storage for Cloud puts data next to, not in, public clouds. You have access to the

enormous scalability of cloud compute and networking, but the data is retained by you, on storage systems within the fabric that you own, manage, and control.

Economical Business Continuity

Cloud-based disaster recovery (DR) can be an attractive alternative for companies that are strapped for IT resources. The usage-based, pay-as-you-go cost model for cloud services is well suited for the DR use case, because replicated data is inactive most of the time.

If your DR plan calls for restoration of applications from public cloud sites, NetApp SnapMirror reduces restoration time by attempting a “partial” restore of missing or corrupt data during a disaster if the primary data isn’t completely lost.

If your DR plan calls for redirecting application users to cloud-based servers, the NetApp-powered data fabric similarly assists in avoiding cloud latency bottlenecks, where DR replicas can reside on private storage arrays, connected to public cloud providers via a direct-connect high-speed link.

Adapt to Changing Business Needs

A data fabric is designed with the knowledge that major technology changes can happen quickly. Whether supporting enterprise applications, disaster recovery, or data backups, a fabric keeps data flowing regardless of changing business requirements. Need a quick

application development cycle? Develop in the cloud. Need to support more users? Move to higher performance storage. Need to sunset an application? Archive to a low-cost cloud provider to save money.

Built for Today, Designed for Tomorrow

It's possible to start building your data fabric today. Start with a unified data platform, and begin connecting your hybrid cloud endpoints. As cloud popularity grows, it is likely that more and more corporate data will move into a shared cloud environment, with only the most sensitive data staying within the confines of the data center. A data fabric is designed to enable (and accelerate) this shift to the cloud.

Next-generation applications (such as big data analytics) will require the sharing of data from multiple application sources. Without a data fabric, the capability to quickly share data between various hybrid cloud endpoints will be awkward at best, or prohibitive at worst.

Maintain control over your data in the cloud

Hybrid clouds that leverage the benefits of both public and private cloud models are becoming increasingly popular. This book shows you how to manage your data across these different cloud models.

- **Transform your organization** — become a broker of information services to the business
- **Manage and maintain data** — control data with confidence across any cloud, whether public, private, or hybrid
- **Choose where your data resides** — maintain data stewardship in the cloud

Larry Freeman has worked in the data storage industry for over 35 years. He is the co-author of *Evolution of the Storage Brain* and has contributed to several *For Dummies* books. **Lawrence C. Miller** has worked in the tech industry for over 15 years. He has written numerous *For Dummies* book.



Open the book and find:

- Why it's important to consider vendors that offer best-in-class technologies, applications, and partners
- How a universal data fabric enables you to evolve to a hybrid cloud
- How dynamic data portability efficiently moves data

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