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## Accelerating the Adoption of Public Storage Clouds By Enterprise Organizations

*Public storage clouds are viewed less than favorably by enterprise organizations even though many of them foresee adopting public storage clouds in the not-too-distant future. Changing that viewpoint requires that service providers bring forward public storage cloud offerings that possess seven key attributes that will sway the opinion of enterprise decision makers and prompt them to adopt public storage clouds sooner rather than later.*

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# Accelerating the Adoption of Public Storage Clouds By Enterprise Organizations

## Executive Summary

There is no longer any doubt that enterprise organizations will eventually adopt public storage clouds as part of their overall storage management strategy. So the question becomes, "What will serve as the flash point that will initiate the broader adoption of public storage clouds by enterprise organizations?"

Enterprises are put off both by the lack of enterprise features found in current public storage cloud offerings as well as by the missteps of today's storage cloud service providers. Today's offerings lack many of the configuration options and reporting tools that enterprises expect and demand while reports of outages and service providers terminating services only add to their concerns about adopting storage cloud services now.

Changing this perception among enterprises requires that service providers first understand what objections that enterprise organizations have to current storage cloud offerings and then offer a storage cloud solution that addresses these objections.

To understand the objections that enterprise organizations have to adopting public storage clouds today and what it will take to change their mind so their adoption accelerates going forward, this paper examines:

- The need that enterprise organizations have for public storage clouds
- How enterprises perceive today's public storage clouds
- The primary objections that they have to the adoption of public storage clouds
- The seven attributes that a public storage cloud intended for enterprise use should possess
- Tools that service providers can offer enterprises to safely transition to a public storage cloud
- How NetApp StorageGRID delivers on these seven attributes that an enterprise requires by providing access to a configurable, scalable, secure public storage cloud solution

## Accelerating the Adoption of Public Storage Clouds By Enterprise Organizations

### Enterprise Public Storage Cloud Adoption: When Will the Flash Point Come?

There is a growing body of evidence that indicates it is no longer a question of “If” enterprises will adopt cloud storage infrastructure; it is a matter of “When.” However pinpointing exactly what will serve as the flash point for enterprise organizations to begin adopting public storage cloud on a large scale is still difficult to ascertain.

It is not that enterprise organizations are unwilling to spend money on public cloud storage services or lack the budget to do so. They are willing to spend and do have the budget. Analyst firm Gartner, Inc., forecasts that enterprise expenditures on cloud services will grow exponentially over the next four years reaching \$148 billion by 2014.<sup>1</sup>

Rather it appears that the reason that enterprise organizations are putting off their adoption of public storage clouds is because they lack the confidence that providers can deliver them in the manner which they need.

For example, one would expect that health care providers (hospitals, physicians, etc.) would be one of the first to jump on board the public storage cloud bandwagon. The existing Health Insurance Portability and Accountability Act (HIPAA) coupled with the new provisions in the recently signed Affordable Healthcare Act are bound to create rapidly growing data stores of Electronic Medical Records (EMRs).

Further, the increased use of higher resolution digital medical images by hospitals in general would seem to make health care providers prime candidates to take advantage of the cost and efficiency benefits that public storage clouds can provide.

Yet at the summer 2010 Mass High Tech Emerging Technology Forum held in Boston, MA, attendees like Robert Buchanan, the CIO of Anna Jacques Hospital in Newburyport, MA, expressed apprehension about storing his hospital's data in public storage clouds. He says, “It will take time for people to feel comfortable with having their personal data out there.”<sup>2</sup>

This lack of comfort explains why, according to another survey released in February 2010, only 3% of health care providers are using public storage clouds in any form and only 5% were adopting them in 2010. Perhaps even more discouraging from the perspective of a service provider, 43% of health care institutions have no interest in public storage clouds and the 43% that did express interest had no formal plans for adoption.<sup>3</sup>

This presents a problem for those service providers looking to offer public storage cloud services. Sectors like health care are

representative of their target enterprise audience as they would stand to benefit greatly from moving their data into public storage clouds. Yet in spite of its benefits, they are not buying in.

Changing that perception requires a two pronged attack on the part of service providers.

- First, they need to understand what it is about current cloud storage offerings that has these enterprise organizations resisting their adoption
- Second, service providers need to provide a cloud storage solution that addresses these concerns and gives them the confidence to move ahead with cloud storage

### Today's Public Storage Clouds: Good for the Consumer, Bad for the Enterprise

Current public storage cloud architectures have been designed and constructed to solve a very narrow set of problems that are reflective of the kinds of issues that consumers and small businesses have. It is for this reason that today's public storage cloud providers primarily offer archiving, backup and file sharing services.

In this respect, public storage cloud offerings like Box.net, FilesAnywhere, Flickr, GigaSize.com, Mozy, and Photobucket have been a boon to end-users, professionals working from home and small businesses. These individuals and businesses now have access to services that they could never build for themselves or otherwise afford.

But the public storage cloud services to which they subscribe are designed for use by the mass consumer market. These users are given few if any options to configure these public storage clouds for their specific requirements for availability, data protection or performance. So while this approach may be acceptable to this class of users, it is largely unacceptable to enterprise organizations.

Stories about outages and suspension of public storage cloud services only add to the concerns that enterprise organizations have about storing their data with public storage cloud providers. Outages at major public storage cloud providers such as Amazon in 2008<sup>4</sup>; Google in 2009<sup>5</sup> and EMC Atmos Online in 2010<sup>6</sup> do not help build confidence. Terminating public storage cloud services such as what recently occurred with Atmos Online<sup>7</sup> only harden their resolve to proceed cautiously so as not to lose their organization's data in the cloud.

It is for reasons like these that if public storage cloud services are used by enterprise organizations at all, it is relegated to a

niche role. Then when used in that context, they are primarily used to archive or backup data that has little or no perceived value to the enterprise.

Changing this perception of public storage clouds and its practical use case in the eyes of enterprise organizations requires a repositioning in terms of how public storage cloud services are delivered to the enterprise. Absent this overhaul, the current resistance to public storage cloud adoption by these enterprise organizations may persist for up to a decade as some users suggest.<sup>8</sup>

However if a provider delivered the type of features in a public storage cloud that enterprise organizations expect and demand, it is likely that public storage cloud providers could earn their trust and that the adoption of public storage clouds in enterprises would accelerate.

## Swaying the Opinion of Enterprise Organizations

Swaying the opinion of enterprise organizations after the widely publicized missteps of current public storage cloud providers will not be easy. These blunders have created an atmosphere of distrust among the leadership in enterprises such that they do not yet believe that a service provider can do a better job of delivering storage cloud services than they can internally do themselves.

Overcoming these objections and earning their trust and confidence of enterprises requires that service providers address the concerns that these organizations harbor about public storage clouds. To accomplish that, they need to offer a solution that contains all of the attributes that enterprise organizations care about such that they are convinced the solution will do a better job of delivering storage services than they can do by themselves.

## Seamless Transition to a Public Storage Cloud

Service providers and enterprise organizations alike want the movement of an enterprise's data into a service provider's public storage cloud to be as seamless as possible. These organizations need more than "assurances" that a solution that moves their data into a public storage cloud will not disrupt their current operations. They also want the tangible proof that the solution is proven and has been "hardened" in production customer environments.

It is these concerns that F5 and NetApp have been working together to address and which they now jointly deliver in the form of two products: the F5® ARX® and NetApp StorageGRID. The F5 ARX eliminates the time, effort and analysis associated with determining which data to move into the cloud while NetApp StorageGRID transparently stores data in a service provider's storage cloud.

There are a number of features that make the cooperation and integration between F5 and NetApp noteworthy as they relate to public storage cloud adoption.

First, the F5 ARX offers these organizations the initial view that they need to assess what files exist in their shared storage environment, where they reside, how frequently these files are accessed and how many of these files can be moved into the cloud.

Second, the F5 ARX also provides the policy based engine that can non-disruptively migrate these files into the cloud. The F5 ARX can move as much or as little of an organization's data into the cloud as they like. This enables them to do a proof of concept by taking a segment of their files and moving them into the cloud so they can get comfortable with the technology before moving the rest of the data identified for storage in the cloud.

Third, F5 and NetApp have together acquired many years of practical experience migrating data to the cloud and then managing it once it is there. Their initial forays into public cloud storage started with medical picture archiving and communication systems (PACS) that held large amounts of data but were managed by only one user.

These single user environments enabled F5 and NetApp to develop best practices for their respective products. They now understand many of the practical concerns associated with first migrating data to the cloud and then managing it once it was there and are able to leverage them as other enterprises look to move to the cloud.

Fourth, the majority of enterprises looking to move data to the cloud plan to initially move the hundreds or thousands of user home directories and their files into the cloud. Further, nearly 70% of these enterprises use Windows shares so a solution certified with Windows environments is required.

This is where NetApp StorageGRID comes into play as it is certified with CIFS and provides full Windows-like CIFS functionality. When NetApp StorageGRID is deployed users continue to get the full Windows experience that they expect as they see a full Windows type share even as the directories and files they access are placed and retrieved from the cloud.

Fifth, the F5 ARX and NetApp StorageGRID work in conjunction with one another to efficiently migrate data into the cloud while preserving the security permissions on each directory and file. As testing between these providers has been going on for nearly two years, F5 and NetApp now have the confidence, experience and real world examples to which they can refer companies. This experience enables them to backup their claims that together they can facilitate a seamless transition of data to a public storage cloud and then manage the data once it is there in a way that both service providers and enterprise organizations expect and need.

## The Seven Key Attributes that a Public Storage Cloud Must Possess to Earn the Confidence of Enterprises

- 1. Cost-effective**
- 2. Highly Available**
- 3. Highly Configurable**
- 4. Highly Scalable**
- 5. Measurable**
- 6. Secure**
- 7. Serviceable**

### 1. Cost-effective

Enterprise organizations already understand that public storage clouds will be much more cost-effective than their current storage implementations. By switching to a public storage cloud, they avoid the upfront capital expenditures associated with storage that they purchase.

Ongoing operational expenses may also be reduced. They only pay for the storage capacity that they use with the public storage cloud provider; they are no longer responsible for the energy and facility costs associated with keeping storage hardware onsite; and, they no longer have to dedicate people to managing the storage hardware.

Further, it is incumbent upon public storage cloud providers that they seek out and take advantage of the latest technologies to increase storage efficiency and utilization. Deduplication, object storage, thin provisioning and storage tiering are examples of technologies that service providers will need to utilize and become proficient in to keep their costs down over time so they can continue to provide a price competitive public storage cloud offering.

### 2. Highly Available

It is commonly understood that even current public storage cloud providers need to achieve 100% uptime. The difference is that consumers and small businesses view the entire public storage cloud as being either “On” or “Off” and, as long as it is “On,” it is considered highly available regardless of its performance.

Enterprise organizations also look at whether or not a public storage cloud is “On” as a benchmark. However enterprises expand that definition to include the constant availability of any of their data that is hosted in the public storage cloud, not just the constant availability of the public storage cloud as a whole.

The nature of the data that they host with the public storage cloud provider will also drive their interpretation of “high availability.” Enterprise organizations may tolerate some latency when retrieving archive or backup data stored in the public storage cloud.

But if and when they start to store production data in the cloud, their definition of high availability will eventually expand to include high performance. Translated, they will expect the service provider to distribute their data across available resources so as to minimize or eliminate any type of disruption whether they are caused by acts of God (earthquakes, tornadoes, floods) or man-made (hardware/software upgrades, routine maintenance) while still delivering the performance that their applications need.

Satisfying these demands will require service providers to put in place a cloud storage infrastructure that is highly redundant, dynamically moves application workloads to the appropriate tier of storage, takes advantage of sophisticated monitoring technologies and has trained engineers to support this environment.

### 3. Highly Configurable

Every component of a public storage cloud intended for enterprise use not only needs to be monitored; it needs to be controlled and configured according to the client's expectations.

Peaks and valleys in application performance and throughput need to be monitored but they are only the first steps to creating a highly configurable and responsive environment. These monitoring tools play into how network bandwidth and/or storage resources can be automatically and dynamically allocated or restricted according to application and/or customer requirements.

This may include increasing or decreasing network bandwidth or storage capacity as the application's demands fluctuate. Or, as data ages or becomes more active, it moves that data to the appropriate tier of storage according to previously set policies that the service provider or even possibly the customer sets.

How quickly the data is recovered and to what previous point in time is yet another example of a feature that needs to be highly configurable. Application that enterprises host with a service provider may and likely will have a variety of recovery time objectives (RTOs) and recovery point objectives (RPOs) so enterprises will need the flexibility to tune these RTOs and RPOs according to their specific SLAs.

To meet these varying requirements, the public storage cloud that the service provider uses will need to include application-aware data protection and recovery options. These options will be found in technologies such as clones, snapshots and asynchronous and synchronous replication.

### 4. Highly Scalable

As service providers look to build out public storage clouds that host the data for enterprise organizations, network throughput and storage capacity will need to scale to

unprecedented heights. Networks will need to deliver hundreds of gigabits per second (Gb/sec) in throughput and storage capacity will need to scale into the petabytes if not exabytes.

Ethernet is emerging as the early leader and the primary means that organizations will use to connect to the public storage cloud. Ethernet is already a proven networking medium as it can scale into the thousands of ports, is cost-effective, stable and supportable. Further, it offers the primary storage networking protocols that are needed to deliver enterprise storage cloud services which include block (FCoE and iSCSI), file (CIFS and NFS) and http (REST).

The challenge that storage providers will have is identifying a storage system that supports the range of features that they need. While many storage systems scale to offer high levels of availability, storage capacity and performance, those that can support these Ethernet storage networking protocols and possess the number of network interfaces needed in an enterprise public storage cloud is much shorter.

## 5. Measurable

Enterprise organizations want all of these features in a public storage cloud though they will only want to pay for the resources in it that they are using. In order to meet that expectation, services providers will have to measure what resources each enterprise organization is using so it can appropriately bill those organizations as well as track and forecast how the use of these resources is growing holistically across the storage cloud.

This means the public storage cloud needs a means to collect information at a granular level such that the service provider can monitor:

- The amount of network bandwidth or storage capacity being used
- When the cloud resources are used (Are they used during peak or off-peak hours)
- What type of storage capacity did they use (Is it high performance or high capacity disk)

Then as the public storage cloud collects this information, it needs to be presented to the service provider in two ways.

First, the public storage cloud will need to offer an application programming interface (API) that a service provider's billing software can tap to pull out each client's usage information to generate invoices for that client.

Second, the public storage cloud will need to provide reports such that all of its network throughput and storage capacity statistics for all of the applications and clients can be both separated and aggregated. This needs to be done to forecast future growth for individual applications and clients as

well as the cloud as a whole. This also needs to be done to identify and plan for seasonal spikes in demands for resources in the cloud.

Filer Name	Volume Purpose	Total Used	Total Available GB	Utilization
krups	Data Store	157	197	80%
perry	Application Binaries	6	24	25%
sperethiel	Admin Home Dir	1	12	8%
speretheil	Stage	2.98	11.9	25%
svlappfl01	Custom Report Binaries	78	335	23%
svlappfl01	LOBs	15	335	4%
svldataflr4	SOX Output	25	100	25%
svldataflr4	NON SOX Output	25	100	25%
		<b>309.98</b>	<b>1114.9</b>	<b>28%</b>

## 6. Secure

One of the primary values of a public storage cloud is that network and storage resources can be aggregated while simultaneously shared among multiple clients. Securely sharing these resources requires the introduction of multi-tenancy into the public storage cloud. This enables each client's data to be logically and/or physically separated so only that client can access its data.

Multi-tenancy should be available in such a way that only that client can access its data without negatively impacting other applications or data that is stored in the public storage cloud. Further, if a client does make changes to the data that it stores in the cloud, these changes should not have a cascading or ripple effect such that it negatively impacts the applications or data of other clients stored in the cloud.

## 7. Serviceable

No matter how automated or simplified any public storage cloud is, it is bound to experience problems. Multiple hardware components may fail simultaneously, humans can and do make errors, and acts of God (earthquakes, floods, lightning strikes, etc.) occur which will then require some level of service.

In these circumstances, the service provider will need a storage provider that offers enterprise level support and trained individuals who understand how to respond so as to meet those needs quickly and professionally without aggravating the situation.



## NetApp StorageGRID: The Enterprise Gateway to the Public Storage Cloud

Service providers that want to attract enterprises as their clients need to deploy storage clouds that possess these seven key attributes. While all seven of these storage cloud attributes may not be initially needed or utilized by enterprises, as they continue to see the benefits that public storage clouds provide they will look to accelerate their rate of adoption.

It is at that point that the configurability, scalability and security of the service provider's underlying storage infrastructure will come under scrutiny. When that occurs those providers that use storage solutions that possess these seven key attributes will quickly distinguish themselves from their competitors.

This is what makes the NetApp public storage cloud story unique. NetApp already delivers the storage cloud features that enterprises are looking for: enterprise class hardware; software and support; unified storage; support of all Ethernet protocols; multi-tenancy; and, multiple storage tiers.

But the addition of NetApp StorageGRID represents the final piece in the puzzle that enterprises were looking for as they sought to seamlessly transition to the cloud. NetApp StorageGRID gives enterprises the confidence to first move their existing archival, backup and infrequently accessed data into a public storage cloud without negatively impacting current operations.

But more importantly they know that on the backend they are storing their data on a platform that can scale with them as they grow so once they have started down the public storage path they do not have to change directions and go with another solution later on.

This is why it is incumbent upon service providers to get this part of the public storage cloud equation right from the start. In all likelihood enterprises will want to store more data in the cloud. Meeting these initial and future expectations demand that service providers put in place the right public storage cloud solution.

NetApp's unified storage platform coupled with NetApp StorageGRID is the ONLY public storage cloud solution that has this full range of functionality. As such NetApp empowers service providers to dynamically scale it in whatever direction that their enterprise clients need as they need it.

Using NetApp StorageGRID coupled with the larger product portfolio from NetApp, service providers can deliver the economical solution that enterprise customers want today. But at the same time they are putting in place a public storage cloud infrastructure that can scale as they grow so as their enterprise clients prepare to go to the next level and store more of their application data in the cloud, they are already positioned to meet those demands. ■

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### About DCIG

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