

ASSESSING PUBLIC CLOUD STORAGE

In many organizations, IT plays a critical role in the embrace of Digital Transformation. However, in cases where IT cannot move fast enough to meet the needs of the business, it can also be seen as a roadblock to the same transformation. Often, the difference between the two lies in the technology infrastructure, with storage being a critical differentiator, especially in light of the explosion in amount of data being generated by today's digital businesses. Traditional storage platforms, while still a critical part of any organization's IT infrastructure, are beset by a number of challenges, which when taken together can lead to a lack of agility in responding to business needs. It's no surprise that business units (BUs) end up looking to public-cloud vendors for their needs, leading to instances of "Shadow IT" cropping up in various parts of the company.

Public cloud storage offerings such as AWS S3, Azure Blob Storage, etc. have seen rising adoption over the last few years owing to a variety of reasons.

CHALLENGES WITH PUBLIC CLOUD STORAGE

- **High cost over time:** Despite low "cents/GB per month" advertised costs, the actual costs of storing large amounts of data in the cloud can add up very quickly as you access, analyze, modify or move data. Public cloud providers have a long fine-print list of charges for accessing data, manipulating data or using tools outside of pure storage including network access that add unpredictability to the cost structure.
- **Unpredictable monthly bills:** The cost of public cloud storage depends on the amount of data stored, as well as data access patterns. This can lead to unpredictable costs from month to month, making it difficult for organizations to plan for and forecast IT spend accurately.
- **Data residency concerns:** Depending on the industry and countries a business operates in, there can be data residency issues related to keeping enterprise data in the cloud.
- **Potential for vendor lock-in:** Once in the cloud, migrating large amounts of data off a public cloud platform is extremely costly and difficult. This can lead to lack of flexibility for organizations if the changes in the business landscape require a change in direction.

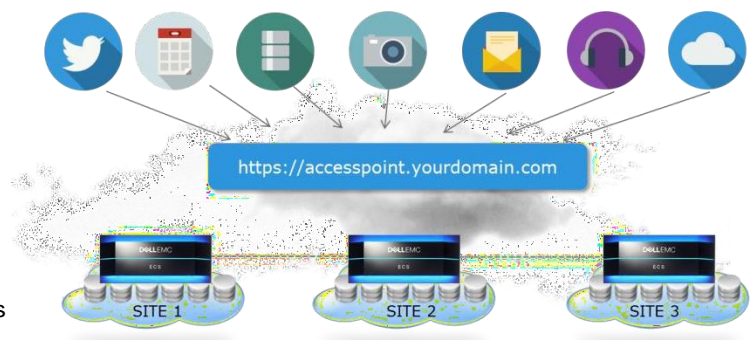
FEATURES OF OBJECT-STORAGE-AS-A-SERVICE

Deploying an Object-Storage-as-a-Service solution can address traditional archive and data silos, which are inefficient and complex. Object-Storage-as-a-Service enables the provisioning of a multi-site, active/active architecture with a single global namespace. Geo-protection optimizes remote access, and small-file optimization ensures storage efficiency. Objects are written once and can be read many times; updates to the data results in the creation of a new version of the object.

- **Self-Service Portal:** Object-Storage-as-a-Service offerings provide a public cloud like experience through a web-based self-service portal. This portal allows users to create credentials, associate themselves with a cost-center, and create storage capacity for their apps or workloads without having to create IT tickets.
- **REST-based API Interface:** An Object-Storage-as-a-Service platform makes data access much easier through the use of a simple REST-based interface (usually S3). It also makes it simple to share data across many different platforms and development technologies.

With REST-based APIs, developers can build applications that use data storage over HTTP such as the Amazon S3 API interfaces. Furthermore, data can be read from any location using a single URL-based gateway for users.

- **Anywhere data access:** For enterprises with many locations and branches, Object-Storage-as-a-Service provides location independence and allows for the decoupling of servers and applications from where the data resides. This is critical for enterprises with extensive data access from mobile devices and distributed locations. Users can access their data from a



gateway or URL where every transaction is authenticated, validated, and tracked. The gateways reside at the edge of the architecture and then synchronize data queues to the object store. In addition, the service allows users to write files from one location to another using the HTTP protocol - a practice that would likely incur additional charges with a public cloud provider.

- **Chargeback/Billing:** Usage of the object store is monitored constantly, and users are charged only for the storage capacity they use. Depending on how an organization sets up chargeback capabilities, cost centers can be billed at regular intervals, e.g. monthly for the storage they consume in a given month.
- **Encryption:** The Object-Storage-as-a-Service architecture automatically stores, encrypts and makes data available across multiple enterprise sites. All data written into the object store is AES 256-bit encrypted to protect data. Only the bucket and object owners originally have access to objects they create.
- **Data Protection:** Object store data is protected from multiple failure conditions. The solution protects data locally using mirroring and erasure coding, which enables multiple paths for recovering lost data via multiple parities. This approach protects against broken components and complete site outages. The solution is designed for extremely long-term data retention without the need for external data backups. The architecture is designed to be redundant and resilient and provides a multi-site availability model for 99.99999% durability.
- **Compatibility with object protocols like S3:** On-demand object platforms are compatible with the AWS S3 protocol (or other object protocols like OpenStack SWIFT), so applications can interface with the object store in the same way they interact with storage platforms in the public cloud. Applications make programmatic calls through the API using the credentials created through the portal.

LOWER TCO THAN PUBLIC CLOUD

There are many reasons for the adoption of public cloud storage, but few are as commonly cited as the perceived low cost. Public cloud storage services like AWS S3 have a strong economic appeal due to the lack of an upfront investment, a pay as you go model, as well as low \$/GB/month pricing. However, as their storage footprint on public cloud services grows, organizations often find that they are surprised by the amount of money they end up spending. At high storage capacity levels, recurring monthly payments can add up, and factors like data access costs and support can have a significant impact on Total Cost of Ownership (TCO) of public cloud storage.

Let's take a look at the cost drivers for a public cloud storage service like AWS S3, and how they impact TCO over a sustained period.

- **Cost of Storage:** As it is presented in a "cents/GB/month" format, the price of a service like AWS S3 appears to be quite low at first glance. However, what happens when an organization pays this low cost as a recurring charge for large amounts of data? Quite simply, the costs add up very quickly. Most organizations are surprised to find that storing even 1 Terabyte (TB) of data on AWS S3 over 3 years can cost more than \$1000. Enterprise organizations that are looking to tier multiple Petabytes (PBs) of data to the cloud will incur extremely high costs over time, even with volume discounts. These costs are likely to be even higher when one considers how long companies expect to keep their mission critical data. In the new digital economy, data is fast becoming a strategic asset to businesses, and is therefore seeing an ever-increasing shelf life. It is not uncommon for enterprises to expect to keep their data for more than 10 years.

In retrospect, the fact that public cloud storage is surprisingly expensive when used over a long period of time is not entirely surprising once we realize that using cloud storage is akin to renting a car. Although renting is very useful for small periods, over time the economic advantages of buying are hard to compete with.

- **Data Access Charges:** Public cloud providers charge a small fee every time data is accessed. The amount an organization ends up paying for data access depends on data usage patterns. For example, if an organization is using public cloud for primarily Long Term Retention (LTR), where data is accessed very infrequently, the data access costs could be low. On the other hand, if an organization runs frequent analytics on data stored in the public cloud, their access costs will be material to the overall TCO of public cloud storage. Furthermore, if data access patterns for an organization are not consistent, then this can add an element of variability to monthly bills, which are difficult to plan and budget for.
- **Support/Maintenance:** The low \$/GB/mo number for AWS S3 or other public cloud storage offerings does not include costs for support. Specifically for AWS S3, organizations have to pay between 5%-10% as maintenance/support fees that includes phone-support. In fact, organizations that want on-site support have to pay an additional fee on top of the standard support tier.

Thanks to these cost drivers, organizations often find that the TCO of public cloud storage can be surprisingly high, especially when storing large quantities of data in the cloud over long periods of time.

By contrast, ECS has been built to drive down TCO for organizations, thanks to a variety of factors such as use of industry-standard hardware, high storage efficiency, and low management overhead, as well as an absence of data access charges.

An Illustrative Example to Compare TCO

To best illustrate the TCO advantages of ECS over AWS storage services, let us consider the following hypothetical scenario. An organization is evaluating the best storage option for the following data footprint:

- Approximately 2 PB of data that it expects to use for a period of 5 years.
- Both read and write requests will come in from various parts of the world, and applications will access the data using the AWS S3 API.
- On average, 5% of the data will be accessed in any given month (around 100 TB per month).

AWS has three object-based storage services –Amazon S3 Standard, Amazon S3 Standard – Infrequent Access and Amazon Glacier (Archive). Using the publically available pricing from the AWS website¹, we can calculate the cost/GB/month for each of the cost drivers discussed earlier in this section

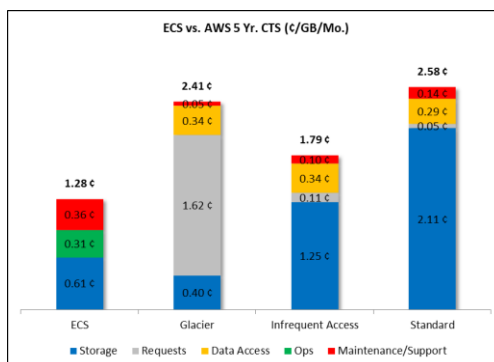
All costs in ¢/GB/Month	AWS S3	AWS S3 – Infrequent Access	AWS Glacier
Cost of Storage	2.11 ¢	1.25 ¢	0.40 ¢
Cost of Data Access	0.29 ¢	0.34 ¢	0.34 ¢
Cost of Requests	0.05 ¢	0.11 ¢	1.62 ¢
Cost of Support/Maintenance	0.14 ¢	0.10 ¢	0.05 ¢
Total Cost of Ownership (TCO)	2.58 ¢	1.79 ¢	2.41 ¢

¹ AWS Pricing as of July 2017 for US East (Virginia) Datacenter

- To calculate the TCO for an on-prem Object-Storage-as-a-Service using ECS, a variety of cost drivers are considered:
- Up-front costs such as the cost of hardware, software, deployment and support/maintenance contract
- On-going costs such as cost of IT staff to manage ECS, power/cooling, as well as datacenter floor space

When the data footprint assumptions are applied to ECS cost drivers, we arrive at the following TCO calculation².

ECS TCO Calculation	Costs in ¢/GB/month
Hardware Costs	0.32 ¢
Software Costs	0.28 ¢



Deployment Costs	0.01 ¢
Support/ Maintenance Costs	0.36 ¢
Total Upfront Costs	0.97 ¢
IT Administrative Costs	0.21 ¢
Power/Cooling Costs	0.06 ¢
Floor Space Costs	0.04 ¢
Total On-Going Costs	0.31 ¢
ECS Total Cost of Ownership	1.28 ¢

The graph below compares the 5-year TCO of ECS in this example with the 5-year TCO for the three AWS S3 services. Under these assumptions, ECS has a TCO that is almost half that of the AWS S3 Standard service. In fact, the ECS TCO is lower than that of AWS Glacier despite having substantially more functionality.

² Assumptions for calculating ECS TCO are provided in the appendix of this whitepaper

Finally, ECS simplifies data governance and management with policy-based retention, analytics enabled by HDFS and built-in optimizations for speed and storage efficiency. Additionally, ECS comes with enterprise grade features for protection, availability, encryption, authentication and fine grain access controls, making it a highly secure platform.

UTILITY/OPEX BASED PAYMENT OPTIONS

Dell EMC offers flexibility in payment/financing options for organizations that prefer the utility based pricing model of the public cloud. Through the [Dell EMC OpenScale Solutions](#) program, ECS can be purchased through a range of flexible, capacity-on-demand procurement options to fit most organizations' IT needs and expense plans. With these options, customers can take advantage of many of the benefits of public cloud storage services, such as no/low upfront payment, "pay-as-you-go" billing, and OpEx treatment of IT spend.

KEY USE CASES FOR OBJECT-STORAGE-AS-A-SERVICE POWERED BY ECS

Common use cases for Object-Storage-as-a-Service based on Dell EMC ECS include:

- **Modern Archive/Cloud Backup:** The easiest way to leverage Object-Storage-as-a-Service is to consolidate storage into a common, "modern" archive or as a target for cloud-based backup. An ECS based archive is highly consolidated, geo-distributed, and pervasively integrated with primary storage. It can be used to reduce the data volume on primary storage like SAN (Storage Area Network) and NAS (Network Attached Storage) systems, in the process drastically reducing storage costs and simplifying operations. ECS supports market leading Dell EMC and 3rd-party tiering and archiving solutions.
- **Tape Replacement:** Object-Storage-as-a-Service powered by ECS can help organizations looking to eliminate or reduce the footprint of their aging tape infrastructure. ECS can deliver an active-archive with the same scalability and low cost benefits of tape-based solutions, but without the operational challenges, lack of IT agility, and reliability concerns. Additionally, ECS makes business data available to BUs in an on-demand fashion. This allows organizations to fully embrace Digital Transformation, which relies on insights mined from business data to create more compelling experiences for customers.
- **Legacy application modernization:** Object-Storage-as-a-Service can serve as ideal storage platforms for organizations looking to modernize legacy applications built on traditional NAS platforms. Modifying legacy apps to point to ECS using the S3 (or other REST-based APIs like OpenStack Swift) protocol can help reduce costs, simplify maintenance of the application, and allow them to scale to handle massive amounts of data.
- **Simplified cloud-native/P3 app development:** Object-Storage-as-a-Service based on ECS is designed for cloud-native applications that utilize the S3 protocol (or other REST-based APIs like OpenStack Swift). This results in the need for considerably fewer lines of code—up to a 10X reduction—for a given application. ECS natively performs many functions like geo-distribution,

ensuring strong data consistency and data protection, therefore allowing application developers to focus on what moves their business forward. Organizations find that Object-Storage-as-a-Service is a great way to simplify the storage stack while improving developer productivity.

- **Data analytics:** Big data analytics and data science continue to emerge as competitive needs for enterprise businesses. Object-Storage-as-a-Service is the predominant cloud-scale data storage model that can handle the high volume and velocity, as well as the specific nature and rapid growth of IoT (Internet of Things) data, in a cost-effective manner. ECS is certified and compatible with most industry standard Hadoop distributions and does not require the traditional ETL (extract, transform, and load) processes associated with traditional HDFS deployments. ECS provides in-place analytics with no data massaging or movement required providing superior time to results and utilization of storage resources.
- **Enterprise sync and share:** Object-Storage-as-a-Service is ideal for enterprise synchronization and sharing of data for collaboration and distribution. The object store can replace home drives and team share sites, which can enhance productivity and increase enterprise control of where data resides.

ECS has enabled multiple other Object-Storage-as-a-Service use-cases with customers, such as **Internet of Things (IOT), storage of website static content, software depot/code repository, storage of logs, seeding of CDN caching.**