



# WHY THE Cloud Storage Market Needs a Change

Cloud storage version 1.0 was an amazing tool when it launched in 2006, but technology has evolved. Unfortunately, today's cloud storage providers haven't.





## Abstract

Having multiple copies of your data is a staple of any good data storage solution because hard drives fail. Traditional cloud storage is an attractive 2nd destination. It is geo-diverse from your on-prem or primary cloud storage solution, and is often housed in a billion dollar datacenter. Unfortunately, no matter how large of an investment, data centers still have outages.

Distributed cloud storage drastically reduces the risk associated with single data center solutions. Bifrost Cloud's storage solution distributes your secured data among thousands of possible facilities located around the world. Should 1 or 10 or even 50 of the facilities go down, your secured data is still available and recoverable.

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# Introduction

**“Data is the new gold” - Mark Cuban**

If this rallying cry for the 4th Industrial Revolution holds true, it seems logical that finding the most safe and secure storage solution would be critical. Today’s storage solutions haven’t really evolved much since the mid 1990’s when virtualized storage was introduced to the marketplace. It’s since been rebranded as “cloud storage”, but other than a few things getting smaller and faster, not much has changed from the original idea of virtualizing a group of disk arrays within one datacenter and networking into it.

In this whitepaper we’ll review the challenges associated with the three most popular data storage approaches, then introduce distributed cloud storage, the first major advance in enterprise storage in decades. This modern solution eliminates the need for overly complicated and expensive data duplication architecture while allowing end users to own their own encryption keys.



# Challenges of Using the Big 3 Cloud Providers

The challenges of using the traditional well known cloud providers for storage can be summarized as cost, data security, and lack of geo-diversity.

## Cost

Pricing plans for these providers have often been characterized as unpredictable, incomprehensible and expensive. Like many leaders in non-competitive markets, these providers seem to be constantly finding new ways to nickel and dime their customers. It's become so challenging to understand a bill that cottage industries have risen up to help end users try to predict and reign in what can be business bankruptcy, inducing costs. Not even NASA is immune to this challenge. In 2020, an audit suggests these fees could add \$30 million to the \$65 million budgeted expense for storing and accessing data from one project.

## Security

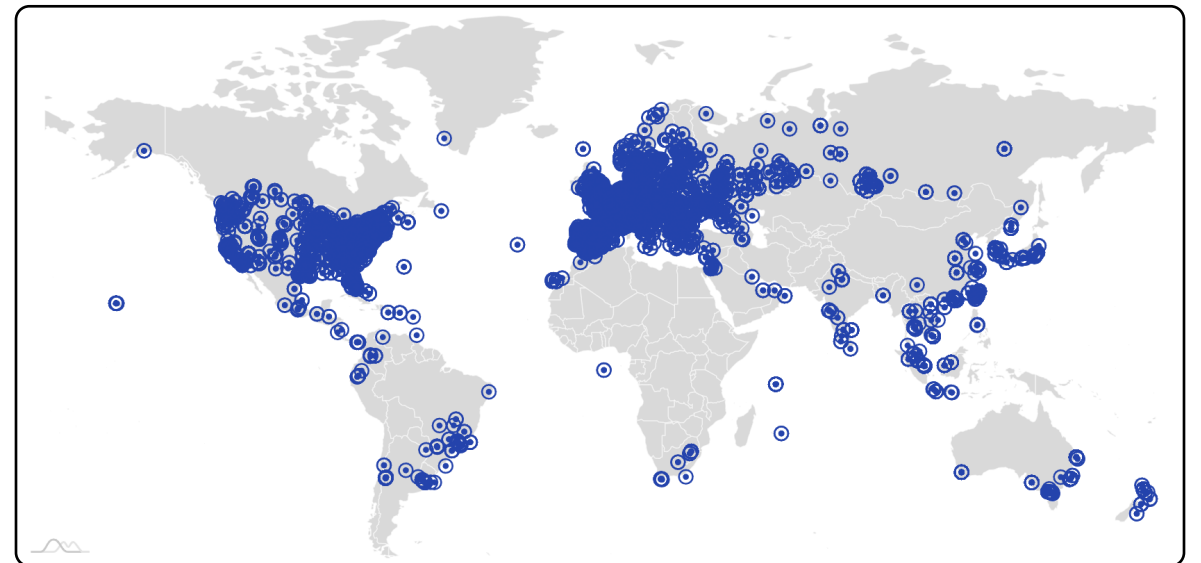
While many of the most publicized security breaches have occurred by taking advantage of end user credential mistakes, a major unpublicized risk comes from end users not being able to own their own encryption keys for data stored with these cloud providers. As a standard practice, millions of companies are simply trusting their data encryption to 3 of the wealthiest corporations in human history. This is one of many reasons why Walmart and other large retailers have gone on record telling their tech vendors to leave AWS.

## Geo-Diversity

These providers do have data centers distributed around the world, however, distributing your data across these locations is technically challenging and immensely expensive. While erasure coding has become a staple of cloud object store solutions (breaking data down into fragments, and coding is used to get redundancy data for re-creation of lost fragments), the distribution of

the fragments is generally restricted to one geographic location. There is a chance that these fragments are even stored within the same rack increasing the likelihood of outages and massive data loss. Their standard solution requires a full duplication of the object copied to another geography, essentially doubling or tripling the already high cost of working with these providers.

These providers have essentially been using the same technology since AWS launched their S3 product in 2006. The scale and flexibility it offered was a significant improvement over the limited alternatives on the market before its introduction, but technology has advanced to allow for better solutions, and they haven't kept up.



# Challenges of Building Your Own Cloud Storage Solution

The challenges of building your own cloud storage really come down to human capital, and equipment manufacturers with unreasonable support contracts.

## Human Capital

Finding and keeping talented IT architects and engineers get more challenging every year. The U.S. Bureau of Labor Statistics predicts the demand for IT pros isn't going to abate any time soon. In fact, the BLS forecasts a 13 percent increase in demand over the next decade, with over one-million technology positions going unfilled. When hiring and keeping employees with highly coveted, specialist skills, it's important to remember that they come at a price (the law of supply and demand creates one of the most difficult challenges when recruiting IT professionals). Even if you're able to build your own cloud storage solution, keeping the team in place to support it is extremely difficult in a job market so hungry for people with those skills.

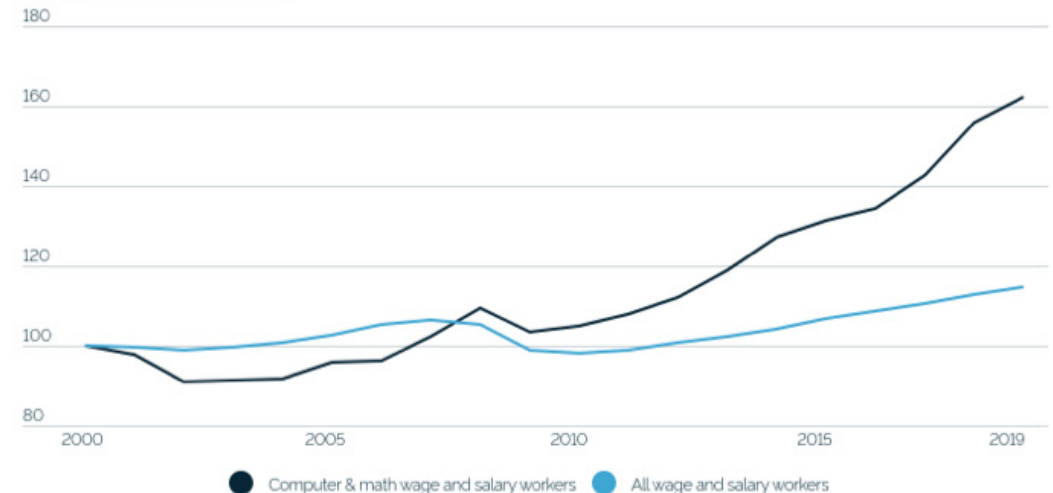
## Support Contracts

One of the dirty little secrets of the hardware industry is that most of the profits don't come from actually selling hardware, its primarily generated by support agreements generally "negotiated" with customers whose choices are generally to pay up, or roll the dice on unsupported equipment that even the most flexible insurance company won't cover. Often these maintenance agreements cost up to 50% of the original purchase price on an annual basis after the initial 2-3 year warranty period.

Even if you are able to overcome these challenges, you still have the strong possibility of building a solution that isn't as stable and flexible as solutions offered by the big three providers, which is one reason why the global cloud storage market has grown from around \$30 billion in 2017 to more than \$61 billion in 2020.

## Employment growth in computer and math occupations has far outpaced overall employment growth

Employment level (Index:2000=100)



Source: U.S. Bureau of Labor Statistics, 2019 Current Population Survey

# Challenges of Using Traditional Discount Cloud Storage

Recently we've seen a few discount cloud storage providers arrive on the market touting extremely low pricing. As you might expect, you generally get what you pay for; limited data center locations, inferior infrastructure, and restrictive usage policies.

## Limited Data Center Locations

One of the first things you'll notice as you begin to evaluate these providers is the very few locations they offer. Generally they are working to have one site on each coast of the US, one in Europe, and one in APAC. The risk of an outage or natural disaster having a dramatic effect on your data availability skyrockets the fewer locations you have to work with.

## Inferior Infrastructure

The importance of using high caliber infrastructure when you're single threaded can't be understated. If you're relying on one site to store your data, it better be rock solid. Unfortunately, to offer the kind of price points these providers have requires you to cut corners somewhere. Some are located in inferior datacenters that have been known to burn to the ground from time to time, others claim to have found a way to extend the life of their spinning disks to justify using hardware well past its prime. Not only do these providers offer increased risk in the short term, but the likelihood of poor storage performance will only increase with time.

## Restrictive Usage Policies

Another way these providers are able to offer such low pricing is to include restrictive usage policies in the small print of their agreements. One well known discount provider advertises free egress (downloading your data), but if you read closer you'll see they only allow for one download a month. Terms like these are pretty common once you take a deep dive into the evaluation process.

Like with most products, the lowest price option isn't always the least expensive when you start factoring in risk or risk mitigation tactics like using 2 discount providers rather than one expensive provider.



# Introducing Modern Distributed Cloud Storage

Distributed Cloud Storage is an object storage solution that gives you all of the perks of traditional cloud storage, but with the added advantage of being highly geographically diverse and minimizing the reliance on building a large power hungry fortress to house the hardware.

The underlying technology has been around for years in the peer to peer and B2C space, but until recently, it had yet to be used in the B2B space. Distributed Cloud Storage takes the thousands of smaller storage providers around the world and allows them to appear as one giant pool of capacity to end users. This decentralized strategy mitigates the risk of data failures and outages, while simultaneously increasing the security, read performance, and privacy of object storage. Providers like Bifrost Cloud have introduced Distributed Cloud Storage to traditional IT organizations behind a familiar API and engineered it in such a way that the solution can comfortably exceed the current levels of SLA performance of the current cloud storage options.

## How it Works

### Functionality

When data is stored with Distributed Cloud Storage providers like Bifrost Cloud, files are encrypted at the user's end and broken up into multiple pieces using a technique called erasure coding. The pieces are distributed to storage providers across the network. To be more specific the data is split into 80 pieces and sent to 80 different storage providers across the network. Once an object is split with erasure codes and storage providers are selected, metadata is created so we can retrieve the data. Metadata is "data that provides information about other data", but not the content of the data.

From referencing metadata, data can be retrieved from the network. The pieces will be retrieved from the various storage providers and the original data will be reassembled and transferred to the client's local machine and then decrypted for consumption.

### How it Works

- Data is encrypted at end user source machine
- Data is sent to gateway for processing of the erasure code
- The 80 pieces are encrypted and distributed among the thousands of Storage-aaS providers available globally with locations recorded as metadata.
- Storage network routinely checks the pieces to ensure they are available and undamaged. File repair is automatically instigated if needed.
- Once data retrieval has been instigated by the end user, 30 pieces of the original object are retrieved from the storage network and are reassembled.
- Object is transferred to the end user for decryption and consumption.

## Redundancy and Durability

Most storage providers use replication to achieve a higher level of redundancy. The Bifrost Network uses erasure coding to provide a much more efficient method to achieve redundancy. When compared to replication, erasure coding also offers improved reliability, and availability.

Erasur coding is parity-based, which means the data is broken into fragments and encoded, so it can be stored anywhere. This makes it well-suited to protecting cloud storage. Erasure coding also uses less storage capacity than RAID, and allows for data recovery if two or more parts of a storage system fail.

Bifrost cloud would have to experience an outage on more than 50 of the storage providers for data loss or data unavailability to occur. Only 30 of the 80 providers have to be online for the data to remain intact.

At rest, data stored on the network is automatically monitored for file consistency. If available file pieces have fallen below a certain threshold, the network triggers a file repair immediately to make sure it always maintains enough healthy pieces on the network for retrieval. For example, more than 50 of the 80 storage providers would have to become unavailable, but with file consistency, the storage providers will be kept as close to 80/80 as possible.

Data durability is the ability to keep the stored data consistent, intact without the influence of bit rot, drive failures, or any form of corruption. Bifrost Cloud ensures 11 nines of durability, which means that if you store 10 million objects, then you can expect to lose an object of your data every 10,000 years.

## Availability

Remember, user data is split and sent to 80 providers. Each provider is operated by a different individual, in a different location, with separate environments (power, network access etc.). The chance of an individual provider failing is almost entirely uncorrelated with the chances of another storage provider failing. As a result, the kinds of availability we obtain are not subject to storms, power outages, or other “black swan” events. Even if the chance of an individual drive failing in the Bifrost Network is higher than in a centralized cloud, the chance of collective failure (e.g. losing 51 out 80 independent nodes) is very low. The Bifrost Network is currently rated at 16 nines for availability.

## Encryption

All data stored on the network is encrypted. Data can be encrypted at the user’s end or as early as possible before leaving the source machine. AES-256 Encryption algorithm is used. By encrypting file-paths, content, and metadata client-side, we avoid the danger of making this data available to attackers, and anyone else who is unable to access the necessary encryption keys.



# Case Study

A mid-sized law firm had terabytes of e-discovery data that were required to be archived for seven years. As the data object grew at an increasingly rapid rate, they engaged with a trusted MSP to find alternatives to their cumbersome on-prem solution that was backing up to one of the increasingly expensive big 3 cloud providers. The exorbitant expense of backing up the archive to the big 3 provider had led to the law firm disabling the replication to the cloud and gambling on the resilience of their on-prem solution. This was far from an ideal solution, but the economic reality forced their hands.

After an extensive evaluation of alternatives, the law firm concluded that the end-to-end encryption, extreme resilience, and competitive pricing of Bifrost Cloud's Distributed Cloud Storage solution was clearly the best option. Since they were able to continue working with their familiar back-up software, there was no additional product training necessary. The IT team was able to begin working on a realistic migration strategy with the MSP at once.



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Partner Quote:

*Bifrost has been great to work with. Their product works and has been a game-changer when talking to prospects. It's made cloud storage a realistic option for our clients with their incredibly secure data storage and aggressive pricing.*

**ANDREW S. CAMPBELL**  
(FOUNDER/OWNER – BRICKHOST)

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## Conclusion

Legacy cloud storage has been a wonderful enabler for data redundancy and SaaS applications, but has done little to address the weaknesses of the solution since they were initially introduced. Distributed Cloud Storage takes the best of what the legacy providers offer, but utilizes modern technology to address risks associated with relying upon one datacenter location and not enabling end-users to control their own encryption keys.

The distributed nature of the solution means IT professionals no longer need to create complicated and inefficient replication solutions to ensure resilience of data. This technology also removes the threat of natural disaster and other single datacenter centric outage risks ensuring that your data is safe and available whenever you need it.

Providers such as Bifrost Cloud have combined this technology with a simple competitive pricing structure and the most common API in the industry to remove many of the barriers that had prevented businesses from adopting this modern solution.

The time has come for the cloud storage marketplace to embrace modern technology to address the flaws in the original solution that they were forced to accept as a trade off for the scalability and flexibility offered by legacy cloud storage hosting providers.

*For more information  
and to test the solution  
please visit*

[www.BifrostCloud.com](http://www.BifrostCloud.com)

# About Bifrost Cloud

Founded in 2019 out of Toronto, Bifrost Cloud is a leader introducing distributed cloud storage to the B2B marketplace. With simple and competitive pricing, S3 API, a generous SLA, and exceptional customer service, they have removed the barriers that have prevented traditional IT from embracing this modern technology and are currently looking for reseller partners.

