**Economic Treatise on Cloud Storage**

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**Introduction**

As cloud computing becomes more and more popular, some are under the believe that any cloud solution will reduce price and costs. Cloud offerings for storage services, and infrastructure need to use total cost methods to ensure that the right approach is used to engineer cloud solutions that can reduce costs. There are cross-over points, sweet spots and problem areas for cloud with several conditions, and an economic approach can help define these areas.

Cloud solutions tend to shift or transfer costs to other providers, without necessarily reducing costs. Until a proper understanding of current costs is made, making claims that storage in the cloud is cheaper may be inaccurate. For the current BAU environment, TCO is a function of age, growth rate, location and total capacity. And storage TCO is defined by 34 different costs[[1]](#endnote-1) that make up to the total cost. A correct view of BAU costs is needed before contrasting or considering cloud options – if cost reduction is the final goal of a cloud approach.

The 451 group[[2]](#endnote-2) defines cloud attributes as being virtualized, tiered, metered, elastic (in capacity) and billable. Many current storage environments do not have these qualities, so moving to a commercial cloud offering can jump start some of these processes. We see opportunities for enterprise clients to seriously consider storage cloud offerings:

* Enterprise drop box
* Archive, Object storage
* Tier 4 in the cloud
* Backup to the cloud (and its several variations)
* Hybrid clouds for highly elastic demand/supply

As enterprise clients become more comfortable with cloud services, the door will be open for more capacity and higher-function services to move into the cloud. That is why an economic framework is needed to quality and certify when cloud options are viable.

This paper will define public, private and hybrid cloud concepts, strengths or weaknesses. It will not defend security and compliance issues. It will not cover utility pricing and consumption methods that often get merged into a cloud discussion. This paper will present an approach to qualify and demonstrate cost effective options that may be available from cloud service providers. It will also cover economic elements that are required if enterprise customers turn themselves into cloud service providers (for internal or commercial uses). The scope of cloud economics discussed here is related to commercial offerings, and is not inclusive of the HDS cloud vision (information cloud, content cloud etc.) This material is an abridgement[[3]](#endnote-3) of many other resources developed within HDS over the last 2-4 years.

**How do Cloud Service Providers Offer Better Costs and Prices?**

Before we answer this question, we have to establish a key principle in Cloud Economics:

Price is not the same as Cost

The price of TB of disk, either purchased internally or acquired by a service provider is only a fraction (about 15%) of the total cost of storing data in that TB of disk. Some messaging from cloud providers on ultra-low costs *prices* confuse the story around for those wanting to reduce the *costs* of storage.

First, large storage cloud service providers can offer good prices since the large volumes of capacity they purchase entitle them to better-than-average discounts on storage hardware, software and also favorable terms on maintenance.

Next, large cloud providers employ key technologies to reduce the amount of physical capacity, and thus sell thin, tiered, pooled and highly optimized virtual capacity. CSP are more naturally incented to reduce their own cost of goods, so they will employ the best architecture, technologies and operations. This diagram depicts what a traditional customer would have to purchase in order to storage a set amount of data, compared to what an optimized (cloud) provider would need to offer the same virtual capability.



Figure 1 Written Capacity is about the same, but usable and raw capacities are reduced

The difference in raw capacity translates to lower power and cooling, purchase costs, maintenance costs etc. Cloud providers promote the concept of selling virtual capacity, and often this is capacity that is pooled or shared between many different clients. If a cloud user wants dedicated, non-shared, non-virtualized capacity, they would have to pay a much higher rate. Large CSP can also negotiate favorable terms for electricity, management labor (very skilled) and other facility charges that can be amortized against a large infrastructure to produce effective rates at the unit cost level.

Public cloud providers also bank on sharing services and resources across a large customer base. These economics of scale and virtualization provide a much higher asset utilization rate (ROA) than is normally seen within an internal IT departments.

Except for the benefits of large scale, most enterprise clients can achieve many of these same benefits on their own, by deploying advanced architectures and developing best practices[[4]](#endnote-4) in their storage operation. Often the internal (or organic) change into these new storage concepts have such a long lead-time, or have political and operational undertows, that simply going to a cloud provider is the best move.

**Assessing and Comparing Cloud with a Total Cost Approach**

Don't be seduced by low price cloud offerings. Price is not the same as costs, look beyond introductory prices

First, determine your current (and near-term future) total cost of storage

Choose from 34 costs

Next, using the same cost categories, calculate the total cost of the cloud offering

You will have to add costs that are above and beyond the service PRICE offering

Taking a multi-year look, try to predict if the BAU costs and Cloud costs will change/decline over time

Example calculation

Cost areas that are (usually) much lower in the cloud model

* Maintenance and depreciation costs are bundled. Due to high volume arrangements, cloud providers can probably negotiate more favorable terms than you can
* Cost of migration
* Cost of growth, holding reserve capacity
* Cost of waste
* Power, cooling, floor space – again economies of scale provide them lower COGs
* Local fibre, WAN in the hosting center (not to the hosting center)
* Cost of management
* Cost of copies
* Cost of procurement
* Unscheduled outage

Cost areas that may be higher with a cloud solution

* Network costs, dark fibre
* Risk
* Recovery
* Security and encryption
* Compliance
* RTO impact
* Performance
* Transformation, on-boarding
* Internal mechanisms for costs allocation
* Machine related outage

Cost areas that will be about the same with a cloud solution

* Provisioning time and effort
* Unscheduled outage due to people, processes
* Cost of duplicate data
* Data loss
* CIFS/NFS Infrastructure
* ROHS

**Additional Considerations for a Economic Review of the Cloud**

Dollarize Soft Costs

One of the tricky aspects of developing comparative cost models (DIY vs Cloud) involved quantifying costs that are typically seen as soft costs[[5]](#endnote-5). Over the years data center operations have built systems and protection against some of these soft costs, and it will not be until some IT resources are taken out of the data center that some of these costs will be exposed. In the case of moving to cloud, some of these soft costs or indirect costs will become hard costs, and will therefore be required to be included in comparative calculations.

* Risk of Assets out of the control of IT – there will be new issues with company data leaving the safe haven of the data center. Can sensitive information be safe in a public cloud offering? What is the cost these (unknown) risks? Company IP or other data be put into a new level of exposure, loss, corruption, hacking?
* Compliance – are there industry, government or legal requirements that will have to be reviewed to ensure that data or infrastructure outside the DC is still compliant with existing rules and regulations? Will there be an exposure to fines or lawsuits with any new data storage arrangement?
* Latency and Performance – resources are now a network distance away, and there will be added latency for access, retrieval, and processing of systems and data. Will the added latency generate new costs of opportunity loss/cost, customer satisfaction, etc.

Don't shift the cost, use cloud to actually reduce costs

|  |  |  |  |
| --- | --- | --- | --- |
| **Traditional Model** |  | **Cloud Model** | |
| Customer Costs |  | Customer Costs | Provider Costs |
| Cost 1 |  | ✓ |  |
| Cost 2 |  |  | ✓ |
| Cost 3 |  |  | ✓ |
| Cost 4 |  |  | ✓ |
| Cost 5 |  | ✓ | ✓ |
|  |  | New cost 6 |  |
|  |  | New cost 7 | ✓ |
| Total BAU Cost |  | Sum of these 2 columns is the new cloud cost | |

In many cases, the BAU costs are simply shifted to the new provider model, and the resulting total cost calculation may not be as much as initially expected. This can be due to

Transformation to the cloud is not free

Moving systems, data and applications to a cloud service will require a transformation of business process and IT operations. These transformations are not cheap, but are usually part of the on-boarding service a CSP offers to clients. Usually this is a one-time exercise, and when the cut-over is complete, all new data and systems will originate in the new cloud infrastructure. Several processes will, require re-engineering and new internal coordination, such as:

* Version control, change control
* CMDB
* Provisioning
* Asset registry
* Charge-back, journal entry
* Management reports and metrics

Project acquisition methods will require a change, and perhaps escrow systems

An Exit Strategy needs to be considered/ budgeted

Getting into a cloud is not free (or fast), and the same will be true if, in the future, data or systems are brought back in-house. Developing and budgeting a cloud-exit strategy may need to be considered with regard to a long-term plan or financial due diligence.

**The economic benefits of Cloud differ based on the cloud produce or offering**

Tier 4 – drop box style

* + Cost of growth
  + Cost of copies

Backup in the Cloud

* + Backup infrastructure
  + Backup media
  + Meeting backup window (usually with hybrid)
  + Beware of slow RTO

Disaster Protection in the cloud

* + Cost of copies
  + DR risk

Elastic , CoD offering

* + Cost of growth
  + Cost of waste

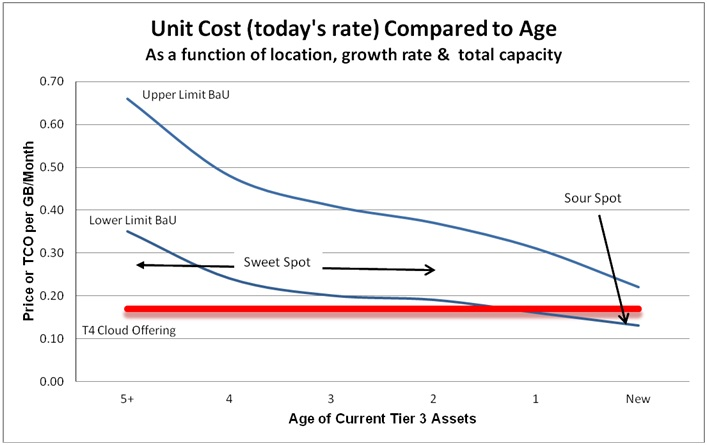
MSS

* + Monitoring
  + Cost of provisioning (time and effort, not project wait time)
  + Labor
  + Backup and DR

**Converting a Private Data Center into a Cloud (CSP)**

* Start with a contracted cloud service. Have this transformation help with the behavioral changes, then develop your own internal approach to cloud services
* Need a storage service catalog
* Need a pricing system that is tiered, flexible and competitive (unless you have a captive client base)

**CSP Economic Sweet Spot(s) Examples, Case Studies**



**Case Study #1**

**Case Study #2**

**Conclusions**

1. Know your costs
2. Present an apples to apples total cost comparison
3. Look to cloud for net-new services that you currently can’t (afford to) offer
4. Don't get seduced by low price cloud offerings
5. Present a current view, or NPV view of multi-year storage (and include growth)

1. See the HDS White Paper on Storage Economics that defines these 34 cost areas - <http://www.hds.com/assets/pdf/four-principles-for-reducing-total-cost-of-ownership.pdf>. For HDS internal readers, more detail in these costs can be found here - <http://loop.hds.com/docs/DOC-7338#comment-3524> [↑](#endnote-ref-1)
2. 451 reference <http://www.the451group.com/ice/ice_detail.php?icid=619> “Cloud computing' describes a service model that combines a general organizing principle for IT delivery, infrastructure components, an architectural approach and an economic model – basically, a confluence of grid computing, virtualization, utility computing,” [↑](#endnote-ref-2)
3. Blogs on the economics of cloud, storage

   <http://blogs.hds.com/david/2012/09/a-penny-for-your-gig.html>

   <http://blogs.hds.com/david/2012/09/comparing-all-the-costs-in-a-1-cent-a-gb-cloud-offering.html>

   <http://blogs.hds.com/david/2012/03/storage-clouds-sweet-and-sour-spots.html>

   <http://blogs.hds.com/david/2011/11/economic-overlay-on-the-cloud-part-2-of-2.html>

   <http://blogs.hds.com/david/2011/10/economic-overlay-on-the-cloud-part-1-of-2.html>

   <http://blogs.hds.com/david/2011/08/don%e2%80%99t-just-transfer-the-costs.html>

   <http://blogs.hds.com/david/2011/08/think-like-an-economist-talk-like-an-accountant-act-like-a-technologist.html>

   <http://blogs.hds.com/david/2011/02/storage-economics-talking-points.html>

   <http://blogs.hds.com/david/2010/11/cloud-storage-economics-part-1.html>

   <http://blogs.hds.com/david/2010/11/cloud-storage-economics-part-2-tco-for-cloud-storage.html>

   <http://blogs.hds.com/david/2010/11/cloud-storage-economics-part-3.html> [↑](#endnote-ref-3)
4. Summary of best practice and architecture elements to produce economically superior storage (lower TCO)

   |  |  |
   | --- | --- |
   | **Examples of investments and standards that can reduce the costs of storage ownership** | |
   | **Architecture** | **Best Practices** |
   | Virtualized Storage | Storage Service Catalogs |
   | Multiple Tiers | Metering, Chargeback |
   | Dynamic Tiers | Mgmt, KPI and Metrics |
   | Policy based lifecyle movement | Orchestration w/ different platforms |
   | Thin volumes | ITIL |
   | Single point of virtual mgmt | Off-shore labor |
   | Advanced backup | Selective Sourcing |
   | Unified block, file | JIT provisioning |
   | Cost effective SAN, connection methods |  |

   [↑](#endnote-ref-4)
5. Sometimes referred to as indirect costs, soft costs are business costs that are not involved in the direct process of a business operation. While essential, these types of costs generally focus on ancillary issues that do not affect the day to day production process. [↑](#endnote-ref-5)