What is Cloud Storage?

◆ According to **Wikipedia**, *Cloud storage is a model of networked online storage where data is stored on virtualized pools of storage which are generally hosted by third parties.*

◆ *Hosting companies operate large data centers; and people who require their data to be hosted buy or lease storage capacity from them and use it for their storage needs.*

◆ *The data center operators, in the background, virtualize the resources according to the requirements of the customer and expose them as storage pools, which the customers can themselves use to store files or data objects.*

◆ *Physically, the resource may span across multiple servers.*

> Your data is backed up/stored online on different servers then when you need it you can access it from anywhere anytime <u>without</u> carrying your data with you all the time.

Cloud storage models

Cloud storage is a service model in which data is maintained, managed and backed up remotely and made available to users over Internet. There are three main cloud storage models:

◆ **Public cloud storage services**, such as Amazon's Simple Storage Service (S3), provide a <u>multi-tenant storage environment</u> that's most suitable for unstructured data.

◆ **Private cloud storage services** provide a <u>dedicated environment</u> protected behind an organization's firewall. Private clouds are appropriate for users who need customization and more control over their data.

◆ **Hybrid cloud storage services** is a combination of the other two models that includes at least one private cloud and one public cloud infrastructure. An organization might, for example, store actively used and structured data in a private cloud and unstructured and archival data in a public cloud.

Characteristic	Public cloud storage	Private cloud storage	Hybrid cloud storage
Scalability	Very high	Limited	Very high
Security	Good, but depends on the security measures of the service provider	Most secure, as all storage is on-premises	Very secure; integration options add an additional layer of security
Performance	Low to medium	Very good	Good, as active content is cached on-premises
Reliability	Medium; depends on Internet connectivity and service provider availability	High, as all equipment is on-premises	Medium to high, as cached content is kept on-premises, but also depends on connectivity and service provider availability
Cost	Very good; pay-as-you-go model and no need for on-premises storage infrastructure	Good, but requires on-premises resources, such as data center space, electricity and cooling	Improved, since it allows moving some of storage resources to a pay-as-you-go model

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Defining cloud storage: The most popular cloud terms

◈ **Storage as a Service (SaaS)**

- A business model in which a large company **rents space** in their storage infrastructure to a smaller company or individual.
- In the enterprise, SaaS vendors are targeting secondary storage applications by promoting SaaS as a convenient way to manage **backups, replications, archive, DR,** etc.

◈ **Cloud backup**

◈ **Utility Storage**

◈ **Cloud Drive Storage**

◈ **Storage Service Provider (SSP)**

◈ **Cloud Storage SLA**

Storage as a Service (SaaS) Advantages

The key advantage to SaaS in the enterprise is in **cost savings** -- in **personnel**, in **hardware** and in **physical storage space**.

◆ Capital expenditures for additional hardware are <u>not</u> required.

◆ <u>Not</u> need to maintain a large tape library and arranging to vault (store) tapes offsite.

◆ Just specify what data on the network should be backed up and how often it should be backed up.

◆ It can be run automatically <u>without</u> manual intervention. (Lights out operation)

◆ In a Service Level Agreement (**SLA**), the SaaS provider agrees to rent storage space on a cost-per-GB-stored and cost-per-GB-transfer basis.

◆ If the company's data ever became corrupt or got lost, the administrator could contact the SaaS provider and request a copy of the data.

◆ An enterprise-level cloud storage system should be **scalable** to suit current needs, accessible from anywhere and application-agnostic.

◆ SaaS is also being promoted as a way for all businesses to mitigate risks in **disaster recovery**, provide **long-term retention** for records and enhance both **business continuity** and **availability**.

Storage and Backup

◆ 60% of organizational data currently stored on desktops, laptops, and mobile devices.

◆ In future that data will be stored in the cloud.

◆ Users <u>don't</u> want to manually move data between devices.

◆ Ubiquitous access to data from **<u>any device</u>** requires cloud based storage.

◆ Cloud based storage allows backup and recovery.

◆ Losing a device does <u>not</u> mean losing critical data

Cloud backup

◆ A strategy for backing up data that involves sending a copy of the data over network to an off-site server.

◆ The server is usually hosted by a third-party service provider, who charges the backup customer a fee based on the volume of data.

◆ The application **collects, compresses, encrypts** and transfers data to the service provider's servers.

◆ To reduce the amount of bandwidth consumed and the time it takes to transfer files, the service provider might only provide **incremental backups** after the initial full backup.

◆ In the enterprise, cloud backup services are primarily being used for archiving non-critical data only. Traditional backup is a better solution for critical data that requires a short recovery time objective (**RTO**) because there are physical limits for how much data can be moved in a given amount of time over internet.

Cloud Backup vs. Traditional Backup

Backup factor	Cloud backup	Traditional backup
Amount of data	Best when the total amount to protect is **less** than 100 GB per 1 Mb of network bandwidth. For example, 100 GB can be supported by a 1 Mb WAN connection (such as DSL)	For **large** amounts of data, or for environments with limited network connectivity, traditional backup techniques are more appropriate.
Rate of change	Best when the rate of change is less than **10%** of the total data per month.	For data that **changes frequently**, traditional backup methods that use local disk and tape, with tape transport off-site are more appropriate

Utility Storage

◆ Utility storage is a service model in which a provider makes storage capacity available to an individual, an organization or a business unit on a pay-per-use basis.

◆ The utility model is sometimes called **metered services** or *storage on demand*.

◆ As in the **utility computing** model, the purpose of utility storage is to use resources efficiently and reduce costs.

◆ A use-based pay structure can be much more cost-effective for an enterprise than it would be for them to purchase, manage and maintain an infrastructure that meets peak requirements, which may be far beyond what's needed normally.

Three basic models of utility storage

◆ **On demand:** Vendors install storage systems configured with more capacity than is needed; users "turn on" additional capacity as required and are billed for the additional usage.

◆ **Internal utility:** The IT department pools its storage resources and adds the components necessary to internally administer the storage as an on-demand service to the company's business units.

◆ **Off site:** Storage service providers (SSPs) provide off-site storage facilities, typically based on a lease arrangement with service level agreements (**SLA**s) that guarantee quality of service (**QoS**).

◆ Many companies use SSPs for off-site backup; increasingly, SSPs are also being used to replace or augment onsite data storage.

Cloud Drive Storage

◆ Cloud drive storage is the **mounting of storage** capacity provided by a **cloud storage service** so that it appears to the server as a normal drive letter.

◆ The server can treat the cloud storage as if it were a drive on **direct-attached storage** or a **shared storage filer** so files can be easily saved to and restored from the cloud.

◆ This practice makes it easy for applications to access the cloud storage -- no middleware or special cloud storage APIs are required; the application just needs to know what drive letter it should direct its requests to.

◆ The term "cloud drive" has been popularized in part by Amazon, which offers the **Amazon Cloud Drive** cloud storage service but many other services offer the same interface and access to cloud storage.

Storage Service Provider (SSP)

◆ On the Internet, a storage service provider (SSP) is a company that provides computer storage space and related management to other companies.

◆ In addition to the storage itself, SSPs typically offer periodic backup and archiving and some offer the ability to consolidate data from multiple company locations so that all locations can share the data effectively.

◆ Customers may be billed a monthly rate and for each managed terabyte of storage.

◆ Two leading SSP companies are **StorageNetworks** and **Managed Storage International**.

◆ Some companies specialize in providing limited storage service, such as periodic remote backup, to individual computer users and small businesses.

Cloud Storage SLA

◆ A cloud storage service-level agreement is crucial for any organization looking to move to cloud storage.

◆ This contract between a customer and their cloud storage service provider provides guarantees and details the services being offered, such as **99.9%** uptime.

◆ The SLA should also define **compensation** for users if the specifications aren't met.

◆ Cloud storage service providers usually offer a tiered service credit plan that gives users credits based on the discrepancy between SLA specifications and the actual service levels delivered.

◆ One vendor SLA, for example, that offers 99.9% uptime. It sounds pretty good. But they don't count downtime unless the client can't access applications for more than 10 minutes. A nine-minute outage is not considered downtime for them in their SLA."

iCloud

◆ iCloud is a service provided by Apple

◆ 5 GB storage space is free of cost

◆ Once the iCloud is used you can share your stored data on **any** of your different Apple devices

◆ Access to all files, music, calendar, email

◆ Only **iOS 5** has iCloud installed

Dropbox

- One of the most popular file-sharing services is **Dropbox**.
- Users like it because it's free and simple.
- The service is named for the repositories used by banks, post offices, video stores and libraries to allow people to drop items off securely.
- It creates desktop folders where a user can store files and documents, then **syncs** those contents to the user's **smartphone**, **tablet** or other **computers**.
- Dropbox is **a personal cloud storage service** that is frequently used for **file sharing** and **collaboration**.
- The Dropbox application is available for **Windows**, **Macintosh** and **Linux** desktop operating systems.
- There are also apps for **iPhone**, **iPad**, **Android**, and **BlackBerry** devices.
- The service provides **2 GB** of storage for free and up to 100 GB on various for-fee plans.

Dropbox

- It's a challenge for IT to secure company data users store in the cloud via their personal Dropbox accounts, but if you're looking for a **corporate file sharing** alternative, **Dropbox for Teams** is a good option.
- **Dropbox for Teams**, provides **350 GB** storage. The user data is stored on **Amazon's Simple Storage Service (S3)** and protected with Secure Sockets Layer (**SSL**) and Advanced Encryption System (**AES**) **256-bit encryption**.
- This paid enterprise service allows corporate admins to set up file-sharing services where IT has control over teams of users who can access certain files.
- This approach creates a more secure environment for **business file sharing**.

www.box.com

◆ Another service developed with the **enterprise** in mind is Box. **Cloud storage and collaboration services** from Box include **Box for Personal** use, **Box for Business** and **Box for Enterprise**.

◆ These professional file-sharing services are good options for IT because they allow IT to manage data access using groups.

◆ With project groups, users and administrators can create groups to share specific documents with specific users, which helps keep data secure.

◆ Box also offers file **encryption**, which minimizes the chances of a document's security being compromised.

◆ There are Box apps for **Apple** and **Android** devices.
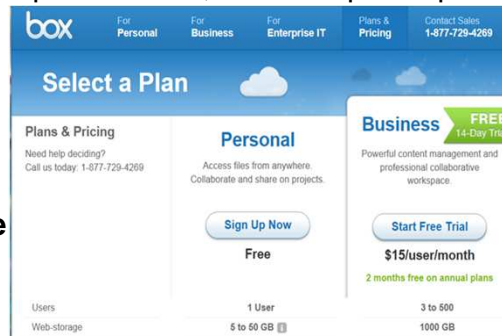
Microsoft SkyDrive

◆ Microsoft SkyDrive is a free cloud service that offers users **25 GB** of storage.

◆ SkyDrive is great for users because all they need to do is log in with their **Windows Live** accounts, and from there they can invite anyone they want to share data.

◆ This approach makes it hard for IT to control SkyDrive.

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Personal cloud storage services benefits & risks

◆ Personal cloud storage services have benefits, but with data security concerns on the rise, organizations may want to consider alternatives that offer more control.

◆ User demand for personal cloud storage services is strong and growing, but every organization must decide which system of document sharing best suits its needs.

◆ **Security (encryption), file sharing, synchronization, manageability,** and **version control** are all factors that IT decision-makers should consider before choosing a system.

Cloud Storage Benefits

◆ A company **doesn't** have to dedicate resources to implementing and supporting a document management system -- **no CapEx**.

◆ With cloud storage, there's **no** need for CDs, external hard drives, or tape silos.

◆ Data is quickly and **automatically updated** in the cloud and available for your retrieval whenever you need it

◆ Should your office become the victim of a burglary, fire, or natural disaster, your data is safe and secure in the cloud, even if your physical assets are destroyed.

◆ One of the greatest benefits of cloud storage is its ability to **grow** with its users.

◆ With **no** need for physical, on-site storage space, you can have a smaller workspace, less equipment to buy, and fewer IT employees to maintain your equipment and manage your data

◆ IT staff's can spend more time to focusing on other important tasks to help your business growth.

◆ **Easy to use:** Drag & drop -- automatically synced in the cloud -- accessed from other devices and shared with others.

◆ Users are always working on **the most up-to-date version** of a document, and they offer **support for a variety of platforms**.

What are the negatives to cloud storage?

◈ Personal cloud storage services eliminate the enterprise's number-one priority when it comes to data: **Control.**

  ▪ Many companies may not want to hand over their data to an external organization to store.

◈ **Security:** Fearing that they may <u>not</u> have the right security software to protect the company's data.

  ▪ **Weak Security:** Just ID and password

  ▪ Earlier 2011, there was a security problem at Dropbox, when a programming error opened a 4 hour window during which anyone could log on to **any account with any password**.

  ▪ There haven't been many security breaches of this nature, but there could be.

◈ **Serviceability:** There were several incidents that some cloud-service providers temporarily went down.

Cloud Storage Advantages & Concerns

Cloud storage advantages

◈ Companies need only pay for the storage they actually use.

◈ Companies do not need to install physical storage devices in their own datacenter or offices, which reduces IT and hosting costs.

◈ Storage maintenance tasks, such as backup, data replication, and purchasing additional storage devices are offloaded to the responsibility of a service provider, allowing organizations to focus on their core business

Potential concerns

◈ Security of stored data and data in transit may be a concern when storing sensitive data at a cloud storage provider

◈ Performance may be lower than local storage

◈ Reliability and availability depends on wide area network availability and on the level of precautions taken by the service provider.

◈ Users with specific records-keeping requirements, such as public agencies that must retain electronic records according to statute, may encounter complications with using cloud computing and storage.

Amazon Cloud Drive

amazon cloud drive

- Amazon Cloud Drive offers **5 GB** of storage for free.
- This personal cloud storage service is geared towards end users who buy music from the **Amazon MP3 service**, but it's open to other types of data as well.
- **Unlimited, secure access from any computer**
  - Use your Amazon Cloud Drive as the go-to location for all your important files. At work, at home, during your commute or while on vacation -- you'll always have access to everything you've uploaded to your Cloud Drive through your Amazon account.
- **Never worry about losing your files again**
  - Store files in your Cloud Drive and never worry about losing them if your computer crashes, or is lost or stolen.
- **Songs purchased from Amazon MP3 are stored in your Cloud Drive for free**
  - When you purchase songs or albums from the Amazon MP3 Store, you can now save your purchases to your Cloud Drive. All your purchases are backed up and available for you to download at any time.

❑ Amazon S3: Simple Storage Service

- **Programmatic access via web services API**
- **Highly scalable data storage in-the-cloud**
- **Simple to get going, simple to use**
- **Fast, highly available and durable**
- **Economical**
- **Busy: 260 billion objects stored!**

- **Media Sharing**
- **Media/Software Distribution**
- **Backup (Server and PC)**
- **Online Storage**
- **Application Storage**
- **Static Content**

Storage Pricing

Storage (Designed for 99.999999999% Durability)		Reduced Redundancy Storage (Designed for 99.99% Durability)		Data Transfer**		Requests	
Tier	**Pricing**	**Tier**	**Pricing**	**Tier**	**Pricing**	**Type**	**Pricing**
First 1 TB / month of Storage Used	$0.140 per GB	First 1 TB / month of Storage Used	$0.093 per GB	All data transfer in	$0.100 per GB	PUT, COPY, POST, or LIST Requests	$0.01 per 1,000 Requests
Next 49 TB / month of Storage Used	$0.125 per GB	Next 49 TB / month of Storage Used	$0.083 per GB	First 1 GB / month data transfer out	$0.000 per GB	GET and all other Requests***	$0.01 per 10,000 Requests
Next 450 TB / month of Storage Used	$0.110 per GB	Next 450 TB / month of Storage Used	$0.073 per GB	Up to 10 TB / month data transfer out	$0.150 per GB		
Next 500 TB / month of Storage Used	$0.095 per GB	Next 500 TB / month of Storage Used	$0.063 per GB	Next 40 TB / month data transfer out	$0.110 per GB		
Next 4000 TB / month of Storage Used	$0.080 per GB	Next 4000 TB / month of Storage Used	$0.053 per GB	Next 100 TB / month data transfer out	$0.090 per GB		
Storage Used / month Over 5000 TB	$0.055 per GB	Storage Used / month Over 5000 TB	$0.037 per GB	Greater than 150 TB / month data transfer out	$0.080 per GB		

Common Use Cases

◆ **Content Storage and Distribution:** Amazon S3 provides a highly durable and available store for a variety of content, ranging from web applications to media files. It allows you to offload your entire storage infrastructure onto the cloud, where you can take advantage of Amazon S3's scalability and pay-as-you-go pricing to handle your growing storage needs. For sharing content that is either easily reproduced or where you're storing an original copy elsewhere, Amazon S3's **Reduced Redundancy Storage (RRS)** feature provides a compelling solution. For example, if you're storing media content in-house but you need to provide accessibility to your customers, channel partners, or employees, RRS is a low-cost solution for storing and sharing this content.

◆ **Storage for Data Analysis:** Storing pharmaceutical data for analysis, financial data for computation and pricing, or photo images for resizing, Amazon S3 is an ideal location to store your original content. You can then send this content to Amazon EC2 for computation, resizing, or other large scale analytics – without incurring any data transfer charges for moving the data between the services. You can then choose to store the resulting, reproducible content using Amazon S3's Reduced Redundancy Storage feature.

◆ **Backup, Archiving and Disaster Recovery:** The Amazon S3 solution offers a highly durable, scalable, and secure solution for backing up and archiving your critical data. You can use Amazon S3's Versioning capability to provide even further protection for your stored data. If you have data sets of significant size, you can use AWS Import/Export to move large amounts of data into and out of AWS with physical storage devices. This is ideal for moving large quantities of data for periodic backups, or quickly retrieving data for disaster recovery scenarios.
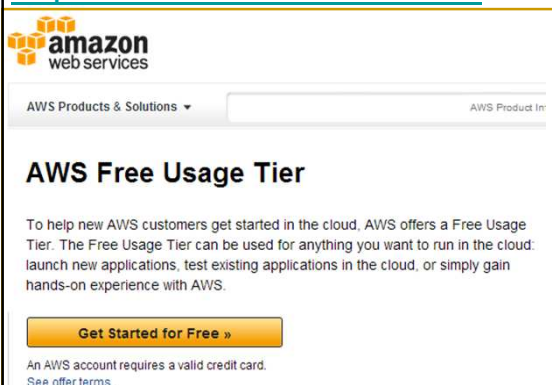
Getting Started with Amazon S3   http://aws.amazon.com/s3/

◈ **Create a Bucket to store your data:** You can choose a Region where your bucket and object(s) reside to optimize latency, minimize costs, or address regulatory requirements.

◈ **Upload Objects to your Bucket:** Your data is durably stored and backed by the Amazon S3 Service Level Agreement.

◈ **Set access controls:** Optionally you can grants others access to your data from anywhere in the world.

◈ **You can easily and securely create buckets, upload objects, and set access controls using the AWS Management Console:** The console provides a point-and-click web-based interface for accessing and managing all of your Amazon S3 resources.

  ▪ The Amazon S3 Getting Started Guide shows you how to start using Amazon S3 from the console.

  ▪ Developers building applications can use the AWS SDK for .NET, the AWS SDK for Java, or a wide variety of 3rd party libraries for other platforms and languages.

HW#2 Cloud Storage – AWS S3

◈ Open a FREE Amazon Web Services (AWS) account

http://aws.amazon.com/free/

amazon
web services

AWS Products & Solutions ▾   AWS Product Inf

AWS Free Usage Tier

To help new AWS customers get started in the cloud, AWS offers a Free Usage Tier. The Free Usage Tier can be used for anything you want to run in the cloud: launch new applications, test existing applications in the cloud, or simply gain hands-on experience with AWS.

Get Started for Free »

An AWS account requires a valid credit card.
See offer terms.

You need to provide a valid credit card. But you will **NOT** get charged if you **ONLY** use the resources within the **Free Usage Tier.**

◈ Upload your picture AWS S3

◈ Submit your S3 URL to D2L Dropbox