DAY- 6
AWS
SIMPLE STORAGE SERVICE

AWS Architecture and Design

1. Day 1 Overview of Cloud Computing
2. Day 2 Overview of AWS
3. Day 3 Amazon EC2*
4. Day 4 Amazon EBS *
5. Day 5 Amazon CloudWatch *
6. **Day 6 Amazon S3***
7. Day 7 Amazon Elastic Load Balancer *
8. Day 8 Amazon Auto Scaling *
9. Day 9 Amazon VPC *
10. Day 10 Amazon IAM *
11. Day 11 Amazon RDS
12. Day 12 Amazon Route 53 *
13. Day 13 Amazon DynamoDB* & Glacier
14. Day 14 Amazon Cloudfront* & Import Export & Amazon SES *
15. Day 15 Amazon ElasticBeanStalk & Amazon Cloudformation & Amazon OpsWorks
16. Day 16 AWS Economics & AWS Account Overview *
17. Day 17 AWS Architecture
18. Day 18 AWS Certification Preparation

[* - With Hands on Demo]

Amazon Simple Storage Service

Agenda

- What is S3 ?
- S3 Keywords
- S3 Consistency Models
- Infrequently Access Storage & RRS
- S3 Pricing

What is S3 ?

Amazon S3

→ AWS S3 provides option for secure, durable, highly-scalable object storage system.

→ Its storage for the internet to help static content stoarge and web scaling.

→ Amazon S3 has very easy to use web services interface that can be used to store and retrieve any amount of
data, at any time, from anywhere on the internet

→ With drag and drop functionality very easy to use.

→ Use from AWS console, programmatic access with API

S3 Vs EBS

	Amazon S3	EBS
Storage Type	Object store	File system
Performance	Very fast	Very very fast
Redundancy	Across data centers (In same region)	Within data center
Security	Public Key / Private Key	Visible only to your EC2
Access from the Net?	Yes	No
Typical use case	Static content storage for Internet. Write once, read many	It’s a disk drive

http://aws.amazon.com/documentation/s3/

S3 Concepts

S3 Definitions

→ Bucket – Buckets are the fundamental container for objects in Amazon S3.

→ Object – Objects are the fundamental entities stored in Amazon S3. Objects consist of object data and metadata. They are Individually addressable data item. Any number per bucket and per account. An object is uniquely identified within a bucket by a key (name) and a version ID.

→ Key – A key is the unique identifier for an object within a bucket. Every object in a bucket has exactly one key.

Because the combination of a bucket, key, and version ID uniquely identify each object, Amazon S3 can be thought of as a basic data map between "bucket + key + version“.

→ Region- Geography where S3 will store objects. Objects are always specific to region and with in region replicated across multiple AZs for HA & durability.

→ ACL – Access Control List which specifies which objects to access and how?

S3 Features

Can be of 5 TB size

Unique Key to identify

Supports Versioning

Object Always stored in Bucket

Intrinsic Redundancy

Full Control

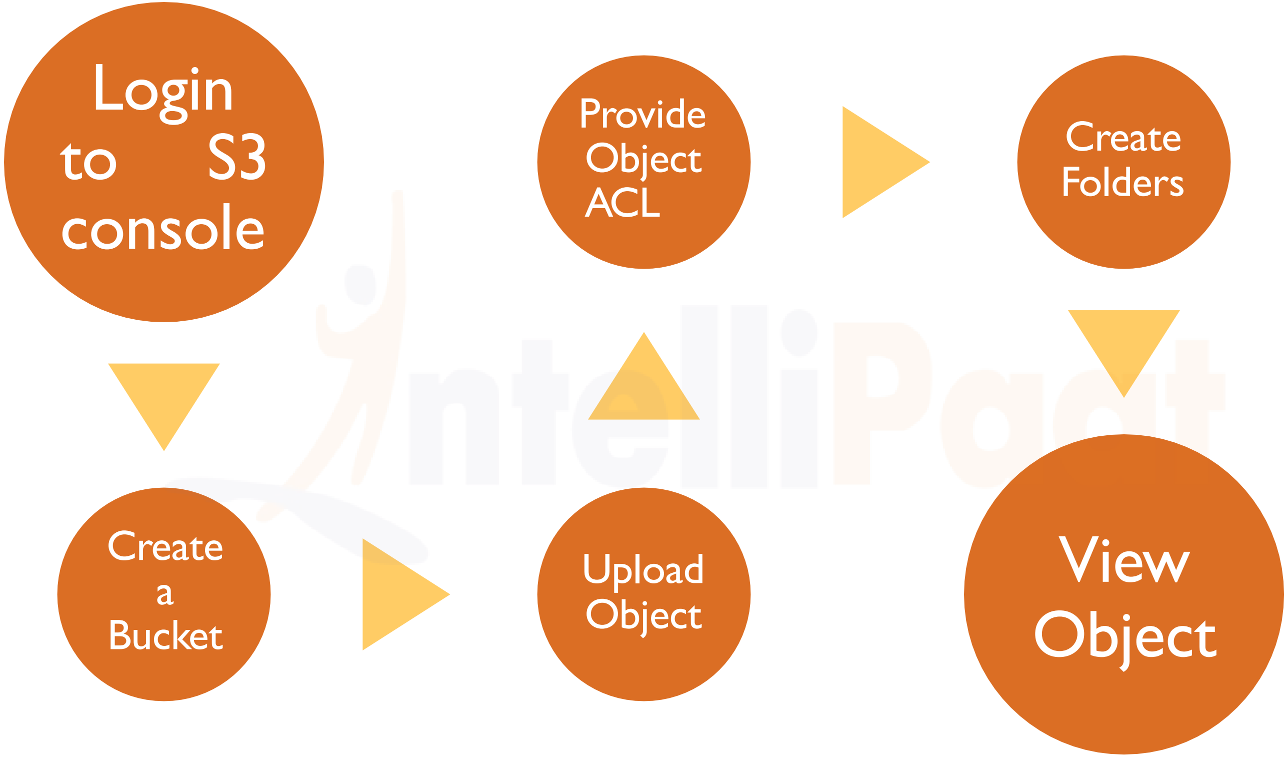
Host Static Websites

Supports Lifecycle

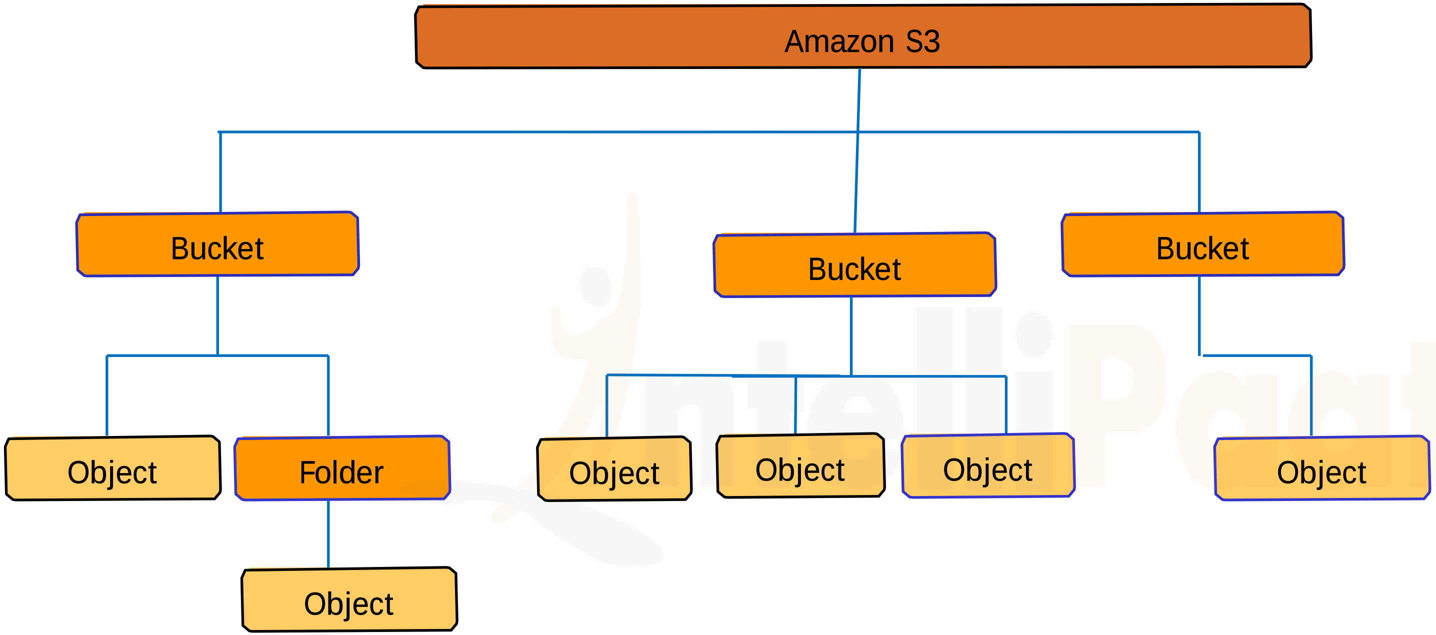
Accessible over internet with unique URL

http://aws.amazon.com/documentation/s3/

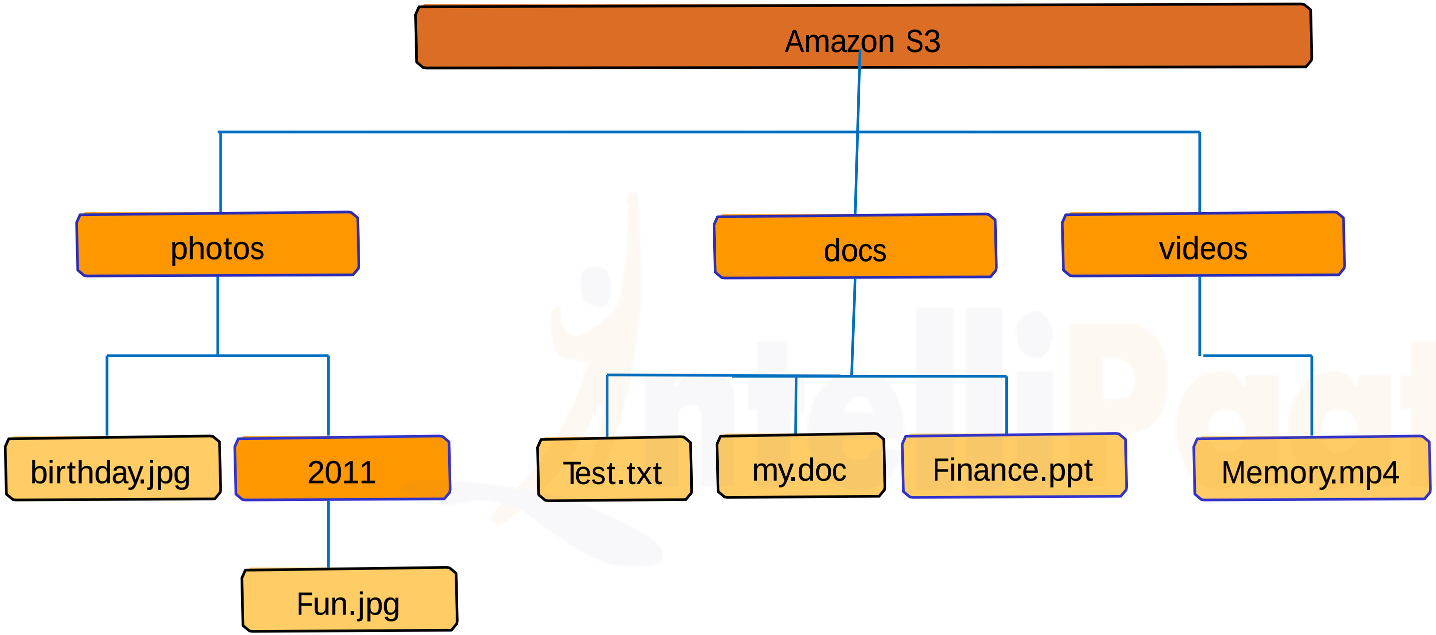
S3 Features


Login to S3 console
Create a Bucket
Upload Object
Provide Object ACL
Create Folders
View Object

Amazon S3 Namespace



Amazon S3 Namespace

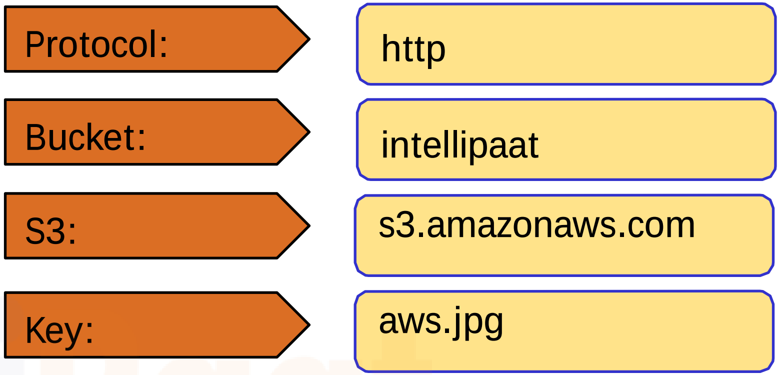


Amazon S3 Namespace Example

→ Amazon S3 supports virtual-hosted-style and path-style access in all Regions

→ http://intellipat.s3.amazonaws.com/aws.jpg
   - » [virtual-hosted-style : Differentiates on host name]

→ http://s3<-region Name>.amazonaws.com/intellipat/landing.jpg
   - » [path-style access differentiates on path type]



Protocol:	http
Bucket:	intellipaat
S3:	s3.amazonaws.com
Key:	aws.jpg

S3 in Details

S3 Data Consistency Model

→Amazon S3 achieves high availability by replicating data across multiple servers within Amazon's Availability Zones.

→After a PUT request is successful, your data is safely stored but sometimes take time to replicate across S3.

A process writes a new object to Amazon S3 and immediately attempts to read it.

Until the change is fully propagated, Amazon S3 might report "key does not exist."

A process writes a new object to Amazon S3 and immediately lists keys within its bucket.

Until the change is fully propagated, the object might not appear in the list.

http://docs.aws.amazon.com/AmazonS3/latest/dev/Introduction.html#Regions

S3 Data Consistency Model (Contd.)

A process replaces an existing object and immediately attempts to read it.

Until the change is fully propagated, Amazon S3 might return the prior data.

A process deletes an existing object and immediately attempts to read it.

Until the deletion is fully propagated, Amazon S3 might return the deleted data.

A process deletes an existing object and immediately lists keys within its bucket.

Until the deletion is fully propagated, Amazon S3 might list the deleted object.

S3 Data Consistency Model (Contd.)

→ Amazon S3 provides read-after-write consistency for PUTS of new objects in your S3 bucket and eventual consistency for overwrite PUTS and DELETES in all regions.

→ Amazon S3 does not currently support object locking. If two puts are simultaneously made to the same key, the put with the latest time stamp wins. If this is an issue, you will need to build an object-locking mechanism into your application.

→ Updates are atomic for single key and there is no way to make atomic updates across keys. **For example**, you cannot make the update of one key dependent on the update of another key unless you design this functionality into your application.

Eventually Consistent Read	Consistent Read
Stale reads possible	No stale reads
Lowest read latency	Potential higher read latency
Highest read throughput	Potential lower read throughput

S3 Functionality

- Read between 1byte to 5 TB
- Store as many objects as you want
- Max 100 buckets per account (can be increased)
- Choose region based on latency need
- Objects stored in bucket never leaves region automatically
- Possible to request replication across regions
- Rest & SOAP
- Supports Bit Torrent
- Encryption and ACL for security
- 99.999999999 Durability
- Supports Different storage types

S3 Infrequent Access Storage

Amazon S3 Infrequent Access Data that is accessed less frequently, but requires rapid access when needed.

Provides a cost-effective, highly available solution high durability, throughput, and low latency of Amazon S3 Standard, with a low per GB storage price and per GB retrieval fee.

For Long Term Storage Data that is deleted from Standard - IA within 30 days will be charged for a full 30 days. Standard - IA is designed for larger objects and has a minimum object size of 128KB. Objects smaller than 128KB in size will incur storage charges as if the object were 128KB.

S3 IA provides 99.999999999% durability of objects over a given year This durability level corresponds to an average expected loss of 0.01% of objects annually.

S3 Reduced Redundancy Storage

Amazon S3 Reduced Redundancy Storage (RRS)

Enables customers to reduce their costs by storing non-critical, reproducible data at lower levels of redundancy than Amazon S3's standard storage

RRS provides a cost-effective, highly available solution

For distributing or sharing content that is durably stored elsewhere, or for storing thumbnails, transcoded media, or other processed data that can be easily reproduced

The RRS option stores objects on multiple devices across multiple facilities

Providing 400 times the durability of a typical disk drive, but does not replicate objects as many times as standard Amazon S3 storage, and thus is even more cost effective.

This durability level corresponds to an average expected loss of 0.01% of objects annually.

S3 Storage Types

	Standard	Standard - Infrequent Access	Reduced Redundancy Storage
Durability	99.999999999%	99.999999999%	99.99%
Availability	99.99%	99.9%	99.99%
Concurrent facility fault tolerance	2	2	1
SSL support	Yes	Yes	Yes
First byte latency	Milliseconds	Milliseconds	Milliseconds
Lifecycle Management Policies	Yes	Yes	Yes

S3 Bucket Policy

→ Bucket policies provide centralized, access control to buckets and objects based on a variety of conditions, including Amazon S3 operations, requesters, resources, and aspects of the request

→ Accounts have the power to grant bucket policy permissions and assign employees permissions based on a variety of conditions. For example, an account could create a policy that gives a user write access:

» To a particular S3 bucket
» From an account's corporate network
» During business hours
» From an account's custom application (as identified by a user agent string)

→ Unlike ACLs (described in previous slide) that can only add (grant) permissions on individual objects, policies can either add or deny permissions across all (or a subset) of objects within a bucket

S3 Access Control List

→ **Each bucket and object in Amazon S3 can be assigned an ACL which defines its access policy.**

- » When a request is made, Amazon S3 authenticates the request using its standard authentication procedure
- » Then checks the ACL to verify sender was granted access to the bucket or object
- » If the sender is approved, the request proceeds
- » Otherwise, Amazon S3 returns an error

→ **Bucket and object ACLs are completely independent:**

An object does not inherit the ACL from its bucket. **For example**, if you create a bucket and grant write access to another user, you will not be able to access the user's objects unless the user explicitly grants access

→ **Access can be granted to:**

- » Owner
- » Email
- » Any AWS account
- » All

IAM Vs Bucket Policies Vs ACLs

IAM

Fine grained

Administer as part of role based access.

Apply policies to S3 at role, user & group level.

Bucket Policies

Fine grained

Apply policies at the bucket level in S3.

Incorporate user restrictions without using IAM.

ACLs

Coarse grained

Apply access control rules at the bucket and/or object level in S3.

AWS S3 Encryption

Server Side Encryption

- Using 256 bit AES Encryption
- Whole encryption managed by AWS
- Three level of encryption

Client Side Encryption

- Encrypt data before sending to S3
  - Your own master key to encrypt or
  - AWS KMS
- Use SDK to encrypt and decrypt

Server Side Encryption (Contd.)

Server Side Encryption offers encryption for data objects at rest within S3 using 256-bit AES encryption.

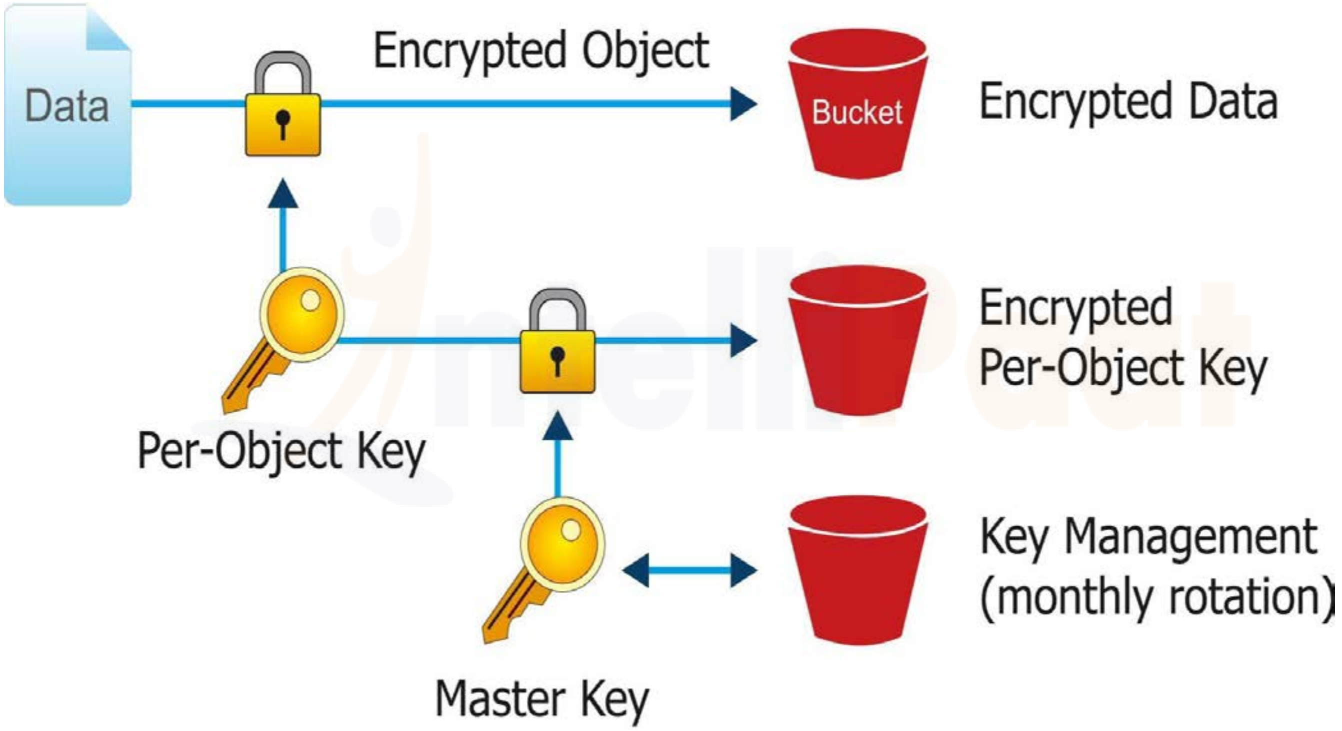
One benefit of SSE is that AWS allows the whole encryption method to be managed by AWS if you choose Amazon S3 encrypts each object with a unique key.

As an additional safeguard, it encrypts the key itself with a master key that it regularly rotates.

Amazon S3 Server Side Encryption uses one of the strongest block ciphers available, 256-bit Advanced Encryption Standard (AES-256), to encrypt your data.

Data
Bucket

Server Side Encryption (Contd.)



S3 Pricing:

Region : US Standard

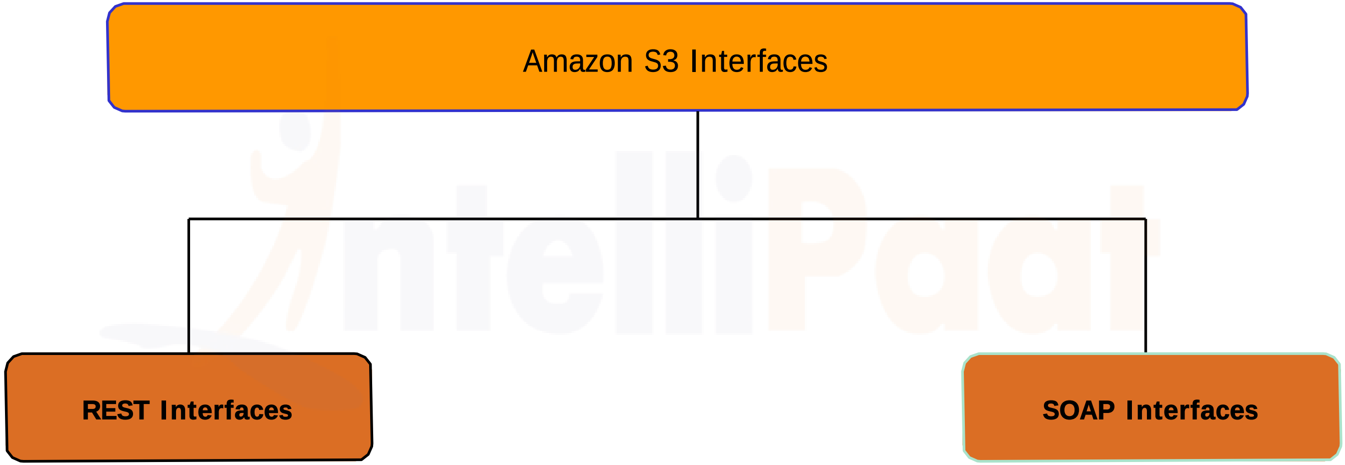
	Standard Storage	Standard Infrequent Access Storage	Reduced Redundancy Storage	Glacier Storage
First 1 TB / month	$0.0300 per GB	$0.0125 per GB	$0.0240 per GB	$0.010 per GB
Next 49 TB / month	$0.0295 per GB		$0. 0236 per GB	
Next 450 TB / month	$0.0290 per GB		$0.0232 per GB	
Next 500 TB / month	$0.0285 per GB		$0.0228 per GB	
Next 4000 TB / month	$0.0280 per GB		$0.0224 per GB	
Over 5000 TB / month	$0.0275 per GB		$0.0220 per GB	

S3 Pricing:

For Requests Not Otherwise Specified Below	
PUT, COPY, POST, or LIST Requests	$0.005 per 1,000 requests
GET and all other Requests	$0.004 per 10,000 requests
Delete Requests	Free Ώ
For Standard – Infrequent Access Requests	
PUT, COPY, or POST Requests GET	$0.01 per 1,000 requests
and all other Requests	$0.01 per 10,000 requests
Lifecycle Transition Requests into Standard – Infrequent Access	$0.01 per 1,000 requests
Data Retrievals	$0.01 per GB
For Glacier Requests	
Glacier Archive and Restore Requests	$0.05 per 1,000 requests
Glacier Data Restores	Free ΐ

S3 Tools & APIs

APIs



Amazon S3 Interfaces

REST Interfaces

SOAP Interfaces

S3 Use Cases

S3 Use Cases

Content Sharing

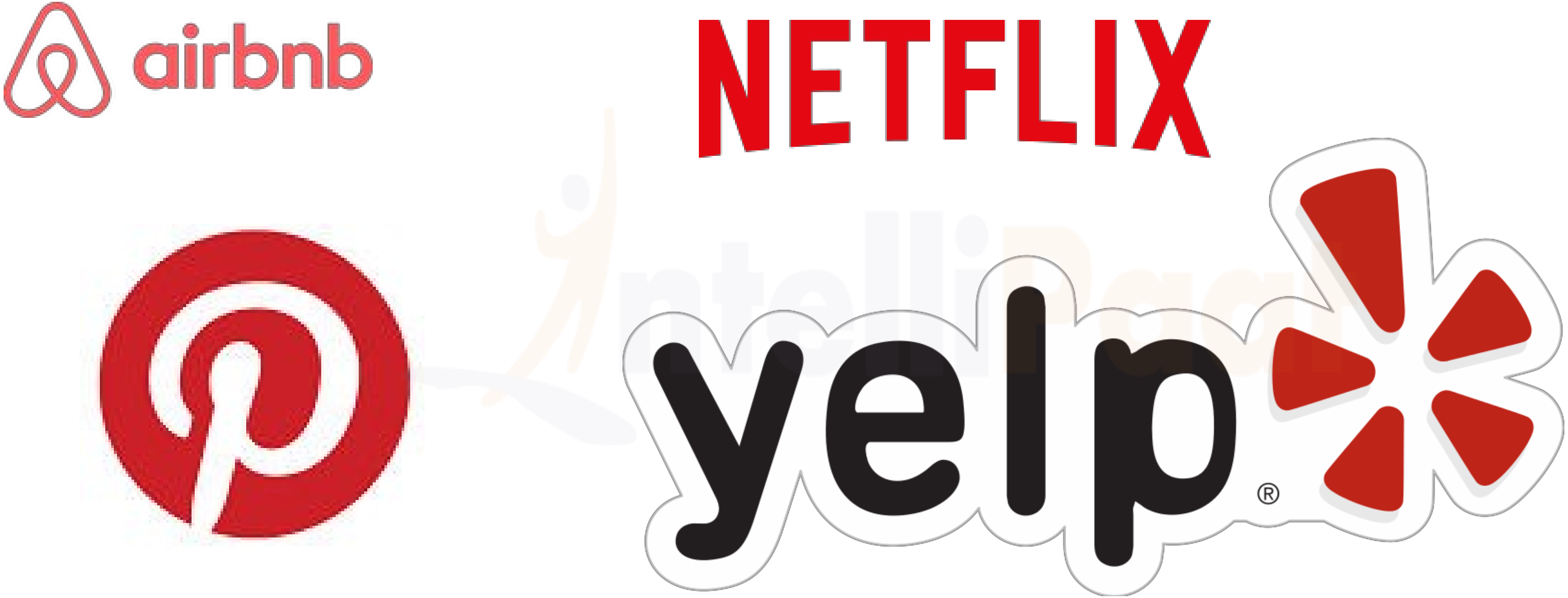
Media Distribution

Online Storage

Backup

Static Website Hosting

Customers



Thank You

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