AWS Storage Extras

AWS Snow Family

- Highly-secure, portable devices to collect and process data at the edge, and migrate data into and out of AWS

Snowcone

Snowball Edge

	Snowcone	Snowball Edge
Storage Capacity	8 TB HDD - 14 TB SSD	80 TB - 210 TB
Migration Size	Up to terabytes	Up to petabytes

Data Migrations with AWS Snow Family

	Time to Transfer		
	100 Mbps	**1Gbps**	**10Gbps**
10 TB	12 days	30 hours	3 hours
100 TB	124 days	12 days	30 hours
1 PB	3 years	124 days	12 days

Challenges:

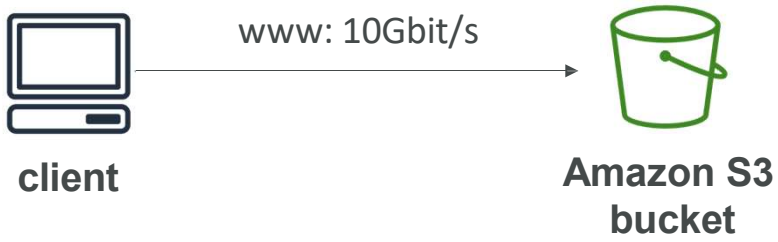
- Limited connectivity
- Limited bandwidth
- High network cost
- Shared bandwidth (can't maximize the line)
- Connection stability

AWS Snow Family: offline devices to perform data migrations

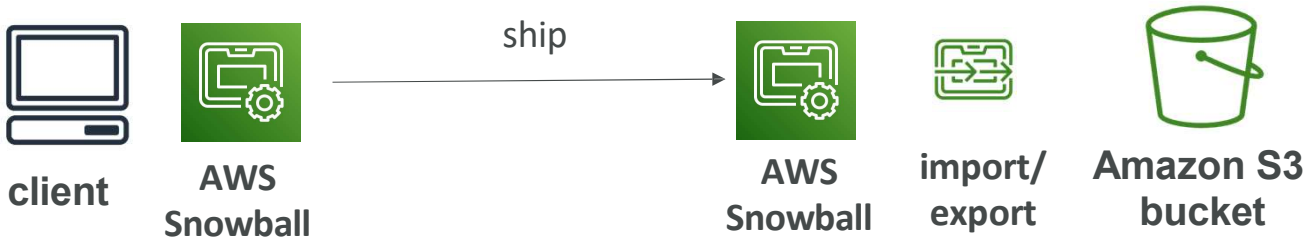
If it takes more than a week to transfer over the network, use Snowball devices!

Diagrams

- Direct upload to S3:



- With Snow Family:



Snow Family - Usage Process

1. Request Snowball devices from the AWS console for delivery
2. Install the snowball client / AWS OpsHub on your servers
3. Connect the snowball to your servers and copy files using the client
4. Ship back the device when you're done (goes to the right AWS facility)
5. Data will be loaded into an S3 bucket
6. Snowball is completely wiped

What is Edge Computing?

- Process data while it's being created on an edge location
  - A truck on the road, a ship on the sea, a mining station underground...

- These locations may have limited internet and no access to computing power
- We setup a Snowball Edge / Snowcone device to do edge computing
  - Snowcone: 2 CPUs, 4 GB of memory, wired or wireless access
  - Snowball Edge Compute Optimized (dedicated for that use case) & Storage Optimized
  - Run EC2 Instances or Lambda functions at the edge
- Use cases: preprocess data, machine learning, transcoding media

Solution Architecture: Snowball into Glacier

- Snowball cannot import to Glacier directly
- You must use Amazon S3 first, in combination with an S3 lifecycle policy

Amazon FSx – Overview

- Launch 3rd party high-performance file systems on AWS
- Fully managed service

FSx for Lustre

FSx for
NetApp ONTAP

FSx for Windows
File Server

FSx for
OpenZFS

Amazon FSx for Windows (File Server)

- FSx for Windows is a fully managed Windows file system share drive
- Supports SMB protocol & Windows NTFS
- Microsoft Active Directory integration, ACLs, user quotas
- Can be mounted on Linux EC2 instances
- Supports Microsoft's Distributed File System (DFS) Namespaces (group files across multiple FS)

- Scale up to 10s of GB/s, millions of IOPS, 100s PB of data
- Storage Options:
  - SSD – latency sensitive workloads (databases, media processing, data analytics, ...)
  - HDD – broad spectrum of workloads (home directory, CMS, ...)
- Can be accessed from your on-premises infrastructure (VPN or Direct Connect)
- Can be configured to be Multi-AZ (high availability)
- Data is backed-up daily to S3

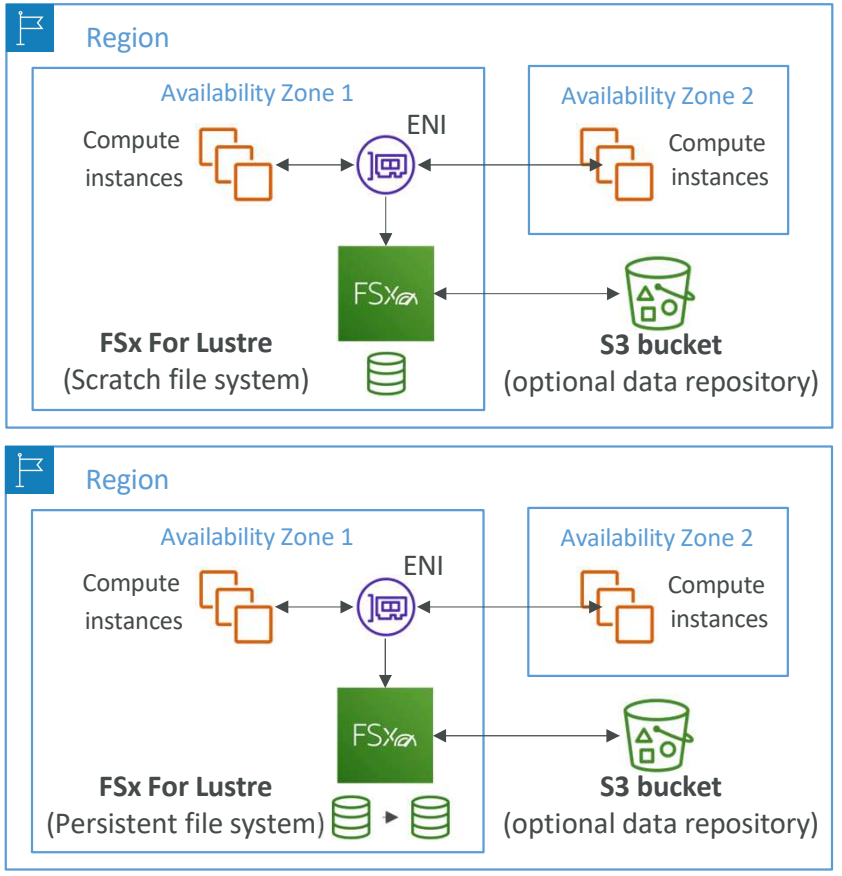
Amazon FSx for Lustre

- Lustre is a type of parallel distributed file system, for large-scale computing
- The name Lustre is derived from "Linux" and "cluster

- Machine Learning, High Performance Computing (HPC)
- Video Processing, Financial Modeling, Electronic Design Automation
- Scales up to 100s GB/s, millions of IOPS, sub-ms latencies
- Storage Options:
  - SSD - low-latency, IOPS intensive workloads, small & random file operations
  - HDD - throughput-intensive workloads, large & sequential file operations
- Seamless integration with S3
  - Can "read S3" as a file system (through FSx)
  - Can write the output of the computations back to S3 (through FSx)
- Can be used from on-premises servers (VPN or Direct Connect)

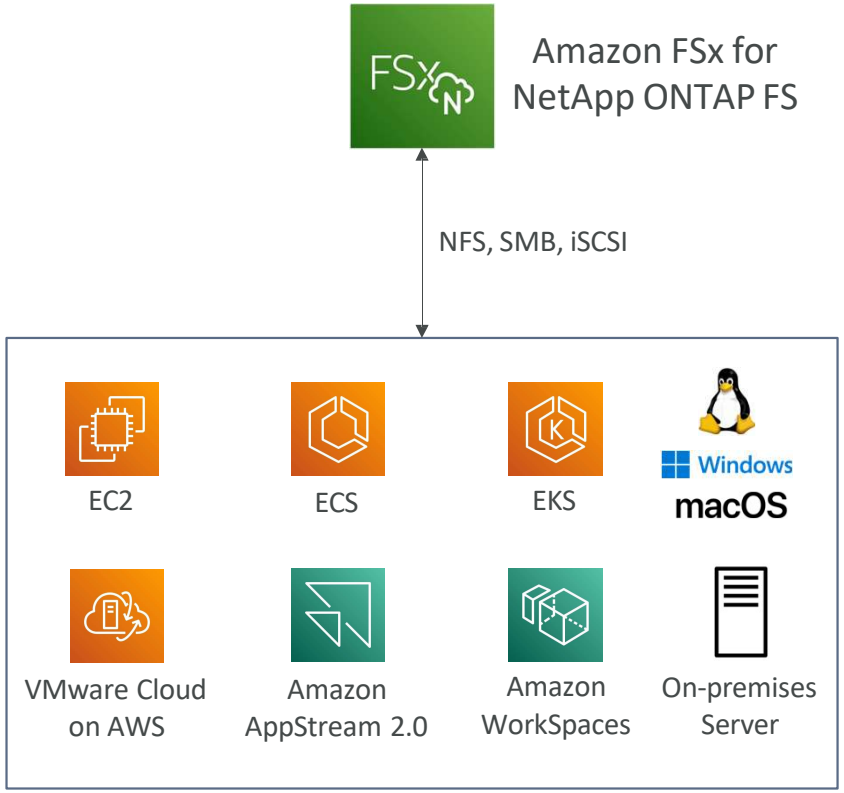
FSx Lustre - File System Deployment Options

- Scratch File System
  - Temporary storage
    - Data is not replicated (doesn't persist if file server fails)
    - High burst (6x faster, 200MBps per TiB)
    - Usage: short-term processing, optimize costs
- Persistent File System
  - Long-term storage
    - Data is replicated within same AZ
    - Replace failed files within minutes
    - Usage: long-term processing, sensitive data



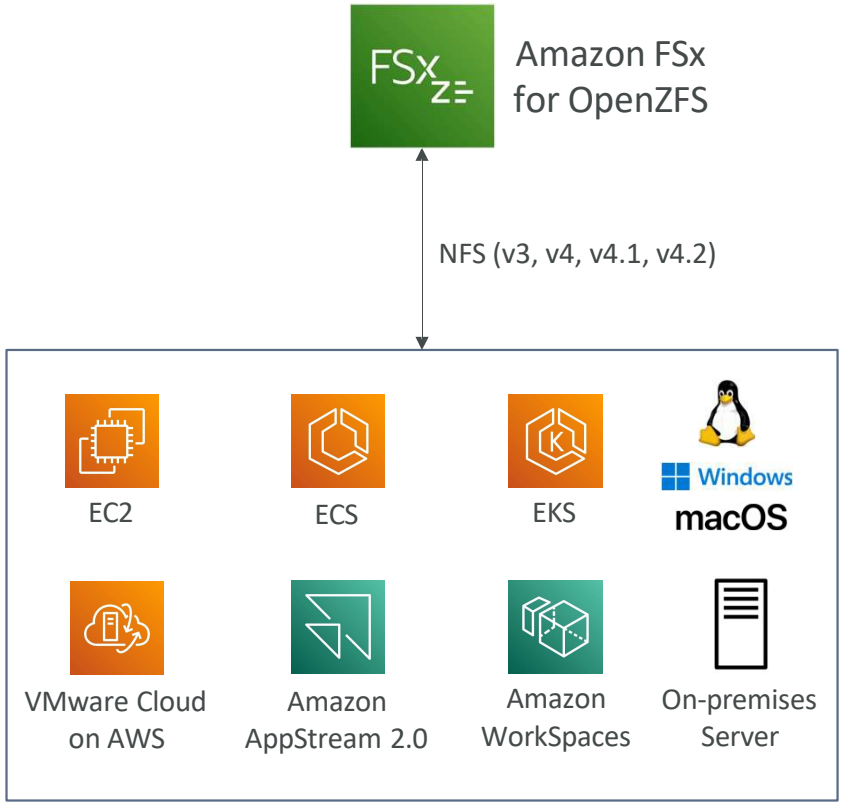
Amazon FSx for NetApp ONTAP

- Managed NetApp ONTAP on AWS
- File System compatible with NFS, SMB, iSCSI protocol
- Move workloads running on ONTAP or NAS to AWS
- Works with:
  - Linux
  - Windows
  - MacOS
  - VMware Cloud on AWS
  - Amazon Workspaces & AppStream 2.0
  - Amazon EC2, ECS and EKS
- Storage shrinks or grows automatically
- Snapshots, replication, low-cost, compression and data de-duplication
- Point-in-time instantaneous cloning (helpful for testing new workloads)



Amazon FSx for OpenZFS

- Managed OpenZFS file system on AWS
- File System compatible with NFS (v3, v4, v4.1, v4.2)
- Move workloads running on ZFS to AWS
- Works with:
  - Linux
  - Windows
  - MacOS
  - VMware Cloud on AWS
  - Amazon Workspaces & AppStream 2.0
  - Amazon EC2, ECS and EKS
- Up to 1,000,000 IOPS with < 0.5ms latency
- Snapshots, compression and low-cost
- Point-in-time instantaneous cloning (helpful for testing new workloads)



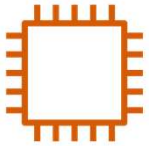
Hybrid Cloud for Storage

- AWS is pushing for ”hybrid cloud”
  - Part of your infrastructure is on the cloud
  - Part of your infrastructure is on-premises
- This can be due to
  - Long cloud migrations
  - Security requirements
  - Compliance requirements
  - IT strategy
- S3 is a proprietary storage technology (unlike EFS / NFS), so how do you expose the S3 data on-premises?
- AWS Storage Gateway!

AWS Storage Cloud Native Options

Block

Amazon EBS



EC2 Instance Store

File

Amazon EFS

Amazon FSx

Object

Amazon S3

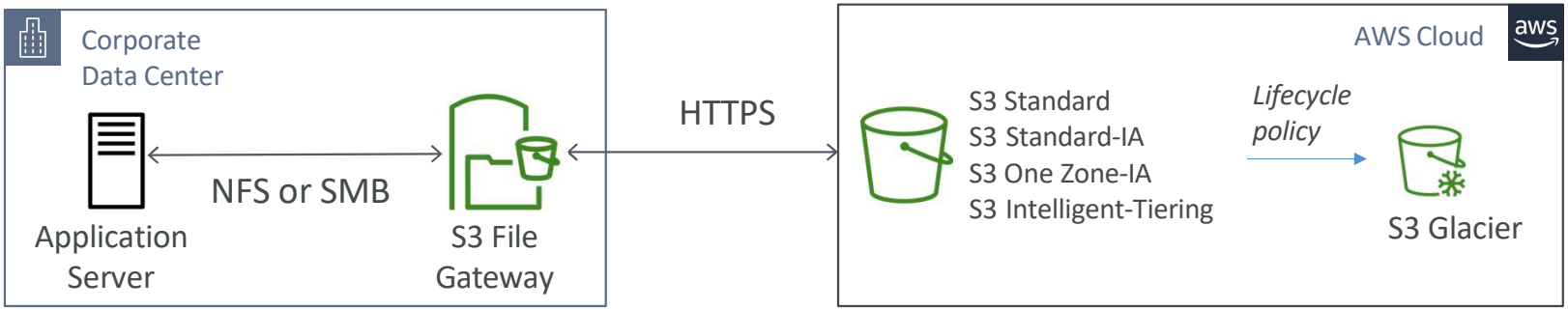
Amazon Glacier

AWS Storage Gateway

- Bridge between on-premises data and cloud data
- Use cases:
  - disaster recovery
  - backup & restore
  - tiered storage
  - on-premises cache & low-latency files access
- Types of Storage Gateway:
  - S3 File Gateway
  - FSx File Gateway
  - Volume Gateway
  - Tape Gateway

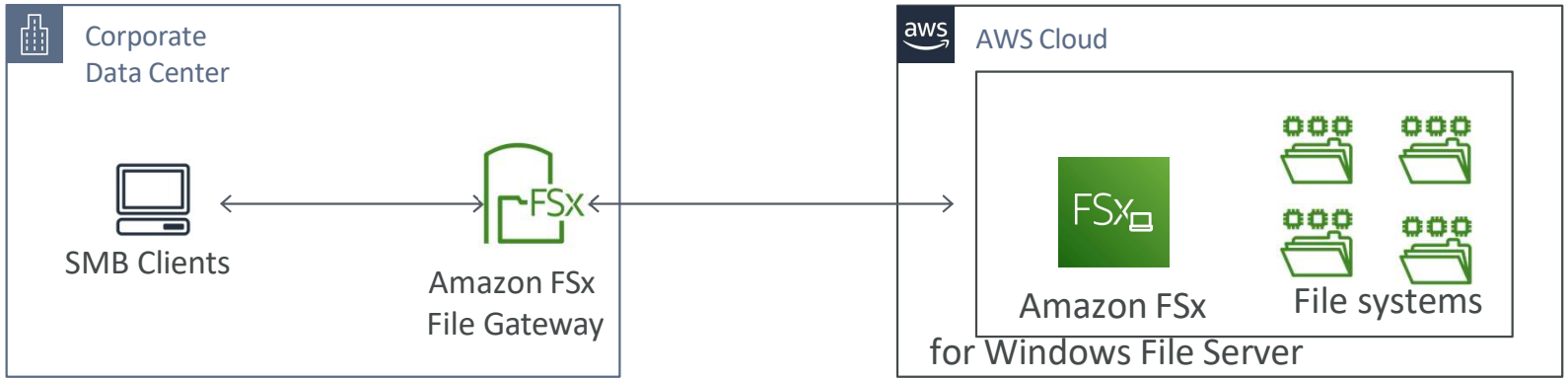
Amazon S3 File Gateway

- Configured S3 buckets are accessible using the NFS and SMB protocol
- Most recently used data is cached in the file gateway
- Supports S3 Standard, S3 Standard IA, S3 One Zone A, S3 Intelligent Tiering
- Transition to S3 Glacier using a Lifecycle Policy
- Bucket access using IAM roles for each File Gateway
- SMB Protocol has integration with Active Directory (AD) for user authentication



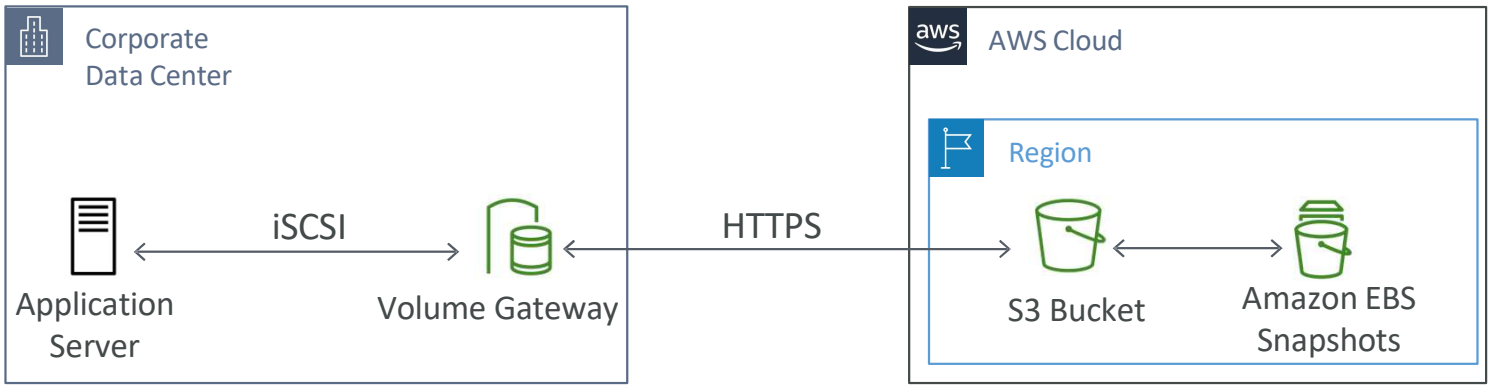
Amazon FSx File Gateway

- Native access to Amazon FSx for Windows File Server
- Local cache for frequently accessed data
- Windows native compatibility (SMB, NTFS, Active Directory...)
- Useful for group file shares and home directories



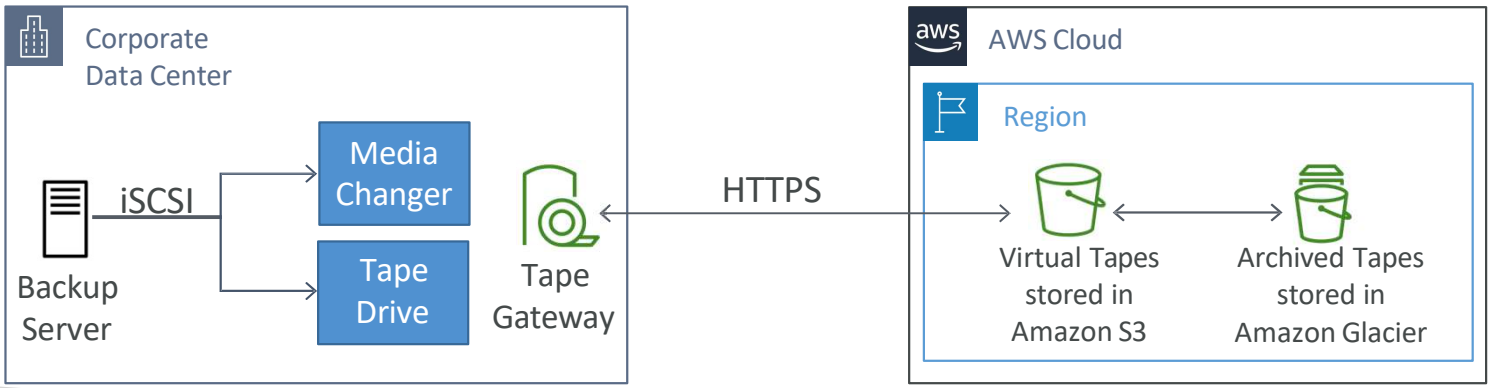
Volume Gateway

- Block storage using iSCSI protocol backed by S3
- Backed by EBS snapshots which can help restore on-premises volumes!
- Cached volumes: low latency access to most recent data
- Stored volumes: entire dataset is on premise, scheduled backups to S3



Tape Gateway

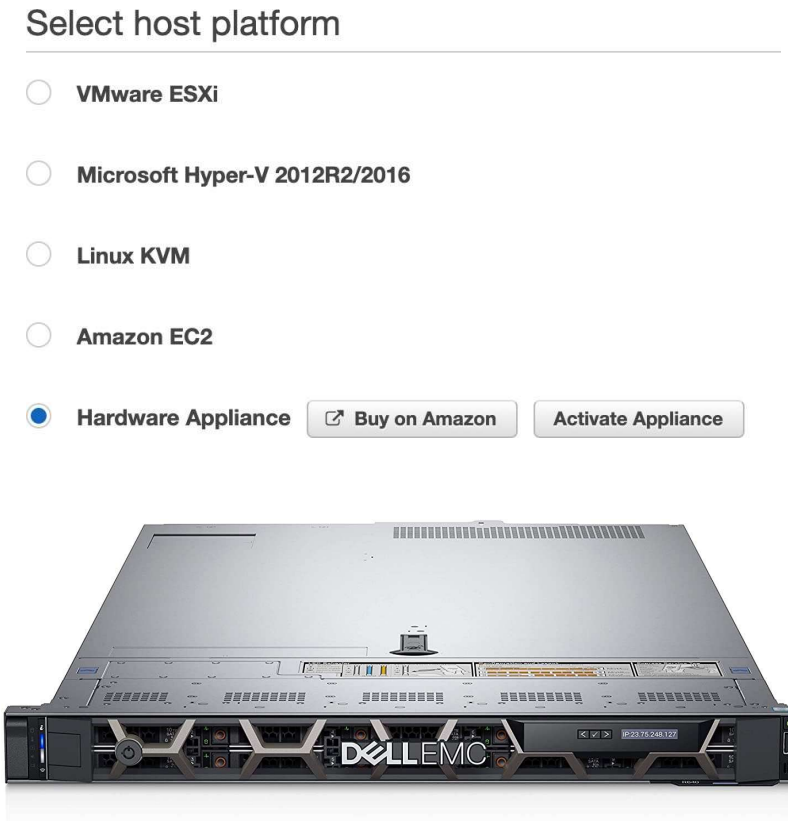
- Some companies have backup processes using physical tapes (!)
- With Tape Gateway, companies use the same processes but, in the cloud
- Virtual Tape Library (VTL) backed by Amazon S3 and Glacier
- Back up data using existing tape-based processes (and iSCSI interface)
- Works with leading backup software vendors



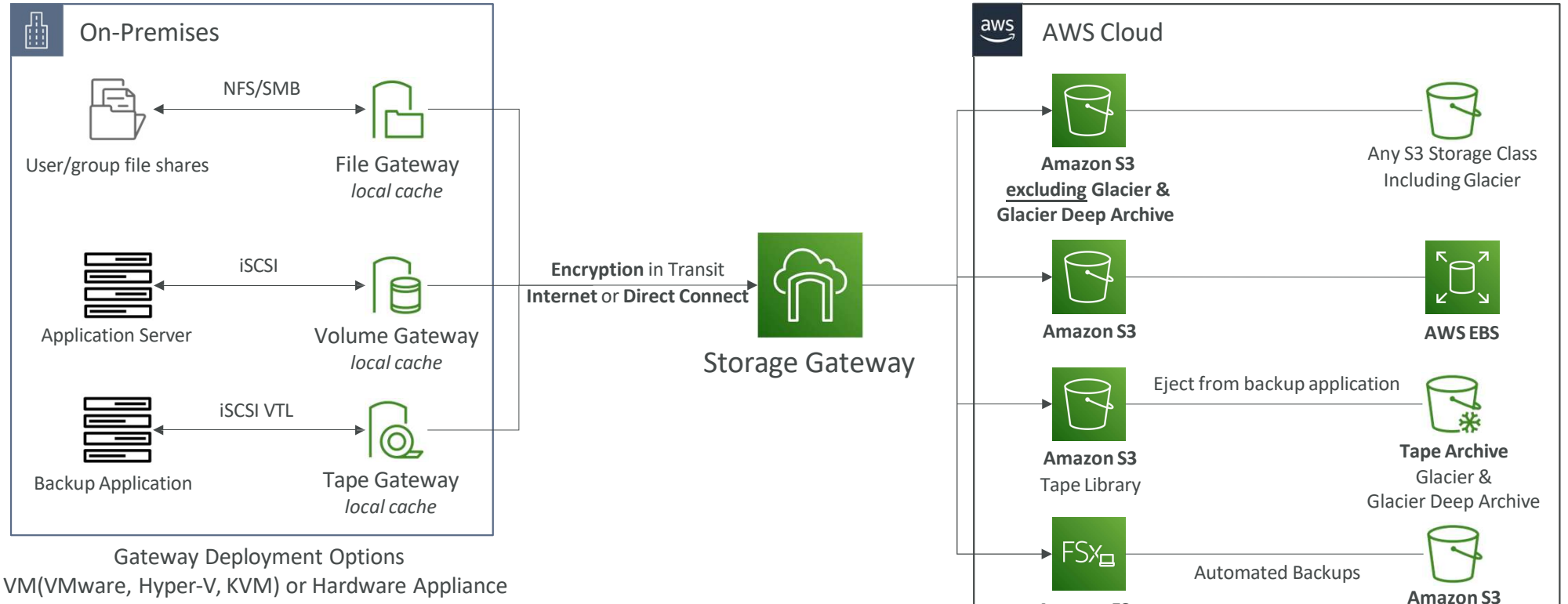
Storage Gateway - Hardware appliance

- Using Storage Gateway means you need on-premises virtualization
- Otherwise, you can use a Storage Gateway Hardware Appliance
- You can buy it on amazon.com

- Works with File Gateway,Volume Gateway, Tape Gateway
- Has the required CPU, memory, network, SSD cache resources
- Helpful for daily NFS backups in small data centers

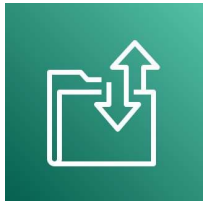


AWS Storage Gateway



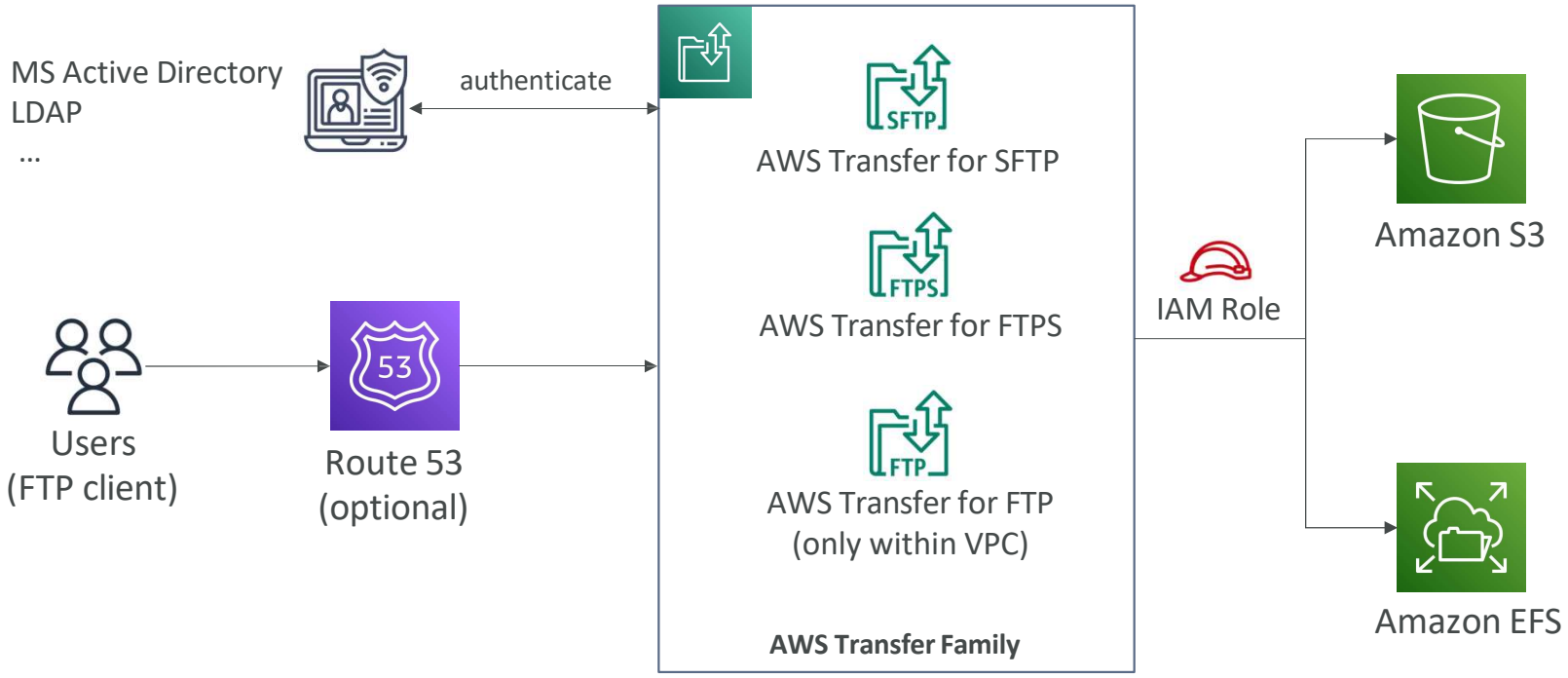
Gateway Deployment Options
VM(VMware, Hyper-V, KVM) or Hardware Appliance

AWS Transfer Family



- A fully-managed service for file transfers into and out of Amazon S3 or Amazon EFS using the FTP protocol
- Supported Protocols
  - AWS Transfer for FTP (File Transfer Protocol (FTP))
  - AWS Transfer for FTPS (File Transfer Protocol over SSL (FTPS))
  - AWS Transfer for SFTP (Secure File Transfer Protocol (SFTP))
- Managed infrastructure, Scalable, Reliable, Highly Available (multi-AZ)
- Pay per provisioned endpoint per hour + data transfers in GB
- Store and manage users' credentials within the service
- Integrate with existing authentication systems (Microsoft Active Directory, LDAP, Okta, Amazon Cognito, custom)
- Usage: sharing files, public datasets, CRM, ERP,...

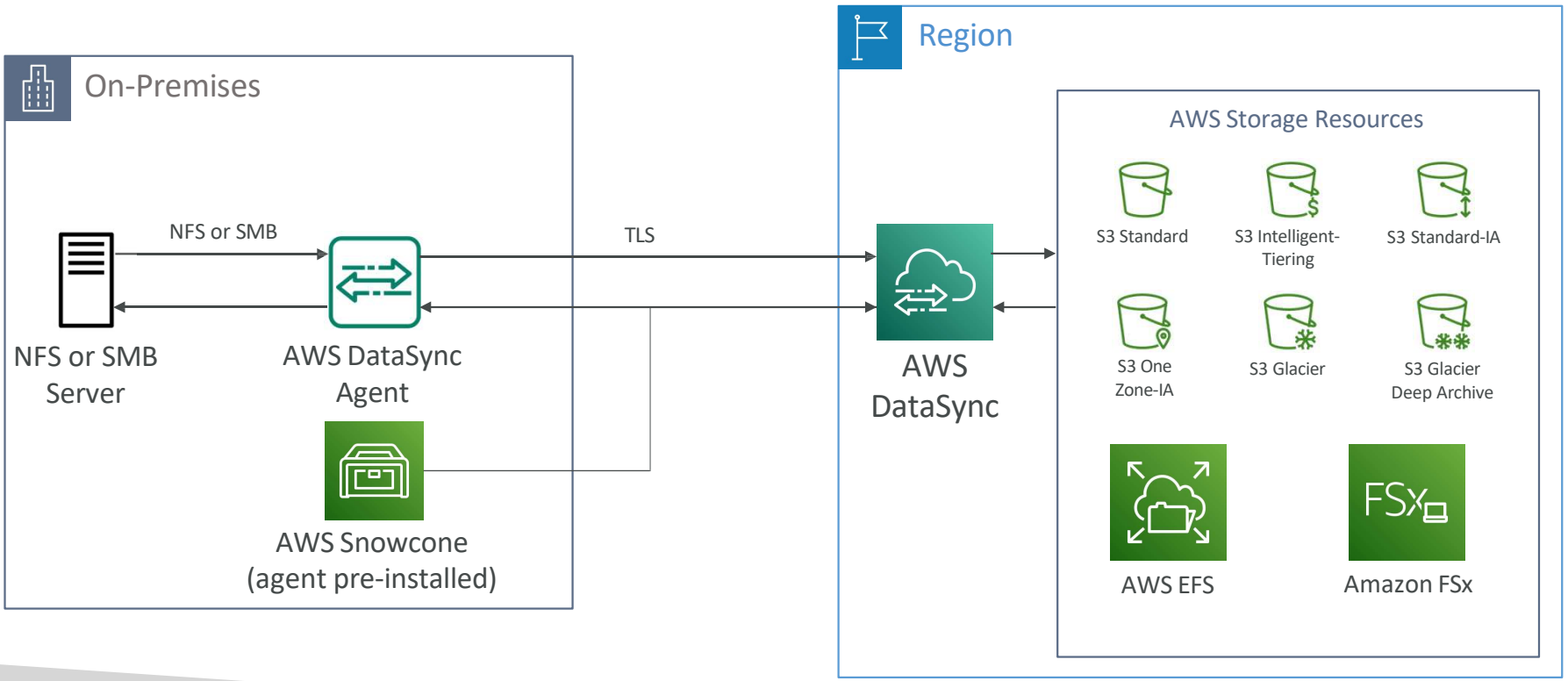
AWS Transfer Family



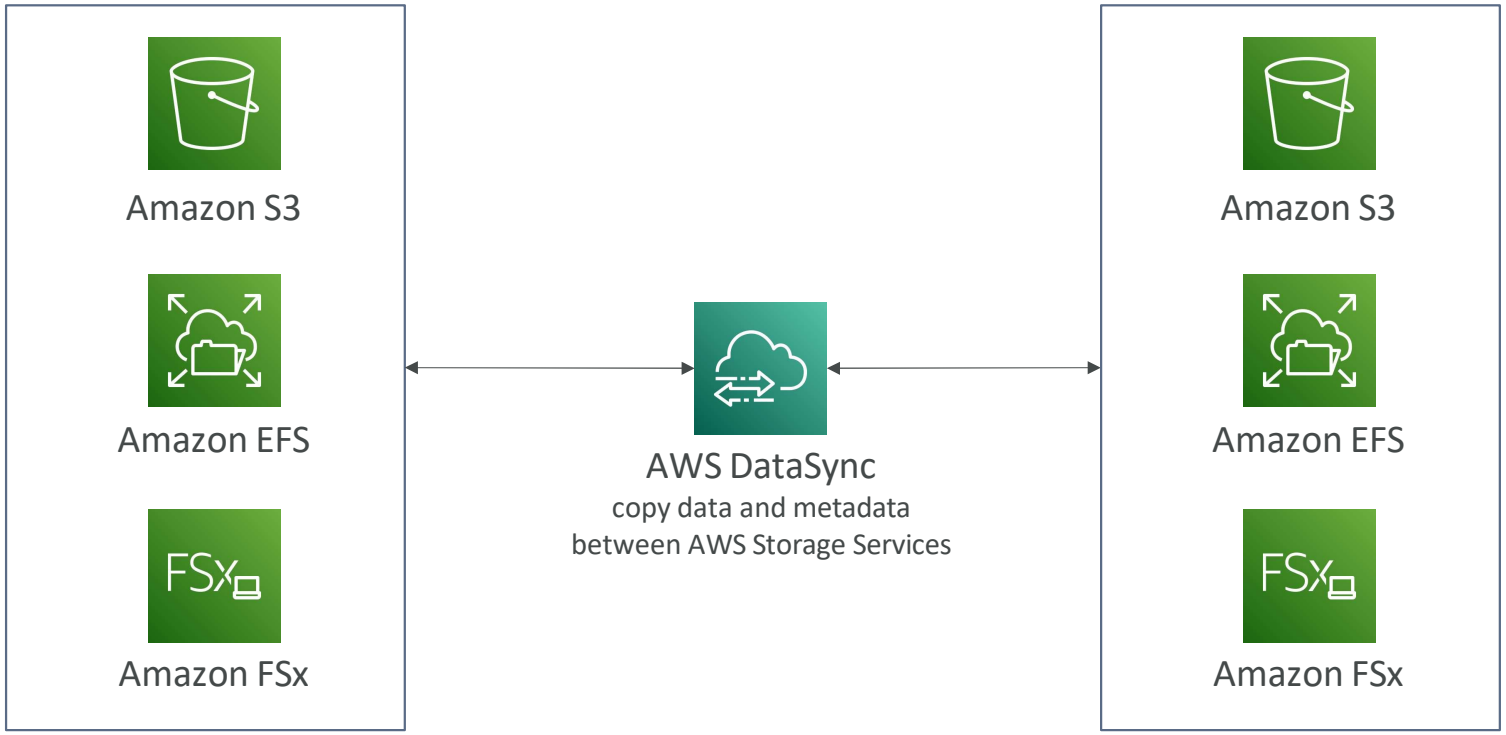
AWS DataSync

- Move large amount of data to and from
  - On-premises / other cloud to AWS (NFS, SMB, HDFS, S3 API...) - needs agent
  - AWS to AWS (different storage services) - no agent needed
- Can synchronize to:
  - Amazon S3 (any storage classes - including Glacier)
  - Amazon EFS
  - Amazon FSx (Windows, Lustre, NetApp, OpenZFS...)
- Replication tasks can be scheduled hourly, daily, weekly
- File permissions and metadata are preserved (NFS POSIX, SMB...)
- One agent task can use 10 Gbps, can setup a bandwidth limit

AWS DataSync
NFS / SMB to AWS (S3, EFS, FSx...)



AWS DataSync
Transfer between AWS storage services



Storage Comparison

- S3: Object Storage
- S3 Glacier: Object Archival
- EBS volumes: Network storage for one EC2 instance at a time
- Instance Storage: Physical storage for your EC2 instance (high IOPS)
- EFS: Network File System for Linux instances, POSIX filesystem
- FSx for Windows: Network File System for Windows servers
- FSx for Lustre: High Performance Computing Linux file system
- FSx for NetApp ONTAP: High OS Compatibility
- FSx for OpenZFS: Managed ZFS file system
- Storage Gateway: S3 & FSx File Gateway, Volume Gateway (cache & stored), Tape Gateway
- Transfer Family: FTP, FTPS, SFTP interface on top of Amazon S3 or Amazon EFS
- DataSync: Schedule data sync from on-premises to AWS, or AWS to AWS
- Snowcone / Snowball / Snowmobile: to move large amount of data to the cloud, physically
- Database: for specific workloads, usually with indexing and querying