

AWS re:Invent

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STG204

Optimize price and performance with Amazon EBS

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AWS Storage portfolio



AWS
Backup



Amazon EBS
Snapshot



Amazon Data
Lifecycle Manager



AWS Transfer
Family

Data services



Amazon S3
Storage Lens



Amazon S3
Lifecycle



Replication



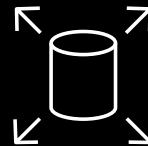
S3 Object
Lambda

Object



Amazon S3
and S3 Glacier

Block



Amazon EBS

File

FSx

Amazon FSx
Family



Amazon EFS



DataSync



Storage Gateway

Hybrid/edge storage Data movement services



Snow Family



Outposts

What is Amazon EBS?

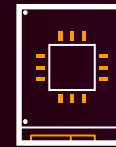


What is Amazon EBS?

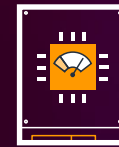
- Block storage **volumes** attached to Amazon EC2 instances
- **Flexible** storage and performance for dynamic workloads such as stateful containers
- Create, attach, and manage volumes through **API, SDK, or AWS Management Console**
- Point-in-time **snapshots** and tools to automate backup and retention via policies



SSD-backed volumes



gp3



io2



HDD-backed volumes

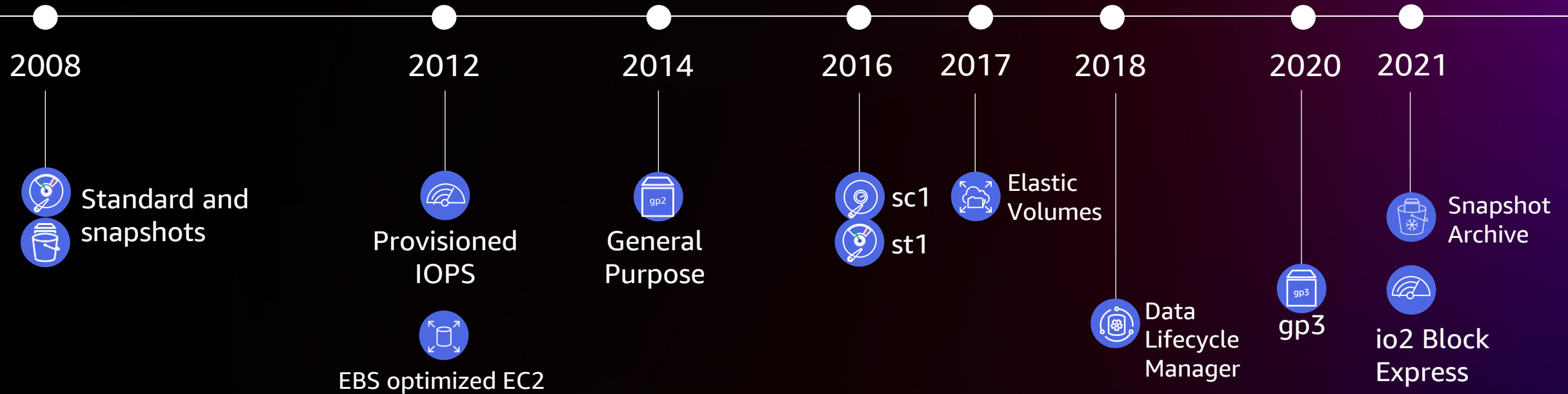


st1

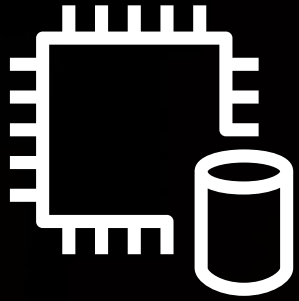


sc1

14 years of EBS innovations

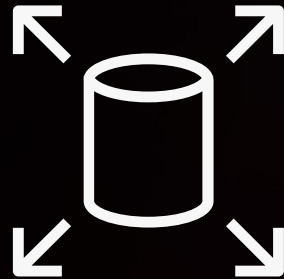


EBS portfolio



Instance Storage

Physically on instance



EBS Volumes

Network attached block storage



Snapshots

Incremental point-in-time
copies of EBS volumes



Data Services

Elastic Volumes,
Data Lifecycle
Management

Millions of AWS customers use Amazon EBS

Johnson & Johnson

Adobe

SAP

experian™

ancestry®

DEVO

Capital One

SONY

INCRAM MICRO

Stanford
University

druva®

splunk®

ONICA
by rackspace technology

PRESIDIO

Comerica

conversa

A&E

BW | Best Western.
Hotels & Resorts

CAL POLY

FDA

BOSE®

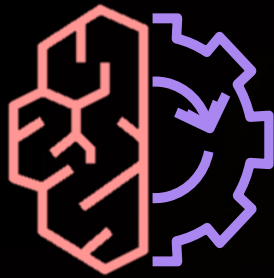
Herman Miller

CROWDSTRIKE

EQUIFAX

COLUMBIA
COLUMBIA UNIVERSITY
IRVING MEDICAL CENTER

Example optimization



Understanding
your workload



Choosing the right volume
type and instance types



Using Elastic Volume to
dynamically adjust performance

Snapshot Archive tiering

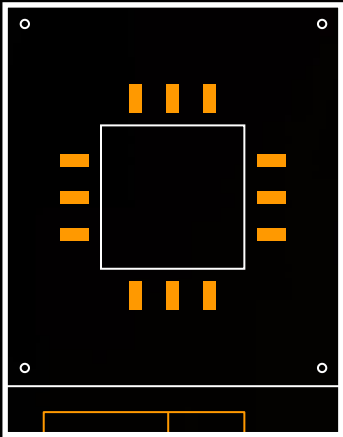
Johnson & Johnson

Selecting the right volume for your workload

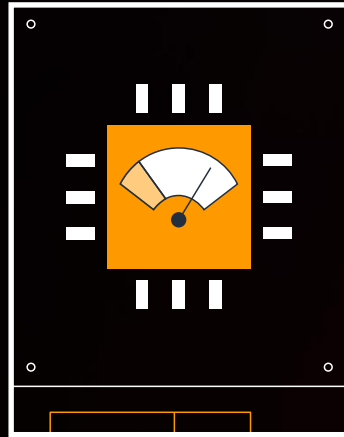


Select the right volume for your workload

SSD

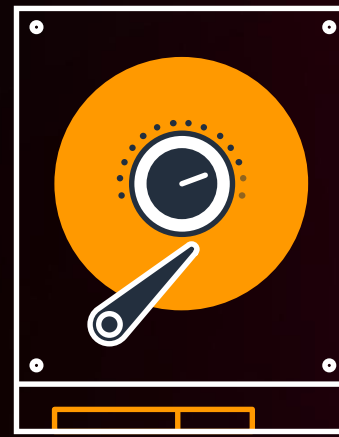


gp3
General
Purpose SSD



io2
Block
Express

HDD

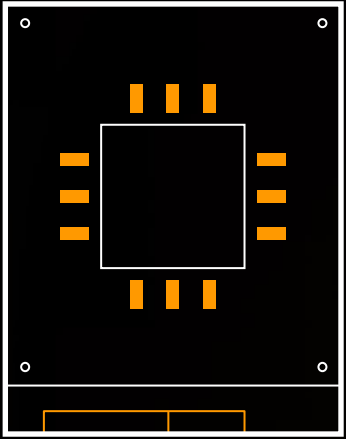


st1
Throughput
Optimized HDD



sc1
Cold
HDD

EBS volume: General Purpose SSD



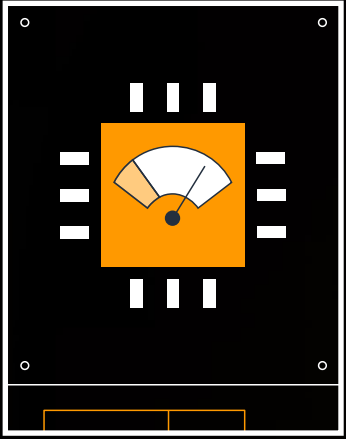
gp3

General Purpose SSD

- IOPS: 3,000 – 16,000 IOPS
- Throughput: 128 – 1,000 MiB/s
- Latency: Single-digit ms
- Capacity: 1 GiB to 16 TiB
- I/O Size: Up to 256 KiB (logical merge)

Great for boot volumes, low-latency applications, and bursty databases

EBS volume: io2 Block Express



io2

Block Express



Next-generation architecture

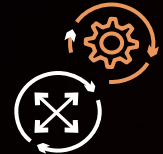


4x throughput and **4x** IOPS

Up to 4,000 MiB/s

Up to 256,000 IOPS

1,000:1 IOPS to GB



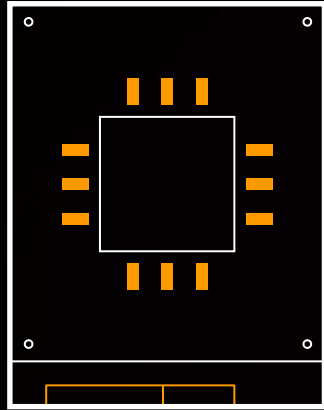
4x volume size up to 64 TB per volume



<1 millisecond latency

Ideal for critical applications and databases with sustained IOPS

Select the right volume for your workload



gp3

General Purpose SSD

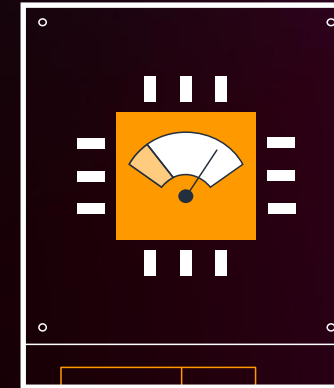
Volume Size: 4GiB–16TiB

IOPS: 3,000–16,000 IOPS

Throughput: 128–1,000 MiB/s

Latency: Single-digit ms

Durability: 99.8% – 99.9%



io2

Block Express

Volume Size: 4GiB–64TiB

IOPS: 100–256,000 IOPS

Throughput: 128–4,000 MiB/s

Latency: <1 millisecond ms

Durability: 99.999%

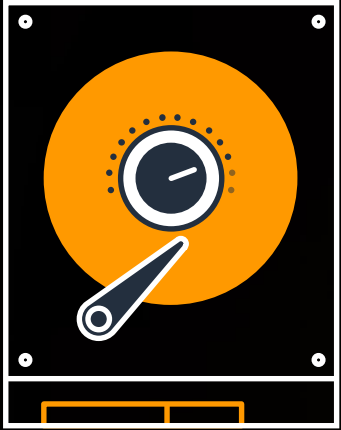
Select the right volume



Areas to consider:

- Is your workload mission critical?
- What level of performance do you need?
- Does your database have built in replication?
- What are your latency requirements?
- What EC2 instance type are you using?

EBS volume: Throughput Optimized



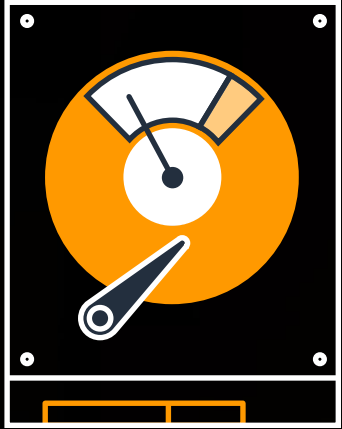
st1

Throughput
Optimized HDD

- Baseline: 40 MiB/s per TiB, up to 500 MiB/s
- Burst: 250 MiB/s per TiB, up to 500 MiB/s
- Capacity: 125 GiB to 16 TiB
- I/O Size: Up to 1 MiB (logical merge)

Ideal for large-block, high-throughput sequential workloads

Amazon EBS volume: Cold HDD



sc1

Cold HDD

- Baseline: 12 MiB/s per TiB, up to 192 MiB/s
- Burst: 80 MiB/s per TiB, up to 250 MiB/s
- Capacity: 125 GiB to 16 TiB
- I/O Size: Up to 1 MiB (logical merge)

Ideal for sequential throughput workloads, such as logging and backup

Would my customers or my business be impacted by degradation or an outage?



Understand your mission



Databases

PostgreSQL, MySQL
Cassandra, MongoDB



Data and Analytics

Kafka, Splunk, Hadoop,
data warehousing



Media

Transcoding, encoding,
render farms



File

CIFS, NFS
archive

Database workloads



Databases

PostgreSQL, MySQL
Cassandra, MongoDB

- Typically high performance requirements
- Mostly random I/O
- Journal is sequential
- Highly workload dependent

Recommendation: SSD

Select the right volume



Virtual desktop

- Latency sensitive
- Mostly random I/O
- Highly workload dependent

Recommendation: General Purpose SSD (gp3)

Select the right volume



Media

Transcoding, encoding,
render farms

- Typically high throughput requirements
- Mostly sequential I/O
- Sustained I/O

Recommendation: Throughput Optimized HDD (st1)

Select the right volume



Data and Analytics

Kafka, Splunk, Hadoop,
data warehousing

- Typically high throughput requirements
- Mostly sequential I/O
- Daily periodicity

Recommendation: HDD

Select the right volume



File

CIFS, NFS
archive

- Typically low throughput requirements
- Bursty workloads
- Cost sensitive

Recommendation: Cold HDD (sc1)

Containerized workloads



kubernetes

- You can specify the volume type based on your workloads
- Low latency data access
- Scale easier and faster
- Highly workload dependent

Recommendation: Amazon EBS CSI Driver

Containerized workloads

Long-running stateful applications



Developer
tools

Jenkins
Jira
Git



Web and content
management

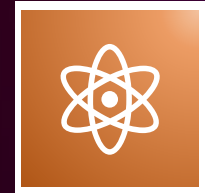
WordPress
Drupal
nginx

Shared data sets



Machine
learning

MXNet
TensorFlow
Kubeflow



Data science
tools

Jupyter(hub)
Airflow

EBS CSI Driver – for Amazon EKS/Kubernetes workloads



- EBS volume provisioning and management using native Kubernetes APIs
- 1-click install as EKS add-on
- Vibrant community support

Workloads on Kubernetes Clusters



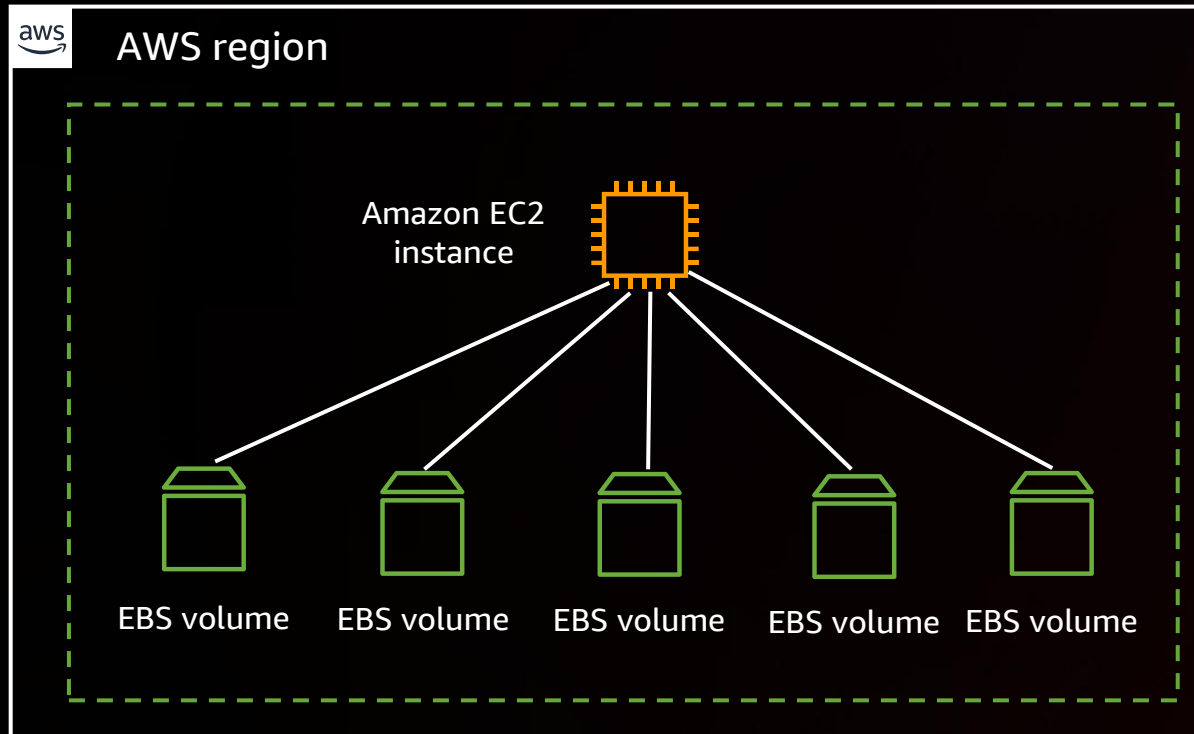
kubernetes

```
~/go/s/g/to/k8s.io main kubectl apply -k "github.com/kubernetes-sigs/aws-ebs-csi-driver/deploy/kubernetes/overlays/stable/?ref=release-1.12"
serviceaccount/ebs-csi-controller-sa created
serviceaccount/ebs-csi-node-sa created
clusterrole.rbac.authorization.k8s.io/ebs-csi-node-role created
clusterrole.rbac.authorization.k8s.io/ebs-external-attacher-role created
clusterrole.rbac.authorization.k8s.io/ebs-external-provisioner-role created
clusterrole.rbac.authorization.k8s.io/ebs-external-resizer-role created
clusterrole.rbac.authorization.k8s.io/ebs-external-snapshotter-role created
clusterrolebinding.rbac.authorization.k8s.io/ebs-csi-attacher-binding created
clusterrolebinding.rbac.authorization.k8s.io/ebs-csi-node-getter-binding created
clusterrolebinding.rbac.authorization.k8s.io/ebs-csi-provisioner-binding created
clusterrolebinding.rbac.authorization.k8s.io/ebs-csi-resizer-binding created
clusterrolebinding.rbac.authorization.k8s.io/ebs-csi-snapshotter-binding created
deployment.apps/ebs-csi-controller created
poddisruptionbudget.policy/ebs-csi-controller created
daemonset.apps/ebs-csi-node created
csidriver.storage.k8s.io/ebs.csi.aws.com created
```

```
~/go/s/g/to/aws-ebs-csi-driver master helm upgrade --install aws-ebs-csi-driver --namespace kube-system ./charts/aws-ebs-csi-driver --values ./charts/aws-ebs-csi-driver/values.yaml

Release "aws-ebs-csi-driver" does not exist. Installing it now.
```

Select the right volumes

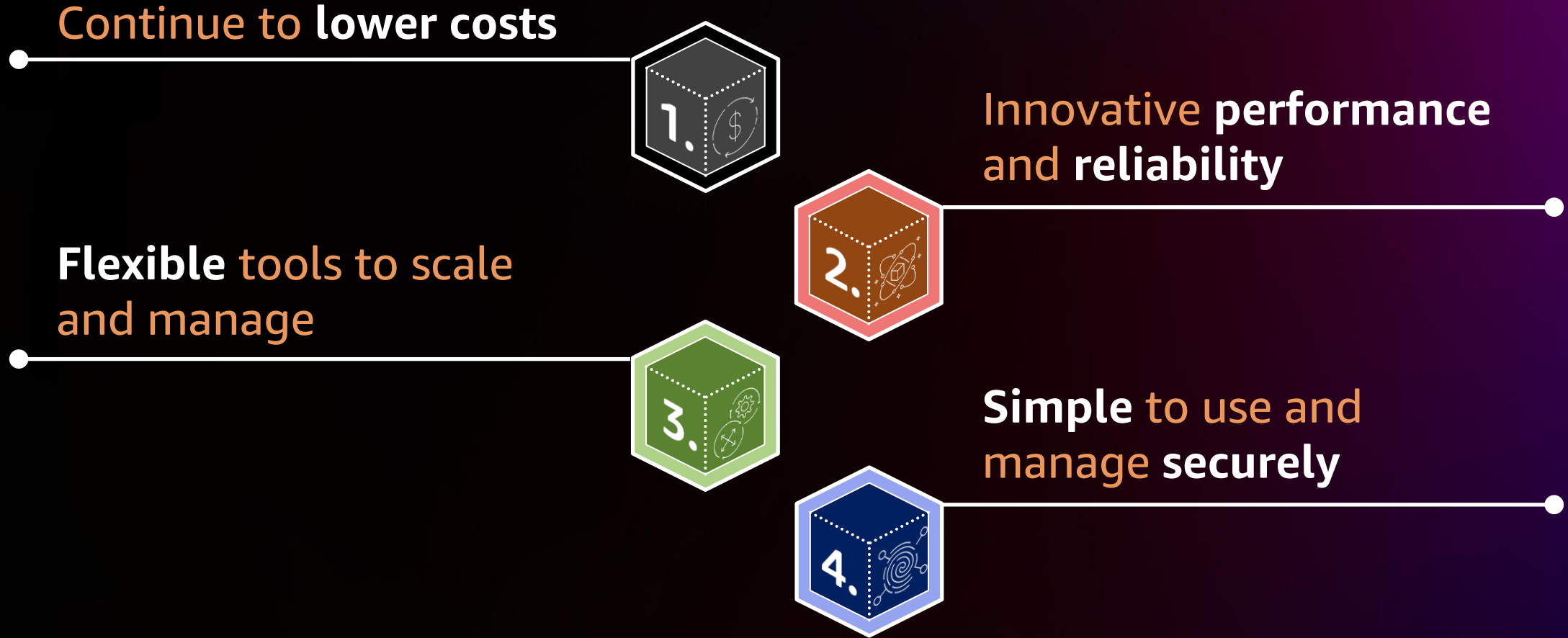


Multiple EBS volumes can be attached to an instance

Mix and match volume types for optimum performance

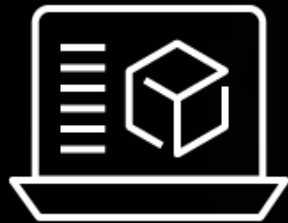
Use Elastic Volumes to change your volume characteristics

Amazon EBS key takeaways



Continue your AWS Storage learning

**Build a
learning plan**



Set your AWS Storage
learning plans via
AWS Skill Builder

**Increase your
knowledge**



Use our **Ramp-Up Guides**
to build your storage
knowledge

**Earn AWS
Storage badges**



Demonstrate your
knowledge by achieving
digital badges

aws.training/storage



Amazon EBS at re:Invent

<u>Date</u>	<u>Time</u>		<u>Session Type</u>	<u>Session Title</u>
Monday, November 28	10:00 AM	STG204	Breakout	Optimize price and performance with Amazon EBS
Monday, November 28	10:00 AM	STG405	Chalk Talk	Best practices on operating at scale with Amazon EBS and EBS Snapshots
Tuesday, November 29	5:45 PM	STG212	Breakout	Protect data and lower costs with Amazon EBS Snapshots
Tuesday, November 29	12:30 PM	STG307	Chalk Talk	Amazon Elastic Block Store: A tech deep dive
Tuesday, November 29	4:15 PM	STG404	Chalk Talk	Reduce time to recovery with Amazon EBS direct APIs and flexible snapshot proxy
Wednesday, November 30	8:30 AM	STG314	Workshop	Amazon EBS snapshots: Build protection and cost-optimize
Wednesday, November 30	9:15 AM	STG220	Chalk Talk	Best practices for moving on-premises applications to Amazon EBS
Wednesday, November 30	12:15 PM	STG406	Builders	Build automated data protection & backup compliance with Amazon EBS Snapshots
Wednesday, November 30	1:45 PM	STG219	Breakout	Build resilient architectures with Amazon EBS
Wednesday, November 30	5:30 PM	STG306	Chalk Talk	Best practices for Amazon EBS volumes & performance monitoring using CloudWatch



Thank you!



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