
AWS
re:Invent

EMB021

Cost-optimize your enterprise workloads with Amazon EBS

Ashish Palekar

PM EBS, GM Snapshots

AWS

AWS re:Invent

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Agenda

Amazon EBS overview

New changes in Stream volumes (st1 and sc1)

Manage EBS Snapshots and AMIs with Amazon Data Lifecycle Manager (DLM)

Using R5b to consolidate workloads

io2 and io2 Block Express: Tiered IOPS pricing

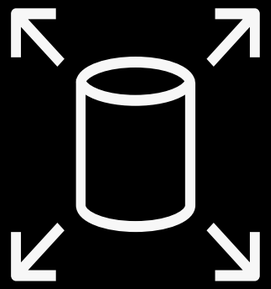
gp3

Using Elastic Volumes to reduce costs

AWS Compute Optimizer support for EBS

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Simple, scalable, high-performance block storage



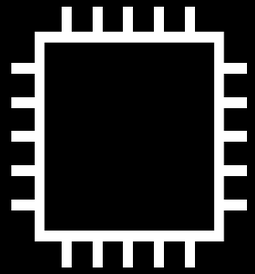
Amazon EBS Volumes

Easy-to-use, high-performance block storage



Snapshots

Incremental point-in-time copies of EBS volumes



Instance storage

Temporary block storage attached to host HW



Data services

Elastic Volumes, data lifecycle management

Why customers choose Amazon EBS



Performance for any workload

Up to 64,000 IOPS and
single-digit millisecond latency



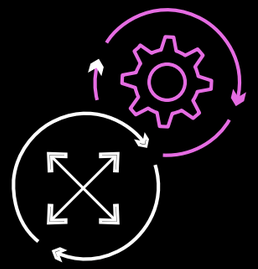
Easy to use

Easily add/remove capacity,
or change volume types with
Elastic Volumes



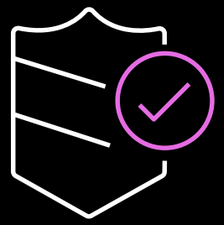
High reliability

99.999% availability and
up to 99.999% durability



Virtually unlimited scale

Use a single gigabyte or less, or
scale up to petabytes of data



Secure

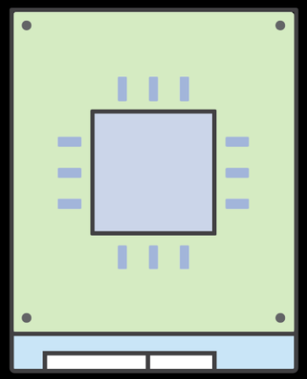
Encrypt all new volumes and
data for a region by default
with a single setting



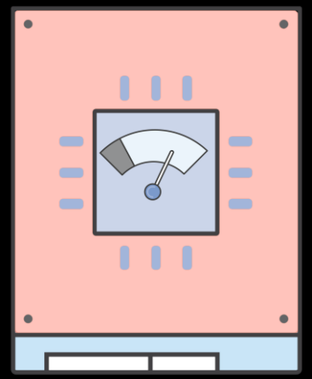
Cost-effective

Pay as low as $0.015/GB-month
for highly cost-effective dollar
per gigabyte block storage

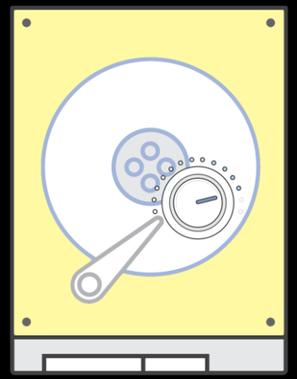
Amazon EBS Volume Portfolio



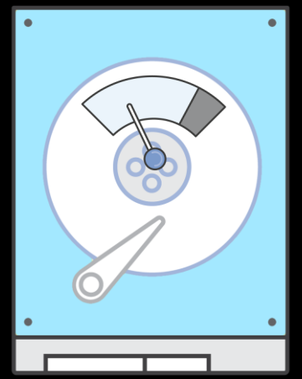
gp2/gp3



io1/io2



st1



sc1



NoSQL Databases

Cassandra, MongoDB, CouchDB



Relational Databases

MySQL, SQL Server, PostgreSQL, SAP, Oracle



Big Data, Analytics

Kafka, Splunk, Hadoop, Data Warehousing



File / Media

CIFS / NFS, Transcoding, Encoding, Rendering



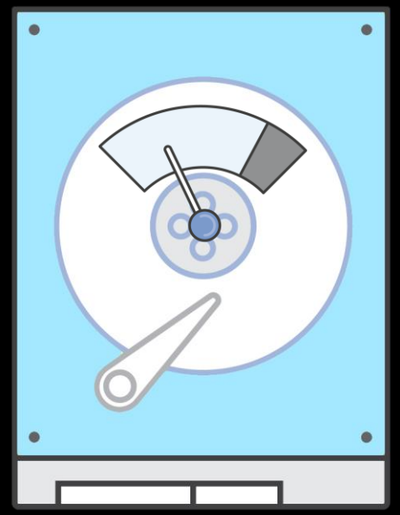
Changes to stream volumes



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Amazon EBS volume: Cold HDD



sc1

Cold HDD

Baseline: 12 MiB/s per TiB, up to 192 MiB/s

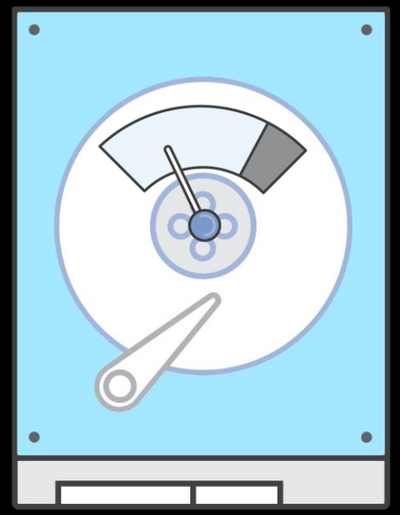
Burst: 80 MiB/s per TiB, up to 250 MiB/s

Capacity: 500 GiB to 16 TiB

I/O size: Up to 1 MiB (logical merge)

Ideal for sequential throughput workloads, such as logging and backup

Lowest cost HDD volume type got even better!



sc1

Cold HDD

$0.025/GiB-month

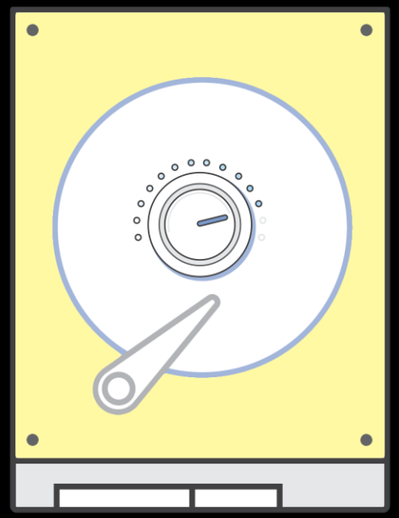
40% Price Drop!

$0.015/GiB-month

Have you considered tiering your colder workloads to sc1?

*us-east-1 pricing for sc1 volumes on December 1st 2020

Amazon 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

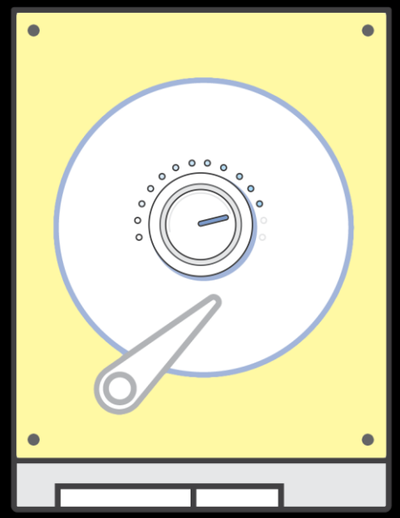
Capacity: 500 GiB to 16 TiB

I/O size: Up to 1 MiB (logical merge)

Ideal for large-block, high-throughput sequential workloads

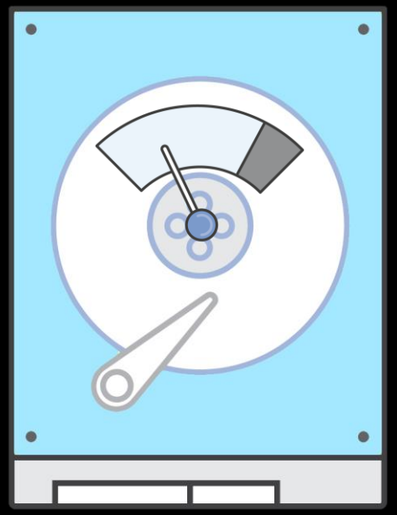
Reducing the minimum size for st1 and sc1

NEW
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st1

Throughput Optimized HDD



sc1

Cold HDD

500 GB → 125 GB

75% Reduction!

Putting it together: An example

Customer needs 100 GB Cold HDD volume for their workload

Previously

Provisioned capacity = 500 GB

Unit price: $0.025/GiB-month

Total Cost = $12.50



85% Lower!

New

Provisioned capacity = 125 GB

Unit price: $0.015/GiB-month

Total Cost = $1.875

*us-east-1 pricing for sc1 volumes on Dec 1st 2020

Manage Snapshots and AMIs with Amazon Data Lifecycle Manager



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Amazon Data Lifecycle Manager



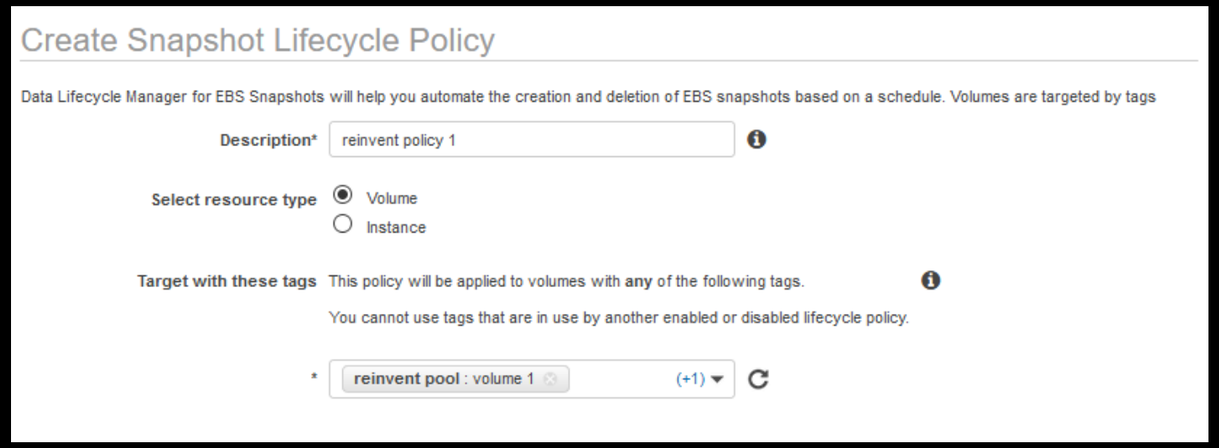
Automate snapshot lifecycle

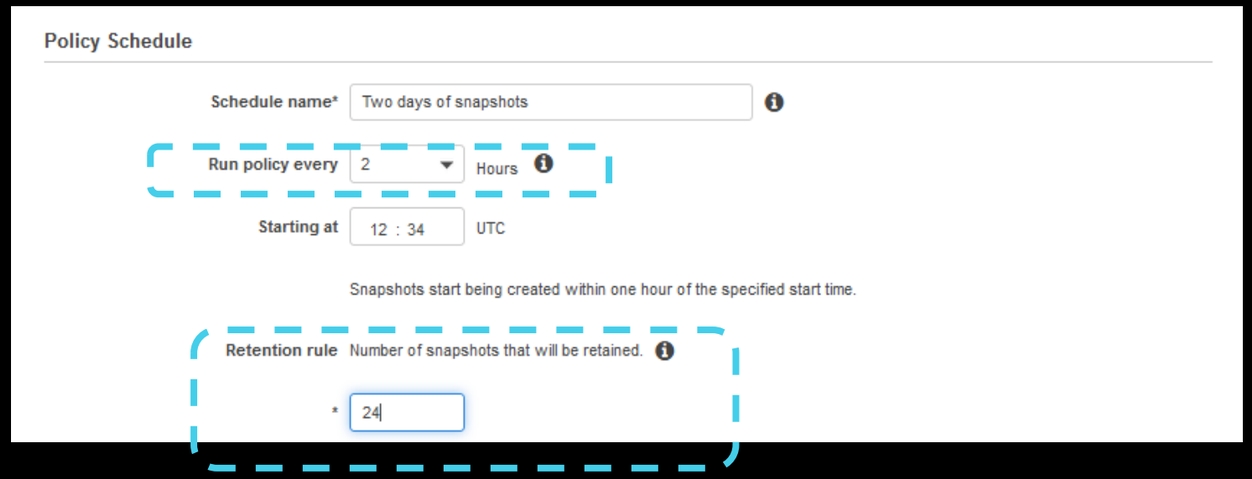
Integrates with AWS CloudFormation

EBS volume or instance-level policies

Manage Snapshot costs with Amazon Data Lifecycle Manager

- Set policies on when snapshots are taken and how many snapshots to keep in a lineage
- Use cost allocation tags to track snapshot costs





New: DLM features

Reduce RPO on your DLM policy to 1 hour

Flexible scheduling based on cron expressions and additional backup intervals including weekly, monthly, and annual schedules

DLM policy creation is simpler with support for multiple schedules within in a single lifecycle policy

Retention management got easier with launch of Time-Based Retention, which allows you to define day, week, month, . . . retention

Snapshot copy across region is now automatic via DLM policy

New DLM Feature: AMI Lifecycle Management

With AMI lifecycle management automated, customers can ensure that their EBS-backed Amazon Machine Images are created and cleaned up regularly to keep their storage costs under control.



Policy and tag-based lifecycle management



Automated backup scheduling



Automated backup retention management

- Identify EC2 instances to backup using tags
- Automate retention and cleanup of AMIs
- Control costs by automatically deleting snapshots of de-registered AMIs
- Define policies for regular backup schedules
- Retain backups for compliance & auditing purposes
- Free to use

Consolidate workloads: New R5b instance

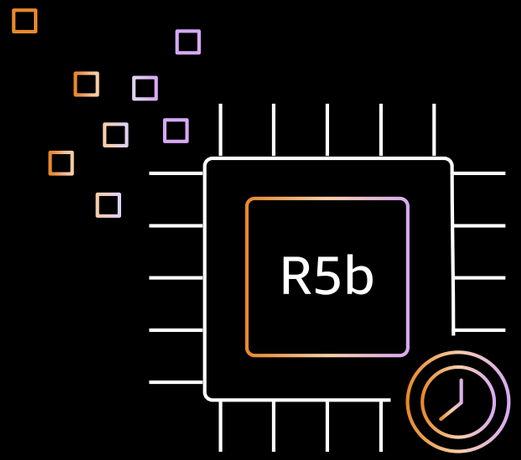


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Introducing Amazon EC2 R5b instances

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Memory-optimized instances delivering 3x faster block storage performance in cloud

Up to **3X** better EBS performance over EC2 R5 instances

Deliver up to 7,500 MB/second bandwidth and 260K IOPS of EBS performance

Designed for large database and data analytics workloads

Consolidate workloads sensitive to storage performance by migrating from R5 to R5b

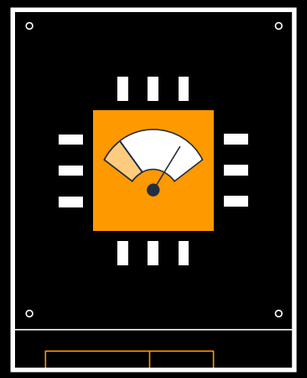
Tiered IOPS Pricing: io2 and io2 Block Express



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io2: For higher performance and durability



Provisioned IOPS SSD

io2

Up to 64,000 IOPs
IOPS

Up to 1,000 MB/s
Throughput

Up to 16 TB
Capacity

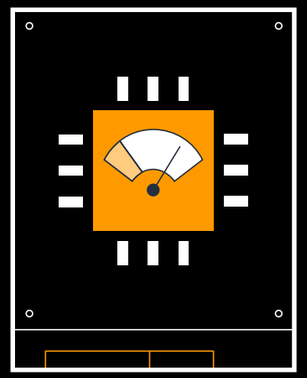
Single-Digit Millisecond
Latency

99.999%
Durability

Introducing io2 Block Express

NEW AT RE:INVENT

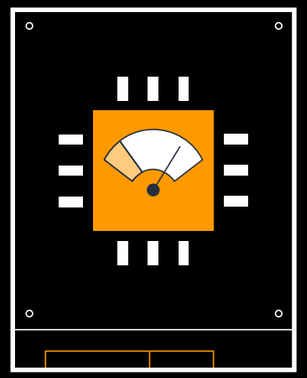
THE FIRST SAN BUILT FOR THE CLOUD – AVAILABLE IN PREVIEW



Provisioned IOPS SSD

	io2	io2 Block Express
IOPS	Up to 64,000 IOPs	Up to 256,000 IOPs (4X)
Throughput	Up to 1,000 MB/s	Up to 4,000 MB/s (4X)
Capacity	Up to 16 TB	Up to 64 TB (4X)
Latency	Single-Digit Millisecond	Sub-Millisecond
Durability	99.999%	99.999%

Tiered IOPS Pricing: io2 and io2 Block Express



Provisioned IOPS SSD
io2 + io2 Block Express

Introducing lower cost
tiered-pricing per volume for io2

Up to 32,000 IOPS
current rate
(e.g., $0.065 per PIOP-mo)

32,001 – 64,000 IOPS
30% lower costs
(e.g., $0.046 per PIOP-mo)

> 64,000 IOPS
additional 30% lower cost
(e.g., $0.032 per PIOP-mo)

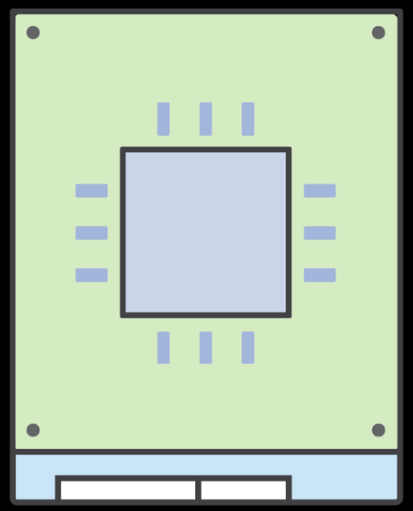
*us-east-1 pricing for io2 and io2 Block Express volumes on December 1st 2020

gp2 General Purpose SSD



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Amazon EBS volume: General Purpose SSD



gp2

General Purpose SSD

Baseline: 100 to 16,000 IOPS @ 3 IOPS/GB

Burst: 3,000 IOPS (< 1000 GB)

Throughput: Up to 250 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

gp2: The most common volume type



What did customers like about gp2?

Simplicity – Provision only capacity

Works at all volume sizes – Small volumes get IOPS with burst

Flexible – Consistent IOPS scaling at 3 IOPS:GiB

Experian cuts time to market for analytics products from a year to under 90 days on AWS

EBS BACKS UP EXPERIAN'S CRITICAL CUSTOMER DATA



All the front-end analytics applications supported by Experian's suite of analytical tools Ascend run on Amazon EC2, backed by Amazon EBS general purpose SSD (gp2) volumes, which give the platform the best balance of price and performance. One Ascend product uses 2 PB of data, and Amazon EBS makes managing it easy.

- Reduced production cycle from years to under 90 days
- Created COVID-19 pandemic tool in under 30 days
- Restores customer data in minutes and ensures security
- Enables customers to test, analyze, and manipulate over 3 PB of data

"The capabilities that we get from AWS enable us to build products quickly. Our cycle time for new products has gone from years to less than 90 days. Amazon EBS enables us to add more data and quickly expand the volume of the data. That is a huge game changer for us in how we react to market conditions."

—Moied Wahid, Vice President of Ascend Platform Engineering, Experian

Feedback from customers on improving gp2

Want more performance without having to provision more storage

Colder workloads need less performance than gp2 offers

Want more predictability without having to deal with burst

NEW

gp3 General Purpose SSD

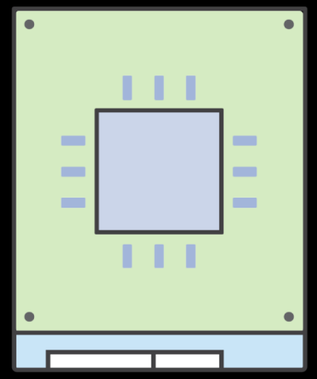


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New EBS volume type: gp3

NEW
AT RE:INVENT



gp3

General Purpose SSD

Ideal for relational and non-relational databases, enterprise applications, containerized workloads, big data, file system, media workflows

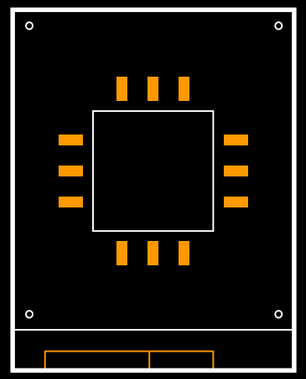
3,000 baseline IOPS (versus 3 IOPS/GiB in gp2) and 1,000 MiB/s (versus 250 MiB/s in gp2); provision throughput and IOPs separately from capacity

Up to 20% lower storage price than gp2 volumes

gp3: New General Purpose SSD volume

NEW AT RE:INVENT

INDEPENDENTLY PROVISION IOPS AND THROUGHPUT AT UP TO 20% LOWER PRICE PER GB

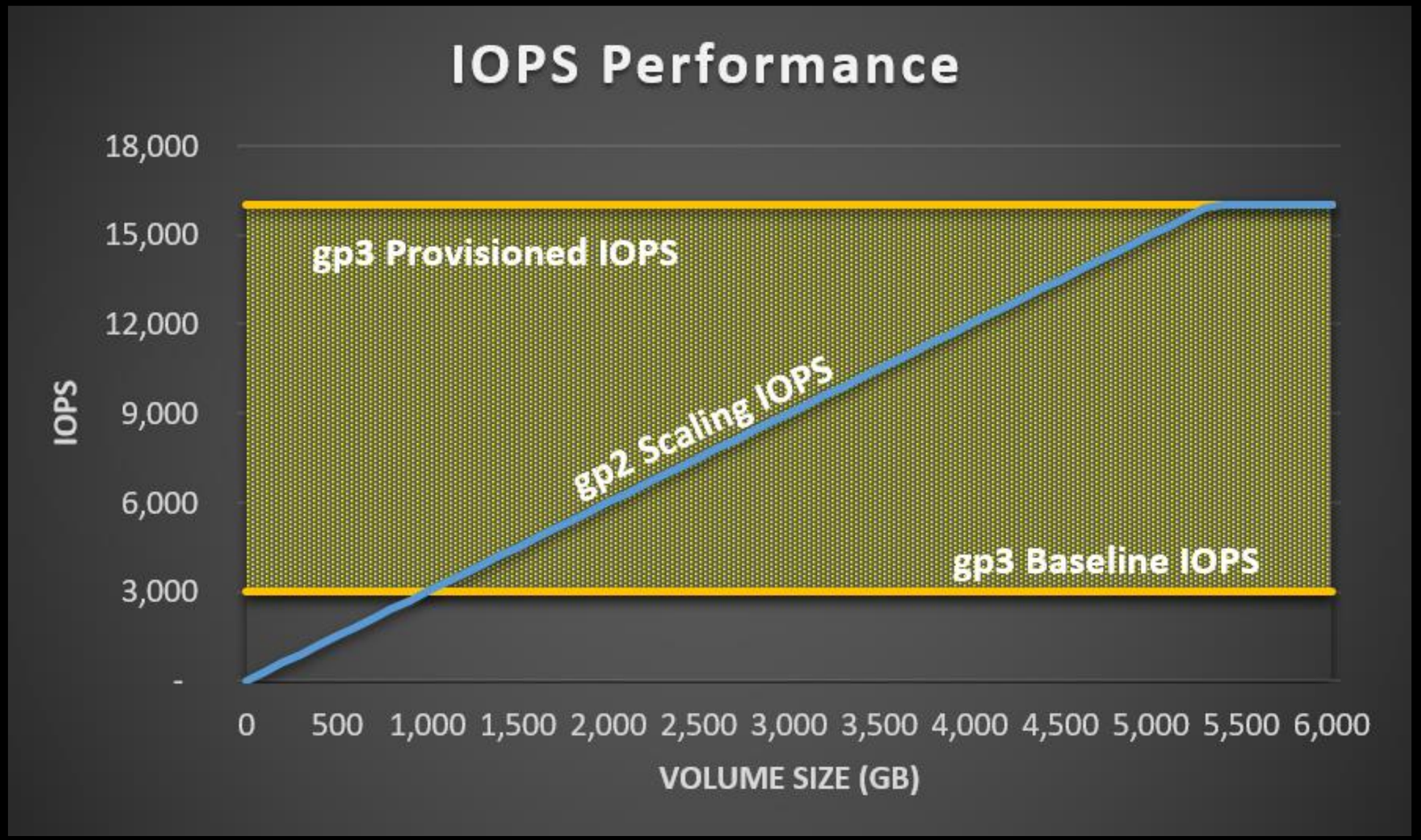


General Purpose SSD

gp2	gp3
Up to 250 MB/s Throughput	4X **Up to 1,000 MB/s** Throughput
3,000 IOPS (burst) Baseline Performance	**3,000 IOPS (no burst)** Baseline Performance
3 IOPS / GB Scaled Performance	**Independently Scale** IOPS and Throughput

Use Elastic Volumes to migrate from gp2 to gp3 without application impact

gp2 vs. gp3 IOPS Performance



gp3 Pricing

Capacity

$0.08/GiB-mo

20% cheaper than gp2

Includes 3,000 IOPS and 125 MiB/s

IOPS

$0.005/IOP-mo

Between 3,001 and 16,000 IOPS

Throughput

$0.04/MiBps-mo

Between 126 and 1,000 MiB/s

*us-east-1 pricing for gp2/gp3 volumes on December 1st 2020

Customer quote



“When your focus is analyzing the world’s data in real time, having the **right balance of price and performance** is critical to our business and our end-customers. With the release of gp3, Teradata AWS customers will experience improved performance and throughput, allowing them to drive increased analytics at scale. With the significant improvements in gp3 over gp2, we expect **4x higher throughput and improved instance level availability**; enabling our customers to receive increased performance with fewer EBS volumes per instance.”

—Dan Spurling, SVP Engineering, Teradata

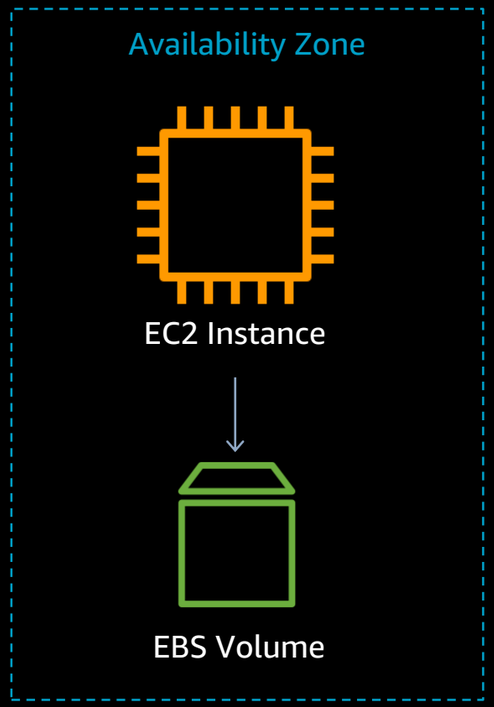
Comparing gp3 to gp2 for real customer workloads



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Customer Workload: Webserver

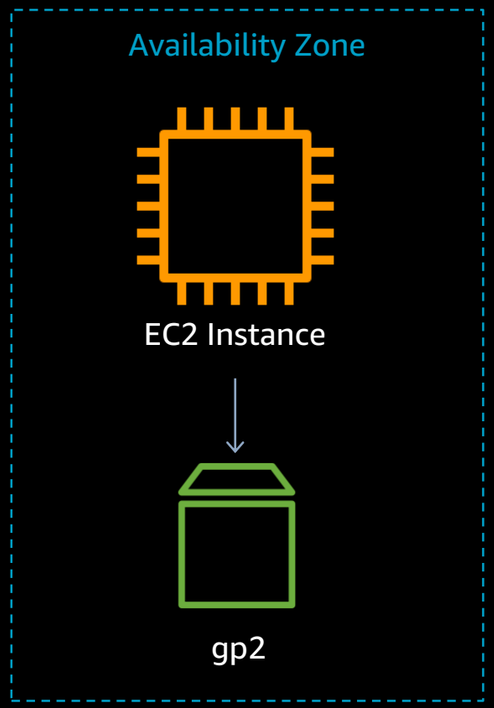


Handles infrequent and bursty web-based application traffic with single-digit millisecond latency

Requirements

- 50 GB
- 2,000 IOPS
- 40 IOPS per GB
- 32 MiB/s

Customer Workload: Webserver

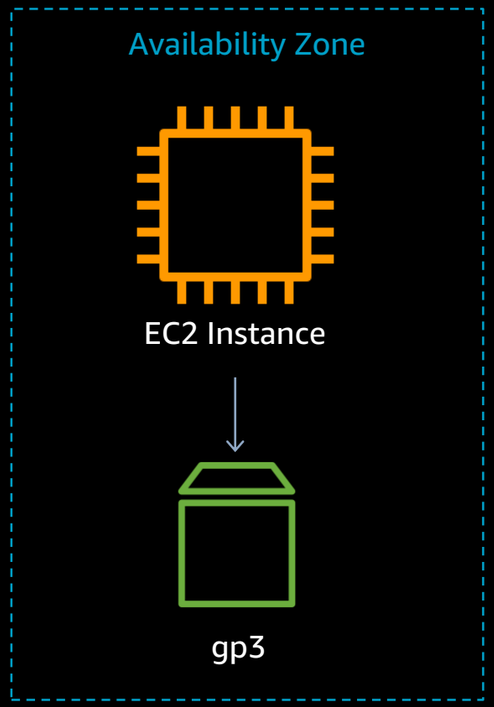


gp2 General Purpose SSD

- **Utilizes burst IOPS for traffic spikes**
- **Volume size: 50 GB**
- **IOPS: 3,000 IOPS (Burst)**
- **Throughput: 125 MiB/s (Burst)**
- **Volume price (us-east-1): $5.00**

Relies on burst IOPS to deliver performance

Customer Workload: Webserver



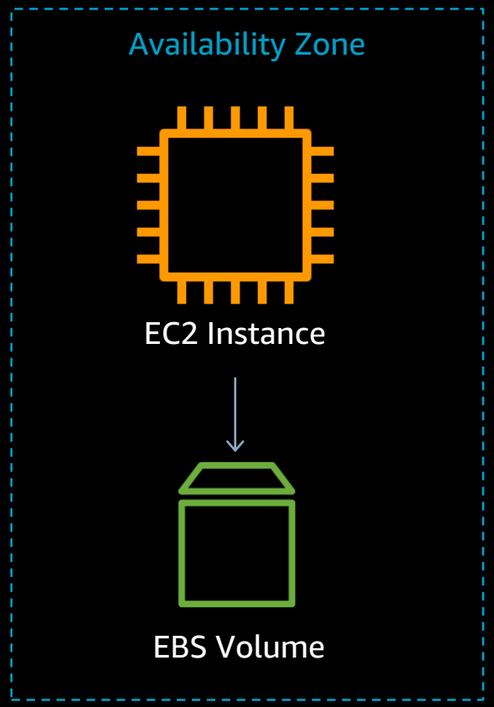
NEW

gp3 General Purpose SSD

- **Volume size: 50 GB**
- **IOPS: 3,000 IOPS included with storage (no burst)**
- **Throughput: 125 MiB/s included with storage (no burst)**
- **Volume price (us-east-1): $4.00 (20% lower)**

Delivers consistent baseline performance instead of burst

Customer Workload: Small MySQL DB

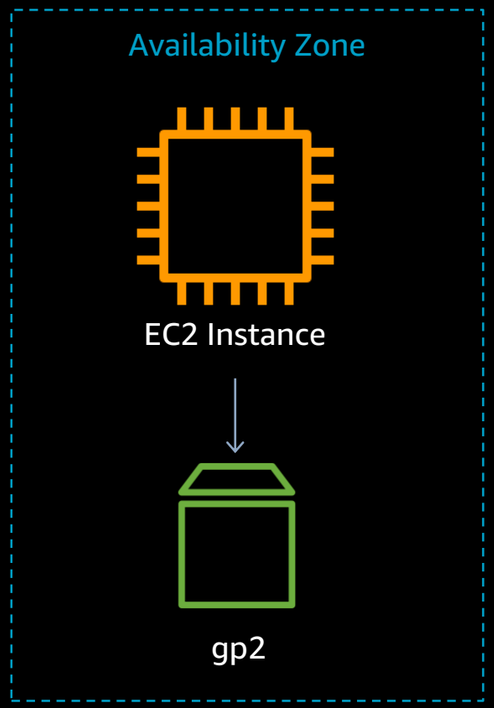


Relational database driving thousands of transactions per second with single-digit millisecond latency

Requirements

- 200 GB
- 5,000 IOPS
- 25 IOPS per GB
- 80 MiB/s

Customer Workload: Small MySQL DB

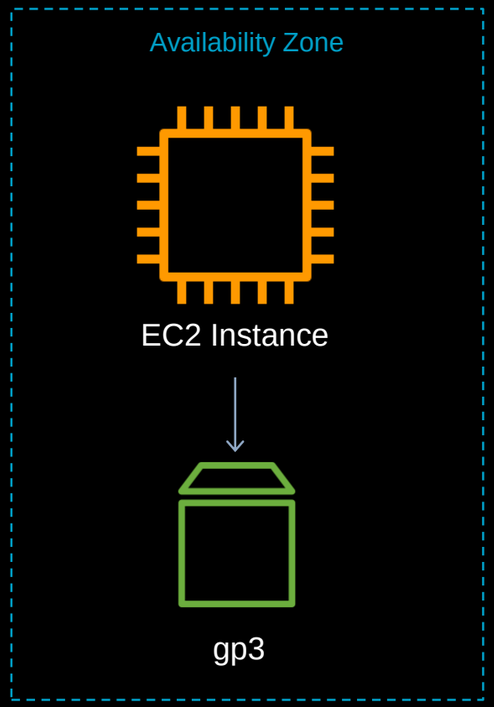


gp2 General Purpose SSD

- **IOPS per GB: 3**
- **Volume size needed for 5,000 IOPS = 1,667 GB**
- **Throughput: 250 MiB/s**
- **Volume price (us-east-1): $166.67**

Provisioning 5,000 IOPS requires additional storage capacity

Customer Workload: Small MySQL DB



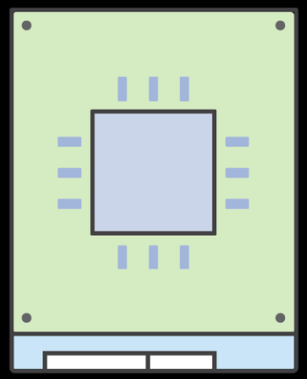
NEW

gp3 General Purpose SSD

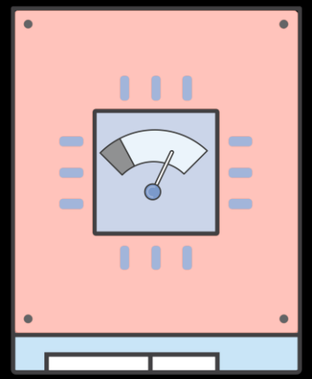
- **IOPS: 5,000 (3,000 included with storage)**
- **Volume size: 200 GB**
- **IOPS per GB: 25**
- **Throughput: 125 MiB/s Included with storage**
- **Volume price (us-east-1): $26.00 (84% lower)**

Provision capacity, IOPS, and throughput independently

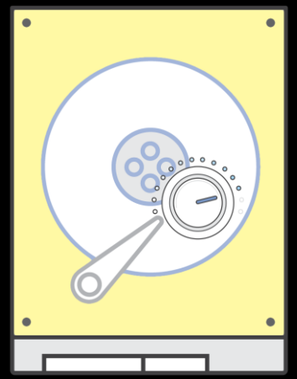
Amazon EBS Volume Portfolio



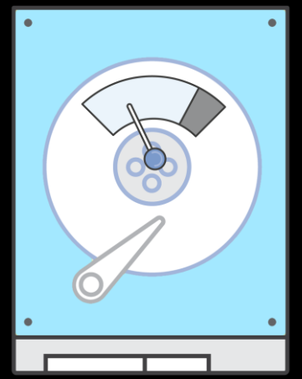
gp2/gp3



io1/io2



st1



sc1



NoSQL Databases

Cassandra, MongoDB, CouchDB



Relational Databases

MySQL, SQL Server, PostgreSQL, SAP, Oracle



Big Data , Analytics

Kafka, Splunk, Hadoop, Data Warehousing



File / Media

CIFS/NFS, Transcoding, Encoding, Rendering

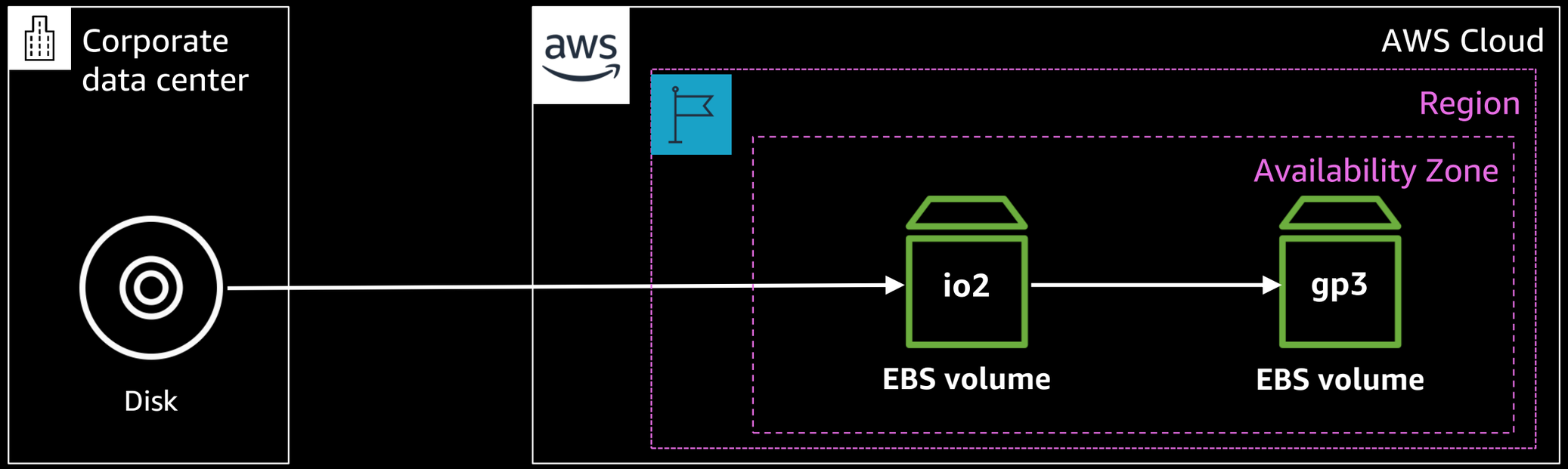
Using Elastic Volumes



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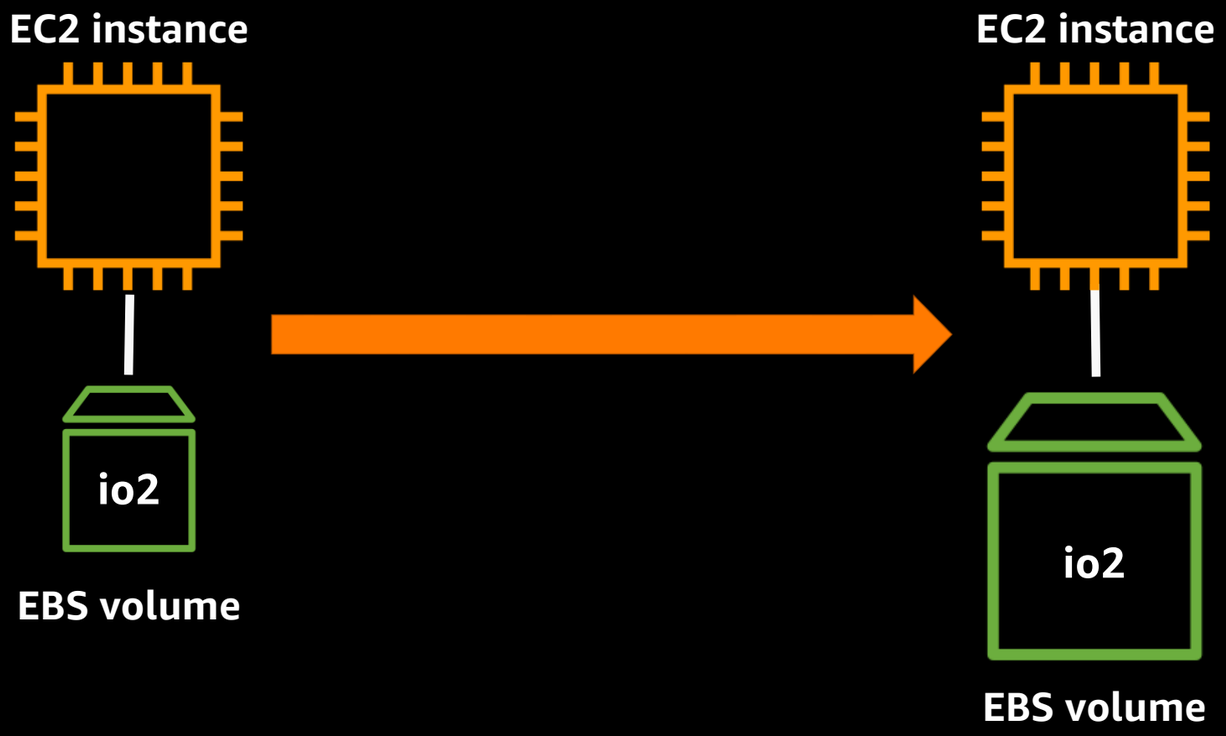
Elastic Volumes: Get to the right volume type




```
aws ec2 modify-volume --volume-id vol-00d820abc6be8d639 --volume-type gp3 --size 10000
```

Ensure that you have enough capacity and IOPS on gp3

Elastic Volumes: Size your volumes correctly!

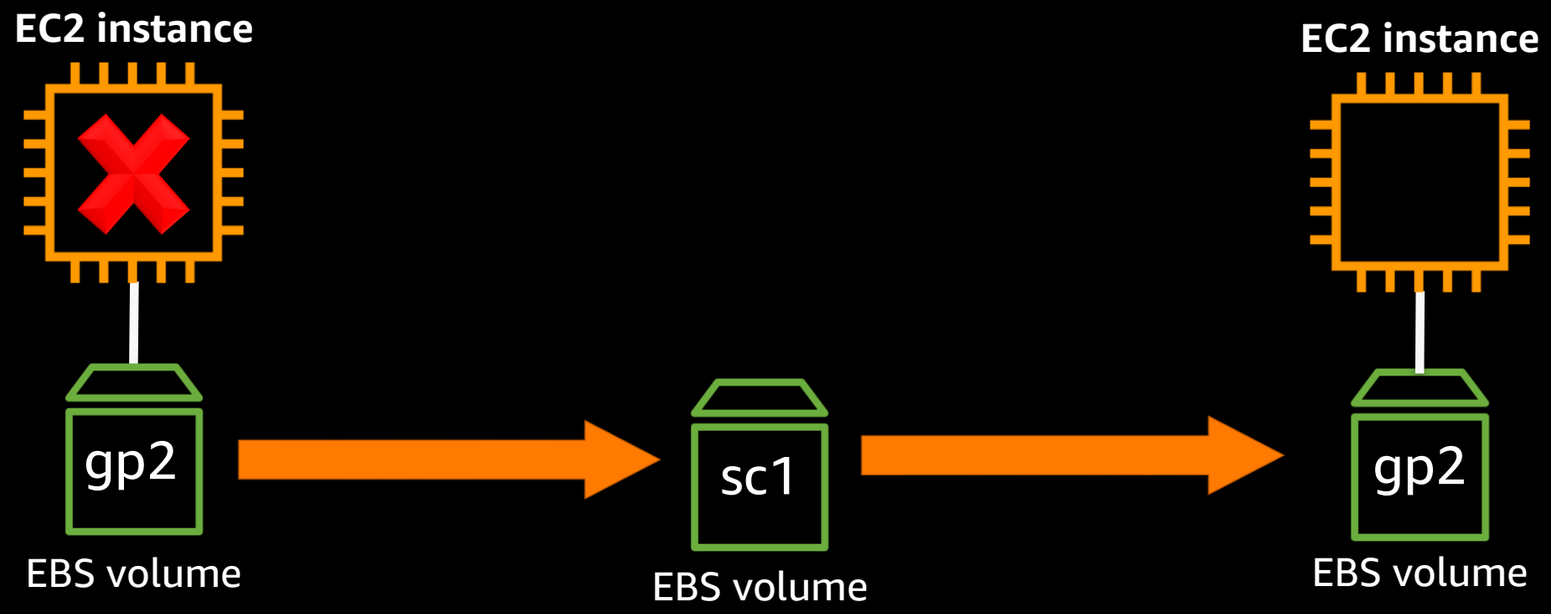


Increase the size of volumes and IOPS as you need it – rather than all upfront

```
aws ec2 modify-volume --volume-id vol-00d820abc6be8d639 --size 10000 --iops 32000
```

Remember to expand the file system to take advantage of the increased capacity

Tier to lower cost volume type if volume is not in use



- Move to lower cost tier if detached longer than
  - 6h (EV time limit) or
  - Time to modify-volume
- Especially helpful for predictable schedules, e.g., weekends, month ends

EBS Optimizations by AWS Compute Optimizer

NEW AT RE:INVENT



`io1/io2`

Optimize Provisioned IOPS settings



`gp2/gp3`

Optimize size of gp2 volumes to meet performance

IOPS and throughput recommendations for gp3 volumes

Eliminates manual optimization & available at no additional charge

Key takeaways

gp3: Provision the capacity and performance you need

Elastic Volumes: Tier to the right volume type / size / performance

st1 / sc1: 125 GiB minimum volume size, 40% price drop on sc1

Reduced tiered IOPS pricing on io2 / io2 Block Express

Amazon Data Lifecycle Manager: Retention policies for Snapshots and AMIs

R5b instance type with higher EBS Performance to consolidate workloads

AWS Compute Optimizer: Recommendations to optimize your volumes

Get the performance and security of running applications on-premises with the simplicity, scalability, and cost-savings of AWS Cloud

Call to action

To learn more about Amazon EBS volumes, visit: https://aws.amazon.com/ebs/

View EBS optimized EC2 instances & select the right fit for your workloads: https://a.co/d9ZJ2L9

Learn how you can drive cost-savings with Amazon EBS sc1 HDD-backed volumes

Additional sessions for Amazon EBS and Snapshots

What's New with Amazon EBS	High performance backup and restore for data on EBS	Powering Amazon EBS: Infrastructure deep dive	Accelerate performance for your business-critical workloads with Amazon EBS

Thank you!

Ashish Palekar

PM EBS, GM Snapshots

@logicalblock

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