

Monitoring EBS



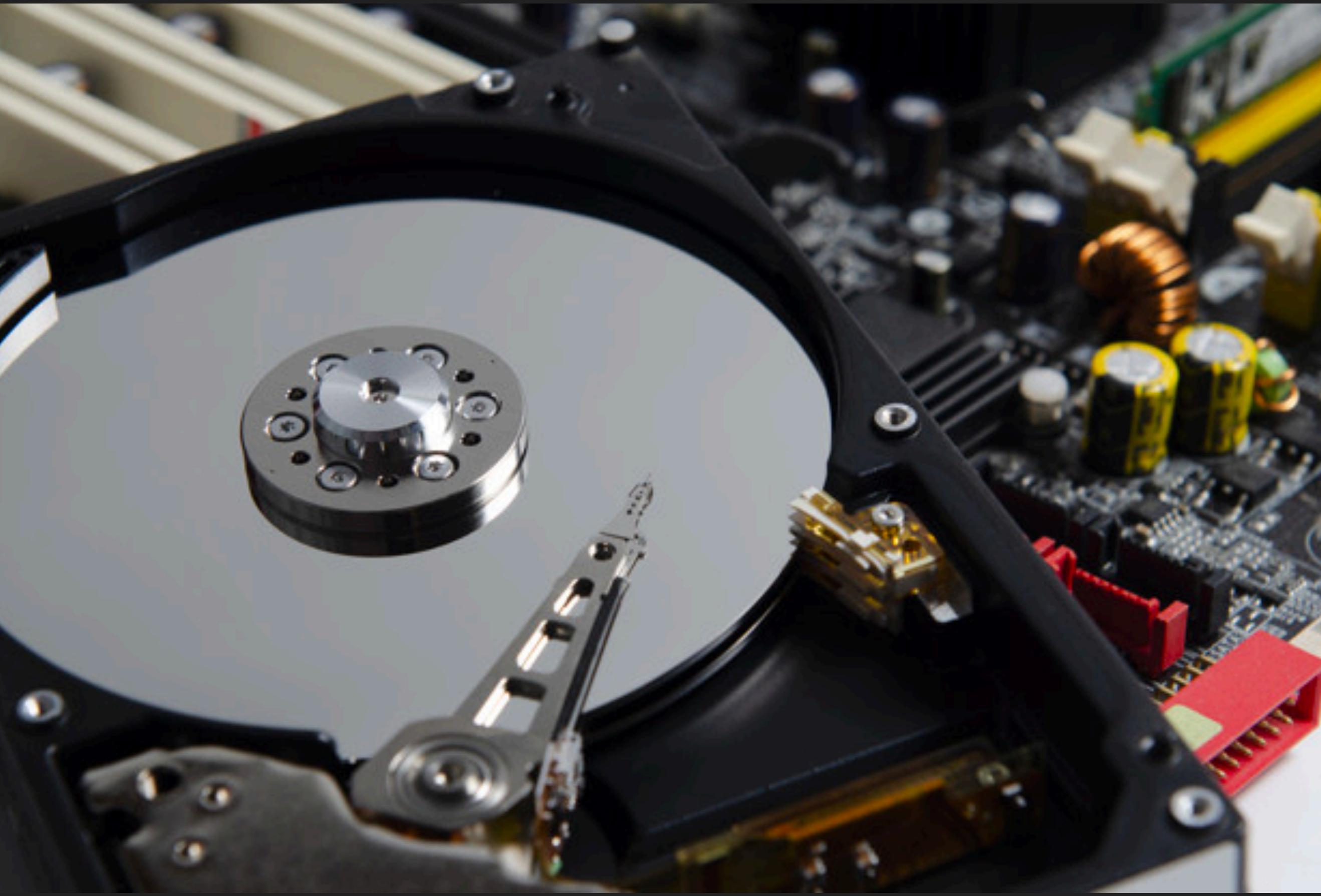
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EBS - Different Volume Types



5 Different Types of EBS Storage;

- General Purpose (SSD)
- Provisioned IOPS (SSD)
- Throughput Optimised Hard Dis
- Cold Hard Disk Drive
- Magnetic





Compare Volume Types

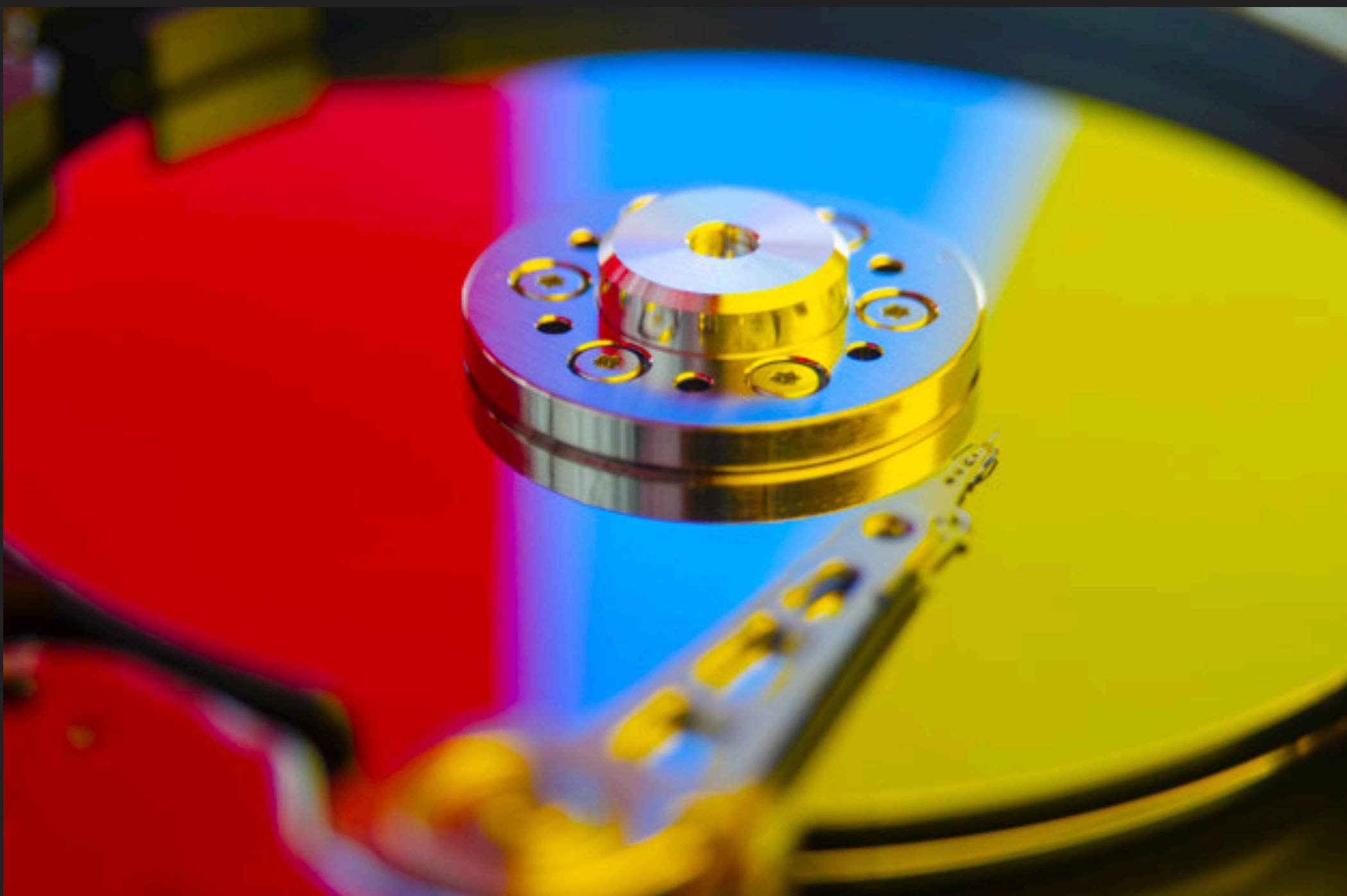
Solid-State Drives (SSD)		Hard disk Drives (HDD)			
Volume Type	General Purpose SSD	Provisioned IOPS SSD	Throughput Optimized HDD	Cold HDD	EBS Magnetic
Description	General purpose SSD volume that balances price and performance for a wide variety of transactional workloads	Highest-performance SSD volume designed for mission-critical applications	Low cost HDD volume designed for frequently accessed, throughput-intensive workloads	Lowest cost HDD volume designed for less frequently accessed workloads	Previous generation HDD
Use Cases	Most Work Loads	Databases	Big Data & Data Warehouses	File Servers	Workloads where data is infrequently accessed
API Name	gp2	io1	st1	sc1	Standard
Volume Size	1 GiB - 16 TiB	4 GiB - 16 TiB	500 GiB - 16 TiB	500 GiB - 16 TiB	1 GiB-1 TiB
Max. IOPS**/ Volume	10,000	20,000	500	250	40-200



IOPS & Volumes

General Purpose SSD volumes have a base of 3 IOPS per/GiB of volume size.

- Maximum Volume Size of 16,384 GiB
- Maximum IOPS Size of 10,000 IOPS Total (after that you need to move to provisioned IOPS)





IOPS & Volumes Examples

Say we have a 1 GiB Volume. We get 3 IOPS per Gb so we have $3 \times$

$1 = 3 \text{ IOPS.}$

- We can burst performance on this volume up to 3000 IOPS if we want.
- Using I/O Credits.



2997 IOPS (ie 3000)





IOPS & Volumes Examples

Say we have a 100 GiB Volume. We get 3 IOPS per Gb so we have 3

$$\times 100 = 300 \text{ IOPS.}$$

- We can burst performance on this volume up to 3000 IOPS if we want.
- Using I/O Credits.



2700 IOPS (ie 3000



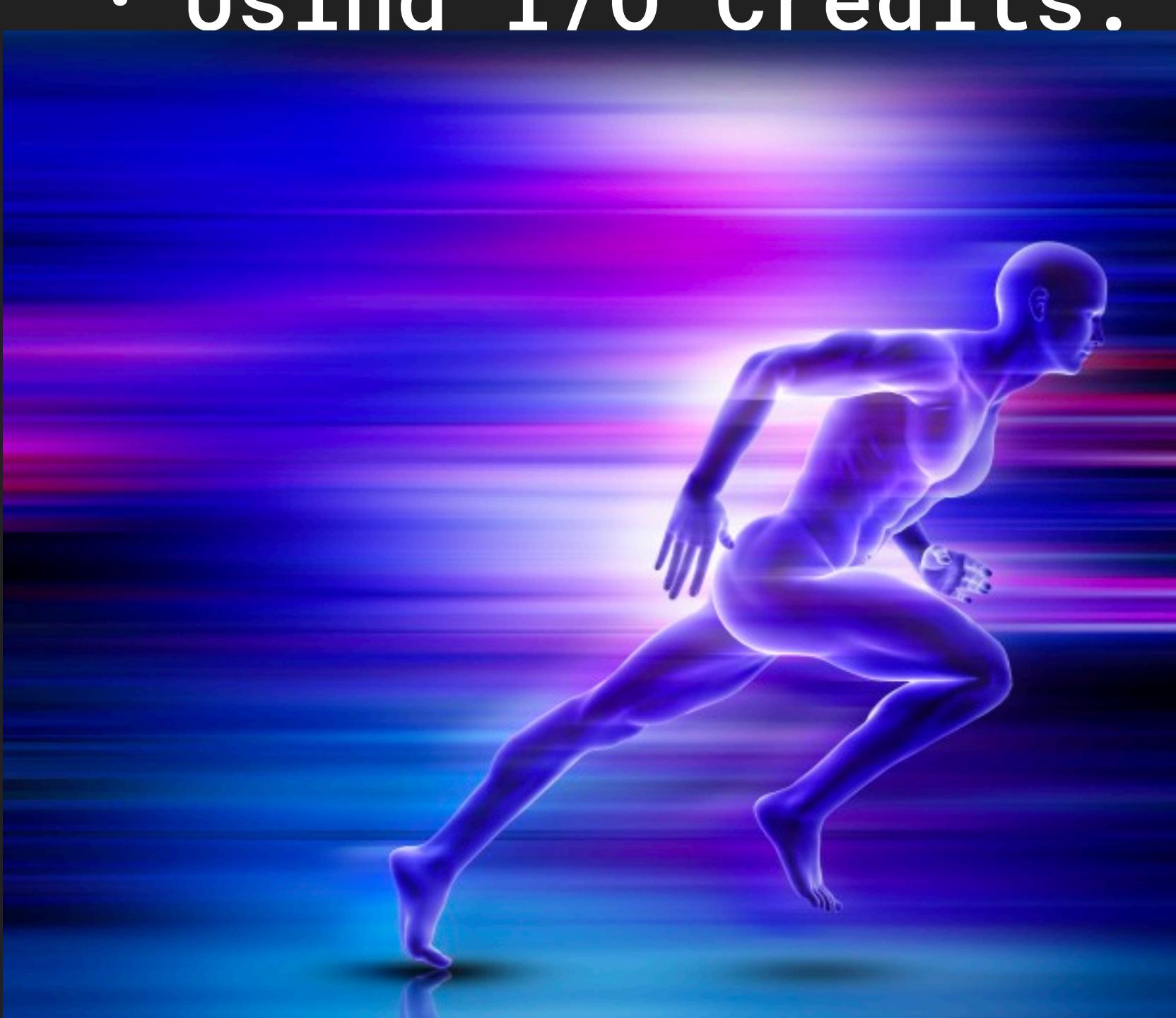


IOPS & Volumes Examples

Say we have a 500 GiB Volume. We get 3 IOPS per Gb so we have 3

$$\times 500 = 1500 \text{ IOPS.}$$

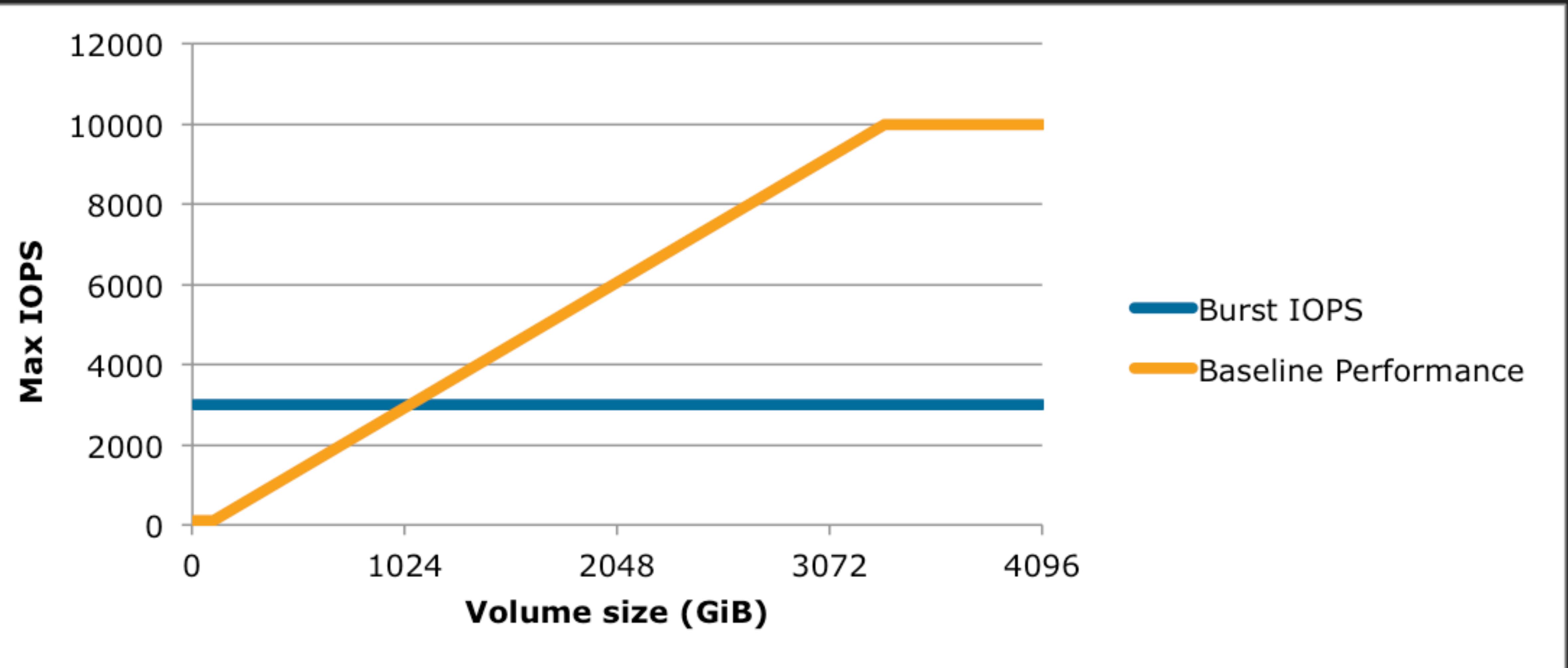
- We can burst performance on this volume up to 3000 IOPS if we want.
- Using I/O Credits.



1500 IOPS (ie 3000



IOPS & Volumes Example



If the provisioned I/O credits required by the volume exceeds the baseline performance I/O level, it simply uses I/O credits in the credit balance to burst to the required performance level, up to a maximum of 3,000 IOPS.

- Each volume receives an initial I/O credit balance of 5,400,000 I/O credits.
- This is enough to sustain the maximum burst performance of 3,000 IOPS for 30 minutes.
- When you are not going over your provisioned I/O (bursts) you will be earning credits.





I/O Credits

<http://docs.aws.amazon.com/AWSEC2/latest/UserGuide/EBSVolumeTypes.html>

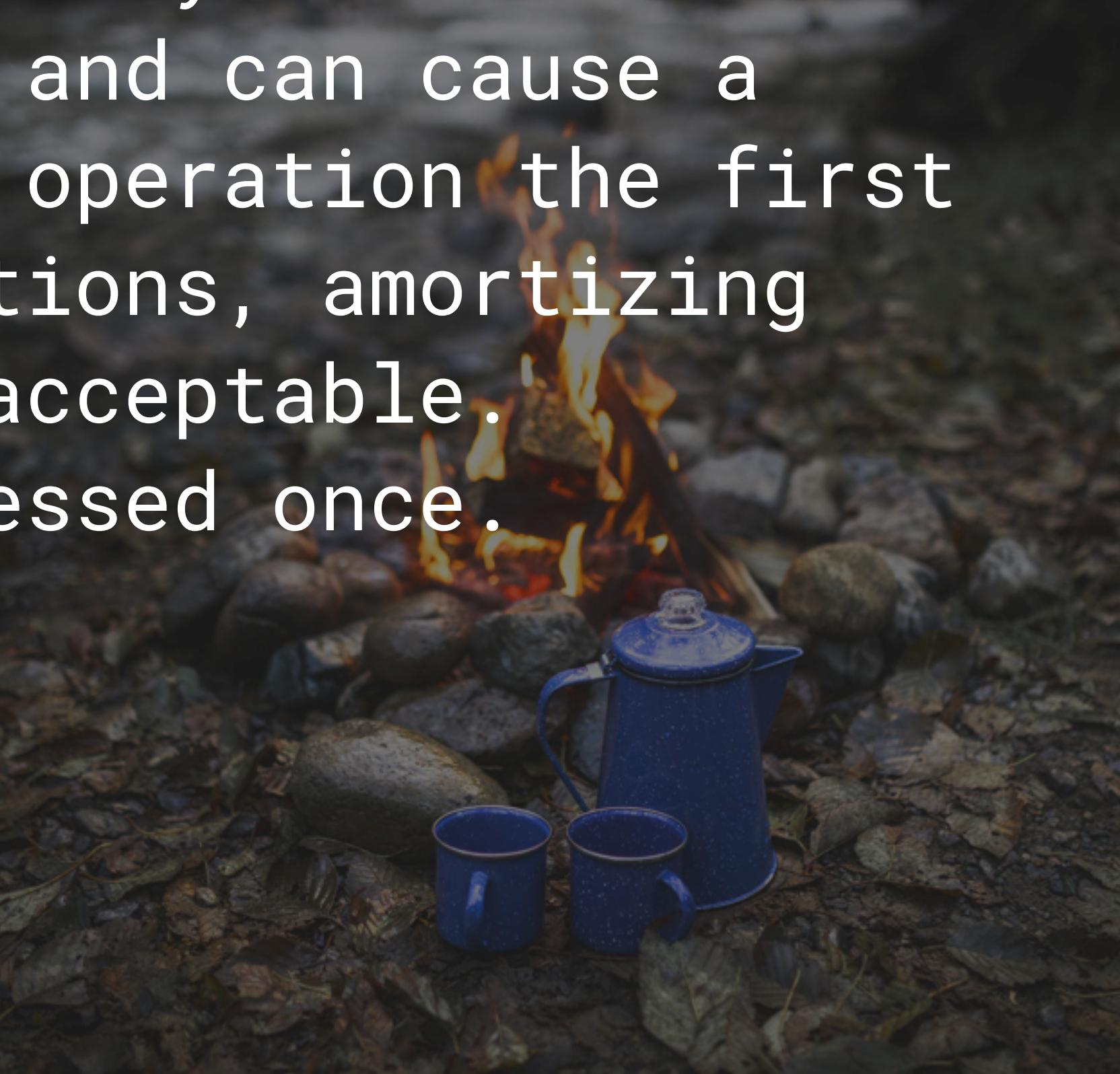
Volume size (GiB)	Baseline performance (IOPS)	Maximum burst duration @ 3,000 IOPS (seconds)	Seconds to fill empty credit balance
1	100	1862	54,000
100	300	2,000	18,000
214 (Min. size for max. throughput)	642	2,290	8,412
250	750	2,400	7,200
500	1,500	3,600	3,600
750	2,250	7,200	2,400
1,000	3,000	N/A*	N/A*
3,334 (Min. size for max. IOPS)	10,000	N/A*	N/A*
16,384 (16 TiB, max. volume size)	10,000	N/A*	N/A*

Exam tip.

It is beyond the scope of the SysOps Associate Exam to be able to calculate this.

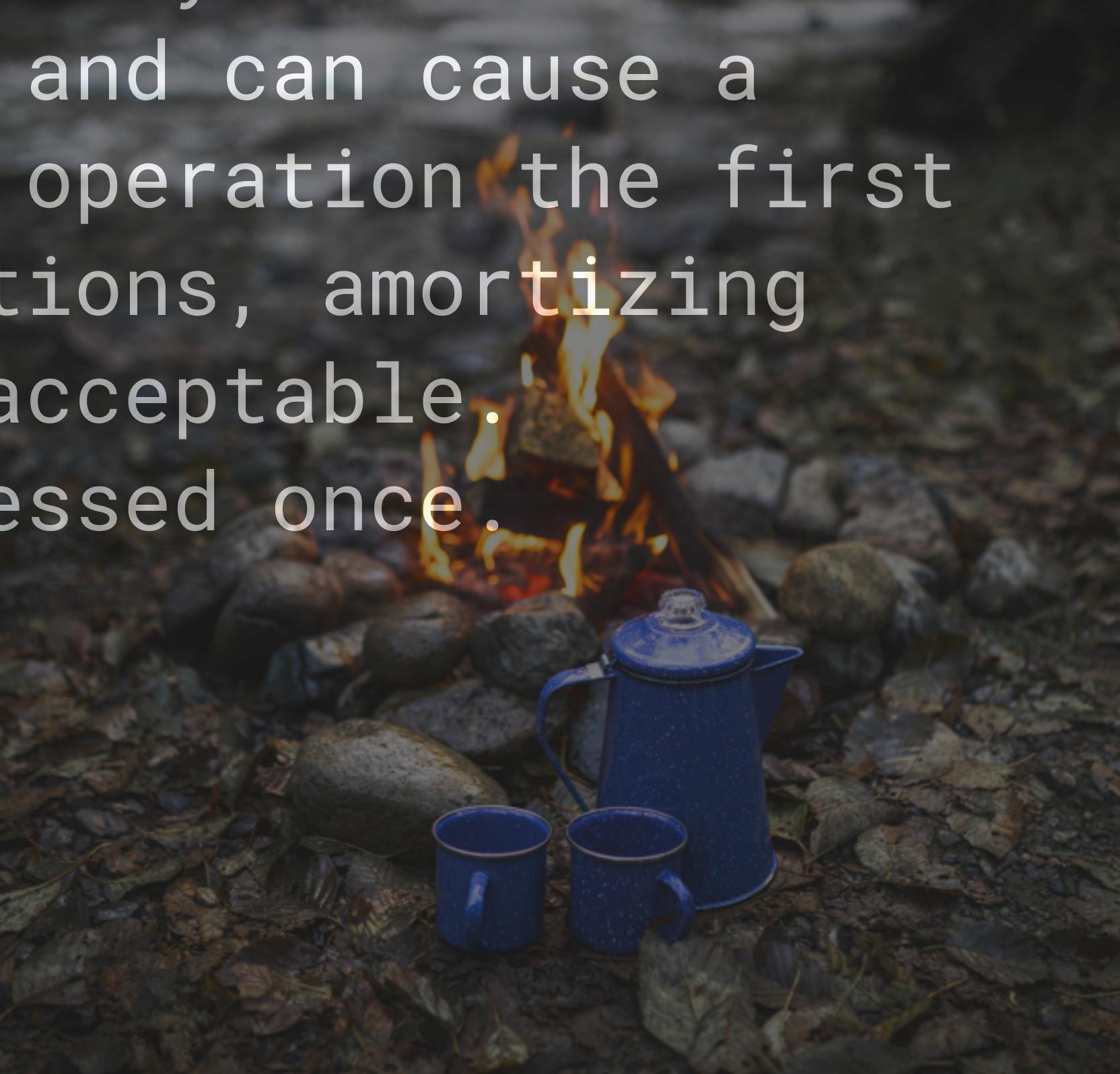
Pre-Warming EBS Volumes

New EBS volumes receive their maximum performance the moment that they are available and do not require initialization (formerly known as pre-warming). However, storage blocks on volumes that were restored from snapshots must be initialized (pulled down from Amazon S3 and written to the volume) before you can access the block. This preliminary action takes time and can cause a significant increase in the latency of an I/O operation the first time each block is accessed. For most applications, amortizing this cost over the lifetime of the volume is acceptable. Performance is restored after the data is accessed once.



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Pre-Warming EBS Volumes



<https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/ebs-initialize.html>





EBS CloudWatch Metrics

Metric	Description
VolumeReadBytes VolumeWriteBytes	<p>Provides information on the I/O operations in a specified period of time. The <code>Sum</code> statistic reports the total number of bytes transferred during the period. The <code>Average</code> statistic reports the average size of each I/O operation during the period. The <code>SampleCount</code> statistic reports the total number of I/O operations during the period. The <code>Minimum</code> and <code>Maximum</code> statistics are not relevant for this metric. Data is only reported to Amazon CloudWatch when the volume is active. If the volume is idle, no data is reported to Amazon CloudWatch.</p> <p>Units: Bytes</p>
VolumeReadOps VolumeWriteOps	<p>The total number of I/O operations in a specified period of time.</p> <p>Note</p> <p>To calculate the average I/O operations per second (IOPS) for the period, divide the total operations in the period by the number of seconds in that period.</p> <p>Units: Count</p>
VolumeTotalReadTime VolumeTotalWriteTime	<p>The total number of seconds spent by all operations that completed in a specified period of time. If multiple requests are submitted at the same time, this total could be greater than the length of the period. For example, for a period of 5 minutes (300 seconds): if 700 operations completed during that period, and each operation took 1 second, the value would be 700 seconds.</p> <p>Units: Seconds</p>
VolumeIdleTime	<p>The total number of seconds in a specified period of time when no read or write operations were submitted.</p> <p>Units: Seconds</p>



EBS CloudWatch Metrics

VolumeQueueLength	<p>The number of read and write operation requests waiting to be completed in a specified period of time.</p> <p>Units: Count</p>
VolumeThroughputPercentage	<p>Used with Provisioned IOPS (SSD) volumes only. The percentage of I/O operations per second (IOPS) delivered of the total IOPS provisioned for an Amazon EBS volume. Provisioned IOPS (SSD) volumes deliver within 10 percent of the provisioned IOPS performance 99.9 percent of the time over a given year.</p> <p>Note</p> <p>During a write, if there are no other pending I/O requests in a minute, the metric value will be 100 percent. Also, a volume's I/O performance may become degraded temporarily due to an action you have taken (e.g., creating a snapshot of a volume during peak usage, running the volume on a non-EBS-optimized instance, accessing data on the volume for the first time).</p> <p>Units: Percent</p>
VolumeConsumedReadWriteOps	<p>Used with Provisioned IOPS (SSD) volumes only. The total amount of read and write operations (normalized to 256K capacity units) consumed in a specified period of time.</p> <p>I/O operations that are smaller than 256K each count as 1 consumed IOPS. I/O operations that are larger than 256K are counted in 256K capacity units. For example, a 1024K I/O would count as 4 consumed IOPS.</p> <p>Units: Count</p>

<http://docs.aws.amazon.com/AWSEC2/latest/UserGuide/monitoring-volume-status.html>



Volume Status Checks

Volume Status	I/O Enabled Status	I/O Performance Status (only available for Provisioned IOPS volumes)
ok	Enabled (I/O Enabled or I/O Auto-Enabled)	Normal (Volume performance is as expected)
warning	Enabled (I/O Enabled or I/O Auto-Enabled)	Degraded (Volume performance is below expectations) Severely Degraded (Volume performance is well below expectations)
impaired	Enabled (I/O Enabled or I/O Auto-Enabled)	Stalled (Volume performance is severely impacted)
	Disabled (Volume is offline and pending recovery, or is waiting for the user to enable I/O)	Not Available (Unable to determine I/O performance because I/O is disabled)
insufficient-data	Enabled (I/O Enabled or I/O Auto-Enabled) Insufficient Data	Insufficient Data

Exam Tip:

Know that Degraded or Severely Degraded = Warning

Stalled or Not Available = Impaired



EBS - Different Volume Types

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EBS Exam Tips



Key IOPS Metrics - You can burst up to 3000 IOPS. If you need more than 3000 but less than 10,000 just increase the volume size. Anything over 10,000 will be limited by baseline performance.

