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Doubling Performance in Amazon Web Services Cloud Using InfoScale Enterprise

Veritas InfoScale™ Enterprise 7.3

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Summary

Veritas InfoScale™ Enterprise comprises the Veritas InfoScale™ Storage and Veritas InfoScale™ Availability components, among others, which let you manage storage and clustering for your data centers.

- InfoScale Storage 7.3 delivered 1,65,000 Oracle transactions per minute (TPM).
- InfoScale Storage with SmartIO read caching enabled delivered 3,52,000 Oracle TPM, thereby demonstrating more than double the performance improvement.

Overview

Enterprises are moving their workloads into cloud environments as they offer agility, infrastructure cost reduction, and ease of manageability. AWS is a leading cloud service provider. AWS provides a range of servers as Elastic Compute Cloud (Amazon EC2) nodes and a range of storage devices as Elastic Block Store (Amazon EBS) volumes. However, the performance limitation of EBS volumes (10K per gp2 volume and 20K per io1 volume) limits the maximum IOPS that an application can deliver.

Even by striping (RAID-0) of multiple EBS volumes, applications cannot achieve more than 65K IOPS per EC2 instance, because AWS enforces a limit on the maximum IOPS EC2 instance. Also, even though Amazon EC2 Instance Store volumes (locally connected SSDs) provide higher IOPS, they are ephemeral in nature and so cannot be used for persistent storage.

As these issues are critical to larger enterprises, they have been reluctant to adopt the AWS platform. The SmartIO feature of InfoScale Storage addresses these concerns by enabling data efficiency on SSDs through I/O caching.

InfoScale Storage

The SmartIO feature of InfoScale Storage enables data efficiency on your SSDs through I/O caching. Using SmartIO to improve efficiency, you can optimize the cost per IOPS. In AWS, SSD Instance Store volumes can be well utilized for configuring SmartIO caching. SmartIO can be setup with the read cache configured on the SSD Instance Store volumes and the application data residing on EBS volumes. Read I/Os can be served from the cache on high-performant Instance Store volumes, which benefit read-intensive applications.

Configuration

I3.8xlarge instances and 7 gp2 EBS volumes of 3.3 TB attached to each EC2 instance. The maximum budget for this configuration was 70K IOPS. Of the 7 gp2 volumes, 6 volumes were used to form a striped layout.

Table 1: AWS configuration

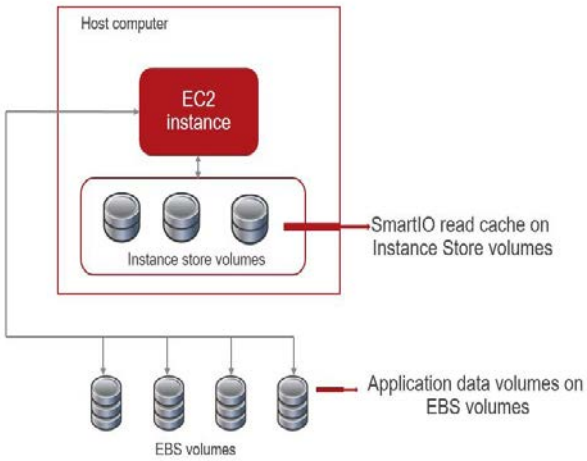
Instances	I3.8xlarge: 2 instances RAM: 244 GB CPU: 32 core
Network	10 Gbps dedicated
Storage	7 gp2 volumes of 3.3 TB each 4 non-volatile memory express (NVMe) SSD instance store volumes of 1.9 TB
Storage tuning	EBS-optimized storage used to separate storage and network traffic

Table 2: Veritas InfoScale storage configuration

InfoScale Enterprise	Version 7.3
Nodes	1
Application data volume	2 TB RAID-0 across 6 gp2 volumes
SmartIO	Read cache configured on 4-way striped instance store volumes

Striping provided increased performance. The remaining gp2 volume was used for the Oracle redo log.

Figure 1: Configuration for InfoScale Storage SmartIO in AWS



Workload

The benchmarking of InfoScale Storage on AWS was tested with a large Oracle database. The online transaction processing (OLTP) workload was generated on the Oracle 12c database with the Transaction Processing Committee's (TPC) benchmark C (TPC-C) in its unaudited form.

Table 3: Oracle database configuration

Oracle database version	12c
Database size	1.5 TB
Oracle System Global Area (SGA) size	32 GB
Database redo log size	100 GB
Database tuning	Hard and soft limits for Oracle users: soft_nproc=4096, hard_nproc=16384 soft_nofile=65536, hard_nofile=65536 soft_stack=10240, hard_stack=32768

The benchmark simulates a wholesale supply company that comprises multiple regional warehouses, which supply 10 sales districts per warehouse. Each district serves 3,000 customers. Each warehouse stocks 1,00,000 items that are sold by the company.

The company's OLTP application performs a set of read-only, update, insert, and delete transactions to process customer orders, payments, and delivery of goods. The TPC-C database consist of 9 tables with a logical entity-relationship defined between the tables.

Table 4: Benchmark and workload details

Benchmark	TPC-C-like OLTP benchmark
Random Read:Write ratio	70:30 percentage ratio
Oracle SGA	32 GB
Users	200
Number of Warehouses	5000
Database size	1.5 TB

While the steady-state transaction load was run, the performance was measured in TPM delivered by the configuration.

Oracle 12c was used to create a database of 1.5 TB with 5000 warehouses. The Oracle SGA size was set to 32 GB. The workload was generated using 200 users.

Results

The performance of InfoScale Enterprise with the OLTP workload on the Oracle database was measured by TPM) delivered by the configuration. System resource metrics such as the CPU usage and storage IOPS were also measured.

Table 5: Database performance with and without SmartIO read caching

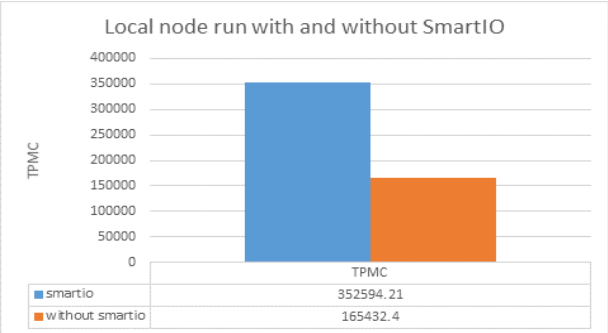
	SGA	Users	TPM	IOPS	CPU
With SmartIO	32 GB	200	352 K	128 K	65%
Without SmartIO	32 GB	200	165 K	63 K	13%

Performance with and without SmartIO read caching

The benchmark results show that InfoScale Storage with the SmartIO read caching feature delivered 3,52,000 OLTP TPM on a large Oracle database with an I3.8xlarge instance and 7 gp2 volumes. The CPU usage was 65% and the SGA size was 32 GB, which means that the remaining CPU and memory was spared for other application processing. The total IOPS delivered was 128 K, which was more than double the performance compared to the configuration without the SmartIO read caching feature.

The key takeaway from this test is that when the SmartIO cache is configured on SSD Instance Store volumes and the application data is stored on EBS volumes, it can provide significantly large numbers of IOPS or throughput, which cannot be achieved using EBS volumes alone. This can help applications get the required performance, which exceeds the per-instance maximum limit of 65 K IOPS with EBS volumes.

Figure 2: Database performance with and without SmartIO read caching



References

You can find more information about InfoScale Enterprise at:

- Veritas InfoScale Enterprise
- Enabling application and database availability

About Veritas Technologies LLC

Veritas Technologies LLC enables organizations to harness the power of their information, with solutions designed to serve the world's largest and most complex heterogeneous environments. Veritas works with 86 percent of Fortune 500 companies today, improving data availability and revealing insights to drive competitive advantage.

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