142,214 operations per second

Process a large number of transactions

1.64ms average read latency

Drive productivity

95 TB of storage in just 3U

Maximize storage density

Support high-performance business applications with a powerful Dell EMC, Nutanix, and Toshiba solution

A Dell EMC XC Series cluster featuring Nutanix software and powered by Toshiba PX05S SAS SSDs delivered strong database performance with a blend of structured and unstructured data

The document-based MongoDB, one of the most popular database engines available,[1] allows developers to create dynamic, responsive enterprise applications and bring together structured and unstructured data. To work at optimal levels, MongoDB projects require a solution with copious storage and fast processing.

Toshiba, Nutanix,® and Dell EMC™ offer such a solution, supporting high usage environments while minimizing wait times. Short wait times keep users from getting distracted or frustrated and increase the likelihood of repeat usage, making your initiative more successful. In addition, a Toshiba, Nutanix, and Dell EMC solution offers high storage density that not only supports massive datastores but keeps datacenter sprawl in check as well.

In the Principled Technologies datacenter, we configured a Dell EMC XC Series cluster, featuring Nutanix software paired with VMware vSphere® ESXi™ as the hypervisor, with Toshiba PX05S SAS SSDs and ran a heavy workload against a MongoDB database. The solution delivered high performance, which can mean a smooth and quick experience with your app, whether viewing search results, finding a tagged photo, or doing a host of other operations.

Make your great app idea a success with Toshiba, Nutanix, and Dell EMC

NoSQL databases, such as MongoDB, power data-driven apps that can effectively process and store disparate datasets regardless of structure, format, or source. This capability enables users to conduct comprehensive searches of the data, analyze patterns, and formulate actionable recommendations.

Imagine you and your organization are close to realizing a bold new MongoDB app. It could modernize your business with more personalized recommendations for users, increased customer loyalty, and a stronger bottom line. If you develop apps for a national realty company for instance, you could get buyers real-time listings that meet environmental criteria. If you work for a municipal government, you may figure out how to get trash trucks from constantly being stuck behind buses. If your employer is a national conglomerate, you can bring together data from multiple divisions of the company.

What infrastructure do you need to turn your idea into a successful app? The answer may be a Toshiba SAS SSDs, Nutanix, and Dell EMC solution in your datacenter.

About the Dell EMC XC Series cluster

Part of the Dell EMC XC Series line, the XC640-10 we tested is a hyperconverged appliance built on the latest 14th generation PowerEdge servers and Nutanix software. According to Dell EMC, XC Series clusters "consolidate compute and storage into a single platform, enabling application and virtualization teams to quickly and simply deploy new workloads. This solution enables datacenter capacity and performance to be easily expanded—one node at a time—delivering linear and predictable scale-out expansion with pay-as-you-grow flexibility."[2] A Dell EMC XC Series cluster supports several hypervisors: Microsoft Windows® Server with Hyper-V®, Nutanix AHV, and VMware vSphere ESXi. Our study used VMware vSphere ESXi as the hypervisor.

By leveraging Nutanix software and VMware vSphere ESXi, the XC Series cluster can utilize the capacity of the Toshiba SAS SSDs of each node. The clusters run the Nutanix Acropolis operating system "in a Controller VM on each node, aggregating storage resources (hard disk drives and flash storage) across all nodes,"[3] which allowed all hosts in our testing to access pooled storage from the Toshiba SSDs. The XC Series clusters also use the Nutanix Prism Central management framework, and admins can use the Prism interface to do the following:

- Manage and monitor hardware, hypervisors, and MongoDB VM layers from a single control pane
- Create new or dev/test MongoDB environments using VM cloning and snapshotting

Handle peak loads of app activity

We set up a Dell EMC XC Series cluster featuring Toshiba SAS SSDs with Nutanix software to pool the storage together. Using Yahoo! Cloud Serving Benchmark (see page 4 for more information), we stressed the MongoDB database with a read-heavy workload of 95 percent reads and 5 percent writes. The Toshiba, Dell EMC, and Nutanix solution delivered 142,214 operations per second with an average CPU utilization of 65 percent. We ran the tests without tuning the Nutanix software.

142,214 operations per second

Process a large number of transactions
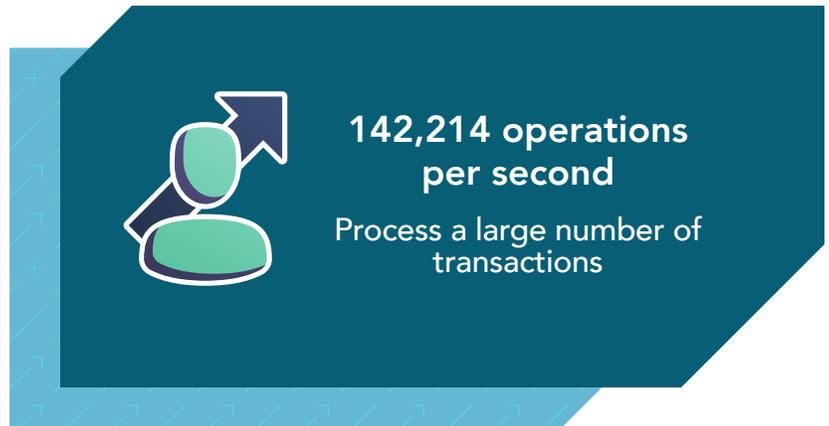
These results show the solution is well suited for running a read-heavy MongoDB workload with sufficient horsepower to scale and support more demanding workloads. Read-heavy workloads include online travel searches or social media photo tagging, where there is only a small amount of write activity. Using this solution, you can serve more concurrent users with a large storage capacity to handle growth. In addition, with Toshiba's PX05SR higher capacity models, administrators can maximize system level storage density. This can enable greater utilization of the storage systems and lower capital expenditures (CapEx) and operational expenditures (OpEx).

More about MongoDB

MongoDB is a document-based database that uses a distributed approach for storing data. According to MongoDB, the database "stores data in flexible, JSON-like documents, meaning fields can vary from document to document and data structure can be changed over time."[4] Fast Toshiba PX05S SAS SSDs can help MongoDB databases operate at high levels of performance.

Toshiba PX05S SAS SSDs

The 12Gbit/s SAS SSD offers up to 3.84 TB of storage and 270K input/output operations per second (IOPS) random read performance.[5] In our testing, we configured each of the Dell EMC XC640-10 appliances with ten Toshiba PX05SRB384Y SAS SSDs.

Enable user efficiency with minimal wait times

The old adage "time is money" still rings true, especially for online sales and e-commerce sites. The North American retail chain Nordstrom once "saw online sales fall 11 percent when its website response time slowed by just half a second."[6] In our testing, the average latency for the Toshiba, Nutanix, and Dell EMC solution remained under two milliseconds: the total average read latency was 1.64ms and the average write latency was 1.40ms.

1.64ms average read latency

Drive productivity

When the storage delivers such low latencies, it's more likely MongoDB app users won't experience noticeable wait times for an app. The faster apps respond to users, the better their experience with your product and the more likely they might be to turn into a returning customer. The accompanying Science report summarizes the results from our hands-on YCSB testing.

Maximize storage density

The XC Series cluster we tested held ten 3.84TB Toshiba SAS SSDs, for a total of 31.76 TB of available storage in a 1U chassis. Our test environment used three appliances with a total of 95.29 TB within a 3U configuration available for the MongoDB database. When you can pack that much storage into such a minimal amount of rack space, you're decreasing the need to add racks or consume more physical floor space and potentially decreasing CapEx and OpEx.

About the Yahoo! Cloud Serving Benchmark

According to Yahoo!, "the goal of the Yahoo Cloud Serving Benchmark (YCSB) project is to develop a framework and common set of workloads for evaluating the performance of different 'key-value' and 'cloud' serving stores."[7]

Although the benchmark focuses on Apache HBase and Cassandra, which are both NoSQL databases that are designed to handle large datasets, it also includes support for MongoDB. Alternatively, according to YCSB, you can "write a new interface layer to benchmark your favorite database."Output from the benchmark can give an indication of overall system performance. To learn more about YCSB, visit https://research.yahoo.com/news/yahoo-cloud-serving-benchmark.
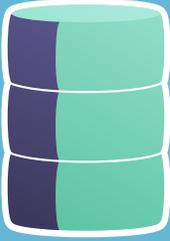
Conclusion

If you're considering MongoDB to power your next great idea, a Toshiba, Nutanix, and Dell EMC solution can handle it. When our solution ran a read-heavy workload against a MongoDB database in our datacenter, it processed a large number of transactions, supporting more than 142,000 operations per second, with the ability to drive productivity by delivering an average read latency of 1.64ms and an average write latency of 1.40ms. The solution achieved these results while keeping the average CPU utilization at 65 percent, which shows that the solutions could potentially handle more work and maximize storage density. You could use this performance to deliver the personalization and speed you need to keep the attention of your current app customers and win new ones.

To find out more about the Dell EMC and Toshiba partnership, visit http://www.dell.com/toshiba and https://storage.toshiba.com/dell

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1   "DB-Engines Ranking," accessed March 27, 2018, https://db-engines.com/en/ranking

2   "Dell EMC XC Series of Hyper-converged Infrastructure Appliances," accessed April 6, 2018, https://www.emc.com/collateral/specification-sheet/xc-series-data-sheet.pdf

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4   "What is MongoDB?," accessed April 6, 2018, https://www.mongodb.com/what-is-mongodb

5   "Enterprise SSD," accessed April 6, 2018, https://business.toshiba-memory.com/en-us/product/storage-products/enterprise-ssd/px05srbxxx.html

6   "How long will you wait for a shopping website to load?," accessed April 6, 2018, http://www.bbc.com/news/business-37100091

7   "Yahoo Cloud Serving Benchmark," accessed April 4, 2018, https://research.yahoo.com/news/yahoo-cloud-serving-benchmark

Read the science behind this report at http://facts.pt/7wwemp ▶

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