



Technical Report

# Sybase Adaptive Server Enterprise Version 15.7 on NetApp EF540 Flash Array and FAS Storage

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## Executive Summary

This technical report discusses the use of Sybase<sup>®</sup> ASE on NetApp<sup>®</sup> storage arrays utilizing a hybrid solution approach. This architecture provides the superior performance and storage efficiency that customers have come to expect from NetApp by using a combination of NetApp EF540 Flash Array and FAS storage.

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# 1 Introduction

The NetApp hybrid solution for Sybase Adaptive Server Enterprise version 15.7 (hereafter called ASE) is intended primarily for customers with a demand for low-latency and high-bandwidth requirements. The solution comes with two types of NetApp storage arrays:

- Flash array, to drive ultrahigh-application performance
- Nonflash array, to provide exceptional manageability and storage efficiency

The solution includes main hardware components.

- NetApp EF540 Flash Array
- NetApp FAS storage array
- Sybase Replication Server (Rep Server)

## 1.1 NetApp EF540 Flash Array

NetApp EF540 Flash Array delivers superior reliability and performance for mission-critical enterprises running applications with high IOPS requirements, especially those enterprises in the financial industry. The EF540 Flash Array, available with either 9.6TB or 19.2TB of raw solid-state-drive (SSD) storage, provides performance capacity to meet the requirements of the most demanding organizations.

### NetApp EF540 Volume Group

The volume group is the top-level unit of storage in the storage array. When a storage array is deployed, the volume group is provisioned based on the following considerations.

- The volume group must have sufficient usable space for the data to be hosted
- The number of disks required to meet performance requirements
- The desired level of RAID protection to meet specific business requirements

### NetApp EF540 Volume

A volume is a logical storage entity created for a host to access disks on the storage array. A volume is created from the capacity available on a volume group. Although a volume might include more than one drive, a volume appears to the host as one logical entity. The volume is presented to the host as disk capacity in the form of a LUN.

### NetApp FAS Array

The NetApp Data ONTAP<sup>®</sup> 8 architecture offers a storage-OS platform to help address the challenges of growing and dynamic businesses. NetApp's storage efficiency features help IT easily define end-to-end data protection strategies. The unified storage architecture is one of the key design features in the NetApp FAS array that helps businesses consolidate IT operations, increase efficiency, and magnify data center savings in terms of power, cooling, and space utilization. NetApp Flash Cache<sup>®</sup> intelligent caching also helps with savings by requiring fewer disk spindles without compromising application performance.

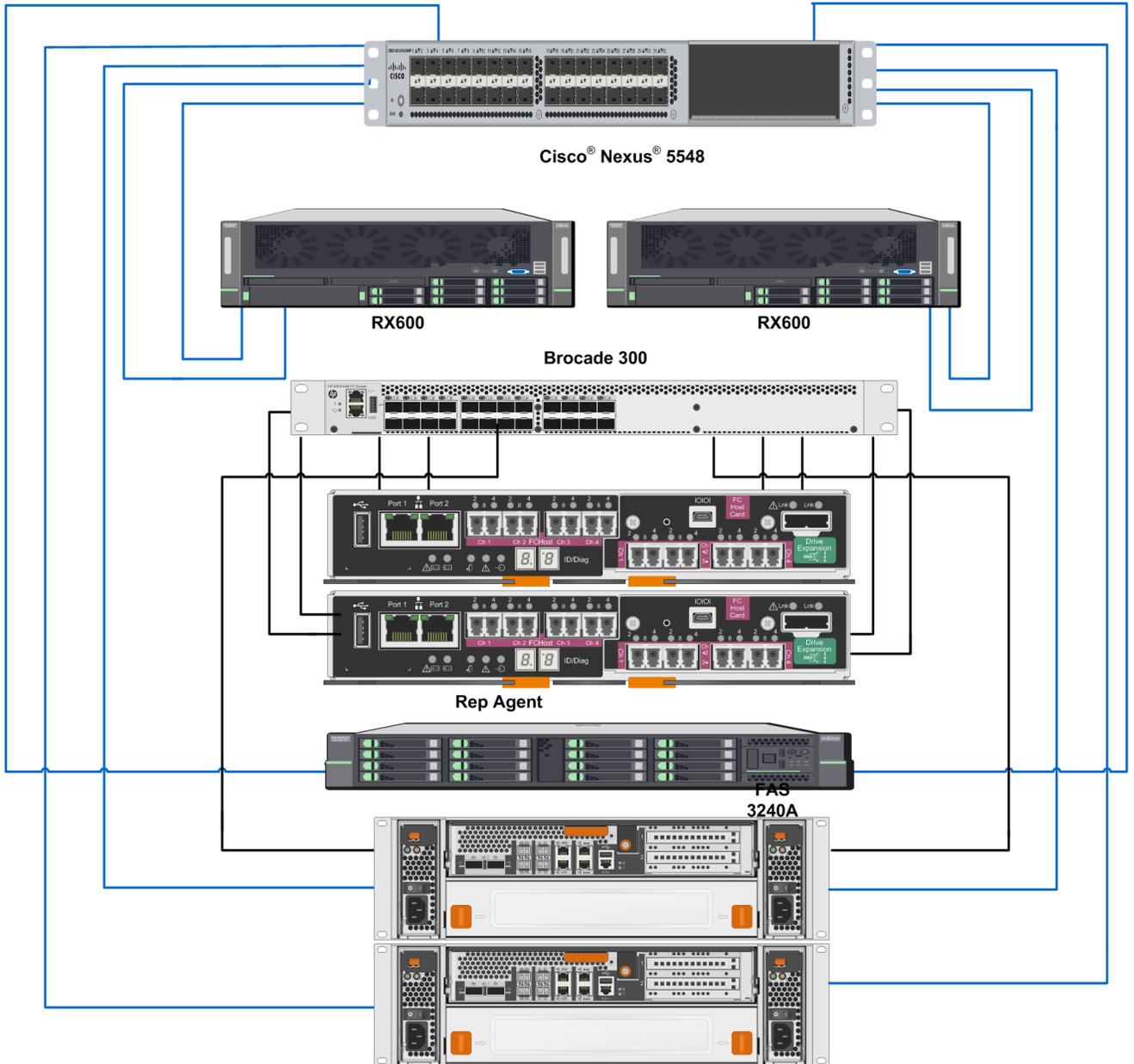
### Sybase Replication Server

Sybase Replication Server (Rep Server) is database replication software that moves and synchronizes data between databases to meet enterprise data protection needs. Sybase Replication Server provides the flexibility to replicate data from any source to any destination by supporting numerous platforms, character sets, and languages. Sybase Replication Server can meet throughput and latency requirements for the most challenging ASE environments.

## 2 Architecture

Figure 1 illustrates the Sybase architecture on NetApp EF540.

Figure 1) Sybase on NetApp EF540.



### 2.1 Hardware Components

- Primary—Fujitsu RX600, 512GB RAM, 2 x 8Gb FC dual port, 4 x 10GbE
- Secondary—Fujitsu RX600, 512GB RAM, 2 x 8Gb FC dual port, 4 x 10GbE
- Cisco® Nexus® 5548UP
- Brocade 300 8Gb fabric switch
- Rep Server—Fujitsu RX300, 32GB RAM, 2 x 10GbE

- NetApp EF540 with 24 SSDs
- FAS3240A storage array, 450GB x 48 drives
- Two Windows Server<sup>®</sup> 2008 for OnCommand<sup>®</sup> Insight systems and Snap Creator<sup>™</sup> Framework

## 2.2 Software Components

- Sybase ASE 15.7
- Sybase Replication Server 15.7
- NetApp OnCommand Insight 2.0
- Data ONTAP 8.1.1 operating in 7-Mode
- NetApp Snap Creator Framework 3.6

## 2.3 Solution Design and Test

The solution uses both the NetApp EF540 and FAS storage. The combined benefit of this hybrid solution brings forth very high performance and extremely low latency with NetApp EF540, in addition to the efficient and flexible backup, restore, and replication capabilities of the NetApp FAS platform. This combination of performance and advanced data protection capabilities meets the key requirements of mission-critical Sybase deployments.

Sybase ASE 15.7 is installed on the primary host server, which is connected to the NetApp EF540 Flash Array. The database layout is explained in section 2.4, “Database Layout.” To demonstrate the performance of the primary database, workload was generated and the results are outlined in section 4, “Workload Testing.”

Sybase Replication Server 15.7 is installed on the Rep Server host and is configured to mirror data changes from the primary system to the secondary system, which is attached to the NetApp FAS storage array. The Rep Server enables the data to be replicated in real time from primary to secondary, which makes the secondary system an ideal candidate for the production standby database in the event of a disaster. Customers also have the option of using the secondary database as a read-only copy. This allows resources on the primary database to be allocated for critical business processes while less mission-critical tasks such as reporting can be performed on the secondary database.

After the data is available on the secondary database, customers have the flexibility to create instantaneous Snapshot<sup>™</sup> based backups and space-saving FlexClone<sup>®</sup> copies of their database for use with development and testing. To support longer retention of backups, a key requirement for financial institutions, data from the secondary system can be replicated to a remote location for long-term retention using NetApp SnapVault<sup>®</sup> technology. Finally, NetApp OnCommand Insight is used to manage the storage arrays and switches that will give a single view to monitor performance.

## 2.4 Database Layout

The ASE database was provisioned on raw devices at the Linux<sup>®</sup> host for both the primary and secondary hosts. The queue\_depth was changed to get the optimal performance for the I/O devices. The tuning parameters that pertain to this paper are outlined in the appendix.

### 2.4.1 Storage Arrays

- EF540—One volume group with 64 volumes (each 30GB)
- FAS3240A—One volume with four data LUNs and one log LUN on each controller

### 2.4.2 Database Servers

- Primary—58 raw devices for data and 6 raw devices for logs
- Secondary—8 raw devices for data and 2 raw devices for logs

### 3 Data Manageability

NetApp Snap Creator Framework is used to manage the backup, recovery, and cloning of the ASE database at the secondary, which is hosted on the NetApp FAS array. The purpose of Snap Creator is to create a central framework that provides seamless integration with the ASE application and NetApp Snapshot technology. The ASE plug-in that comes with Snap Creator Framework handles the application consistency in Snap Creator during a Snapshot operation at the NetApp FAS array. Snap Creator communicates with NetApp storage and performs various tasks that include policy-based Snapshot management and integration with other NetApp products, especially SnapMirror® and SnapVault technologies.

### 4 Workload Testing

An online transaction processing (OLTP) workload was used for all tests. This workload simulated 100–1,000 users interacting with 4,000 product warehouses in an order-processing application. The client processes for the OLTP application were executed on the same server as the Sybase database server. The number of transactions completed per minute (TPM) was the primary metric used to measure application throughput. The I/O characteristic of the workload was small random reads. The database created for the OLTP workload uses a data model designed for order-entry transaction processing and is approximately 850GB in size. Figure 2 shows the transactions during the workload. A maximum of 584K TPM was achieved with 1,000 users.

Figure 2 illustrates the Sybase workload on NetApp EF540.

Figure 2) Sybase workload on NetApp EF540.

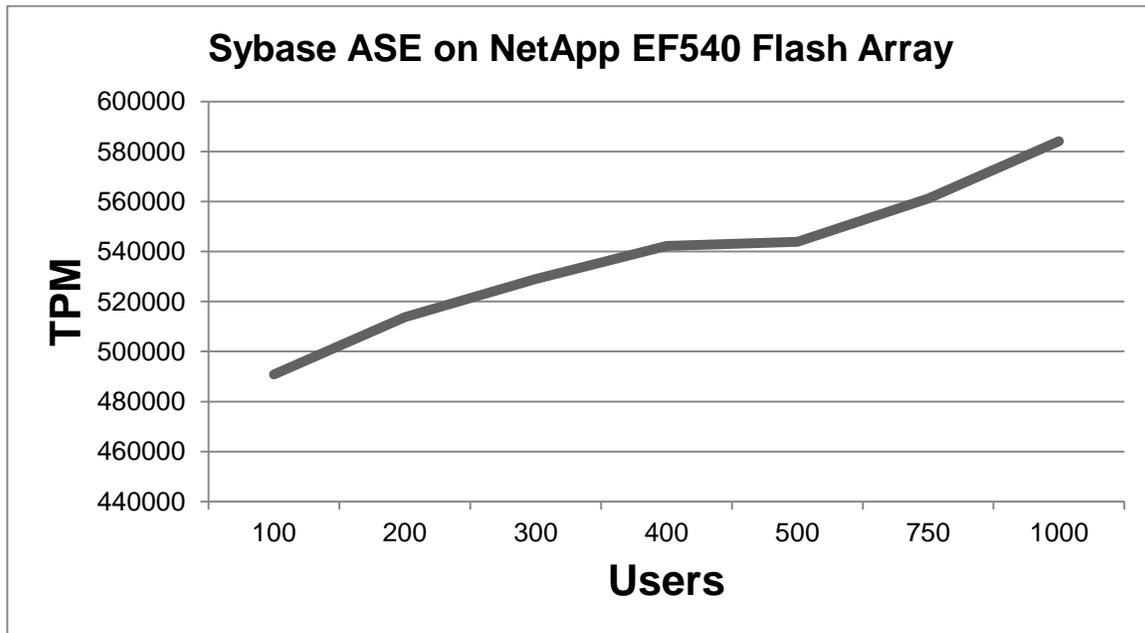


Figure 3 and Figure 4 show the latency and throughput that were recorded during the raw I/O tests on the primary database system, which was configured on the NetApp EF540 Flash Array. The tests conclude that the NetApp EF540 Flash Array can handle high data volume under low latency, which would be the key requirement for some of the applications that are available in the field.

Figure 3 illustrates the IOPS and latency with 4k random reads.

Figure 3) IOPS and latency with 4k random reads.

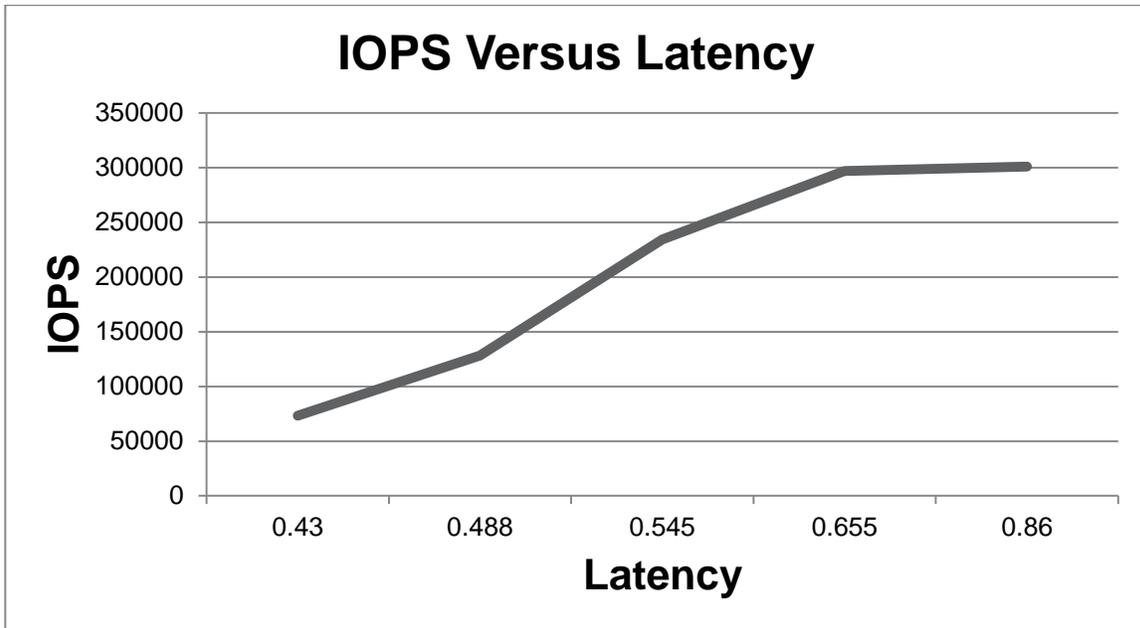
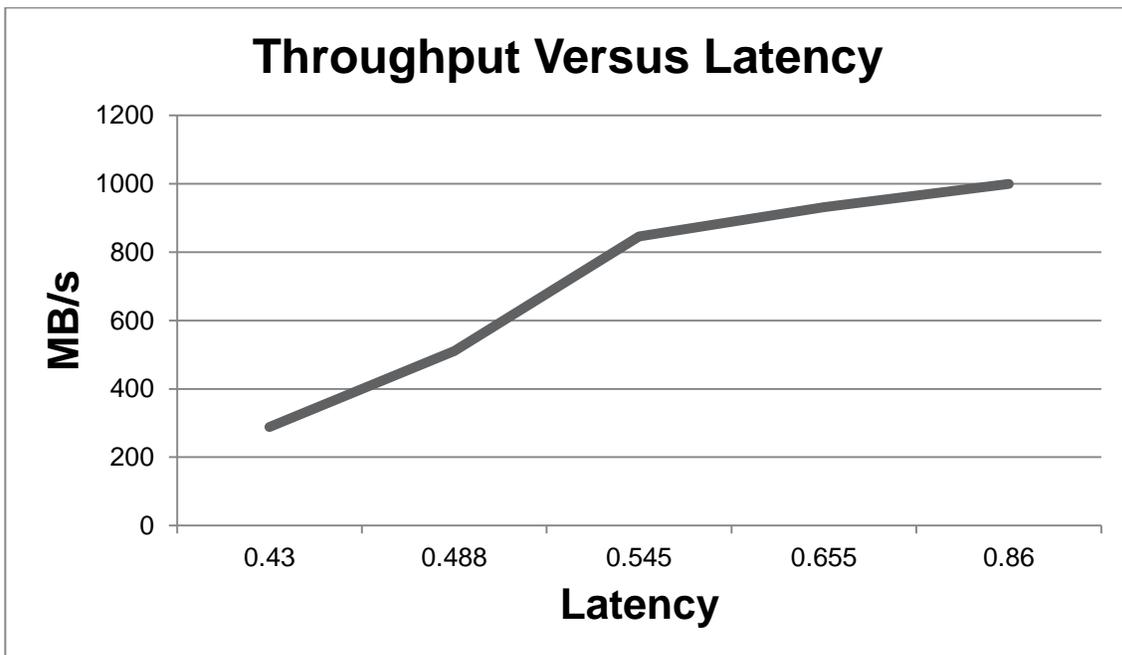


Figure 4 illustrates the throughput and latency with 4k random reads.

Figure 4) Throughput and latency with 4k random reads.



## 5 Conclusion

This hybrid solution is designed for customers who have demanding random I/O workloads with low latency requirements. The Snapshot features integrated into the solution enable customers to perform faster backup and recovery operations to meet strict SLAs. When regulatory requirements include longer

retention of backups or even permanent archival, customers can leverage NetApp SnapVault. Finally, NetApp OnCommand Insight and Snap Creator Framework offer customers the ability to monitor and manage storage array performance and automate all aspects of data protection.

## Appendix

Tuning considerations for the workload test are:

- Queue depth. The queue for the disk devices at the Linux host is changed to 256.
- Scheduler. The Linux I/O scheduler is set to NOOP.
- Multipathing. DMM multipathing was used to create redundancy.

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## Version History

Version	Date	Document Version History
Version 1.0	February 2013	Initial release

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