

DELL EMC APPSYNC PERFORMANCE AND SCALABILITY GUIDELINES

ABSTRACT

This document contains performance guidelines that will help you configure DELL EMC® AppSync® to optimize for performance and scalability of your application protection solution. Use this document in conjunction with other AppSync documents that contain supplemental information as referenced in the ["References" section on page 34](#).

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EXECUTIVE SUMMARY

This document contains measured performance data, guidelines, and descriptions of internal workload distribution mechanisms in the DELL EMC AppSync Server. This document provides guidance for planning, deploying, and configuring DELL EMC® AppSync™ protected Microsoft Exchange Server, Microsoft SQL Server, Oracle Database, VMware VMFS Datastores (Non-NFS), and FileSystem software environments. The information and guidelines described in this document will help you maximize performance and scalability, and therefore realize the full potential of the DELL EMC AppSync product.

AUDIENCE

This document is intended for DELL EMC internal and field personnel, and technically qualified DELL EMC customers who will be deploying and operating DELL EMC AppSync. Dell EMC assumes that the reader is familiar with the various components of the listed solution previously.

USING THE PERFORMANCE AND SCALABILITY GUIDELINES

The guidelines and performance measurements described in this document have been stated by DELL EMC AppSync engineering. Every effort to provide clearly-defined guidelines has been made, however, many external environmental factors make it challenging and variable to establish guidelines. Overall system performance is determined by the following factors:

- Count and/or size of environmental items like arrays, appliances, hosts, application objects, and number of LUNs for source storage.
- Number of service plans scheduled to be concurrently active and the number of application objects that each plan is protecting.
- Level of network latency between the AppSync Server and hosts.
- Level of network latency between the AppSync Server and vCenter Servers.
- Level of network latency between the AppSync Server, arrays and RecoverPoint appliances.
- Number of concurrent active consoles.
- Hardware specifications and overall performance of the virtual machine or physical server hosting the AppSync Server.
- Hardware specifications and overall performance of the virtual machine or physical servers hosting a Microsoft Windows OS used as Microsoft Exchange Servers, Microsoft SQL Servers, and Utility hosts. (This includes each individual host's performance of the Microsoft VSS writers, Virtual Disk Service, and Volume Shadow Copy Service).
- Hardware specifications and overall performance of the virtual machine or physical servers hosting a UNIX/Linux OS used as Oracle Database or FileSystem Servers. (This includes performance of disk managers and disk services).
- Hardware specifications and overall performance of the virtual machine or physical servers used as VMware vCenter Servers.
- Hardware specifications and overall performance of the virtual machine or physical servers used as SMI-S Servers.
- Hardware specifications and overall performance of ESX Servers hosting the VMFS Datastores that are protected.
- The number of powered-on virtual machines in a datastore (when VM-Consistent copies are created).
- Hardware specifications and overall performance of your DELL EMC storage arrays and RecoverPoint appliances that the protected applications reside on.
- Running the user interface directly on the machine hosting the AppSync Server versus from a remote machine. For best performance, we recommend to open DELL EMC AppSync console on utility host (machine not hosting AppSync Server) once the AppSync Server has been put into production.
- Using TimeFinder Clone replication technology for VMAX Array storage can require long-duration sync or re-sync of target devices, causing longer create-copy time durations versus other replication technologies.
- When AppSync provisions replication targets for VMAX/PowerMax replication technologies, the time duration for the create-copy phases will run longer until the maximum number of copies for application objects is initially reached. The maximum number of copies is determined by the expiration rotation policy service plan setting.

- Using TimeFinder snapvx copy(snapvxclone) mode requires long-duration to link or relink the copies. Provision devices from storage resource pool would take longer time to provision the copy devices.
- For PowerMAX/VMAX3, AppSync supports both volume level and storage group level snapshots. To utilize the storage group level snapshots, create storage group for each application as recommended by VMAX. It would improve the performance in snapvx snapshot creation.
- When using XtremIO Snap replication technology, see the release notes for your storage systems' software version to learn the following limits:
 - Number of snapshots per production volume
 - Number of members in snapshot set operationThese limits will affect the scalability of snapshot retention, the number of source volumes for an app object, and the number of protected app objects within your AppSync application protection environment.

The best practice when adopting a new product is to build up your configuration incrementally, testing as you go. This action ensures that configuration issues can be resolved promptly, and not affect the performance of the rest of your large-scale software environment.

HARDWARE RESOURCE GUIDELINES

Learn about the system resources your DELL EMC AppSync software environment requires.

HARDWARE CONSIDERATIONS

Note: DELL EMC requires that the AppSync Server is the only application running on the system that is hosting it.

Minimum AppSync Server hardware

Memory: 6 GB

Number of CPU's: 2

Disk Space: 2GB

Recommended AppSync Server hardware

Memory: 12 GB

Number of CPU's: 4

Disk Space: 10 GB free at any point of time (includes space for AppSync Meta data for application objects)

Minimum AppSync Host Plug-In hardware

Memory: 6 GB*

Number of CPU's: 2

Disk Space: 2GB

Note: When using a virtual machine to host your AppSync Server, ensure that it is able to utilize 100 percent of the CPU and memory resources allocated to it.

- 2 GB dedicated for AppSync host plug-in service

Required disk space for AppSync meta Data

AppSync maintains internal Meta data for its operations. For every 50 databases, datastores, or filesystems protected, allocate 4.25 GB of disk space at the AppSync install location on the AppSync sever. This guarantees enough space for meta data growth requirements.

CHANGES NEEDED FOR LARGE ENVIRONMENT DEPLOYMENT

1. While deploying AppSync in large environment like protecting large number of sql database (like 200) as part of single service plan or protecting big SQL/Oracle database (datafiles in several thousands) below changes are necessary.
 - Stop AppSync server services
 - Increase memory requirement for JVM by changing following parameters in C:\EMC\AppSync\jboss\executive\application-service.conf (default installation location, path may change based on install location) file.
wrapper.java.additional.2=-Xms2048m (previous value - 1024m or 1GB)
wrapper.java.additional.3=-Xmx5120m (previous value - 2048m or 2GB)

Note: This will impact RAM requirement for AppSync Server.

- With large number of databases subscribed to service plan, service plan execution request to AppSync server may timeout. To avoid service plan execution timeout due to server load, increase transaction timeout from 5 (300) mins to 1hr (3600) mins in transaction subsystem in the file C:\EMC\AppSync\jboss\standalone\configuration\standalone.xml (default installation location, path may change based on install location) like shown below.

```
<subsystem xmlns="urn:jboss:domain:transactions:3.0">
```



```

<core-environment>
  <process-id>
    <uuid/>
  </process-id>
</core-environment>
<recovery-environment socket-binding="txn-recovery-environment" status-socket-binding="txn-status-
manager"/>
<coordinator-environment default-timeout="3600"/>
</subsystem>

```

Start AppSync server services

2. In large Unix/Linux environment with Oracle user may have to set sufficient large values for the variables below. In many cases default values are good enough. However, on case by case base these values may need change for successful service plan run.

sftp.timeout.in.seconds	60 minutes	This is the one which AppSync is using to limit the ssh channel timeout	Server settings; is moved to UI under advanced settingsf
Command Execution time out	60 minutes	Timeout for executing operating system commands. Can be set from UI	Configured from UI for each host
oracleTimeout	15 minutes	Recently added to control the SQL command execution timeout.	Configured using acp utility for each host
Hardcoded timeouts	60 minutes	Used in many places to like RMAN execution, SQL command and SQL query etc	Hardcoded

MICROSOFT EXCHANGE SERVER PROTECTION PERFORMANCE GUIDELINES

Learn about the Microsoft Exchange Server hardware specifications, deployment time estimates, throughputs, service cycle time and resource utilization estimates, and internal workload distribution mechanisms.

HARDWARE SPECIFICATIONS THAT WERE USED FOR MICROSOFT EXCHANGE SERVER TESTING

All systems were virtual machines hosted on VMware ESX Servers. 100% reservation for CPU and memory was enabled to ensure there was not a machine performance bias.

AppSync Server

- OS: Windows Server 2008 Service Pack 2
- Memory: 6GB
- CPU: 2 (2.40 GHZ cores)

Microsoft Exchange Server Hosts

- OS: Windows Server 2008 R2 Enterprise
- Memory: 4 GB
- CPU: 1 (2.50 GHZ core)
- Microsoft Exchange Server version: Exchange Server 2010
- Number of volumes per mailbox database: 2
- RDM devices were used

Mount Hosts

- OS: Windows Server 2008 R2 Enterprise
- Memory: 4 GB
- CPU: 1 (2.50 GHZ core)
- RDM Devices were used

Storage Hardware

- VMAX array model: VMAX 40K
- VMAX Enginuity version: 5876.229.145
- VMAX Pool Storage: Thin Pools [TDEV's] used

DELL EMC VPLEX Metro 5.4.1

- XtremIO Storage System Configuration: 1 X-Brick; XtremIO Storage System Software version: 4.0.2 Build 80

DEPLOYMENT TIME ESTIMATE FOR APPSYNC MICROSOFT EXCHANGE SERVER PROTECTION

Table 1 shows time estimates for deploying and configuring the DELL EMC AppSync product for Microsoft Exchange Server Protection.

Table 1 Deployment time estimates

DEPLOYMENT TYPE	TIME ESTIMATE
Installation of the AppSync Server	5 Minutes
Push installing 8 hosts for use with AppSync	7 Minutes
Configuring 2 service plans each protecting 25 Microsoft Exchange databases across 2 Microsoft Exchange Servers and using 2 utility hosts for mounting copies	10 Minutes

SUPPORTED APPSYNC MICROSOFT EXCHANGE MAILBOX DATABASE THROUGHPUTS

AppSync is designed for the following throughputs for Microsoft Exchange Server mailbox database protection:

- 50 Mailbox databases replicated per hour
- 25 Mailbox databases replicated and mounted per hour

The throughputs do not include the time that is required for consistency checking the databases, because that time can be variable depending on the utility host performing the check, the size of the databases, and the number of logs that must be checked. For more information about Microsoft Exchange database consistency checking, see the *DELL EMC AppSync User Guide*.

The throughputs stated are maximums recommended by DELL EMC. They may not be achievable for all AppSync Protected Microsoft Exchange Server environments, due to the factors listed in "[Using the Performance and Scalability Guidelines](#)" on page 6. Protection of active or passive copies within a Microsoft Exchange Server DAG cluster should not have a major effect on performance. The size of the mailbox databases and log files has little effect on copy creation and mounting a copy.

APPSYNC INTERNAL WORKLOAD DISTRIBUTION MECHANISMS FOR MICROSOFT EXCHANGE SERVER

A workload for AppSync Microsoft Exchange Server protection is defined as the total number of mailbox databases that are protected by AppSync. In the DELL EMC AppSync Server, the workload is divided into efficiency groupings for optimal performance.

When distributing protected application objects into groupings, consider the following:

- Databases within the same service plan.
- Databases on the same host.
- Databases with storage sourced on the same storage array or appliance.

Each efficiency grouping can have a maximum of 12 Microsoft Exchange mailbox databases. AppSync is optimized to be concurrently working on a service plan phase for three of these efficiency groupings, with the maximum of 12 databases per grouping. If the efficiency groupings in the AppSync configuration contain a smaller number of databases (for example, two databases per efficiency grouping), then up to five efficiency groupings will be concurrently worked on. When the optimal AppSync Server protection activity level is reached, other work that is currently scheduled is queued to be run as soon as possible to allow for maximum protection performance.

AppSync is optimized to protect large amounts of application objects that are subscribed to a service plan. DELL EMC does not recommend a one to one mapping of application object to service plans, unless it is a requirement.

Note: DELL EMC recommends a maximum workload of 300 mailbox databases per AppSync Server.

MICROSOFT EXCHANGE DATABASE PROTECTION SERVICE CYCLE TIME AND RESOURCE UTILIZATION ESTIMATES (VMAX VPSNAP, CLONE)

Table 2 shows the observed service cycle time and resource utilization (AppSync Server and Client) estimates for Microsoft Exchange DAG mailbox Protection and Restore databases, with the Bronze service plan.

Database Layout:

12 Microsoft Exchange Mailbox databases, each with Data and Logs on separate LUNs with 4GB in size.

Table 2 Protection and Restore service cycle time and resource utilization (VMAX VP Snap, TF Clone)

SERVICE CYCLE TYPE	DURATION* (HH:MM:SS)	SERVER AVERAGE CPU USAGE	SERVER MAXIMUM MEMORY (GB)	HOST PLUG-IN AVERAGE CPU USAGE	HOST PLUG-IN MAXIMUM MEMORY (MB)
Replication of 12 databases (VP Snap)	00:03:00	22%	3.67	11%	165
Replication and Mount of 12 databases (VP Snap)	00:21:00	35%	4.34	15%	280
Unmount of 12 databases (VP Snap)	00:23:15	27%	4.20	12%	220
Restore of 1 Microsoft Exchange Database (VP Snap)	00:03:25	5%	2.34	3%	57
Replication of 12 databases (TF Clone)	00:03:30	24%	5.50	13%	190
Replication and Mount of 12 databases (TF Clone)	00:22:00	25%	4.60	14%	315
Unmount of 12 databases (TF Clone)	00:24:30	18%	4.10	11%	190
Restore of 1 Microsoft Exchange Database (TF Clone)	00:03:28	6%	2.55	5%	65

*Duration does not include initial automatic provisioning of target devices. In the test environment, required target devices are created and placed in a storage group, which is configured in AppSync. Replication takes another one hour to provision the target devices.

MICROSOFT EXCHANGE DATABASE PROTECTION SERVICE CYCLE TIME AND RESOURCE UTILIZATION ESTIMATES (XTREMIO SNAP)

Table 3 shows the observed service cycle time and resource utilization (AppSync Server and Client) estimates for Microsoft Exchange DAG mailbox Protection and Restore databases, with the Bronze sservice plan.

Database Layout:

12 Microsoft Exchange Mailbox databases, each with Data and Logs on separate LUNs with 4GB in size.

Table 3 Protection and Restore service cycle time and resource utilization (XtremIO Snap)

SERVICE CYCLE TYPE	DURATION (HH:MM:SS)	SERVER AVERAGE CPU USAGE	SERVER MAXIMUM MEMORY (GB)	HOST PLUG-IN AVERAGE CPU USAGE	HOST PLUG-IN MAXIMUM MEMORY (MB)
Replication of 12 databases	00:01.20	22%	5.87	18%	324
Replication and Mount of 12 databases	00:13:30	32%	5.50	22%	468
Unmount of 12 databases	00:17:00	28%	4.35	23%	432
Restore of 1 Microsoft Exchange Database	00:01:40	23%	6.66	13%	281

MICROSOFT EXCHANGE DATABASE PROTECTION SERVICE CYCLE TIME AND RESOURCE UTILIZATION ESTIMATES (VPLEX WITH XTREMIO AS BACKEND ARRAY)

Table 4 shows the observed service cycle time and resource utilization (AppSync Server and Client) estimates for Microsoft Exchange DAG mailbox Protection and Restore databases, with the Bronze sservice plan and VPLEX virtual volumes of RAID-0.

Database Layout:

12 Microsoft Exchange Mailbox databases, each with Data and Logs on separate LUNs with 4GB in Size.

Table 4 Protection and Restore service cycle time and resource utilization (VPLEX Snap)

SERVICE CYCLE TYPE	DURATION (HH:MM:SS)	SERVER AVERAGE CPU USAGE	SERVER MAXIMUM MEMORY (GB)	HOST PLUG-IN AVERAGE CPU USAGE	HOST PLUG-IN MAXIMUM MEMORY (MB)
Replication of 12 databases	00:03:20	26%	5.15	20%	127
Replication and Mount of 12 databases	00:15:17	24%	5.18	17%	130
Unmount of 12 databases	00:17:00	18%	5.20	16%	122
Restore of 1 Microsoft Exchange Database	00:02:00	24%	4.45	12%	130

VNXe Array Storage Performance Factors

DELL EMC recommends that Microsoft Exchange Server Mailbox Databases sourced on VNXe block LUNs have either:

- All of the data and log files contained within one VNXe LUN group.
- All of the data files contained within a LUN group and all of the log files contained within a separate LUN group.

MICROSOFT SQL SERVER PROTECTION PERFORMANCE GUIDELINES

Learn about the Microsoft SQL Server hardware specifications, deployment time estimates, throughputs, service cycle time and resource utilization estimates, and internal workload distribution mechanisms.

HARDWARE SPECIFICATIONS THAT WERE USED FOR MICROSOFT SQL SERVER TESTING (RECOVERPOINT)

All systems were virtual machines hosted on VMware ESX Servers. 100% reservation for CPU and memory was enabled to ensure there was not a machine performance bias.

AppSync Server

- OS: Windows Server 2012 R2 Service Pack 1;
- Memory: 12 GB
- CPU: 2 (2.3 GHZ cores)

Microsoft SQL Server Hosts

- OS: Windows Server 2016 Datacenter
- Memory: 12 GB
- CPU: 2 (2.3 GHZ cores)
- Microsoft SQL Server version: SQL Server 2016 Enterprise Edition
- Number of volumes per database: 2

Utility Hosts

- OS: Windows Server 2016 Datacenter
- Memory: 16 GB
- CPU: 2 (2.3 GHZ cores)
- Microsoft SQL Server version: SQL Server 2016 Enterprise Edition

Storage Hardware

- VNX array model: VNX 7600
- VNX Block OE version: 5.33.000.5.038
- VNX Pool Storage Thick LUNs used
- RecoverPoint hardware version: Generation 4
- RecoverPoint software version: RecoverPoint 3.5 Service Pack 2
- Number of RPA's: 2
- Number of RecoverPoint sites: 1
- XtremIO Storage System Configuration: 2 X-Brick; XMS Version: 4.2.2; System Software version: 4.0.25-27
- VMAX3 VMAX450F: HyperMax OS: 5977.1125.1125
- SMI-S Version: 9.0.0.0 (For optimal performance 6 GKs to be presented to SMI-S host)
- X2 XtremIO Storage System Configuration: 1 X-Brick; XMS Version: 6.2; System Software version: 6.2.0-81
- X2 XtremIO Storage System Configuration: 2 X-Brick; XMS version: 6.1; System Software version: 6.1.0.99

DEPLOYMENT TIME ESTIMATE FOR APPSYNC MICROSOFT SQL SERVER PROTECTION

Table 5 shows time estimates for deploying and configuring the DELL EMC AppSync product for Microsoft SQL Server database protection.

Table 5 Deployment time estimates

DEPLOYMENT TYPE	TIME ESTIMATE
Installation of the AppSync Server	5 Minutes
Push installing 4 hosts for use with AppSync	5 Minutes
Configuring 2 service plans each protecting 25 Microsoft SQL Server databases across 2 Microsoft SQL Server Instances and using 2 additional hosts for mounting copies	7 Minutes

SUPPORTED APPSYNC MICROSOFT SQL SERVER DATABASE THROUGHPUTS

AppSync is designed for the following throughputs for Microsoft SQL Server database protection:

- 50 databases replicated per hour
- 25 databases replicated and mounted per hour

The throughputs stated are maximums recommended by DELL EMC. They may not be achievable for all AppSync Protected Microsoft SQL Server environments, due to the factors listed in ["Using the Performance and Scalability Guidelines" on page 6](#). Most of the time, the size of the database files and log files has little effect on copy creation and mounting a copy.

APPSYNC INTERNAL WORKLOAD DISTRIBUTION MECHANISMS FOR MICROSOFT SQL SERVER

A workload for AppSync Microsoft SQL Server is defined as the total number of databases that are protected by AppSync. In the DELL EMC AppSync Server, the workload is divided into efficiency groupings for optimal performance.

When distributing protected application objects into groupings, consider the following:

- Databases within the same service plan.
- Databases on the same host.
- Databases with storage sourced on the same storage array or appliance.

Each efficiency grouping can have a maximum of 12 Microsoft SQL Server databases. AppSync is optimized to be concurrently working on a service plan phase for three of these efficiency groupings, with the maximum of 12 databases per grouping. If the efficiency groupings in the AppSync configuration contain a smaller number of databases (for example, two databases per efficiency grouping), then up to five efficiency groupings will be concurrently worked on. When the optimal AppSync Server protection activity level is reached, other work that is currently scheduled is queued to be run as soon as possible to allow for maximum protection performance.

AppSync is optimized to protect large amounts of application objects that are subscribed to a service plan. DELL EMC does not recommend a one to one mapping of application object to service plans, unless it is a requirement.

Note: DELL EMC recommends a maximum workload of 300 Microsoft SQL Server databases per AppSync Server.

MICROSOFT SQL SERVER DATABASE PROTECTION SERVICE CYCLE TIME AND RESOURCE UTILIZATION ESTIMATES (RECOVERPOINT CDP)

Table 6 shows the observed service cycle time and resource utilization (AppSync client) estimates for Microsoft SQL Server databases that are protected with the Bronze service plan.

Database Layout:

12 SQL Databases, each with Data and Logs on separate LUNs on a Single SQL instance.

Table 6 Protection service cycle time and resource utilization (RecoverPoint CDP)

SERVICE CYCLE TYPE	DURATION	HOST PLUG-IN	HOST PLUG-IN
	(HH:MM:SS)	AVERAGE CPU USAGE	MAXIMUM MEMORY (MB)
Replication of 12 databases	0:03:59	3%	63
Replication and mount of 12 databases	0:12:09	2%	58
Unmount of 12 databases	0:09:32	1%	51

MICROSOFT SQL SERVER DATABASE PROTECTION SERVICE CYCLE TIME AND RESOURCE UTILIZATION ESTIMATES (XTREMIO SNAP)

Table 7 shows the observed service cycle time and resource utilization (AppSync client) estimates for Microsoft SQL Server databases that are protected with the Bronze service plan.

Database Layout:

12 SQL Databases, each with Data and Logs on separate LUNs on Single SQL instance.

Table 7 Protection service cycle time and resource utilization (RecoverPoint CDP)

SERVICE CYCLE TYPE	DURATION	HOST PLUG-IN	HOST PLUG-IN
	(HH:MM:SS)	AVERAGE CPU USAGE	MAXIMUM MEMORY (MB)
Replication of 12 databases	0:02:20	5%	60
Replication and mount of 12 databases	0:6:14	2%	60
Unmount of 12 databases	0:03:43	1%	30

MICROSOFT SQL SERVER DATABASE RESTORE SERVICE CYCLE TIME AND RESOURCE UTILIZATION ESTIMATES (RECOVERPOINT CDP)

Table 8 shows the observed service cycle time and resource utilization (AppSync client) estimates for a Microsoft SQL Server database's copy that is restored after it is protected with the Bronze service plan*.

Table 8 Restore service cycle time and resource utilization (RecoverPoint CDP)

SERVICE CYCLE TYPE	DURATION*	HOST PLUG-IN	HOST PLUG-IN
	(HH:MM:SS)	AVERAGE CPU USAGE	MAXIMUM MEMORY (MB)
Full restore of 1 database	0:3:41	1%	77

*This time does not include synchronization or replay of data on the RecoverPoint appliance and Microsoft SQL Server.

SQL DATABASE PROTECTION SERVICE CYCLE TIME AND RESOURCE UTILIZATION ESTIMATES (VMAX SNAP, VMAX CLONE)

Table 9 shows the observed service cycle time and resource utilization (AppSync Server and Client) estimates for Microsoft SQL Server Pprotection and Restore databases with the Bronze sservice plan.

Database Layout:

12 SQL Databases, each with Data and Logs on separate LUNs on Single SQL instance.

Table 9 Protection and Restore service cycle time and resource utilization (VMAX Snap, VMAX Clone)

SERVICE CYCLE TYPE	DURATION* (HH:MM:SS)	SERVER AVERAGE CPU USAGE	SERVER MAXIMUM MEMORY (GB)	HOST PLUG-IN AVERAGE CPU USAGE	HOST PLUG-IN MAXIMUM MEMORY (MB)
Replication of 12 databases (VP Snap)	00:02:45	18%	3.67	12%	172
Replication and Mount of 12 databases (VP Snap)	00:22:00	40%	4.34	15%	290
Unmount of 12 databases (VP Snap)	00:23:30	32%	4.20	16%	232
Restore of 1 SQL Database (VP Snap)	00:03:40	7%	2.34	3%	82
Replication of 12 databases (TF Clone)	00:03:50	27%	5.50	17%	210
Replication and Mount of 12 databases (TF Clone)	00:24:00	28%	4.60	24%	345
Unmount of 12 databases (TF Clone)	00:23:00	15%	4.10	18%	170
Restore of 1 SQL Database (TF Clone)	00:02:50	5%	2.55	6%	85

* Duration does not include initial automatic provisioning of target devices. In the test environment, required target devices are created and placed in a sstorage group, which is configured in AppSync. Replication takes another one hour to provision the target devices.

SQL DATABASE PROTECTION SERVICE CYCLE TIME AND RESOURCE UTILIZATION ESTIMATES (VMAX3 SNAPVXSNAP & SNAPVXCLONE)

Tables 10 and 11 show the observed service cycle time and resource utilization (AppSync Server and Client) estimates for Microsoft SQL Server protection and Restore databases with the Bronze service plan.

Database Layout:

12 SQL Databases, with Data and Logs on single LUN(500 GB) on Single SQL instance.

Table 10 Protection and Restore service cycle time and resource utilization (VMAX3 SnapVxSnap & SnapVxClone)

SERVICE CYCLE TYPE	DURATION* (HH:MM:SS)	SERVER AVERAGE CPU USAGE	SERVER MAXIMUM MEMORY (GB)	HOST PLUG-IN AVERAGE CPU USAGE	HOST PLUG-IN MAXIMUM MEMORY (MB)
Replication of 12 databases (SnapVxClone)	00:02:30	22%	3.2	12%	180
Replication and Mount of 12 databases (SnapVxClone)	00:04:00	38%	4.2	15%	290
Unmount of 12 databases (SnapVxClone)	00:03:30	32%	4.3	16%	250
Restore of 1 SQL Database (SnapVxClone)	00:03:40	7%	2.34	3%	125
Replication of 12 databases (SnapVxSnap)	00:01:30	27%	4.3	17%	210
Replication and Mount of 12 databases (SnapVxSnap)	00:04:40	28%	4.5	24%	330
Unmount of 12 databases (SnapVxSnap)	00:03:40	15%	4.10	18%	170
Restore of 1 SQL Database (SnapVxSnap)	00:02:50	7%	2.55	6%	85

* Duration include initial automatic provisioning of target device

Database Layout:

200# SQL Databases, with Data and Logs on single LUN (500 GB) on Single SQL instance.

Table 11 Protection and Restore service cycle time and resource utilization (VMAX3 SnapVxSnap & SnapVxClone)

SERVICE CYCLE TYPE	DURATION* (HH:MM:SS)	SERVER AVERAGE CPU USAGE	SERVER MAXIMUM MEMORY (GB)	HOST PLUG-IN AVERAGE CPU USAGE	HOST PLUG-IN MAXIMUM MEMORY (MB)
Replication of 200 databases (SnapVxClone)	00:10:25	90%	6.2	92%	505
Replication and Mount of 200 databases (SnapVxClone)	00:15:30	90%	6.3	92%	490
Unmount of 200 databases (SnapVxClone)	00:15:20	90%	5.9	92%	505
Restore of 1 SQL Database (SnapVxClone)	00:20:40	60	5.9	92%	505
Replication of 200 databases (SnapVxSnap)	00:05:30	90%	6.1	92%	505
Replication and Mount of 200 databases (SnapVxSnap)	00:18:20	90%	6.3	92%	505
Unmount of 200 databases (SnapVxSnap)	00:03:40	90%	6.0	92%	505
Restore of 1 SQL Database (SnapVxSnap)	00:20:40	60	5.9	92%	505

* Duration include initial automatic provisioning of target devices.

AppSync 4.0.0.0 used for protecting 200 sql database

SQL DATABASE PROTECTION SERVICE CYCLE TIME AND RESOURCE UTILIZATION ESTIMATES (XTREMIO SNAP)

Table 12, 13, 14, 15 and 16 shows the observed service cycle time and resource utilization (AppSync Server and Client) estimates for Microsoft SQL Server Protection and Restore databases with the Bronze and Silver service plans

Database Layout:

12 SQL Databases, each with Data and Logs on separate LUNs one single instance.

Table 12 Protection and Restore service cycle time and resource utilization (XtremIO Snap) Bronze service plan

SERVICE CYCLE TYPE	DURATION (HH:MM:SS)	SERVER AVERAGE CPU USAGE	SERVER MAXIMUM MEMORY (GB)	HOST PLUG-IN AVERAGE CPU USAGE	HOST PLUG-IN MAXIMUM MEMORY (MB)
Replication of 12 databases	00:01:45	15%	6.63	17%	280
Replication and Mount of 12 databases	00:12:30	13%	6.54	22%	342
Unmount of 12 databases	00:18:00	22%	5.47	19%	267
Restore of 1 SQL Database	00:02:15	11%	3.46	5%	160

Database Layout:

12 SQL Databases, with Data and Logs on single LUN (500 GB) one single instance.

Table 13 Protection and Restore service cycle time and resource utilization (XtremIO Snap) Bronze service plan

SERVICE CYCLE TYPE	DURATION (HH:MM:SS)	SERVER AVERAGE CPU USAGE	SERVER MAXIMUM MEMORY (GB)	HOST PLUG-IN AVERAGE CPU USAGE	HOST PLUG-IN MAXIMUM MEMORY (MB)
Replication of 12 databases	00:00:45	40%	6.63	31%	280
Replication and Mount with Recovery of 12 databases	00:2:10	46%	6.54	22%	342
Unmount of 12 databases	00:02:40	42%	5.47	19%	267
Restore of 1 SQL Database	00:02:15	11%	3.46	5%	160

Database Layout:

200# SQL Databases, with Data and Logs on single LUN (500 GB) one single instance.

Table 14 Protection and Restore service cycle time and resource utilization (X1 array XtremIO Snap Bronze service plan)

SERVICE CYCLE TYPE	DURATION (HH:MM:SS)	SERVER AVERAGE CPU USAGE	SERVER MAXIMUM MEMORY (GB)	HOST PLUG-IN AVERAGE CPU USAGE	HOST PLUG-IN MAXIMUM MEMORY (MB)
Replication of 200 databases	00:40:00	90%	6.2	22%	505
Replication and Mount with Recovery of 200 databases	00:46:00	90%	6.4	31%	505
Unmount of 200 databases	00:14:10	90%	5.9	25%	180
Restore of 1 SQL Database	00:42:12	90%	5.5	10%	505

AppSync 4.0.0.0 used for protecting 200 sql database

Database Layout:

200# SQL Databases, with Data

Table 15 Protection and Restore service cycle time and resource utilization (X2 XtremIO Snap local copy Bronze service plan)

SERVICE CYCLE TYPE	DURATION (HH:MM:SS)	SERVER AVERAGE CPU USAGE	SERVER MAXIMUM MEMORY (GB)	HOST PLUG-IN AVERAGE CPU USAGE	HOST PLUG-IN MAXIMUM MEMORY (MB)
Replication of 200 databases	00:40:00	90	6.1	22%	510
Replication and Mount with Recovery of 200 databases	00:51:00	90	6.5	25%	520
Unmount of 200 databases	01:13:00	90	6.0	20%	200
Restore of 1 SQL Database	00:45:00	90	5.5	10%	500

* Duration includes copy rotation time.

** 10K IOPS on XtremIO array.

Database Layout:

200# SQL Databases, with Data and Logs on separate luns (two luns each 500 GB) one single instance.

Table 16 Protection and Restore service cycle time and resource utilization (X2 XtremIO Snap Remote copy Silver Service plan)

SERVICE CYCLE TYPE	DURATION (HH:MM:SS)	SERVER AVERAGE CPU USAGE	SERVER MAXIMUM MEMORY (GB)	HOST PLUG-IN AVERAGE CPU USAGE	HOST PLUG-IN MAXIMUM MEMORY (MB)
Replication of 200 databases	00:42:00	90	6.2	26%	520
Replication and Mount with Recovery of 200 databases	00:52:00	90	6.4	23%	530
Unmount of 200 databases	01:11:00	90	6.1	25%	500

* Duration includes copy rotation time.

** 10K IOPS on XtremIO array.

SQL DATABASE PROTECTION SERVICE CYCLE TIME AND RESOURCE UTILIZATION ESTIMATES (VPLEX XTREMIO)

Table 177 shows the observed service cycle time and resource utilization (AppSync Server and Client) estimates for Microsoft SQL Server Protection and Restore databases, with the Bronze service plan and VPLEX virtual volumes of RAID-0.

Database Layout:

12 SQL Databases, each with Data and Logs on separate LUNs on Single SQL instance.

Table 17 Protection and Restore service cycle time and resource utilization (VPLEX Snap)

SERVICE CYCLE TYPE	DURATION (HH:MM:SS)	SERVER AVERAGE CPU USAGE	SERVER MAXIMUM MEMORY (GB)	HOST PLUG-IN AVERAGE CPU USAGE	HOST PLUG-IN MAXIMUM MEMORY (MB)
Replication of 12 databases	00:03:10	24%	5.06	10%	230
Replication & Mount of 12 databases (VPLEX Mount)	00:14:16	22%	5.05	20%	185
Unmount of 12 databases	00:15:00	20%	5.05	15%	127
Restore of 1 SQL Database	00:02:00	22%	4.47	23%	135

VNXe Array Storage Performance Factors

DELL EMC recommends that Microsoft SQL Server databases that are sourced on VNXe block LUNs, have either:

- All of the data and log files contained in one VNXe LUN group.
- All of the data files contained in a LUN group and all of the log files contained in a different LUN group.

FILESYSTEM PERFORMANCE GUIDELINES

Learn about the FileSystem deployment time estimates, throughputs, and internal workload distribution mechanisms.

DEPLOYMENT TIME ESTIMATE FOR APPSYNC FILESYSTEM PROTECTION

Table 188 shows time estimates for deploying and configuring the DELL EMC AppSync product for FileSystem protection.

Table 18 Deployment time estimates

DEPLOYMENT TYPE	TIME ESTIMATE
Installation of the AppSync Server	5 Minutes
Push installing 4 hosts for use with AppSync	5 Minutes
Configuring 2 service plans each protecting 25 FileSystems across 2 servers and using 2 additional hosts for mounting copies	7 Minutes

SUPPORTED APPSYNC FILESYSTEM THROUGHPUTS

AppSync is designed for the following throughputs for FileSystem protection:

- 100 FileSystems replicated per hour
- 50 FileSystems replicated and mounted per hour

The throughputs stated are maximums recommended by DELL EMC. They may not be achievable for all AppSync Protected FileSystem environments, due to the factors that are listed in ["Using the Performance and Scalability Guidelines" on page 6](#). Most of the time, the size of the filesystem has little effect on copy creation and mounting a copy.

APPSYNC INTERNAL WORKLOAD DISTRIBUTION MECHANISMS FOR FILESYSTEMS

A workload for FileSystem protection is defined as the total number of filesystems that are protected by AppSync. In the EMC AppSync Server, the workload is divided into efficiency groupings for optimal performance. When distributing protected application objects into groupings, consider the following:

- Databases within the same service plan.
- Databases on the same host.
- Databases with storage sourced on the same storage array or appliance.

AppSync is optimized to be concurrently working on a service plan phase for one or multiple efficiency groupings, totaling to 50 filesystems. For example, two efficiency groupings that contain 25 filesystems each, could have phases running concurrently. However, if the efficiency groupings in your AppSync Server configuration contain a small number of filesystems, then AppSync may not be able to work concurrently on 50 filesystems. The reason for this is the AppSync Server allows up to five efficiency groupings to be concurrently worked on. When the optimal AppSync Server protection activity level is reached, other work that is currently scheduled is queued to be run as soon as possible to allow for maximum protection performance.

AppSync is optimized to protect large amounts of application objects that are subscribed to a service plan. DELL EMC does not recommend a one to one mapping of application object to service plans unless it is a requirement.

Note: DELL EMC recommends a maximum workload of 300 FileSystems per AppSync Server.

VMWARE VMFS DATASTORE (NON-NFS) PROTECTION PERFORMANCE GUIDELINES

Learn about the VMware Datastore hardware specifications, deployment time estimates, throughputs, service cycle time and resource utilization estimates, and internal workload distribution mechanisms.

HARDWARE SPECIFICATIONS THAT WERE USED FOR VMWARE DATASTORE TESTING

AppSync Server

- OS: Windows Server 2008 R2 Service Pack 1
- Memory: 6GB
- CPU: 2 (2.3 GHZ cores)

VMware ESX Server

- VMware ESXi version: 5.0 Update 1
- Memory: 6 GB
- CPU: 8 (2.3 GHZ cores)
- Number of datastores: 25
- Average number of virtual machines per datastore: 4
- Number of virtual machines registered: 92
- ESX Cluster : No

VMware vCenter Server environment

- VCenter Server Version: 5.5.0
- Memory: 16 GB
- CPU: 4 (2.0 GHZ cores)
- Total Number of Datastores in tested Datacenter: 100
- Total Number of Virtual Machines in tested Datacenter: 350
- Total Number of ESXi Servers in tested Datacenter: 5
- Total Number of datacenters under vCenter Control: 8
- Total Number of Virtual Machines under vCenter Control: 400
- Total Number of ESXi Servers under vCenter Control: 16

Storage Hardware

- VNX array model: VNX 7600
- VNX Block OE version: 5.33.000.5.038
- VNX Pool Storage Thick LUNs used

DEPLOYMENT TIME ESTIMATE FOR APPSYNC VMWARE DATASTORE PROTECTION

Table 199 shows time estimates for deploying and configuring the DELL EMC AppSync product for VMware Datastore Protection.

Table 19 Deployment time estimates

DEPLOYMENT TYPE	TIME ESTIMATE
Installation of the AppSync Server	5 Minutes
Registering and Discovery of VMware VirtualCenter Server	1 Minute
Configuring 2 service plans each protecting 25 datastores	2 Minutes

SUPPORTED APPSYNC VMWARE DATASTORE THROUGHPUTS

AppSync is designed to replicate 50 VMware VMFS datastores per hour.

This is a maximum recommended by DELL EMC and may not be achievable for all AppSync VMware Datastore protection environments, due to the factors that are listed in ["Using the Performance and Scalability Guidelines"](#) on page 6. The size of the datastores has little effect on copy creation and mounting a copy.

APPSYNC INTERNAL WORKLOAD DISTRIBUTION MECHANISMS FOR VMWARE DATASTORES

A workload for DELL EMC AppSync VMware Datastore Protection is defined as the total number of datastores that are protected by AppSync. In the DELL EMC AppSync Server, the workload is divided into efficiency groupings for optimal performance.

When distributing protected application objects into groupings, consider the following:

- Databases within the same service plan.
- Databases within the same VMware vCenter Server.
- Databases with storage sourced on the same storage array or appliance.

Each efficiency grouping can have a maximum of 12 datastores. AppSync is optimized to be concurrently working on a service plan phase for three of these efficiency groupings, with the maximum of 12 datastores per grouping. If the efficiency groupings in the AppSync configuration contain a smaller number of datastores (for example, two datastores per efficiency grouping), then up to five efficiency groupings will be concurrently worked on. When the optimal AppSync Server protection activity level is reached, other work that is currently scheduled is queued to be run as soon as possible to allow for maximum protection performance.

AppSync is optimized to protect large amounts of application objects that are subscribed to a service plan. EMC does not recommend a one to one mapping of application object to service plans unless it is a requirement.

Note: DELL EMC recommends a maximum workload of 300 datastores per AppSync Server.

VMWARE DATASTORES PROTECTION SERVICE CYCLE TIME ESTIMATES (VNX SNAPSHOTS)

Table 20 shows the observed service cycle time estimate for VMware VMFS datastores that are protected with the Bronze service plan.

Table 20 Protection service cycle time (VNX Snapshots)

SERVICE CYCLE TYPE	MEASURED TIME* DURATION(HH:MM:SS)
Replication of 12 datastores	0:01:20

*This time does not include the creation of VMware Snapshots for the virtual machines.

VMWARE DATASTORES RESTORE SERVICE CYCLE TIME ESTIMATES (VNX SNAPSHOTS)

Table 21 shows the observed service cycle time and estimate for a VMware VMFS datastore's copy that is restored after it is protected with the Bronze service plan.

Table 21 Restore service cycle time (VNX Snapshots)

SERVICE CYCLE TYPE	MEASURED TIME* DURATION (HH:MM:SS)
Full restore of 1 VMware Datastore	0:1:18

*This time does not include synchronization or replay of data on the VNX Array, or any manipulation of virtual machines, such as powering them on after restore.

VMWARE DATASTORES PROTECTION SERVICE CYCLE TIME AND RESOURCE UTILIZATION ESTIMATES (VMAX SNAP, VMAX CLONE)

Table 22 shows the observed service cycle time and resource utilization (AppSync Server and Client) estimates for VMware Datastores Protection and Restore with the Bronze service plan.

Database Layout:

12 VMware Datastores each on separate LUN with 10GB Size.

Table 22 Protection and Restore service cycle time and resource utilization (VMAX VP Snap, TF Clone)

SERVICE CYCLE TYPE	DURATION* (HH:MM:SS)	SERVER AVERAGE CPU USAGE	SERVER MAXIMUM MEMORY (GB)
Replication of 12 datastores (VP Snap)	00:02:00	22%	3.47
Replication and Mount of 12 datastores (VP Snap)	00:24:00	35%	4.45
Unmount of 12 datastores (VP Snap)	00:22:00	42%	4.00
Restore of 1 VMware Datastore (VP Snap)	00:02:35	10%	3.54
Replication of 12 datastores (TF Clone)	00:03:00	34%	5.30
Replication and Mount of 12 datastores (TF Clone)	00:27:00	26%	4.20
Unmount of 12 datastores (TF Clone)	00:25:00	18%	4.30
Restore of 1 VMware Datastore (TF Clone)	00:02:00	8%	2.25

* Duration does not include initial automatic provisioning of target devices. In the test environment, required target devices are created and placed in a storage group, which is configured in AppSync. Replication takes another one hour to provision the target devices.

VMWARE DATASTORES DATABASE PROTECTION SERVICE CYCLE TIME AND RESOURCE UTILIZATION ESTIMATES (XTREMIO SNAP)

Table 23 shows the observed service cycle time and resource utilization (AppSync Server and Client) estimates for VMware Datastores Protection and Restore with the Bronze service plan.

Database Layout:

12 VMware Datastores, each on separate LUN with 10GB Size.

Table 23 Protection and Restore service cycle time and resource utilization (XtremIO Snap)

SERVICE CYCLE TYPE	DURATION (HH:MM:SS)	SERVER AVERAGE CPU USAGE	SERVER MAXIMUM MEMORY (GB)
Replication of 12 databases	00:01:30	18%	6.43
Replication and Mount of 12 databases	00:10:30	17%	6.34
Unmount of 12 databases	00:17:00	32%	5.00
Restore of 1 VMware datastore	00:02:45	17%	3.20

VMWARE DATASTORES DATABASE PROTECTION SERVICE CYCLE TIME AND RESOURCE UTILIZATION ESTIMATES (VPLEX XTREMIO)

Table 24 shows the observed service cycle time and resource utilization (AppSync Server and Client) estimates for VMware Datastores Protection and Restore with the Bronze service plan and VPLEX virtual volumes of RAID-0.

Database Layout:

12 VMware Datastores, each on separate LUN with 10GB Size.

Table 24 Protection and Restore service cycle time and resource utilization (VPLEX Snap)

SERVICE CYCLE TYPE	DURATION (HH:MM:SS)	SERVER AVERAGE CPU USAGE	SERVER MAXIMUM MEMORY (GB)
Replication of 12 databases	00:03:30	34%	5.40
Replication and Mount of 12 databases (VPLEX Mount)	00:15:16	42%	5.30
Unmount of 12 databases	00:16:00	30%	5.20
Restore of 1 VMware Datastore	00:02:30	18%	4.00

ORACLE DATABASE PERFORMANCE GUIDELINES

Learn about the Oracle Database hardware specifications, deployment time estimates, throughputs, service cycle time and resource utilization estimates, and source storage being the key performance factor.

DEPLOYMENT TIME ESTIMATE FOR APPSYNC ORACLE DATABASE PROTECTION

Table 25 shows time estimates for deploying and configuring the DELL EMC AppSync product for Oracle Database protection.

Table 25 Deployment time estimates

DEPLOYMENT TYPE	TIME ESTIMATE
Installation of the AppSync Server	5 Minutes
Push installing 4 hosts for use with AppSync	5 Minutes
Configuring 1 service plan protecting an Oracle RAC Database and also scheduling a Repurposing Copy.	7 minutes

APPSYNC ORACLE DATABASE PROTECTION KEY PERFORMANCE FACTOR: SOURCE STORAGE

The main performance and scalability factors of an AppSync Oracle Database protection environment are the number of storage devices, size of storage devices and number of datafiles that the Oracle Database resides on. The duration of time for creating a copy and mounting a copy is linear on the scale of the number of source devices. For example, if it takes five minutes to create the copy for an Oracle Database that is sourced on 25 devices, then it would take around 10 minutes to create the copy for an Oracle Database that is sourced on 50 devices.

DELL EMC recommends protecting databases with AppSync that reside on a maximum of 128 storage devices.

VNX Array Storage Scalability Factors

For crash consistent copies of an Oracle Database on VNX array storage, the number of LUNs that the database files can reside on is bound by the maximum number of LUNs allowed within a VNX Consistency Group. All the database files must be contained within the same VNX Consistency Group. For app consistent copies of an Oracle Database on VNX, there is no limit for how many LUNs the data files reside on, but the LUNs sourcing the archive logs must all reside within the same VNX Consistency Group.

Note: Oracle databases that are sourced on VNX array storage and that are protected by AppSync, must have all source LUNs contained within VNX Consistency Groups.

VNXe Array Storage Scalability Factors

For crash consistent copies of an Oracle Database on VNXe array storage, the number of LUNs that the database files can reside on is bound by the maximum number of LUNs allowed within a VNXe LUN Group. All the database files must be contained within the same VNXe LUN Group. For app consistent copies of an Oracle Database on VNXe, there is no limit for how many LUNs the data files reside on, but the LUNs sourcing the archive logs must all reside within the same VNXe LUN Group.

Note: Oracle databases that are sourced on VNXe array storage and that are protected by AppSync, must have all source LUNs contained within VNXe LUN Groups.

Unity Array Storage Scalability Factors

For app consistent copies of Oracle database on Unity array, Oracle data (data files, control files and redo log files) and archive log need to be on separate consistency groups. However, for crash consistent copies both data and archive log luns can be on same consistency group.

AppSync always recommends minimum of two consistency groups per Oracle database one for data and one for archive logs. This will provide user choice of taking app consistent or crash consistent copies of same database.

Note: The purpose of a consistency group is to take simultaneous snap of multiple volumes, reducing copy creation time.

PowerMax Array Storage Scalability Factors

AppSync supports both volume level and storage group level snapshots on PowerMax/VMAX3 arrays . To utilize the storage group level snapshots, create storage group for each application as recommended by VMAX. It would improve the performance in snapvx snapshot creation.

For app consistent copies of Oracle database on PowerMax array, Oracle data (data files, control files and redo log files) and archive log need to be on separate storage groups. However, for crash consistent copies both data and archive log luns can be on same storage group.

AppSync always recommends minimum of two storage groups per Oracle database one for data and one for archive logs. This will provide user choice of taking app consistent or crash consistent copies of same database.

Note: The purpose of a storage group is to take simultaneous snap of multiple volumes, reducing copy creation time.

SUPPORTED APPSYNC ORACLE DATABASE THROUGHPUTS

AppSync supports the following throughputs for Oracle database protection:

- 128 Oracle Database Source Storage Devices replicated per hour
- 64 Oracle Database Source Storage Devices replicated and replication target devices mounted per hour

The throughput for number of databases can be calculated by the number of source devices of each database. For example, eight oracle databases could be replicated per hour if each database had around 16 source storage devices. The throughputs stated are guidelines provided by DELL EMC. They may not be achievable for all AppSync Oracle Database protection environments due to the factors that are listed in ["Using the Performance and Scalability Guidelines" on page 6](#). The number of source storage devices that Oracle databases reside on can impact the protection throughputs. For more information, see "AppSync Oracle Database Protection Key Performance Factor: Source Storage".

ORACLE DATABASE PROTECTION SERVICE CYCLE TIME ESTIMATES (VNX SNAPSHOTS)

Table 26 shows the observed service cycle time estimate for a very large-scale Oracle Database protected with the Bronze service plan.

HARDWARE SPECIFICATIONS THAT WERE USED FOR ORACLE DATABASE TESTING

AppSync Server

- OS: Windows Server 2008 R2 Service Pack 1
- Memory: 8GB
- CPU: 4 (2.3 GHZ cores)

Oracle Database Production Hosts

- OS: Oracle Enterprise Linux 6.5
- Kernel: Red Hat Compatible Kernel
- Memory: 16 GB
- CPU: 16 (2.3 GHZ cores)
- Oracle Database version: Oracle Database 11g Enterprise Edition Release 11.2.0.3
- Volume Group: Native lvm2
- Number of volume groups per database: 2
- Number of logical volumes per database: 8
- Number of physical volumes per database: 128 (64 per volume group)

Mount Hosts

- OS: Oracle Enterprise Linux 6.5
- Kernel: Red Hat Compatible Kernel
- Memory: 16 GB
- CPU: 16 (2.3 GHZ cores)

Storage Hardware

- VNX array model: VNX 7600
- VNX Block OE version: 5.33.000.5.035
- VNX Pool Storage Thin LUNs used

Table 26 Protection service cycle time (VNX Snapshots)

SERVICE CYCLE TYPE	MEASURED TIME DURATION (HH:MM:SS)
Replication of database	0:11:58*
Replication and mount of database	1:05:28*

*Does not include time for rotation of copies.

ORACLE DATABASE PROTECTION SERVICE CYCLE TIME ESTIMATES (DELLSC SNAPSHOTS)

Table 267 shows the observed service cycle time estimate for a very large-scale Oracle Database protected with the Bronze service plan

HARDWARE SPECIFICATIONS THAT WERE USED FOR ORACLE DATABASE TESTING

AppSync Server

- OS: Windows Server 20012 R2
- Memory: 8GB
- CPU: 4 (2.3 GHZ cores)

Oracle Database Production Hosts

- OS: RHEL 7.4
- Kernel: Red Hat Compatible Kernel
- Memory: 10 GB
- CPU: 4 (2.3 GHZ cores)
- Oracle Database version: Oracle Database 12c R2
- File system: ASM
- Number of diskgroups per database: 3
- Number of physical volumes per database: 10
- Number of database per host: 3

Mount Hosts

- OS: RHEL 7.4
- Kernel: Red Hat Compatible Kernel
- Memory: 10 GB
- CPU: 4 (2.3 GHZ cores)
- Oracle Database version: Oracle Database 12c R2
- Number of Mount hosts: 3

Storage Hardware

- DellSC array model: SC4000; Dell SCOS: 6.7.x; Dell Storage Manager: 16 R2.x

Table 27 Protection service cycle time (DellSC Snapshots)

SERVICE CYCLE TYPE	MEASURED TIME DURATION (HH:MM:SS)
Replication of 1 ASM database	00:01:50
Replication and mount with recovery of 1 ASM database to alternate host	00:05:40
Mount of 1 database without recovery	00:01:10
Mount and Recovery of 1 ASM database on alternate host	00:02:20
Unmount of 1 ASM database	00:02:55
Replication of 10 ASM database	00:12:20
Replication and mount with recovery of 10 ASM database to alternate hosts	00:40:00
Mount of 10 ASM database without recovery	00:15:00
Mount and Recovery of 10 ASM database on alternate (Three) hosts	00:17:00
Unmount of 10 ASM database	00:18:00

*Does not include time for rotation of copies.

AppSync 3.7.0.1 used for protecting 10 Oracle database

ORACLE DATABASE PROTECTION SERVICE CYCLE TIME ESTIMATES (UNITY SNAPSHOTS)

HARDWARE SPECIFICATIONS THAT WERE USED FOR ORACLE DATABASE TESTING

AppSync Server

- OS: Windows Server 20012 R2
- Memory: 8GB
- CPU: 4 (2.3 GHZ cores)

Oracle Database Production Hosts

- OS: RHEL 7.4
- Kernel: Red Hat Compatible Kernel
- Memory: 10 GB
- CPU: 4 (2.3 GHZ cores)
- Oracle Database version: Oracle Database 18c
- File system: LVM
- Number of physical volumes per database: 30
- Number of database per host: 2

Mount Hosts

- OS: RHEL 7.4
- Kernel: Red Hat Compatible Kernel
- Memory: 10 GB
- CPU: 4 (2.3 GHZ cores)
- Oracle Database version: Oracle Database 18c
- Number of Mount hosts: 1

Storage Hardware

- Unity array model: Unity 400; Software version: 4.2.2

Table 268 and 29 shows the observed service cycle time estimate for a very large-scale Oracle Database protected with the Bronze service plan.

Table 28 Protection service cycle time (Unity Snapshots) local Copy and luns in consistency group

SERVICE CYCLE TYPE	MEASURED TIME DURATION (HH:MM:SS)
Replication of 1 Filesystem database	00:10:00
Replication and mount with recovery of 1 Filesystem database to alternate host	00:30:00
Mount of 1 database without recovery	00:10:00
Mount and Recovery of 1 Filesystem database on alternate host	00:12:00
Unmount of 1 Filesystem database	00:10:00

*Time includes time for rotation of copies.

** 5K IOPS on Unity array

Table 29 Protection service cycle time (Unity Snapshots) local Copy and luns not in consistency group

SERVICE CYCLE TYPE	MEASURED TIME DURATION (HH:MM:SS)
Replication of 1 Filesystem database	00:13:00
Replication and mount with recovery of 1 Filesystem database to alternate host	00:35:00
Mount of 1 database without recovery	00:12:00
Mount and Recovery of 1 Filesystem database on alternate host	00:13:00
Unmount of 1 Filesystem database	00:10:00

*Time includes time for rotation of copies.

** 5K IOPS on Unity array

Table 2630, 31, 32 and 33 shows the observed service cycle time estimate for a very large-scale Oracle Database protected with the Silver service plan

Table 30 Protection service cycle time (Unity Snapshots) sync remote Copy and luns in consistency group

SERVICE CYCLE TYPE	MEASURED TIME DURATION (HH:MM:SS)
Replication of 1 Filesystem database	00:13:00
Replication and mount with recovery of 1 Filesystem database to alternate host	00:37:00
Mount of 1 database without recovery	00:12:00
Mount and Recovery of 1 Filesystem database on alternate host	00:13:00
Unmount of 1 Filesystem database	00:11:00

*Time includes time for copy rotation.

** 5K IOPS on Unity array

Table 31 Protection service cycle time (Unity Snapshots) sync remote Copy and luns not in consistency group

SERVICE CYCLE TYPE	MEASURED TIME DURATION (HH:MM:SS)
Replication of 1 Filesystem database	00:21:00
Replication and mount with recovery of 1 Filesystem database to alternate host	00:35:00
Mount of 1 database without recovery	00:14:00
Mount and Recovery of 1 Filesystem database on alternate host	00:15:00
Unmount of 1 Filesystem database	00:10:00

*Time includes time for copy rotation.

** 5K IOPS on Unity array

Table 32 Protection service cycle time (Unity Snapshots) async remote Copy and luns in consistency group

SERVICE CYCLE TYPE	MEASURED TIME DURATION (HH:MM:SS)
Replication of 1 Filesystem database	00:20:00
Replication and mount with recovery of 1 Filesystem database to alternate host	00:33:00
Mount of 1 database without recovery	00:12:00
Mount and Recovery of 1 Filesystem database on alternate host	00:13:00
Unmount of 1 Filesystem database	00:11:00

*Time includes time for copy rotation.

** 5K IOPS on Unity array

Table 33 Protection service cycle time (Unity Snapshots) async remote Copy and luns not in consistency group

SERVICE CYCLE TYPE	MEASURED TIME DURATION (HH:MM:SS)
Replication of 1 Filesystem database	00:32:00
Replication and mount with recovery of 1 Filesystem database to alternate host	01:00:00
Mount of 1 database without recovery	00:15:00
Mount and Recovery of 1 Filesystem database on alternate host	00:16:00
Unmount of 1 Filesystem database	00:12:00

*Time includes time for copy rotation.

** 5K IOPS on Unity array

ORACLE DATABASE PROTECTION SERVICE CYCLE TIME ESTIMATES (POWERMAX SNAPS) WITH LARGE NUMBER OF DATA FILES (21K)

HARDWARE SPECIFICATIONS THAT WERE USED FOR ORACLE DATABASE TESTING

AppSync Server

- OS: Windows Server 2019
- Memory: 32 GB
- CPU: 16 (Cores: 2, Socket: 8, 2.3 GHZ)
- AppSync Server and agent version: 4.0.0.0

Oracle Database Production Hosts

- OS: RHEL 7.4 virtual machine
- Kernel: Red Hat Compatible Kernel
- Memory: 64 GB
- CPU: 20 (Cores: 2, Socket: 10, 2.3 GHZ)
- Oracle Database version: Oracle Database 12c
- File system/ASM: ASM (Five diskgroups: 3 diskgroups for data, 1 diskgroup for redo logs and 1 diskgroup for archive logs. All disk groups created on virtual disks presented to VM)
- Number for datafiles: 21K
- DB Size: 10 TB
- Number of physical volumes per database: 100
- LUN Size: 100 GB each
- Number of databases per host: 1

Mount Hosts

- OS: RHEL 7.4 virtual machine
- Kernel: Red Hat Compatible Kernel
- Memory: 64 GB
- CPU: 20 (Cores: 2, Socket: 10, 2.3 GHZ)
- Oracle Database version: Oracle Database 12c
- Number of Mount hosts: 1

Storage Hardware

- PowerMax array model: PowerMax2000; Software version: 5978.479.479
- U4P Version: 9.1.0.9; Standalone Appliance
- Storage Configuration: SRDF/A

Note:

1. AppSync recommends use of standalone U4P over embedded U4P to manage PowerMax arrays. We have noticed performance issues in AppSync when embedded U4P is used for managing PowerMax arrays in AppSync.
2. All the numbers in the below tables are focused on SnapVxsnap as SnapVxclone is not very popular use case with PowerMax arrays as recommended by PowerMax array team.
3. Note all the times mentioned in the below tables does not include copy rotation time.
4. All times mentioned below are specific to VMware environment, using physical (production and mount) hosts can considerably reduce time take for appsync operations like mount and unmount.
5. Configuring iscsi on mount host in VMware environment may also bring down mount and unmount time in AppSync.

Tables 34, 35, 36, 37, 38, 39, 40 and 41 shows the observed service cycle time estimate for a very large-scale Oracle Database protected with the various service plans.

Table 34 Protection service cycle time (SnapVxSnap hot backup copy) local Copy (Bronze ServicePlan) and luns in storage group

SERVICE CYCLE TYPE	MEASURED TIME DURATION (HH:MM:SS)	SERVER MAXIMUM MEMORY (GB)
Replication of 1 ASM database*#	00:25:00	7.7
Replication and mount with recovery of 1 ASM database to alternate host	01:00:00	7.7
Mount and Recovery of 1 ASM database to alternate host	00:35:00	7.7
Unmount of 1 ASM database	00:18:00	7.7
Expire 1 copy	00:34:00	6.5

*Duration does not include copy rotation time. #Duration include initial automatic provisioning of target devices

Table 35 Protection service cycle time (SnapVxSnap no hot backup copy) local Copy (Bronze ServicePlan) and luns in storage group

SERVICE CYCLE TYPE	MEASURED TIME DURATION (HH:MM:SS)	SERVER MAXIMUM MEMORY (GB)
Replication of 1 ASM database*#	00:20:00	7.7
Replication and mount with recovery of 1 ASM database to alternate host	00:50:00	7.7
Mount and Recovery of 1 ASM database to alternate host	00:30:00	7.7
Unmount of 1 ASM database	00:14:00	7.7
Expire of 1 copy	00:34:00	6.5

*Duration does not include copy rotation time. #Duration include initial automatic provisioning of target devices

Table 36 Protection service cycle time (SnapVxSnap hot backup copy) remote Copy (Silver ServicePlan) and luns in storage group

SERVICE CYCLE TYPE	MEASURED TIME DURATION (HH:MM:SS)	SERVER MAXIMUM MEMORY (GB)
Replication of 1 ASM database*#	00:28:00	7.7
Replication and mount with recovery of 1 ASM database to alternate host	01:05:00	7.7
Mount and Recovery of 1 ASM database to alternate host	00:35:00	7.7
Unmount of 1 ASM database	00:18:00	7.7
Expire 1 copy	00:34:00	6.5

*Duration does not include copy rotation time. #Duration include initial automatic provisioning of target devices

Table 37 Protection service cycle time (SnapVxSnap no hot backup copy) remote Copy (Silver ServicePlan) and luns in storage group

SERVICE CYCLE TYPE	MEASURED TIME DURATION (HH:MM:SS)	SERVER MAXIMUM MEMORY (GB)
Replication of 1 ASM database*#	00:23:00	7.7
Replication and mount with recovery of 1 ASM database to alternate host	00:55:00	7.7
Mount and Recovery of 1 ASM database to alternate host	00:30:00	7.7
Unmount of 1 ASM database	00:14:00	7.7
Expire of 1 copy	00:34:00	6.5

*Duration does not include copy rotation time. #Duration include initial automatic provisioning of target devices

Table 38 Repurpose 1st gen cycle time (SnapVxSnap hot backup copy) local copy and luns in storage group

SERVICE CYCLE TYPE	MEASURED TIME DURATION (HH:MM:SS)	SERVER MAXIMUM MEMORY (GB)
Replication of 1 ASM database*#	00:38:00	7.7
Replication and mount with recovery of 1 ASM database to alternate host	01:05:00	7.7
Mount and Recovery of 1 ASM database to alternate host	00:25:00	7.7
Unmount of 1 ASM database	00:18:00	7.7
Expire 1 copy	00:34:00	6.5

Table 39 Repurpose 2nd gen cycle time (SnapVxSnap hot backup copy) local copy and luns in storage group

SERVICE CYCLE TYPE	MEASURED TIME DURATION (HH:MM:SS)	SERVER MAXIMUM MEMORY (GB)
Replication of 1 ASM database*#	00:10:00	7.7
Replication and mount with recovery of 1 ASM database to alternate host	00:45:00	7.7
Mount and Recovery of 1 ASM database to alternate host	00:35:00	7.7
Unmount of 1 ASM database	00:18:00	7.7
Expire 1 copy	00:34:00	6.5

Table 40 Repurpose 1st gen cycle time (SnapVxSnap no hot backup copy) local copy and luns in storage group

SERVICE CYCLE TYPE	MEASURED TIME DURATION (HH:MM:SS)	SERVER MAXIMUM MEMORY (GB)
Replication of 1 ASM database*#	00:28:00	7.7
Replication and mount with recovery of 1 ASM database to alternate host	00:55:00	7.7
Mount and Recovery of 1 ASM database to alternate host	00:25:00	7.7
Unmount of 1 ASM database	00:18:00	7.7
Expire 1 copy	00:34:00	6.5

Table 41 Repurpose 2nd gen cycle time (SnapVxSnap no hot backup copy) remote copy and luns in storage group

SERVICE CYCLE TYPE	MEASURED TIME DURATION (HH:MM:SS)	SERVER MAXIMUM MEMORY (GB)
Replication of 1 ASM database*#	00:10:00	7.7
Replication and mount with recovery of 1 ASM database to alternate host	00:40:00	7.7
Mount and Recovery of 1 ASM database to alternate host	00:30:00	7.7
Unmount of 1 ASM database	00:18:00	7.7
Expire 1 copy	00:34:00	6.5

*Duration does not include copy rotation time. #Duration include initial automatic provisioning of target devices.

**ORACLE DATABASE PROTECTION SERVICE PLAN CYCLE TIME COMPARISON:
APPSYNC 3.9.0.0 VS 4.0.0.0 WITH LARGE NUMBER OF DATAFILES (21K) ON
POWERMAX ARRAY**

Tables 42 and 43 shows the observed service cycle time estimate for a very large-scale Oracle Database protected with the various service plans with AppSync 4.0.0.0 and 3.9.0.0

Oracle Database Layout:

No. of database: 1
Database size: 10 TB (100 luns of 100 GB each)
Storage: PowerMax 2000
No. of datafiles: 21K
Database type: ASM

Table 42 Bronze Service Plan (local copy) Hot backup copy (including archive logs)

SERVICE CYCLE TYPE	MEASURED TIME DURATION (HH:MM:SS)	
	APPSYNC 4.0.0.0	APPSYNC 3.9.0.0
Protection	00:25:00	01:30:00
Mount and recover	00:35:00	00:35:00
Unmount	00:18:00	Unmount fails
Expire	00:34:00	Expire fails

Table 43 Silver Service Plan (Remote copy SRDF/A) Hot backup copy (including archive logs)

SERVICE CYCLE TYPE	MEASURED TIME DURATION (HH:MM:SS)	
	APPSYNC 4.0.0.0	APPSYNC 3.9.0.0
Protection	00:28:00	01:56:00
Mount and recover	00:35:00	00:35:00
Unmount	00:18:00	Unmount fails
Expire	00:34:00	Expire fails

END USER RESPONSE TIMES WITHIN APPSYNC USER INTERFACE

Table 44 lists the estimated end user response times for common actions. These actions are based on AppSync's protection of 20 application objects that each has 100 successful copies. The AppSync Server was put under a moderate workload while the UI response times were gathered.

Note: Use Google Chrome for better UI performance with AppSync 4.0 and beyond.

Table 44 End User Response times within AppSync UI

UI TASK	MEASURED TIME DURATION (HH:MM:SS)
Clicking to see a list of Application Servers or Datacenters or Servers hosting FileSystems	3 seconds
Clicking to see a list of Databases or Datastores or FileSystems owned by a parent application instance	3-4 seconds
Clicking to see a list of 100 copies for a specific Database or FileSystem or Datastore	3-4 seconds
Clicking on a specific copy for Events data	3-4 seconds
Clicking on a Service plan	3 - 4 seconds
Clicking on a specific Service Plan Cycle within the Events tab for a service plan	10 seconds

* AppSync 4.0.0.0 SQL service plan copies tab takes about 4 mins to load with 10000 copies.

BEST PRACTICES

- To avoid nslookup resolution delays, when registering in AppSync, provide IP addresses instead of the Full DNS names for AppSync clients and Application Servers and Storage Arrays.
- For quick name resolutions, provide IP addresses and AppSync Clients Host names in the AppSync Server at: C:\Windows\System32\drivers\etc\hosts.
- For quick AppSync Server host name resolution, provide the IP address and the AppSync Server name in AppSync Clients in one of the following files:
 - For UNIX Servers: /etc/hosts
 - For Windows Servers: C:\Windows\System32\drivers\etc\hosts

XtremIO:

- For faster copy operation responses, configure one XMS Server for one XtremIO Cluster. This step reduces the load on the XMS Server.
- Include the XMS Sever and AppSync Server as part of one DNS Domain.
- Configure the XMS Server IP address and the XMS Server name in the following AppSync Server file: C:\Windows\System32\drivers\etc\hosts file

VMAX:

- Provide a dedicated SMI-S Host Provider per VMAX Array for higher performance gains in the SMI-S calls to the VMAX array.
- Follow the SMI-S Provider/UniSphere Configuration recommendations.
- Provide a dedicated Unisphere to manage PowerMax arrays for higher performance, we have noticed intermittent performances issues when embedded Unisphere is used to manage PowerMax arrays in AppSync.
- U4P or SMI-S should not be installed on AppSync server host.

APPSYNC SERVER SETTINGS FOR PERFORMANCE FINE TUNE

Contact DELL EMC Customer Support to configure AppSync Server Settings for performance fine tuning based on deployment size.

Note: Server settings is now available in UI Advanced setting.

CONFIGURING MULTIPLE CONCURRENT SERVICE PLAN RUN ON APPSYNC SERVER:

If user has started a service plan and it is waiting for another server plan for completion (with info in server log "current weight of work in the system is 60, max allowed is: 50") this can be due to internal AppSync server throttling for optimal performance.

AppSync internal variable "throttle.maxweight" decides the number of service plans that can run simultaneously in an AppSync server. A new service plan can run only if current weight on AppSync server is below "throttle.maxweight".

Other related variables are "throttle.application.weight" and "throttle.phase.weight".

"throttle.maxweight" = "throttle.phase.weight" + "application weight"

"application weight" = number of *application* X "throttle.application.weight"

Where one application means one database or filesystem or datastore

Default value of these variables are

"throttle.maxweight" = 50

"throttle.application.weight" = 1

"throttle.phase.weight" = 10

In the examples below, next service plan run will wait in both cases:

1. "throttle.maxweight" will be 50 if a service plan with 40 applications subscribed is running.
2. "throttle.maxweight" will be 50 if 2 service plans with subscription of 15 applications are running.

IF user also wants to run next service plan together, then "throttle.maxweight" variable needs to be modified in consultation with Dell EMC customer support team. Increasing "throttle.maxweight" is subjected to available resources (CPU and RAM) on the host hosting AppSync server.

CONCLUSION

DELL EMC AppSync Servers are optimized and proven to achieve a high level of performance for a discrete number of application objects, to ensure that the end user can achieve the Recovery Point objectives that are offered for all the service plans that are bundled with the product.

REFERENCES

This section lists related documentation.

WHITE PAPERS

- *Advanced Protection for Microsoft Exchange 2010 on EMC VNX Storage – EMC VNX and EMC AppSync*
- *Enhancing the Performance and Protection of Microsoft SQL Server 2012 – EMC Next-Generation VNX, EMC FAST Suite, EMC AppSync, EMC PowerPath/VE, VMware vSphere*
- *Implementing FAST VP and Storage Tiering on Oracle Database 11g and EMC SYMMETRIX VMAX*
- *AppSync with VMAX all Flash*

PRODUCT DOCUMENTATION

For additional information, see the following documentation:

- *AppSync Installation-and-Configuration-Guide*
- *AppSync User-and-Administration-Guide*
- *Security-Configuration-Guide*
- *AppSync REST API Reference*

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