

GNAST REQUIREMENTS, TEST PLAN & TEST RESULTS

For

EMC VMAX3

Storage and Backup Engineering

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1. **Document Purpose**

This document provides the requirements, basic test plan, for EMC VMAX3 Storage array and supporting management infrastructure.

2. **Owner of Standard**

GNAST (Global Network Architecture and Standards Team) is the owner of this standard and the related documents. CATE (Citi Architecture & Technology Engineering) is the custodial organization. CitiNetwork & CitiStorage Platform Engineering technologists will drive and generate content.

3. **Intended Audience**

The intended audience is CitiNetwork & CitiStorage Engineering, Global and Regional Operations and Engineering personnel responsible for designing, building, supporting, and managing VMAX3 Storage array and supporting management infrastructure, deployed within Citi.

4. **Principles**

4.1. **Revision History**

Version	Description	Date	Author/ Contact Information
0.1	Initial Draft	12-11-2014	Carl Williams
1.0	Initial GNAST Standard	dd-mm-yyyy	Author
1.1	Test Results (Draft)	03-23-2015	Quang Le

4.2. **VMAX3 Overview**

EMC's VMAX3 is the 3rd Generation of the VMAX Storage array – With the previous generations already certified for use within Citi, this will be classified as a 'Maintain' project.

This certification effort introduces support for:

- EMC's Symmetrix VMAX3 Storage array
- HYPERMAX OS 5977
- Solutions Enabler 8.0.2.0 (Edit Level: 2004)
- Unisphere for VMAX 8.0.2.6

EMC's VMAX3 Storage array and supporting management products was released by EMC on September 25th 2014, however certain key features used in Citi will not be available until a code release sometime in Q4 – as such this certification effort will be split into phases to reflect the products readiness.

Phase1:

- VMAX3 Storage array
 - Configured for Non Replicated storage
- Management platforms

- Solutions Enabler

Phase2:

- VMAX3 Storage array
 - Configured for Replicated Storage
 - SNAPVX
- Management platforms
 - Unisphere for VMAX
 - SMI-S

4.2.1. Schedule

- Target for Phase 1 certification completion is **March 31st 2015** so that CTI can deploy hardware already purchased.
- Target for Phase 2 certification completion is **May 29th 2015**
- Some non-critical Items that are currently in scope may be dropped from either phase if there are issues with the certification that will push out the target date and impact CTI's deployment schedule.

4.3. Product Components

VMAX3 Storage array – configured with 2.7GHz, 48 Core Ivy-Bridge engines with 1TB of memory per engine.

VMAX3 storage array supports performance and capacity disks to maximize array performance across all drive types utilizing Fully Automated Storage Tiering (FAST) to fine tune performance according to application workload requirements.



The system bay will house 1-2 engines.



System bays contain 2-4 disk enclosures



System bay also contains power supplies with LI-ON battery backup, Virtual matrix Infiniband interconnect, and component cabling.

4.4. Key Feature Changes

This is the initial release of EMC VMAX3 & Hypermax OS. Many of the features have been changed or simplified from previous generations the following are the key changes:

- Array set up
- FAST set up
- Service Level Objective Provisioning
- FAST SRDF - *TBC*
- SNAP VX

4.5. Citi Production Configuration Standards Attestation

Has the solution you are certifying been tested against Citi's production configuration standards?

Test plan and results fully comply with GNAST Configuration Guide for EMC VMAX3.

4.6. Key Features Tested

This is a snapshot of mandatory and required key features tested with pass/fail/outcome.

Feature	Mandatory/Optional	Test Result (Pass/Fail)
1. Installation/Configuration	Mandatory	Pass
2. Rolling Upgrades	Mandatory	Pass
3. Provisioning	Mandatory	Pass
4. Security features	Mandatory	Pass
5. SANstack integration	Mandatory	Partial Pass
6. CLI Functionality	Mandatory	Pass
7. Security Testing (CIVA)	Mandatory	In Progress
8. Failure Testing	Mandatory	Pass
9. Event Notification (Tivoli)	Mandatory	Pass
10. Log Reconciliation (ArcSight/SEMs)	Mandatory	Pass
11. Capacity/Chargeback reporting (SRM)	Mandatory	In Progress
12. Automated SBCC (HPNA)	Mandatory	Pass

4.7. Issues and Limitations

The following table specifies notable limitations and capabilities of the current Hypermax OS release level as well as planned releases of Hypermax OS¹.

Hypermax Code Level	Notable Limitations	Notable Capabilities
5977.596.583	- DAE additions not supported. - Online Virtual Matrix upgrade not supported - Engine memory upgrades not supported - Flash I/O module addition/upgrade not supported - Online addition of 16 Gb FC I/O modules not supported - Online addition of engines not supported - Changes to SRP configuration not supported (with the exception of expanding and adding SRP pools) - LUN expansion not supported - SRDF not supported on 16Gb card ports	- Non-disruptive Hypermax code upgrade - Add drives to existing DAEs online - Expansion of current SRP pools - Addition of new SRP pools
September Release	TBD	DAE additions

¹ Refer to the EMC Release Notes for 5977.596.583 for more detailed information.

		○ Online Virtual Matrix ○ Engine memory upgrades ○ Flash I/O module addition/upgrade ○ Online addition of engines ○ Changes to SRP configuration ○ LUN expansion ○ SRDF on 16Gb card ports (at 4/8/16Gb)
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The following are issues and limitations found in testing for this certification:

Category	Description
Fault Tolerance	Local RAID is part of the VMAX3 architecture which puts all members of a RAID group local to a single engine. It is no longer possible to distribute RAID members across engines to protect against a single engine failure that would result in data unavailable. EMC has made this architectural decision to improve performance and speed of recovery for drive failures.
Configuration	Cannot delete devices until all allocated space is freed. Must issue the 'symdev free -all' command to free the device allocation before deleting. Refer to KB000193460.
Audit logging	Symaudit log entries have a 32 char limit for username and 11 char limit for client hostname. Any entries beyond that will result in a truncated username or client hostname.
SAN Stack	• Windows 2008 SAN stack ○ Powerpath 5.5 not supported • RHEL 5.11 Cluster SAN Stack ○ Configuration is not included on Symantec Veritas 5.1 SP1 RP4 HCL ○ No Array Support Library (VRTSaslapm package) available from Symantec for 5.1 SP1 RP4 ○ VCS 5.1 SP1 RP4 Configuration is not qualified by EMC on ESM • Veritas SAN Support Pack for RHEL6 (this is a replacement for PowerPath with Veritas on RHEL6) ○ In CATE lab testing, we are unable to configure fencing on VMAX3 devices when using VxDMP 6.0.5. However, VMAX3 works when using PowerPath. ○ VMAX3 is listed as only supported with VCS 6.0.5 with compatibility mode. Currently investigating with Symantec what this refers to.
Host-based access control	Hostname limited to 31 chars. The error message states a 32 char limit but actually is a 31 char limit.
MMCS Anti-Virus	The current ePO implementation for earlier Symmetrix models does not work with the VMAX3 MMCSs. EMC has submitted an RPQ to provide a new solution for the VMAX3 MMCSs.
CIVA Testing	Citi's CIVA testing was started but not completed at the time of release of this document.

5. Requirements Overview

5.1. Hardware Requirements

All specific hardware configurations and best practices are discussed in the GNAST Configuration Guide for VMAX3 that will be located on the CATE standards page:

<https://catecollaboration.citigroup.net/domains/platstor/gdse/products/default.aspx>

5.2. Software Requirements

Below is a table providing the versions of software and O.S. Platforms for this initial release of the management products for EMC VMAX3.

Component Name	Version / Platform
Solutions Enabler	V8.0.2 / RHEL 5.x/6.x
Solutions Enabler	V8.0.2 / Windows 2008 and 2012 R2
Unisphere for VMAX	V8.0.2 / Windows 2008 and 2012 R2

Any required software that is needed prior to installing any VMAX3 storage array is discussed in the GNAST Configuration Guide that will be located on the CATE standards page:

<https://catecollaboration.citigroup.net/domains/platstor/gdse/products/default.aspx>

5.3. System/Functional Requirements

5.3.1. System and Network Management Test

This section covers Systems and NMS tools required by the respective operations teams for turnover to production.

Review [NMS / PLC Certification Process](#) for details

You must provide email evidence showing all requirements has been met and that CitiNetwork Services team has signed off confirming their approval. Embed email evidence to 5.3.x section below. **GNAST approval will not be issued without this evidence.**

5.3.2. Smarts

Test Details/Action	Capture evidence to show discovery and event management of Device Under Test by EMC Smarts Fault Management platform.
---------------------	---

Expected Results	
Actual Results	Not in scope for integration testing. Storage Equipment does not use Smarts
Email evidence Net Serv has signed off on PLC evidence (embed email)	
Additional comments	Please supply link to the Network Services SharePoint site where evidence is stored for this effort/test.

☐ PASS
 ☐ FAIL
 ☐ CONDITIONAL PASS
 ☒ Not APPLICABLE (WITH DETAIL)

5.3.3. Hewlett Packard Network Automation

Test Details/Action	Capture evidence to show discovery and event management of Device Under Test by Hewlett Packard Network Automation Configuration and Device inventory Tool
Expected Results	HPNA check should result in no fails.
Actual Results	HPNA discovered the VMAX3s successfully. The HPNA checks resulted with no fails.
Additional comments	

☒ PASS
 ☐ FAIL
 ☐ CONDITIONAL PASS
 ☐ Not APPLICABLE (WITH DETAIL)

5.3.4. InfoVista

Test Details/Action	Capture evidence to show discovery and event management of Device Under Test by InfoVista Performance Management Tool
Expected Results	
Actual Results	Not in scope for integration testing. Storage equipment uses EMC SRM & U4Vfor performance Management
Email evidence Net Serv has signed off on PLC evidence (embed email)	
Additional comments	Please supply link to the Network Services SharePoint site where evidence is stored for this effort/test.

☐ PASS
 ☐ FAIL
 ☐ CONDITIONAL PASS
 ☒ Not APPLICABLE (WITH DETAIL)

5.3.5. Event Notification (Tivoli)

Test Details/Action	Capture evidence to show discovery and event management of Device Under Test by Tivoli
Expected Results	Events captured by Tivoli Monitor and alerts on events in the include list.
Actual Results	Results as expected.
Additional comments	The new solution requires the ITM agent installed on the RHEL Solutions Enabler server and configured to connect to the ITM TEMS server to have the KLO agent for VMAX3 agent installed.

☒ **PASS**
☐ **FAIL**
☐ **CONDITIONAL PASS**

5.3.6. SEMs/ArcSight (Log Reconciliation)

Test Details/Action	Capture evidence to show discovery and event management of Device Under Test by SEMs/ArcSight
Expected Results	Symaudit entries for user-initiated changes are captured by the SEMS system.
Actual Results	Results as expected.
Additional comments	Symaudit log entries have a 32 char limit for username and 11 char limit for client hostname. Any entries beyond that will result in a truncated username or client hostname.

☒ **PASS**
☐ **FAIL**
☐ **CONDITIONAL PASS**

5.4. Technical Requirements

Testing and certification will only be conducted on Software versions and Operating Systems listed in the [Software Requirements](#) section of this document. Only features and functionality specifically listed in the [Functionality in Scope](#) section of this document will be considered part of this certification.

5.5. Business/User Requirements

VMAX3 was purchased in Citigroup as part of 2014 Q3 Global Storage deal. Any Region, Business, or Customer of any kind wishing to build and use VMAX3 should contact CATE Storage Engineering.

5.6. Integration/Compatibility Requirements

5.7. Performance Requirements

Performance targets for VMAX3 is
 > 450 IOPS/TB for Silver
 > 900 IOPS/TB for Gold.

5.8. **Security Requirements**

All VMAX management products will run on SOE built platforms which will require single sign-on access (KRB or AD). Once logged into a server the users Kerberos group needs to be mapped to an appropriate symauth role to be provided privileges to run certain CLI commands. All details of the required security configuration will be listed in the GNAST Configuration Guide -.

5.9. **Capacity/Stress Test Requirements**

It is not possible to get an environment large enough to appropriately stress test the VMAX3.
Citi will need to rely on EMC for Stress tested using vendor provided equipment and labs.

5.10. **Continuity of Business Requirements**

Individual environments would be responsible for their own COB if their application requires it.

The second phase of VMAX3 Certification will cover the remote replication feature that will provide applications with remote copy of data for COB purposes.

5.11. **Backup & Restore Requirements**

Data is mirrored internally to the array, therefore traditional backups are not applicable.
Array based replication will be tested in Phase 2.

6. **Test Scope**

The purpose of this testing is to certify new EMC VMAX3 block storage and management infrastructure for production use.

6.1. **Functionality in Scope**

Below is a list of items that will be in scope for this EMC VMAX3 certification. All configuration instructions and setting for this project will be recorded in the Solutions Guide document, and all test results will be recorded in the Release Notes document.

6.1.1. **Phase 1**

Function, feature or component	Work Effort			Rely on EMC for Testing or Best Practice
	Light	Med	Heavy	
Information Security Assessment				

ISRP			√	√
CIVA SCAN (to Include U4V product)			√	√
CATE Process Compliance				
GNAST				
CTC				
Hardware				
VMAX3 hardware configuration standards:			√	√
Base SE Components & HYPERMAX OS				
Base Solutions Enabler functions - Base commands - Including symacl, symauth (AD Group support) - GNS.			√	
Solutions Enabler Packaging (Redhat)	√			
Functionality/Feature				
eLicensing	√			√
Virtual Provisioning: - General VP functionality re-certification - Best practices - Other Miscellaneous new features			√	√
FAST VP: - 5977 enhancements/changes, including SLO provisioning			√	√
Integration testing				
ESRS		√		√
SRM		√		√
HPNA - Including any updates to the existing SBCC		√		√
SEMS		√		
Tivoli		√		
ePO		√		√
DRA (TBC)	√			√
SAN stack verification with VMAX3 & 5977				
AIX SAN stacks		√		√
Solaris SAN stacks		√		√
ESX SAN stacks		√		√
Windows SAN stacks		√		√
Redhat Linux SAN stacks		√		√

6.1.2. Phase 2

Function, feature or component	Work Effort			Rely on EMC for Testing or Best Practice
	Light	Med	Heavy	
VMAX3 & HYPERMAX OS Functionality/Features				
Replication: - General replication functionality - ZSR - Existing Script impact/changes			√	√
FAST SRDF (To be Confirmed)			√	√
SNAP VX: - General SNAP VX functionality certification - Script impact/Changes			√	√
U4V Components				
Unisphere for VMAX configuration and Functions - Hardware - Security Reporting & Feature enhancements			√	√
Solutions Enabler Packaging - (Windows for U4V ONLY)	√			√
SMI-S -				
SMI-S Base configuration / Set up			√	√
- Integration testing				
ViPR		√		√
SRM via SMIS		√		√

6.2. **Functionality not in Scope**

Functionality that will not be considered in scope for this project is listed below:

Protectpoint
Federated Tiered Storage
File services
Open Replicator
Onboard Applications

6.3. **Test Lab Configuration**

For this initial release of VMAX3 the test environment was very small and only intended for functional testing. The following sections will detail the test environment used for this certification.

6.3.1. *Hardware*

VMAX3 : 2 Engine 200K – 2TB Memory	
Module or Part Number	Description
VMAX3 200K	
600GB Drive	600GB 10K SAS disk @ Raid 1
1200GB Drive	1200GB 10K SAS disk @ Raid 6 (6+2)
800GB Drive	800GB Flash Drive @ Raid 5 (3+1)
VMAX3 : 2 Engine 200K – 2TB Memory	
Module or Part Number	Description
VMAX3 200K	
600GB Drive	600GB 10K SAS disk @ Raid 1
1200GB Drive	1200GB 10K SAS disk @ Raid 6 (6+2)
800GB Drive	800GB Flash Drive @ Raid 5 (3+1)

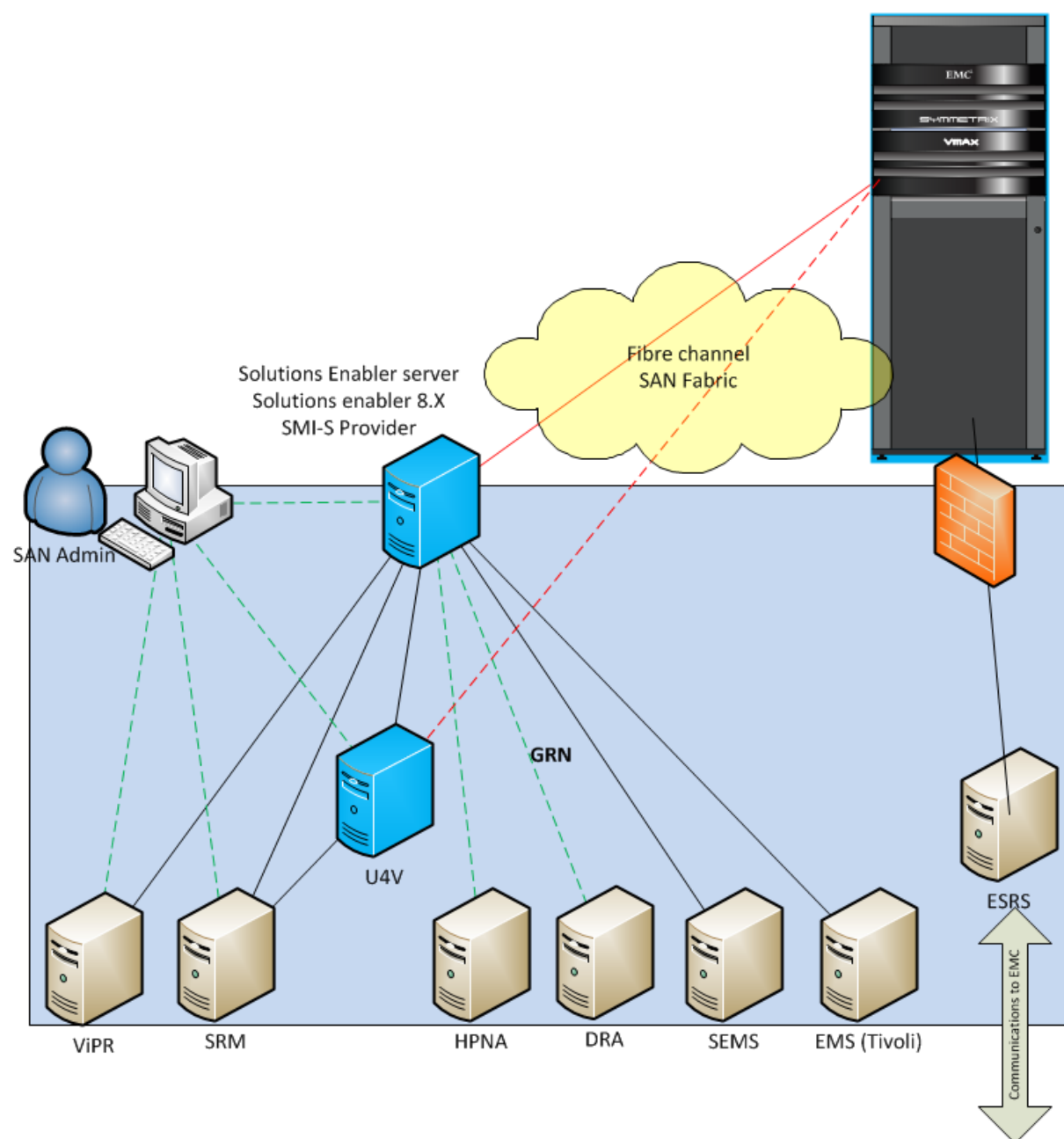
6.3.2. *Software*

Vendor Part /Version	Description	Build	Product O/S	Feature Set	Image Filename
8.0.2.0	Solutions Enabler		RHEL 6.5 (SOE Built)		
8.0.2.0	Solutions Enabler		Win 2008 R2		
8.0.2.6	Unisphere for VMAX server		Win 2008 R2		
5977.596.583	Hypermax OS for VMAX3		Hypermax		

6.3.3. *Test Equipment*

Aside from the hardware detailed, a selection of servers/OS's will be provisioned storage in order to test some SAN Stack elements

6.3.4. Network Layout/Topology



6.3.5. Parameter/Communication Protocol

All VMAX3 Data traffic is block storage over Fibre Channel Protocol.
IP is used for Vendor remote access

Network Addressing

Device	IP Address	Subnet	Mask	VLAN	Note
Solutions Enabler	10.40.42.90	10.40.42.0	255.255.255.0		
U4V	10.40.52.45	10.40.52.0	255.255.255.0		
ESRS	10.40.45.110 10.40.45.146	10.40.45.0	255.255.255.0		

7. Testing & Results

7.1. Hardware Test

The purpose of this test is to verify that: VMAX3 storage array hardware components are fully redundant and can recover from any single hardware failure.

Test Details/Action	Vendor test plans/results will be leveraged for this section.
Expected Results	Every FRU (Field Replaceable Unit) is tested by EMC before the VMAX3 is released. And the FRUs are not just tested once to say it was "done." Both hardware and software tests are run continuously for the life of the product. Each new code release will have a specified number of regression cycles that have tests for both new and legacy features.
Actual Results	EMCE QE designates basic functionality tests as "Must Pass Test Cases" (MPTC) that must be run and must pass during each regression cycle. Other corner cases are run either as part of regression cycles, as well as independently.
Additional comments	

☒ PASS ☐ FAIL ☐ CONDITIONAL PASS ☐ Not APPLICABLE

7.2. Software Test

The purpose of this test is to verify that: the Solutions Enabler and Unisphere test environment has the correct versions that will be certified for production.

Test Details/Action	- Show software version from Solutions enabler CLI - Show software version from login screen from U4V
Expected Results	SE version should be 8.0.2
Actual Results	Version matches
Additional comments	

☒ PASS ☐ FAIL ☐ CONDITIONAL PASS ☐ Not APPLICABLE

7.3. System/Functional Test

7.3.1. Basic Functionality Test

The purpose of this test is to verify that: Provision VMAX3 storage to a host server.

Test Details/Action	• Create a LUN • Mask the LUN to an SOE server • Validate the LUN exists on the SOE server • Verify the SOE server can format or write to the LUN
Expected Results	LUNs should be discoverable and usable by the host server.
Actual Results	LUNs provisioned successfully to multiple hosts of various OS types. Hosts were able to discover and read/write from the LUNs
Additional comments	CSBE supported SAN stacks will be verified by EMC e-lab for compatibility with VMAX3.

☒ PASS ☐ FAIL ☐ CONDITIONAL PASS ☐ Not APPLICABLE

7.3.2. Installation/Configuration Test

The purpose of this test is to verify that: Install and configure the VMAX3 Storage array

Test Details/Action	• Verify EMC factory configuration of Disk Groups, TDATs, and SRPs • VMAX3 management infrastructure setup (e.g. management hosts, monitoring systems, reporting systems) • Configure TDEVs (i.e. LUNs) to allocate to hosts • SAN configuration and zoning
Expected Results	Management infrastructure (Unisphere and SE) was able to discover and manage the VMAX3.
Actual Results	Results as expected.
Additional comments	

☒ PASS ☐ FAIL ☐ CONDITIONAL PASS ☐ Not APPLICABLE

The purpose of this test is to verify that: Citi certified Windows SAN stacks supported with VMAX3.

Test Details/Action	• Verify Windows SAN stack support with EMC e-Lab
Expected Results	e-Lab should specify whether the SAN stack versions are supported with VMAX3 or not.
Actual Results	Current Windows SAN stacks supported except for: • Windows 2008 SAN stack • Powerpath 5.5 not supported
Additional comments	

☐ PASS ☐ FAIL ☒ CONDITIONAL PASS ☐ Not APPLICABLE

The purpose of this test is to verify that: Citi certified RHEL SAN stacks supported with VMAX3.

Test Details/Action	• Verify RHEL SAN stack support with EMC e-Lab
Expected Results	e-Lab should specify whether the SAN stack versions are supported with VMAX3 or not.

Actual Results	Current RHEL SAN stacks supported except for: • RHEL 5.11 Cluster SAN Stack ◦ Configuration is not included on Symantec Veritas 5.1 SP1 RP4 HCL ◦ No Array Support Library (VRTSaslapm package) available from Symantec for 5.1 SP1 RP4 ◦ VCS 5.1 SP1 RP4 Configuration is not qualified by EMC on ESM • Veritas SAN Support Pack for RHEL6 (this is a replacement for PowerPath with Veritas on RHEL6) ◦ In CATE lab testing, we are unable to configure fencing on VMAX3 devices when using VxDMP 6.0.5. However, VMAX3 works when using PowerPath. ◦ VMAX3 is listed as only supported with VCS 6.0.5 with compatibility mode. Currently investigating with Symantec what this refers to.
Additional comments	

☐ PASS
 ☐ FAIL
 ☒ **CONDITIONAL PASS**
☐ **Not APPLICABLE**

The purpose of this test is to verify that: Citi certified Solaris SAN stacks supported with VMAX3.

Test Details/Action	• Verify Solaris SAN stack support with EMC e-Lab
Expected Results	e-Lab should specify whether the SAN stack versions are supported with VMAX3 or not.
Actual Results	Current Solaris SAN stacks supported.
Additional comments	

☒ **PASS**
☐ **FAIL**
☐ **CONDITIONAL PASS**
☐ **Not APPLICABLE**

The purpose of this test is to verify that: Citi certified AIX SAN stacks supported with VMAX3.

Test Details/Action	• Verify AIX SAN stack support with EMC e-Lab
Expected Results	e-Lab should specify whether the SAN stack versions are supported with VMAX3 or not.
Actual Results	Current AIX SAN stacks supported.
Additional comments	

☒ **PASS**
☐ **FAIL**
☐ **CONDITIONAL PASS**
☐ **Not APPLICABLE**

7.3.3. Rolling Upgrades

The purpose of this test is to verify that: No firmware upgrades for the VMAX3 storage array will be covered since this is the first release of this generation hardware platform. However, upgrades for management software will be covered.

Test Details/Action	• Upgrade management software on hosts managing VMAX3 (SE and Unisphere) • Roll back management software
---------------------	---

Expected Results	Management software install/upgrade using GPS packaged software.
Actual Results	Installation, upgrade, and rollback of software successful.
Additional comments	

☒ **PASS** ☐ **FAIL** ☐ **CONDITIONAL PASS** ☐ **Not APPLICABLE**

7.3.4. Host Path Failure Testing

The purpose of this test is to verify that: Test failure of host paths and still be able to service requests

Test Details/Action	- Host multipathing software - Simulate path failure on host, SAN switch, and storage FE port
Expected Results	Host should not lose access to LUN on a single path failure.
Actual Results	Results as expected
Additional comments	CSBE supported SAN stacks will be verified by EMC e-lab for compatibility with VMAX3.

☒ **PASS** ☐ **FAIL** ☐ **CONDITIONAL PASS** ☐ **Not APPLICABLE**

7.3.5. CLI Testing

The purpose of this test is to verify that: Validation of environment discovery CLI commands

Test Details/Action	- View the configuration - View environment configuration - View memory configuration - View director configuration (FAs, DAs) - View drive configuration (disk groups, drives, pools) - View SRP configuration - View volume configuration (TDATs, TDEVs)
Expected Results	CLI commands should execute without error.
Actual Results	Results as expected
Additional comments	

☒ **PASS** ☐ **FAIL** ☐ **CONDITIONAL PASS** ☐ **Not APPLICABLE**

The purpose of this test is to verify that: Validation of configuration management CLI commands

Test Details/Action	- Set configuration metrics (disk group names, data pool names, SRDF/A DSE max) - Set SRP parameters (reserved capacity, enable/disable DSE on SRP)
Expected Results	CLI commands should execute without error.
Actual Results	Results as expected
Additional comments	- Data pool names have a 12 character limit. - SRP reserved capacity can be 1-80% of SRP's space. Default is 10%. - SRDF/A DSE can only be enabled on 1 SRP. Disabling fails if only 1 SRP is configured

☒ PASS ☐ FAIL ☐ CONDITIONAL PASS ☐ Not APPLICABLE

The purpose of this test is to verify that: Validation of auto-provisioning CLI commands

Test Details/Action	• ACLX device management • Initiator Group management • Port Group management • Storage Group management • Masking View management
Expected Results	CLI commands should execute without error.
Actual Results	Results as expected
Additional comments	• The ACLX device is visible on FA port 1d4 by default • The 'map' and 'unmap' no longer work on ACLX enabled ports (default)

☒ PASS ☐ FAIL ☐ CONDITIONAL PASS ☐ Not APPLICABLE

The purpose of this test is to verify that: Validation of SLO-based provisioning CLI commands

Test Details/Action	• List available SLOs • View SLO details • Associate SLO with a Storage Group • Create cascaded Storage Group with child SGs associated with different SLOs. • SLO-provisioning reporting • Modify SLO associated with SG
Expected Results	CLI commands should execute without error.
Actual Results	Results as expected
Additional comments	

☒ PASS ☐ FAIL ☐ CONDITIONAL PASS ☐ Not APPLICABLE

The purpose of this test is to verify that: Validation of Storage Group management CLI commands

Test Details/Action	• Add devices to SG • Remove devices from SG • Move device between SGs • Move devices between child SGs • Convert standalone SG to cascaded • Covert cascaded SG to standalone
Expected Results	CLI commands should execute without error.
Actual Results	Results as expected
Additional comments	

☒ PASS ☐ FAIL ☐ CONDITIONAL PASS ☐ Not APPLICABLE

The purpose of this test is to verify that: Validation of device management CLI commands

Test Details/Action	- List devices in SGs - List thin devices not in SGs - List thin devices associated with an SLO - Create TDEV - Delete TDEV
Expected Results	CLI commands should execute without error.
Actual Results	Results as expected
Additional comments	

☒ PASS ☐ FAIL ☐ CONDITIONAL PASS ☐ Not APPLICABLE

The purpose of this test is to verify that: Validation of Virtual Provisioning management CLI commands

Test Details/Action	- Pre-allocate all devices in SG - Pre-allocate a single device - Perform zero space reclaim on SG - Perform free all space on SG - Perform free all space on single device
Expected Results	CLI commands should execute without error.
Actual Results	Results as expected
Additional comments	Must issue the 'symdev free -all' command on devices being deleted before deleting devices on VMAX3. This will free all allocated tracks for the devices. Refer to KB000193460.

☒ PASS ☐ FAIL ☐ CONDITIONAL PASS ☐ Not APPLICABLE

The purpose of this test is to verify that: Validation of port management CLI commands

Test Details/Action	- View director/port associations - View director ports - Disassociate/Associate port with front-end director - Online/Offline a director port
Expected Results	CLI commands should execute without error.
Actual Results	Results as expected
Additional comments	

☒ PASS ☐ FAIL ☐ CONDITIONAL PASS ☐ Not APPLICABLE

The purpose of this test is to verify that: Validation of user-based access control CLI commands

Test Details/Action	- Add symauth users - Modify symauth users - List symauth users - Enable symauth - Change enforcement policy
Expected	CLI commands should execute without error.

Results	
Actual Results	Results as expected
Additional comments	

☒ PASS ☐ FAIL ☐ CONDITIONAL PASS ☐ Not APPLICABLE

The purpose of this test is to verify that: Validation of host-based access control CLI commands

Test Details/Action	- Obtain symacl uniqueID - Add symacl entry for a host - Remove symacl entry for a host - Add accgroup
Expected Results	CLI commands should execute without error.
Actual Results	Results as expected
Additional comments	Hostname limited to 31 chars. The error message states a 32 char limit but actually is a 31 char limit.

☒ PASS ☐ FAIL ☐ CONDITIONAL PASS ☐ Not APPLICABLE

7.3.6. VMAX3 GUI Test

The purpose of this test is to verify that: Validation of Unisphere features

Test Details/Action	- Software installation - Basic functionality - Performance Monitoring
Expected Results	Unisphere should be able to discover and manage VMAX3 and earlier Symmetrix models.
Actual Results	Unisphere was able to remotely connect to a RHEL Solutions Enabler server via symapi. Unisphere was able to discover all Symmetrix arrays discoverable by the RHEL SE server. Basic functionality tasks (e.g. storage provisioning, reporting) were completed without issue. Performance statistics were gathered and reported successfully in Unisphere.
Additional comments	GPS packaging for SE and U4V is currently in UAT testing and is expected to be moved to production once this solution is certified for production.

☒ PASS ☐ FAIL ☐ CONDITIONAL PASS ☐ Not APPLICABLE

7.3.7. Capacity/Chargeback Reporting Test

The purpose of this test is to verify that: The VMAX3 can send capacity and performance data over to EMC ViPR SRM for chargeback purposes

Test Details/Action	- Verify that ViPR SRM is receiving data for chargeback
Expected Results	ViPR SRM should be able to report capacity and configuration information on VMAX3

Actual Results	ViPR SRM was able to discover the VMAX3 and earlier arrays via Solutions Enabler SMI-S and Unisphere.
Additional comments	Issue with reporting topology information for prior generation VMAX models. Currently investigating. The release of SRM 3.6.2 is expected at the end of Q2 2015.

☐ PASS
 ☐ FAIL
 ☒ **CONDITIONAL PASS**
☐ **Not APPLICABLE**

7.3.8. MMCS McAfee Anti-Virus Management Test

The purpose of this test is to verify that: MMCS anti-virus software can be updated by Citi's ePO infrastructure.

Test Details/Action	Verify that the MMCSs can connect to Citi's ePO infrastructure to obtain anti-virus software updates and policies.
Expected Results	The MMCSs updated with Citi's standard anti-virus software and policies.
Actual Results	The current ePO implementation for earlier Symmetrix models does not work with the VMAX3 MMCSs. EMC has submitted an RPQ to provide a new solution for the VMAX3 MMCSs.
Additional comments	

☐ PASS
 ☒ **FAIL**
☐ **CONDITIONAL PASS**
☐ **Not APPLICABLE**

7.4. Technical Test

The purpose of this test is to verify that: N/A

Test Details/Action	
Expected Results	
Actual Results	All required technical tests required for VMAX3 were performed in the Systems/Functional Test section of this document.
Additional comments	

☐ PASS
 ☐ FAIL
 ☐ **CONDITIONAL PASS**
☒ **Not APPLICABLE**

7.5. Business/Unit Test

The purpose of this test is to verify that: N/A

Test Details/Action	
Expected Results	

Actual Results	Business test for VMAX3 is not in scope for this project.
Additional comments	

☐ PASS
 ☐ FAIL
 ☐ CONDITIONAL PASS
 ☒ Not APPLICABLE

7.6. Integration/Compatibility Test

The purpose of this test is to verify that: N/A

Test Details/Action	
Expected Results	
Actual Results	All integration/compatibility tests were performed in Section 5 of this document on systems that VMAX3 is required to integrate with for compliance.
Additional comments	

☐ PASS
 ☐ FAIL
 ☐ CONDITIONAL PASS
 ☒ Not APPLICABLE

7.7. Performance Test

The purpose of this test is to verify that: N/A

Test Details/Action	
Expected Results	
Actual Results	N/A. LAB environment was too small to test performance. All testing done in LAB environment were functional in scope
Additional comments	

☐ PASS
 ☐ FAIL
 ☐ CONDITIONAL PASS
 ☒ Not APPLICABLE

7.8. Security Test

The purpose of this test is to verify that: CIVA test completed for VMAX3 components.

Test Details/Action	- Obtain results of the CIVA test - Address any major vulnerabilities identified in the CIVA test
Expected Results	Any major vulnerabilities identified in the CIVA test should be addressed with a fix, compensating control, or a risk exception.
Actual Results	Citi's CIVA testing was started but not completed at the time of release of this document.
Additional comments	

☐ PASS
 ☐ FAIL
 ☐ CONDITIONAL PASS
 ☐ Not APPLICABLE

7.9. Capacity/Stress Test

The purpose of this test is to verify that:

Test Details/Action	
Expected Results	
Actual Results	N/A. LAB environment is too small to test capacity. All testing done in LAB environment were functional in scope
Additional comments	

☐ PASS
 ☐ FAIL
 ☐ CONDITIONAL PASS
 ☒ Not APPLICABLE

7.10. Continuity of Business Test

The purpose of this test is to verify that:

Test Details/Action	
Expected Results	
Actual Results	N/A. COB and Replication is not in scope for this first release of VMAX3 into Citigroup production.
Additional comments	

☐ PASS
 ☐ FAIL
 ☐ CONDITIONAL PASS
 ☒ Not APPLICABLE

8. Glossary/Definition

Term or Acronym	Explanation or Definition
CATE	Citi Architecture & Technology Engineering
GNAST	Global Network Architecture and Standards Team
NMS	Network Management System
U4V	Unisphere for VMAX
FAST	Fully Automated Storage Tiering

9. Appendix

9.1. External References

- <https://www.emc.com/storage/vmax/vmax3.htm>

- EMC Corporation (2015) EMC VMAX3 Family with HYPERMAX OS 5977
(Release Level HYPERMAX OS 5977.596.583)

9.2. ***Bill of Material***



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