



CATE Storage and Backup Engineering

Unisphere for VMAX

CSBE-12025-SG
Best Practice Guide
Version 1.7

Version

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Latest Versions

It is recommended that the latest version of the document be used from the [CATE Storage and Backup Engineering website](#). Newer versions may include certification on additional platforms, or comments on issues discovered after deployment.

Regional Reviewers

Region	Reviewed By
Asia Pacific	
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1 Overview of Unisphere for VMAX

Unisphere for VMAX (U4V) is a web browser based user interface introduced by EMC to combine and supersede both Symmetrix Management Console (SMC) and Symmetric Performance Analyzer (SPA). It is designed to provide storage management for EMC Symmetrix products under a common framework and offers features such as provisioning, managing, monitoring, alerting and performance analysis.

U4V with Performance Options provides a Real Time view for examining high frequency data points, Historical View for all Symmetrix array Key Performance Indicators (KPI), and Diagnostic View for root cause analysis.

U4V allows data to be collected and stored for analysis and reports to be produced on workload, resource usage trends for service level management, diagnostics and capacity planning.

The CATE Certification of Unisphere for VMAX features include:

- Performance data collection and drill down data for root cause investigation
- View graphs detailing system performance and Symmetrix system heat maps
- On demand reports or scheduled reports and data export to file

In this release, the capabilities of Unisphere re-tested and certified continues to be limited to monitoring and viewing. Notification functionality is pending further testing and strategic direction of SRM.

Certification of control functions in the future will depend on a clear statement from CTI storage management on what Unisphere control features they require.

1.1 Intended Audience

This document describes the installation and configuration of Unisphere for VMAX and in particular how it should be deployed within Citi to best meet security and controls requirements. It also describes briefly the type of functionalities that are available within U4V. However, this document does not discuss how to conduct performance analysis of storage arrays themselves.

2 Unisphere Deployment Model

2.1 U4V Server

Unisphere for VMAX should be set up in a “remote installation” configuration, installed on a VM, using a remote Linux SYMAPI server.

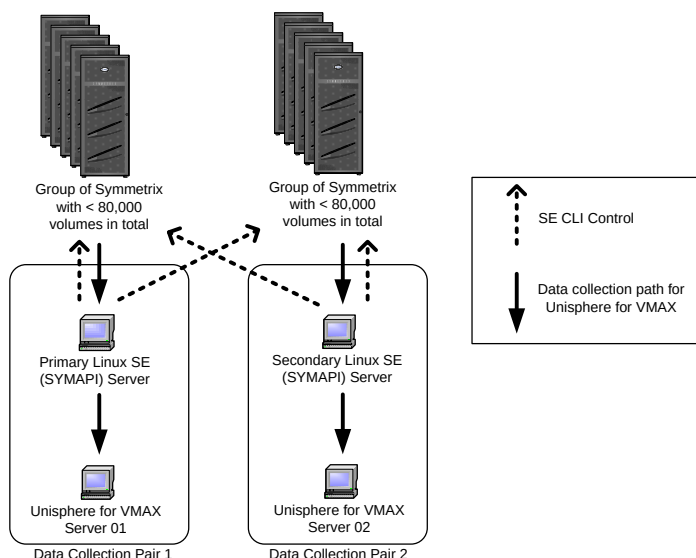
U4V must only be used to collect performance data from Symmetrix that are local to the SYMAPI_SERVER. Data collection over RDF links to a remote Symmetrix is prohibited.

U4V server can only connect to a single SYMAPI server.

Existing Linux Solutions Enabler (SE) servers should be used where possible to collect the STP data. In relation to U4V & SE a maximum of 80,000 devices can be collected by a single STP daemon i.e. a single SE server.

- An SE server can collect STP data on a defined subset of the arrays that it can see
- The primary or secondary SE server can manage (via CLI) all of the Symmetrix visible to both the primary or secondary SE server

As SE servers are deployed in redundant pairs. Each SE server in the pair could act as a separate SYMAPI server for multiple U4V instances.



See the section *SYMAPI Server* for a diagram and further details.

The following table can be used to **estimate** how many U4V and SYMAPI servers will be needed. It assumes that each U4V/SYMAPI server pair can manage about 8 Symmetrix systems i.e. each has no more than an average of 10,000 volumes.

A minimum of 2 SE servers is assumed for all sites for CLI management via Solutions Enabler (SE).

No. Local Symms with Unisphere for VMAX	Physical SE servers needed (SYMAPI)	Unisphere for VMAX VMs needed
1 to 8	2	1
9 to 16	2	2
17 to 24	4	3
25 to 32	4	4

2.1.1 Scalability

Unisphere for VMAX continues to have limited scalability due to:

- The potentially large amount of data that it needs to collect, store and manipulate.
- For each U4V instance, EMC only support visibility + data collection of a maximum of 80,000 devices, EMC provide a guideline limit of 10 Symmetrix arrays per U4V instance.

The hard limit is 80,000 devices per U4V/SYMAPI server pair, and hence the maximum number of Symmetrix systems that can be managed may be less than 10 (or potentially more depending on device count per array).

The 80,000 device count per U4V/SE server pair includes ANY array/devices the symapi can see (locally or remotely) – **Not just the devices on the arrays registered for data collection.**

In larger estates it is highly likely the SYMAPI server will discover/have access to more arrays than a single U4V server will be configured to monitor – **in this scenario certain arrays may need to be excluded from U4V in order to ensure the setup does not exceed the products limitation and impact data collection and general usage** – please see section 5.5 for further details.

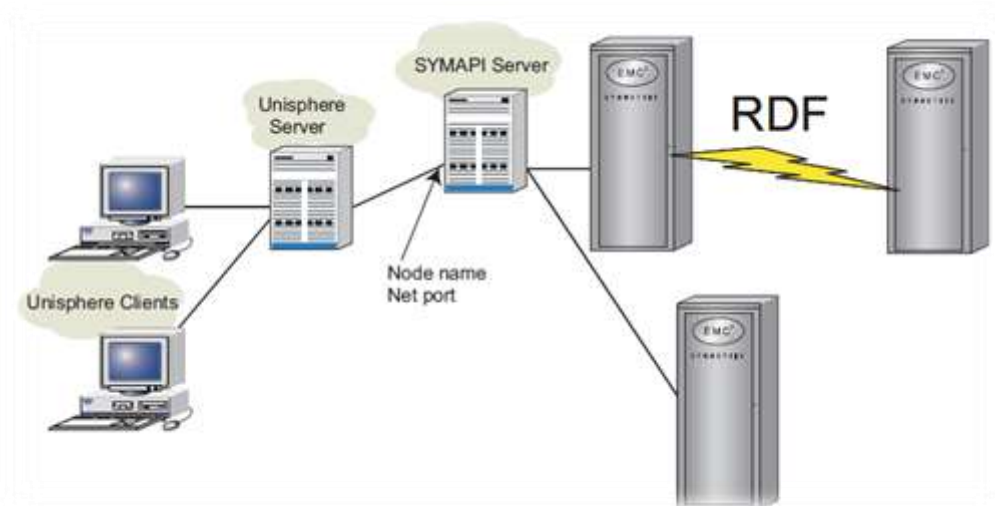
2.1.2 Unisphere for VMAX COB

COB for Unisphere for VMAX is not practical due to the way that each instance only maps to a single symapi server, although a degree of Inter-site redundancy is theoretically achievable, it would require deploying two U4V instances, both to be mapped to the same symapi server, both collecting the same data. Furthermore the option of cross site data collection is not recommended due to bandwidth and security concerns.

From a business perspective – There will be no impact to production/business processing systems if a U4V instance was to fail and from a functional /operations perspective you would still have access to the storage via one of the symapi servers (which are deployed redundantly).

2.2 SYMAPI Server

Unisphere for VMAX should be installed in “Remote Installation” configuration. U4V and Solutions Enabler are installed on a Windows server, which remotely connects to a SYMAPI server which is also running with Solutions Enabler and attached to Symmetrix systems.



Remote installation: U4V server is connected to a remote SYMAPI server attached to Symmetrix systems

The remote installation configuration has the following benefits:

- Ability to leverage existing SAN-connected Solutions Enabler (SE) server pairs (for potentially up to 16~20 Symmetrix systems) data collection.
 - Additional SAN-connected SE servers would only be needed for very large datacenters
- Ability to place U4V server in VM and avoid to purchase
 - Additional HBAs for U4V server
 - Additional fabric ports for U4V server
- Leverage VM clustering to provide HA for the U4V server.

Note that EMC do not recommend using the remote model between sites. WAN bandwidth will definitely get occupied by the U4V for collecting data from remote SYMAPI server. You may experience U4V displaying wrong data at times when there is a choke in bandwidth/Latency increased. Hence EMC do not recommend the U4V installation over WAN link. Also one would need to open the ports 2707 over the WAN link for the U4V to access the remote server, which can potentially expose the network to a security risk.

3 Installation/upgrade Planning & Deployment

3.1 Planning

3.1.1 Unisphere for VMAX Server Requirement

Unisphere for VMAX server should be run on a VMware virtual machine with:

1. Windows Server 2008 R2 Standard Edition (64-bit)
2. CPU equivalent to dual processor 1.8GHz
3. Minimum 100GB disk space
 - 80GB Minimum is required for performance database any additional will be used by OS requirements
4. Minimum 10 GB RAM
 - 8GB is the minimal dedicated amount of memory (**not shared memory**) required to run Unisphere for VMAX with performance option this is **in addition** to OS requirement.
 - Regional VMware teams can now provide virtual machines with <128GB RAM – it is recommended to request **at least** 10 GB.

Note: as shown below the installer checks/warns should there be insufficient Disk and/or memory available



5. Must not be same host as ECC infrastructure components

3.1.1.1 Note on server redundancy

Unisphere for VMAX is not considered sufficiently vital to warrant clustering.

To protect against loss of a server (unlikely as U4V will be running within a VM), regular backups of the database should be taken (see section Backup Unisphere Database). If necessary, these can be restored to another server, assuming the backup is accessible.

3.1.1.2 Interoperability with other applications

Due to the large memory requirements of Unisphere for VMAX, **it is mandatory that no other applications (over and above standard build items) be installed on the same server.**

3.1.2 Unisphere for VMAX Client Access Requirement

Windows client access for Unisphere for VMAX through web browser over port 8443 (e.g. <https://<hostname>:8443>) and require:

1. Internet Explorer 7.0 and above
2. Flash Player 11.2 and above¹
3. 600MB RAM²

3.1.2.1 Concurrent user limit

Unisphere for VMAX 1.6 and above is documented to support up to 10 concurrent users.

The vendor release notes previously advised that performance degradation occurred with more than 3 users – however this statement has been removed from later documentation. Recent testing showed that performance degradation can still be encountered with multiple users, but generally experienced at 5 + Users depending on the jobs being run. (Reference SR 60442458).

We recommend where ever possible limit U4V session/users that are interacting with each array at any one time to minimize potential querying load on the array FA. (Also refer to section 3.2)

The amount of active user session can be viewed under:
Administration > Security > User Sessions

EMC Unisphere for VMAX V1.6.1.6		
 Home  Performance  Support		
All Symmetrix > Home > Administration > Security > User Sessions		
User Sessions		
User Name	Start Time	IP Address
L:\namdev.nsrootdev.net\cw68238*	Wed Jan 15 15:28:59 GMT+0000 2014	169.186.86.25
D:\namdev\Unitest	Wed Jan 15 15:42:53 GMT+0000 2014	169.186.86.25
D:\namdev\Unitest3	Wed Jan 15 15:41:04 GMT+0000 2014	169.186.86.25
D:\namdev\cw68238	Wed Jan 15 15:43:14 GMT+0000 2014	169.186.86.25
D:\namdev\Unitest2	Wed Jan 15 15:40:17 GMT+0000 2014	169.186.86.25
D:\namdev\Unitest4	Wed Jan 15 15:41:42 GMT+0000 2014	169.186.86.25

¹ If update is required request via CMP – Global Other Desktop Software

² Required for the web browser where the Console was launched

3.1.3 SYMAPI server requirement

- The remote SYMAPI server must be running SE 7.6 (64-bit) and above. SE version must be greater or equal to the version of Solutions enabler running on the U4V server.
- The remote SYMAPI server must be running RedHat Linux
- An existing SYMAPI server can be used (that meets the above criteria)

3.1.4 Use of SYMAUTH on Target Arrays

The use of **symauth** as a user-based access control mechanism to a Symmetrix is **mandatory** when using U4V. Setup of symauth is covered in the CSBE SE 7.x Solutions Guides (as is configuration of audit logging) and hence only symauth topics specific to U4V are discussed in the present document.

Please reference the CSBE SE 7.x Solutions Guides and the overview in section SYMAUTH for further details.

3.1.5 Licensing

Unisphere for VMAX uses Symmetrix-based eLicensing. As the SPA functionality has been incorporated within U4V, there is no need for a separate host-based SPA eLicensing entitlement. All functionality is available through the Unisphere SMC eLicensing entitlement.

See Installation of Licenses for further details on installing the licenses.

3.1.6 Supported Symmetrix Systems and Enginuity versions

Unisphere for VMAX 1.6 will support the following Symmetrix Systems and Enginuity versions:

- Symmetrix VMAX 10K/20K Series systems running Enginuity 5874 or higher
- Symmetrix VMAX 40K Series systems running Enginuity 5876 or higher
- Symmetrix DMX3/4 systems running Enginuity 5671 or higher

Note: No Citi testing could be completed on DMX 3/4 but it is acknowledged this is supported by the vendor.

Please refer to the EMC Symmetrix Configuration Matrix on the [CATE Storage and Backup Engineering website](#) for current CATE supported hardware and Enginuity levels.

3.2 Unisphere – Rules on Poling & Array loading

U4V uses STP data that is already being captured by the Service Processor in a VMAX array for EMC's remote diagnostic and troubleshooting purposes.

From previous issues encountered a potential risk comes from the frequency at which Unisphere polls an array for data, since requests are sent as in-band SCSI commands to a single FA (Front-end Adapter) on the VMAX which is also servicing IO to hosts. If the polling frequency is set too low, or particular types of data gathering modes are used, the load on the FA can increase to the point where host IO performance starts to degrade

Five key rules of the road to ensure that this does not happen are as follows:

1. Unisphere should be configured to **poll via the least busy FA** on the array.

This can be identified using SPA heat maps/metrics (if SPA is already being used on the array in-question) or Unisphere itself if upgrading or following a suitable time period when used for the first time against the array.

U4V EMC Dashboards 'ALL FE Directors' or 'Heat map' can be used or metrics can be directly generated from the Analyze >Historical (or Diagnostic) Pane >Select FA's>Plot charts against %Busy / Host IO per sec / Host MB per Sec.

2. Use **dedicated gatekeeper** devices on the arrays for Unisphere – do not share them with any other role/function
3. Use **minimum 10 minute granularity for diagnostic data** – this is sufficient for workload analysis and anything configured to poll more frequently than this introduces a greater load on the FA. – See Section 5.6 Setting up Data Collection
4. **Do not use the Real Time View or Real Time Trace functions as a standard operating practice** – e.g. Do not include real time heat map/metrics as part of standard dashboards or have unnecessary data traces continually scheduled as this again increases the polling frequency to an unacceptable level.

Real time data should only be collected when absolutely required – e.g. Live problem analysis on the understanding this increases the polling frequency and could contribute to an increased load on the mapped FA.

NOTE: From investigation and testing if real time data collection is enabled in the product, data is collected 24x7 no matter if you have realtime views in your templates or not, therefore no additional polling takes place over and above the data collection.

The more templates utilized and varied statistics displayed the greater the processing required, but the impact of this is on the **U4V server** NOT at the array.

5. Where possible - **one U4V session/user should be interacting with each array** at any one time to again minimize querying load on the array FA.

3.3 Unisphere for VMAX - Initial installation and configuration checklist

The check list summarizes high-level steps required to install and configure Unisphere for VMAX as a fresh deployment, and references the relevant sections in this document.

Task	Section in this document
Prerequisites	
Ensure hardware and other requisites are available: - Windows 2008 R2 VM for Unisphere for VMAX server N.B RAM & Disk size recommendations - RedHat SYMAPI_SERVER running SE7.6 64-bit (or later) already configured to manage target Symmetrix - SE7.6 & Unisphere for VMAX 64-bit wraps for Window 2008 R2 - Unisphere for VMAX elicense - Flash Player 11.2 or above on Client (desktop only)	Section 2
Installing Unisphere for VMAX	
Install SE7.6 on the Unisphere for VMAX server	Section 3 & 4
Install Unisphere for VMAX package on the server	
Install Unisphere for VMAX license	
Set up Unisphere for VMAX to use a remote SYMAPI server	
Request mysqld.exe process is added to LRP for McAfee Virus Scanning – Requires ResolveIT	
Configure SYMAPI server	
Test Unisphere for VMAX server has access to remote SYMAPI server	
Setting up Authorization	
Setting up authorization on target Symmetrix systems	Section 4 of this document & CSBE Solutions Enabler 7.X Solutions Guide
Configuring Unisphere for VMAX	
Security: Centralized Authentication via LDAP - Requires CMP for Service account and Authentication Parent AD group	Section 5
Security: Restricting activity when in Unisphere for VMAX	
Setting up data collection	
Web server certificates – Requires CMP	
Scheduling database backup for Unisphere for VMAX server	

3.4 Unisphere for VMAX - upgrade checklist

Task	Section in this document
Hardware check	
Ensure hardware and other requisites are unchanged/available: - Windows 2008 R2 VM for Unisphere for VMAX server N.B RAM & Disk size recommendations - You will need to have at least the same amount of free space available as the current database size. - RedHat SYMAPI_SERVER running SE7.6 64-bit (or later) already configured to manage target Symmetrix - SE7.6 (or later) & Unisphere for VMAX 64-bit packages for Window 2008 R2 - Flash Player 11.2 or above on Client (desktop only)	Section 2
Prerequisites	
Backup the Performance database.	Section 3.5.4 Section 6.11
Record the Symmetrix system registrations, including the settings for data collection and diagnostic interval.	
Export the Performance settings (metric and alert definitions and user templates).	
Upgrade Unisphere for VMAX	
Upgrade SE on the Unisphere for VMAX server	Section 3
Upgrade Unisphere for VMAX package on the server	
Post upgrade checks	
Confirm configured users/groups persisted on target Symmetrix systems	No examples given – manual post check
Confirm performance database has persisted through the upgrade	
Confirm correct systems are registered	
Confirm Alert Policies and threshold settings	
Confirm templates and dashboards have persisted	

3.5 Installation/Upgrade Steps

3.5.1 Solutions Enabler Installation on Unisphere for VMAX Server

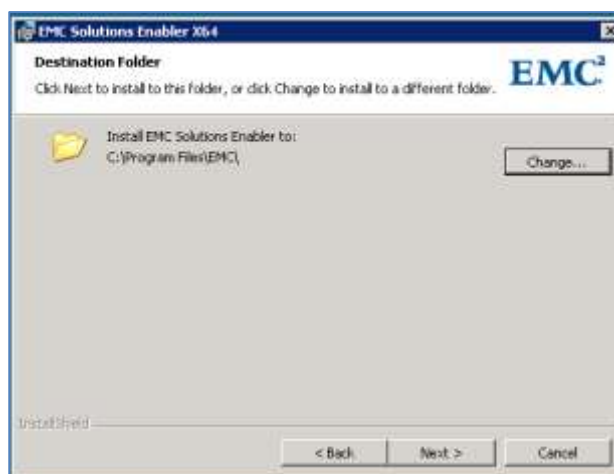
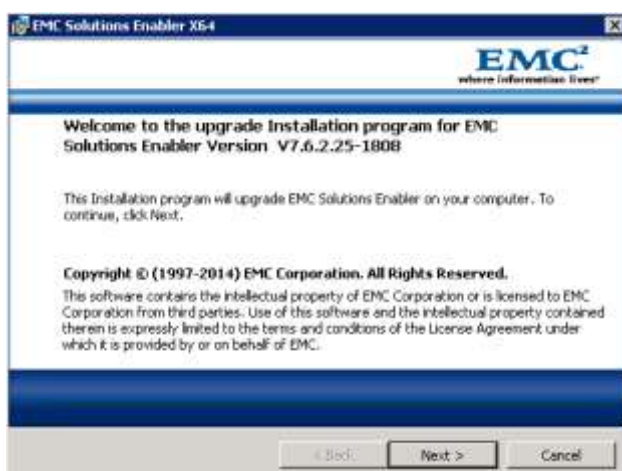
Solutions Enabler Installation on the Unisphere for VMAX Server is a pre-requisite for U4V.

The Installation of this package should be via TPM. It will also detect and upgrade the previous version automatically.

This is now an **“interactive”** install package, so that regional deployment differences can be accommodated and hence screenshots are provided below.

TPM Package Name: CITI_WIN_SolutionsEnabler_762_02

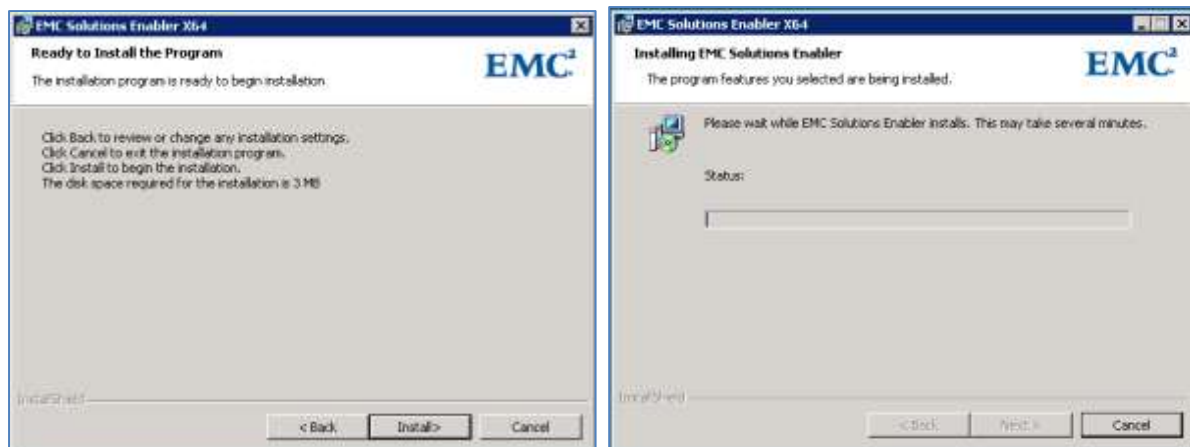
- Request the SA to push the package from TPM
 - Note: Installation location can be set as required before pushing from TPM
- Run the installation package and follow the installation instructions
 - Click Next
 - Install to appropriate location (typically default)



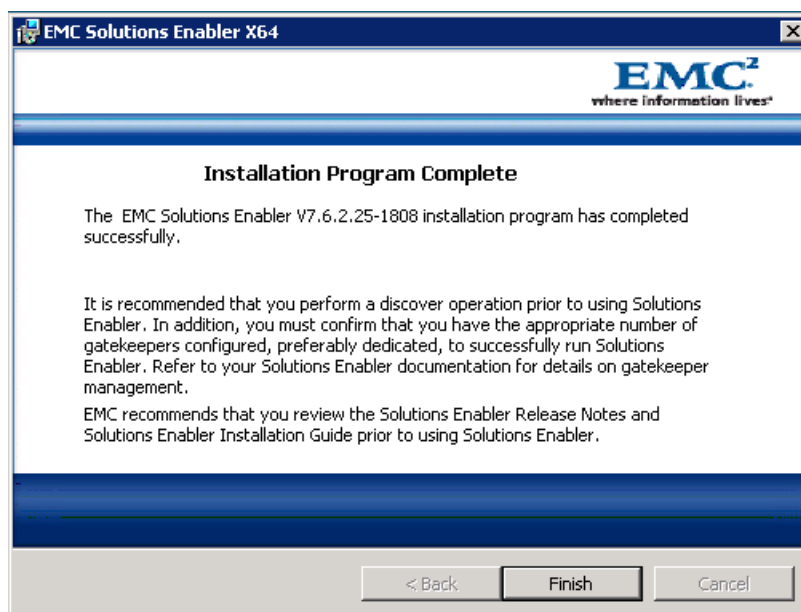
- Click Next > Next



- Select 'Install'
- Status bar will fill as the program installs



- Select finish on completion



3.5.2 Solutions Enabler Upgrade on Unisphere for VMAX Server

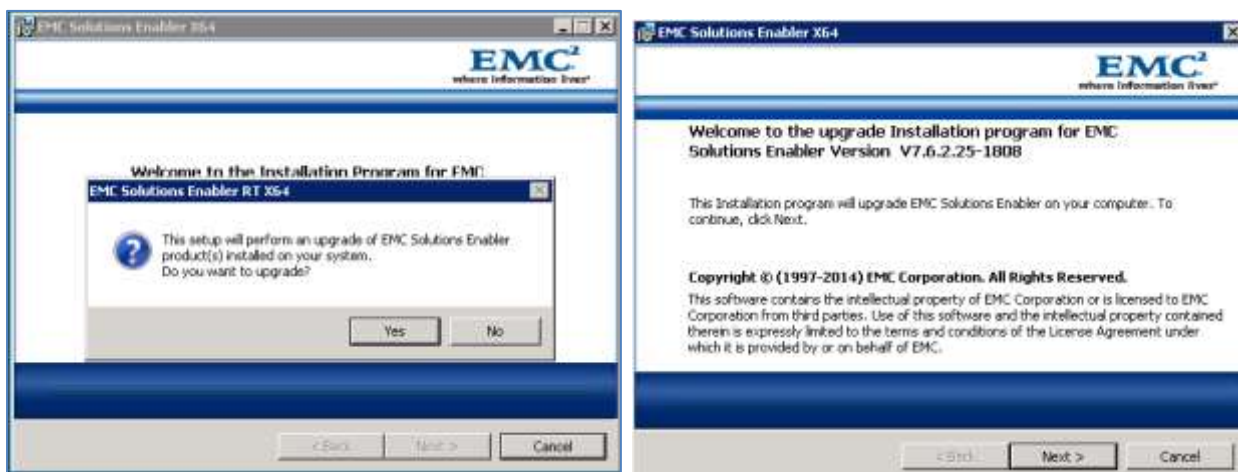
Solutions Enabler Upgrade on the Unisphere for VMAX Server is a pre-requisite for U4V.

The Upgrade of this package should be via TPM. It will detect and upgrade the previous version automatically.

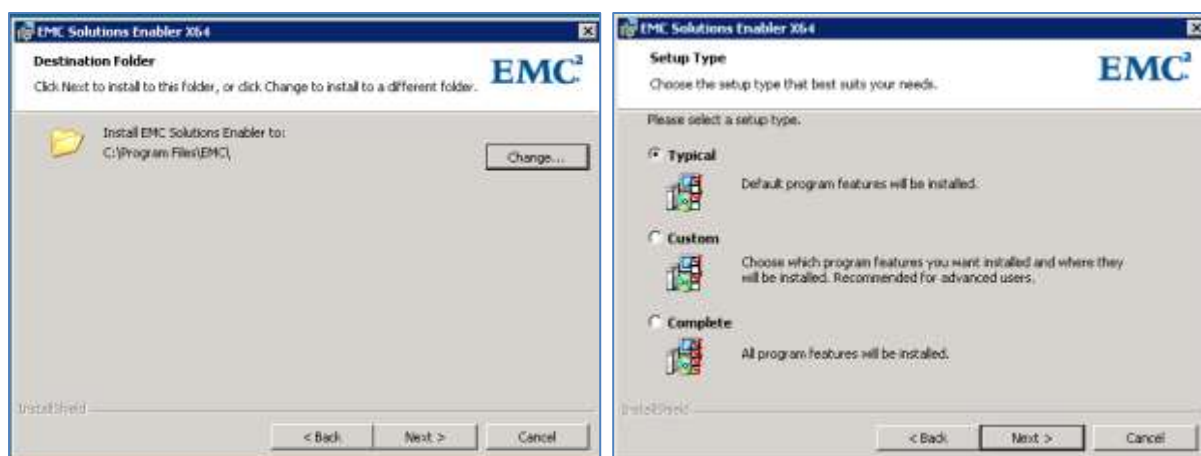
This is now an **“interactive”** install package, so that regional deployment differences can be accommodated and hence screenshots are provided below.

TPM Package Name: CITI_WIN_SolutionsEnabler_761_02 Request the SA to push the package from TPM

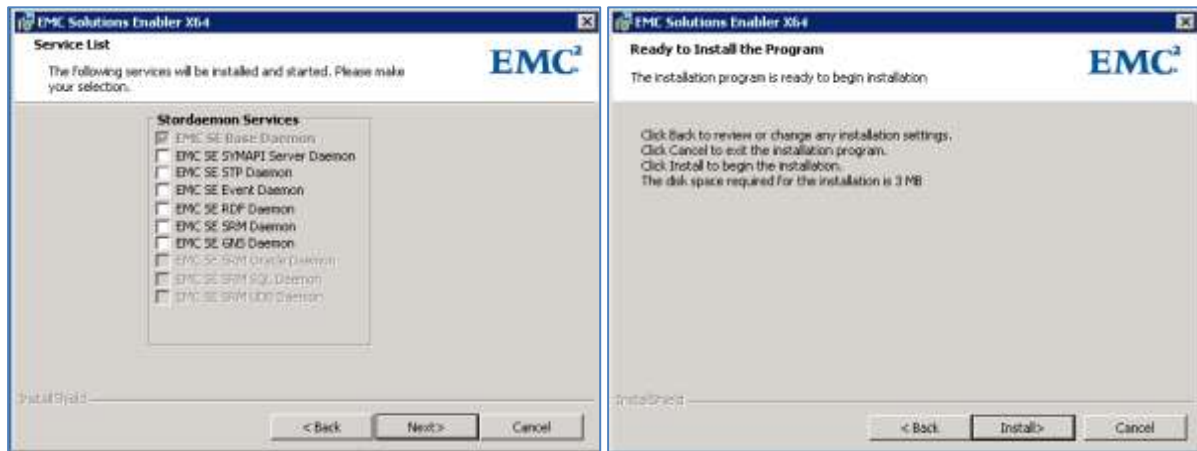
- Note: Installation location can be set as required before pushing from TPM
- Run install package It will detect and upgrade the previous version automatically
- Follow the installation instructions
 - Click Next



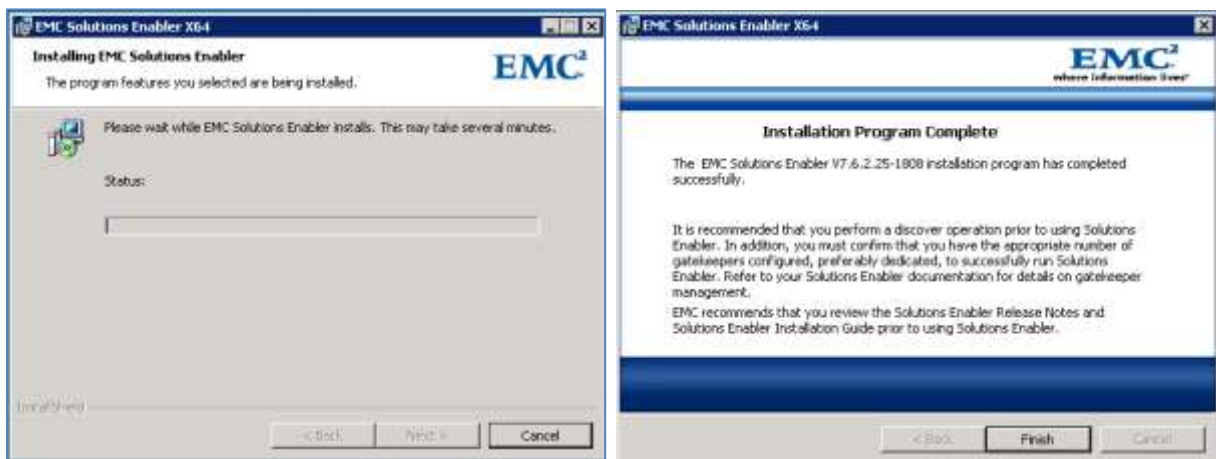
- Install update to appropriate location (typically default unless other location selected on first install)



- Click Next > Next



- Status bar will fill as the program upgrades
- Select finish on completion



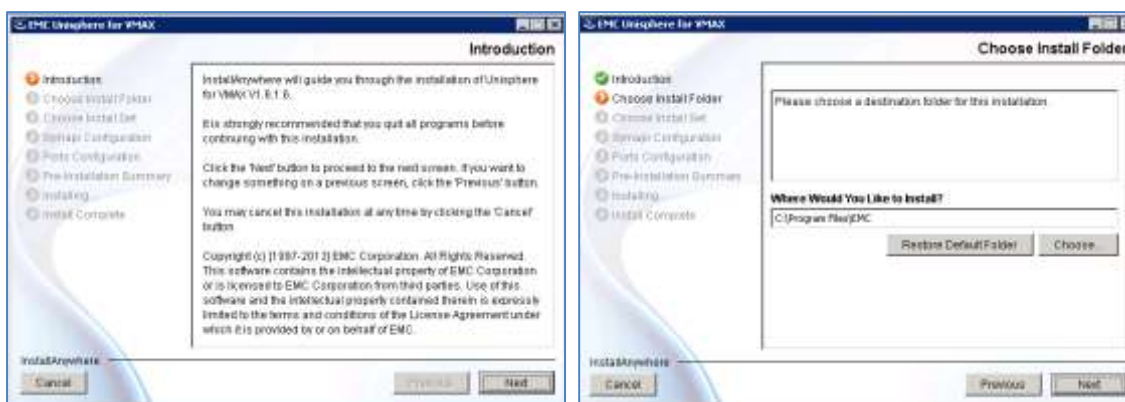
3.5.3 Unisphere for VMAX Installation

Installation of this package should be via TPM. It will also detect and upgrade the previous version automatically.

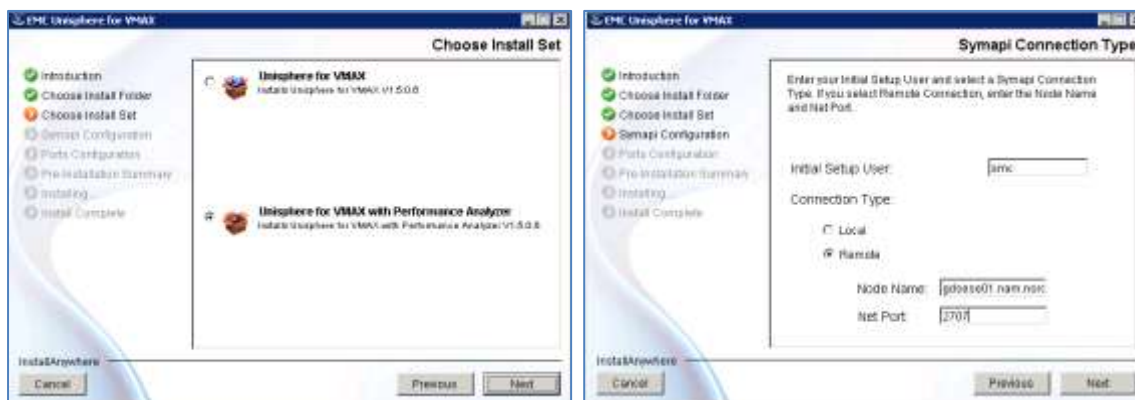
This is an **“interactive”** install package and hence screenshots are provided below.

TPM Package Name: CITI_WIN_X64_UnisphereforVMAX_1616_00

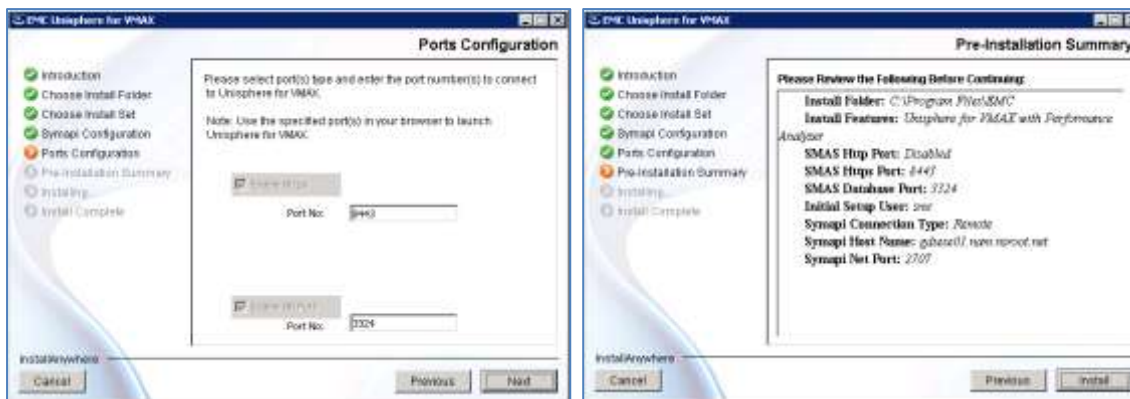
- Request the SA to push the package from TPM
 - Note: Installation location can be set as required before pushing from TPM
- Run the installation package and follow the installation instructions
 - Select Next
 - Install to appropriate location (typically default)



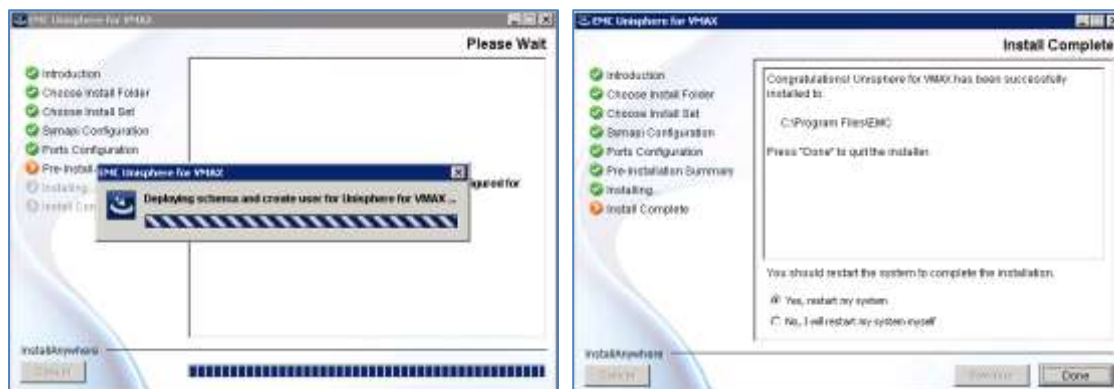
- Select “Unisphere for VMAX with Performance Analyzer” as the Install set. > Next
- You should select the “Remote” connection type, providing the fully qualified name of the remote SYMAPI server that you will be using, leaving the net port as 2707 default. > Next



- You should select the default net port number > Next
- Review the installation summary and select Install



- Install will commence and status bar/window will show progress
- Once installation is completed select Done
 - If your system does not restart itself, manually reboot you server.



3.5.4 Unisphere for VMAX upgrade

NOTE: If upgrading an existing SPA instance carry out prerequisite SPA upgrade and database reformatting covered in Appendix E before continuing.

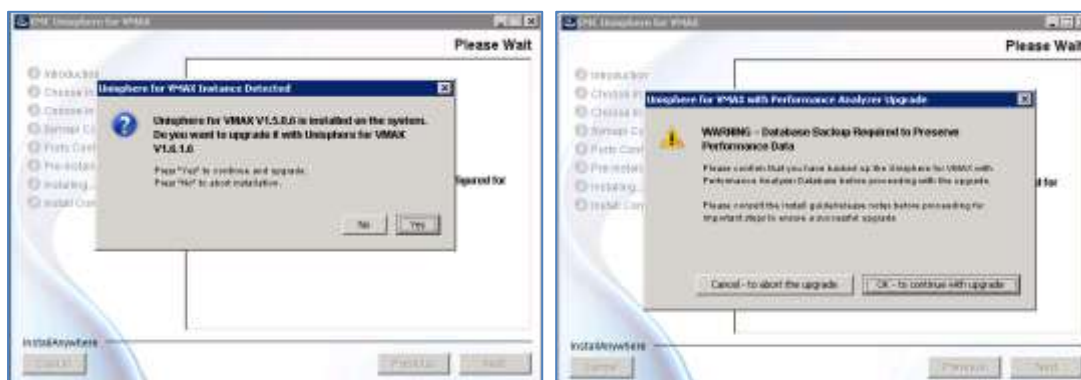
Recommended Pre-upgrade steps:

- Check existing database size & Check the same or more system disk space is available – e.g. if existing database is 50GB, you will need to have at least 50GB space available.
<Install Drive>:\Program Files\EMC\SMAS\jboss\standalone\data\msq – view Properties for existing database size.
- As a safe guard ensure the performance database has recently been backed up, or perform a manual back up. (see section 5.8)
 - As a further safeguard the database backups can also be copied/saved to another location from
Install Drive:\Program Files\EMC\SMAS\backup\SPA\<backups_file>.
- If the SYMAPI server has access to multiple arrays over and above what U4V collects data on, record what symmetrix are registered to the U4V instance you are upgrading.
- Export any Performance metrics and alert definitions, and user defined templates.
- Export any user defined storage templates
 - As a further safeguard the template Files can also be copied/saved to another location from
Install Drive:\Program Files\EMC\SMAS\jboss\standalone\data\TemplateFiles\<file>

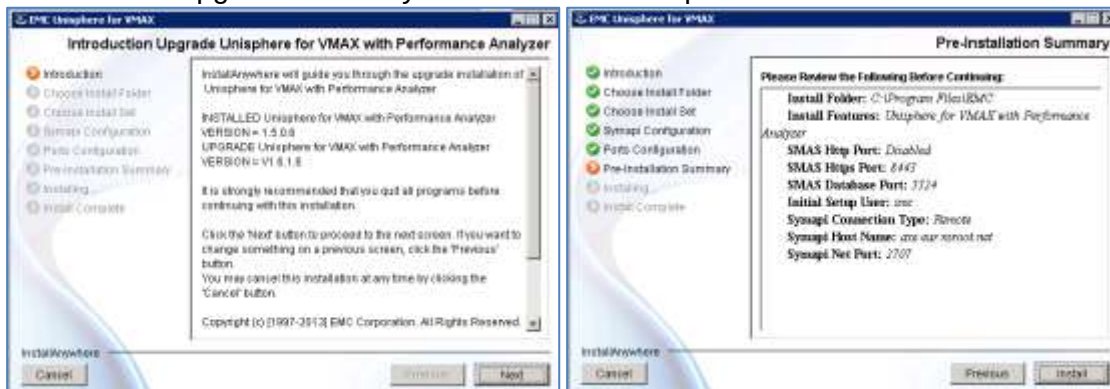
Installation of this package should be via TPM. It will also detect and upgrade the previous version automatically. This is an **“interactive”** install package and hence screenshots are provided below.

TPM Package Name: CITI_WIN_X64_UnisphereforVMAX_1616

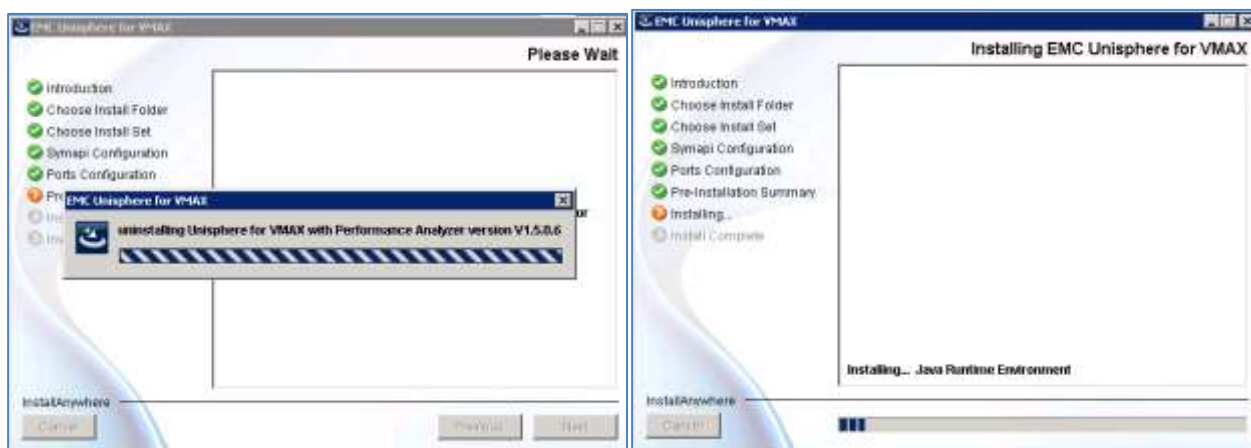
- Request the SA to push the package from TPM
 - Note: Source Installation location can be set as required before pushing from TPM
- Run the installation package and follow the installation instructions
 - You will be prompted to confirm the upgrade > Select Yes
 - You will be prompted to confirm the performance data base has been backed up (as instructed in pre-upgrade steps above) If this has been done > Select ‘Ok –To continue with upgrade’



- Select Next
- Review the upgrade summary and select Install to proceed



- Upgrade will commence and status bar/window will show progress



- Once installation is completed select Done
 - If your system does not restart itself, manually reboot you server.



3.6 Post install activities – U4V Server

If this is an upgrade verify the settings as below, which should already be in place.

3.6.1 Configure CLI path and System variables

On the U4V server request the system administrator to add in the path of the Solutions Enabler command line directory into the System path Variable:

```
<installpath>\EMC\SYMCLI\bin;
```

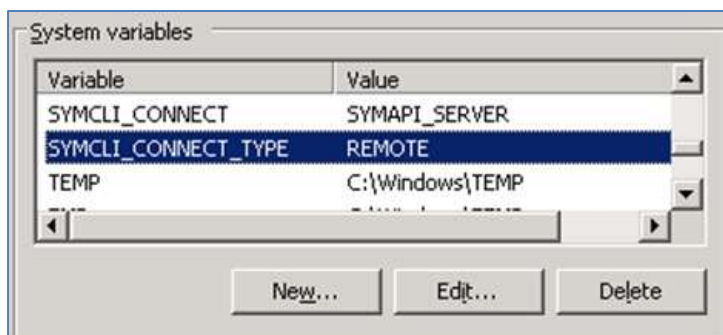
For example:



And request the system administrator to add in new variables in System Variables:

Variable Name	Variable Value
SYMCLI_CONNECT	SYMAPI_SERVER
SYMCLI_CONNECT_TYPE	REMOTE

For example



3.6.2 U4V (Solutions Enabler) Client\Server set up – SSL negotiation

Unisphere for VMAX server (Windows) and remote SYMAPI server (RHEL) should be configured to utilise SECURE.³ SSL sessions.

From U4V server, edit "<installpath>\emc\sympapi\config\netcnfg" to set the connection session to remote SYMAPI server.

SYMAPI_SERVER - TCPIP HOSTNAME WWW.XXX.YYY.ZZZ 2707 SECURE

Replace the hostname and IP with remote SYMAPI server, for example

SYMAPI_SERVER⁴ - TCPIP gdsese01.nam.nsroot.net 10.40.42.122 2707 SECURE

Restart SMAS service for the changes to take effect

Note: you will need to also restart SMAS service follow in the next step so could combine restarts.

3.6.3 POODLE Vulnerability workaround

SSLv3 Poodle Vulnerability - SSLv3 is a cryptographic protocol designed to provide communication security. The SSLv3 uses nondeterministic CBC padding, which makes it easier for man-in-the-middle attackers to obtain cleartext data using a padding-oracle attack. This is commonly referred to as the "POODLE" (Padding Oracle On Downgraded Legacy Encryption) attack.

Unisphere for VMAX Versions 8.0 and below (including v1.6.1.6) are open to the vulnerability. This vulnerability is resolved in U4V 8.0.1 that CATE has commenced certification on, however in the interim the following workaround should be applied:

1. Stop the SMAS service.

2. Edit the following file:

standalone-full.xml located in
<installdrive>\Program
Files*\SMAS\jboss\standalone\configuration\standalone-full.xml

Change the following:

Incorrect:

cipher-

suite="TLS_DHE_RSA_WITH_AES_256_CBC_SHA,TLS_DHE_RSA_WITH_AES_128_CBC_SHA,SSL_RSA_WITH_RC4_128_MD5" protocol="TLS"

Correct:

³ Server Certificate need to exist on both SYMAPI server and U4V server

⁴ You will see a 'SYMAPI_SECURE' example in the netcnfg file, the format of this could be used, but the recommended entry has been left as 'SYMAPI_SERVER' to align with the system variable shown and any existing U4V deployments.

```
cipher-suite="TLS_RSA_WITH_AES_256_CBC_SHA,TLS_RSA_WITH_AES_128_CBC_SHA"
protocol="TLSv1,TLSv1.1,TLSv1.2"
```

3. Restart the SMAS service

3.6.4 Configure Idle User Timeout Session



By default, the Unisphere for VMAX initiate automatic logout for user session after 480 minutes (8 hours).

Edit the **web.xml** file - Changing the setting from so users will be automatically logout after inactive session for more than 30 minutes.

Web.xml located in

```
<installdrive>\Program
Files\EMC\SMAS\jboss\standalone\deployments\smc.ear\smc.war\WEB-INF
```

Note: You will not see the above file location via explorer - Paste the path into the explorer window

Edit the parameter from 480 to 30

```
<param-name>sageIdleUserTimeoutInMinutes</param-name>
<param-value>30</param-value>
```

Restart SMAS service from the U4V server to take effective for this setting.

3.6.5 Configure language and regional settings

For Windows users outside the United States, it is recommended to configure your regional and language settings to English (United States).

To configure your settings:

1. Stop the EMC SMAS service (if it is running).
2. In the Windows Control Panel, double-click Regional and Language Options.
3. On the Regional Options tab, set the Standards and formats to English (United States).
4. On the Advanced tab, set the Language for non-Unicode programs to English (United States)
5. Select Apply all setting to the current user account and to the default user profile.
6. Restart the service.

3.7 Post install activities – SYMAPI Server

If this is an upgrade verify the settings as below, which should already be in place.

3.7.1 Nethost file configuration

Allow the Unisphere for VMAX server to connect to the remote SYMAPI server. On the remote SYMAPI server, edit

```
/var/symapi/config/nethost
```

Add <Unisphere for VMAX server name> *

For example: i10-unisp-vm01.nam.nsroot.net *

3.7.2 SSL Negotiation

Unisphere for VMAX server (Windows) and remote SYMAPI server (RHEL) should be configured to utilise SECURE.⁵ SSL sessions.

From remote SYMAPI server, ensure the configuration file options is set as per the default:

```
storsrvd:security level = SECURE
```

Note: If this is leveraging an existing SE deployment and there are other clients that need to utilise unsecured SSL sessions, the security level can be set accordingly to accommodate both Secure and Non Secure.

```
storsrvd:security level = ANY
```

If any changes are made to the options file the storsrvd service needs to be restarted for them to take effect.

3.8 Testing Unisphere for VMAX server has access to remote SYMAPI server

Post install and upgrades:

Before trying to use Unisphere for VMAX, it is recommended that you confirm that the remote SYMAPI server is accessible from the U4V server using a command line test on the server.

Use the command 'symcli -def' to confirm if the Symmetrix command line is configured correctly:

```
C:\Users\cw68238>symcli -def
```

```
Symmetrix Command Line Interface (SYMCLI) Version V7.6.2.25 (Edit Level: 1808)
```

```
built with SYMAPI Version V7.6.2.25 (Edit Level: 1808)
```

```
Current settings of the SYMCLI environmental variables:
```

```
SYMCLI__CONNECT : SYMAPI__SERVER
```

⁵ Server Certificate need to exist on both SYMAPI server and U4V server

<code>SYMCLI_CONNECT_TYPE</code>	<code>: REMOTE</code>
----------------------------------	-----------------------

If the command is not recognized or environmental variables are not set correctly as display above, check system path and parameters and confirm they are configured correctly.

Verify that you can run a symcli command (via the remote SYMAPI server). For example:

<code>C:\symcfg list</code>

Will run `symcfg list` on the remote SYMAPI server and return a list of arrays that are known to the remote SYMAPI_SERVER instance.

If this fails, check the `storsrvd.log` file in `/var/symapi/log` on the remote SYMAPI server for clues as to why the connection was rejected.

3.9 McAfee Virus Scan – Addition of MySQLD.exe in to Low Risk Process Policy

Unisphere for VMAX is using the MySQL database for performance statistic data.

EMC recommend the exclusion of the directories and files from antivirus scan to avoid performance database corruption

However, as advised by the Host & Security Engineering (HSE) team, Citi best practice is to avoid scanning on the processes rather than excluding files from virus scanning.

Therefore 'mysqld.exe' process needs to be added into the 'Low Risk Processes' (LRP) policy whereby the antivirus will ignore files accessed by the 'mysqld.exe' process, which will avoid virus scanning on the database files.

As advised by the HSE team – in order to request the mysqld.exe process is moved in to the low risk process policy the CTI teams carrying out the production deployments/upgrade will need to raise a ResolveIT Ticket to the HSE team.

- From the CATE website download a copy of the Security Deviation Request Form zip file – Which includes the SDRF, SMT and TISO email approval, and a copy of the device list.
- Raise a ResolveIT Ticket to: **CTI GL AD APPLICATIONS-Information Assurance Ops (IAO)** detailing the requirement to move the mysqld.exe process in to the low risk process policy for the specific deployments.
 - o Reference/Attach the approved SDRF form
 - o Update the device list with the devices being deployed/upgraded

3.10 Installation of Licenses

Unisphere for VMAX supports Electronic Licensing (eLicensing) introduced with Enginuity 5875.

The license for U4V is included in Symmetrix-based license bundles which should be installed in the Symmetrix systems before U4V server can use for the Symmetrix systems.

Unisphere for VMAX is sold as part of the following software:

- VMAX:
 - o Symmetrix Management
 - o Symm Pack Enhanced
- VMAX 20K/40K:
 - o Symmetrix Management Suite
- VMAX 10K:
 - o VMAX 10K Advanced Software Suite
 - o VMAX 10K Base Software Suite
 - o VMAX 10K Symm Management Suite

The eLicensing for U4V uses the array-based SMC entitlement, which gives access to all functionality. There is no SPA-related eLicensing entitlement needed. As the SPA functionality has been incorporated within U4V, there is no need for a separate host-based SPA eLicensing

entitlement. Unisphere uses an SMC eLicensing entitlement, and all functionality is available through that. If you do have a host-based SPA eLicense, it will still be recognized and honored.

Please note DMX licensing has not been tested – therefore will be clarified in a subsequent release.

For installing the license for Unisphere for VMAX,

- Obtain the Symmetrix-based license file from EMC online support with the License Authorization Code (LAC) (retrieve from local account team or emailed LAC letter)⁶
- Use the `symlmf add` command on the remote SYMAPI server to push the license file to the Symmetrix array:

```
symlmf add -type emclm -sid <SymmID> -file <FileName> -v
```

Where:

- *SymmID* — Specifies the Symmetrix array on which you are installing the license file.
- *FileName* - Specifies the name of the license file
- Use the `symlmf view` command on the remote SYMAPI server to confirm the license has been applied:

```
symlmf list -type emclm -sid <SymmID>
```

For example:

```
#symlmf list -type emclm -sid 4261
```

```
Symmetrix ID: 000192604261
Issue Date : 01/30/2012
```

Feature Name	Activation Type	Capacity ID	Type	Install Licensed	Date
SYMM_VMAX_ENGINUITY	P-IND	1701838	R-TB-SATA	130	84 09/14/2012
SYMM_VMAX_FAST_TIERING	P-IND	1701838	R-TB-SATA	130	84 09/14/2012
SYMM_VMAX_SMC	P-IND	1701838	R-TB-SATA	0	214 09/14/2012

Legend:

Activation Type:

E-IND = Evaluation Individual

P-IND = Permanent Individual

P-ENT = Permanent Enterprise Agreement

P-LTD = Permanent Limited

⁶ As per document date, Citi has signed global ELA with EMC and Symmetrix Management Suite is included in the ELA list

4 SYMAUTH

The use of symauth as a user-based access control mechanism to a Symmetrix is **mandatory** when using Unisphere for VMAX.

Setup of symauth is covered in the CSBE Solutions Enabler 7.X Solutions Guide, as is audit logging, and is covered here in reference to U4V set up only.

Symauth meets Citi audit requirements since all user changes are logged with fmt=symaud and reviewed accordingly, if audit logging is correctly set up as per the above Solutions Guide.

Available roles can be assigned as per symauth:

- **Monitor** - Performs read-only operations on a Symmetrix array excluding the ability to read the audit log or Access Control definitions.
- **StorageAdmin** - Performs all management operations (active or control) on a Symmetrix array or on individual components within an array. This is the only role that can be given access rights to specific components within an array and is limited to Virtualization domain users. It can modify the GNS group definitions and monitor all operations (even if only granted rights to one component); includes application performance monitor privileges.
- **Administrator** - Performs all operations on a Symmetrix array, including security operations, in addition to all monitor operations, and including application performance monitor privileges. Has both StorageAdmin and SecurityAdmin rights.
- **SecurityAdmin** - Performs security operations (symaudit, symacl, symauth) on a Symmetrix array in addition to all monitor operations. Users or groups assigned the SecurityAdmin or Admin roles can create or delete component-specific authorization rules.
- **Auditor** - Grants the ability to view, but not modify, security settings for a Symmetrix array (including reading the audit log, symacl list, and symauth) in addition to all monitor operations.
- **PerfMonitor** - Includes Monitor role permissions and grants additional privileges within the performance component of Unisphere for VMAX application to setup various alerts and update thresholds to monitor Symmetrix performance.

'**PerfMonitor**' is a new role that limits access to managing performance related activities on Symmetrix systems specifically via Unisphere for VMAX. Where applicable the role should be assigned in order to limit certain users/AD groups to performance monitoring related and read-only operations, but not operational configuration via U4V.

4.1 Group Based User Authorization Mapping

4.1.1 Background

The symauth provides user-based authorization that assigns a user or group to a role to limit the management operations they can perform on a Symmetrix array.

With the 7.6 release of Solutions Enabler CATE have provided instruction on using group based authentication based on Kerberos groups. However U4V cannot utilize these groups for authentication, and there have continued to be issues with U4V using the native AD authentication option.

Using AD based authentication U4V cannot:

- Look up and pass user group information to symauth.
- Use AD group based symauth rules – therefore CTI would still need to maintain individual rules for each user
- Look up and pass nested AD group information
- Enforce a group based restriction for user access to U4V

To work-around the restrictions found with U4V using native AD, U4V does allow authentication via LDAP where you specify the authentication source. This has successfully been tested utilizing the AD domain controllers as the authentication source. Further information is provided in section 5 covering the configuration steps.

It is acknowledged that existing deployments will likely be leveraging Windows AD for authentication – Please refer to appendix F for details of how to convert an existing deployment to LDAP authentication.

4.1.2 Configuration

Solutions Enabler represents user or group identity as a string that comprises of the User/Group Name and the authentication source. Although Symauth entries for U4V will be based on active directory groups, the authentication source however will **NOT** be specified as 'D:' (Windows Domain).

The Authentication source will need to be specified as 'L:' (LDAP)

New active directory groups can be requested and membership edited via Citi Marketplace (search for Active Directory) or you can utilize existing AD groups if they contain the appropriate users.

Once the AD groups have been set up (or you have identified the existing groups you wish to use) appropriate symauth rules will need to be applied, for example:

```
# symauth -sid 1234 -f filename commit
```

Where the contents of example file is

```
Add group L:namdev.nsrootdev.net\per_csbe_unispherevmax_admins to role StorageAdmin;
Add group L:namdev.nsrootdev.net\per_csbe_unispherevmax_users to role PerfMonitor;
```

Therefore In this **example**:

- Authentication source **LDAP**: (Using Active Directory Domain controllers)
namdev.nsrootdev.net ** (Windows AD group) 'per csbe unispherevmax admin**' is mapped to the **StorageAdmin role**
- Authentication source **LDAP**: (Using Active Directory Domain controllers)
namdev.nsrootdev.net ** (Windows AD group) 'per csbe unispherevmax users**' is mapped to the **PerfMonitor role**

Once applied you can check/confirm the entry - Symauth list below has also been edited to just show these entries relevant to U4V.

```
# symauth -sid 4261 list -users -v

Role name           : StorageAdmin
Group name          :
L:namdev.nsrootdev.net\per_csbe_unispherevmax_admins

Role name           : PerfMonitor
Group name          :
L:namdev.nsrootdev.net\per_csbe_unispherevmax_users
```

4.2 Propagation of SYMAUTH roles changes

If changes are made to a user's symauth role outside of U4V (e.g. a change to the membership of an AD group that is used to define which users have a specific role), then the change will not immediately be visible to U4V.

This is because it can take some time for the authorization rule to update on SFS and be sent back to SE and U4V. Authorization rules are only *immediately* recognized within the process in which they were created. So if you were to create a rule through U4V, then that rule would be immediately enforced for that instance. It will take a few minutes to propagate to other instances of U4V/SE.

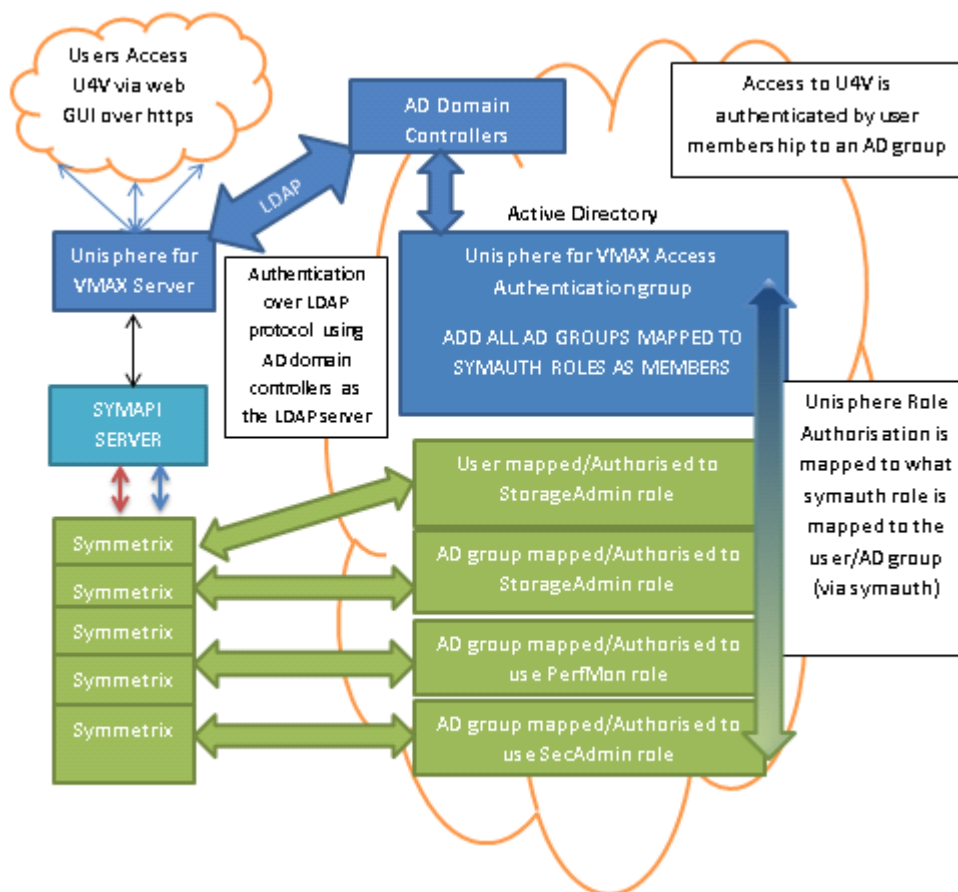
The bottom line is that you may have to wait several minutes (depending on the size of your environment, although there is no way to determine exact time) for the change to be visible to and used by U4V.

5 Configuration of Unisphere for VMAX

5.1 Security Model Overview

The following table & Diagram summarizes the security configuration that has been adopted in Citi.

Requirement	Implementation for Unisphere for VMAX
Centralized Authentication	User Authentication via LDAP using Active Directory as the source
Restricting activity when in Unisphere for VMAX	Authorization based on AD Group\User mapped to symauth roles
User access to U4V	Users will utilize desktop web browser for access (rather than direct RDP to a server)



5.2 Authentication: Setting Up Centralized AD over LDAP

It is acknowledged that existing deployments will likely be leveraging Windows AD for authentication – Please refer to appendix F for details of how to convert an existing deployment to LDAP authentication.

Prerequisites:

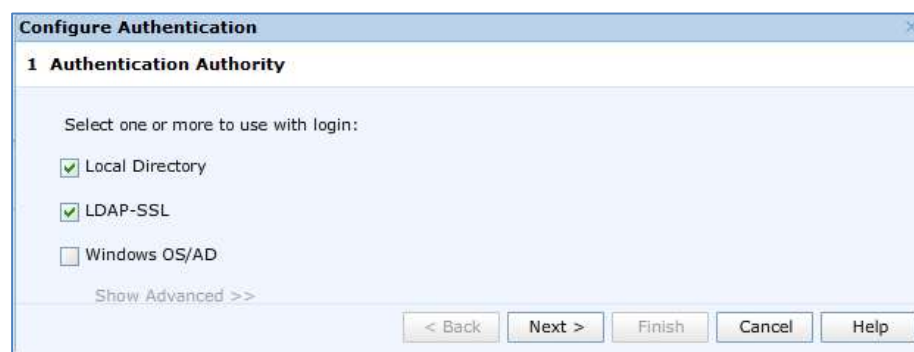
- A Windows AD group will need to be set up to restrict access to U4V application to only the members of the AD groups that will be nested within it.
 - The Nested groups will be the ones that have been mapped to symauth roles (Section 5.2).
- A Functional ID/service account will need to be set up to carry out the user look up for authentication queries controlling access to Unisphere for VMAX.
- The default U4V 'smc' account has been given admin role on the arrays via symauth

FID/Service account and active directory groups can be requested and membership edited via Citi Marketplace (search for Active Directory), or an existing FID could be leveraged.
e.g. DCNM/HPNA

Process:

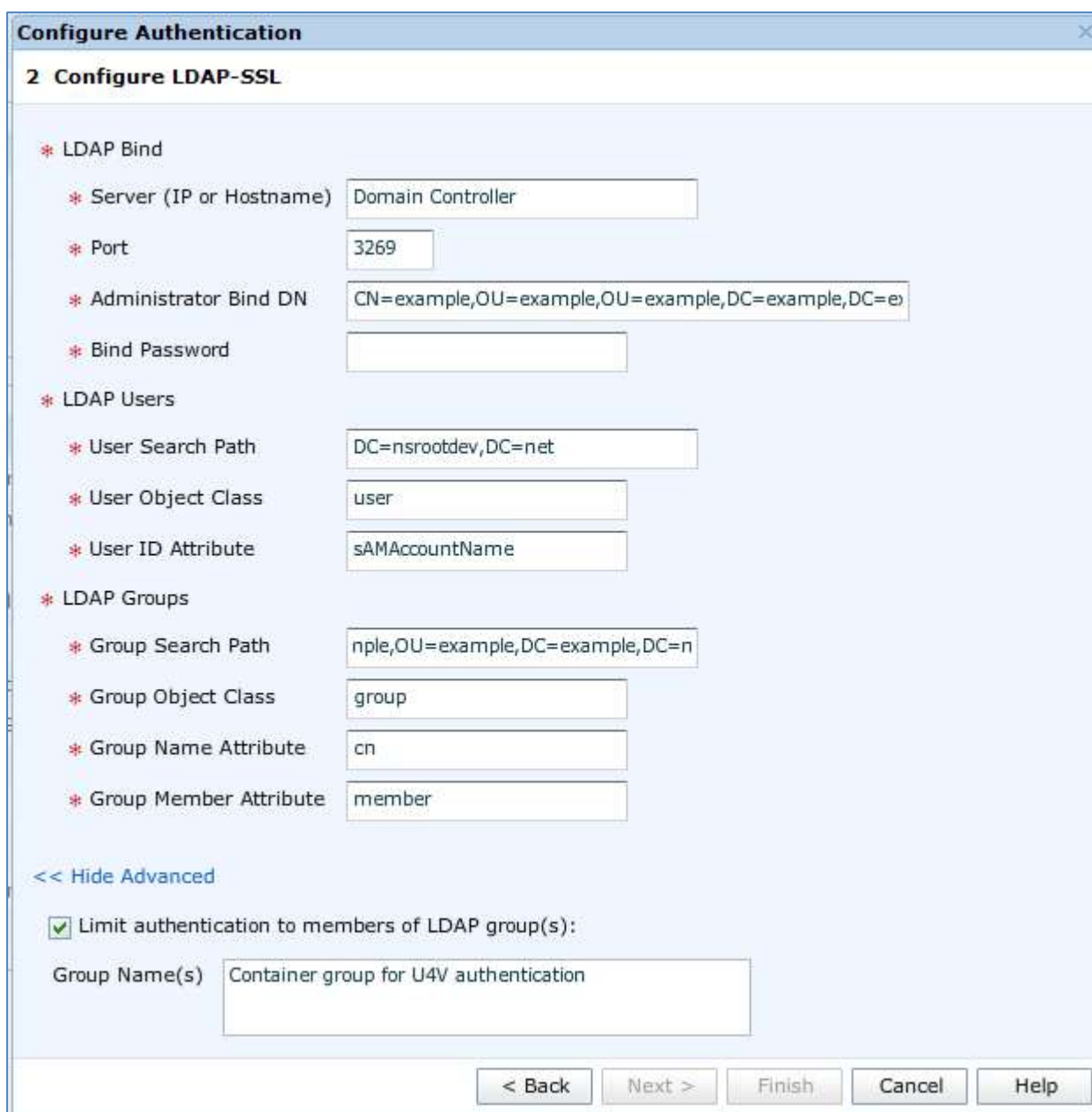
To set up the Authentication:

- Access Unisphere for VMAX via URL <https://<UnisphereforVmax-server-name>:8443>
Login into U4V with the initial default 'smc' account.
- Select 'Administration' → 'Security' → 'Authentication' which will display a summary of the current configuration.
- Select Edit and the Authentication Wizard will launch.
- Select LDAP-SSL



1. Click Next

2. LDAP-SSL configuration window will open Input details pertaining to your deployment/environment



Configure Authentication

2 Configure LDAP-SSL

* LDAP Bind

* Server (IP or Hostname)

* Port

* Administrator Bind DN

* Bind Password

* LDAP Users

* User Search Path

* User Object Class

* User ID Attribute

* LDAP Groups

* Group Search Path

* Group Object Class

* Group Name Attribute

* Group Member Attribute

<< Hide Advanced

☒ Limit authentication to members of LDAP group(s):

Group Name(s)

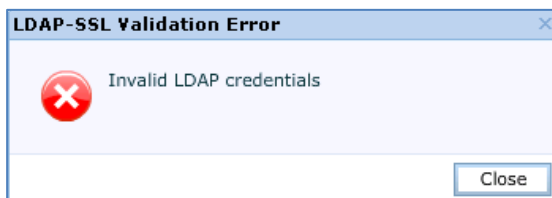
< Back Next > Finish Cancel Help

3. Click Next once complete

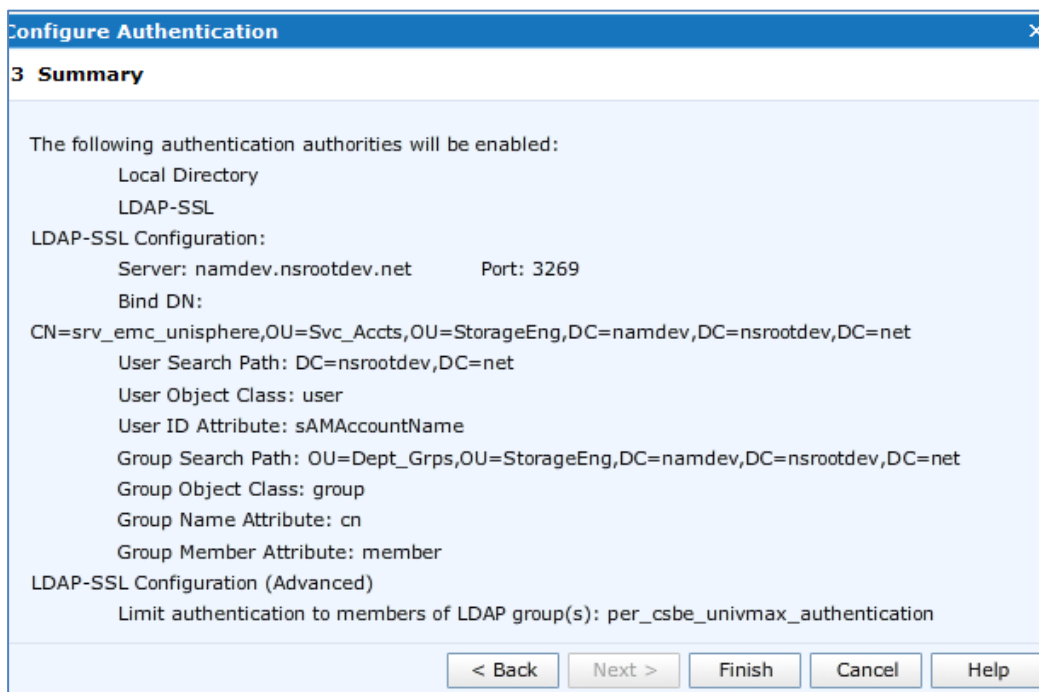
Please see the table below providing further reference of the input details or contact the author if you have any queries.

Configuration Item	Description	Citi entry
Server	IP address or hostname of the server to use for authentication	AD Domain xxxxxx.nsroot.net Example: eur.nsroot.net
Port	Port number of the LDAP/S service (Global Catalogue)	3269
Administration Bind DN	Distinguished Name of the service account used to perform operations, such as searching users and groups	Request this information from AD operations if this is not known. CN="FID sAMAccountName",OU="XXX",OU="YYY",DC="ZZZ",DC=nsrootdev,DC=net Example: CN=svr_emc_unisphere,OU=Svc_Accts,OU=StorageEng,DC=namdev,DC=nsrootdev,DC=net OR sAMAccountName@domain Example svr_account@xxxxxx.nsroot.net svr_emc_unisphere,@namdev.nsrootdev.net
Bind Password	Password of the service account	Password that has been set for service account
User Search Path	Distinguished name of the node at which to begin user searches	DC=nsrootdev,DC=net
User Object Class	Object class identifying users in the LDAP hierarchy	User
User ID Attribute	Attribute identifying the user login ID within the user object	sAMAccountName
Group Search Path	Distinguished name of the node at which to begin group searches	OU=XXXX,OU=YYYY, DC=nsrootdev,DC=net Example: OU=Svc_Accts,OU=StorageEng, DC=nsrootdev,DC=net
Group Object Path	Object class identifying groups in the LDAP hierarchy	Group
Group Name Attribute	Attribute identifying the group name	Cn
Group Member Attribute	Attribute indicating group membership for a user within the group object	Member
Limit Authentication to members of LDAP group	Specifies to limit authentication to only members of a specified group	This is the AD group created for containing the nested groups NOT the groups mapped to symauth rules e.g. per_univmax_authentication

If any settings are incorrect you will get an error banner, click close and you will return to the previous configuration page

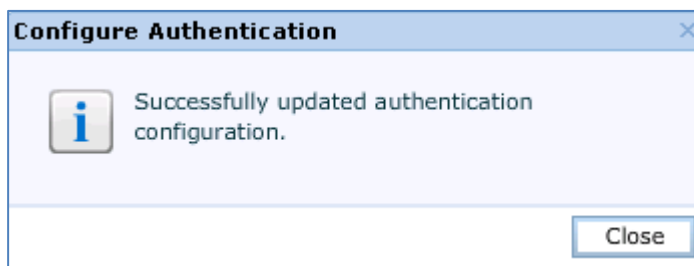


If all settings are entered correctly a summary will be displayed



4. Click Finish

Confirmation box will appear – click close



The Authentication Summary will update once you apply the change:

LDAP Details	
Server	namdev.nsrootdev.net
Bind DN	CN=svr_emc_unisphere,OU=Svc_Accts,OU=StorageEng,DC=namdev,DC=nsrootdev,DC=net
Port	3269
User Search Path	DC=nsrootdev,DC=net
User Object Class	user
User ID Attribute	sAMAccountName
Group Search Path	OU=Dept_Grps,OU=StorageEng,DC=namdev,DC=nsrootdev,DC=net
Group Object Class	group
Group Name Attribute	cn
Group Member Attribute	member
Limit Authentication to Group(s)	per_csbe_univmax_authentication

For initial setup, Local Directory should be left enabled as a temporary measure until setup is complete. Remove “Local directory” only when there is a user set as “Administrator” or “SecurityAdmin” in symauth **and** the user has confirmed authentication access via LDAP.

If you disable Local access prematurely, you may lock yourself out of Unisphere for VMAX. You have been warned.

5.3 Authorization: Restricting Activity Using Unisphere for VMAX

Unisphere for VMAX users gain access to a Symmetrix systems based on the SYMAUTH roles they or their AD group are mapped to.

An example of how to set up the group based mapping is provided in section 5.

The following tables derived from Citi testing show what you can do in U4V on a given array depending on your symauth role.

In reality most SAN operations team members will already be assigned to the ‘StorageAdmin’ role in order to carry out day to day CLI manipulation. The ‘Administrator’ role should not be assigned for providing rights for standard storage administration activities.

	SYMAUTH roles				
	Monitor	Security Admin	StorageAdmin	Admin	PerfMonitor
Can access Unisphere for VMAX Administration menu?	No	Yes	Yes	Yes	No

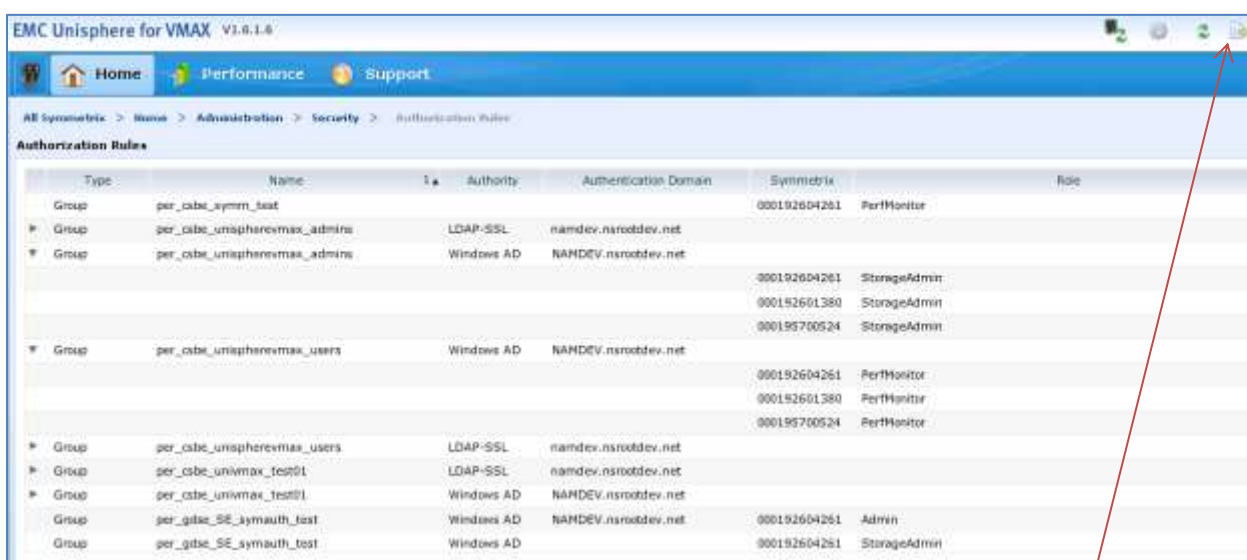
Can Edit Security Options	No	Yes	No	Yes	No
Can start data collections?	Yes	Yes	Yes	Yes	Yes
Can manage Symm systems?	No	No	Yes	Yes	No
Can view Symm systems configuration?	Yes	Yes	Yes	Yes	Yes

Note: It is possible to assign more than one role to a user (directly or indirectly via AD Group membership) in U4V and the combined privilege will be granted to the user.

5.3.1 Symauth viewed via Unisphere for VMAX

All configured symauth rules for all arrays visible to U4V can be viewed via Administration → Security → Authorization Rules

This provides a consolidated equivalent of symauth – sid XXX list –users –v output



Type	Name	Authority	Authentication Domain	Symmetria	Role
Group	per_cstc_symm_test			000192604261	PerfMonitor
Group	per_cstc_unispherevmax_admins	LDAP-SSL	namdev.nsrootdev.net		
Group	per_cstc_unispherevmax_admins	Windows AD	NAMDEV.nsrootdev.net		
				000192604261	StorageAdmin
				000192601380	StorageAdmin
				000195700524	StorageAdmin
Group	per_cstc_unispherevmax_users	Windows AD	NAMDEV.nsrootdev.net		
				000192604261	PerfMonitor
				000192601380	PerfMonitor
				000195700524	PerfMonitor
Group	per_cstc_unispherevmax_users	LDAP-SSL	namdev.nsrootdev.net		
Group	per_cstc_univmax_test01	LDAP-SSL	namdev.nsrootdev.net		
Group	per_cstc_univmax_test01	Windows AD	NAMDEV.nsrootdev.net		
Group	per_gdsc_SE_symauth_test	Windows AD	NAMDEV.nsrootdev.net	000192604261	Admin
Group	per_gdsc_SE_symauth_test	Windows AD		000192604261	StorageAdmin

Tip: If you need a report on all users/groups and the roles they have use the export button at the top of the page to export the all the data as a CSV.

5.4 User Access to Unisphere for VMAX

U4V is not limited to only being accessible via the window management workstation it resides on. Users do not need to RDP to a specific server before launching a browser on the server and logging on or have need to have access to the server.

Users will continue to access U4V from their desktop web browser after set up is complete

Access Unisphere for VMAX via URL

<https://<UnisphereforVmax-server-name>:8443>

5. Enter **JUST** your SOE ID & Password
6. Click Login



Version V1.6.1.6
EMC Unisphere for VMAX

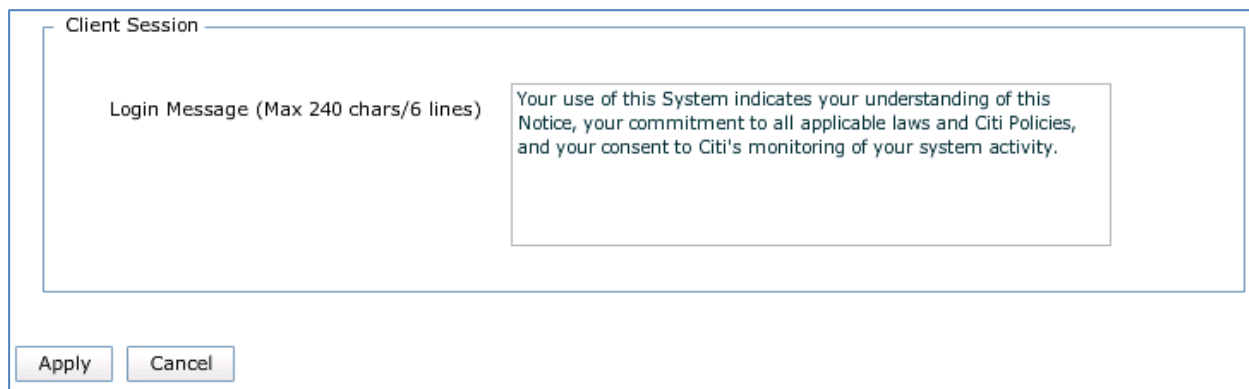
User

Password

this log on message should persist through the upgrade

5.5 Login message

The login message should be configured via Administration → Preferences.
 In the Client Session dialogue box enter the appropriate message and select apply (Message shown is an example)

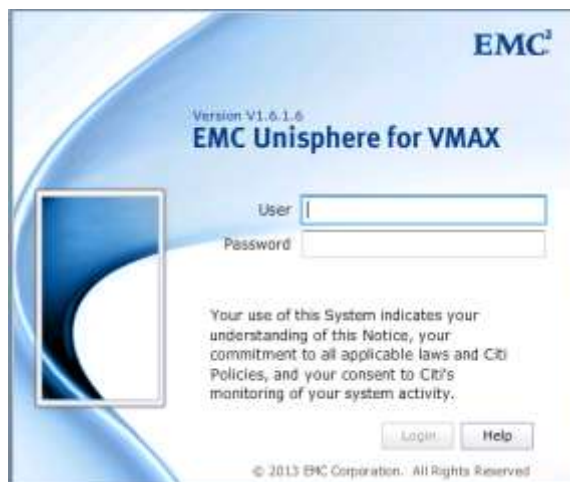


Client Session

Login Message (Max 240 chars/6 lines)

Your use of this System indicates your understanding of this Notice, your commitment to all applicable laws and Citi Policies, and your consent to Citi's monitoring of your system activity.

Message is reflected at the log on window



5.6 Limiting/Filtering array discovery in U4V

As highlighted in earlier sections, U4V scalability is poor - limited to a maximum of 80,000 devices – Within larger estates a SYMAPI server may well see 20+ arrays.

By default U4V will discover **whatever** the SYMAPI server has discovered, which includes local and remote arrays, and is not limited to only arrays that are registered in U4V for collection.

In some of the larger regional data centers, there have previously been incidents where U4V has not collected data for the arrays registered, with the cause being attributed to the U4V instances having more than the 80000 devices visible.

– In order to stay within the device limit U4V can be configured to exclude specified arrays from its discovery. The update requires making a change to an xml file on the U4V server, and example is shown below

It is recommended to limit U4V to only discover/monitor/view

- 1. Arrays Registered for Data collection**
- 2. Local Arrays ONLY**
 - Remote arrays should be excluded to eliminate un-needed traffic on RDF links

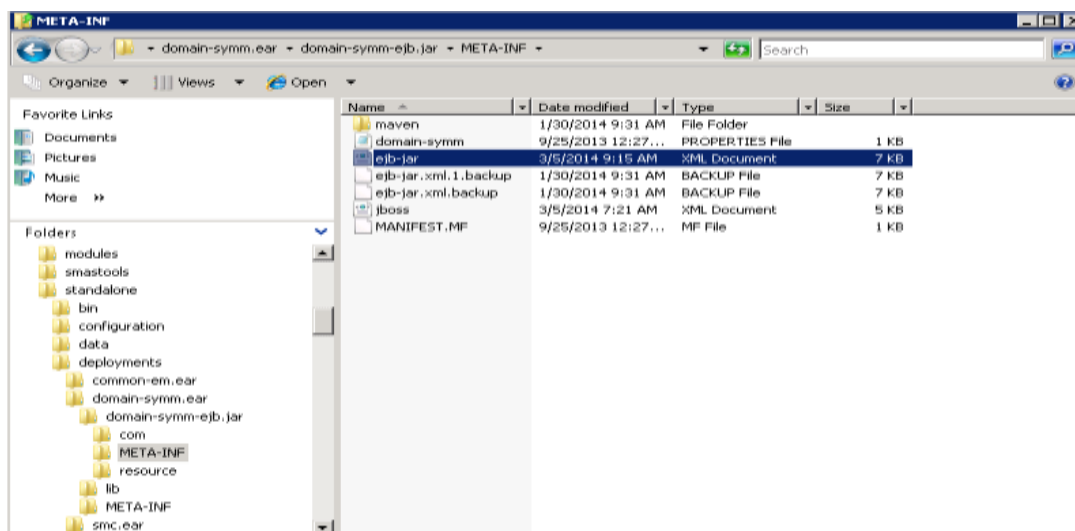
All Arrays visible on the SYMAPI server are visible on U4V instance



- On the U4V server, locate and open the ejb-jar.xml file.
Note: you will require appropriate rights to carry out changes to this file.

For U4V 1.6 the file was found to be located at:

C:\Program Files\EMC\SMAS\jboss\standalone\deployments\domain-symm.ear\domain-symm-ejb.jar\META-INF



- In the ejb-jar.xml file locate the section as shown below

```
<!-- Comma-separated symm-id collection -->
<env-entry>
  <env-entry-name>filterSymms</env-entry-name>
  <env-entry-type>java.lang.String</env-entry-type>
  <env-entry-value></env-entry-value>
</env-entry>
```

- Update the file to include all SYM IDs to be filtered OUT, depicted in the example below. The example depicts one SYM IDs that will be excluded, multiple entries should be comma separated.

```
<!-- Comma-separated symm-id collection -->
<env-entry>
  <env-entry-name>filterSymms</env-entry-name>
  <env-entry-type>java.lang.String</env-entry-type>
  <env-entry-value>000192601380</env-entry-value>
</env-entry>
```

- Save the changes, Close the file
- Stop & start the SMAS services
Specified array should then no longer be visible to U4V.



An RPQ was submitted by Peter Kemp (EMEA TC) to support the use of this exclusion workaround – This was rejected however EMC have advised they will support Citi – If any support issues are raised by the use of this exclusion, please inform the author of this document.

5.7 Setting Up Data Collection

The Performance component of Unisphere for VMAX only collects performance data after you register your Symmetrix systems. Note that **ONLY local Symmetrix systems** can be registered for Performance data collection.

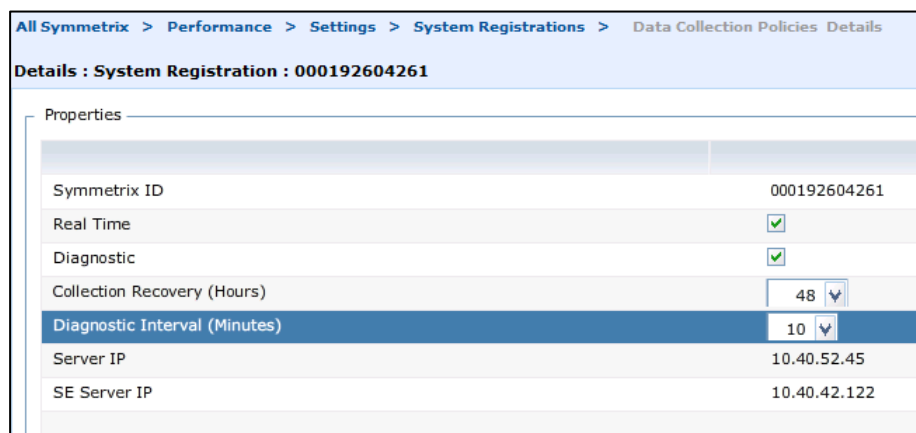
Ensure that you have completed configuration of symauth to give the right privileges to set up data collection – see Section SYMAUTH) before attempting to set up data collection.

Login into Unisphere for VMAX using an AD account/Group with symauth roles 'PerfMonitor' or 'StorageAdmin' assigned on the Symmetrix array from which data is to be collected.

Once logged in, follow the below to register a Symmetrix system for performance data collection:

- Select the Symmetrix system
- Click 'Performance' → 'Settings' → 'Systems Registrations' to open the Systems Registrations view.
- Click Register to open the Register dialog box. The Symmetrix ID automatically populates the Select Symmetrix list.
- Select both the type of performance data to collect, 'Real Time' and 'Diagnostic'.
- **Set Diagnostic Interval to 10 Minutes (Minimum)**
- Click OK.

View the system registrations by selecting 'Performance' → 'Settings' → 'System Registrations'. Click on the 'View Details' button from bottom left panel to view further details or make changes (e.g enable/disable Real time collections) to the system registrations on the Symmetrix array.



Properties	
Symmetrix ID	000192604261
Real Time	☒
Diagnostic	☒
Collection Recovery (Hours)	48
Diagnostic Interval (Minutes)	10
Server IP	10.40.52.45
SE Server IP	10.40.42.122

Go to 'Performance' → 'Analyze' and look at the 3 tabs to confirm if data is being collected. Real Time data will be available immediately, but trend information will not be available for a couple of hours as at least two data points are needed for trending.

5.8 Web Server Certificates

When you first try to connect to the Unisphere for VMAX via web browser the error message for security certificate as shown below:



As a workaround you can click 'Continue to this Website' to access Unisphere.

During CIVA testing it was advised it is required to apply a valid CA-signed digital certificate instead of using the self-signed certificate from U4V – Subsequent testing found the vendor process for replacing the certificate was not compatible with Citi's requirements, therefore the following process has been written and validated by EMC – but is currently subject to RPQ evaluation – please contact the author before implementing.

High level steps on how to replace the certificate for U4V are:

1. Request certificate from CA/DCS
2. Create a new keystore and generate certificate request
3. Retrieve Server and CA certificate
4. Import CA certificate into the U4V server as keystore default trust chain
5. Import CA-signed certificate into the U4V server keystore

Detailed steps are described as below:

Step 1: Request certificate from CA and Digital Certificate Service (DCS)

Submit request from Citi Market Place (CMP) by searching for 'Entrust Device 50036_1219' Complete the questionnaire (example below excludes some admin related questions):

- What action do you require?
 - New
- From which certificate Authority do require the certificate?
 - <Dev/QA/UAT or Production>
- What type of certificate do you require?
 - <Web Server SSL>
- Provide a description of Device, hardware or Application
 - Enter as appropriate – e.g Unisphere for VMAX - Performance and Monitoring Web GUI for EMC Storage arrays
- Provide a DNS Name (FQDN).

- <Type in the host name that will be displayed in the certificate>
- IP address
 - U4V Server IP address
- CSI ID
 - <Unisphere for VMAX CSI ID>

Also refer to: [GIDA - How to guide - Request Certificates](#)

NOTE: If required, certificate revocation can also be requested via marketplace – search against 'ENTRUST REVOKE' Also refer to [GIDA - How to Guide - Revoke Certificate](#)

Once request approved and completed, a **reference number** and authorization code will be provided.

Step 2: Create the Keystore & CSR

In order to request CA for digital certificate, it is required to generate a certificate request file from U4V server.

However - The CSR file that the keytool will generate by default, **will not** meet the Citi requirement for the CN to match the **reference number** supplied on fulfillment of the CMP request.

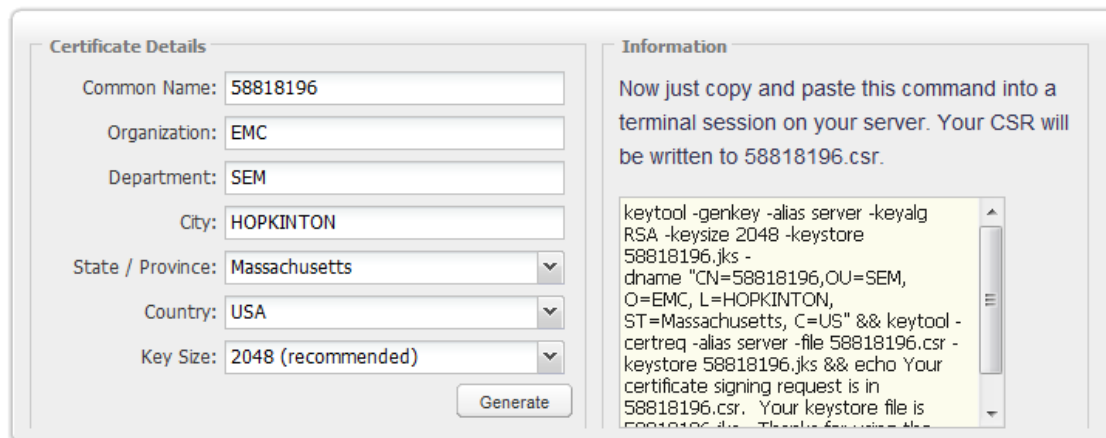
Therefore you need to generate a new keystore, and change the CN details to match the supplied reference number.

The easiest way to achieve this is using the wizard <https://www.digicert.com/easy-csr/keytool.htm>

- Organization, Department, City, State, Country and Key Size will be as shown below
- **Common name field will be the reference number provided on completion of the Entrust CMP**

Java Keytool CSR Wizard The fastest way to create your CSR for Tomcat (or any platform using Keytool)

Fill in the details, click Generate, then paste your customized Keytool CSR command into your terminal.



This wizard does provide all the required commands combined to create the keystore with the CN based on the reference number and then generate the appropriate csr - but to break this down:

```
cd <InstallDirectory>\SMAS\jboss\standalone\configuration\
```

- Run the following command to create the new keystore
- When prompted input a password of your choice, and confirm again
- Where requested to Enter Key Password hit return

```
<InstallDirectory>\SMAS\jboss\standalone\configuration"><InstallDirectory>\
\EMC\SMAS\jre\bin\keytool.exe" -genkey -alias server -keyalg RSA -
keysize 2048 -keystore 58818196.jks -dname "CN=58818196, OU=SEM, O=EMC,
L=HOPKINTON, ST=Massachusetts, C=US"
```

```
Enter keystore password:
Re-enter new password:
Enter key password for <server>
(RETURN if same as keystore password):
```

- Run the following command to create the CSR file
- When prompted input keystore password previously chosen

```
<InstallDirectory>\EMC\SMAS\jboss\standalone\configuration"><InstallDirecto
ry>\EMC\SMAS\jre\bin\keytool.exe" -certreq -alias server -file
58818196.csr -keystore 58818196.jks
Enter keystore password:
```

- Confirm if the certificate request file is created under the directory

Step 3: Retrieve CA signed certificates from Digital Certificate Service (DCS)

There are two certificates you need to retrieve:

1. Signed Webserver certificate
2. CA Certificate

Browse to DCS webpage to request for certificate. DCS URL as below:

- PRD: <https://digitalcertificate7.citigroup.com>
- UAT: <https://digitalcertificate7uat.citigroup.com>

Generate signed webserver certificate

Click on 'Create Web Server Certificate from PKCS#10 Request' to continue.

Enter the reference number and authorization code provided on completion of CMP request from Step 1

Leave Options as default

Paste CSR detail into the window

e.g.

```
-----BEGIN NEW CERTIFICATE REQUEST-----
MIIBOzCCAQwCAQAwYzELMAkGA1UEBhMCVVMxCzAJBgNVBAgTAk1BMRIwEAYDVQQHEw1IT1BLSU5U
-----END NEW CERTIFICATE REQUEST-----
```

Submit request & Certificate will be generated. Save to file

CA certificate

Retrieve CA certificate from DCS webpage > 'Install or Save to File'

Move both certificates to the U4V server

Step 3: Import CA certificate

It is required to import CA certificate into keystore to serve as the root for the trust chain.

- Go to the directory in U4V server from command prompt:

```
cd <InstallDirectory>\SMAS\jboss\standalone\configuration\
```

- Run the following command to import the CA certificate as trusted chain:

```
<install_directory>\emc\smas\jre\bin\keytool -import -alias root -
file <CA_certificate_location\filename> -keystore <Keystore created
in step2> -trustcacerts
```

- When prompted, enter the keystore password previously created (step 2).

Step 4: Import the CA-signed certificate

- From the U4V server, stop the SMAS service

```
C:\>net stop "EMC Symmetrix Management Application Server"
```

- Run the following command on the command prompt:

```
<install_directory>\jre\bin\keytool -import -alias server -file
<certificate_location\filename> -keystore <Keystore created in
step2> -trustcacerts
```

- When prompted, enter the keystore password previously created (step1).

Step 5: Update configuration file to utilize keystore and certificates

Final step will be to update the standalone-full file to reflect the new keystore and password

- Go to the `SMAS\jboss\standalone\configuration\` directory on the U4V server using Windows Explorer.
- Select the Standalone-full xml file, and open with wordpad
- Search for 'key-alias' and change this to 'server'

- On the same line update the password field with the password selected during step 2
- In the line under the key-alias and password entries update the file name at the end of certificate-key-file.

For example:

Before:

```
socket-binding="https" secure="true">
  <ssl key-alias="tomcat" password="hostname@Keystore-2"
certificate-key-file="${jboss.server.config.dir}/keystore"
```

After:

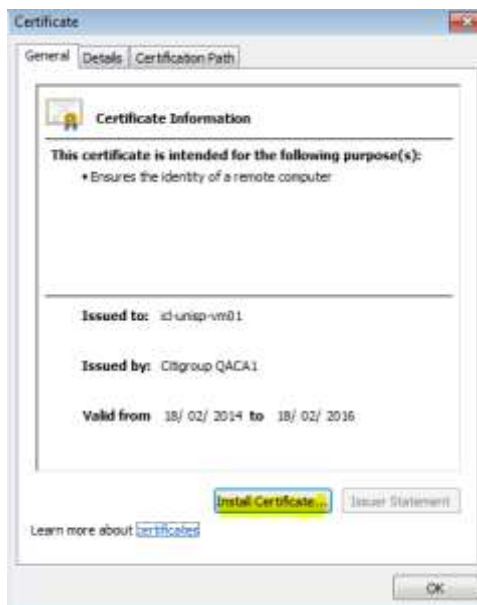
```
socket-binding="https" secure="true">
  <ssl key-alias="server" password="Password"
certificate-key-file="${jboss.server.config.dir}/58818196.jks"
```

- Move (or delete) the standalone-full_xml_history folder, and any standalone-full.xml.backup files.

- Start the SMAS service

```
C:\>net start "EMC Symmetrix Management Application Server"
```

- On next attempted launch, you can install the Citi/CA signed certificate



RPQ: S1292588 was raised by Peter Kemp (EMEA TC) and approval was provided 14 March 2014 to utilize the above process

5.9 Backup Unisphere Database

Unisphere for VMAX performance database should be backed up regularly to protect against accidental corruption. On Symmetrix arrays with many devices, the disk space required eventually may be high.

To backup U4V performance database,

- Select Performance → Settings → Databases to open the Databases view.
- Select a database from the list and click 'Backup' to open the Database Backup wizard.
- Select the Symmetrix system.
- Enter a backup File Name. The file name will be started with Symmetrix system ID and timestamp of backup taken follow by the file name as defined here. For example:
 - 000192604261_201212060237_unispherev1.5.0.3_SPABackup.dat⁷



- Optional: Select any of the following Data to Save:
 - *Historical*⁷
 - **Last day of Diagnostics*⁸
 - **Named Real Time Traces*
- Set the "Execution Time":
 - If 'Now' – Click Finish.
 - If selecting 'Schedule' - Click 'Next'. Select the 'Start Date and time'. Select 'Yes' to configure for recurring database backup and select the day to run on weekly basis.



- Click Finish.

The backup will be written to the directory <InstallDirectory>\Program Files\EMC\SMAS\backup\SPA

⁷ "Historical" is always selected and cannot be unselected

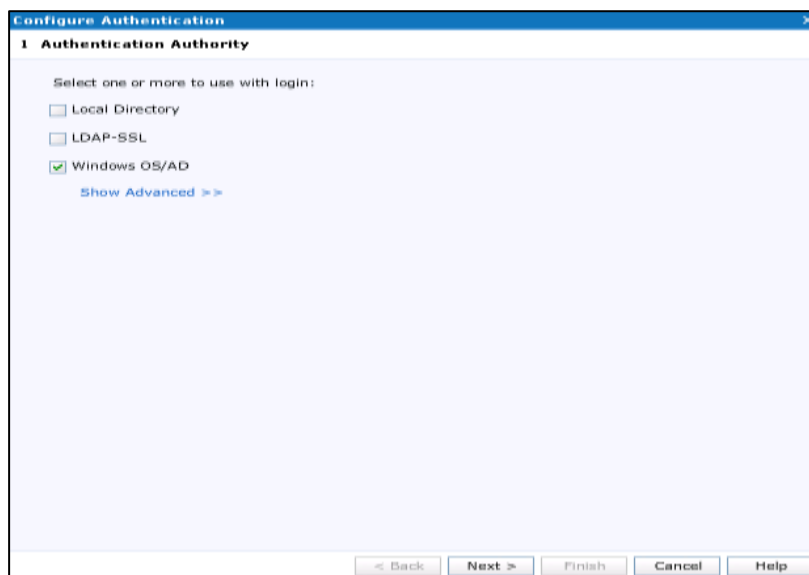
⁸ The two * options are not recommended for recurring backups

5.10 Remove authorization via local directory

Once setup has been completed and tested, local directory account assess must be disabled.

Users with appropriate Administrator (temporary) or SecurityAdmin rights will need to login into U4V.

Select 'Administration' from the right bottom common tasks panel and select 'Authentication'
Unselect 'Local Directory' from the list



Note: During testing with U4V 1.6.1.6 & SE 7.6.1 it was found that although Local Authentication had been disabled AND the SMC account deleted failed authorization attempts were being logged on the symapi server (/var/symapi/log/symapi.log) every 10 minutes.

This was investigated by EMC who advised there is a code defect in the client/server setup for U4V/Solutions Enabler. There is actually no attempt to login and the messages in the api log were spurious. (Reference SR 59355276).

The only way the 'spurious' logs could be suppressed was by adding a symauth rule for SMC, with the minimum roles.

5.11 Operational Observations

5.11.1 Using Unisphere for VMAX at large sites

At large sites, where the remote SE server can see many local and remote Symmetrix, it was found that the SMC product could hang. Increasing the Java heap size was found to alleviate this issue (experienced by Citi operation team). This can be achieved by editing the file

C:\Program Files\EMC\SMAS\jboss\bin\run.bat and change the line

set JAVA_OPTS=%JAVA_OPTS% -Xms1024m -Xmx2560m

to

set JAVA_OPTS=%JAVA_OPTS% -Xms1024m -Xmx5120m

If encountered with U4V - Before implementing, it is essential a support case is raised with EMC and involve in CSBE. So this can be acknowledged and tracked for product enhancement based on the impact and occurrence.

5.11.2 Add Trusted Sites

If there is any problem when launching the Unisphere for VMAX on Internet Explorer, you may also have to add the U4V URL (<https://<UnisphereforVmax-server-name>:8443>) into trusted sites in the Internet Explorer Security options:

- From Internet Explorer, click 'Tools' → 'Internet Options' → 'Security' tab
- Click 'Trusted Sites' → 'Sites' to add new site
- Enter the Unisphere for VMAX URL and click 'Add' button and close it to complete
- Refresh the page and the Unisphere for VMAX should appear correctly

5.11.3 Optimize Remote Connection

Once logged into the system, Unisphere for VMAX connection can be optimized (for example, animations are removed) for remotely connect users – Although feedback from Citi Operations indicate this feature provide limited benefit.

Click on 'Settings' on right top title bar and open the 'Preference Settings' dialog box. Select the option 'Optimize for Remote Connection' for better connection over low bandwidth situation.



6 Using Unisphere for VMAX

6.1 Introduction

Unisphere for VMAX has many functions. These are described in the Unisphere for VMAX on-line help system (launch by click on 'Help' button from 'Support' section within U4V) and no attempt is made here to duplicate that documentation.

The following is a selection of certain displays and functions which are considered to be particularly useful. However, the user is encouraged to explore U4V, read the help, and find which displays they find most useful.

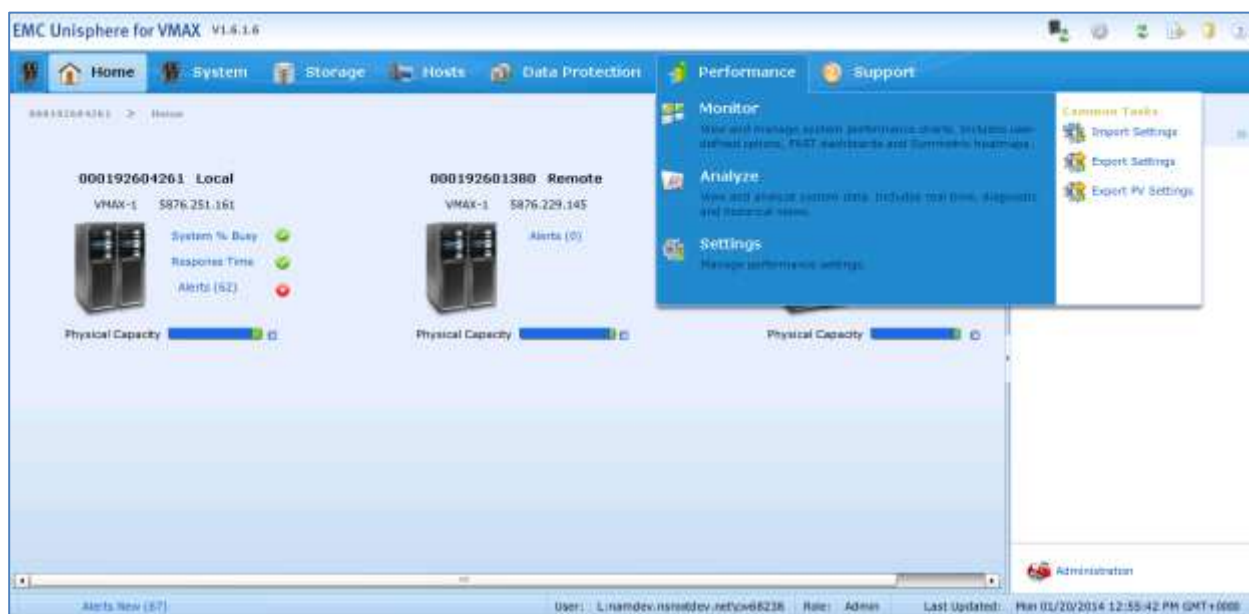
The CATE FAST VP Directives and Best Practice document will also have a section for suggestions on how to use Unisphere for VMAX with FAST VP and that material is not repeated here.

Each Unisphere for VMAX view is considered briefly in turn in each sub-section, but in summary the views are:

Section	Function
Home	View dashboard charts showing each system's usage. - View graphic representations of how the well the Symmetrix systems are performing. - View and manage Administration Settings (lower right icon): - View and manage alert settings. - View and manage authentication options (local directory, Windows OS/AD, LDAP-SSL). - View and manage system preferences. - View and manage user authorizations. - View and manage link and launch client registrations.
System	- View system dashboards - Display a list of active jobs - Display a list of alerts - View the selected Symmetrix system's attributes - View and manage the visible Symmetrix systems' licenses
Storage	- View and manage storage groups (create, edit, delete, expand) - View and manage the FAST™ controller policies - View and manage storage tiers - View and manage thin pools - View and manage storage volumes - View and manage storage templates - View external storage - View and manage disk groups
Hosts	- View and manage initiators - View and manage masking views - View and manage initiator groups (rename alias, set attributes, set

	flags, replace initiator) - View a list of host aliases on the storage system - View and manage port groups
Data Protection	- View and manage local replication (create sessions, activate, recreate) - Monitor and manage replication pools - Create and view device groups and consistency groups - Monitor and manage Symmetrix system migration sessions - Monitor and manage RecoverPoint™ sessions
Performance	- Monitor and manage Symmetrix system dashboards (charts/graphs, heat maps, predefined for FAST) - Perform trend analysis for future capacity planning - Analyze Symmetrix system data for diagnostic troubleshooting - Create charts for historical, diagnostic, and realtime Symmetrix system data - Manage policies for data collection and polling. - Customize the performance metrics to your requirements - Set thresholds and alert notifications for Symmetrix system components - Maintain and schedule captures of a specified time period of real time data - Create, schedule, execute, and export data queries - Configure the performance database and perform backups and restores
Support	View online help for Unisphere for VMAX

Each view type is available near the top of the Unisphere for VMAX window with drop-down menu for quick access.



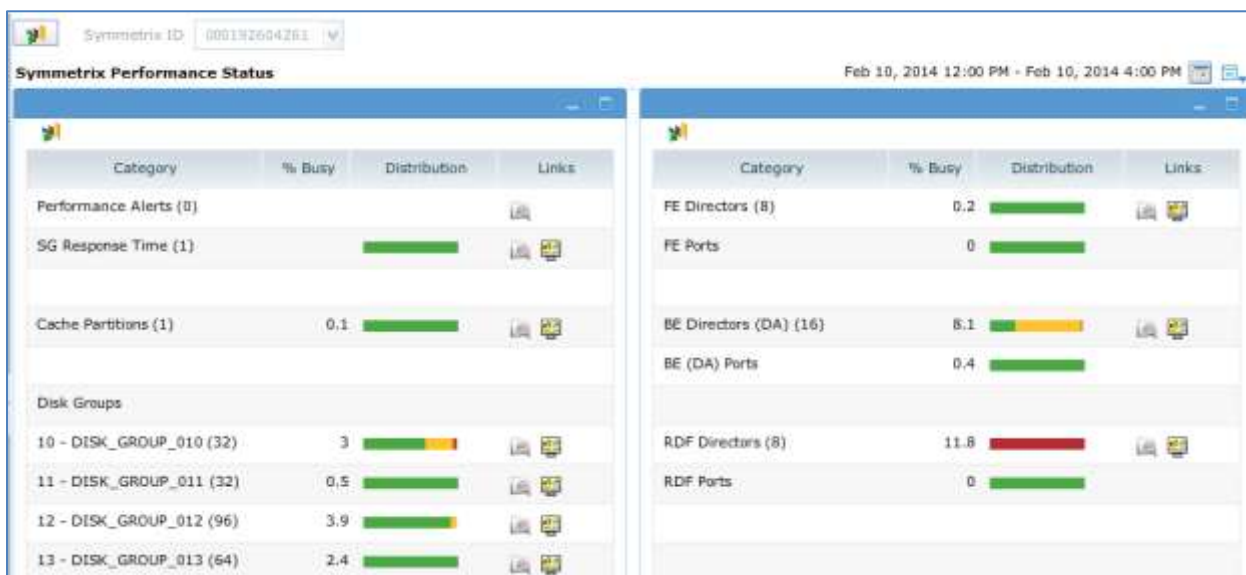
6.2 Home View - System RAG status

On the home screen each array discovered and registered for data collection will display a Red, Amber, Green status indicator for % Busy & Response time for a quick view – the status will change according to preset thresholds. (Although preset these can be edited).



6.3 Symmetrix Performance Status

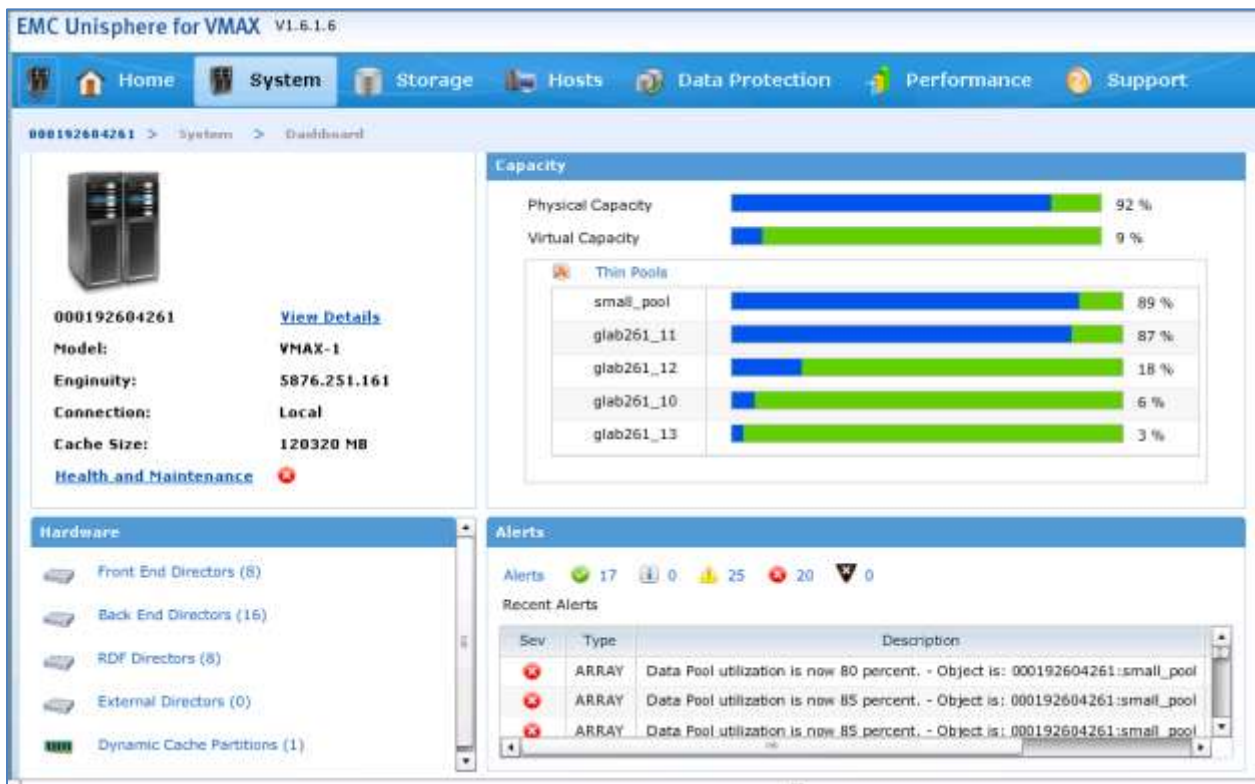
By clicking either System % Busy or Response Time, you can navigate from the RAG status to a Performance status report of the selected array – this provides a high-level end to end overview of the array's performance. For each component area it displays a Red, Amber, Green status indicator based on preset threshold. (Although preset these can be edited).



From here, component level reports can be accessed using the navigation buttons or you can navigate to the Analyze view for the selected component.

6.4 System Dashboard

Single pane providing high level system overview and click to detailed information metrics and access health and maintenance features.



6.4.1 System feature - Symaudit log via Unisphere for VMAX

Symmetrix Audit log can now be viewed from U4V.

Select the desired array then navigate to System → Audit Log, and the last 512 log entries will be displayed.

The screenshot displays the EMC Unisphere for VMAX Audit Log (V1.6.1.6). The interface shows the navigation bar with the "System" tab selected, and the "Audit Log" link is active. The main content area displays a table of audit log entries:

Record	Date	Application	Username	Host	Function Class	Action Code	OS Name	Activity
585944	Tue 02/04/2014 10:32:33 AM GMT+0000	UNIVMAX	L:namdev.nsroutde...	gdsese01	Security	Remove	LINUX	SE6fb56a...
585945	Tue 02/04/2014 10:32:34 AM GMT+0000	UNIVMAX	L:namdev.nsroutde...	gdsese01	Security	Remove	LINUX	SE6fb56a...
585946	Tue 02/04/2014 10:33:49 AM GMT+0000	UNIVMAX	L:namdev.nsroutde...	gdsese01	Security	Add	LINUX	SE9d8dcd...
585947	Tue 02/04/2014 10:33:50 AM GMT+0000	UNIVMAX	L:namdev.nsroutde...	gdsese01	Security	Add	LINUX	SE9d8dcd...
585948	Tue 02/04/2014 10:38:01 AM GMT+0000	SYMAUTH	H:gdsese01\cw68238	gdsese01	Security	Remove	LINUX	SEf90c705...
585949	Tue 02/04/2014 10:38:01 AM GMT+0000	SYMAUTH	H:gdsese01\cw68238	gdsese01	Security	Remove	LINUX	SEf90c705...
585950	Tue 02/04/2014 05:39:27 PM GMT+0000	SYMACCESS	H:hk192604261\SY...	HK192...	DevMask	BeginBackup	WinNT	SE438ba7...
585951	Tue 02/04/2014 05:39:27 PM GMT+0000	SYMACCESS	H:hk192604261\SY...	HK192...	DevMask	EndBackup	WinNT	SE438ba7...
585952	Wed 02/05/2014 04:59:28 AM GMT+0000	VolumeLogix		Symm...	Security	SysCalls	Enginuity	

Select the desired entry and click on the View Details button

EMC Unisphere for VMAX V1.6.1.6

Home System Storage Hosts Data Protection Performance

000192604261 > System > Audit Log > 585948

Details : Audit Log Record : 585948

Properties

Record Number	585948
Text	Starting a User Authorization operation to delete role for user D:NAMDEV\cw68238
Time	Tue 02/04/2014 10:38:01 AM GMT+0000
Application ID	SYMAUTH
Username	H:gdse01\cw68238
Function Class	Security
Action Code	Remove
Host	gdse01
Records in Seq	1
Offset in Seq	1
Vendor ID	EMC Corp
Application Version	7.6.1.0
API Library	SEK
API Version	V7.6.1.0 (Edit Level: 1755)
OS Name	LINUX
OS Revision	2.6.18-164
Client Host	
Activity ID	SEF90c705425
Process ID	26462
Task ID	1

By default U4V will display the last 512 entries – however Symaudit information can be viewed for any Date range, Function, Action Activity ID, Host, Vendor ID, Application ID, user name and/or device range by using the filter

000192604261 > System > Audit Log

Audit Log

Record	Date	Application	Username	Host	Function Class	Action Code	OS Name	Activity ID
67094	Fri 05/25/2012 11:49:14 AM GMT+0100	UNIVMAX	D:NAMDEV\ccf3851...	gdse01	Security	Remove	LINUX	SE7b5...
67095	Fri 05/25/2012 11:49:14 AM GMT+0100	UNIVMAX	D:NAMDEV\ccf3851...	gdse01	Security	Remove	LINUX	SE7b5...

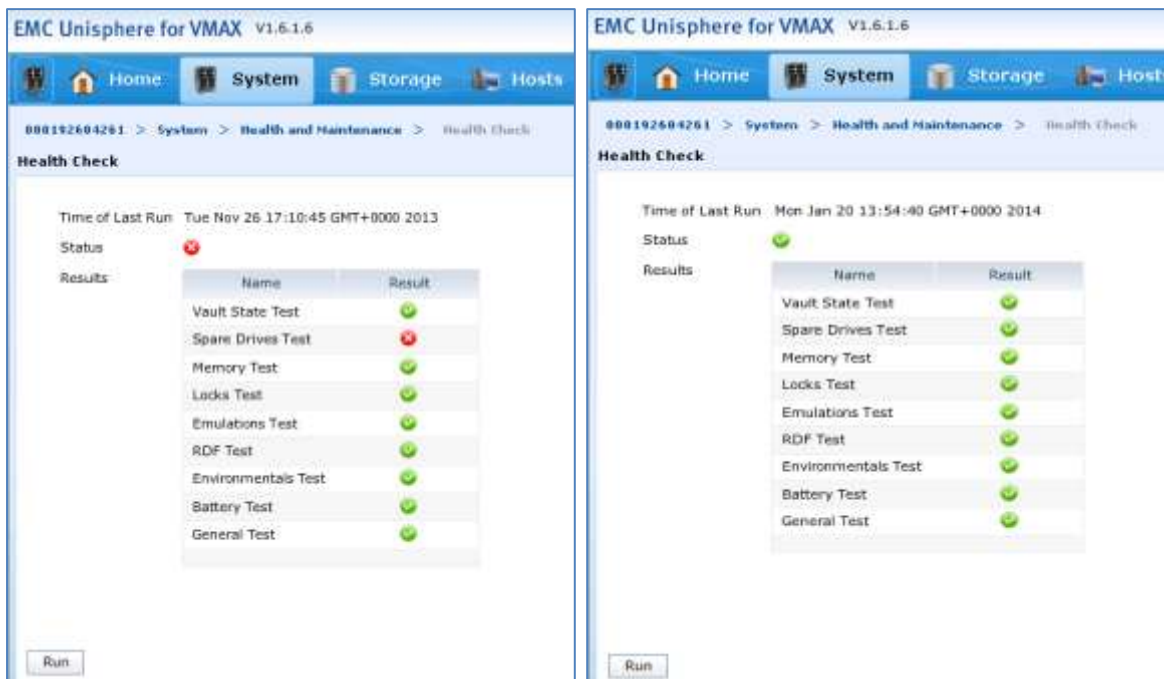
6.4.2 System Feature - Health Check

Runs a variety of checks against system components – recommended before/after maintenance, upgrades

Health check performs the following tests:

- Vault State Test — Verifies the ability of the system to save data in case of a power failure.
- Spare Drive Test — Verifies that spare drives are available in case of a drive failure.
- Memory Test — Verifies that the memory is reporting no errors or disabled banks.
- Locks Test — Verifies that there are no software locks present.
- Emulations Test — Verifies that all directors are loaded with the same Engenuity release as that on the service processor.
- RDF Test — Verifies that all SRDF links are online.
- Environmental Test — Verifies that internal environmental components (power supplies, fans, batteries, etc.) are reporting no errors.
- Battery Test — Verifies that the most-recent battery test reported no errors.
- General Tests — Checks for any abnormal conditions in the following areas: volume status, director status, hung upgrade, code table integrity, directors running same code.

System > Health and Maintenance → Health Check → Run



EMC Unisphere for VMAX V1.6.1.6

Home System Storage Hosts

000192604261 > System > Health and Maintenance > Health Check

Health Check

Time of Last Run: Tue Nov 26 17:10:45 GMT+0000 2013

Status: 

Results:

Name	Result
Vault State Test	
Spare Drives Test	
Memory Test	
Locks Test	
Emulations Test	
RDF Test	
Environmentals Test	
Battery Test	
General Test	

Run

EMC Unisphere for VMAX V1.6.1.6

Home System Storage Hosts

000192604261 > System > Health and Maintenance > Health Check

Health Check

Time of Last Run: Mon Jan 20 13:54:40 GMT+0000 2014

Status: 

Results:

Name	Result
Vault State Test	
Spare Drives Test	
Memory Test	
Locks Test	
Emulations Test	
RDF Test	
Environmentals Test	
Battery Test	
General Test	

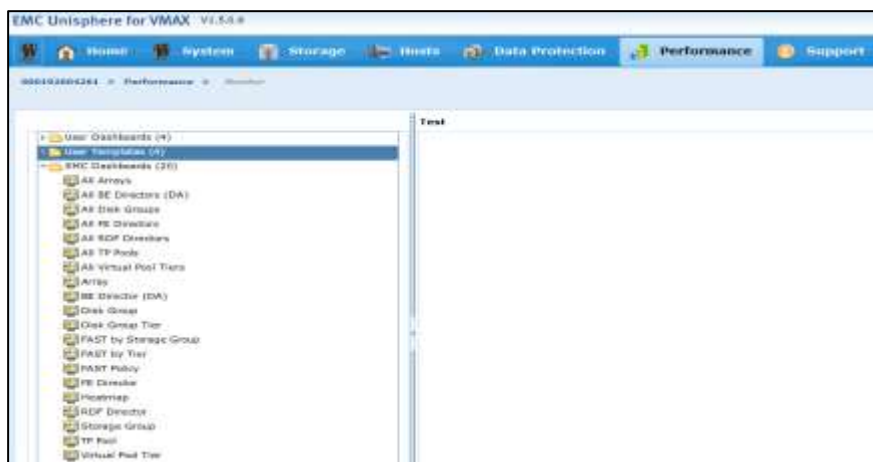
Run

6.5 Performance Button Features

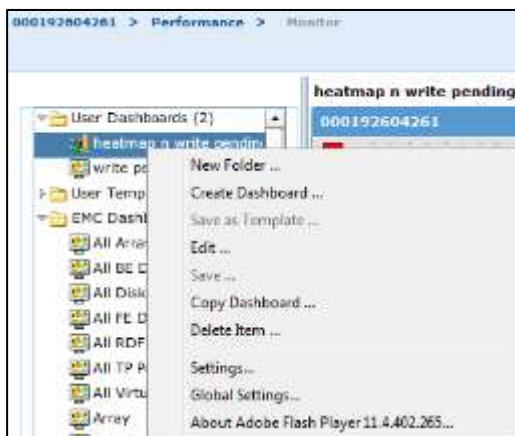
6.5.1 Monitor

From the Performance option in Unisphere for VMAX, there are buttons to navigate to 'Monitor' and 'Analyze' views.

Monitor view provides access to dashboard views for quick overall look at the storage environment. It includes some decent pre-defined dashboards, and new dashboards can be user-defined and organized in folders. A dashboard can contain charts and/or a Symmetrix heat map



The dashboards are customizable by right clicking on the dashboard items from left panel:



Most entries are self-explanatory. The "Edit" option can be used to edit the selected dashboard. Each pre-defined dashboards can be adjusted and saved as a template for own dashboard.

Charts from the Analyze view that have been saved to the clipboard can be added to a dashboard. In this way, personalized dashboards can be built. Heat maps for each Symmetrix can also be added.

6.5.2 Heat Maps

Array heat map dashboard is found within the Monitor view providing a color coded graphical % utilization for Front End, Backend ports and other components depending on type of chart chosen.

Symmetrix Array → <SID> → Performance → Monitor → EMC Defined Dashboards → Heatmap

6.5.2.1 Heat Map Type: Realtime

NOTE: Do not use the Real Time View as a standard operating practice: Real time data should only be collected when absolutely required – e.g. live problem analysis – Also refer to section 3.2.

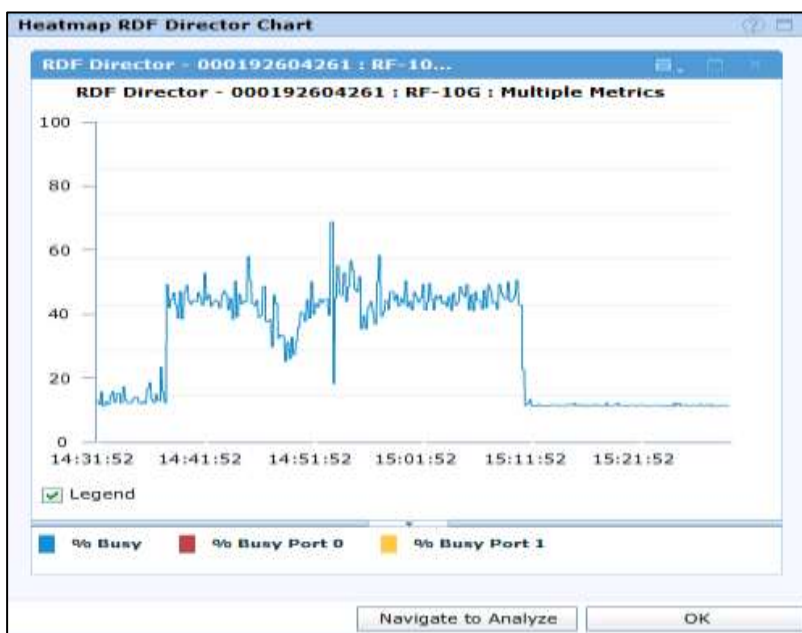
– Also displays Cache % WP Used



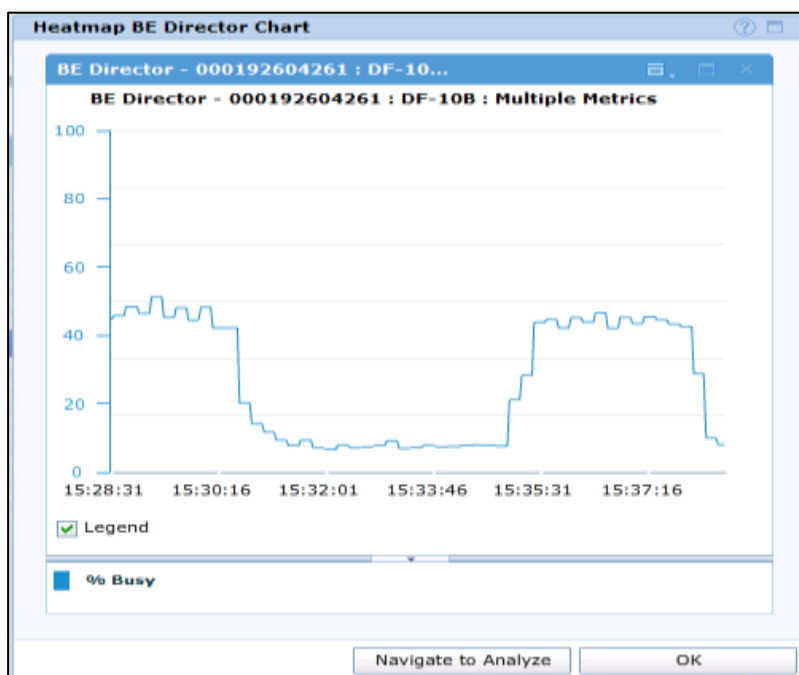
- Double Click Cache '%WP Used' status bar to display time series chart



- Double Click specific Front End director to show % Busy



- Double Click specific Back End directors to show % Busy



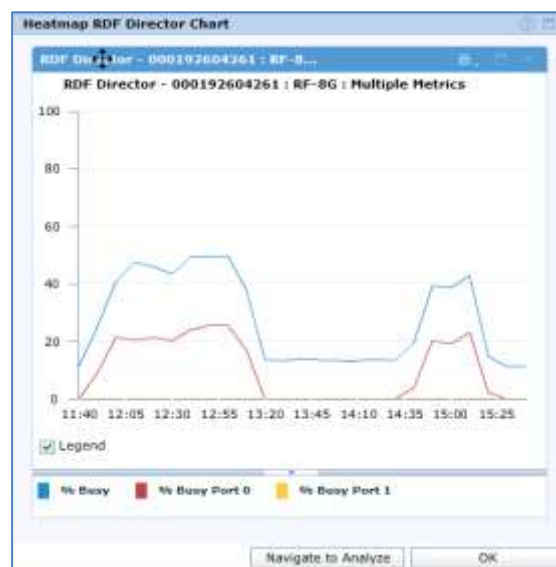
6.5.2.2 Heat Map Type: Diagnostic

Displays Front and Back End Utilization

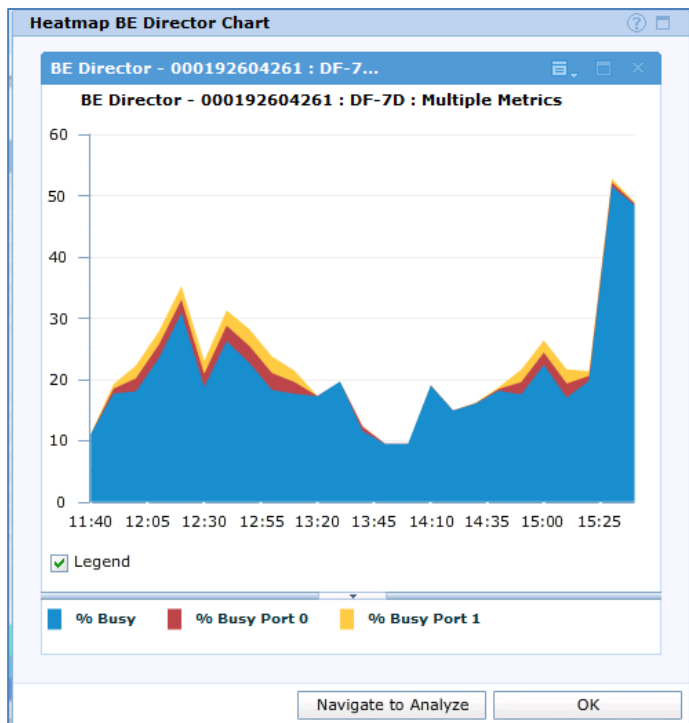
– Also displays Director Port Utilization by 'Disk Bucket' (See 6.5.2.5)



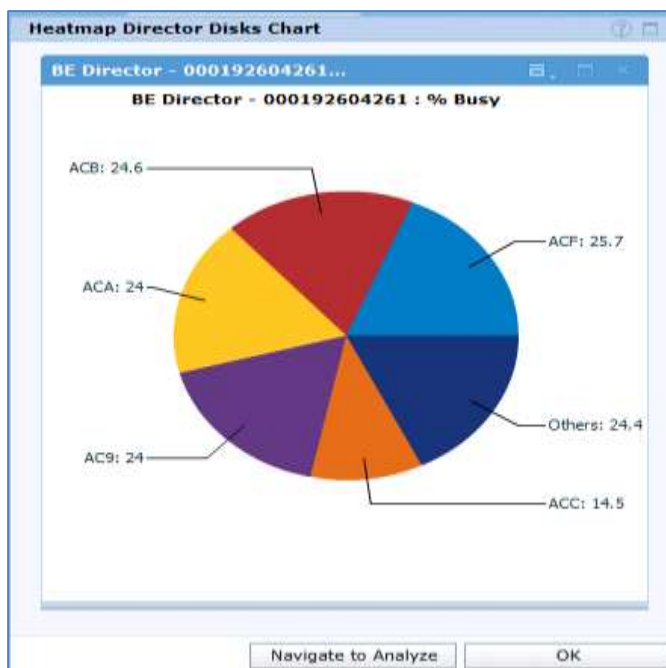
- Double Click specific Front End director to show % Busy per port versus % Busy for the array



- Double Click specific Back End directors to show % Busy per port versus % Busy for the array (area chart style shown as an example)



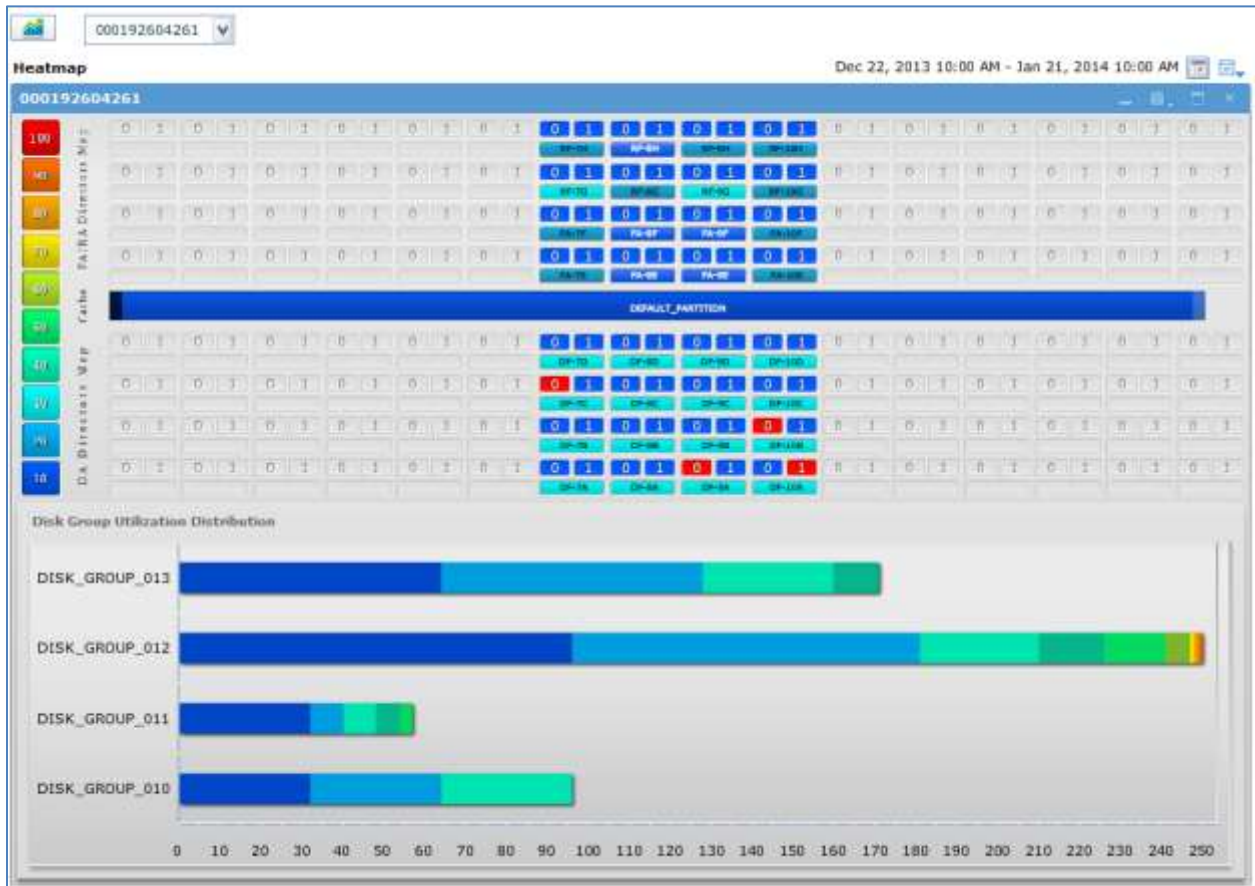
- Double Click Specific Directors to show Disk Distribution/% utilization



6.5.2.3 Heat Map Type: Historical

Displays Front and Back End Utilization

– Also displays Disk Group Utilization by 'Disk Bucket' (See 6.5.2.5)



- Double Click specific Front End director to show % Busy per port versus % Busy for the array



- Double Click specific Back End directors to show % Busy per port versus % Busy for the array (stacked line chart style shown as an example)



6.5.2.4 Navigate to Analyze

After double clicking to view more detail metrics on a component - by clicking the 'Navigate to the Analyze' button you can review and plot further key metrics on the specific component of interest.



6.5.2.5 Disk Utilization Buckets

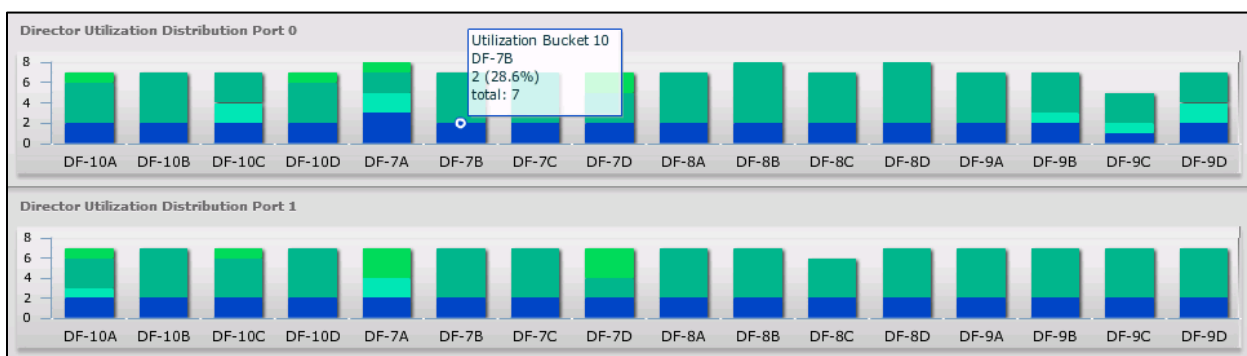
U4V does not save **individual** disk statistics for historical and diagnostic views; instead it will save some statistics on activity and capacity breakdown by 'buckets' of disks.

U4V creates 10 buckets for each configured disk group. The buckets are based on disk utilization (% Busy) where each bucket summarizes (or averages) key metrics of disks that their utilization in the last sample put them in the bucket.

- In diagnostic heatmaps, this is relevant to the 'Director Utilization Distribution' for the ports, which are displayed by utilization buckets.

Note: When hovering the cursor over the director port a text summary is shown.

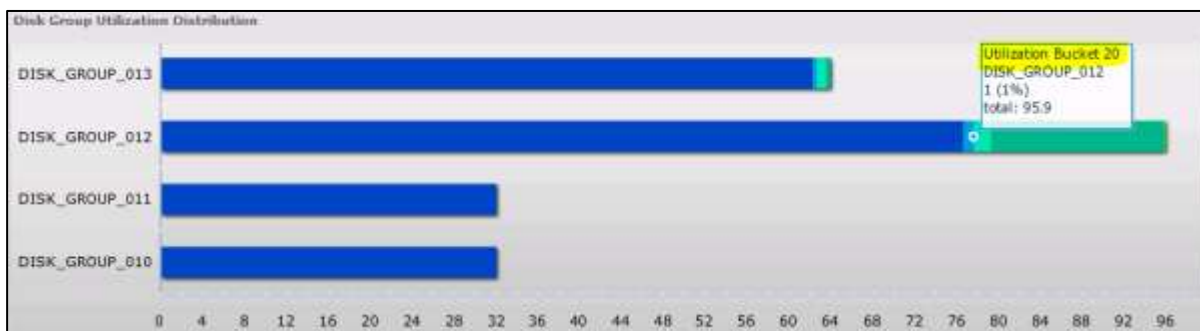
In the example below of the 7 disks accessed through director 7B port 0, 2 disks were utilized between 0-10 percent during the last sample period.



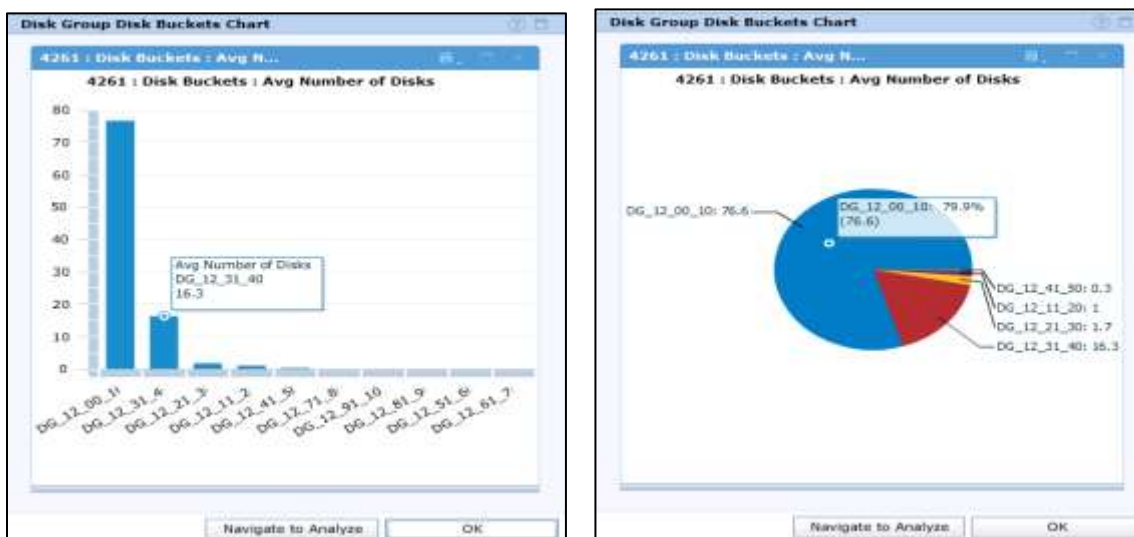
- In Historical Heatmaps – this is relevant to the 'Disk Group Utilization Distribution', which is displayed by utilization buckets

Note: When hovering the cursor over the disk group a text summary for each bucket is shown.

In this example below 1% of disks in DISK_GROUP_012 were utilized between 11-20 percent utilized during the last sample period.



You can double click into the group to display all buckets and change chart type if required.

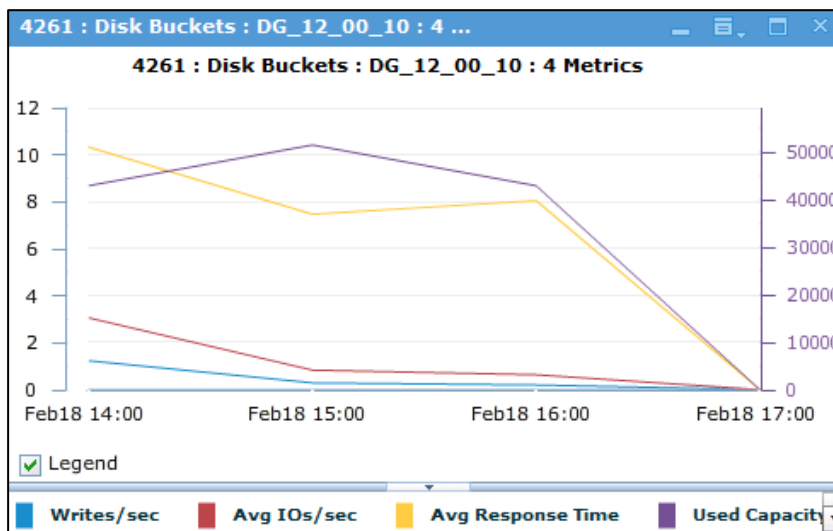


Note, on drilling into the disk groups, the bucket names displayed in a different format than shown on previous summaries – these granular bucket names are derived from the disk group name and the utilization range and prefixed by 'DG_'.

e.g. In the heatmap screen shot the text summary displays 'Utilization Bucket 20', on drilling into the disk group this is displayed as 'DG_12_11_20' which equates to Disk Group 12 statistics for the 'bucket' of disks that on average are 11-20% utilized during the last sample period.

Bucket name	Bucket Utilization Range	Heatmap Name
DG <DG> 00 10	00 <= X < 10	Utilization Bucket 10
DG <DG> 11 20	10 <= X < 20	Utilization Bucket 20
DG <DG> 21 30	20 <= X < 30	Utilization Bucket 30
.....		
DG <DG> 91 100	90 <= X <= 100	Utilization Bucket 100

From double clicking on a disk group, you can then 'Navigate to Analyze', which will provide the ability to graph additional metrics for the disk utilization buckets. (Defined in the table below)

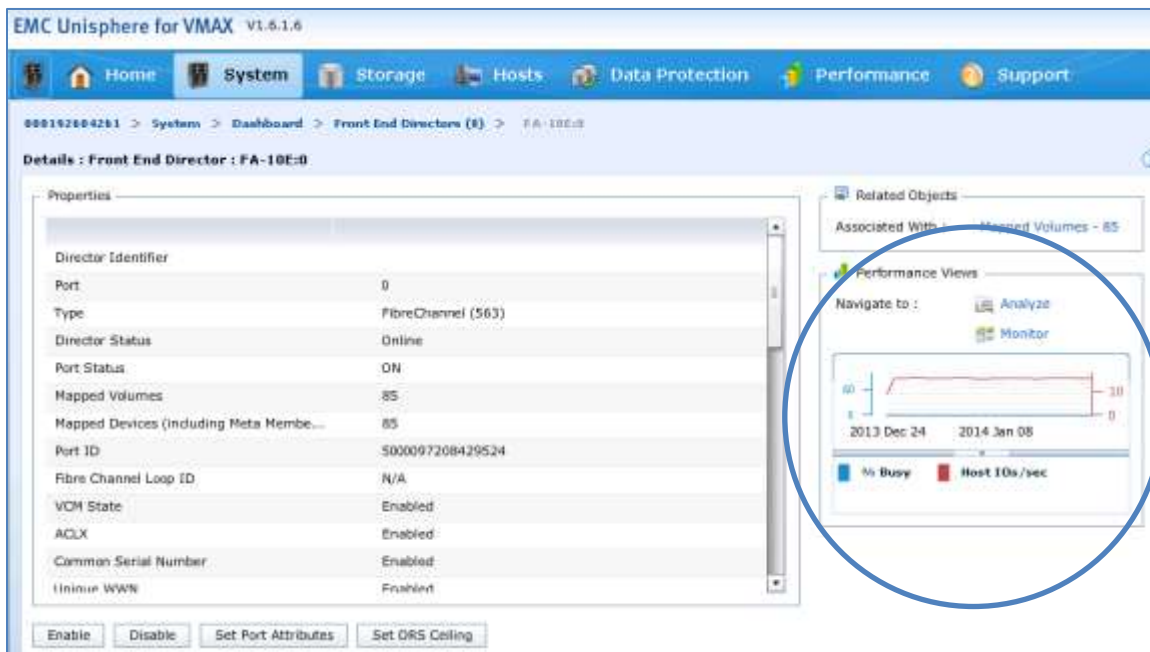


Metric Name	Description
Number of Disks	Number of disks in this bucket
Total Capacity (GB)	Total capacity of disks in this bucket
Used Capacity (GB)	Used capacity of disks in this bucket
Avg Response Time (ms)	Weighted average response time (read + writes) for disks in this bucket
Avg Read Response Time (ms)	Average read response time
Avg Write Response Time (ms)	Average write response time
IOs/sec	Average number of disk IOs of disks in this bucket
Reads/sec	Average number of disk Reads of disks in this bucket
Writes/sec	Average number of disk Writes of disks in this bucket
MBs/sec	Average number of MBs read and written to disks in this bucket
MBs Read/sec	Average number of MBs read to disks in this bucket
MBs Written/sec	Average number of MBs written to disks in this bucket
Avg Busy	Average %Busy of disks in this bucket
Avg Queue Depth	Average queue depth of disks in this bucket

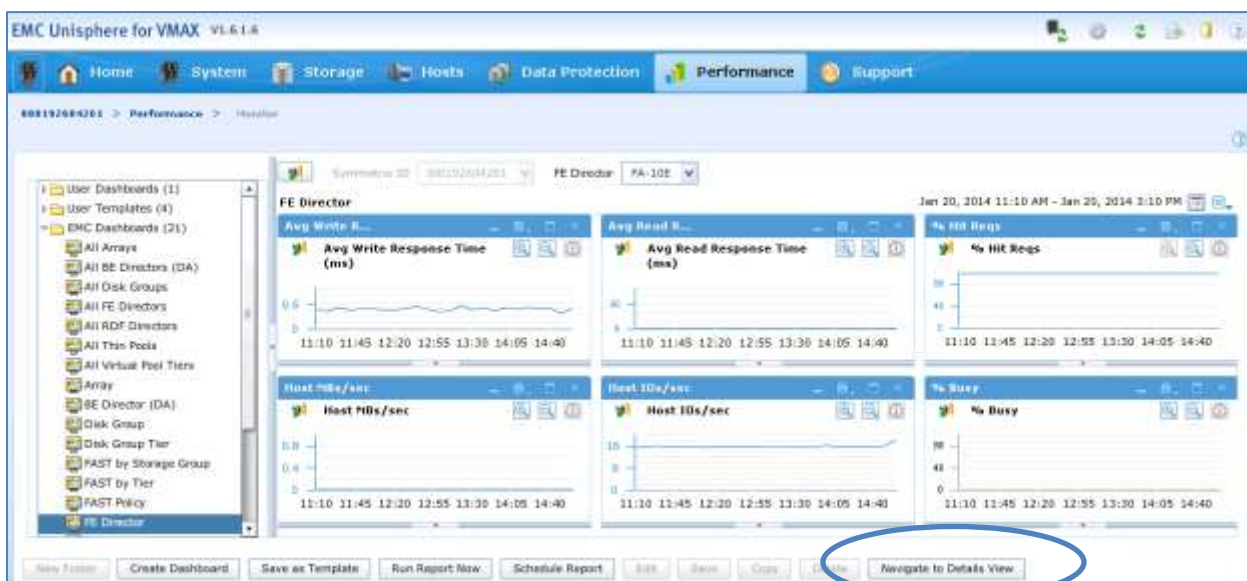
6.5.3 In-context link's

Unisphere provides the in-context linking between an object's detail view and the Analyze and Monitor views:

For instance you are investigating high utilisation on a specific Front end director, from component details view you are provided a small sample graph of two key performance indicators (HostIO/Sec & % Busy) and if you wish to investigate further you are able to directly navigate to the provided dashboards (within Monitor view) or you can plot the required metrics (within Analyze view).



Click on the 'Navigate to Monitor' link to bring up the EMC dashboards showing Front End Metrics, the 'Navigate to Details' View will bring you back.



6.6 Analyze

U4V Performance → Analyze view enables you to assess Symmetrix systems data for various collection ranges:

- Real Time - The previous 1 hour. Real Time view collects data between 2 and 5 seconds for a limited group of metrics. The data is available for the previous hour (Note usage guidance in Section 3.2)
- Diagnostic - The previous 4 hours. Diagnostic view collects data every 10 minutes for root cause analysis. The data is available for the previous 7 days
- Historical - The previous 24 hours. Historical view collects data in 15 minute intervals for trending and planning. The data is available for the previous year

In Diagnostic or Historical you can change the data legend layout to maximum and/or average, In Real time you can change the data legend layout to maximum and/or average and/or Latest by clicking the right most drop down list above the table.

Symmetrix ID	Host I/Os/sec	Host MBs/sec	FE Utilization	BE Utilization	RDF Utilization	% Cache WP	Disk Utilization	Avg Fail Thru Time
000192004261	781.6 / 48.3	59 / 0.1	15.3 / 0.4	28.8 / 7.7	18.4 / 11.9	0.9 / 0	37.4 / 2.6	176 / 134.4

Symmetrix ID	Host I/Os/sec	Host MBs/sec	FE Reps/sec	System WP Events/sec	Device WP Events/sec
000192004261	57.5 / 968.1 / 97.1	0.3 / 2.7 / 0.3	23.7	255.3 / 34.5	0 / 0 / 0

Double click the Symmetrix systems display in the table format to zoom into further detailed information

ID	% Busy	Host I/Os/sec	Host MBs/sec	FE Director	BE Director (DA)	BE Director (DX)	RDF Director	Cache Partition	Disk Group Tier	Virtual Pool Tier
FA-1DE	1.4	15.7	0	0	0	0	0	0	0	0
FA-9F	0.2	5.5	0.1	4	0	0	0	0	0	0
FA-1DF	0.2	6.5	0	4.6	0	0	0	0	0	0
FA-8F	0.1	4.5	0.1	3.9	0	0	0	0	0	0
FA-7F	0.1	5.6	0	4.7	0	0	0	0	0	0

Create own user-defined charts on the lower portion from the Analyze view by selecting either “Key Performance Indicators” or “All” metrics:

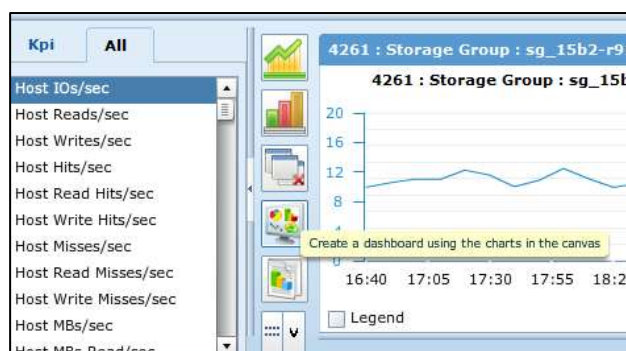
- Key Performance Indicators (KPI) - Lists the key performance indicators that correspond to the column headings in the current table
- All - Lists all available metrics for the selected object in the table



If set, thresholds can also be shown in the chart by selecting from the chart submenu (if set).



Personalized dashboards can also be created from the charts you have created at this view. Click on the icon to create a dashboard or template dashboard using the charts showing in canvas:



Assign the name for the dashboard and click ‘OK’ to save it. The dashboards will be viewable from the Monitor view.

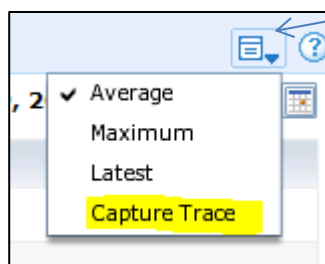
6.6.1 Real Time View

NOTE: Do not use the Real Time View as a standard operating practice: Real time data should only be collected when absolutely required – e.g. live problem analysis – Also refer to section 3.2.

In Real Time view, double click Symmetrix systems and it can provide few tabbed information such as FE Director, BE Director and RDF Director. Each of these tabs can generate the charts base on the performance metrics.



It can also capture the Real Time trace for the previous hour (using the table layout icon)



6.6.1.1 Real Time Trace

Real time traces/data collections can be run on demand (as above) or scheduled to run at a specific time. e.g. if an application team report performance issues occurring at specific times, you can schedule a real data collection for during the reported time frame, for more detailed analysis.

Performance → Settings → Real Time Traces

- Click Create
- Select Symm ID

- Select Date and Time you want to start the collection
- Select how many traces you want
- Optional: Retention
- Options Description
- Click Ok

Create Real Time Trace

Symmetrix ID: 000192604261

Date: April 18 2013

Trace Start Time: 8:00 pm

Number of Hourly Traces: 4

Status: Scheduled

Retention: 7 Days

Description: Test for SG Screenshot

OK Cancel Help

You will see the traces scheduled in the summary screen

000192604261 > Performance > Settings > Real Time Traces

Real Time Traces

Symmetrix ID	Date	Trace Time	Status	Retention (Days)	Description
000192604261	Apr 18 2013	14:00 - 15:00	Completed	7	
000192604261	Apr 18 2013	14:44 - 15:44	Completed	10	000192604261 Apr 18, 2013 2:44 PM
000192604261	Apr 18 2013	18:00 - 19:00	Scheduled	7	Test for SG screenshot
000192604261	Apr 18 2013	19:00 - 20:00	Scheduled	7	Test for SG screenshot
000192604261	Apr 18 2013	20:00 - 21:00	Scheduled	7	Test for SG screenshot
000192604261	Apr 18 2013	21:00 - 22:00	Scheduled	7	Test for SG screenshot

Once complete you can view the data via the real time view time by clicking the date icon, and selecting the trace you have collected

Apr 19, 2013 10:33:49 AM - Apr 19, 2013 11:33:49 AM

Time Selection - Real Time

☐ Now

☒ Trace 000192604261 Apr 18, 2013 2:00 PM

OK Cancel Help

6.6.2 Diagnostic View

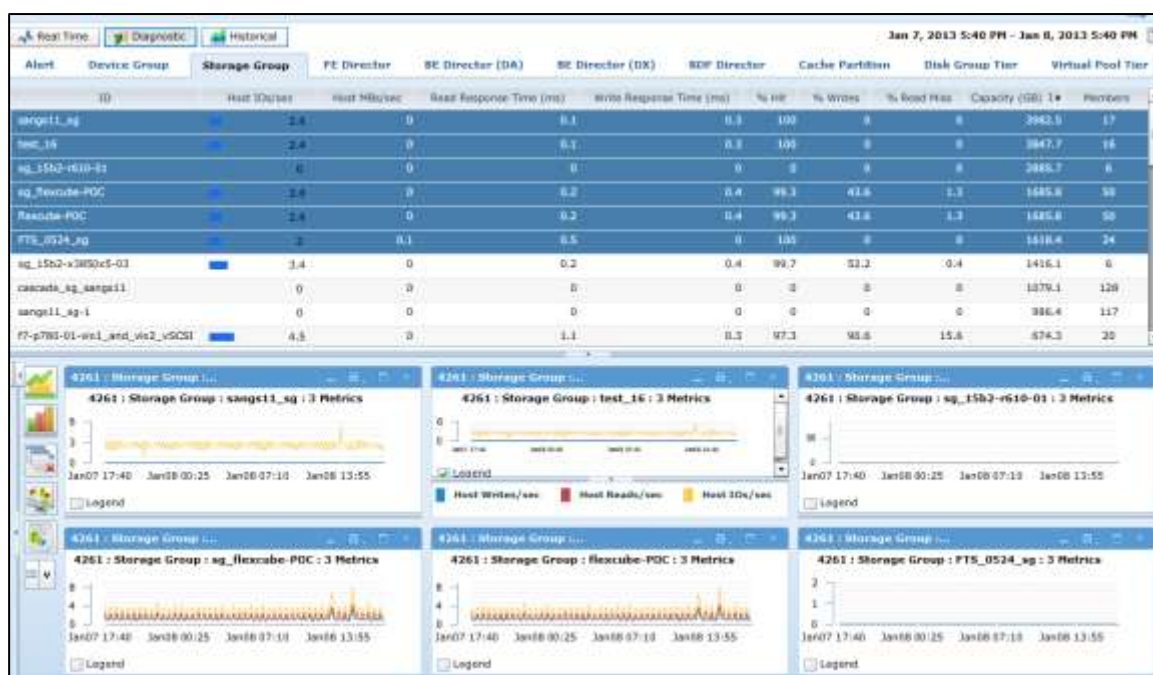
The top level Analyze → Diagnostic view provides similar information table with additional fields such as Alerts, % Cache WP, Disk Utilization and Average Fall Through.

Symmetrix ID	Alerts	Host I/Os/sec	Host MBs/sec	FE Utilization	BE Utilization	RDF Utilization	% Cache WP	Disk Utilization	Avg Fall Thru Time
000192604261	2	97.9	0.3	0.3	7.6	11.3	0	0.0	29415.2

Double click on selected Symmetrix systems to view more information such as Alert details, FAST VP Policy and TP Pool. The past 4 hours data is displayed for by default, it can be changed to display between the last 1 and 24 hours. Data is collected in 10-15 minute intervals.. All the information can be drilled down through the links itself by double clicking on the items.

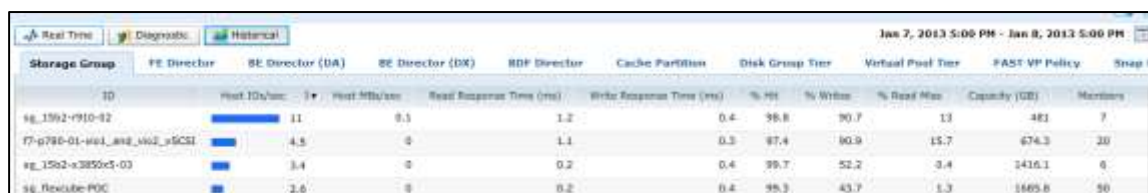
ID	Host I/Os/sec	Read Response Time (ms)	Write Response Time (ms)	% Hit	% Writes	% Read Miss	Capacity (GB)	Members
UNGROUPED	30.7	0.4	0.4	99	63	2.2	165185.5	1351
flexcube_sg_sang15	1.5	0.1	0	100	0	0	337.2	10
flexcube_sg_sang11	1.5	0.1	0	100	0	0	337.2	10

There are huge numbers of metrics that can be plotted in Analyze view. Select multiple objects from the table and select different types of metrics from bottom to create charts.



6.6.3 Historical View

Historical view provides a similar metrics to what is available via the Diagnostic View, the main difference is that data is not as granular (due to longer data points) and some will be averaged. The data can be displayed for up to the past 12 months.



Storage Group	FE Director	SE Director (DA)	SE Director (DR)	BDP Director	Cache Partition	Disk Group Type	Virtual Pool Type	FAST VP Policy	Snap P.
sg_1592-v910-02	11	0.5	1.2	0.4	98.8	90.7	13	481	7
f7-p790-01-ws1_and_ws2_sCSI	4.5	0	1.1	0.3	97.4	80.9	15.7	674.3	20
sg_1592-x3850c5-03	3.4	0	0.2	0.4	99.7	52.2	3.4	1416.1	6
sg_Rexcube-POC	2.6	0	0.2	0.4	98.3	43.7	1.3	1605.6	90

Different types of charts can be plotted too with various metrics available for each category. Refer to product guide for detail explanation on each metric.

6.7 Alerts

Unisphere for VMAX can be configured to monitor symmetrix systems for specific events, error conditions and breaches of thresholds. When U4V has been enabled to capture the specified event, error or threshold breach it will **display** a reactive 'alert'.

An alert in U4V can be considered to be a visible representation of an entry in the audit log or Symevent file – the U4V Alert is **not** the same as an alert from an event monitoring system.

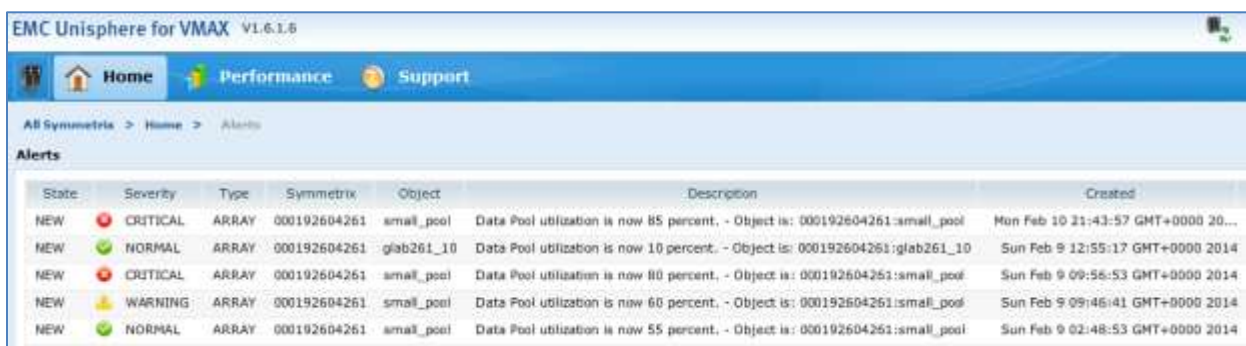
6.7.1 Default Alerts

As part of solutions enabler configuration a number of essential events/alerts are already captured and forwarded to Citi Event Monitoring systems (see Solutions Enabler Guide for Further details) – Some of the same events included as part of the recommended solutions enabler configuration are also enabled as default in U4V.

These pertain to various Pool & FAST Policy Utilization levels, providing Normal, Warning, Critical & Fatal alerts based on % Utilisation.

The default threshold alerts provided in U4V cannot be disabled or edited.

When a condition occurs triggering the alert, they are logged/displayed in the System Alerts Pane.



The screenshot shows the EMC Unisphere for VMAX V1.6.1.6 interface. The top navigation bar includes 'Home', 'Performance', and 'Support'. Below this, the 'Alerts' section is active, displaying a table of alerts. The table has columns for State, Severity, Type, Symmetrix, Object, Description, and Created. There are five alerts listed, all with a 'NEW' state. The severities are CRITICAL, NORMAL, CRITICAL, WARNING, and NORMAL. The types are all 'ARRAY'. The objects are 'small_pool' and 'glab261_10'. The descriptions relate to Data Pool utilization percentages. The created times range from Sun Feb 9 12:55:17 GMT+0000 2014 to Mon Feb 10 21:43:57 GMT+0000 2014.

State	Severity	Type	Symmetrix	Object	Description	Created
NEW	CRITICAL	ARRAY	000192604261	small_pool	Data Pool utilization is now 85 percent. - Object is: 000192604261:small_pool	Mon Feb 10 21:43:57 GMT+0000 20...
NEW	NORMAL	ARRAY	000192604261	glab261_10	Data Pool utilization is now 10 percent. - Object is: 000192604261:glab261_10	Sun Feb 9 12:55:17 GMT+0000 2014
NEW	CRITICAL	ARRAY	000192604261	small_pool	Data Pool utilization is now 80 percent. - Object is: 000192604261:small_pool	Sun Feb 9 09:56:53 GMT+0000 2014
NEW	WARNING	ARRAY	000192604261	small_pool	Data Pool utilization is now 60 percent. - Object is: 000192604261:small_pool	Sun Feb 9 09:46:41 GMT+0000 2014
NEW	NORMAL	ARRAY	000192604261	small_pool	Data Pool utilization is now 55 percent. - Object is: 000192604261:small_pool	Sun Feb 9 02:48:53 GMT+0000 2014

They can be acknowledged and/or deleted which will reduce/clear the alert count on the Home screen adjacent to the array.

6.7.2 U4V System Runtime Checks/Alerts

Unisphere for VMAX performs the following runtime checks. If a check returns a result outside the expected range, Unisphere for VMAX will raise the appropriate alert.

Checks are run on 10 minute intervals and alerts are raised on 24 hour intervals from the time the server was last started.

The checks and alerting is provided by default and cannot be disabled or edited.

Runtime check	Threshold	Alert
Total memory on the Unisphere server	Unisphere = 4 GB* Unisphere and Performance = 8 GB	System memory (# GB) is below the minimum requirement of (# GB)
Free disk space on the Unisphere installed directory	20 GB	Free disk space <# GB> is below the minimum requirement of 20 GB
Number of managed Symmetrix systems	10	Number of managed arrays (#) is over the maximum supported number of 10
Number of managed volumes	80,000	Number of managed volumes (#) is over the maximum supported number of 80,000. Note that Solutions Enabler may indicate a slightly different number of volumes than indicated in this alert.
Number of gatekeepers	6	Number of gatekeepers (#) on Symmetrix (SymmID) is below the minimum requirement of 6.

6.7.3 Target Engenuity level

By default U4V will log an alert if the symmetrix are not at EMC's target Engenuity level. It is unlikely Citi would be at the same Engenuity levels as the latest vendor release – to avoid unneeded alert entries we would recommend this alert is disabled.

Home → Administration → Alert Settings → Alert Policies Select the Target Engenuity Warning listed against each array discovered, click Disable

As previously highlighted the alerts that are captured and displayed in Unisphere for VMAX are not the same as an alert in an event monitoring system. However the 'Notification' feature in U4V can provide Email, Syslog and SNMP Notifications against the alerts U4V receives.

6.8.1 Optional Email Notification

We have included it as an option for the case that certain operations teams or even individuals did wish to receive U4V notifications via email (even on a short term basis for a specific issue), as a supplementary addition to any existing alerting.

The appropriate message sending service package provided by the Global messaging team will need to be requested & deployed on the U4V server.

Windows Version	Package
Windows 2000	IIS 5 SMTP SPACS: IIS50030 & ISTEP5010
Windows 2003	IIS 6 SMTP SPACS: IIS60010 & ISTEP6010
Windows 2008	IIS 7 TPM Pkg ID : CITI_WIN_2K8_IISSMTPServer_70_01

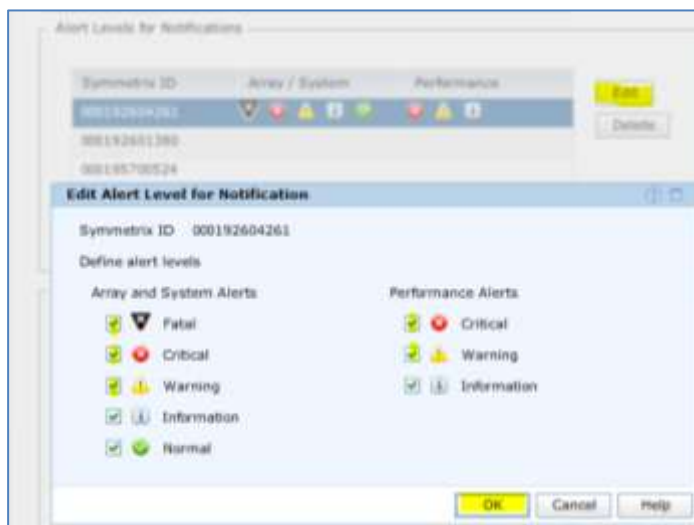
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Once the message sending service package has been installed on the U4V server and the DL has been set up you will need to configure the email server in Administration → Alert Setting → Notifications → Config Email Server

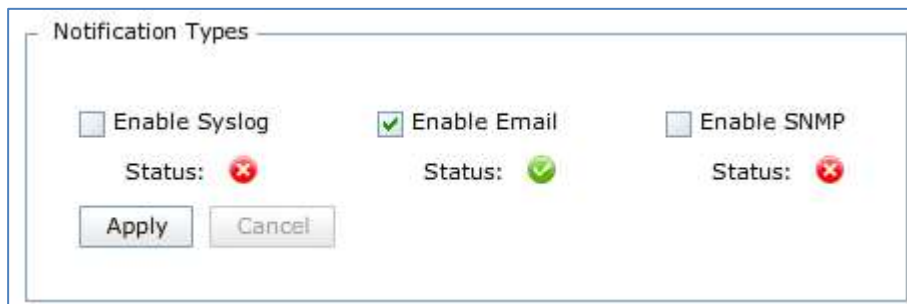
Enter the DL details in the Sender field, and enter 'localhost' as the IP address/Host, leave the port as 25 → Click Ok



In Administration → Alert Setting → Notifications → Set the Alert Level notifications on each array according to at what level you wish to receive Alerts – typically this is Warning, Critical & Fatal.



Enable the notification – check the tick box and click apply.



6.8.2 SNMP Notification

The process and rules for requesting Citi EMS to collect U4V SNMP traps is currently under review, as initial investigations have found some inconsistencies in the traps that were being received verses what was expected.

This section will be updated following resolution of SNMP integration set up and testing.

6.9 Performance Thresholds and Alerts

U4V provides the ability to create performance thresholds. There are some default system values for thresholds however these can be edited or new ones created. The threshold values can be viewed from the charts in the Analysis or Diagnostic view. And If enabled, U4V Alerts can be generated against threshold breaches

To create performance thresholds and alerts, select 'Performance' from top panel and 'Settings'. Click on 'Thresholds and Alerts' to view and manage thresholds and alerts.



Click the 'Create' button from bottom left to create performance thresholds and alerts. Select the Symm ID, Category, Instance, and Metric to set the thresholds on, and enter the value for first/second threshold. It can be enabled with alerts based on severity and occurrence. There are also numbers of default thresholds you can set and customize it.

Create Performance Threshold and Alert

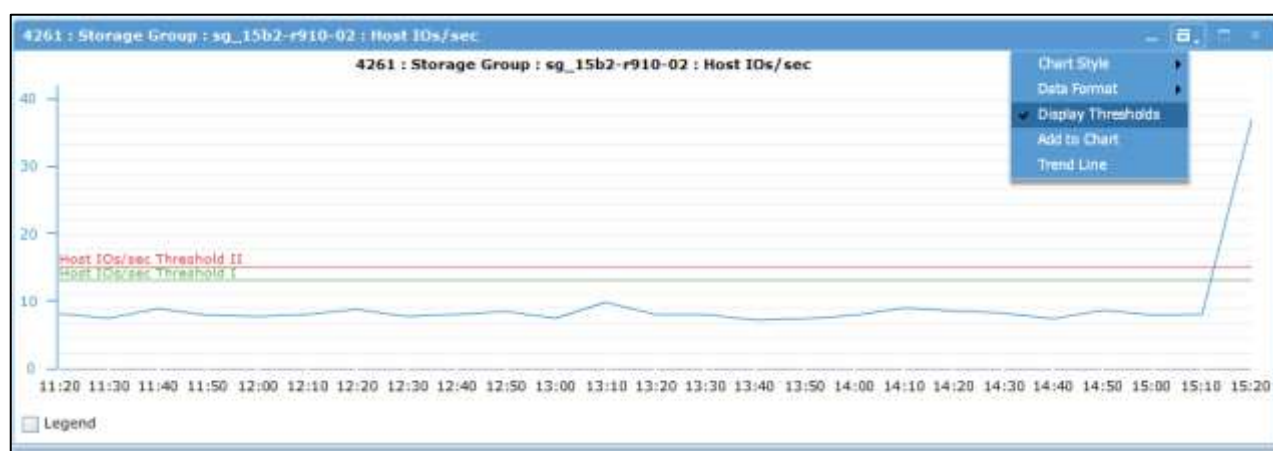
Symmetrix ID: 000192604261
 Category: Storage Group
 Instance: sg_15b2-r910-02
 Metric: Host IOs/sec

First Threshold
 Value: 40
☒ Enable Alert
 Severity: Warning
 Occurrence: 3 / 5 samples

Second Threshold
 Value: 150
☒ Enable Alert
 Severity: Critical
 Occurrence: 4 / 5 samples

OK Cancel Help

Thresholds can be seen from the chart in Analyze Diagnostic View too. Click on the menu bar on the chart in Analyze Diagnostic View and tick 'Display Thresholds'. Threshold values will be displayed in the chart then.



Performance alerts can be viewed from Analyze Diagnostic View (select Symmetrix systems and alerts will be listed in the Alert tab). There are also many places to view the alerts including centralized Alerts tab (by clicking the 'Alerts New' from left bottom panel at any page) which includes all alerts (Array, SMAS, Performance) or Alerts tab for specific Symmetrix system (by clicking 'System' → 'Alerts'). Analyze Diagnostic view will be the best place for easy view on performance alerts only.

Jan 8, 2013 1:20 PM - Jan 8, 2013 5:20 PM										
Alert	Device Group	Storage Group	FE Director	BE Director (DA)	BE Director (DX)	RDF Director	Cache Partition	Disk Group Tier	Virtual Pool Tier	
Created	Severity	Category	Instance	Metric	Value	Count	Acknowledge	Type	Message	
Mon Jan 7 12:30:00 GMT+0800 2013	Warning	TP Pool	glab261_11	Used Pool Capacity (GB)	471.6700134277344	174	true	Static	Used Pool Capacity (GB) (471	
Mon Jan 7 12:30:00 GMT+0800 2013	Critical	TP Pool	glab261_11	Used Pool Capacity (GB)	471.6700134277344	174	true	Static	Used Pool Capacity (GB) (471	

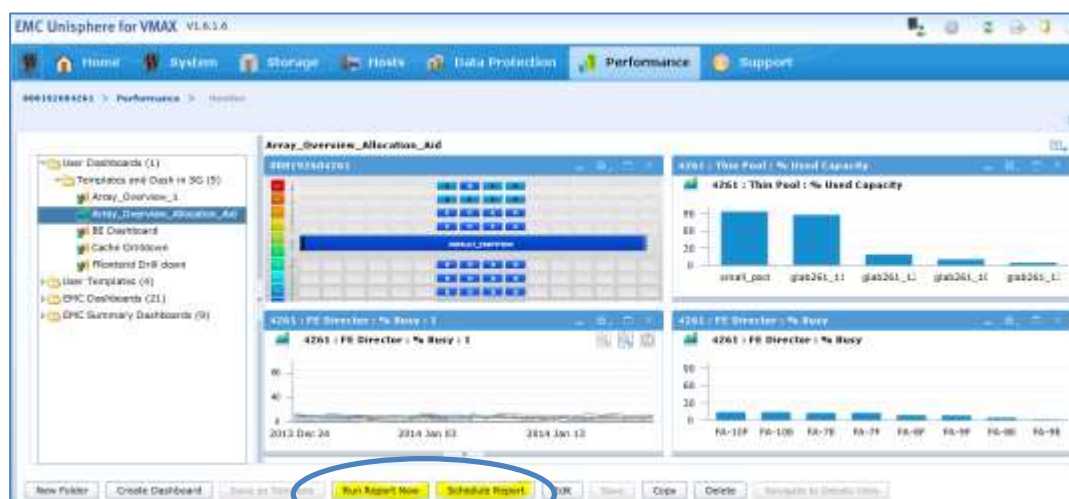
6.10 Reports

6.10.1 Dashboard Reports

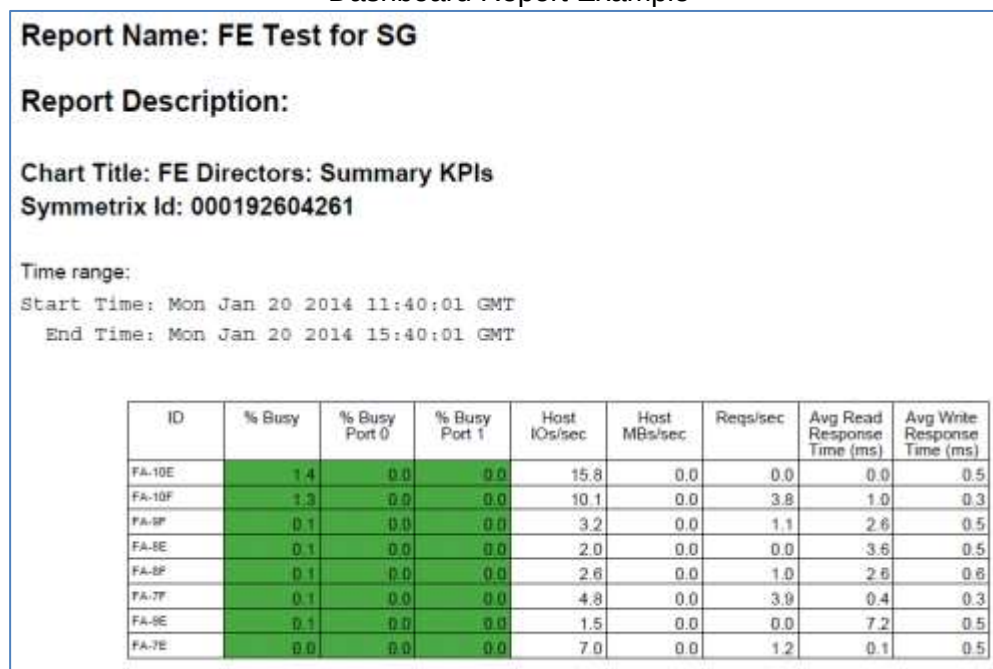
In U4V, reports can be run by on demand or on a scheduled basis against the Diagnostic or Historical Data.

The easiest way to set up a report is to use the report buttons at the bottom of the Performance → Monitor pane.

Once the dashboard or template is displayed, select 'Run the report now', saving a PDF of the displayed data to a user specified location or 'Schedule the report' up to 7 days ahead and set to reoccur. Note scheduled/reoccurring reports will be saved to
Install Drive:\Program Files\EMC\ SMAS\jboss\standalone\data\spa\querydata\



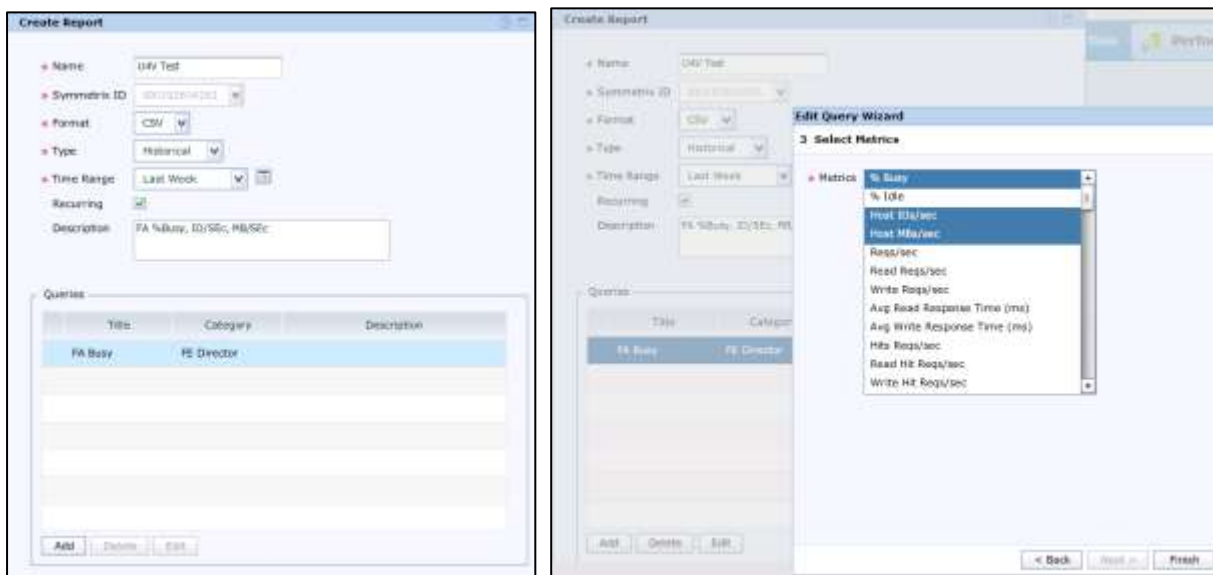
Dashboard Report Example



6.10.2 Customised reports

Alternatively customized reports can be created and provided as CSV, XML, BTP
Go to Performance' → 'Settings' → 'Reports' to create report.

Add required queries to the report – the wizard will prompt for Categories, Format, and then you select the metrics required



Created/Scheduled reports will be visible in the summary

000192604261 > Performance > Settings > Reports							
Reports							
Name	Type	Description	Symmetric ID	Format	Recurring	Run Date	
ReportTestarray2	Historical		000192604261	CSV		Sat Apr 20 2013 11:26:00 AM	
ReportTestarray1	Diagnostic	test array report	000192604261	XML	N/A		
SG TEST Example	Diagnostic		000192604261	CSV	N/A		
U4V Test	Historical	FA %Busy, IO/Sec, MB/Sec	000192604261	CSV		Fri Apr 19 2013 12:59:23 PM	

- Reports ran on demand will be saved to user specified location.
- Scheduled reports will save to:
Install Drive:\Program Files\EMC\SMAS\jboss\standalone\data\spa\querydata\

Example CSV

SYMM_ID	DATE	TIME(ms)	INTERVAL(min)	CATEGORY	VALUE TYPE	INSTANCE	Host MBs Per Sec.	IOs per Sec.	Busy (%)
192604261	2013-04-12 01:00:00 PM GMT	1.36577E+12	60	FE_DIR	MAX	FA-7E	0.28	93.68	14.88
192604261	2013-04-12 01:00:00 PM GMT	1.36577E+12	60	FE_DIR	MAX	FA-8E	0.49	34.75	0.27
192604261	2013-04-12 01:00:00 PM GMT	1.36577E+12	60	FE_DIR	MAX	FA-9E	0.49	13.08	0.23
192604261	2013-04-12 01:00:00 PM GMT	1.36577E+12	60	FE_DIR	MAX	FA-10E	0.34	64.33	7.36
192604261	2013-04-12 01:00:00 PM GMT	1.36577E+12	60	FE_DIR	MAX	FA-7F	0.51	146.25	0.53
192604261	2013-04-12 01:00:00 PM GMT	1.36577E+12	60	FE_DIR	MAX	FA-8F	0.37	14.33	0.25
192604261	2013-04-12 01:00:00 PM GMT	1.36577E+12	60	FE_DIR	MAX	FA-9F	0.45	25.83	0.28
192604261	2013-04-12 01:00:00 PM GMT	1.36577E+12	60	FE_DIR	MAX	FA-10F	0.32	220.08	12.41

6.11 Export button

U4V has an excellent export feature that will allow most tables/charts & data to be exported to various formats.

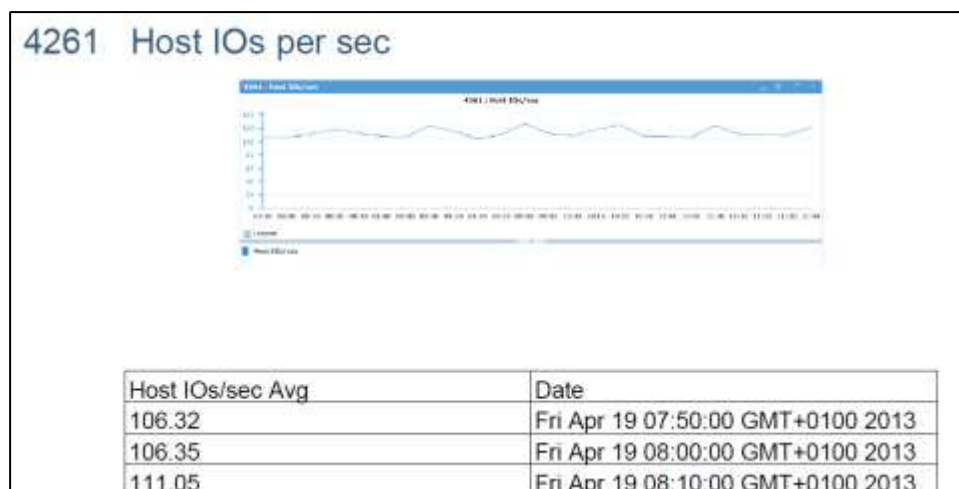
On the pane where you have the metric you wish to export - click the export button



A wizard launches, where you specify the Item you wish to export, and depending on what you are exporting options are provided as to what data to export and what format

Export Wizard		
1 Select a Component		
- Application Container - Array Table - Analyze Dashboard 4261 Host IOs per sec		
2 Select to Export Data or Image		
☐ Data ☐ Image ☒ Image and Data Table		
3 Select a Format		
☐ CSV ☐ JPEG ☐ PNG ☒ PDF		

Exported Data is saved locally to your desktop in the chosen format



6.12 Export/Importing Performance Settings

The following settings can be exported and imported to assist the implementation process for multiple instances and as a pre-upgrade step:

- The Performance metrics (KPIs) definitions with their default (not instance-specific) settings
- The user template dashboards

To export Performance settings:

1. Select a Symmetrix system
2. Select any category (Databases, Metrics, Reports, etc.) under 'Performance' → 'Settings'
3. Select 'Export Settings' from the Common Tasks panel to open the Export Settings dialog box
4. Select the settings to export: Metrics Definitions, User Templates, or both.
5. Enter and confirm a file password.



6. Click OK. The Save Settings confirmation appears. Select preferred location to save the settings.

To import Performance settings:

1. Select a Symmetrix system
2. Select any category (Databases, Metrics, Reports, etc.) under 'Performance' → 'Settings'
3. Select 'Import Settings' from the Common Tasks panel to open the Import Settings dialog box
4. Select the settings to import: Metrics Definitions, User Templates, or both.
5. Enter the file password (which was set during the export process). Click OK
6. The Select File dialog box opens. Open the settings file from your preferred location

6.13 Other Viewable Functions

The primary use case for Unisphere for VMAX within Citi is the 'Performance' related functionality as U4V superseded SPA that was previously deployed for this function.

The recommended tool for array administration continues to be Solutions Enabler via command line (RHEL)

– However because U4V has combined both SMC and SPA features it has also other functions available besides the 'Performance' tab. U4V's Storage, Host and Data Protection panes in U4V are very useful providing the ability to easily view and report on configuration data for Symmetrix array, which can be useful for other tasks for example capacity planning, reviewing FAST.

The following slides are for the reader's quick reference/familiarization, most are self-explanatory.

In addition to navigating through the panes for familiarization, it is recommended to review the vendor related documentation and online help.

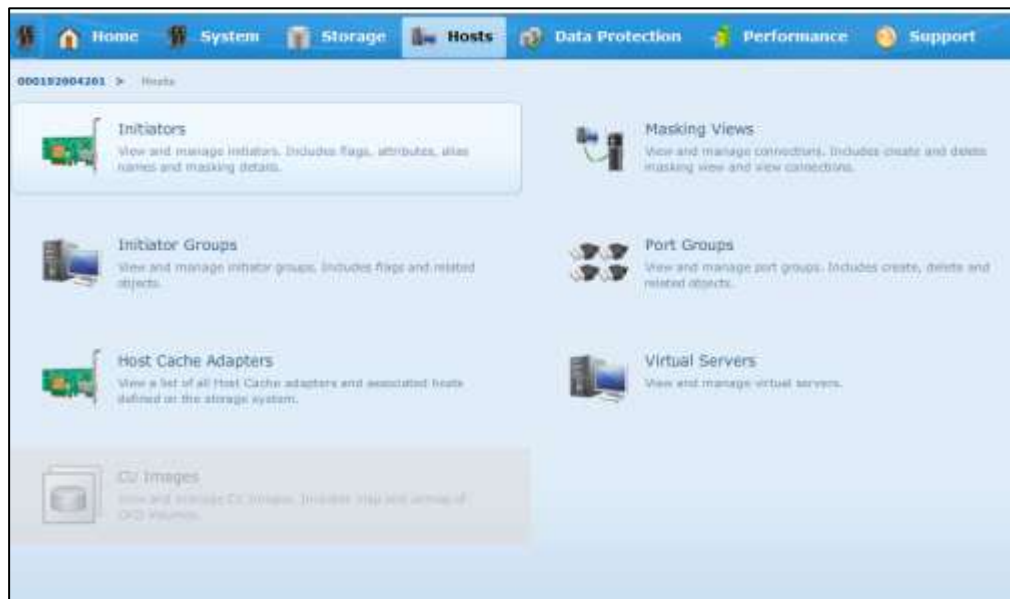
6.13.1 Storage

Click on the 'Storage' button from the top menu where you can then select the desired storage related component to view information - including Tiers, Disk Groups, Thin Pools, Storage Groups and FAST related configurations.



6.13.2 Hosts

Click on the 'Hosts' button from the top menu where you can then select the desired host related information. - including Port & Initiator Groups, Host masking views.



6.13.3 Data Protection

Click on the 'Data Protection' button from the top menu where you can view replication related information including Device Groups and Replication Groups.



7 Appendix A – Related Documentation

Document	URL
EMC Unisphere for VMAX Installation Guide	CATE - SYMMETRIX Documentation page
EMC Solutions Enabler 7.xSolution Guide	
Unisphere for VMAX – Release notes	
FAST VP	
Approved SDRF form for requesting Antivirus LRP inclusion	
EMC Unisphere for VMAX 1.6 Product Guide	Use the help system built into application or download product guide from EMC website support.emc.com

8 Appendix B – Known Issues & Enhancement Requests

Issue Category	Issue Description	Scenario	Work Around/Remark
Scalability	80K Device / 10 Symm Limit Per U4V instance	Data Centres with up to 10 Symms that have more than 80K Devices configured	On enhancement list – No ETA from vendor
Display	No ability to 'Auto Show Legend' on graphs	Legend is not shown by default – this needs to be selected on each Graph created – the ability to Auto Show Legend would be a nice to have	Enhancement request 5275040 Submitted 21/01/14
Display	Cannot scroll through symms on home screen drop down	If SYMAAPI server see's +35 Arrays symm drop down list cannot display all and you cannot scroll	EMC 'Limit' is 10 arrays/80K devices – so unneeded arrays should be blocked from U4V discovery.
Set up	Inclusion of :port details in user name causes U4V to hang	Testing showed that Symauth entries that specified tcp port as part of the username string caused U4V to hang	No update required – do not include tcp port details in symauth string
Set up	Unisphere does not support nested AD groups for authentication	Authentication failed when using nested AD groups !	Workaround is addition of individual users to Authentication AD group or use of LDAP
Display	U4V does not display the SG/DG presented Filtered by FA Port..so select the FA port and U4V to show the SG/DG presented	We would like the ability to select the FA, and see what SG/DG are presented through it - both in performance and general storage/systems tabs	Enhancement request 5274579 Submitted 18/12/13:
Items Outstanding from Citi Security review/Process			
CIVA-H2	The embedded MySQL version (5.5.17) will not be patched or updated to a later version – This version is not supported in Citi – MySQL is listening on both localhost and the LAN interface – Is the LAN interface needed?		EMC Advise MYSQL will be superseded in a later release of U4V – Details TBA.
CIVA-M1	Tighten up cross domain policy setting - The Flash parameter AllowScriptAccess is set to 'Always'. According to our security team it is possible to steal or manipulate customer session and cookies, which could be used to impersonate a legitimate user.		Enhancement request 5274600 Submitted 18/12/13: Set the AllowScriptAccess parameter to 'sameDomain' or ".validdomain.com"
CIVA-M2	HTTP Track and TRace debugging is enabled		Enhancement request 5274601 Submitted 18/12/13: Disable unneeded HTTP debugging Track and Trace functions
CIVA-M4	The POST method should return a 302 (redirect) to avoid caching of the Session ID		Enhancement request 5275030 Submitted 21/01/14:
CIVA-	Identify if all TCP services running/ports open are required and		Enhancement request 5274602

M5/N2	specify what U4V is using them for	Submitted 18/12/13: Requesting identification of TCP services and if they are required.
ISRP-064	All symmetric and asymmetric (private) keys, except public keys, should be encrypted and stored in a hardware or software cryptographic module with proper access control	Enhancement request 5274591 Submitted 18/12/13: Tomcat private key password is in clear text - would like the product to encrypt this
ISRP-104	Product uses root account for deployment, our security team would like us to be able to use a specified functional account	Enhancement request 5274592 Submitted 18/12/13: Deploy product using nonroot account

Appendix D – Templates and Dashboards

8.1 Background & Objective

Following discussions with CTI, CATE were requested to work with EMC provide some suggested Templates/Dashboards that can be deployed on the production Unisphere instances to show meaningful metrics on various array components so health can quickly be assessed and allocation decisions made.

The primary request from CTI was to provide a dashboard that could be used to assist with allocation decisions with emphasis on front end loading.

In additional we have also looked to provide some templates and dashboards that could be adopted as a base pack for Citi Unisphere deployments that cover Overall Array Health, Front End, Cache, Back End, Pool/Tier and Disks .

The idea is that the same templates/dashboards can be applied on all Unisphere instances and all CTI (EMC and CATE) engineers are familiar with their layout and data collected.

– The proposed templates/dashboards **are not** intended to supersede any CTI currently use, and CTI are encouraged to custom build to present whatever data is most useful to local teams.

Further reviews/iterations will likely follow on usage/feedback from CTI and as new functionality is provided in the product.

8.2 Intended Audience

This document describes suggested Templates/Dashboards for use in regional Unisphere for VMAX deployments – Primary audience is Storage Operations teams, however anyone interacting with Unisphere will benefit from being familiar with the layout and data.

8.3 Templates/Dashboards notes

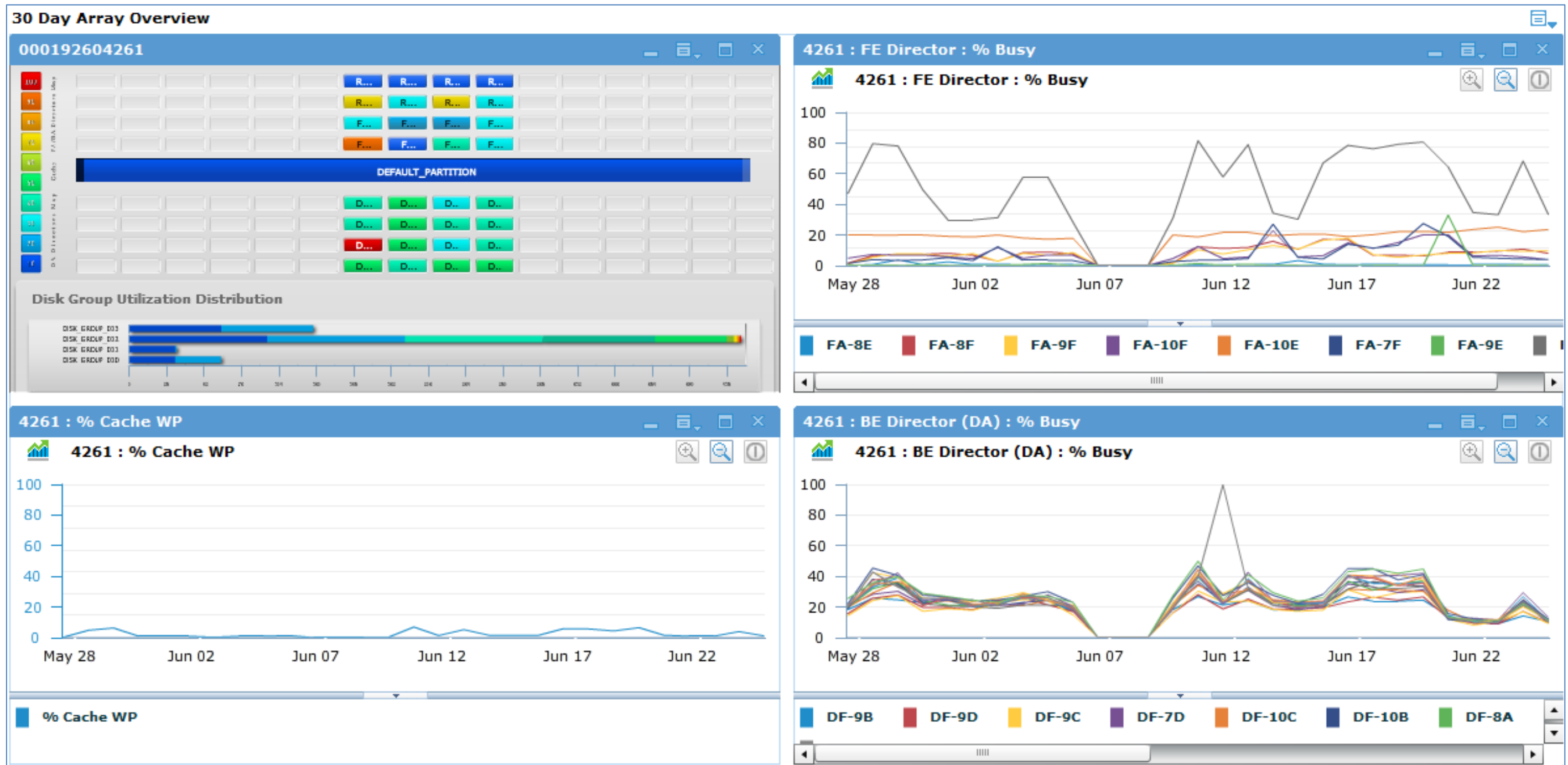
- The dashboards shown are based on the last 30 Days
- Maximum Values where ever applicable
- Any graphs shown can be minimised (or removed completely)
- Most Graph formats can be changed if the user prefers to view the information differently (e.g. Snapshots can be displayed as Pie charts)
- The Templates display variable data that can be changed to display the component/collection period of interest.

In order to show the meaningful screenshots the following pages are formatted in A3 landscape orientation

8.4 Array Overview - Dashboard

Array 'vital signs' at a glance

- **Heatmap** providing pictorial view of Hotspots over Time period
- **ALL FE Directors % Busy** – Trend – Provide Overview of When busy period occurs, if sustained
- **% Cache WP** – Trend - Effectiveness of cache – overview of any busy periods/loads.
- **ALL BE Directors % Busy** – Trend – Provide Overview of When busy period occurs, if sustained

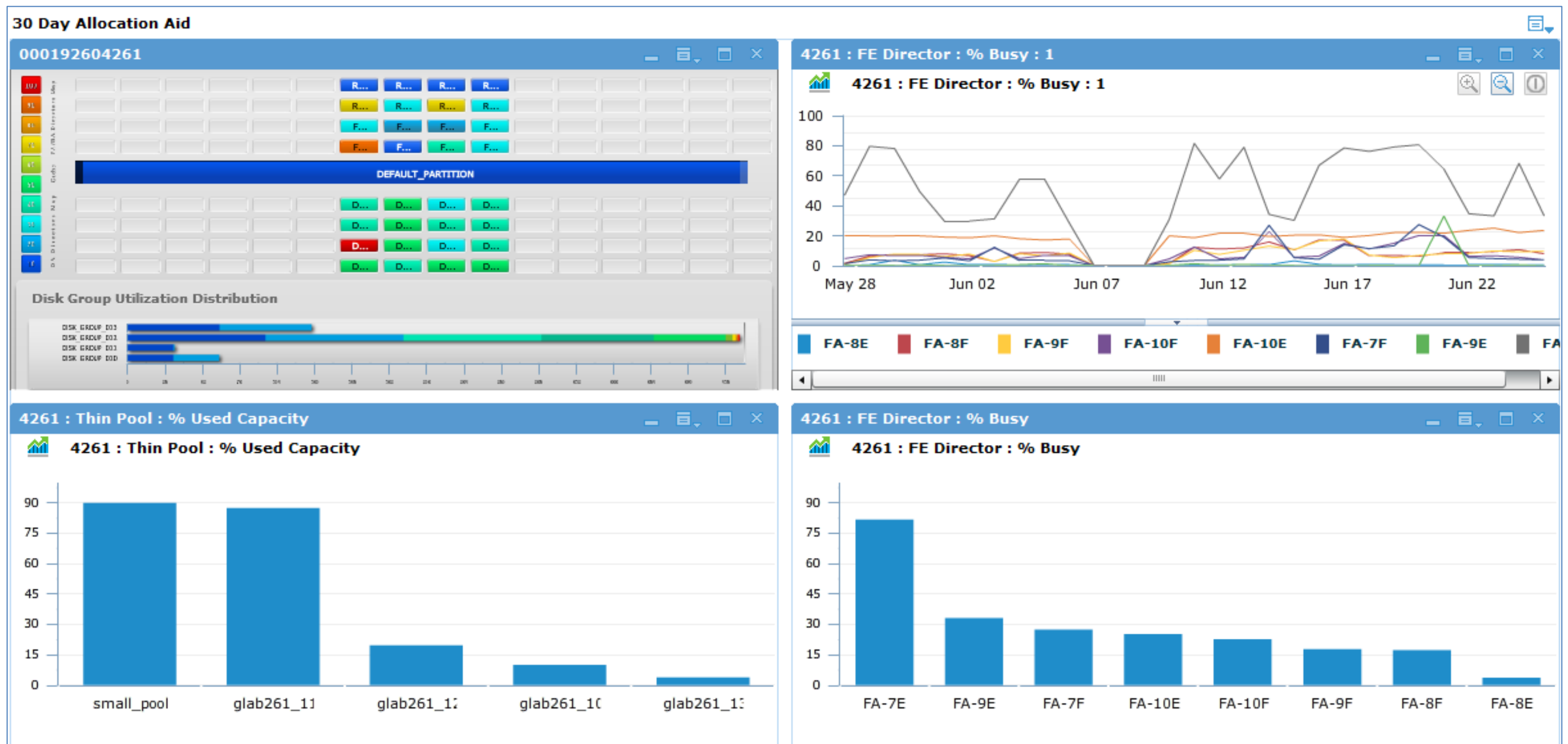


8.5 Array Overview/Allocation Aid Dashboard

Array 'vital signs' at a glance (Front End Biased) – Identify least used FE directors to aid allocation decisions

- Heatmap providing pictorial view of Hotspots over Time period
- ALL FE Directors % Busy – Trend – Provide Overview of When busy period occurs, if sustained
- ALL FE Directors % Busy – Snapshot – Provide Quick view of Dir. that can be correlated to above
- % Pool Capacity Used

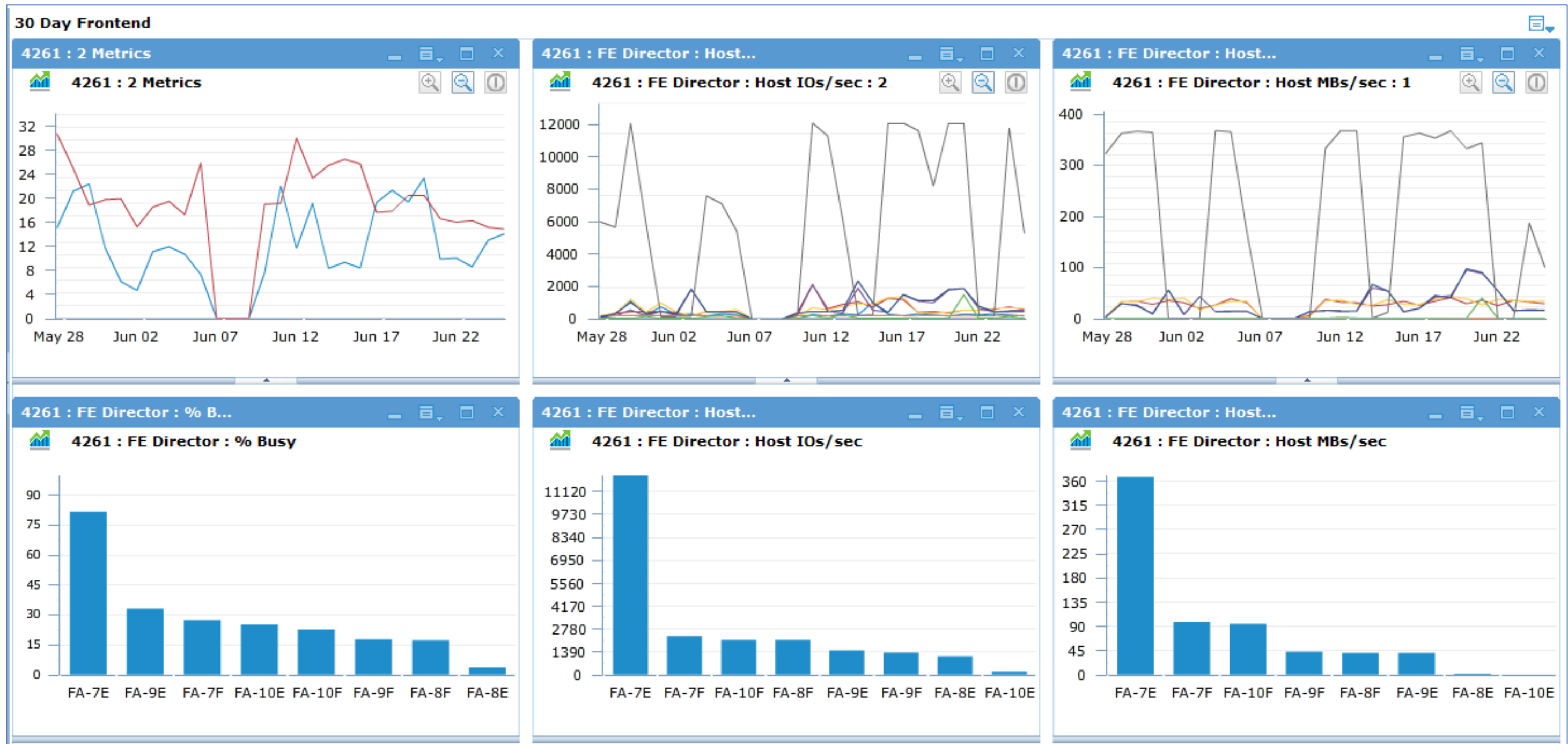
Acknowledged this is not the most helpful view for capacity – but no overall summary is available – We have requested an enhancement from EMC to be able to plot a capacity overview Free/Used by Physical/Virtual/Pool



8.6 Front End Dashboard

Frontend Director drill down

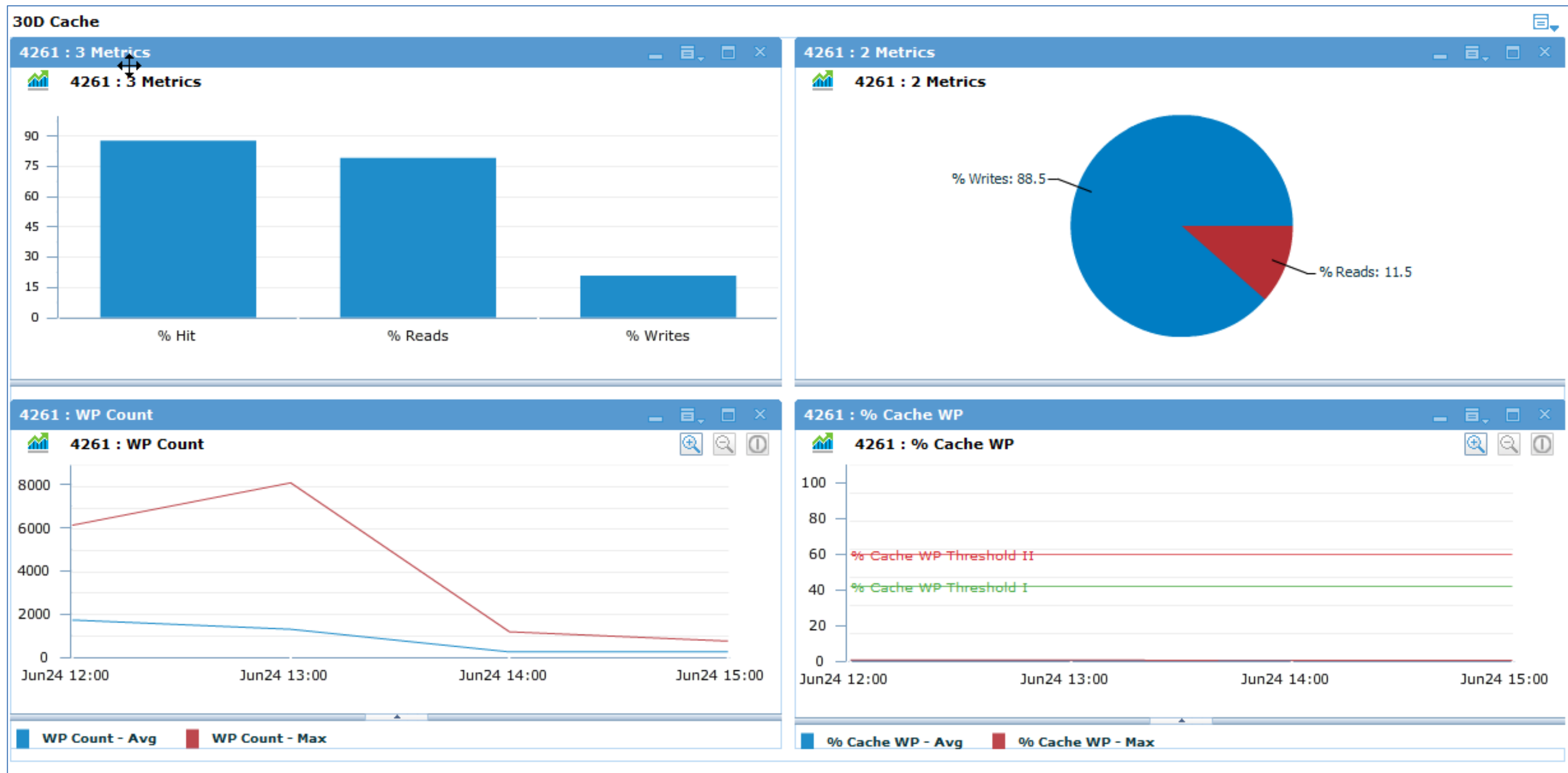
- **FE Dir % busy** – Snap shot – Are Directors Over Utilised
- **Host IO/Sec** – Snapshot – Are Directors Balanced
- **Host IO/Sec** – Trend – Are Directors Balanced / Is load sustained/when are the Peaks
- **Read/Write Response** – Trend – Response times excessive ? Increase inline with workload peaks?
- **Host MB/Sec** – Snapshot – Are Directors Balanced
- **Host MB/Sec** – Trend – Are Directors Balanced / Is load sustained/when are the Peaks



8.7 Cache – Dashboard

Cache Drill down

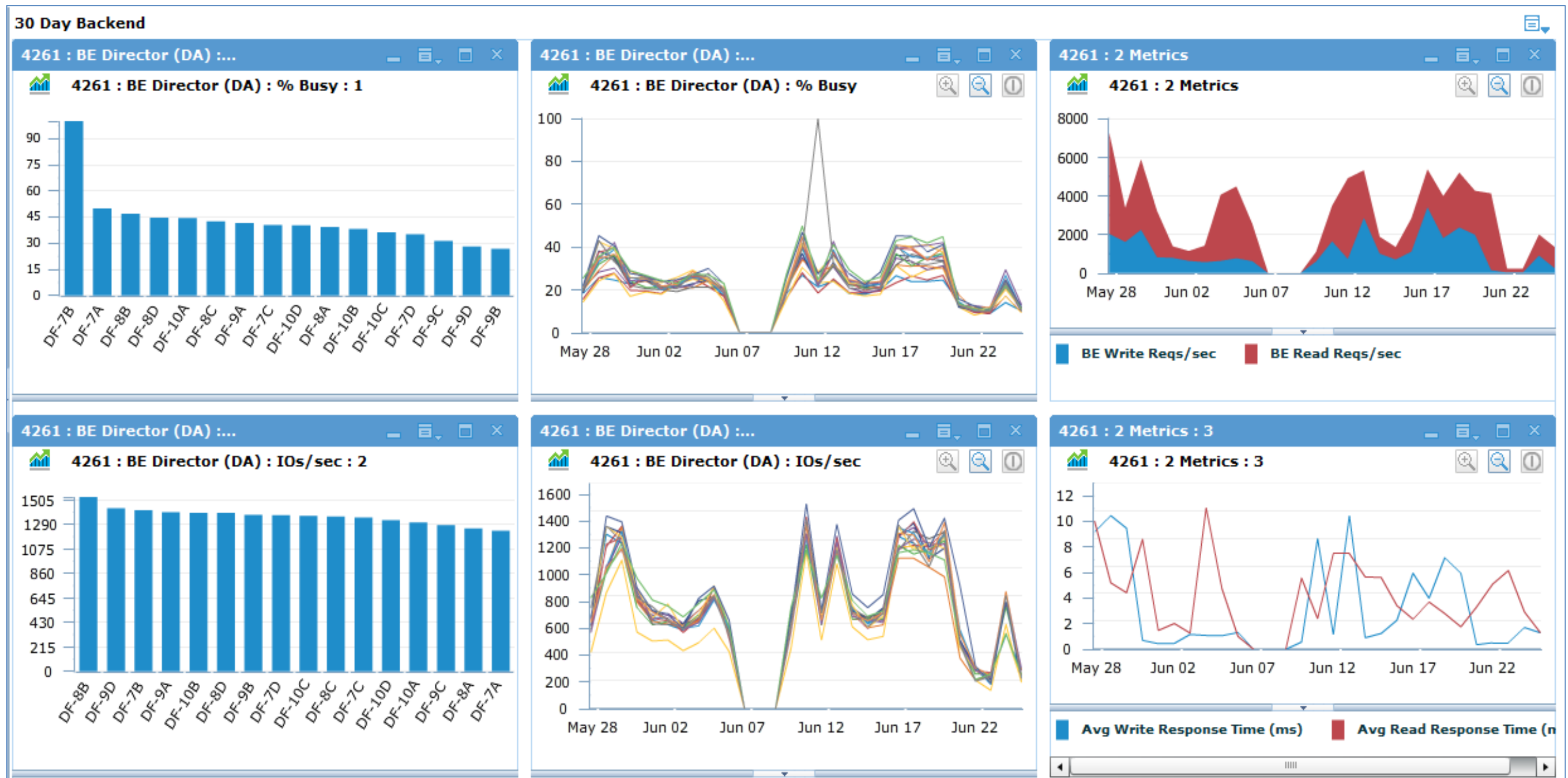
- **% Cache WP Average V's Max** – Trend – Effectiveness of cache & If utilisation high or reach specific peaks, is it close to any defined thresholds – Example show 40 & 60% Thresholds
- **WP Count v's System Max** – Trend – Are WP excessive in comparison to System Max ?
- **WP Count Average V's Max** – Trend – Are WP counts excessive?
- **% Hit/Reads/Writes** – snapshot - Ratio of workload



8.8 Backend – Dashboard

Backend Drill down

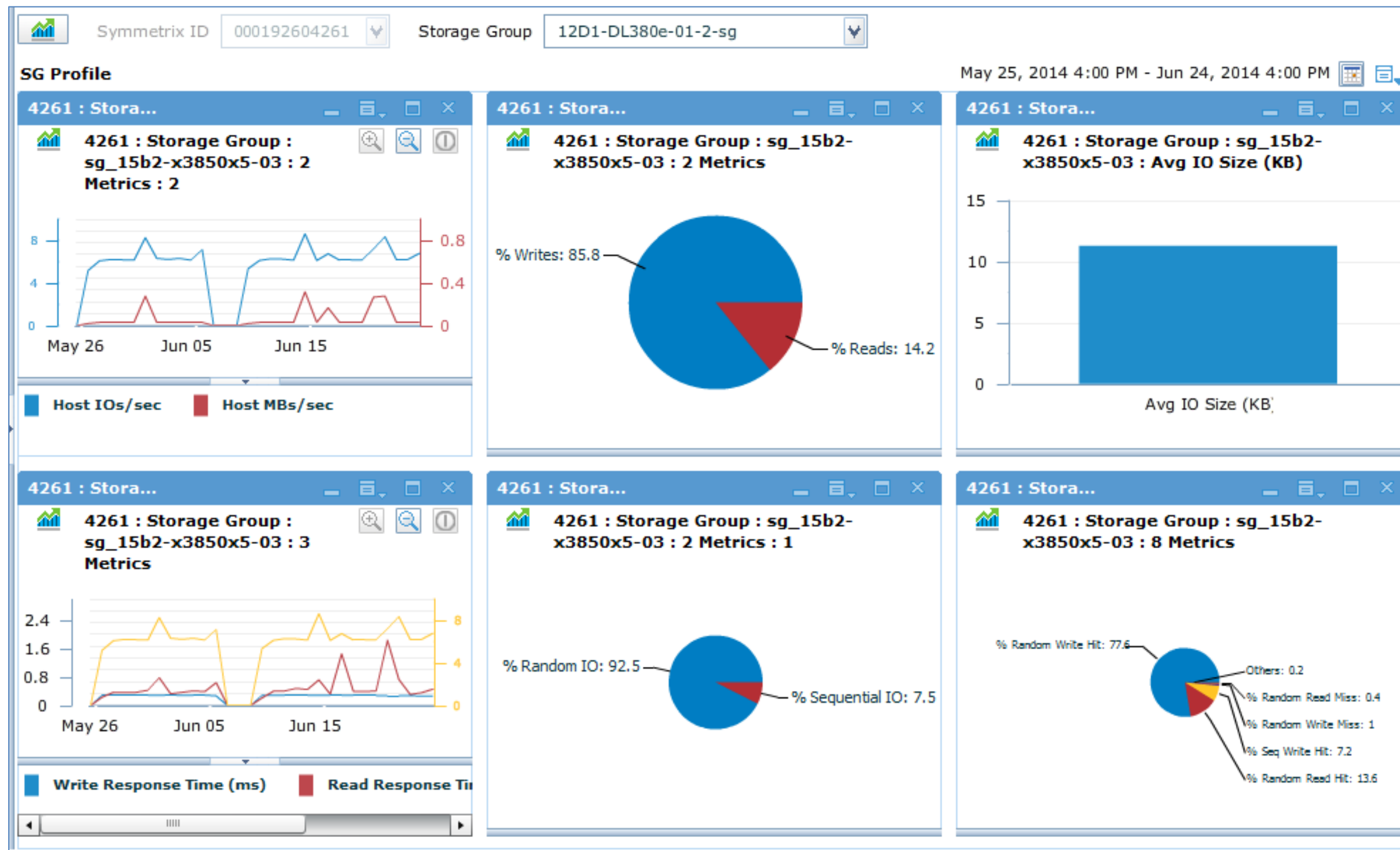
- **IOs/Sec & % Busy by BED** – Snap Shot – Is IO evenly spread across all of the back end ?
- **IOs/Sec & % Busy by BED** – Trend – Is IO peaking at any particular time is there any one BED significantly busier than the others?
- **WP BE Read/Write requests** – Trend – What is the workload breakdown ? If allot of reads further investigate Read Miss
- **Read/Write Response times** – Trend – Does the BE IO correspond to an increase in response times/workload type



8.9 Storage group Profile Template

Select Storage group for IO Profile

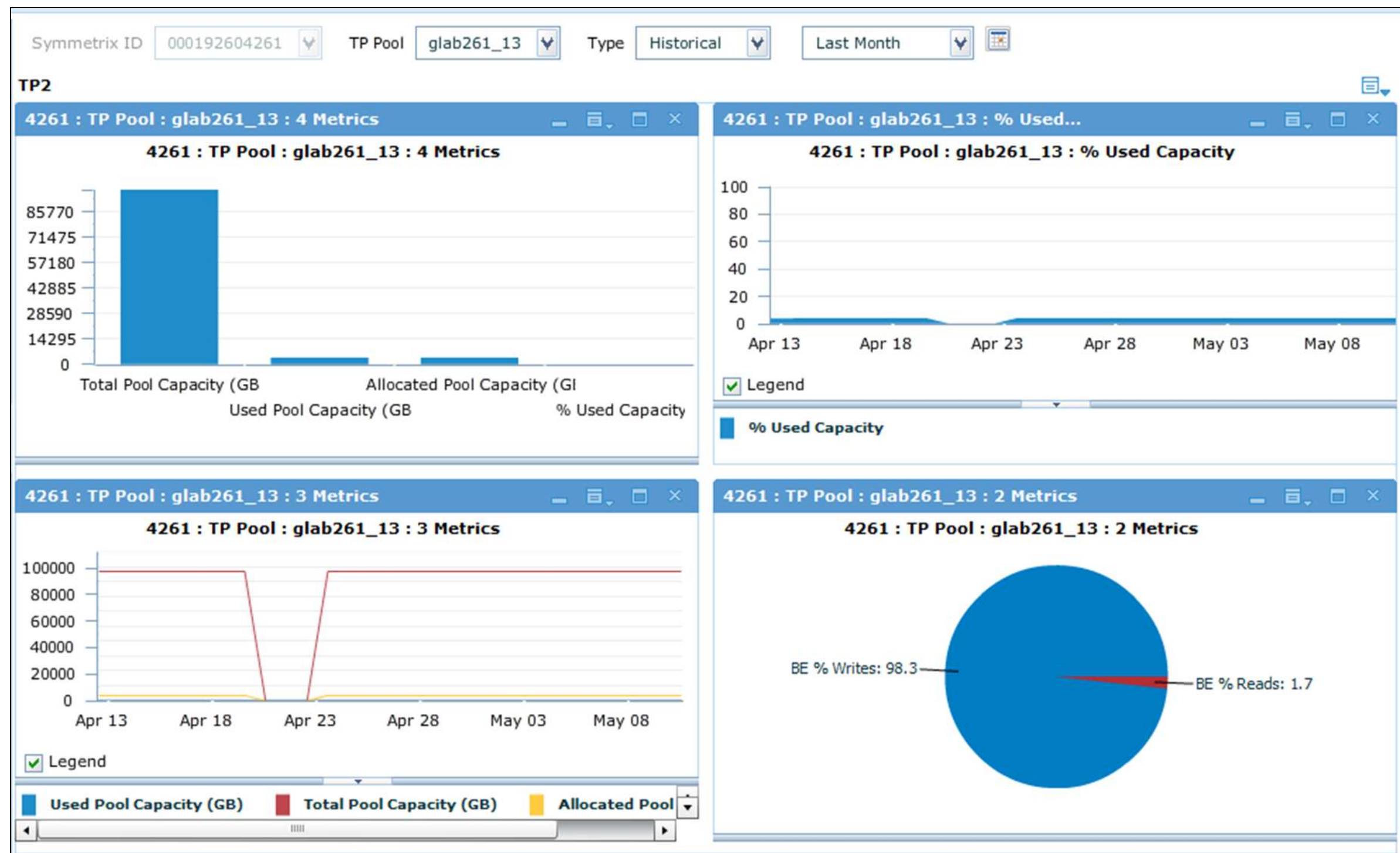
- Host IO v Host MB/Sec
- Read/Write Response times
- %Read v % Writes
- % Random v Sequential
- IO profileAv IO Size



8.10 Thin Pool Template

Drill Down for a specific Thin Pool

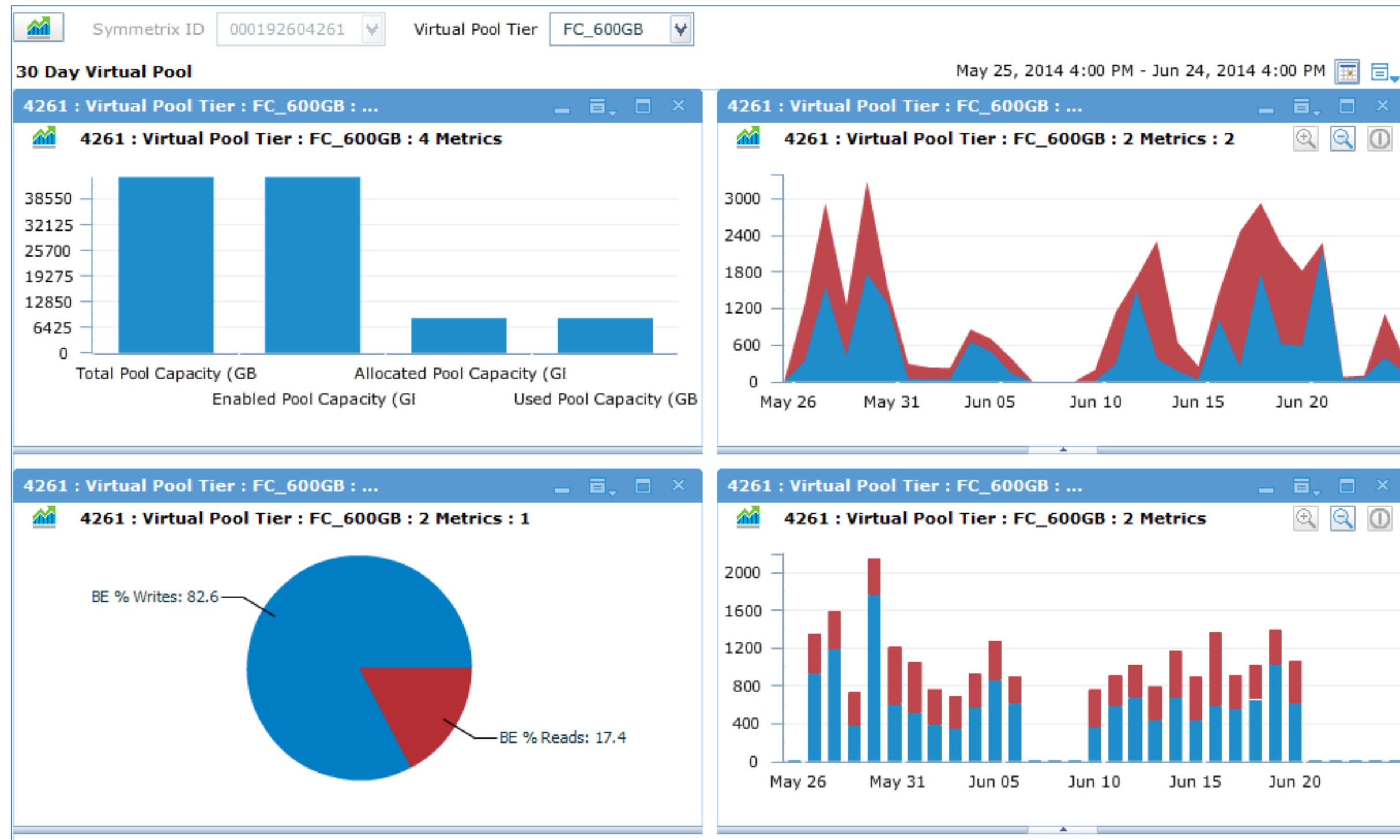
- **Total/Used/Allocated GB & % Used** – snapshot of Pool capacity utilisation
- **Total/Allocated/Used GB** –Trend – Overview of Pool capacity utilisation over time
- **% Used** – Trend – Used Capacity over time
- **% Reads/%Writes** – Work load Overview



8.11 Virtual Pool Template

Drill Down for a specific Virtual Pool

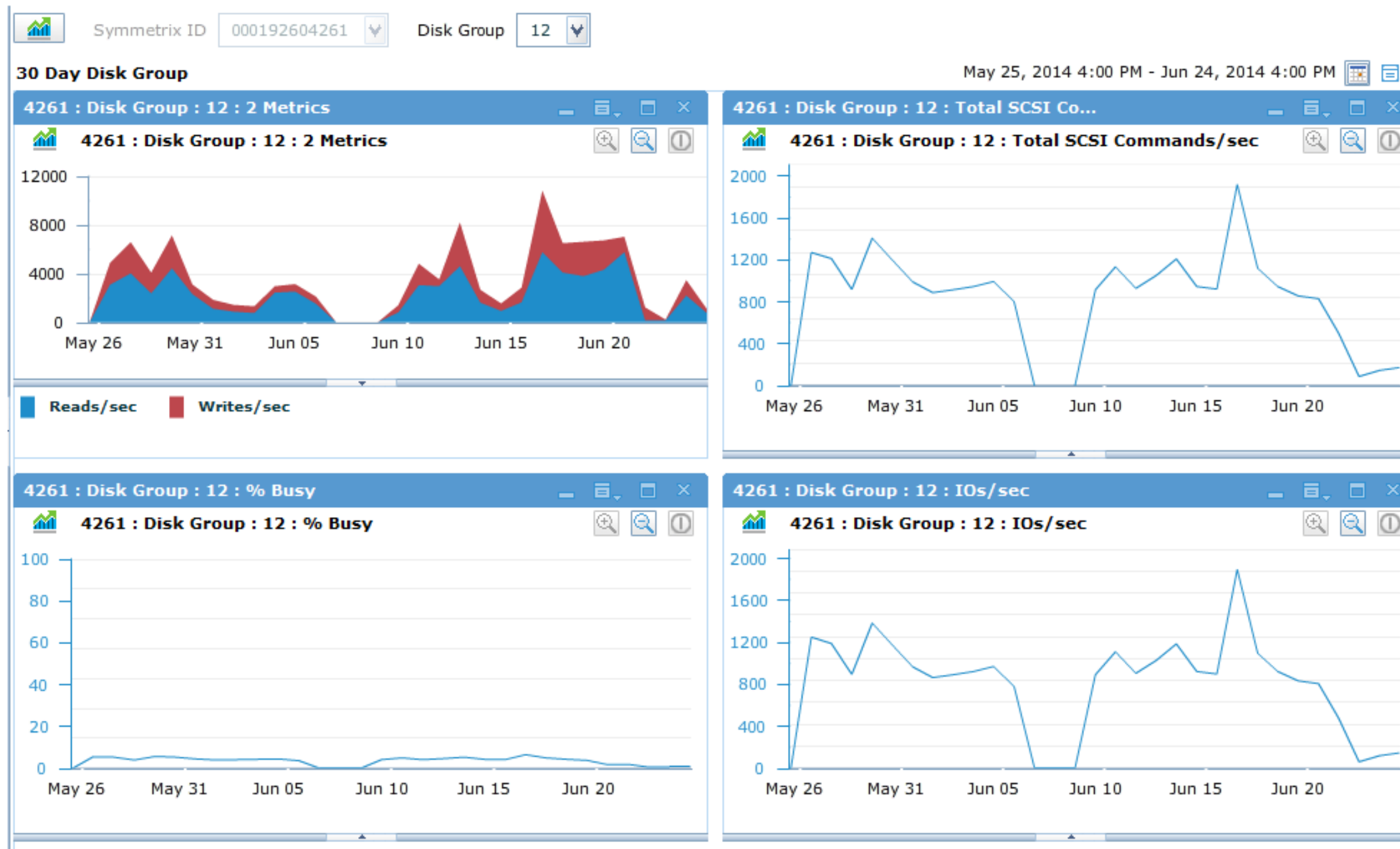
- **Total/Allocated/Used GB** - Snapshot – Overview of Pool capacity utilisation.
- **Egress/Ingress Tracks** - Trend – movement of data between tiers.
- **Back End Reads/%Writes** - Snapshot – Work load
- **Back End Reads/%Writes** - Trend – Work load over time



8.12 Disks Group Template

Drill Down for specific Disk Group to view general utilisation

- **% Busy** – Trend – % utilisation to be compared with SCSI/Sec
- **Total SCSI Commands/Sec** – Trend – Total Disk Traffic for Comparison for % utilisation
- **IO/Sec** – Trend – Workload obvious
- **Read/Writes per Sec** – Trend – Workload comparison



8.13 Further Optional Templates & Dashboards

During assessment and discussion with the Vendor and CTI other dashboards were reviewed.

- **Granular Front End port view** – See Below
- **FAST related Templates & Dashboards** – See Below

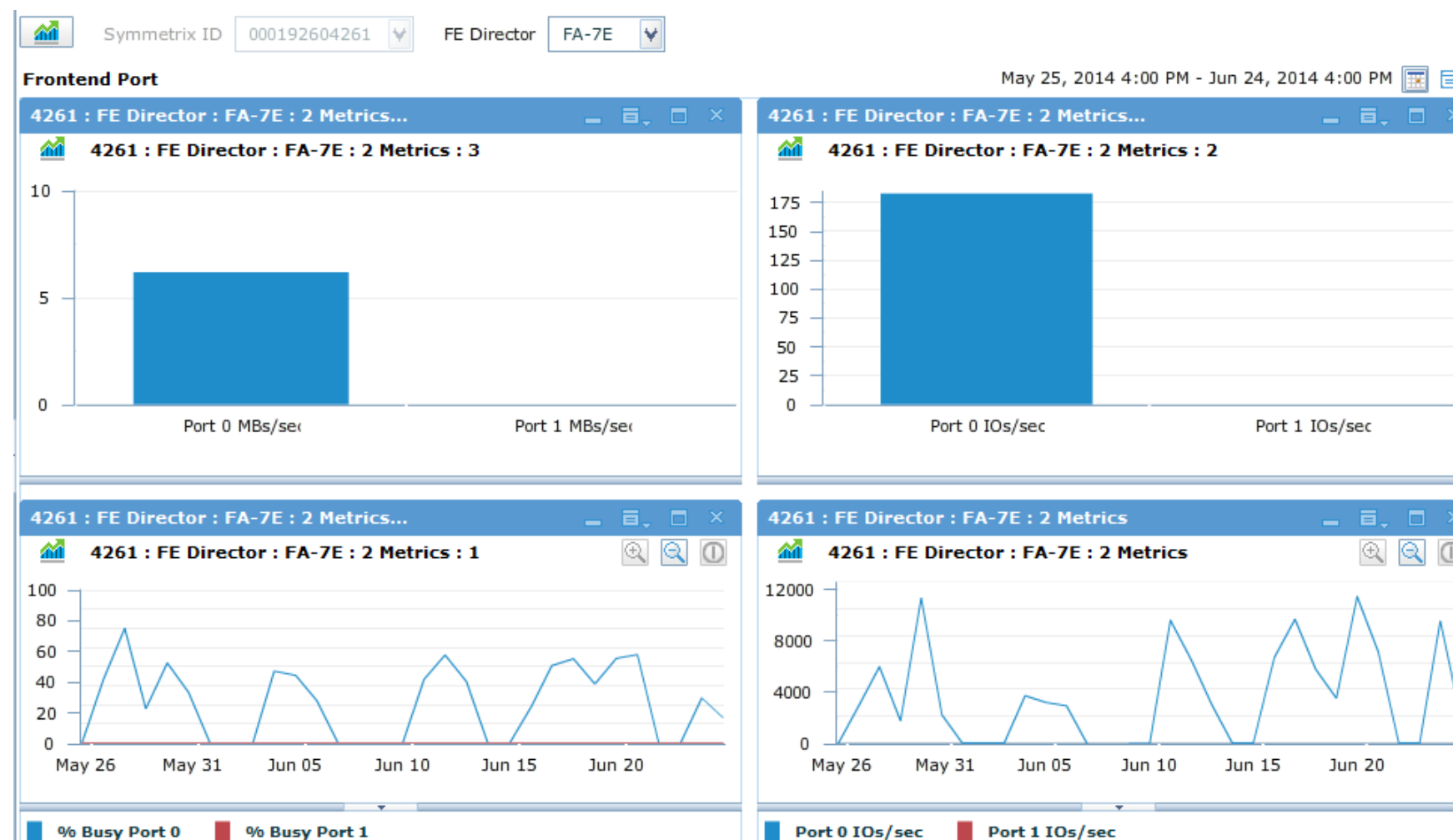
The following have not been included (Reasons provided) Further assessment will continue as the product matures, and hopefully requested dashboards will be added in the future.

- Storage Groups mapping to Front End ports/Directors - Unisphere cannot provide Storage group to Front end port mapping as part of a dashboard or template – this can be viewed using the analyze pane, selecting singular storage groups.
- Storage Group Performance Metrics / Top 10 - storage group performance a one view fits all approach will not work as it will depend on the issue area of performance you are investigating – the recommendation is to plot on demand or formulate several dashboards as relevant. The Top 10 groups is a metric that currently can only be produced manually

8.13.1 Front End Ports Template

Drill Down for specific Front End Port

- **Front End IO/Sec By Port** – Snapshot – If both ports are used is workload balanced or more aggressive on one port.
- **Front End IO/Sec By Port** – Trend – If both ports are used is workload balanced or more aggressive on one port / Is load sustained/when are the Peaks
- **Front End % Busy By Port** – Snapshot – If both ports are used is utilisation balanced or more aggressive on one port ?
- **Front End % Busy By Port** – Trend – If both ports are used is utilisation balanced or more aggressive on one port ? / Is load sustained/when are the Peaks



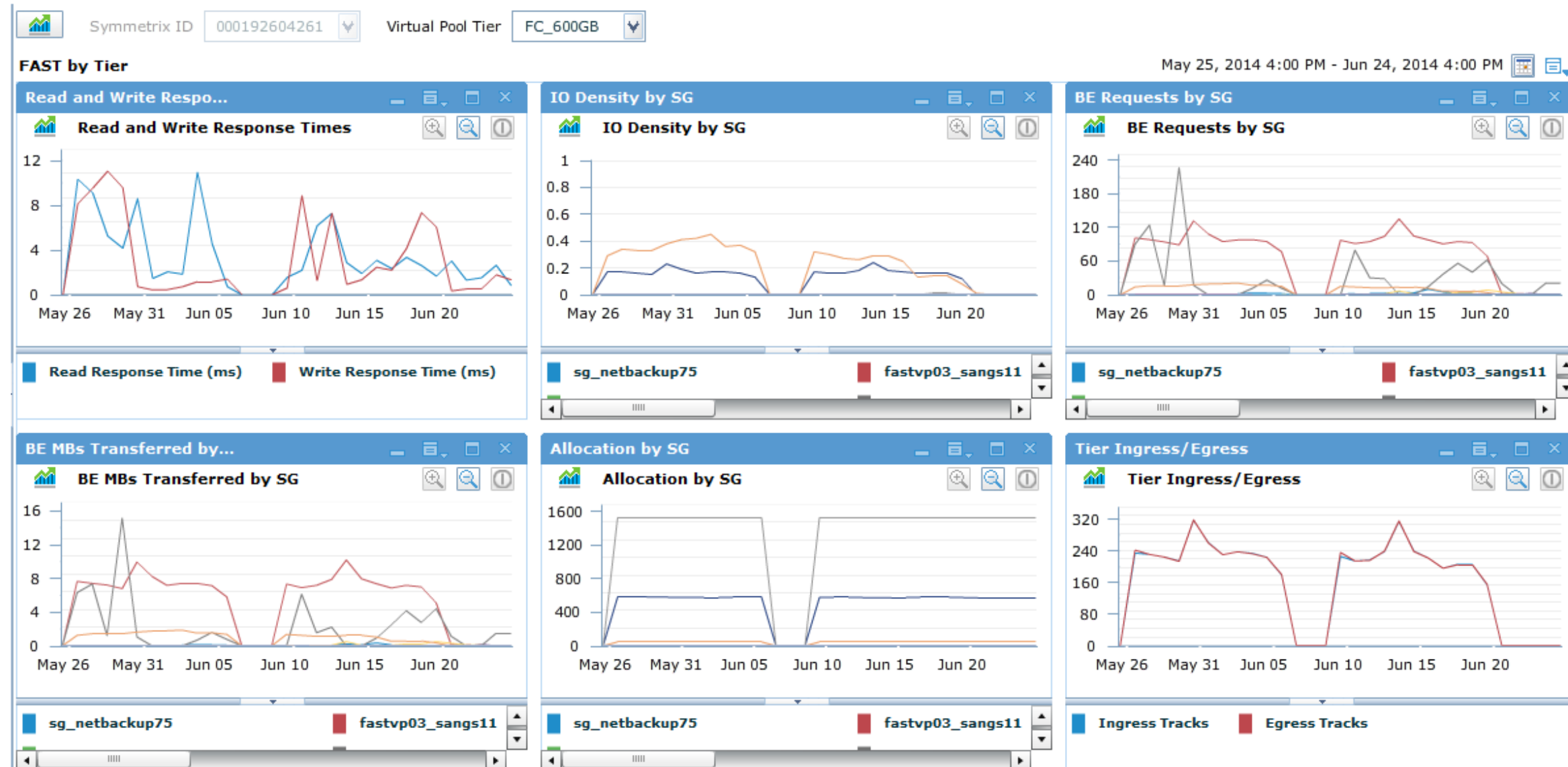
8.13.2 FAST related Templates & Dashboards Suggestions

There are three canned templates provided as part of the predefined EMC Templates: These are also referenced in the FAST Best Practice Solutions guide as they align to SPA templates previously used for FAST – Users are also advised to reference Section 8 of the FAST BP guide which covers usage of SPA and its Unisphere equivalents. Elements of the FAST templates along with other related metrics that can be plotted depending on what you are looking to see.

8.13.2.1 FAST by Tier Template:

Provides the following parameters by selected Tier

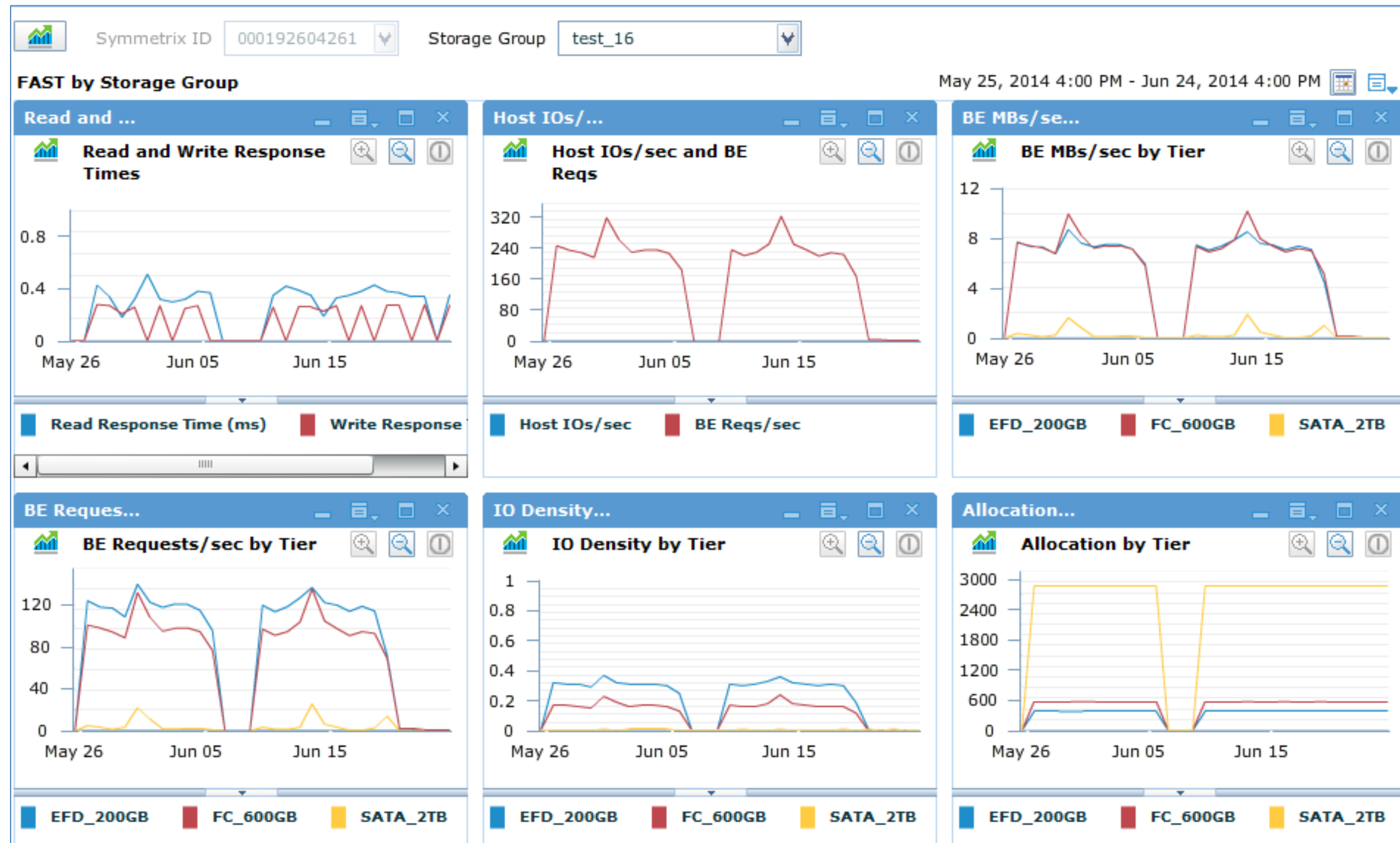
- **Read/Write Response Time** - Shows the time it takes the disk to satisfy IO requests
- **Ingress/Egress Tracks** - number of extents entering and leaving the virtual pools that reside on the tier. Shows that the FAST controller is moving extents around
- **IO Density (by SG)** - Shows how efficiently the FAST controller is managing the IO
- **BE requests (by SG)** - Shows the request rate to/from the tier
- **BE MB's Transferred (by SG)** - Shows the throughput rate to/from the tier
- **Allocated Tier Capacity (by SG)** - Shows the capacity of each storage group within the tier



8.13.2.2 FAST by Storage Group Template

Provides the following parameters as a time series view by selected storage group:

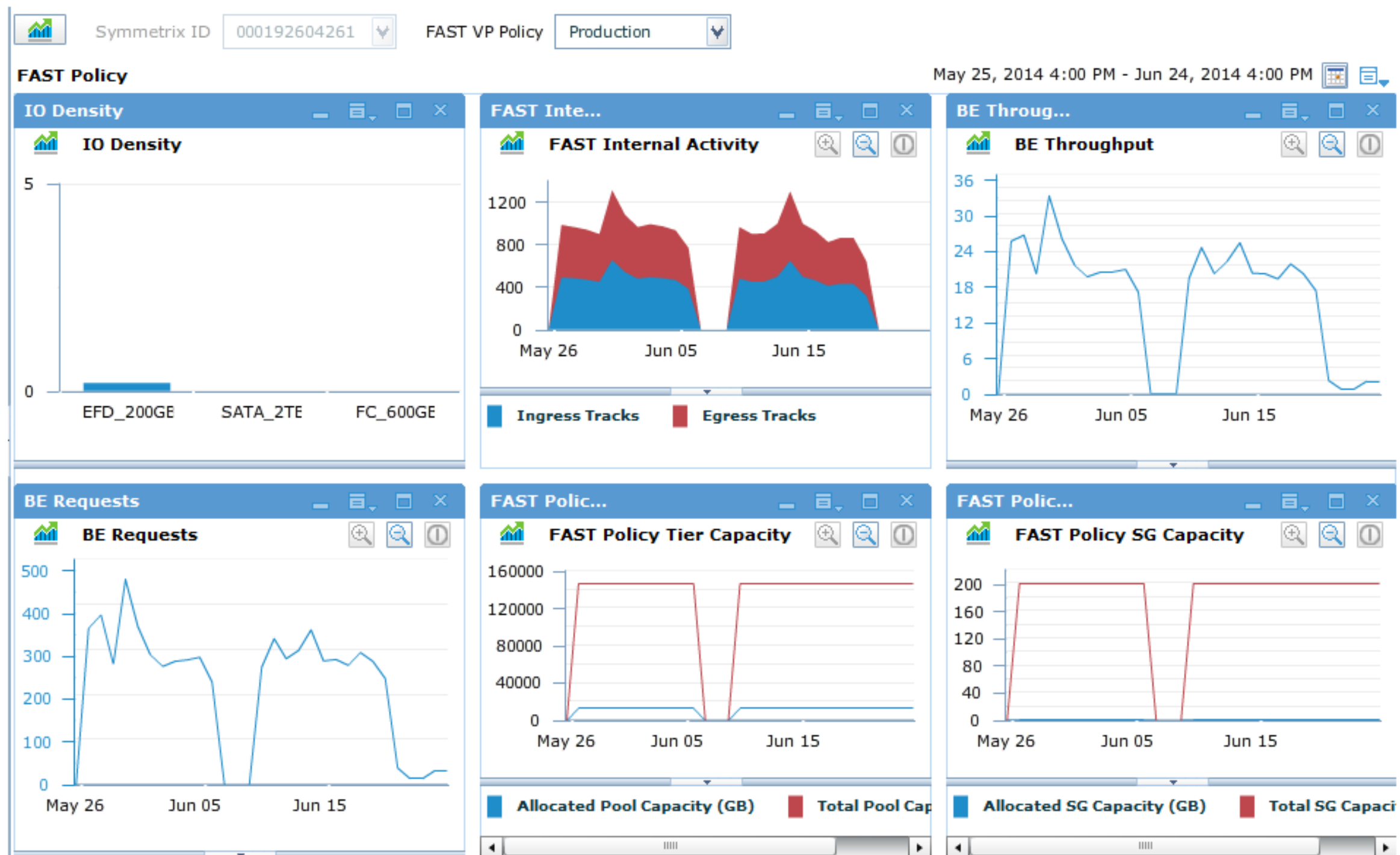
- **Allocated Capacity (By Tier)** - How much of the storage group is allocated to each tier
- **IO Density (by Tier)** - How many IOs are done per GB of disk
- **Host IO & Back End requests/Sec** - This chart compares the host IOs that are satisfied from cache with the back-end requests that FAST is handling
- **Back End MB's Transferred /Sec (by Tier)** – Throughput indication
- **Back End Requests (by Tier)**
- **Read & Write Response Times**



8.13.2.3 FAST Policy Template

Provides the following parameters as a time series view by Policy:

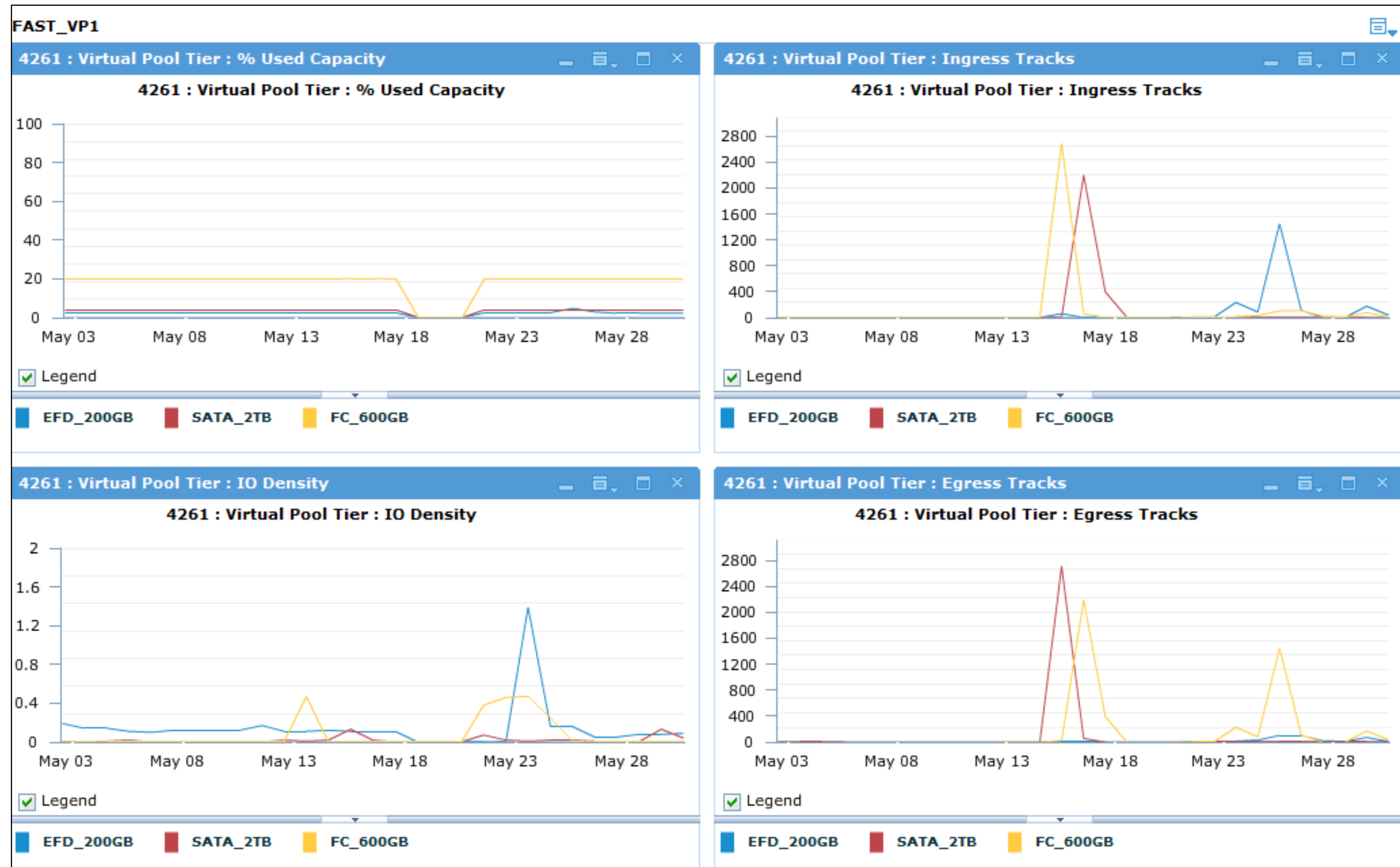
- **Total used/Total Available Tier Capacity** for the selected Policy
- **Total used/Total Available** for all Storage Groups associated to the selected Policy
- **IO Density**
- **Ingress/Egress Tracks** - number of extents entering and leaving the virtual pools that reside on the tier. Shows that the FAST controller is moving extents around
- **Total Back End requests/Sec** by all storage groups associated with Policy
- **Back End MB's Transferred /Sec** for all storage groups associated with Policy



8.13.2.4 Example Virtual Pool/FAST Related Dashboard

As advised, elements of the FAST templates or any other relevant metric of interest can be used to form individual, following example is biased toward the Virtual Pools to provide a higher level overview

- **IO Density** — Shows how many IOs are done per GB of disk
- **Egress/Ingress** — Shows the total number of extents moving in and out each second from the virtual pools (Is FAST moving extents)
- **% Capacity** — effect of FAST movements on capacity



9 Appendix E – Upgrading from SPA

Upgrade from SPA to U4V 1.6 was **not** tested in the lab. It is assumed that all SPA deployments were upgraded to U4V 1.5.

This section was retained in case of inheriting legacy environments that need to be upgraded. This will be moved to a separate document at a later date.

9.1 Unisphere for VMAX upgrade from SPA - installation and configuration checklist

The check list summarizes high-level steps required to install and configure Unisphere for VMAX as an upgrade from SPA, and references the relevant sections in this document

Task	Section in this document
Prerequisites	
Ensure hardware and other requisites are available: - Review RAM & Disk size recommendations if upgrade is required for U4V Server - Flash Player 11.2 or above on Client (desktop only)	Section 3
Upgrading SPA to Unisphere for VMAX	
Upgrading SE7.x on the (SPA) Unisphere for VMAX server	Section 3 & Section 4
Upgrade SPA to v2.2.1	
SPA DB Extraction and reformatting	
Install (Upgrade to) Unisphere for VMAX package on the server	
Installing Unisphere for VMAX license	
Setting up Unisphere for VMAX to use a remote SYMAPI server	
Request mysqld.exe process is added to LRP for McAfee Virus Scanning – Requires ResolveIT	
Restore Historical SPA Data	
Confirm SYMAPI server settings and Deamon_option defaults	
Test Unisphere for VMAX server has access to remote SYMAPI server	
Setting up Authorization	
Setting up authorization on target Symmetrix systems (If not previously done)	Section 5 of this document & CSBE Solutions Enabler 7.X Solutions Guide
Configuring Unisphere for VMAX	
Security: Centralized Authentication via AD group	Section 6
Security: Restricting activity when in Unisphere for VMAX	
Setting up data collection	
Web server certificates – Requires CMP	
Scheduling database backup for Unisphere for VMAX server	

9.2 Upgrading from SPA 2.2.0.6 to Unisphere for VMAX

If SPA v2.2.0.6 is deployed, it will need to be upgraded as described in the steps further below.

Upgrading to Unisphere for VMAX can only be done from SPA v2.2.1 or above, therefore it is a prerequisite to upgrade existing SPA instances to v2.2.1 first.

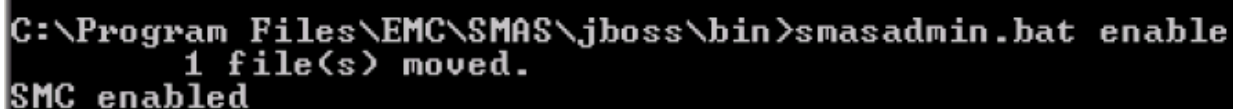
SPA performance databases will also need to be extracted and backed up using a Citi wrapped EMC tool so the databases will be generated in U4V format (from single DB table for all arrays to individual DB tables for each array).

9.2.1 Re-enable SMC

From the SPA deployment SMC should be disabled, to ensure there are no adverse effects during the upgrade re-enable SMC.

1. Shutdown the SMAS service
2. Run the following command from a cmd window run as Administrator.

```
C:\Program Files\EMC\SMAS\jboss\bin\smasadmin.bat enable
```



```
C:\Program Files\EMC\SMAS\jboss\bin>smasadmin.bat enable
1 file(s) moved.
SMC enabled
```

3. Restart the SMAS service

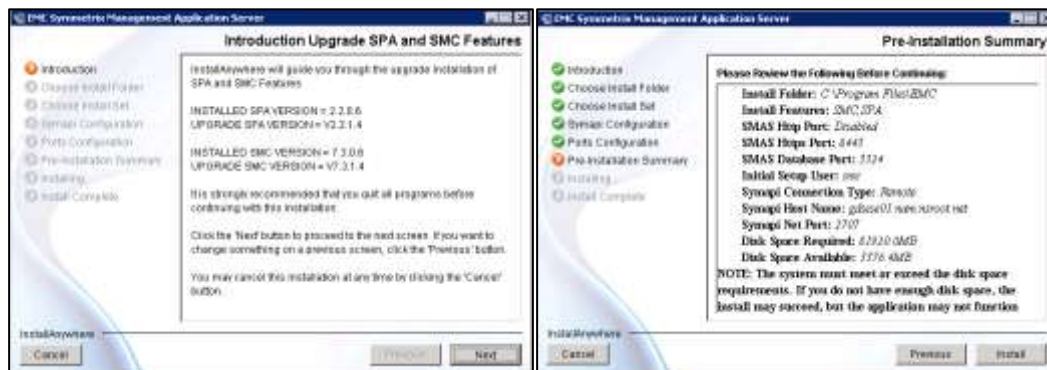
9.2.2 SPA v2.2.0.6 upgrade to v2.2.1

Upgrade steps below to be run from the SPA server:

1. Perform a manual backup of SPA database. Click 'Administration' → 'Database Management' → 'Backup'.
2. Upgrade to SPA v2.2.1 by pushing the software from TPM <package ID: CITI_WIN_EMCSymmetrixAnalyzer_22_00> to the SPA server. It will be interactive services mode for the installation. Existing version will be detected and click the 'Upgrade Installed Features' button to proceed.



3. It should pick up all settings from the existing SPA instance. Review the settings before pressing the 'Install' button.



4. Once the upgrade is completed, login into SPA and verify the version installed. It is advised to verify if everything is intact.

9.2.3 SPA Database extraction & reformatting

1. Before upgrading to Unisphere for VMAX 1.x, you need to extract historical data for all VMAX arrays from the SPA database. This is achieved by using a Citi wrapped vendor tool.

Push the package from TPM (TPM ID: CITI_WIN_2K8_EMCSPADBUnisphere_15_00).

2. Once the package is pushed to SPA server, request the SA to execute the 'run.bat' from 'c:\SPADBUUpgradeBackupSMASToUniVMAX\' directory.

This batch file will carry out the following

- a. Check the SPA installation directory
- b. Create a directory named 'upgrade' under
`<installpath>\smas\jboss\server\default-em\deploy\spa.ear\database\`

For example

`C:\Program Files\EMC\SMAS\jboss\server\default-em\deploy\spa.ear\database\upgrade`

- c. Copy all required files into the newly created 'upgrade' directory
- d. Execute vendor batch file 'SPADBUUpgradeBackup.bat' to start extracting the SPA DB for Unisphere for VMAX upgrade

3. Once the batch file is completed successfully, verify backup files created in '`<installpath>\smas\backup\SPA`' directory for each Symmetrix stored in the SPA database in this format:
`<symmetrix_id>_<date>_SPAUpgradeBackup.dat`

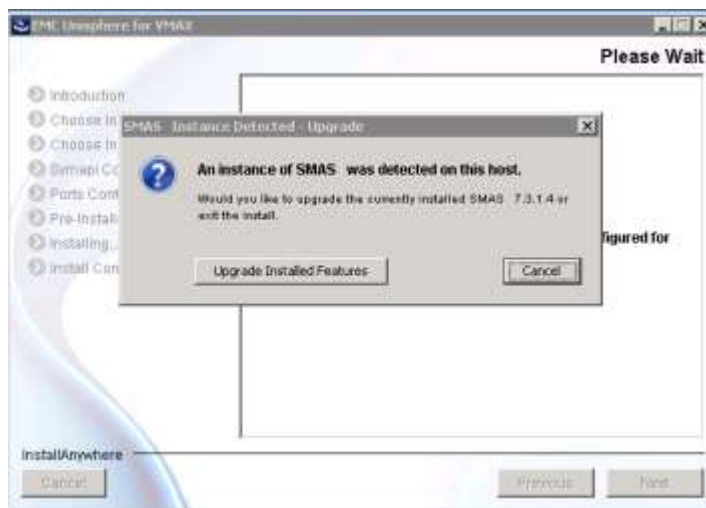
For example:

`c:\Program Files\EMC\SMAS\backup\SPA\000195900189_201108091823_SPAUpgradeBackup.dat`

4. Move all the newly created *.dat files to a temporary location outside the SPA installation directory.

9.2.4 Upgrade from SPA to U4V

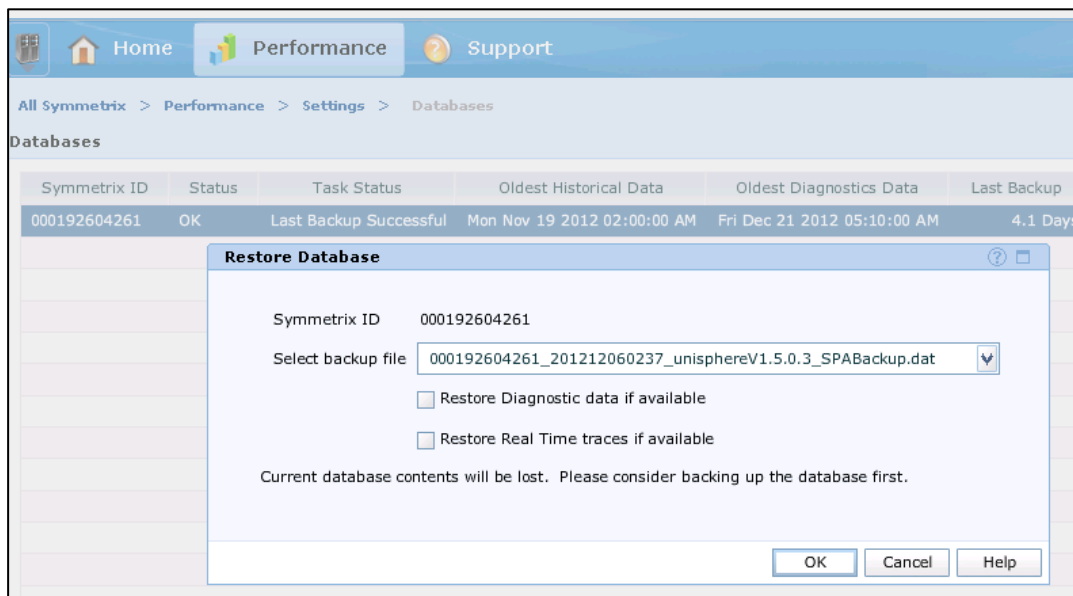
Upgrade from SPA v2.2.1 by pushing the software from TPM <package ID: CITI_WIN_XXXXXX> to the SPA/U4V server. It will be interactive services mode for the installation. Existing version will be detected and click the 'Upgrade Installed Features' button to proceed.



9.2.5 Restoring Historical SPA data into Unisphere for VMAX

1. After completing the instructions from [Installation Steps](#) section to configure the Unisphere for VMAX
2. Copy/Move all the *.dat database files created in section 9.2.3 back to '*<installpath>\smas\backup\SPA*' directory
3. Login into Unisphere for VMAX 1.x and restore each Symmetrix with the database backup files by selecting Performance → Settings → Database.

If there is no restore files available to select for restore, make sure the database files are copied to the '*<installpath>\smas\backup\SPA*' directory.



9.2.6 Legacy SPA related Storstopd daemon changes

9.2.6.1 Monitoring 7 and more arrays

In SPA there are some settings required to be configured if more than 6 Symmetrix arrays are being monitored. These settings are no longer required in U4V. Comment these out so default value will be used and restart the respective services to take effect.

In `daemon_options` file on remote SYMAPI server, if it has set as below:

```
Storstopd:dmn_symmids = xxxx,xxxx,xxxx,xxxx,xxxx
storstopd:dmn_max_arrays = 10
```

Where xxxx is the serial numbers of Symms

Comment it out so default value will be used:

```
#Storstopd:dmn_symmids = xxxx,xxxx,xxxx,xxxx,xxxx
#storstopd:dmn_max_arrays = 10
```

Restart the storstopd and storsrvd for the changes to take effect.

10 Appendix F – Migrate User Authentication from AD to LDAP

This appendix covers the migration steps to move user authentication from AD to LDAP to take advantage of group based symauth entries, and nested AD groups.

Whilst this can be done via solutions enabler using symauth files – U4V can be used to do this very quickly creating and applying new rules to multiple arrays at once.

The starting point assumes Local Directory Authentication has been disabled, and the storage administrator implementing has admin rights assigned on the arrays, and is logging onto U4V using AD authentication.

Prerequisites:

- AD group that will be used to contain groups authorized to access U4V– This may exist from the AD deployment
- Domain based FID/Service account that will be used to query the AD domain controller – This could be an existing FID (DCNM, HPNA)
- AD Authenticated User initially accessing U4V has Admin rights mapped on the arrays
- Local smc account has Admin rights mapped on the arrays visible to the symapi server. (optional)

Process:

AD authenticated SAN administrator accesses Unisphere for VMAX via URL

<https://<UnisphereforVmax-server-name>:8443>



Enable Local authentication - This is an optional safeguard against locking out all users following configuration error.

1. Select 'Administration' → 'Security' → Select 'Authentication' which will display a summary of the current configuration.
2. Select Edit and the Authentication Wizard will launch.
3. Check the Local Directory box
4. Click Next
5. Click Finish

Set up LDAP Authentication

1. Select Edit and the Authentication Wizard will launch.
2. Select LDAP-SSL
3. Click Next – The LDAP-SSL configuration window will open
4. **Complete the LDAP set up as highlighted in Section 5**

Set up Symauth rules for AD groups

1. Select 'Administration' → 'Security' → 'Authorization Rules' which will display a summary of the current symauth entries for all arrays.
2. Click Create at the bottom of the screen and a wizard will launch
 - Add the AD group that you want mapped to the symauth Role in the Name field
 - Select 'LDAP-SSL' in the Authority Field
 - Select 'Group' in the Type Field
 - For Each array select the role you want members of the group mapped to

Create Authorization Rules

* Name: AD group you want RBAC

Authority: LDAP-SSL

* Type: Group

Domain: namdev.nsrootdev.net

* Specify Roles

Symmetrix	Role
000192604261	StorageAdmin
000195700524	StorageAdmin

OK Cancel Help

3. Click Ok once complete
 - The Symauth rule will be created on the selected arrays, and will be displayed in the Authorization summary

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Home Performance Support

All Symmetrix > Home > Administration > Security > Authorization Rules

Authorization Rules

Type	Name	Authority	Authentication Domain	Symmetrix	Role
Group	*	LDAP-SSL	emc_admin	000192604261	StorageAdmin
Group	AD group you want RBAC	LDAP-SSL	namdev.nsrootdev.net		
				000192604261	StorageAdmin
				000195700524	StorageAdmin

At this point you can test log on using LDAP authentication in another explorer/chrome window.

1. Enter **JUST** your SOE ID & Password
2. Click Login



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User:

Password:

this log on message should persist through the upgrade

You should have access at whatever role you mapped to the AD group you are a member of.

Remove unwanted Symauth rules

After successfully logging on using the LDAP authentication, and confirming you have appropriate role based access, you can then remove AD related Symauth Rules.

1. Select 'Administration' → 'Security' → 'Authorization Rules' which will display a summary of the current symauth entries for all arrays Select AD based Symauth rules you wish to remove and click Delete at the bottom of the screen



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Home Performance Support

All Symmetrix > Home > Administration > Security > Authorization Rules

Authorization Rules

Type	Name	Authority	Authentication Domain	Symmetrix	Role
Group	AD group to delete	Windows AD	NAMDEV		
				000192604261	None
				000195700524	None
Group	AD group you want RBAC	LDAP-SSL	namdev.nsrootdev.net		

2. A summary will display – Click OK when you are satisfied the right group/user is being removed



Delete Authorization Rule

You are about to delete authorization rules across all licensed and authorized Symmetrix for:
 Windows AD (NAMDEV) group AD group to delete

Continue?

3. Repeat for all unwanted Unisphere groups/Users that are configured under Windows AD/OS.

Finally disable Local authentication

1. Select 'Administration' → 'Security' → 'Authentication' which will display a summary of the current configuration.
2. Select Edit and the Authentication Wizard will launch.
3. Unselect Local Directory
4. Click Next
5. You will need to re-enter the LDAP service account password
6. Click Next
7. Click Finish
8. Log off

11 Appendix G – Version Tracker

Version	Changes Since the Last Version
0.1	New certification draft
0.2	0.1 Re-written
0.3	Edits following peer review
1.0	Updates following RFC – Added Section 3.3 Guidance on Polling& Array loading following vendor discussions. - Removed section 4.1.2.2 – not required - Updated AD authentication diagram and text due to U4V not being able to process nested AD groups - Updated Data collection settings to 10min collections (min) - Updated Heat Map - Real Time View based on Section 3.3 - Added new section 7.3.1.1 Real Time Trace - Added more info to 7.5 Reports - Added new section 7.6 Export Button
1.1	Added Appendix D – Suggested Templates and Dashboards- Following discussion and assessment with CTI and EMC
1.2	Added Instructions on array filtering for U4V following collection issues in production instances attributed to exceeding product device limitations. Updated 3.6.4 – As Testing found SYMAPI session between W2K8 →RHEL could work as SECURE
1.3	Major update for U4V 1.6.1.6 - Edits through-out - Overhauled Webserver Certificate process - Added notes on new in context linking - Added notes on Health Check and Runtime checks & Alert - Movement of upgrade from SPA out of main document - Added notes on viewable symaudit log - Added note on export and reporting features
1.4	Updated Webserver certificate & array exclusion section with RPQ references. Released for production
1.5	Changed User authentication from AD to LDAP Updated SE Package Added 2.1.2 COB statement Updated all templates
1.6	Updated Solutions Enabler version
1.7	Added Workaround for POODLE Vulnerability