Welcome to Unisphere for VMAX Implementation and Management.

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This course covers Unisphere for VMAX functionality, architecture and installation. It also covers how to use the various views and perform administration tasks using Unisphere for VMAX.

A key part of the course includes recorded examples demonstrating how to configure, administer and use Unisphere for VMAX.
Module 1: Overview and Architecture

Upon completion of this module, you should be able to:

- Explain Unisphere for VMAX functionality
- Describe Unisphere for VMAX architecture
- List environment and system requirements for Unisphere for VMAX
- Explain deployment options

This module provides an overview of Unisphere for VMAX. It focuses on functionality and architecture. Environment, system requirements and deployment options for Unisphere for VMAX are also covered.
Unisphere for VMAX v8.3 - Overview

- Management GUI for VMAX Family of arrays
- Supports Service Level (SL) Based Management
- Also installed by default
  - Performance Analyzer
  - PostgreSQL RDBMS

Unisphere for VMAX v8.3 is a web-based GUI application that can be used to configure and manage EMC’s Symmetrix-based line of storage arrays, including DMX, DMX-3, VMAX, VMAX³, and VMAX All Flash storage arrays.

Unisphere for VMAX v8.3 supports Service Level (SL) based management.

Performance Analyzer is also installed by default during the installation of Unisphere for VMAX as of version 8.0.

Also starting with Unisphere v8.0, PostgreSQL replaced MySQL as the database for Performance Analyzer. PostgreSQL is an open source relational database management system (RDBMS).
Unisphere for VMAX can be used to perform storage array configuration operations such as create thin volumes, set volume attributes, mask volumes, set storage attributes, and set port flags.

Users can change volume configuration, set volume status, and create/dissolve meta volumes.

Advanced storage features can be managed such as Service Level (SL) based provisioning, Fully Automated Storage Tiering (FAST), FAST.X, workload planning, and Embedded NAS (eNAS).

You can use Unisphere for VMAX for creating and managing user accounts and roles, configuring system authentication, and viewing user sessions, authorized users and groups.

Alerts and alert thresholds can be configured and monitored. Multiple storage arrays can be configured and monitored including capacities.
In addition, Unisphere for VMAX provides tools for performing analysis and historical trending of VMAX performance data. With the performance option, you can view high-frequency metrics in real time, view Symmetrix system heat maps and view graphs detailing system performance. You can also drill-down through data to investigate issues, monitor performance over time, execute scheduled and ongoing reports (queries), and export that data to a file. Users can utilize a number of predefined dashboards for many of the system components, or customize their own dashboard view.

You can use Unisphere for VMAX to perform and monitor replication, and backup operations that were created using EMC TimeFinder® SnapVX, TimeFinder/Snap, TimeFinder VP Snap, TimeFinder/Clone, TimeFinder/Mirror, Symmetrix Remote Data Facility (SRDF®), Open Replicator for Symmetrix (ORS), and ProtectPoint™.

Unisphere for VMAX can be used to install eLicenses and register discovered storage arrays.

You can monitor and troubleshoot database performance issues using Database Storage Analyzer (DSA).
### X.509 Certificate-Based User Authentication Support

- Supports X.509 certificate-based user authentication
  - HYPERMAX OS Q1 2015 SR and higher
- Fresh installations only on Windows and Linux servers
  - Once enabled, irreversible
- Can use certificate issued by trusted public third-party certificate authority (CA)
- Use with Unisphere for VMAX or REST API
- Digital identity smartcards supported (Part of multi-factor authentication)
  - Common Access Card (CAC) and Personal Identity Verification (PIV)
- Must import CA-signed certificate into the keystore
- Optionally configure a Certificate Revocation List (CRL)

Starting with HYPERMAX OS Q1 2015 SR, X.509 certificate-based user authentication is supported on fresh installations of Unisphere for VMAX on Windows and Linux servers. You can use a certificate issued by a trusted public third-party certificate authority (CA) to authenticate user identity when using the Unisphere for VMAX web client or REST API interfaces. The use of digital identity smartcards such as Common Access Card (CAC) and Personal Identity Verification (PIV) as part of a multi-factor authentication process is also supported.

You can enable certificate-based user authentication as part of the installation. After you have confirmed your intentions, the choice becomes irreversible. You must import the CA certificates using the Command Line Interface (CLI) or scripts before certificate-based user authentication can be used.

For more information refer to the *EMC VMAX Family Security Configuration Guide*. 
Unisphere for VMAX v8.3 also provides a comprehensive set of APIs for provisioning, replication, planning and performance health monitoring which can be used by orchestration services like ViPR, Open Stack and VMware. The idea is to provide simple to use APIs that provide higher level of abstraction for a simpler operational model.

Please refer to the *EMC Unisphere for VMAX REST API Concepts and Programmer’s Guide* for more information.
## Unisphere for VMAX v8.3 – Requirements

<table>
<thead>
<tr>
<th><strong>Solutions Enabler v8.3</strong></th>
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<tr>
<td>• 64-bit v8.3</td>
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<table>
<thead>
<tr>
<th><strong>Client/Server architecture with client on supported browser</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>• IE v11.0 (Desktop Only), Firefox v30+, or Chrome 21.0.1180+ on Windows</td>
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<tr>
<td>• 600 MB memory</td>
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<table>
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<tr>
<th><strong>Unisphere Server</strong></th>
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</thead>
<tbody>
<tr>
<td>• Runs on Windows or Linux</td>
</tr>
<tr>
<td>• 64-bit OS, Minimum 2-core 1.8 GHz processor</td>
</tr>
<tr>
<td>• Local, Remote or Embedded installation configuration</td>
</tr>
<tr>
<td>• Available memory – 12-20 GB (Dependent on maximum volume count)</td>
</tr>
<tr>
<td>• Available disk space – 120-180 GB (Dependent on maximum volume count)</td>
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</tbody>
</table>

Unisphere for VMAX v8.3 is a 64-bit application and therefore requires the 64-bit version of Solutions Enabler v8.3. Unisphere for VMAX uses a client/server architecture where users access the management console using a supported web browser.

The client is supported on Internet Explorer, Firefox and Chrome running on Windows platforms. Any Windows host that runs a supported browser with network connectivity to a Unisphere server can be used. The client console requires 600 megabytes or more of RAM. The Unisphere client uses static ports, and hence, functions with most VPN solutions. Please refer to the latest version of the *EMC Unisphere for VMAX Installation Guide* for the specific versions of the supported browsers.

The Unisphere for VMAX Server can be installed on 64-bit versions of Windows and Linux. The server requires a minimum of one dual-core processor or two CPUs. Again, please refer to the latest Installation Guide and release notes for the latest supported platforms and caveats.

The Unisphere server is a SYMAPI application and can be deployed either in a Local, Remote or Embedded configurations with Embedded deployment being the newest. We will discuss these options further later in the course. The Unisphere Server requires 12-20 GB of available memory and 120-180 GB of available disk space, dependent on maximum volume count. The installation process will check if Solutions Enabler v8.3 is installed on the server host, and if the server meets the memory and disk space requirements.
Unisphere of VMAX server can be installed on Linux. Please note the Linux-specific requirements listed on the slide, however, as mentioned before, always refer to the appropriate version of the *EMC Unisphere for VMAX Installation Guide*.
The Unisphere for VMAX Server can be deployed in Local, Remote, or Embedded configurations. In the local configuration, the Unisphere Server and Solutions Enabler are installed on the same host server that has a direct connection to one or more Symmetrix/VMAX arrays. In the remote configuration, the Unisphere Server discovers the SYMAPI Server (storsrvd) over the network. The host on which Unisphere Server is installed does not need direct connectivity to a VMAX; instead, the Unisphere Server communicates over the IP Network with a host connected to a VMAX(s), and running the SYMAPI Server (storsrvd).

Starting with HYPERMAX OS Q3 2015, you can manage VMAX³ arrays using the Embedded Management (eManagement) container application. eManagement embeds VMAX³ management software (Solutions Enabler, SMI-S, Unisphere for VMAX) on the VMAX³ array, enabling management of the array without requiring software installed on a separate host.

Solutions Enabler utilizes a wide variety of daemon processes to handle different client requests. Most of these daemons start only when needed. Unisphere leverages the various Solutions Enabler daemons. The Base API daemon (storapid) monitors VMAX gatekeeper access, helping to reduce contention between daemons and other client applications. The SYMAPI Server daemon (storsrvd) provides SYMAPI services to remote clients, like the Unisphere Server, in a remote configuration. The Event daemon (storevntd) monitors VMAX events and asynchronously sends alerts to registered clients, like the Unisphere Server. This eliminates the need for the Unisphere Server to poll for updates, while ensuring that notifications are made in near real-time.
Unisphere for VMAX v8.3 introduced new home dashboard for embedded installations. It displays information (capacity, alerts, systems utilization, and storage group compliance) for the local storage system only. Because data about only one storage system is displayed, the information is more detailed than what is displayed on the traditional Unisphere for VMAX dashboard.

Unisphere for VMAX v8.3 supports Non-Disruptive migration (NDM), which allows users to migrate storage group (application) data in a non-disruptive manner with no downtime from source arrays running Enginuity 5876 Q3 2016 or higher to target arrays running HYPERMAX OS 5977 Q3 2016 or higher.

For VMAX All Flash systems running HYPERMAX OS 5977 Q3 2016 SR and later, Unisphere for VMAX allows enabling and disabling compression on storage groups. It also provides the ability to monitor the current compression ratio on storage resource pools (SRP), storage groups, and volumes. Compression is only available for FBA systems.

Unisphere for VMAX now supports the vWitness solution that provides the Witness functionality without requiring any extra VMAX hardware while meeting the security requirements of the customer. Unisphere allows you to:
- Suspend vWitness and make it temporarily inactive
- Add vWitness to the configuration table
- Remove vWitnesses from the configuration table and break the connection (if exited) to that vWitness Locking Server
- Query the configuration/state of the vWitnesses

Dynamic Cache Partitions can now be viewed on VMAX³ arrays running HYPERMAX OS 5977 Q3 2016 SR and above. However, active management of DCPs is only available on arrays running Enginuity 5773 or 5876.

SRDF/Metro has been enhanced to support additional 3-site configurations.
eLicensing provides an end-to-end solution designed to help customers manage, track, and comply with software license entitlement. You can only manage a storage system from a Unisphere host if the storage array contains a Unisphere for VMAX Symmetrix Management Console (SMC) eLicense. However, you can use Unisphere for VMAX to obtain and install the proper eLicense on the storage system.

After a storage system that has been managed by Unisphere for VMAX SMC is upgraded to Enginuity 5876 or higher, Unisphere will operate with the storage array even if the proper eLicense is not present. The Unisphere for VMAX SMC eLicense is noted as “In Use” in the Unisphere eLicensing report. This designation means that the required eLicense is missing, but access to the system is still allowed to avoid service disruption. To clear this designation, you must obtain and apply the proper eLicense. We will discuss this more later in the course when registering the system.

With the incorporation of Performance Analyzer into Unisphere for VMAX, the former Symmetrix Performance Analyzer host-based eLicense is no longer required.

For more information on eLicensing, refer to the *EMC Solutions Enabler Installation Guide*.

Unisphere for VMAX is also supported on a guest operating system as a virtual appliance (vApp) on VMware ESX/ESXi Server versions 4.0, 4.1, 5.0, 5.1, 5.5, and 6.0 (and all updates of each version), and Hyper-V Windows Server versions 2008 R2 (Standard and Enterprise), 2012, and 2012 R2 platforms provided the guest is listed in the EMC Support Matrix and in VMware/Hyper-V support documentation, and Unisphere for VMAX supports the platform. The guest must provide the same CPU, memory, disk, gatekeeper, and other requirements as if Unisphere for VMAX were installed on a physical machine.

Note that this course does not cover the deployment of the Unisphere for VMAX Virtual Appliance. For instructions on installing the appliance, refer to the *EMC Virtual Appliance Manager Installation Guide v8.3.x*. 
Module Summary

Key points covered in this module:

- Unisphere for VMAX functionality
- Unisphere for VMAX architecture
- Environment and system requirements
- Deployment options

This module covered Unisphere for VMAX functionality and architecture. Environment, system requirements, and deployment options for Unisphere for VMAX were also covered.
This module covers the available Unisphere for VMAX documentation and where to locate it. It explains the Initial Setup User and its role. This module also covers how to install Unisphere for VMAX and what to consider when upgrading the software.
Obtain Documentation and Software

Unisphere for VMAX v8.3 and Solutions Enabler v8.3 documentation and software can be downloaded from the Dell EMC Online Support Website (https://support.emc.com). The example displays the page produced by typing in Unisphere for VMAX v8.3 from the Search EMC Support page and initiating a search. From this page, you can locate the appropriate documentation and software needed to install Unisphere for VMAX and Solutions Enabler as well as other valuable information.

As a best practice, download the appropriate information and review the process before starting the installation. Any concerns should be fully addressed in the pre-installing phase of a project, not after you start the installation. Being prepared eliminates wasted time.
Download Documentation and Software

- EMC Unisphere for VMAX v8.3.x - Release Notes
- EMC Unisphere for VMAX v8.3.x - Installation Guide
- Unisphere for VMAX v8.3.x for Windows, Linux, or vApp Software
- Locate and review interoperability information in the E-Lab
- Virtual Appliance Manager v8.3.x Installation Guide
- Various Solutions Enabler (SE) Product Guides of same version
- EMC Unisphere for VMAX Online Help

Locate and download Unisphere for VMAX documentation and software:

**Release Notes:** The *EMC Unisphere for VMAX Release Notes* provides information about new and changed features, environment and system requirements, known problems and limitations, installation, troubleshooting, and non-EMC software attribution.

**Installation Guide:** The *EMC Unisphere for VMAX Installation Guide* gives detailed information on pre-installation considerations, including environment and system requirements. It also provides step by step instructions to install, upgrade or uninstall the product.

**Unisphere for VMAX Software:** The installation software for either Windows, Linux or the virtual appliance (vApp) depending on how you are deploying Unisphere for VMAX.

**E-Lab Interoperability Navigator:** For detailed interoperability information with host systems and storage system operating environments, refer to E-Lab Interoperability Navigator at EMC Online Support.

**Virtual Appliance Manager Installation Guide:** Provides information and installation instructions for deploying Unisphere for VMAX on a virtual machine as a vApp.

**Solutions Enablers Product Guides and Software:** As stated in Module 1, Solutions Enabler (SE) must be installed first and SE functionality is covered in various EMC Solutions Enabler Product Guides. Best practice is to install the same version of SE as Unisphere for VMAX. For example, if installing Unisphere for VMAX v8.3 then install Solutions Enabler v8.3 first. Refer to the appropriate Solutions Enabler release notes, installation guides and software.

**EMC Unisphere for VMAX – Online Help:** After the installation is complete and you have access to Unisphere for VMAX, you can view Online Help by opening a Help window, where you can browse content or search for information. Updates to Online Help can be downloaded from Dell EMC support.
Unisphere for VMAX v8.3 supports VMAX Family systems running HYPERMAX OS 5977 or higher, Symmetrix VMAX 10K/20K/40K Series systems running Enginuity 5876, and Symmetrix DMX systems running Enginuity 5773.

The installation process will check if Solutions Enabler v8.3 is installed on the server host, and if the server meets the memory and disk space requirements. The requirements were listed in previous module under architecture.

The installation process will also allow you to overwrite the default Unisphere Lockbox Password. The Unisphere Lockbox Password is required when performing upgrades as of v8.0. Keep a record of any custom Lockbox Password if created.

The Linux-specific requirements listed in the previous module should be addressed before installation.
### Unisphere Initial Setup User

<table>
<thead>
<tr>
<th>Used only to install and set up the Unisphere environment</th>
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<tbody>
<tr>
<td>Defined during installation</td>
</tr>
<tr>
<td>Default user “smc” with password “smc”</td>
</tr>
<tr>
<td>• Note: Change the password to avoid unauthorized access!</td>
</tr>
<tr>
<td>Recommended to create other Administrators</td>
</tr>
<tr>
<td>Different username must have a valid login to the Unisphere Server host</td>
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</table>

While installing Unisphere for VMAX, you will be prompted to specify a Unisphere **Initial Setup User (ISU)**. The role of this Unisphere Initial Setup User is to install and set up the Unisphere Environment, such as to create users and add roles. It is intended to be a temporary role, as it allows you only to perform administrative tasks on storage systems that do not have defined user roles (authorization rules).

During the installation, you can either specify the user ID you currently use to access the VMAX system (if User Authorization is enabled), or you can use the default user ID “smc”. If you plan on using the default ID, there must be no user IDs listed in the User Authorization database. If there are user IDs in the database (regardless of whether user authorization is enabled), then you must use SYMCLI, which is installed with Solutions Enabler, to add the default user ID (smc) to the database.

Once an Administrator or SecurityAdmin is assigned to a VMAX system, the Unisphere Initial Setup user will no longer be able to access, or even see the system from the Unisphere console. It is recommended that users not operate using the default “smc” role for too long or change the default password to prevent unauthorized access.

If you want to create a username for the Unisphere Initial Setup User that is different from the default of “smc,” then the only restriction is that the chosen name must be a valid login to the Unisphere Server host. This is for the purpose of authentication from the Unisphere Server host OS.
This is a brief summary of the Unisphere for VMAX installation process. More details are available in the Installation Guide. The installation can be done using an Installation Wizard or using a command line. The Installation Guide provides detailed steps for Windows and Linux.

There are a number of user-selectable values during installation. It should be noted that all pathnames used in this training assume that the default directory paths were chosen at installation. However, there are options to specify non-default paths. There is a special user called the Unisphere Initial Setup User (ISU). The ISU identifies the initial user with the privileges for creating additional user accounts and setting permissions. The default Unisphere Initial Setup User name is lowercase “smc” with password lowercase “smc”. To ensure security, this default password should always be changed after the installation. To specify any other Unisphere Initial Setup User name, the name must be an authorized user of the Unisphere server host, as there is no mechanism to specify the password. Connection type is another value which defaults to local, but can be set as remote if the Unisphere Server is communicating with a remote SYMAPI server running on a different host.

You can also modify the values of the port assignments for the Unisphere server and the Performance database. The default HTTPS port for Unisphere is 8443, and the default port of the Performance database is 3324. To change these values after the product has been installed, you may need to uninstall and reinstall the application. Finally, you can choose to overwrite the default Unisphere Lockbox Password. The lockbox is a vault containing user and password information, secured with a key.

Note that this course does not cover the deployment of the Unisphere for VMAX Virtual Appliance. The detailed instructions on deploying the Unisphere for VMAX Virtual Appliance can be found in the Virtual Appliance Manager v8.3.x Installation Guide.
In this example, we downloaded and executed `UNIVMAX_V8.3.x.x_WINDOWS_X86_64.exe`. The next few slides display the steps that require user input while installing Unisphere for VMAX on a Windows host using the Installation Wizard.
This dialog allows us to choose the destination folder for the installation. The **C:\Program Files\EMC** folder is the default install location that has been chosen in this case. The installation folder can be changed if desired.
Initial Setup User and SymAPI Configuration

The default **Unisphere Initial Setup User** name of "smc" has been used. A different User name can be specified. This user should have a valid login to the Unisphere Server host.

The default **SymAPI Connection Type** of Local is selected. If the remote option were to be used, the Node name and Net port of the remote SYMAPI server have to be specified. This would be the host that is attached to the VMAX arrays, and should be running the SYMAPI server.
This dialog screen allows us to select the Ports Configuration. The default HTTPS port is 8443 and the Performance Database Storage Analyzer port defaults to 3324. In this example, they have not been changed.
Unisphere Lockbox Password

The default Unisphere Lockbox Password can be changed by the user. If the default Unisphere Lockbox Password is accepted, you will receive the upper notification on the right. If you change it, you will receive the lower notification. The Unisphere Lockbox Password is required when performing upgrades. Keep a record of the Custom Lockbox Password if the default is overwritten.
In this dialog, you can choose to use X.509 Certificate-based Client Authentication or not. You are presented with a question “Do you want SMAS service to authenticate the client’s X.509 certificate?” Beware: If you choose X.509 authentication, it is irrevocable and if selected, client connection will not be possible without a valid client certificate. Also, if you select X.509 you will have to select either “Use CN (Common Name) of client certificate” or “Use UPN (User-Principal Name) of client certificate”. The UPN that is an Internet-style login name for a user. You can also elect to define and enter a “Unisphere 360 X.509 Common Name”. 
Server Protocol

Here you can see or select which version of the Internet protocol you want Unisphere for VMAX to use. Notice that IPv6 is grayed out. This indicates that the installation wizard did not detect IPv6 on this host. Once you click Next, the bound IP address is shown. Click OK to continue.
Here you have an opportunity to accept the default hostname/FQDN/CN of “mgmt-8818” for your certificate or change it. It is recommended that you use that address as CN of the certificate.

FQDN is the acronym for Fully Qualified Domain Name.
The installer will check for adequate disk space and available memory. This slide shows examples of Disk Space and Memory warnings.

Note that the installation may succeed, but the application may not function properly if one chooses to ignore these warnings.
The wizard provides an opportunity to review all installation configuration settings entered before starting the actual install. Once the settings have been confirmed, click Install to continue.
Unisphere for VMAX begin by extracting files and then installing.
Here is an example of a successful installation.
Unisphere for VMAX – Windows Services

- EMC Symmetrix Management Application Server (SMAS)
- EMC Performance Database Service (smasdb)

The installation process automatically starts the EMC Symmetrix Management Application Server (SMAS) Service and the EMC smasdb service. Note, the EMC smasdb service is only implemented when Unisphere is installed with the Performance option.

These services can be started or stopped like any other Windows Service. Also note that the order in which the services are started and stopped is important.

- If stopping manually, always stop the SMAS service before stopping the Performance DB.
- If starting manually, always start the Performance DB before starting the SMAS service.
This slide shows the steps required to start and stop the Performance database and the SMAS daemon on Linux hosts. The order in which these are started and stopped is also important. Always start the Performance DB before starting the SMAS daemon. Always stop the SMAS daemon before stopping the Performance DB.

To start or stop these processes, change the directory to the location shown on the slide and then execute the commands shown on the slide.
To ensure that virus-scanning software does not affect the operation of Unisphere for VMAX, you might need to exclude the directories and all subdirectories listed on the slide from any virus scan.

Not following this advice may lead to data corruption in the Performance database or problems with data collection.
Unisphere for VMAX is a very simple product to install and operate. However, there are a few potential issues that could occur. The Installation application verifies key information, such as the presence of prerequisite software, minimal memory and disk space requirements. A successful installation depends on the correct remote SYMAPI server port assignments and Initial Setup User name. The Pre-Installation Summary screen while running the Install Wizard is the place to catch port assignments, BIND IP address, and SYMAPI Connection Type errors. When the Unisphere for VMAX Client is invoked and an error occurs, the error message usually points out the problem. For example, a message that the SYMAPI server was not detected, cannot distinguish if the host or port assignment is wrong, or if a SYMAPI server has simply not been started. However, the message is sufficient to lead the user to make the appropriate checks to ensure that SYMAPI server is up and running on the correct host and port. Using Unisphere for VMAX with firewalls requires that the correct port(s) be open on the firewall.

Also, eLicense entitlements should be verified if problems are encountered on installation, or when trying to run licensed features.

SMAS and SYMAPI log files are required for troubleshooting. EMC Customer Service personnel may instruct you to gather the required files and send to EMC for analysis.

The Release Notes have a section titled “Known Problems and Limitations” and a section titled “Technical Notes”. Please refer to these sections for any known issues.
When upgrading Unisphere for VMAX there are a few things to consider:

- **Upgrade paths** - Unisphere for VMAX can be upgraded from Unisphere for VMAX v1.6.2 and v8.x. The settings used in the previous installation are preserved, including Port, Connection Type, Users, Alert Policies and Threshold settings, Email settings and mailing list, Performance Dashboard, and Queries.

- **Before upgrade** - Check the size of the performance database folder, ensure that the minimum RAM and disk space requirements for Unisphere for VMAX v8.3.x are met. Backup all data.

- **Running upgrade** – Download and copy executable install file to host. Start installation in Windows or Linux. Follow steps in *EMC Unisphere for VMAX Installation Guide*.

- **After upgrade** – You must renew link, launch client registrations, and then restore and verify system and performance data.

- **Upgrade Database Storage Analyzer Listener** - Upgrade the Database Storage Analyzer Listener on the SQL Server database monitored environment.
Module Summary

Key points covered in this module:
- Unisphere for VMAX documentation
- Installation considerations
- Initial Setup User
- Installation of Unisphere for VMAX
- Upgrade considerations

This module showed where to find Unisphere for VMAX documentation and installation considerations. It explained the role of the Initial Setup User, covered how to install Unisphere for VMAX, and described what to consider when upgrading.
Module 3: Unisphere for VMAX Interface

Upon completion of this module, you should be able to:

- Launch Unisphere for VMAX interface
- Utilize online help to accomplish desired tasks
- Navigate the Unisphere for VMAX interface

This module focuses on launching and navigating the Unisphere for VMAX graphical user interface. The use of online help is also covered.
You can launch the Unisphere GUI by opening a supported Web browser and using the Uniform Resource Locator (URL) shown on the slide (https://<Unisphere Server IP>:8443). If a non-default port was specified during installation, the port specified during the installation should be used in the URL. Once the login screen is displayed and a valid User name and Password are entered, the Unisphere console is displayed, as shown on the right of the slide.

The first screen after the login is the Home Dashboard section for all the VMAX family arrays that the Unisphere server has discovered and can manage.

The Home sections (white rectangles) in the Home Dashboard show some high level properties of the arrays being managed by the Unisphere Server.
The main components of the Unisphere Home Dashboard are highlighted on the screen. First there is the Menu Bar. The first menu item is the Home button. The Home button is used to select the Home Dashboard, Administration, Alerts, and VMAX Capacity screens. Next to the Home button is the System Selector. It is used to toggle the interface between two modes; All Symmetrix and individual Symmetrix IDs (SIDs) systems. We will discuss this further on the next slide. The Performance button displays performance details for either All Symmetrix systems or the selected SID. The Support button provides users with access to online help, a provisioning overview, product support and version information, Unisphere utilities and a link to access support request information. The Title Bar section consist of two buttons. The first is used to search for Storage Groups, Initiators, and Hosts by name. The second Title Bar button is used to identify who is logged in, invoke online help, provide Unisphere for VMAX version and copyright information, export data, set preferences for Display Language, Logging Level, and Remote Connection Optimization, and lastly to log out.

The center part of the screen shows the contents of specific selections. Here, with the All Symmetrix button selected, information on all VMAX/Symmetrix systems discovered are shown.

The Status bar shows when the information was last updated and the total number of new alerts. If jobs are pending a list of jobs will also appear on the Status bar.
The System Selector button, located on the Menu bar, displays a list of all managed Symmetrix systems. It allows you to toggle the interface between two modes; All Symmetrix and individual Symmetrix systems. Selections you make in the list provide the context for subsequent operations.

To pick an individual Symmetrix, click the System Selector button and then click the desired Symmetrix. The System Selector menu item can also be used to Discover Symmetrix Arrays.

If All Symmetrix is selected, then only the Home, Performance and Support menu items are shown. If an individual Symmetrix is chosen then all the available menu items are shown (Home, System Selector, Storage, Hosts, Data Protection, Performance, Databases, System, and Support) as shown in the lower image.

The current location is shown as hyperlinks, just below the Home and System Selector buttons. You can use the hyperlinks to navigate back to a previous screen(s).
To open access the Unisphere for VMAX Online Help System, start by clicking the Support button in the Menu Bar shown with a question mark, then click Help which opens the Support page. You can also access the Unisphere for VMAX Online Help System as explained earlier by clicking Help under the User button in the Title Bar.

Also, the EMC Website Product Support Page can be accessed by clicking the Product Support Page button if an external network is available and no firewall(s) are blocking Internet connections.

Clicking help in a Dialog box, Wizard page, or View opens a help topic specifically for that dialog, page or view.
To perform administrative tasks start by clicking Administration in the Home menu, this will give a list of all available tasks. One can setup and manage Alert Settings, Preferences, Security, Link and Launch client registrations, and view or configure databases.

If a menu item is grayed out (disabled), that item is not available at the time and usually another menu item must be selected first to enable it. In the example shown, select either the Home Dashboard or the All Symmetrix menu item to enable the Administration, Alerts, and VMAX Capacity menu items.
The System Dashboard can be accessed by clicking the System Menu button of a specific Symmetrix/VMAX and it will bring up the System Dashboard for that specific array.

The System Dashboard provides a place from which to monitor a Symmetrix/VMAX system, including hardware and capacity, and to perform a health check.

You can click the Front End, Back End and Available Ports links to list the configured Front End, Back End and Available Ports respectively. The Symmetrix Hardware link will show the status of the individual hardware components of the array.
In addition to the Dashboard link, the System menu has links which allow you to view and manage the Audit logs, Alerts, Jobs and system settings.

Click the Settings link in the System menu to show the available System Settings.

The System Settings tasks can be used to view and manage Symmetrix Attributes, Electronic Licenses, and Symmetrix Access Controls.
Storage Groups Dashboard

The Storage Menu has links to the Storage Group Dashboard, Service Level, Storage Resource Pools (SRPs), Volumes and to tasks to help Provision Storage to Host and Create Volumes.

Click the Storage Menu button to show the Storage Group Dashboard as shown in the slide.
Hosts – Tasks

The Hosts menu can be used to view and manage Hosts (Initiator Groups), Masking views, Initiators, Port Groups, XtremSW Cache Adapters and Virtual Servers.

The Hosts menu also has links to tasks that can be used to Create a Host and Host Group. Click the Hosts menu button to show the listing of Hosts (Initiator Groups).
The Protection Dashboard allows you to monitor and perform replication and backup operations running on or associated with local storage systems.

- Under the TimeFinder menu item, for Local Replications, you will find TimeFinder® SnapVX, TimeFinder/Clone, and TimeFinder/Mirror.

- Under the SRDF menu item, for Remote Replications, you will find Storage Groups (SRDF views/management using Storage Groups), Device Groups (SRDF views and management using Device Groups) and Symmetrix Remote Data Facility (SRDF®)/Metro (SRDF/Metro views and management using Storage Groups).

- Under the Replication Groups and Pools menu item you will find Device Groups (View and manage device groups), SRDF Groups (view and manage SRDF groups), and SRDF Virtual Witnesses (View and manage Virtual Witnesses).

- Under the Open Replicator menu item there is Open Replication Sessions (View detail about Open Replication Data Migration sessions) and Open Replicator SAN View (Monitor and Manage SAN LUNs, Open Replicator Data Migration and Federated Live Migration).

- Under Common Tasks you can Create Device Group(s) and Create SRDF Group(s).
The Performance menu can be used to navigate to the Performance Dashboard to Monitor, Analyze or plot Charts of the managed arrays. In addition, the Performance menu can be used to manage reports and settings. The Performance related settings to be managed are System Registrations, Performance Thresholds/Alerts, Real Time Traces, Databases, and Metrics.
This demo covers the Unisphere for VMAX user interface.

Click the Launch button to view the video.
Module Summary

Key points covered in this module:
• Launching the Unisphere for VMAX interface
• Utilizing online help to accomplish desired tasks
• Navigating the Unisphere for VMAX interface

This module covered launching and navigating the Unisphere for VMAX graphical user interface. The use of online help was also covered.
Module 4: Unisphere for VMAX Administration

Upon completion of this module, you should be able to:

• Perform security-related tasks
• Configure alerts and thresholds
• Register arrays for performance data collection
• Backup the performance database

This module focuses on some administrative tasks that can be performed with Unisphere for VMAX. We will cover security-related tasks, configure alerts and thresholds, registering VMAX\(^3\) arrays for performance data collection and backing up the performance database.
Under **All Symmetrix > Home > Administration** is the Security page. This is where security-related tasks can be performed. There are four sections; Authentication, User Sessions, Local Users, and Authorized Users & Groups. Different authentication configuration options can be viewed here. This is explained more on the next page.

Active user sessions can be viewed under User Sessions.

Under Local Users, user names and descriptions can be created, edited, deleted, and you can view details on all local users.

Under the, Authorized Users & Groups button you can view and manage the authorization rules for all users and groups. Unisphere for VMAX v8.3 includes the Database Storage Analyzer (DSA) application. Two user roles, DSA Admin and DSA Read-only are available.
Unisphere for VMAX supports the following types of authentication:

1. **Local Directory**: Users login with their Unisphere username and password (if they have a local Unisphere user account).

2. **Windows (local and domain based)**: Users login with Windows domain\username and password (if they have a Windows account on the Unisphere server).

3. **LDAP (Lightweight Directory Access Protocol)**: Users login with their LDAP-SSL (Secure Sockets Layer) username and password (if they have a user account stored on a LDAP-SSL server).

To view/configure authentication methods, click the Authentication button from the **Home > Administration > Security** page. In order to configure this, the user must be the Initial Setup User, Admin, or SecurityAdmin. The Local Directory and Windows OS/AD (Operating System/Active Directory) authentication methods are enabled by default. To make changes to the Authentication method, click the Edit button in the **Security > Authentication** page to start the Configure Authentication Wizard. To enable LDAP-SSL, check the LDAP-SSL box on Page 1 and click Next. On Page 2, specify the LDAP-SSL server credentials. Please read the Online Help for additional information on configuring LDAP authentication.
## Storage System User Roles

- **None** - Login only (default) No permissions
- **Monitor** - View-only access to storage array
- **StorageAdmin** - Full storage array control
- **Administrator** - StorageAdmin and SecurityAdmin
- **SecurityAdmin** - Create user accounts and manage roles. Cannot make array changes
- **Auditor** - View, but not modify security settings in addition to Monitor operations
- **PerfMonitor** - Monitor array performance and setup alerts, traces and thresholds
- **DSA Admin** - Can only collect and analyze database activity with Database Storage Analyzer

Roles must be explicitly defined for all users or groups, as the default permission is set as “None”. These roles apply only to Unisphere for VMAX. Limiting roles in Unisphere does not block a user from using the CLI commands for operations not permitted with Unisphere. There are eight different types of storage system users with roles, from “None” to “Admin,”. Note that multiple user roles can be assigned.

**None** – This role can only log into Unisphere for VMAX – It provides no permissions.

**Monitor** – The Monitor role has very limited privileges, and can only view all information about a storage array, without making any configuration changes.

**StorageAdmin** – StorageAdmin performs all management (active or control) operations on a storage system and modifies GNS group definitions in addition to all Monitor operations, however cannot create or delete user accounts.

**Administrator** – The Administrator user performs all operations on a storage system, including security operations, in addition to all StorageAdmin and Monitor operations.

**SecurityAdmin** – The SecurityAdmin performs security operations on a storage array, like creating user accounts and managing roles, in addition to all Monitor operations, but is unable to make configuration changes to the storage array.

**Auditor** – The Auditor has all the viewing abilities to view including reading the audit log, symcacy list and symauth in addition to all Monitor operations. This is the minimum role required to view the Symmetrix audit log. However, Auditor cannot modify security settings.

**PerfMonitor** – A PerfMonitor user 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 storage array performance.

**DSA Admin** – EMC Database Storage Analyzer (DSA) can be used to collect and analyze database activity. A user can be configured with one of three different roles to access DSA: None, Read Only, and...
Admin. A **DSA Hinting** role can only be added to DSA Admins. Also, DSA Hinting is enabled only if DSA Hinting-enabled arrays are available.
Creating Local User

To create local users and assign roles, click the **Create** button on the **Home > Administration > Security > Local Users** page to launch the dialog, shown here. This dialog can be used to create Local Directory users managed by Unisphere and assign roles to these users.

On the slide, the creation of a Local Directory user is shown. In this example, we are creating a new user “JohnStorage”. Type the name in the User Name field, then enter a description and password. For Local Directory users, a password has to be specified.

Privileges to access the Database Storage Analyzer can also be entered here, either None, Read Only, or Admin.

Select the VMAX array that this user will have access to and then specify which role this user will have.

Click the **Show only VMAX with hinting** enabled checkbox to see the list of storage systems with Hinting enabled.

The VMAX with hinting option is only available on storage arrays running HYPERMAX 5977 or higher.
This demo covers management of Local Users and Roles in Unisphere for VMAX.

Click the Launch button to view the video.
Click **Alert Settings** in the Administration page to see all the Alert settings. On VMAX³ arrays, alert thresholds can be set for SRPs. The Performance Thresholds and Alerts interface has been changed to improve ease of use.
Alert Policies

To configure Alert Policies, click the Alert Policies big button from the Home > Administration > Alert Settings page.

The Alert Policies page allows you to configure Symmetrix alerts. Most of the alerts are disabled by default. All alerts need to be explicitly enabled through this dialog if they are to be used.

In the Alerts Policies page, highlight the alert categories that you wish to enable, then click the Enable button. In the example shown, some of the alerts have been enabled for Symmetrix ID 570. Only enabled alerts can be displayed in the System Alerts view.

Optionally, you can configure Unisphere to send out notifications when an alert triggers. In order to do this, click the Notify button. Then, select one or more of the notification types: E-mail, SNMP (Simple Network Management Protocol), or Syslog.
SLO Compliance Alert Policies

Enabled Compliance States

- **Stable** — Storage group performing within the service level target
- **Marginal** — Storage group performing below service level target
- **Critical** — Storage group performing well below service level targets

Unisphere for VMAX can be configured to alert when the performance of a storage group, relative to its service level target, changes. This is called Service Level Compliance.

Once configured, Unisphere for VMAX will assess the performance of the storage every 30 minutes, and deliver the appropriate alert level.

When a storage group (workload) is said to be compliant, it means that it is operating within the associated response time band.

When assessing the compliance of a storage group, Workload Planner calculates its weighted response time for the past 4 hours and for the past 2 weeks, and then compares the two values to the maximum response time associated with its given service level. If both calculated values fall within (under) the service level defined response time band, the compliance state is STABLE. If one of them is in compliance and the other is out of compliance, then the compliance state is MARGINAL. If both are out of compliance, then the compliance state is CRITICAL.
To create a Compliance Alert Policy, you must register at least one VMAX for SPA Performance Statistics.

SL Compliance Alerts can be set under **Home > Administration > Alert Settings > Compliance Alert Policies.**
To configure Symmetrix Threshold Alerts, click the **Symmetrix Threshold Alerts** button from the **Home > Administration > Alert Settings** page.

On older VMAX family arrays, the Symmetrix Threshold Alerts page can be used to enable monitoring and setting threshold limits on the percentage of utilization of TimeFinder/Snap, SRDF/A Delta Set Extension (DSE), Virtual Provisioning Thin Pools and FAST VP Policies. When enabling threshold alerts, you can specify a threshold value (percentage of utilization) for each of the severity levels; Warning, Critical, and Fatal. For example, if you set warning to 50 for a particular pool, Unisphere will issue a warning alert when that device pool is at 50% utilization.

The Symmetrix Threshold Alerts page can also be used to configure Unisphere to alert you when an SRDF/A session has been off loading (spilling) cycle data to a DSE pool for a certain length of time. The settings are in minutes.

For VMAX³ and VMAX All Flash Arrays, Alert Thresholds can be set on the Storage Resource Pools.

Please note that the default threshold policies cannot be modified. To setup customized thresholds, click the **Create** button. In the **Create Thresholds Policies** dialog, pick the VMAX system from the dropdown menu, then pick the category from the dropdown menu. Next, highlight the pools to which the policy should apply, choose the threshold levels, and click OK to create a customized threshold.
To configure Performance Thresholds and Alerts, click the **Performance Thresholds and Alerts** button from the **Home > Administration > Alert Settings** page. These settings can also be accessed via the **Performance > Settings** page.

The Performance Thresholds and Alerts page lists all the performance thresholds for all the performance metrics. Alerting is not enabled for any of the metrics by default. This page can be used to create new thresholds for various performance metrics, or to edit the default metrics and enable Alerting.

The metrics display is filtered by array and category. You can further filter a given category by metrics that are designated as KPI (Key Performance Indicators).

The next slide shows an example of the creation of a new custom performance threshold.
Click the **Create** button in the **Performance Thresholds and Alerts** page to create a new Performance Threshold and Alert.

In the **Create Performance Threshold and Alert** dialog box, select the Symmetrix ID, Category, Instance and Metric. If there is a default value for the Metric, it automatically displays in the Value fields for First Threshold and Second Threshold. Add or change the value for the First Threshold, Second Threshold, or both.

Enable the alert and then select the severity for the alert. Possible values are Information, Warning, Error, and Critical. Set the number of occurrences in the data samples that must happen before the alert is triggered. For example, if the threshold is breached 3 times out of 5 samples, initiate an alert. Click OK.

In this example, threshold and alerting has been enabled for the Array Host IOs/Sec metric for Symmetrix ID 570.
In order to collect performance data, a Symmetrix array has to be registered for data collection. On the Home screen, arrays which are not registered for performance data collection will have a link to Register this system to collect performance data. Click on this link to navigate to the System Registration page. Alternately, one can also click on the System Registrations button in the Performance > Settings page to change the view to the System Registrations page. Highlight the array, then click on the Register button.

In the Register dialog, check the Real Time and Root Cause Analysis boxes to collect real time and root cause analysis data, then click OK.

The System Registrations view will show that the system is registered to collect data.

Diagnostic data is called root cause analysis data.
The Performance Database is managed by using the Databases button on the **Performance > Settings** page. Click the **Databases** button to switch to the Databases view. The databases for all the arrays for which performance is being collected will be displayed.

Click on a specific array instance. You can backup or restore the database.

Click **Backup** to backup the database. The backup can be run immediately, or it can be scheduled. A recurring schedule can be setup for the backup, as shown on the slide. The backup file is stored on the Unisphere server host (specifically, in the `<install_location>\SMAS\backup\SPA folder`).
System Registration - Demo

This demo covers

- System Registration for Performance Data
- Backup of Performance Database

Click the Launch button to view the video.
This module covered some of basic Administrative tasks that can be performed with Unisphere for VMAX. We covered security-related tasks, configuration of alerts and thresholds, registration of VMAX³ arrays for performance data collection and backup of the performance database.
This course covered Unisphere for VMAX functionality, architecture and installation. It also covered how to use the various views and perform administration tasks.

A key part of the course included recorded examples demonstrating how to configure, administer, and use Unisphere for VMAX.

This concludes the training.