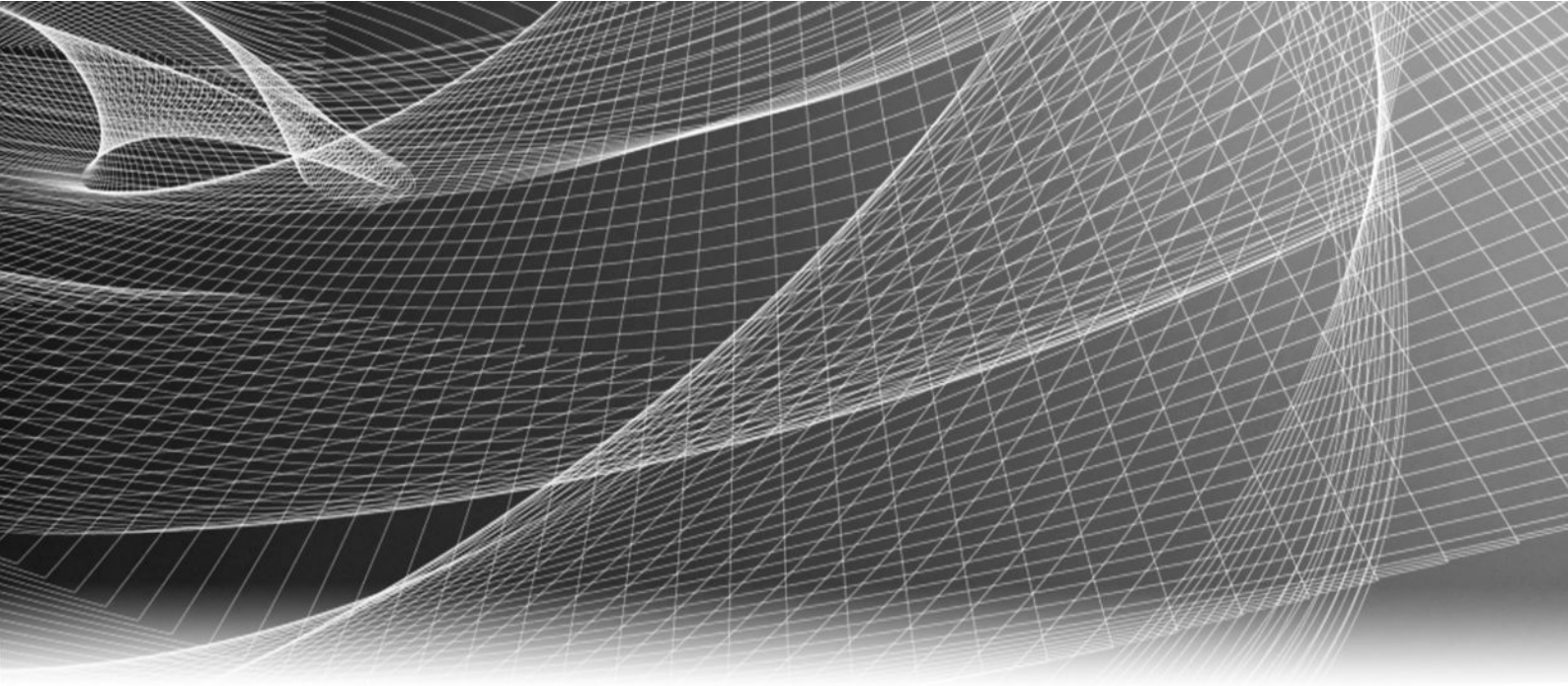


EMC® ViPR™

Version 1.1.0

Installation and Configuration Guide

302-000-479

02

EMC²

Published March, 2014

For the most up-to-date regulatory document for your product line, go to EMC Online Support (https://support.emc.com). For documentation on EMC Data Domain products, go to the EMC Data Domain Support Portal (https://my.datadomain.com).

EMC Corporation
Hopkinton, Massachusetts 01748-9103
1-508-435-1000 In North America 1-866-464-7381
www.EMC.com

CONTENTS

CHAPTER 1

Prerequisites

Checklist for ViPR installation and configuration readiness

Use the checklist as an overview of the information needed to install and configure a ViPR virtual appliance.

Detailed procedures are described elsewhere in the ViPR documentation.

Refer to the *EMC ViPR Data Sheet and Compatibility Matrix* on support.EMC.com for the specific models and versions supported.

Table 1 Checklist for ViPR installation and configuration readiness

Basic step	Description	Notes	Done?
Identify and confirm preconfiguration requirements for the storage systems in the data center to be used by ViPR.	VNX file, VNX block, Isilon, VMAX, VPLEX, and NetApp are supported. Refer to the *EMC ViPR Data Sheet and Compatibility Matrix* on support.EMC.com for exact models.		
Identify the storage pools in the data center to be used by ViPR.	You can put a subset of an array's storage under the control of ViPR.		
Identify the switches to be used by ViPR, confirm preconfiguration requirements, and collect credentials.	Adding switches to ViPR will discover the storage topology of the VSAN or fabric. Cisco and Brocade are supported. Refer to the *EMC ViPR Data Sheet and Compatibility Matrix* on support.EMC.com for specific models. For Cisco, obtain credentials for an account that has admin privileges on the switch. Brocade uses its own SMI-S Provider.		
Collect array credentials, IP address, and port for VNX file, Isilon, and NetApp.	When you add VNX file, Isilon, or NetApp storage to ViPR, you need to provide credentials for an account with administrator privileges on the array.		
Identify or deploy an SMI-S provider for VMAX and VNX (block).	SMI-S credentials, IP address and port are needed when VMAX storage and VNX block are used by ViPR. Refer to the *EMC ViPR*		

Table 1 Checklist for ViPR installation and configuration readiness (continued)

Basic step	Description	Notes	Done?
	Data Sheet and Compatibility Matrix on support.EMC.com for supported SMI-S versions. Refer to "Configure the SMI-S Provider" in the *EMC ViPR Installation and Configuration Guide* for details.		
Identify a vCenter Server and ESXi on which to deploy the ViPR vApps.	ViPR is deployed as a vApp. Refer to the *EMC ViPR Data Sheet and Compatibility Matrix* on support.EMC.com for supported vCenter Server and ESXi versions.		
Collect credentials to access the vCenter Server.	Deploying ViPR with vSphere Client requires credentials for an account that has privileges to deploy the OVA on the vCenter Server.		
Verify that the ESXi has sufficient resources for ViPR vApp deployment.	Refer to "ViPR Controller VM Requirements" and "VMware requirements" in the *EMC ViPR Installation and Configuration Guide*.		
Collect credentials for VNX File onboard SMI-S Provider.	VNX File has an SMI-S Provider that runs on its Control Station.		
Identify an IP to act as the virtual IP for Controller VMs.	In addition to the 3 or 5 Controller VMs, ViPR uses a virtual IP by which REST clients and the UI access the system.		
Identify and configure a load balancer for ViPR Object Data Service VMs.	A separate load balancer (not included) is required for Object Data Service VMs.		
Identify an authentication provider and related attributes.	ViPR validates added users against an authentication server. To use other than the built-in user accounts, you need to specify an Active Directory or LDAP server and related attributes.		

Table 1 Checklist for ViPR installation and configuration readiness (continued)

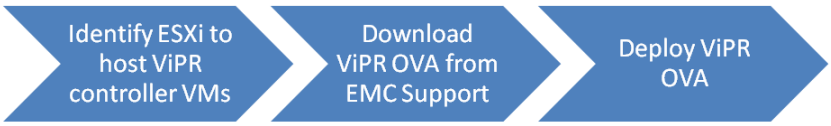
Basic step	Description	Notes	Done?
Identify two or three DNS servers.	Two or three DNS server IPs need to be supplied during ViPR deployment.		
Identify two or three NTP servers.	Two or three NTP servers need to be supplied during ViPR deployment		
For each ViPR Controller VM, collect: IP address, IP network mask, IP network gateway.	You need this information when deploying the Controller VM OVA.		
For ViPR Object Data Service VMs, collect: IP address, IP network mask, IP network gateway.	You need this information when deploying the Object Data Service VM.		
Obtain EMC license.	Obtain the license authorization code (LAC, usually emailed from EMC) and apply it at the EMC License management web page to obtain a .lic file. After deployment, upload the .lic file using the UI, CLI or API.		
Deploy the ViPR Controller vApp.	Download the ViPR OVA from support.EMC.com and deploy. Refer to "Deploy ViPR using vSphere Client" in the *EMC ViPR Installation and Configuration Guide*.		
Log in to the ViPR UI.	Open https://*ViPR_virtual_ip* in a supported browser to proceed with site-specific configuration, infrastructure, and provisioning operations.		
Deploy the ViPR Object Data Service VM.	Refer to the steps in "Installation and initial configuration of ViPR Data Services" in *EMC ViPR Installation and Configuration Guide*.		

How ViPR virtual appliance is deployed

ViPR is deployed as three or five Controller VMs.

Deployment steps for the ViPR virtual appliance are described in this guide.

Figure 1 Deployment process



For ViPR Object Data Service support, additionally deploy one or more data VMs. Deployment steps for Object Data Service are described in Installation and initial configuration of Object Data Service on page 61.

Note

For the procedures to deploy the ViPR plugins, see their respective guides:

- *EMC ViPR Analytics Pack for VMware vCenter Operations Management Suite Installation and Configuration Guide*
- *EMC ViPR Plug-in for vCenter Orchestrator Installation and Configuration Guide*
- *EMC ViPR Storage Provider for VMware vCenter Server Configuration Guide*
- *EMC ViPR Add-in for Microsoft System Center Virtual Machine Manager Installation and Configuration Guide*

ViPR Controller VM requirements

ViPR virtual appliance can be deployed in a 3-VM or 5-VM configuration. You need to verify that the ESX server has sufficient resources for deployment.

Refer to the *EMC ViPR Data Sheet and Compatibility Matrix* on support.EMC.com for supported version numbers and other information.

Prerequisites for ViPR UI

The UI runs on a variety of web browsers. Refer to the *EMC ViPR Data Sheet and Compatibility Matrix* on support.EMC.com for supported version numbers and other information. Refer to the *EMC ViPR Data Sheet and Compatibility Matrix* on support.EMC.com for specific information on supported web browsers and versions.

VMware requirements

ViPR deployment requires administrative rights to the VMware Virtual Center.

Refer to the *EMC ViPR Data Sheet and Compatibility Matrix* on support.EMC.com for detailed information on supported VMware versions and related requirements.

Prerequisites for ViPR CLI

The ViPR CLI can run on supported Linux and Windows computers.

Although the ViPR CLI is available on a ViPR Controller VM, it is recommended that you install and run it on a different computer.

Refer to the *EMC ViPR Data Sheet and Compatibility Matrix* on support.EMC.com for specific information on supported OS versions and additional requirements of the CLI.

Environment preconfiguration

Before you add physical assets such as storage systems and fabrics to ViPR, make sure they fulfill the necessary prerequisites.

Preconfiguration requirements for VMAX arrays

The VMAX arrays that you add to ViPR must meet certain preconfiguration requirements.

Before adding a VMAX array to ViPR, you need to:

- Create sufficient pools for storage provisioning.
- Create storage tiers (for example, SSD, SAS, NL-SAS).
- Define FAST policies.

Storage Tier and FAST Policy names must be consistent across all VMAX systems.

Note

You do not need to create any LUNs, storage groups, port groups, initiator groups, or masking views.

The *EMC ViPR Data Sheet and Compatibility Matrix* on support.EMC.com is the authoritative source of supported version numbers.

Preconfiguration requirements for VNX block

The VNX block storage that you add to ViPR must meet certain preconfiguration requirements.

Before adding VNX block storage to ViPR:

- Create sufficient pools for storage provisioning.
- Create RAID groups.
- If volume full copies are required, install SAN Copy enabler software on the array.
- If volume continuous-native copies are required, create clone private LUNs on the array.

The *EMC ViPR Data Sheet and Compatibility Matrix* on support.EMC.com is the authoritative source of supported version numbers.

Preconfiguration requirements for VNX file

The VNX file storage that you add to ViPR must meet certain preconfiguration requirements.

Before adding VNX file storage to ViPR, verify that:

- VNX File Control Stations are at a supported version. See the *EMC ViPR Data Sheet and Compatibility Matrix*.
- Storage pools for VNX File have been created.
- Control Stations are operational and will be reachable from ViPR Controller VMs.
- VNX SnapSure is installed, configured, and licensed.

Preconfiguration requirements for VPLEX systems

ViPR supports VPLEX in a Local or Metro configuration. VPLEX Geo configurations are not supported.

Before adding a VPLEX system to ViPR, you need to:

- Configure VPLEX metadata back-end storage.
- Create VPLEX journal back-end storage.
- Each VPLEX cluster needs to be in its own ViPR virtual array, so verify that the:
  - Ports for each cluster are in distinct fabrics. This will allow you to assign the fabric as a ViPR network to its own virtual array.
  - Storage arrays to be used are connected to the networks containing the VPLEX back-end ports.
  - Hosts to be used have initiators in the networks containing the VPLEX front-end ports.
- Verify that logging volumes are configured to support distributed volumes in a VPLEX Metro configuration.

It is not necessary to preconfigure zones between the VPLEX and storage systems, or between hosts and the VPLEX, except for those necessary to make the metadata backing storage and journal backing storage available.

Preconfiguration requirements for Isilon

The Isilon storage systems that you add to ViPR must meet certain preconfiguration requirements.

Before adding an Isilon system to ViPR, verify that:

- OneFS version is listed in the *EMC ViPR Data Sheet and Compatibility Matrix*.
- SmartConnect is configured as described in Isilon documentation. Be sure to verify that:
  - the names for SmartConnect zones are set to the appropriate delegated domain.
  - DNS is in use for ViPR and provisioned hosts are delegating requests for SmartConnect zones to SmartConnect IP.
- There is a minimum of 3 nodes in the Isilon cluster configured.
- Isilon clusters and zones will be reachable from ViPR Controller VMs.

Preconfiguration requirements for NetApp arrays

The NetApp systems that you add to ViPR must meet certain preconfiguration requirements.

Before adding a NetApp array to ViPR, verify that:

- Aggregates are created.

- ONTAP version is listed as supported in the *EMC ViPR Data Sheet and Compatibility Matrix*.
- ONTAP is in 7-mode configuration.
- You have NetApp licenses for NFS, CIFS, and snapshots.
- Run the `cifs setup` command to perform initial configuration of the filer for CIFS. You must have installed the CIFS license before you run this command.

Preconfiguration requirements for fabrics

The SAN fabrics you add to ViPR must meet certain preconfiguration requirements.

The EMC ViPR Data Sheet and Compatibility Matrix on support.EMC.com is the authoritative source of information on supported switches.

Cisco MDS / Nexus
Before adding a Cisco switch to ViPR, verify that:

- SSH is enabled.
- The VSANs to be used already exist. The appropriate interfaces must be already assigned to the VSAN database.
- Any ISL links, port channels, etc., for multiple switch networks, have been preconfigured and are up. This will ensure that the FCNS database is correctly distributed and up-to-date on any switches that you add to ViPR. It is highly recommended that all ISL connections between switches be implemented redundantly, so that the failure of a single ISL link will not partition VSANs.
- Each VSAN is visible from at least one registered switch in ViPR. If multiple registered switches have access to the same VSAN, switches directly connected to the storage port(s) being zoned will be preferred as the control point to add or remove zones.

Brocade
Before adding Brocade switches to ViPR, verify that:

- EMC Connectrix Manager Converged Network Edition (CMCNE) is installed and has access to the switches with admin privileges. The switches should be prediscovered using the CMCNE UI.
- The fabrics to be used are already created, and have ports assigned. Any ISL links needed to connect a fabric between multiple switches should be already configured. It is highly recommended that all ISL connections between switches be implemented redundantly, so that the failure of a single ISL link will not partition fabrics.

There is no restriction on the number of fabrics.

Note

You do not need to create any SAN zones.

Preconfiguration requirements for EMC RecoverPoint systems

The EMC RecoverPoint system you add to ViPR must meet certain preconfiguration requirements.

- RecoverPoint systems must be installed and licensed. Refer to the *EMC ViPR Data Sheet and Compatibility Matrix* on support.EMC.com for information on supported RecoverPoint versions.
- If ViPR is not managing the SAN network, RecoverPoint systems must be zoned to the storage arrays and RecoverPoint splitters must be attached.

- IP connectivity between RecoverPoint and the ViPR virtual appliance is required.

Preconfiguration requirements for SRDF

ViPR supports SRDF for use as a data protection type when you create a virtual pool. The SRDF configuration must meet certain preconfiguration requirements.

- VMAX running Enginuity versions as specified in the *EMC ViPR Data Sheet and Compatibility Matrix*.
- One or more front-end directors configured for RDF connectivity.
- The source and destination arrays must already have one or more dynamic RDF groups created of the desired policy type, either synchronous or asynchronous (not both).
- The RDF group label must match the ViPR project name associated with the provision request. The label can be up to ten characters in length and is case-sensitive.

Preconfiguration requirements for hosts

The hosts that you add to ViPR must meet certain preconfiguration requirements.

Host requirements

The requirements for hosts that ViPR can provision storage for are provided here.

Refer to the *EMC ViPR Data Sheet and Compatibility Matrix* on support.EMC.com for the supported hosts and operating systems and versions. Supported hosts must also conform to the configuration requirements in the table below.

Table 2 Host configuration requirements

Host Type	Requirements
Linux	Linux hosts must meet the following requirements: SSH and LVM enabled. EMC PowerPath or native Linux multipathing software installed. Time synchronization configured. **Note** In some cases, it may be necessary to install lsb_release. If host discovery fails due to compatibility, and logs indicate that the lsb_release command is not found, the package that includes that command must be installed.
Windows	Windows hosts must meet the following requirements: WinRM enabled. See Configuring a Windows host on page 16 EMC PowerPath or Microsoft MPIO (not both) enabled. Time synchronization configured.

Configuring multipath software on hosts

A supported host must have mulitpath software configured.

Refer to the following documentation for details on configuring multipath software on hosts:

- EMC PowerPath: *EMC PowerPath for Linux Installation and Configuration Guide* and *EMC PowerPath and PowerPath/VE for Microsoft Windows Installation and Administration Guide*.
- SuSE Linux Enterprise Server (SLES): *Storage Administration Guide* under "Configuring the System for Multipathing".
- Red Hat Enterprise Linux (RHEL): *DM Multipath Configuration and Administration.*
- Windows: *Microsoft Multipath I/O Step-by-Step Guide.*

Configuring a Windows host

Configures a Windows host to allow ViPR to run commands on it.

Before you begin

- You must be logged in to the Windows host as administrator.
- For the ViPR server to connect to Windows remote hosts, the host must accept remote Windows PowerShell commands. You can do this by enabling Windows remote access over HTTP.

Procedure

1. At an administrator command prompt on the Windows host, issue the following command:

   ```
   winrm quickconfig
   ```

   This starts up a listener on port 5985. The port on which you start the listener must be consistent with the port that you configure for the host in the host asset page.
2. You may need to make some configuration changes depending on how you want to connect to the host.
   - If you want ViPR to connect to the host as a local user, you need to:
     a. Check the winrm settings by running:
        ```
        winrm get winrm/config/service
        ```
        Basic Authentication and AllowUnencrypted must be set to true.
     b. If basic authentication is not set to true, run:
        ```
        winrm set winrm/config/service/auth @{Basic="true"}
        ```
     c. If AllowUnencrypted is not set to true, run:
        ```
        winrm set winrm/config/service @{AllowUnencrypted="true"}
        ```
     d. The host must be added to the **Admin** › **Physical Assets** › **Hosts** page.
   - If you want ViPR to connect to the host as a domain user, you need to:
     a. Ensure Kerberos is enabled. You can check using:
        ```
        winrm get winrm/config/service
        ```
     b. If you need to enable Kerberos, run:
        ```
        winrm set winrm/config/service/auth @{Kerberos="true"}
        ```
     c. Ensure that your domain has been configured as an authentication provider in ViPR by a System Administrator (**Admin** › **Security** › **Authentication Providers**).

d. The host must be added to the **Admin** › **Physical Assets** › **Hosts** page by a System Administrator.
The credentials you supply for the host are of the form:

domain\username

3. Check that the host is displayed as valid in the table.

After you finish

After ViPR is deployed, you can check that the host is displayed as valid in **Admin** › **Physical Assets** › **Hosts**. If you receive the following message WinRM may not be enabled or configured properly, or there may be a network problem.

```
Failed to connect to host. Please ensure the connection details
are correct. [Error connecting: Connection refused]
```

Linux host sudo command requirements

When ViPR attaches storage to a Linux host it needs to run commands on the host. To access the host, ViPR uses the credentials entered for the host at the **Admin** › **Physical Assets** › **Hosts** page. These are usually the credentials for the root account. If you do not wish to give ViPR root access to a Linux host, you must ensure that the sudo command has sufficient privileges to allow the user configured for the host to run the commands it requires.

Sudo privileges

The sudoers file configuration for the host user account must have the privileges listed in the table below.

Table 3 Sudo privileges required by ViPR user

Type	Name
Command	e2fsck, fdisk, multipath, ifconfig, vgdisplay, sh, mkdir, mke2fs, mkfs.ext3, mkfs.ext4, mount, umount, resize2fs, iscsiadm, lsb_release, lvcreate, lvchange, lvremove, lvresize, pvcreate, pvremove, rpm, vgchange, vgremove, vgextend, vgreduce, vgcreate, powermnt
	find, sed, ls, sleep, rm

For example, to allow "vipradmin" to run these commands as all users, you could add the following lines to the sudoers file:

```
Cmnd_Alias VIPRMGMT = /sbin/e2fsck, /sbin/fdisk, /sbin/multipath, /
sbin/ifconfig,
/sbin/vgdisplay,/usr/bin/sh, /bin/mkdir, /sbin/mke2fs, /sbin/
mkfs.ext3, /sbin/mkfs.ext4,
/bin/mount, /bin/umount, /sbin/resize2fs, /sbin/iscsiadm, /usr/bin/
lsb_release, /sbin/lvcreate,
/sbin/lvchange, /sbin/lvremove, /sbin/lvresize, /sbin/pvcreate, /sbin/
pvremove, /bin/rpm,
/sbin/vgchange, /sbin/vgremove, /sbin/vgextend,/sbin/vgreduce, /sbin/
vgcreate, /sbin/powermnt,
/bin/find, /bin/sed, /bin/ls, /bin/sleep, /bin/rm
```

```
vipradmin ALL=(ALL) VIPRMGMT
```

Collect information for ViPR Controller VM virtual machines

When you deploy ViPR you need to supply an IP address for each Controller VM.

Procedure

1. Record the IP addresses needed for deployment.

   ViPR can be deployed in a configuration of 3 or 5 Controller VMs. Use a unique, static IPv4 address for each Controller VM. All IP addresses must be IPv4, except for the public virtual IP address, which can have an IPv4 address, IPv6, or both.

Host role	IP address
Controller VM 1	
Controller VM 2	
Controller VM 3	
Controller VM 4	
Controller VM 5	
Public virtual IP address (can be IPv4 or IPv6 or both)	
IPv6 prefix length (if IPv6 is used for Public virtual IP address)	
IPv6 default gateway (if IPv6 is used for Public virtual IP address)	
Network netmask	
Network gateway	
DNS servers (2 or 3 required)	
NTP servers (2 or 3 required)	

CHAPTER 2

Deployment Steps

ViPR deployment files

ViPR Controller is available as an OVA file that you can download from the ViPR product page on support.EMC.com.

File	Description
vipr-‹version›-controller-2+1.ova	For Controller virtual appliance deployment. One VM can go down without affecting availability of the virtual appliance.
vipr-‹version›-controller-3+2.ova	For Controller virtual appliance deployment. Two VMs can go down without affecting availability of the virtual appliance. Recommended for deployment in production environments.
vipr-‹version›-dataservice.zip	For Object Data Service deployment.
vipr-‹version›.img	For environments where upgrade via an img file is needed, such as at restricted sites.

ViPR deployment properties for Controller VMs

A ViPR Controller VM has configurable properties that you set during deployment.

Property name in vSphere Client	Key name	Description
Server *n* IP address	network_*n*_ipaddr	One IPv4 address for public network. You will supply one IPv4 address for each of the Controller VMs you are deploying. Each VM requires a unique, static IPv4 address in the subnet defined by the netmask. **Note** An address conflict across different ViPR installations can result in ViPR database corruption that would need to be restored from a previous good backup.
Public virtual IPv4 address	network_vip	IPv4 address used for UI and REST client access. See also the restriction in Avoiding conflicts in network virtual IP addresses on page 21
Network netmask	network_netmask	IPv4 netmask for the public network interface.
IPv4 default gateway	network_gateway	IPv4 address for the public network gateway.
Public virtual IPv6 address	network_vip6	IPv6 address used for UI and REST client access.

Property name in vSphere Client	Key name	Description
		You can have both an IPv4 address and an IPv6 address for the public virtual address. See also the restriction in Avoiding conflicts in network virtual IP addresses on page 21
IPv6 prefix length	network_prefix_length	IPv6 prefix length. Default is 64.
IPv6 default gateway	network_gateway6	IPv6 address for the public network gateway.
DNS servers	network_nameservers	Two or three IPv4 addresses (not FQDNs) for DNS servers, separated by commas.
NTP servers	network_ntpservers	Two or three IPv4 addresses (not FQDNs) for NTP servers, separated by commas.

Avoiding conflicts in ViPR virtual IP addresses

Restrictions exist on the ViPR virtual IP address when there are multiple ViPR instances in the same subnet.

When more than one ViPR instance exists in the same subnet, use care when allocating the ViPR virtual IP addresses, to prevent a conflict in the load balancer's virtual router ID. The virtual router ID is calculated using the virtual IP address configuration with the following algorithm:

- IPv4 only or dual stack: virtual router ID is the last octet of the IPv4 address.
- IPv6 only: virtual router ID is the decimal equivalent of the last two hex digits in the IPv6 address.

For example, the following addresses in the same subnet would be invalid:

- 172.16.33.98 and 172.16.34.98 (because the last octets are the same, both 98)
- 172.16.33.98 and 2001:db8:170:2842::2462 (because 98 decimal equals 62 hex)

Deploying ViPR Controller VMs with vSphere Client

You can deploy ViPR Controller VMs using the vSphere Client.

Before you begin

- You need access to the ViPR deployment files.
- You need credentials to log in to vSphere Client.

Procedure

1. Download to a temporary directory the ViPR OVA file from the ViPR product page.
2. Start the vSphere Client and log in to the vCenter Server through which you will be deploying the virtual appliance.
3. From the **File** menu, select **Deploy OVF Template**.
4. Browse to and select the ViPR OVA file, located in the temporary directory you created earlier.

5. On the **OVF Template Details** page, review the details about the appliance.
6. Accept the End User License Agreement.
7. Specify a name for the appliance.
8. Select the host or cluster on which to run the virtual appliance.
9. If resource pools are configured (not required for ViPR), select one.
10. If more than one datastore is attached to the ESX Server, select the datastore for your appliance.
11. Select a disk format: **Thick Provision Lazy Zeroed**, **Thick Provision Eager Zeroed** (recommended for production deployment), or **Thin Provision**.
12. On the **Network Mapping** page, map the source network to a destination network as appropriate.
13. Enter values for the properties. See ViPR OVF settings for Controller VMs on page 20.
14. Power on the VM.

After you finish

Editable vApp properties can be changed in the ViPR UI at **Admin** › **Configuration** › **Network**. Do not use the vSphere Client to modify Controller vApp properties. The modifications will be saved in vCenter but they will have no effect on the ViPR appliance itself.

Obtaining the license file

You need to obtain the license file (.lic) from the EMC license management web site for uploading to ViPR.

Before you begin

In order to obtain the license file you must have the License Authorization Code (LAC), which was emailed from EMC.

Procedure

1. Go to support.EMC.com
2. Select **Support** › **Service Center**.
3. Select **Get and Manage Licenses**.
4. Select **ViPR Family** from the list of products.
5. On the LAC Request page, enter the LAC code and **Activate**.
6. Select the entitlements to activate and **Start Activation Process**.
7. Select **Add a Machine** to specify any meaningful string for grouping licenses.

   The "machine name" does not have to be a machine name of any kind; enter any string that will help you keep track of your licenses.
8. Enter the quantities for each entitlement to be activated, or select **Activate All**. Click **Next**.
9. Optionally specify an addressee to receive an email summary of the activation transaction.
10. Click **Finish**.
11. Click **Save to File** to save the license file (.lic) to a folder on your computer.

    This is the license file that is needed during initial setup after deployment.

Installing the ViPR CLI on Linux

You can install the ViPR command line interface executable directly from ViPR appliance onto a supported Linux host.

Before you begin

- You need access to the ViPR appliance host.
- You need root access to the Linux host.

Procedure

1. Log in to the Linux server as root.
2. Create a temporary directory to download the CLI installer.

   ```
   mkdir cli/temp
   cd cli/temp
   ```

3. Either point your browser to `https://<FQDN>:4443/cli` or run the `wget` command to retrieve the ViPR CLI installation bundle:

   ```
   wget https://<FQDN>:4443/cli
   ```

   Note

   For sites with self-signed certificates or where issues are detected, optionally use `http://<ViPR_virtual_IP>:9998/cli` only when you are inside a trusted network. ‹ViPR_virtual_IP› is the ViPR public virtual IP address, also known as the network vip. The CLI installation bundle is downloaded to the current directory.

4. Use tar to extract the CLI and its support files from the installation bundle.

   ```
   tar -xvzf <cli_install_bundle>
   ```

5. Run the CLI installation program.

   ```
   ./Installer_viprcli.linux
   ```

6. Change directory to `/opt/vipr/cli` or to the directory where the CLI is installed.
7. **Note**

   Perform this step only when you have not provided the correct input in step 5.

   Edit the file viprcli.profile using the `vi` command and set the `VIPR_HOSTNAME` to the ViPR public virtual IP address and `VIPR_PORT=4443` environment variable and save the file.

   ```
   # vi viprcli.profile
   #!/usr/bin/sh


   # Installation directory of ViPR CLI
   ViPR_CLI_INSTALL_DIR=/opt/ViPR/cli

   # Add the ViPR install directory to the PATH and PYTHONPATH env
   variables
   if [ -n $ViPR_CLI_INSTALL_DIR ]
   then
           export PATH=$ViPR_CLI_INSTALL_DIR/bin:$PATH
           export PYTHONPATH=$ViPR_CLI_INSTALL_DIR/bin:$PYTHONPATH
   fi

   # USER CONFIGURABLE ViPR VARIABLES
   ```

```
# ViPR Host fully qualified domain name
ViPR_HOSTNAME=example.mydomain.com

# ViPR Port Number
ViPR_PORT=4443

:wq
```

8. Run the source command to set the path environment variable for the ViPR executable.

   ```
   source ./viprcli.profile
   ```

9. From the command prompt run: `viprcli -h`.

   If the help for viprcli is displayed, then the installation is successful.

Installing the ViPR CLI on Windows

You can download and install the ViPR command line interface executable directly from the ViPR appliance onto a supported Windows host.

Before you begin

- You need access to the ViPR appliance host.
- You need to be logged in to the Windows host as a user with administrator privileges.

Procedure

1. Log in to the Windows server as ‹admin user›.
2. Point your browser to `http://<FQDN>:4443/cli`

   Note

   For sites with self-signed certificates or where issues are detected, optionally use `http://<ViPR_virtual_IP>:9998/cli` only when you are inside a trusted network. ‹ViPR_virtual_IP› is the ViPR public virtual IP address, also known as the network vip. The CLI installation bundle is downloaded to the current directory.

3. Save the CLI installer file `ViPR-cli.tar` from the path.
4. Extract the `ViPR-cli.tar` file to a folder of your choice. For example, `c:\opt\vipr\cli`.
5. Navigate to the extract folder `c:\opt\vipr\cli\Linux\`.
6. From the Linux folder, extract the `viprcli.tar` zip file.

   Note

   Though the folder name is Linux, it contains the Windows CLI files.

7. Copy the extracted folders and files to the user-defined path before proceeding.

   For example, `c:\opt\vipr\cli`.

8. Set the following environment variables:

Variable	Example Value
Set **VIPR_HOSTNAME** under User variable section.	‹Fully Qualified Domain Name of a ViPR host or virtual IP address of your ViPR configuration. For example, **vipr-system.mydomain.com**
Set **VIPR_PORT** under User variable section.	**4443**
Set **Path** under System variable section.	Add the `bin` and `python27` directories under the installation folder **c:\opt\vipr\cli\bin;C:\Python27** **Note** Python can be installed on a drive other than drive C:, if your %HOMEDRIVE% is mapped to a different drive letter. For example 'Boot-from-SAN configs'. Therefore, use the drive letter used for the python installation when setting the path.

9. Download and install Python 2.7.3.

   Note

   Installing lower or higher versions of Python may not work as expected.

10. Download and install the `setuptools` for Python 2.7.3.
11. Navigate to the extract folder `c:\opt\vipr\cli\Linux\`.
12. From the Linux folder, extract the argparse and requests packages.
13. Open a command prompt and change the directory to point to the extracted argparse folder and run `python setup.py install` command to install the package.
14. From the command prompt change the directory to point to the extracted requests folder and run `python setup.py install` to install the package.

    Note

    Starting from step #15 all the steps are done only to verify the Python tools and viprcli were installed successfully.

15. From the command prompt run the **python** command.
16. Run the `help()` command in the Python interpreter.
17. Run the `modules argparse` command in the Python interactive help.
18. Run the `modules requests` command in the `Python interactive help`.
19. Run the `quit` command to exit the Python interactive help.
20. Run the `quit()` command to exit the Python interpreter.
21. Open a new command prompt and run `viprcli -h` command.

Overview of configuration steps

After installation, you can configure the ViPR virtual appliance by using the REST API, the command line interface `viprcli`, or the UI.

Refer to the *EMC ViPR Installation and Configuration Guide*, *EMC ViPR REST API Reference*, *EMC ViPR CLI Reference*, and the *EMC ViPR Administrator Guide* for detailed information on steps, syntax, and payloads.

Table 4 Overview of configuration steps

Step	UI (https://*ViPR_virtual_ip*)	REST API	CLI
Complete the configuration steps			
1	Change passwords of root and system accounts (Initial Setup wizard)	PUT /config/properties	not available with CLI
2	Configure ConnectEMC settings (Initial Setup wizard)		viprcli system connectemc-smtp *options*
3	Specify an SMTP server (Initial Setup wizard)		viprcli system set-properties *options*
4	Upload license (Initial Setup wizard)	POST /license	viprcli system add-license *options*
5	Add an authentication provider (AD/LDAP) (Admin › Security › Authentication Providers)	POST /vdc/admin/authnproviders	viprcli authentication add-provider *options*
Assign roles to users			
6	Assign roles to users (Admin › Security › Role Assignments)	PUT /vdc/role-assignments	viprcli tenant add-role *options*
Add storage, switches, data protection systems, hosts, clusters, vCenters			
7	Add storage arrays (Admin › Physical Assets › Storage Systems)	POST /vdc/storage-systems	viprcli storagesystem create *options*
8	Add switches (Admin › Physical Assets › Fabric Managers)	POST /vdc/network-systems	viprcli networksystem create *options*
9	Add data protection systems (Admin › Physical Assets › Data Protection Systems)	POST /vdc/protection-systems	viprcli protectionsystem create -name *name*
10	Add hosts (Admin › Physical Assets › Hosts)	POST /tenants/{id}/hosts	viprcli host create *options*
11	Add clusters (Admin › Physical Assets › Clusters)	POST /tenants/{id}/clusters	viprcli cluster create *options*
12	Add vCenters (Admin › Physical Assets › vCenters)	POST /tenants/{id}/vcenters	viprcli vcenter create *options*
Create virtual arrays and virtual pools (also referred to as Virtual Storage Arrays and Virtual Storage Pools)			
13	Create virtual arrays (Admin › Virtual Assets › Virtual Arrays)	POST /vdc/varrays	viprcli varray create *options*

Table 4 Overview of configuration steps (continued)

Step	UI (https://*ViPR_virtual_ip*)	REST API	CLI
14	Assign networks to virtual arrays (Admin › Virtual Assets › Virtual Arrays › Networks)	POST /vdc/varrays/{id}/networks	viprcli storageport update *options*
15	Create virtual pools (Admin › Virtual Assets › Virtual Pools)	POST /block/vpools POST /file/vpools	viprcli vpool create *options*
16	Assign physical storage pools to virtual storage pools (Admin › Virtual Assets › Virtual Pools)	PUT /block/vpools/{id}/assign-matched-pools PUT /file/vpools/{id}/assign-matched-pools	viprcli storagepool update *options*
17	Create a project (Admin › Tenant › Projects)	POST /tenants/{id}/projects	viprcli project create *options*

CHAPTER 3

Upgrading ViPR Software

Upgrade

Use the **Admin** › **System** › **Upgrade** page to:

- View the present ViPR version installed on all VMs, and any newer versions available in the upgrade repository.

  Note

  The upgrade repository is on an EMC server by default, and can be changed from the **Admin** › **System** › **Configuration** › **Upgrade** page.

- Upgrade to a newer version of ViPR.

Table 5 Supported upgrade paths to ViPR 1.1.0 Patch 1

Version	Upgrade path to ViPR 1.1.0 Patch 1
ViPR 1.0.0	Must first upgrade to ViPR 1.0.0 Patch 1, then to ViPR 1.1.0, then to ViPR 1.1.0 Patch 1.
ViPR 1.0.0 Patch 1	Must first upgrade to ViPR 1.1.0, then to ViPR 1.1.0 Patch 1.
ViPR 1.1.0	Upgrade directly to ViPR 1.1.0 Patch 1

Pre-upgrade planning

Some pre-upgrade steps are required and you should prepare for ViPR to be unavailable for a period of time.

Prepare for the ViPR virtual appliance to be unavailable for a total of approximately 25 minutes, starting from the time you take the VMs offline for the snapshots, until the upgraded ViPR virtual appliance state is stable.

- Unmount Linux volumes on page 30.
- Take offline virtual machine snapshots on page 30
- Perform the upgrade on page 31

Unmount Linux volumes before upgrade

Linux volumes that were mounted in v1.0 cannot be expanded, unmounted, or deleted in v1.1. Before upgrade, run the ViPR service Unmount Volume on Linux on mounted Linux volumes.

Take virtual machine snapshots before upgrade

You should take snapshots of all ViPR controller VMs before upgrade.

Before you begin

This procedure is not supported and should not be used if data services VMs are deployed.

This operation requires the System Administrator role in ViPR and root access to the ViPR controller VMs.

In the unlikely event that there is a need to revert to a snapshot, keep in mind that the ViPR database will be at the state it was in when the snapshot was taken.

Procedure

1. Connect using SSH to each ViPR controller VM and shut down with the `halt` command.
2. Use vSphere Client to take a snapshot of each controller VM. Do not snapshot the virtual machine's memory.
3. When the snapshots are complete, power up the ViPR controller vApp.
4. In the ViPR UI, look at the ViPR virtual appliance state in **Admin** › **System** › **Dashboard**.

   When the state is Stable, you can proceed with the upgrade.

Upgrading ViPR software

New versions of software made available from the upgrade repository can be downloaded and installed from the **System** › **Upgrade** page.

Before you begin

- This operation requires the System Administrator role in ViPR.
- Refer to the pre-upgrade steps in the *EMC ViPR Installation and Configuration Guide*.
- To see the available software versions, the upgrade repository must have been configured from the **System** › **Configuration** › **Upgrade** page.
- An upgrade to ViPR 1.1 patch 1 can only be performed from ViPR 1.1 (1.1.0.0.425). If you are running a ViPR version less than 1.1, follow a supported upgrade path to ViPR 1.1 before upgrading to ViPR 1.1 patch 1.
- Verify that the ViPR virtual appliance status is Stable (**Admin** › **System** › **Dashboard**).

Procedure

1. Select **Admin** › **System** › **Upgrade**.
2. Select an available ViPR version and **Download**.

   Note

   The downloaded software is stored on the VM and can be installed at anytime.

3. Click **Install**.

   A rolling upgrade is performed on the ViPR VMs.

   The **System Maintenance** page opens while installation is in progess, and presents the current state of the upgrade process.

   Wait for the system state to be Stable before making provisioning or data requests.

Post-upgrade steps

Depending on which pre-upgrade steps were taken, there may be some required steps after upgrade.

- Mount any Linux volumes that you unmounted before upgrade.
- The list of discovered unmanaged file systems will be out of date after upgrade. Run **File Storage Services** › **Discover Unmanaged File Systems** on all storage systems after upgrade.

- After a successful upgrade, discard the pre-upgrade snapshots. Resume regular ViPR backups.

Reverting to pre-upgrade snapshots

If you need to revert to the VM snapshots made before upgrade, use the vCenter Snapshot Manager.

Before you begin

You need access to the vCenter Server via vSphere Client where the ViPR VMs are located.

You need credentials that allow you to shut down the ViPR VM from the console.

Note that the ViPR database will be at the state it was in when the snapshot was taken.

Procedure

1. From vSphere Client, open the console on each controller VM and shut it down with the `halt` command.
2. From vSphere Client, right-click each ViPR VM and select **Snapshot** › **Snapshot Manager**.
3. For each VM, select the snapshot to which you want to revert and select **Go to** .
4. When the revert operations are complete, power on the controller VMs.

Upgrading ViPR from an internal repository

You can upgrade ViPR from an internal location by downloading a ViPR img file from support.EMC.com and copying it to the ViPR virtual appliance for upgrade.

Before you begin

- This operation requires the System Administrator role in ViPR.
- You need credentials to access support.EMC.com.

Procedure

1. Download the ViPR img file from support.EMC.com and save it locally.
2. Run the following ViPR CLI command:

   ```
   ./viprcli -hostname ViPR_virtual_ip -cf cookie_file system
   upload -imagefile locally_saved_img
   ```

   This command copies the img file to a location on the ViPR virtual appliance where it is found by the upgrade feature.

   Refer to *EMC ViPR CLI Reference* for details of how to install and use the ViPR CLI.
3. In the ViPR UI select **Admin** › **System** › **Upgrade**.
4. Select **Install** next to the version you uploaded with the viprcli command.

CHAPTER 4

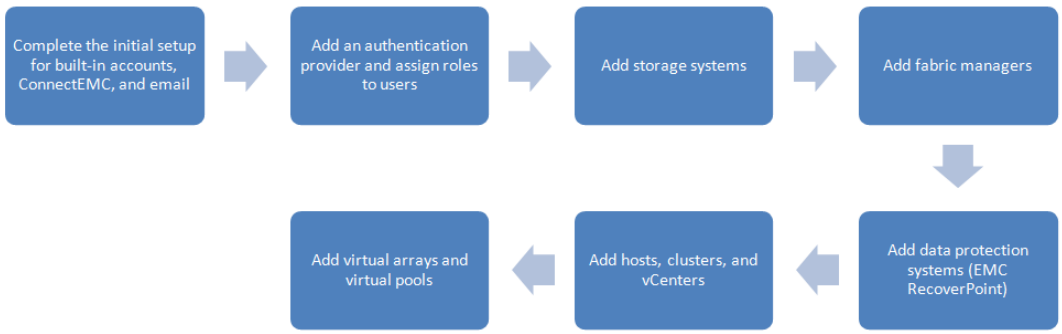
Initial Configuration of ViPR Virtual Appliance

Completing the configuration

After ViPR is deployed, use the UI to complete the configuration steps that are required before users can order ViPR services.

- Complete the initial setup steps, using the wizard that runs when you log in as root for the first time.
- Add an authentication provider so you can later assign roles and ACLs to external users.
- Add physical assets such as storage arrays, fabric managers, and data protection systems.
- Create virtual arrays and virtual pools.

Figure 2 Steps for completing configuration



Avoid out-of-band changes to the physical environment

Once you have added a physical asset to the ViPR virtual appliance, avoid reconfigurations with management tools other than the ViPR interfaces.

Collect information needed during configuration

Before configuring ViPR, you should have information at hand, such as IP addresses, ports, and credentials, about the physical assets you are adding.

Collect Brocade configuration information

You need to verify the configuration of the Brocade switches and obtain the credentials needed when adding the switches to the ViPR virtual appliance.

Before you begin

Be sure you have access to the required Brocade switch information.

Procedure

1. Obtain the following information:

Setting	Value
Obtain credentials for an account on CMCNE that has admin privileges to the switches.	
Confirm that the switches have been discovered through CMCNE.	
Confirm that the CMCNE SMI-S provider interface is enabled.	
Obtain credentials for the SMI-S provider used by CMCNE.	
Confirm that fabrics have been created and have ports assigned.	

Collect Cisco configuration information

You need to verify the configuration of the Cisco switch and obtain the credentials needed when you add the switches to the ViPR virtual appliance.

Before you begin

Be sure you have access to the required Cisco switch information.

Procedure

1. Record the following information about each Cisco switch:

Setting	Value
Confirm that SSH is enabled on the switch.	
Obtain login credentials for an account with privileges to provision (configure the mode of zone, zonesets, VSAN) and to show the FCNS database.	
Confirm that ISL links and port channels are configured and are up.	
Confirm that enhanced zone mode is enabled (not required but highly recommended).	

Validate EMC SMI-S Provider setup

If you are planning to use VMAX storage or VNX block, then EMC SMI-S Provider (a component of EMC Solutions Enabler) is required. Verify that your SMI-S Provider setup is valid.

Before you begin

Be sure you have access to the SMI-S Provider information.

Procedure

1. Verify the following:
   - VNX array connection is over the IP network with connections to both VNX storage processors.

- The host server running Solutions Enabler (SYMAPI Server) and SMI-S Provider (ECOM) differs from the server where the VMAX service processors or VNX storage processors are running.
- For VMAX, the host is able to see the gatekeepers (six minimum). For VNX, the host needs IP connectivity.
- The VMAX/VNX array is discovered in the SMI-S Provider.
- The remote host, SMI-S Provider (Solutions Enabler (SYMAPI Server) and EMC CIM Server (ECOM)) are configured to accept SSL connections. (Refer to *EMC Common Object Manager (ECOM) Toolkit ECOM Deployment and Configuration Guide* .)
- The EMC storsrvd daemon is installed and running.
- Ensure that SYMAPI Server and the ViPR server hosts are configured in the local DNS server and that their names are resolvable by each other, for proper communication between the two. If DNS is not used in the environment, be sure to use the hosts files for name resolution (`/etc/hosts` or `c:/Windows/System32/drivers/etc/hosts`).
- The EMC CIM Server (ECOM) default user login, password expiration option is set to "Password never expires."

Collect EMC SMI-S Provider information

Collect the following information to be used when adding EMC VMAX or VNX block storage to ViPR.

Before you begin

Be sure you have access to the required SMI-S Provider information.

Procedure

1. Obtain the following information:

Setting	Value
SMI-S Provider credentials (default is admin/#1Password)	
SMI-S Provider port (default is 5989)	
SMI-S Provider CLI Port (default is 2707)	

Collect Isilon configuration information

You need to supply certain configuration information when you add an Isilon storage system to the ViPR virtual appliance.

Before you begin

Be sure you have access to the required Isilon information.

Procedure

1. Obtain the following information about the Isilon arrays that you want to add to the ViPR virtual appliance:

Setting	Value
IPv4 address	

Setting	Value
Port (default is 8080)	
Credentials for the root account on the Isilon array	

Collect VNX file configuration information

You need to supply certain configuration information when adding VNX File storage to the ViPR virtual appliance.

Before you begin

You need access to the required VNX File information.

Procedure

1. Obtain the following information:

Setting	Value
Control Station IPv4 address	
Port (default is 443)	
Credentials for an account with administrator privileges on the array (default nasadmin/ nasadmin)	
IP address and credentials for the onboard SMI-S Provider that runs on the control system (default admin/#1Password)	

Collect VPLEX information

When you add VPLEX storage to ViPR you need to supply certain configuration information and credentials information for use during setup.

Before you begin

You need access to the required VPLEX information.

Procedure

1. Collect the following information:

Setting	Value
IPv4 address	
Port (default is 443)	
Credentials for an account with administrator privileges on the array	

Collect NetApp configuration information

You need to supply certain configuration information when adding a NetApp array to the ViPR virtual appliance.

Before you begin

You need access to the required NetApp information.

Procedure

1. Collect the following information:

Setting	Value
IPv4 address	
Port (default is 443)	
Credentials for an account with administrator privileges on the array	

Collect EMC RecoverPoint site information

You need to supply certain configuration information and credentials when adding an EMC RecoverPoint system to the ViPR virtual appliance.

Before you begin

You need access to the required RecoverPoint information.

Procedure

1. Obtain the following information:

Setting	Value
RecoverPoint site management IPv4 address or hostname	
Port	
Credentials for an account that has the RecoverPoint admin role to access the RecoverPoint site	

Collect SMTP server information

During ViPR configuration you need to supply information about the SMTP server to be used for ConnectEMC and ViPR approvals.

Before you begin

You need access to the required SMTP information.

Procedure

1. Record the following information about the SMTP server:

Setting	Description	Value
SMTP server	SMTP server or relay for sending email (For ConnectEMC and Approvals)	
Port	The port on which the SMTP service on the SMTP server is listening for connections. Default is 25, or 465 is TLS/SSL is used.	
Encryption used?	Use TLS/SSL for the SMTP server connections. **Note** If TLS/SSL encryption used, the SMTP server must have a valid CA certificate.	
Authentication type	Authentication type for connecting to the SMTP server (none, login, plain, cram-md5)	
Username and password	Credentials for authenticating with the SMTP server	
From address	From email address for sending email messages (user@domain)	

Initial login and setup

On first login as the root user, you need to change the ViPR root and system passwords, set the ConnectEMC and email settings, and upload the ViPR license.

Before you begin

- Wait 5 minutes after controller deployment before following the steps in this procedure. This will give the required ViPR services time to start up.
- Be prepared to provide new passwords for the ViPR root and system accounts.
- You need the name of an SMTP server. If TLS/SSL encryption used, the SMTP server must have a valid CA certificate.
- You need access to the ViPR license file.

Procedure

1. Open https://*ViPR_virtual_ip* with a supported browser and log in as root.

   Initial password is ChangeMe.

   The *ViPR_virtual_IP* is the ViPR public virtual IP address, also known as the network.vip (the IPv4 address) or the network.vip6 (IPv6). Either value, or the corresponding FQDN, can be used for the URL.
2. Enter new passwords for the root and system accounts.

The ViPR root account has all privileges that are needed for initial configuration; it is also the same as the root user on the Controller VMs. The system accounts (sysmonitor, svcuser, and proxyuser) are used internally by ViPR.

3. Select a transport option for ConnectEMC (FTPS (default), SMTP, or none) and enter an email address (user@domain) for the ConnectEMC Service notifications.

   If you select the SMTP transport option (required by the ViPR approval notification feature), you must specify an SMTP server under SMTP settings in the next step. "None" disables ConnectEMC on the ViPR virtual appliance.

4. Specify an SMTP server and port for notification emails, encryption type (TLS/SSL or not), a From address, and authentication type (login, plain, CRAM-MD5, or none).

   Optionally test the settings and supply a valid addressee. The test email will be from the From Address you specified and will have a subject of "Mail Settings Test".

   If TLS/SSL encryption used, the SMTP server must have a valid CA certificate.

5. **Finish.**

   ViPR services restart (this can take several minutes) and the UI opens to the License page.

6. Browse to and select the license file that was downloaded from the EMC license management web site and **Upload License**.

Results

At the end of this procedure you are logged in to the UI as root user, at **Admin** › **System** › **Dashboard**.

Authentication providers

User authentication is done through an authentication provider added to ViPR.

Except for the special built-in administrative users (root, sysmonitor, svcuser, and proxyuser) there are no local users in ViPR. Users who can log in, and who are assigned roles or ACLs, must be found through an authentication provider added to ViPR.

Adding an authentication provider

You need to add at least one authentication provider to ViPR in order to perform operations using accounts other than the built-in administrative accounts.

Before you begin

This operation requires the Security Administrator role in ViPR. (The root user has this role.)

You need access to the authentication provider information listed in Authentication provider settings on page 41. Note especially the requirements for the Manager DN user.

Procedure

1. Select **Admin** › **Security** › **Authentication Providers**
2. **Add**.
3. Enter values for the attributes. Refer to Authentication provider settings on page 41.
4. **Save**.
5. To verify the configuration, add a user from the authentication provider at **Admin** › **Security** › **Role Assignments**, then try to log in as the new user.

Authentication provider settings

You need to provide certain information when adding or editing an authentication provider.

UI name	CLI name (Provider.cfg)	Description and requirements
Name	name	The name of the authentication provider. You can have multiple providers for different domains.
Type	mode	Active Directory or LDAP. In Provider.cfg (CLI), use ad or ldap.
Description	description	Free text description of the authentication provider.
Domains	domains	Active Directory and LDAP allow administrators to organize objects of a network (such as users, computers, and devices) into a hierarchical collection of containers. Domains are a collection of administratively defined objects that share a common directory database, security policies, and trust relationships with other domains. In this way, each domain is an administrative boundary for objects. A single domain can span multiple physical locations or sites and can contain millions of objects. A typical entry in this field of the authentication provider would look like this: `mycompany.com`
Server URLs	url	ldap or ldaps (secure LDAP) with the domain controller IP address. Default port for ldap is 389 and ldaps is 636. Usage: one or more of ldap://‹Domain controller IP ›:‹port› (if not default port) or ldaps://‹Domain controller IP ›:‹port› (if not default port) If the authentication provider supports a multidomain forest, use the global catalog server IP and always specify the port number. Default is 3268 for ldap, 3269 for ldaps. Usage: ldap(s)://‹Global catalog server IP›:‹port›
Manager DN	managerdn	Indicates the Active Directory Bind user account that ViPR uses to connect to Active Directory or LDAP server. This account is used to search Active Directory when a ViPR administrator specifies a user for role assignment, for example. Requirement:

UI name	CLI name (Provider.cfg)	Description and requirements
		This user must have **Read all inetOrgPerson information** in Active Directory. The InetOrgPerson object class is used in several non-Microsoft, Lightweight Directory Access Protocol (LDAP) and X.500 directory services to represent people in an organization. To set this privilege in Active Directory, open Active Directory Users and Computers, right click on the domain, and select **Delegate Control...** . Click **Next**, then select the user that you are using for managerdn and click **Next**. The required permission is on the next screen "Read all inetOrgPerson information." Example: CN=Manager,CN=Users,DC=mydomaincontroller,DC=com In this example, the Active Directory Bind user is Manager, in the Users tree of the mydomaincontroller.com domain. Usually managerdn is a user who has fewer privileges than Administrator, but has sufficient privileges to query Active Directory for users attributes and group information. **⚠WARNING** **You must update this value in ViPR if the managerdn credentials change in Active Directory.**
Manager Password	passwd_user	The password of the managerdn user. **⚠WARNING** **You must update this value in ViPR if the managerdn credentials change in Active Directory.**
Disabled	disable	Select Disabled if you want to add the server to ViPR but not immediately use it for authentication. (Regardless of whether this property is true, ViPR validates that the provider's name and domain are unique.)
Group Attribute	groupattr	Indicates the Active Directory attribute that is used to identify a group. Used for searching the directory by groups. Example: CN Active Directory only. Does not apply to other authentication providers.

UI name	CLI name (Provider.cfg)	Description and requirements
		Note Once this value is set for a provider, it cannot be changed, because of the tenants that are using this provider may already have role assignments and permissions configured using group names in a format using the current attribute.
Group Whitelist	whitelist	Optional. One or more group names as defined by the authentication provider. This setting will filter the group membership information that ViPR retrieves about a user. • When a group or groups are included in the whitelist, it means that ViPR will be aware of a user's membership in the specified group[s] only. Multiple values (one per line in ViPR UI, comma-separated in CLI and API) and wildcards (for example MyGroup*,TopAdminUsers*) are allowed. • Blank value (default) means that ViPR will be aware of any and all groups that a user belongs to. Asterisk (*) is the same as blank. Example: UserA belongs to Group1 and Group2. If the whitelist is blank, ViPR knows that UserA is a member of Group1 and Group2. If the whitelist is "Group1", ViPR knows that UserA is a member of Group1, but does not know that UserA is a member of Group2 (or of any other group). Use care when adding a whitelist value. For example, if mapping a user to a tenant is based on group membership, then ViPR must be aware of the user's membership in the group. To restrict access to a tenant to users of certain group(s) only, one must: • add these group(s) to the tenant user mapping (using the CLI command `viprcli tenant add-group`), so the tenant is configured to accept only users of these group(s). • add these group(s) to the whitelist, so that ViPR is authorized to receive information about them

UI name	CLI name (Provider.cfg)	Description and requirements
		Note that by default, if no groups are added to the tenant user mapping, users from any groups are accepted, regardless of the whitelist configuration. Active Directory only. Does not apply to other authentication providers.
Search Scope	searchscope	One Level (search for users one level under the search base) or Subtree (search the entire subtree under the search base).
Search Base	searchbase	Indicates the Base Distinguished Name that ViPR uses to search for users at login time and when assigning roles or setting ACLs. Example: CN=Users,DC=mydomaincontroller,DC=com This example searches for all users in the Users container. Example: CN=Users,OU=myGroup,DC=mydomaincontroller, DC=com This example searches for all users in the Users container in the myGroup organization unit. Note that the structure of the searchbase value begins with the "leaf" level and goes up to the domain controller level--the reverse of the structure seen in the Active Directory Users and Computers UI.
Search Filter	searchfilter	Indicates the string used to select subsets of users. Example: userPrincipalName=%u **Note** ViPR does not validate this value when you add the authentication provider.
(not applicable)	maxpagesize	Value that controls the maximum number of objects returned in a single search result. This is independent of size of the each returned object. If specified must be greater than 0. Cannot be higher than the max page size configured on the authentication provider.
(not applicable)	validatecertificate	When ldaps protocol is used, SSL validates the certificate from the authentication provider. Default is false. If set to true, the LDAP needs to have a valid CA certificate.

Considerations when adding authentication providers

When you configure ViPR to work with Active Directory, you must decide whether to manage several domains in a single authentication provider, or to add separate authentication providers for each domain.

The decision to add a single authentication provider, or multiple, depends on the number of domains in the environment, and the location on the tree from which the manager user is able to search. Authentication providers have a single search_base from which searches are conducted. They have a single manager account who must have read access at the search_base level and below.

Use the one-authentication-provider-for-multiple-domains if you are managing an Active Directory forest and these conditions are present: the manager account has privileges to search high enough in the tree to access all user entries, and the search will be conducted throughout the whole forest from a single search base, and not just the domains listed in the provider. Otherwise, configure an authentication provider for each domain.

Note that even if you are dealing with a forest and you have the correct privileges, you might not want to manage all the domains with a single authentication provider. You would still use one authentication provider per domain when you need granularity and tight control on each domain, especially to set the search base starting point for the search. Since there is only one search base per configuration, it needs to include everything that is scoped in the configuration in order for the search to work.

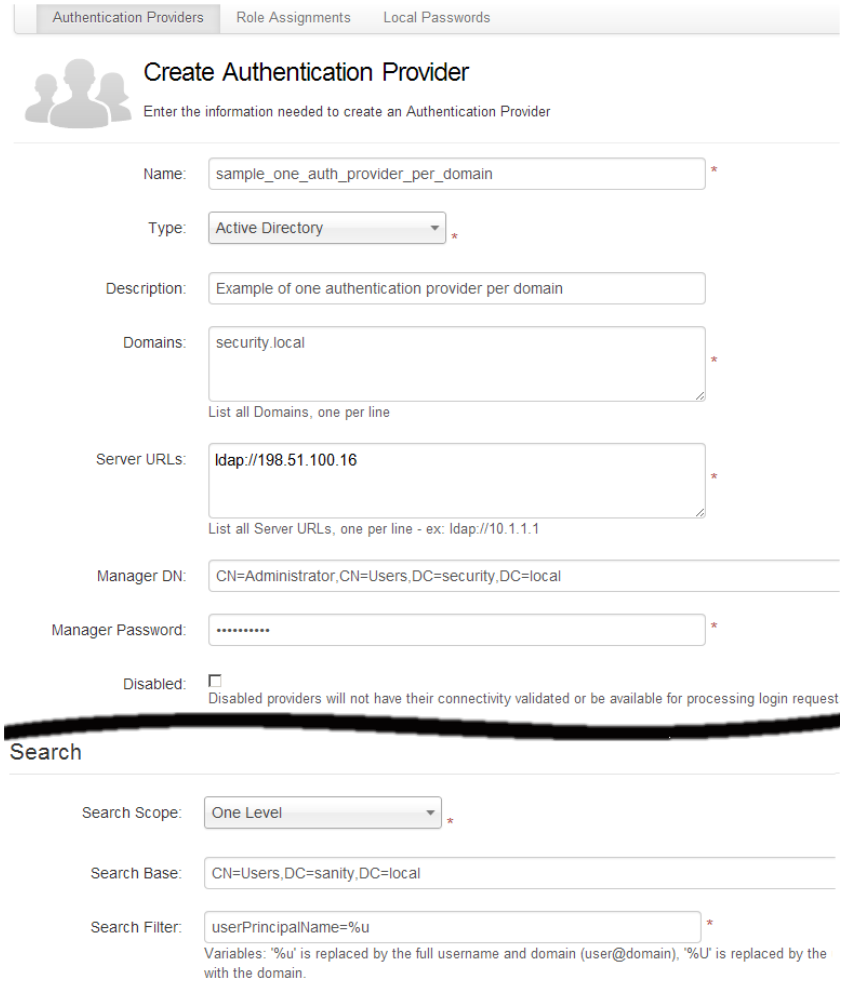
The search base needs to be high enough in the directory structure of the forest for the search to correctly find all the users in the targeted domains.

- If the forest in the configuration contains ten domains but you target only three, do not use a single provider configuration, because the search will unnecessarily span the whole forest, and this may adversely affect performance. In this case, use three individual configurations.
- If the forest in the configuration contains ten domains and you want to target ten domains, a global configuration is a good choice, because there is less overhead to set up.

Example of one authentication provider per domain

In environments where the whole ViPR virtual data center integrates with a single domain, or with several individually-managed domains, use one domain per authentication provider.

The following example creates an authentication provider for security.local.

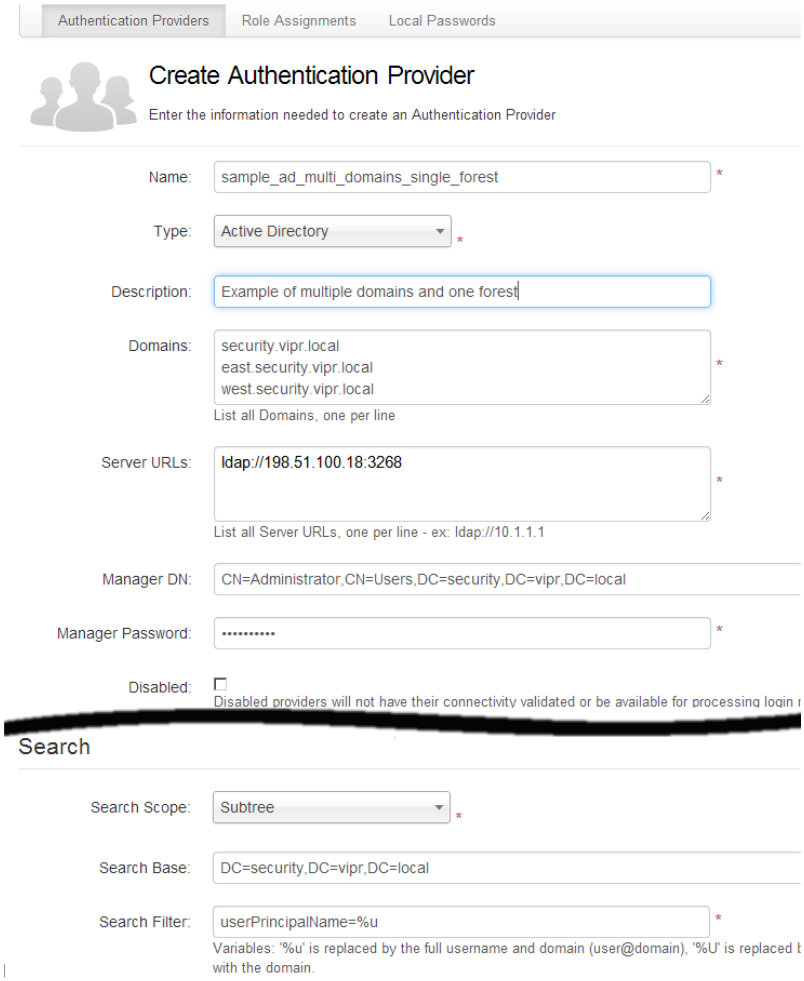


Example of one authentication provider managing multiple domains in a single forest

In this example, the environment includes a forest with one top domain and two subdomains. A single authentication provider manages all the domains.

In this example:

- The port for the Global Catalog (central repository of domain information for the forest) in the server URL is 3268.
- The domains to be managed are the top domain, security.vipr.local, and the subdomains east.security.vipr.local, and west.security.vipr.local.
- The manager user on the Global Catalog has read access on the search base.
- The search base is high enough in the hierarchy that it encompasses the subpaths to include east and west subdomains. In this case, the common path between users.security.vipr.local, users.east.security.vipr.local, and users.west.security.vipr.local is security.vipr.local.
- The search scope parameter is set to Subtree.



Adding a storage system

You can add a supported storage system from the Admin view's **Physical Assets** tab.

Before you begin

- This operation requires the System Administrator role in ViPR.

Procedure

1. Select **Admin** › **Physical Assets** › **Storage Systems**.
2. **Add** a storage system.
3. Select the storage system type.
4. To add VMAX or VNX block storage, select **SMI-S Provider for EMC VMAX and VNX Block** as the storage system type and enter the SMI-S provider's host name, IP address, port used for communication between the ViPR virtual appliance, and credentials for an account that has administrator privileges.

   To add file storage (**EMC Isilon**, **EMC VNX File**, **EMC VPLEX**, **NetApp**), enter a name for the storage, the IP address of the host or control station, port (Isilon default is 8080, otherwise 443), and credentials with storage system administrator privileges.

   When adding VNX file storage, additionally enter information about the onboard SMI-S provider that resides on the control station. You need to enter the provider host, SSL setting, port (default 5989), and credentials for the onboard SMI-S provider.

5. **Save**.

SMI-S providers

You can use the SMI-S Providers tab (**Admin** › **Physical Assets** › **SMI-S Providers)** to add an SMI-S provider and discover all storage known to it.

Adding an SMI-S provider

You can add an SMI-S provider to ViPR and use it to discover VMAX and VNX block storage.

Before you begin

- This operation requires the System Administrator role in ViPR.

Procedure

1. Select **Admin** › **Physical Assets** › **SMI-S Providers**.
2. **Add** an SMI-S Provider.
3. Enter the SMI-S provider's host name, IPv4 address, port used for communication between the ViPR virtual appliance, and credentials for an account that has array administrator privileges. Enable SSL if used.
4. **Save**.

   Storage discovered through the SMI-S provider is displayed on the **Storage Systems** tab.

Fabric managers

Use the Fabric Managers tab (**Admin** › **Physical Assets** › **Fabric Managers)** to add a SAN network system to ViPR, the first step in making SAN storage available for provisioning.

When you add a SAN switch, ViPR discovers the topology seen by the switch, and creates a network for each Cisco VSAN or Brocade fabric.

Adding a fabric manager

Add a SAN network switch such as Cisco or Brocade to discover the storage topology.

Before you begin

- This operation requires the System Administrator role in ViPR.
- You need to provide the IPv4 address, port, and administrator credentials for a switch or its SMI-S provider, depending on the switch type.

Procedure

1. Select **Admin** › **Physical Assets** › **Fabric Managers**.
2. **Add** a fabric manager.
3. Select a switch type and enter the switch's name, IPv4 address, the port used for communication between the ViPR virtual appliance and switch, and credentials for an account that has administrator privileges on the switch. For a Brocade switch, you provide the IPv4 address, the port and credentials of the associated SMI-S provider, not of the switch itself.

4. **Save**.

   The fabric manager is automatically registered and all discovered networks associated with the switch are registered.

Data protection systems

You can use the Data Protection Systems tab (**Admin** › **Physical Assets** › **Data Protection Systems**) to add a protection system such as EMC RecoverPoint to ViPR.

Adding a data protection system

You can add a data protection system on the Admin view's **Physical Asset** tab.

Before you begin

- This operation requires the System Administrator role in ViPR.

Procedure

1. Select **Admin** › **Physical Assets** › **Data Protection Systems**.
2. **Add** a data protection system.
3. Enter a name for the data protection system and select a data protection type.

   For RecoverPoint, enter the site management IPv4 address or fully-qualified domain name of the host. The default port to communicate with RecoverPoint is 7225. The credentials must be for an account that has the RecoverPoint admin role to access the RecoverPoint site.
4. **Save**.

Hosts

Hosts are added to ViPR from the **Admin** › **Physical Assets** › **Hosts Physical Hosts** page.

The list of supported hosts is provided in the *EMC ViPR Data Sheet and Compatibility Matrix* on support.EMC.com.

When provisioning storage for a host, ViPR needs to communicate with the host to validate the host and connect storage to it. For Linux hosts, ViPR will SSH into the host; for Windows hosts, ViPR needs to execute remote PowerShell commands on the host.

When a host is connected to a Fibre Channel (FC) fabric, ViPR uses information from the fabric manager to discover storage systems and host initiator end-points and add them to a network.

When an IP connected host is added, ViPR does not know if it is on the same IP network as the storage system, so the host must be manually added to the IP network that contains the storage system IP ports.

Adding a host

You must add a host to ViPR before you can attach provisioned storage to it.

Before you begin

- This operation requires the Tenant Administrator role in ViPR .
- You need to know the host credentials.

- When adding Windows hosts using LDAP or Active Directory domain account credentials, the domain user credentials must be in the same domain where the Windows host is located; otherwise the Windows host discovery will fail.

Procedure

1. Select **Admin** › **Physical Assets** › **Hosts**.
2. **Add** a host.
3. Specify the operating system of the host, assign it a name by which it will be known in ViPR, and enter its fully qualified domain name or IP address.
4. Enter the port that ViPR will use to contact the host.
   - Connection to Linux hosts is using SSH.
   - Connection to Windows hosts is using Windows Remote Management (WinRM). WinRM must be configured on the host and must listen on the port that you have specified here.
   - If adding a host other than a Linux, or Windows host, you will need to manually list the World Wide Names (WWNs) with the ports, (Node WWN:Port WWN) or IP addresses.
5. Check the status of the **Validation on Save** checkbox.

   If you leave this box checked, ViPR checks that it can connect to the host before saving the host details. If validation fails you will not be allowed to save the host details.

   If some of the information, such as the user credentials, are incorrect, but you still want to save the information you have entered, uncheck the box. The host will fail discovery but you can edit the host details later. Once corrected, the host will be successfully discovered.
6. **Save**.

After you finish

Hosts that use ViPR services with the iSCSI protocol must have their iSCSI ports logged into the correct target array ports before they can use the service.

ViPR Clusters

ViPR provides the capability to discover, and create clusters within the ViPR physical assets, and perform service operations using the ViPR clusters or individual hosts.

Cluster discovery

When adding a Windows host to ViPR, if discovery is enabled, ViPR will identify if the Windows host is part of a cluster, and add the cluster to the ViPR assets. Once it is added to ViPR, the cluster can be managed and edited as a ViPR cluster. Changes made to the Windows cluster from ViPR will only be made in the ViPR environment, and will not be applied to the Windows configuration. ViPR imports the Windows cluster information with the host, but does not discover the other hosts that are in the Windows cluster until the hosts are manually added to the ViPR physical assets.

ESX and ESXi clusters are also automatically discovered by ViPR when a vCenter is added. Once the ESX or ESXi cluster is added to ViPR, the cluster can be managed and edited as a ViPR cluster. Changes made to the ESX or ESXi cluster from the ViPR **Cluster** page, will only be made in the ViPR environment, and will not be applied to the vCenter configuration.

ViPR cluster operations

Discovered clusters are displayed, and new clusters are created, and managed from the **Admim** › **Physical Assets** › **Clusters** page of the ViPR UI. After a cluster is discovered or

created, hosts are added to the cluster. Hosts can be added to the cluster while creating or editing a host in ViPR, or from the Clusters page. A host can only exist in one cluster. Once a host is part of a ViPR cluster, service operations can be performed exclusively on a single host, or shared across the hosts in a cluster.

- Hosts that are not currently in use in a ViPR service, can be moved to different clusters by adding it to the new cluster. The host does not have to be removed from the previous cluster, to move it to a new cluster. ViPR will recognize the last assigned cluster as the cluster to which the host belongs.
- Hosts that are in use cannot be removed from the cluster.

Creating a ViPR cluster

Clusters are created from the **Admin** › **Physical Assets** › **Clusters** tab.

Procedure

1. Go to the **Admin** › **Physical Assets** › **Clusters** tab.
2. Click **Add**.
3. Provide the **Name**, and click **Save**.

After you finish

Once the cluster is created hosts can be added at the time the host is created, or by clicking the **Edit** button in the **Clusters** page.

Edit hosts in a cluster

Editing hosts in the cluster includes adding, and removing hosts from the cluster.

Before you begin

- Clusters must be created before the hosts can be added to them.
- Hosts can be also be added to the cluster while creating or editing a host in ViPR.
- A host can only exist in one cluster.
- Hosts that are not currently in use in a ViPR service, can be moved to different clusters by adding it to the new cluster. The host does not have to be removed from the previous cluster, to move it to a new cluster. ViPR will recognize the last assigned cluster as the cluster to which the host belongs.
- Hosts that are in use cannot be removed from the cluster.

Procedure

1. Go to the **Admin** › **Physical Assets** › **Clusters** tab.
2. Locate the cluster that will be edited in the list of clusters.
3. Click **Edit Hosts** in the right column in the same row as the cluster.
4. Check the box to the left of one or more of the hosts.
5. Click **Add** to add the selected hosts to the cluster.

   Click **Remove** to remove the selected hosts from the cluster.

vCenters

You can use the vCenters tab (**Admin** › **Physical Assets** › **vCenters**) to add a vCenter to ViPR which storage can be exported and mounted as a datastore.

Adding a vCenter server

Add a vCenter Server to make provisioned volumes available to ESX hosts. You can add a vCenter from the Admin view's **Physical Asset** tab.

Before you begin

- This operation requires the System Administrator role in ViPR.

Procedure

1. Select **Admin** › **Physical Assets** › **vCenters**.
2. **Add**.
3. Enter the vCenter Server's name, its hostname or IP address, port used for communication between the ViPR virtual appliance and the vCenter server, and credentials for an account that has administrator privileges. Optionally validate the connection on save.

   Use care when identifying the vCenter; the UI does not prevent you from adding the same vCenter twice: once with its hostname, and again with its IP address.
4. Check the status of the **Validate Connection on Save** checkbox.

   If you leave this box checked, ViPR will check that it can connect to the host before saving the host details. If validation fails you will not be allowed to save the host details.

   If some of the information, such as the user credentials, are incorrect, but you still want to save the information you have entered, uncheck the box. The host will fail discovery, however, you can edit the host details later and, once corrected, it will be successfully discovered.
5. **Save**.

Virtual arrays

A virtual array is an abstract or logical array that is created to partition a virtual data center into a group of connected compute, network, and storage resources.

In ViPR, a virtual array is created by giving it a meaningful name and defining whether SAN zoning for the virtual array will be done automatically by ViPR or be manually configured. Once the virtual array is created, it must be populated with at least one network and one virtual pool.

A network consists of the storage ports and the host or initiator ports connected to the SAN switches that were added to ViPR as fabric managers. The assignment of the network to the virtual array, and the subsequent association of the virtual array with a virtual pool, determines the storage that is available when a user requests a provisioning service. Optionally, the devices available to a virtual array can be controlled by manually selecting the storage ports to make available to the virtual array, and the physical storage pools that will supply the storage for the virtual pools associated with the virtual array.

Adding a virtual array

You should create one virtual array for each physical site, enterprise SAN, or computing "pod".

Before you begin

- This operation requires the System Administrator role in ViPR.
- At a minimum, a virtual array defines the type of SAN Zoning that will occur when a volume is exported from the array, and must include one or more networks
- Storage systems are brought into the virtual array with the networks.

Procedure

1. Select **Admin** › **Virtual Assets** › **Virtual Arrays**.
2. **Add**.
3. Enter a name for the virtual array.
4. Either:
   - Accept the default SAN zoning setting of **Automatic** to allow ViPR to automatically create the required zones in the SAN fabric when a provisioning request is made in this virtual array.
   - Select **Manual** to configure the zones outside of ViPR.
     - If there is an existing zone for the Host and Array:
       After the ViPR provisioning operation completes, check the Port Group within the Masking View to identify the FA ports that ViPR selected for the provisioning request. Compare the FA ports in the zone to the FA ports in the Port Group. If they match, no further action is required. If they do not match, reconfigure the zone to use the same FA ports. Alternatively, a new zone can be created.
     - If there is no existing zoning for the Host and Array:
       After the ViPR provisioning operation completes, check the Port Group within the Masking View to identify the FA ports that ViPR selected for the provisioning request. Create a zone with the appropriate initiator and target ports.
5. **Save**.

   One or more networks must be added to the virtual array before it can be managed by ViPR.
6. Locate the added virtual array in the table.
7. Click **Networks** in the **Edit** column.
8. Click **Add** to add one or more Fibre Channel SAN, or existing IP networks to the virtual array, or click**Add IP Network** to create a new IP network to add to the virtual array.

After you finish

Optionally, continue to assign storage ports and storage pools to the virtual array.

Adding an IP network

Networks for IP connected storage must be manually created, and added to the virtual array.

Before you begin

- This operation requires the System Administrator role in ViPR.
- There are two ways to access the IP networks page either

Procedure

1. Go to the **Add IP Networks** page:

Option	Description
From the Networks page	a. Go to the **Admin** › **Virtual Assets** › **Networks** page. b. Click **Add IP Network**.
From the Virtual Array page	a. Go to the **Admin** › **Virtual Assets** › **Virtual Arrays** page. b. Click **Networks** in the **Edit** column. c. Click **Add IP Network**.

2. Enter the network **Name**.
3. Select the virtual arrays to which the network will be added.
4. Click **Save**.

Adding an IP-connected host to a network

After initial setup, use the **Admin** › **Virtual Assets** › **Virtual Arrays** › **Edit IP Networks** page to add hosts to an IP network.

Before you begin

- This operation requires the System Administrator role in ViPR.

Procedure

1. Select **Admin** › **Virtual Assets** › **Virtual Arrays**.
2. Select the virtual array to which the host will be connected.
3. At the **Edit Virtual Array** page, select **Networks**.
4. In the **Networks** table, select the IP network to which the host will be made available.
5. In the **IP Ports** table, select **Add**.
6. Enter IP ports in the **Add Ports** box and click **Add**.

Virtual pools

Virtual pools are created after virtual arrays have been created in ViPR. Virtual pools must be associated with one or more virtual arrays.

Virtual pools are a collection of storage pools grouped together according to user-defined characteristics.

For example, if your virtual array has a number of storage pools that can provide block storage using SSDs, you can group those physical pools into a single virtual pool. In that

case, the performance and protection characteristics of the virtual pool would determine that it provides high performance storage. Hence, when giving a name to the virtual pool, you might choose "gold" or "tier1" to indicate that the storage provides the highest performance.

When a provisioning user requests the creation of a block volume from the "gold" virtual pool, ViPR chooses the physical array/physical storage pool combination on which the volume will be created. The virtual pool can comprise physical pools spanning a number of arrays, so the actual array chosen could be any of them. The provisioning user does not care which physical pool is chosen, only that it provides the level of performance consistent with "gold" storage.

Automatic and manual virtual pools

When creating or editing a virtual pool, the UI helps you choose the physical pools that match the performance and protection criteria that you are looking for by providing a set of criteria and listing the pools that match the criteria. The storage pools table list all of pools that are currently available that match the criteria and is dynamically updated as you make criteria selections.

If you set the pool to be a "manual" pool, you can select the storage pools that will comprise the pool. These storage pools will be fixed unless you edit the virtual pool.

If you select "automatic", the storage pools that comprise the virtual pools will be automatically updated during the virtual pool's lifetime based on the availability of storage pools in the virtual array.

An automatic virtual pool will be updated under the following circumstances:

- During discovery of a storage system.
- When a virtual pool is updated and saved (once a pool has associated assets only protection criteria can be updated).
- When a storage system, storage pool or port is registered or deregistered.
- When the storage ports for a network are updated.
- When the storage pools in a virtual array are updated.
- When a network is assigned to a virtual array.

Creating or editing a virtual pool for block storage type

Create a virtual pool for block by specifying the criteria that physical storage pools must match.

Before you begin

- This operation requires the System Administrator role in ViPR.
- When determining the minimum number of paths, maximum number of paths, and paths per initiator:
  - The values must match the configuration and limitations of the physical infrastructure.
  - There must be enough physical paths available to meet the criteria of the virtual pool.

Procedure

1. Select **Admin** › **Virtual Assets** › **Virtual Pools**.
2. Click **Add** or select an existing virtual pool name to edit.
3. Name and describe the pool.

4. Select the storage type, Block.

   The criteria you specify will determine the physical storage pools that are eligible to be part of this virtual pool.

5. Select a provisioning type (thick, thin).
6. Select one or more virtual storage arrays that can contribute physical storage pools to the virtual pool.

   A virtual pool must be associated with at least one virtual array.

7. Select one or more storage-type-specific protocols used to access the data: FC, iSCSI.
8. Select the minimum number of paths from the host to the storage array
9. Select the maximum number of paths that can be configured per host.
10. Select the number of paths (ports) to allocate to each initiator that is used. ViPR will not allocate more paths than the Maximum Path allows. When the Maximum Path is set too low there may be unused initiators which will not be zoned to ports.
11. Optionally, accept the default Expandable setting (enabled).

    Storage pools that can be expanded non-disruptively are selected by default. Note that this can decrease performance in some cases. If you disable this option, the underlying storage selected for volume creation will consider performance over expandability.

12. Enable multi-volume consistency if you want resources provisioned from the pool to support the use of consistency groups. If not enabled, a resource cannot be assigned to a consistency group when running ViPR block provisioning services.
13. Optionally select a drive type: SSD, FC, SAS, or SATA.
14. Optionally select a system type: EMC VNX Block or EMC VMAX.
15. Optionally specify select one or more RAID types.
16. Optionally specify an auto-tiering policy, that is, storage using Fully Automated Storage Tiering (FAST).

    For VNX Block, a ranking algorithm is applied to get matching pools. For VMAX, only pools associated with VMAX auto-tier policies are matched.

17. Under **Data Protection**, select the maximum number of native (that is, ViPR) snapshots allowed for resources from this virtual pool.
18. Select the maximum number of native continuous copies allowed for resources from this virtual pool.
19. Optionally select an existing virtual pool (not the one you are creating in this procedure) to use for native continuous copies (applicable only if native continuous copies › 0).
20. Select a data protection type, such as EMC RecoverPoint, VPLEX Distributed, or VPLEX Local.

    Refer to data protection sections below for details.

21. Under **Quota**, optionally specify the maximum amount of of storage that can be provisioned using this virtual pool. (The value can be overridden at the project level.)
22. Under **Storage Pool Association**, specify whether you want to manually select a subset of eligible storage pools, or automatically assign all eligible physical pools to the virtual pool.
23. Select **Save**.

The matching physical storage pools (listed under Storage Pools) will be saved in this virtual pool.

Setting RecoverPoint data protection criteria for a block virtual pool

You can set RecoverPoint criteria when you create or edit a block virtual pool.

Before you begin

- This operation requires the System Administrator role in ViPR.
- RecoverPoint data protection is part of the block virtual pool settings, so you need to be creating or editing a block virtual pool to do these steps. Refer to Creating or editing a virtual pool for block storage type on page 55.
- You need a virtual array to act as the RecoverPoint target and optionally an existing target virtual pool.
- ViPR sets a default journal size, but if you have specific journal requirements, have them available when creating the virtual pool.

Procedure

1. Select **Admin** › **Virtual Assets** › **Virtual Pools**.
2. Click **Add** or select an existing virtual pool name to edit.
3. Set properties as described in Creating or editing a virtual pool for block storage type on page 55.
4. For **Remote Protection/Availability**, select EMC RecoverPoint.
5. Set the source journal size as needed. You can accept the RecoverPoint default (2.5 times protected storage) or select one of the following:
   - A fixed value (in MB, GB or TB)
   - A multiplier of the protected storage
   - Minimum allowable by RecoverPoint (10 GB)
6. Select **Add Copy** to add one or two RecoverPoint copies, specifying the destination virtual array, optionally a virtual pool, and journal size.

   The virtual pool specifies the characteristics of the RecoverPoint target and journal volumes.

   - Set the journal size as needed. You can accept the RecoverPoint default (2.5 times protected storage) or select one of the following:
     - A fixed value
     - A multiplier of the protected storage other than the default
     - Minimum allowable by RecoverPoint (10 GB)

Setting VPLEX data protection criteria for a block virtual pool

You can set VPLEX data protection criteria when you create or edit a block virtual pool.

Before you begin

- This operation requires the System Administrator role in ViPR.
- VPLEX Distributed and VPLEX Local data protection are optional block virtual pool settings, so you need to be creating or editing a block virtual pool to do these steps. Refer to Creating or editing a virtual pool for block storage type on page 55.

Procedure

1. Select **Admin** › **Virtual Assets** › **Virtual Pools**.
2. Click **Add** or select an existing virtual pool name to edit.
3. Set properties as described in Creating or editing a virtual pool for block storage type on page 55.
4. For Remote Protection, select **VPLEX Distributed** or **VPLEX Local**.
   a. If you select **VPLEX Distributed**, select an existing virtual array to act as a destination for the distributed volume. Optionally select a different virtual pool to use when creating the distributed volume.

Setting SRDF data protection criteria for a block virtual pool

You can set SRDF criteria when you create or edit a block virtual pool.

Before you begin

- This operation requires the System Administrator role in ViPR.
- SRDF data protection is part of the block virtual pool settings, so you need to be creating or editing a block virtual pool to do these steps. Refer to Creating or editing a virtual pool for block storage type on page 55.
- You need a virtual array to act as the SRDF target and optionally an existing target virtual pool.

Procedure

1. Select **Admin** › **Virtual Assets** › **Virtual Pools**.
2. Click **Add** or select an existing virtual pool name to edit.
3. Set properties as described in Creating or editing a virtual pool for block storage type on page 55.
4. For **Remote Protection/Availability**, select **VMAX SRDF**.
5. Select a copy mode, either **Synchronous** or **Asynchronous**.
6. Select **Add Copy** to add an SRDF copy, specifying the destination virtual array, and optionally a virtual pool.

Creating or editing a virtual pool for file storage type

Create a virtual pool by specifying the criteria that physical storage pools must match. You can also edit an existing virtual pool's settings except the storage type.

Before you begin

- This operation requires the System Administrator role in ViPR.

Procedure

1. Select **Admin** › **Virtual Assets** › **Virtual Pools**.
2. Click **Add** or select an existing virtual pool name to edit.
3. Name and describe the pool.
4. Select **File** for the storage type.

   The criteria you specify will determine the physical storage pools that are eligible to be part of this virtual pool. Storage type is not editable once the virtual pool is created.

5. Select a provisioning type (thick, thin).
6. Select one or more virtual storage arrays that can contribute physical storage pools to the virtual pool.

   A virtual pool must be associated with at least one virtual array.
7. Select one or more storage-type-specific protocols used to access the data.

   The options for file are NFS and CIFS.
8. Select a system type.

   For file, the options are EMC VNX, EMC Isilon, NetApp, or none.
9. Under **Data Protection**, select the maximum number of local snapshots allowed for resources from this virtual pool.
10. Under **Quota**, optionally specify the maximum amount of of storage that can be provisioned using this virtual pool. (The value can be overridden at the project level.)
11. Under **Storage Pool Association**, specify whether you want to manually select a subset of eligible storage pools, or automatically assign all eligible physical pools to this virtual pool.
12. Select **Save**. The matching physical storage pools will be saved in the virtual pool.

Creating a project

Go to **Admin** › **Tenant** › **Projects** to create a new project and assign users to the project.

Before you begin

- You must be either a Tenant Administrator or a Project Administrator to be allowed to create projects. You will not see the **Admin** › **Tenant** › **Projects** menu item unless you are in one of these roles.
- Projects created by a Tenant Administrator can only be administrated by a Project Administrator if the Project Administrator is the project owner.
- Projects created by a Project Administrator are visible to, and can be administrated by, a Tenant Administrator.

Procedure

1. Select **Admin** › **Tenant** › **Projects**.
2. Select **Add**.
3. Enter the name of the project.
4. In the **Owner** field, enter the name of the project owner.

   This is the AD/LDAP name of the user. If you do not enter a name, you will be the project owner.

   The project owner should be a Project Administrator. This provides a way of allowing a project created by a Tenant Administrator to be delegated to a Project Administrator.

   If you are a Tenant Administrator, projects that you own cannot be administrated by Project Administrator unless you make them the owner.

   If you assign project ownership to a provisioning user, the user will not be able to perform administration at the UI.
5. You can associate a quota with the project to limit the amount of storage provision for the project.

a. Check the **Enable Quota** box

b. In the **Quota** field, enter the maximum amount of storage that you want to allow.

6. To assign project permissions to other users, select **Add ACL**.

   An ACL field is displayed allowing you enter a user or group name and assign a permission.

7. Enter the name of a user or group and set the **Type** field to be consistent.
8. Select the access permission for the user as either ALL or BACKUP.

   ALL permission allows users to provision resources that belong to a project and to run services against resources owned by a project. BACKUP allows a user to view the resources belonging to a project and perform data protection operations.

   More information on adding users and groups to an access control list is provided in Assigning permissions using ACLs.

9. To add more users or groups, select **Add ACL** again.

   You can remove an ACL entry by clicking **Remove**.

10. When you have added all ACL entries, click **Save**.

After ViPR configuration

Once the ViPR virtual appliance is configured, users can place orders for services.

Deployment steps for Object Data Service are described in Installation and initial configuration of Object Data Service on page 61.

Detailed user and administration information for the ViPR virtual appliance is described in:

- *EMC ViPR User Guide*
- *EMC ViPR Administrator Guide*

The REST API and command-line interfaces are described in:

- *EMC ViPR CLI Guide*
- *EMC ViPR REST API Reference*
- *EMC ViPR Controller REST API Developer Guide*

CHAPTER 5

Installation and Initial Configuration of ViPR Data Services

Setting up ViPR Data Services

One or more Data Services VMs must be added to ViPR, and a data services virtual pool must be created and provisioned in the ViPR virtual data center, before users can perform object or HDFS data operations using ViPR Data Services.

A summary of the procedure that must be performed to set up the Data Services is provided below and is followed by the detailed steps.

Note

You need to have System Administrator, Security Administrator and Tenant Administrator roles to perform the setup. The root user has these roles, or a Security Administrator can assign these roles to a specific user.

Procedure

1. Make sure that you have an IP network and one or more file virtual pools.

   Data Services uses file systems provided by a file virtual pool to supply the backing storage.

2. Deploy one or more data VMs.

   Data VMs are required to support the object data path. The Controller VM and data VMs must be configured so that the data VMs can communicate with the Controller VMs.

3. Assign an IP network for Data Services.

   ViPR uses a single IP network for the data services. The IP network is used to access the underlying file arrays.

4. Create a data services virtual pool.

   A data services virtual pool is used to group data stores together.

5. Create one or more data stores.

   The created data store(s) are added to the data services virtual pool specified during data store creation. A data store uses a file virtual pool to provide its file storage.

6. Assign a namespace and default values to the tenant.

   The tenant namespace provides a unique reference for a specific tenant, and enables objects to be accessed by bucket and by tenant.

   Once the tenant namespace has been assigned, users who are members of the tenant can perform object data operations.

7. Create a base URL for use in object data path operations. (This step is optional.)

   A base URL:

   - Is an option provided for those users who want to use applications written against the Amazon S3 API.
   - Can be used to support virtual-hosted style access in object data requests.
   - Is not required for a user to perform object data operations, but the System Administrator may choose to configure it.

   To process object requests, required parameters include the tenant namespace and bucket that the object belongs to; these may be included with or without a base URL.

Option	Description
Without base URL	Tenant namespace and bucket are provided with the x-emc headers in the REST request.
With base URL	Encode the tenant namespace and bucket in the hostname part of the URL.

Obtaining Data Services deployment files and HDFS support files

To install one or more data VMs to enable ViPR Data Services, you will need to download the `vipr-*-dataservice.zip` from the ViPR product page on support.EMC.com.

In addition, if you intend to configure a Hadoop cluster to use ViPR HDFS storage, you will need to obtain the ViPR HDFS zip file (`vipr-hdfs-<version>.zip`) from support.EMC.com. This file contains a JAR file that must be deployed to each client node in the Hadoop cluster and contains tools to aid the configuration of ViPR to allow access from the Hadoop cluster.

Before you can set up a Hadoop cluster to use ViPR HDFS, you must complete the installation and configuration of Data Services. You can then refer to the instructions on configuring a Hadoop cluster to use ViPR HDFS provided in the *Data Services Solutions Guide*.

Data Services prerequisite steps

Before you can set up Data Services, make sure that you have prepared the file system storage that it will use. You also need to have a user account with the required roles to access the Data Services area of the ViPR UI.

The Data Services area of the UI is designed to guide you through the setup procedure. Make sure that the following prerequisite steps have been performed to verify that you have a file virtual pool that can be used by the data service:

- Create an IP network that contributes file storage to the virtual array (Adding an IP network on page 54)
- Create a file virtual pool (Creating or editing a virtual pool for file storage type on page 58 - supporting information is provided in: Virtual pools on page 54)

If you are using EMC Isilon, configure your DNS server to delegate resolution of the Isilon SmartConnect name to the SmartConnect service. The SmartConnect service returns the IP address used to connect to the Isilon cluster, based on the load balancing policy that has been selected.

To access the Data Services area you must have the System Administrator role. Two additional roles are required to complete the setup: Security Administrator and Tenant Administrator. The root user account has all of the required roles. Alternatively, the Security Administrator can assign these roles to a specific user who can perform the configuration.

The pages in the Data Services area are arranged so that you can work through them from left to right to complete the installation and configuration.

Choosing an IP network to support Data Services

Select the IP network that provides the file storage systems that underpin Data Services. If an IP network that provides file storage does not exist, create it.

Before you begin

This operation requires the System Administrator role in ViPR.

Procedure

1. Select **Admin** › **Data Services** › **Setup**.
2. In the Network Configuration area, select the network that you want to provide the virtual arrays used by the data services.

   If you have not configured a network, you can do it from the **Admin** › **Virtual Assets** › **Virtual Arrays** page by selecting a virtual array and using **Create IP Network**.
3. Select **Save**.

Configuring the ViPR controller to allow access by data VMs

Before you deploy data VMs, the addresses of the data VMs must be specified in the ViPR controller node configuration to allow each data node to connect to the Controller services.

Before you begin

This operation requires the Security Administrator role in ViPR.

Allocate IPv4 addresses for all data nodes that you intend to add. If you create a subnet for the data VMs, you can use the subnet address. Using a subnet enables you to add data VMs without having to perform this procedure.

The Controller node needs to know which data VMs it will access so that these nodes are allowed to connect through its firewall to access the controller node coordination services.

This configuration must be in place when the data VM first starts. If it is not, the data VMs need to be restarted, one by one, after the data node addresses are added.

Procedure

1. Select **Admin** › **System** › **Configuration**.
2. In the **Network** › **Data Services** area of the Configuration page, enter the IPv4 address of the data node VMs that you are adding in the Data VM IPs field. If you are adding more than one, enter all addresses in a comma separated list. Alternatively, if you have created a new subnet for the data VMs, enter the subnet address.
3. Select **Save**.

Deploying ViPR data VMs

For Data Services (object and HDFS storage) support, you need to deploy data VMs in addition to the ViPR Controller VMs.

Before you begin

- The ViPR virtual appliance to which you are adding data VMs must already be deployed.

- The IPv4 address or hostname of all data VMs must have been added to the controller node configuration using the procedure in Configuring the ViPR controller to allow access by data VMs on page 64.
- If you are deploying the data node(s) immediately after deploying the ViPR virtual appliance, wait until the ViPR virtual appliance status on the Dashboard tab says "Stable" (about 2 minutes).
- The ESX host to which the data VM is deployed must meet the prerequisites listed below.

Table 6 ViPR data VM prerequisites

Item	Value
Number of CPUs	8
Memory	32 GB
Disk	150 GB
Connectivity	Ensure all data VMs have connectivity to each other.

- You need to be able to access the UI for the deployed ViPR virtual appliance.
- You need an available IPv4 address for each data VM and you need to know the subnet mask and gateway address for the data node.
- You need access to the ViPR data node VM distribution archive file.
- Refer to the *EMC ViPR Data Sheet and Compatibility Matrix* for the CPU, memory, and storage requirements of a data VM.

Procedure

1. Identify a working location that is accessible from the vCenter where you are deploying ViPR and put the files required to install the ViPR data node VM in this location.

   These comprise a dataservice OVF, the ViPR virtual machine disk files (VMDKs), and a configuration file that you download in this procedure. The working location does not need to be on a ViPR VM. You can use laptop storage, for example.

2. Extract the ViPR dataservice OVF file and the VMDK files from the distribution archive, `vipr-*-dataservice.zip`, to the working location.

   The files are `vipr-*-dataservice.ovf`, `vipr-*-disk1.vmdk`, `vipr-*-disk2.vmdk`, `vipr-*-disk4.vmdk`, and `vipr-*-dataservice.mf`.

3. Open a web browser window on https://*ViPR_virtual_ip* to run the ViPR UI.
4. Log in to the UI as a user who has the System Administrator role and the Security Administrator role. The root user has these permissions or the Security Administrator can assign these roles to a user.

   The System Administrator role is required to access the Data Services area of the UI. The Security Administrator role is required due to the need to download a file containing secure configuration information.

5. Select **Admin** › **Data Services** › **Setup**.
6. Under Data Services Configuration, download the Data Services configuration file (`config.iso`).

If you have a previously downloaded `.iso` file, do not use it if you have made any controller node configuration changes since it was downloaded. Use a newly downloaded `.iso` file.

During deployment, the ISO image is mounted by vCenter and configuration information required by the data node VM is obtained. This information comprises the addresses and ports of the controller node services that the data node needs to access.

7. Using an OS command, file browser, or the like (not the ViPR UI), copy `config.iso` from the download location to the working location where the OVF file and VMDK files reside.
8. Log in to vCenter using the vSphere client and deploy `vipr-*-dataservice.ovf` for each data VM using the following steps.
   a. From the **File** menu, select **Deploy OVF Template...**.
   b. Browse to and select the dataservice OVF file, located in the working location created earlier.
   c. On the **OVF Template Details** page, review the details about the data node VM.
   d. Accept the End User License Agreement.
   e. Enter a name for the data node VM and select its location.
   f. Select the host or cluster that hosts the VM.

      If you selected a host or cluster before starting the deployment, you are not be offered this selection.
   g. Select a resource pool for the VM.

      If you selected a resource pool before starting the deployment, you are not be offered this selection.

      When selecting the resource pool, do not select the controller vApp.
   h. If more than one datastore is attached to the ESX host, select the datastore for your VM.
   i. Select a disk format: **Thick Provision Lazy Zeroed**, **Thick Provision Eager Zeroed** (recommended for production deployment), or Thin Provision.
   j. On the **Network Mapping** page, map the source network to a destination network as appropriate.
   k. Enter the properties for the VM.

Table 7 ViPR data node VM OVF properties

Property name in vSphere Client	OVF property key name	Description
Data service IP address	network_datanode_ipaddr	One IPv4 address for the data VM.
Data service network netmask	network_datanode_netmask	IPv4 netmask for the data VM.
Data service network gateway IP address	network_datanode_gateway	IPv4 address for the data VM.

l. Review the selections you have made at the **Ready to Complete** page and select **Finish**.

9. Once the deployment has completed successfully, start each data node VM, one at a time, and check to see that the data node VM appears in the ViPR Virtual Appliance area of the UI Dashboard: **Admin** › **System** › **Dashboard**.

Adding a data services virtual pool

Objects are stored in data services virtual pools and each pool must have at least one data store to provide the underlying file system storage.

Before you begin

The following prerequisites apply:

- This operation requires the System Administrator role in ViPR.
- You must know whether the pool will be used for object, HDFS, or both object and HDFS data.

Procedure

1. Select **Admin** › **Data Services** › **Virtual Pools**.
2. Enter a name for the virtual pool.
3. Optional. Enter a description for the virtual pool.

   When the virtual pool has been created, the object description will be displayed on the **Virtual Pools** page.
4. Select the Type of the virtual pool. The type is either: Object (default), HDFS, or Object and HDFS.
5. Select **Save**.

   The virtual pool will be displayed on the **Admin** › **Data Services** › **Virtual Pools** page.

After you finish

A data services virtual pool must have a data store before it can be used. This applies even when you are intending to ingest data into object storage - a process which adds the ingested file system as a data store.

Adding a data store

A data services virtual pool must be backed by one or more data stores, each of which is associated with an underlying file system.

Before you begin

This operation requires the System Administrator role in ViPR.

Procedure

1. Select **Admin** › **Data Services** › **Data Stores**.
2. On the **Data Stores** page, select **Add**.
3. Enter a name for the data store.

   The data store name can reflect the underlying file system storage that provides the data store.
4. Optionally, add a description for the data store.

5. Select the virtual array that will provide the data store.

   The file virtual pools that you will be offered will be those associated with the selected array.
6. Select the file virtual pool that will provide the file system that underlies the data store.
7. Enter the size of the data store.
8. Select the data services virtual pool to which this data store belongs.

   When creating object buckets, clients do not know which data stores underpin a data services virtual pool. They choose the virtual pool based on its name.
9. Select **Save**.

Results

The state field in the Data Stores table should display "readytouse".

Configuring the root tenant to use Data Services

Enables the configuration of a namespace for the root tenant and configuration of default values for the data services virtual pool and the project to which object storage for this tenant should be assigned.

Before you begin

This operation requires the user to be assigned to more than one role, or to be assigned additional permissions:

- The System Administrator role is required to access the **Admin** › **Data Services** › **Tenant Configuration** area.
- The Tenant Administrator role, or ACL permissions for a project, is required in order to choose the default project.

The root user account has these roles and can be used to perform this task.

Procedure

1. Select **Admin** › **Data Services** › **Tenant Configuration**.
2. Enter the identity of the namespace to use for this tenant.

   The namespace must be unique for each tenant in the same ViPR virtual data center.
3. Select the default virtual pool. If a virtual pool has not been created yet, you can create one by selecting **Create Virtual Pool**.

   When using the Object Data Service, if a client does not specify a virtual pool, the contents of the default virtual pool that is visible to the logged in user will be returned by ViPR.
4. Select the default project that will be used when object requests are made.

   If you are a Tenant Administrator you will be able to select **Create Project** and create a new project. If you are a System Administrator with project permissions, you will be presented with a list of projects that you are assigned to, but you will not be able to create a new one.
5. Select **Save**.

Adding a Base URL

This task is only necessary if you use object clients that encode the location of an object, its namespace and bucket, in a URL. In that case you can specify a base URL that will be used, together with the namespace, as the path to objects in a tenant.

Before you begin

This operation requires the System Administrator role in ViPR.

You must ensure that the domain specified in a request that uses a URL to specify an object location resolves to the location of the ViPR appliance.

Procedure

1. Select **Admin** › **Data Services** › **Base URLs**.
2. Select **Add**.

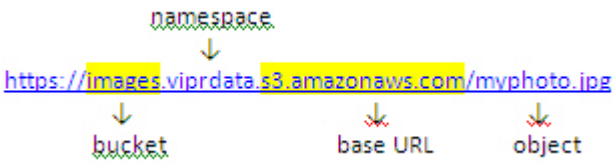
   The **Create Base URL** page is displayed.
3. Enter the name of the base URL. This will provide additional information about the base URL when looking at the base URL table.
4. Enter the base URL.

   If your objects location URLs are in the form: `https://mybucket.mynamespace.acme.com` (that is, `bucket.namespace.baseurl`) or `https://mybucket.acme.com` (that is, `bucket.baseurl`), the base URL would be `acme.com`.

   You can specify which format in the Use Namespace selector.
5. Choose the format in which your object address is encoded in the URL: with a namespace or without a namespace.
6. Select **Save**.

Example of a base URL

As an example of the use of the Base URL, an object named myphoto.jpg in the images bucket with a base URL of s3.amazonaws.com and a tenant namespace of viprdata, would be addressable using the following URL: `https://images.viprdata.s3.amazonaws.com/myphoto.jpg`



Note

The Object Data Service may include a list of base URLs.

Using the Object Data Service

Once you have configured data services, clients can access object storage using the ViPR API or using an existing object client, such as the S3 browser.

Steps are provided to enable you to demonstrate that the object service is configured, and that you can create buckets and store objects in the buckets using the S3 browser.

Object storage users are required to present an object data store key (also referred to as a secret key) to enable them to authenticate with the object service. Object data store keys can be generated programmatically by a client or can be generated manually from the ViPR UI.

Adding an object data store key

An object data store key can be created in the UI and used to access ViPR object storage.

Before you begin

Object store keys can be created by ViPR users who are domain users and have access to the UI.

Procedure

1. Select **User Menu** › **Manage Data Store Keys**.
2. Select **Add**.

   A new key will be added to the Data Store Keys table. An object user can have a maximum of 2 object data store keys. The key can be copied and used as the secret key when accessing the ViPR object stores using an object client.

Testing the object service using the S3 Browser

You can test your installation by creating an object bucket using the ViPR Amazon S3 API through the S3 Browser.

Before you begin

- You will need to have the S3 Browser installed.
- You will need an object data store key (a secret key) generated from the ViPR UI (refer to Adding an object data store key on page 70).
- You will need to have an authentication provider configured in ViPR so that one or more domain users are available.

Procedure

1. In the S3 Browser, select **Accounts** › **Add New Account**.
2. At the Add New Account dialog, enter the required details listed below.

Account Setting	Description
Account Name	The name of the account. This can be any name you choose.
Access Key Id	This is the name of the ViPR account. It must be the same account name that you used to generate an object store key. You can use the "root" user or any other available user. For the root user you would simply enter "root", for a normal ViPR user you would enter a name in the format: username@yourco.com.

Account Setting	Description
Secret Access Key	This is the ViPR object store key that must be generated from the UI or by using the ViPR CLI or API. You can copy it from the ViPR UI and paste it into this field.

3. At the Add New Account Dialog, click **Advanced** (in the bottom left-hand corner).
4. Check the Use Amazon S3 Compatible Storage box.
5. Enter the hostname or IP address of the data node and specify the appropriate port for the S3 service. For https the port is 9021, for http it is 9020.

   For example: `mc1234.yourco.com:9021`
6. Select **Close**.
7. Complete the account creation by clicking **Add New Account**.
8. Select **Buckets › Create New Bucket**
9. Enter a name for the bucket and specify a region.
10. Select **Create New Bucket**.

Results

You can now upload files to the bucket.

CHAPTER 6

Setting Up Multiple Tenants

Prerequisites for creating multiple tenants

ViPR can be configured with multiple tenants. Each tenant has its own environment for creating and managing storage. Storage resources assigned to a tenant cannot be accessed by users from other tenants.

Before creating additional tenants, you must have performed the deployment and initial configuration of the ViPR controller described in the *EMC ViPR Installation and Configuration Guide* chapter entitled "Initial configuration of ViPR virtual appliance".

The initial configuration of ViPR sets up a single-tenant environment. Only the provider tenant is available by default. To set up a multi-tenant ViPR environment, you must use the API procedure described in this chapter. (An analogous procedure using the ViPR CLI is also available.) You cannot create subtenants under the provider tenant from the ViPR User Interface.

Physical assets, such as storage systems and fabrics, added to ViPR are available to the virtual data center and can be assigned to any tenant. Similarly, virtual arrays and virtual pools created in ViPR are virtual data center assets and can be assigned to any tenant, including new tenants that you create. For example, the configuration of virtual arrays and virtual pools can be performed for the provider tenant from the UI. Those virtual arrays and virtual pools can then be assigned to new tenants.

ViPR role requirements
The root user for your ViPR vApp has all the role assignments you need to complete the multi-tenant setup.

Configuring multiple tenants with the REST API

This section shows how to configure multiple tenants with the ViPR API.

Before you begin

Complete the deployment and initial configuration steps in the *EMC ViPR Installation and Configuration Guide*.

Procedure

1. Authenticate with ViPR using an account that has Security Administrator and System Administrator roles. The root user has these roles and can be used.

   How you authenticate depends on the HTTP client that you are using. If you are using a browser-based client, you could log in at the ViPR UI and the session cookie created will authenticate the HTTP client connection.

2. Ensure you have an authentication provider configured that will authenticate users in your domain.

   Either:

   - Create an authentication provider at the **Admin** › **Security** › **Authentication Providers** menu of the ViPR UI.
   - Use the `/vdc/admin/authnproviders` API. For example:
     Request

     ```
     POST /vdc/admin/authnproviders
           <authnprovider_create>
             <mode>ad</mode>
             <domains>
                   <domain>yourco.com</domain>
                   <domain>domain2.yourco.com</domain>
                   <domain>domain3.yourco.com</domain>
     ```

```
            </domains>
            <name>multi-domain forest</name>
            <server_urls>
                <server_url>ldaps://MyLDAPServer.yourco.com:3269</
    server_url>
            </server_urls>
            <server_cert>my_server_certificate</server_cert>

    <manager_dn>CN=manager_bind,OU=Test1,OU=Test,DC=yourco,DC=com</
    manager_dn>
            <manager_password>Password</manager_password>
            <group_attribute>CN</group_attribute>
            <search_base>DC=yourco,DC=com</search_base>
            <search_filter>userPrincipalName=%u</search_filter>
            <search_attribute_key>userPrincipalName</
    search_attribute_key>
            <group_whitelist_values></group_whitelist_values>
            <search_scope>SUBTREE</search_scope>
       </authnprovider_create>
```

3. Get the urn ID of the root provider tenant.

   You must have the Tenant Administrator role to perform this operation.

   Request

   ```
   GET /tenant
   ```

   Response

   ```
   <tenant_info>
       <id>urn:storageos:TenantOrg:e5013f5e-41d7-4cf9-
   b1fd-4fecfad0c18c:</id>
       <name>Provider Tenant</name>
       <link href="/tenants/
   urn:storageos:TenantOrg:e5013f5e-41d7-4cf9-b1fd-4fecfad0c18c:"
             rel="self"/>
     </tenant_info>
   ```

   The urn of the root provider tenant in this example is:

   ```
   urn:storageos:TenantOrg:e5013f5e-41d7-4cf9-b1fd-4fecfad0c18c:
   ```

   Use this urn as the parent when creating a new tenant in the following step.

4. Create a new tenant and map users to it through a domain that is included in the authentication provider.

   Note

   The set of LDAP users assigned to a subtenant is always a subset of the users mapped to the Provider Tenant.

   In this example, the users in the domain `domain2.yourco.com` are mapped into the tenant called `EMC tenant`. You must have the Tenant Administrator role for the parent tenant to perform this operation. The {id} variable is the URN of the provider tenant.

   Request

   ```
   POST /tenants/{id}/subtenants
   <tenant_create>
     <name>EMC_tenant</name>
     <user_mappings>
       <user_mapping>
         <domain>domain2.yourco.com</domain>
       </user_mapping>
     </user_mappings>
   </tenant_create>
   ```

You can control the users mapped into a tenant by specifying attributes. For example, if you only want users assigned to a specific department in AD to be mapped into the tenant, you can set key/value attributes. For example:

```
<user_mapping>
  <domain>domain2.yourco.com</domain>
   <attributes>
     <attribute>
     <key>department</key>
     <value>development</value>
    </attribute>
   <attributes>
  </user_mapping>
```

Alternatively, you can map users into the tenant based on their AD group. The following user mapping maps members of the "lab users" group into the tenant:

```
<user_mapping>
  <domain>domain2.yourco.com</domain>
  <groups>
   <group>lab users</group>
  </groups>
 </user_mapping>
```

You can include more than one ‹user_mapping› to enable users to be mapped from any of the specified mappings.

If you included more than one group in a ‹user_mapping›, the user must belong to all groups. In the example below, users must belong to both "lab users" and "lab administrators" groups to be mapped into the tenant.

```
<user_mapping>
  <domain>domain2.yourco.com</domain>
  <groups>
   <group>lab users</group>
   <group>lab administrators</group>
  </groups>
 </user_mapping>
```

Response

```
<tenant>
    <creation_time>1378919846777</creation_time>
    <id>urn:storageos:TenantOrg:4edc456c-
c7f5-4c54-84b2-29715cc8f504:</id>
    <inactive>false</inactive>
    <link href="/tenants/urn:storageos:TenantOrg:4edc456c-
c7f5-4c54-84b2-29715cc8f504:" rel="self"/>
    <name>EMC tenant</name>
    <tags/>
    <parent_tenant>
      <id>urn:storageos:TenantOrg:e5013f5e-41d7-4cf9-
b1fd-4fecfad0c18c:</id>
      <link href="/tenants/
urn:storageos:TenantOrg:e5013f5e-41d7-4cf9-b1fd-4fecfad0c18c:"
rel="self"/>
    </parent_tenant>
    <user_mappings>
      <user_mapping>
        <attributes/>
        <domain>domain2.yourco.com</domain>
        <groups/>
      </user_mapping>
    </user_mappings>
</tenant>
```

5. If you want to assign access to a virtual array to the newly created tenant you can use the following steps.
   By default, the access control list (ACL) for a virtual array is wide open and all tenants have access. Once you assign a tenant to the ACL for a virtual array, only that tenant will have access unless you assign other tenants to the ACL.

a. Get a list of virtual arrays.

Request

```
GET /vdc/varrays
```

Response

```
  <varrays>
    <varray>
      <id>urn:storageos:VirtualArray:1b86bbe1-c939-49d3-
b0ae-027dc95b1ccc:</id>
      <link href="/vdc/varrays/urn:storageos:VirtualArray:
1b86bbe1-c939-49d3-b0ae-027dc95b1ccc:" rel="self"/>
      <name>VSA</name>
    </varray>
  </varrays>
```

Use one of the virtual array IDs for the next step. This example shows the following ID:

```
<id>urn:storageos:VirtualArray:1b86bbe1-c939-49d3-
b0ae-027dc95b1ccc:</id>
```

b. Assign the new tenant access to a virtual array by adding this tenant to the ACL for the virtual array.

You must be authenticated as a user with the System Administrator or Security Administrator role to perform this operation.

Request

```
PUT /vdc/varrays/urn:storageos:VirtualArray:1b86bbe1-c939-49d3-
b0ae-027dc95b1ccc:/acl
  <acl_assignment_changes>
    <add>
      <privilege>USE</privilege>
      <tenant>urn:storageos:TenantOrg:4edc456c-
c7f5-4c54-84b2-29715cc8f504:</tenant>
    </add>
  </acl_assignment_changes>
```

Response

```
  <acl_assignments>
    <acl_assignment>
      <privilege>USE</privilege>
      <tenant>urn:storageos:TenantOrg:4edc456c-
c7f5-4c54-84b2-29715cc8f504:</tenant>
    </acl_assignment>
  </acl_assignments>
```

6. If you want to a assign access to a virtual pool to the new tenant you can use the following steps.

By default, the access control list (ACL) for a virtual pool is wide open and all tenants have access. Once you assign a tenant to the ACL for a virtual pool, only that tenant will have access unless you assign other tenants to the ACL.

a. Get a list of virtual pools. In the example below, file virtual pools have been listed.

Request

```
GET /file/vpools
```

Response

```
  <vpool_list>
    <virtualpool>
      <id>urn:storageos:VirtualPool:58406f8b-5a0e-41c0-
a91b-5a8c59ac3a02:</id>
```

```
      <link href="/file/vpools/urn:storageos:VirtualPool:
58406f8b-5a0e-41c0-a91b-5a8c59ac3a02:" rel="self"/>
      <name>vsp1</name>
      <vpool_type>file</vpool_type>
    </virtualpool>
  </vpool_list>
```

b. Retrieve the urn of a virtual pool and add the tenant to the ACL for that pool.

You must be authenticated as a user with the System Administrator or Security Administrator role to perform this operation.

Request

```
PUT /file/vpools/urn:storageos:VirtualPool:58406f8b-5a0e-41c0-
a91b-5a8c59ac3a02:/acl
  <acl_assignment_changes>
    <add>
      <privilege>USE</privilege>
      <tenant>urn:storageos:TenantOrg:4edc456c-
c7f5-4c54-84b2-29715cc8f504:</tenant>
    </add>
  </acl_assignment_changes>
```

Response

```
    <acl_assignments>
      <acl_assignment>
        <privilege>USE</privilege>
        <tenant>urn:storageos:TenantOrg:4edc456c-
c7f5-4c54-84b2-29715cc8f504:</tenant>
      </acl_assignment>
    </acl_assignments>
```

7. To perform any tenant-specific administration, you need to have a Tenant Administrator for the tenant. You can create a Tenant Administrator using the `/tenants/{id}/role-assignments` path, as shown below:

Request

```
PUT /tenants/urn:storageos:TenantOrg:4edc456c-
c7f5-4c54-84b2-29715cc8f504:/role-assignments

<role_assignment_change>
<add>
<role>TENANT_ADMIN</role>
<subject_id>fjones@domain2.yourco.com</subject_id>
</add>
</role_assignment_change>
```

8. For users to provision file or block storage, or to access object storage, the user must be assigned to a project. To create projects for the tenant, you can use `/tenants/{id}/projects`. For example:

Request

```
POST /tenants/urn:storageos:TenantOrg:4edc456c-
c7f5-4c54-84b2-29715cc8f504:/projects

<project_create>
   <name>marketing_project</name>
</project_create>
```

Response

```
<tenant_project>
    <id>urn:storageos:Project:
60a3069e-74cc-4e79-9857-1c121ce1635a:</id>
    <link href="/projects/urn:storageos:Project:
60a3069e-74cc-4e79-9857-1c121ce1635a:" rel="self"/>
    <name>marketing_project</name>
</tenant_project>
```

If you have assigned a user to the Tenant Administrator role for the tenant, they will automatically have access to the project.

You can use the `projects/{id}/acl` path to assign permissions to a user for the project. For example:

Request

```
PUT projects/ urn:storageos:Project:
60a3069e-74cc-4e79-9857-1c121ce1635a:/acl
<acl_assignment_changes>
   <add>
      <privilege>USE</privilege>
      <subject_id>bsmith@domain2.yourco.com</subject_id>
   </add>
</acl_assignment_changes>
```

9. If you want to use Data Services, you need to assign a namespace to the tenant and assign a default data services virtual pool. You can also assign a default project. You must be authenticated as a user with the System Administrator role to perform this operation.

   Request

   ```
   POST /object/namespaces/namespace
     <namespace_create>
       <namespace>namespace1</namespace>
       <vdcs>
         <tenant>urn:storageos:TenantOrg:4edc456c-
   c7f5-4c54-84b2-29715cc8f504:</tenant>
       </vdcs>
     </namespace_create>
   ```

   Response

   ```
     <namespace>
       <id>namespace1</id>
       <inactive>false</inactive>
       <link href="/object/namespaces/namespace/namespace1"
   rel="self"/>
       <tags/>
       <vdcs/>
     </namespace>
   ```

Configuring multiple tenants with the CLI

This section describes how to configure multiple tenants with the ViPR CLI. Complete the following procedure for each tenant you want to create.

Before you begin

- This procedure uses the ViPR CLI. Follow the setup instructions in the *EMC ViPR CLI Reference* to setup the command line interface.
- Follow the ViPR initial configuration for the Controller and Data Services in the *EMC ViPR Installation and Configuration Guide*.

Procedure

1. Authenticate using the "root" user.

   ```
   viprcli authenticate -u root -d /tmp

   Password: <enter user password>
   ```

2. Ensure you have an authentication provider that will authenticate users in your domain.

   Either:

- Create an authentication provider at the **Admin** › **Security** › **Authentication Providers** menu of the ViPR UI.
- Create an authentication provider using the CLI, as follows:

  a. Create a `provider.cfg` file in local folder. The content of `provider.cfg` should resemble the example below.

```
[Camb AD]
mode:ad
url:ldap://192.0.2.20
certificate:test_cert
passwd_user:Password
managerdn:CN=Administrator,CN=Users,DC=mytown,DC=emc,DC=com
searchbase:CN=Users,DC=mytown,DC=emc,DC=com
searchfilter:sAMAccountName=%U
searchkey:sAMAccountName
groupattr:CN
name:ad configuration
domains:mytown.emc.com
whitelist:*Admins*,*Test*
```

  b. Add AD/LDAP authentication provider. You must be authenticated as a user with the Security Administrator role to do this operation.
  `viprcli authentication add-provider -configfile provider.cfg`

3. Create a new tenant that uses the domain covered by the authentication provider. You need to be a Tenant Administrator for the parent tenant to create a tenant. For example:

   `viprcli tenant create -name marketing -domain mytown.emc.com`

4. You can control the users mapped into a tenant by specifying attributes or specifying AD group. For example, if you only want users assigned to a specific department in AD to be mapped into the tenant, you can set key/value attributes. For example:

   `viprcli tenant add-attribute -name marketing -key department -value marketingdepartment`

   This provides the ability, if required, to map uses from the same domain into different tenants by the appropriate attribute to their AD user.

   To map user from an Active Directory group into the tenant, you can use the `tenant add-group`. For example:

   `viprcli tenant add-group -name marketing -group "lab users" -domain mytown.emc.com`

5. If you want to assign access to a virtual array to the newly-created tenant, you can use the following steps.

   By default, the access control list (ACL) for a virtual array is wide open and all tenants have access. Once you assign a tenant to the ACL for a virtual array, only that tenant will have access unless you assign other tenants to the ACL.

   a. Get a list of virtual arrays.

      `viprcli varray list`

   b. Assign an array to the ACL for the tenant. For example:

      `viprcli allow -name <varray name> -tn marketing`

```
viprcli varray list
  NAME
  Isilon_Virtual_Array
  v_array
```

```
  viprcli varray allow -name Isilon_Virtual_Array -tenant
marketing
```

6. If you want to a assign access to a virtual pool to the newly-created tenant, you can use the following steps.

   By default, the access control list (ACL) for a virtual pool is wide open and all tenants have access. Once you assign a tenant to the ACL for a virtual pool, only that tenant will have access unless you assign other tenants to the ACL.

   a. Get a list of virtual pools, using:

   ```
   # viprcli vpool list -type file

   viprcli vpool list -type file

   Name                    Type    Protocol
   Isilon_Virtual_Pool     file    NFS
   ```

   or:

   ```
   viprcli vpool list -type block
   ```

   b. Give the tenant access to a virtual pool using `vpool allow`, as below:

   ```
   viprcli vpool allow -name Isilon_Virtual_Pool -tn
   marketing
   ```

7. For users to provision file or block storage, or to access object storage, the user must be assigned to a project. To create one or more projects for the tenant, use `project create`. For example:

   ```
   viprcli project create -name marketing_project -tn marketing
   ```

   You can assign users to the project using the update-acl operation and specifying the user and the appropriate privilege (own, use or backup).

   For example, to assign privileges to use a project , you might use:

   ```
   viprcli project update-acl -name marketing_project -tenant
   marketing -privilege use -subjectid bill@mytown.emc.com
   ```

   If you assign a user to the Tenant Administrator role for the tenant, they will automatically have access to all projects in the tenant.

   Note

   The next several steps are specific to Object/HDFS storage.

8. If you want to use Data Services, you need to assign a namespace to the tenant and assign a default data services virtual pool using the steps below. You can also assign a default project.

   a. Get a list of data services virtual pools.

   ```
   viprcli objectvpool list
     OBJECTVPOOL
     Isilon_DS_Virtual_Pool
   ```

   b. Create the namespace and assign a default virtual pool (cos). You can also assign a default project. You must be authenticated as a user with the System Administrator role to do this operation.

   ```
   viprcli namespace create -name namespace1 -cos
   Isilon_DS_Virtual_Pool -project marketing_project
   ```

Creating data store (secret) keys

Each object user requires their user id, from LDAP or Active Directory, and a secret key, also called an object data store key.

To generate a secret key for a user, use one of these three methods:

- Choose **User Menu › Manage Data Store Keys** from the ViPR UI.
- Call the following CLI operation:

  ```
  viprcli secretkeyuser add -uid <username from LDAP or AD>
  ```

- Call this ViPR REST API.

  ```
  POST object/secret-keys

  Request body
    <?xml version="1.0" encoding="UTF-8"?>
      <secret_key_create_param>
      <existing_key_expiry_time_mins>60</
  existing_key_expiry_time_mins>
    </secret_key_create_param>

  Response
    <user_secret_key>
      <secret_key>...</secret_key>
      <key_timestamp>...</key_timestamp>
      <link rel="..." href="..." />
    </user_secret_key>
  ```