SIMPLIFIED PROVISIONING WITH VIPR AND VPLEX

Discussion of Use Cases

ABSTRACT

This white paper illustrates how ViPR can be used to manage the day to day VPLEX provisioning and management tasks through the description of the validations performed to verify the applicable use cases.

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EXECUTIVE SUMMARY

EMC VPLEX federates data located on heterogeneous storage arrays to create dynamic, distributed, highly available data centers allowing for data mobility, collaboration over distance, and data protection. VPLEX transforms the delivery of IT to a flexible, efficient, reliable, and resilient service. EMC ViPR is a lightweight, software-only product that transforms existing storage into a simple, extensible, and open platform which can deliver fully automated storage services to help realize the full potential of the software-defined data center. VPLEX and ViPR together provide power to storage administrators to reduce the time to deliver complex growing environments required by their end users. With ViPR, provisioning can be conducted by storage consumers using a self-service portal by selecting a service profile template that meets their storage needs.

This paper discusses a series of validation procedures to verify the ability of ViPR to fully accomplish a set of VPLEX day to day use cases. Validation on use cases consisted of executing the supported VPLEX use cases in a variety of topologies. The ultimate goal of each use case is to complete all the tasks by using the ViPR user interface as a single entry point for the supported tasks.

AUDIENCE

This white paper is intended for readers that are familiar with storage technology and EMC products in general and are looking for information on how and what ViPR and VPLEX can accomplish when they are implemented together.

VPLEX AND VIPR OVERVIEW

WHAT IS VPLEX?

EMC® VPLEX™, and its GeoSynchrony™ operating system, addresses three significant IT needs:

- **Mobility:** Move data non-disruptively between EMC and non-EMC storage arrays without any downtime for the host. VPLEX moves data transparently and the virtual volumes retain the same identities and the same access points to the host. The host does not need to be reconfigured.

  VPLEX moves data between different storage installations:

  - Within the same data center or across a campus (VPLEX Local)
  - Within a geographical region (VPLEX Metro)

- **Availability:** VPLEX creates high-availability storage infrastructure across these same varied geographies with unmatched resiliency. Protect data in the event of disasters or failure of components in your data centers. With VPLEX, you can withstand failures of storage arrays, cluster components, an entire site failure, or loss of communication between sites (when two clusters are deployed)

- **Collaboration:** VPLEX provides efficient real-time data collaboration over distance for Big Data applications. AccessAnywhere provides cache-consistent active-active access to data across VPLEX clusters. Multiple users at different sites can work on the same data while maintaining consistency of the dataset.

VPLEX CLUSTERING ARCHITECTURE

VPLEX uses a clustering architecture and enables servers at multiple data centers to have concurrent read and write access to shared block storage devices. VPLEX is located between host systems and storage arrays in the data path. A VPLEX cluster, as shown below, can scale up through the addition of more engines, and scale out by connecting two clusters to form an EMC VPLEX Metro configuration.

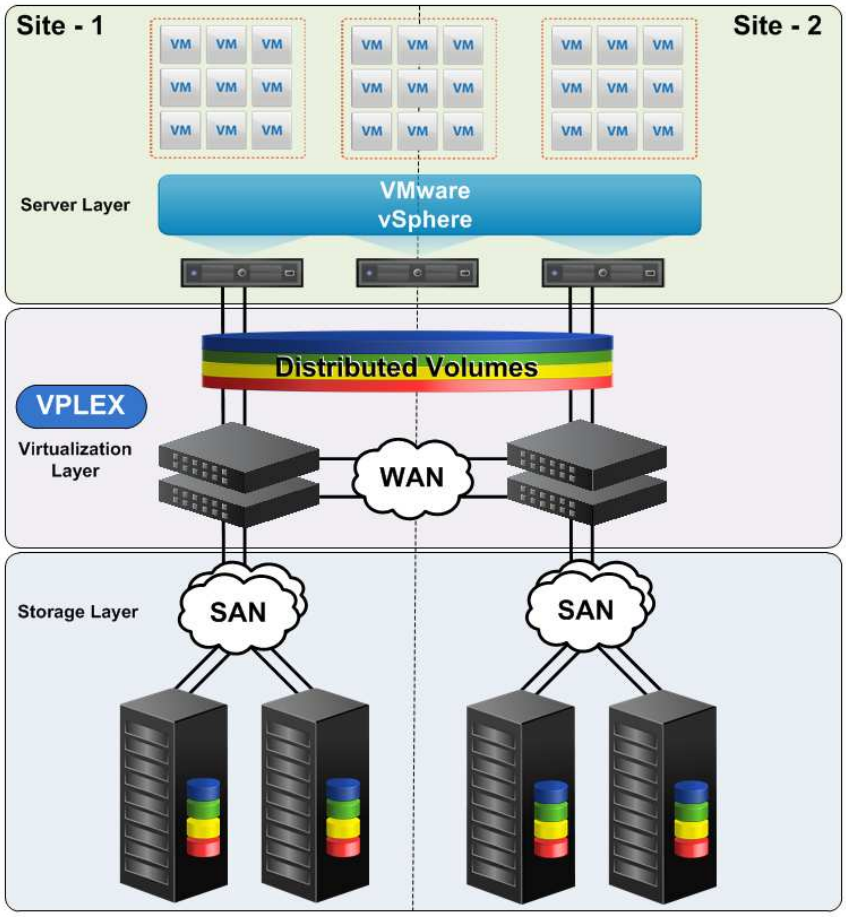


Figure 1 - VPLEX Distributed Devices

WHAT IS VIPR?

EMC® ViPR™ is a software-defined platform that abstracts, pools, and automates a data center's underlying physical storage infrastructure. It provides a single control plane for heterogeneous storage systems to data center administrators. ViPR enables software-defined data centers by providing:

- Storage automation capabilities for heterogeneous block and file storage (control path).
- Integration with VMware and Microsoft compute stacks to enable higher levels of compute and network orchestration.
- A comprehensive RESTful interface for integrating ViPR with management and reporting applications.
- A web-based User Interface (UI) that provides the ability to configure and monitor ViPR, as well as perform self-service storage provisioning by enterprise users.
- Comprehensive and customizable platform reporting capabilities, including capacity metering, chargeback, and performance monitoring through the included ViPR SolutionPack.

ViPR employs a policy-based placement algorithm to find the best fit in the infrastructure for the request given the target virtual pool and virtual array to:

- Select a physical array that matches the policies specified in the virtual array and virtual pool, then select a disk and create a LUN or file system.
- Establish the data path between the host and the storage by selecting ports and fabrics that connect the devices at an optimal level of performance setting up zones as needed.

VPLEX AND VIPR CONCEPTS AND TERMINOLOGY

VPLEX

VPLEX Local is a single VPLEX cluster and provides simplified management and non-disruptive data mobility across heterogeneous arrays.

VPLEX Metro provides data access and mobility between two VPLEX clusters within synchronous distances. A virtual volume can be Local to a single cluster or distributed across both clusters in a Metro.

Storage volume is a LUN or unit of storage presented by an array to a VPLEX cluster.

Virtual volume is a unit of storage presented by VPLEX to hosts

Distributed virtual volume is a virtual volume that is available to hosts at both VPLEX clusters in a VPLEX Metro.

VPlex Witness is an optional component that runs as a virtual machine on a customer host and on each cluster in a VPLEX Metro. VPLEX Witness observes the state of the clusters, and can distinguish between an outage of the inter-cluster link and a cluster failure. VPLEX Witness uses this information to guide the clusters to either resume or suspend I/O. In VPLEX Metro systems, VPLEX Witness provides seamless zero RTO failover for storage volumes in consistency groups. It is highly recommended that all Metro environments implement VPLEX Witness.

VIPR

Continuous copy is a mirror of a block volume.

Virtual Storage Array is a ViPR abstraction for the physical arrays, and the network connectivity between the physical arrays (and VPLEX) and hosts. All physical arrays in a virtual array must be connected on the same fabrics. The components that combine to enable connectivity from host to physical array(s) represent a virtual array. A separate ViPR virtual array should be created for each VPLEX cluster in a VPLEX Metro and should include the appropriate physical storage arrays and SAN fabrics.

Virtual Storage Pool is a collection of storage pools grouped together according to user-defined characteristics. The virtual pool defines the policies that will be applied to select the physical arrays, connectivity, performance, and protection applied in the provisioning process. Virtual pools expose performance and protection levels from storage to user. A virtual pool can be either thick or thin. Other notes on creating and configuring a virtual pool:

- Combine disks that have similar performance and protection characteristics into virtual pools.
- Native continuous copies are not supported with pools that have the expandable volume attribute.
- Multi-volume consistency provides the ability of assigning a volume from the pool to a consistency group.
- High Availability can be either VPLEX Local or Distributed
- Data Protection using snapshots and/or continuous copies. The maximum snaps and copies is a limit on all snaps and copies made from all volumes provisioned from this pool. It does not apply to each volume individually.
    - Max (native) snaphots - must be at least 1 to use array based snaps
    - Max (native) continuous copies - If HA=local or distributed, then this setting can only be 0 or 1. When set to 1 it allows you to create a VPLEX RAID-1 volume by running the “create continuous copy service” after initially provisioning a vplex volume.
- Storage Pool Assignment: If you set the (physical) 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.

ViPR Consistency Groups: Volumes can be assigned to consistency groups to ensure that snapshots of all volumes in the group are taken at the same point in time. This feature is also used to indicate whether a VPLEX consistency group is utilized when ViPR creates a VPLEX virtual volume. Consistency group names can be up to 64 characters consisting of letters, numbers or underscores.

ViPR Host Connectivity/Management:

- ViPR performs operations on the Linux host using SSH. The host must be configured to enable SSH login with root access to the system.
- ViPR performs operations on the Windows host using the WinRM service. This access must be enabled on the host. Make sure to check the ViPR Support Matrix for supported Windows server versions.

USE CASE ENVIRONMENT

The environment used for validate each Use Case consisted of a VPLEX Metro, ViPR controller, VMware ESX hosting Windows Server 2008 and SLES VMs. Additionally, each VPLEX cluster each had connectivity to a VMAX and VNX storage array. The following diagram depicts the Use Case environment. Solid lines represent SAN fabric connectivity. The broken lines represent management (IP) connectivity.

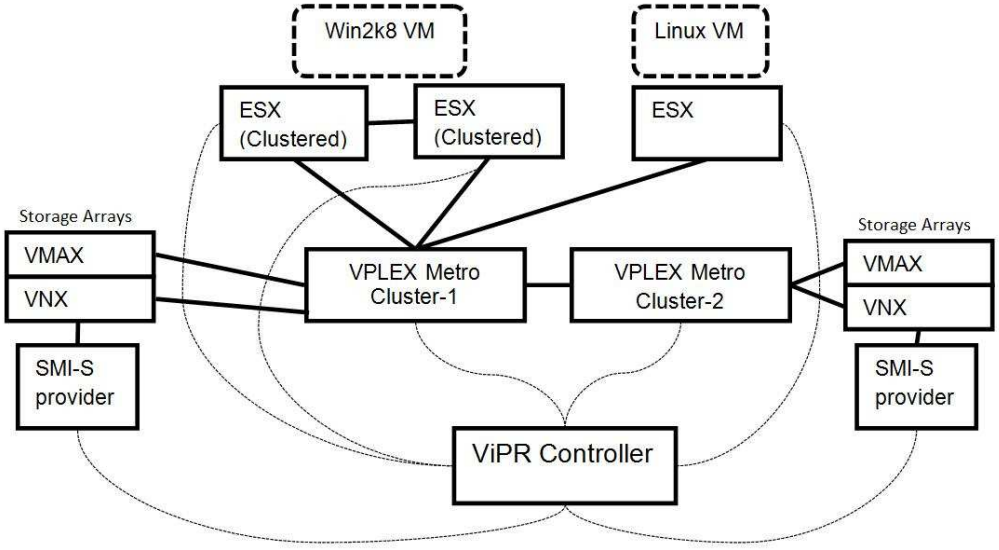


Figure 2 - VPLEX Metro with ViPR

The diagram below clarifies connectivity at a single VPLEX cluster level.

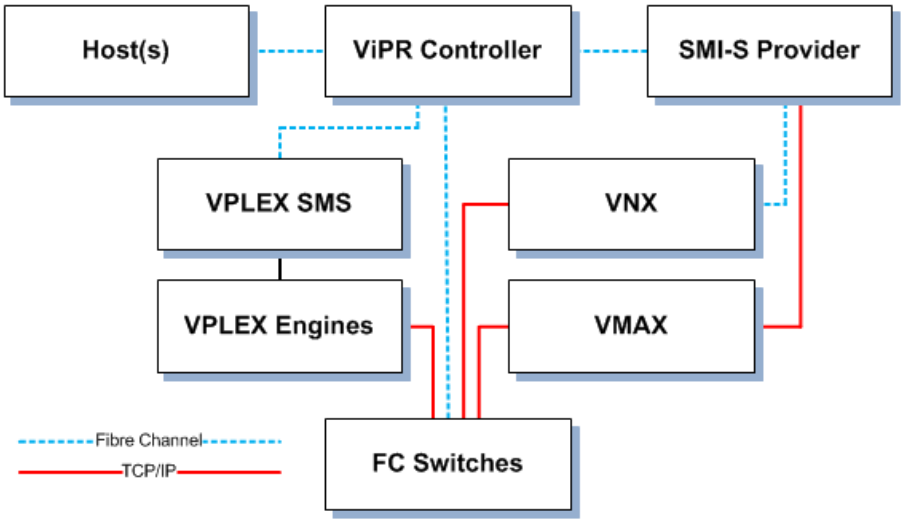


Figure 3 - ViPR Connectivity Diagram

SOFTWARE AND OS VERSIONS

- VPLEX Metro GeoSynchrony 5.4.1
- ViPR Controller 2.2 SP1
- Hosts: ESX 5.5
    - Virtual Machines:
        - Windows 2008
        - SLES 6

CONFIGURATION DETAILS

VPLEX is configured with metadata and logging volumes (system volumes) and has SAN paths to Arrays and hosts. The host connectivity isn't specifically necessary; ViPR can do the zoning if enabled.

Each VPLEX cluster in the VPLEX Metro is configured as a ViPR virtual Array.

USE CASES OVERVIEW

The following use cases were selected to illustrate whether ViPR could provide value in simplifying the management and provisioning of VPLEX. (see table). Each use case was executed via the ViPR GUI. The intent was to eliminate the use of native VPLEX management for these tasks.

Table 1 - List of VPLEX Use Cases with ViPR

Use Case Test Names
Add VPLEX as a physical asset to ViPR
Ingest UNexported VPLEX virtual-volumes
Create VPLEX block volume via ViPR: Local: Basic
Create VPLEX block volume via ViPR: Local: Batch
Create VPLEX block volume via ViPR: Metro: Basic
Create VPLEX block volume via ViPR: Metro: Batch
Expand VPLEX block volume via ViPR
Destroy VPLEX block volume via ViPR
Consistency group – create
Consistency group – add/remove volumes
Consistency group – destroy
Full Copy Creation Using VNX or VMAX Storage: Local or Distributed Volume
Create snapshot
Recover snapshot to production (note: VMAX/VNX only)
Re-use snapshot on other host
Volume encapsulation onto VPLEX from other array
Move local volume across Metro
Virtual Pool change:change BE of a virtual volume
Virtual Pool change: VPLEX Local to VPLEX Distributed
Snap of consistency group (snap of any in a cg = snap of all)
Create Continuous Copy of VPLEX volume (=VPLEX mirroring)
Detach Continuous Copy of VPLEX volume (=split VPLEX mirror)

For all of the use cases, ViPR Controller was already deployed. VPLEX was installed in the environment with metadata and logging volumes. VPLEX had connectivity to hosts and storage arrays. SMI-S providers for array management were also deployed prior to the start of validation.

All of the following use cases included the following requirements:

- Complete task without using any other UI besides ViPR.
- Complete task without errors.
- Where applicable, I/O was performed during the validation process to the appropriate volumes and the proper resulting state of data on the volume was verified.

NOTE: VPLEX and other User Interfaces may have been used to verify completion.

NAVIGATION OF THE VIPR GUI

Once logged into the ViPR UI, there is a menu bar along the left side. This menu bar expands and provides navigation to various features. Most of the use cases will be initiated from the **Service Catalog** using **View Catalog**. After a few use case descriptions this will simply be referred to as the **Service Catalog**.

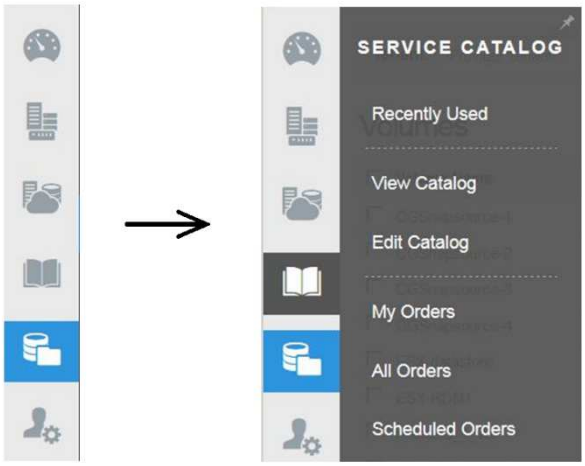


Figure 4 - ViPR Navigation

ADD VPLEX AS A PHYSICAL ASSET TO VIPR

In this step we added the storage arrays and both VPLEX and SMI-S storage providers to ViPR. Using the menu bar select **Physical Assets** and then select **Storage Providers**.

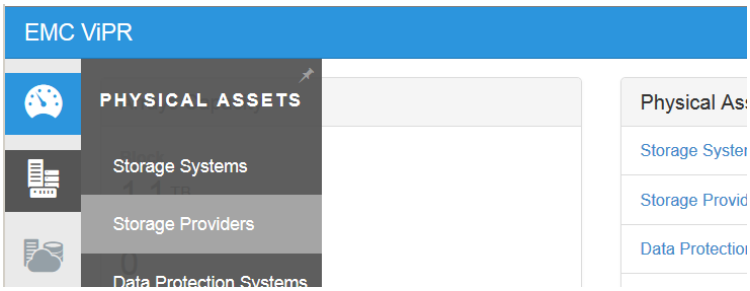


Figure 5 - Setting Storage Providers

For each provider:

- Click Add
- Provide a Name
- Select either "SMI-S for EMC VMAX, VNX Block" or VPLEX as appropriate.
- Provide the appropriate management account authentication information (username, password and port)

Once this information is saved, ViPR will list providers including the status of the latest update/discovery of the provider. It may take a few minutes to complete the discovery:

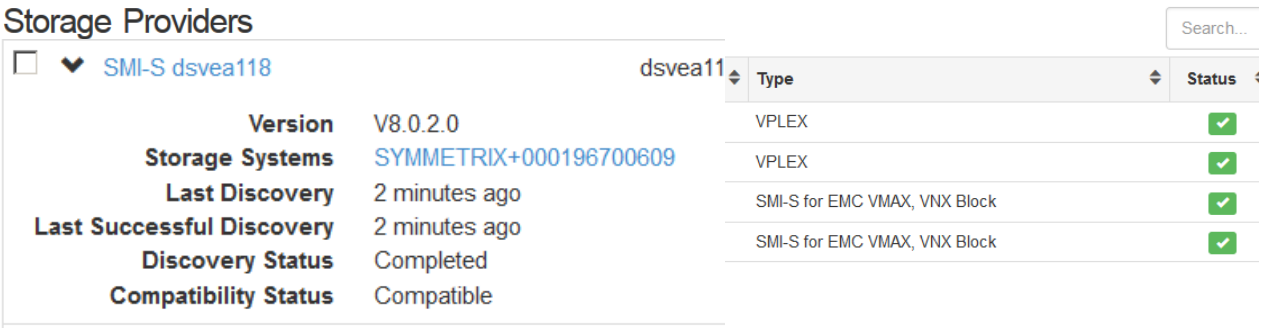


Figure 7 - SMI-S Provider Status

You can also get more details about a provider status by expanding a particular provider listing:

Next navigate to Storage Systems under Physical Assets on the menu bar.

Figure 8 - List Physical Assets

You should see the arrays and VPLEX listed.

INGEST UNEXPORTED VPLEX VIRTUAL-VOLUMES

ViPR has the ability to begin managing a pre-existing VPLEX virtual volume as long as it has not been exported to a host. This task is executed from the **Block Storage Services** portion of the **Service Catalog**. This is a two-step process where you must first discover the volumes and then ingest them.

Navigate to the **Service Catalog** section of the menu bar and select **View Catalog**:

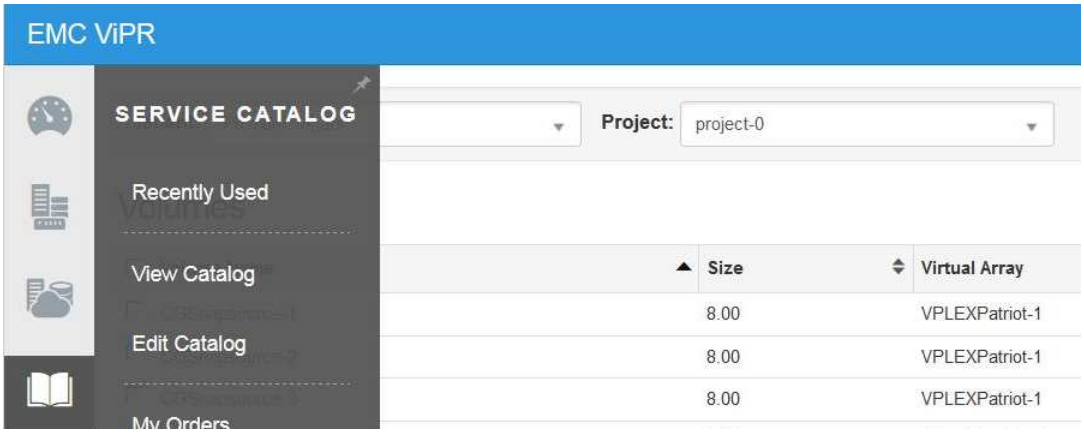


Figure 9 – View Service Catalog

NOTE: We will simply refer to this **View Catalog** selection as the **Service Catalog** through the rest of this document.

Select Block Storage Services

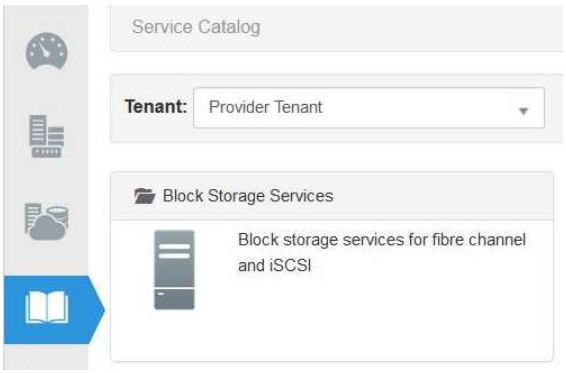


Figure 10 - Block Storage Services

Select Discover Unmanaged Volumes

Figure 11 - Discover Unmanaged Volumes

Select the Storage System

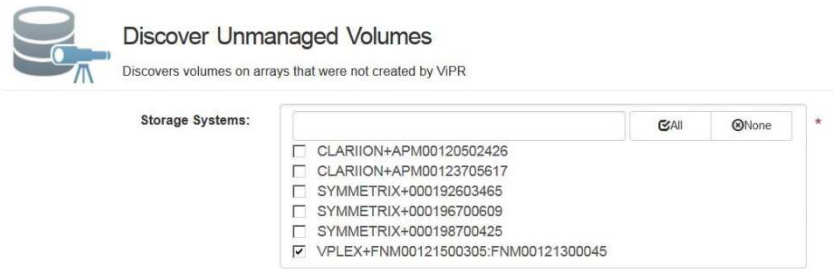


Figure 12 - Selecting the Storage System

Then click **Order** and the discovery process will start. When completed, discovered volumes will be indicated as shown below:

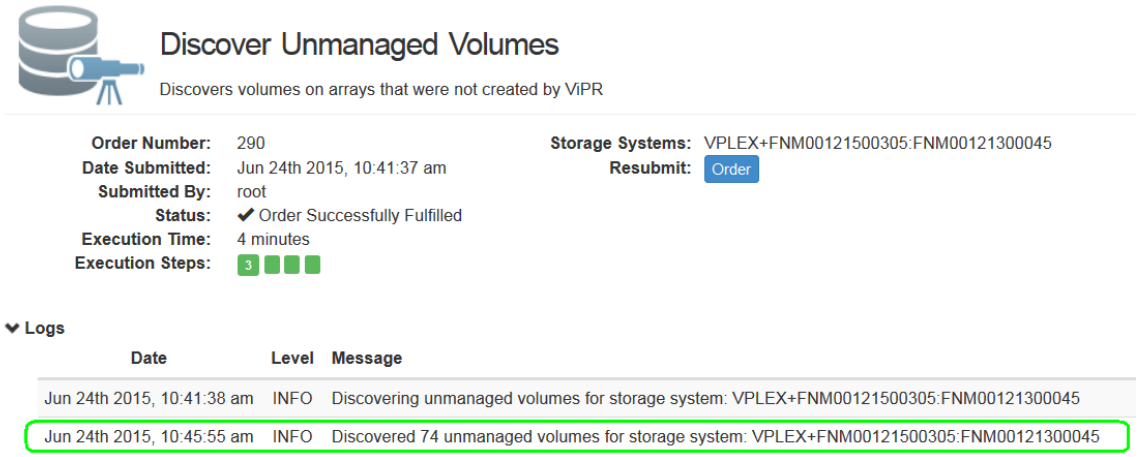


Figure 13 - Discovering Unmanaged Volumes

To ingest any newly discovered volumes, select **View Catalog** from the menu bar. Select **Block Services** and then select **Ingest Unexported Unmanaged Volumes**.

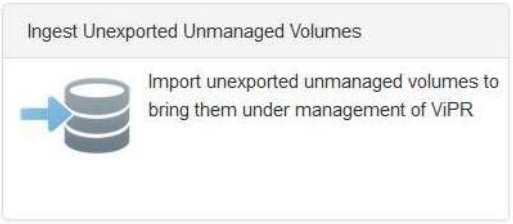
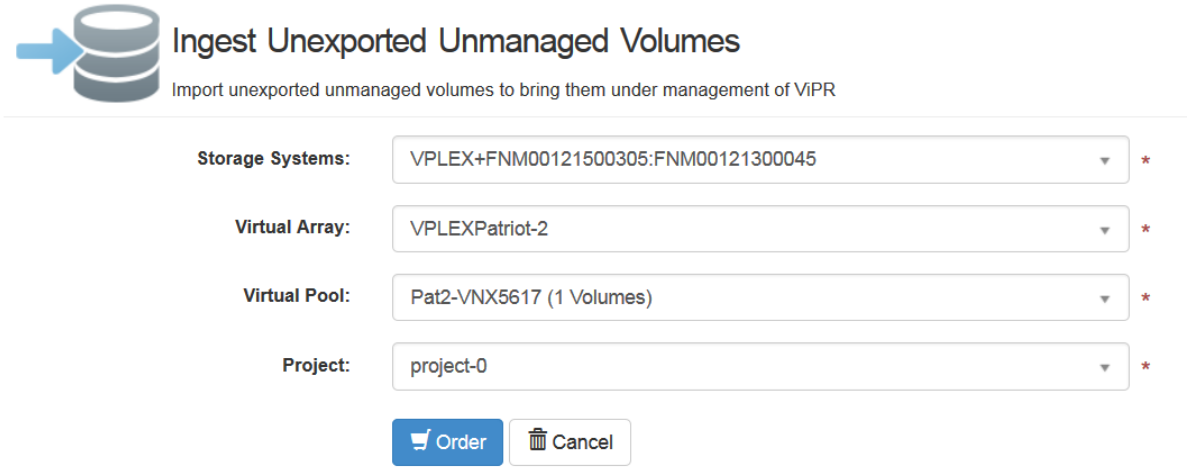


Figure 14 - Ingesting Unexported Unmanaged Volumes



Select the appropriate storage systems, virtual array, and virtual pool:

Figure 15 - Select Storage, Virtual Array, and Pool

Once the ingest order is complete you can see the ingested volumes in **Volumes** under the **Resources** selection from the menu bar:

Figure 16 - Ingested Volume Status

The VPLEX virtual volume name of each ingested volume will be assigned as the ViPR volume name.

Figure 17 - Ingested Volume Naming

CREATE VPLEX LOCAL VOLUME VIA VIPR

This use case verified the ability to create virtual volumes. The actual validation confirmed the ability to create a single volume, multiple volumes of the same size, as well as the ability to create terabyte size volumes. Note that the current version of ViPR only supports volume capacities that map to whole GB numbers.

Navigate to Create Block Volume in the Block Services section of the Service Catalog.

Figure 18 - Create a Block Volume

Enter in the virtual array, virtual pool, name and capacity. A consistency group can be selected if ViPR Data Protection is intended for these volumes. Currently, ViPR only allows volumes to become part of a consistency group when they are created. Also remember that currently, ViPR only supports whole numbers for the capacity specification.

NOTE: In order to create a local volume, you must select a virtual pool that has **High Availability** set to VPLEX Local.

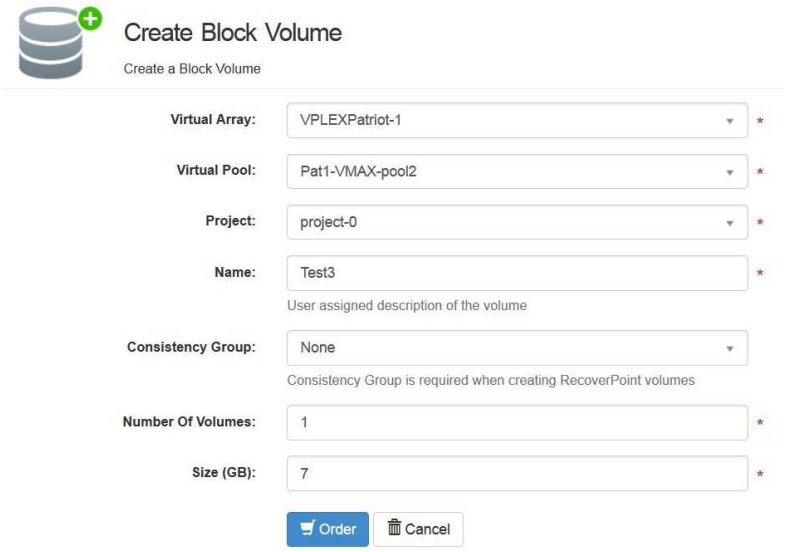


Figure 19 - Create Block Volume Options

To create multiple volumes with the same parameters, adjust the number of volumes to the number of volumes to be created. When multiple volumes are created, the names of the volumes will begin with the name specified on the order followed by "-X" where X is from 1 to the number of volumes specified. Click **Order** to create the volume(s).

CREATE VPLEX DISTRIBUTED VOLUMES WITH VIPR

This use case verified the ability to create VPLEX distributed virtual volumes. A distributed or Metro virtual volume is a VPLEX virtual volume created using a VPLEX distributed device that has mirror legs at each of the two VPLEX Metro clusters. The actual validation confirmed the ability to create a single Metro volume, multiple Metro volumes of the same size, as well as the ability to create terabyte size volumes.

The process for creating a Metro or distributed virtual volume is nearly identical to that of a local virtual volume. There are two differences:

- You must select a virtual pool that has **High Availability** set to **VPLEX Distributed**.
- You should select a ViPR consistency group. It is a VPLEX Best Practice that VPLEX Metro implementations include VPLEX Witness. VPLEX Witness only operates upon virtual volumes that are members of a VPLEX consistency group. Therefore, when creating VPLEX distributed virtual volumes with ViPR you must specify the appropriate ViPR consistency group. ViPR will create a consistency group on VPLEX if it doesn't already exist. Remember that ViPR only allows the assignment of a volume to a consistency group during the volume's creation. Currently, ViPR only supports VPLEX consistency groups created by ViPR.

The rest of the selections work the same as for a VPLEX local volume:

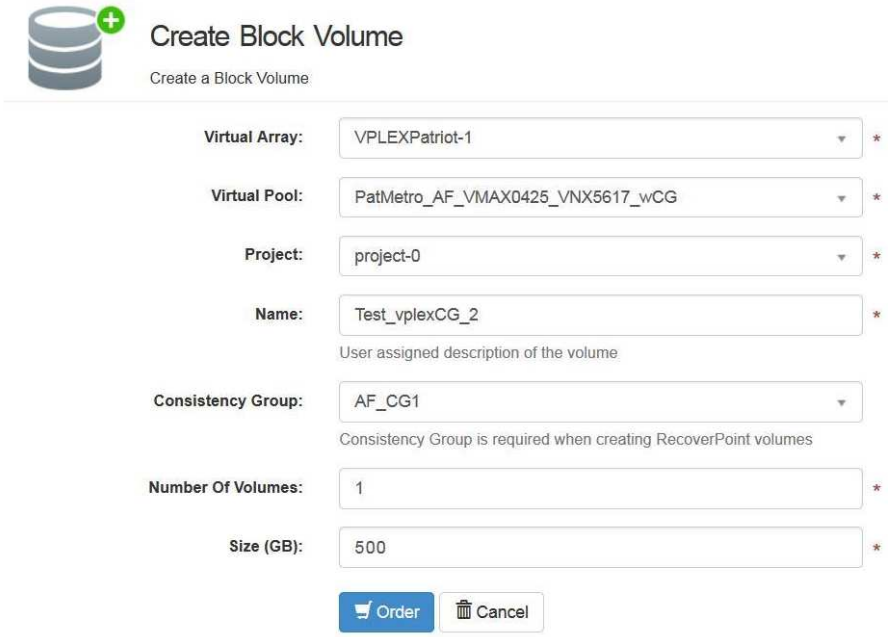


Figure 20 - Creating Distributed Block Volumes

EXPAND VPLEX BLOCK VOLUME VIA VIPR

This use case verified that the ability to expand the capacity of a VPLEX virtual volume. Note that in order to expand a ViPR volume the ViPR virtual pool must have been created with the expandable setting checked. Also note that some virtual pool Data Protection settings are not allowed when the expandable setting is checked.

Navigate to Expand Block Volume in the Block Services section of the Service Catalog.

Figure 21 - Expand Block Volumes

Select the volume to expand and enter in the new capacity. ViPR will only list volumes that are expandable. Also note that the resulting expansion may not be the exact capacity specified due to limitations on how storage is allocated by the physical array where the volume actually resides.

DESTROY VPLEX BLOCK VOLUME WITH VIPR

There are a couple of ways to remove or destroy a ViPR volume. There is a **Remove Block Volumes** selection in the **Block Services** section of the **Service Catalog**.

Figure 22 - Expanding Block Volumes

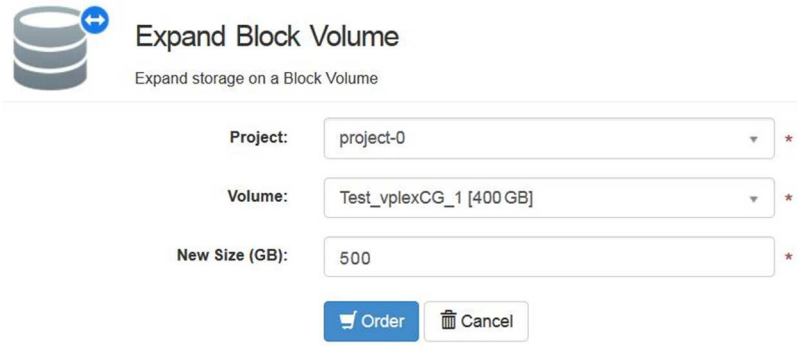


Figure 23 - Expand Block Volume

The other method is to navigate to the **Resources** menu bar selection and select **Volumes**.

Figure 25 - Navigating to Delete Volumes

Select one or more volumes and click **Delete Volume**.

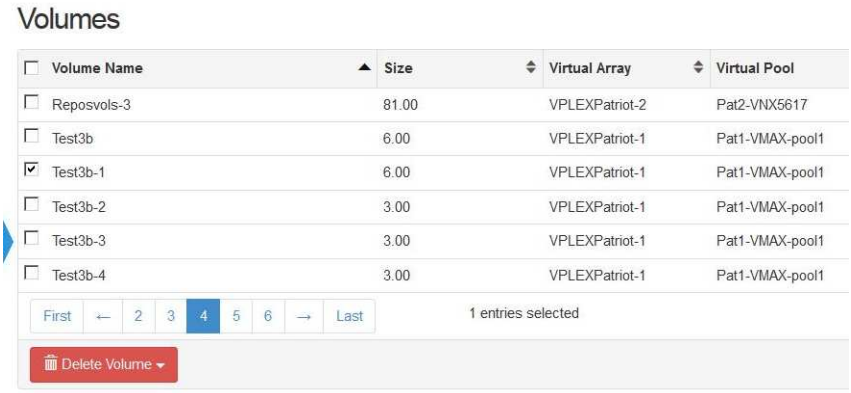


Figure 26 - Delete Volume Selection

You can also click on a volume name and see more detailed information. There is also a **Delete Volume** button on the detailed information window.

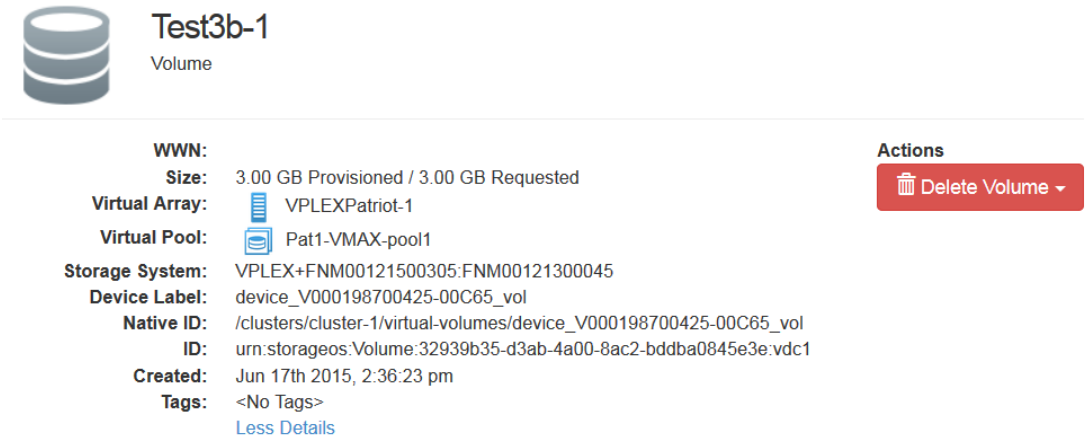


Figure 27 - Delete Volume Information

CONSISTENCY GROUP – CREATE

As mentioned in earlier use case validations, you will need ViPR consistency groups for VPLEX Metro distributed virtual volumes. Additionally, ViPR consistency groups provide for consistency across multiple volumes when creating snapshots or full copies (ViPR data protection features). ViPR consistency groups are managed under **Tenant Settings** in the menu bar.

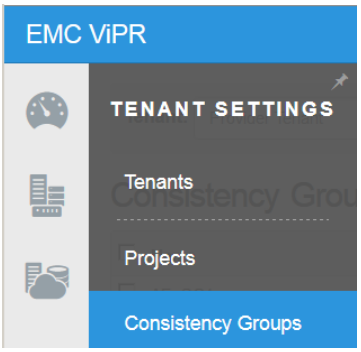


Figure 28 - Tenant Settings

To create a consistency group, select **Add** in the listing.

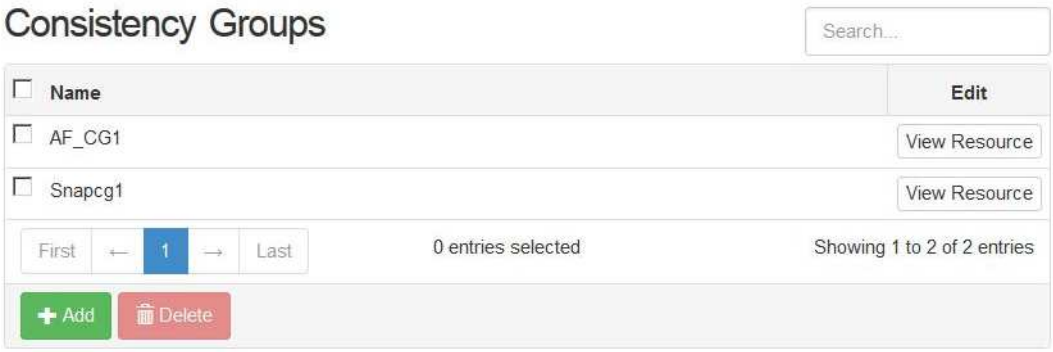


Figure 29 - Create Consistency Group

NOTE: Only standard naming conventions are allowed. Names must be 64 characters or less consisting of a combination of numbers, letters and/or underscores. No other special characters or wildcards are allowed.

CONSISTENCY GROUP – ADD/REMOVE VOLUMES

The only way to add a ViPR volume to a consistency group is to select the consistency group when creating the volume. The consistency group must exist prior to creating a volume so that it can be selected when creating the volume.

To delete a volume from a consistency group, select the consistency group from the list (similar to the list above). Then click the **Remove** button for the appropriate volume(s).

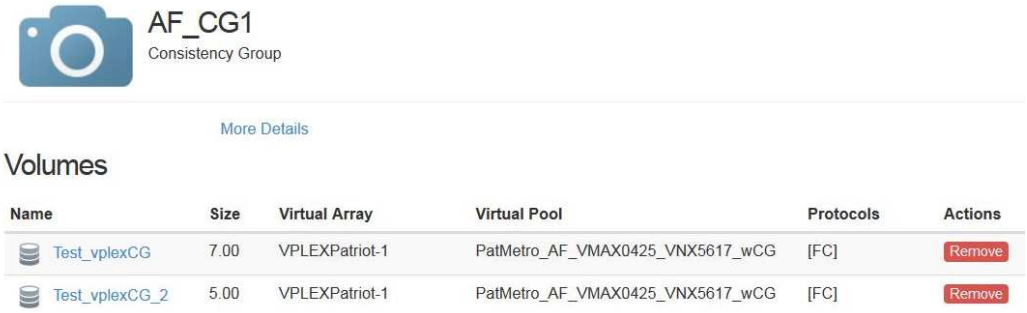


Figure 30 - Consistency Group Add/Remove Volumes

CONSISTENCY GROUP – DESTROY

A ViPR consistency group can be deleted after it has been emptied. Select (check) the empty consistency group and then select Delete. A confirmation box will appear. When a ViPR consistency group is deleted the corresponding VPLEX consistency group is deleted. See Figure 29 - Create Consistency Group.

FULL COPY CREATION USING VNX OR VMAX STORAGE

This section describes 4 use cases and involves the creation of a full copy (clone) on the same array as the selected source volume. If the source is a distributed volume then appropriate copies are created at each VPLEX cluster.

Navigate to the **Create Full Copy** service in the **Block Services** section of the **Service Catalog**. The array in question has to support the clone capability and the virtual pool of the source must have the appropriate data protection configuration.

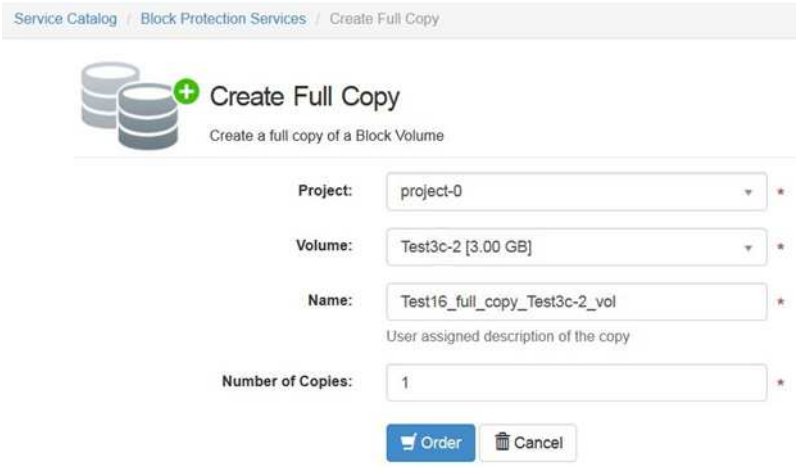


Figure 31 - Create Full Copy Options

CREATE BLOCK SNAPSHOT

Navigate to **Block Protection Services** in the **Service Catalog** and select **Create Block Snapshot**.

Select the appropriate volume and specify **Local Array Snapshot** for the type. Provide a meaningful name to indicate the volume is a snapshot and its source and possibly the date and time.

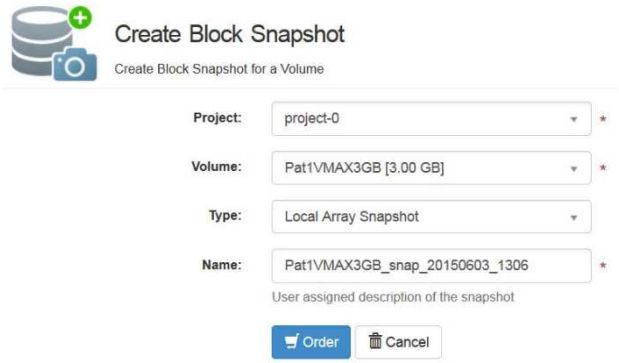


Figure 32 - Create Block Snapshot Options

RECOVER SNAPSHOT TO PRODUCTION

This use case will apply the snapshot image back to the production volume. This essentially rolls back any changes made on the production volume since the snapshot was taken. Sometimes this is referred to as a recovery from snapshot. Applications that utilize the production volume should be stopped and the volume should be unmounted from the host prior to executing this step. In the current release, this is only supported with VNX and VMAX backing storage. (This feature uses array native snapshot services.)

Navigate to **Restore Block Snapshot** in the **Block Protection Services** section of the **Service Catalog**. Select the snapshot to restore from and click **Order** to start the recovery.

Figure 33 - Recover Snapshot Options

RE-USE SNAPSHOT ON OTHER HOST

This use case will expose a ViPR snapshot of a VPLEX virtual-volume to a different host and verify that data is preserved. NOTE: When exporting a snapshot to a new host, ViPR does not encapsulate the snapshot into a VPLEX virtual-volume. It presents the underlying physical array volume directly to the host from the physical array, circumventing and removing VPLEX from the I/O path for the snapshot volume.

Navigate to **Export Snapshot to a Host** under **Block Protection Services** in the **Service Catalog**. Select the host and the snapshot to export. You may select the LU number for the host (HLU) or let ViPR select one (-1). Click **Order** to export the snapshot directly to the host from the array.

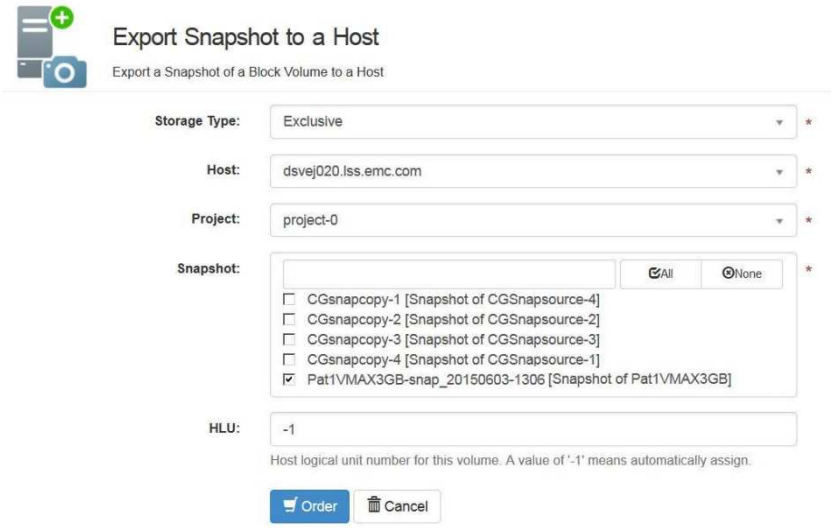


Figure 34 - Export Snapshot to Host

VOLUME ENCAPSULATION ONTO VPLEX FROM OTHER ARRAY

This use case involves a ViPR volume that has been created on an array and exported directly to a host. The array must also be part of a ViPR virtual Array that includes VPLEX as an associated storage system. The host must also have the connectivity to the same fabric as the VPLEX Front-End (FE or host facing) ports. The procedure removes the connection directly between the array and the host and encapsulates the array volume into a VPLEX virtual volume and then presents the virtual volume back to the host so that I/O will now flow through VPLEX.

NOTE: This process requires suspension of I/O from the host during the encapsulation. Host applications utilizing the volume must be suspended and any applicable file system(s) unmounted prior to and during this process.

Navigate to **Change Volume Virtual Pool** under **Block Services** in the **Service Catalog**. Select the volume to encapsulate. Select **Move into VPLEX** as the operation and select the appropriate virtual pool. Click **Order** to initiate the process (after preparing the host and applications for temporary loss of connectivity to the volume).

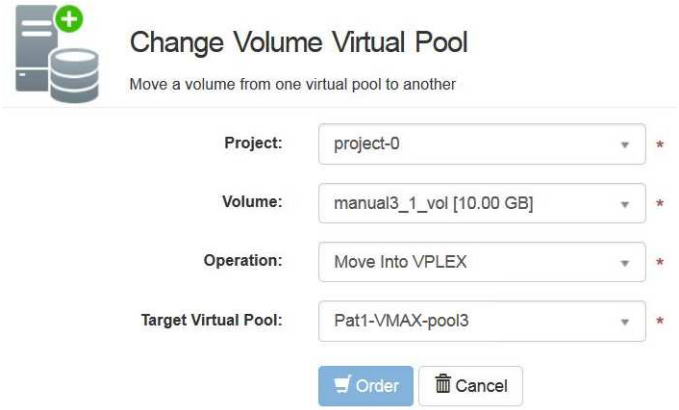


Figure 35 - Change Volume Virtual Pool

MOVE LOCAL VOLUME ACROSS METRO

This procedure uses ViPR to move a VPLEX local virtual-volume from one cluster of a Metro to the other cluster of the same Metro. This is done by changing the virtual-array used by a volume. The process is only supported on volumes that are NOT exposed to a host.

Navigate to **Change Virtual Array** under **Block Services** in the **Service Catalog**. Once a target virtual array is selected, a list of candidate volumes will become available. Select the volume to move and click **Order**.

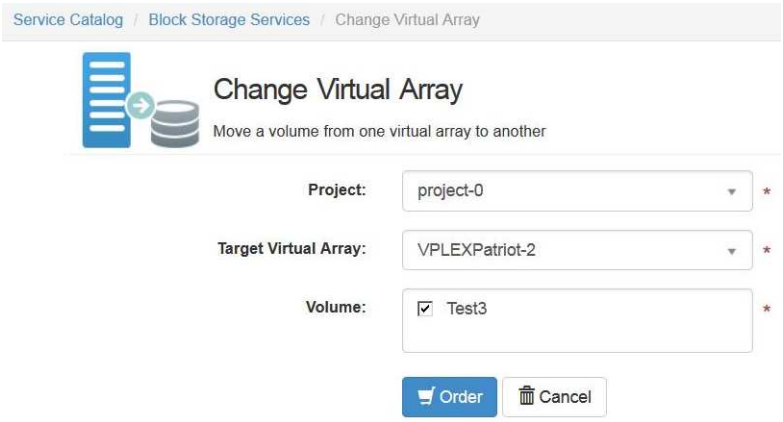


Figure 36 - Move Volume between Virtual Arrays

VPOOL CHANGE: CHANGE PHYSICAL ARRAY OF A VIRTUAL VOLUME

Navigate to **Change Volume Virtual Pool** under **Block Services** in the **Service Catalog**. Select the virtual volume to migrate to a different array. Select **VPLEX Data Migration** as the Operation. Select the Target virtual pool from the generated list of candidates and click **Order**.

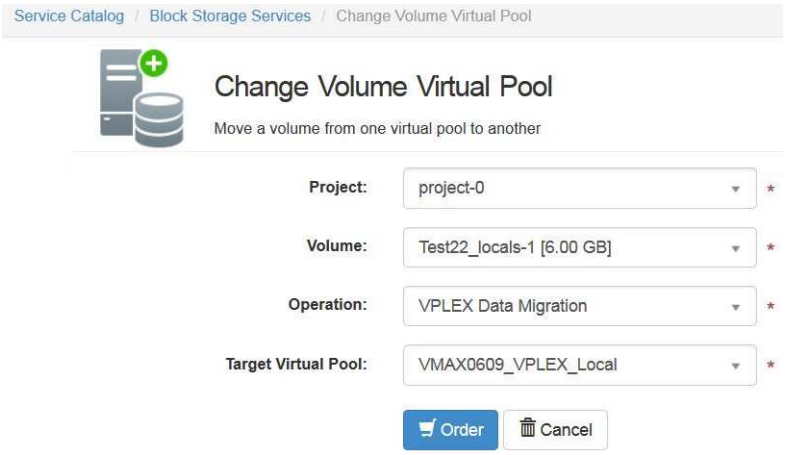


Figure 37 - Change Physical Array of Virtual Volume

VPOOL CHANGE: VPLEX LOCAL TO VPLEX DISTRIBUTED

This functionality provides the ability to convert a local volume to a distributed volume by attaching a mirror from the remote VPLEX cluster.

Navigate to **Change Virtual Pool** under **Block Services** in the **Service Catalog**. Select the source virtual volume to which a remote mirror will be added. Select **Change From VPLEX Local to VPLEX Distributed** as the Operation. Select the Target virtual pool from the generated list of candidates and click **Order**.

Figure 38 - Convert a Local Volume to Distributed

SNAP OF CONSISTENCY GROUP (SNAP OF ANY IN A CG = SNAP OF ALL)

This function will perform a consistent snapshot for all members of a ViPR consistency group. This is accomplished by creating a snapshot for any volume belonging to the consistency group. When this service order is placed, a synchronized snapshot of all volume members of the consistency group will be performed.

Navigate to **Create Block Snapshot** under **Block Protection Services** in the **Service Catalog**. Select a volume from the appropriate consistency group. Set the Type to **Local Array Snapshot**. Provide a base name for the snapshots. Each volume in the consistency group will have a snapshot named with the base name followed by a number (see output below). Click **Order** to begin the snapshots.

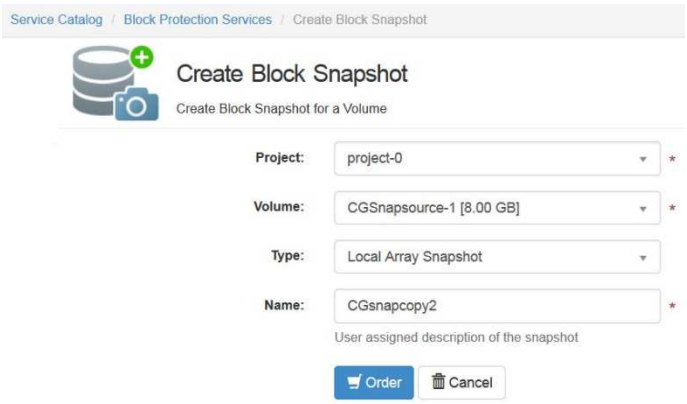


Figure 39 - Snap of a Consistency Group

To see the resulting snapshots, navigate to **Consistency Groups** under **Tenant Settings** on the menu bar. Select the click on the **View Resources** button for the appropriate consistency group.

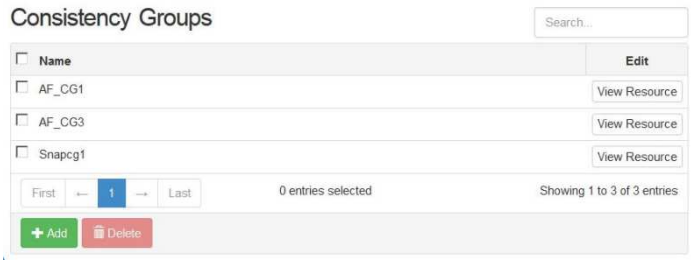


Figure 40 - Viewing Created Snapshots

The consistency group will then be shown with the member volumes listed and snapshots volumes listed below:

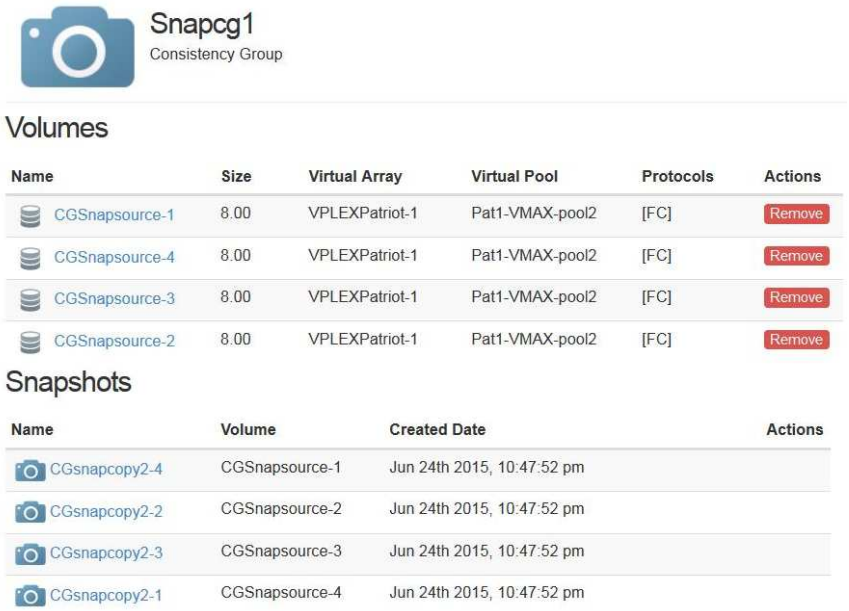


Figure 41 - Consistency Group Properties

CREATE CONTINUOUS COPY OF VPLEX VOLUME (=VPLEX MIRRORING)

VPLEX has the ability to attach a local mirror any VPLEX virtual volume. Use the ViPR Create Continuous Copy service to create a mirror within VPLEX.

Navigate to **Create Continuous Copy** under **Block Protection Services** in the **Service Catalog**. Select the volume to which a mirror will be attached. Provide a name for the mirror. Note that when a mirror is detached (split) from the source ViPR renames the mirror volume using the source volume name and the mirror name. See images below for more details. It is suggested that when naming a mirror volume use "mirror" and some short unique identifier that is different from the source volume name. Click **Order** to create and attach the mirror volume.

See the next use case for details on detaching (splitting) the mirror and the resulting name of the mirror volume.

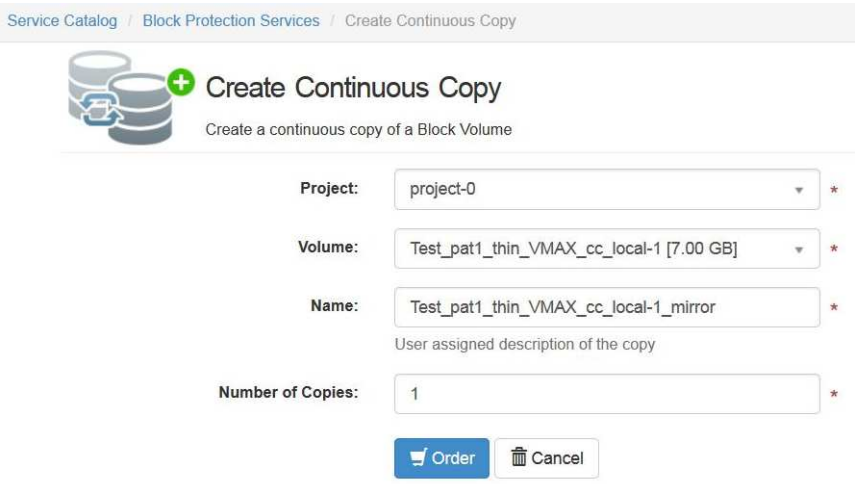


Figure 42 - Creating Continuous Copies

DETACH CONTINUOUS COPY OF VPLEX VOLUME (=SPLIT VPLEX MIRROR)

ViPR provides a means to detach (split) a VPLEX local mirror. Navigate to **Volumes** under **Resources** in the menu bar.

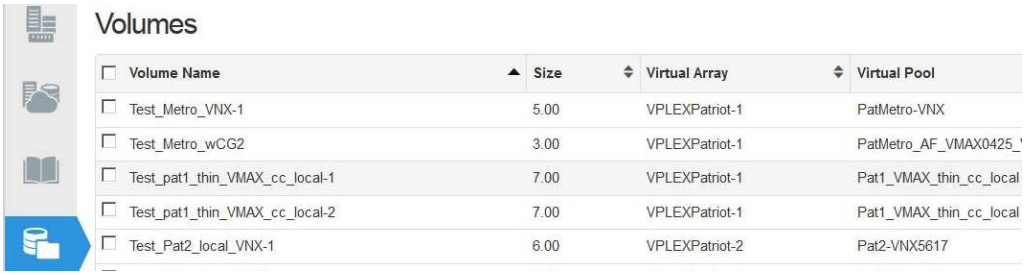


Figure 43 - Splitting VPLEX Mirrors

Click on the name of the source volume. Expand Continuous Copies section and click Stop located next to the mirror volume. When you stop a continuous copy the mirror is detached. A confirmation box will appear. Click **OK**.

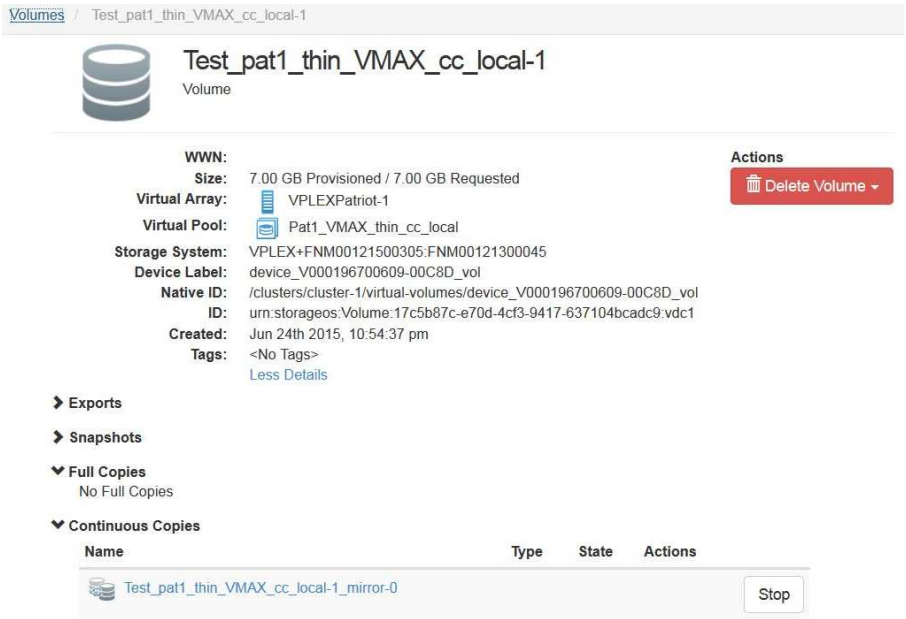


Figure 44 - Detach Mirror Confirmation

Navigate back to **Volumes** under **Resources** in the menu bar. You will find the mirror volume listed near the source volume since the resulting split (former) mirror volume begins with the name of the source volume.

Figure 45 - Volume Status after Detach Mirror

BEST PRACTICES AND RECOMMENDATIONS

The following are general best practices applied to each of the Use Cases provided in this White Paper:

- Always try to use the simplest configuration possible
- Suggestions for naming objects (volumes, virtual pools, etc)
- Name of ViPR virtual pool should reflect unique characteristics such as performance and protection attributes.
- Name ViPR volumes to indicated characteristics such as consistency group, and usage, but not necessarily characteristics that might change with a change of virtual pool or virtual array.
- Keep mirror volume names simple. When a mirror is split the resulting volume is renamed using the source volume name and the mirror name.
- Recommendation is to keep naming consistent across all physical arrays:
    - Create pools used for provisioning
    - Create tiers - naming consistently across all arrays
    - Create/define FAST policies (naming consistently across all arrays)
- A common misconception is to think there is an exclusive relationship between virtual arrays and virtual pools. Virtual pools can have physical storage pools from multiple virtual arrays—additionally these physical storage pools can belong to multiple virtual pools.
- Using VPLEX witness with VPLEX Metro is a best practice. VPLEX Witness functionality only works with VPLEX virtual volumes that are members of a consistency group. Therefore, when provisioning distributed storage using ViPR, a consistency group must be specified. There is no way to add a ViPR volume to a ViPR consistency group after the volume has been created.