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IBM PureApplication Software Version 2.1 on VersaStack

Designing and Implementing PureApplication Software on VersaStack

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Cloud

PureSystems

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International Technical Support Organization

IBM PureApplication Software Version 2.1 on VersaStack

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Contents

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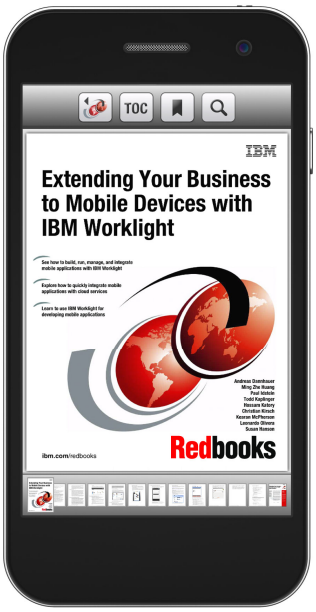

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Preface

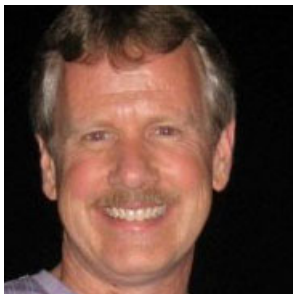
This IBM® Redpaper™ publication covers how to use the Cisco IBM VersaStack integrated infrastructure as a platform for IBM Middleware by using the IBM PureApplication® Software V2.1 product, which has the means to install, configure, and manage IBM Middleware on VersaStack.

VersaStack can run many software stacks, and PureApplication Software can run on many integrated infrastructures. This paper gives specific design and implementation recommendations for integrating PureApplication Software Version 2.1 on to Cisco IBM VersaStack. Most of this paper focuses on PureApplication Software Version 2.1, but always in the context of VersaStack. It describes and gives the business values of PureApplication Software, provides an overview of VersaStack, shows the preparation of VersaStack for PureApplication Software, gives some hints about installing and configuring the PureApplication Software, and describe how to use PureApplication Software to deploy an IBM Middleware pattern on VersaStack.

The target audience for this paper is IT professionals who are responsible for designing and implementing PureApplication Software on VersaStack.

Authors

This paper was produced by a team of specialists from around the world working at the International Technical Support Organization, Raleigh Center.



Dave Willoughby has 30 years of experience in mainframe, UNIX, and x86 server development, in areas of system design, boot and runtime firmware, hypervisors, virtualization, network, storage, integrated solution optimization, converged fabric, Hadoop, and OpenStack cloud.

Dave leads the development of hybrid cloud solutions for IBM, which involves OpenStack, Bluemix™, Spectrum Storage, and IBM Middleware, focusing on hybrid storage solutions. Dave also leads the usage and customer enablement of PureApplication Software on the Cisco IBM VersaStack integrated infrastructure.

Jeremy R Geddes has 15 years of service, test, and development experience, working mostly with networking, hardware integration, and cloud solutions. He has been a developer and architect on PureApplication System since its inception, and is a lead development architect for PureApplication System Software.

Thanks to the following people for their contributions to this project:

Rohit Badlaney, Vasfi Gucer, Tina Lustig, James C Riordan
IBM US

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1

Introduction

This chapter provides an overview of IBM PureApplication Software.

This chapter has the following sections:

1.1 What this paper is about

This paper covers how to use Cisco IBM VersaStack integrated infrastructure as a platform for IBM Middleware by using the PureApplication Software V2.1 product, which has the means to install, configure, and manage IBM Middleware on VersaStack.

VersaStack can run many software stacks, and PureApplication Software can run on many integrated infrastructures. This paper gives specific design and implementation recommendations for integrating PureApplication Software Version 2.1 on to Cisco IBM VersaStack. Most of this paper focuses on PureApplication Software Version 2.1, but always in the context of VersaStack. It describes and gives the business values of PureApplication Software, provides an overview of VersaStack, shows the preparation of VersaStack for PureApplication Software, gives some hints about installing and configuring the PureApplication Software, and describe how to use PureApplication Software to deploy an IBM Middleware pattern on VersaStack.

1.2 PureApplication Software

PureApplication Software is a cloud application platform that provides the ability to accelerate and simplify the repeatable deployment and lifecycle management tasks of enterprise middleware workloads, such as the following ones:

- IBM WebSphere® Application Server
- IBM Business Process Manager
- Mobile
- Portal
- Commerce
- Analytics
- IBM DB2®

As shown in Figure 1-1 on page 3, you can use PureApplication Software to design the infrastructure to your own specifications. The configuration work must be completed before the installation of the PureApplication Software and must meet all the prerequisites. Although you must adhere to the prerequisites, PureApplication Software provides flexible compute and storage characteristics, which you can use to define an infrastructure that meets unique use cases. With PureApplication Software, you bring your own licenses for OS, hypervisor, and middleware. The Cisco IBM VersaStack validated design meets all the prerequisites of PureApplication Software and is well-suited for PureApplication Software.

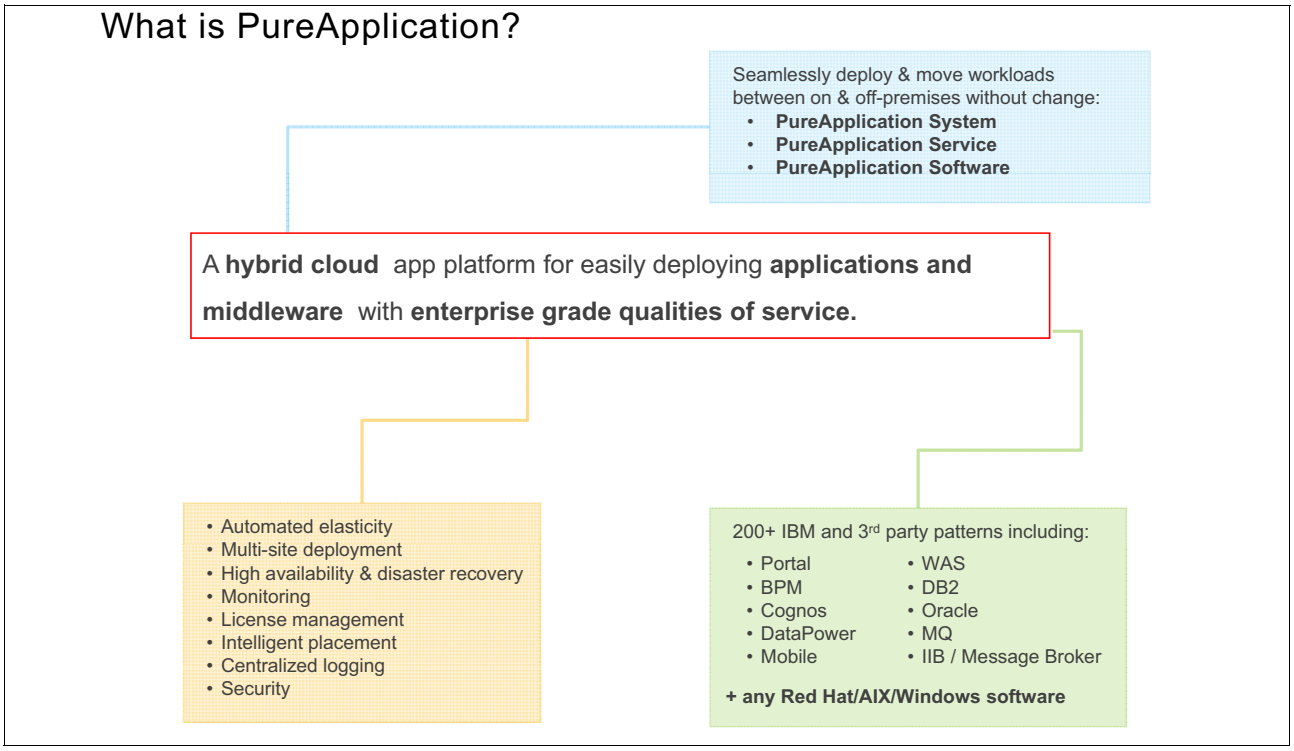


Figure 1-1 What is PureApplication

PureApplication Software is part of the IBM PureSystems® family of systems, which are designed to accelerate the deployment of an enterprise's applications and analytics platform. For more information about the entire family of systems, go to the following website:

http://www.ibm.com/ibm/puresystems/us/en/

1.2.1 Business value of PureApplication Software

Pre-sales specialists, IT managers, and decision makers will recognize the business values of PureApplication Software.

PureApplication Software provides significant deployment and lifecycle automation for IBM Middleware. Pattern-based deployment ensures rapid, consistent, stress-free, and error-free deployment of IBM Middleware products. The use of patterns ensures consistent deployments across multiple environments, such as development, test, and production, both on-premises and off-premises.

In addition to supporting the long-standing, proven IBM patterning technology of virtual systems and virtual applications, PureApplication Software supports the deployment of emerging deployment technologies, including Docker and Chef.

Figure 1-2 summarizes the business value of PureApplication Software.

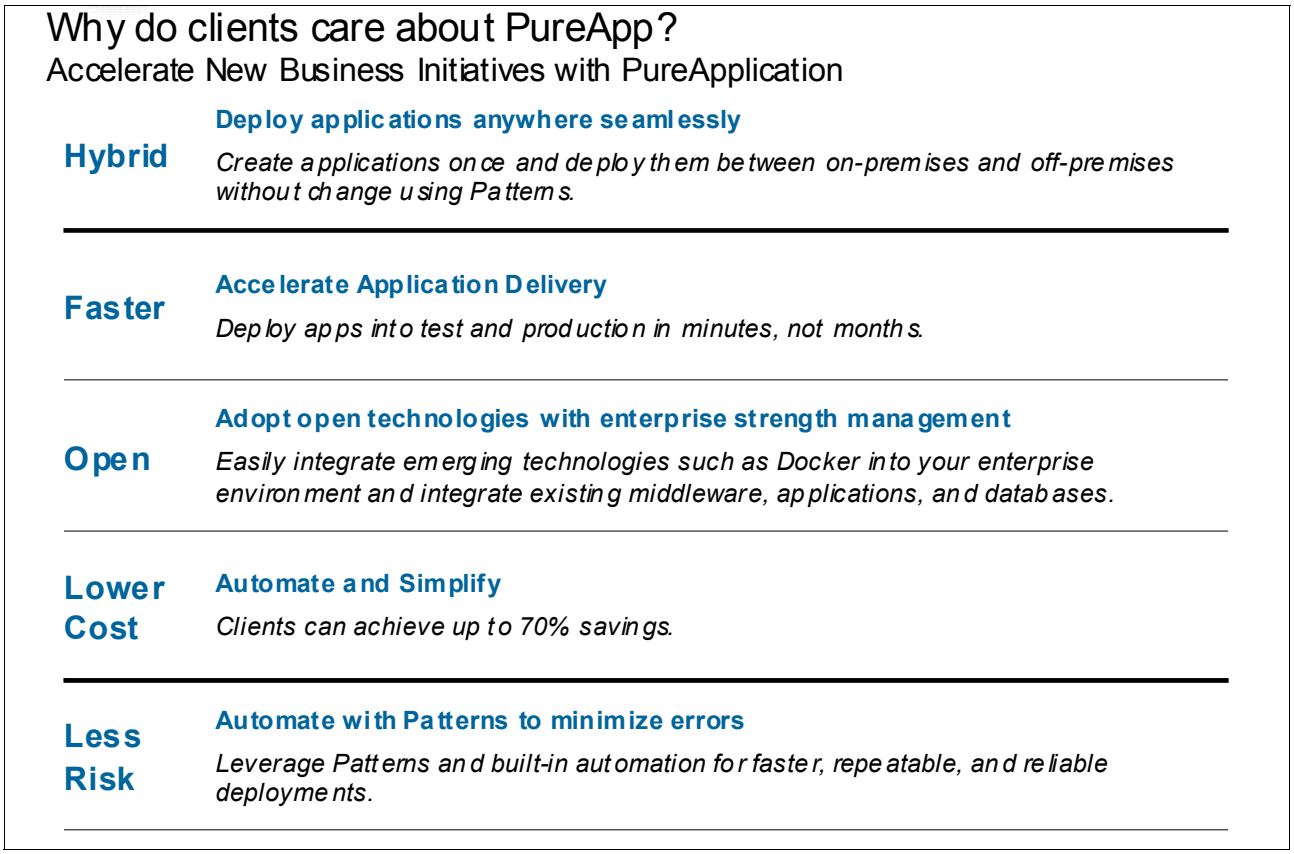
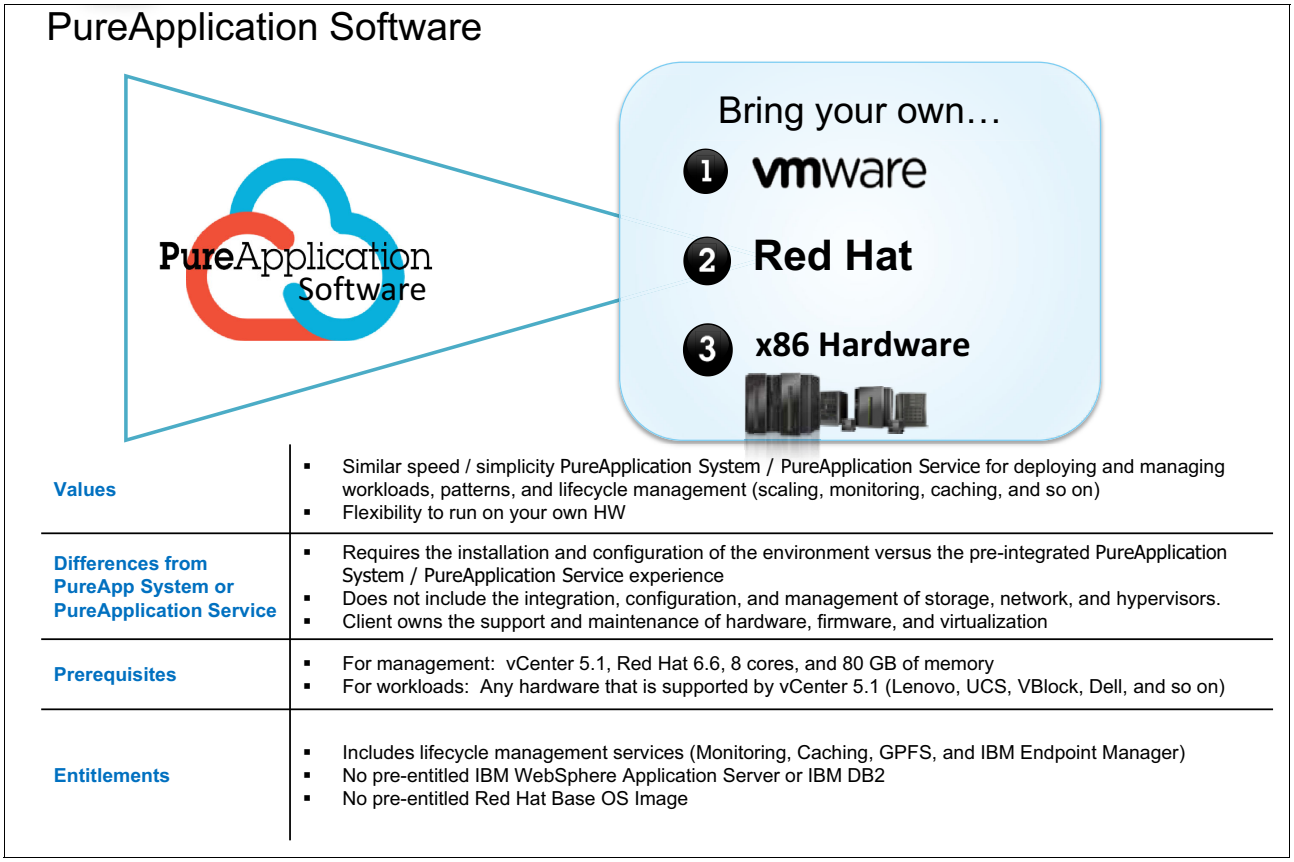


Figure 1-2 How PureApplication can accelerate new business initiatives

The IBM PureApplication System family has been evolving and growing since 2012. PureApplication was initially released as a fully integrated hardware and software platform for on-premises *cloud in a rack*. In 2014, PureApplication Service was released, running in the IBM SoftLayer® public cloud. In 2015, PureApplication Software was released, allowing customers to *use their own hardware*, but still achieve a fully integrated platform for an on-premises *cloud in a rack*. PureApplication Software V2.1 integrates with VMware Version 5 platforms, interacting with vCenter to provide deployment and lifecycle management of IBM Middleware.

Figure 1-3 shows some specifics about PureApplication Software Version 2.1. For more information about the latest specifications of PureApplication Software, see the following website:

https://www.ibm.com/support/knowledgecenter/SSL5ES_2.1.0/doc/common/welcome.dita



Values	▪ Similar speed / simplicity PureApplication System / PureApplication Service for deploying and managing workloads, patterns, and lifecycle management (scaling, monitoring, caching, and so on) ▪ Flexibility to run on your own HW
Differences from PureApp System or PureApplication Service	▪ Requires the installation and configuration of the environment versus the pre-integrated PureApplication System / PureApplication Service experience ▪ Does not include the integration, configuration, and management of storage, network, and hypervisors. ▪ Client owns the support and maintenance of hardware, firmware, and virtualization
Prerequisites	▪ For management: vCenter 5.1, Red Hat 6.6, 8 cores, and 80 GB of memory ▪ For workloads: Any hardware that is supported by vCenter 5.1 (Lenovo, UCS, VBlock, Dell, and so on)
Entitlements	▪ Includes lifecycle management services (Monitoring, Caching, GPFS, and IBM Endpoint Manager) ▪ No pre-entitled IBM WebSphere Application Server or IBM DB2 ▪ No pre-entitled Red Hat Base OS Image

Figure 1-3 PureApplication Software

2

Overview and architecture of VersaStack

This chapter provides a broad overview of VersaStack and describes the VersaStack architecture.

This chapter has the following sections:

2.1 Cisco VersaStack CVD overview

IBM has worked closely with Cisco to create the VersaStack CVD. A CVD is a Cisco Validated Design. Cisco works with partners like IBM on a substantial set of detailed design and implementation guidance for integrated infrastructure. The VersaStack CVD is composed of the following major components:

- Cisco Unified Computing System (UCS)
- Cisco switches
- IBM Storwize® V7000 system
- VMware Version 5

A CVD is a blueprint or recipe that has a deep set of design and implementation guidance. A Cisco CVD is similar to an IBM Redbooks publication. Cisco has all the required hardware and software components in their lab, and fully validated all the guidance that is given in the CVD. CVDs are posted and maintained by Cisco at the following website:

http://www.cisco.com/

VersaStack is not a priced bundle or solution. Customers work with sellers and partners to procure each component, and follow the CVD guidance on deploying their target configuration.

There are five VersaStack CVDs: one on design, two on implementation, one on UCS Director, and one on scale-out. These CVDs are maintained at the following website:

http://www.cisco.com/c/en/us/solutions/enterprise/data-center-designs-cloud-computing/versastack-designs.html

2.2 VersaStack rack-level components, topology, and scalability

This section provides a description of the rack-level components of VersaStack, how they interconnect, and the variations of the baseline configuration that is shown in Figure 2-1 on page 9.

The baseline configuration shows full redundancy of the rack-level components and rack-level interconnects.

Starting at the bottom, there are two UCS chassis with four 10 Gb Ethernet *uplinks* to dual UCS-6248 Fabric Interconnects, with two uplinks to each of two Fabric Interconnects. For additional bandwidth, eight 10 Gb Ethernet uplinks can be used. It is possible to have more than two UCS chassis that are attached to the two Fabric Interconnects that are shown to scale out additional compute resources. The two Fabric Interconnects are also connected to each other by a pair of inter-switch links (ISLs).

The Fabric Interconnects uplink to two Nexus 9396 Ethernet switches, in a cross-connected pattern of four links total, and the Nexus switches are connected to each other by ISLs. Horizontal scaling can be done at this level also, with additional UCS compute groups, each with a pair of Fabric Interconnects, connecting to the Nexus switches. These additional UCS compute groups might be in adjacent racks. Data center connectivity is also achieved at the Nexus switch level.

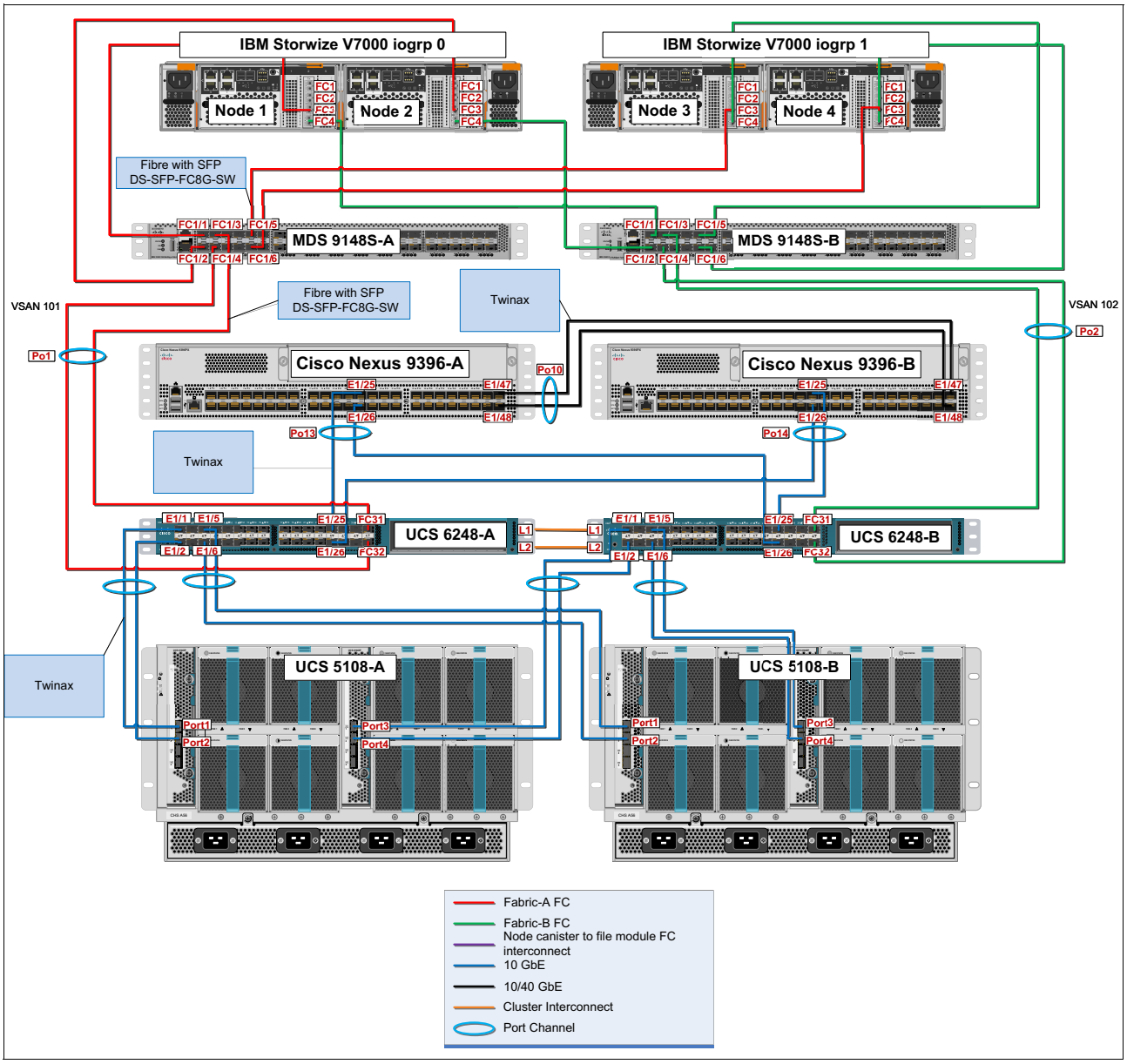


Figure 2-1 VersaStack block diagram - UCS chassis + Ethernet and SAN switches + Storwize V7000 system

The Fabric Interconnects additionally *uplink* to the pair of MDS 9148S SAN switches with Fibre Channel links, but in a direct fashion, not a cross-connect fashion.

The pair of SAN switches uses eight total FC links, in both direct and cross-connected fashion, to a pair of Storwize V7000 storage subsystems, as two distinct SAN fabrics, with four FC links each. Each Storwize V7000 system can have additional disk enclosures daisy-chained to the two V7000 controllers (not shown in Figure 2-1). Storage can also be scaled horizontally with additional V7000 controllers that are connected to the MDS SAN switches (not shown in Figure 2-1).

2.2.1 Cisco Unified Computing System

Cisco UCS Manager is a blade server product. VersaStack customers should choose a number of UCS chassis and blade servers to meet their needs. PureApplication Software Version 2.1 requires dedicating one UCS blade server for the PureApplication Software itself. Customers should purchase additional blade servers to match the maximum planned deployment of applications over some period. Customers might consider deploying extra chassis capacity, with open bays, and then additional blade servers as needs arise. The configuration and management of UCS is provided by UCS Manager, which is provided by the UCS Fabric Interconnect components. Figure 2-2 shows an example of the UCS Manager UI. For more information about the UCS configuration and management through the UCS Manager, see the VersaStack CVDs.

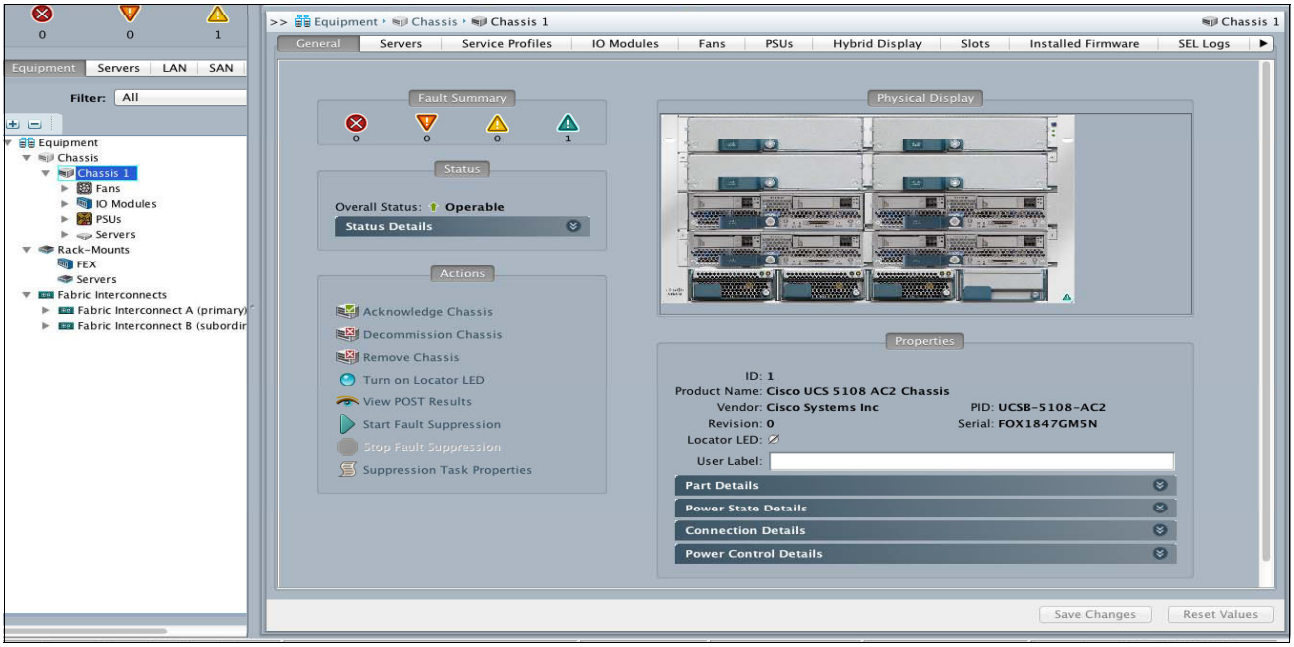


Figure 2-2 UCS Manager GUI through a Java applet

2.2.2 IBM Storwize V7000

A Storwize V7000 system provides block storage, and optionally file storage, to make the VersaStack integrated infrastructure complete. Figure 2-1 on page 9 shows a Storwize V7000 SAN that is attached to the VersaStack design. A Storwize V7000 system can also be direct-attached (not shown), and in addition to being SAN-attached, a Storwize V7000 system can be simultaneously attached as file storage by using the Storwize V7000 Unified option (not shown). For more information about these configurations, see the VersaStack CVDs, found at:

http://www.cisco.com/c/en/us/solutions/enterprise/data-center-designs-cloud-computing/versastack-designs.html

Figure 2-3 on page 11 shows an example of the Storwize V7000 management GUI.

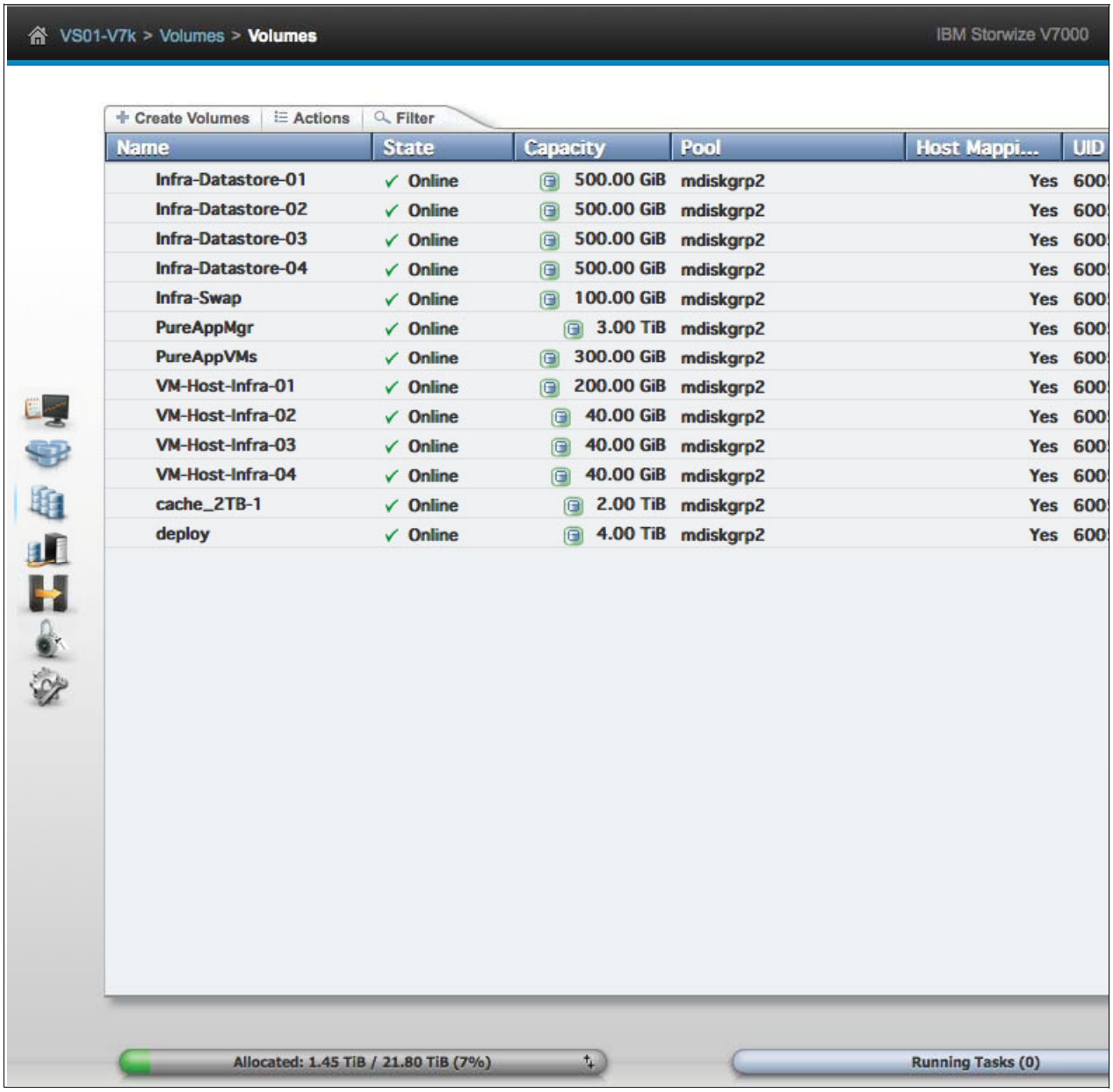


Figure 2-3 Storwize V7000 management UI showing volumes

2.2.3 Integrated hardware management

The baseline management of VersaStack uses Cisco UCS Manager to manage Cisco hardware, and Storwize Manager to manage the Storwize V7000 system. Optionally, a customer can obtain a single unified management interface by using the separate Cisco product UCS Director, which is Cisco's more advanced hardware management solution with a task-oriented automation approach. UCS Director can manage a Storwize V7000 system by using a plug-in that is provided by IBM. For more information, see the VersaStack UCS Director CVD, found at:

http://www.cisco.com/c/en/us/solutions/enterprise/data-center-designs-cloud-computing/versastack-designs.html

2.3 Initial VersaStack configuration

The VersaStack deployment CVDs show step-by-step guidance for the initial installation and configuration of a VersaStack configuration. Here is a quick overview of the steps that are involved in the initial configuration:

1. Rack and cable a UCS chassis and interconnect, Cisco switches, and Storwize V7000 system
2. Power on equipment and configure management connectivity.
3. Configure UCS to detect the server blades, Fabric Interconnect (FI), and switches.
4. Create VLANs, VSANs, and Port Groups.
5. Create a VDisk on the Storwize V7000 system to allow SAN booting for the hosts.
6. Configure a SAN bootable host in UCS and map to VDisk on a Storwize V7000 system.
7. Install KVM on to the hosts and boot in to ESXi installation mode by using a mounted and preconfigured Cisco ESXi installer ISO.
8. Install IP ESXi on servers and configure it to use the relevant VLANs.
9. Using the vSphere client, connect to an ESXi host and create a vCSA.

2.4 VersaStack VMware implementation architecture

VMware Version 5 is the baseline virtualization product for the VersaStack integrated infrastructure.

vCenter can be set up on a dedicated UCS server, if required, for availability or alignment with administration zones, but this paper uses the suggestion of using vCSA. vCSA is a vCenter appliance VM that can run on one of the ESXi servers of VersaStack.

Within vCenter, a separate virtual data center is created for management, which is shown as the PureAppMgmtDataCenter in Figure 2-4 on page 13. This virtual data center hosts both the PureAppvCenter vCenter vCSA VM and hosts the PureSystems Manager (PSM), which is part of the PureApplication Software, in a PSM VM. This provides a more compact deployment footprint than dedicating servers to management functions.

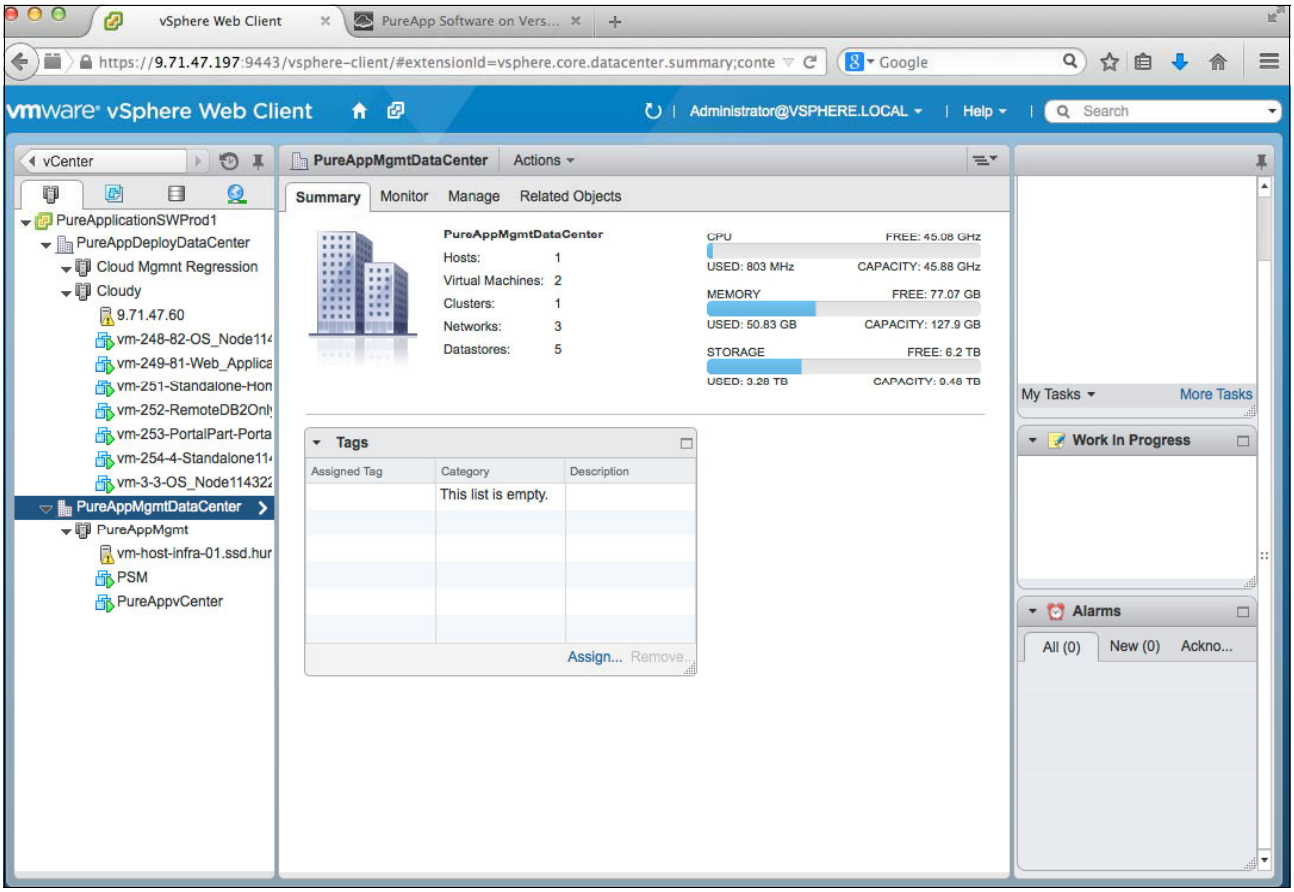


Figure 2-4 vCenter management through vCSA VM in PureAppMgmt virtual data center

PureApplication Software Version 2.1 requires that application pattern deployment be done to ESXi servers separate from the PureApplication management function PSM VM. Therefore, the PureAppMgmtDataCenter is hosted on its own dedicated ESXi server, as shown in Figure 2-4.

For an example of the VM that is used for the vCSA vCenter function, see Figure 2-5.

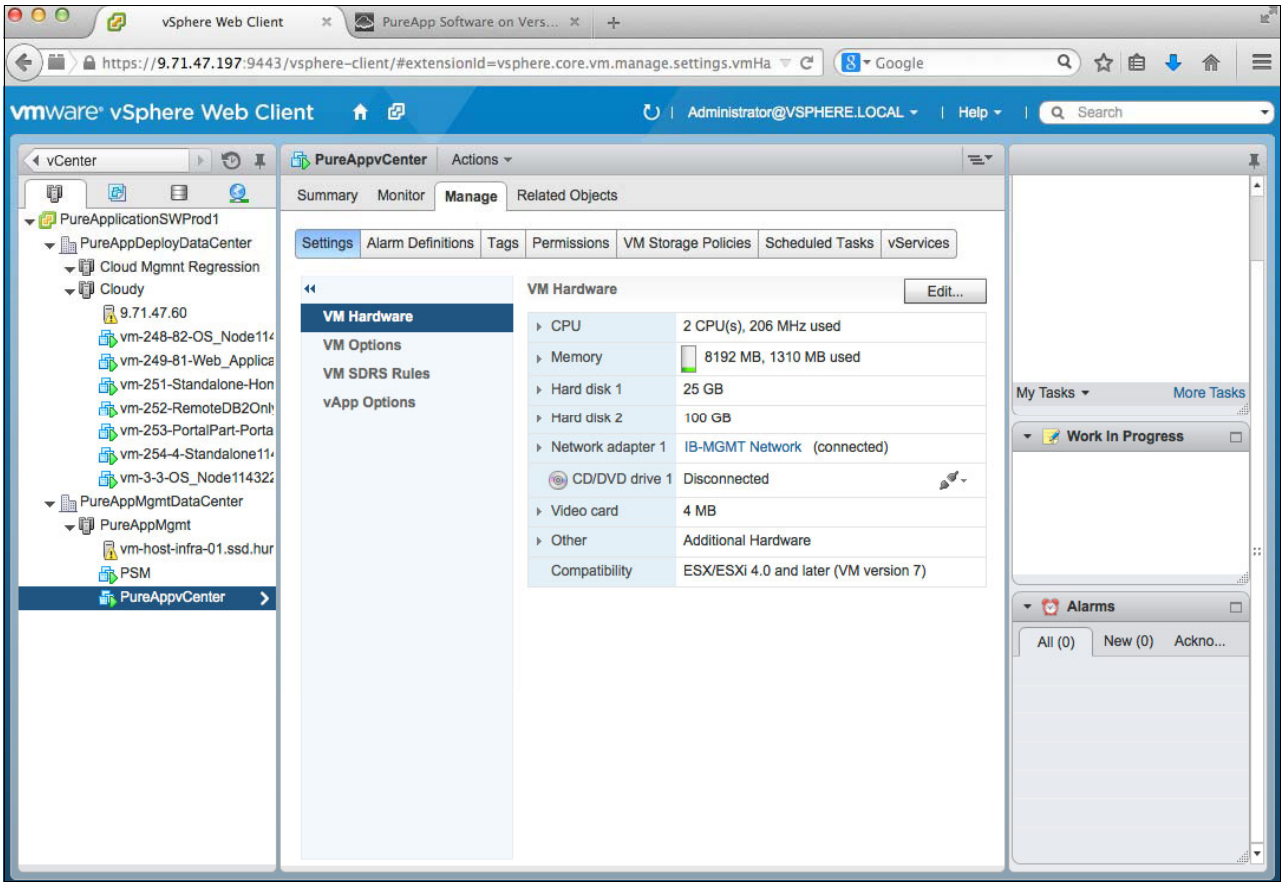


Figure 2-5 vCSA VM details

A strength of VersaStack and UCS is that individual blade servers are stateless. If a blade were replaced for some reason, all the hardware level settings, such as uEFI settings and network settings, are restored to the new replacement blade.

Also, in VersaStack and UCS, each blade server lacks any form of disk or SSD or boot device. All ESXi blade servers boot from the appropriate volume on the SAN-attached Storwize V7000 system.

Figure 2-6 on page 15 gives a view of the FCoE HBAs, which are shown in vCenter, that are used as SAN boot adapters.

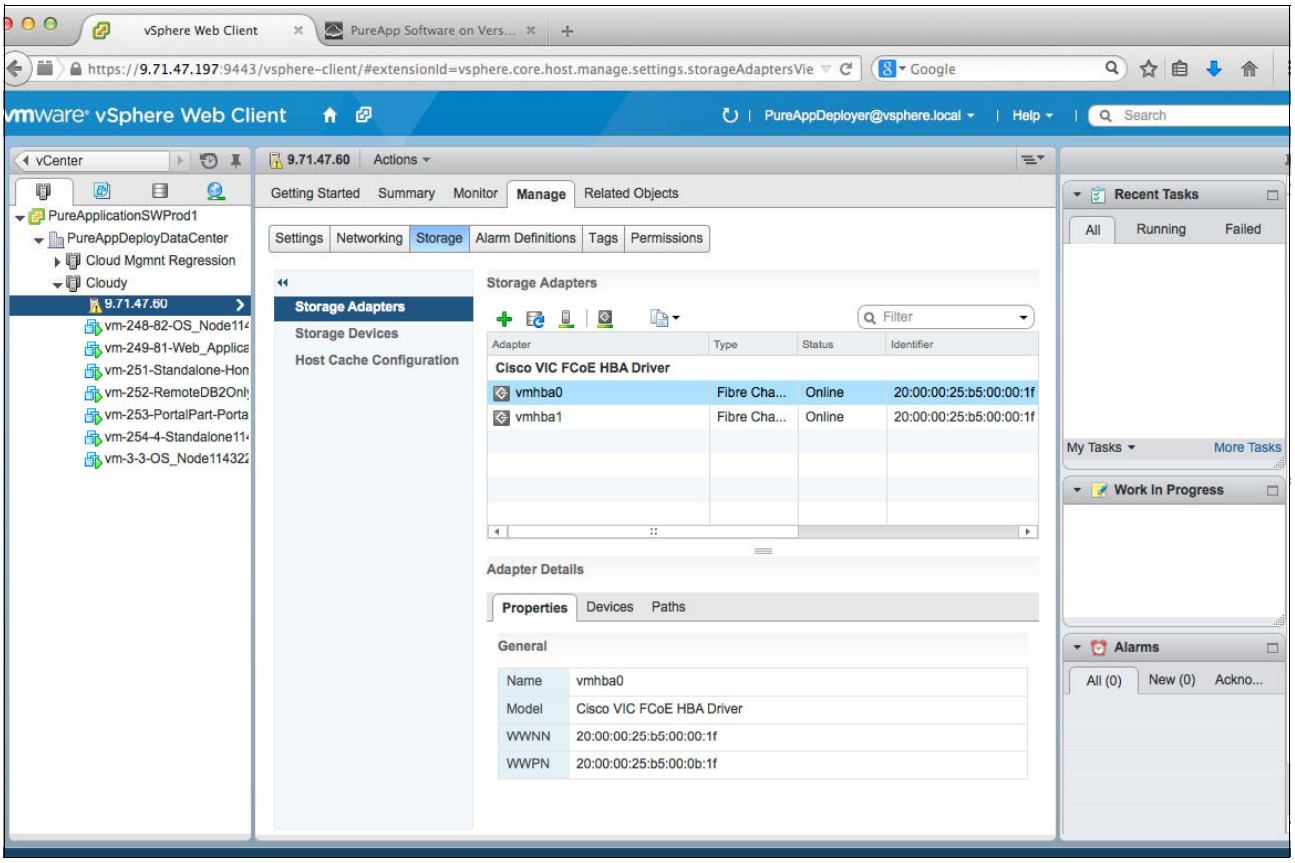


Figure 2-6 ESXi servers are stateless and boot VMware ESXi from SAN-attached LUNs

A basic configuration of PureApplication Software requires three data stores to be configured in vCenter, which are loosely termed PSM, image cache (cache_2TB-1), and cloud group (deploy) data stores.

The PSM VM itself needs a combined space of 2 TB of external, shared “disk” to install and operate the PureApplication Software itself. This “disk” can be partitioned into the required 500 GB and 1.5 TB for the “disks” that the PSM VM requires.

The image cache (cache_2TB-1) data store is 2 TB, and it is used to hold the IBM Middleware pattern assets and operating system Open Virtualization Archive (OVA) files. This image cache is not the type of cache that is a copy for performance reasons and is self-created and populated through its ongoing use, but rather is the permanent storage of the IBM Middleware Pattern assets and OVAs that a customer has installed.

Important: Back up this data store, in addition to other data stores, for easy restore if it becomes lost or damaged.

The cloud group (deploy) data store is 4 TB, and it is used to hold all the space that VMware will use to create volumes for VMs, at the direction of the PureApplication Software, during pattern deployments.

These three data stores are VMware VMFS data stores, and are required to be attached to *all* ESXi servers that are used for PureApplication management or pattern deployment.

Figure 2-7 gives a view, through vCenter, of the three Fibre Channel disk volumes that support the three data stores. Figure 2-3 on page 11gives a closer view of these same volumes, through the Storwize V7000 GUI.

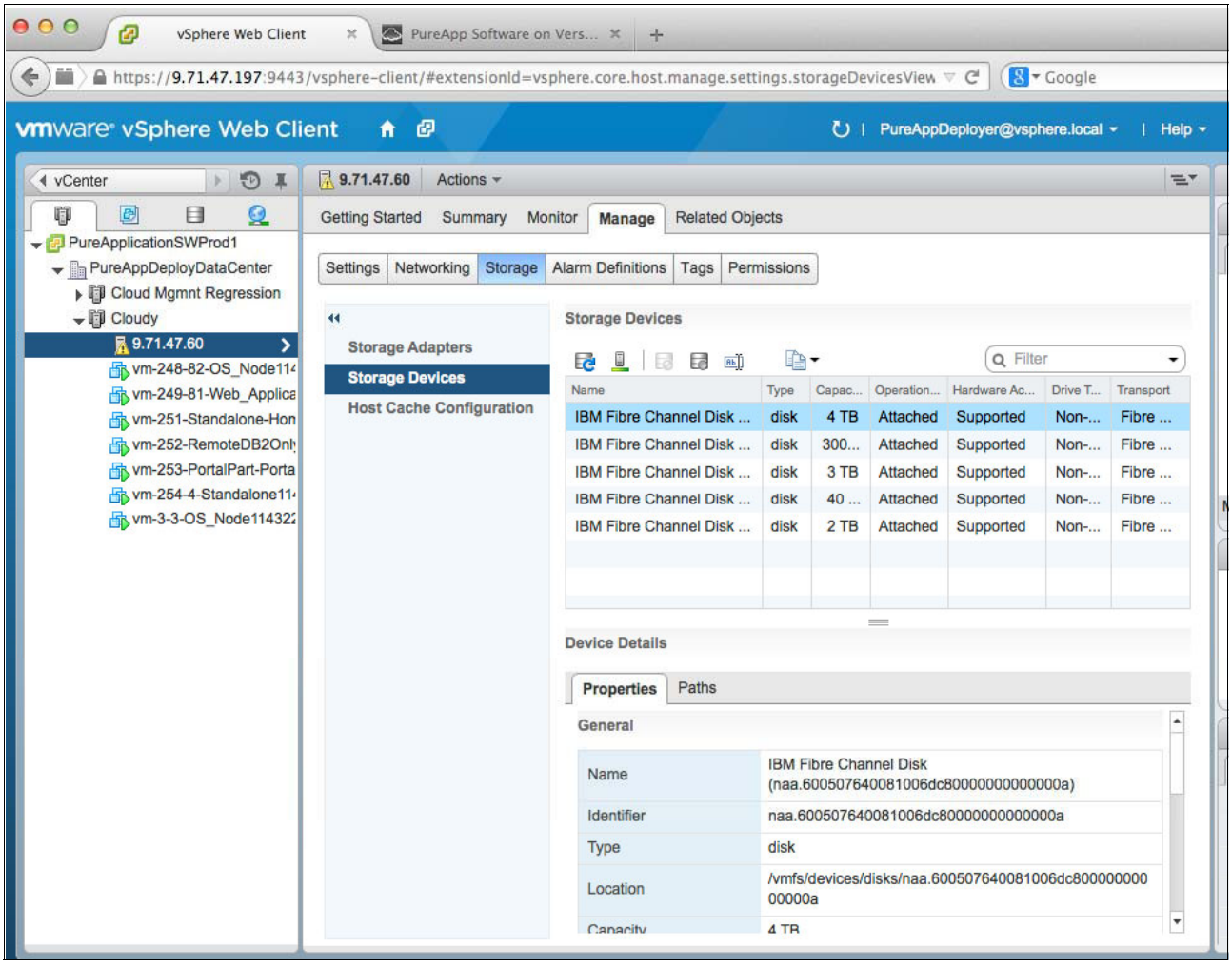


Figure 2-7 Three remote shared data stores required by PureAppSW - 4 TB Deploy, 2 TB PSM, and 2 TB cache

Here is a summary of the steps to create shared data stores:

1. ESXi hosts are zoned and added to the Storwize V7000 system as Generic Fibre Channel Hosts.
2. The shared data stores *cache_2TB* and *deploy* are created as thin-provisioned volumes on the Storwize V7000 system and then mapped to the ESXi hosts being used for PureApplication Software as both the management and deployment zone ESXi servers.
3. Within the vCSA client, browse for volumes that are shared with each ESXi host and add them as VMFS data stores.

3

Integrating PureApplication Software with VersaStack

This chapter describes how to integrate PureApplication Software with VersaStack.

This chapter has the following sections:

3.1 PureSystems Manager virtual machine implementation

This section gives suggestions for installing the PureApplication Software PureSystems Manager (PSM) virtual machine (VM) in the VersaStack VMware vCenter context.

For more information, see the PureApplication Software documentation in the IBM Knowledge Center, found at:

https://www.ibm.com/support/knowledgecenter/SSL5ES_2.1.0/doc/common/welcome.dita

Review of this material is recommended before proceeding.

You can find installation instructions at the following website:

http://www.ibm.com/support/knowledgecenter/SSL5ES_2.1.0/doc/getstart/swinstall.dita

You can find information about configuring VMware vCenter and ESXi at the following website:

http://www.ibm.com/support/knowledgecenter/SSL5ES_2.1.0/doc/getstart/cfgvmware.dita

As described in 2.3, “Initial VersaStack configuration” on page 12, the PSM VM should be part of the management zone virtual data center PureAppMgmtDataCenter, as shown in Figure 3-1.

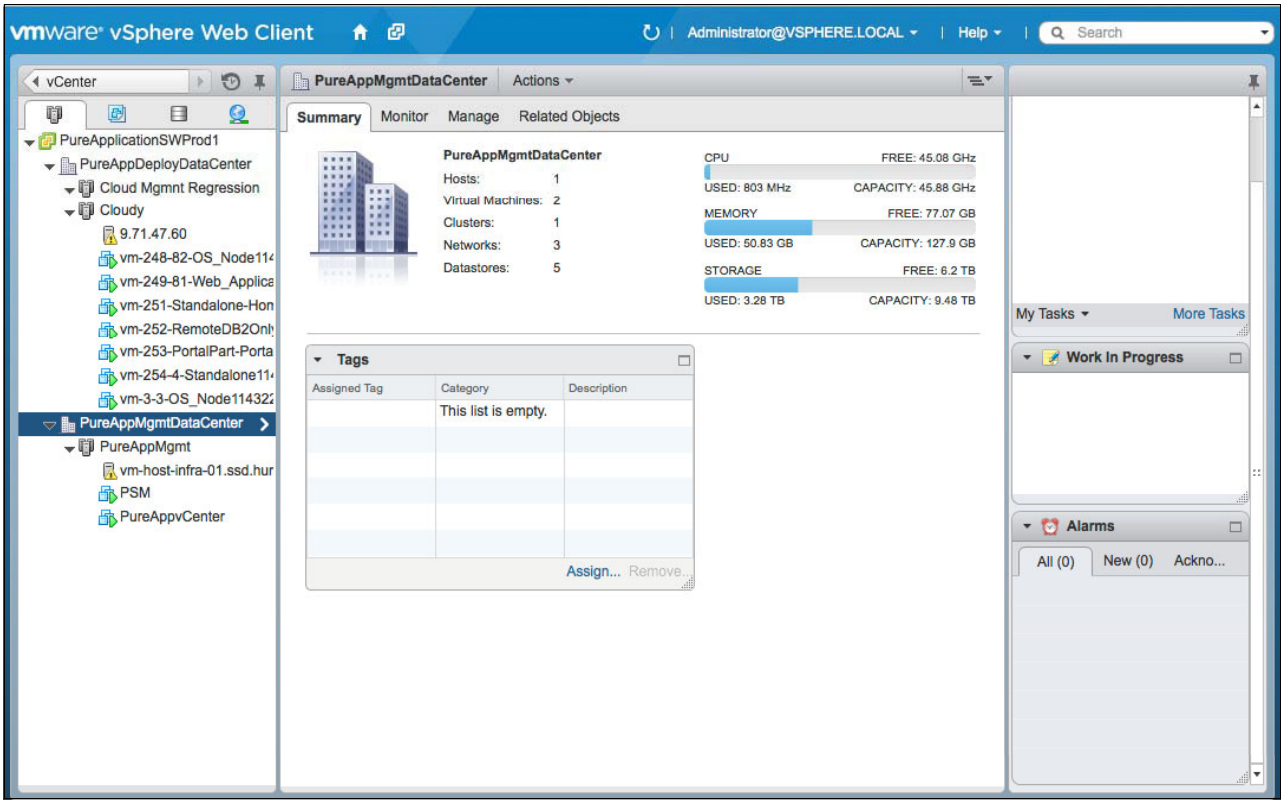


Figure 3-1 Management Zone virtual data center - PureAppMgmtDataCenter

The PSM VM can be created in vCenter by using the sizing guidance in the PureApplication Software documentation in the IBM Knowledge Center, found at:

http://www.ibm.com/support/knowledgecenter/SSL5ES_2.1.0/doc/getstart/sysreqs.dita

Make sure to attach a second hard disk drive (HDD) (by clicking **Hard disk 2**) when creating the PSM VM, which is the 2 TB PSM volume that is described in 2.3, “Initial VersaStack configuration” on page 12.

Figure 3-2 shows this 2 TB disk attached.

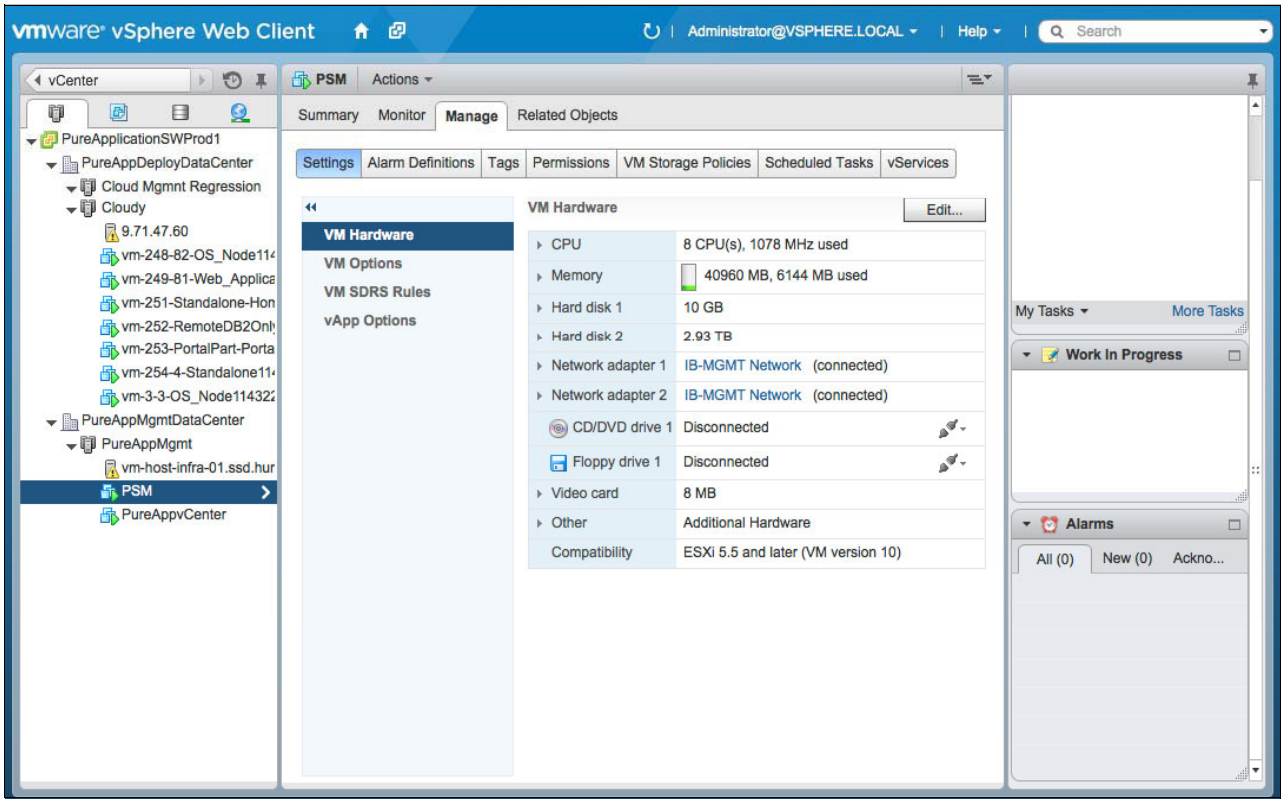


Figure 3-2 Details for PSM VM - 2 TB disk

Figure 3-3 gives another view of the 2 TB PSM data store, which is from the vCenter data store view.

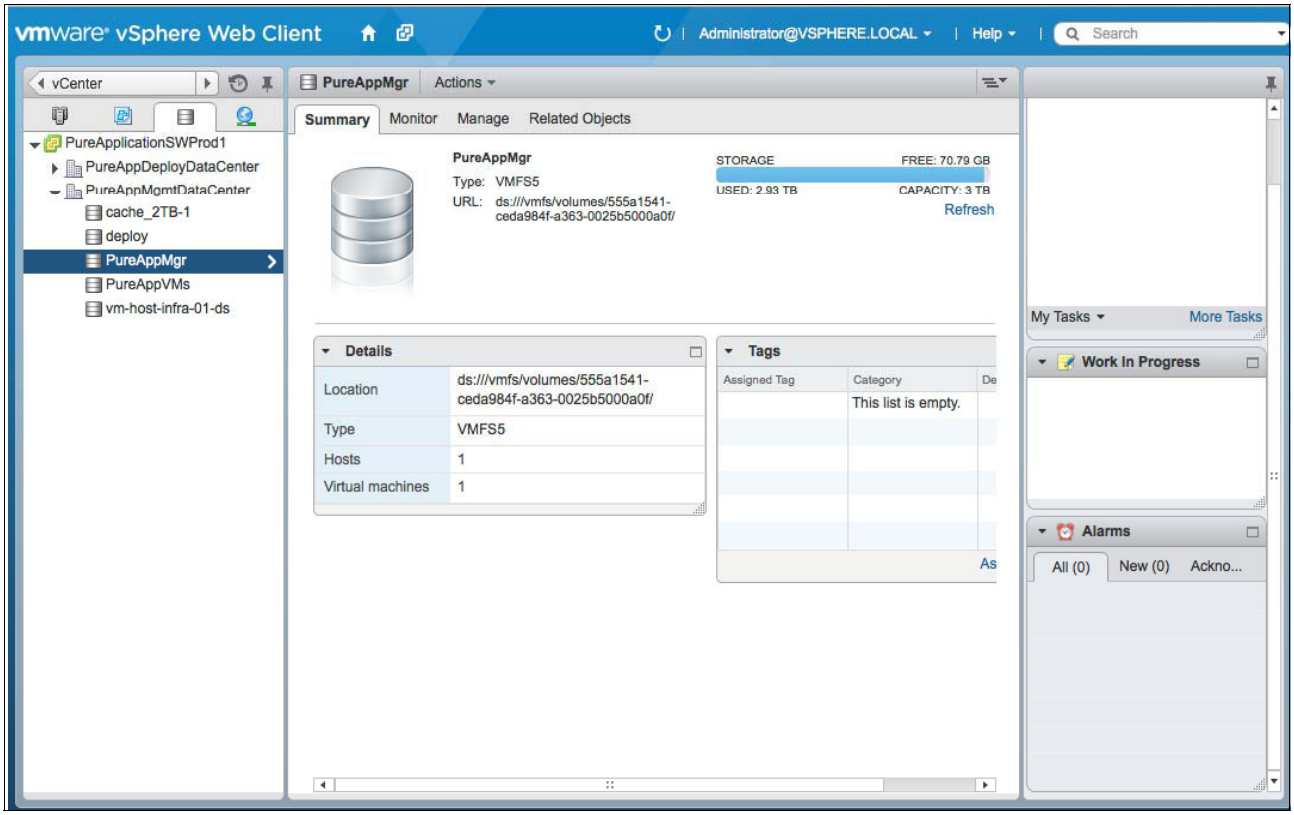


Figure 3-3 2 TB data store for PSM disk requirements

The OS that is required for the PSM VM is RHEL. It is helpful to upload the RHEL `.iso` file to an ISO folder on a shared data store. Figure 3-4 on page 21 shows the `.iso` file in an ISO folder on a shared PureAppVMs data store. The Hard disk 1 for the PSM is also hosted by this PureAppVMs data store, where Hard disk 1 is the root volume for this RHEL VM. With the `.iso` file uploaded, the `.iso` file can be *attached* to the VM through the CD/DVD dialog box, so when this VM is powered on, it boots from the `.iso` file.

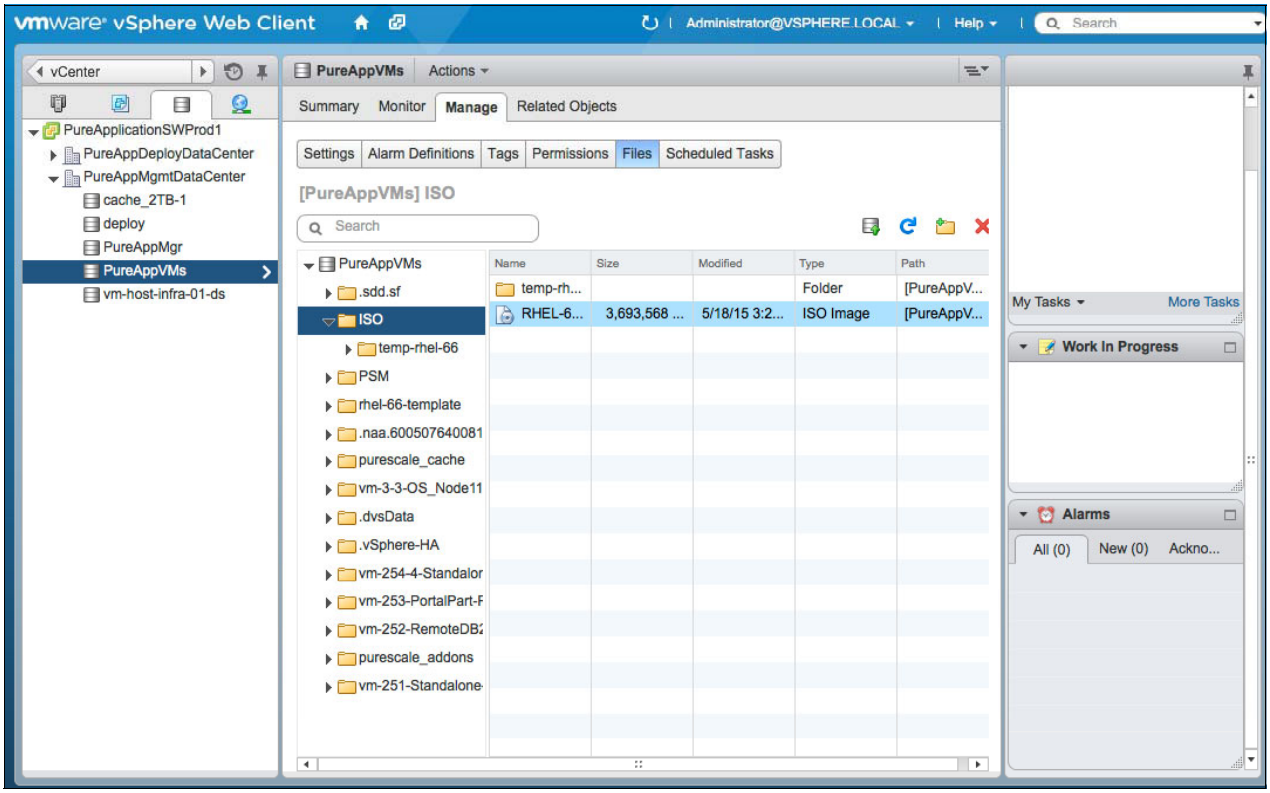


Figure 3-4 It is handy to have the RHEL ISO on the local data store

Encrypting the external file systems that are used by the PSM VM is recommended. Encryption ensures that only the PureApplication Software domain can mount these file systems, and that the VMware administrator cannot mount and see these file systems.

Example 3-1 shows a sample script for creating the encrypted file systems that the PSM VM requires.

Example 3-1 Sample script for creating the encrypted file systems

```
#!/bin/bash
set -e -o pipefail -u

RuntimeDisk="xvde"
DataDisk="xvdc"
LogicalRuntime="runtime_lg"
LogicalData="data_lg"
RuntimeGroup="runtime_vg"
DataGroup="data_vg"
RuntimeSize="500G"
DataSize="1500G"
RuntimePassword="runtimepw"
DataPassword="datapasswd"
RuntimeKey="runtimekey"
DataKey="datakey"

echo "---Runtime Disk---"

#Create physical volume on two installation disks: one runtime & one data
```

```
echo -n "Creating runtime volume... "
pvcreate /dev/$RuntimeDisk
echo -n "Creating data volume... "
pvcreate /dev/$DataDisk

#Create a volume group on each physical volume:
echo -n "Creating Volume group... "
vgcreate $RuntimeGroup /dev/$RuntimeDisk

#Create a logical volume in each volume group
echo  "Creating Logical Volume in group... "
lvcreate --size $RuntimeSize --name $LogicalRuntime $RuntimeGroup

#Install LUKS if not installed
echo "Installing LUKS if needed... "
yum install -y cryptsetup-luks

#Activate LUKS module
echo "Activating LUKS... "
modprobe dm_crypt

#verify if module is running
echo "Verifying if dm_crypt is running"
Verify=`lsmod | grep dm_crypt`
if [ -z "$Verify" ]
then
  echo "dm_crypt is not running!"
  echo "Install failed."
  exit 1
else
  echo "dm_crypt is running."
fi

#Change the logical volume to the LUKS format:
cryptsetup luksFormat /dev/$RuntimeGroup/$LogicalRuntime
#Name LUKS logical volume.
cryptsetup luksOpen /dev/$RuntimeGroup/$LogicalRuntime luks-runtime
#Create ext4 system on LUKS volume
mkfs.ext4 /dev/mapper/luks-runtime

#Create /etc/crypttab file
echo "luks-runtime /dev/$RuntimeGroup/$LogicalRuntime /root/$RuntimeKey.key" > /etc/crypttab

#create key file
echo $RuntimePassword > /root/$RuntimeKey.key

#add key to LUKS logical volume
cryptsetup luksAddKey /dev/$RuntimeGroup/$LogicalRuntime /root/$RuntimeKey.key

###### DISK 2 #######
echo ""
echo ""
echo "---Data Disk---"

vgcreate $DataGroup /dev/$DataDisk
```

```
lvcreate --size $DataSize --name $LogicalData $DataGroup
cryptsetup luksFormat /dev/$DataGroup/$LogicalData
cryptsetup luksOpen /dev/$DataGroup/$LogicalData luks-data
mkfs.ext4 /dev/mapper/luks-data
echo "luks-data /dev/$DataGroup/$LogicalData /root/$DataKey.key" >> /etc/crypttab
echo $DataPassword > /root/$DataKey.key
cryptsetup luksAddKey /dev/$DataGroup/$LogicalData /root/$DataKey.key


######  Both  #######
#add link to fstab
echo "/dev/mapper/luks-runtime /luks-runtime ext4 defaults 1 2" >> /etc/fstab
echo "/dev/mapper/luks-data /luks-data ext4 defaults 1 2" >> /etc/fstab

#Mount volume
mkdir /luks-runtime
mount /luks-runtime
mkdir /luks-data
mount /luks-data
#Check encryption
cryptsetup status /dev/mapper/luks-runtime
cryptsetup status /dev/mapper/luks-data

#Create runtime directories
mkdir /var/log/purescale
mkdir /home/iwd
mkdir /opt/ibm
mkdir /data

mkdir -p /luks-runtime/var/log/purescale
mkdir -p /luks-runtime/home/iwd
mkdir -p /luks-runtime/opt/ibm
mkdir -p /luks-runtime/data

cp -r /opt/ibm /luks-runtime/opt/ibm

mount --bind /luks-runtime/var/log/purescale /var/log/purescale
mount --bind /luks-runtime/home/iwd /home/iwd
mount --bind /luks-runtime/opt/ibm /opt/ibm
mount --bind /luks-runtime/data /data
echo "/luks-runtime/var/log/purescale /var/log/purescale none defaults,bind 0 0" >> /etc/fstab
echo "/luks-runtime/home/iwd /home/iwd none defaults,bind 0 0" >> /etc/fstab
echo "/luks-runtime/opt/ibm /opt/ibm none defaults,bind 0 0" >> /etc/fstab
echo "/luks-runtime/data /data none defaults,bind 0 0" >> /etc/fstab

#data directories
mkdir /drouter
mkdir /data/workload
mkdir /data/system

mkdir /luks-data/drouter
mkdir -p /luks-data/data/workload
mkdir -p /luks-data/data/system

mount --bind /luks-data/drouter /drouter
```

```
mount --bind /luks-data/data/workload /data/workload
mount --bind /luks-data/data/system /data/system

echo "/luks-data/drouter /drouter none defaults,bind 0 0" >> /etc/fstab
echo "/luks-data/data/workload /data/workload none defaults,bind 0 0" >> /etc/fstab
echo "/luks-data/data/system /data/system none defaults,bind 0 0" >> /etc/fstab
```

The PSM VM also has repo and RPM prerequisites. The script that is shown in Example 3-2 can help check some of these prerequisites.

Example 3-2 Script to check RPM prerequisites

```
#! /bin/bash
epel=`yum search epel-release | grep No`
echo $epel
if [ -n "$epel" ]
then
  wget http://dl.fedoraproject.org/pub/epel/6/x86_64/epel-release-6-8.noarch.rpm
  rpm -Uvh epel-release-6-8.noarch.rpm
  yum repolist
  rm epel-release-6-8.noarch.rpm
else
  yum install -y epel-release
fi

yum install -y compat-libstdc++-33.i686 compat-libstdc++-33.x86_64 bind-utils.x86_64 dhcp.x86_64
dnsmasq.x86_64 genisoimage.x86_64 httpd.x86_64 libcgroup.x86_64 lsof.x86_64 mod_ssl.x86_64
openssh-clients.x86_64 pam.i686 redhat-lsb-core.x86_64 unzip.x86_64 ntp

echo
echo "Checking NTP"
ntpstat #check if ntp is running
if [ $? != 0 ]
then
  service ntpd start
  ntpdate 0.rhel.pool.ntp.org 1.rhel.pool.ntp.org
  chkconfig ntpd on
fi

echo
sel=`cat /etc/selinux/config | grep enabled`
if [ -n "$sel" ]
then
  echo "SELinux is currently enabled."
else
  echo "SELinux is currently disabled or unavailable."
fi

ifconfig -a > ip_settings
ifconfig -ad
```

Example 3-3 on page 25 shows the console interaction when you run the PureApplication Software installer on the PSM VM.

Tip: The installation can take two or more hours. Also, there can be long periods with no console traffic, so consider using **nohup** or another keep-alive mechanism.

Example 3-3 Console interaction when running the PureApplication Software installer on the PSM VM

```
[root@sdepuremgmt pureappsw]# ./install.sh
Mon Apr  6 09:38:43 CDT 2015 Welcome to PureApplication Installation process
Mon Apr  6 09:38:43 CDT 2015 You're about to install PureApplication:
Mon Apr  6 09:38:43 CDT 2015 Version: 2.1.0.0
Mon Apr  6 09:38:43 CDT 2015 Build: 20150307.0226.456
Mon Apr  6 09:38:43 CDT 2015 ++++++ PureApplication install.sh script start
Mon Apr  6 09:38:43 CDT 2015 Logging to file:
/var/log/pureapp_software/install_pureapp_software-20150406_093843.log
Mon Apr  6 09:38:43 CDT 2015 Verifying installation prerequisites
Mon Apr  6 09:38:43 CDT 2015 Selinux is disabled or in permissive mode. Continue installation
Mon Apr  6 09:38:43 CDT 2015 Verification completed successfully
Are you sure you wish to continue? [y/n] (default [y])?y
Mon Apr  6 09:38:50 CDT 2015 ++++++ Gathering installation properties
Mon Apr  6 09:38:50 CDT 2015 Please select installation type
Mon Apr  6 09:38:50 CDT 2015 [1] IBM PureApplication Software
Mon Apr  6 09:38:50 CDT 2015 [2] IBM PureApplication Service
Mon Apr  6 09:38:50 CDT 2015 [3] IBM PureApplication Azure
Installation type [1/2/3]: 1
Please enter installation name: drdavewtest
Enter administrator login: (default: 'admin'):
Please enter administrator password: *********
Please re-enter administrator password: *********
Mon Apr  6 09:39:14 CDT 2015 Entered installation name: 'drdavewtest', Administrator login:
'admin'
Mon Apr  6 09:39:14 CDT 2015 ++++++ Creating backup of system configuration files (Step 1 of 9)
Mon Apr  6 09:39:14 CDT 2015 ++++++ Updating /etc/hosts to reference machine hostname (Step 2 of
9)
Mon Apr  6 09:39:14 CDT 2015 ++++++ Installing prerequisite rpms ... (Step 3 of 9)
Mon Apr  6 09:39:35 CDT 2015 Packages installed successfully.
Mon Apr  6 09:39:35 CDT 2015 ++++++ Installing PureApplication yum repository ... (Step 4 of 9)
Mon Apr  6 09:39:39 CDT 2015 PureApplication repository created.
Mon Apr  6 09:39:39 CDT 2015 ++++++ Installing PureApplication rpms ... (Step 5 of 9)
Mon Apr  6 09:40:38 CDT 2015 PureApplication rpms installed successfully
Mon Apr  6 09:40:38 CDT 2015 +++++++ Installing TSA ... (Step 6 of 9)
...................
Mon Apr  6 09:42:14 CDT 2015 TSA installed successfully
Mon Apr  6 09:42:14 CDT 2015 ++++++ Installing purescale services ... (Step 7 of 9)
................................................................................
................................................................................
Mon Apr  6 09:57:52 CDT 2015 Purescale services installed successfully
Mon Apr  6 09:57:52 CDT 2015 ++++++ Configuring purescale services ... (Step 8 of 9)
................................................................................
................................................................................
................................................................................
............
Mon Apr  6 10:31:36 CDT 2015 Purescale services configured successfully
Mon Apr  6 10:31:36 CDT 2015 PureApplication installation has finished.
Mon Apr  6 10:31:36 CDT 2015 Please log in to Web Console:
Mon Apr  6 10:31:36 CDT 2015 Web Console url: http://localhost.localdomain
```

```
Mon Apr  6 10:31:36 CDT 2015 Web Console admin: admin
Mon Apr  6 10:31:37 CDT 2015 ++++++ Installing default data ... (Step 9 of 9)
Mon Apr  6 10:31:37 CDT 2015 Unpacking default data archive ...
................................................................................
..............................................
Mon Apr  6 10:43:53 CDT 2015 Waiting for purescale services to start  ...
..................
Mon Apr  6 10:45:31 CDT 2015 Importing default data ...
```

3.2 Deployment zone implementation

Section 3.1, “PureSystems Manager virtual machine implementation” on page 18 gave suggestions for creating the PSM VM and installing the PureApplication Software in to that VM. Section 3.3, “Connecting and integrating PureApplication Software with vCenter on VersaStack” on page 37 describes how to connect and integrate PureApplication Software with vCenter on VersaStack.

This section describes four additional preparations in vCenter for PureApplication Software overall:

1. Creating a second virtual data center for application deployment and creating a vCenter ID for this virtual data center
2. Creating a virtual distributed switch
3. Adding hosts to the distributed virtual switch
4. Verifying the data stores are connected to the ESXi servers

3.2.1 Creating a second virtual data center for application deployment and creating a vCenter ID for this virtual data center

A separate deployment zone virtual data center is required by PureApplication Software as the target for IBM Middleware deployments, with one of more ESXi servers included in this virtual data center.

Figure 3-5 shows an example of a second deployment zone virtual data center that is named *PureAppDeployDataCenter*.

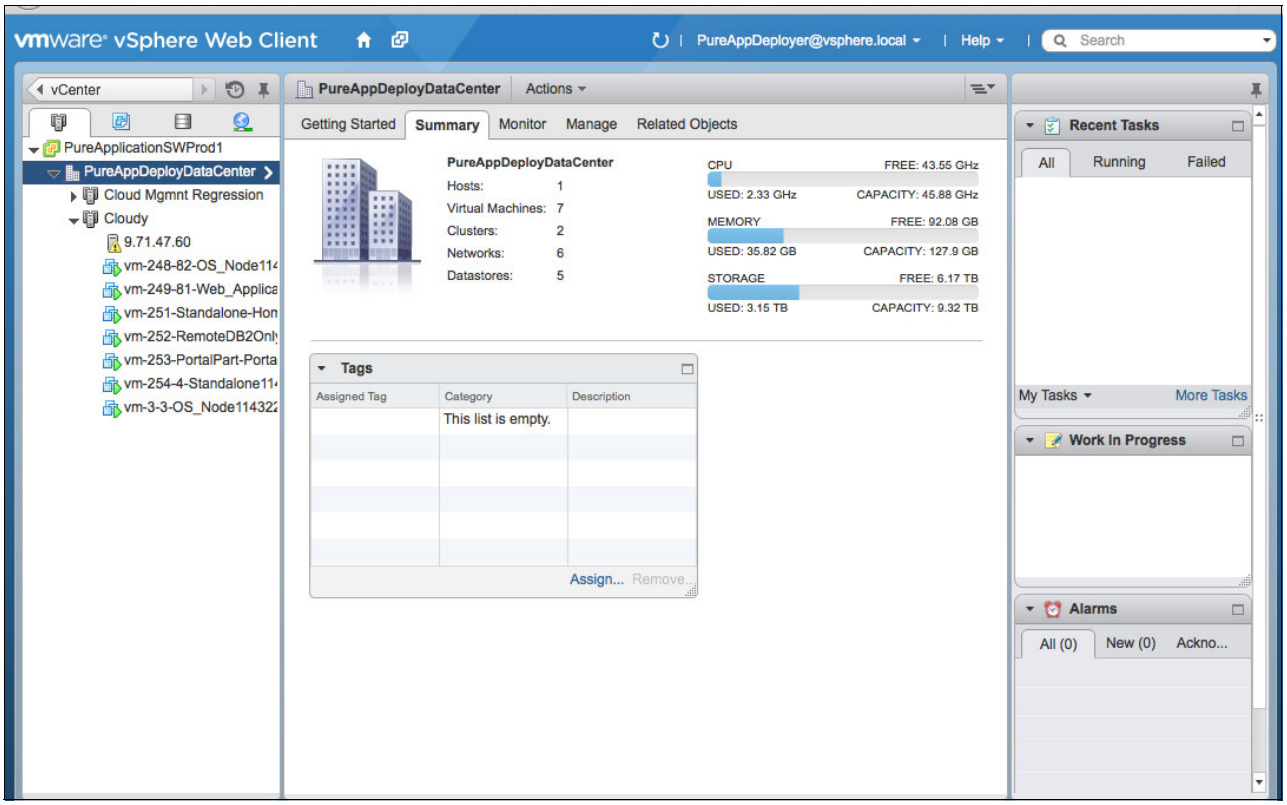


Figure 3-5 Deployment zone virtual data center - PureAppDeployDataCenter

A vCenter user must be created, such as `PureAppDeployer@vsphere.local`, that has administrator privileges for the PureAppDeploymentDataCenter. When using vCSA vCenter on VersaStack, use the Permissions section of vCenter to accomplish this task, as shown in Figure 3-6. Click **Manage** → **Permissions** for the virtual data center object.

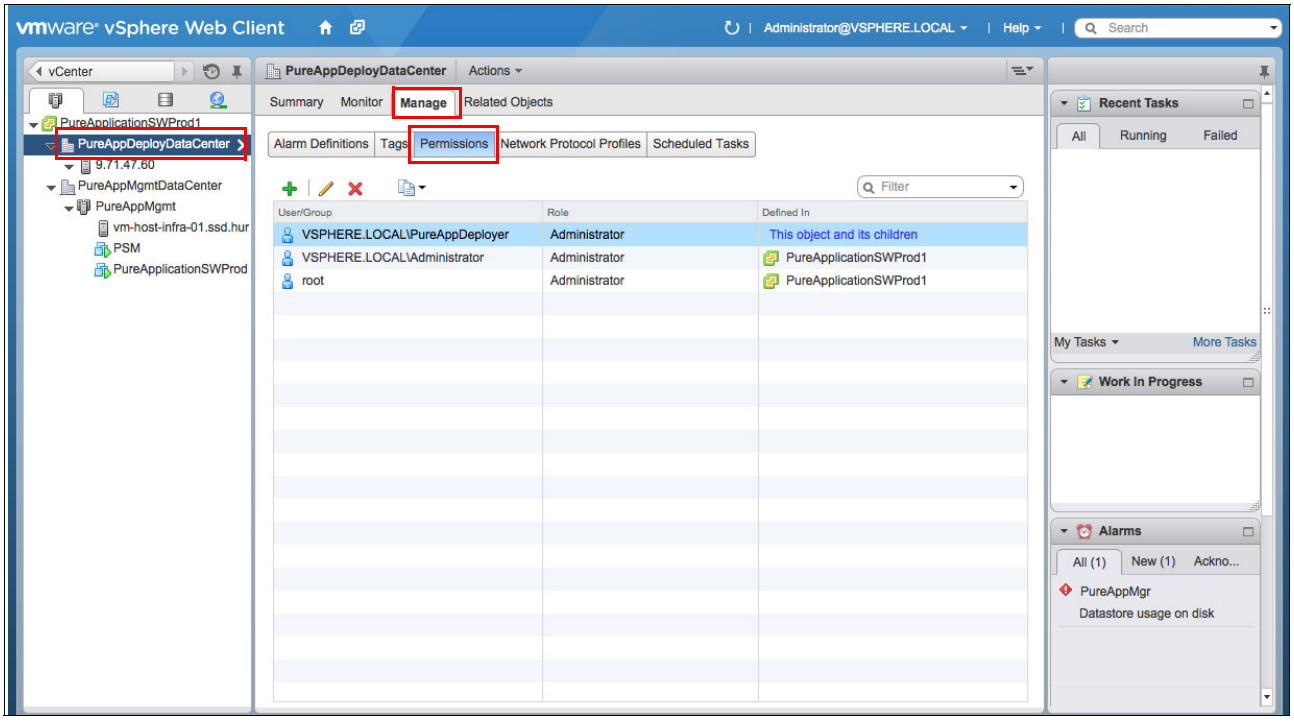


Figure 3-6 PureAppDeployer as the administrator of a virtual data center - PureAppDeployDataCenter

3.2.2 Creating a distributed virtual switch

PureApplication Software requires a virtual distributed switch for the deployment zone virtual data center. ESXi servers start with standard virtual switches, so there is a migration process to a distributed virtual switch that you must use for all ESXi servers in the deployment zone. The kernel adapter should be migrated simultaneously.

Figure 3-7 on page 29 shows the necessary distributed virtual switch (*DeployPrivateDVSwitch*) that was configured by following the instructions that are provided in the IBM Knowledge Center, found at:

`http://www.ibm.com/support/knowledgecenter/SSL5ES_2.1.0/doc/getstart/cfgvmware.dita`

After you create the distributed virtual switch, add hosts to this distributed virtual switch.

3.2.3 Adding hosts to the distributed virtual switch

To add hosts to the distributed virtual switch, complete the following steps:

1. Click the icon that is highlighted in Figure 3-7 to open the Add and Manage Hosts window.

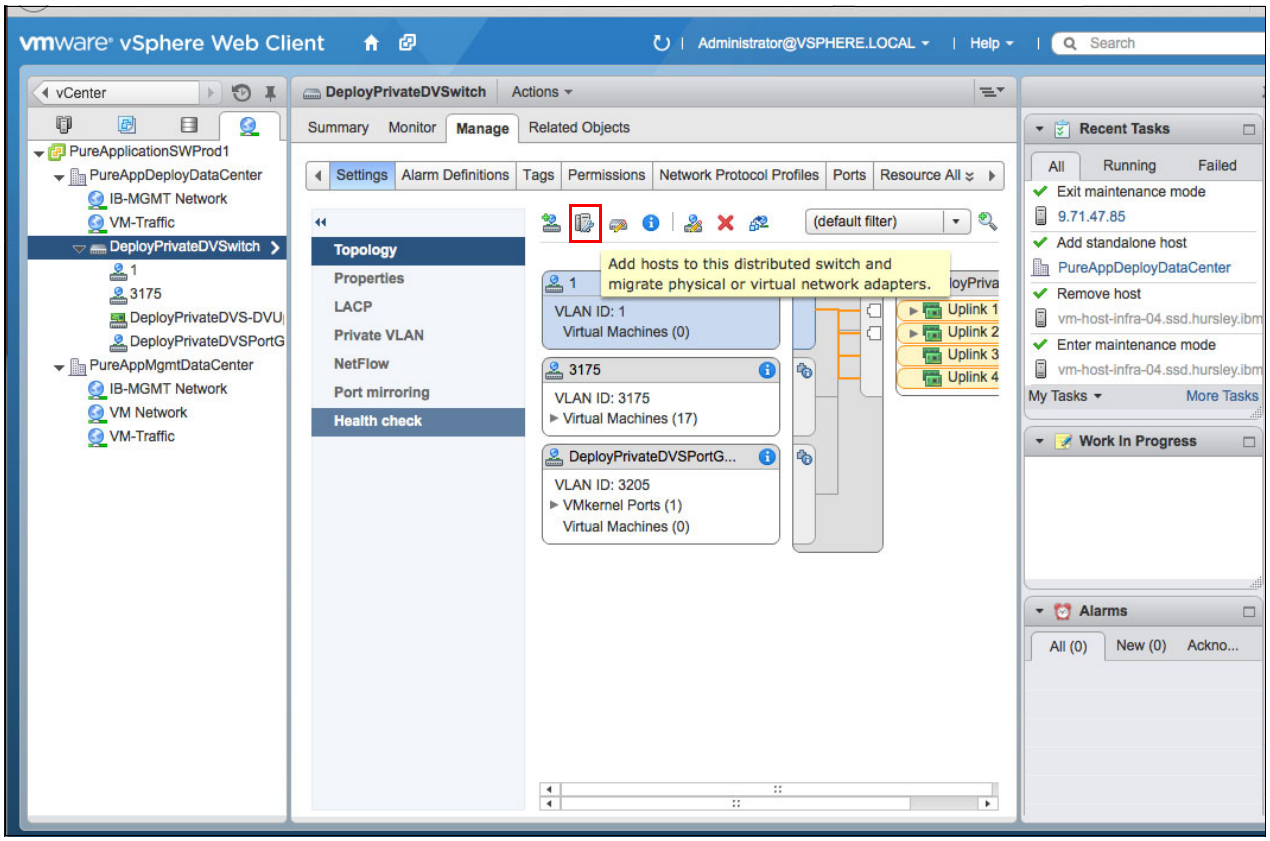


Figure 3-7 Add hosts to the distributed virtual switch - icon

2. Figure 3-8 shows the Add and Manage Hosts window. Select **Add hosts**.

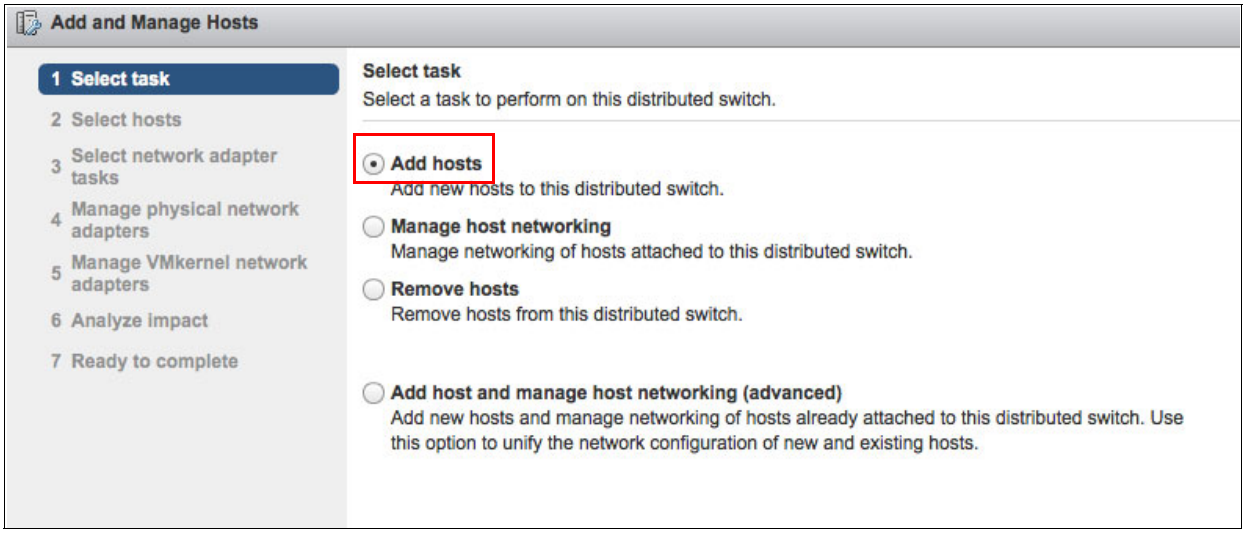


Figure 3-8 Add hosts to the distributed virtual switch - Add hosts

3. Select the hosts to be added to the distributed virtual switch. Select the check boxes of the hosts to be added, and click **OK**, as shown in Figure 3-9.

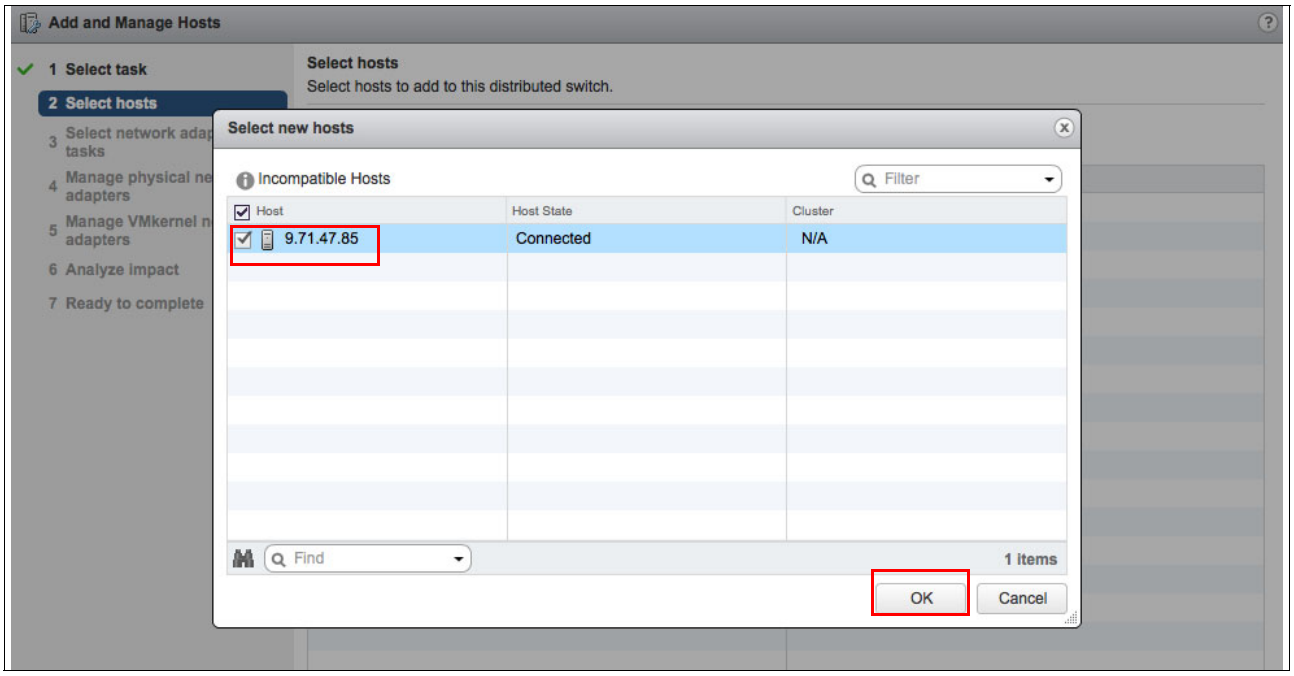


Figure 3-9 Add hosts to the distributed virtual switch - Select new hosts

4. Review the hosts to be added, verify them, and click **Next**, as shown in Figure 3-10.

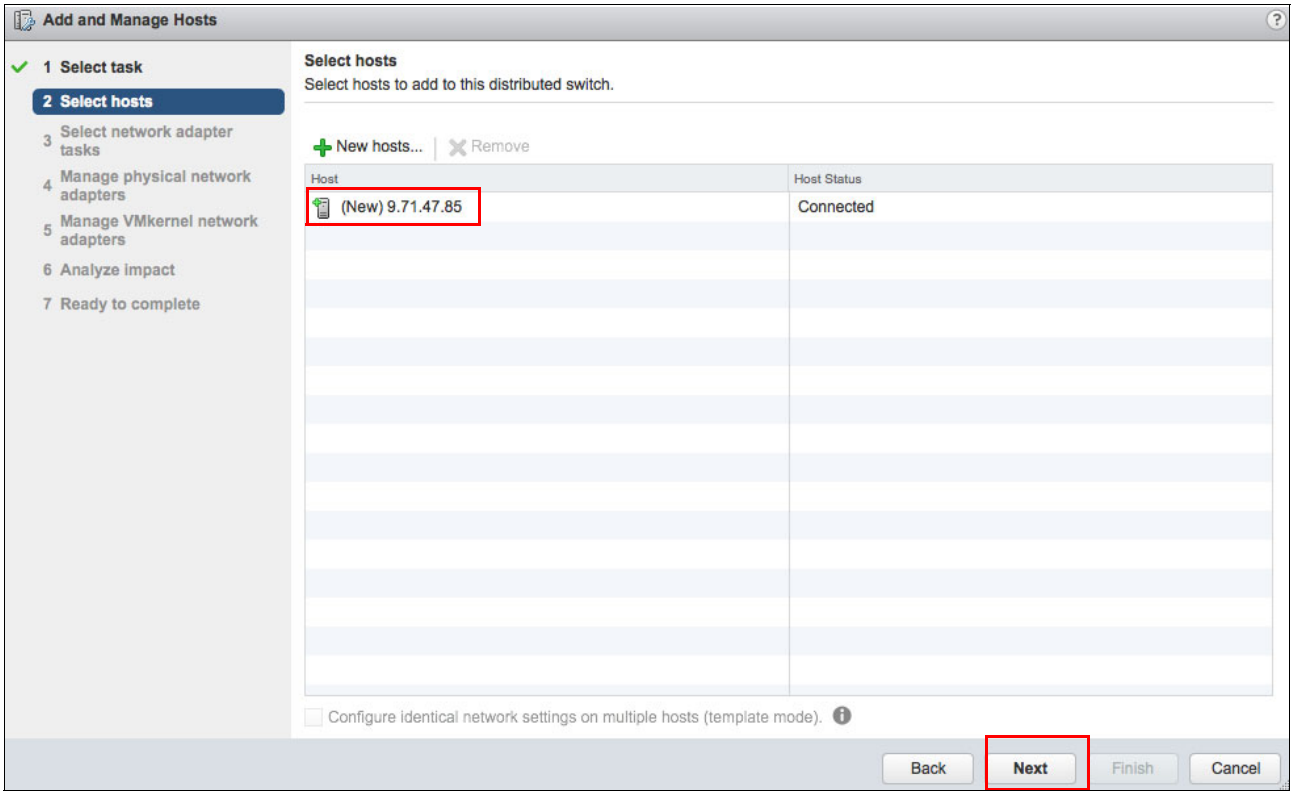


Figure 3-10 Add hosts to the distributed virtual switch -review and verify the hosts

5. Ensure the “Manage physical adapters” and “Manage VMkernel adapters” are checked, as shown in Figure 3-11.

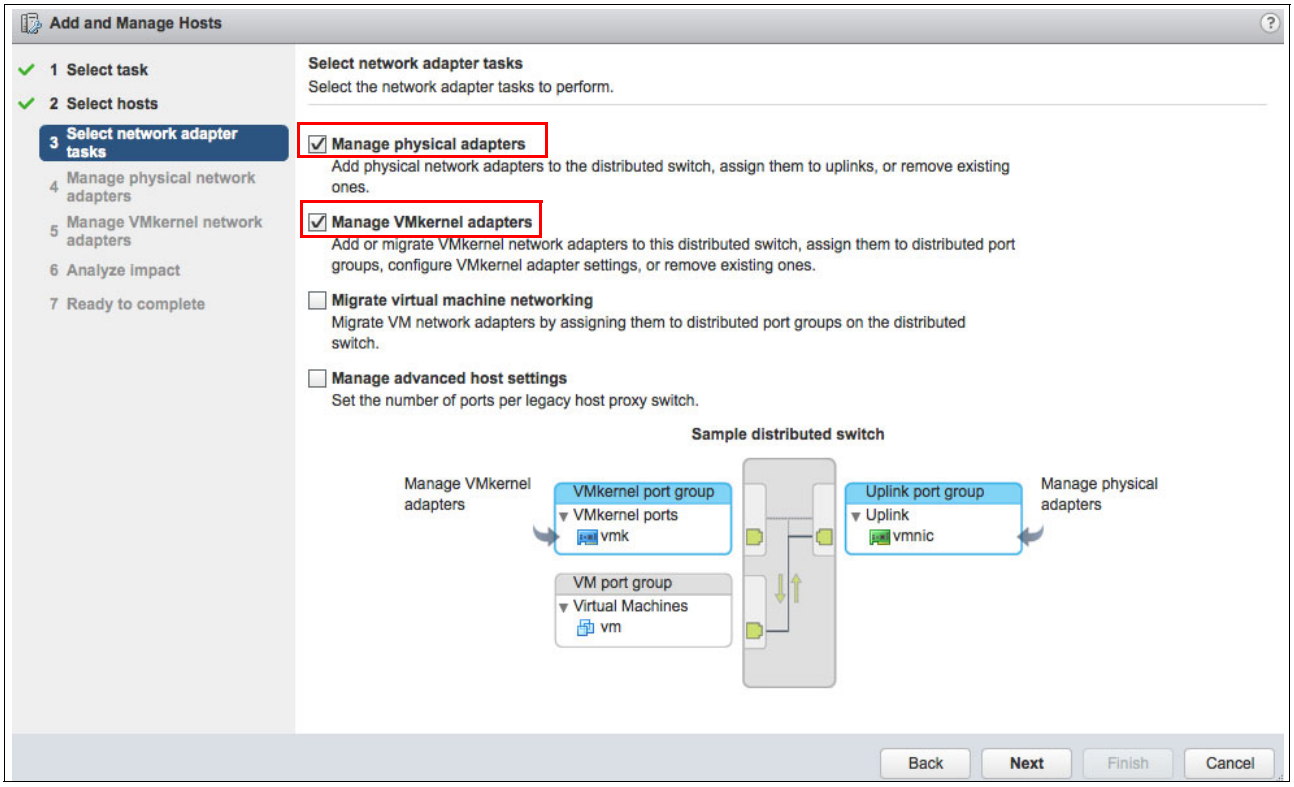


Figure 3-11 Adding hosts to the Distributed Virtual Switch - ensure that check boxes are checked

6. Add your physical network adapters to the virtual adapters list by selecting them and clicking **Next**, as shown in Figure 3-12.

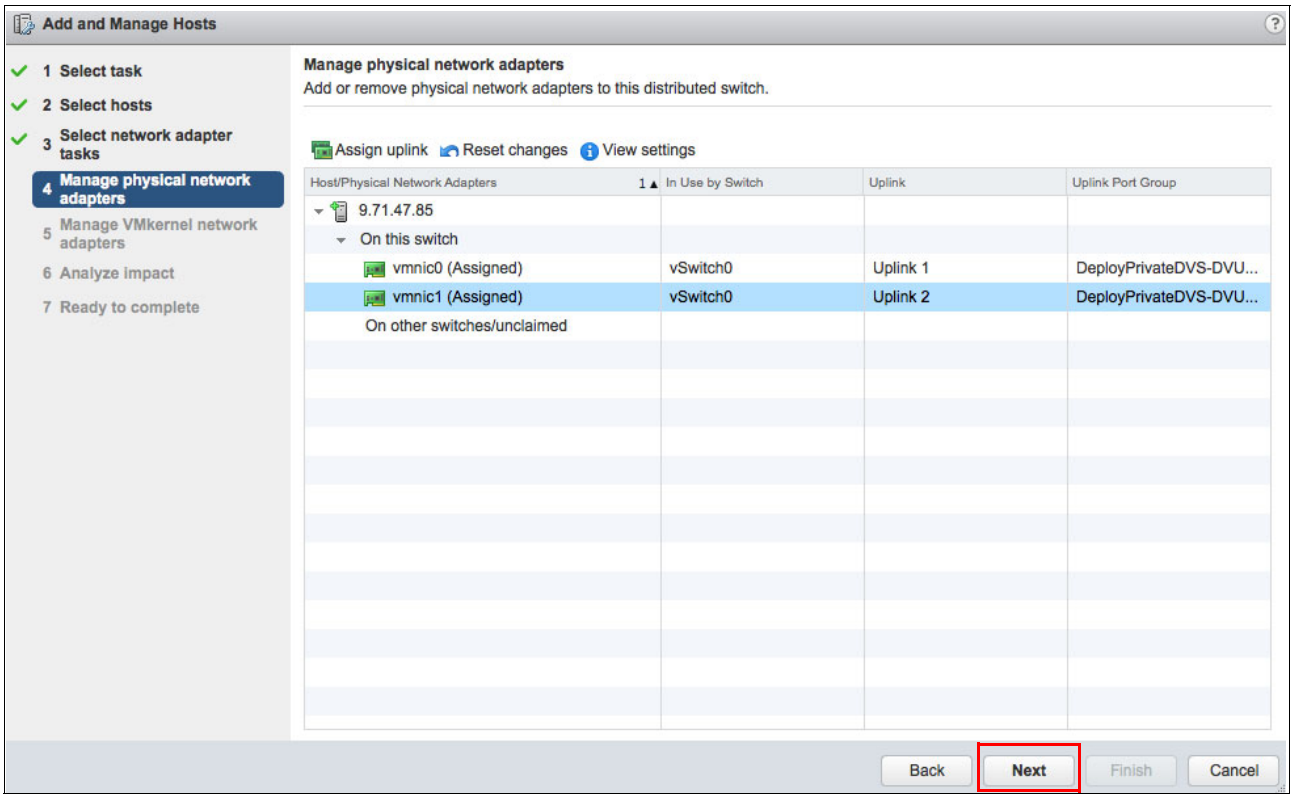


Figure 3-12 Add hosts to the distributed virtual switch - Manage physical network adapters

7. Select the **Port Groups** to be assigned, as shown in Figure 3-13 on page 33.

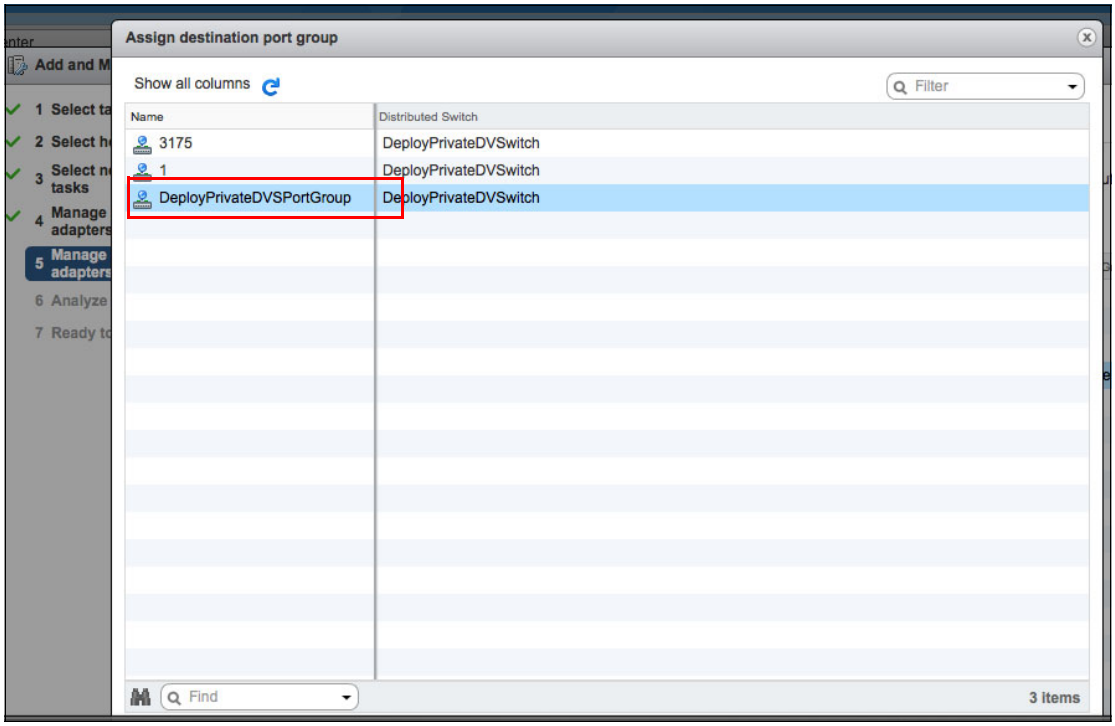


Figure 3-13 Add hosts to the distributed virtual switch - Assign destination port group

8. Verify the settings and click **Next**, as shown in Figure 3-14.

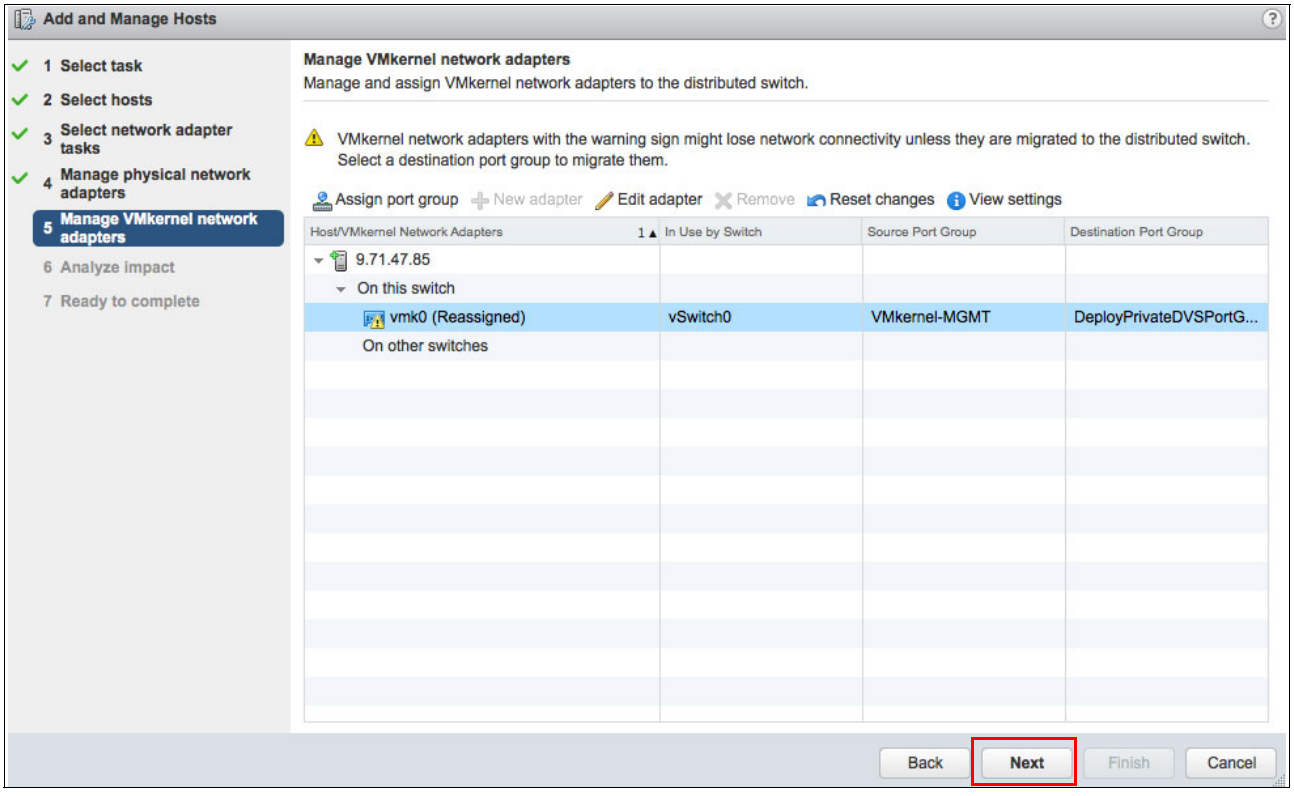


Figure 3-14 Add hosts to the distributed virtual switch - verify the settings - Manage VMkernal network adapters

9. Verify the settings and click **Next**, as shown in Figure 3-15.

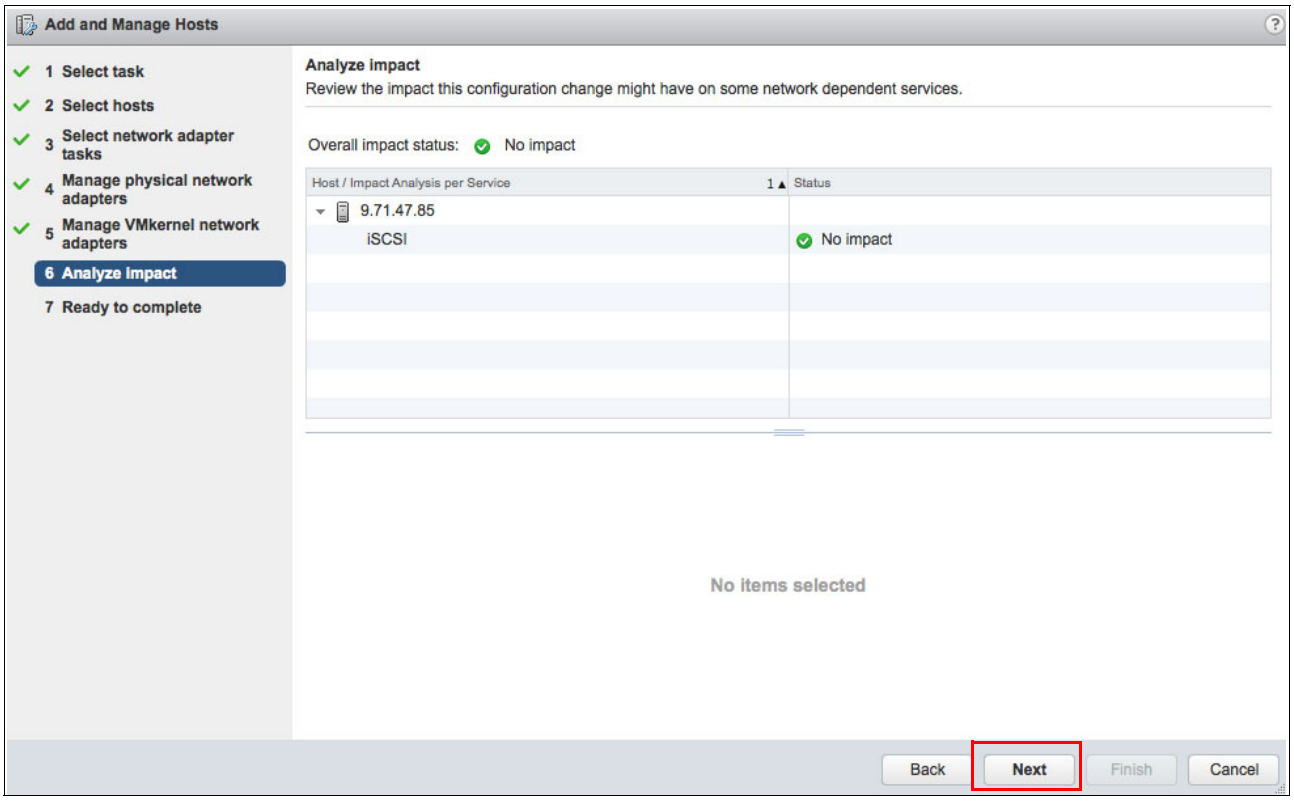


Figure 3-15 Add hosts to the distributed virtual switch - verify the settings - Analyze impact

10. Verify the settings and click **Finish** to add the distributed virtual switch, as shown in Figure 3-16 on page 35.

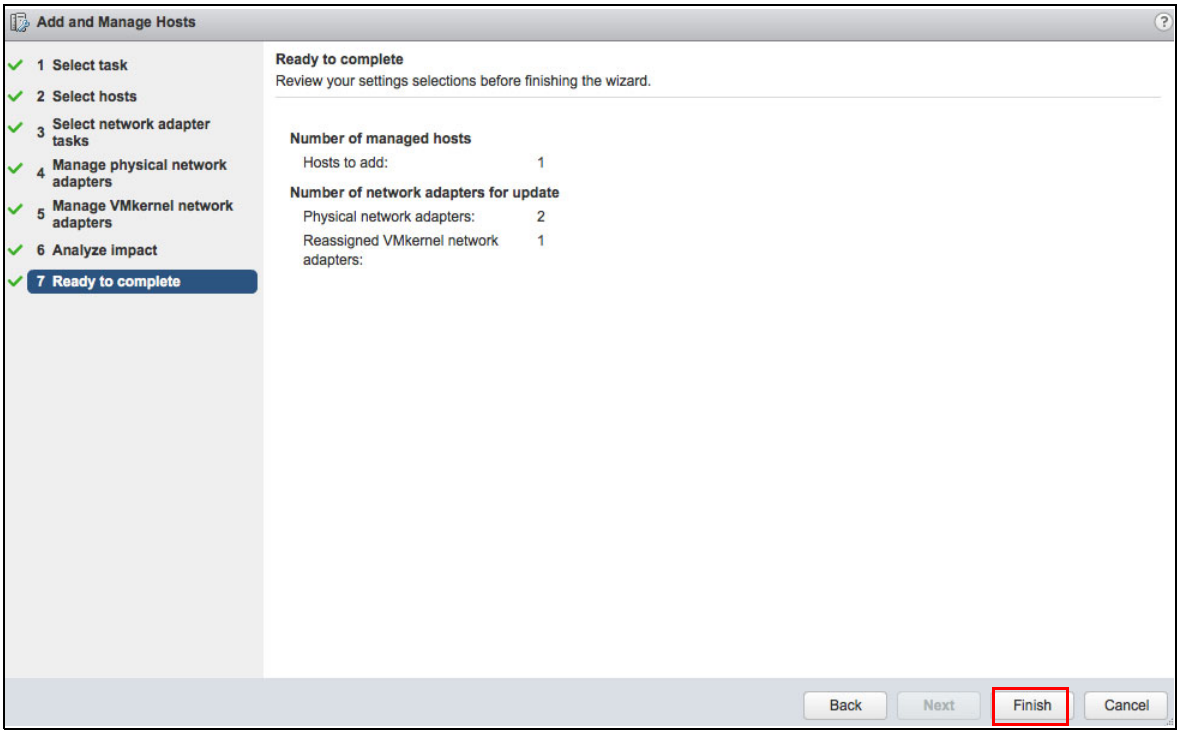


Figure 3-16 Add hosts to the distributed virtual switch - Ready to complete

11. Figure 3-17 shows the final result.

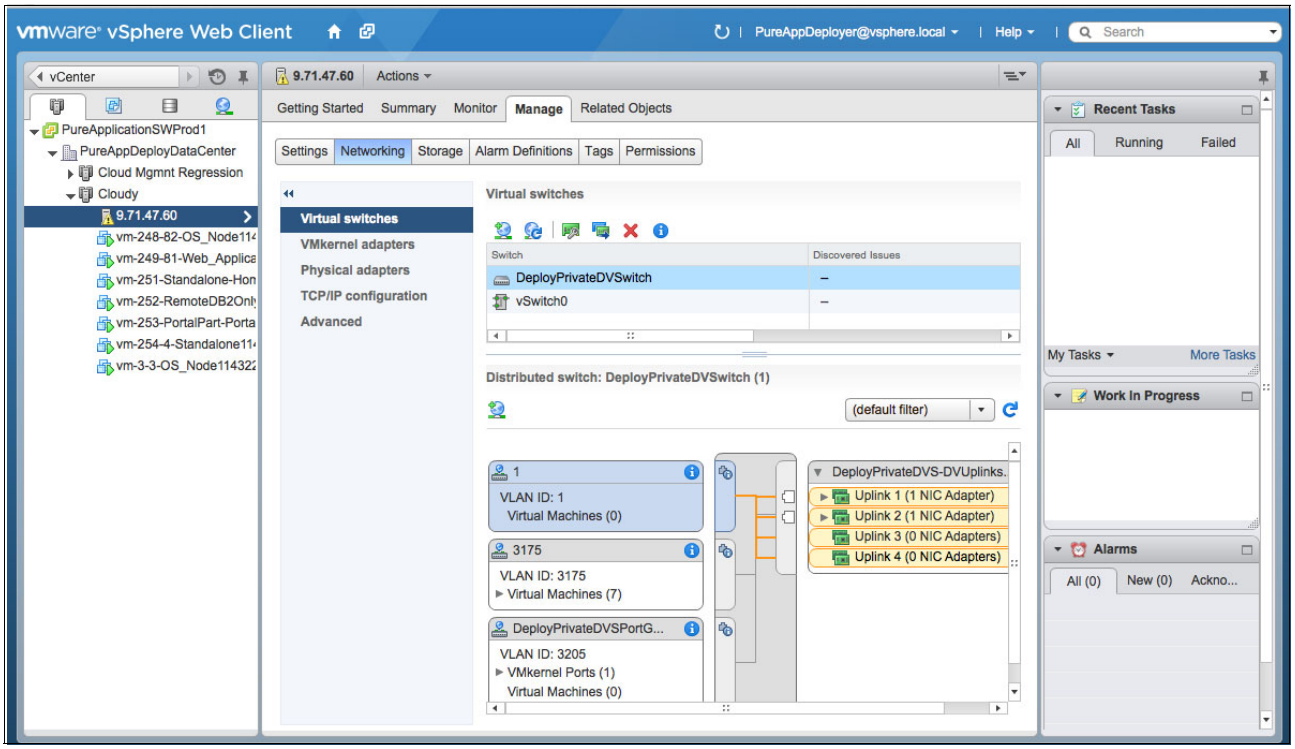


Figure 3-17 Migration to distributed virtual switch - complete

Tip: Adding hosts to the distributed virtual switch can be tricky because the switch attempts to migrate the VMkernel adapter, which is responsible for communication with the ESXi server at the beginning of the migration process. An error in this migration process can result in loss of communications with the ESXi server, and VMware is designed to automatically to roll back changes to the prior working standard virtual switch configuration if an error occurs.

When migrating from a standard virtual switch to a distributed virtual switch, trunking, VLANs, and so forth, must match between the current location of the VMkernel adapter and the future location of the VMkernel adapter, or you might see *lost contact or rolling back* types of errors.

For more information, see the Knowledge Base item found at the following website:

`http://kb.vmware.com/selfservice/microsites/search.do?language=en_US&cmd=displayKC&externalId=1010614`

3.2.4 Verifying that the data stores are connected to the ESXi servers

The data stores for PureApplication Software must be attached to all ESXi servers in the management and deployment zones.

Figure 3-18 shows the properly connected cache_2TB-1 and deploy data stores to the ESXi servers in the deployment zone virtual data center.

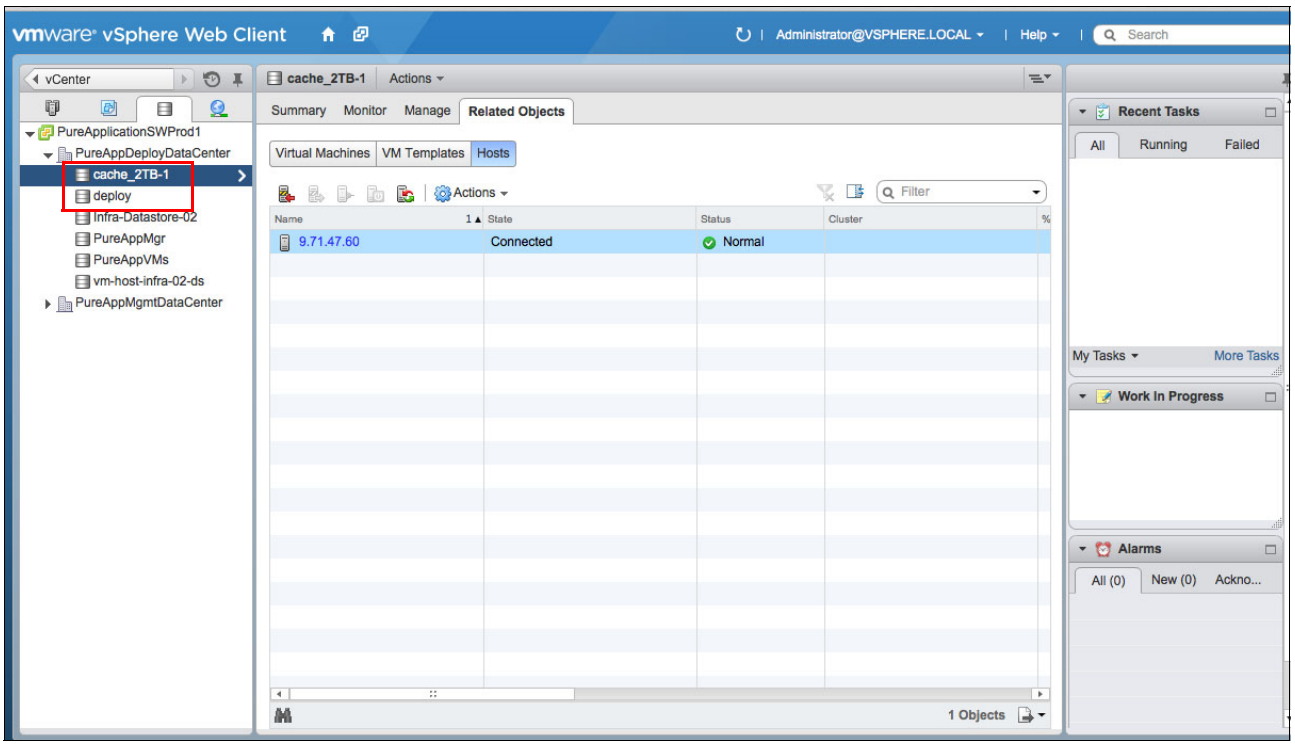


Figure 3-18 Cache_2TB-1 and deploy data stores connected to ESXi servers in the deployment zone

3.3 Connecting and integrating PureApplication Software with vCenter on VersaStack

The post PSM installation welcome wizard has nine configuration steps to complete. After the PureApplication Software is installed in the PSM VM, and all the preparations are completed, you are ready to configure your cloud.

After logging in to the PureApplication Software web-based GUI, the Configure Your Cloud welcome window opens, as shown in Figure 3-19.

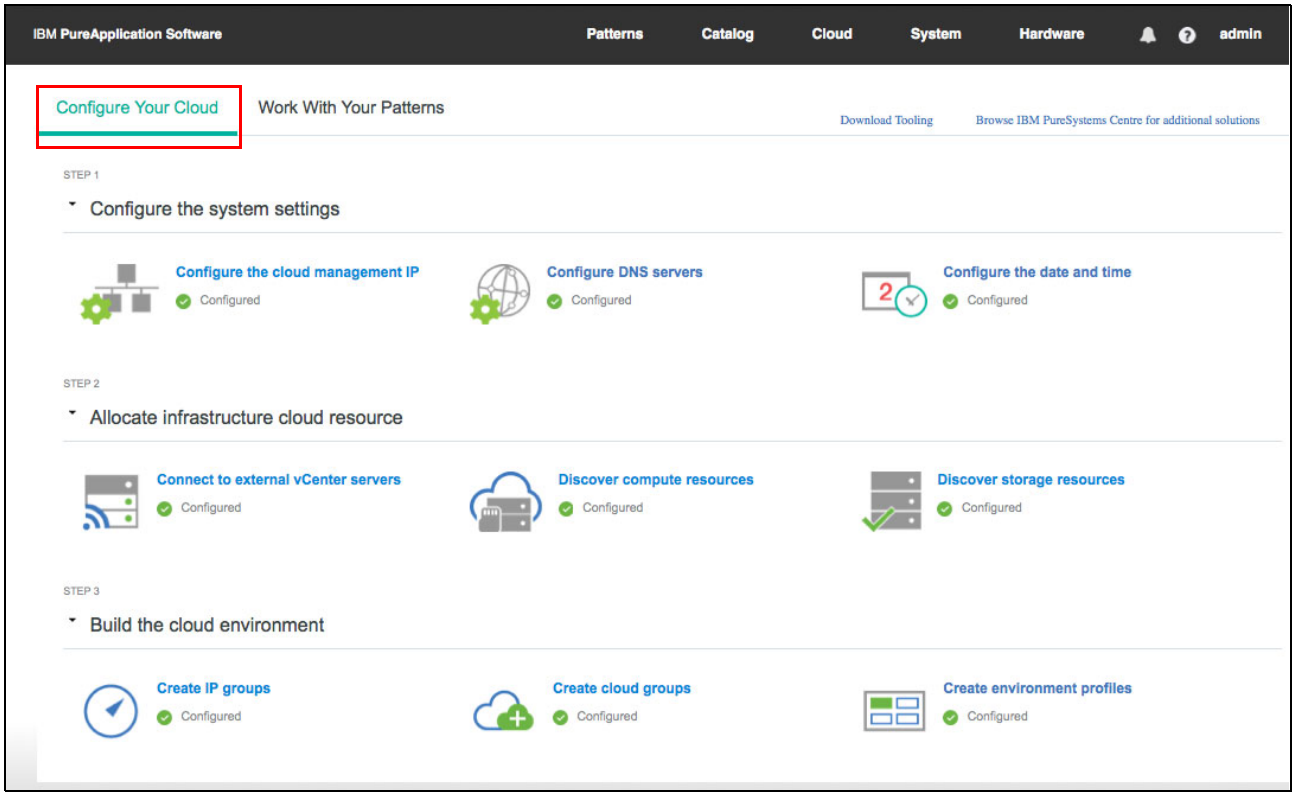


Figure 3-19 Postinstallation configuration wizard

These tasks can be viewed one at a time. This section gives information about some of the key entries.

Click **Configure the cloud management IP**. In the “Configure the cloud management IP” section, the management IP is the IP address of the PSM VM. This IP must be on the deployment network. If this deployment network is internal to the VersaStack configuration, the PSM VM must be attached to a second external network to reach the PSM VM from outside the VersaStack rack.

Important: After this information is saved, it cannot be changed, so be certain of this information before configuring it.

VLANs, shown in Figure 3-20, is a comma-separated lists of VLANs that are used by the PSM for the data subnets that are used for VM deployment. When the subnets are created by using these VLANs, the port groups are created in your vCenter data center.

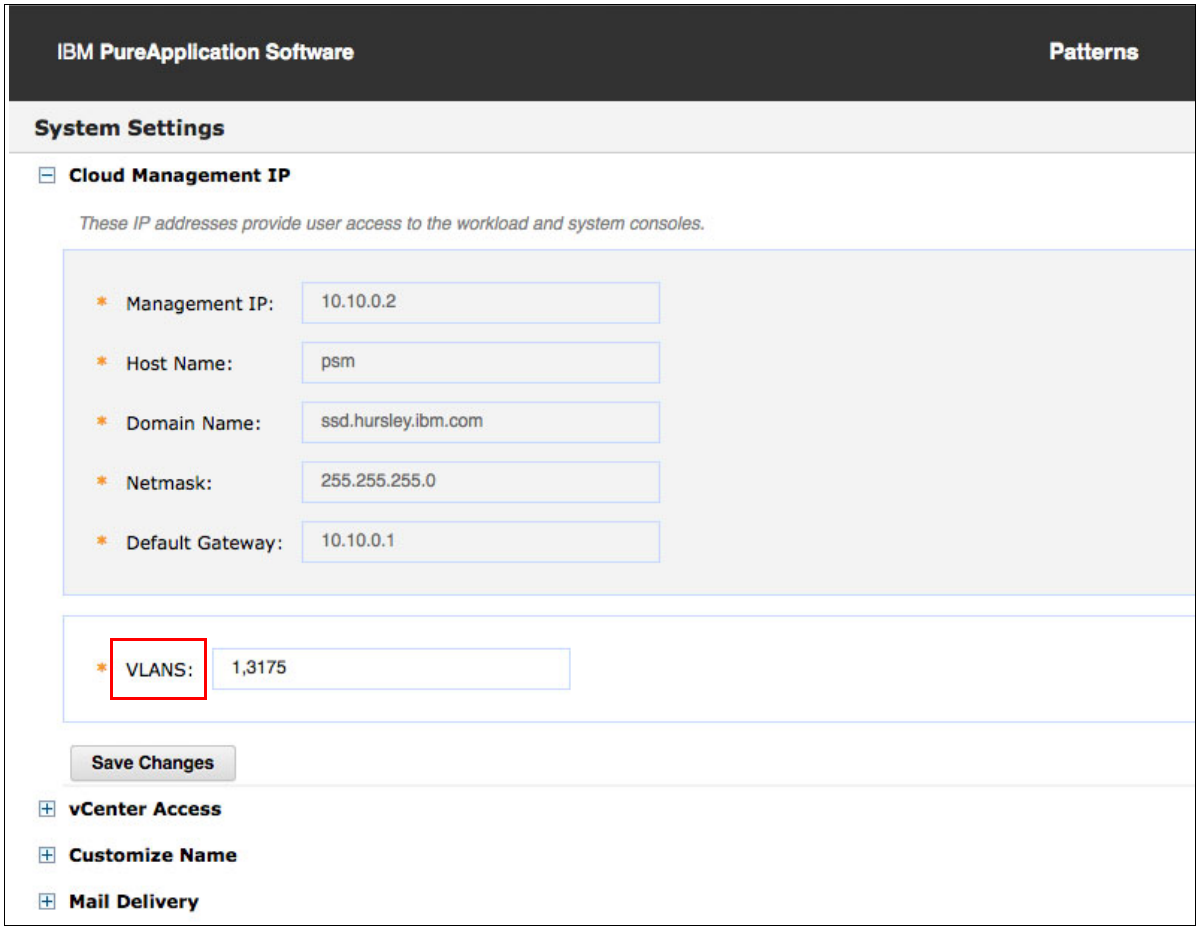


Figure 3-20 Cloud Management IP

In the vCenter access section (see Figure 3-21 on page 39), use the configured values from 2.4, “VersaStack VMware implementation architecture” on page 12.

- *vCenter IP* is the IP address of the vCSA appliance VM.
- *User name/Password* is the user name and password that has permission to administer the deployment zone virtual data center.
- *Datacenter* is the name of the virtual data center, which is PureAppDeployDataCenter.
- *Virtual Distributed Switch* is the name of the virtual distributed switch, which is DeployPrivateDVSwitch.

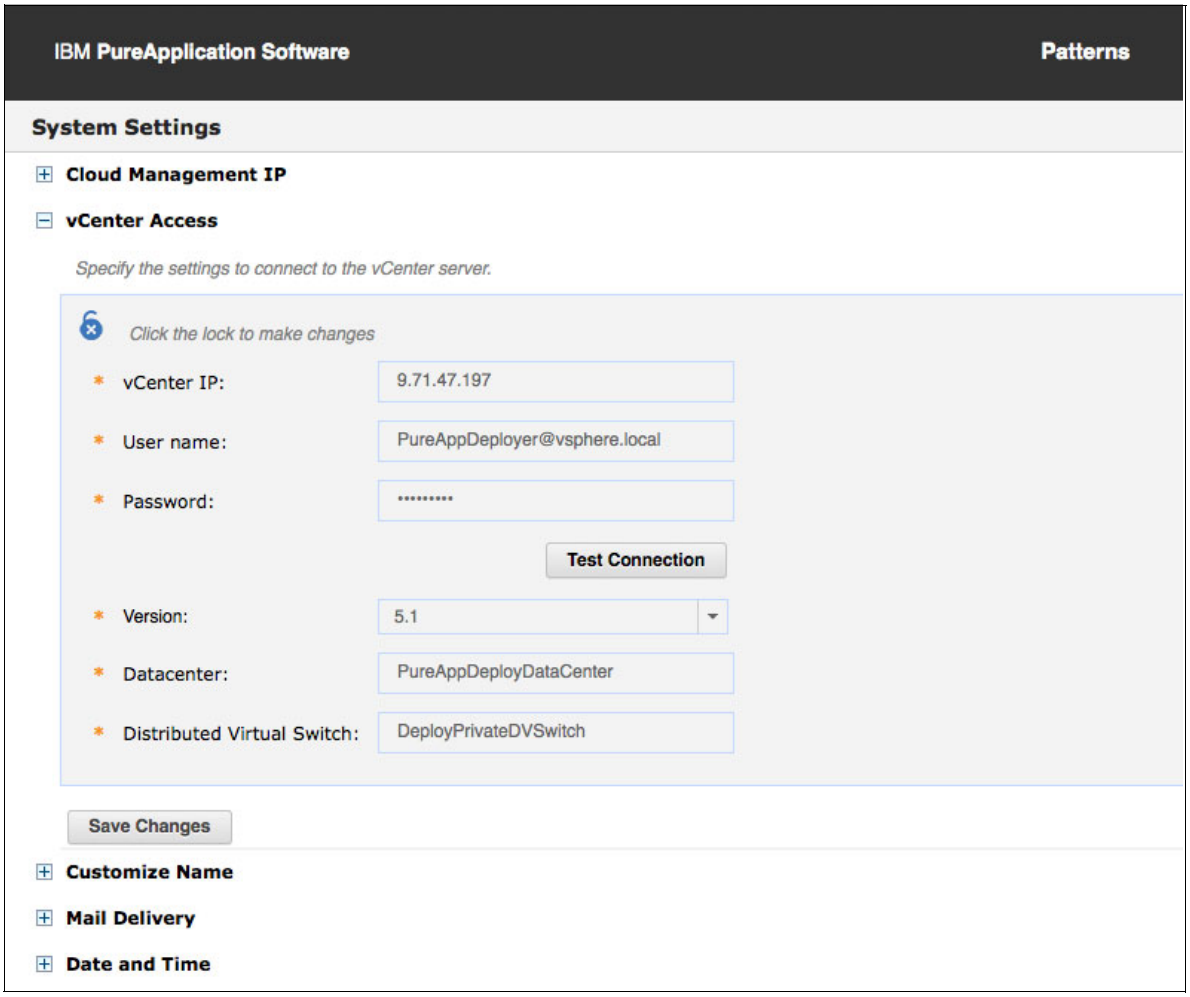


Figure 3-21 vCenter Access

If a DNS is needed inside the VersaStack PureApplication domain, the DNS step can wait until PureApplication Software is fully configured, and then PureApplication Software can be used to deploy a VM to host the DNS function.

Discovery of compute resource in PureApplication Software is easier if the compute resource is discovered through the IP address in vCenter, rather than the host name. Figure 3-5 on page 27 shows the ESXi host that is connected in vCenter through its IP address `9.71.47.60` rather than its host name.

Here are the basic compute node discovery steps in the configuration wizard:

1. Request discovery by clicking the eye icon, which initiates a background job to look for new ESXi servers in the deployment zone virtual data center, as shown in Figure 3-22.

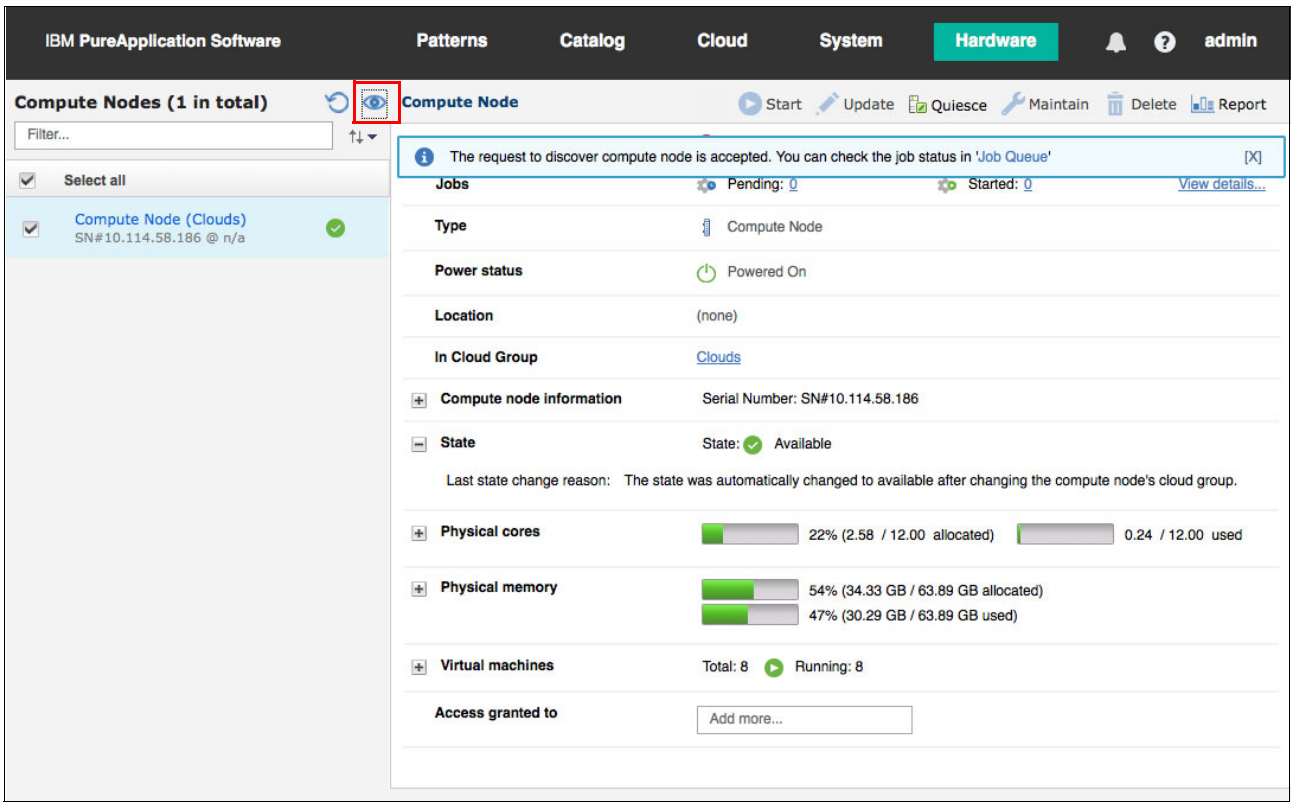


Figure 3-22 Postinstallation configuration wizard - discovery process

2. The newly discovered compute node shows with the eye icon in the left pane (Figure 3-23 on page 41). The State field has the comment “Discovered, update the credentials information to make it available”. Although the PureApplication Software PSM has discovered the compute node from vCenter, it still needs the required login credentials to be considered fully available.

3. Click **Update** (pencil icon) to add login credentials, as shown in Figure 3-23.

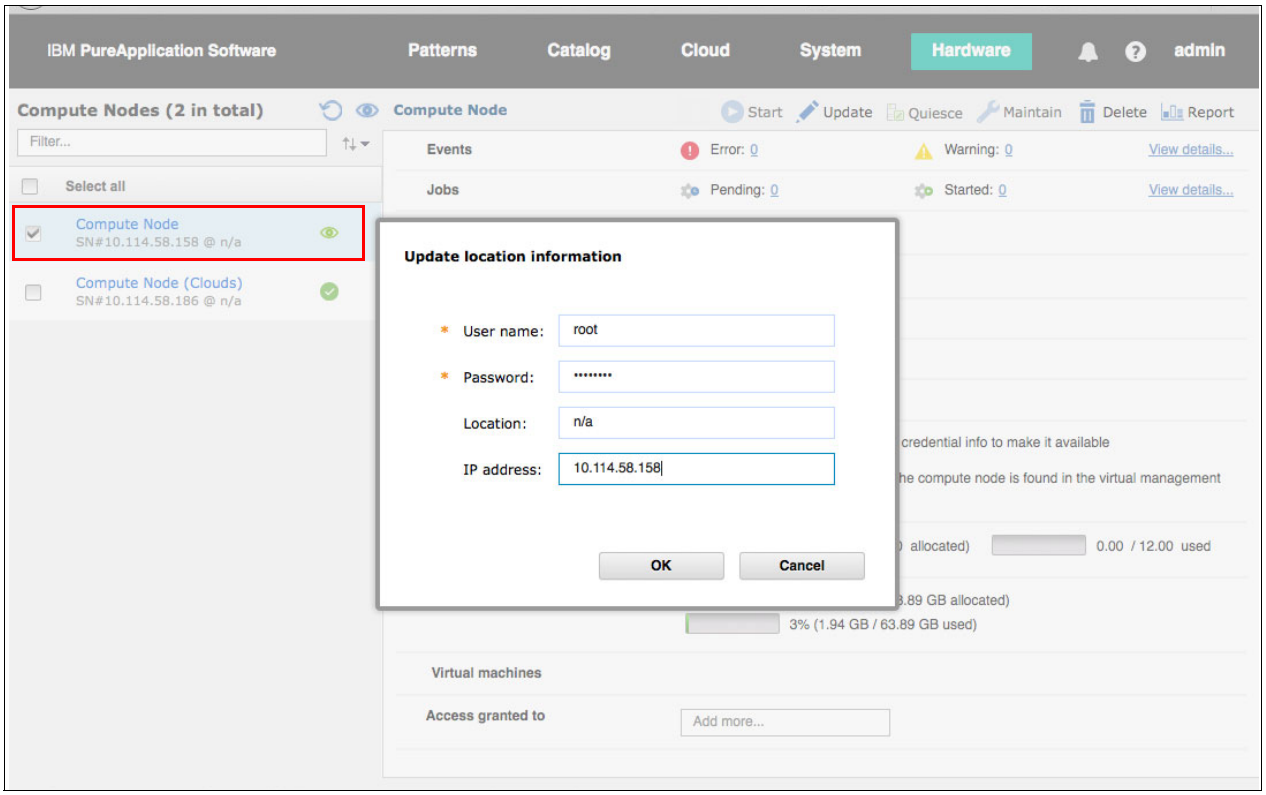


Figure 3-23 Postinstallation configuration wizard - Update location information

4. Eventually, the compute node should show fully available in both the left and right panes. First, it is shown as discovered in Figure 3-24.

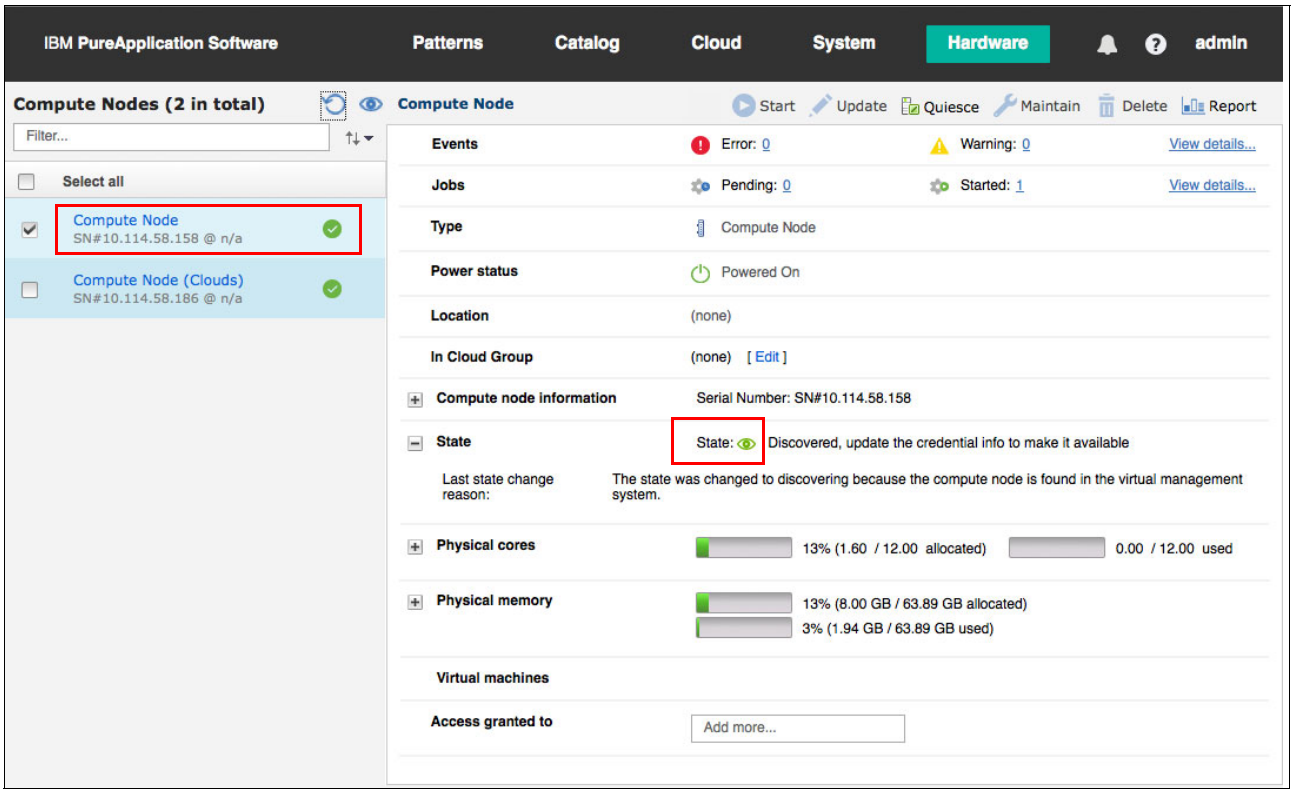


Figure 3-24 Postinstallation configuration wizard - compute not available yet in right pane

5. It might take some time. You can click the refresh icon, or navigate away and back until Available is seen in both the left and right panes, as shown in Figure 3-25 on page 43.

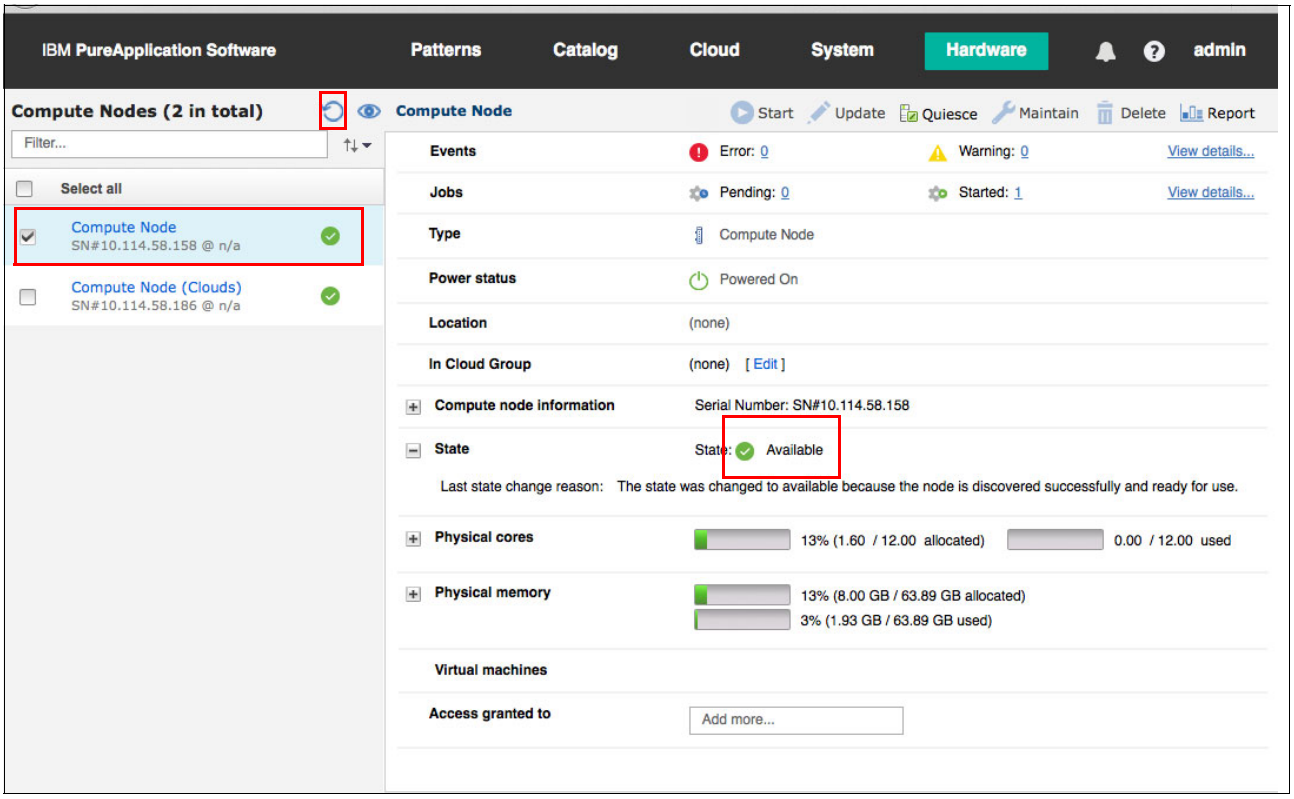


Figure 3-25 Postinstallation configuration wizard - compute available in right pane

6. The image cache data store (cache_2TB-1) and the cloud group data store (deploy) must be discovered in the PureApplication Software. Click the **Discover** eye icon to have PSM discover the data stores that are present in the deployed virtual data center in vCenter, and click the refresh icon to update the display.

Note: The cache_2TB-1 is a special data store that is used to store the images and is considered a permanent *system* resource, and should not be deleted like other cloud group data stores. Therefore, the red X is not present for the cache_2TB-1, as shown in Figure 3-26 on page 44.

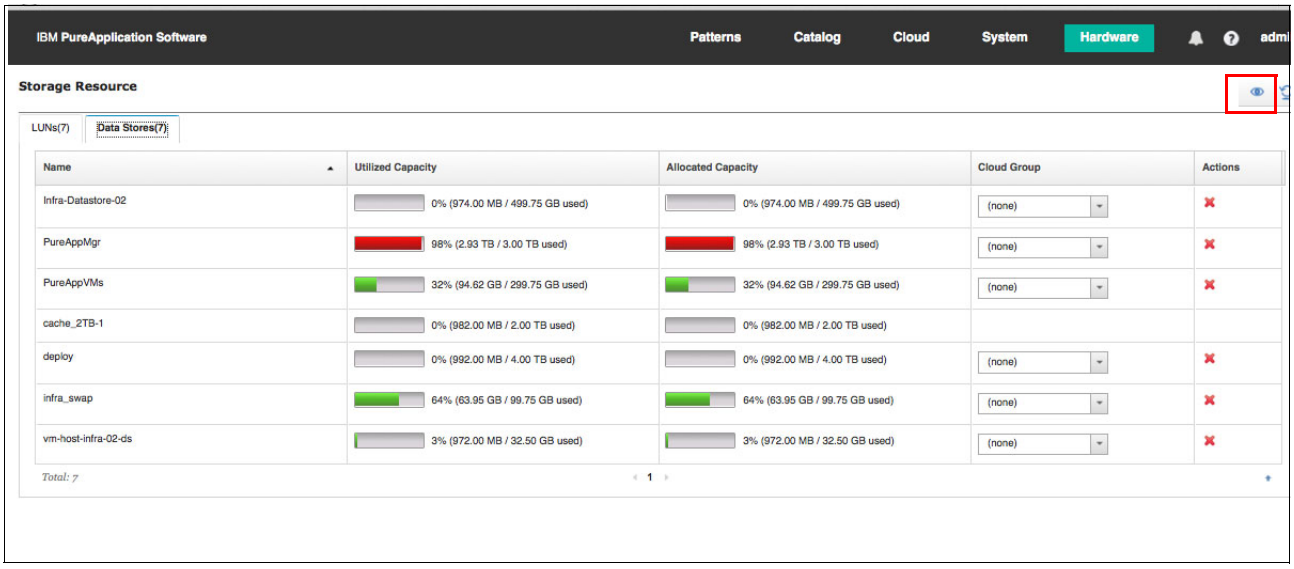


Figure 3-26 Postinstallation configuration wizard - storage

7. The window that is used to create IP groups is shown in Figure 3-27.

   One or more IP address ranges can be created that are used for pattern deployment. There can be one or more networks that are created for deployment. Here are the two main types of networks that are described here:

   – Internal network: Routable inside but not outside the VersaStack configuration.

   – External network: Routable inside and outside of the VersaStack configuration.

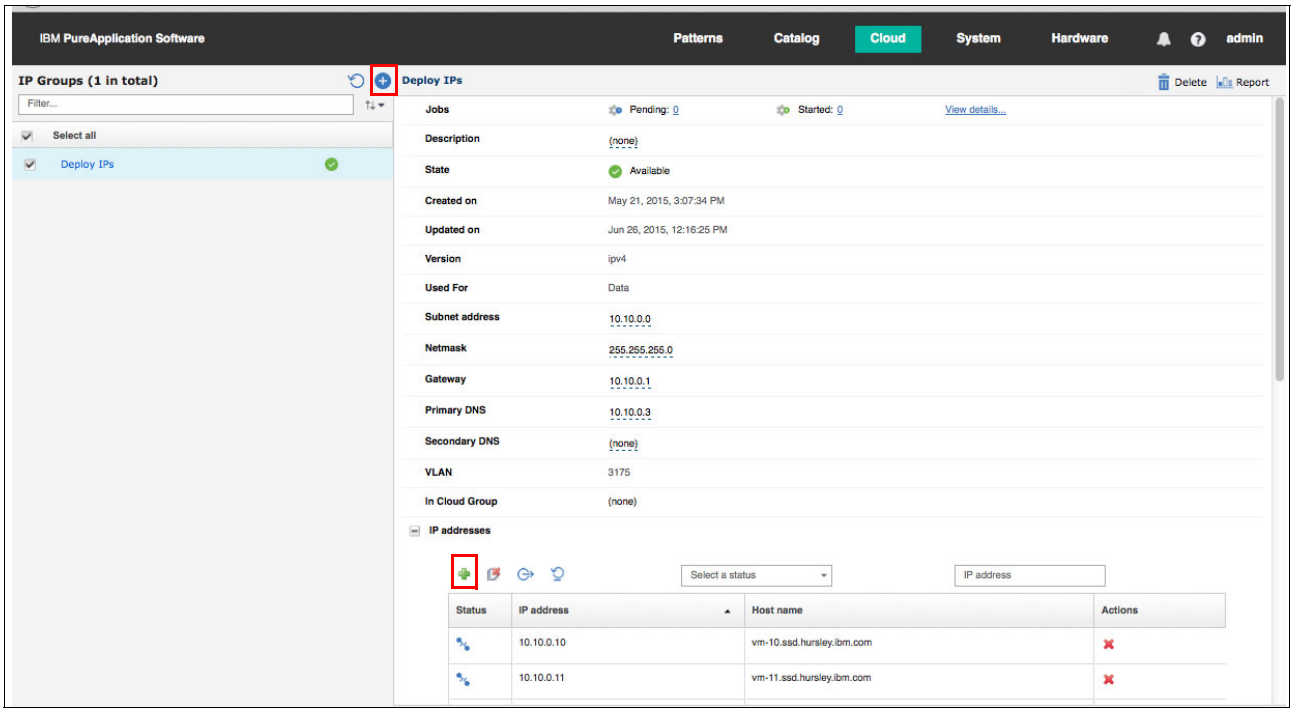


Figure 3-27 Postinstallation configuration wizard - IP range

8. Figure 3-28 shows an example of separate internal and external networks:
   - 10.10.0.x internal network to VersaStack, which is used for the deployment of IBM Middleware patterns and the management of PureApplication Software.
   - 172.10.x.x external network, which is used for communication between the hardware and software infrastructure components and management of PureApplication Software.

The PSM VM has an interface on both the internal and external network, and can route internal traffic to the external network.

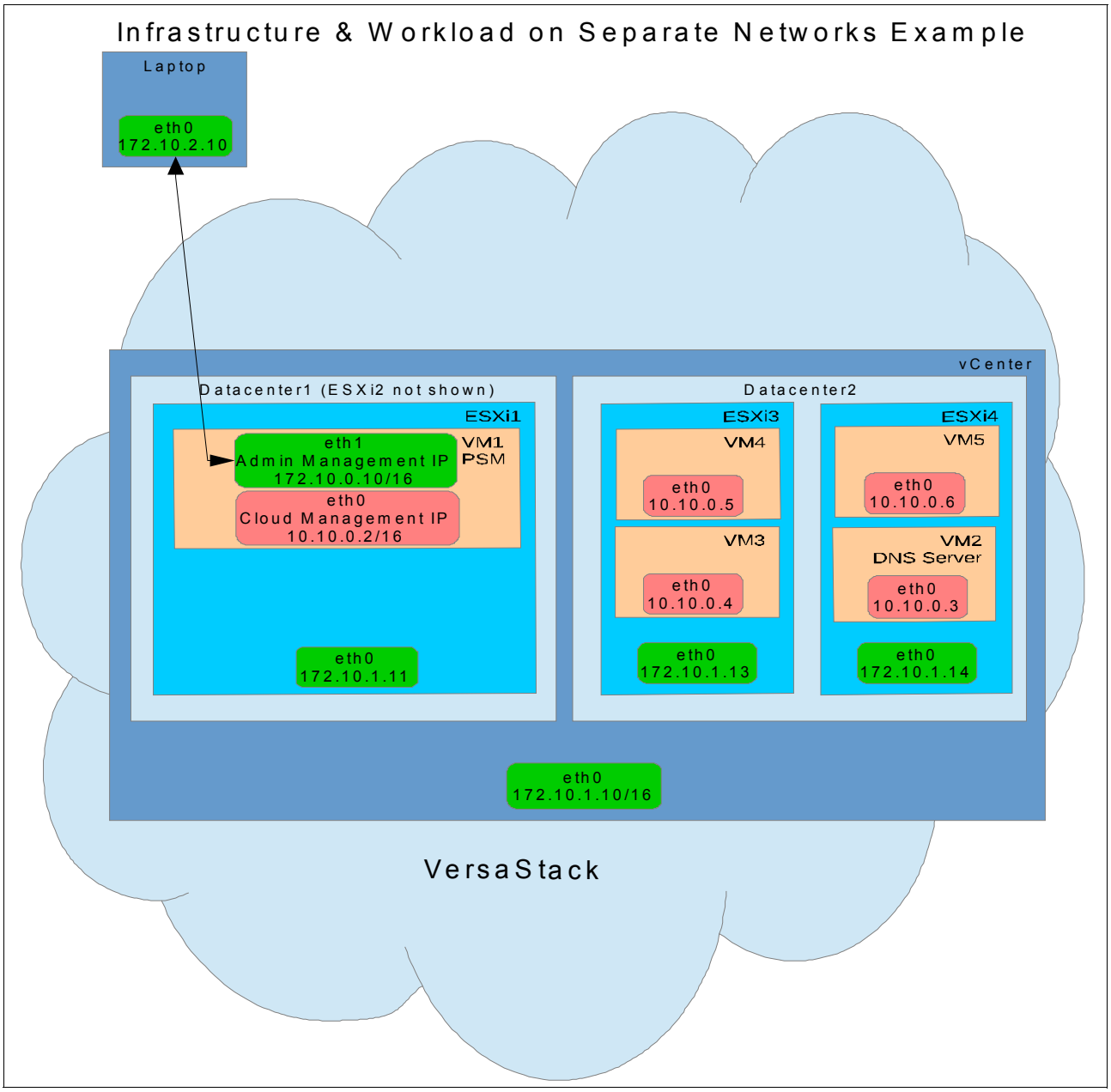


Figure 3-28 Separate deployment network example

Figure 3-29 on page 47 shows an example where deployments of IBM Middleware are made on to the same network as the external data center network of 10.10.x.x.

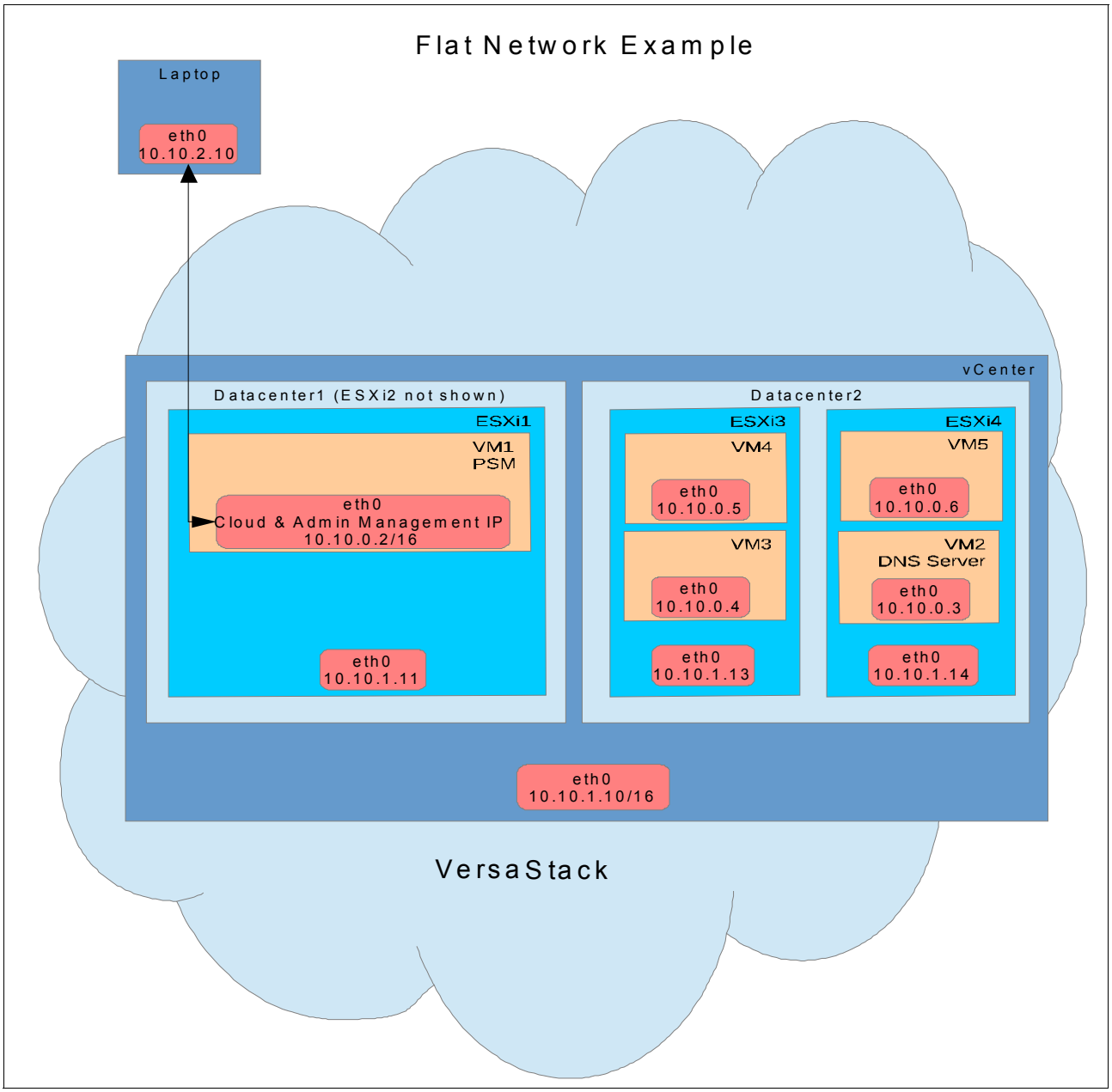


Figure 3-29 Common external and internal flat deployment network example

9. You will likely want to create one or more Cloud Groups. Cloud Groups allow the separation of the overall PureApplication Software deployment zone to give different teams or departments separate sets of resources to work with.

   After creating a Cloud Group, to make it available for use, at a minimum, the following items must be added:

   – One IP group containing configured IPs.
   – One data store to provide storage for deployed VMs to create the VMs and volumes.
   – One compute node that is the target of the deployed VMs.

There are a few supported types of workload high availability configurations on a Cloud Group basis. To support them, the VMKernel adapters on all ESXi hosts in the data center must have vMotion enabled. Here are the high availability configurations:

– System-level high availability maintains high availability for a Cloud Group when there are one or more spare compute nodes for the system.

– Cloud Group high availability maintains a *best effort* approach, and there are times when high availability becomes inactive, as shown in Figure 3-30.

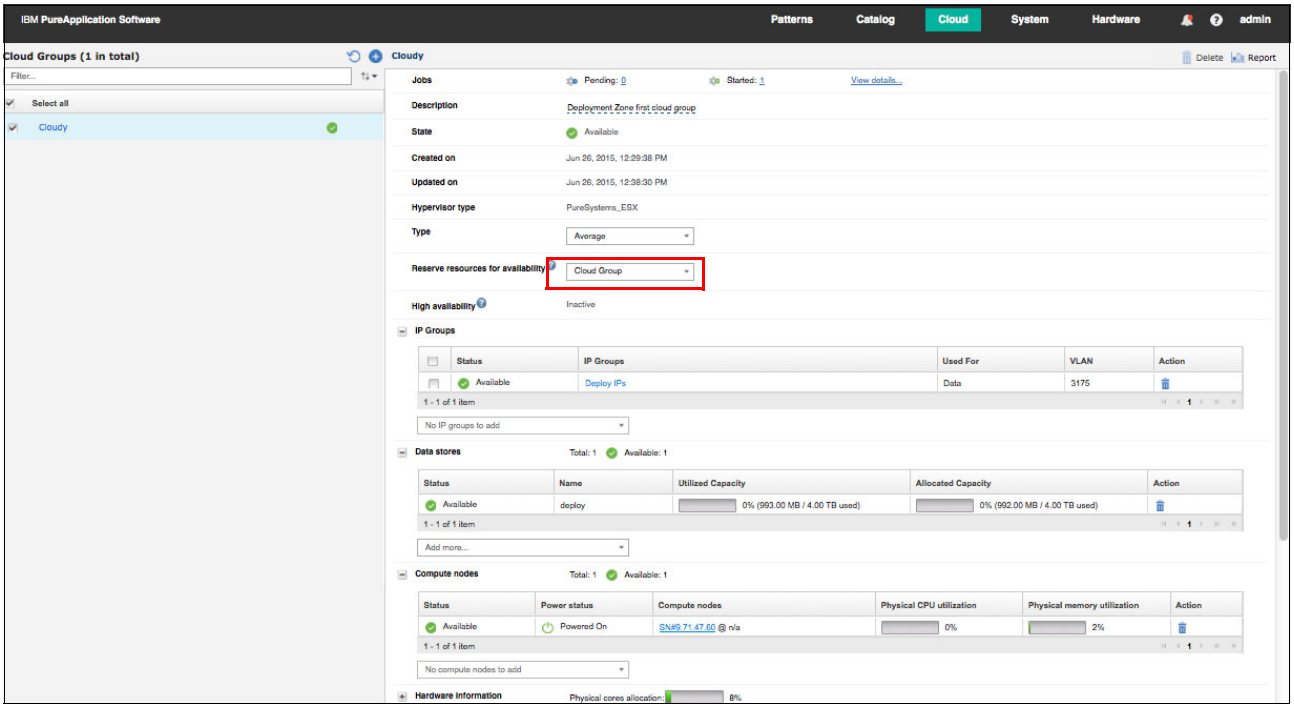


Figure 3-30 Postinstallation configuration wizard - Create Cloud Group

10. Create an environment profile for deploying VMs, where the IP address is provided manually during the deployment process. For example, *IP provided by deployer* in Figure 3-31 on page 49 is an environment profile for manually supplying IP addresses during deployment, which is handy for setting up the DNS VM.

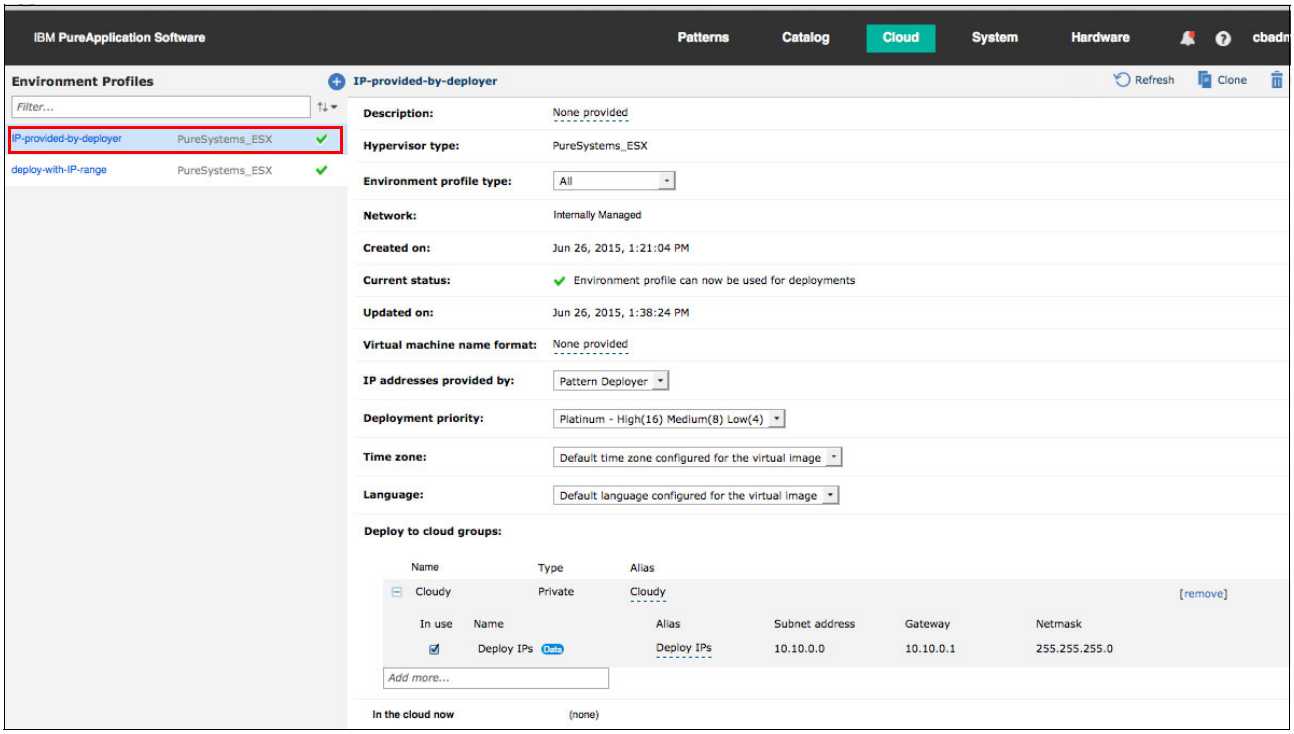


Figure 3-31 Postinstallation configuration wizard - Environment for manually inserting IP address during deployment

11. Make sure to create an environment profile for deploying with IP addresses automatically from a predefined IP address range, which is shown as *deploy-with-IP range* in Figure 3-32. Automatic selection of IP addresses probably is used the most often in pattern deployments.

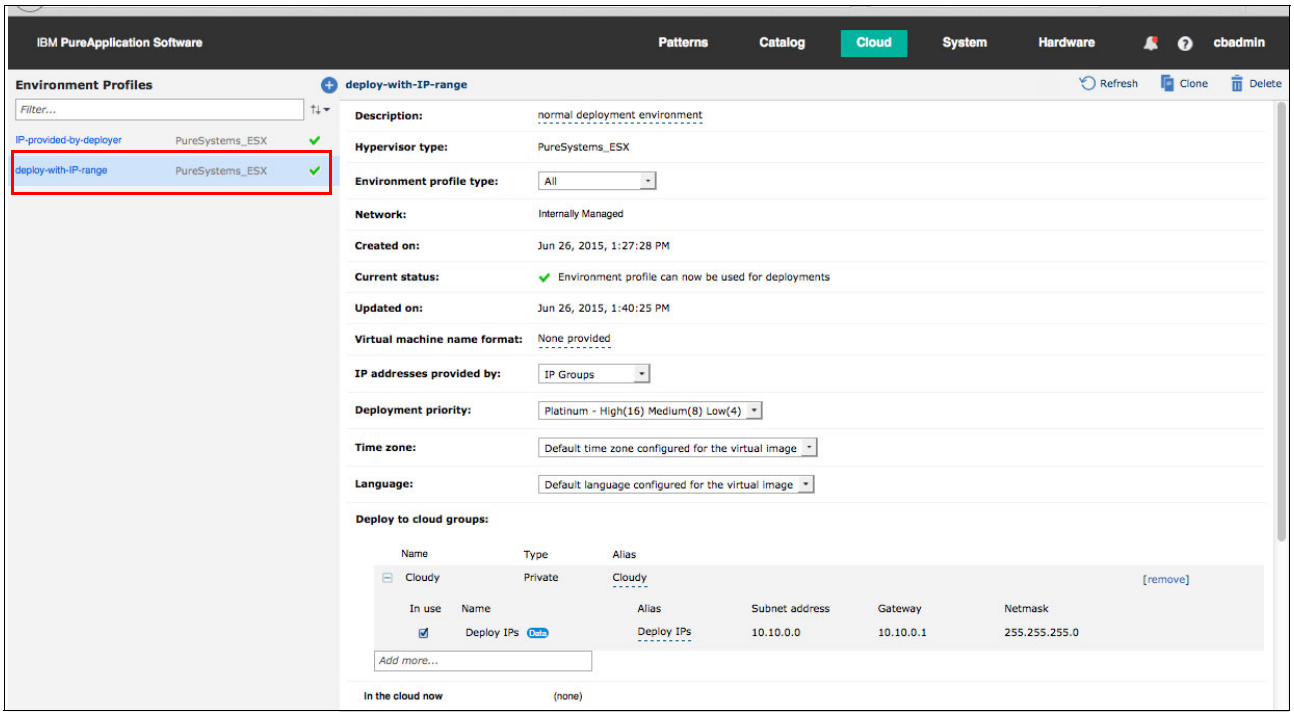


Figure 3-32 Postinstallation configuration wizard - environment automatically selects the IP address from a pre-configured range during deployment

3.3.1 Creating local DNS through PureApplication Software

To create the VM to host a local DNS in the PureApplication Software deployment domain, complete the following steps:

1. Create a Virtual System Instance with the Red Hat Virtual System Pattern. Click the cloud icon, as shown in Figure 3-33.

Note: For information about importing operating system Open Virtualization Archive (OVA) files, see 3.4, “Using PureApplication Software to deploy patterns” on page 55.

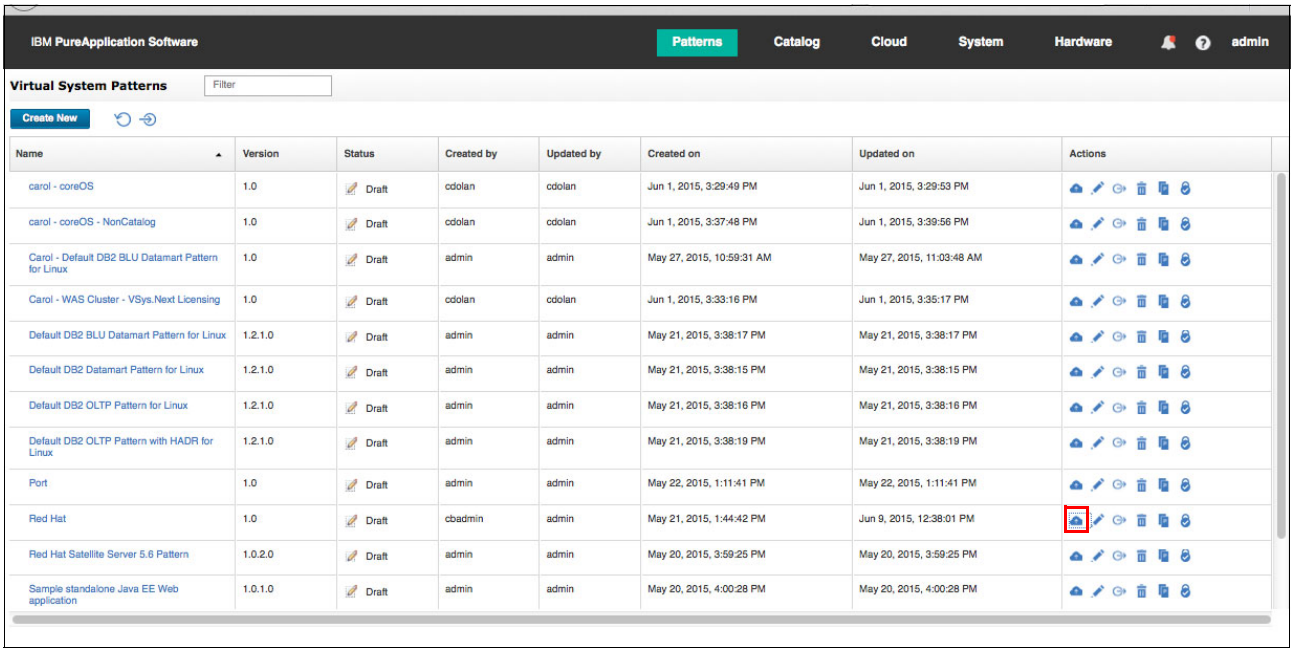


Figure 3-33 Create a local DNS - deploy a Red Hat Virtual System Pattern

2. Select **Environment Profile IP-provided-by-deployer** and click **Prepare to Deploy**, as shown in Figure 3-34 on page 51.

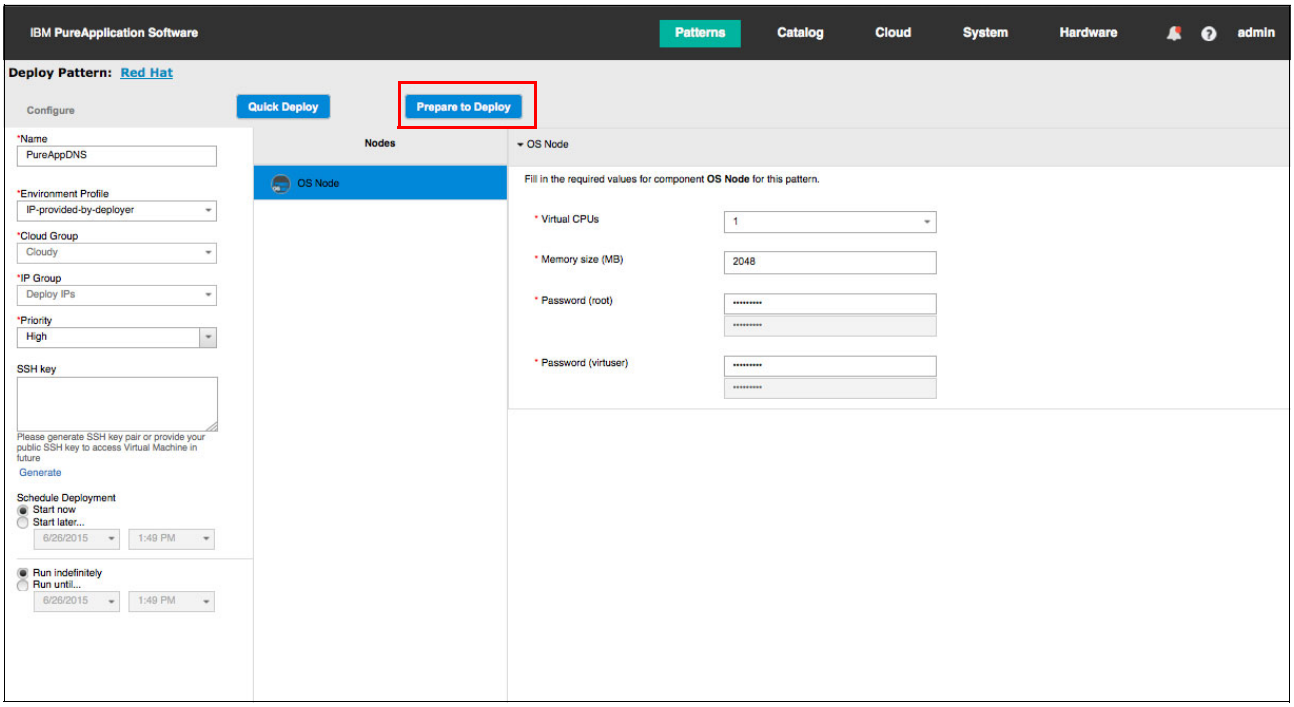


Figure 3-34 Create a local DNS - Prepare to Deploy

3. Wait for the window to refresh. The window that is shown in Figure 3-35 opens.

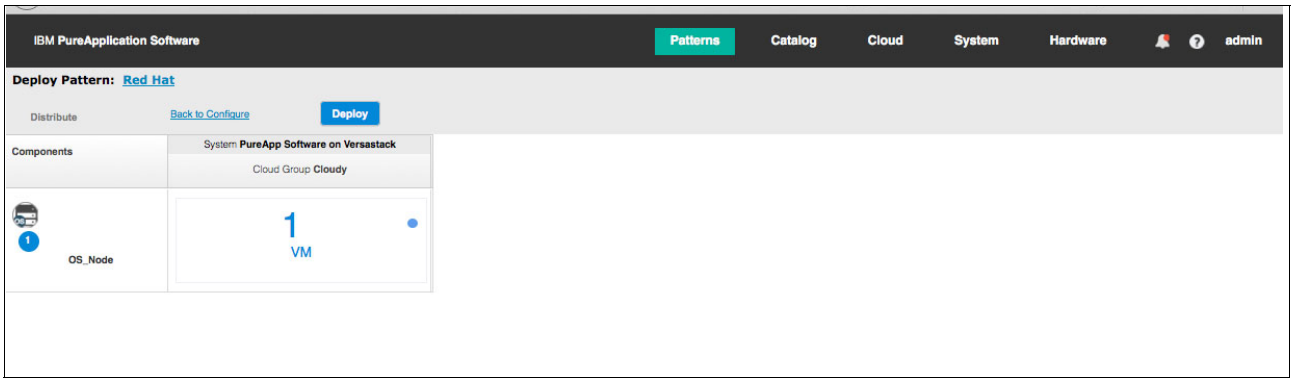


Figure 3-35 Create a local DNS - prepare results shown

4. Hover your cursor over the **1 VM** tile until the tooltip appears, as shown in Figure 3-36. Click the pencil icon to specify manually the IP address for this deployment.

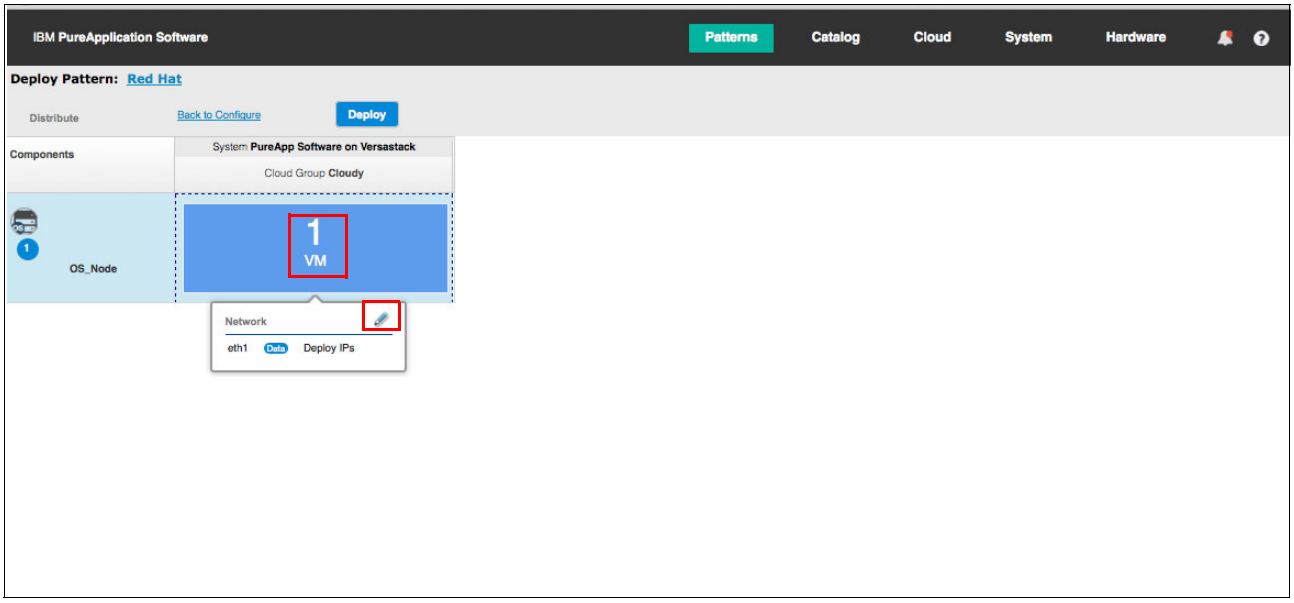


Figure 3-36 Create a local DNS - prepare results by hovering your cursor over 1 VM

5. Press **OK** in the next window (Figure 3-37).

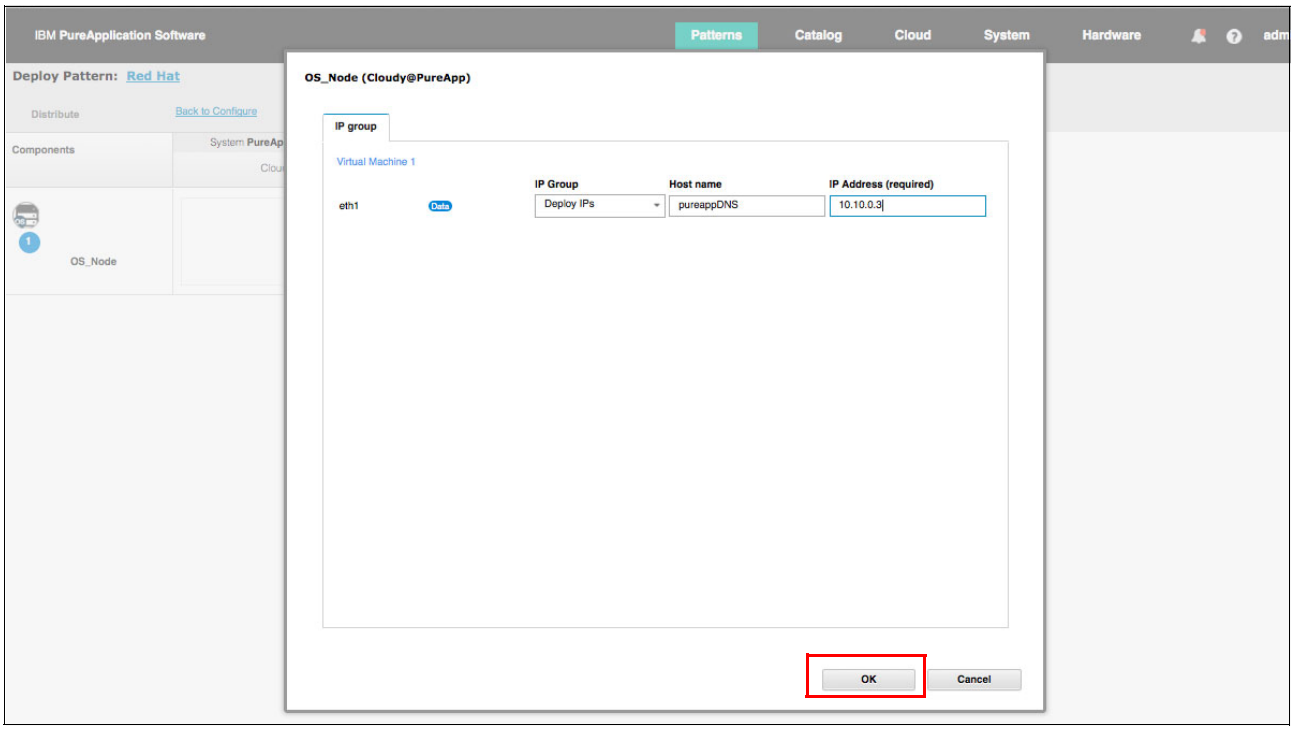


Figure 3-37 Create a local DNS - manually assign the IP address for the DNS VM

6. Press **Deploy**, as shown in Figure 3-38 on page 53.

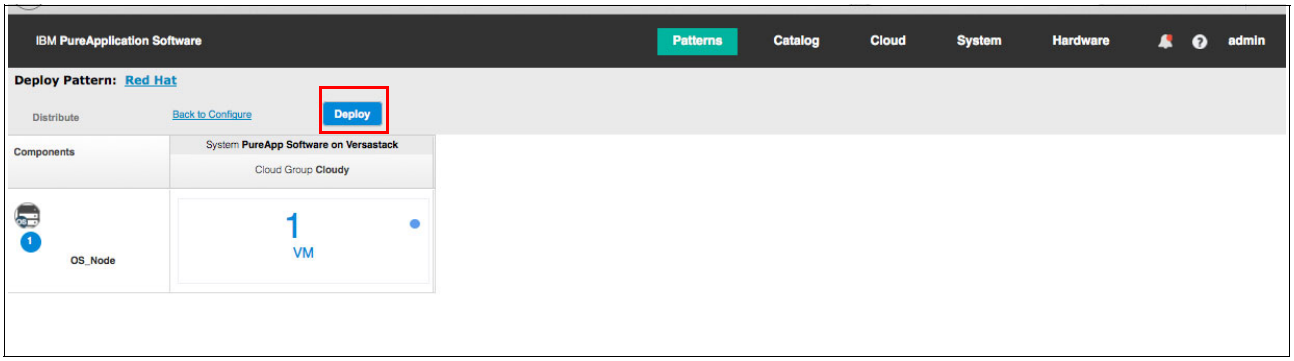


Figure 3-38 Click Deploy

7. You see the deployment in progress, as shown in Figure 3-39.

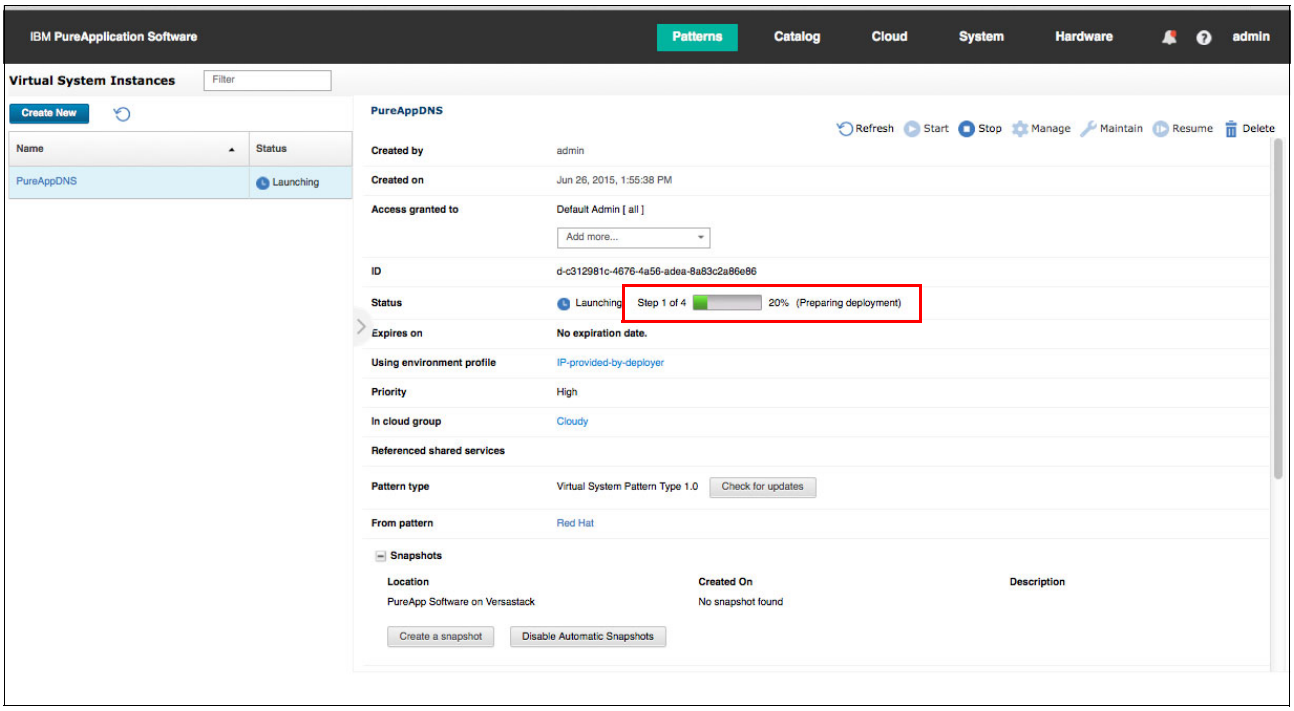


Figure 3-39 Create a local DNS - deployment in progress

8. After the VM for the DNS function is running, you must configure the DNS. Here is an example of configuring it:

   a. Disable `iptables` and `ip6tables` by running the following commands:

      - **`service iptables stop`**
      - **`service ip6tables stop`**

   b. Update `/etc/dnsmasq.conf` as shown in Example 3-4.

Example 3-4 Update /etc/dnsmasq.conf

```
#listen-address=127.0.0.1
listen-address=10.10.0.3

port=53
bind-interfaces
```

```
#user=dnsmasq
#user=root
#group=root
pid-file=/var/run/dnsmasq.pid
#domain-needed
domain=ssd.hursley.ibm.com
expand-hosts
local=/ssd.hursley.ibm.com/
server=127.0.0.1

#bogus-priv
#no-hosts
#dns-forward-max=150
cache-size=100000
#no-negcache
neg-ttl=3600
resolv-file=/etc/resolv.dnsmasq
no-poll
log-facility=/var/log/dnsmasq.log
#server=/e.8.7.1.d.5.1.2.c.8.d.f.ip6.arpa.charlotte.ibm.com/
#server=/e.8.7.1.d.5.1.2.c.8.d.f.ip6.arpa/
```

c. Update `/etc/hosts` as shown in Example 3-5.

Example 3-5 Update /etc/hosts

```
127.0.0.1 localhost.localdomain localhost
::1  localhost6.localdomain  localhost6  ip6-localhost  ip6-loopback
10.10.0.3  vm-3.ssd.hursley.ibm.com vm-3
10.10.0.2    ntp25843.ssd.hursley.ibm.com    ntp25843
10.10.0.2  IBMWorkloadDeployer.ssd.hursley.ibm.com  IBMWorkloadDeployer
10.10.0.4 vm-4.ssd.hursley.ibm.com
10.10.0.5 vm-5.ssd.hursley.ibm.com
10.10.0.6 vm-6.ssd.hursley.ibm.com
10.10.0.7 vm-7.ssd.hursley.ibm.com
10.10.0.8 vm-8.ssd.hursley.ibm.com
10.10.0.9 vm-9.ssd.hursley.ibm.com
10.10.0.10 vm-10.ssd.hursley.ibm.com
10.10.0.11 vm-11.ssd.hursley.ibm.com
10.10.0.12 vm-12.ssd.hursley.ibm.com
10.10.0.13 vm-13.ssd.hursley.ibm.com
10.10.0.14 vm-14.ssd.hursley.ibm.com
10.10.0.15 vm-15.ssd.hursley.ibm.com
10.10.0.16 vm-16.ssd.hursley.ibm.com
10.10.0.17 vm-17.ssd.hursley.ibm.com
10.10.0.18 vm-18.ssd.hursley.ibm.com
10.10.0.19 vm-19.ssd.hursley.ibm.com
10.10.0.20 vm-20.ssd.hursley.ibm.com
10.10.0.21 vm-21.ssd.hursley.ibm.com
```

d. Run the **`service dnsmasq restart`** command.

Now, your DNS should be configured.

3.4 Using PureApplication Software to deploy patterns

Unlike PureApplication System and PureApplication Service, with PureApplication Software, OS image OVA files and pattern and template files must be purchased and installed separately. These assets can be downloaded from IBM Passport Advantage® at the following website:

http://www.ibm.com/software/passportadvantage/

OVA file: OVA stands for Open Virtualization Archive. It contains a compressed and installable version of a virtual machine. When you open an OVA file, it extracts the VM and imports the content into the virtualization software that is installed on your computer.

After the OVA file is downloaded from Passport Advantage, you can load an OS image OVA file in to PureApplication Software from an HTTP server, as shown in Figure 3-40.

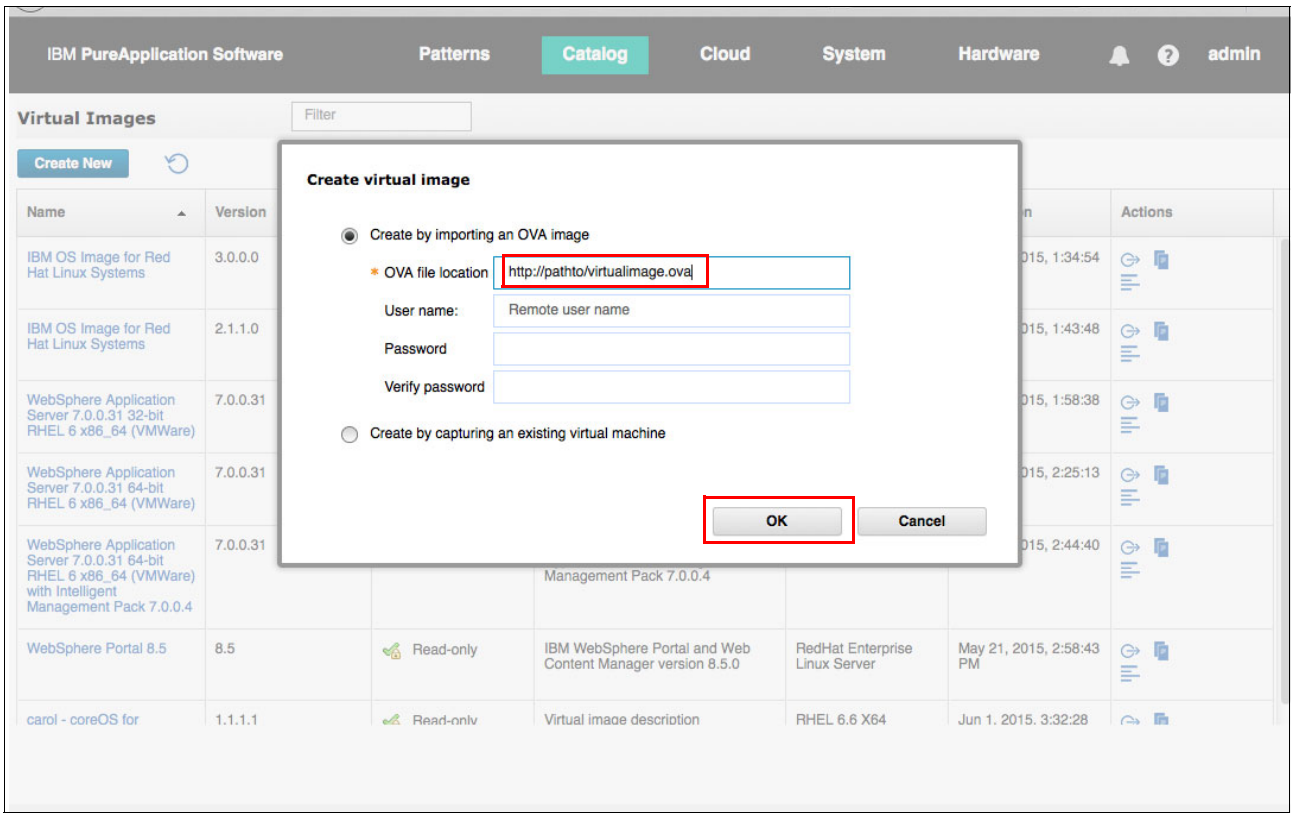


Figure 3-40 Load an OVA file in to the Virtual Images Library

Tip: As an alternative to purchasing OS image OVA files, you can also create custom OS image OVA files by using the process that is described at the following website:

http://www.ibm.com/support/knowledgecenter/SSL5ES_2.1.0/doc/iwd/pct_byos_image.dita

Figure 3-41 shows an example of the Virtual Image Catalog window with several OS images that are available.

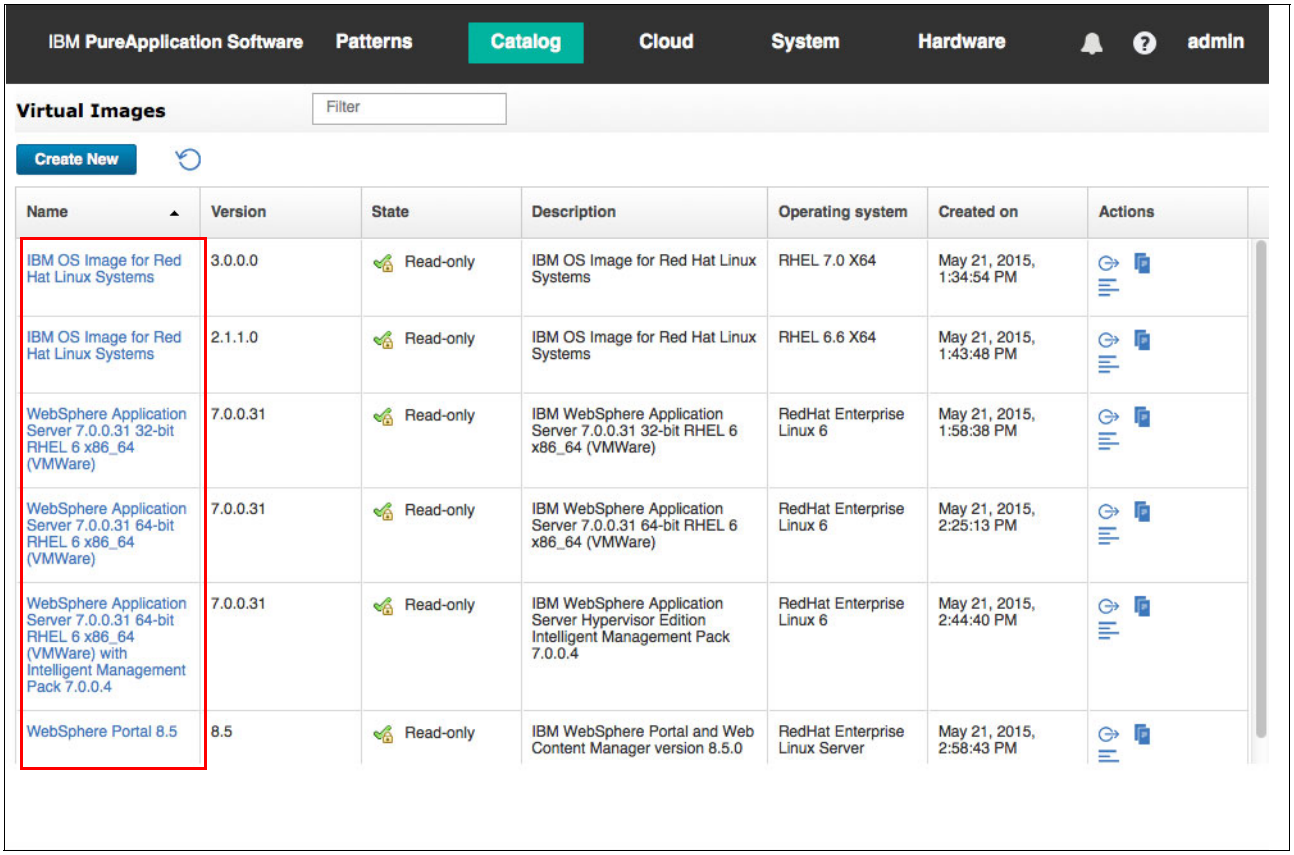


Figure 3-41 Example Virtual Images Library

Patterns are purchased separately from IBM and are downloaded from Passport Advantage. After they are downloaded, patterns can be imported through the relevant pattern catalog window by clicking the import icon. Figure 3-42 shows the Virtual System Patterns catalog window where the import icon is in the upper left of the window, immediately to the right of the refresh icon.

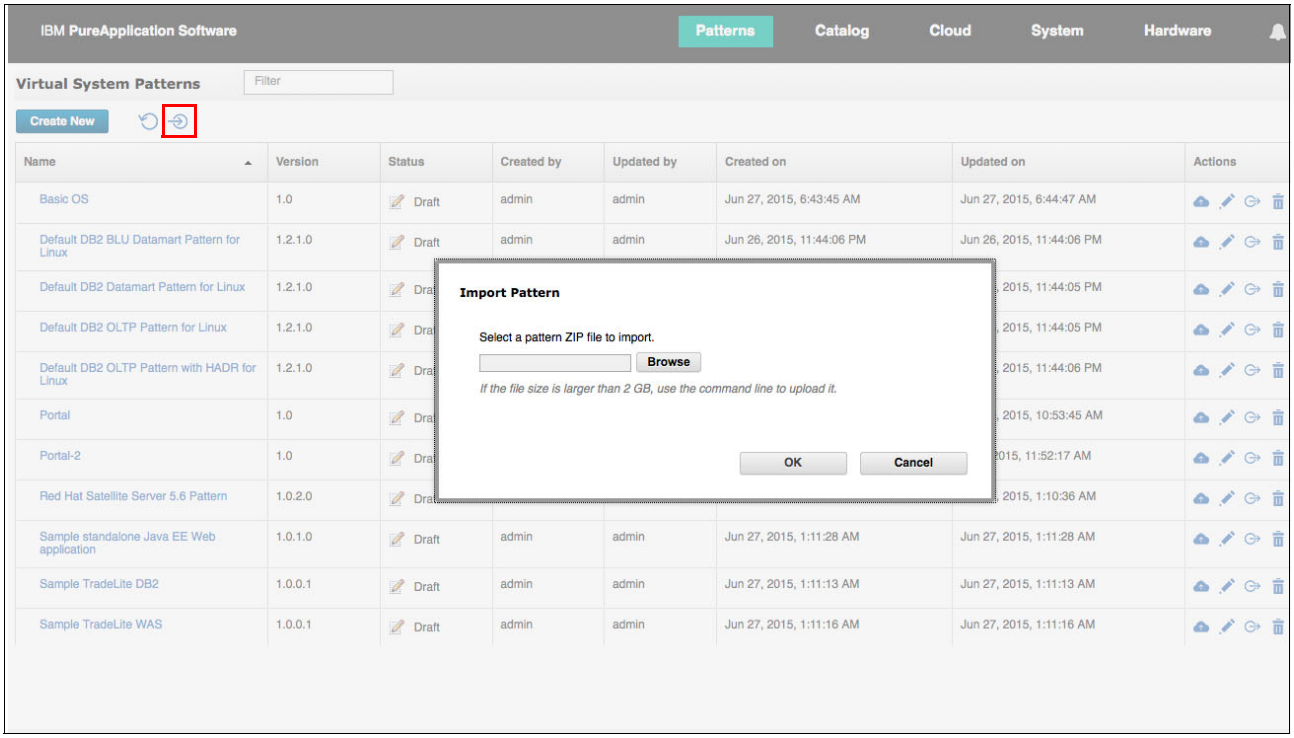


Figure 3-42 Example Virtual System Patterns - Import Pattern dialog box

With OVA images and patterns loaded, PureApplication Software should be ready to deploy the Virtual System and Virtual System Classic patterns. The deployment of Virtual Application Patterns and Shared Services requires that you specify a default image under the Default Deployment Settings window, as shown in Figure 3-43.

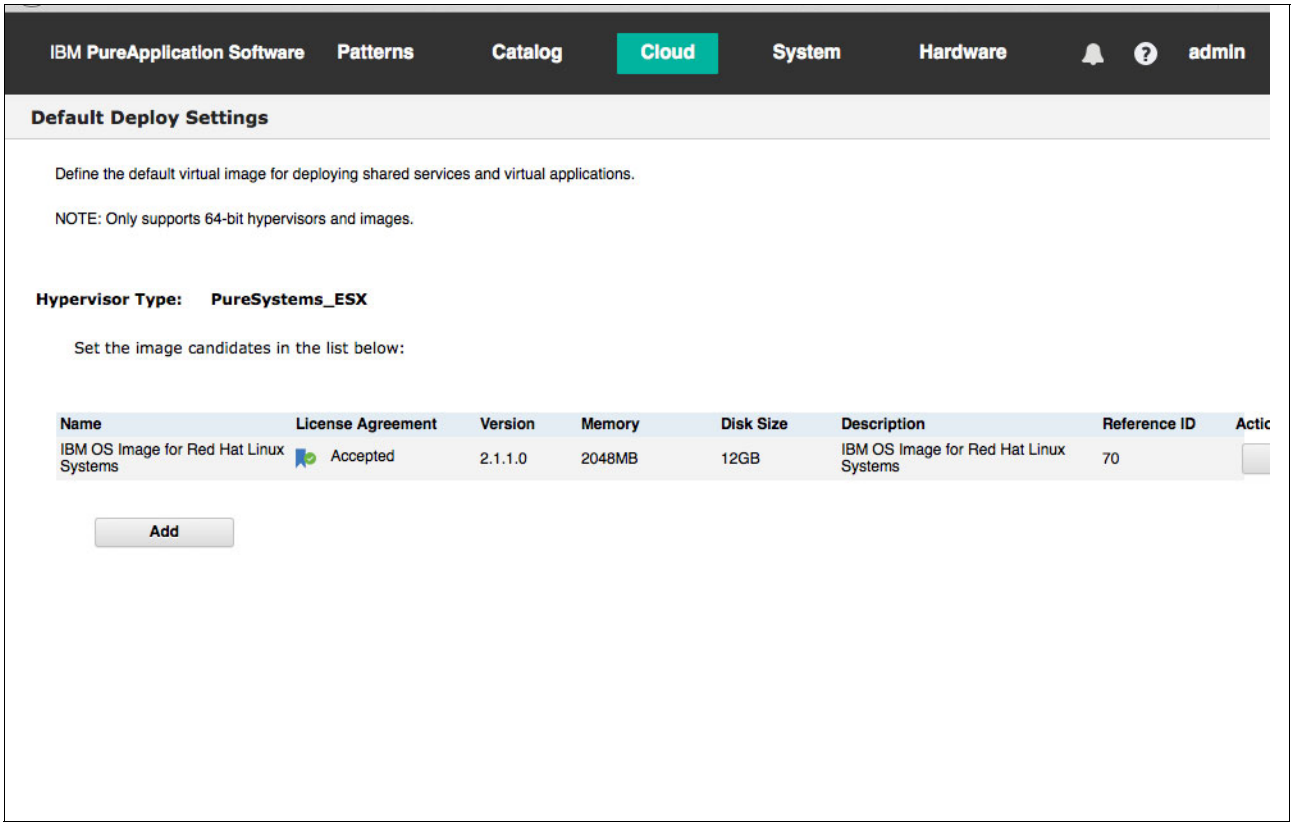


Figure 3-43 Set the Default Deploy Settings

Figure 3-44 on page 59 shows an example of Virtual Systems Patterns that are already loaded and ready for deployment. You can click the cloud deployment icon in the right Actions area to deploy an instance of one of these patterns. In this example, Red Hat is shown.

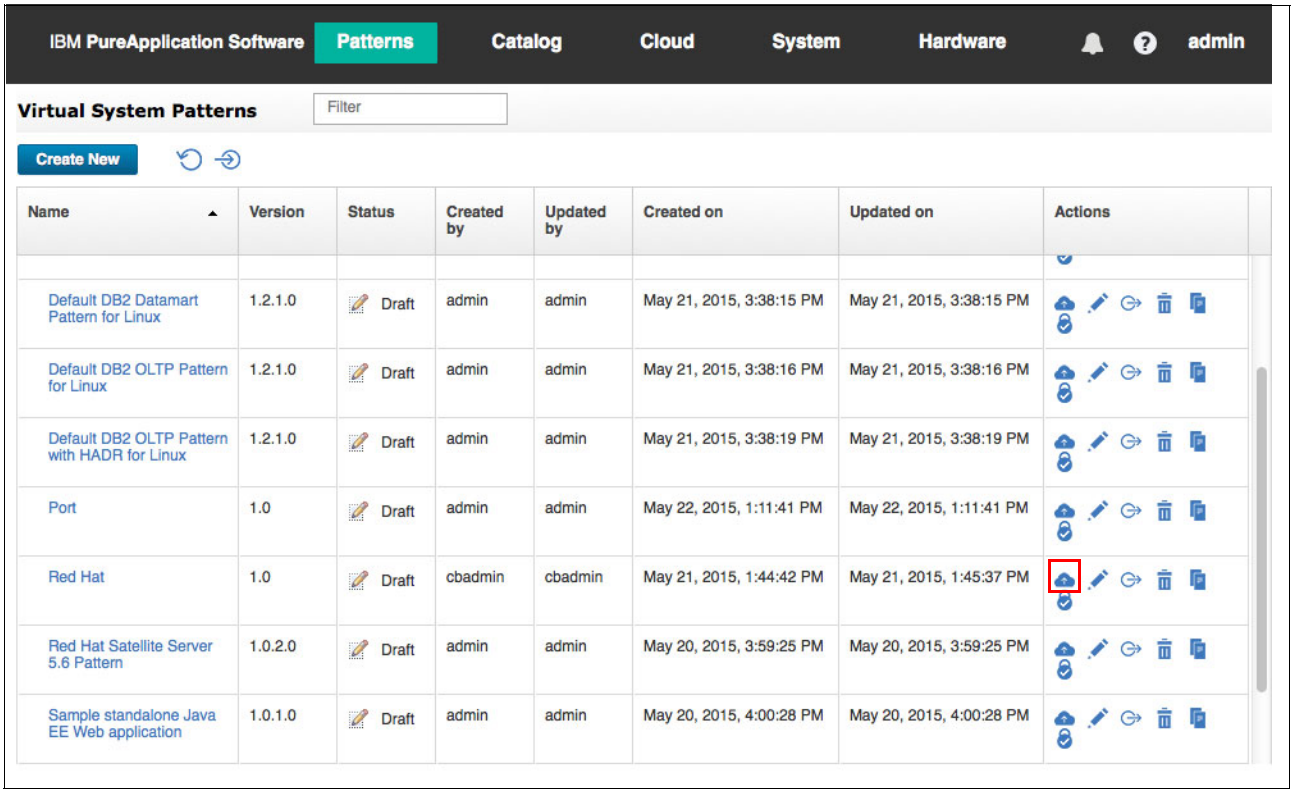


Figure 3-44 Virtual System Patterns library

Figure 3-45 shows an example of two running Virtual System Pattern instances running.

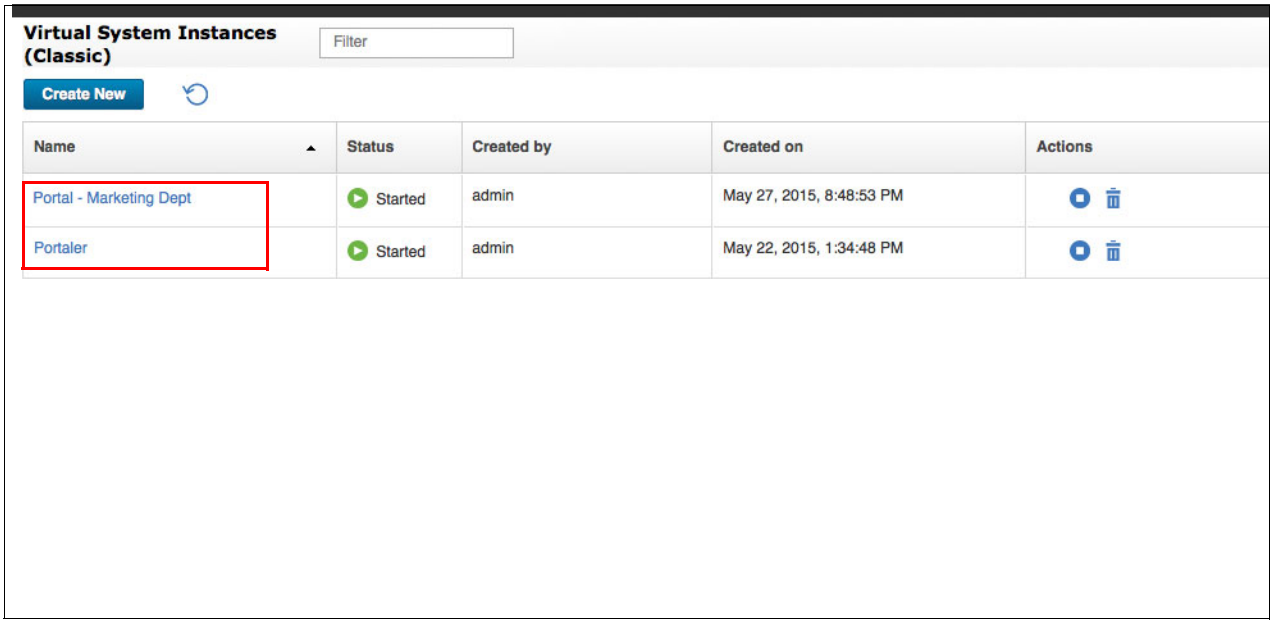


Figure 3-45 Two running Virtual System Pattern instances

3.5 Conclusions and additional references

Because the only real dependencies of PureApplication Software are on the VMware vCenter and networking configuration, you can see how it easily can be integrated in to any type of hardware, and Cisco IBM VersaStack (UCS + Storwize V7000 system) is no exception.

For more information about the topics that are described in this paper, see “Related publications” on page 61.

Related publications

The publications that are listed in this section are considered suitable for a more detailed description of the topics that are covered in this paper.

IBM Redbooks

The following IBM Redbooks publication provides additional information about the topics in this document. Some publications that are referenced in this list might be available in softcopy only.

- *Integrating an IBM PureApplication Environment*, TIPS1328

You can search for, view, download, or order these documents and other Redbooks, Redpapers, Web Docs, draft and additional materials, at the following website:

ibm.com/redbooks

Online resources

These websites are also relevant as further information sources:

- FixCentral:

  https://www.ibm.com/support/fixcentral/
- IBM PartnerWorld:

  https://www.ibm.com/partnerworld/wps/servlet/ContentHandler/isv/sac
- Passport Advantage:

  http://www.ibm.com/software/passportadvantage/
- PureApplication IBM Knowledge Center:

  http://www.ibm.com/support/knowledgecenter/SSL5ES_2.1.0/doc/common/welcome.dita

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