Appendices for SAP Applications Built on FlexPod

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Cisco Validated Design

Building Architectures to Solve Business Problems

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The CVD program consists of systems and solutions designed, tested, and documented to facilitate faster, more reliable, and more predictable customer deployments. For more information visit

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Appendix

Appendix A Installing SuSE Linux Enterprise Server

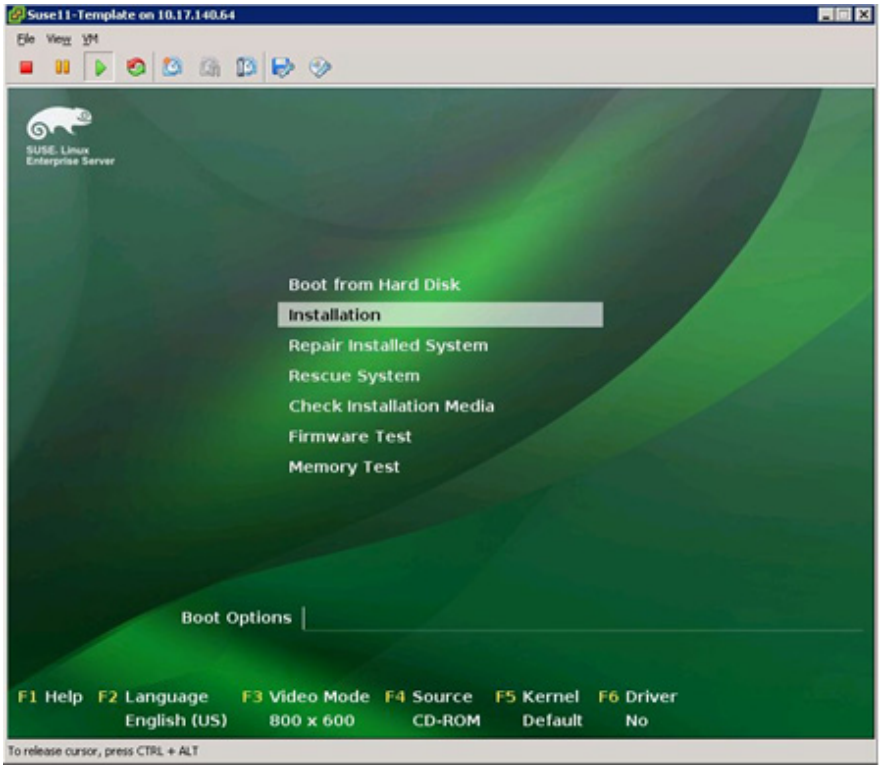
SuSE Linux Enterprise Server (SLES) is installed by means of a graphical user interface. In addition to the standard installation shown in this appendix (including the special software components that must be installed), a few post-installation procedures must be added to build an OS for use in a FlexPod environment.

SuSE Linux Installation (SLES 11)

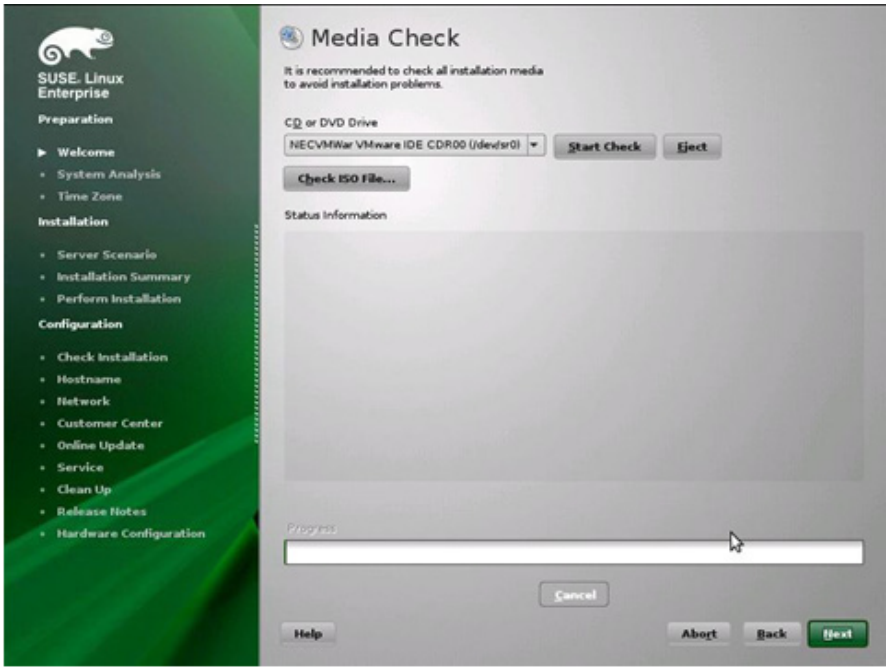
The following are the installation steps as carried out on a virtual machine (see section "Linux Template Creation"). After the boot process has completed, mount the installation DVD to start the SuSE installation.

Corporate Headquarters:
Cisco Systems, Inc., 170 West Tasman Drive, San Jose, CA 95134-1706 USA

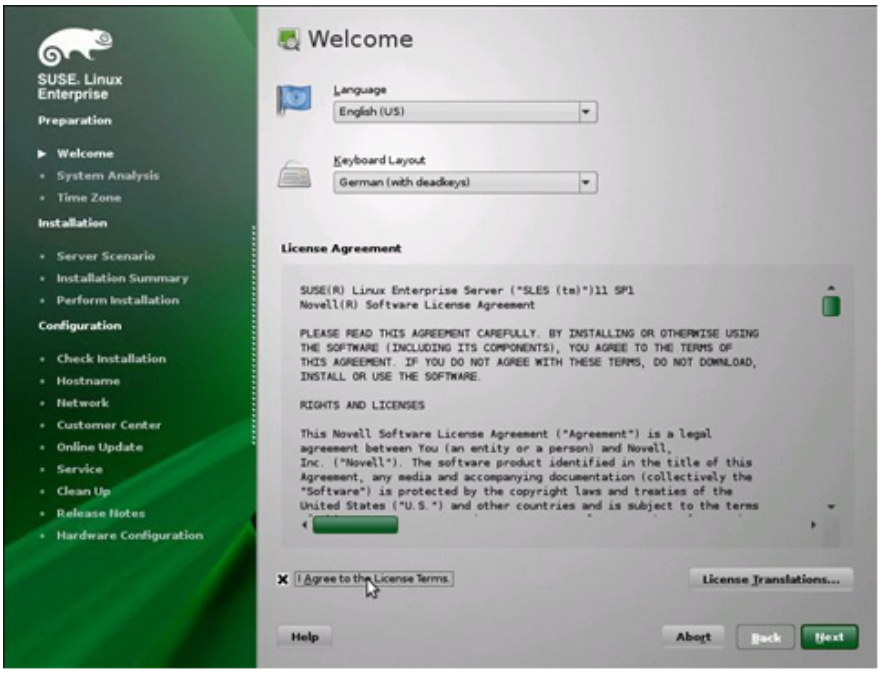
1 Select Installation at the SuSE Boot Options screen to proceed.



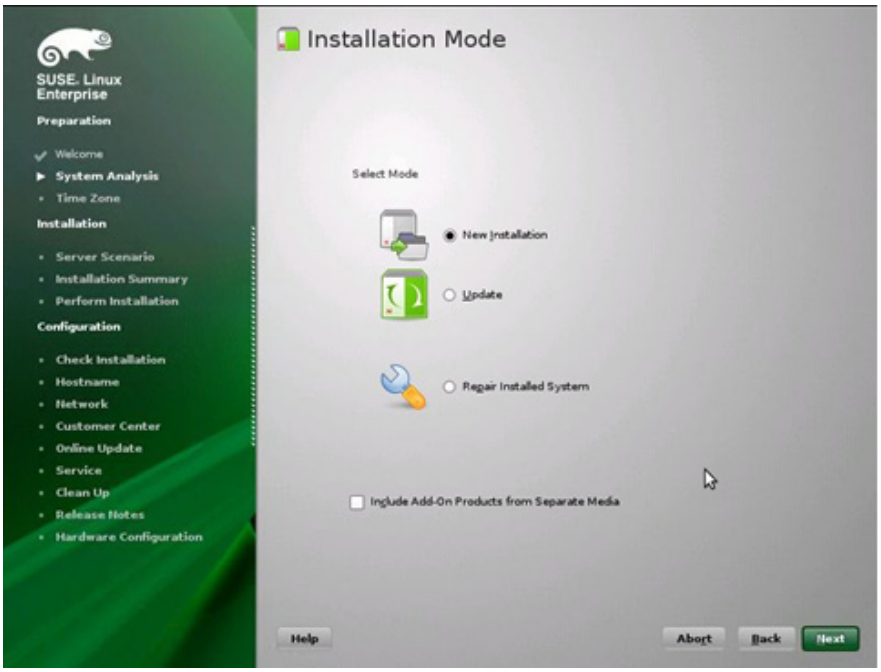
2 If desired, check the installation medium. Otherwise, click Next.



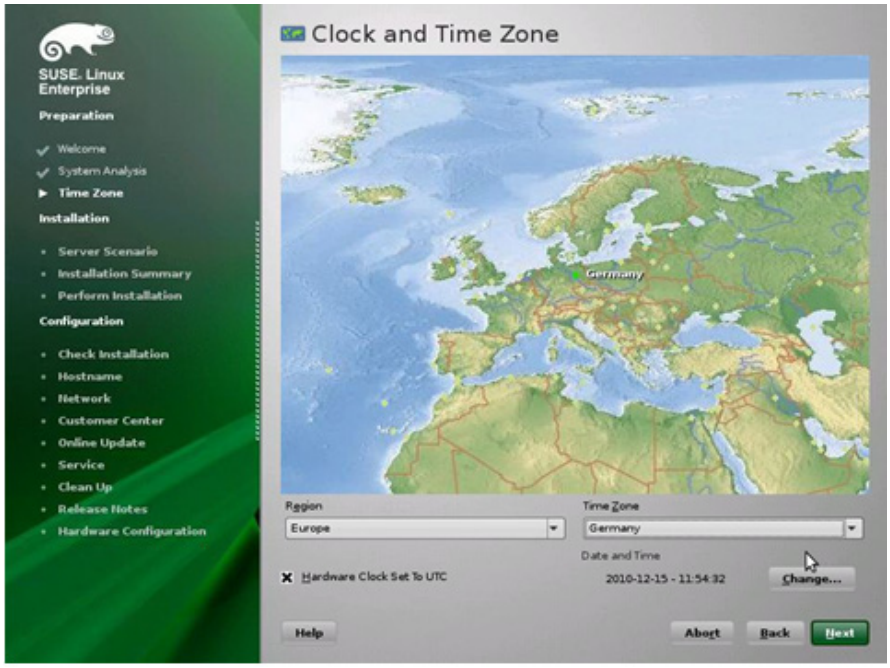
3 Select English (US) as the language, select a keyboard layout, and read and accept the license terms.



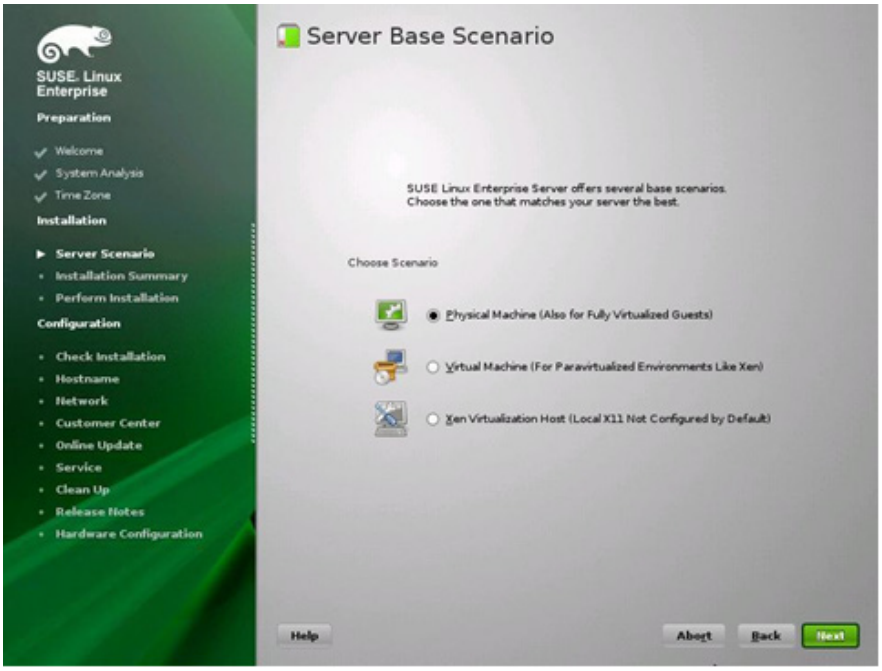
4 Select New Installation.



5 Define your time zone settings.

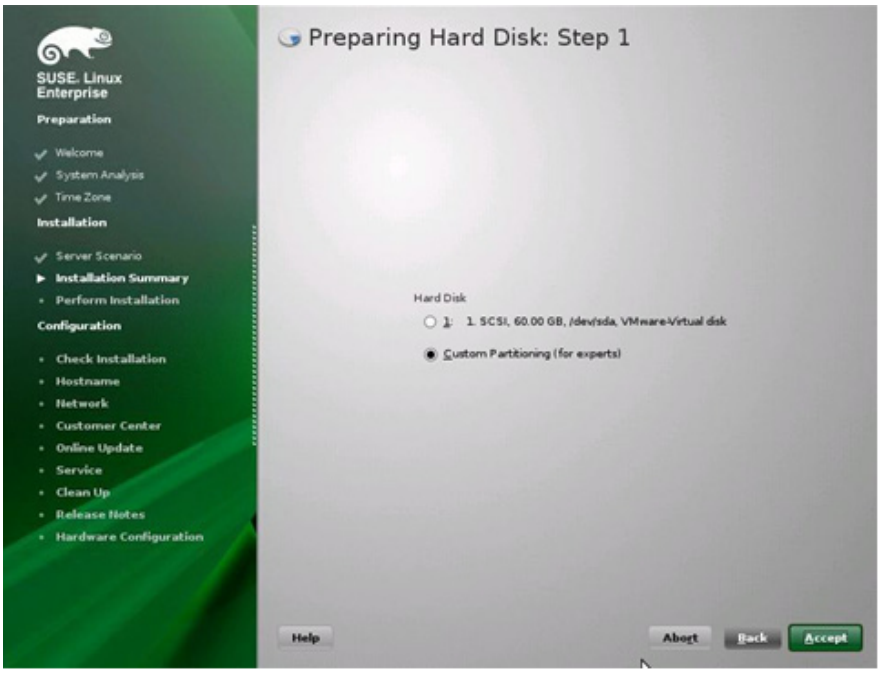


6 Select Physical Machine as the server base scenario.

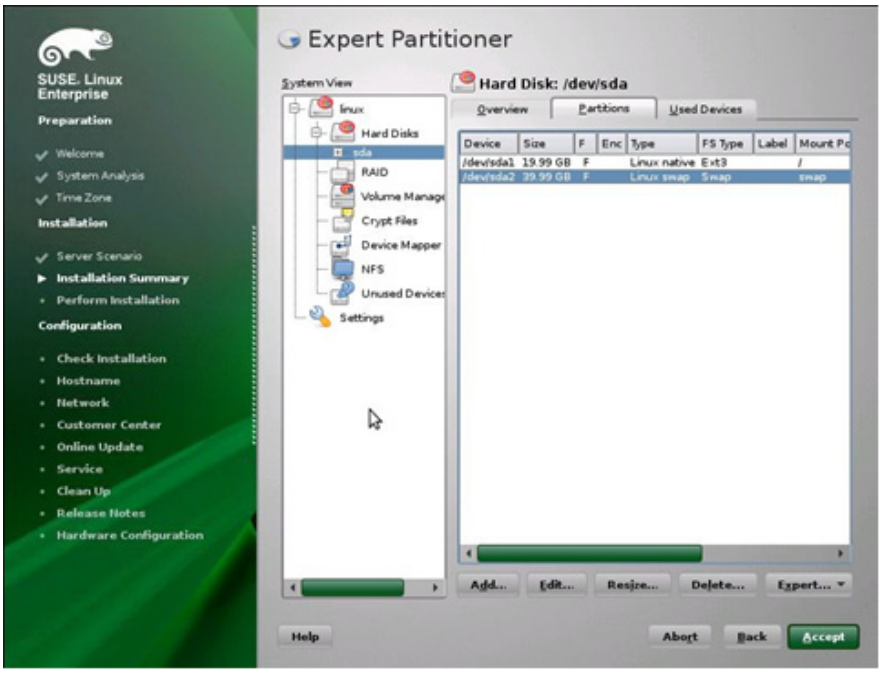


7 On the Expert tab under Installation Settings, change the partitioning of the hard disk and the software components to be installed.

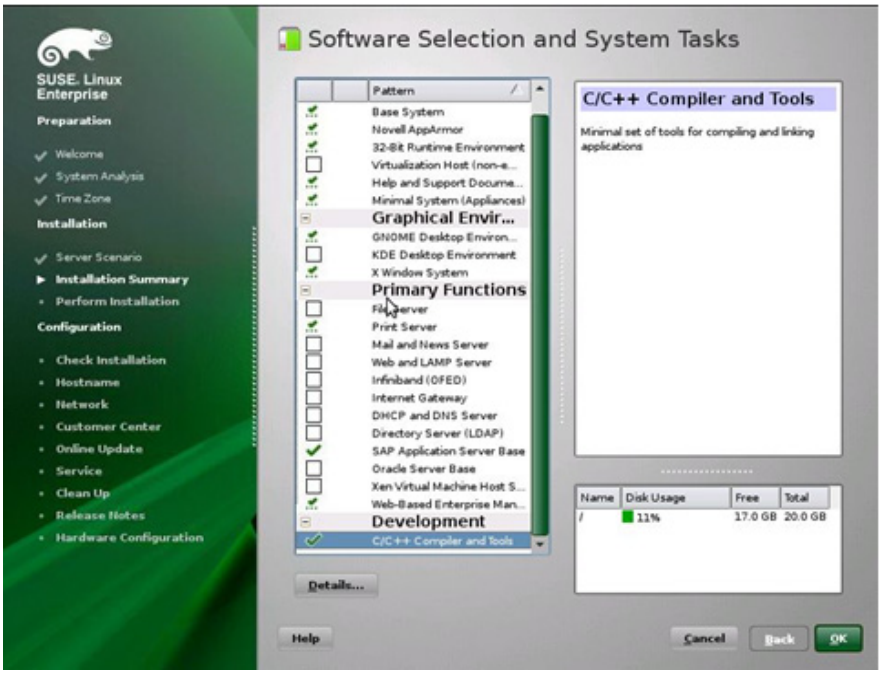
8 Select the Custom Partitioning option to prepare the hard disk.



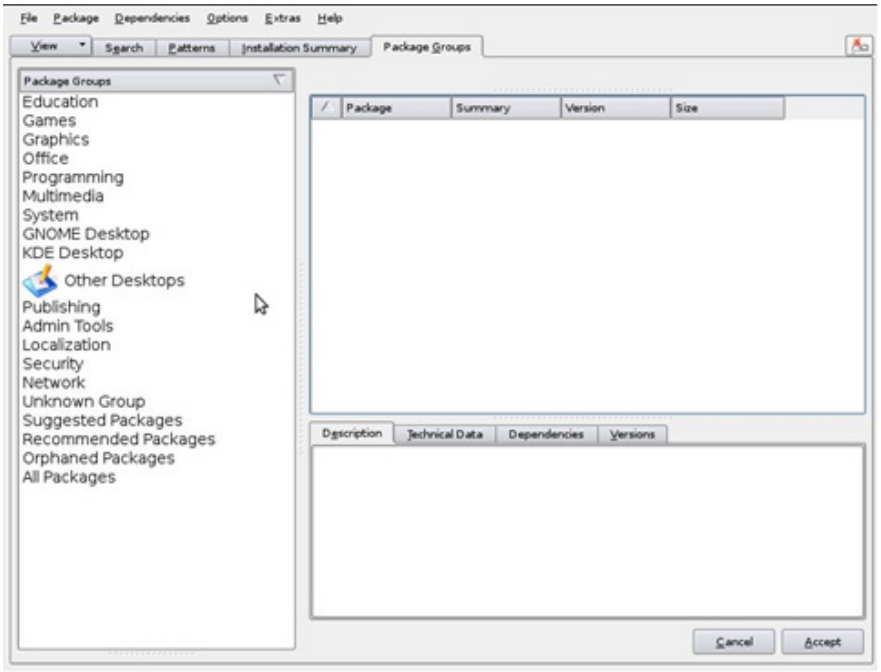
9 Add two primary partitions: a 20GB Linux native type with Ext3 FS type mounted at /; and a 40GB Linux swap partition. Click Accept.



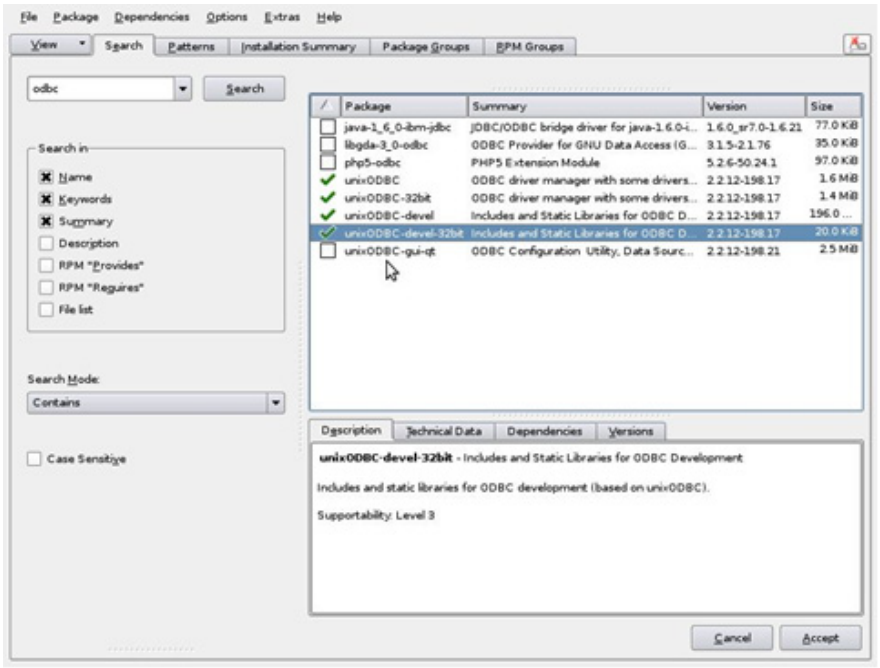
10 Add the following software components in addition to the standard: SAP Application Server Base, C/C++ Development tools, and your desired desktop. Click Details.



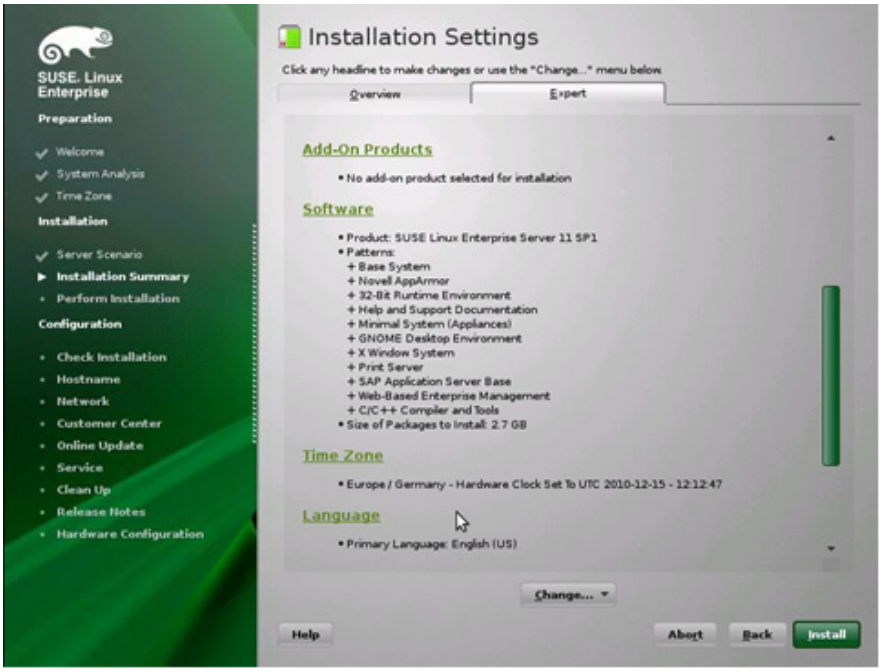
11 On the screen that is displayed, search for ODBC.



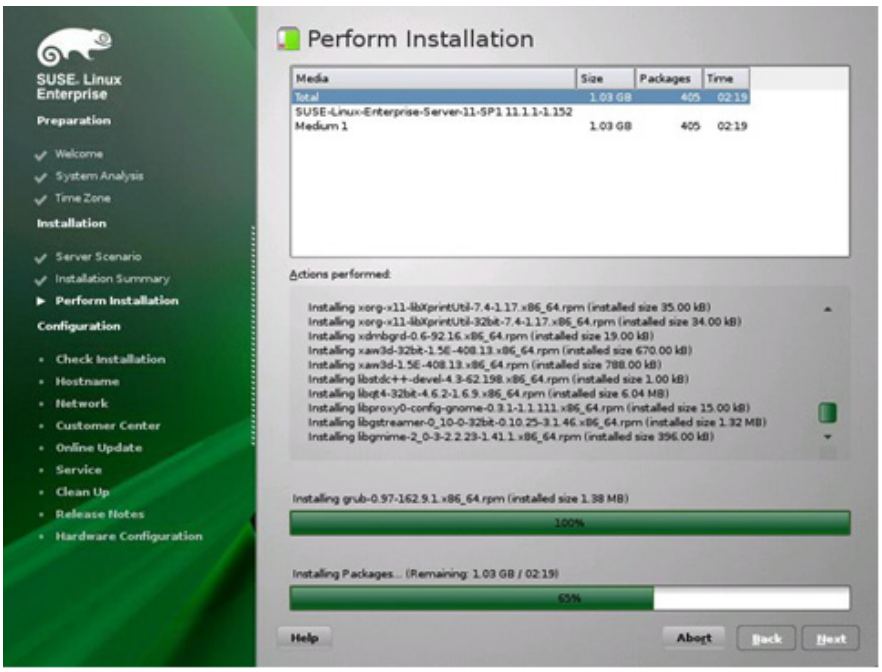
12 Select unixODBC, unixODBC-32bit, unixODBC-devel, and unixODBC-devel-32bit. In addition, search for java and install java-1_4_2-ibm. Confirm that Perl 5 is selected for installation. If not, select Perl 5 also. When you are finished, click Accept.



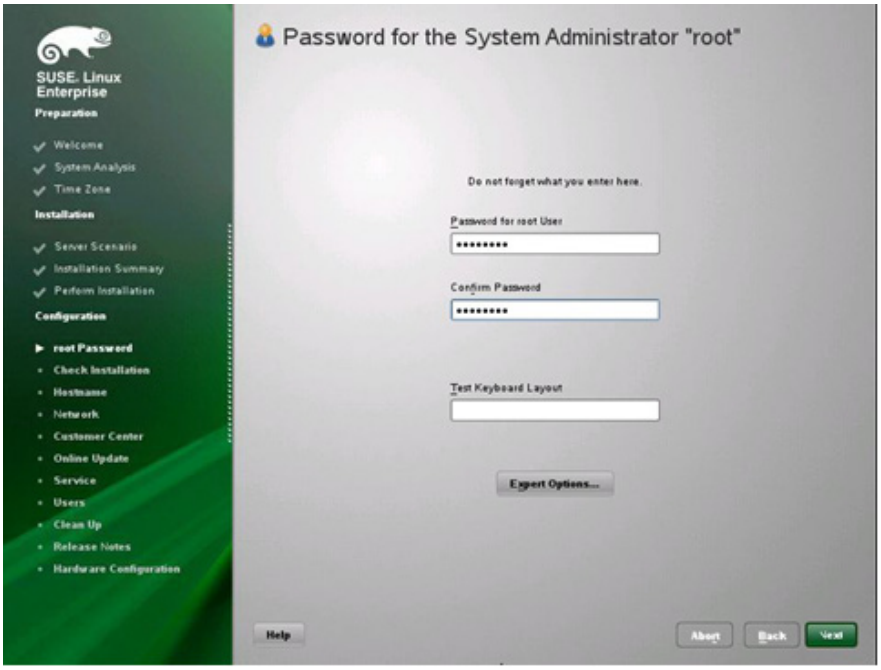
13 Click Install to start the installation.



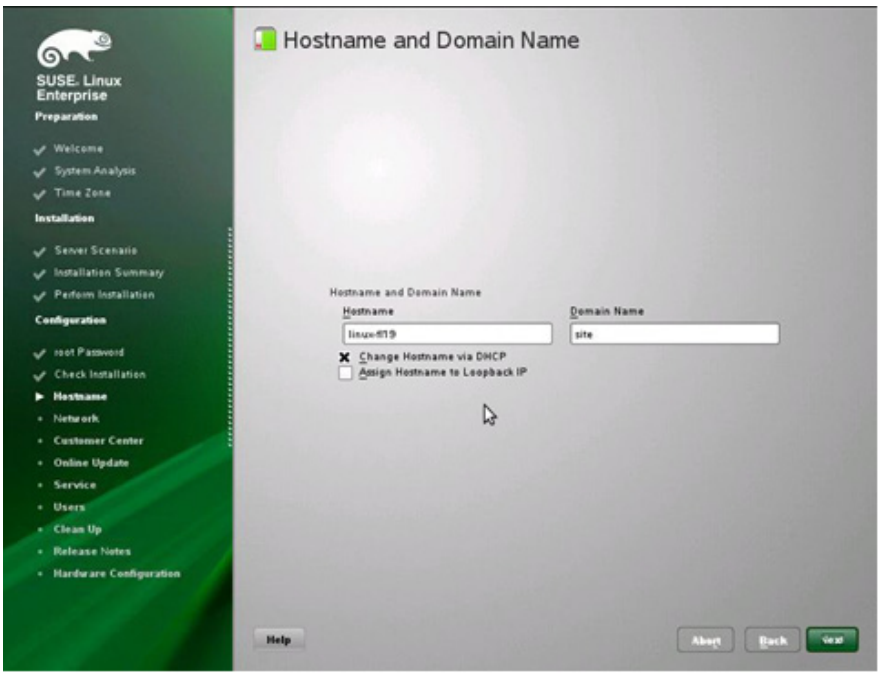
14 After the components have been installed, click Next.



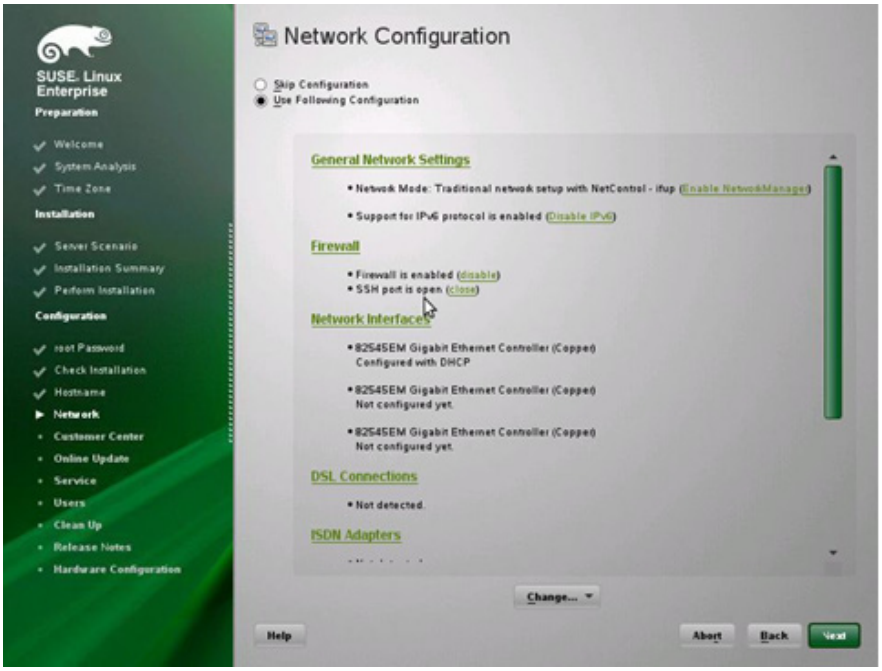
15 Set the root password.



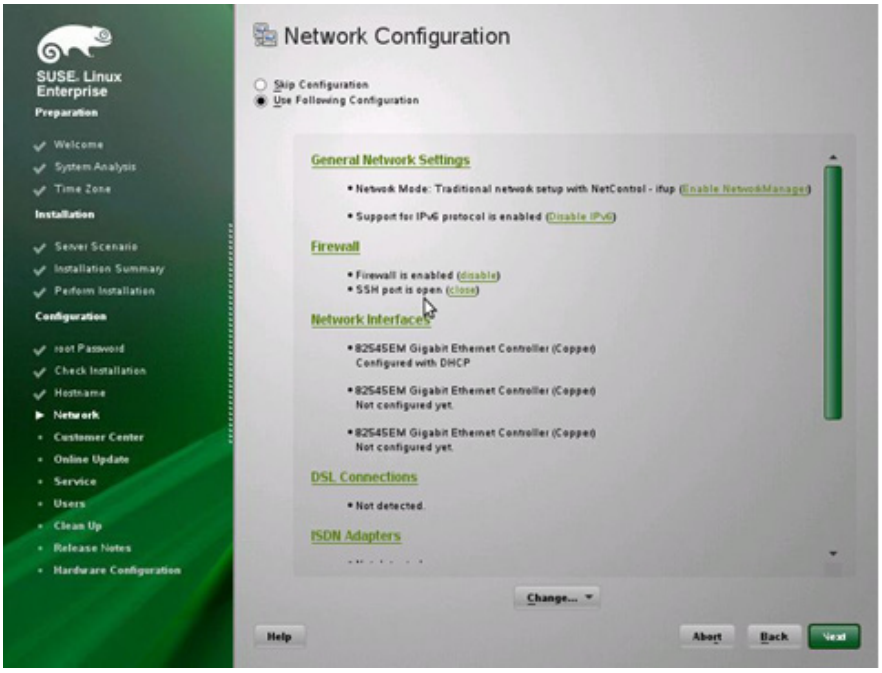
16 Select Change Hostname through DHCP.



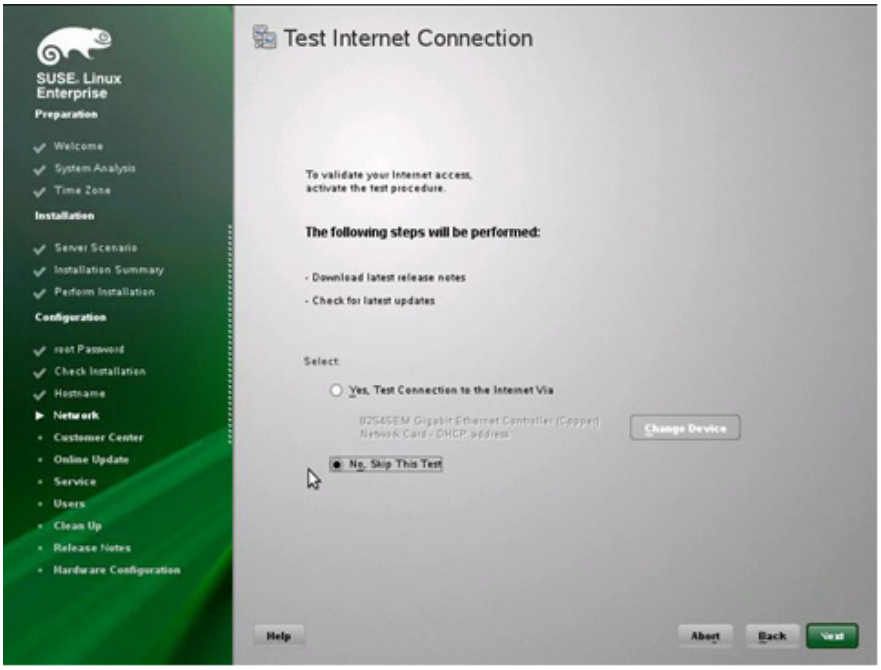
17 Open the SSH ports in the firewall and set the network interfaces (eth0-ethX) to internal networks.



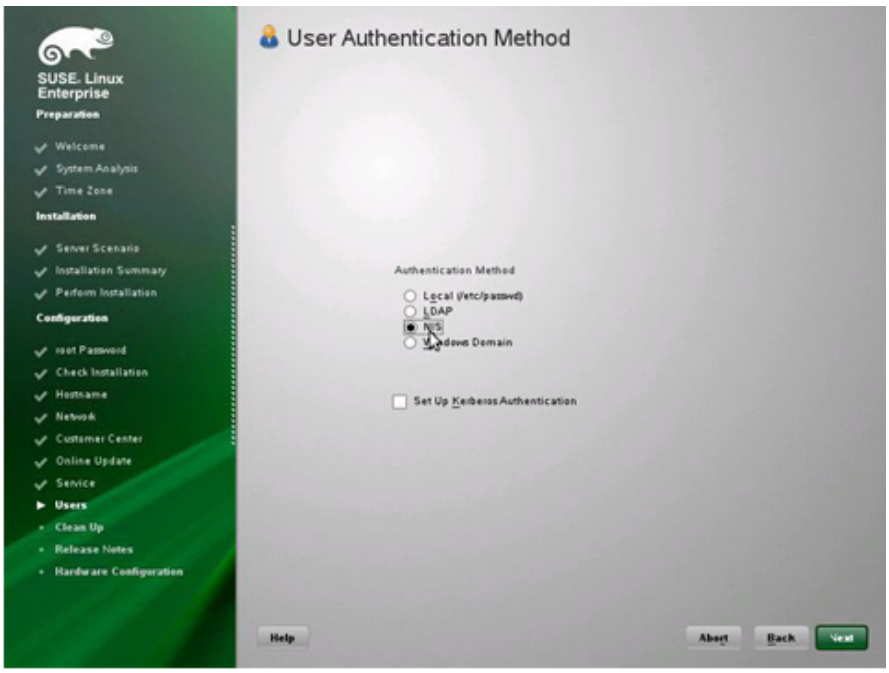
18 Use the default network services configuration.



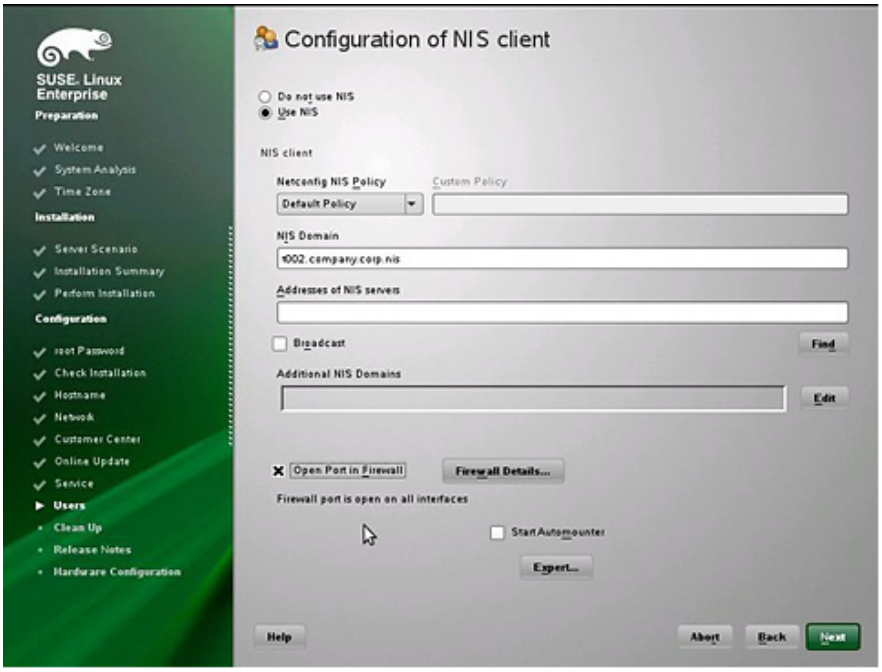
19 Skip the network test.



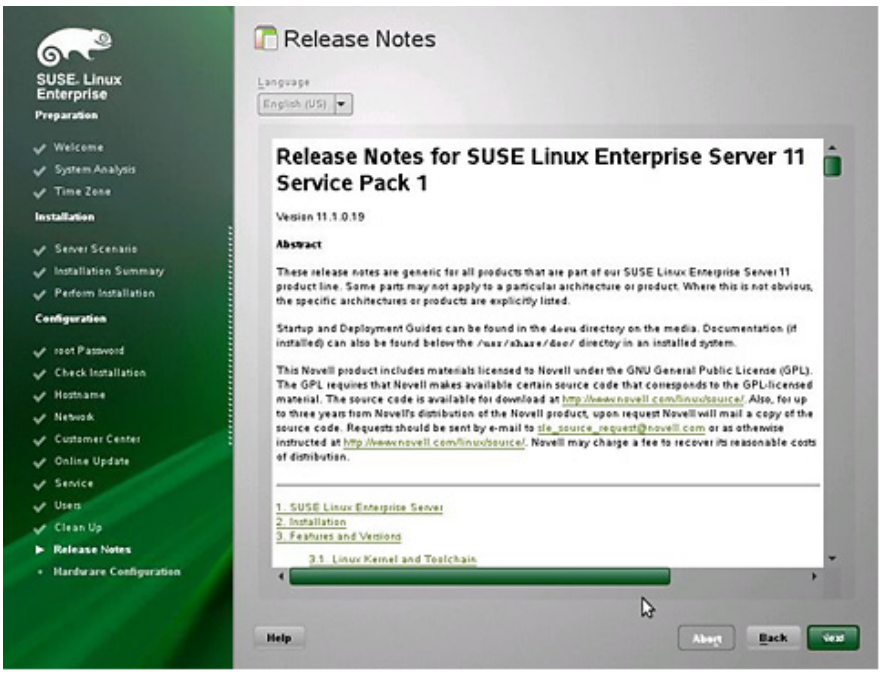
20 Change the User Authentication Method to NIS.



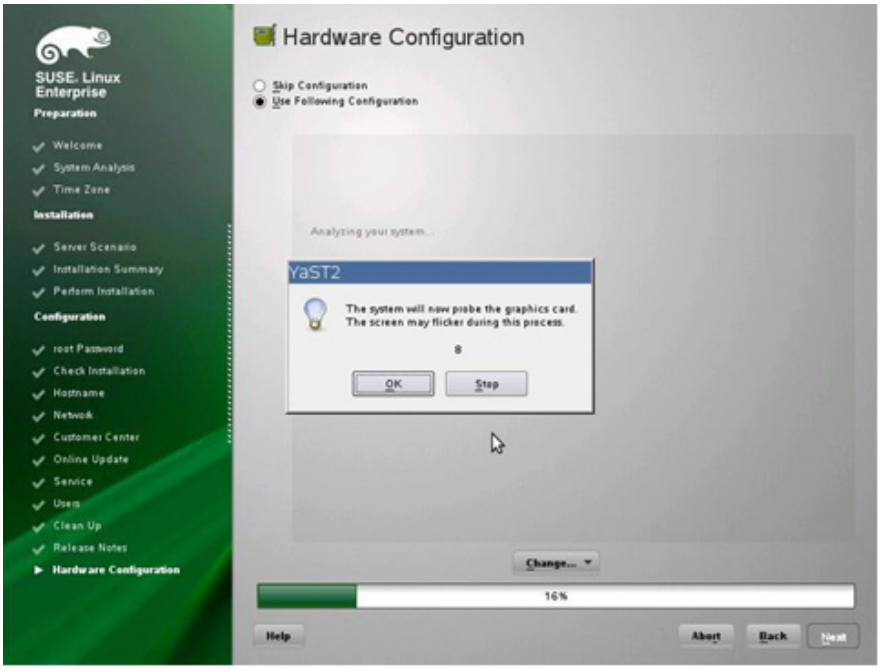
21 Configure the NIS: Select the Use NIS and Open Port in Firewall.



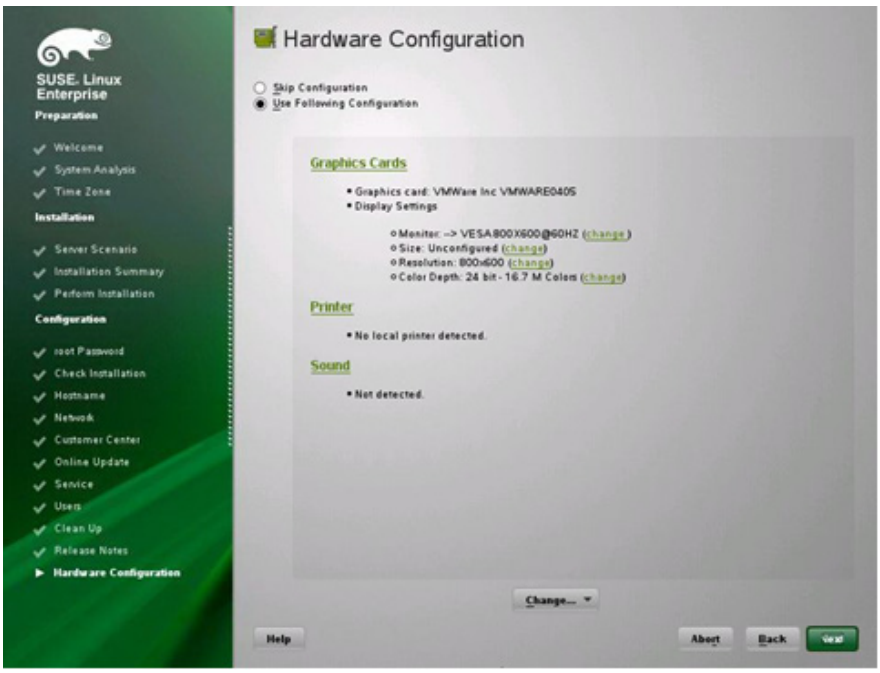
22 Read the release notes and click Next.



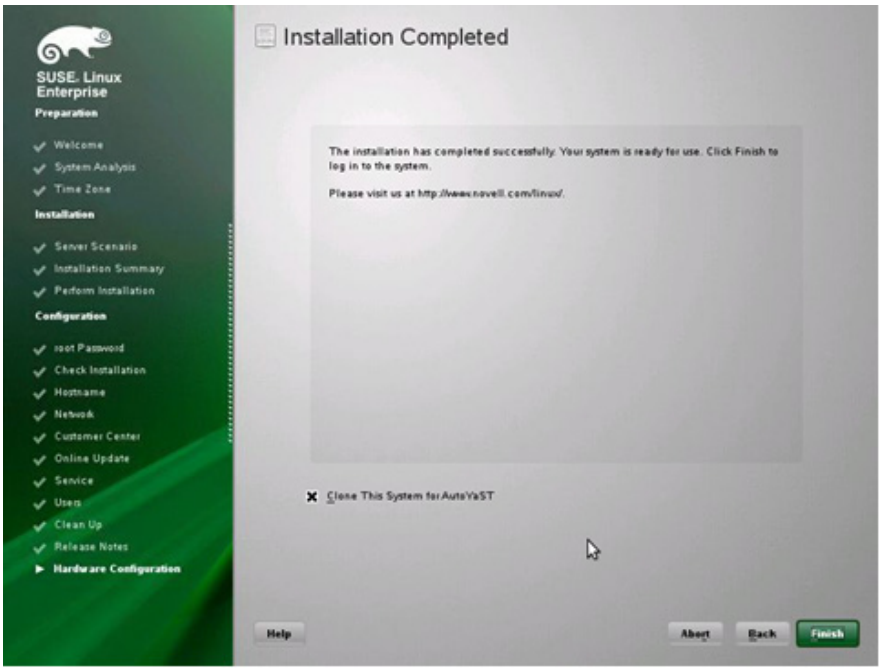
23 Accept the default hardware configuration.



24 Click Next.



25 Click Finish to complete the installation. If you want to repeat this installation for another VM, select the Clone This System for AutoYaST checkbox.



DHCP Client Configuration

This section describes the required DHCP client configuration and other network-related configurations.

Set the DHCP client timeout to 99 seconds. This prevents the DHCP client from going into the background to get the DHCP lease. This is necessary to prevent other scripts or services that require network access from failing to start at boot time. Edit /etc/sysconfig/network/dhcp and change the timeout value to 99:

DHClient_TIMEOUT='99'

Because all interfaces should get the same hostname, insert the line hostname > /etc/HOSTNAME into the section case$state in /etc/sysconfig/network/scripts/dhcpd-:

```
…
case $state in
up)
        write_cached_config_data  dhcp4_state up       $INTERFACE
        commit_cached_config_data                      $INTERFACE

        $debug && NC_OPTIONS="-v"
        /sbin/netconfig modify -s "dhcpcd" \
                -i $INTERFACE $NC_OPTIONS  \
                -l $leaseinfo 2>&1 | $log_dbg

        hostname > /etc/HOSTNAME
```

In addition, it is necessary for all other interfaces to wait until the first interface (eth0) is up and gets the new hostname assigned. Therefore add the following line to the configuration files (for example, /etc/sysconfig/network/ifcfg-eth1 for eth1) of all interfaces except for eth0:

PRE_UP_SCRIPT='wait4eth0'

Then create the script wait4eth0 in the directory /etc/sysconfig/network/script with the following content:

```
#!/bin/bash
ifstatus eth0
eth0up=$?
while [ $eth0up -gt 0 ]; do
        echo "waiting for eth0...";
        sleep 5;
        ifstatus eth0;
        eth0up=$?;
done
```

Disable the use of persistent network device names by clearing the UDEV configuration for network interfaces according to the Novell/SUSE TID 3048119:

cat< /dev/null > /etc/udev/rules.d/70-persistent-net.rules

This step must be repeated if the template is started or rebooted for other changes.

Check whether the network interfaces are set to internal networks at the firewall.

Open /etc/sysconfig/SuSEfirewall2 and check whether the network interfaces are included in FW_DEV_INT:

FW_DEV_INT="eth0 eth1 eth2"

NIS Configuration

The OS template is configured to run a NIS client communicating with a NIS server to provide central user management capabilities. The following maps are provided by the NIS server: passwd, group, services. This section describes the necessary configurations.

nsswitch

The file /etc/nsswitch.conf configures the source of data for the different user configuration files. The OS template should contain the following nsswitch.conf entries:

```
passwd:      compat
shadow:      files
group:       compat

hosts:       dns files
networks:    files dns

services:    nis
```

passwd

If it is not already present, the following line must be appended to the file /etc/passwd to merge NIS users with local users:

+::::::

Groups

If it is not already present, the following line must be appended to the file /etc/group to merge NIS groups with local groups:

+:::

Services

The services definition is retrieved solely from the NIS server. No local services are possible.

Linux Kernel Configuration

No special kernel settings are required for the SAP Applications built on FlexPod landscape other than the ones mentioned in SAP note 1310037 for SLES 11 installations. The most important item to install is the sapconf (fka sapinit) package. This is done automatically when you select the pattern SAP Application Server Base during the SLES installation procedure.

Appendix B Installing Red Hat Enterprise Linux

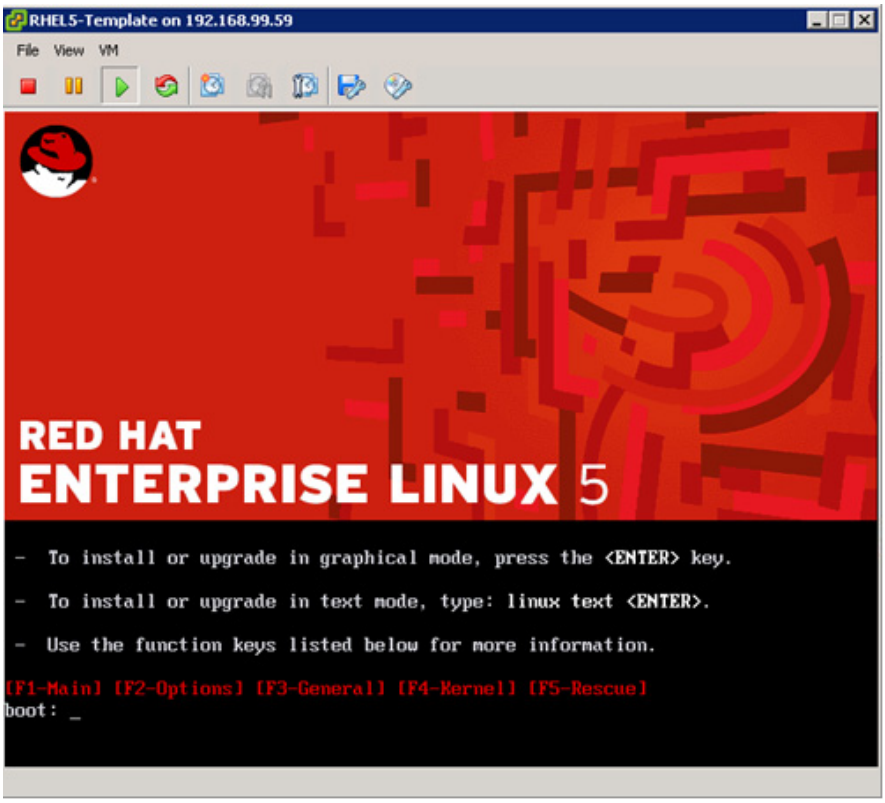
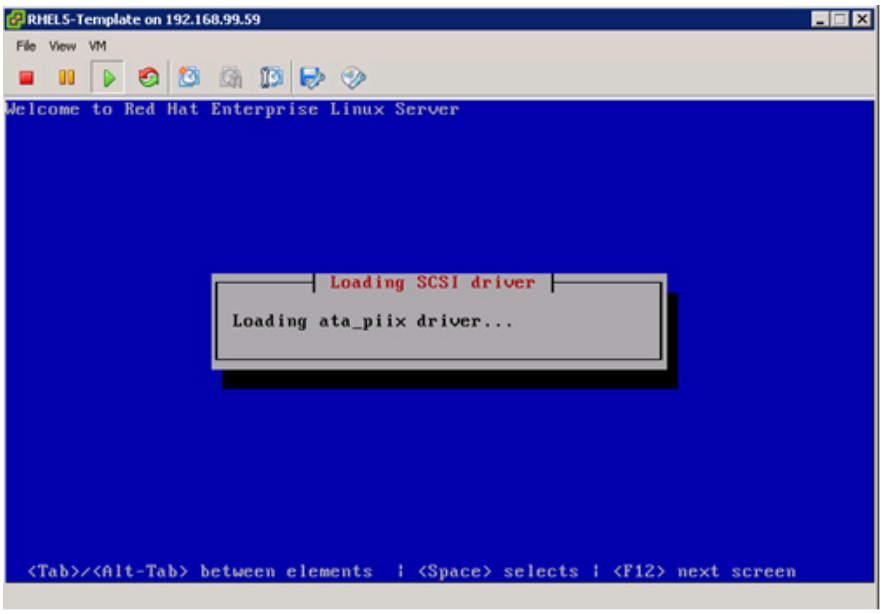
This section describes the creation of a VMware template for Red Hat Enterprise Linux (RHEL) 5.5.

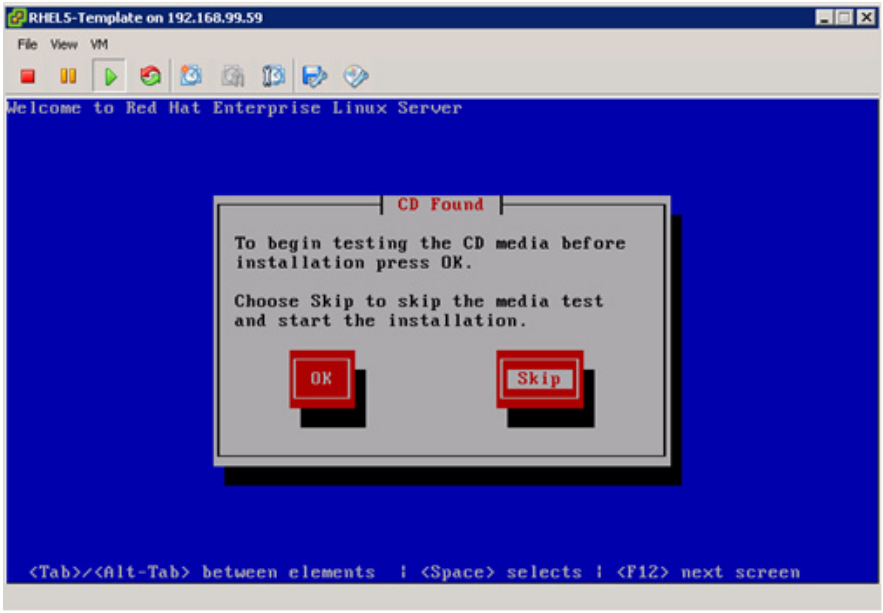
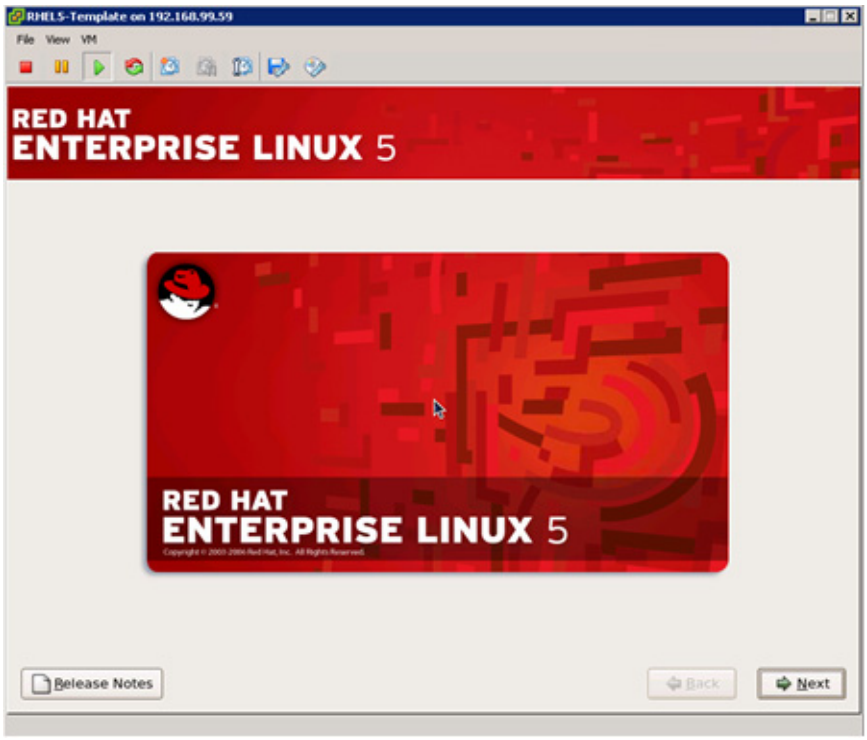
The first sections ("OS Template Installation" and "Post-installation Activities") describe the standard OS installation and post-installation procedures required to install RHEL on a virtual machine.

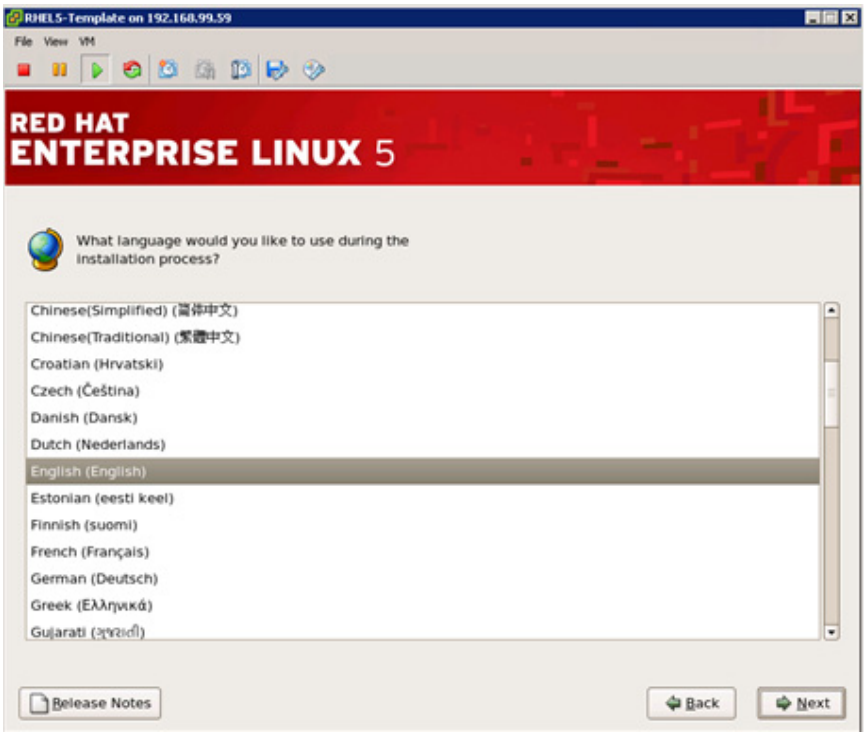
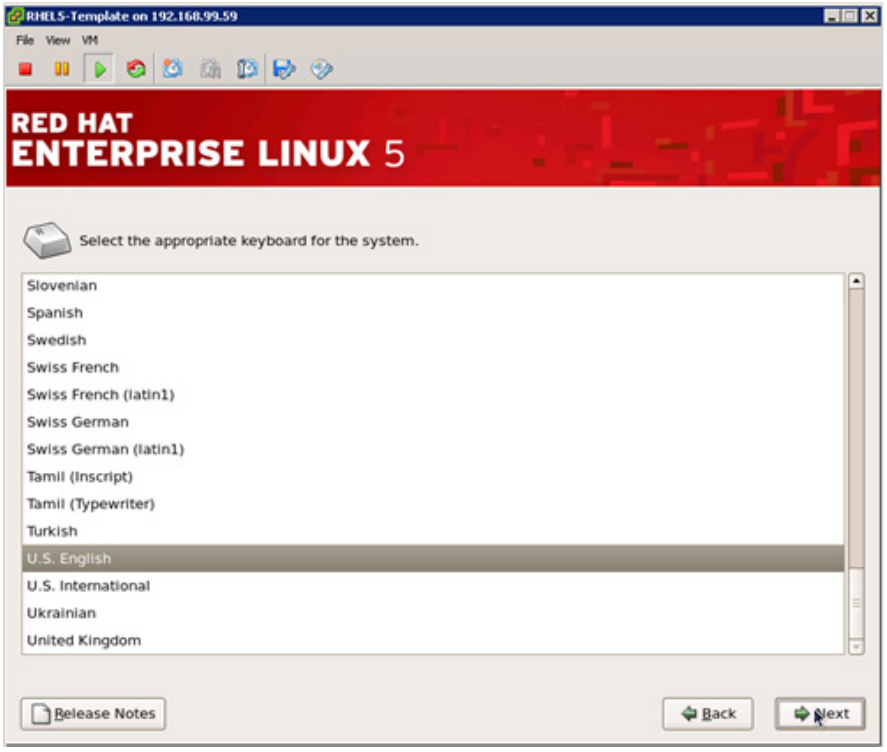
The final section, "Preparing Red Hat for a Kickstart Installation on Bare Metal", focuses on an automated procedure that uses a predefined kickstart file.

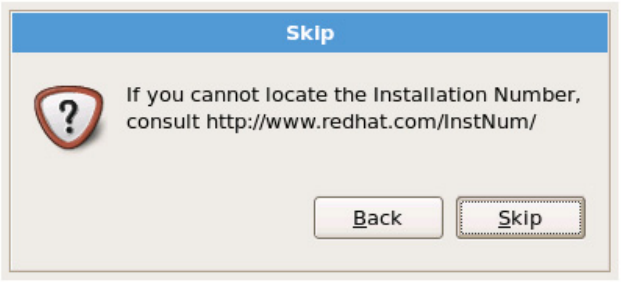
OS Template Installation

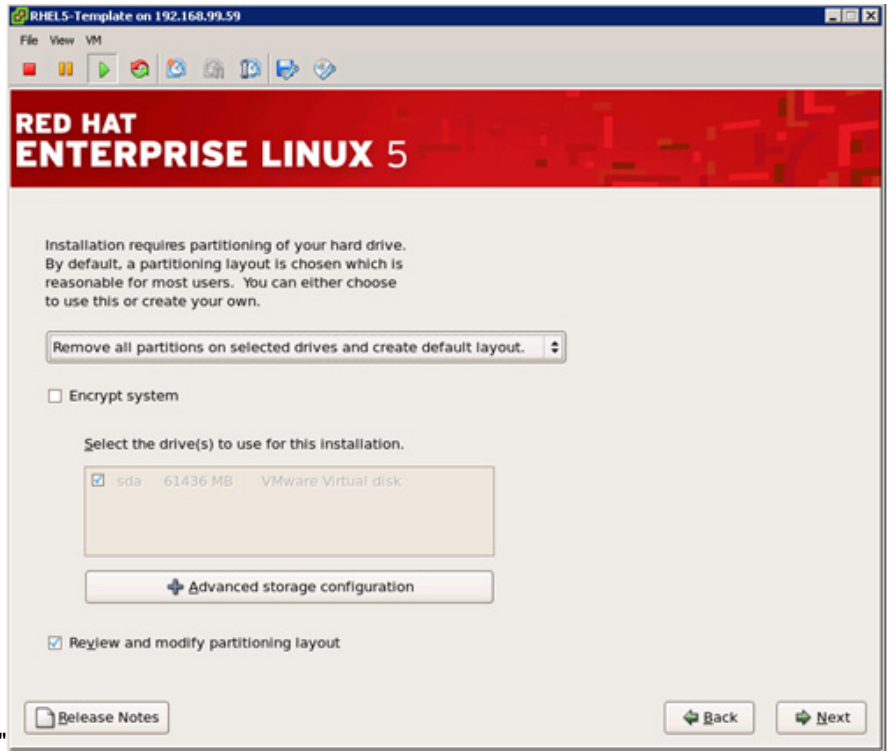
The standard RHEL installation procedure starts when the virtual machine (or physical server) is booted with the installation DVD mounted in the CD-ROM (physical or virtual) drive. The following lists the installation steps:

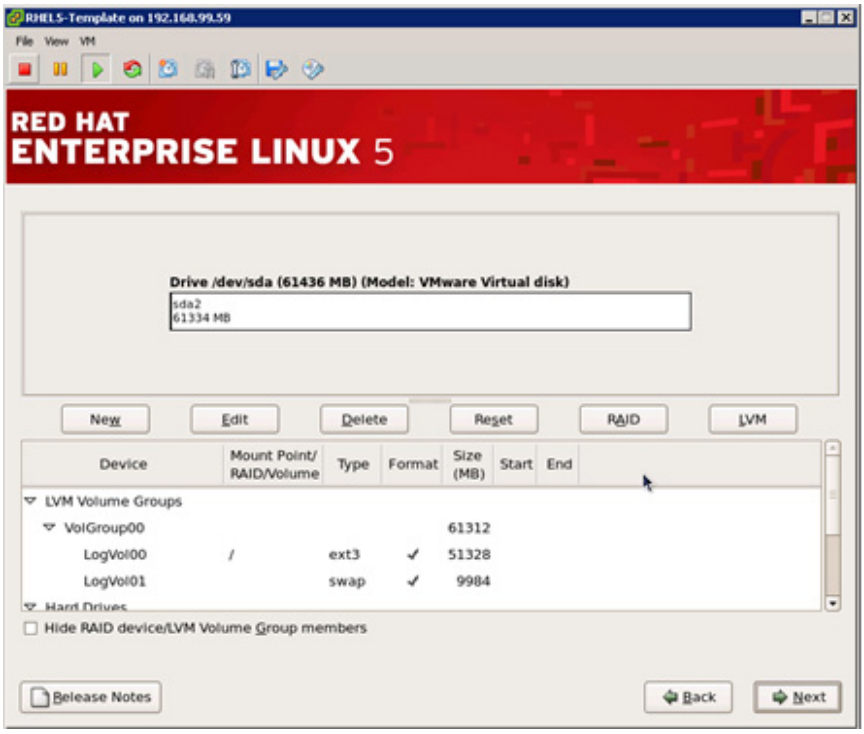
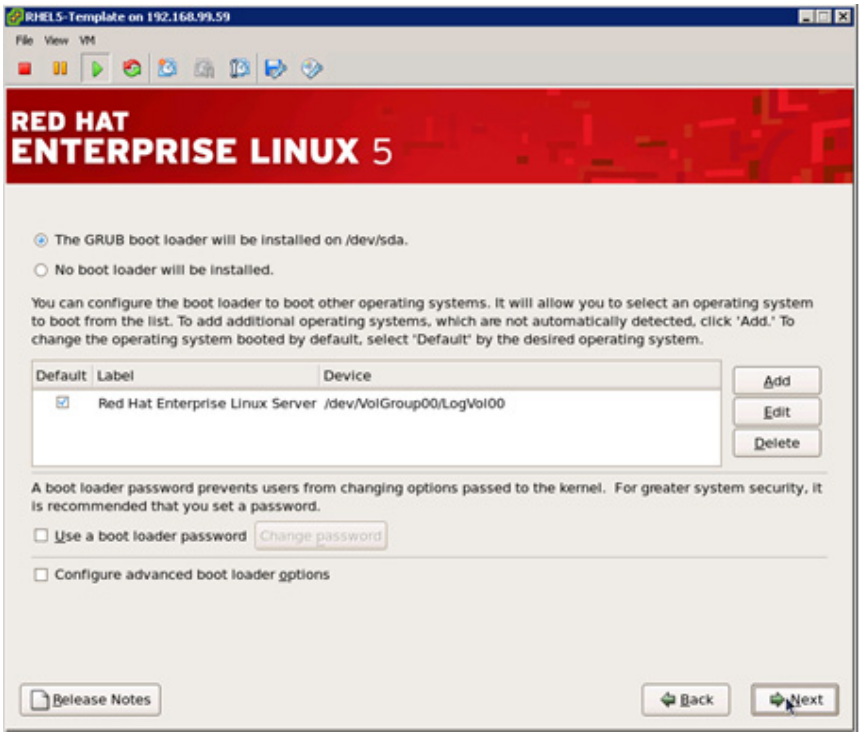
1	Boot from the physical or virtual CD-ROM to start the installation process. 
2	Wait until the boot of the CD is finished. 

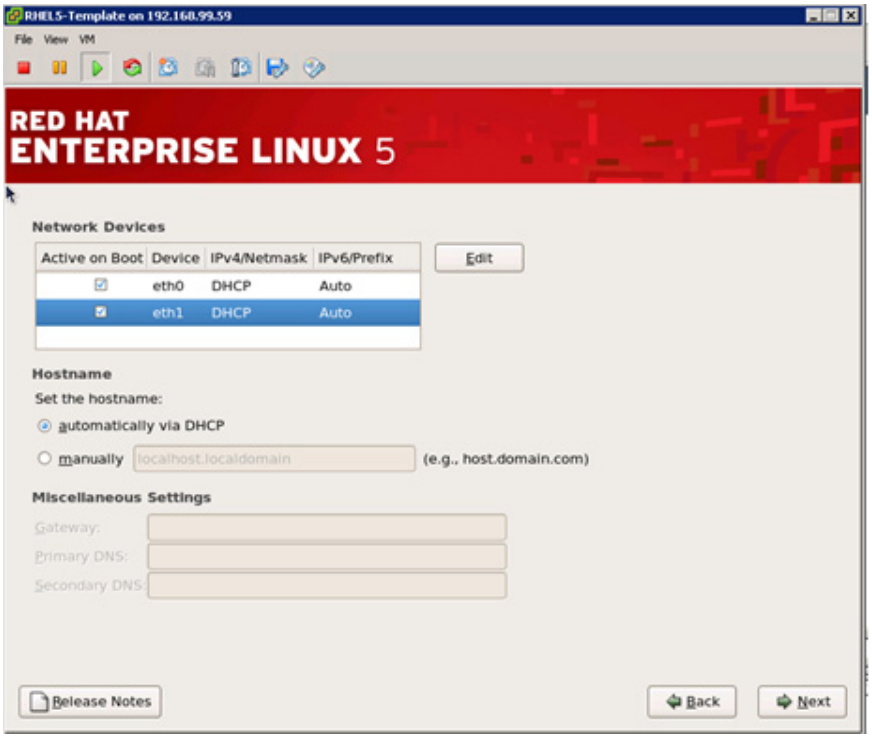
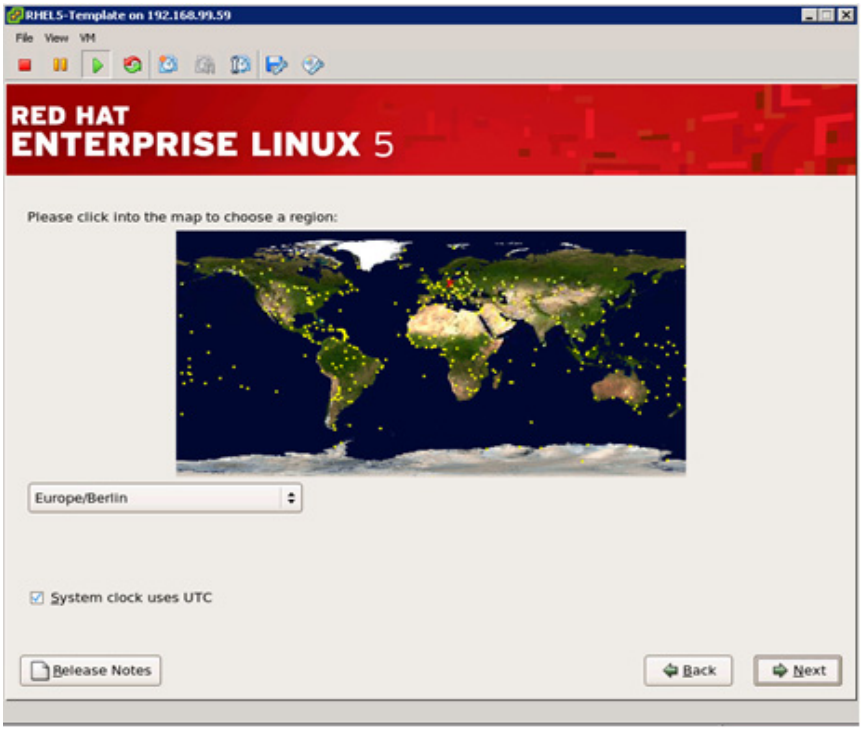
3	Click Skip to skip the media test. 
4	Click Next. 

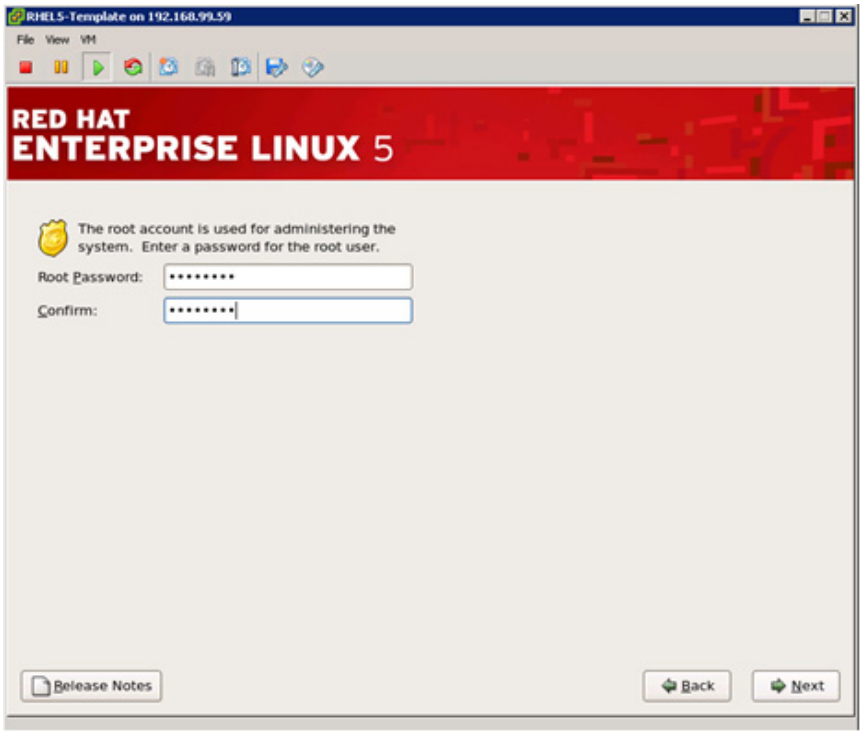
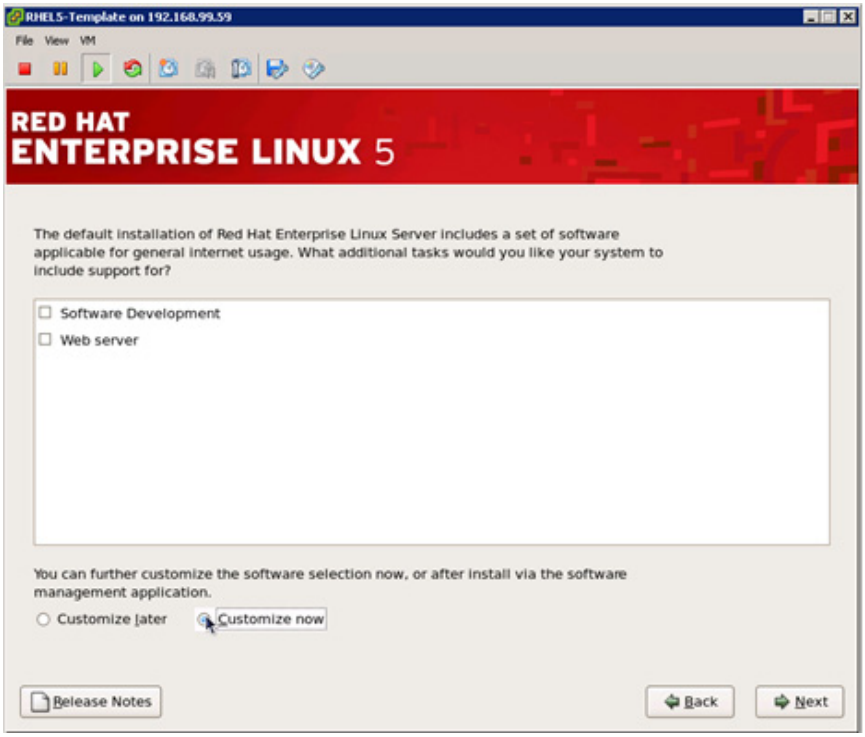
5	Select English as the default language. 
6	Select a keyboard layout. 

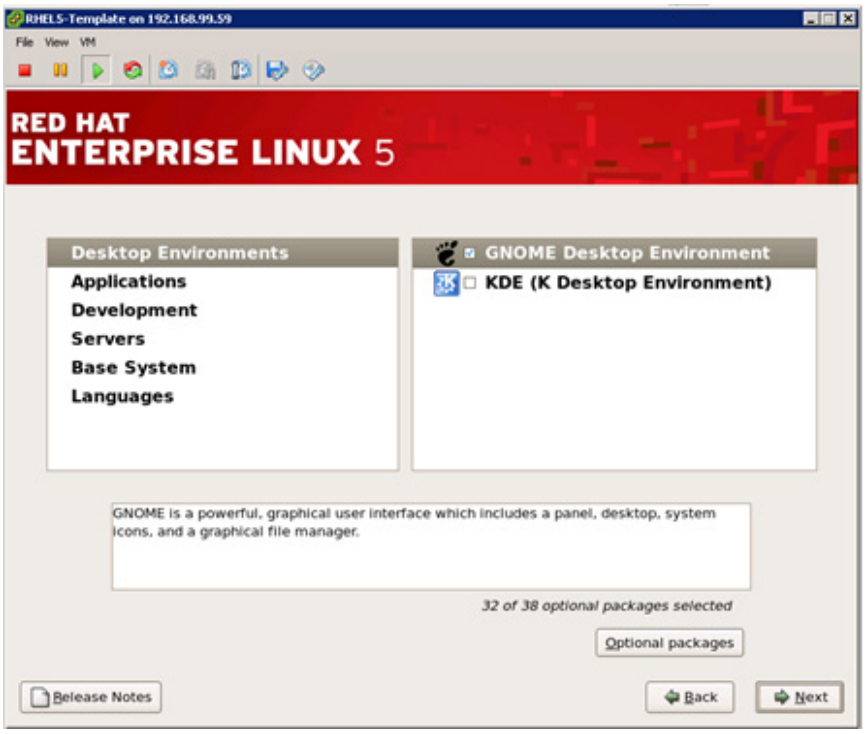
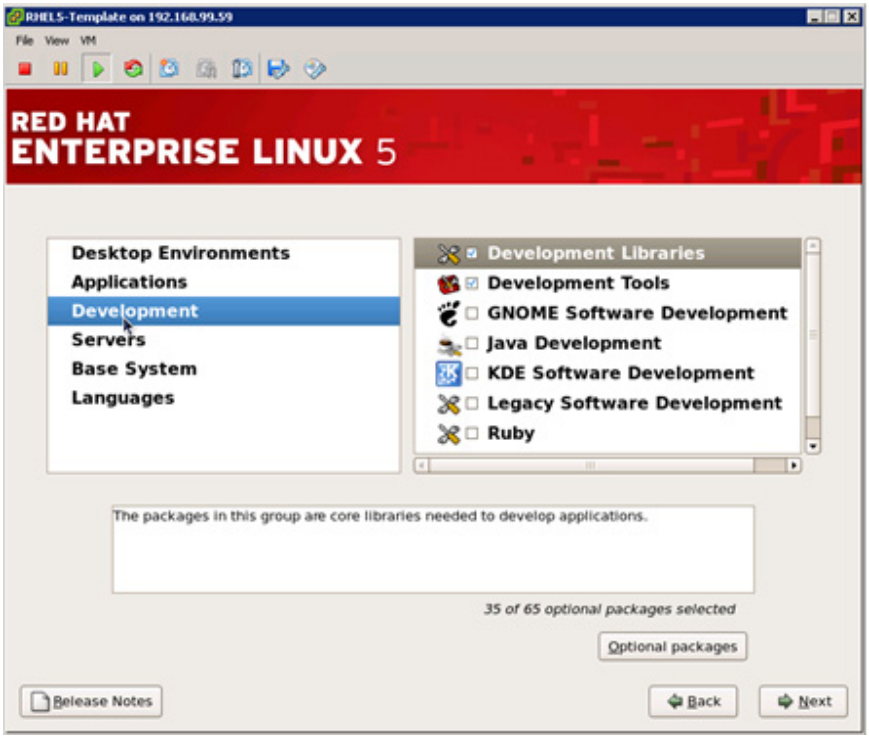
7	Skip the step of entering the installation number. 
8	Click Skip to acknowledge that you have skipped entering the installation number. 
9	Click Yes to initialize the disk. 

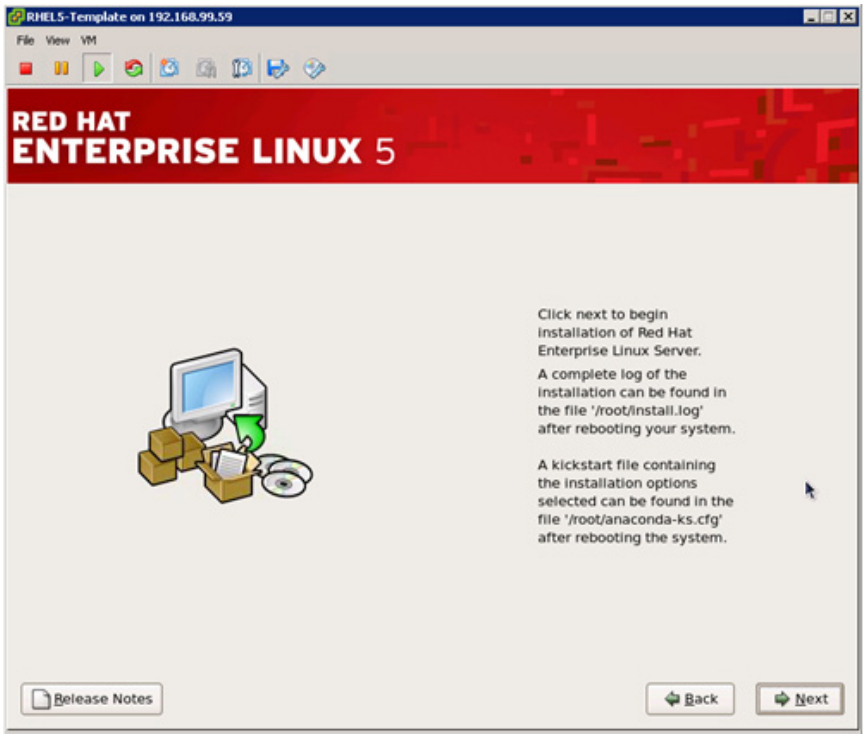
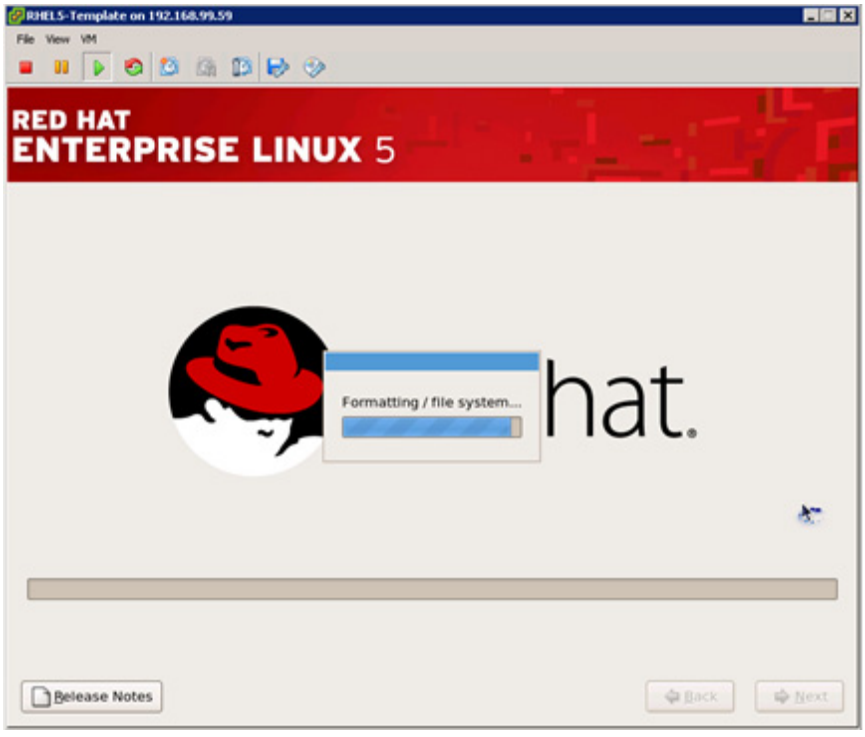
10	From the drop-down list, select “Remove all partitions on selected drives and create default layout,” then select the “Review and modify partitioning layout” checkbox.  "
11	Click Yes to create the partition table. 

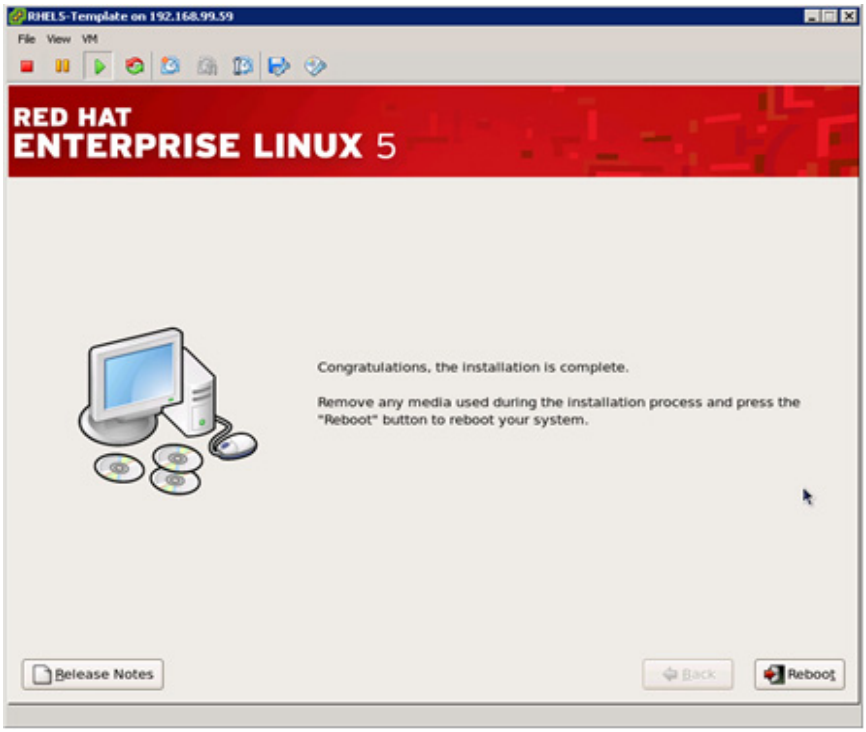
12	Review the new disk layout. 
13	Review the boot loader configuration. 

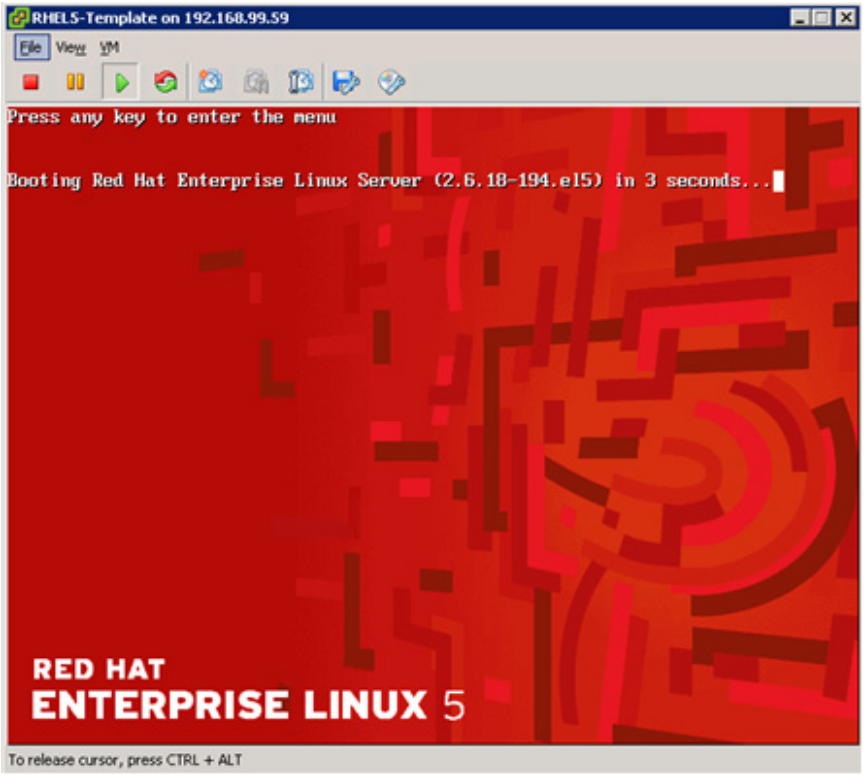
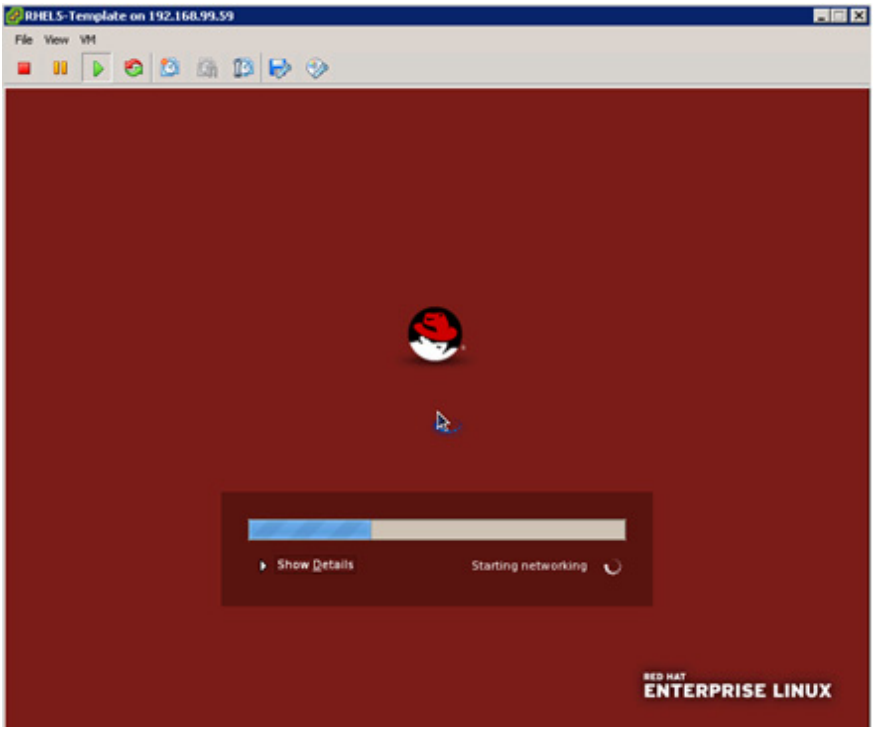
14	Select the Activate on Boot checkbox for all Ethernet interfaces. 
15	Select the time zone for your location. 

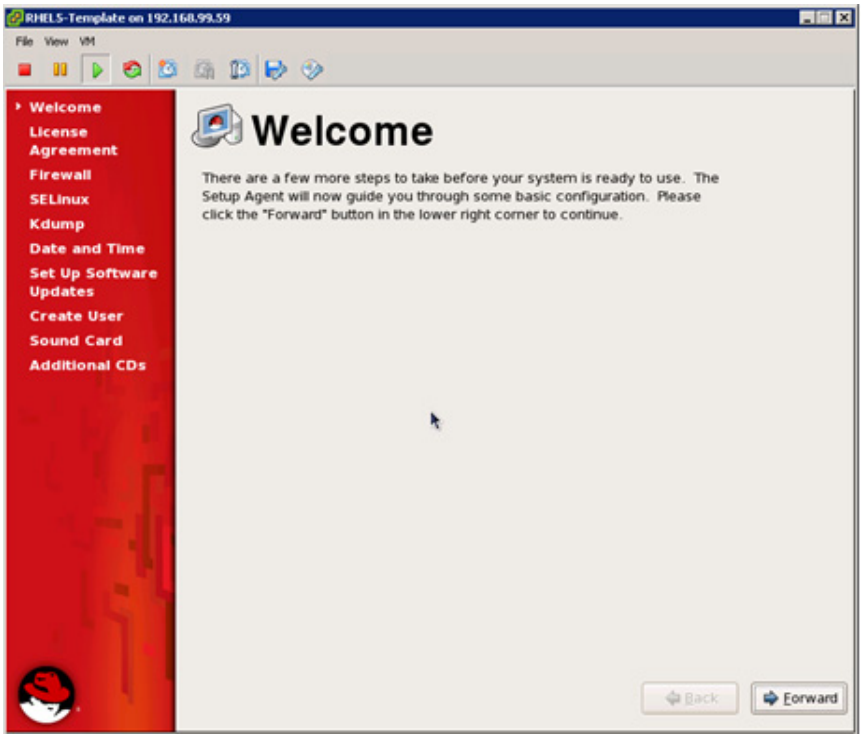
16	Enter the root password twice. 
17	Select Customize now and click Next. 

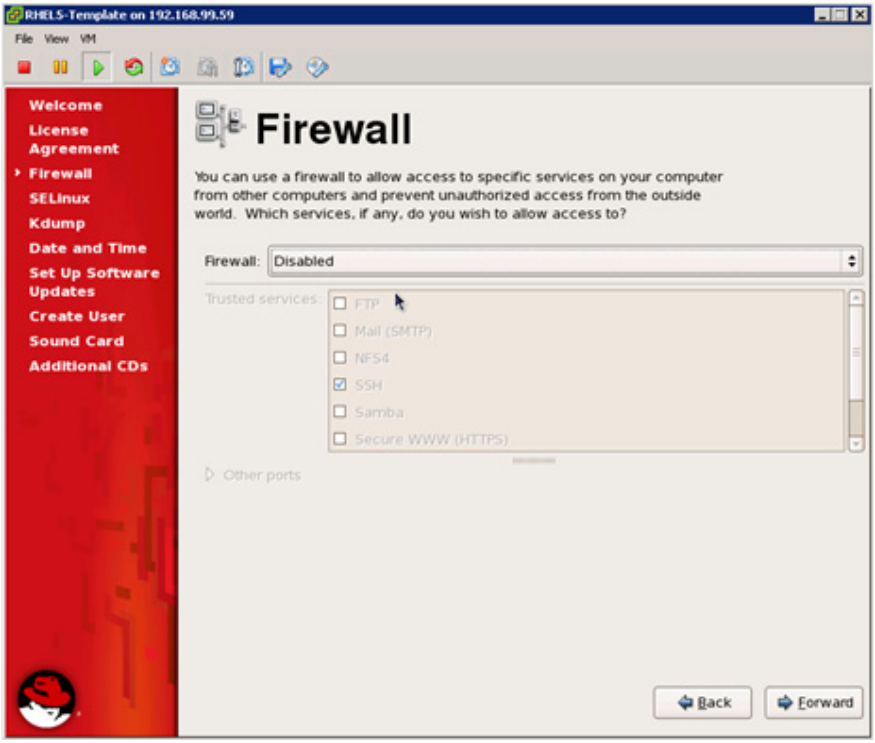
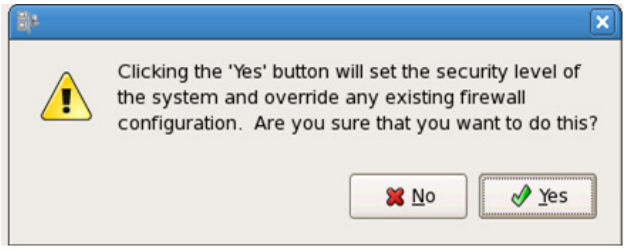
18	Select or deselect the GNOME or KDE desktop. 
19	Select Development, select Development Libraries and Development Tools, and click Next. 

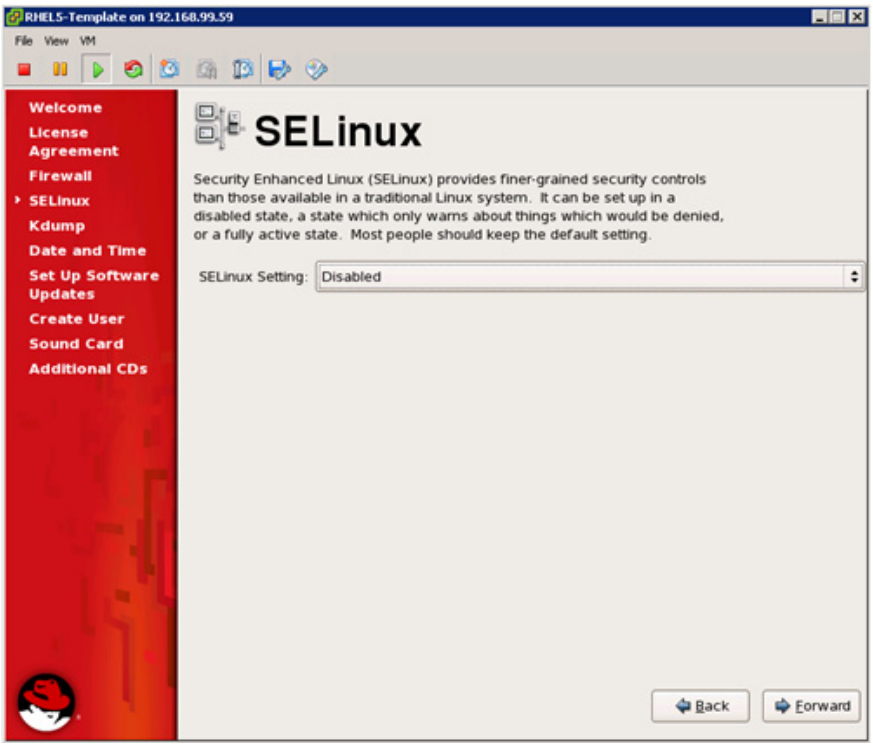
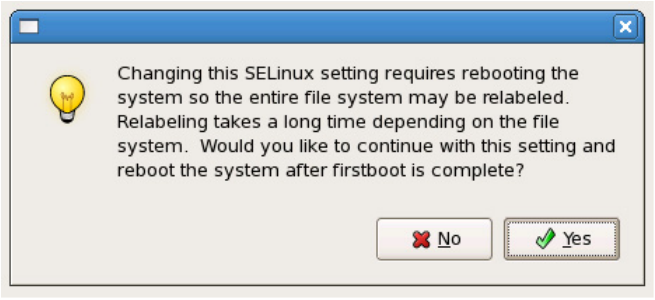
20	Click Next to start the installation. 
21	Wait until the file system has been formatted. 

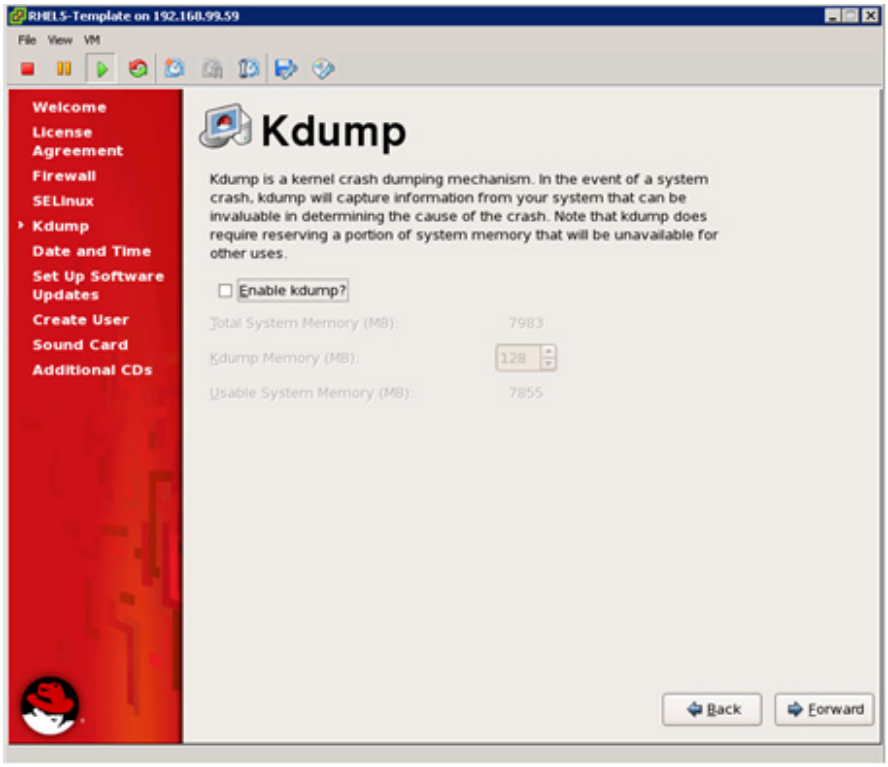
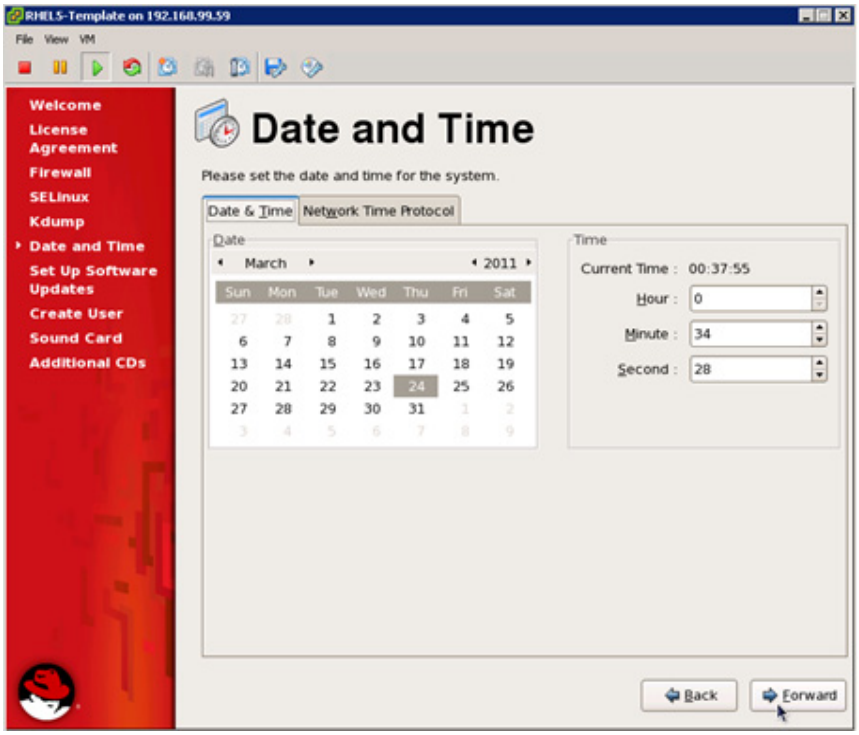
22	Wait until the installation of the packages is finished. 
23	Click Reboot to restart the server. 

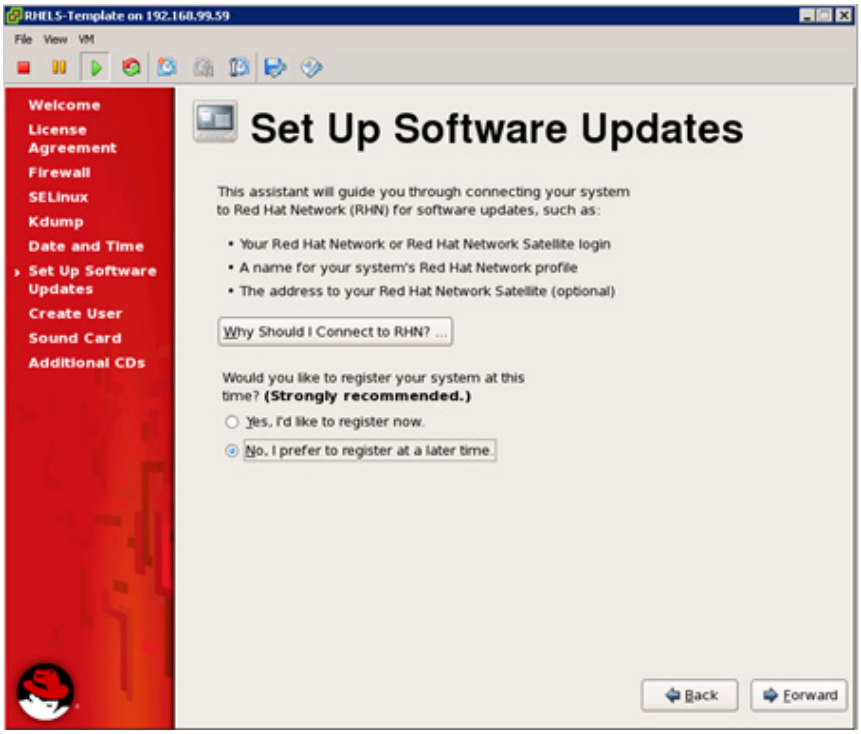
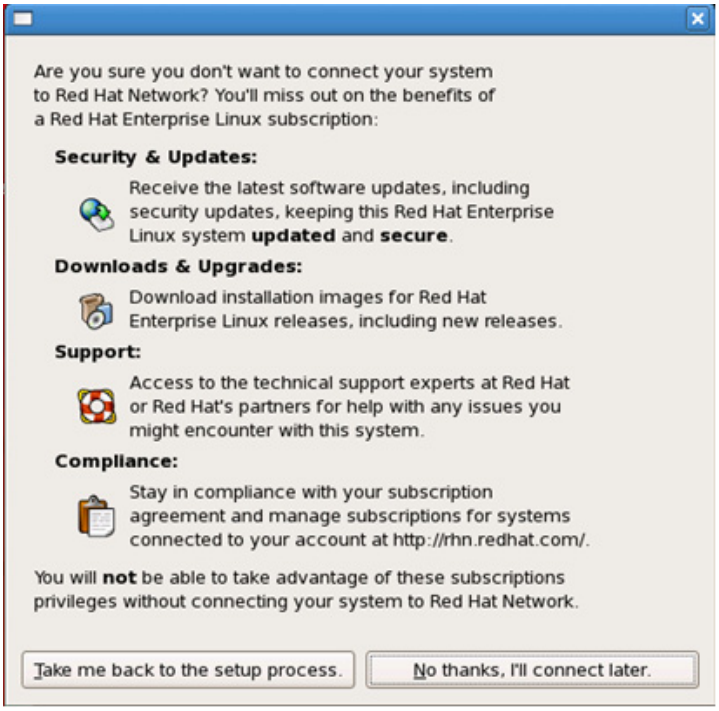
24	This screen appears during reboot. Wait until the reboot is finished. 
25	This screen appears during reboot. Wait until the reboot is finished. 

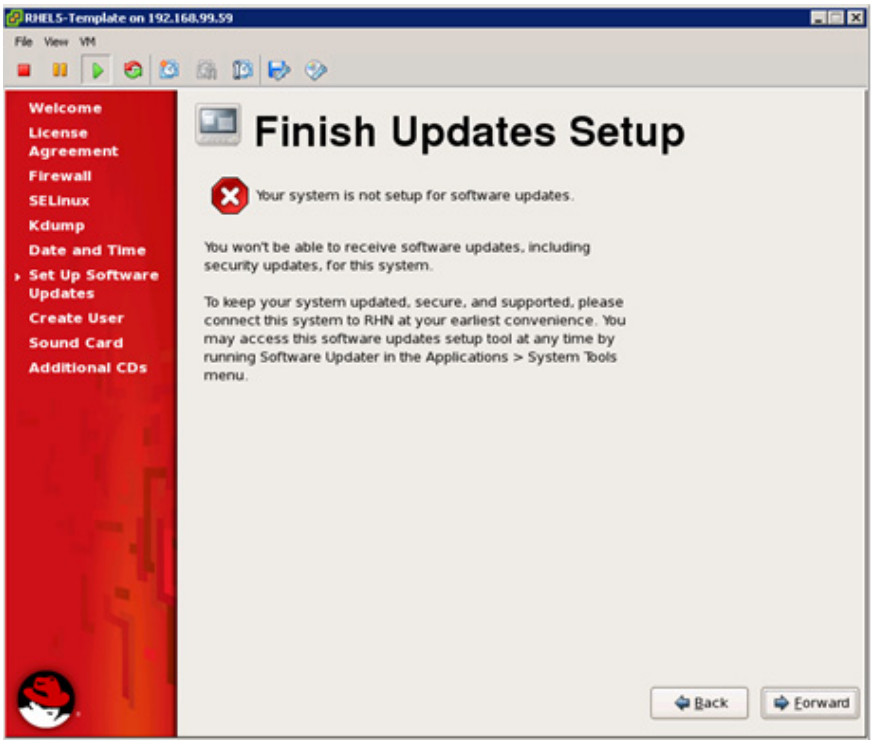
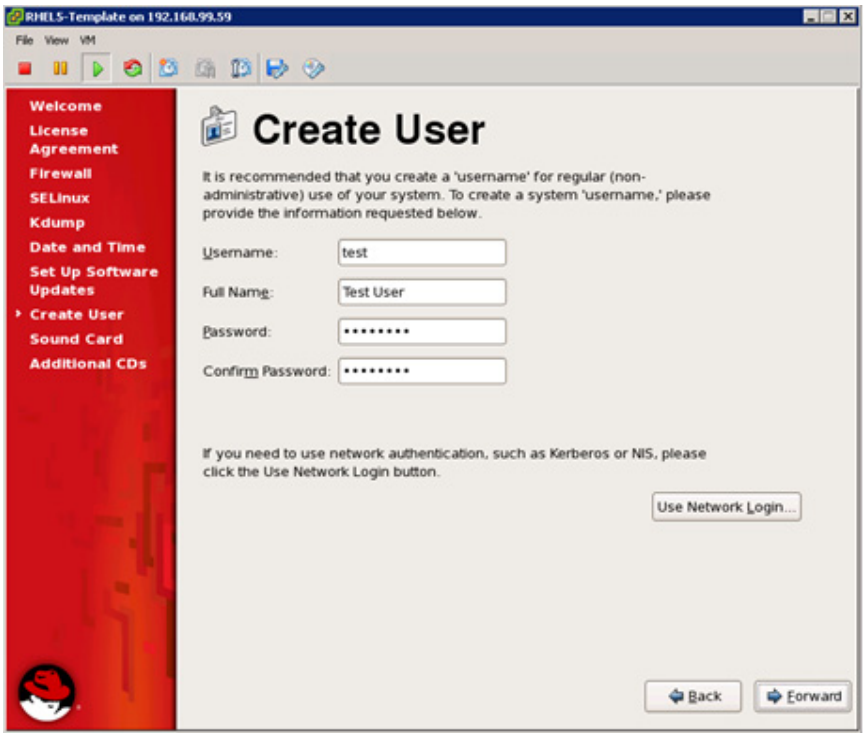
26	Click Forward. 
27	Select Yes, I agree to the License Agreement and click Forward. 

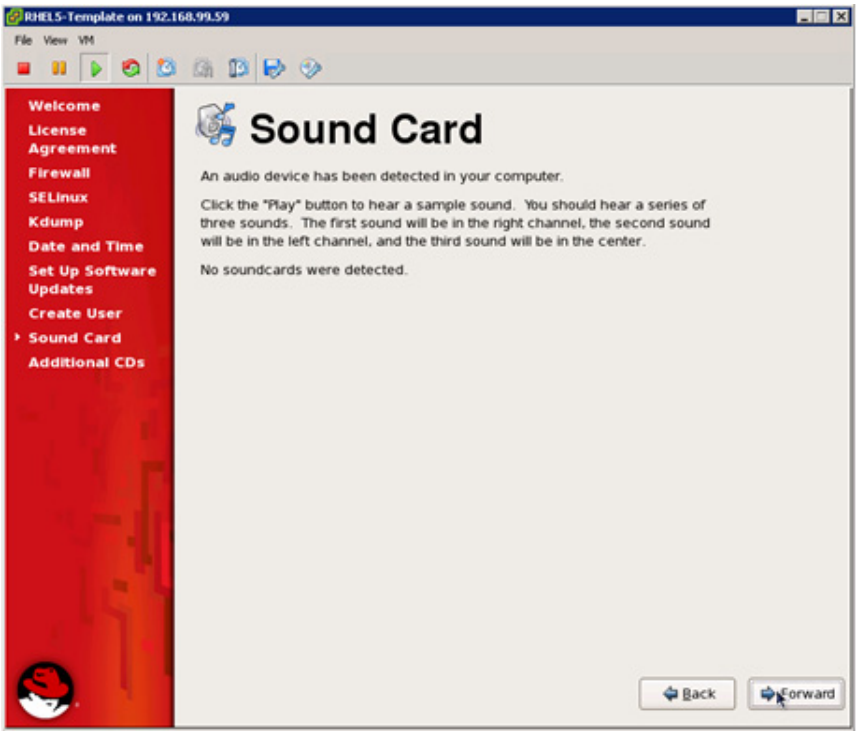
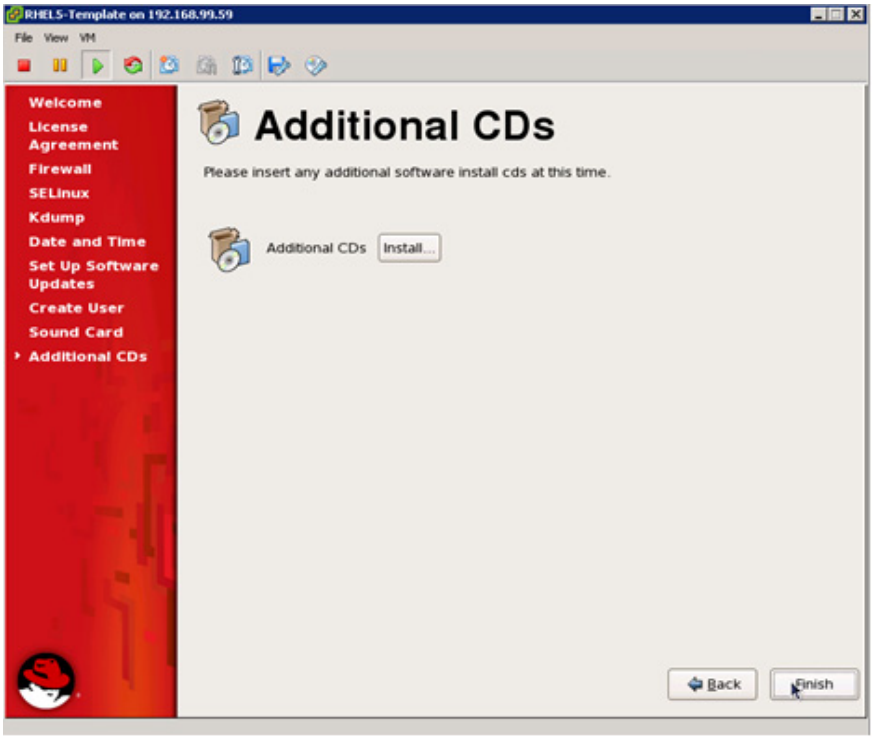
28	Disable the firewall and click Forward. 
29	Click Yes. 

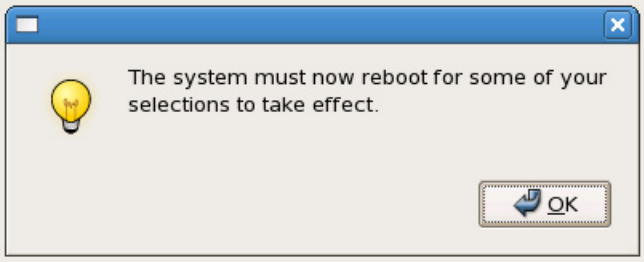
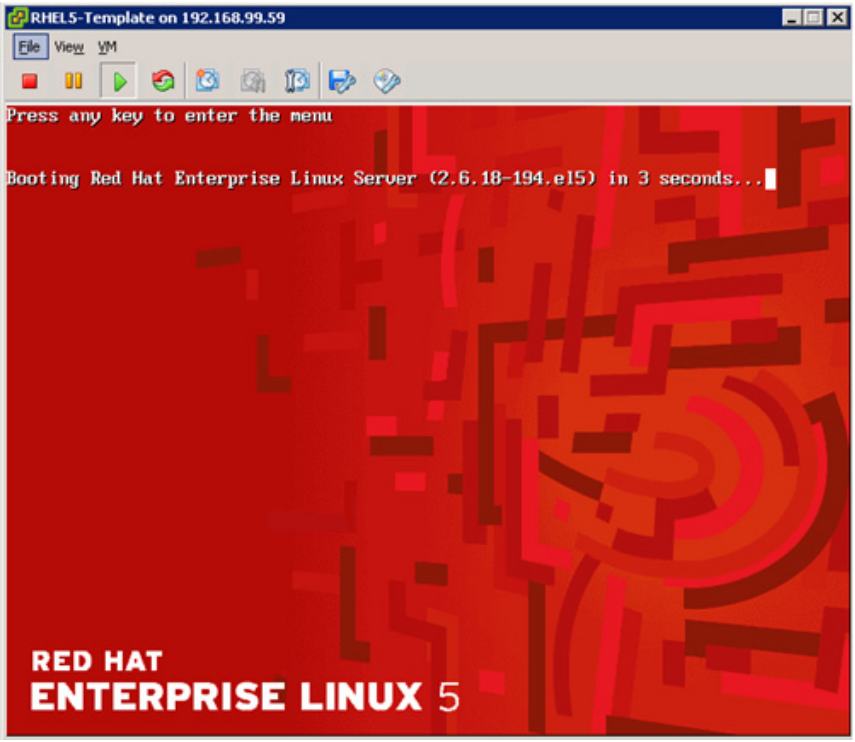
30	Select Disabled and click Forward. 
31	Click Yes. 

32	Leave the Enable kdump? checkbox unselected (the default) and click Forward. 
33	Configure the date and time and click Forward. 

34	Select “No, I prefer to register at a later time” and click Forward. 
35	Click “No thanks, I’ll connect later.” 

36	Click Forward. 
37	Create an additional user and click Forward. 

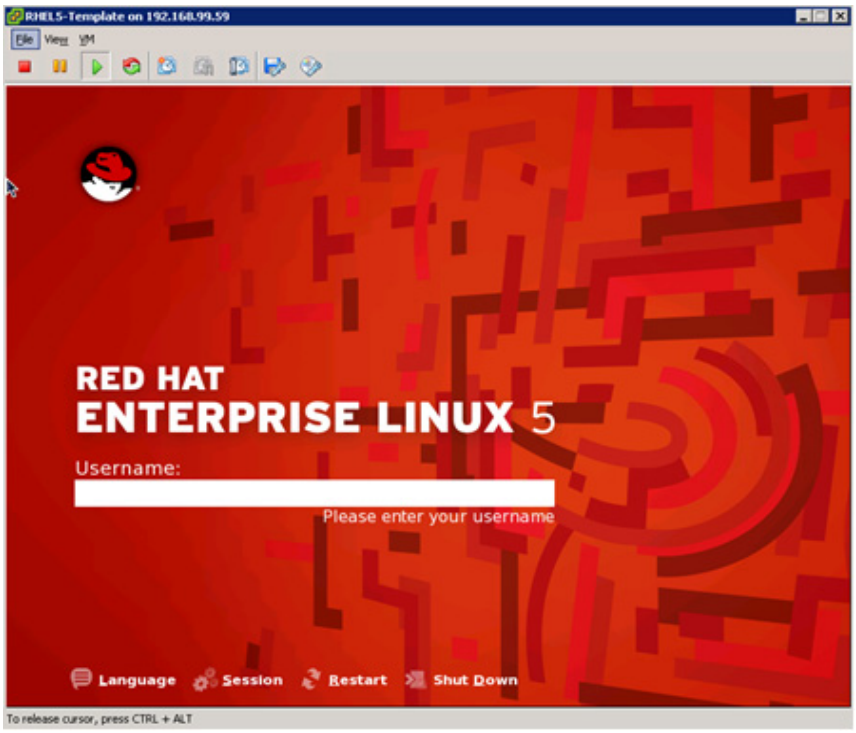
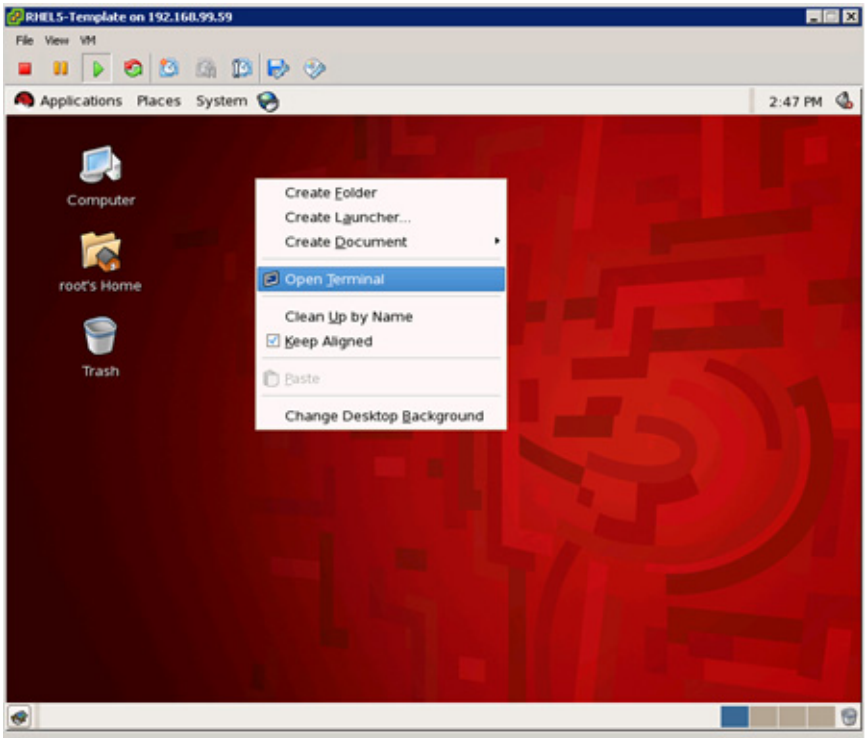
38	Click Forward. 
39	Click Finish. 

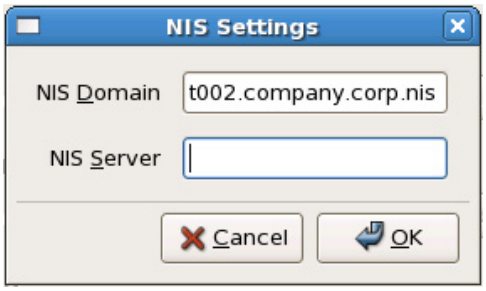
40	Click OK to initiate the server reboot. 
41	The server automatically boots the newly installed operating system. 

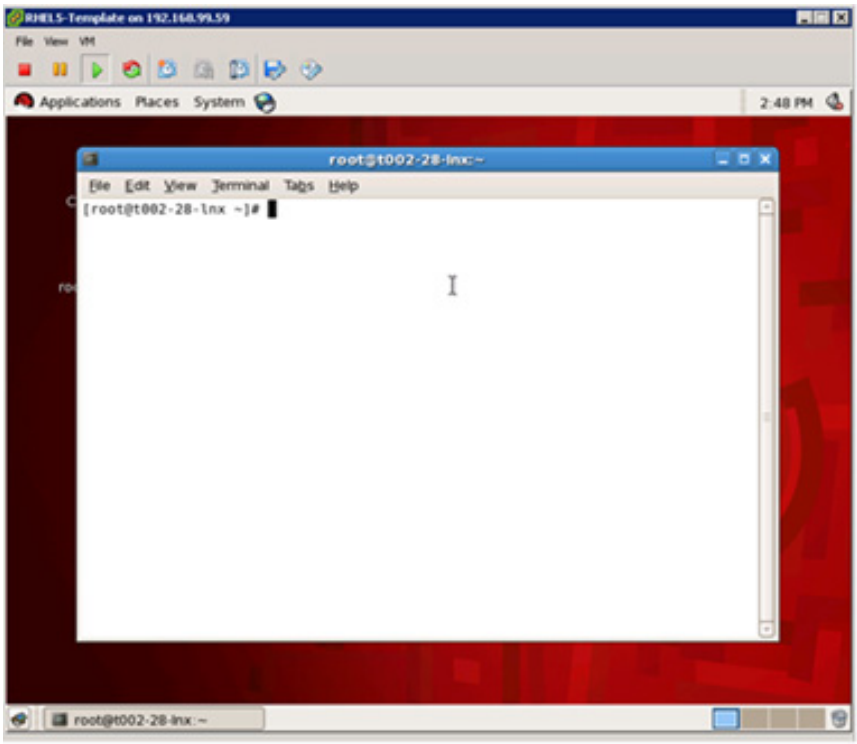
Post-Installation Activities

NIS Client Configuration

The NIS client can easily be configured by using the graphical interface (GNOME). The following lists the steps to configure the NIS client.

1	Log in to the server as `root`. 
2	Open a terminal. 

3	Select System > Authentication. In the Authentication Configuration window, User Information tab, select Enable NIS Support and click Configure NIS. 
4	Enter `t002.company.corp.nis` as the NIS Domain and leave the NIS Server field empty. Click OK to close the NIS Settings window. 
5	In the Authentication Configuration window, click OK to accept the NIS configuration and close the window.

6	Open a terminal window. 
7	Open the file `/etc/nsswitch.conf` with an editor such as `vi` and change the listed lines as follows: Passwd: `files nis` Shadow:`files nis` Group: `files nis` Hosts: `files dns` Services:`files nis`

DHCP Client Hook

To retain all necessary search domains in the /etc/resolv.conf file, a custom DHCP client hook is needed. Therefore the file /etc/dhclient-enter-hooks must be created with the following content.

Copy the function make_resolv_conf() from the original /sbin/dhclient-script to the file. Replace the if [-n "$SEARCH"]; … fi clause with the following:

```
if [ -z "$SEARCH" ]; then
  make_search $new_domain_name
fi
echo search $SEARCH >> $rscf
```

Add the following function to the file:

```
make_search() {
  domain_name=`dnsdomainname`
  if [ -z "$domain_name" ] ||
     [ "$domain_name" == "localdomain" ]; then
    domain_name=$1
```

```
  fi
  echo "using domain $domain_name..."
  old_search=`grep search /etc/resolv.conf`
  old_search="$old_search $1"
  new_search=

  for item in $old_search; do
    match=`echo $item | grep -o $domain_name`
    if [ -n "$match" ]; then
      already_added=
      for added_item in $new_search; do
        if [ "$item" == "$added_item" ]; then
          already_added=1
        fi
      done
      if [ -z "$already_added" ]; then
        new_search="$new_search $item"
      fi
    fi
  done

  SEARCH=$new_search
}
```

Network Card Configuration

Add the following line to /etc/sysconfig/network-scripts/ifcfg-eth1:

DHCP_HOSTNAME=`hostname`

Delete the following line from /etc/sysconfig/network-scripts/ifcfg-eth0 and /etc/sysconfig/network-scripts/ifcfg-eth1:

HWADDR=….

Linux Kernel Configuration

No special kernel settings are required for the FlexPod on SAP Application landscape other than the ones mentioned in SAP note 1048303 for Red Hat Enterprise Linux 5 installations.

Preparing Red Hat for a Kickstart Installation on Bare Metal

Instead of a manual installation of the OS, Red Hat supports an automated installation procedure (kickstart) that allows you to install not only the base operating system, but additional software components as well. Especially for the provisioning of bare metal servers, where the OS is to be installed on local (SAN) disks with the attendant difficulty of preparing a standard boot image, this is an easy method to standardize the installation process.

To use the kickstart file listed in this section, the reference software must be in place.

The difference between automated installation and a standard installation is that in an automated installation all additional components and configuration steps have already been applied.

ISO Images

Copy ISO image RHEL 5.5 to the central software share on the central software vFiler unit.

Log in to a server in the infrastructure tenant with read/write permissions on the central software share. The default mountpoint on Linux operating systems is /mnt/software.

Create a new directory for the ISO images:

Mkdir /mnt/software/ISO

Copy the required ISO images to the new directory:

Cp /tmp/rhel-server-5.5-x86-_64-dvd.iso /mnt/software/ISO/rhel-server-5.5-x86_64-dvd.iso

Required Software

The kickstart files refer to software components on the software share /mnt/software. To use the kickstart file as shown, the software components must be found at the following locations:

- /mnt/software/SMT_Software/SDU/netapp.snapdrive.linux_4_2.rpm
- /mnt/software/SMT_Software/SMSAP/netapp.smsap.linux-x64-3.1.bin
- /mnt/software/SMT_Software/SMSAP/snapmanager
- /mnt/software/SMT_Software/SMSAP/ORADBUSR.SQL
- /mnt/software/SMT_Software/SMSAP/os_db_authentication.sh
- /mnt/software/ACC/hostagent7.2L.tgz
- /mnt/software/ACC/installsapinit.sh
- /mnt/software/scripts/flexpod_config

Kickstart File for RHEL 5.5

Create a new directory on the central software share:

Mkdir /mnt/software/RHEL

Create a new kickstart file in the new directory:

vi /mnt/software/RHEL/rhel55.ks

Add the following lines to the new kickstart file:

```
START OF SAMPLE KICKSTART
# Kickstart file automatically generated by anaconda.

install
nfs --server=192.168.96.10 --dir=/vol/software/ISO
key --skip
lang en_US.UTF-8
keyboard us
network --device eth0 --bootproto dhcp
network --device eth1 --bootproto dhcp --hostname=`hostname`
rootpw --iscrypted $1$BCDPox75$CyI4U56yKfDkd5E/lCQrh.
firewall --enabled --trust eth0 --trust eth1
authconfig --enableshadow --enablemd5 --enablenis --nisdomain=company.corp.nis

selinux --permissive
reboot
timezone --utc Europe/Berlin
bootloader --location=mbr --driveorder=sda --append="rhgb quiet"
# The following is the partition information you requested
# Note that any partitions you deleted are not expressed
# here so unless you clear all partitions first, this is
```

```
# not guaranteed to work
%include /tmp/part-include

%packages
@base
@core
@development-libs
@development-tools
@editors
@legacy-software-development
@legacy-software-support
@printing
@base-x
@gnome-desktop
iscsi-initiator-utils
fipscheck
device-mapper-multipath
sgpio
python-dmidecode
imake
openssl097a
compat-openldap
xorg-x11-utils
xorg-x11-server-Xvfb
-emacs-leim
-psgml
-emacspeak
%post
#!/bin/bash
. /etc/bashrc
( # for logging purpose
echo "BEGIN:  KICKSTART POST PROCEDURE"
echo "BEGIN:  Prepare eth1 setup"
cat > /etc/sysconfig/network-scripts/ifcfg-eth1 <<EOF
DEVICE=eth1
BOOTPROTO=dhcp
DHCP_HOSTNAME=`hostname`
ONBOOT=yes
EOF

echo "Bring up eth1"
ifconfig eth1 up
dhclient eth1 -H `hostname`
echo "Start portmap"
/etc/init.d/portmap start
echo "END  :  Prepare eth1 setup"

echo "BEGIN:  MKDIR and MOUNTS"
mkdir /mnt/software
mkdir /mnt/data
mkdir /mnt/backup

sleep 2
echo "Mount"
/bin/mount <<var_software_ip>>:/vol/software /mnt/software
sleep 1
/bin/mount
echo "END  :  MKDIR and MOUNTS"

echo "BEGIN:  NetApp SDU SnapDrive"
rpm -ivh /mnt/software/SMT_Software/SDU/netapp.snapdrive.linux_4_2.rpm
echo "use-https-to-filer=off" >> /opt/NetApp/snapdrive/snapdrive.conf
echo "snapcreate-check-nonpersistent-nfs=off" >> /opt/NetApp/snapdrive/snapdrive.conf
echo "autosupport-enabled=off" >> /opt/NetApp/snapdrive/snapdrive.conf
```

```
echo "END  :  NetApp SDU SnapDrive"

echo "BEGIN:  NetApp SnapManager for SAP"
/mnt/software/SMT_Software/SMSAP/netapp.smsap.linux-x64-3.1.bin <<EOF

root
root
1


EOF
echo "auto_support.on=off" >> /opt/NetApp/smsap/properties/smsap.config
cp /mnt/software/SMT_Software/SMSAP/snapmanager /etc/pam.d/snapmanager
cp /opt/NetApp/smsap/plugins/examples/clone/create/post/*activities.sh
/opt/NetApp/smsap/plugins/clone/create/post/
cp /opt/NetApp/smsap/plugins/examples/clone/create/post/os_db_auth*.sh
/opt/NetApp/smsap/plugins/clone/create/post/
cp /mnt/software/SMT_Software/SMSAP/ORADBUSR.SQL
/opt/NetApp/smsap/plugins/clone/create/post/
cp /mnt/software/SMT_Software/SMSAP/os_db_authentication.sh
/opt/NetApp/smsap/plugins/clone/create/post/
echo "END  :  NetApp SnapManager for SAP"

echo "BEGIN:  SAP Hostagent "
cd /tmp
tar -xf /mnt/software/ACC/hostagent7.2L.tgz
groupadd sapsys
useradd -g sapsys sapadm
cd /tmp/hostctrl
cp -fp /mnt/software/ACC/installsapinit.sh .
./saphostexec -install
echo "END  :  SAP Hostagent "

echo "BEGIN:  FlexPod bootscript config "
mkdir /opt/NetApp/FlexPod
sleep 1
cp /mnt/software/scripts/flexpod_config /etc/init.d
/sbin/chkconfig --add flexpod_config
echo "END  :  FlexPod bootscript config "

echo "END  :  KICKSTART POST PROCEDURE"

%pre
#!/bin/bash
# VMs may have different device name for 1st hdd
if [ -b /dev/vda ]; then
        disk=vda
        disk2=vda
elif [ -b /dev/mapper/mpath0 ]; then
        disk=mapper/mpath0
        disk2=dm-0
elif [ -b /dev/sda ]; then
        disk=sda
        disk2=sda
fi


# decide whether to use LVM or not (size < 40gb ==> no LVM)
size=$(grep "$disk2$" /proc/partitions | awk '{ print $3 }')

if [ -z "$size" ]; then
        echo "E: could not get size of installation disk"
        exit 1
fi
```

```
if [ "$size" -gt 40000000 ]; then
        # lvm setup, 100m /boot, 2g swap, 10g root
        cat > /tmp/part-include <<-EOF
                bootloader --location=mbr --append=selinux=0
                clearpart --all --initlabel --drives=$disk
                part /boot --fstype ext3 --size 100
                part pv.01 --size 1000 --grow --ondisk=$disk
                volgroup vg0 pv.01
                logvol swap --fstype swap --name=swap --vgname=vg0 --size=40000
                logvol / --fstype ext3 --name=root --vgname=vg0 --size=10000
        EOF
else
        # small disk, use one big plain parititon, no swap
        cat > /tmp/part-include <<-EOF
                bootloader --location=mbr --append=selinux=0
                clearpart --all --initlabel --drives=$disk
                part / --fstype ext3 --size 100 --grow
        EOF
fi
%end


%end
```

Appendix C Configuring PXE Boot with SuSE Linux Enterprise Server

This Appendix explains the process of configuring a PXE boot process for the SAP Application built on FlexPod environment. The goal of this configuration is to support the use of physical blades in almost the same way as booting a virtual machine.

The following overview summarizes the procedure:

1. For every server that should be used as a physical blade in a tenant, a dedicated server profile must be created, except that in this case the servers are configured diskless and they boot by using the storage LAN NIC.
2. Because network traffic is isolated in a tenant, the PXE boot server is configured in a tenant. The tenant-specific services VM with dnsmasq is used for a TFTP service that assigns the MAC address of the created server to an IP address and OS image.
3. The OS image must be provisioned from the vFiler unit in a tenant. Once created globally, an OS image needs only minor adaptations in a given tenant. As usual with PXE boot, the image is mapped 1:1 to a server profile by using the MAC addresses.

This three-step procedure assumes that an OS image has already been created in such a way that it includes all the tools and procedures to be started by means of PXE boot and all the features and tools that are required for the SAP Application built on FlexPod environment.

Creating a Server Profile

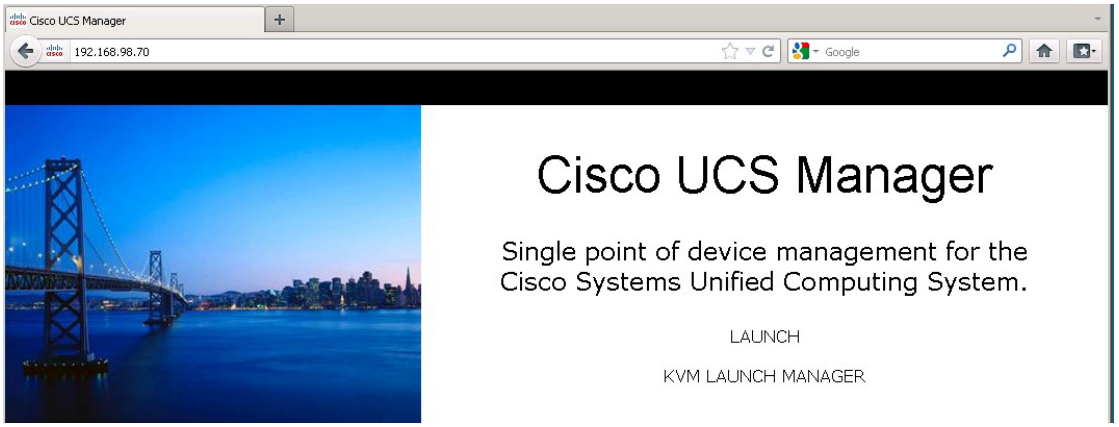
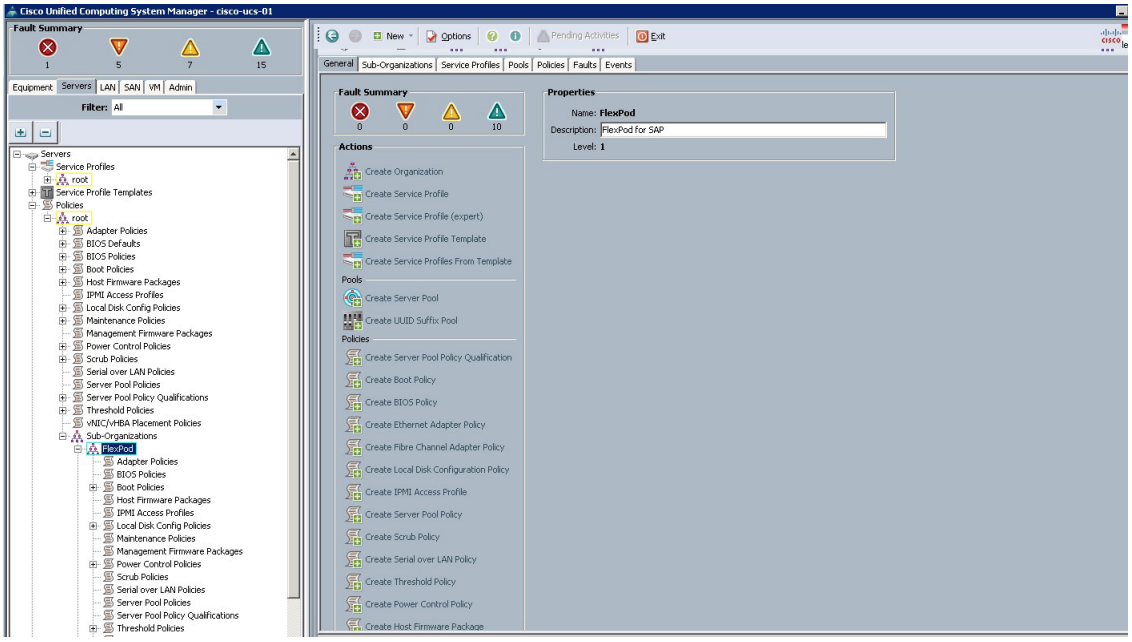
Most of the settings and definitions in the Cisco UCS Manger can be reused. Only new settings are covered in this section.

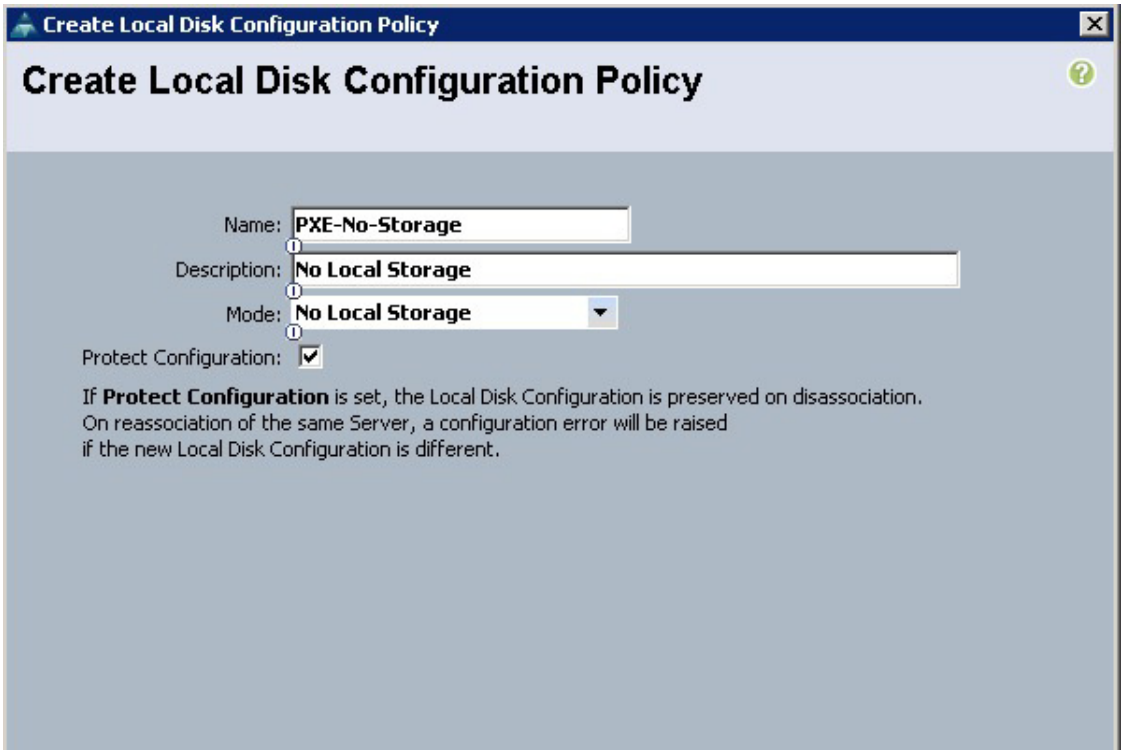
Creating Required Policies

To simplify the server profile creation, you must create the following policies:

- No local storage usage
- Boot using storage LAN (eth1)

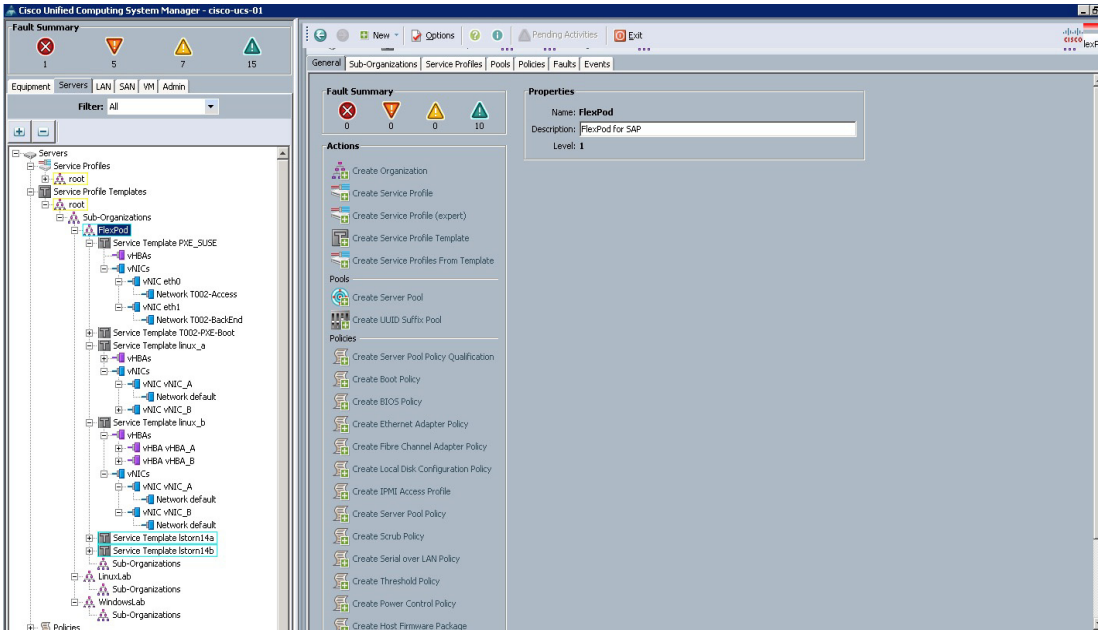
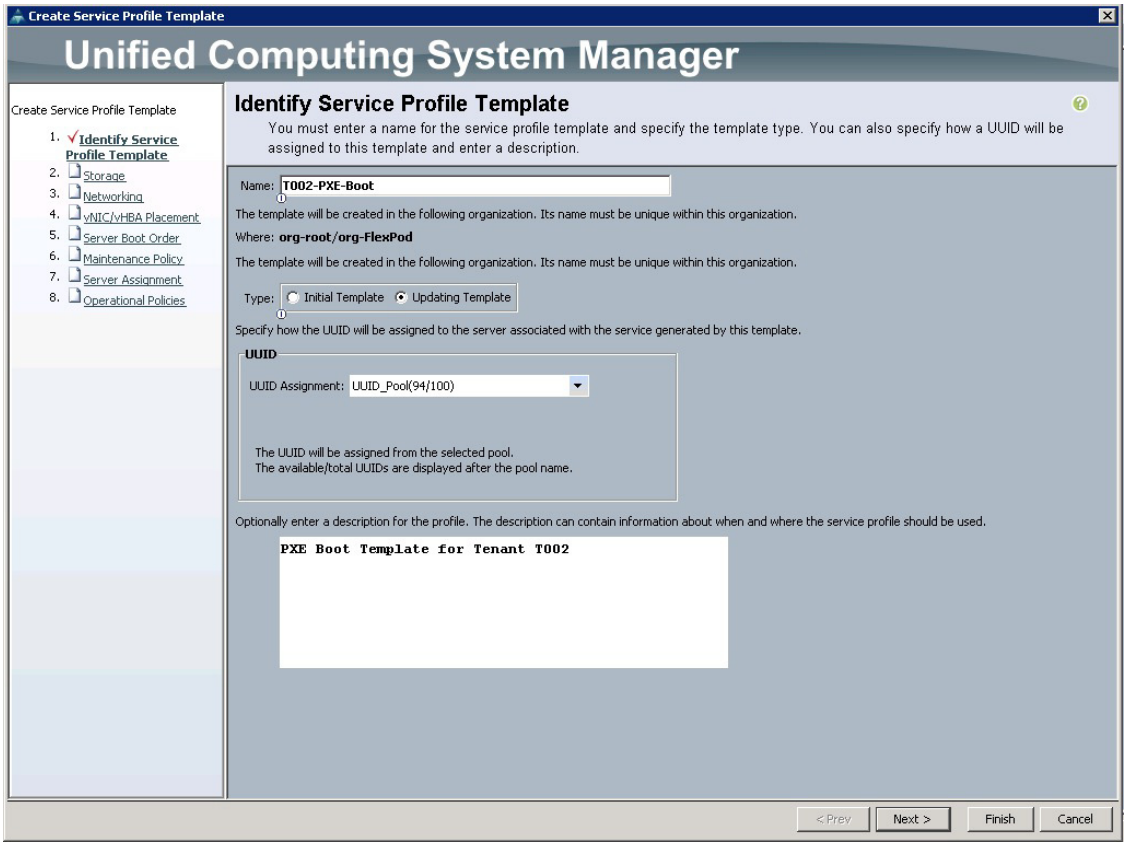
The following describes the steps to create the required boot policies.

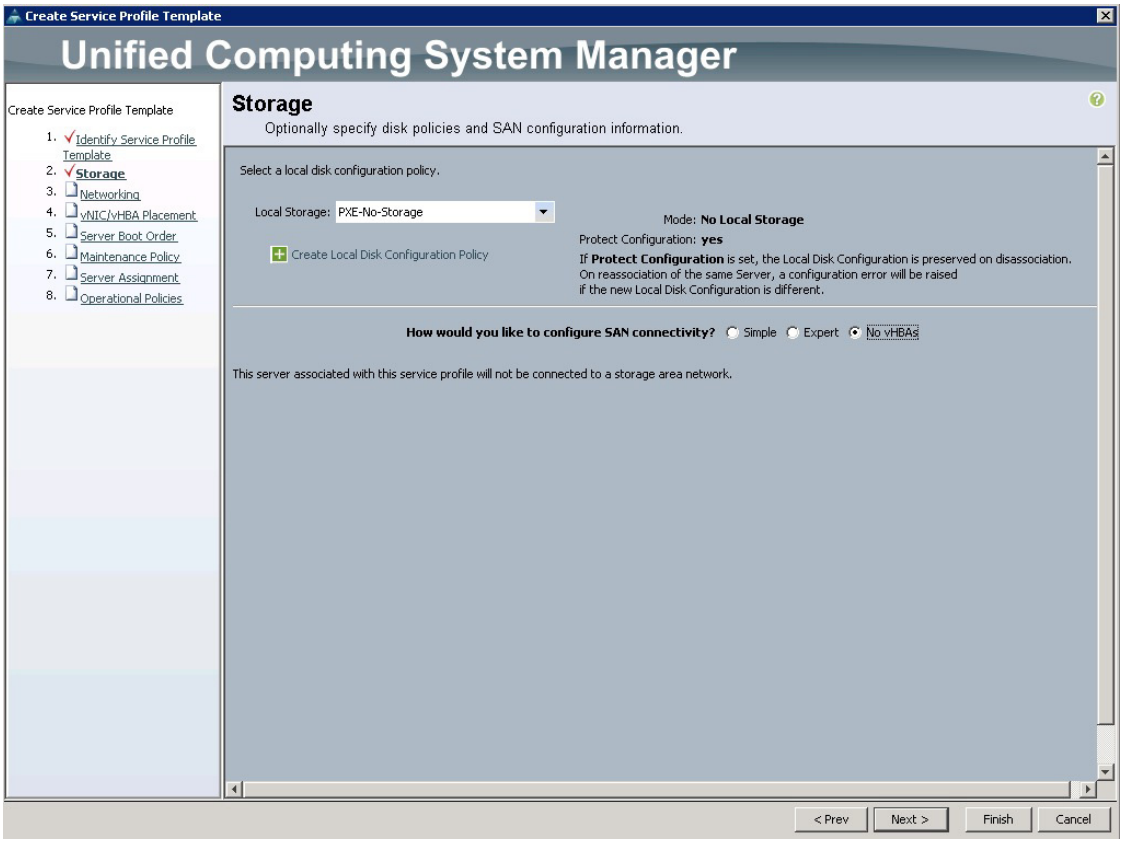
1	Log on to Cisco UCS and launch Cisco UCS Manager. 
2	Select the Servers tab. In the tree view on the left, select Server > Policies > root > Sub-Organizations > FlexPod. 

3	Select Create Local Disk Configuration Policy, enter a name, select No Local Storage for the mode, and save the settings. 

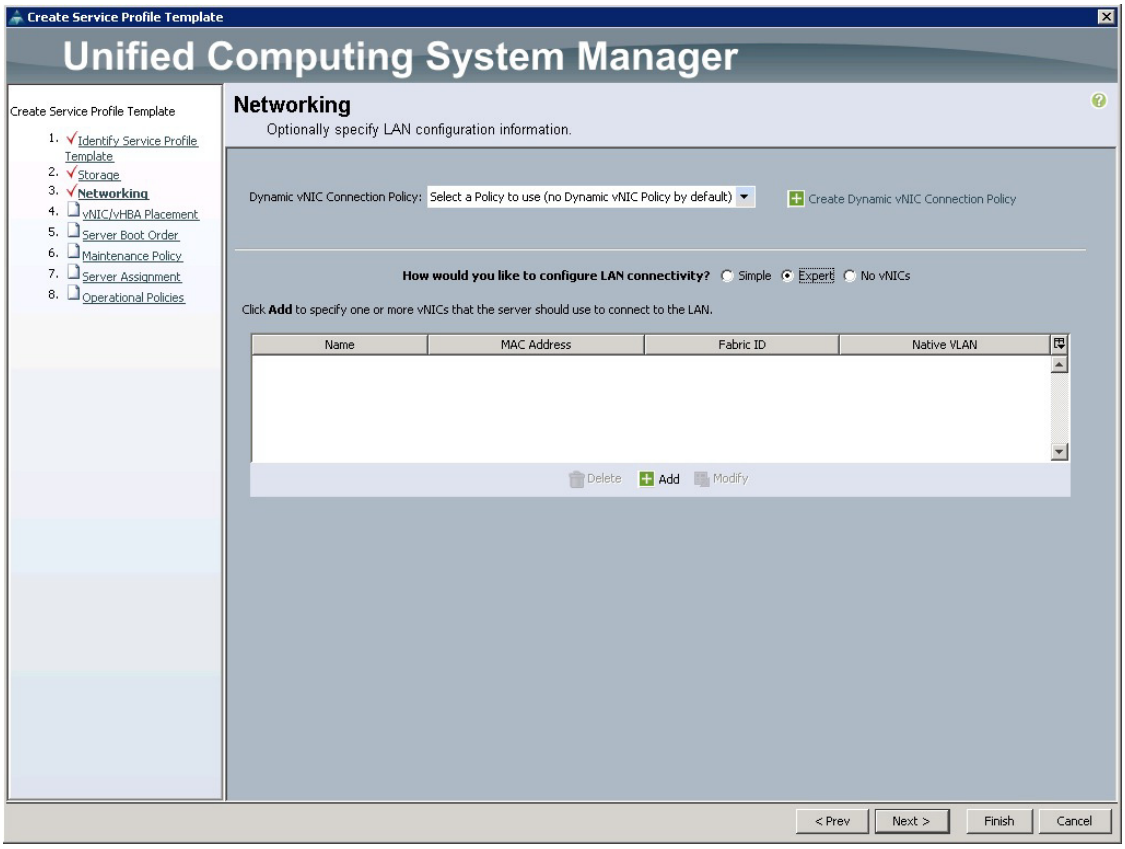
Create a Service Template

The following describes the steps to create a service template that can be used to provision service profiles for a tenant.

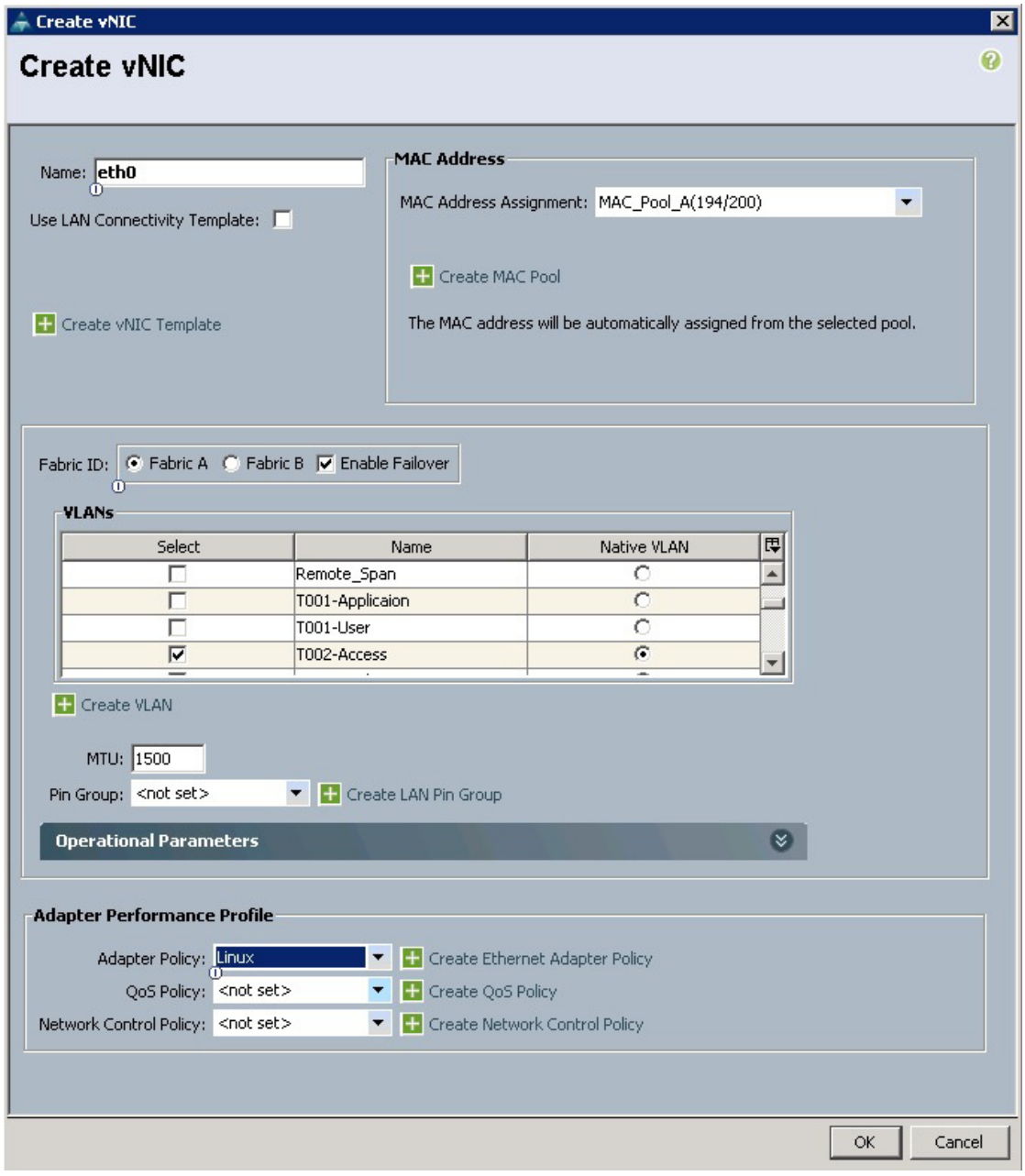
1	instill on the Servers tab, select Server > Service Profile Templates > root > Sub-Organizations > FlexPod. Under Actions, select Create Service Profile Template. 
2	Enter a name and description, select the previously created UUID_Pool, and click Next. 

3	Select the local storage policy that was previously created, select No vHBAs, and click Next. 

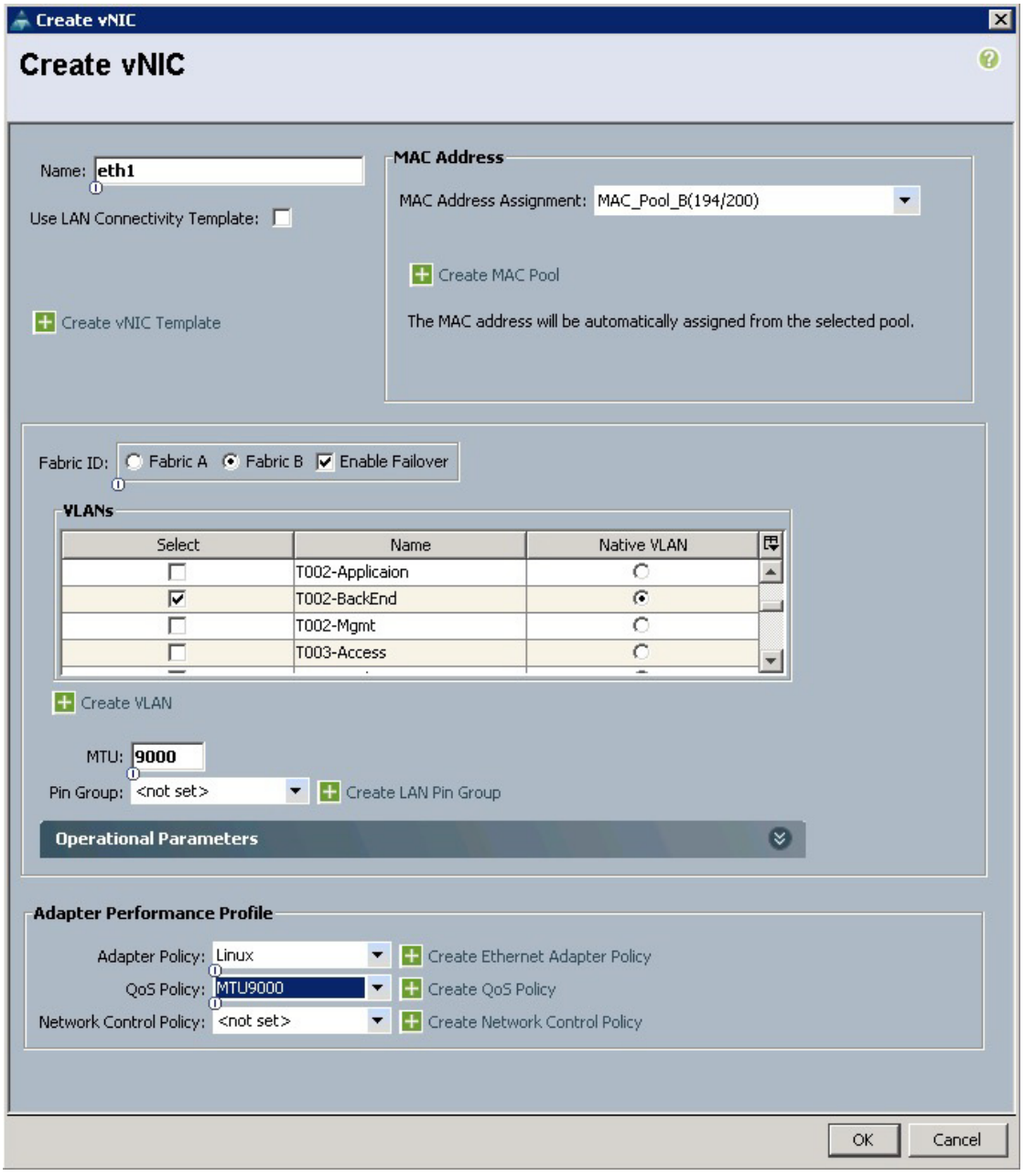
4	In the Networking section, click Add to add the NICs.



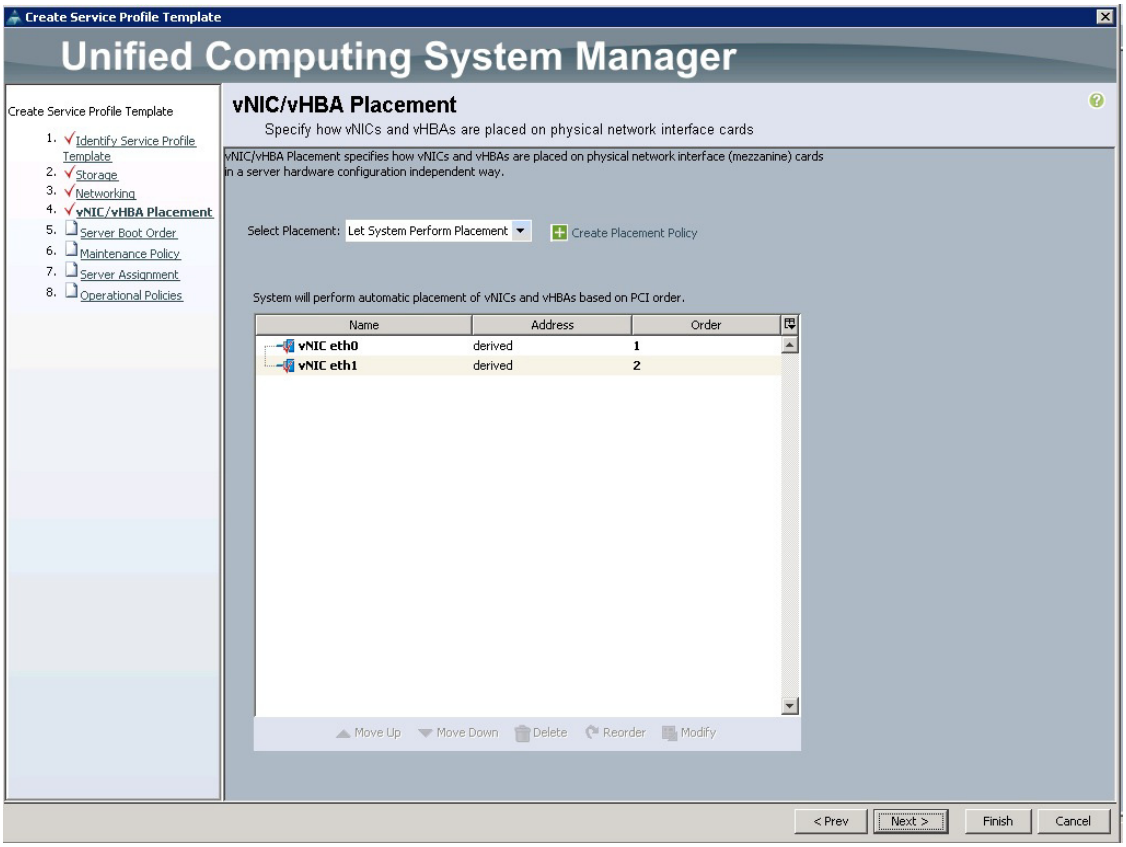
5 Create eth0 for the access LAN of tenant 002.

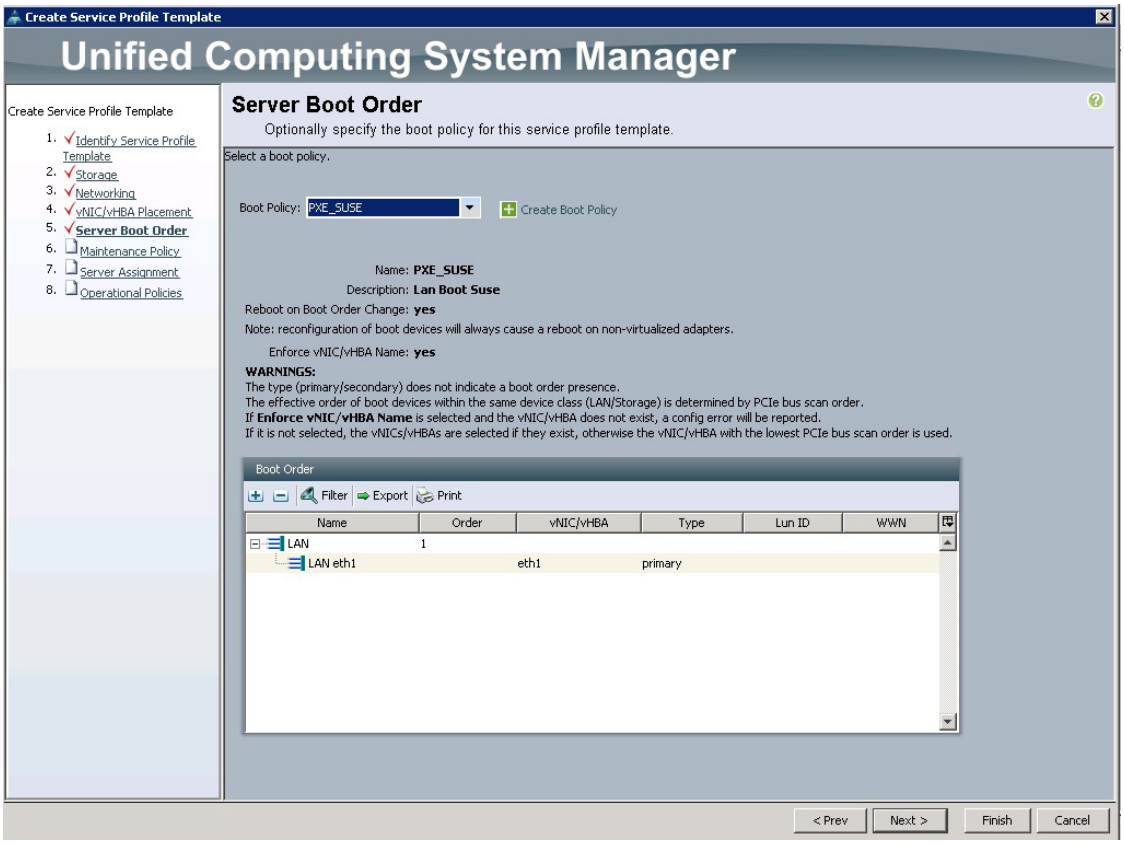


6	Create eth1 for the storage LAN. Select the settings as shown and click OK.



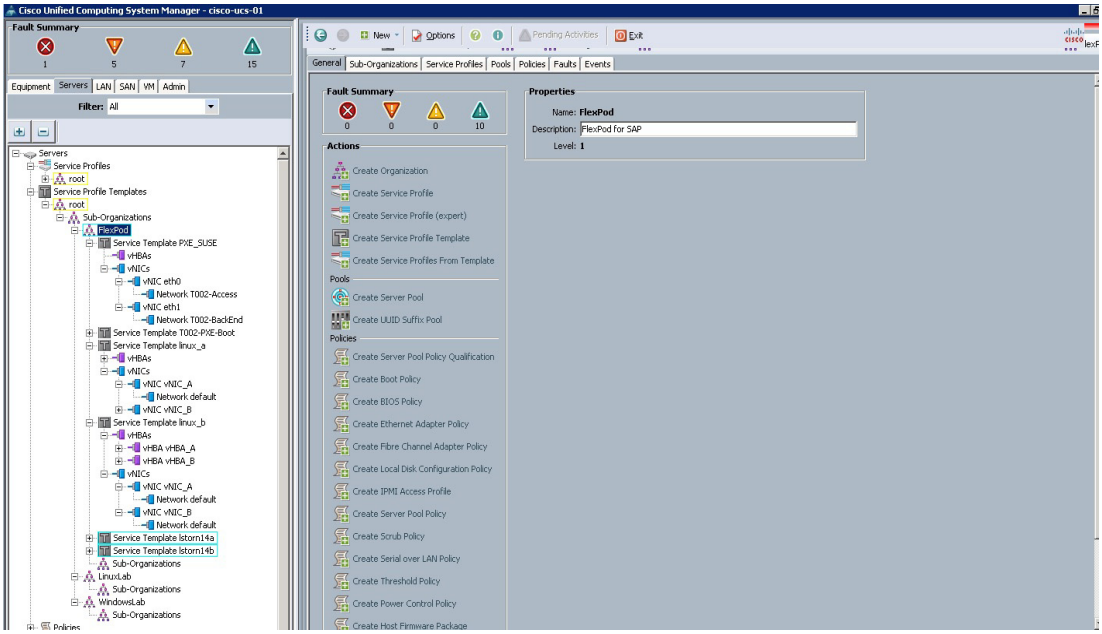
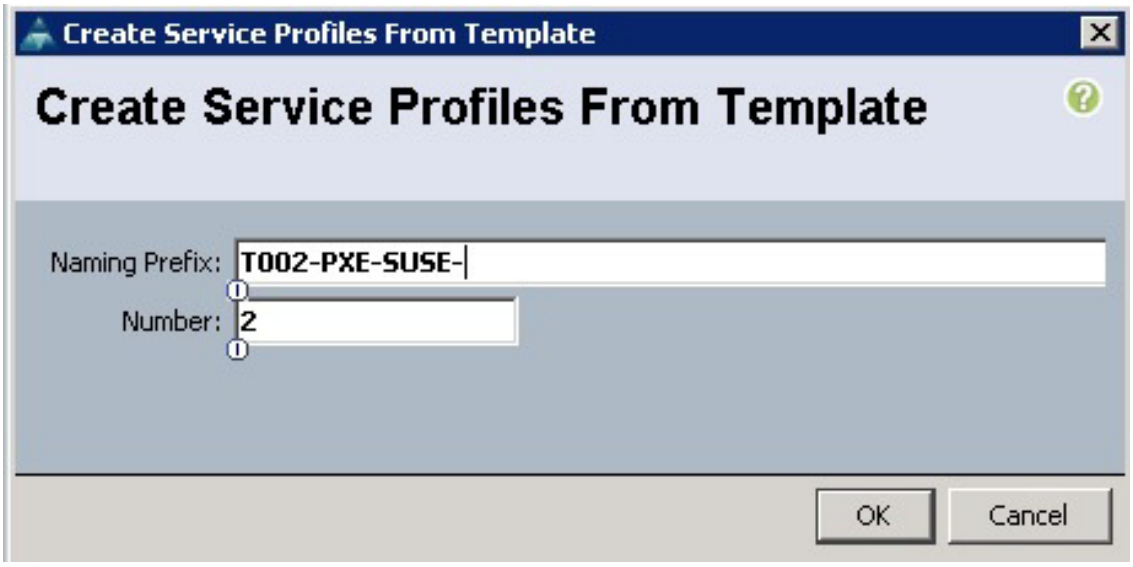
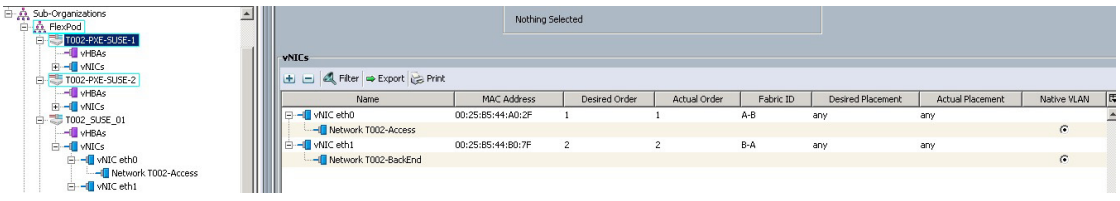
7 Verify the placement as shown and click Next.



8	In The Server Boot Order section, select your boot policy and verify that the server boots by using eth1. 
9	All the other sections are defaults. Save your settings.

Create Service Profiles from the Template

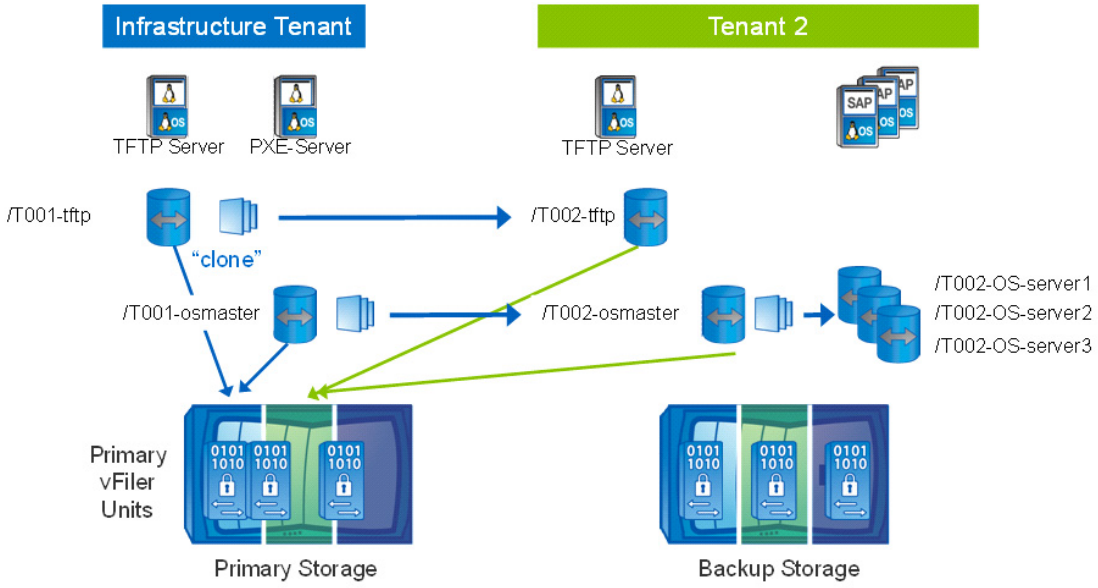
The following describes the steps to create the service profiles from the template.

1	Still on the Servers tab, select Servers > Service Profile Templates > root > Sub-Organizations > FlexPod. Under Actions, select the Create Service Profiles from Template. 
2	Enter a name prefix and the number of profiles to create. 
3	The service profiles are created. Verify them in the Service Profiles tree. The MAC addresses created are important in configuring the PXE boot. You can find them in the created service profile in the Networking section. Note the MAC addresses of both adapters for future reference. 

Required Storage Layout

To support the PXE boot process and simplify maintenance, the storage layout shown in Figure 1 should be used.

Figure 1 Storage Layout



To configure PXE boot, each tenant must have the following volumes:

- Tnnn-tftp. This volume holds all required information for the TFTP server, such as Initrd, vmlinuz, and additional configurations. This volume is mounted from the tenant-specific services VM that must be configured as the TFTP server.
- Tnnn-osmaster. This is the osmaster image that a server must boot. It is considered to be tenant specific to allow tenant-specific adaptations. The osmaster volume must have two qtrees, one for the OS itself, the other for the swap area. The naming convention can be used to identify the kernel release. In the example, Rel 2.6.32.49 results in:
  - /vol/t001-osmaster/sles_263249_001
  - /vol/t001-osmaster/swap_263249_001
- Tnnn-OS-server or servers. Each PXE server that must be booted is assigned to a specific volume in a tenant.

The infrastructure tenant volumes are considered to be "golden images." All of the tenant-specific volumes are based on clones from this master copy. The server-specific OS volumes in a tenant are also clones of the tenant-specific OS master image.

To focus on the PXE boot configuration, this appendix assumes that the storage has been created and is available for NFS mount in the tenant.

Golden Image Creation

In the example configuration, the golden image creation occurs in the infrastructure tenant. It is also possible to create a dedicated test tenant in which all of the golden image preparation steps can be applied. This test tenant can also be used for SAP installation and other administrative tests. The rest of this appendix uses the infrastructure tenant.

The following steps are required to create the golden image:

1. Extract the SuSE DVD.
2. Mount the golden TFTP and osmaster volumes.
3. Prepare the TFTP boot volume
4. Configure dnsmasq
5. Install Linux

Extract the SuSE DVD

On the software vFiler unit, create a folder to hold the SuSE installation DVD. It is assumed that DVD.iso is copied to /mnt/software/SLES.

```
T001-0-lnx:~ # cd /mnt/software/SLES
T001-0-lnx:~ # mkdir ISO
T001-0-lnx:~ # mount -o loop SLES-11-SP1-DVD-x86_64-GM-DVD1.iso ISO
T001-0-lnx:~ # mkdir SLES11
T001-0-lnx:~ # cp ISO/* SLES11/
```

Mount the Golden TFTP and Osmaster Volumes

Create the folder structure and mount the volumes:

```
T001-0-lnx:~ # mkdir /NetApp
T001-0-lnx:~ # mkdir /NetApp/osmaster
T001-0-lnx:~ # mkdir /NetApp/tftpboot
T001-0-lnx:~ # mount -t nfs software:/vol/t001-osmaster /NetApp/osmaster
T001-0-lnx:~ # mount -t nfs software:/vol/t001-tftp /NetApp/tftpboot
T001-0-lnx:~ # ln -s /NetApp/tftpboot /tftpboot
```

Prepare the TFTP Boot Volume for the First Installation

To start the SLES installation by means of PXE boot, you must prepare the tftpboot folder for the first installation: pxelinux.0 must be copied from an existing Linux installation (such as the tenant-specific services VM) and the boot configuration files must be created.

```
T001-0-lnx:~ # cp /usr/share/syslinux/pxelinux.0 /tftpboot
T001-0-lnx:~ # cd /mnt/software/SLES/ISO/boot/x64_64/loader
T001-0-lnx:~ # cp initrd /tftpboot/initrd-iso
T001-0-lnx:~ # cp linux /tftpboot/linux-iso
T001-0-lnx:~ # cd /tftpboot
T001-0-lnx:~ # mkdir pxelinux.cfg
T001-0-lnx:~ # cd pxelinux.cfg/
T001-0-lnx:~ # vi default
T001-0-lnx:~ #
```

The default configuration must contain the following:

```
# SAP UCS PXE Boot Definition
display ../boot.msg
default Install
```

```
#
prompt 1
timeout 10
LABEL Install
        KERNEL linux-iso
        APPEND initrd=initrd-iso
install=nfs://192.168.96.10:/vol/software/SLES/SLES11/?device=eth1
```

Create the file boot.msg:

```
T001-0-lnx:~ # cd /tftpboot/
T001-0-lnx:~ # vi boot.msg
T001-0-lnx:~ #
```

The content should be:

```
################################################################################
#################                                                #############
#####                                                                      #####
##                            CISCO Systems Inc.                            ##
##                       SAP Applications built on FlexPod                      ##
#####                                                                      #####
#################                                                #############
################################################################################
```

Configure dnsmask

Dnsmask is already used for DNS and DHCP. The extension to enable tftpboot is quite simple.

To adapt the configuration file /etc/dnsmasq.conf, insert these lines:

```
#
# Activate MAC address based ip's
#
read-ethers
```

Also enter the tfpt boot activation at the end of the file:

```
enable-tftp
tftp-root=/tftpboot
dhcp-boot=pxelinux.0
tftp-no-blocksize
```

If you have not yet enabled the infrastructure tenant dhcp functionality, dnsmasq.conf should also contain:

```
# 1: Subnet Mask
dhcp-option=1,255.255.255.0

# 3: Router (default gateway)
dhcp-option=tag:access,3,192.168.99.1
dhcp-option=tag:backend,3

# 6: Domain Name Server
#dhcp-option=tag:access,6,192.168.99.50
#dhcp-option=tag:backend,6,192.168.101.50
dhcp-option=6,192.168.99.50

# 119: DNS domain search list
dhcp-option=119,t001.company.corp,bknd.t001.company.corp
```

Create or add the file /etc/ethers. Here you need the MAC addresses of your service profile:

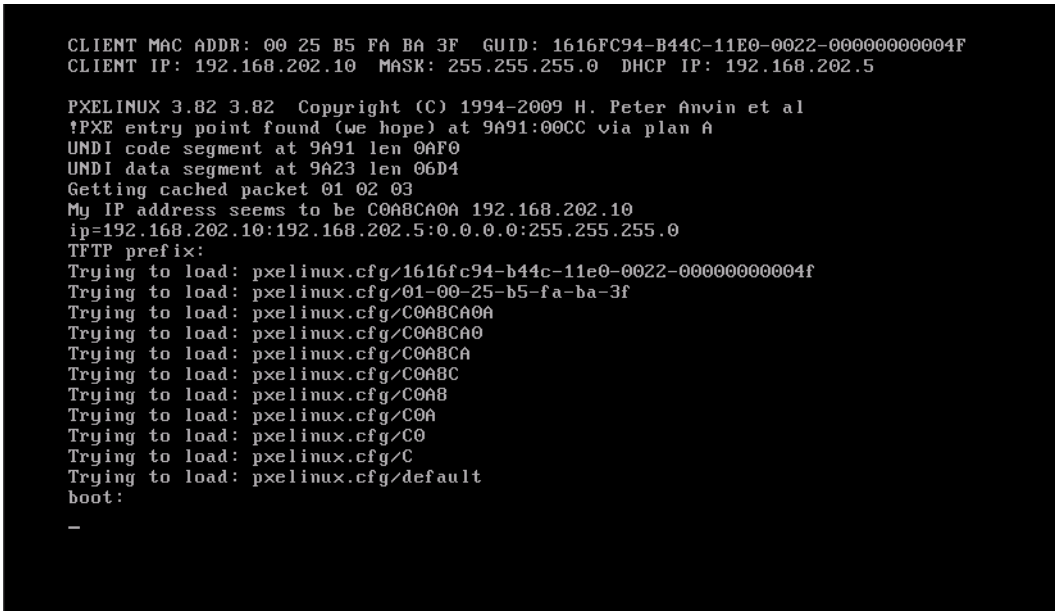
```
00:25:B5:44:A0:5F       192.168.99.51
00:25:B5:44:B0:4F       192.168.101.51
```

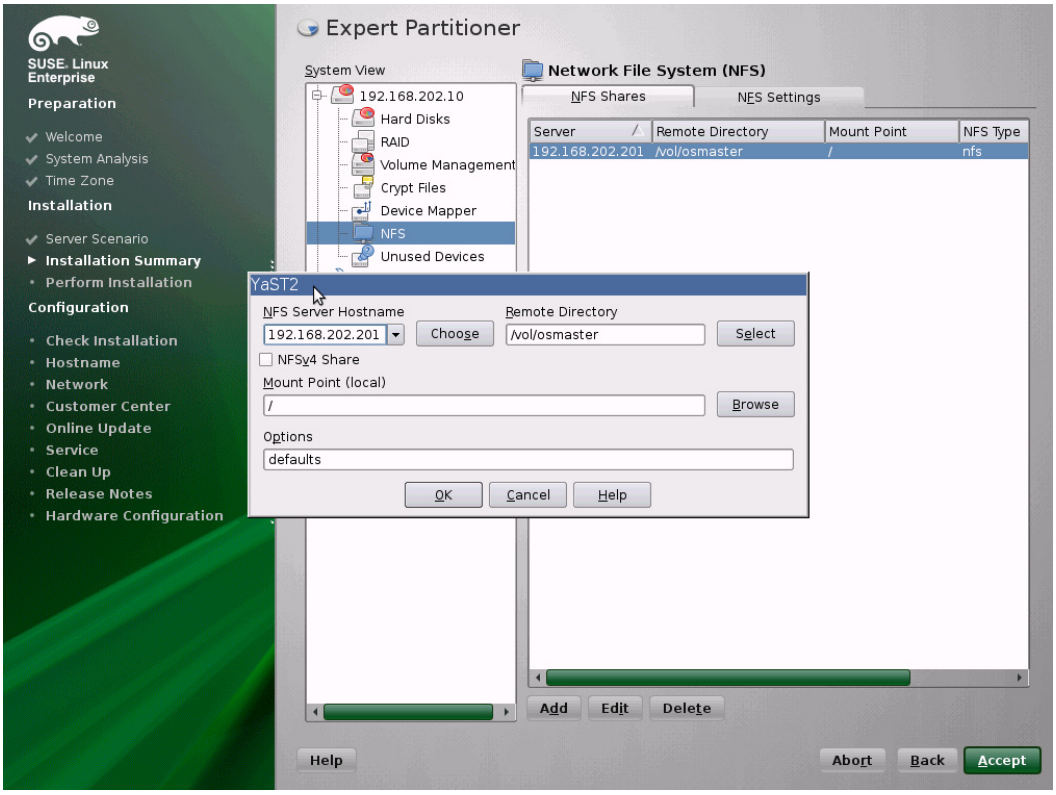
Add the appropriate hostnames to the file /etc/hosts, assuming that t001-1-lnx is the host name:

```
# PXE Boot pairs
192.168.99.51    t001-1-lnx.t002.company.corp    t001-1-lnx
192.168.101.51   t001-1-lnx.bknd.t002.company.corp
```

Install SuSE Linux

With these settings in place, the server profile is ready to boot the SuSE installation. The following describes the PXE boot-specific installation steps.

1	Assign the service profile to a blade, start the KVM, and boot the system. The following boot message appears. 

2	The Linux installation starts. Proceed until you reach the disk portioning step. Select an expert partitioner. You must add the volume `/vol/t001-osmaster/sles_263249_001` from the vFiler unit and mount it as root. (The screenshot shows different values.) 
3	Finalize the installation, as shown in steps 9–25 Do not reboot the system.

Create the nfsroot initrd

At this point, the newly created initrd must be customized for a PXE boot.

Initially, kernel version 2.6.32.12 is installed.

1. Mount the newly created OS master, copy the initrd to the tftpboot folder, and unpack it in a temporary folder.

```
T001-0-lnx:/tftpboot # mount -t nfs 192.168.99.10:/vol/t001-osmaster/sles_263249_001
/NetApp/osmaster
T001-0-lnx:/tftpboot # cd /NetApp/osmaster/boot
T001-0-lnx:/tftpboot # cp initrd-2.6.32.12-0.7-default
/tftpboot/initrd-2.6.32.12-0.7-default.gz
T001-0-lnx:/tftpboot # cp vmlinuz-2.6.32.12-0.7-default /tftpboot/
T001-0-lnx:/tftpboot # cd /tftpboot
T001-0-lnx:/tftpboot # gunzip initrd-2.6.32.12-0.7-default.gz
T001-0-lnx:/tftpboot # mkdir tmp_12
T001-0-lnx:/tftpboot # cd tmp_12
T001-0-lnx:/tftpboot/tmp_12 # cpio -idumf < ../initrd-2.6.32.12-0.7-default
```

2. Edit run_all.sh in the unpacked initrd and change the following sections to reflect the location of the boot image.

```
...
..
.
source boot/02-start.sh
[ "$modules" ] && load_modules
[ "$debug" ] && echo preping 03-storage.sh
[ "$fallback_rootdev" ] ||
fallback_rootdev='192.168.101.10:/vol/t001-osmaster/sles_263249_001 '
[ "$rootdev" ] || rootdev='192.168.101.10:/vol/t001-osmaster/sles_263249_001 '
[ "$rootfsopts" ] || rootfsopts='defaults'
...
..
.
[ "$debug" ] && echo preping 12-network.sh
[ "$nettype" ] || nettype='dhcp'
[ "$ip" ] || ip=':::::eth1:none'
[ "$interface" ] || interface='eth1'
[ "$macaddress" ] || macaddress=''
[ "$drvlink" ] || drvlink=''
if [  "$interface" -o "$dhcp" -o "$ip" -o "$nfsaddrs" -o "$drvlink" ]; then
modules=" af_packet $bonding_module"
...
..
.
[ "$debug" ] && echo running 82-resume.kernel.sh
source boot/82-resume.kernel.sh
[ "$modules" ] && load_modules
[ "$debug" ] && echo preping 83-mount.sh
[ "$rootdev" ] || rootdev='192.168.101.10:/vol/t001-osmaster/sles_263249_001 '
if [  ! "$root_already_mounted" ]; then
[ "$debug" ] && echo running 83-mount.sh
source boot/83-mount.sh
[ "$modules" ] && load_modules
```

3. Recreate the new initrd.

```
T001-0-lnx:/tftpboot/tmp_12 # find . |cpio --create --format='newc' >
../initrd_nfsroot_2.6.32.12-cisco
31301 blocks
T001-0-lnx:/tftpboot/tmp_12 # cd ..
mgmtsrv02:/tftpboot # gzip -9 initrd_nfsroot_2.6.32.12-cisco
mgmtsrv02:/tftpboot #
```

4. In the mounted OS image, disable the network resources during shutdown; otherwise the system will not shut down completely.

```
T001-0-lnx: # cd /NetApp/osmaster/etc/init.d/rc3.d
T001-0-lnx:/NetApp/osmaster/etc/init.d/rc3.d # rm K04nfs K07network K05rpcbind
T001-0-lnx:/ NetApp/osmaster/etc/init.d/rc3.d # cd ../rc5.d
T001-0-lnx:/ NetApp/osmaster/etc/init.d/rc5.d # rm K04nfs K07network K05rpcbind
T001-0-lnx:/ NetApp/osmaster/etc/init.d/rc5.d #
```

5. Disable the cups daemon, smartd, samba fs, splash, kernel dump, and raid-manager.

```
T001-0-lnx:~ # chkconfig cups off
T001-0-lnx:~ # chkconfig smartd off
T001-0-lnx:~ # chkconfig smbfs off
T001-0-lnx:~ # chkconfig splash off
T001-0-lnx:~ # chkconfig boot.kdump off
T001-0-lnx:~ # chkconfig boot.md off
T001-0-lnx:~ # chkconfig boot.cycle off
T001-0-lnx:~ # chkconfig postfix off
```

6. Extend the PXE default configuration to include the new kernel (initrd, vmlinuz).

```
T001-0-lnx:~ # cd /tftpboot/pxelinux.cfg/
T001-0-lnx:~ # vi default
T001-0-lnx:~ #
```

7. Add the following lines, so that the final default content is:

```
# SAP UCS PXE Boot Definition
display ../boot.msg
#default Install
default SLES11_12
#
prompt 1
timeout 10
LABEL Install
        KERNEL linux-iso
        APPEND initrd=initrd-iso
install=nfs://192.168.96.10:/vol/software/SLES/SLES11/?device=eth1
LABEL SLES11_12
        KERNEL vmlinuz-2.6.32.12-0.7-default
        APPEND initrd=initrd_nfsroot_2.6.32.12-cisco.gz rw
rootdev=192.168.101.10:/vol/t001-osmaster/sles_263249_001  rootfsopts=default
ip=::::::dhcp
```

8. Reboot the system to activate the kernel.

Online Update

The process described throughout this document assumes that an online update is performed to reach the most recent kernel version (currently 2.6.32.49). While online, you must apply an online update. Depending on your network scenario, you may have to adjust the proxy settings.

After the online upgrade, do not reboot. Instead, apply the similar steps previously described to adapt the initrd and PXE boot configuration for the new kernel.

From the KVM, reboot the system to activate the new kernel. If everything is fine, the OS master image must be cleaned of temporary files.

Clean up the OS master image:

```
T001-0-lnx:/ # cd /NetApp/osmaster
T001-0-lnx: /NetApp/osmaster # rm -rf tmp/*
T001-0-lnx: /NetApp/osmaster # rm -rf tmp/.*
rm: cannot remove `.' directory `tmp/.'
rm: cannot remove `..' directory `tmp/..'
T001-0-lnx: /NetApp/osmaster # cd var/log
T001-0-lnx: /NetApp/osmaster/var/log # rm *
rm: cannot remove `ConsoleKit': Is a directory
rm: cannot remove `YaST2': Is a directory
rm: cannot remove `apparmor': Is a directory
rm: cannot remove `audit': Is a directory
rm: cannot remove `cups': Is a directory
rm: cannot remove `gdm': Is a directory
rm: cannot remove `krb5': Is a directory
rm: cannot remove `news': Is a directory
rm: cannot remove `puppet': Is a directory
rm: cannot remove `sa': Is a directory
rm: cannot remove `samba': Is a directory
rm: cannot remove `zypp': Is a directory
T001-0-lnx: /NetApp/osmaster/var/log # rm ConsoleKit/* YaST2/* apparmor/* audit/* cups/*
gdm/* krb5/* news/* puppet/* sa/* samba/* zypp/*
rm: cannot remove `apparmor/reports': Is a directory
rm: cannot remove `apparmor/reports-archived': Is a directory
rm: cannot remove `apparmor/reports-exported': Is a directory
```

```
rm: cannot remove `krb5/*': No such file or directory
rm: cannot remove `puppet/*': No such file or directory
rm: cannot remove `samba/*': No such file or directory
T001-0-lnx: /NetApp/osmaster1/var/log #
T001-0-lnx:/NetApp/osmaster1/var/log # cd ../../etc
```

At this point, all of the FlexPod specific installations and configurations as described throughout the VM template creation process must have been applied. See section "Installation of Additional Software Components" for details.

After all steps have been tested and the cleanup procedures described in section "Converting the Virtual Machine to a Template" have been performed, create a golden Snapshot copy of the osmaster image and the tftpboot volume. Create the Snapshot copy by using the snap create command (with the desired options) at the command line of the controller that contains the volumes.

This Snapshot copy must be used to create the template volumes for each tenant.

Preparation for PXE Boot in a Tenant

At this point it is assumed that the new tenant has clones of the tftpboot and osmaster images with the following names:

- Tnnn-tftpboot
- Tnnn-osmaster

In a new tenant, the preparations for the PXE boot must be done similarly to the steps described in "Golden Image Creation," earlier in this appendix. The following is a general checklist:

1. Mount the tnnn-tftpboot in the tenant /tftpboot folder.
2. Configure dnsmasq to enable tftpboot.
3. Configure a tenant service profile template and create the required number of service profiles. Note the MAC address for each of the service profiles that you create.
4. Edit the /etc/ethers and /etc/hosts files to define the host names and IP addresses for the newly created service profiles.

Based on this checklist, the following additional steps must be performed:

Clone the Osmaster for Each of the Servers

Based on the mapped MAC-to-IP address, calculate the ex IP for each server (storage LAN).

If the IP for server T002-1-lnx is 192.168.102.44:

- Using the MAC address 00:25:B5:44:A0:2F, run the command gethostip 192.168.102.44, resulting in 192.168.102.44 192.168.102.44 C0A8662C>

The hex IP is used to create a unique name for the OS master volume. Create a clone of the OS template and name it as the hex IP. This name is unique through the whole infrastructure.

Adapt the tftpboot Configuration

The tftp boot configuration must be adapted so that every server can find its own image.

```
T002-0-lnx:/tftpboot # cd pxelinux.cfg/
T002-0-lnx:/tftpboot/pxelinux.cfg # cat default
# SAP UCS PXE Boot Definition
display ../boot.msg
```

```
#default Install
default SLES11_49
prompt 1
timeout 10
LABEL Install
        KERNEL linux-iso
        APPEND initrd=initrd-iso
install=nfs://192.168.96.10:/vol/software/SLES/SLES11/?device=eth1
LABEL SLES11_12
        KERNEL vmlinuz-2.6.32.49-0.3-default
        APPEND initrd=initrd_nfsroot_2.6.32.49-cisco.gz rw
rootdev=192.168.101.10:/vol/osmaster/sles_263249_001 rootfsopts=default ip=::::::dhcp

T002-0-lnx:/tftpboot/pxelinux.cfg # cp default C0A8662C
T002-0-lnx:/tftpboot/pxelinux.cfg # vi C0A8662C
# SAP UCS PXE Boot Definition
display ../boot.msg
#default Install
default SLES11_49
prompt 1
timeout 10
LABEL Install
        KERNEL linux-iso
        APPEND initrd=initrd-iso
install=nfs://192.168.96.10:/vol/software/SLES/SLES11/?device=eth1
LABEL SLES11_49
        KERNEL vmlinuz-2.6.32.49-0.3-default
        APPEND initrd=initrd_nfsroot_2.6.32.49-cisco.gz rw
rootdev=192.168.102.10:/vol/C0A8662C /sles_263249_001 rootfsopts=default ip=::::::dhcp
OS_VOLUME=C0A8662C
T002-0-lnx:/tftpboot/pxelinux.cfg #
```

First Boot

Before you can boot the server for the first time, the individual swap file must be configured.

Create the Swap Partition

Boot the server and log in as root (assuming server name T002-1-lnx):

```
T002-1-lnx:~ # mkdir /swap
T002-1-lnx:~ # mount -t nfs 192.168.102.10:/vol/C0A8662C/swap_263249_001 /swap
T002-1-lnx:~ # dd if=/dev/zero of=/swap/swap-0001 bs=1M count=1024
1024+0 records in
1024+0 records out
1073741824 bytes (1.1 GB) copied, 9.99352 s, 107 MB/s
T002-1-lnx:~ #
T002-1-lnx:~ # mkswap /swap/swap-0001
Setting up swapspace version 1, size = 1048572 KiB
no label, UUID=7a8fabb2-b4a5-456c-8853-fe0f4033b42a
T002-1-lnx:~ # swapon /swap/swap-0001
T002-1-lnx:~ # swapon -s
Filename                                Type            Size    Used    Priority
/swap/swap-0001                         file            1048568 0       -1
T002-1-lnx:~ #
T002-1-lnx:/etc/init.d # cp splash_early nfs-swap
```

Create an Automatic Swap Mount File

```
T002-1-lnx:/etc/init.d # vi nfs-swap
#! /bin/sh
#
# /etc/init.d/nfs-swap
#
### BEGIN INIT INFO
# Provides: nfs-swap
# Required-Start:
# Should-Start: $network $syslog
# Required-Stop:
# Should-Stop: $syslog
# Default-Start: 2 3 5
# Default-Stop: 0 1 4 6
# Description: kills animation after network start
### END INIT INFO

. /etc/rc.status

case "$1" in
 start)
 echo -n "Starting swap: "
 mount -o vers=3,proto=tcp,rsize=32768,wsize=32768,hard,intr 192.168.102.10:/vol/C0A8662C
/swap_263249_001 /swap
 sleep 1
 swapon /swap/swap-0001
 echo "done"
 ;;
 stop)
 echo -n "Stopping swap: "
 swapoff /swap/swap-0001
 umount -l /swap
 echo "done"
 ;;
 restart)
 swapoff /swap/swap-0001
 swapon /swap/swap-0001
 ;;
 *)
 echo "Usage: swap { start | stop | restart }" >&2
 exit 1
 ;;
esac

rc_exit
T002-1-lnx:/etc/init.d #
T002-1-lnx:/etc/init.d # chmod 755 nfs-swap
T002-1-lnx:/etc/init.d # chkconfig nfs-swap
nfs-swap  off
T002-1-lnx:/etc/init.d # chkconfig nfs-swap on
T002-1-lnx:/etc/init.d # ./nfs-swap stop
Stopping swap: done
T002-1-lnx:/etc/init.d # swapon -s
Filename                                Type            Size    Used    Priority
T002-1-lnx:/etc/init.d # ./nfs-swap start
Starting swap: done
T002-1-lnx:/etc/init.d # swapon -s
Filename                                Type            Size    Used    Priority
/swap/swap-0001                         file            1048568 0       -1
T002-1-lnx:/etc/init.d #
```

The new server with the previously mentioned IP now uses the C0A8662C configuration for PXE boot. Create a dedicated configuration for each of the servers in a tenant.

Each server profile now has its own preconfigured image and can be PXE booted into the tenant.

Appendix D Configuring Cisco VM-FEX with the Cisco UCS Manager

Background

FlexPod for VMware and thus SAP applications built on FlexPod utilize a distributed switch to manage the VLAN settings on a VMware vCenter from a central point. This not only simplifies the management but also provide additional features.

While the previous version used Cisco Nexus 1000 / Cisco Nexus 1000V, the new available hardware used in this setup allow using the built-in functionality within the Cisco UCS Manager. This offers several advantages.

1. There is no need for an extra hardware such as Cisco Nexus 1010.
2. Cisco Unified Computing System provides a central configuration environment with which the administrator is already familiar
3. Compared to using the Cisco Nexus 1010 V as virtual appliances within the VMware vCenter itself, this setup avoids a SPOF and common restart issues when running the distributed switches in an environment in which they are required for the network functionality of the ESX servers they are running on. This is a common problem that needs to be taken care in the solution design.

The Cisco UCS Manager dramatically simplifies the hardware setup and operation utilizing the new HW features to its fullest.

Process Overview

The setup and configuration of the distributed switches (Cisco Nexus 1000/V) in the previous setup is described in TR-3939: VMware vSphere Built on FlexPod Implementation Guide in detail and is also distributed and embedded in various sections of the document. This section provides a detailed overview of all related topics such as setup, configuration, and operation using the Cisco UCS Manager.

The following sections provide:

- Background information on VM-FEX on Cisco UCS
- Initial set up and configuration
- Operation, i.e. adding networks for additional tenants

Initial Setup

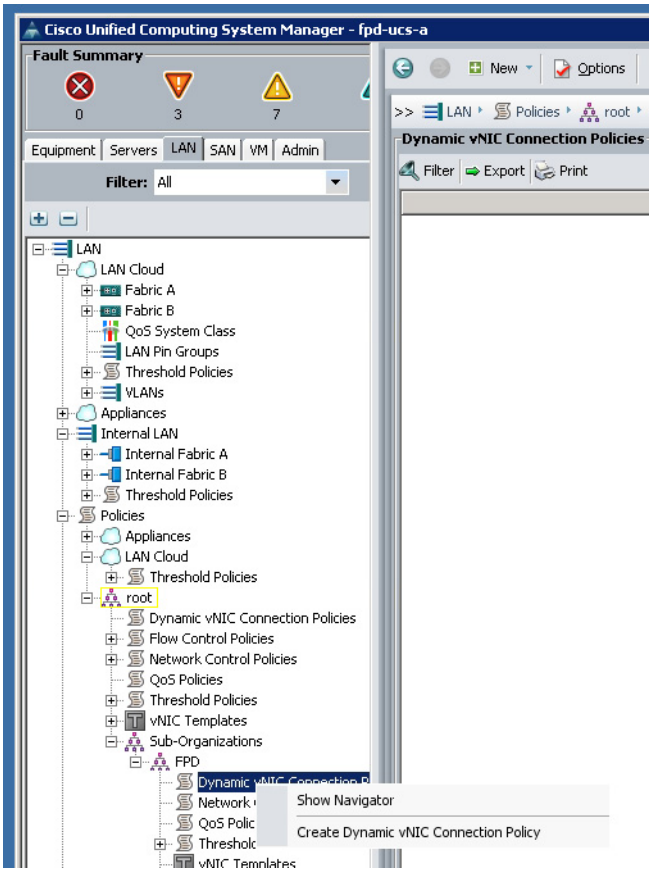
The initial setup is a three-step procedure:

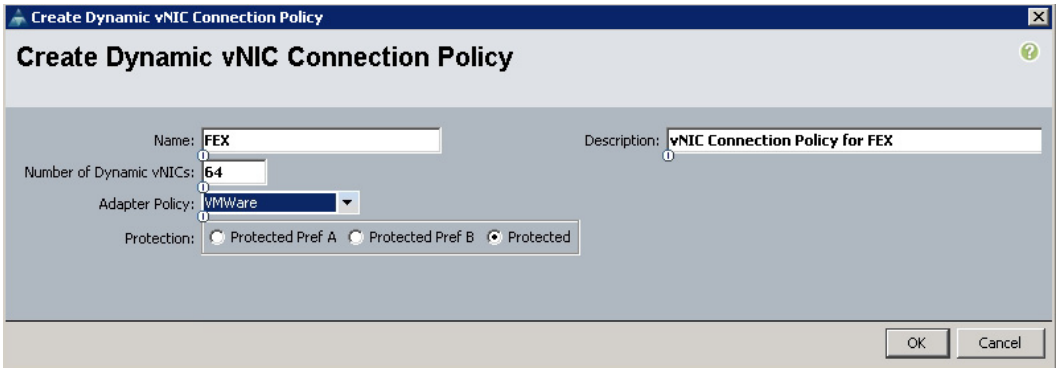
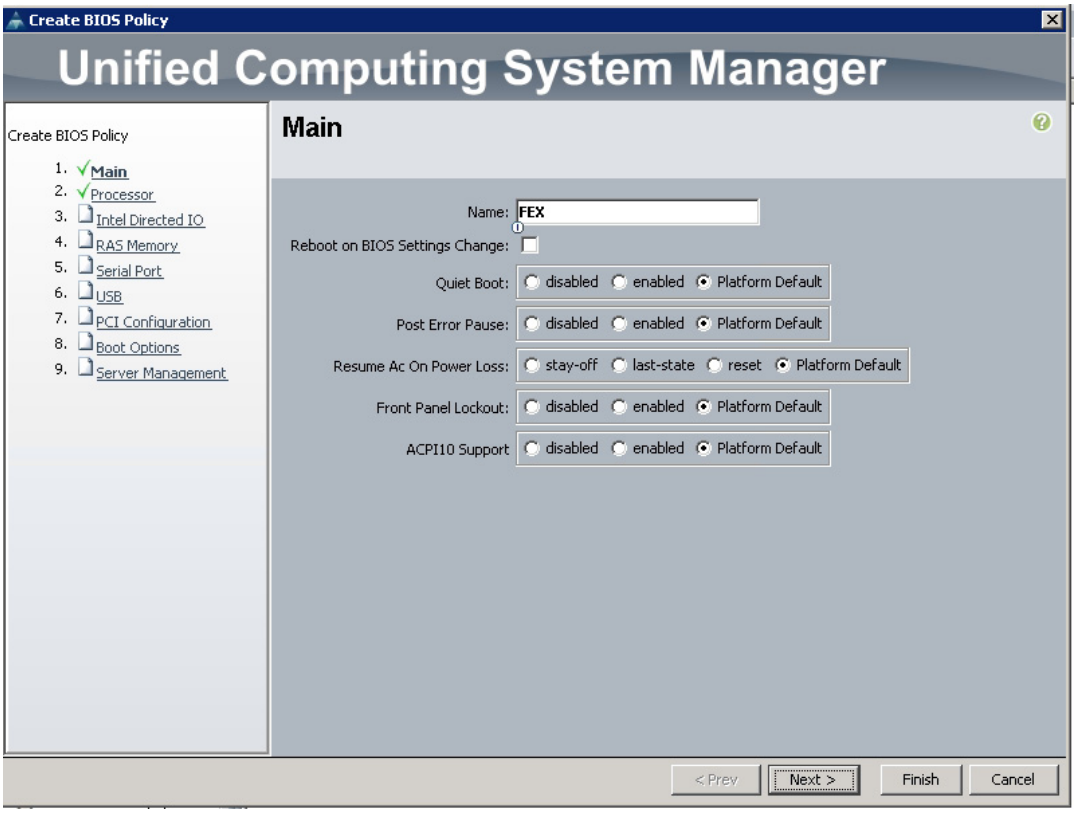
- Create a vNIC Connection policy in the Cisco UCS Manager
- Install the VEM software on the ESX server

- Install the plug-in into the VMware vCenter.

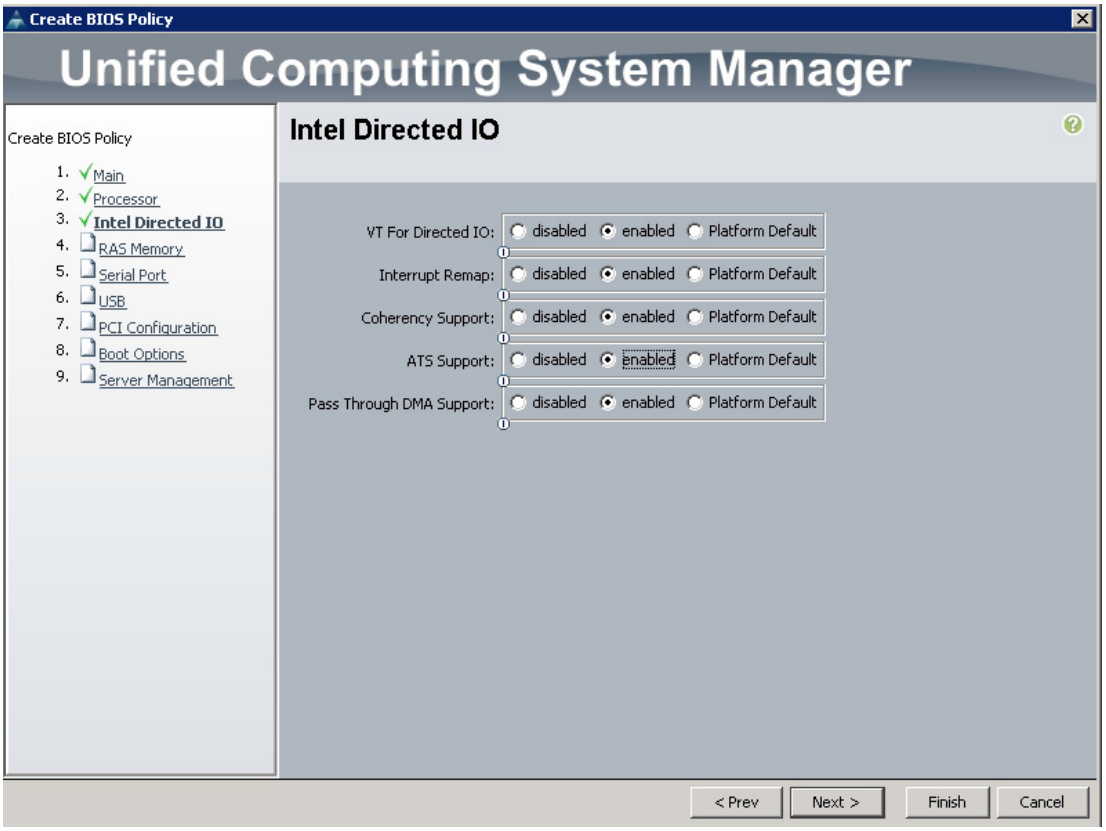
Create a vNIC Connection Policy

To create a vNIC connection policy, follow these steps:

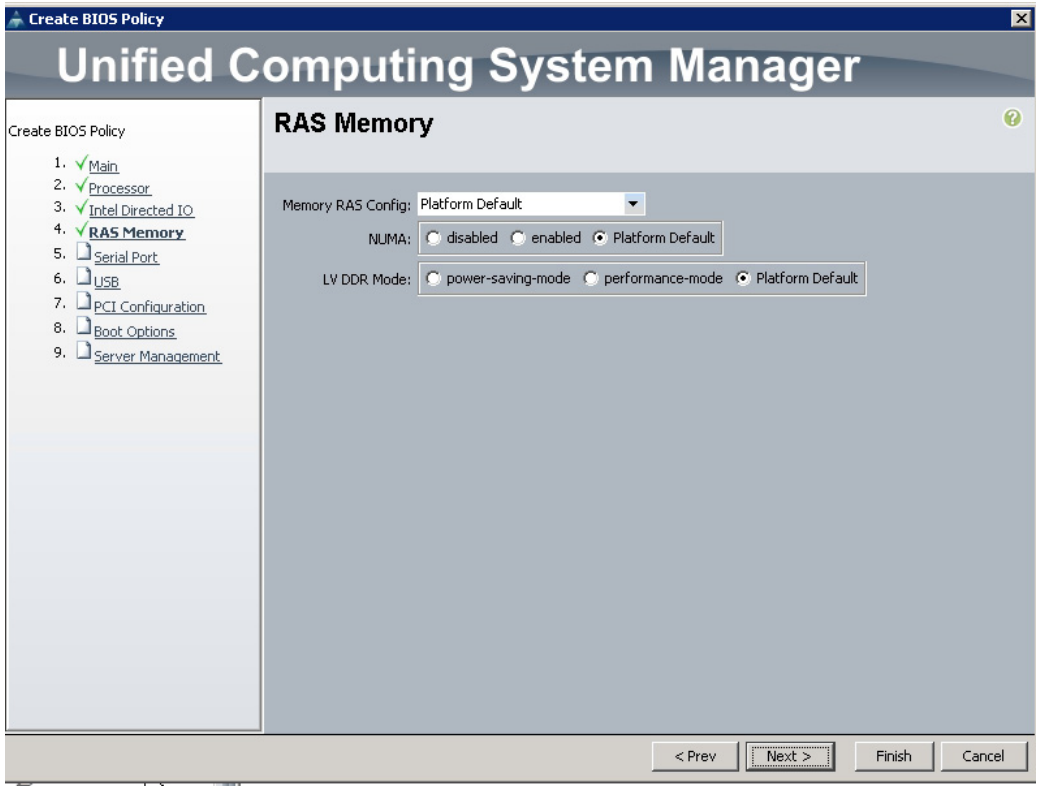
Step	Action
	Log in to the Cisco UCS Manager.
	Select the LAN tab in the left navigation pane and click LAN > Policies > root > Sub-organizations > > FPD(name of the sub-organization in this example) > Dynamic vNIC Connection Profile. Right-click and select Create Dynamic vNIC Connection Policy to start the wizard. 

	Type a name and description for the vNIC connection policy. Select `VMWare` from the Adapter Policy drop-down menu. Select the Protected option. Click OK. 
	In the Main section, retain the platform defaults. 

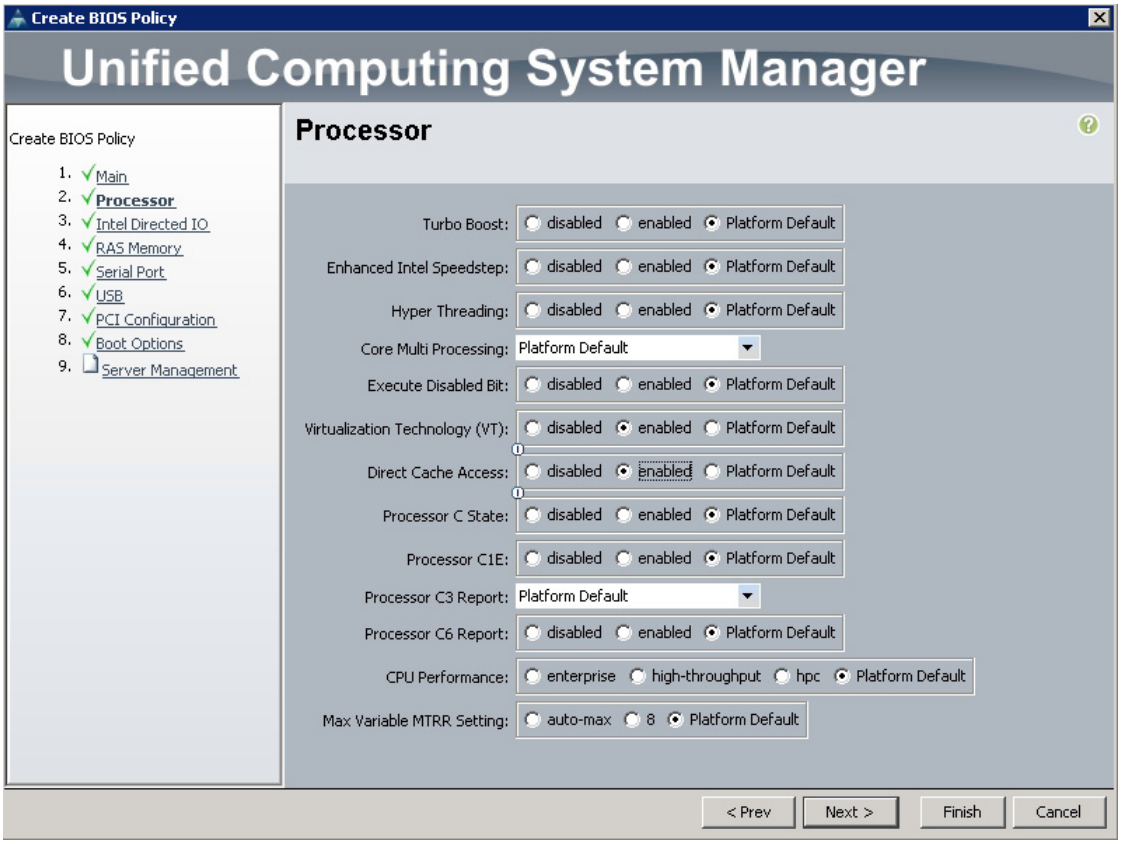
For Intel Directed IO, select enabled.



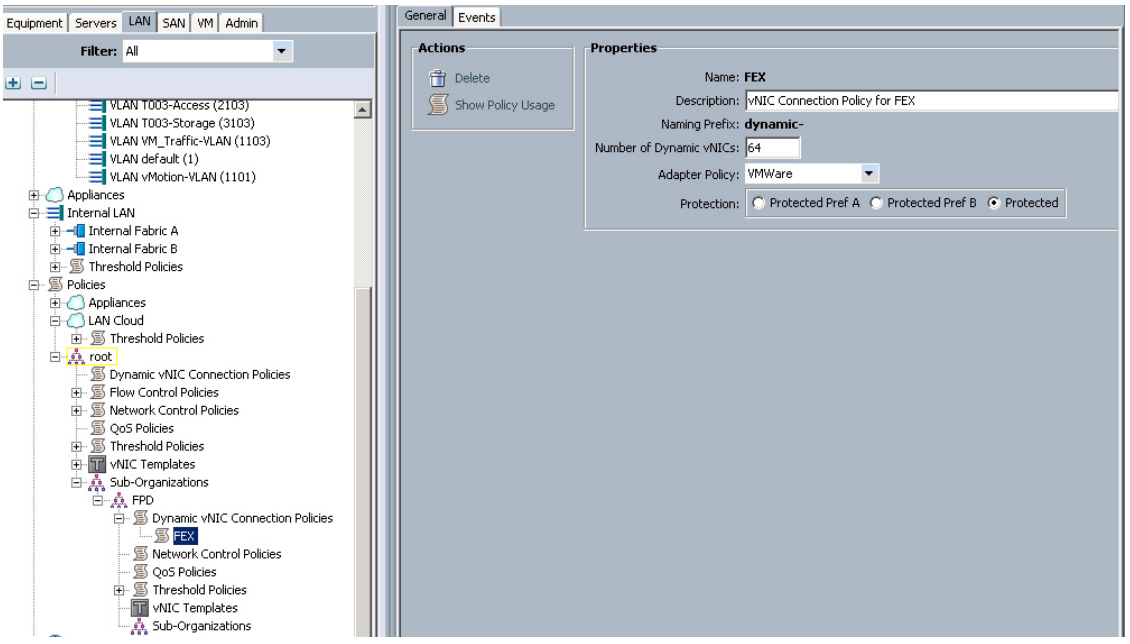
For RAS Memory, retain the Platform Default options.



Retain the Platform Default option for the remaining sections of the Create BIOS Policy wizard. Click Next on each of these windows and then click Finish to complete the wizard



Leaving the Wizard you see the created Profile.



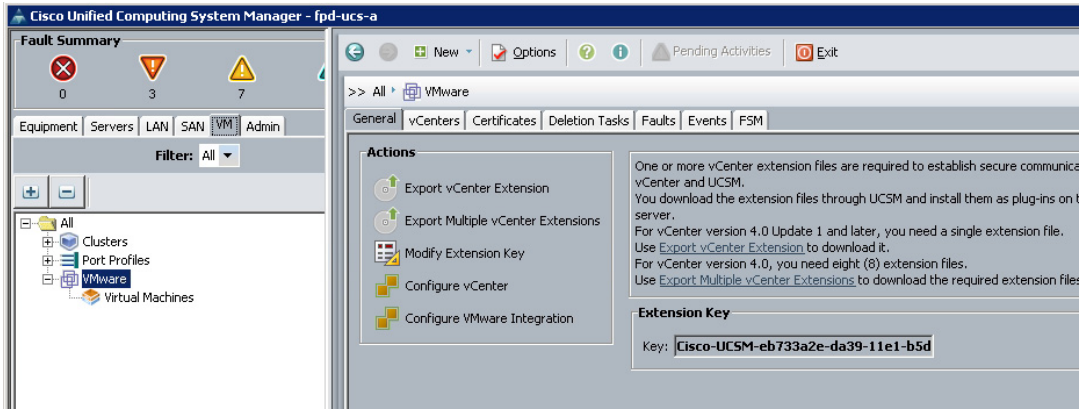
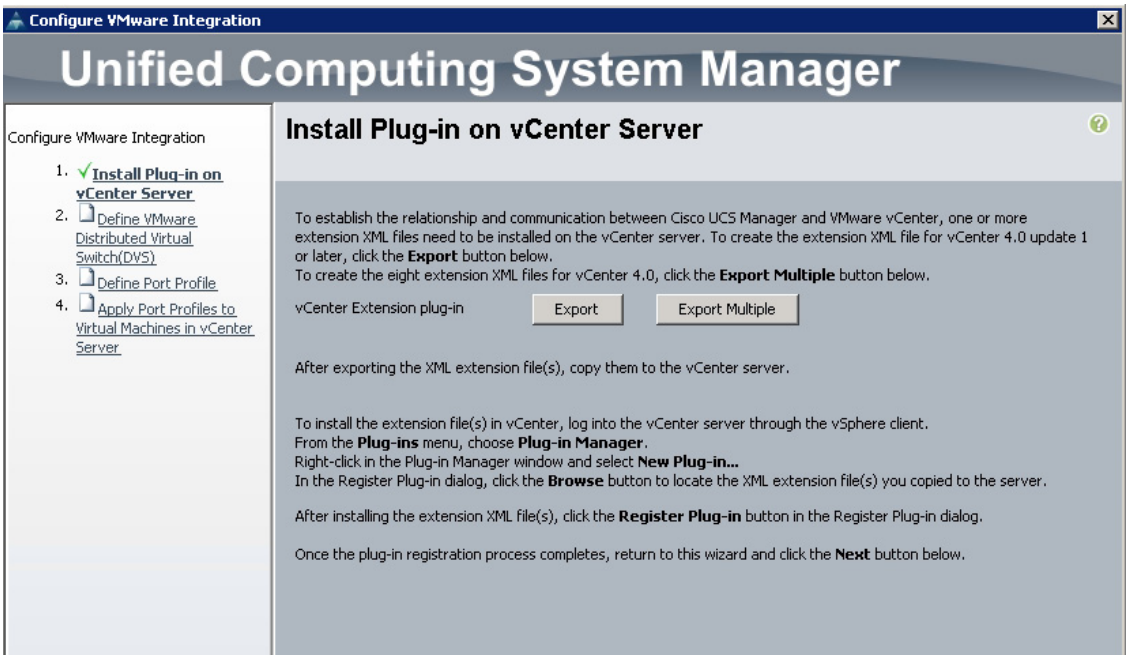
Install the VEM Software on each ESXi Server

The communication between the vCenter, the Cisco UCS Manager's FEX and the ESXi server requires installing a VEM (Virtual Ethernet Module) on each of the ESXi servers.

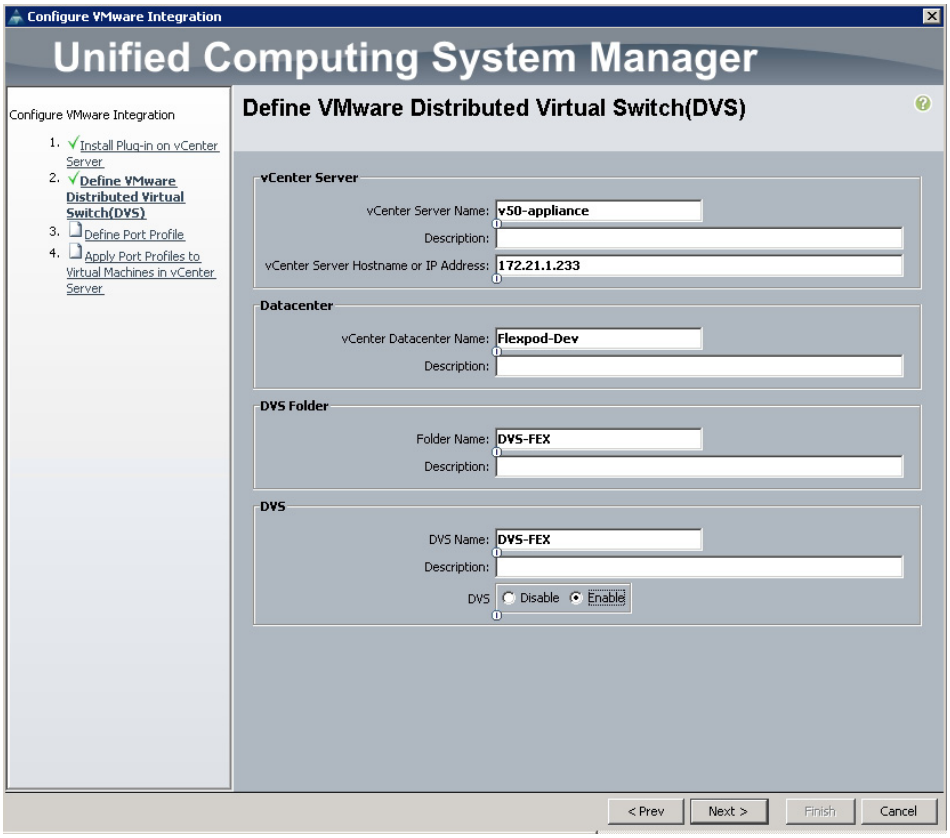
Download and install the VEM software according to the VM-FEX for VMware Configuration Guide: http://www.cisco.com/en/US/partner/products/ps10281/products_installation_and_configuration_guides_list.html

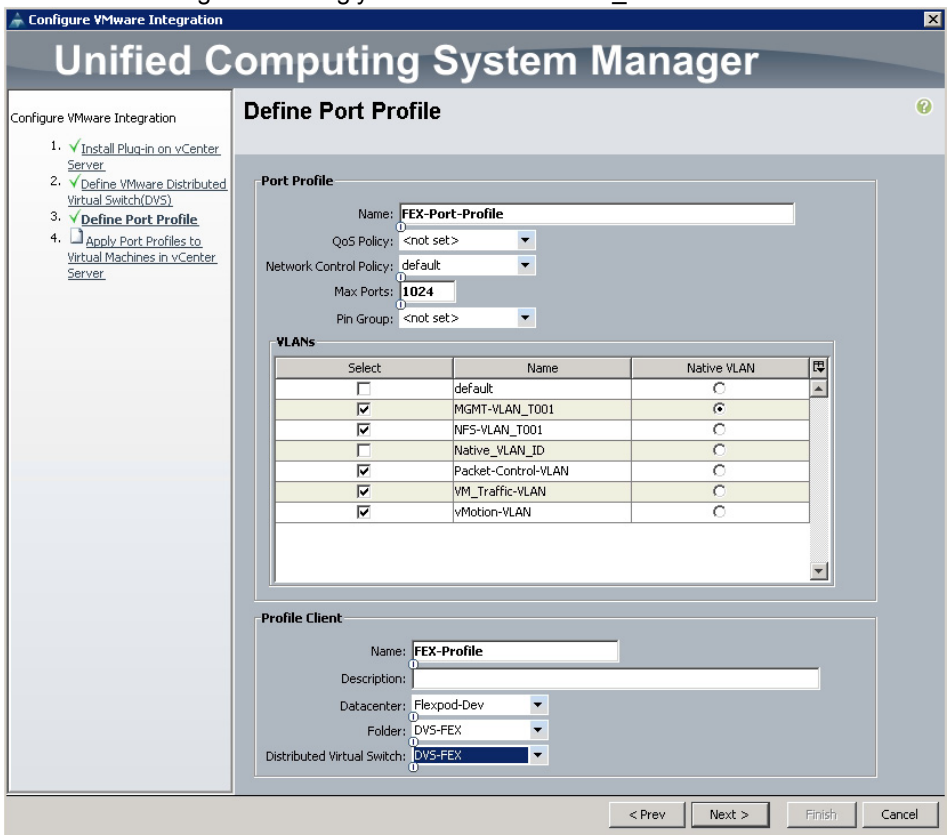
Integrate Cisco UCS with VMware vCenter

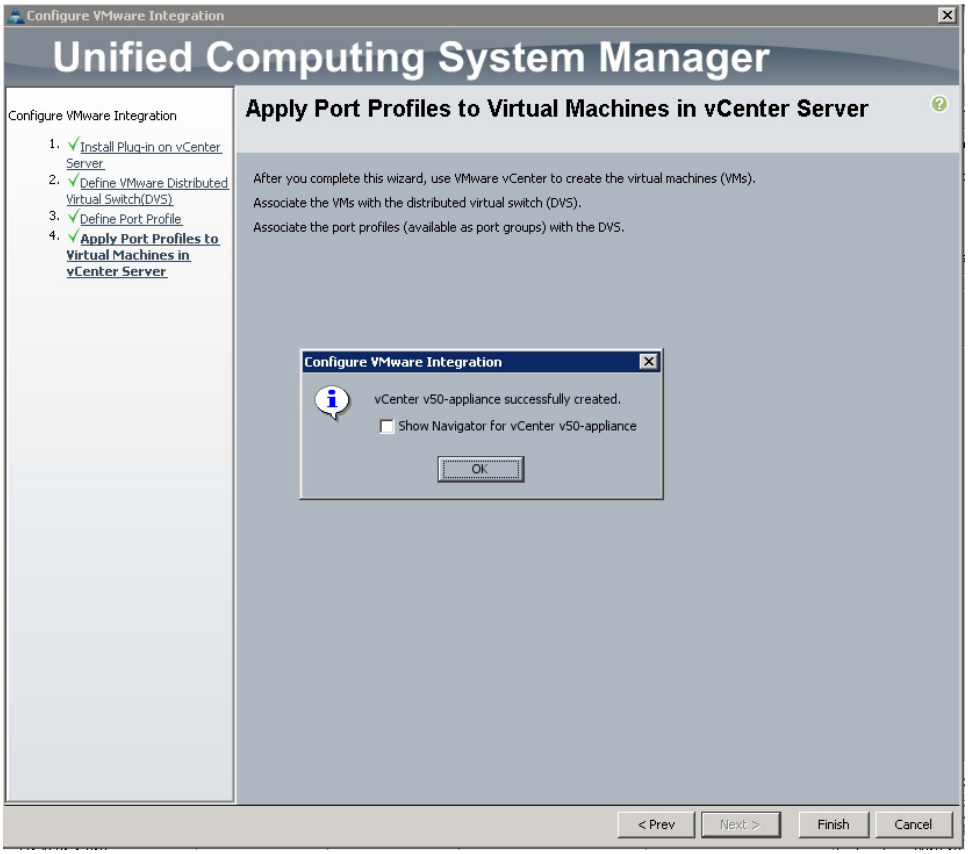
The vCenter integration requires configuration within the Cisco UCS Manager and the vCenter. To do this integration, follow these steps:

Step	Action
	Log in to the Cisco UCS Manager.
	In the navigation pane, click the VM tab, and in the VM tab, expand the All folder. Select the VMware node, and in the Working Area, click the General tab. 
	Select the Configure VMware Integration menu in the Actions area to start the Configuration wizard.
	Follow the instructions and click Export. 

	Enter the VMware vCenter Server name, vCenter Server host name or IP address, vCenter data center name, DVS folder, and DVS name. Click Next.



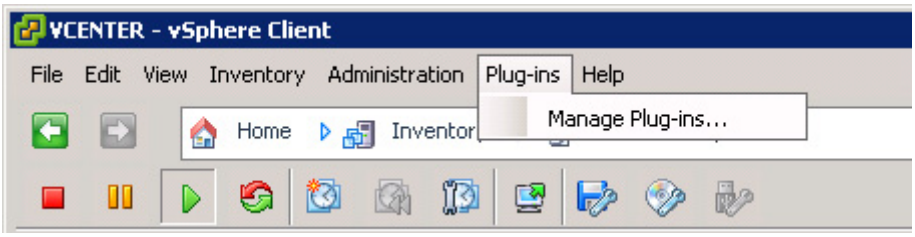
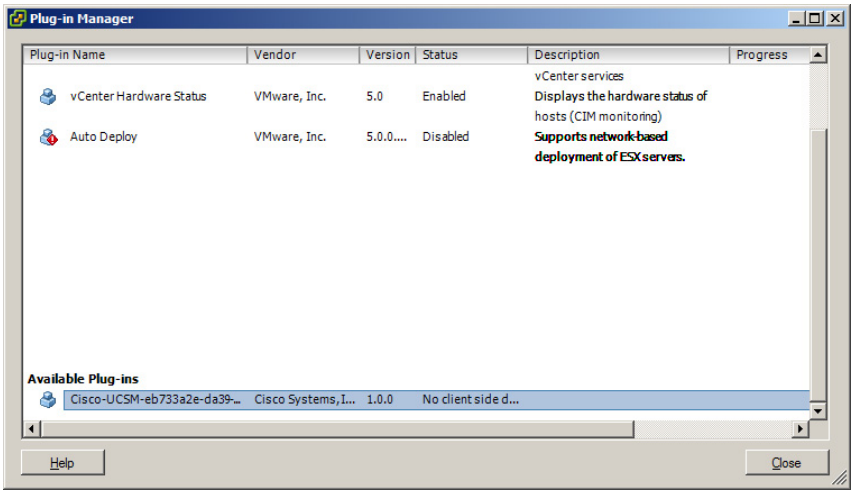
	Define the port profiles. It is important to select the basic VLANs that are required to communicate with the VEM and the vCenter that have been previously defined in the Cisco Nexus switches and the Cisco UCS Manager accordingly. Select MGMT-VLAN_T001 and indicate it is the native VLAN.. 

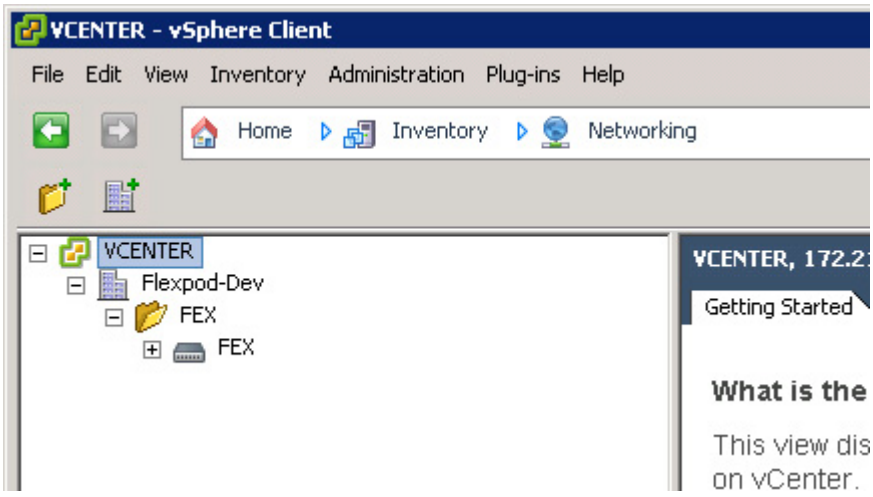


When finishing the Wizard, the Cisco UCS Manager connects to the vCenter and adds the plug-in.

Validate Settings in VMware vCenter

To validate the successful installation of the Cisco UCS Manager plug-in, complete the following steps:

	Log in to the vCenter Server. 
	In the Main menu, select Plug-ins > Manage Plug-ins. 
	The popups will show that Cisco UCS Manager is already integrated in vCenter. 

	Click Inventory > Networking to see FEX added to distributed switch from Cisco UCS. 

Standard Operations

As part of standard operations such as the Tenant provisioning, the Network environment and such the additional port profiles (VLANS) at the distributed switch must be created. The following section shows in detail how to add this "additional" VLAN's i.e. distributed Port Groups.

Add Distributed Port Group to the VDS (vSphere Distributed Switch)

Port Profiles

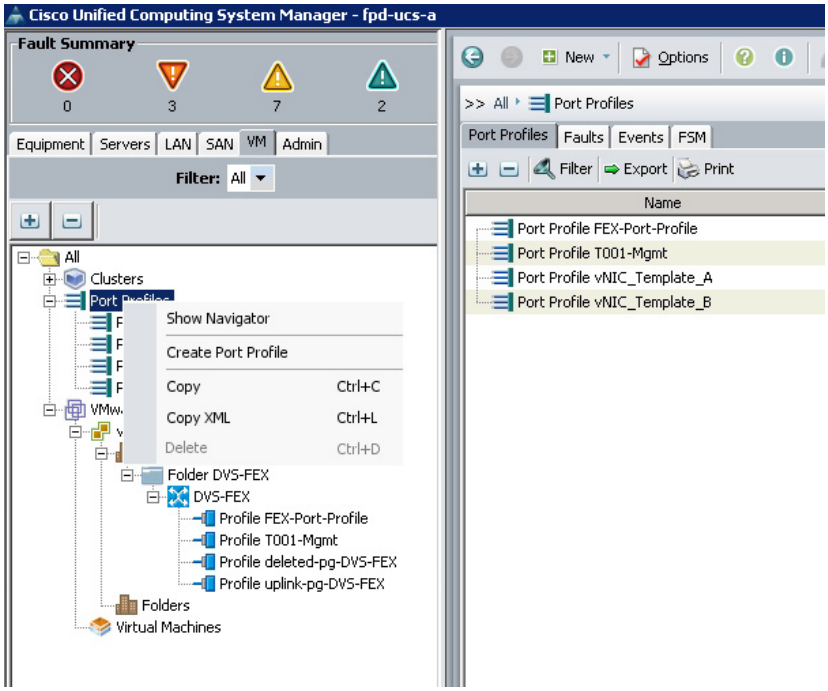
Port profiles contain the properties and settings that you can use to configure virtual interfaces in Cisco UCS for VM-FEX. The port profiles are created and administered in Cisco UCS Manager. After a port profile is created, assigned to, and actively used by one or more distributed virtual switches (DVSs), any changes made to the networking properties of the port profile in Cisco UCS Manager are immediately applied to those DVSs.

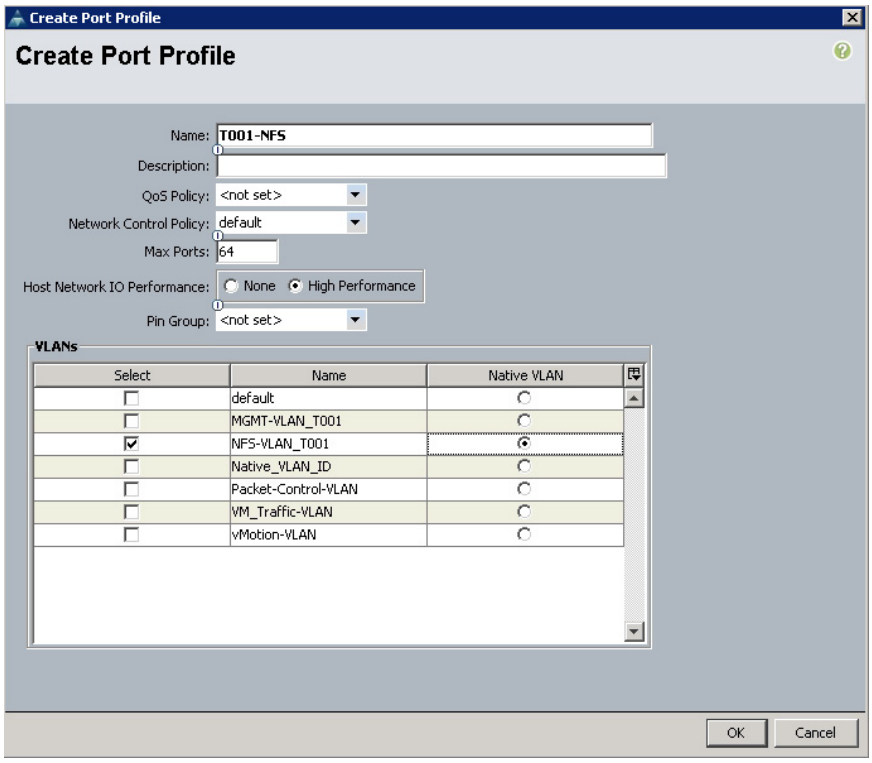
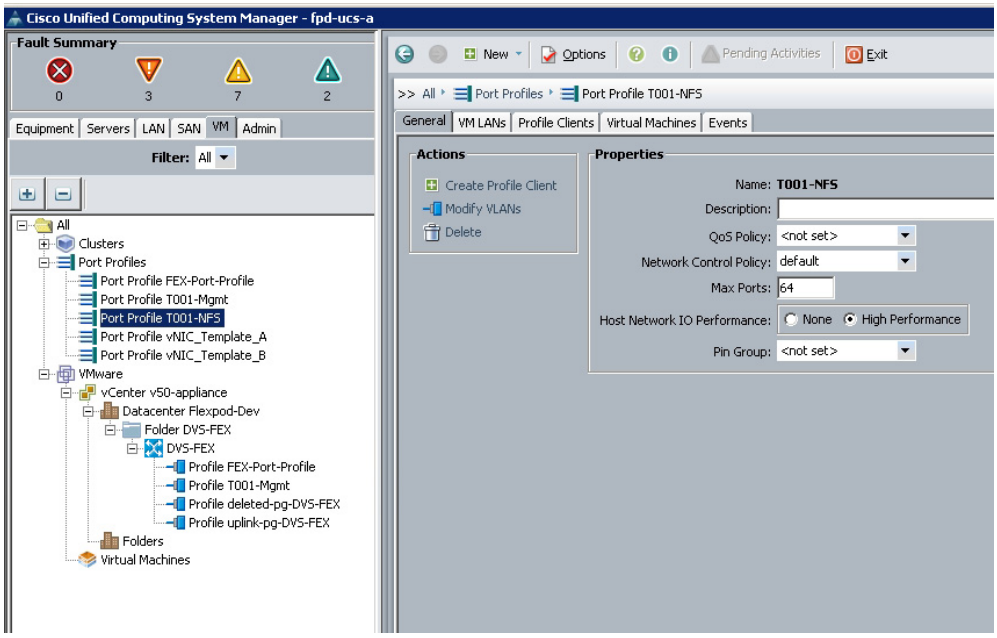
In VMware vCenter, a port profile is represented as a port group. Cisco UCS Manager pushes the port profile names to VMware vCenter, which displays the names as port groups. None of the specific networking properties or settings in the port profile is visible in VMware vCenter. You must configure at least one port profile client for a port profile if you want Cisco UCS Manager to push the port profile to VMware vCenter.

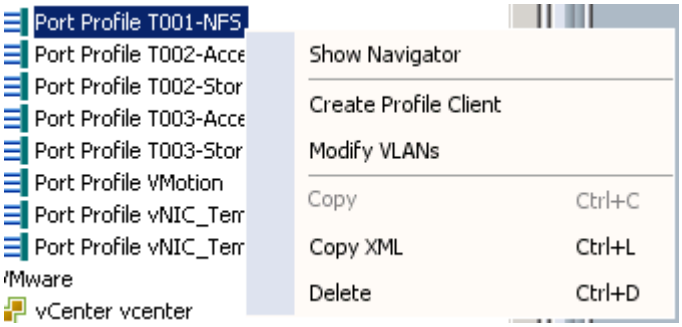
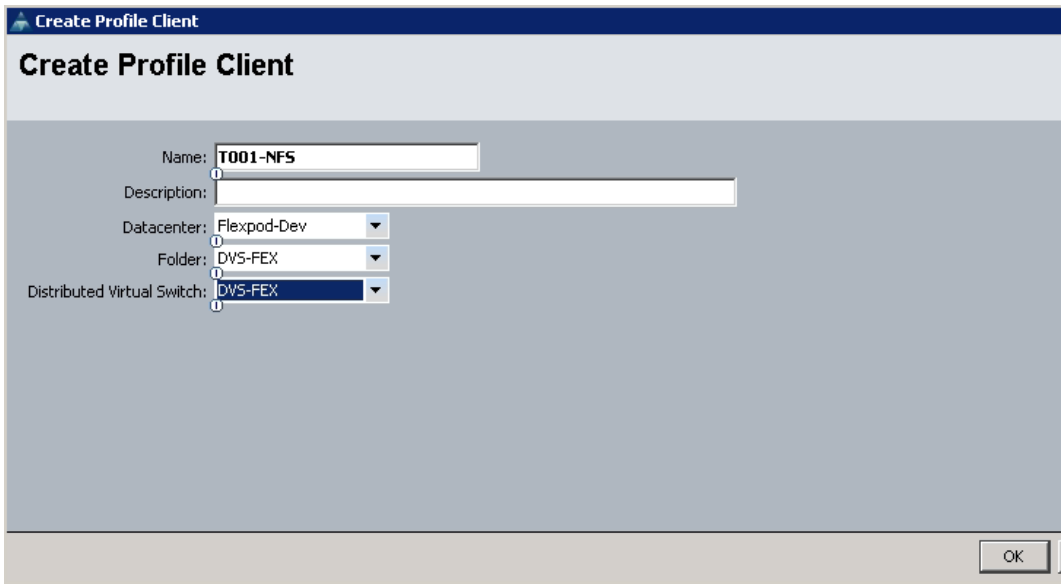
Port Profile Client

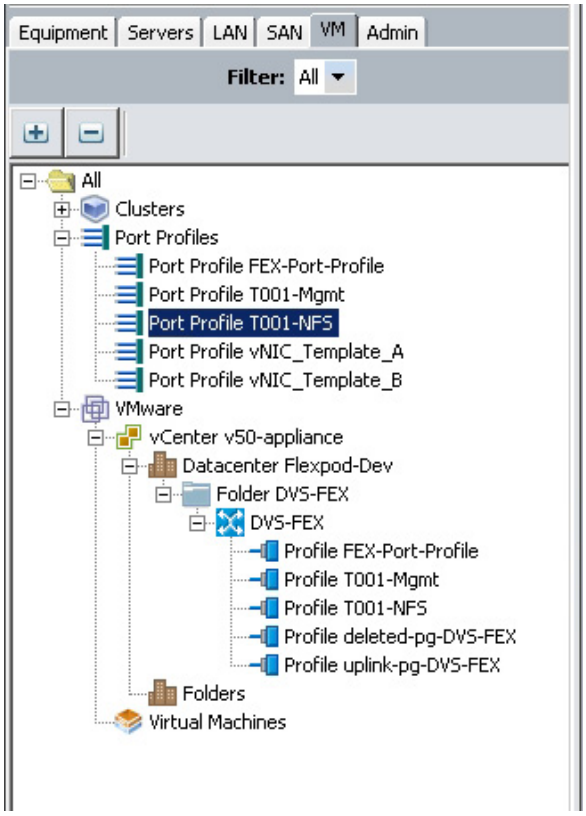
The port profile client determines the DVSs to which a port profile is applied. By default, the port profile client specifies that the associated port profile applies to all DVSs in VMware vCenter. However, you can configure the client to apply the port profile to all DVSs in a specific data center or data center folder or to only one DVS.

Complete the following steps to create VM-FEX port profiles for use on the Cisco UCS distributed virtual switch.

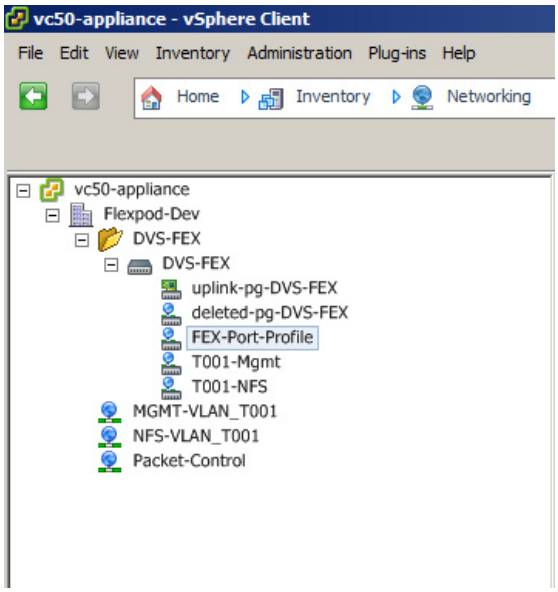
Step	Action
1.	Log in to Cisco UCS Manager. Click the VM tab. Right-click Port Profile > Create Port Profile. 

2.	Enter the name of the Port Profile. For example, T001-NFS for the storage VLAN in tenant t001. Select the VLAN for NFS in t001 and press OK 
3.	The Port profile created will appear. 

4.	Create the profile client to be integrated in the vCenter as a distributed port group in vDS. To create profile client, right-click Port Profile T001-NFS and click Create Profile Client.  Choose the data center created in your vCenter Server, folder, and distributed virtual switch previously created. Click OK.  The client profile created will appear in your distributed virtual switch DVS-FEX.



5. Log into vCenter to see the vSphere Distributed Switch (VDS) created along with T001-NFS port group.



6. Repeat the these steps for creating a distributed port group for T001-Mgmt.

Adding Additional Tenant to Distributed Port Group to vCenter

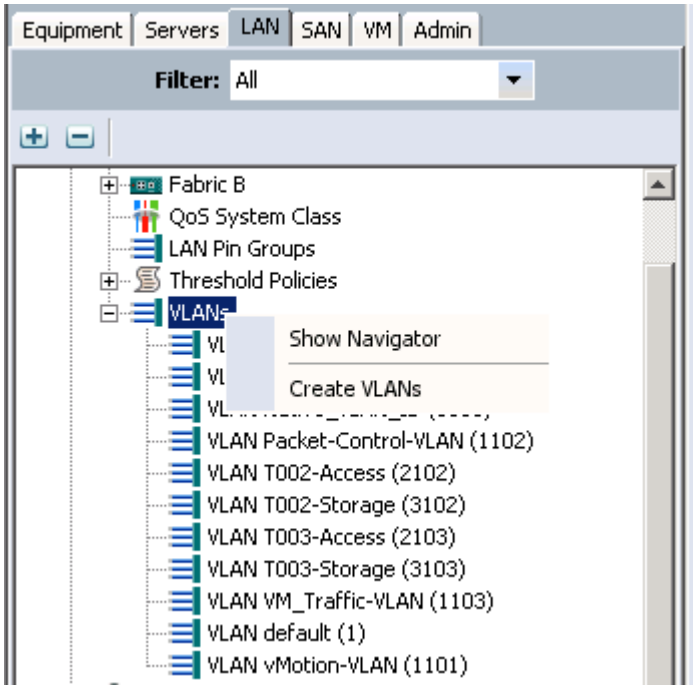
As described in section, "Tenant Provisioning" part of the task to provision a tenant is to create the required networks, as follows:

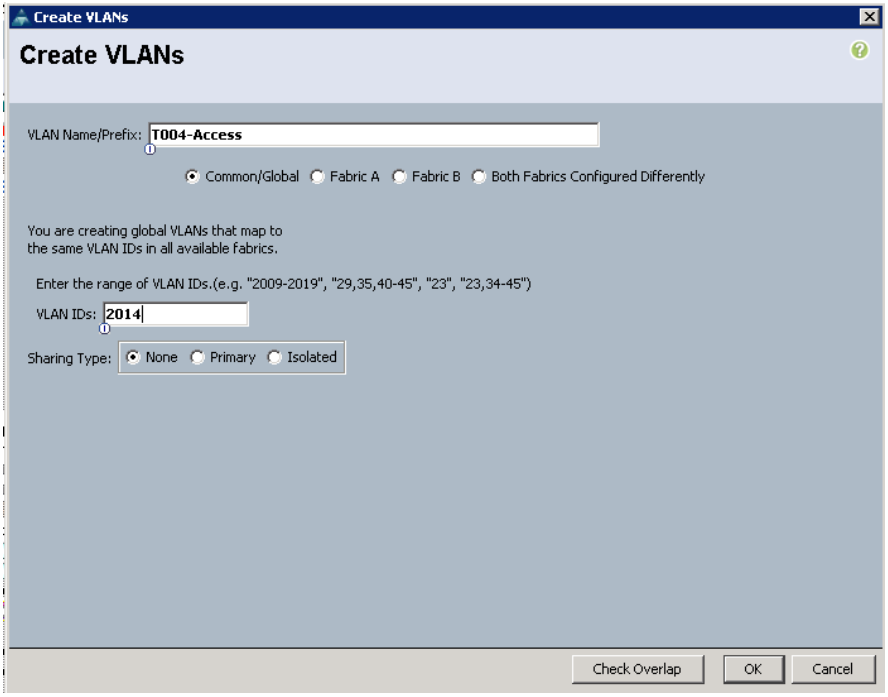
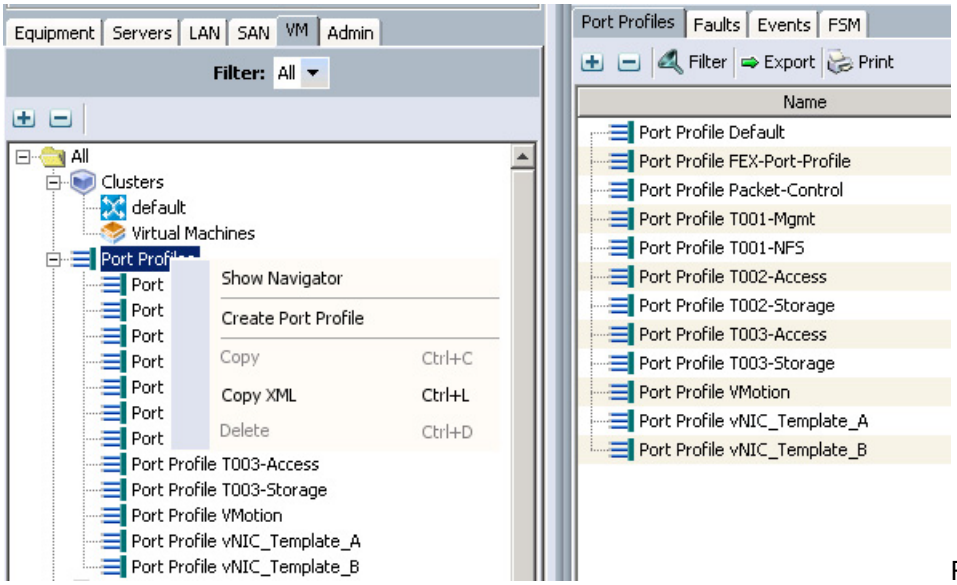
- Access LAN (txxx-access)
- Storage or backend LAN (txxx-storage)

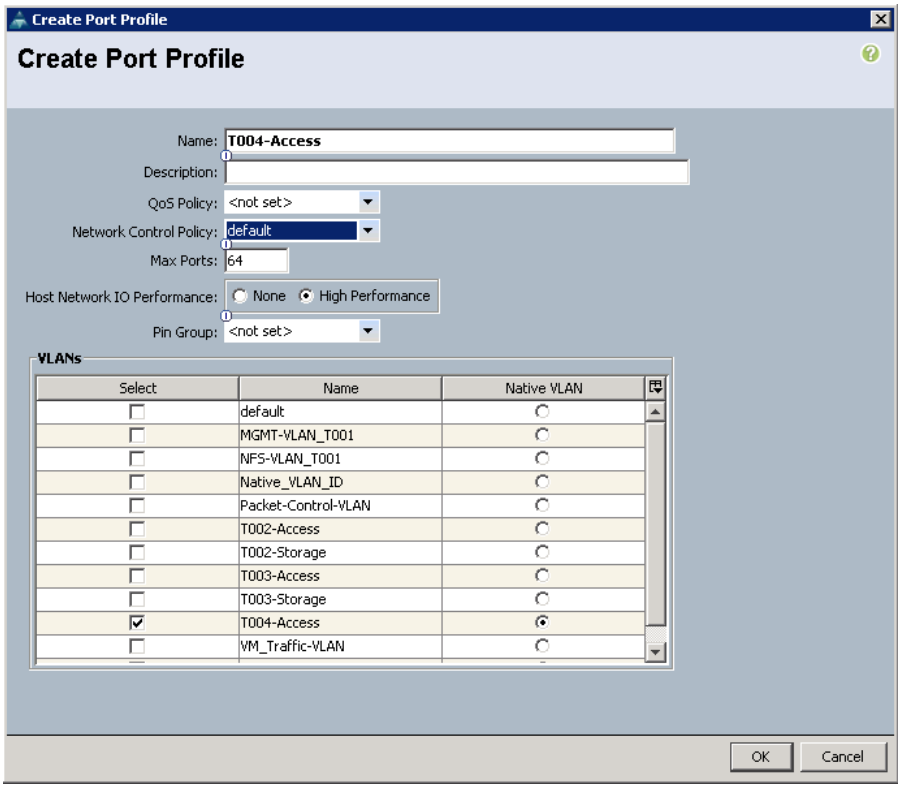
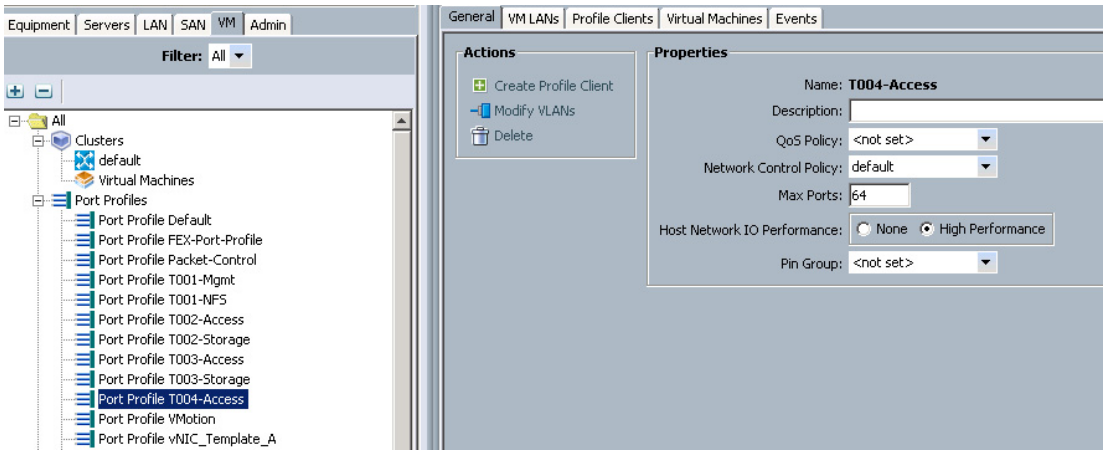
To create the network setting, the following configuration steps must be completed.

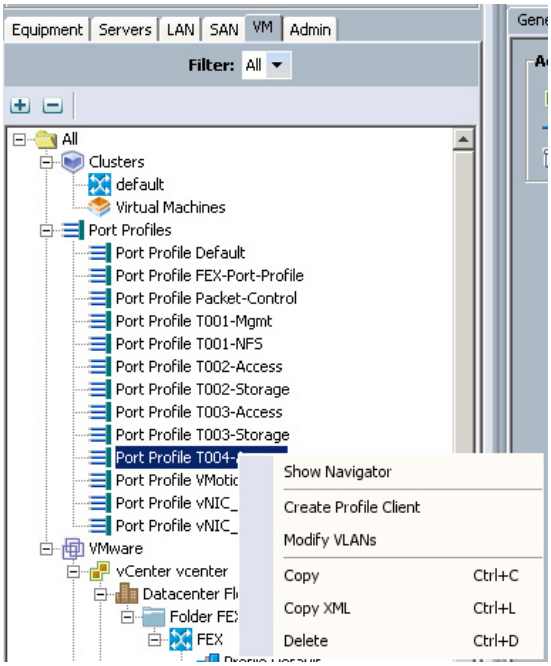
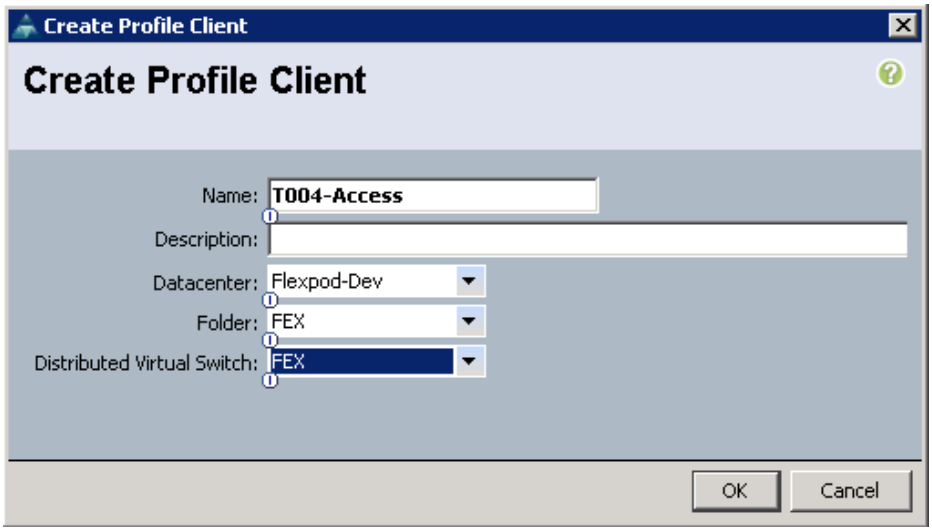
1. Create the VLAN on "Cisco Nexus" (not part of this section).
2. Create the VLAN in Cisco UCS Manager.
3. Uplink/Server port assignment (not part of this section)
4. Create the VM-FEX port profile.
5. Create the VM-FEX port client.

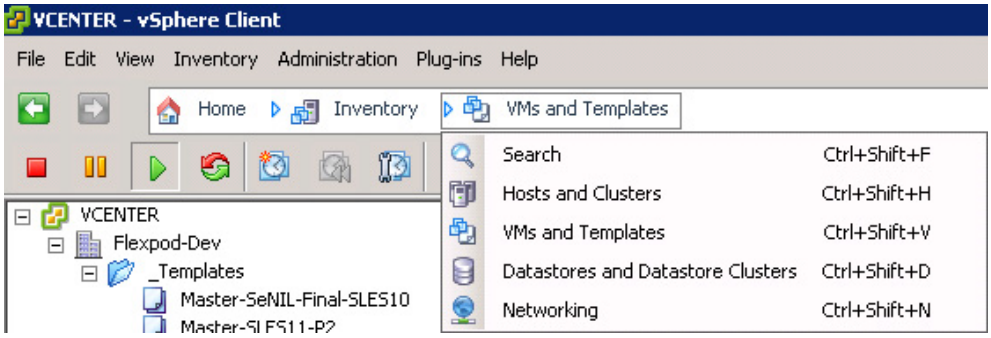
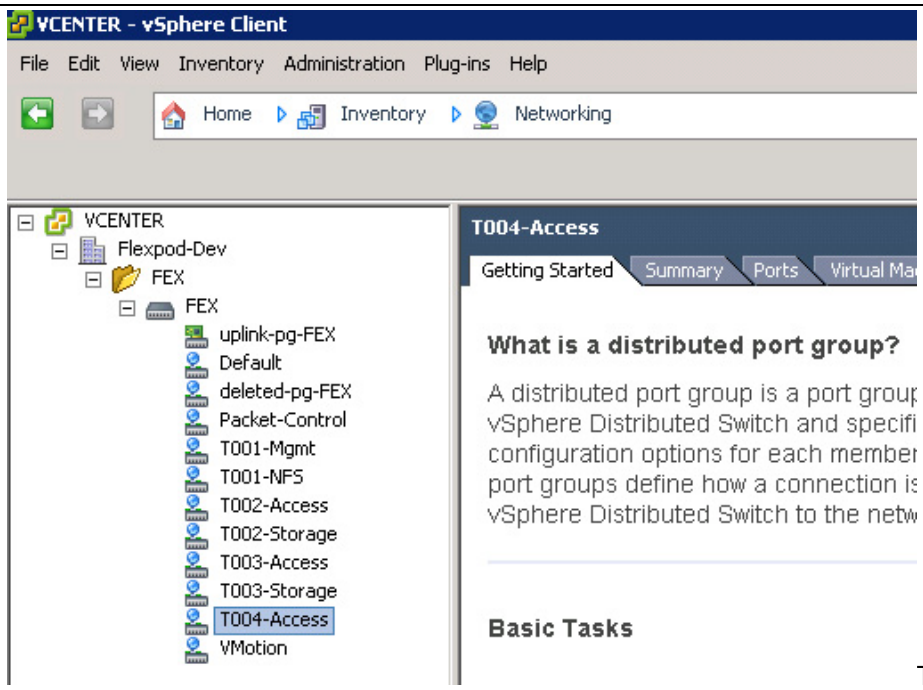
Steps 2, 4, and 5 are required for adding the tenant network to the vCenter and are described in detail. For all other network configurations, refer section, "Tenant Provisioning."

Step	Action
1	Create VLAN. Log in to Cisco UCS Manager. Click the LAN tab and click Create VLANs. 

2	Enter T004-Access as the VLAN name for tenant t004 access. Enter 2014 as the VLAN ID. Click OK. 
3.	Click the VM tab in Cisco UCS Manager.  Right-click Port Profile > Create Port Profile.

4.	Enter T004-Access as name of the port profile. Select T004-Access, and select the Native VLAN button. 
5	Port profile created displays. 

6	Create the Profile Client: Right-click the T004-Access Port Profile and click Create Profile Client. 
7.	Enter a name of the Distributed port group on the vCenter Select the data center. Select the folder for vDS. Select FEX for Distributed Virtual Switch. Click OK. 

8.	Log in to vCenter and click Inventory >Networking. 
9	 The T004-Access distributed port group will be created in the vDS.
9.	Repeat the steps to add the T004-Storage distributed port group.