Dell EMC Ready Bundle for Red Hat OpenStack

Single Node Undercloud Deployment Guide

Version 6.0.1

DELLEMC

Dell EMC Converged Platforms and Solutions

Contents

List of Figures

List of Tables

Trademarks

Notes, Cautions, and Warnings

A **Note** indicates important information that helps you make better use of your system.

A **Caution** indicates potential damage to hardware or loss of data if instructions are not followed.

A **Warning** indicates a potential for property damage, personal injury, or death.

This document is for informational purposes only and may contain typographical errors and technical inaccuracies. The content is provided as is, without express or implied warranties of any kind.

Chapter

1

Overview

Topics:

- *Intended Audience*
- *Prerequisites*
- *Dependencies*

This guide provides information necessary to deploy the Dell EMC Ready Bundle for Red Hat OpenStack Undercloud, to facilitate OpenStack application and API development only. It is not intended for production use.

This deployment includes the Solution Admin Host (SAH) and RHEL OSP Director Node. No Overcloud deployment is performed, including the Controller and Compute nodes.

For an example of how to configure a workload atop the Undercloud, see the Technical Guide - Deploying OpenShift Container Platform 3.3 in the Dell EMC Ready Bundle for Red Hat OpenStack.

Intended Audience

This guide is written for OpenStack application development and is not intended for a production OpenStack cluster. It only deploys the Undercloud portion of the Dell EMC Ready Bundle for Red Hat OpenStack; no Overcloud deployment. It assumes that the reader is familiar with:

- OpenStack
- Red Hat Enterprise Linux (RHEL)
- Red Hat OpenStack Platform (RHOSP) documentation
- Networking and system administration

Prerequisites

In order to deploy the Dell EMC Ready Bundle for Red Hat OpenStack Undercloud on Dell EMC hardware, the following prerequisites must be met:

- Successful Solution Admin Host hardware setup and configuration, per the Dell EMC Ready Bundle for Red Hat OpenStack Hardware Deployment Guide
- Must have access to Red Hat's subscription hosts

Dependencies

For customers performing a self-installation, these files are available upon request from Dell EMC. Please contact your account representative, or email *openstack@dell.com* for instructions.

Dell EMC Ready Bundle for Red Hat OpenStack Single Node Undercloud Deployment Guide dependencies include:

- `Dell-OSP-6.0.1.tgz`, which encapsulates the following archives:

  - `dell-mgmt-node.tgz` - Contains helper scripts for SAH node installation
  - `dell-pilot-deploy.tgz` - Contains helper scripts for RHOSP installation

Chapter
2

Red Hat Subscriptions

Topics:

- *Determining Pool IDs*

Once all prerequisites have been met, you must determine the appropriate Red Hat subscription entitlements for the:

- Solution Admin Host
- Director Node

Determining Pool IDs

To determine the pool IDs, you must have an existing server that is registered to the Red Hat Hosted Services. This server must also be registered using the same credentials as the ones being used in this environment.

1. Once the server is correctly registered, execute the following command to see the available subscription pools.

```
# subscription-manager list --all --available
```

The command will output a list of available pools. Each section of information lists what the subscription provides, its pool ID, how many are available, the type of system it is for, as well as other information.

2. Determine the correct pool ID needed for this environment and take note of it.

> **Note:** Pay close attention to the **System Type**. The System Type can be *Virtual* or *Physical*. If necessary you can use a physical license for a virtual node. However, you cannot use a virtual license for a physical node.

```
# subscription-manager list --all --available

[OUTPUT ABBREVIATED]

Subscription Name: Red Hat Cloud Infrastructure, Standard (8-sockets)
Provides:          Red Hat Beta
                   Red Hat OpenStack Beta
                   JBoss Enterprise Application Platform
                   Red Hat Software Collections (for RHEL Server)
                   Red Hat Enterprise Virtualization
                   Oracle Java (for RHEL Server)
                   Red Hat OpenStack
                   Red Hat Enterprise MRG Messaging
                   Red Hat Enterprise Linux Server
                   Red Hat Enterprise Linux High Availability (for RHEL
 Server)
                   Red Hat Software Collections Beta (for RHEL Server)
                   Red Hat Enterprise Linux Load Balancer (for RHEL Server)
                   Red Hat CloudForms
SKU:               MCT2861
Pool ID:           aaaa111bbb222ccc333ddd444eee5556
Available:         7
Suggested:         1
Service Level:     Standard
Service Type:      L1-L3
Multi-Entitlement: No
Ends:              09/23/2015
System Type:       Physical

[OUTPUT ABBREVIATED]
```

The above output shows a subscription that contains the Red Hat OpenStack entitlement. The required entitlement types for each node are shown in

Table 1: Red Hat Subscription Entitlements

Node Role	Entitlement	System Type
Solution Admin Host	Red Hat Enterprise Linux Server	physical

Node Role	Entitlement	System Type
Director Node	Red Hat OpenStack	virtual

Chapter

3

Solution Admin Host Deployment

Topics:

The SAH hosts one virtual machine (VM):

- **RHEL OSP Director Node** - Used for hosting Red Hat OpenStack Director deployment software

Solution Admin Host Deployment Overview and Prerequisites

Installation of the Dell EMC Solution Admin Host begins with the installation of Red Hat Enterprise Linux Server 7. The *osp-sah.ks* kickstart file is provided to assist automation of this process. The installation process can be accomplished using different processes (CD-ROM, CD image, or via a PXE installation). Instructions for how to include the kickstart file are provided later in this document.

This kickstart file performs the following steps when properly configured:

- Partitions the system
- Sets SELinux to *permissive* mode
- Disables `firewalld`, and uses `iptables`
- Disables NetworkManager
- Configures networking, including:

  - Bonding
  - Bridges
  - Static IP addresses
  - Gateway
  - Name resolution
  - NTP service
- Registers the system using the Red Hat Subscription Manager

Additionally, there are some requirements that must be satisfied prior to installation of the OS:

- A Red Hat subscription license
- Access to the Subscription Manager hosts

Note: If your network configuration/firewall require them, you must provide the proxy values in order to access Red Hat's Subscription Manager servers.

The osp-sah.ks Kickstart File

The *Dell-OSP-6.0.1.tgz* archive file (see *File References* on page 25) contains the *osp-sah.ks* kickstart file, and must be customized for the environment into which it is being installed.

Note: All edits that usually require changes are in the section marked **CHANGEME** and **END of CHANGEME**. Do not make other edits outside of these lines.

There are many changes that you will need to make, so a brief description of the SAH networks might help clarify the need for the variables in *Figure 1: Solution Admin Host Internal Network Fabric* on page 14.
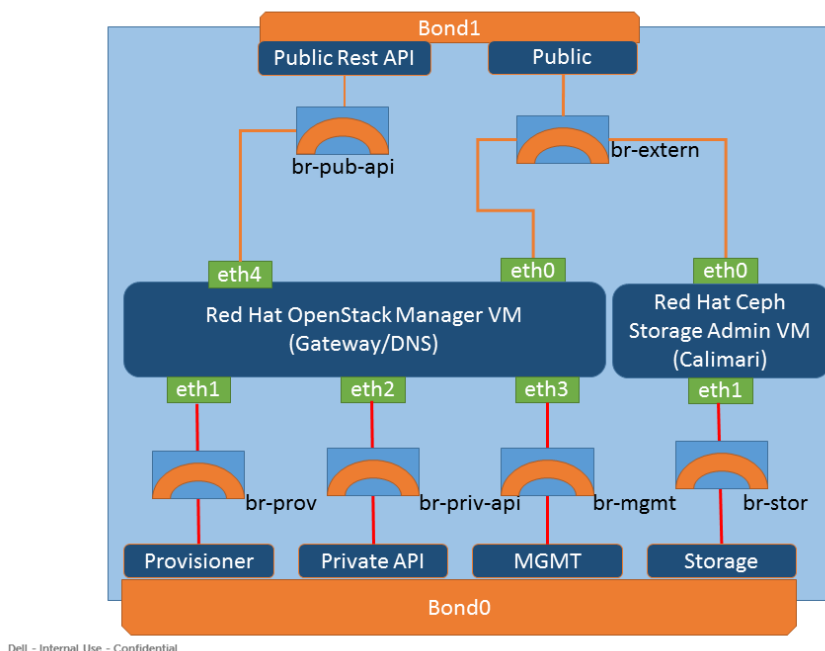
Dell - Internal Use - Confidential

Figure 1: Solution Admin Host Internal Network Fabric

There are 4 network interface files, created during the OS installation, that are required by the SAH:

- `ifcfg-em1`
- `ifcfg-em2`
- `ifcfg-p1p1`
- `ifcfg-p1p2`

> **Note:** The interfaces names (`ifcfg-em1`, `ifcfg-em2`, `ifcfg-p1p1` and `ifcfg-p1p2`) might be different on different system configurations, so these might need to change for your hardware configuration.

These are combined to build the bond interfaces (`bond0` and `bond1`). Interfaces `em1` and `p1p1` (**private_ifaces**) are combined to form `bond0` (**private_bond_name**) which is used by both the provisioning and storage networks. Interfaces `em2` and `p1p2` (**public_ifaces**) are combined to form `bond1` (**public_bond_name**). The other bond variables listed in the table are the **public_boot_opts, public_bond_opts, private_boot_opts** and **private_bond_opts**. These four variables can be left as is unless your configuration requires their modification.

Two VLANs are created to segregate the provisioning and storage traffic across the private network. For our example, we set the **provision_bond_name** to *bond0.120* and **storage bond_name** to *bond0.170* and the **provision_boot_opts** and **storage boot_opts** to *"onboot none vlan"*. You must configure the values for these variables to match your configuration.

The SAH requires three bridges to allow network traffic to pass through the SAH to and from the VM instances. The **public_bridge_boot_opts, provision_bridge_boot_opts** and **storage_bridge_boot_opts** variables are the last changes you must make to the kickstart file. For these variables you must set the boot options, IP address and netmask. The `osp-sah.ks` kickstart file provides an example of the format required.

To customize the kickstart file:

1. Extract the contents of the archive file using the `tar -zxf` command or a Windows® archive utility (*7zip*, *WinRaR*, etc).

2. Extract the contents of the *dell-mgmt-node.tgz* file, where you will find the *osp-sah.ks* that you will change as described below.
3. Set the following variables:

Table 2: Kickstart File Variables

Variable	Description
HostName	The FQDN of the server, e.g., sah.acme.com.
SystemPassword	The root user password for the system.
SubscriptionManagerUser	The user credential when registering with Subscription Manager.
SubscriptionManagerPassword	The user password when registering with Subscription Manager.
SubscriptionManagerPool	The pool ID used when attaching the system to an entitlement.
SubscriptionManagerProxy	Optional proxy server to use when attaching the system to an entitlement.
SubscriptionManagerProxyPort	Optional port for the proxy server.
SubscriptionManagerProxyUser	Optional user name for the proxy server.
SubscriptionManagerProxyPassword	Optional password for the proxy server.
Gateway	The default gateway for the system.
NameServers	A comma-separated list of nameserver IP addresses.
NTPServers	A comma-separated list of time servers. This can be IP addresses or FQDNs.
TimeZone	The time zone in which the system resides.
anaconda_interface	The public interface that allows connection to Red Hat Subscription services.
extern_bond_name	The name of the bond that provides access to the external network.
extern_boot_opts	The boot options for the bond on the external network. Typically, there no need to change this variable.
extern_bond_opts	The bonding options for the bond on the external network. Typically, there no need to change this variable.
extern_ifaces	A space delimited list of interface names to bond together for the bond on the external network.
internal_bond_name	The name of the bond that provides access for all internal networks.
internal_boot_opts	The boot options for the bond on the internal network. Typically, there no need to change this variable.

Variable	Description
internal_bond_opts	The bonding options for the bond on the internal network. Typically, there no need to change this variable.
internal_ifaces	A space delimited list of interface names to bond together for the bond on the internal network.
mgmt_bond_name	The VLAN interface name for the management network.
mgmt_boot_opts	The boot options for the management VLAN interface. Typically, there no need to change this variable.
prov_bond_name	The VLAN interface name for the provisioning network.
prov_boot_opts	The boot options for the provisioning VLAN interface. Typically, there no need to change this variable.
stor_bond_name	The VLAN interface name for the storage network.
stor_boot_opts	The boot options for the storage VLAN interface. Typically, there no need to change this variable.
pub_api_bond_name	The VLAN interface name for the public API interface.
pub_api_boot_opts	The boot options for the public API VLAN interface. Typically, there no need to change this variable.
priv_api_bond_name	The VLAN interface name for the private API interface.
priv_api_boot_opts	The boot options for the private API VLAN interface. Typically, there no need to change this variable.
br_extern_boot_opts	The bonding options, IP address and netmask for the external bridge.
br_mgmt_boot_opts	The bonding options, IP address and netmask for the management bridge.
br_prov_boot_opts	The bonding options, IP address and netmask for the provisioning bridge.
br_stor_boot_opts	The bonding options, IP address and netmask for the storage bridge.
br_pub_api_boot_opts	The bonding options, IP address and netmask for the public API bridge.
br_priv_api_boot_opts	The bonding options, IP address and netmask for the private API bridge.

Making the Kickstart File Available for Installation

This procedure places the kickstart file in the top level of a USB image and makes it available for installation. This is useful if you are using the iDRAC virtual media to install.

> **Note:** The USB key must be formatted as *vfat* or *ext2*.

The following example performs these steps:

1. Creates a *ks* image
2. Mounts the image through a loopback device
3. Copies the *osp-sah.ks* file to the image
4. Unmounts the image from the system

The resulting image can be used as removable media for PXE boot or iDRAC. As this is an example, please refer to the man pages or the reference manual for further information on the commands.

There are several options for presenting the *osp-sah.ks* to the OS installation. Below are two ways of preparing the image prior to presenting it to the OS installation for inclusion into the installation process:

- *Preparing an Image File for use with iDRAC (Option 1)* on page 17
- *Preparing a USB Key for Physical Boot (Option 2)* on page 17

Preparing an Image File for use with iDRAC (Option 1)

1. From an existing RHEL 7.2 system, create a USB image:

```
mkfs.vfat -C ks_usb.img 1024
```

2. Mount the image:

```
mount -o loop ks_usb.img /mnt
```

3. Place the `osp-sah.ks` file into the image:

```
cp osp-sah.ks /mnt
```

4. Unmount the image:

```
sync; umount /mnt
```

5. Make the image file, ks_usb.img, available using the *Map the image as Removable Media* option on the iDRAC.

   > **Note:** If only one physical hard disk is presented to the server, the device name presented to the installer should be `sdb`.

Preparing a USB Key for Physical Boot (Option 2)

1. From an existing RHEL 7.2 system, format a USB key:

```
mkfs.ext3 /dev/sdb
```

2. Mount the USB key.

```
mount /dev/sdb /mnt
```

3. Place the `osp-sah.ks` file onto the USB key:

```
cp osp-sah.ks /mnt
```

4. Unmount the image:

> **Note:** If only one physical hard disk is presented to the server, the device name presented to the installer should be `sdb`.

```
sync; umount /mnt
```

Presenting the Image to the RHEL OS Installation Process

1. Boot the Solution Admin Host using the Red Hat Enterprise Server 7.x installation media.

    a. At the installation menu, select the **Install** option. *Do not press the [Enter] key*.

    b. Press the **Tab** key.

    c. Move the cursor to the end of the line that begins with `vmlinuz`.

    d. Append the following to the end of the line:

> **Note:** The device `sdb` can change, depending upon the quantity of disks being presented to the installation environment. These instructions assume that a single disk is presented. If otherwise, adjust accordingly.

```
ks=hd:sdb:/<kickstart_file_directory>/osp-sah.ks
```

2. Press the **[Enter]** key to start the installation.

> **Note:** It may take a few minutes before progress is seen on the screen. Press the ESC key at the memory check to speed up the process.

Next Steps

After the SAH is installed:

1. Copy the ISO of the **Red Hat Enterprise Linux Server 7 installation DVD** to the `/store/data/iso` directory. **Only RHEL 7.2 is supported**. This ISO is used to install the RHEL OSP Director Node.

2. Set up the Director Node by following the procedures in *RHEL OSP Director Node Deployment* on page 19.

Chapter

4

RHEL OSP Director Node Deployment

Topics:

The deployment of the RHEL OSP Director Node (Director Node) is performed using the `deploy-director-vm.sh` script. This script creates a kickstart file and then executes the `virt-install` command to install the system.

The Director Node Kickstart file

The generated kickstart script performs the following steps:

- Partitions the system
- Sets SELinux to enforcing mode
- Configures `iptables` to ensure the following services can pass traffic:
  - HTTP
  - HTTPS
  - DNS
  - TFTP
  - TCP port 8140
- Configures networking, including:
  - Static IP addresses
  - Gateway
  - Name resolution
  - NTP time service
- Registers the system using the Red Hat Subscription Manager
- Installs the RHEL OSP Director installer
  - Configures the RHEL OSP Director installer to not install the EPEL repository

Setup

To set up the Director Node deployment:

1. Log into the SAH node as the *root* user.
2. Ensure that a copy of the **Red Hat Enterprise Linux Server 7 Installation DVD** ISO (RHEL 7.2) is in the `/store/data/iso` directory.
3. Download the *dell-mgmt-node* archive (zip or tgz) file and extract the contents of the archive file into the */root* directory as per the example below:

```
# cd /root
# tar zxvf /PATH/TO/FILE/dell-mgmt-node.tgz
```

Configuration

To configure the Director Node deployment:

1. Edit the configuration file, named `director.cfg`, in the `/root/mgmt` directory.
2. Set the following variables in the `director.cfg` file:

Table 3: Director Node Configuration Parameters

Parameter	Description
rootpassword	The root user password for the system.
timezone	The timezone the system is in.

Parameter	Description
smuser	The user credential when registering with Subscription Manager.
smpassword	The user password when registering with Subscription Manager. The password must be enclosed in single quotes if it contains certain special characters.
smpool	The pool ID used when attaching the system to an entitlement. **Note:** Edit the line with the smpool-changeme. The # smpool line is an example only.
hostname	The FQDN of the Director Node.
gateway	The default gateway for the system.
nameserver	A comma-separated list of nameserver IP addresses.
ntpserver	A comma-separated list of time servers. This can consist of IP addresses or FQDNs.
user	The ID of an admin user to create to use for installing RHEL OSP Director. Default admin user is *stack*.
password	The password for the admin user.
eth0	This line specifies the IP address and network mask for the external network. The line begins with eth0, followed by at least one space, the IP address of the VM on the external network, another set of spaces, and then the network mask.
eth1	This line specifies the IP address and network mask for the provisioning network. The line begins with eth1, followed by at least one space, the IP address of the VM on the provisioning network, another set of spaces, and then the network mask.
eth2	This line specifies the IP address and network mask for the management network. The line begins with eth2, followed by at least one space, the IP address of the VM on the management network, another set of spaces, and then the network mask.
eth3	This line specifies the IP address and network mask for the private API network. The line begins with eth3, followed by at least one space, the IP address of the VM on the management network, another set of spaces, and then the network mask.

Parameter	Description
eth4	This line specifies the IP address and network mask for the public API network. The line begins with `eth4`, followed by at least one space, the IP address of the VM on the management network, another set of spaces, and then the network mask.

Installing the RHEL OSP Director Node

To install the Director Node:

1. Invoke the `deploy-director-vm.sh` script.

   a. Pass `director.cfg` as the first parameter.

   b. Pass the full path to the Red Hat Enterprise Linux Server 7 Installation media as the second parameter.

```
# ./deploy-director-vm.sh director.cfg /store/data/iso/rhel-server-7.2-
x86_64-dvd.iso
Starting install...
Retrieving file .treeinfo...
| 3.2 kB 00:00:00
Retrieving file vmlinuz...
| 7.9 MB 00:00:00
Retrieving file initrd.img...
| 64 MB 00:00:00
Creating storage file director.img
| 16 GB 00:00:00
Creating domain...
| 0 B 00:00:00
Domain installation still in progress. You can reconnect to
the console to complete the installation process.
```

The installation will begin, but no console will be displayed.

2. To display the console:

   a. Ensure that you are logged into a GUI environment.

   b. Open a terminal.

   c. Enter the following command:

      ▨ **Note:** If you are connected to the Director Node using a Windows® system, you must install and configure an **Xwin Server** before executing `virt-viewer director` to see the output.

```
   virt-viewer director
```

3. A console for the Director Node will open.

4. After the Director Node completes the installation, it will power itself off.

5. The power state of the Director Node can be viewed using the `virsh list --all` command:

```
 Id Name State
 ----------------------------------------------------
 2 director shut off
```

6. The Director Node can be started using the following command:

```
# virsh start director
```

Installing RHEL OSP Director

To install RHEL OSP Director:

1. Log into the Director Node using the user name and password specified in *director.cfg*.

2. Download the `dell-pilot-deploy.tgz` archive file. See for a list of solution files for the Dell EMC Ready Bundle for Red Hat OpenStack.

3. Extract the contents of the `tar` archive file into the home directory of the user:

```
$ cd
$ tar xzvf /PATH/TO/FILE/dell-pilot-deploy.tgz
```

4. Subscribe to, and enable, RHOSP repositories:

```
$ sudo ~/pilot/enable-repos.py
```

5. Edit the `~/pilot/undercloud.conf` configuration file.

6. Set the following variables in `undercloud.conf`:

Table 4: Undercloud Configuration Parameters

Parameter	Description
local_ip	The IP address and prefix of the Director Node on the provisioning network in CIDR format (xx.xx.xx.xx/yy). This must be the IP address used for *eth1* in *director.cfg*. The prefix used here must correspond to the netmask for *eth1* as well (usually *24*).
masquerade_network	The network address and prefix of the Director Node on the provisioning network in CIDR format (xx.xx.xx.xx/yy). This must be the network used for *eth1* in *director.cfg*. The prefix used here must correspond to the netmask for *eth1* as well (usually *24*).
dhcp_start	The starting IP address on the provisioning network to use for OpenStack cloud nodes. **Note:** Ensure the IP address of the Director Node is not included.
dhcp_end	The ending IP address on the provisioning network to use for OpenStack cloud nodes.
network_cidr	The network and prefix in CIDR format for the Neutron managed network for Overcloud instances. **Note:** Used only if the Overcloud is deployed atop the Undercloud.
network_gateway	The network gateway for Neutron-managed Overcloud instances. **Note:** Used only if the Overcloud is deployed atop the Undercloud.

Parameter	Description
inspection_iprange	An IP address range on the provisioning network to use during node inspection. **Note:** This should not overlap with the *dhcp_start/dhcp_end* range.

7. Set the passwords, if desired, in the `[auth]` section; otherwise passwords will be randomly generated.

> **Note:** The *undercloud_heat_encryption_key* parameter **must** be either 16, 24, or 32 characters in length in order for RHEL OSP Director to successfully create a stack.

8. Determine the IP address of a DNS server for the Overcloud nodes to use.

> **Note:** Perform this step only if the Overcloud is deployed atop the Undercloud.

9. Execute the following command:

```
$ ~/pilot/install-director.sh <dns_ip> <subscription_manager_user>
  <subscription_manager_pass> <subscription_manager_poolid>
```

Where:

- `dns_ip` = IP address of the DNS server
- `subscription_manager_user` = Red Hat Subscription Manager user, as specified in *Determining Pool IDs* on page 10
- `subscription_manager_pass` = Red Hat Subscription Manager user password, as specified in *Determining Pool IDs* on page 10

The RHEL OSP Director installation can take approximately 30 minutes to complete.

> **Note:** The installation log is available at *~/pilot/install-director.log*.

Using RHEL OSP Director

The RHEL OSP Director installer creates an *rc* file for using the CLI commands, and a file containing all passwords.

1. Before running any CLI commands, first `source` the *rc* file:

```
source ~/stackrc
```

2. All of the passwords are in the `undercloud-passwords.conf` file.
3. You are now ready to use the OpenStack Undercloud for your application development.

Appendix
A

File References

Topics:

- *Solution Files*

This appendix lists documents and script archives that are required to install and deploy the Dell EMC Ready Bundle for Red Hat OpenStack. Please contact your Dell EMC representative for copies if required.

Solution Files

Dell EMC Ready Bundle for Red Hat OpenStack files include:

- *Dell-OSP-6.0.1.tgz* - Contains all solution documentation and scripts
- *Dell EMC Ready Bundle for Red Hat OpenStack BOM Guide*
- *Dell EMC Ready Bundle for Red Hat OpenStack Software Manual Deployment Guide*
- *Dell EMC Ready Bundle for Red Hat OpenStack Hardware Deployment Guide*
- *Dell EMC Ready Bundle for Red Hat OpenStack Workbook*
- *Dell EMC Ready Bundle for Red Hat OpenStack Architecture Guide*
- *Dell EMC Ready Bundle for Red Hat OpenStack Release Notes*
- `dell-mgmt-node.tgz` - Contains helper scripts for SAH node installation
- `dell-pilot-deploy.tgz` - Contains helper scripts for RHOSP installation

Appendix
B

References

Topics:

- *To Learn More*

Additional information can be obtained at *http://www.dell.com/en-us/work/learn/openstack-cloud* or by e-mailing *openstack@dell.com*.

If you need additional services or implementation help, please contact your Dell EMC sales representative.

To Learn More

For more information on the Dell EMC Ready Bundle for Red Hat OpenStack visit *http://www.dell.com/learn/us/en/04/solutions/red-hat-openstack*.