Dell Cloud Solution
for Web Applications

Installation Guide

Notes and Cautions

NOTE: A NOTE indicates important information that helps you make better use of your computer.

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

January 2011 Rev. A00

Contents

Installation Overview

1. Review information gathered from the customer regarding power requirements, naming, networking, and VLAN numbering schemes.
2. Rack and cable the provisioning server (PS) and switches.
3. Configure the baseboard management controller (BMC) and BIOS information on the PS and the compute nodes (the servers used for accelerators).
4. Install the Ubuntu/Joyent base on the PS.
5. Configure Joyent on the PS.
6. Use the template switch configuration to configure switches with the network addresses and VLAN construction.
7. Install the first compute node.
8. Install the data sets (SmartMachine template).

   NOTE: SmartMachines are zones (ZFS datasets and zone configurations). Formerly called “accelerators,” SmartMachines are optimized virtual machines (VMs) running on the compute nodes.

9. Instantiate the SmartMachine on a compute node.
10. Repeat steps 7, 8, and 9 to add additional compute nodes.
11. Set up the redundant administration server.

Required Information

To complete the installation, you will need the following information:

- Type of cloud to deploy:
  - Proof of concept (PoC)
  - Three in one rack
  - One to three racks
  - Enterprise
- Network address ranges:
  - External range—Routable outside/inside the cloud
  - Internal range—Routable inside/outside the cloud
  - Admin range—Routable inside/outside the cloud
    (The PS with Cloud Control installed requires access to all pods.)
- Domain name system (DNS) information (if required):
  - DNS server
  - DNS domain
- Simple mail transfer protocol (if required):
  - Relay host (not required if using DNS with validate mail server definitions)
  - Domain
  - Email destination for administrative messages
- MAC addresses of the Ethernet card (eth0) on all compute nodes
- Cloud connectivity to the outside world:
  - Customer preference—1G or 10G ports
  - Number of uplink ports

Racking and Cabling

Stacked Top of Rack Switches

When more than one rack of equipment (greater than fourteen compute nodes) is deployed, the top of rack (ToR) switches continue to perform layer three routing and are logically stacked.

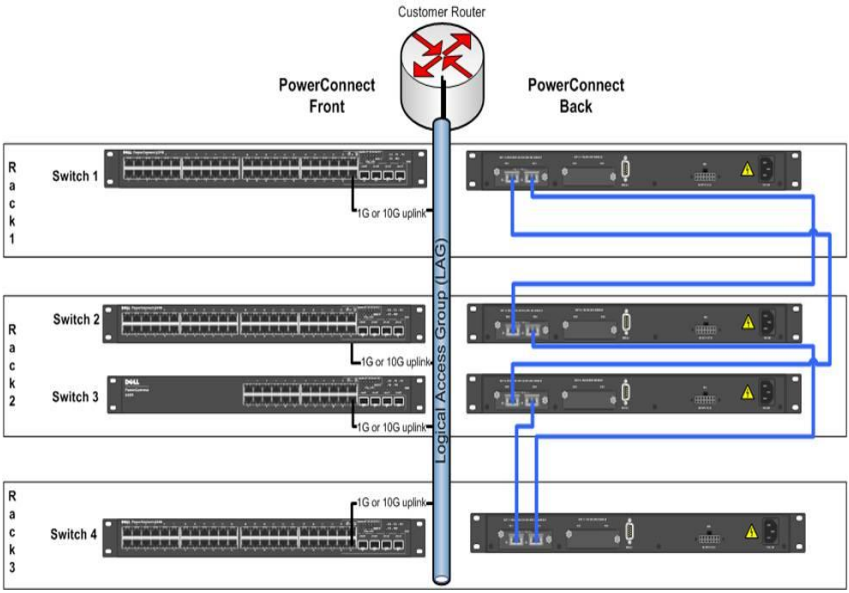


Figure 1. Three-Rack Stacked Network Configuration

Enterprise Deployment

Within the enterprise deployment, the stacked multiple switches are maintained within sets of three racks. These racks are aggregated at a pair of core switches with multiple redundant links.

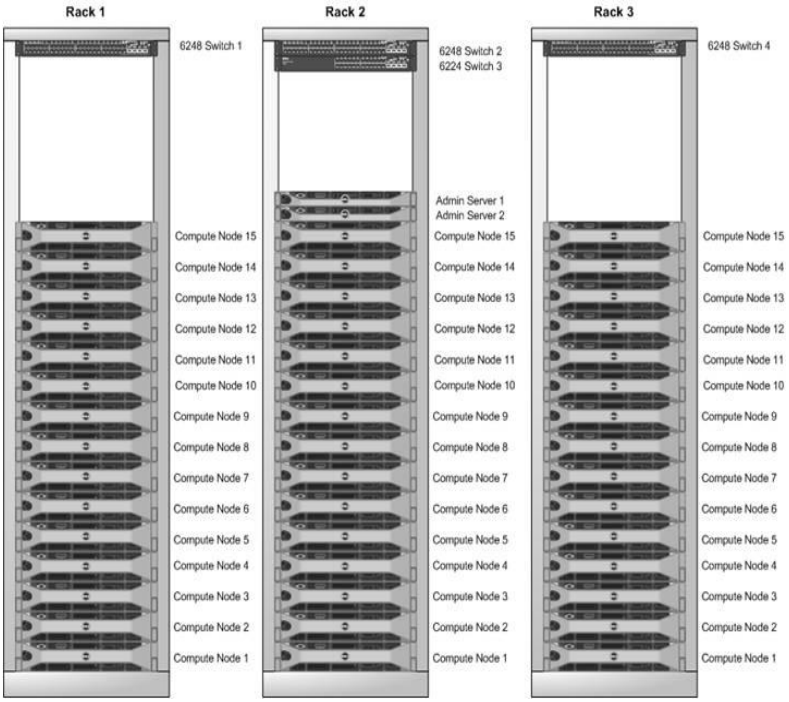


Figure 2. Node Placement in a Three-Rack Configuration

Switch Port Assignments

Regardless of the deployment, the ToR switch is either a PowerConnect 6224 or 6248.

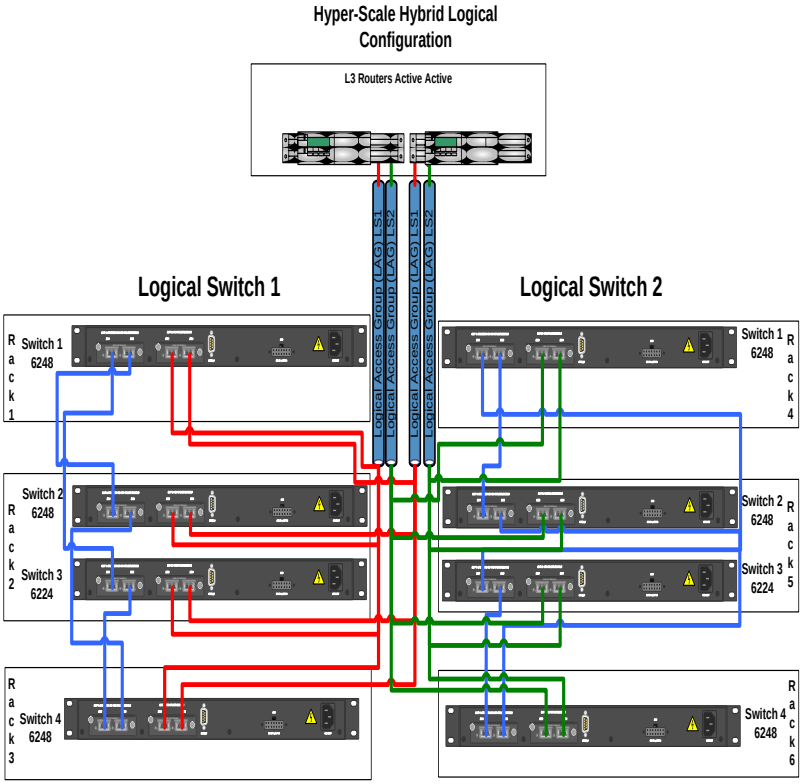


Figure 3. Switch Ports

Following are the VLAN port assignments.

6248 Ports

Network	Ports	Notes
Admin	X/g1-X/g15	Untagged
External/Public	X/g16-X/g30	Tagged
Internal/Private	X/g31-X/g45	Tagged
External/Public	X/g46	Untagged for admin node
Admin	X/g47	Untagged
Uplink	X/g48	Only if required

For the admin node, port g47 is used for the admin network and port g46 is used for the external network. The switch configuration is the same for all deployments. Depending on the setup, some ports are not populated. In all cases, at least two ports remain unused to allow for quick re-routing around port failures. The uplink and cross-switch connections vary depending on deployment.

6224 Ports

Network	Ports	Notes
Admin	X/g1-X/g5	Untagged
External/Public	X/g6-X/g10	Tagged
Internal/Private	X/g11-x/g15	Tagged
External/Public	X/g16	Untagged
Admin	X/g17	Untagged
Uplink	X/g24	Only if required

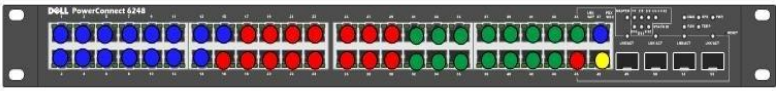
For the admin node, port g17 is used for the admin network and port g16 is used for the external network. The switch configuration is the same for all deployments. Depending on the setup, some ports are not populated. The uplink and cross-switch connections vary based on deployment.

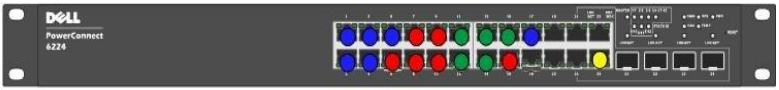
Blue: Admin

Red: Public

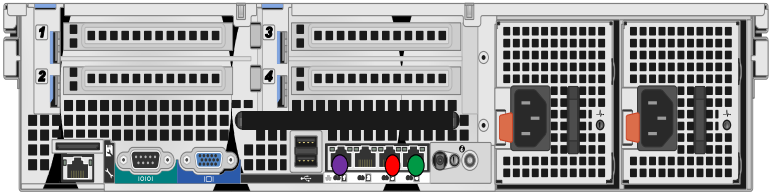
Green: Private

Yellow: Uplink

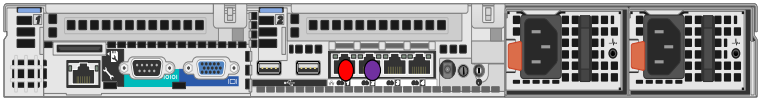




NOTE: The following two figures are for the R710 and R610, respectively.



Compute Node



Cloud Control/ Provisioning Server

Figure 4. Port Assignments

Configure BMC and BIOS Information on the Compute Nodes and PS

RAID Setting for all Nodes

Configure all compute nodes in the solution as follows:

- First two drives (indicated by the server drive number on the front): Labeled “OS Volume”—Configure as Raid 1.
- Remaining drives:
  Labeled “Data Volume”—Configure as Raid 5.
- PS nodes: Configure as RAID 10, utilizing all drives.

Use default settings for everything else.

BIOS Settings for PowerEdge Servers (R610/R710)

NOTE: Record the MAC address of interface eth0 for later use.

System Setup Program BIOS Settings

Screen	Option	Setting
Processor Settings	Virtualization Technology	**Enabled**
Serial Communication	Serial Communication	**ON with Console Redirection via COM2**
	Serial Port Address	**Serial Device1=COM1, Serial Device2=COM2** (default)
	Failsafe Baud Rate	**115200** (default)
	Remote Terminal Type	**VT100/VT220** (default)
	Redirection After Boot	**Enabled** (default)
Power Management	Power Management	**Maximum Performance**

- Set the iDRAC6 mode to **Shared**.
- Set the IP and gateway addresses to the address on the administration network, and set the username and password.

BIOS Settings for PowerEdge–C Servers (C1100/C2100)

NOTE: Record the MAC address of interface eth0 for later use.

BIOS Setup Utility

Menu	Option	Setting
Advanced	CPU Configuration➔Intel(R) Virtualization Tech	**Enabled** (default)
	PCI Configuration➔Intel VT-d	**Enabled**
Boot	Boot Settings Configuration➔Quick Boot	**Enabled** (default)
	Boot Settings Configuration➔Force PXE First	**Disabled**
	Boot Settings Configuration➔Boot Order	First—PowerEdge Expandable RAID Controller (PERC) Second—PXE network interface card (NIC)
Server	Set iBMC LAN Configuration➔iBMC LAN Port Configuration	**Shared-NIC** (default)
	Set iBMC LAN Configuration➔DHCP Enabled	**Disabled** (default)
	Set iBMC LAN Configuration➔IP Address	IP address from administration network
	Set iBMC LAN	IP address from

Menu	Option	Setting
	Configuration➔Gateway Address	administration network
	Remote Access Configuration➔Remote Access	**Enabled** (default)
	Remote Access Configuration➔Serial Port Number	**COM2** (BMC or DRAC)
	Remote Access Configuration➔Serial Port Mode	**115200 8,n,1** (default)
	Remote Access Configuration➔Redirection After BIOS POST	**Enabled** (default)
	Restore on AC Power Loss	**Power On**
Security	Change Supervisor Password/Change User Password	User password

Install Ubuntu/Joyent Base on the PS with VMware Player

Prior to the installation, verify that the following requirements are met:

- The admin node BIOS is configured appropriately. The most important element in this install is that the BIOS be configured to boot from the second network interface card.
- A KVM is available, either in a data center crash-cart or purchased for the rack.
- The following files are available:
  - VMware Player for your system:
    - Windows: **VMware-player-3.1.3-324285.exe**
    - Linux: **VMware-Player-3.1.3-324285.x86_64.bundle**
  - Joyent software DVD from iDrive: **H732PA00v526_16.iso**
  - Joyent install VM: **joyent_installer.tgz**

Install VMware Player and Virtual Machine

To prepare the virtual machine for the first time, follow these steps. (After the installation is complete, simply booting the VM will be sufficient.)

1. Install the VMware Player using the install image for your system.

   In Windows, double-click the executable file and accept the default values.

   a. Ensure that the network bridge is connected to the physical port.

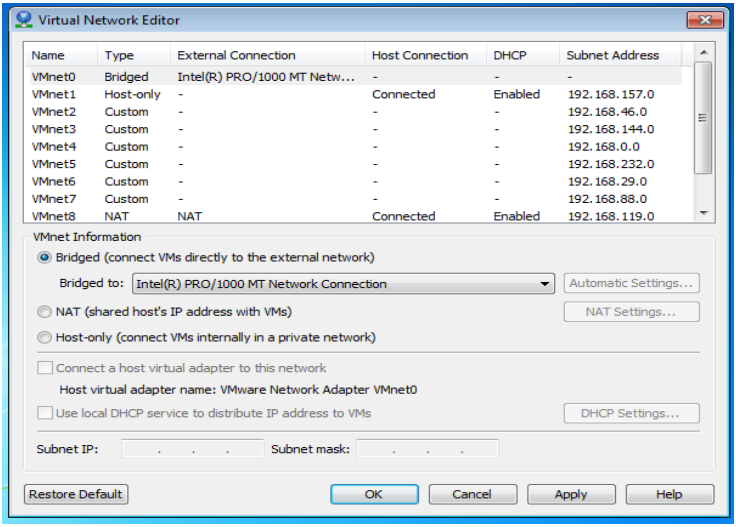
   b. Obtain **VMnetcfg.exe.** It is included in the installer, but is not installed. To get the file, run the installer with the `/e` option. Example:

   c. `VMware-player-3.0.0-197124.exe /e .\extract`

   All contents are extracted to an extract folder.

   d. Open network.cab and copy VMnetcfg.exe to an installation folder (typically C:\Program Files\VMware\VMware Player\).

   e. Run **VMnetcfg.exe.** Select the **Bridged** radio button, and from the **Bridged to:** drop-down list, select the proper external connection.



In Linux, run the following commands and accept the default values:

```
cd/<install path>
```

```
chmod +x VMware-Player-3.1.3-
324285.x86_64.bundle
```

./VMware-Player-3.1.3-324285.x86_64.bundle

2 Extract the Joyent VM image.

In Windows, use Winzip (or other program) to extract the components to a directory.

In Linux, run the following commands:

```
cd/<image destination>
```

```
tar -zxvf<joyent_installer.tgz image>
```

3 Configure the initial image.

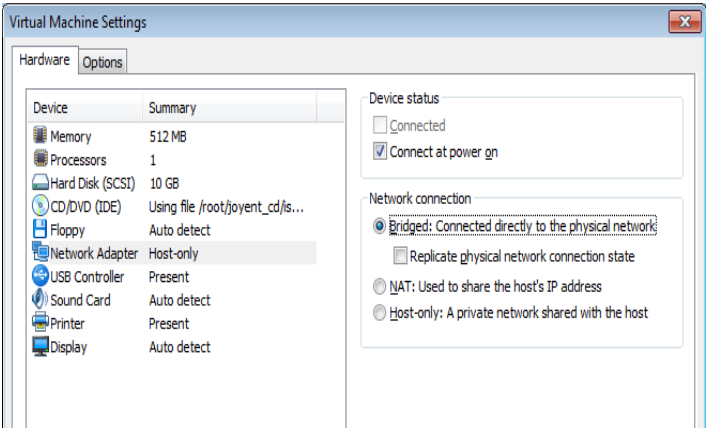
a Start VMware Player:
In Windows, double-click the icon.
In Linux, run the command `<path>/vmplayer`.

b Click the Open a Virtual Machine link.

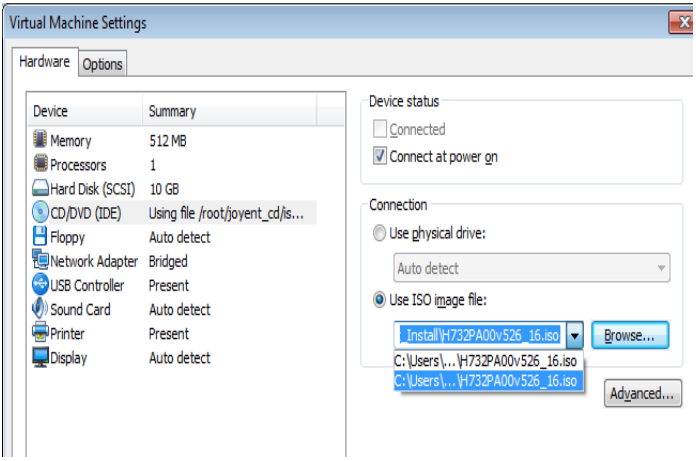
c Browse to and open the ***.vmx** file.

d The machine appears in the navigation panel. Click the **Edit virtual machine settings** link.

e On the **Hardware** tab, select **Network Adapter**. Click the **Bridged: Connected directly to the physical network** radio button if it is not already selected.



f On the **Hardware** tab, select **CD/DVD (IDE).** Click the **Use ISO image file** radio button if it is not already selected, then browse to and select the Joyent iso (**H732PA00v526_16.iso**).

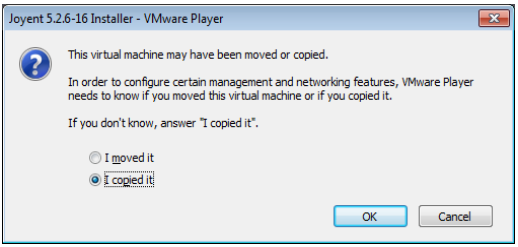


g Click the **OK** button to save the changes.

Installing the Admin Node

After preparing the VM, install the admin node.

1. Prepare the host machine:
   a. Turn off wireless (not required, but ensures that the VMware Player uses the Ethernet port).
   b. Close other programs to make resources available for the VM, which requires approximately 1G of memory (512M for the VM and 512M for cache and overhead).
2. Start the VMware Player:
   a. *In Windows*, double-click the icon.
   In Linux, run the command `<path>/vmplayer`.
   b. In the navigation panel, select **Joyent 5.2.6-16 Installer** and click the **Play virtual machine** link.
   c. If you are running the VM for the first time, the following message displays. Select the **I copied it** radio button, then click the **OK** button.



   d. The Ubuntu login screen displays. The system is ready for the installation of an admin node.
3. Use a standard Ethernet cable to connect the host machine's Ethernet port to the admin node's second Ethernet port (the one plugged into the admin network).
4. Force the admin node to execute a PXE network boot (usually <F11> from the BIOS screen). Once the admin node returns to a login prompt with hostname redundant, the install is complete.
5. Re-cable the admin node back into the switch.
6. Power off the VM: From the menu bar, select **Virtual Machine➔ Power➔Power Off**.

7 Stop the VMware Player. From the menu bar, select **Virtual Machine➔Exit.**

8 Continue the install process by logging into the admin node as user "jill" with password "joyent".

Troubleshooting

- For both the VM and the PS, the login user name is "jill" and the password is "joyent". Use **sudo** to run root commands.
- If you move a VM (instead of using a fresh copy from the ***.tgz** file) or if the DHCP server fails to start because of a missing interface, log in to the VM and as root, edit the file **/etc/udev/rules.d/70-persistent-net.rules** to remove the eth0 line. Reboot the VM.
- If the admin node network boots but then fails due to missing files, verify that the CD ***.iso** file is the correct one and is mounted. If the CD image is wrong or missing, restart the VM.

Configure Joyent For the PS

The install process automatically instantiates the services and other configured items. This edits the **/opt/cloudcontrol/bootstrap/config.json** file. This file does not take comments or variables.

CAUTION: Most of the file must not be modified because it is the full configuration for the rest of the system.

Run the following to edit the file:

- `cd/opt/cloudcontrol/bootstrap`
- `cp config.json config.json.orig`
- `vi config.json`

Make the appropriate changes to each file section (refer to the examples on the following pages). When finished, save and exit.

NFS Section

```
nfs: {
    exports: {
      /jumpstart/OS:
192.168.1.0/24(ro,no_root_squash,async,no_subtree_
check)
      /jumpstart:
192.168.1.0/24(ro,no_root_squash,async,no_subtree_
check)
    }
  }
```

Change “192.168.1.0/24” to the admin network address and mask.

Net Section

```
net: {
    interfaces: {
      eth0: {
        mode: dhcp
      }
      eth1: {
        netmask: 255.255.255.0
        mode: static
        address: 192.168.1.1
      }
    }
  }
```

This section represents the networking on the admin server. The default networks and routing are shown below. The first network should be on the external network. Replace the `mode: dhcp` line with the following:

```
netmask: 255.255.254.0
mode: static
address: 10.0.50.240
gateway: 10.0.50.1
```

Verify that the `eth1` section matches the networking for the admin network.

Nameservers Section

```
nameservers: [
    8.8.8.8
    127.0.0.1
  ]
```

- If there are nameservers, replace the “8.8.8.8” with lines for each server.
- If there are no nameservers, remove the “8.8.8.8” line.
- In all cases, leave the `127.0.0.1` line last.

DHCP Section

```
dhcpd: {
    interfaces: [
      eth1
    ]
    subnets: {
      192.168.1.0/255.255.255.0: {
        range_first: 192.168.1.6
        range_last: 192.168.1.20
        routers: 192.168.1.1
        vlan: 100
      }
    }
  }
```

This section specifies the DHCP environment for the pod. It uses the admin interface.

- Verify that `eth1` matches the interface with the admin network from the Net section.
- `Subnets`—Defines the admin network. Update the subnet and mask.
- `Range_first` and `range_last`—Refers to the range of addresses reserved for the compute nodes. This list is inclusive.
- `Routers`—Change to the default router for the admin network.
- `VLAN`—Set to the VLAN ID for the admin network. The system will use an untagged interface, but this will aide switch configuration.

NTP Section

```
ntp: {
    servers: [
      pool.ntp.org
    ]
    broadcast: 192.168.0.255
  }
```

This section specifies the servers to sync with and the broadcast address to use to send out updates.

- `Servers`: If there are no servers to use, leave the field empty; otherwise, enter a comma-separated list of names or IP addresses.
- `Broadcast`: Enter the broadcast address of the admin network.

Nodes Section

```
  nodes: {
  }
```

Do not modify this section. It is used to store information when the **add-host** command is used to add compute nodes to the system.

Postfix Section

```
  postfix: {
    relayhost: 10.0.0.1
    myhostname: ubuntu
    mydomain: joyent.us
    myorigin: joyent.us
  }
```

This section configures the mail server on the compute node. If there is an outbound mail server, enter the IP address in the `relayhost` field. If there is not an outbound mail server, enter `""` in the field.

Set the other three parameters according to the desired outbound mail header. Ideally, use the name and domain of the admin server.

Postgres Section

```
postgres: {
    db_username: joyent
    db_password: joy4postgres
    db_host: localhost
  }
```

This section defines the user, password, and host for the Postgres database used by Cloud Control.

BIND Section

```
  bind: {
    admin_email: root@joyent.dev
  }
```

This section defines the email address used to notify the nameserver of issues inside the **BIND** files.

Recipes Section

CAUTION: This section directs the installation system. Do not modify it.

```
recipes: [
 update_hostname
 appliance
 net
 bind9
 dhcpd
 nfs::server
 tftpd
 nginx
 pkgsrc_nginx
 jumpstart::pxegrub
 jumpstart::profile
 dns::client
 postgresql
 postfix
```

```
 rabbitmq
 apps
   apps::cloud_control
 apps::cloud_control_api
 apps::cloud_control_dop
 apps::cloud_control_capi
 cloud_control_defaults
 god
 switch_config
  ]
```

Apps Section

CAUTION: This section defines Joyent's Cloud Control applications and controls their ports and number of workers. Do not modify it.

```
apps: {
    cloud_control_api: {
      port: 8081,
      workers: 4
    }
    cloud_control_capi: {
      port: 8082,
      workers: 4
    }
    cloud_control_dop: {
      port: 8083
      workers: 4
    }
    cloud_control: {
      port: 8080,
      workers: 4
    }
  }
```

Sysinfo Section

```
sysinfo: {
  domain: joyent.dev
  hostname: ubuntu
}
```

This section defines the domain and hostname of the admin server. Complete both fields.

Internal Section

```
internal: {
 192.168.2.0/255.255.255.0: {
  range_first: 192.168.2.6
  range_last: 192.168.2.20
  routers: 192.168.2.1
  vlan: 200
  }
}
```

This section defines the networking parameters for the internal network. Complete all sections.

The `range_first` and `range_last` information defines an inclusive network range for compute nodes.

External Section

```
external: {
  192.168.3.0/255.255.255.0: {
    range_first: 192.168.3.6
    range_last: 192.168.3.20
    routers: 192.168.3.1
    vlan: 300
  }
}
```

This section defines the networking parameters for the external network, Complete this section the same way you completed the “Internal” section.

TFTP Section

CAUTION: This section defines the location of the jumpstart directory that is served by the TFTP server. Do not modify it.

```
  tftpd: {
    directory: /jumpstart
  }
```

RabbitMQ Section

```
rabbitmq: {
vhosts: [
/metrics
]
 user: joyent
 password: spaghetti
}
```

This section defines the parameters for the Erlang-based message bus and is used to gather metrics. If a user or password is changed, it must be synchronized with metering clients.

Cloud Control Defaults

```
cloud_control_defaults: {
    data_center: {
      company_name: ACME
      city: Shelbyville
      state: CA
    },
    http_basic: {
      user: admin
      password: joyadmin
    }
    admin: {
      login: admin
      company_name: ACME
      first_name: Cloud
```

```
      last_name: Admin
      email_address: admin@cloud.local
      password: joyadmin
    },
    datasets: [
      protemplate-2.3.2
      mysql-1.0.2
      dell_zxtm-7.0.2
    ],
    api: {
      user: admin
      password: joyadmin
      mcp_uri:https: //localhost:8080/admin/
      mail_from: support@joyent.com
      mail_to: devs@joyent.com
      sendmail_path: /usr/sbin/sendmail
    },
    pod: {
      nameservers: 192.168.1.1
      pkgsrc_url:http:
//192.168.1.1:8090/2010Q2/packages/All
    }
  }
```

This section defines the initial configuration in the Cloud Control database. Each subsection defines part of the CC object model. Not all objects are presented and not all UI fields are reflected here. Only the ones specified in this file are used or settable.

- `User` and `login` fields—Do not change.
- `Password`—Keep these fields in sync for concurrent operation. There are three passwords for the admin user. You must change all three for proper operation.
- `Nameserver`—Should point to the external address of the admin server.
- `Pkgsrc_url`—Should point to the external address of the admin server.

Uplink Section

```
uplink: {
    192.168.34.0/255.255.255.0: {
      routers: 192.168.34.1
      address: 192.168.34.12
      vlan: 2
    }
  }
```

This section defines the network used by the switches to connect the cloud to the rest of the network.

- `Routers`—Defines the default gateway for this network.
- `Address`—Defines the address the switch should use in this network.
- `VLAN`—Defines the VLAN ID for this network to use within the cloud. The uplinks are not tagged.

Switch Section

```
switch: {
password: cow2cow2,
snmp_community: snmpRules
uplink_10g: 0
admin_hyper_ip: 10.0.0.1
arista_virtual_mac: 00:1c:73:00:00:99
arista_mgmt_vlan: 4094
arista_mgmt_r1_ip: 10.0.0.1
arista_mgmt_r2_ip: 10.0.0.2
arista_mgmt_mask_bits: 30
arista_admin_r1_ip: 192.168.1.2
arista_admin_r2_ip: 192.168.1.3
arista_external_r1_ip: 192.168.1.2
arista_external_r2_ip: 192.168.1.3
arista_internal_r1_ip: 192.168.1.2
arista_internal_r2_ip: 192.168.1.3
arista_uplink_r1_ip: 192.168.1.2
arista_uplink_r2_ip: 192.168.1.3
}
```

This section defines the switch information needed to build switch configurations.

- `Password`—Password used to access the switch's command line interface (CLI).
- `Snmp_community`—SNMP RO password.
- `Uplink_10g`—Set to 1 if the customer will be using 10G uplinks or the deployment will use Arista switches.

Redundant Admin Section

```
redundant_admin: {
on: 0
macs: [
00:21:9b:9d:01:56
00:e0:81:46:61:e6
]
interface: eth1
install_interface: eth1
admin_address: 192.168.100.10
}
```

This section defines the information needed to build a redundant admin node and have the systems backup and restore each other. The system assumes two nodes.

- `On`—Set to 1 to enable automatic backup jobs to the backup admin node.
- `Macs`—The two admin interfaces on the admin nodes.
- `Interface`—Leave this as is.
- `Admin_address`—The address of the redundant admin for the admin network.

Install Joyent on the PS

Complete the configuration process on the PS.

1 First, run the following:

```
cd/opt/cloudcontrol
sudo –s ./install.sh
```

2 The script asks you to press any key to continue. When the process is finished, the cloud is configured and ready to have compute nodes added.

If you encounter a problem with the **config.json** file, edit it and run the following commands before running `install.sh` again. Watch for missing commas or extra commas within stanzas.

```
sudo rm –rf /data
sudo rm –rf /opt/joyent
sudo rm –rf /jumpstart/*
```

Final Switch Configuration

At the completion of the install script run, the system generates a set of switch configurations to apply to your switches.

NOTE: This procedure refers only to the PoC or three-rack system.

Follow these steps:

1 Run `cd/opt/dell/switch`.

2 Select the file that best maps to your configuration:

- 24 port PowerConnect PoC— **poc_24.cfg**
- 48 port PowerConnect PoC— **poc_48.cfg**
- Single rack with three stacked ToR switches— **stack_1x3x15.cfg**
- Three-rack setup— **stack_3x4x45.cfg**

NOTE:. The files **hyper_arista.cfg** and **hyper_3x4x45.cfg** are enterprise scale and do not apply.

3 Copy the file to `/jumpstart/switch/config`**.**
For example,

```
sudo cp /opt/dell/switch/poc_48.cfg
/jumpstart/switch/config.
```

4 If needed, edit `/jumpstart/switch/config` to handle special circumstances.

5 Paste the startup script into `minicom`:

a Press <Cntl + a z>.

b Type <y>.

c Press <Enter>.

d Type `/opt/dell/switch/startup_config.cfg` and press <Enter>.

e The screen scrolls and pulls over the new configuration.

f Press <Cntl + a z q>, then press <Enter>.

At this point, you should be able to ping the router addresses from all the interfaces on the compute nodes and ping the BMC addresses of the compute nodes.

Deploy the Compute Nodes

Complete the following for each compute node.

1 Add the compute node to the system:

a Run: `cd /opt/joyent/bin`

b Run: `./add-host /data/config/config.json c8:0a:a9:1f:94:84 dell_c2100 joyent <hostname>`

NOTE: The MAC is the MAC address of the admin interface on the compute node. `Joyent` is the root password of the compute node. You may specify an optional hostname to override the default naming scheme of admin-1, admin-2, etc.

2 Run the instigate command: `./instigate.`

- If you do not enter command-line arguments, the system asks for an IP address, username, and password.
  - Use the BMC IP address.
  - C2100: Default username and password are `root/root`.
  - R710: Default username and password are `root/calvin`.
- To bypass the questions, use these command-line arguments:

- -h <*host BMC IP*>
- -u root
- -p <*password*>

- To watch through this tool, add -w.
- To check node installation, run `showmount -a` to determine if the node is attached to the admin.

3 Edit the newly added server in Cloud Control.

a Enter the rack information (remember to leave space for servers larger than 1U).

b Click the **Update** button**.**

4 Deploy tools.

- The server appears in the **Requiring Setup** list.
- Each server has a **Deploy Joyprovision Tools** button at the top of its view page.
- The tools have been deployed if you can enter `ssh joyprovsn@<node ip>` directly without password or RSA key challenges.

5 Mark as set up.

- Each server has a **Mark as Setup** button at the top of its view page.
- This step removes a server from the "waiting for setup" list and allows it to be provisioned for zones.

Deploy Templates

On the admin node, run:

```
/opt/dell/bin/finalize_servers.rb
```

The script pushes all the templates to all configured compute nodes and sets up the metering system. This script can be run repeatedly without harm.

Check the Status of the Compute Nodes

On the admin node, run:

```
/opt/dell/bin/collect_information.rb
```

This script prints a comma-separated stream of data for each server, used to validate and store the status of the compute nodes in the cloud.

Set Up the Redundant Administration Server

1. PXE boot the redundant head node from the second interface (this must be set up in the BIOS).
2. Wait for the OS to be installed and the device to come online.
3. On the currently active head node, run:
   ```
   sudo /opt/joyent/bin/run_backups
   ```
   This command pushes the backup files to the redundant node. If the `On` field in `config.json` is set to 1, this will run automatically on an hourly basis.