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This blog post is intended to be a complete, comprehensive step-by-step how-to for installing Oracle 12c RAC GNS ASM Flex Cluster on Ubuntu 14.10 using Oracle Enterprise Linux 6.5 LXC Linux Containers and OpenvSwitch.

Updated Begin for Ubuntu 15.04 2015-05-16

I recently upgraded my laptop to Ubuntu 15.04 and there were a few issues which were resolved which had to do with SCST. The cpu_mask issue is a reported bug in SCST. Bart Van Assche responded back to my SCST list server enquiry with the following information:

```
Until June 2014 there was a
bug in the SCST code for
parsing cpu masks. You may
have hit that bug.
```

```
  Updating to SCST trunk
r5596 or later or to the
latest version of the  SCST
3.0 branch should resolve
the issue related to
parsing cpu masks.
```

Update End for Ubuntu 15.04 2015-05-16

This guide is also a de-facto recipe for creating an OpenvSwitch-based Ubuntu Linux [desktop | laptop] networking environment that accomplishes a number of key goals as enumerated below.

Design Assumptions

This set of procedures has been tested and built on a fresh install of the following Ubuntu distributions. Installation on matching Ubuntu installations which have been running for a few months or years and have been customized could possibly introduce variations of existing configuration that could cause the steps described in this blog to have results different from the desired and expected results, YMMV.   This blog to reiterate assumes a fresh install of the following distributions, and has been built and tested successfully on all of the following distributions of Ubuntu Linux.

- Ubuntu 14.04 64-bit desktop edition
- Ubuntu 14.10 64-bit desktop edition

- Ubuntu 15.04 64-bit desktop edition

Note, if installing Ubuntu 14.04 or 14.10 fresh for this work, do NOT accept the "download updates during install" option. The reason is because these updates contain a number of CVE kernel security updates, and this procedure uses the post install Ubuntu CVE updates to check and verify correct operation of Oracle Ksplice, so, in other words, Oracle Ksplice will handle the post-install CVE kernel security updates. Once KSplice operation has been so verified, Ubuntu Software Updater can be used for updates going forward as normal. Oracle KSplice can be used for urgent CVE kernel security updates with zero downtime as needed.

Definitions

DEU

Density and elasticity unit. What formerly was called a "VM" but which now, with the advent of Linux Containers, requires imho a new term which includes density and elasticity solutions such as LXC which do not use hardware virtualization and as such are not "machines" at all. So in this blog, a "DEU" will be used as the all-inclusive term to describe a single "VM" or "LXC Linux Container".

VM

G+

A type of DEU which uses a hypervisor to virtualize (emulate using software) the hardware layers of an actual physical machine and provides what is often called a "guest" operating system.

LXC

The term LXC will be used interchangeably according to context to either mean the software called LXC which is a Linux Container software in the same category as OpenVZ and others, and in other contexts, LXC may be used to denote a specific single LXC DEU which is running on LXC software.

Design Features

1. No changes to Ubuntu dnsmasq-base default network, i.e is a pure add-on networking overlay;
2. Does not require any changes to Ubuntu NetworkManager or to default Ubuntu networking;
3. Does not require any removal of Linux Bridge software;
4. No physical interfaces directly to the OpenvSwitch (iptables/NAT/masq for external address resolution);
5. Allows external interface switching on LXC containers are running with NO loss of www DNS resolution;
6. Automatic internet-connected

interface (eth0, wlan0, bnep0) detection and connection to OpenvSwitch;

7. Uses OpenvSwitch as the networking solution for LXC, KVM and VirtualBox DEUs;

8. Uses bind9 for OpenvSwitch DNS;

9. Uses isc-dhcp-server for OpenvSwitch DHCP services;

10. Integrates DNS and DHCP to update DNS automatically when new DEUs are added;

11. Uses the built-in Ubuntu dnsmasq-base for Ubuntu default networking.

12. Because it's LXC, VT-d and VT-x are NOT needed so older laptops and desktops without VT-d/x should be able to run LXC

The installation of bind9 is constructed so as not to interfere with the default Ubuntu desktop; that is, both bind9 and dnsmasq-base coexist peacefully and successfully so that even with the OpenvSwitch and bind9 installed, all the features of Ubuntu NetworkManager are preserved, including use of WIFI network manager, VPN manager, and in general ALL default and configurable features of Ubuntu NetworkManager.

Install Synaptic Package Manager (optional)

Synaptic Package Manager is not required, but has some very nice

features so it can be installed. It was the GUI for package management in Ubuntu Linux desktop prior to the introduction of the "Ubuntu Software Manager". Both tools can coexist, and synaptic can sometimes be very useful for some tasks.

```
gstanden@W520:~$ sudo apt-
get install synaptic
Reading package lists...
Done
Building dependency
tree
Reading state
information... Done
The following extra
packages will be installed:
  docbook-xml libcairo-perl
libept1.4.12 libglib-perl
libgtk2-perl libpango-perl
librarian0 rarian-compat
sgml-data
Suggested packages:
  docbook docbook-dsssl
docbook-xsl docbook-
defguide libfont-freetype-
perl libgtk2-perl-doc
perlsgml w3-recs opensp
libxml2-utils dwww menu
deborphan tasksel
The following NEW packages
will be installed:
  docbook-xml libcairo-perl
libept1.4.12 libglib-perl
libgtk2-perl libpango-perl
librarian0 rarian-compat
sgml-data synaptic
0 upgraded, 10 newly
installed, 0 to remove and
79 not upgraded.
Need to get 3,396 kB of
archives.
After this operation, 17.5
MB of additional disk space
will be used.
Do you want to continue?
[Y/n] Y
Get:1
http://us.archive.ubuntu.com
/ubuntu/ utopic/main
libept1.4.12 amd64 1.0.12
[142 kB]
Get:2
http://us.archive.ubuntu.com
/ubuntu/ utopic/main sgml-
```

```
data all 2.0.9-1 [277 kB]
Get:3
http://us.archive.ubuntu.com
/ubuntu/ utopic/main
docbook-xml all 4.5-7.2
[336 kB]
Get:4
http://us.archive.ubuntu.com
/ubuntu/ utopic/universe
libcairo-perl amd64
1.104-1build1 [91.9 kB]
Get:5
http://us.archive.ubuntu.com
/ubuntu/ utopic/universe
libglib-perl amd64
3:1.305-1build1 [334 kB]
Get:6
http://us.archive.ubuntu.com
/ubuntu/ utopic/universe
libpango-perl amd64
1.226-1build1 [187 kB]
Get:7
http://us.archive.ubuntu.com
/ubuntu/ utopic/universe
libgtk2-perl amd64
2:1.2492-2 [560 kB]
Get:8
http://us.archive.ubuntu.com
/ubuntu/ utopic/main
librarian0 amd64 0.8.1-6
[50.4 kB]
Get:9
http://us.archive.ubuntu.com
/ubuntu/ utopic/main
rarian-compat amd64 0.8.1-6
[55.7 kB]
Get:10
http://us.archive.ubuntu.com
/ubuntu/ utopic/universe
synaptic amd64 0.81.2
[1,361 kB]
Fetched 3,396 kB in 3s (884
kB/s)
Selecting previously
unselected package
libept1.4.12:amd64.
(Reading database ...
169725 files and
directories currently
installed.)
Preparing to unpack
.../libept1.4.12_1.0.12_amd64
...
Unpacking
libept1.4.12:amd64 (1.0.12)
...
Selecting previously
unselected package sgml-
data.
Preparing to unpack
.../sgml-
data_2.0.9-1_all.deb ...
```

```
Unpacking sgml-data
(2.0.9-1) ...
Selecting previously
unselected package docbook-
xml.
Preparing to unpack
.../docbook-
xml_4.5-7.2_all.deb ...
Unpacking docbook-xml
(4.5-7.2) ...
Selecting previously
unselected package
libcairo-perl.
Preparing to unpack
.../libcairo-
perl_1.104-1build1_amd64.deb
...
Unpacking libcairo-perl
(1.104-1build1) ...
Selecting previously
unselected package libglib-
perl.
Preparing to unpack
.../libglib-
perl_3%3a1.305-1build1_amd64.
...
Unpacking libglib-perl
(3:1.305-1build1) ...
Selecting previously
unselected package
libpango-perl.
Preparing to unpack
.../libpango-
perl_1.226-1build1_amd64.deb
...
Unpacking libpango-perl
(1.226-1build1) ...
Selecting previously
unselected package libgtk2-
perl.
Preparing to unpack
.../libgtk2-
perl_2%3a1.2492-2_amd64.deb
...
Unpacking libgtk2-perl
(2:1.2492-2) ...
Selecting previously
unselected package
librarian0.
Preparing to unpack
.../librarian0_0.8.1-6_amd64.
...
Unpacking librarian0
(0.8.1-6) ...
Selecting previously
unselected package rarian-
compat.
Preparing to unpack
.../rarian-
compat_0.8.1-6_amd64.deb
...
Unpacking rarian-compat
```

```
(0.8.1-6) ...
Selecting previously
unselected package
synaptic.
Preparing to unpack
.../synaptic_0.81.2_amd64.deb
...
Unpacking synaptic (0.81.2)
...
Processing triggers for
sgml-base
(1.26+nmu4ubuntu1) ...
Processing triggers for
man-db (2.7.0.2-2) ...
Processing triggers for
doc-base (0.10.6) ...
Scrollkeeper was installed,
forcing re-registration of
all documents.
Unregistering 34 doc-base
files, re-registering 34
doc-base files...
Registering documents with
scrollkeeper...
Processing triggers for
gnome-menus
(3.10.1-0ubuntu2) ...
Processing triggers for
desktop-file-utils
(0.22-1ubuntu2) ...
Processing triggers for
bamfdaemon
(0.5.1+14.10.20140925-0ubuntu
...
Rebuilding /usr/share
/applications/bamf-
2.index...
Processing triggers for
mime-support (3.55ubuntu1)
...
Processing triggers for
hicolor-icon-theme (0.13-1)
...
Setting up
libept1.4.12:amd64 (1.0.12)
...
Setting up sgml-data
(2.0.9-1) ...
Setting up libcairo-perl
(1.104-1build1) ...
Setting up libglib-perl
(3:1.305-1build1) ...
Setting up libpango-perl
(1.226-1build1) ...
Setting up libgtk2-perl
(2:1.2492-2) ...
Setting up librarian0
(0.8.1-6) ...
Setting up synaptic
(0.81.2) ...
Processing triggers for
sgml-base
```

```
(1.26+nmu4ubuntu1) ...
Setting up docbook-xml
(4.5-7.2) ...
Processing triggers for
sgml-base
(1.26+nmu4ubuntu1) ...
Setting up rarian-compat
(0.8.1-6) ...
Processing triggers for
libc-bin (2.19-10ubuntu2)
...
gstanden@W520:~$
```

Install Oracle Ksplice (optional)

Oracle Ksplice is a free product for Ubuntu Linux which allows updates of kernel software with no downtime. Oracle Ksplice is not required for this project, but as Wim Coaekerts has pointed out here, Oracle Ksplice is likely to play a big role for organizations using Linux Containers, because Ksplice allows zero downtime kernel security patching. So it is included in this blog as part of this build, especially since Ksplice is free to install and use the service for Ubuntu Linux.

Oracle Ksplice will be a key part of any LXC Linux Container deployment because it allows all LXC Containers to continue running during security updates to the single kernel used by all LXC containers on the system. **Installation of Ksplice for Ubuntu 14.10 is detailed here**.

Note, however, that I found that the instructions given at that link DO NOT work for Ubuntu 14.04

nor for Ubuntu 14.10 desktops. In particular, the Oracle agreement popups do not launch from the Ubuntu Software Manager. Thus KSplice must be installed as shown below. Along the way a couple of screens will appear that require accepting license terms etc. Accept the terms and continue. KSplice Uptrack is successfully installed. Installing KSplice I found required attempting to install using Ubuntu Software Center, which fails (screen goes gray), then killing the Ubuntu Software Center screen (force quit) and then running the install with dpkg -i command. There's probably a better way but this works.

Install Pre-requisite Packages for Oracle KSplice

Next install the pre-requisite packages for KSplice. Some of them will already be present, but issue the command with all of them to be sure to get all required Ksplice pre-requisite packages installed.

```
gstanden@W520:~/Downloads$
sudo apt-get install python
python-support debconf
python-yaml uuid-runtime
gnupg python-pycurl lsb-
base python-gtk2 python-
glade2 gksu dbus dbus-x11
python-dbus consolekit
librsvg2-common module-
init-tools lsb-release
dmidecode iproute util-
linux cron debconf curl

Reading package lists...
```

```
Done
Building dependency
tree
Reading state
information... Done
cron is already the newest
version.
debconf is already the
newest version.
dmidecode is already the
newest version.
gnupg is already the newest
version.
iproute is already the
newest version.
librsvg2-common is already
the newest version.
lsb-base is already the
newest version.
lsb-release is already the
newest version.
module-init-tools is
already the newest version.
python is already the
newest version.
python-dbus is already the
newest version.
python-gtk2 is already the
newest version.
util-linux is already the
newest version.
uuid-runtime is already the
newest version.
The following extra
packages will be installed:
  libck-connector0 libcurl3
libgksu2-0 libglade2-0
libpam-ck-connector
libyaml-0-2
Suggested packages:
  python-gtk2-doc libcurl4-
gnutls-dev python-pycurl-
dbg python-pycurl-doc
The following NEW packages
will be installed:
  consolekit curl gksu
libck-connector0 libgksu2-0
libglade2-0 libpam-ck-
connector libyaml-0-2
python-glade2 python-pycurl
python-support python-yaml
The following packages will
be upgraded:
  dbus dbus-x11 libcurl3
3 upgraded, 12 newly
installed, 0 to remove and
76 not upgraded.
Need to get 1,028 kB of
archives.
After this operation, 2,962
kB of additional disk space
will be used.
```

```
Do you want to continue?
[Y/n] Y
Get:1
http://us.archive.ubuntu.com
/ubuntu/ utopic/main libck-
connector0 amd64 0.4.6-5
[8,784 B]
Get:2
http://us.archive.ubuntu.com
/ubuntu/ utopic-
updates/main libcurl3 amd64
7.37.1-1ubuntu3.1 [178 kB]
Get:3
http://us.archive.ubuntu.com
/ubuntu/ utopic/main
libglade2-0 amd64 1:2.6.4-2
[44.6 kB]
Get:4
http://us.archive.ubuntu.com
/ubuntu/ utopic/main
libyaml-0-2 amd64 0.1.6-1
[47.4 kB]
Get:5
http://us.archive.ubuntu.com
/ubuntu/ utopic-
updates/main dbus amd64
1.8.8-1ubuntu2.1 [243 kB]
Get:6
http://us.archive.ubuntu.com
/ubuntu/ utopic/main
consolekit amd64 0.4.6-5
[77.3 kB]
Get:7
http://us.archive.ubuntu.com
/ubuntu/ utopic-
updates/main curl amd64
7.37.1-1ubuntu3.1 [126 kB]
Get:8
http://us.archive.ubuntu.com
/ubuntu/ utopic-
updates/main dbus-x11 amd64
1.8.8-1ubuntu2.1 [21.3 kB]
Get:9
http://us.archive.ubuntu.com
/ubuntu/ utopic/universe
libgksu2-0 amd64
2.0.13~pre1-6ubuntu7 [72.1
kB]
Get:10
http://us.archive.ubuntu.com
/ubuntu/ utopic/universe
gksu amd64 2.0.2-6ubuntu2
[27.8 kB]
Get:11
http://us.archive.ubuntu.com
/ubuntu/ utopic/main
libpam-ck-connector amd64
0.4.6-5 [7,616 B]
Get:12
http://us.archive.ubuntu.com
/ubuntu/ utopic/main
python-glade2 amd64
```

```
2.24.0-3ubuntu3 [8,744 B]
Get:13
http://us.archive.ubuntu.com
/ubuntu/ utopic/universe
python-support all 1.0.15
[26.7 kB]
Get:14
http://us.archive.ubuntu.com
/ubuntu/ utopic/main
python-yaml amd64 3.11-1
[103 kB]
Get:15
http://us.archive.ubuntu.com
/ubuntu/ utopic/main
python-pycurl amd64
7.19.5-3ubuntu1 [36.2 kB]
Fetched 1,028 kB in 3s (262
kB/s)
Selecting previously
unselected package libck-
connector0:amd64.
(Reading database ...
170668 files and
directories currently
installed.)
Preparing to unpack
.../libck-
connector0_0.4.6-5_amd64.deb
...
Unpacking libck-
connector0:amd64 (0.4.6-5)
...
Preparing to unpack
.../libcurl3_7.37.1-1ubuntu3.
...
Unpacking libcurl3:amd64
(7.37.1-1ubuntu3.1) over
(7.37.1-1ubuntu3) ...
Selecting previously
unselected package
libglade2-0:amd64.
Preparing to unpack
.../libglade2-0_1%3a2.6.4-2_a
...
Unpacking libglade2-0:amd64
(1:2.6.4-2) ...
Selecting previously
unselected package libyaml-
0-2:amd64.
Preparing to unpack
.../libyaml-
0-2_0.1.6-1_amd64.deb ...
Unpacking libyaml-0-2:amd64
(0.1.6-1) ...
Preparing to unpack
.../dbus_1.8.8-1ubuntu2.1_amd
...
Unpacking dbus
(1.8.8-1ubuntu2.1) over
(1.8.8-1ubuntu2) ...
Selecting previously
unselected package
```

```
consolekit.
Preparing to unpack
.../consolekit_0.4.6-5_amd64.
...
Unpacking consolekit
(0.4.6-5) ...
Selecting previously
unselected package curl.
Preparing to unpack
.../curl_7.37.1-1ubuntu3.1_am
...
Unpacking curl
(7.37.1-1ubuntu3.1) ...
Preparing to unpack
.../dbus-
x11_1.8.8-1ubuntu2.1_amd64.de
...
Unpacking dbus-x11
(1.8.8-1ubuntu2.1) over
(1.8.8-1ubuntu2) ...
Selecting previously
unselected package
libgksu2-0.
Preparing to unpack
.../libgksu2-0_2.0.13~pre1-6u
...
Unpacking libgksu2-0
(2.0.13~pre1-6ubuntu7) ...
Selecting previously
unselected package gksu.
Preparing to unpack
.../gksu_2.0.2-6ubuntu2_amd64
...
Unpacking gksu
(2.0.2-6ubuntu2) ...
Selecting previously
unselected package libpam-
ck-connector:amd64.
Preparing to unpack
.../libpam-ck-
connector_0.4.6-5_amd64.deb
...
Unpacking libpam-ck-
connector:amd64 (0.4.6-5)
...
Selecting previously
unselected package python-
glade2.
Preparing to unpack
.../python-
glade2_2.24.0-3ubuntu3_amd64.
...
Unpacking python-glade2
(2.24.0-3ubuntu3) ...
Selecting previously
unselected package python-
support.
Preparing to unpack
.../python-
support_1.0.15_all.deb ...
Unpacking python-support
(1.0.15) ...
```

```
Selecting previously
unselected package python-
yaml.
Preparing to unpack
.../python-
yaml_3.11-1_amd64.deb ...
Unpacking python-yaml
(3.11-1) ...
Selecting previously
unselected package python-
pycurl.
Preparing to unpack
.../python-
pycurl_7.19.5-3ubuntu1_amd64.
...
Unpacking python-pycurl
(7.19.5-3ubuntu1) ...
Processing triggers for
ureadahead (0.100.0-16) ...
ureadahead will be
reprofiled on next reboot
Processing triggers for
man-db (2.7.0.2-2) ...
Processing triggers for
gconf2 (3.2.6-2ubuntu1) ...
Processing triggers for
gnome-menus
(3.10.1-0ubuntu2) ...
Processing triggers for
desktop-file-utils
(0.22-1ubuntu2) ...
Processing triggers for
bamfdaemon
(0.5.1+14.10.20140925-0ubuntu
...
Rebuilding /usr/share
/applications/bamf-
2.index...
Processing triggers for
mime-support (3.55ubuntu1)
...
Setting up libck-
connector0:amd64 (0.4.6-5)
...
Setting up libcurl3:amd64
(7.37.1-1ubuntu3.1) ...
Setting up
libglade2-0:amd64
(1:2.6.4-2) ...
Setting up libyaml-
0-2:amd64 (0.1.6-1) ...
Setting up dbus
(1.8.8-1ubuntu2.1) ...
Installing new version of
config file
/etc/init.d/dbus ...
Setting up curl
(7.37.1-1ubuntu3.1) ...
Setting up libgksu2-0
(2.0.13~pre1-6ubuntu7) ...
update-alternatives: using
/usr/share/libgksu/debian
```

```
/gconf-defaults.libgksu-
sudo to provide /usr/share
/gconf/defaults/10_libgksu
(libgksu-gconf-defaults) in
auto mode
Setting up libpam-ck-
connector:amd64 (0.4.6-5)
...
Setting up python-glade2
(2.24.0-3ubuntu3) ...
Setting up python-support
(1.0.15) ...
Setting up python-yaml
(3.11-1) ...
Setting up python-pycurl
(7.19.5-3ubuntu1) ...
Processing triggers for
ureadahead (0.100.0-16) ...
Setting up consolekit
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Setting up dbus-x11
(1.8.8-1ubuntu2.1) ...
Processing triggers for
gconf2 (3.2.6-2ubuntu1) ...
Setting up gksu
(2.0.2-6ubuntu2) ...
Processing triggers for
libc-bin (2.19-10ubuntu2)
...
Processing triggers for
dbus (1.8.8-1ubuntu2.1) ...

gstanden@W520:~/Downloads$
```

Download Oracle KSplice Uptrack

Now download the KSplice
Uptrack *.deb package from the
Ksplice website. Download it
but do not install it (do not use
Ubuntu Software Installer
option). The installation will be
done manually using the "dpkg -i"
command as shown below.

```
gstanden@W520:~/Downloads$
ls -lrt
-rw-rw-r-- 1 gstanden
gstanden 250832 Dec 25
22:54 ksplice-uptrack.deb
```

Install Oracle KSplice Uptrack

Now install KSplice using "dpkg -i" command as shown below.

```
gstanden@W520:~/Downloads$
sudo dpkg -i ksplice-
uptrack.deb

Selecting previously
unselected package ksplice-
uptrack.
(Reading database ...
170869 files and
directories currently
installed.)
Preparing to unpack
ksplice-uptrack.deb ...
Unpacking ksplice-uptrack
(1.2.23-1~ubuntu14.10) ...
Setting up ksplice-uptrack
(1.2.23-1~ubuntu14.10) ...
update-rc.d: warning: start
and stop actions are no
longer supported; falling
back to defaults
Adding 'diversion of
/sbin/modprobe to
/sbin/modprobe.ksplice-orig
by ksplice-uptrack'
Adding 'diversion of
/sbin/depmod to
/sbin/depmod.ksplice-orig
by ksplice-uptrack'
Adding 'diversion of
/usr/share/update-notifier
/notify-reboot-required to
/usr/share/update-notifier
/notify-reboot-
required.ksplice-orig by
ksplice-uptrack'
Adding 'diversion of
/etc/kerneloops.conf to
/etc/kerneloops.conf.ksplice-
orig by ksplice-uptrack'
update-rc.d: warning: start
and stop actions are no
longer supported; falling
back to defaults
 * Restarting Kernel Oops
catching service
kerneloops
[ OK ]
OK
Processing triggers for
ureadahead (0.100.0-16) ...
Processing triggers for
hicolor-icon-theme (0.13-1)
...
Processing triggers for
gnome-menus
(3.10.1-0ubuntu2) ...
```

```
Processing triggers for
desktop-file-utils
(0.22-1ubuntu2) ...
Processing triggers for
bamfdaemon
(0.5.1+14.10.20140925-0ubuntu
...
Rebuilding /usr/share
/applications/bamf-
2.index...
Processing triggers for
mime-support (3.55ubuntu1)
...
Processing triggers for
man-db (2.7.0.2-2) ...
Processing triggers for
python-support (1.0.15) ...

gstanden@W520:~/Downloads$
```

Test KSplice GUI

Test Ksplice using the GUI tool
and see if it finds any updates
that are needed. As shown below,
KSplice locates CVE kernel
security updates that are available
and queues them up for
installation.
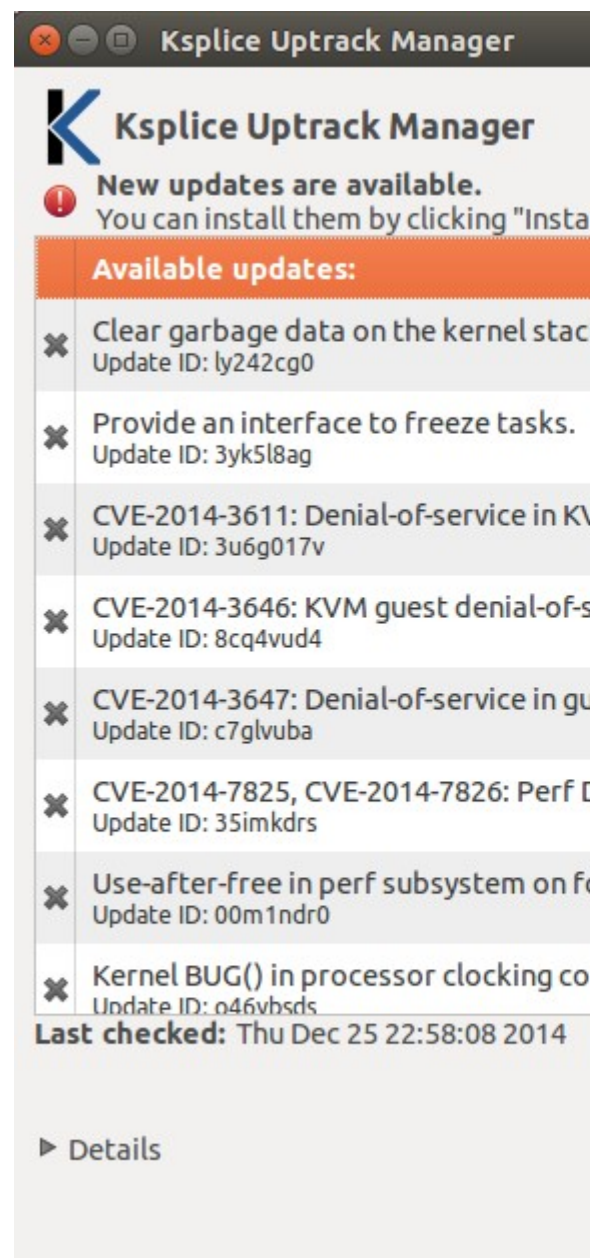
As usual, Ubuntu requires
authentication to run a privileged
app. Enter your linux account
password and press
"authenticate".
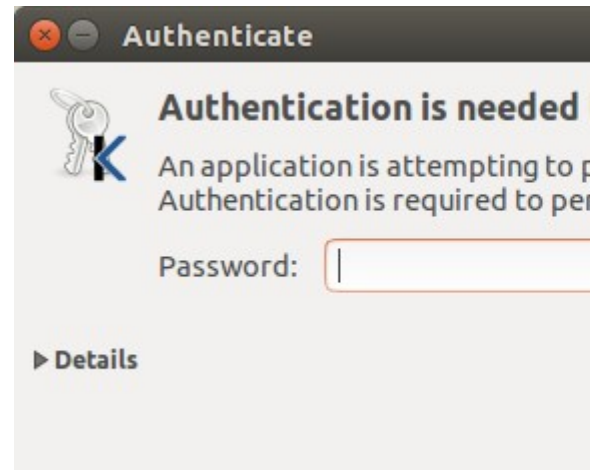
Oracle KSplice Uptrack installs all updates and indicates which updates are currently installing on the progress bar as shown below.
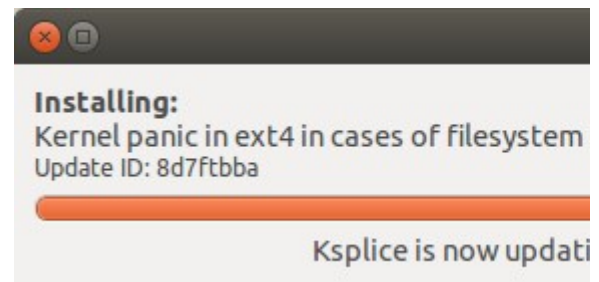
Oracle KSplice Uptrack reports on the GUI that kernel is now fully updated and all CVE have been applied as shown below. Review the updates and press "close".
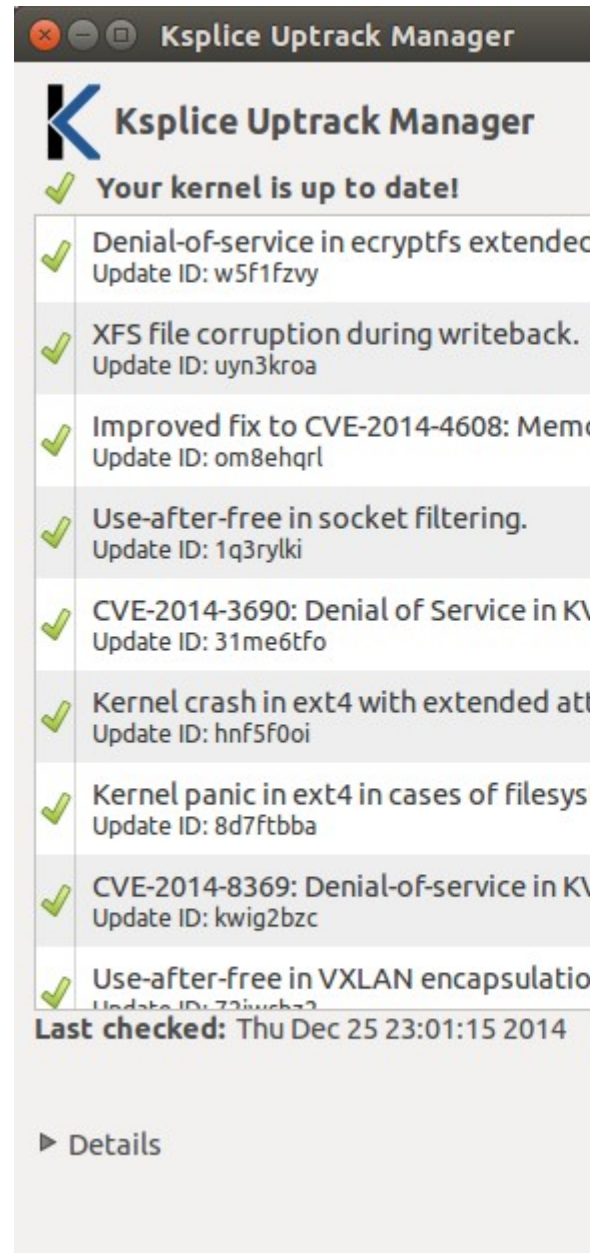
Update Fresh Installation (optional)

If this is a fresh install, then update Ubuntu software to get all most recent updates using the Software Updater app or "sudo apt-get update". If this is not a fresh install, optionally check for updates using the same steps.

Install LXC, OpenvSwitch, and UML-Utilities Packages

Now install other required packages as shown below.

```
gstanden@W520:~$ sudo apt-
get install lxc uml-
utilities openvswitch-
switch
[sudo] password for
gstanden:
Reading package lists...
Done
Building dependency
tree
Reading state
information... Done
The following extra
packages will be installed:
  bridge-utils cloud-image-
utils debootstrap distro-
info distro-info-data
euca2ools libaio1 libboost-
thread1.55.0 liblxc1
librados2 librbd1
libseccomp2 lxc-templates
  openvswitch-common
python-distro-info python-
requestbuilder python-
requests python-setuptools
python-urllib3 python3-lxc
qemu-utils sharutils uidmap
Suggested packages:
  shunit2 btrfs-tools lxctl
qemu-user-static
openvswitch-datapath-module
bsd-mailx mailx user-mode-
linux
The following NEW packages
will be installed:
  bridge-utils cloud-image-
utils debootstrap distro-
info distro-info-data
euca2ools libaio1 libboost-
thread1.55.0 liblxc1
librados2 librbd1
libseccomp2 lxc
  lxc-templates
openvswitch-common
openvswitch-switch python-
distro-info python-
requestbuilder python-
requests python-setuptools
python-urllib3 python3-lxc
qemu-utils
  sharutils uidmap uml-
utilities
0 upgraded, 26 newly
installed, 0 to remove and
0 not upgraded.
Need to get 5,711 kB of
archives.
```

```
After this operation, 25.7
MB of additional disk space
will be used.
Do you want to continue?
[Y/n] Y
Get:1
http://us.archive.ubuntu.com
/ubuntu/ utopic/main
libaio1 amd64 0.3.110-1
[6,454 B]
Get:2
http://us.archive.ubuntu.com
/ubuntu/ utopic/main
libboost-thread1.55.0 amd64
1.55.0+dfsg-1ubuntu3 [27.4
kB]
Get:3
http://us.archive.ubuntu.com
/ubuntu/ utopic/main
libseccomp2 amd64 2.1.1-1
[26.3 kB]
Get:4
http://us.archive.ubuntu.com
/ubuntu/ utopic/main
liblxc1 amd64
1.1.0~alpha2-0ubuntu3 [173
kB]
Get:5
http://us.archive.ubuntu.com
/ubuntu/ utopic-
updates/main librados2
amd64
0.80.7-0ubuntu0.14.10.1
[1,582 kB]
Get:6
http://us.archive.ubuntu.com
/ubuntu/ utopic-
updates/main librbd1 amd64
0.80.7-0ubuntu0.14.10.1
[355 kB]
Get:7
http://us.archive.ubuntu.com
/ubuntu/ utopic/main
python-urllib3 all 1.8.3-1
[43.9 kB]
Get:8
http://us.archive.ubuntu.com
/ubuntu/ utopic/main
python-requests all 2.3.0-1
[191 kB]
Get:9
http://us.archive.ubuntu.com
/ubuntu/ utopic/main
python-requestbuilder all
0.1.0-1 [25.5 kB]
Get:10
http://us.archive.ubuntu.com
/ubuntu/ utopic/main
bridge-utils amd64
1.5-7ubuntu1 [29.1 kB]
Get:11
http://us.archive.ubuntu.com
```

```
/ubuntu/ utopic/main
distro-info-data all 0.23
[4,032 B]
Get:12
http://us.archive.ubuntu.com
/ubuntu/ utopic/main
distro-info amd64 0.14
[20.1 kB]
Get:13
http://us.archive.ubuntu.com
/ubuntu/ utopic/main
python-setuptools all
5.5.1-1 [218 kB]
Get:14
http://us.archive.ubuntu.com
/ubuntu/ utopic/main
euca2ools all
3.0.2-1ubuntu1 [251 kB]
Get:15
http://us.archive.ubuntu.com
/ubuntu/ utopic/main
python3-lxc amd64
1.1.0~alpha2-0ubuntu3 [20.3
kB]
Get:16
http://us.archive.ubuntu.com
/ubuntu/ utopic/main lxc
amd64 1.1.0~alpha2-0ubuntu3
[509 kB]
Get:17
http://us.archive.ubuntu.com
/ubuntu/ utopic/main lxc-
templates amd64
1.1.0~alpha2-0ubuntu3 [63.1
kB]
Get:18
http://us.archive.ubuntu.com
/ubuntu/ utopic/main
python-distro-info all 0.14
[8,200 B]
Get:19
http://us.archive.ubuntu.com
/ubuntu/ utopic-
updates/main qemu-utils
amd64 2.1+dfsg-4ubuntu6.3
[426 kB]
Get:20
http://us.archive.ubuntu.com
/ubuntu/ utopic/main
sharutils amd64 1:4.14-2
[146 kB]
Get:21
http://us.archive.ubuntu.com
/ubuntu/ utopic/main uidmap
amd64 1:4.1.5.1-1.1ubuntu2
[63.0 kB]
Get:22
http://us.archive.ubuntu.com
/ubuntu/ utopic/main cloud-
image-utils all
0.27-0ubuntu10 [25.8 kB]
Get:23
```

```
http://us.archive.ubuntu.com
/ubuntu/ utopic/main
debootstrap all 1.0.64
[30.0 kB]
Get:24
http://us.archive.ubuntu.com
/ubuntu/ utopic/main
openvswitch-common amd64
2.1.3-0ubuntu1 [488 kB]
Get:25
http://us.archive.ubuntu.com
/ubuntu/ utopic/main
openvswitch-switch amd64
2.1.3-0ubuntu1 [919 kB]
Get:26
http://us.archive.ubuntu.com
/ubuntu/ utopic/universe
uml-utilities amd64
20070815-1.3ubuntu1 [61.9
kB]
Fetched 5,711 kB in 35s
(161 kB/s)
Selecting previously
unselected package
libaio1:amd64.
(Reading database ...
200362 files and
directories currently
installed.)
Preparing to unpack
.../libaio1_0.3.110-1_amd64.d
...
Unpacking libaio1:amd64
(0.3.110-1) ...
Selecting previously
unselected package
libboost-
thread1.55.0:amd64.
Preparing to unpack
.../libboost-
thread1.55.0_1.55.0+dfsg-
1ubuntu3_amd64.deb ...
Unpacking libboost-
thread1.55.0:amd64
(1.55.0+dfsg-1ubuntu3) ...
Selecting previously
unselected package
libseccomp2:amd64.
Preparing to unpack
.../libseccomp2_2.1.1-1_amd64
...
Unpacking libseccomp2:amd64
(2.1.1-1) ...
Selecting previously
unselected package liblxc1.
Preparing to unpack
.../liblxc1_1.1.0~alpha2-0ubu
...
Unpacking liblxc1
(1.1.0~alpha2-0ubuntu3) ...
Selecting previously
unselected package
```

```
librados2.
Preparing to unpack
.../librados2_0.80.7-0ubuntu0
...
Unpacking librados2
(0.80.7-0ubuntu0.14.10.1)
...
Selecting previously
unselected package librbd1.
Preparing to unpack
.../librbd1_0.80.7-0ubuntu0.1
...
Unpacking librbd1
(0.80.7-0ubuntu0.14.10.1)
...
Selecting previously
unselected package python-
urllib3.
Preparing to unpack
.../python-
urllib3_1.8.3-1_all.deb ...
Unpacking python-urllib3
(1.8.3-1) ...
Selecting previously
unselected package python-
requests.
Preparing to unpack
.../python-
requests_2.3.0-1_all.deb
...
Unpacking python-requests
(2.3.0-1) ...
Selecting previously
unselected package python-
requestbuilder.
Preparing to unpack
.../python-
requestbuilder_0.1.0-1_all.de
...
Unpacking python-
requestbuilder (0.1.0-1)
...
Selecting previously
unselected package bridge-
utils.
Preparing to unpack
.../bridge-
utils_1.5-7ubuntu1_amd64.deb
...
Unpacking bridge-utils
(1.5-7ubuntu1) ...
Selecting previously
unselected package distro-
info-data.
Preparing to unpack
.../distro-info-
data_0.23_all.deb ...
Unpacking distro-info-data
(0.23) ...
Selecting previously
unselected package distro-
info.
```

```
Preparing to unpack
.../distro-
info_0.14_amd64.deb ...
Unpacking distro-info
(0.14) ...
Selecting previously
unselected package python-
setuptools.
Preparing to unpack
.../python-
setuptools_5.5.1-1_all.deb
...
Unpacking python-setuptools
(5.5.1-1) ...
Selecting previously
unselected package
euca2ools.
Preparing to unpack
.../euca2ools_3.0.2-1ubuntu1_
...
Unpacking euca2ools
(3.0.2-1ubuntu1) ...
Selecting previously
unselected package python3-
lxc.
Preparing to unpack
.../python3-
lxc_1.1.0~alpha2-0ubuntu3_amd
...
Unpacking python3-lxc
(1.1.0~alpha2-0ubuntu3) ...
Selecting previously
unselected package lxc.
Preparing to unpack
.../lxc_1.1.0~alpha2-0ubuntu3
...
Unpacking lxc
(1.1.0~alpha2-0ubuntu3) ...
Selecting previously
unselected package lxc-
templates.
Preparing to unpack
.../lxc-
templates_1.1.0~alpha2-0ubunt
...
Unpacking lxc-templates
(1.1.0~alpha2-0ubuntu3) ...
Selecting previously
unselected package python-
distro-info.
Preparing to unpack
.../python-distro-
info_0.14_all.deb ...
Unpacking python-distro-
info (0.14) ...
Selecting previously
unselected package qemu-
utils.
Preparing to unpack
.../qemu-utils_2.1+dfsg-
4ubuntu6.3_amd64.deb ...
Unpacking qemu-utils
```

```
(2.1+dfsg-4ubuntu6.3) ...
Selecting previously
unselected package
sharutils.
Preparing to unpack
.../sharutils_1%3a4.14-2_amd6
...
Unpacking sharutils
(1:4.14-2) ...
Selecting previously
unselected package uidmap.
Preparing to unpack
.../uidmap_1%3a4.1.5.1-1.1ubu
...
Unpacking uidmap
(1:4.1.5.1-1.1ubuntu2) ...
Selecting previously
unselected package cloud-
image-utils.
Preparing to unpack
.../cloud-image-
utils_0.27-0ubuntu10_all.deb
...
Unpacking cloud-image-utils
(0.27-0ubuntu10) ...
Selecting previously
unselected package
debootstrap.
Preparing to unpack
.../debootstrap_1.0.64_all.de
...
Unpacking debootstrap
(1.0.64) ...
Selecting previously
unselected package
openvswitch-common.
Preparing to unpack
.../openvswitch-
common_2.1.3-0ubuntu1_amd64.d
...
Unpacking openvswitch-
common (2.1.3-0ubuntu1) ...
Selecting previously
unselected package
openvswitch-switch.
Preparing to unpack
.../openvswitch-
switch_2.1.3-0ubuntu1_amd64.d
...
Unpacking openvswitch-
switch (2.1.3-0ubuntu1) ...
Selecting previously
unselected package uml-
utilities.
Preparing to unpack
.../uml-
utilities_20070815-1.3ubuntu1
...
Unpacking uml-utilities
(20070815-1.3ubuntu1) ...
Processing triggers for
man-db (2.7.0.2-2) ...
```

```
Processing triggers for
ureadahead (0.100.0-16) ...
ureadahead will be
reprofiled on next reboot
Processing triggers for
install-info
(5.2.0.dfsg.1-4) ...
Setting up libaio1:amd64
(0.3.110-1) ...
Setting up libboost-
thread1.55.0:amd64
(1.55.0+dfsg-1ubuntu3) ...
Setting up
libseccomp2:amd64 (2.1.1-1)
...
Setting up liblxc1
(1.1.0~alpha2-0ubuntu3) ...
Setting up librados2
(0.80.7-0ubuntu0.14.10.1)
...
Setting up librbd1
(0.80.7-0ubuntu0.14.10.1)
...
Setting up python-urllib3
(1.8.3-1) ...
Setting up python-requests
(2.3.0-1) ...
Setting up python-
requestbuilder (0.1.0-1)
...
Setting up bridge-utils
(1.5-7ubuntu1) ...
Setting up distro-info-data
(0.23) ...
Setting up distro-info
(0.14) ...
Setting up python-
setuptools (5.5.1-1) ...
Setting up euca2ools
(3.0.2-1ubuntu1) ...
Setting up python3-lxc
(1.1.0~alpha2-0ubuntu3) ...
Setting up lxc
(1.1.0~alpha2-0ubuntu3) ...
lxc start/running
Setting up lxc dnsmasq
configuration.
Setting up python-distro-
info (0.14) ...
Setting up qemu-utils
(2.1+dfsg-4ubuntu6.3) ...
Setting up sharutils
(1:4.14-2) ...
Setting up uidmap
(1:4.1.5.1-1.1ubuntu2) ...
Setting up cloud-image-
utils (0.27-0ubuntu10) ...
Setting up debootstrap
(1.0.64) ...
Setting up openvswitch-
common (2.1.3-0ubuntu1) ...
Setting up openvswitch-
```

```
switch (2.1.3-0ubuntu1) ...
openvswitch-switch
start/running
Setting up uml-utilities
(20070815-1.3ubuntu1) ...
 * Starting User-mode
networking switch
uml_switch
[ OK ]
Processing triggers for
ureadahead (0.100.0-16) ...
Setting up lxc-templates
(1.1.0~alpha2-0ubuntu3) ...
Processing triggers for
libc-bin (2.19-10ubuntu2.1)
...
gstanden@W520:~$
```

Install DNS and DHCP packages

Next install bind9 and isc-dhcp-utils as shown below.

```
gstanden@W520:~$ sudo apt-
get install bind9
bind9utils isc-dhcp-server
Reading package lists...
Done
Building dependency
tree
Reading state
information... Done
Suggested packages:
  bind9-doc isc-dhcp-
server-ldap
The following NEW packages
will be installed:
  bind9 bind9utils isc-
dhcp-server
0 upgraded, 3 newly
installed, 0 to remove and
0 not upgraded.
Need to get 1,222 kB of
archives.
After this operation, 3,826
kB of additional disk space
will be used.
Get:1
http://us.archive.ubuntu.com
/ubuntu/ utopic-
updates/main bind9utils
amd64 1:9.9.5.dfsg-
4.3ubuntu0.1 [146 kB]
Get:2
http://us.archive.ubuntu.com
```

```
/ubuntu/ utopic-
updates/main bind9 amd64
1:9.9.5.dfsg-4.3ubuntu0.1
[294 kB]
Get:3
http://us.archive.ubuntu.com
/ubuntu/ utopic/main isc-
dhcp-server amd64
4.2.4-7ubuntu14 [782 kB]
Fetched 1,222 kB in 2s (443
kB/s)
Preconfiguring packages ...
Selecting previously
unselected package
bind9utils.
(Reading database ...
201707 files and
directories currently
installed.)
Preparing to unpack
.../bind9utils_1%3a9.9.5.dfsg
4.3ubuntu0.1_amd64.deb ...
Unpacking bind9utils
(1:9.9.5.dfsg-4.3ubuntu0.1)
...
Selecting previously
unselected package bind9.
Preparing to unpack
.../bind9_1%3a9.9.5.dfsg-
4.3ubuntu0.1_amd64.deb ...
Unpacking bind9
(1:9.9.5.dfsg-4.3ubuntu0.1)
...
Selecting previously
unselected package isc-
dhcp-server.
Preparing to unpack
.../isc-dhcp-
server_4.2.4-7ubuntu14_amd64.
...
Unpacking isc-dhcp-server
(4.2.4-7ubuntu14) ...
Processing triggers for
man-db (2.7.0.2-2) ...
Processing triggers for ufw
(0.34~rc-0ubuntu4) ...
Processing triggers for
ureadahead (0.100.0-16) ...
ureadahead will be
reprofiled on next reboot
Setting up bind9utils
(1:9.9.5.dfsg-4.3ubuntu0.1)
...
Setting up bind9
(1:9.9.5.dfsg-4.3ubuntu0.1)
...
Adding group `bind' (GID
128) ...
Done.
Adding system user `bind'
(UID 118) ...
Adding new user `bind' (UID
```

```
118) with group `bind' ...
Not creating home directory
`/var/cache/bind'.
wrote key file "/etc/bind
/rndc.key"
#
 * Starting domain name
service...
bind9
[ OK ]
Setting up isc-dhcp-server
(4.2.4-7ubuntu14) ...
Generating /etc/default
/isc-dhcp-server...
isc-dhcp-server
start/running, process 4943
isc-dhcp-server6 stop/pre-
start, process 4994
Processing triggers for ufw
(0.34~rc-0ubuntu4) ...
Processing triggers for
ureadahead (0.100.0-16) ...
gstanden@W520:~$
```

Install OpenvSwitch Configuration Scripts

These scripts create and configure the OpenvSwitch switches. The "crt_ovs_sw*.sh" scripts and the /etc/init/my-network-up script and reboot to verify openvswitch is creating switches and ports correctly. The scripts are attached to this blog and can be downloaded directly. They will be downloaded by default to "/home /username/Downloads" directory.

Once the scripts are downloaded, create a directory "/home /username/OpenvSwitch" and install the "crt_ovs_sw*.sh" scripts to that directory and set correct permissions as shown below.

Also download the "my-network-up.sh" script from the end of this

blog. This script is used to ensure that the OpenvSwitch "crt_ovs_sw*.sh" scripts run only after networking has started. The idea of using the "my-network-up.sh" script for starting up the OpenvSwitches at boot after the network interfaces are up is **thanks to Cheesehead here**.

Update Ubuntu 15.04 2015-05-16

The my-network-up.sh script doesn't seem to be working anymore in Ubuntu 15.04. In any case, I had to add entries to /etc/rc.local script to get OpenvSwitch network to startup ok at boot on 15.04, so currently, the /etc/init/my-network-up.sh script is still in place, but not working, and now also the following entries are added in /etc/rc.local as well as shown below and it is the /etc/rc.local entries that are starting the OpenvSwitch at boot.

```
gstanden@vmem1:~/OpenvSwitch$
cat /etc/rc.local
#!/bin/sh -e
#
# rc.local
#
# This script is executed
at the end of each
multiuser runlevel.
# Make sure that the script
will "exit 0" on success or
any other
# value on error.
#
# In order to enable or
disable this script just
change the execution
# bits.
#
# By default this script
does nothing.
```

```
/home/gstanden/OpenvSwitch
/crt_ovs_sx1.sh 2>&1 >
/home/gstanden/OpenvSwitch
/crt_ovs_sx1.log
/home/gstanden/OpenvSwitch
/crt_ovs_sw1.sh 2>&1 >
/home/gstanden/OpenvSwitch
/crt_ovs_sw1.log
/home/gstanden/OpenvSwitch
/crt_ovs_sw2.sh 2>&1 >
/home/gstanden/OpenvSwitch
/crt_ovs_sw2.log
/home/gstanden/OpenvSwitch
/crt_ovs_sw3.sh 2>&1 >
/home/gstanden/OpenvSwitch
/crt_ovs_sw3.log
/home/gstanden/OpenvSwitch
/crt_ovs_sw4.sh 2>&1 >
/home/gstanden/OpenvSwitch
/crt_ovs_sw4.log
/home/gstanden/OpenvSwitch
/crt_ovs_sw5.sh 2>&1 >
/home/gstanden/OpenvSwitch
/crt_ovs_sw5.log
/home/gstanden/OpenvSwitch
/crt_ovs_sw6.sh 2>&1 >
/home/gstanden/OpenvSwitch
/crt_ovs_sw6.log
/home/gstanden/OpenvSwitch
/crt_ovs_sw7.sh 2>&1 >
/home/gstanden/OpenvSwitch
/crt_ovs_sw7.log
/home/gstanden/OpenvSwitch
/crt_ovs_sw8.sh 2>&1 >
/home/gstanden/OpenvSwitch
/crt_ovs_sw8.log
/home/gstanden/OpenvSwitch
/crt_ovs_sw9.sh 2>&1 >
/home/gstanden/OpenvSwitch
/crt_ovs_sw9.log

exit 0

gstanden@vmem1:~/OpenvSwitch$
```

Note also that crt_ovs_sx1.sh has been added. This is the addition of a new network subnet 10.207.29.1 and comes with a new set of bind9 and dhcp configurations. Basically, this update to the guide here shows how you add additional networks to the DNS-DHCP bind9/isc-dhcp-server setup on the laptop such

that the additional networks will also hand out DHCP addresses over the OpenvSwitch network and also automatically add the newly assigned IP addresses to DNS bind9 (named).

Update End Ubuntu 15.04 2015-05-16

Once the "crt_ovs_sw*.sh" scripts are downloaded, create a directory for them as shown below, and move the scripts to the "/home/username /OpenvSwitch" directory as shown below. Ensure that the "crt_ovs_sw*.sh" scripts have the correct ownership, permissions, and are installed in the directory as shown below. The log files do not need to be created. They are written automatically during each bootup of the laptop or desktop when the OpenvSwitch switches are created during bootup.

At this time, also download and install the "my-network-up.sh" script and also ensure that /etc/rc.local is configured as shown above. Install the my-network-up.sh script as shown into the "/etc/init" directory. Create a soft link in the "/home /username/OpenvSwitch" directory as a reminder of where this important script is installed for future maintenance or reference. The idea is that all scripts directly relevant to the OpenvSwitch configuration are

linked in the "/home/username /OpenvSwitch" directory for quick reference and accessability.

```
gstanden@W520:~$ pwd
/home/gstanden
gstanden@W520:~$ ls -lrt
total 52
-rw-r--r-- 1 gstanden
gstanden 8980 Dec 25 22:29
examples.desktop
drwxr-xr-x 2 gstanden
gstanden 4096 Dec 25 22:48
Videos
drwxr-xr-x 2 gstanden
gstanden 4096 Dec 25 22:48
Templates
drwxr-xr-x 2 gstanden
gstanden 4096 Dec 25 22:48
Public
drwxr-xr-x 2 gstanden
gstanden 4096 Dec 25 22:48
Music
drwxr-xr-x 2 gstanden
gstanden 4096 Dec 25 22:48
Documents
drwxr-xr-x 2 gstanden
gstanden 4096 Dec 25 22:48
Desktop
drwxr-xr-x 4 gstanden
gstanden 4096 Dec 25 23:03
Pictures
drwxr-xr-x 2 gstanden
gstanden 4096 Dec 26 12:09
Downloads
drwxr-xr-x 2 gstanden
gstanden 4096 Dec 26 12:19
OpenvSwitch
drwxrwxr-x 2 gstanden
gstanden 4096 Dec 26 14:31
Networking

gstanden@W520:~$ cd
OpenvSwitch/

gstanden@W520:~/OpenvSwitch$
ls -lrt
total 52
-rwxr-xr-x 1 gstanden
gstanden  704 Oct 27  2014
crt_ovs_sw4.sh
-rwxr-xr-x 1 gstanden
gstanden  704 Oct 28  2014
crt_ovs_sw5.sh
-rwxr-xr-x 1 gstanden
gstanden  704 Oct 28  2014
crt_ovs_sw6.sh
-rwxr-xr-x 1 gstanden
gstanden  704 Oct 28  2014
crt_ovs_sw7.sh
```

```
-rwxr-xr-x 1 gstanden
gstanden  704 Oct 28  2014
crt_ovs_sw8.sh
-rwxr-xr-x 1 gstanden
gstanden  704 Oct 31  2014
crt_ovs_sw9.sh
-rwxr-xr-x 1 gstanden
gstanden 1016 Oct 31  2014
crt_ovs_sw2.sh
-rwxr-xr-x 1 gstanden
gstanden 1019 Oct 31  2014
crt_ovs_sw3.sh
-rwxr-xr-x 1 gstanden
gstanden 1921 May  2 20:13
crt_ovs_sw1.sh
-rwxr-xr-x 1 gstanden
gstanden 1935 May  2 20:24
crt_ovs_sx1.sh
lrwxrwxrwx 1 gstanden
gstanden   26 May 16 16:30
my-network-up.sh ->
/etc/init/my-network-up.sh
lrwxrwxrwx 1 gstanden
gstanden   13 May 16 16:31
rc.local -> /etc/rc.local
-rw-r--r-- 1 gstanden
gstanden  413 Dec 26 14:12
crt_ovs_sw1.log
-rw-r--r-- 1 gstanden
gstanden  195 Dec 26 14:12
crt_ovs_sw2.log
-rw-r--r-- 1 gstanden
gstanden  195 Dec 26 14:12
crt_ovs_sw3.log
-rw-r--r-- 1 gstanden
gstanden    0 Dec 26 14:12
crt_ovs_sw4.log
-rw-r--r-- 1 gstanden
gstanden    0 Dec 26 14:12
crt_ovs_sw5.log
-rw-r--r-- 1 gstanden
gstanden    0 Dec 26 14:12
crt_ovs_sw6.log
-rw-r--r-- 1 gstanden
gstanden    0 Dec 26 14:12
crt_ovs_sw7.log
-rw-r--r-- 1 gstanden
gstanden    0 Dec 26 14:12
crt_ovs_sw8.log
-rw-r--r-- 1 gstanden
gstanden    0 Dec 26 14:12
crt_ovs_sw9.log
-rw-r--r-- 1 gstanden
gstanden    0 Dec 26 14:12
crt_ovs_sx1.log
gstanden@W520:~/OpenvSwitch$
```

Ensure as shown below that the
"/etc/init/my-network-up.sh"

script is installed in the correct directory, and has the ownership, group, and permissions and review the content of the file as shown below.

```
gstanden@W520:~/OpenvSwitch$
ls -l /etc/init/my-network-
up.conf
-rw-r--r-- 1 gstanden
gstanden 1288 Dec 26 01:25
/etc/init/my-network-
up.conf

gstanden@W520:~/OpenvSwitch$
cat /etc/init/my-network-
up.conf

# 'my-network-up.conf' - My
custom upstart events
#
# These are the scripts
that run when a network
appears.

description "My custom
upstart events"

start on net-device-up
# Start a daemon or run a
script
stop on net-device-down
# (Optional) Stop a daemon,
scripts already self-
terminate.

script
# You can really put shell
script in here, including
if/then and tests.
/home/gstanden/OpenvSwitch
/crt_ovs_sw1.sh 2>&1 >
/home/gstanden/OpenvSwitch
/crt_ovs_sw1.log
/home/gstanden/OpenvSwitch
/crt_ovs_sw2.sh 2>&1 >
/home/gstanden/OpenvSwitch
/crt_ovs_sw2.log
/home/gstanden/OpenvSwitch
/crt_ovs_sw3.sh 2>&1 >
/home/gstanden/OpenvSwitch
/crt_ovs_sw3.log
/home/gstanden/OpenvSwitch
/crt_ovs_sw4.sh 2>&1 >
/home/gstanden/OpenvSwitch
/crt_ovs_sw4.log
/home/gstanden/OpenvSwitch
```

```
/crt_ovs_sw5.sh 2>&1 >
/home/gstanden/OpenvSwitch
/crt_ovs_sw5.log
/home/gstanden/OpenvSwitch
/crt_ovs_sw6.sh 2>&1 >
/home/gstanden/OpenvSwitch
/crt_ovs_sw6.log
/home/gstanden/OpenvSwitch
/crt_ovs_sw7.sh 2>&1 >
/home/gstanden/OpenvSwitch
/crt_ovs_sw7.log
/home/gstanden/OpenvSwitch
/crt_ovs_sw8.sh 2>&1 >
/home/gstanden/OpenvSwitch
/crt_ovs_sw8.log
/home/gstanden/OpenvSwitch
/crt_ovs_sw9.sh 2>&1 >
/home/gstanden/OpenvSwitch
/crt_ovs_sw9.log
/bin/chown
gstanden:gstanden
/home/gstanden/OpenvSwitch
/crt_ovs_sw*.log
end script

gstanden@W520:~/OpenvSwitch$
ls -lrt /etc/init/my-
network-up.conf
-rw-r--r-- 1 gstanden
gstanden 1288 Dec 26 10:06
/etc/init/my-network-
up.conf
gstanden@W520:~$
```

The OpenvSwitch switch scripts
are also listed below for
reference.

```
gstanden@vmem1:~/OpenvSwitch$
more crt_ovs_s*.sh

::::::::::::::
crt_ovs_sw1.sh
::::::::::::::

#!/bin/bash
# Requires use of Upstart
Script /etc/init/my-
network-up.conf to ensure
interfaces are up before
running.

tunctl -t s1
tunctl -t s2
tunctl -t s3
tunctl -t s4
tunctl -t s5
#tunctl -t s6
ip link set s1 up
ip link set s2 up
```

```
ip link set s3 up
ip link set s4 up
ip link set s5 up
#ip link set s6 up
ovs-vsctl add-br sw1
ovs-vsctl add-port sw1 s1
ovs-vsctl add-port sw1 s2
ovs-vsctl add-port sw1 s3
ovs-vsctl add-port sw1 s4
ovs-vsctl add-port sw1 s5
#ovs-vsctl add-port sw1 s6
ip link set up dev sw1
ip addr add 10.207.39.1/24
dev sw1
ip route replace
10.207.39.0/24 dev sw1

ovs-vsctl set port sw1
trunks=10
ovs-vsctl set port sw1
tag=10

# GLS 20140825 Get active
external interface
dynamically at boot.
Tested & works with {wlan0,
eth0, bnep0} on Ubuntu
14.04.1 Desktop x86_64.
# GLS 20140825 Interface
"bnep0" is Blackberry Z30
OS10 Bluetooth Tether.

### BEGIN Get Active EXTIF
Dynamcially. ###
function GetInterface
{
ifconfig | egrep -B1 'inet
addr' | egrep -A1
'wlan|eth|bnep' | sed
'$!N;s/\n/ /' | sed 's/  */
/g' | cut -f1,7 -d' ' | sed
's/ addr//' | head -1 | cut
-f1 -d':'
}
function GetIP
{
ifconfig | egrep -B1 'inet
addr' | egrep -A1
'wlan|eth|bnep' | sed
'$!N;s/\n/ /' | sed 's/  */
/g' | cut -f1,7 -d' ' | sed
's/ addr//' | head -1 | cut
-f2 -d':'
}
### END Get Active EXTIF
Dynamically. ###

echo '        IP: '$(GetIP)
echo 'Interface:
'$(GetInterface)

INTIF="sw1"
```

```
EXTIF=$(GetInterface)
# EXTIF="wlan0"

echo 1 > /proc/sys/net/ipv4
/ip_forward

# clear existing iptable
rules, set a default policy
iptables -P INPUT ACCEPT
iptables -F INPUT
iptables -P OUTPUT ACCEPT
iptables -F OUTPUT
iptables -P FORWARD DROP
iptables -F FORWARD
iptables -t nat -F

# set forwarding and nat
rules
iptables -A FORWARD -i
$EXTIF -o $INTIF -j ACCEPT
iptables -A FORWARD -i
$INTIF -o $EXTIF -j ACCEPT
iptables -t nat -A
POSTROUTING -o $EXTIF -j
MASQUERADE

service isc-dhcp-server
start
service bind9 restart

:::::::::::::::
crt_ovs_sw2.sh
:::::::::::::::

#!/bin/bash

tunctl -t t1
tunctl -t t2
tunctl -t t3
tunctl -t t4
tunctl -t t5
ip link set t1 up
ip link set t2 up
ip link set t3 up
ip link set t4 up
ip link set t5 up
ovs-vsctl add-br sw2
ovs-vsctl add-port sw2 t1
ovs-vsctl add-port sw2 t2
ovs-vsctl add-port sw2 t3
ovs-vsctl add-port sw2 t4
ovs-vsctl add-port sw2 t5
ip link set up dev sw2
ip addr add 10.207.40.1/24
dev sw2
ip route replace
10.207.40.0/24 dev sw2
ifconfig sw2 10.207.40.1
netmask 255.255.255.0

ovs-vsctl set port sw2
tag=80
```

```
# INTIF="sw2"
# EXTIF="wlan0"
# echo 1 > /proc/sys
/net/ipv4/ip_forward

# clear existing iptable
rules, set a default policy
# iptables -P INPUT ACCEPT
# iptables -F INPUT
# iptables -P OUTPUT ACCEPT
# iptables -F OUTPUT
# iptables -P FORWARD DROP
# iptables -F FORWARD
# iptables -t nat -F

# set forwarding and nat
rules
# iptables -A FORWARD -i
$EXTIF -o $INTIF -j ACCEPT
# iptables -A FORWARD -i
$INTIF -o $EXTIF -j ACCEPT
# iptables -t nat -A
POSTROUTING -o $EXTIF -j
MASQUERADE

# service isc-dhcp-server
start

:::::::::::::::
crt_ovs_sw3.sh
:::::::::::::::

#!/bin/bash

tunctl -t w1
tunctl -t w2
tunctl -t w3
tunctl -t w4
tunctl -t w5
ip link set w1 up
ip link set w2 up
ip link set w3 up
ip link set w4 up
ip link set w5 up
ovs-vsctl add-br sw3
ovs-vsctl add-port sw3 w1
ovs-vsctl add-port sw3 w2
ovs-vsctl add-port sw3 w3
ovs-vsctl add-port sw3 w4
ovs-vsctl add-port sw3 w5

ip link set up dev sw3
ip addr add 10.207.41.1/24
dev sw3
ip route replace
10.207.41.0/24 dev sw3
ifconfig sw3 10.207.41.1
netmask 255.255.255.0

 ovs-vsctl set port sw3
tag=90
```

```
# INTIF="sw3"
# EXTIF="wlan0"
# echo 1 > /proc/sys
/net/ipv4/ip_forward

# clear existing iptable
rules, set a default policy
# iptables -P INPUT ACCEPT
# iptables -F INPUT
# iptables -P OUTPUT ACCEPT
# iptables -F OUTPUT
# iptables -P FORWARD DROP
# iptables -F FORWARD
# iptables -t nat -F

# set forwarding and nat
rules
# iptables -A FORWARD -i
$EXTIF -o $INTIF -j ACCEPT
# iptables -A FORWARD -i
$INTIF -o $EXTIF -j ACCEPT
# iptables -t nat -A
POSTROUTING -o $EXTIF -j
MASQUERADE

# service isc-dhcp-server
start

:::::::::::::::
crt_ovs_sw4.sh
:::::::::::::::

#!/bin/bash

ovs-vsctl add-br sw4
ip link set up dev sw4
ip addr add 192.210.39.1/24
dev sw4
ip route replace
192.210.39.0/24 dev sw4
ifconfig sw4 192.210.39.1
netmask 255.255.255.0

# INTIF="sw3"
# EXTIF="wlan0"
# echo 1 > /proc/sys
/net/ipv4/ip_forward

# clear existing iptable
rules, set a default policy
# iptables -P INPUT ACCEPT
# iptables -F INPUT
# iptables -P OUTPUT ACCEPT
# iptables -F OUTPUT
# iptables -P FORWARD DROP
# iptables -F FORWARD
# iptables -t nat -F

# set forwarding and nat
rules
# iptables -A FORWARD -i
```

```
$EXTIF -o $INTIF -j ACCEPT
# iptables -A FORWARD -i
$INTIF -o $EXTIF -j ACCEPT
# iptables -t nat -A
POSTROUTING -o $EXTIF -j
MASQUERADE

# service isc-dhcp-server
start

:::::::::::::::
crt_ovs_sw5.sh
:::::::::::::::

#!/bin/bash

ovs-vsctl add-br sw5
ip link set up dev sw5
ip addr add 192.211.39.1/24
dev sw5
ip route replace
192.211.39.0/24 dev sw5
ifconfig sw5 192.211.39.1
netmask 255.255.255.0

# INTIF="sw3"
# EXTIF="wlan0"
# echo 1 > /proc/sys
/net/ipv4/ip_forward

# clear existing iptable
rules, set a default policy
# iptables -P INPUT ACCEPT
# iptables -F INPUT
# iptables -P OUTPUT ACCEPT
# iptables -F OUTPUT
# iptables -P FORWARD DROP
# iptables -F FORWARD
# iptables -t nat -F

# set forwarding and nat
rules
# iptables -A FORWARD -i
$EXTIF -o $INTIF -j ACCEPT
# iptables -A FORWARD -i
$INTIF -o $EXTIF -j ACCEPT
# iptables -t nat -A
POSTROUTING -o $EXTIF -j
MASQUERADE

# service isc-dhcp-server
start

:::::::::::::::
crt_ovs_sw6.sh
:::::::::::::::

#!/bin/bash

ovs-vsctl add-br sw6
ip link set up dev sw6
ip addr add 192.212.39.1/24
```

```
dev sw6
ip route replace
192.212.39.0/24 dev sw6
ifconfig sw6 192.212.39.1
netmask 255.255.255.0

# INTIF="sw3"
# EXTIF="wlan0"
# echo 1 > /proc/sys
/net/ipv4/ip_forward

# clear existing iptable
rules, set a default policy
# iptables -P INPUT ACCEPT
# iptables -F INPUT
# iptables -P OUTPUT ACCEPT
# iptables -F OUTPUT
# iptables -P FORWARD DROP
# iptables -F FORWARD
# iptables -t nat -F

# set forwarding and nat
rules
# iptables -A FORWARD -i
$EXTIF -o $INTIF -j ACCEPT
# iptables -A FORWARD -i
$INTIF -o $EXTIF -j ACCEPT
# iptables -t nat -A
POSTROUTING -o $EXTIF -j
MASQUERADE

# service isc-dhcp-server
start

::::::::::::::
crt_ovs_sw7.sh
::::::::::::::

#!/bin/bash

ovs-vsctl add-br sw7
ip link set up dev sw7
ip addr add 192.213.39.1/24
dev sw7
ip route replace
192.213.39.0/24 dev sw7
ifconfig sw7 192.213.39.1
netmask 255.255.255.0

# INTIF="sw3"
# EXTIF="wlan0"
# echo 1 > /proc/sys
/net/ipv4/ip_forward

# clear existing iptable
rules, set a default policy
# iptables -P INPUT ACCEPT
# iptables -F INPUT
# iptables -P OUTPUT ACCEPT
# iptables -F OUTPUT
# iptables -P FORWARD DROP
# iptables -F FORWARD
```

```
# iptables -t nat -F

# set forwarding and nat
rules
# iptables -A FORWARD -i
$EXTIF -o $INTIF -j ACCEPT
# iptables -A FORWARD -i
$INTIF -o $EXTIF -j ACCEPT
# iptables -t nat -A
POSTROUTING -o $EXTIF -j
MASQUERADE

# service isc-dhcp-server
start

::::::::::::::
crt_ovs_sw8.sh
::::::::::::::

#!/bin/bash

ovs-vsctl add-br sw8
ip link set up dev sw8
ip addr add 172.220.40.1/24
dev sw8
ip route replace
172.220.40.0/24 dev sw8
ifconfig sw8 172.220.40.1
netmask 255.255.255.0

# INTIF="sw3"
# EXTIF="wlan0"
# echo 1 > /proc/sys
/net/ipv4/ip_forward

# clear existing iptable
rules, set a default policy
# iptables -P INPUT ACCEPT
# iptables -F INPUT
# iptables -P OUTPUT ACCEPT
# iptables -F OUTPUT
# iptables -P FORWARD DROP
# iptables -F FORWARD
# iptables -t nat -F

# set forwarding and nat
rules
# iptables -A FORWARD -i
$EXTIF -o $INTIF -j ACCEPT
# iptables -A FORWARD -i
$INTIF -o $EXTIF -j ACCEPT
# iptables -t nat -A
POSTROUTING -o $EXTIF -j
MASQUERADE

# service isc-dhcp-server
start

::::::::::::::
crt_ovs_sw9.sh
::::::::::::::
```

```
#!/bin/bash

ovs-vsctl add-br sw9
ip link set up dev sw9
ip addr add 172.221.40.1/24
dev sw9
ip route replace
172.221.40.0/24 dev sw9
ifconfig sw9 172.221.40.1
netmask 255.255.255.0

# INTIF="sw3"
# EXTIF="wlan0"
# echo 1 > /proc/sys
/net/ipv4/ip_forward

# clear existing iptable
rules, set a default policy
# iptables -P INPUT ACCEPT
# iptables -F INPUT
# iptables -P OUTPUT ACCEPT
# iptables -F OUTPUT
# iptables -P FORWARD DROP
# iptables -F FORWARD
# iptables -t nat -F

# set forwarding and nat
rules
# iptables -A FORWARD -i
$EXTIF -o $INTIF -j ACCEPT
# iptables -A FORWARD -i
$INTIF -o $EXTIF -j ACCEPT
# iptables -t nat -A
POSTROUTING -o $EXTIF -j
MASQUERADE

# service isc-dhcp-server
start

:::::::::::::::
crt_ovs_sx1.sh
:::::::::::::::

#!/bin/bash
# Requires use of Upstart
Script /etc/init/my-
network-up.conf to ensure
interfaces are up before
running.
sleep 10
tunctl -t a1
tunctl -t a2
tunctl -t a3
tunctl -t a4
tunctl -t a5
#tunctl -t a6
ip link set a1 up
ip link set a2 up
ip link set a3 up
ip link set a4 up
ip link set a5 up
#ip link set a6 up
```

```
ovs-vsctl add-br sx1
ovs-vsctl add-port sx1 a1
ovs-vsctl add-port sx1 a2
ovs-vsctl add-port sx1 a3
ovs-vsctl add-port sx1 a4
ovs-vsctl add-port sx1 a5
#ovs-vsctl add-port sx1 a6
ip link set up dev sx1
ip addr add 10.207.29.1/24
dev sx1
ip route replace
10.207.29.0/24 dev sx1

ovs-vsctl set port sx1
trunks=10
ovs-vsctl set port sx1
tag=10

# GLS 20140825 Get active
external interface
dynamically at boot.
Tested & works with {wlan0,
eth0, bnep0} on Ubuntu
14.04.1 Desktop x86_64.
# GLS 20140825 Interface
"bnep0" is Blackberry Z30
OS10 Bluetooth Tether.

### BEGIN Get Active EXTIF
Dynamcially. ###
function GetInterface
{
ifconfig | egrep -B1 'inet
addr' | egrep -A1
'wlan|eth|bnep' | sed
'$!N;s/\n/ /' | sed 's/  */
/g' | cut -f1,7 -d' ' | sed
's/ addr//' | head -1 | cut
-f1 -d':'
}
function GetIP
{
ifconfig | egrep -B1 'inet
addr' | egrep -A1
'wlan|eth|bnep' | sed
'$!N;s/\n/ /' | sed 's/  */
/g' | cut -f1,7 -d' ' | sed
's/ addr//' | head -1 | cut
-f2 -d':'
}
### END Get Active EXTIF
Dynamically. ###

echo '      IP: '$(GetIP)
echo 'Interface:
'$(GetInterface)

INTIF="sx1"
EXTIF=$(GetInterface)
# EXTIF="wlan0"

echo 1 > /proc/sys/net/ipv4
```

```
/ip_forward

# clear existing iptable
rules, set a default policy
iptables -P INPUT ACCEPT
iptables -F INPUT
iptables -P OUTPUT ACCEPT
iptables -F OUTPUT
iptables -P FORWARD DROP
iptables -F FORWARD
iptables -t nat -F

# set forwarding and nat
rules
iptables -A FORWARD -i
$EXTIF -o $INTIF -j ACCEPT
iptables -A FORWARD -i
$INTIF -o $EXTIF -j ACCEPT
iptables -t nat -A
POSTROUTING -o $EXTIF -j
MASQUERADE

# service isc-dhcp-server
restart
# service bind9 restart

gstanden@vmem1:~/OpenvSwitch$
```

Setup DNS and DHCP for System

The DNS and DHCP are setup in this blog so that DHCP can provide addresses to LXC containers and VMs on the OpenvSwitch, and also add those DHCP assignments to DNS automatically.

Backup DNS Default Configuration Files and Install Downloaded Versions

First backup the default configuration files as shown below.

Then download from the end of this blog this files

"named.conf.options" and "named.conf.local" and move to "/etc/bind" directory as shown below.

```
gstanden@W520:~$ cd
/etc/bind
gstanden@W520:/etc/bind$ ls
-lrt
total 52
-rw-r--r-- 1 root root 1317
Dec  9 13:06 zones.rfc1918
-rw-r--r-- 1 root bind  165
Dec  9 13:06
named.conf.local
-rw-r--r-- 1 root bind  490
Dec  9 13:06
named.conf.default-zones
-rw-r--r-- 1 root bind  463
Dec  9 13:06 named.conf
-rw-r--r-- 1 root root 3048
Dec  9 13:06 db.root
-rw-r--r-- 1 root root  270
Dec  9 13:06 db.local
-rw-r--r-- 1 root root  353
Dec  9 13:06 db.empty
-rw-r--r-- 1 root root  237
Dec  9 13:06 db.255
-rw-r--r-- 1 root root  271
Dec  9 13:06 db.127
-rw-r--r-- 1 root root  237
Dec  9 13:06 db.0
-rw-r--r-- 1 root root 2389
Dec  9 13:06 bind.keys
-rw-r----- 1 bind bind   77
Dec 26 01:01 rndc.key
-rw-r--r-- 1 root bind  890
Dec 26 01:01
named.conf.options

gstanden@W520:/etc/bind$
sudo cp -p named.conf.local
named.conf.local.original.ins
gstanden@W520:/etc/bind$
sudo cp -p
named.conf.options
named.conf.options.original.i
gstanden@W520:/etc/bind$
sudo cp -p rndc.key
rndc.key.original.install.bak
gstanden@W520:/etc/bind$ cd
gstanden@w520:~/Downloads$
sudo mv named.* /etc/bind/.
gstanden@w520:~/Downloads$
```

Backup DHCP Default Configuration Files

Now backup the isc-dhcp-server (DHCP) original install configuration files as shown below. Although dhclient.conf is backed up, there are no changes to dhclient.conf and it is used as is default format. Only the dhcpd.conf file needs to be updated with the downloaded version.

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There is a change to the /etc/dhcp /dhclient.conf file for the added mccc.org domain as shown below.

```
root@vmem1:/etc/dhcp# cat
dhclient.conf
# Configuration file for
/sbin/dhclient, which is
included in Debian's
#    dhcp3-client package.
#
# This is a sample
configuration file for
dhclient. See
dhclient.conf's
#    man page for more
information about the
syntax of this file
#    and a more
comprehensive list of the
parameters understood by
#    dhclient.
#
# Normally, if the DHCP
server provides reasonable
information and does
#    not leave anything out
(like the domain name, for
example), then
#    few changes must be
made to this file, if any.
#

option rfc3442-classless-
static-routes code 121 =
array of unsigned integer
8;

send host-name =
gethostname();
```

```
prepend domain-name-servers
127.0.0.1;

# Oracle GNS and additional
domains
append domain-name "
mccc.org";

request subnet-mask,
broadcast-address, time-
offset, routers,
    domain-name, domain-
name-servers, domain-
search, host-name,
    dhcp6.name-servers,
dhcp6.domain-search,
    netbios-name-servers,
netbios-scope, interface-
mtu,
    rfc3442-classless-
static-routes, ntp-servers,
    dhcp6.fqdn, dhcp6.sntp-
servers;
root@vmem1:/etc/dhcp#
```

Note the section in bold which
adds mccc.org to the dhclient.conf
and this is responsible for adding
it to /etc/resolv.conf at bootup.

```
gstanden@W520:/etc/dhcp$
sudo cp -p dhcpd.conf
dhcpd.conf.original.install.k
gstanden@W520:/etc/dhcp$
sudo cp -p dhclient.conf
dhclient.conf.original.instal
gstanden@W520:/etc/dhcp$
```

Install Downloaded DHCP Files

Move the downloaded
"dhcpd.conf" to "/etc/dhcp"
directory as shown below.

```
gstanden@W520:~$ cd
Downloads
gstanden@W520:~/Downloads$
ls -lrt
total 272
-rw-rw-r-- 1 gstanden
gstanden 250832 Dec 25
22:54 ksplice-uptrack.deb
-rw-rw-r-- 1 gstanden
gstanden    940 Dec 26
10:15 dhclient.conf
```

```
-rw-rw-r-- 1 gstanden
gstanden     890 Dec 26
10:15 dhcpd.conf
-rw-rw-r-- 1 gstanden
gstanden    1096 Dec 26
10:15 fwd.vmem.org
-rw-rw-r-- 1 gstanden
gstanden     435 Dec 26
10:15 named.conf.local
-rw-rw-r-- 1 gstanden
gstanden     299 Dec 26
10:15 named.conf.options
-rw-rw-r-- 1 gstanden
gstanden     671 Dec 26
10:16 rev.vmem.org
gstanden@W520:~/Downloads$
sudo mv dhcpd.conf
/etc/dhcp/.

gstanden@W520:~/Downloads$
sudo su -
root@W520:~# cd /etc/dhcp
root@W520:/etc/dhcp# ls
-lrt
total 28
-rw-r--r-- 1 root
root     3602 Apr  3  2014
dhcpd.conf.original.install.k
-rw-r--r-- 1 root
root     1830 Apr  3  2014
dhclient.conf.original.instal
drwxr-xr-x 2 root
root     4096 Oct 22 14:11
dhclient-enter-hooks.d
drwxr-xr-x 2 root
root     4096 Dec 25 23:14
dhclient-exit-hooks.d
drwxr-x--- 2 root
dhcpd    4096 Dec 26 01:01
ddns-keys
-rw-rw-r-- 1 gstanden
gstanden  940 Dec 26 10:15
dhclient.conf
-rw-rw-r-- 1 gstanden
gstanden  890 Dec 26 10:15
dhcpd.conf
root@W520:/etc/dhcp# cat
dhcpd.conf
#
# Configuration file for
ISC dhcpd for Ubuntu 14.04
#
ddns-updates on;
ddns-update-style interim;
update-static-leases on;
authoritative;
key rndc-key { algorithm
hmac-md5; secret
"5rcWKMkWCP6RBUeu9tjIZg==";}
<-- This value must be
changed.
allow unknown-clients;
```

```
use-host-decl-names on;
default-lease-time 1814400;
max-lease-time 1814400;
log-facility local7;

zone vmem.org. {
    primary 10.207.39.1;
    key rndc-key;
}
zone 39.207.10.in-
addr.arpa. {
    primary 10.207.39.1;
    key rndc-key;
}
subnet 10.207.39.0 netmask
255.255.255.0 {
#    default gateway
    option routers
     10.207.39.1;
    option subnet-mask
     255.255.255.0;
    option domain-name
     "vmem.org";
    option domain-name-
servers 10.207.39.1;
#    option ntp-servers
     10.207.39.1;
    ddns-domainname
    "vmem.org.";
    ddns-rev-domainname
    "in-addr.arpa.";
    range
        10.207.39.70
10.207.39.254;
    default-lease-time
    1814400;
    max-lease-time
    1814400;
}
root@W520:/etc/dhcp#
```

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I have updated the dhcpd.conf to support multiple DHCP-DNS networks, so see below for an example of having **multiple networks support** and **multiple domains support** by named as shown below for dhcpd.conf. In the example below, the 10.207.29.1 subnet has been added to my original 10.207.39.1 supported subnet, and the

mccc.org domain has been added to the **vmem.org** domain support. The new sections added for the new subnet are in bold as shown below.

```
gstanden@vmem1:~/OpenvSwitch$
cat /etc/dhcp/dhcpd.conf
#
# Configuration file for
ISC dhcpd for Ubuntu 14.04
# Configuration file for
ISC dhcpd for Ubuntu 15.04
GLS Tested on 15.04
2015.05.02
# Added a second subnet
configuration
(10.207.29.1/24) for
mediacomcorp.org domain
#
ddns-updates on;
ddns-update-style interim;
update-static-leases on;
authoritative;
key rndc-key { algorithm
hmac-md5; secret
"5rcWKMkWCP6RBUeu9tjIZg==";}
allow unknown-clients;
use-host-decl-names on;
default-lease-time 1814400;
max-lease-time 1814400;
log-facility local7;

zone vmem.org. {
    primary 10.207.39.1;
    key rndc-key;
}
zone mccc.org. {
    primary 10.207.29.1;
    key rndc-key;
}
zone 39.207.10.in-
addr.arpa. {
    primary 10.207.39.1;
    key rndc-key;
}
zone 29.207.10.in-
addr.arpa. {
    primary 10.207.29.1;
    key rndc-key;
}
subnet 10.207.39.0 netmask
255.255.255.0 {
#  ---  default gateway
    option routers
     10.207.39.1;
    option subnet-mask
     255.255.255.0;
    option domain-name
```

```
          "vmem.org";
     option domain-name-
servers 10.207.39.1;
#    option ntp-servers
      10.207.39.1;
     ddns-domainname
     "vmem.org.";
     ddns-rev-domainname
     "in-addr.arpa.";
     range
          10.207.39.70
10.207.39.254;
     default-lease-time
     1814400;
     max-lease-time
     1814400;
}
subnet 10.207.29.0 netmask
255.255.255.0 {
#  ---  default gateway
     option routers
      10.207.29.1;
     option subnet-mask
      255.255.255.0;
     option domain-name
      "mccc.org";
     option domain-name-
servers 10.207.29.1;
#    option ntp-servers
      10.207.29.1;
     ddns-domainname
     "mccc.org.";
     ddns-rev-domainname
     "in-addr.arpa.";
     range
          10.207.29.70
10.207.29.254;
     default-lease-time
     1814400;
     max-lease-time
     1814400;
}
gstanden@vmem1:~/OpenvSwitch$
```

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Update DHCP Configuration Files with Correct RNDC Key

The dhcpd.conf file must be updated with a correct rndc.key value so this is a good time to update the rndc.key value. The value from the install can be used, or a new rndc.key file can be

generated. Here the value from the installed rndc.key file is used. Notice that with the newly added second supported subnet of 10.207.29.1, we still can use the same rndc.key for both subnets. it may be possible to use different keys for different subnets (probably is, or I should think it would be) but for the purposes of this blog, the same rndc.key value is used for all subnets.

```
root@W520:/etc/dhcp# cd
/etc/bind
root@W520:/etc/bind# ls
-lrt
total 64
-rw-r--r-- 1 root root 1317
Dec  9 13:06 zones.rfc1918
-rw-r--r-- 1 root bind  165
Dec  9 13:06
named.conf.local.original.ins
-rw-r--r-- 1 root bind  165
Dec  9 13:06
named.conf.local
-rw-r--r-- 1 root bind  490
Dec  9 13:06
named.conf.default-zones
-rw-r--r-- 1 root bind  463
Dec  9 13:06 named.conf
-rw-r--r-- 1 root root 3048
Dec  9 13:06 db.root
-rw-r--r-- 1 root root  270
Dec  9 13:06 db.local
-rw-r--r-- 1 root root  353
Dec  9 13:06 db.empty
-rw-r--r-- 1 root root  237
Dec  9 13:06 db.255
-rw-r--r-- 1 root root  271
Dec  9 13:06 db.127
-rw-r--r-- 1 root root  237
Dec  9 13:06 db.0
-rw-r--r-- 1 root root 2389
Dec  9 13:06 bind.keys
-rw-r----- 1 bind bind   77
Dec 26 01:01
rndc.key.original.install.bal
-rw-r----- 1 bind bind   77
Dec 26 01:01 rndc.key
-rw-r--r-- 1 root bind  890
Dec 26 01:01
named.conf.options.original.i
-rw-r--r-- 1 root bind  890
```

```
Dec 26 01:01
named.conf.options

root@W520:/etc/bind# cat
rndc.key

key "rndc-key" {
    algorithm hmac-md5;
    secret
"5rcWKMkWCP6RBUeu9tjIZg==";
};

root@W520:/etc/bind#
```

Edit the dhcpd.conf file and update the secret key value as shown below.

```
root@W520:/etc/dhcp# vi
dhcpd.conf
root@W520:/etc/dhcp# cat
dhcpd.conf
#
# Configuration file for
ISC dhcpd for Ubuntu 14.04
#
ddns-updates on;
ddns-update-style interim;
update-static-leases on;
authoritative;
key rndc-key { algorithm
hmac-md5; secret
"5rcWKMkWCP6RBUeu9tjIZg==";)
<-- Key value has been
changed.
allow unknown-clients;
use-host-decl-names on;
default-lease-time 1814400;
max-lease-time 1814400;
log-facility local7;

zone vmem.org. {
    primary 10.207.39.1;
    key rndc-key;
}
zone 39.207.10.in-
addr.arpa. {
    primary 10.207.39.1;
    key rndc-key;
}
subnet 10.207.39.0 netmask
255.255.255.0 {
#    default gateway
    option routers
     10.207.39.1;
    option subnet-mask
     255.255.255.0;
    option domain-name
```

```
        "vmem.org";
    option domain-name-
servers 10.207.39.1;
#    option ntp-servers
    10.207.39.1;
    ddns-domainname
    "vmem.org.";
    ddns-rev-domainname
    "in-addr.arpa.";
    range
        10.207.39.70
10.207.39.254;
    default-lease-time
    1814400;
    max-lease-time
    1814400;
}
root@W520:/etc/dhcp#
```

Set Ownership and Permissions of DHCP Configuration Files

Change ownership of dhcp configuration files to root as shown below.

```
root@W520:/etc/dhcp# chown
root:root dhclient.conf
dhcpd.conf
root@W520:/etc/dhcp# ls
-lrt *.conf
total 28
-rw-rw-r-- 1 root root
940 Dec 26 10:15
dhclient.conf
-rw-rw-r-- 1 root root
890 Dec 26 10:25 dhcpd.conf
root@W520:/etc/dhcp#
```

Install DNS Forward and Reverse Zone Configuration Files

Download the "fwd.vmem.org" and the "rev.vmem.org" zone files from the downloadable files at the end of this blog. Install the downloaded zone files into correct location as shown below. Download the "named.conf.options" and the "named.conf.local" file from the

downloadable files at the end of the blog and install.

```
gstanden@W520:~$ cd
Downloads
gstanden@W520:~/Downloads$
ls -lrt
total 264
-rw-rw-r-- 1 gstanden
gstanden 250832 Dec 25
22:54 ksplice-uptrack.deb
-rw-rw-r-- 1 gstanden
gstanden   1096 Dec 26
10:15 fwd.vmem.org
-rw-rw-r-- 1 gstanden
gstanden    435 Dec 26
10:15 named.conf.local
-rw-rw-r-- 1 gstanden
gstanden    299 Dec 26
10:15 named.conf.options
-rw-rw-r-- 1 gstanden
gstanden    671 Dec 26
10:16 rev.vmem.org
gstanden@W520:~/Downloads$
sudo mv fwd.vmem.org
/var/lib/bind/.
gstanden@W520:~/Downloads$
sudo mv rev.vmem.org
/var/lib/bind/.
gstanden@W520:~/Downloads$
sudo su -
root@W520:~# cd
/var/lib/bind
root@W520:/var/lib/bind#
```

Edit DNS Forward and Reverse Zone Files

Setup the forward and reverse zone files. Change the domain name information if desired. Be careful when editing not to remove any of the "." characters in the file, they matter! Also, verify the hostname as shown and make sure to update the forward and reverse zone files with the name of your desktop host (in this example the desktop hostname is "W520").

```
root@W520:/var/lib/bind#
cat fwd.vmem.org

$ORIGIN .
$TTL 86400
; time-to-live in seconds
vmem.org        IN SOA
W520.vmem.org.
postmaster.vmem.org. (
                1412261100
; serial
                60
; refresh (1 minute)
                1800
; retry (30 minutes)
                604800
; expire (1 week)
                86400
; minimum (1 day)
                )
            NS
W520.vmem.org.
$ORIGIN vmem.org.
_sflow._udp         TXT
"txtvers=1" "polling=20"
"sampling=512"
            SRV    0 0 6343
W520
W520           A
10.207.39.1
lxc1-gns-vip.vmem.org.
A    10.207.39.3
$ORIGIN gns1.vmem.org.
@    IN        NS    lxc1-
gns-vip.vmem.org.

root@W520:/var/lib/bind#
named-checkzone vmem.org
fwd.vmem.org
zone vmem.org/IN: loaded
serial 1412261100
OK

root@W520:/var/lib/bind#
cat rev.vmem.org
$ORIGIN .
$TTL 86400            ;
time-to-live in seconds
39.207.10.in-addr.arpa
IN SOA    W520.vmem.org.
postmaster.vmem.org. (
                1412261100
; serial
                60
; refresh (1 hour)
                1800
; retry (30 minutes)
                604800
; expire (1 week)
                86400
; minimum (1 day)
```

```
                )
              NS
W520.vmem.org.
$ORIGIN 39.207.10.in-
addr.arpa.
1           PTR
W520.vmem.org.
3           PTR    lxc1-
gns-vip.vmem.org.
39.207.10.in-addr.arpa
NS    W520.vmem.org.
W520            A
10.207.39.1

root@W520:/var/lib/bind#
named-checkzone
39.207.10.in-addr.arpa
rev.vmem.org
zone 39.207.10.in-
addr.arpa/IN: loaded serial
1412261100
OK

root@W520:/var/lib/bind#
uname -a
Linux W520 3.16.0-28-
generic #38-Ubuntu SMP Fri
Dec 12 17:37:40 UTC 2014
x86_64 x86_64 x86_64
GNU/Linux

root@W520:/var/lib/bind#
hostname -f
W520
root@W520:/var/lib/bind#
```

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Additional zones have been added
for the **mccc.org** domain and for
the **10.207.29.1/24** network
reverse lookups as shown below.

```
root@vmem1:/var/lib/bind#
named-checkzone mccc.org
fwd.mccc.org
zone mccc.org/IN: loaded
serial 1505021309
OK

root@vmem1:/var/lib/bind#
named-checkzone
29.207.10.in-addr.arpa
rev.mccc.org
zone 29.207.10.in-
addr.arpa/IN: loaded serial
```

```
1411021420
OK

root@vmem1:/var/lib/bind#
cat fwd.mccc.org

$ORIGIN .
$TTL 86400      ; 1 day
mccc.org        IN SOA
mccc1.mccc.org.
postmaster.mccc.org. (
                1505021309
; serial
                60
; refresh (1 minute)
                1800
; retry (30 minutes)
                604800
; expire (1 week)
                86400
; minimum (1 day)
                )
                NS
mccc1.mccc.org.
$ORIGIN mccc.org.
_sflow._udp        TXT
"txtvers=1" "polling=20"
"sampling=512"
            SRV    0 0 6343
mccc1
mccc1           A
10.207.29.1

root@vmem1:/var/lib/bind#
cat rev.mccc.org

$ORIGIN .
$TTL 86400      ; 1 day
29.207.10.in-addr.arpa
IN SOA    mccc1.mccc.org.
postmaster.mccc.org. (
                1411021420
; serial
                3600
; refresh (1 hour)
                1800
; retry (30 minutes)
                604800
; expire (1 week)
                86400
; minimum (1 day)
                )
                NS
mccc1.mccc.org.
$ORIGIN 29.207.10.in-
addr.arpa.
1               PTR
mccc1.mccc.org.

root@vmem1:/var/lib/bind#
```

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Configure dnsmasq-base

Now configure dnsmasq-base ("NetworkManager" component) to IGNORE DNS requests for the local-only vmem.org domain as shown below. In other words, this step puts the local domain "vmem.org" under the control of bind9, and tells dnsmasq-base to ignore this domain.

```
gstanden@W520:~$ sudo vi
/etc/NetworkManager
/dnsmasq.d/local
[sudo] password for
gstanden:
gstanden@W520:~$ sudo vi
/etc/NetworkManager
/dnsmasq.d/local
gstanden@W520:~$ cat
/etc/NetworkManager
/dnsmasq.d/local
server=/vmem.org
/10.207.39.1
server=/39.207.10.in-
addr.arpa/10.207.39.1
gstanden@W520:~$
```

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Additional entries are needed for the new subnet forward and reverse lookups to /etc/NetworkManager/dnsmasq.d /local to ensure that dnsmasq ignores these networks and allows bind9 (named) to managed the DNS lookups for these networks. The updated /etc/NetworkManager/dnsmasq.d /local file is shown below.

```
root@vmem1:/var/lib/bind#
```

```
cat /etc/NetworkManager
/dnsmasq.d/local

server=/vmem.org
/10.207.39.1
server=/39.207.10.in-
addr.arpa/10.207.39.1
server=/mccc.org
/10.207.29.1
server=/29.207.10.in-
addr.arpa/10.207.29.1

root@vmem1:/var/lib/bind#
```

Note the new entries above, in bold, for the mccc.org and 10.207.29.1 forward and reverse lookup zones.

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Configure /etc/network /interfaces

Ensure that "/etc/network /interfaces" file has the following three lines added after "iface" line. These lines are responsible for configuring the "/etc/resolv.conf" file. There are no changes to the /etc/network /interfaces file for the Ubuntu 15.04 update. Note that "mccc.org" is added to /etc/resolv.conf using /etc/dhcp /dhclient.conf (see above) but it probably could also be added here in /etc/network/interfaces as an additional entry on the "dns-search" line.

```
gstanden@W520:~$ sudo vi
/etc/network/interfaces
[sudo] password for
gstanden:
gstanden@W520:~$ cat
/etc/network/interfaces
```

```
# interfaces(5) file used
by ifup(8) and ifdown(8)
auto lo
iface lo inet loopback
    dns-domain vmem.org
    dns-search
gns1.vmem.org
    dns-nameserver
127.0.0.1

gstanden@W520:~$
```

Configure /etc/sysctl.conf

Make the settings values changes to existing parameters in the /etc/sysctl.conf as shown below **thanks to the blogpost from Venu Murthy here**. Additional reference material and full-resolution schematics of OpenvSwitch OpenStack networking can be found at **OpenStack documentation**.

```
gstanden@W520:~/Networking$
cat /etc/sysctl.conf |
egrep -B1
'rp_filter|ip_forward'
# GLS 20141226
http://thenewstack.io
/solving-a-common-
beginners-problem-when-
pinging-from-an-openstack-
instance/
net.ipv4.conf.default.rp_filt
net.ipv4.conf.all.rp_filter=(
--
# GLS 20141226
http://thenewstack.io
/solving-a-common-
beginners-problem-when-
pinging-from-an-openstack-
instance/
net.ipv4.ip_forward=1

gstanden@W520:~/Networking$
```

Install and Configure Required Apparmor Package

Next install apparmor-utils
package as shown below.

```
gstanden@W520:~$ sudo apt-
get install apparmor-utils

Reading package lists...
Done
Building dependency
tree
Reading state
information... Done
The following extra
packages will be installed:
  python3-apparmor python3-
libapparmor
Suggested packages:
  apparmor-docs vim-addon-
manager
The following NEW packages
will be installed:
  apparmor-utils python3-
apparmor python3-
libapparmor
0 upgraded, 3 newly
installed, 0 to remove and
0 not upgraded.
Need to get 140 kB of
archives.
After this operation, 903
kB of additional disk space
will be used.
Do you want to continue?
[Y/n] Y
Get:1
http://us.archive.ubuntu.com
/ubuntu/ utopic/main
python3-libapparmor amd64
2.8.98-0ubuntu2 [24.7 kB]
Get:2
http://us.archive.ubuntu.com
/ubuntu/ utopic/main
python3-apparmor amd64
2.8.98-0ubuntu2 [62.1 kB]
Get:3
http://us.archive.ubuntu.com
/ubuntu/ utopic/main
apparmor-utils amd64
2.8.98-0ubuntu2 [53.0 kB]
Fetched 140 kB in 1s (78.5
kB/s)
Selecting previously
unselected package python3-
libapparmor.
(Reading database ...
203805 files and
directories currently
installed.)
Preparing to unpack
.../python3-
```

```
libapparmor_2.8.98-0ubuntu2_a
...
Unpacking python3-
libapparmor
(2.8.98-0ubuntu2) ...
Selecting previously
unselected package python3-
apparmor.
Preparing to unpack
.../python3-
apparmor_2.8.98-0ubuntu2_amd6
...
Unpacking python3-apparmor
(2.8.98-0ubuntu2) ...
Selecting previously
unselected package
apparmor-utils.
Preparing to unpack
.../apparmor-
utils_2.8.98-0ubuntu2_amd64.c
...
Unpacking apparmor-utils
(2.8.98-0ubuntu2) ...
Processing triggers for
man-db (2.7.0.2-2) ...
Setting up python3-
libapparmor
(2.8.98-0ubuntu2) ...
Setting up python3-apparmor
(2.8.98-0ubuntu2) ...
Setting up apparmor-utils
(2.8.98-0ubuntu2) ...

gstanden@W520:~$
```

Set the apparmor profile for lxc-
start to "complain" mode as
shown below. Currently, this is
considered by the author to be
the Ubuntu Linux equivalent of
setting selinux to "permissive" but
not absolutely sure of that. This
then would mean that this is the
equivalent step in Venu's blog
post for setting selinux to
permissive mode in the apparmor
paradigm.

```
gstanden@W520:~$ sudo aa-
complain /usr/bin/lxc-start
Setting /usr/bin/lxc-start
to complain mode.
gstanden@W520:~$
```

Add Settings to /etc/sysctl.conf File

Next add the following settings at the end of /etc/sysctl.conf for Oracle as shown below. Hugepages value is optional and can be adjusted downward depending on whether Hugepages are used or not and depending on what size of Oracle SGA.

```
# Oracle

kernel.shmmni = 4096
kernel.sem = 250 32000 100
128
fs.file-max = 6815744
fs.aio-max-nr = 1048576

net.ipv4.ip_local_port_range
= 9000 65500
net.core.rmem_default =
262144
net.core.rmem_max = 4194304
net.core.wmem_default =
262144
net.core.wmem_max = 1048576

vm.nr_hugepages = 2060
kernel.panic_on_oops = 1
```

The final /etc/sysctl.conf file after all above edits should be similar to the one shown below. Sections edited and added are shown in bold.

```
gstanden@W520:~/Networking$
cat /etc/sysctl.conf

# /etc/sysctl.conf -
Configuration file for
setting system variables
# See /etc/sysctl.d/ for
additional system
variables.
# See sysctl.conf (5) for
information.
#
```

```
#kernel.domainname =
example.com

# Uncomment the following
to stop low-level messages
on console
#kernel.printk = 3 4 1 3

#############################
# Functions previously
found in netbase
#

# Uncomment the next two
lines to enable Spoof
protection (reverse-path
filter)
# Turn on Source Address
Verification in all
interfaces to
# prevent some spoofing
attacks
# GLS 20141226
http://thenewstack.io
/solving-a-common-
beginners-problem-when-
pinging-from-an-openstack-
instance/
net.ipv4.conf.default.rp_filt
net.ipv4.conf.all.rp_filter=(

# Uncomment the next line
to enable TCP/IP SYN
cookies
# See http://lwn.net
/Articles/277146/
# Note: This may impact
IPv6 TCP sessions too
#net.ipv4.tcp_syncookies=1

# Uncomment the next line
to enable packet forwarding
for IPv4
# GLS 20141226
http://thenewstack.io
/solving-a-common-
beginners-problem-when-
pinging-from-an-openstack-
instance/
net.ipv4.ip_forward=1

# Uncomment the next line
to enable packet forwarding
for IPv6
#  Enabling this option
disables Stateless Address
Autoconfiguration
#  based on Router
Advertisements for this
host
```

```
#net.ipv6.conf.all.forwarding

############################
# Additional settings -
these settings can improve
the network
# security of the host and
prevent against some
network attacks
# including spoofing
attacks and man in the
middle attacks through
# redirection. Some network
environments, however,
require that these
# settings are disabled so
review and enable them as
needed.
#
# Do not accept ICMP
redirects (prevent MITM
attacks)
#net.ipv4.conf.all.accept_red
= 0
#net.ipv6.conf.all.accept_red
= 0
# _or_
# Accept ICMP redirects
only for gateways listed in
our default
# gateway list (enabled by
default)
#
net.ipv4.conf.all.secure_red:
= 1
#
# Do not send ICMP
redirects (we are not a
router)
#net.ipv4.conf.all.send_redi
= 0
#
# Do not accept IP source
route packets (we are not a
router)
#net.ipv4.conf.all.accept_sou
= 0
#net.ipv6.conf.all.accept_sou
= 0
#
# Log Martian Packets
#net.ipv4.conf.all.log_martia
= 1

# Oracle
kernel.shmmni = 4096
kernel.sem = 250 32000 100
128
fs.file-max = 6815744
fs.aio-max-nr = 1048576
```

```
net.ipv4.ip_local_port_range
= 9000 65500
net.core.rmem_default =
262144
net.core.rmem_max = 4194304
net.core.wmem_default =
262144
net.core.wmem_max = 1048576

vm.nr_hugepages = 2060
kernel.panic_on_oops = 1

gstanden@W520:~/Networking$
```

Apply the changes to the system using the command as shown below and verify that all new settings were accepted and applied.

```
gstanden@W520:~/Networking$
sudo sysctl -p

net.ipv4.conf.default.rp_filt
= 1
net.ipv4.conf.all.rp_filter
= 1
net.ipv4.ip_forward = 1
kernel.shmmni = 4096
kernel.sem = 250 32000 100
128
fs.file-max = 6815744
fs.aio-max-nr = 1048576
net.ipv4.ip_local_port_range
= 9000 65500
net.core.rmem_default =
262144
net.core.rmem_max = 4194304
net.core.wmem_default =
262144
net.core.wmem_max = 1048576
vm.nr_hugepages = 2060
kernel.panic_on_oops = 1

gstanden@W520:~/Networking$
```

Restart DNS and DHCP to Verify Configuration

Reboot the desktop host to reset the "/etc/resolv.conf" file to the new settings, and verify DNS and

DHCP configuration is correct by doing an nslookup on "w520" and "w520.vmem.org". Both should return the local IP address for that server. Run the tests as shown below to:

- Verify DNS is working;
- Verify that "named" is monitoring 10.207.39.1
- Verify that "named" in monitoring 10.207.29.1 (new network for mccc.org) GLS 2015-05-16
- Verify that "dnsmasq" is monitoring 10.0.3.1
- Verify that the OpenvSwitch switches are created
- Verify that "/etc/resolv.conf" has the correct settings

These tests are shown below with correct expected output.

```
gstanden@w520:~$ cat
/etc/resolv.conf

# Dynamic resolv.conf(5)
file for glibc resolver(3)
generated by resolvconf(8)
#     DO NOT EDIT THIS FILE
BY HAND -- YOUR CHANGES
WILL BE OVERWRITTEN
nameserver 127.0.0.1
search vmem.org
gns1.vmem.org

gstanden@w520:~$
gstanden@w520:~$ nslookup
w520
Server:        127.0.0.1
Address:    127.0.0.1#53

Name:    W520.vmem.org
Address: 10.207.39.1

gstanden@w520:~$ nslookup
w520.vmem.org
Server:        127.0.0.1
Address:    127.0.0.1#53
```

```
Name:    W520.vmem.org
Address: 10.207.39.1

gstanden@w520:~$ sudo
netstat -ulnp | grep 53
[sudo] password for
gstanden:
udp        0       0
0.0.0.0:5353
0.0.0.0:*
655/avahi-daemon: r
udp        0       0
0.0.0.0:55382
0.0.0.0:*
2262/dhcpd
udp        0       0
10.0.3.1:53
0.0.0.0:*
3139/dnsmasq
udp        0       0
10.207.39.1:53
0.0.0.0:*
2374/named
udp        0       0
127.0.0.1:53
0.0.0.0:*
2374/named
udp        0       0
127.0.1.1:53
0.0.0.0:*
2062/dnsmasq
udp6       0       0
:::5353
:::*
655/avahi-daemon: r
udp6       0       0
fe80::14f1:a8ff:fe89:53
:::*
3139/dnsmasq
udp6       0       0
:::53
:::*
2374/named
gstanden@w520:~$ sudo ovs-
vsctl show
2044e8b7-5949-4c10-8e3a-
0825f7b69ea5
    Bridge "sw9"
        Port "sw9"
            Interface "sw9"
                type:
internal
    Bridge "sw6"
        Port "sw6"
            Interface "sw6"
                type:
internal
    Bridge "sw5"
        Port "sw5"
            Interface "sw5"
                type:
internal
```

```
        Bridge "sw8"
            Port "sw8"
                Interface "sw8"
                    type:
internal
    Bridge "sw7"
        Port "sw7"
            Interface "sw7"
                type:
internal
    Bridge "sw4"
        Port "sw4"
            Interface "sw4"
                type:
internal
    Bridge "sw3"
        Port "sw3"
            tag: 90
            Interface "sw3"
                type:
internal
        Port "w2"
            Interface "w2"
        Port "w4"
            Interface "w4"
        Port "w3"
            Interface "w3"
        Port "w5"
            Interface "w5"
        Port "w1"
            Interface "w1"
    Bridge "sw1"
        Port "s4"
            Interface "s4"
        Port "s3"
            Interface "s3"
        Port "s1"
            Interface "s1"
        Port "s2"
            Interface "s2"
        Port "s5"
            Interface "s5"
        Port "sw1"
            tag: 10
            trunks: [10]
            Interface "sw1"
                type:
internal
    Bridge "sw2"
        Port "t1"
            Interface "t1"
        Port "t4"
            Interface "t4"
        Port "t2"
            Interface "t2"
        Port "t5"
            Interface "t5"
        Port "t3"
            Interface "t3"
        Port "sw2"
            tag: 80
            Interface "sw2"
```

```
                         type:
internal
        ovs_version: "2.1.3"
gstanden@w520:~$
```

Update Begin Ubuntu 15.04 2015-05-16

```
gstanden@vmem1:~/OpenvSwitch$
nslookup vmem1
Server:        127.0.1.1
Address:      127.0.1.1#53

Name:     vmem1.vmem.org
Address: 10.207.39.1

gstanden@vmem1:~/OpenvSwitch$
nslookup mccc1
Server:        127.0.1.1
Address:      127.0.1.1#53

Name:     mccc1.mccc.org
Address: 10.207.29.1

gstanden@vmem1:~/OpenvSwitch$
sudo ovs-vsctl show

2fc24710-34b5-4aa2-
a32d-4e7bcb1afa1a
    Bridge "sw8"
        Port "sw8"
            tag: 60
            trunks: [60,
70]
            Interface "sw8"
                type:
internal
    Bridge "sw7"
        Port "sw7"
            tag: 50
            trunks: [20,
30, 40, 50]
            Interface "sw7"
                type:
internal
    Bridge "sw4"
        Port "sw4"
            tag: 20
            trunks: [20,
30, 40, 50]
            Interface "sw4"
                type:
internal
    Bridge "sw6"
        Port "sw6"
            tag: 40
            trunks: [20,
```

```
30, 40, 50]
            Interface "sw6"
                type:
internal
    Bridge "sw5"
        Port "sw5"
            tag: 30
            trunks: [20,
30, 40, 50]
            Interface "sw5"
                type:
internal
    Bridge "sw2"
        Port "t1"
            Interface "t1"
        Port "sw2"
            tag: 80
            Interface "sw2"
                type:
internal
        Port "t4"
            Interface "t4"
        Port "t3"
            Interface "t3"
        Port "t2"
            Interface "t2"
        Port "t5"
            Interface "t5"
    Bridge "sw9"
        Port "sw9"
            tag: 70
            trunks: [60,
70]
            Interface "sw9"
                type:
internal
    Bridge "sw1"
        Port "s2"
            Interface "s2"
        Port "s4"
            Interface "s4"
        Port "s1"
            Interface "s1"
        Port "s5"
            Interface "s5"
        Port "sw1"
            tag: 10
            trunks: [10]
            Interface "sw1"
                type:
internal
        Port "s3"
            Interface "s3"
    Bridge "sw3"
        Port "w4"
            Interface "w4"
        Port "w2"
            Interface "w2"
        Port "w1"
            Interface "w1"
        Port "sw3"
            tag: 90
```

```
                Interface "sw3"
                    type:
internal
        Port "w3"
            Interface "w3"
        Port "w5"
            Interface "w5"
    Bridge "sx1"
        Port "a4"
            Interface "a4"
        Port "a5"
            Interface "a5"
        Port "a3"
            Interface "a3"
        Port "a2"
            Interface "a2"
        Port "a1"
            Interface "a1"
        Port "sx1"
            tag: 10
            trunks: [10]
            Interface "sx1"
                type:
internal
    ovs_version: "2.3.1"


gstanden@vmem1:~/OpenvSwitch$
sudo netstat -ulnp | grep
53
[sudo] password for
gstanden:

udp        0      0
0.0.0.0:5353
0.0.0.0:*
1031/avahi-daemon:
udp        0      0
192.168.122.1:53
0.0.0.0:*
3285/named
```

udp   0   0
10.207.29.1:53
0.0.0.0:*
3285/named <-- New Network
added

```
udp        0      0
10.207.39.1:53
0.0.0.0:*
3285/named
udp        0      0
127.0.0.1:53
0.0.0.0:*
3285/named
udp        0      0
192.168.122.1:53
0.0.0.0:*
2810/dnsmasq
udp        0      0
127.0.1.1:53
0.0.0.0:*
1993/dnsmasq
udp6       0      0
```

```
:::53622
:::*
1174/rpc.mountd
udp6        0      0
:::5353
:::*
1031/avahi-daemon:
udp6        0      0
:::53
:::*
3285/named
gstanden@vmem1:~/OpenvSwitch$
```

Create Oracle Enteprise Linux 6.5 LXC Linux Container

Install Ubuntu rpm and yum Packages

Create an Oracle Enteprise Linux (OEL) 6.5 LXC Linux Container as shown below. Notice that the "rpm" and "yum" deb packages must be installed first. As shown below, LXC container creation is not possible without the Ubuntu versions of "rpm" and "yum" installed first.

```
gstanden@W520:~$ sudo lxc-
create -t oracle -n
lxcora01 | tee lxcora01.log

Host is Ubuntu 14.10
No release specified with
-R, defaulting to 6.5
Create configuration file
/var/lib/lxc/lxcora01
/config
failed: The rpm command is
required, please install it
lxc_container:
lxccontainer.c:
create_run_template: 1121
container creation template
for lxcora01 failed
lxc_container:
lxc_create.c: main: 280
Error creating container
lxcora01

gstanden@W520:~$ sudo apt-
```

```
get install rpm

Reading package lists...
Done
Building dependency
tree
Reading state
information... Done
The following extra
packages will be installed:
   debugedit librpm3
librpmbuild3 librpmio3
librpmsign1 rpm-common
rpm2cpio
Suggested packages:
   rpm-i18n alien elfutils
rpmlint rpm2html
The following NEW packages
will be installed:
   debugedit librpm3
librpmbuild3 librpmio3
librpmsign1 rpm rpm-common
rpm2cpio
0 upgraded, 8 newly
installed, 0 to remove and
0 not upgraded.
Need to get 451 kB of
archives.
After this operation, 2,026
kB of additional disk space
will be used.
Do you want to continue?
[Y/n] Y
Get:1
http://us.archive.ubuntu.com
/ubuntu/ utopic/main
librpmio3 amd64 4.11.2-3
[69.0 kB]
Get:2
http://us.archive.ubuntu.com
/ubuntu/ utopic/main
debugedit amd64 4.11.2-3
[15.6 kB]
Get:3
http://us.archive.ubuntu.com
/ubuntu/ utopic/main
librpm3 amd64 4.11.2-3 [154
kB]
Get:4
http://us.archive.ubuntu.com
/ubuntu/ utopic/main
librpmbuild3 amd64 4.11.2-3
[58.0 kB]
Get:5
http://us.archive.ubuntu.com
/ubuntu/ utopic/main
librpmsign1 amd64 4.11.2-3
[8,024 B]
Get:6
http://us.archive.ubuntu.com
/ubuntu/ utopic/main rpm-
common amd64 4.11.2-3 [26.3
```

```
kB]
Get:7
http://us.archive.ubuntu.com
/ubuntu/ utopic/main
rpm2cpio amd64 4.11.2-3
[5,196 B]
Get:8
http://us.archive.ubuntu.com
/ubuntu/ utopic/main rpm
amd64 4.11.2-3 [115 kB]
Fetched 451 kB in 2s (152
kB/s)
Selecting previously
unselected package
librpmio3.
(Reading database ...
203302 files and
directories currently
installed.)
Preparing to unpack
.../librpmio3_4.11.2-3_amd64.
...
Unpacking librpmio3
(4.11.2-3) ...
Selecting previously
unselected package
debugedit.
Preparing to unpack
.../debugedit_4.11.2-3_amd64.
...
Unpacking debugedit
(4.11.2-3) ...
Selecting previously
unselected package librpm3.
Preparing to unpack
.../librpm3_4.11.2-3_amd64.de
...
Unpacking librpm3
(4.11.2-3) ...
Selecting previously
unselected package
librpmbuild3.
Preparing to unpack
.../librpmbuild3_4.11.2-3_amd
...
Unpacking librpmbuild3
(4.11.2-3) ...
Selecting previously
unselected package
librpmsign1.
Preparing to unpack
.../librpmsign1_4.11.2-3_amd6
...
Unpacking librpmsign1
(4.11.2-3) ...
Selecting previously
unselected package rpm-
common.
Preparing to unpack
.../rpm-
common_4.11.2-3_amd64.deb
...
```

```
Unpacking rpm-common
(4.11.2-3) ...
Selecting previously
unselected package
rpm2cpio.
Preparing to unpack
.../rpm2cpio_4.11.2-3_amd64.c
...
Unpacking rpm2cpio
(4.11.2-3) ...
Selecting previously
unselected package rpm.
Preparing to unpack
.../rpm_4.11.2-3_amd64.deb
...
Unpacking rpm (4.11.2-3)
...
Processing triggers for
man-db (2.7.0.2-2) ...

gstanden@W520:~$
```

Install Ubuntu yum Package

Now install the OEL 6.5 LXC Linux
Container as shown below. Notice
that the "yum" deb package must
first be installed, as shown below.

```
gstanden@W520:~$ sudo lxc-
create -t oracle -n
lxcora01

Host is Ubuntu 14.10
No release specified with
-R, defaulting to 6.5
Create configuration file
/var/lib/lxc/lxcora01
/config
failed: The yum command is
required, please install it
lxc_container:
lxccontainer.c:
create_run_template: 1121
container creation template
for lxcora01 failed
lxc_container:
lxc_create.c: main: 280
Error creating container
lxcora01

gstanden@W520:~$ sudo apt-
get install yum

Reading package lists...
Done
Building dependency
```

```
tree
Reading state
information... Done
The following extra
packages will be installed:
   libsqlite0 python-libxml2
python-rpm python-sqlite
python-sqlitecachec python-
urlgrabber
Suggested packages:
   python-sqlite-dbg
The following NEW packages
will be installed:
   libsqlite0 python-libxml2
python-rpm python-sqlite
python-sqlitecachec python-
urlgrabber yum
0 upgraded, 7 newly
installed, 0 to remove and
0 not upgraded.
Need to get 1,220 kB of
archives.
After this operation, 5,391
kB of additional disk space
will be used.
Do you want to continue?
[Y/n] Y
Get:1
http://us.archive.ubuntu.com
/ubuntu/ utopic/universe
libsqlite0 amd64
2.8.17-10ubuntu2 [139 kB]
Get:2
http://us.archive.ubuntu.com
/ubuntu/ utopic/main
python-libxml2 amd64
2.9.1+dfsg1-4ubuntu1 [143
kB]
Get:3
http://us.archive.ubuntu.com
/ubuntu/ utopic/universe
python-sqlite amd64
1.0.1-11 [20.7 kB]
Get:4
http://us.archive.ubuntu.com
/ubuntu/ utopic/main
python-urlgrabber all
3.9.1-4ubuntu3 [42.3 kB]
Get:5
http://us.archive.ubuntu.com
/ubuntu/ utopic/universe
python-rpm amd64 4.11.2-3
[33.5 kB]
Get:6
http://us.archive.ubuntu.com
/ubuntu/ utopic/universe
python-sqlitecachec amd64
1.1.4-1 [21.4 kB]
Get:7
http://us.archive.ubuntu.com
/ubuntu/ utopic/universe
yum all 3.4.3-2ubuntu1 [821
```

```
kB]
Fetched 1,220 kB in 5s (209
kB/s)
Selecting previously
unselected package
libsqlite0.
(Reading database ...
203549 files and
directories currently
installed.)
Preparing to unpack
.../libsqlite0_2.8.17-10ubunt
...
Unpacking libsqlite0
(2.8.17-10ubuntu2) ...
Selecting previously
unselected package python-
libxml2.
Preparing to unpack
.../python-
libxml2_2.9.1+dfsg1-4ubuntu1_
...
Unpacking python-libxml2
(2.9.1+dfsg1-4ubuntu1) ...
Selecting previously
unselected package python-
sqlite.
Preparing to unpack
.../python-
sqlite_1.0.1-11_amd64.deb
...
Unpacking python-sqlite
(1.0.1-11) ...
Selecting previously
unselected package python-
urlgrabber.
Preparing to unpack
.../python-
urlgrabber_3.9.1-4ubuntu3_all
...
Unpacking python-urlgrabber
(3.9.1-4ubuntu3) ...
Selecting previously
unselected package python-
rpm.
Preparing to unpack
.../python-
rpm_4.11.2-3_amd64.deb ...
Unpacking python-rpm
(4.11.2-3) ...
Selecting previously
unselected package python-
sqlitecachec.
Preparing to unpack
.../python-
sqlitecachec_1.1.4-1_amd64.de
...
Unpacking python-
sqlitecachec (1.1.4-1) ...
Selecting previously
unselected package yum.
Preparing to unpack
```

```
.../yum_3.4.3-2ubuntu1_all.de
...
Unpacking yum
(3.4.3-2ubuntu1) ...
Processing triggers for
man-db (2.7.0.2-2) ...
Setting up libsqlite0
(2.8.17-10ubuntu2) ...
Setting up python-libxml2
(2.9.1+dfsg1-4ubuntu1) ...
Setting up python-sqlite
(1.0.1-11) ...
Setting up python-
urlgrabber (3.9.1-4ubuntu3)
...
Setting up python-rpm
(4.11.2-3) ...
Setting up python-
sqlitecachec (1.1.4-1) ...
Setting up yum
(3.4.3-2ubuntu1) ...
Processing triggers for
libc-bin (2.19-10ubuntu2.1)
...

gstanden@W520:~$
```

Create LXC Container

Now install the OEL 6.5 LXC Linux
Container as shown below. The
full log of the installation is
attached to the blog as
"lxcora01.log". Abridged
information from the creation of
the LXC is shown below.

```
gstanden@W520:~$ sudo lxc-
create -t oracle -n
lxcora01 | tee lxcora01.log
gstanden@W520:~$ head
lxcora01.log

Host is Ubuntu 14.10
No release specified with
-R, defaulting to 6.5
Create configuration file
/var/lib/lxc/lxcora01
/config
Yum installing release 6.5
for x86_64
Setting up Install Process
Resolving Dependencies
--> Running transaction
check
---> Package
```

```
chkconfig.x86_64
0:1.3.49.3-2.el6_4.1 will
be installed
--> Processing Dependency:
libc.so.6(GLIBC_2.2.5)
(64bit) for package:
chkconfig-
1.3.49.3-2.el6_4.1.x86_64
--> Processing Dependency:
libc.so.6(GLIBC_2.8)(64bit)
for package: chkconfig-
1.3.49.3-2.el6_4.1.x86_64
...
...
...
Complete!
Rebuilding rpm database
Patching container rootfs
/var/lib/lxc/lxcora01
/rootfs for Oracle Linux
6.5
Configuring container for
Oracle Linux 6.5
Added container user:oracle
password:oracle
Added container user:root
password:root
Container : /var/lib
/lxc/lxcora01/rootfs
Config    : /var/lib
/lxc/lxcora01/config
Network   : eth0 (veth) on
virbr0

gstanden@W520:~$  sudo lxc-
ls -f

NAME        STATE     IPV4
IPV6  GROUPS  AUTOSTART
---------------------------
lxcora01  STOPPED  -
-      -         NO

gstanden@W520:~$
```

Start LXC Linux Container
lxcora01 in foreground mode ("-
F") so that console will connect on
current startup session as shown
below. Notice that DHCP provided
by default by dnsmasq-base
listening on lxcbr0 (10.0.3.1) has
provided a dhcp-issued IP address
for the container. This is the
default networking provided by
the standard template. After

verifying, shutdown the container using "shutdown -h now" as shown below.

Also, note the MAC address shown in bold below which will be used when editing the config file for the container for OpenvSwitch networking.

```
gstanden@W520:~$ sudo lxc-
start -n lxcora01 -F

        Welcome to Oracle
Linux Server
Setting hostname
lxcora01:
[  OK  ]
Checking filesystems

[  OK  ]
Mounting local
filesystems:
[  OK  ]
Enabling /etc/fstab
swaps:
[  OK  ]
Entering non-interactive
startup
Bringing up loopback
interface:
[  OK  ]
Bringing up interface
eth0:
Determining IP information
for eth0... done.

[  OK  ]
Starting system
logger:
[  OK  ]
Mounting
filesystems:
[  OK  ]
Generating SSH1 RSA host
key:
[  OK  ]
Generating SSH2 RSA host
key:
[  OK  ]
Generating SSH2 DSA host
key:
[  OK  ]
Starting
sshd:
[  OK  ]
```

```
Oracle Linux Server release
6.5
Kernel 3.16.0-28-generic on
an x86_64

lxcora01 login: root
Password:

[root@lxcora01 ~]# ifconfig

eth0      Link
encap:Ethernet  HWaddr
FE:71:FA:7E:CB:AF
          inet
addr:10.0.3.116
Bcast:10.0.3.255
Mask:255.255.255.0
          inet6 addr:
fe80::fc71:faff:fe7e:cbaf/64
Scope:Link
          UP BROADCAST
RUNNING MULTICAST
MTU:1500  Metric:1
          RX packets:30
errors:0 dropped:0
overruns:0 frame:0
          TX packets:13
errors:0 dropped:0
overruns:0 carrier:0
          collisions:0
txqueuelen:1000
          RX bytes:4625
(4.5 KiB)  TX bytes:1458
(1.4 KiB)

lo        Link encap:Local
Loopback
          inet
addr:127.0.0.1
Mask:255.0.0.0
          inet6 addr:
::1/128 Scope:Host
          UP LOOPBACK
RUNNING  MTU:65536
Metric:1
          RX packets:0
errors:0 dropped:0
overruns:0 frame:0
          TX packets:0
errors:0 dropped:0
overruns:0 carrier:0
          collisions:0
txqueuelen:0
          RX bytes:0 (0.0
b)  TX bytes:0 (0.0 b)

[root@lxcora01 ~]# shutdown
-h now
```

Configure LXC Container for OpenvSwitch Networking

Make a backup of the original install LXC config file as shown below.

```
gstanden@W520:~$ sudo su -
root@W520:~# cd /var/lib
/lxc/lxcora01
root@W520:/var/lib/lxc
/lxcora01# ls -lrt
total 8
-rw-r--r--  1 root root
663 Dec 28 14:48 config
dr-xr-xr-x 21 root root
4096 Dec 28 15:12 rootfs
root@W520:/var/lib/lxc
/lxcora01# cp -p config
config.original.install.bak
```

Edit LXC Container config File for OpenvSwitch

The original "/var/lib/lxc/lxcora01 /config" file is shown below. In the next step, the config is edited to put the container on the OpenvSwitch network., The lines shown in bold will be commented out in the next step to remove the LXC container from Linux Bridge networking, and the file will be rearranged slightly for clarity and readability.

```
root@W520:/var/lib/lxc
/lxcora01# cat
config.original.install.bak

# Template used to create
this container: /usr/share
/lxc/templates/lxc-oracle
# Parameters passed to the
template:
# For additional config
options, please look at
lxc.container.conf(5)
lxc.network.type = veth
```

```
lxc.network.link = lxcbr0
lxc.network.flags = up
lxc.network.hwaddr =
00:16:3e:xx:xx:xx
lxc.rootfs = /var/lib
/lxc/lxcora01/rootfs
# Common configuration
lxc.include = /usr/share
/lxc/config
/oracle.common.conf
# Container configuration
for Oracle Linux 6.5
lxc.arch = x86_64
lxc.utsname = lxcora01
lxc.cap.drop = sys_resource
lxc.cap.drop = setfcap
setpcap
# Networking
lxc.network.name = eth0
lxc.network.mtu = 1500
lxc.network.hwaddr =
fe:71:fa:7e:cb:af
root@W520:/var/lib/lxc
/lxcora01#
```

The edited version of the "/var/lib
/lxc/lxcora01/config" for use with
OpenvSwitch networking is shown
below. TheLinux Bridge
networking lines have been
removed, and the file has also
been rearranged into sections for
better readability and clarity.

```
root@W520:/var/lib/lxc
/lxcora01# cat config
# Template used to create
this container: /usr/share
/lxc/templates/lxc-oracle
# Parameters passed to the
template:
# For additional config
options, please look at
lxc.container.conf(5)

# Filesystem
lxc.rootfs = /var/lib
/lxc/lxcora01/rootfs

# Common configuration
lxc.include = /usr/share
/lxc/config
/oracle.common.conf

# Container configuration
```

```
for Oracle Linux 6.5
lxc.arch = x86_64
lxc.utsname = lxcora01
lxc.cap.drop = sys_resource
lxc.cap.drop = setfcap
setpcap

# OpenvSwitch
Networking
```
<-- OpenvSwitch Networking is added.
```
lxc.network.type = veth
lxc.network.flags = up
lxc.network.script.up =
```
/etc/network/if-up.d/lxc-ifup-sw1
```
lxc.network.script.down =
```
/etc/network/if-down.d/lxc-ifdown-sw1
```
lxc.network.veth.pair =
lxcora01-pub
lxc.network.name = eth0
lxc.network.mtu = 1500
```
lxc.network.hwaddr = fe:71:fa:7e:cb:af   <-- Same MAC address is reused from original config for eth0
```
# Linux Bridge
Networking
```
<-- Linux Bridge Networking is commented out.
```
# lxc.network.type = veth
# lxc.network.link = lxcbr0
# lxc.network.flags = up
# lxc.network.hwaddr =
00:16:3e:xx:xx:xx
# lxc.network.name = eth1
# lxc.network.mtu = 1500

root@W520:/var/lib/lxc
/lxcora01#
```

Create Additional Required Networking Files

Next the two files "lxc-ifup-sw1" and "lxc-ifdown-sw1" must be installed and configured as shown below.

```
root@W520:/etc/network/if-
up.d# chmod 744 lxc-ifup-
sw1
root@W520:/etc/network/if-
```

```
up.d# cd ..
root@W520:/etc/network# cd
if-down.d
root@W520:/etc/network/if-
down.d# chmod 744 lxc-
ifdown-sw1
root@W520:/etc/network/if-
down.d#

root@W520:/etc/network/if-
up.d# cat lxc-ifup-sw1

#!/bin/bash
ovsBr='sw1'
ovs-vsctl add-port ${ovsBr}
$5
ovs-vsctl set port $5
tag=10


root@W520:/etc/network/if-
up.d# cd ..
root@W520:/etc/network# cd
if-down.d/

root@W520:/etc/network/if-
down.d# cat lxc-ifdown-sw1

#!/bin/bash
ovsBr='sw1'
ovs-vsctl del-port ${ovsBr}
$5

root@W520:/etc/network/if-
down.d#
```

Configure dhclient.conf File

Next edit the "/var/lib
/lxc/lxcora01/rootfs/etc/dhcp
/dhclient.conf" file for the LXC
container as shown below. This
file configures the
"/etc/resolv.conf" file of the LXC
Linux Container at boot time
ensuring that it always has the
correct set of nameserver values
and domain name values added
dynamically at boot. Note that
the "vmem.org" domain name is
not included because it is added
to the container /etc/resolv.conf
by DHCP of the host. Optionally, it

could be included here, but typically this would result in "vmem.org" appearing twice in the resolv.conf file of the LXC container.

```
root@W520:/var/lib/lxc
/lxcora01# cat rootfs/etc
/dhcp/dhclient.conf

append domain-name-servers
8.8.8.8, 10.207.39.3;
append domain-name "
gns1.vmem.org";

root@W520:/var/lib/lxc
/lxcora01#
```

The "/var/lib/lxc/lxcora01/rootfs /etc/sysconfig/network-scripts /ifcfg-eth0" file can be listed and checked as well as shown below just to verify it is correct. It should be similar to the one shown below.

```
root@W520:/var/lib/lxc
/lxcora01# cat rootfs/etc
/sysconfig/network-scripts
/ifcfg-eth0

DEVICE=eth0
BOOTPROTO=dhcp
ONBOOT=yes
HOSTNAME=lxcora01
DHCP_HOSTNAME=lxcora01
NM_CONTROLLED=no
TYPE=Ethernet

root@W520:/var/lib/lxc
/lxcora01#
```

Verify Container Operation on DHCP and DNS with OpenvSwitch

Start the container (or reboot if it is already running) as shown below. IP assignment ot eth0 should be successful.

```
gstanden@W520:~$ sudo lxc-
start -n lxcora01 -F

         Welcome to Oracle
Linux Server
Setting hostname
lxcora01:
[  OK  ]
Checking filesystems

[  OK  ]
Mounting local
filesystems:
[  OK  ]
Enabling /etc/fstab
swaps:
[  OK  ]
Entering non-interactive
startup
Bringing up loopback
interface:
[  OK  ]
Bringing up interface
eth0:
Determining IP information
for eth0... done.

[  OK  ]
Starting system
logger:
[  OK  ]
Mounting
filesystems:
[  OK  ]
Starting
sshd:
[  OK  ]

Oracle Linux Server release
6.5
Kernel 3.16.0-28-generic on
an x86_64

lxcora01 login:
```

Verify Container on OpenvSwitch Network

Login to the container and verify that the container is now on the OpenvSwitch network as shown below. In this case the first container gets ".70" as it's IP because this was set as the lowest IP in the DHCP reserved range. IP

addresses below 70 are reserved for static assignment on the 10.207.39.x subnet.

```
[root@lxcora01 ~]# ifconfig

eth0      Link
encap:Ethernet  HWaddr
FE:71:FA:7E:CB:AF
          inet
addr:10.207.39.70
Bcast:10.207.39.255
Mask:255.255.255.0
          inet6 addr:
fe80::fc71:faff:fe7e:cbaf/64
Scope:Link
          UP BROADCAST
RUNNING MULTICAST
MTU:1500  Metric:1
          RX packets:124
errors:0 dropped:0
overruns:0 frame:0
          TX packets:11
errors:0 dropped:0
overruns:0 carrier:0
          collisions:0
txqueuelen:1000
          RX bytes:24086
(23.5 KiB)  TX bytes:1074
(1.0 KiB)

lo        Link encap:Local
Loopback
          inet
addr:127.0.0.1
Mask:255.0.0.0
          inet6 addr:
::1/128 Scope:Host
          UP LOOPBACK
RUNNING  MTU:65536
Metric:1
          RX packets:0
errors:0 dropped:0
overruns:0 frame:0
          TX packets:0
errors:0 dropped:0
overruns:0 carrier:0
          collisions:0
txqueuelen:0
          RX bytes:0 (0.0
b)  TX bytes:0 (0.0 b)

[root@lxcora01 ~]#
```

**Verify Container /etc/resolv.conf
Correct Dynamic Formatting**

Check that the /etc/resolv.conf has the correct entries assigned at startup by dhclient.conf file as shown below.

```
[root@lxcora01 ~]# cat
/etc/resolv.conf

; generated by
/sbin/dhclient-script
search vmem.org
gns1.vmem.org
nameserver 10.207.39.1
nameserver 8.8.8.8
nameserver 10.207.39.3

[root@lxcora01 ~]#
```

Install Package "bind-utils" into LXC Container

Install the "bind-utils" package inside the LXC container using "yum" as shown below, and check then check that "nslookup" can resolv "lxcora01" the hostname of the LXC container as shown below. The bind-utils package is needed to obtain "nslookup".

```
[root@lxcora01 ~]# yum
install bind-utils
Loaded plugins: lxc-patch
ol6_u5_base
| 1.4 kB       00:00
ol6_u5_base/primary
| 3.2 MB       00:01
ol6_u5_base
8573/8573
Setting up Install Process
Resolving Dependencies
--> Running transaction
check
---> Package bind-
utils.x86_64
32:9.8.2-0.17.rc1.0.2.el6_4.6
will be installed
--> Processing Dependency:
bind-libs =
32:9.8.2-0.17.rc1.0.2.el6_4.6
for package: 32:bind-utils-
9.8.2-0.17.rc1.0.2.el6_4.6.x8
```

```
--> Processing Dependency:
libdns.so.81()(64bit) for
package: 32:bind-utils-
9.8.2-0.17.rc1.0.2.el6_4.6.x8
--> Processing Dependency:
libbind9.so.80()(64bit) for
package: 32:bind-utils-
9.8.2-0.17.rc1.0.2.el6_4.6.x8
--> Processing Dependency:
libisc.so.83()(64bit) for
package: 32:bind-utils-
9.8.2-0.17.rc1.0.2.el6_4.6.x8
--> Processing Dependency:
libisccc.so.80()(64bit) for
package: 32:bind-utils-
9.8.2-0.17.rc1.0.2.el6_4.6.x8
--> Processing Dependency:
liblwres.so.80()(64bit) for
package: 32:bind-utils-
9.8.2-0.17.rc1.0.2.el6_4.6.x8
--> Processing Dependency:
libisccfg.so.82()(64bit)
for package: 32:bind-utils-
9.8.2-0.17.rc1.0.2.el6_4.6.x8
--> Running transaction
check
---> Package bind-
libs.x86_64
32:9.8.2-0.17.rc1.0.2.el6_4.6
will be installed
--> Finished Dependency
Resolution

Dependencies Resolved

===============================
 Package
Arch
Version
Repository
Size
===============================
Installing:
 bind-
utils
x86_64
32:9.8.2-0.17.rc1.0.2.el6_4.6
ol6_u5_base
182 k
Installing for
dependencies:
 bind-
libs
x86_64
32:9.8.2-0.17.rc1.0.2.el6_4.6
ol6_u5_base
878 k

Transaction Summary
===============================
Install     2 Package(s)
```

```
Total download size: 1.0 M
Installed size: 2.6 M
Is this ok [y/N]: y
Downloading Packages:
(1/2): bind-
libs-9.8.2-0.17.rc1.0.2.el6_4
| 878 kB     00:30
(2/2): bind-utils-
9.8.2-0.17.rc1.0.2.el6_4.6.x8
| 182 kB     00:02
----------------------------
Total
29 kB/s | 1.0 MB
00:36
warning: rpmts_HdrFromFdno:
Header V3 RSA/SHA256
Signature, key ID ec551f03:
NOKEY
Retrieving key from
file:///etc/pki/rpm-
gpg/RPM-GPG-KEY-oracle
Importing GPG key
0xEC551F03:
 Userid : Oracle OSS group
(Open Source Software
group)
<build@oss.oracle.com>
 Package: 6:oraclelinux-
release-6Server-
5.0.2.x86_64
(@ol6_u5_base/$releasever)
 From   : /etc/pki/rpm-
gpg/RPM-GPG-KEY-oracle
Is this ok [y/N]: y
Running rpm_check_debug
Running Transaction Test
Transaction Test Succeeded
Running Transaction
  Installing : 32:bind-
libs-9.8.2-0.17.rc1.0.2.el6_4
1/2
  Installing : 32:bind-
utils-
9.8.2-0.17.rc1.0.2.el6_4.6.x8
2/2
lxc-patch: checking if
updated pkgs need
patching...
  Verifying  : 32:bind-
libs-9.8.2-0.17.rc1.0.2.el6_4
1/2
  Verifying  : 32:bind-
utils-
9.8.2-0.17.rc1.0.2.el6_4.6.x8
2/2

Installed:
  bind-utils.x86_64
32:9.8.2-0.17.rc1.0.2.el6_4.6
```

```
Dependency Installed:
  bind-libs.x86_64
32:9.8.2-0.17.rc1.0.2.el6_4.(

Complete!
[root@lxcora01 ~]#
```

Run nslookup Tests in LXC Container to Verify DNS Resolutions

Now run nslookup as shown below to verify automatic DNS registration of DHCP-issued IP addresses and to test that various configured dynamic and static forward and reverse lookups are working correctly from the LXC container.

```
[root@lxcora01 ~]# nslookup
lxcora01
Server:        10.207.39.1
Address:    10.207.39.1#53

Name:    lxcora01.vmem.org
Address: 10.207.39.70

[root@lxcora01 ~]# nslookup
10.207.39.70
Server:        10.207.39.1
Address:    10.207.39.1#53

70.39.207.10.in-
addr.arpa    name =
lxcora01.vmem.org.

[root@lxcora01 ~]# nslookup
w520
Server:        10.207.39.1
Address:    10.207.39.1#53

Name:    W520.vmem.org
Address: 10.207.39.1

[root@lxcora01 ~]# nslookup
10.207.39.1
Server:        10.207.39.1
Address:    10.207.39.1#53

1.39.207.10.in-addr.arpa
name = W520.vmem.org.
```

```
[root@lxcora01 ~]# nslookup
lxc1-gns-vip
Server:          10.207.39.1
Address:     10.207.39.1#53

Name:     lxc1-gns-
vip.vmem.org
Address: 10.207.39.3

[root@lxcora01 ~]# nslookup
10.207.39.3
Server:          10.207.39.1
Address:     10.207.39.1#53

3.39.207.10.in-addr.arpa
name = lxc1-gns-
vip.vmem.org.

[root@lxcora01 ~]#
```

Run Various Status Commands on Container

The LXC container is now on the OpenvSwitch network and ready for configuration of pre-requisites for Oracle Enterprise Database product installations. Various checks on the running container can be run as shown below.

```
gstanden@w520:~$ sudo lxc-
info -n lxcora01
[sudo] password for
gstanden:
Name:          lxcora01
State:          RUNNING
PID:          5288
IP:
10.207.39.70
CPU use:       4.99
seconds
BlkIO use:     2.23 MiB
Memory use:    33.65 MiB
KMem use:      0 bytes
Link:          lxcora01-
pub
 TX bytes:     107.54 KiB
 RX bytes:     4.54 MiB
 Total bytes:  4.65 MiB
gstanden@w520:~$ sudo lxc-
ls -f
NAME       STATE
IPV4           IPV6  GROUPS
```

```
AUTOSTART
--------------------------
lxcora01  RUNNING
10.207.39.70  -      -
NO
gstanden@w520:~$
```

Create File Management Links

Several files located in various directories are used to configure and manage this environment. It is useful to build links off of the "/home/username" directory to act as pointers to various required files for centralized managment and control. Use the "ln -s" command to create links as shown below. Note that links to files inside the rootfs of the LXC container will show as red due to access permissions when connected as non-root account, but are useful nevertheless for reminding location of these files.

```
root@vmem1:/home/gstanden
/Networking# cat
crt_links.sh

ln -s /etc/dhcp/dhcpd.conf
.
ln -s /etc/dhcp
/dhclient.conf .
ln -s /etc/init/my-network-
up.sh .
ln -s /var/lib
/bind/fwd.vmem.org .
ln -s /var/lib
/bind/rev.vmem.org .
ln -s /var/lib
/bind/fwd.mccc.org .
ln -s /var/lib
/bind/rev.mccc.org .
ln -s /etc/network/if-
up.d/lxc-ifup-sw1 .
ln -s /etc/network/if-
down.d/lxc-ifdown-sw1 .
ln -s /etc/bind
/named.conf.options .
ln -s /etc/bind
/named.conf.local .
```

```
ln -s /etc/bind/rndc.key .
ln -s /var/lib/lxc/lxcora02
/config lxcora02-config
ln -s /var/lib/lxc/lxcora03
/config lxcora03-config
ln -s /etc/NetworkManager
/dnsmasq.d/local .

root@vmem1:/home/gstanden
/Networking#
```

Contents of the /home/gstanden
/OpenvSwitch directory shown
below.

```
gstanden@w520:~$ cd
OpenvSwitch
gstanden@w520:~/OpenvSwitch$
ls -lrt
total 48
-rwxr-xr-x 1 gstanden
gstanden 2153 Dec 30 19:34
crt_ovs_sw1.sh
-rwxr-xr-x 1 gstanden
gstanden 1016 Dec 30 19:34
crt_ovs_sw2.sh
-rwxr-xr-x 1 gstanden
gstanden 1019 Dec 30 19:34
crt_ovs_sw3.sh
-rwxr-xr-x 1 gstanden
gstanden  704 Dec 30 19:34
crt_ovs_sw4.sh
-rwxr-xr-x 1 gstanden
gstanden  704 Dec 30 19:34
crt_ovs_sw5.sh
-rwxr-xr-x 1 gstanden
gstanden  704 Dec 30 19:34
crt_ovs_sw6.sh
-rwxr-xr-x 1 gstanden
gstanden  704 Dec 30 19:34
crt_ovs_sw7.sh
-rwxr-xr-x 1 gstanden
gstanden  704 Dec 30 19:34
crt_ovs_sw8.sh
-rwxr-xr-x 1 gstanden
gstanden  704 Dec 30 19:34
crt_ovs_sw9.sh
lrwxrwxrwx 1 gstanden
gstanden   28 Dec 30 19:38
my-network-up.conf ->
/etc/init/my-network-
up.conf
-rw-r--r-- 1 gstanden
gstanden  414 Dec 30 20:50
crt_ovs_sw1.log
-rw-r--r-- 1 gstanden
gstanden  195 Dec 30 20:50
crt_ovs_sw2.log
-rw-r--r-- 1 gstanden
```

```
gstanden  195 Dec 30 20:50
crt_ovs_sw3.log
-rw-r--r-- 1 gstanden
gstanden    0 Dec 30 20:50
crt_ovs_sw4.log
-rw-r--r-- 1 gstanden
gstanden    0 Dec 30 20:50
crt_ovs_sw5.log
-rw-r--r-- 1 gstanden
gstanden    0 Dec 30 20:50
crt_ovs_sw6.log
-rw-r--r-- 1 gstanden
gstanden    0 Dec 30 20:50
crt_ovs_sw7.log
-rw-r--r-- 1 gstanden
gstanden    0 Dec 30 20:50
crt_ovs_sw8.log
-rw-r--r-- 1 gstanden
gstanden    0 Dec 30 20:50
crt_ovs_sw9.log
gstanden@w520:~/OpenvSwitch$
cd ..
gstanden@w520:~$ cd
Networking
root@vmem1:/home/gstanden
/Networking# ls -lrt

total 4
lrwxrwxrwx 1 root
root      20 May 16 17:38
dhcpd.conf -> /etc/dhcp
/dhcpd.conf
lrwxrwxrwx 1 root
root      23 May 16 17:38
dhclient.conf -> /etc/dhcp
/dhclient.conf
lrwxrwxrwx 1 root
root      26 May 16 17:38
rev.vmem.org -> /var/lib
/bind/rev.vmem.org
lrwxrwxrwx 1 root
root      26 May 16 17:38
fwd.vmem.org -> /var/lib
/bind/fwd.vmem.org
lrwxrwxrwx 1 root
root      26 May 16 17:38
rev.mccc.org -> /var/lib
/bind/rev.mccc.org
lrwxrwxrwx 1 root
root      26 May 16 17:38
fwd.mccc.org -> /var/lib
/bind/fwd.mccc.org
lrwxrwxrwx 1 root
root      33 May 16 17:38
lxc-ifup-sw1 ->
/etc/network/if-up.d/lxc-
ifup-sw1
lrwxrwxrwx 1 root
root      37 May 16 17:38
lxc-ifdown-sw1 ->
/etc/network/if-down.d/lxc-
ifdown-sw1
```

```
lrwxrwxrwx 1 root
root       18 May 16 17:38
rndc.key -> /etc/bind
/rndc.key
lrwxrwxrwx 1 root
root       28 May 16 17:38
named.conf.options ->
/etc/bind
/named.conf.options
lrwxrwxrwx 1 root
root       26 May 16 17:38
named.conf.local ->
/etc/bind/named.conf.local
lrwxrwxrwx 1 root
root       35 May 16 17:38
local ->
/etc/NetworkManager
/dnsmasq.d/local
lrwxrwxrwx 1 root
root       28 May 16 17:39
lxcora02-config -> /var/lib
/lxc/lxcora02/config
lrwxrwxrwx 1 root
root       28 May 16 17:39
lxcora03-config -> /var/lib
/lxc/lxcora03/config
-rwxr-xr-x 1 gstanden
gstanden 569 May 16 17:40
crt_links.sh
lrwxrwxrwx 1 root
root       26 May 16 17:40
my-network-up.sh ->
/etc/init/my-network-up.sh

root@vmem1:/home/gstanden
/Networking#

gstanden@w520:~/Networking$
cd ..
gstanden@w520:~$ cd
Templates
gstanden@w520:~/Templates$
ls -lrt
total 0

lrwxrwxrwx 1 gstanden
gstanden 24 Dec 30 21:18
templates -> /usr/share
/lxc/templates

gstanden@w520:~/Templates$
```

crt_o... Gilbe...	**v.2**	⬇
crt_o... Gilbe...	**v.2**	⬇
crt_o... Gilbe...	**v.2**	⬇
crt_o... Gilbe...	**v.2**	⬇
crt_o... Gilbe...	**v.2**	⬇
crt_o... Gilbe...	**v.2**	⬇
crt_o... Gilbe...	**v.2**	⬇
crt_o... Gilbe...	**v.2**	⬇
crt_o... Gilbe...	**v.2**	⬇
crt_o... Gilbe...	**v.2**	⬇
dhcli... Gilbe...	**v.2**	⬇
dhcp... Gilbe...	**v.2**	⬇
fwd.... Gilbe...	**v.2**	⬇
fwd.v... Gilbe...	**v.2**	⬇
interf... Gilbe...	**v.2**	⬇
local ... Gilbe...	**v.2**	⬇
lxcor... Gilbe...	**v.2**	⬇

📄	my-n... Gilbe...	**v.2**	⬇
📄	name... Gilbe...	**v.2**	⬇
📄	name... Gilbe...	**v.2**	⬇
📄	rc.loc... Gilbe...	**v.2**	⬇
📄	resol... Gilbe...	**v.2**	⬇
📄	rev.m... Gilbe...	**v.2**	⬇
📄	rev.v... Gilbe...	**v.2**	⬇

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