# DEPLOYMENT OF OVS-DPDK-QEMU USING RPM



Prepared By
Infinity Labs Architectures Team

# Table of Contents

# 1 Document Identification

## 1.1 Document Version

| Sr No | Document Reference | Version | Issue Date | Author | Email Address |
|---|---|---|---|---|---|
| 1 | Deployment Guide for QEMU-OVS-DPDK Using RPM | 1.0 | 22 Jul, 2020 | Engineering Team | engineering@infinitylabs.in |

## 1.2 Document Review History

| Sr No | Reviewer Name & Designation | Version | Review Date | Author | Email Address |
|---|---|---|---|---|---|
| 1 | Mohit C. Saxena, CTO Infinity Labs Ltd. | 1.0 | 23 Jul, 2020 | Engineering Team | mohit.saxena@infinitylabs.in |

## 1.3 Proprietary Notice

# 2 Introduction

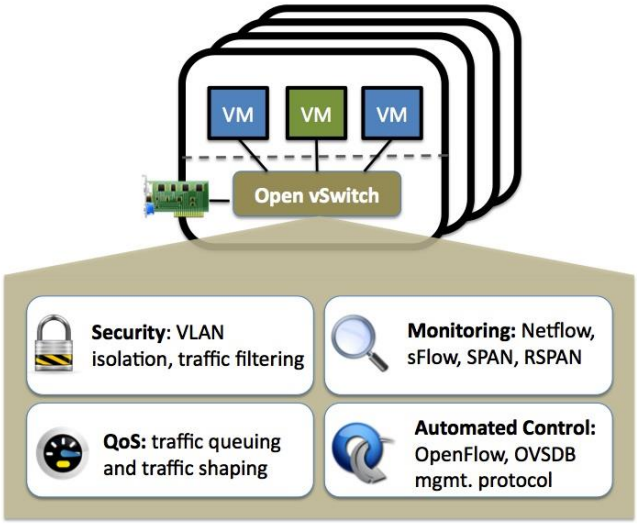
## 2.1 Document Scope

The RPM Package Manager (RPM) is a powerful command-line driven package management system capable of installing, uninstalling, verifying, querying, and updating computer software packages.
Each software package consists of an archive of files along with information about the package like its version, a description, and the like.

The scope of this document is to mention deployment steps of Openswitch, DPDK and Qemu with the use of '.rpm' files . It will make our deployment process of the packages much faster and easy to use.

### 2.1.1 OVS (Open V-Switch)

Open vSwitch is a multilayer software switch licensed under the open source Apache 2 license. Our goal is to implement a production quality switch platform that supports standard management interfaces and opens the forwarding functions to programmatic extension and control.




Open vSwitch is well suited to function as a virtual switch in VM environments. In addition to exposing standard control and visibility interfaces to the virtual networking layer, it was designed to support distribution across multiple physical servers. Open vSwitch supports multiple Linux-based virtualization technologies including Xen/XenServer, KVM, and VirtualBox.

### 2.1.2 DPDK

DPDK is the Data Plane Development Kit that consists of libraries to accelerate packet processing workloads running on a wide variety of CPU architectures.
Designed to run on x86, POWER and ARM processors, it runs mostly in Linux userland, with a FreeBSD port available for a subset of DPDK features. DPDK is licensed under the Open Source BSD License.

### 2.1.3 QEMU

QEMU (Quick Emulator) is a free and open-source emulator and virtualizer that can perform hardware virtualization.
It can be considered as a hosted virtual machine monitor: it emulates the machine's processor through dynamic binary translation and provides a set of different hardware and device models for the machine, enabling it to run a variety of guest operating systems.
It also can be used with KVM to run virtual machines at near-native speed (by taking advantage of hardware extensions such as Intel VT-x).

# 3 RPM Setup and Installation

This section explains the installation of required packages to work on RPM.

## 3.1 Environment Details

The RPM setup has been done on CentOS-7-x86_64-DVD-1908.iso image which is used to create a bootable pen drive and this image we have implemented in our Infinity Box.

## 3.2 Install the required packages to work on RPM

# **yum install rpm-build rpmdevtools**
# **mkdir -p /root/rpmbuild/{BUILD,RPMS,SOURCES,SPECS,SRPMS,tmp}**
# **vim ~/.rpmmacros**
Note: Change the %packager name to Infinity

## 3.3 QEMU RPM

- Download the tar file in /root/rpmbuild/SOURCE/
  # cd /root/rpmbuild/SOURCE/
  # **wget http://portal.infinitylabs.in/rpm/qemu-4.0.0.tar.xz**

- Create the .spec file in /root/rpmbuild/SPEC.
  # cd /root/rpmbuild/SPEC/
  # **vim qemu.spec**

Clear the qemu.spec file and then add the below content in qemu.spec file.

```
################################ qemu.spec ######################################
Name:          qemu
Version:       4.0.0
Release:       1%{?dist}
Summary:       qemu TEST

License:       GPLv2
URL:           https://download.qemu.org
Source0:       wget https://download.qemu.org/qemu-4.0.0.tar.xz

BuildRequires:    gtk2-devel
BuildArch:        x86_64

%description
Packaging the latest (at time of writing) version of qemu that is not available from Red Hat repository

%prep
%setup -q -n %{name}-%{version}

%build
./configure --target-list=x86_64-softmmu
make
```

```
%install
%make_install

%files
/usr/local/bin/
/usr/local/libexec/
/usr/local/share/
/usr/local/share/qemu
################################################################################
```

- Run "rpmbuild -ba qemu.spec" command to generate the RPM, this will take some time.
  # **rpmbuild -ba qemu.spec**

- Check the last few lines after completion of process of "rpmbuild -ba qemu.spec" command.
  1. There should be an RPM file generated in /RPMS repositpory .
  2. An untar image with all the updated files should be present in /root/rpmbuild/RPMS.

Last few lines for reference

Wrote: **/root/rpmbuild/SRPMS/qemu-4.0.0-1.el7.src.rpm**
Wrote: **/root/rpmbuild/RPMS/x86_64/qemu-4.0.0-1.el7.x86_64.rpm**
Wrote: **/root/rpmbuild/RPMS/x86_64/qemu-debuginfo-4.0.0-1.el7.x86_64.rpm**
Executing(%clean): /bin/sh -e /var/tmp/rpm-tmp.SwecmC
+ umask 022
+ cd /root/rpmbuild/BUILD
+ cd qemu-4.0.0
+ /usr/bin/rm -rf /root/rpmbuild/BUILDROOT/qemu-4.0.0-1.el7.x86_64
+ exit 0

Cross check in repository

[root@localhost rpmbuild]# **cd ../RPMS/**
[root@localhost RPMS]# **ls**
**x86_64**
[root@localhost RPMS]# **cd x86_64/**
[root@localhost x86_64]# **ls**
**qemu-4.0.0-1.el7.x86_64.rpm  qemu-debuginfo-4.0.0-1.el7.x86_64.rpm**

Install the Qemu RPM

Install your rpm using the below command. After install check that the files are properly installed at defined location.
  # **rpm -ivh qemu-4.0.0-1.el7.x86_64.rpm**
**Preparing...** ################################# **[100%]**
**Updating / installing...**
**1: qemu-4.0.0-1.el7** ################################# **[100%]**

## 3.4 DPDK RPM

- Download the tar file in /root/rpmbuild/SOURCE/
  # cd /root/rpmbuild/SOURCE/
  # **wget http://portal.infinitylabs.in/rpm/dpdk-19.11.3.tar.xz**

- Create the .spec file in /root/rpmbuild/SPEC.
  # cd /root/rpmbuild/SPEC/
  # **vim dpdk.spec**

Clear the dpdk.spec file and then add the below content in dpdk.spec file.

```
############################## dpdk.spec  ########################################
Name:          dpdk-stable
Version:       19.11.3
Release:       1%{?dist}
Summary:       DPDK TEST

License:       GPLv2
URL:           http://fast.dpdk.org
Source0:       http://fast.dpdk.org/rel/dpdk-19.11.3.tar.xz

BuildRequires:   gtk2-devel
BuildArch:       x86_64

%description
Packaging the latest (at time of writing) version of qemu that is not available from Red Hat repository

%prep
%setup -q -n %{name}-%{version}

%build
export DPDK_DIR=/root/rpmbuild/SOURCEs/dpdk-stable-19.11.3/
export DPDK_TARGET=x86_64-native-linuxapp-gcc
export DPDK_BUILD=$DPDK_DIR/$DPDK_TARGET
%make_install T=$DPDK_TARGET DESTDIR=install

%files
#/usr/bin/
#/usr/local/share/qemu/
#/usr/share/locale/

###############################################################################
```

- Run "rpmbuild -ba qemu.spec" command to generate the RPM, it will take some time.
  # **rpmbuild -ba qemu.spec**

- Check the last few lines after completion of process of "rpmbuild -ba qemu.spec" command .
  1. There should be an RPM file generated in /RPMS repositpory .
  2. An untar image with all the updated files should be present in /root/rpmbuild/RPMS.

Last few lines for reference

```
Wrote: /root/rpmbuild/SRPMS/dpdk-stable-19.11.3-1.el7.src.rpm
Wrote: /root/rpmbuild/RPMS/x86_64/dpdk-stable-19.11.3-1.el7.x86_64.rpm
Wrote: /root/rpmbuild/RPMS/x86_64/dpdk-stable-debuginfo-19.11.3-1.el7.x86_64.rpm
```

```
Executing(%clean): /bin/sh -e /var/tmp/rpm-tmp.LSKFsx
+ umask 022
+ cd /root/rpmbuild/BUILD
+ cd dpdk-stable-19.11.3
+ /usr/bin/rm -rf /root/rpmbuild/BUILDROOT/dpdk-stable-19.11.3-1.el7.x86_64
+ exit 0
```

Cross check in repository

```
[root@localhost SPECS]# cd ../RPMS/
[root@localhost RPMS]# ls
x86_64
[root@localhost RPMS]# cd x86_64/
[root@localhost x86_64]# ls
dpdk-stable-19.11.3-1.el7.x86_64.rpm
dpdk-stable-debuginfo-19.11.3-1.el7.x86_64.rpm
```

Install the DPDK RPM

```
[root@localhost x86_64]# rpm -ivh dpdk-stable-19.11.3-1.el7.x86_64.rpm
Preparing...                          ################################# [100%]
Updating / installing...
1: dpdk-stable-19.11.3-1.el7 ################################# [100%]
```

## 3.5 OPENSWITCH RPM

- Download the tar file in /root/rpmbuild/SOURCE/

  # cd /root/rpmbuild/SOURCE/

  # **wget http://portal.infinitylabs.in/rpm/openvswitch-2.12.0.tar.xz**

- Extract the file and add the connection.sh script which is used to resolve DPDK based dependency issues of netdev_dpdk.c file.

  # **tar -zxvf openvswitch-2.12.0.tar.gz.**

  # **cd openvswitch-2.12.0**

  # **vim connection.sh**

Add the below lines in connection.sh file.

```
############################## connection.sh##################################
#!/bin/bash
sed -i "s/ ETHER_/ RTE_ETHER_/" lib/netdev-dpdk.c
sed -i "s/(ETHER_/(RTE_ETHER_/" lib/netdev-dpdk.c
sed -i "s/ ETHER_/ RTE_ETHER_/" lib/netdev-dpdk.c
sed -i "s/ e_RTE_METER_/ RTE_COLOR_/" lib/netdev-dpdk.c
sed -i "s/struct ether_addr/struct rte_ether_addr/" lib/netdev-dpdk.c
sed -i "s/struct ether_hdr/struct rte_ether_hdr/" lib/netdev-dpdk.c
################################################################################
```

  # **cd ../**

  # **tar cjf openvswitch-2.12.0.tar.xz openvswitch-2.12.0**

- Create the ovs.spec file in /root/rpmbuild/SPEC.

# cd /root/rpmbuild/SPEC/
# **vim ovs.spec**

Clear the ovs.spec file and then add the below content in ovs.spec file.

```
############################### # ovs.spec  ######################################
Name:          openvswitch
Version:       2.12.0
Release:       1%{?dist}
Summary:       OVS TEST

License:       GPLv2
URL:           http://www.openvswitch.org/
Source0:       https://www.openvswitch.org/releases/openvswitch-2.12.0.tar.xz

BuildRequires:   gtk2-devel
BuildArch:       x86_64

%description
Packaging the latest (at time of writing) version of qemu that is not available from Red Hat repository

%prep
%setup -q -n %{name}-%{version}

%build
./boot.sh
export DPDK_DIR=/usr/src/dpdk-stable-19.11.3/
export DPDK_TARGET=x86_64-native-linuxapp-gcc
export DPDK_BUILD=$DPDK_DIR/$DPDK_TARGET
./configure --with-dpdk=$DPDK_BUILD
./connection.sh
make

%install
%make_install

%files
/usr/local/bin/
/usr/local/share/openvswitch
/usr/local/etc/bash_completion.d/ovs-appctl-bashcomp.bash
/usr/local/etc/bash_completion.d/ovs-vsctl-bashcomp.bash
/usr/local/include/openflow/intel-ext.h
/usr/local/include/openflow/netronome-ext.h
/usr/local/include/openflow/nicira-ext.h
/usr/local/include/openflow/openflow-1.0.h
/usr/local/include/openflow/openflow-1.1.h
/usr/local/include/openflow/openflow-1.2.h
/usr/local/include/openflow/openflow-1.3.h
/usr/local/include/openflow/openflow-1.4.h
/usr/local/include/openflow/openflow-1.5.h
/usr/local/include/openflow/openflow-common.h
/usr/local/include/openflow/openflow.h
/usr/local/include/openvswitch/compiler.h
/usr/local/include/openvswitch/dynamic-string.h
/usr/local/include/openvswitch/flow.h
/usr/local/include/openvswitch/geneve.h
/usr/local/include/openvswitch/hmap.h
/usr/local/include/openvswitch/json.h
/usr/local/include/openvswitch/list.h
/usr/local/include/openvswitch/match.h
/usr/local/include/openvswitch/meta-flow.h
/usr/local/include/openvswitch/namemap.h
/usr/local/include/openvswitch/netdev.h
```

/usr/local/include/openvswitch/nsh.h
/usr/local/include/openvswitch/ofp-actions.h
/usr/local/include/openvswitch/ofp-bundle.h
/usr/local/include/openvswitch/ofp-connection.h
/usr/local/include/openvswitch/ofp-ed-props.h
/usr/local/include/openvswitch/ofp-errors.h
/usr/local/include/openvswitch/ofp-flow.h
/usr/local/include/openvswitch/ofp-group.h
/usr/local/include/openvswitch/ofp-ipfix.h
/usr/local/include/openvswitch/ofp-match.h
/usr/local/include/openvswitch/ofp-meter.h
/usr/local/include/openvswitch/ofp-monitor.h
/usr/local/include/openvswitch/ofp-msgs.h
/usr/local/include/openvswitch/ofp-packet.h
/usr/local/include/openvswitch/ofp-parse.h
/usr/local/include/openvswitch/ofp-port.h
/usr/local/include/openvswitch/ofp-print.h
/usr/local/include/openvswitch/ofp-prop.h
/usr/local/include/openvswitch/ofp-protocol.h
/usr/local/include/openvswitch/ofp-queue.h
/usr/local/include/openvswitch/ofp-switch.h
/usr/local/include/openvswitch/ofp-table.h
/usr/local/include/openvswitch/ofp-util.h
/usr/local/include/openvswitch/ofpbuf.h
/usr/local/include/openvswitch/packets.h
/usr/local/include/openvswitch/poll-loop.h
/usr/local/include/openvswitch/rconn.h
/usr/local/include/openvswitch/shash.h
/usr/local/include/openvswitch/thread.h
/usr/local/include/openvswitch/token-bucket.h
/usr/local/include/openvswitch/tun-metadata.h
/usr/local/include/openvswitch/type-props.h
/usr/local/include/openvswitch/types.h
/usr/local/include/openvswitch/util.h
/usr/local/include/openvswitch/uuid.h
/usr/local/include/openvswitch/vconn.h
/usr/local/include/openvswitch/version.h
/usr/local/include/openvswitch/vlog.h
/usr/local/include/ovn/actions.h
/usr/local/include/ovn/expr.h
/usr/local/include/ovn/lex.h
/usr/local/include/ovn/logical-fields.h
/usr/local/lib/libofproto.a
/usr/local/lib/libofproto.la
/usr/local/lib/libopenvswitch.a
/usr/local/lib/libopenvswitch.la
/usr/local/lib/libovn.a
/usr/local/lib/libovn.la
/usr/local/lib/libovsdb.a
/usr/local/lib/libovsdb.la
/usr/local/lib/libsflow.a
/usr/local/lib/libsflow.la
/usr/local/lib/libvtep.a
/usr/local/lib/libvtep.la
/usr/local/lib/pkgconfig/libofproto.pc
/usr/local/lib/pkgconfig/libopenvswitch.pc
/usr/local/lib/pkgconfig/libovsdb.pc
/usr/local/lib/pkgconfig/libsflow.pc
/usr/local/sbin/ovs-bugtool
/usr/local/sbin/ovs-vlan-bug-workaround
/usr/local/sbin/ovs-vswitchd
/usr/local/sbin/ovsdb-server
/usr/local/share/man/man1/ovn-detrace.1

```
/usr/local/share/man/man1/ovs-pcap.1
/usr/local/share/man/man1/ovs-tcpundump.1
/usr/local/share/man/man1/ovsdb-client.1
/usr/local/share/man/man1/ovsdb-server.1
/usr/local/share/man/man1/ovsdb-tool.1
/usr/local/share/man/man5/ovn-nb.5
/usr/local/share/man/man5/ovn-sb.5
/usr/local/share/man/man5/ovs-vswitchd.conf.db.5
/usr/local/share/man/man5/ovsdb-server.5
/usr/local/share/man/man5/vtep.5
/usr/local/share/man/man7/ovn-architecture.7
/usr/local/share/man/man7/ovs-actions.7
/usr/local/share/man/man7/ovs-fields.7
/usr/local/share/man/man8/ovn-controller-vtep.8
/usr/local/share/man/man8/ovn-controller.8
/usr/local/share/man/man8/ovn-ctl.8
/usr/local/share/man/man8/ovn-nbctl.8
/usr/local/share/man/man8/ovn-northd.8
/usr/local/share/man/man8/ovn-sbctl.8
/usr/local/share/man/man8/ovn-trace.8
/usr/local/share/man/man8/ovs-appctl.8
/usr/local/share/man/man8/ovs-bugtool.8
/usr/local/share/man/man8/ovs-ctl.8
/usr/local/share/man/man8/ovs-dpctl-top.8
/usr/local/share/man/man8/ovs-dpctl.8
/usr/local/share/man/man8/ovs-kmod-ctl.8
/usr/local/share/man/man8/ovs-l3ping.8
/usr/local/share/man/man8/ovs-ofctl.8
/usr/local/share/man/man8/ovs-parse-backtrace.8
/usr/local/share/man/man8/ovs-pki.8
/usr/local/share/man/man8/ovs-tcpdump.8
/usr/local/share/man/man8/ovs-testcontroller.8
/usr/local/share/man/man8/ovs-vlan-bug-workaround.8
/usr/local/share/man/man8/ovs-vsctl.8
/usr/local/share/man/man8/ovs-vswitchd.8
/usr/local/share/man/man8/vtep-ctl.8
#############################################################################
```

- Run "rpmbuild -ba qemu.spec" command to generate the RPM, it will take some time .
  # **rpmbuild -ba ovs.spec**

- Check the last few lines after completion of process of "rpmbuild -ba ovs.spec" command .
  1. There should be an RPM file generated in /RPMS repository .
  2. An untar image with all the updated files should be present in /root/rpmbuild/RPMS.

Last few lines for reference

```
Wrote: /root/rpmbuild/SRPMS/openvswitch-2.12.0-1.el7.src.rpm
Wrote: /root/rpmbuild/RPMS/x86_64/openvswitch-2.12.0-1.el7.x86_64.rpm
Wrote: /root/rpmbuild/RPMS/x86_64/openvswitch-debuginfo-2.12.0-1.el7.x86_64.rpm
Executing(%clean): /bin/sh -e /var/tmp/rpm-tmp.gZEGk4
+ umask 022
+ cd /root/rpmbuild/BUILD
+ cd openvswitch-2.12.0
+ /usr/bin/rm -rf /root/rpmbuild/BUILDROOT/openvswitch-2.12.0-1.el7.x86_64
+ exit 0
```

Cross check in repository
[root@localhost SPECS]# **cd ../RPMS/**
[root@localhost RPMS]# **ls**
**x86_64**
[root@localhost RPMS]# **cd x86_64/**
[root@localhost x86_64]# **ls**
**openvswitch-2.12.0-1.el7.x86_64.rpm openvswitch-debuginfo-2.12.0-1.el7.x86_64.rpm**

Install OVS RPM

[root@localhost x86_64]# **rpm -ivh openvswitch-2.12.0-1.el7.x86_64.rpm**
**Preparing... ################################# [100%]**
**Updating / installing...**
**1:openvswitch-2.12.0-1.el7 ################################# [100%]**

## 3.6 Disclaimer

The RPM tar files used in the wget URLs are compiled by Infinity Labs Limited. For any clarification please reach out to engineering@infinitylabs.in.
Please note that the files are distributed without any implied warranty.

# 4 TROUBLESHOOTING RPM ISSUES

Below issues were faced by our team while doing the setup and were resolved. This is for informational purpose only; it may not or may rarely occur for the other users.

**1.** DPDK ERROR
After executing the *"rpmbuild -ba dpdk.spec"* command if you get below error

**+ /usr/bin/make install DESTDIR=/root/rpmbuild/BUILDROOT/dpdk-stable-19.11.3-1.el7.x86_64 T= DESTDIR=install**
make[1]: Nothing to be done for `pre_install'.
/root/rpmbuild/BUILD/dpdk-stable-19.11.3/mk/rte.vars.mk:33: build/.config: No such file or directory
/root/rpmbuild/BUILD/dpdk-stable-19.11.3/mk/rte.vars.mk:56: *** RTE_ARCH is not defined. Stop.
make: *** [install] Error 2
error: Bad exit status from /var/tmp/rpm-tmp.MuLMST (%install)

RPM build errors:
Bad exit status from /var/tmp/rpm-tmp.MuLMST (%install)

Solution
Set the below line just after all the commands in %build section in dpdk.spec file.

**%build**
**%make_install T=$DPDK_TARGET DESTDIR=install**

2. OVS RPM ERROR - 1
After running the “rpmbuid -ba ovs.spec” command we faced the error with tar file format .

Solution
I have extracted the file first and then changed the format from tar.gz to tar.xz format.

3. OVS RPM ERROR - 2
After executing the *"rpmbuild -ba ovs.spec"* command if you get the below error

**checking target hint for cgcc... x86_64**
**checking vector options for cgcc... -D__MMX__=1 -D__SSE2_MATH__=1 -D__SSE_MATH__=1 -D__SSE2__=1 -D__SSE__=1**
checking whether dpdk datapath is enabled... yes
checking for rte_config.h... no
configure: error: unable to find rte_config.h in
**[root@test openvswitch-2.12.0]#**

Solution
Edit the ovs.spec file and add the below commands in %build section.
**export DPDK_DIR=/usr/src/dpdk-stable-19.11.3/**
**export DPDK_TARGET=x86_64-native-linuxapp-gcc**
**export DPDK_BUILD=$DPDK_DIR/$DPDK_TARGET**

4. OVS RPM ERROR -2
After executing the *"rpmbuild -ba ovs.spec"* command if you get the below error

RPMBuild Error: error: Installed (but unpackaged) file(s) found

RPM build errors:
Installed (but unpackaged) file(s) found:
/usr/bin/curl-config
/usr/include/curl/curl.h
/usr/include/curl/curlbuild.h
/usr/include/curl/curlrules.h
/usr/include/curl/curlver.h
/usr/include/curl/easy.h
/usr/include/curl/mprintf.h
/usr/include/curl/multi.h

Solution

Whatever files comes under the “RPMBuild Error: error: Installed (but unpackaged) file(s) found” Add those file with location in ovs.spec %file section.

Just copy all the files with location from error and paste it in the %files section.