VirtIO Acceleration through Hardware vDPA
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Hardware vDPA requires QEMU v2.12 (or with upstream 6.1.0) and DPDK v20.11 as minimal versions.

To install QEMU:

1. Clone the sources:

   ```bash
   git clone https://git.qemu.org/git/qemu.git
   cd qemu
   git checkout v2.12
   ```

2. Build QEMU:

   ```bash
   mkdir bin
   cd bin
   ../configure --target-list=x86_64-softmmu --enable-kvm
   make -j24
   ```

To install DPDK:

1. Clone the sources:

   ```bash
   git clone git://dpdk.org/dpdk
   cd dpdk
   git checkout v20.11
   ```

2. Install dependencies (if needed):

   ```bash
   yum install cmake gcc libnl3-devel libudev-devel make pkgconfig valgrind-devel pandoc libibverbs libmlx5 libmnl-devel -y
   ```
3. Configure DPDK:

```bash
export RTE_SDK=$PWD
make config T=x86_64-native-linuxapp-gcc
cd build
sed -i 's/(CONFIG_RTE_LIBRTE_MLX5_PMD=)n/(\1y)/g' .config
sed -i 's/(CONFIG_RTE_LIBRTE_MLX5_VDPA_PMD=)n/(\1y)/g' .config
make -j
```

4. Build DPDK:

```bash
make -j
```

5. Build the vDPA application:

```bash
cd $RTE_SDK/examples/vdpa/
make -j
```

**Hardware vDPA Configuration**

To configure huge pages:

```bash
mkdir -p /hugepages
mount -t hugetlbfs hugetlbfs /hugepages
echo <more> > /sys/devices/system/node/node0/hugepages/hugepages-1048576kB/nr_hugepages
echo <more> > /sys/devices/system/node/node1/hugepages/hugepages-1048576kB/nr_hugepages
```

To configure a vDPA VirtIO interface in an existing VM's xml file (using libvirt):

1. Open the VM's configuration XML for editing:

```bash
virsh edit <domain name>
```
2. Perform the following:

1. Change the top line to:

```
<domain type='kvm' xmlns:qemu='http://libvirt.org/schemas/domain/qemu/1.0'>
```

2. Assign a memory amount and use 1GB page size for huge pages (size must be the same as that used for the vDPA application), so that the memory configuration looks as follows.

```
<memory unit='KiB'>4194304</memory>
<currentMemory unit='KiB'>4194304</currentMemory>
<memoryBacking>
  <hugepages>
    <page size='1048576' unit='KiB'/>
  </hugepages>
</memoryBacking>
```

3. Assign an amount of CPUs for the VM CPU configuration, so that the `vcpu` and `cputune` configuration looks as follows:

```
<vcpu placement='static'>5</vcpu>
<cputune>
  <vcpupin vcpu='0' cpuset='14'/>
  <vcpupin vcpu='1' cpuset='16'/>
  <vcpupin vcpu='2' cpuset='18'/>
  <vcpupin vcpu='3' cpuset='20'/>
  <vcpupin vcpu='4' cpuset='22'/>
</cputune>
```

4. Set the memory access for the CPUs to be shared, so that the `cpu` configuration looks as follows:

```
<cpu mode='custom' match='exact' check='partial'>
  <model fallback='allow'>Skylake-Server-IBRS</model>
</cpu>
```
5. Set the emulator in use to be the one built in step 2, so that the emulator configuration looks as follows:

```xml
<emulator><path to qemu executable></emulator>
```

6. Add a virtio interface using QEMU command line argument entries, so that the new interface snippet looks as follows:

```xml
<qemu:commandline>
  <qemu:arg value='-chardev'/>
  <qemu:arg value='socket,id=charnet1,path=/tmp/sock-virtio0'/>
  <qemu:arg value='-netdev'/>
  <qemu:arg value='vhost-user,chardev=charnet1,queues=16,id=hostnet1'/>
  <qemu:arg value='-device'/>
  <qemu:arg value='virtio-net-pci,mq=on,vectors=6,netdev=hostnet1,id=net1,mac=e4:11:c6:d3:45:f2,bus=pci.0,addr=0x6, page-per-vq=on,rx_queue_size=1024,tx_queue_size=1024'/>
</qemu:commandline>
```

**Note**

In this snippet, the vhostuser socket file path, the amount of queues, the MAC and the PCIe slot of the virtio device can be configured.

**Running Hardware vDPA**
1. Create the ASAP\textsuperscript{2} environment:

   1. Create the VFs.

   2. Enter switchdev mode.

   3. Set up OVS.

2. Run the vDPA application:

   cd $RTE_SDK/examples/vdpa/build
   ./vdpa -w <VF PCI BDF>,\texttt{class=vdpa} --log-level=pmd,info -- -i

3. Create a vDPA port via the vDPA application CLI:

   create /tmp/sock-virtio0 <PCI DEVICE BDF>

4. Start the VM:

   Note

   Hardware vDPA supports switchdev mode only.

   The vhostuser socket file path must be the one used when configuring the VM.
virsh start <domain name>

For further information on the vDPA application, visit the Vdpa Sample Application DPDK documentation.

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