Dynamic NFV Deployment with Port Hotplug and Virtio

Tetsuya Mukawa, IGEL Co., Ltd.
• I am a software engineer at IGEL Co., Ltd.
• Roughly 10 years experience in embedded Linux products.
• Currently, I am one of developers of Lagopus, an open source software switch.
  – [https://lagopus.github.io/](https://lagopus.github.io/)
Agenda

• Current Status of Port Hotplug
• Dynamic NFV Deployment with Port Hotplug and Virtio
  – Current limitations
  – What will be solved in DPDK-2.2/2.3?
What is Port Hotplug?

• After starting an application
  – attach to a port
  – detach from a port

• To support Port Hotplug, each PMD and EAL needs to be changed.
## Supported OS and UIO module

- **Linux**
  - igeb_uio
  - uio_pci_generic
  - VFIO
- **BSD**
  - nic_uio

*No support for VFIO*
<table>
<thead>
<tr>
<th>PMD</th>
<th>Supported version</th>
<th>Submitter of Port Hotplug</th>
</tr>
</thead>
<tbody>
<tr>
<td>bond</td>
<td>2.1</td>
<td>Bernard Iremonger</td>
</tr>
<tr>
<td>ring</td>
<td>2.1</td>
<td>Bernard Iremonger</td>
</tr>
<tr>
<td>virtio</td>
<td>2.1</td>
<td>Bernard Iremonger</td>
</tr>
<tr>
<td>i40e</td>
<td>2.1</td>
<td>Bernard Iremonger</td>
</tr>
<tr>
<td>ixgbe</td>
<td>2.1</td>
<td>Bernard Iremonger</td>
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<tr>
<td>e1000</td>
<td>2.1</td>
<td>Bernard Iremonger</td>
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<tr>
<td>fm10k</td>
<td>2.1</td>
<td>Michael Qiu</td>
</tr>
<tr>
<td>null</td>
<td>2.0</td>
<td>Tetsuya Mukawa</td>
</tr>
<tr>
<td>pcap</td>
<td>2.0</td>
<td>Tetsuya Mukawa</td>
</tr>
</tbody>
</table>

Thanks for hard working of Bernard and Michael.
Not Supported PMD

- Below PMDs
  - af_packet
  - mlx4
  - xenvirt
  - bnx2x
  - cxgbe
  - mpipe
Dynamic NFV Deployment with Port Hotplug and Virtio
• In some cases, NFV is needed to be deployed on demand.
To deploy NFV dynamically, followings are needed.

- Software Switch (SSW)
- Port Hotplug function
- Hotplugged port for NFV
Block Diagram of NFV

Detail of Host
- NFV
- Hotplugged Port for NFV

Detail of NFV
- VM / Container
  - Application
  - Virtual NIC Driver
  - Virtual NIC
  - Virtual Wire to SSW

Software Switch (SSW)
- Port
<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>VM / Container</td>
<td>Isolation to separate NFV and Software switch</td>
</tr>
<tr>
<td>Application</td>
<td>NFV application</td>
</tr>
<tr>
<td>Virtual NIC Driver</td>
<td>Device driver for virtual NIC</td>
</tr>
<tr>
<td>Virtual NIC</td>
<td>Virtual NIC device to connect to SSW</td>
</tr>
<tr>
<td>Virtual Wire to SSW</td>
<td>Connection between Virtual NIC and SSW</td>
</tr>
<tr>
<td>Hotplugged Port for NFV</td>
<td>Abstraction for SSW to treat NFV connection as normal port</td>
</tr>
<tr>
<td>Software Switch (SSW)</td>
<td>Packet distributor</td>
</tr>
</tbody>
</table>

Component description

VM / Container

Application

Virtual NIC Driver

Virtual NIC

Virtual Wire to SSW

Hotplugged Port for NFV

Software Switch (SSW)

Port
Which legacy implementations can be used?

<table>
<thead>
<tr>
<th>Feature</th>
<th>Available implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td>VM / Container</td>
<td>QEMU/KVM(*1)</td>
</tr>
<tr>
<td>Virtual NIC Driver</td>
<td>virtio-net PMD</td>
</tr>
<tr>
<td>Virtual NIC</td>
<td>virtio-net</td>
</tr>
<tr>
<td>Virtual Wire to SSW</td>
<td>vhost-user / vhost-cuse</td>
</tr>
<tr>
<td>Hotplugged Port for NFV</td>
<td>Port Hotplug API(*2)</td>
</tr>
<tr>
<td></td>
<td>librte_vhost</td>
</tr>
<tr>
<td>Software Switch</td>
<td>Lagopus / dpdk-ovs / etc...</td>
</tr>
</tbody>
</table>

(*1) No support for container.
(*2) There is no PMD for this purpose.
Current limitations

• No PMD for NFV connected port.
• No Support for container like docker.
• Denial of reconnection.
  – Currently, when SSW is killed or stopped, then restarted, NFV cannot connect to SSW. To connect again, NFV also needs to be restarted.
What will be solved in DPDK-2.2/2.3?

• “vhost PMD” for NFV connected port.
  – The PMD will support Port Hotplug.

• Container support.
  – Virtio and vhost will be used.
  – All containers will be supported.
Conclusion

• So far, we have a few issues.
  1. No PMD for NFV connected port.
  2. No container support.
  3. Denial of reconnection.
• Hopefully “1” and “2” will be solved in half year.
• But still “3” will be left.
Thanks