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Enabling DPDK in Akraino and Airship for 5G Networks

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30000ft Ecosystem Overview
Akraino

- Akraino is a Linux Foundation project
  - Create end-to-end configurations for edge use cases
  - Complete, tested and deployable hardware / software stacks

- Akraino consists of three project types
  - Integration projects of blueprints
    - Define and integrate deployable hardware / software stacks
  - Verification projects
    - Test blueprints and provide sample apps/VNFs
  - Feature projects
    - Upstream contributions or Akraino features
Airship and OpenStack-Helm

- Kernel
- User space
  - K8s
  - Helm
  - Neutron
  - Nova
  - Glance
  - Horizon
  - Cinder
  - Heat
  - Keystone
- Hardware
- Docker
  - Ceph
  - Calico
  - Divingbell
  - Drydock
  - Shipyard
  - Deckhand
  - Promenade

OpenStack-Helm

Overcloud

Undercloud
OVS-DPDK Blueprint

- Add OVS-DPDK support to existing Network Cloud Unicycle Blueprint
- Integration with feature project to add OVS-DPDK support to upstream Airship projects
- Note
  - DPDK functionality self-contained in OpenStack Helm
Contributors

in alphabetical order
5G Evolution

**Aggregated deployment** (classic LTE)
- TN
- PDCP
- RLC
- MAC
- PHY-HI
- PHY-LO
- CPRI

**Disaggregated deployment** (5G)
- TN-light
- RLC
- MAC
- PHY-HI
- TN-light
- PHY-LO

- Packet processing functionality
- Low latency, high bandwidth
- Virtualized deployment
Packet Processing Options

<table>
<thead>
<tr>
<th>Interface from application</th>
<th>To VNIC via sockets (Linux kernel)</th>
<th>Direct to VNIC using DPDK</th>
<th>To physical NIC via virtual function (e.g., SR-IOV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comments</td>
<td>+ High portability</td>
<td>+ Good portability</td>
<td>+ Good performance for most use cases</td>
</tr>
<tr>
<td></td>
<td>- Poor performance</td>
<td>+ Good performance for most use cases</td>
<td>- HW dependency and vendor lock-in</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ Functionality in open source, outside the VM</td>
<td>- Functionality pushed to VM</td>
</tr>
</tbody>
</table>
OVS-DPDK Software Stack

- **User Space**
  - OVS
  - vswitchd
  - DPDK
  - Neutron
  - Nova
  - VM
  - VM
  - libvirt / qemu
  - K8s
  - Docker

- **Kernel**
  - KVM

- **Hardware**
  - NICs
OVS-DPDK Core Components

- **OpenVswitch**
  - Functionality split in two pods
  - openvswitch-db
    - OVSDB server and database
  - openvswitch-vswitchd
    - DPDK-enabled userspace switch

- **Neutron**
  - Functionality spread across 10+ pods
  - neutron-ovs-agent
    - Performs configuration of OVS
    - DPDK specific operations
      - Loading of kernel modules
      - Binding of NICs to DPDK
      - Creation of DPDK-enabled bridges
      - Adding of DPDK ports (NICs) to bridges
      - Configuration of IPs for overlay tunneling

- **“other Neutron components”**
DPDK Configuration for OpenStack-Helm

- New configuration parameters

**Hugepage configuration**

resources:
  enabled: false
  ovs:
    vswitchd:
      requests:
        memory: "128Mi"
        cpu: "100m"
      limits:
        memory: "1024Mi"
        cpu: "2000m"
      hugepages-1Gi: "1Gi"
      hugepages-2Mi: "512Mi"

**DPDK configuration**

ovs_dpdk:
  enabled: false
  socket_memory: 1024
  hugepages_mountpath: /dev/hugepages
  mem_channels: 4
  lcore_mask: 0x1
  pmd_cpu_mask: 0x4

**OVS agent configuration**

ovs_dpdk:
  enabled: false
  driver: uio_pci_generic
  nics:
    - name: dpdk0
      pci id: '0000:05:00.0'
      migrate_ip: true
      n_rxq: 2
      pmd rxq affinity: "0:3,1:27"
      ofport_request: 1
      bridges:
        - name: br-phy
Integration in Akraino Network Cloud Blueprint

- Additional DPDK-specific input configuration for blueprint
- New set of templates to render DPDK configuration for Airship
Development and Demo Environment

- Airship-in-a-bottle multi-node deployment
  - Fully virtualized Airship environment running on a single server
Open and Ongoing Items

- Troubleshooting and configuration guide
- Full integration into Airship-in-a-bottle multi-node environment
References

• Airship
  • https://www.airshipit.org/

• OpenStack-Helm
  • https://github.com/openstack/openstack-helm

• Akraino
  • https://www.akraino.org
Thank you

• Questions