Open Source in Networking

An Ecosystem Update
ONF Connect 2019

Roy Chua
If Software is Eating the World, and Open Source is Eating Software, is Open Source Eating the World?
What Open Source Likes to Eat

Proprietary Hardware

Proprietary Software

People?
Types of Open Source

**HW Design/Architecture/Platform**
- OCP OpenRack, TIP, RISC V

**SW Platforms**
- OpenStack, OvS/OpenSwitch, ONOS, ODL, ONIE, Stratum

**SW Architecture**
- Lean NFV, MEF LSO

**Applications**
- FreeRange Routing, Quagga, XORP, SNORT

**Language**
- P4

**Protocols and APIs**
- OpenFlow, MEF LSO - Sonata

**Components/Libraries/SDK**
- DPDK, FD.io/VPP

**Reference Implementations**
- Code, Platforms
  - OPNFV, MEF LSO, SEBA, COMAC

©2018 AvidThink LLC
## Evolution of Open-Source in Networking

<table>
<thead>
<tr>
<th>Pre-SDN Era</th>
<th>SDN</th>
<th>vSwitches/vRouters/Network Virtualization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apache httpd, lynx, gopher, wu-ftp</td>
<td>OpenFlow, Mininet, Beacon, NOX, POX</td>
<td>OVS/OVN</td>
</tr>
<tr>
<td>BIN, SSH + bunch of UNIX daemons</td>
<td>Floodlight, ODL, ONOS</td>
<td>OpenSwitch</td>
</tr>
<tr>
<td>Quagga, XORP</td>
<td>OpenStack Neutron</td>
<td>Quagga, FreeRange Routing</td>
</tr>
<tr>
<td>Snort/BRO, ipfw, iptables etc</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NFV/Edge</th>
<th>Orchestration</th>
<th>Hardware disaggregation</th>
</tr>
</thead>
<tbody>
<tr>
<td>OpenStack</td>
<td>OSM</td>
<td>SONiC, Stratum</td>
</tr>
<tr>
<td>DPDK, IOVisor, FD.io, VPP</td>
<td>ONAP</td>
<td>dNOS, DANOS</td>
</tr>
<tr>
<td>CORD/COMAC/SEBA/OMEC/VOLTHA</td>
<td>MEF LSO</td>
<td>ORAN</td>
</tr>
<tr>
<td>StarlingX/Akraino</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

©2018 AvidThink LLC
Open Source in Networking Ecosystem

Some More Prominent Organizations

- Apache Software Foundation
- MEF
- OpenStack Foundation
- ETSI
- Open Compute Project (OCP)
- Telecom Infra Project (TIP)
- Linux Foundation - Networking (LFN)
- Open Networking Foundation (ONF)

Plus many independent projects
Layered View of Open Source in Networking

- Applications
- Application Infrastructure
- Control and Management
- Network Virtualization
- Infrastructure Layer
- Hardware Platform
Open Source/SDO Ecosystem - View from LFN

View from Linux Foundation (from Harmonization 2.0 paper) (slightly dated)
Open Source Ecosystem - View from ONF

Open Source

- End-to-End Orchestration
  - ONAP / OSM

ONF & CORD
- Access & Edge Cloud
  - SEBA
  - R-CORD
  - COMAC
  - OMEC

- NG-SDN
  - XOS
  - Trellis
  - ONOS
  - O-RAN
  - VOLTDA
  - Stratum
  - CDTN

Kubernetes & Akraino
- CNCF

Standards

- MEC
  - Edge APIs

- O-RAN
  - Architecture & Standardization for open RAN

Infrastructure Software

Hardware Peripherals

©2018 AvidThink LLC
Different Viewpoints

Cloud Providers
- Love open-source networking
- Taking advantage of it
- Sometimes give back

Service Providers
- Love open-source networking
- Trying to take advantage of it
- Figuring out how to give back (except for a few)

Enterprise
- Not sure how to deal with open-source networking
- Not sure how to take advantage of it
- Give what? (with exceptions)

Vendors
- Love/hate open-source networking
- Taking advantage of it?
- Sometimes give back
A Problem with Open Source in Networking?

Where are the boundaries?

Hardware Related
SONIC, ONIE, P4

Orchestration
ONAP, OSM, Cloudify

Security
BRO, Suricata, etc

Automation
Ansible, Puppet, Chef, and more

App Infra
Service Mesh - Istio, Envoy, Linkerd

Infrastructure
OpenStack, KVM, Network Service Mesh, Calico

Analytics
FD.io VPP, DPDK

and more...
kitchen sink - anyone?
Timely Topics in Open Source

- **Dealing with a hundred (thousand) flowers**
  - Keep track of projects
  - One hit wonders
  - Darwinism time
  - Assisted pruning
  - Selecting smartly

- **Role of standards today**
  - Less of debate - but still ongoing
  - When and where do standards come in
  - Organic, ad-hoc versus structured
  - Battle of code contributions

- **Independent developers and open-source organizations**
  - Role of LF, ONF, MEF, ETSI
  - Marketing vehicles
  - Active communities
  - Giving the independents voice

- **Absorptive capacity and contribution capability**
  - Many organizations can't consume open-source
  - Security and legal worries hold many back
  - Organizations don't understand how to interact with and contribute back to open-source projects
Where Do We Go From Here?

- **Continued scope expansion**
  - Data center
  - Campus
  - WAN (SD-WAN)
  - Public Clouds
  - Transport
  - Edge

- **Growth of vertical stack - up and down**
  - Containers and app infrastructure - service mesh
  - NICs/FPGA
  - Switches, Routers
  - Chips

- **Continued cross-org efforts**
  - Watch out for platitudes versus real cross-pollination and integration
  - More neutral parties - Intel, ARM, CSPs, cloud providers play role

- **Ecosystem will grow before it shrinks**
  - Waiting for the Kubernetes moment (when it all folds in)
  - Open-source orgs must cull and retire mature but projects past-prime (e.g., data center and NV stacks)
  - Meanwhile, dilution of resources, battle of egos, end-user confusion and Darwinian battles
  - Cloud providers can play key role - selecting winners

- **Momentum rules**
  - For most enterprises and CSPs, align with high-momentum projects
  - Ecosystem support important
  - Enterprises/CSPs not equipped to consume OSS directly should still choose OSS-based solutions (support, compatibility, feature velocity, potential portability)
  - Large scale CSPs and cloud providers still free to do what they want
Thank You!

AvidThink.com
@avidthink
research@avidthink.com

Roy Chua (@wireroy)