Open Source Networking & LFN

Arpit Joshipura
GM, Linux Foundation
The Linux Foundation is creating the greatest shared technology investment in history by enabling open source collaboration across companies, developers, and users.
Today the Linux Foundation is much more than Linux

Security  
We are helping global privacy and security through a program to encrypt the entire internet.

Networking  
We are creating ecosystems around networking to improve agility in the evolving software-defined datacenter.

Cloud  
We are creating a portability layer for the cloud, driving de facto standards and developing the orchestration layer for all clouds.

Automotive  
We are creating the platform for infotainment in the auto industry that can be expanded into instrument clusters and telematics systems.

Blockchain  
We are creating a permanent, secure distributed ledger that makes it easier to create cost-efficient, decentralized business networks.

Web  
We are providing the application development framework for next generation web, mobile, serverless, and IoT applications.

Let’s Encrypt  

We are regularly adding projects; for the most up-to-date listing of all projects visit tlfprojects.org
What is LF’s role in projects?

| Governance and Membership | • Incorporation, Tax status, Bylaws, Member Agreements, Anti-trust, etc.  
<table>
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<th>• Ongoing business development and membership recruitment</th>
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| Development Process       | • Technical Decision Making  
|                          | • Project Life Cycle  
|                          | • Release Process |
| Infrastructure            | • Custom infrastructure using open source best practices  
|                          | • Security and reliability |
| Ecosystem Development     | • Marketing  
|                          | • Events  
|                          | • Training |
| IP Management             | • Code Provenance  
|                          | • Trademark management  
|                          | • Legal defense and Collaboration |
142 years old Networking Industry – learnings in last 5 years

1. The Power of Open & Harmonized Community drives innovation and value

2. Networking is shaping adjacent communities: Cloud, Edge, AI, IOT, Access

3. Journey continues with best of both worlds: clouds and telecom with VNFs to CNFs
The Power of Open & Harmonized Community drives innovation and value

› Open Collaboration + Open Community
› Open Standards + Open Source

We call it “Harmonization” & Results have been Amazing!
We are seeing the impact in a Trillion dollar industry
Thank you!
Networking is the fabric for Growth & Innovation Across Industries

**Automotive**
Connected Cars
Connected cars market projected to reach USD $219.21 billion by 2025*

**Retail**
Connected Stores
82% of smartphone user say they consult their phones for in-store purchases***

**Energy**
Connected Homes
Global Smart Home Market to Exceed $53.45 Billion by 2022**

**Agriculture**
Connected Cows
Global Connected Cow and Farm Market Set to Exceed $10 Billion in 2021****

Data Sources:
*ResearchAndMarkets.com  **Zion Market Research  ***Salesforce: Connected Shopper Report  ****Arcluster
Linux Foundation Leads Modern Networking Innovation

- 21 Open Source Networking Projects
- 10/10 Networking Vendors Active
- $576 M Shared Innovation
- 9/10 Most Important Projects
- ~70% Global Subscribers Represented
- 15 Minute New Service Creation
Why Open Source Networking?

› Choose each element of your networking stack, with assured interoperability

› Improve efficiency & quality for development & implementation reduce risk & cost

› Deliver exactly the network services you need, as you need them

Source: ACG report: The Impact of Open Source Technologies on the Communication Service Provider Vendor Ecosystem
Leading Surveys on Open Source & Networking

<table>
<thead>
<tr>
<th>Industry</th>
<th>Yes, we have an open source program</th>
<th>We are planning an open source program</th>
<th>No, we do not have an open source program</th>
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<tbody>
<tr>
<td>Technology (software or IT) industry</td>
<td>40%</td>
<td>16%</td>
<td>44%</td>
</tr>
<tr>
<td>Telecom, communications and media industry</td>
<td>37%</td>
<td>10%</td>
<td>53%</td>
</tr>
<tr>
<td>Financial services industry</td>
<td>27%</td>
<td>20%</td>
<td>53%</td>
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72% of companies rely on open source software across top verticals – technology, telecom and fintech
Leading Surveys on Open Source & Networking

Motivators of Open Networking
End User Driven Innovation

All Layers of Open Network
Core to CPE, Edge & Access next
LF Networking Vision: Automating Cloud, Network, & IOT Services

Services
- Cloud Services
- Residential Services
- Enterprise Services
- IOT Services

Software & Automation
- Cloud Automation
  (ONAP, ONFV, ODL, FD.io, SNAS, PNDA, Tungsten Fabric)

Infrastructure
- Data Centers
- Carrier Network
- Cloud Network
- Public/Hybrid
  - Cloud Service Providers
  - Cloud Hosting
  - Private Cloud Providers
  - Web Service Providers

Service Providers
- MSO/CableCo
Sustainable Innovation: Open Source Networking
Creating De-Facto Platforms to Enable Next Generation Solutions in Telecom, Enterprise & Cloud

Network Automation/Zero Touch
New Services in Minutes
$576M Shared Innovation
SDO+OSS Harmonization
New Services 5G/IoT/Edge/AI
LF 9/10 Most important projects

De-Facto Platform for ~70% Global Sub
Leading media and analysts support our leadership

The LF is Changing the Fabric of Networking
“…bringing top networking vendors, operators, service providers, and users together.”

Forbes

Orange plans 5G + Automation RFP
“Requires Open Source/ONAP”
Open Source Networking / SDO Landscape

AUTOMATION OF NETWORK INFRASTRUCTURE FOR CLOUD + APPS + IOT

CLOUD FOUNDRY

STANDARDS

THE LINUX FOUNDATION
Open Source Data Plane and NOS Projects
Rapid feature iteration independent of hardware lifecycle

What
Innovative features that may not exist in commercial offerings.

Why
NFV options enable near-instant delivery of new network services.

How Consume
May be OEM’d in commercial offerings, or implemented in white box environments.
Open Source Control Plane Projects
The backbone of modern network management

What
Execute the detailed network requirements of larger orchestration and automation frameworks (ONAP, OpenStack, CORD).

Why
Assume multi-vendor, mixed P/V environments.

How Consume
Range of open source and/or packaged distribution options.
Management Plane, Monitoring and Analytics Projects
Translate business layer intent to network - ensure healthy operations

What
Capture large amounts of real-time data, cut down weeks/months of big data stack integration effort for network analytics to just 1 hour.

Why
Cloud & carrier focus on network automation = doubling of investment in orchestration layer in the next 5 years.

How Consume
Multi-team design, implementation efforts
Open source platforms + custom development + integration services.
Networking is shaping adjacent communities
Cloud, Edge, AI, IOT, Access
Projects crossing boundaries to interoperate and create more value.
Edge is Hot and IHS survey confirms the need

Non-traditional video & connected things are the killer apps for Edge
The Linux Foundation Brings Network Automation and Cloud Native Communities Together as Network Functions evolve to CNFs

Leading open source communities spearhead migration from Virtual Network Functions to Cloud-native Network Functions

AMSTERDAM - Open Networking Summit Europe - Sept. 25, 2018 - The Linux Foundation, the nonprofit organization enabling mass innovation through open source, today announced further collaboration between telecom and cloud industry leaders enabled by the Cloud Native Computing Foundation (CNCF) and LF Networking (LFN), fueling migrations of Virtual Network Function (VNFs) to Cloud-native Network Functions (CNFs).
Commercialization of Open Source

Engagement across the ecosystem and commercialization of products and services are required to create and sustain a vibrant ecosystem

› **Vendors:** Invest in the future by leveraging open source for non-differentiated R&D

› **Integrators:** Provide end-to-end integration and deployment solutions

› **Operators:** Consume, collaborate and help shape the supply chain

› **Developers:** Join projects, start projects, fail fast, lead, innovate, transform
Training News

3 new FREE courses live in 2018:
› Intro to Open Source Networking, Intro to NFV, Intro to ONAP
› Over 10,000 registrations to date

2 new paid eLearning courses live in 2018:
› ONAP Fundamentals & OPNFV Fundaments
› Hundreds of enrollments each

2 courses in active development
› DevOps for Networking Engineers, Software Defined Networking

Introduction to Open Source Networking Technologies (LFS165) – 2,114 total enrollments PRIOR to Aug 9 launch!
It Pays to Give Back

It is a competitive advantage for companies to allow developers to contribute.

"New research by Assistant Professor Frank Nagle, a member of the Strategy Unit at Harvard Business School, shows that paying employees to contribute to such software boosts the company's productivity from using the software by as much as 100 percent, when compared with free-riding competitors."

https://hbswk.hbs.edu/item/the-hidden-benefit-of-giving-back-to-open-source-software
There are lots of ways to get involved!

- Join TSC calls and subscribe to project mailing lists
- Attend Hackfests, Plugfests and developer events
- Contribute to release documentation
- Provide your deployment feedback through the EUAG
- Search for Open Bugs, or Report a New One, in the project JIRAs
- Start or join a local OSN User Group Meetup
- Define compliance and verification test cases
- Review and submit code patches

› Join the Linux Foundation and LFN
› Invest in your personnel
› Participate in the technical communities
› Take a training course

› Follow best practices and develop your own
› Empower yourself with knowledge
› Begin Anywhere
› LFN-info@linuxfoundation.org