State of Networking & Edge

What a Year!

Arpit Joshipura
GM, Networking, Edge & IOT
The Linux Foundation
We have answered 5 hard questions

Thank You Community!
Why Open?

“Open-Sourcification” of Vertical Industries

Telecom at the forefront

+ Automotive
+ Motion Pictures
+ Fintech
+ Public Health
Why Open Networking & Edge

“From Cost Savings to Market Adoption”

Source: LF Edge Community Survey, Sept 2020

Top Reasons
Market Creation, Adoption Acceleration & Collaboration
2 SDO or OSS

Is it Standards OR Open Source?

“Harmonize” was a hot word 3 years ago

Unification well beyond Standards - now Open Source communities, Markets, Verticals are taking direction from the LFN playbook

Linux Foundation Projects are harmonized with Standards
Why Contribute?

- Open Networking
- Open Edge/IOT
- Open RAN
- Open Enterprise
- Open Cloud
- Open Source Software
- Open Testing & Interop

accelerated by

ONAP, OPNFV, CNTT, ODL, O-RAN, Akraiino, EdgeX, CNTT, OpenStack and Kubernetes among other projects

From Consumption to Contribution

- 14,132 Commits
- 439 Code Authors
- 200 Repositories

- 34 Organizations Contributing Code

4 of the Top 10 Contributions in ONAP Frankfurt release from End Users
POC to Production

Open Compliance & Verification
Open Interop & Testing
Open Training & Certification

1. LFN EUAG (operational)
2. (NEW) End User Edge Vertical Solutions Group
3. (NEW) Certified ONAP Professional

OPNFV, CNTT, Akraino Blueprints leading Open Interop & compliance
Value of Open Source Software

- **Total Value**: $7.3B
- **Total LOC**: 87.6M

**Money?**

Value of Open Source Software created in LF Networking

- **8 Projects**
- **6+ Years**
- **2000+ Developers**

Source: [https://lfanalytics.io/projects/lfn](https://lfanalytics.io/projects/lfn) & COCOMO II model of estimation
2020 Priorities

By/For the Communities
“The Acronyms”

LFN/OVP/CNTT/OPNFV/CVC
CNTT + OPNFV: Announcing a merger

CNTT

- Reference Model (RM)
- Reference Architecture (RA)

OPNFV

- Tests & Tools
- Reference Implementations (RI)
- Verification Program (OVP)

Industry Collaboration
Integration
Single Entity for allocating resources

“MERGED PROJECT”

Join Us!

Global Community collaboration
From Specifications to Deployments

"Everyone benefits, vendors don't have to build one-off architectures for every single telecom customers, and operators don't have to devote resources to building potentially unsupportable infrastructures”
- Beth Cohen, Verizon

"This project has a significant impact on both CNTT and OPNFV, and much is at stake. I look forward to seeing this project through to a successful conclusion."
- Scot Steele, AT&T
End to End Architecture

Unified Edge Access with ORAN-SC
End to End Architecture: Deployment Ready Open Source

Carriage Edge

End to End Architecture: Deployment Ready Open Source

Carrier Cloud

Data Center

Carrier Interconnect

Internet / Web

Public Cloud

Enterprise & IIOT

Hosted Private Cloud

Device Edge

End to End Architecture: Deployment Ready Open Source

Enterprise

Service Provider Edge

Core & Cloud

End to End Architecture: Deployment Ready Open Source

X-Project Collaboration
The Edge

Dedicated, Operated Shared, XaaS

Regional Data Centers
Distributed Devices and Systems
Research and Reports
Buildings / Factories / Smart Homes Access
Networks
User Edge Service Provider Edge

MCU-based devices
Embedded compute
Smartphones, PCs, ruggedized IoT gateways and servers in accessible to semi-secure areas
Servers in secure on-prem data centers, MDCs

Stage 1: At Large Projects
Baetyl, Open Horizon, Secure Device Onboard

Stage 2: Growth Projects
EVE, Fledge, Home Edge, State of the Edge

Stage 3: Impact Projects
Akraino Edge Stack, EdgeX Foundry

Last Mile Networks
Access Networks
Aggregation Hubs/COs
Regional Data Centers
Servers in traditional cloud data centers

LOCATION
S
Aggregation Hubs/COs
Centralized Data Centers

On-Prem Data Center Edge

Constrained Device Edge
Smart Device Edge

On-Prem Data Center Edge

Access Edge
Regional Edge

User Edge
Dedicated, Operated

Service Provider Edge
Shared, XaaS
5G and Edge Critical in the Next Battle, a new normal!
Edge is 4X the size* of Cloud Market!

“As businesses and governments establish their own new normal, **5G and Edge computing** will be necessary to deliver the automation, performance and cognitive insight required by many industries—including manufacturing, healthcare, energy and utilities, among others. Telecom operators will need to embrace open ecosystems to externalize innovation and accelerate new services.”


Source: 451 Research
Cloud and Telecom Harmonization

Fueled by 5G, Edge and IOT
A new hybrid world: PNF+VNF+CNF + Cloud Native Applications

VM Architecture

- VNFs/PNFs
- OSS/BSS
- MANO
- Multi-Cloud and/or Bare Metal

Cloud Native Architecture

- CNFs/CNAs
- VNFs
- OSS/BSS
- Service Assurance
- MANO
- Kubernetes
- Bare Metal
- Any Cloud
Google Cloud Joins Linux Foundation Networking at Platinum Level
Cloud Native Network Automation in Action

Focus areas

In Action

Kubernetes Usage in Telecommunications

**Top challenge**
Networking

**Top features**
Performance & VNF+CNF

Source: Survey of Linux Foundation Dev Communities, Sept 2020