Open Source
Networking & ONAP

THE NETWORK AUTOMATION PLATFORM DRIVING
OPEN SOURCE & STANDARDS HARMONIZATION

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GM, Networking

THE LINUX FOUNDATION
Open Source & Open Networking Vision
Open Source Development is Accelerating

- **23M+** Open Source Developers
- **64M+** Repositories on GitHub
- **41B+** Lines of Code
- **10,000+** New Versions per Day
- **1,100** New Projects a Day

Sources: Sourceclear, Sonatype, Github
The Linux Foundation leads Open Source momentum

Cloud, Containers & Virtualization
- Cloud Foundry
- CNCF
- OCI
- Xen Project

Cloud Foundry
- CNCF
- OCI
- Xen Project

Embedded/IOT/Auto
- AllJoyn/IoTivity
- EdgeX Foundry
- Zephyr Project
- AGL
- Dronecode
- Yocto Project
- Tizen

Blockchain, Data, Analytics
- Linux
- Node.js Foundation
- OpenAPI
- JS Foundation
- Open Mainframe
- Open Project
- MAMA
- Let’s Encrypt!
- CII

Platforms & Applications
- OpenDaylight
- OPNFV
- ONAP
- CORD/ONOS
- FRR
- OvS, IO Visor
- Pnda, SNAS.io
- OpenSwitch, OSC
- FD.IO, DPDK

Networking & Orchestration
- Hyperledger
- ODPi
- R Consortium

* Few examples only
LF Open Source Networking – Carriers, Cloud, Enterprises

8/10 Most Important Projects

55% Global Subscribers represented

15 min New Service Creation

10/10 Networking Vendors Active

$576 Shared Innovation
Disaggregation of Networking Components (Trials)

Production Ready Components (Early Deployment)

Production Ready End to End Solutions (Scaled Deployment & Harmonization)

1876-2013

2013-14

2016

2017+

Telecom Transformation is now in the 3rd Phase
Vision: Automating Cloud, Network, & IOT Services

Services

Cloud Services
Residential Services
Enterprise Services
IOT Services

Software & Automation

Fragmented & Disjoint Manual Tooling

Infrastructure

Enterprise
Software Defined Data Centers (SDDC)

Cloud Services

Data Centers
Carrier Network
Cloud Network

Public/Hybrid
Cloud Service Providers
Cloud Hosting
Private Cloud Providers
Web Service Providers

Service Providers
MSO/CableCo

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## Vision: Automating Cloud, Network, & IOT Services

<table>
<thead>
<tr>
<th>Services</th>
<th>Cloud Services</th>
<th>Residential Services</th>
<th>Enterprise Services</th>
<th>IOT Services</th>
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<tbody>
<tr>
<td><strong>Software &amp; Automation</strong></td>
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<tr>
<td><strong>Infrastructure</strong></td>
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**Mandatory Automation before 5G**

- **Enterprise**
  - Software Defined Data Centers (SDDC)

- **Public/Hybrid**
  - Cloud Service Providers
  - Cloud Hosting
  - Private Cloud Providers
  - Web Service Providers

- **Service Providers**
  - MSO/CableCo

- **Data Centers**
  - Carrier Network
  - Cloud Network
The 5G and IOT impact to Network

1000X Data Volume  100X Data Rates
100X Devices (IOT/Autos/..)  10X Bandwidth
1/5th Latency

Source: Ericsson

Services
Cloud Services  Residential Services  Enterprise Services  IOT Services

Software & Automation

Infrastructure

Enterprise
Software Defined Data Centers (SDDC)

Data Centers  Carrier Network  Cloud Network

Service Providers
MSO/CableCo

Public/Hybrid
Cloud Service Providers
Cloud Hosting
Private Cloud Providers
Web Service Providers

THE LINUX FOUNDATION
Vision: Automating Cloud, Network, & IOT Services

**Services**

- **Cloud Services**
  - Open Network Automation
  - ONAP+ODL+OPNFV

- **Residential Services**
- **Enterprise Services**
- **IOT Services**
  - IOT Automation
  - EdgeX Foundry

**Software & Automation**

- Cloud Automation
  - Cloud Foundry + CNCF

**Infrastructure**

- **Enterprise**
  - Software Defined Data Centers (SDDC)

- **Private Cloud Providers**
- **Web Service Providers**
- **Public/Hybrid**
  - Cloud Service Providers
  - Cloud Hosting
  - Private Cloud Providers

**Data Centers**

- Carrier Network
- Cloud Network

**Service Providers**

- MSO/CableCo

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Market Disruption & Open Source Innovation

VENDOR A, B, C
- Features/Service
- Mgmt & Ops
- Control software
- Operating System
- Control Plane CPU
- Fabric Silicon
- Data Plane Silicon

Market Disruption
- Virtual Functions
- Software-Defined
- Dis-Aggregation

Few Open Source Projects
- Services/WL/Apps
- Orch/Mgmt
- Control Plane SW
- Network OS
- Control Plane CPU
- Data Plane ASIC
- Data Plane Acceleration
- Data Plane Server
- Optical
Open Source Networking Landscape

Automation of Network + Infrastructure + Cloud + Apps + IOT
Introducing ONAP
(Open Network Automation Platform)
Linux Foundation Framework, Governance, Control
Bringing the best of both worlds together

- 2+ years of Deployment Maturity at AT&T
- Comprehensive: Design + Orchestration + Control + Policy + Analytics
- Model-based design enabling self-serve capabilities for instantiation and closed loop automation

Based on extensions & integration with OpenDaylight & OPNFV

- Open TOSCA model
- Most Advanced Open Source Process & tool chain
- Architected for ease of VNF insertion (SDK)
ONAP: The Business Value
Accelerate Services with Network Automation

**End User Value**  
1. Faster Services on Demand including 4G, 5G & Business/Enterprise solutions  
2. Elimination of manual steps/errors/time  
3. Design, Agility & Automation enabler for 5G

**Open Source Ecosystem Value**  
1. Harmonized shared investment in technology across Major Carriers globally  
2. Neutral platform that will foster innovation on top of SDN/NFV eg Services, Virtual Functions, 5G Apps, IOT ecosystem

At Inception, ONAP enables up to 38% of Global Subscribers

![Open Network Automation Platform](image)
ONAP Tipping point: 55% of global subscribers, 50+ members

Sept 2017
ONAP Executive Metrics: YTD as of Sep 2017

ONAP Community Growth and Diversity

Wiki Membership

ONAP is creating the largest shared technology investment in Open Source Networking @ LF

Source:
Press releases, JIRA, Gerrit, Git,
ONAP 2017 market momentum

“ONAP is one of the biggest open source initiatives out there today.” -- Monica Alleven, Fierce Wireless, July 24, 2017

“Through its efforts to develop a common open source framework for network automation, ONAP is becoming one of the key vehicles for minimizing the fragmentation within the SDN market.” -- Sean Buckley, Fierce Telecom, June 28, 2017

“The Open Network Automation Platform added a large feather to its cap with Monday’s announcement that Comcast -- as well as some large networking vendors -- had signed up as a new member.” -- Mike Robuck, Telco Transformation, July 31, 2017
ONAP: Architecture Value
Design, Execute and Operate – Network Automation

1. Active and Available Inventory
2. Application Controller
3. Data Collection, Analytics, and Events
4. Design Studio
5. Service Orchestrator
6. Network Controller
7. Policy Framework
8. Portal
9. Virtual Network Function SDK
10. Virtual Function Controller
11. Modeling

<table>
<thead>
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<th>Service Provider Stack</th>
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<tbody>
<tr>
<td>Residential &amp; Business Products/Services</td>
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<tr>
<td>Orchestration, Management, Policy, Services</td>
</tr>
<tr>
<td>Control Plane SW</td>
</tr>
<tr>
<td>Network OS</td>
</tr>
<tr>
<td>Control Plane CPU</td>
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<tr>
<td>Leaf Spine Architecture</td>
</tr>
<tr>
<td>Data Plane ASIC</td>
</tr>
<tr>
<td>Optical</td>
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<tr>
<td>Data Plane Server</td>
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ONAP Initial Architecture

**ONAP Portal**

**Operational Functions**
- ONAP Controller
- ONAP Portal

**Design Functions**
- Recipe/Engineering Rules & Policy Distribution
- Service Design & Creation
- Policy Creation
- Analytic Application Design

**E – Services**
- Dashboard
- OA&M Operation Administration & Maintenance

**BSS / OSS**
- Service Orchestrator
- Active & Available Inventory

**Big Data**
- External Data Movement & APIs
- Data Collection & Analytics

**Common Services, Data Movement, Access Control & APIs**

**Storage & Compute**
- Networking
- VNFs / Applications
ONAP now the De-facto Automation Platform for Carriers

- Model driven service design
- Multivendor VNF and PNF support
- MultiVIM/Cloud
- Cross WAN DCI underlay and overlay network support
- Workflow driven service orchestration
- Multiple ONAP controllers support
- Closed loop automation with data collection, data analytics and policy

Global Subscribers

- 55% Existing Subscribers
- 28% Untapped, for now
- 17% Additional Wireless Subscribers (In Pipeline)
ONAP Call to Action

› Global End User Participation (55% subs covered) & Top10 Vendors form a vibrant community of 1100+ developers

› Operators requesting Harmonization in Networks across Open Source, Open Standards – allowing for Automation before 5G and IOT

› Let the best of minds solve North Bound/South Bound, Upstream/Downstream for Open Source & Open Standards
Harmonizing Open Source and Standards in the Telecom World

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www.linuxfoundation.org