The New Open "Edge"
IOT+Telecom+Cloud+Enterprise

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Why Edge and Defining the Edge
Emerging Edge Applications & Convergence of Technologies are demanding & fueling lower latency + accelerated processing

<table>
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<tr>
<th>NFV Edge Infrastructure</th>
<th>Wireless (vRAN,vEPC)</th>
<th>Wireline (PON)</th>
<th>uCPE (SD-WAN)</th>
<th>IP Enterprise Services</th>
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<tr>
<td>Autonomous Devices</td>
<td>Drones</td>
<td>Autonomous Vehicles</td>
<td>Industry Robots</td>
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<td>Immersive Experiences</td>
<td>Virtual Reality</td>
<td>Augmented Reality</td>
<td>360 Video</td>
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<td>Industrial Sensors</td>
<td>Home Devices</td>
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<td>Hardware Acceleration</td>
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<td>Microservices</td>
<td>5G</td>
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Edge Killer Apps: Non-traditional video + Connected things that move

Q: What are the top 5 (or more) edge services?

- Many metro IX locations within 20ms of parts of populations...
- Telcos have advantage of COs, cell sites, cell backhaul aggregation, fixed backhaul, street cabinets, etc. much closer to users
- Edge enhanced apps include many elements: natural language, facial recognition, immersive experience, swarming
- Big (too much) bandwidth top driver
- Our categories are a grouping of several applications; can be user delivered

Source: IHS Markit. NFV Strategies: Global Service Provider Survey, June 2017; Respondents control 61% of global telecom capex
Market Opportunity for LF Edge

Industrial, Enterprise and Consumer use cases in complex environments spanning multiple edges and domains.

Examples:

- Industrial Manufacturing
- Energy (Oil & Gas, Utilities)
- Commerce
- Homes (including B2B2C use cases)
- Automotive
- Fleet/Transportation
- Logistics
- Building Automation
- Cities and Government
- Healthcare

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022
Where are the edges?
Distributed cloud, edge compute, AI/ML, IoT, 5G, VNFs/NFV, FMC

EDGE
Enterprise & IoT

EDGE
MEC server, AI/ML, IoT, 5G

EDGE
97% of operators plan VNF execution in Smart CO

EDGE
VNFs, vEPC, MEC, distributed RAN, vRAN, BBU hotel, FMC, vCPE, AI/ML, IoT go here

PARTIAL EDGE
85% of operators plan VNF execution in DC Near CO

NOT EDGE
70% of operators plan VNF execution in DC Not Near CO

EDGE
82% of operators plan VNF execution on uCPE at customer sites

Datos Center Near CO [Regional DC]

Data Center Not Near CO [Central DC]

IoT G/W

IoT G/W

IoT G/W

20msecs

Smart CO with Mini DC/CDN+ [Edge DC]
Introducing LF Edge
LF Anchor projects for Edge

Akraino and EdgeX Foundry are complementary open source projects addressing Telecom, Enterprise and IOT edge

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- EDGE VNFs, vEPC, MEC, distributed RAN, vRAN, BBU hotel, FMC, vCPE, AI/ML, IoT
- go here

- 85% of operators plan VNF execution in DC Near CO
- 70% of operators plan VNF execution in DC Not Near CO

- IoT Interoperability framework

- Interoperability framework

- Validated Blueprint

- Vertical
- Retail
- O&G
- Industry
- Agriculture
- Vertical
- Vertical
- Vertical
- Vertical
- Vertical

- Data Center Near CO [Regional DC]
- Data Center Not Near CO [Central DC]
Interoperability between IoT devices and applications

Application
Interoperability

OS

Hypervisor

Device
 Provisioning

Infrastructure

Device Edge
Control Edge

Gateways (Thin and Thick)

Industrial/ Telco
Radio Edge/HCI

MDC
Edge

On-Prem
DC Edge

Telco/Cloud
Edge

API coordination for intelligent orchestration of IoT edge workloads

Scope of LF Edge

Edge Computing Glossary
Open Source LF Edge

**IIoT Today**
Vertical data silos & platform lock-in
Data/edge sovereignty & control issues
Hardware-defined & unmanaged edge

**IIoT with LF Edge**
Open IoT data architecture, no lock-in
Data & edge belong to the enterprise
Software-defined & ubiquitous edge
LF Edge – New umbrella for Edge Projects

Drivers

› Complementary and aligned vision on multiple LF projects
› Fuels faster adoption and deployment
› Edge market is fragmented and creating a larger entity provides leadership

Projects
Bringing It All Together – LF Open Source Edge
With Complementary Standards, Ref Arch and Ref Implementations
Automating Cloud, Network & IOT/Edge Services

Services
- Cloud Services
- Residential Services
- Enterprise Services
- IOT/Edge/AI Services

Software & Automation
- Cloud Automation
- Telecom Network Automation
- Edge Automation

Infrastructure
- Enterprise
  - Software Defined Data Centers (SDDC)
- Data Centers
- Carrier Network
- Cloud Network

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

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Premier Members

- Altran
- ARM
- AT&T
- Baidu
- Charter Communications
- Dell EMC
- Dianomic
- Ericsson
- Fujitsu
- GE
- HP
- Hewlett Packard Enterprise
- Huawei
- IBM
- Intel
- InwinStack
- Juniper Networks
- MobiledgeX
- Netsia
- Nokia
- NTT
- OSIsoft
- Qualcomm
- Radisys
- Red Hat
- Samsung
- Seagate
- Tencent
- Wind
- Wipro
- Zededa

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LF EDGE
General Members

Associate Members and Liaisons
LF Edge: Key Takeaways

1. Harmonizing Open Source Edge Communities across IOT, Enterprise, Cloud & Telecom

2. Keeping LF Edge Open & Interoperable with
   - Hardware, Silicon, Cloud, OS, Protocol independence
   - Bringing the best of telecom, cloud and enterprise – location, latency & mobility
   - In collaboration with Consortiums/SDO (IIC, AECC, OEC, ETSI)

3. Hosted by the Linux Foundation similar to other Open Source Communities like CNCF (Kubernetes), LF Networking (ONAP) and many more.
The Linux Foundation Launches New LF Edge to Establish a Unified Open Source Framework for the Edge

More than 60 global founding members across enterprise, IoT, telecom and cloud collaborate on open source framework for edge computing and future of IoT

SAN FRANCISCO, January 24, 2019 – The Linux Foundation, the nonprofit organization enabling mass innovation through open source, today announced the launch of LF Edge, an umbrella organization to establish an open, interoperable framework for edge computing independent of hardware, silicon, cloud, or operating system. LF Edge is initially comprised of five projects that will support emerging edge applications in the area of non-traditional video and connected things that require lower latency, faster processing and mobility.

LF Edge includes Akaino Edge Stack, EdgeX Foundry, and Open Glossary of Edge Computing, formerly stand-alone projects at The Linux Foundation and new projects EVE (Edge Virtualization Engine), Home Edge.

LF Edge Momentum continues with Project EVE seed code, project demonstrations at IOT World and new members

- IOT OnPrem Edge Virtualization Engine seed code contributed by Zededa to LF Edge
- Four new members join existing community of 70+ LF Edge organizations
- LF Edge on Display at IOT World, with Akaino Edge Stack, EdgeX Foundry and Project EVE demonstrations

SANTA CLARA, Calif. – IOT World – May 14, 2019 – LF Edge, an umbrella organization within the Linux Foundation that aims to establish an open, interoperable framework for edge computing independent of hardware, silicon, cloud, or operating system, today announced its availability of EVE (Edge Virtualization Engine) seed code within the Linux Foundation. The Linux Foundation is a nonprofit organization enabling mass innovation through open source by bringing together the world’s leading organizations and developers to create communities, which develop, host, advance, and sustain software, services, and solutions that drive innovation and enable further community collaboration. The EVE seed code will be available in the Community Forum under the EVE project page.

Akraino Edge Stack Issues Premier Release, Sets Framework to Enable 5G, IoT Edge Application Ecosystem

- Inaugural release unifies multiple sectors of the edge across disciplines, including IoT, Enterprise, Telecom, and Cloud
- Delivers tested and validated deployment-ready blueprints
- Creates framework for defining and standardizing APIs across stacks, via upstream/downstream collaboration

SAN FRANCISCO – June 6, 2019 – LF Edge, an umbrella organization within the Linux Foundation that aims to establish an open, interoperable framework for edge computing independent of hardware, silicon, cloud, or operating system, today announced the availability of Akraino Edge Stack Release 1 (“Akraino R1”). Created via broad community collaboration, Akraino’s premier release unlocks the power of intelligent edge with deployable, self-certified blueprints for a diverse set of edge use cases.

EdgeX Foundry Announces Production Ready Release Providing Open Platform for IoT Edge Computing to a Growing Global Ecosystem

- Enables IoT digital transformation for Enterprise, Industrial, Retail and Consumer
- Supports complementary products and services from global open ecosystem including commercial support, training and customer pilot programs
- Deployed in many end user projects; EdgeX also collaborates with IIC on AI testbeds and is the foundation for the Open Retail Initiative (ORI)

SAN FRANCISCO – July 11, 2019 – EdgeX Foundry, a project under the LF Edge umbrella organization within the Linux Foundation that aims to establish an open, interoperable framework for edge computing independent of hardware, silicon, application cloud, or operating system, today announced the availability of its “Edinburgh” release.
LF Edge
(www.lfedge.org)

Bringing Edge Initiatives Together

IOT | Telecom | Cloud | Enterprise