The New Intelligent Edge
Akraino Edge Stack Project Overview

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Travis Broughton, Community Manager, Intel
May 2018
Emerging Technologies in IOT and Networks are demanding lower latency and accelerated processing at the edge

<table>
<thead>
<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>
</tr>
</thead>
<tbody>
<tr>
<td>Autonomous Devices</td>
<td>Drones</td>
<td>Autonomous Vehicles</td>
<td>Industry Robots</td>
<td>Medical</td>
</tr>
<tr>
<td>Immersive Experiences</td>
<td>Virtual Reality</td>
<td>Augmented Reality</td>
<td>360 Video</td>
<td>Wearable Cognitive Assistance</td>
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<tr>
<td>IoT &amp; Analytics</td>
<td>Industrial Sensors</td>
<td>Home Devices</td>
<td>Retail</td>
<td>Healthcare</td>
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<tr>
<td>On-Demand NFV</td>
<td>Hardware Acceleration</td>
<td>A.I.</td>
<td>Microservices</td>
<td>5G</td>
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AKRAINO
EDGE STACK
New Edge Requires End-to-End Automation & Interworking

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

Software & Automation
- Cloud Automation
- Network Automation
- IOT Automation

Infrastructure
- Enterprise Software Defined Data Centers (SDDC)
- Data Centers
- Carrier Network
- Cloud Network
- Public/Hybrid Cloud Service Providers
  - Cloud Hosting
  - Private Cloud Providers
  - Web Service Providers

Logos: openstack, airship, StarlingX, Cloud Native Computing Foundation, LF Networking, Akraino Edge Stack, Edgeworx
The New Edge Requirements for Akraino Project

Akraino Edge Stack is the first open source collaborative community project exclusively focused on integrated distributed cloud edge platform.

Edge Challenges

- Large Scale >1000 Locations
- Need Simple Operations
  - Zero-touch provisioning
  - Zero-touch operations
  - Zero-touch lifecycle
- Low Cost
  - Start-up, Build, Run
- Multiple Edge Use Cases
  - Faster innovation but with right integration

Solution

Akraino Edge Stack integrates multiple open sources to supply holistic Edge Platform, Edge Application, and Developer APIs ecosystem.
What is Akraino?

Everything About Edge – Akraino is Edge Project

**Deliverable**

- Development of Edge Applications
  - Develop Edge Middleware, SDKs, applications and create an app/VNF ecosystem

- Development of Edge Middleware & API
  - Develop Edge API
    - Develop framework for interoperability with 3rd party Edge providers & hybrid cloud models

- Fully Integrated Open Edge Stack
  - Create & Integrate Edge stack to address Edge use cases (Blueprints)
  - Edge Stack Life Cycle - CI/CD & Tooling
  - Upstream collaboration

Scope
LF Announcement March 2018

› First Open Source Project at Edge gathers momentum, complements other standards & consortiums

› Edge now an integral part of Open Source Software Ecosystem
Akraino Edge Stack – Key Principles

**Design**

- Finite set of configurations – reduce complexity
- Cloud native applications – design application to be optimized from the beginning
- Simplified security – secure platform and services while not being a burden
- Autonomous, turn-key solution for service enablement – enable rapid introduction
- Platform, VNF and application assessment and gating – assess whether the application is fit to run at the edge (e.g., latency sensitiveness, code quality)

**Build**

- Low startup cost – space, power, capital but scalable and evolvable
- Low latency placement and processing – support the edge drivers
- Plug and play modular architecture – building blocks using multiple cloud management technologies

**Operate**

- Zero touch provisioning, operations and lifecycle – reduce OpEx
- Automated maturity measurement – operations, designs and services
- Software abstraction based homogeneity – hide any hardware differences via software
- Common platform and service orchestration – ONAP
Akraino is Complementary
Akraino Interfaces With Adjacent Projects

Zero Touch Edge Cloud Automation

Zero Touch Edge Cloud Automation

Container Orchestration
Multi-cloud portability

Open Source Software for
Creating Private and Public
Clouds

AI Framework Across Projects
Networking
Analytics/Automation

Disaggregated Networking
Whitebox Operating Systems
### Akraino Benefits
Enables New Business Ecosystem & Cost Savings

<table>
<thead>
<tr>
<th>Users (Enterprises)</th>
<th>New Services</th>
<th>Open Source-Based</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application Developers</td>
<td>New Edge Applications</td>
<td>Global Open Source Collaboration</td>
</tr>
<tr>
<td>Public Cloud Provider</td>
<td>New Cloud Services</td>
<td>More Footprint</td>
</tr>
<tr>
<td>Suppliers</td>
<td>Infrastructure (H/W)</td>
<td>Support as a Service</td>
</tr>
<tr>
<td>Telco Operator</td>
<td>Edge Processing – Reduced Backhaul Traffic</td>
<td>NFV Infrastructure (5G, Etc.)</td>
</tr>
</tbody>
</table>
### Edge Optimal Zone For Edge Placement

<table>
<thead>
<tr>
<th>Customer Devices</th>
<th>Customer Premises</th>
<th>Access Methods</th>
<th>Telco Network Edge</th>
<th>Backbone</th>
<th>Backbone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mobile</td>
<td>Home</td>
<td>5G</td>
<td>Tower</td>
<td>Centralized Clouds</td>
<td></td>
</tr>
<tr>
<td>AR/VR End User</td>
<td>Smart Cities</td>
<td>LTE</td>
<td>Offices</td>
<td>Public Clouds</td>
<td></td>
</tr>
<tr>
<td>Drones</td>
<td>Stadiums</td>
<td>WiFi</td>
<td>Other Telco Real Estates</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Autonomous Vehicles</td>
<td>Enterprises</td>
<td>Wireline</td>
<td>(Wire Centers, etc.)</td>
<td></td>
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</tr>
</tbody>
</table>

- **Device** ~2 ms
- **Last Mile Network** <5 ms
- **Access** 1-3 ms
- **Edge Computing** ~5-20 ms
- **Backbone** ~2-100

*Estimates

Source: AT&T
Blueprints — Approved and tested declarative configuration based on use cases, set of Hardware & Software, Point of delivery (POD).

Reference Architecture — Defines Akraino building blocks

Declarative Configuration — Hides lower layer complexity to user

CI/CD, Integration & Testing Tools — Drive product quality

Akraino release — End Product

Source: AT&T
Edge Point of Delivery (POD)

Hosted @ Telco or Provider (e.g., Network Cloud)

### Characteristics
- 6 Racks POD
- Containerized Control plane (OpenStack, Ceph, etc.)
- K8 based resiliency

- 3 Racks POD
- Containerized Control plane
- K8 based resiliency

- 1 Rack POD
- Containerized Control plane
- K8 based resiliency
- Possible - Data plane/Control Plane mixed

- Remote Edge – 1 or 2 servers
- Containerized Control plane
- No K8 based resiliency
- Data plane/Control Plane mixed

- Remote @ customer or public buildings
- DANOS based
- White boxes

### Use Cases (e.g.)
- 5G Core
- 5G access
- IP Services
- 5G Access
- IoT, - Wireline (PON), Store
- Remote Edge (Analytics, etc.)
- Over the top edge applications
- Over the top edge applications
- SD-WAN

Source: AT&T

6/6/18

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Akraino – AT&T contributions to kick start the community

**Demonstration of working Blueprint**

- Real world Edge Architecture and Knowledge
- Blueprint based on Kubernetes, OpenStack, Airship, Workflow, GUI etc.,
- Integration of Platform Life cycle tools – Airship
- VNF Orchestration based on ONAP Orchestration
- Sample Edge Applications
- CI/CD& Testing documentation
- Future – Narad, PINC, DANOS Integration

Source: AT&T
Akraino Community Labs (Unison)

- NFV Edge Infrastructure
- Autonomous Devices
- Immersive Experiences
- IoT & Analytics

Akraino Community to drive interoperable Edge APIs

- Applications Area – Experiment Edge application
- Community CI/CD – Share Results
- Certification – Demonstrate Interoperability
For More Information, Please Visit www.akraino.org