The Networking of Edge Computing and Edge Stack on Arm Platform

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Agenda

• What is Edge Computing
• Edge Computing Communities
  • Akraino
• Edge Reference Stack – Proposal
• Current Progress
• Next Steps
What is Edge Computing

- Information processing and content collection and delivery are placed closer to the data sources and consumers.

- Computing and network resources along the path between data sources and cloud data centers

(A case of Edge Computing)
Why is Edge Computing

• Push from cloud services
  • Bandwidth

• Pull from IoT devices
  • Latency

• Cloud users: from data consumer to producer
  • Privacy

(A Centralized Cloud Data Center)
Edge Application Profile

Placement varies depending upon the use case, latency, space availability, etc.,

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Device*: ~2 ms
Last mile network*: <5 ms
Access*: 1-3 ms
Edge computing*: ~5-20 ms
Total latency need to be <20 ms for immersed AR/VR experiences

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Customer devices
Mobile
AR/VR end user
Drones
Autonomous Vehicles

Customer Premises
EC
Home
Smart Cities
Small Enterprises
Stadiums
Enterprises
Public buildings

Access Network
EC

Telco Real estate & Network Edge
(Central Offices, etc.)
EC

Centralized and/or EC

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Millions
Thousands
Tens

(Ref: Edge Automation through ONAP)
Edge Use Cases

• Cloud offloading

• Video analytics

• Smart home

• Smart city

(A Smart Home IoT system)
Edge Computing Communities

• **Akraino Edge Stack**: Fully integrated edge stack

• **ONAP Edge Cloud**: Edge Automation through ONAP

• **OPNFV Edge Cloud**: Reference platform design for edge cloud in OPNFV

• **OPNFV Container4NFV**: NFV Infrastructure of VNFs composed of containers

• **ETSI MEC**: development of specifications, informative reports, white papers, SW implementation of the standardized APIs, testing and compliance framework
Akraino Edge Stack

• A Linux Foundation open source project

• Development of a fully integrated edge infrastructure solution
Akraino Scope

What is Akraino? Everything About Edge – Akraino is the Edge Project

- Develop Edge applications and create an app/VNF ecosystem
- Development of Edge API, Middleware, SDKs
- Cross Platform Interoperability (3rd party Clouds)
- Fully integrated Edge blueprints
- Edge Stack Life Cycle - CI/CD & Tooling
- Upstream collaboration

(Ref: Akraino Edge Stack)
Edge Reference Stack - Proposal

- **Heterogeneous Architecture**
  - VM, container, bare metal
  - Servers and customized Edge platforms
  - Virtualized NFs and Physical NFs

- **Resource constraints**
  - Lightweight Kubernetes
  - OpenStack deployment on K8s
  - Lightweight SDN Controller

- **HW Accelerations**
  - Integrated accelerators
  - Smart NICs

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**Lightweight ONAP**
- Apps
  - Bare metal
- Apps
  - Container
- Apps
  - VM

**Infra Orchestration and Installer**
- Kubernetes
- OpenStack-helm
- Containerized Compass

**Accelerated vSwitch**
- VPP
- OVS

**Controller**
- OpenDaylight
- Calico
- Contiv

**Arm Servers or Arm Edge HW Platform**
- Acceleration
  - Integrated Accelerators
    - Smart NICs
    - FPGA/GPU

**Network Equipment**
- Switch/GW

**DPDK**
- Real Time Linux distribution
Current Progress

• Building containerized NFV-I on Arm architecture
  • Working in OPNFV Container4NFV, Auto and Edge Cloud
  • ONAP as the orchestration platform for VNF or PNF
  • Kubernetes as Virtual Infrastructure Manager
  • Data plane acceleration integration (SRIOV/DPDK, VPP)

• Participating in Akraino project
  • Edge reference stack proposal
  • Project blueprint
Container Networking for Edge Stack

Containerized NFV-I on Arm

Lightweight Edge Orchestration

C-VNF-M

VNFM

openstack.

docker

Arm Servers

(Ref: Container4NFV Architecture)
Next Steps – Build Edge stack on Arm platform

• Edge Use Scenarios
  • Telco/enterprise Edge cloud – Edge data center for one region
  • Telco/enterprise remote Edge locations – Edge hardware platform with limited resources

• Hardware
  • Arm servers or customized Edge hardware platforms
  • Acceleration: SR-IOV/DPDK, SmartNICs …

• Virtualization Layer
  • VMs + Containers

• Lightweight Orchestration & Management
Thank You
Danke
Merci
谢谢
ありがとうございます
Gracias
Kiitos
감사합니다
धन्यवाद
תודה