Beyond the hype: edge computing in open source

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Structure

• Edge computing in general
• State of the art
• Edge in OPNFV
• ETSI MEC
• StarlingX
• LF Edge
• Other groups
What is edge computing?

- Distributed architecture to process the data as close to the originating source as possible

- Objective:
  - Lowers the cost of data transport
  - Decreases latency
  - Increases locality

- Driven by 5G networks and growth of data
  - Current centralized architecture cannot support emerging application and business requirements
Edge computing

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

Customer devices  Customer Premises  Access Network  Telco Real estate & Network Edge (Central Offices, etc.)

Mobile  AR/VR end user  Drones  Autonomous Vehicles  Home  Smart Cities  EC  EC  EC  Centralized and/or EC

Small Enterprises  Stadiums  Enterprises  Public buildings

 Millions  Thousands  Tens

* - Approximate

https://www.youtube.com/watch?v=fbxLlkY_I3U
Challenges

- Network connectivity
- Limited processing capacity and non-homogeneous
- Management, orchestration and maintainability (ZTP)
- Security
- Comply with latency and performance requirements
- Standardization needed
Use cases

➢ Large scale IoT and IIoT
➢ Video games
➢ Autonomous vehicles
➢ Content delivery
➢ Video surveillance
➢ NFV and C-RAN
➢ Compute and network offloading (xCloud, Stadia)
ENOUGH BUZZ WORDS!!!
I AM A DEVELOPER!!!!
Where developers can contribute to edge?

- **EDGE INFRASTRUCTURE**
  - Cloud, containers...

- **EDGE MIDDLEWARE**
  - Edge libraries, frameworks, life cycle manager...

- **EDGE APPS**
  - IoT engines, automotive applications, edge-ready videogames
Where open source developers can contribute?

Battle of open source vs proprietary

- Open source seems like the best approach for infrastructure and middleware
  - Standardize
  - No lock-in and fragmentation
  - Accelerate development
MEC (Multi-access Edge Computing)

- ETSI created an Edge standard reference
StarlingX – What is it?

Ultra Low-latency 5G and Industrial IoT (IIoT)

- Autonomous vehicles (drones, cars and trucks)
- Industrial automation (robotics and virtual Programmable Logic Controller (vPLC))
- Cloud/virtual Radio Access Network (cRAN/vRAN)
- Smart city/buildings (metering and monitoring)
StarlingX – History and community

- Open sourced in May 2018 under openstack foundation
- Mainly driven by Intel and Windriver
- First release comes in May 2019
- Active community
  - Documentation must improve
  - Not much diversity
OpenStack Components

Cinder  Ironic  Magnum  Horizon  Swift-API  Murano
Nova   Keystone  Neutron  Glance  Heat  Telemetry

New StarlingX Services

Configuration Management  Fault Management  Host Management  Service Management  Software Management

Some of the Open Source Building Blocks Used by StarlingX

Kubernetes  Ceph  Collectd  libvirt  QEMU  Open vSwitch  DPDK  SR-IOV

Linux
StarlingX – Distributed Cloud
StarlingX - deploy and contribute

• Deploy
  – Baremetal or virtual env (QEMU or VirtualBox)
  – AIO is available
  – https://docs.starlingx.io/installation_guide/latest/index.html

• Contribute
  – StarlingX projects are using the same openstack tools (gerrit, zuul…)
  – Three types of contributions are welcome:
    • Helping StarlingX close forked gaps
    • Develop stx projects further
    • Packaging proces: ISO builds, packaging, multi-os…
MEC & StarlingX

- ETSI created an Edge standard reference
Akraino – What is it?

- Implements different edge use cases integrating open source projects
- Objectives:
  - Create an open source software stack that supports high-availability cloud services optimized for edge computing systems and applications
  - Improve the state of edge cloud infrastructure for enterprise edge, OTT edge, and carrier edge networks
- Targeted families of use cases:
  - Carrier Network Edge use cases
  - Enterprise and Industrial IoT use cases
Akaino - History and community

- Launched in 2018, the first release in May and 6 months cadence
- Several companies involved: AT&T, Huawei, ARM, Intel, Nokia...
- Not very active but slowly improving
  - Current activity is focused on discussing, investigating… not on code
- Intents to cover both the infrastructure and the middleware part
  - 10 approved blueprints so far
- Independent projects without much in common
  - E2E CI/CD work on-going
Akraino – Deploy and contribute

• Deploy
  – There is not a standard way to deploy projects/blueprints
    • Perhaps airship and others in the future
  – Go to the project page in the wiki:
    • https://wiki.akraino.org/display/AK/Approved+blueprints

• Contribute
  – Projects are looking for contributions!
  – Some projects focus on infrastructure: sxfedc, kni, iec…
  – Some projects focus on middleware: eliot, seba, edge video…
MEC & Akraino

- ETSI created an Edge standard reference
OPNFV – What it is?

• Open Platform for NFV is an open source project which addresses the e2e testing and integration of different open source projects

• Objectives:
  – Build a carrier-grade, integrated platform
  – Bring top NFV companies together to accelerate innovation, as well as market new technologies.
  – Collaborate with ETSI NFV
OPNFV – History and community

• OPNFV started in September 2014
• OPNFV Edge group was founded around May 2018
• Wants to position itself as a edge infra. testing community
  - Neutral
  - Unique hardware distribution
• Led by China Mobile and a few people participating
  - List of test cases defined
  - Being inspired by openstack edge group
Edge testcases in OPNFV examples

➢ Resource limitations
  ▶ Resource isolation test
  ▶ Controller and compute services can run in one host test
  ▶ Collecting multi-VIM virtualization resource list test

➢ Management
  ▶ Support remote upgrading of edge VIM from "center of edge" test
  ▶ Alarm/warning from edge is displayed at the "center of edge" test
  ▶ Provision new edge HW test
  ▶ "Single Sign on" in multiple cloud environment test

➢ Reliability
  ▶ Latency and jitter problems when connecting multi-cloud test
  ▶ Backup of edge information test
OPNFV – How to contribute

- **Deploy**
  - No deployment available right now

- **Contribute**
  - Test cases discussion:
    - [https://etherpad.opnfv.org/p/edge_cloud_test_case](https://etherpad.opnfv.org/p/edge_cloud_test_case)
  - Test cases implementation
    - Using OPNFV tools
  - Bi-weekly meetings
    - Wednesdays at 13h UTC
Linux Foundation Edge

• On Jan 24th 2019 the linux foundation created the LF Edge. It contains 5 projects initially:
  - Akraino Edge Stack (Already covered)
  - EdgeX Foundry
  - Home Edge Project
  - Open Glossary of Edge Computing
  - Project EVE - Edge Virtualization Engine
EdgeX foundry project

- Open Platform for IoT Edge
- Loosely-coupled microservices framework allowing to plug and play them
- https://www.edgexfoundry.org/
Home Edge Project

- Provides an open source framework to run devices. That framework offers a set of APIs, libraries and runtimes to enable services on top.
- Promised by Samsung.
- Still no code (coming soon?)
  - [https://www.lfedge.org/projects/homeedge/](https://www.lfedge.org/projects/homeedge/)
Open Glossary of Edge Computing

- Concise collection of terms related to the field of edge computing
- To improve communication and accelerate innovation through a shared vendor-neutral vocabulary
- https://github.com/State-of-the-Edge/glossary
- Also provides a report about the state of the art:
Project EVE (Edge Virtualization Engine)

- Contributed by Zededa
- Architecture to develop and orchestrate cloud-native applications across the edge
- Code still missing (coming soon?):
  - https://dev-lfedge.pantheonsite.io/projects/project-eve/
What is your edge? From the cloud to the edge, extending your reach

Friday 9AM, Ryman 1
Questions
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