Reference Platform Design for Edge Cloud

-- OPNFV Edge Cloud Project

https://wiki.opnfv.org/spaces/viewspace.action?key=EC

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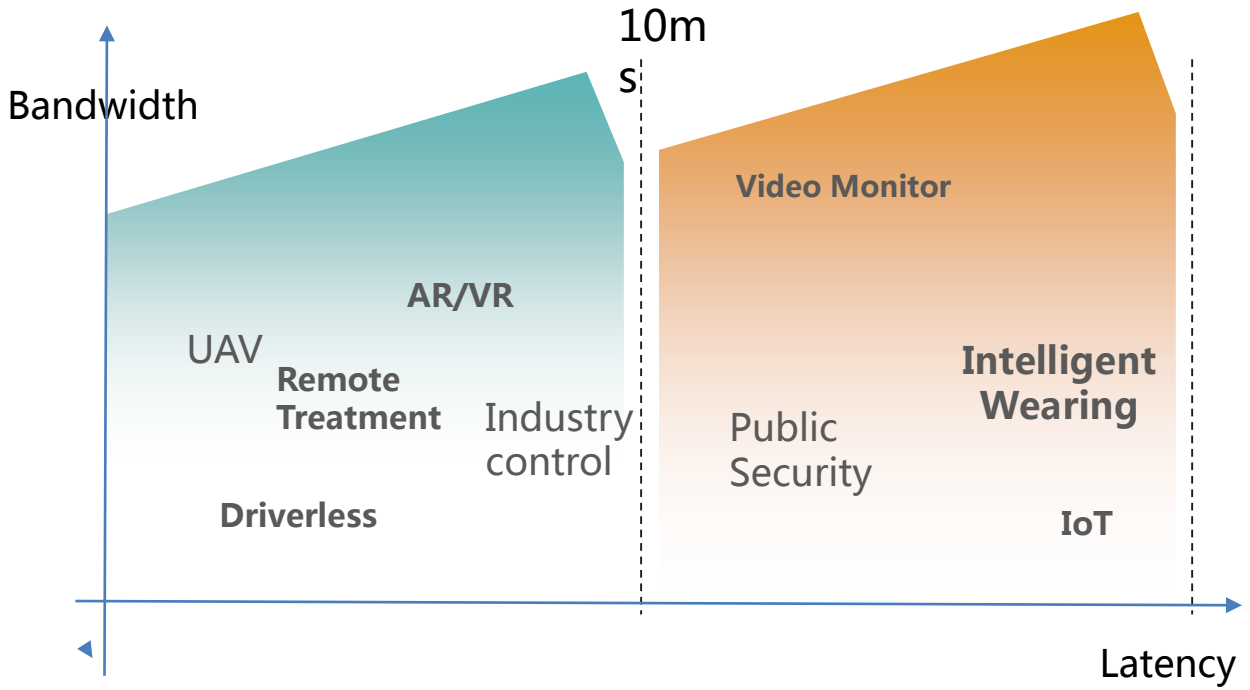
Service Requirement for Edge

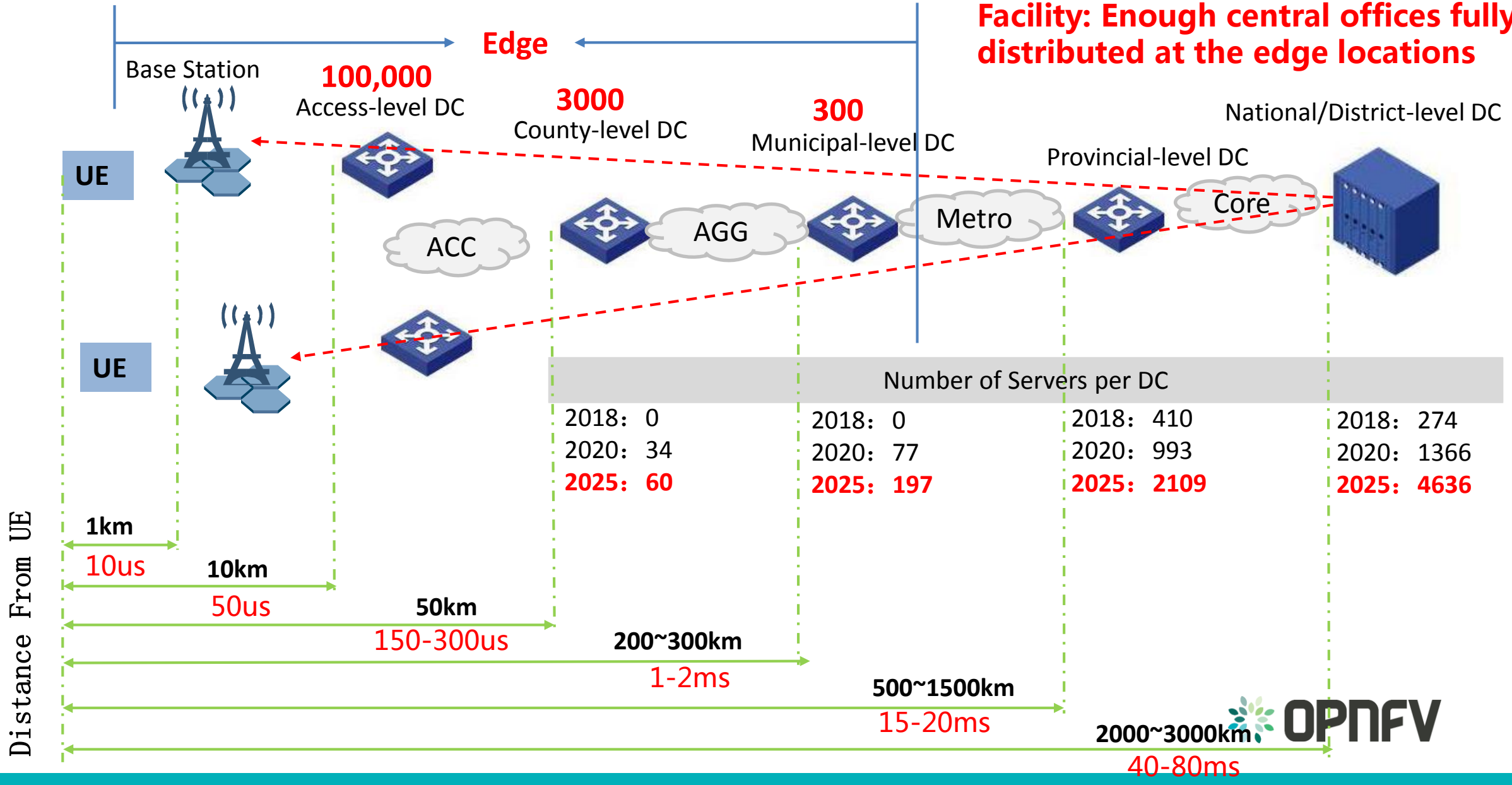
With the emergence of 5G, lots of services with requirement of low latency and high bandwidth appears, leading to huge demand for edge cloud

Service for Edge:

- User plane services: SAE-GW, UPF
- Low Latency Services: VR, automatic driving
- High Throughput services: AR, Video surveillance
- Services with huge requirement for multicast: IPTV
- High Speed Mobile Services: UAV



Where is Edge Cloud



Latency and Bandwidth

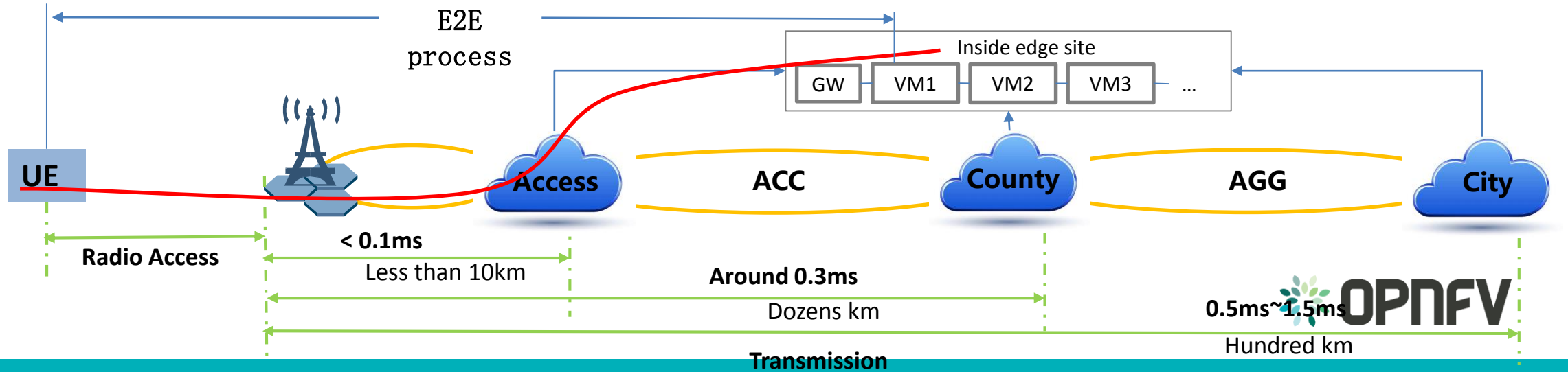
Bandwidth and **Latency** are the main constrains to decide the deployment location of edge services.

Basic policy:

- Service E2E delay demand > E2E delay = radio access + transmission + GW + VM
- Service bandwidth demand < Transmission bandwidth
- **Telco Edge cloud can provide high enough bandwidth and low enough latency**

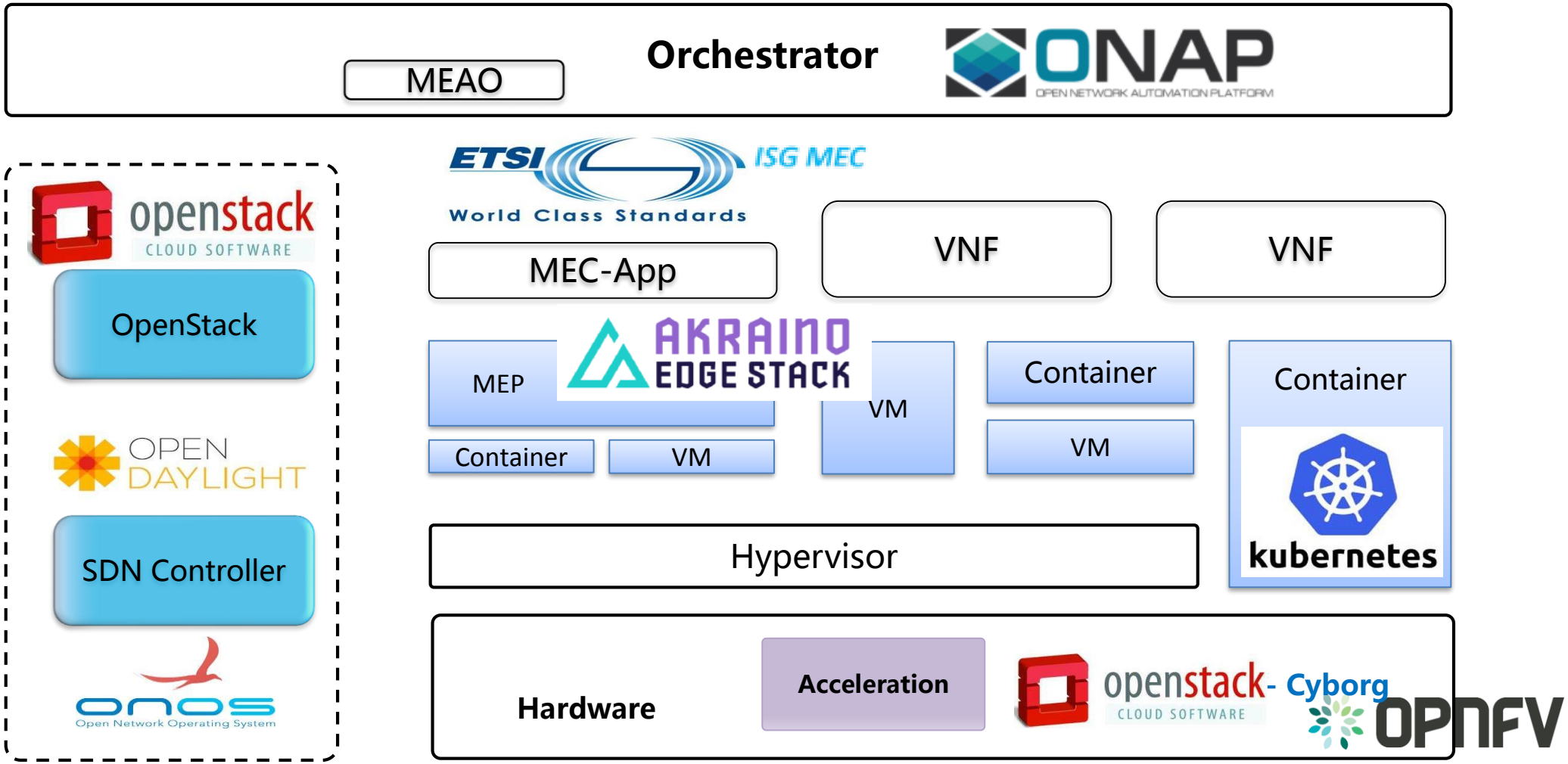
DC Level	Access	County	City
E2E delay	Around 2ms	Less than 2.5ms	Around 4ms
Transmission bandwidth	50G	100G	200G

All calculations are based on 5G technology.



Communities

Lots of communities have setup projects or WGs to focus on edge usecase

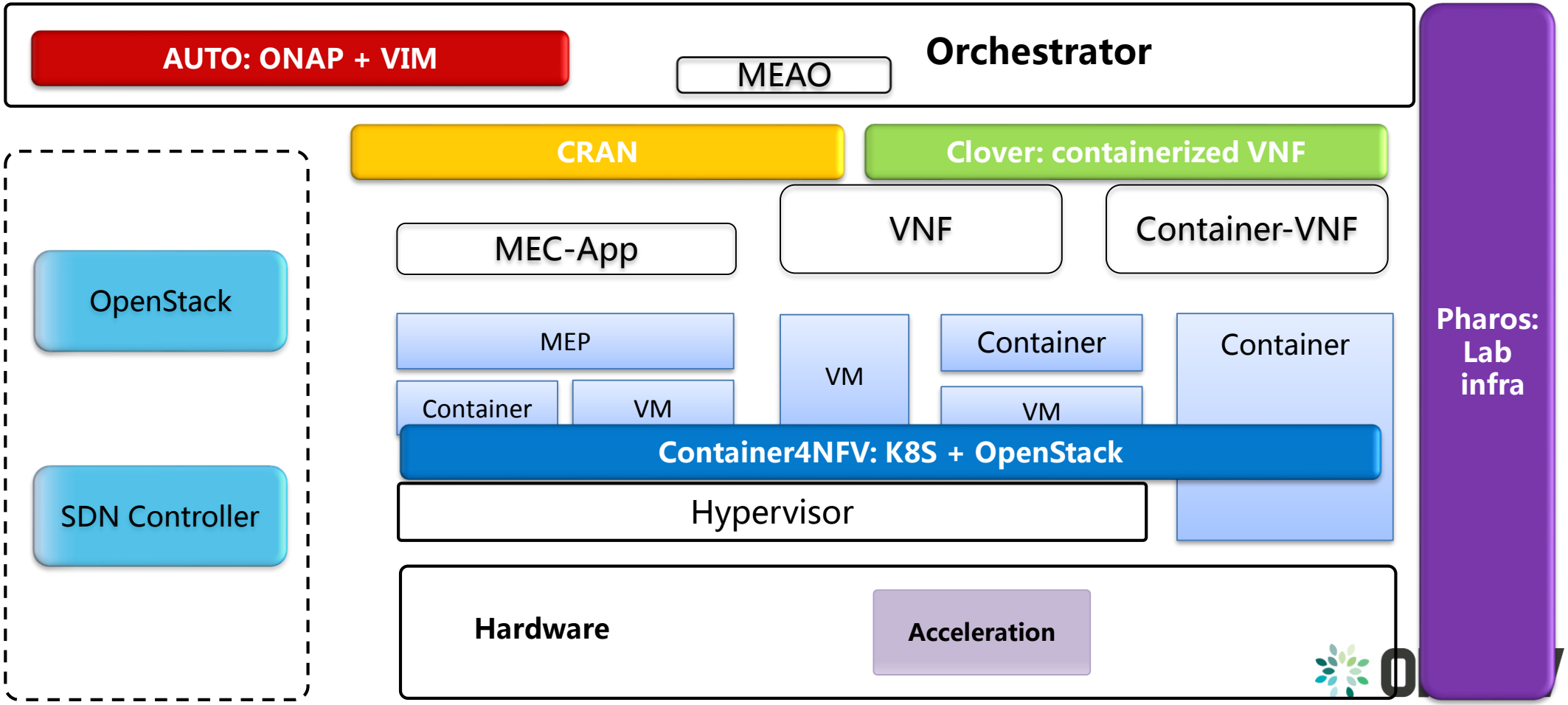


OPNFV Projects

Each project focuses on a certain study point. Edge requirements are not fully covered.

Need a new edge-focused project to combine them and cover those uncovered requirements for edge.

https://etherpad.opnfv.org/p/tsc_edge_cloud



Edge Cloud Project in OPNFV

- **Purpose for this project:**
  - Focusing on the NFV Platform integration for Telco Edge cloud.
  - Platform for edge, which is homogeneous with core in orchestration, so that unified orchestration and operation mechanism can be used
  - Better trimmed platform to meet the specific need for edge services
- **What we can do:**
  - **Requirement Analysis**
    - Analyze and conclude the requirement from multiple services (MEC, CRAN, vCPE, vOLT, vCDN, etc.)
    - Translate requirement of edge into deployment requirements including NFV/SDN component requirement (NFVO, VNFM, VIM, Hypervisor, VSW, HW, etc.)
  - **Reference platform design**
    - **Define and release a limited number of OPNFV scenarios for edge cloud** taking consideration of the analyzed requirements
  - **Upstream collaboration**
    - Collaborate with related communities (ONAP, OpenStack Akraino etc.) for requirement analysis and scenario design
    - Output detailed requirements for components to relevant project/s
  - **Testing strategy**

Features for Edge

Different from core, edge cloud, especially edge cloud located in access and county levels, are highly distributed.

Space and power are quite limited in edge cloud, leading to constraints on devices of edge cloud

Light weight control

- Taking consideration of limited space and power, there could be a dozen to less than a hundred nodes in one edge, where it is unnecessary to deploy Orchestrator and VNFM
- VIM and SDN should be deployed in a light weight manner, especially in CO with very hash environment(say less than 10 nodes a stack)

Remote provisioning

- Edge cloud is rather distributed, while the operation environment is considerably hash. Remote provisioning is necessary
- Only hardware maintenance in Access and County level edge, with virtual resource operator sitting at the city level edge for overall virtual resource maintenance
- A unified Orchestrator together with OSS/BSS, EMS, and VNFM are used in regional level to support overall service orchestration and maintenance
- Multi region OpenStack could be considered as one of the solution

Resource Heterogeneity

- With various applications running on edge, heterogeneous resources, including VM, containers, and bare-metal could co-exist in edge
- Edge cloud should be capable of managing the heterogeneous resource pool
- MANO workflow should take these different resources into consideration

Hardware/software acceleration

- Low latency, high bandwidth, large computing service requires various acceleration technology, including DPDK, SR-IOV, GPU, Smart NIC, FPGA and etc.
- OpenStack should fully expose these acceleration capabilities
- Unified API is necessary to fully decouple the VNF services with acceleration resources

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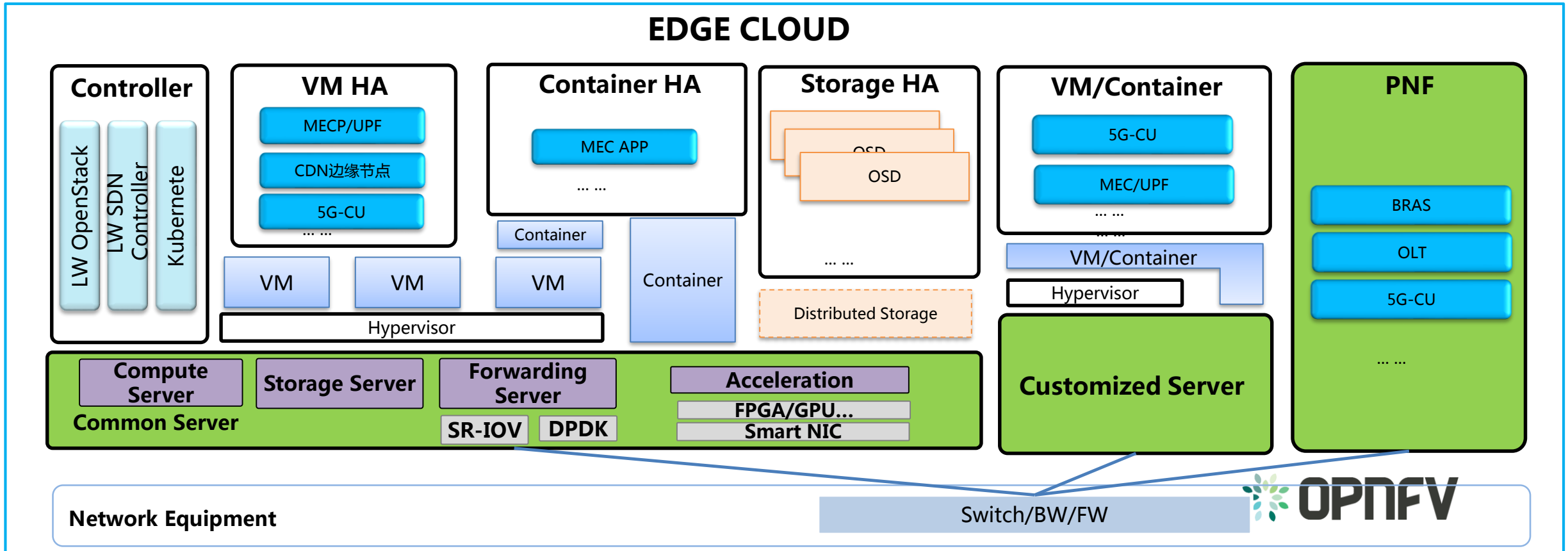
Edge Cloud Architecture

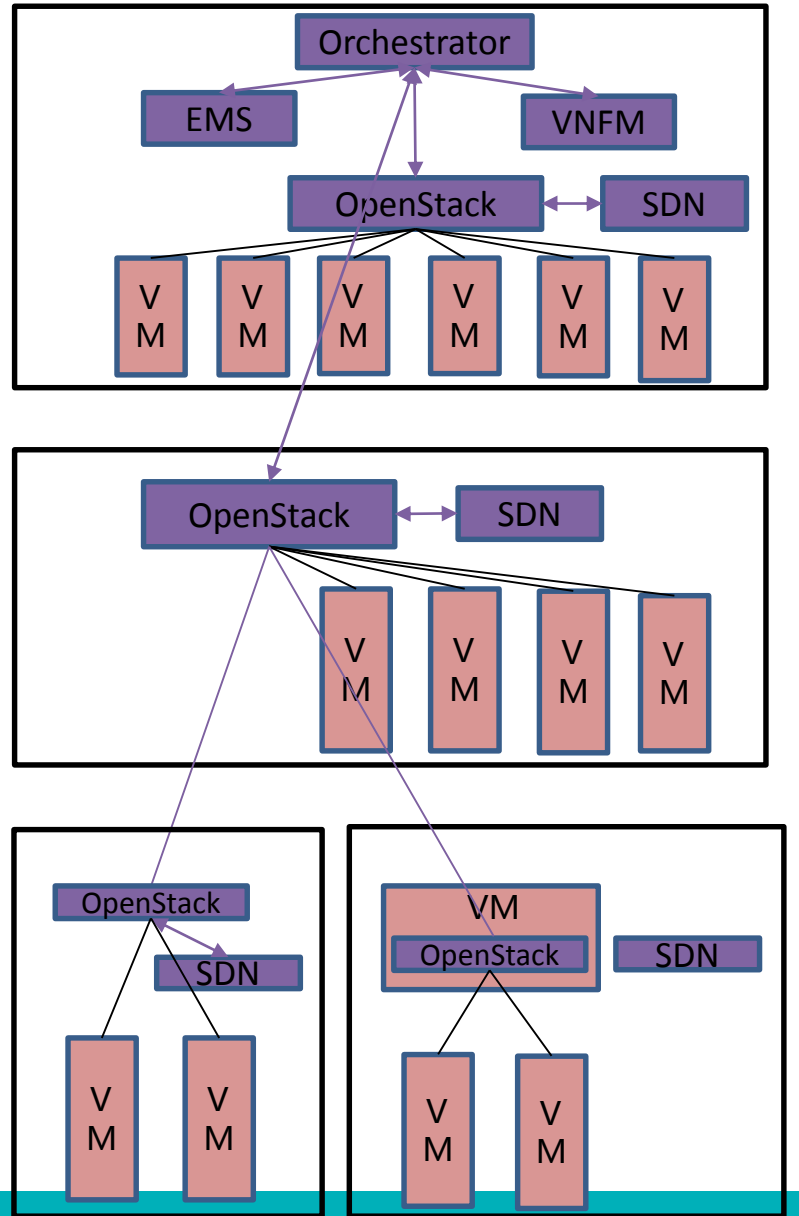
Distributed edge clouds bear various applications, resulting in a quite heterogeneous architecture

- Common server & customized server
- VM & container & Bare metal
- VNF & PNF



Edge Cloud Resource Management Architecture

Multi region and light weight OpenStack are the main solutions for edge cloud



Core cloud

- **Scale：>100**
- With fully deployment of MANO
- Cloud resources are managed with one or several OpenStack cloud

City Level Cloud

- **Scale: local 20-200 nodes, remote 200-300 nodes**
- Only OpenStack deployed，no Orchestrator/VNFM/EMS
- Remotely managing County and access level OpenStack with shared Keystone and Horizon

County/access level cloud

- **Scale：20-100 nodes**
- Remotely controlled by city level OpenStack

County/access/Customer premises level cloud

- **Scale：<20 nodes**
- Light weight OpenStack with few virtual resources

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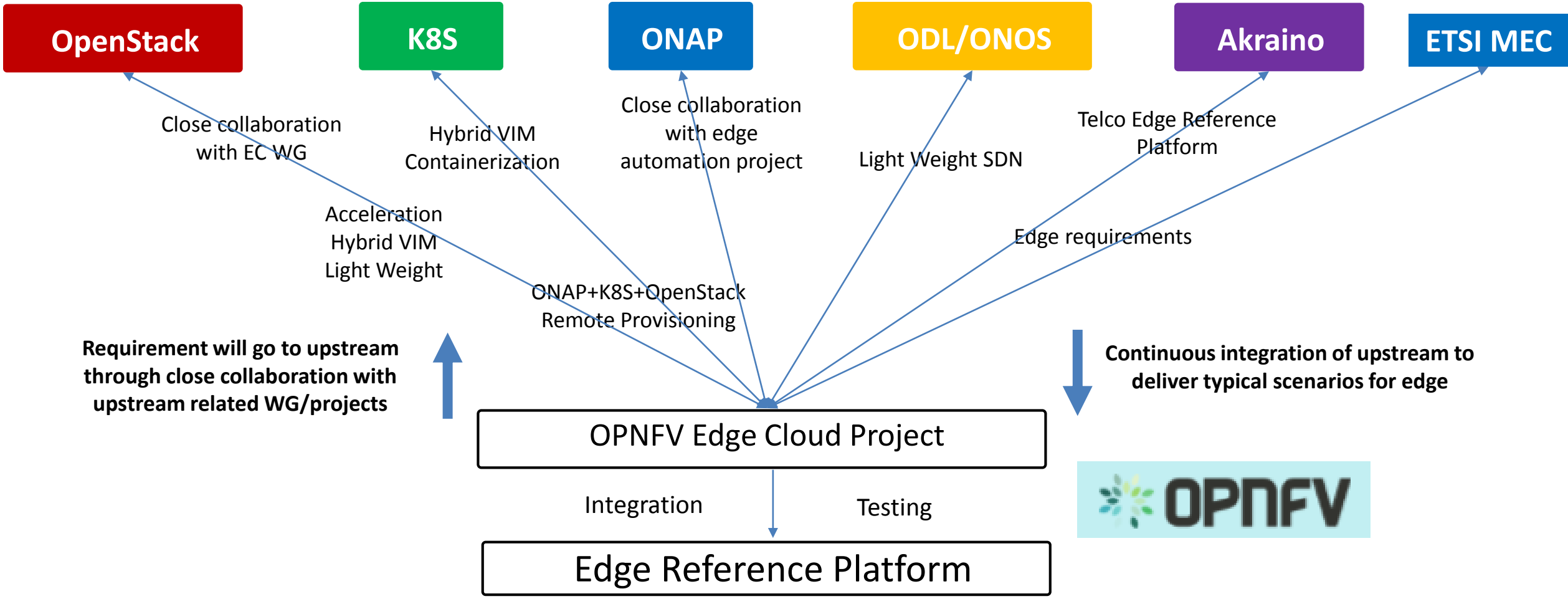
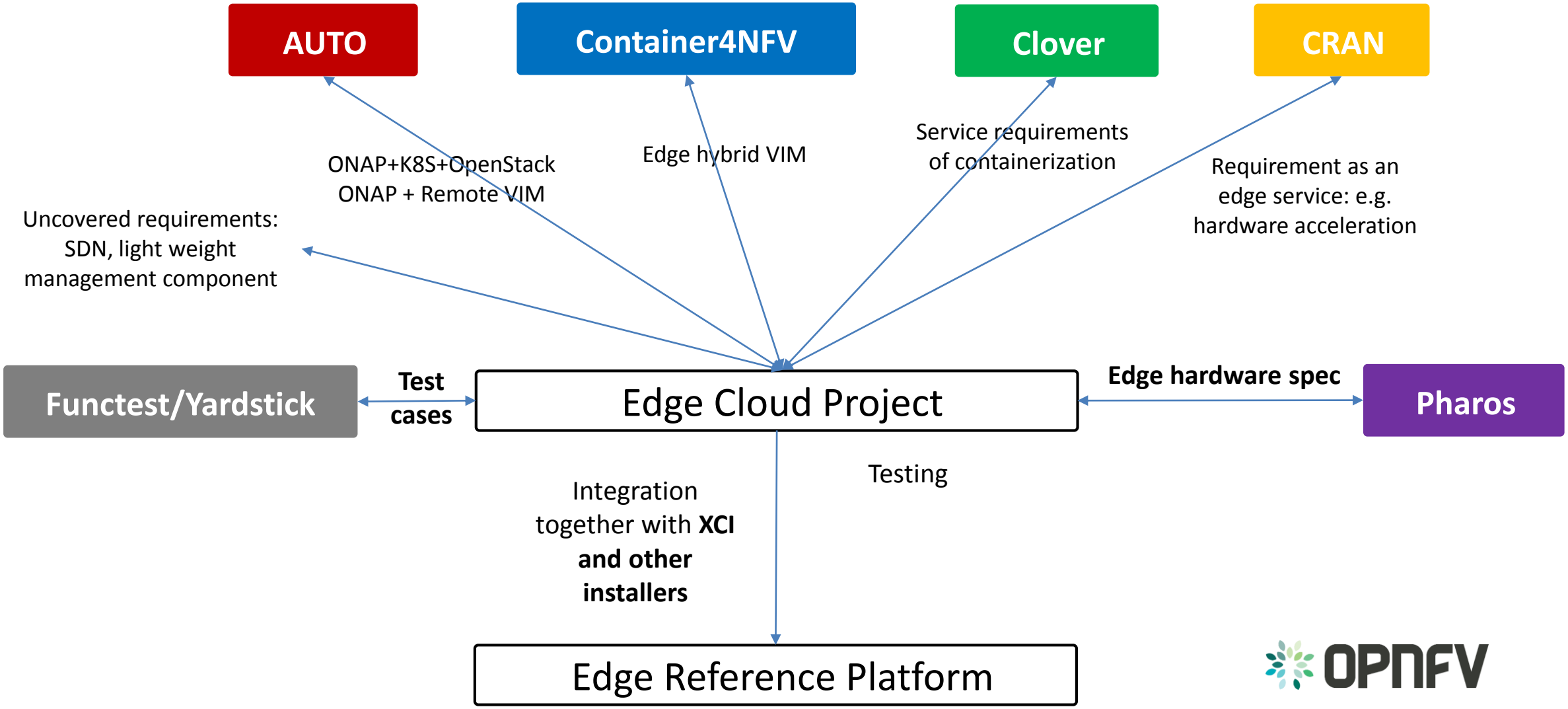
Upstream Collaboration



OPNFV Projects Cooperation



Progress and Plan for OPNFV G release

- First discussed during 2018 ONS-North America

https://etherpad.opnfv.org/p/edge_cloud_discussion_in_ONS2018

- Project on-boarding: Apr.24
- OPNFV G release plan
  - Requirement analysis for edge cloud
  - Architecture design for edge cloud
  - Release scenario: ONAP orchestration of K8S & OpenStack (collaborate with AUTO)
- Project wiki page: https://wiki.opnfv.org/spaces/viewspace.action?key=EC
- Project meeting minutes: https://wiki.opnfv.org/pages/viewpage.action?spaceKey=EC&title=Edge+Cloud+Project+Meeting

Progress and Plan for OPNFV G release

Current work at hand

- Pharos spec for edge
  - Should we work out specific pharos pod for edge?
  - Two spec for edge pod
    - General pod: 3 controller, 2 compute, 1 jump server
    - Slim edge: 4 nodes, 3 nodes with light weight controlling service distributed and LB. Save the rest resources to compute; 1 node for compute
  - Define multi-cloud scenario template
- Requirement and Architecture design
  - https://etherpad.opnfv.org/p/edge_cloud_requirements
  - Waiting for building gerrit commit and start contribute

OPNFV

Progress and Plan for OPNFV G release

- Code base for edge: ONAP+OpenStack+K8S
  - Need detailed discussion with AUTO team for the code base
  - What is the architecture of AUTO release, whether it fit into the requirement for edge
- OpenStack component testing
  - Collaborate with OpenStack EC WG
  - Build testing and integration environment, joint testing with OpenStack projects

OPNFV Edge Work Force

- Edge Taskforce Objectives
  - Report back to TSC with recommendations on an OPNFV Edge Cloud Strategy (At this stage report out is informal - TSC will ask for any progress / updates in weekly meetings)
  - Survey related projects in OPNFV and understand overlaps and synergies
  - Understand if there are gaps with existing or proposed activities to determine need for additional Edge projects or activites in OPNFV
  - Make recomendations on collaboration across OPNFV Edge activities
  - Make recomendations for collaboration with other Open-source communities
  - https://etherpad.opnfv.org/p/tsc_edge_cloud
- Progress for OPNFV Projects
  - https://etherpad.opnfv.org/p/tsc_edge_cloud_project_questions
  - https://etherpad.opnfv.org/p/tsc_edge_cloud_opnfv_activities
- Progress for Upstreams
  - https://etherpad.opnfv.org/p/tsc_edge_cloud_upstream_communities
- Comments and Next Steps
  - https://wiki.opnfv.org/display/meetings/Edge+Cloud

Thank You!
You are very welcome to join us.