Cross Community Collaboration

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Distinguished Engineer, Juniper Networks

Tungsten Fabric In China

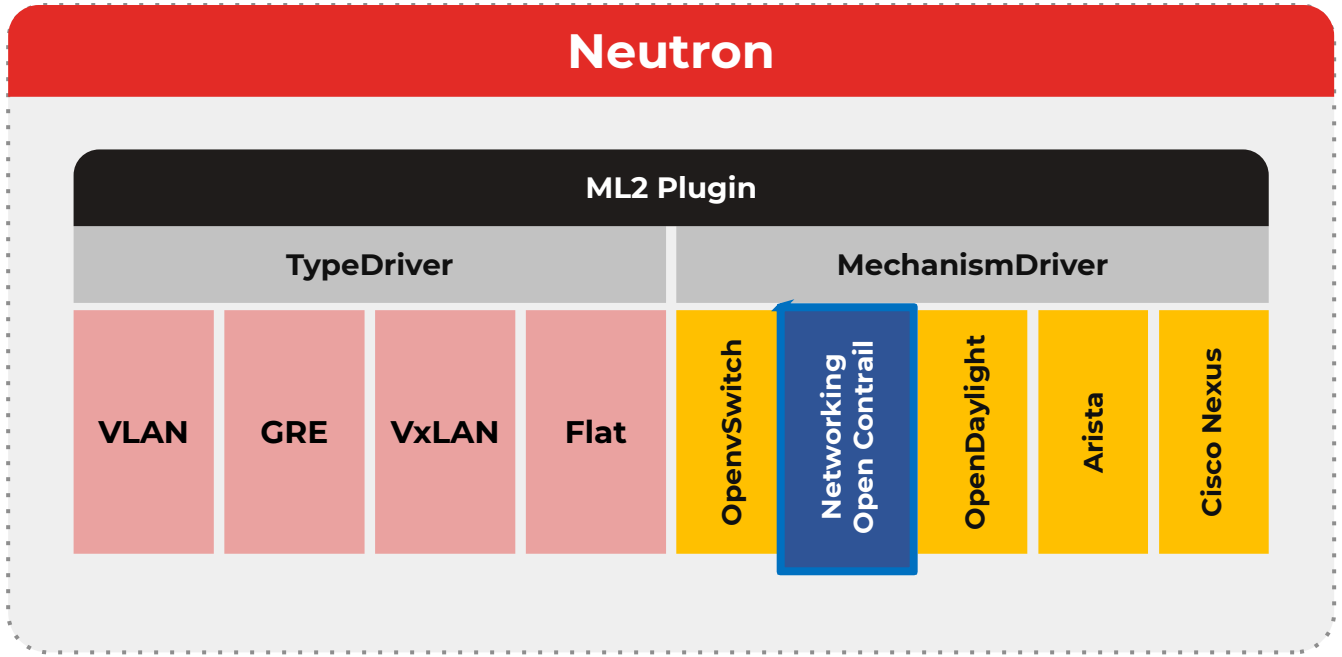
TF China Community Kick off

- Qingdao, China – November 7th 2019
- 100+ participants
- http://net.it168.com/a2019/1108/6084/000006084057.shtml

OpenStack Integration with ML2

OpenStack ML2

- **Two Deployment Models**
  - **Monolithic Plugin**
  - **ML2 Plugin**



openstack®

Why ML2?

- Running Tungsten Fabric SDN along with other ML2 drivers
- This facilitates:
  - Running OVS, SR-IOV and vRouter based works simultaneously
  - Running OVS and SR-IOV workloads and have Tungsten Fabric manage the fabric
  - Live migration of OVS based computes to vRouter based computes

https://opendev.org/x/networking-opencontrail

Tungsten Fabric And LF Edge

Why Edge Computing?

Emerging technologies are demanding lower latency and accelerated processing at the edge

NFV Edge Infrastructure

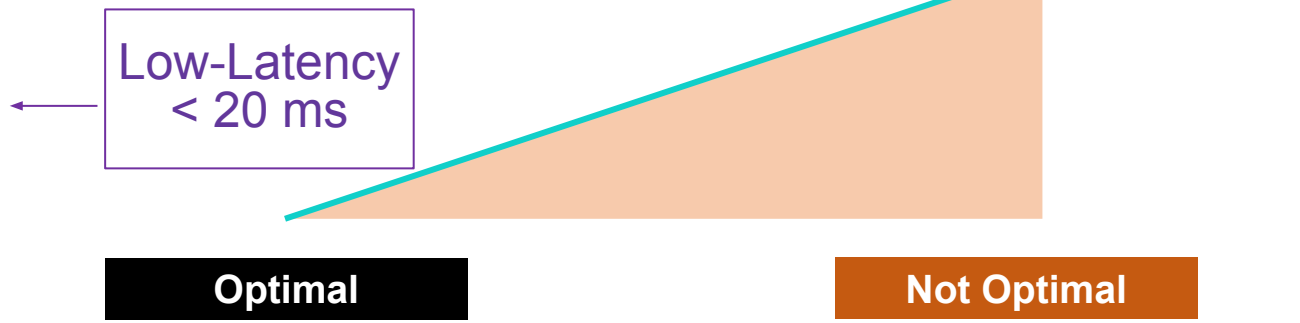
Autonomous Devices

Immersive Experiences

Industrial IOT

Edge Cloud

Perform data processing at the edge of the network, near data sources



Central Cloud

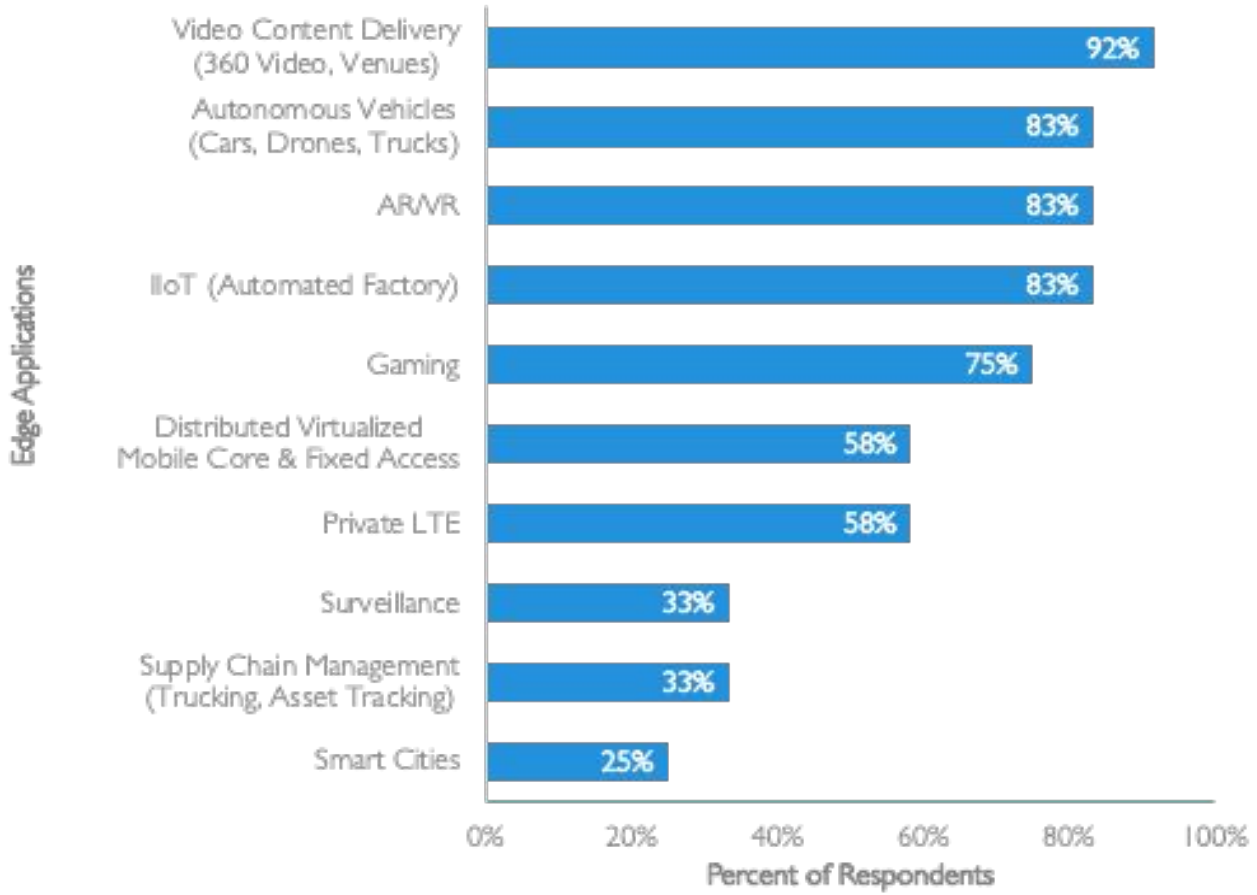
Highly centralized computing resources of cloud service providers

Emerging Edge Applications & Convergence of Technologies are demanding lower latency + accelerated processing

NFV Edge Infrastructure	Wireless (vRAN,vEPC)	Wireline (PON)	uCPE (SD-WAN)	IP Enterprise Services
Autonomous Devices	Drones	Autonomous Vehicles	Industry Robots	Medical
Immersive Experiences	Virtual Reality	Augmented Reality	360 Video	Wearable Cognitive Assistance
IoT & Analytics	Industrial Sensors	Home Devices	Retail	Healthcare
On-Demand NFV	Hardware Acceleration	A.I.	Microservices	5G

Edge Killer Apps: Non-traditional video + Connected things that move

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

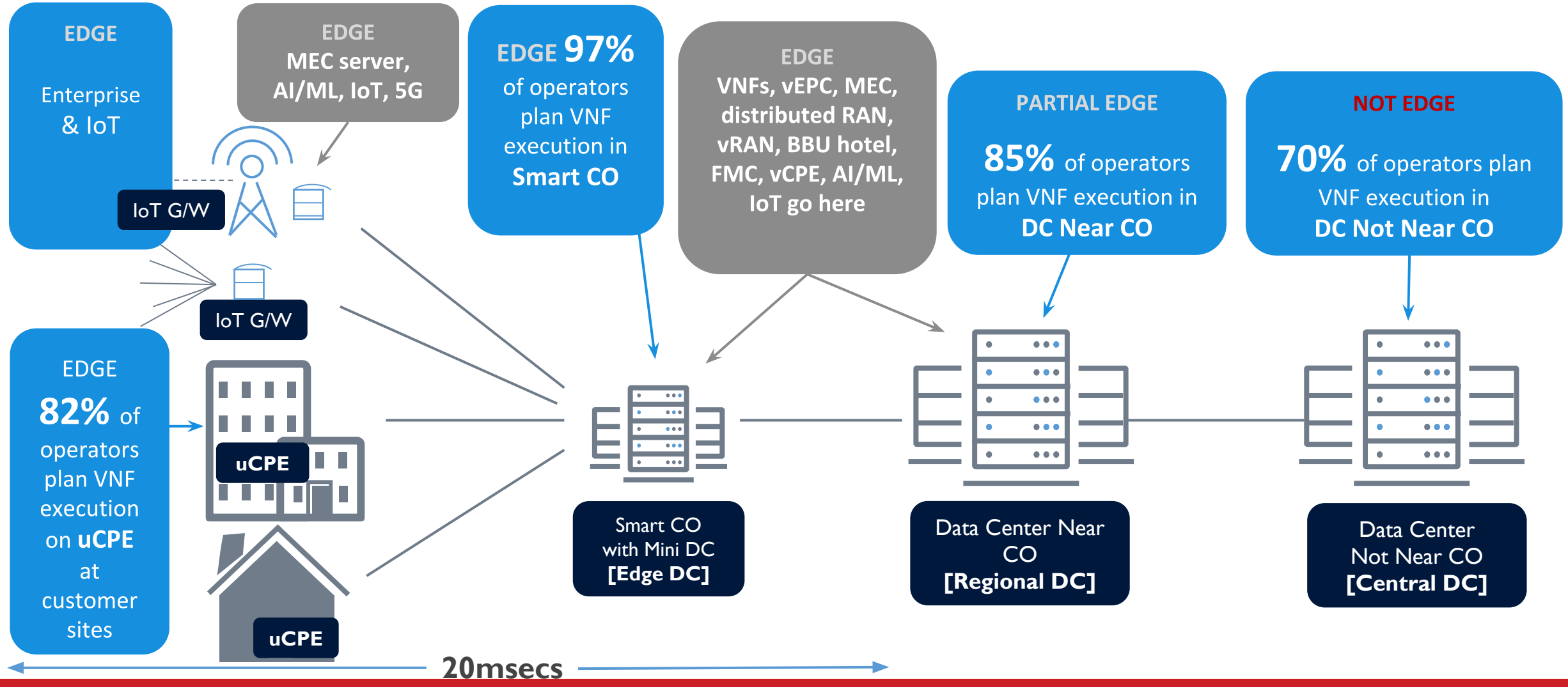


- Many metro IX locations within 20ms of parts of populations…
- Telcos have advantage of COs, cell sites, cell backhaul aggregation, fixed backhaul, street cabinets, etc. much closer to users
- Edge enhanced apps include many elements: natural language, facial recognition, immersive experience, swarming
- 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*

Where are the edges?

Distributed cloud, edge compute, AI/ML, IoT, 5G, VNFs/NFV, FMC



Source: IHS Markit. *NFV Strategies: Global Service Provider Survey*, June 2017; *Respondents control 61% of global telecom capex*

LF Edge - Founding projects

Bringing several Edge verticals and domains under one umbrella

AKRAINO EDGE STACK

EDGE X FOUNDRY™

EDGE VIRTUALIZATION ENGINE

HOME EDGE

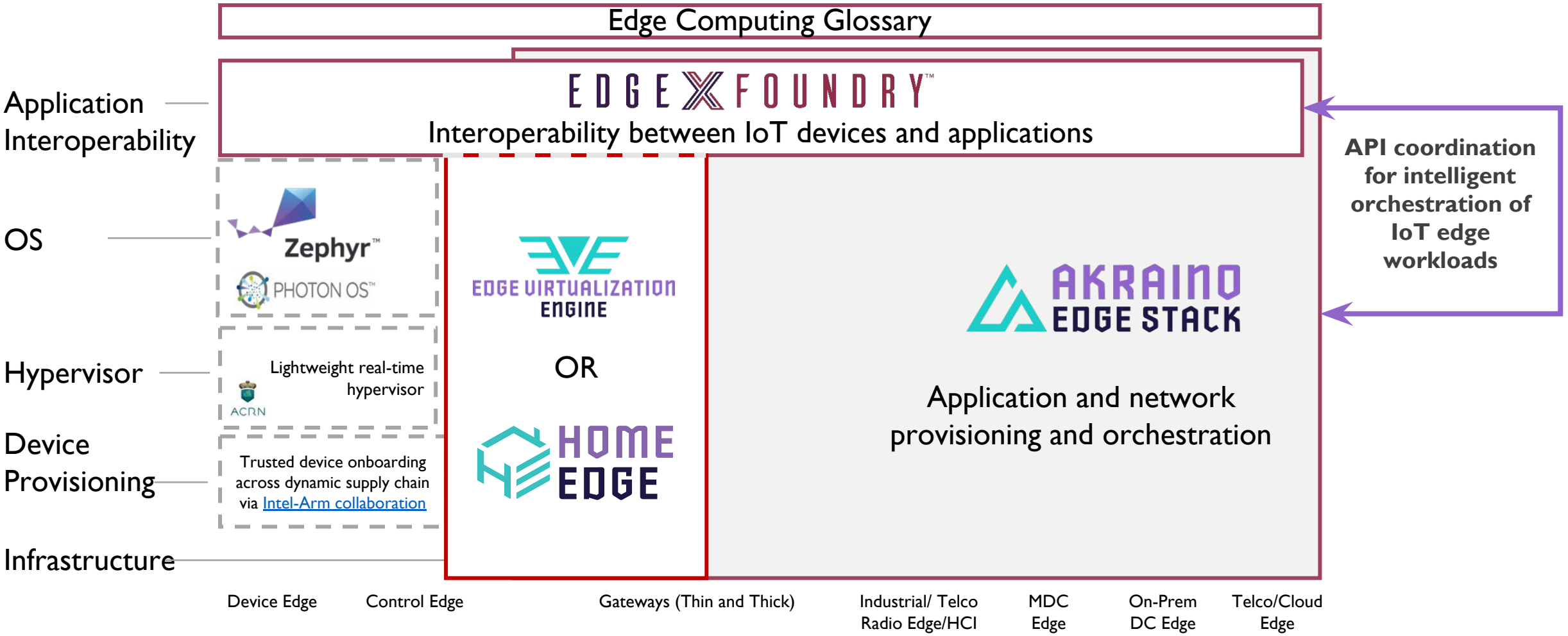
OPEN GLOSSARY OF EDGE COMPUTING

Platinum Members:

arm, AT&T, DELL EMC, ERICSSON, Hewlett Packard Enterprise, HUAWEI, IBM, intel, inwinSTACK, JUNIPER NETWORKS, MobiledgeX, NETSIA, NOKIA, NTT, Qualcomm, Radisys, redhat, SAMSUNG, SEAGATE, Tencent 腾讯, WIND, wipro, ZEDEDA

60 + Members already

Scope of LF Edge



Tungsten Fabric And Akraino

Akraino Edge Stack Executive Summary

Akraino is an Edge project targeted to

- Address Telco, Enterprise and Industrial IoT use cases

Zero Touch
Edge Cloud
Automation

Mission:

1. Create end to end configuration for a particular Edge Use case which is complete, tested and production deployable meeting the use case characteristics {Integration Projects - Blueprints}

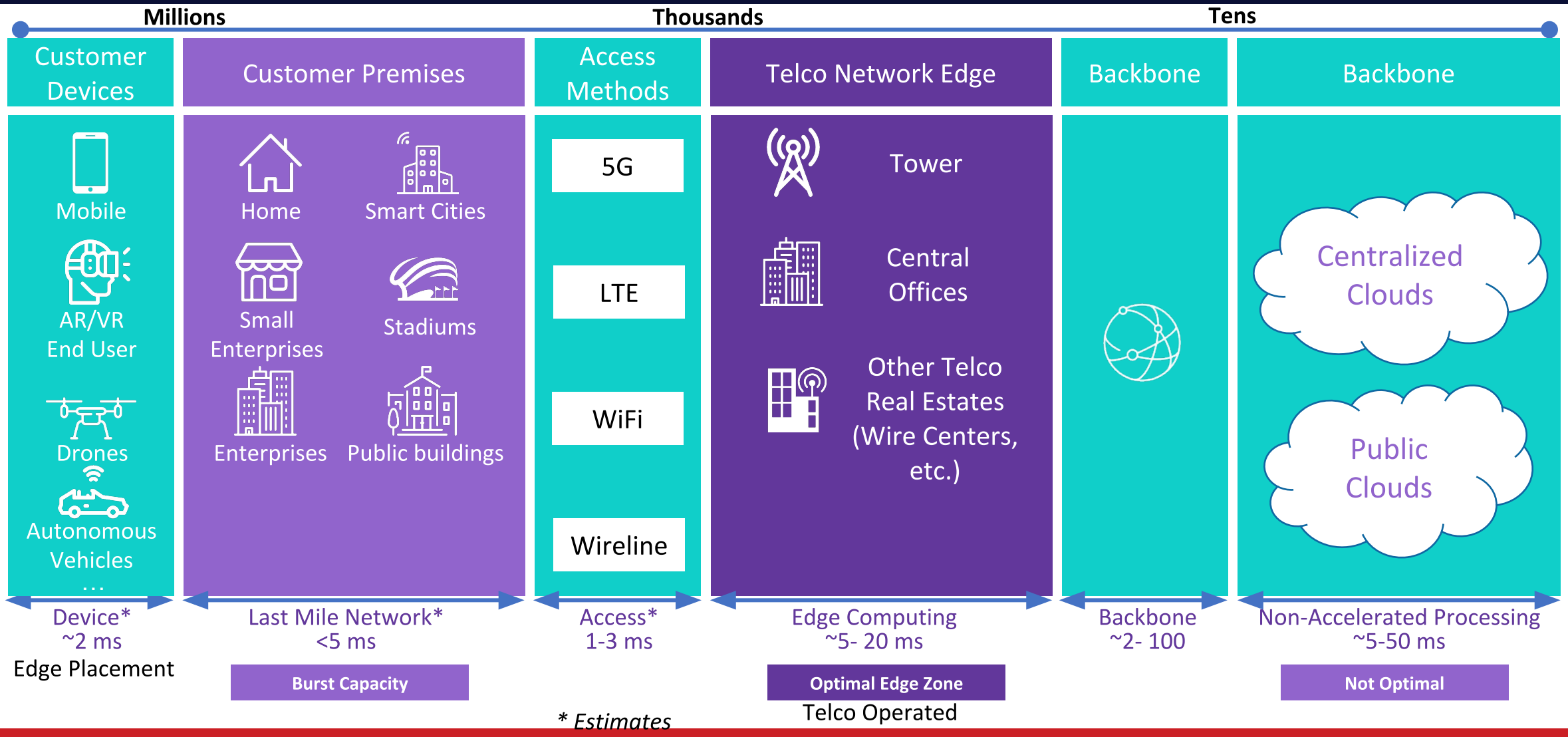
2. Develop projects to support such end to end configuration. Leverage upstream community work as much as possible to avoid duplication. {Feature Projects}

3. Work with broader edge communities to standardize edge APIs {Upstream Open Source Community Coordination - For example, Socialization, so community tools and Blueprints can interoperate. This work can be a combination of an upstream collaboration and development within the Akraino community [i.e. a feature project]}

4. Encourage Vendors and other communities to validate Edge applications and VNFs on top of Akraino blueprints {Validation Project - ensures the working of a Blueprint}

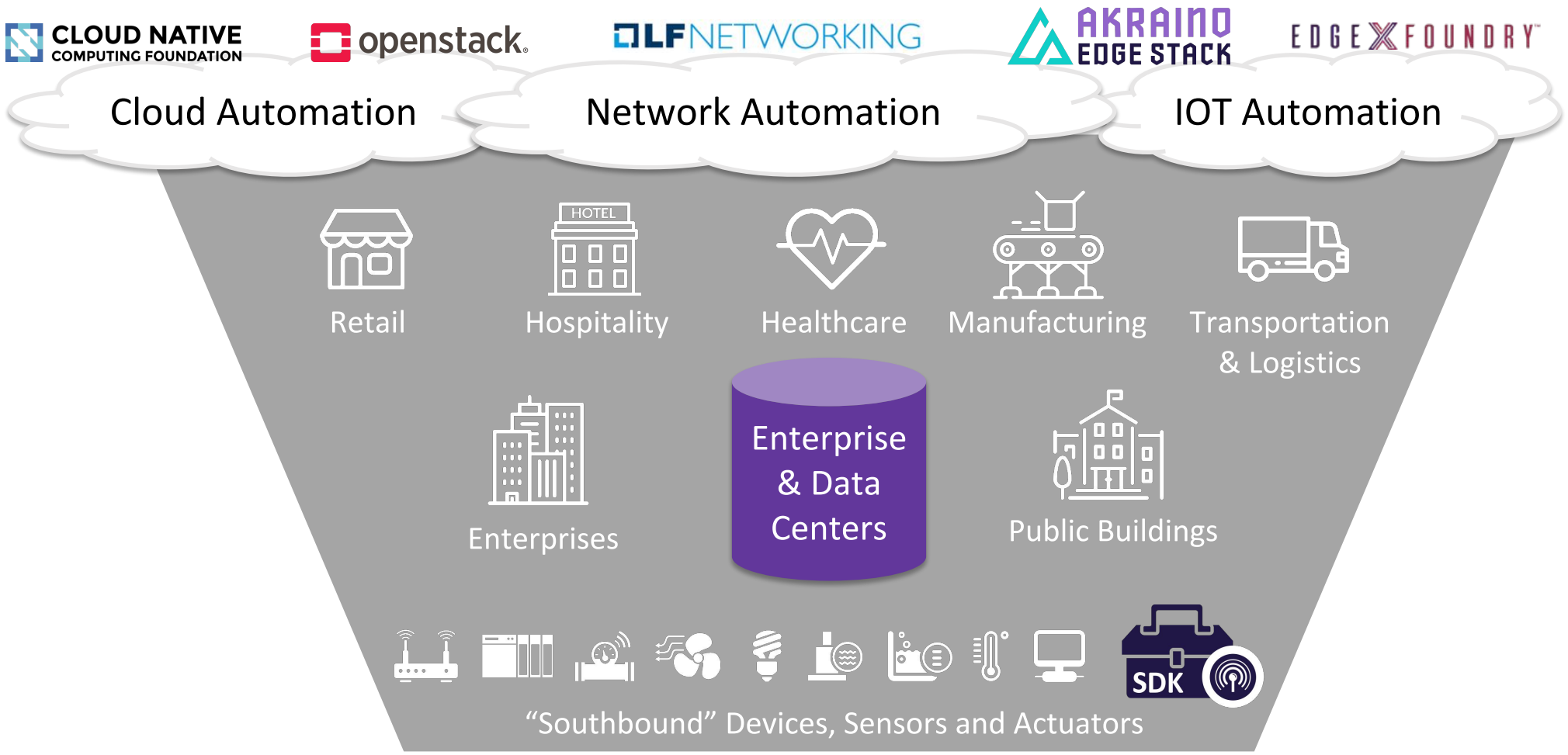
Use Case 1: Operator's Owned Network Edge

Optimal Zone For Edge Placement



Use Case 2: IOT Driving the New Edge for Enterprise

Retail, Transportation, Healthcare…

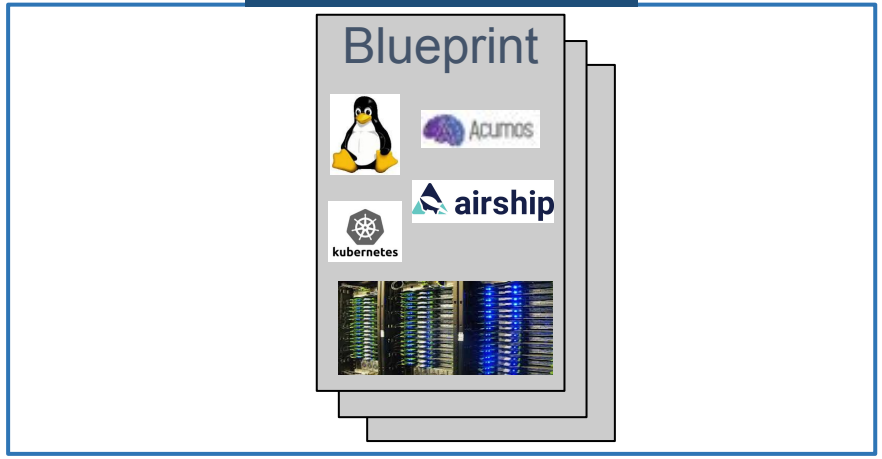


Akraino Edge Stack Blueprint

Before Akraino

AKRAINO EDGE STACK

Akraino Model

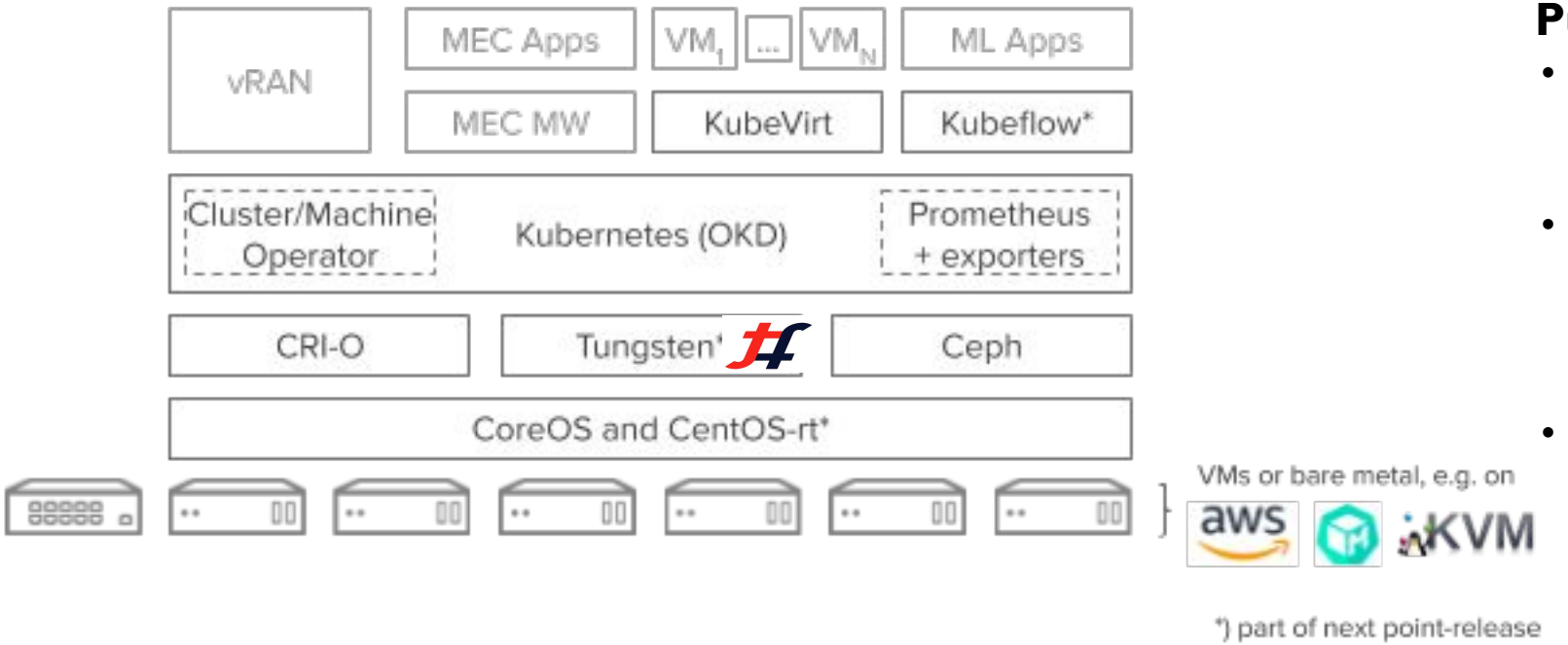


- User integrates multiple opensource
- Multiple gaps
- No integrated solution for Edge use cases
- Complex CI
- No guaranteed working solution

- Akraino Community Integrates multiple opensource for edge use cases.
- Bridge gaps (development of code in upstream and at Akraino)
- Fully integrated solution
- Simple CI
- Validated with multiple testing

Akraino: Provider Access Edge + TF

Kubernetes Native Infrastructure for Industrial Automation

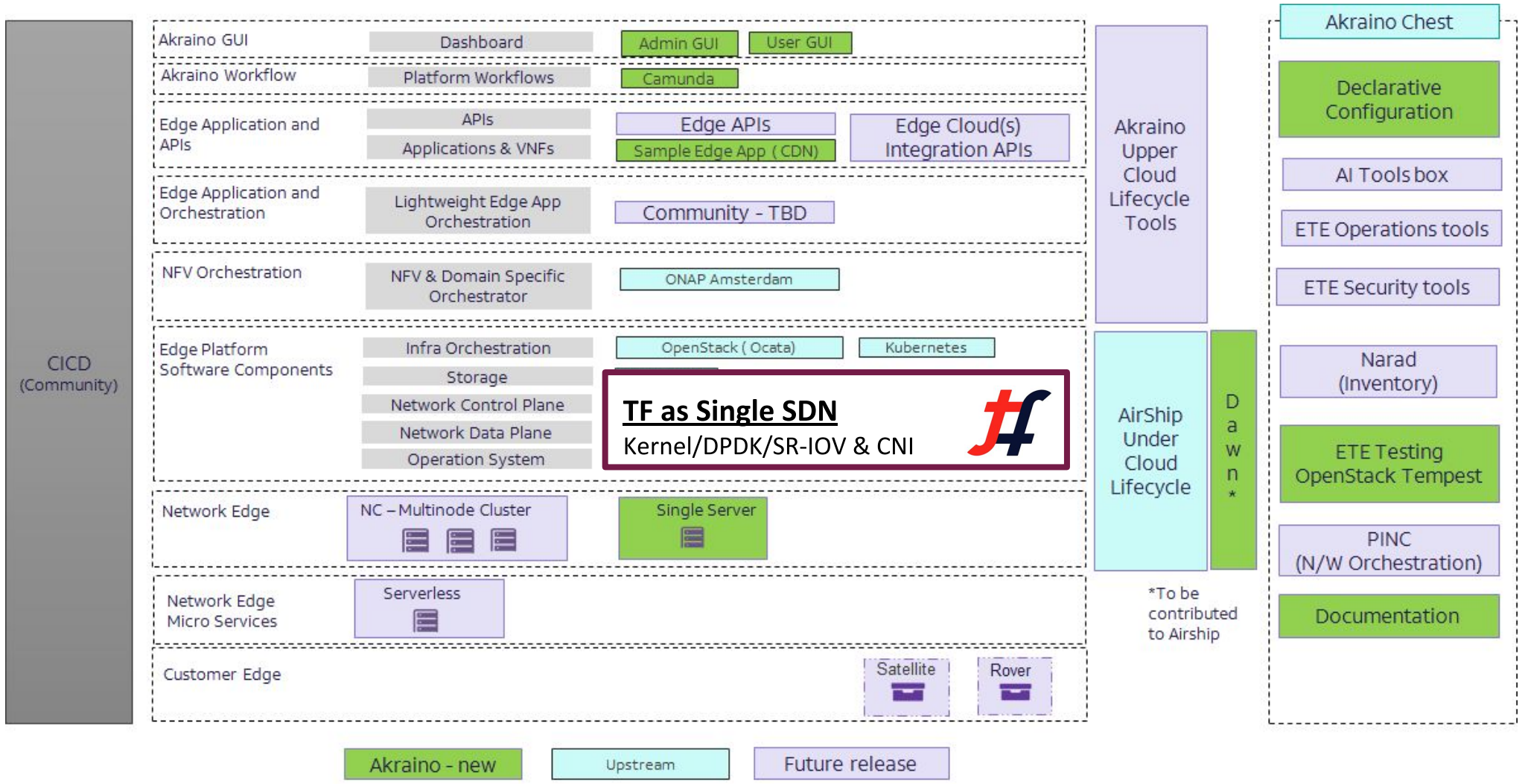


Purpose/Features

- Addresses generic Edge Use cases (small footprints deployments)
- Focused on Native Container workloads able to host NFV and MEC with no OpenStack
- Manage edge stacks at scale and with a consistent, uniform user experience from infrastructure up to workloads, on bare metal or public cloud

Target Industry: Telco, Enterprise

Akraino: Network Cloud & TF Integration



https://wiki.akraino.org/display/AK/Akraino+Network+Cloud+Blueprint+-+Reference+Architecture

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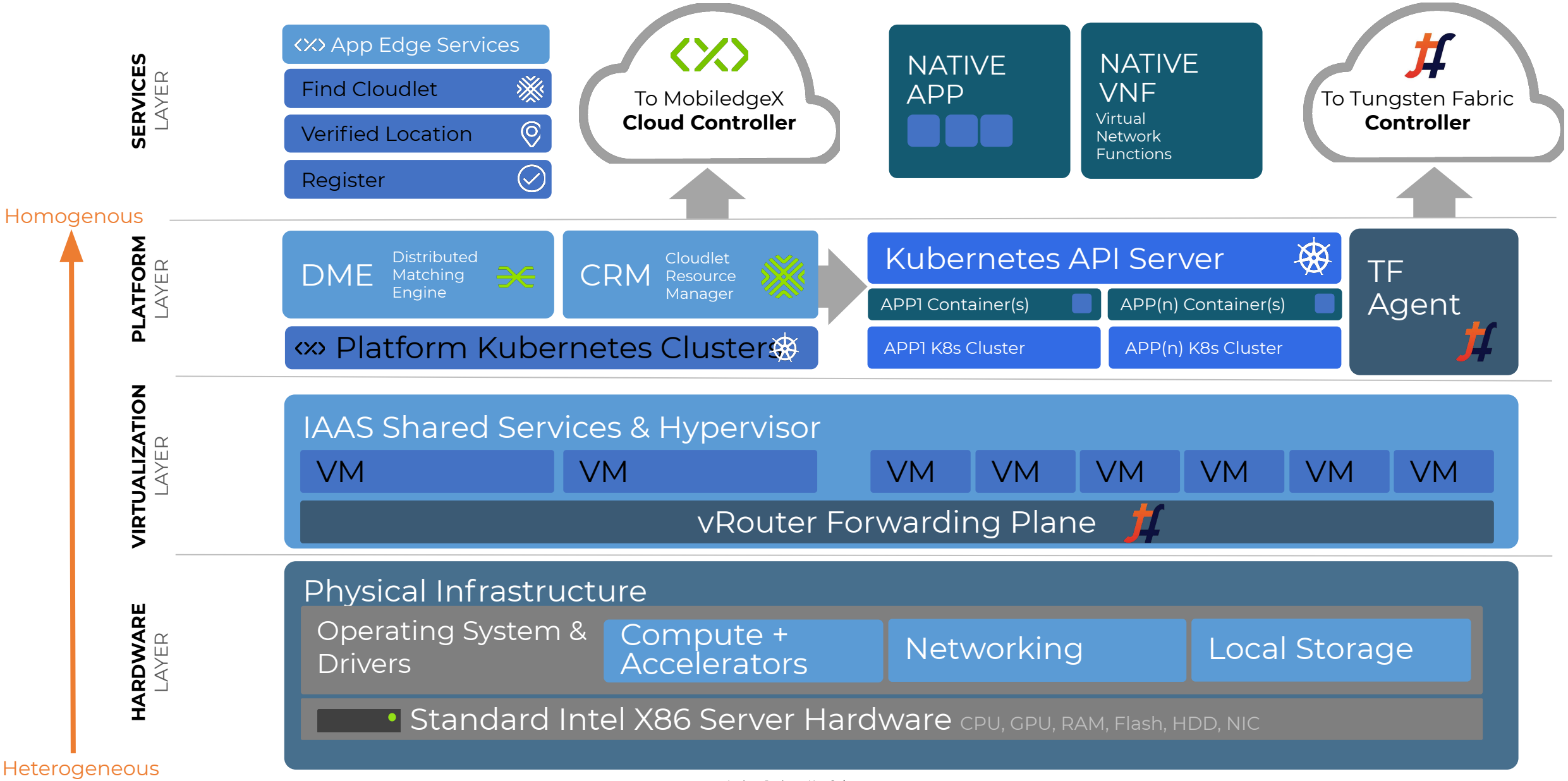
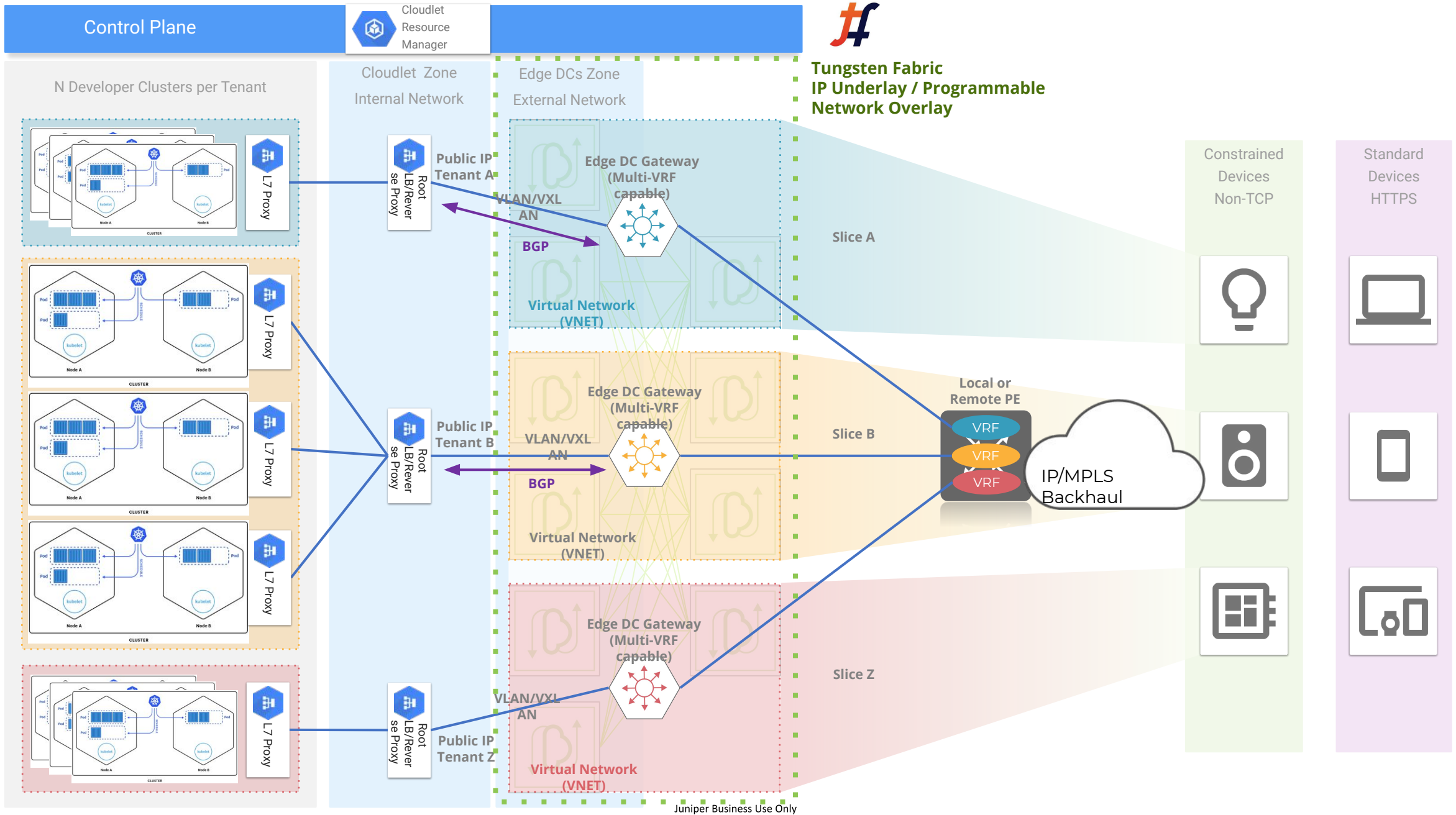
Cloudlet Software Stack

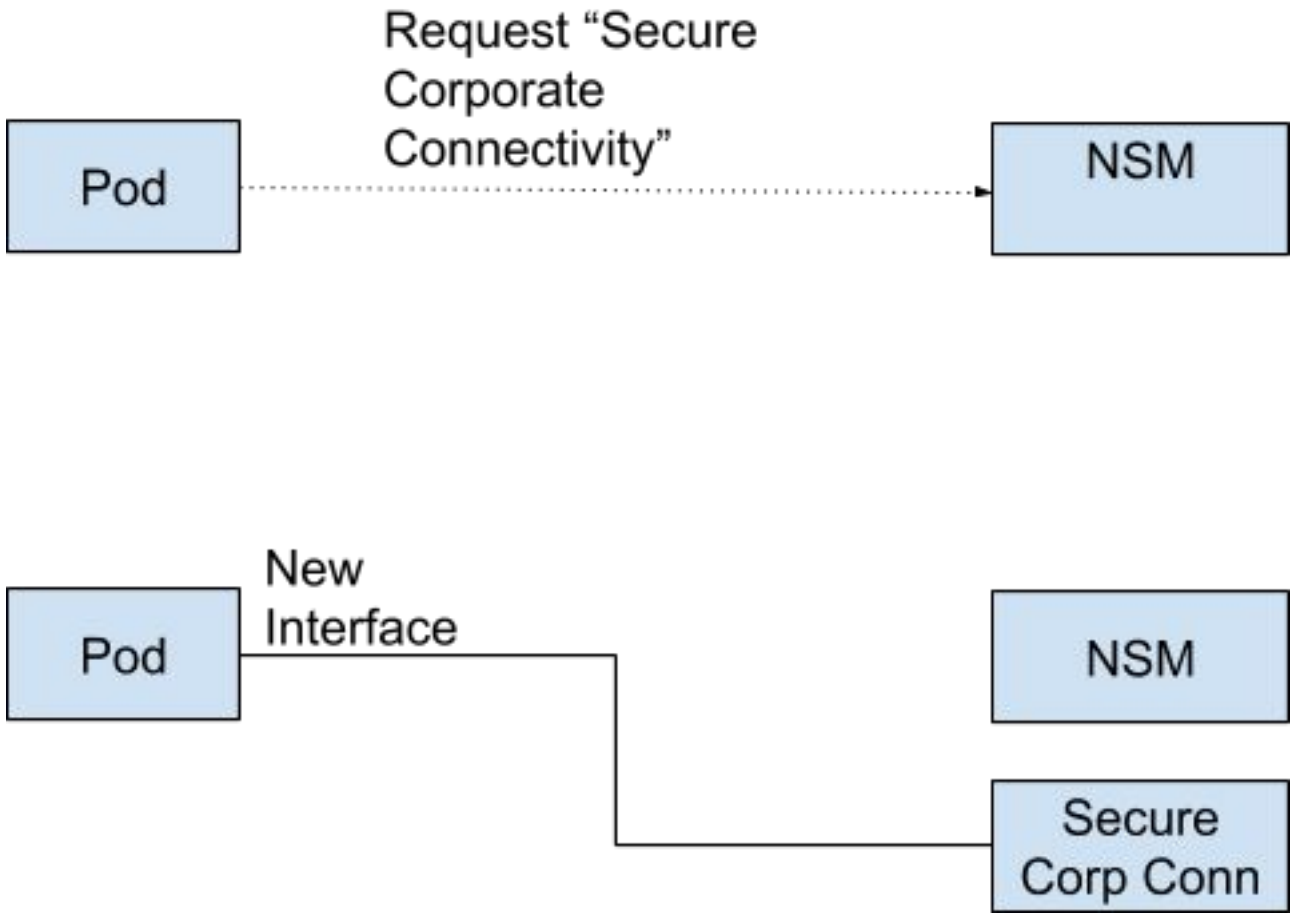


End-to-End Network Slicing

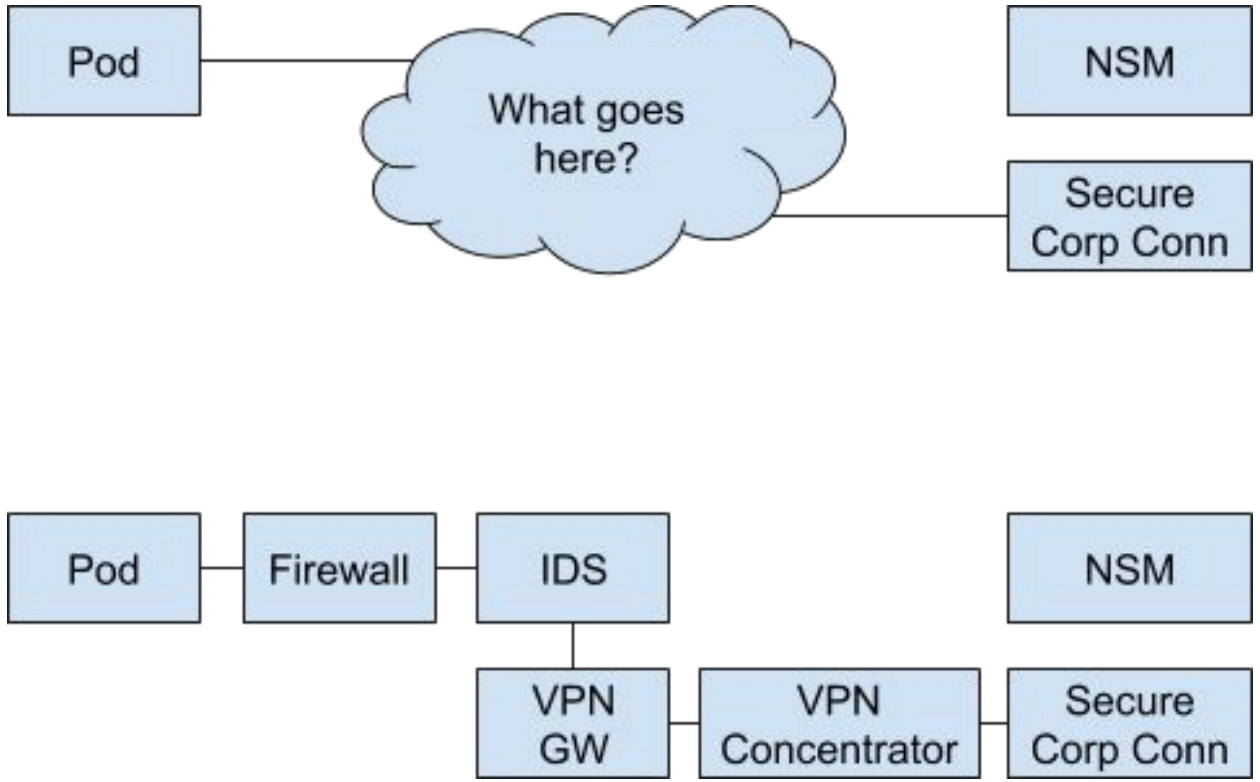


Tungsten Fabric And Network Service Mesh (NSM)

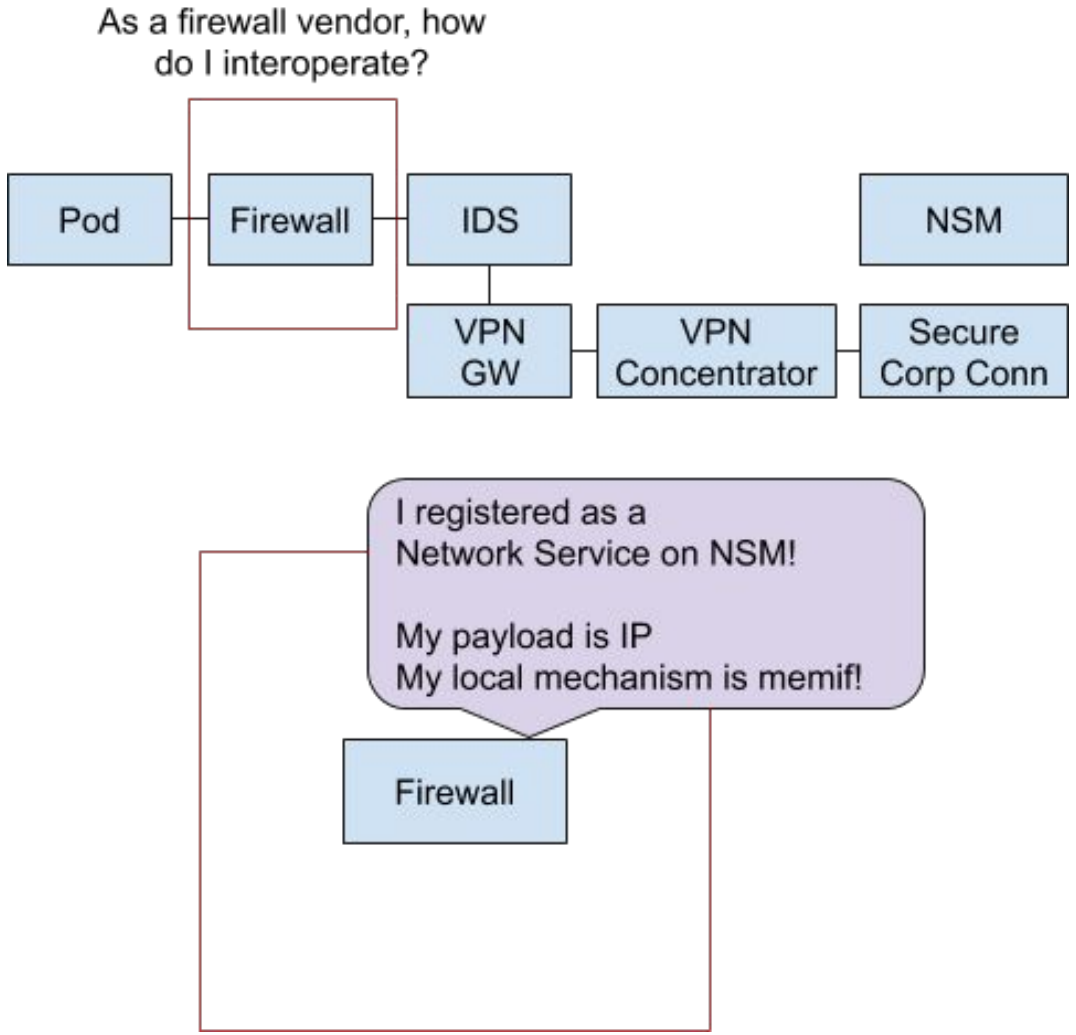
NSM - Developer's Point of View



NSM - Operator's Point of View



NSM - CNF Vendor's Point of View

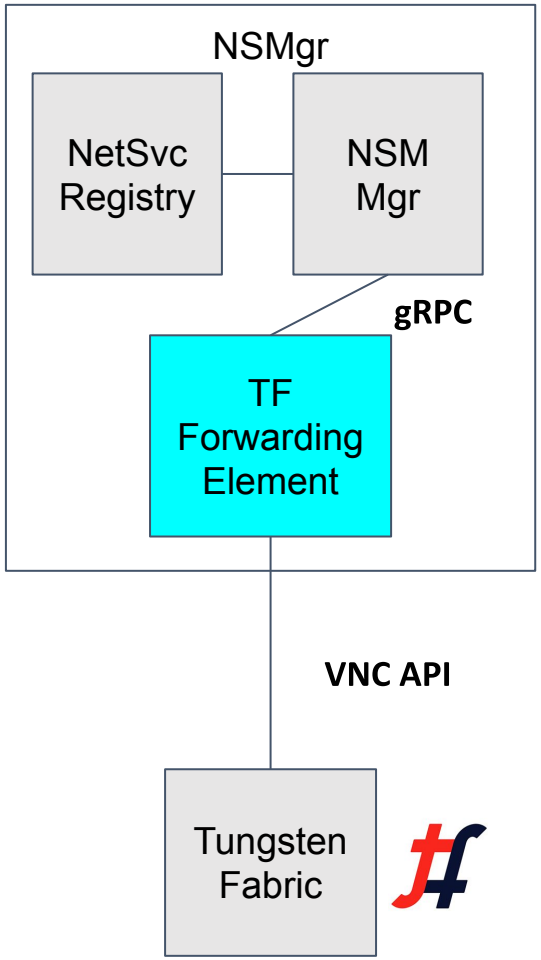


NSM + TF Integration

TF Forwarding Element is new component which implements -

gRPC Contract

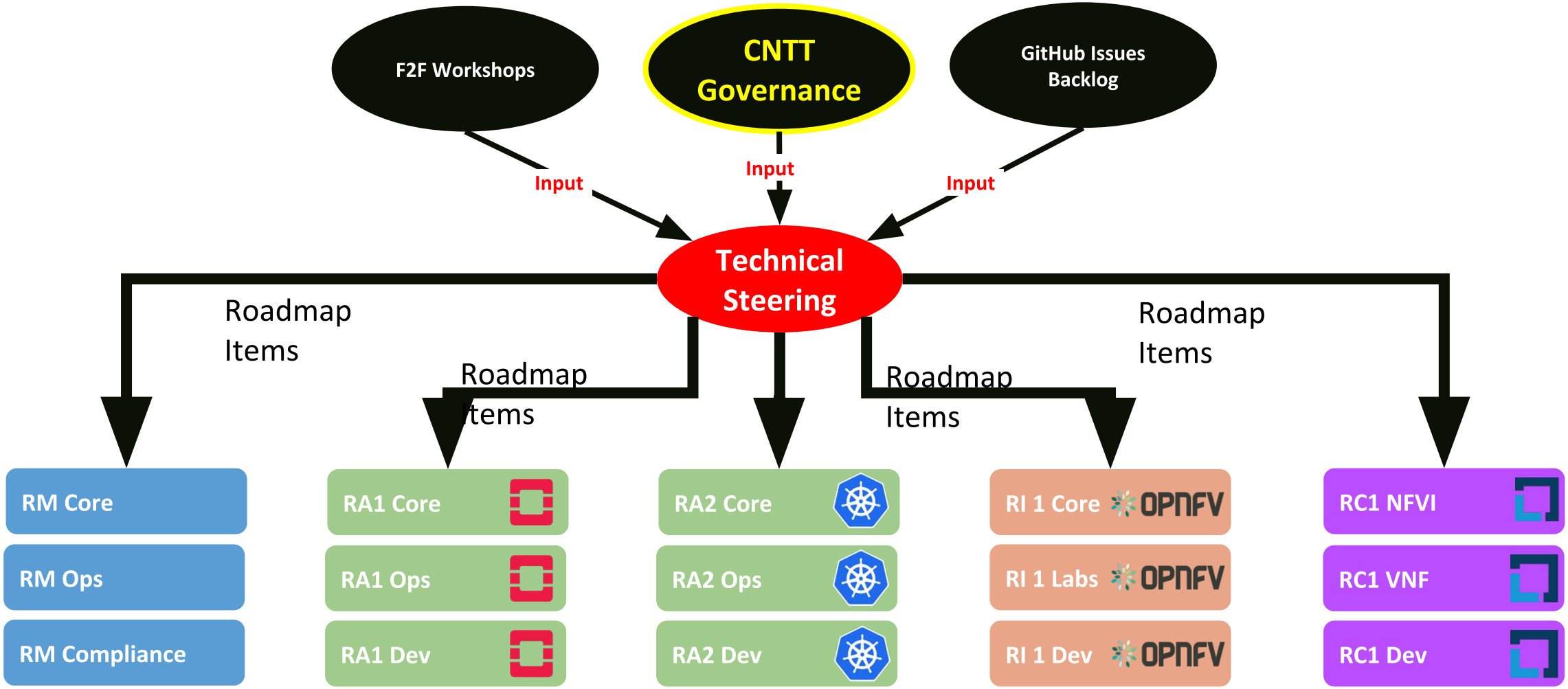
```
service Forwarder {
  rpc Request(crossconnect.CrossConnect) returns (crossconnect.CrossConnect);
  rpc Close(crossconnect.CrossConnect) returns (google.protobuf.Empty);

}

service MechanismsMonitor {
    rpc MonitorMechanisms (google.protobuf.Empty) returns (stream MechanismUpdate);
}
```



Common NFVI Telco Taskforce

SDN in CNTT

CNTT | Deciding on Technical Roadmap



CNTT | Technical Workstreams Leads/Co-Leads

WSL

Responsibilities:

- Drive content creation for their corresponding chapters.
- Deliver on the Roadmap.
- Assign PRs and issues to Committers.
- Track status and issues.
- Seek community consensus.
- Administer approval process and merge approved PRs.
- Drive technical meetings and agenda.
- Discuss PRs that has not got to a conclusion online.
- Raise any concern to Technical Steering meetings.

Note: If you would like to participate in any of these WS or show interest to lead, please add your details into https://wiki.lfnetworking.org/display/LN/CNTT+Workstreams

RM Core	Mark S, Kelvin E, Ulrich K
RM Ops	Ahmed S, Beth C,
RM Compliance	TBA, Victor Gao, Yan Yang
RA1 Core	Pankaj, Ian G
RA1 Ops	Karine S, Ian G
RA1 Dev	Sukhdev K, TBA
RA2 Core	Tom K, Gerg0, Tamas, Xu Yang
RA2 Ops	Tom K, Mike B, Walter K
RA2 Dev	Rabi A, Pankaj, Sukhdev
RI 1 Core	Fu Qiao, TBA We need to recruit vendor
RI 1 Labs	Rajesh R, TBA We need to recruit operator
RI 1 Dev	Cedric, Rex Lee, Lei Huang
RC1 NFVI	Mike F, Rajesh,, Dan Xu
RC1 VNF	Mike F, Kanag, Yan Yang
RC1 Dev	Cedric, Mark S, Kanag, Yan Yang

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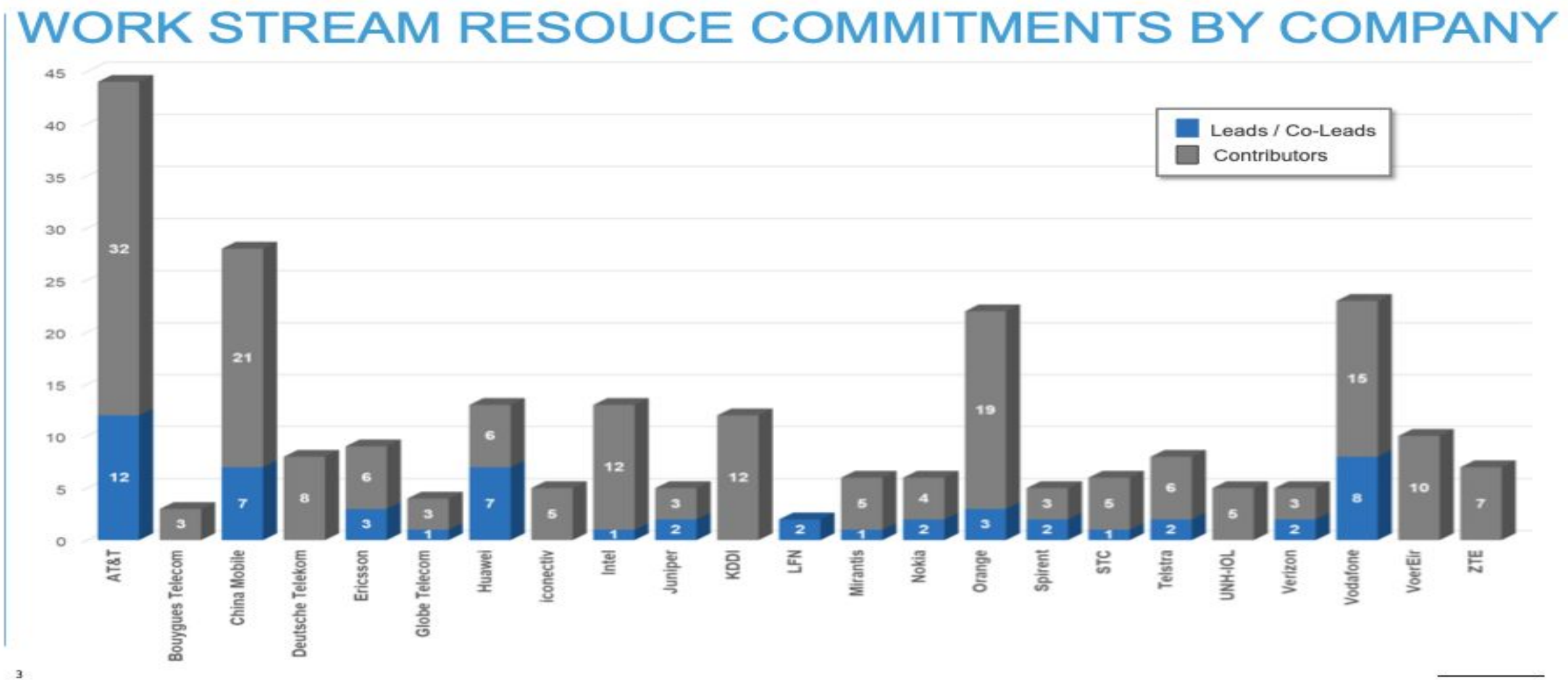
Lead, Co-Lead

Late Nomination

CNTT Participants



WORK STREAM ALLOCATIONS | LEAD COMPANIES

Area	Workstream	Leads | Co-Leads	Contributors	Leads | Co-Lead Companies
Steering	Governance	4	11	Ericsson, AT&T, Vodafone, China Mobile
Steering	Technical	3	20	Vodafone, Telstra, Globe Telecom
Governance	Community Strategy & Oversight	3	13	Ericsson, AT&T, LFN
Governance	Release & Lifecycle Management	2	2	China Mobile, AT&T
Governance	Recruiting, Engagement, & Adoption	3	5	Verizon, Vodafone, AT&T
Governance	Marketing & Communications	2	3	Mirantis, Intel
Governance	Business | Technical Metrics	1	5	AT&T
Governance	Technical F2F Work Shop	2	1	LFN, AT&T
Reference Model	Core	3	15	Nokia, AT&T, Huawei
Reference Model	Ops	2	12	Verizon, STC
Reference Model	Compliance	2	14	Huawei, China Mobile
Reference Architecture	RA 1 Core	2	13	Vodafone, AT&T
Reference Architecture	RA 1 Ops	2	11	Vodafone, Orange
Reference Architecture	RA 1 Dev	1	4	Juniper
Reference Architecture	RA 2 Core	4	14	Vodafone, Nokia, Ericsson, Huawei
Reference Architecture	RA 2 Ops	3	11	Vodafone, AT&T, Telstra
Reference Architecture	RA 2 Dev	3	2	Vodafone, AT&T, Juniper
Reference Implementation	Core	1	5	China Mobile
Reference Implementation	Labs	1	6	Spirent
Reference Implementation	Dev	3	2	Orange, Huawei, China Mobile
Reference Compliance	NFVI	3	13	AT&T, Spirent, Huawei
Reference Compliance	VNF	3	7	AT&T, Huawei, China Mobile
Reference Compliance	Dev	3	4	Orange, Huawei, China Mobile
TOTALS		**56**	**193**	

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Thank You