

# Launching the LF Edge End User Community

IoT + Telecom + Cloud + Enterprise

 **LF** EDGE

 **THE LINUX** FOUNDATION

# Welcome! Agenda for today...

1. Overview of LF Edge and Vertical Solution Focus Groups
  2. Use Case:Automotive
  3. Use Case: Manufacturing/Industrial
  4. Use Case:Telco
  5. Use Case:Transportation and Logistics
  6. Panel: Meeting at the Edge - Cross community collaboration to define Telecom Edge Reference Architectures
- › Session will be recorded and posted to LF Edge [YouTube](#) post-call and slides posted to the [Wiki](#)
  - › Please utilize the Zoom Q&A feature for questions

# Overview of LF Edge

**Arpit Joshipura**

GM, Edge, IOT & Networking - Linux Foundation

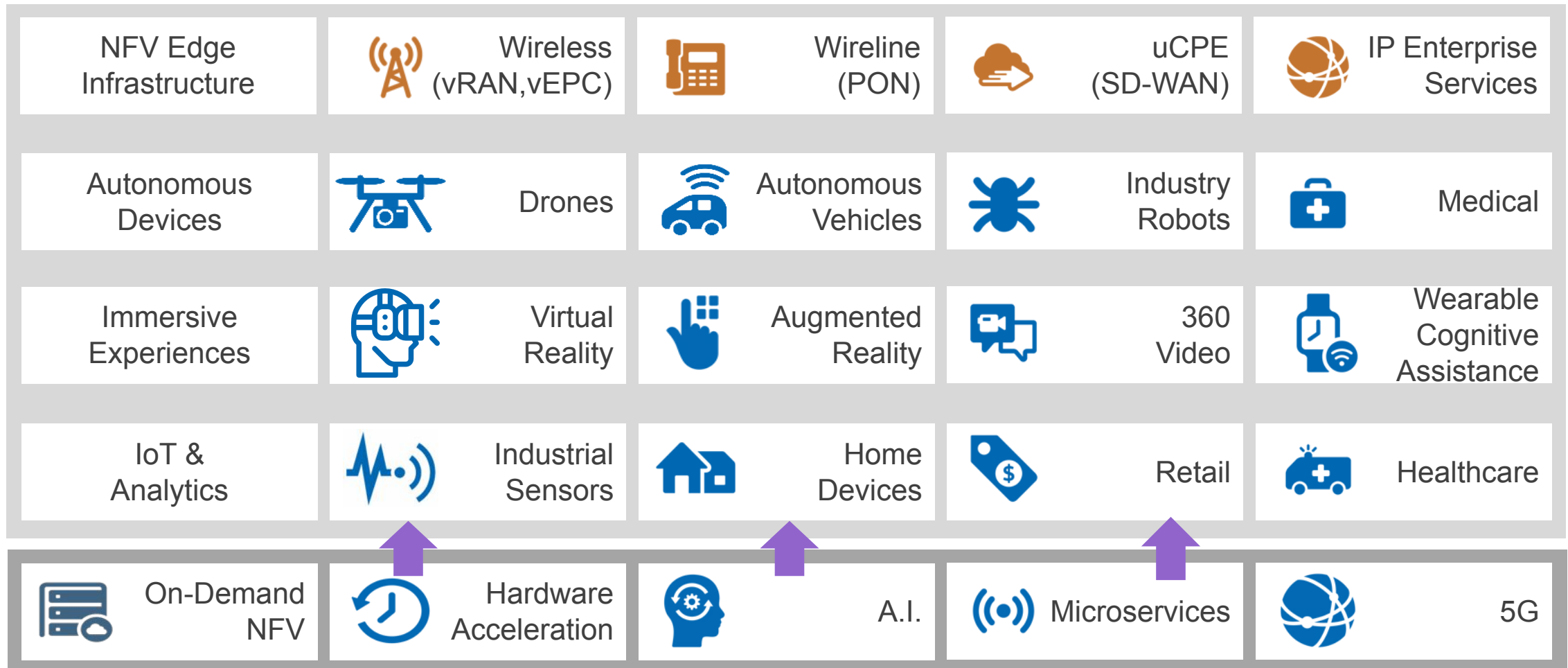
**Jason Shepherd**

LF Edge Board Member and VP of Ecosystem @ ZEDEDA

# Edge Market - Narrowing Down on Top Applications, Use Cases and Deployments

# Emerging Edge Applications & Convergence of Technologies

are demanding & fueling lower latency + accelerated processing



2018

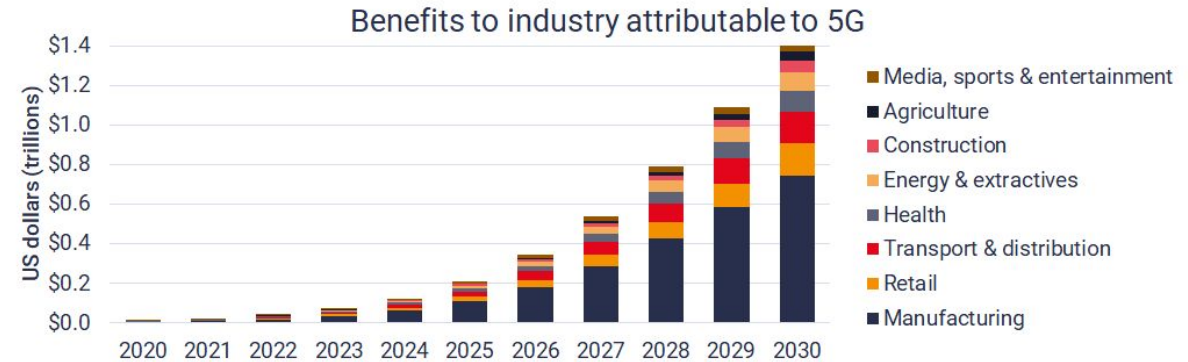
# 5G and Edge Critical in the Next Battle, a new normal!

## Edge is 4X the Size\* of Cloud Market !

“As businesses and governments establish their own new normal, **5G and Edge computing** will be necessary to deliver the automation, performance and cognitive insight required by many industries—including manufacturing, healthcare, energy and utilities, among others. Telecom operators will need to embrace open ecosystems to externalize innovation and accelerate new services.”

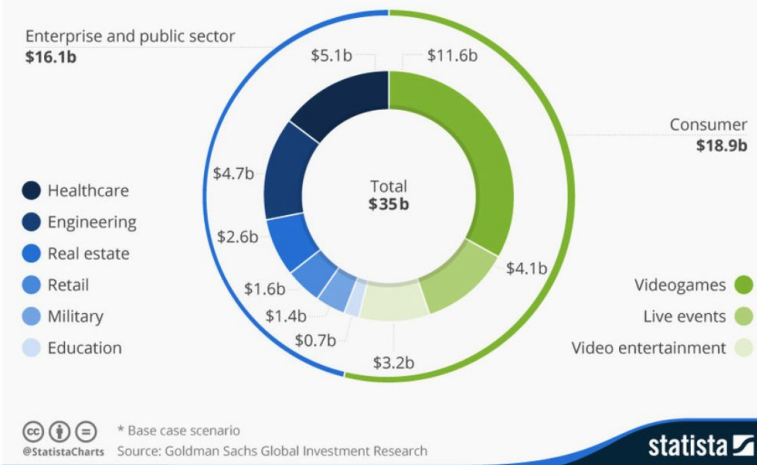


<http://www.chetansharma.com/publications/edge-internet-economy/>



### The Diverse Potential of VR & AR Applications

Predicted market size of VR/AR software for different use cases in 2025\*

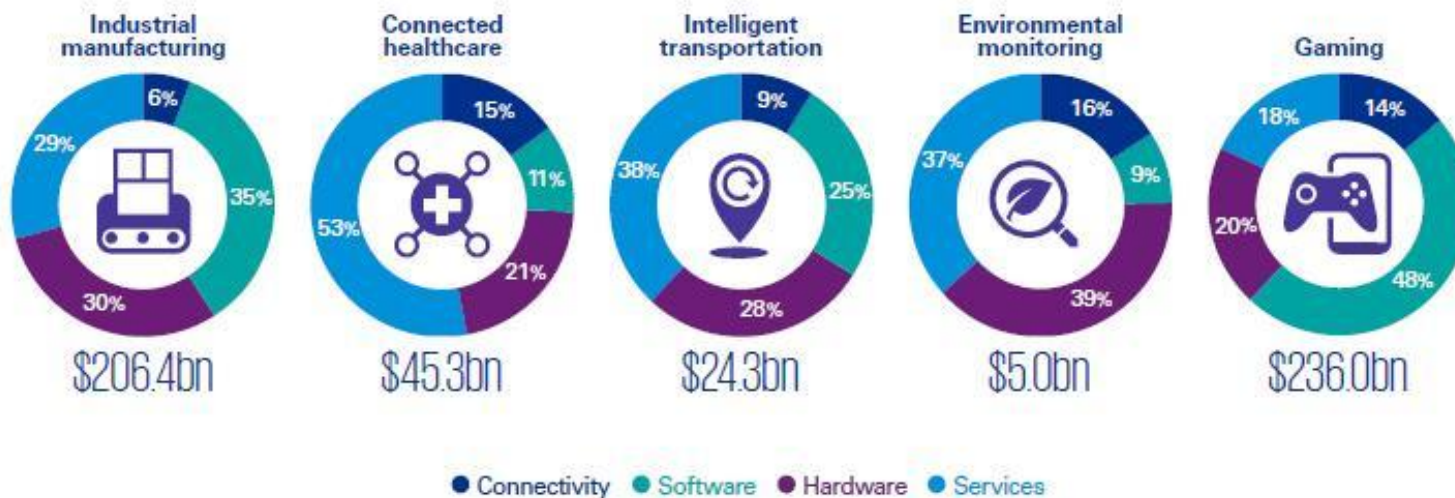


How VR and AR will be used in 2025

Image: Statista

# Top 5 Edge Markets

The US\$517bn 5G+Edge ecosystem across just five industries



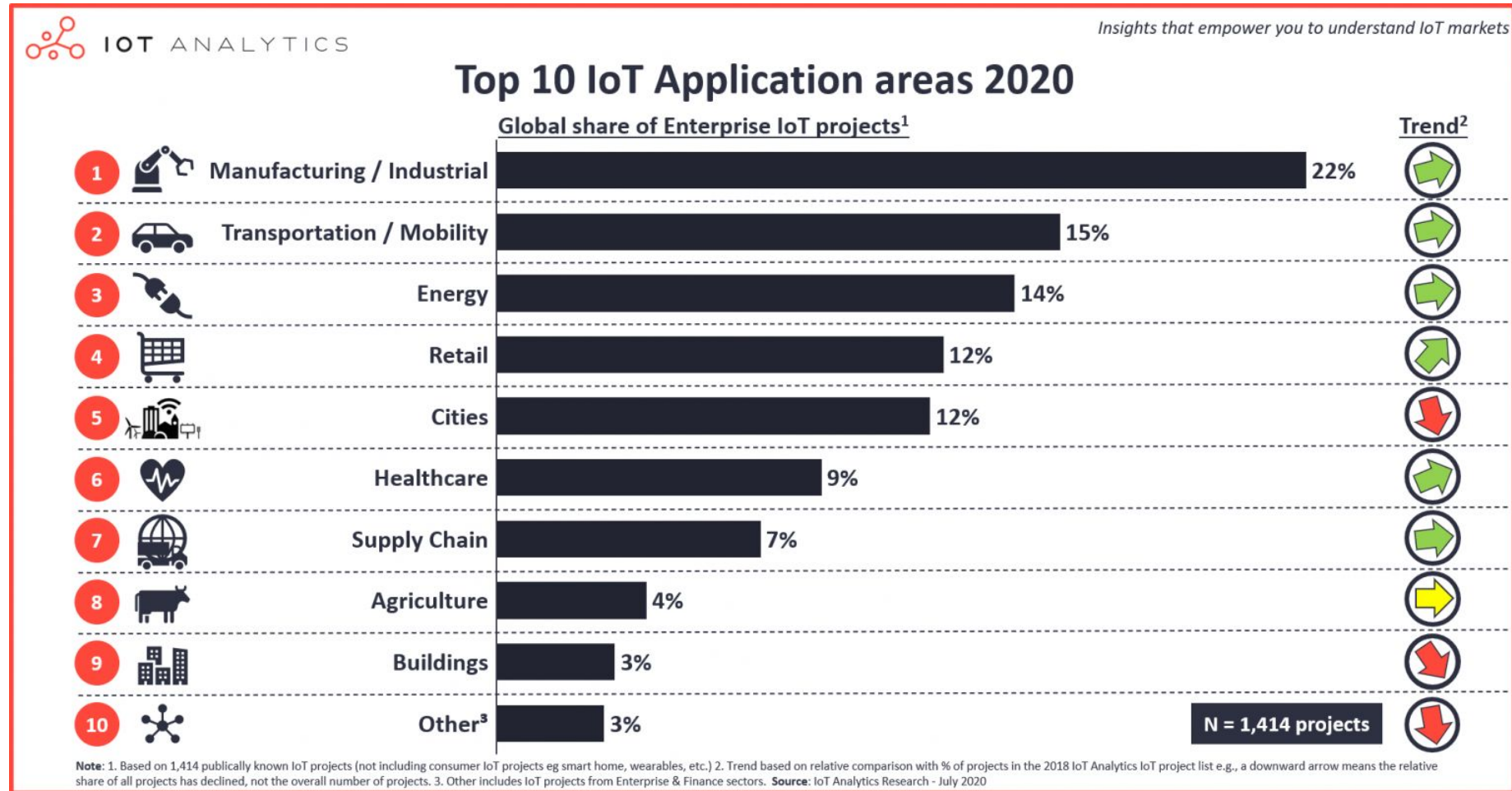
Source KPMG

1. Industrial Manufacturing
2. Energy (Oil & Gas, Utilities)
3. Commerce/Retail
4. Homes (including B2B2C use cases)
5. Automotive
6. Fleet/Transportation
7. Logistics
8. Building Automation
9. Cities and Government
10. Healthcare

Source LF Edge Community focus



# IoT Killer apps 2020



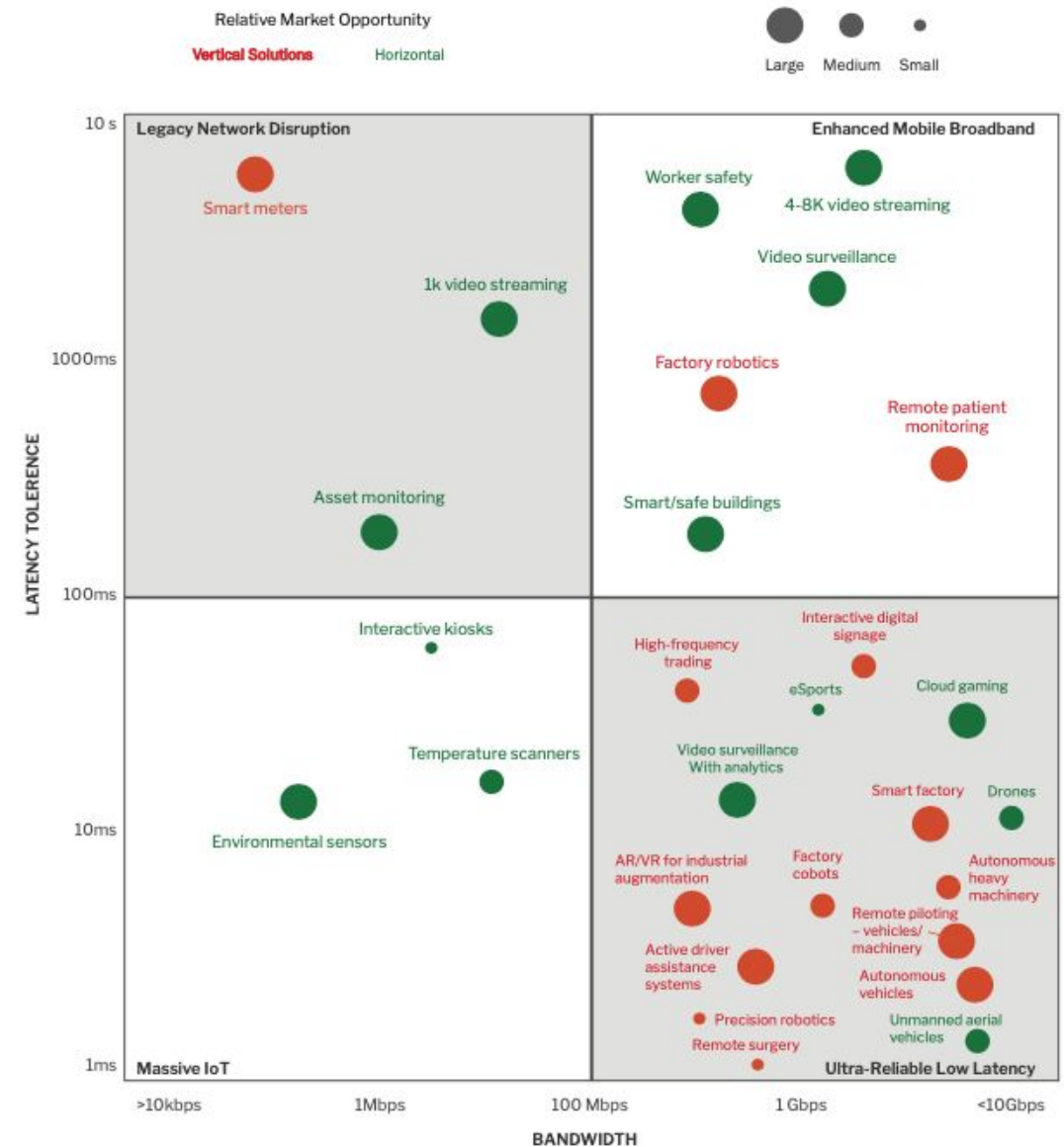
Note: Not all IoT requires an Edge



# Edge Use Cases

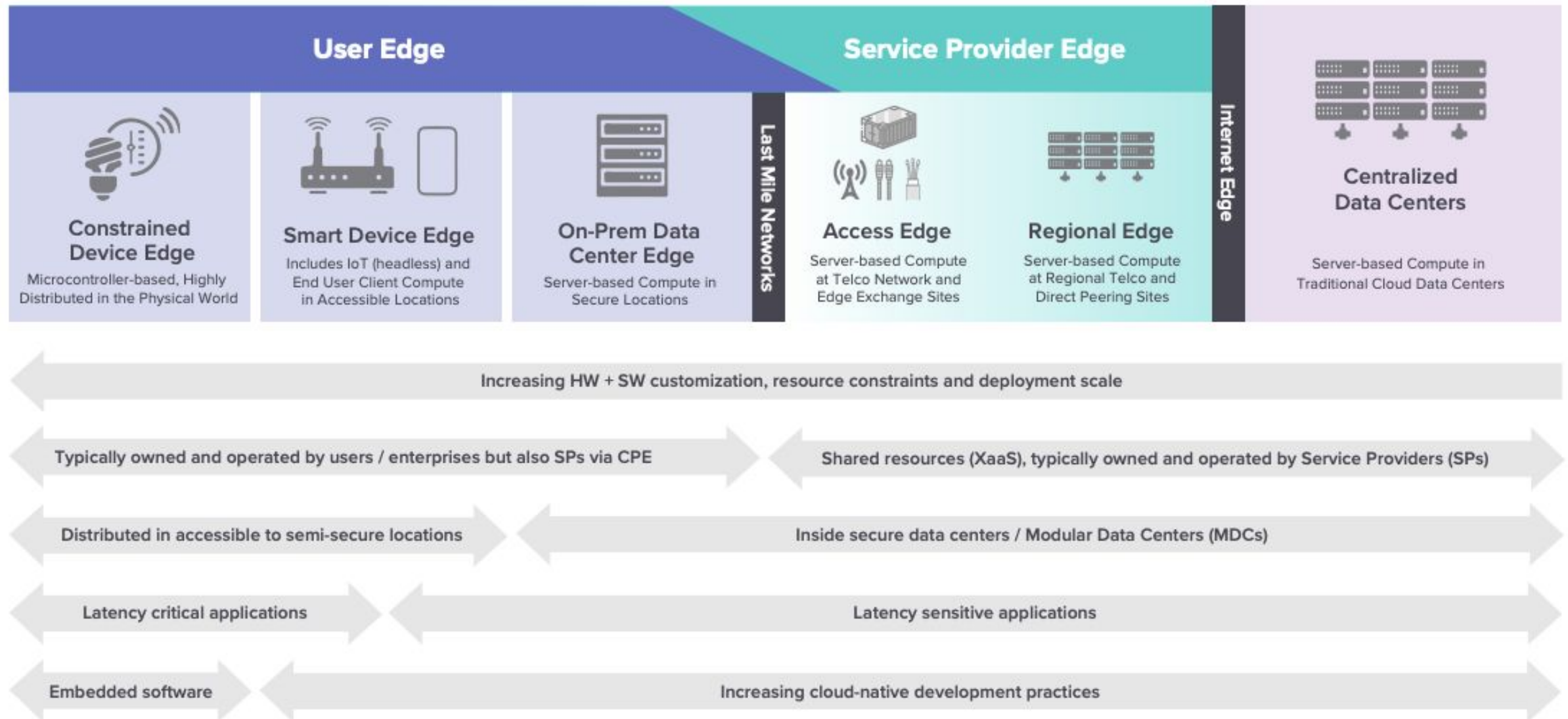
- › Market Accepting Latency & Bandwidth factors
- › Establishing Vertical and Horizontal Solutions
- › Akraino – Key pillar for horizontal solutions with focus on Vertical Blueprints

Source: 451 Research

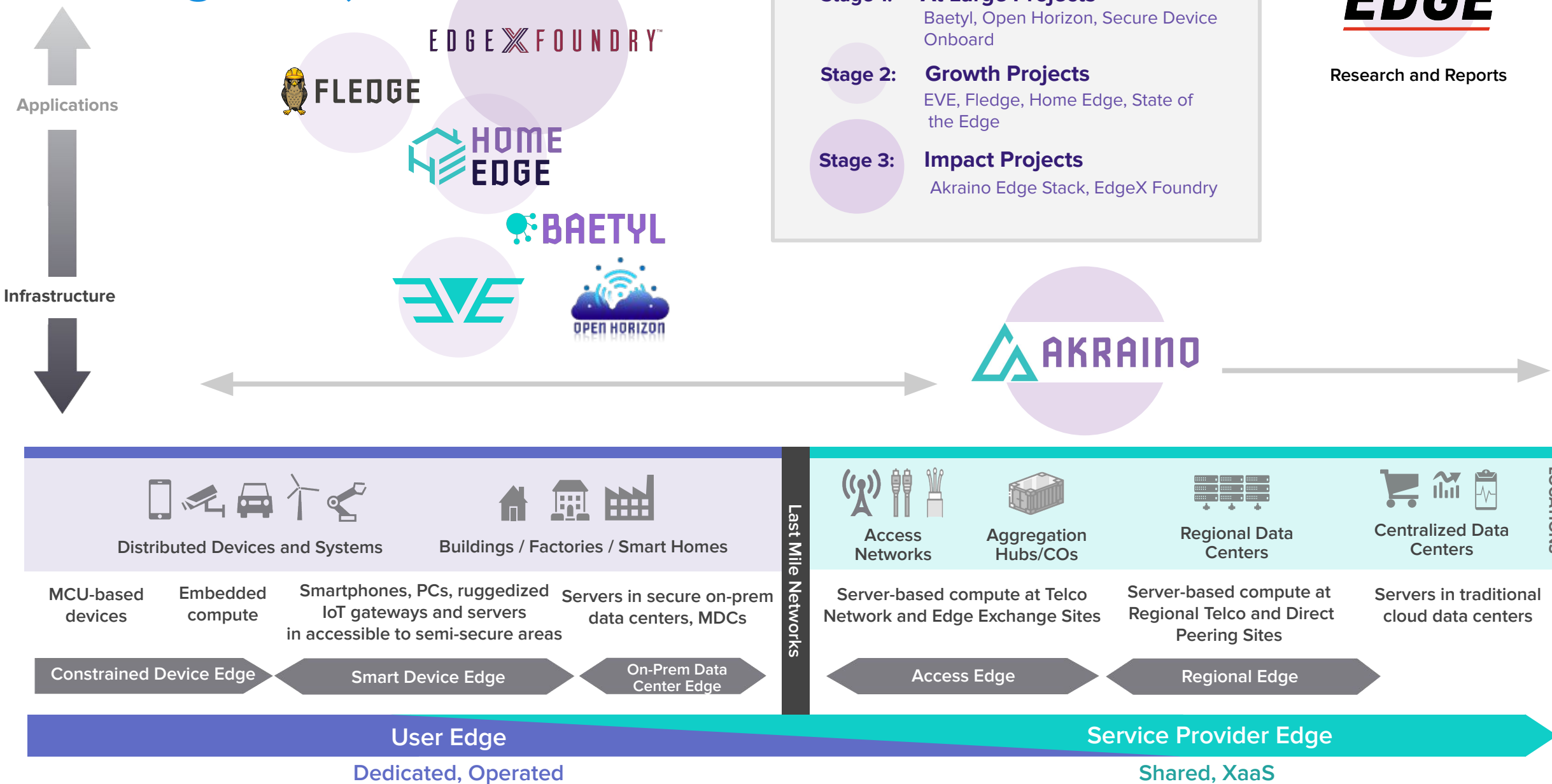


# Defining the Edge

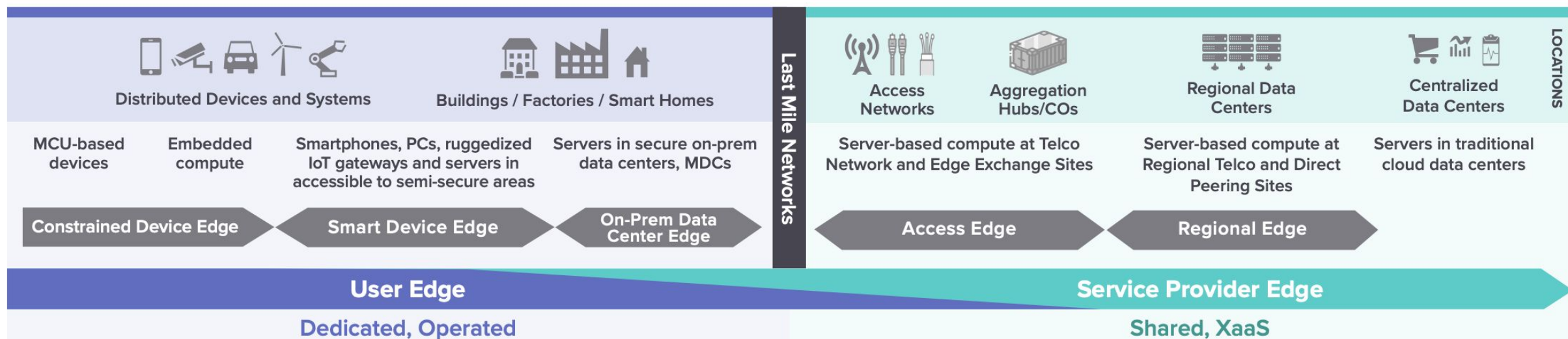
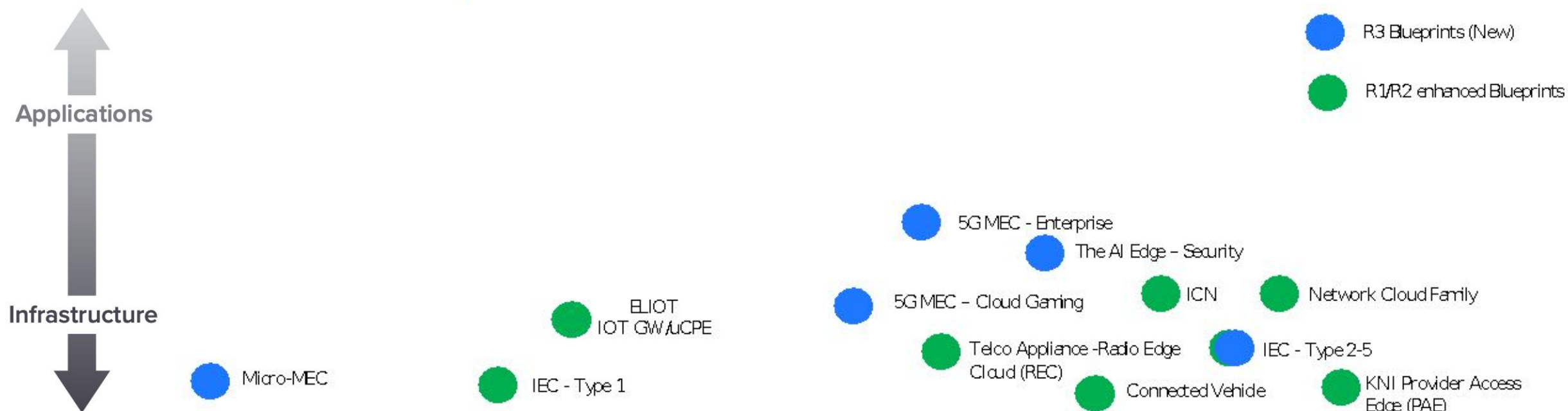
# LF Edge Taxonomy



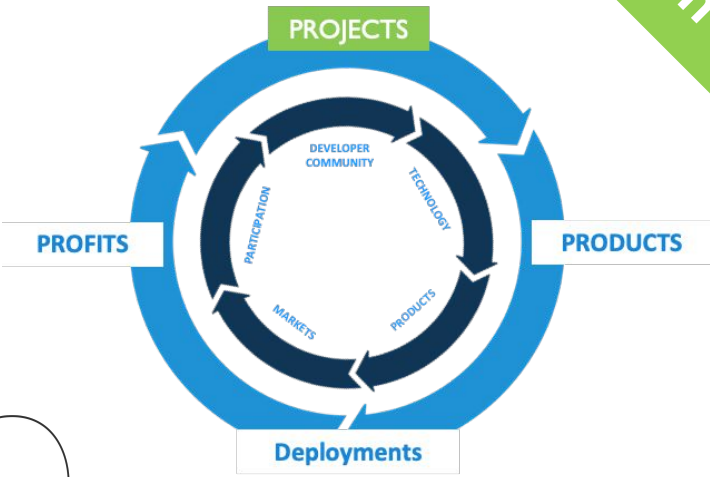
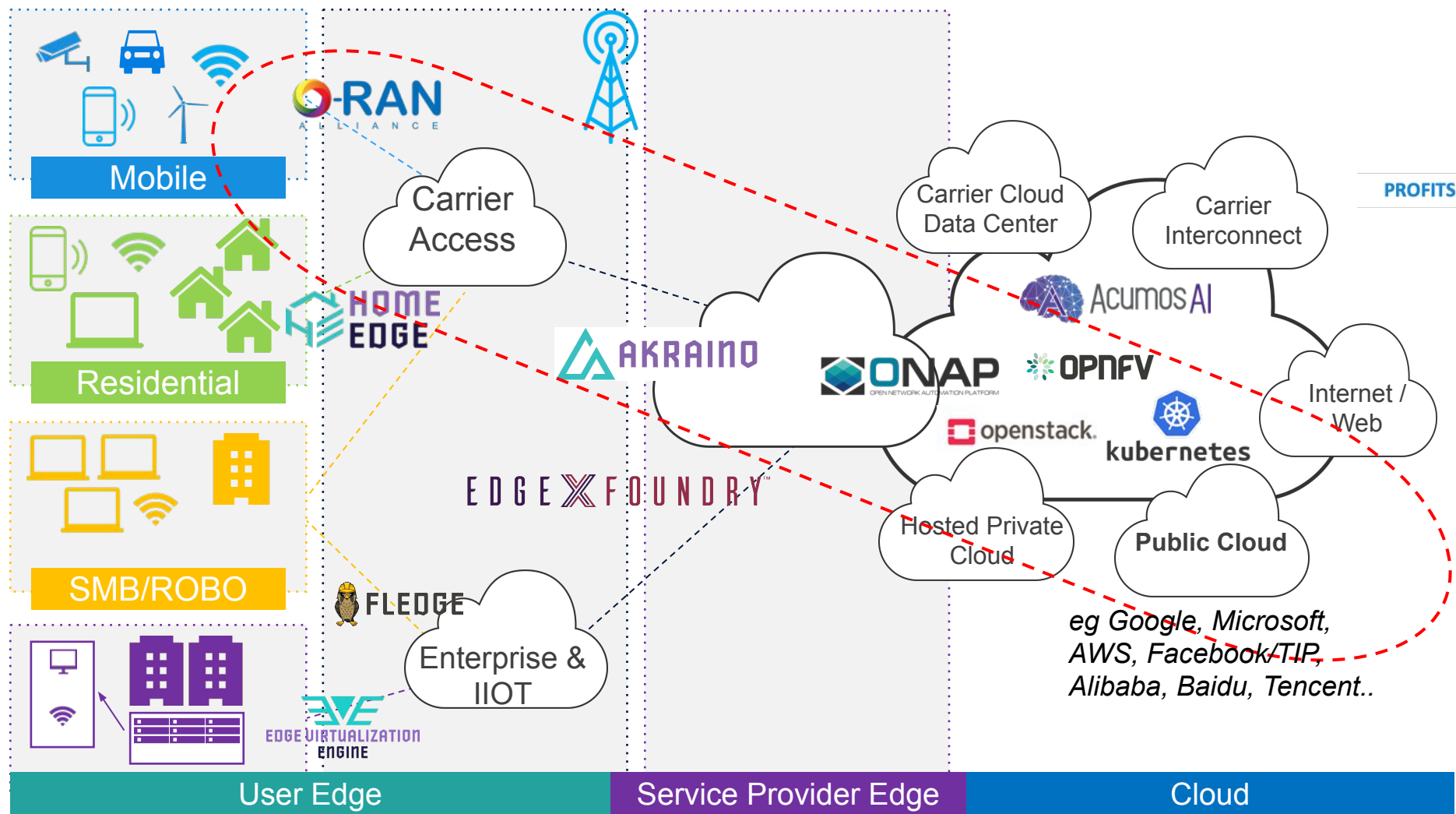
# LF Edge Projects



# Akraino R3 Blueprints



# Deployment Ready Open Source



ETSI ISG MEC  
World Class Standards

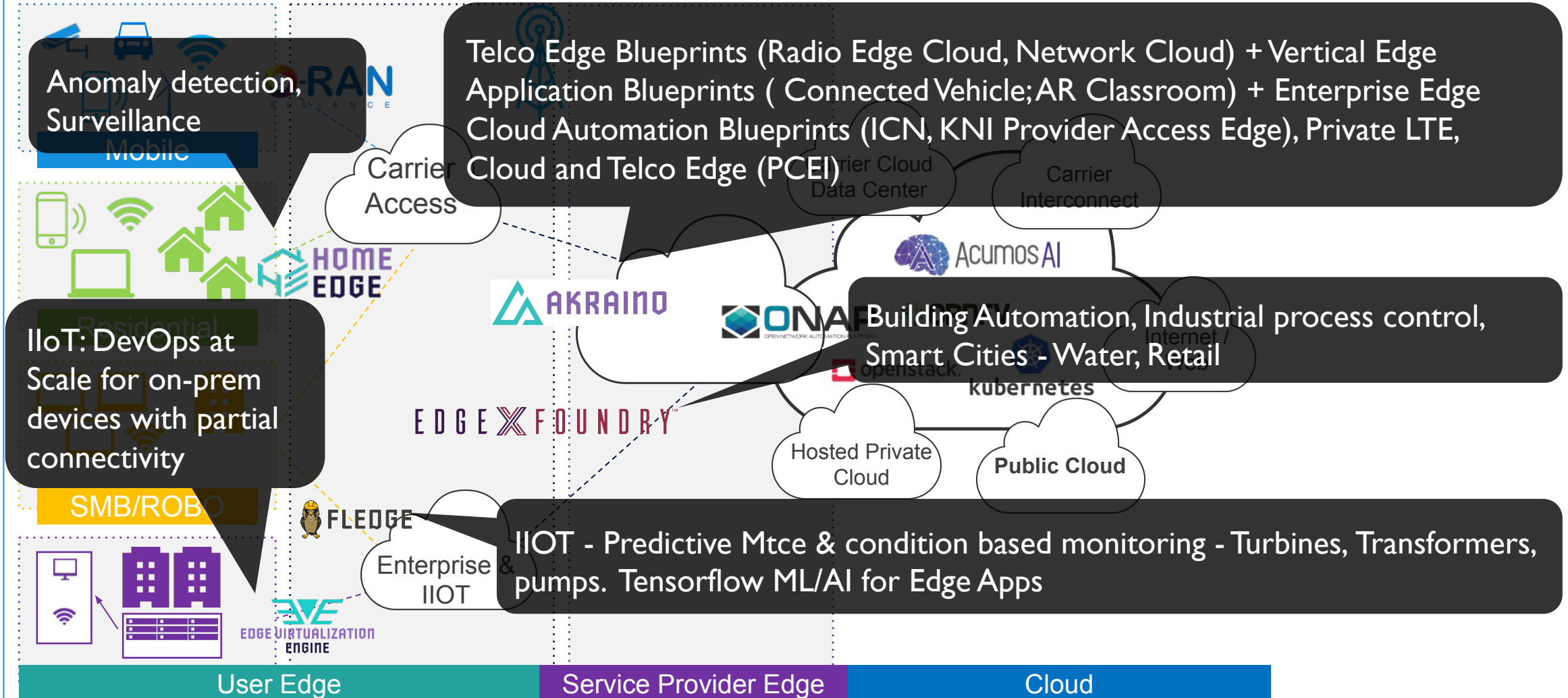
AEC  
AUTOMOTIVE EDGE  
COMPUTING CONSORTIUM

Industrial Internet  
CONSORTIUM

X-Project Collaboration



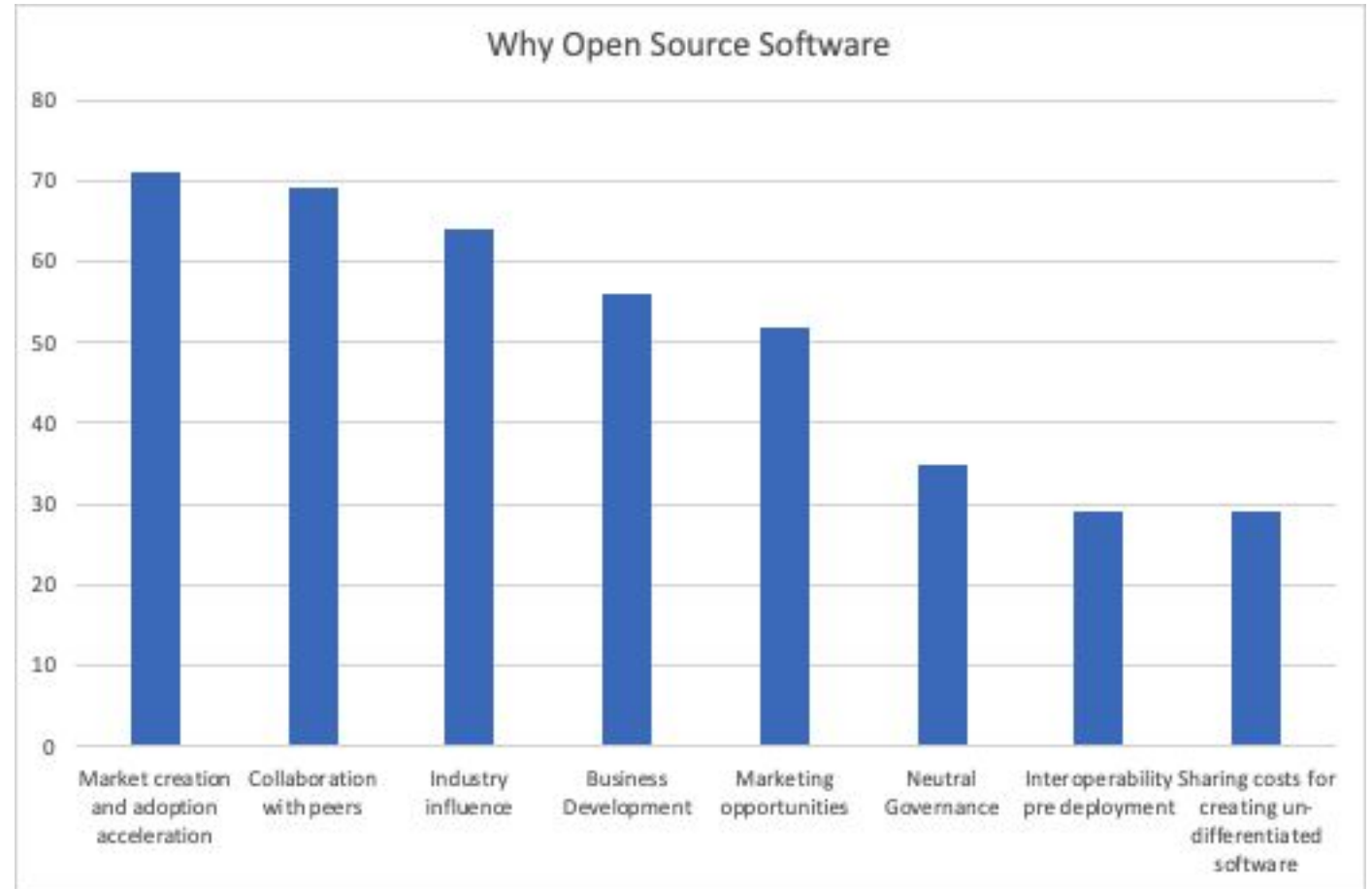
# LF Edge - Deployment-ready Open Source Edge Foundation



# LF Edge Community is Growing Stronger by the Day

# LF Edge Member Survey – Why Participate?

- › Announced at ONES this week
- › True Recognition of the value of Open Source Software



Source: LF Edge Community Survey, Sept 2020

**Top Reasons**  
**Market Creation, Adoption Acceleration & Collaboration**

# LF Edge Accelerating Community Collaboration



**25+%**

**New Member**  
Y/Y increase



**80%**

**New Projects increase**  
SOTE, OpenHorizon, SDO...



**25+**

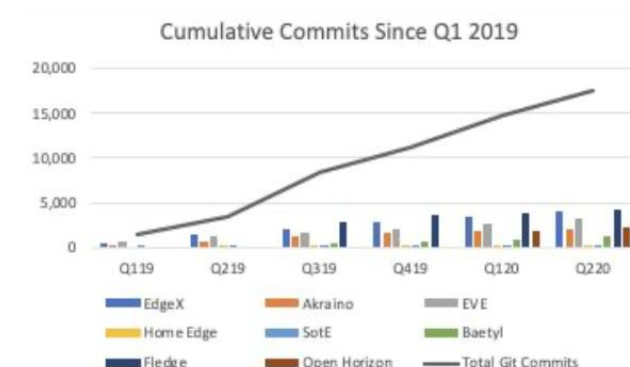
**Global Deployments &**  
Commercial Products



**6M+ / 18+**

**EdgeX Downloads and**  
**Akraino Blueprints**

**160% Growth in Developers Y/Y, 4X Commits Y/Y**



**15,800 global mentions since Launch**

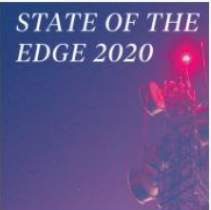
Reset Filters

- Grouping  
N/A
- Sort By  
N/A
- Category  
N/A
- LF Edge Relation  
Any
- License  
Any
- Organization  
Any
- Headquarters Location  
Any

## Example filters:

- Open source cards by age
- Apache-2.0 landscape
- Cards in categories
- Cards by stars
- Group by location
- Cards by MCap/Funding

Download as CSV



The LF Edge landscape (png, pdf) is dynamically generated from a community-supported Github account. It is modeled after the CNCF landscape and based on the same open source code.

If you would like to contribute, please open a pull request with projects in the edge ecosystem. Please note all images submitted must be true SVG files, include a URL to the company's site, and a Crunchbase link. Please open a pull request to correct any issues. Greyed logos are not open source. Last Updated: 2020-09-30 19:19:45Z

You are viewing 185 cards with a total of 100,149 stars, market cap of \$9.01T and funding of \$5.57B.

landscape.lfedge.org



# LF Edge Summary

*Vision: Our software & projects enable rapid productization of Edge platforms by leveraging end user input to drive and supply the necessary building blocks (and/or frameworks, reference solutions) to facilitate integration and interoperability for Edge Computing across Telecom Service Providers, Cloud Providers, IOT & Enterprises*

## Projects

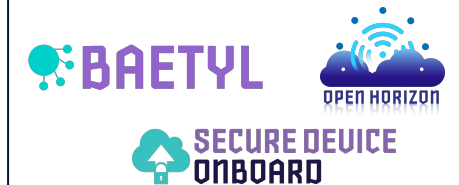
### IMPACT - STAGE 3



### GROWTH - STAGE 2



### AT LARGE - STAGE 1



## Premier Members





# General Members



# Associate Members and Liaisons



# LF Edge: Key Takeaways

1. Harmonizing Open Source Edge Communities across IoT, Enterprise, Cloud & Telecom
2. Keeping LF Edge Open & Interoperable with
  - › Hardware, Silicon, Cloud, OS, Protocol independence
  - › Bringing the best of telecom, cloud and enterprise – location, latency & mobility
  - › In collaboration with Consortia/SDO (IIC, AECC, OEC, ETSI)
3. Hosted by the Linux Foundation similar to other Open Source Communities like CNCF (Kubernetes), LF Networking (ONAP) and many more.

# Introduction to LF Edge Vertical Solution Focus Groups

# Introducing LF Edge Vertical Solution Focus Groups

- › Precedent set by CNCF and LF Networking
- › Goal: highlight unique requirements for use cases spanning Industrial, Enterprise and Consumer markets
- › Diverse vertical-specific feedback will ensure that LFE projects are delivering maximum value from shared technology investment
- › Output of VSFGs to include feature requirements, demos, messaging, white papers and other collateral

# Opportunities to Engage

- › **Join one of the three emerging Vertical Solution Focus Groups**
  - a. Manufacturing: <https://lists.lfedge.org/g/VSFG-Manufacturing>
  - b. Retail: <https://lists.lfedge.org/g/VSFG-Retail>
  - c. Telco Cloud: <https://lists.lfedge.org/g/VSFG-Telco>
- › As with any LFE community effort, participation is open to all!

# Opportunities to Engage (cont.)

- › **Join the second End User Kickoff event** co-located with [EDGE Computing World](#) on October 20
  - › Registration information will be added soon to <https://wiki.lfedge.org/display/LE/2020+Fall+Kickoff+Virtual+Event+Series>
- › Email [info@lfedge.org](mailto:info@lfedge.org) if you would like to **lead a new VSFG**
  - › Areas of interest include energy/utilities, oil and gas, smart buildings, smart cities and beyond
  - › Proposal of a new group requires inclusion of at least one LF Edge Project
- › **Join the LF Edge TAC** to keep updated as new VSFGs are added (<https://lists.lfedge.org/g/TAC>)



# Get Involved in the LF Edge Technical Communities

- › Participation in LF Edge Projects is open to all
- › Getting involved in the technical communities is the best way to learn
  - › **Step 1:** Get a Linux Foundation ID Here:  
<https://identity.linuxfoundation.org/>
  - › **Step 2:** Visit LF Edge Wiki (<https://wiki.lfedge.org/>)
  - › **Step 3:** Join workflows for the projects and working groups, subscribe to mailing lists, ask questions, contribute and participate below
    - › Attend project meetings
    - › Attend developer events
    - › Join approved projects
    - › Propose a project
    - › Write documentation
    - › Contribute use cases
    - › Analyze requirements
    - › Define tests / processes
    - › Review and submit code patches
    - › Build upstream relationships
    - › Contribute upstream code
    - › Provide feedback through VSFG
    - › Host and staff a community lab
    - › Answer questions
    - › Give a talk / training
    - › Create a demo
    - › Evangelize LFE and its projects

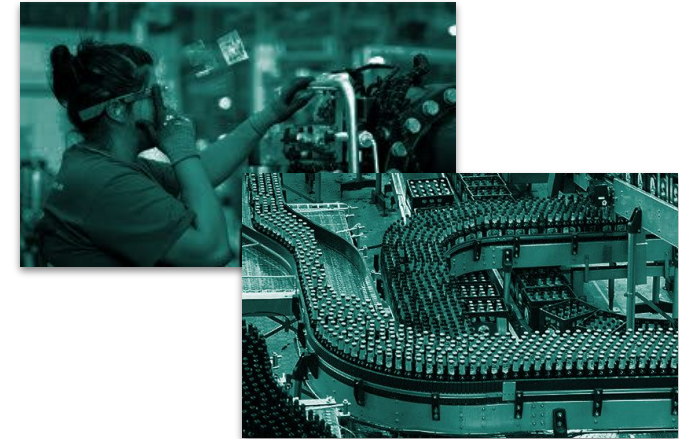
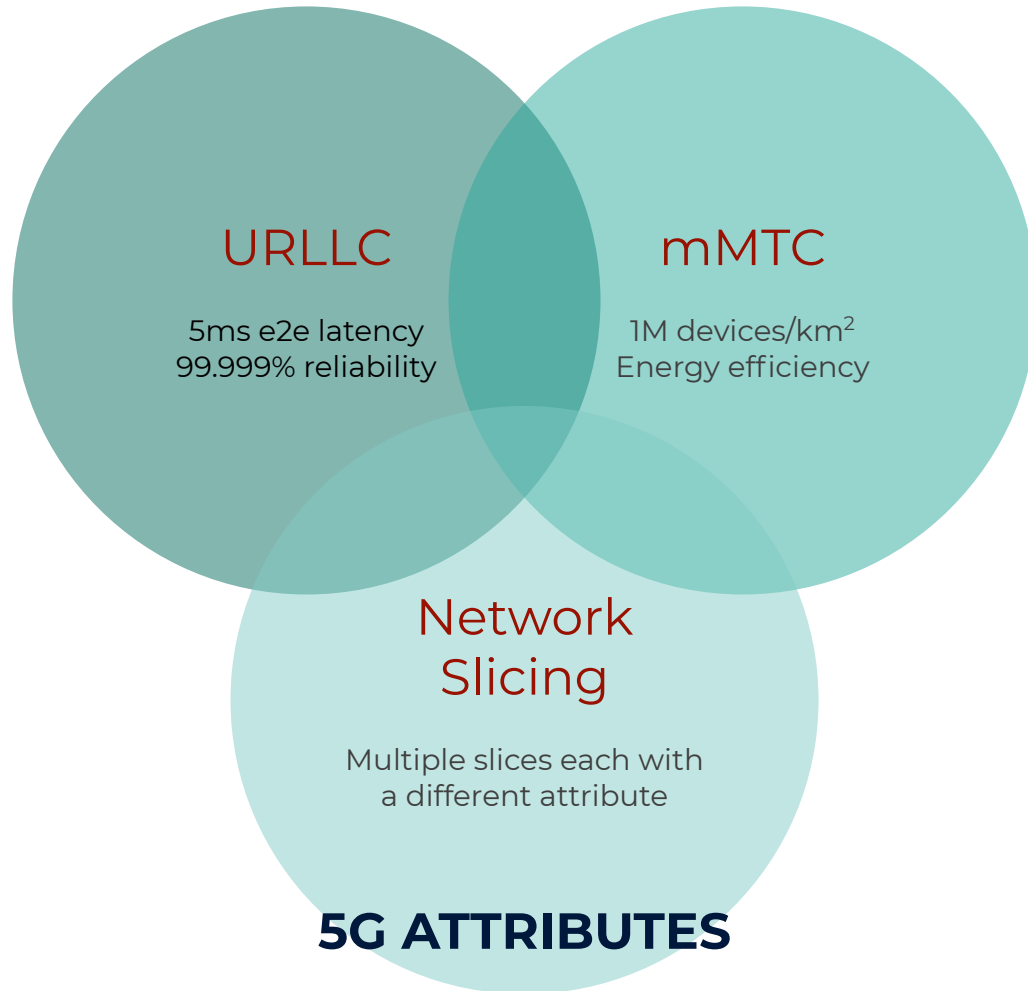
# Use Case: Automotive

Zhuming Zhang (Xinhong)

# Use Case: Manufacturing/Industrial

Sriram Rupanagunta (Aarna Networks)

# 5G Enables Industry 4.0



**INDUSTRY 4.0**

# Industry 4.0 Requires a Set of 5G/Edge Capabilities

## Reliable Connectivity



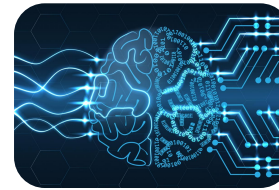
- Ethernet is too expensive and hard to maintain
- Wifi does not provide the reliability, low latency, support for edge apps, or end device management

## Edge IoT Frameworks



- Edge IoT frameworks needed to communicate with and to manage end devices
- Examples: AWS IoT Greengrass, Azure IoT Edge, EdgeXFoundry

## Edge AI/ML



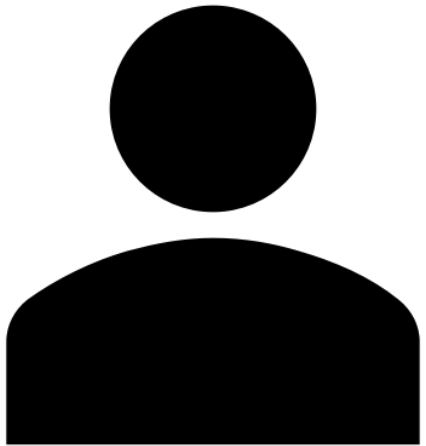
- Edge AI/ML inference engines required for use cases such as QA, machine analytics, video surveillance, and more
- AI/ML algorithms may be dynamic

## Edge Applications



- Arbitrary cloud native applications such as Augmented Reality for proactive maintenance, drone control, V2X for autonomous vehicles, and more

# Industry 4.0 Application Management Problem

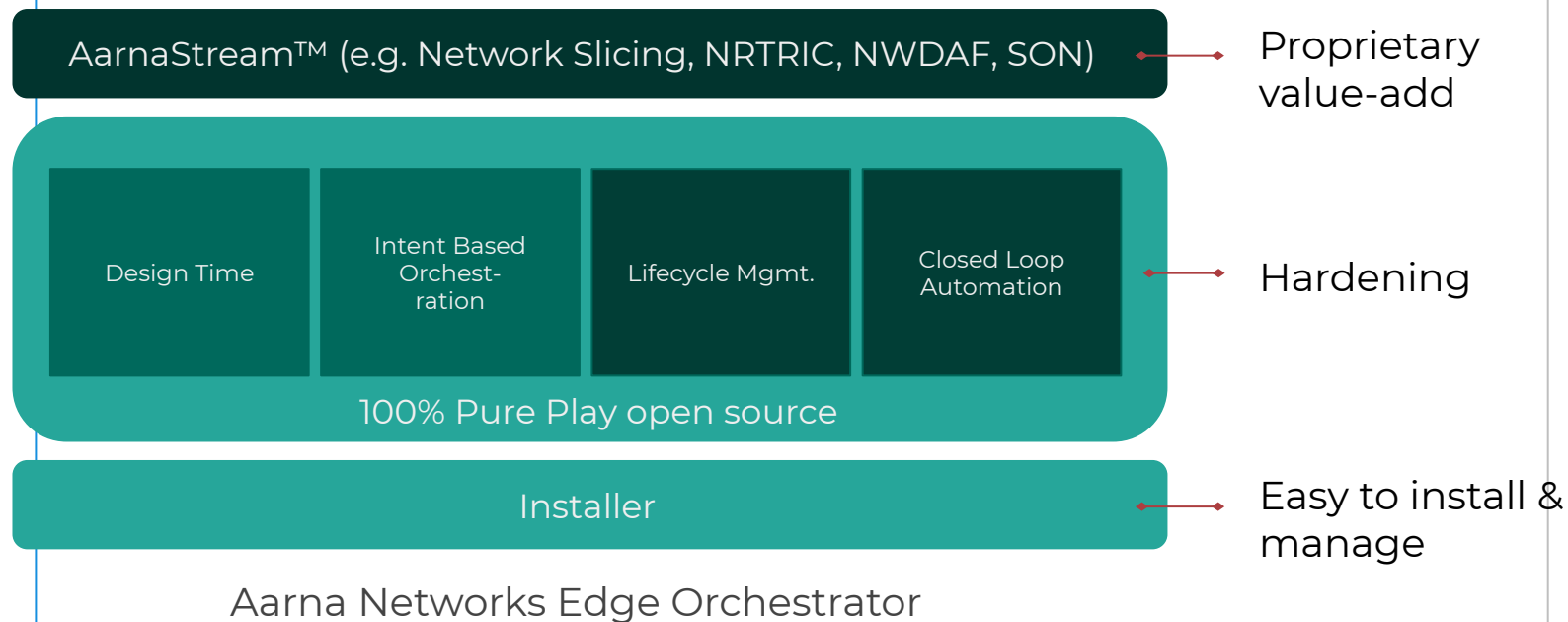


Factory Operations  
Manager

- I need reliable 5G management in all my factories
  - Zero touch provisioning
  - Network slicing
  - Ongoing optimization
  - Automatic corrective action (service assurance)
- I need to manage my edge computing apps
  - Initial orchestration and config based on business intent
  - Ongoing lifecycle management and service assurance
  - Termination upon completion
- I need the process to be fully automated, one-click
  - Training my team on 100s/1000s of vendor tools and/or writing ad-hoc scripts for each application is not scalable

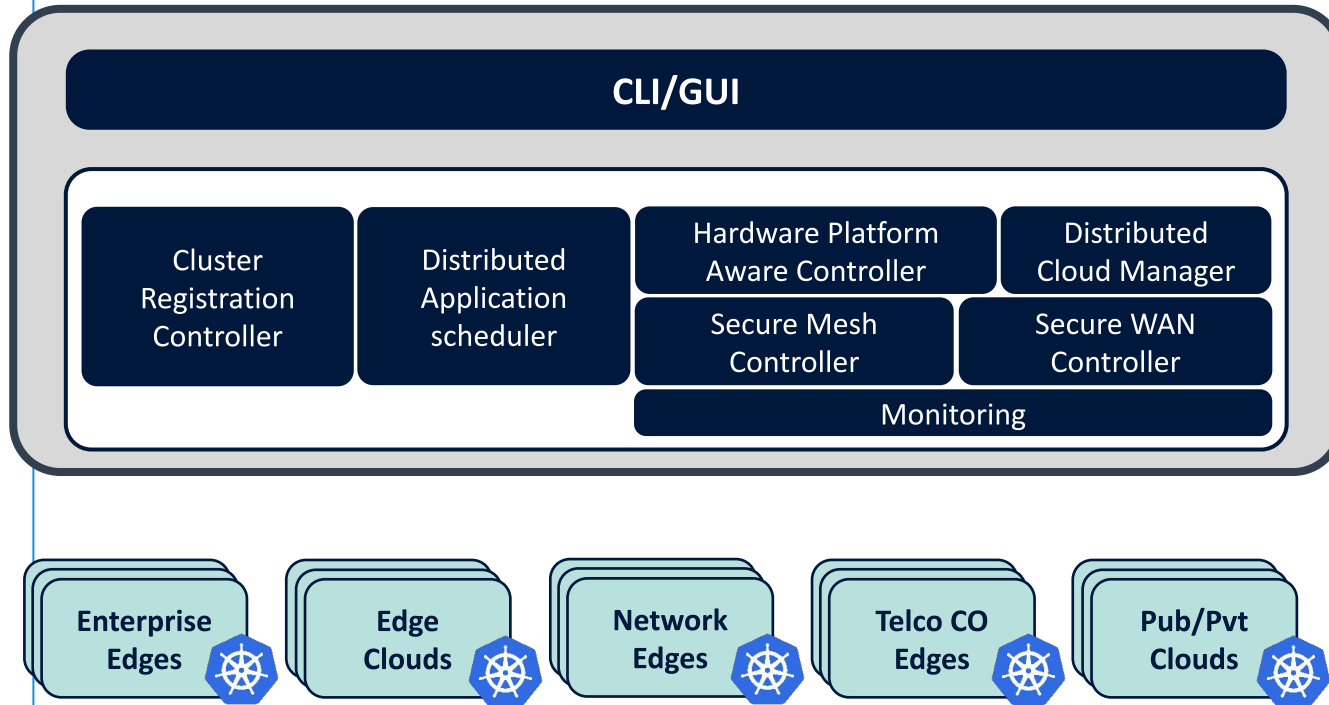


# Aarna Networks Solution



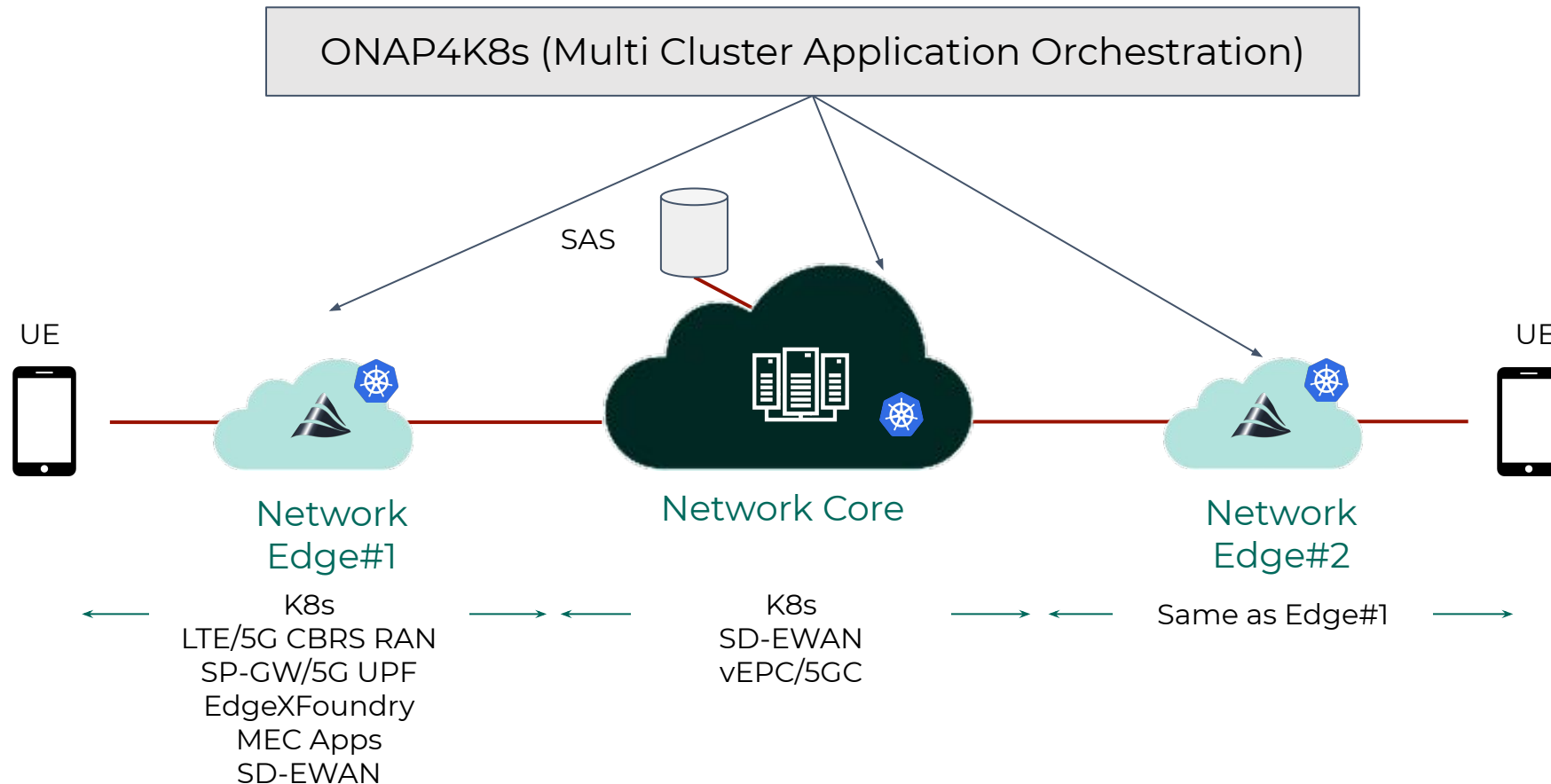
- Lightweight
- Cloud native
- CI/CD release process
- Vendor agnostic wrt. CNF or K8s provider
- Access technology agnostic (5G, LTE, WiFi)
- Support for K8s NFVI clouds
- Uses projects from open source LFN ONAP

# Product Details



- **Cluster Registration Controller** registers clusters by cluster owners
- **Distributed Application Scheduler** provides simplified, and extensible placement
- **Hardware Platform Aware Controller** enables scheduling with auto-discovery of platform features/ capabilities
- **Distributed Cloud Manager** presents a single logical cloud from multiple edges
- **Secure Mesh Controller** auto-configures both service mesh (ISTIO) and security policy (NAT, firewall)
- **Secure WAN Controller** automates secure overlays across edge groups
- **Monitoring** covers distributed application performance, and accesses

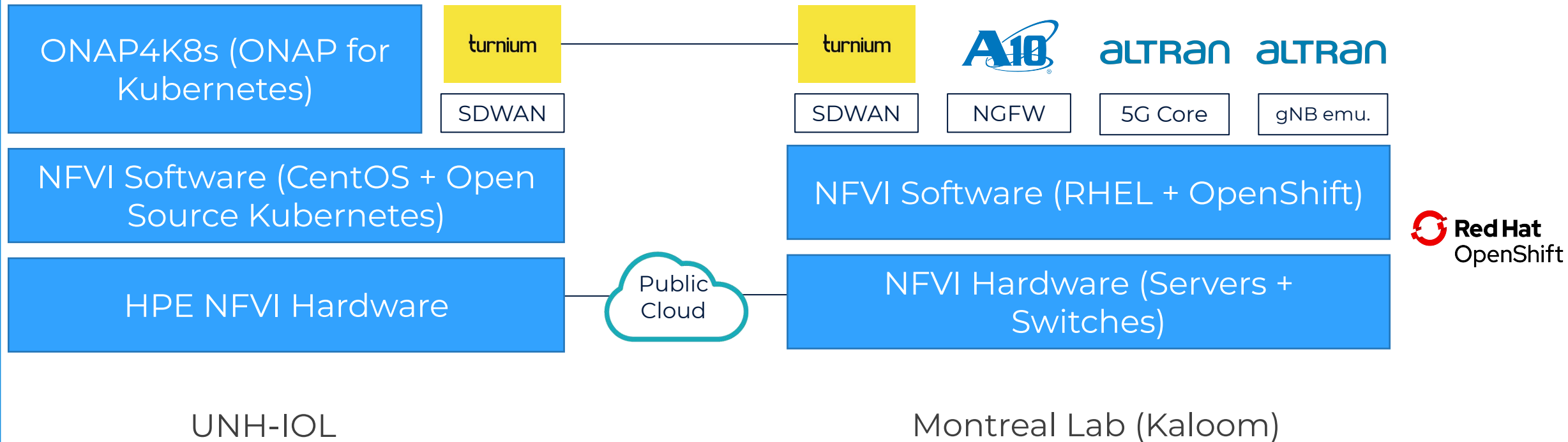
# Current PoC#1: Private LTE/5G with MEC



For more info: <https://wiki.akraino.org/pages/viewpage.action?pageId=28967182>

# Current PoC#2: Cloud Native 5G + ONAP

For more info: <https://wiki.opnfv.org/pages/viewpage.action?pageId=52790056>



# 5G POC Technology Partners



Microsoft  
Partner



# Thank You

Sriram Rupanagunta  
srupanagunta@aarnanetworks.com  
+91 98457 54275  
<http://www.aarnanetworks.com>

# Use Case: Telco

Yanjun Chen (China Mobile)

# Use Case: Transportation and Logistics

Eric Aquaronne (IBM)

Naeem Altaf (IBM)



Panel:  
Meeting at the Edge - Cross community  
collaboration to define Telecom Edge Reference  
Architectures

Ahmad ElSwaf (Saudi Telecom)

Beth Cohn (Verizon)

Sukhdev Kapur (Juniper)

# Thank You!

Join us for the second session  
at Edge Computing World on October 20!