Arm at the New Edge

ONS Summit

April 4, 2019
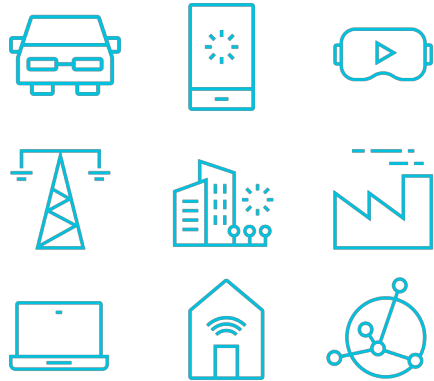
Shai Tsur

Sr. SW Ecosystem Program Manager
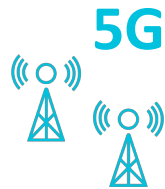
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Data consumption is driving future designs
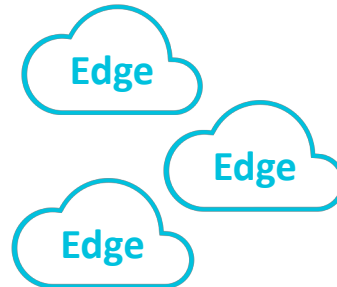
Trillions
of Devices

Massive Amounts of Data

Critical Data

5G

Edge

Edge

Edge

Cloud Data Centers

Local Decisions

Filter & React
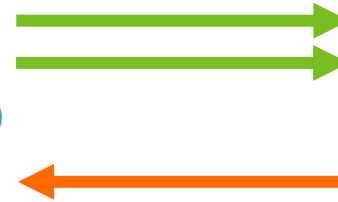
Analyze & Store

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The Edge Needs Flexibility

Edge Computing

Device	Local Services	Infrastructure Services	Edge Cloud	Public/Private Cloud
	Fixed Single service Multi-service	Extra Large, Large, Medium		

Compute

Acceleration

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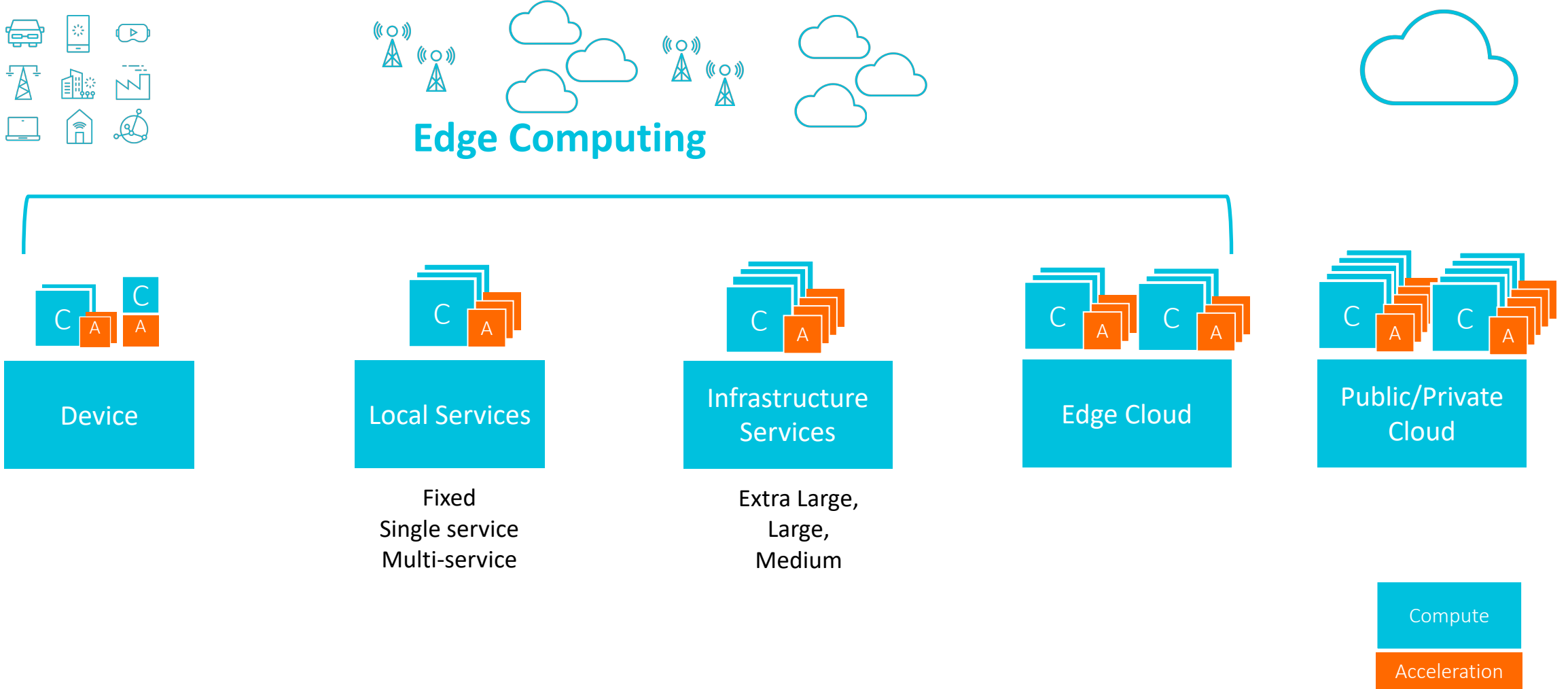
Edge Taxonomy: V2X Use Case

Infrastructure Services

4. V2X message distribution by 5G V2X slice

5G V2X slice

3. intelligent V2X data analysis and decision

5G UPF

MEC

Edge Cloud

Local Service

2. real time video back to MEC

gNB/RSU

1. video capturing

Device

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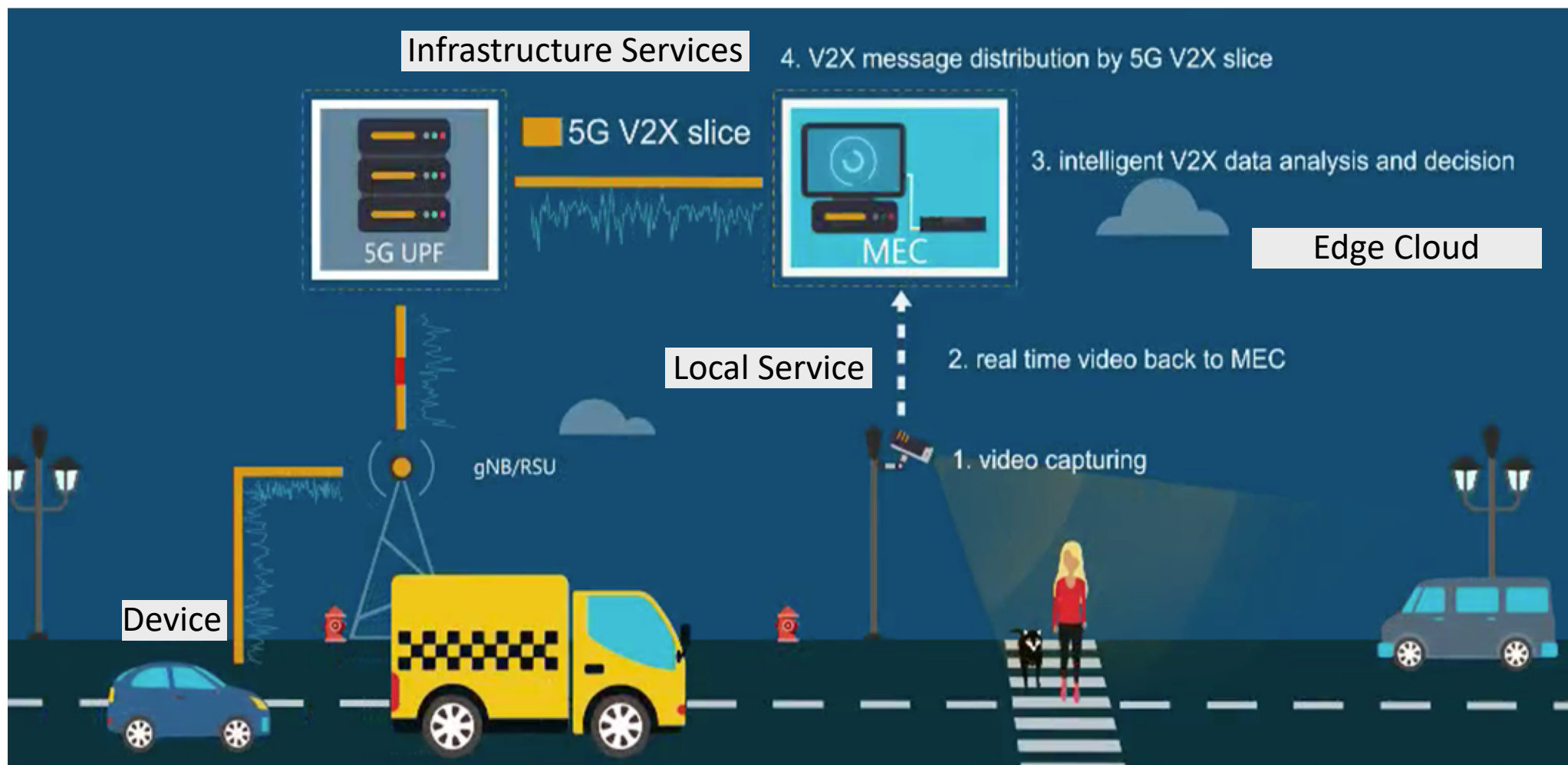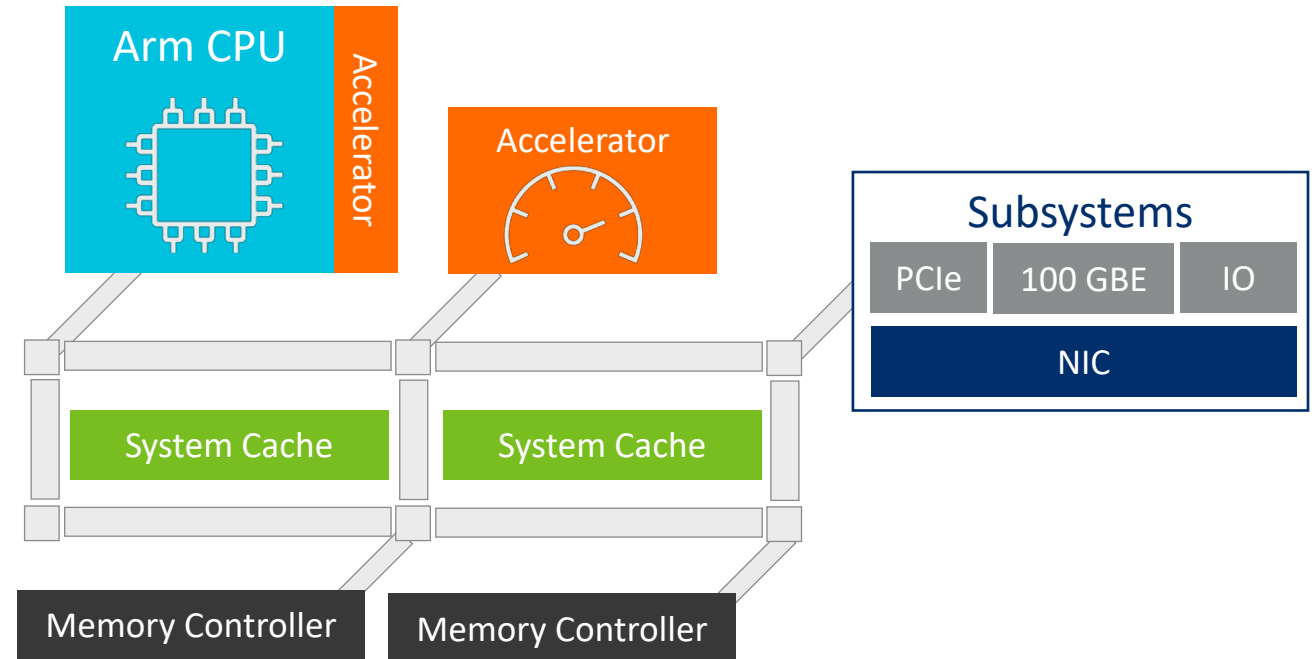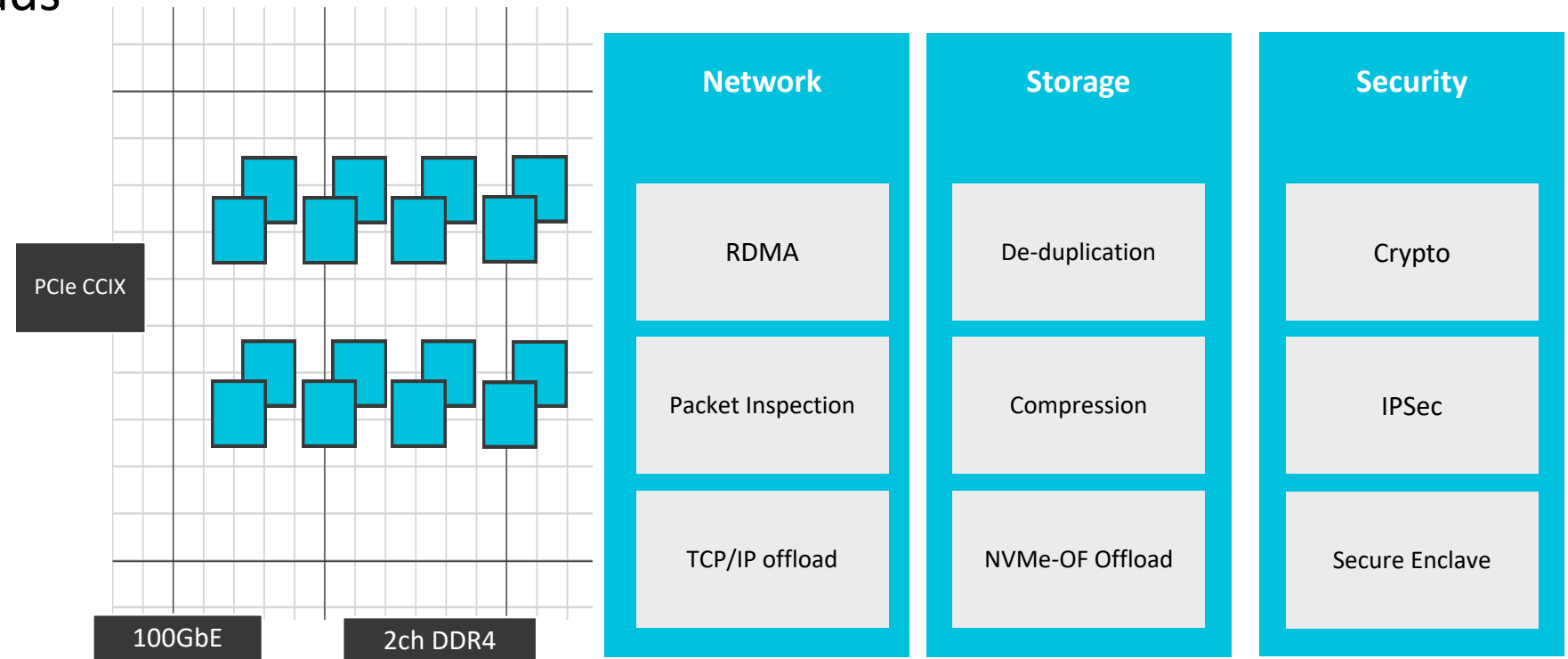
Arm Advantage at the Edge: Scalability

- Heterogeneous SoC architecture
  - Up to 64 coherent clusters
- Mix of Arm CPUs and accelerators
  - Acceleration
  - Memory controllers
  - IO Coherent Subsystems
- High-performance, scalable coherent mesh network
  - Allows for greater throughput
- Predictable power and performance

Arm CPU | Accelerator

Accelerator

Subsystems
PCIe | 100 GBE | IO
NIC

System Cache | System Cache

Memory Controller | Memory Controller

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Arm Advantage at the Edge: Acceleration

On-chip acceleration for maximizing performance of workloads

- OVS
- IPSec
- NFV/SDN
- Storage

PCIe CCIX

100GbE

2ch DDR4

Custom Acceleration

Network	Storage	Security
RDMA	De-duplication	Crypto
Packet Inspection	Compression	IPSec
TCP/IP offload	NVMe-OF Offload	Secure Enclave

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Arm Advantage at the Edge: Security

- ## Platform Secure Architecture (PSA)

  - Combination of hardware and software

  - Delivers key platform security functions with a common security model

- ## Protects sensitive assets by separating from application software and hardware

  - Defines secure (SPE) and non-secure processing (NSPE) environments

  - Requires secure installation of initial keys and secure boot firmware during manufacture

  - Provides verified boot so that only authentic, trusted firmware runs in the SPE
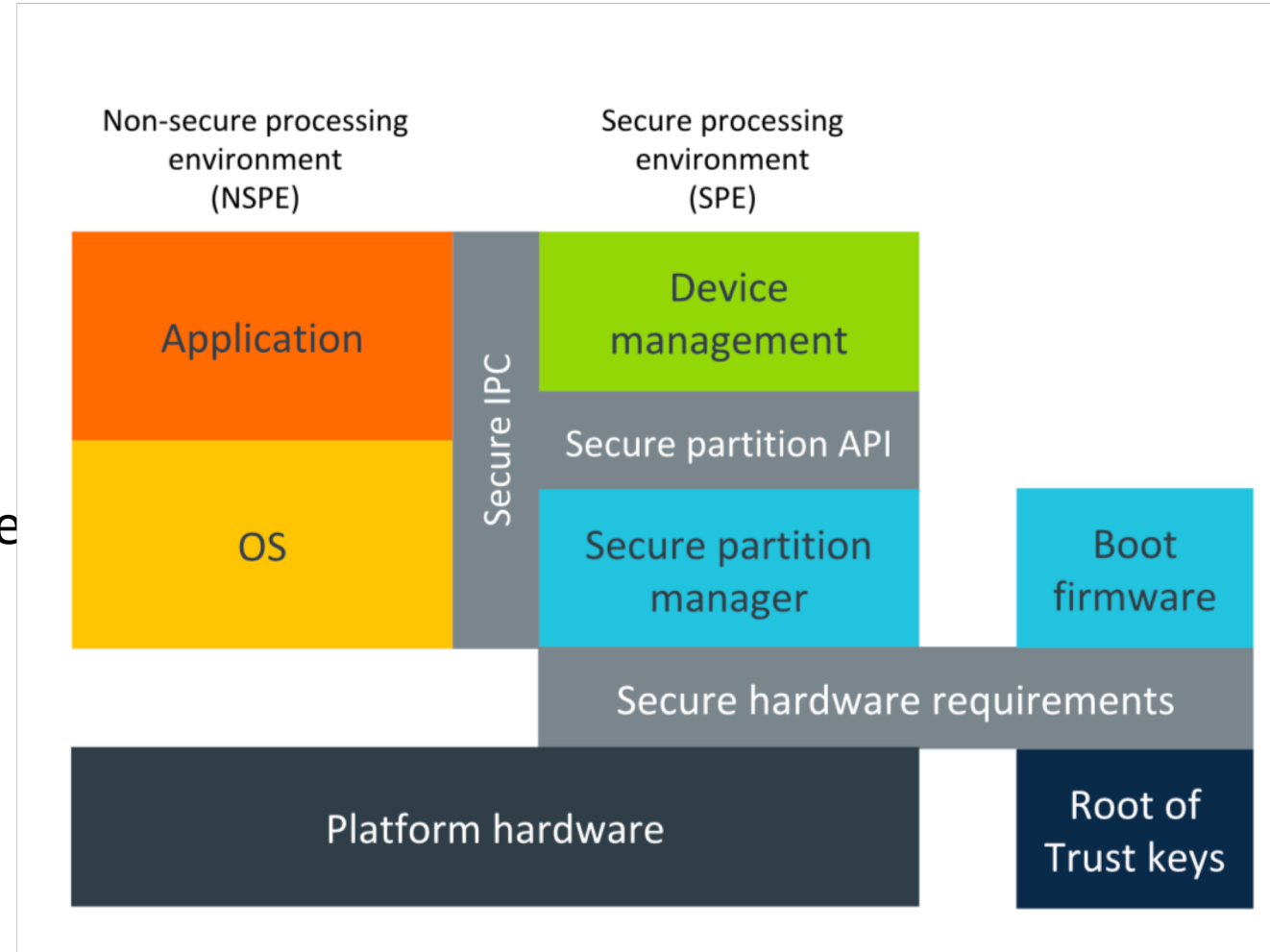
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Arm Neoverse

The cloud to edge infrastructure foundation for a world of 1T devices

High performance, secure IP and architectures

Diverse solutions and ecosystem

Scalable from hyperscale to the edge

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Introducing the Arm Neoverse N1 and E1 platforms
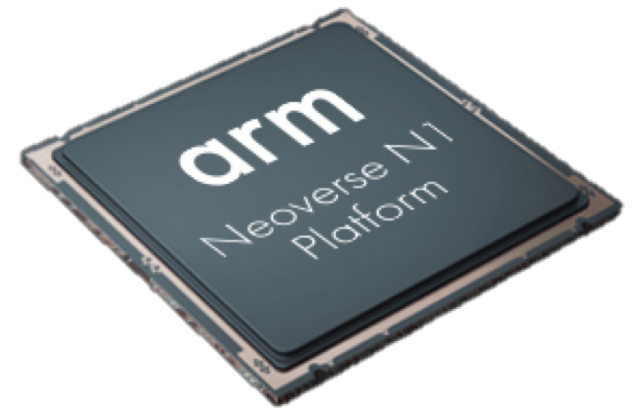
Neoverse N1 platform: Accelerating the transformation to a scalable cloud to edge infrastructure

Neoverse E1 platform: Empowering the infrastructure to meet next generation throughput demands
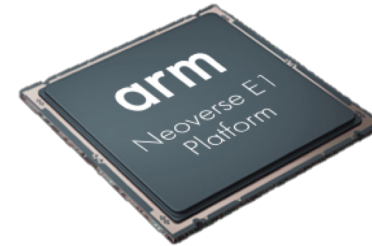
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Neoverse N1 platform

Accelerating the transformation to a scalable cloud to edge infrastructure

Revolutionary compute performance

Platform features specific to infrastructure

Extreme range of scale and diversity of compute

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Neoverse N1 platform

Built from the ground up with platform specific features for infrastructure

Server class virtualization

Power and performance management

State of the art RAS support

System level profiling

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Neoverse E1 platform

Empowering the infrastructure to meet next-gen throughput demands

Intelligent design for highly efficient throughput

Fully leverages diverse Arm software ecosystem

Highly scalable throughput for edge to core data transport

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Neoverse E1 platform

Enables the transition to a scalable 5G infrastructure

2.7X
throughput performance

2.4X
throughput efficiency

2.1X
compute performance

Legacy & Open Source Software

ONAP
OPEN NETWORK AUTOMATION PLATFORM

fd.io

OPNFV

DPDK
DATA PLANE DEVELOPMENT KIT

AKRAINO
EDGE STACK

< 35W 5G base stations

Multi-100 gigabyte routers
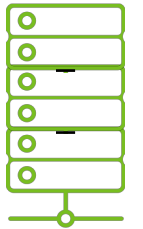
Intelligent design for highly efficient throughput

Fully leverages diverse Arm software ecosystem

Highly scalable throughput for edge to core data transport

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Arm Edge Focus Areas

5G	Connected Car	Universal CPE

V2X	Industrial

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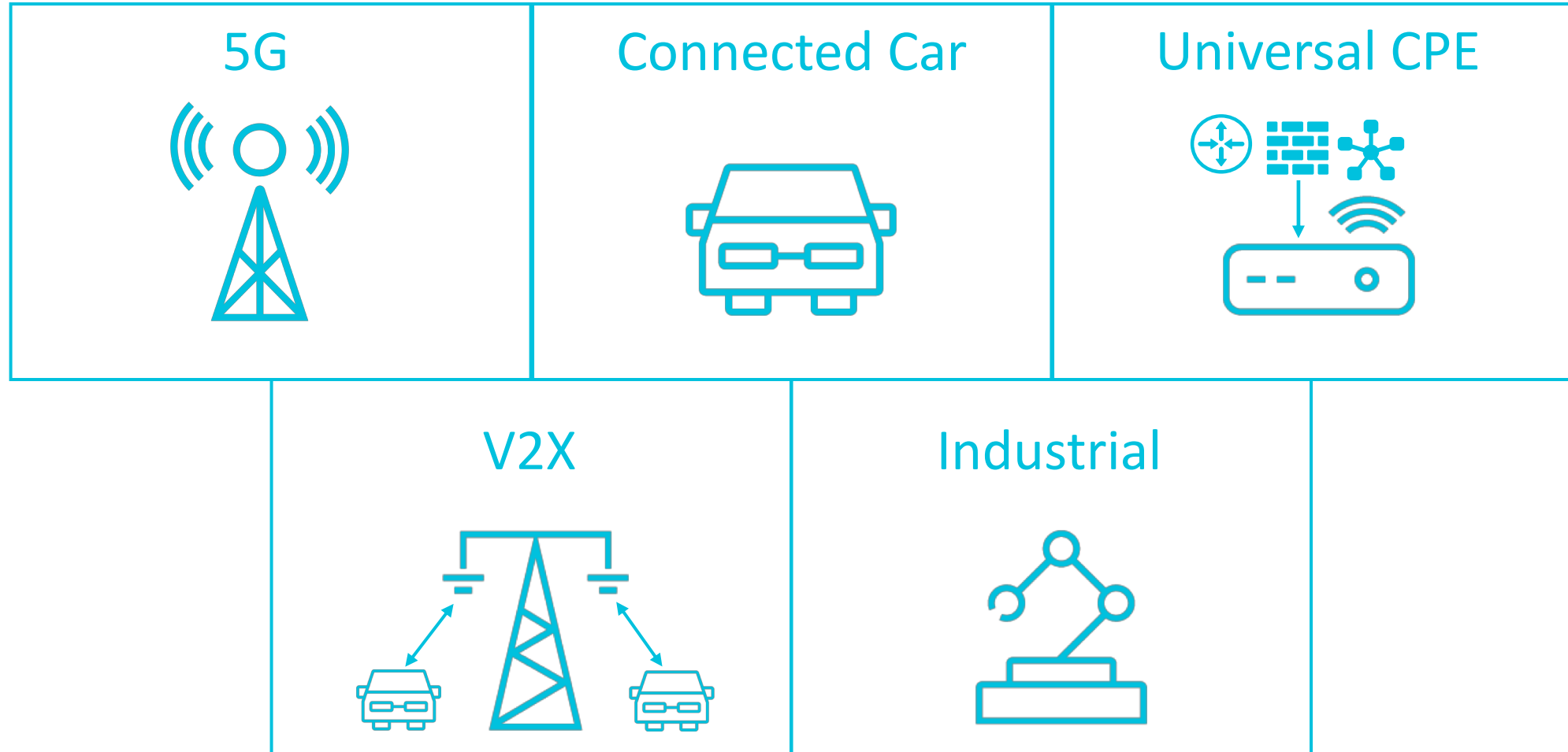
Arm and LF Edge

- Akraino – Founding Member and technical leadership on multiple industry blueprints

- EdgeX Foundry – Arm providing technical insights based on experience with IoT Gateways

- Extending technical leadership/insights to the additional LF Edge projects

- Driving a holistic approach for additional open source projects into LF Edge

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Arm Akraino Activities

- Co-chair Akraino TSC
- Leading Integrated Edge Cloud Blueprint Family
- Participating in 5 additional blueprints:
  - Network Cloud
  - SDN Enabled Broadband Access (SEBA), Real Time Edge Media Processing
  - Edge Light & IoT
  - Micro MEC
  - Time Critical Edge Compute

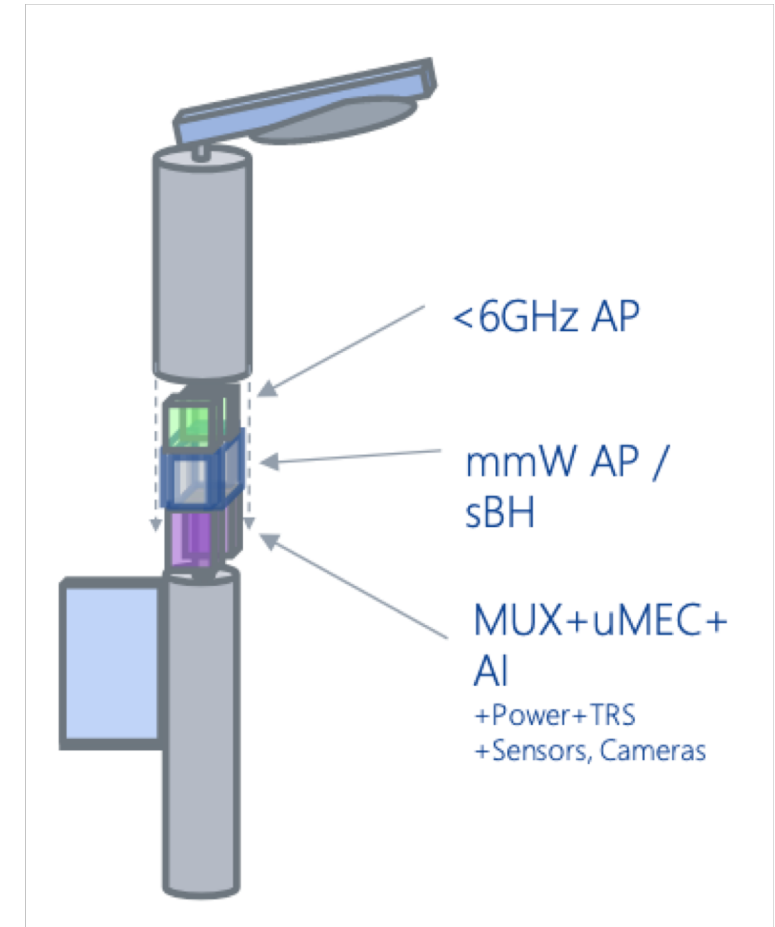| Blueprint Family	Blueprint Species Name	Submitter	Release Target
Network Cloud	SDN Enabled Broadband Access (SEBA)	AT&T	R1
	Serverless	AT&T	R1
	Unicycle Blueprint (SR-IOV)	AT&T	R1
	Rover Blueprint	AT&T	R2
	Real Time Edge Media Processing	Radisys	R1
	Network Cloud and TF Integration	Juniper	R1
	OVS-DPDK Unicycle (Dell)	Ericsson	R1
Integrated Edge Cloud	IEC Type 1: small deployment	Arm	R1
	IEC Type 2: medium deployment	Arm	R1
Edge Light & IoT	ELIoT 2: LW Edge	Huawei	R1
	SD-WAN	Huawei	R1
Kubernetes Native Infrastructure for Edge	Provider Access Edge	Red Hat	R1
	Industrial Edge	Red Hat	R1
Micro MEC	Micro MEC Type 1	Nokia	R2
	Micro MEC Type 2	Nokia	R2
	Micro MEC Type 3	Nokia	R2
Radio Edge Cloud	Radio Edge Cloud	Nokia	R1
Far Edge Cloud	Starling X Far Edge Distributed Cloud	WindRiver	R1
TBD	Time Critical Edge Compute	Intel	R1

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Arm Ecosystem ONS Demos

Micro MEC

Ecosystem Partners: Marvell, Nokia

Concept

- Utilize 5G base station and μMEC servers on lamp posts

- μMEC server is fitted with sensors and cameras

- Provides information on cars passing by

Target Industry: Smart Cities, Connected Cars

<6GHz AP

mmW AP / sBH

MUX+uMEC+ AI
+Power+TRS
+Sensors, Cameras

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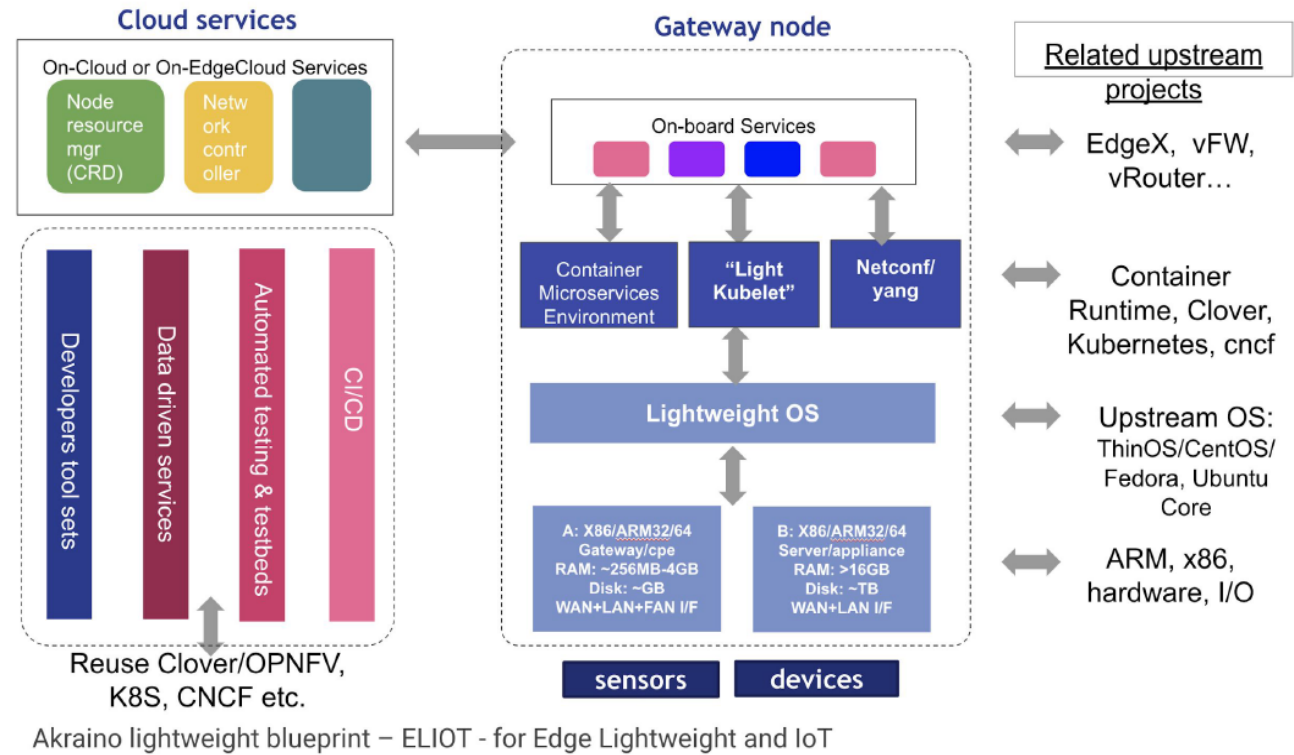**arm** NEOVERSE

Arm Ecosystem ONS Demos

ELIOT (Edge Light & IoT)

Ecosystem Partners: Huawei,

Concept

- Edge IoT and Universal CPE Use cases
- Targets IoT appliances
- Very thin OS and orchestration

Target Industry: Industrial, uCPE

Akraino lightweight blueprint – ELIOT - for Edge Lightweight and IoT
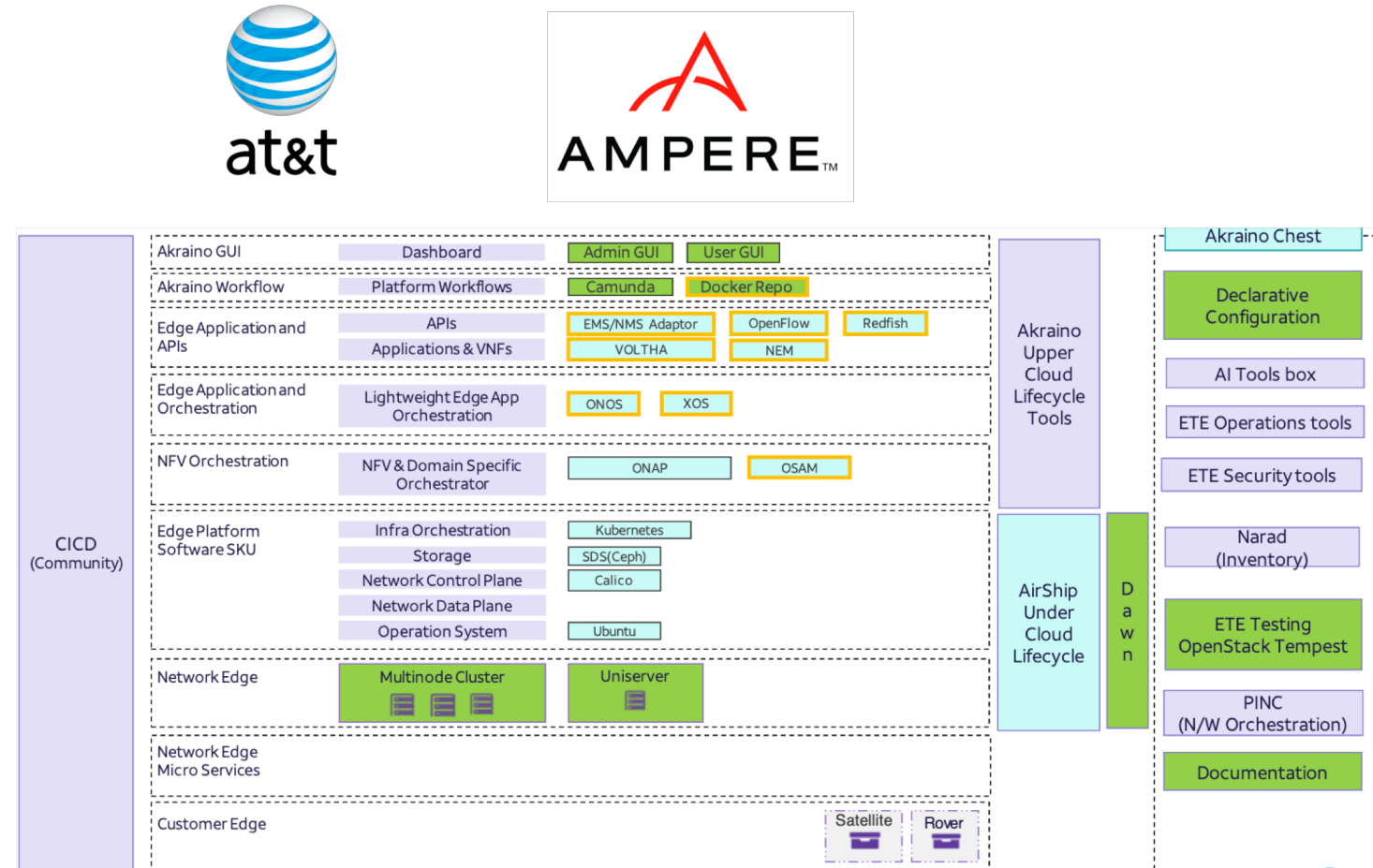
Arm Ecosystem ONS Demos

SDN Enabled Broadband Access (SEBA)

Ecosystem Partners: AT&T, Ampere

Concept:

- Run multiple applications for broadband access such as VoLTE and aggregation

- Demonstrate Arm advantage in performance/watt performance for Telcos

Target Industry: 5G, Telco Access

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# Arm Ecosystem ONS Demos

Connected Vehicle

Ecosystem Partners: Tencent, Nokia

Concept

- MEC Platform for connected vehicles

- Capture vehicle and traffic information, dispatch to corresponding edge process unit

- Process data in the Edge Cloud or Public Cloud to determine optimal action for vehicle

- Return suggested action to vehicle

Target Industry: Connected cars, V2X
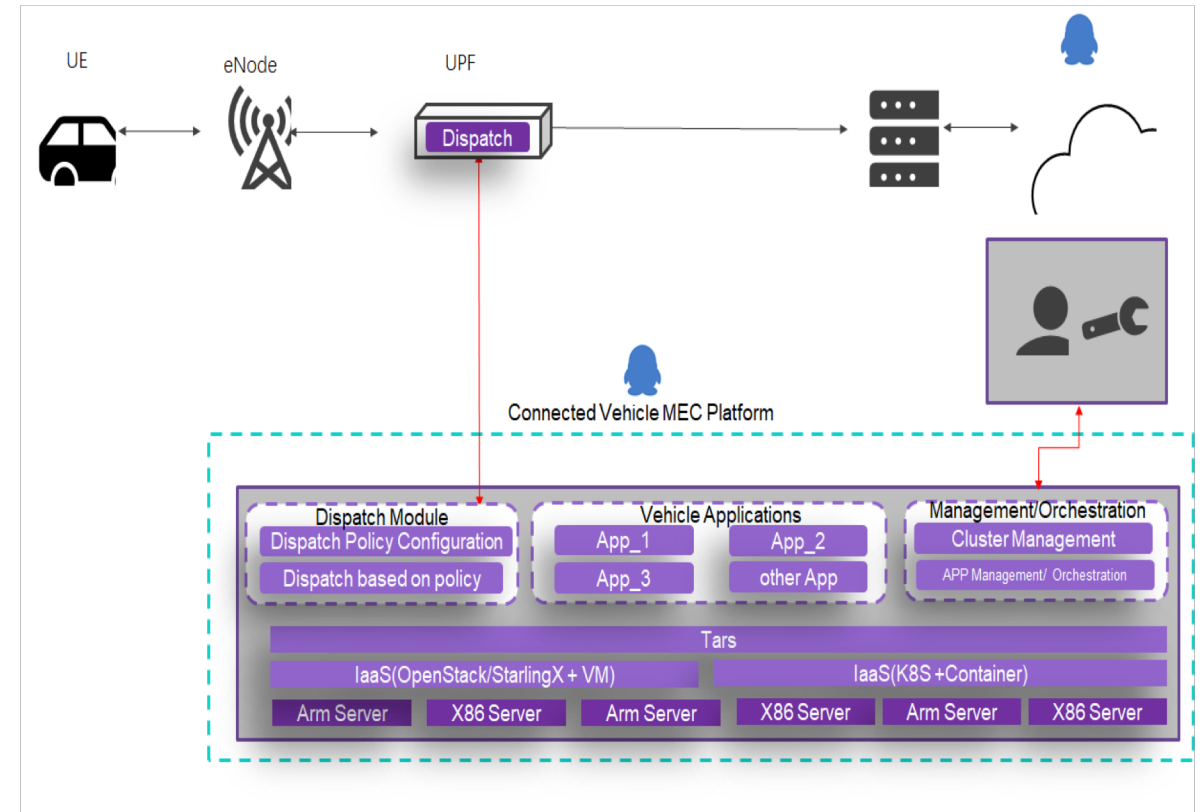
Thank You!

Arm talks @ ONS

• Your path to edge computing - Akraino Edge Stack	Thu., Apr. 4	5:00pm	230B
• How Ecosystem Business Models are Shifting to Take Advantage of Open Source	Fri., Apr 5	9:45am	Hall 3
• Edge Computing League – LF Edge Umbrella	Fri., Apr 5	11:10am	230B
• Securing the Smart Cities Edge with OP-TEE and Arm TrustZone	Fri., Apr 5	11:50am	230B
• Empowering High Performance User Space Network Stack on Arm	Fri., Apr 5	4:10pm	230C

Visit Us – Exhibit Hall, Booth 518

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