Enabling the Virtualized Edge with Smart NIC Data Acceleration

Making Truly Programmable Networks a Reality

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CTO, Ethernity Networks

LIVE! LightReading WEBINAR

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Today's Presenters

Moderator

Simon Stanley

Analyst at Large

Heavy Reading

Barak Perlman

CTO

Ethernity Networks

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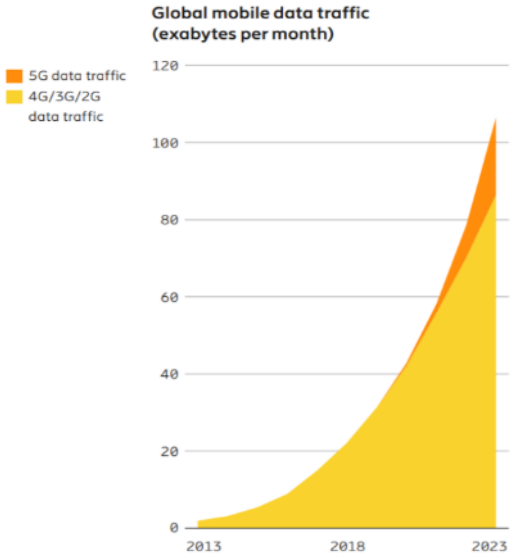
Agenda

- ✓ Introduction
- ✓ What is the Virtualized Edge?
- ✓ FPGA-Based SmartNIC Acceleration
- ✓ Ethernity Networks' Solutions for the Virtualized Edge
- ✓ Q&A

HEAVY READING

Cloud-based Services Driving Data Growth

- Cloud-based services
  - Video, content delivery
  - Social media, messaging
  - Storage
  - Data Management
  - Big data processing
  - IoT services
- Rapidly growing network capacity
  - 5G/LTE,
  - Gigabit Broadband
  - Ethernet Services
- Services hosted in large and hyperscale data centers
- Virtualized infrastructure
  - Based on SDN and NFV

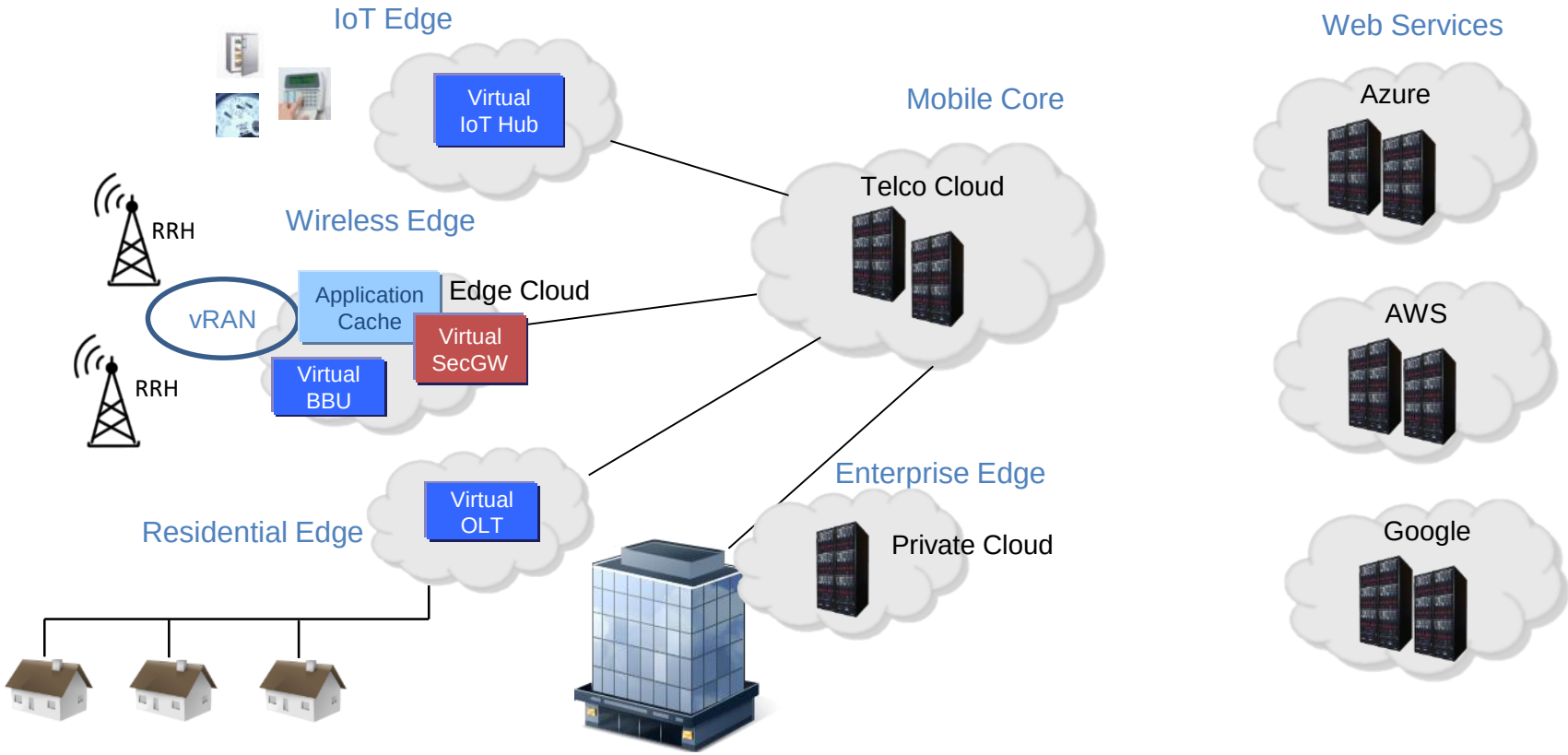


Ericsson Mobility Report June 2018

The Need for Edge Computing

- Many applications and services require processing close to the user
  - Low latency, high bandwidth, caching, localized services
  - Multi-access Edge Computing (MEC) is a key initiative
- 5G/LTE wireless
  - vRAN and Cloud RAN already being deployed carriers
  - The virtualized edge is built into the 5G architecture
- Other applications
  - Broadband
  - Enterprise services
  - IoT Services

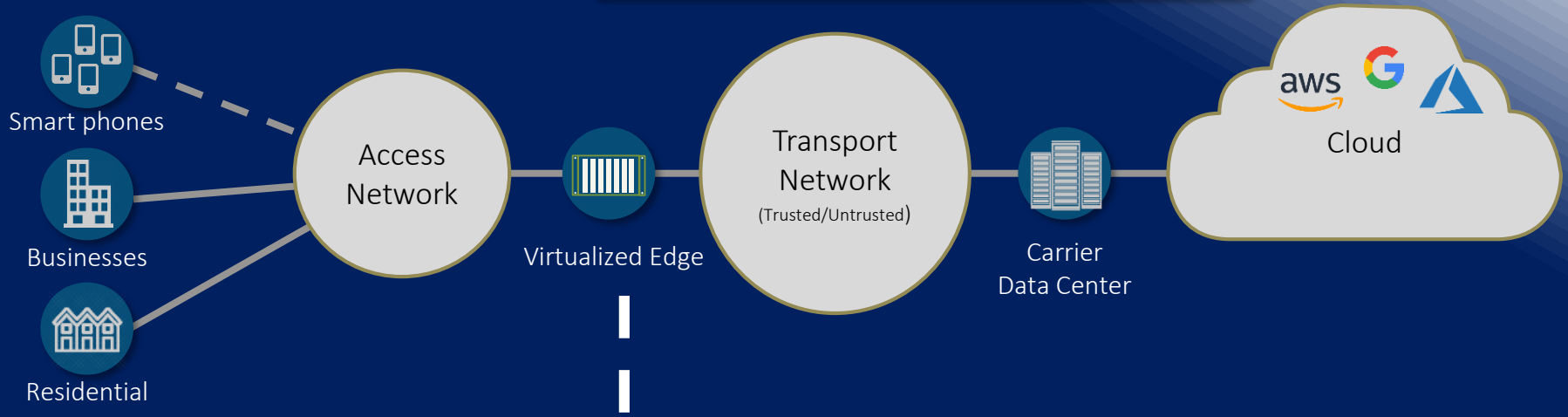
The Virtualized Network Edge



Virtualized Edge

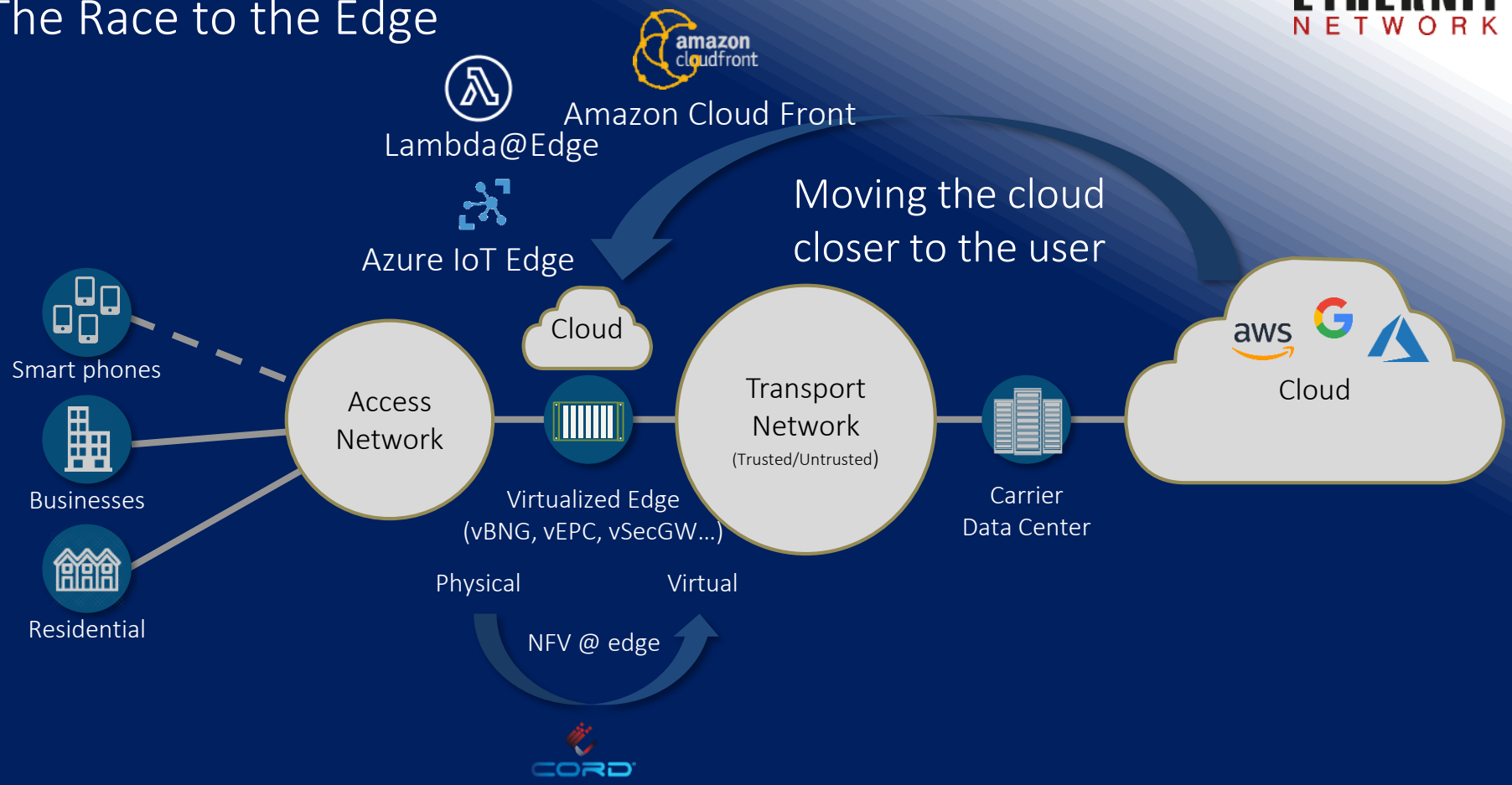
Operator survey: smart central offices to be in 85% of service provider networks this year

IHS Markit, Jan 2018



Remote Edge, Far Edge, Extreme Edge, Smart Edge, Distributed Cloud, Multi-Access Edge Computing (MEC), Central Office, Hub, Fog Computing, cRAN, vRAN

The Race to the Edge



Edge Related Open Source and Standardization Projects

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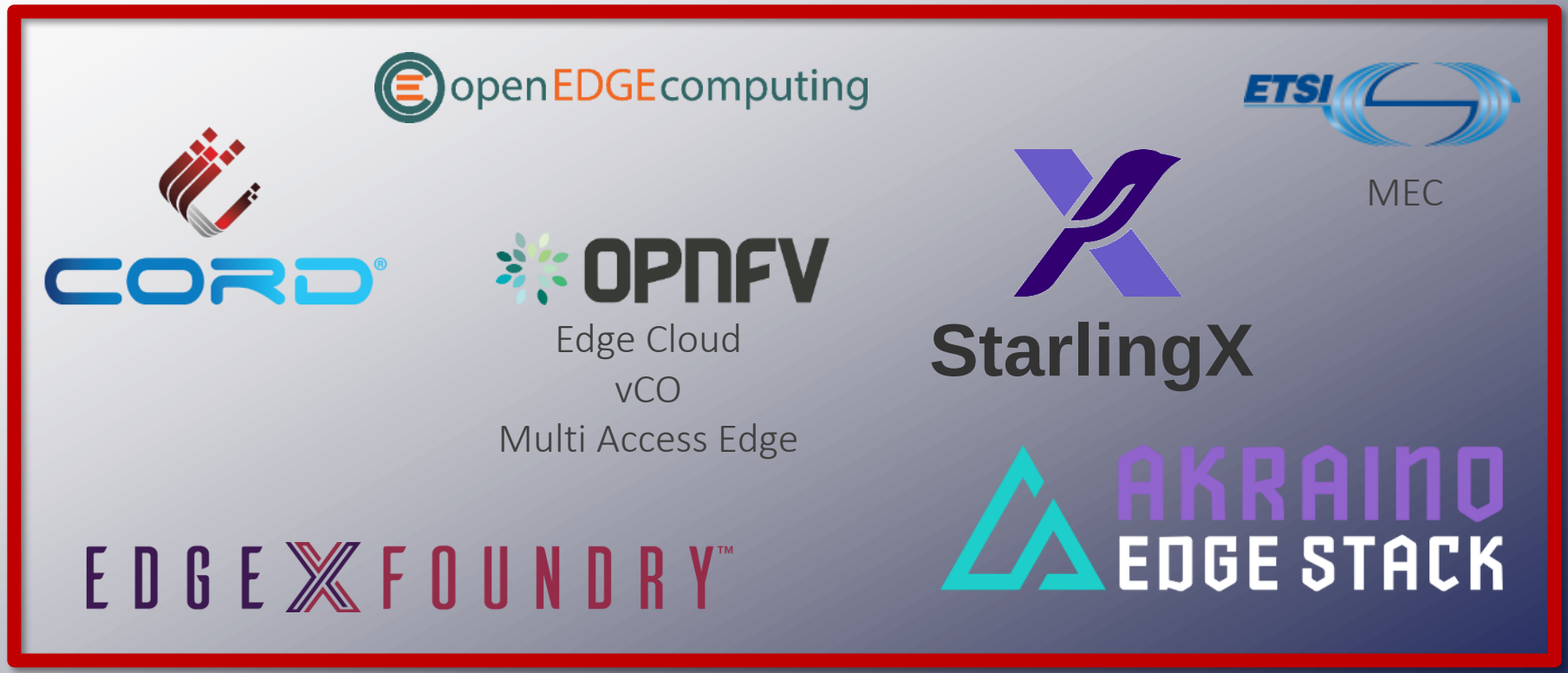

Edge Related Open Source and Standardization Projects

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Project	Description
CORD	Reference implementations in CO for residential, mobile, and enterprise use cases
OpenEdgeComputing	Any application is able to utilize the nearby edge computing services independent of the communication bearer, the edge node technology, and the edge operator
OPNFV Multi-Access Edge	Provide documentation, test, and scenario integration support for access hardware and VNFs for edge-deployment use cases
OPNFV Edge Cloud	Focused on design and development of reference platform of edge cloud in OPNFV. Scope includes NFVI, VIM, MANO
OPNFV vCentral Office	OPNFV PoC, similar to CORD, but using ODL, OCP, and OpenStack
StarlingX	Part of OpenStack, open source contributed by Wind River, specially for the edge
Akraino	Akraino Edge Stack, a Linux Foundation project in formation, AT&T contribution
EdgeXfoundry	IoT framework simplifying the process to design, develop, and deploy solutions
Multi-Access Edge Computing	ETSI ISG standardization effort, providing industry standards

Unique Needs at the Network Edge

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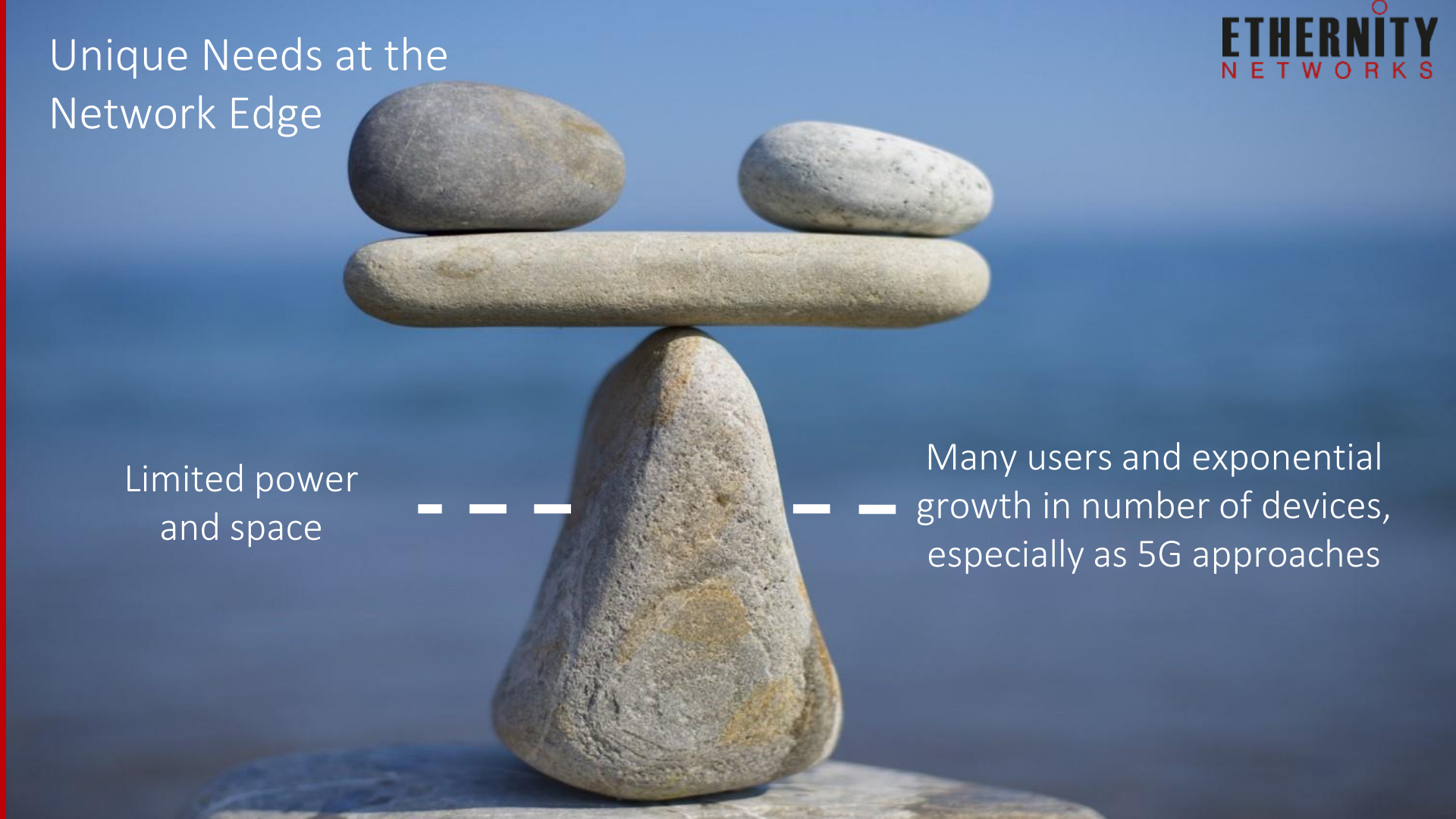


Limited power and space

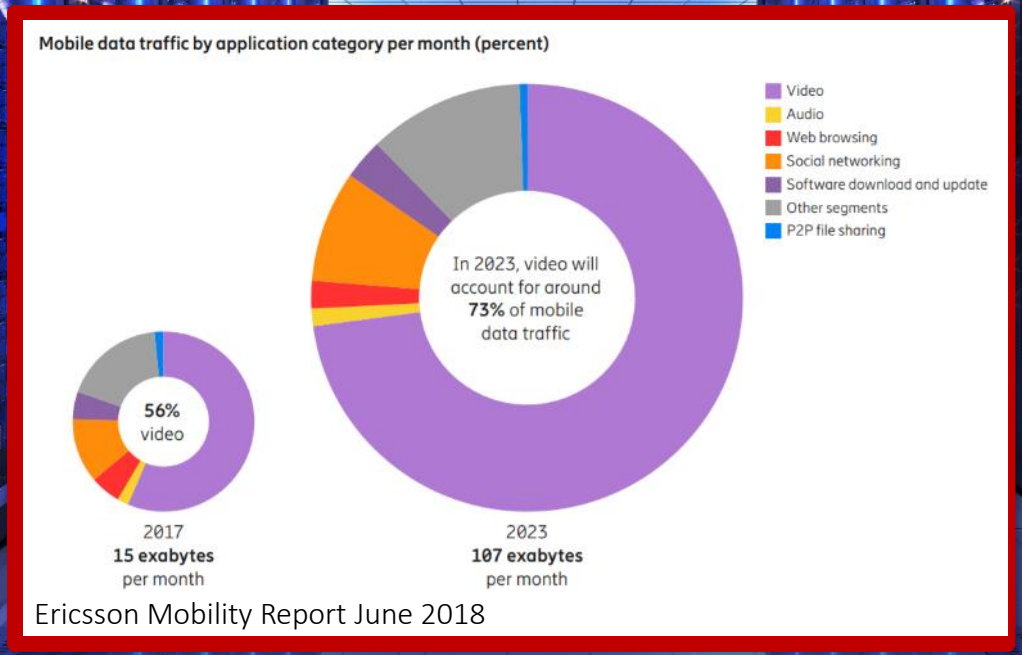
Many users and exponential growth in number of devices, especially as 5G approaches

More Challenges for Virtualizing the Edge

- Security
- Openness
- Futureproof
- Multiple applications per site
- Low latency

Accelerating Traffic, Mainly Video

- 3Mbps for SD video
- 10Mbps for HD video
- 25Mbps for 4K UHD video (*Netflix recommendation*)

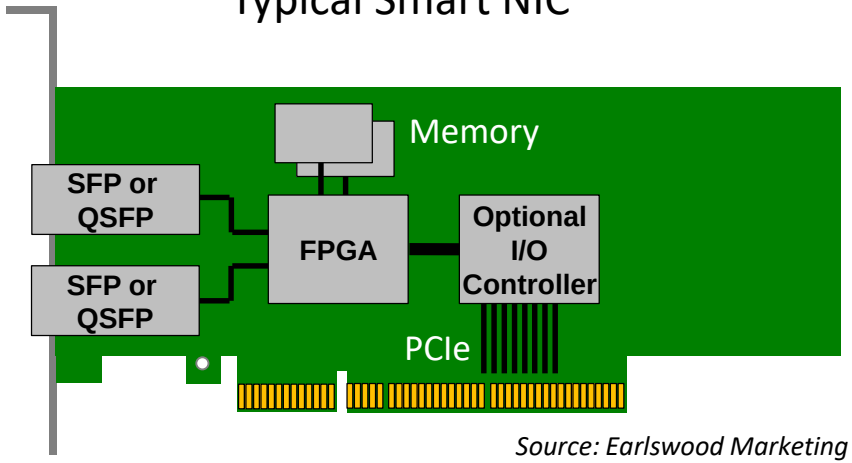


Ericsson Mobility Report June 2018

Smart NIC Acceleration

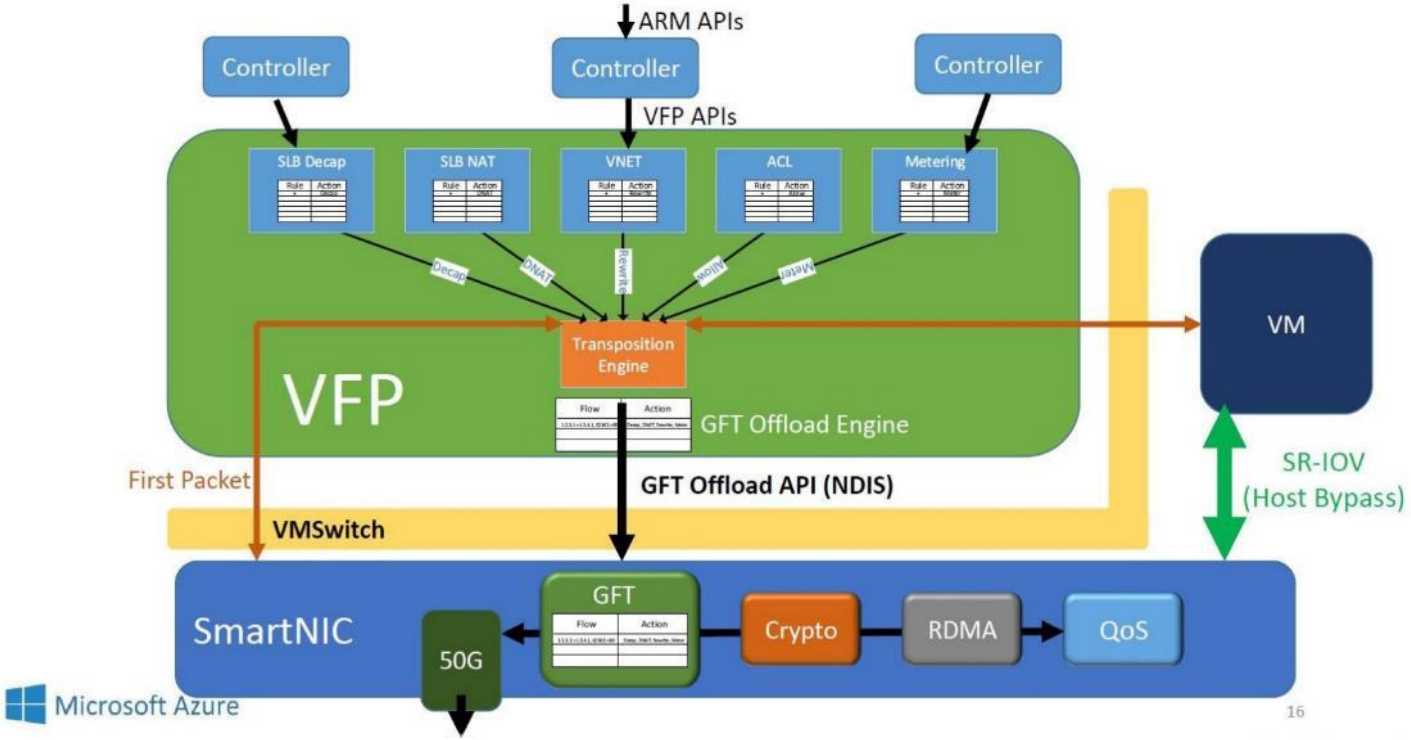
- Smart NICs accelerate application performance
- Replacing standard NICs
  - Hyperscale data centers
  - Edge computing
- Multi-host CPU offload
  - Applications
  - Network functions
- FPGA or processor based
- I/O controller integrated or separate

Typical Smart NIC

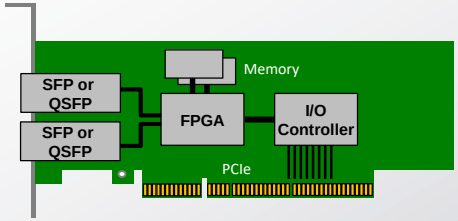


Source: Earlswood Marketing

SmartNIC – Accelerating SDN

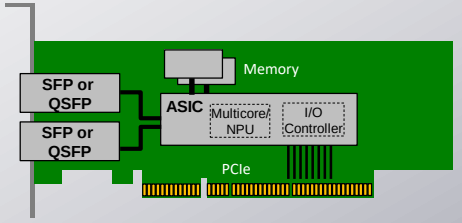


Smart NICs
Networking and Security Acceleration Options



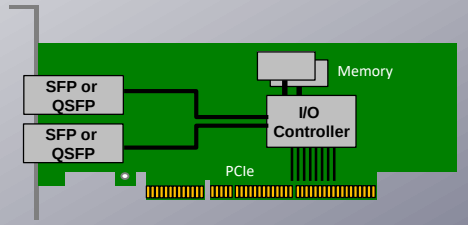
FPGA Based, Optional I/O Controller

- Fully programmable
- Open
- Disaggregation



Multicore/NPU (data path) and I/O Controller

- Fat pipes issue
- Vendor lock-in
- Scalability issue



I/O Controller

- Not programmable → Not a SmartNIC

SmartNICs in Microsoft Azure: Lessons Learned

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- FPGAs demonstrate the "… performance characteristics of an ASIC, but the programmability and reconfigurability inherent in a software solution like a SoC."

- "We stopped burning CPU cores to run the network datapath… Host cores show less than 1% utilization…" after implementing FPGA SmartNICs

Azure Accelerated Networking: SmartNICs in the Public Cloud, February 2018

FPGA-Based SmartNICs for the Virtualized Edge

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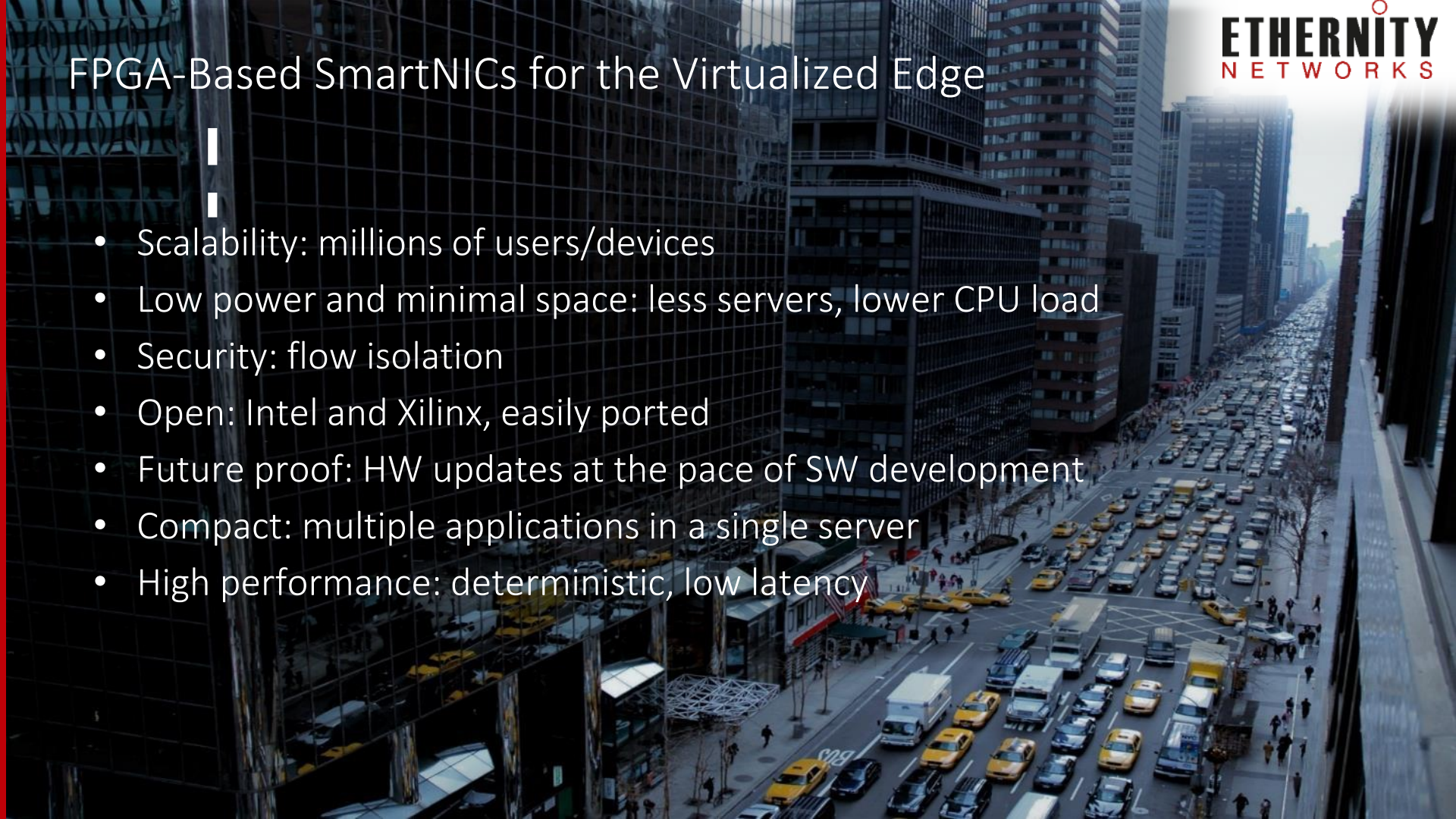
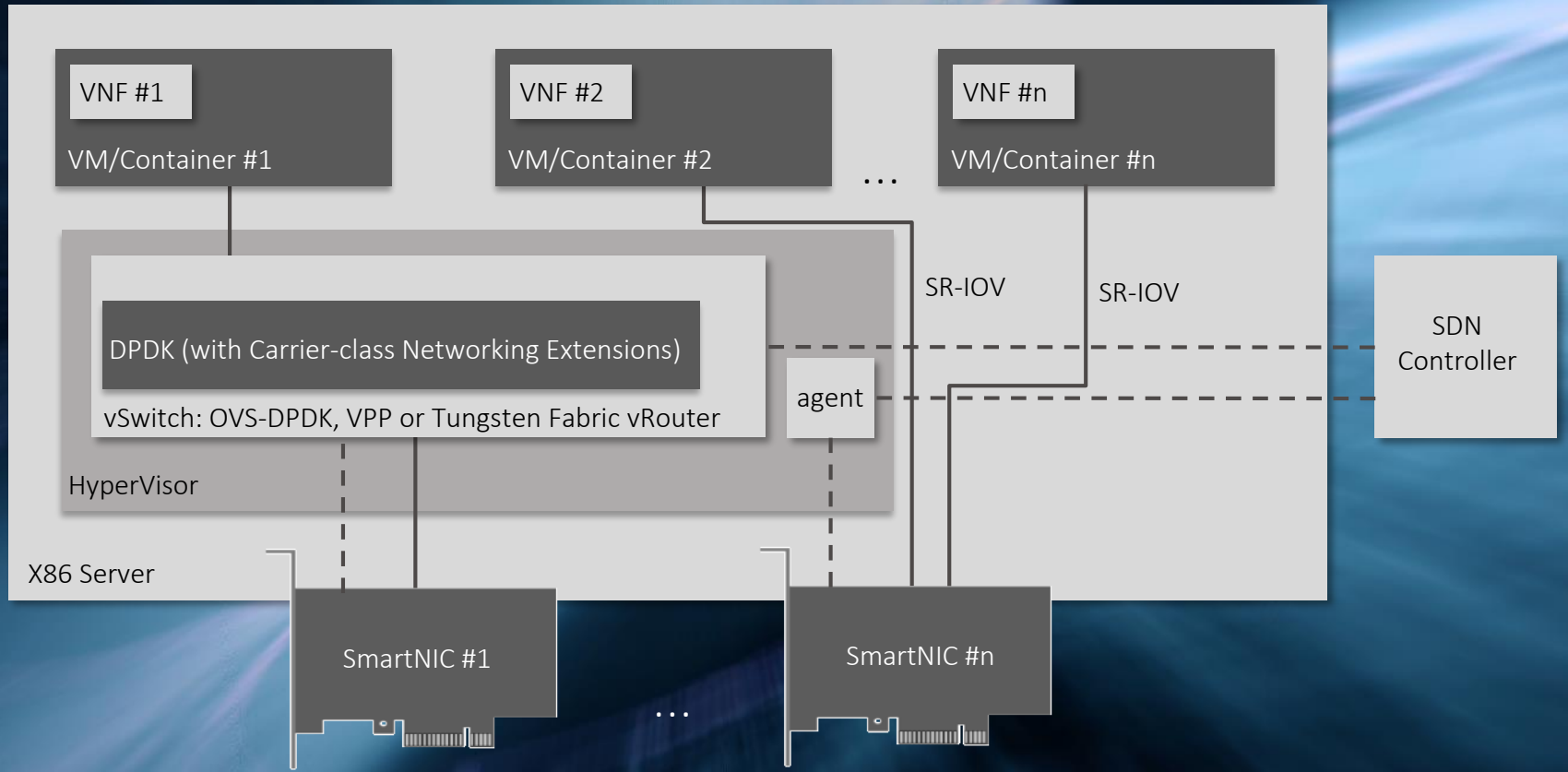
- Scalability: millions of users/devices
- Low power and minimal space: less servers, lower CPU load
- Security: flow isolation
- Open: Intel and Xilinx, easily ported
- Future proof: HW updates at the pace of SW development
- Compact: multiple applications in a single server
- High performance: deterministic, low latency



Two Typical Offloading Options

II. VNF offload

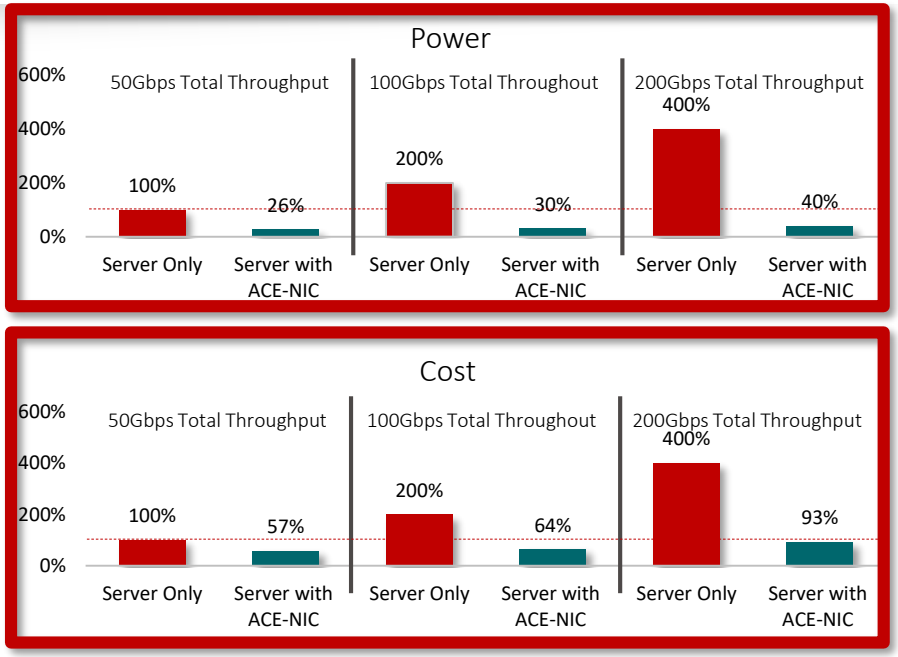


Just Released: ACE-NIC100 SmartNIC

PR: Ethernity Networks Releases the 100G ACE-NIC100 FPGA-based Smart NIC

- FH/HL
- Fully programmable, FPGA-based
- 10G, 25G, 40G, 100G ports
- PCIe Gen3 x16, DDR4 for packet buffering
- Complete networking IP for the edge:
  vCPE, vEPC, vBNG/vBRAS, vFW, SecGW, SD-WAN
- Carrier-class DPDK acceleration

Example: Accelerated vs. SW-Only vBNGs

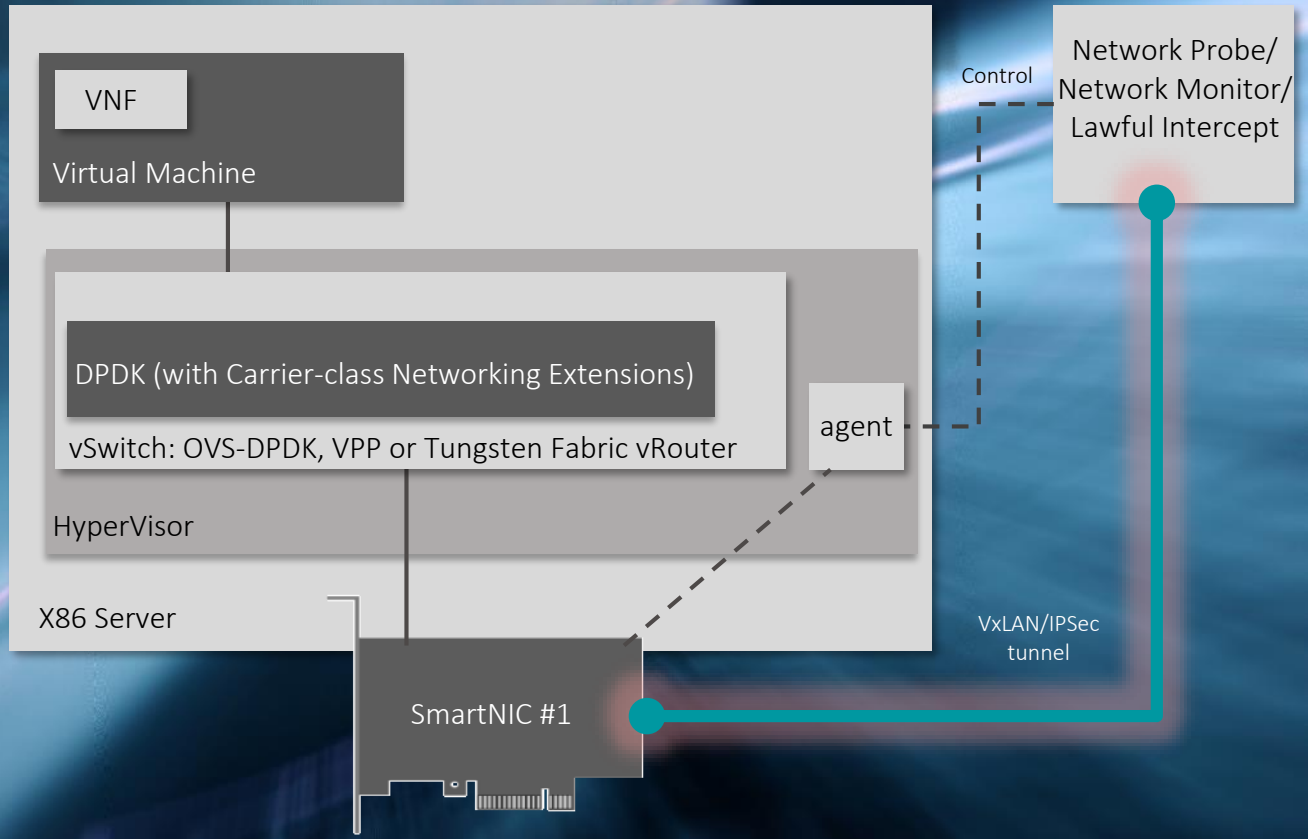


- This analysis is based on Intel's figures and Ethernity Networks' tests.
- Assuming 3Mbps user rates and 8,300 users in the 50Gbps case. Higher user rates are significantly more challenging for server-only solutions.
- Not covered above, server-only consumes more real estate and has over 100microsec delay and large delay variation (EANTC and Nokia tests). Deterministic performances with less than 15microsec are assured by ACE-NIC HW acceleration.

ACE-NICs make vBNG realistic!

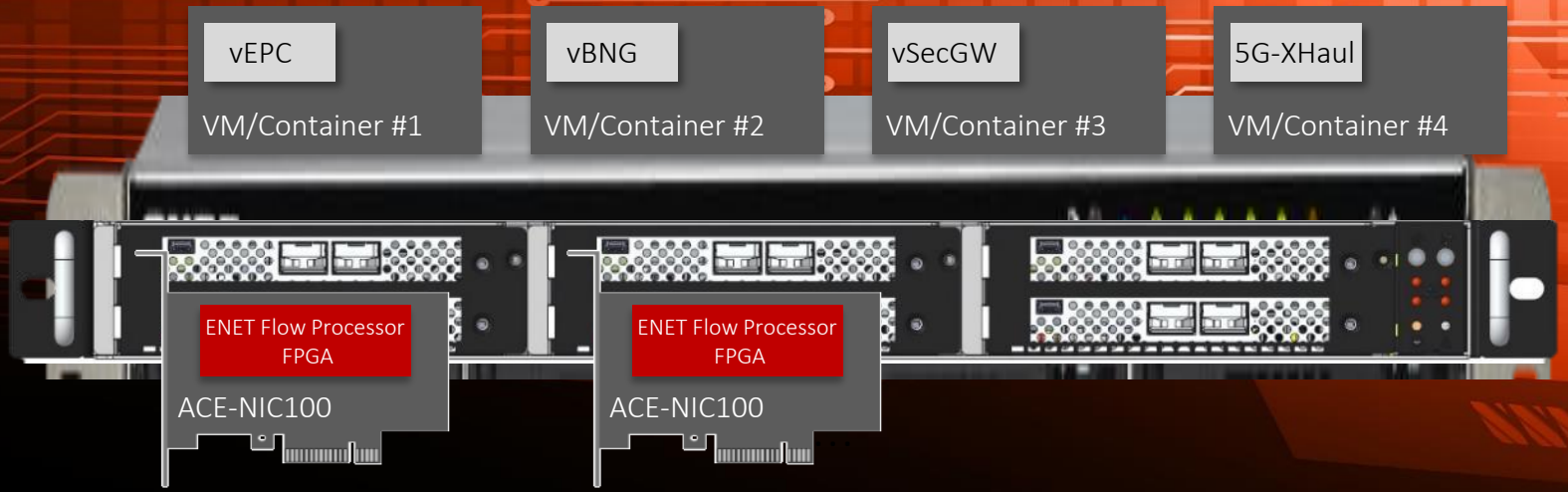
Example: Tap as a Service

- Flow-based tapping of flows to monitor/probe
- Flexible flow classification
- Can tap any flow (n-tuple)
- Programmable tunnels
- Millions of flows



Multi-Access Edge Computing (MEC)

- 1U server-based solution with HW acceleration
- Optimal for network edge deployment
- High performance, fully programmable, future-ready



About Ethernity Networks

- ✓ Leading innovator of network processing technology and products
  - ✓ Systems-on-Chip (SoCs) – IP licensing
  - ✓ SmartNICs and innovative server-based network appliances
- ✓ Over 500,000 systems already deployed with Ethernity's data processing technology, connecting over 100M end users
- ✓ Unique patented networking technology, FPGA-based
- ✓ Founded in 2004, public company traded on AIM of the London Stock Exchange
- ✓ HQ in Israel, sales offices in North America and Asia

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Takeaways

- ✓ Virtualization is happening at the edge
- ✓ The virtualized edge has some unique requirements
- ✓ FPGA-based SmartNICs address the virtualized edge requirements
- ✓ Ethernity Networks has a full solution for the virtualized edge

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Questions and Answers?

Moderator

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Thank you

For your attention

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