Where is uCPE Going in 2021?

An Open Source Approach to Secure SD-WAN

January 19, 2021

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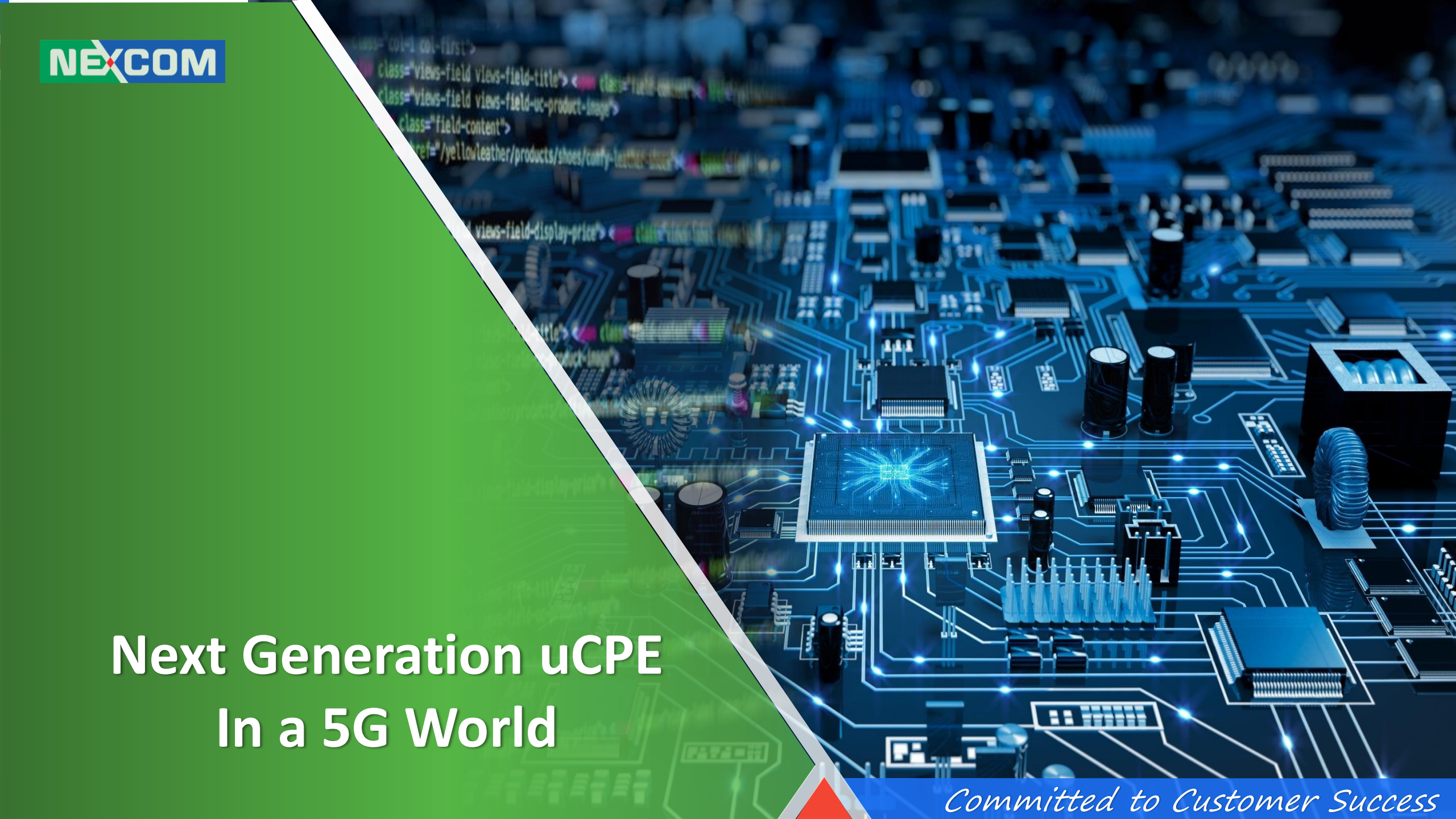
NEXCOM

Next Generation uCPE In a 5G World



Committed to Customer Success

Fact Sheet

NEXCOM International Co., Ltd.

Established	November 1992, Taipei, Taiwan
Listing Information	A Public Company, Taipei Stock Exchange (TWSE 8234)
Subsidiaries	USA, UK, China, Taiwan, Japan
Worldwide Workforce	1,500+

About NEXCOM

Founded in 1992, NEXCOM integrates its diverse capabilities and operates 6 global businesses, including Network & Communication Solutions. Its platforms are widely adopted in:

- Cyber Security
- Load Balancing
- uCPE
- Routers
- SD-WAN
- Edge Computing
- Content Delivery Network (CDN)
- Network Video Recorder (NVR)

As well as other network applications that help customers build their IT infrastructure.

NEXCOM's other business units include Industry 4.0 smart manufacturing solutions, robots, industrial wireless solutions and IoT security.

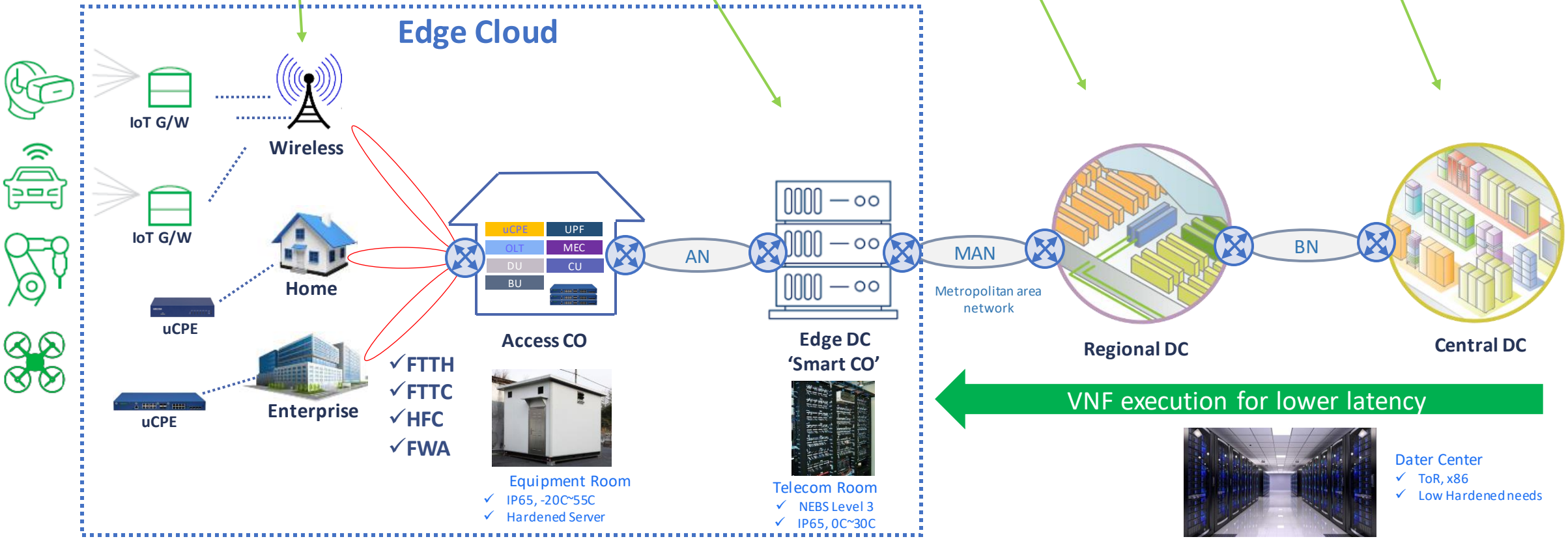
5G Networking Topology

Edge/Endpoint
82% plan VNF execution on **uCPE** at customer sites

Edge
97% of operators plan VNF execution in **Edge Data Center**

Partial Edge
85% of operators plan VNF execution in **Data Center Near Central Office**

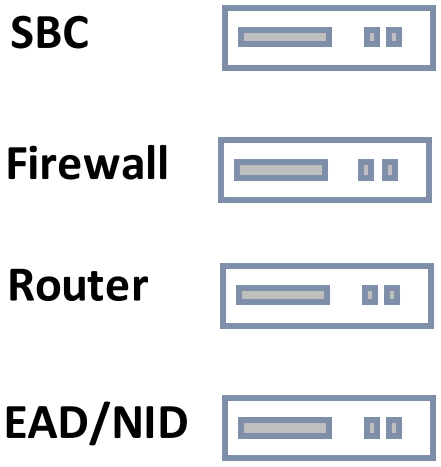
Core
70% of operators plan VNF execution in **Data Center Not Near Central Office**



Customer Premises Equipment Transformation

Legacy CPE

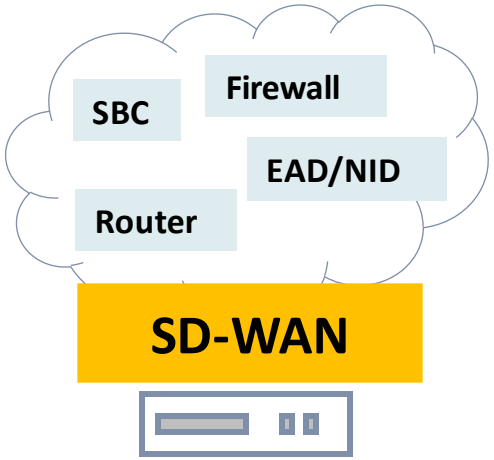
(Proprietary OEM Gear)



Proprietary Hardware

uCPE

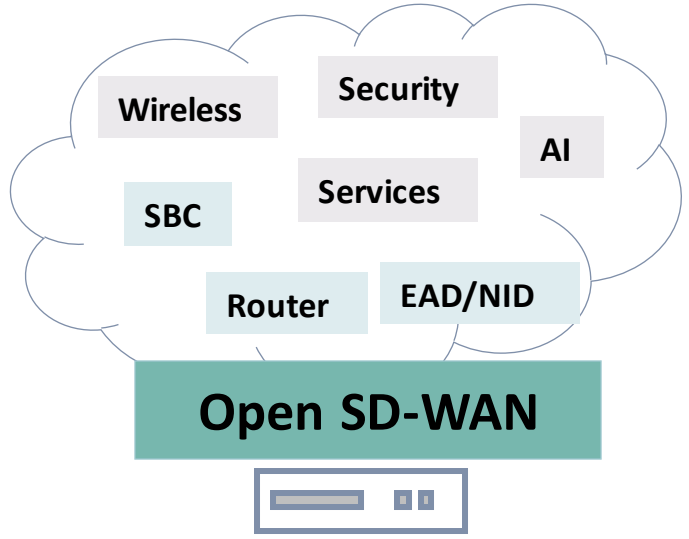
(Commercial off the shelf, COTS)



Off the Shelf Hardware

Next Generation uCPE

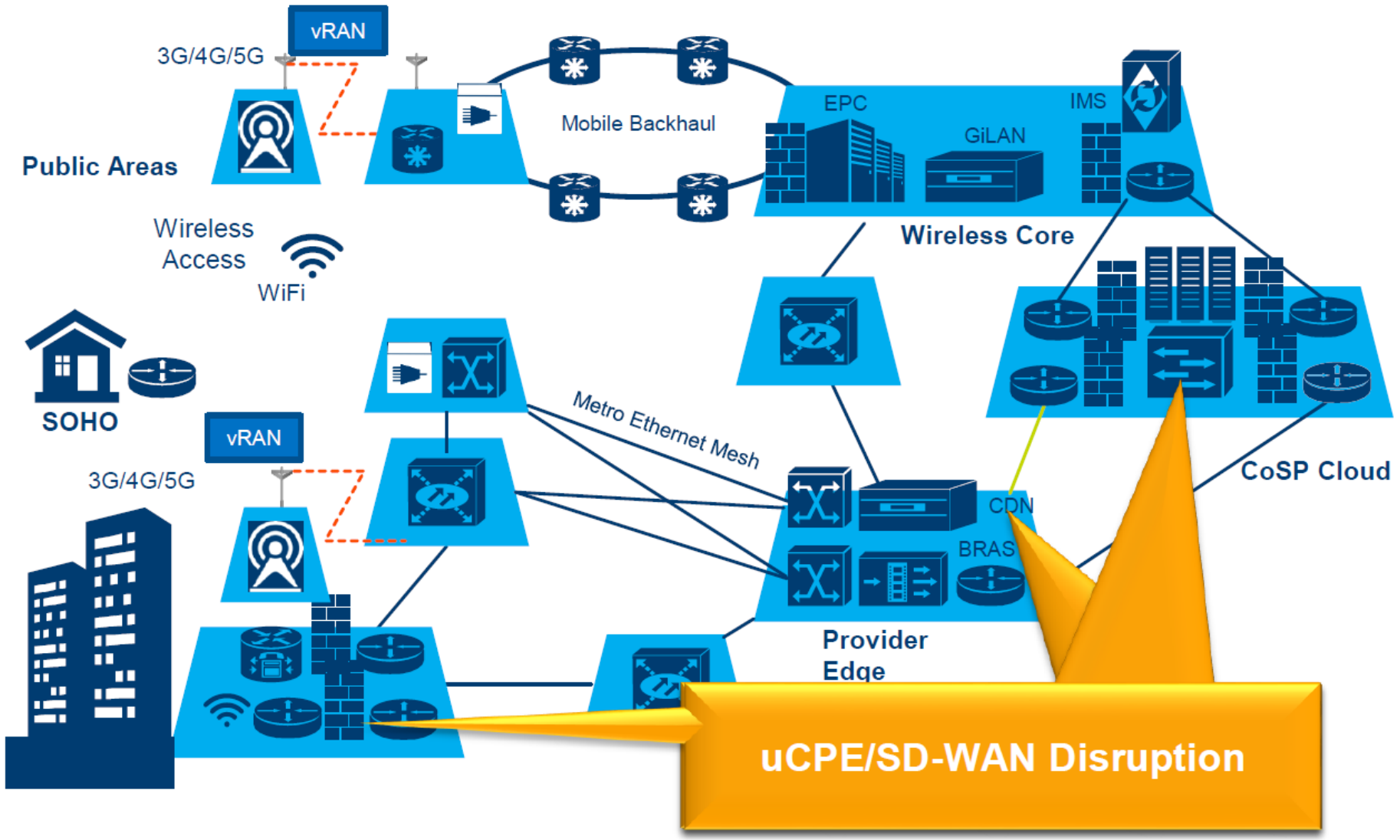
(Open Architecture)



Open Hardware

Open architecture drives lower cost, advance innovation and better flexibility/scalability

Enterprise and Service Provider Transformation



SD-WAN

- ✓ WAN Link Optimization
- ✓ Centralized Policy Control
- ✓ Real Time Analytics
- ✓ Service Can Be Provided as a VNF @ CPE

uCPE

- ✓ Delivery of Enterprise Services as VNFs
- ✓ Delivered on 'white box' HW or pre-integrated
- ✓ Reference platform

3 Deployment Locations

- ✓ Customer Premise
- ✓ Provider Edge (CO/POP)
- ✓ CoSP Clould/Datacenter

Workload-driven uCPE Hardware Platform

VNFs @ POP/DATA CENTER	Routing, VPN, FW, CGNAT, WiFi CTRL, SD-WAN CTRL	Routing, VPN, FW, IPS, SBC, CGNAT, WiFi CTRL, SD-WAN CTRL	FW, IPS, CGNAT, SBC, SD-WAN CTRL	WAN Accel, SD-WAN CTRL
SERVICE PROVIDER / ENTERPRISE	SOHO	Small Branch	Medium Branch	Large Branch
VNFs @ CPE	SD-WAN, VPN, Routing	DPI, SD-WAN, VPN, vRouter	DPI, VPN, WAN Accel, SD-WAN, WAC, vRouter	Routing, VPN, WiFi CTRL, WAN Accel, FW, IPS, SD-WAN, vRAN
	1-2 VNFs	1-4 VNFs	2-6 VNFs	6+ VNFs
INTEL® TECHNOLOGIES TO DRIVE PERFORMANCE, SCALE, & SECURITY	**Intel Atom® Processors (2-core)**	**Intel Atom Processors (4-core or 8-Core)**	**Intel Atom Processors (12-core to 16-core)** **Intel® Xeon® D Processors**	**Intel Xeon D Processors** **Intel® Xeon® Scalable Processors**
	• Data Plane Developer Kit • Intel® QuickAssist Technology • Hyperscan	• Intel® Virtualization Technology • Intel® AES New Instructions • Intel® Run Sure Technology	• Intel® Trusted Execution Technology • Intel® Platform Trust Technology	

Detailed validation is in the whitepaper

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Summary

- uCPE/SD-WAN is taking off
  - Underlying use case for NFVi
  - Driven by Enterprises and CoSPs
- Next generation uCPE is adopting open hardware and open SD-WAN to reduce OPEX and CAPEX
- Large and fast growing ecosystem of vendors and technology partners to deliver best-in-class products

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Thank You

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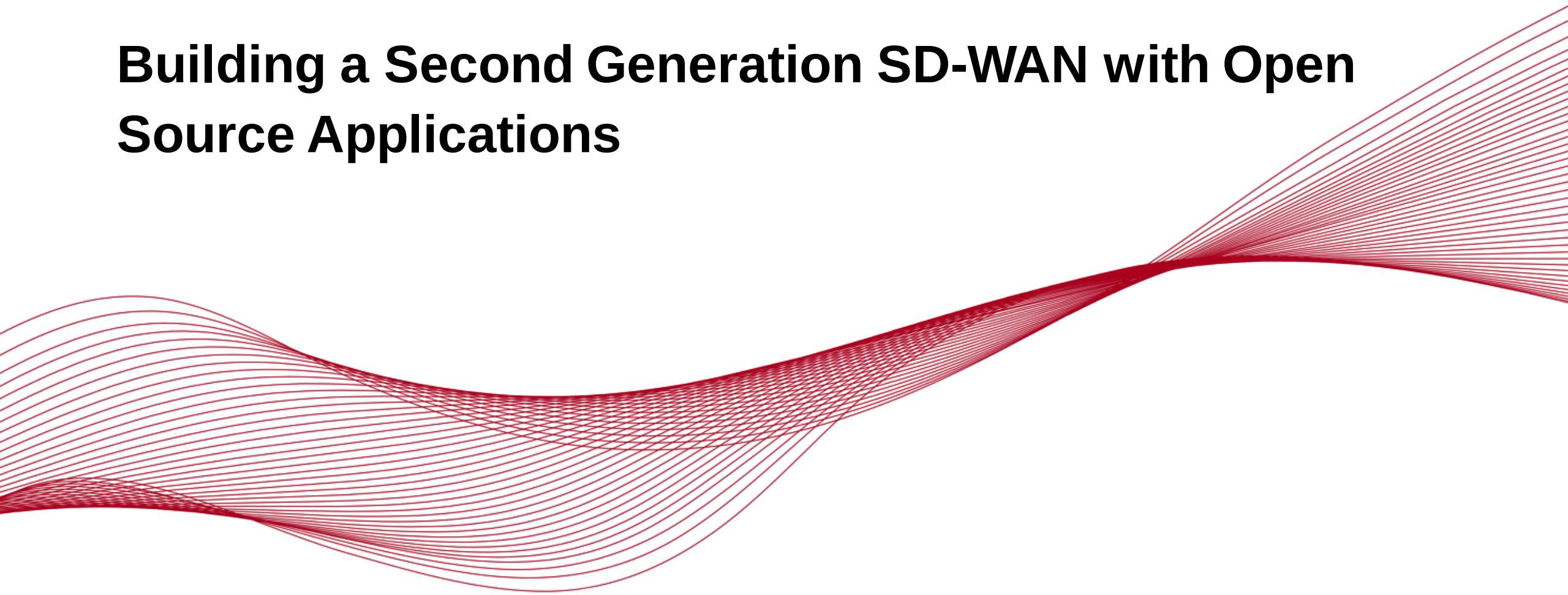
Building a Second Generation SD-WAN with Open Source Applications



Contents

- Enea – who are we?
- Why uCPE for SD-WAN and how to get there
- Open source applications
- Benchmarks
- Conclusion

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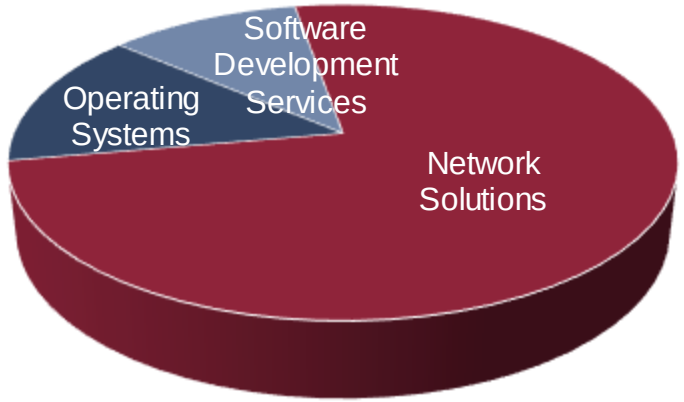
What We Do at Enea

Software Development Services

Network Solutions

Edge Virtualization and Operating Systems



Edge virtualization

Traffic management

DPI

5G data management

WiFi

Software development

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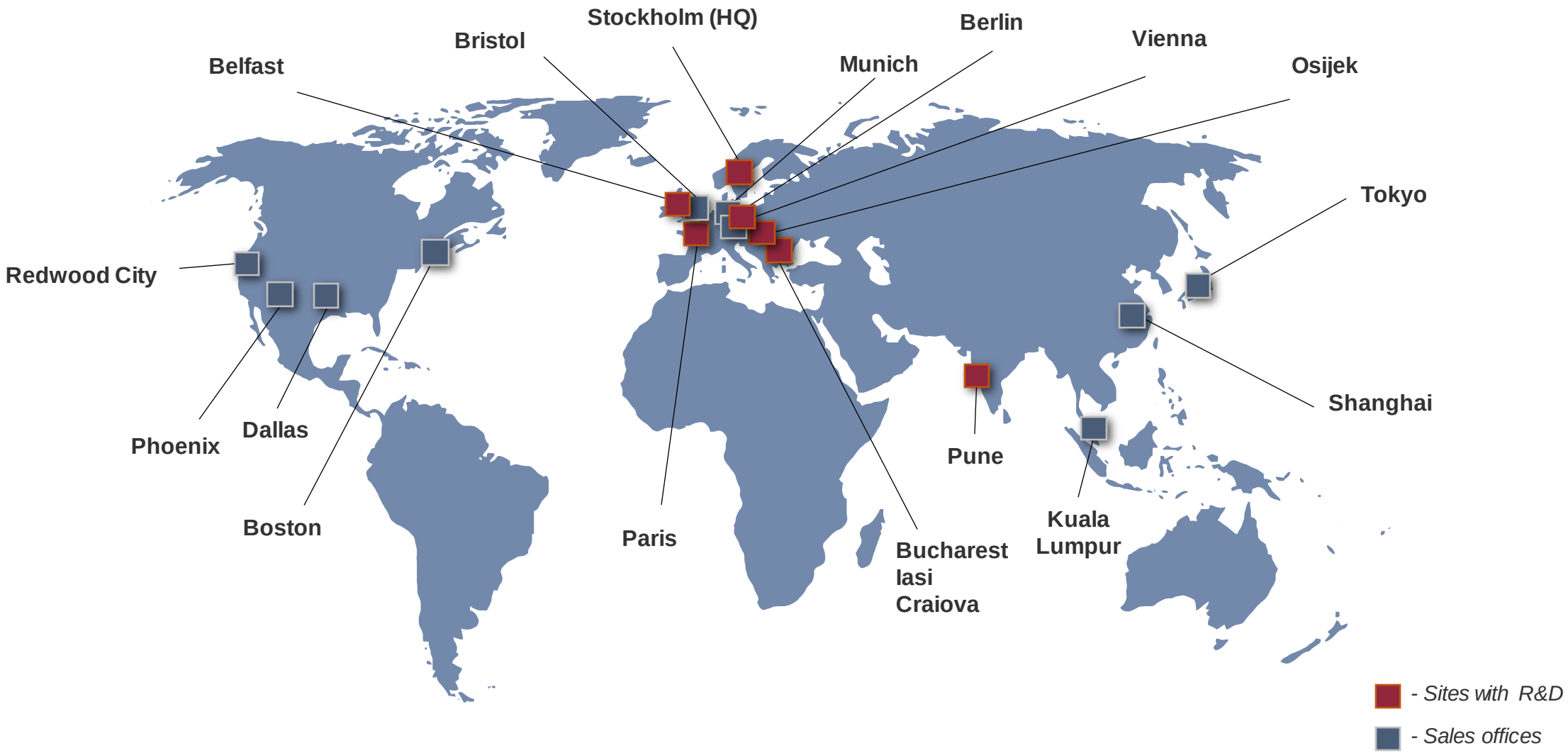
Where We Are



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Why uCPE?

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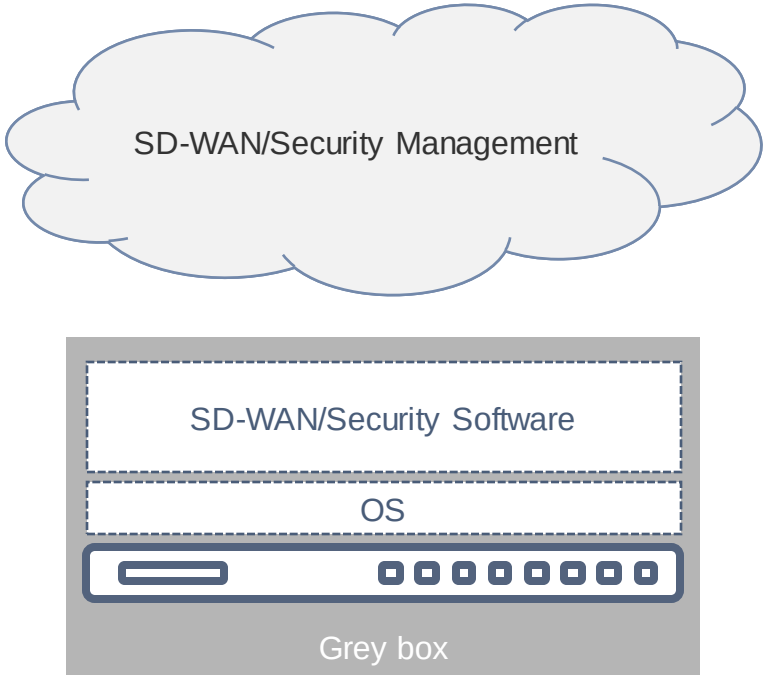
1st and 2nd Generation SD-WAN – A True Story!



- **Multi-link**
- **Cloud breakout**
- **Centralized management**

- **Issues with 1st Generation SD-WAN**
  1. Costly installation and support due to several physical devices (CPE, router, FW)
  2. Lack of flexibility due to lock-in with single vendor of SD-WAN
  3. Service Provider not able to offer differentiated services according to customer requirements
  4. Innovation is slow and depends on vendor roadmap

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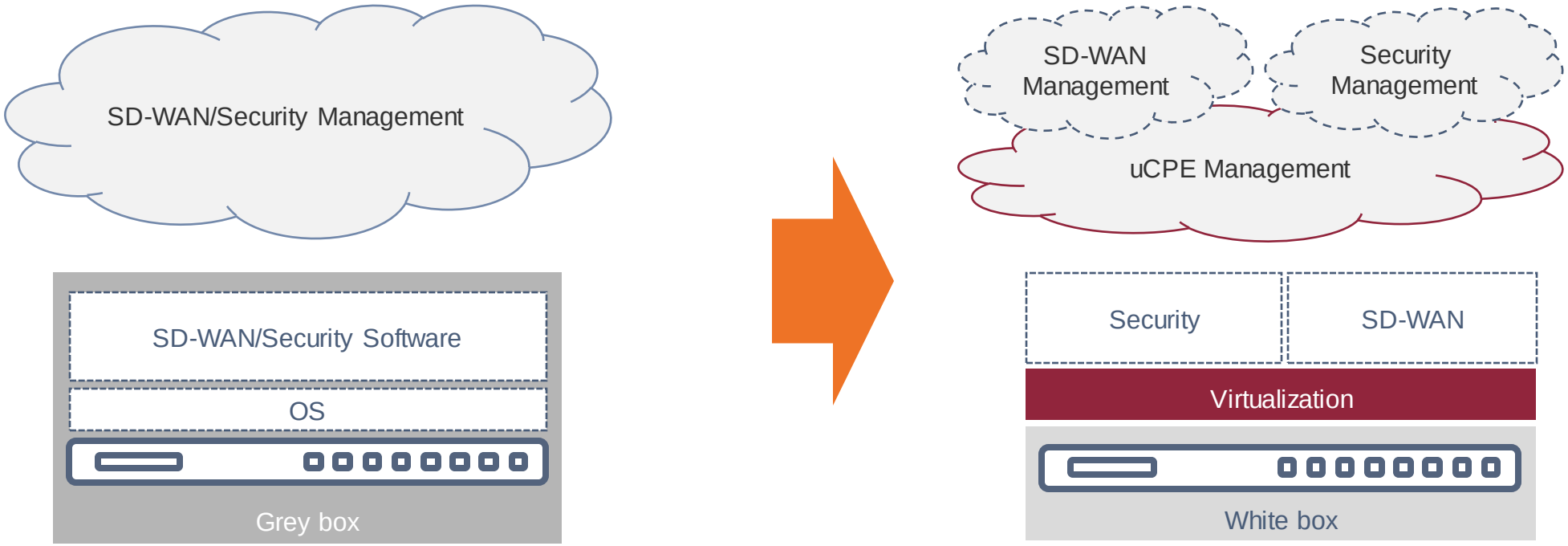
1st and 2nd Generation SD-WAN



- **Multi-link**
- **Cloud breakout**
- **Centralized management**

+

- **Multi-vendor**
- **No vendor lock-in**
- **Adaptable to customize and evolve**

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5 Benefits with uCPE

1. Future proof
2. Value added services
3. Agility
4. No vendor lock- in
5. Reduced cost

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Moving to uCPE

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Moving to uCPE in Three Steps

1. Plan use cases and determine dependencies
2. Introduce virtualization
3. Extend and evolve

Typically 3-6 months

Continuously

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Open Source – A Deployment Ready Solution

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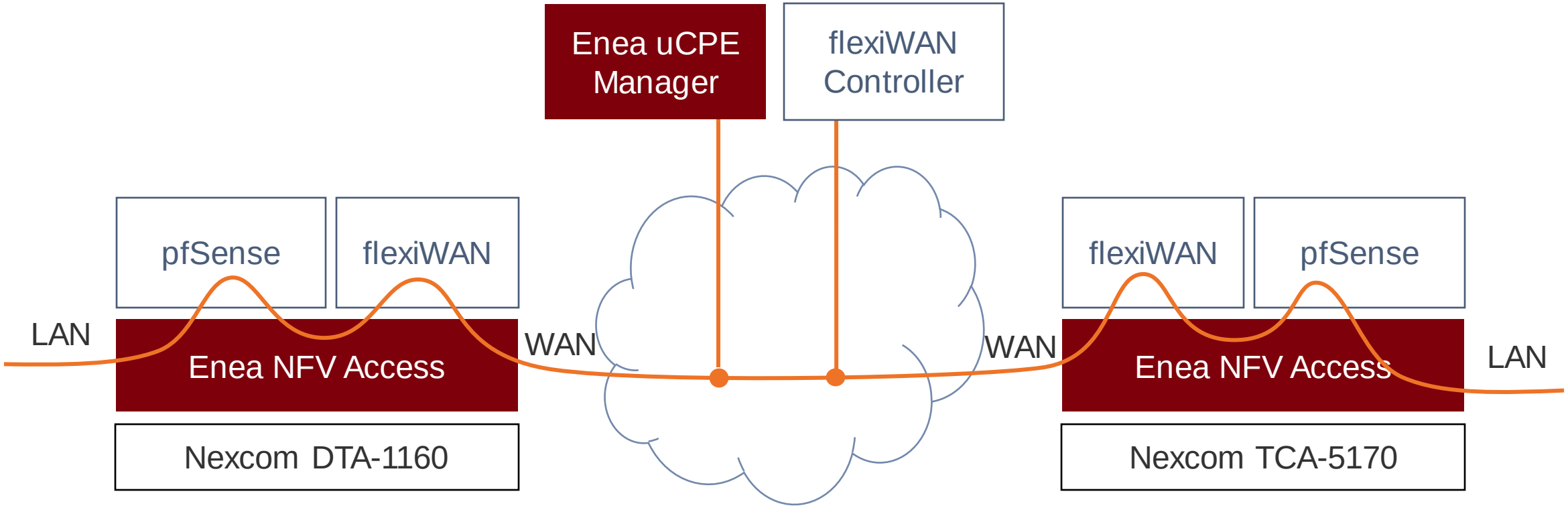
Security Protected Open Source SD-WAN on uCPE



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Open Source Components

- **flexiWAN is a pioneer for the second wave of SD-WAN**
- **flexiWAN is an open source SD-WAN solution**
  - flexiEdge is the SD-WAN application
    - A fully transparent open source project
  - flexiManage is the management application
    - Has a commercial license
    - Up to three flexiEdge instances are free-of-charge

- **pfSense is an open source Firewall/Router application**
  - The pfSense project is hosted and developed by Rubicon Communications, LLC (Netgate).
  - Commercial support is offered by Netgate
- **pfSense is managed from a Web GUI**

https://flexiwan.com/

https://www.pfsense.org/

Benefits with an Open Source SD-WAN Solution

- **Accessible technology**
  - Download – build – deploy
- **Cost-effective solution**
  - “Almost free-of-charge”
- **Great for evaluations**
  - Explore new technology/applications
  - Define your requirements
- **Based on uCPE, the solution can evolve**
  - Applications can be extended or replaced over time
- **There are deployment-ready solutions**

Benchmarking the Solution

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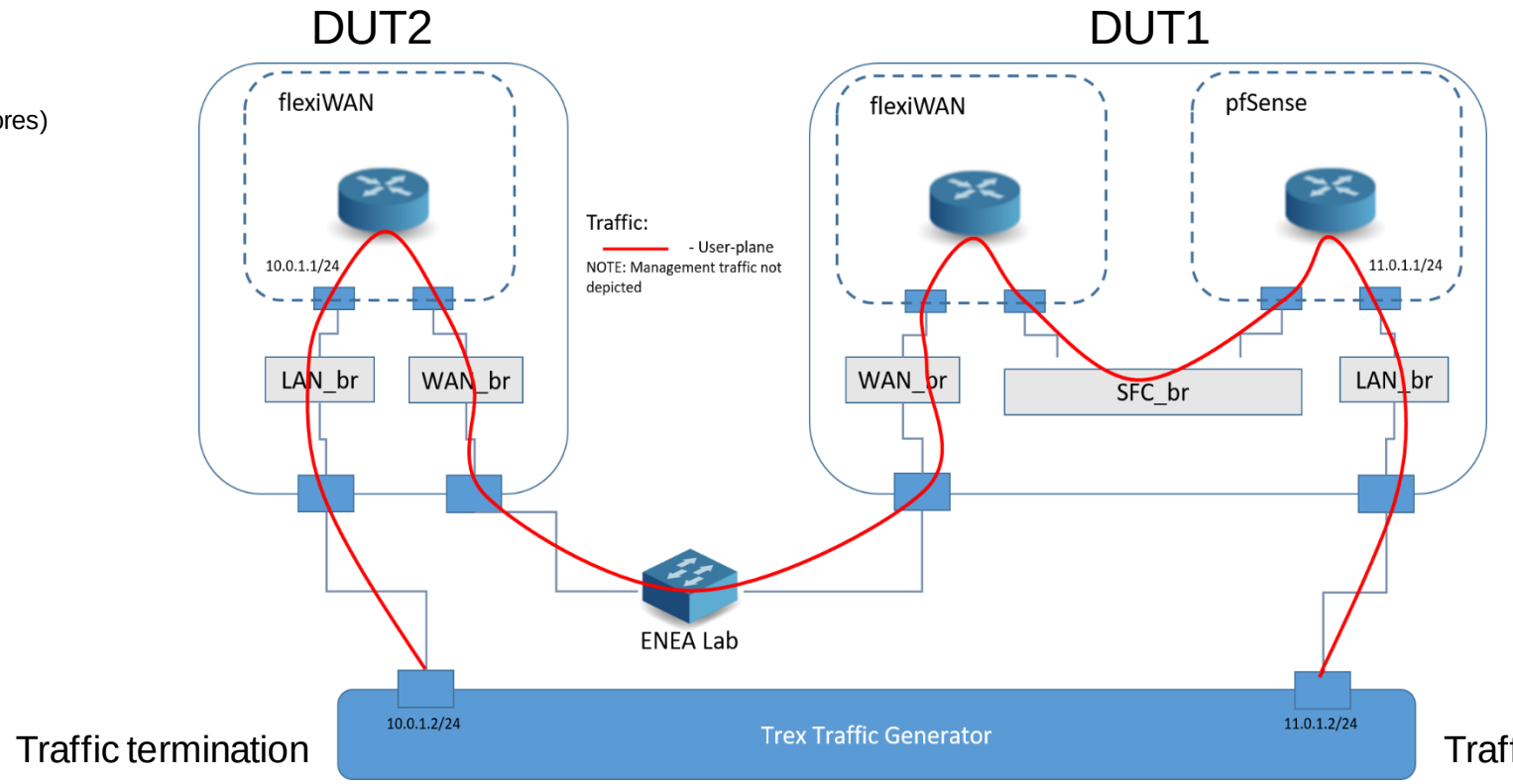
System Under Test Configuration

DUT2
Intel Xeon D-2145NT (8 cores)
NFV Access:
- 1core

DPDK/OVS:
- 3 cores

FlexiWAN VNF:
- 2 cores,
- 4GB RAM,
- 10GB HDD,
- Linux Ubuntu 18.04.3,
- FlexiEdge 1.3.17



DUT1
Nexcom DTA-1160
- 8x Intel Atom C3758

NFV Access:
- 1core

DPDK/OVS:
- 3 cores

pfSense VNF:
- 2 cores,
- 4GB RAM,
- 10GB HDD,
- 11.3-STABLE,
- pfSense 2.4.5-RELEASE (Patch 1)

FlexiWAN VNF:
- 2 cores,
- 4GB RAM,
- 10GB HDD,
- Linux Ubuntu 18.04.3,
- FlexiEdge 1.3.17

- **IPv4 traffic**
- **10 Gbps WAN connections**
- **TRex Advance Stateful feature sets (ASTF) for emulation of L7 applications, e.g HTTP/HTTPS**

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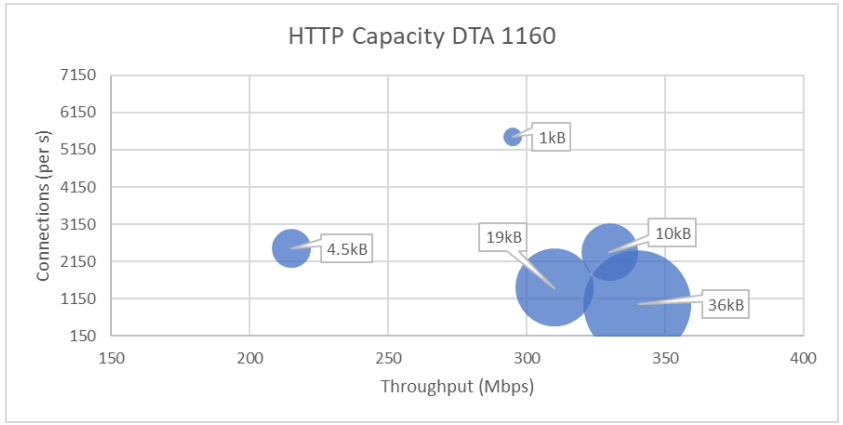
HTTP Capacity

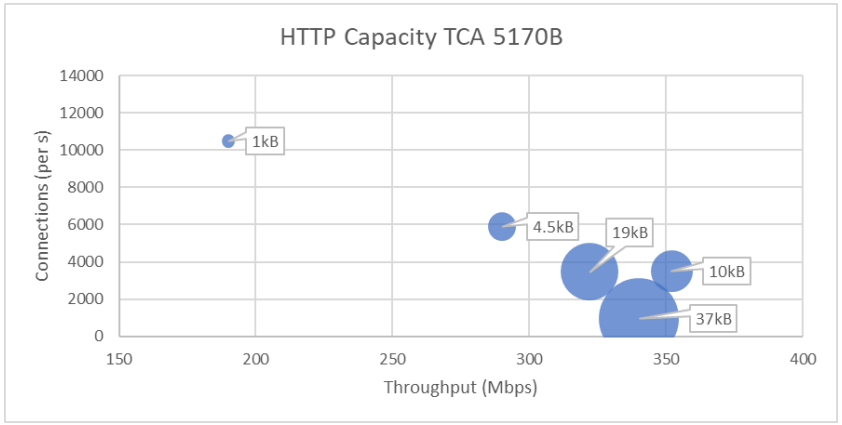
Nexcom DTA 1160

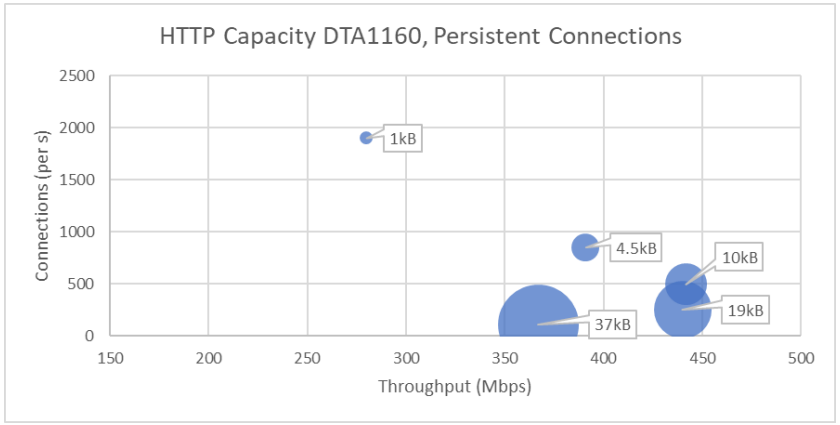
- 8-core Intel Atom C3758

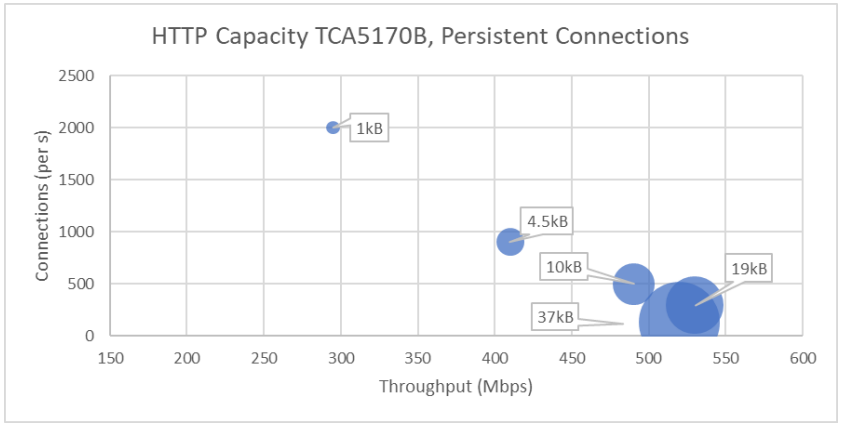
Nexcom TCA 5170B

- 14-core Intel Xeon D-2177NT









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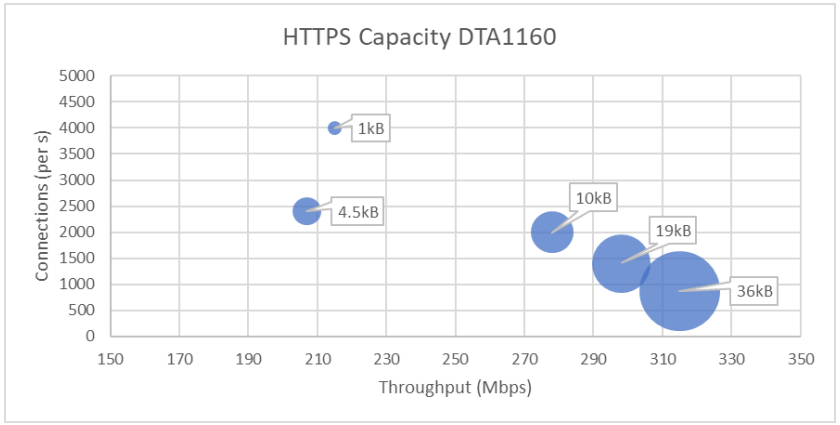
HTTPS Capacity

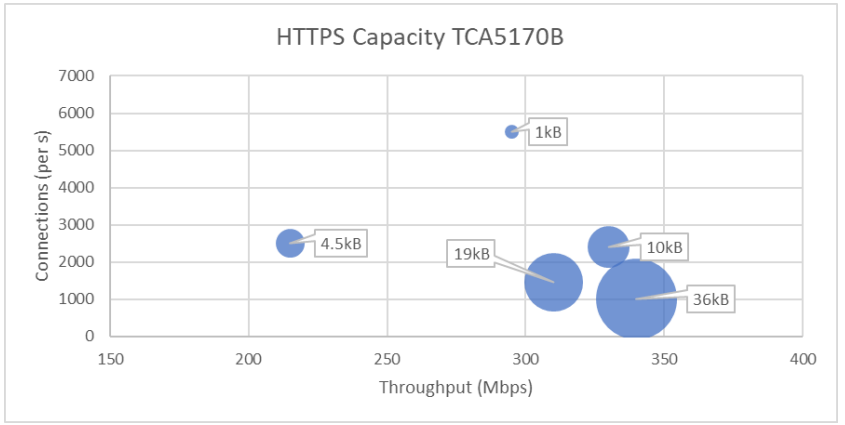
Nexcom DTA 1160

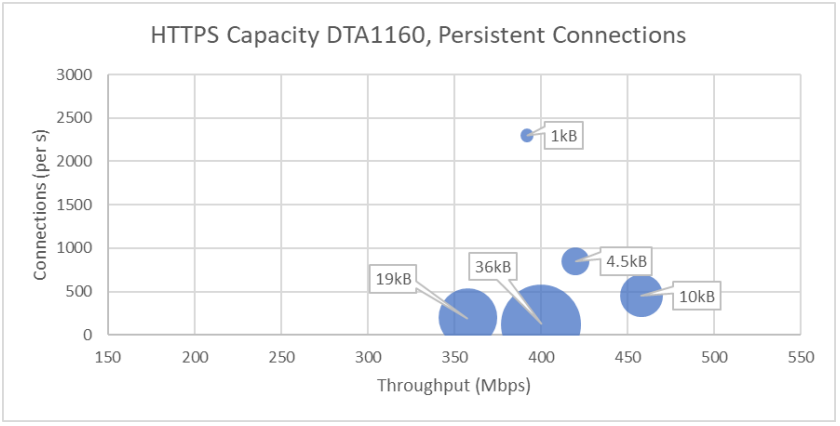
- 8-core Intel Atom C3758

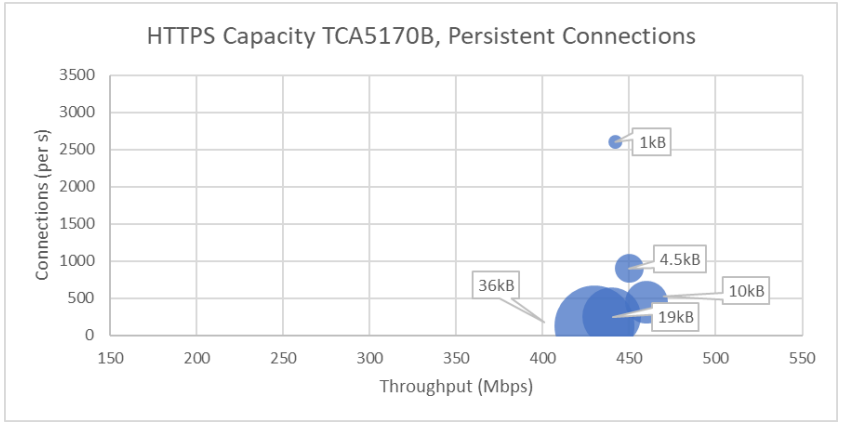
Nexcom TCA 5170B

- 14-core Intel Xeon D-2177NT









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Latency

Nexcom DTA 1160

- 8-core Intel Atom C3758

Latency

Average Latency	Max Latency	Traffic	Traffic type	Jitter
137us	56ms	10%	http 1KB resp	3-10us
270us	58ms	90%	http 1KB resp	20-120us

Nexcom TCA 5170B

- 14-core Intel Xeon D-2177NT

Latency

Average Latency	Max Latency	Traffic	Traffic type	Jitter
100us	50ms	10%	http 1KB resp	1-6us
300us	50ms	90%	http 1KB resp	50-200us

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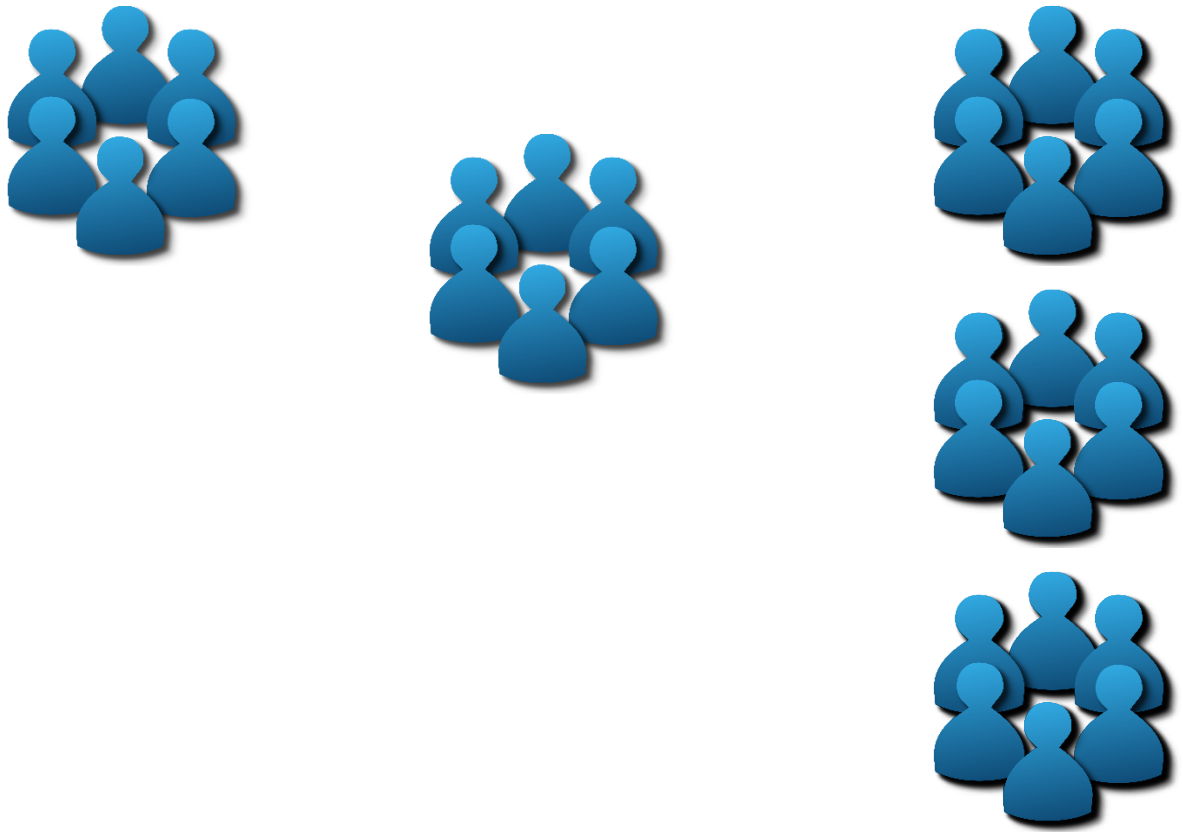
Conclusion

- **Benchmarks with interesting results**
- **The generated Web traffic is similar to what a Small Medium-sized Enterprise (SME) may produce**
  - Both solutions expected to serve up to 300 users
- **This is a business ready solution**
- **The solution is extendable**
  - The TCA 5170B box has sex (6) unused cores
  - Available for applications, like Analytics and/or LTE/5G small cell

Small Medium-sized Enterprise
(up to 300 users)



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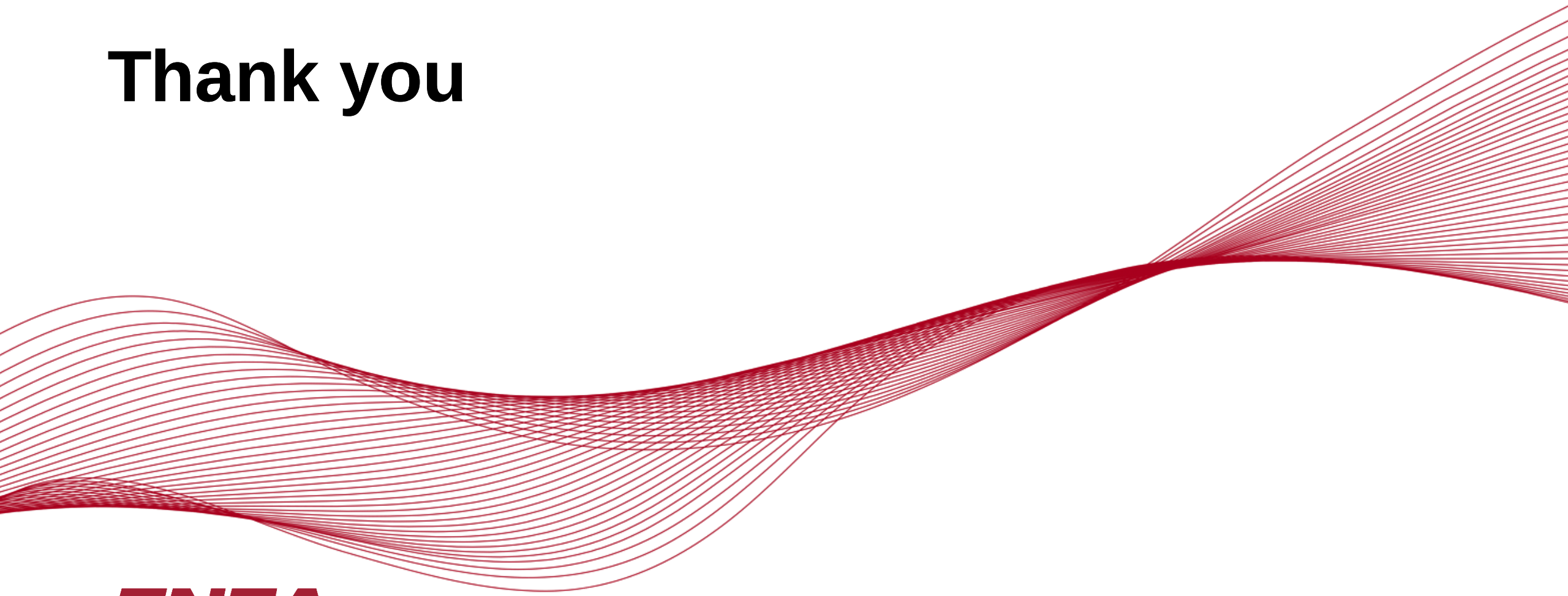
Thank you



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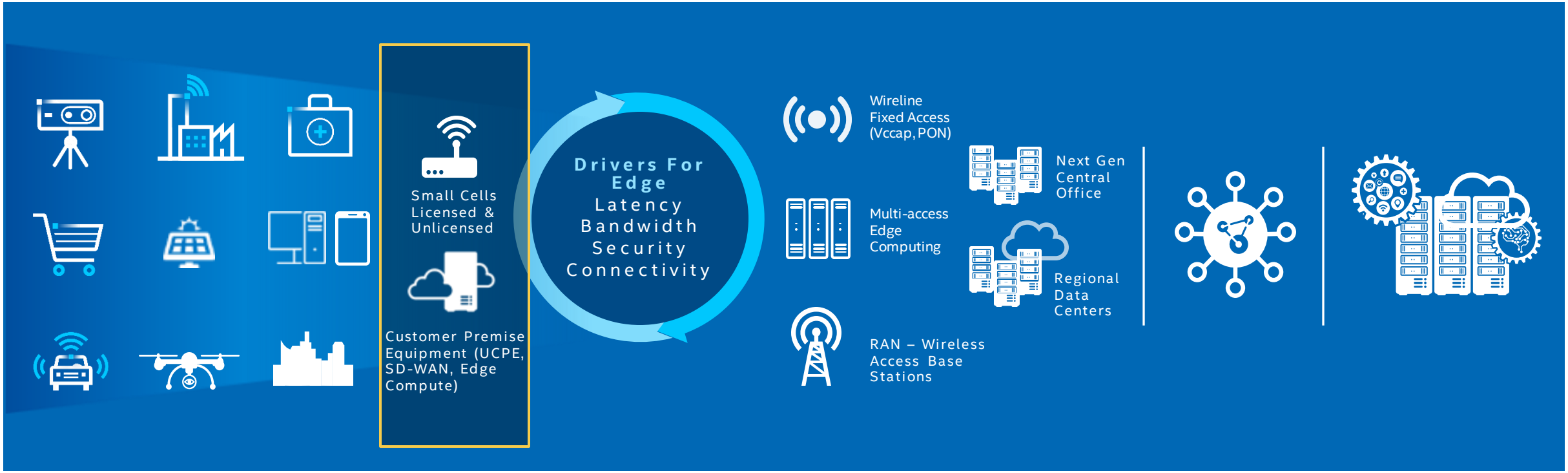
www.enea.com

Future Directions

Workload Convergence at the Enterprise Edge



Devices/Things | **Enterprise Edge** | Network Edge | Core Network | Cloud Data Center

IOT Journey To The Edge

Network Journey To The Edge

Convergence of IT, OT & CT Workloads

Workload convergence

a key enabler for service innovation

Open Network Edge Services Software: OpenNESS

OPEN NETWORK EDGE SERVICES SOFTWARE

OpenNESS is an edge computing software toolkit that enables **highly optimized and performant edge platforms** to on-board and manage applications and network functions with **cloud-like agility across any type of network**

Modular

Microservices Based Architecture

Consume as individual Building Blocks or as Experience Kits

- Kubernetes-based framework
- Service orchestration (EMCO)
- Cloud Native SD-WAN (SD-EWAN)
- Networking, IT/OT apps convergence
- Enterprise and Network Edge
- MEC including private wireless
- Edge inferencing with OpenVINO

Free Distribution from Intel	Cloud Native	IA Optimized for Performance & ROI

Notices and Disclaimers

Tests conducted by Enea in Sept. 2020: Server configuration one was a DTA-1160 server that featured an 8-core Intel Atom C3758 processor (microcode: 0x24) with Intel® Hyper-Threading Technology turned on. BIOS version was 5.13 (G162-006) 11/07/2018. System memory totaled 16 GB. The system featured 20 GB of HDD storage. Network connectivity was provided by an Intel Corporation Ethernet Connection X553 10 GbE SFP+ (rev 11). Enea NFV Access 2.2.2 was the virtualization platform (NFVI), VIM was the Enea uCPE Manager and applications were DPDK OVS (18.02.1), pfSense 2.4.5-RELEASE (Patch 1) and FlexiEdge 1.3.17.

Tests conducted by Enea in Sept. 2020: Server configuration two was a TCA-5170B server that featured a 14-core Intel Xeon D-2177NT processor (microcode: 0x200005e) with Intel® Hyper-Threading Technology turned on. BIOS version was 5.14 (G517-001) 12/18/2019. System memory totaled 64 GB. The system featured 480 GB of SSD storage. Network connectivity was provided by an Intel Corporation Ethernet Connection X722 10 GbE SFP+. Enea NFV Access 2.2.2 was the virtualization platform (NFVI), VIM was Enea uCPE Manager and applications were DPDK OVS (18.02.1), pfSense 2.4.5-RELEASE (Patch 1) and FlexiEdge 1.3.17.

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Performance results are based on testing as of dates shown in configurations and may not reflect all publicly available updates. See backup for configuration details. No product or component can be absolutely secure.

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