WNC Wistron NeWeb Corp.

基於Agilex™ FPGA 的智慧網卡如何增強 O-RAN 效能 以及5G WWC無線與有線匯流之未來

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low-earth orbit (LEO)

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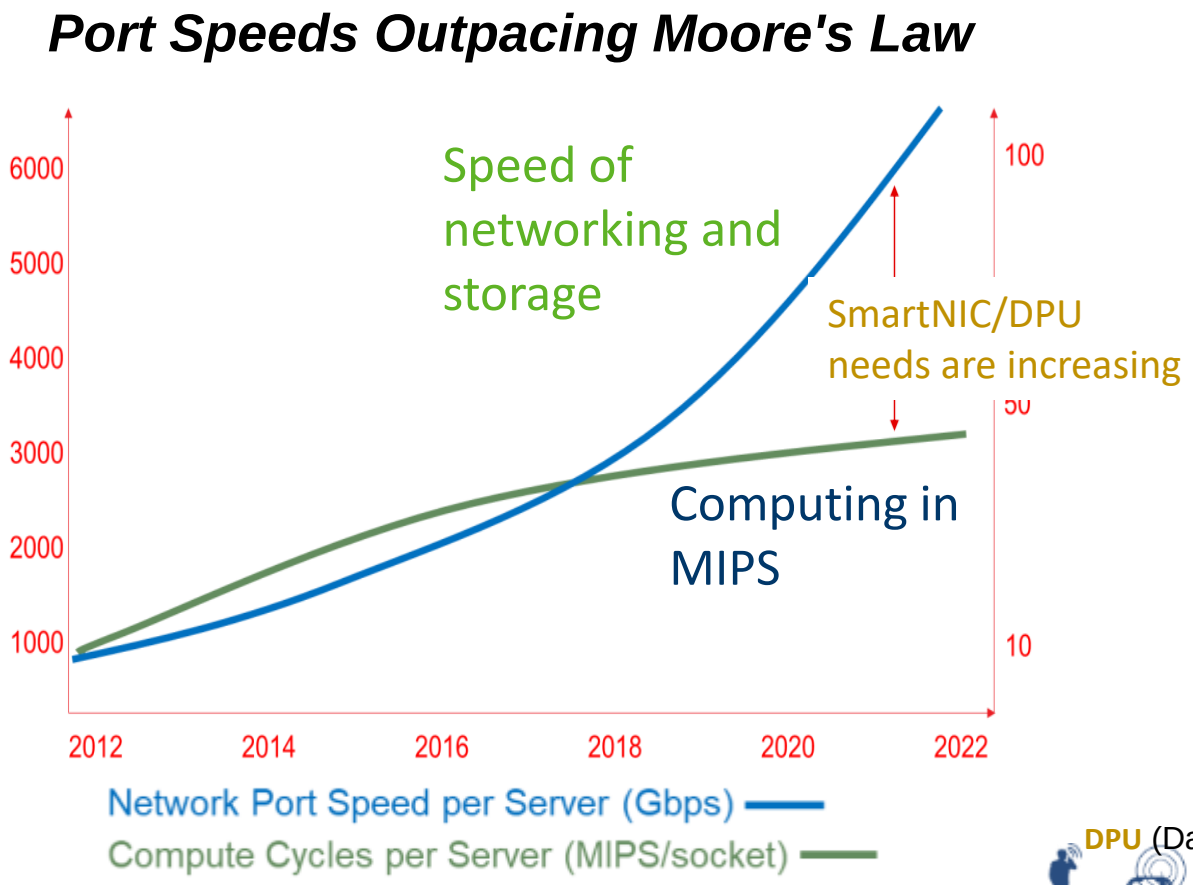
Data Driven Everything: Networking and DPU Matter

1. Data (thru Networking) are driving the decision making with AI/ML
2. Collect, process and transmit data effectively with SmartNIC or DPU



DPU (Data Processing Unit)

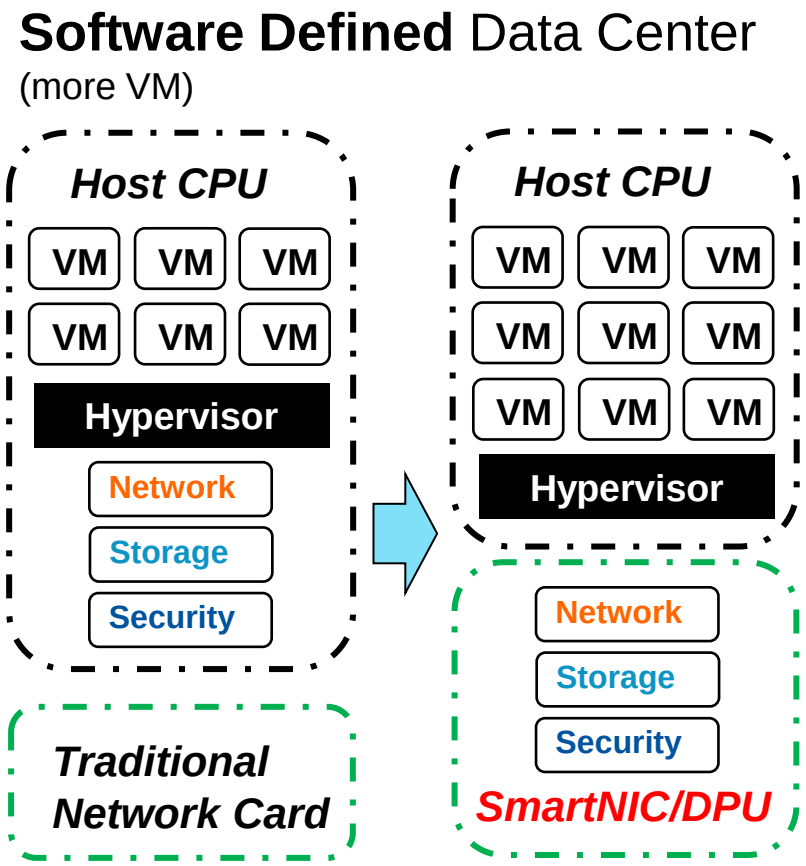
Data is King: CPU Needs DPU for Data Processing

1. Data processing unit (DPU) is a HW accelerator to handle networking packets, data storage or analytics

2. DPUs minimize latency and jitter and free up CPU cores for more VM and app.

3. DPUs have been increasingly used in data centers due to the rise of cloud, big data, security, and AI/ML

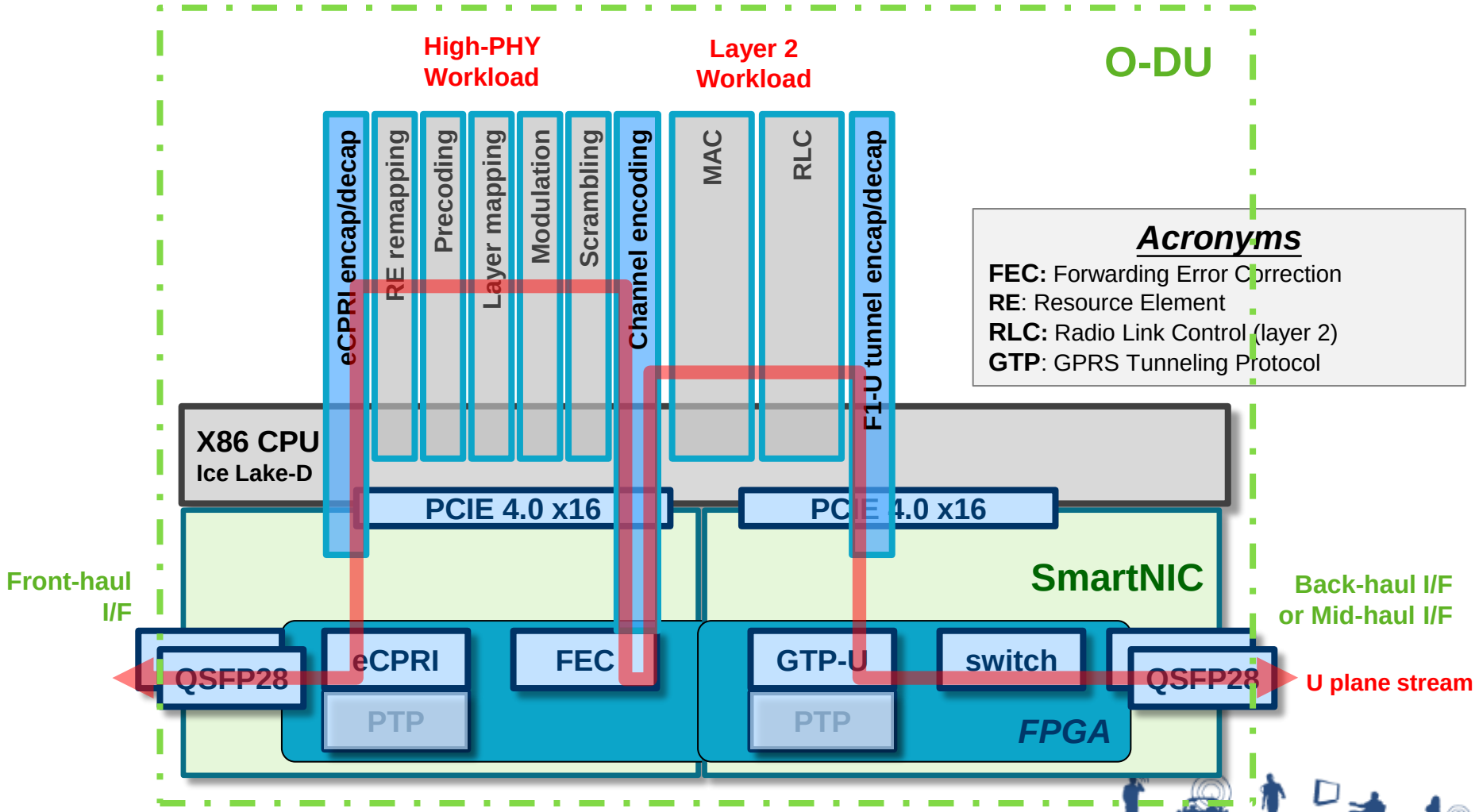
4. SmartNIC offloads functions such as traffic forwarding, firewalling, DPI, encryption/decryption, and monitoring.



VM: virtual machine

5G O-DU/CU Functions with FPGA Acceleration

O-CU (O-RAN Central Unit): runs L3/L2 SW
O-DU (O-RAN Distributed Unit): hosts RLC/MAC/High-PHY layers.



SmartNIC Acceleration PCIe Card

Intel Agilex FPGA-Based SmartNIC

- Software-Defined HW Acceleration
- Real-Time Line-Rate Processing
- Support IOFS (Intel Open FPGA Stack) Software

WSN6050 Series SmartNIC

Applications:

- 5G vRAN/MEC Acceleration
- Network Func Virtualization (NFV)
- Cyber Security
- Ultra-Low Latency for Electronic Trading (aka High Freq Trading)
- AI inference

N6000 (aka Arrow Creek) vs. N3000

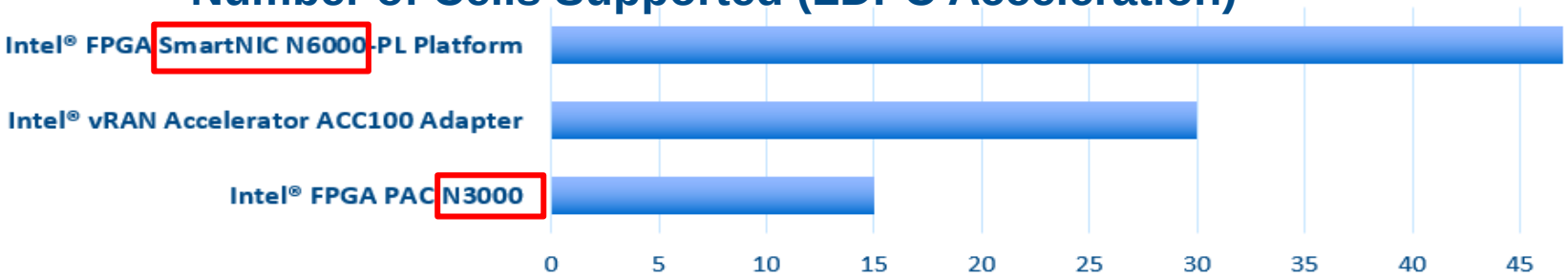
(2013, 20nm)

3x Performance Improvement & TCO Optimization

(2019, 10nm)

PAC N3000	Arrow Creek (N6000)
Integrated FH/BH and FEC	Integrated xHaul and FEC Plus
Arria 10 FPGA and Fortville NIC (XL710)	Agilex FPGA and Columbiaville NIC (E810)
PCIe Gen 3 x16	PCIe Gen4 x16 (Ice Lake Ecosystem)
2x2x25GE; 4x25GE; 8x10GE	2x100GE; 2x4x25GE; 8x10GE
IEEE-1588TC, C3	IEEE-1588GM/BC, SyncE, LLS-C1, C2, C3, C4 (TOD via RJ45)
12 cell 4T4R 20MHz or higher	24-36 cells 4T4R 20MH, 100MHz/80MHz

Number of Cells Supported (LDPC Acceleration)



Video Data: Analog to Serial-Digital to All-IP

1. Video content makes up > 1/2 of the fixed traffic and > 1/3 of the mobile.
2. Media-over-IP: applications of **broadcast and live production** are moving to “All-IP” with SMPTE ST-2110 and timing/sync through 1588/PTP.
3. Camera A/V with JPEG-XS lossless compression of 8K UHD SDI over ST2110 thru 5G enables inexpensive, minimal latency, long distance transmission.

Proprietary vertical integrated boxes

- **Video Mixer**
- **Switcher**
- **Replay Server**
- **Graphics**
- **Broadcast**
- **Audio**

$$$

Standard x86 COTS HW Virtual Machine [VM]

Containerized (VM):
Video Mixer/ Switcher/Replay Server/Graphics/ Broadcast/Audio

$

8K/4K Camera

8K ST2110 Broadcast Mixer

8K JPEG-XS Decoder

COTS (Commercial Off-The-Shelf), SDI (Serial Digital I/F)

vCSR with N6000 SmartNIC

N6000 SmartNIC accelerates 5G X-haul connections with IP-MPLS (multi protocol label switching), O-RAN synchronization and FEC/LDPC

SW on Xeon CPU

- DPDK
- OPAE (Open Programmable Acceleration Engine)

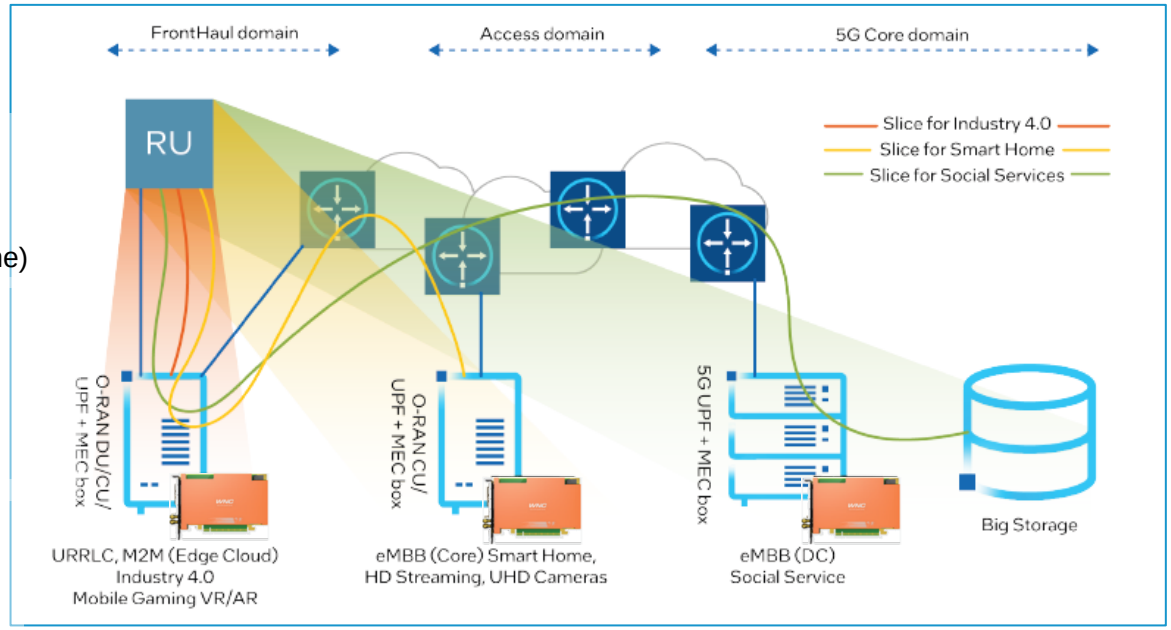
SW on HPS

- Juniper Cloud Native Router (JCNR) stack
- LinuxPTP stack

FPGA

- Multi-layer switching
- MPLS multi protocol label switching
- PTP T-GM, T-BC or T-TSC
- FEC/LDPC acceleration

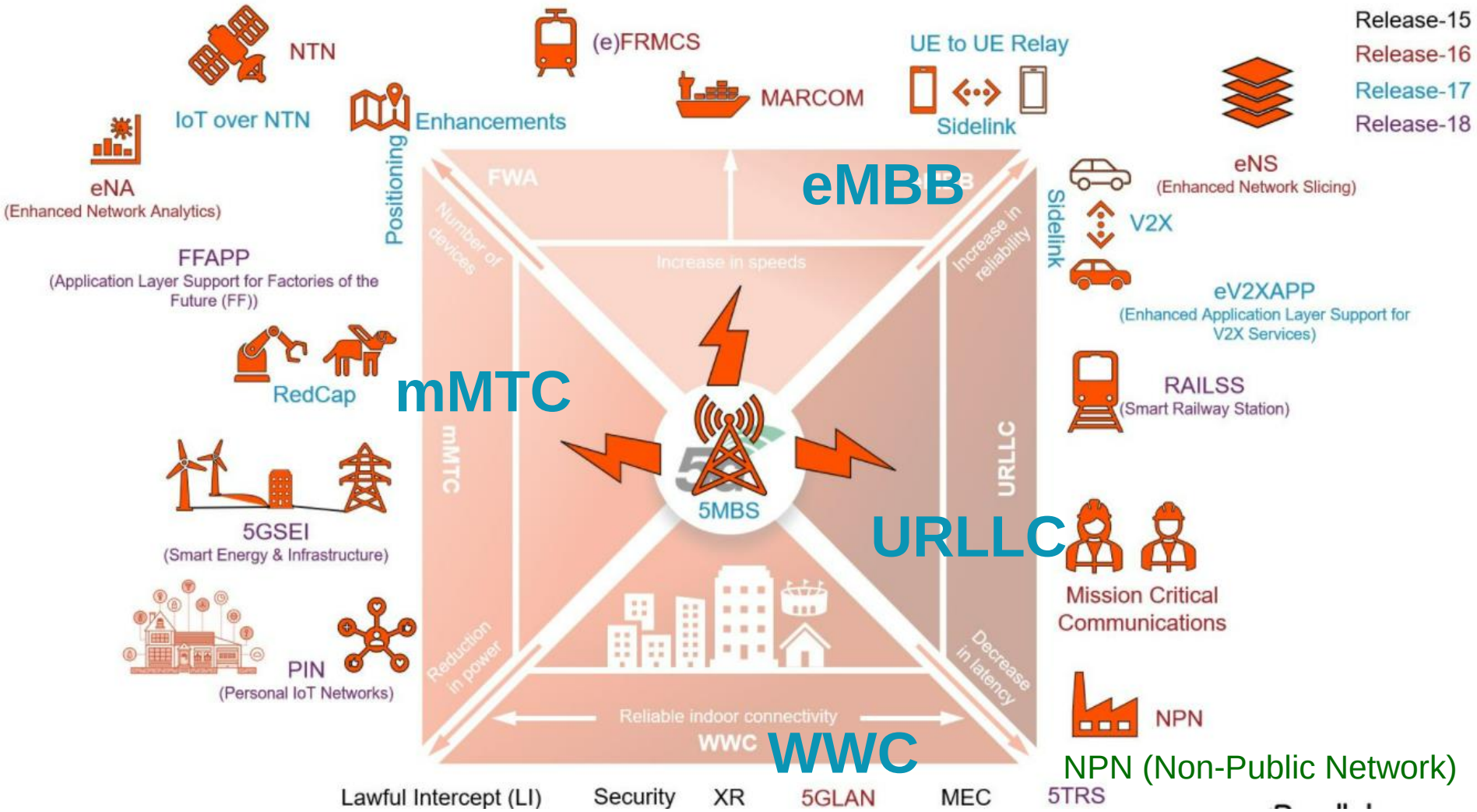
vCSR - Virtual Cell Site Router



WSN6050

5G to 6G Communication

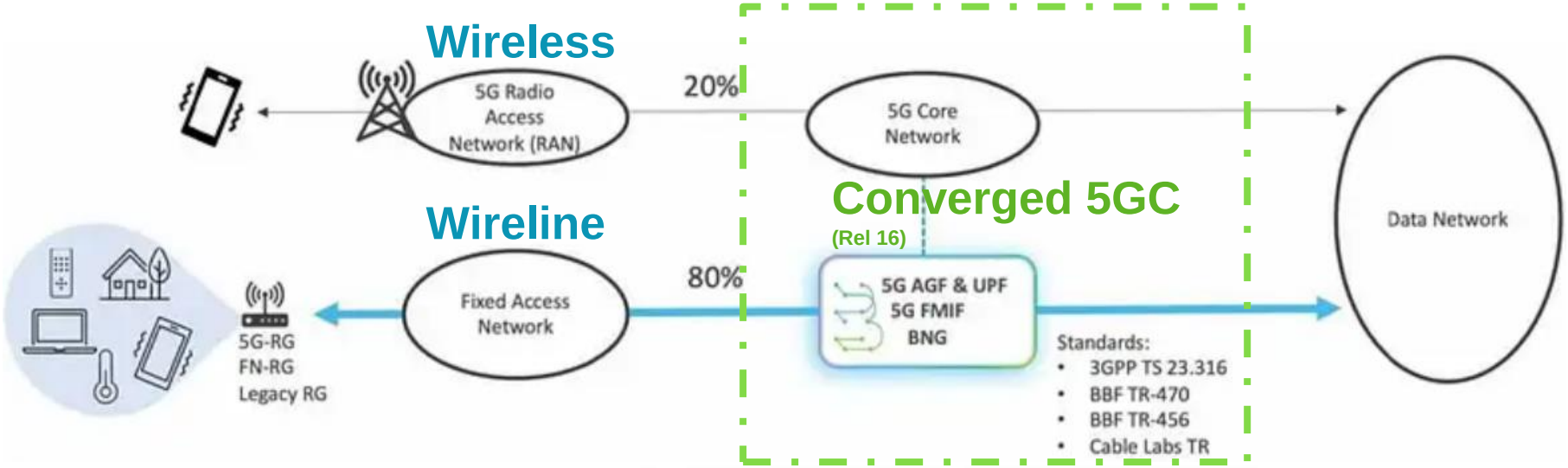
NTN (Non-terrestrial Network =~ 6G (LEO)



WWC (Wireless Wireline Convergence)

Wireless Wireline Convergence (WWC)

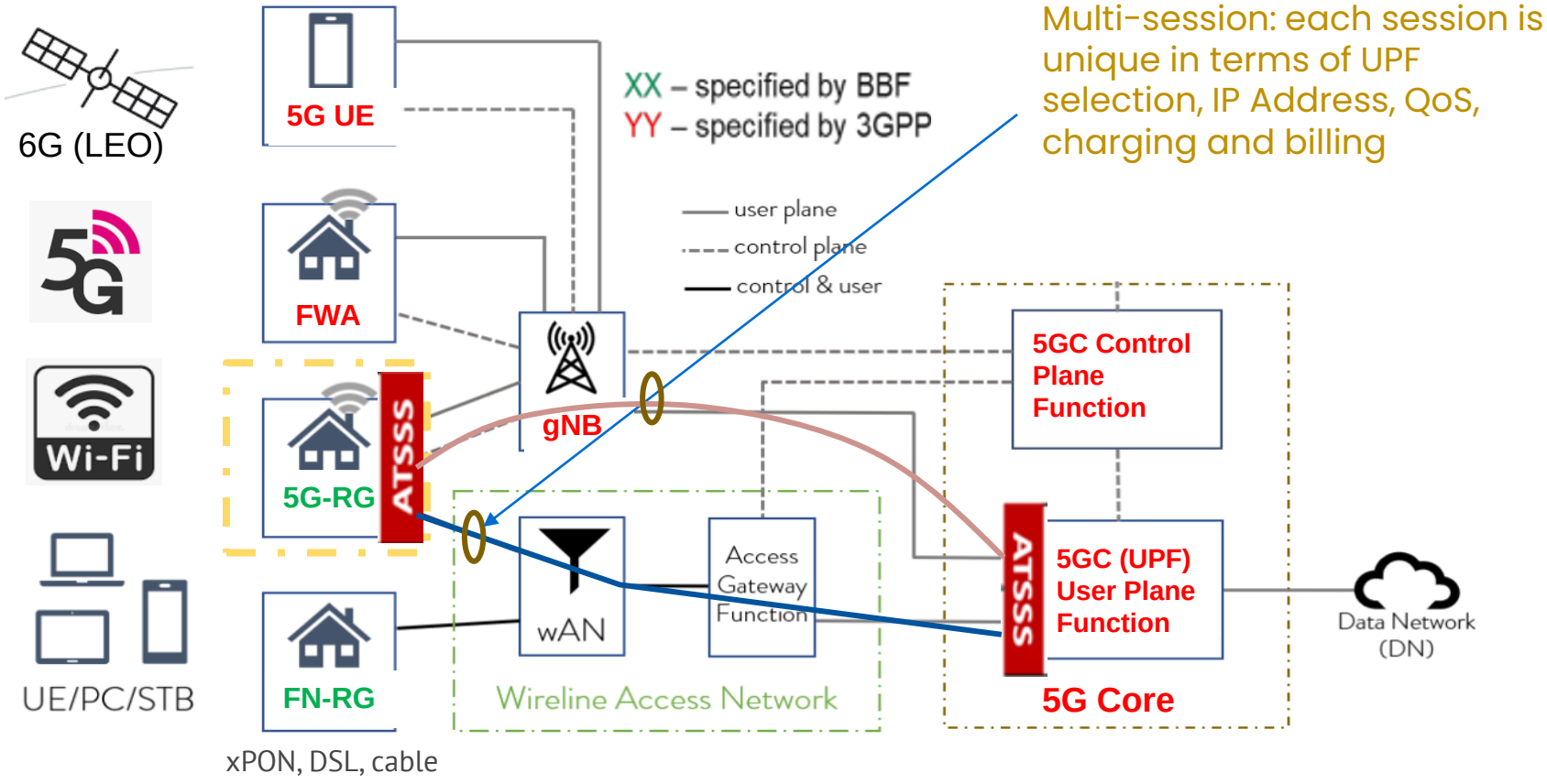
1. The 5G Access Gateway Function is a joint initiative between the Broadband Forum (BBF) and 3GPP.
2. 5G will provide traffic shaping and policing for fixed network and 5G residential gateways (RGs) being served from a standard 3GPP User Plane Function (UPF) within a common 5G Core (5GC).



Broadband Network Gateways (BNG). Broadband Remote Access Servers (BRASs)

Wireless Wireline Convergence (WWC)

1. 3GPP (from Release 16) and BBF together will support 5G wireless and wireline convergence (5G WWC).



ATSSS (Access Traffic Steering, Switching & Splitting, Rel 16)

Key Values of Networking

WiFi 6E, WiFi 7, XGS-PON, Switch,
5G O-RAN, 6G (LEO)

CONNECT

SASE (Secure SD-WAN),
SmartNIC & Acceleration

SECURITY

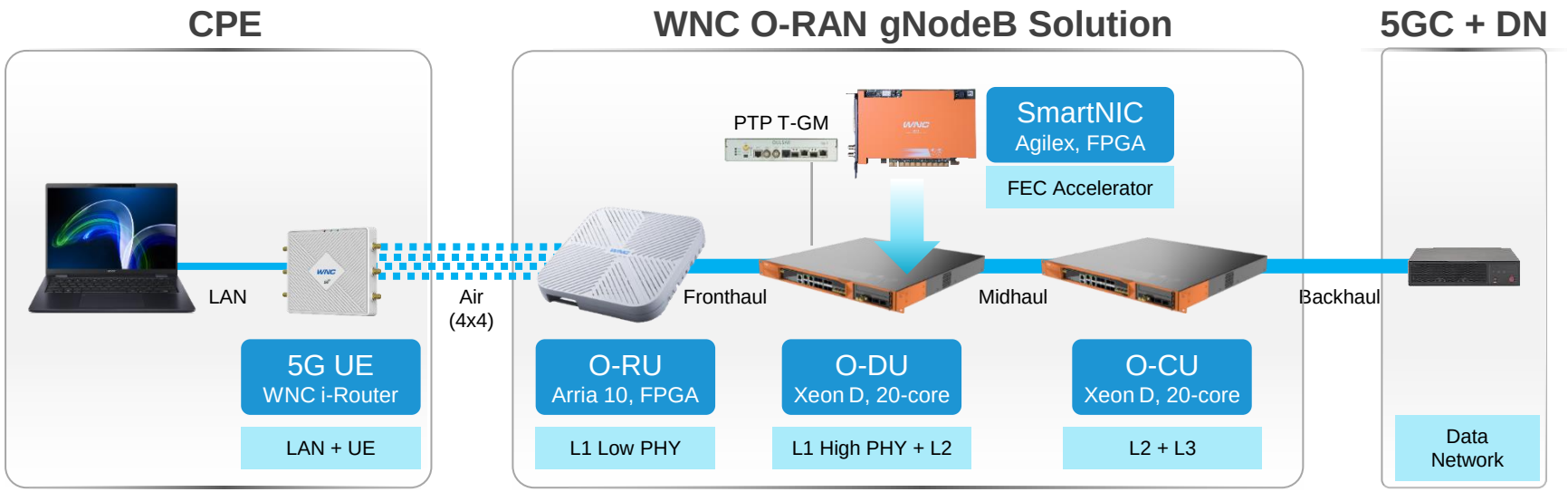
5G URLLC, MEC,
Low Latency WiFi 7

TSN (3GPP Rel. 16/17)

LATENCY

secure access service edge (SASE)

WNC 5G O-RAN Demo Plot



- O-RU supports 4x4 MIMO for CBRS/n48, n77, n78, and n79 bands.
- WNC's O-RU was awarded O-RAN OTIC's Conformance Certification.
- Using Intel® Xeon-D, WNC's slim server is a cost-effective solution of DU/CU with integrated FlexRAN and Radisys L2/L3 software.
- In this 5G demo setup, TDD DL/UL ratio 7:3, we show a downlink data rate over 1.2Gbps

WNC

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