



New connectivity in 5G

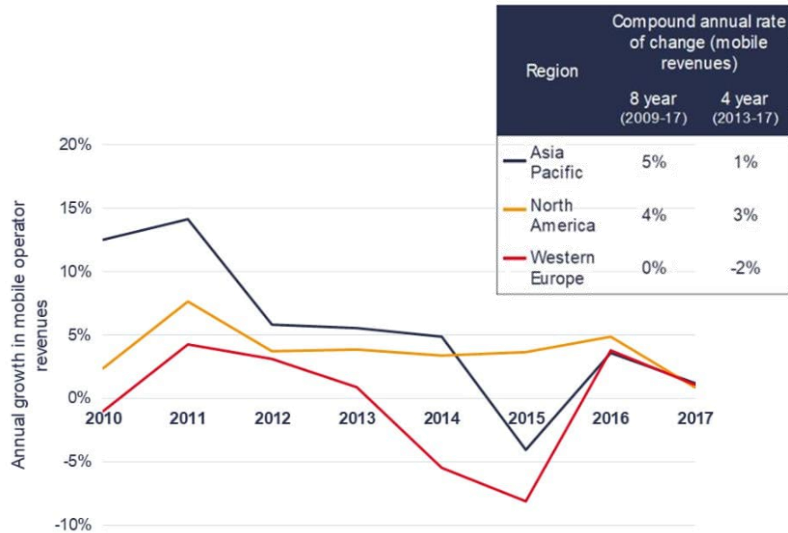
Avoiding dead-ends in the road to mobile growth

Ulrich Kohn, solutions marketing

October 2020

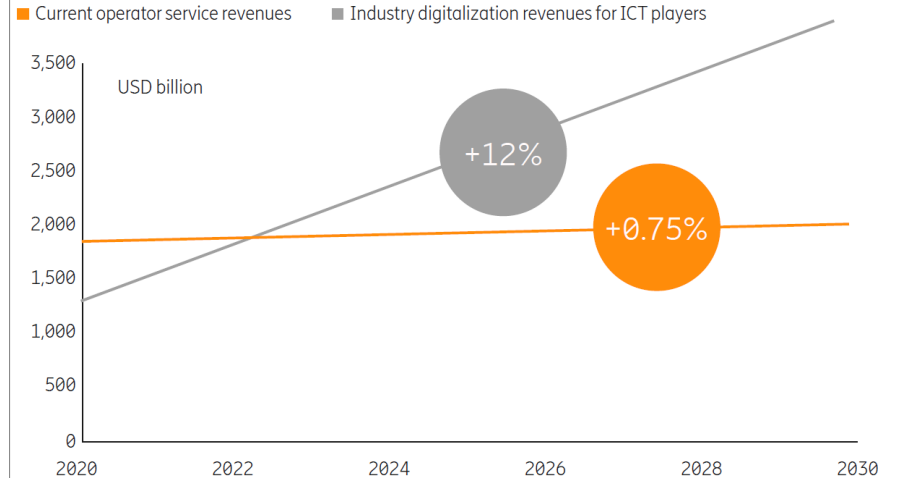
5G will bring mobile back on track to growth

Stagnating revenues in mobile



Source: STL Partners Analysis, using publicly available information

Industrial applications for growth



Source: 5G for business: a 2030 market compass, Oct 2019, Ericsson

Stagnating revenues with mobile users – industrial internet of things as growth driver

5G is 10,000,000 times better

Growth opportunities

- 1000x cell capacity
- 100x peak rates
- 10x lower latency
- 10x reliability

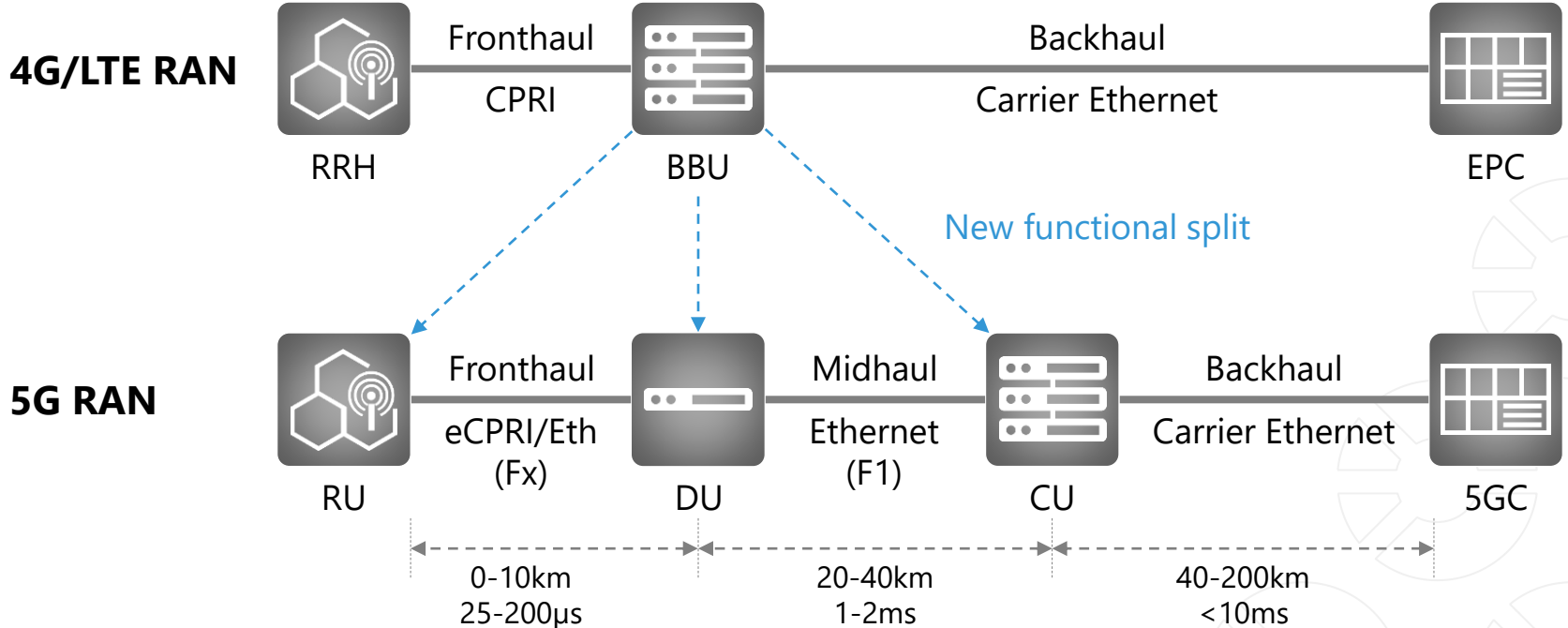
Enabling technologies

- Scalable networking
- Virtualization
- Precise timing
- Automation



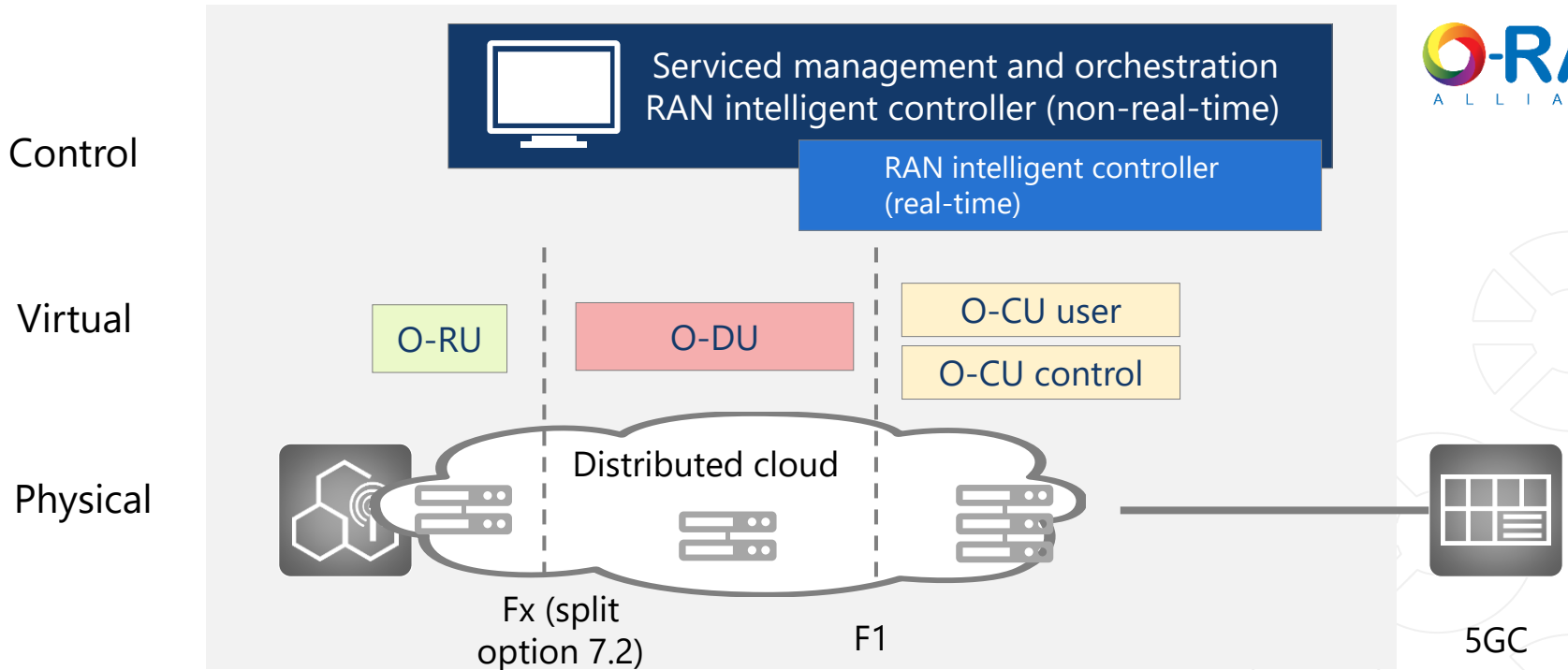
Cost-conscious innovation secures bottom-line growth

From 4G to a new 5G RAN architecture



5G decomposition into radio unit, distributed unit and central unit

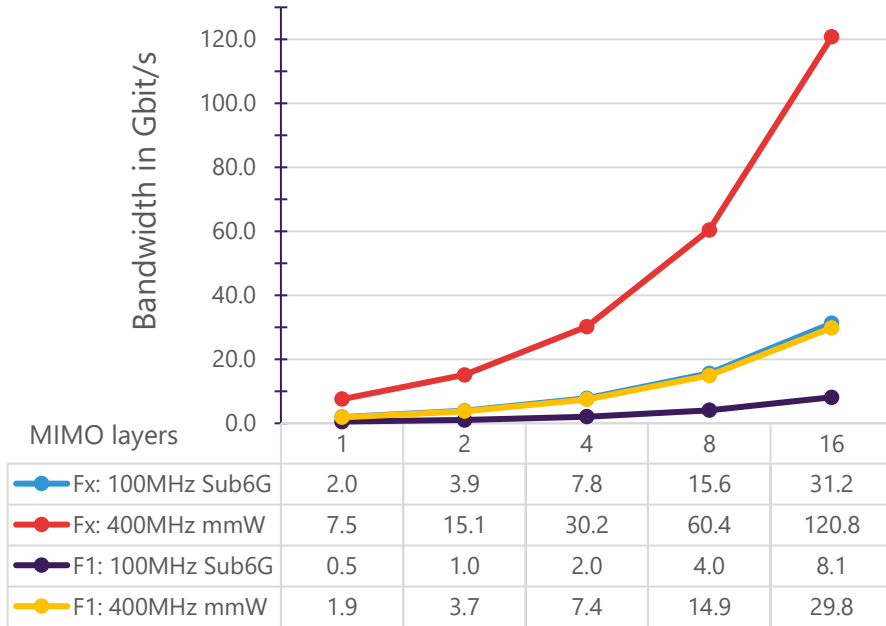
Towards virtualized open RAN architecture



Openness – intelligence – automation

Transport requirements - bandwidth

Single sector DL transport bandwidth (peak)



Source: O-RAN Alliance

Significantly higher bandwidth needs at Fx interface

Broad radio spectrum at mmWaves results in 100Gbit/s fronthaul capacity and beyond

Multi-layer MIMO mainly in dense areas, rural areas with less stringent requirements

General base station interface will move to 10G/25G in dense areas

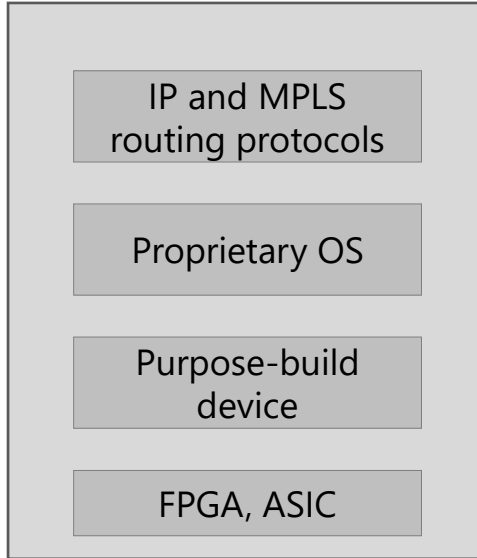
μ Wave backhaul networks need to consider fiber

Established backhaul network architectures and technologies might not scale

Disaggregating high-end routers

High-end edge/core router

Deep vertical integration



Speed

Flexibility

Cost

Open ecosystem

Applications, e.g., routing protocols

Network operating system (NOS)

Original design manufacturer (ODM)

Merchant silicon

Metaswitch Networks



CUMULUS ipinfusion™

ADVA™ Optical Networking

Edge-core NETWORKS

DELTA

ALPHA

ufiSpace

BROADCOM

BAREFOOT NETWORKS

Mellanox TECHNOLOGIES

Leveraging the innovative power of an open multi-vendor ecosystem

Agile innovation with multi-stakeholder cooperation

Fast, targeted innovation

TIP provides collaborative environment

Major MNOs drive specifications and in-field verifications

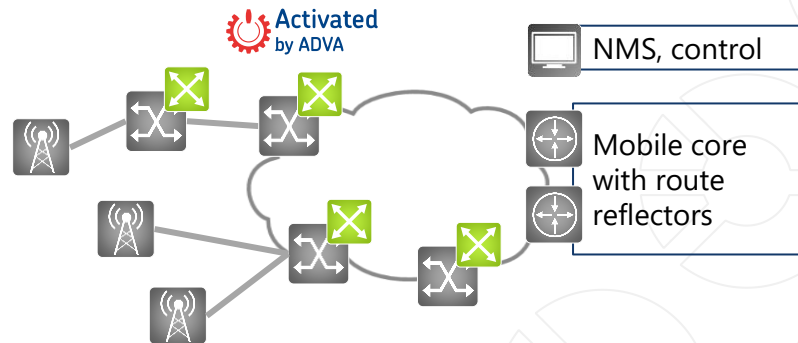
Vendors optimize open software and bare-metal hardware

Continuous improvement process

Rapid innovation cycles



Trial in MNOs' production networks



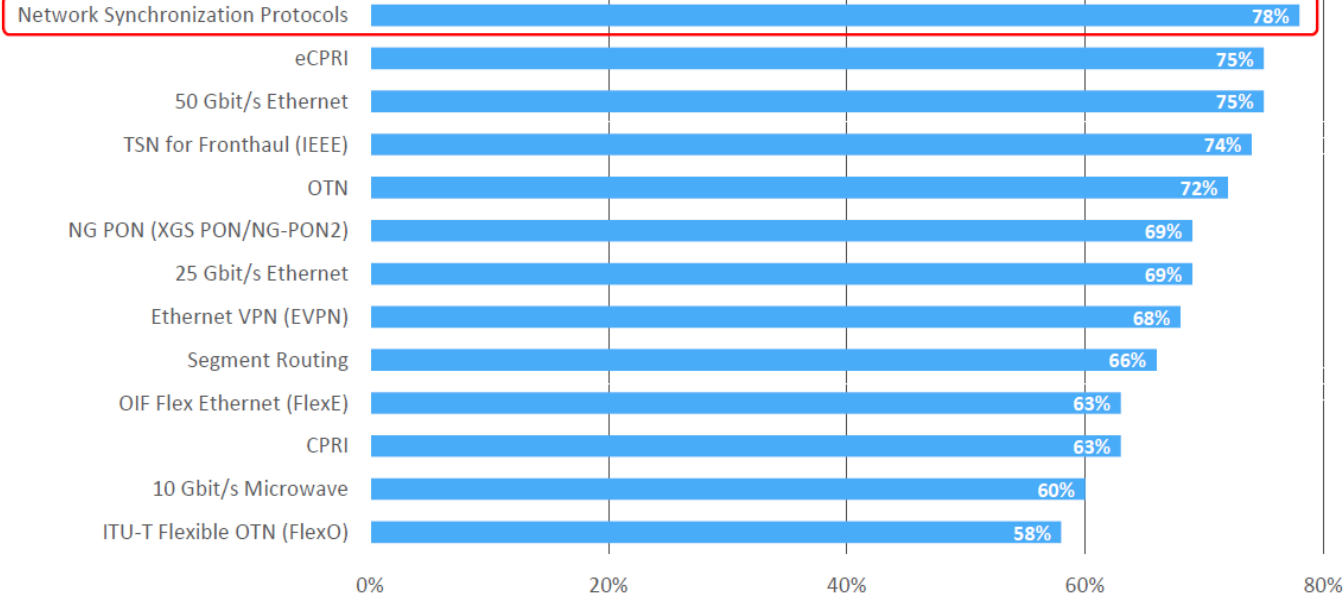
Open alliances and disaggregated networking – a winning team

Precise synchronization is a key requirement for 5G

Survey question: *How important are the following technologies and protocols for your 5G transport network?*

(Ranked by percentage of important or critical for each)

N = 141



Source: Heavy Reading 5G Network & Services Strategies, 2020 Operator Survey; results analyzed by OMDIA

Many 5G services as well as efficient use of spectrum depend on precise timing

A possible way to synchronize 5G networks

Edge-delivered timing

Satellite-based synchronization
with local clock

PTP and SyncE for delivery
over packet network



RU

~100ns time accuracy @ F_x



DU

~1 μ s time accuracy @ F1



CU

Challenges:

- Satellite signals are subject to malicious attacks, interference and obstructions
- High number of DU sites requires many satellite receivers (capex, opex)

Precise timing is provided at DU sites

Reliable and precise synchronization of 5G networks

Key benefit

- Highly resilient synchronization with fully protected, time-aware transport
- With atomic clocks, satellite outages are efficiently mitigated

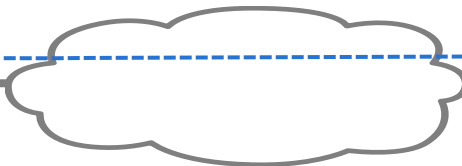
Satellite-delivered time is backed up with cesium atomic clocks

Timing-aware transport with on-path synchronization support

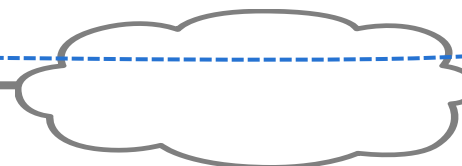
PTP-optimized DWDM transport and ultra-precise boundary clock devices



RU



DU

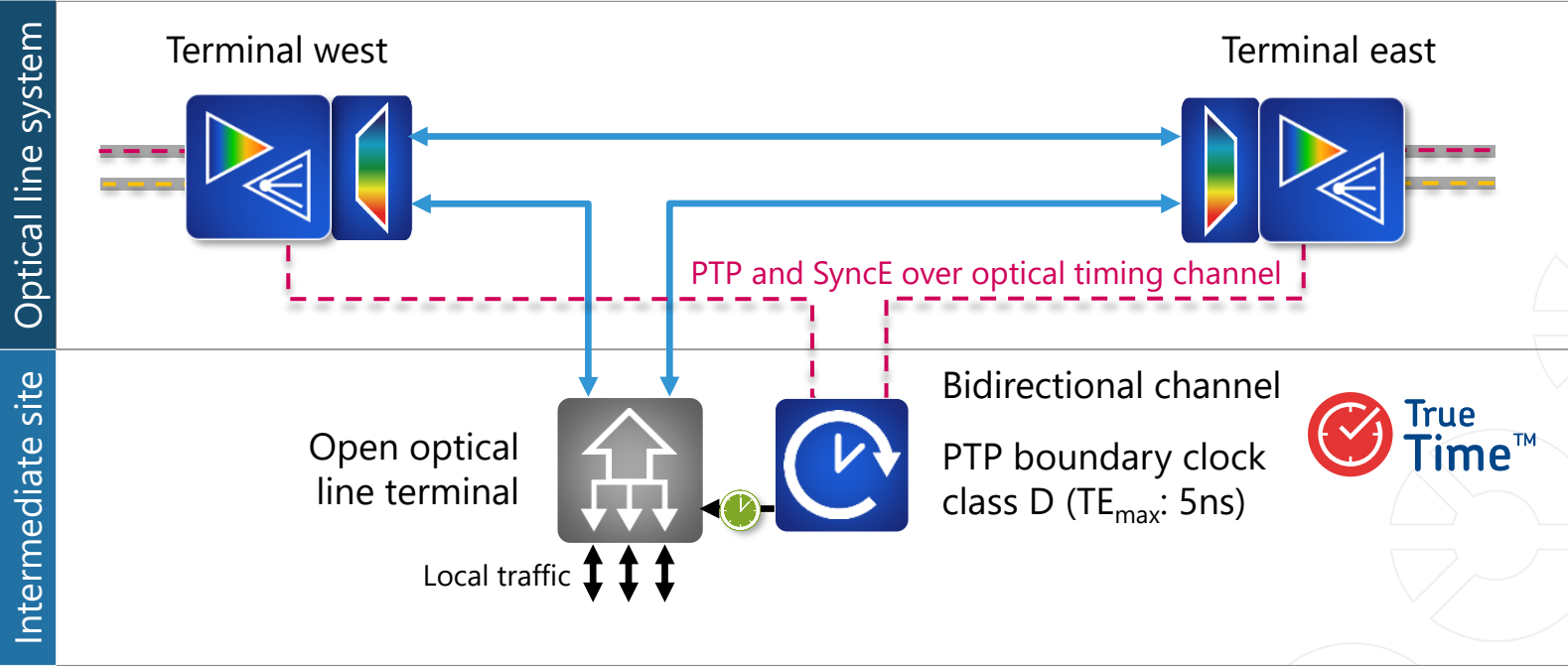
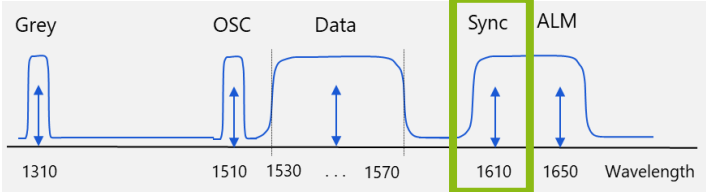


CU

Better than 100ns time accuracy end-to-end

Multiple central high-performance clocks and time-aware transport network

Highly precise sync overlay



Combining PTP-optimized optical transport with on-path PTP/SyncE support

Summary: 5G new connectivity

New connectivity networks for scale, reliability and lowest latency

Architectural optimization and innovative technologies

Disaggregation is key to agility and rapidly growing capacity

Timing transport with latency and asymmetric delay compensation

Open collaboration for early rollout of commercialized solutions



We make connectivity networks fit for 5G



Thank you

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