

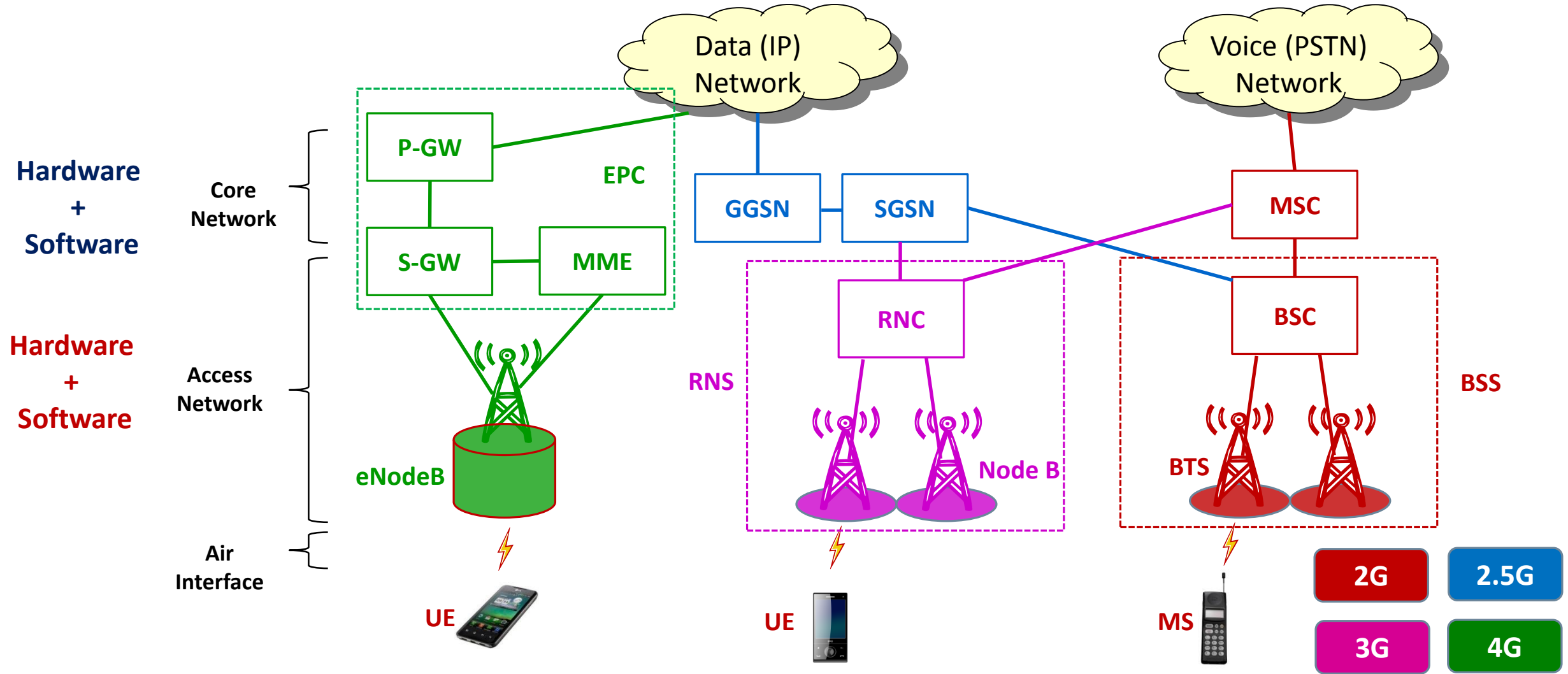


Open RAN, White Box

RAN & vRAN

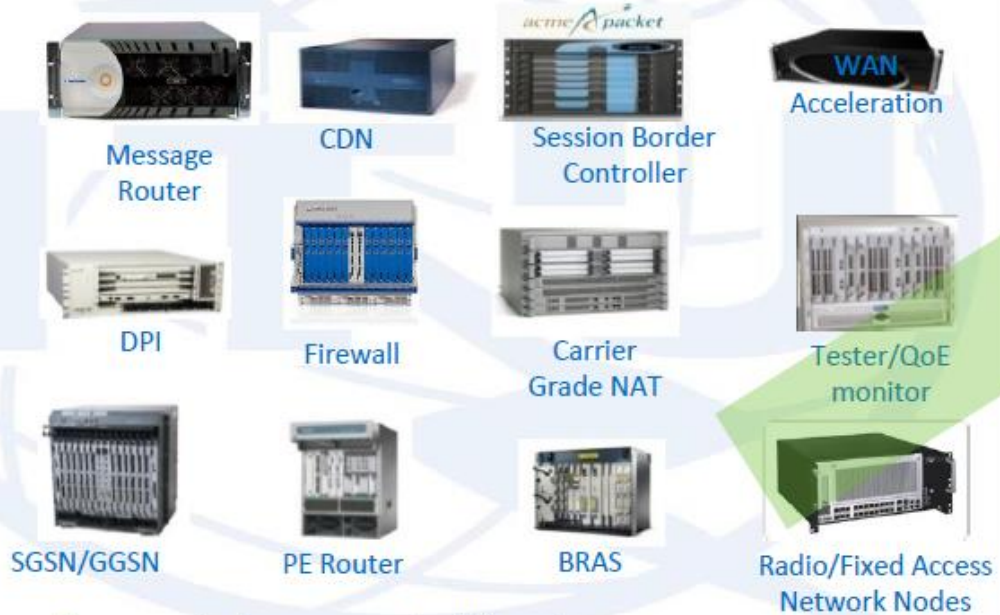


Traditional Mobile Network Architecture



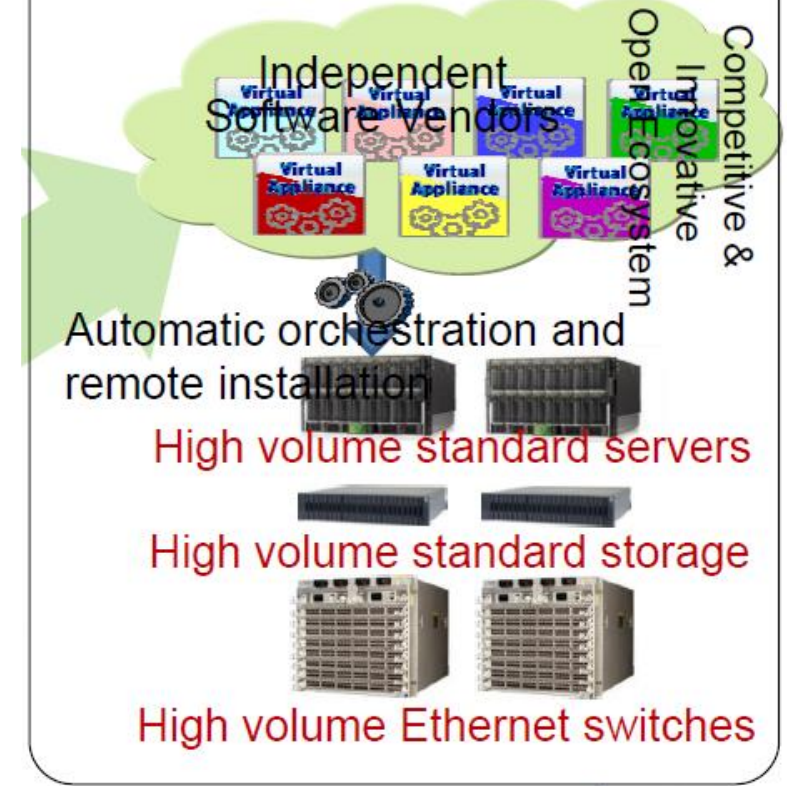
Virtualization: The 'Core Network' Story

Classical Network Appliance Approach



- Fragmented, purpose-built hardware
- Physical install per appliance per site
- Hardware development: large barrier to entry for new vendors, constraining innovation & competition

Network Functions Virtualisation Approach



Commercial off-the-shelf (COTS) Hardware

Virtualization: The 'Core Network' Story

1994

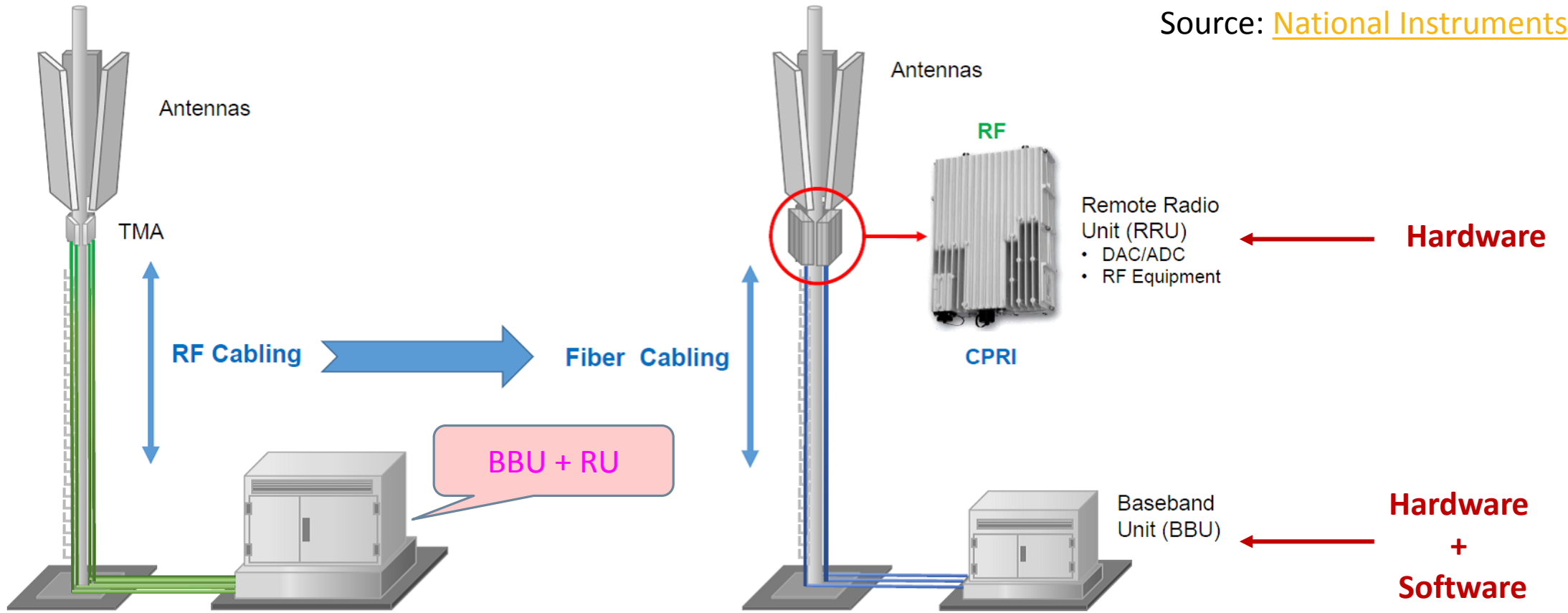
2014



NFV (Network Functions Virtualization) has enabled moving of hardware into software

Mobile Towers in Real Life

Source: [National Instruments](#)



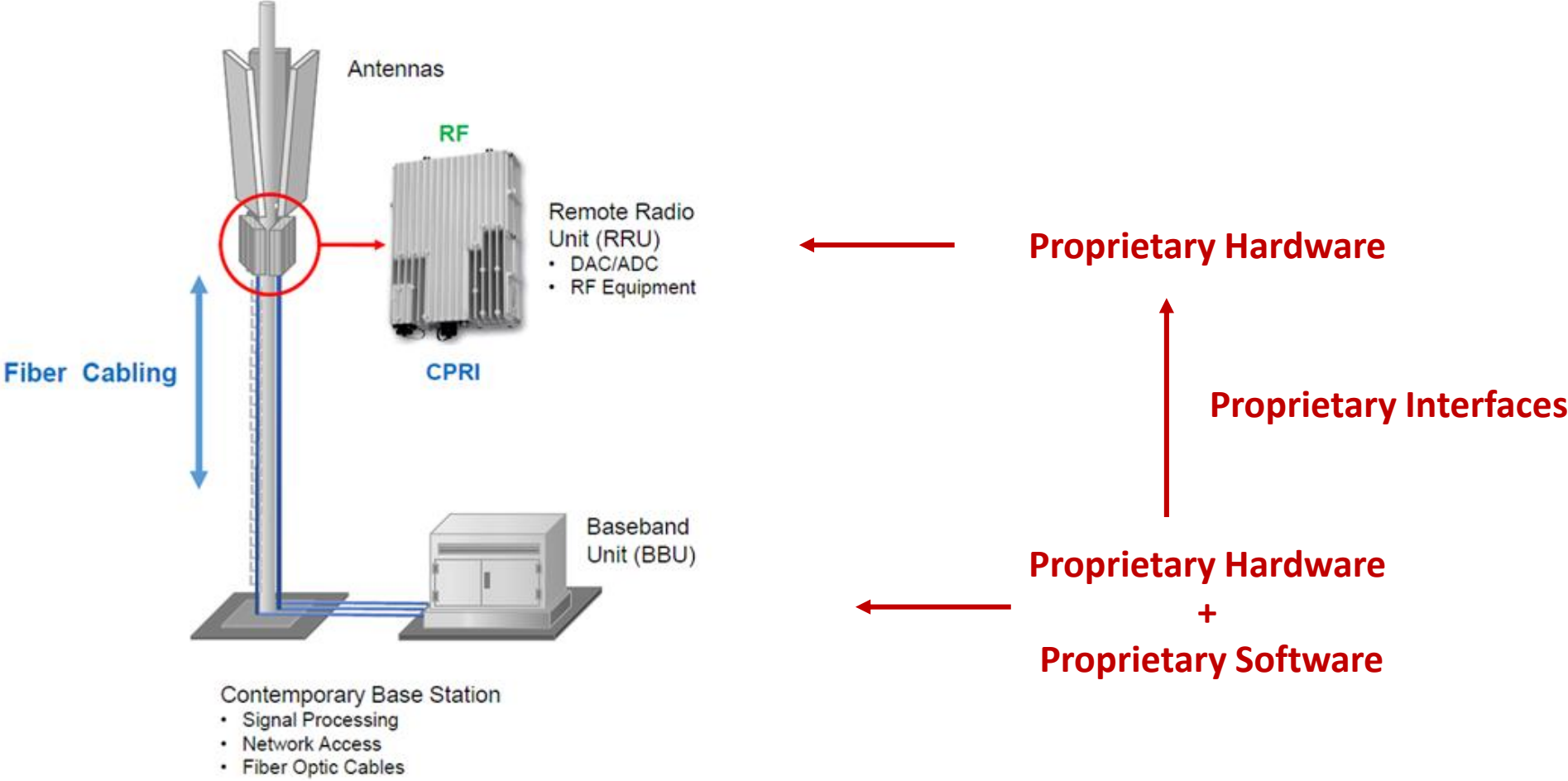
Traditional Base Station

- Signal Processing
- RF Equipment
- Network Access
- Long RF Cables

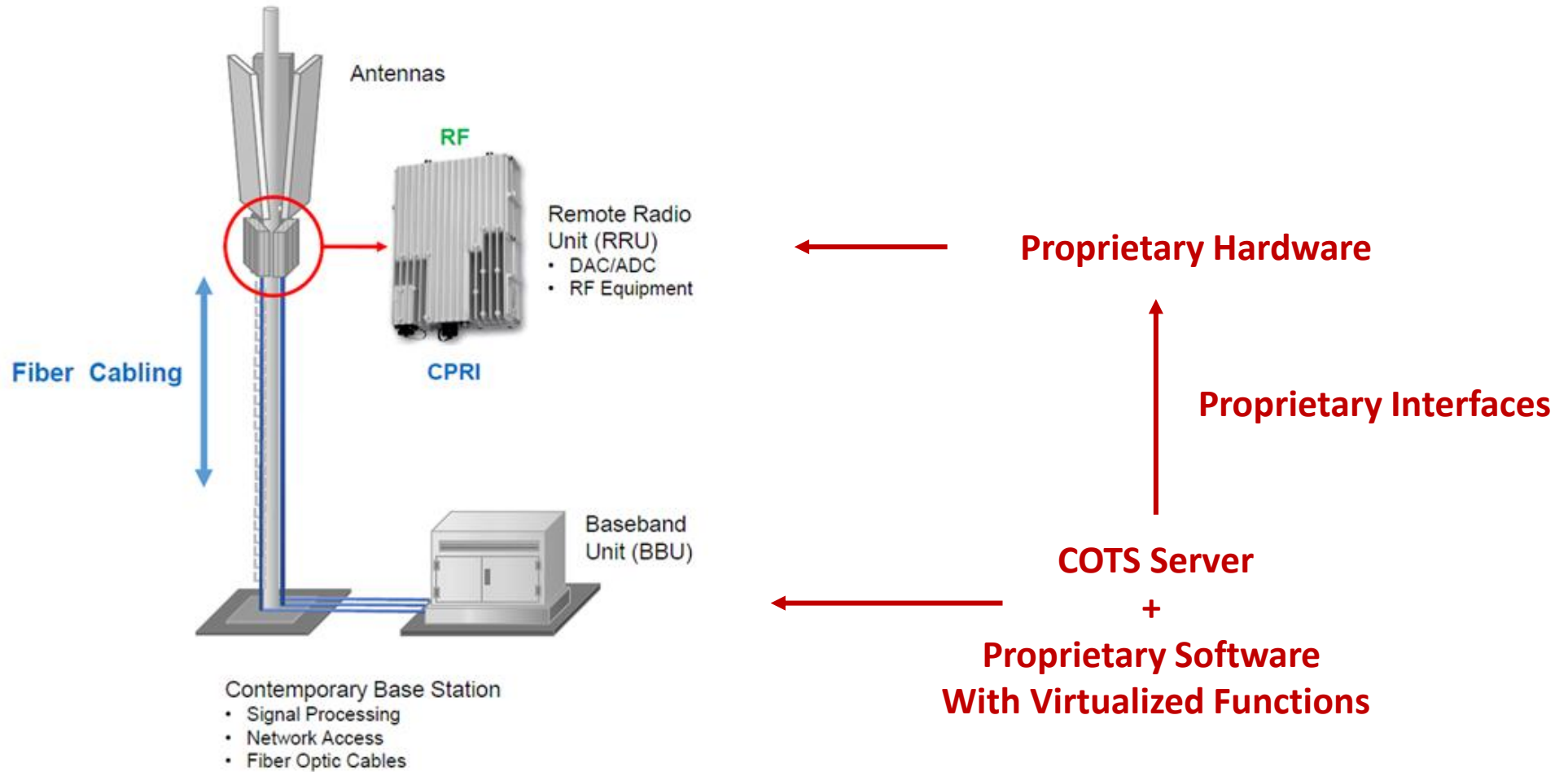
Contemporary Base Station

- Signal Processing
- Network Access
- Fiber Optic Cables

Contemporary RAN



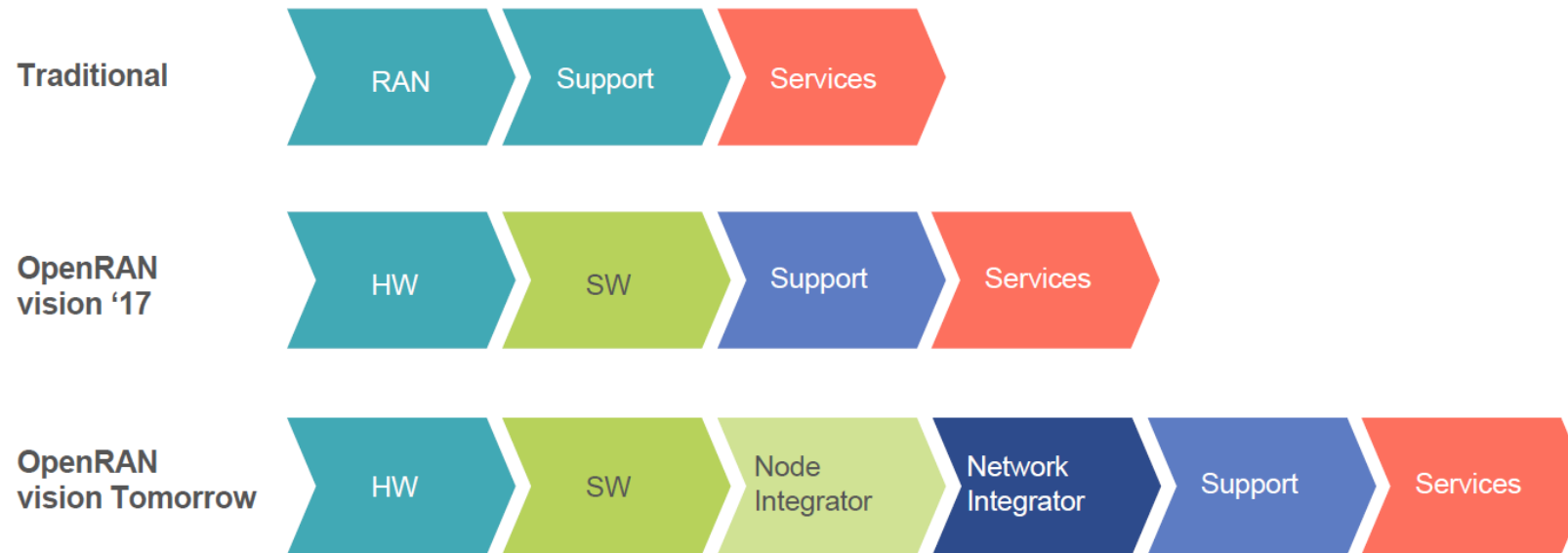
Virtualized RAN (vRAN) Approach



vRAN is not Open RAN

Open RAN: Disaggregating Hardware and Software

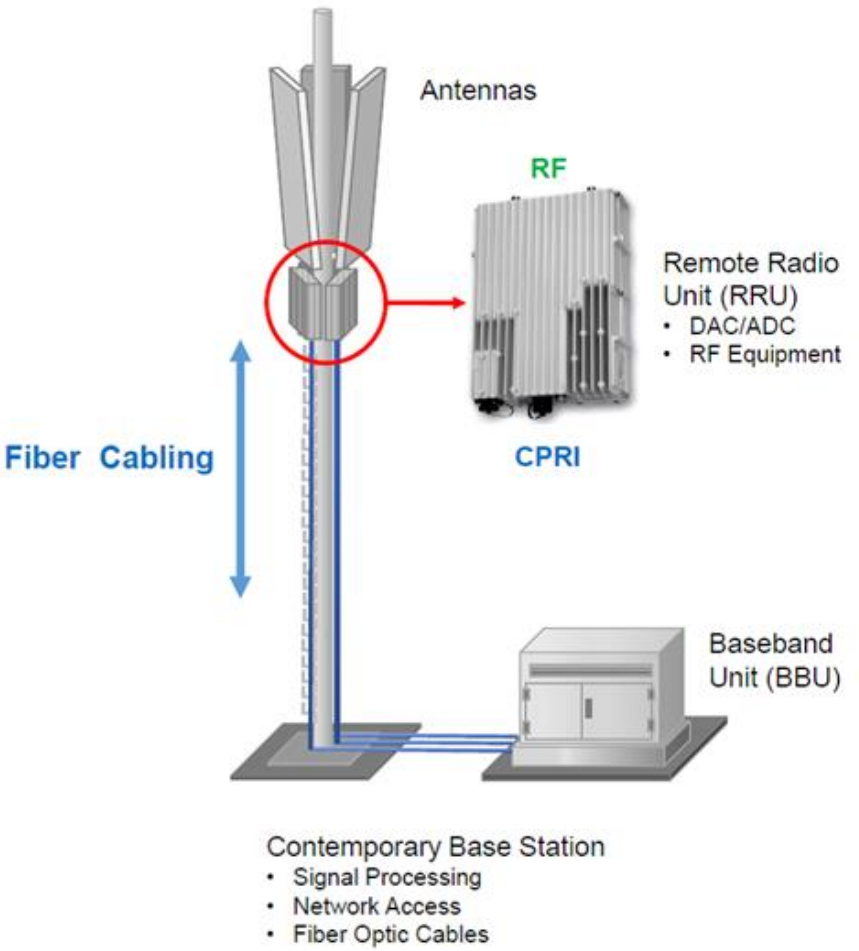
New Value Chain for RAN Deployments



Modular, Flexible, Best-in-class, Ecosystem, Openness

Picture Source: [David del Val Latorre](#), CEO, Telefonica R&D at TIP Summit 2018

Open RAN Vision



← **GPP based COTS Hardware (SDR)**
Can be purchased from any ODM / OEM / RAN Hardware Vendor

↑ **Open Interface**
Any vendor software can work on this hardware

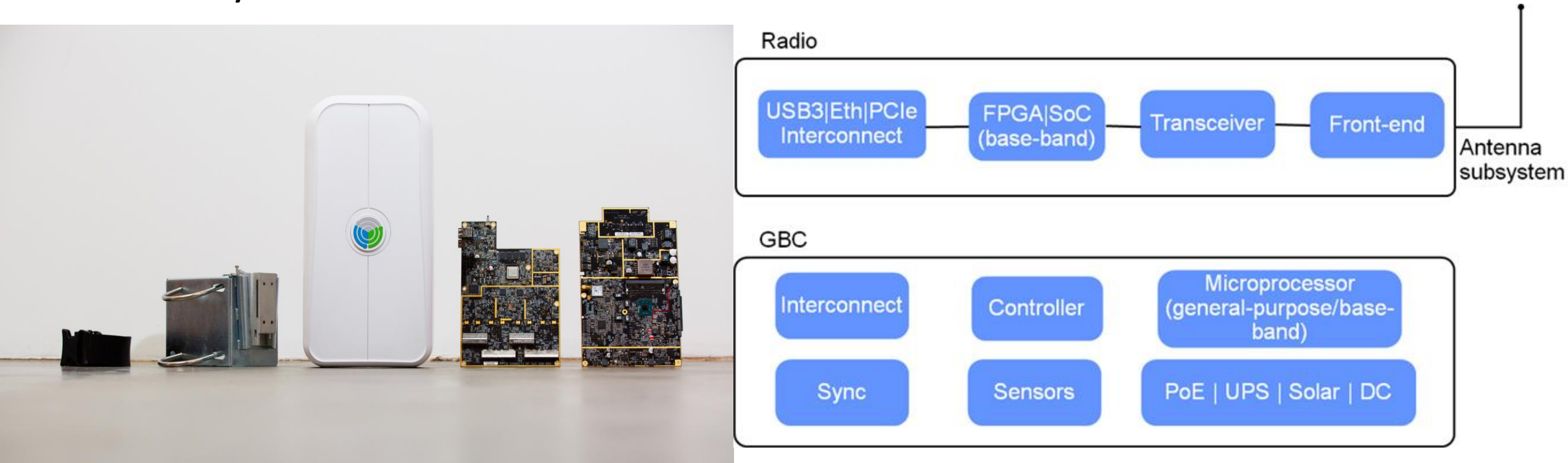
← **COTS Server**
+
Proprietary Software With Virtualized Functions

Basics: GPP vs SPP

- A general purpose processor (GPP) is generally called a Central Processing Unit (CPU). It performs all of the general work of the computer.
- Intel x86, ARM, MIPS, SPARC, RISC-V are examples of GPP
- True hardware / software disaggregation possible
- The main advantage of GPP is that:
 - Due to large volumes, economy of scale is achievable
 - Costs are lower in high volumes
 - Faster pace of innovation due to software-driven development.
- A single purpose processor (SPP) has a limited number of functions and would be optimized for a specific area.
- An example might be a MAC processor from DSP, you might built and FPGA or ASIC using several of these to create a digital filter for some specific application.
- It would run much faster than running the same algorithm on a general CPU, probably would use a lot less power.

Open RAN: Enabling White Box RAN

- Whitebox RAN = All-in-one GPP based base station
- But you can have a Whitebox RRU + COTS BBU



Picture shows [Facebook's OpenCellular](#): An open source wireless access platform

Will OpenRAN work in practice?

Vodafone & Telefonica at TIP Summit 2018



Picture Source: [Caroline Chan on Twitter](#)

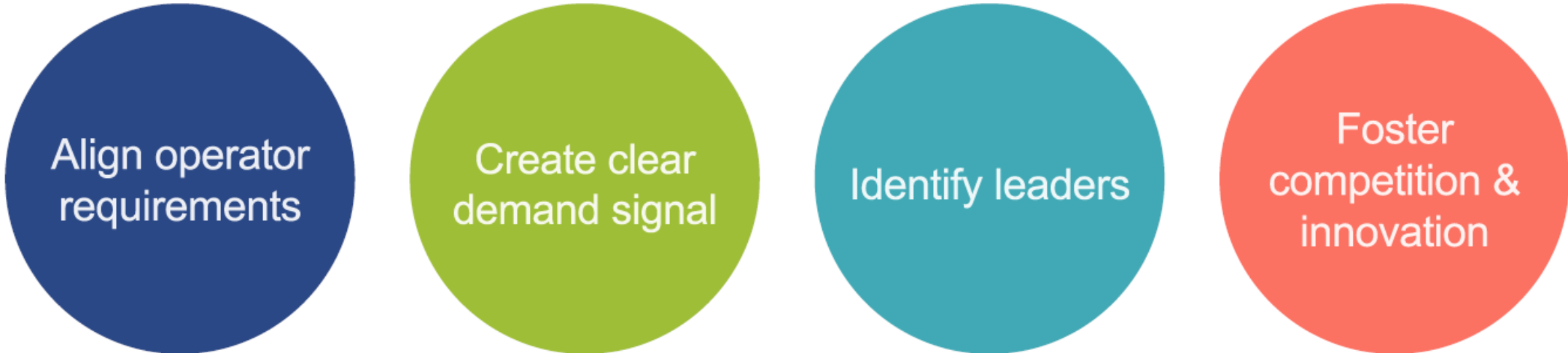
Announced the Joint OpenRAN RFI Results



OPENRAN RFI Results

Telefonica

RFI Objectives



Align operator requirements

Create clear demand signal

Identify leaders

Foster competition & innovation

RFI Engagement

Responded



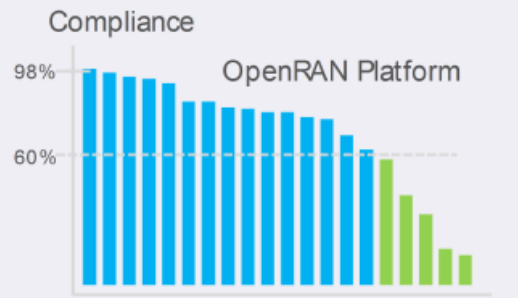
Indirect Engagement



Three Evaluation Dimensions

OPENNESS

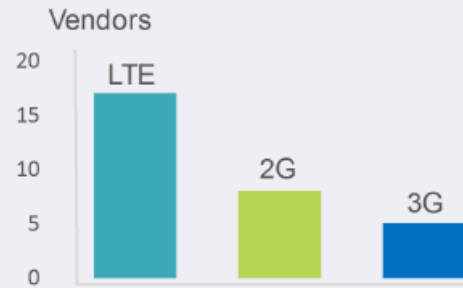
Enable multi-vendor interoperability
(based on GPP)



- Majority of respondents complied with principals
- Multivendor supported, especially between BBU/RRH
- GPP platforms widely adopted

PERFORMANCE

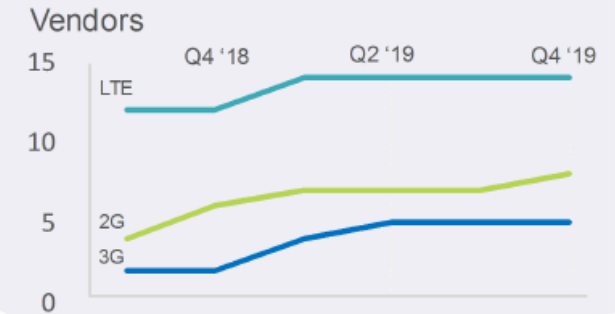
4G capabilities and 2G/3G feature readiness



- All vendors provide at least 4G capabilities
- Feature roadmaps support early deployments
- 2G and 3G lack similar support

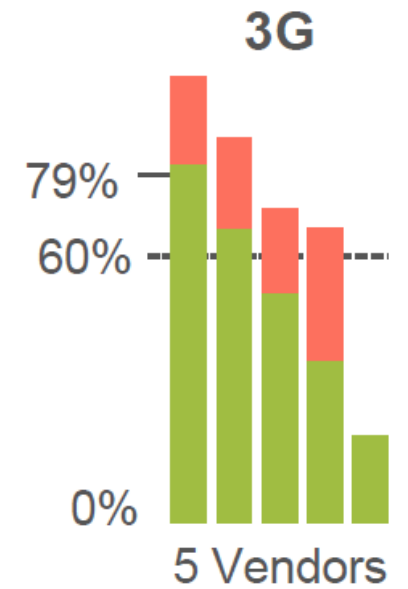
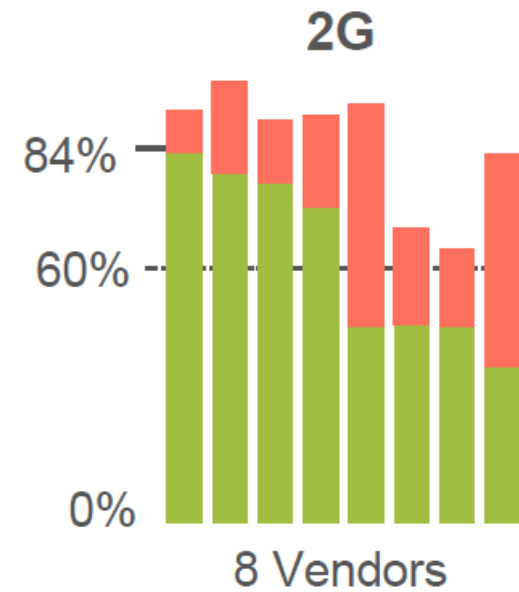
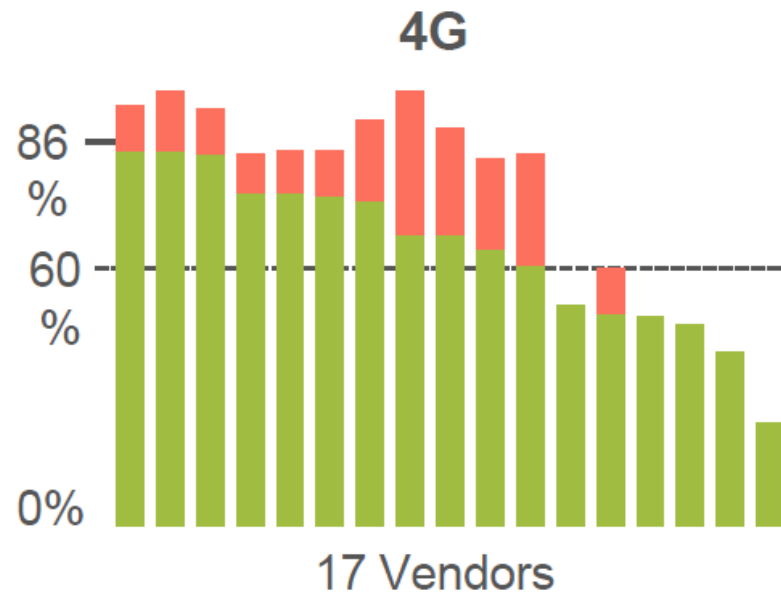
TIME TO MARKET

Solution maturity to start deployments



- LTE ready for deployment
- Late vendors and 'paper compliance' will require + 6 months
- Many vendors lack scale for big deployment, need partners

Legacy Is Still Key for Deployments



■ July 18 compliance

■ July 19 uplift

Best Performing Vendors - 2018

Most Compliant e2e Platforms



MAVENIR



Parallel
Wireless



ALTIOSTAR

2G SW



fairwaves



Parallel
Wireless

3G SW



MAVENIR



Parallel
Wireless

4G SW



ALTIOSTAR



Parallel
Wireless



radisys

RRH/Radio Hardware



Bai Cells



NEC



Parallel
Wireless

Innovators



ASOCS
On-premise mobile clouds



Phluido

Challengers



Comba



Dalf
WIRELESS

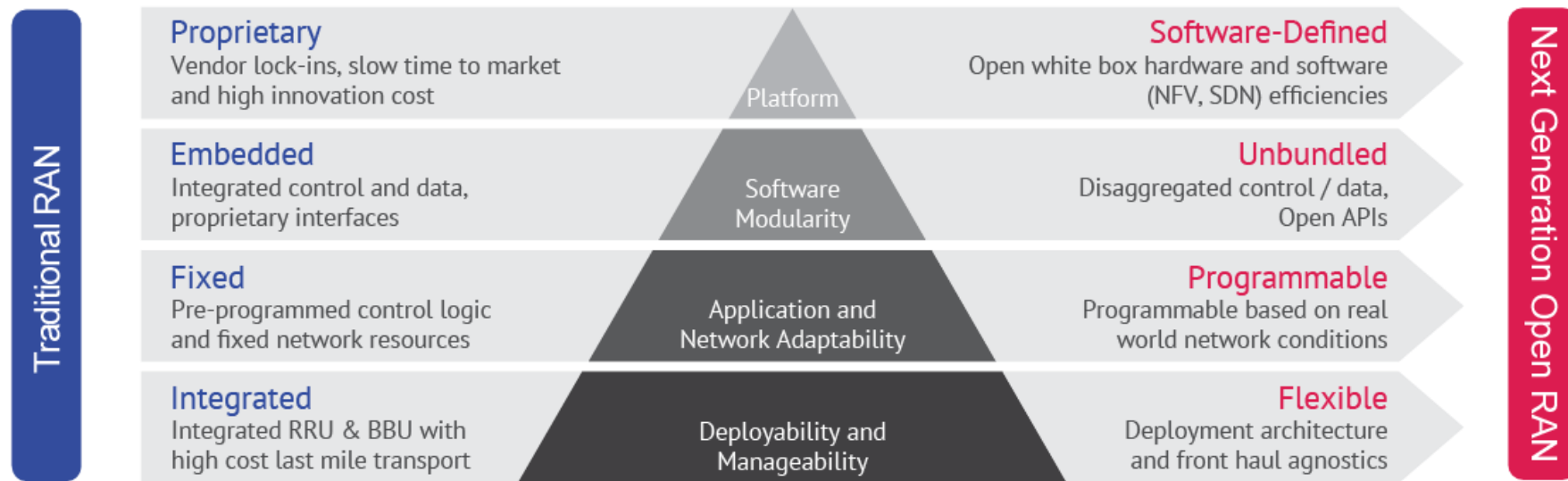


fairwaves



VANU

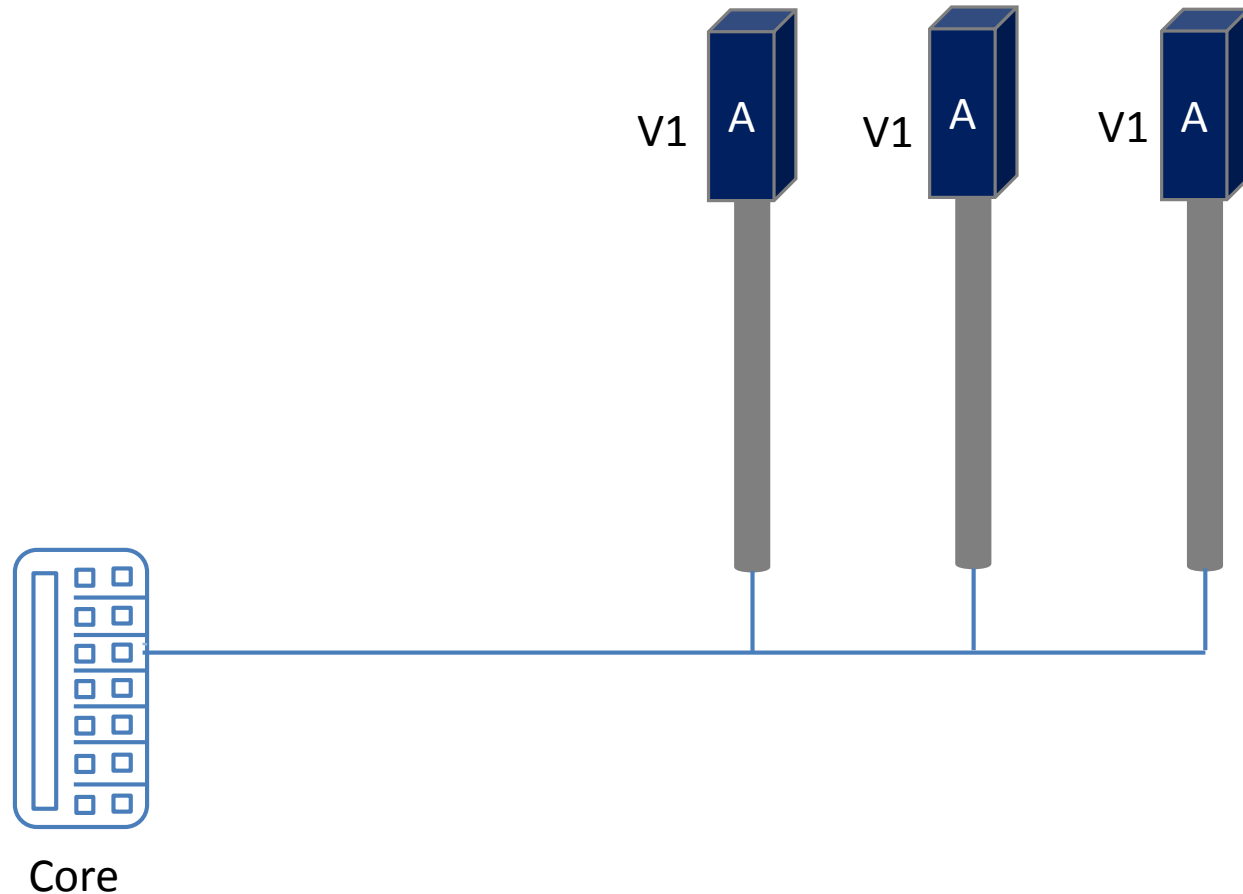
Traditional RAN vs Open RAN



Source: [Radisys](#)

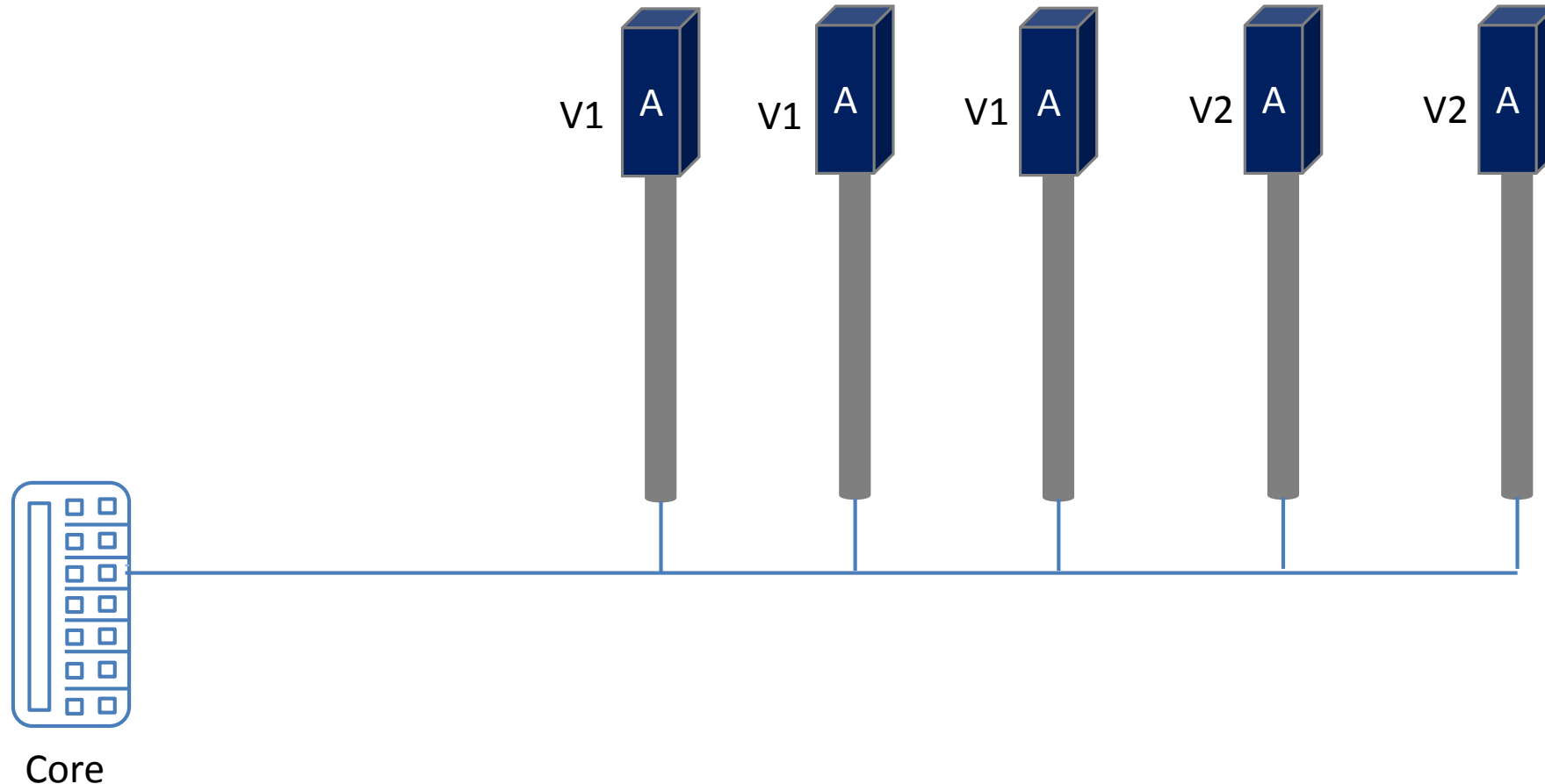
So why is Open RAN so interesting?

- Lets take an example scenario of an operator (MNO) or service provider (SP)



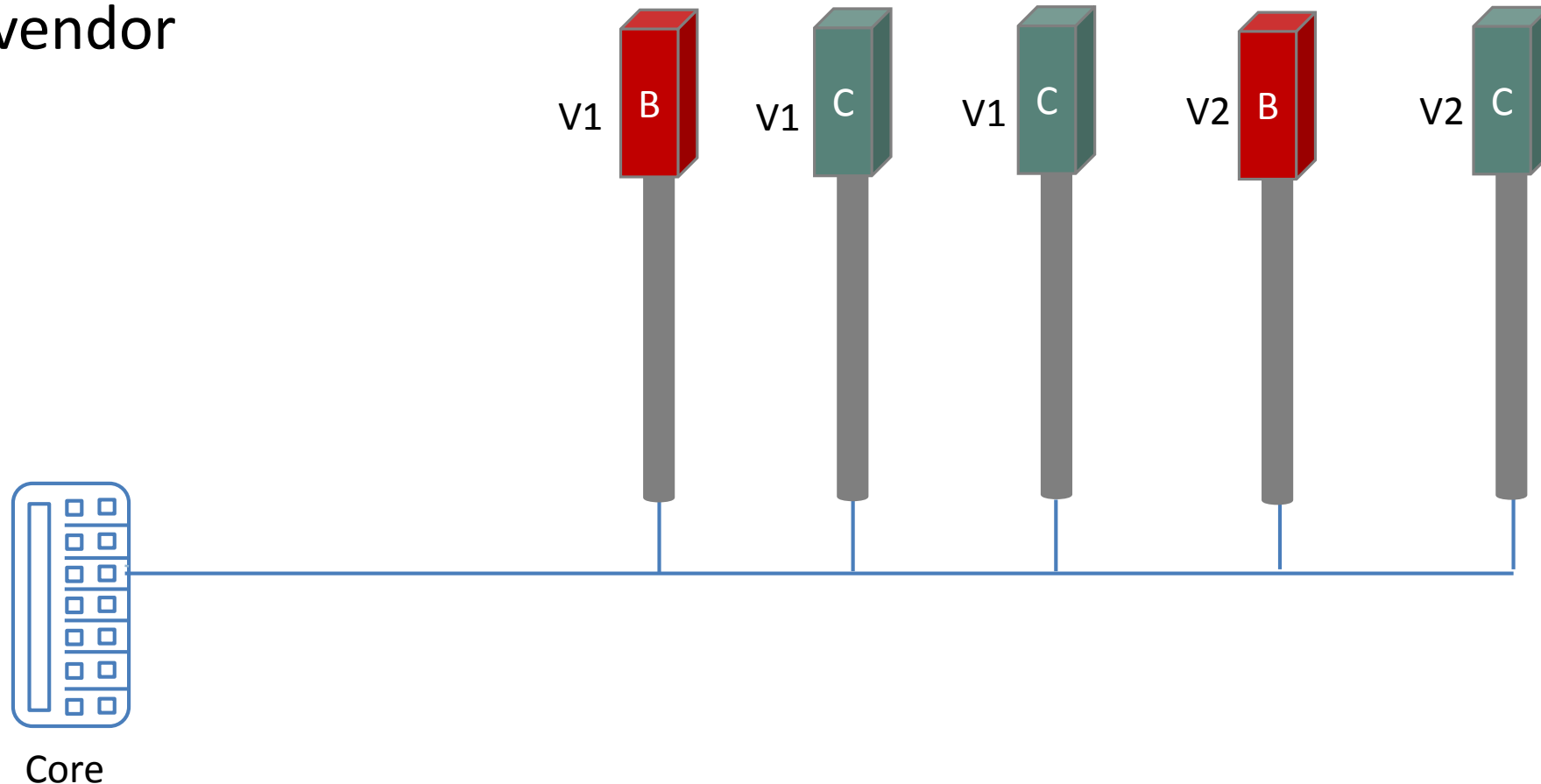
So why is Open RAN so interesting?

- When the MNO / SP is looking to expand the network, they may decide to introduce vendor V2



So why is Open RAN so interesting?

- If the hardware from ODM / OEM vendor A is not performing well, the MNO / SP may start replacing the RAN while keeping same software vendor



Further Reading

- Videos from [TIP Summit 2018](#) – Telecom Infra Project
- [TIP's Radio Access Network \(RAN\) initiatives](#) – Facebook Telecom Infra Project
- [“Opening up on the Open RAN”](#) – The Mobile Network Magazine
- [“What is a difference between general purpose processor and single purpose processor?”](#) – Quora
- [Guide to TIP: OpenRAN](#) – Telecom TV
- [“Parallel Wireless leads in Open RAN solutions”](#) – Telecom TV
- [“Edging Closer to Open Telecom Networks with Open RAN”](#) - Pipeline

Thank You

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