



# The Shift with 5G: From Technology to QoS/QoE Testing

Presenter: Faisal Ghazaleh, InfoVista VP Tech Services

More info; Dr. Irina Cotanis, Infovista -Senior Director of Technology, ITU-T SG12

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# Agenda

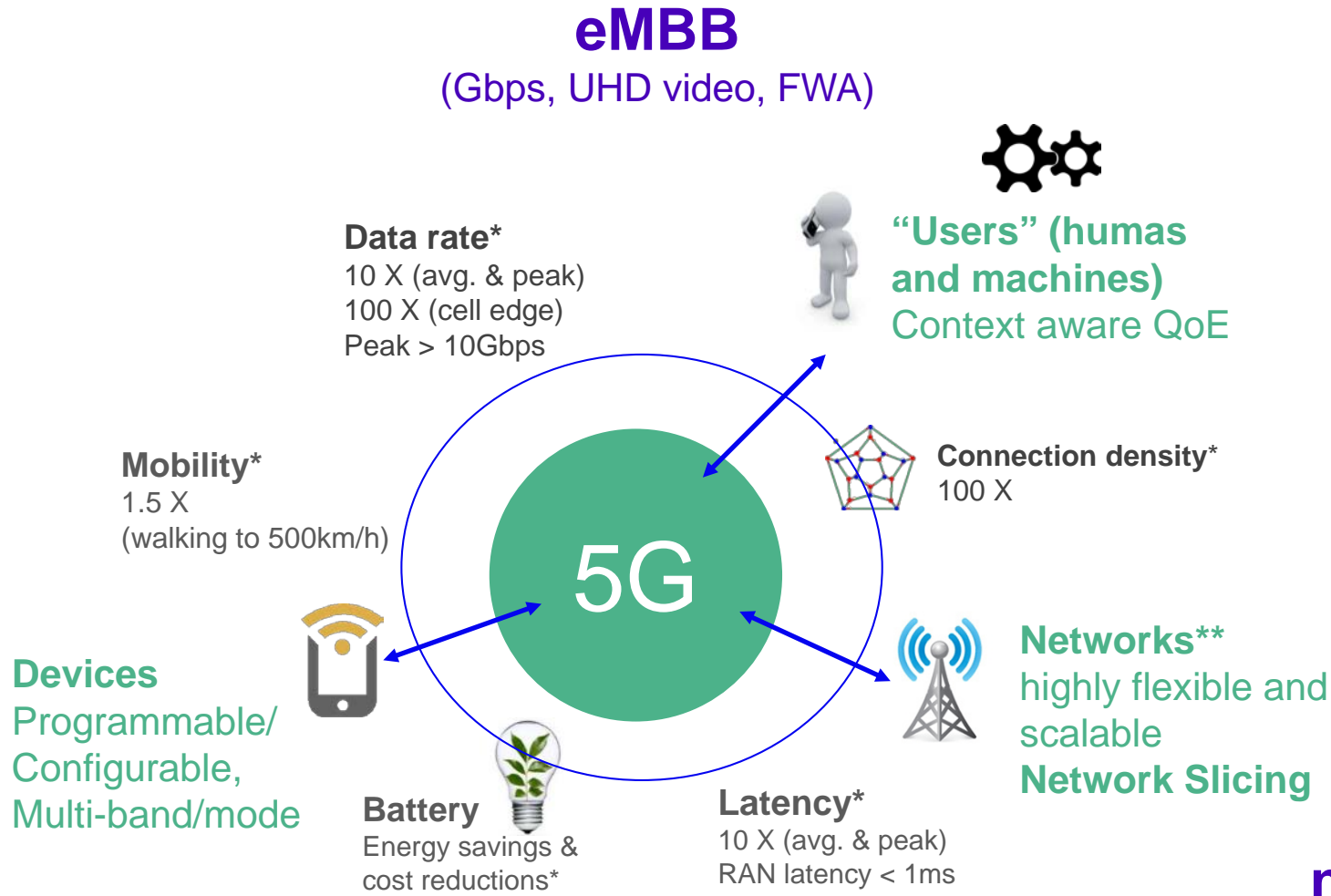
- 5G at a glance: reminder and updates
- The technology and QoS/QoE paradigm's shift
- Rethinking planning and testing concepts
- InfoVista examples of how the 5G shift works



# 5G Reminder and updates



# A reminder: 5G on one slide....



**URLLC**  
AR/VR, Remote Surgery  
Industry 4.0

**mMTC**  
Smart cities, Asset tracking  
Remote patient monitoring

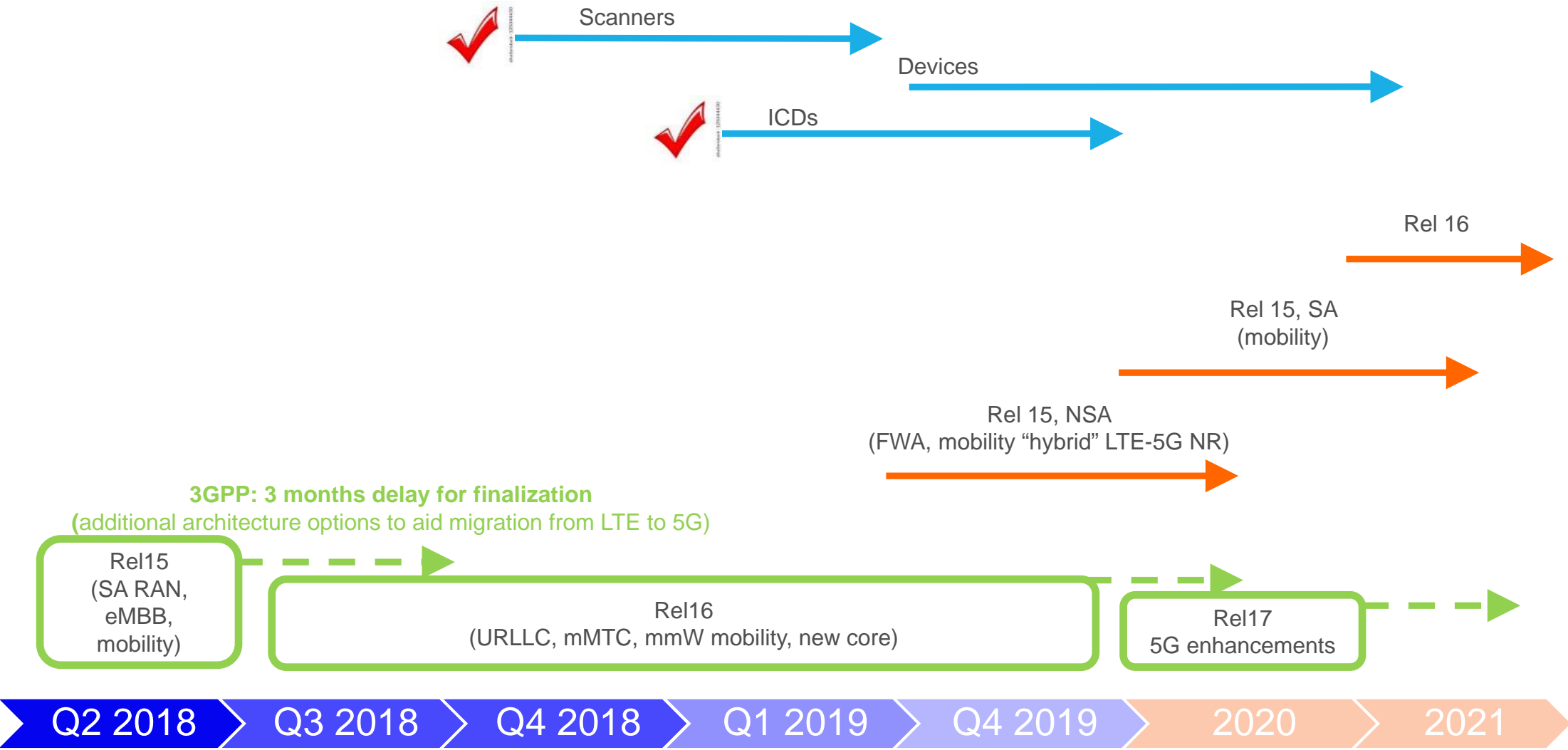
\*Vs. 3GPP Rel.12; \*\* no single solution to satisfy all these extreme requirements at the same time

# Technology updates ..... 3GPP and the market

Scanners and Devices

Commercial deployments

3GPP releases



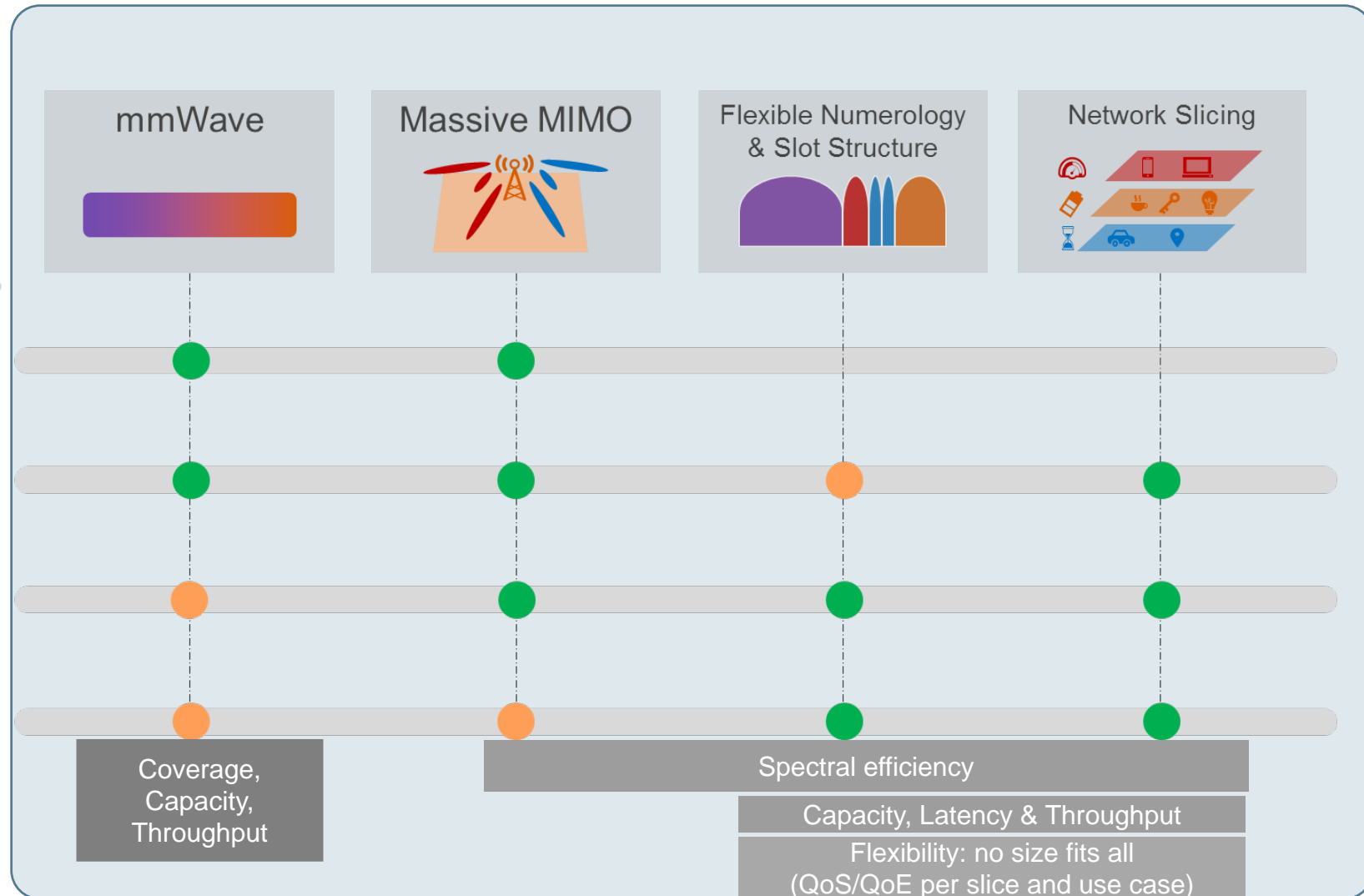
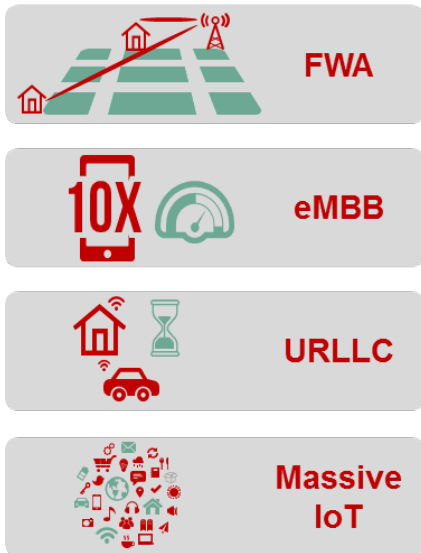
# The technology and QoS/QoE paradigm shift



# Technology Shift: 5G based on technology disruptions

## 5G Key Features

## 5G Target Use Cases



# Technology shift

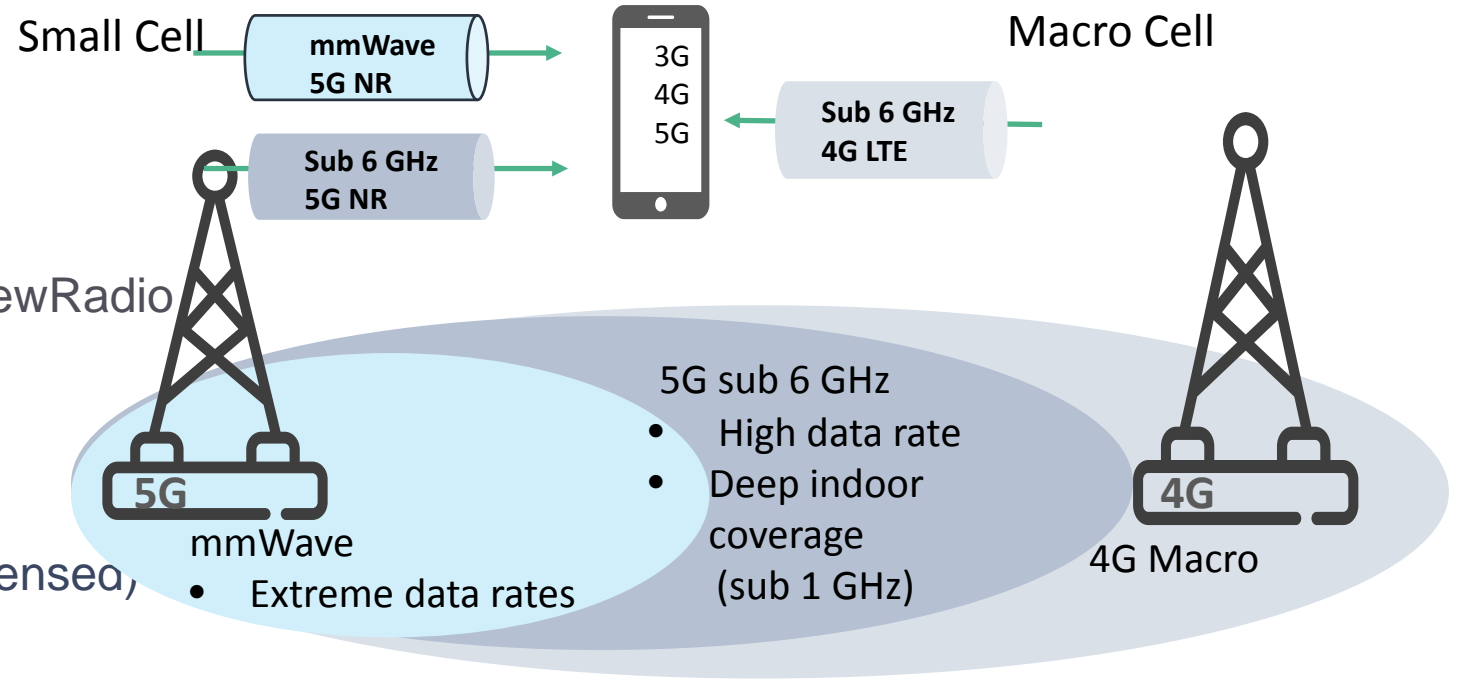
## 5G deployments: the network of networks (1)

### Use cases: fixed and mobile

- FWA (CPE, Customer Premises Equipment):
  - 5G Technology Forum (Vzw), 3GPP NewRadio
- Mobile Access (UE): 3GPP NR

### Bandwidth: sub6GHz and mmW

- sub 6GHz (e.g. 600/700MHz; 3.5GHz, unlicensed),  
mmW (e.g. 15GHz, 24GHz, 28GHz, 39GHz)



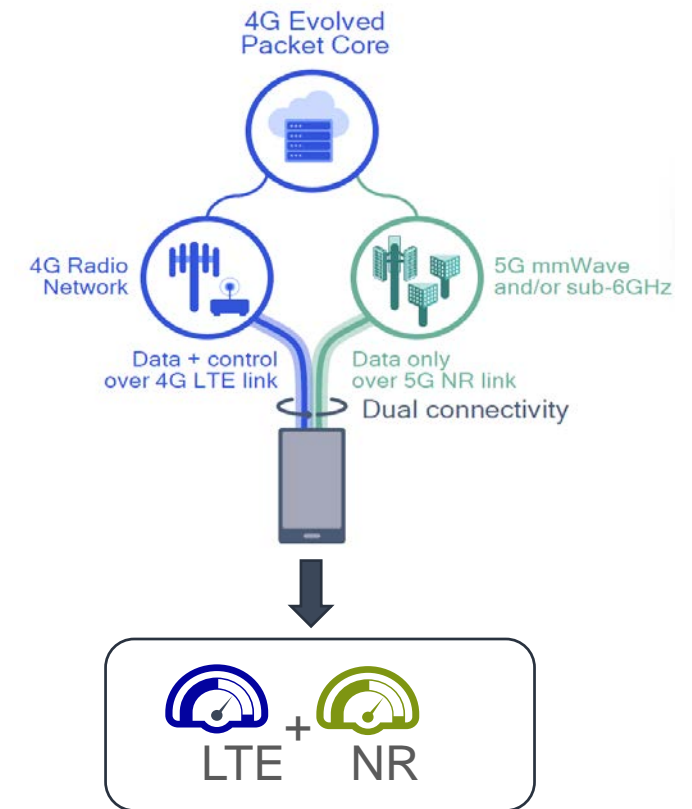
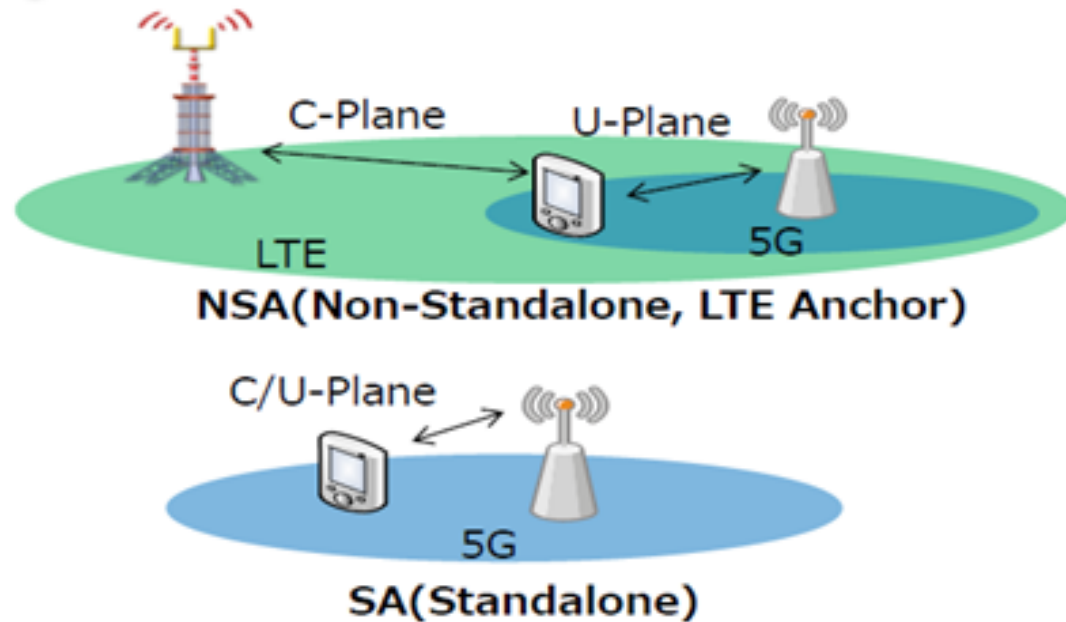


# Technology shift

## 5G deployments: the network of networks (2)

**Smooth tied integration with legacy:** 5G NR designed to leverage on LTE anchor for control signaling (non-standalone) or to operate stand-alone with new 5G core – based on CUPS (Control and User Plane Split)

- In the Non-Standalone (NSA) mode, coverage of both LTE and 5G NR required  
Band combinations (NR vs. LTE band)



Combined view in test tool

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# Technology shift

## 5G deployments: the network of networks (3)

### Designed to support various verticals: slices

A network slice is viewed as a **logical end-to-end network** that provides specific network capabilities and characteristics.

Slices may be dynamically created.

The network slicing architecture contains (higher QoS granularity)

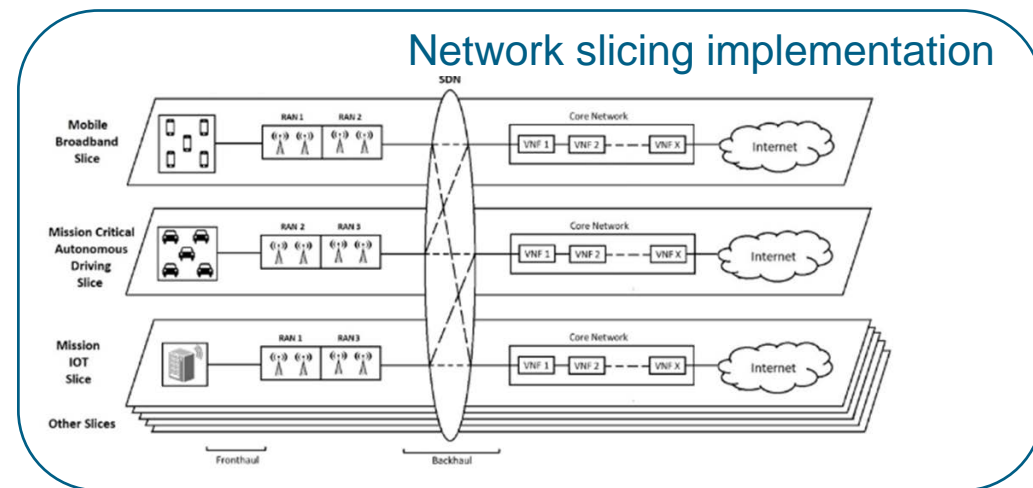
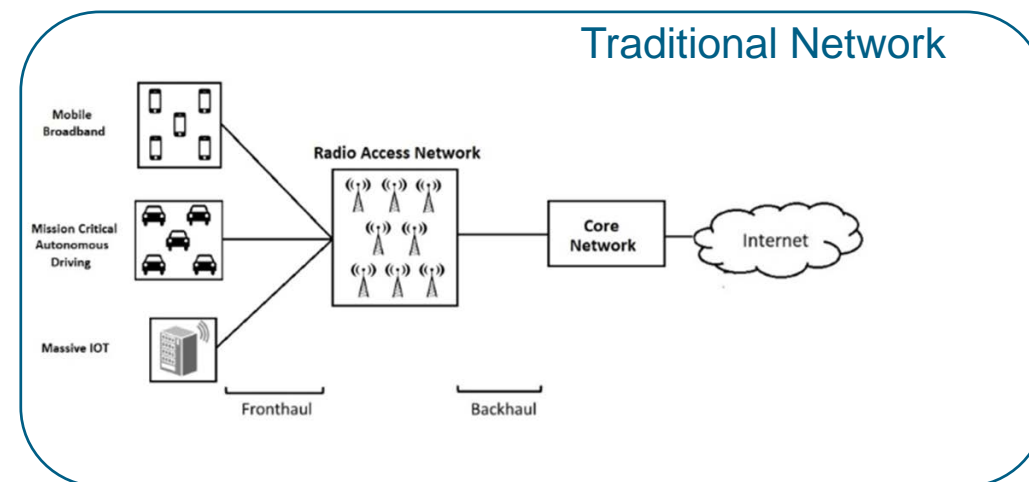
**Access slices** (both radio access and fixed access)

**CN slices**

**The slice pairing function** that connects the above slices into a complete E2E network slice.

Pairing function 1: services to slices

Pairing function 2: CN slice to RAN slice (per AN resources)



# QoS/QoE shift

## 5G QoS/QoE rules

### Is 5G QoS different than LTE?

1:1 between EPC and radio bearers

Packets not matching any DL or UL filters go to the default bearer

- A 2-step process mapping of IP-flows to QoS flows (NAS) and from QoS flows to DRBs (Access Stratum).
- QFI flows are not bidden to AN resources, AN decides what resources to allocated (due to slicing)
- In 5G, packets not matching the filters also go to the default DRB of the PDU session
- Support of **Reflective QoS** over RAN under control of the network.
  - The network decides on the QoS to apply on the DL traffic and the UE reflects the DL QoS to the associated UL traffic

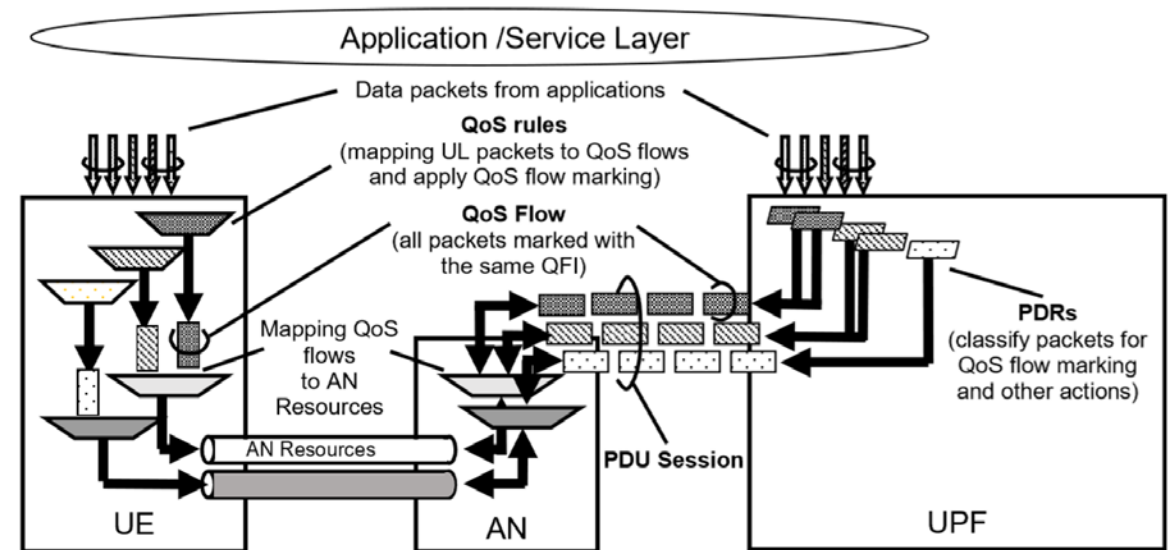
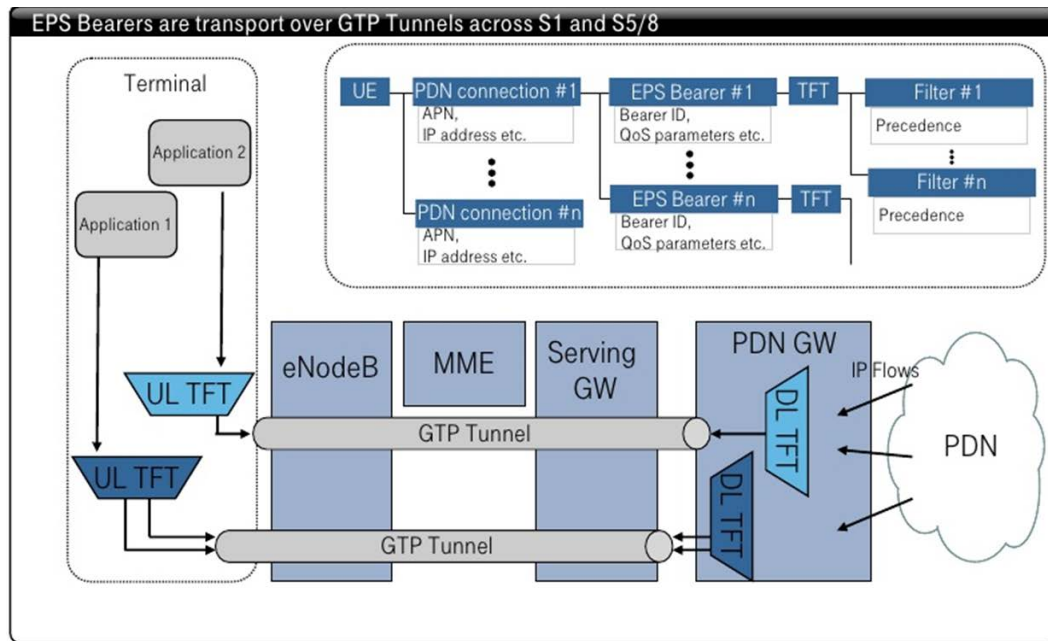


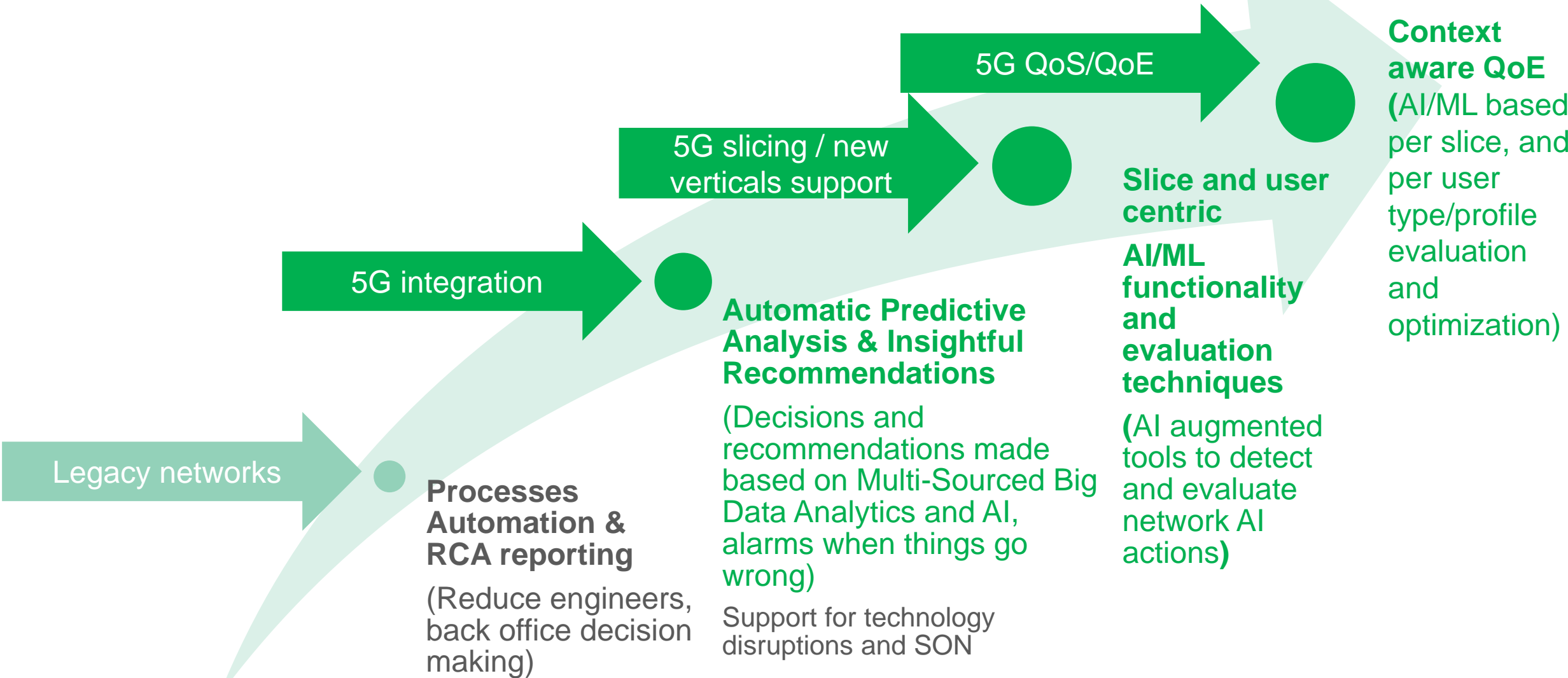
Figure 5.7.1.5-1: The principle for classification and User Plane marking for QoS Flows and mapping to AN Resources

ETSI TS 123 501 V15.2.0 (2018-06)

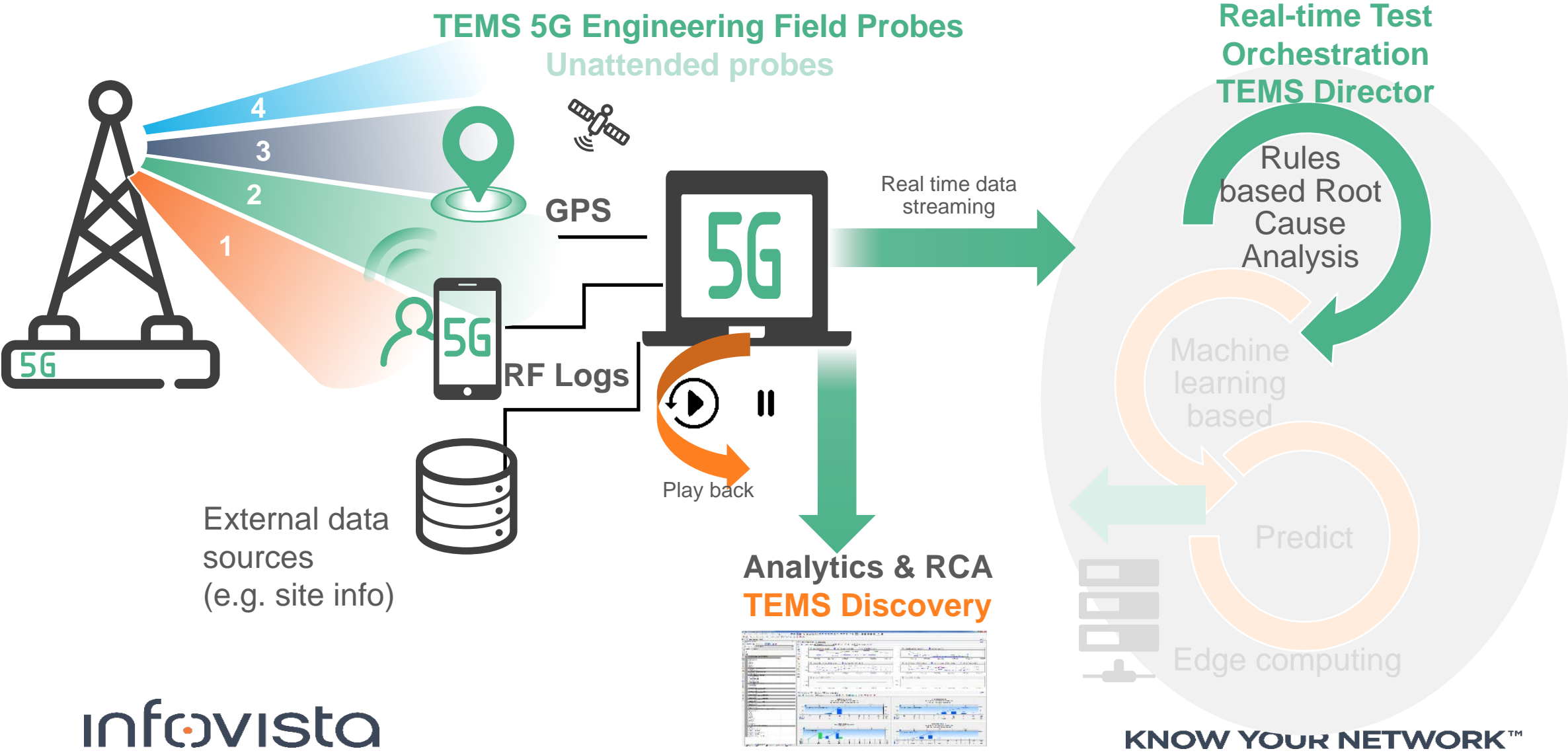
# Rethinking planning & testing concepts



# The shift with 5G impacting testing



# Rethinking testing probes: machine learning based running at the edge



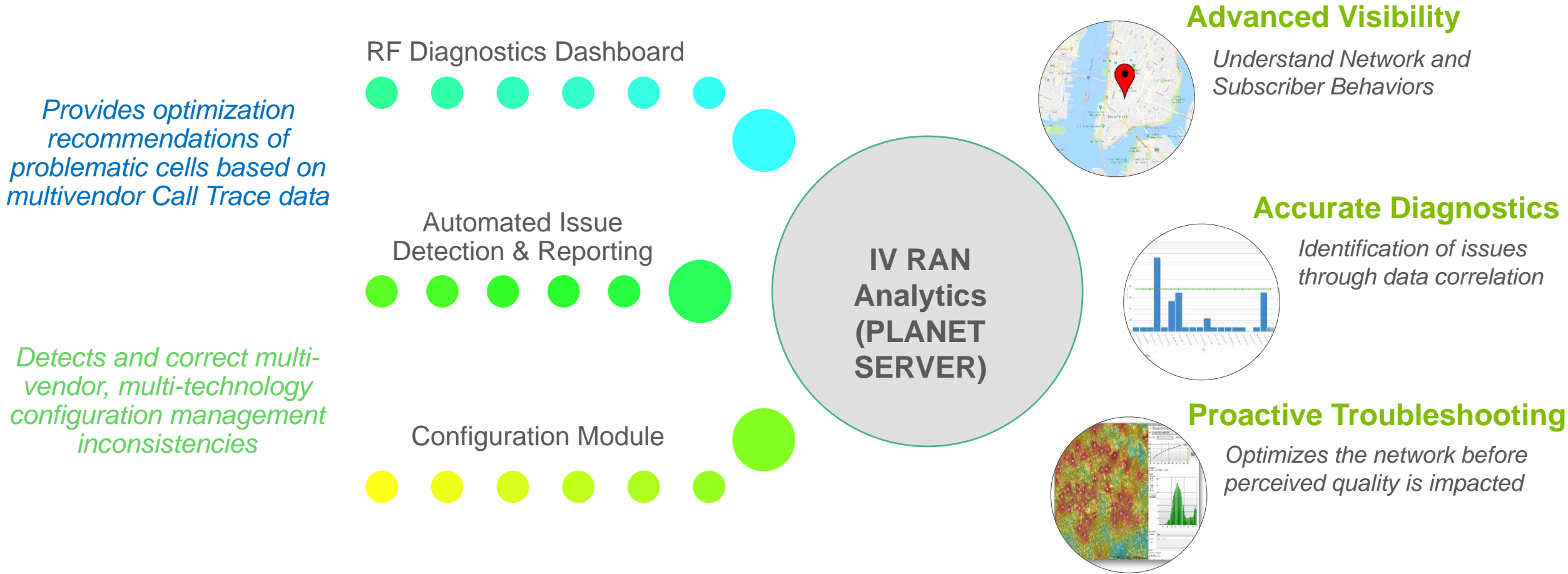
# InfoVista examples of how the shift works



# Combine data source: planning and call-trace

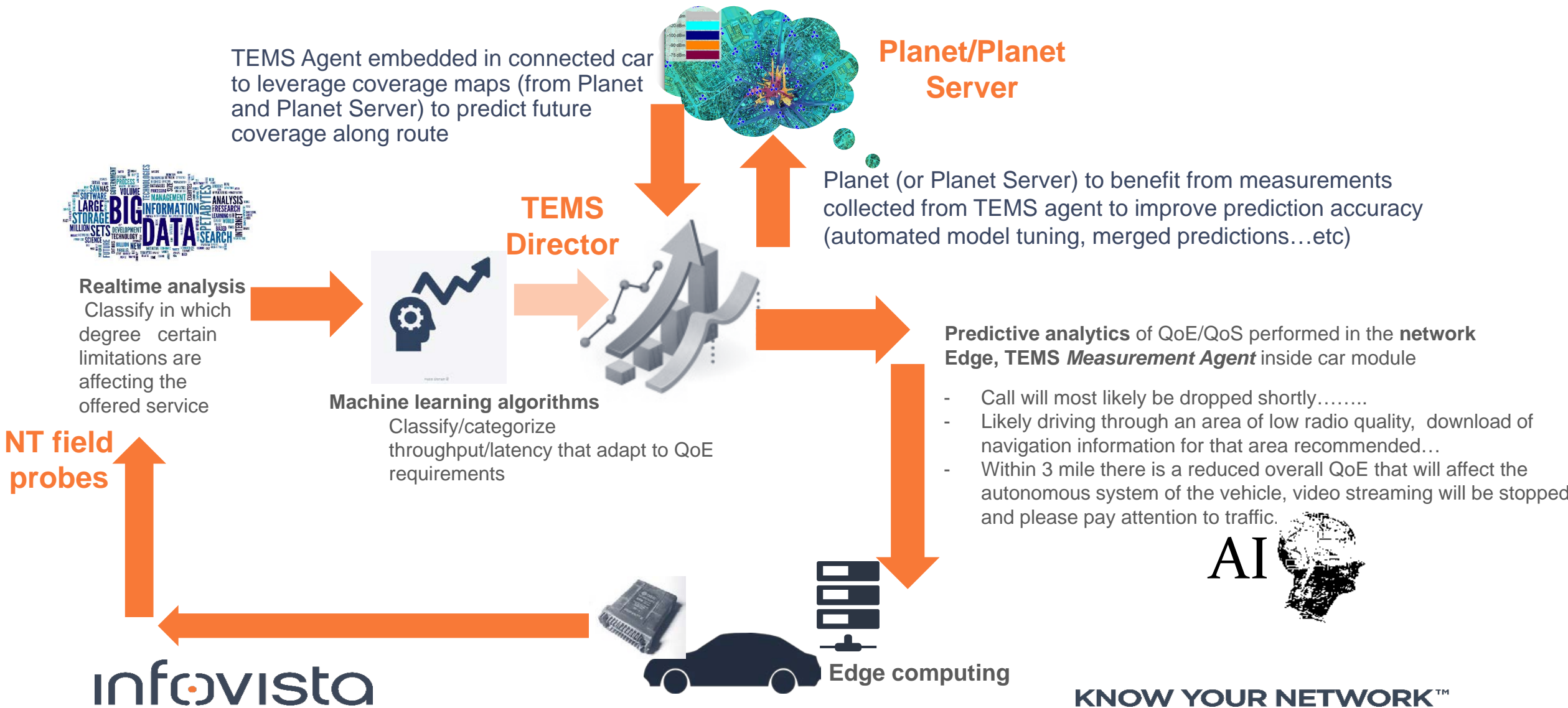
Automated RAN Analytics and Location Intelligence towards per slice

QoS/QoE optimization





# New Verticals: Connected Car IV concept



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Thank you!

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