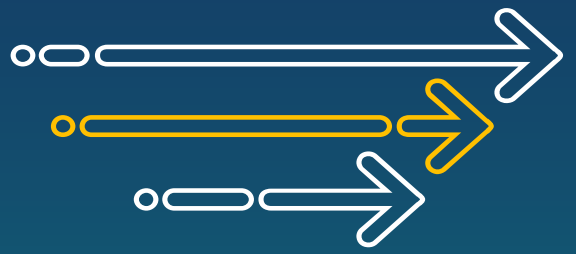

QoS/QoE Developments in 4G-IoT & 5G Technologies

Fernando Rodini
Director, Engineering
Qualcomm

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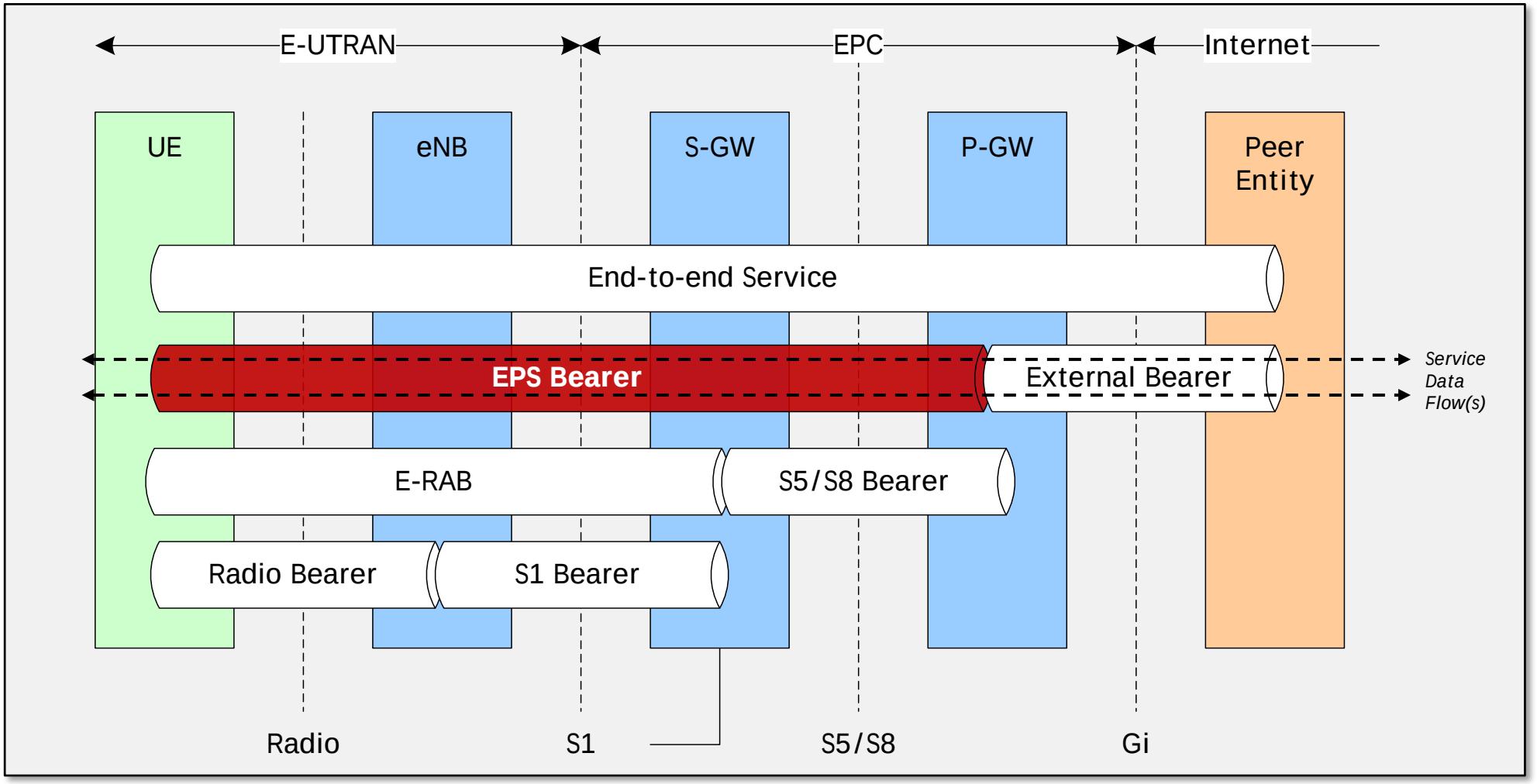
QoS enforced per EPS Bearer:



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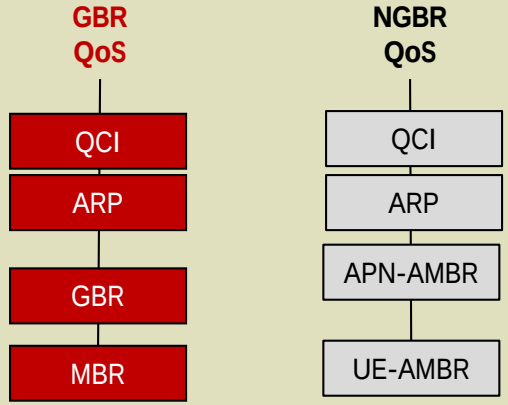
EPS Bearer QoS depends on the ***resource type:*** ***GBR*** *or* ***Non-GBR***

- A ***Default EPS Bearer*** is always **Non-GBR**
- A ***Dedicated EPS Bearer*** can be **GBR or Non-GBR**

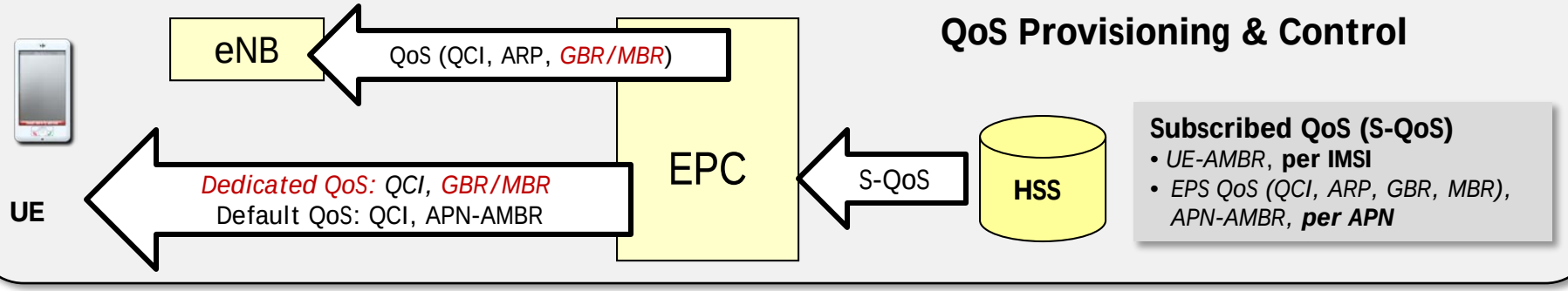
EPS QoS Parameters

- QoS Class Identifier (**QCI**)
- Allocation/Retention Priority (**ARP**)
- Guaranteed Bit Rate (**GBR**), Maximum Bit Rate (**MBR**)
  - GBR Bearers only - (Uplink/Downlink)
- Per UE/APN Aggregate MBR(**UE-AMBR, APN-AMBR**)
  - Non-GBR Bearers only - (Uplink/Downlink)

APN = Access Point Name



QoS Provisioning & Control



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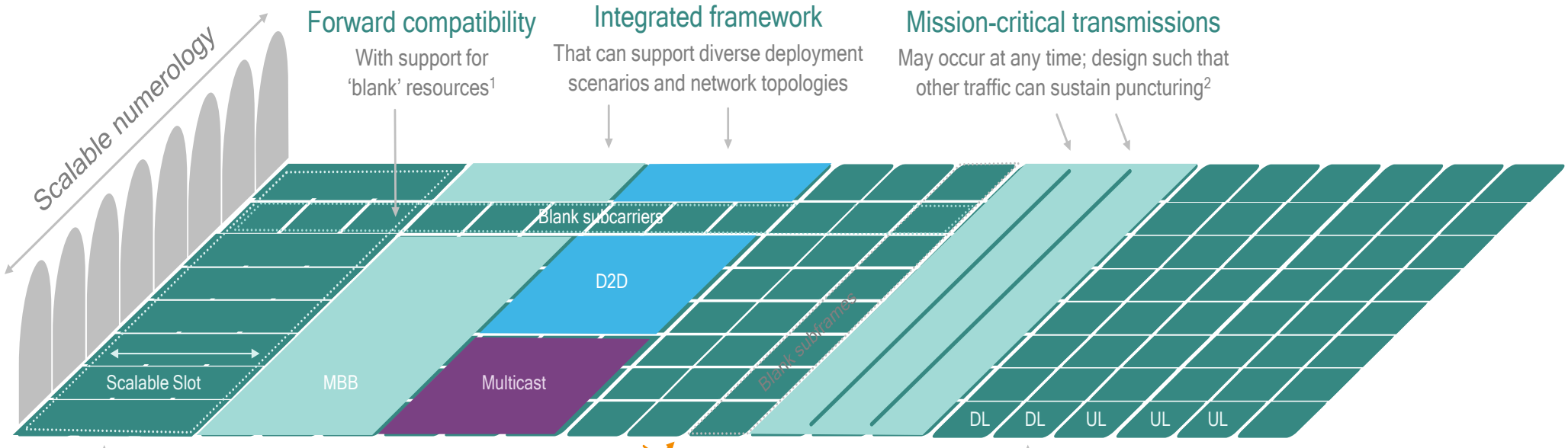
5G NR: Flexible Framework with Forward Compatibility



[1] Blank resources may still be utilized, but are designed in a way to not limit future feature introductions; [2] Nominal 5G access to be designed such that it is capable to sustain puncturing from mission-critical transmission or bursty interference

Wide range of 5G services require more than optimized waveforms and multiple access

5G NR flexible frame structure to efficiently multiplex services & offer forward compatibility

Need → Flexibility in time domain & also freq domain (with scalable OFDM)

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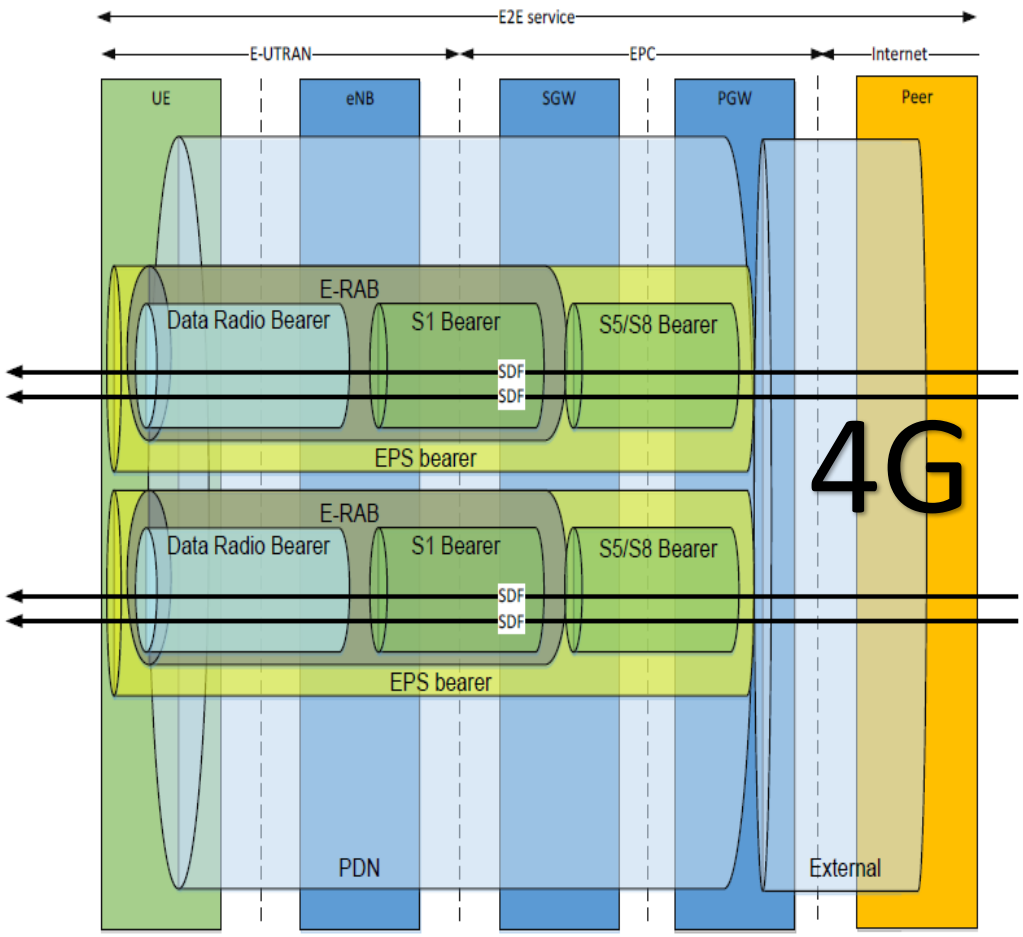
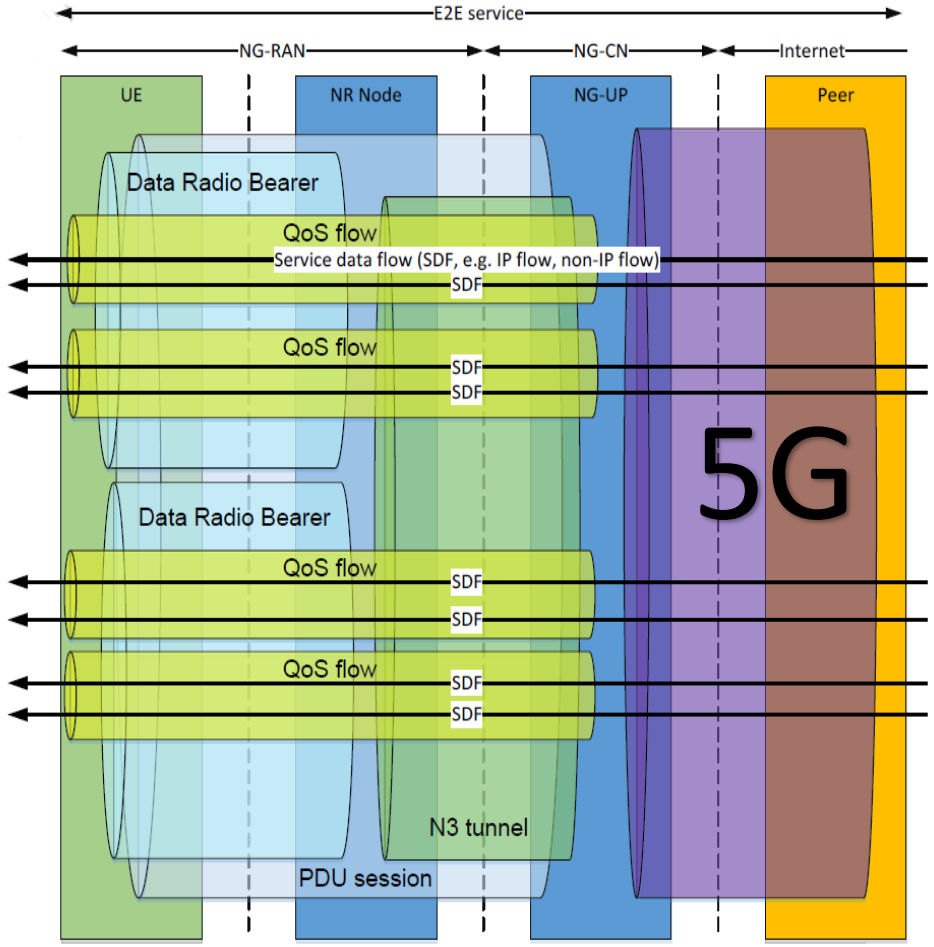
Quality of Service (QoS) Comparison 4G and 5G





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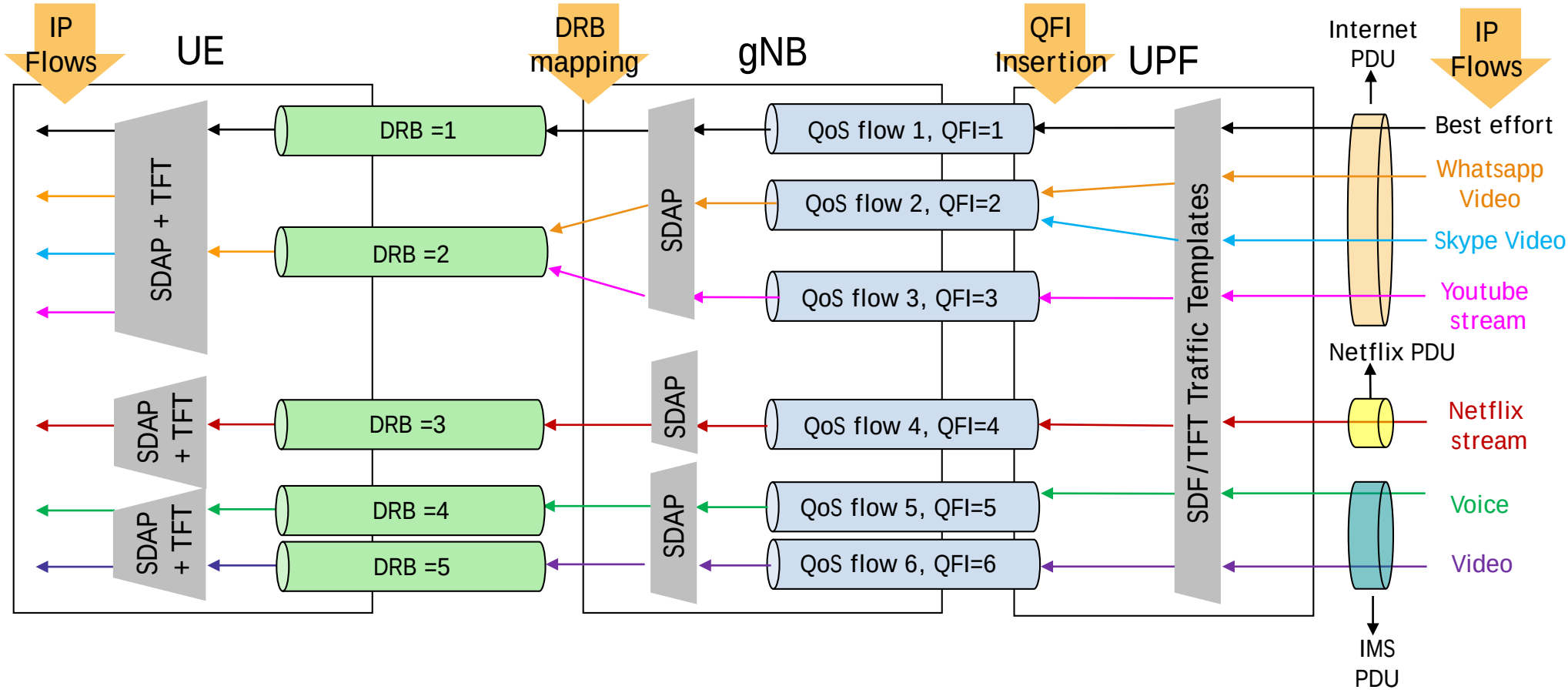
Downlink QoS Flow Example (typical apps)



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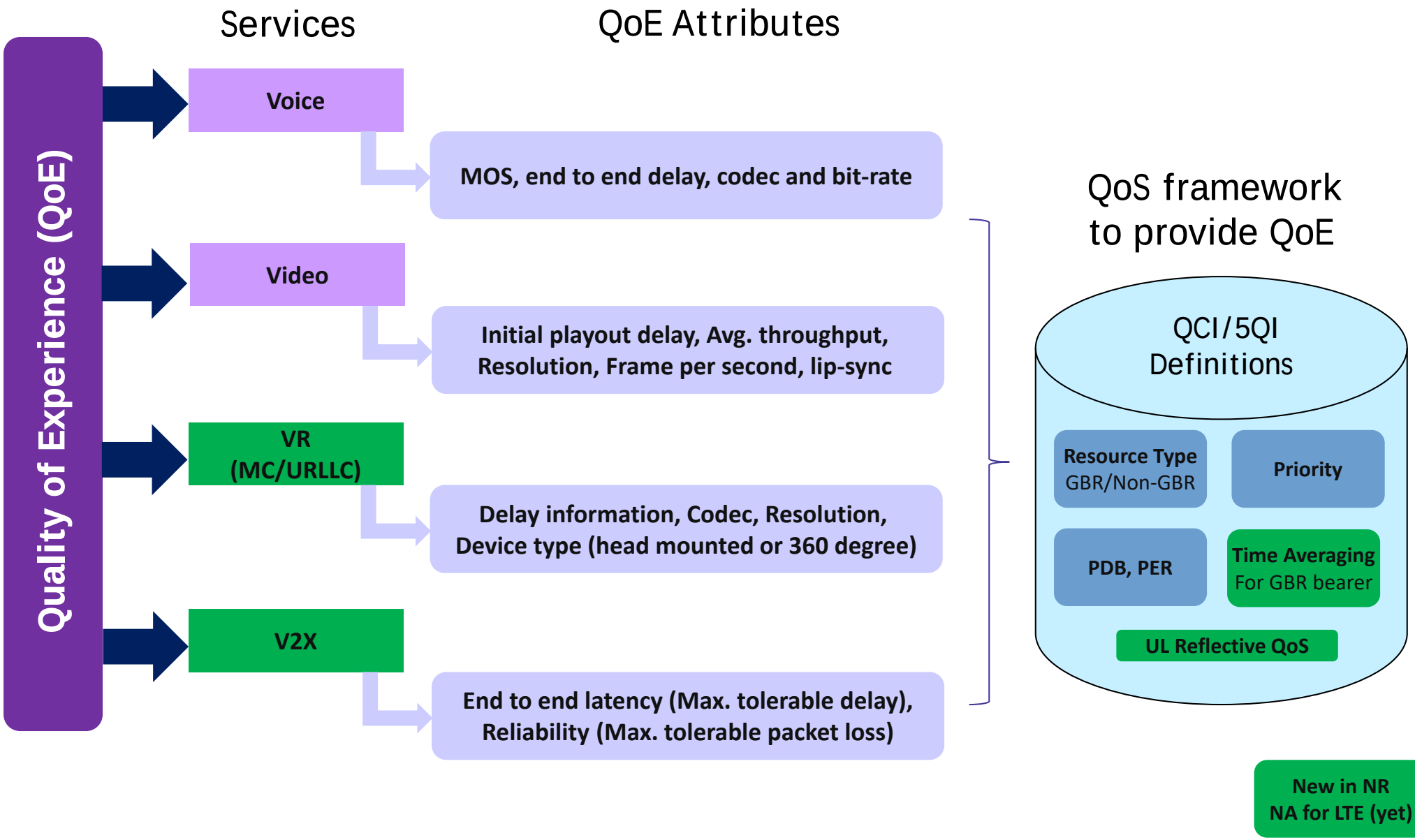
QoE enablement via QoS



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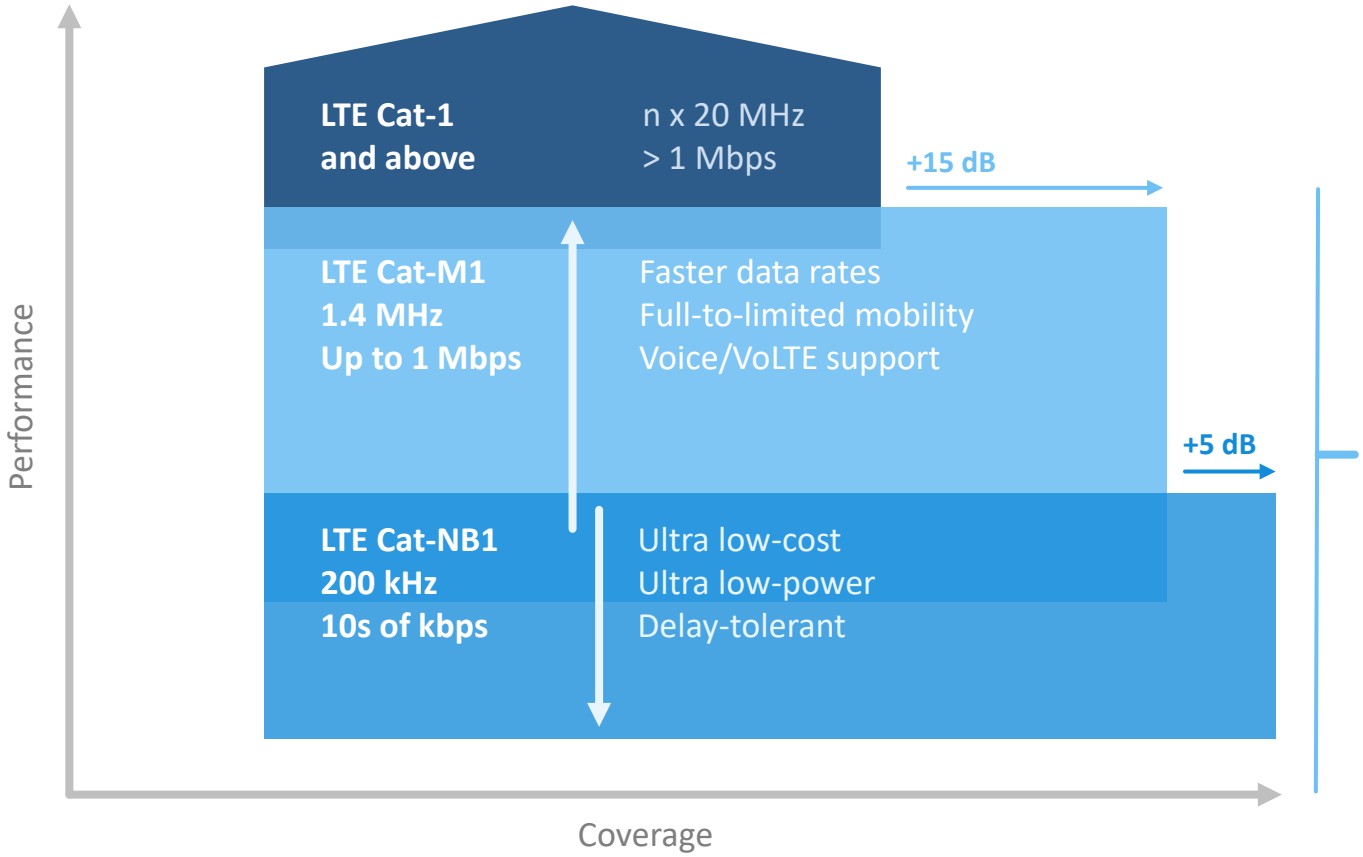
Cat-M1 aka Bandwidth Reduced Low Complexity / Coverage Enhancement (BL/CE) UE



LTE Cat-M1 (eMTC)

Broadest range of IoT capabilities with support for advanced features, e.g. voice support

Many IoT devices & LTE networks can benefit from multi-mode operations to optimize for different traffic profiles and RF conditions

LTE Cat-NB1 (NB-IoT)

Scalable to lowest cost/power for delay-tolerant, low-throughput IoT use cases, e.g. remote sensors

- **Deeper Coverage also depends on IOT device; Cat-NB1 offers 5/20dB wider coverage than CatM/Cat1**

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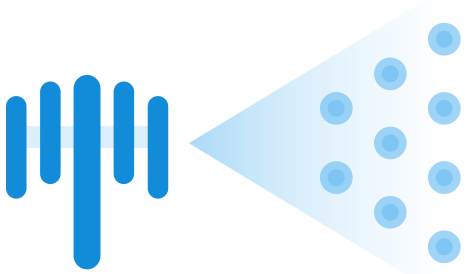
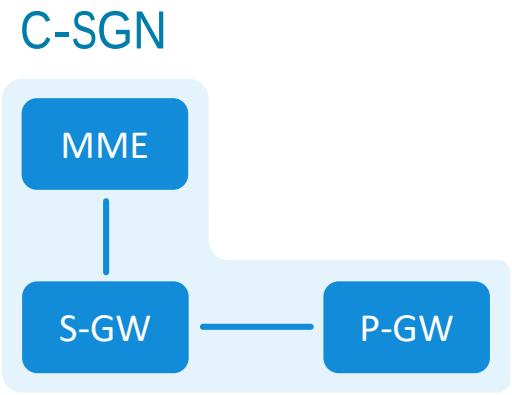
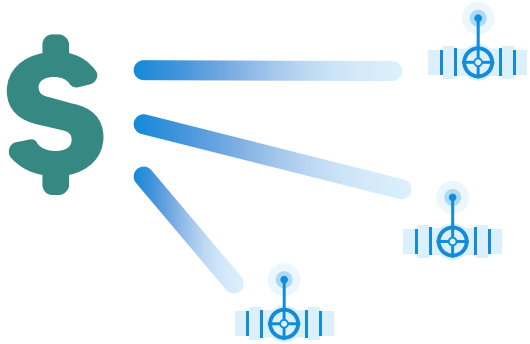
3GPP Release 13 TS 23.401







More efficient signaling

To support a larger number of devices per cell with new features such as group-based paging and messaging

Simplified Core Network

Reduced functionality, e.g. limited mobility and makes possible for integrating network functions into a single entity

Enhanced resource management

Such as optimizations to allow a large set of devices to share the same subscription, e.g. all the water meters in a city

The Core Network node involved in the EPS Architecture optimized for CIoT can be deployed as Dedicated Core Networks (DCNs) within a PLMN

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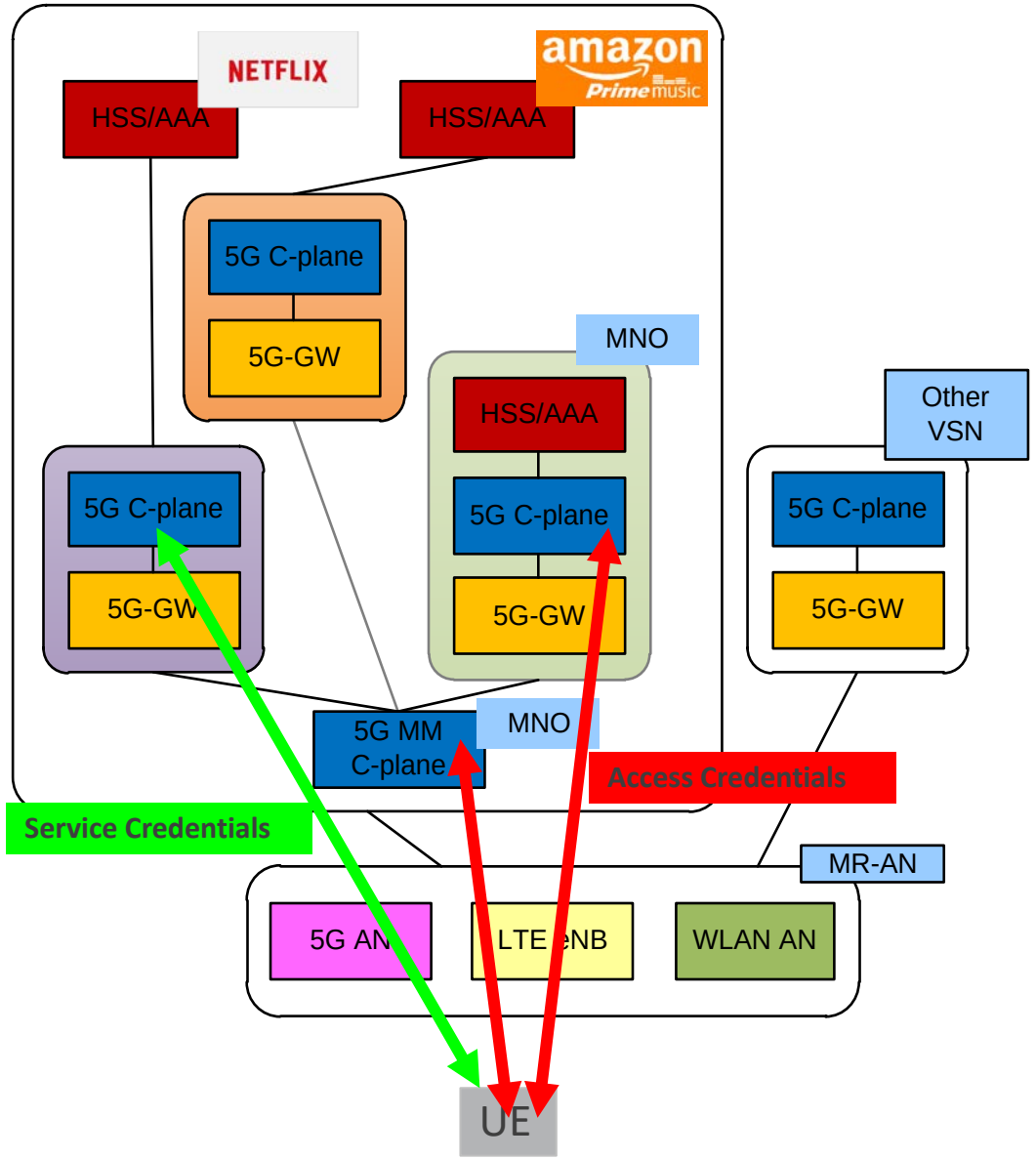
Enabling service authorization (e.g. charging to 3rd party, 3rd party request/profiling for QoS, etc.) for specific connections (sessions a-la PDN) **creates flexibility and enables new service models**



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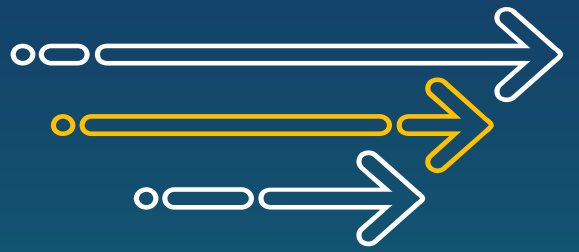

Thanks

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