

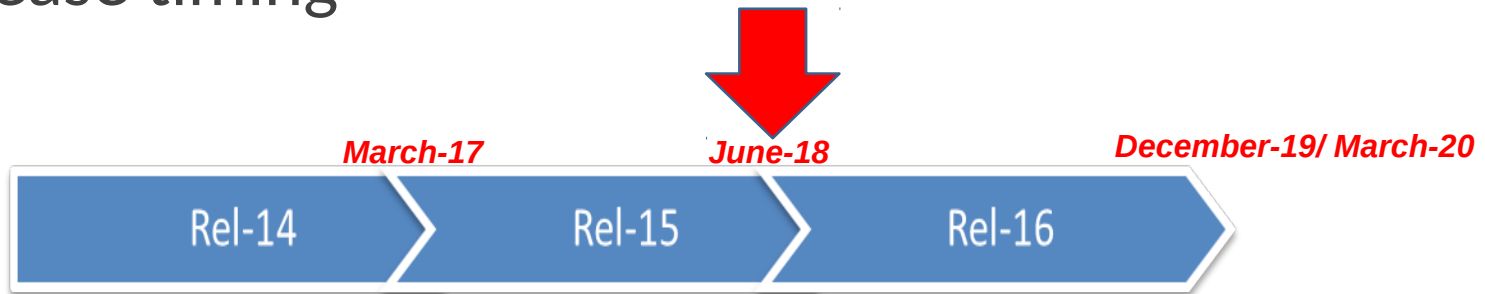
# 3GPP Network Slicing

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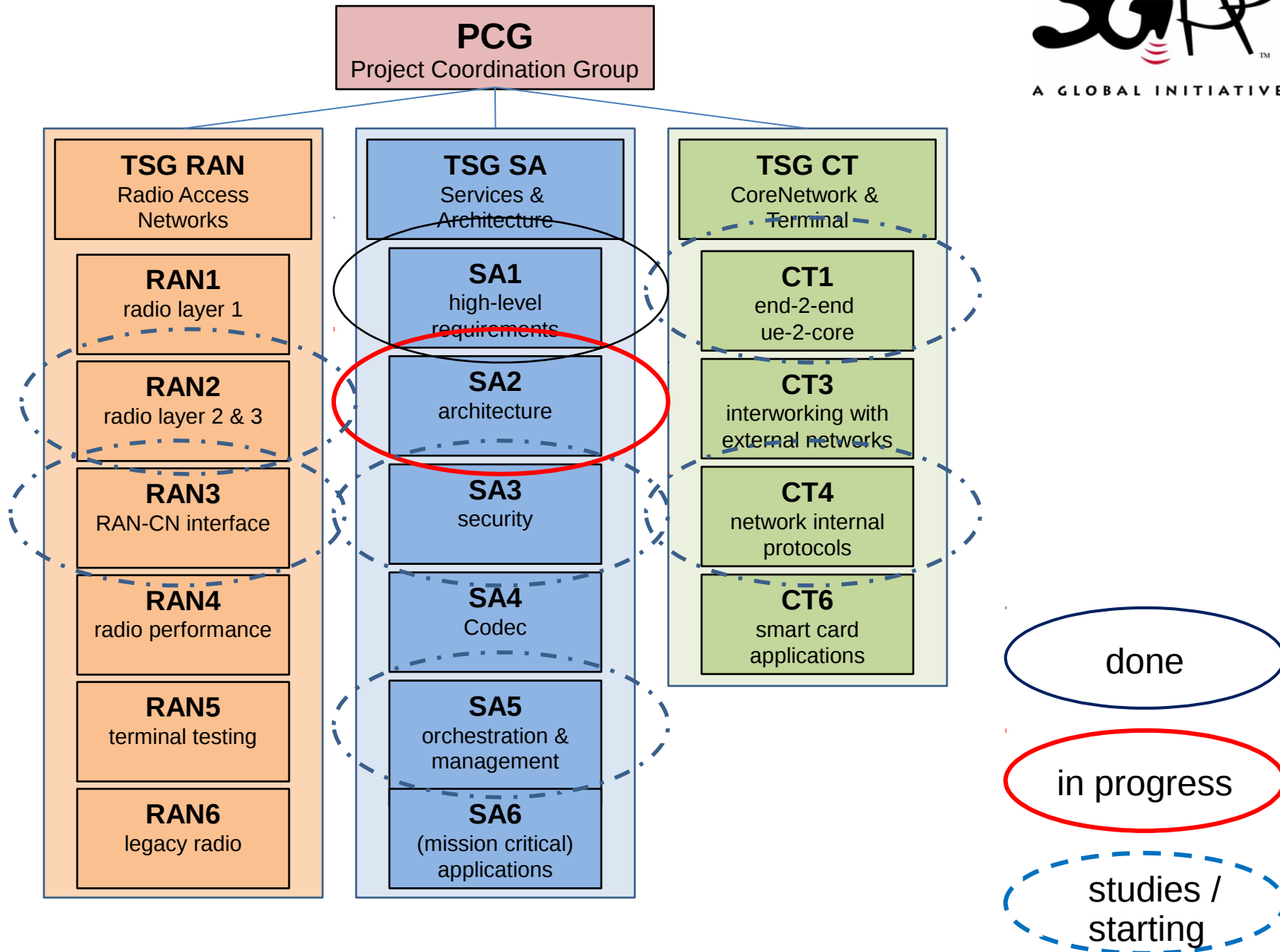
# 5G Timeline & Phasing

## › Release timing



## › Two phases for the normative 5G work

- › Phase 1 (Rel-15) to be completed by June 2018  
addresses the more urgent subset for commercial deployments
- › Phase 2 (Rel-16) to be completed by March 2020  
IMT 2020 submission, addresses all identified use cases & requirements



# 3GPP Requirements For IETF netslicing

- › Does 3GPP currently have dedicated requirements for any kind of IETF protocol or activity related to nw-slicing?
  - › At the moment: No
- › *Why?*
  - › Normative work so far only on high-level requirements and architecture
  - › Protocol, security, orchestration related studies ongoing, but no definite results yet – don't speculate!
- › *What's foreseeable?*
  - › UE-to-Core / Core-internal (CT1/CT4) – can be done by existing mechanisms (NAS/SBA), i.e. most likely no requirements to IETF
  - › RAN – most likely nothing
  - › Orchestration – too early to say
  - › Collaboration with BBF (Broadband Forum)

# 5G Network Slicing

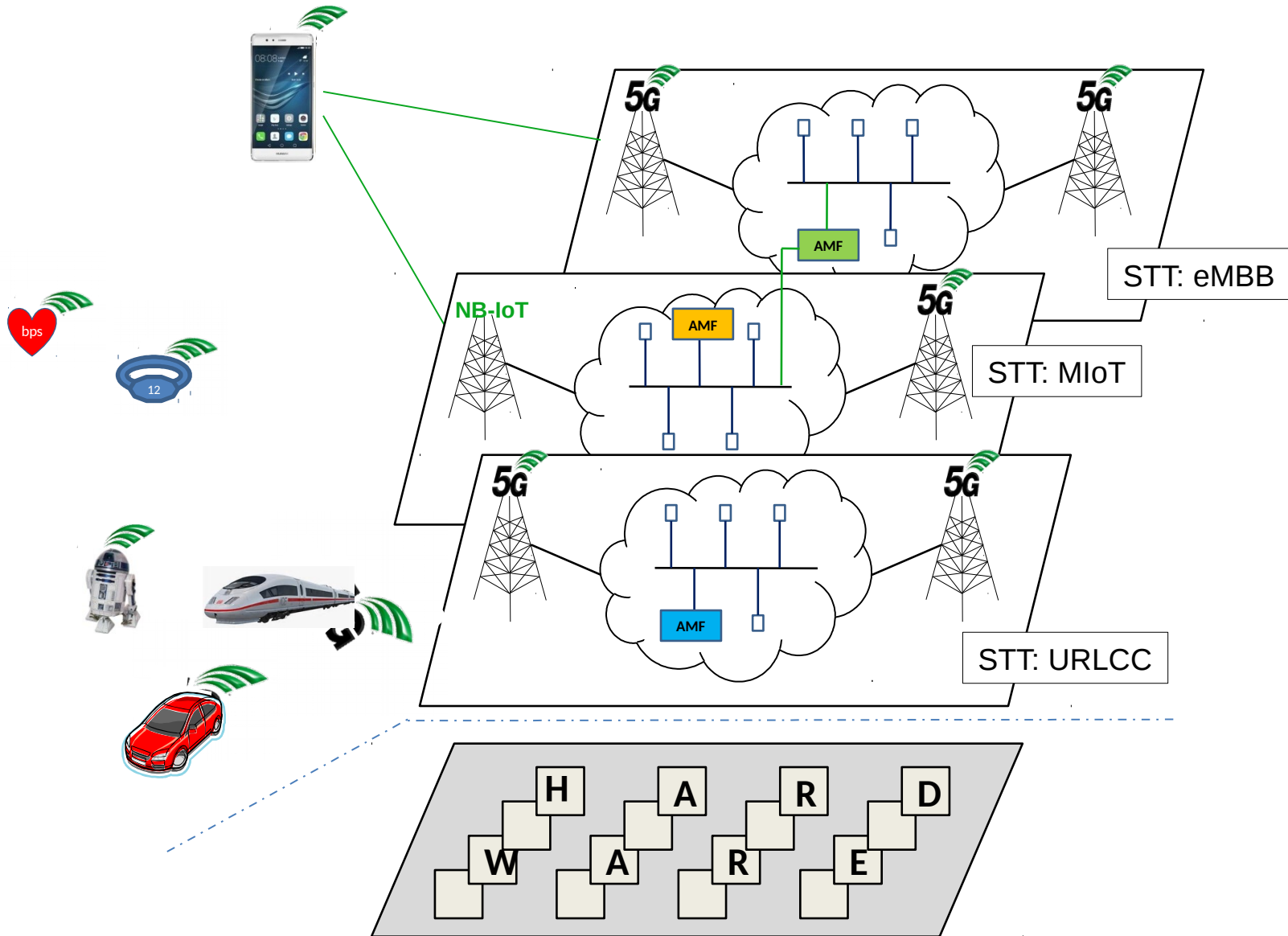
- › Network Slice
  - › A logical end-to-end network
  - › Dynamically created
- › Different slices for different services types
  - › Committed services – slice types
  - › Dedicated customers
- › May comprise
  - › 5G CoreNetwork (CP & UP)
  - › 5G Radio Access Network
  - › Interworking Functions to non-3GPP Access Networks
- › UE connects
  - › Max 8 slices in parallel
  - › Common AMF for one UE in all slices

# Network Slicing – Slice Identification

TS 23.501, section 5.15.2

- › S-NSSAI – single network slice selection assistance information
  - › SST – slice type, describes expected network behavior
  - › SD – slice differentiator, optional, further differentiation
- › S-NSSAI can have standard or network-specific values
  - › Standard SST values: *eMBB*, *URLCC*, *MIoT* (see next slides)
- › NSSAI is a collection of max 8 S-NSSAI
- › UE sends NSSAI – based on which related slice(s) are selected

# 3GPP Network Slicing - Simplified



# Standard Slice Type (STT) Values

TS 23.501, section 5.15.2.2-1

Slice/Service type	SST value	Characteristics.
<b>eMBB (enhanced Mobile Broadband)</b>	1	<p>Slice suitable for the handling of 5G enhanced Mobile broadband, useful, but not limited to the <b>general consumer space</b> mobile broadband applications including</p> <ul style="list-style-type: none"><li>- streaming of High Quality Video,</li><li>-Fast large file transfers etc.</li></ul> <p>It is expected this SST to aim at supporting High data rates and high traffic densities</p>
<b>URLLC (ultra- reliable low latency communications)</b>	2	<p>Supporting ultra-reliable low latency communications for applications including,</p> <ul style="list-style-type: none"><li>- industrial automation,</li><li>- (remote) control systems.</li></ul>
<b>MIoT (massive IoT)</b>	3	<p>Allowing the support of a large number and high density of IoT devices efficiently and cost effectively.</p>



# e.g. MIoT Performance Requirements TS 22.261, table 7.1-1

	Scenario	Experienced data rate (DL)	Experienced data rate (UL)	Area traffic capacity (DL)	Area traffic capacity (UL)	Overall user density	Activity factor	UE speed	Coverage
1	<b>Urban macro</b>	50 Mbps	25 Mbps	100 Gbps/km <sup>2</sup> (note 4)	50 Gbps/km <sup>2</sup> (note 4)	10 000/km <sup>2</sup>	20%	Pedestrians and users in vehicles (up to 120 km/h)	Full network (note 1)
2	<b>Rural macro</b>	50 Mbps	25 Mbps	1 Gbps/km <sup>2</sup> (note 4)	500 Mbps/km <sup>2</sup> (note 4)	100/km <sup>2</sup>	20%	Pedestrians and users in vehicles (up to 120 km/h)	Full network (note 1)
3	<b>Indoor hotspot</b>	1 Gbps	500 Mbps	15 Tbps/km <sup>2</sup>	2 Tbps/km <sup>2</sup>	250 000/km <sup>2</sup>	note 2	Pedestrians	Office and residential (note 2) (note 3)
4	<b>Broadband access in a crowd</b>	25 Mbps	50 Mbps	[3,75] Tbps/km <sup>2</sup>	[7,5] Tbps/km <sup>2</sup>	[500 000]/km <sup>2</sup>	30%	Pedestrians	Confined area
5	<b>Dense urban</b>	300 Mbps	50 Mbps	750 Gbps/km <sup>2</sup> (note 4)	125 Gbps/km <sup>2</sup> (note 4)	25 000/km <sup>2</sup>	10%	Pedestrians and users in vehicles (up to 60 km/h)	Downtown (note 1)
6	<b>Broadcast-like services</b>	Maximum 200 Mbps (per TV channel)	N/A or modest (e.g., 500 kbps per user)	N/A	N/A	[15] TV channels of [20 Mbps] on one carrier	N/A	Stationary users, pedestrians and users in vehicles (up to 500 km/h)	Full network (note 1)
7	<b>High-speed train</b>	50 Mbps	25 Mbps	15 Gbps/train	7,5 Gbps/train	1 000/train	30%	Users in trains (up to 500 km/h)	Along railways (note 1)
8	<b>High-speed vehicle</b>	50 Mbps	25 Mbps	[100] Gbps/km <sup>2</sup>	[50] Gbps/km <sup>2</sup>	4 000/km <sup>2</sup>	50%	Users in vehicles (up to 250 km/h)	Along roads (note 1)
9	<b>Airplanes connectivity</b>	15 Mbps	7,5 Mbps	1,2 Gbps/plane	600 Mbps/plane	400/plane	20%	Users in airplanes (up to 1 000 km/h)	(note 1)

NOTE 1: For users in vehicles, the UE can be connected to the network directly, or via an on-board moving base station.

NOTE 2: A certain traffic mix is assumed; only some users use services that require the highest data rates [2].

NOTE 3: For interactive audio and video services, for example, virtual meetings, the required two-way end-to-end latency (UL and DL) is 2-4 ms while the corresponding experienced data rate needs to be up to 8K 3D video [300 Mbps] in uplink and downlink.

NOTE 4: These values are derived based on overall user density. Detailed information can be found in [10].

NOTE 5: All the values in this table are targeted values and not strict requirements.

# Thank You!

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