3GPP TSG RAN Rel-18 workshop
Electronic Meeting, June 28 - July 2, 2021
Agenda: 4
Document for: Discussion

RWS-210392

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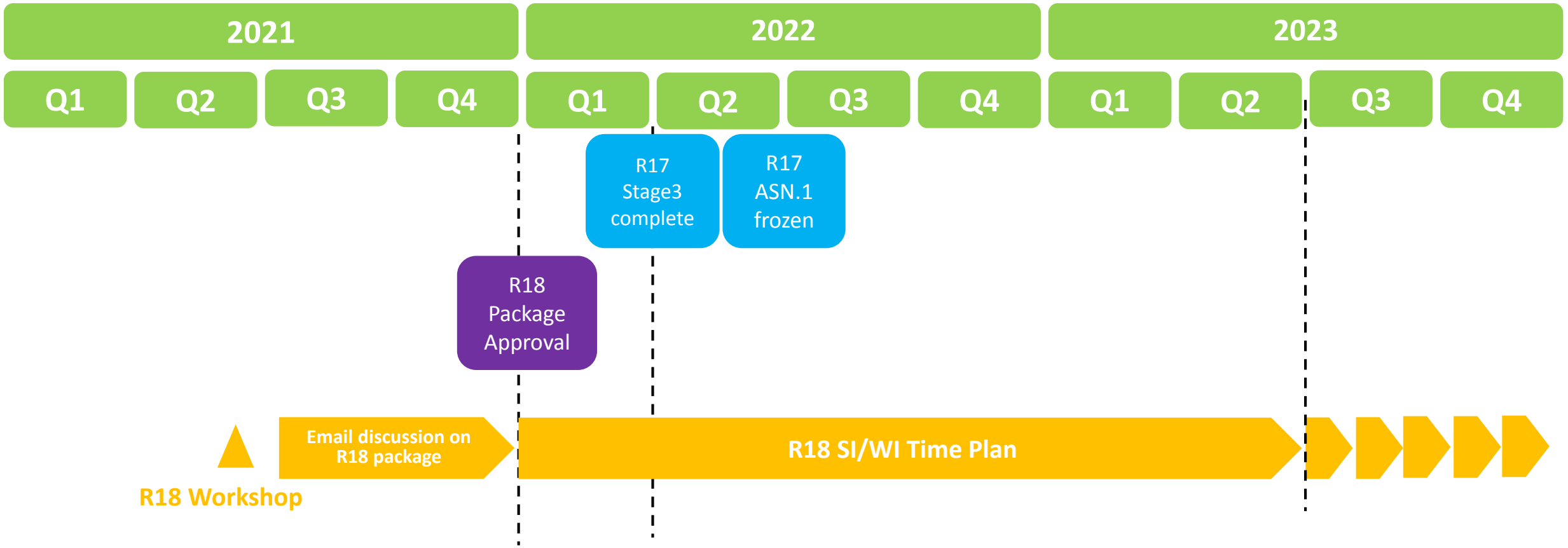
China Unicom Views on Rel-18

Source: China Unicom

Views on R18 time plan



Views on R18 potential topics

- China Unicom views on R18 potential topics. R17 feature enhancement and new features for R18.
  - MIMO enhancement
  - Mobility enhancement
  - IAB enhancement
  - NTN enhancement
  - Redcap enhancement
  - Sidelink enhancement
  - Positioning enhancement
  - SON&MDT enhancement
  - RAN slicing enhancement
  - Multi-SIM enhancement
  - Flexible Duplex enhancement
  - RAN slicing enhancement
  - XR
  - AI/ML for Lower layer and Higher layer
  - Network energy saving
  - MBS
  - RIS
  - Blockchain/Trustworthiness
  - ……

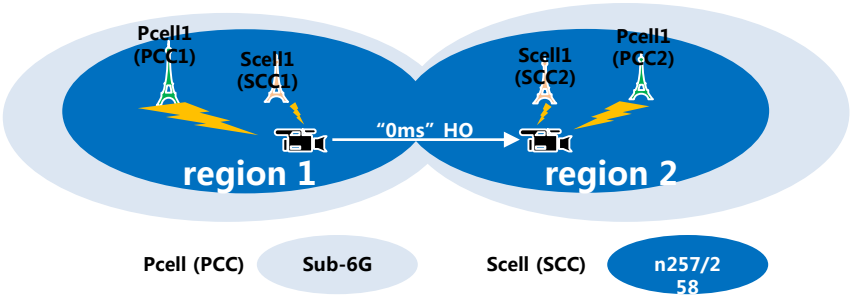
Proposals on R18 topics

- China Unicom proposals on R18 topics.
  - eMBB-driven
    - Mobility enhancement for FR1&FR2 (***RWS-210384/RWS-210385***)
  - Cross-Functionalities
    - Interference Coordination for Flexible Frame Configuration(***RWS-210388/ RWS-210389***)
    - 5G Reconfigurable Intelligent Surface (RIS)(***RWS-210390***)
    - NR QoE Enhancement(***RWS-210386/ RWS-210387***)
  - Non-eMBB-driven
    - 5G HAPS (***RWS-210391***)

1. R18 Mobility enhancement for FR1&FR2

Guarantee high quality experience in FR1 and FR2 hybrid network

- 5G network will deploy with higher frequency band and lower frequency band in MR-DC/NR-CA mode to provide a better user experience. For instance, lower frequency band is deployed for coverage and higher frequency band is deployed for capacity.
  - As shown in the figure, when the 4K / 8K liveTV moves from region 1 to region 2, extremely low delay and high throughput need to be guaranteed to ensure a good live broadcast effect. For instance, 40Mbps/120Mbps is needed for 4K / 8K liveTV to upload data, and “0 ms HO” is necessary during a live broadcast..
  - For 5G new service, service continuity and capacity should be guaranteed simultaneously in MR-DC/NR-CA network.



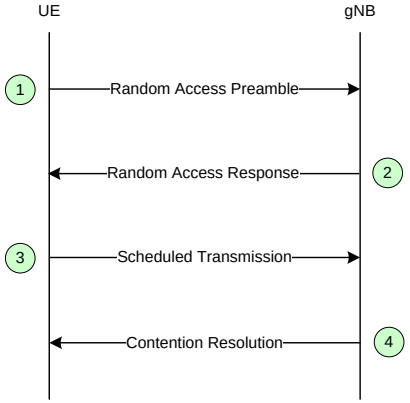
4K / 8K liveTV move from region 1 to region 2

Throughput requirements of 4K / 8K broadcast

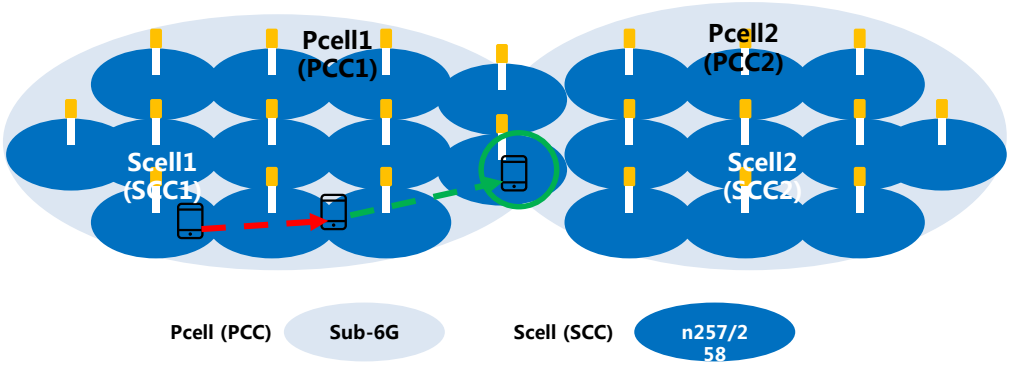
Video service type	UL data rate
4K	40Mbps~80Mbps
8K	120Mbps~160Mbps

1. R18 Mobility enhancement for FR1&FR2

- Solve issues in ultra-dense deployment scenario for FR1 and FR2 hybrid network
  - For mobile cameras/phones/VR devices, in order to meet high edge rates requirements (e.g. up to 160 Mbps for 8K videos), the mmw coverage range is a smaller area than sub-6G network in LOS/NLOS scenario. So the 5G mmw network will be an ultra-dense network when coordinating with anchor stations. For ultra-dense scenario, frequent handover and cell reselection will consume lots of signalling overhead.



Contention based RA with 4-step RA type



UE rapidly move through millimeter wave cells in ultra-dense hybrid high capacity and low delay networks

1. R18 Mobility enhancement for FR1&FR2

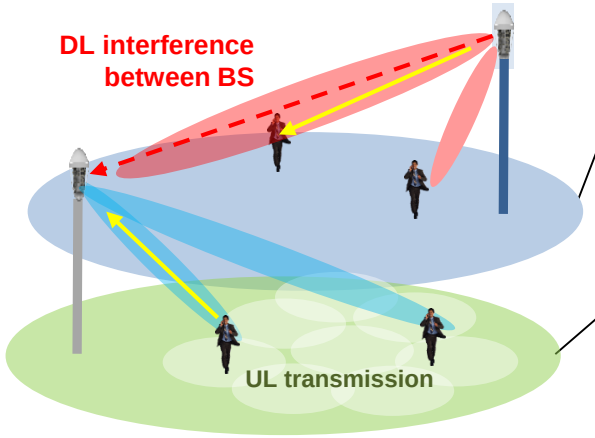
- Support for DAPS enhancement for FR1&FR2 MR-DC/MR-CA
  - Keep SN unchanged in HO procedure, inter-SN change before/simultaneously with inter-MN change.
- Signalling overhead optimization for NR dense network
  - Support Make-before-break for NR dense network
  - RACH-less HO solution.
  - Support CHO-like solution for NR dense network.
- Support mobility enhancement for 5G RAN sharing
  - Support network sharing specific information in UE reselection/handover procedure.
- R16/R17 feature enhancements
  - CHO aligned with CPAC, CHO and/or CPAC aligned with DAPS, inter-RAT PScell change, etc.
- L1/L2 solutions to enhance mobility
  - Support L1/L2 triggered CHO.

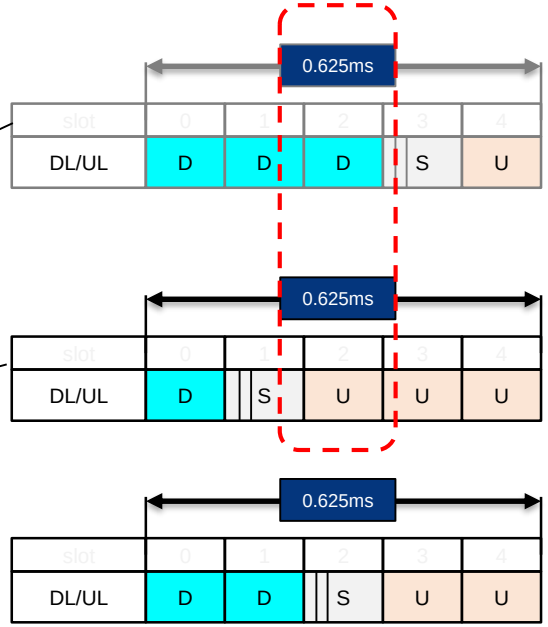
2. R18 Interference Coordination for Flexible Frame Configuration

Scenarios

- With the new service demands for a higher uplink data rate, such as 4K/8K live streaming, security monitoring and tele-medicine, etc. adjacent gNBs may be flexibly configured with different frame structures adopting to wide variations of traffic load. i.e. the frame structure is DDDSU, DSUUU, DDSUU. In such a use case, there may cause interference issue.

Deployment scenario in gym
The dynamic frame structure is configured in different area to adopt the service, i.e. 4K/8K live streaming area is configured with **DSUUU**.
Business area is configured with **DDSUU**.





Option 1 : Conventional frame structure

Option 2: Uplink dominant frame structure

Option 3 uplink & downlink equalization frame structure

Background

- RIM and CLI were studied in R16, to solver remote BS-BS interference, and UE-UE interference issue.
- The above deployment scenario and FR2 beamforming are not considered in R16.

2. R18 Interference Coordination for Flexible Frame Configuration

Objective

The detailed objectives of the SI are listed as follows:

- Study interference mitigation between base stations:
  - Interference measurement between adjacent cells
    - ✓ Study the mechanism to support BS-BS interference measurement.
    - ✓ Study the CSI-RS to measure interference between gNBs,
      - Reuse CSI-RS or define a new type of reference signal.
      - Support beam based measurement.
    - ✓ Study interference reporting mechanisms.
  - Interference mitigation scheme
    - ✓ Study interference coordination scheme, including beam-based coordination and Xn/NG signal coordination.
    - ✓ Study interference avoidance scheme.
    - ✓ Study interference suppression scheme.
  - Interference measurement and reporting for UEs
    - ✓ Study Enhancement of interference measurements between UEs.
    - ✓ Study interference reporting from UEs.

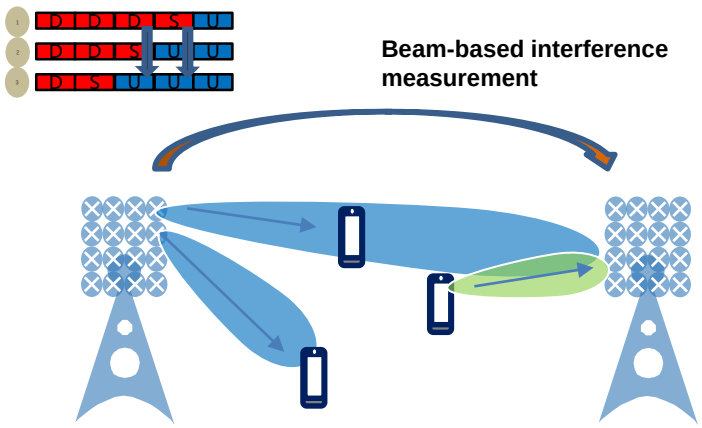
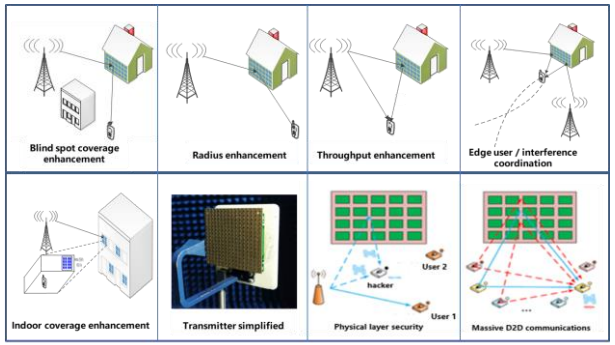


Fig. Interference Coordination with beamforming

3. R18 5G Reconfigurable Intelligent Surface (RIS)

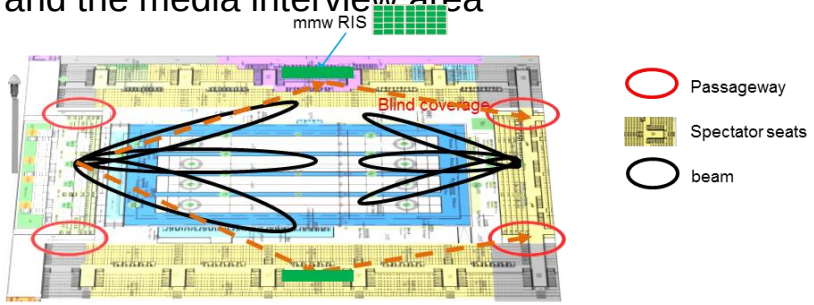
Background

- RIS is a kind of digitally-controlled meta surface with massive low-cost meta-atoms (elements). Each element may induce different amplitude/phase/frequency/polarization change in the incident signal with different codebook on control board.
  - ✓ NLOS paths are constructed to reduce blind coverage.
  - ✓ Works as relay to enhance coverage radius.
  - ✓ Multiple paths to obtain distributed MIMO gain.
  - ✓ Transmitter is simplified with less antennas.
  - ✓ Cost-effective products.



Typical reflection scenarios of RIS

- RIS can be combined with the millimeter wave wireless technology and applied to the stadium coverage area.
  - ✓ The millimeter wave base station can ensure the signal coverage of the curling track and the media interview area
  - ✓ The entry passageway is a blind spot for signal coverage
  - ✓ RIS can be deployed in this scenario to increase the coverage of the FR2 band.



RIS deployed in stadium coverage area

Objective

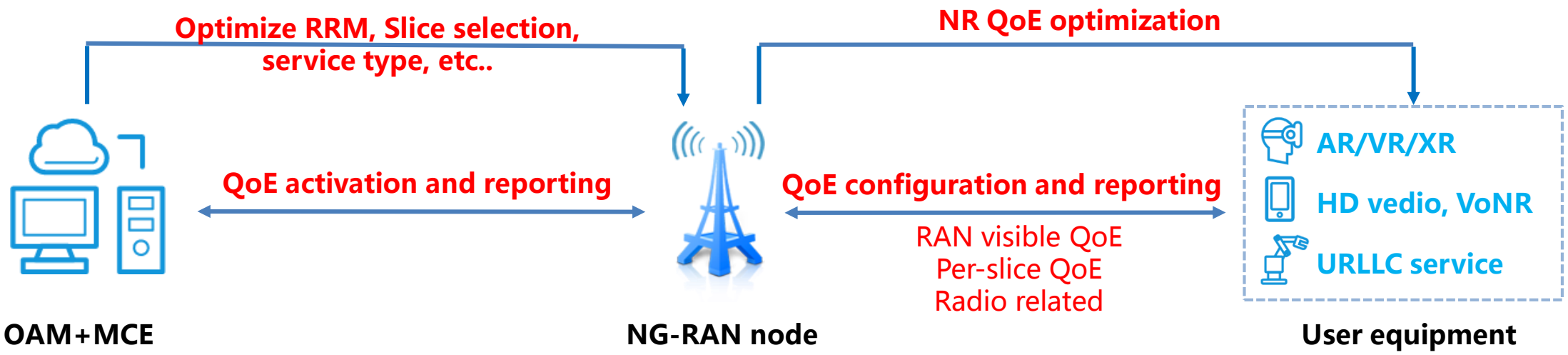
The detailed objectives of the SI are listed as follows:

- Study FR1&FR2 scenarios for Reconfigurable Intelligent Surface.
- Study evaluation methodology and carry out evaluations of the system performance of RIS in some typical scenarios.

4. R18 NR QoE enhancement

Background

- In R17, a generic mechanisms for NR QoE reporting is standardized to support triggering, configuration, collection, mobility, as well as some new features, i.e. RAN-visible QoE, per-slice QoE, radio-related measurements alignments, etc.
- Some leftover features in R17 such as , 4G/5G inter-system QoE reporting, inter-RAT mobility , support for RRC_IDLE state, support for MR_DC, etc.



4. R18 NR QoE enhancement

Objective

R17 NR QoE feature enhancement

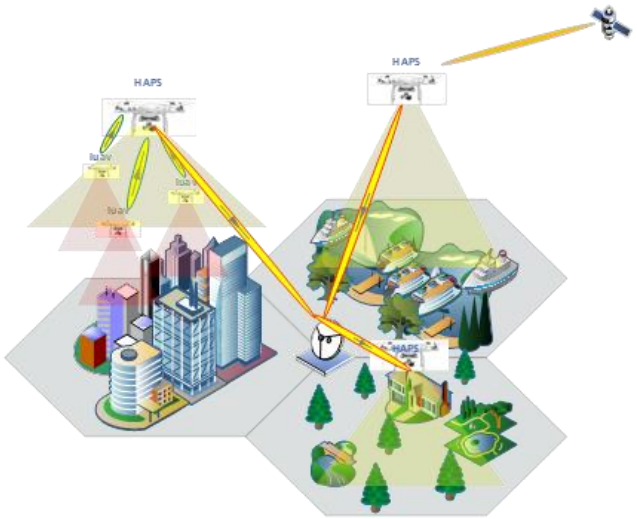
- RAN-visible QoE
  - Specify RAN-visible parameters, metrics, and potential impacts on procedures to support new service type, maybe depending on SA4.
- per-slice QoE measurement
  - Specify per-slice QoE measurement and reporting procedure if not complete in R17, configure the slice scope, NR QMC according to service type, slice and some other info.

Leftover features in R17

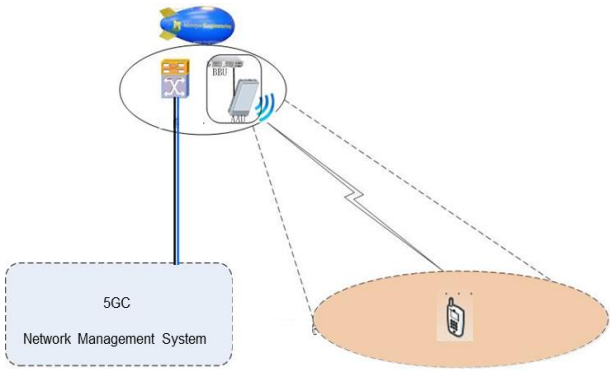
- Specify and support for QoE continuity in 4G/5G inter-system scenarios, and inter-RAT mobility scenarios.
  - Specify NR QMC and reporting continuity for 4G/5G inter-system scenarios.
  - Specify NR QMC and reporting continuity for s-based and/or m-based inter-RAT scenario.
- Specify to support for QoE measurement in RRC_IDLE state.
- Specify and support for QoE in MR_DC.
  - Specify the QoE configuration, measurement reporting via MN/SN as well as RAN-visible, per-slice and radio-related QoE.
  - Specify the QoE continuity for mobility scenarios.

5. R18 5G High Altitude Platform Station (HAPS)

Background



HAPS: An airborne vehicle operating in altitudes 20-50 km including High Altitude Platforms.



- HAPS can be used to provide services in various scenarios including pedestrian, vehicular connectivity, airplanes connectivity, stationary stations, high-speed train, and wide area IoT (i.e. massive connection, relative lower data rate) connectivity.
- 2 types of high altitude platforms: Airplane and Airship.

Objectives

- Evaluate Co-channel interference issue btw HAPS and TN and study the potential solution.
- Identify and solve the mobility issue.
  - Study the HAPS gNB handover via NG interface between the backhaul link ground stations and between 5GCs.
  - Study to identify new neighbor cell relationship with terrestrial networks.
  - Beam measurement and beam management enhancement to solve the problems caused by the instable HAPS gNB antenna surface.
- Specify core specifications of RF requirements for coexistence
  - Identify the FR1 potential band(s) to be used as example for HAPS
  - FR1 co-existence evaluation for HAPS network (e.g. ACLR, ACS)
- Specify RF requirements HAPS network
  - Specify new BS type(s) for HAPS network for airplane and airship respectively, if necessary.
  - Specify RF requirements for HAPS gNB if needed.
- Network performance optimization for UE to support the link budget.

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Thank you！