



CATT's view of SA Rel-19



Overall View on Rel-19 Content

Greater possibility to have a standalone SID

Enhancements & Important Leftover

5GS integrating satellite

Architecture enhancement for Regenerative payload;
 Store&forward; UE-satellite-UE communication

eNA

Leftover of R18 SID (e.g. UE using analytics);
 Interaction/coordination with RAN AI; new use cases

5G ProSe

U2N Relay and U2U Relay enhancements for R18
 leftovers and new requirements

5MBS

Roaming & specific SMF service areas; Resource efficiency for
 multicast; MM procedure enhancement

XRM

Multi-Flow coordination, non-3GPP access, PDU Set
 Control, EC

EDGE

Inter-MNO MEC resource sharing; Common EAS for roaming
 scenario; Leftover of R18 SID

Location service

Enhancement for dual 3GPP access, AIoT
 positioning, positioning over satellite access

TSN

Time sync for UE mobility; ProSe-based
 TSC; Aperiodic deterministic comm;
 distributed model

GMEC, VMR, NPN....

New Features

Integrated Sensing And Comm.

Sensing architecture and procedure, privacy check,
 sensing information exposure, service continuity

Ambient IoT

Architecture enhancements for ID design, MM, SM,
 PCC&QoS, pos/loc, exposure

Indirect Network Sharing

Function, Service, Architecture enhancement

Dual steer

New use case for NTN and NPN scenarios,
 Mobility/Session/Policy Management enhance



Overall View on Rel-19 Content

#	Title	Brief Description and Key Objectives	Related Stage-1 Study/Work Item	Lead Stage-2 WG	RAN dependencies	Other WG dependencies
1	Study on Integration of satellite components in the 5G architecture Phase III. (See slide 7~12 for more details)	R17 and R18 assume transparent mode satellite access. Some interested topics, such as Regenerative payloads, Store and Forward are being considered by SA1 in Rel-19. Key Work Tasks includes defining - <ol style="list-style-type: none"> 1. Regenerative payload generic architecture study. 2. Store and Forward 3. UE-satellite-UE communication 4. GNSS independent operation 5. Multicast and Broadcast Service via satellite 	Yes, TS 22.261	SA2	Yes, Major	SA3 for the Security aspects, SA5 for the Charging aspects
2	5G_ProSe_Ph3 (See slide 13 for more details)	5G system enhancements to support Rel-18 leftovers and new SA1 requirements. Key Work Tasks includes defining - <ol style="list-style-type: none"> 1. Enhance UE-to-Network Relay functionality to support MBS traffic to Remote UE by UE-to-Network Relay, Multiple NR PC5 hops, Non-3GPP RAT (e.g. Wi-Fi or Bluetooth) over PC5 reference point, and Multi-path transmission over multiple indirect network communication paths. 2. Enhance UE-to-UE Relay functionality to support multiple NR PC5 hops. 	Yes, TS 22.261, TS 22.278, TS 22.115	SA2	Yes, Major	SA3 for security, SA5 for charging
3	XRM Ph2 (See slide 14 for more details)	The study item aims at identify the system architecture aspects related to better support advanced media services, e.g., High Data Rate Low Latency (HDRLL) services, and Metaverse. Key Work Tasks includes defining - <ol style="list-style-type: none"> 1. New PDU Set Information and new PDU QoS Parameters; 2. PDU Set Handling Enhancement; 3. Further enhancement to support non-3GPP access; 4. enhancement with edge computing and Quick network openness; 5. Metaverse and mobility; 	Yes, TS 22.261	SA2	Yes, Major	SA4 for media codec; SA3 for security, SA5 for charging



Overall View on Rel-19 Content

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4	Multicast-Broadcast Services in 5G - Phase 3 (See slide 15 for more details)	Further enhancements on 5G Multicast-Broadcast Services architecture are needed, considering Rel-17 SID leftover (e.g. roaming scenarios), resource efficiency for multicast and other optimizations/applications (e.g. MBS in NTN). Key Work Tasks includes defining - <ol style="list-style-type: none"> Rel-17 SID leftover, e.g. support MBS in roaming scenarios or in deployment topologies with specific SMF service areas. Resource sharing across multicast MBS Sessions during network sharing. Enhancements/optimizations for multicast session status synchronization between UE and network. Support of MBS services with satellite access/backhaul (NTN), or for 5G ProSe communication. 	Yes, TS 22.261	SA2	Yes. Major	SA3 for security. SA4 for user services architecture and protocols. SA5 for OAM & charging. SA6 for public safety services.
5	Enablers for Network Automation for 5G – Phase 4 (See slide 16 for more details)	Further enhancements on Network Automation (i.e. AI for network) based on NWDAF-oriented architecture defined in Rel-17 and Rel-18 are expected, taking into account of e.g. Rel-18 SID leftover, progress of RAN AI and other use cases. Key Work Tasks includes defining - <ol style="list-style-type: none"> Rel-18 SID leftover, e.g. new output type of the NWDAF, UE consumption of network analytics, online learning. Interaction/coordination with RAN AI (i.e. AI/ML for NG-RAN in Rel-18). New scenarios / use cases, e.g. network analytics for 5G MBS and ProSe. 	No	SA2	Yes. For work task 2: Major	Possible SA5 for analytics/ML model interworking
6	Indirect Network Sharing (See slide 17 for more details)	Enabling new Network Sharing mechanism different from 5G MOCN (i.e. Indirect Network Sharing defined in SA1), which do not require the operators to maintain a large number of inter-PLMN interfaces, between hosting operator's NG-RAN and participating operator's 5GC (e.g. N2/N3).	Yes / TR 22.851	SA2	Yes	SA3/SA5



Overall View on Rel-19 Content

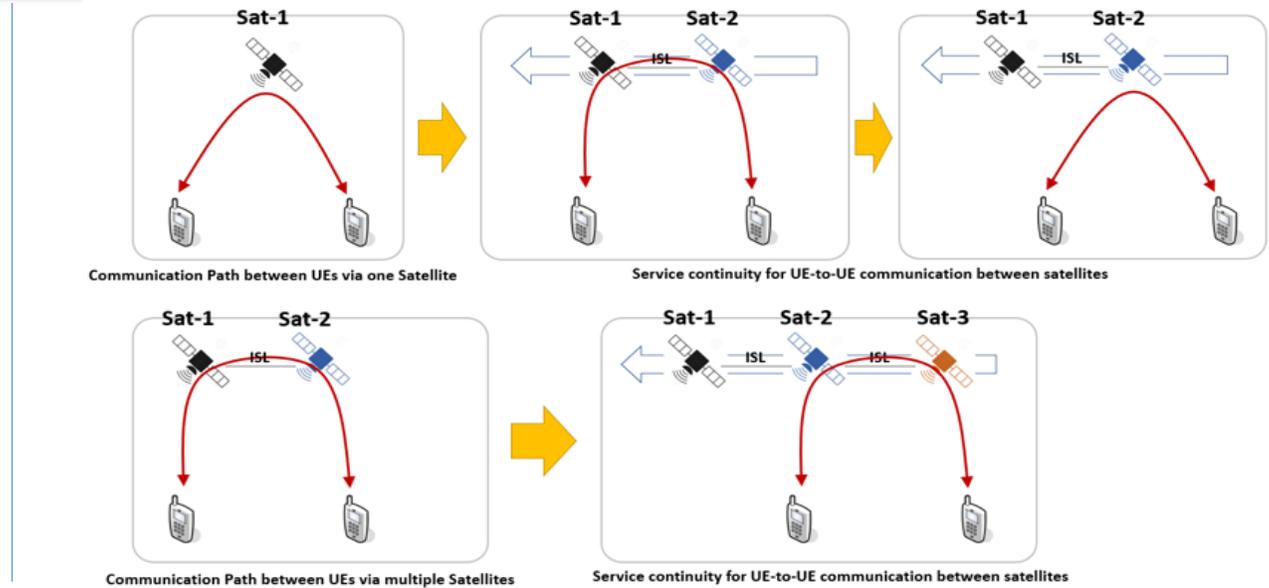
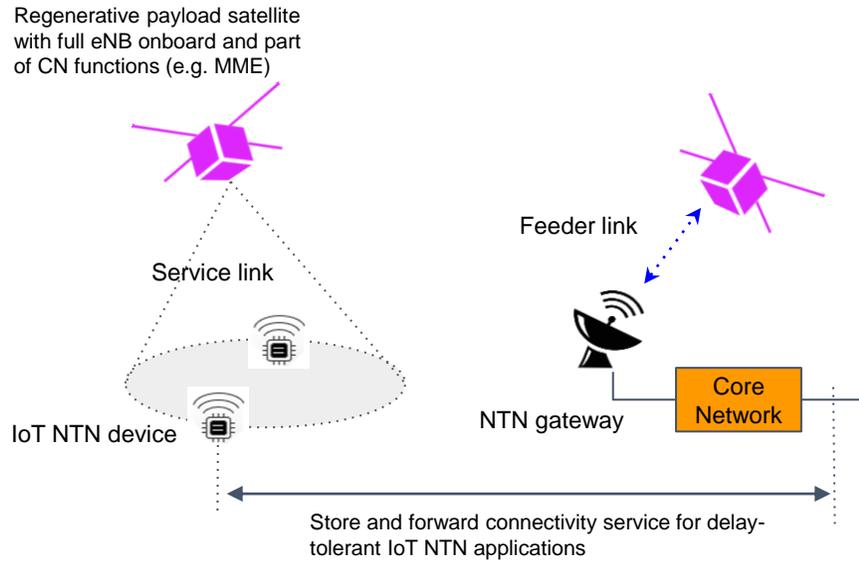
#	Title	Brief Description and Key Objectives	Related Stage-1 Study/Work Item	Lead Stage-2 WG	RAN dependencies	Other WG dependencies
7	Edge Computing Phase 3 (See slide 18 for more details)	Further 5G system enhancement for support of Edge Computing. Key Work Tasks includes defining - 1. Further support for the case where there is no connectivity between the local Data Network and the central Data Network 2. Support for additional EAS (re)discovery criteria (e.g. based on EAS load, EAS computing capacity, etc.) 3. Support of Edge Computing in the ETSUN scenario (i.e. in presence of Intermediate SMFs) 4. Localized control of Edge access (e.g. EAS (re)discovery/(re)selection, local traffic routing influence, local exposure, etc.) with less impact to existing 5GC network elements (i.e. AMF, SMF).	No	SA2	No	SA3 for security, SA5 for charging (for WT#4)
8	ISAC (See slide 19 for more details)	The study item aims at investigating on Architecture enhancement to support Integrated Sensing and Communication based on use cases and SA1 requirements: Key Work Tasks includes defining - 1. Architecture enhancements to support ISAC 2. NF function enhancements and sensing procedures, e.g. sensing trigger, capabilities exchange, measurements and result delivery via UP and/or CP; 3. Sensing service exposure, e.g. to third party, NF, UE 4. Sensing measurements/results privacy assurance 5. Sensing service continuity	Yes, TR 22.837	SA2	Yes, --	SA3 for security, SA5 for charging
9	Ambient IoT (See slide 20 for more details)	5G system to support new SA1 requirements on FS_AmbientIoT. Key Work Tasks includes defining - 1. Overall architecture and function enhancement to support new Ambient IoT. 2. Basic functionality and E2E procedure for access and mobility management enhancement, session management enhancement, policy and QoS control enhancement, positioning/location enhancements, and network capability exposure enhancements.	Yes, TS 22.xxx	SA2	Yes, ----	SA3 for security, SA5 for charging



Overall View on Rel-19 Content

#	Title	Brief Description and Key Objectives	Related Stage-1 Study/Work Item	Lead Stage-2 WG	RAN dependencies	Other WG dependencies
10	Dual Steer (See slide 21 for more details)	The study item is to study how to enhance the 5G system architecture to address MA PDU Session enhancement to simultaneously support two 3GPP access paths with the same or different PLMNs/SNPNs. Key Work Tasks includes defining - <ol style="list-style-type: none"> 1. UE capability for dual 3GPP access 2. Network Selection 3. Mobility Management enhancement 4. Session Management enhancement 5. Policy and QoS control enhancement 6. Interworking with non-3GPP access 7. Roaming between HPLMN and VPLMN/SNPN 	Yes, TR 22.841	SA2	Unknown, Minor/Alignment.	SA3 for security, SA5 for charging

#1: Study on Integration of satellite components in the 5G architecture Phase III.



Topics to be addressed by 5GSAT phase 3	SA impacts	Stage 3Impacts	Market Relevance
Store & Forward Satellite operation	SA2, SA5, SA3, SA6	RAN3, RAN2, CT1, CT4	VERY HIGH ⁽¹⁾ ⁽²⁾
UE-Satellite-UE communication (Local switching)	SA2, SA5, SA6	RAN3, RAN2, CT1, CT4	VERY HIGH ⁽¹⁾ ⁽²⁾
GNSS independent operation	SA2, SA5, SA6	RAN1, RAN2, CT1, CT4	VERY HIGH ⁽¹⁾ ⁽²⁾
Positioning enhancements	SA2, SA6	RAN, CT1, CT4	HIGH ⁽³⁾

(1): key capability needed to support commercial deployments planned in the (very) short term
(2): already supported by non 3GPP solutions
(3): enhancements needed to improve existing services

Objective #1: Support of regenerative payload satellite

Possible work to support regenerative payload satellite access

✓ *Interface management*

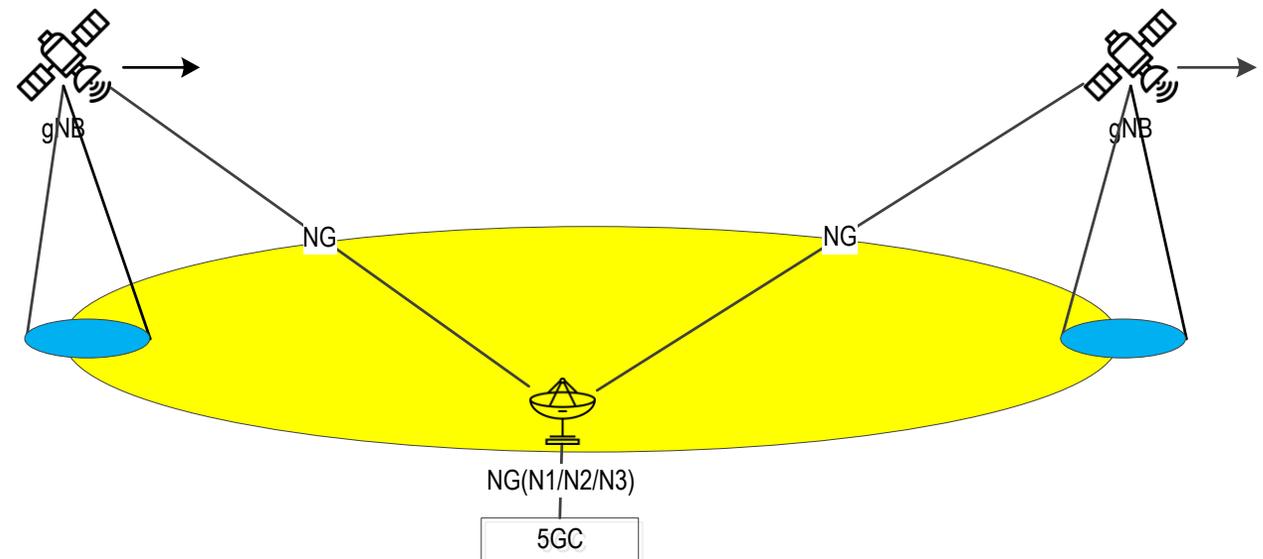
- Efficiently handling of frequent NG connection change
- Efficient configuration update for RAN and AMF

✓ *Mobility management*

- Paging handling considering dynamic gNB coverage

✓ *Protocol impact*

- Whether the impact of increased delay caused by ISL to NAS/NG-AP/F1 protocol exists



Objective #2: Support of Store and Forward(1)

Scenarios of using store and forward:

- ✓ **Scenario 1: temporary /intermittent loss of feeder link**
 - The NGSO may lose the feeder link towards the ground gateway temporarily.
- ✓ **Scenario 2: no feeder link in certain area**
 - At a remote area, the NGSO satellite has no feeder link towards the ground gateway.
- ✓ **Scenario 3: temporary store packets from UEs**
 - In a certain area, the satellite may have inefficient path toward 5GC on the ground (e.g. in case of cross-seam ISL involved in the backhaul connection), so the satellite may store UL data temporarily and forward them when the path become efficient
 - In the above case, the satellite may store packets from multiple UEs and send them as A bundle payload as defined in the rfc9171.



Challenges to support the scenarios:

- ✓ **For scenario 1:**
 - Which NF(s) is responsible for detecting the loss of feeder link
 - How to activate store and forward when detecting the loss of feeder link
- ✓ **For scenario 2:**
 - The UE in a remote area can not be authenticated by 5GC as the UE signaling can never be sent to the 5GC on the ground.
- ✓ **For scenario 3:**
 - How does the satellite decide to store the UL packets
 - How to know whether a packet is delay tolerant.

Objective #2: Support of Store and Forward(2)

Architectural assumption:

- ✓ Only satellite working in regenerative mode can support store and forward
- ✓ UE must be authenticated when the UE data is to be stored and forwarded

Possible work to support store and forward

✓ *Authentication of using store and forward*

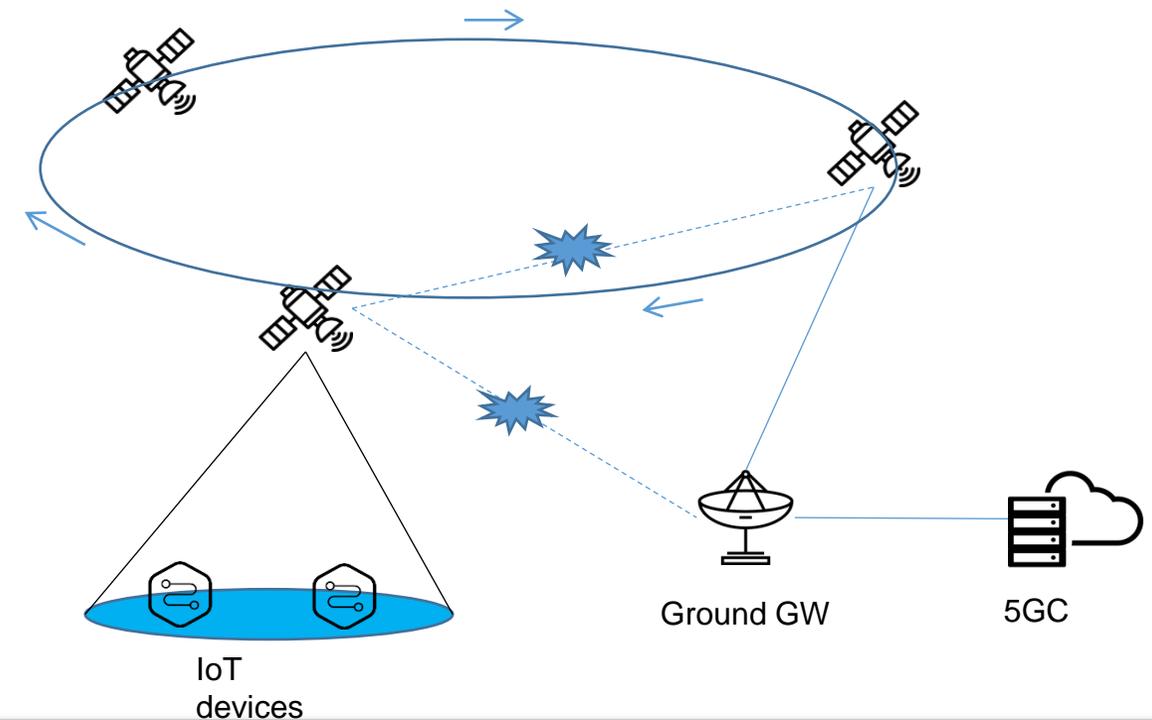
- Authentication of UE to use store and forward.
- UE configuration (e.g., time, area).
- satellite configuration (e.g., buffer size, time).

✓ *Store UL/DL data*

- When and where (which NF) to store the UL/DL data
- How to store UL/DL data on the satellite

✓ *Forward UL/DL data*

- How to forward the stored UL/DL data



Objective #3: Support of UE-satellite-UE communication

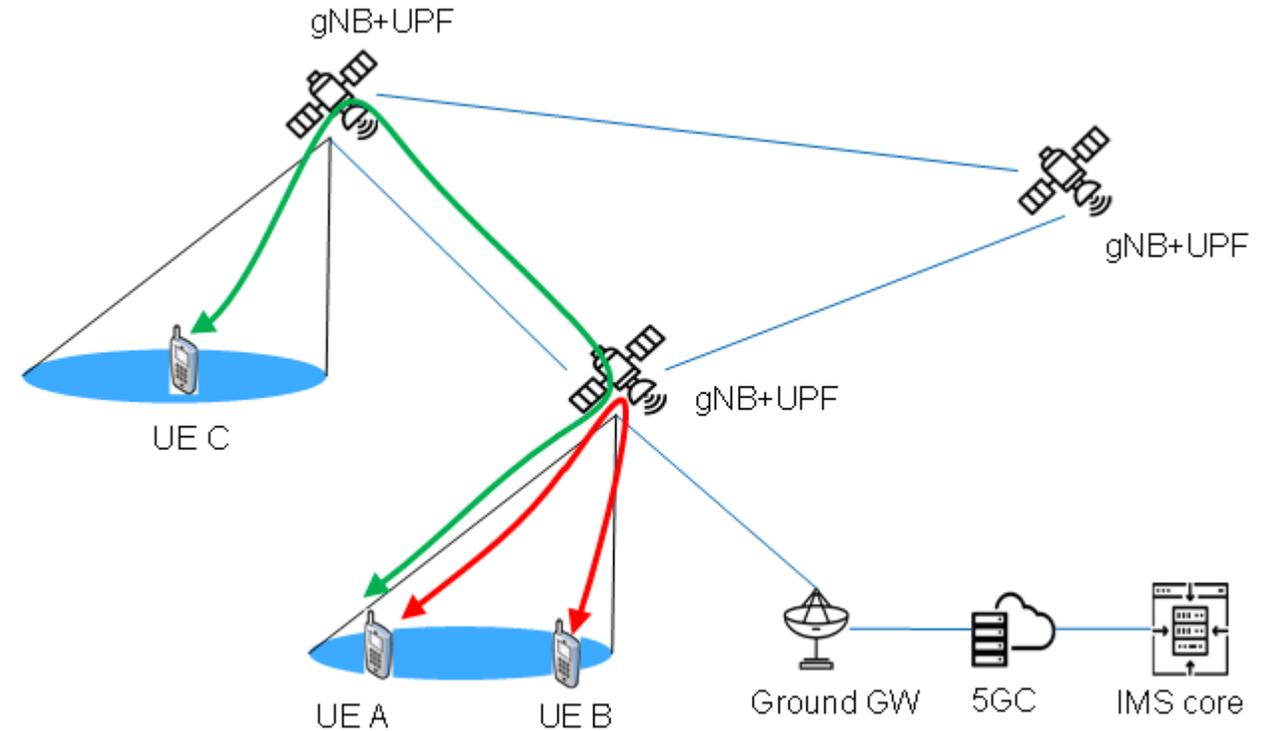
Possible work to support UE-satellite-UE communication

✓ *Activation of UE-sat-UE communication*

- How to determine a UE-sat-UE communication
- How to activate a UE-sat-UE communication

✓ *Session management aspects for UE-sat-UE communication*

- service continuity when the satellite serving the UE changes
- QoS control and charging.



NOTE: When UPF on-board LEO satellite is used to support UE-sat-UE communication, LEO satellite enabled edge computing can also be supported.



Objective: Other aspects

- GNSS independent operation
 - Impact to UE location verification
 - Align to RAN study

- TN-NTN Coordination (maybe not in the scope of this SID)
 - When and how to trigger a UE select an appropriate access network
 - Service continuity when changing access network

- Multicast and Broadcast Service via satellite.
 - Align to RAN study

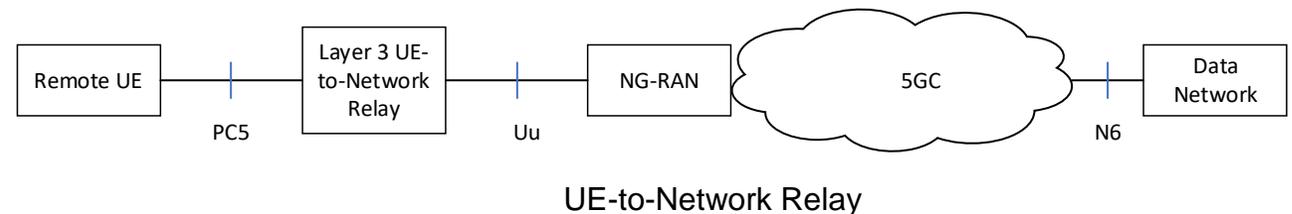
#2: 5G_ProSe_Ph3

Motivation

- To support Rel-18 leftovers and new SA1 requirements

Proposals

- Enhance UE-to-Network Relay functionality to support
 - MBS traffic to Remote UE by UE-to-Network Relay.
 - Multiple NR PC5 hops.
 - Non-3GPP RAT (e.g. Wi-Fi or Bluetooth) over PC5 reference point for Layer-3 UE-to-Network Relay.
 - Multi-path transmission over multiple indirect network communication paths.
- Enhance UE-to-UE Relay functionality to support
 - Multiple NR PC5 hops.



#3: 5GS XRM Enhancement

Motivation

- R18 Leftover: Support of new Multiple-Flow network coordination
- XRM enhancement: non-3GPP access and QoS Enhancement for XRM.
- New SA1 requirements: Metaverse and XRM mobility.

Proposals

- New PDU Set Information;
- New QoS Parameters;
- PDU Set Handling Enhancement;
- XR enhancement with Edge computing and Quick network openness;
- Non-3GPP Access;
- Metaverse & Mobility;

#4: Multicast-Broadcast Services in 5G - Phase 3

Motivation

- ✓ Leftover from Rel-18 SID
- ✓ Issue identified during Rel-18 study/normative work
- ✓ SA1 requirements

Proposals

Roaming & specific SMF service areas

- Outstanding issues in Rel-17 SA2 5MBS to support MBS traffic delivery:
 - support the UEs reception of MBS session data in roaming scenario;
 - support MBS session in deployment topologies with specific SMF service areas.

Resource efficiency for multicast

- Resource sharing across multicast MBS Sessions during network sharing

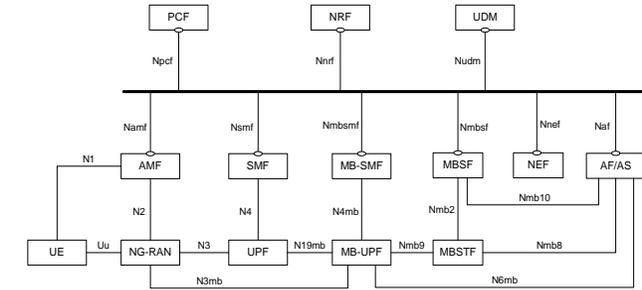
MM procedures enhancements

- Enhancements/optimizations for multicast session status synchronization between UE and network

SA1 requirements

- Support of MBS services with satellite access/backhaul (NTN)
- Support of MBS services in 5G ProSe communications

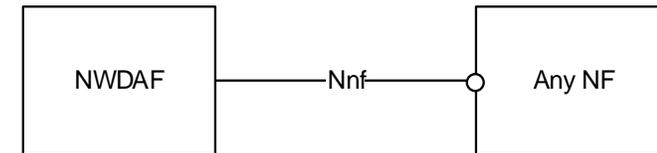
Note: These may be captured in other WIs (e.g. Sat_Ph3, 5G_ProSe_Ph3). Coordination is needed.



#5: Enablers for Network Automation for 5G – Phase 4

Motivation

- ✓ Leftover from Rel-18 SID
- ✓ Interaction/coordination with RAN AI
- ✓ New scenarios / use cases of eNA



Proposals

Leftover of Rel-18 SID

- WT#1.1: whether and how new types of output need to be provided by NWDAF and how would those outputs be defined
- WT#3.8: Investigate QoS sustainability in Multi-MNO/Cross-border environments
- WT#4.4: Study whether and how UE consumes data analytics from NWDAF
- WT#4.5: Study whether and how to enhance architecture to support online learning in the 5GC

Interaction/coordination with RAN AI

- Interaction/coordination with RAN AI may be needed, taking into account RAN AI WID (i.e. AI/ML for NG-RAN) in Rel-18.

New scenarios / use cases

- Network analytics for 5MBS
- Network analytics for 5G ProSe
- ...

#6: Indirect Network Sharing

Motivation

- ✓ New SA1 requirement derived from Rel-19 FS_NetShare;
- ✓ A new network sharing model beyond legacy MOCN configuration is introduced to 5GS, entitled as Indirect network sharing.

Proposals

Architecture enhancements

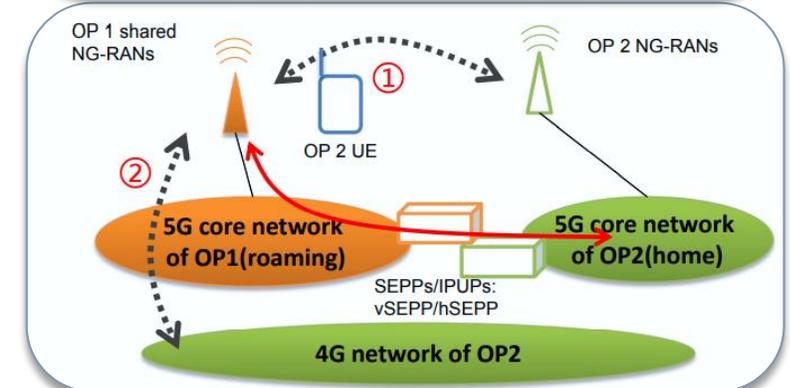
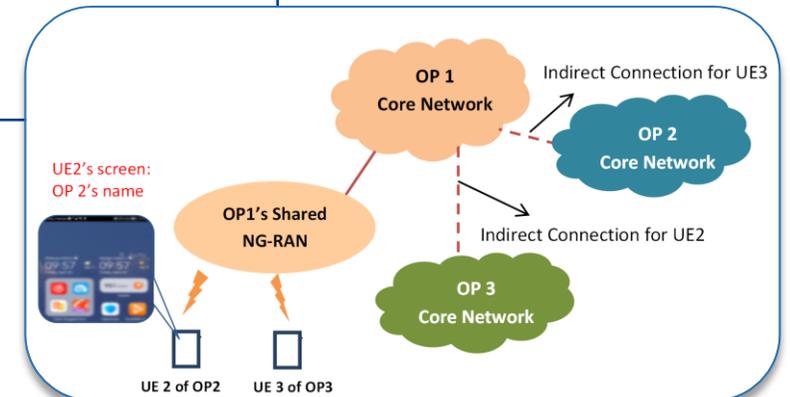
- NRF enhancement on service discovery and network function selection
- Information exposure
- Coordination between network roaming and indirect network sharing

Service and Service Areas

- Emergency Services support
- Hosted Services support

Function enhancements

- Access control
 - Network selection steering by both Hosting and Participating Operators
 - Differentiated policy for different shared RAN(i.e. satellite, UAV)
- Mobility Management
 - Mobility between Shared NG-RAN and non-shared NG-RAN
 - Interworking with EPC w/ or w/o N26
- QoS control
- Charging info. collection





#7: EDGE_Ph3

Motivation

- ✓ Support the MEC resource sharing for inter-MNO, e.g. use case identified by 5GAA.
- ✓ Support a roaming UE belonging to a set of UEs to access a common EAS.
- ✓ Support optimized EAS (re)discovery and edge relocation.
- ✓ Leftover: Consecutive steering application traffic for processing at different locations (C-DN and L-DN).

Proposals

MEC resource sharing for inter-MNO

- How HPLMN knows the Potential Locations of Applications
- How to route traffic to appropriate UPF via N9

Common EAS (re)discovery for roaming UE

- How to support a roaming UE belonging a set of UE accessing EAS in VPLMN or HPLMN (e.g. via HR-SBO PDU session)

Optimized EAS (re)discovery/edge relocation

- How to support EAS (re)discovery/edge relocation based on computing resource service requirement and computing network resource status.

Consecutive steering application traffic

- How to support consecutive traffic steering to central and local DN using ULCL/BP mechanisms for both UL and DL traffic.



#8: Integrated Sensing And Communication

Motivation

- New use cases on Communication assisted sensing and Sensing assisted communication.
- New SA1 requirements in TR 22.837

Proposals

- Architecture enhancements to support ISAC
- NF function enhancements and sensing procedures, e.g. sensing trigger, capabilities exchange, measurements and result delivery via UP and/or CP;
- Sensing service exposure, e.g. to third party, NF, UE
- Sensing measurements/results privacy assurance
- Sensing service continuity

Prioritize gNB-involved sensing and core network-involved sensing. The idea of location service can be reused for reference.

#9: Ambient IoT

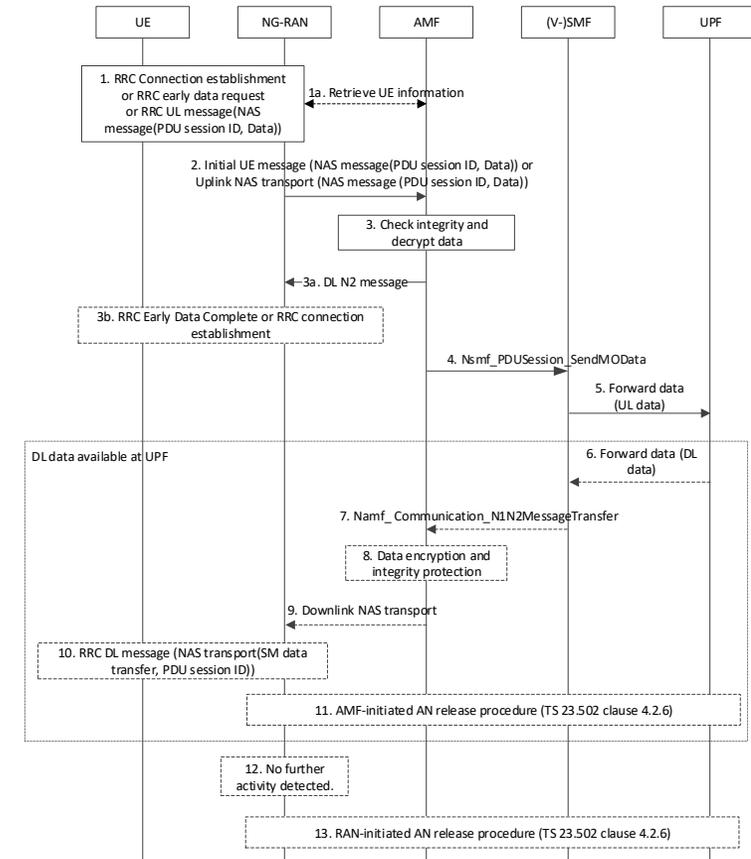
Motivation

- To support new SA1 requirements on FS_AmbientIoT.

Proposals

- Architecture enhancements to support Ambient IoT
 - ID design and management.
 - Access and mobility management enhancement for Ambient IoT.
 - Session management enhancement for Ambient IoT.
 - Policy and QoS control enhancement for Ambient IoT.
 - Positioning/location enhancements for Ambient IoT.
 - Network capability exposure enhancements for Ambient IoT.
- Cooperation with RAN WGs, SA3 and SA5.

The existing NB-IoT mechanisms (e.g. small data transmission) can be used as starting point for A-IoT study.



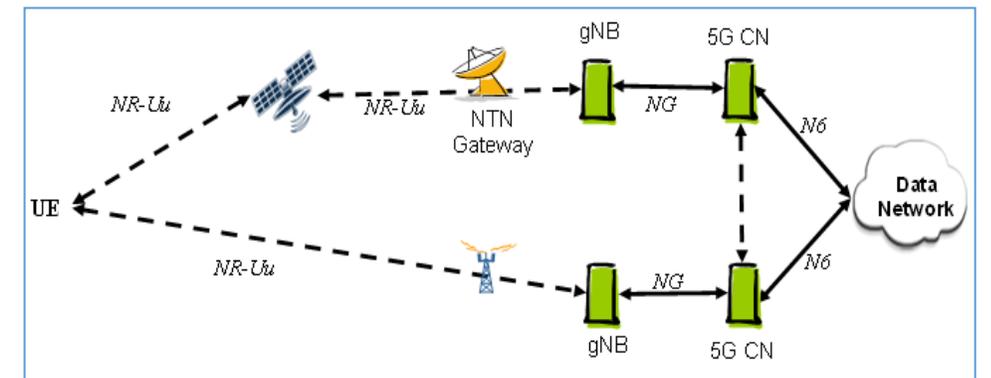
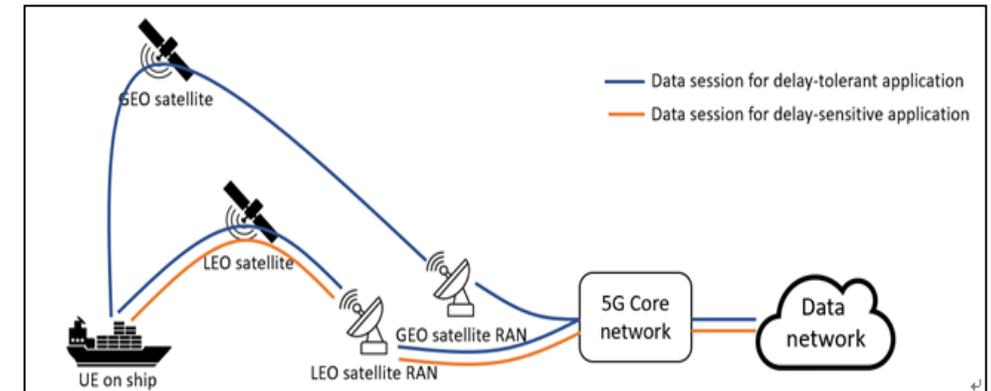
#10: Dual Steering

Motivation

- New SA1 requirements: Dual 3GPP access connectivity for NPN and NTN scenario in TR 22.841

Proposals

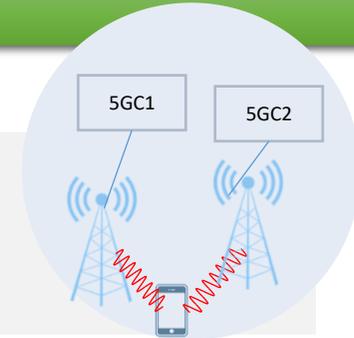
- UE capability for dual 3GPP access
- Network Selection
- Mobility Management enhancement
- Session Management enhancement
- Policy and QoS control enhancement
- Interworking with non-3GPP access
- Roaming between HPLMN and VPLMN/SNPN



(Backup)#1: Location Services

Dual 3GPP access Pos. enh.

- ✓ Accuracy and resource efficiency improvement: Location measurements from dual 3GPP access for location calculation.
- ✓ Reduce latency: Positioning access selection, UE location sharing.



Satellite Pos. support

- ✓ During natural disasters, TN may not work, but NTN works: location should be accurate and reliable;
- ✓ Non-GNSS capable satellite access UEs: location of various UEs can be acquired.



AIoT Pos. support

- ✓ Location service enhancements to support ambient IoT device
- ✓ Position tracking
- ✓ Privacy check





(Backup)#2: 5GS TSN/TSC

Motivation

- ✓ Support time synchronization service continuity, e.g. due to UE mobility
- ✓ SA1 requirement: Support of ProSe-based TSC; Support of aperiodic deterministic communication.
- ✓ Leftover: Integration with IEEE TSN distributed model, e.g. support IEEE 802.1CS Link-local Registration Protocol.

Proposals

Time synchronization service continuity

- UE mobility and time source switch
 - How to maintain time synchronization service
 - How to report time synchronization status

ProSe-based TSC

- Clock synchronization
 - How to determine GM clock for UEs
 - How to synchronize a group of UEs (meet the 5GS synchronicity budget)

Aperiodic deterministic communication

- How to support transmission of aperiodic data or mixed periodic and aperiodic data

Integration with IEEE TSN distributed model

- Topology and forwarding management: Spanning Tree Protocols
- VLAN and group membership management
- Stream registration



Thanks for Reviewing

For questions and comments,
please feel free to contact us.