

**SA2 Rel-19 23Q3 moderated discussion - Satellite Architecture Enhancements - moderator proposals**

**Variant of SA2 Rel-19 23Q3 moderated discussion - Satellite Architecture Enhancements  
Version 0.0.1**

**SA2**

<https://nwm-trial.etsi.org/#/documents/8555>

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## 1 Introduction

Based on the SA#100 guidance provided in SP-230765, this moderated discussion on 5G satellite access Phase 3 is initiated.

5GSAT\_Phase 2 is now completed in Release 18 and the main topic covered was support of discontinuous coverage.

New capabilities have been addressed in SA1 5GSAT phase 3 for Release 19:

- Store and Forward Satellite operation for delay-tolerant communication services
- UE-Satellite-UE communication (without going through the ground network)
- GNSS independent operation
- Positioning enhancements for satellite access

The 2 first capabilities are implicitly requiring a regenerative payload (non transparent) approach (R17 and R18 assumed transparent mode satellite access.)

It is expected to consolidate a R19 SA2 study able to enhance and complete the 5GC/EPC architecture to support new capabilities important to support new use cases or to optimise network operation, all relevant for the market, in accordance with RAN scoping.

The work tasks in section 2.1 are based on satellite enhancements list from SP-230759, "Input from TSG SA Rel-19Workshop: Consolidated SA WG2 Rel-19 Topics for moderated discussions", TSG SA Chair.

The content of section 2.1 is based on the following inputs to the SA Rel-19 workshop:

- SWS-230014: Intel's view on possible Rel-19 package
- SWS-230019: Rakuten Mobile's view on Release 19
- SWS-230025: MediaTek Thoughts - Release 19
- SWS-230027: MITRE Views on Rel-19 SA Content
- SWS-230035: Samsung view on Rel-19
- SWS-230081: Satellite Access - SA Rel-19 topics and priorities

## 2 Scoping

### 2.1 Work Tasks based on input to and outcome of the Workshop

The initial set of Work Tasks for discussion, based on the input to the workshop and SP-230759 are as follows:

From SWS-230081 & SWS-230025

#### **WT-1: Regenerative payload generic architecture study**

- WT-1.1: Study minimum necessary set of 3GPP core network functions to be embedded in the satellite for the new uses cases, and study the different possible architectures if any.
- WT-1.2: Study core network impacts on interfaces, protocols (mobility management, paging) of having “flying” embedded 3GPP functions.

#### **WT-2: Store and Forward Satellite operation**

WT-2.1: Study specific impacts on interfaces and protocols of the S&F communication scheme, 4GS.

- WT-2.1.1: Study user data storage on the satellite when the feeder link is unavailable and forward when the feeder link is available.
- WT-2.1.2: Study the definition of the parameters needed to characterize S&F operation from a service perspective (e.g. Authentication, Store UL/DL data and forward, S&F data retention period, S&F data storage quota, forwarding priority, acknowledgement policy) and specification of the related capabilities necessary to enforce them
- WT-2.1.3: Study mobility and paging optimizations for S&F operation
- WT-2.1.4: Study new architectural extensions for S&F operation (e.g. distributed satellite-ground EPC functions for S&F)

WT-2.2: Study specific impacts on interfaces and protocols of the S&F communication scheme, 5GS.

#### **WT-3: UE-Satellite-UE communication, 5GS**

- WT-3.1: Study activation of UE-Satellite-UE communication
- WT-3.2: Study impacts on session management
- WT-3.3: Study service continuity when the satellite serving the UE changes
- WT-3.4: Study impacts on possibly regulated services
- WT-3.5: QoS control and charging

#### **WT-4: Dual access/steer, TN-NTN and GSO/NGSO, 5GS**

- WT-4.1: Study impacts of NTN specificities on the architecture, interfaces, protocols, in the context of these dual steer use cases.

#### **WT-5: GNSS independent operation**

- WT-5.1: Study impacts on 5GC/EPC of UE location determination (going further from R18 verification) by network only method(s).

#### **WT-6: Multicast and Broadcast Service via satellite**

- WT-6.1: Study enhancements to support multicast over a downlink only NTN (Receive Only Mode) and support for a heterogeneous return path (3GPP or non-3GPP access).
- WT-6.2: Study need for architectural enhancements for 5G multicast-broadcast services via NTN

#### **WT-7: 5GC supporting IoT NTN**

- WT-7.1: Study specific impacts, if any, on interfaces and protocols of 5GC supporting IoT-NTN

From SWS-230014 (& SWS-230035):

#### **WT-8: Definition of Satellite Coverage Availability Information (SCAI) (leftover from Rel-18)**

- WT-8.1: Study definition of Satellite Coverage Availability Information (SCAI) (leftover from Rel-18)
- WT-8.2: Study further enhancements to accurately determine unavailability period for the UE.

#### **WT-9: Architecture for provisioning of SCAI to 5GS or EPS by a 3rd party AF (leftover from Rel-18)**

- WT-9.1: Study possible architectures for provisioning of SCAI to 5GS or EPS by a 3rd party AF (leftover from Rel-18)

From SWS-230019:

#### **WT-10: IAB/MBSR applicability to the Satellite Access**

- WT-10.1: Study IAB/MBSR applicability to the Satellite Access

From SWS-230027:

#### **WT-11: Services requirements related to Pointing, Acquisition, Tracking**

- WT-11-1: Study services requirements related to Pointing, Acquisition, Tracking

**WT-12: How packets for these services will be forwarded**

- WT-12-1: Study how packets for these services will be forwarded

**WT-13: Synchronization and time stamping requirements for PNT-enabled services**

- WT-13-1: Study synchronization and time stamping requirements for PNT-enabled services

**WT-14: Study benefits of OISL (Optical Inter Satellite Links) to deliver 5G and beyond services with stringent security, low latency, and high throughput requirements**

- WT-14-1: Study benefits of OISL (Optical Inter Satellite Links) to deliver 5G and beyond services with stringent security, low latency, and high throughput requirements

**Feedback Form 1: Which of the above Work Tasks should be in scope of Rel-19?**

**1 – MediaTek Inc.**

**It would be good to have individual feedback forms per WT for easier commenting (and following of the comments), before this very feedback form. (Timeout issues can occur when commenting)**

**WT-1 - Fundamental in Rel-19**

- In our view, it is important to define from the outset whether or not ISL is assumed – we expect regen. payload will be studied with ISL as an underlying assumption else it probably does not make much sense.
- Other fundamental assumptions are
  - a) Full backwards compatibility with Rel-17 and Rel-18 NR NTN UEs
  - b) No UE Impact
- There are different architecture options for a regenerative architecture e.g. distributed gNB (with CU on the ground and satellite-borne DU) with CN on the ground, satellite-borne gNB (i.e. CU and DU) with CN on the ground, and satellite-borne gNB with satellite-borne CN functionality and other (or full) CN functionality on the ground
  - Maybe not all arch. options need to be studied – it would be good to **agree in coordination with RAN what the starting point is** before the work kicks off. This will also enable a more accurate definition of the WT itself
- WT-1 is NR NTN only (for IoT NTN S&F, it of course assumes a regenerative architecture, but we see this needs to be studied independently from NR NTN)

**WT-2 - Fundamental in Rel-19**

- WT-2 is IoT NTN only - the current work task says "4GS" but this should be "IoT NTN" esp. if read in relation with WT-7
- Contrary to WT-1 we think ISL cannot be assumed in this scenario. This should be reflected as well.
- Contrary to WT-1 we think this WT clearly requires a satellite-borne eNB and (some) satellite-borne CN functions i.e. we don't see any value with satellite-borne eNB only
- Min. UE impact are expected

**WT-3 - Dependent on and a by-product of WT-1 - Not essential in Rel-19**

- This should be a subset of WT-1 and importantly an assumption should be introduced of there being no UE impact.

**WT-4 - Should be discussed as part of the ATSSS Ph4 thread (multi-access) - Dual-steer is not essential in Rel-19 overall**

**WT-5 - Not needed in Rel-19**

- UE GNSS capability is a fundamental assumption of 3GPP NTN and how it was designed - this assumption cannot be jeopardized in Rel-19
- What is actually intended with this WT?

**WT6 - Not essential in Rel-19 (esp. in view of MBS market situation)**

- What is meant by "non-3GPP access" return path in NTN context?

**WT8 - WT8-2 is not necessary anymore and can be left out of Rel-19**

**WT9 - Should be part of WT-8**

- Replace 5GS (EPS) by 5GC (EPC)

**WT11, 12, 13 - Unclear what these are incl. in view of the original TDoc**

- Problem statement?
- What does the proposal mean, and what purpose does it serve?

## WT14 - Out of 3GPP Scope

### 2 – OPPO

We are interested in the following Work Tasks:

- WT-1: Regenerative payload generic architecture study
- WT-2: Store and Forward Satellite operation
- WT-3: UE-Satellite-UE communication, 5GS
- WT-5: GNSS independent operation

### 3 – VODAFONE Group Plc

This is the third release for NTN work in 3GPP and I have not noticed anyone having actually launched satellites to use even the first release's features. Hence, we need to be very careful to use 3GPP time carefully.

With such a situation it is worthwhile to focus on features that could help start the market:

**WT 2.1** is **sensible to study** as (potentially) it allows global NB-IoT service with “one satellite and one earth station”.

**WT 2.2** is probably **not needed** as Store and Forward is likely to be for low data volumes and hence EPC-NB-IoT is sufficient.

**WT-1** the **NON-ISL** part is likely to have **some value** as – for a satellite with multiple spot beams (c.f. Table 3, annex 2 of ITU M.2514), having the gNB (or DU part of the gNB) on the satellite could reduce the feeder link bandwidth dramatically. However I don't yet understand why Mediatek link this work to inter-satellite links. The **ISL part** seems commercially **value-less** until someone can show how regulatory aspects such as LI are going to be solved.

**WT-4** Dual Steer -> this would be best handled under “dual steer” work as I don't see anything specific for NTN other than e.g. “NTN and TN is claimed to be a use case”

**WT-5** GNSS less operation -> we should **wait to see if RAN** start any work on this and, if so, then we can align.

**WT-6** MBS -> this does **not seem critical** for initial market growth.

**WT 7** – 5GC support for IoT NTN -> **not needed** unless someone can show that terrestrial NB-IoT is being already connected to 5GC in large numbers.

**WT-8** – as a complement to WT 2, this would be **useful**

**WT-9** may have some benefits if WT 8 is done and work load is small.

**WT-10:** IAB/MBSR – I would treat this as **WT 1 “regenerative”**

**WT-11,12,13** These tasks are not clearly explained. Can MITRE add more information, please?

**WT-14:** Study benefits of OISL (Optical Inter Satellite Links) This seems commercially **value-less** until someone can show how regulatory aspects such as LI are going to be solved.

**In summary:**

For Rel 19 **ONLY** consider to work on:

**WT 1 for non-ISL (noting that WT-10 is part of this WT);**

**WT 2.1**

**WT 8 and possibly WT 9**

**Do “alignment with RAN” for WT 5.**

**4 – Rakuten Mobile**

I think WT-10 (IAB/MBSR) already has clear requirements specified in SA1, and if those requirements can be ensured, there is a possibility of including it within WT-1 (regenerative). However, since IAB, which assumes installation on the ground, can have a different architecture from regenerative, it might be easier for discussions to designate it as a separate WT to avoid confusion in the discussions.

**5 – China Telecommunications**

Regarding WT1, i agree with MediaTek on the Regeraretive architecture should be in coordination with RAN. We need to decide between satellite-borne gNB and distributed gNB(CD/DU). For distributed gNB, since it oraginally has little impact on 5GC, we could discuss IAB/MBSR which is a more advanced atchi-tecture based on CU/DU and has more impact on 5GC.

**6 – CATT**

**WT-1 is essential to Rel-19, and should be prioritized**

We agree with MTK, regenerative payload should be studied with the assumption of supporting ISL, as most satellite constellations are already or about to support ISL. If no ISL, why not work at transparent mode.

Regarding the architecture option, from SA2 point of view, we should at least focus on the option of whole gNB on board, and the option of both gNB and UPF on board. In addition, we may also have to consider the option of control plane core network functions on board to support some particular features, e.g, S&F.

**WT-2 is also essential to Rel-19, but we prefer to prioritize the study for 5GS**

S&F would be a good solution to support delay tolerant services, since it doesn't rely on ISL or local ground gateway to deliver UL/DL data, which would make the satellite network construction easier; moreover, S&F allows the satellite to send multiple packets as a bundle to improve transmission efficiency.

However, we propose to prioritize the study for 5GS, since from our point of view, the integration of satellite into 5GS is development trend, a new constructed satellite network will not be considered to support 4G functions, instead, it will support 5G functions.

**WT-3 is also essential to Rel-19, and should be prioritized**

According to the study in SA1, UE-satellite-UE communication can:

- reduce the consumption of ISL and feeder link resources, which then improves system capacity, especially for a satellite network without many ground gateway.

- shorten the communication latency, which can improve user QoE, especially for voice call.

In another word, WT-3 aims to provide an efficient method to reduce the investment of satellite network construction indirectly, and improve user experience, thus it should be prioritized in rel-19.

Regarding the concerns from VDF regarding regulatory requirement, we think it should not be a big issue if similar mechanism as that defined in rel-18 applies, i.e., using local PSA on board to support local switching. However, we can also cooperate with SA3-LI to develop other solutions.

WT-4: the case is valid, but the study can be done in another SID, e.g., dual access/steer.

WT-5: we can live with it if RAN has such work.

WT-6: we can live with it if RAN has such work.

WT-7: it is a valid case, but considering existing work in Rel-18, it is not clear what the further enhancement is.

WT-8.1: the solution is quite clear, if necessary, it can be done via a TEI WID

WT-8.2 is not needed

WT-9: can be merged into WT-8.1

WT-11 to 13: not sure the impacts to SA2, these tasks are not clearly explained

WT-14: The impact to 5GS is not clearly described.

## 7 – Qualcomm Technologies Int

**Qualcomm Answer:** For WT1 and 2, see comments below. WT4 should be discussed separately (see MED on "Multi-access and ATSSS" since it is a generic problem not specific only to satellite access). It is not clear to us what are the SA2 impacts from WT5 and WT6. For WT5, network assisted methods should also be included. WT6 was discussed also in rel.18 but the outcome was that there are no additional impacts since NTN NR already supports MBS. What is specifically missing? We don't think there is anything missing to support MBS over NR NTN.

For WT7 (5GC supporting IoT NTN), the choice to consider only EPC for IoT NTN was based on market realities and the fact that there are no products to support NB-IoT/eMTC connectivity to 5GC either on the UE or NW even more TN IoT market.

For WT8 and WT9 given the decisions taken in rel.18 we don't see much value to reopen the discussions from the beginning. We therefore don't see a realistic chance for WT9 to conclude in rel.19 and for WT8 we propose a downscoping that could minimise the work in SA2.

For WT10 we think it should be discussed separately (see MED on "VMR enhancements").

For WT11, WT12, WT13, WT14 we don't fully understand what they mean and they appear ambiguous, possibly out of SA2 scope and do not seem high priority. We thus suggest to remove these.

## **8 – Qualcomm Technologies Int**

General comment: the total number of proposed WTs (14) by far exceed the allowed number of maximum TUs.

## **9 – Avanti**

We are most interested in WT4, and WT6; noting that the former may better fit in the Dual Steer work (WT-MTK-1). Otherwise we are generally supportive of the proposed work.

## **10 – LG Electronics France**

WT-8 and WT-9 which are leftover from Rel-18.

## **11 – Ericsson LM**

General: Several WTs have RAN dependencies and the SID should include topics that are inline with RAN rel-19 scope.

WT-3: Does not seem necessary in rel-19.

WT-4 is dependent on the Multi-access (Dual 3GPP + ATSSS Enh) topic. Better to study DualSteer in a single study and avoid having a parallel NTN-specific part.

WT-6: Does not seem necessary in rel-19. It is not clear what is NTN specific when it comes to MBS. More detailed comments:

WT-6.1: Receive Only Mode is not available in MBS rel-18. Such enhancement should not be specific to NTN and if included in rel-19 it should rather be done in an MBS study. What does “support for a heterogeneous return path (3GPP or non-3GPP access)” mean?

WT-6.2: This is vague and too open. What is missing?

WT-7: Does not seem necessary in rel-19. IoT NTN is only supported for EPS.

WT-10: Does not seem necessary in rel-19. Would also be dependent on RAN scope. RAN has already discussed IAB via satellite and did not conclude to progress such solution. If this is to be re-opened it should rather be discussed in RAN first. IAB via NTN would also not be compatible with S&F (WT-2).

WT-11: Not clearly explained. Seems to be RAN related and outside SA2 scope.

WT-12: Wording is too vague. Why does data forwarding need to be studied? What is missing?

WT-13: Not clearly explained. Seems to be RAN related and outside SA2 scope.

WT-14: Not clear what is to be studied. Seems transport network related and thus outside 3GPP scope.

## **12 – SKY Perfect JSAT Corporation**

### **WT-1 is essential to Rel19**

To provide new services and use cases like WT-3 and satellite edge computing, gNB onboard is essential. In addition to gNB onboard, UPF onboard architecture should be essential to enable them. Furthermore, gNB + UPF onboard with ISL architecture will be the essential for future 3D Mesh networks (satellites in different orbit are interconnected in space each other).

### **WT-3 is also essential to Rel19**

Direct communications between sites is one of the most important use cases for satellite communications. Doubling the amount of delay would not be accepted by customers from the perspective of efficiency.

**WT-4 is also essential to Rel19**

Dual access or roaming by multiple satellite operators, or between satellite and terrestrial operators, are important for satellite operators' businesses to extend each other's coverage and capacity.

**WT-6 is also essential to Rel19**

Multicast and Broadcast service is one of the most important use cases for satellite communications. Although large size beams of a communication satellite give lower spectrum efficiency, it is suitable for Multicast and Broadcast service.

**WT-5 is of interest**

We think this task is important to reduce the cost of UEs.

**WT-10 is also of interest**

We believe there is demand for this use cases like using VSAT as IAB so that handheld UE and GEO can be connected indirectly. However, we do not believe that it necessarily needs to be considered in Rel 19.

**WT-12 is also of interest**

However we think this task need to be elaborated.

**13 – Huawei Technologies R&D UK**

**WT-1: Regenerative payload generic architecture study**

There are multiple options regenerative payload, none of which required embedded CN functions on the satellite. There seems to be an underlying assumption that there is a full RAN node onboard as far as CN is concerned, which needs full alignment with RAN.

WT-1.1: Without any RAN conclusion in place about what is onboard, is it difficult to determine the scope of this WT and we need that in place to be able to study what impacts there are to the CN functions. The potential impacted CN functions will be different between 5GS and EPS, so it needs to be clarified whether we are considering EPS and/or 5GS.

WT-1.2: seems to be related to an assumption there are CN functions are onboard, however we would expect that any impacts from having any CN functions onboard would be covered by solutions for WT-1.1, which can only be determined after RAN coordination.

Generally speaking we expect the conclusions about any additional CN functions onboard to be based on any potential additional WT requirements and RAN outputs.

We are ok to study this once RAN has determined aspects related to this, and once those aspects are known the scope and TUs in SA2 can be evaluated.

**WT-2: Store and Forward Satellite operation**

For this WT we need to be careful about the type of traffic that it is possible to S&F. For example, TCP/IP traffic expects to be able to have continuous communication at least at the TCP layer. We should scope this WT to be for traffic types that can be stored and forwarded, for example nonIP IoT traffic. This will be ok as we understand this to be for IoT type of devices (i.e. IoT NTN, which is not in 5GC).

We need WT-1 to be complete before we can consider how to approach this S&F aspect, as different options present different possible solutions, making the study almost impossible.

We are ok to study this once some assumptions about baselines are in place and WT-1 is clear.

**WT-3: UE-Satellite-UE communication, 5GS**

The scope of the traffic again needs to be clarified for this WT. The difference between providing, for example, N6 loopback onboard for all types of direct communication traffic, compared with full IMS server or other major servers for UE-UE voice/other traffic is huge and will have an impact on the TUs allocated. Existing features may already provide all that is needed for this WT.

This WT depends fully on WT-1.

We need to scope this WT more before we can determine what needs to be studied and the TU impacts. Overall the WT should be limited to the N6 loop back scenarios.

**WT-4: Dual access/steer, TN-NTN and GSO/NGSO, 5GS**

Should be studied in Dual Steer and not a parallel study or studied in satellite.

**WT-5: GNSS independent operation**

It is reasonable to assume a UE can determine its position. The CN needs to have a trustable location for the UE so it can take account of geography, for example borders and whether the UE is allowed to operate in a location.

If RAN choose to obtain a trustable location in a different way that has no impact to the CN then that is OK, but unless there are conclusions in RAN for supporting this and how, it is difficult to see what SA2 can study.

We don't think this should be included.

**WT-6: Multicast and Broadcast Service via satellite**

Does not need to be studied. The WTs imply a solution, which if supported, would be entirely in MBS scope as whether using the NTN RAT is not relevant.

We don't think this should be included.

**WT-7: 5GC supporting IoT NTN**

Not essential to study, as the uptake of IoT to 5GS is low at present.

We don't think this should be included.

**WT-8: Definition of Satellite Coverage Availability Information (SCAI) (leftover from Rel-18)**

WT-8.1: There is nothing to study here, as these details would be part of any protocol, which is not in SA2s scope.

WT-8.2: We have a UE being able to determine unavailability and the CN being able to determine unavailability in Rel-18. It is not clear what there is left here to consider as further aspects required to improve accuracy cannot be covered by SCAI (e.g. predictable UE mobility).

We don't think this should be included.

**WT-9: Architecture for provisioning of SCAI to 5GS or EPS by a 3rd party AF (leftover from Rel-18)**

Not necessary, as the information can be provided by O&M in Rel-18.

We don't think this should be included.

**WT-10: IAB/MBSR applicability to the Satellite Access**

This seems to be related to WT-1 and the RAN work for it.

We don't think this should be included.

**WT-11: Services requirements related to Pointing, Acquisition, Tracking**

**WT-12: How packets for these services will be forwarded**

**WT-13: Synchronization and time stamping requirements for PNT-enabled services**

We assume these 3 WTs are related, i.e. WT-12/WT-13 are to study to the how to implement the services mentioned in WT-11. It is unclear what is really being proposed here and therefore can't be studied.

We don't think this should be included.

**WT-14: Study benefits of OISL (Optical Inter Satellite Links) to deliver 5G and beyond services with stringent security, low latency, and high throughput requirements**

This is out of scope of 3GPP.

We don't think this should be included.

**14 – Spreadtrum Communications**

We are interested in WT-1, WT-2, WT-3 and WT-4.

WT-1: Regenerative payload generic architecture study

WT-3: UE-Satellite-UE communication, 5GS

UE-SAT-UE communication, e.g. voice call, is kind of important especially in emergency scenarios where the delay of communication may be optimized regarding the long wireless link in NTN. For UE-Satellite-UE communication the regenerative payload could be probably involved.

WT-2: Store and Forward can help to facilitate the services that can tolerate delay when the continuous communication links cannot be guaranteed.

WT-4: Dual Access could enhance the coverage and the reliability for the services and could be studied with the topic "Multi-access (Dual 3GPP + ATSSS Enh)" together.

## 15 – Nokia Germany

### We are interested in the following WTs:

- **WT#1** - Regenerative payload generic architecture study
- **WT#2** - Store and Forward Satellite operation
- **WT#10** - IAB/MBSR can be part of WT#1 reusing MBSR from Rel-18.
- **WT-8 & 9**: This can be merged.

### WTs which we think can be avoided in Rel-19:

- **WT-2.1.4**: The WT can be covered with other WTs in WT#2. it seems open-ended at this point.
- **WT-3**: doesn't seem to be essential for Rel-19. If the UE-to-UE requires N6 loopback (i.e. IMS at ground), it will not add much value.
- **WT-4**: is dependent on the Dual-access and dual registration topic. Prefer to keep the outside of Satellite study and keep it in Rel-19 Dual 3GPP + ATSSS Enh.
- **WT-5**: it is fair to assume UE to have GNSS capability. GNSS capability is fundamental for UE to have services via satellite. This can be deprioritized. It will have a significant RAN impact.
- **WT-6**: Do not see any change is needed for MBS through satellite. This can reuse existing MBS functionality. MBS services would be far-fetched from commercial viability using satellite. Prefer to deprioritize.
- **WT-6.1**: For receive-only operation, broadcast seems to be sufficient as well as more efficient than multicast (assuming satellite will not be used for bandwidth-heavy applications).
- **WT-7**: Do not see this as necessary in rel-19. It may have a RAN impact.
- **WT-10, 11, 12**: It seems to be transparent to SA2. More clarity is needed on the impact on SA2.
- **WT-14**: we do not see any 3gpp impact in optical links via satellite.

## 16 – Motorola Mobility Germany GmbH

Lenovo proposes the following WTs to be part of Rel-19:

WT-1: Regenerative payload generic architecture study

WT-2: Store and Forward Satellite operation

WT-3: UE-Satellite-UE communication, 5GS

WT-4 (Dual access/steer, TN-NTN and GSO/NGSO, 5GS) can be studied as part of the Multi-access (Dual 3GPP + ATSSS Enh) topic.

## 17 – Orange

### **WT-1, WT-4 and WT-5 should be in Rel-19.**

WT-4 should be split into 2 sub-tasks, one for TN/NTN and one for GSO/NGSO and focus on the application of DualSteer WI to satellite use case.

Regarding WT-5, the issue is not about UE's support of GNSS. This WT is needed because the satellite access needs to be resilient to GNSS disruption.

## 18 – Sateliot

Mainly from an IoT NTN perspective, we consider the following WTs as essential in Rel-19:

- **WT-1:** Regenerative payload generic architecture study. We think it is important to differentiate within this study between the cases of NR NTN and IoT NTN as well as to distinguish among architecture options that could be already realizable with minimum or no impact on specifications from architecture options that may require more extensive assessments. Agree with MTK that coordination with RAN before kicking off the work in SA2 is highly desirable to establish the starting points. However, it is also important to avoid an “egg-and-chicken” situation between RAN and SA that could delay the work to be done.

- **WT-2:** Store and Forward Satellite operation. For IoT NTN and from an architecture viewpoint, we think this WT should consider at least the case of a regenerative architecture with full eNB and part of EPC functions on board. In this respect, we think that dependencies with WT-1 should be limited to the minimum extent possible, understanding that the ambition/scope of WT-1 could be broader. We think the S&F functionality is a must for IoT NTN (WT2.1) deployment in cost-efficient LEO constellations and this should be the first priority in this WT. Extending S&F to 5GC (WT2.2), partly in connection to WT-7, is also of relevance but considered as second priority.

We are also interested in:

-**WT-7:** 5GC supporting IoT NTN. We agree with previous comments pointing that the uptake of IoT to 5GS is low at present in terrestrial networks, but we think that the “NTN” element could be a game changer here to better support e.g. joint NR NTN and IoT NTN deployment as well as strengthen the evolution roadmap of NB-IoT NTN in 5GS.

## 19 – Deutsche Telekom AG

WT 1, WT 2, WT 8, WT 9, other WTs either not needed or should be part of another SID.

## 20 – Gatehouse Satcom A/S

We support most strongly WTs working towards growing the accumulated 3GPP-NTN market: Use-cases that take advantage of the modern satellite industry (Cheap cubesats, ISL, SDRs and FPGAs, etc.) to deliver new business cases or reduce the CAPEX.

- WT-1: Regenerative payload generic architecture study

- o Enabling regen satellite architecture, reducing CAPEX and enabling new use-cases and performance enhancements

- WT-2: Store and Forward Satellite operation
  - o Reduced CAPEX, essential value for IoT, competing non-3GPP technologies support S&F
- WT-5: GNSS independent operation
  - o Reduced UE cost, very beneficial for IoT
- WT-6: Multicast and Broadcast Service via satellite
  - o Scalability of satellite broadcast is great due to the coverage areas involved
- WT-3: UE-Satellite-UE communication, 5GS
  - o Loop-back could reduce latency especially in GEO. Useful also for emergency services or coordination between ships within a large geographic area. Could possibly be included in WT-1?
- WT-7: 5GC supporting IoT NTN
  - o Enables a single-core solution for NTN-NR and NTN-IoT, reducing CAPEX

## **21 – HUGHES Network Systems Ltd**

We are interested in the following feature, it is important to consider them in Rel-19:

### **WT-1: Regenerative payload generic architecture study**

### **WT-2: Store and Forward Satellite operation**

This will depend on WT-1 but we the S&F functionality is essential.

### **WT-3: UE-Satellite-UE communication, 5GS**

Also, this will depend on WT-1 and it is an essential feature. It can be a subset of WT-1

### **WT-4: Dual access/steer, TN-NTN and GSO/NGSO, 5GS**

### **WT-5: GNSS independent operation**

### **WT-6: Multicast and Broadcast Service via satellite**

### **WT-7: 5GC supporting IoT NTN**

This is essential for satellite operators - it may not need much to study, just to be sure the existing feature in TN can be adapted to NTN/Sat\_Arch. It may not be popular in TN because there are many legacy EPC and not a NB-IoT is not good business case in TN. It's the contrary in the case of satellite, and agree with Sateliot that this feature could be a game changer here to better support e.g. joint NR NTN and IoT NTN deployment as well as strengthen the evolution roadmap of NB-IoT NTN in 5GS.

### **WT-8: Definition of Satellite Coverage Availability Information (SCAI) (leftover from Rel-18)**

## 22 – Cisco Systems Belgium

We are interested in the following work-tasks for Rel-19

WT-1 Regenerative payload in coordination with the architecture that RAN groups propose as feasible for Rel-19.

WT-7 5GC supporting IoT NTN: IoT is the prime use-case for NTN and these aspects should be studied.

WT-8,9: Continuation of Rel-18

Other work-tasks specially WT-2 and WT-3 can be considered for later releases.

WT-4 can be studied in the realm of Dual-access ATSSS work-task.

## 23 – Beijing Xiaomi Mobile Software

WT-1: fundamental in R-19

To support new service or use cases proposed in SA1 R-19, regenerative payload architecture is essential. In addition, to support other WT like WT2, WT3, regenerative architecture should be clear.

WT-2: essential in R-19

Service link interruption may exist, it has been studied in R-18, in similar, feeder link may interrupt as well, S&F operation is to cope with the feeder link unavailable.

WT-4: It would be better to be studied in "dual steer" topic, considering there is no specific for NTN access.

WT-5: This has RAN dependency, SA2 can align if RAN starts the work.

WT-6: This has RAN dependency, SA2 can align if RAN starts the work.

WT-7: Share the same view as Vodafone

WT-8: We can live with 8.1. 8.2 is not needed.

WT-9: It can be merged into WT-8, if WT-8 is included.

WT-10: It has been studied in RAN, RAN has decided not to progress.

WT11-13: It not clear whether there is impact to 5GC, needs more explain.

WT-14: It's out of SA2 scope.

In summary, WT-1 and WT-2 are preferred.

## 24 – THALES

As shared during the workshop in SWS-230081, we imagine in R19 the following topics:

WT-1 regenerative payload, with added values for user and network operator, mainly with following use cases: ISL in 5G and Store&Forward in 4G

WT-2 high interest for IoT NTN, with few satellites in orbit.

WT-3 reduces latency, give possible services in certain areas...

WT-4: optimizes use of GEO bandwidths, agree that could be covered in dedicated ATSSS study

WT-5: interest on UE location determination (going further from R18 verification) by network only method(s)

WT-6: adaptation of MBS to NTN specificities (moving radio nodes, location dependance...) and multicast over DL only to combine GSO multicast while saving resources.

WT-7: 5GC support of IoT in case of new deployment with no existing EPC

## 25 – Nubia Technology Co.

(from ZTE)

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WT#1, #2, should be in the scope of R19

WT#4 should be part of “dual access/steer” topic.

## 26 – NOVAMINT

First, we would like to outline that **first IoT NTN commercial launches based on Rel-17 are ongoing** or will be happening soon (several commercial IoT NTN deployments done or planned to be launched in the next 6 months - some commercial launches with GEO & some with LEO). Therefore, it is very important to continue to support a significant work on Satellite in Rel-19 including the necessary enhancements addressing the current limitations of Rel-17 & 18 in particular for IoT NTN.

### **WT-1 is fundamental to Rel-19 and should be prioritized**

Until now, transparent mode was assumed – It is essential to address this topic now. It is desirable to coordinate the work with RAN. However, some work can already be started.

### **WT-2 is fundamental to Rel-19 and should be prioritized**

WT 2.1: **This is essential to support IoT NTN LEO constellation** and already supported by non 3GPP. The work can start immediately (assuming a regenerative architecture with full eNB and some EPC functions on board and no ISL) as there are extensive requirements coming out of SA1.

### **WT2.2: Less urgent than WT 2.2**

### **WT 3 - ‘This is very important to be addressed**

There are many requirements coming out of SA1 on this topic and it is important to align this with WT1.

### **WT4 – This is very important and should be addressed in the multi-access (Dual 3GPP + ATSSS Enh) thread**

**WT5 – We believe it is very important to start looking into this aspect** as it is currently an issue and a barrier for adoption of NTN for several vertical use cases – this is particularly relevant for IoT and Redcap type of devices.

### **WT6 - there is definitely some interest to look into this topic**

WT 6.1 can be discussed in larger scope than NTN

WT 6.2 at minimum to be discussed in the context of Regenerative architecture (WT1)

**WT7 – this is important to assess the impact of 5GC supporting IoT NTN** - this may not require a huge effort in SA2.

**WT8 /WT 8.1– could be addressed if there is room for that** – we would prefer to address in priority WT7, WT5, WT6 rather than WT8 & 9

WT8-2 not necessary anymore

**WT9 / WT 9.1 - Could be part of WT-8** (Replace 5GS (EPS) by 5GC (EPC))

**WT 10 – not a priority for Rel-19**

**WT 11, 12 & 13 – not clear – we do not support**

**WT14 - Out of 3GPP Scope**

## 27 – SES S.A.

We are interested in the following work items:

WT-1 - Regenerative Payload for NTN

Important for R-19 NTN and essential for NR-NTN.

WT-3 - UE-Sat-UE direct link is an important use case with mesh, reduced latency for applications which need this.

WT-4 - Dual steer is an important use case.

WT-6 - MBS - Multicast and Broadcast Services with NTN link

Important complement to address MBS NTN aspects. This could be split into different tasks with priorities to broadcast GSO and NGSO and subsequently multicast GSO and NGSO.

## 28 – Airbus

**We support most strongly the following WTs to be included in the scope of Rel-19:**

- **WT-1: Regenerative payload generic architecture study:** as the main developments for Rel-19.
  - WT-1.1: Study minimum necessary set of 3GPP core network functions to be embedded in the satellite  
for the new use cases, and study the different possible architectures if any.
  - WT-1.2: Study core network impacts on interfaces, protocols (mobility management, paging) of having  
“flying” embedded 3GPP functions.
- **WT-3: UE-Satellite-UE communication, 5GS: including ISLs and direct routing policies in the context of N GEO/LEO constellations.**
  - WT-3.1: Study activation of UE-Satellite-UE communication
  - WT-3.2: Study impacts on session management
  - WT-3.3: Study service continuity when the satellite serving the UE changes

- WT-3.4: Study impacts on possibly regulated services
- WT-3.5: QoS control and charging

**We would support including ISLs and direct routing policies in the context of NGENO/LEO constellations.**

**- WT-4: Dual access/steer, TN-NTN and GSO/NGSO, 5GS:**

WT-4.1: Study impacts of NTN specificities on the architecture, interfaces, protocols, in the context of these dual steer use cases.

**- WT-14: Study benefits of OISL (Optical Inter Satellite Links) to deliver 5G and beyond services with**

**stringent security, low latency, and high throughput requirements**

- WT-14-1: Study benefits of OISL (Optical Inter Satellite Links) to deliver 5G and beyond services with

stringent security, low latency, and high throughput requirements

We would support as a second set of priorities the following WTs:

- WT-2: Store and Forward Satellite operation
- WT-5: GNSS independent operation
- WT-6: Multicast and Broadcast Service via satellite
- WT-7: 5GC supporting IoT NTN
- WT-10: IAB/MBSR applicability to the Satellite Access
- WT-11: Services requirements related to Pointing, Acquisition, Tracking
- WT-13: Synchronization and time stamping requirements for PNT-enabled services

**29 – Ligado Networks**

Ligado supports WTs 1, 2, 4, 6, 7 and 8 being in scope of Release 19.

**30 – Lockheed Martin**

Lockheed supports WT-1,2,3,4,5,6,7 as a part of teh Rel-19 scope

**31 – Apple (UK) Limited**

**We support the following WTs:**

- **WT#1** - Regenerative payload generic architecture study: We agree RAN should provide guidance what architecture options to study and whether EPS and/or 5GS need to be considered.
- **WT#2.1** - Store and Forward Satellite operation: We support the focus should be on IoT NTN and WT#2.1. Extending S&F to 5GC should be low priority.

- **WT#3** - UE-Satellite-UE communication, 5GS: UE-satellite-UE communication will shorten the communication latency, improves QoE for voice call.

**WTs we think don't need to progress in Rel-19:**

- **WT-4:** This is covered by Multi-access SID proposal.
- **WT-5:** We consider UE can always determine its position. Unless RAN WGs require this work, we don't see the need for SA2 to study this.
- **WT-6:** We don't see the need to study this, we can rely on existing MBS functionality.
- **WT-7:** IoT NTN support for 5GC should be low priority. Considering the amount of work and limited number of WTs available for R19, this should be removed.
- **WT-8 / WT-9:** We agree with the view that R18 conclusions would unlikely change in R19, re-opening these discussions most likely will lead us to the same conclusions. Hence, we are proposing to save the efforts and not spend time on this activity.
- **WT-10:** If RAN requires this work, it can be reconsidered, but we don't see the need to start this WT in SA2.
- **WT-11-13:** We agree with the views that more clarity is needed to understand the impacts on SA2.
- **WT-14:** We consider this to be out of scope.

**32 – Inmarsat**

Not in a prioritized order:

**WT-4: Dual access/steer, TN-NTN and GSO/NGSO, 5GS**

We think there is an important area of integration between TN-NTN at the network layer here. The system needs to be able to make use of satellite and terrestrial coverage, at least for resiliency.

**WT-6: Multicast and Broadcast Service via satellite**

We think this is an easy win and is an important capability for satellite access. From our perspective this should not be oriented at multimedia, but rather at efficient data delivery to large number of UE, including emergency broadcast, large scale software delivery and multicast communication groups.

**WT-7: 5GC supporting IoT NTN**

We think it's important that 5GC support for NTN is completed by including IoT NTN support. The lack of support from terrestrial mobile implementations should not be a barrier for satellite.

**WT-8: Definition of Satellite Coverage Availability Information (SCAI) (leftover from Rel-18)**

This will be important for satellites with dynamic beams or intermittent cell availability. Particularly for IoT NTN use cases more than NR.

**WT-9: Architecture for provisioning of SCAI to 5GS or EPS by a 3rd party AF (leftover from Rel-18)**

### 33 – Nokia France

(complement of comment already made by Nokia)

#### General:

- Are UE impacts allowed for each of the WT? I'd assume not for the WT1 to have chances to be deployed soon; we agree that WT2 requires UE changes
- In the Following SAT means satellite. BTW for each WT it would be good to specify which type of SAT (LEO, MEO, GEO) is meant ("sometimes it goes without saying, but it goes better when saying it")
- This is the typical example where we could have on a per WT (different) assumptions wrt Allowed UE impacts and type of SAT that is targeted
- Working on all proposed WTs (14) would by far exceed the maximum allowed number of TUs.

#### WT1:

- We DO need to **co-ordinate with RAN what the target architecture to study is/are (e.g. monolithic gnb in the air, only DU in the air, only CU in the air)** before the work can really start.
- WT1 reads "Study minimum necessary set of 3GPP core network functions to be embedded in the satellite for the new uses cases, and study the different possible architectures if any.": this assumes that vanilla regenerative SAT (SAT without advanced features like EAS on SAT that would have to be studied in different WT) mandates Core NF on the air which is far from obvious. So this should be reworded. I'd assume no UE impact here.
- We are interested in or can live with this WT in R19
- (if desired/targeted) There could be a specific (dedicated) WT on EAS/edge Computing on satellite. EAS/edge Computing on satellite cannot be a trigger for work on putting 5GC NF(s) on SAT in WT1
- There is already a WT3 on UE-UE communication, Which 5GC NF are hosted on the SAT should be studied on per service target option ( vanilla regenerative SAT in WT1, SAT supporting UE-UE communication if WT3 was finally part of R19 which , on EAS/edge Computing on satellite)

#### WT2 Store and Forward:

- clarify that here ISL cannot be assumed and that UE impacts are possible. Clarify that RT services like IMS voice, XRM, or TCP based ... are excluded
- This is dependant on RAN WGs study and conclusions (e.g. assumes at least CU on the SAT)
- We are interested in or can live with this WT in R19

**WT3** UE-Satellite-UE communication; this should not target LEO satellites; we see this WT as non priority and possibly requiring a huge work (if this would impact IMS) and **suggest to remove from the SID**;

We see **WT-4** Dual access/steer as Mandatory in R19 but could be **studied as part of the dual steer/ATSSS SID**

**WT-5:** GNSS independent operation. it is fair to assume UE to have GNSS capability. GNSS capability is fundamental for UE to have services via satellite. This WT shall be **removed from the SID**. It would have a significant RAN impact

**WT-6 (5MBS):** we **see this WT to be deferred** (this SID would consume too much TU(s) and time). 5MBS deployment on TN need to first happen before we study 5MBS on SAT;

**WT-8:** Definition of Satellite Coverage Availability Information and **WT9** (Architecture for provisioning of SCAI to 5GS or EPS by a 3rd party AF):.R18 has defined solutions that don't require this work; (this SID would consume too much TU(s) and we have no time to lose on a topic that will not converge). **TO be left out of Rel-19**

**WT-10:** IAB/MBSR; We are interested in or can live with this WT in R19. can be part of WT#1. Likely RAN dependency.

**WT-11:** Services requirements related to Pointing, Acquisition, Tracking; first needed to clarify what is the requirement / what is meant. **Suggest to remove from the SID**

**WT-12:** How packets for these services will be forwarded: these should be part of other WT (regenerative, Store and Forward, EAS on the SAT, UE-UE com involving only the SAT). **Suggest to remove from the SID**

**WT-13:** Synchronization and time stamping requirements for PNT-enabled services. ; first needed to clarify what is the requirement / what is meant; **Suggest to remove from the SID**

**WT-14:** Study benefits of OISL (Optical Inter Satellite Links) ; looks out of scope, at laest of SA2, . **Suggest to remove from the SID**

#### **34 – Eutelsat S.A.**

##### **Eutelsat support the following WTs:**

##### **WT-1: Regenerative payload generic architecture study**

- WT-1.1: Study minimum necessary set of 3GPP core network functions to be embedded in the satellite for the new uses cases, and study the different possible architectures if any.
- WT-1.2: Study core network impacts on interfaces, protocols (mobility management, paging) of having “flying” embedded 3GPP functions.

Note 1: this work task is critical to address new use cases and improve efficiency in the support of existing use cases over NTN.

Note 2: the work in SA2 should focus on architecture impacts to the Core Network at the first place, and should aim at converging with the corresponding work and decisions in RAN TSG/WGs, so coordination will be beneficial in this respect.

### **WT-3: UE-Satellite-UE communication, 5GS**

- WT-3.1: Study activation of UE-Satellite-UE communication
- WT-3.2: Study impacts on session management
- WT-3.3: Study service continuity when the satellite serving the UE changes
- WT-3.4: Study impacts on possibly regulated services
- WT-3.5: QoS control and charging

Note 1: UE-Satellite-UE communication is required to reduce the latency inherent to satellites systems.

Note 2: "Study impacts on possibly regulated services" may be changed to "Study compliance to applicable regulated services".

Note 3: There should be some dependencies to WT-1: Regenerative payload generic architecture study.

### **WT-4: Dual access/steer, TN-NTN and GSO/NGSO, 5GS**

- WT-4.1: Study impacts of NTN specificities on the architecture, interfaces, protocols, in the context of these dual steer use cases.

Note: whether this WT should fit in an NTN study or be moved as a specific NTN task to a generic Dual access/steer SID/WID may be considered.

### **WT-5: GNSS independent operation**

- WT-5.1: Study impacts on 5GC/EPC of UE location determination (going further from R18 verification) by network only method(s).

Note 1: this work should aim at studying solutions which are consistent and non-duplicated with regards to the related work that would take place in RAN.

Note 2: a two-step approach may be considered in which a first step would consist in reducing dependency to GNSS (e.g. to address intermittent GNSS disruptions, or situations where an approximate location is sufficient, etc.).

### **WT-6: Multicast and Broadcast Service via satellite**

- WT-6.1: Study enhancements to support multicast over a downlink only NTN (Receive Only Mode) and support for a heterogeneous return path (3GPP or non-3GPP access).
- WT-6.2: Study need for architectural enhancements for 5G multicast-broadcast services via NTN

Note 1: broadcast / multicast are essential services provided by legacy satellite systems. MBS would enable support by 3GPP of existing downlink only GEO operation.

Note 2: it is understood that impacts to existing 5GC 5MBS functions for taking NTN RATs into account may be limited.

Note 3: the work should be convergent with potential enhancements on the RAN side for supporting NTN in MBS.

**Feedback Form 2: Can any of the Work Tasks above be combined/merged?**

**1 – MediaTek Inc.**

See comments above:

- WT3 is dependent on WT1 in our understanding i.e. sub-task
- WT9 should be part of WT8, if included i.e. sub-task

**2 – VODAFONE Group Plc**

Agree with Mediatek, and I also view WT 10 as part of the WT 1 study.

**3 – Rakuten Mobile**

I think we should have separate study of WT1 from WT10

**4 – CATT**

we think:

- WT-3 should be a task separate from WT-1;
- If WT-8 exists, then WT-9 should be merged into it as a sub-task.

**5 – Qualcomm Technologies Int**

WT1 and WT2 are related and might be combined into a single larger WT

**6 – Huawei Technologies R&D UK**

WT-10 seems to be suggesting a realisation of WT-1, so would naturally be covered by WT-1 anyway.

WT-1, WT-2 and WT-3 are related, as WT-2/WT-3 are avoiding any ground station traffic. It is difficult to see how they could be fully merged, but they are related and any conclusions should minimise the difference between them.

WT-11/WT-12/WT-13: look to be related and possibly mergeable, but without a lot of further clarification on these they can't be included.

**7 – Nokia Germany**

**WT-8** and **WT-9** can be merged.

**8 – Gatehouse Satcom A/S**

WT-1 and WT-2 are related as both relate to regenerative architecture, but WT-1 relates to NR and 5GC whereas WT-2 relates to IoT NTN and EPC (S&F), which are different use-cases and architectures so we'd like to keep them separate, but agree with Huawei to keep differences in conclusions between them minimized.

**9 – HUGHES Network Systems Ltd**

**WT-2 and WT-3 can be a subset of WT-1**

**10 – Beijing Xiaomi Mobile Software**

We prefer S&F to 5GS can be started firstly, then solutions can be aligned to EPS. Therefore, WT2.1 and WT2.2 can be merged into a single WT.

**11 – NOVAMINT**

Agree with suggestions from MediaTek:

- WT3 is dependent on WT1 in our understanding i.e. sub-task
- WT9 should be part of WT8, if included i.e. sub-task

In regards of WT2, the priority is clearly IoT and WT2.1 - this was studied mainly in this context in SA1 (delay tolerant IoT) and it is urgent to support S&F satellite operation to enhance commercial deployments of IoT NTN

WT 6.2 can be addressed in the context of Regenerative architecture (WT1) similar to WT3

**12 – Lockheed Martin**

WT-1 and WT-10 should be separate. WT-8 and WT-9 should be combined.

**13 – Apple (UK) Limited**

WT-3 could be defined as a sub-WT of WT-1.

**Feedback Form 3: Should any of the Work Tasks above be reworded? If so, propose the required rewording.**

**1 – MediaTek Inc.**

See comments above

**2 – OPPO**

- The WT-1.1 can be reworded into: “Study minimum necessary set of 3GPP core network functions and/or RAN to be embedded in the satellite for the new uses cases, and study the different possible architectures if any” . The reason is that:
  - o The original wording confuses us and we’re not sure whether the case of only RAN embedded to the Satellite has been excluded.
- We understand that the S&F enhancement to 5GS should be aligned with 4GS and there’s no need to introduce different features to 5GS and 4GS individually, therefore we propose to study 4GS and 5GS together and combine the WT-2.1 and WT-2.2 into one sub-WT: “WT-2.1: Study specific impacts on interfaces and protocols of the S&F communication scheme” .
- We understand that the service link should also be considered, and therefore we proposed to reword the WT-2.1.1 to “Study user data storage on the satellite when the feeder or service link is unavailable and forward when the feeder or service link is available.”

### 3 – VODAFONE Group Plc

WT 1 - We seem to have different views on the key reasons to look at regenerative payloads. For me they are (a) improved radio link performance from less delay in the layer 2 RLC/MAC protocol acks; and (b) reduced feeder link capacity. Other features such as 'direct routing' seem likely to be a regulatory nightmare and hence of very low utility. The final wording should focus on the relevant and realistic objectives.

### 4 – CATT

We would propose to reword the WT-1.1 to focus on regenerative payload satellite access, which is mainly for alignment with RAN work.

Whether to embed 3GPP core network function depends on architectural requirement of specific use cases, and should be studied in a standalone work task. Otherwise, WT-1 would have overlapping with other WTs, e.g., WT-2 and WT-3, and then is not self-contained.

The proposed wording is:

#### “WT-1: Regenerative payload satellite access architecture study

WT-1.1: Study core network impacts on interfaces, protocols (mobility management, paging) of having “flying” embedded gNB/eNB.”

We also propose to combine WT-2.1 and WT-2.2 into one WT, since similar sub-tasks for WT-2.1 also apply to WT-2.2. The proposed wording is:

“WT-2.1: Study specific impacts on interfaces and protocols of the S&F communication scheme, for EPS and 5GS respectively.”

### 5 – Qualcomm Technologies Int

For WT3, add a new WT3.x to WT3 to evaluate which UE services can/should be supported locally (e.g. only IMS).

For WT8 we propose the following rewording:

**WT-8: Definition of Satellite Coverage Availability Information (SCAI) (leftover from Rel-18)**

- WT-8.1: Complete definition of Satellite Coverage Availability Information (SCAI) (leftover from Rel-18)
- WT-8.2: Enable stage 3 definition of SCAI by CT1

**6 – LG Electronics France**

WT-11 and WT-13 are about service requirement.

WT-14, the impact on SA2 is not clear.

**7 – Ericsson LM**

WT-2: The assumptions for WT-2 are not so clear. Will it only cover scenarios where the feeder link is unavailable? Is it assumed that the service link is always available, or that unavailability of service link does not require any work?

WT-2.1: This WT seems to focus on user plane only. How to handle control plane signalling in case feeder link is not available?

WT-2.1.1: What is “user data storage”? Suggest to reword to “user plane data storage”.

WT-2.1.2: The examples in parenthesis are not clear. Why is authentication mentioned? Why is forwarding priority mentioned (what is different from the existing QoS framework)? What is “acknowledgement policy”? Suggest removing those examples.

WT-2.1.3: Should rather focus on whether addition to existing mobility/paging functions are necessary, if any, in order to enable S&F operation.

WT-2.1.4: This WT is too vague and open ended. Also, the WT seems not needed considering the other WTs.

**8 – Huawei Technologies R&D UK**

Most to the WTs will need rewording, considering assumptions and additional clarifications for the intentions of the WTs, see our above answers.

**9 – Orange**

WT-1.1: as proposed by OPPO.

WT-4 should be split into 2 sub-tasks, one for TN/NTN and one for GSO/NGSO and focus on the application of DualSteer WI to satellite use case:

- WT-4.1: Application of DualSteer functionality to TN+NTN deployment scenario
- WT-4.2: Application of DualSteer functionality to GSO+NGSO deployment scenario

## **10 – Beijing Xiaomi Mobile Software**

WT-2.1 as reworded: Study specific impacts on interfaces and protocols of the S&F communication scheme, for both 5GS and EPS

WT-2.2 is removed.

## **11 – Sateliot**

Agree with CATT proposal for WT1.1 rewording. We share the view this could be a valid way to avoid overlapping between WT1 and the other WTs (WT-2 and WT-3).

## **12 – Lockheed Martin**

We don't have a particular concern with the wording.

## **13 – NOVAMINT**

To address Ericsson's comments on WT2, Store and Forward Satellite operation has been studied in SA1 in Rel-19 and has led to several requirements.

The definition in SA1 for S&F Satellite operation is: an operation mode of a 5G system with satellite-access where the 5G system can provide some level of service (in storing and forwarding the data) when satellite connectivity is intermittently/temporarily unavailable, e.g. to provide communication service for UEs under satellite coverage without a simultaneous active feeder link connection to the ground segment so it covers scenario where the feeder link is not available.

We acknowledge that S&F Satellite operation also impacts on control plane signaling.

We suggest to use the SA1 terminologies as in TR 22.865 in particular S&F data storage or S&F data retention.

The task 2.1.1 is in fact more the description of the scope of 2.1 so can be removed.

We would propose to rephrase WT 2.1.2 (now WT 2.1.1) as such

**WT-2.1.1:** Study, and if applicable, define the parameters needed to characterize and support S&F Satellite operation from a service perspective (e.g., S&F data retention period, S&F data storage quota, S&F forwarding priority, S&F acknowledgement policy).

And capture the impact on both user plane and control plane in

**WT-2.1.2:** Study, and if applicable, define the control plane and user plane enhancements to support S&F Satellite operation (e.g., capability to inform the UE that the network is operating in S&F mode, capability to suspend / resume a signaling procedure that cannot be successfully completed within the expected time due to S&F Satellite operation, capabilities to enforce S&F service-related parameters, impact on mobility management/ paging/ discontinuous coverage management if any)

**WT-2.1.3:** Study, and if applicable, define new architectural extensions for S&F Satellite operation (e.g., distributed satellite-ground EPC functions for S&F)

**14 – Eutelsat S.A.**

**WT-3: UE-Satellite-UE communication, 5GS**

- WT-3.1: Study activation of UE-Satellite-UE communication
- WT-3.2: Study impacts on session management
- WT-3.3: Study service continuity when the satellite serving the UE changes
- WT-3.4: Study impacts on possibly regulated services
- WT-3.5: QoS control and charging

”Study impacts on possibly regulated services” may be changed to ” Study compliance to applicable regulated services”.

## 2.2 Additional Work Tasks

As well as the initial set of Work Tasks in section 2.1 companies can request to add additional Work Tasks. The naming of these additional Work Tasks should follow the format: WT-company name-# (eg WT-Samsung-1) so that other participants can reference them.

**Feedback Form 4: Are there any additional Work Tasks that should be part of Rel-19?**

**1 – China Telecommunications**

From SWS-230055

**WT-China Telecom-1: U2N relay via satellite access**

- Enhancement on Authorization, Discovery, QoS and Mobility management, to support U2N relay via satellite access

**WT-China Telecom-2: Low latency call between UEs via satellite**

- Enhancement on 5GC and IMS to support Low latency call between UEs via satellite access  
*Note: It could be part of WT3. Satellite can act as Regenerative payload or backhaul.*

**WT-China Telecom-3: Further enhancement on discontinuous satellite coverage**

- Further enhancement on Registration, mobility and connection management for discontinuous satellite coverage based on R18 study.

**2 – Samsung R&D Institute India**

From SWS-230035

WT-Samsung-1: Enhancements to mobility aspects and emergency service.

Study mechanisms to improve performance of emergency service and any potential mobility enhancements for the UE using satellite access

**3 – China Mobile Com. Corporation**

WT-China Mobile-1: Enhancement to support roaming or inter PLMN communication to support service continuity in NTN scenario.

**4 – Qualcomm Technologies Int**

No

**5 – LG Electronics France**

No.

**6 – Ericsson LM**

No

**7 – Huawei Technologies R&D UK**

Comments on the additionally proposed WTs.

**WT-China Telecom-1: U2N relay via satellite access**

It is not clear what there is here to study, as the Relay can use NTN uU like TN Uu for ProSe. Some additional clarification would be good for the scope.

**WT-China Telecom-2: Low latency call between UEs via satellite**

This should be considered as part of WT-3, as it is UE-SAT-UE communication. Does not need to be studied separately.

**WT-China Telecom-3: Further enhancement on discontinuous satellite coverage**

It is not clear what there is here to study or left over from Rel-18 on this aspect. Does not need to be studied.

**WT-Samsung-1: Enhancements to mobility aspects and emergency service**

Similar view as for WT-China Telecom-3 for mobility. Not clear what is missing from emergency service. Does not need to be studied.

**WT-China Mobile-1: Enhancement to support roaming or inter PLMN communication to support service continuity in NTN scenario.**

Not really clear what is missing here, as roaming is supported and any existing inter PLMN service continuity will be handled the same as for TNs.

#### **8 – Sateliot**

##### **WT-Sateliot-1: UE location reporting for mobility management in IoT NTN**

Objectives: Specification of a mandatory mechanism for UE location reporting for NB-IoT NTN devices. Mobility management enhancements for IoT NTN enabled by the support of UE location reporting.

The proposed WT is further described in **Feedback Form 5**.

#### **9 – Samsung R&D Institute India**

On comments seeking more information: Please refer to form-5 for further description on **WT-Samsung-1**

#### **10 – NOVAMINT**

We are supportive of **WT-Sateliot-1** as indeed it addresses a current and important issue. We could imagine to combine this work with WT5 and renamed it WT5 UE location determination enhancements with WT5.1 unchanged and WT5.2 being UE location reporting for mobility management in IoT NTN.

We are supportive as well of **WT-Samsung-1** as it addresses also an important issue. In our view, there are 2 way forward to address this:

- if the effort is very limited, it could be addressed in Rel-19
- if there is a need to look deeper on how to support emergency services by Satellite and the regulatory aspects associated, we would recommend to go first to SA1 to study all those aspects - on our side, we were planning already to propose this topic in SA1 for Rel-20

#### **11 – Lockheed Martin**

Suggest the DL Waveform as a part of coverage enhancement should be considered.

#### **12 – Inmarsat**

##### **Emergency attach for NB-IoT over satellite access (NTN).**

We think given the current and upcoming applications of NB-IoT this has been an overlook and we should look to make sure it's supported.

### **Feedback Form 5: If there are any additional Work Tasks required, describe them**

#### **1 – Sateliot**

##### **WT-Sateliot-1: UE location reporting for mobility management in IoT NTN**

Mobility management in IoT NTN is currently based on the definition of Tracking Areas (TAs) and Mapped Cell IDs, which correspond to fixed geographical areas on ground. The assumption is that E-UTRAN would provide its best estimate of the UE's location as a TAI+CGI to the MME. To support efficient mobility management (as least as efficient as supported in TN networks), the size of these TAI+CGI related areas should, ideally, be comparable to the ones used in terrestrial deployments (e.g. within 5-10 km for the

mapped cell ID, similar to terrestrial network macro cell size).

However, achieving a resolution within 5-10 km is challenging, especially with NGSO satellites that rely on large and earth-moving beams (e.g. beams of hundreds of kms in diameter). For these deployment cases, and given that NTN-capable devices are expected to support GNSS positioning, enabling UE reported location information (e.g. for example UE GNSS coordinates) would allow the MME to count with a more accurate UE location estimate that could be exploited for improved mobility management.

To our best knowledge, in current specifications, there is no mandatory feature for UE location reporting for NB-IoT NTN devices. In more detail:

- The RRC CoarseLocationInfo mechanism introduced in Rel-17 is not supported for NB-IoT. Such a mechanism was only defined for eMTC. The reason is that sending location information over RRC needs AS security to be in place and AS security is not mandatory for NB-IoT devices with support for CP CIoT EPS Optimization only.
- The LTE Positioning Protocol (LPP), which actually would allow for reporting of GNSS coordinates from the UE to a location server on the network side, cannot be assumed to be supported by the device, as it is not mandatory for NB-IoT devices.

Previous discussion on the support of UE location reporting for NB-IoT NTN was held in the context of Rel-17 (R2-2204458, R2-2204437) and some proposals assuming UE location knowledge on the CN side were considered when studying discontinuous coverage in SA2 in Rel-18 (TR 23.700-28, S2-2207184).

Based on the above, work in this WT proposal should at least consider:

- Specification of a mandatory mechanism for UE location reporting for NB-IoT NTN devices. Potential options could be:
  - o Introduction of a UE location reporting feature as part of NAS signaling.
  - o Leveraging LPP functionality for reporting of UE GNSS coordinates, making existing Location Information Transfer Procedure (section 5.3.1 of 3GPP TS 37.355), a mandatory feature for NB-IoT NTN devices but without the need for the NB-IoT NTN device to support the full LPP capabilities.
- Mobility management enhancements for IoT NTN enabled by the support of UE location reporting.

## **2 – Samsung R&D Institute India**

Description on WT-Samsung-1:

Different regulatory bodies have strict requirement to establish the emergency call quickly. The most important aspect to achieve this for UE in limited service is to identify accurately the operator supporting emergency service in UEs location. But in the area where UE is not allowed to operate (i.e. UE has received #78), though the NG-RAN node broadcast emergency services as supported, it is not guaranteed

that UE can still get the emergency service. On attempt of emergency service, the UE may be allowed or not allowed for emergency service even if broadcast information on emergency service indicates it is supported. This is a false information for the UE which can lead for delay in establishing the emergency call. Thus we propose to study mechanism to improve performance of emergency service in such cases.

### 3 Dependencies

These feedback forms will help define the dependencies between Work Tasks, dependencies of Work Tasks on other Working Groups (SA, RAN or CT), and dependencies on other potential SA2 Rel-19 SIDs and WIDs. The Work Tasks can be from the list in section 2.1, or any additional Work Tasks identified in the feedback in section 2.2.

#### **Feedback Form 6: Describe the dependencies that any of the Work Tasks have on other 3GPP Working Groups**

<p><b>1 – MediaTek Inc.</b></p> <p>WT1 and WT2 have dependencies with RAN (RAN3) WT5 has dependencies with RAN - all the way down to RAN1 depending on the intention WT7 has dependencies with RAN (RAN2/RAN3)</p>
<p><b>2 – OPPO</b></p> <p>WT-1, WT-2, WT-3, WT-5 may have dependency on RAN WGs</p>
<p><b>3 – CATT</b></p> <p>WT-1, WT-5, and WT-6 have dependency with RAN</p>
<p><b>4 – Qualcomm Technologies Int</b></p> <p>WT1, WT2, WT4, WT5, WT6, WT7 and WT11 to WT14 may be heavily dependent on RAN decisions</p>
<p><b>5 – LG Electronics France</b></p> <p>WT-1, WT-2, WT-3, WT-5, and WT-6 have RAN dependency.</p>
<p><b>6 – China Telecommunications</b></p> <p>WT-1, WT-2 have strong dependancy on RAN. WT-3, WT7, WT10 have dependancy on RAN. WT-5 may have dependancy on RAN.</p>
<p><b>7 – Ericsson LM</b></p> <p>WT-1, WT-2, WT-3 have strong dependencies on RAN scope and RAN conclusions. They assume that RAN selects an architecture with full gNB on board the satellite, otherwise it may not make sense to place CN functionality on board.</p>

WT-5 has dependency on RAN scope/work. GNSS-independent operation primarily impacts RAN and it is not so clear what SA2 aspects would be studied.

WT-7 has dependency on RAN scope and RAN conclusions. IoT NTN is currently only supported for EPC.

WT-10 is related to RAN discussions. RAN already studied IAB via satellite and concluded to not progress such solution. If this is to be re-opened, it should rather be in RAN scope.

WT-11 WT-13, WT-14 are not clearly described but seem to be in RAN scope.

#### **8 – Huawei Technologies R&D UK**

WT1/2/3: all require RAN to conclude and has a full dependency on their output.

WT-3: has impacts to SA3 and potential security issues.

WT-5: Requires RAN to lead and is fully dependent on them. Potential SA3 for validating other positioning methods are secure enough.

WT-7: May need RAN work to combine both 5GC NTN/IoT and EPS NTN/IoT aspects together (as they don't always share a common RRC layer for example).

#### **9 – Nokia Germany**

**WT-1, WT-2 and WT-3** have dependencies on RAN WGs study and conclusions.

**WT-5** GNSS-independent operation needs to be studied in RAN WGs.

**WT-7** IoT will have RAN and requires RAN WGs study.

**WT-11 WT-13, WT-14** seems to be RAN WGs impacting topic.

#### **10 – Sateliot**

**WT-1** has dependencies with RAN

**WT-2** has also dependencies with RAN, but most of the work needed to support S&F operation is believed to impact mostly SA2 and CT1.

#### **11 – Beijing Xiaomi Mobile Software**

WT-1,2,3,5,6,10 have dependencies on RAN WGs

#### **12 – NOVAMINT**

**WT1, WT2 and WT3** have dependencies with RAN (RAN3). However, we believe the topic of S&F satellite operation is mostly with impact in SA2 and CT1 and **the work on WT2 (2.1) can already start** as there will be extensive requirements on this topic coming out of SA1.

**WT5** has dependencies with RAN

#### **13 – Lockheed Martin**

Agree with Mediatek.

**14 – Apple (UK) Limited**

WT-1, WT-2, WT-3 are heavily dependent on RAN scope / guidance / conclusions

**15 – Eutelsat S.A.**

WT-1, WT-5 would require suitable coordination with RAN TSG and relevant WGs

**Feedback Form 7: Describe dependencies between the Work Tasks**

**1 – MediaTek Inc.**

See above (regarding some WT being sub-tasks of other WT)

WT6 has dependencies with WT1

**2 – OPPO**

WT-2, WT-3 may have dependency on WT-1

**3 – China Telecommunications**

Agree with OPPO, WT-2 and WT-3 have dependency on WT-1.

**4 – CATT**

WT-1 is the pre-condition to have WT-2, WT-3 and WT-6.

**5 – Qualcomm Technologies Int**

WT2 is dependent on WT1. WT4 should be removed and discussed separately i.e. in MED on "Multi-access and ATSSS" since it is a generic problem not specific only to satellite access.

**6 – LG Electronics France**

WT-2 and WT-3 require regenerative payload architecture, so they have dependencies with WT-1.

**7 – Ericsson LM**

WT-2 and WT-3 depend on WT-1 as well as discussions in RAN.

**8 – Huawei Technologies R&D UK**

The main dependency we see is that WT-2 & WT-3 fully depend on WT-1 (which depends on RAN). Additionally, the scope of these may change based on WT-7.

There are other dependences/relationships described above.

**9 – Sateliot**

Comments on dependencies/relationships between WT-1 and WT-2 can be found in our response to Feedback Form#1.

**10 – Beijing Xiaomi Mobile Software**

WT-2 and WT-3 will base on regenerative payload architecture, therefore, both of them have dependencies on WT-1.

**11 – NOVAMINT**

There are some dependencies between WT2, 3 and as well WT6 with WT1. However, the work on WT2.1 can start immediately (assuming a regenerative architecture with full eNB and some EPC functions on board and no ISL) as there are extensive requirements coming out of SA1.

**12 – Apple (UK) Limited**

WT-2 are WT-3 depend on the progress in WT-1.

**13 – Eutelsat S.A.**

WT-3 should have dependencies to WT-1.

**Feedback Form 8: Describe any dependencies on potential work/study items that might be created as a result of the other Q3 moderated discussions.**

**1 – MediaTek Inc.**

See above: dependency between WT-4 and Multi-access/ATSSS Ph4: if this topic is included, it should be discussed in the multi-access thread.

**2 – OPPO**

We suggest to move the WT-4 into the potential work/study items related to Multi-access (Dual 3GPP + ATSSS Enh).

**3 – VODAFONE Group Plc**

Agree with Mediatek and Oppo

<p><b>4 – CATT</b></p> <p>agree with previous comments</p>
<p><b>5 – Qualcomm Technologies Int</b></p> <p>WT4 with MED on "Multi-access and ATSSS" since it is a generic problem not specific only to satellite access. WT10 with MED on "VMR enhancements".</p>
<p><b>6 – LG Electronics France</b></p> <p>WT-4 can be discussed under "Multi-access (Dual 3GPP + ATSSS Enh)".</p>
<p><b>7 – Ericsson LM</b></p> <p>WT-4 is dependent on the Multi-access (Dual 3GPP + ATSSS Enh) topic. Better to study DualSteer in a single study and avoid having a parallel NTN-specific part of it.</p>
<p><b>8 – Huawei Technologies R&amp;D UK</b></p> <p>WT-4 should not be considered as part of this SID.</p>
<p><b>9 – Nokia Germany</b></p> <p>WT-4 is dependent on the Dual 3GPP + ATSSS Enh Rel-19 topic.</p>
<p><b>10 – Beijing Xiaomi Mobile Software</b></p> <p>WT-4 is dependent on Dual-Steer, and can be discussed under "Multi-access (Dual 3GPP + ATSSS Enh)".</p>
<p><b>11 – Nubia Technology Co.</b></p> <p>(from ZTE)</p> <p>WT#4 should be part of "dual access/steer" topic.</p>
<p><b>12 – NOVAMINT</b></p> <p>We can move WT-4 in Multi-access/ATSSS Ph4 thread.</p>
<p><b>13 – Lockheed Martin</b></p> <p>Agree with the other comments herein.</p>
<p><b>14 – Apple (UK) Limited</b></p> <p>WT-4 should be part of Multi-access SID.</p>

## 4 Partitioning

These questions will help determine whether there is one, or more than one, Study Item, Work Item or TEI-19 item to be created from these Work Tasks.

### Feedback Form 9: Should there be more than one SID, WID or TEI-19 item created based on the Work Tasks?

<p><b>1 – MediaTek Inc.</b></p> <p>Single SID (+follow-up WID) is enough - generally we do recommend focusing SA2 effort on defining enhancements that <i>broaden the applicability</i> of NR and IoT NTN, rather than specifying alternatives to existing 3GPP solutions.</p>
<p><b>2 – CATT</b></p> <p>single SID + some possible TEI WIDs would be OK.</p>
<p><b>3 – Qualcomm Technologies Int</b></p> <p>No</p>
<p><b>4 – LG Electronics France</b></p> <p>No, one SID is sufficient.</p>
<p><b>5 – Ericsson LM</b></p> <p>No</p>
<p><b>6 – Huawei Technologies R&amp;D UK</b></p> <p>Only one SID is expected.</p>
<p><b>7 – Nokia Germany</b></p> <p>No</p>
<p><b>8 – Gatehouse Satcom A/S</b></p> <p>Agree with Mediateks comment</p>
<p><b>9 – Beijing Xiaomi Mobile Software</b></p> <p>One SID is sufficient.</p>
<p><b>10 – NOVAMINT</b></p> <p>Agree with MediaTek’s comment - one SID is sufficient</p>

<b>11 – Lockheed Martin</b> One SID is sufficient.
<b>12 – Apple (UK) Limited</b> Single SID
<b>13 – Inmarsat</b> One SID is sufficient

**Feedback Form 10: If the answer to the above question is yes, describe how the Work Tasks should be partitioned into different items.**

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## 5 Summary from the Q3 discussions

### 5.1: Summary from sections 2.1 and 2.2

This chapter is to analyze and make synthetic proposals regarding the feedbacks on both Work Tasks based on input to and outcome of the Workshop (chap2.1) and Additional Work Tasks (chap2.2).

Here is first part related to the output of the workshop:

Regarding companies' feedbacks on form 1 (which of the above work tasks should be in the scope of R19), for the method, it is proposed to classify the feedbacks as follow:

- “cat1” WT is needed in R19.
- “cat2” WT is optional/to be discussed in R19.
- “cat3” WT is not needed in R19.
- “cat4” WT with no response.

Then WTs with strong majority of “cat1” among provided responses will be proposed to be included in the R19 and in the SID, taking into account different companies' proposals of rewording, merge, re-organization.

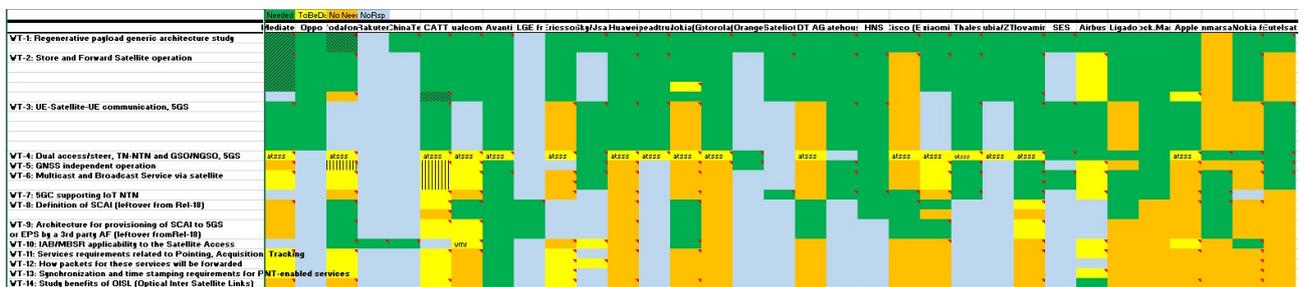
WTs with majority of “cat2” among provided responses will be analyzed on case by case.

WTs with majority of “cat3” among provided responses will be proposed not to be included in the R19 nor in the SID.

33 companies provided feedbacks on form1 for the different WTs. Following table provides number of responses in each of the four categories listed previously:

**Table 1: votes from 33 companies**

	cat1	cat2	cat3	cat4
WT1	30	0	1	2
WT2	23	1	3	6
WT3	17	0	7	9
WT4	11	16	0	6
WT5	9	5	10	9
WT6	11	6	8	8
WT7	10	2	10	11
WT8	12	1	7	13
WT9	9	2	8	14
WT10	6	4	11	12
WT11	1	5	14	13
WT12	1	5	14	13
WT13	1	5	14	13
WT14	2	4	14	13



**Figure 1: ranking into categories**

Regarding companies' feedbacks on form 2 (can any of the WT above can be combined/merged), 13 companies provide feedback. There is a consensus to link WT-8 and WT-9, no consensus between WT-1 and WT-10, no consensus between WT-1 and WT-3.

**»> Moderator Proposal #1: Proposed Conclusion on combine/merge**

**WT-8 and WT-9 are to be merge in single WT.**

Regarding companies' feedbacks on form 3 (can any of the WT above be reworded, if so propose the required rewording), 14 companies provide feedback. Several companies propose rewording of WT-1 & WT-2, including sub-tasks, and for WT-3.4

New sub-task is proposed for WT-3

Considering the feedbacks in the different forms, moderator proposals are the following:

**»> Moderator Proposal #2: Proposed Conclusion for WT-1**

**There is significant positive support for WT-1 and WT-1 shall be part of R19, with RAN alignment on the different architectures to study.**

**Rewording of sub tasks is necessary for clarification. Hypothesis listing is also required (in the justification part of the SID). Considering the different comments, the following description is proposed, introducing a new sub-task:**

**WT-1.1: Study minimum necessary set of 3GPP core network functions and/or RAN to be embedded in the satellite for the new uses cases and study the different possible architectures if any.**

**WT-1.2.1: In case of RAN only embedded architecture, study core network impacts on interfaces, protocols (mobility management, paging) of having “flying” embedded gNB/eNB.” This task also includes LI aspects.**

**WT-1.2.2: In case of RAN + CN embedded architecture, study core network impacts on interfaces, protocols (mobility management, paging) of having “flying” RAN + CN functions.” This task also includes LI aspects.**

**»> Moderator Proposal #3: Proposed Conclusion for WT-2**

**There is significant positive support for WT-2 and WT-2 shall be part of R19.**

**There is no consensus on whether EPS and 5GS may be studied together or independently. Some companies expressed lower priority for 5GS, other for EPS.**

**Rewording proposed by Novamint is taken as basis to propose the following:**

**WT-2.1: Study, and if applicable, define the parameters needed to characterize and support S&F Satellite operation from a data service perspective (e.g., S&F data retention period, S&F data storage quota, S&F forwarding priority, S&F acknowledgement policy), both for 5GS and EPC.**

**WT-2.1.2: Study, and if applicable, define the control plane and user plane enhancements to support S&F Satellite data operation (e.g., capability to inform the UE that the network is operating in S&F mode, capability to suspend / resume a signaling procedure that cannot be successfully completed within the expected time due to S&F Satellite operation, capabilities to enforce S&F service-related parameters, impact on mobility management/ paging/ discontinuous coverage management if any) , both for 5GS and EPC.**

**WT-2.1.3: Study, and if required, define new architectural extensions for S&F Satellite operation (e.g., distributed satellite-ground EPC functions for S&F), in line with regenerative payload architecture**

**study (WT1), both for 5GS and EPC.**

**»> Moderator Proposal #4: Proposed Conclusion for WT-3**

**There is significant positive support for WT-3 and WT-3 shall be part of R19.**

**To consider a proposed rewording, WT-3 is completed as follow:**

**WT-3.1: Evaluate which UE service can/should be supported locally (e.g: only IMS) and study activation of such UE-Satellite-UE communication**

**WT-3.4: Study compliance to applicable regulated services**

**»> Moderator Proposal #5: Proposed Conclusion for WT-4**

**A large majority of comments propose to treat WT-4 rather in ATSSS dedicated study (example of comment: should be discussed separately (see MED on "Multi-access and ATSSS") since it is a generic problem not specific only to satellite access. Consequently, the WT-4 is removed from satellite architecture enhancement study.**

**»> Moderator Proposal #6: Proposed Conclusion for WT-5**

**Given balanced ratio between should/should not be in R19, it is proposed to discuss WT-5 during SA2#158**

**»> Moderator Proposal #7: Proposed Conclusion for WT-6**

**Given balanced ratio between should/should not be in R19, it is proposed to discuss WT-6 during SA2#158**

**»> Moderator Proposal #8: Proposed Conclusion for WT-7**

**Given balanced ratio between should/should not be in R19, it is proposed to discuss WT-7 during SA2#158**

**»> Moderator Proposal #9: Proposed Conclusion for WT-8**

**There is significant positive support for WT-8 and WT-8 shall be part of R19, merging with WT-9. WT-8.2 could be discussed as some companies are not supportive.**

**»> Moderator Proposal #10: Proposed Conclusion for WT-9**

**There is significant positive support for WT-9 and WT-9 shall be part of R19, merging with WT-8**

**»> Moderator Proposal #11: Proposed Conclusion for WT-10**

**Given balanced ratio between should/should not be in R19, it is proposed to discuss WT-10 during SA2#158**

**»> Moderator Proposal #12: Proposed Conclusion for WT-11**

**No clarification, moderator proposes to remove this WT from the scope of R19.**

**»> Moderator Proposal #13: Proposed Conclusion for WT-12**

**No clarification, moderator proposes to remove this WT from the scope of R19.**

**»> Moderator Proposal #14: Proposed Conclusion for WT-13**

**No clarification, moderator proposes to remove this WT from the scope of R19.**

**»> Moderator Proposal #15: Proposed Conclusion for WT-14**

**No clarification, moderator proposes to remove this WT from the scope of R19.**

Here in a second part, companies feedbacks on Additional Work Tasks are analyzed:

6 companies provide total of 8 additional WTs.

3 companies indicate that no additional WTs are required.

1 company comments on the additional WTs, requesting clarification, merge or that WT does not need to be studied.

2 companies give descriptions of the proposed work task.

**»> Moderator Proposal #16: Proposed Conclusion: WT-China Telecom-1**

**Given single comment requesting clarification and no specific support, moderator proposes to remove this WT from the scope of R19.**

**»> Moderator Proposal #17: Proposed Conclusion: WT-China Telecom-2**

**Given single comment requesting clarification and no specific support, moderator proposes to remove this WT from the scope of R19.**

**»> Moderator Proposal #18: Proposed Conclusion: WT-China Telecom-3**

**Given single comment requesting clarification and no specific support, moderator proposes to remove this WT from the scope of R19.**

**»> Moderator Proposal #19: Proposed Conclusion: WT-Samsung-1**

**Given explanations in form5 and supportive company, moderator proposes to discuss this WT during SA2#158. checking Emergency attach for NB-IoT over satellite access (NTN) as proposed by Inmarsat can be included.**

**»> Moderator Proposal #20: Proposed Conclusion: WT-China Mobile-1**

**Given single comment requesting clarification and no specific support, moderator proposes to remove**

**this WT from the scope of R19.**

**»> Moderator Proposal #21: Proposed Conclusion: WT-Lockheed Martin**

**Not SA2 scope, moderator proposes to remove this WT from the scope of R19.**

**»> Moderator Proposal #22: Proposed Conclusion: WT-Sateliot-1**

**Given explanations in form5 and supportive company, moderator proposes to discuss this WT during SA2#158.**

### **5.2: Summary from section 3, dependencies**

Regarding dependencies on other working groups, 15 companies provide feedback. Dependencies to RAN are mentioned in all comments. One company mentions also SA3 for security.

**»> Moderator Proposal #23: Proposed Conclusion on RAN dependencies**

**Gathering responses, WT-1, WT-2, WT-3, WT-4, WT-5, WT-6, WT-7, WT-10, WT-11, WT-12, WT-13, WT-14 have RAN dependencies.**

**»> Moderator Proposal #24: Proposed Conclusion on SA3 dependencies**

**Gathering responses, WT-3 have SA3/SA3-LI dependencies.**

Regarding dependencies between work tasks, 13 companies provide feedback. Most of feedbacks notice that WT-2 and WT-3 strongly depends on WT-1. Some companies also notice WT-6 and WT-7 depends also on WT-1

**»> Moderator Proposal #25: Proposed Conclusion on dependencies between work tasks**

**Gathering responses, WT-2, WT-3, WT-6, WT-7 depends on WT-1**

Regarding dependencies on potential work/study items that might be created as a result of the other Q3 moderated discussion, 14 companies provide feedback. All comments propose to move WT-4 to work/study items related to Multi-access (Dual 3GPP + ATSSS Enh). This is already covered by Moderator proposal #5.

### **5.3: Summary from section 4, partitioning**

Here 13 companies provide feedbacks, and all indicates that a single SID is enough. One company refers to possible TEI.

**»> Moderator Proposal #26: Proposed Conclusion on partitioning: A single SID/WID is enough to study and do the normative phase for satellite enhancement study phase 3.**