SA2 Rel-19 23Q3 moderated discussion - Multi-access (Dual 3GPP + ATSSS Enh) - Version 0.0.4

SA2

https://nwm-trial.etsi.org/#/documents/8587

1 Introduction

The intent of this document is to define the Work Tasks for the combined ”Upper layer traffic steering, switching and splitting over dual 3GPP access” and ”Streamlined (or Lightweight) Access Traffic Steering, Switching and Splitting support in the 5G system architecture” study item.

The content of section 2.1 is based on SP-230759 and the following inputs to the SA Rel-19 workshop:

SWS-230012: Qualcomm’s views on SA2 Release 19 package

SWS-230014: Intel’s view on possible Rel-19 package

SWS-230015: Futurewei’s view on Rel-19

SWS-230017: Maritime perspective on Release 19 content (SyncTechno Inc.)

SWS-230020: OPPO views on Rel-19 Contents

SWS-230022: UK Government priorities for Release 19

SWS-230027: MITRE Views on Rel-19 SA Content

SWS-230025: MediaTek Thoughts - Release 19

SWS-230030: LGE’s view on Rel-19 5G-Advanced

SWS-230035: Samsung view on Rel-19

SWS-230036: Nokia views on Rel-19

SWS-230038: Xiaomi’s View on Release 19

SWS-230040: CableLabs view on Release 19

SWS-230041: NEC’s view on Release 19

SWS-230042: CATT’s view on SA Rel-19

SWS-230048: On High Priorities in Release 19 (NICT)

SWS-230057: Release-19 priorities (Charter Communications, Inc, Comcast, CableLabs)

SWS-230058: Overview of Preferred SA Release 19 Features (Lenovo)

SWS-230061: Cisco’s views on SA Rel-19

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SWS-230066: Interdigital's views on SA R19 Package

SWS-230069: Google's views on SA2 R19 package

SWS-230073: Apple's views on Rel-19 topics in SA2

SWS-230079: KDDI Rel-19 View - Services & System Aspects

SWS-230081: Satellite Access - SA Rel-19 topics and priorities (NOVAMINT, Thales, TNO, Airbus Defence and Space, Avanti, b-com, CEWiT, Gilat, EDF, ESA, Eutelsat, Gatehouse, Hispasat, Hughes, Inmarsat, Intelsat, IRT Saint Exupéry, Ligado, Lockheed Martin, OneWeb, OQ Technology, Sateliot, SES, ST Engineering iDirect Ire)

SWS-230055: China Telecom views on Release 19.

2 Scoping

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

There are two sets of Work Tasks, the first group includes the Dual-steer related Work Tasks (marked with WT-D-x), the second group includes the ATSSS Phase-4 related work tasks (marked with WT-A-x). Overlapping Work Tasks taken from different input documents are marked as WT-D-xA, WT-D-xB, etc., to show the different alternatives.

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

1. Dual-steer Work Tasks:

WT-D-1 (SWS-230038) (SWS-230014) Overall architecture and function enhancement to support dual 3GPP access with one singe PLMN, two different PLMNs or PLMN+NPN.

WT-D-2 (SWS-230012) (SWS-230038) How to select the second PLMN or SNPN in case of different 3GPP networks after an initial PLMN was selected for the UE.

WT-D-3 (SWS-230038) (SWS-230014) (SWS-230025) (SWS-230036) (SWS-230035) (SWS-230055)How to support simultaneous registration to 5GC via Multiple NR accesses for a UE with single subscription. The UE can be registered to a single PLMN, to a single SNPN, to two different PLMNs or SNPNs, or to one PLMN and one SNPN. The UE may in addition be registered via one non-3GPP access to 5GC.

WT-D-4A (SWS-230012) (SWS-230055) How to enhance session management procedures.

WT-D-4B (SWS-230038) (SWS-230025) MA PDU session establishment using two 3GPP access.

WT-D-4C (SWS-230020) Study the 5GC session management extensions in SMF to derive the N4 (MAR) for the UPF to include together with routing and QoS information (FAR, PDR, etc.), and to derive the ATSSS rules to the UE delivered via AMF together with the UE Route Selection Policy (URSP) rules via NAS (N1).

WT-D-5A (SWS-230038) How to support MO/MT services when the UE is registered to the 5GC

simultaneously via multiple NR accesses and potentially one non-3GPP access.

WT-D-5B (SWS-230036) How to support mobile originating and terminating services (e.g., mobile data, voice, SMS, LCS) when the UE is registered to the 5GC network simultaneously via multiple NR accesses and potentially one non-3GPP access.

WT-D-6A (SWS-230012) How to support mobility between a PDU Session with single 3GPP access and a MA PDU Session with dual 3GPP access as well as between MA PDU Sessions with dual 3GPP accesses.

WT-D-6B (SWS-230036) (SWS-230035) Study how to support UE mobility between 5GS and EPS when 5GS supports ”Simultaneous registration to 5GC via Multiple NR accesses” and EPS supports UE attach via only a single LTE access.

WT-D-6C (SWS-230025) How to support session continuity between the two accesses.

WT-D-7 (SWS-230012) How to route the traffic of the MA PDU Session towards the PSA UPF.

WT-D-8A (SWS-230012) (SWS-230038) (SWS-230055) How to extend policies, steering functionalities, steering modes and charging.

WT-D-8B (SWS-230020) Study the unified policy and charging control support.

- Compatible policy control rule for MA-PDU session over different 3GPP access types or over 3GPP and non-3GPP access types.
- Any possible extensions to NWDAF to assist PCF to derive the ATSSS policy decision.
- Changes to the charging policy, if needed.

WT-D-8C (SWS-230025) Traffic switching/steering and associated changes to ATSSS rules.

2. ATSSS Phase-4 Work Tasks:

WT-A-1 (SWS-230073) (SWS-230036) Study how the MPQUIC steering functionality can be extended to be able to steer, switch, and split non-UDP traffic (TCP, IP, Ethernet traffic).

WT-A-2A (SWS-230073) Study how to relax the mandatory use of IPSec tunnel encapsulation on the untrusted non-3GPP access for the MPQUIC steering functionality, investigate new architectural options for ATSSS, if necessary.

WT-A-2B (SWS-230012) (SWS-230035) Define a new architecture for Lightweight Access Aggregation and Steering of non-integrated Wi-Fi in 5GC not based on TNGF/N3IWF. Introduce the concept of Non-Integrated Aggregated (NIA) PDU Session based on the re-use of IETF RFC protocols (e.g., MPQUIC/MPTCP) and related functions in the UE and in the PSA UPF.

- How to establish and modify NIA PDU Sessions.

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- How to extend the usage of rules for UE and UPF to coordinate the aggregation and steering of traffic within a NIA PDU Session, including how to configure the MPTCP/MPQUIC proxy functionality in the UPF.

  NOTE: It is assumed that the Lightweight Access Aggregation and Steering functionality applies to non-GBR traffic type only.

WT-A-2C (SWS-230057) Study an ATSSS-like solution between one 3GPP access and one WLAN. Since the first release of 5GS, untrusted/trusted WLAN (i.e., N3IWF and TNGF) have not been fully adapted that also prevents adaption of 5GS capabilities like ATSSS. A 'lightweight' ATSSS-like capabilities between one 3GPP and one WLAN can be beneficial for the ecosystem until (un)trusted access nodes become widely available. Note: Rel-19 proposals like the ones in S2-2306991/92 to SA2#157 have similar concept.

WT-A-3 (SWS-230073) Study how to support an MA PDU Session using a Branching Point (IPv6 multi-homing) or an UL Classifier. The UE shall not be required to know whether the MA PDU Session is using an UL Classifier.

WT-A-4 (SWS-230073) Study how to support the establishment of an MA PDU Session to a LADN.

WT-A-5A (SWS-230036) (SWS-230035) Support MA PDU Sessions with two 3GPP accesses and one non-3GPP access. This includes enhancements to existing steering modes, steering functionalities, ATSSS and N4 rules.

WT-A-5B (SWS-230057) Study ATSSS between two 3GPP and one non-3GPP access legs for a UE with single or multiple subscriptions.

WT-A-6 (SWS-230057) Separate ATSSS functions out of UPF.

WT-A-7 (SWS-230036) Use of available QoS and congestion information or performance measurement results, e.g., provided by the Access Network or UE, for making ATSSS decisions. This includes studying potential updates to existing steering modes or definition of a new steering mode.

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

1 – Nokia Germany WT-A-2A (SWS-230073): this is **not** in scope of SA2
2 – Comcast To be determined after the WTs have been consolidated/merged to a stable set of WTs.
3 – Charter Communications Merged version of WT-D-8A through WT-D-8C, WT-A-5A and WT-A-5B Merged version of WT-A-2A through WT-A-2C

4 – QUALCOMM Europe Inc. - Italy

With respect to DualSteer, the aspects that need to be studied are only those captured in WT-D-1, WT-D-2, WT-D-4, WT-D-5 (only MT and without additional Non-3GPP access), WT-D-6, WT-D-7 and WT-D-8A.

With respect to ATSSS_Ph4, only WT-A-2 and WT-A-6 should be studied.

All other WTs (WT-D-3, WT-D-8B, WT-D-8C as well as WT-A-1, WT-D-3, WT-D-5 and WT-D-7) should be removed and out of scope of Rel-19.

Justification:

- Network deployment options (single PLMN, PLMN + SNPN, etc.) as well as RAT combinations (terrestrial NR + terrestrial NR, terrestrial NR + non-terrestrial NR, etc.) need to be consistent with the outcome of the SA1 work.
- The requirement of an additional non-3GPP access on top of the two 3GPP accesses (see e.g., WT-D-5A) is currently not in the scope of SA1 DualSteer work and we think it should be removed unless SA1 conclude to include it.
- The extension to NWDAF (see WT-D-8B) should not be studied here, rather in AIMLsys. This is also a second order optimization, since first we need to define the policies for DualSteer.

5 – Comcast

SA1 requirements are one input to a release planning; it is our understanding that companies can bring other proposals for consideration as part of Release scoping. Lack of SA1 requirements cannot be a justification.

Given that ATSSS is already specified for 1 3GPP and 1 N3GPP, it would make sense to consider adding another 3GPP access to the MA-PDU. This will have to be studied anyways for the scenario where MA-PDU session has already been established between 1 3GPP + 1N3GPP and another 13GPP access is being requested.

6 – VODAFONE Group Plc

WT-A-2B, WT-A-2C and the new proposed WT from DT (WT-DeutscheTelekom-1).

The SID is extremely long already and several of the WTs require lots of clarification and rationale.

7 – LG Electronics France

Consolidated objectives based on WT-D-1, WT-D-4A, WT-D-5A, WT-A-2B.

Other WTs in ATSSS Phase-4 should be low priority.

8 – Huawei Technologies R&D UK

For DualSteer:

The potential impacts on the whole system are significant, while the potential benefit it could bring to both user and operator is little, even making the system performance worse than the existing one especially when the traffic aggregation or splitting is performed at CN rather than RAN. For 5G we already have the DC/CA for NR and DC for LTE and NR for traffic aggregation or splitting, what is the benefit and justification to do the aggregation or splitting at UPF side? **We need RAN WG to evaluate the feasibility and performance. Without the clear justification regarding the traffic aggregation or splitting at UPF for two 3GPP access networks (same or different RAT types), we question all the related WTs.**

Overall, the structure of the WTs has mixed all the combinations of network deployment options (e.g. single PLMN or dual PLMNs or PLMN+NPN), RAT type and traffic scenarios (e.g. steering, switching or splitting) together without any justification, clarification and rationale on whether the scenarios are valid or valuable. In particular, WT-D-1 and WT-D-2 as the basic ones are too ambiguous. **We should differentiate and decouple the issue of data aggregation/splitting/steering/switching with two 3GPP access networks (with same or different RAT types) and the issue of dual registration.** These two areas are fundamentally different and having very different system level impacts. Hence, do not mix them together and all the WTs shall be clarified clearly.

Since different scenarios may lead to quite different solutions, which may have different impacts on the whole 5G system, in order to pave the way for a structured and clear discussion on the SID scope in future, it is strongly suggested to first clarify, justify and determine the target scenarios or use cases that are valuable and worthwhile to study. **For each determined, justified and valid scenario or use case, sub-WTs should be listed to cover different aspects of the 5G system**, such as registration management, mobility management, session management, policy control, security, charging, as well as the backward compatibility with: legacy UE, existing features (e.g. slicing, prose, Edge, etc) and existing services (e.g. XR services, LADN services).

Therefore, based on the aforementioned considerations, if there is a valid and valuable scenario or use case for future study, **each WT should correspond to one scenario only, i.e. specific network deployment option with specific RAT type combination for one specific traffic scenario (traffic switching, splitting or steering).** For the determined valued scenario constituting a WT in the new possible structure of the SID, we suggest to considerthe rewording and reorganization of current WT that could eventually be considered as the **following sub-WTs in each WT corresponding to a specific target scenario**:

- Reworded WT-D-3: study whether and how to enhance the registration management to support the specific scenario
- Merged version of WT-D-4: study whether and how to enhance the session management to support the specific scenario
- Merged version of WT-D-6: study whether and how to enhance the mobility management to support the specific scenario
- Merged version of WT-D-8: study whether and how to enhance the policy and charging control to support the specific scenario

Following WTs of current proposed structure (i.e. WTs in 2.1) **should be removed** from the SID discussion:

- **WT-D-1: should be removed** because it is too open now. If architecture or function enhancement is needed for specific scenario or area, the solution will clarify and reflect it. Therefore, standalone WT for it is not needed.
- **WT-D-2: should be removed** because it can be covered by reworded WT-D-3.
- **WT-D-5: should not be a sub-WT**. If additional non-3GPP access is determined to be a valuable and worthwhile scenario to be studied, it should be reflected as a new target scenario, i.e. as a new WT to be studied as per the new SID structure proposal.
- **WT-D-7: can be removed.** It makes assumption on using MA PDU session. MA PDU session could be an option, but at this stage it is not possible to generalize that this option is applicable to different scenarios. Additionally, WT should not make any assumptions on the solution, rather focus on the issues to be studied. Therefore, WT-D-7 can be removed and the WT-D-4 about session management will cover the issues to be studied on traffic transmission.

For ATSSS_Ph4:

There are several WTs proposing to remove the use of N3IWF/TNGF for traffic steering. **The value of not using N3IWF/TNGF shall be justified.** N3IWF/TNGF is not only used for traffic steering, it can enable the UE to access the network via non-3GPP access e.g. when there is no 3GPP access network coverage. Additionally, N3IWF is also used in other scenarios such as Prose, PLMN and SNPN interworking architecture. Moreover, without using the IPSec, potential security risk may be introduced which shall be evaluated by SA WG3. Therefore, the WTs related to relax the mandatory use of N3IWF/TNGF and IPSec requires clarification, justification, and rationale. Currently, we think that the impacts are much more than the benefits it could bring and the motivation is not clear. **Hence, the WT-A-2A, WT-A-2B, WT-A-2C should not be in scope of ATSSS_Ph4.**

WT-A-5A and WT-A-5B should not be in scope of ATSSS_Ph4 as they are related to DualSteer. As commented above, if additional N3GPP leg is also considered, it should be added as a new target scenario to be studied.

WT-A-6 should not be in scope. If ATSSS function is out of UPF, then the function needs to be supported either by application or in N6, both of which are out of 3GPP scope, and nothing needs to be studied in this SA2 SID.

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9 – KDDI Corporation

Response to comment #8 from Huawei

"For 5G we already have the DC/CA for NR and DC for LTE and NR for traffic aggregation or splitting, what is the benefit and justification to do the aggregation or splitting at UPF side?"

I agree with Huawei that NR already has traffic aggregation or splitting capabilities in NR/NR and NR/LTE scenarios. However, we believe that MA PDU Session with two 3gpp-accesses is still necessary.

First, MA PDU Session is useful in scenarios where DC is not applicable. For example, MA PDU Session is preferable in scenarios where interworking between CUs is difficult, such as multiple PLMN or TN+NTN scenarios.

Also, there are some situations where MA PDU Session is more effective even when DC is applicable. MA PDU Session has an obvious difference from DC in that it does not use the Xn interface, and it can ignore situations where the physical bandwidth of the Xn interface is insufficient, or the Xn interface is congested.

I hope that it would be reasonable to you and that you accept the necessity of an MA PDU Session with two 3gpp-accesses.

We would also like to hear other companies' views on this and other concerns raised by Huawei.

10 – KDDI Corporation

DualSteer

- WT-D-1, 2, 3, 4A, 8A
- Justification
  - MA PDU Session is needed to achieve high capacity and low latency communications in more areas and situations; WT-1, 2, 3, and 4A are the minimum required features to apply MA PDU Session with two 3gpp-accesses.

ATSSS

- WT-A-5A
- Justification
  - Because the ability to use two 3gpp access and non-3gpp access paths simultaneously may lead to high capacity and low latency communications. WT-D-8A is also needed along with this.

11 – Comcast

WT-D-12-5AB-MTK1MergedMerged (described in fbk form 2)

WT-D-3

WT-D-4ABCMerged (described in fbk form 2)

WT-D-5ABMerged (described in fbk form 2)

WT-D-7Reword (described in fbk form 3)

WT-D-8ABCMerged (described in fbk form 2)

WT-A-1

WT-A-2A

WT-A-2B

WT-A-6

WT-A-7

12 – CableLabs

WT-D-1, WT-D-2, WT-D-3, Merged version of WT-D-4 and WT-A-5, WT-A-2B/C, WT-A-6

13 – Apple (UK) Limited

WT-A-1 is important to keep to reduce complexity and allow standalone MPQUIC steering functionality deployment

14 – Apple (UK) Limited

WT-D-1 (WT-D-2 and WT-D-3 are merged into WT-D-1)

WT-D-4A (WT-D-4B and WT-D-4C are merged into WT-D-4A)

WT-D-5A (WT-D-5B is merged into WT-D-5A)

WT-D-6A (WT-D-6B and WT-D-6C are merged into WT-D-6A)

WT-D-8A (WT-D-8B and WT-D-8C are merged into WT-D-8A)

WT-A-1

WT-A-2A (WT-A-2B and WT-A-2C are merged into WT-A-2A)

WT-A-3

WT-A-4

WT-A-5 is merged into WT-D-8A

WT-A-6

15 – MediaTek Inc.

For Dualsteer, the following WTs can be included in Rel-19

WT-D-1 can be included as reworded in Form 3 to consider only TN + NTN accesses in one PLMN or different PLMNs.

WT-D-2 can be included as reworded in Form 3 to consider only TN + NTN accesses

WT-D-3 can be included as reworded in Form 3 to consider only TN + NTN accesses

WT-D-4A can be included as is

WT-D-5B can be included as reworded in Form 3 to consider only TN + NTN accesses

WT-MTK-1 can be included as described in Form 4 to consider only TN + NTN accesses and one non-3GPP access

WT-D-6B can be included as reworded in Form 3 to consider only TN + NTN accesses

WT-D-7 can be included as is

WT-8A can be included as reworded in Form 3

NOTE: The scenarios of only TN + NTN accesses are described below:

1) UE switches/ steers between TN access and NTN access based on coverage availability

2) UE uses only TN access if both TN and NTN coverage are available.

3) No aggregation between TN and NTN supported.

For ATSSS enhancements:

Only WT-A-1 and WT-A-4 can be included in Rel-19 as TEI 19. We do not support the other ATSSS enhancements in scope of Rel-19.

16 – Motorola Mobility Germany GmbH

Lenovo supports the following WTs to be included in Rel-19:

DualSteer:

WT-D-1

WT-D-2

WT-D-3

WT-D-4B (creation of ATSSS rules and MAR could be handled as part of this WT)

WT-D-5B

WT-D-6B

WT-D-6C (we support this in case ”access path switching” is studied under this WT, e.g. how to transfer a source 3GPP access path to a target 3GPP or non-3GPP access path – without this addition, WT-D-6C is already supported using ATSSS existing procedures)

ATSSS_Ph4:

WT-A-1

WT-A-3

WT-A-5A

WT-A-7 (additional steering modes could be considered, e.g., taking into account energy efficiency)

17 – Orange

DualSteer:

The proposed structure is unacceptable as every WT mixes different access combination scenarios, and in particular we cannot accept the scenario with PLMN+NPN.

The WTs to be included in Rel-19 are those proposed by MediaTek (post #15).

For ATSSS:

WT-A-A2, WT-A-2B, WT-A-7 with the rewording proposed in Form 3 post #13, and WT-Nokia-1 should be in Rel-19.

18 – Ericsson LM

DualSteer:

WT-D-1,2,3: Based on the SA1 study, the use case for dual 3GPP accesses is targeting traffic steering, splitting, switching only. It should therefore be stated in the WT-D-1,2,3 that the purpose of two 3GPP accesses is to enable TSSS for two 3GPP accesses. In addition, the main motivation for using dual 3GPP accesses is the resiliency aspect, i.e. using two networks in parallel. Using DualSteer for a single PLMN

/ RAN is questionable and we propose to remove it to reduce scope and impacts. Scope should be limited to separate PLMNs only. For the single PLMN case we already have solutions e.g. based on DC and CA.

WT-D-1,2,3: The RAT combination scenarios should be clearer. To keep the study focused, our suggestion is to focus on NR TN + NR NTN case as well as LTE/EPC + NR/5GC for the multiple PLMN scenarios (resiliency use cases).

WT-D-5A,B: These WTs do not seem needed, and also assumes a solution. The use case is limited to MA PDU Sessions via two 3GPP accesses. Impacts to other services should be avoided.

ATSSS_Ph4:

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

WT-A-4: Support for LADN is not available in non-3GPP access. This WT therefore seems more general than ATSSS and should probably be in a different SID.

WT-A-5: Seems to be part of the WT-D category, i.e. related to dualsteer.

WT-A-6: Does not seem necessary in rel-19. WT is also too minimalistic. What are the "ATSSS functions"? The control plane aspects are not mentioned.

19 – China Telecom Corporation Ltd.

For WT-A-3, the UL CL usage in MA PDU session has been studied in R16. During the study some potential problems has been found and there are some Editor's Notes in TR23.793, e.g. whether the UL CL can be used in both accesses or only in 3GPP access. In case it is used in both accesses, if the N3IWF is centric deployed the Non-3gpp leg with the UL CL may prolong the traffic routing. Besides, the UL CL can't identify the traffic flow when the UL CL is insert in the MA PDU session because of the IPsec.

It seems that it is better to use the UL CL only in the 3GPP access in order to overcome the problems above. But there are still some problems to be resolved, e.g., Session-AMBR.

Therefore, we propose to study whether and how an MA PDU Session can support traffic diversion.

20 – China Telecom Corporation Ltd.

For KDDI's comment at #9, we also want to point out that for DC solution today relies on the main RAN node to aggregate the traffic from itself and from the secondary RAN node.

Usually, the RAN nodes won't connected in a point-to-point manner. The RAN nodes of a specific area may connect to one central node through the transport network, i.e., the traffic from the secondary RAN may first tranport to the central node, to the main RAN, and aggregated with the traffic from the main RAN, then the central node again to the 5GC/EPC. It may has great pressure on both the Xn and gNB interfaces, especially of the main node. If we can have a new solution that the traffic from two RAN aggregated in the core, it shall relieve the traffic load and shorten the delay.

21 – Guangdong OPPO Mobile Telecom.

For WT-D-1,2,3, we support to prioritize the LTE/EPC + NR/5GC as well as NR TN + NR NTN case for one or multiple PLMN scenarios. Other scenario may be deprioritized considering the TU limitation.

22 – Huawei Technologies R&D UK

Response to comment #9 from KDDI and comment #20 from China Telecom.

Firstly, the statement of using MA PDU Session with two 3GPP accesses is more effective may not be valid because it depends very much on the target scenario as MA PDU session would not be the optimal solution in every scenario.

For TN+NTN, actually there is no benefit to perform traffic aggregation as the latency of TN and NTN are quite different. The latency of traffic aggregation will depend on the path with larger latency. Therefore, compared with only using TN, the actually traffic delay will be increased when using MA PDU session over TN+NTN.

For multiple PLMN scenario, we can use multi-SIM to perform the aggregation at application layer which can meet the service requirement of larger bandwidth with no impact on existing mechanism. However, using single SIM with two 3GPP access network from two PLMNs must re-design the system mechanism from E2E, while almost same effects are achieved compared with multi-SIM. Therefore, the motivation is also not clear.

Furthermore, applying MA PDU session over two 3GPP access networks requires 5G system to support dual active paths within the same Access Type, which will fundamentally change the mechanism of registration management, session management, mobility management and policy control we defined for 5G system, while the performance could be even worse than the existing mechanism. Hence, we should think about carefully what is the benefit and motivation with the additional complexity due to complete network re-design to achieve MA PDU session over two 3GPP access networks.

Regarding the issue of Xn interface mentioned by CTCC, this is more related to network deployment. Utilizing MA PDU session may not help because there could also be transport issues between RAN and UPF due to network deployment, let alone the performance of traffic aggregation at UPF may be worse than the that of DC.

23 – ZTE Corporation.

The current structure seems not possible to be accepted.

For WT-D, it is proposed to group into two WTs, one for the dual registration via two 3GPP access, the other for the MA PDU session over two 3GPP access. Otherwise it is difficulty to evaluate the TU for each WT. We don't need to have separated bullets for everything to support single feature.

On the WG-A, WT-A-2A is in SA3 scope. For WT-A-2B/2C, we propose to study it as separated study because it introduce a new non 3GPP access technology. After that we can study how MA PDU session can use that leg. We support WT-A-3 because it doesn't make sense that MA PDU session doesn't support ULCL/BP.

Considering the time limit, we don't support other WTs, i.e. WT-A-1,WT-A-4,WT-A-5A,WT-A-5B,WT-A-6, WT-A-7.

24 – BROADCOM CORPORATION

We support the following WTs to be included in Release 19.

Dual Steer:

WT-D-1,2,3

WT-D-4B

WT-D-5(A and B)

WT-D-6(A and B and C)

WT-D-8(A and B and C)

ATSSS Phase4:

WT-A-1

WT-A-2(A and B and C)

WT-A-5A (this may be merged with the WT-D task)

WT-A-7

Note: as few other companies have noted the current SI proposal seems to become quite large. If a reduced version of this SID is to be adopted then such version should include:

WT-A-1

WT-A-7

and

WT-D-1.2.3

WT-D-4A

WT-A-5A

25 – KDDI Corporation

Response to comment #22 from Huawei:

Thank you for your valuable comments. We answered your questions inline. I hope that it would be reasonable for you. Below is our view, so comments from other companies are also welcome!

Firstly, the statement of using MA PDU Session with two 3GPP accesses is more effective may not be valid because it depends very much on the target scenario as MA PDU session would not be the optimal solution in every scenario.

[KDDI] Agree. But DC is not a perfect solution for every scenario as well as the MA PDU Session. Studying the area where DC doesn't work well and covering them with MA PDU Session is beneficial for improving the performance of mobile communication. And I believe Huawei's knowledge will be helpful for this work.

For TN+NTN, actually there is no benefit to perform traffic aggregation as the latency of TN and NTN are quite different. The latency of traffic aggregation will depend on the path with larger latency. Therefore,

compared with only using TN, the actually traffic delay will be increased when using MA PDU session over TN+NTN.

[KDDI] MA PDU Session has ”redundant” and ”active-standby” modes, and these steering modes can be beneficial in the TN+NTN scenario. For example, MA PDU Session with ”active-standby” mode can continue communication even if the TN path gets congested or the connection is lost.

For multiple PLMN scenario, we can use multi-SIM to perform the aggregation at application layer which can meet the service requirement of larger bandwidth with no impact on existing mechanism. However, using single SIM with two 3GPP access network from two PLMNs must re-design the system mechanism from E2E, while almost same effects are achieved compared with multi-SIM. Therefore, the motivation is also not clear.

[KDDI] In your scenario, the opposite host must have an aggregation functionality. MA PDU Session can increase the radio bandwidth or improve the reliability of the radio section transparently to the opposite host.

Furthermore, applying MA PDU session over two 3GPP access networks requires 5G system to support dual active paths within the same Access Type, which will fundamentally change the mechanism of registration management, session management, mobility management and policy control we defined for 5G system, while the performance could be even worse than the existing mechanism. Hence, we should think about carefully what is the benefit and motivation with the additional complexity due to complete network re-design to achieve MA PDU session over two 3GPP access networks.

[KDDI] We would like to know the specific logic of ”the performance could be even worse than the existing mechanism.” But anyhow, we agree that there will be an impact on registration and session management. We should minimize the impacts as much as possible and avoid greater disadvantages than advantages.

Regarding the issue of Xn interface mentioned by CTCC, this is more related to network deployment. Utilizing MA PDU session may not help because there could also be transport issues between RAN and UPF due to network deployment, let alone the performance of traffic aggregation at UPF may be worse than the that of DC.

[KDDI] From our view, the comment from CTCC is correct. Considering the traffic flow of the second path, MA PDU can simply eliminate ”Aggregate point → CU1 → Aggregate point” transmission.

- Flow of DC: UE → RU/DU → CU2 → CU Aggregate point → CU1 → CU Aggregate point → UPF

- Flow of MA PDU: UE → RU/DU → CU2 → UPF

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26 – SKY Perfect JSAT Corporation

For Dual Steer:

WT-D-1

WT-D-2

WT-D-3

WT-D-4A (WT-D-4B and WT-D-4C are merged into WT-D-4A)

WT-D-5A

WT-D-6

WT-D-7

WT-D-8B

WT-D-8C

For ATSSS_Ph4:

WT-A-1

WT-A-3

WT-A-4

27 – Beijing Xiaomi Mobile Software

Dual-Steer:

WT-D-2,3,4,5,8 can be in the scope of R-19 based on necessary merge and rewording. WT-D-1 seems more like a work scope not a work task since all the WTs as mentioned can belong to arch. or function enhancement.

The proposed WTs can be grouped into two WTs, one is for dual registration over two 3GPP access, WT-D-2,3 can be treated as sub-WTs. The other is tarffic steering, splitting, swtiching over two 3GPP access, WT-D-4,5,8 can be treated as sub-WTs.

ATSSS Ph-4:

WT-A-5A/B is proposed to be in the scope of R-19, but it can be merged into WT-D-5 as it is related to Dual-steer.

WT-DeutscheTelekom-1:

It is proposed to be in the scope of R-19. Considering it has been studied in R-18 and has some potential solutions, this WT can be studied in TEI-19.

28 – VODAFONE Group Plc

Considering:

a) the uplink transmit power limitations in the UE;

b) the well reported performance advantages of NR-StandAlone over Non-StandAlone (that come from having one transmitter in the UE rather than the UE's uplink power being rather "hard split" between two transmitters in the UE);

c) the availability of R17 and R18 MUSIM specifications; and

d) the likely high complexity of upgrading multiple network functions to handle two connections with the same IMSI;

then the commercial value of this work seems likely to **low** and hence the need for 3GPP to perform substantial work on it (in a very large number of WGs) seems **very low**.

If companies insist is spending time on the Dual Steer concept, it becomes **ESSENTIAL to demonstrate that UEs using this functionality have NO IMPACT on legacy VPLMNs and (owing to SIM portability between devices) NO IMPACT to legacy HPLMN**s. This would require a NEW WT that requires a positive conclusion before embarking on any normative work on Dual Steer.

29 – InterDigital Communications

WT-A-2A is obviously out of SA2 scope and should not be in R19.

With so many WTs on the table, there is also need to downscope. In our view DualSteer related work should be prioritized: WT-D-1, WT-D-2, WT-D-3, WT-D-4A/4B/4C, WT-D-8A/8B/8C

30 – Cisco Systems

1. Dual-steer Work Tasks:

WT-D-1

WT-D-2

WT-D-3

WT-D-4

WT-D-4A: **Whether** and how to enhance SM procedures beyond Rel-18 ATSSS.

WT-D-4B: Merge with 4A

WT-D-4C:

WT-D-7

WT-D-8A

WT-D-8B

2. ATSSS Phase-4 Work Tasks:

WT-A-2B

WT-A-2C

31 – Charter Communications

DualSteer:

A merged version of (WT-D-1 through WT-D-3) revised in Feedback Form 3

A merged version of (WT-D-8A through WT-D-8C) revised in Feedback Form 3

A merged version of (WT-D-4A + WT-A-5) revised in Feedback Form 3

Note: Charter believes a DualSteer SID that does not include non-3GPP access adds more complexity to the specifications and requires procedures for transiting to and from two 3GPP access and one 3GPP + one non-3GPP. This is why the SID should include non-3GPP access for DualSteer.

ATSSS_Ph4:

WT-A-1

A merged version of (WT-A-2A through WT-A-2C) revised in Feedback Form 3

WT-A-6 – The intent of the WT is for an architectural study of offloading ATSSS functionality from the UPF. For example, study the benefits/impact of a new NF with the appropriate reference points and where it resides in the 5GC, as well as an inband signaling study between the UE & ATSSS function.

32 – NOVAMINT

We believe we need more consolidation as there are too many WT for this 1st version of Dual steer.

One of the main drivers for this consolidation and reducing the WT should be based on who are the potential end users - we see a lot of perspectives of Dual steer for SNPN-SNPN as well as SNPN -NTN for resilience and assuring the service is working.

We would be supportive of **WT-D-1, WT-D-2, WT-D-3, WT-D-4A, 4B, WT-D-5** (without additional Non-3GPP access), **WT-D-6, WT-D-7 and WT-D-8A**

We would like a more explicit mention of NTN in WT-D-1, WT-D-2, WT-D-3, WT-D-5

33 – Dish Network

Need to organize the Work tasks.. it's really hard to follow..

In general, we're supportive

WT-D-1. WT-D-2, WT-D-3, WT-D-4A, WT-D-4B

WT-A-2A, WT-A-2B

34 – China Mobile Com. Corporation

1□we should firstly specify what is the requirement and scenario of the Dual Registration. Two 3GPP access in single PLMN or two PLMNs. If it is for single PLMN, there seems no much better improvement for UE ,since the TX/RX power in UE side cannot be improved no matter in 1 3GPP access or 2 3GPP accesses. So the data rate in UE side cannot be improved. if it is for two PLMNs, not clear how to support MA PDU session establishment using two 3GPP access within two PLMNs. Since in MA PDU session, the single AMF/SMF/UPF are used, not clear how single NF can be used among two 3GPP access. 2) we agree some KDDI's explanation that it seems MA PDU session is more simple than DC, but the two problems in 1) should be considered for the MA PDU session. 3) CMCC support the WT-A-2B Define a new architecture for Lightweight Access Aggregation and Steering of non-integrated Wi-Fi in 5GC not based on TNGF/N3IWF.

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

1 – Nokia Germany

WT-A-2A and WT-A-2C can be merged.

2 – Nokia Germany

WT-D-1 and WT-D-3 can be merged

3 – Nokia Germany

WT-D-5A and WT-D-5B can be merged.

4 – Nokia Germany

WT-D-8A and WT-D-8C can be merged with WT-A-5A and WT-A-5B .

5 – Comcast

Potential to merge WT-D-4A/4B/4C

Potential to merge WT-D-5A/5B

Potential to merge WT-A-2A/2B/2C

Potential to merge WT-5A/5B and move under dual-steer WTs

6 – Comcast

WT-D-6A requires more elaboration as the concept of mobility of MA PDU session and between PDU and MAPDU session is not clear

WT-D-6B requires clarification on whether this task is referring to mobility scenario of a MAPDU session from 2 NR accesses to 1 NR access + 1 LTE access or another scenario? The text requires more elaboration

WT-D-6C requires more elaboration in terms of session continuity for an MAPDU session across 2 accesses

7 – Nokia Germany

WT-D-6B addresses the case of 2 NR registration and how to cover mobility to LTE. This is explained in the text.

WT-D-6C is not clear what it means and what specifically has to be done.

8 – Nokia Germany

WT-D-4B and 4C can be merged

9 – Charter Communications

WT-D-1 through WT-D-3 can be merged and reworded.

WT-D-4A through WT-D-4C can be merged and reworded.

WT-D-5A removed since it is reflected in WT-D-5B. Consider removing “potentially” From WT-D-5B.

WT-D-6A “…as well as between MA PDU Sessions with dual 3GPP accesses” text seems redundant, consider removing.

WT-D-8A through WT-D-8C can be merged and reworded.

WT-A-2A through WT-A-2C can be merged and reworded.

WT-A-5A and WT-A-5B can be merged and reworded.

Support Nokia’s feedback, which adds non-3GPP to DualSteer and WT-A-5A&B probably can be removed from ATSSS Phase-4 WTs

10 – CableLabs

WT-A-5B can be combined with WT-D-3.

11 – Guangdong OPPO Mobile Telecom.

D1 and D2 should be merged, the D2 is the further detail of D1.

12 – China Telecom Corporation Ltd.

WT-D-4A and WT-D-4B should be merged, WT-D-4C and WT-D-7 should be merged.

13 – QUALCOMM Europe Inc. - Italy

- WT-D-4A and WT-D-4B should be merged into a single sub-WT
- WT-D-5A and WT-D-5B should be merged into a single sub-WT and reworded to remove MO and Non-3GPP access.
- WT-D-6A, WT-D-6B and WT-D-6C can be merged, with focus on **session continuity** plus examples of mobility.

14 – LG Electronics France

WT-D-3 can be merged into WT-D-1

WT-D-4B/WT-D-4C can be merged into WT-D-4A.

WT-D-8A/ WT-D-8B/ WT-D-8C can be merged into WT-D-4A.

WT-A-2C can be merged into WT-A-2B.

WT-A-5A/ WT-A-5B can be merged into WT-D-4A.

WT-A-6 can be merged into WT-A-2B.

15 – CATT

WT-D-4A, WT-D-4B should be merged

WT-D-4C should be deleted or merged in WT-D-4A after rewording

WT-D-5A, WT-D-5B should be merged, pefer WT-D-5B

WT-D-6A, WT-D-6C should be merged

WT-D-8A, WT-D-8C should be merged

WT-A-5A should considered to be merged with WT-D-3 if the two work tasks will be studied seperately

16 – Huawei Technologies R&D UK

As commented in feedback form 1, following WTs can be merged for future discussion:

- WT-D-4A, WT-D-4B and WT-D-4C can be merged to WT-D-4 (a sub-WT below a WT corresponding to a specific scenario): study whether and how to enhance the session management to support the specific scenario.

- WT-D-6A, WT-D-6B and WT-D-6C can be merged to WT-D-6 (a sub-WT below a WT corresponding to a specific scenario): study whether and how to enhance the mobility management to support the specific scenario.

- WT-D-8A and WT-D-8B can be merged to WT-D-8 (a sub-WT below a WT corresponding to a specific scenario): study whether and how to enhance the policy and charging control to support the specific scenario.

The specific scenario shall be clarified and corresponding to a specific network deployment option with specific RAT type combination for one specific traffic scenario (traffic switching, splitting or steering).

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17 – Comcast

Proposal for merged WTs:

WT-D-12-5AB-MTK1Merged - Overall architecture and function enhancement including PLMN or SNPN selection to support dual 3GPP access and one non-3GPP access. Dual 3GPP and one N3GPP accesses may comprise of same or different PLMNs + NPN.

WT-D-4ABCMerged MA PDU session establishment and management using two 3GPP accesses and one non-3GPP access, including i) derivation of MAR/ATSSS rules for the UPF to be included together with routing and QoS information and ii) ATSSS rules for the UE (delivered via AMF together with the URSP over N1).

WT-D-5ABMerged How to support mobile originating and terminating services (e.g., mobile data,

voice, SMS, LCS) when the UE is registered to the 5GC network simultaneously via multiple NR accesses and

one non-3GPP access.

WT-D-6ABCMerged: How to support session continuity and mobility between 3 accesses (2 3GPP accesses and 1 N3GPP access), e.g., mobility of MA-PDU session from 1 3GPP access + 1 N3GPP access to 2 3GPP accesses + 1 N3GPP access and vice versa, from 2 3GPP access (2 NR or 1 NR + LTE) plus 1 N3GPP access to 2 3GPP accesses and vice versa, from 1 3GPP access to 2 3GPP access and vice versa

WT-D-8ABCMerged - How to extend policies, steering functionalities, steering modes andcharging.

- *Any possible extensions to NWDAF to assist PCF to derive the ATSSS policy decision.*

18 – CableLabs

WT-D-4 and WT-A-5 should be merged

19 – Apple (UK) Limited

Proposes to merge WT-A-2A and WT-A-2B: Study how to relax the mandatory use of IPSec tunnel encapsulation on the untrusted non-3GPP access for the MPQUIC steering functionality, and define a functional architecture and procedures for steering, switching and splitting of traffic between non-integrated non-3GPP access not based on TNGF/N3IWF and 3GPP access. This includes studying how to define the non-integrated non-3GPP access (e.g. eliminate IPSec tunnel encapsulation only on the user plane or both control plane and user plane), how to define or extend rules for UE and UPF to coordinate aggregation and steering of traffic in DL and UL directions and how to configure the MPTCP/MPQUIC proxy functionality in the UPF.

20 – Motorola Mobility Germany GmbH

Lenovo proposes the following:

WT-D-4A can be merged with WT-D-4B

WT-D-4C can be merged with WT-D-4B

WT-D-5A can be merged with WT-D-5B

WT-D-8C can be covered by other WTs

WT-A-5B can be merged with WT-A-5A

21 – Ericsson LM

WT-D: There are several WTs that are overlapping. For example WT-D-4 A,B,C could be merged into a single WT. Also WT-D-5A, 5B can be merged. WT-D-6B, 6C can be merged.

WT-A-2A,B,C can be merged.

WT-A-5A/5B: These two WTs seems to be related to DualSteer and should in that case be in the WT-D category.

22 – Samsung Electronics Co.

WT-D-4A,4B,4C can be merged. We can use the reworded WT-D-4A as proposed in Feedback Form 3.

WT-D-5A,5B can be merged. We can keep only 5B as it has given some examples of services.

WT-D-6A,6B,6C can be merged.

WT-D-8A,8B,8C can be merged.

WT-A-2A,2B,2C can be merged. We can use the reworded WT-A-2B as proposed in Feedback Form 3.

WT-A-5A,5B can be merged.

23 – Beijing Xiaomi Mobile Software

WT-D-3: the case for UE registering over two 3GPP accesses and one non-3GPP access can be merged into WT-D-5

WT-D-4A/B/C can be merged and reworded.

WT-D-5A/B and WT-A-5A/B can be merged and reworded.

WT-D-8A/B/C can be merged into WT-D-4, since all the WTs forcus on policy enhancements

24 – InterDigital Communications

WT-D-4A/4B/4C can be merged:

Proposal: WT-D-4A Study how to enhance session management procedures for MA PDU session with multiple 3GPP accesses.

WT-D-6A/6B/6C can be merged:

Proposal: WT-D-6A Study how to handle different mobility scenarios and service continuity scenarios for MA PDU session with multiple 3GPP accesses.

WT-D-8A/8B/8C can be merged:

Proposal: WT-D-8A Study how to extend policies, steering functionalities, steering modes and charging for MA PDU session with multiple 3GPP accesses.

WT-A-2B/2C can be merged, and remove any text that may suggest a solution

Proposal: WT-A-2A Study an ATSSS solution between one 3GPP access and one non-3GPP access, where the non-3GPP access is not integrated with the 5GC.

WT-D-5A/5B and WT-A-5A/5B can be merged.

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

1 – Nokia Germany

WT-A-2B (SWS-230012) (SWS-230035) Define a functional architecture and procedures for steering, switching and splitting of traffic between **non-integrated non-3GPP** access (providing IP connectivity) not based on TNGF/N3IWF and 3GPP access. This includes studying how to define or extend rules for UE and UPF to coordinate aggregation and steering of traffic in DL and UL directions and how to configure the MPTCP/MPQUIC proxy functionality in the UPF.

2 – Nokia Germany

WT-D-1 (SWS-230038) (SWS-230014) Overall architecture and function enhancement to support dual 3GPP access with one singe PLMN, two different PLMNs **(including two VPLMNs or a VPLMN and the HPLMN)** or PLMN+NPN.

3 – CableLabs

WT-D-3 should be reworded to - How to support simultaneous registration to 5GC via Multiple NR accesses for a UE with single **or multiple subscriptions**. The UE can be registered to a single PLMN, to a single SNPN, to two different PLMNs or SNPNs, or to one PLMN and one SNPN. The UE may in addition be registered via one non-3GPP access to 5GC.

4 – Guangdong OPPO Mobile Telecom.

WT-D-3: ”via Multiple NR accesses” is reworded to ”via Multiple NR accesses or via NR accesses and E-UTRA access”. NR+E-UTRA is an important requirement as well.

5 – QUALCOMM Europe Inc. - Italy

We propose to re-word the Work Tasks for Dual Steer as follows:

- WT-D-1, WT-D-2 and WT-D-7 should be maintained as they are.
- The new WT-D-4A should read ”WT-D-4A: How to enhance session management procedures to support MA PDU Sessions with two 3GPP accesses”; WT-D-4B should be deleted.
- The new WT-D-5 combining WT-D-5A and WT-D-5B should read ”WT-D-5: How to support MT services when the UE is registered to the 5GC simultaneously via two 3GPP accesses”. WT-D-5A and WT-D-5B should then be deleted.
- The new WT-D-6 combining WT-D-6A, WT-D-6B and WT-D-6C should read ”WT-D-6: Study how to support session continuity between the two access, e.g., mobility between single 3GPP access MA PDU Session and dual 3GPP access PDU Session as well as between dual 3GPP access MA PDU Sessions”. WT-D-6A, WT-D-6B and WT-D-6C should then be deleted.
- WT-D-8B and WT-D-8C should be removed, and WT-D-8A should become the new WT-D-8.

We propose to re-arrange the Work Tasks for ATSSS_Ph4 as follows:

- The new WT-A-2 should be the merge of WT-A-2A, WT-A-2B and WT-A-2C and should read ”WT-A-2: Study how to relax the mandatory use of IPSec tunnel encapsulation on the untrusted non-3GPP access for the MPQUIC steering functionality and define a new lightweight Access Aggregation and Sterring of non-integrated Wi-Fi in 5GC without TNGF and N3WIF”. WT-A-2A, WT-A-2B and WT-A-2C should then be deleted.
- WT-A-6 should remain as is.

6 – LG Electronics France

WT-D-1: Overall architecture and function enhancement to support dual 3GPP access **registration** with one singe PLMN, two different PLMNs or PLMN+NPN **and to support providing the same service over dual 3GPP access or different services from the each registered networks simultaneously**[a1] .

WT-D-2: How to select the second PLMN or SNPN in case of different 3GPP networks after an initial PLMN **or SNPN** was selected for the UE.

WT-D-4A: How to enhance session management procedures **to support MA PDU session over the two 3GPP accesses and necessary policy enhancement including URSP/ATSSS/N4 rules**.

WT-D-6A: Meaning of ”mobility between a PDU Session with single 3GPP access and MA PDU Session with dual 3GPP access as well as between MA PDU Sessions with dual 3GPP accesses” is not clear. Intention needs to be clarified by proponent.

WT-D-6C: Does this mean that how to support steering in case one access becomes unavailable? Intention needs to be clarified by proponent.

WT-D-7: Does this mean that how to enhance ATSSS rule to support UL traffic steering? Intention needs to be clarified by proponent.

7 – LG Electronics France

WT-A-2B: Define a new architecture for Lightweight Access Aggregation and Steering of non-integrated **~~Wi Fi~~non-3GPP access** in 5GC not based on TNGF/N3IWF. Introduce the concept of Non-Integrated Aggregated (NIA) PDU Session **~~based on the re-use of IETF RFC protocols (e.g. MPQUIC/MPTCP)~~** and related functions in the UE and in the **~~PSA UPF~~network**.

WT-A-7: Why do we need to support enhancement or new steering mode? Motivation is not clear.

8 – CATT

WT-D-3: ”via Multiple NR accesses” should be reworded to ”via Multiple radio accesses”.

WT-D-4C: Suggest rewording to ”Study the 5GC session management extension function, procedure, etc.”.

WT-A-7: The purpose is not clear, suggest to clarify the motivation.

9 – CATT

WT-D-3: ”via Multiple NR accesses” should be reworded to ”via Multiple radio accesses”.

WT-D-4C: Suggest rewording to ”Study the 5GC session management extension function, procedure, etc.”.

WT-A-7: The purpose is not clear, suggest to clarify the motivation.

10 – Huawei Technologies R&D UK

As commented in feedback form 1, the target scenario with detailed network deployment option, RAT type and traffic scenario should be firstly clarified, justified and determined.

Each WT should correspond to each target specific scenario. Below each WT, several sub-WTs covering different aspects of 5G system shall be studied.

Following is **the example of WT structure**, which would make it clear what to be discussed and studied.

WT-D-X: Support UE accesses to X PLMN with RAT type A and B for traffic switching:

- WT-D-X-1 (=reworded WT-D-3): study whether and how to enhance the registration management to support this scenario
- WT-D-X-2 (=merged version of WT-D-4): Study whether and how to enhance the session management to support this scenario
- WT-D-X-3 (=merged version of WT-D-6): Study whether and how to enhance the mobility management to support this scenario
- WT-D-X-4 (=merged version of WT-D-8): Study whether and how to enhance the policy and charging control to support this scenario
- WT-D-X-5 (=additional WT mentioned in feedback form 4): Study the security aspect to support the specific scenario, which has dependency and requires coordination with SA WG3.
- WT-D-X-6 (=additional WT mentioned in feedback form 4): Study the backward compatibility with legacy UE, existing features (e.g. Slicing, Prose, Edge) and existing services (e.g. LADN services, XR services)

11 – Comcast

WT-D-7Reword: How to select PSA UPF and route the traffic across 3GPP and N3GPP accesses towards the PSA UPF

12 – MediaTek Inc.

WT-D-1 as reworded: Overall architecture and function enhancement to support only TN + NTN accesses with one singe PLMN, two different PLMNs.

WT-D-2 as reworded: How to select an additional PLMN for the UE.

WT-D-3 as reworded: How to support registration to 5GC via only TN + NTN accesses for a UE with single subscription. NOTE: The UE may be registered via one non-3GPP access to 5GC.

WT-D-5B as reworded: How to support mobile originating and terminating services (e.g., mobile data, voice, SMS, LCS) when the UE is registered to the 5GC network simultaneously via only TN + NTN accesses and potentially one non-3GPP access.

WT-D-6B as reworded: Study how to support UE mobility between 5GS and EPS when 5GS supports ”Simultaneous registration to 5GC via only TN + NTN accesses” and EPS supports UE attach via only a single LTE access.

WT-D-8A as reworded: How to extend policies, and charging.

13 – Orange

WT-A-1 should be reworded to remove TCP. The problem is already solved for TCP without the troubles raised for a QUIC-based solution that would suffers from: redundant encryption schemes (see WT-A-2A (SWS-230073)), MTU issues induced by HTTP encapsulation as plain transport mode is used for MPTCP/ATSSS).

WT-A-7: Use of available energy efficiency, QoS and congestion information or performance measurement results for making ATSSS decisions. This includes studying potential updates to existing steering modes or definition of a new steering mode.

14 – Ericsson LM

WT-D-3: This WT talks about "multiple" NR accesses while other WTs talk about "two" NR accesses. Should align the WTs and state that two accesses are targeted.

WT-D-6A: This WT is not clear. What does "mobility between PDU Sessions" mean? Does it refer to mobility between accesses?

WT-D-6B,C: Should be made clear that this is for MA PDU Sessions only.

WT-D-7: What is to be studied here? What is missing?

15 – Samsung Electronics Co.

WT-D-4A How to enhance session management procedures and policy enhancements for UE supporting dual 3GPP registration

- For UE registered with 2 3GPP accesses, the UE needs to support selection on which 3GPP access (or both 3GPP accesses) to use for application traffic. To this end, the study on the enhancement on the policy (e.g., 3GPP access with specific RAT, both 3GPP accesses with same or different RATs, etc.) is needed.

WT-A-2B (SWS-230012) (SWS-230035) Define a new architecture for native non-3GPP access in 5GC not based on TNGF/N3IWF and study how to steer traffic between native non-3GPP access

- Whether to define new PDU session type can be discussed during the study.

16 – Beijing Xiaomi Mobile Software

WT-D-4 as reworded: study the potential enhancement of session management procedures to support MA PDU session over the two 3GPP accesses (e.g. policy enhancement including URSP/ATSSS/N4 rules, etc)

WT-D-5.1 as reworded: study how to support MO/MT services when the UE is registered to the 5GC simultaneously via multiple NR accesses and potentially one non-3GPP access.

WT-D-5.2 as reworded: study how to support MA PDU Sessions with two 3GPP accesses and one non-3GPP access. This includes enhancements to existing steering modes, steering functionalities, ATSSS and N4 rules.

17 – InterDigital Communications

Please see our wording suggestion in merge proposals.

18 – Charter Communications

Merged WT-D-1 through WT-D-3 reworded as: Overall architecture and functional enhancements to support dual 3GPP access and one non-3GPP access with one single PLMN, two different PLMNs or PLMN+NPN. This includes how to select the second PLMN or SNPN in case of different 3GPP networks after an initial PLMN was selected for the UE and how to support simultaneous registration to 5GC via Multiple NR accesses for a UE with single or multiple subscriptions. The UE can be registered to a single PLMN, to a single SNPN, to two different PLMNs or SNPNs, or to one PLMN and one SNPN. The UE may in addition be registered via one non-3GPP access to 5GC.

For WT-D-8A through WT-D-8C reworded as: Study how to extend policies, steering functionalities, steering modes and charging.

For WT-D-4A through WT-D-4C + WT-A-5: How to enhance Session Management producers to support MA PDU Sessions with two 3GPP accesses and one non-3GPP access. This includes enhancements to existing steering modes, steering functionalities, ATSSS and N4 rules. Study ATSSS between two 3GPP and one non-3GPP access legs for a UE with single or multiple subscriptions.

For WT-A-2A through WT-A-2C reworded as: Define a functional architecture and procedures for supporting ATSSS steering functionality between non-integrated a non-3GPP access (not based on TNGF/N3IWF) and a 3GPP access. This includes studying how to define or extend rules for UE and UPF to coordinate aggregation and steering of traffic in DL and UL directions and how to configure the MPTCP/MPQUIC proxy functionality in the UPF.

19 – NOVAMINT

We would like a more explicit mention of TN-NTN cases in WT-D-1, WT-D-2, WT-D-3, WT-D-5

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 – Deutsche Telekom AG

Study how the MPDCCP steering functionality can be introduced to be able to steer, switch, and split all kind of traffic (UDP, TCP, IP, Ethernet traffic).

2 – Nokia Germany

WT-Nokia-1: Overall architecture and function enhancement to support dual 3GPP access with two differ-

ent VPLMNs.

3 – MediaTek Inc.

WT-MTK-1: How to support an MA PDU Session with dual 3GPP accesses and one non-3GPP access

4 – MediaTek Inc.

Revision on WT-MTK-1: How to support an MA PDU Session with only TN + NTN accesses and one non-3GPP access

5 – QUALCOMM Europe Inc. - Italy

No

6 – Comcast

We prefer the original version of WT-MTK-1; there is not reason to limit the 2 3GPP accesses to TN and NTN; they could both be TN or both be NTN or one TN and one NTN

7 – Deutsche Telekom AG

This just an update to comment in #1 to give the proposed work task a number according to chairs guidance:

WT-DeutscheTelekom-1: Study how the MPDCCP steering functionality can be introduced to be able to steer, switch, and split all kind of traffic (UDP, TCP, IP, Ethernet traffic).

8 – VODAFONE Group Plc

Vodafone supports the addition of WT-DeutscheTelekom-1

9 – THALES

WT-D-XX (SWS-XXXXXX) Investigate solutions allowing unidirectional services in one access (e.g. from the CN to the UE) and unidirectional services in another access (e.g. from the UE to the CN).

10 – BT plc

BT also supports the addition of WT-DeutscheTelekom-1

11 – Avanti

We support WT-MTK-1 and tend to agree with Comcast; and we also support Thales suggestion on separate forward and return links.

12 – Huawei Technologies R&D UK

For DualSteer, following sub-WTs should also be considered:

- Study the security aspect to support the specific scenario, which has dependency and requires coordination with SA WG3.

- Study the backward compatibility with legacy UE, existing features (e.g. Slicing, Prose, Edge) and existing services (e.g. LADN services, XR services)

For ATSSS_Ph4, Huawei supports the addition of WT-DeutscheTelekom-1.

13 – NEC Europe Ltd

WT-D-1 should also include the case of PNI-NPN and a PLMN network, where a UE is a PNI-NPN subscriber.

14 – Apple (UK) Limited

WT-MTK-1 is covered by WT-D-4A: Study how to enhance session management procedures to support MA PDU Sessions over two 3GPP accesses and one non-3GPP access.

15 – Apple (UK) Limited

WT-DeutscheTelekom-1 has been studied in R18 and concluded not to move forward with it.

16 – Motorola Mobility Germany GmbH

Lenovo proposes the following additional WT:

WT-Lenovo-1: A specific WT (if not part of WT-D-6C) for enabling access path switching, e.g., to transfer a source 3GPP access path to a target 3GPP or non-3GPP access path.

17 – Ericsson LM

No additional WTs. We agree with Apple's comment that WT-DeutscheTelekom-1 has been studied in R18 and it was concluded not to move forward with it. WT-MTK-1 is covered by WT-A-5A (should be a WT-D type of WT) and WT-D-3. For WT-D-XX it is not clear that anything is missing.

18 – IIT Bombay

Would there be an impact on Performance Measurement Function (PMF) as well and can that be included as an additional WT?

19 – InterDigital Communications

We support WT-DeutscheTelekom-1 and WT-Nokia-1.

20 – NOVAMINT

We could be supportive of WT-Nokia-1

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

1 – VODAFONE Group Plc

For Dual Steer it is essential to show HOW there is no impact to legacy networks. E.g. with ”Dual steer across NR-NTN and NR” how can a legacy network avoid a TN-NTN handover leading to an AMF having two connections with the same UE, and this leading to some kind of software crash in the AMF.

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

1 – Comcast

SA3 may have to study security aspects related to lightweight ATSSS

SA5 may have to study charging aspects and whether existing ATSSS aspects can be leveraged or not.

2 – Charter Communications

Agree with Comcast feedback .

3 – Nokia Germany

agree on Comcast post

4 – QUALCOMM Europe Inc. - Italy

For DualSteer there are dependencies on SA3 (for security aspects) and on SA5 (for charging). Dependency on RAN WGs is to be defined.

For ATSSS_Ph4 there are dependencies on SA3 (for security aspects).

5 – LG Electronics France

Some proposals indicates that there may exist RAN impacts. Expected RAN impacts need to be clarified.

6 – CATT

Agree with LG, besides impacts for SA3 and SA5, there will be the expected RAN impacts and they should be clarified.

7 – Huawei Technologies R&D UK

For DualSteer:

It did have RAN WG relationship considering at least following impacts:

- UE capability sharing, radio resource management and interference issues when two 3GPP access networks (with/without Xn interface) schedule a single UE simultaneously
- mobility issues for both idle/inactive UE (e.g. cell selection/reselection) and for connected UEs (e.g. RAN selection in handover) in each target scenario.

As commented in feedback form 1, for traffic aggregation and splitting, we already have the DC/CA for NR and DC for LTE and NR, what is the benefits and justification to perform traffic aggregation and splitting at UPF side? **We need RAN WG to evaluate the feasibility and performance.**

Additionally, there are dependencies on SA3 (for security aspects) and on SA5 (for charging aspects).

For ATSSS_Ph4:

There are dependencies on SA3 (for security aspects) and may have RAN WG impacts (e.g. for access network performance).

8 – MediaTek Inc.

CT1 due to WT-D-1 and WT-D-2.

Coordination with RAN WGs is required to avoid any AS impact.

9 – Ericsson LM

No dependencies on other SA WG, even though follow-up work may be needed by e.g. SA3 and SA5. Dependencies on RAN WGs can and should be avoided, e.g. by focusing on separate PLMN cases for DualSteer.

10 – Beijing Xiaomi Mobile Software

For ATSSS_Ph4 there are dependencies on SA3 (for security aspects)

Feedback Form 7: Describe dependencies between the Work Tasks

1 – QUALCOMM Europe Inc. - Italy

For DualSteer the work tasks are interdependent.

For ATSSS_Ph4, there is no interdependency between the two work tasks.

2 – Charter Communications

ATSSS_Ph4 WTs should focus on enhancements/optimizations to current R18 ATSSS which are independent of DualSteer WTs and DualSteer WTs should focus on adding 3 access support (i.e., 2 3GPP + 1 non-3GPP) and the related items with supporting an additional 3GPP access.

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 – QUALCOMM Europe Inc. - Italy

The NWDAF extension aspect of WT-D-8B needs to be moved to the AIMLsys MED and, if agreed, it should be included in the associated SID.

In addition, in our view WT-A-6 (Separate ATSSS functions out of UPF) should be studied under ATSSS_Ph4, and not under UPEAS_Enhancements.

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?

1 – Nokia Germany

Based on the tasks described for multi registration and the (partly) unrelated tasks described for ATSSS, it makes sense in Nokia view to create two separated SIDs.

2 – ZTE Corporation.

ZTE agree with Nokia. How to support dual registration in two 3gpp accesses is the first step. How to steer the traffic in two 3gpp accesses is second step and can be studied after the first step is concluded.

3 – China Telecom Corporation Ltd.

China Telecom agree the study of dual 3GPP access and ATSSS enhancement should be seperated.

4 – QUALCOMM Europe Inc. - Italy

There should be two study items, one for DualSteer and one for ATSSS_Ph4.

5 – Comcast

Our preference is for one study item that covers all ATSSS aspects. We view dual steering as further enhancements to ATSSS in the same way ATSSS across 2 N3GPP in Rel-18 was considered part of ATSSS_Ph3.

Given that dual registration is a broader concept not dependent on ATSSS or MA-PDU, we could be open to having a separate SID for that as Nokia has suggested.

6 – LG Electronics France

Dual-steer WTs and ATSSS Phase 4 WTs are not dependent and should have separate study items.

7 – CATT

Agree to seperate the Dual-steer and ATSSS_Ph4 WT to different study items.

8 – Comcast

It not clear why the two are not dependent. Can someone elaborate? For the development of NIA, wouldn't that also apply in the scenario for 2 3GPP and 1 N3GPP? Wouldn't WT-A-1 and WT-A-2A not be applicable for dual steering? If not, why not? Wouldn't it be more efficient to keep all of ATSSS enhancements in a single study

9 – CableLabs

One SID is preferable for the related Dual Steer and ATSSS enhancement work tasks since they are interrelated. Existing ATSSS features such as MA-PDU session should be common with the Dual Steer MA-PDU feature. Also, new ATSSS features such as WT-A-1 (MPQUIC for non-UDP traffic) would also be applicable for Dual Steer. Hence, in order to avoid redundant work, one SID is preferable for the related ATSSS and Dual Steer work tasks. Dual registration related work tasks can be studied as a separate topic.

10 – Apple (UK) Limited

One SID is preferable per SA#100 guidance to create Multi-access SID

11 – MediaTek Inc.

One SID for Dualsteer based on Form 1.

one TEI for ATSSS enhancements for WT-A-1 and WT-A-4.

12 – Motorola Mobility Germany GmbH

Lenovo prefers a single SID to handle both DualSteer and ATSSS enhancements.

13 – Ericsson LM

A single SID is preferred. The use case for DualSteer is targeting ATSSS only (based on the SA1 study) and a single SID ensures that the focus is on that intended use case.

14 – BROADCOM CORPORATION

We also prefer a single SID to handle both ATSSS enhancements and DualSteer.

15 – Huawei Technologies R&D UK

DualSteer and ATSSS_Ph4 should be decoupled as the target scenarios and the issues to be addressed are quite different. Therefore, we agree to seperate the DualSteer and ATSSS_Ph4.

16 – Beijing Xiaomi Mobile Software

Decoupling Dual-steer and ATSSS-Ph4 is preferred.

One TEI for WT-DeutscheTelekom-1.

17 – InterDigital Communications

We suggest to have one SID focus on DualSteer, and if necessary, include a selection of ATSSS-ph4 work tasks.

18 – Deutsche Telekom AG

Depending on what is agreeable one or two SIDs, and

WT-DeutscheTelekom-1: can be done as TEI-19.

19 – Charter Communications

Prefer 2 SIDs, where ATSSS_Ph4 SID focus is only on enhancements/optimizations related to R18 and DualSteer SID focus is on supporting ATSSS current set of features across 3 accesses (i.e., two 3GPP + 1 non-3GPP).

20 – China Mobile Com. Corporation

Prefer one SID for the dual access.

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

1 – Nokia Germany

The ATSSS related WTs liek WT-D-4B and WT-D-4C under Multi-registration should be moved to ATSSS.

2 – ZTE Corporation.

How to support dual registration in two 3gpp accesses is the first step. How to steer the traffic in two 3gpp accesses is second step and can be studied after the first step is concluded. It is better to split them into two study items.

3 – China Telecom Corporation Ltd.

WT-D-4B should be merged to WT-D-4A, and reworded as: MA PDU session management enhencement for two 3GPP access. And keep this in DualSteer SID.

WT-D-4C might be further reword and studied in ATSSS enhancement SID.

4 – China Telecom Corporation Ltd.

WT-D-4C might be further reword and studied in ATSSS enhancement SID.

5 – QUALCOMM Europe Inc. - Italy

DualSteer should include all agreed WT-D-XX tasks, while ATSSS_Ph4 should include all agreed WT-A-XX tasks.

6 – China Telecom Corporation Ltd.

I'm not quite understand what WT-D-4C now is trying to solve.

7 – LG Electronics France

Dual-steer WTs and ATSSS Phase 4 WTs are not dependent and should have separate study items.

8 – CATT

WT-A-5A should be merged with WT-D-3 and studied in ATSSS study item.

9 – MediaTek Inc.

See the response in Form 9

10 – Beijing Xiaomi Mobile Software DualSteer should include WT-D-2,3,4,5,8 and WT-A-5 based on necessary merge and rewording.
11 – Charter Communications Agree that DualSteer is a sub-set of ATSSS, as indicated by Ericsson. There are advantages for a single SID, which Charter is OK with as well, but having 2 SIDs will allow more focus on either adding a 3rd access leg (i.e. 2 3GPP + 1 non-3GPP) and the related items with supporting this and another SID focused only on enhancing R18 ATSSS features such as removal of ATSSS from UPF, MPQUIC for non-UDP traffic, and lightweight ATSSS. Charter believes a DualSteer SID that does not include non-3GPP access adds more complexity to the specifications and requires procedures for transiting to and from two 3GPP access and one 3GPP + one non-3GPP. This is why the SID should include non-3GPP access for DualSteer.

5 Summary from the Q3 discussions

Total 29 companies provided feedbacks (listed in alphabetical order) :

- **Apple, Avanti, Broadcom, Cablelabs, CATT, Charter Communications, China Mobile, China Telecom, Cisco, Comcast, Deutsche Telekom, Dish Network, Ericsson, Huawei, Interdigital, KDDI, Lenovo, LG Electronics, Mediatek, Nokia, Novamint, Oppo, Orange, Qualcomm, Samsung, SKY Perfect JSAT Corporation, Vodafone, Xiaomi, ZTE**

5 5.1 Summary from section 2.1

Table 1:

Q#1: Which of the above Work Tasks should be in scope of Rel-19?	
# of companies that provided feedback on Q#1	27 companies (Apple, Avanti, Broadcom, Cablelabs, Charter Communications, China Mobile, China Telecom, Cisco, Comcast, Deutsche Telekom, Dish Network, Ericsson, Huawei, Interdigital, KDDI, Lenovo, LG Electronics, Mediatek, Nokia, Novamint, Oppo, Orange, Qualcomm, SKY Perfect JSAT Corporation, Vodafone, Xiaomi, ZTE)

WT-D-1: Overall architecture and function enhancement to support dual 3GPP access with one singe PLMN, two different PLMNs or PLMN+NPN.	• Support from 18 companies (Apple, Broadcom, Cablelabs, Charter Communications, Cisco, Comcast, Dish Network, Ericsson, Interdigital, KDDI, Lenovo, LG Electronics, Mediatek, Novamint, Oppo, Orange, Qualcomm, SKY Perfect JSAT Corporation)
	• Need clarification from 2 companies (Huawei, Vodafone):
	  ◦ Huawei commented that WT-D-1 should be removed because it is too open now. If architecture or function enhancement is needed for specific scenario or area, the solution will clarify and reflect it. Therefore, standalone WT for it is not needed. Furthermore, Huawei commented that RAN WGs need to evaluate the feasibility and performance. Without the clear justification regarding the traffic aggregation or splitting at UPF for two 3GPP access networks (same or different RAT types), Huawei questions all the related WTs
	  ◦ Vodafone commented that it would be essential to demonstrate that UEs using this functionality have non impact on legacy VPLMNs and (owing to SIM portability between devices) no impact to legacy HPLMNs. This would require a new WT that requires a positive conclusion before embarking on any normative work on Dual Steer.
	• 7 companies (Qualcomm, Mediatek, Orange, Ericsson, Oppo, Novamint, China Mobile) commented on the scope of the Dualsteer work:
	  ◦ Qualcomm commented that network deployment options (single PLMN, PLMN + SNPN, etc.) as well as RAT combinations (terrestrial NR + terrestrial NR, terrestrial NR + non-terrestrial NR, etc.) need to be consistent with the outcome of the SA1 work.
	  ◦ Mediatek and Orange commented to consider only TN + NTN accesses in one PLMN or different PLMNs. They cannot accept the scenario with PLMN+NPN. This is their preferred scope:
	  i) UE switches/ steers between TN ac-

WT-D-2: How to select the second PLMN or SNPN in case of different 3GPP networks after an initial PLMN was selected for the UE.	• Support from 19 companies (Apple, Broadcom, Cablelabs, Charter Communications, Cisco, Comcast, Dish Network, Ericsson, Huawei, Interdigital, KDDI, Lenovo, Mediatek, Novamint, Oppo, Orange, Qualcomm, SKY Perfect JSAT Corporation, Xiaomi) including 4 companies (Huawei, Apple, Charter Communications, Comcast) mentioned this WT should be covered in another WT or merged with another WT (Huawei: covered in WT-D-3, Apple: merged into WT-D-1, Charter: merged version proposed including WT-D-1 through WT-D-3, Comcast: merged version proposed including WT-D-1 and WT-D-2).
WT-D-3: How to support simultaneous registration to 5GC via Multiple NR accesses for a UE with single subscription. The UE can be registered to a single PLMN, to a single SNPN, to two different PLMNs or SNPNs, or to one PLMN and one SNPN. The UE may in addition be registered via one non-3GPP access to 5GC.	• Support from 18 companies (Apple, Broadcom, Cablelabs, Charter Communications, Cisco, Comcast, Dish Network, Ericsson, Huawei, Interdigital, KDDI, Lenovo, Mediatek, Novamint, Oppo, Orange, SKY Perfect JSAT Corporation, Xiaomi) including 2 companies (Apple, Charter Communications) mentioned this WT should be covered in another WT or merged with another WT (Apple: merged into WT-D-1, Charter: merged version proposed including WT-D-1 through WT-D-3). • NO support from 1 company (Qualcomm)

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WT-D-4A: How to enhance session management procedures.
 	
WT-D-4B: MA PDU session establishment using two 3GPP access.
 	
WT-D-4C: Study the 5GC session management extensions in SMF to derive the N4 (MAR) for the UPF to include together with routing and QoS information (FAR, PDR, etc.), and to derive the ATSSS rules to the UE delivered via AMF together with the UE Route Selection Policy (URSP) rules via NAS (N1).
	• Support from 17 companies (Apple, Cablelabs, Charter Communications, Cisco, Comcast, Dish Network, Huawei, Interdigital, KDDI, Lenovo, LG Electronics, Mediatek, Novamint, Orange, Qualcomm, SKY Perfect JSAT Corporation, Xiaomi) including:
	  ◦ 6 companies (Comcast, Qualcomm, Huawei, Xiaomi, Interdigital, Cisco) supported any of the alternative wording or a merged version of the 3 alternative wordings.
	  ◦ 2 companies (Novamint, Dish Network) supported either alternative A or alternative B.
	  ◦ 2 companies (Charter, Cablelabs) supported a merged version of WT-D-4A and WT-A-5.
	  ◦ 6 companies (LG, KDDI, Apple, Mediatek, Orange, SKY Perfect JSAT Corporation) supported WT-D-4A.
	  ◦ 1 company (Lenovo) supported WT-D-4B.
	
	• Charter believes a DualSteer SID that does not include non-3GPP access adds more complexity to the specifications and requires procedures for transiting to and from two 3GPP access and one 3GPP + one non-3GPP. This is why the SID should include non-3GPP access for DualSteer.

WT-D-5A: How to support MO/MT services when the UE is registered to the 5GC simultaneously via multiple NR accesses and potentially one non-3GPP access.
 	
WT-D-5B: How to support mobile originating and terminating services (e.g., mobile data, voice, SMS, LCS) when the UE is registered to the 5GC network simultaneously via multiple NR accesses and potentially one non-3GPP access.
	• Support from 11 companies (Apple, Broadcom, Comcast, Lenovo, LG Electronics, Mediatek, Novamint, Orange, Qualcomm, SKY Perfect JSAT Corporation, Xiaomi) including:
	  ◦ 6 companies (Apple, Broadcom, Comcast, Qualcomm, Xiaomi, Novamint) supported any of the alternative wording or a merged version of the 3 alternative wordings.
	  ◦ 2 companies (LG, SKY Perfect JSAT Corporation) supported WT-D-5A.
	  ◦ 3 companies (Lenovo, Mediatek, Orange) supported WT-D-5B.
	
	• NO support from 1 company (Ericsson). Ericsson commented that the use case is limited to MA PDU Sessions via two 3GPP accesses. Impacts to other services should be avoided.
	
	• Qualcomm commented that we should only study how to support MT services.
	
	• Qualcomm commented the requirement of an additional non-3GPP access on top of the two 3GPP accesses is currently not in the scope of SA1 DualSteer work and they think it should be removed unless SA1 conclude to include it.
	
	• Huawei commented that if additional non-3GPP access is determined to be a valuable and worthwhile scenario to be studied, it should be reflected as a new target scenario, i.e. as a new WT to be studied as per the new SID structure proposal.

WT-D-6A: How to support mobility between a PDU Session with single 3GPP access and a MA PDU Session with dual 3GPP access as well as between MA PDU Sessions with dual 3GPP accesses.
 	
WT-D-6B: Study how to support UE mobility between 5GS and EPS when 5GS supports "Simultaneous registration to 5GC via Multiple NR accesses" and EPS supports UE attach via only a single LTE access.
 	
WT-D-6C: How to support session continuity between the two accesses.
	• Support from 9 companies (Apple, Broadcom, Huawei Lenovo, Mediatek, Novamint, Orange, Qualcomm, SKY Perfect JSAT Corporation) including:
	  ◦ 5 companies (Apple, Broadcom, Qualcomm, SKY Perfect JSAT Corporation Huawei, Novamint) supported any of the alternative wording or a merged version of the 2 alternative wordings.
	  ◦ 3 companies (Lenovo, Mediatek, Orange) supported only WT-D-6B.
	
	• Lenovo commented they support 6C in case "access path switching" is studied under this WT, e.g. how to transfer a source 3GPP access path to a target 3GPP or non-3GPP access path – without this addition, WT-D-6C is already supported using ATSSS existing procedures.

WT-D-7: How to route the traffic of the MA PDU Session towards the PSA UPF.	• Support from 7 companies (Comcast, Cisco, Mediatek, Novamint, Orange, Qualcomm, SKY Perfect JSAT Corporation) • NO support from 1 company (Huawei): Huawei commented this WT makes assumption on using MA PDU session. MA PDU session could be an option, but at this stage it is not possible to generalize that this option is applicable to different scenarios. Additionally, WT should not make any assumptions on the solution, rather focus on the issues to be studied. Therefore, WT-D-7 can be removed and the WT-D-4 about session management will cover the issues to be studied on traffic transmission.

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WT-D-8A: How to extend policies, steering functionalities, steering modes and charging.
 	
WT-D-8B: Study the unified policy and charging control support.
Compatible policy control rule for MA-PDU session over different 3GPP access types or over 3GPP and non-3GPP access types.
Any possible extensions to NWDAF to assist PCF to derive the ATSSS policy decision.
Changes to the charging policy, if needed.
 	
WT-D-8C: Traffic switching/steering and associated changes to ATSSS rules.
	• Support from 14 companies (Apple, Broadcom, Charter Communications, Cisco, Comcast, Huawei, Intedigital, KDDI, Mediatek, Novamint, Orange, Qualcomm, SKY Perfect JSAT Corporation, Xiaomi) including:
	  ◦ 7 companies (Apple, Broadcom, Charter, Comcast, Huawei, Interdigital, Xiaomi) supported any of the alternative wording or a merged version of the 3 alternative wordings.
	  ◦ 5 companies (Qualcomm, KDDI, Novamint, Mediatek, Orange) supported WT-D-8A.
	  ◦ 1 company (SKY Perfect JSAT Corporation) supported WT-D-8B and WT-D-8C.
	  ◦ 1 company (Cisco) supported WT-D-8A and WT-D-8B.
	• Qualcomm commented the extension to NWDAF (WT-D-8B) should not be studied here, rather in AIMLsys.

WT-A-1: Study how the MPQUIC steering functionality can be extended to be able to steer, switch, and split non-UDP traffic (TCP, IP, Ethernet traffic).	• Support from 6 companies (Apple, Broadcom, Charter Communications,, Comcast, Lenovo, SKY Perfect JSAT Corporation) • NO support from 2 companies (Qualcomm, ZTE) • Mediatek commented to pursue this WT as TEI19.

WT-A-2A: Study how to relax the mandatory use of IPSec tunnel encapsulation on the untrusted non-3GPP access for the MPQUIC steering functionality, investigate new architectural options for ATSSS, if necessary.
 	
WT-A-2B: Define a new architecture for Lightweight Access Aggregation and Steering of non-integrated Wi-Fi in 5GC not based on TNGF/N3IWF. Introduce the concept of Non-Integrated Aggregated (NIA) PDU Session based on the re-use of IETF RFC protocols (e.g., MPQUIC/MPTCP) and related functions in the UE and in the PSA UPF.
 	
How to establish and modify NIA PDU Sessions.
How to extend the usage of rules for UE and UPF to coordinate the aggregation and steering of traffic within a NIA PDU Session, including how to configure the MPTCP/MPQUIC proxy functionality in the UPF.
NOTE: It is assumed that the Lightweight Access Aggregation and Steering functionality applies to non-GBR traffic type only.
 	
WT-A-2C: Study an ATSSS-like solution between one 3GPP access and one WLAN. Since the first release of 5GS, untrusted/trusted WLAN (i.e., N3IWF and TNGF) have not been fully adapted that also prevents adaption of 5GS capabilities like ATSSS. A 'lightweight' ATSSS-like capabilities between one 3GPP and one WLAN can be beneficial for the ecosystem until (un)trusted access nodes become widely available. Note: Rel-19 proposals like the ones in S2-2306991/92 to SA2#157 have similar concept.
	• Support from 13 companies (Apple, Broadcom, Cablelabs, Charter Communications, China Mobile, Cisco, Dish Network, Comcast, LG Electronics, Orange, Qualcomm, Vodafone, ZTE) including:
	  ◦ 5 companies (Apple, Boradcom, Charter, Qualcomm, Vodafone) supported any of the alternative wording or a merged version of the 3 alternative wordings.
	  ◦ 3 companies (Comcast, Orange, Dish Network) supported a merged version of WT-A-2A and WT-A-2B.
	  ◦ 2 companies (LG, China Mobile) supported WT-A-2B.
	  ◦ 3 companies (Cablelabs, ZTE, Cisco) supported a merged version of WT-A-2B and WT-A-2C.
	• NO support from 2 companies (Huawei, Mediatek)
	  ◦ Huawei commented that the value of not using N3IWF/TNGF shall be justified. N3IWF/TNGF is not only used for traffic steering, it can enable the UE to access the network via non-3GPP access e.g. when there is no 3GPP access network coverage. Additionally, N3IWF is also used in other scenarios such as Prose, PLMN and SNPN interworking architecture. Moreover, without using the IPSec, potential security risk may be introduced which shall be evaluated by SA WG3. Therefore, the WTs related to relax the mandatory use of N3IWF/TNGF and IPSec requires clarification, justification, and rationale.
	• 2 companies (Nokia, Interdigital) commented that WT-A-2A is not in scope

WT-A-3: Study how to support an MA PDU Session using a Branching Point (IPv6 multi-homing) or an UL Classifier. The UE shall not be required to know whether the MA PDU Session is using an UL Classifier.	• Support from 5 companies (Apple, China Telecom, Lenovo, SKY Perfect JSAT Corporation, ZTE): ◦ China Telecom commented that UL CL can't identify the traffic flow when the UL CL is inserted in the MA PDU session because of the IPsec. It seems that it is better to use the UL CL only in the 3GPP access in order to overcome the problems above. But there are still some problems to be resolved, e.g., Session-AMBR. They propose to study whether and how an MA PDU Session can support traffic diversion. • NO support from 3 companies (Qualcomm, Mediatek, Ericsson) • Support if TU budget allows (Nokia)
WT-A-4: Study how to support the establishment of an MA PDU Session to a LADN.	• Support from 2 companies (Apple, Broadcom) • NO support from 3 companies (Qualcomm, Ericsson, ZTE): ◦ Ericsson commented that support for LADN is not available in non-3GPP access. This WT therefore seems more general than ATSSS and should probably be in a different SID. • Mediatek commented to pursue this WT as TEI19.

WT-A-5A: Support MA PDU Sessions with two 3GPP accesses and one non-3GPP access. This includes enhancements to existing steering modes, steering functionalities, ATSSS and N4 rules.
 	
WT-A-5B: Study ATSSS between two 3GPP and one non-3GPP access legs for a UE with single or multiple subscriptions.
	• Support from 7 companies (Cablelabs, Lenovo, KDDI, Broadcom, Ericsson, Xiaomi, Charter, Apple) including:
	  ◦ 1 company (Cablelabs) supported any of the alternative wording.
	  ◦ 3 companies (Lenovo, KDDI, Broadcom) supported alternative A.
	  ◦ 4 companies (Ericsson, Xiaomi, Charter, Apple) indicated this WT is in scope and should be covered in WT-D work tasks.
	• NO support from 4 companies (Huawei, Mediatek, Ericsson, ZTE)

WT-A-6: Separate ATSSS functions out of UPF.	• Support from 6 companies (Apple, Charter Communications, Qualcomm, Comcast, Cablelabs, Samsung):
	  ◦ Charter commented that the intent of the WT is for an architectural study of offloading ATSSS functionality from the UPF. For example, study the benefits/impact of a new NF with the appropriate reference points and where it resides in the 5GC, as well as an inband signaling study between the UE & ATSSS function.
	• NO support from 5 companies (Mediatek, ZTE, Huawei, Ericsson, DT)
	  ◦ Huawei commented if ATSSS function is out of UPF, then the function needs to be supported either by application or in N6, both of which are out of 3GPP scope.
	  ◦ Ericsson commented that the control plane aspects are not mentioned in the WT description.
	• Support if TU budget allows (Nokia)

WT-A-7 Use of available QoS and congestion information or performance measurement results, e.g., provided by the Access Network or UE, for making ATSSS decisions. This includes studying potential updates to existing steering modes or definition of a new steering mode.	• Support from 5 companies (Comcast, Lenovo, Orange, Broadcom, Nokia): ◦ Lenovo commented that additional steering modes could be considered, e.g., taking into account energy efficiency. • NO support from 3 companies (Qualcomm, Mediatek, ZTE)

Table 2:

Q#2: Can any of the Work Tasks above be combined/merged?	
# of companies that provided feedback on Q#2	16 companies (Nokia, Comcast, Charter Communications, Cablelabs, Oppo, China Telecom, Qualcomm, LG Electronics, CATT, Huawei, Apple, Lenovo, Ericsson, Samsung, Xiaomi, Interdigital)
WT-D-1: Overall architecture and function enhancement to support dual 3GPP access with one singe PLMN, two different PLMNs or PLMN+NPN.	• D-1 and D-3 (Nokia, LG) • D-1 and D-2 and D-3 (Charter) • D-1 and D-2 (Oppo) • D-1 and D-2 (Comcast): Overall architecture and function enhancement including PLMN or SNPN selection to support dual 3GPP access and one non-3GPP access. Dual 3GPP and one N3GPP accesses may comprise of same or different PLMNs + NPN.
WT-D-2: How to select the second PLMN or SNPN in case of different 3GPP networks after an initial PLMN was selected for the UE.	• D-1 and D-2 and D-3 (Charter) • D-1 and D-2 (Oppo)

WT-D-3: How to support simultaneous registration to 5GC via Multiple NR accesses for a UE with single subscription. The UE can be registered to a single PLMN, to a single SNPN, to two different PLMNs or SNPNs, or to one PLMN and one SNPN. The UE may in addition be registered via one non-3GPP access to 5GC.	• D-1 and D-3 (Nokia, LG) • D-1 and D-2 and D-3 (Charter) • D-3 and D-5 (Xiaomi)
WT-D-4A: How to enhance session management procedures. WT-D-4B: MA PDU session establishment using two 3GPP access. WT-D-4C: Study the 5GC session management extensions in SMF to derive the N4 (MAR) for the UPF to include together with routing and QoS information (FAR, PDR, etc.), and to derive the ATSSS rules to the UE delivered via AMF together with the UE Route Selection Policy (URSP) rules via NAS (N1).	• D-4A and D-4B and D-4C (Charter, LG, CATT, Huawei, Ericsson, Samsung, Xiaomi) • D-4B and D-4C (Nokia, Lenovo) • D-4A and D-4B (China Telecom, Qualcomm, Lenovo) • D-8A/D-8B/D-8C and D-4A (LG) • D-4A and D-4B and D-4C (Comcast): MA PDU session establishment and management using two 3GPP accesses and one non-3GPP access, including i) derivation of MAR/ATSSS rules for the UPF to be included together with routing and QoS information and ii) ATSSS rules for the UE (delivered via AMF together with the URSP over N1). • D-4A and D-4B and D-4C (Interdigital): Study how to enhance session management procedures for MA PDU session with multiple 3GPP accesses.
WT-D-5A: How to support MO/MT services when the UE is registered to the 5GC simultaneously via multiple NR accesses and potentially one non-3GPP access. WT-D-5B: How to support mobile originating and terminating services (e.g., mobile data, voice, SMS, LCS) when the UE is registered to the 5GC network simultaneously via multiple NR accesses and potentially one non-3GPP access.	• D-5A and D-5B (Nokia, Comcast, Qualcomm, CATT, Lenovo, Ericsson, Samsung) • D-5A/D-5B and D-4A (LG) • D-5A and D-5B (Comcast): How to support mobile originating and terminating services (e.g., mobile data, voice, SMS, LCS) when the UE is registered to the 5GC network simultaneously via multiple NR accesses and one non-3GPP access. • D-3 and D-5 (Xiaomi) • D-5A/D-5B and A-5A/A-5B (Xiaomi, Interdigital)

WT-D-6A: How to support mobility between a PDU Session with single 3GPP access and a MA PDU Session with dual 3GPP access as well as between MA PDU Sessions with dual 3GPP accesses. WT-D-6B: Study how to support UE mobility between 5GS and EPS when 5GS supports "Simultaneous registration to 5GC via Multiple NR accesses" and EPS supports UE attach via only a single LTE access. WT-D-6C: How to support session continuity between the two accesses.	• D-6A and D-6B and D-6C (Qualcomm, Huawei, Samsung) • D-6A and D-6C (CATT) • D-6A and D-6B and D-6C (Comcast): How to support session continuity and mobility between 3 accesses (2 3GPP accesses and 1 N3GPP access), e.g., mobility of MA-PDU session from 1 3GPP access + 1 N3GPP access to 2 3GPP accesses + 1 N3GPP access and vice versa, from 2 3GPP access (2 NR or 1 NR + LTE) plus 1 N3GPP access to 2 3GPP accesses and vice versa, from 1 3GPP access to 2 3GPP access and vice versa • D-6B and D-6C (Ericsson) • D-6A and D-6B and D-6C (Interdigital): Study how to handle different mobility scenarios and service continuity scenarios for MA PDU session with multiple 3GPP accesses.
WT-D-7: How to route the traffic of the MA PDU Session towards the PSA UPF.	

WT-D-8A: How to extend policies, steering functionalities, steering modes and charging. WT-D-8B: Study the unified policy and charging control support. Compatible policy control rule for MA-PDU session over different 3GPP access types or over 3GPP and non-3GPP access types. Any possible extensions to NWDAF to assist PCF to derive the ATSSS policy decision. Changes to the charging policy, if needed. WT-D-8C: Traffic switching/steering and associated changes to ATSSS rules.	• A-5A and A-5B can be merged into D-8A and D-8C (Nokia, Comcast) • D-8A and D-8B and D-8C (Charter, Samsung) • D-8A/D-8B/D-8C and D-4A (LG, Xiaomi) • D-8A and D-8C (CATT) • A-5A can be merged into D-3 (CATT) • D-8A and D-8B (Huawei) • D-8A and D-8B and D-8C (Comcast): How to extend policies, steering functionalities, steering modes andcharging. Any possible extensions to NWDAF to assist PCF to derive the ATSSS policy decision. • D-8C can be covered by other WTs (Lenovo) • D-8A and D-8B and D-8C (Interdigital): Study how to extend policies, steering functionalities, steering modes and charging for MA PDU session with multiple 3GPP accesses.
WT-A-1: Study how the MPQUIC steering functionality can be extended to be able to steer, switch, and split non-UDP traffic (TCP, IP, Ethernet traffic).	

WT-A-2A: Study how to relax the mandatory use of IPSec tunnel encapsulation on the untrusted non-3GPP access for the MPQUIC steering functionality, investigate new architectural options for ATSSS, if necessary. WT-A-2B: Define a new architecture for Lightweight Access Aggregation and Steering of non-integrated Wi-Fi in 5GC not based on TNGF/N3IWF. Introduce the concept of Non-Integrated Aggregated (NIA) PDU Session based on the re-use of IETF RFC protocols (e.g., MPQUIC/MPTCP) and related functions in the UE and in the PSA UPF. How to establish and modify NIA PDU Sessions. How to extend the usage of rules for UE and UPF to coordinate the aggregation and steering of traffic within a NIA PDU Session, including how to configure the MPTCP/MPQUIC proxy functionality in the UPF. NOTE: It is assumed that the Lightweight Access Aggregation and Steering functionality applies to non-GBR traffic type only. WT-A-2C: Study an ATSSS-like solution between one 3GPP access and one WLAN. Since the first release of 5GS, untrusted/trusted WLAN (i.e., N3IWF and TNGF) have not been fully adapted that also prevents adaption of 5GS capabilities like ATSSS. A 'lightweight' ATSSS-like capabilities between one 3GPP and one WLAN can be beneficial for the ecosystem until (un)trusted access nodes become widely available. Note: Rel-19 proposals like the ones in S2-2306991/92 to SA2#157 have similar concept.	• A-2A and A-2C (Nokia) • A-2A and A-2B and A-2C (Comcast, Charter, Ericsson, Samsung) • A-2B and A-2C (LG) • A-6 can be merged into A-2B (LG) • A-2A and A-2B (Apple): Study how to relax the mandatory use of IPSec tunnel encapsulation on the untrusted non-3GPP access for the MPQUIC steering functionality, and define a functional architecture and procedures for steering, switching and splitting of traffic between non-integrated non-3GPP access not based on TNGF/N3IWF and 3GPP access. This includes studying how to define the non-integrated non-3GPP access (e.g. eliminate IPSec tunnel encapsulation only on the user plane or both control plane and user plane), how to define or extend rules for UE and UPF to coordinate aggregation and steering of traffic in DL and UL directions and how to configure the MPTCP/MPQUIC proxy functionality in the UPF. • A-2B and A-2C (Interdigital): Study an ATSSS solution between one 3GPP access and one non-3GPP access, where the non-3GPP access is not integrated with the 5GC.
WT-A-3: Study how to support an MA PDU Session using a Branching Point (IPv6 multi-homing) or an UL Classifier. The UE shall not be required to know whether the MA PDU Session is using an UL Classifier.	
WT-A-4: Study how to support the establishment of an MA PDU Session to a LADN.	

WT-A-5A: Support MA PDU Sessions with two 3GPP accesses and one non-3GPP access. This includes enhancements to existing steering modes, steering functionalities, ATSSS and N4 rules. WT-A-5B: Study ATSSS between two 3GPP and one non-3GPP access legs for a UE with single or multiple subscriptions.	• A-5A and A-5B can be merged into Dualsteer WTs (Ericsson, Comcast, Charter) • A-5A and A-5B can be merged into D-8A and D-8C (Nokia) • A-5 can be merged into D-4 (Cablelabs) • A-5 can be merged into D-4A (LG Electronics) • A-5 can be merged into D-3 (CATT) • A-5A and A-5B (Lenovo, Samsung) • D-5A/D-5B and A-5A/A-5B (Xiaomi, Interdigital)
WT-A-6: Separate ATSSS functions out of UPF.	• A-6 can be merged into A-2B (LG)
WT-A-7 Use of available QoS and congestion information or performance measurement results, e.g., provided by the Access Network or UE, for making ATSSS decisions. This includes studying potential updates to existing steering modes or definition of a new steering mode.	

Table 3:

Q#3: Should any of the Work Tasks above be reworded? If so, propose the required rewording.	
# of companies that provided feedback on Q#3	15 companies (Nokia, Cablelabs, Oppo, Qualcomm, LG Electronics, CATT, Huawei, Comcast, Mediatek, Orange, Ericsson, Samsung, Interdigital, Charter, Novamint)

WT-D-1: Overall architecture and function enhancement to support dual 3GPP access with one singe PLMN, two different PLMNs or PLMN+NPN.	• Nokia: Overall architecture and function enhancement to support dual 3GPP access with one singe PLMN, two different PLMNs **(including two VPLMNs or a VPLMN and the HPLMN)** or PLMN+NPN.
	• LG: Overall architecture and function enhancement to support dual 3GPP access **registration** with one singe PLMN, two different PLMNs or PLMN+NPN **and to support providing the same service over dual 3GPP access or different services from the each registered networks simultaneously**[a1].
	• Huawei proposed a new structure for the WTs: WT-D-X: Support UE accesses to X PLMN with RAT type A and B for traffic switching:
	  ◦ WT-D-X-1 (=reworded WT-D-3): study whether and how to enhance the registration management to support this scenario:
	  ◦ WT-D-X-2 (=merged version of WT-D-4): Study whether and how to enhance the session management to support this scenario
	  ◦ WT-D-X-3 (=merged version of WT-D-6): Study whether and how to enhance the mobility management to support this scenario
	  ◦ WT-D-X-4 (=merged version of WT-D-8): Study whether and how to enhance the policy and charging control to support this scenario
	  ◦ WT-D-X-5 (=additional WT mentioned in feedback form 4): Study the security aspect to support the specific scenario, which has dependency and requires coordination with SA WG3.
	  ◦ WT-D-X-6 (=additional WT mentioned in feedback form 4): Study the backward compatibility with legacy UE, existing features (e.g. Slicing, Prose, Edge) and existing services (e.g. LADN services, XR services)
	• Mediatek: Overall architecture and function enhancement to support only TN + NTN accesses with one singe PLMN, two different PLMNs.
	• Charter proposed to merge WT-D-1 through

WT-D-2: How to select the second PLMN or SNPN in case of different 3GPP networks after an initial PLMN was selected for the UE.	• LG: How to select the second PLMN or SNPN in case of different 3GPP networks after an initial PLMN **or SNPN** was selected for the UE. • Mediatek: How to select an additional PLMN for the UE.
WT-D-3: How to support simultaneous registration to 5GC via Multiple NR accesses for a UE with single subscription. The UE can be registered to a single PLMN, to a single SNPN, to two different PLMNs or SNPNs, or to one PLMN and one SNPN. The UE may in addition be registered via one non-3GPP access to 5GC.	• Cablelabs: How to support simultaneous registration to 5GC via Multiple NR accesses for a UE with single **or multiple subscriptions**. The UE can be registered to a single PLMN, to a single SNPN, to two different PLMNs or SNPNs, or to one PLMN and one SNPN. The UE may in addition be registered via one non-3GPP access to 5GC. • Oppo: ”via Multiple NR accesses” is reworded to ”via Multiple NR accesses or via NR accesses and E-UTRA access”. NR+E-UTRA is an important requirement as well. • CATT: ”via Multiple NR accesses” should be reworded to ”via Multiple radio accesses”. • Mediatek: How to support registration to 5GC via only TN + NTN accesses for a UE with single subscription. NOTE: The UE may be registered via one non-3GPP access to 5GC. • Ericsson: This WT talks about “multiple” NR accesses while other WTs talk about “two” NR accesses. Should align the WTs and state that two accesses are targeted.

WT-D-4A: How to enhance session management procedures. WT-D-4B: MA PDU session establishment using two 3GPP access. WT-D-4C: Study the 5GC session management extensions in SMF to derive the N4 (MAR) for the UPF to include together with routing and QoS information (FAR, PDR, etc.), and to derive the ATSSS rules to the UE delivered via AMF together with the UE Route Selection Policy (URSP) rules via NAS (N1).	• WT-D-4A (Qualcomm): How to enhance session management procedures to support MA PDU Sessions with two 3GPP accesses. Delete WT-D-4B. • WT-D-4A (LG): How to enhance session management procedures **to support MA PDU session over the two 3GPP accesses and necessary policy enhancement including URSP/ATSSS/N4 rules**. • WT-D-4C (CATT): Suggest rewording to ”Study the 5GC session management extension function, procedure, etc.”. • WT-D-4A (Samsung): How to enhance session management procedures and policy enhancements for UE supporting dual 3GPP registration. For UE registered with 2 3GPP accesses, the UE needs to support selection on which 3GPP access (or both 3GPP accesses) to use for application traffic. To this end, the study on the enhancement on the policy (e.g., 3GPP access with specific RAT, both 3GPP accesses with same or different RATs, etc.) is needed. • Xiaomi: Study the potential enhancement of session management procedures to support MA PDU session over the two 3GPP accesses (e.g. policy enhancement including URSP/ATSSS/N4 rules, etc) • Charter proposed to merge WT-D-4A through WT-D-4C + WT-A-5: How to enhance Session Management producers to support MA PDU Sessions with two 3GPP accesses and one non-3GPP access. This includes enhancements to existing steering modes, steering functionalities, ATSSS and N4 rules. Study ATSSS between two 3GPP and one non-3GPP access legs for a UE with single or multiple subscriptions.

WT-D-5A: How to support MO/MT services when the UE is registered to the 5GC simultaneously via multiple NR accesses and potentially one non-3GPP access. WT-D-5B: How to support mobile originating and terminating services (e.g., mobile data, voice, SMS, LCS) when the UE is registered to the 5GC network simultaneously via multiple NR accesses and potentially one non-3GPP access.	• Qualcomm: How to support MT services when the UE is registered to the 5GC simultaneously via two 3GPP accesses • WT-D-5B (Mediatek): How to support mobile originating and terminating services (e.g., mobile data, voice, SMS, LCS) when the UE is registered to the 5GC network simultaneously via only TN + NTN accesses and potentially one non-3GPP access. • Xiaomi: Study how to support MO/MT services when the UE is registered to the 5GC simultaneously via multiple NR accesses and potentially one non-3GPP access. Study how to support MA PDU Sessions with two 3GPP accesses and one non-3GPP access. This includes enhancements to existing steering modes, steering functionalities, ATSSS and N4 rules.
WT-D-6A: How to support mobility between a PDU Session with single 3GPP access and a MA PDU Session with dual 3GPP access as well as between MA PDU Sessions with dual 3GPP accesses. WT-D-6B: Study how to support UE mobility between 5GS and EPS when 5GS supports ”Simultaneous registration to 5GC via Multiple NR accesses” and EPS supports UE attach via only a single LTE access. WT-D-6C: How to support session continuity between the two accesses.	• Qualcomm: Study how to support session continuity between the two access, e.g., mobility between single 3GPP access MA PDU Session and dual 3GPP access PDU Session as well as between dual 3GPP access MA PDU Sessions. • WT-D-5B (Mediatek): Study how to support UE mobility between 5GS and EPS when 5GS supports ”Simultaneous registration to 5GC via only TN + NTN accesses” and EPS supports UE attach via only a single LTE access. • WT-D-6A (Ericsson): This WT is not clear. What does “mobility between PDU Sessions” mean? Does it refer to mobility between accesses? • WT-D-6B/6C (Ericsson): Should be made clear that this is for MA PDU Sessions only.

WT-D-7: How to route the traffic of the MA PDU Session towards the PSA UPF.	• Comcast: How to select PSA UPF and route the traffic across 3GPP and N3GPP accesses towards the PSA UPF.
WT-D-8A: How to extend policies, steering functionalities, steering modes and charging. WT-D-8B: Study the unified policy and charging control support. Compatible policy control rule for MA-PDU session over different 3GPP access types or over 3GPP and non-3GPP access types. Any possible extensions to NWDAF to assist PCF to derive the ATSSS policy decision. Changes to the charging policy, if needed. WT-D-8C: Traffic switching/steering and associated changes to ATSSS rules.	• Keep only D-8A (Qualcomm) • WT-D-8A (Mediatek): How to extend policies and charging. • Charter: Study how to extend policies, steering functionalities, steering modes and charging.
WT-A-1: Study how the MPQUIC steering functionality can be extended to be able to steer, switch, and split non-UDP traffic (TCP, IP, Ethernet traffic).	• Orange: WT-A-1 should be reworded to remove TCP. The problem is already solved for TCP without the troubles raised for a QUIC-based solution that would suffers from: redundant encryption schemes (see WT-A-2A (SWS-230073)), MTU issues induced by HTTP encapsulation as plain transport mode is used for MPTCP/ATSSS).

WT-A-2A: Study how to relax the mandatory use of IPSec tunnel encapsulation on the untrusted non-3GPP access for the MPQUIC steering functionality, investigate new architectural options for ATSSS, if necessary. WT-A-2B: Define a new architecture for Lightweight Access Aggregation and Steering of non-integrated Wi-Fi in 5GC not based on TNGF/N3IWF. Introduce the concept of Non-Integrated Aggregated (NIA) PDU Session based on the re-use of IETF RFC protocols (e.g., MPQUIC/MPTCP) and related functions in the UE and in the PSA UPF. How to establish and modify NIA PDU Sessions. How to extend the usage of rules for UE and UPF to coordinate the aggregation and steering of traffic within a NIA PDU Session, including how to configure the MPTCP/MPQUIC proxy functionality in the UPF. NOTE: It is assumed that the Lightweight Access Aggregation and Steering functionality applies to non-GBR traffic type only. WT-A-2C: Study an ATSSS-like solution between one 3GPP access and one WLAN. Since the first release of 5GS, untrusted/trusted WLAN (i.e., N3IWF and TNGF) have not been fully adapted that also prevents adaption of 5GS capabilities like ATSSS. A 'lightweight' ATSSS-like capabilities between one 3GPP and one WLAN can be beneficial for the ecosystem until (un)trusted access nodes become widely available. Note: Rel-19 proposals like the ones in S2-2306991/92 to SA2#157 have similar concept.	• WT-A-2B (Nokia): Define a functional architecture and procedures for steering, switching and splitting of traffic between **non-integrated non-3GPP** access (providing IP connectivity) not based on TNGF/N3IWF and 3GPP access. This includes studying how to define or extend rules for UE and UPF to coordinate aggregation and steering of traffic in DL and UL directions and how to configure the MPTCP/MPQUIC proxy functionality in the UPF. • Qualcomm: Study how to relax the mandatory use of IPSec tunnel encapsulation on the untrusted non-3GPP access for the MPQUIC steering functionality and define a new lightweight Access Aggregation and Steering of non-integrated Wi-Fi in 5GC without TNGF and N3IWF. • WT-A-2B (LG): Define a new architecture for Lightweight Access Aggregation and Steering of non-integrated **~~Wi-Fi~~non-3GPP access** in 5GC not based on TNGF/N3IWF. Introduce the concept of Non-Integrated Aggregated (NIA) PDU Session **~~based on the re-use of IETF RFC protocols (e.g. MPQUIC/MPTCP)~~** and related functions in the UE and in the **~~PSA UPF~~network** • WT-A-2B (Samsung): Define a new architecture for native non-3GPP access in 5GC not based on TNGF/N3IWF and study how to steer traffic between native non-3GPP access. Whether to define new PDU session type can be discussed during the study. • Charter: Define a functional architecture and procedures for supporting ATSSS steering functionality between non-integrated a non-3GPP access (not based on TNGF/N3IWF) and a 3GPP access. This includes studying how to define or extend rules for UE and UPF to coordinate aggregation and steering of traffic in DL and UL directions and how to configure the MPTCP/MPQUIC proxy functionality in the UPF.

WT-A-3: Study how to support an MA PDU Session using a Branching Point (IPv6 multi-homing) or an UL Classifier. The UE shall not be required to know whether the MA PDU Session is using an UL Classifier.	
WT-A-4: Study how to support the establishment of an MA PDU Session to a LADN.	
WT-A-5A: Support MA PDU Sessions with two 3GPP accesses and one non-3GPP access. This includes enhancements to existing steering modes, steering functionalities, ATSSS and N4 rules. WT-A-5B: Study ATSSS between two 3GPP and one non-3GPP access legs for a UE with single or multiple subscriptions.	
WT-A-6: Separate ATSSS functions out of UPF.	
WT-A-7 Use of available QoS and congestion information or performance measurement results, e.g., provided by the Access Network or UE, for making ATSSS decisions. This includes studying potential updates to existing steering modes or definition of a new steering mode.	• Orange: Use of available energy efficiency, QoS and congestion information or performance measurement results for making ATSSS decisions. This includes studying potential updates to existing steering modes or definition of a new steering mode.

Table 4:

Moderator Proposal for each WT by considering all feedbacks in section 2.1 **Each WT is categorized as IN, IN* or OUT** • **IN : including the WT in the draft SID is proposed.** • **IN* : including the WT in the draft SID is proposed for further discussion and final decision on whether including it or not.** • **OUT: NOT including the WT in the draft SID is proposed because other ”IN” WT(s) can cover it or due to insufficientsupport.**		

Moderator Proposal#1	**WT-D-1 to WT-D-6 and WT-D-8**	**IN** **Restructured as WT-D-1 with sub-WTs. WT-D-1 focuses on simultaneous NR TN/5GC and NR NTN/5GC access scenario that has consensus to be included. Other scenarios need more discussion. Questions included (Q1-Q14) to guide further discussions.** WT-D-1: Study the overall architecture and function enhancements to support simultaneous NR TN/5GC access and an NR NTN/5GC access by a UE in a single PLMN or two different PLMNs **(including two VPLMNs or a VPLMN and the HPLMN).** Q1: Do we support the following case: The UE can be dual registered via an NR/5GC access and an E-UTRA/EPC access in two different PLMNs **(including two VPLMNs or a VPLMN and the HPLMN)** with single subscription? Q2: Do we support multiple subscriptions? Q3: Do we support the following case: The UE can be dual registered via an NR/5GC access and an E-UTRA/EPC access to a single PLMN? Q4: Do we support the following case: The UE can be registered via two NR/5GC accesses to a single PLMN or in two different PLMNs? Q5: Do we support the following case: The UE can be registered to an SNPN (or a PNI-NPN) and another SNPN or one PLMN (TN or NTN access)? Q6: Do we support the following case: The UE may in addition be registered via one non-3GPP access to 5GC? WT-D-1.1: Study how to support dual 3GPP access registration to support this scenario. WT-D-1.2: Study how to support mobile terminating services (e.g., data, voice, SMS, LCS) when the UE is registered to the 5GC simultaneously via two 3GPP accesses. Q7: Do we support one additional

Moderator Proposal#2	**WT-D-7**	**IN*** **Renamed as WT-D-2 and re-wording proposed.** **Questions included (Q15-Q16) to guide further discussions.** WT-D-2: Study how to select the PSA UPF and route the traffic of the MA PDU Session across 3GPP accesses towards the PSA UPF. Q15: Do we have consensus to keep WT-D-2? Q16: Do we have consensus to study ”across 3GPP and non-3GPP accesses”?
Moderator Proposal#3	**WT-A-1**	**IN** **No changes proposed to the wording. This WT has 6 supporting companies and 2 non-supporting companies. This WT may move to TEI19.**
Moderator Proposal#4	**WT-A-2**	**IN** **Rewording proposed.** **One question included (Q17) to guide further discussions.** WT-A-2: Study how to define a functional architecture and procedures for steering, switching and splitting of traffic between non-integrated non-3GPP access not based on TNGF/N3IWF and 3GPP access. Q17: Do we need additional details? One proposal: ”This includes studying how to define the non-integrated non-3GPP access (e.g. eliminate IPSec tunnel encapsulation only on the user plane or both control plane and user plane), how to define or extend rules for UE and UPF to coordinate aggregation and steering of traffic in DL and UL directions and how to configure the MPTCP/MPQUIC proxy functionality in the UPF.”

Moderator Proposal#5	**WT-A-3**	**IN* No changes proposed to the wording. This WT has 5 supporting companies and 3 non-supporting companies.**
Moderator Proposal#6	**WT-A-4**	**OUT This WT has 2 supporting companies and 3 non-supporting companies.**
Moderator Proposal#7	**WT-A-5**	**OUT This WT is covered by the new WT-D-1.**
Moderator Proposal#8	**WT-A-6**	**IN* No changes proposed to the wording. This WT has 5 supporting companies and 3 non-supporting companies.**
Moderator Proposal#9	**WT-A-7**	**IN* Rewording proposed. This WT has 4 supporting companies and 3 non-supporting companies.** WT-A-5: Use of available energy efficiency, QoS and congestion information or performance measurement results, e.g., provided by the Access Network or UE, for making ATSSS decisions. This includes studying potential updates to existing steering modes or definition of a new steering mode.

5 5.2 Summary from section 2.2

Table 5:

Q#4: Are there any additional Work Tasks that should be part of Rel-19?	

WT-DeutscheTelekom-1: Study how the MPDCCP steering functionality can be introduced to be able to steer, switch, and split all kind of traffic (UDP, TCP, IP, Ethernet traffic).	• Support from 5 companies (DT, BT, Huawei, Vodafone, Interdigital) • NO support from 2 companies (Apple, Ericsson): this WT has been studied in R18 and concluded not to move forward with it. • Xiaomi proposed to convert this into a TEI19 topic. **Moderator Proposal#10: IN***

WT-MTK-1:
How to support an MA PDU Session with only TN + NTN accesses and one non-3GPP access
	• Support from 3 companies (Mediatek, Comcast, Avanti)
	• Comcast commented there is no reason to limit the 2 3GPP accesses to TN and NTN; they could both be TN or both be NTN or one TN and one NTN
	• NO support from 2 companies (Apple, Ericsson):
	  ◦ WT-MTK-1 is already covered by WT-D-4A: Study how to enhance session management procedures to support MA PDU Sessions over two 3GPP accesses and one non-3GPP access (Apple).
	  ◦ WT-MTK-1 is covered by WT-A-5A (should be a WT-D type of WT) and WT-D-3 (Ericsson).
	Moderator Proposal#11: OUT

WT-Nokia-1: Overall architecture and function enhancement to support dual 3GPP access with two different VPLMNs.	• Support from 3 companies (Nokia, Interdigital, Novamint) **Moderator Proposal#12: OUT**
WT-Thales-1: Investigate solutions allowing unidirectional services in one access (e.g. from the CN to the UE) and unidirectional services in another access (e.g. from the UE to the CN).	• Support from 2 companies (Thales, Avanti) **Moderator Proposal#13: OUT**

WT-Lenovo-1: A specific WT (if not part of WT-D-6C) for enabling access path switching, e.g., to transfer a source 3GPP access path to a target 3GPP or non-3GPP access path.	• Support from 1 company (Lenovo) **Moderator Proposal#14: OUT**
WT-Huawei-1: Study the security aspect to support the specific scenario, which has dependency and requires coordination with SA WG3.	• Support from 1 company (Huawei) **Moderator Proposal#15: OUT**
WT-Huawei-2: Study the backward compatibility with legacy UE, existing features (e.g. Slicing, Prose, Edge) and existing services (e.g. LADN services, XR services)	• Support from 1 company (Huawei) **Moderator Proposal#16: OUT**

Table 6:

Q#5: If there are any additional Work Tasks required, describe them	
For Dual Steer it is essential to show HOW there is no impact to legacy networks. E.g. with "Dual steer across NR-NTN and NR" how can a legacy network avoid a TN-NTN handover leading to an AMF having two connections with the same UE, and this leading to some kind of software crash in the AMF.	• Support from 1 company (Vodafone) **Moderator Proposal#17: OUT**

5 5.3. Summary from section 3

Table 7:

Q#6: Describe the dependencies that any of the Work Tasks have on other 3GPP Working Groups	
# of companies that provided feedback on Q#6	10 companies (Comcast, Charter Communications, Nokia, Qualcomm, LG Electronics, CATT, Huawei, Mediatek, Ericsson, Xiaomi)

Summary	• SA3 may have to study security aspects related to DualSteer and Lightweight ATSSS • SA5 may have to study charging aspects and whether existing ATSSS aspects can be leveraged or not. • Dependency on RAN WGs should be avoided. Huawei suggested for RAN WGs to evaluate the feasibility and performance for DualSteer.
Moderator Proposal#18: Proposed Conclusion	**Consensus on SA3 and SA5 impacts. Impacts on RAN WGs should be avoided.**

Table 8:

Q#7: Describe dependencies between the Work Tasks	
# of companies that provided feedback on Q#7	2 companies (Charter Communications, Qualcomm)
Summary	• For DualSteer the work tasks are interdependent. • For ATSSS_Ph4, there is no interdependency between the WTs. ATSSS_Ph4 WTs should focus on enhancements/optimizations to current R18 ATSSS which are independent of DualSteer WTs.

Table 9:

Q#8: Describe any dependencies on potential work/study items that might be created as a result of the other Q3 moderated discussions.	
# of companies that provided feedback on Q#8	1 company (Qualcomm)

Qualcomm feedback	• The NWDAF extension aspect of WT-D-8B needs to be moved to the AIMLsys MED and, if agreed, it should be included in the associated SID. • In addition, in our view WT-A-6 (Separate ATSSS functions out of UPF) should be studied under ATSSS_Ph4, and not under UPEAS_Enhancements.

5 5.4 Summary from section 4

Table 10:

Q#9: Should there be more than one SID, WID or TEI-19 item created based on the Work Tasks?	
Summary	• 8 companies suggested a single SID: Comcast, Cablelabs, Apple, Lenovo, Ericsson, Broadcom, Interdigital, DT • 9 companies suggested to have two separate SIDs: Nokia, China Telecom, Qualcomm, LG Electronics, CATT, Huawei, Xiaomi, DT, Charter • Mediatek suggested one SID for Dualsteer, one TEI for ATSSS enhancements for WT-A-1 and WT-A-4. • Xiaomi, DT proposed a TEI WID for WT-DeutscheTelekom-1. • China Mobile proposed one SID for Dualsteer
Moderator Proposal#19: Proposed Conclusion	**It is proposed to create a single SID per SA#100 guidance (Multi-access SID).**

Table 11:

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

https://nwm-trial.etsi.org/#/documents/8587

Summary	• DualSteer should include all agreed WT-D-XX tasks, while ATSSS_Ph4 should include all agreed WT-A-XX tasks. • China Telecom suggested that WT-D-4C might be further reworded and studied in ATSSS enhancement SID.