
1 Introduction

After SA2#162 meeting (April 2024), TR 23.700-54 v0.3.0 contains 6 key issues, 19 DualSteer solutions and 13 ATSSS_Ph4 solutions.

In the following discussion, the goal is to collect companies' views in order to help the conclusion of each key issue.

2 Company views for key issue conclusions (round 1)

Companies are encouraged to explain the technical reasons for a particular view, including the assumptions that were not described in the solutions.

Companies are encouraged to consider conclusions that can fit the WID, which has 6 TUs planned for the normative phase.

2.1 Key Issue #1.1 – Round 1 Questions

Question KI#1.1.1: Should one of the SUPIs be identified as primary SUPI or could either of two SUPIs be used to first register or request the PDU session establishment?

Feedback Form 1: Question KI#1.1.1

1 – VODAFONE Group Plc

I suspect that there are many situations where (at least at stage 3 level) any primary SUPI might not succeed in registering/PDU establishment and a secondary SUPI does succeed. Similarly, when using dual steer to change PLMN, which SUPI would be primary after the PLMN change? So, (except for PLMN selection aspects) I think that it is probably simplest to accept that either SUPI could be first to succeed with PDU establishment and not have a primary SUPI concept.

2 – China Telecom Corporation Ltd.

We prefer the Primary/Secondary is not pre-defined by the subscription data, but by the order of the SUPIs' successful registration, i.e., the first SUPI registered to the network would be the primary one.

3 – LG Electronics France

One of the SUPIs should be identified as primary SUPI. According to SA1 requirement, operator should be able to enable / disable DualSteer service. If operator want to limit the usage of secondary SUPI e.g. only to use it as part of DualSteer, usage of second registration needs to be controlled by operator.

4 – vivo Mobile Communication Co.

Either of two SUPIs can be used to first register.

There's no need to distinguish primary and secondary SUPI by network and in any configuration or in subscription data. Lots of situation exist, an example is that user may first plug in any of the SUPI and then another, it is not a flexible way to restrict one SUPI to be primary.

5 – MediaTek Inc.

We support primary and secondary concept. The determination on which SUPI is primary and secondary can be made up to UE implementation to avoid the simultaneously registration for the two SUPIs in Dual-steer Device.

6 – Samsung Electronics Co.

Either of two SUPIs could be used to first register or request the PDU session establishment. no need to fix the primary and secondary SUPI. Especially for PDU Session establishment, need to consider together DNN and S-NSSAI to check whether duplicated PDU Session is allowed or not.

7 – Deutsche Telekom AG

It is simpler if a primary SUPI is defined.

8 – Google Inc.

Either SUPI can be the first request registration or PDU session. The first registered SUPI can be the primary SUPI (but not the other way around). The specific setting for primary SUPI and secondary SUPI would result in unnecessary restrictions and many error cases.

9 – OPPO

Either of two SUPIs be used to first register. The network can decide the first registration to a PLMN supporting dual steer to be the Primary Access (or the related SUPI can be treated as the primary SUPI). The static subscription for primary SUPI and secondary SUPI would cause restrictions to the UE behavior and bring out more complicated issues (especially when restricting the secondary SUPI's registration behavior).

10 – Huawei Technologies R&D UK

Each SUPI will have its own MSISDN, the voice/SMS services would not be switched to other SUPI. User may always try to use one of the two SUPIs as much as possible.

A DualSteer subscriber is provisioned with a main (primary) SUPI and a supplementary (secondary) SUPI. The two subscriptions share a single subscription profile.

It is beneficial to differentiate the two SUPIs by identifying a Primary SUPI and Secondary SUPI. This will facilitate the coordination and the policies to support the dual steer scenarios. For example, DualSteer Device can always attempt the registration of Primary SUPI as existing mechanism, while the secondary SUPI can be triggered to perform registration or establish PDU sessions when needed to support DualSteer based on operator policies. Treating the two SUPIs as equivalent would in fact add complexity to the design of appropriate policies and perform charging.

<p>11 – ZTE Corporation</p> <p>We don't support primary SUPI/secondary SUPI concept. It is not required in SA1 requirement.</p>
<p>12 – NEC Europe Ltd</p> <p>One SUPI should be identified as Primary SUPI.</p>
<p>13 – QUALCOMM Europe Inc. - Italy</p> <p>There is no need to identify a priori a primary and secondary SUPI, either SUPI can be used to first register or request the PDU session establishment. Control of the use of SUPIs by HPLMN is possible independently of one being identified as primary or secondary.</p>
<p>14 – Ericsson LM</p> <p>There is no need of primary and secondary SUPI approach. Either of the two SUPIs can be used to first register or request the PDU session establishment. If there is a need for asymmetry in policy delivery during registration and PDU session establishment it could be applied to the first SUPI vs second SUPI instead of defining primary and secondary SUPI.</p>
<p>15 – CableLabs</p> <p>There is no need to mandate one SUPI is first registered over the other SUPI. Each SUPI can initiate registration/PDU session establishment without priority/dependency.</p>
<p>16 – InterDigital Communications</p> <p>We believe it's necessary to have a concept of Primary/Secondary SUPI. The device uses Primary SUPI for normal operation and uses secondary SUPI when needed for DualSteer service. The primary/secondary SUPI may not be pre-determined though.</p>
<p>17 – Charter Communications</p> <p>NO need for specifying primary or secondary SUPI concept in the UDM. In other words, either of the SUPIs can register and establish PDU session based on the operator policies delivered to each SUPI.</p>
<p>18 – Apple Distribution Intl Ltd</p> <p>Either SUPI could be used as first to register / establish PDU session, no need to define a static primary SUPI concept. First registered SUPI can be chosen for policy delivery.</p>
<p>19 – Nokia</p> <p>NO. There is no need for a fixed primary and secondary. Either of the UE may register first and the network can decide which is the active/standby path for an application traffic.</p>

20 – ETRI

Yes, we prefer to distinguish primary/secondary SUPIs.

Question KI#1.1.2: Association of SUPIs

1. Should there be an association between the two SUPIs?
2. If yes to 1), should it be maintained in UDM?
3. If yes to 1), should the association also include Access Type/RAT restrictions?
4. If no to 1), can the subscriptions reside in different UDMs?
5. If yes to 2), should the two SUPIs of the DualSteer Device stored as a "DualSteer Pair" in UDM, with DualSteer Pair having its own identifier?

Feedback Form 2: Question KI#1.1.2

1 – VODAFONE Group Plc

- 1) I expect that the HPLMN needs to maintain an association between the two SUPIs.
- 2) With one IMSI on 4G and one on 5G it is difficult to say that they are on the same UDM... perhaps each SUPI/IMSI subscription record in the HSS/UDM just needs a field containing the "paired SUPI/IMSI".
- 3) I expect that each SUPI/IMSI has independent Access Type and RAT (and roaming) restrictions and QoS settings (e.g. only one IMSI might be allowed to roam onto expensive satellite systems and then have a low AMBR).
- 4) For some operational aspects (e.g. only one of the two SIMs gets broken/stolen) a solution that allows separate UDMs (or HSSs) may be useful.
- 5) the operator is likely to need one identifier as a "parent ID". Whether there is then one parent and one child SUPI; or one parent and two child SUPIs is less obvious, but one parent SUPI and one child SUPI might be less complex as the parent SUPI could be managed mostly the same as an existing SUPI/IMSI.

2 – China Telecom Corporation Ltd.

1. Yes.
2. Yes. The network needs to know the association of the SUPIs and generate policies for DualSteer Device based on the association information from UDM.
3. We can accept if the Access Type/RAT restriction is maintained in UDM so that the network can generate the corresponding policies (e.g. AM policy) to manage the accesses.
5. Yes, this way can facilitate the management of the DualSteer related subscription data in the network.

3 – Deutsche Telekom AG

1. Yes.
2. Yes, for the 5G case it is necessary to ensure that both SUPI have same subscription data subscribed (e.g. allowed services, slices, etc.) except potentially for some DualSteer related data where some distinction might be needed between the two SUPIs

3. If the decision is to distinguish primary and secondary SUPI the Access Type/RAT/roaming restrictions might be different otherwise they would be in general the same and depend on the "primary" connection.
4. No, For the EPS/5GS case HSS and UDM access to same UDR can be assumed.
5. Yes.

4 – LG Electronics France

UDM should maintain association of two SUPIs. Without such association information, network cannot control DualSteer service. In the subscription of each SUPI, whether the SUPI is Primary SUPI or Secondary SUPI is stored and also have associated SUPI (i.e., for Primary SUPI, associated SUPI is Secondary SUPI and for Secondary SUPI, associated SUPI is Primary SUPI) is stored without pairing identifier. Each subscription can have Access Type, RAT restriction according to existing subscription information. It's better to manage two SUPIs in the same UDM, otherwise, one UDM needs to fetch associated SUPI's subscription data from different UDM, which causes additional signaling.

5 – vivo Mobile Communication Co.

YES for a) and b), slightly prefer YES for e)
No for c) and d)

6 – MediaTek Inc.

1. Yes based on the scope of the SID
2. Yes
3. Yes
4. Skip since yes to (1)
5. No based on (1), the UDM should know the association between these two SUPIs. It is not clear why need the pairing ID info and how to use within the NW

7 – Samsung Electronics Co.

1. Yes. There should be an association between the two SUPIs.
2. Yes. It should be maintained in UDM. but no need correlation ID in UDM either.
3. Yes. Access Type/RAT restrictions for a SUPI should be determined with considerations of the other SUPI
4. N/A.
5. The two SUPIs of the DualSteer Device should be stored as a "DualSteer Pair" in UDM. No special identifier required to identify the pair.

8 – OPPO

1. Yes.
2. Yes.

3. No. It is not necessary to have Access Type/RAT restrictions for a SUPI in the subscription data. Access Type/RAT restrictions are related to PLMN selection and this may also cause RAN impacts. This should not be discussed in this stage.

5. I'd prefer "DualSteer Group". More than two SUPIs can be included in one "DualSteer Group" and two of them can be selected by the user and put them in one device to have DualSteer service. Under this assumption, a "group ID" may be necessary. If only two SUPIs are in the "DualSteer Pair", there is no need to have a pair ID.

9 – Huawei Technologies R&D UK

1. Yes.

2. Yes.

3. No. We do not believe it is necessary to include new access type/RAT restrictions: the existing mechanism to control access type and RAT can be applied to each SUPI independently.

4. N/A.

5. No strong opinion on whether to use reference in each SUPI subscription or have a standalone subscription profile for DualSteer. However, how to use such "DualSteer Pair Identifier" shall be clearly specified considering registration or session procedure.

10 – ZTE Corporation

1. Yes.

2. Yes.

3. No.

4. N/A.

5. Yes

11 – NEC Europe Ltd

Yes to 1) and 2). Separate UDM could be OK.

12 – Ericsson LM

1. Yes.

2. Yes.

3. No, Access Type/RAT restrictions should be used as per existing subscription data.

4. It is not precluded, although it is reasonable to assume that the subscriptions will be handled by the same UDM.

5. No. Each subscription profile can contain the SUPI of the other profile (i.e. cross-referencing the two subscription profiles). No need to add new subscription data types in UDM.

13 – InterDigital Communications

1, Yes.

2, Yes.

3. It's not clear what "Access type/RAT restriction" for "SUPI association" means.

4. N/A
5. Yes.

14 – QUALCOMM Europe Inc. - Italy

1. Yes
2. Yes
3. No
5. No, no need for extra identifiers

15 – Charter Communications

1. There can be an association, but it depends on the overall solution to be agreed where (such as SM subscription data) such association will be maintained.
2. Depends on the overall solution to be agreed where (such as SM subscription data) such association will be maintained.
3. No. Such association is not required. Operators can configure such restrictions for each SUPI separately as such configuration for each SUPI is already available; therefore, possibly no need to enhance in Rel-19.
4. Independent to the answer 1), as per the answer to 2), subscriptions can reside in two separate UDMs. There is no need to have any operational restrictions and maintain two subscriptions in the same UDM. Existing SUCI/SUPI format (e.g., Routing ID) allows an NF to locate the UDM where a subscription resides.
5. Depends on the overall solution. For example, SM subscription data of each SUPI may be enhanced/-configured to pair/link two PDU sessions that can be established by the UEs/SUPIs for DualSteer service.

16 – CableLabs

Please find our answers below:

- a. Yes, there would be an association between two SUPIs, but not necessarily direct linkage between two SUPIs (e.g., linkage via SM subscription data or policy)
- b. Yes, UDM may store a paired SUPI or Session Management Subscription Data for the linkage.
- c. No
- d. At least some solutions propose maintaining paired SUPIs/linked SUPIs in each UDM, and also we like to retain MUSIM architecture/procedure whenever possible for Dual steer devices. As storing SUPIs in multiple UDMs may be independent issue to (a), we propose to rephrase the question as “~~If no to a~~), can the subscriptions reside in different UDMs?” Based on rephrased question, Yes.
- e. As mentioned in above, we prefer that each SUPI is maintained potentially independently in a UDM, and UDM has information for the linked SUPI. Whether to use SUPI directly or use another parameter, we think using SUPI is simpler. As the association is mainly for a session, solutions to update SM subscription data seems reasonable. Moreover, we like to note that a dual steer device may establish independent single PDUs for each SUPI while it may establish a dual steer PDU via two SUPIs simultaneously (at least when the device supports simultaneous TX/RX). Solutions, in our view, should allow this.

17 – Apple Distribution Intl Ltd

1. Yes.
2. Yes.
3. No. It is not necessary to include new access type/RAT restrictions.
4. N/A.
5. No strong view whether to link the other SUPI in each SUPI subscription or have a standalone subscription profile for DualSteer but simplest approach is not define new identifiers.

18 – Nokia

1. YES
2. YES
3. NO. There is no need for indicating any Access/RAT restriction
4. I think it is simpler (and also most likely to be the case) to have them in a single UDM.
5. NO. We only need to link the 2 SUPIs. i.e. in the subscription data information about the linked SUPI

19 – ETRI

1. Yes.
2. Yes.
3. N/A.
4. N/A.
5. NO, we prefer to direct relationship between two SUPIs without extra ID.

Question KI#1.1.3: Access and Mobility Subscription Data for DualSteer

1. Is there a need to enhance the Access and Mobility Subscription Data for DualSteer?
2. If yes to 1), what additional information needs to be added?
3. Should the following information be considered?
 - a) an indication that the SUPI is part of a DualSteer subscription
 - b) the linked 2nd SUPI of the DualSteer subscription
 - c) DNN, S-NSSAI that are allowed for DualSteer switching

Feedback Form 3: Question KI#1.1.3

1 – VODAFONE Group Plc

I would aim to avoid (or at least minimise) mandatory changes to the VPLMN(s). Optional changes to VPLMNs could be OK, but, if the process works without them, why enhance it?

2 – China Telecom Corporation Ltd.

1. yes
2. the Access Type/RAT restriction when acts as part of a DualSteer device, for example.
3. a) Yes, the AMF can select the same SMF based on the subscription data during the establishment of PDU Session for switching or potential switching.
b) yes
c) yes

3 – LG Electronics France

Access and Mobility Subscription Data may contain PCF selection information to enable selecting the same PCF for two SUPIs. Based on that, PCF can generate updated AM policy (e.g. RFSP Index) to control the UE to stay in preferred RAT.

In case of roaming, V-PCF does not retrieve subscription data of roaming UE. Therefore, if enhancement is needed, AMF needs to provide some information (e.g. DualSteer indication and associated SUPI information) to the PCF.

4 – vivo Mobile Communication Co.

YES for a), and c.2) is preferred

The AM subscription data need to include linked SUPI, so that if AMF is enhanced, the AMF can do some further work, e.g., benefit the device to change status from dual-transmission to single-transmission with minimal interruption.

5 – MediaTek Inc.

1. Yes
2. It could be e.g., access type/RAT/PLMN.
3. (a) No (b) No (c) No, it is not AM subscription data

6 – Samsung Electronics Co.

1. Yes.
2. A SUPI's AM subscription data should be extended to have the other SUPI as the DualSteer pair, etc. The AM subscription can be enhanced to have RAT restriction/RFSP index dedicated to DualSteer (e.g., in addition to those for non-DualSteer registration). When the registration type changes between DualSteer registration/non-DualSteer registration, different set of RAT restriction/RFSP index need to be enforced.
3. Not sure to be necessary an indication for DualSteer separately. DNN/S-NSSAI can be used for SMF selection. But UE has to be indicated the second linked SUPI which should come from UDM to AMF. Thus at least second linked SUPI is required. The linked SUPI itself can act as indication for "a)". Thus b) and c) are required but "a)" is not required.

7 – OPPO

1. Yes but may be only optional.
2. It is beneficial to have some additional information for same SMF selection. But it is also likely to have other alternative solutions without enhancing the AM policy.
3. c is helpful.

8 – Huawei Technologies R&D UK

1. Not needed.
2. N/A.
3. Some information can be considered but it is not in Access and Mobility Subscription Data. Following answer is to clarify whether the subscription data requires such information but does not mean the information should be included in the Access and Mobility Subscription Data.
 - a) Yes, the subscription should indicate the SUPI has DualSteer subscription.
 - b) Yes, the subscription should indicate the associated SUPI to support DualSteer.
 - c) No, making switching granularity at DNN, S-NSSAI level is not aligned with the requirement in the SID.

9 – ZTE Corporation

- 1) Yes
- 2) The associated SUPI
- 3) 3a is not needed. 3b/3c are needed.

10 – Ericsson LM

1. No need, unless AM subs data enhancement is needed to assist in the selection of common SMF the DS PDU sessions.
2. If needed, AM subs data may be enhanced with an indication that the SUPI can be used for - and a reference to the other SUPI belonging to the same DS subscription.
3.
 - a) No explicit indication in AM subscription data is needed.
 - b) Possibly, it depends on the solution for selecting a common SMF.
 - c) No. The SMF can check whether DS is allowed for a PDU Session

11 – NEC Europe Ltd

- 1) Yes
- 2) The following additional information should be included:
 - Dual Steer support flag for both, UE and NW
 - Primary and Secondary SUPI indication
 - Linked SUPI from the UDM.
- 3) Yes to all

12 – Deutsche Telekom AG

- 3.
- a) Yes
- b) yes
- c) yes, in general slice subscription should be per DualSteer Device, i.e. same for both SUPIs.

13 – Deutsche Telekom AG

1. yes.

14 – QUALCOMM Europe Inc. - Italy

1. No
2. N/A
- 3.a. no need in MM signalling to provide extra indication, and this way we can aim at avoiding impact
- 3.b. no, not necessary
- 3.c. No, this should not be part of MM signalling but it should be part of the URSP

15 – Charter Communications

1. No. Mandatory impact to AM subscription should be avoided.
2. N/A
3. No need for such enhancements.

16 – CableLabs

1. No
2. N/A
3. It is solution specific. We do not see it as a mandatory item.

17 – Apple Distribution Intl Ltd

1. Yes.
2. See 3.
3. a) No
- b) Yes
- c) This could be indicated via URSP

18 – Nokia

- I think this needs further evaluation. We first need to agree on
- What policies are delivered to the UE
 - How the policies or rules are delivered to the UE

- Impact on session management and how to select the common SMF/UPF.

Based on the above, we may further need to analyse what would be the impact on registration and related Access and Mobility Subscription data.

19 – ETRI

1. Yes.
2. -
3. a) Yes
b) Yes
c) No, We prefer to allow DualSteer for DNN, S-NSSAI in Network granularity, not UE basis.

Question KI#1.1.4: Session Management Subscription Data for DualSteer

1. Is there a need to enhance the Session Management Subscription Data for DualSteer?
2. If yes to 1), what additional information needs to be added?
3. Should the following information be considered?
 - a) combinations of DNN, S-NSSAI for which traffic switching between the two UEs is applicable along with the selected SMF for the given DNN, S-NSSAI?

Feedback Form 4: Question KI#1.1.4

1 – LG Electronics France

Session Management Subscription Data may contain whether DualSteer PDU Session is allowed for a specific DNN and S-NSSAI.

2 – vivo Mobile Communication Co.

YES to 1)

For 2), an indication that a combination of DNN, S-NSSAI is for traffic switching needs to be added.

It is not clear whether 3.a) is same as Question KI#1.1.5, if yes then 3.a) is preferred, otherwise more clarification is needed for the bullet.

3 – MediaTek Inc.

1. Yes
2. It could be, e.g., an indication indicates that an DNN/S-NSSAI where the UE is allowed to use Dualsteer feature
3. (a) not clear question

4 – Samsung Electronics Co.

1. Yes. There is a need to enhance the SM Subscription Data for DualSteer.
2. DualSteer SM of one SUPI needs to consider the other SUPI's SM. e.g. info whether the PDU Session can be allowed for the same DNN/S-NSSAI via 2ndary SUPI when the PDU session is established via 1st SUPI.
3. e.g.a) for DNN/S-NSSAI, both accesses(i.e. SUPIs) of a DualSteer device can have each PDU Session.

5 – Huawei Technologies R&D UK

1. Yes.
2. The Session Management subscription data needs to include sufficient information to enable correlating PDU session before and after switching.
3. The availability of DualSteer is per service granularity, which is associated to DNN, S-NSSAI, SSC mode, IP address type and so on.

6 – ZTE Corporation

- 1) Yes
- 2) UE context in SMF data is used to correlate the PDU session for the two SUPIs
- 3) Yes

7 – Ericsson LM

1. Yes.
2. A cross-reference between SUPIs belonging to the same DS device (in the SM subscription data).

8 – NEC Europe Ltd

- 1) Yes
- 2) The additional information should include:
 - DualSteer requested
 - Connection ID in order to structure DualSteer
- 3) Yes

9 – InterDigital Communications

1. Yes.
2. the associated SUPI, DNN/S-NSSAI allowed for DualSteer operations, etc.
3. the question is not clear.

10 – Deutsche Telekom AG

1. Yes.
2. some correlation information

11 – QUALCOMM Europe Inc. - Italy

1. enhancements are needed for selecting a UPF in H-PLMN that supports DS
2. No additional information required if DNN/S-NSSAI combination are used to identify DS and select UPF appropriately
- 3.1 yes

12 – Charter Communications

1. Yes
2. Depending on the overall solution. For example, SM subscription data of each SUPI may be enhanced/-configured to pair/link two PDU sessions that can be established by the SUPIs for DualSteer service.
3. Not clear question but what DNNs/S-NSSAIs are allowed in the subscription data of each SUPI for DualSteer PDU session establishments can be enhanced. Such information should be harmonized with the URSP rules sent to each UE/SUPI.

13 – CableLabs

Our goal overall goal is to minimize the impact to support dual steer. In terms of dual steer, we consider this is a multi-access PDU session management process, and thus prefer to limit impact on registration/-subscription data. Moreover, it is noted that a dual steer device should be able to establish one or more single PDU sessions via each SUPI separate from dual steer multi-access PDU session. Based on this our answers are:

- a) Yes,
- b) Information to correlate two PDU sessions (e.g., Linked SUPIs for dual steer session(s), same session ID)
- c) Probably not and it is solution specific.

14 – Apple Distribution Intl Ltd

1. Yes.
2. Information to correlate two PDU sessions (PDU Session ID)
3. a) Yes

15 – Nokia

1. Yes
2. Enhancements needed to select the same SMF
3. Yes

16 – ETRI

1. Yes.
2. correlation information between PDU sessions
- 3 a) yes

Question KI#1.1.5: Is there a need to associate the two PDU session requests from the DualSteer Device in SMF registration information and UE context in SMF data in UDM/UDR?

Feedback Form 5: Question KI#1.1.5

1 – China Telecom Corporation Ltd.

There is a need to associate the two PDU session of same DNN/S-NSSAI from the Dualsteer Device. But if it is the solution that the same SMF is selected for both session, the SMF registration information and UE context of SMF data in the UDM/UDR might not need to be changed.

2 – LG Electronics France

In order to support the same SMF selection, UDM needs to update "UE context in SMF data" subscription data of associated SUPI.

3 – vivo Mobile Communication Co.

YES for AMF selecting same SMF for two PDU Sessions of two SUPIs without AMF impact

4 – MediaTek Inc.

1. It is not clear question

5 – Samsung Electronics Co.

Yes. in case that MAPDUSession is based, in order to have the same SMF b/w two PDU Session, (H)SMF ID/address info and PDU Session ID can be associated in UDM.

6 – Huawei Technologies R&D UK

In general, we believe that Session Management related issues have not been sufficiently progress to allow to formulate conclusive answers to this question.

For the PDU session established for new services (for steering), there is no need to associate any PDU sessions. For switching with service continuity requirement, source PDU session (PDU session before switching) is associated with the target PDU session (PDU session after switching) so that the same SMF/UPF can be selected during switching. After finishing switching, the source PDU session is released.

7 – ZTE Corporation The UE context in SMF data is used to correlate the PDU Sessions.
8 – Ericsson LM The two PDU session requests are associated/linked by including a DS Correlation ID when the SMF registers the PDU Sessions in UDM. The DS correlation ID is provided by the DS device during PDU session establishment procedure from the two SUPIs.
9 – NEC Europe Ltd Yes
10 – InterDigital Communications Yes. A correlation ID that links two PDU Sessions can help DS session management.
11 – QUALCOMM Europe Inc. - Italy Yes
12 – Charter Communications Yes
13 – Apple Distribution Intl Ltd Yes
14 – Nokia We are still evaluating and will provide comment during the 2nd round of NWM discussion
15 – ETRI YES

2.2 Key Issue #1.2 – Round 1 Questions

Question KI#1.2.1: Is it necessary to define when the UE decides to register to a second 3GPP access network and how the UE selects this 3GPP access network?

Feedback Form 6: Question KI#1.2.1

1 – VODAFONE Group Plc Yes. However, the PLMN selection topic is much more for SA1 and CT 1 than for SA2.

<p>2 – LG Electronics France</p> <p>According to SA1 requirement, operator should be able to enable / disable DualSteer service. Therefore, operator should be able to control when to access and which 3GPP access is used by the UE as a second 3GPP access.</p>
<p>3 – vivo Mobile Communication Co.</p> <p>Network selection is in CT1 scope</p>
<p>4 – MediaTek Inc.</p> <p>1. For "when the UE registers to second 3GPP": After primary SUPI is successfully registered to the NW. for "how the UE selects": depends on SA1's feedback for the LS</p>
<p>5 – Samsung Electronics Co.</p> <p>Yes. There may be needed to define a new policy.</p>
<p>6 – OPPO</p> <p>No. PLMN selection is the CT1's scope. UE can decide when to register to the second access (perhaps not for dual steer) based on UE's implementation. The network can decide whether to accept the UE's registration for the second access, but should not control the UE's registration behavior.</p>
<p>7 – Huawei Technologies R&D UK</p> <p>Operator can provide policies to guide the DualSteer Device when to trigger the secondary SUPI registration. However, how the DualSteer Device selects the second 3GPP access network (PLMN/RAT selection) is not in SID scope and will be based on already defined mechanisms.</p>
<p>8 – ZTE Corporation</p> <p>The secondary SUPI registration is triggered by the DualSteer Device. There is no need to define a new policy for it. The stage 2/stage 3 on PLMN selection are defined by CT1.</p>
<p>9 – NEC Europe Ltd</p> <p>Yes, this is needed. The NW can provide the VPLMN selection policy using, for example, the URSP rule or a new DualSteer policy rule.</p>
<p>10 – InterDigital Communications</p> <p>Yes. We believe the device only registers the second 3GPP access when needed. And there is a need to coordinate the access selection between the two SUPIs. For example, they should not select the same 3GPP access in the same PLMN.</p>

11 – QUALCOMM Europe Inc. - Italy

No, we should wait for the LS response by SA1 and the work in CT1 to proceed on this. At this point, there is no need to define in SA2 when the DS device decides to register to the second 3GPP access network.

A mechanism is required for the UE to appropriately select the second 3GPP access network (RAT and PLMN), with the help of SA1 and CT1 (ref. pending LS from Athens SA2 meeting). We believe a mechanism is required to enable the HPLMN to control, when required, when the DS device establishes connectivity to the second 3GPP access network and to influence which RAT and PLMN is selected.

12 – Deutsche Telekom AG

Yes, but this needs to be done by SA1, i.e some clarification of the service requirements for selecting the secondary network/RAT combination is needed, and then by CT1.

13 – Charter Communications

Assuming this question is in the context of primary or secondary UE/SUPI context, which is not preferred by us, some optional enhancements on when a SUPI can register to a 3GPP access. For example, the operator can have relevant policies to have one of the UE/SUPI to start PLMN search at certain geolocation (location criteria).

14 – Apple Distribution Intl Ltd

SA2 should proceed with the assumption that UE decides when to register to second 3GPP access network based on UE's implementation. Whether to define a new policy for network selection, it should be further discussed/decided by SA1/CT1.

15 – Nokia

No.

16 – ETRI

No need for additional policy

Question KI#1.2.2: Is there a need for the DualSteer Device to indicate to the AMF its capabilities to support for DualSteer during registration? The following has been considered:

1. whether it supports simultaneous/non-simultaneous data transfer
2. whether it acts (or can act) as the primary UE or secondary UE?

Feedback Form 7: Question KI#1.2.2

1 – VODAFONE Group Plc

While the SMF might need this information, I'm not sure that the AMF /MME needs it.

2 – VODAFONE Group Plc

While the SMF might need this information, I'm not sure that the AMF /MME needs it.

3 – China Telecom Corporation Ltd.

Yes. There might be different AM policy applied to the SUPI when it is in a "normal" UE or a DualSteer device.

4 – China Telecom Corporation Ltd.

There is no need to define the primary UE or secondary UE.

5 – Deutsche Telekom AG

1.) yes, for UE/AM policies needed.

2) if the subscription does not distinguish between the primary/secondary the UE needs to indicate this in the registration

6 – LG Electronics France

UE needs to indicate its support of DualSteer so that the DualSteer supporting AMF can apply necessary policies to support DualSteer.

7 – vivo Mobile Communication Co.

YES, the device needs to indicate capability to AMF during registration.

Furthermore, the capability also needs to be sent to PCF via AMF transparently.

YES for 1) but No for 2)

The device capability can be sent from AMF (if enhanced) to SMF during PDU Session establishment. It benefits SMF to determine whether to perform DualSteer switching for the device based on the device capability, e.g., for DSDS capable device (do not send indication to AMF), even the two associated SUPIs are used in the device, DualSteer switching may not be activated.

The AMF may be not enhanced, if the H-PCF can receive device capability, it benefits the H-PCF to determine whether to send steering policy to the device, so the capability to (H-)PCF better is included in UE policy container, which is transparent to AMF.

8 – MediaTek Inc.

1. Possible it depends on the content of Dualsteer policy

2. please see the answers to 1.1.1

9 – Samsung Electronics Co.

There is a need for the DualSteer Device to indicate to the AMF its capabilities to support for DualSteer during registration. E.g. in order to select a same SMF between associated PDU Sessions.

1. DS Device is needed to indicate the AMF whether it supports simultaneous/non-simultaneous data transfer.
2. No need to distinguish b/w primary and secondary UEs by specific indication from UE side.

10 – OPPO

It is necessary for the UE to indicate its capability support for dualsteer during registration procedure.

1. Yes.
2. Currently there is no need to distinguish primary and secondary SUPI. If it is decided that the network need this information in future discussion, the UE can indicate this info in registration procedure.

11 – Huawei Technologies R&D UK

1. Yes. The DualSteer Device should indicate to the network this capability so that the network can determine the appropriate policies to apply .
2. The question should be about whether the registering UE reports to the AMF that it is acting as Primary UE or Secondary UE. This reporting is not necessary if the primary and secondary SUPI are marked in the UDM. The AMF should not derive such information from the UE.

12 – ZTE Corporation

- 1) Yes. It can be used by the SMF to determine proper DualSteer policy.
- 2) No, we don't see the need to define primary UE and secondary UE.

13 – Ericsson LM

- 1) No. This information is instead provided during PDU session establishment.
- 2) No. Defining primary and secondary UEs is not necessary in our view.

14 – CableLabs

] It is not necessary to indicate the DS capabilities during registration. As it is shown in our solution we do assume that the DS device capability is advertised to the network during PDU Session Establishment Request. Therefore the answers for both a and b are NO.

15 – NEC Europe Ltd

Regarding 2), it should not matter as the network knows which one is Primary and which Secondary.

16 – InterDigital Communications

1. Yes
2. Though it is necessary to indicate "primary" in the first SUPI registration, the second SUPI registration should indicate it belongs to a DualSteer device and probably other information (e.g. the network ID of the first registration)

17 – QUALCOMM Europe Inc. - Italy

1. no capability indication is required during registration
2. no need to distinguish between primary and secondary, so that if e.g. the connectivity for the first SUPI is lost, the connectivity for the second SUPI becomes "primary".

18 – Charter Communications

YES. There is a need for the DualSteer Device to indicate to the AMF its capabilities to support for DualSteer during registration. For example when AMF receives this information, it can forward to the PCF in order to deliver DualSteer specific UE policies (like URSP rules) for each SUPI.

1. Yes
2. No need to define primary / secondary UE; therefore no need to deliver such information to the AMF.

19 – Apple Distribution Intl Ltd

The DualSteer Device should indicate its DualSteer capabilities to AMF during registration.

- a) Yes. This can be used to provision the relevant policy to the UE.
- b) No. No need to define such concept.

20 – Nokia

We are still evaluating and provide comment in the 2nd round of NWM discussion on whether we need to impact registration procedure.

For 2) our answer is NO.

21 – ETRI

YES, DualSteer capability is to be sent to AMF

- 1) No
- 2) No

Question KI#1.2.3: Is there a need for the AMF to indicate to the DualSteer Device whether the network supports DualSteer during registration?

Feedback Form 8: Question KI#1.2.3

<p>1 – VODAFONE Group Plc</p> <p>Provided that the correlation ID can be passed between UE and HPLMN without changing the AMF, then I haven't seen a need for the AMF to indicate DS support</p>
<p>2 – Deutsche Telekom AG</p> <p>If the solution is similar to ATSSS such indication is needed</p>
<p>3 – LG Electronics France</p> <p>AMF needs to indicate its capability if it supports DualSteer so that UE can perform different behavior to avoid any impact in the VPLMN, e.g. UE can use "exiting PDU Session" in the Request Type instead of using "DualSteer" if VPLM does not support DualSteer.</p>
<p>4 – vivo Mobile Communication Co.</p> <p>YES.</p> <p>It benefits device to determine whether establishing a PDU Session for switching or not (i.e., stay data transmission in old RAT instead of performing DualSteer switching for changing RAT for data transmission) based on the network capability.</p>
<p>5 – MediaTek Inc.</p> <p>1. This depends on solutions.</p>
<p>6 – Samsung Electronics Co.</p> <p>There is a need for the AMF to indicate to the DualSteer Device whether the network supports DualSteer during registration. Based on this indication, DS device can decide 2ndary registration for DS or not.</p>
<p>7 – OPPO</p> <p>Yes.</p> <p>It is necessary when considering the legacy VPLMN support. The dualsteer device can use the dual steer service when at least one of Access Networks supports dual steer service. There are 3 scenarios: a. both access networks support; b. only 1 access network supports; c. both access networks do not support. In a and b, dual steer service can be used, while in c dual steer service is not available.</p>
<p>8 – Huawei Technologies R&D UK</p> <p>Not necessary.</p> <p>If the serving AMF supports the DualSteer, it will transfer the DualSteer Device capability to the UDM, which will be used by the UDM to perform DualSteer authorization. If the DualSteer Device is authorized to use DualSteer (an indication sent from the UDM to the UE via the AMF), it can indicate that the serving network (e.g. serving AMF) supports such capability. Therefore, there is no need to have an additional explicit indication.</p>

9 – ZTE Corporation No
10 – Ericsson LM Yes if a solution with AMF/VPLMN impacts is chosen, e.g. a solution where AMF is enhanced to select DS capable SMF.
11 – NEC Europe Ltd Yes, it can be indicated by a DualSteer-allowed indication.
12 – InterDigital Communications Yes.
13 – QUALCOMM Europe Inc. - Italy Not needed
14 – Charter Communications YES. Based on such indicator from the AMF, the DualSteer Device can decide whether to initiate PDU session establishment procedures with DualSteer specific attributes.
15 – CableLabs Yes, (same as ATSSS) this is the mechanism based on which the device knows that DS is supported by the network and may decide to initiate the DS PDU Session establishment,
16 – Apple Distribution Intl Ltd Yes. Using this indication, the DualSteer Device can decide to proceed with DualSteer procedures.
17 – Nokia If a solution with registration impact is chosen then Yes, the UE needs to be informed. How the UE is informed again depends on solution. In one solution we proposed, the network provides a Reg-ID and this can be taken as an indication that the network supports DS.
18 – ETRI YES

Question KI#1.2.4: Correlation id

1. Is it necessary to perform two separate registration procedures for each of the subscriptions/SUPIs?
2. Should there be a correlation id during registration to correlate the two registrations?
3. If yes to 2), should this correlation id identify each 3GPP access leg uniquely?
4. If yes to 2), would it be allocated by the DualSteer Device and communicated to the network via each UE registered access or would it be allocated by the UDM during UE registration procedure?

Feedback Form 9: Question KI#1.2.4

1 – VODAFONE Group Plc

- 1) (the question is probably mis-written) ONE registration procedure is needed for each SUPI. So 2 SUPIs means 2 registration procedures.
- 2) probably unnecessary if the HSS/UDM knows the attach/detach status of each IMSI/SUPI.
Correlation IDs are probably needed at the Session Mgmt level, not MM level.

2 – China Telecom Corporation Ltd.

1. yes
- 2.

3 – China Telecom Corporation Ltd.

1. yes
2. No, the network can know the registration status of the two SUPI and correlate the status based on the association information of the two SUPIs.

4 – LG Electronics France

For each SUPI, two separate registrations should be performed. But there is no need for correlation id. Subscription data stored in the UDM (indication of Primary SUPI, Secondary SUPI) can be used to differentiate each registration and 3GPP access leg.

5 – vivo Mobile Communication Co.

Yes for 1), No for 2)
For 2), the network is able to correlate the two registrations according to the subscription data, and SUPI can be used by network to distinguish the different leg of the registration.

Are bullet 2) and 3) related with Question KI#1.4.10? If so, better to have these two questions together.

6 – MediaTek Inc.

1. Yes
- 2,3,4: this depends on the solutions

7 – Samsung Electronics Co.

1. Yes. It is necessary to perform two separate registration procedures for each of the subscriptions/SUPIs.
2. No. There need not be a correlation id during registration to correlate the two registrations. The AMFs can get associations of the registrations from the Device or can derive associations of the registrations of the Associated SUPIs from UDM.
3. N/A
4. N/A

8 – OPPO

1. Yes.
2. No. AMF and UDM can manage the association.

9 – Huawei Technologies R&D UK

In order to avoid confusion, I would like to reword the "correlation id" to "Registration Correlation Information" since there is also correlation id mentioned in the questions related session management. In addition, whether this information is an id is not clear and really depends on the purpose. Therefore, we can generalize it as Registration Correlation Information at this stage.

1. Yes. The condition to trigger each SUPI's registration is dependent on operator policies.
2. Yes. But the purpose of using Registration Correlation Information shall be clarified. Firstly, the Registration Correlation Information is used by the DualSteer Device to be aware of that the two SUPIs are associated. Secondly, it can be also used by the UDM to determine that the two SUPIs are used by the same DualSteer Device.
3. No. The Registration Correlation Information is not used to identify each 3GPP access leg uniquely. In terms of whether each 3GPP leg should be identified uniquely, the answer is that this is not needed. Firstly, if there is Primary or Secondary concept for each SUPI, there is no need to use additional id to identify each 3GPP access leg uniquely. Moreover, if DualSteer policy only considers the PLMN/RAT combination to select the 3GPP access leg, there is no need to identify each 3GPP access leg uniquely.
4. Assuming that the Registration Correlation Information is used to recognize that the two SUPIs are used by the same device, the Registration Correlation Information is allocated by the UDM.

10 – ZTE Corporation

- 1) Yes
- 2) No

11 – Ericsson LM

- 1) Yes
- 2) No. The connection between two SUPIs are maintained in UDM and there is no need to communicate additional correlation ID during registration. The AMFs do not need to link the two Registrations.

12 – NEC Europe Ltd

- 1), 2) Yes
- 3) No
- 4) It should be allocated by the UDM.

13 – InterDigital Communications

- 1, Yes.
- 2, Not necessary if the SUPIs are associated in the subscription data.

14 – QUALCOMM Europe Inc. - Italy

1. yes, two separate and independent registration procedures
2. no correlation ID is needed for registration
3. each legs is identified by the corresponding SUPI

15 – Deutsche Telekom AG

1. yes
2. probably yes
3. probably not
4. UDM

16 – Charter Communications

1. Yes. Two separate registrations.
2. No need for correlation id during registration procedures.
3. N/A
4. N/A

17 – CableLabs

- a) Yes (each SUPI needs a separate/independent registration to same or different PLMNs)
- b) Not necessarily, as one SUPI registration can be used for single PDU establishment and/or dual steer PDU, we do not want to enhance registration only for dual steer PDU session
- c) N/A
- d) N/A

18 – Apple Distribution Intl Ltd

1. Yes.
2. Yes. The DualSteer Device gets aware about the network association of the two SUPIs via the correlation id (or correlation information). The network can also verify the two SUPIs are used by the same DualSteer Device when the correlation id is returned by the DualSteer Device via the second registration.
3. No. The access legs can be identified by the SUPI.
4. Allocated by the UDM during UE registration procedure.

19 – Nokia

1. Yes. These are 2 independent UEs and hence shall perform 2 independent registrations
2. There is no need for a common correlation ID for the 2 registration. However, each registration (i.e. access leg) can be identified by a unique Reg-ID
3. YES. SUPI cannot be used in the rules to identify the access leg. hence a new Id is needed.
4. Neutral. Prefer DS device allocating the Reg-ID (may or may not communicate to the network, depends on solutions agreed)

20 – ETRI

1. YES
2. YES
3. unique only in DualSteer Device
4. both UE and UDM are possible. We prefer to UE's allocation.

Question KI#1.2.5: Should the DualSteer device provide assistance information (e.g., the available PLMNs, additional RATs, UE location) to the network after registering its first SUPI to help registering the second SUPI (e.g. selecting a PLMN for it)?

Feedback Form 10: Question KI#1.2.5

1 – LG Electronics France

No. Network can provide policies which contains prioritized list of preferred PLMNs/RATs and based on the policy, UE can perform registration to the available network.

2 – vivo Mobile Communication Co.

Network selection is in CT1 scope.

3 – MediaTek Inc.

1. Yes

<p>4 – Samsung Electronics Co.</p> <p>Yes. The DualSteer device should provide assistance information (e.g., the available PLMNs, additional RATs, UE location) to the network after registering its first SUPI to help registering the second SUPI (e.g. selecting a PLMN for it). But maybe new kinds of policy should be defined.</p>
<p>5 – OPPO</p> <p>No. Network selection is in CT1 scope.</p>
<p>6 – Huawei Technologies R&D UK</p> <p>No. It is assumed that no impact on PLMN/RAT selection. If there is requirement from SA1 to enhance PLMN/RAT selection, it is CT1 responsibility to specify it. This is out of SA2 scope.</p>
<p>7 – ZTE Corporation</p> <p>No</p>
<p>8 – NEC Europe Ltd</p> <p>No. The correlation should be done during the registration procedure.</p>
<p>9 – InterDigital Communications</p> <p>No. This radically changes existing PLMN selection mechanism without justification.</p>
<p>10 – QUALCOMM Europe Inc. - Italy</p> <p>no, no need for this</p>
<p>11 – Deutsche Telekom AG</p> <p>No</p>
<p>12 – Charter Communications</p> <p>No. The operator can provide relevant policies for each SUPI .</p>
<p>13 – Apple Distribution Intl Ltd</p> <p>No.</p>
<p>14 – Nokia</p> <p>No. Not needed.</p>

15 – ETRI

No. the assistance information may be changed after the registration of the first SUPI

Question KI#1.2.6: Should there be impact on AMF for Registration? For no AMF impact, it could be based on e.g. SMF redirection and it needs homogeneous deployment of SMFs that support DualSteer for a DNN/S-NSSAI.

Feedback Form 11: Question KI#1.2.6

1 – China Telecom Corporation Ltd.

For PLMN that supports DualSteer, the AMF can select the SMF based on the subscription data. And for PLMN not supporting DualSteer, the SMF redirection may be needed.

2 – LG Electronics France

UE and AMF need to negotiate capability so that UE can determine whether to operate as a DualSteer device. There should be impact to the AMF. However, e.g. in case of HPLMN + VPLMN case, if VPLMN does not support DualSteer, legacy procedure can be re-used to avoid VPLMN impact.

3 – vivo Mobile Communication Co.

No impact on AMF for AMF selecting SMF selection, this can ensure that even VPLMN does not support DualSteer, the basic functionalities of the DualSteer feature still is applicable.

SMF redirection (HTTP or SBA operation redirection) and modify “UE context in SMF” subscription data are three possible methods for SMF selection without AMF impact.

It is not clear of the question whether the impact is for SMF selection or other aspects. If it is for SMF selection, the question needs to be clarified whether it means, e.g., “should there be impact on AMF for **SMF selection**?”. This question has relationship with Question KI#1.1.4 and Question KI#1.1.5, better to have these questions together.

4 – MediaTek Inc.

1. Yes

5 – Samsung Electronics Co.

Yes. There should be impact on AMF for Registration. There need not be a correlation id during registration to correlate the two registrations. The AMFs can get associations of the registrations from the Device or can derive associations of the registrations of the Associated SUPIs from UDM.

One SUPI’s AMF may get SMF registration info and UE context of the other UE from UDM.

6 – OPPO

UE and AMF need to negotiate capability so that UE can determine whether to trigger dual steer service. There should be impact to the AMF in PLMN supporting dual steer service. For legacy VPLMN, AMF impacts can be avoided. The main procedures can take place in the leg supporting dual steer service and the legacy VPLMN just act without enhancements.

7 – Huawei Technologies R&D UK

Firstly, Session Management related issues are not mature.

Secondly, since it is inevitable to enhance AMF in order to support DualSteer feature in Registration procedure e.g. the AMF shall be able to derive DualSteer subscription to enable the DualSteer Device to perform DualSteer traffic steering or DualSteer traffic switching and to enforce registration policy regarding the second Registration, enhancements on AMF to support DualSteer can be considered.

8 – ZTE Corporation

No impact on AMF for Registration.

The SMF selection is in PDU Session establishment. The AMF is enhanced to select a proper SMF based on the DualSteer request indication from UE.

9 – Ericsson LM

The AMF impact should be avoided or be kept minimal. We are open to solutions with no AMF impacts and SMF redirection.

10 – NEC Europe Ltd

Yes

11 – InterDigital Communications

AMF impact should not be considered as a critical factor for solution evaluation.

12 – QUALCOMM Europe Inc. - Italy

no impact on AMF to avoid impacts on VPLMN

13 – Deutsche Telekom AG

AMF impact is not really avoidable.

14 – Charter Communications

YES. Similar to the reply to the question KI#1.2.3, the AMF should be impacted.

<p>15 – Apple Distribution Intl Ltd</p> <p>Yes. UE and AMF should negotiate their capabilities. Once UE gets aware about the network association of the two SUPIs, the UE can decide to operate as a DualSteer Device.</p>
<p>16 – Nokia</p> <p>We are still evaluating and need more time to comment</p>
<p>17 – ETRI</p> <p>YES</p>

2.3 Key Issue #1.3 – Round 1 Questions

Question KI#1.3.1: Should DualSteer PDU Session re-use the principles of MA PDU session?

Feedback Form 12: Question KI#1.3.1

<p>1 – China Telecom Corporation Ltd.</p> <p>For simultaneous case, the principle of MA PDU session can be reused.</p>
<p>2 – LG Electronics France</p> <p>Yes, e.g. if overlay-underlay architecture is used, DualSteer can be supported while minimizing system impacts.</p>
<p>3 – vivo Mobile Communication Co.</p> <p>If optionally supported and used for DualSteer, no strong opinion whether to specify some method that re-use the principle of MA PDU session.</p> <p>If mandate for DualSteer, then No.</p>
<p>4 – MediaTek Inc.</p> <p>1. it is not clear question.</p>
<p>5 – Samsung Electronics Co.</p> <p>DualSteer PDU Session can re-use the principles of MA PDU session. Simple PDU Session switch can also be supported similarly to 3GPP-Non-3GPP handover.</p>

6 – OPPO

It is clear that there are at least two alternative mechanisms for dual steer. One is PDU Session level switching/steering, the other is MA PDU Session-like data flow level switching/steering. MA PDU Session principles are not necessary for the first mechanism but necessary for the second mechanism. We prefer the first mechanism but we can live with the second mechanism as an optional way forward.

7 – ZTE Corporation

We prefer not to reuse MA PDU session since MA PDU session is used for single UE. We prefer to use two separated PDU sessions for DualSteer handling.

8 – Huawei Technologies R&D UK

Firstly, the question is not correct and not clear since **we do not have any agreed terminology of "DualSteer PDU Session"**. The question should be reworded to "Should PDU Session established to support DualSteer traffic steering or PDU Session established to support DualSteer traffic switching re-use the principles of MA PDU session?"

The answer is:

Session Management related issues are not mature.

The question asked is not correct. Solution #1.4, #1.13 are reusing ATSSS, while some others are inspired by ATSSS but could be implemented without the burden of the format of ATSSS.

The principle of MA PDU session is to establish two legs under the same SUPI for data transmission and both two legs are active.

It should be noted that this approach cannot work in single UE case since DualSteer Device in single UE case cannot support simultaneous transmission.

For DualSteer traffic steering, the DualSteer Device just select one UE to transmit the new service. There is no need to trigger two PDU session establishments for the new service since one service will only be transmitted via one 3GPP access according to the SID scope. Therefore, **from DualSteer traffic steering perspective, only one PDU session will be selected for service transmission and there is no need to associate any two PDU sessions.**

For DualSteer traffic switching, two PDU sessions are required and need to be associated. This happens during the switching procedure. The same UPF and SMF are selected to ensure that the same anchor is used after switching so that service interruption can be minimized. **After switching, the source PDU session is not used for the service transmission and can be released in result.**

Therefore, to support either DualSteer traffic steering or DualSteer traffic switching, there is no need to keep two associated PDU sessions actively. Hence, the principle of MA PDU session is not needed.

Moreover, if the principle of MA PDU session is reused, a number of issues will have to be addressed:

- 1) whether a common SM policy association and common N4 session shall be used for the two associated PDU sessions? How to design such common SM policy and N4 session rules? If two separate SM policy associations and N4 sessions are used, how to steer the traffic in both UL and DL based on two separate rules?
- 2) how to determine when to trigger the establishment of the associated PDU session? Does it mean both network and DualSteer Device shall maintain double resource for the services transmission?
- 3) How this solution work with single UE case?

9 – Ericsson LM

Yes, principles can be re-used. Although splitting is not within the scope, some of the ATSSS steering modes (e.g., Active-Standby) can be used to facilitate the DS feature.

10 – CableLabs

Yes, re-using the principles of MA PDU session is the straight forward way to provide a solution for DualSteer PDU Session.

11 – NEC Europe Ltd

Yes, but there should be two different regular PDU Sessions.

12 – InterDigital Communications

The question is too vague. Some MA PDU Session mechanisms can certainly be re-used, such as enhanced ATSSS rules, steering functionalities, steering mode, PMF measurements, etc. but not everything.

13 – QUALCOMM Europe Inc. - Italy

partially. We should use the terms DS Session, being composed of two PDU sessions (can be regular PDU sessions) correlated and corresponding to two different SUPIs, each PDU session on a different RAT/-PLMN.

14 – Charter Communications

Yes. Some principles can be used, such as same anchor SMF/UPF, common N4 session, ATSSS-like rules.

15 – Apple Distribution Intl Ltd

Yes. The PDU Session established to support DualSteer traffic steering & switching can re-use some of the principles of MA PDU session. Since splitting is not in scope, only some of the ATSSS steering modes (e.g., Active-Standby) are applicable to DualSteer.

16 – Nokia Yes. re-using principles of MA PDU Sessions would be simpler.
17 – ETRI Not clear, DualSteer incorporates possibly two PLMNs, while ATSSS is for a single PLMN

Question KI#1.3.2: Can MA PDU Session be used directly for dual 3GPP accesses based on using e.g. the overlay-underlay architecture?

Feedback Form 13: Question KI#1.3.2

1 – LG Electronics France Yes. Using overlay-underlay architecture enables DualSteer feature while minimizing system impacts.
2 – vivo Mobile Communication Co. This method is not in the scope, if device supports the solution and network deployed N3IWF, existing method can be used, which is not DualSteer but MA PDU Session over both 3GPP and non-3GPP access.
3 – MediaTek Inc. 1. it depends on the solutions
4 – Samsung Electronics Co. No. MA PDU session cannot be used directly.
5 – ZTE Corporation No
6 – Huawei Technologies R&D UK Firstly, the question is not correct since the MA PDU session is not over dual 3GPP accesses. From PLMN perspective, the MA PDU session is over one 3GPP access and one Non-3GPP access. Therefore, the question should be reworded to: ”Can MA PDU Session be used directly for over two UEs based on using the overlay-underlay architecture?” The answer is: Session Management related issues are not mature.

<p>Sol#1.4 can be a possible option but it still requires to support the operator policies as per SA1 requirements.</p>
<p>7 – Ericsson LM</p> <p>Yes, this is a simple and straight-forward solution. The connection between the underlay and overlay network should not be restricted to only using N3IWF as is depicted in Sol#1.4, but any connectivity option defined for how to activate a leg over an underlay may also be used (e.g., ePDG).</p>
<p>8 – CableLabs</p> <p>No, Updates for the MA PDU Session may be needed as we show in our proposed solution.</p>
<p>9 – InterDigital Communications</p> <p>From both UE and network perspective the traffic steering and switching is between 3GPP access and non-3GPP access. It's not clear whether it can address all DualSteer requirements. We should not aim to define multiple mechanisms and we don't think this is the mainstream approach.</p>
<p>10 – QUALCOMM Europe Inc. - Italy</p> <p>No because MA PDU session applies to a single UE (SUPI).</p>
<p>11 – Charter Communications</p> <p>No. The solution based on overlay-underlay architecture seem to require 3 different PDU sessions that makes it more compute heavy.</p>
<p>12 – Apple Distribution Intl Ltd</p> <p>Yes. This architecture could enable DualSteer with minimalistic system impacts. The solution needs to accommodate the two SUPIs of the DualSteer Device.</p>
<p>13 – Nokia</p> <p>No. MA PDU Session applies to a single UE and with this solution we now have 3 access legs from 2 SUPIs.</p>
<p>14 – ETRI</p> <p>No</p>
<p>15 – Deutsche Telekom AG</p> <p>Yes, it can be an the only or an additional solution which should be specified. (sorry for late comment)</p>

Question KI#1.3.3: Correlation id

1. Is it necessary to perform twoseparate PDU Session establishments for each of the subscriptions/SUPIs?

2. Should there be a correlation id defined to correlate the two PDU Session establishment?
3. If yes to 2), should this correlation id identify each 3GPP access leg uniquely?
4. If yes to 2), would it be allocated by the DualSteer Device and communicated to the network via each UE registered access or would it be allocated by the UDM during PDU Session establishment procedure?
5. If yes to 2), would the correlation id be unique per S-NSSAI and DNN combination?

Feedback Form 14: Question KI#1.3.3

1 – China Telecom Corporation Ltd.

- 1) The two PDU Session for each of the SUPIs can be established respectively, but the mechanism that correlates the two PDU Session is needed.
- 2) open
- 3) It depends on what the correlation id is used for. If the correlation id is used to correlate the two separate PDU Sessions for each of the SUPIs, there is no need to identify each 3GPP access leg uniquely.

2 – LG Electronics France

two separate PDU Session establishment is necessary but there is no need to define correlation id. Existing PDU Session ID can be reused to associate two PDU Sessions in the UE and network.

3 – vivo Mobile Communication Co.

Yes for 1), No for 2)
The associated two (DNN, S-NSSAI) combinations or same (DNN, S-NSSAI) combination for two PDU Sessions for switching can be configured in subscription data. SMF can associate the two PDU Sessions base on subscription data.

4 – MediaTek Inc.

1. it depends on the solutions
2. it can be addressed by SM subscription data. Possible No
3. skip
4. skip
5. skip

5 – Samsung Electronics Co.

1. Yes
2. No. There need not be a correlation id to correlate the two PDU Session establishment. The AMF(s)/SMF(s) can get associations of the two PDU Session establishment from the Device or can derive the associations of the two PDU Session establishment of the Associated SUPIs from UDM.

PDU Session ID should be shared between two SUPIs within a DS device.

3. N/A
4. N/A
5. N/A

6 – OPPO

1. Yes.
2. Perhaps PDU Session ID can be reused.

7 – ZTE Corporation

- 1) Yes.
- 2) Yes. two PDU Sessions can use same PDU Session ID therefore the AMF can select same SMF for the secondary PDU Session.

8 – Huawei Technologies R&D UK

Firstly, the question should be reworded to "Session Correlation Information" since there is also another correlation id mentioned in the question related to registration aspect, which is not clear and confusing. Secondly, whether this information is an id is not clear and depends on purpose. Therefore, we can just generalize it as "Session Correlation Information" at this stage to avoid confusion.

Answer for question 1:

Session Management related issues are not mature.

It is never necessary to perform two separate PDU session establishments over two 3GPP accesses to support a single service. To support multiple services, this depends on the DualSteer Device capability and the policy for DualSteer traffic steering. If the DualSteer Device capability cannot support simultaneous transmission, PDU session establishment over two subscriptions/SUPIs is not applicable.

Even the DualSteer Device can support simultaneous transmission, if the policy for DualSteer traffic steering does not enable simultaneous transmission, the DualSteer Device cannot establish two PDU session establishment for each of the subscriptions/SUPIs.

Answer for question 2:

Session Management related issues are not mature.

The second PDU session establishment is executed as part of DualSteer traffic switching, which is not in parallel with the first PDU session establishment. The two PDU sessions are not maintained simultaneous for DualSteer.

The Session Correlation Information could be a possible option to enable serving AMF select the same SMF/UPF for DualSteer traffic switching.

Answer for question 3:

Session Management related issues are not mature.

The Session Correlation Information in this case is not used to identify two 3GPP access legs but to identify which source PDU session needs to be replaced by the target PDU session for DualSteer traffic switching so that the same SMF and UPF are selected.

Answer for question 4:

Session Management related issues are not mature.

The Session Correlation Information is allocated by anchored SMF to the UE which will be sent by the other UE to the network in order to select the same anchored SMF for DualSteer traffic switching.

Answer for question 5:

Session Management related issues are not mature.

The Session Correlation Information should allow the network to identify the SMF of the source PDU session which needs to be replaced by the target PDU session for DualSteer traffic switching.

9 – Ericsson LM

- 1) Yes
- 2) Yes
- 3) No, the correlation ID provided in the two PDU session requests should be identical.
- 4) Allocated by DS device, similar to how PDU Session ID is allocated by UE
- 5) The correlation ID should be unique per each SUPI that is used for the corresponding PDU Sessions, to ensure that the combination of DS Correlation ID and each SUPI is unique.

10 – CableLabs

The following answers may refer to specific solutions captured in the TR. Please find our answers below:

- a. YES in our view it is necessary that the DS Session initiates two separate PDU Session Requests, one for each SUPI.
- b. Our solution proposes using PDU session ID as a correlation ID instead of introducing a new correlation ID.
- c. N/A as we prefer to reuse PDU session ID.
- d. N/A

e. N/A
11 – NEC Europe Ltd 1), 2) Yes 3) No 4) Allocated by the UDM when the UE registers. 5) No.
12 – InterDigital Communications 1. Yes. 2. Yes. 3. The question is not clear to us. 4. Both options are possible. 5. Yes
13 – QUALCOMM Europe Inc. - Italy 1. yes 2. no need for a correlation ID if the two SUPIs are correlated in the UDM. 3. corresponding SUPI identifies each leg uniquely 4. N/A 5. no need for a correlation ID unique to S-NSSAI/DNN combination
14 – Deutsche Telekom AG 1. No, one separate PDU Session establishment for each of the subscriptions/SUPIs is the maximum acceptable number of PDU sessions. 2. No. 3.-5. N/A
15 – Charter Communications YES, in principle, some kind of correlation between the PDU sessions established over each 3GPP access legs is preferred. The method depends on the solution, i.e., there are different solutions captured in the TR that use “Correlation ID” or “DualSteer ID” , etc. 1. YES 2. YES 3. unclear 4. Depends on the solution. Such correlation ID can be provided to the UE as part of the URSP rules sent to each SUPI/UE. 5. Depends on the solution as per 4 above. Please also note that depending on an operator’s use case the URSP rules (as per solution 6.1.5) can be configured such that the DualSteer Device may need to

establish multiple DualSteer PDU session with two 3GPP legs. Each need to be identified with some kind of correlation ID.

16 – Apple Distribution Intl Ltd

1. Yes
2. No need for a separate correlation id to correlate the two PDU Session establishment. PDU Session ID can be shared between two SUPIs of the DualSteer device.
3. N/A
4. N/A
5. N/A

17 – Nokia

1. YES
2. There is no need to define a new correlation ID. Since the 2 UEs establish 2 different PDU Session, the UE can use the PDU Session ID of the other UE as the linked PDU Session ID
3. Each 3GPP access leg can be identified by a unique ID assigned/shared during registration
4. Neutral. Prefer the approach where the DS device allocates the ID
5. NO

18 – ETRI

1. YES
2. YES
3. Required to be only unique per DualSteer Device basis.
4. We prefer UDM's allocation
5. No

Question KI#1.3.4: Can the two PDU Session establishment requests use the same PDU Session ID and not rely on correlation id?

Feedback Form 15: Question KI#1.3.4

1 – LG Electronics France

Yes, the same PDU Session ID can be used to associate two PDU Sessions in the UE and network.

2 – vivo Mobile Communication Co.

No strong opinion on whether same PDU Session ID is used, but using same PDU Session ID simplifies network to manage the association of the two PDU Sessions.

<p>3 – MediaTek Inc.</p> <p>1. Possible</p>
<p>4 – Samsung Electronics Co.</p> <p>Same PDU session ID or independent PDU session ID/SUPI can be used to identify the association.</p>
<p>5 – OPPO</p> <p>Possible.</p>
<p>6 – ZTE Corporation</p> <p>Yes</p>
<p>7 – Huawei Technologies R&D UK</p> <p>Firstly, the question is not clear. It should be reworded to "Can the target PDU Session establishment request reuse the same PDU Session ID as the source PDU session and not rely on Session Correlation Information?"</p> <p>The answer is:</p> <p>Session Management related issues are not mature.</p> <p>The Session Correlation Information could be the PDU session ID of the source PDU session but it is not flexible and it would be difficult to ensure the two UEs will allocate the same PDU session ID for the PDU sessions which are associated. Alternatively, specific PDU session IDs are reserved for PDU sessions used for DualSteer traffic switching.</p>
<p>8 – Huawei Technologies R&D UK</p> <p>It seems that the questions related to Session Management imply that two PDU sessions shall be pre-established no matter when the DualSteer traffic switching is performed. However, Session Management related issues are not mature and not all solutions require such pre-establishment of PDU sessions for potential services switching. Therefore, following question should be added in the second round.</p> <p>Question KI#1.3.4a: Whether there is a need to pre-establish the PDU session for potential services switching?</p>
<p>9 – Ericsson LM</p> <p>If the same PDU session ID can be assigned to both PDU session requests, then the correlation ID is not needed. The DS device would however need to ensure that the common PDU Session ID is unique per both SUPI1 and SUPI2.</p>

<p>10 – CableLabs</p> <p>Yes, please see our solution 1.12.</p>
<p>11 – NEC Europe Ltd</p> <p>No.</p>
<p>12 – InterDigital Communications</p> <p>In our view, this would depend on the level of coordination between the two UEs. If there is little coordination, since the PDU Session ID is chosen independently by the two UEs, it would be difficult to use it as a correlation ID.</p>
<p>13 – QUALCOMM Europe Inc. - Italy</p> <p>this is not useful nor necessary</p>
<p>14 – Deutsche Telekom AG</p> <p>No</p>
<p>15 – Charter Communications</p> <p>As per our reply to KI#1.3.3, some kind of correlation ID is preferred, regardless the PDU sessions can have the same or different PDU Session IDs.</p>
<p>16 – Apple Distribution Intl Ltd</p> <p>Yes.</p>
<p>17 – Nokia</p> <p>NO. These are 2 independent PDU Sessions and hence shall also have 2 different PDU Session IDs. The UE may additionally provided the linked PDU Session ID of the other SUPI if available.</p>
<p>18 – ETRI</p> <p>Possible, but not preferred.</p>

Question KI#1.3.5: Should the PDU Session establishment include the Linked SUPI information?

Feedback Form 16: Question KI#1.3.5

<p>1 – China Telecom Corporation Ltd.</p> <p>No, the network already maintain the linked SUPI information if the network supports DualSteer feature, and there is no need to let the device send the linked SUPI information. Meanwhile, the security issue of</p>

sending SUPI information directly also needs SA3 to evaluate.

2 – LG Electronics France

No, subscription data should contain associated SUPI so there is no need to include Linked SUPI information during the PDU Session Establishment.

3 – vivo Mobile Communication Co.

No.

Considering the answer to Question KI#1.3.3, SMF is able to know the linked SUPI based on subscription.

4 – MediaTek Inc.

1. No

5 – Samsung Electronics Co.

The linked SUPI can be obtained either from the UE or the UDM. If the PDU Session establishment does not include the Linked SUPI information, Network itself can derive the linked SUPI from SM subscription data.

6 – ZTE Corporation

No. The AMF can receive the linked SUPI from the UDM.

7 – OPPO

Possible but not necessary. The AMF can derive the linked SUPI from the UE context or subscription data. But it is likely that the SMF need this info to identify the linked SUPI's PDU Session.

8 – Huawei Technologies R&D UK

Session Management related issues are not mature.

Not needed. The 5GC is aware that the two SUPIs are associated. There is no need to provide the linked SUPI information in the PDU session establishment. Instead, the UE shall provide the indication that the PDU session is established for DualSteer traffic switching.

9 – Ericsson LM

No, in our view the linkage between SUPIs is part of the subscription data and can be retrieved by the NFs from UDM.

10 – CableLabs It is solution specific. As mentioned in the previous answers it may be needed based on the adopted solution.
11 – NEC Europe Ltd No.
12 – InterDigital Communications The linked SUPI information is not necessary if the UEs include a correlation ID
13 – QUALCOMM Europe Inc. - Italy not necessary if the correlation is in UDM
14 – Deutsche Telekom AG No
15 – Charter Communications YES. Providing such information in the PDU session establishment will assist AMF to select the same anchor SMF for both PDU sessions.
16 – Apple Distribution Intl Ltd No.
17 – Nokia The UE need not provide linked SUPI. It can only provide linked PDU Session ID if available. The linking of SUPI is done at subscription level. One UE/SUPI shall not be made aware of the SUPI of the other UE.
18 – ETRI No. it can be found in the UDM.

Question KI#1.3.6: Should the DualSteer device include DualSteer capabilities in the PDU Session establishment, e.g., supported steering functions (MPTCP, MPQUIC, DS-LL), supported steering modes (e.g., Active-Standby, etc.), and support for simultaneous or non-simultaneous data transfer?

Feedback Form 17: Question KI#1.3.6

1 – KDDI Corporation Yes. As with the MA PDU Session, capability information is essential for setting appropriate policies.

2 – China Telecom Corporation Ltd.

Yes. The capability of supporting simultaneous or non-simultaneous transmission is needed. Based on the capability information, the network can decide whether to accept or reject the PDU Session establishment request when there is existing PDU Session for the DualSteer device over the other 3GPP access.

3 – LG Electronics France

DualSteer needs to include capabilities (e.g. steering functions) but there is no need to indicate whether it supports simultaneous or non-simultaneous data transfer. Network can generate preferred policies and UE can send traffic over single access if UE does not support simultaneous data transmission.

4 – vivo Mobile Communication Co.

It is one of the MA PDU session principles, see the answer to Question KI#1.3.1. I.e., optional OK mandatory NO.

5 – MediaTek Inc.

1. this depends on the solutions

6 – Samsung Electronics Co.

Yes. DualSteer device has to indicate DualSteer capabilities for network to derive the related policies.

7 – ZTE Corporation

Similar as MA PDU session:

- 1) The UE provides DualSteer capability to AMF during registration procedure.
- 2) The UE sends DualSteer Request to AMF in the PDU session establishment request.

8 – Huawei Technologies R&D UK

Session Management related issues are not mature.

No. DualSteer Device capability should be communicated as part of Registration procedure which is used by the HPLMN to provide appropriate policies to support DualSteer.

Additionally, **there is no need to support MPTCP, MPQUIC, DS-LL, etc because splitting is not supported in any scenario.**

Secondly, **there is no steering mode in DualSteer** because for traffic steering, when the new service is coming from the application, the DualSteer Device only needs to select one 3GPP access leg for data transmission. This happens before UE determining whether establishing a new PDU session or reuse an existing PDU session, which means **the policy for DualSteer traffic steering is a UE policy**. Therefore, there is no need to report such steering mode capability.

<p>Thirdly, the support for simultaneous or non-simultaneous data transfer is a device capability but not session level. This should be provided during Registration procedure which is used by the HPLMN to provide appropriate policies to support DualSteer.</p>
<p>9 – OPPO</p> <p>For MA PDU Session related capabilities it can be optional if MA PDU Session like way forward is adopted as optional way forward. For simultaneous-transmission capability, this should be a UE level capability and this will be indicated in registration request and not indicated in PDU Session establishment request.</p>
<p>10 – Ericsson LM</p> <p>Yes</p>
<p>11 – CableLabs</p> <p>Yes.</p>
<p>12 – NEC Europe Ltd</p> <p>Yes.</p>
<p>13 – InterDigital Communications</p> <p>Yes.</p>
<p>14 – QUALCOMM Europe Inc. - Italy</p> <p>yes</p>
<p>15 – Deutsche Telekom AG</p> <p>No</p>
<p>16 – Deutsche Telekom AG</p> <p>No, capabilities should be within registration.</p>
<p>17 – Charter Communications</p> <p>Yes</p>
<p>18 – Apple Distribution Intl Ltd</p> <p>Yes.</p>
<p>19 – Nokia</p> <p>In our view there is no steering mode needs to be defined (as MPQUIC or MPTCP etc cannot be supported). Hence no such negotiation needed at PDU Session establishment.</p> <p>The UE may provide indication of whether simultaneous data transfer is supported, if such negotiation is not done at registration</p>

20 – ETRI

It depends on the solutions.

Question KI#1.3.7: Should the DualSteer device include an indication in the PDU Session establishment whether the PDU session is applicable for potential DualSteer switching?

Feedback Form 18: Question KI#1.3.7

1 – KDDI Corporation

Yes, because it affects policy settings. For example, the network needs to notify switching conditions for sessions with the possibility of switching.

2 – China Telecom Corporation Ltd.

Yes, only the PDU Sessions for DualSteer switching or potential switching needs to be correlated. In other word, there is no need to correlate the PDU Session for steering.

3 – LG Electronics France

No need to indicate potential DualSteer switching. DualSteer PDU Session can be used for both steering and switching.

4 – vivo Mobile Communication Co.

No.

If the two PDU Sessions are configured not for switching in subscription data, device can perform switch over application layer via the two PDU Sessions, network is not necessary to be aware of the purpose.

If the two PDU Sessions are configured for switching in subscription data, SMF is aware of it based on subscription data and simultaneous transmission is not allowed by SMF for the two PDU Sessions, i.e., the two PDU Sessions are only allowed to perform switching, the switch indication from device to network also is not needed.

5 – MediaTek Inc.

1. Yes

6 – Samsung Electronics Co.

Yes. However, even if the DualSteer device does not include an include an indication in the PDU Session establishment whether the PDU session is applicable for potential DualSteer switching, the each PDU session is applicable for DS switching depending on each SUPI's URSP and SM policy.

<p>7 – ZTE Corporation</p> <p>Yes. The UE provides DualSteer Request indication in the PDU Session Establishment request message.</p>
<p>8 – Huawei Technologies R&D UK</p> <p>Session Management related issues are not mature.</p> <p>Yes. If the related operator policy indicates that the PDU session established can be subject to DualSteer traffic switching, the DualSteer Device includes the indication in the PDU Session establishment. Based on the indication, AMF can select a SMF supporting DualSteer. For the PDU session which is applicable for potential DualSteer traffic switching, the UDM will record the SMF information which will be provided to the serving AMF of the target UE for switching so that when the DualSteer traffic switching is triggered, the serving AMF of the target UE will select the same SMF to perform DualSteer traffic switching.</p>
<p>9 – OPPO</p> <p>Yes. It is helpful when there is a need to switch the PDU Session from the leg supporting dual steer to the leg in legacy VPLMN.</p>
<p>10 – Ericsson LM</p> <p>Yes</p>
<p>11 – NEC Europe Ltd</p> <p>Yes.</p>
<p>12 – QUALCOMM Europe Inc. - Italy</p> <p>yes</p>
<p>13 – InterDigital Communications</p> <p>If DNN/S-NSSAI indicates whether it's applicable for switching then there is no need for UE indication in PDU Session request.</p>
<p>14 – Deutsche Telekom AG</p> <p>yes.</p>
<p>15 – CableLabs</p> <p>No, the network has the capability to decide in providing steering only or both without an explicit notification from the terminal device.</p>

<p>16 – Charter Communications</p> <p>No. DualSteer PDU sessions are used for both steering and switching.</p>
<p>17 – Apple Distribution Intl Ltd</p> <p>Yes. Such indication could have an impact on network’s decision whether to anchor the session at the same SMF/UPF.</p>
<p>18 – Nokia</p> <p>Yes</p>
<p>19 – ETRI</p> <p>Yes, DualSteer indication can be used as potential DS switching indication.</p>

Question KI#1.3.8: Is there a need to use specific DNNs/S-NSSAIs for DualSteer PDU Session establishment?

Feedback Form 19: Question KI#1.3.8

<p>1 – China Telecom Corporation Ltd.</p> <p>Yes, the DualSteer PDU Session needs the DNN/S-NSSAI that supports DualSteer feature.</p>
<p>2 – LG Electronics France</p> <p>Yes. URSP rule indicates whether DualSteer is preferred for a service. Based on the URSP rule, UE needs to include DNN/S-NSSAI of matched RSD to establish DualSteer PDU Session.</p>
<p>3 – vivo Mobile Communication Co.</p> <p>No.</p> <p>Which DNN/S-NSSAI is used for DualSteer depends on configuration in subscription data. All the SMFs serving the DNN/S-NSSAI for DualSteer Switching need to be enhanced.</p>
<p>4 – MediaTek Inc.</p> <p>1. yes</p>
<p>5 – Samsung Electronics Co.</p> <p>Yes. There is a need to use specific DNNs/S-NSSAIs for DualSteer PDU Session establishment.</p>

<p>6 – ZTE Corporation</p> <p>No. The DualSteer can be applicable for any DNN/S-NSSAI</p>
<p>7 – Huawei Technologies R&D UK</p> <p>Session Management related issues are not mature.</p> <p>Whether to restrict that DualSteer feature is applied to certain DNNs/S-NSSAIs should be based on operator policies but the feature should work for any DNN/S-NSSAI that the operator wants, e.g. deployment where only one DNN/S-NSSAI is used for all services.</p>
<p>8 – OPPO</p> <p>Specific DNN/S-NSSAI for dual steer service is beneficial. But this can be optional according to operator's demand.</p>
<p>9 – Huawei Technologies R&D UK</p> <p>The question should avoid using the terms of "DualSteer PDU session" which is not clear and confusing since there is no such definition. The rewording suggestion is:</p> <p>"Is there a need to use specific DNNs/S-NSSAIs for PDU Session supporting DualSteer feature?"</p>
<p>10 – Ericsson LM</p> <p>This is not necessary. An indication can be added to the PDU session establishment request to show that the PDU session can be used for DS and the two PDU session requests can be connected via a correlation ID instead of a DNN/S-NSSAI. SM subscription data can indicate whether a DNN/S-NSSAI is authorized to use DS.</p>
<p>11 – NEC Europe Ltd</p> <p>Yes.</p>
<p>12 – QUALCOMM Europe Inc. - Italy</p> <p>yes, this would simplify SMF selection in case non-homogeneous DS support is provided by the SMFs</p>
<p>13 – InterDigital Communications</p> <p>Yes</p>
<p>14 – Deutsche Telekom AG</p> <p>No, no need of such restriction. As the subscription profile needs to be shared according to SA1 requirements the two subscriptions have to have same DNN/S-NSSAI subscribed and also need to end up in same slice.</p>

<p>15 – Charter Communications</p> <p>Yes, if it is meant that URSP rules are intended for selection of the appropriate DNN/S-NSSAI for DualSteer sessions.</p>
<p>16 – Apple Distribution Intl Ltd</p> <p>Operator can control DNNs/S-NSSAIs for which DualSteer is applicable via URSP.</p>
<p>17 – ETRI</p> <p>YES</p>

Question KI#1.3.9: Should 3GPP specify how the DualSteer Device internally controls and coordinates the DualSteer feature, e.g. via a Control Function or Coordination Layer?

Feedback Form 20: Question KI#1.3.9

<p>1 – LG Electronics France</p> <p>DualSteer Device internal architecture can be left as an implementation. Some requirements to support DualSteer can be captured in the spec.</p>
<p>2 – vivo Mobile Communication Co.</p> <p>No.</p> <p>It is implementation aspect of device.</p>
<p>3 – MediaTek Inc.</p> <p>1. No up to implementation</p>
<p>4 – Samsung Electronics Co.</p> <p>Yes. At least for PDU Session ID should be shared and coordinated within DualSteer Device so that correlation ID for SM is not required.</p>
<p>5 – ZTE Corporation</p> <p>No. up to implementation.</p>
<p>6 – Huawei Technologies R&D UK</p> <p>No. This is based on implementation, which is out of SID scope.</p>

7 – OPPO No. Internal control logic is up to implementation.
8 – CableLabs No.
9 – NEC Europe Ltd Yes.
10 – QUALCOMM Europe Inc. - Italy yes
11 – InterDigital Communications It depends on the definition of DualSteer device, esp. "two-UE" device. A coordination layer for two UEs may be helpful.
12 – Deutsche Telekom AG depends...
13 – Charter Communications It can be implementation specific in the device.
14 – Apple Distribution Intl Ltd No.
15 – Nokia No. It can be left to implementation
16 – ETRI It depends on the solutions.

Question KI#1.3.10: Should AMF be impacted for PDU Session establishment? For no AMF impact, it could be based on e.g. SMF redirection and needs homogeneous deployment of SMFs that support DualSteer for a DNN/S-NSSAI.

Feedback Form 21: Question KI#1.3.10

1 – China Telecom Corporation Ltd. For PLMN that supports DualSteer, the AMF can select the SMF based on the subscription data. And for PLMN not supporting DualSteer, the SMF redirection may be needed.

2 – LG Electronics France

AMF needs to be enhanced to select the SMF that supports DualSteer. Otherwise, operator should update all SMFs of specific DNN/S-NSSAI from the early deployment of DualSteer service, which is not realistic. SMF redirection causes additional signaling and better to update AMF behaviour. However, e.g. in case of HPLMN + VPLMN case, if VPLMN does not support DualSteer, legacy procedure can be re-used to avoid VPLMN impact.

3 – vivo Mobile Communication Co.

No impact on AMF for AMF selecting SMF, this can ensure that even VPLMN does not support DualSteer, the basic functionalities of the DualSteer feature still are applicable.

Is this question same as Question KI#1.2.6? If so, better to combine these two.

4 – MediaTek Inc.

1. Yes

5 – Samsung Electronics Co.

AMF can be impacted for PDU Session establishment, at least for considering DS-supporting SMF selection. If there no AMF impact, SMF redirection or AMF consulting with UDM for SMF selection is needed to support DualSteer for a DNN/S-NSSAI.

AMF should perform SMF selection based on DS support. Thus AMF impacts are foreseen. SMF redirection is not optimum in our view.

6 – ZTE Corporation

AMF needs to select same SMF for the secondary PDU Session establishment based on the UE context in SMF data

7 – ZTE Corporation

AMF needs to select same SMF for the secondary PDU Session establishment based on the UE context in SMF data

8 – Huawei Technologies R&D UK

Session Management related issues are not mature.

AMF can be enhanced to select the same SMF for DualSteer traffic switching. AMF impact cannot be avoided during Registration procedure. Therefore, there is no need to further enhance SMF for SMF redirection or restrict to homogeneous deployment of SMFs and use a single SMF set to support DualSteer.

<p>9 – OPPO</p> <p>For PLMN that supports DualSteer, the AMF can select the SMF based on e.g. UE context or subscription data. And for legacy VPLMN not supporting DualSteer, the SMF redirection in HPLMN may be needed.</p>
<p>10 – Ericsson LM</p> <p>The AMF impact should be avoided or be kept minimal. We are open to solutions with no AMF impacts and SMF redirection.</p>
<p>11 – NEC Europe Ltd</p> <p>Yes.</p>
<p>12 – QUALCOMM Europe Inc. - Italy</p> <p>no impact on AMF to avoid impact on VPLMN</p>
<p>13 – InterDigital Communications</p> <p>AMF impact is not a critical factor for solution evaluation.</p>
<p>14 – Deutsche Telekom AG</p> <p>Yes, AMF impact is not avoidable</p>
<p>15 – Charter Communications</p> <p>Yes</p>
<p>16 – Apple Distribution Intl Ltd</p> <p>AMF should be enhanced to select an SMF that supports DualSteer.</p>
<p>17 – Nokia</p> <p>We are open to solutions. Would prefer a solution with no or least impact on AMF</p>
<p>18 – ETRI</p> <p>YES</p>

Question KI#1.3.11: Anchoring

1. Should the DualSteer PDU session be always anchored in a common UPF and managed by a common SMF and potentially a common PCF?
2. Should SMF have the same SM policy association towards the PCF?
3. If yes to 1), would it be required only for PDU Sessions that are subject to traffic switching?

Feedback Form 22: Question KI#1.3.11

1 – China Telecom Corporation Ltd.

1 yes

2 – LG Electronics France

DualSteer PDU Session should be always anchored in a common UPF regardless of traffic steering and switching, which is SA1 requirement. To support common UPF, the same SMF should be selected. The PCF also should be common to provide harmonized policy to the SMF.

3 – vivo Mobile Communication Co.

Yes for 1) and 3), but PCF could be different.
Prefer No for 2)

4 – MediaTek Inc.

1. Yes for common UPF.
2. Yes for common SMF
3. not clear question

5 – Samsung Electronics Co.

1. The DualSteer PDU session should be always anchored in a common UPF for switching and managed by a common SMF and potentially a common PCF.
2. SMF should have the same SM policy association towards the PCF.
3. It would be required only for PDU Sessions that are subject to traffic switching. For traffic steering, different anchor UPFs may be used for different services.

6 – ZTE Corporation

1) Yes 2) Yes 3) applicable for traffic steering and traffic switching.

7 – Huawei Technologies R&D UK

Session Management related issues are not mature.

The terms of "DualSteer PDU session" is not clear and there is no such agreed terminology. Therefore, the question 1 should be reworded to **"Should PDU sessions established to support DualSteer feature be always anchored in a common UPF and managed by a common SMF and potentially a common PCF?"**

1. No. For DualSteer traffic steering of a new coming service, only one PDU session is used for transmission. There is no need to anchor the PDU session specifically. The anchoring at the specific UPF is only needed for DualSteer traffic switching.

2. For the PDU session established for traffic steering, there is no need to have any association with other PDU session. The existing mechanism is reused. For the PDU session established for traffic switching, the SMF can reuse the SM policy association and N4 session context of the source PDU session for the target PDU session and release the source PDU session which can minimize the impacts.

3. It is required to anchor the target PDU session at the same SMF and UPF as the source PDU session only for DualSteer traffic switching

8 – OPPO

1. Yes (same SMF and UPF) for traffic switching.
2. Same PCF is not necessary.
3. Yes.

9 – Ericsson LM

1. Yes
- 2 The impacts on SMF and PCF need further evaluation, to ensure that the solution with least impact is selected.
3. For traffic mapped to a DS session, i.e. two linked PDU Sessions supporting DS, the common UPF applies to both traffic steering and switching.

10 – CableLabs

These answers are solution specific. Please see our answers below:

- a. Yes, the DS PDU Session should be anchored in a common UPF in the HPLMN
- b. The behaviour should be aligned with ATSSS feature
- c. No.

11 – NEC Europe Ltd

Yes to 1) and 3).

12 – QUALCOMM Europe Inc. - Italy

1. yes, the PDU sessions that constitute a DS Session should be anchored in a common UPF.
2. yes
3. yes, for all PDU sessions that are part of a DS session. PDU sessions not part of a DS session do not need to be anchored in the same UPF.

13 – InterDigital Communications

Yes to 1) and 3) per requirements.

14 – Charter Communications

1. Yes. Common SMF, UPF and PCF anchored in the HPLMN should be used for DualSteer PDU sessions.
2. Depends on the solution
3. No because traffic steering is also a requirement.

15 – Apple Distribution Intl Ltd

1. No. Anchoring is only required for DualSteer traffic switching.
2. Needs further evaluation.
3. N/A.

16 – Nokia

- 1) Yes
- 2) Needs further evaluation on the actual impacts on SMF and PCF
- 3) Yes

17 – ETRI

1. YES
2. No, different SMpolicyID, in the same PCF and SMF
3. YES

Question KI#1.3.12: When the SMF links the two PDU sessions from the two SUPIs of DualSteer device, should the SMF (or UPF) allocate the same IP address for the linked PDU Sessions?

Feedback Form 23: Question KI#1.3.12

1 – LG Electronics France

Yes. The same IP address should be allocated to minimize service interruption during the traffic switching.

2 – vivo Mobile Communication Co.

Yes.
Allocating same IP address will benefit the switch to have less interruption.

3 – MediaTek Inc.

1. Yes

<p>4 – Samsung Electronics Co.</p> <p>When the SMF links the two PDU sessions from the two SUPIs of DualSteer device, the SMF (or UPF) should allocate the same IP address for the linked PDU Sessions. (at least for switching)</p>
<p>5 – ZTE Corporation</p> <p>It depends on the DualSteer functionality. If MPTCP/MPQUIC is used then it is possible to allocate two different IP addresses for two PDU Session.</p>
<p>6 – Huawei Technologies R&D UK</p> <p>Session Management related issues are not mature.</p> <p>There is no linked PDU session but correlated PDU session. The purpose of DualSteer traffic switching is to minimize the service interruption. Therefore, same IP address can be allocated to the target PDU session during switching and release the source PDU session so that single IP address will be used by single PDU session which has least impacts on the 5G system.</p>
<p>7 – OPPO</p> <p>Yes. During the switching procedure, the same IP address will be allocated for the newly established PDU Session. But after that, the old PDU session will be released to guarantee that single IP address is associated to single PDU Session.</p>
<p>8 – Ericsson LM</p> <p>Yes, common/single UE IP address on N6 is needed to fulfil the requirement of minimum service interruption during switching.</p>
<p>9 – CableLabs</p> <p>Yes, the DS device should expose a single IP address to the outside world associated with an IP DS PDU Session.</p>
<p>10 – NEC Europe Ltd</p> <p>The end-user IP address is the same, i.e., there is a single IP address for the UE.</p>
<p>11 – QUALCOMM Europe Inc. - Italy</p> <p>yes (this would make traffic switching smoother)</p>
<p>12 – Deutsche Telekom AG</p> <p>yes</p>

13 – Charter Communications Yes. The same IP address should be allocated to minimize traffic interruption during switching.
14 – Apple Distribution Intl Ltd Yes, a common UE IP address is needed to minimize service interruption during switching.
15 – Nokia Yes, a common IP address shall be allocated and is needed for DS functionality.
16 – ETRI YES

Question KI#1.3.13: Should SMF use same N4 session towards the UPF? Should SMF provide two SUPIs to UPF over N4?

Feedback Form 24: Question KI#1.3.13

1 – LG Electronics France UPF manages session based on N4 Session ID not based on SUPI. There is no need to provide SUPI to the UPF for the purpose of N4 Session control. SMF can configure common N4 Session for two PDU Sessions to minimize impact on the UPF.
2 – vivo Mobile Communication Co. No. Separate N4 session is OK for anchor-SMF managing the switch. No need to provide SUPI to UPF, N4 session is enough for configure the N4 rule.
3 – MediaTek Inc. Not clear questions
4 – Samsung Electronics Co. SMF should use same N4 session towards the UPF for switching. SMF does not need to provide two SUPIs to UPF over N4 for switching.
5 – ZTE Corporation 1) Same N4. 2) SUPI is not needed in UPF.

6 – Huawei Technologies R&D UK

Session Management related issues are not mature.

During the DualSteer traffic switching, the SMF can update the N4 session context to include the information for the target PDU session and the source PDU session will be released. For the PDU session established for traffic steering, there is no need to have any association with other PDU session. The existing mechanism is reused.

7 – OPPO

Using separate N4 session may help during the switching procedure since one PDU Session should be established and one PDU Session should be released, these could be two procedures happened in different timeline.

There is no need to provide SUPI to UPF, N4 session ID is enough for configure the N4 rule.

8 – Ericsson LM

The impacts on SMF and UPF need further evaluation, to ensure that the solution with least impact is selected.

9 – NEC Europe Ltd

Yes, towards PSA-UPF.

10 – QUALCOMM Europe Inc. - Italy

The SMF provides the UPF with two SUPIs. We are neutral whether this is done via one N4 session or via two

11 – Charter Communications

Yes to both questions.

12 – Apple Distribution Intl Ltd

Neutral on this.

13 – Nokia

We are still evaluating both the options and need for time to comment

14 – ETRI

No. separate N4 sessions are preferred.

Question KI#1.3.14: Steering functionalities

1. Is it necessary to define steering functionalities for the UE and UPF (e.g. DS-LL steering functionality, DS-HL steering functionalities including MPQUIC and MPTCP)?
2. How would MPTCP and MPQUIC steering functionalities apply to a DualSteer Device with no simultaneous transfer capability?

Feedback Form 25: Question KI#1.3.14

1 – LG Electronics France

1. UE and UPF should support DS-LL steering functionality and optionally DS-HL steering functionalities.
2. Since the SMF/PCF knows that PDU Session is used for DualSteer, the SMF/PCF should generate steering / switching rule that only allows to send traffic over a single access, i.e. only allowing Active-Standby mode.

2 – vivo Mobile Communication Co.

It is one of the MA PDU session principles, see the answer to Question KI#1.3.1. I.e., Optional OK mandatory NO.

This question seems to be a policy related question, may be together with Questions KI#1.4.7 and KI#1.4.9.

3 – MediaTek Inc.

It depends on the solutions

4 – Samsung Electronics Co.

1. It is not necessary to define steering functionalities for the UE and UPF (e.g. DS-LL steering functionality, DS-HL steering functionalities including MPQUIC and MPTCP), just for switching.
2. MPTCP and MPQUIC steering functionalities can apply to a DualSteer Device with no simultaneous transfer capability by applying Steering rules/mode to DualSteer Device.

5 – ZTE Corporation

In general we are ok to reuse simialr steering functionalities as MA PDU Session. Need further study in normative phase.

6 – Huawei Technologies R&D UK

1. No. There is no need to apply any steering functionality since splitting is not supported.
2. There is no need to apply any steering functionality since splitting is not supported.

<p>7 – QUALCOMM Europe Inc. - Italy</p> <ol style="list-style-type: none">1. yes2. it would be used for only steering and switching
<p>8 – Deutsche Telekom AG</p> <p>for DualSteer probably not needed</p>
<p>9 – Charter Communications</p> <ol style="list-style-type: none">1. Yes2. The PCF and SMF should generate the applicable DualSteer steering and switching rules to send the applicable traffic over a single access at a given time.
<p>10 – Apple Distribution Intl Ltd</p> <ol style="list-style-type: none">1. Yes.2. We propose to use same steering functionalities as in ATSSS but only for steering and switching.
<p>11 – Nokia</p> <p>No. there is no need to define steering functionalities. Moreover, MPTCP and MPQUIC cannot be supported.</p>
<p>12 – ETRI</p> <ol style="list-style-type: none">1. No. we prefer to use NAS signaling for steering and switching.2. -

2.4 Key Issue #1.4 – Round 1 Questions

Question KI#1.4.1: URSP rules

1. Is it necessary to extend URSP rules?
2. Would URSP rules be associated with the DualSteer Device or would each SUPI of the DualSteer Device have its own URSP rules?
3. If extended URSP rules are supported, should the UE indicate its capability of enhanced URSP rules during the registration procedure?

Feedback Form 26: Question KI#1.4.1

<p>1 – LG Electronics France</p> <p>UE needs to support enhanced URSP rule and PCF needs to aware of UE's capability to provide URSP rule</p>
--

for DualSteer. The PCF can provide URSP rule only for the UE of Primary SUPI.

2 – vivo Mobile Communication Co.

No for 1).

Each SUPI has its own URSP rules for 2).

Switching and steering does not need to extend URSP rules. Network can provide two collaborative sets of URSP rules to two SUPIs of the device after registration, and the device can generate steering policy locally based on the two collaborative sets of URSP rules.

3 – MediaTek Inc.

1. No

2. Each SUPI has its own URSP rule

3. skip

4 – Samsung Electronics Co.

1. It is necessary to extend URSP rules to DualSteer Device.

2. URSP rules would be associated with the DualSteer Device, but for SUPI perspective, each SUPI of the DualSteer Device would have its own URSP rules.

3. If extended URSP rules are supported, the UE should indicate its capability of enhanced URSP rules during the registration procedure.

5 – Huawei Technologies R&D UK

Answer to question 1:

It depends on what's the purpose of the policy.

For policy to guide the DualSteer device when to trigger the secondary SUPI registration, URSP rules cannot be used as they apply after the registration has taken place.

Also for policy to guide the DualSteer Device whether simultaneous transmission is allowed, using URSP rules may be difficult as the policy applies to the DualSteer Device as a whole while URSP rules scope is a UE.

For policy to guide the DualSteer Device how to perform DualSteer traffic steering, this can either be a new policy or an extension of the URSP rules. The policy should include the information to indicate which UE/3GPP access leg is used to transmit the new coming services.

For policy to guide the DualSteer device when to trigger the DualSteer traffic switching, URSP rules shall be enhanced so that the services with same traffic switching conditions will be grouped to the same PDU

session. By performing this grouping, during DualSteer traffic switching, all traffics within the source PDU session can be switched to the target PDU session and the source PDU session can be released reducing the impact on the 5G system.

Answer to question 2:

If the URSP is used for DualSteer, each SUPI of the DualSteer Device will receive its own URSP rules. Depending on how the registration is handled, the contents of these URSP rules may be identical.

Answer to question 3:

There is no need for the UE to indicate the capability of supporting enhanced URSP. DualSteer Devices are expected to support such enhanced URSP rules (if they exist) and non DualSteer Devices will ignore the enhanced URSP rules.

6 – OPPO

1. No. New policy will be used to bind the traffic to specific SUPI.
2. Each SUPI should has its own URSP rule.

7 – Ericsson LM

1. Yes.
2. Each SUPI receives its own URSP rules but the part for DS should be the same for both SUIPs.
3. No. There is no need for this. The UE can ignore the DS parts of the URSP rules if it does not support it, similar to existing URSP handling.

8 – NEC Europe Ltd

- 1) Yes.
- 2) If a DualSteer device has a Control Function or Coordination Layer, the DualSteer URSP rules can be associated with the device.
- 3) No, it should be sufficient that the device indicates its DualSteer capability during registration.

9 – QUALCOMM Europe Inc. - Italy

1. yes
2. URSP rules are per SUPI. The URSP rules may be sent only for the first SUPI (in that case, the rule needs to include also details that apply to the traffic related to the other SUPI), or may be sent for each SUPI (one set of rules for SUPI1 and one for SUPI2 – in that case the DS control function needs to aggregate/harmonize them).
3. we don't think this is needed and in general there is no support for capability negotiation between the UE and the PCF, typically the UE ignores the rules that contain parameters that does not support. The subscription information in the UDM indicates the UE policies for DualSteer and these are provided to the UE.

10 – InterDigital Communications

1. yes.
2. Probably not necessary to have separate URSP rules.
3. Not necessary. It's part of dualsteer capability.

11 – Deutsche Telekom AG

1. yes
2. probably easier to send separate URSP rules though the probably need to be almost identical (as the subscription profile is shared)
3. no

12 – CableLabs

Please see answers below:

- a. URSP rules for the DS device need to be extended with a new Access Type preference in Route Selection Description
- b. The URSP rules are to be associated with the DS device. Each UE device should have its own URSP rules but the DS related component should be common across both entities in the DS device.

13 – Charter Communications

1. YES
2. Each SUPI of DS Device has its own URSP rules
3. YES. UE can indicate its capability of enhanced URSP rules by indicating its support for DualSteer capabilities.

14 – Apple Distribution Intl Ltd

1. Yes.
2. First registered SUPI can be chosen for policy delivery.
3. No.

15 – Nokia

1. Yes.
2. Each SUPI receives its own URSP rules
3. Neutral. providing DS support indication to PCF is better as then PCF can provide rules accordingly.

16 – ETRI

1. YES
2. URSP is to be associated to DualSteer Device.

Question KI#1.4.2: Which URSP extensions need to be supported?

1. the Access Type preference in Route Selection Descriptor is extended to include a Dual Steering indication or Multiple Accesses.
2. DualSteer ID and Linked SUPI added to Route Selection Descriptor. The AMF uses the Linked SUPI to query the UDM of the Linked SUPI to get the H-SMF ID and H-PCF ID in use for the PDU session of the Linked SUPI if already activated.
3. DualSteer service indication added to Route Selection Descriptor. It indicates if the traffic of the matching application is to be steered or switched via a PDU session.
4. RAT validity. The RAT validity, if included, is used to select the possible RAT combinations for the DualSteer communication. RAT validity values include:
 - a) NR_NR: this RSD applies to NR + NR combination, i.e. both SUPI 1 and SUPI 2 are in NR.
 - b) NR_LTE: this RSD applies to NR + LTE combination, e.g. SUPI 1 is in NR and SUPI 2 is in LTE
 - c) NR: this RSD applies when the UE has only one access, and such access is over NR.
 - d) LTE: this RSD applies when the UE has only one access, and such access is over LTE.
 - e) (no RAT validity): the RSD applies to any RAT.
5. 3GPP access for DualSteer traffic steering. One single value of following 3GPP access:
 - a) Existing activated 3GPP access, otherwise Primary 3GPP access
 - b) Prefer Primary 3GPP access
 - c) Prefer Secondary 3GPP access
 - d) List of ordered PLMN and/or RAT
6. DualSteer traffic switching actions. One single value of following actions:
 - a) switch to Primary 3GPP access whenever it becomes available
 - b) switch to Secondary 3GPP access whenever it becomes available
 - c) switch to the other 3GPP access if the current access status meets the condition of DualSteer traffic switching
 - d) switch to the other 3GPP access whenever necessary

Feedback Form 27: Question KI#1.4.2

1 – China Telecom Corporation Ltd.

- 2) The linked SUPI information is not needed.
- 5) prefer a
- 6) prefer c

2 – LG Electronics France

URSP rule is not a per PDU Session level rule. Therefore, it should not contain steering, switching rules.

Possible extension is extending Access Type to include DualSteer or adding separate DualSteer indication in the RSD.

3 – vivo Mobile Communication Co.

No.

See answer to Question KI#1.4.2.

Steering is done after two registrations have been done over two accesses, device can locally generate steering policy based on two collaborative sets of URSP rules, i.e., steering based on existing accesses, any indication of PLMN/RAT information that is not associated with the existing accesses will imply network selection, which is not in SA2 scope.

Switching does not need any UE policy, if device determines to perform switch then it establishes PDU Session in another PLMN/RAT, any UE policy indicating PLMN/RAT for switching will imply network selection, which also is not in SA2 scope

4 – MediaTek Inc.

Skip due to NO to 1.4.1

5 – Samsung Electronics Co.

1. Yes.

2. Yes.

3 Not sure the new indication is needed in RSD. UE with URSP already supports steering/switching between PDU session.

4. Yes.

5. Yes

6. Yes

6 – Huawei Technologies R&D UK

1. Individual parameter cannot be discussed as long as it is not clear whether a policy independent from URSP rules is necessary. We expect that existing URSP RSD parameters cannot be reused.

2. Individual parameter cannot be discussed as long as it is not clear whether a policy independent from URSP rules is necessary. We expect that existing URSP RSD parameters cannot be reused.

3. Individual parameter cannot be discussed as long as it is not clear whether a policy independent from URSP rules is necessary. We expect that existing URSP RSD parameters cannot be reused.

4. Individual parameter cannot be discussed as long as it is not clear whether a policy independent from URSP rules is necessary. We expect that existing URSP RSD parameters cannot be reused.

5. It is necessary to decide the operator policy for DualSteer traffic steering. The list of the above is a good start for the discussion. Some policies are only available when simultaneous transmission policy is allowed.

6. It is necessary to decide the operator policy for DualSteer traffic switching. The list of the above is a good start for the discussion. Some policies are only available when simultaneous transmission policy is allowed. If simultaneous transmission policy is not allowed, the policies of all PDU sessions need to be considered simultaneously.

7 – OPPO

Some of the enhancements could be considered in a new UE policy.

8 – Ericsson LM

1. Yes. The Access Type preference should be extended to include DS.
2. -
3. See answer to #1
4. -
5. No. Access selection for DS traffic steering is not part of URSP rules.
6. No. Switching and Steering rules are not part of URSP rules.

9 – CableLabs

URSP rules for the DS device need to be extended with a new Access Type preference in Route Selection Description. The rest are solution specific, may be deferred to normative phase.

10 – QUALCOMM Europe Inc. - Italy

1. At least DualSteer indication and RAT validity should be included.
2. not needed
3. we don't think this is needed. Whether a traffic is to be steered or switched can be indicated in the DS Rules (from the SMF).
4. this should be provided in URSP rules
5. Not needed. This type of details should be in the DS UE/UPF Rule.
6. Not needed. This type of details should be in the DS UE/UPF Rule.

11 – NEC Europe Ltd

- 1) No, the preference is to have a separate indicator for DualSteer.
- 2) No.
- 3) Yes.
- 4) Yes.
- 5) No. This should be a part of DualSteer rules.

6) No. This should be a part of DualSteer rules.

12 – Deutsche Telekom AG

1. Not convinced; Could be enhanced with "Dual3GPP-Access"?, "Primary3GPP-Access"?, "Secondary3GPP-Access"?. For all of them it would also mean that it excludes Multi-Access....
2. No
3. is actually part of answer #1
4. No
5. Maybe
6. No

13 – CableLabs

We believe that it is too early to do this selection. One of the common understanding so far seems to be that URSP rules for the DS device need to be extended with a new Access Type preference in Route Selection Description. Therefore our answer for a. is YES.

14 – Charter Communications

1. Prefer to include Dual Steering in Access Type Preference.
2. Yes, both DualSteer ID and Linked SUPI (as per solution 6.1.5) need to be supported. In addition to the benefit stated in this NWM bullet, this pair of these attributes in the URSP rules will allow the DualSteer Device know whether the SUPIs active in device are paired and can initiate the DualSteer PDU session activation for each SUPI.
3. No
4. Neutral as long as it is optional.
5. No. There is no need to classify primary or secondary SUPI access.
6. No. There is no need to classify primary or secondary SUPI/access.

15 – Apple Distribution Intl Ltd

1. Yes.
2. No.
3. No.
4. No.
5. No.
6. No.

16 – Nokia

only 1. (I think 3 is related to or an alternative to 1?)

17 – ETRI

1. YES

others. -

Question KI#1.4.3: Should a new UE policy be defined that can be used in combination with URSP, e.g. ASP (Access Selection Policy) that includes a PLMN selection preference and RAT preference for the access?

Feedback Form 28: Question KI#1.4.3

1 – LG Electronics France

No need to define ASP (Access Selection Policy). Traffic steering, switching should be performed based on per DualSteer PDU Session level not based on per UE level policy.

2 – vivo Mobile Communication Co.

If device and network optionally support additional policy/rules for DualSteer, no strong opinion whether it is a new UE policy/rules or extended ATSSS rule.

If mandate to have a new UE policy/rule, then No.

3 – MediaTek Inc.

This should wait for SA1's feedback

4 – Samsung Electronics Co.

A new UE policy should be defined that can be used in combination with URSP, e.g. ASP (Access Selection Policy) that includes a PLMN selection preference and RAT preference for the access.

5 – ZTE Corporation

We prefer to define a new policy for dualSteer. However it is not necessary to impact the PLMN/RAT selection.

6 – Huawei Technologies R&D UK

Individual parameter cannot be discussed as long as it is not clear whether a policy independent from URSP rules is necessary. We expect that existing URSP RSD parameters cannot be reused.

SA2 solution should not have any impacts on PLMN/RAT selection. It is SA1 take the responsibility to define PLMN/RAT selection and CT1 to implement it. The new policy within UE policy could be used by

<p>the device to select the preferred 3GPP access (with preferred PLMN, preferred RAT) for the new service transmission from the registered 3GPP access(es).</p>
<p>7 – OPPO</p> <p>A new UE policy should be defined to select the registered 3GPP access(es) for traffic transmission. PLMN/RAT preference can only be used to validate the registered 3GPP access of the the two SUPIs and should not be used for PLMN selection. PLMN selection is CT1's scope.</p>
<p>8 – QUALCOMM Europe Inc. - Italy</p> <p>yes, DS UE/UPF Rules should be provided to the DS device and UPF when the first PDU session of the DS session is established.</p>
<p>9 – InterDigital Communications</p> <p>Yes. A separate UE policy would be necessary.</p>
<p>10 – NEC Europe Ltd</p> <p>No.</p>
<p>11 – Deutsche Telekom AG</p> <p>Probably not needed</p>
<p>12 – Charter Communications</p> <p>Not sure about the benefit of mixing such ASP at the DualSteer PDU session level policy. Also, having some of the new ASP attributes as mandatory (as in solution 6.1.16) seems restrictive.</p>
<p>13 – Apple Distribution Intl Ltd</p> <p>No.</p>
<p>14 – Nokia</p> <p>We need more time to comment on this. We would like to come back on this at the 2nd round of NWM discussion.</p>
<p>15 – ETRI</p> <p>YES</p>

Question KI#1.4.4: For the registration of the Second SUPI, should the DualSteer Device be controlled by the following policy?

- a) No restriction (UE of secondary SUPI can always attempt registration)
- b) Only when primary SUPI is not registered

- c) Only when primary 3GPP access is below a certain SINR/RSRP/RSSI threshold (similar to the mechanism defined in clause 23.6 in TS 36.300)
- d) Location dependent (only attempt to register when in a specific area e.g., TAI(s), countries or PLMN(s))

Feedback Form 29: Question KI#1.4.4

1 – LG Electronics France

a), d) are ok but b), c) are not needed. b) is not aligned with SA1 requirement, i.e. minimize interruption. Registration based on SINR/RSRP/RSSI threshold is not needed. Those parameters can be considered during the PLMN selection process if needed like SENSE.

2 – vivo Mobile Communication Co.

Prefer a).

No primary and secondary SUPI is preferred. There're lots o conditions, e.g., power, APP requirements, signalling strength, user requirements, etc., it is better to have no restriction.

3 – MediaTek Inc.

The registration of Secondary SUPI is allowed only when the Primary SUPI has registered successfully to the NW

4 – Samsung Electronics Co.

a) No restriction (UE of secondary SUPI can always attempt registration) but actually no need define first/second SUPI explicitly.

5 – ZTE Corporation

prefer a) however there is no secondary SUPI concept

6 – Huawei Technologies R&D UK

Yes. We need to include a), b) and d). Point c) is the consequence of executing policy d) and does not need to be captured in a separate policy. Different information in the above bullets can be included in different policies.

This question is somehow a general question, which should be answered first in order to reach consensus on the principle of policy to support DualSteer, e.g. what's the purpose of different policies, what guidance is needed in the policy. When we reach such consensus, we can further discuss whether new policies are needed to introduce or just enhance the existing policies.

7 – Huawei Technologies R&D UK

Please ignore the previous post since the answer is not corresponding to this question. Sorry about confusion.

The answer to this question is:

The network will provide proper guidance by means of policies to instruct the DualSteer Device when to trigger the Second SUPI to perform the registration. In order to avoid consuming unnecessarily network resources and to improve UE power saving it is critical that the DualSteer feature is triggered only when certain criteria are met.

8 – OPPO

No. "Secondary SUPI" should not be restricted so there is no need to define "Secondary SUPI". The network can decide whether to accept the UE's registration but should not restrict the UE's registration behavior via UE policy.

9 – Ericsson LM

a)

10 – QUALCOMM Europe Inc. - Italy

Only (a)

11 – InterDigital Communications

The registration of second SUPI should be triggered by some condition, e.g. need for establishing dualsteer PDU Session, but not necessarily by conditions in b)c)d).

12 – Deutsche Telekom AG

The home network will provide proper guidance to instruct the DualSteer Device when to trigger the Second SUPI to perform the registration.

13 – CableLabs

We do not see the need of primary and secondary differentiation.

- a. N/A
- b. N/A
- c. N/A
- d. Yes.

14 – Charter Communications

- a) and d) are Okay.
- b) and c) are not Okay because primary/secondary SUPI concept is not preferred.

15 – Apple Distribution Intl Ltd a)
16 – Nokia a)
17 – NEC Europe Ltd Neither a) nor b). Location criteria should be included in a DualSteer policy.
18 – ETRI No restriction

Question KI#1.4.5: Should the following information be included in DualSteer policy (provided to both DualSteer Device and NF in the network):

1. Information that determines the 3GPP access network to be used for the new service (additional PLMN/PNI-NPN or an additional 3GPP access network within the same PLMN)
2. Information when to register the second SUPI
3. Information when to establish a secondary PDU Session
4. Information that determines how to switch the service between two connected 3GPP access networks.

Feedback Form 30: Question KI#1.4.5

1 – LG Electronics France 1, 2, 4 are ok but 3 is not needed. If UE successfully registers network using secondary SUPI, UE should be able to establish secondary PDU Session to add a leg.
2 – vivo Mobile Communication Co. If supporting additional policy is optional for DualSteer: No for 1) and 3) 2) related to network selection, which is in CT1 scope 4) related to ATSSS-like rule, no strong opinion If mandate to support new DualSteer policy, then No for all.
3 – MediaTek Inc. They are possible included in the Dualsteer policy and this depends on the solutions

4 – Samsung Electronics Co.

yes for a) and d). Not sure for b) and c).

5 – Samsung Electronics Co.

yes for 1 and 4. Not sure for 2 and 3. (Sorry for duplication. 1,2,3,4 instead of a),b),c),d))

6 – ZTE Corporation

1) for traffic steering. 4)for traffic swithing.

7 – Huawei Technologies R&D UK

Yes. We need to include 1), 2) and 4).

Point 3) is the consequence of executing policy 4) and does not need to be captured in a separate policy. Different information in the above bullets can be included in different policies.

This question is somehow a general question, which should be answered first in order to reach consensus on the principle of policy to support DualSteer, e.g. what's the purpose of different policies, what guidance is needed in the policy. When we reach such consensus, we can further discuss whether new policies are needed to introduce or just enhance the existing policies.

8 – OPPO

1. No.
2. Prefer no restriction and it is related to CT1's decision.
3. No.
4. Not sure whether it is needed.

9 – Ericsson LM

The DualSteer policy should include at least information mentioned in 4. The information mentioned in bullet 3 could be part of URSP rules, indicating when an application should be mapped to PDU Sessions using DS.

10 – QUALCOMM Europe Inc. - Italy

None of the above. The intention is to use the DS UE/UPF rules as ATSSS/N4 rules (with the caveat that we limit them to active-standby and smallest delay)

11 – InterDigital Communications

1. Same answer as to 1.4.3.
2. Same answer as to 1.4.4.
3. Not necessary.
4. Enhanced ATSSS rule may be used for this purpose.

12 – CableLabs

- a. N/A
- b. N/A
- c. N/A
- d. This information needs to be provided for both steering and switching and it should be available for PCF DS policy.

13 – Deutsche Telekom AG

1. no
2. no
3. no
4. yes

14 – Charter Communications

Some of these information (i.e., 1 and 2) assumes primary/secondary SUPI concept, which is not preferred. Switching kind of rules in 4) can be in DualSteer Rules provided to each SUPI when each establish the PDU session for DualSteer.

15 – NEC Europe Ltd

- 1) Yes, this should be a part of a policy.
- 2) Yes, this should be a part of a policy.
- 4) Yes, based on the PCC rule, the DualSteer rules for the session for the UE and the NW can be derived.

16 – Apple Distribution Intl Ltd

No. Policy should re-use ATSSS/N4 rules with selected steering modes applicable to steering and switching.

17 – Nokia

- 1), 2) are not needed
- 3) can be part of URSP to indicate for which application traffic DS is needed
- 4) DS rules provided to the UE and UPF shall have information about when to switch traffic to the other access. (But the question says how to switch, so it was not clear)

18 – ETRI

1. YES
2. no
3. no
4. It depends on the solutions

Question KI#1.4.6: PCC rules

1. How the PCC rules should be extended?
2. Would a PCC rule only apply to one of the PDU sessions or to both PDU Sessions?

Feedback Form 31: Question KI#1.4.6

1 – LG Electronics France

PCC rule needs to be extended to include DualSteer policies (e.g. Steering, Switching rules, Steering functionalities). The same PCF will be used for DualSteer PDU Session and PCF will provide harmonized PCC rules to the SMF applies to both PDU Sessions.

2 – vivo Mobile Communication Co.

Each PDU Session has its own PCC rule and network can configure them properly for DualSteer.

If the extension is optional for DualSteer, no strong opinion for the extension, e.g., for generating ATSSS-like rules and MAR-like N4 rule.

If the extension is mandate for DualSteer to generate new policy/rule for UE and MAR-like N4 rule for UPF, then No.

3 – Samsung Electronics Co.

1. PCC rules should be extended to include DualSteer supporting.

2. PCC rule would be apply to only apply to one of the PDU sessions in general. But if there is an PCC rule update from the NW, PCC rule would be apply to both PDU Sessions

4 – ZTE Corporation

1) PCC rule includes the DualSteer Rule. 2) single SM association for both PDU Sessions.

5 – Huawei Technologies R&D UK

1. It is too early to answer this question before the overall solution is decided.

2. A PCC rule only applies to the only existing PDU session.

6 – OPPO

Each PDU Session should have its own PCC rule. Whether it should be enhanced is not clear since the session management solution is not clear yet.

7 – Ericsson LM

1. The MA PDU Session control part of the PCC rule can be extended with a new field “access descriptor” to identify each of the access with the PLMN ID and the access type. This field helps UE and SMF to e.g., identify which of the access should be assigned as Active access and which one as Standby.
2. If a single SM policy association is used, the PCC rules would apply to both PDU Sessions.

8 – QUALCOMM Europe Inc. - Italy

2. both

9 – InterDigital Communications

1. PCC rule should be enhanced to support DS functionalities.
2. A common PCC rule may be used for both PDU Sessions.

10 – Deutsche Telekom AG

2. PCC rules can only apply to one PDU session

11 – CableLabs

Similar to ATSSS the PCC rules in the PCF in the home network need to be enhanced to provide DS policies.

12 – Charter Communications

PCC rules need to be enhanced to include DualSteer related policies. The same PCF will be used for DualSteer PDU sessions established by the UEs in the DualSteer Device and the PCF will provide harmonized PCC rules to the SMF.

13 – NEC Europe Ltd

The PCC rules should be extended at least with Dual Steer Control information, including steering functionality, RAT preference/validity, charging and monitoring keys for the second access.

14 – Apple Distribution Intl Ltd

Similar to ATSSS. PCC rule applies to both PDU Sessions.

15 – Nokia

We need more time to comment on this. We would like to come back on this at the 2nd round of NWM discussion.

16 – ETRI

1. PCC rule is to be enhanced to support DualSteer.
2. One PCC rule for a PDU session but may have same information for DualSteer.

Question KI#1.4.7: Is it possible to re-use ATSSS Rules to enforce DualSteer policies in the UL direction? DualSteer rules and ATSSS rules can be differentiated by e.g. using a new Access Descriptor parameter.

Feedback Form 32: Question KI#1.4.7

1 – China Telecom Corporation Ltd.

For simultaneous case, the ATSSS rule can be reused.

2 – LG Electronics France

Yes. If network sets Active-Standby mode, DualSteer requirement (single 3GPP access transmission for a service) can be satisfied.

3 – vivo Mobile Communication Co.

If optionally supported and used for DualSteer, no strong opinion whether to specify some method that re-use ATSSS rules.

If mandate to support, then No.

4 – MediaTek Inc.

Not clear question

5 – Samsung Electronics Co.

It is possible to re-use ATSSS Rules to enforce DualSteer policies in the UL direction. DualSteer rules and ATSSS rules can be differentiated by e.g. using a new Access Descriptor parameter.

6 – ZTE Corporation

We prefer to define a new DualSteer rule, since ATSSS rule is only used for MA PDU Session.

7 – Huawei Technologies R&D UK

The ATSSS rules is used by a UE within a single PDU session with 3GPP access and non-3GPP access. However, for DualSteer, DualSteer Device selects one UE/3GPP access for the new service which is totally different from ATSSS. Moreover, ATSSS rules is a part of SM policy which is provided to the UE during PDU session establishment procedure. However, the DualSteer Device should determine the UE/3GPP

<p>access before establishing/re-use existing PDU session for the new service. Therefore, it is impossible to re-use ATSSS rules to enforce DualSteer policies in the UL direction.</p>
<p>8 – QUALCOMM Europe Inc. - Italy yes, the DS UE rules are re-using the ATSSS rules with necessary extensions and steering mode limitations</p>
<p>9 – InterDigital Communications Yes. ATSSS rules may be re-used as much as possible.</p>
<p>10 – Deutsche Telekom AG Not applicable. DualSteer Device has to determine the 3GPP access/RAT before establishing or re-use existing PDU session for the new service.</p>
<p>11 – CableLabs Yes, these rules need to be enhanced to accommodate the DS</p>
<p>12 – Charter Communications Yes, ATSSS-like rules can be used to enforce DualSteer policies in the UL direction.</p>
<p>13 – NEC Europe Ltd The ATSSS rules can be used as a basis for the DualSteer rules, but there should be separate DualSteer rules.</p>
<p>14 – Apple Distribution Intl Ltd Yes.</p>
<p>15 – Nokia No we cannot re-use ATSSS rules. The DS rules can be based on the principles of ATSSS rules.</p>
<p>16 – ETRI Possible But a new rule, although very similar to ATSSS rule, is preferred.</p>

Question KI#1.4.8: Is it possible to re-use N4 Rules to enforce DS policies in the DL direction?

Feedback Form 33: Question KI#1.4.8

<p>1 – China Telecom Corporation Ltd.</p> <p>Yes for simultaneous case.</p>
<p>2 – LG Electronics France</p> <p>Yes. Similar mechanism for MA PDU session can be re-used to enforce DS policies in the DL direction.</p>
<p>3 – vivo Mobile Communication Co.</p> <p>The question is not clear about the N4 rule, I assume it means N4 rules for ATSSS (e.g., MAR).</p> <p>If the N4 rules means N4 rules for ATSSS (e.g., MAR), then no strong opinion if optionally supported and used, and No if mandate to support for DualSteer.</p> <p>The SMF can determine to perform switch based on NAS message (e.g., PDU Session Establishment, Service Request) received from device via another access leg (distinguished by SUPI). Additional rules can be optional for further control.</p>
<p>4 – MediaTek Inc.</p> <p>Not clear question</p>
<p>5 – Samsung Electronics Co.</p> <p>It is possible to re-use N4 Rules to enforce DS policies in the DL direction.</p>
<p>6 – ZTE Corporation</p> <p>Yes</p>
<p>7 – Huawei Technologies R&D UK</p> <p>Yes (without the usage of MAR), for DualSteer traffic switching, the only thing we need to do is to replace the N3 tunnel information of the source PDU session with the one of the target PDU session.</p>
<p>8 – Ericsson LM</p> <p>Yes, the N4 rules for MA PDU session can be reused.</p>
<p>9 – QUALCOMM Europe Inc. - Italy</p> <p>same approach as for ATSSS rules: the DS UPF rules are the extension of the N4 rules.</p>
<p>10 – CableLabs</p> <p>Yes.</p>

11 – Deutsche Telekom AG yes
12 – Charter Communications Yes. N4 rules used for ATSSS (e.g. MAR) can be enhanced to enforce the DS policies in the DL direction.
13 – Apple Distribution Intl Ltd Yes.
14 – Nokia NO. We cannot re-use N4 rules for ATSSS. We have to enhance the N4 rules to support DS
15 – ETRI YES

Question KI#1.4.9: If ATSSS and N4 rules are re-used, which steering modes need to be supported:

1. Active-Standby?
2. Smallest Delay?
3. Priority-Based?

Feedback Form 34: Question KI#1.4.9

1 – KDDI Corporation (a) and (b). Splitting is out of scope, so (c) can be encompassed by (a).
2 – LG Electronics France Only Active-Standby can satisfies SA1 requirement, i.e. single 3GPP access transmission for a service.
3 – vivo Mobile Communication Co. It is not clear what N4 rules are re-used. I assume it means N4 rules for ATSSS (e.g., MAR) If re-using ATSSS rules and N4 rules for ATSSS (e.g., MAR) is optionally supported and used for DualSteer, no strong opinion, otherwise No.

<p>4 – MediaTek Inc.</p> <p>It depends on the solutions</p>
<p>5 – Samsung Electronics Co.</p> <p>1,2,3</p>
<p>6 – ZTE Corporation</p> <p>1,2,3</p>
<p>7 – Huawei Technologies R&D UK</p> <p>It makes no sense to reuse ATSSS as explained above.</p>
<p>8 – Ericsson LM</p> <p>Active-Standby and Smallest-Delay for the case when simultaneous transmission is possible and Active-Standby when simultaneous transmission is not possible.</p>
<p>9 – CableLabs</p> <p>It depends if the DS device is capable of simultaneous transmission or not. If yes all three steering modes can be supported otherwise priority-based may not be supported.</p>
<p>10 – QUALCOMM Europe Inc. - Italy</p> <p>Only Active-Standby and Smallest-Delay. Priority-Based should be excluded because it may imply simultaneous transmission of same SDF over both accesses (which is out of scope of Rel-19).</p>
<p>11 – Deutsche Telekom AG</p> <p>N/A</p>
<p>12 – Charter Communications</p> <p>1, 2, 3.</p>
<p>13 – NEC Europe Ltd</p> <p>At least 1) and 2).</p>
<p>14 – Apple Distribution Intl Ltd</p> <p>1. Yes. 2. Yes. 3. No.</p>

15 – Nokia

It is not clear what is meant by re-use ATSSS rules and N4 rules. In our view we cannot re-use ATSSS rules for DualSteer. We have to provide new rules, they can be based on ATSSS rules principles. With this in mind we should support:

1. Active-Standby
2. Smallest delay, only for DS device that support simultaneous transmission

16 – ETRI

1, 2, 3.

Priority-based is to be modified for switching, not splitting.

It depends on the solutions.

Question KI#1.4.10: Is there a need for the DualSteer policy to identify each 3GPP access leg uniquely, e.g. in a form of a Registration-ID? If yes, would the network provide individual UE/SUPI specific rules or complete DualSteer policy that can be provided to either of the UE/SUPI of the DualSteer device?

Feedback Form 35: Question KI#1.4.10

1 – LG Electronics France

No need to define Registration-ID. Each 3GPP access can be identified based on 3GPP access associated with Primary SUPI and 3GPP access associated with Secondary SUPI.

2 – vivo Mobile Communication Co.

No.

The DualSteer policy can be provided to two SUPIs separately, even if the two accesses are same RAT type and PLMN. Device can consolidate the two policies. Not necessary to have IDs to associate the two accesses.

Is this question related to the question KI#1.2.4 bullet 2) and 3)? If so, it is better to have these two questions together.

3 – MediaTek Inc.

Yes/Yes

4 – Samsung Electronics Co.

There is a need for the DualSteer policy to identify each 3GPP access leg uniquely, but not in a form of Registration-ID. The network would provide individual UE/SUPI specific rules or complete DualSteer policy that can be provided to either of the UE/SUPI of the DualSteer device.

<p>5 – Huawei Technologies R&D UK</p> <p>This should be determined by the question 1.4.2 bullet 5 and 6.</p>
<p>6 – OPPO</p> <p>UE's access network information can be used to identify the 3GPP access leg uniquely, no need to define the new parameter reg-ID.</p>
<p>7 – Ericsson LM</p> <p>This is not necessary. The DS rules can be specified based on the PLMN and the access type of each access leg.</p>
<p>8 – CableLabs</p> <p>No.</p>
<p>9 – QUALCOMM Europe Inc. - Italy</p> <p>No, there is no need for it, corresponding SUPI is sufficient</p>
<p>10 – InterDigital Communications</p> <p>No.</p>
<p>11 – Deutsche Telekom AG</p> <p>There is a need for the DualSteer policy to identify each 3GPP access leg uniquely, but not in a form of Registration-ID. The network would provide individual UE/SUPI specific rules.</p>
<p>12 – Charter Communications</p> <p>Identification of each 3GPP access leg may be needed for DualSteer steering policy but not sure in the form of a Registration-ID. The same PCF selected for the DualSteer PDU sessions will provide the UE/SUPI specific rules separately in a harmonized way.</p>
<p>13 – NEC Europe Ltd</p> <p>No.</p>
<p>14 – ZTE Corporation</p> <p>Reg ID is not need to identify the target 3GPP access leg. In most cases the RAT type is sufficient to identify the 3GPP access leg in the DualSteer rule. In case of two NR legs, the uplink traffic can be routed reflective mechanism, however the details are FFS.</p>

15 – Apple Distribution Intl Ltd No
16 – ETRI YES. Reg-ID is handy than linked SUPI.

Question KI#1.4.11: Is it necessary to include the following elements for the DualSteer policy?

1. an indication to indicate "Terrestrial Network (TN) access has higher priority than Non-Terrestrial Network (NTN) access" or "Non-Terrestrial Network (NTN) access has higher priority than Terrestrial Network (TN) access"
2. an indication to indicate "HPLMN has higher priority than VPLMN" or "VPLMN has higher priority than HPLMN"

Feedback Form 36: Question KI#1.4.11

1 – LG Electronics France No. Steering based on selected RAT combination makes frequent traffic switching depending on radio conditions. It's better to make steering and switching policy independent from UE's mobility. UE's mobility can be controlled based on existing mobility management mechanism e.g. RAT restriction.
2 – vivo Mobile Communication Co. No.
3 – MediaTek Inc. Yes
4 – Samsung Electronics Co. 1. Yes. 2. Yes.
5 – Huawei Technologies R&D UK 1. This should be determined by the question 1.4.2 bullet 5 and 6. It can be ok to have such information in UE policy to select the preferred 3GPP access (preferred PLMN, preferred RAT) for the new service transmission from the registered 3GPP access(es). However, impact on PLMN/RAT selection should be avoided which is not in SA2 scope.

<p>2. This should be determined by the question 1.4.2 bullet 5 and 6. It can be ok to have such information in UE policy to select the preferred 3GPP access (preferred PLMN, preferred RAT) for the new service transmission from the registered 3GPP access(es). However, impact on PLMN/RAT selection should be avoided which is not in SA2 scope.</p>
<p>6 – OPPO</p> <p>It is not a clear question. This will depend on what policy will be used. And the format of the indication should be further discussed.</p>
<p>7 – Ericsson LM</p> <p>No</p>
<p>8 – QUALCOMM Europe Inc. - Italy</p> <p>1) is already captured in the RAT priority; 2) should be part of DS UE/UPF rules (= extended ATSSS/N4 rules). These should apply only to steering and switching (and do not apply to access selection).</p>
<p>9 – Deutsche Telekom AG</p> <p>1) No 2) No</p>
<p>10 – Charter Communications</p> <p>No</p>
<p>11 – ZTE Corporation</p> <p>1) No 2) No</p>
<p>12 – Apple Distribution Intl Ltd</p> <p>1. No. 2. No.</p>
<p>13 – Nokia</p> <p>NO</p>
<p>14 – ETRI</p> <p>NO, PLMN preference and RAT preference in Q#1.4.3 will be more specific.</p>

2.5 Key Issue #2.1 – Round 1 Questions

Question KI#2.1.1: MPQUIC steering functionalities are to be defined at least based on CONNECT-IP and CONNECT-Ethernet.

1. Should these steering functionalities be defined as a new Steering Functionality (i.e. multiple MPQUIC steering functionalities, each one associated with a specific proxy mode) or be part of the existing Rel-18 MPQUIC Steering Functionality (i.e. a single MPQUIC steering functionality encompassing multiple proxy modes)?
2. Should CONNECT-TCP be also supported?

Feedback Form 37: Question KI#2.1.1

1 – CableLabs

[CL] 1. Based on the reasons detailed in Solution 2.11 we support the use of multiple MPQUIC based steering functionalities, one for each proxy mode.

2. CONNECT-TCP shall be supported as a MPQUIC based steering functionality from this release on. The solution can be based on Solutions 2.3 and 2.10 and the CONNECT-TCP proxy functionality developed in IETF. This IETF work is captured into a working group draft which is now in the LAST CALL stage.

2 – Deutsche Telekom AG

[DT] We disagree with the first statement in 2.1.1. i.e. we disagree that MPQUIC steering functionalities can be properly defined based on CONNECT-Ethernet as the IETF discussions are in very early stage and the whole draft was even questioned at the last IETF meeting. Very basic issues are still discussed and far from resolution. Therefore and because of historic experience we cannot agree that CONNECT-Ethernet would be part of RE119 conclusions (<https://datatracker.ietf.org/doc/minutes-119-masque/#proxying-ethernet>).

Ad 1.) We support the use of multiple MPQUIC based steering functionalities, one for each proxy mode as e.g. existing ATSSS rules can be reused.

Ad 2.) For TCP there exists a 3GPP specified MPTCP solution since Release 16. Advantages should be very significant for an additional solution for TCP and any new solution that targets only TCP should be based on an RFC, i.e. CONNECT-TCP in our opinion should not be part of Release 19 conclusions.

3 – LG Electronics France

Multiple MPQUIC steering functionalities, each one associated with a specific proxy mode. No need to support CONNECT-TCP.

4 – Charter Communications

1. Either option is fine, maybe multiple MPQUIC steering functionalities has the least CN & signalling impact. But it seems possible to add a row to the ATSSS Rule (i.e., update Table 5.32.8-1) to indicate the

proxy mode when the steering functionality is MPQUIC. Should be decided by stage 3, either approach is possible.

2. Yes, better to include all these proxy protocols in this release.

5 – Samsung Electronics Co.

1. These steering functionalities should be defined as a new Steering Functionality
2. CONNECT-TCP should be also supported

6 – HUAWEI Technologies Japan K.K.

For 1, our view is that this should be part of the existing Rel-18 MPQUIC Steering Functionality. Furthermore, if only connect-IP is defined for TCP when the MPQUIC functionality is applied, then the UE and UPF can decide the proxy mode based on the non-UDP traffic (connect-ip) or UDP traffic (connect-udp), so there is no need to negotiate proxy mode, can be specified as connect-ip for non-UDP IP traffic, connect-udp for UDP.

For 2, our answer is No. First, MPTCP can be used well for TCP traffic, which is mature and already supported by both UE and the network. Secondly the CONNECT-TCP has big impact on the UE. To avoid impact on the application layer, the UE needs to support a fake TCP layer to the applications, which brings complexity to the UE implementation, not even mention how this can be supported by the UE due to lack of protocol support in IETF. Thirdly if MPQUIC is really to be applied for TCP traffic, CONNECT-IP can be used. Fourthly, to support CONNECT-TCP, a negotiation between UE and network for the proxy protocol is needed, since there would be two protocols CONNECT-IP for TCP which introduces much complexity to the system, unless it is specified that CONNECT-IP cannot be used for TCP.

7 – Ericsson LM

1. The latter option, i.e. single MPQUIC steering functionality encompassing multiple proxy modes.
2. OK to support CONNECT-TCP but also OK to add only support CONNECT-IP and CONNECT-Ethernet.

8 – QUALCOMM Europe Inc. - Italy

1. yes
2. yes

9 – InterDigital Communications

1. A single steering MPQUIC functionality supporting multiple Connect protocols is preferred.
2. Yes.

10 – ZTE Corporation

- 1) existing Rel-18 MPQUIC Steering Functionality
- 2) No

11 – Apple Distribution Intl Ltd

1. New Steering Functionalities
2. Yes.

12 – Nokia

1. existing Rel-18 MPQUIC Steering Functionality with new proxy modes
2. OK to support Connect-TCP also. One advantage could that we can avoid need to support different steering functions in future. We can use ATSSS-LL and MPQUIC (with various proxy modes).

Question KI#2.1.2: This is the latest proposal from the conclusion paper to negotiate the CONNECT method to be used: "During MA PDU Session Establishment with an IP-based PDU Session type, the UE indicates to SMF what CONNECT methods it supports. The SMF is configured, as part of the DNN configuration, what proxy protocols are supported. The SMF determines what CONNECT methods are supported for the MA PDU Session, considering UE capabilities, network capabilities and network local policies and indicates that to the UE in PDU Session Establishment Accept. If multiple CONNECT methods are supported for a traffic flow, the UE selects the CONNECT method based on the application type (e.g. UDP or TCP) and/or based on UE implementation."

1. Should SMF determine a single CONNECT method to be supported for the MA PDU Session based on network local policies and indicate that to the UE in PDU Session Establishment Accept?
2. If no to 1), should the UE select the CONNECT method based on the application type (e.g. UDP or TCP) and/or based on UE implementation?

Feedback Form 38: Question KI#2.1.2

1 – CableLabs

[CL] We assume that both the UE and the network are fully aware of the steering capabilities of each other. Much more, we do consider that the UE device is in a better position than the network in deciding which CONNECT method to use for the traffic associated with a specific application, although we do acknowledge that this decision has a clear impact on the load of the proxy node/function. Based on this our answers are: NO for a and YES for b.

2 – Deutsche Telekom AG

- Ad 1. Yes.
Ad 2. not applicable.

3 – LG Electronics France

SMF can determine multiple CONNECT method for a MA PDU Session BUT only a single method for a SDF. There is no need to provide multiple options for a SDF and having such option just increases protocol complexity because SMF need to provide multiple options for each SDF to the UE.

4 – Charter Communications

Neutral to 1) or 2). Having network control may reduce network resources. Not sure if it is major issue for either approach.

5 – Samsung Electronics Co.

1. If only a single CONNECT method is supported for whole of the PDU Session, there might be issues since then UE would have to create a different PDU Session for UDP traffic (connect-udp), different PDU Session for TCP traffic (using connect-tcp) and so on.

So maybe supporting multiple CONNECT methods could be beneficial.

2. Accordingly if multiple CONNECT method can be supported in a single MA PDU Session, then either the UE can decide based on ATSSS rules which CONNECT Method to use for a traffic, or based on UE application type and/or UE implementation.

6 – HUAWEI Technologies Japan K.K.

Not needed for both questions, referring to answer to question 2 for KI#2.1.1.

7 – Ericsson LM

1. No. in our view there is no need to limit a PDU Session to support a single CONNECT method. It can e.g. be possible to support both CONNECT-IP and CONNECT-UDP.

2. Yes, if multiple CONNECT methods are supported on a MA PDU Session it seems reasonable that the UE selects CONNECT method based on the application type or, if ambiguous, based on UE implementation.

8 – QUALCOMM Europe Inc. - Italy

1. yes

9 – InterDigital Communications

1. No. The network should be able to control if a single CONNECT method or multiple CONNECT methods are supported by an MA PDU session, and indicate one or more CONNECT methods to the UE.

2. No strong position on application type vs. UE implementation.

10 – Apple Distribution Intl Ltd

1. No

2. Yes

11 – Nokia

1. No
2. Yes. If multiple CONNECT methods are supported, the SMF may indicate to the UE the CONNECT methods that are supported for the respective PDU Session, and then UE determines the Connect method to be used based on nature of traffic (UDP, TCP, IP, Eth)

Question KI#2.1.3: Should MPQUIC Connect-IP steering functionality be allowed to be used with Ethernet MA PDU Sessions?

Feedback Form 39: Question KI#2.1.3

1 – CableLabs

[CL] We do not see the benefit of supporting CONNECT-IP steering functionality for an Ethernet MA PDU Session. On the contrary, we believe that this may introduce unnecessary complications. Therefore our answer for this question is NO.

2 – Deutsche Telekom AG

We do not see the benefit of supporting CONNECT-IP steering functionality for an Ethernet MA PDU Session.

3 – LG Electronics France

No. 5GC does not manage IP address for Ethernet PDU Session.

4 – Charter Communications

Neutral, but prefer connect-ethernet.

5 – Samsung Electronics Co.

MPQUIC Connect-IP steering functionality should not be allowed to be used with Ethernet MA PDU Sessions.

6 – Ericsson LM

No. This is not needed. CONNECT-IP only support IP payload over Ethernet, and is therefore not a generic solution for Ethernet MA PDU Sessions. With Ethernet PDU Sessions the 5GS should not care about the payload of the Ethernet frame, as it could contain non-IP protocols. There was an issue with Ethernet header compression in RAN, but this can be avoided e.g. if the SMF indicates Unstructured PDU Session Type to RAN when MPQUIC is supported over Ethernet PDU Sessions (this would be a generic solution that works for any payload in the Ethernet frames).

<p>7 – QUALCOMM Europe Inc. - Italy</p> <p>no, not needed</p>
<p>8 – InterDigital Communications</p> <p>No.</p>
<p>9 – ZTE Corporation</p> <p>No</p>
<p>10 – Apple Distribution Intl Ltd</p> <p>No.</p>
<p>11 – Nokia</p> <p>NO. Connect-IP for Eth MA PDU would create additional complexity and unnecessary protocol overhead. To keep things simpler our answer is NO.</p>
<p>12 – CICT</p> <p>Yes</p>

2.6 Key Issue #2.2 – Round 1 Questions

Question KI#2.2.1: Should co-locating ePDG with the PSA UPF and using null encryption for IPSec between UE and ePDG be supported to simplify ATSSS deployment?

Feedback Form 40: Question KI#2.2.1

<p>1 – CableLabs</p> <p>[CL] This solution does not simplify the ATSSS deployment but on the contrary it may create unnecessary restrictions for both ePDG as well as UPF due to their collocation. Also similar with the solutions that propose making the UPF globally reachable from any public address via the collocated ePDG exposes the UPF to potential DoS attacks at least on the ingress links of the collocated ePDG/UPF.</p> <p>Even without collocating the ePDG and UPF, as detailed in Solution 2.12, there is a possibility of using NULL encryption between the UE and ePDG when all the UP traffic between them is due to a MA PDU session using MPQUIC based steering.</p> <p>Therefore our answer is NO, there is no need to collocate ePDG with PSA UPF as a mean to simplify ATSSS deployments.</p>
<p>2 – LG Electronics France</p> <p>Yes. This solution actually simplifies protocol stack because NAS protocol is not used. Also this solution supports all steering functionalities including ATSSS-LL. The ePDG address is dedicated to a single MA PDU Session of the UE and the address is only provided to the UE that is successfully authenticated/au-</p>

<p>thorized by the network over the 3GPP access. Therefore, there is no security risk.</p>
<p>3 – Charter Communications</p> <p>This approach/solution requires support for ePDG, operators who only have SA would not benefit from this light version requiring them to add functionality for ePDG & PGW-C.</p>
<p>4 – Samsung Electronics Co.</p> <p>For Simplified ATSSS, 4G should be implemented/deployed in UE as well as CN. We don't need deployment restriction.</p>
<p>5 – HUAWEI Technologies Japan K.K.</p> <p>It can be taken either as a deployment solution, or when something needs to be specified, it can be the UPF to support ePDG functionality as described in solution #2.6. Null encryption for IPSec is only applicable to MPQUIC, not for ATSSS-LL.</p>
<p>6 – Intel Deutschland GmbH</p> <p>No. ePDG comes together with legacy interfaces (SWm, SWx) and legacy nodes (AAA server). We do not think it is a good idea to perpetuate legacy technology in the third release of 5G-Advanced.</p>
<p>7 – QUALCOMM Europe Inc. - Italy</p> <p>No, co-location of ePDG with the PSA UPF can be supported based on existing standard and does not need further standardization. IPSec NULL encryption should not be supported (see reply to KI#2.2.2).</p>
<p>8 – Deutsche Telekom AG</p> <p>No.</p>
<p>9 – NEC Europe Ltd</p> <p>No.</p>
<p>10 – ZTE Corporation</p> <p>Could be a deployment option, but there is no need to specify in standard.</p>
<p>11 – Apple Distribution Intl Ltd</p> <p>Could be a deployment option.</p>
<p>12 – Nokia</p> <p>No. If the idea is to use IKE between UE and ePDG for UE authentication/authorization, then why not use existing ePDG solution?</p>

Question KI#2.2.2: Should NULL encryption IPSec tunnels be allowed for the MA PDU Session user plane traffic between UE and N3IWF?

Feedback Form 41: Question KI#2.2.2

1 – CableLabs

[CL] As proponents of Solution 2.12 we believe that using NULL encryption for IPSec SAs associated with UP traffic of a MA PDU Session using MPQUIC steering functionalities is the simplest solution, while it also addresses the costs of double layers of encryptions done both on the access and network. Therefore our answer is YES.

2 – LG Electronics France

No. This solution need to maintain NAS signalling connection and does not actually simplifies protocol stack. Also, in case of roaming, if serving PLMN does not support this feature, NULL encryption is not supported.

3 – Charter Communications

Yes, this approach has the smallest impact addressing the double encryption concern for MPQUIC in a backward compatible manner and compared to other solutions it doesn't depend on a 3GPP access to initiate ATSSS.

4 – Samsung Electronics Co.

It is against IPSec RFC's principles of using NULL encryption. Need to check from SA3. No much advantage due to N3IWF should be deployed. No N3IWF was originally intended by SID.

5 – HUAWEI Technologies Japan K.K.

In case of MPQUIC, the IPSec tunnel for the child SA can be NULL encrypted. For other ATSSS functionalities, e.g. ATSSS-LL, encryption of IPSec tunnel is still needed.

6 – Ericsson LM

It does not provide simplification, so it does not fulfil the main goal with the KI#2.2. NAS is kept over non-3GPP and the IKEv2 and IPSec stacks remain, as well as the packet encapsulation overhead of IPSec. Furthermore, NULL encryption still requires integrity protection in IPSec.

7 – Intel Deutschland GmbH

No. The protocol stack complexity on the UE side remains intact (with NAS messages encapsulated in EAP-5G packets, etc.).

8 – QUALCOMM Europe Inc. - Italy

No. Does not provide simplification. NULL encryption in N3IWF does not solve one of the problems which is to pass NAS messages over N3IWF/non-3GPP access. There is also the problem of exposing the PLMN inner deployment (UPF IP address) if IPSec encryption is disabled.

9 – Deutsche Telekom AG Yes
10 – NEC Europe Ltd No.
11 – ZTE Corporation Yes. It could be possible with less impact on non 3GPP.
12 – Apple Distribution Intl Ltd This option does not achieve simplification due to need for NAS over non-3GPP and the same protocol stacks (IKEv2, IPsec) as before.
13 – Nokia This looks to be the simplest solution with least impact on the 3GPP specs. However, there are few questions that needs to be discussed: - For NULL encryption is there any dependency on IETF RFCs? We may have to also check with SA3. - Can we ensure that NULL encryption is used only for QUIC traffic? If N3IWF uses NULL encryption, our understanding is that any subsequent traffic for any PDU session will also use NULL encryption. - What do we gain by using NULL encryption in terms of performance and reducing signaling messages? The IPsec stack would still remain and also there will be integrity protection as well. So essentially, we may not achieve any simplification of stack or any performance gain?

Question KI#2.2.3: Should N3IWF/TNGF be allowed to stop initiating Child SA for the PDU Session as well as not to apply security for the UP of the PDU Session?

Feedback Form 42: Question KI#2.2.3

1 – CableLabs [CL] We do not see the reason why one would entirely remove the IPsec tunnelling mechanism for the user plane between the UE and N3IWF/TNGF. The existence of an IP based tunnelling between UE and N3IWF/TNGF is the one that allows a transparent mechanism of forwarding data over the non-3GPP access while it also allows properly associating the data with the corresponding N3 tunnel toward the UPF. Eliminating the IP tunnelling mechanism is doable but, in this case, introduces unnecessary requirements on the non-3GPP access (eg. similar with the ones we have for 4G trusted access). Our answer is NO.
2 – LG Electronics France No. How N3IWF/TNGF identifies traffic and associates N3 tunnel is not resolved. There is a security risk.

<p>3 – Charter Communications</p> <p>If no Child SAs, how to differentiate QoS flows and route traffic in via non-3GPP isn't clear. Still requires some sort of tunnel protocol.</p>
<p>4 – Samsung Electronics Co.</p> <p>No. Need to check from SA3. Moreover, without child SA it could make difficulty on treating differentiated QoS flows (<i>and also different PDU Sessions</i>). No much advantage due to N3IWF should be deployed. No N3IWF was originally intended by SID.</p>
<p>5 – HUAWEI Technologies Japan K.K.</p> <p>No, it is unclear on how to transport the data between the UE and N3IWF if no child SA tunnel is established, the corresponding ENs as described in the TR for the solution need to be addressed before it can be justified.</p>
<p>6 – Ericsson LM</p> <p>No. This solution is not clear. It is e.g. not explained how the routing between UE and N3IWF/TNGF is done if there is no IPsec tunnel. It does also not provide simplification since the NAS is kept over non-3GPP and the IKEv2 and IPsec stacks remain.</p>
<p>7 – Intel Deutschland GmbH</p> <p>No. The protocol stack complexity on the UE side remains intact (with NAS messages encapsulated in EAP-5G packets, etc.).</p>
<p>8 – QUALCOMM Europe Inc. - Italy</p> <p>No. The solution does not address how to handle the mapping of traffic from the UE to the correct N3 tunnel. No simplification to UE stack.</p>
<p>9 – Deutsche Telekom AG</p> <p>No.</p>
<p>10 – NEC Europe Ltd</p> <p>No.</p>
<p>11 – ZTE Corporation</p> <p>No</p>
<p>12 – Apple Distribution Intl Ltd</p> <p>No.</p>

13 – Nokia

No.

The Child IP SA is analogous to the DRBs (Data Radio Bearers/user resources) in the 3GPP (RAN) case and is created within the procedure of establishing a PDU session. Hence it is needed in order to send and receive Traffic. The solution is not clear and without answering the ENs this solution cannot be considered for conclusions.

Question KI#2.2.4: Is there a need to define an architecture which keeps the NAS signalling between UE and CN over non-3GPP access?

Feedback Form 43: Question KI#2.2.4

1 – CableLabs

[CL] This question is unclear for us. The current 5G architecture for non-3GPP access allows NAS signalling between UE and CN over non-3GPP access. Also, the current ATSSS based solution provides means for a MA PDU Session to have NAS signalling over non-3GPP access. From this perspective if the question is about defining a NEW architecture (different than the current Single Access PDN Session over non-3GPP access) which keeps the NAS signalling between UE and CN over non-3GPP access, the answer is NO.

On the contrary, if the question is referring to the need of having an architecture which keeps NAS signalling between UE and CN over non-3GPP access then our answer is YES

2 – LG Electronics France

No. From the beginning of SID discussion, study objective indicates whether NAS signaling connection can be removed to simplify architecture. Therefore, if technically feasible, there is no need to keep NAS signaling connection. If needed, network can send signaling over 3GPP access.

3 – Charter Communications

Yes, this is important for operators who have a converged network that supports 3GPP access as well as non-3GPP access. Intuitively, majority of UE's are on WiFi and only use cellular when there is a lack of WiFi coverage.

4 – Samsung Electronics Co.

No. There is not a need to define an architecture which keeps the NAS signalling between UE and CN over non-3GPP access.

5 – HUAWEI Technologies Japan K.K.

No, there is no need to support the NAS signalling between UE and CN via non-3GPP access.

<p>6 – Ericsson LM</p> <p>No. Solutions keeping NAS (and possible also IKEv2/IPSec) do not provide simplification, so it does not fulfil the main goal with KI#2.2. Solutions with NAS over non-3GPP are already existing as per rel-18 specifications.</p>
<p>7 – Intel Deutschland GmbH</p> <p>No. In our understanding the main objective of KI#2.2 was to specify as solution that removes the complexity on the UE side, not only in terms of removal of double encryption, but also in terms of simplified protocol stack. In the N3IWF approach there are up to four layers of IP in the protocol stack when using non-3GPP access, whereas in some of the simplified ATSSS solutions there are only two layers of IP.</p>
<p>8 – QUALCOMM Europe Inc. - Italy</p> <p>No</p>
<p>9 – Deutsche Telekom AG</p> <p>Yes, this is important for operators who have a converged network that supports 3GPP access as well as non-3GPP access.</p>
<p>10 – NEC Europe Ltd</p> <p>No.</p>
<p>11 – ZTE Corporation</p> <p>The question is unclear, since current architecture already support NAS signalling between UE and CN over non-3GPP access</p>
<p>12 – Apple Distribution Intl Ltd</p> <p>No. Solutions keeping NAS over non-3GPP access do not provide simplification.</p>
<p>13 – Nokia</p> <p>The question is not clear. If we want to reuse N3IWF then we cannot avoid NAS.</p>

Question KI#2.2.5: Should "non-3GPP access without 5G NAS over non-3GPP" be supported to simplify the network operation over non-3GPP access? This assumes an architecture without TNGF/N3IWF where the UE connects to the UPF via the public IP network over a new interface.

- a) Should the connection between the UE and the UPF only secured using TLS over the non-3GPP access? Is there a need to establish an IPSec security association (this assumes the UPF is enhanced to support IPSec)?
- b) Should MPQUIC steering functionality be the only steering functionality to be defined? Should MPTCP be supported?
- c) Would the UE authentication solely rely on authenticating the UE via 3GPP access only?

- d) For MA PDU Session establishment, should it be transparent to the AMF or should AMF be enhanced to support simplified ATSSS procedures over non-3GPP access?
- e) If the UE loses 3GPP access coverage, should the MA PDU Session be kept until a specified timer value expires?

Feedback Form 44: Question KI#2.2.5

1 – CableLabs

[CL] We do not see how the network operations over non-3GPP access are simplified by having “non-3GPP access without 5G NAS over non-3GPP access”. As indicated in our answer to the previous question we do see the need for operators to be able to control devices which are accessing 5G services when these devices operate using non-3GPP access, with or without an additional 3GPP leg. Much more, any potential changes due to “non-3GPP access without 5G NAS over non-3GPP access” may result into a different “Single access PDU Session architecture over non-3GPP access. This may result in further fragmentation of the solution space without any clear benefits. Our answer is NO.

- a. The question is unclear. There are at least two aspects to be addressed: UPF reachability and UP data security between UE and UPF. As indicated before we see a security related issue exposing the UPF to traffic coming from anywhere in the internet as it is clear exposure to potential DoS attacks. With regard to the end to end encryption of the data between UE and UPF using TLS we believe that when this is applied, UP encryption of data on the access is not needed anymore.
- b. We do not see the need of MPTCP steering if MPQUIC based steering (using CONNECT-TCP) is available. The answer is NO.
- c. The answer is NO based on our earlier arguments.
- d. The AMF must be enhanced if one must support this scenario.
- e. As indicated before the UE must be able to be controllable with or without the availability of the 3GPP access and not only for a limited specified timer value.

2 – LG Electronics France

No. Solutions using High-layer steering functionalities does not support ATSSS-LL. ATSSS-LL is the simplest steering functionality so it should be supported especially considering the objective, i.e. simplifying ATSSS architecture.

3 – Charter Communications

All proposed solutions were not handled, and the current solutions are addressing the KI from a 3GPP deployment perspective and not a primary non-3GPP deployment perspective.

The majority of approved solutions are introducing a new type of access network (i.e., non-integrated non-3GPP access).

There is no need to support solutions that remove TNGF/N3IWF over non-3GPP access, this fragments the market and adds more complexity (i.e., additional options/features for accessing 5GC via non-3GPP access).

Removing NAS from non-3GPP also adds UE dependency on 3GPP coverage, there are valid use cases illustrating a UE having only WiFi coverage (i.e. no 3GPP coverage) but would like to access 5GC.

4 – Samsung Electronics Co.

- a) The connection between the UE and the UPF should be only secured by a security mechanism using e.g. TLS over the non-3GPP access. So, IPsec SA between UE and UPF does not need to be established.
- b) depending on the result of KI#2.1 (if Connect-TCP is supported, then MPTCP may not be needed). No need to block MPTCP based mechanism.
- c) basically UE (*over the Non-3GPP leg*) can be authenticated with CN based on authentication data (e.g. certificate or some credentials/timer/nonce etc.) delivered over 3gpp access. No AUSF based authentication needed over non-3GPP access.
- d) AMF should be enhanced to select a simplified ATSSS supporting SMF.
- e) If the UE loses 3GPP access coverage, non-3gpp access leg can be kept until a specified timer value expires because further controlling the non-3gpp access leg is not possible due to lack of 3gpp access. No AUSF based authentication needed over non-3GPP access.

5 – HUAWEI Technologies Japan K.K.

- a) Necessary to keep IPsec between the UE and UPF, to simplify the impact on the UE side. And ATSSS-LL shall be supported as well, where TLS is not available and IPsec has to be used for security.
- b) No, MPQUIC is mainly used for per-packet traffic steering, for other steering modes, ATSSS-LL shall be supported. We don't see the benefit to apply MPQUIC for them, considering the overhead, such as every IP header replacement for UL and DL packets in the UPF, the complexity and extra delay in the MPQUIC connection setup procedure per QoS Flow per proxy mode, and the delay will be aggravated if the first MPQUIC connection has to be created via 3GPP side, as described by some solutions, e.g. solution #2.8, but the 3GPP access has long latency at that moment. It should be noted that this solution is not applicable to the trusted WLAN access case, since NULL encryption is now applied to trusted WLAN access and mandatory encryption with MPQUIC is not necessary.
- c) This question is only applicable to MPQUIC based solution, such as solution #2.8, which needs to be investigated by SA3.
- d) The AMF needs to be enhanced to support the ATSSS-lite: First the AMF needs to select the SMF supporting the ATSSS-lite feature, which is different from the existing ATSSS mechanism; Secondly the AMF may need to be aware that the MA PDU Session is established without UE being explicitly registered over non-3GPP access.

In addition, when both N3IWF and ATSSS-lite are supported in the PLMN, it needs to be discussed if the network/AMF needs to control only N3IWF or only ATSSS-lite can be applied to a single UE.
- e) ok to keep MA PDU Session for some time, up to operator's configuration, e.g. via a specific timer.

6 – Ericsson LM

Yes.

- a) TLS should be sufficient and there should be no need for IPsec. There are no security benefits with IPsec compared to TLS.
- b) In case KI#2.1 concludes on supporting CONNECT-IP, it would be sufficient to support MPQUIC.
- c) Yes.
- d) Either option is OK. In case the AMF is enhanced for simplified ATSSS procedures it is possible to select an SMF that support simplified ATSSS procedures. If the existing ATSSS capability is used, it is possible to select an SMF that supports ATSSS.
- e) Yes, if the UE loses 3GPP access coverage, the MA PDU Session can be kept at least until the UE is (implicitly) deregistered from 3GPP access.

7 – Intel Deutschland GmbH

Yes.

- a) Using only TLS is sufficient. In any case, it is up to SA3 to confirm.
- b) We think that supporting MPQUIC only is sufficient.
- c) Yes.
- d) We are neutral. The only reason for impacting the ATSSS is to enable heterogeneous network deployments where only a subset of the SMFs support the Simplified ATSSS functionality. It should be noted that there is no need for AMF functionality that coordinates the two legs of the MA PDU Session comparable to the existing AMF functionality. With Simplified ATSSS the AMF sees only a single-access PDU Session.

8 – Intel Deutschland GmbH

e) Yes.

9 – QUALCOMM Europe Inc. - Italy

- a. it should be secured only by TLS tunnels
- b. only MPQUIC (since it will be extended to support also non-UDP traffic)
- c. this should be left to SA3
- d. AMF should not be impacted
- e. yes

10 – InterDigital Communications

- a) TLS should be sufficient, pending SA3 approval
- b) MPQUIC should be sufficient.
- c) Yes, pending SA3 approval
- d) neutral
- e) Yes

11 – Deutsche Telekom AG

We do not see how the network operations over non-3GPP access are simplified by having “non-3GPP access without 5G NAS over non-3GPP access”. In contrary it will complicate network operation (customer care complaints). This architecture does not allow to start a session when only Non-3GPP access is available. It would cause troubles with customer complaints and customer care will need to explain this cumbersome session drops, etc, We see a security issue exposing the UPF to traffic coming from anywhere in the internet.

I.e. the answer is no to the first question in **Question KI#2.2.5**. That means that the remaining questions are not applicable.

12 – NEC Europe Ltd

- a) Should be decided by SA3.
- b) No.
- c) Should be decided by SA3.
- d) No.
- e) No, the MA PDU Session should not be kept.

13 – ZTE Corporation

The overall answer is no. There is no need to make big architecture changes at 5GA. We can rediscuss the overall architecture in 6G. Also using non 3GPP access should not have dependency over 3GPP access.

14 – Apple Distribution Intl Ltd

- Yes.
- a) TLS is sufficient. No need for IPSec.
 - b) MPQUIC alone is sufficient, CONNECT-IP is necessary, CONNECT-TCP is preferred. No need to keep MPTCP.
 - c) Yes.
 - d) Both options are OK.
 - e) Yes.

15 – Nokia

NO.

The solutions have a limitation that the UE shall always first establish MA PDU Session over 3GPP access. This does not address the scenarios where the primary deployment is non-3GPP access.

When the 3GPP connection is lost, the UE would lose the complete MA PDU Session.

Exposing a public IP address from UPF will introduce further security threats/risks that needs to be first analyzed by SA3.

The UE is not authenticated over the non-3GPP access. Can we only rely on the security mechanisms provided by the QUIC layer?

The non-3GPP access market is already fragmented and introducing this solution (i.e. remove N3IWF/TNGF) to support some use cases (i.e. ATSSS lite) would further add to the fragmentation and deployment complexities.

Considering all the above, our position is to not remove N3IWF/TNGF from the non-3GPP access architecture so late into the 5G standards.

Response to individual questions below (although our preference is to not standardize this solution):

a) NO. UPF should not be enhanced to support IPSec.

b) NO. only MPQUIC

c) NO. There shall be some way for the network to authenticate and authorize the UE also via non-3gpp access, otherwise any UE could use the non-3gpp path.

d) YES. Should be transparent to AMF

e) There shall be some way for the network to control the UE when the UE loses 3GPP connection. Without such control, allowing UE to access the PDU Session (even for a short duration) is not a good idea. SA3 shall be involved for such decision.

3 Round 1 Summary from Rapporteur

3.1 Key Issue #1.1 – Round 1 Summary

Question KI#1.1.1 asked "Should one of the SUPIs be identified as primary SUPI or could either of two SUPIs be used to first register or request the PDU session establishment?"

20 companies responded. 13 companies indicated there is no need of primary and secondary SUPI approach. Either of the two SUPIs can be used to first register or request the PDU session establishment.

7 companies indicated it would be beneficial to differentiate the two SUPIs by identifying a Primary SUPI and Secondary SUPI, this would facilitate the coordination and the policies to support the DualSteer scenarios.

Based on the responses, the proposal is to ask in round 2, "**Either of two SUPIs can be used to first register or request the PDU session establishment. The primary/secondary SUPI would not be pre-determined by the subscription data, but by the order of the SUPIs successful registration. Should one of the SUPIs be treated as primary SUPI if it was registered first?**"

Question KI#1.1.2 asked about Association of SUPIs. 19 companies responded.

"1. Should there be an association between the two SUPIs?"

18 companies indicated 'yes', no companies indicated 'no'.

"2. If yes to 1), should it be maintained in UDM?"

18 companies indicated 'yes', no companies indicated 'no'.

Proposal: proceed with the assumption there is an association between the two SUPIs and it is maintained in UDM.

"3. If yes to 1), should the association also include Access Type/RAT restrictions?"

6 companies indicated 'yes'. 10 companies indicated 'no'.

Proposal: in round 2, ask **"Would existing mechanism to control access type and RAT restrictions applied to each SUPI independently be satisfactory?"**

"4. If no to 1), can the subscriptions reside in different UDMs?"

3 companies indicated 'yes'. 5 companies indicated 'no'.

Proposal: in round 2, ask the question without the condition: **"Can the subscriptions reside in different UDMs?"**

"5. If yes to 2), should the two SUPIs of the DualSteer Device stored as a "DualSteer Pair" in UDM, with DualSteer Pair having its own identifier?"

6 companies indicated 'yes'. 7 companies indicated 'no'.

Proposal: in round 2, ask **"Should the two SUPIs of the DualSteer Device stored as:**

1. One parent SUPI and one child SUPI

2. One "DualSteer Group"?"

Question KI#1.1.3 asked about Access and Mobility Subscription Data for DualSteer.

19 companies responded.

"1. Is there a need to enhance the Access and Mobility Subscription Data for DualSteer?"

11 companies indicated 'yes'. 5 companies indicated 'no'.

"2. If yes to 1), what additional information needs to be added?"

Based on the responses, the proposal is to ask in round 2, **"Is there a need to enhance the Access and Mobility Subscription Data for DualSteer with the following information?"**

1. Access Type/RAT/PLMN restriction?

2. PCF selection information to enable selecting the same PCF for two SUPIs?

3. RFSP index dedicated to DualSteer?"

"3. Should the following information be considered?"

a) an indication that the SUPI is part of a DualSteer subscription”

4 companies indicated 'yes'. 7 companies indicated 'no'.

b) the linked 2nd SUPI of the DualSteer subscription

8 companies indicated 'yes'. 4 companies indicated 'no'.

c) DNN, S-NSSAI that are allowed for DualSteer switching

6 companies indicated 'yes'. 6 companies indicated 'no'.

Question KI#1.1.4 asked about Session Management Subscription Data for DualSteer.

16 companies responded.

”1. Is there a need to enhance the Session Management Subscription Data for DualSteer?”

15 companies indicated 'yes'. No companies indicated 'no'.

Proposal: proceed with the assumption that Session Management Subscription Data needs to be enhanced for DualSteer.

”2. If yes to 1), what additional information needs to be added?”

Based on the responses, the proposal is to ask in round 2, **”Is there a need to enhance the Session Management Subscription Data for DualSteer with the following information?**

1. A cross-reference between SUPIs belonging to the same DualSteer device?

2. Information to correlate two PDU sessions (e.g., Linked SUPIs for dual steer session(s), same PDU session ID)?

3. whether DualSteer PDU Session is allowed for a specific DNN and S-NSSAI?

4. whether to enable correlating PDU session before and after switching?

”3. Should the following information be considered?

a) combinations of DNN, S-NSSAI for which traffic switching between the two UEs is applicable along with the selected SMF for the given DNN, S-NSSAI?”

7 companies indicated 'yes'. 1 companies indicated 'no'.

Proposal: proceed with the assumption that Session Management Subscription Data for DualSteer needs to include combinations of DNN and S-NSSAI for which traffic switching between the two UEs is applicable along with the selected SMF for the given DNN, S-NSSAI.

Question KI#1.1.5 asked "Is there a need to associate the two PDU session requests from the DualSteer Device in SMF registration information and UE context in SMF data in UDM/UDR?"

15 companies responded. 11 companies indicated 'yes'.

Proposal: proceed with the assumption there is a need to associate the two PDU session requests from the DualSteer Device in SMF registration information and UE context in SMF data in UDM/UDR.

3.2 Key Issue #1.2 – Round 1 Summary

Question KI#1.2.1 asked "Is it necessary to define when the UE decides to register to a second 3GPP access network and how the UE selects this 3GPP access network?"

16 companies responded. 6 companies indicated that operator policy is necessary to guide the DualSteer Device when to trigger the secondary SUPI registration. 7 companies indicated there is no need for such policy. Regarding "which RAT and PLMN is selected by the UE", there is consensus it is up for SA1/CT1 discussion.

Based on the responses, the proposal is to ask in round 2, **"Is there a need to specify a policy in SA2 that enables the HPLMN to control when the DualSteer device establishes connectivity to the second 3GPP access network?"**

Question KI#1.2.2 asked "Is there a need for the DualSteer Device to indicate to the AMF its capabilities to support for DualSteer during registration?"

13 companies indicated 'yes'. 4 companies indicated 'no'.

Proposal: proceed with the assumption that DualSteer Device indicates to the AMF its capabilities to support for DualSteer during registration.

"The following has been considered:

1. whether it supports simultaneous/non-simultaneous data transfer"

6 companies indicated 'yes'. 2 companies indicated 'no'.

"2. whether it acts (or can act) as the primary UE or secondary UE?"

2 companies indicated 'yes'. 14 companies indicated 'no'.

Proposal: proceed with the assumption that UE does not need to indicate to AMF whether it acts (or can act) as the primary UE or secondary UE.

Question KI#1.2.3 asked "Is there a need for the AMF to indicate to the DualSteer Device whether the

network supports DualSteer during registration?”

18 companies responded. 13 companies indicated 'yes', 4 companies indicated 'no'.

Proposal: proceed with the assumption that AMF needs to indicate to the DualSteer Device whether the network supports DualSteer feature during registration.

Question KI#1.2.4 asked about Correlation id. 19 companies responded.

”1. Is it necessary to perform a separate registration procedures for each of the subscriptions/SUPIs? ”

18 companies indicated 'yes'. 1 companies indicated 'no'.

Proposal: proceed with the assumption that DualSteer Device performs separate registration procedures for each of the subscriptions/SUPIs.

”2. Should there be a correlation id during registration to correlate the two registrations?”

5 companies indicated 'yes'. 12 companies indicated 'no'.

Based on the responses, the proposal is to ask in round 2, **”Would it be necessary to specify a Registration Correlation Information in order for the DualSteer Device to be aware that the two SUPIs are associated? If yes, could the Registration Correlation Information be also used by the UDM to determine that the two SUPIs are used by the same DualSteer Device?”**

”3. If yes to 2), should this correlation id identify each 3GPP access leg uniquely?

1 companies indicated 'yes'. 5 companies indicated 'no'.

Proposal: proceed with the assumption that there is no need for the Registration Correlation Information (if such information is defined) to identify each 3GPP access leg uniquely.

”4. If yes to 2), would it be allocated by the DualSteer Device and communicated to the network via each UE registered access or would it be allocated by the UDM during UE registration procedure?

4 companies indicated 'UDM'. 2 companies indicated 'DualSteer Device'.

Proposal: if Registration Correlation Information is defined based on the assumption stated in the previous question, it should be allocated by UDM.

Question KI#1.2.5 asked ”Should the DualSteer device provide assistance information (e.g., the available PLMNs, additional RATs, UE location) to the network after registering its first SUPI to help registering the second SUPI (e.g. selecting a PLMN for it)?”

15 companies responded. 2 companies indicated 'yes', 13 companies indicated 'no'.

Proposal: proceed with the assumption that DualSteer device does not provide any assistance information to

the network after registering its first SUPI to help registering the second SUPI.

3.3 Key Issue #1.3 – Round 1 Summary

Question KI#1.3.1 asked "Should DualSteer PDU Session re-use the principles of MA PDU session?"

17 companies responded. 11 companies indicated 'yes' or 'partially', 2 companies indicated 'no', 1 company indicated 'can live with it as an optional way forward'.

Based on the responses, the proposal is to ask in round 2 more clarifications, "**Should PDU Session established to support DualSteer traffic steering or PDU Session established to support DualSteer traffic switching re-use the principles of MA PDU session? If yes, what properties of MA PDU session should be re-used?**"

1. Enhanced ATSSS rules?

2. Steering functionalities?

3. Steering modes?

4. PMF measurements?

5. Same anchor SMF/UPF?

6. Common N4 session?"

Question KI#1.3.2 asked "Can MA PDU Session be used directly for dual 3GPP accesses based on using e.g. the overlay-underlay architecture?"

15 companies responded. 5 companies indicated 'yes', 9 companies indicated 'no'.

Based on the responses, the proposal is to ask in round 2 more clarifications, "**Can MA PDU Session be used directly for over two UEs based on using the overlay-underlay architecture assuming ATSSS rules are aligned with SA1 requirements for DualSteer?"**"

Question KI#1.3.3 asked about Correlation id.

18 companies responded.

"1. Is it necessary to perform two separate PDU Session establishments for each of the subscriptions/SUPIs?"

15 companies indicated 'yes'. 0 companies indicated 'no'.

Proposal: proceed with the assumption that it necessary to perform two separate PDU Session establishments for the two SUPIs.

”2. Should there be a correlation id defined to correlate the two PDU Session establishment?”

6 companies indicated 'yes'. 11 companies indicated 'no'.

Based on the responses, the proposal is to ask in round 2, **”Is it necessary to define the Session Correlation Information to enable the serving AMF to select the same SMF/UPF at least for DualSteer traffic switching?”**

”3. If yes to 2), should this correlation id identify each 3GPP access leg uniquely?

No companies indicated 'yes'. 4 companies indicated 'no'.

Proposal: proceed with the assumption that there is no need for the Session Correlation Information (if such information is defined) to identify each 3GPP access leg uniquely.

”4. If yes to 2), would it be allocated by the DualSteer Device and communicated to the network via each UE registered access or would it be allocated by the UDM during PDU Session establishment procedure?”

3 companies indicated 'UDM', 3 companies indicated 'DualSteer Device', 1 company indicated 'URSP rules'.

”5. If yes to 2), would the correlation id be unique per S-NSSAI and DNN combination?”

1 company indicated 'yes'. 4 companies indicated 'no'.

Proposal: proceed with the assumption that there is no need for the Session Correlation Information (if such information is defined) to be unique per S-NSSAI and DNN combination.

Question KI#1.3.4 asked ”Can the two PDU Session establishment requests use the same PDU Session ID and not rely on correlation id?”

17 companies responded. 9 companies indicated 'yes', 8 companies indicated 'no'.

Based on the responses, the proposal is to ask in round 2 more clarifications, **”If the DualSteer device can ensure to choose a common PDU Session ID that is unique per both SUPI1 and SUPI2, can such common PDU Session ID be used to correlate the two PDU Session establishments?”** and **”Is there a need to pre-establish the PDU session for potential services switching?”**

Question KI#1.3.5 asked ”Should the PDU Session establishment include the Linked SUPI information?”

18 companies responded. 1 company indicated 'yes', 16 companies indicated 'no'.

Proposal: proceed with the assumption that PDU Session establishment does not include the Linked SUPI information.

Question KI#1.3.6 asked ”Should the DualSteer device include DualSteer capabilities in the PDU Session

establishment, e.g., supported steering functions (MPTCP, MPQUIC, DS-LL), supported steering modes (e.g., Active-Standby, etc.), and support for simultaneous or non-simultaneous data transfer?"

19 companies responded. 15 company indicated 'yes', 2 companies indicated 'no'.

Proposal: proceed with the assumption DualSteer device includes DualSteer capabilities in the PDU Session establishment.

Based on the responses, the proposal is to ask in round 2 more clarifications, **"Which capabilities should be included in the PDU Session establishment by the DualSteer Device:**

- 1. Supported steering functions?**
- 2. Supported steering modes?**
- 3. Support for simultaneous or non-simultaneous data transfer?"**

Question KI#1.3.7 asked "Should the DualSteer device include an indication in the PDU Session establishment whether the PDU session is applicable for potential DualSteer switching?"

19 companies responded. 14 company indicated 'yes', 6 companies indicated 'no'.

Proposal: proceed with the assumption that the DualSteer device should include an indication in the PDU Session establishment whether the PDU session is applicable for potential DualSteer switching.

Question KI#1.3.8 asked "Is there a need to use specific DNNs/S-NSSAIs for DualSteer PDU Session establishment?"

16 companies responded. 10 company indicated 'yes', 5 companies indicated 'no'.

Based on the responses, the proposal is to ask in round 2 more clarifications, **"Should the DualSteer feature apply to any DNN/S-NSSAI? If no, should the applicable DNNs/S-NSSAIs controlled 1. via URSP?, 2. via SM subscription data?"**

Question KI#1.3.9 asked "Should 3GPP specify how the DualSteer Device internally controls and coordinates the DualSteer feature, e.g. via a Control Function or Coordination Layer?"

16 companies responded. 4 company indicated 'yes', 10 companies indicated 'no'.

Proposal: proceed with the assumption that the 3GPP should not specify the details how the DualSteer Device internally controls and coordinates the DualSteer feature.

Based on the responses, the proposal is to ask in round 2 more clarifications, **"Is it necessary to share the PDU Session ID between the 2 UEs of the DualSteer Device so that another correlation ID for SM would not be required?"**

Question KI#1.3.10 asked "Should AMF be impacted for PDU Session establishment? For no AMF impact, it could be based on e.g. SMF redirection and needs homogeneous deployment of SMFs that support DualSteer for a DNN/S-NSSAI."

17 companies responded. 10 companies indicated 'yes', 3 companies indicated 'no', 3 companies indicated that AMF impact should be avoided or be kept minimal.

Proposal: proceed with the assumption that AMF can be impacted for PDU Session establishment. AMF impact should be kept minimal.

Question KI#1.3.11 asked about Anchoring. 17 companies responded.

"1. Should the DualSteer PDU session be always anchored in a common UPF and managed by a common SMF and potentially a common PCF?"

16 companies indicated 'yes', 1 companies indicated 'no', 5 companies indicated 'PCF could be different'.

Based on the responses, the proposal is to ask in round 2 more clarifications, "**Should PDU sessions established to support DualSteer feature be always anchored in a common PCF?**"

"2. Should SMF have the same SM policy association towards the PCF?"

4 companies indicated 'yes', 3 companies indicated 'no'.

"3. If yes to 1), would it be required only for PDU Sessions that are subject to traffic switching?"

9 companies indicated 'yes', 6 companies indicated 'no'.

Proposal: proceed with the assumption that PDU sessions established to support DualSteer feature are anchored in a common UPF and managed by a common SMF.

Based on the responses, the proposal is to ask in round 2 more clarifications, "**Should the common UPF anchor established within the PDU sessions established to support the DualSteer feature apply to both traffic steering and switching or traffic switching only?**"

Question KI#1.3.12 asked "When the SMF links the two PDU sessions from the two SUPIs of DualSteer device, should the SMF (or UPF) allocate the same IP address for the linked PDU Sessions?"

16 companies responded. 15 companies indicated 'yes', 1 company indicated 'no', 6 companies highlighted that same IP address should apply at least for switching.

Proposal: proceed with the assumption when the SMF links the two PDU sessions from the two SUPIs of DualSteer Device and the PDU sessions are targeted for potential DualSteer switching, the SMF (or UPF) allocates the same IP address for the correlated PDU Sessions to minimize service interruption during traffic switching.

Question KI#1.3.13 asked "Should SMF use same N4 session towards the UPF?"

14 companies responded. 6 companies indicated 'yes', 3 companies indicated 'no', 2 companies indicated 'neutral', 1 company asked for more time.

Proposal: evaluate further whether SMF uses the same N4 session towards the UPF.

"Should SMF provide two SUPIs to UPF over N4?"

14 companies responded. 1 company indicated 'yes', 1 company indicated 'no', 4 companies indicated 'There is no need to provide SUPI to UPF, N4 session ID is enough for configure the N4 rule.'

Proposal: proceed with the assumption there is no need to provide SUPI to UPF, N4 session ID is used for configure the N4 rule.

Question KI#1.3.14 asked about Steering functionalities. 12 companies responded.

"1. Is it necessary to define steering functionalities for the UE and UPF (e.g. DS-LL steering functionality, DS-HL steering functionalities including MPQUIC and MPTCP)?"

7 companies indicated 'yes', 4 companies indicated 'no', 1 company indicated 'UE and UPF should support DS-LL steering functionality and optionally DS-HL steering functionalities', 1 company indicated 'steering functionality is needed for switching only'.

Based on the responses, the proposal is to ask in round 2 more clarifications, "**Should DualSteer feature re-use steering functionalities defined by ATSSS? Steering functionalities in DualSteer could only be applied to steer and switch traffic, so e.g. QUIC protocol could apply but not its multipath extensions.**"

"2. How would MPTCP and MPQUIC steering functionalities apply to a DualSteer Device with no simultaneous transfer capability?"

5 companies indicated that 'a DualSteer Device with no simultaneous transfer capability should only be allowed to use steering modes that allow to send traffic over a single access, i.e. only allow Active-Standby steering mode'.

3.4 Key Issue #1.4 – Round 1 Summary

Question KI#1.4.1 asked about URSP rules. 16 companies responded.

"1. Is it necessary to extend URSP rules?"

13 companies indicated 'yes', 3 companies indicated 'no'.

Proposal: proceed with the assumption that DualSteer feature requires extension to URSP rules.

"2. Would URSP rules be associated with the DualSteer Device or would each SUPI of the DualSteer Device

have its own URSP rules?"

11 companies indicated that 'Each SUPI should have its own URSP rules but the rules controlling the DualSteer feature should be the same for both SUPIs'. 3 companies indicated that 'the URSP rules controlling the DualSteer feature can be associated with the DualSteer Device assuming a Coordination Layer is specified between the 2 SUPIs'. 2 companies indicated that 'First registered SUPI (or primary SUPI) can be chosen for policy delivery'.

Proposal: proceed with the assumption that each SUPI should have its own URSP rules but the rules controlling the DualSteer feature should be the same for both SUPIs.

"3. If extended URSP rules are supported, should the UE indicate its capability of enhanced URSP rules during the registration procedure?"

3 companies indicated 'yes', 7 companies indicated 'no'.

Proposal: proceed with the assumption that UE does not need to indicate its capability of enhanced URSP rules during the registration procedure.

Question KI#1.4.2 asked about URSP rules that need to be supported. 17 companies responded.

"1. The Access Type preference in Route Selection Descriptor is extended to include a Dual Steering indication or Multiple Accesses?"

10 companies indicated 'yes', 1 company indicated 'no'.

Proposal: proceed with the assumption that the Access Type preference in Route Selection Descriptor is extended to include a Dual Steering indication or Multiple Accesses.

"2. DualSteer ID and Linked SUPI added to Route Selection Descriptor. The AMF uses the Linked SUPI to query the UDM of the Linked SUPI to get the H-SMF ID and H-PCF ID in use for the PDU session of the Linked SUPI if already activated."

2 companies indicated 'yes', 5 companies indicated 'no'.

Proposal: proceed with the assumption that DualSteer ID and Linked SUPI are not added to Route Selection Descriptor.

"3. DualSteer service indication added to Route Selection Descriptor. It indicates if the traffic of the matching application is to be steered or switched via a PDU session."

1 company indicated 'yes', 5 companies indicated 'no'.

Proposal: proceed with the assumption that DualSteer service indication is not added to Route Selection Descriptor.

"4. RAT validity. The RAT validity, if included, is used to select the possible RAT combinations for the DualSteer communication. RAT validity values include:

a) NR_NR: this RSD applies to NR + NR combination, i.e. both SUPI 1 and SUPI 2 are in NR.

<https://nwm-trial.etsi.org/#/documents/8882>

b) NR_LTE: this RSD applies to NR + LTE combination, e.g. SUPI 1 is in NR and SUPI 2 is in LTE

c) NR: this RSD applies when the UE has only one access, and such access is over NR.

d) LTE: this RSD applies when the UE has only one access, and such access is over LTE.”

3 companies indicated 'yes', 2 companies indicated 'no', 1 company indicated 'neutral'.

Based on the responses, the proposal is to ask in round 2 more clarifications, **”Should 'Allowed RAT combinations for DualSteer communication' be indicated in DualSteer policy? If yes, should URSP rules be enhanced with this policy information?”**

”5) 3GPP access for DualSteer traffic steering. One single value of following 3GPP access:

a) Existing activated 3GPP access, otherwise Primary 3GPP access

b) Prefer Primary 3GPP access

c) Prefer Secondary 3GPP access

d) List of ordered PLMN and/or RAT”

2 companies indicated 'yes', 6 companies indicated 'no'.

Proposal: proceed with the assumption that Access selection rules for DualSteer traffic steering are not part of URSP rules.

”6) DualSteer traffic switching actions. One single value of following actions:

a) switch to Primary 3GPP access whenever it becomes available

b) switch to Secondary 3GPP access whenever it becomes available

c) switch to the other 3GPP access if the current access status meets the condition of DualSteer traffic switching

d) switch to the other 3GPP access whenever necessary

e) (no RAT validity): the RSD applies to any RAT. ”

2 companies indicated 'yes', 7 companies indicated 'no'.

Proposal: proceed with the assumption that DualSteer traffic steering rules are not part of URSP rules.

Question KI#1.4.3 asked ”Should a new UE policy be defined that can be used in combination with URSP, e.g. ASP (Access Selection Policy) that includes a PLMN selection preference and RAT preference for the access?”

16 companies responded. 6 companies indicated 'yes', 6 companies indicated 'no'.

Proposal: Based on earlier questions, proceed with the assumption that it is SA1's responsibility to define PLMN/RAT selection and CT1's responsibility to implement it.

Question KI#1.4.4 asked "For the registration of the Second SUPI, should the DualSteer Device be controlled by the following policy?"

- a. No restriction (UE of secondary SUPI can always attempt registration)
- b. Only when primary SUPI is not registered
- c. Only when primary 3GPP access is below a certain SINR/RSRP/RSSI threshold (similar to the mechanism defined in clause 23.6 in TS 36.300)
- d. Location dependent (only attempt to register when in a specific area e.g., TAI(s), countries or PLMN(s))".

17 companies responded. 11 companies indicated 'a', 2 companies indicated 'd', 2 companies indicated 'a+d', 2 companies indicated 'The network will provide proper guidance by means of policies to instruct the DualSteer Device when to trigger the Second SUPI to perform the registration.'

Proposal: proceed with the assumption that the DualSteer Device can always attempt the registration of the second SUPI.

Question KI#1.4.5 asked "Should the following information be included in DualSteer policy (provided to both DualSteer Device and NF in the network)?"

16 companies responded.

"1. Information that determines the 3GPP access network to be used for the new service (additional PLMN/PNI-NPN or an additional 3GPP access network within the same PLMN)"

6 companies indicated 'yes', 4 companies indicated 'no', 3 companies indicated that 'DualSteer rules for UE and UPF should re-use ATSSS and N4 rules with limited steering modes'.

Proposal: Based on earlier questions, proceed with the assumption that it is SA1's responsibility to define PLMN/RAT selection and CT1's responsibility to implement it.

"2. Information when to register the second SUPI"

3 companies indicated 'yes', 3 companies indicated 'no'.

Proposal: ask follow-up question KI#1.2.7

3. Information when to establish a secondary PDU Session

No companies indicated 'yes', 5 companies indicated 'no', 2 companies indicated 'it should be set via URSP rules'.

Proposal: Policy information when to establish a secondary PDU Session is controlled via URSP rules.

4. Information that determines how to switch the service between two connected 3GPP access networks.”

10 companies indicated 'yes', no companies indicated 'no'.

Proposal: DualSteer policy should control how to switch the service between two connected 3GPP access networks.

Question KI#1.4.6 asked ”1. How the PCC rules should be extended?, 2. Would a PCC rule only apply to one of the PDU sessions or to both PDU Sessions?”

16 companies responded. Most companies responded that PCC rules need to be extended to include DualSteer policies. If a single SM policy association is used, the PCC rules would apply to both PDU Sessions.

Proposal: proceed with the assumption that PCC rules need to be extended to include DualSteer policies. If a single SM policy association is used, the PCC rules would apply to both PDU Sessions.

Question KI#1.4.7 asked ”Is it possible to re-use ATSSS Rules to enforce DualSteer policies in the UL direction? DualSteer rules and ATSSS rules can be differentiated by e.g. using a new Access Descriptor parameter.”

16 companies responded. 11 companies indicated 'yes', 3 companies indicated 'no'.

Based on the responses, majority of the companies think that DualSteer rules can be based on the principles of ATSSS rules, but since ATSSS rules are used for MA PDU Session, necessary extensions and steering mode limitations need to be defined.

Proposal: proceed with the assumption that DualSteer rules can be based on the principles of ATSSS rules with necessary extensions and steering mode limitations in place.

Question KI#1.4.8 asked ”Is it possible to re-use N4 Rules to enforce DS policies in the DL direction?”

15 companies responded. 12 companies indicated 'yes', 1 company indicated 'no'.

Based on the responses, majority of the companies think that enhanced N4 rules can be used enforce DualSteer policies in the DL direction.

Proposal: proceed with the assumption that enhanced N4 rules can be used enforce DualSteer policies in the DL direction.

Question KI#1.4.9 asked ”If ATSSS and N4 rules are re-used, which steering modes need to be supported: 1. Active-Standby?, 2.Smallest Delay?, 3. Priority-Based?”

16 companies responded. 12 companies indicated 'yes' for Active-Standby, 11 companies indicated 'yes' for Smallest Delay (1 company indicated support for Smallest-Delay only for the case when simultaneous transmission is possible), 5 companies indicated 'yes' for Priority-Based (1 company indicated support for Priority-Based only for the case when simultaneous transmission is possible, 1 company indicated that Priority-Based needs to be modified for switching, not splitting.), 1 company indicated 'It makes no sense to reuse ATSSS steering modes'.

Based on the responses, majority of the companies think that Active-Standby and Smallest Delay steering modes can be supported for DualSteer.

The proposal is to ask in round 2 more clarifications, **"If Smallest Delay steering mode is supported for DualSteer, should it be restricted for the case when simultaneous transmission is possible? If Priority-Based steering mode is supported for DualSteer, should it be restricted for the case when simultaneous transmission is possible?"**

Question KI#1.4.10 asked "Is there a need for the DualSteer policy to identify each 3GPP access leg uniquely, e.g. in a form of a Registration-ID? If yes, would the network provide individual UE/SUPI specific rules or complete DualSteer policy that can be provided to either of the UE/SUPI of the DualSteer device?"

16 companies responded. 2 companies indicated 'yes', 10 company indicated 'no', 3 companies indicated 'there is a need for the DualSteer policy to identify each 3GPP access leg uniquely, but not in a form of Registration-ID', 2 companies think the network should provide individual UE/SUPI specific rules, 1 company is OK with either option (individual UE/SUPI specific rules or complete DualSteer policy that can be provided to either of the UE/SUPI of the DualSteer device).

Proposal: proceed with the assumption that Registration-ID is not defined to identify each 3GPP access leg uniquely in the DualSteer policy.

Question KI#1.4.11 asked "Is it necessary to include the following elements for the DualSteer policy?"

1. an indication to indicate "Terrestrial Network (TN) access has higher priority than Non-Terrestrial Network (NTN) access" or "Non-Terrestrial Network (NTN) access has higher priority than Terrestrial Network (TN) access"
2. an indication to indicate "HPLMN has higher priority than VPLMN" or "VPLMN has higher priority than HPLMN"

14 companies responded. 2 companies indicated 'yes', 10 company indicated 'no'.

Proposal: proceed with the assumption that it is not necessary to include TN vs NTN or HPLMN vs VPLMN priorities in the DualSteer policy.

3.5 Key Issue #2.1 – Round 1 Summary

Question KI#2.1.1 asked "MPQUIC steering functionalities are to be defined at least based on CONNECT-IP and CONNECT-Ethernet.

1. Should these steering functionalities be defined as a new Steering Functionality (i.e. multiple MPQUIC steering functionalities, each one associated with a specific proxy mode) or be part of the existing Rel-18 MPQUIC Steering Functionality (i.e. a single MPQUIC steering functionality encompassing multiple proxy modes)?

2. Should CONNECT-TCP be also supported?"

12 companies responded. 6 companies indicated preference for 'multiple MPQUIC steering functionalities, each one associated with a specific proxy mode', 5 companies indicated preference for 'a single MPQUIC steering functionality encompassing multiple proxy modes', 1 company indicated 'either option is fine'.

7 companies indicated that CONNECT-TCP should be supported, 4 companies indicated that CONNECT-TCP should not be supported, 1 company indicated that CONNECT-Ethernet should not be supported.

Proposal: more discussion is needed how to define MPQUIC steering functionalities and whether to support CONNECT-TCP.

In round 2, more clarification is needed, "**Should CONNECT-Ethernet be supported?**"

Question KI#2.1.2 asked "This is the latest proposal from the conclusion paper to negotiate the CONNECT method to be used: "During MA PDU Session Establishment with an IP-based PDU Session type, the UE indicates to SMF what CONNECT methods it supports. The SMF is configured, as part of the DNN configuration, what proxy protocols are supported. The SMF determines what CONNECT methods are supported for the MA PDU Session, considering UE capabilities, network capabilities and network local policies and indicates that to the UE in PDU Session Establishment Accept. If multiple CONNECT methods are supported for a traffic flow, the UE selects the CONNECT method based on the application type (e.g. UDP or TCP) and/or based on UE implementation."

1. Should SMF determine a single CONNECT method to be supported for the MA PDU Session based on network local policies and indicate that to the UE in PDU Session Establishment Accept?"

14 companies responded. 3 companies indicated 'yes', 6 company indicated 'no', 1 company indicated 'neutral', 1 company think the scenario does not happen.

"2. If no to 1), should the UE select the CONNECT method based on the application type (e.g. UDP or TCP) and/or based on UE implementation?"

6 companies indicated 'yes', no companies indicated 'no'.

Proposal: proceed with the assumption that if multiple CONNECT methods are supported, the SMF may indicate to the UE the CONNECT methods that are supported for the respective PDU Session, and then UE determines the CONNECT method to be used based on nature of traffic.

Question KI#2.1.3 asked "Should MPQUIC Connect-IP steering functionality be allowed to be used with Ethernet MA PDU Sessions?"

11 companies responded. No companies indicated 'yes', 10 company indicated 'no', 1 company indicated 'neutral'.

Proposal: proceed with the assumption that MPQUIC Connect-IP steering functionality is not to be used with Ethernet MA PDU Sessions.

3.6 Key Issue #2.2 – Round 1 Summary

Question KI#2.2.1 asked "Should co-locating ePDG with the PSA UPF and using null encryption for IPSec between UE and ePDG be supported to simplify ATSSS deployment?"

12 companies responded. 1 company indicated 'yes', 8 companies indicated 'no', 3 companies indicated 'it could be a deployment option, but there is no need to specify in standard'.

Proposal: proceed with the assumption that co-locating ePDG with the PSA UPF and using null encryption for IPSec between UE and ePDG can be supported as a deployment option, but there is no need to specify this option in 3GPP specification.

Question KI#2.2.2 asked "Should NULL encryption IPSec tunnels be allowed for the MA PDU Session user plane traffic between UE and N3IWF?"

13 companies responded. 5 companies indicated 'yes', 7 companies indicated 'no', 1 company indicated 'In case of MPQUIC, the IPSec tunnel for the child SA can be NULL encrypted. For other ATSSS functionalities, e.g. ATSSS-LL, encryption of IPSec tunnel is still needed'.

The proposal is to ask in round 2 more clarifications:

"Assuming NULL encryption IPSec tunnels are allowed for the MA PDU Session user plane traffic between UE and N3IWF:

- 1. For NULL encryption, is there any dependency on IETF RFCs? Should this be checked with SA3?**
- 2. Can it be ensured that NULL encryption is only used for QUIC traffic? If N3IWF uses NULL encryption, would subsequent traffic for any PDU session also use NULL encryption?**
- 3. What is the gain by using NULL encryption in terms of performance and reducing signaling messages? If the IPSec stack remains and integrity protection remains too, is there any simplification or any performance gain achieved?"**

Question KI#2.2.3 asked "Should N3IWF/TNGF be allowed to stop initiating Child SA for the PDU Session as well as not to apply security for the UP of the PDU Session?"

13 companies responded and all the companies indicated 'no'.

Proposal: proceed with the assumption that a solution for N3IWF/TNGF to stop initiating Child SA for the PDU Session as well as not to apply security for the UP of the PDU Session will not be adopted for Rel-19.

Question KI#2.2.4 asked "Is there a need to define an architecture which keeps the NAS signalling between UE and CN over non-3GPP access?"

13 companies responded. 3 companies indicated 'yes', 8 companies indicated 'no', 2 companies indicated 'The question is not clear. If we want to reuse N3IWF then we cannot avoid NAS.'

The proposal is to ask the question again in round 2 with better wording, **"Is there a need to define a simplified architecture that is not the current architecture and it keeps the NAS signalling between UE and CN over non-3GPP access?"**

Question KI#2.2.5 asked "Should "non-3GPP access without 5G NAS over non-3GPP" be supported to simplify the network operation over non-3GPP access? This assumes an architecture without TNGF/N3IWF where the UE connects to the UPF via the public IP network over a new interface."

14 companies responded. 8 companies indicated 'yes', 6 companies indicated 'no'.

Proposal: more discussion is needed whether to support non-3GPP access without 5G NAS over non-3GPP.

"a) Should the connection between the UE and the UPF only secured using TLS over the non-3GPP access? Is there a need to establish an IPSec security association (this assumes the UPF is enhanced to support IPSec)?"

8 companies indicated 'yes', 1 company indicated 'no', 1 company indicated 'it is up to SA3 to confirm', 1 company thinks it is necessary to keep IPSec between the UE and UPF for ATSSS-LL.

In round 2, more clarification is needed, **"If "non-3GPP access without 5G NAS over non-3GPP" is defined, should it support ATSSS-LL and keep IPSec between the UE and UPF?"**

"b) Should MPQUIC steering functionality be the only steering functionality to be defined? Should MPTCP be supported?"

7 companies indicated 'yes' (i.e. MPQUIC steering functionality should be the only steering functionality to be defined), 3 companies indicated 'no' (1 company indicated MPTCP is needed, 1 company indicated ATSSS-LL is needed).

"c) Would the UE authentication solely rely on authenticating the UE via 3GPP access only?"

5 companies indicated 'yes', 2 companies indicated 'no', 2 companies indicated 'this should be left to SA3'.

Proposal: it should be checked with SA3 whether relying on authenticating the UE via 3GPP access only is a feasible approach or not.

"d) For MA PDU Session establishment, should it be transparent to the AMF or should AMF be enhanced to support simplified ATSSS procedures over non-3GPP access?"

3 companies prefer Enhanced AMF, 2 companies indicated 'AMF should not be impacted', 2 companies indicated 'neutral', 2 companies indicated 'either option is OK'.

Proposal: more discussion is needed whether to enhance AMF to support simplified ATSSS procedures over non-3GPP access.

"e) If the UE loses 3GPP access coverage, should the MA PDU Session be kept until a specified timer value expires?"

7 companies indicated 'yes', 2 companies indicated 'no', 1 company indicated 'UE must be controllable with or without the availability of the 3GPP access'.

Proposal: if "non-3GPP access without 5G NAS over non-3GPP" is defined, when the UE loses 3GPP access coverage, MA PDU Session should be kept until a specified timer value expires.

4 Company views for key issue conclusions (round 2)

4.1 Key Issue #1.1 – Round 2 Questions

Question KI#1.1.6: Either of two SUPIs can be used to first register or request the PDU session establishment. The primary/secondary SUPI would not be pre-determined by the subscription data, but by the order of the SUPIs successful registration. Should one of the SUPIs be treated as primary SUPI if it was registered first?

Feedback Form 45: Question KI#1.1.6

1 – MediaTek Inc.

Yes

2 – Huawei Technologies R&D UK

Whether each of two SUPIs can be used to first register or request the PDU session establishment depends on operator policies.

In terms of registration, the operator policies may want to make the secondary SUPI to be triggered to register in some certain condition (e.g. in specific location or when the coverage of 3GPP access network connected by the Primary SUPI is not good), in this case, the secondary SUPI may not be used to first register. If there is no such policy, each of two SUPIs can be used to first register.

Whether to request the PDU session establishment is depending on the steering policy.

It would be messy to determine the primary or secondary SUPI based on the order of the SUPI successful registration because the policy is determined based on the primary SUPI and secondary SUPI. If the SUPI role is not determined by subscription, it means that the policies shall be determined not only based on subscription but also the status of the registration (the order of registration). Moreover, how to determine the order of the registration is not clear. Is it determined by the UDM when AMF registers to the UDM or by the AMF when it receives the Registration Request or when it sends the Registration Accept? Whether the role of the SUPI will change due to the registration status of the other SUPI? For example, when the Primary SUPI deregister, whether the Secondary SUPI change to the Primary SUPI? All these issues would make the mechanism complicated.

3 – Qualcomm Germany

No, not necessarily, because it is unclear what the difference between primary and secondary SUPI is (this is solution dependent).

4 – LG Electronics France

If we assume that the first registered SUPI becomes primary SUPI, it should be unchanged until two SUPIs are deregistered over each 3GPP access. For example, after SUPI#1 becomes Primary SUPI and SUPI#2 becomes Secondary SUPI, even if UE#1 (using SUPI#1) is deregistered from the network, SUPI#2 should remain as Secondary SUPI.

5 – vivo Mobile Communication Co.

First/second is for registration sequence, which can be changed if first SUPI deregistered and then registered again as second SUPI. Primary SUPI will not be changed.

If above understanding is correct, then No, it is not necessary to mark any of the SUPI as primary

6 – CATT

Agree with Huawei, which SUPI is primary/secondary is based on operator's policies. It will be better to define it as subscription profiles in the UDM to make the policies realization easily.

7 – CableLabs

No. In our view, we do not want either SUPI to be treated as primary or secondary (either by subscription data or by the order of registration).

8 – Charter Communications

No.

There is no need to classify the SUPIs as primary or secondary SUPI.

9 – ETRI

No.

If we use Primary/Secondary, it should be statically defined in the UDM.

10 – China Telecom Corporation Ltd.

We are open to this, but more prefer the registration order decide the primary/secondary.

However, not sure about the primary/secondary here is only to indicate the SUPIs as number 1 and number 2, or the intention is to have specific and different policies to these two SUPIs? It should be depend on the solution of other KIs.

11 – NEC Corporation.

No, primary/secondary SUPI should be defined by the subscription in the UDM and provided to the UE.

12 – OPPO

There is no need to differentiate primary SUPI or secondary SUPI. The network may need to decide which access to deliver the dual steer related policy (i.e. when one of the leg may be via the legacy VPLMN). In this case, the network can decide which is the primary access based on the registration order or operator's policy.

Indeed I don't like the statement of "treat one of the SUPIs as primary SUPI", I hope this has the same meaning as what I presented.

13 – Samsung Electronics Co.

Yes. One of the SUPIs be treated as primary SUPI if it was registered first. However, for each PDU Session, the steering precedence is decided by the SM policy.

14 – ZTE Corporation

No. In UDM these two SUPIs should have similar role.

15 – Lenovo Future Communications

No. It is not necessary to have primary/secondary SUPI distinction.

16 – Nokia

NO. Which access is used a primary can be determined by the network and provided as part of the DS rules.

17 – Deutsche Telekom AG

Yes. In our opinion PLMN/RAT selection and registration would happen for one of the SUPIs first and only afterwards the second SUPI would select a PLMN/RAT and register, i.e. so that they never end up in same PLMN/RAT (which they would as we will not touch PLMN selection for the first registering SUPI due to DualSteer). I.e. there needs to be some hierarchy between first registered SUPI to second. This would be simpler if subscription already defines primary/secondary SUPI.

18 – Deutsche Telekom AG

Yes. In our opinion PLMN/RAT selection and registration would happen for one of the SUPIs first and only afterwards the second SUPI would select a PLMN/RAT and register, i.e. so that they never end up in same PLMN/RAT (which they would as we will not touch PLMN selection for the first registering SUPI due to DualSteer). I.e. there needs to be some hierarchy between first registered SUPI to second. This would be simpler if subscription already defines primary/secondary SUPI.

19 – Deutsche Telekom AG

Yes. In our opinion PLMN/RAT selection and registration would happen for one of the SUPIs first and only afterwards the second SUPI would select a PLMN/RAT and register, i.e. so that they never end up in same PLMN/RAT (which they would as we will not touch PLMN selection for the first registering SUPI due to DualSteer). I.e. there needs to be some hierarchy between first registered SUPI to second. This would be simpler if subscription already defines primary/secondary SUPI.

20 – Deutsche Telekom AG

Yes. In our opinion PLMN/RAT selection and registration would happen for one of the SUPIs first and only afterwards the second SUPI would select a PLMN/RAT and register, i.e. so that they never end up in same PLMN/RAT (which they would as we will not touch PLMN selection for the first registering SUPI due to DualSteer). I.e. there needs to be some hierarchy between first registered SUPI to second. This would be simpler if subscription already defines primary/secondary SUPI.

21 – Deutsche Telekom AG

Yes. In our opinion PLMN/RAT selection and registration would happen for one of the SUPIs first and only afterwards the second SUPI would select a PLMN/RAT and register, i.e. so that they never end up in same PLMN/RAT (which they would as we will not touch PLMN selection for the first registering SUPI due to DualSteer). I.e. there needs to be some hierarchy between first registered SUPI to second. This would be simpler if subscription already defines primary/secondary SUPI.

22 – Philips International B.V.

Agree with Huawei.

23 – InterDigital Communications

Yes. The SUPIs should be differentiated as Primary and Secondary. The secondary SUPI should be used only when needed for a service.

24 – Ericsson LM

The question is not very clear. In our view there is no need to designate a SUPI as primary and secondary in subscription data. Then, whether and how to treat a first registered SUPI as primary and a second registered SUPI as secondary will depend on solutions. If considering the first registered SUPI as primary reduces the impacts to the UE or 5GC NFs it may be useful, but this needs to be shown by solutions.

25 – Apple Distribution Intl Ltd

No need to define a static primary/secondary SUPI concept in subscription data. Considering the order of SUPIs in registration can impact other procedures (e.g. first registered SUPI may be chosen for policy delivery, etc.). If first registered SUPI is deregistered, the other SUPI can take the role of first registered SUPI.

26 – China Mobile Com. Corporation

No need to differentiate two SUPIs as primary or secondary unless the benefit and how to use the differentiation is clarified.

Question KI#1.1.7: Would existing mechanism to control access type and RAT restrictions applied to each SUPI independently be satisfactory?

Feedback Form 46: Question KI#1.1.7

1 – MediaTek Inc.

No

2 – Huawei Technologies R&D UK Yes. There is no need to have impact on existing mechanism on access type and RAT restrictions.
3 – Qualcomm Germany No; there is a dependency of SA1/CT1 discussions.
4 – LG Electronics France Yes.
5 – vivo Mobile Communication Co. If "restriction" means "forbiden" instead of "those not in allowed", then Yes for "restriction" aspect. The "allowed" aspect is in SA1/CT1 scope.
6 – CATT No.
7 – CableLabs Yes
8 – Charter Communications Yes.
9 – ETRI YES.
10 – NEC Corporation. Yes.
11 – OPPO Yes, there should be no enhancement to existing mechanism.
12 – Samsung Electronics Co. No. Access Type/RAT restrictions for a SUPI should be determined with considerations of the other SUPI Access Type/RAT restrictions for a SUPI should be determined with considerations of the other SUPI. An example, If RAT for a SUPI is restricted to NR-TN, if the RAT for the other SUPI is NR-NTN.
13 – ZTE Corporation Yes

14 – Nokia Yes. We do not see the need for any new mechanisms for Access and RAT type restrictions.
15 – Deutsche Telekom AG Yes.
16 – Philips International B.V. No, agree with Samsung
17 – InterDigital Communications No. There need to be some coordination between two SUPIs for access type/RAT restrictions.
18 – Ericsson LM Yes
19 – Apple Distribution Intl Ltd SA1/CT1 should decide.

Question KI#1.1.8: Can the subscriptions reside in different UDMs?

Feedback Form 47: Question KI#1.1.8

1 – CICT From 3GPP point of view, the subscriptions are in the same UDM. whether different physical servers for the same UDM for reliability is implementation.
2 – MediaTek Inc. No
3 – Deutsche Telekom AG No
4 – Huawei Technologies R&D UK No. It is unnecessary to make the subscriptions reside in different UDMs. Residing in the same UDM can simplify the procedure.
5 – Qualcomm Germany Yes, in that case both UDMs need to be aware of the SUPI 1- SUPI 2 association; we do not believe specific restrictions are necessary

<p>6 – LG Electronics France</p> <p>No. The AMF needs to select the same SMF based on UDM subscription data. If two different UDMs are used, when first PDU Session is established by using SUPI#1, the UDM of SUPI#1 needs to send signalling to UDM of SUPI#2 to update subscription data. Therefore, both SUPIs should be managed by single UDM.</p>
<p>7 – vivo Mobile Communication Co.</p> <p>No</p>
<p>8 – CATT</p> <p>No</p>
<p>9 – CableLabs</p> <p>Yes, the subscriptions can reside in different UDMs.</p> <p>In case of inter PLMN (HPLMN-VPLMN scenario) the two subscriptions need to reside in HPLMN. Either within the same logical UDM entity (that can be deployed in different physical servers depending on implementation) or the same logical UDR from which different UDMs can fetch it.</p>
<p>10 – Charter Communications</p> <p>Yes.</p>
<p>11 – ETRI</p> <p>NO.</p>
<p>12 – NEC Corporation.</p> <p>Yes.</p>
<p>13 – China Telecom Corporation Ltd.</p> <p>Agree with HW's comment. To reside in the same UDM would save additional interactions with UDM or between UDMs.</p>
<p>14 – Samsung Electronics Co.</p> <p>Yes, it should be supported regardless of UDM deployment.</p>
<p>15 – ZTE Corporation</p> <p>No</p>

<p>16 – Lenovo Future Communications</p> <p>Yes, subscriptions can reside in different UDMs.</p>
<p>17 – Nokia</p> <p>I think this is a deployment choice. We do not need to specify. Ideally both SUPI should reside in the same UDM</p>
<p>18 – InterDigital Communications</p> <p>No. Agree with HW’s comment.</p>
<p>19 – Ericsson LM</p> <p>Yes, that is not precluded, although it is reasonable to assume that the subscriptions will be handled by the same UDM.</p>
<p>20 – Apple Distribution Intl Ltd</p> <p>No strong view. Both SUPIs should reside in the same UDM but using different UDMs may be possible in certain deployments.</p>
<p>21 – China Mobile Com. Corporation</p> <p>No, it would be good to simplify the issue with deployment choice to avoid any interaction between UDMs.</p>

Question KI#1.1.9: Should the two SUPIs of the DualSteer Device stored as:

1. One parent SUPI and one child SUPI?
2. One ”DualSteer Group”?”

Feedback Form 48: Question KI#1.1.9

<p>1 – MediaTek Inc.</p> <p>This is related to the implementation and this is not needed to be discussed in 3GPP</p>
<p>2 – Huawei Technologies R&D UK</p> <ol style="list-style-type: none">1. What’s the difference between Parent SUPI/Child SUPI and Primary SUPI/Secondary SUPI?2. It is not clear whether this is in SID scope since we do not consider the case where more than two SUPIs are corresponding to the same DualSteer subscription.
<p>3 – Qualcomm Germany</p> <p>NO to Q1 and NO to Q2. The two SUPIs are considered ”equal” and no specific structure of SUPIs is</p>

required. The subscription info for each SUPI should contain the association to the other SUPI (so, there is no need for a DualSteer Group)

4 – LG Electronics France

What is the difference between Primary/Secondary and Parent/Child? Each SUPI's subscription can store the other/peer SUPI. No need to have any other information.

5 – vivo Mobile Communication Co.

For 1) No, each SUPI can have an associated SUPI, there's no need to define parent/child.

For 2) can live with if the group ID is only used in 5GC.

6 – CATT

Agree with LG and Vivo for 1), there is no need to define the parent/child as each SUPI can have an associated SUPI.

7 – CableLabs

1. No. As previously stated, we do not prefer either SUPI to be treated as primary/secondary or parent/child (either by subscription data or by the order of registration).

2. No

8 – Charter Communications

1. No

2. No

9 – ETRI

1. No

2. No

Should be stored by cross referencing.

10 – NEC Corporation.

1. One parent SUPI and one child SUPI.

11 – NEC Corporation.

1. One parent SUPI and one child SUPI.

12 – China Telecom Corporation Ltd.

”Group ID” method would be better in operational view. For example, if there is specific policy or configuration of the ”pair”, such as RAT type combination between SUPI#1 and SUPI#2, then this information stored in UDM/UDR under a ”Group ID”-identified element will be better to be add/update/delete. And this might be only used within 5GC.

But we can live with the alternative way that SUPI#1 subscription stores its paired SUPI#2 as a pointer to SUPI#2’s subscription.

13 – OPPO

1. No. no need to differentiate parent SUPI or child SUPI.
2. Cross referencing can be used, but we prefer the associated SUPI(s) of a SUPI can be more than one. Then the SUPI can be used along with one of the associated SUPIs in one dual steer device to perform dual steer service. This will provide more flexibility to the users.

14 – Samsung Electronics Co.

2. The two SUPIs of the DualSteer Device should be stored as a ”DualSteer Pair” in UDM. No special identifier required to identify the pair.

15 – ZTE Corporation

- 1) No, 2) No. One SUPI in UDM may be associated with alternative SUPI. It doesn’t imply that one SUPI is parent, one is child.

16 – Lenovo Future Communications

No, to both 1 & 2.

17 – Nokia

1. NO
2. NO

Our preference is that the association is at the UDM and each subscription contains 1) indication that it is part of DualSteer and 2) the linked SUPI and optionally 3) DNN, S-NSSAI that are eligible for switching. There is no need for parent/child or DualSteer grouping.

18 – Philips International B.V.

Depends on outcome of question KI1.1.6. If there is a need to distinguish primary/secondary SUPI then option 1 may be a possible implementation option. However, other implementation options may exist for indicating primary/secondary SUPI.

19 – InterDigital Communications

1. What’s the difference between Parent SUPI/Child SUPI and Primary SUPI/Secondary SUPI?
2. No. Two SUPIs need to be linked but there is no need to introduce a ”DS Group” concept.

20 – Ericsson LM

We assume that the question refers to storage of SUPIs in subscription data.

- 1. We do not see the need to introduce parent/child SUPIs in subscription data. Each SUPI has its own set of subscription data. For the SM subscription data, there can be a cross-reference between the two SUPI's subscription data, i.e. the SM subscription data of SUPI1 includes SUPI2 as "linked SUPI", and SM subscription data of SUPI2 includes SUPI1 as "linked SUPI"
- 2. We do not see the need to define a new subscription data type for a "DualSteer Group". Defining a group with just two members seems not necessary. Furthermore, a separate group level subscription data can be useful if there is additional group-level parameters, but so far no such parameters have been identified or agreed.

21 – Apple Distribution Intl Ltd

1. No
 2. No.
- No need to define such concepts in subscription data.

22 – China Mobile Com. Corporation

No to both, the SUPIs should be equally stored with separate subscriptions

Question KI#1.1.10: Is there a need to enhance the Access and Mobility Subscription Data for DualSteer with the following information?

1. Access Type/RAT/PLMN restriction?
2. PCF selection information to enable selecting the same PCF for two SUPIs?
3. RFSP index dedicated to DualSteer?

Feedback Form 49: Question KI#1.1.10

1 – MediaTek Inc.

the above 1, 2 and 3 can be included in AM subscription data

2 – Huawei Technologies R&D UK

1. Not needed.
2. May be needed.
3. May be needed which depends on operator policies for RAT combination of two SUPIs. If the operator prefers that two SUPIs connect with different RATs in the same PLMN, different RFSPs can be set accordingly as per existing mechanism.

3 – Qualcomm Germany

- 1: this depends on SA1/CT1 discussions;
- 2: no, there is no need for that;
- 3: no, there is no need for that.

4 – LG Electronics France

- 1: No.
- 2: Yes.
- 3: No.

5 – vivo Mobile Communication Co.

No for all

6 – CATT

1. Yes, but the PLMN selection may depends on the SA1/CT1 discussion
2. Yes
3. No

7 – CableLabs

1. No
2. No
3. No

8 – Charter Communications

1. No
2. No
3. No

9 – ETRI

1. NO.
2. YES
3. YES

10 – NEC Corporation.

1. Access Type/RAT/PLMN restriction - Supported
2. PCF selection information to enable selecting the same PCF for two SUPIs - Supported.
3. RFSP index dedicated to DualSteer - Not supported.

11 – China Telecom Corporation Ltd.

1. yes
2. yes, and this should be restricted to (H) SM-PCF. Not sure how AM-PCF to be the same if registered through two different PLMNs.
3. no

12 – OPPO

1. NO.
2. Yes.
3. NO.

13 – Samsung Electronics Co.

1. Yes.
2. Yes.
3. Yes. When the registration type changes between DualSteer registration/non-DualSteer registration, different set of RAT restriction/RFSP index need to be enforced.

14 – ZTE Corporation

These two SUPIs are registered separately and may be registered to different PLMNs. So the answer is NO to all three questions.

15 – Nokia

NO for all 3 questions.
We do not see any reason to extend mobility subscription data for DualSteer with the above information. The existing mechanism is sufficient.

16 – Deutsche Telekom AG

1. No
2. Yes
3. Probably not

17 – Philips International B.V.

1. This depends on SA1/CT1 discussions.
2. Yes
3. Could be useful, but no strong opinion.

18 – InterDigital Communications

1. Yes.
2. May be needed.
3. Yes.

19 – Ericsson LM

1. No
2. The use case for having a common PCF is not clear. Common policy information should be added to UDR for each SUPI (it would require consistent provisioning of this info in subscription data of each SUPI)
3. No

20 – Apple Distribution Intl Ltd

1. SA1/CT1 should decide
- 2: Maybe
- 3: No

21 – China Mobile Com. Corporation

1. Yes
2. Yes
3. No

Question KI#1.1.11: Is there a need to enhance the Session Management Subscription Data for DualSteer with the following information?

1. A cross-reference between SUPIs belonging to the same DualSteer device?
2. Information to correlate two PDU sessions (e.g., Linked SUPIs for dual steer session(s), same PDU session ID)?
3. whether DualSteer PDU Session is allowed for a specific DNN and S-NSSAI?
4. whether to enable correlating PDU session before and after switching?

Feedback Form 50: Question KI#1.1.11

1 – MediaTek Inc.

We think only 3 can be included in SM subscription data

2 – Huawei Technologies R&D UK

1. This can be a new type of Subscription data but not necessary be in the Session Management Subscription Data.
2. The information to correlate two PDU sessions should be stored in the UE context in SMF data but not the Session Management Subscription Data.
3. It depends on what does it mean for “DualSteer PDU Session”. Currently there is no such definition. The question is not clear.
4. The correlation of PDU session should happen during switching but not before or after switching. This information can be included in either Session Management Subscription or in a new type of Subscription Data.

3 – Qualcomm Germany

1: yes, there is a need to link the two SUPIs. E.g. to include the associated SUPI of the other subscription in the list of subscription information of one SUPI; or use the same External ID, etc.

4 – Qualcomm Germany

- 2: the UPF needs to know that the PDU Sessions are linked. How this is done is solution dependent.
- 3: no, adopting specific DNN/S-NSSAI combinations for DS is not a necessity, it is a means to simplify SMF selection. This does not impact the current Session Management Subscription Data, it just requires allocating DNN/S-NSSAI combinations for DS
- 4: the question is not clear. Also, it is unclear why anything in addition to point 2 is needed

5 – LG Electronics France

- 1: No.
- 2: No.
- 3: Yes.
- 4: No.

6 – vivo Mobile Communication Co.

1. Not clear, but considering answer to 2 and 3, No for this.
2. Yes and solution dependent.
3. No if it means DNN/S-NSSAI is an indication of DualSteer. Question is not clear, any DNN/S-NSSAI can be used as usual that all SMF shall be enhanced for the DNN/S-NSSAI for DualSteer if AMF is not enhanced for SMF selection. It is a configuration/deployment aspect.
4. Not clear. Correlation shall be done during second PDU Session Establishment procedure for switching, after the two establishments, if any of the two sessions is not released, correlation needs to be held for successive switching.

7 – CableLabs

1. Yes
2. Yes
3. It can be, although it doesn't have to be. Depends on operator implementation.
4. No

8 – Charter Communications

1. Yes
2. Yes
3. It depends on operator's deployment. Based on URSP configuration a DualSteer PDU Session can be established for an appropriate DNN/S-NSSAI combination. Note also that DualSteer Device can establish multiple DualSteer PDU Sessions (each towards a different DNN/S-NSSAI) for different traffic descriptors.
4. No

9 – ETRI

1. YES.
2. YES.
3. YES.
4. N/A

10 – NEC Corporation.

1. A cross-reference between SUPIs belonging to the same DualSteer device – Supported.
2. Information to correlate two PDU sessions (e.g., Linked SUPIs for dual steer session(s), same PDU session ID) – Supported, but an identifier needs to be clarified. Example, correlation ID.
3. whether DualSteer PDU Session is allowed for a specific DNN and S-NSSAI – Supported.
4. whether to enable correlating PDU session before and after switching – Yes, it should be correlated before switching.

11 – China Telecom Corporation Ltd.

- 1 and 2 seem not belong to SM subscription, but ok to have them, e.g., UE context.
- 3 yes.
- 4 not clear. it should depends on KI#3 conclusion.

12 – OPPO

Only 3 may be stored as SM subscription data. The others should not be included in SM subscription.

13 – Samsung Electronics Co.

1. Yes
2. Yes, also, linked SUPI and the same S-NSSAI/DNN can be used to correlate the PDU session.
3. Yes. Also, whether simultaneous transmission over two 3GPP accesses is allowed for a specific DNN and S-NSSAI.
4. Not sure. For DualSteer switching without MA PDU Session, the PDU session in the target 3gpp access can be correlated to the old PDU session during the switching.

14 – ZTE Corporation

- 1) Yes.
- 2) Propose to use same PDU Session ID
- 3) No, the S-NSSAI and DNN are used to select SMF. In our view the AMF can use dualsteer indication from the UE to select a proper SMF. So there is no need to restrict dualsteer to specific DNN and S-NSSAI.
- 4) The correlation is established when the second PDU session is established.

15 – ZTE Corporation

- 1) Yes.
- 2) Propose to use same PDU Session ID
- 3) No, the S-NSSAI and DNN are used to select SMF. In our view the AMF can use dualsteer indication from the UE to select a proper SMF. So there is no need to restrict dualsteer to specific DNN and S-NSSAI.
- 4) The correlation is established when the second PDU session is established.

16 – ZTE Corporation

- 1) Yes.
- 2) Propose to use same PDU Session ID
- 3) No, the S-NSSAI and DNN are used to select SMF. In our view the AMF can use dualsteer indication from the UE to select a proper SMF. So there is no need to restrict dualsteer to specific DNN and S-NSSAI.
- 4) The correlation is established when the second PDU session is established.

17 – Nokia

1. Yes, the SM subscription data should have a Linked SUPI information and for each DNN, S-NSSAI of the SM subscription data an indication whether DS switching is allowed.
2. NO. Only linked SUPI information is sufficient. Information to correlate the PDU Session does not need to be in the SM subscription data. If the SM subscription data has the linked SUPI, the network e.g. SMF can then find out the SMF that is serving the PDU Session to this DNN, S-NSSAI for the Linked SUPI.
3. YES. for each DNN, S-NSSAI of the SM subscription data of a SUPI, it can have an indication whether DS switching is allowed.
4. Is the question about whether SM subscription data should contain some PDU Session correlation information? Then the answer is NO. The SM Subscription data should have the linked SUPI information. The SMF can the find out the SMF serving the PDU Session of the linked SUPI.

18 – Deutsche Telekom AG

1. Yes
3. No
4. No

19 – Philips International B.V.

1. Yes
2. Yes
3. Yes
4. Not clear

20 – InterDigital Communications

1. Yes
2. Yes
3. Yes
4. Question is not clear

21 – Ericsson LM

1. Yes
2. No. SM subscription data (SDM) should not be used to correlate the PDU Sessions. Information to correlate the PDU Sessions by SMF should come from the AMF together with the CreateSMContext, i.e. SMF should be able to link the two PDU Sessions before contacting UDM (e.g. Linked SUPI and PDU Session ID / Correlation ID). The SMF can store the correlation info in UDM via the SMF registration information (UECM service) so that e.g. AMF can use it to select the same SMF.
3. Yes, this can be indicated in the SM subscription data for the DNN and S-NSSAAI
4. See answer to Q2 above

22 – Apple Distribution Intl Ltd

- 1: Yes.
- 2: Yes. (same PDU Session ID)
- 3: Yes.
- 4: No.

23 – China Mobile Com. Corporation

1. No
2. Correlation ID
3. Yes

4.2 Key Issue #1.2 – Round 2 Questions

Question KI#1.2.7: Is there a need to specify a policy in SA2 that enables the HPLMN to control when the DualSteer device establishes connectivity to the second 3GPP access network?

Feedback Form 51: Question KI#1.2.7

<p>1 – MediaTek Inc.</p> <p>Yes</p>
<p>2 – Huawei Technologies R&D UK</p> <p>Should clarify what it is meant by "establish connectivity to the second 3GPP access network". If it means triggering Registration, the answer is it is possible for Operator to provide a policy to guide the DualSteer Device when to attempt the Registration. However, this policy does not have any impact on the PLMN/RAT that the DualSteer Device attempt to register to. Further discussion can be based on the outcome of SA1 discussion.</p> <p>But if it means "when to establish PDU session over the second 3GPP access network", then this shall be determined by the DualSteer steering policy and the URSP rules. If the DualSteer steering policy indicates the service is transmitted by the second UE/SUPI, based on the URSP rule, the DualSteer Device will determine whether to establish PDU session or reuse the existing PDU session over the second 3GPP access network.</p>
<p>3 – Qualcomm Germany</p> <p>yes, the HPLMN should provide conditions under which the two SUPIs shall be active</p>
<p>4 – LG Electronics France</p> <p>Yes.</p>
<p>5 – vivo Mobile Communication Co.</p> <p>URSP rules already specify when to establish PDU Session, not clear the question. If it means registration, then it depends on SA1/CT1.</p>
<p>6 – CATT</p> <p>Yes</p>
<p>7 – CableLabs</p> <p>No</p>

<p>8 – Charter Communications</p> <p>Neutral. We are positive on any OPTIONAL policy enhancements when the DualSteer device to establish connectivity with the network. For example, the operator can have relevant policies to have any of the UE/-SUPI to start PLMN search for example, at a certain geolocation (similar to location assistance information introduced for SNPNs).</p>
<p>9 – KDDI Corporation</p> <p>Yes</p>
<p>10 – ETRI</p> <p>YES</p>
<p>11 – NEC Corporation.</p> <p>Yes, with a good coordination with SA1.</p>
<p>12 – Samsung Electronics Co.</p> <p>Yes.</p>
<p>13 – OPPO</p> <p>No. It is up to the UE to decide when to register. The network can redirect the UE or trigger the UE re-register for dual steer service in a non-policy control manner.</p>
<p>14 – ZTE Corporation</p> <p>There is no need for policy to do registration in second access. However there is policy needed to establish a PDU session in second access with same PDU session ID.</p>
<p>15 – Lenovo Future Communications</p> <p>No, there is no need to restrict the device from performing registration over the second access and should be up to device's decision.</p>
<p>16 – Nokia</p> <p>NO. If anything to be done for PLMN selection (based on SA1 response) it shall be done at CT1</p>
<p>17 – Nokia</p> <p>Is the question referring to the proposal where a "DualSteer ID" is provided to the device to correlate the 2 UEs? Then the answer is NO.</p> <p>If the question is about having a Reg-ID to identify each leg or each UE, our view is we need to identify each access leg uniquely. Whether we use Reg-ID or some other Identity can be discussed.</p>

18 – Nokia Please ignore the 2nd comment from Nokia above, as it was meant for the next question.
19 – Deutsche Telekom AG Probably yes
20 – Philips International B.V. Yes, with a good coordination with SA1.
21 – InterDigital Communications Yes. The question is a bit not clear on whether "connectivity" means registration or PDU Session. In both cases HPLMN policy is required per requirements.
22 – Apple Distribution Intl Ltd No, UE can decide when to register to second 3GPP access network based on UE's implementation.

Question KI#1.2.8: Would it be necessary to specify a Registration Correlation Information in order for the DualSteer Device to be aware that the two SUPIs are associated? If yes, could the Registration Correlation Information be also used by the UDM to determine that the two SUPIs are used by the same DualSteer Device?"

Feedback Form 52: Question KI#1.2.8

1 – MediaTek Inc. 1) Yes 2) Yes
2 – Huawei Technologies R&D UK Firstly, these two questions can be answered independently. The DualSteer Device can be aware that the two SUPIs are associated. In addition, the UDM shall also need to determine that the two SUPIs are used by the same DualSteer Device. In terms of how to achieve these two objectives, based on the Solution#1.8, the same Registration Correlation Information can be used for these two purposes.
3 – Qualcomm Germany 1) NO; 2) NO
4 – LG Electronics France No need for Registration Correlation Information.

<p>5 – vivo Mobile Communication Co.</p> <p>The question may need to be rewording as "Would it be necessary for DualSteer Device and UDM to be aware that the two SUPIs are associated and in the same device". Whether using Registration Correlation Information is solution aspect.</p> <p>Considering above, No for both for using Registration Correlation Information.</p>
<p>6 – CATT</p> <p>The DS Device and UDM can be aware of two SUPIs associated without the registration correlation information. But we think it's necessary to define such information to indicate the two SUPIs are in the same device. That's solution aspects.</p>
<p>7 – CableLabs</p> <p>No.</p>
<p>8 – Charter Communications</p> <p>No.</p>
<p>9 – ETRI</p> <p>NO</p>
<p>10 – NEC Corporation.</p> <p>The Dual Steer Device shall be aware that the two SUPIs are associated. In addition, the UDM shall also need to determine that the two SUPIs are used by the same Dual Steer Device.</p>
<p>11 – China Telecom Corporation Ltd.</p> <p>1) yes 2) yes</p>
<p>12 – Samsung Electronics Co.</p> <p>No.</p>
<p>13 – OPPO</p> <p>The dual steer device knows that the two SUPIs are associated and equipped in the same device. The network should also be aware that the two SUPIs are in the same device.</p> <p>But Registration Correlation Information is too solution specific. For example, the other UE's ID info and access network info can also be used to verify.</p> <p>So the answer is NO.</p>
<p>14 – ZTE Corporation</p> <p>No. There is no need to correlate the two registrations. The correlations are only for PDU sessions.</p>

<p>15 – Lenovo Future Communications</p> <p>No.</p>
<p>16 – Nokia</p> <p>Is the question referring to the proposal where a "DualSteer ID" is provided to the device to correlate the 2 UEs? Then the answer is NO.</p> <p>If the question is about having a Reg-ID to identify each leg or each UE, our view is we need to identify each access leg uniquely. Whether we use Reg-ID or some other Identity can be discussed.</p>
<p>17 – Deutsche Telekom AG</p> <p>yes, yes</p>
<p>18 – Ericsson LM</p> <p>The question or assumed solution is not very clear. Which entity generates the Registration Correlation Information? In general, a solution to allow the UE to be aware that the two SUPIs are associated is needed.</p>
<p>19 – Apple Distribution Intl Ltd</p> <p>1. Yes</p> <p>2. Yes</p>

4.3 Key Issue #1.3 – Round 2 Questions

Question KI#1.3.15: Should PDU Session established to support DualSteer traffic steering or PDU Session established to support DualSteer traffic switching re-use the principles of MA PDU session? If yes, what properties of MA PDU session should be re-used?

1. Enhanced ATSSS rules?
2. Steering functionalities?
3. Steering modes?
4. PMF measurements?
5. Same anchor SMF/UPF?
6. Common N4 session?"

Feedback Form 53: Question KI#1.3.15

1 – MediaTek Inc.

1) partially yes 2) the properties of MA PDU Session can be re-used, e.g., the above 3 and 5

2 – Huawei Technologies R&D UK

No. The principle of MA PDU session cannot be reused to PDU Session established to support DualSteer traffic steering or PDU Session established to support DualSteer traffic switching.

In ATSSS scenario, there is only one UE/SUPI. In other words, there is no UE/SUPI selection. Therefore, based on URSP rules, the UE can directly establish the MA PDU session and derive the ATSSS rules via SM policy. According to the ATSSS rules, the UE selects one access leg or two access legs (since splitting is supported and it is assumed that UE can support simultaneous transmission over 3GPP access and non-3GPP access) for the service data transmission.

In DualSteer scenario, there are two UEs/SUPIs. Each UE/SUPI is used to connect only one 3GPP access network.

For DualSteer traffic steering, **the DualSteer Device needs to select a 3GPP access network for service transmission. In this case, 3GPP access network selection is equivalent to UE/SUPI selection, which is essentially different from access network selection in ATSSS scenario.** Therefore, for a new coming service, the DualSteer Device should select the appropriate UE/SUPI first for transmission based on DualSteer traffic steering policy. When the target UE/SUPI is selected, the UE can determine whether to establish a new PDU session or re-use the existing PDU session to transmit the service based on URSP rules. **Hence, the DualSteer traffic steering policy should be a UE policy instead of SM policy.**

For DualSteer traffic switching, the DualSteer traffic switching policy should not only consider the conditions when the service can be switched, but also consider the Device capability (whether the simultaneous transmission is supported or not) which may further determine whether all other services shall be switched to the other 3GPP access when switching specific services is triggered. This is different from the switching in ATSSS mechanism where the UE is assumed that simultaneous transmission is supported over 3GPP access and non-3GPP access. Therefore, the DualSteer traffic switching shall also include the policy per service and the policy per Device.

In summary, the principle of MA PDU session shall not be re-used. Therefore, all properties mentioned in the question are not applicable. In terms of same anchor SMF/UPF, this is only needed during switching. After switching, the source PDU session is released.

3 – Qualcomm Germany

Some aspects of the principles of MA PDU Session can be re-used; 1) Yes (in the form of DualSteer UE rules); 2) yes; 3) yes (limited to active-standby and shortest delay); 4) yes

4 – Qualcomm Germany

5) yes; 6) no strong opinion

5 – LG Electronics France

All above 6 can be re-used with necessary extension.

6 – vivo Mobile Communication Co.

Can live with optionally re-using the principles of MA PDU session. In case optional re-usage:

- 1). partially
- 2). No considering same IP address is used for switching and no anchoring for steering
- 3). No
- 4). Yes
- 5). This is mandate for DualSteer switching, shall not be treated as re-using of MA PDU session.
- 6). no strong opinion

7 – CableLabs

Yes, in general.

1. Yes
2. Yes
3. Yes
4. Yes
5. Yes
6. Yes

8 – Charter Communications

Yes, PDU Session established to support DualSteer traffic steering or PDU Session established to support DualSteer traffic switching should re-use some principles of MA PDU session.

1. Yes
2. Yes
3. Yes
4. Yes
5. Yes
6. Yes

9 – KDDI Corporation

1)~6) Yes.

Enhancement may be necessary, but basically every principle can be reused.

10 – ETRI

1. - 5. YES
6. NO

11 – NEC Corporation.

1. Enhanced ATSSS rules? – Yes
2. Steering functionalities? – Yes
3. Steering modes? – Yes
4. PMF measurements? – Yes
5. Same anchor SMF/UPF? – Yes
6. Common N4 session? – Yes

12 – China Telecom Corporation Ltd.

1. Yes
2. Yes
3. Yes
4. yes, for simultaneous transmission. Not sure how to perform the PMF measurement for non-simultaneous transmission.
5. Yes
6. not strong view.

13 – Samsung Electronics Co.

Yes, for UEs supporting DualSteer traffic steering/switching with the support of DualSteer PDU Session (I.e., DS MA PDU Session). Which steering functionalities to be supported need further discussion.

No, for UEs supporting DualSteer traffic steering/switching without the support of DualSteer PDU Session (just use normal PDU session)

14 – ZTE Corporation

1. Enhanced ATSSS rules? – It is a new rule with similar structure of ATSSS rule
2. Steering functionalities? – up layer steering functionalities, low layer steering functionality is FFS
3. Steering modes? – active/standby, load balance, others FFS
4. PMF measurements? – Yes
5. Same anchor SMF/UPF? – Yes
6. Common N4 session? – Yes

15 – Lenovo Future Communications

We believe that the principles of MA PDU session should be re-used as much as possible. All the above properties should be re-used with the necessary enhancements to support the DS case.

16 – Nokia

1. NO. We should re-use the principles of ATSSS, however we cannot re-use ATSSS rules. It shall be new Dual Steer rules.
2. NO. We cannot use MPQUIC or MPTCP for DS. So only a DS_LL can be used. There is no need for defining steering functionality.
3. YES. Active/Standby and Lowest Delay
4. YES, for lowest delay mode.
5. YES
6. Need further discussion. We think this is not very critical to determine at this phase. It is important to agree on the principles e.g. selecting same SMF, PCF, UPF. The protocol level changes can be further determined at normative phase or even left to Stage 3 to decide.

17 – Deutsche Telekom AG

5. yes;
- 1.-4. , 6. probably not

18 – InterDigital Communications

1. Yes. It doesn't matter it's called "Enhanced ATSSS rules" or "DS rules". The structure and functionality of ATSSS rules can be reused.
2. Yes.
3. Yes. Not all existing steering modes are supported for DS though.
4. Yes. PMF packets sent on both accesses shouldn't be considered as violating non-simultaneous requirements.
5. Yes.
6. Needs further study.

19 – Ericsson LM

Since the same UE IP address is shared between two PDU Sessions for switching purposes, a common anchor SMF and UPF are required. Then it is preferable to re-use the principles of MA PDU session even though we may call it something else, e.g. DS PDU session.

1. Yes
2. Yes, the existing steering functionalities can be re-used
3. A limited set of steering modes can be re-used, applicable only to switching and also limited for the case with transmission in a single access only.
4. Useful for ATSSS-LL
5. Yes, to minimize service impacts due to switching

6. A common N4 session can simplify the UPF behavior.

20 – Apple Distribution Intl Ltd

1. Yes
2. Yes
3. Yes
4. Yes. (Only Active-Standby & Smallest Delay in scope)
5. Partially yes (Anchoring is only required for DualSteer traffic switching.)
6. Yes.

Question KI#1.3.16: Can MA PDU Session be used directly for over two UEs based on using the overlay-underlay architecture assuming ATSSS rules are aligned with SA1 requirements for DualSteer?

Feedback Form 54: Question KI#1.3.16

1 – MediaTek Inc.

Yes since it is agreed as one of TR solution

2 – Huawei Technologies R&D UK

This can be a possible option. Whether there are potential impacts can be further evaluated.

3 – Qualcomm Germany

no, this solution should not be adopted

4 – LG Electronics France

Yes.

5 – vivo Mobile Communication Co.

No

6 – CATT

No

7 – Charter Communications

It can be used; but not a preferred way forward.

8 – ETRI No
9 – NEC Corporation. No.
10 – China Telecom Corporation Ltd. Not sure on the word ”directly”. We agree the current documented ”overlay-underlay” solution could be further evaluated by comparing to other solutions, as it goes to a different direction.
11 – Samsung Electronics Co. No. MA PDU session cannot be used directly.
12 – OPPO No. Potential impacts should be further evaluated.
13 – ZTE Corporation No. MA PDU session cannot be used directly.
14 – Nokia NO. We believe using MA PDU Session from 2 UEs would bring more complexities as we have now more than 2 access networks (including on N3GPP access which was not the goal of SA1 requirements for DS)
15 – Deutsche Telekom AG Yes, this solution should be adopted
16 – InterDigital Communications No.
17 – Ericsson LM Yes, this is a simple and straightforward solution. Extensions to ATSSS rules, if needed, can be discussed.
18 – Apple Distribution Intl Ltd Yes.

Question KI#1.3.17: Is it necessary to define the Session Correlation Information to enable the serving AMF to select the same SMF/UPF at least for DualSteer traffic switching?

Feedback Form 55: Question KI#1.3.17

<p>1 – MediaTek Inc.</p> <p>No</p>
<p>2 – Huawei Technologies R&D UK</p> <p>Yes. Whether the Session Correlation Information can be the PDU session ID or other new correlation ID can be further discussed.</p>
<p>3 – Qualcomm Germany</p> <p>No, there is no need for this.</p>
<p>4 – LG Electronics France</p> <p>No.</p>
<p>5 – vivo Mobile Communication Co.</p> <p>If "UE context in SMF"/"SMF redirection" is used for anchoring second PDU Session, then no such information needed by AMF.</p> <p>Such information may be needed by DualSteer device and SMF to be aware of the two associated PDU Sessions for switching, whether PDU Session ID/PDU Session Pair ID/SUPI association/DNN association... is solution dependent, but no new Session Correlation Information needed.</p>
<p>6 – vivo Mobile Communication Co.</p> <p>No for defining a new Session Correlation Information</p>
<p>7 – CATT</p> <p>No, no need to define a new session correlation ID, AMF can select the same SMF based on the subscription</p>
<p>8 – CableLabs</p> <p>Yes</p>
<p>9 – Charter Communications</p> <p>Yes, some kind of session correlation can be used.</p>
<p>10 – ETRI</p> <p>YES, session correlation ID is useful for AMFs to select same SMF</p>
<p>11 – NEC Corporation.</p> <p>Yes.</p>

<p>12 – China Telecom Corporation Ltd.</p> <p>We admit the intention for this. But it seems the answer to KI#1.1 covers this. No need to duplicate the IDs for the similar/same purpose.</p>
<p>13 – Samsung Electronics Co.</p> <p>No. There need not be a correlation id to correlate the two PDU Session establishment. The AMF(s)/SMF(s) can get associations of the two PDU Session establishment from the Device or can derive the associations of the two PDU Session establishment of the Associated SUPIs from UDM.</p>
<p>14 – OPPO</p> <p>No.</p> <p>The serving AMF needs to select the same SMF, but it can use existing association info such as SUPI, PDU Session ID, DNN S-NSSAI etc. New Session Correlation Information is too solution specific.</p>
<p>15 – ZTE Corporation</p> <p>We support to use PDU session ID to correlate the two PDU Sessions. There is no need to define any other mechanism.</p>
<p>16 – Nokia</p> <p>NO. If we want to go with a solution where AMF selects the right SMF, for AMF to select the correct SMF it is not necessary to have a session correlation information. Only information about linked SUPI is sufficient as the AMF can find out which SMF is serving the linked SUPI for the requested DNN, S-NSSAI</p>
<p>17 – Deutsche Telekom AG</p> <p>rather yes</p>
<p>18 – InterDigital Communications</p> <p>Yes.</p>
<p>19 – Ericsson LM</p> <p>Yes, this depends on the solution, but either a common PDU Session ID or a common DS correlation ID could be used, allowing the AMF to select the same SMF/UPF.</p>
<p>20 – Apple Distribution Intl Ltd</p> <p>Yes. PDU session ID can be used as Session Correlation Information.</p>

Question KI#1.3.18: If the DualSteer device can ensure to choose a common PDU Session ID that is unique per both SUPI1 and SUPI2, can such common PDU Session ID be used to correlate the two PDU Session establishments?

Feedback Form 56: Question KI#1.3.18

<p>1 – MediaTek Inc.</p> <p>Yes</p>
<p>2 – Huawei Technologies R&D UK</p> <p>Using the same PDU session ID is not flexible. The mechanism on how to ensure the same PDU session will be used would be complex since this should coordinate all the PDU sessions established by the two UEs not matter whether these PDU sessions are established to support DualSteer traffic switching or not.</p>
<p>3 – Qualcomm Germany</p> <p>No, this is not feasible since, for example, it would require the SMF to allocate a unique PDU Session ID across all the UEs served by an SMF. The SMF can find the context of the already established PDU Sessions based on the link to the other subscription - see answer to KI#1.1.11 question #1))</p>
<p>4 – LG Electronics France</p> <p>Yes.</p>
<p>5 – vivo Mobile Communication Co.</p> <p>It is solution dependent, but using same PDU Session ID is not a flexible way, if it is the only way then No.</p>
<p>6 – CATT</p> <p>Yes, using the same PDU session ID is a possible solution.</p>
<p>7 – CableLabs</p> <p>Yes.</p>
<p>8 – Charter Communications</p> <p>Yes, it can be.... but additional session correlation information may also be needed for AMF to locate a common anchor SMF for each DualSteer session established by each SUPI.</p>
<p>9 – ETRI</p> <p>Possible, but it causes complicatedness of control</p>
<p>10 – NEC Corporation.</p> <p>No.</p>

<p>11 – Samsung Electronics Co.</p> <p>No. Same PDU session ID or independent PDU session ID/SUPI can be used to identify the association. Combination of S-NSSAI and DNN can be used to indicate correlation of the PDU Sessions. So even if different PDU Session IDs are assigned, they can be correlated.</p>
<p>12 – OPPO</p> <p>Possible. But additional information may be needed.</p>
<p>13 – ZTE Corporation</p> <p>Yes</p>
<p>14 – Nokia</p> <p>Since the PDU Sessions are from 2 different UEs, we prefer to use different PDU Session ID.</p> <p>How can we ensure that the same PDU Session ID is not used by the other UE already for some other PDU Session?</p> <p>NO. we cannot use the same PDU Session ID across two UEs.</p>
<p>15 – Philips International B.V.</p> <p>Yes, that would be a possible solution.</p>
<p>16 – Ericsson LM</p> <p>Yes, it is beneficial if the DS device can provide the same PDU Session ID for the two PDU Sessions, that is unique per both SUPI1 and SUPI2. The AMF should then indicate the PDU Session ID and Linked SUPI to SMF, to allow the SMF to correlate with the existing PDU Session.</p>
<p>17 – InterDigital Communications</p> <p>It's possible. But that probably requires reserved PDU Session ID spaces at both UEs. Using a linked ID is easier.</p>
<p>18 – Apple Distribution Intl Ltd</p> <p>Yes.</p>

Question KI#1.3.19: Is there a need to pre-establish the PDU session for potential services switching?

Feedback Form 57: Question KI#1.3.19

<p>1 – MediaTek Inc.</p> <p>Yes</p>
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<p>2 – Huawei Technologies R&D UK</p> <p>No. The PDU session established for DualSteer traffic switching is only needed during switching to minimize impact on 5G system.</p>
<p>3 – Qualcomm Germany</p> <p>No.</p>
<p>4 – LG Electronics France</p> <p>Yes.</p>
<p>5 – vivo Mobile Communication Co.</p> <p>No</p>
<p>6 – CATT</p> <p>No</p>
<p>7 – CableLabs</p> <p>Yes.</p>
<p>8 – Charter Communications</p> <p>Yes.</p>
<p>9 – KDDI Corporation</p> <p>Yes. Pre-establishment should be possible.</p>
<p>10 – ETRI</p> <p>NO, Pre-establishment causes waste of resources</p>
<p>11 – NEC Corporation.</p> <p>No.</p>
<p>12 – Samsung Electronics Co.</p> <p>No. Same PDU session ID or independent PDU session ID/SUPI can be used to identify the association.</p>
<p>13 – OPPO</p> <p>No.</p>

<p>14 – ZTE Corporation</p> <p>No sure the question. The second PDU Session has to be established before switching the traffic.</p>
<p>15 – Nokia</p> <p>If the question is whether the 2nd UE shall have a PDU Session established before switching traffic from UE1 then the answer is YES.</p> <p>For service switching we must ensure that the other access path is ready to take over the traffic before the switching is done. So it is absolutely necessary that the PDU Session is established on the other UE where the traffic needs to be switched.</p>
<p>16 – Philips International B.V.</p> <p>Agree with Nokia</p>
<p>17 – Deutsche Telekom AG</p> <p>Yes, shortly before switching</p>
<p>18 – Ericsson LM</p> <p>Yes, it will speed up the traffic switching when radio conditions change quickly.</p>
<p>19 – InterDigital Communications</p> <p>Yes.</p>
<p>20 – Apple Distribution Intl Ltd</p> <p>Yes.</p>

Question KI#1.3.20: Which capabilities should be included in the PDU Session establishment by the DualSteer Device:

1. Supported steering functions?
2. Supported steering modes?
3. Support for simultaneous or non-simultaneous data transfer?

Feedback Form 58: Question KI#1.3.20

<p>1 – MediaTek Inc.</p> <p>This question relates to the previous question</p> <p>”Should PDU Session established to support DualSteer traffic steering or PDU Session established to support DualSteer traffic switching re-use the principles of MA PDU session? If yes, what properties of MA PDU session should be re-used”.</p> <p>We should have answer on previous one then we can have answer for this one</p>
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2 – Huawei Technologies R&D UK

As explained in the above question, **the principle of MA PDU session is not applicable**. Therefore, bullet 1 and 2 is not needed.

The bullet 3 capability shall be provided to the network during Registration procedure which is used by the HPLMN to provision appropriate policies for DualSteer. Therefore, it should not be provided in the PDU session establishment.

3 – Qualcomm Germany

1) yes; 2) yes; 3) no, this indication is not useful because it's not a static capability that can be signaled by the UE (it depends on radio capabilities/combinations etc.)

4 – LG Electronics France

- 1: Yes.
- 2: Yes.
- 3: No.

5 – vivo Mobile Communication Co.

No for all

6 – CATT

No for all

7 – CableLabs

- 1. Yes
- 2. Yes
- 3. Yes

8 – Charter Communications

- 1. Yes
- 2. Yes
- 3. Yes

9 – KDDI Corporation

- 1. Yes
- 2. Yes
- 3. Yes

10 – ETRI

1. yes
2. yes
3. yes

11 – NEC Corporation.

1. Supported steering functions? - Yes
2. Supported steering modes? - Yes
3. Support for simultaneous or non-simultaneous data transfer? - Yes

12 – China Telecom Corporation Ltd.

- 1,2 depend on whether to reuse the ATSSS method
3. yes

13 – Samsung Electronics Co.

1. It is required only for when MA PDU session principle is used for DualSteer.
2. It is required only for when MA PDU session principle is used for DualSteer.
3. support for simultaneous/non-simultaneous data transfer is required for both cases (e.g., when PDU session request is for normal PDU session or MA PDU session)

14 – OPPO

no for 3. simultaneous or non-simultaneous transport is a UE level capability, should not be included in the PDU Session establishment request.

15 – ZTE Corporation

no for 3. The UE only needs to provide dualsteer indication to the network so the AMF can select same SMF. The simultaneous and non-simultaneous transition capability as part of dual steer capability should be sent to network during registration procedure so the network can provide a new rule to the UE to trigger the establishment of second PDU session.

16 – Lenovo Future Communications

1. Yes
2. Yes
3. Yes

<p>17 – Nokia</p> <ol style="list-style-type: none">1. NO. We cannot support steering functionality like MPTCP or MPQUIC2. NO. May be not needed. Active/standby is default supported. And lowest delay is supported only by DS device that support simultaneous transmission. So only 3 below is needed.3. YES
<p>18 – Deutsche Telekom AG</p> <p>No for all</p>
<p>19 – Philips International B.V.</p> <ol style="list-style-type: none">1. Yes, seems useful.2. Yes, seems useful.3. Maybe, if not sent during registration procedure.
<p>20 – Ericsson LM</p> <ol style="list-style-type: none">1. Yes2. Yes3. Yes
<p>21 – InterDigital Communications</p> <ol style="list-style-type: none">1. Yes.2. Yes.3. No. Better to be indicated as device capability during Registration.
<p>22 – Apple Distribution Intl Ltd</p> <ol style="list-style-type: none">1. Yes2. Yes3. No

Question KI#1.3.21: Should the DualSteer feature apply to any DNN/S-NSSAI? If no, should the applicable DNNs/S-NSSAIs controlled 1. via URSP?, 2. via SM subscription data?

Feedback Form 59: Question KI#1.3.21

<p>1 – MediaTek Inc.</p> <ol style="list-style-type: none">1) no 2) yes
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<p>2 – Huawei Technologies R&D UK</p> <p>The DualSteer feature shall work in any DNN/S-NSSAI. However, which DNN/S-NSSAI apply such feature depends on operator policy.</p>
<p>3 – Qualcomm Germany</p> <p>No, DualSteer may not apply to every DNN/S-NSSAI. On the contrary, specific DNN/S-NSSAIs are needed to select DS capable SMFs/UPFs; 1) URSP: yes; 2) SM data: no.</p>
<p>4 – LG Electronics France</p> <p>No. it should be controlled by URSP rule and SM subscription data.</p>
<p>5 – vivo Mobile Communication Co.</p> <p>No.</p> <p>1) URSP yes; 2) SM sub data yes</p>
<p>6 – CATT</p> <p>No, the URSP and SM subscription can also be applied to control it.</p>
<p>7 – CableLabs</p> <p>Yes, it can apply to any DNN/S-NSSAI. For which DNN/S-NSSAI a DualSteer feature is applicable depends on operator implementation.</p>
<p>8 – Charter Communications</p> <p>Unclear question.</p> <p>No</p> <p>1. Yes</p> <p>2. Yes</p>
<p>9 – ETRI</p> <p>Yes, but operator may control DualSteer service of DNN/S-NSSAI through both URSP and SM subscription data</p>
<p>10 – NEC Corporation.</p> <p>Should the DualSteer feature apply to any DNN/S-NSSAI? – No.</p> <p>If no, should the applicable DNNs/S-NSSAIs controlled 1. via URSP?, 2. via SM subscription data – URSP for the UE and SM subscription data for 5GC entities.</p>

11 – China Telecom Corporation Ltd.

It should be operator's selection and configured via URSP.

12 – Samsung Electronics Co.

No. There is a need to use specific DNNs/S-NSSAIs for DualSteer PDU Session establishment.

1 and 2. The applicable DNNs/S-NSSAIs should be controlled 1. via URSP and 2. via SM subscription data as well.

13 – OPPO

Dual steer should be available for each DNN S-NSSAI. But there could be specific DNN S-NSSAIs configured by the operator for dedicated use of dual steer.

14 – ZTE Corporation

Yes. There is no need for specific DNN/S-NSSAI for Dualsteer. This has too much restriction for operators.

15 – Nokia

NO. For DS device that support simultaneous transmission, it shall be possible that only for some DNN, S-NSSAI DualSteer switching is performed, other services may still run on either of the UEs. So, the feature shall be applicable per DNN, S-NSSAI.

Control shall be based on both URSP and SM subscription data.

URSP indicates to the UE for which RSD (DNN, S-NSSAI) DS switching is allowed.

SM Subscription data also has an indication for that DNN, S-NSSAI if switching is allowed, for SMF to control.

16 – Philips International B.V.

No. It should be controlled by URSP for the UE and SM subscription data for 5GC entities.

17 – Deutsche Telekom AG

Yes, it can apply to any DNN/S-NSSAI. For which DNN/S-NSSAI DualSteer is applied should be based on operator policy/configuration.

18 – Ericsson LM

There is no need to predefine a specific DNN/S-NSSAI for DS.

1. Yes. The network can indicate to the UE via URSP rules what traffic should be mapped to DS sessions (including corresponding DNN and S-NSSAI as per existing URSP rules).

2. Yes. It should also be part of SM subscription data to allow the SMF to understand what DNN/S-NSSAIs are authorized to use DS.

19 – InterDigital Communications No. It can be controlled via URSP rules and SM subscription data.
20 – Apple Distribution Intl Ltd No. Via URSP and SM subscription data.

Question KI#1.3.22: Is it necessary to share the PDU Session ID between the 2 UEs of the DualSteer Device so that another correlation ID for SM would not be required?

Feedback Form 60: Question KI#1.3.22

1 – MediaTek Inc. Yes
2 – Huawei Technologies R&D UK This can be another possible option.
3 – Qualcomm Germany No, there is no need for it
4 – LG Electronics France Yes.
5 – vivo Mobile Communication Co. Not necessary
6 – CATT Yes, it's a possible way.
7 – CableLabs Yes.
8 – Charter Communications Depending on the enhancements of the URSP rules of each SUPI in the DualSteer device, other PDU session correlation information might be necessary to exchange.
9 – ETRI YES

10 – NEC Corporation. No.
11 – Samsung Electronics Co. Yes, for UEs supporting DualSteer traffic steering/switching with the support of DualSteer PDU Session (I.e., DS MA PDU Session). Which steering functionalities to be supported need further discussion. No, for UEs supporting DualSteer traffic steering/switching without the support of DualSteer PDU Session (just use normal PDU session)
12 – OPPO Possible.
13 – ZTE Corporation Yes
14 – Nokia Yes, possible
15 – Philips International B.V. Yes, that is a possible solution
16 – Deutsche Telekom AG Possibly yes
17 – Ericsson LM The question is not clear. Does it ask whether the two UEs share a _common_ PDU Session ID for the two PDU Sessions, or that each UE provide its PDU Session ID to the other UE? A common PDU Session ID for the two PDU Sessions would be good as it would simplify the solution.
18 – Apple Distribution Intl Ltd Yes.

Question KI#1.3.23: Should PDU sessions established to support DualSteer feature be always anchored in a common PCF?

Feedback Form 61: Question KI#1.3.23

1 – Huawei Technologies R&D UK No. For DualSteer traffic steering, there is no need to have any association or correlation. There is no need to anchored at the same PCF.

2 – Qualcomm Germany No, as long as the policy information in the different PCF is consistent
3 – LG Electronics France Yes.
4 – vivo Mobile Communication Co. No
5 – CATT No, but the policies for each SUPIs should be same and anchored in the hPCF.
6 – CableLabs Yes, within the same logical PCF entity (that can be deployed in different physical servers depending on implementation)
7 – Charter Communications Yes
8 – KDDI Corporation Neutral, but DualSteer policies need to be consistent for each SUPI, so anchoring in the same PCF is simpler.
9 – ETRI No
10 – NEC Corporation. No.
11 – Samsung Electronics Co. The DualSteer PDU session should be always anchored in a common UPF for switching and managed by a common SMF and potentially a common PCF. SMF should have the same SM policy association towards the PCF.
12 – OPPO No strong opinion.

13 – ZTE Corporation Yes
14 – Lenovo Future Communications Yes.
15 – Nokia Yes
16 – Philips International B.V. Neutral, but DualSteer policies need to be consistent for each SUPI.
17 – Deutsche Telekom AG probalby yes
18 – Ericsson LM Yes, the PCF handling session management policy association is common to both PDU Sessions (a single SM policy association should be used). The PCF handling UE policies and AM policies could be different from the SM PCF.
19 – Apple Distribution Intl Ltd Neutral.

Question KI#1.3.24: Should the common UPF anchor established within the PDU sessions established to support the DualSteer feature apply to both traffic steering and switching or traffic switching only?

Feedback Form 62: Question KI#1.3.24

1 – Huawei Technologies R&D UK No. The anchor UPF is only needed to select during switching . After the switching, the source PDU session is released.
2 – Qualcomm Germany A common UPF anchor is always needed because switching shall always be supported.
3 – LG Electronics France Apply to both steering and switching.

4 – vivo Mobile Communication Co. Only for switching
5 – CATT only for switching
6 – CableLabs Yes, it should apply to both traffic steering and switching.
7 – Charter Communications Yes, applicable for both traffic steering and switching.
8 – KDDI Corporation A common UPF anchor is always needed because switching shall always be supported.
9 – ETRI Switching only
10 – NEC Corporation. Yes.
11 – China Telecom Corporation Ltd. Yes, it will be easier for potential switch.
12 – Samsung Electronics Co. The common anchor UPF is required only for PDU Sessions that are subject to traffic switching. For traffic steering, different anchor UPFs may be used for different services.
13 – OPPO Only for switching.
14 – ZTE Corporation Yes
15 – Lenovo Future Communications Yes, the common UPF anchor should apply to both traffic steering and switching.

16 – Nokia YES. What is the scenario or use case where we would only need steering and do not need switching?
17 – Deutsche Telekom AG Yes
18 – Ericsson LM Both traffic steering and switching.
19 – InterDigital Communications Common UPF should apply only to traffic switching. No need to restrict traffic steering to use the same UPF.
20 – Apple Distribution Intl Ltd Traffic switching only.

Question KI#1.3.25: Should DualSteer feature re-use steering functionalities defined by ATSSS? Steering functionalities in DualSteer could only be applied to steer and switch traffic, so e.g. QUIC protocol could apply but not its multipath extensions.

Feedback Form 63: Question KI#1.3.25

1 – MediaTek Inc. No
2 – Huawei Technologies R&D UK No. There is no splitting. Any steering functionality is not needed.
3 – Qualcomm Germany Yes (but MPQUIC can still be used without performing traffic splitting)
4 – LG Electronics France Yes.
5 – CATT No

<p>6 – CableLabs</p> <p>Yes. With regard to the 2nd question the example is unclear, and we don't agree.</p>
<p>7 – vivo Mobile Communication Co.</p> <p>No.</p>
<p>8 – Charter Communications</p> <p>Yes, DualSteer feature should re-use steering functionalities defined by ATSSS. Second sentence is unclear.</p>
<p>9 – ETRI</p> <p>YES</p>
<p>10 – NEC Corporation.</p> <p>Yes, DualSteer feature should re-use steering functionalities defined by ATSSS. Second sentence is unclear.</p>
<p>11 – Samsung Electronics Co.</p> <p>Yes, for UEs supporting DualSteer traffic steering/switching with the support of DualSteer PDU Session (DS MA PDU Session). Which steering functionalities to be supported need further discussion. (E.g. Only DS-LL steering functionality can be applied to a DualSteer Device.)</p> <p>No, for UEs supporting DualSteer traffic steering/switching without the support of DualSteer PDU Session (just use normal PDU session)</p>
<p>12 – OPPO</p> <p>No.</p>
<p>13 – ZTE Corporation</p> <p>Yes. prefer uplayer steering functionality. lower steering functionality is FFs.</p>
<p>14 – Lenovo Future Communications</p> <p>Yes, the DualSteer feature should re-use the steering functionalities defined by ATSSS. The multipath extensions (of TCP or QUIC protocol) do not enforce traffic splitting per se. The ATSSS/N4 rules are those that indicate the steering functionality and steering mode to be applied for UL/DL traffic routing. The multipath extensions are necessary in re-using the ATSSS principles for the DS case.</p>
<p>15 – Nokia</p> <p>NO. We cannot support MPQUIC or MPTCP. Additionally we do not need splitting.</p>

16 – Ericsson LM MPQUIC can be re-used, but only limited Steering Modes such as Active-Standby and Smallest-Delay (the latter only if dual transmission is supported).
17 – Deutsche Telekom AG No
18 – InterDigital Communications In principle Yes. The second sentence in the question is not clear.
19 – Apple Distribution Intl Ltd Yes. MPQUIC can be re-used with limited Steering Modes such as Active-Standby and Smallest-Delay.

4.4 Key Issue #1.4 – Round 2 Questions

Question KI#1.4.12: Should 'Allowed RAT combinations for DualSteer communication' be indicated in DualSteer policy? If yes, should URSP rules be enhanced with this policy information?"

Feedback Form 64: Question KI#1.4.12

1 – MediaTek Inc. No
2 – Huawei Technologies R&D UK No. One service is transmitted via one 3GPP access. There is no need to care about the RAT of the other access for this service.
3 – Qualcomm Germany Yes; Yes;
4 – LG Electronics France No.
5 – CATT Yes, Yes
6 – vivo Mobile Communication Co. 1) no strong opinion if optional 2) No

<p>7 – Charter Communications</p> <p>1. No 2. No</p>
<p>8 – ETRI</p> <p>YES YES</p>
<p>9 – NEC Corporation.</p> <p>Yes, it is in the PCF. It will be signalled to the Dual steer device as a part of the Dual Steer rules.</p>
<p>10 – Samsung Electronics Co.</p> <p>We think preferred RAT combination can be indicated for URSP rule since the URSP rule is not for access control. Access control on RAT combination can be enforced by existing mechanism (e.g., mobility restrictions).</p>
<p>11 – China Telecom Corporation Ltd.</p> <p>yes, use to assist the network selection/registration ; no.</p>
<p>12 – OPPO</p> <p>No. It is confusing to let one UE's UPSP evaluate the other UE's RAT status.</p>
<p>13 – OPPO</p> <p>No. It is confusing to let one UE's UPSP evaluate the other UE's RAT status.</p>
<p>14 – ZTE Corporation</p> <p>No. We prefer to use different policy rule</p>
<p>15 – Nokia</p> <p>No. DualSteer rules can be provided to indicate the the DS device which of the two UE's access path is active/standby etc.</p>
<p>16 – Ericsson LM</p> <p>Further evaluation needed.</p>
<p>17 – Deutsche Telekom AG</p> <p>No., No</p>

18 – InterDigital Communications Yes. Yes.
19 – Apple Distribution Intl Ltd No.

Question KI#1.4.13: If Smallest Delay steering mode is supported for DualSteer, should it be restricted for the case when simultaneous transmission is possible? If Priority-Based steering mode is supported for DualSteer, should it be restricted for the case when simultaneous transmission is possible?

Feedback Form 65: Question KI#1.4.13

1 – MediaTek Inc. Possible
2 – Huawei Technologies R&D UK Firstly, these two steering modes are not applicable to the DualSteer as explained above (principles of MA PDU session is not applicable). Without simultaneous transmission capability, there is no way to measure the performance of the other access.
3 – Qualcomm Germany No; No; (Smallest Delay is applicable to DualSteer, while Priority Based is not)
4 – LG Electronics France Both smallest delay and priority-based cannot satisfy single access transmission. For example, if uplink and downlink latencies are different, UE and UPF can select different 3GPP access.
5 – CATT Yes, there is no way to measure the performance of the other access without simultaneous transmission capability, .
6 – CableLabs No & No.
7 – vivo Mobile Communication Co. No need such restriction on network side, on terminal side, it depends on implementation

8 – Charter Communications

1. No. No need to restrict Smallest Delay steering mode to the case for simultaneous transmission.
2. No. No need to restrict Priority-Based steering mode to the case for simultaneous transmission.

9 – KDDI Corporation

1) No and 2) No. Priority-based implies splitting, so it cannot be used directly; it is possible to reuse the concept of making switching decisions based on congestion.

10 – ETRI

No

No

11 – Samsung Electronics Co.

Simultaneous transmission over two 3GPP accesses for same service has been ruled out.

So the “simultaneous transmission” is the simultaneous transmission over two 3GPP accesses for the different service.

Hence, the smallest delay and/or priority-based steering mode under this “simultaneous transmission” condition, as RTT measurements for the same service does not work in this condition. If time division RTT measurements are fine, then the smallest delay and/or priority-based steering mode is supported.

12 – ZTE Corporation

We are ok to support these two steering mode in case of simultaneous transmission.

13 – Lenovo Future Communications

There is no need to restrict the smallest-delay and priority-based steering modes only to the simultaneous transmission case. Both steering modes could be supported in case of simultaneous/non-simultaneous transmission. In case of non-simultaneous transmission, however, where one UE/SUPI has established connection over one access path, either mode (smallest-delay or priority-based) will be just applied on the single available access, thus no effect is expected.

14 – Nokia

YES for both. But Priority based steering mode may not be in the scope based on SA1 requirements/restriction (i.e. application traffic shall be always sent via only one access. For Priority based the UE or UPF may send the traffic on both access)

15 – Ericsson LM

Yes to Smallest-Delay. Not clear whether Priority-Based steering mode can apply since splitting is not supported.

<p>16 – Deutsche Telekom AG</p> <p>Probably both modes are not applicable. For smallest delay one needs simultaneous transmission for measurements, ie. if applicable then yes to the question. Priority-Based steering mode is certainly not applicable to DualSteer RE119.</p>
<p>17 – InterDigital Communications</p> <p>No. this would be too limiting. The device should be allowed to select an leg based on smallest delay, even for the non-simultaneous transmission</p>
<p>18 – Apple Distribution Intl Ltd</p> <ol style="list-style-type: none">1. No2. N/A. Priority-based steering mode is not in scope.

4.5 Key Issue #2.1 – Round 2 Questions

Question KI#2.1.4: Should CONNECT-Ethernet be supported?

Feedback Form 66: Question KI#2.1.4

<p>1 – CICT</p> <p>If MPQUIC proxy is used for Ethernet type PDU Session, the CONNECT-Ethernet needs to be supported. But if the CONNECT-Ethernet is not supported in IETF, we need to support Connect-IP over Ethernet as propose in solution#2.9.</p>
<p>2 – China Mobile Com. Corporation</p> <p>Based on our analysis, the MASQUE-based connect-Ethernet can be supported on both types of the Ethernet PDU session and the IP PDU session.</p> <ol style="list-style-type: none">1) The MASQUE-based connect-Ethernet, together with the Rel-18 MPQUIC framework, is actually based on IP-encapsulation (i.e., HTTP datagram/ HTTP3 datagram/(MPQUIC) QUIC-datagram).2) For both PDU-session types, the UE-IP (routable) and UE link-local IP addresses can be obtained via in-band, out-of-band, local-config, etc.3) While the Encapsulation-stack for connect-Ethernet over an IP PDU session has no specific difference, the complete Encap-stack over an Ethernet PDU session is (note the ‘external part’). <p>(internal) real-ethernet frame</p> <p>_____</p> <p><IP-stack></p> <p>_____</p> <p>(external) ethernet-frame corresponding Ethernet PDU session</p>

<p><Conclusion></p> <p>Connect-ethernet can be supported over both IP- and Ethernet PDU session types.</p>
<p>3 – Qualcomm Germany</p> <p>No</p>
<p>4 – LG Electronics France</p> <p>Depends on IETF progress.</p>
<p>5 – CableLabs</p> <p>Yes. As we indicated in our previous answer we believe that the current SI proposes a solution that enables an Ethernet MA PDU session using MPQUIC based steering functionality. It is based on an active IETF working group draft draft-ietf-masque-connect-ethernet.</p> <p>From this perspective we conclude that CONNECT-Ethernet should be supported in this Release and all the elements needed for such a solution are in place too.</p>
<p>6 – Samsung Electronics Co.</p> <p>Yes.</p>
<p>7 – ZTE Corporation</p> <p>Yes</p>
<p>8 – Lenovo Future Communications</p> <p>Yes, we believe Connect-Ethernet should be supported.</p>
<p>9 – Nokia</p> <p>Yes and normative work is dependent on IETF progress</p>
<p>10 – InterDigital Communications</p> <p>Yes if the IETF work can be completed for this release.</p>
<p>11 – Ericsson LM</p> <p>Yes, to be used with Ethernet PDU Sessions. The CONNECT-Ethernet draft in IETF is stable and adopted by the IETF WG.</p>

12 – Deutsche Telekom AG

No. There is no need to rush as with ATSSS-LL there is a solution for Ethernet-PDU sessions and currently the solution only would add overhead without any advantage (as release 18 still does not support per-packet splitting), i.e. it should not be adopted before RFC status. As mentioned IETF still discusses very basic issues and is far from any resolutions. (<https://datatracker.ietf.org/doc/minutes-119-masque/#proxying-ethernet>).

13 – Apple Distribution Intl Ltd

Yes, it can be used with Ethernet PDU Sessions.

4.6 Key Issue #2.2 – Round 2 Questions

Question KI#2.2.6: Assuming NULL encryption IPsec tunnels are allowed for the MA PDU Session user plane traffic between UE and N3IWF:

1. For NULL encryption, is there any dependency on IETF RFCs? Should this be checked with SA3?
2. Can it be ensured that NULL encryption is only used for QUIC traffic? If N3IWF uses NULL encryption, would subsequent traffic for any PDU session also use NULL encryption?
3. What is the gain by using NULL encryption in terms of performance and reducing signaling messages? If the IPsec stack remains and integrity protection remains too, is there any simplification or any performance gain achieved?

Feedback Form 67: Question KI#2.2.6

1 – HUAWEI Technologies Japan K.K.

For Q1, NULL encryption is already supported in 3GPP for TNGF.

For Q2, only MA PDU session with MPQUIC function can use NULL encryption IPsec.

For Q3, there is some gain with NULL encryption for MPQUIC based traffic, but not applicable to other traffic.

2 – Intel Deutschland GmbH

We still think that studying solutions that keep N3IWF/TNGF in the architecture is not in scope of FS_MASSS, as per the following excerpt from the study justification in SP-231802:

”3) The Rel-16 to Rel-18 Access Traffic Steering, Switching and Splitting feature requires that MA PDU Sessions require integrated trusted or untrusted non-3GPP accesses. This means that to enable ATSSS either a TNGF (Trusted Non-3GPP Gateway Function) or an N3IWF (Non-3GPP InterWorking Function) is deployed in the PLMN. At the same time, many network deployments do not have such nodes and it is therefore beneficial to study how to support a limited set of access traffic aggregation and steering features applicable to non-integrated non-3GPP access not based on TNGF/N3IWF.”

If the majority in SA2 thinks that this type of solutions is worth taking forward, then the specific questions on NULL encryption with IPsec and the related gains should be asked to SA3.

3 – Qualcomm Germany

NULL encryption IPsec tunnel should not be supported - see unresolved issues raised in first round of NWM questions

4 – Charter Communications

1. Unaware of any dependency on IETF, the RFC supports NULL encryption. As with all solutions that modifies current security aspects, should get checked by SA3 for feedback.
2. Yes, NULL encryption can be confined to only QUIC traffic and non-QUIC traffic can use encryption. This can be specified during normative phase, since the N3IWF shall determine the number of IPsec Child SAs to establish and the QoS profiles associated with each IPsec Child SA.
3. There is an obvious reduction in compute cycles (i.e., encryption vs null encryption), which in turns reduces power consumption at a minimum.

5 – LG Electronics France

This solution does not actually resolve Key Issue, i.e. does not simplify protocol stack. Therefore, should not be selected as a conclusion.

6 – CableLabs

Q1: As we are discussing IPsec tunneling, this work is entirely dependent on existent IETF RFCs.

The use of NULL encryption is not new in both 4G and 5G architecture as this is currently used for non-3GPP trusted access in 5GS.

As any of the potential solutions for KI2.2, an adopted solution must be validated with SA3. However, this is not something that is only specific to this solution but is valid for any of the solutions for this KI.

Q2: YES, it can be ensured that NULL encryption is used only for QUIC traffic. This can be done either under the UE control or N3IWF control or both.

Q3: Using NULL encryption does not have impact on the overall signaling over non-3GPP access. However, NULL encryption has a significant impact on the user plane traffic as it shortcuts the use of encryption over non-3GPP access. All encryption algorithms which are used by IPsec are $O(N)$ where N is the length of the message. How many times a bit of data is read/write and used in a computation is dependent on the encryption algorithm being used. For example in the case of 3DES this may be 3 times more than in the case of DES.

Therefore in short the answer is YES, there is a cost due to the encryption of data. The cost of this operation, is linear in the size of the data to be encrypted and it is also dependent on the encryption of algorithm being used. This cost is eliminated over non-3GPP access when NULL encryption is used.

7 – Samsung Electronics Co.

It is against the RFC's principles of using NULL encryption (RFC 7296), thus this needs to be checked with SA3. Also, as such we don't see much advantage of deploying N3IWF and using NULL encryption.

8 – ZTE Corporation

- 1) No RFC dependency. However it is better to check with SA3.
- 2) Yes. For other traffic the NULL encryption is not used.
- 3) We are open to consider this solution if SA3 feedback is positive.

9 – Ericsson LM

1. IPsec with NULL encryption is already used for trusted non-3GPP access. However, it is not fully clear whether it is possible to have in one PDU Session different Child SAs where some have full encryption (for ATSSS-LL traffic) and others have NULL encryption (for MPQUIC traffic). This may need to be verified with IETF. The solution would also need to be checked with SA3.
2. A separate IPsec SA needs to be established for QUIC traffic (if allowed by IETF). This would require impacts on UE and N3IWF to support mapping of QUIC traffic on the IPsec SA (today only separate QoS Flows are mapped to different IPsec SAs).
3. In our understanding there is no or minimal gain. The performance impact comes more from the processing of multiple IP layers. There are thus performance impacts as long as IPsec layer exists even with NULL encryption. Also, in case NULL encryption is negotiated, integrity protection seems to be mandated by the RFC which further reduces the benefits.

10 – Deutsche Telekom AG

1. NULL encryption is already used in 3GPP; as any solution it needs to be checked by SA3 regarding security
2. assume yes. For other traffic the NULL encryption is not used.
- 3) yes, some gain is there

11 – Apple Distribution Intl Ltd

NULL encryption IPsec tunnel should not be supported, it does not simplify protocol stack.

Question KI#2.2.7: Is there a need to define a simplified architecture that is not the current architecture and it keeps the NAS signalling between UE and CN over non-3GPP access?

Feedback Form 68: Question KI#2.2.7

1 – HUAWEI Technologies Japan K.K.

Not needed

2 – Intel Deutschland GmbH

Not needed.

3 – Qualcomm Germany

No, not needed

4 – Charter Communications

The question should be if any solution without NAS over non-3GPP be defined. There is no need to define a simplified architecture that is not based on the current architecture for ATSSS. Each phase of ATSSS thus far, was introduced in a backward compatible way with add-on features. However, the solutions that remove NAS over non-3GPP deviates from this backward compatibility. 3GPP is nearing the end of the 5G release (5G: Rel-15/16/17, 5G Adv Rel-18/19/20) and in the 4th release of ATSSS, this or any simplified architecture not based on the current architecture would be a significant architectural change that will cause market fragmentation with little benefit.

5 – LG Electronics France

No.

6 – CableLabs

NO it is not needed.

For fixed operators an architecture which allows the operators to manage and control terminal devices which operate most of the time using non-3GPP access is very important. The current 5G architecture provides an access agnostic mechanism to 5G services for such devices which achieves the needs of fixed operators. In this context we do not see the benefits of defining a new signaling architecture over non-3GPP access.

7 – Samsung Electronics Co.

No.

8 – ZTE Corporation

No

9 – Nokia

NO

10 – InterDigital Communications

NAS signaling is not needed. But it would be beneficial to have some control plane mechanisms over non-3GPP access when 3GPP access is not available.

11 – Ericsson LM

Not needed. The existing N3WIF arch can be used if NAS is required over non-3GPP, e.g. for single access PDU Sessions or for MA PDU Sessions where there is a need for additional control via non-3GPP access.

12 – Deutsche Telekom AG

not in Release 19

13 – Apple Distribution Intl Ltd No.
14 – CICT No

Question KI#2.2.8: If "non-3GPP access without 5G NAS over non-3GPP" is defined, should it support ATSSS-LL and keep IPsec between the UE and UPF?

Feedback Form 69: Question KI#2.2.8

1 – HUAWEI Technologies Japan K.K. Yes. ATSSS-LL shall be supported considering its simplicity and applicability to non per packet splitting and non-redundancy modes. IPsec is needed for ATSSS-LL, and it should be noted that IPsec is based on SUPI's security mechanism which is more aligned with the security requirement by 3GPP.
2 – Intel Deutschland GmbH No. The justification for WT2.2 in SP-231802 indicates that it is fine to study support for only a <i>limited set</i> of ATSSS functionality, as per the following excerpt: <i>"3) The Rel-16 to Rel-18 Access Traffic Steering, Switching and Splitting feature requires that MA PDU Sessions require integrated trusted or untrusted non-3GPP accesses. This means that to enable ATSSS either a TNGF (Trusted Non-3GPP Gateway Function) or an N3IWF (Non-3GPP InterWorking Function) is deployed in the PLMN. At the same time, many network deployments do not have such nodes and it is therefore <u>beneficial to study how to support a limited set of access traffic aggregation and steering features applicable to non-integrated non-3GPP access not based on TNGF/N3IWF.</u>"</i> MPQUIC has built-in security based on TLS and therefore there is no need for IPsec between the UE and UPF.
3 – Qualcomm Germany No
4 – Charter Communications Any solution that does not support NAS over non-3GPP should not be considered as explained in CHTR response to Question KI#2.2.7. But solutions that maintain NAS over non-3GPP should also support ATSSS-LL. For the solutions that remove NAS over non-3GPP, the following technical concerns/issues should be addressed: - How would the solution work if ATSSS uses one of the legs at the EPS?

- In case of roaming if a VPLMN does not support this new way of ATSSS, the HPLMN must support both legacy and new architecture (because the V-AMF needs to select SMFs that support this new architecture).
- How would the solution work in roaming scenarios as described in TS23.501 **Figure 4.2.10-2: Roaming with Home-routed architecture for ATSSS support (UE registered to the same VPLMN)?**
- How will non-3GPP path switching work?
- How would the QoS work by eliminating TNGF/N3IWF?
- The following ENs have not been addressed:
 - Whether and how it is possible to keep the MA PDU Session via non-3GPP access even if the UE is deregistered from 3GPP access is FFS.
 - Whether and how the solution can be enhanced to support establishment of a MA PDU Session via non-3GPP access is FFS.

5 – LG Electronics France

Yes.

6 – CableLabs

We see various issues with this question:

1. As we indicated in Phase 1, we do not see the need of an architecture with "non-3GPP access without 5G NAS over non-3GPP".
2. We do not see the relation between a "non-3GPP access without 5G NAS signaling over non-3GPP access" and the support for ATSSS-LL.
3. Also, none of the current architectures allow a direct link between UE and UPF as the two are in different security domains. The existence of a potential IPSec tunnel between UE and UPF assumes UPF to be reachable from any IP address, which is coming against the current security requirements of the 5G System.

7 – Samsung Electronics Co.

It is not necessary to support ATSSS-LL to keep IPSec between the UE and UPF.

8 – ZTE Corporation

Yes.

9 – Nokia

We do not think "Non-3GPP access without 5G NAS over Non-3GPP access" shall be specified due to reasons explained in round 1.

The solutions that should be considered for normative work shall also support all steering functionalities and shall be backward compatible with the work done until Rel-18.

For the above question the answer is YES.
10 – InterDigital Communications No. MPQUIC is sufficient.
11 – Ericsson LM In our view it is not necessary to support ATSSS-LL for "non-3GPP access without 5G NAS over non-3GPP". MPQUIC is sufficient. In case ATSSS-LL is anyway needed, the existing rel-18 solutions can be used. Possibly the solution with ePDG collocated with UPF could also be used and co-exist with a MPQUIC based solution for "non-3GPP access without 5G NAS over non-3GPP".
12 – Deutsche Telekom AG Any solution that does not support NAS over non-3GPP should not be considered for normative work. For the answer to this question: yes.
13 – Apple Distribution Intl Ltd No.
14 – CICT Not applicable, "non-3GPP access without 5G NAS over non-3GPP" is not supported.

5 Round 2 Summary from Rapporteur

5.1 Key Issue #1.1 – Round 2 Summary

Question KI#1.1.6 asked "Either of two SUPIs can be used to first register or request the PDU session establishment. The primary/secondary SUPI would not be pre-determined by the subscription data, but by the order of the SUPIs successful registration. Should one of the SUPIs be treated as primary SUPI if it was registered first?"

21 companies responded. 6 indicated 'yes', 13 companies indicated 'no', 1 company indicated 'whether and how to treat a first registered SUPI as primary and a second registered SUPI as secondary will depend on solutions', 1 company's response was unclear.

Among the 13 companies that indicated 'no' 4 companies indicated 'The primary/secondary SUPI should be pre-determined by the subscription data', 1 company indicated 'if we use Primary/Secondary concept, it should be statically defined in the UDM', 1 company indicated 'primary access can be determined by the network and provided as part of the DS rules', 1 company thinks 'it would be simpler if subscription already defines primary/secondary SUPI.'

Proposal: proceed with the assumption that no primary or secondary SUPI is defined as part of subscription data. Either of two SUPIs can be used to first register, but the first registered SUPI is not treated as primary SUPI.

Question KI#1.1.7 asked "Would existing mechanism to control access type and RAT restrictions applied to each SUPI independently be satisfactory?"

19 companies responded. 12 companies indicated 'yes', 6 companies indicated 'no'. Among the answers, 3 companies indicated this discussion has SA1/CT1 dependency.

Proposal: proceed with the assumption that existing mechanism to control access type and RAT restrictions applied to each SUPI independently are satisfactory.

Question KI#1.1.8 asked "Can the subscriptions reside in different UDMs?"

19 companies responded. 7 indicated 'yes', 11 companies indicated 'no', 2 companies indicated 'deployment choice'.

Proposal: proceed with the assumption that the 2 SUPIs will be handled by the same UDM. Having different UDMs may be possible in deployments, however 3GPP does not need to specify such scenario.

Question KI#1.1.9 asked "Should the two SUPIs of the DualSteer Device stored as:"

20 companies responded.

"1. One parent SUPI and one child SUPI"

1 company indicated 'yes', 15 companies indicated 'no', 3 companies indicated 'no need to specify' or 'not in scope'. 1 company indicated 'maybe'.

2. One "DualSteer Group?"

1 company indicated 'yes', 12 companies indicated 'no', 3 companies indicated 'no need to specify' or 'not in scope'. 1 company indicated 'can live with it'.

Proposal: proceed with the assumption that the two SUPIs of the DualSteer Device is not associated with any additional identifier and they are not stored in a hierarchical structure.

Question KI#1.1.10 asked "Is there a need to enhance the Access and Mobility Subscription Data for DualSteer with the following information?"

19 companies responded.

"1. Access Type/RAT/PLMN restriction?"

5 companies indicated 'yes', 11 companies indicated 'no', 4 companies indicated 'it depends on SA1/CT1'.

”2. PCF selection information to enable selecting the same PCF for two SUPIs?”

10 companies indicated 'yes', 7 companies indicated 'no', 3 companies indicated 'maybe'.

”3. RFSP index dedicated to DualSteer?”

4 companies indicated 'yes', 14 companies indicated 'no', 1 company indicated 'maybe'.

Proposal: proceed with the assumption that Access and Mobility Subscription Data needs to be enhanced for DualSteer, however there is no consensus what additional information needs to be added. There is consensus not to add information including RFSP index dedicated to DualSteer.

Question KI#1.1.11 asked ”Is there a need to enhance the Session Management Subscription Data for DualSteer with the following information?”

19 companies responded.

”1. A cross-reference between SUPIs belonging to the same DualSteer device?”

13 companies indicated 'yes', 6 companies indicated 'no'.

”2. Information to correlate two PDU sessions (e.g., Linked SUPIs for dual steer session(s), same PDU session ID)?”

12 companies indicated 'yes', 6 companies indicated 'no'.

”3. whether DualSteer PDU Session is allowed for a specific DNN and S-NSSAI?”

12 companies indicated 'yes', 3 companies indicated 'no', 2 companies indicated 'maybe'.

”4. whether to enable correlating PDU session before and after switching?”

1 companies indicated 'yes', 7 companies indicated 'no', 1 company indicated 'maybe'.

Proposal: proceed with the assumption that Session Management Subscription Data should include information whether the PDU Session established for DualSteer is allowed for a specific DNN and S-NSSAI. There is no consensus what additional information needs to be added. There is consensus not to add information whether to enable correlating PDU session before and after switching.

5.2 Key Issue #1.2 – Round 2 Summary

Question KI#1.2.7 asked ”Is there a need to specify a policy in SA2 that enables the HPLMN to control when the DualSteer device establishes connectivity to the second 3GPP access network?”

13 companies indicated 'yes', 5 companies indicated 'no', 1 company indicated 'depends on SA1/CT1'.

Proposal: proceed with the assumption that an operator policy should be specified that enables the HPLMN to control when the DualSteer device registers to the second 3GPP access network. SA1/CT1 should discuss and

decide how the UE selects the RAT and the PLMN.

Question KI#1.2.8 asked "Would it be necessary to specify a Registration Correlation Information in order for the DualSteer Device to be aware that the two SUPIs are associated?"

19 companies responded. 5 companies indicated 'yes', 12 companies indicated 'no'.

"If yes, could the Registration Correlation Information be also used by the ?"

7 companies indicated 'yes', 2 companies indicated 'no'.

Proposal: more discussion is needed whether it is necessary to specify a Registration Correlation Information in order 1. for the DualSteer Device to be aware that the two SUPIs are associated, or 2. UDM to determine that the two SUPIs are used by the same DualSteer Device.

5.3 Key Issue #1.3 – Round 2 Summary

Question KI#1.3.15 asked "Should PDU Session established to support DualSteer traffic steering or PDU Session established to support DualSteer traffic switching re-use the principles of MA PDU session?"

19 companies responded. 18 companies indicated 'yes' or 'partially', 1 company indicated 'no'

"If yes, what properties of MA PDU session should be re-used?"

1. Enhanced ATSSS rules?"

14 companies indicated 'yes', 3 companies indicated 'no'.

"2. Steering functionalities?"

13 companies indicated 'yes', 4 companies indicated 'no'.

"3. Steering modes?"

15 companies indicated 'yes', 2 companies indicated 'no'.

"4. PMF measurements?"

15 companies indicated 'yes', 2 companies indicated 'no'.

"5. Same anchor SMF/UPF?"

16 companies indicated 'yes', no companies indicated 'no'.

"6. Common N4 session?"

9 companies indicated 'yes', 2 companies indicated 'no', 2 companies indicated 'needs further study'.

Proposal: proceed with the assumption that a PDU Session established to support DualSteer traffic steering or a PDU Session established to support DualSteer traffic switching can re-use the principles of the MA PDU session including 1. enhanced ATSSS rules for DualSteer, 2. Steering functionalities, 3. Steering modes, 4. PMF measurements, 5. Same anchor SMF/UPF. Whether a common N4 session can be used or not can be decided during normative phase.

Question KI#1.3.16 asked "Can MA PDU Session be used directly for over two UEs based on using the overlay-underlay architecture assuming ATSSS rules are aligned with SA1 requirements for DualSteer?"

18 companies responded. 7 companies indicated 'yes', 10 companies indicated 'no'.

Proposal: No consensus on using MA PDU Session directly for over two UEs based on using the overlay-underlay architecture. Proponents of the solution can trigger further discussion.

Question KI#1.3.17 asked "Is it necessary to define the Session Correlation Information to enable the serving AMF to select the same SMF/UPF at least for DualSteer traffic switching?"

19 companies responded. 9 companies indicated 'yes', 10 companies indicated 'no'.

Proposal: more discussion is needed whether to define Session Correlation Information to enable the serving AMF to select the same SMF/UPF at least for DualSteer traffic switching.

Question KI#1.3.18 asked "If the DualSteer device can ensure to choose a common PDU Session ID that is unique per both SUPI1 and SUPI2, can such common PDU Session ID be used to correlate the two PDU Session establishments?"

18 companies responded. 11 companies indicated 'yes', 6 companies indicated 'no'.

Proposal: more discussion is needed whether a common PDU Session ID can be used to correlate the two PDU Session establishments.

Question KI#1.3.19 asked "Is there a need to pre-establish the PDU session for potential services switching?"

20 companies responded. 11 companies indicated 'yes', 8 companies indicated 'no'.

Proposal: more discussion is needed whether to pre-establish the PDU session for potential services switching.

Question KI#1.3.20 asked "Which capabilities should be included in the PDU Session establishment by the DualSteer Device:

22 companies responded.

”1. Supported steering functions?”

12 companies indicated 'yes', 4 companies indicated 'no', 2 companies indicated "depends on whether to reuse the ATSSS method", 1 company indicated 'principle of MA PDU session is not applicable.'

”2. Supported steering modes?”

12 companies indicated 'yes', 4 companies indicated 'no', 2 companies indicated "depends on whether to reuse the ATSSS method", 1 company indicated 'principle of MA PDU session is not applicable.'

”3. Support for simultaneous or non-simultaneous data transfer?”

10 companies indicated 'yes', 10 companies indicated 'no', 1 companies indicated "maybe".

Proposal: proceed with the assumption DualSteer device includes these capabilities in the PDU Session establishment: supported steering functions, supported steering modes.

Question KI#1.3.21 asked "Should the DualSteer feature apply to any DNN/S-NSSAI?"

20 companies responded. 1 company indicated 'yes', 19 companies indicated 'no'.

”If no, should the applicable DNNs/S-NSSAIs controlled 1. via URSP?”

14 company indicated 'yes', 1 companies indicated 'no'.

2. via SM subscription data?”

13 company indicated 'yes', 1 companies indicated 'no'.

Proposal: proceed with the assumption that DualSteer PDU Session establishment should be applicable to specific DNNs/S-NSSAIs. The applicable DNNs/S-NSSAIs should be controlled via URSP and SM subscription data.

Question KI#1.3.22 asked "Is it necessary to share the PDU Session ID between the 2 UEs of the DualSteer Device so that another correlation ID for SM would not be required?"

18 companies responded. 13 companies indicated 'yes', 3 companies indicated 'no', 1 company indicated 'maybe'.

Proposal: proceed with the assumption that the 2 UEs of the DualSteer Device can share a common PDU Session ID.

Question KI#1.3.23 asked "Should PDU sessions established to support DualSteer feature be always anchored in a common PCF?"

19 companies responded. 10 companies indicated 'yes', 6 companies indicated 'no'.

Proposal: more discussion is needed whether PDU sessions established to support DualSteer feature should always be anchored in a common PCF or not.

Question KI#1.3.24 asked "Should the common UPF anchor established within the PDU sessions established to support the DualSteer feature apply to both traffic steering and switching or traffic switching only?"

20 companies responded. 12 companies indicated 'both traffic steering and switching', 8 companies indicated 'traffic switching only'.

Proposal: more discussion is needed whether a common UPF anchor established within the PDU sessions established to support the DualSteer feature apply to both traffic steering and switching or traffic switching only.

Question KI#1.3.25 asked "Should DualSteer feature re-use steering functionalities defined by ATSSS?"

19 companies responded. 12 companies indicated 'yes', 7 companies indicated 'no'.

Proposal: more discussion is needed whether to re-use steering functionalities defined by ATSSS.

5.4 Key Issue #1.4 – Round 2 Summary

Question KI#1.4.12 asked "Should 'Allowed RAT combinations for DualSteer communication' be indicated in DualSteer policy?"

17 companies responded. 6 companies indicated 'yes', 10 companies indicated 'no', 1 company indicated 'neutral'.

"If yes, should URSP rules be enhanced with this policy information?"

4 companies indicated 'yes', 3 companies indicated 'no'.

Proposal: more discussion is needed whether 'Allowed RAT combinations for DualSteer communication' can be indicated in DualSteer policy or not.

Question KI#1.4.13 asked "If Smallest Delay steering mode is supported for DualSteer, should it be restricted for the case when simultaneous transmission is possible?"

18 companies responded. 7 companies indicated 'yes', 9 companies indicated 'no', 1 company indicated 'steering modes are not applicable to the DualSteer'.

"If Priority-Based steering mode is supported for DualSteer, should it be restricted for the case when simultaneous transmission is possible?"

18 companies responded. 5 companies indicated 'yes', 8 companies indicated 'no', 1 company indicated 'steering modes are not applicable to the DualSteer', 3 companies indicated 'Not clear whether Priority-Based steering mode can apply'.

Proposal: more discussion is needed which steering modes need to be supported and how.

5.5 Key Issue #2.1 – Round 2 Summary

Question KI#2.1.4 asked "Should CONNECT-Ethernet be supported?"

13 companies responded. 10 companies indicated 'yes', 2 company indicated 'no', 1 company indicated 'Depends on IETF progress.'

Proposal: proceed with the assumption that CONNECT-Ethernet is supported in Rel-19 for Ethernet PDU Sessions.

5.6 Key Issue #2.2 – Round 2 Summary

Question KI#2.2.6 asked "Assuming NULL encryption IPsec tunnels are allowed for the MA PDU Session user plane traffic between UE and N3IWF:"

11 companies responded.

"1. For NULL encryption, is there any dependency on IETF RFCs? Should this be checked with SA3?"

5 companies indicated 'NULL encryption IPsec tunnel should not be supported' (1 company indicated it should be verified with IETF whether one PDU Session can have different Child SAs where some have full encryption (for ATSSS-LL traffic) and others have NULL encryption (for MPQUIC traffic)), 4 companies indicated 'NULL encryption is already supported in RFC & 3GPP', 1 company indicated 'it is against the RFC's principles of using NULL encryption'.

Proposal: more discussion is needed whether allowing NULL encryption IPsec tunnels for the MA PDU Session user plane traffic between UE and N3IWF should be supported or not.

2. Can it be ensured that NULL encryption is only used for QUIC traffic? If N3IWF uses NULL encryption, would subsequent traffic for any PDU session also use NULL encryption?

5 companies indicated 'yes, it can be ensured that NULL encryption is only used for QUIC traffic', 1 company indicated 'a separate IPsec SA needs to be established for QUIC traffic'.

3. What is the gain by using NULL encryption in terms of performance and reducing signaling messages? If the IPsec stack remains and integrity protection remains too, is there any simplification or any performance gain achieved?"

5 companies indicated they consider some reduction in compute cycles due to null encryption.

Question KI#2.2.7 asked "Is there a need to define a simplified architecture that is not the current architecture

<https://nwm-trial.etsi.org/#/documents/8882>

and it keeps the NAS signalling between UE and CN over non-3GPP access?"

14 companies responded. 2 companies indicated 'yes', 12 companies indicated 'no'.

Proposal: proceed with the assumption that in Rel-19 a simplified architecture will not be defined that is not the current architecture and it keeps the NAS signalling between UE and CN over non-3GPP access.

Question KI#2.2.8 asked "If "non-3GPP access without 5G NAS over non-3GPP" is defined, should it support ATSSS-LL and keep IPsec between the UE and UPF"?

14 companies responded. 4 companies indicated 'yes', 6 companies indicated 'no', 4 companies indicated 'No need to define "non-3GPP access without 5G NAS over non-3GPP" architecture'.

Proposal: more discussion is needed whether "non-3GPP access without 5G NAS over non-3GPP" architecture (if defined) should support ATSSS-LL and keep IPsec between the UE and UPF.