**3GPP TSG SA Meeting #102 SP-231389**

**Edinburgh, UK, December 11-15, 2023**

**Source: Apple (Moderator for Multi-Access)**

**Title: New SID on Multi-Access (DualSteer + ATSSS Ph-4)**

**Document for: Approval**

**Agenda Item: 6.4.2**

3GPP™ Work Item Description

Information on Work Items can be found at <http://www.3gpp.org/Work-Items>
See also the [3GPP Working Procedures](http://www.3gpp.org/specifications-groups/working-procedures), article 39 and the TSG Working Methods in [3GPP TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm)

Title: Study on Multi-Access
(DualSteer+ ATSSS Ph-4)

Acronym: FS\_MASSS

Unique identifier: TBD

Potential target Release: Rel-19

# 1 Impacts

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Affects: | UICC apps | ME | AN | CN | Others (specify) |
| Yes |  | X |  | X |  |
| No | X |  | X |  | X |
| Don't know |  |  |  |  |  |

# 2 Classification of the Work Item and linked work items

## 2.1 Primary classification

### This work item is a …

|  |  |
| --- | --- |
| X | Study  |
|  | Normative – Stage 1 |
|  | Normative – Stage 2 |
|  | Normative – Stage 3 |
|  | Normative – Other\* |

**\* Other = e.g. testing**

## 2.2 Parent Work Item

For a brand-new topic, use “N/A” in the table below. Otherwise indicate the parent Work Item.

|  |
| --- |
| Parent Work / Study Items  |
| Acronym | Working Group | Unique ID | Title (as in 3GPP Work Plan) |
|  |  |  | N/A |

### 2.3 Other related Work Items and dependencies

|  |
| --- |
| Other related Work /Study Items (if any) |
| Unique ID | Title | Nature of relationship |
| 940070 | Access Traffic Steering, Switch and Splitting support in the 5G system architecture; Phase 3 | Rel-18 Work Item |
| 960018 | Study on upper layer traffic steering, switching and split over dual 3GPP access | Stage 1 study for DualSteer in Rel-19 |
| [TBD] | Upper layer traffic steering and switching over dual 3GPP access  | Stage 1 work item for DualSteer in Rel-19 |
|  |  |  |

# 3 Justification

1) As identified in the SA1 study and service requirements on DualSteer (see TR 22.841 and TS 22.261), it is beneficial for a DualSteer Device to apply traffic steering and/or switching between two 3GPP access networks connected to the same or different PLMN networks. Use cases cover examples of diverse combinations of 3GPP access networks using the same or different RATs, including terrestrial NR plus NR, or NR plus E-UTRA (e.g. using a combined EPC and 5GC), a mix of terrestrial and non-terrestrial NR, as well as dual non-terrestrial NR access (using same or different NTN orbits, e.g., GEO/MEO/LEO).

2) In Rel-18, a high-layer steering functionality "MPQUIC steering functionality using UDP proxying over HTTP" was defined that enables steering, switching, and splitting UDP traffic based on IETF protocols. For TCP traffic, ATSSS has been relying on the use of the "MPTCP steering functionality" that was specified in Rel-16. The associated proxy functionalities (MPQUIC and MPTCP) add complexity for the operator deployment. In order to ease this deployment burden, it would be beneficial to study how to enable the MPQUIC steering functionality to also steer, switch, and split non-UDP traffic (TCP, IP, Ethernet traffic) and at the same time make the MPTCP steering functionality optional for TCP traffic in ATSSS.

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.

# 4 Objective

The following aspects will be studied:

**Dual-steer Work Tasks:**

**NOTE 1:** Solutions are expected to demonstrate not to impact VPLMNs and/or HPLMNs that do not support this functionality.

WT-D-1: Study the overall architecture and function enhancements to 5GS to support a DualSteer Device (see TS 22.261 for definition of DualSteer Device). A DualSteer Device supports traffic steering and switching of user data for different services (i.e. PDU Sessions???) across two 3GPP access networks; it can be (a) a single UE, in case of non-simultaneous data transmission over the two networks, or (b) two separate UEs in case of simultaneous data transmission over the two networks. The subscriber of the DualSteer device has two subscriptions/SUPIs, sharing one subscription profile from the same operator. For any particular service, at any given time, the DualSteer Device shall transmit all traffic of that service using only a single 3GPP access network.

**The following scenarios are considered:**

1. Two NR/5GC accesses in a single PLMN (HPLMN or VPLMN) with each access being NR TN or NR NTN;

2. Two NR/5GC accesses in two different PLMNs (including two VPLMNs or a VPLMN and the HPLMN) with each access being NR TN or NR NTN;

3. NR/5GC access and E-UTRA/EPC access in two different PLMNs (including two VPLMNs or a VPLMN and the HPLMN);

4. NR/5GC access and E-UTRA/EPC access in a single PLMN (HPLMN or VPLMN);

5. PNI-NPN (integrated with the HPLMN or integrated with the VPLMN) and PLMN access (TN/NTN plus TN or NTN). This scenario assumes only non-simultaneous transmission.

**Alternative:**

1. Across two 3GPP access networks belonging to the same PLMN (either HPLMN or VPLMN), assuming data anchoring in the HPLMN;

2. Across two 3GPP access networks belonging to two PLMNs, assuming a business/roaming agreement between PLMN operators (if different), data anchoring in the HPLMN;

NOTE: Inter-PLMN requirements can apply also to PLMN-NPN scenarios assuming a PLMN-integrated NPN (NPN hosted by a PLMN or offered as a slice of a PLMN).

NOTE 2: The study assumes there is no coordination in RAN between the two 3GPP access networks where the DualSteer device is accessing simultaneously.

NOTE 3: For the PNI-NPN scenario, the subscriber is assumed to be a subscriber of the PNI-NPN.

NOTE 4: the 5GC-EPC scenarios will be studied once the baseline 5GC-5GC scenarios are stable.

WT-D-1.1: Study whether and how to enhance subscription aspects for each of the above scenarios.

WT-D-1.2: void.

WT-D-1.3: Study whether and how, based on HPLMN policies, after the DualSteer Device registers and obtains connectivity in an initial PLMN (or PNI-NPN), the DualSteer Device registers or establishes connectivity in a second PLMN (or PNI-NPN), or establishes connectivity in a second access network of the same PLMN.

**Alternative**: WT-D-1.3: Study whether and how the DualSteer Device registration and connectivity establishment to a second PLMN (or PNI-NPN) or connectivity establishment to a second access network of the same PLMN to be enhanced after the DualSteer device registers and obtains connectivity in an initial PLMN (or PNI-NPN) based on HPLMN policies.

NOTE 5: This WT requires coordination with SA3 for handling security aspects.

NOTE 6: No impacts on network slicing features, i.e. network slicing features apply to each subscription/SUPI separately.

NOTE 7: If any PLMN selection enhancement is identified, SA2’s role could be limited to study system level impacts and/or trigger SA1 and CT1 to handle the work.

WT-D-1.4: Session management enhancements and policies:

WT-D-1.4.1: Study whether and how to enhance network policies provided by the HPLMN to the DualSteer Device and within the network to support DualSteer Devices.

WT-D-1.4.2: Study whether and how to enhance session management procedures for initial steering and potential subsequent switching. Traffic policies are in full control of the HPLMN. For sessions subject to potential switching, assuming data anchoring in the HPLMN or, in case of PNI-NPN plus PLMN, assuming data anchoring in the PNI-NPN, study how to select the PSA UPF(s) in the HPLMN to allow routing the traffic across 3GPP accesses towards the same PSA UPF during the switching for the purpose of service continuity.

WT-D-1.5: Study whether and how to enhance the mobility management scenarios and minimize service interruption when switching a DualSteer Device’s user data, for one or multiple services, between two 3GPP access networks.

WT-D-1-5.1: Study whether any enhancement is required to support to change a service related data from a 3GPP access network to a non-3GPP access network of the same subscription (and vice versa).

**ATSSS Phase-4 Work Tasks:**

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

WT-A-2: Study whether and how to define a functional architecture and procedures for steering, switching and splitting of traffic not based on current TNGF/N3IWF to simplify the operation over non-3GPP access without compromising the security of the 5G network.

WT-A-2.1: Study whether to keep the NAS signalling connection on non-3GPP access or not, whether to eliminate IPSec tunnel encapsulation on the user plane only or both on the control plane and the user plane, simplifying the protocol stack, reduce the user plane overhead.

WT-A-2.2. Study whether and how to support splitting, switching, steering between 3GPP access and "non-3GPP access without 5G NAS". Study whether and how to enhance registration and security aspects for supporting "non-3GPP access without 5G NAS".

NOTE 8: This WT requires coordination with SA3 for handling security aspects.

## TU estimates and dependencies

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Work Task ID** | **TU Estimate****(Study)** | **TU Estimate****(Normative)** | **RAN Dependency****(Yes/No/Maybe)**  | **Inter Work Tasks Dependency**  |
| WT-D-1 | 4.75 | 4.5 | No | WT-D-1 is self-contained |
| WT-D-1.1 | 0.5 | 0.25 | No |  |
| void |  |  |  |  |
| WT-D-1.3 | 1 | 1 | No |  |
| WT-D-1.4 | 2.25 | 2.25 | No |  |
| WT-D-1.5 | 1 | 1 | No |  |
| WT-A-1 | 0.5 | 0.25 | No | WT-A-1 is self-contained |
| WT-A-2 | 2 | 2 | No | WT-A-2 is self-contained |
| WT-A-2.1 | 1 | 1 | No |  |
| WT-A-2.2 | 1 | 1 | No |  |

**Total TU estimates for the study phase: 7.25**

**Total TU estimates for the normative phase: 6.75**

**Total TU estimates: 7.25+ 6.75 = 14**

# 5 Expected Output and Time scale

|  |
| --- |
| New specifications {One line per specification. Create/delete lines as needed} |
| Type  | TS/TR number | Title | For info at TSG#  | For approval at TSG# | Rapporteur |
| Internal TR | 23.xyz | Study on Multi-Access (Dual 3GPP + ATSSS Ph-4) | TSG#104(June 2024) | TSG#105(September 2024) |   |
|  |  |  |  |  |  |

|  |
| --- |
| Impacted existing TS/TR {One line per specification. Create/delete lines as needed} |
| TS/TR No. | Description of change  | Target completion plenary# | Remarks |
|  |  |  |  |
|  |  |  |  |

# 6 Work item Rapporteur(s)

# 7 Work item leadership

SA2

# 8 Aspects that involve other WGs

The following aspects involving other WGs may arise related to this SID:

Security impacts to be covered by SA3.

Potential charging and OAM impact to be covered by SA5.

# 9 Supporting Individual Members

|  |
| --- |
| Supporting IM name |
| Airbus |
| Apple |
| Avanti |
| BT |
| Broadcom |
| CableLabs |
| Charter Communications, Inc |
| China Telecom |
| Cisco |
| Comcast |
| Dish Network |
| ETRI |
| KDDI |
| Interdigital |
| Lenovo |
| LG Electronics |
| MATRIXX Software |
| MITRE |
| NEC |
| Nokia |
| Nokia Shanghai Bell |
| Oppo |
| Samsung |
| SES |
| SHARP |
| SKY Perfect JSAT Corporation |
| SyncTechno Inc. |
| US Cellular |