**3GPP TSG SA Meeting #101 SP-231138**

**Bangalore, India, September 11-15, 2023**

**3GPP TSG SA WG2 Meeting #158 S2-2310032**

**Gothenburg, Sweden, August 21-25, 2023**

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

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

**Document for: Approval**

**Agenda Item: 7.4**

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 |
| Don't know |  |  | X |  |  |

# 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 |
|  |  |  |
|  |  |  |

# 3 Justification

1) The Rel-16 to Rel-18 Access Traffic Steering, Switching and Splitting feature enables simultaneous communication between UE and UPF over multiple paths. By leveraging the simultaneous communication over multiple paths, the 5G system provides services with improved user experience, distributes the traffic across multiple accesses in a policy-based fashion, provides new high-data-rate services, etc.

However currently the feature requires a Multi-Access PDU Session to have one 3GPP access path and one non-3GPP access path, with the possibility to temporarily leverage two non-3GPP access paths in case of non-3GPP access path switch. As identified in the SA1 study on DualSteer (see TR 22.841), there are certain use cases in which it is necessary to apply traffic steering, switching and splitting between dual 3GPP access paths connected to the same or to different 3GPP networks. Use cases cover examples of diverse combinations of 3GPP access networks using the same or different RATs, including terrestrial NR and NR, or NR and E-UTRA (e.g. using a combined EPC and 5GC), mix of terrestrial and non-terrestrial NR, as well as dual non-terrestrial NR access (e.g. 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) During the Rel-17 study and normative phase of ATSSS, certain scenarios were excluded from ATSSS and certain enhancements were deferred to later releases:

a) An MA PDU Session using a Branching Point or UL Classifier was not supported. TS 23.501 states: "In this Release of the specification, a MA PDU Session using IPv6 multi-homing (see clause 5.6.4.3) or UL Classifier (see clause 5.6.4.2) is not specified." However, in several scenarios (e.g., for supporting ATSSS towards edge-computing services) it would be beneficial to specify how an MA PDU Session can support a Branching Point or UL Classifier.

5) In order to allow flexibility for operator deployments, it would be beneficial to study how to define ATSSS functionalities outside of the UPF (e.g., a new NF or an external node).

6) In order to make highly accurate ATSSS decisions, it would be beneficial to study how to use available QoS and congestion information or performance measurement results, e.g., provided by the Access Network or the UE.

# 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 support access traffic steering, switching and splitting via two simultaneous 3GPP access networks**.**

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

WT-D-1.1: Study whether and how to enhance registration and security aspects for supporting access traffic steering, switching and splitting via two simultaneous 3GPP access networks for each of the above scenarios. If dual 3GPP access registration is needed, study how to support it.

NOTE 3: This WT requires coordination with SA3.

WT-D-1.2: If the UE is registered to the 5GC simultaneously to support access traffic steering, switching and splitting via two 3GPP accesses, study how to support mobile originating and terminating services (e.g. data, IMS, SMS, LCS, emergency services, MBMS).

WT-D-1.3: Study how to select the second PLMN or NPN in case the two 3GPP accesses used for access traffic steering, switching and splitting belong to different 3GPP networks after an initial PLMN or NPN was selected for the UE.

NOTE 4: This WT requires that SA1 specifies corresponding requirements on network selection. CT1 owns the Stage-2 for PLMN selection, SA2’s role could be limited to study system level impacts for PLMN selection and/or trigger CT1 to initiate the work.

WT-D-1.4: Study whether and how to enhance session management procedures to support access traffic steering, switching and splitting over two 3GPP accesses. This includes studying whether and how to enhance policy and charging control **including URSP/ATSSS/N4 rules**, steering functionalities and steering modes. Study how to select the PSA UPF(s) and route the traffic of the MA PDU Session across 3GPP accesses towards the PSA UPF(s). Study whether to support one additional non-3GPP access to be added to the MA PDU session (i.e. MA PDU session with three access legs) in addition to the two 3GPP accesses.

WT-D-1.5: Study whether and how to enhance the mobility management and session continuity scenarios. Study UE mobility between 5GS and EPS when 5GS supports dual 3GPP access registration and EPS supports UE attach via only a single LTE access. Study impacts on area-based PDU sessions (LADN, PRA, etc.) and mobility restriction. If additional non-3GPP access is supported for MA PDU session, study whether and how to further enhance the mobility management and session continuity scenarios.

NOTE 5: The session continuity scenarios depend on the supported use cases. For example, if dual registration via two NR/5GC accesses to a single PLMN or in two different PLMNs is supported, then session continuity between two 3GPP accesses could be studied, e.g. mobility between single 3GPP access and dual 3GPP access, as well as between dual 3GPP accesses. If additional non-3GPP access to 5GC is supported, then session continuity between two 3GPP accesses and one non-3GPP access could be studied, e.g. mobility between single 3GPP access + non-3GPP access and dual 3GPP access + non-3GPP access, as well as between dual 3GPP accesses with additional non-3GPP access.

**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 on non-integrated non-3GPP access. The non-integrated non-3GPP access is the capability provided by the 5GS and the UE to enable the connection between the UE and 5GS via non-3GPP access network without using 5G NAS via non-3GPP access network to 5GS. Study whether and how to enhance registration and security aspects for supporting non-integrated non-3GPP access.

NOTE 6: This WT requires coordination with SA3.

## 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 | 5 | 4.5 | Maybe | WT-D-1 is self-contained |
| WT-D-1.1 | 1.5 | 1.5 | Maybe | WT-D-1.1 is self-contained |
| WT-D-1.2 | 0.5 | 0.5 | No | WT-D-1.2 depends on WT-D-1.1 |
| WT-D-1.3 | 0.5 |  | No | WT-D-1.3 is self-contained |
| WT-D-1.4 | 1.5 | 1.5 | No | WT-D-1.4 depends on WT-D-1.1 |
| WT-D-1.5 | 1 | 1 | No | WT-D-1.5 depends on WT-D-1.1 |
| WT-A-1 | 0.25 | 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-2.1 is self-contained |
| WT-A-2.2 | 1 | 1 | No | WT-A-2.2 is self-contained |

**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**

NOTE 7: TU estimates for WT-D-1 may need to be re-visited based on the scenarios in scope.

# 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 Enhancements) |  |  |   |
|  |  |  |  |  |  |

|  |
| --- |
| 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 on WT-D-1.1 and WT-A-2 to be covered by SA3.

Potential charging and OAM impact to be covered by SA5.

Dependency on RAN WGs should be avoided.

# 9 Supporting Individual Members

|  |
| --- |
| Supporting IM name |
| Apple |
| BT |
| Broadcom |
| CableLabs |
| Charter Communications |
| China Telecom |
| Cisco |
| Dish Network |
| KDDI |
| Lenovo |
| LG Electronics |
| MATRIXX Software |
| NEC |
| Nokia |
| Samsung |
| SHARP |
| SKY Perfect JSAT Corporation |