3GPP SA WG1 Meeting #98e S1-221017r1\_DT

Electronic Meeting, 9 - 19 May 2022 (revision of S1-220206)

**Source: Qualcomm, Lenovo, CableLabs, Xiaomi, Comcast Corporation, Verizon UK Ltd, Tencent, Thales, Charter Communications, SyncTechno Inc., InterDigital, KDDI, Nokia, Nokia-Shanghai Bell, vivo, Lockheed Martin, Sennheiser, Viasat**

**Title: New SID on Upper layer traffic steering, switching and split over dual 3GPP access**

**Document for: Approval**

**Agenda Item: 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 Upper layer traffic steering, switching and split over dual 3GPP access

Acronym: FS\_DualSteer

Unique identifier: TBD

Potential target Release: *Rel-19*

# 1 Impacts

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

# 2 Classification of the Work Item and linked work items

## 2.1 Primary classification

### This work item is a …

|  |  |
| --- | --- |
|  | Feature |
|  | Building Block |
|  | Work Task |
| x | Study Item |

## 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 |
| 820044 | ATSSS  | Related (Rel-16) stage-2/3 work  |
| 900033 | ATSSS-ph2  | Related (Rel-17) stage-2/3 work  |
| 940070 | FS\_ATSSS-ph3  | Related ongoing (Rel-18) stage-2 study |

Dependency on non-3GPP (draft) specification:

# 3 Justification

5GS supports certain functionalities to provide multi-access data connectivity at the upper layers (above RAN), i.e., the possibility to exchange user-plane traffic between the UE and a data network by simultaneously using two access network paths and two independent user plane tunnels between RAN and an anchor user plane function in 5GC. For example, ATSSS supports traffic steering, split and switching across one 3GPP access path and one non-3GPP access path.

In some scenarios, it is desired to distribute and/or aggregate the traffic across two 3GPP access paths, such as:

- Two 3GPP access paths in the same PLMN, e.g., one path using LTE/EPC and another path using NR/5GC, or two paths using 3GPP NTN access (e.g., over LEO and MEO/GEO).

- Two 3GPP access paths over two different PLMNs, or between a PLMN and an NPN, e.g., one path using 3GPP NTN access via PLMN-1 and another path using 3GPP terrestrial access via PLMN-2 (or NPN); it can also include two 3GPP terrestrial access paths, using the same RAT (e.g., NR&NR, NTN&NTN) or different RATs (e.g., NR plus LTE).

In those scenarios, it would be beneficial to enable additional 5GS mechanisms, under MNO control/policy, to provide flexible user plane traffic aggregation, steering and switching, which are known to improve access and network resources utilization, capacity, coverage, reliability and QoE. Such additional tools may be quite helpful when other solutions, i.e., RAN-based, are not available or suitable, e.g., for two-PLMN scenarios where RAN sharing is not in place, or single PLMN deployments where NR&LTE MR-DC Option4 is unsuitable, or inter-NTN dual connectivity is not supported.
For the scenarios involving interworking between two PLMNs (or PLMN plus NPN), the two networks can be assumed to be managed by the same MNO, or by different partner MNOs (with some business agreement in place). In the latter case, inter-MNO agreements would include appropriate incentives and policies on how traffic should be managed and routed across the networks, not in scope of this study.

Some more specific examples of use cases are:

- Terrestrial plus Satellite access (single or multiple PLMNs): extra resources available by the NTN network can be used to extend capacity/Tput of terrestrial network, or vice versa. The opportunity to use traffic aggregation (or selection/switch) can be based on demand or temporary coverage situations. e.g., for UEs in a train / cruise-ship / plane (served normally by NTN), arriving at a stopover (where dual NTN&TN coverage is available).

- Dual-satellite access (same or different PLMN): traffic aggregation/split can be used to expand bandwidth/Tput through multi satellite access, e.g., over both LEO & MEO/GEO networks. Also, steering and switch of traffic over different type of satellite accesses can be better controlled, e.g. based on application delay or bandwidth requirements, LEO discontinuous coverage, etc..

- Local dual-terrestrial connectivity (PLMN1 plus PLMN2 or NPN): in specific areas or premises, e.g., in a stadium during high-data traffic events, available resources from the local network (NPN or PLMN2) can be used to provide extra capacity to a wide-area PLMN1 network, or vice versa. Similar scenarios may apply in other local environments, e.g., campus, enterprise, factory, home.

With regard to existing SA1 requirements and gaps, few SA1 requirements can be found in the specs, covering general multi-access and multi-NW connectivity aspects, e.g. (from 22.261):

- Sec. 6.3: Multiple access technologies: Covers support of simultaneous data transmission via different access technologies (e.g., NR, E-UTRA, non-3GPP);

- Sec. 6.18: Multi-network connectivity and service across operators: Covers simultaneous connectivity to multiple serving networks operated by different operators;

- Other multi-NW connection requirements can be found e.g. in sec 6.1 (Network slicing) and 6.41 (PALS).

It is observed that the above requirements focus mostly on different services/apps over different network (not on multi- network connectivity for the same data session).

To conclude, it is therefore proposed to study new use cases and potential requirements to add support of upper layer traffic steering, split and switching over dual 3GPP access, as per objectives outlined below.

# 4 Objective

Study use cases and potential new service requirements for enabling 5GS support of upper layer steering, split and switching of UE’s traffic pertaining to the same data session using dual 3GPP access including the following scenarios:

* Single PLMN, PLMN plus (standalone) NPN, two PLMNs
* Single subscription of a PLMN

- Same or different 3GPP RATs (NR or NTN, plus one of NR, NTN or LTE)

 NOTE: NTN refers to NR-based satellite access, including different orbits (GEO/MEO/LEO)

For the PLMN plus PLMN/NPN scenarios, the two networks can be managed by the same operator or by different operators (assumed to have a business agreement among them).

The study should include a gap analysis with regard to existing service requirements and functionalities, including the potential applicability of existing multi-NW requirements (e.g. from TS 22.261 sec. 6.1, 6.3, 6.18, 6.41).

NOTE 1: simultaneous connectivity over dual 3GPP access (including access via CPN) assumes UE support of proper radio capabilities (e.g., dual radio).

NOTE 2: the study should focus on dual 3GPP access; other scenarios, i.e., combination and interaction with non-3GPP access, might also be considered.

# 5 Expected Output and Time scale

|  |
| --- |
| New specifications {One line per specification. Create/delete lines as needed} |
| Type  | TS/TR number | Title | For info  | For approval  | Rapporteur |
| TR | 22.xxx | Upper layer traffic steering, switching and split over dual 3GPP access  | Mar ‘23 | Jun ‘23 | Qualcomm |

|  |
| --- |
| 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)

Francesco Pica; Qualcomm

# 7 Work item leadership

SA1

# 8 Aspects that involve other WGs

None

# 9 Supporting Individual Members

|  |
| --- |
| Supporting IM name |
| Qualcomm  |
| Lenovo |
| CableLabs |
| Xiaomi |
| Comcast Corporation |
| Verizon UK Ltd |
| Tencent |
| Thales |
| Charter Communications |
| SyncTechno Inc. |
| InterDigital |
| KDDI |
| Nokia |
| Nokia-Shanghai Bell |
| Vivo |
| Lockheed Martin |
| Sennheiser  |
| Viasat |