**3GPP SA WG2 Meeting #162 S2-2404426**

**Changsha, China, April 15 – April 19, 2024**

**Source: MediaTek Inc.**

**Title:** **New Sol: Registration Management and Policy Control for DualSteer Device**

**Document for: Approval**

**Agenda Item: 19.13**

**Work Item / Release: FS\_MASSS/Rel-19**

*Abstract of the contribution:* *This paper proposes solutions to resolve issues from KI#1.1, #1.2 and #1.4*

# Discussion

This paper proposes solutions to resolve the following Key issues:

"Whether and how the 5G System identifies and associates the two subscriptions/SUPIs for DualSteer." from KI#1.1

"Whether and what enhancements are needed in functions and procedures of registration, deregistration and mobility management for supporting DualSteer." from KI#1.2

"For DualSteer traffic steering, whether and what policies need to be provided by the HPLMN to guide the DualSteer device to select a 3GPP access network to be used for the new service" from KI#1.4

"For DualSteer traffic switching, whether and what policies need to be provided by the HPLMN to guide the DualSteer device for traffic switching between two connected 3GPP access networks" from KI#1.4

# Proposal

It is proposed to include the below solution to the TR 23.700-54

\*\*\* Start of changes \*\*\*

## 6.0 Mapping of Solutions to Key Issues

Table 6.0-1: Mapping of DualSteer Solutions to Key Issues

|  |  |
| --- | --- |
|  | Key Issues for DualSteer |
| Solution# | Key Issue #1.1 | Key Issue #1.2 | Key Issue #1.3 | Key Issue #1.4 |
| #X | X | X |  | X |
|  |  |  |  |  |

\*\*\* Second change (All New Text) \*\*\*

## 6.X Solution #X: Registration Management and Policy Control for DualSteer Device

### 6.X.1 Description

#### 6.X.1.1 Registration management for DualSteer device

A DualSteer device has two subscriptions/SUPIs, sharing one subscription profile from the same operator. However, the 5GC does not know a priori whether these two subscriptions/SUPIs are in the same DualSteer device. Therefore, the DualSteer device and the 5GC which supports the DualSteer feature cannot use the DualSteer feature efficiently for traffic transmission without some indication. To resolve the above issue, the UE(s) in the DualSteer device needs to indicate to the 5GC that the two subscriptions/SUPIs are in the same DualSteer device during Registration procedure. Therefore, the 5GC can do identification and association for these two subscriptions/SUPIs in the network for DualSteer feature.

To achieve this, the following principles are applied:

- Two subscriptions/SUPIs require separate registration procedures for each of the subscriptions/SUPIs in the DualSteer device (regardless of non-simultaneous transmission or simultaneous transmission).

- The UE(s) in the DualSteer device is aware of belonging to the DualSteer device to support DualSteer feature and decides which subscription/SUPI is primary or secondary by implementation manner. To ensure the DualSteer feature can be activated between the UE(s) in the DualSteer device and 5GC, the network for the secondary subscription/SUPI to register is decided after the registration of the primary subscription/SUPI is completed and the network information for the secondary subscription/SUPI is transmitted to the primary subscription/SUPI during the Registration procedure (e.g., in Registration accept message).

- After PLMN selection as specified in TS 23.122 [xx] for primary subscription/SUPI, during the Registration procedure for the primary subscription/SUPI, the UE(s) in the DualSteer device can transmit "UE assisted information for DualSteer" (e.g., the available PLMNs, additional RATs, UE location) to 5GC, and the 5GC can decide which network (possibly with RAT type) can be dedicated to the secondary subscription/SUPI to register for DualSteer and transfer the network information to primary subscription/SUPI.

Editor’s note: what information can be included in "UE assisted information for DualSteer" is FFS.

- When the primary subscription/SUPI completes the Registration procedure, the UE(s) in the DualSteer device selects and registers to the network obtained from the primary subscription/SUPI.

**Registration to same PLMN**

When the UE(s) in DualSteer device triggers the registration procedure for one of the subscriptions/SUPIs (e.g., SUPI1) for primary subscription/SUPI, the DualSteer device includes SUCI1 of SUPI1 or 5G-GUTI 1 of SUPI1 (if available) along with the UE assisted information and the SUCI2 of SUPI2 in the Registration Request to the 5GC. When the 5GC receives the identity information from SUPI1 along with the identity information of SUPI2, the 5GC knows the subscription/SUPI from the DualSteer device in current registration procedure supports DualSteer feature for the SUPI1. Furthermore, the 5GC will proceed to handle the UE assisted information for deciding the network (additional RAT) for the secondary subscription/SUPI if the primary subscription/SUPI can successfully register to 5GC. If the 5GC does not support DualSteer feature, the 5GC ignores the UE assisted information and the identity information from SUPI2 and considers the registration procedure as normal registration for SUPI1 as specified in clause 4.2.2.2.2 in TS 23.502 [4].

Similar to the registration operation of SUPI1,when the DualSteer device triggers the registration procedure for the secondary subscription/SUPI (e.g. SUPI2) to access the network obtained from the Registration procedure from primary subscription/SUPI, the DualSteer device includes the SUCI2 of SUPI2 or 5G-GUTI2 along with the SUCI1 of SUPI1 in the Registration Request to the 5GC. When the 5GC receives the identity information from SUPI2 along with the identity information from SUPI1, the 5GC knows the DualSteer device supports DualSteer feature for the SUPI2. If the 5GC does not support DualSteer feature, the 5GC ignores the SUCI1 of SUPI1 and considers the registration as normal registration for SUPI2 as specified in clause 4.2.2.2.2 in TS 23.502 [4].

When the 5GC receives the above registration information from SUPI1 and SUPI2, the 5GC knows SUPI1 and SUPI2 are associated to the same DualSteer device and these two subscriptions/SUPIs are ready for DualSteer feature. Therefore, the 5GC and the DualSteer device can use the DualSteer feature (e.g., DualSteer steering, or DualSteer switching) in the serving PLMN.

If the serving PLMN is not the subscriptions owner of the SUPI1 and SUPI2, the serving PLMN needs to forward the received information from SUPI1 and SUPI2 to the subscription owner of SUPI1 and SUPI2 (i.e., to the UDM of the subscription owner).

**Registering to different PLMNs**:

Similarly, if DualSteer device triggers the separate registration procedures for SUPI1 and SUPI2 to different PLMN (e.g., PLMN1 and PLMN2), the similar behavior of the DualSteer device as registering to the same PLMN.

If one of the PLMNs are the subscription owner of SUPI1 and SUPI2 (e.g., PLMN1), the other PLMN (e.g., PLMN2) needs to forward the received information from SUPI2 to the subscription owners (e.g., PLMN 1) for using DualSteer feature.

If none of PLMN1 and PLMN2 are the subscription owner of SUPI1 and SUPI2, PLMN1 and PLMN2 need to forward the received information from SUPI1 and SUPI 2 to the subscription owner for using DualSteer feature.

**Handling in UDM**

The UDM verifies whether the DualSteer feature can be activated for these two subscriptions/SUPIs in the DualSteer device. After handling, if the UDM activates the DualSteer feature for SUPI1, the UDM also includes the network information (additional RAT type) for the secondary subscription/SUPI to primary subscription/SUPI. If the UDM finds the primary subscription/SUPI cannot perform DualSteer feature, the UDM may accept the Registration from primary without supporting DualSteer feature.

**Out of Service Handling for Primary subscription/SUPI:**

Similar to SoR-CMCI in Annex C.4 in TS 23.122 [xx], if the UE is in CONNECTED mode, the UE delays the PLMN selection for the ongoing service. To avoid the DualSteer traffic transmission interruption, a DualSteer guard timer may be configured in the UE(s) to keep the DualSteer traffic transmission as long as possible in the connectivity of the secondary subscription/SUPI. Otherwise, based on the behavior of recovery from lack of coverage in TS 23.122 [xx], the primary subscription/SUPI needs to perform the PLMN selection to select a PLMN. This may result in the DualSteer traffic not to be transmitted using the connectivity of the secondary subscription/SUPI since the network for the secondary subscription/SUPI is dependent on the network registered by the primary subscription/SUPI as described in the above descriptions (i.e. the descriptions of "Registering to same PLMN" or "Registering to different PLMNs")

#### 6.X.1.2 DualSteer policy for DualSteer device after registration for DualSteer device

After two subscriptions/SUPIs registered to the network(s), the DualSteer device needs guidance, when a first application needs to send PDUs (e.g., IP Packets), to determine which subscription/SUPI or which PLMN or which RAT to send (steer/switch) the first application’s PDU by using Dualsteer traffic steering or switching.

The UE(s) in the Dualsteer device receives Dualsteer policy which includes the list of the applications can use Dualsteer feature. The UE(s) establishes the PDU Session(s) for the transmission of the applications, e.g., the UE establishes the PDU Session(s) over the registered accesse(s) in both networks or both RATs.

The list of applications can contain Traffic Description (for application), e.g., the information for Application, it could be e.g., Traffic Descriptor information as included in the URSP rules, application ID, S-NSSAI, DNN, IP address, FQDN information to be used in this field. Each traffic descriptor is associated with a prioritized list of (preferred) steering or switching using which subscription/USIM/SUPI/path/route/PLMN.

NOTE: The PDU Session established in both networks could be SA-PDU Session or MA-PDU Session based on the URSP rules.

Dualsteer policy further includes the dualsteer steering/switching rules for the traffic across the PDU Sessions between the primary and secondary networks. The conditions to apply dualsteer steering/switching rules can be similar like to ATSSS rules but the measurements are performed across the PDU sessions between both networks across subscriptions/SUPIs regardless of 3GPP or non-3GPP access.

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### 6.X.2 Procedures

Editor’s note: the details of call flows are FFS

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#### 6.X.2.1 Registration procedure for Same PLMN



1. UE(s) in the Dualsteer device decides which subscription/SUPI is primary subscription/SUPI by an implementation specific manner. The other SUPI is regarded as secondary SUPI
2. Dualsteer device triggers Registration procedure for primary subscription/SUPI and it includes Identity information of primary SUPI, UE assisted information, and Identity information of secondary SUPI in the Registration Request.
3. If the AMF of Serving PLMN supports Dualsteer, it further forwards the received information from primary SUPI to the subscription owner network (HPLMN) for the further handling in the UDM (refereeing to the description of the handling of UDM clause). The UDM may accept the registration of primary SUPI based on the subscription profile, then interacts with PCF to obtain the network information (possibly with additional RAT) for secondary SUPI and includes such network information in Registration accept message to primary SUPI
4. Perform the following steps (from Step 15) as specified in clause 4.2.2.2.2 of TS 23.502 [4].
5. Sends the Registration accept message to primary SUPI
6. Registration complete steps as specified in clause 4.2.2.2.2 of TS 23.502 [4].
7. Dualsteer device triggers Registration procedure for secondary subscription/SUPI to the network which is obtained from primary SUPI and it includes Identity information of secondary SUPI, and Identity information of primary SUPI in the Registration Request.
8. If the AMF of Serving PLMN supports Dualsteer, it further forwards the received information from secondary SUPI to the subscription owner network (HPLMN) for the further handling in the UDM (refereeing to the description of the handling of UDM clause). The UDM accepts the registration of secondary SUPI based on the subscription profile

The following Steps 8-10 are same as specified in clause 4.2.2.2.2 of TS 23.502 [4].

#### 6.X.2.2 Registration procedure for Different PLMNs



For Registering to different PLMNs, the steps are same as registering to same PLMN.

### 6.X.3 Impacts on services, entities and interfaces

UE(s) with two SUPIs (SUPI1 and SUPI2) in DualSteer Device:

* Needs to determine primary and secondary subscription/SUPI
* Needs to include the identity information of the other subscription/SUPI (may additionally include UE assisted information) in Registration Requests
* Is aware of belonging to DualSteer Device/ support for two SUPIs

V-AMF:

* Needs to forward the pair identity information (additionally with UE assisted information) to the UDM of subscription owner of SUPI1 and SUPI2
* Needs to forward the network information (possibly with additional RAT) to the primary subscription/SUPI

H-UDM:

* Needs to access the sharing subscription profile to determine whether two subscriptions/SUPIs are for DualSteer feature
* Needs to determine whether two subscriptions/SUPIs are in the same DualSteer device and to decide whether to activate DualSteer feature for the DualSteer device
* Needs to provide the network information to (V)-AMF

H-PCF:

- Provides DualSteering policies to DualSteer device for application traffic transmission using DualSteer traffic steering and switching

\*\*\* End of changes \*\*\*