**3GPP TSG-WG SA2 Meeting #162 *S2-2405262***

**Changsha, China, April 15th – 19th, 2024 (revision of S2-2404698)**

**Source: Huawei, HiSilicon**

**Title: KI#1.4, New solution on DualSteer policy content and provisioning**

**Document for: Approval**

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*Abstract: A new solution is proposed to address KI#1.3 about policy enhancement for DualSteer.*

# 1. Introduction/Discussion

This solution mainly addresses the Key Issue #1.4 about policy enhancement for DualSteer. In particular, the policy from the HPLMN includes the policies provided to the UE of DualSteer Device and the policies provided to the NF within the network. The policies provided to the UE of DualSteer cover following aspects:

- how to guide the DualSteer Device to activate the secondary SUPI in order to select an additional PLMN/PNI-NPN or an additional 3GPP access network within the same PLMN;

- how to determine the 3GPP access network to be used for the new service;

- how to determine to switch the service between two connected 3GPP access networks;

Some of the policies provided to the UE of DualSteer Device might apply only to single Dual-USIM DualSteer UE case or two separate Single-USIM DualSteer UEs case.

According to SA1 requirements, it is assumed that there is no restriction regarding registration for the primary SUPI, and HPLMN policies regarding registration only apply to the secondary SUPI.

In addition, the network should be provided with enough information to be able enforce these policies.

Therefore, considering the above aspects and device capabilities, the general principles are listed below:

**Policy for registration of Secondary SUPI**

Policy for registration of Secondary SUPI is used to guide the UE of a DualSteer Device to perform the Registration Procedure with the Secondary SUPI in some certain conditions for different purposes (e.g., for backup) based on operator policy.

**Policy for DualSteer traffic steering**

The policy for DualSteer traffic steering is used by the UE of DualSteer Device to determine the 3GPP access to be used to transmit the new matching traffic. Once the 3GPP access has been determined, the traffic will be transmitted via that 3GPP access and the policy of DualSteer traffic steering for such matching traffic will not be considered. Whether the ongoing traffic will be moved to the other 3GPP access will be determined by the policy for DualSteer traffic switching.

Considering the capability of the DualSteer Device in single Dual-USIM DualSteer UE case and the DualSteer Device in two separate Single-USIM DualSteer UEs case is different for traffic steering, some policies provisioned to the DualSteer Device cannot be provided to the DualSteer Device with single Dual-USIM DualSteer UE case

**Policies for DualSteer traffic switching**

The policies for DualSteer traffic switching are used by the UE of DualSteer Device to determine following aspects:

1) Whether the traffic of partial services can be switched to the other 3GPP access or the traffic of all services shall be moved so that only single 3GPP access will be used to transmit all traffic at one time.

This policy is used by the DualSteer Device to determine a general principle for the DualSteer traffic switching which considers the DualSteer Device capability and operator policy. For example, the policy that the traffic of some services only can be switched is only provided to the DualSteer Device in two separate Single-USIM DualSteer UEs case.

2) Whether and when the matching traffic can be switched to the other 3GPP access

This policy is used by the UE of DualSteer Device to determine DualSteer traffic switching actions (i.e., whether and when the matching traffic should be moved to the other 3GPP access) based on the policy and principle mentioned in 1).

This policy will further help the UE of DualSteer Device to group the traffic with the same DualSteer traffic switching actions into the same PDU Session so that the traffic with the same DualSteer traffic switching action can be switched together to the other 3GPP access by switching the PDU Session from the source 3GPP access to the target 3GPP access. In this case, service level switching can be achieved.

Therefore, based on the above consideration, the detailed policies are described in the solution below.

# 2. Text Proposal

It is proposed to capture the following changes vs. TR 23.700-54.

\* \* \* \* First change \* \* \* \*

## 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 |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

Table 6.0-2: Mapping of ATSSS\_Ph4 Solutions to Key Issues

|  |  |
| --- | --- |
|  | Key Issues for ATSSS\_Ph4 |
| Solution# | <Key Issue #2.1> | <Key Issue #2.2> |
| #2.1 | **X** |  |
| #2.2 |  | **X** |
| #2.3 | **X** |  |
| #2.4 | **X** |  |
| #2.5 | **X** |  |
| #2.6 |  | **X** |
| #2.7 |  | **X** |
| #2.8 |  | **X** |

\* \* \* \* Second change (all new text below) \* \* \* \*

### 6.1.X Solution #X: DualSteer policy content and provisioning

#### 6.1.X.1 Description

Editor's note: This clause will describe the solution principles and architecture assumptions for corresponding key issue(s). (Sub) clause(s) may be added to capture details.

##### 6.1.X.1.1 General Principle of Policy for DualSteer

This solution mainly addresses the Key Issue #1.4 about policy enhancement for DualSteer. In particular, the policy from the HPLMN includes the policies provided to the UE of DualSteer Device and the policies provided to the NF within the network. The policies provided to the UE of DualSteer cover following aspects:

- how to guide the DualSteer Device to activate the secondary SUPI in order to select an additional PLMN/PNI-NPN or an additional 3GPP access network within the same PLMN;

- how to determine the 3GPP access network to be used for the new service;

- how to determine to switch the service between two connected 3GPP access networks;

Some of the policies provided to the UE of DualSteer Device might apply only to single Dual-USIM DualSteer UE case or two separate Single-USIM DualSteer UEs case.

In order to have clearer understanding of the solution, the definitions of some terms are provided below:

**Dual-USIM DualSteer UE**: A UE of a DualSteer device that can connect to two 3GPP access networks using a different USIM for each 3GPP access network, and is only capable of non-simultaneous data transmission, i.e, where all traffic is sent on only one 3GPP access network at any given time.

**Single-USIM DualSteer UE:** A UE part of a DualSteer device that connects to a single 3GPP access network. The combination of two single-USIM DualSteer UEs as part of a DualSteer device allows the DualSteer device to transmit data simultaneously over two 3GPP access networks.

**Primary 3GPP access:** the 3GPP access network connected by the UE of DualSteer Device using the Primary SUPI

**Secondary 3GPP access:** the 3GPP access network connected by the UE of DualSteer Device using the Secondary SUPI

**Primary SUPI:** the SUPI whose subscription includes DualSteer subscription indicating that it is the Primary one to support DualSteer.

**Secondary SUPI:** the SUPI whose subscription includes DualSteer subscription indicating that it is the Secondary one to supplement the Primary SUPI to support DualSteer.

According to SA1 requirements, it is assumed that there is no restriction regarding registration for the primary SUPI, and HPLMN policies regarding registration only apply to the secondary SUPI.

In addition, the network should be provided with enough information to be able enforce these policies.

Therefore, considering the above aspects and device capabilities, the general principles are listed below:

**Policy for registration of Secondary SUPI**

Policy for registration of Secondary SUPI is used to guide the UE of a DualSteer Device to perform the Registration Procedure with the Secondary SUPI in some certain conditions for different purposes (e.g., for backup) based on operator policy.

The DualSteer device can be provided with a combination of the following policies related to the registration of the Secondary SUPI:

- No restriction (UE of secondary SUPI can always attempt registration)

- Only when primary SUPI is not registered

- 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 [x])

- Location dependent (only attempt to register when in a specific area e.g., TAI(s), countries or PLMN(s))

**Policy for DualSteer traffic steering**

The policy for DualSteer traffic steering is used by the UE of DualSteer Device to determine the 3GPP access to be used to transmit the new matching traffic. Once the 3GPP access has been determined, the traffic will be transmitted via that 3GPP access and the policy of DualSteer traffic steering for such matching traffic will not be considered. Whether the ongoing traffic will be moved to the other 3GPP access will be determined by the policy for DualSteer traffic switching.

Considering the capability of the DualSteer Device in single Dual-USIM DualSteer UE case and the DualSteer Device in two separate Single-USIM DualSteer UEs case is different for traffic steering, some policies provisioned to the DualSteer Device cannot be provided to the DualSteer Device with single Dual-USIM DualSteer UE case

Therefore, following are the policies for DualSteer traffic steering which is applicable to individual new matching traffic:

- Steer to existing activated access (either Primary 3GPP access or Secondary 3GPP access). If neither SUPI is active, trigger to activate UP on Primary 3GPP access

- Steer to Primary 3GPP access regardless of other traffic (applicable to two separate Single-USIM DualSteer UEs only)

- Steer to Secondary 3GPP access regardless of other traffic (applicable to two separate Single-USIM DualSteer UEs only)

NOTE 1: Additional optional policies can be further considered to improve the flexibility of DualSteer.

**Policies for DualSteer traffic switching**

The policies for DualSteer traffic switching are used by the UE of DualSteer Device to determine following aspects:

1) Whether the traffic of partial services can be switched to the other 3GPP access or the traffic of all services shall be moved so that only single 3GPP access will be used to transmit all traffic at one time.

This policy is used by the DualSteer Device to determine a general principle for the DualSteer traffic switching which considers the DualSteer Device capability and operator policy. For example, the policy that the traffic of some services only can be switched is only provided to the DualSteer Device in two separate Single-USIM DualSteer UEs case.

2) Whether and when the matching traffic can be switched to the other 3GPP access

This policy is used by the UE of DualSteer Device to determine DualSteer traffic switching actions (i.e., whether and when the matching traffic should be moved to the other 3GPP access) based on the policy and principle mentioned in 1).

This policy will further help the UE of DualSteer Device to group the traffic with the same DualSteer traffic switching actions into the same PDU Session so that the traffic with the same DualSteer traffic switching action can be switched together to the other 3GPP access by switching the PDU Session from the source 3GPP access to the target 3GPP access. In this case, service level switching can be achieved.

Therefore, based on the above consideration, the policies for DualSteer traffic switching are:

1. DualSteer simultaneous transmission policy for DualSteer Device:

- no restriction (only be applicable to two separate Single-USIM DualSteer UEs case)

- always use single 3GPP access for all traffic

2. DualSteer traffic switching policy for the matching traffic:

- based on DualSteer simultaneous transmission policy, switch to Primary 3GPP access whenever it becomes available

- based on DualSteer simultaneous transmission policy, switch to Secondary 3GPP access whenever it becomes available

- based on DualSteer simultaneous transmission policy, switch to the other 3GPP access if the current 3GPP access status meets the condition of DualSteer traffic switching

- based on DualSteer simultaneous transmission policy, switch to the other 3GPP access whenever necessary

When the DualSteer traffic switching policy is not present:

- for SSC mode 1, the traffic will never be moved to the other 3GPP access via DualSteer traffic switching mechanism

- for SSC mode 2 or 3, the traffic can be moved to the other 3GPP access by disconnecting the current UP and establishing the new UP over the other 3GPP access

##### 6.1.X.1.2 Proposed solution of policy handling

**Policy for registration of Secondary SUPI**

This is a new information of UE policy provisioned to UE. The UE Configuration Update procedure as specified in clause 4.2.4 in TS 23.501 [3] is re-used to provision this policy to UE.

**Policy for DualSteer traffic steering**

The URSP rule can be enhanced to include the policy for DualSteer traffic steering. It is assumed that such URSP rules supporting DualSteer traffic steering can be provisioned to the DualSteer Device via either Primary 3GPP access or Secondary 3GPP access. The UE of the DualSteer Device can evaluate the URSP to determine whether the new matching traffic is transmitted via current 3GPP access or the other 3GPP access. If the new matching traffic is determined to be transmitted via the other 3GPP access, the traffic will be transferred across UEs within the DualSteer Device (in two separate Single-USIM DualSteer UEs case) based on implementation. Following is the example of the enhanced URSP rules.

Table 6.1.X.1.1-1: Route Selection Descriptor

| Information name | Description | Category | PCF permitted to modify in URSP | Scope |
| --- | --- | --- | --- | --- |
| Route Selection Descriptor Precedence  | Determines the order in which the Route Selection Descriptors are to be applied.  | Mandatory | Yes | UE context |
| **Route selection components** | *This part defines the route selection components* | Mandatory |  |  |
| … | … | … | … | … |
| 3GPP access for DualSteer traffic steering  | One single value of following 3GPP access:1. Existing activated 3GPP access, otherwise Primary 3GPP access
2. Prefer Primary 3GPP access
3. Prefer Secondary 3GPP access
4. List of ordered PLMN and/or RAT
 | Optional | Yes | UE context |

The different values of 3GPP access for DualSteer traffic steering are used to support different steering polices:

- Value 1 – Existing activated 3GPP access, otherwise Primary 3GPP access: steering the new service to the existing activated 3GPP access, if no activated 3GPP access, use the Primary 3GPP access to transmit the new service.

- Value 2 – Prefer Primary 3GPP access: try to steering the new service to the Primary 3GPP access. Otherwise, use the Secondary 3GPP access to transmit the new service.

- Value 3 – Prefer Secondary 3GPP access: try to steering the new service to the Secondary 3GPP access. Otherwise, use the Primary 3GPP access to transmit the new service.

- Value 4 – List of ordered PLMN and/or RAT: select the 3GPP access network which match the PLMN and/or RAT in the list of ordered.

The value of the 3GPP access included in the URSP is determined based on the DualSteer subscription and DualSteer Device capability. For example, if the DualSteer Device is in single Dual-USIM DualSteer UE case, the second and third value would not be included in the URSP rule.

The UE Configuration Update procedure as specified in clause 4.2.4 in TS 23.501 [3] is re-used to provision this policy to UE.

**Policies for DualSteer traffic switching**

DualSteer simultaneous transmission policy for DualSteer Device is a new information of UE policy. The UE Configuration Update procedure as specified in clause 4.2.4 in TS 23.501 [3] is re-used to provision this policy to the DualSteer Device.

For the DualSteer traffic switching policies used by the UE of DualSteer Device for the matching traffic, the URSP rule can be enhanced to include such policy. It is assumed that such URSP rules supporting DualSteer traffic switching can be provisioned to the DualSteer Device via either Primary 3GPP access or Secondary 3GPP access or both of them. Each UE can evaluate the URSP to determine whether the matching traffic can be moved to the other 3GPP access via DualSteer traffic switching with the same condition.

The policy for DualSteer traffic switching is stored in the PDU Session context similarly to DNN, S-NSSAI, SSC mode, etc. When new traffic is established, the rule for reusing an existing PDU Session (see clause X.X.X in TS 23.503 [x]) will also take in account the policy for DualSteer traffic switching, i.e. it will only reuse an existing PDU Session if that PDU Session has the same policy for DualSteer traffic switching as the matching URSP rule for the new traffic. Otherwise, a new PDU Session will be established for the new traffic. This allows to switch all traffic of a given PDU Session simultaneously as they share the same trigger conditions for switching. If the parameter of "DualSteer traffic switching actions" is not present in the URSP, it means that the DualSteer traffic switching mechanism is not enabled for this service.

Table 6.1.X.1.2-1: Route Selection Descriptor

| Information name | Description | Category | PCF permitted to modify in URSP | Scope |
| --- | --- | --- | --- | --- |
| Route Selection Descriptor Precedence  | Determines the order in which the Route Selection Descriptors are to be applied.  | Mandatory | Yes | UE context |
| **Route selection components** | *This part defines the route selection components* | Mandatory |  |  |
| … | … | … | … | … |
| DualSteer traffic switching actions | One single value of following actions:1. switch to Primary 3GPP access whenever it becomes available
2. switch to Secondary 3GPP access whenever it becomes available
3. switch to the other 3GPP access if the current access status meets the condition of DualSteer traffic switching
4. switch to the other 3GPP access whenever necessary
 | Optional | Yes | UE context |

The different values of DualSteer traffic switching actions are used to support different switching triggers:

- Value 1 - Switch to Primary 3GPP access whenever it becomes available: switch the services of the PDU session to the Primary 3GPP access whenever it becomes available.

- Value 2 - Switch to Secondary 3GPP access whenever it becomes available: switch the services of the PDU session to the Secondary 3GPP access whenever it becomes available.

- Value 3 - Switch to the other 3GPP access if the current access status meets the condition of DualSteer traffic switching: when the status of current 3GPP access meets the condition of DualSteer traffic switching, switch the services of the PDU session to the other 3GPP access.

- Value 4 - Switch to the other 3GPP access whenever necessary: some services need not have specific conditions to trigger the switching. However, in some cases such as when the DualSteer Device is in single UE case, some services are triggered to be switched to the other 3GPP access network. The leftover services are also triggered to switched to the other 3GPP network. In this case, the DualSteer traffic switching actions corresponding to these services can use the action.

When the conditions of the 3GPP accesses change (e.g. one 3GPP access becomes available/registered, one 3GPP access becomes unavailable), the value of the DualSteer traffic switching action associated to the PDU Sessions of the DualSteer device are evaluated, and taking in account the DualSteer simultaneous transmission policy for the DualSteer device, none, some, or all PDU Sessions are moved from one 3GPP access to another.

NFs (e.g., SMF) in the network are provided with corresponding information allowing them to enforce these policies. The detailed parameters and call flows depends on solutions for KI#1.3.

#### 6.1.X.2 Procedures

Editor's note: This clause describes high-level procedures and information flows for the solution.



Figure 6.1.X.2-1: Procedure of policy provisioning

1. UE of DualSteer Device performs Registration procedure with Primary SUPI. During the procedure, policies mentioned in clause 6.1.X.1 are generated by PCF based on operator policy. In particular, the policies provisioned to the UE of the DualSteer Device also consider the DualSteer Device capability.

The detailed call flows and the corresponding parameters in each message depends on solutions for KI#1.1 and KI#1.2.

2. When the UE of the DualSteer Device performs Registration procedure successfully and is authorized to perform DualSteer traffic steering and DualSteer traffic switching, the UCU procedure is triggered to provision the policies for DualSteer to UE as specified in clause 4.2.4 in TS 23.502 [4].

3. Based on the policies for registration of Secondary SUPI, the DualSteer Device activates the Secondary SUPI and performs Registration procedure. During the procedure, policies mentioned in clause 6.1.X.1 may be generated or updated by PCF based on operator policy. In particular, the policies provisioned to the UE of the DualSteer Device also consider the DualSteer Device capability.

The detailed call flows and the corresponding parameters in each message depends on solutions for KI#1.1 and KI#1.2.

4. When the UE of the DualSteer Device performs Registration procedure successfully and is authorized to perform DualSteer traffic steering and DualSteer traffic switching, the UCU procedure may be triggered to provision the policies for DualSteer to UE as specified in clause 4.2.4 in TS 23.502 [4].

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

Editor's note: This clause captures impacts on existing 3GPP services, entities and interfaces.

**PCF:**

- generate and provision the policies for DualSteer to the UE of DualSteer Device by considering the operator’s policy, DualSteer subscription and DualSteer Device capability.

**UE:**

- receive new UE policies or enhanced URSP from the network

- Evaluate the policies for DualSteer to determine whether and when to activate the Registration of Secondary SUPI, how to steer the traffic of a new service and how to switch the traffic of service(s) from source 3GPP access to target 3GPP access if the conditions for DualSteer traffic switching are met.

\* \* \* \* Third change \* \* \* \*

# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non‑specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document in the same Release as the present document.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 22.261: "Service requirements for the 5G system".

[3] 3GPP TS 23.501: "System architecture for the 5G System (5GS)".

[4] 3GPP TS 23.502: "Procedures for the 5G System (5GS)".

[5] 3GPP TS 23.503: "Policy and charging control framework for the 5G System (5GS); Stage 2".

[6] IETF RFC 9298: "Proxying UDP in HTTP".

[7] IETF RFC 9484: "Proxying IP in HTTP".

[8] IETF draft-ietf-masque-connect-ethernet: "Proxying Ethernet in HTTP".

Editor's note: The above document cannot be formally referenced until it is published as an RFC.

[9] IETF RFC 9114: "Hypertext Transfer Protocol Version 3 (HTTP/3)".

[10] IETF draft-ietf-httpbis-connect-tcp: "Template-Driven HTTP CONNECT Proxying for TCP".

Editor's note: The above document cannot be formally referenced until it is published as an RFC.

[11] IETF RFC 9297: "HTTP Datagrams and the Capsule Protocol".

[12] IETF RFC 9000: "QUIC – A UDP based Multiplexed and Secured Protocol".

[13] IETF RFC 9001: "Using TLS to Secure QUIC".

[14] IETF RFC 9002: "QUIC Loss Detection and Congestion Control".

[15] IETF RFC 9221: "An Unreliable Datagram Extension to QUIC".

[16] IETF draft-ietf-quic-multipath: "Multipath Extension for QUIC".

Editor's note: The above document cannot be formally referenced until it is published as an RFC.

[17] 3GPP TR 23.700‑53: "Study on access traffic steering, switching and splitting support in the 5G system architecture; Phase 3".

[18] IETF RFC 9369: "QUIC Version 2".

[19] IETF RFC 9220: "Bootstrapping WebSockets with HTTP/3".

[20] 3GPP TS 33.402: "3GPP System Architecture Evolution (SAE); Security aspects of non-3GPP accesses".

[x] 3GPP TS 36.300: "Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access Network (E-UTRAN)".

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