S2-220xxxx
was S2-220xxxx

FS_MASSS:
Way Forward for DualSteer

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Content

- **Fundamental assumptions for DualSteer**
- Proposed fundamental aspects for DualSteer
- Proposals for KI#1.3 session management of DualSteer
- Proposals for KI#1.2 registration management of DualSteer
- Proposals for KI#1.4 policy management of DualSteer

Some background for DualSteer

- General:
  - No splitting
  - PDU Session level switch instead of data flow level switch
  - No impact on VPLMN not supporting DualSteer
  - Not all services require DualSteer traffic switching.

- Device:
  - Two SUPIs
    - One SUPI one access network
    - Different SUPI different access network
  - Data transmission modes (related to a) two SUPIs transmit data of two PDU Sessions simultaneously, and b) ATSSS-like)
    - Non-simultaneous
      - Only one SUPI is active in data and signaling transmission (i.e., **no interaction between network and SUPI#2 when SUPI#1 activate**)
    - Simultaneous
      - Tow SUPIs are active in data and signaling transmission (e.g., for different services)
      - Conditions related to whether simultaneous transmission is possible
        - Device capability (static)
        - Power condition (dynamic)
        - Radio condition (dynamic) (e.g., device supports simultaneous transmission only for some band combinations)

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S2-220xxxx
was S2-220xxxx

Proposed fundamental aspects for DualSteer

- Session management for DualSteer traffic switching:
  - For the source PDU session establishment on source SUPI
    - Selection of SMF for DualSteer
    - Authorization and parameters for establishing target PDU Session establishment
  - For the target PDU session establishment on target SUPI
    - SMF awareness of the association between the source and target PDU Sessions
    - SMF anchoring the two PDU Sessions at same UPF with same IP address allocated
    - Whether the target PDU Session is for switching immediately or for pre-establishment
    - Session handover or ATSSS-like (partially related to simultaneous and non-simultaneous)
    - Steering functionalities and steering modes (e.g., Active-standby) can be determined in normative phase
  - How to anchor the source and target PDU Sessions on same SMF
    - “UE context in SMF” subscription data
  - Switching when target PDU Session exist but is inactive (e.g., for switching back)
    - DualSteer device initiates Service Request on target SUPI with activation of target PDU Session

Proposed fundamental aspects for DualSteer

- Registration management:
  - Association of the two SUPIs
  - Identifying the two associated SUPIs are in same device
  - Capability interaction (see page 8 “selection of SMF for DualSteer”)

- Policy management for DualSteer:
  - Procedure for policy delivery
  - Content of UE policy for DualSteer
    - Traffic descriptors (TD) and PDU Session parameters per TD
    - RAT list per TD/session - steering based on RAT type
    - Whether the following are needed can be determined in normative phase
      - PLMN ID list per TD/session - steering based on PLMN
      - SUPI index (e.g., 0=the SUPI who receives the policy, 1=the other SUPI) per TD/session - steering based on SUPI
      - Validity information per TD/session, e.g., time, location, RAT combination.
      - Condition/Indication of activating additional SUPI
  - Whether using extended URSP or new UE policy (e.g., ASP) can be determined in normative phase

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For the source PDU session establishment

Selection of SMF for DualSteer

- **Observations:** The PDU Session for DualSteer traffic switching needs to be served by SMF enhanced for DualSteer. There're two different opinions on SMF selection for the first PDU session: (A) AMF selects SMF based on DNN/S-NSSAI or (B) AMF selects H-SMF based on device capabilities. Option A requires deploying dedicated slice with homogeneous enhanced SMF. Option B makes DualSteer applicable to any DNN and slice.

Proposed principle:

- **Option B is selected**
- **For roaming case, DualSteer is not applicable when VPLMN of any SUPI does not support DualSteer**

Proposed conclusions:

- (1) AMF indicates DualSteer capable to DualSteer device during Registration procedure (Capability interaction during Registration procedure)
- (2) DualSteer device indicates DualSteer Required to AMF during PDU Session Establishment procedure
- (3) AMF selects SMF based on DualSteer capability

For the source PDU session establishment

- Authorization and parameters for establishing target PDU Session establishment
  - **Observations:** The DualSteer device needs to know whether a PDU Session can be switched and what's the parameters for the target PDU Session. There're two different opinions on "Authorization": (1.A) Indicated "switch" in UE policy or (1.B) Indicated "switch allowed" by SMF during PDU Session establishment. There're two different opinions on "parameters": (2.A) Indicated in UE policy or (2.B) Same (DNN, S-NSSAI) for source and target PDU Sessions. It is reasonable for 2.B considering the source and target PDU Sessions should be towards same DNN/Slice. All the rules in UE policy for DualSteer are for DualSteer, switch indication is not necessary considering CN anyway needs to authorize and indicates result to device.

- **Proposed principle:**
  - **Option (1.B) and (2.B) are used.**

- **Proposed conclusions**:
  - (1) SMF indicates "DualSteer traffic switching allowed or not" to device based on authorization information from UDM (subscription data enhanced)
  - (2) DualSteer device uses same (DNN, S-NSSAI) for source and target PDU Sessions

For the target PDU session establishment

- SMF Awareness of the association between source and target PDU Sessions
  - **Observations:** The SMF needs to identify the source and target PDU Sessions for DualSteer traffic switching. There're two different opinions on this aspect: (A) Association is recorded in subscription data or (B) Association is indicated by DualSteer device using PDU Session ID. Option A has issue on the case that one (DNN, S-NSSAI) multiple PDU Sessions.

- **Proposed principle:**
  - **Linked SUPI and source PDU Session ID is used for association.**

- **Proposed conclusions**:
  - (1) Subscription data includes Linked SUPI
  - (2) DualSteer device sends source PDU Session ID to AMF for association purpose

For the target PDU session establishment

- SMF anchoring the two PDU Sessions at same UPF with same IP address allocated
  - **Observations:** No company is negative on this aspect in NWM survey.

- **Proposed principle:**
  - **SMF anchoring the two PDU Sessions at same UPF with same IP address allocated**
  - **N4 session aspect can be determined in normative phase.**

- **Proposed conclusions**:
  - (1) SMF anchors the target PDU Session on the same UPF serving the source PDU Session and allocates IP address same as the source PDU Session
  - (2) It is determined in normative phase whether common N4 session for source and target PDU Sessions is used or not

For the target PDU session establishment

- Whether the target PDU Session is for pre-establishment or not
  - **Observations:** There're two different opinions on the purpose of the target PDU Session: (A) For Pre-establishment without switch or (B) For switching immediately during establishment. Both options may be needed, e.g., if there's only one PDU Session needs to be switched, the DualSteer device may use PDU Session Est. for switch to save signalling. If DualSteer device has multiple PDU Sessions need to be switched, it may decide to pre-establish all the target PDU Sessions, and when switch criteria is met, it can switch all the PDU Sessions in one Service Request procedure instead of multiple PDU Session Establishment procedures.

- **Proposed principle:**
  - **Both options are supported.**
  - **Which option is used depends on indication from DualSteer device**

- **Proposed conclusions**:
  - (1) DualSteer device indicate **pre-establishment or not** via target PDU Session establishment
  - (2) Only one of the source and target PDU Sessions is active
    - SMF deactivates/releases source PDU Session if pre-establishment not indicated.
    - SMF does not reserve UP resource for target PDU Session if pre-establishment indicated

For the target PDU session establishment

- Session handover or ATSSS-like (partially related to simultaneous/non-simultaneous)
  - **Observations:** There're two different opinions on this aspect: (A) Session handover or (B) ATSSS-like. Option B requires the DualSteer device to keep source and target PDU Sessions both active (but cannot simultaneously transmit service data – except control data, e.g., PMF protocol data).

    Simultaneous transmission is only used for steering considering splitting is not in the scope. Both simultaneous transmission and non-simultaneous transmission are supported will require less normative work because there will be no necessary to specify on how to handle the simultaneous transmission for two PDU Sessions on two SUPIs

- **Proposed principle:**
  - **Both options (session handover and ATSSS-like) are supported for compromise**
  - **Which option is used depends on indication from DualSteer device (i.e., DualSteer device needs to be able to keep both SUPIs active considering, e.g., radio, power condition etc., and supports ATSSS-like mechanism)**

- **Proposed conclusions**:
  - (1) DualSteer device may indicate **dual-active or not** via target PDU Session Establishment procedure.
  - (2) SMF does not deactivate/release source PDU Session.

S2-220xxxx
was S2-220xxxx

How to anchor the source and target PDU Sessions on same SMF

Observations: No company is negative on the way that UDM updates "UE context in SMF" subscription data of target SUPI. The subscription data includes "PDU Session ID" of target SUPI, there're two opinions on how to get the information of target PDU Session ID: (A) DualSteer device uses same PDU Session ID for both source and target PDU Session or (B) AMF obtains "UE context in SMF" of linked SUPI and uses source PDU Session ID to select SMF. Option A has impact on DualSteer device that it shall find a spare PDU Session ID for both source and target SUPI, which may not always be possible.

Proposed principle:

- **"UE context in SMF" subscription data of linked SUPI is used for SMF selection.**
- **AMF selects SMF based on source PDU Session ID and "UE context in SMF" of linked SUPI**

Proposed conclusions:

- (1) AMF selects SMF based on source PDU Session ID and "UE context in SMF" of linked SUPI provided by UDM.

S2-220xxxx
was S2-220xxxx

Switching when target PDU Session exist but is inactive

Observations: When non-simultaneous transmission mode applied, the SMF may not be able to release the source PDU Session because the DualSteer device may not be able to receive signalling from network side. In this case, when the DualSteer device decide to switch back, the target PDU Session (originally be the source PDU Session) already exists and PDU Session establishment cannot be used for switching.
Another case is switching to a pre-established target PDU Session.
Service Request is proposed to be used for switching. One of the benefit of using Service Request is that this procedure can switch multiple PDU Sessions at one shot.

Proposed principle:

- **Service Request is used for switching to target PDU Session if it exists and is inactive.**

Proposed conclusions:

- (1) DualSteer device initiates Service Request to activate the target PDU Session.

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Registration management

- Association of the two SUPIs
  - **Observations:** No company is negative on the way that UDM does the association.

- **Proposed principle:**
  - **UDM associates the two registrations based on configuration of SUPI association in UDM.**
  - **No new subscription data subset.**

- **Proposed conclusions**:
  - (1) The subscription data association of the two SUPIs is configured in UDM for UDM associating the two registration procedures of the two SUPIs.

Registration management

- Identifying the two associated SUPIs are in same device
  - **Observations**: For activating DualSteer, the two SUPIs shall be in same device. There're three different opinions on how UDM identifies the associated two SUPIs are in same device: (A) Use Registration Correlation information, (B) Device sends SUCIs/5G-GUTIs to UDM via AMF, or (C) UDM sends GPSIs to device for device activating DualSteer.

- **Proposed principle:**
  - **No or less impact on registration procedure is preferred.**

- **Proposed conclusions**:
  - (1) UDM updates the authorization information in subscription data according to whether the two SUPIs are in same device
  - (2) What information is used by UDM to determine the two SUPIs are in same device, and how to obtain the information can be determined in normative phase

  - **DP XXXX shows an example of how UDM obtains PEI binding information via APP layer, which is out of 3GPP scope**

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S2-220xxxx
was S2-220xxxx

Policy management for DualSteer

- Procedure for policy delivery
  - **Observations**: No company is negative on the way that DualSteer is activated when two SUPIs are in same device, so the UE policy for DualSteer is delivered only when the two SUPIs are in same device.
    No company is negative on the way that UCU procedure is used for policy delivery.

- **Proposed principle:**
  - **UCU procedure is used based on whether the two associated SUPIs are in same device**

- **Proposed conclusions**:
  - (1) UCU procedure is used for UE policy delivery for DualSteer based on whether the two SUPIs are in same device.

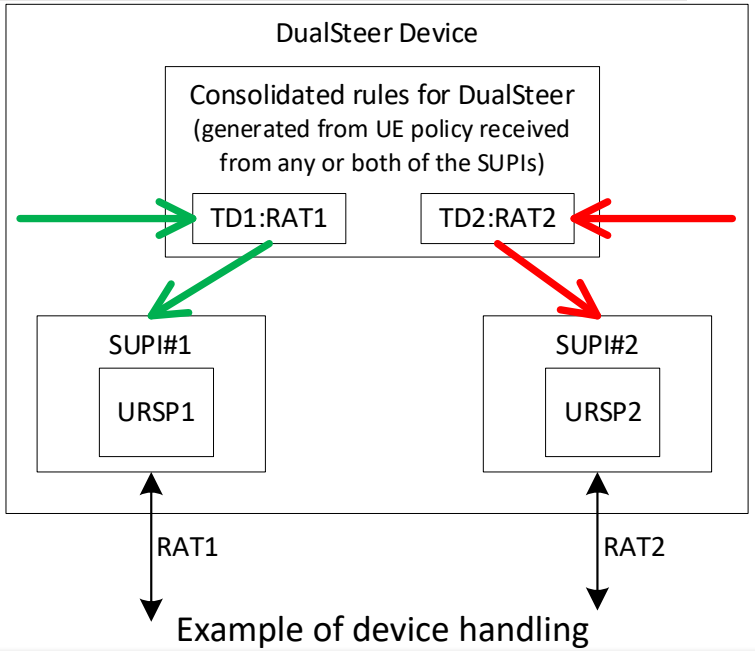
Policy management for DualSteer

Content of UE policy for DualSteer

- **Observations**: There're two opinions on the content of UE policy for DualSteer: (A) Includes switch indication, or (B) Includes steering information.
  Rules of UE policy for DualSteer are all for DualSteer, no matter whether steering or switching. The steered PDU Session can also be switched if allowed. So, no switch indication needed in the policy, it is a kind of authorization result per PDU Session, and is provided during PDU Session Est. procedure.

Proposed principle:

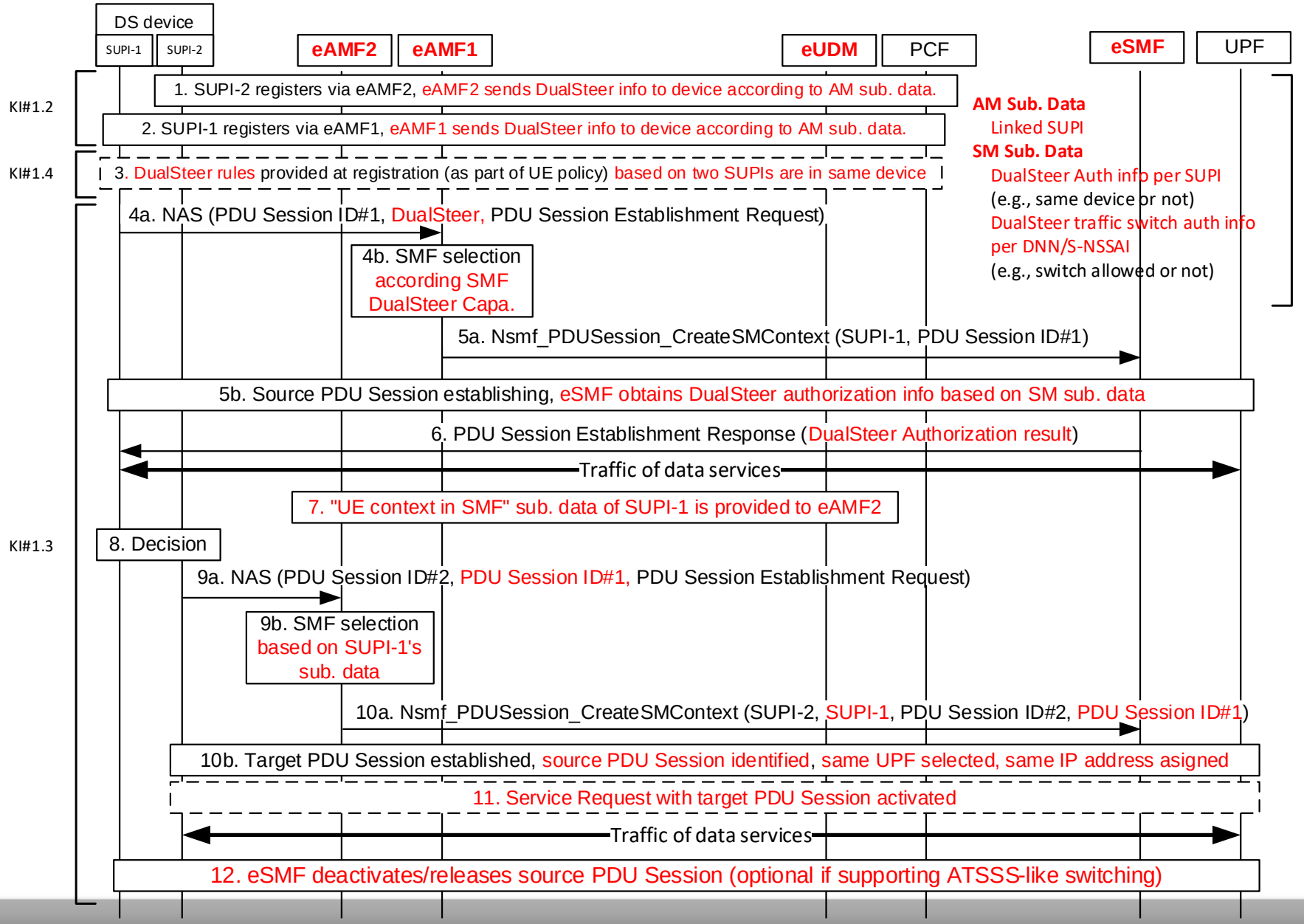
- **No switch indication**
- **RAT list included as steering information.**
- **ASP or eURSP as well as further content are determined in normative phase.**



Example of device handling

Proposed conclusions:

- (1) RAT list is included in the UE policy for DualSteer to steer a traffic flow towards a suitable registered UE according to the RAT (then URSP of the corresponding SUPI is used to map the traffic flow into a suitable PDU Session as usual).



Example call flow according to the proposals

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