







3GPP SA2 DualSteer

CableLabs

Agenda

-  Use Cases & Architectures
-  CLs High Level Views
-  Clarification on Device Definition
-  Conclusions

Use Cases and Assumptions

- Use Case of Interest
 - Two NR/5GC accesses in two different PLMNs (including two VPLMNs or a VPLMN and the HPLMN) with each access being NR TN
 - NR/5GC access and E-UTRA/EPC access in two different PLMNs (including two VPLMNs or a VPLMN and the HPLMN)

Assumptions (for simultaneous and non-simultaneous transmission):

1. Voice services on AN2 only – voice sessions (e.g.: IMS) are not part of DualSteer (DS) sessions
2. AN1 is only used for providing data services (e.g.: internet), has limited non-contiguous coverage
3. AN2 used for providing both voice and data, has ubiquitous coverage
4. If AN2 is unavailable, DualSteer device can access only data services via AN1
5. Independent registrations on individual ANs based on network availability
6. AN resources allocated only when active traffic is being sent on AN
7. Which application/service on which AN decided using access descriptors in URSP/DualSteer/N4 rules based on operator policies

Example Use Cases – Non-simultaneous transmission



Use Case 1a – Non-simultaneous Transmission (active/standby steering mode) (switching based on voice paging) - Voice Traffic (higher priority traffic) overrides DualSteer Rules

- DualSteer device registered with AN1 (active) configured for data only and AN2 (standby) configured for both data and voice
- DualSteer device with active data session (e.g., browsing and video streaming) on AN1
- DualSteer device gets paged (e.g., incoming voice call) on AN2
- DualSteer device switches all existing DS PDU sessions from AN1 (active) to AN2 while using voice on AN2 (standby)
- After the voice call on AN2 is terminated, if AN1 is still available, DualSteer device switches all existing DS PDU sessions from AN2 (standby) to AN1 (active)

Use Case 1b – Non-simultaneous Transmission (active/standby steering mode) (switching based on access availability from active to standby)

- DualSteer device registered with AN1 (active) configured for data only and AN2 (standby) configured for both data and voice
- DualSteer device with active data sessions (e.g., browsing and video streaming) on AN1
- AN1 (active) becomes unavailable (e.g.: DualSteer device moves outside AN1 coverage)
- DualSteer device switches all existing DS PDU sessions from AN1 (active) to AN2 (standby)

Use Case 1c – Non-simultaneous Transmission (active/standby steering mode) (switching based on access availability from standby to active)

- DualSteer device registered with AN2 (standby) which is configured for data and voice
- DualSteer device not registered with AN1 (active) configured for data only (outside the coverage of AN1)
- DualSteer device with active data sessions (e.g., browsing and video streaming) on AN2
- AN1 (active) becomes available (DualSteer device moves inside AN1 coverage)
- DualSteer device switches all existing DS PDU sessions from AN2 (standby) to AN1 (active)

Example Use Cases – Simultaneous transmission



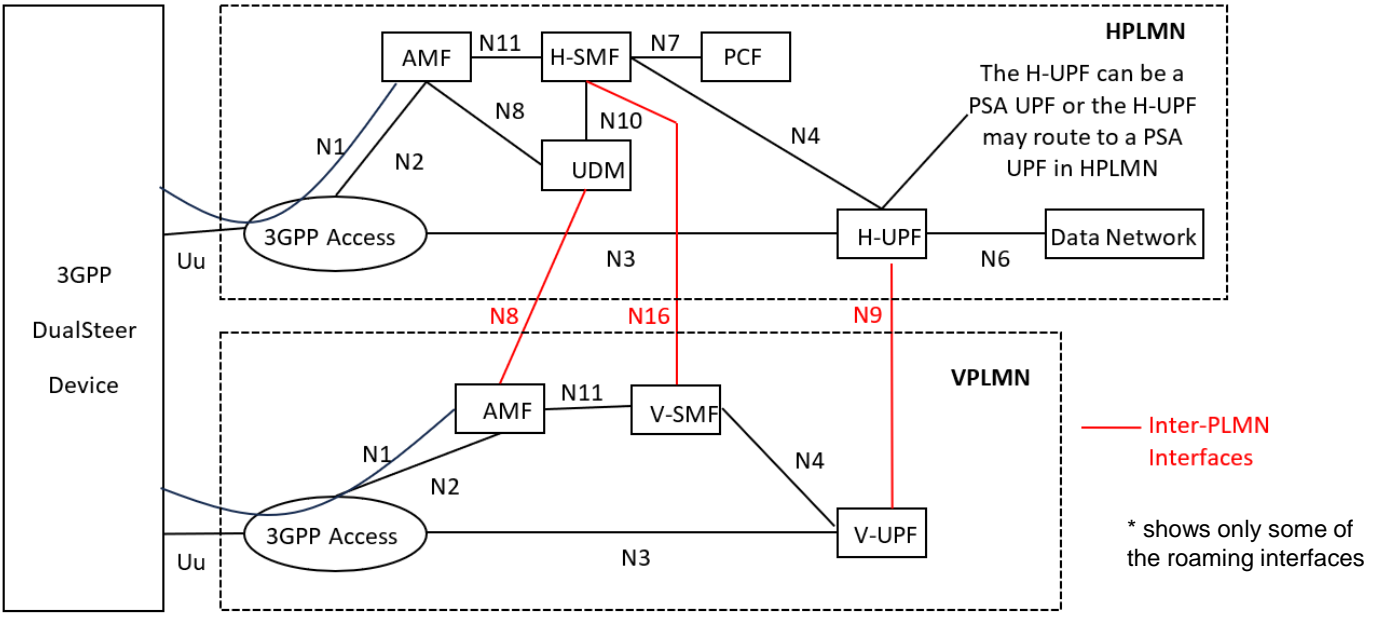
Use Case 2a – Simultaneous Transmission (Data on AN1 and Voice on AN2)

- DualSteer device registered with AN1 configured for data only and AN2 configured for data and voice
- DualSteer device with active DS session (e.g., browsing) on AN1
- DualSteer device gets paged (e.g., incoming voice call) on AN2
- DualSteer device continues to use data on AN1 while using voice on AN2

Use Case 2b – Simultaneous Transmission (Data on AN1 and AN2)

- DualSteer device registered with AN1 configured for data only and AN2 configured for data and voice
- DualSteer device with active DS session(e.g., browsing) on AN1 and active DS session (e.g., video streaming) on AN2
- AN1 becomes unavailable (DualSteer device moves outside AN1 coverage)
- All existing DS sessions on AN1 are switched to AN2

Architecture 1: DualSteer Session between DualSteer UE Device and (PSA) UPF across different PLMNs (HPLMN and VPLMN)



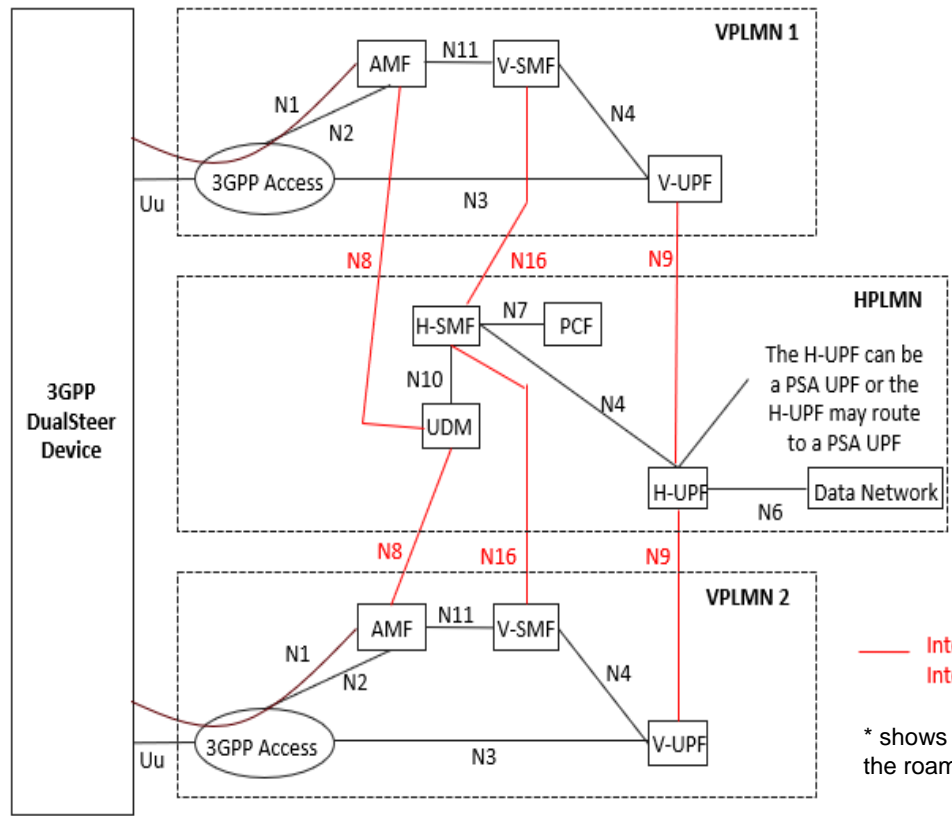
Use Case 1: Non-simultaneous Transmission

- Data on either AN (may be switched based on voice paging on other AN or based on the availability of AN)

Use Case 2: Simultaneous Transmission

- Voice on AN2 and data on AN1 or data (different services/ applications) on AN1 and AN2

Architecture 1: DualSteer Session between DualSteer UE Device and (PSA) UPF across different PLMNs (two VPLMNs)



- Use Case 1: Non-simultaneous Transmission
- Data on either AN (may be switched based on voice paging on other AN or based on the availability of AN)
- Use Case 2: Simultaneous Transmission
- Voice on AN2 and data on AN1 or Data (different services/ applications) on AN1 and AN2

— Inter-PLMN Interfaces

* shows only some of the roaming interfaces

CLs High Level Views



- DualSteer should leverage the existing ATSSS Framework and MA PDU procedures
 - Allows faster progress without reinventing the wheel – minimal impact to existing procedures
 - Makes it less challenging for feature adoption and makes it easy for ATSSS and Dual Steer to coexist
- DualSteer device is a type of multi-SIM UE (does not have to support MUSIM features defined in 3GPP)
 - DualSteer device capable of non-simultaneous transmission is a 1Tx/2Rx multi-SIM UE
 - DualSteer device capable of simultaneous transmission is a 2Tx/2Rx multi-SIM UE
- Registration across the two SUPIs/subscriptions is independent without needing to define a SUPI as primary/secondary
 - Registration is initiated based on network availability
 - Since the two SUPIs/subscriptions are managed and provisioned by the same operator the RAT/access selection across both should not be conflicting
- DualSteer sessions are anchored in a common UPF and managed by a common SMF and PCF in the home network
 - PDU sessions will be linked across the two SUPIs
 - URSP rules may need to be extended but will be coordinated across the two SUPIs managed by same operator
- Both simultaneous and non-simultaneous transmission use cases and both MPQUIC and MPTCP steering functionalities (in addition to the lower layer functionality) should be supported

CLs High Level Views



- Current SA1 definition for DualSteer device needs to be updated for SA2 to make progress
DualSteer device: *A device supporting traffic steering and switching of user data (for different services) across two 3GPP access networks; it can be **capable of a single UE, in case of either** non-simultaneous data transmission over the two networks, or ~~two separate UEs in case of simultaneous data transmission over the two networks~~*
- SA1 specification also includes a note that states that the specified requirements can apply to different DualSteer device types (e.g., smartphones, IoT, UAV, VSAT devices)
- Multi-SIM* device can perform both simultaneous and non-simultaneous data transmissions depending on its implementation - 1Tx/2Rx multi-SIM device can only perform non-simultaneous data transmission (DSDS) whereas 2Tx/2Rx multi-SIM UE can perform simultaneous data transmission (DSDA)
- Both DualSteer and multi-SIM device use two subscriptions/SUPIs and use a separate PEI for each SUPI/subscription when it registers to the network, however, multi-SIM device does not need the two SUPIs/subscriptions to be from the same operator and to be linked unlike a DualSteer device
- DualSteer device is a type of multi-SIM device that uses linked SUPIs/subscriptions from the same operator, each associated with a separate USIM. DualSteer device may or may not support the 3GPP defined MUSIM features but DualSteer device supporting MUSIM features may be beneficial for non-simultaneous transmission

* Multi-SIM device – UE that supports multiple USIM; MUSIM UE – UE that supports MUSIM features in addition to supporting multiple USIMs

Conclusion for KI#1.1 – Subscription Aspects



- The two SUPIs/subscriptions of the DualSteer device will be managed and provisioned by the same operator (HPLMN)
- The two SUPIs/subscriptions of the DualSteer device need to be associated (or linked) for network to manage traffic across both 3GPP access networks
- The two SUPIs are associated (or linked) but they may have different subscription in terms of the applications/ services (e.g., DNN, S-NSSAI) that the two SUPIs are subscribed for (and there can be some common services)
- The association between the two SUPIs/subscriptions of the DualSteer device should be maintained in the UDM or UDR, where both the SUPIs/subscriptions use linked subscription profiles
 - The association of the DualSteer session between the two SUPIs/subscriptions by the network should be at the service data flow (SDF) level (e.g.: PDU session ID association leveraging ATSSS principles), and any SUPI-specific traffic enforcement should be managed using access descriptors as part of the DualSteer rules
 - The subscriptions may reside in different UDMs (but within the HPLMN domain) and how the two SUPIs/subscriptions are stored can be implementation specific (e.g.: two SUPIs stored as a DualSteer pair or each having its own identifier linked to a common subscription profile)

Conclusion for KI#1.2 – Registration Aspects



- The two SUPIs for DualSteer should not be identified as primary and secondary. The registrations on each of the two 3GPP access networks should be independent
 - DualSteer device should be able to leverage any available access without dependency on being registered on one of the access to avail the services subscribed for and supported by that access
 - If two networks are available, the DualSteer device will be registered on both, even though only one of them is being actively used (in case of non simultaneous transmission using active-standby steering mode)
- There should not be an impact on Registration procedures except for the network indicating support for DualSteer in the Registration Accept message
 - No capabilities sent by the DualSteer device at registration, the serving network should consider the capabilities from the device in the SM signaling to drive the steering and/or switching decisions
 - DualSteer will only include the support and capabilities, if network indicates support during registration
- The DualSteer device indicates DualSteer support (including support for simultaneous/non-simultaneous data transmission and supported steering functionalities/modes) during DualSteer Session Establishment
- In the case of inter-PLMN (HPLMN-VPLMN) scenario, there are no new impacts on VPLMN to support DualSteer (as specified for ATSSS, where VPLMN AMF indicates support for DualSteer)
 - SMF selection in HPLMN by the AMF in VPLMN will be based on PDU Session ID and DNN/S-NSSAI combinations
 - From VPLMN perspective, this will be just the home routed traffic

Conclusion for KI#1.3 – Session Management Aspects



- Existing underlying ATSSS framework and principles should be reused (MA-PDU Session, Steering Rules, Steering Functionalities, Policies and Rules enforcement, etc.) wherever applicable
- DualSteer device should include an indication whether the PDU session is applicable for potential DualSteer steering and/or switching within the PDU Session Establishment
 - PDU Session flow association should be maintained using a common PDU-Session ID for the PDU sessions established across the two 3GPP access networks
 - PDU sessions for each SUPI will be kept established as long as the DualSteer device is registered and AN resources allocated only when traffic needs to be sent over an access
- DualSteer session should be always anchored in a common UPF and managed by a common SMF and PCF in the home network for a DualSteer device that supports both steering and switching
 - The AMF should select a PCF and DS capable SMF for any PDU Session applicable for DualSteer steering/switching
 - In case of inter-PLMN scenarios, where both 3GPP networks associated with DualSteer belong to different operators, the AMF in home and visited network should be able to select the same PCF and SMF in the home network for any PDU Session applicable for DualSteer steering and/or switching
 - The SMF in the home network managing the DualSteer PDU session should select a DualSteer capable UPF to anchor and handle the N4 rules specific to the DualSteer PDU Sessions
- Support for both MPQUIC and MPTCP steering functionalities – better switching performance with IP address continuity, embedded link quality measurements, better API integration with application layer

Conclusion for KI#1.4 – Policy Aspects



- Policies provided to the DualSteer Device to control the steering/switching using the URSP rules, DualSteer rules and N4 rules during the DualSteer Session establishment. Normal policy update triggers (similar to ATSSS rule updates)
- PCC rules enhanced to include DualSteer policies
 - PCF creates PCC rules and SMF maps the PCC rules into DualSteer rules which are sent to DualSteer device via the AMF and N4 rules which are sent to the UPF
 - Enhance URSP rules for the DualSteer device with a new Access Type preference in Route Selection Description. Each SUPI should have its own URSP rules, but the DualSteer related component should be common across both
 - DualSteer rules (similar to ATSSS rules) to enforce DualSteer policies in UL and N4 Rules to enforce DualSteer policies in DL
- DualSteer device makes steering/switching decisions across the two access using access descriptors in the DualSteer/N4 rules (similar to ATSSS); no dependency of updating the rules based on access network availability
- SMF manages the DualSteer PDU Session using separate SM policy association towards PCF, which provides unified policies across both SUPIs/subscriptions of the DualSteer device and two separate N4 rules towards UPF