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TECHNICAL SPECIFICATION

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Universal Mobile Telecommunications System (UMTS);
LTE;
Single Radio Voice Call Continuity (SRVCC);
Stage 2
(3GPP TS 23.216 version 17.0.0 Release 17)

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2 presented to TSG for approval;

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should indicates a recommendation to do something

should not indicates a recommendation not to do something

may indicates permission to do something

need not indicates permission not to do something

The construction "may not" is ambiguous and is not used in normative elements. The unambiguous constructions "might not" or "shall not" are used instead, depending upon the meaning intended.

can indicates that something is possible

cannot indicates that something is impossible

The constructions "can" and "cannot" are not substitutes for "may" and "need not".

will indicates that something is certain or expected to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document

will not indicates that something is certain or expected not to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document

might indicates a likelihood that something will happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

might not indicates a likelihood that something will not happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

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1 Scope

This document specifies the architecture enhancements for Single Radio Voice Call Continuity (SRVCC) between the following access systems for voice calls that are anchored in the IMS:

- from E-UTRAN to 3GPP2 1xCS;
- from E-UTRAN to UTRAN/GERAN;
- from UTRAN (HSPA) to UTRAN/GERAN.
- from UTRAN/GERAN to E-UTRAN.
- from GERAN to UTRAN (HSPA).
- from NG-RAN to UTRAN.

This document will not describe 3GPP2 functional entities. However, interfaces between both 3GPP and 3GPP2 functional entities are described in this specification.

SRVCC from E-UTRAN access to 3GPP2 1xCS is covered in this specification, including the handling of IMS emergency call continuity. Handling of non-voice component and SRVCC from 3GPP2 1xCS to E-UTRAN direction is not specified in this release.

SRVCC from NG-RAN/E-UTRAN/UTRAN (HSPA) access and 3GPP UTRAN/GERAN CS accesses for voice calls that are anchored in the IMS, as well as the coordination between the SRVCC for voice call and the handover of non-voice PS bearers are covered in this specification. SRVCC with IMS emergency call continuity from E-UTRAN/UTRAN (HSPA) to 3GPP UTRAN/GERAN CS accesses and from NG-RAN to UTRAN for voice calls is covered in this specification. SRVCC with eCall over IMS continuity from E-UTRAN/UTRAN (HSPA) to 3GPP UTRAN/GERAN CS accesses is covered in this specification. SRVCC with priority handling from E-UTRAN to 3GPP UTRAN/GERAN CS accesses for voice or voice and video calls is also covered in this specification. The handover of non-voice PS bearer from E-UTRAN is specified by the procedures defined in TS 23.401 [2], TS 23.060 [10], TS 25.413 [11] and TS 43.129 [12]. The handover of non-voice PS bearer from UTRAN (HSPA) is specified by the procedures defined in TS 23.060 [10], TS 25.413 [11] and TS 43.129 [12]. The handover of non-voice PS bearer from NG-RAN to UTRAN is not supported.

This document specifies the architecture enhancements for Single Radio Video Call Continuity (vSRVCC) from E-UTRAN to UTRAN-CS access for Video Calls that are anchored in the IMS.

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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 23.401: "GPRS enhancements for E-UTRAN access".

[3] 3GPP TS 23.402: "Architecture enhancements for non-3GPP accesses".

[4] 3GPP2 X.S0042-0: "Voice Call Continuity between IMS and Circuit Switched System".

[5] Void.

[6] Void.

[7] 3GPP TR 36.938: "Improved Network Controlled Mobility between E-UTRAN and 3GPP2/Mobile WiMAX Radio Technologies".

[8] 3GPP2 A.S0008-C: "Interoperability Specification (IOS) for High Rate Packet Data (HRPD) Radio Access Network Interfaces with Session Control in the Access Network".

[9] 3GPP TS 22.278: "Service requirements for the Evolved Packet System (EPS)".

[10] 3GPP TS 23.060: "General Packet Radio Service (GPRS); Service description; Stage 2".

[11] 3GPP TS 25.413: "UTRAN Iu interface Radio Access Network Application Part (RANAP) signalling".

[12] 3GPP TS 43.129: "Packet-switched handover for GERAN A/Gb mode; Stage 2".

[13] 3GPP TS 23.292: "IP Multimedia Subsystem (IMS) Centralized Services: Stage 2".

[14] 3GPP TS 23.237: "IP Multimedia Subsystem (IMS) Service Continuity: Stage 2".

[15] 3GPP TS 23.002: "Network Architecture".

[16] 3GPP TS 36.300: "Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Overall description; Stage 2".

[17] Void.

[18] 3GPP TS 23.009: "Handover procedures".

[19] 3GPP TS 25.331: "Radio Resource Control (RRC) protocol specification".

[20] 3GPP2 A.S0014: "Interoperability Specification (IOS) for cdma2000 Access Network Interfaces".

[21] 3GPP TS 33.210: "3G Security; Network Domain Security; IP network layer security".

[22] 3GPP TS 33.401: "3GPP System Architecture Evolution (SAE): Security architecture".

[23] 3GPP TS 48.008: "Mobile Switching Centre - Base Station System (MSC-BSS) interface; Layer 3 specification".

[24] 3GPP TS 48.018: "General Packet Radio Service (GPRS); Base Station System (BSS) - Serving GPRS Support Node (SGSN); BSS GPRS Protocol (BSSGP)".

[25] 3GPP TS 33.102: "3G Security; Security architecture".

[26] 3GPP TS 22.173: "IP Multimedia Core Network Subsystem (IMS) Multimedia Telephony Service and supplementary services".

[27] 3GPP TS 23.003: "Numbering, addressing and identification".

[28] 3GPP TS 23.167: "IP Multimedia Core Network Subsystem (IMS) emergency sessions".

[29] 3GPP TS 23.271: "Functional stage 2 description of Location Services (LCS)".

[30] 3GPP TS 36.413: "Evolved Universal Terrestrial Radio Access Network (E-UTRAN); S1 Application Protocol (S1AP)".

[31] 3GPP TS 22.101: "Service aspects; Service principles".

[32] 3GPP TS 23.203: "Policy and charging control architecture".

[33] ITU-T Recommendation H.324 Annex K: "Media oriented negotiation acceleration procedure" and associated changes to Annex J".

[34] 3GPP TS 26.111: "Codec for circuit switched multimedia telephony service; Modifications to H.324".

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[35] 3GPP TR 26.911: "Codec(s) for Circuit-Switched (CS) multimedia telephony service; Terminal implementor's guide".

[36] 3GPP TS 36.423: "Evolved Universal Terrestrial Radio Access Network (E-UTRAN); X2 Application Protocol (X2AP)".

[37] 3GPP TS 29.303: "Domain Name System Procedures; Stage 3".

[38] 3GPP TS 22.002: "Circuit Bearer Services (BS) supported by a Public Land Mobile Network (PLMN)".

[39] 3GPP TS 22.003: "Circuit Teleservices supported by a Public Land Mobile Network (PLMN)".

[40] 3GPP TS 23.251: "Network sharing; Architecture and functional description".

[41] 3GPP TS 29.002: "Mobile Application Part (MAP) specification".

[42] 3GPP TS 23.272: "Circuit Switched (CS) fallback in Evolved Packet System (EPS)".

[43] 3GPP TS 26.267: "eCall data transfer; In-band modem solution; General description".

[44] 3GPP TS 24.008: "Mobile radio interface Layer 3 specification; Core network protocols; Stage 3".

[45] 3GPP TS 23.502: "Procedures for the 5G System".

[46] 3GPP TS 38.423: "Xn application protocol (XnAP)".

[47] 3GPP TS 38.413: "NG Application Protocol (NGAP)".

[48] 3GPP TS 23.501: "System Architecture for the 5G System; Stage 2".

[49] 3GPP TS 38.300: "NR and NG-RAN Overall Description; Stage 2".

[50] 3GPP TS 23.273: "5G System (5GS) Location Services (LCS); Stage 2".

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3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in TR 21.905 [1].

1xCS: The 3GPP2 legacy circuit switched signalling system as defined in 3GPP2 X.S0042-0 [4].

3GPP SRVCC UE: A 3GPP SRVCC UE is a UE enhanced for IMS Service Continuity with the additional UE capabilities described in this specification for SRVCC NG-RAN to 3GPP UTRAN and / or between E-UTRAN and 3GPP UTRAN and / or between E-UTRAN and 3GPP GERAN and / or between UTRAN (HSPA) and 3GPP UTRAN and 3GPP GERAN.

Correlation MSISDN: An MSISDN used for correlation of sessions. See TS 23.003 [27] for more information.

Emergency Session Transfer Number for SRVCC (E-STN-SR): see TS 23.237 [14].

IMS-based MPS Session: see TS 23.401 [2].

Session Transfer Number for SRVCC (STN-SR): see TS 23.237 [14].

Single Radio Voice Call Continuity (SRVCC): Voice call continuity between IMS over PS access and CS access for calls that are anchored in IMS when the UE is capable of transmitting/receiving on only one of those access networks at a given time.

Single Radio Video Call Continuity (vSRVCC): Video call continuity from E-UTRAN to UTRAN-CS for calls that are anchored in the IMS when the UE is capable of transmitting/receiving on only one of those access networks at a

given time. In this specification, the term vSRVCC is introduced for Single Radio Video Call Continuity to differentiate it from Single Radio Voice Call Continuity (SRVCC).

CS to PS Single Radio Voice Call Continuity (CS to PS SRVCC): SRVCC from UTRAN to E-UTRAN, and SRVCC from GERAN to UTRAN/E-UTRAN.

Video Call: For IMS over E-UTRAN, it represents the session using bidirectional voice and synchronised real time video as specified in TS 22.173 [26]. For UTRAN-CS, it represents the Circuit Switched (CS) multimedia calls as specified in TS 22.101 [31].

For the purposes of the present document, the following terms and definitions given in TS 23.401 [2] apply:

eCall Only Mode: See TS 23.401 [2].

For the purposes of the present document, the following terms and definitions given in TS 22.101 [31] apply:

eCall: See TS 22.101 [31].

Minimum Set of Data (MSD): See TS 22.101 [31].

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in TR 21.905 [1].

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1xCS IWS	Single Radio Voice Call Continuity Interworking solution Function for 3GPP2 1xCS
ARP	Allocation and Retention Priority
C-MSISDN	Correlation MSISDN
MPS	Multimedia Priority Service
MSD	Minimum Set of emergency related Data
SAI	Service Area Identifier as defined in TS 25.413 [11] and TS 23.003 [27]
SRVCC	Single Radio Voice Call Continuity
vSRVCC	Single Radio Video Call Continuity
MME_SRVCC	MME Supporting 5G-SRVCC

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4 High level Principles and Concepts

4.1 High level Principles

4.1.1 Architectural Principles for 3GPP2 1xCS SRVCC

The solution for SRVCC fulfils the requirements of TS 22.278 [9] and the following architectural principles:

1. The solution shall allow coexistence and be compatible with the 1xCS procedures specified in the 3GPP2 VCC specification, X.S0042 [4].
2. The solution shall not require UE with multiple RATs capability to simultaneously signal on two different RATs.
3. The solution shall be transparent to E-UTRA only terminal or network.
4. The solution shall minimize the coupling between the E-UTRAN and the 3GPP2 access. In particular, the solution shall allow the cdma2000 1xRTT specification to evolve without necessitating a modification to the E-UTRAN specifications.
5. RAT change and domain selection should be under network control.
6. In roaming cases, the Visited PLMN should control the RAT change and/or domain selection while taking into account any related HPLMN policies.
7. The solution shall not impact cdma2000 RAT.

8. The solution shall not impact cdma2000 CS CN.

9 All IMS sessions that may be subject to SRVCC shall be anchored in the IMS (VCC Application).

10. When SRVCC is deployed, QCI=1:

    - shall not be used for IMS sessions that are not anchored in the IMS (VCC Application); and

    - shall only be used for the voice bearer.

4.1.2 Architectural Principles for SRVCC and vSRVCC to 3GPP UTRAN/GERAN

The solution for (v)SRVCC fulfils the requirements of TS 22.278 [9] and the following architectural principles:

1. The solution shall allow coexistence and be compatible with TS 23.292 [13] and TS 23.237 [14].

2. The solution shall not require UE with multiple RATs capability to simultaneously signal on two different RATs.

3. RAT change and domain selection should be under network control.

4. E-UTRAN/UTRAN (HSPA) to UTRAN/GERAN CS handover for SRVCC is triggered by the same radio handover conditions and mechanisms as for an E-UTRAN/UTRAN (HSPA) to UTRAN/GERAN PS handover.

5. The Video Call by IMS over E-UTRAN is the IMS session with bi-directional video and voice media e.g. IMS Multimedia Telephony as defined in TS 22.173 [26] which uses separate EPS bearers for video and voice components, respectively.

6. In roaming cases, the VPLMN shall be able to control the RAT/domain selection change while taking into account any related HPLMN policies for IMS sessions with bi-directional video and voice media e.g. IMS Multimedia Telephony as defined in TS 22.173 [26].

7 All IMS sessions that may be subject to (v)SRVCC shall be anchored in the IMS (SCC AS).

8. When SRVCC is deployed, QCI=1 / traffic-class 'Conversational' with Source Statistics Descriptor ='speech':

    - shall not be used for IMS sessions that are not anchored in the IMS (SCC AS); and

    - shall only be used for the voice bearer.

NOTE 1: The UE may have multiple voice media streams that are multiplexed over a single voice (e.g. QCI=1) bearer. Selection of the voice streams for SRVCC by the SCC AS is as specified in TS 23.237 [14].

NOTE 2: The UE may have multiple voice and video media streams that are carried over a single voice but multiple video (QCI=1 and the vSRVCC marked bearer) bearers or are multiplexed each over a single media bearer. Only one of these voice or voice and video streams is selected for SRVCC or vSRVCC by the SCC AS (see TS 23.237 [14]).

4.1.3 Architectural Principles for SRVCC to 3GPP E-UTRAN/UTRAN (HSPA)

The solution for CS to PS SRVCC fulfils the following architectural principles in addition to the ones defined in clause 4.1.2:

- A CS to PS SRVCC procedure shall be possible for CS call that is originated from UTRAN/GERAN.

- After transfer from CS to PS SRVCC, it shall support moving the session back to UTRAN/GERAN CS domain if SRVCC from E-UTRAN/HSPA PS-domain is supported.

- A CS to PS SRVCC procedure shall be possible after SRVCC from E-UTRAN/HSPA PS-domain to CS domain has occurred.

- Emergency session is not subjected to CS to PS SRVCC procedure.

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A prerequisite for the CS to PS SRVCC procedure to take place is that the UE is registered in IMS and has at least one PS bearer (usable for SIP signalling).

4.1.4 Architectural Principles for 5G-SRVCC to UTRAN

The solution for 5G-SRVCC fulfils the requirements of TS 22.278 [9] and the following architectural principles:

1. The solution shall not require UE with multiple RATs capability to simultaneously signal on two different RATs.
2. RAT change and domain selection should be under network control.
3. NG-RAN to UTRAN CS handover for 5G-SRVCC is triggered by radio handover conditions.
4. All IMS sessions that may be subject to 5G-SRVCC shall be anchored in the IMS (SCC AS).
5. In roaming cases, the VPLMN shall be able to control the RAT/domain selection and change while taking into account any related HPLMN policies for IMS sessions with voice media.

4.2 Concepts

4.2.1 E-UTRAN to 3GPP2 1xCS SRVCC

For SRVCC-capable UEs, the call is always anchored at the VCC AS in the 3GPP2's IMS. The 3GPP2 1xCS IWS enables a single radio UE to communicate in parallel both with the source system and the target system. From VCC perspective, this mechanism minimizes the voice gap by supporting the transport of signalling for establishment of the target CS access leg while the terminal is connected to the source PS access network.

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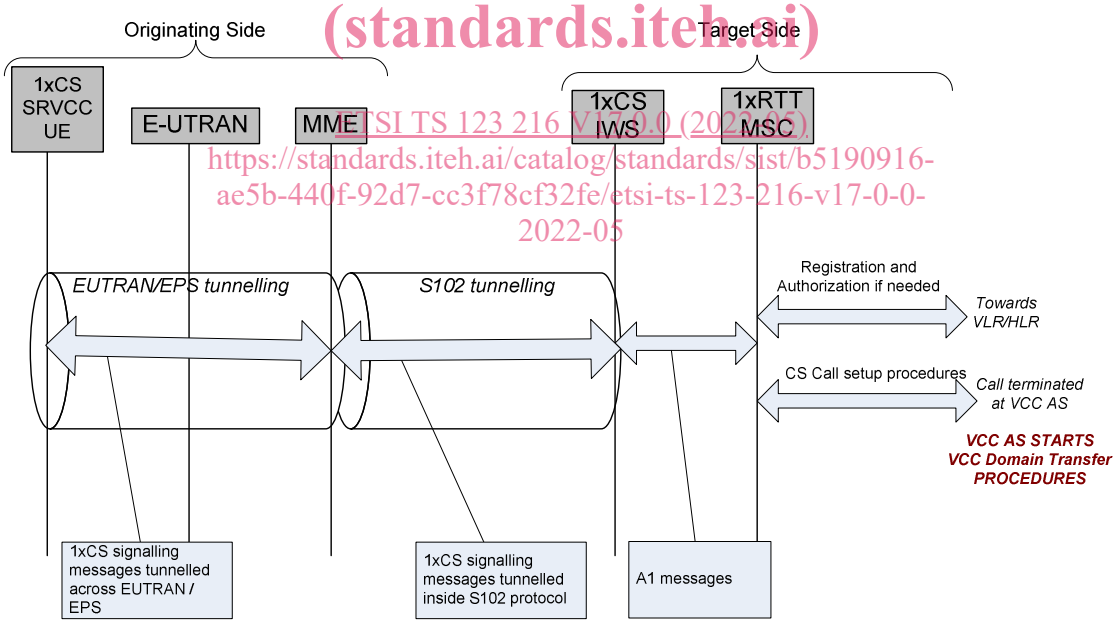

Figure 4.2.1-1: Transport of 3GPP2 1xCS signalling messages for preparation of the CS access leg in the target system

The S102 reference point is used to convey 3GPP2 1xCS signalling messages between the MME and 3GPP2 1xCS IWS. These 1x CS signalling messages are actually exchanged between the UE and the 3GPP2 1xCS IWS, and S102 is only one link in the overall UE-1xCS IWS tunnelling path. On the remaining portion of the tunnelling path, the 3GPP2 1xCS signalling messages are encapsulated in E-UTRAN/EPS tunnelling messages (UE-MME).

4.2.2 E-UTRAN to 3GPP UTRAN/GERAN SRVCC

For facilitating session transfer (SRVCC) of the voice component to the CS domain, the IMS multimedia telephony sessions needs to be anchored in the IMS.

For SRVCC from E-UTRAN to UTRAN/GERAN, MME first receives the handover request from E-UTRAN with the indication that this is for SRVCC handling, and then triggers the SRVCC procedure with the MSC Server enhanced for SRVCC via the Sv reference point if MME has STN-SR information for this UE. If SRVCC with priority is supported, based on the ARP associated with the EPS bearer used for IMS signalling, the MME sets the priority indication appropriately toward the MSC Server. MME aware of which EPS bearer is used for IMS signalling based on local configuration. MSC Server enhanced for SRVCC then initiates the session transfer procedure to IMS and coordinates it with the CS handover procedure to the target cell. If SRVCC with priority is supported, IMS session transfer procedure and the CS handover procedure are performed with priority handling per the priority indication received from MME. MSC Server enhanced for SRVCC then sends PS-CS handover Response to MME, which includes the necessary CS HO command information for the UE to access the UTRAN/GERAN.

Handling of any non-voice PS bearer is done by the PS bearer splitting function in the MME. MME starts the handover of non-voice PS bearer during SRVCC procedure based on the information received from E-UTRAN. The handover of non-voice PS bearer(s), if performed, is done as according to Inter RAT handover procedure as defined in TS 23.401 [2]. The MME is responsible to coordinate the Forward Relocation Response from PS-PS handover procedure and the SRVCC PS to CS Response.

NOTE: Depending on operator's policy, when 5GS is deployed, the eNB can switch the PS HO off when it initiates SRVCC procedure, i.e. SRVCC only for CS voice.

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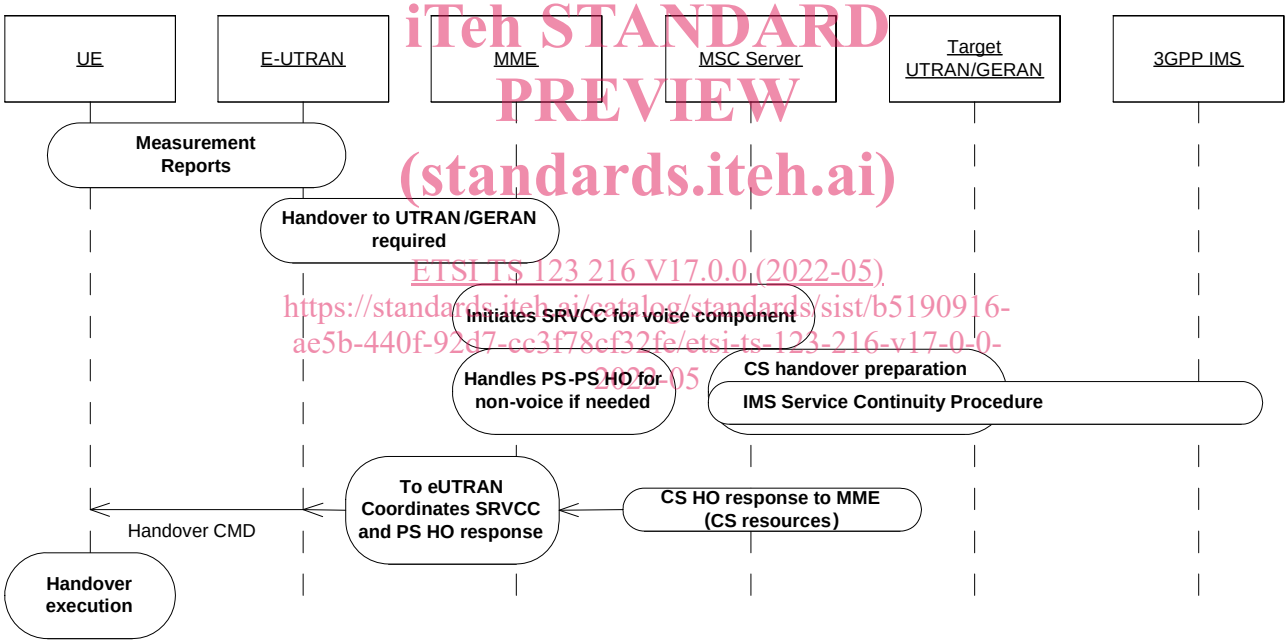

Figure 4.2.2-1: Overall high level concepts for SRVCC from E-UTRAN to UTRAN/GERAN

4.2.2a E-UTRAN to 3GPP UTRAN vSRVCC

For facilitating session transfer of the voice and video components to the CS domain, the IMS multimedia telephony sessions needs to be anchored in the IMS.

For vSRVCC, the UE uses one voice and one video media component over the associated QCI=1 and vSRVCC marked PS bearers for bearer identification reasons. The MME first receives the handover request from E-UTRAN. It then triggers the vSRVCC procedure with the MSC Server enhanced for vSRVCC via the Sv reference point with vSRVCC related information. MSC Server enhanced for vSRVCC then interacts with IMS and initiates the session transfer procedure to IMS and coordinates it with the CS handover procedure to the target cell. If SRVCC with priority is supported, IMS session transfer procedure and the CS handover procedure are performed with priority handling according to the priority indication received from MME.