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SERIES Y: GLOBAL INFORMATION INFRASTRUCTURE, INTERNET PROTOCOL ASPECTS, NEXT-GENERATION NETWORKS, INTERNET OF THINGS AND SMART CITIES

Next Generation Networks – Service aspects: Interoperability of services and networks in NGN

Voice and video call continuity over LTE, Wi-Fi and 2G/3G

Recommendation ITU-T Y.2255

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Recommendation ITU-T Y.2255

Voice and video call continuity over LTE, Wi-Fi and 2G/3G

Summary

Recommendation ITU-T Y.2255 specifies the voice and video call continuity (VCC) over long term evolution (LTE), Wi-Fi and 2G/3G. The scenarios and relevant requirements are specified, as well as the solutions for access transfer between each of the access types, handover policy, terminating access domain selection (T-ADS), evolved packet data gateway (ePDG) selection and other call continuity related solutions.

History

Edition	Recommendation	Approval	Study Group	Unique ID*
1.0	ITU-T Y.2255	2018-01-13	13	11.1002/1000/13462

Keywords

Multi-connection, voice and video call continuity.

* To access the Recommendation, type the URL http://handle.itu.int/ in the address field of your web browser, followed by the Recommendation's unique ID. For example, http://handle.itu.int/11.1002/1000/11830-en.

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1 Scope

This Recommendation specifies the requirements and solutions for voice and video call continuity (VCC). These requirements and solutions are applied for the scenarios where the multi-connection user equipment (MUE) is attached to the network with multi-connection via long term evolution LTE, Wi-Fi and 2G/3G accesses.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

[ITU-T Y.2027] Recommendation ITU-T Y.2027 (2012), *Functional architecture of multi-connection.*

[ITU-T Y.2251] Recommendation ITU-T Y.2251 (2011), *Multi-connection requirements.*

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 connection [b-ITU-T X.200]: A connection is an association established for the transfer of data between two or more peer-(N)-entities. This association binds the peer-(N)-entities together with the (N–1)-entities in the next lower layer.

3.1.2 multi-connection [ITU-T Y.2251]: The functionality which provides capability to the user equipment (UE) and network to maintain more than one access network connection simultaneously.

NOTE 1 – All connections are coordinated to provide service to higher layer entities.

NOTE 2 – In a multi-connection communications at least one UE is required to be a multi-connection UE.

3.1.3 multi-connection user equipment (MUE) [ITU-T Y.2027]: A user equipment which can support two or more network connections simultaneously under the control of a network enhanced for multi-connection capability.

3.2 Terms defined in this Recommendation

This Recommendation defines the following term:

3.2.1 voice and video call continuity (VCC): When the MUE moves between different access types, the ongoing voice and video call is not impacted and continues to serve the user. The user is not aware of the access transfer.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

AAA	Authentication, Authorization and Accounting
APN	Access Point Name
CS	Circuit Switched Domain
CSCF	Call Session Control Function
EDGE	Enhanced Data for GSM Evolution
EPC	Evolved Packet Core
ePDG	Evolved Packet Data Gateway
E-UTRAN	Evolved Universal Terrestrial Radio Access Network
FQDN	Fully Qualified Domain Name
GERAN	GSM EDGE Radio Access Network
GSM	Global System for Mobile communication
HLR	Home Location Register
HPLMN	Home Public Land Mobile Network
HSPA	High Speed Packet Access
HSS	Home Subscriber Server
I-CSCF	Interrogating – Call Session Control Function
IMS	IP Multimedia Subsystem
IUT-AS	Inter UE Transfer Application Server
LTE	Long Term Evolution
MME	Mobility Management Entity
MSC	Mobile Switching Centre
MUE	Multi-connection User Equipment
PCRF	Policy and Charging Rules Function
P-CSCF	Proxy – Call Session Control Function
PDN	Packet Data Network
PLMN	Public Land Mobile Network
PGW	Packet data network Gateway
PS	Packet Switch
RAT	Radio Access Technologies
S-CSCF	Serving – Call Session Control Function
SDP	Session Description Protocol
SRVCC	Single Radio Voice Call Continuity
SSID	Service Set Identifier
T-ADS	Terminating Access Domain Selection
URI	Uniform Resource Identifier

UTRAN	Universal Terrestrial Radio Access Network
VCC	Voice and video Call Continuity
VoLTE	Voice over Long Term Evolution
VPLMN	Visited Public Land Mobile Network
Wi-Fi	Wireless Fidelity

5 Conventions

In this Recommendation:

The keywords "is required to" indicate a requirement which must be strictly followed and from which no deviation is permitted if conformance to this Recommendation is to be claimed.

6 Scenarios and requirements

6.1 Scenarios

In a multi-connection environment (LTE, Wi-Fi, 2G/3G, etc.), the voice or video call session can move among multiple connections according to the wireless environment and policy seamlessly.

Voice or video call continuity over LTE, Wi-Fi and 2G/3G can enhance user experience of voice and video calling, especially in the switching scenarios. The switching scenarios are described as follows:

Scenario I (LTE → Wi-Fi)

Multi-connection user equipment (MUE) establishes a voice or video call session over LTE. While the session is going on, MUE moves to an environment with weak LTE coverage but strong Wi-Fi coverage. In this scenario, the voice or video call session can handover from the LTE connection to a Wi-Fi connection seamlessly to keep call continuity.

Scenario II (Wi-Fi → LTE)

MUE establishes a voice or video call session over Wi-Fi. While the session is going on, MUE moves to an environment with weak Wi-Fi coverage but strong LTE coverage. In this scenario, the voice or video call session can handover from the Wi-Fi connection to an LTE connection seamlessly to keep call continuity.

Scenario III (LTE → 2G/3G)

MUE establishes a voice or video call session over LTE. While the session is going on, MUE moves to an environment with weak LTE coverage but strong 2G/3G coverage. In this scenario, the voice or video call session can handover from the LTE connection to a 2G/3G connection seamlessly to keep call continuity.

Scenario IV (2G/3G → LTE)

MUE establishes a voice or video call session over 2G/3G. While the session is going on, MUE moves to an environment with weak 2G/3G coverage but strong LTE coverage. In this scenario, the voice or video call session can handover from the 2G/3G connection to an LTE connection seamlessly to keep call continuity.

Scenario V (LTE → Wi-Fi, 2G/3G)

MUE establishes a voice or video call session over LTE. While the session is going on, MUE moves to an environment with weak LTE coverage but strong Wi-Fi and 2G/3G coverage. In this scenario, the voice or video call session can handover from the LTE connection to a Wi-Fi or 2G/3G connection according to the policy seamlessly to keep call continuity.

Scenario VI (inter MUE transfer)

The subscriber signed for multi-device service. MUE establishes a voice or video call session over Wi-Fi/LTE. While the session is going on, the subscriber can transfer the call session to other Wi-Fi/LTE devices such as a PAD or watch to keep call continuity.

6.2 Requirements

The requirements of voice and video call continuity over LTE, Wi-Fi and 2G/3G are based on the requirements described in [ITU-T Y.2251], in addition to those described in clauses 6.2.1, 6.2.2 and 6.2.3.

6.2.1 Voice and video call continuity

When the MUE moves out of the coverage of an access type under which the ongoing session was initiated and into the coverage of another access type (see scenarios described in clause 6.1), the ongoing session must be maintained.

6.2.2 Handover policy

The handover between different access types can be triggered by the following means:

- The network instructs the MUE to perform handover;
- The MUE automatically decides to perform handover;
- The user instructs the MUE to perform handover.

When a handover conflict happens, i.e., when more than one target accesses are available, the MUE shall select only one of the target accesses to perform handover in accordance with the handover policy.

It shall be possible for the network to control the handover policy.

The handover policy can take into account factors such as:

- Whether the coverage strength exceeds a specific threshold;
- The type of ongoing session, e.g., voice call, video call;
- Whether the MUE is in a roaming case.

6.2.3 Terminating access domain selection

The network which serves an MUE must support terminating access domain selection (T-ADS) functionality. T-ADS directs an incoming call to an MUE via circuit switched (CS) domain or via IP multimedia subsystem (IMS).

T-ADS must be able to take into account the following factors:

- The radio access type the MUE is currently using, i.e., 2G/3G, LTE or Wi-Fi;
- The network capability, e.g., whether voice service over the current radio access type is supported by the network;
- The MUE capability, e.g., whether the MUE supports LTE to 2G/3G handover, Wi-Fi to LTE handover;
- The operator's policy;
- The user's preference;
- The ongoing call, e.g., if the MUE has an ongoing call via CS, the subsequent incoming call is also routed via CS;

- The type of the incoming call, e.g., an incoming video call may only be routed via Wi-Fi;
- The combination of the above conditions and the corresponding T-ADS result must be configurable by the operators.

7 Solutions

7.1 Overview

The architecture for VCC over multi-connection for the following major scenarios is shown in Figure 1.

- Evolved universal terrestrial radio access network (E-UTRAN) to non-3GPP IP access
- Non-3GPP IP access to E-UTRAN
- E-UTRAN to UTRAN/GERAN single radio voice call continuity (SRVCC)
- CS to packet switch (PS) SRVCC
- E-UTRAN to UTRAN/GERAN/Non-3GPP IP access

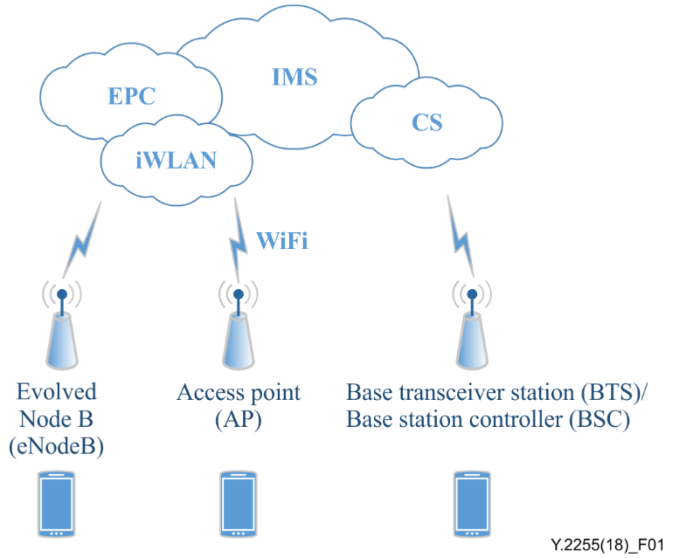

Figure 1 – The architecture for VCC over multi-connection

In a multi-connection environment (LTE, Wi-Fi, 2G/3G, etc.), voice and video call services can be provided with use of PS bearers and CS bearers for the media. When using PS bearer for media transport of an IMS sessions, either E-UTRAN or Wi-Fi wireless network can be used to access evolved packet core (EPC)/IMS core network. When using CS bearer for media transport sessions, the CS domain must support the SRVCC procedures for handover from E-UTRAN.

The following content specifies the description of solutions and procedures for voice and video service continuity when MUE moves among multiple-connection (LTE, Wi-Fi, 2G/3G, etc.).

7.2 Description of solutions

7.2.1 Initial attach via Wi-Fi access

This clause concerns the case when the MUE powers-on in a Wi-Fi IP access network and accesses the core network.

The procedure for MUE initial attach via Wi-Fi access is shown in Figure 2.

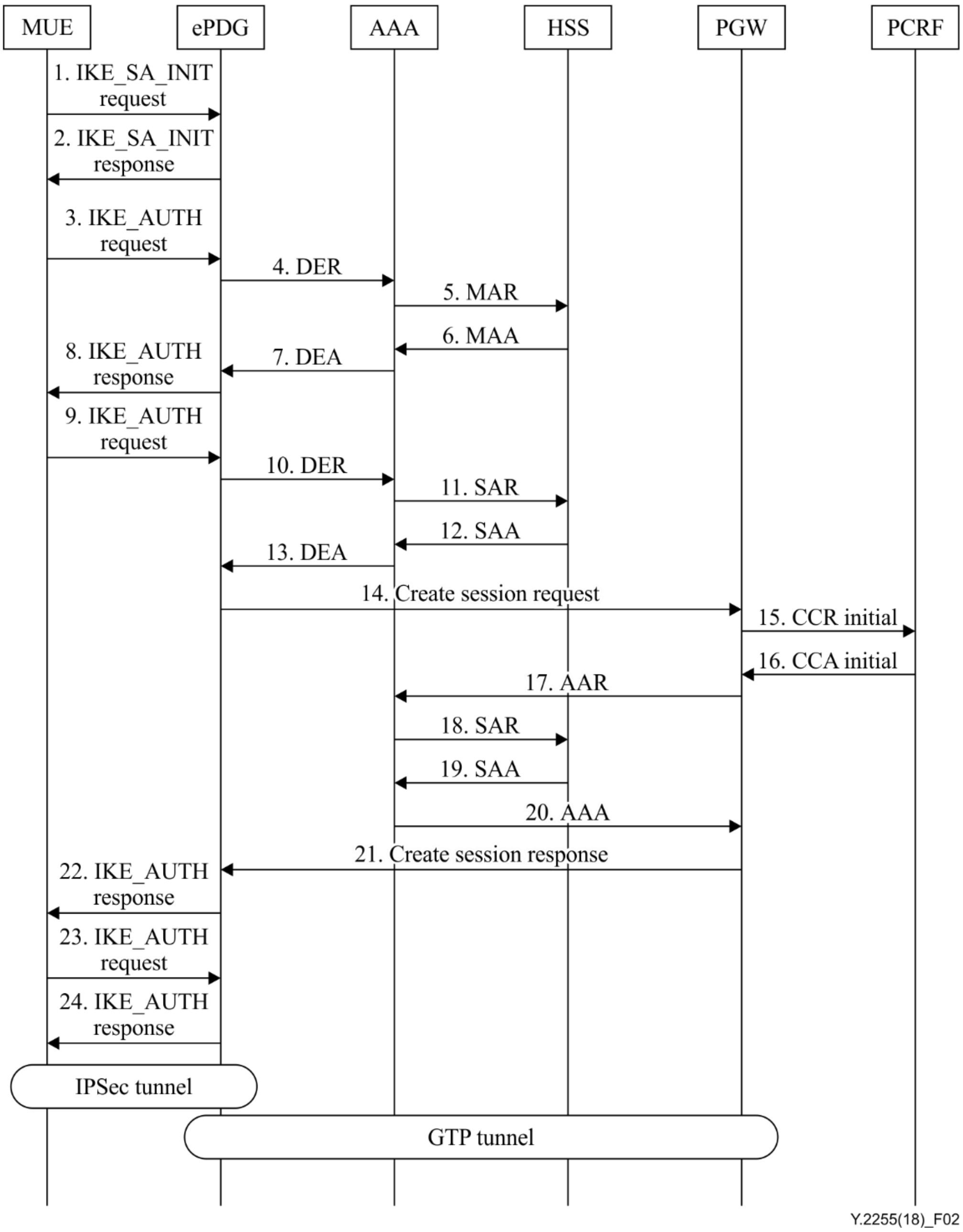

Figure 2 – Initial attachment via Wi-Fi access

1-2. The MUE and evolved packet data gateway (ePDG) initially set up a security association via an IKE_SA_INIT [b-IETF RFC 5685] Request/Response exchange.

3. The MUE sends an IKE_AUTH Request message to the ePDG.

4. The ePDG invokes the authentication, authorization and accounting (AAA) server with a DER message.

5-6. The AAA server obtains the authentication data by invoking the home subscriber server (HSS) with a MAR message. The HSS returns authentication data in a MAA message. The authentication method is EAP-AKA.

7. The AAA server issues the EAP-AKA challenge to the ePDG via a DEA message.

8. The ePDG sends an EAP-AKA challenge to the MUE via the IKE_AUTH Response message.

9. The MUE authenticates the network by checking the AUTN and MAC parameters. The MUE generates CK, IK and computes the XRES and MAC parameters which are returned to the ePDG in an IKE_AUTH Request (EAP-AKA Challenge Response).

10. The ePDG invokes the AAA server with a DER message, containing the XRES and XMAC parameters.

11-12. The AAA server checks the XRES and XMAC parameters are correct. If so, the AAA registers the MUE at the HSS via a SAR message. The HSS responds with a SAA message.

13. The AAA server sends a DEA message to the ePDG indicating EAP success.

14. The ePDG initiates a Create Session Request to the public data network gateway (PGW) to create a default bearer.

15-16. The PGW allocates an IP address for the MUE and utilizes dynamic PCC to initiate a CCR-Initial message to the policy and charging rules function (PCRF), to obtain the default PCC. The PCRF binds the related policy rules to the IP address of the default bearer and responds to the PGW with a CCA-Initial message.

17. The PGW informs the AAA server of its PGW identity and the access point name (APN) corresponding to the MUE's public data network (PDN) connection via a Diameter AAR message.

18-19. The AAA server registers the PGW in the HSS via the SAR message. The HSS stores the PGW identity against the user and responds with a SAA message to the AAA server.

20. The AAA server responds a Diameter AAA message to the PGW.

21. The PGW sends a Create Session Response to the ePDG with the IP address for the MUE, QoS parameters, PCO, etc.

22. The GTP tunnel is now established between the ePDG and PGW. The ePDG sends an IKE_AUTH Response message to the MUE indicating EAP success.

23-24. The MUE and ePDG mutually authenticate each other via a final exchange of IKE_AUTH Request/Response messages containing an AUTH header derived from their respective identities (user identity) and the EAP master session key. The MUE is informed of its allocated IP address during this exchange.

7.2.2 IMS registration via Wi-Fi access

This clause concerns the case of IMS registration via Wi-Fi access.

The procedure for MUE IMS registration via Wi-Fi access is shown in Figure 3.

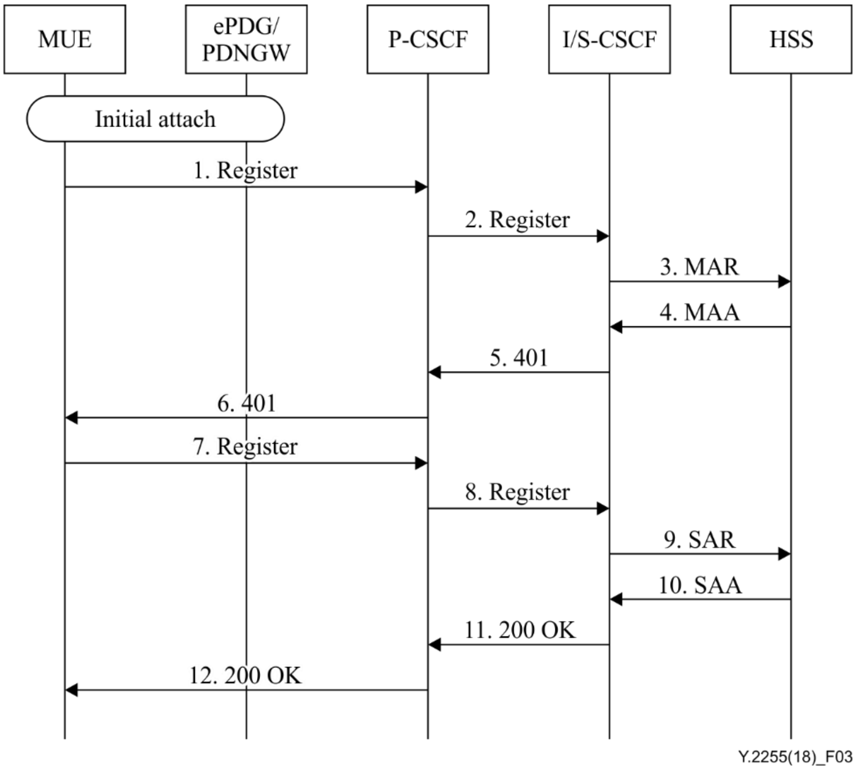

Figure 3 – IMS registration via Wi-Fi access

1-2. The MUE sends a SIP REGISTER request message to the interrogating – call session control function (I-CSCF) / serving – call session control function (S-CSCF) via proxy – call session control function (P-CSCF). The MUE should include the information of the Wi-Fi access network and cell information (if available) in the SIP REGISTER request message.

3-4 The S-CSCF obtains the authentication data by invoking the HSS with a MAR message. The HSS returns authentication data in a MAA message. The authentication method is IMS-AKA.

5-6 The S-CSCF sends an IMS-AKA challenge to the MUE via the 401 unauthorized message.

7-8 The UE authenticates the network by checking the AUTN and RAND parameters. The MUE generates CK, IK and computes the XRES which are returned to the S-CSCF in a SIP REGISTER request message (IMS-AKA Challenge Response).

9-10 The S-CSCF checks the XRES parameter is correct. If so, the S-CSCF registers the MUE at the HSS via a SAR message. The HSS responds with a SAA message.

11-12 The S-CSCF sends a SIP 200 (OK) message to the MUE, indicating register success.

7.2.3 Access transfer from E-UTRAN to Wi-Fi

To facilitate access transfer between E-UTRAN and Wi-Fi, a new entity called an evolved packet data gateway (ePDG) is required to be deployed on the network side so that the MUE can access the evolved packet core (EPC) via Wi-Fi. The network architecture is shown in Figure 4.

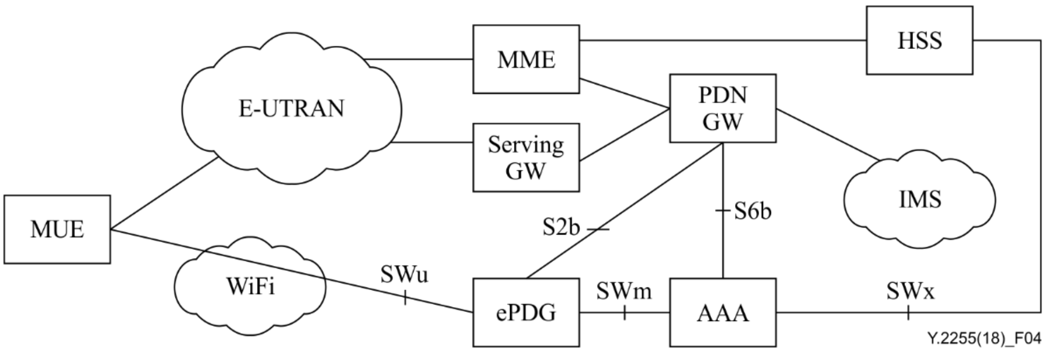

Figure 4 – Network architecture with ePDG

The session transfer from E-UTRAN to Wi-Fi proceeds with the following steps:

1 The MUE has established an IMS call via the access of E-UTRAN;

2 The MUE detects that there is available Wi-Fi access and then starts to proceed with E-UTRAN to Wi-Fi access transfer due to one of the following reasons:
   – The E-UTRAN coverage strength decreases to a preconfigured threshold;
   – The local policy indicates that voice over Wi-Fi always takes precedence over voice over LTE;
   – The user instructs the MUE to transfer the ongoing session to Wi-Fi;

3 The MUE performs handover from E-UTRAN to Wi-Fi access;

4 When the handover is completed, the MUE can optionally inform the IMS the access has been changed.

7.2.4 Access transfer from Wi-Fi to E-UTRAN

1 The session transfer from Wi-Fi to E-UTRAN proceeds with the following steps:

2 The MUE has established an IMS call via the access of Wi-Fi;

3 The MUE detects that there is available E-UTRAN coverage and then starts to proceed with Wi-Fi to E-UTRAN access transfer due to one of the following reasons:
   – The Wi-Fi coverage strength decreases to a preconfigured threshold;
   – The local policy indicates that voice over LTE always takes precedence over voice over Wi-Fi;
   – The user instructs the MUE to transfer the ongoing session to E-UTRAN;

4 The MUE performs handover from Wi-Fi access to E-UTRAN;

5 When the handover is completed, the MUE can optionally inform the IMS that the access has been changed.

7.2.5 ePDG selection

The MUE must select an ePDG through one of the following options:

Option I: the MUE has preconfigured the ePDG name, the ePDG name can be the IP address of the ePDG or the fully qualified domain name (FQDN) of the ePDG;

Option II: the MUE can derive the FQDN of the ePDG from available information, the information can be, e.g., the visited public land mobile network (VPLMN) ID, the home public land mobile network (HPLMN) ID and the service set identifier (SSID) of accessed Wi-Fi;

Option III: the SIM card of the MUE has been provisioned with an ePDG name, the ePDG name can be the IP address of the ePDG or the FQDN of the ePDG.

If option III is available, it takes precedence over the other options.

The MUE must support the IKEv2 redirection mechanism defined in [b-IETF RFC 5685], so that the network can perform load balance or help to select a closer ePDG during the ePDG selection.

7.2.6 E-UTRAN to 3GPP UTRAN/GERAN SRVCC solution

The SRVCC solution shown in Figure 5, is used to provide session continuity when the MUE moves from E-UTRAN to UTRAN/GERAN. To facilitate SRVCC, the IMS multimedia telephony sessions need to be anchored in the IMS.

The mobility management entity (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 mobile switching centre (MSC) server enhanced for SRVCC via the Sv reference point if the 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. The MME is aware of which EPS bearer is used for IMS based on local configuration. The 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. The MSC server enhanced for SRVCC then sends PS-CS handover response to the MME, which includes the necessary CS HO command information for the UE to access the UTRAN/GERAN.

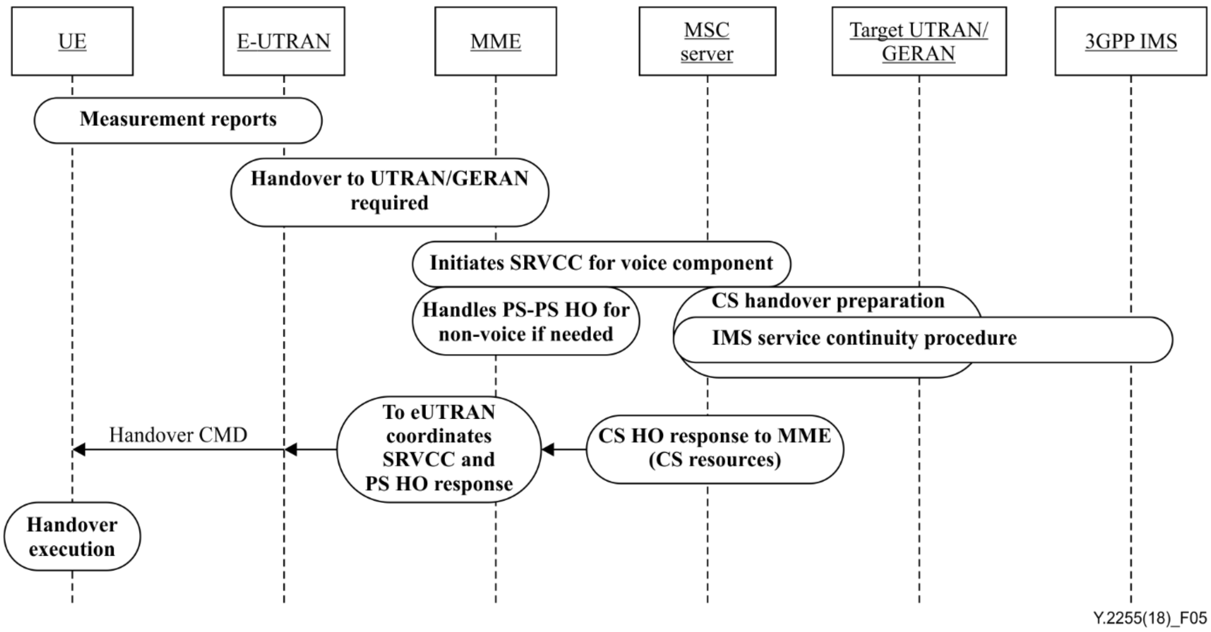

Figure 5 – Overall concepts for SRVCC from E-UTRAN to UTRAN/GERAN

7.2.7 CS to PS SRVCC solution

To facilitate session transfer (SRVCC) of the voice component from the CS domain, the voice session shall be anchored in the IMS. Figure 6 shows session continuity when the MUE moves from UTRAN/GERAN to E-UTRAN/UTRAN, in this case high speed packet access (HSPA) is required.

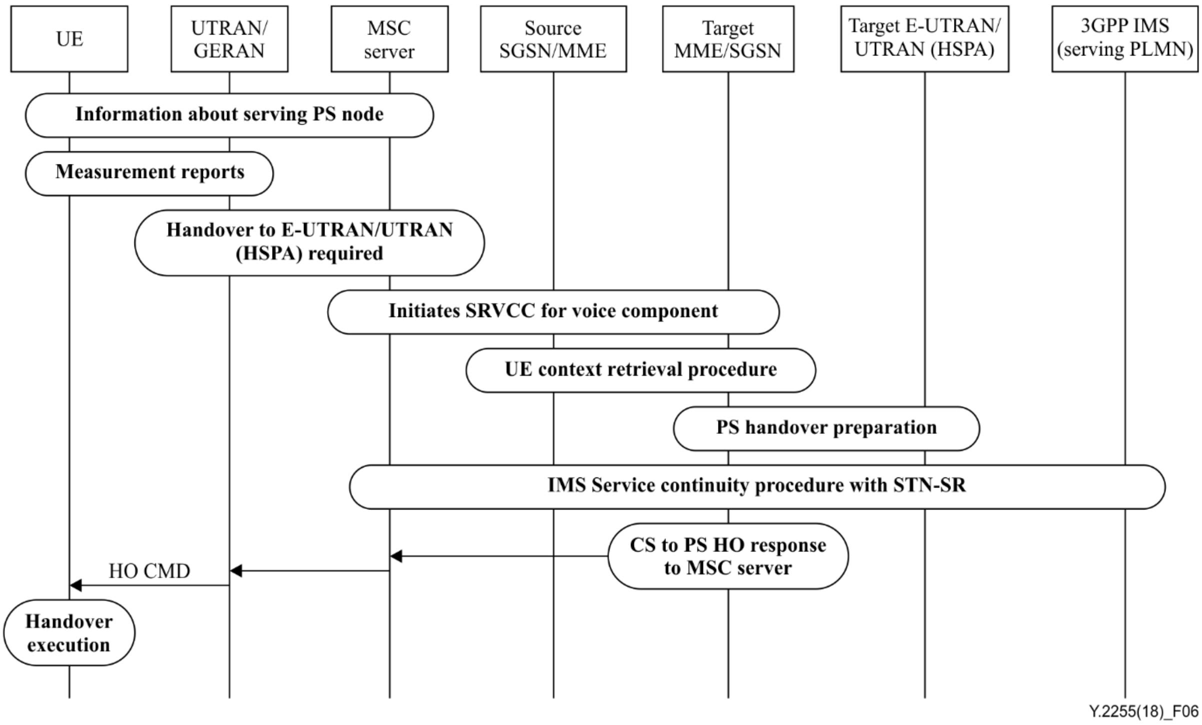

Figure 6 – UTRAN/GERAN to E-UTRAN/UTRAN (HSPA)

7.2.8 Provision of handover policy

The network provides MUE with handover policy by operator configuration on the MUE. The user instruction shall take priority over the handover policy provided by the network.

7.2.9 MUE moves between E-UTRAs

When the MUE is in a voice over long term evolution (VoLTE) session and moving from E-UTRAN (VoLTE enabled) to E-UTRAN (VoLTE disabled), the SRVCC handover is requested. The access is transferred to 2G/3G and the voice call continuity can be maintained.

The E-UTRAN needs to support preconfiguring neighbour cells including LTE and 2G/3G; and be capable of configuring the ability of neighbour cells to support VoLTE. The procedure is as follows:

1 A VoLTE UE is in the coverage of LTE supporting VoLTE and in a VoLTE call session.

2 VoLTE UE is moving to neighbour cells. If E-UTRAN detects that UE is in a VoLTE call session while there are neighbour LTE cells not supporting VoLTE, then E-UTRAN instructs the UE to measure the signal quality of neighbour cells.

3 The UE returns a measurement report.

4 E-UTRAN selects a cell as a target transfer cell according to the measurement report and its supporting capability of VoLTE:

   – When the signal quality of a cell is higher than the threshold level and the cell supports VoLTE, this cell shall be selected as the target transfer cell; E-UTRAN issues PS to PS handover request to source MME; the next procedures are standard procedures for PS to PS handover.

   – When the signal quality of a cell is higher than the threshold level but the cell does not support VoLTE, a 2G/3G cell shall be selected as the target transfer cell instead; E-UTRAN issues PS to PS handover request to source MME; the next procedures are standard procedures for SRVCC handover.

– When the signal quality of all the cells in the measurement report is lower than the threshold level, a 2G/3G cell shall be selected; the next procedures are standard procedures for SRVCC handover.

7.2.10 T-ADS

7.2.10.1 T-ADS overall description

In the IMS core network T-ADS is typically collocated with an application server. When the T-ADS receives an incoming call targeting an MUE, the T-ADS performs the following procedures:

1 Determine the radio access technologies (RAT) currently used by the MUE, as described in clause 7.2.10.2;

2 Determine the capabilities of the network that the MUE is currently using, as described in clause 7.2.10.3;

3 Determine the MUE capabilities as described in clause 7.2.10.4;

4 Determine the type of the incoming call as described in clause 7.2.10.5;

5 Acquire the user preference of T-ADS from the serving database, e.g., HSS/home location register (HLR);

6 Use the information determined in the above steps to derive the T-ADS result according to user preference and local configured operator policy, the operator policy must take precedence over the user preference.

7.2.10.2 Determination of currently used RAT

To determine the currently used RAT, the T-ADS queries HSS/HLR of the registration state of the MUE on each RAT, i.e., 2G, 3G, LTE and Wi-Fi.

If the result returned by HSS/HLR indicates that the MUE is currently registered to a single RAT, then the T-ADS considers the MUE is currently using that RAT.

If the result returned by the HSS/HLR indicates the MUE is registered to more than one RAT, then the T-ADS queries the HSS/HLR about the timestamps of the latest registration to those RATs. The T-ADS considers the MUE is using the RAT with the latest timestamp.

7.2.10.3 Determination of network capabilities

The network capabilities that need to be determined include:

- whether the network supports voice, video, multimedia service via a specific RAT;
- whether the network supports session continuity between LTE and Wi-Fi;
- whether the network supports session continuity between LTE and 2G/3G CS.

The network capabilities can be configured directly on the network equipment which holds the T-ADS functionality.

The T-ADS can query the network functionality from:

- HSS/HLR;
- MME for LTE network;
- SGSN for 2G/3G network.

7.2.10.4 Determination of MUE capabilities

The MUE capabilities that need to be determined include:

- whether the MUE support voice, video, multimedia service via a specific RAT;
- whether the MUE supports session continuity between LTE and Wi-Fi;
- whether the MUE supports session continuity between LTE and 2G/3G CS.

The MUE capabilities can be part of the subscription data stored permanently in e.g., HSS/HLR. The MUE can populate its capabilities during the procedure of registration to the network and such information is stored in the HSS/HLR as temporary data.

7.2.10.5 Determination of the call type

The call types include:

- voice call, i.e., a call with only voice media;
- video call, i.e., a call with voice and video media;
- multimedia call is a call involving media types other than voice and video, e.g., text.

The T-ADS determines the call type according to the session description protocol (SDP) information contained in the messages used to set up the session.

7.2.11 Inter MUE transfer

Inter UE transfer application server (IUT-AS) is required to be implemented with the following capabilities:

- Basic call control functionality, including splitting and merging multiple call flows, supplementary services and abnormal scene control and management;
- Changing the calling party identities to display as a unified one in the MO calling process;
- Storing the binding of MUEs' uniform resource identifier (URI);
- Media processing capabilities for playing notification tones.

7.2.11.1 Notify all binding MUEs

In this case, on receipt of a handover request from UE-A, the IUT-AS initiates the paging to at least one of the other terminals bound to UE-A.

The IUT-AS releases the session connection between MUEs after the other MUE is connected with UE-D.

MUE transfer to other devices by notifying all binding terminals uses the procedures as shown in Figure 7.

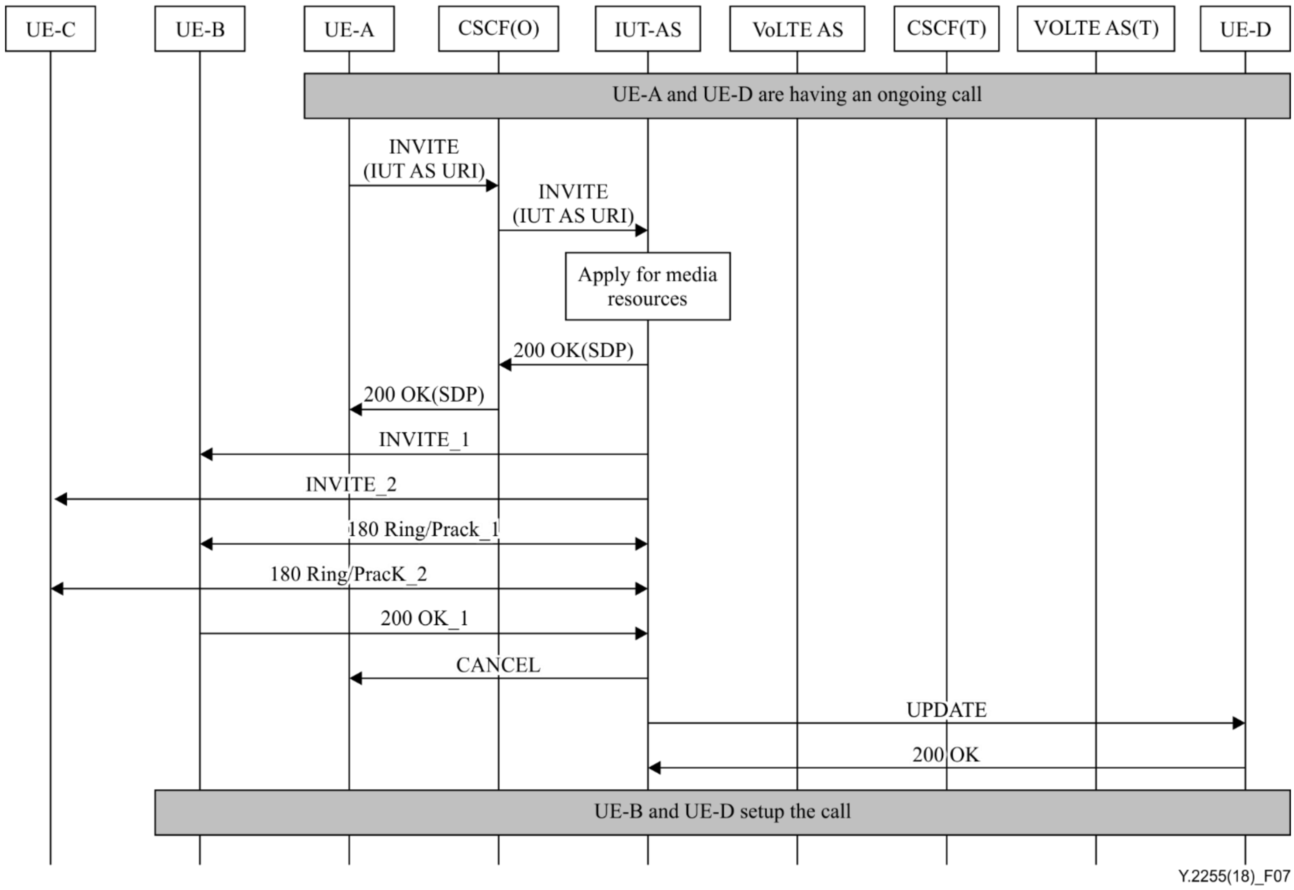

Figure 7 – MUE transfer to other devices by notifying all binding terminals

1 UE A and UE D are in an ongoing call;

2 UE A uses "switch button" to send an INVITE request (IUT- AS's URI is included) to IUT- AS, IUT- AS apply for the media resources, according to the subscription, IUT- AS separately send calls to UE B and UE C;

3 After UE B rings, the IUT- AS updates the media to UE D, while the IUT- AS sends CANCEL messages to UE A and UE C, releasing UE A and UE C;

4 UE B and UE D set up the call.

7.2.11.2 Switch to specified MUE

In this case, UE-A gets all the binding information through core network primarily and displays it to the users, so UE-A can send the handover request containing other MUE's information (e.g., URI) and handover to at least one of the other terminals bound to UE-A.

The IUT-AS releases the session connection between MUEs after the other MUE is connected with UE-D.

MUE transfer to other devices by switching to specified MUE uses the procedures as shown in Figure 8.

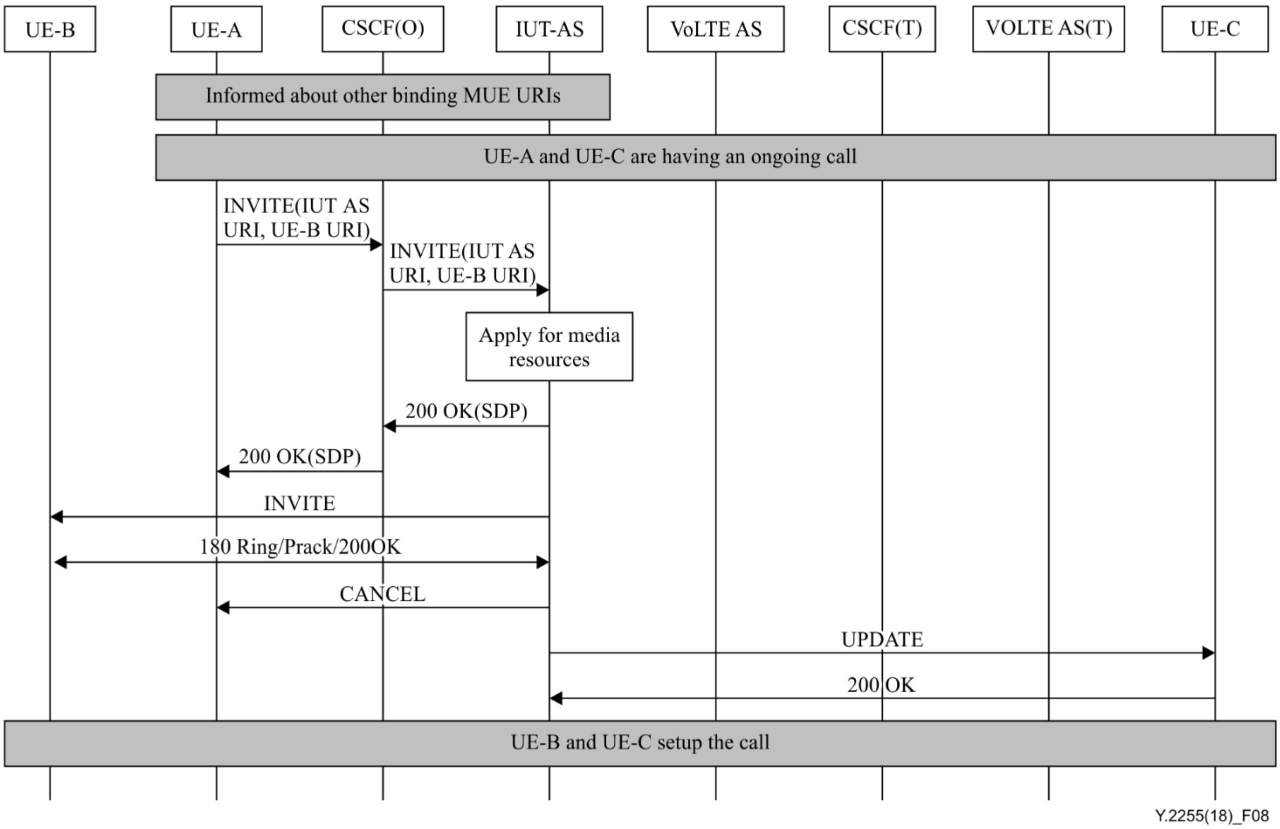

Figure 8 – MUE transfer to other devices by switching to specified MUE

1 UE A and UE C are in an ongoing call, UE A has been informed about other binding MUE URIs by the network.

2 UE A uses "switch button" to send INVITE request (IUT-AS's and UE B's URI are included) to IUT AS and IUT- AS applies for the media resources, according to the subscription and then IUT-AS sends call request to UE B;

3 After UE B rings, the IUT-AS updates the media to UE C, while the IUT-AS sends CANCEL message to UE A, releasing UE A;

4 UE B and UE C set up the call.

8 Security considerations

The security considerations of VCC over LTE, Wi-Fi and 2G/3G are aligned with the multi-connection security requirements according to [ITU-T Y.2027] and [ITU-T Y.2251].

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