

<https://nrcalculator.firebaseio.com/cheatsheet.html>

## EN-DC / MR-DC

• [Secondary Node Addition \(SCG Add\)](#)

• [Secondary Node Modification \(SCG Mod on same gNB\) – MN Initiated](#)

- [Secondary Node Modification \(SCG Mod on same gNB\) – SN Initiated with MN Involved](#)
- [Secondary Node Modification \(SCG Mod on same gNB\) – SN Initiated without MN Involved](#)
- [Secondary Node Modification \(SCG Mod on same gNB\) – Continued from previous](#)
- [Secondary Node Modification \(SCG Mod on same gNB\) – Continued from previous](#)

• [Secondary Node Release \(SCG Release\) – MN/SN Initiated](#)

• [Secondary Node Change \(SCG handover\) – MN Initiated](#)

• [Secondary Node Change \(SCG handover\) – SN Initiated](#)

• [Inter-MN Handover \(with/without SN change\)](#)

• [MN to eNB/gNB Change](#)

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• [RRC Transfer \(For special cases in red below\)](#)

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## VoLTE

### • Local

- [VoLTE UE Attachment and IMS Registration message sequence](#)
- [VoLTE UE Attachment and IMS Registration message sequence – Continued from previous](#)
- [VoLTE UE Initiated Detach & IMS Deregistration](#)
- [VoLTE to VoLTE MO Call](#)
- [VoLTE to VoLTE MT Call](#)
- [VoLTE to VoLTE Call Clearing \(Initiating Side Sequence\)](#)
- [VoLTE to VoLTE Call Clearing \(Receiving Side Sequence\)](#)
- [VoLTE MO to CS Call](#)
- [VoLTE MT to CS Call](#)
- [VoLTE to CS Call Clearing \(VoLTE Side Initiated\)](#)
- [VoLTE to CS Call Clearing \(VoLTE is Receiving side\)](#)
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- [Roaming VoLTE UE Attach](#)
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- [Roaming VoLTE UE Initiated Detach](#)
- [Roaming VoLTE to VoLTE MO Call](#)
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- [Roaming VoLTE to VoLTE Call Clearing \(Initiated by Roamer\)](#)
- [Roaming VoLTE to VoLTE Call Clearing \(Received by Roamer\)](#)

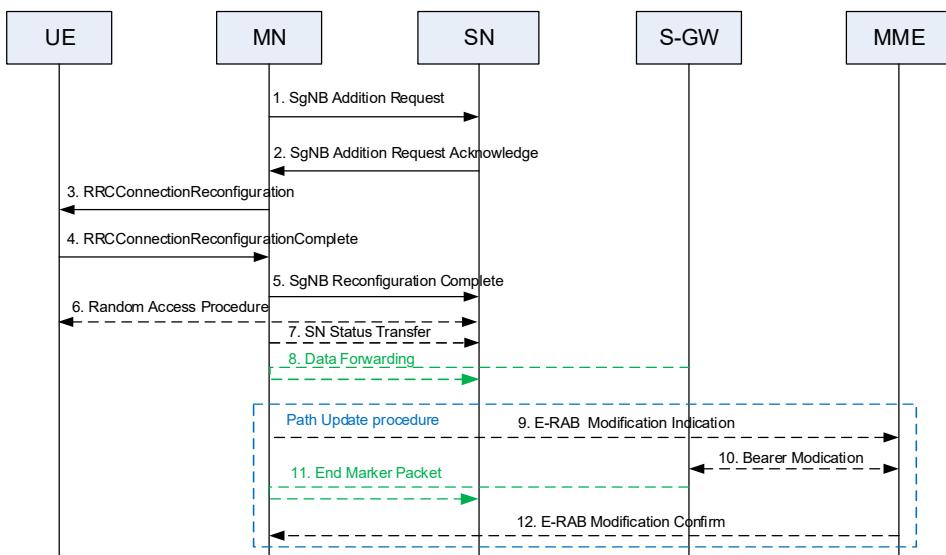
### • VoLTE Packet Drops

Please send any issues to Ali Asgher Mansoor Habiby  
[aliasgherman at gmail dot com]

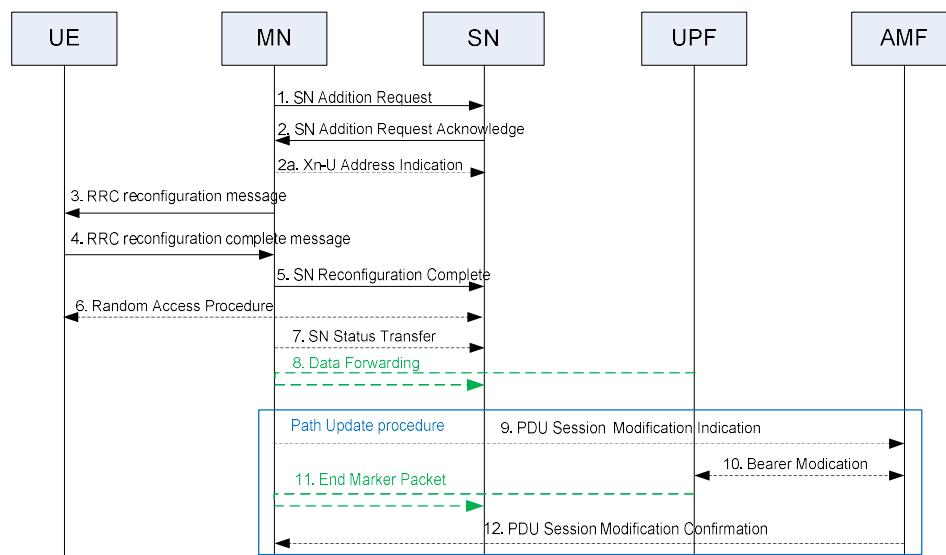
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Procedure	Secondary Node Addition (SCG Add)
Specification	37.340
Section	10.2 [TS 37.340 V16.5.0]

## EN-DC

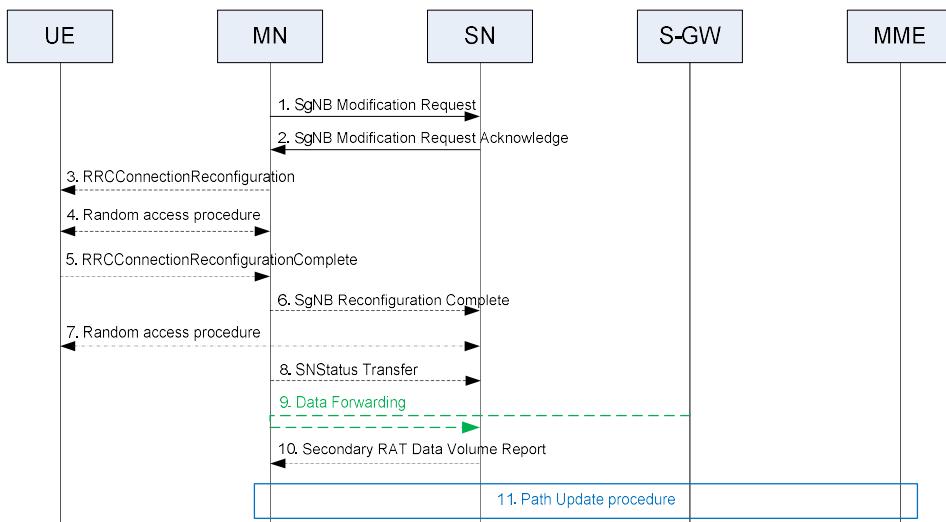


## MR-DC with 5GC

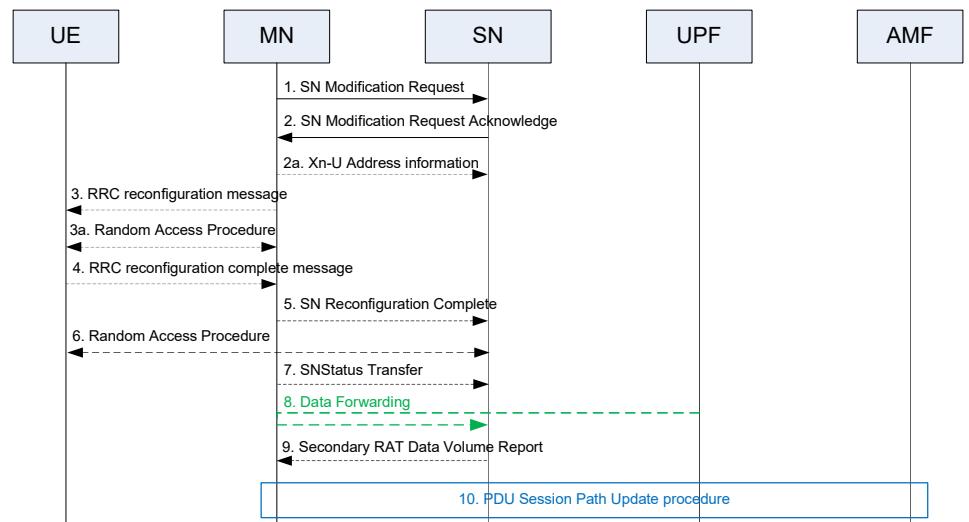


Procedure	Secondary Node Modification (SCG Mod on same gNB)
Specification	37.340
Section	10.3 [TS 37.340 V16.5.0]

## EN-DC



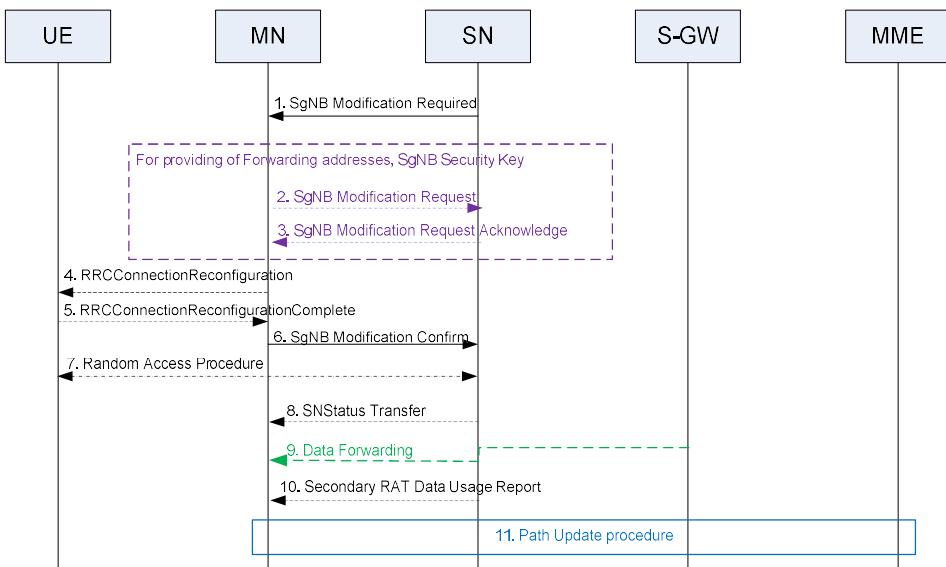
## MR-DC with 5GC



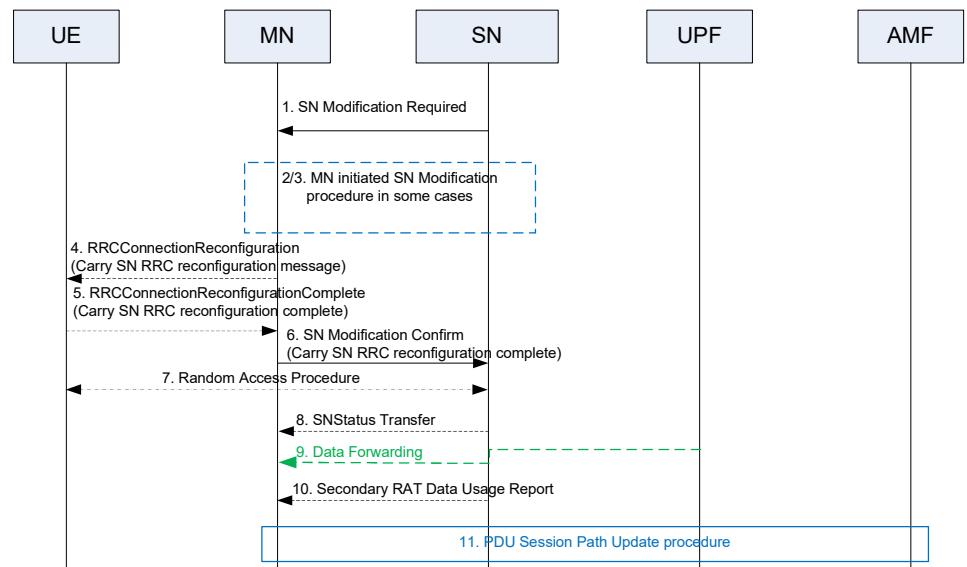
## MN-Initiated SN Modification

Procedure	Secondary Node Modification (SCG Mod on same gNB)
Specification	37.340
Section	10.3 [TS 37.340 V16.5.0]

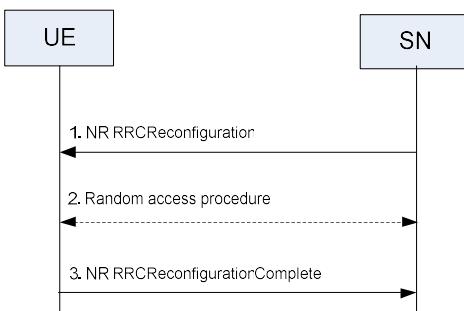
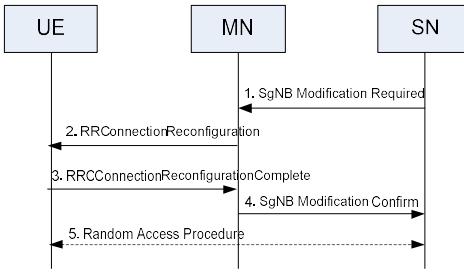
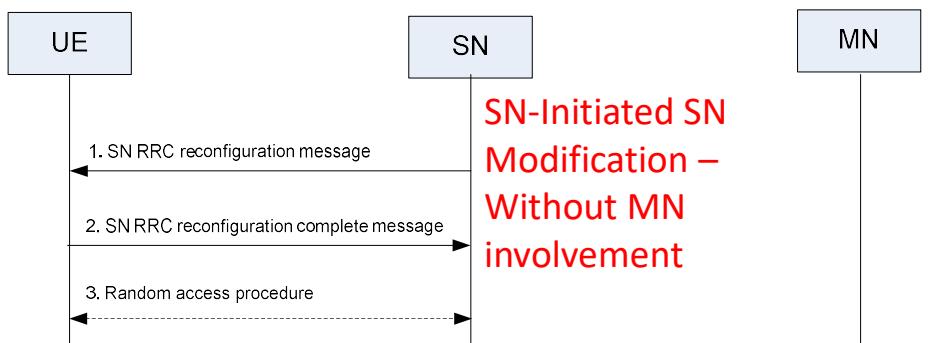
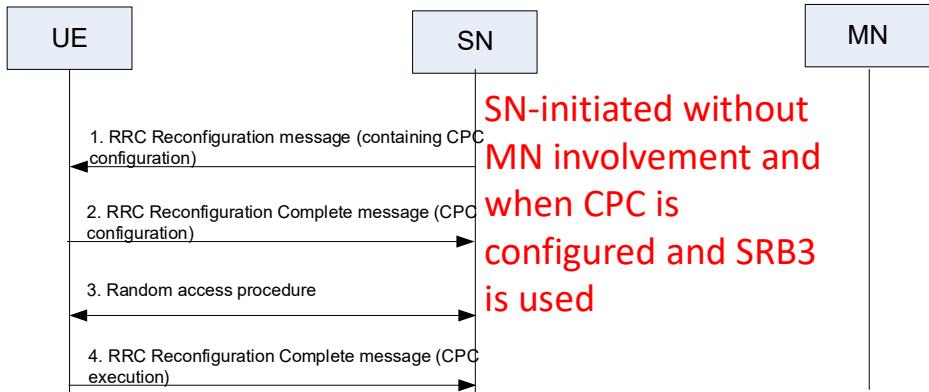
## EN-DC



## MR-DC with 5GC



## SN-Initiated SN Modification (with MN Involvement)

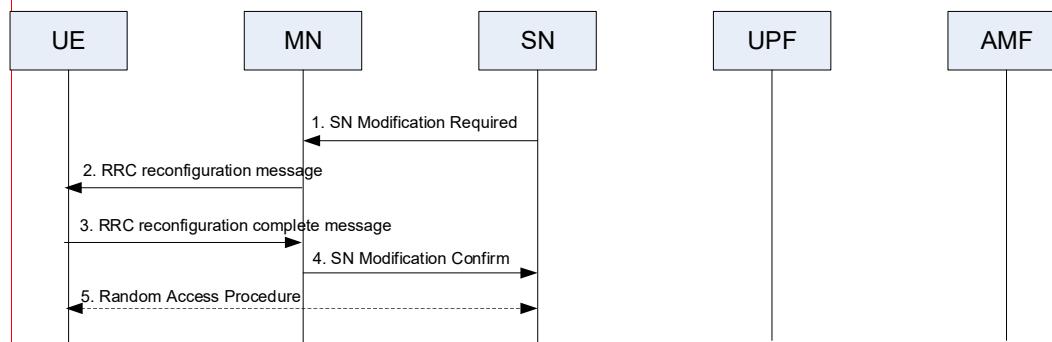
Procedure	Secondary Node Modification (SCG Mod on same gNB)
Specification	37.340
Section	10.3 [TS 37.340 V16.5.0]
<b>EN-DC</b>	
 <p>Transfer of an NR RRC message to/from the UE (when SRB3 is not used)</p>	
 <p>Transfer of an NR RRC message to/from the UE (when SRB3 is not used)</p>	
<b>MR-DC with 5GC</b>	
	<p>SN-Initiated SN Modification – Without MN involvement</p> 
	<p>SN-initiated without MN involvement and when CPC is configured and SRB3 is used</p> 
<b>SN-Initiated SN Modification (without MN Involvement)</b>	

Procedure	Secondary Node Modification (SCG Mod on same gNB)
Specification	37.340
Section	10.3 [TS 37.340 V16.5.0]

**EN-DC**

*Continued from previous*

**MR-DC with 5GC**



**Transfer of an NR RRC message to/from the UE (when SRB3 is not used)**

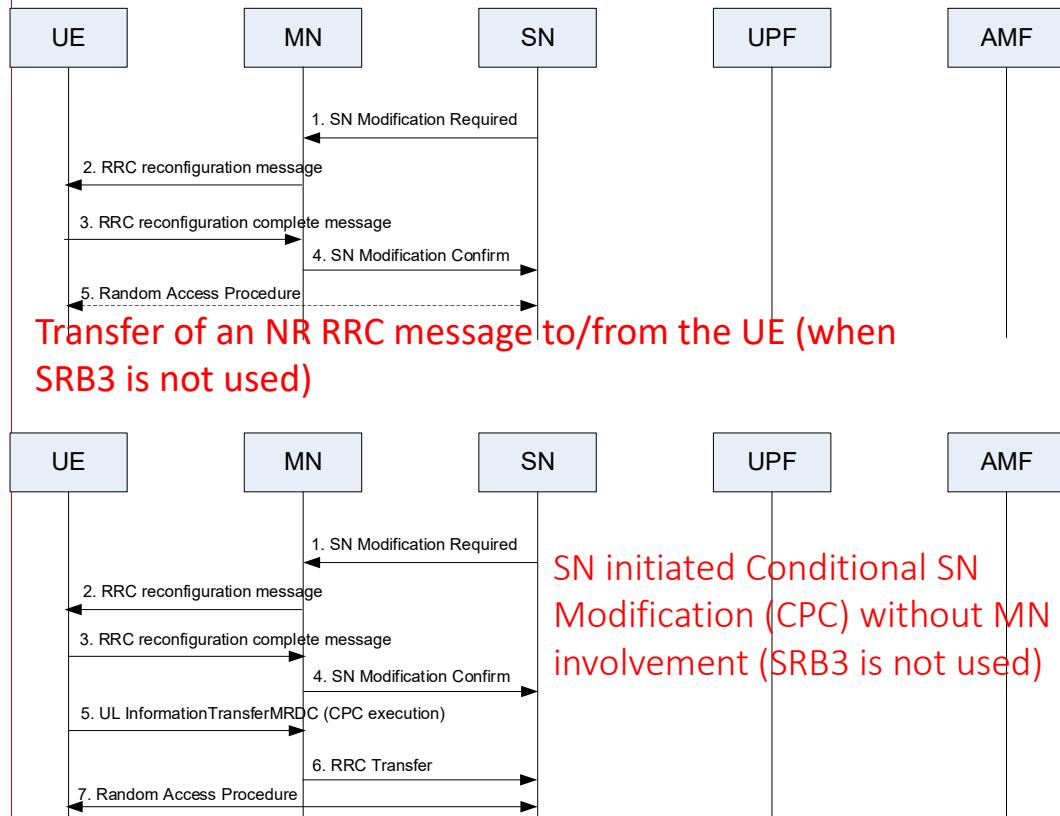
**SN-Initiated SN Modification (**without** MN Involvement)**

Procedure	Secondary Node Modification (SCG Mod on same gNB)
Specification	37.340
Section	10.3 [TS 37.340 V16.5.0]

## EN-DC

*Continued from previous*

### MR-DC with 5GC

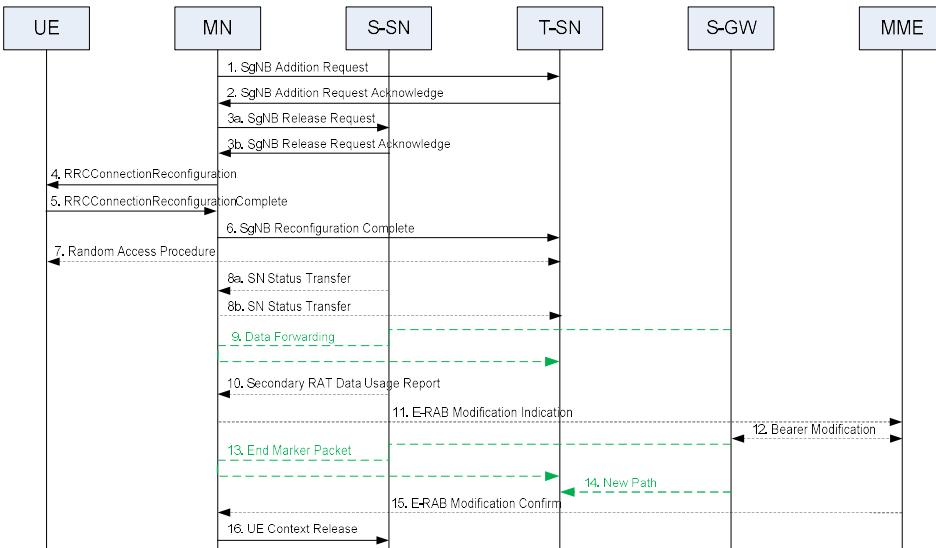


### SN-Initiated SN Modification (without MN Involvement)

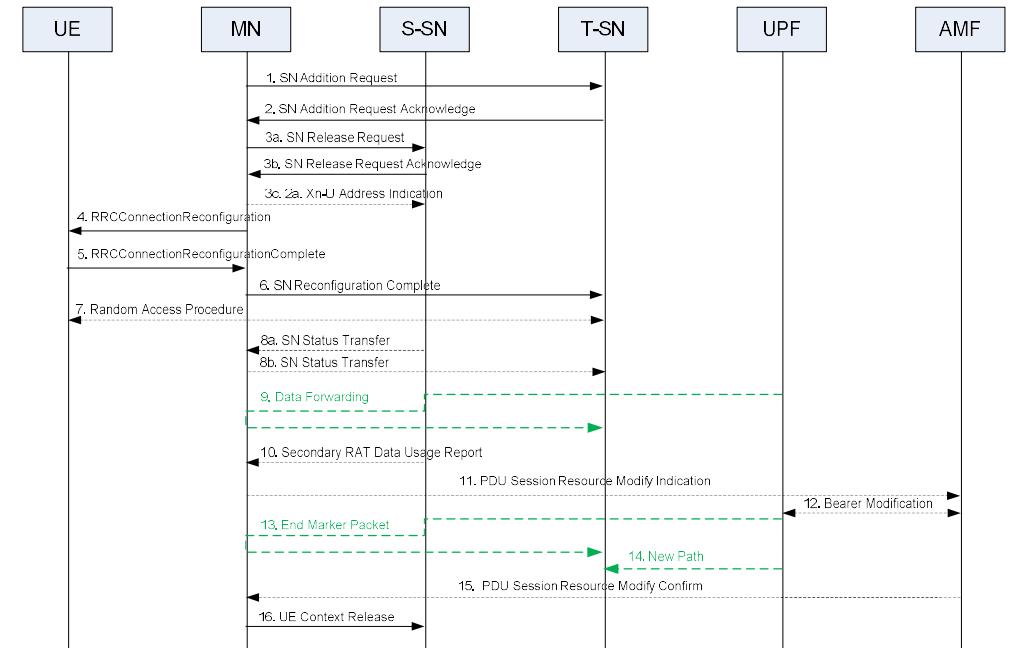
Procedure	Secondary Node Release (SCG Release)
Specification	37.340
Section	10.4 [TS 37.340 V16.5.0]
<b>EN-DC</b>	
	<b>MR-DC with 5GC</b> <p><b>SN Release – MN Initiated</b></p>
	<p><b>SN Release – SN Initiated</b></p>

Procedure	Secondary Node Change (SCG handover) – MN Initiated
Specification	37.340
Section	10.5 [TS 37.340 V16.5.0]

## EN-DC

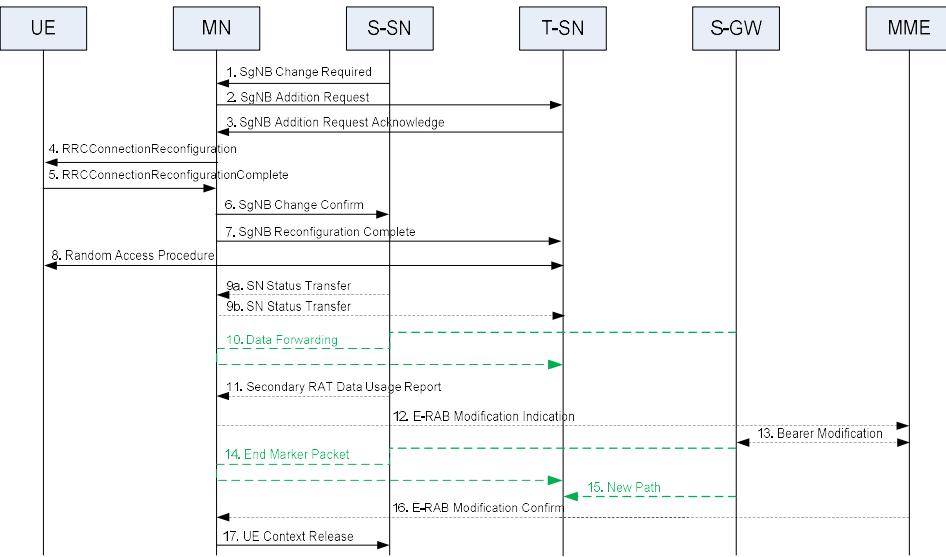


## MR-DC with 5GC

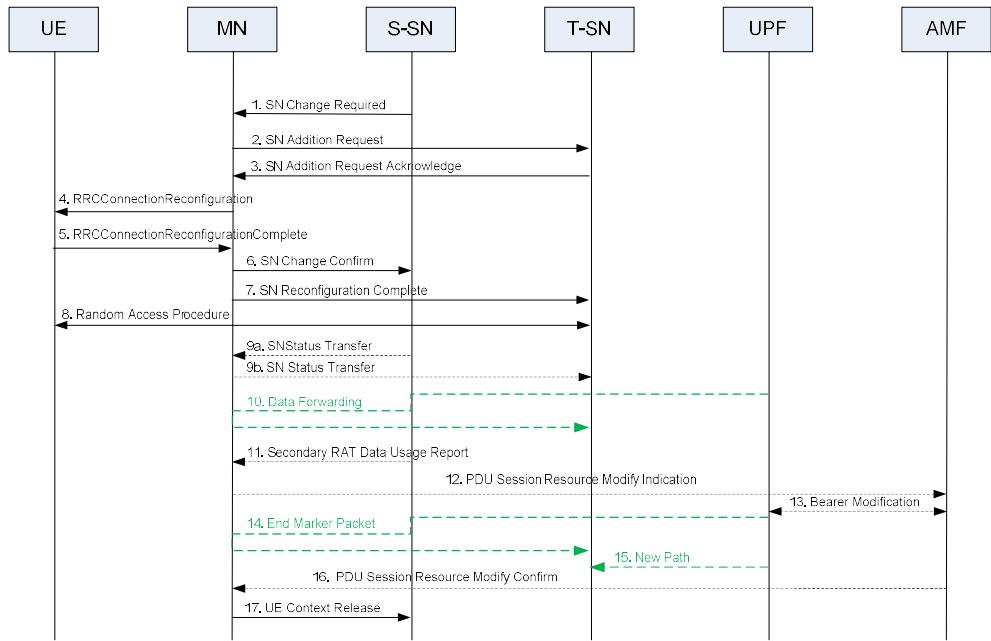


Procedure	Secondary Node Change (SCG handover) – SN Initiated
Specification	37.340
Section	10.5 [TS 37.340 V16.5.0]

## EN-DC

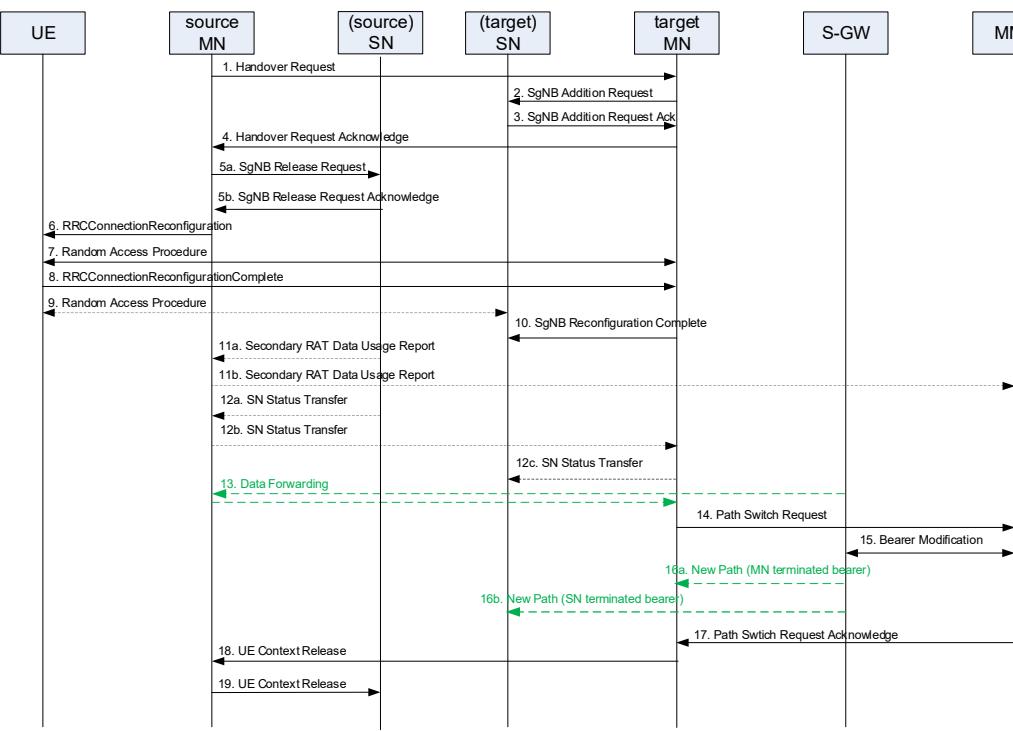


## MR-DC with 5GC

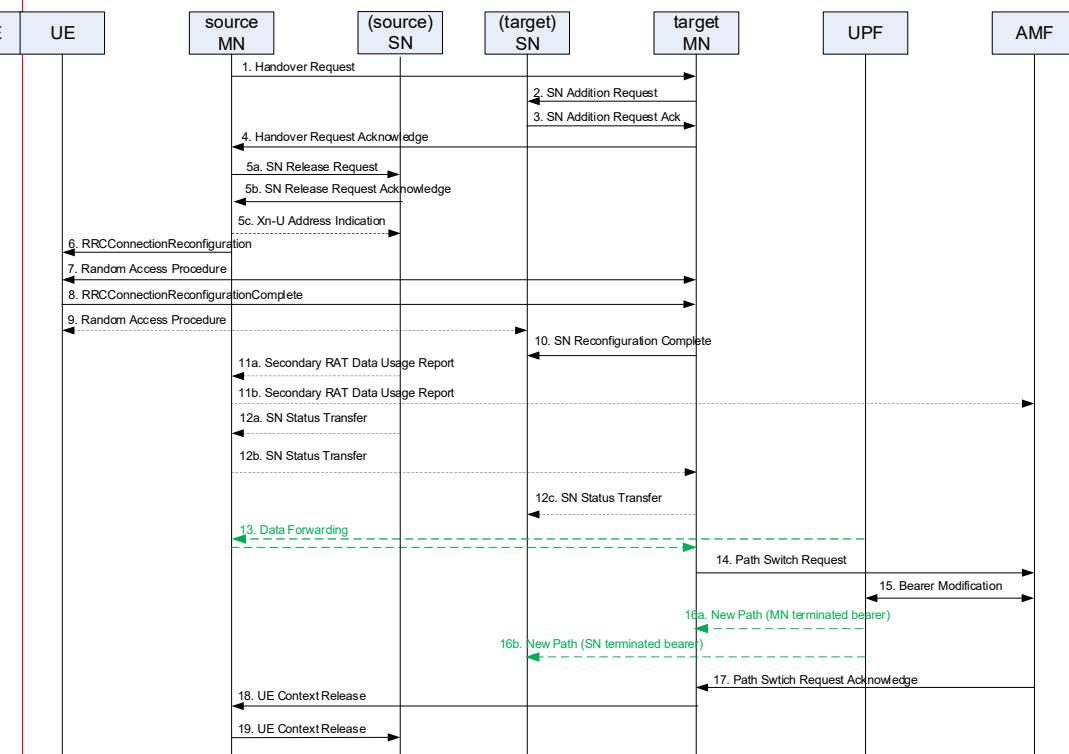


Procedure	Inter-MN Handover (with/without SN change)
Specification	37.340
Section	10.7 [TS 37.340 V16.5.0]

EN-DC



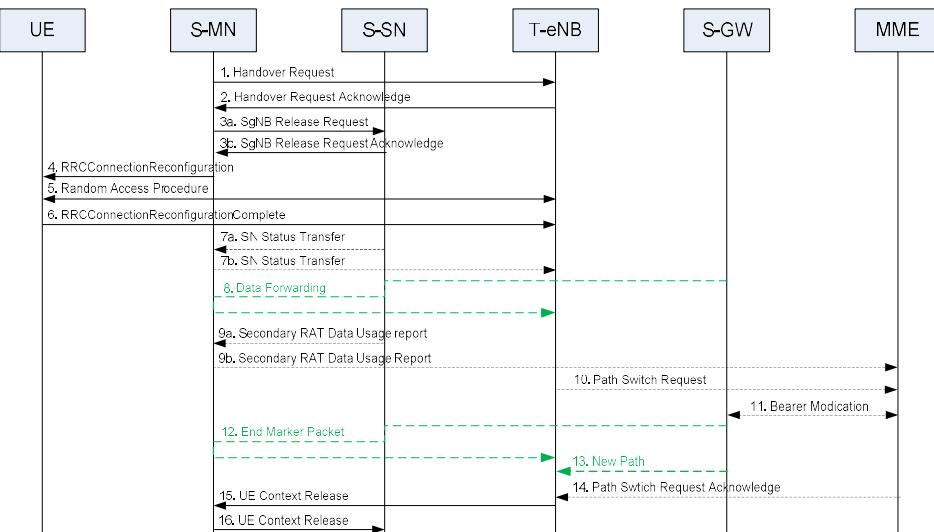
# MR-DC with 5GC



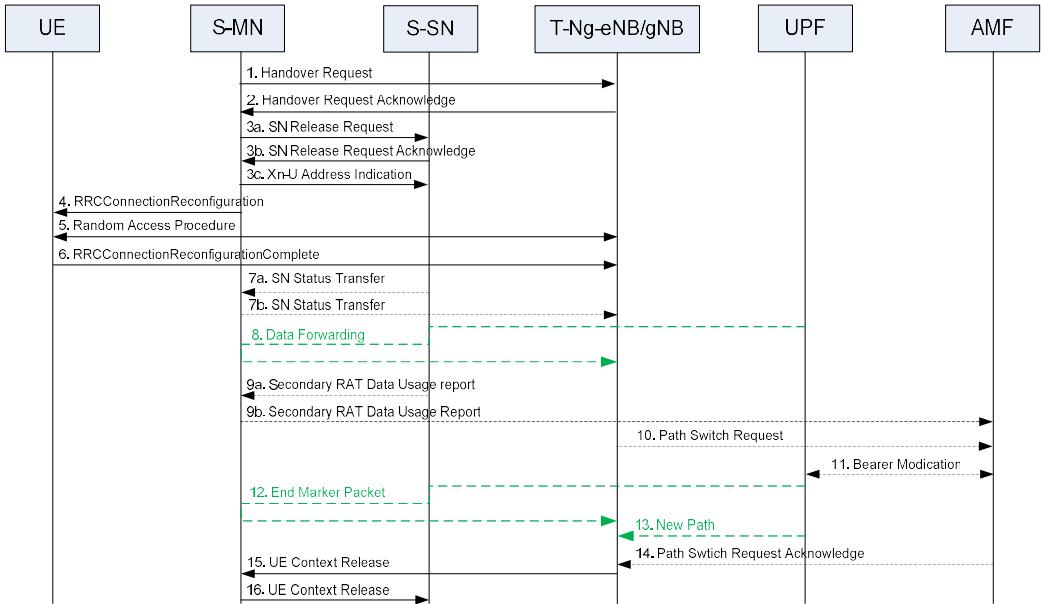
If SN change is not required, then assume that target SN is same as source SN

Procedure	MN to eNB/gNB Change
Specification	37.340
Section	10.8 [TS 37.340 V16.5.0]

## EN-DC

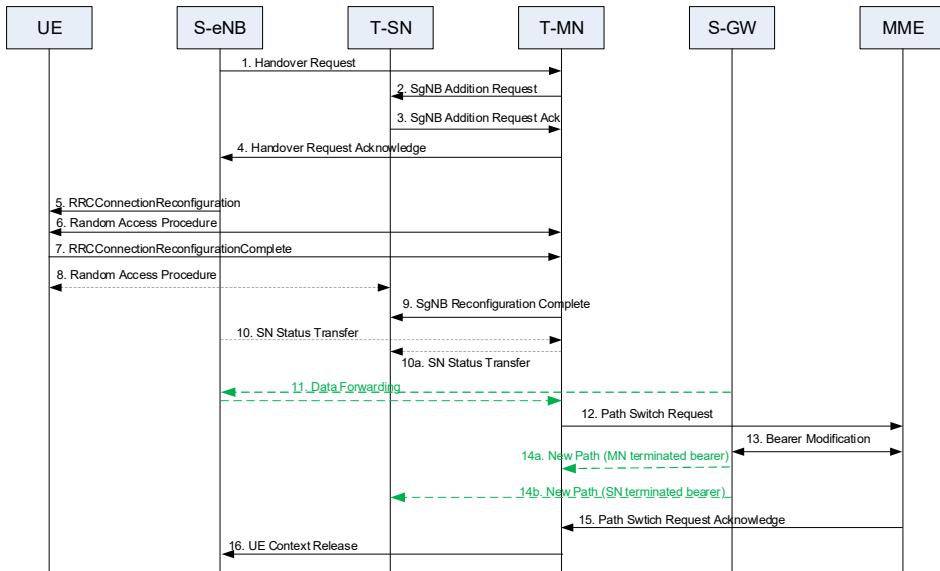


## MR-DC with 5GC

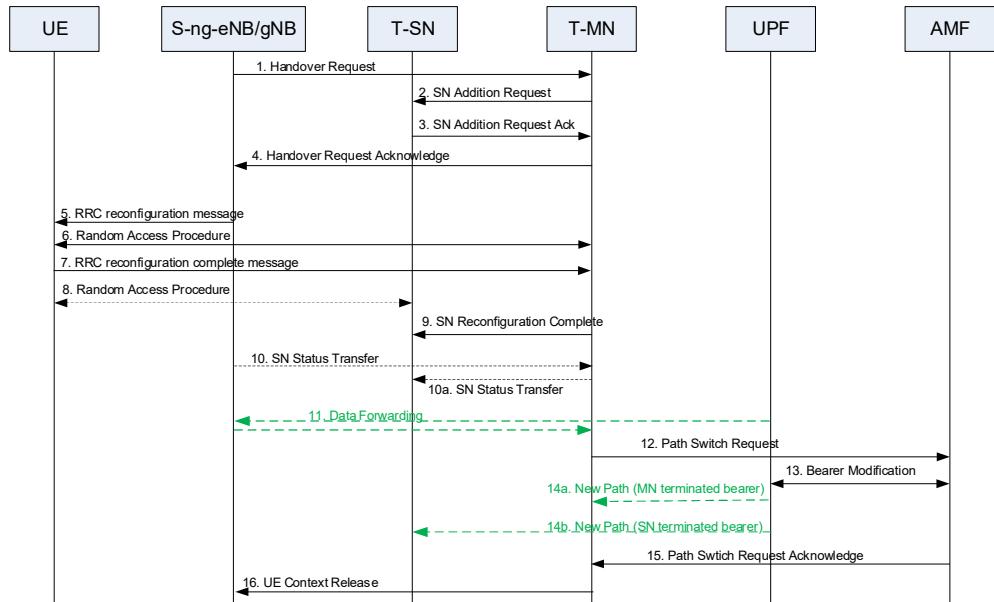


Procedure	eNB/gNB to MN Change
Specification	37.340
Section	10.9 [TS 37.340 V16.5.0]

## EN-DC

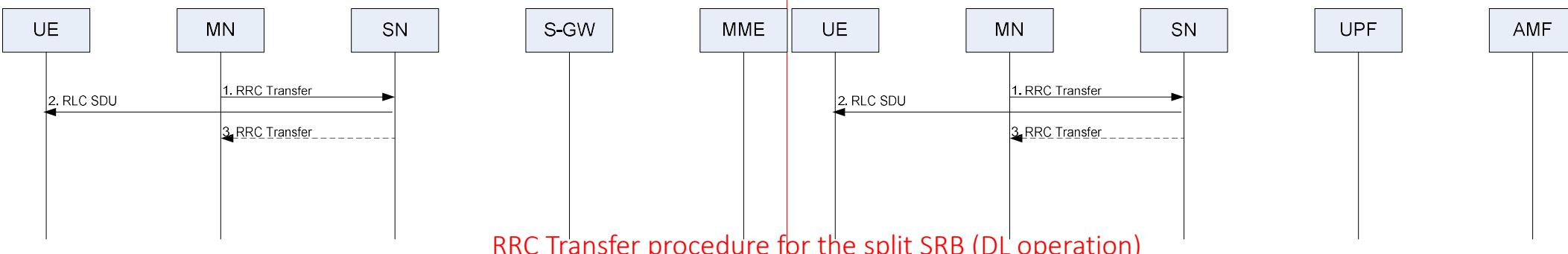


## MR-DC with 5GC

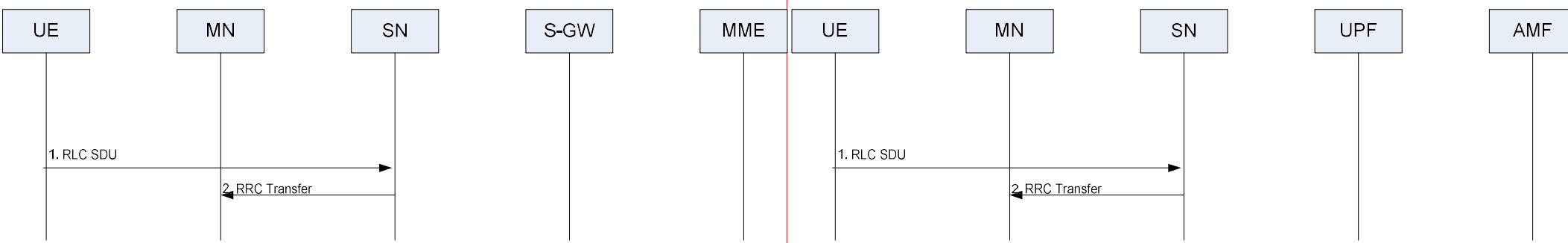


Procedure	RRC Transfer (when split SRB is utilized)
Specification	37.340
Section	10.10 [TS 37.340 V16.5.0]

## EN-DC

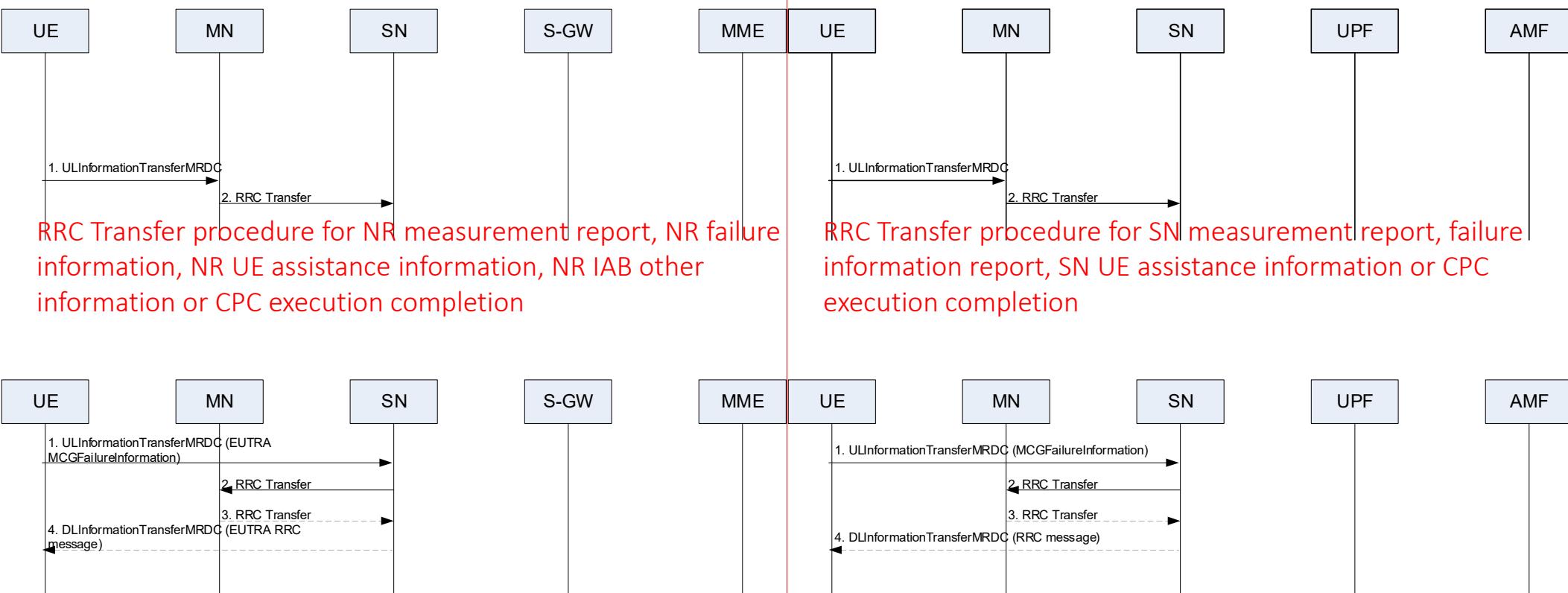


## MR-DC with 5GC



Procedure	RRC Transfer (For special cases in red below)
Specification	37.340
Section	10.10 [TS 37.340 V16.5.0]

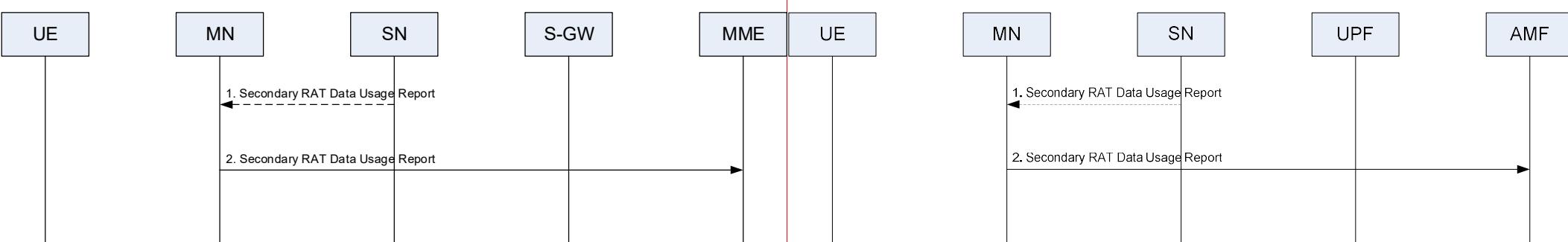
## EN-DC



Procedure	Secondary RAT Usage Reporting
Specification	37.340
Section	10.11 [TS 37.340 V16.5.0]

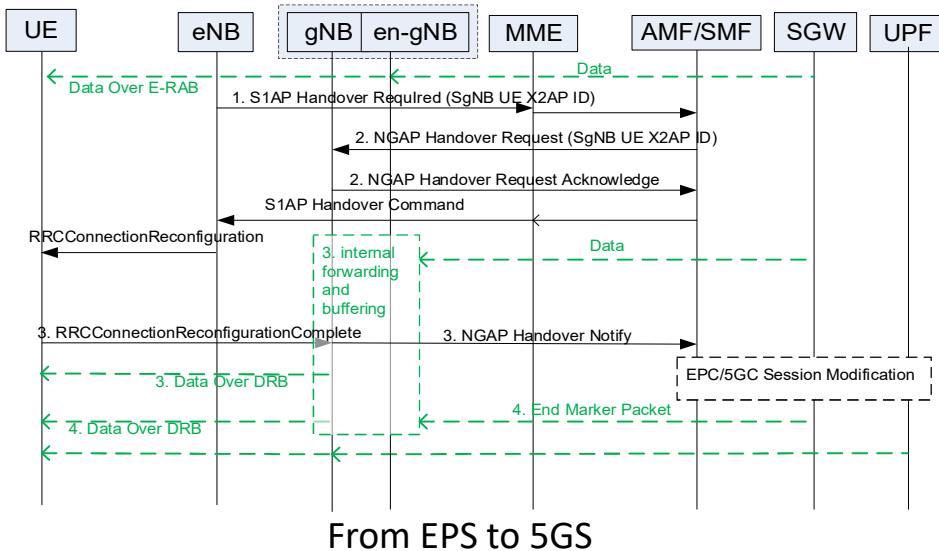
**EN-DC**

**MR-DC with 5GC**

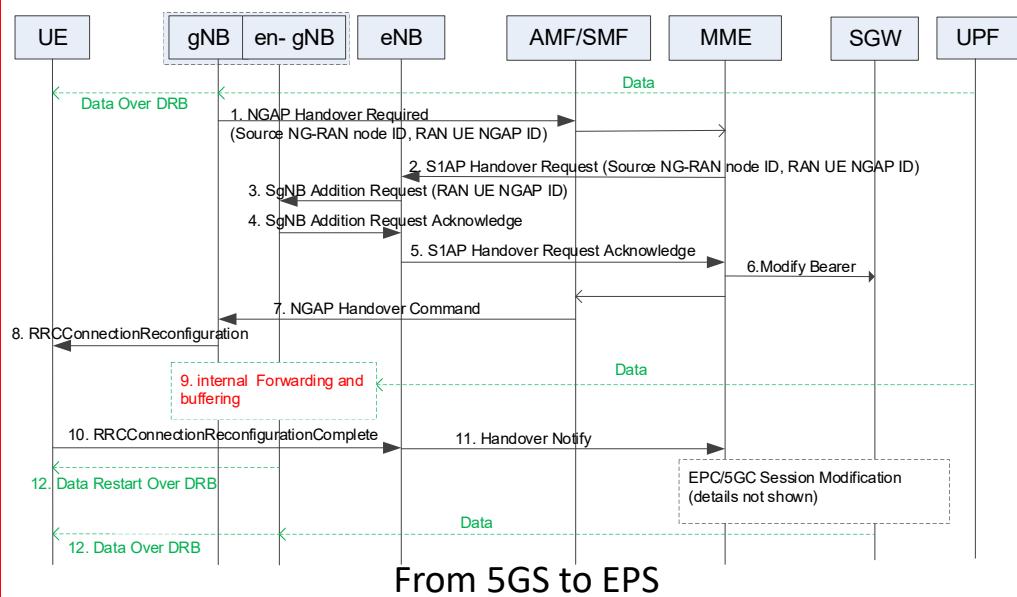


Procedure	Inter-System Handover
Specification	37.340
Section	10.16 [TS 37.340 V16.5.0]

## EN-DC



## MR-DC with 5GC

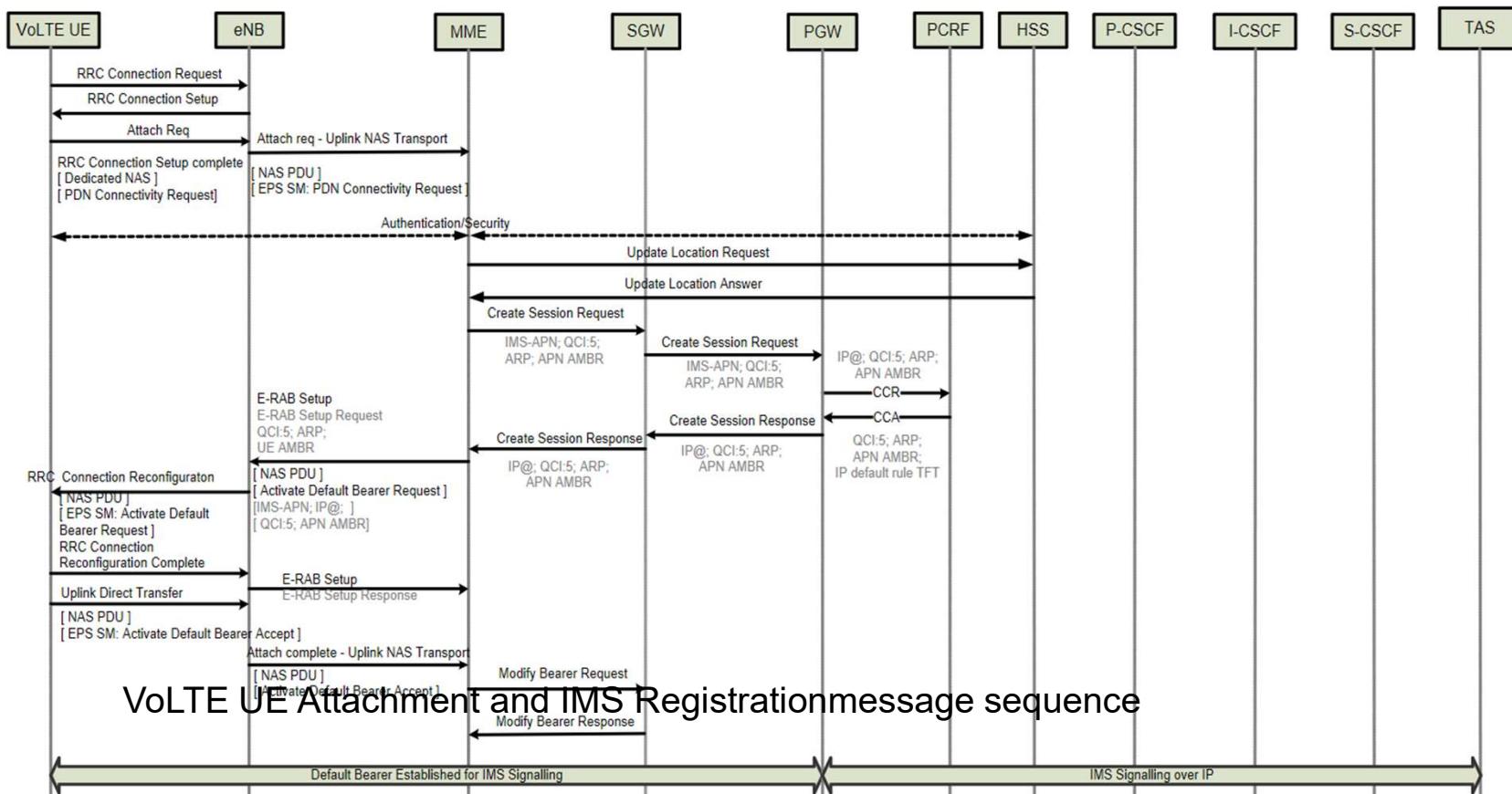


Procedure	Supported Handover b/w MR-DC
Specification	37.340
Section	Appendix B [TS 37.340 V16.5.0]

Table B-1: Supported MR-DC handover scenarios.

HO from (row) \ To (column)	E-UTRA with EPC	E-UTRA with 5GC	NR	GERAN or UTRAN	EN-DC	NGEN-DC	NE-DC	NR-DC
E-UTRA with EPC	YES	YES	YES	YES	YES	NO	NO	NO
E-UTRA with 5GC	YES	YES	YES	NO	NO	YES	NO	NO
NR	YES	YES	YES	NOTE 1	YES	NO	YES	YES
GERAN or UTRAN	YES	NO	NO	YES	NO	NO	NO	NO
EN-DC	YES	YES	YES	YES	YES	NO	NO	NO
NGEN-DC	YES	YES	YES	NO	NO	YES	NO	NO
NE-DC	YES	YES	YES	NOTE 1	NO	NO	YES	NO
NR-DC	YES	YES	YES	NOTE 1	NO	NO	NO	YES

Procedure	VoLTE UE Attachment and IMS Registration message sequence
Specification	<a href="https://www.gsma.com/futurenetworks/wp-content/uploads/2014/05/FCM.01-v1.1.pdf">https://www.gsma.com/futurenetworks/wp-content/uploads/2014/05/FCM.01-v1.1.pdf</a>
Section	Figure 3

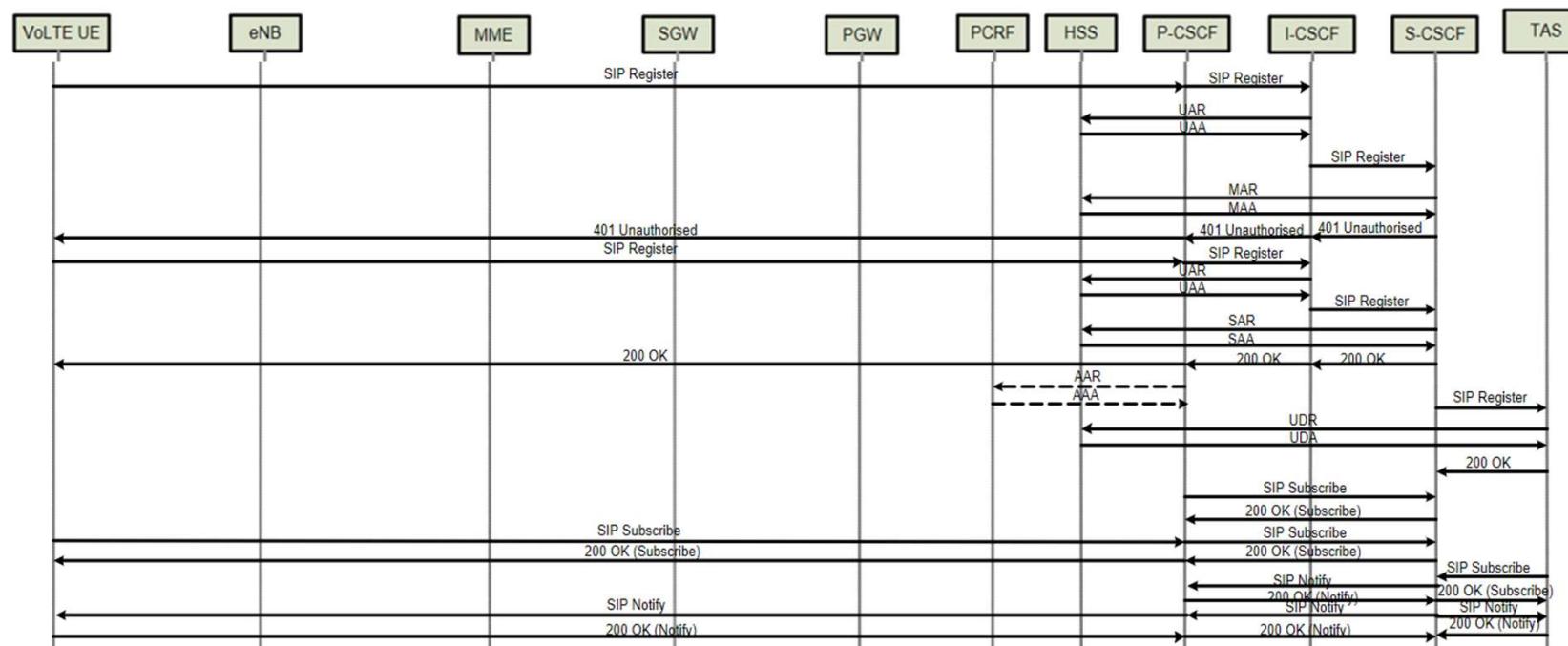


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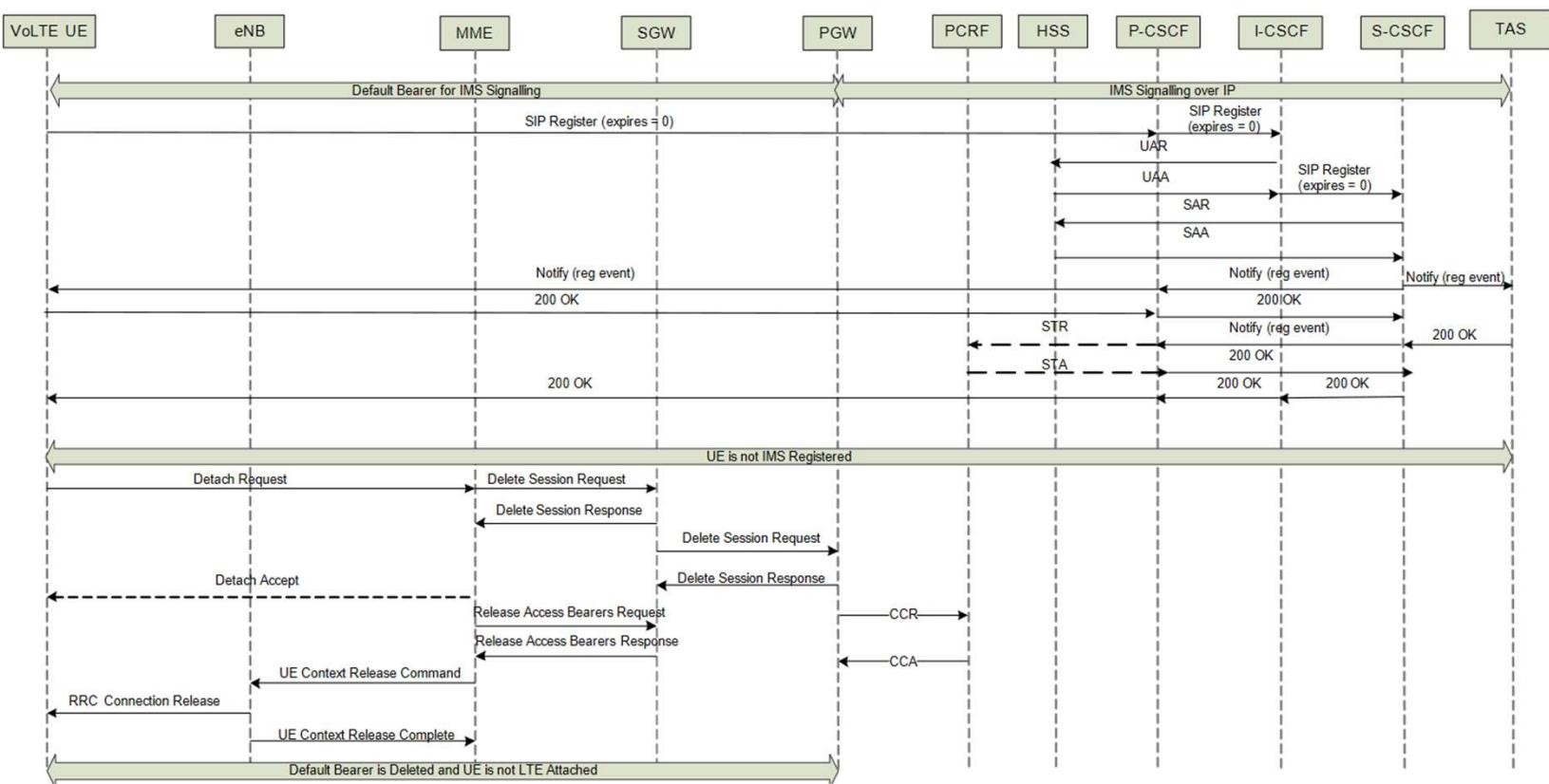
Procedure	VoLTE UE Attachment and IMS Registration message sequence
Specification	<a href="https://www.gsma.com/futurenetworks/wp-content/uploads/2014/05/FCM.01-v1.1.pdf">https://www.gsma.com/futurenetworks/wp-content/uploads/2014/05/FCM.01-v1.1.pdf</a>
Section	Figure 3

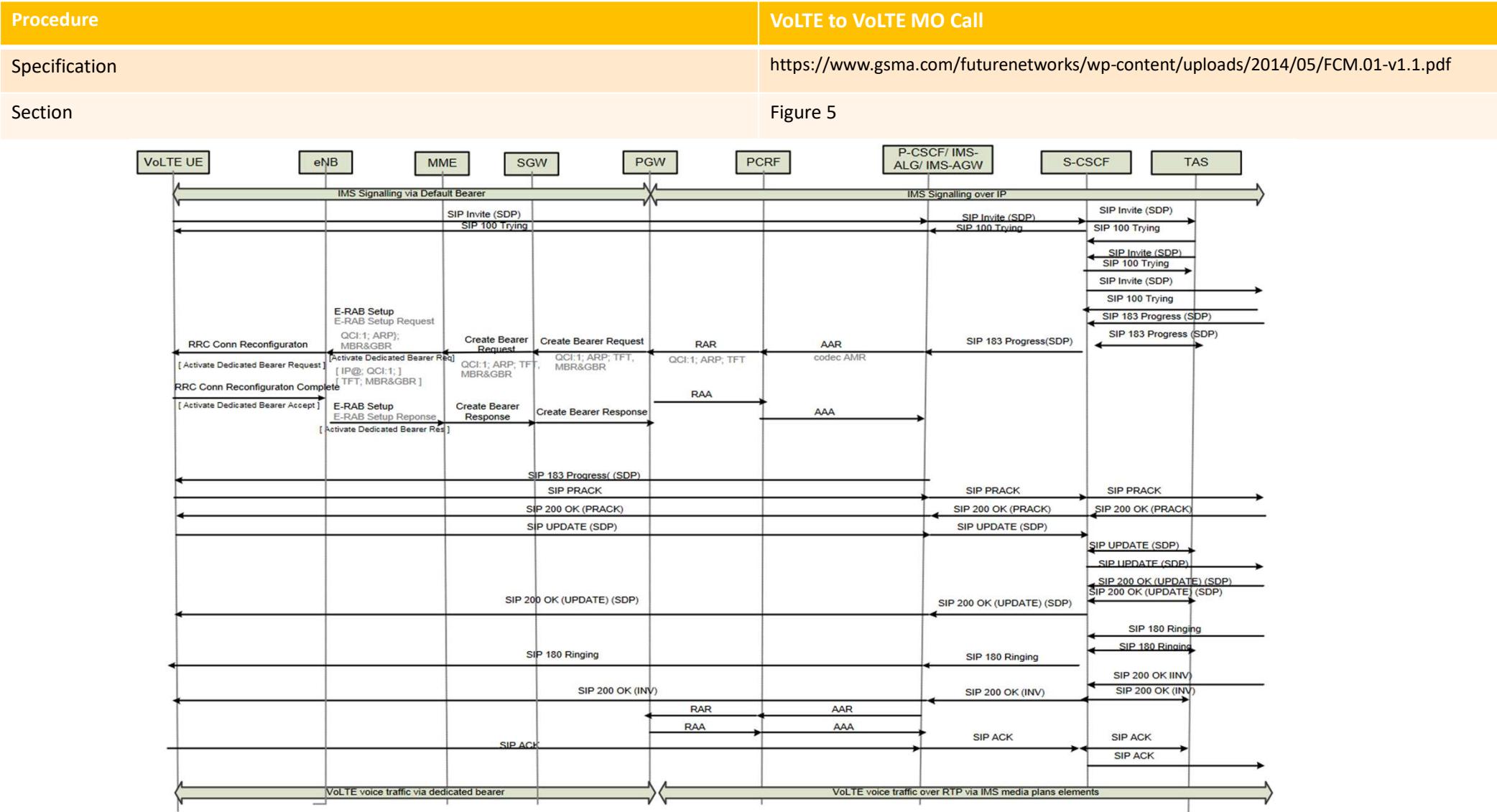
PREVIOUS SNAPSHOT

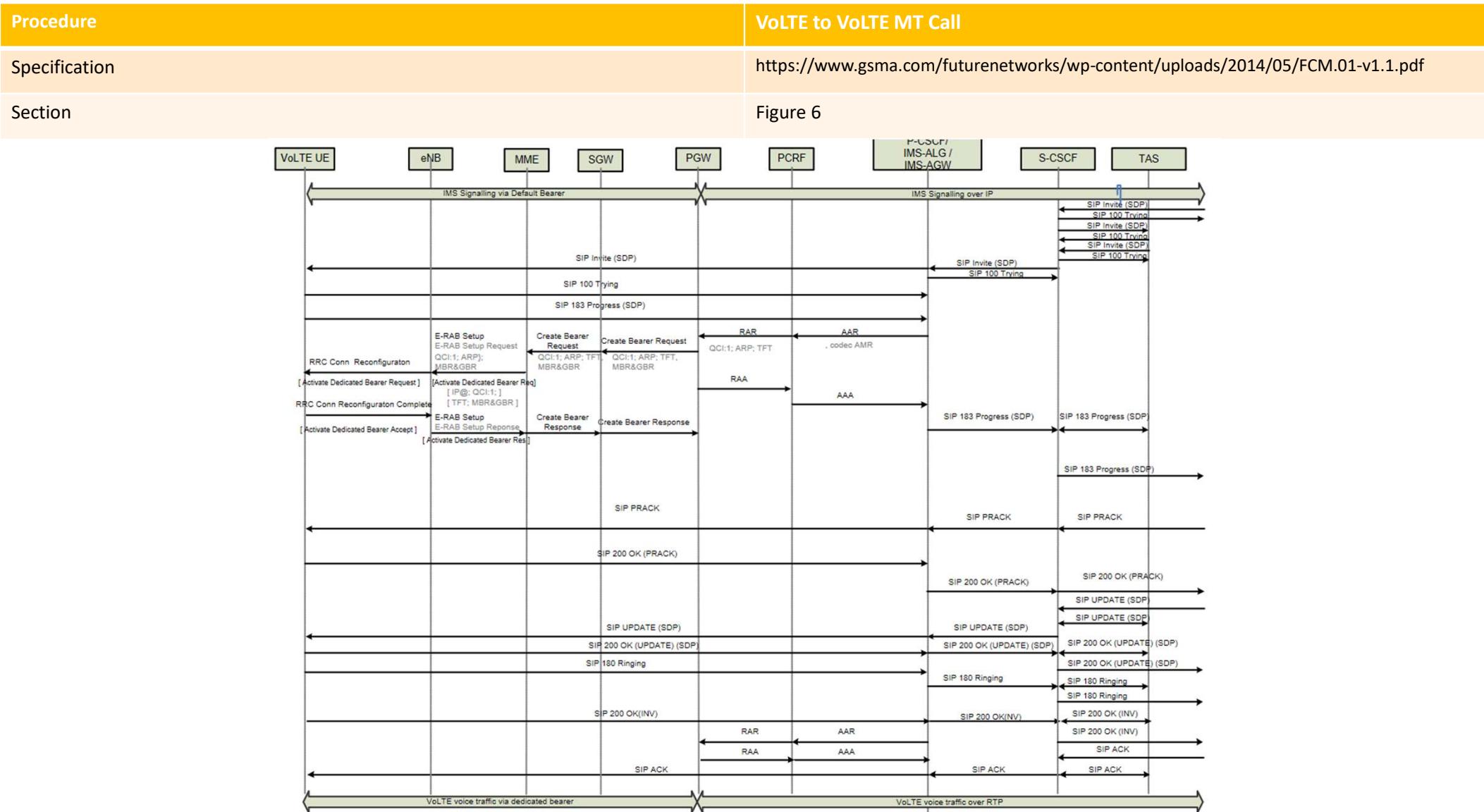
CONTINUED



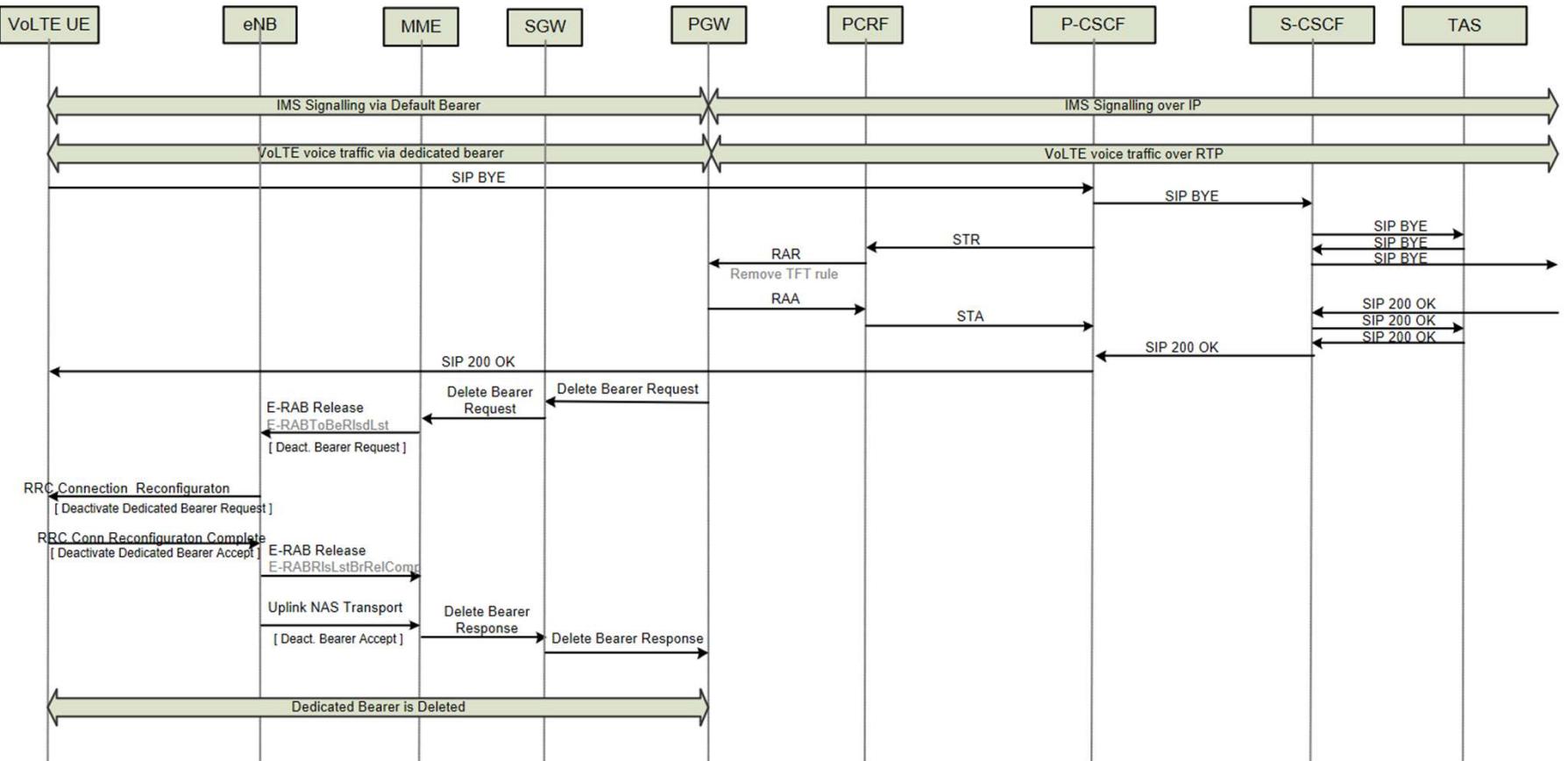
Procedure	VoLTE UE Initiated Detach & IMS Deregistration
Specification	<a href="https://www.gsma.com/futurenetworks/wp-content/uploads/2014/05/FCM.01-v1.1.pdf">https://www.gsma.com/futurenetworks/wp-content/uploads/2014/05/FCM.01-v1.1.pdf</a>
Section	Figure 4



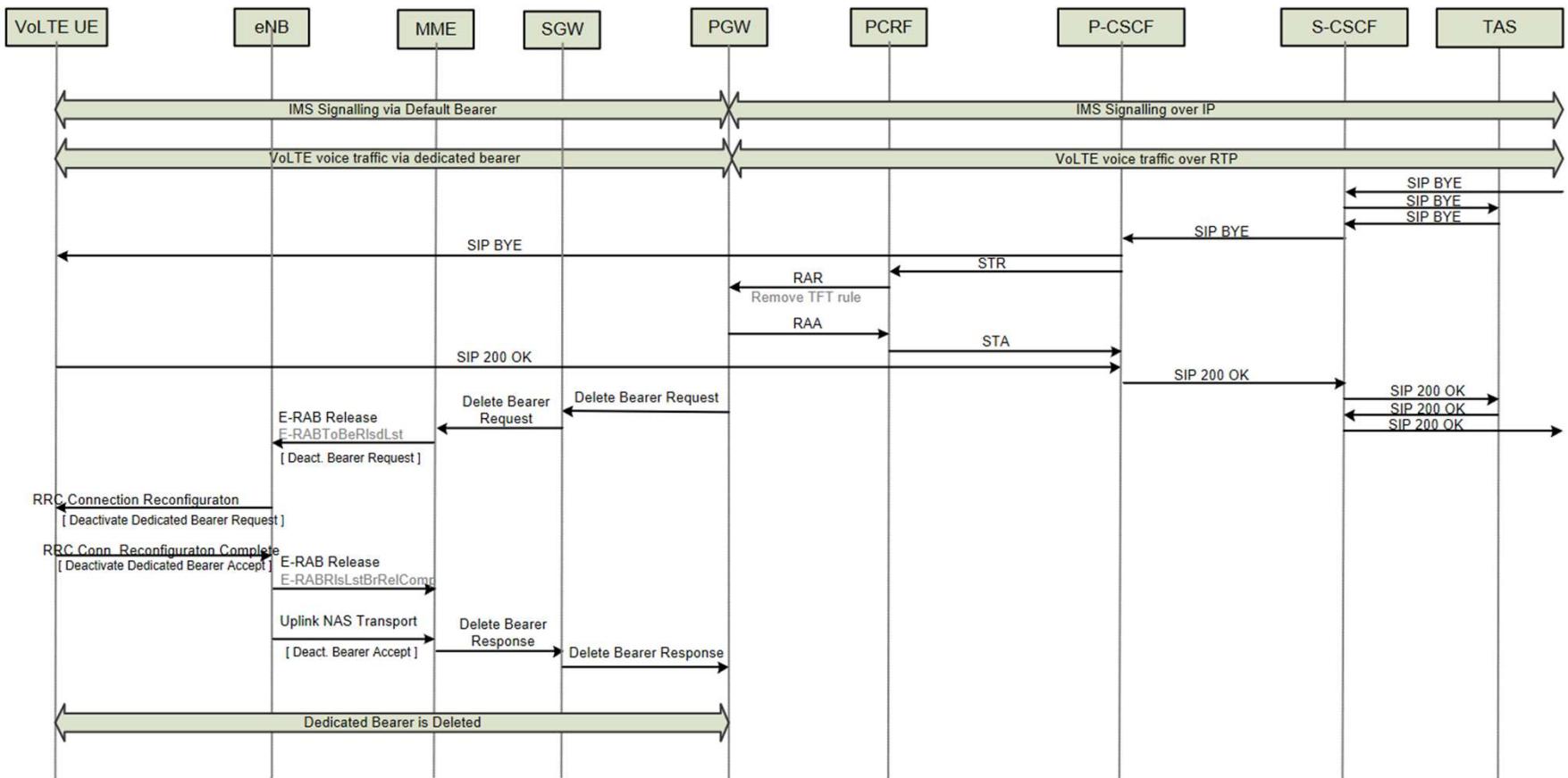




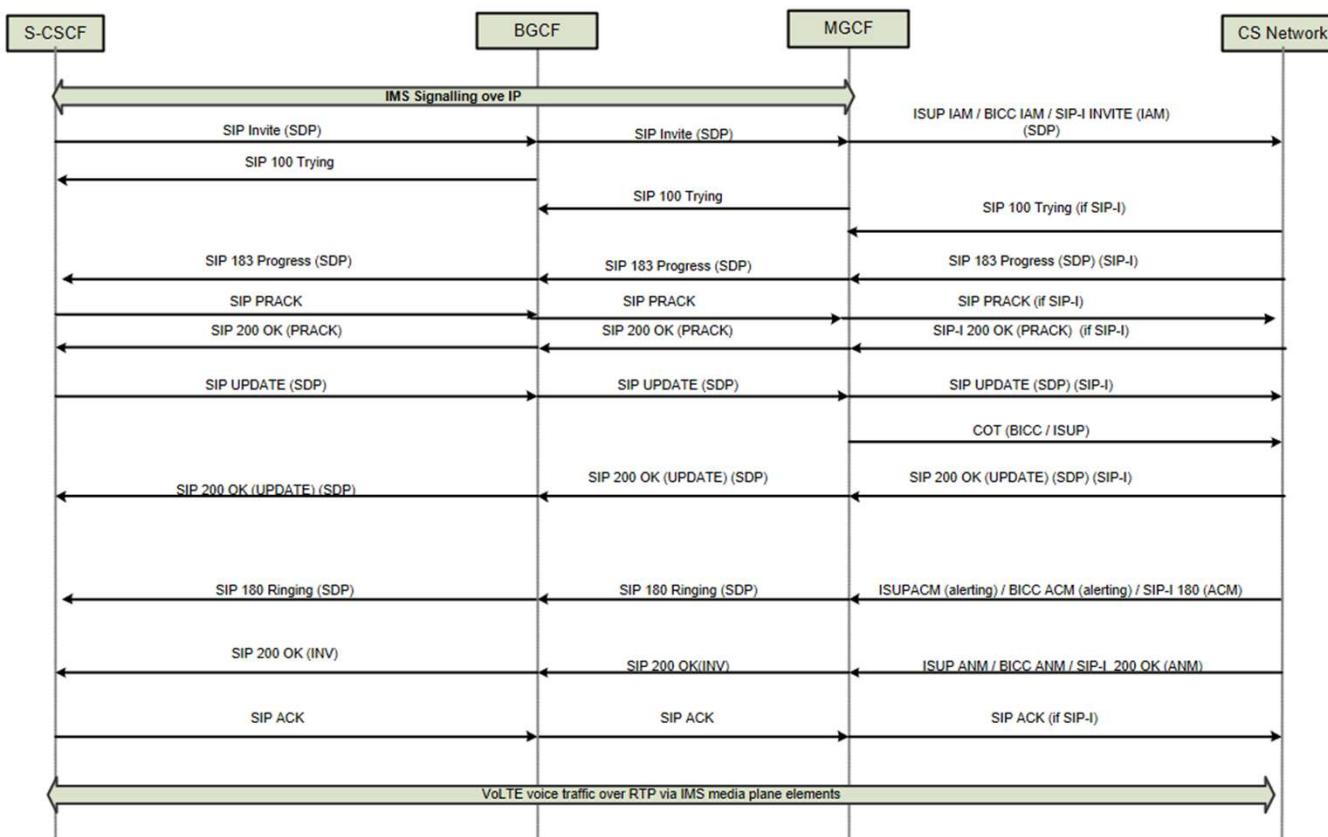
Procedure	VoLTE to VoLTE Call Clearing (Initiating Side Sequence)
Specification	<a href="https://www.gsma.com/futurenetworks/wp-content/uploads/2014/05/FCM.01-v1.1.pdf">https://www.gsma.com/futurenetworks/wp-content/uploads/2014/05/FCM.01-v1.1.pdf</a>
Section	Figure 7



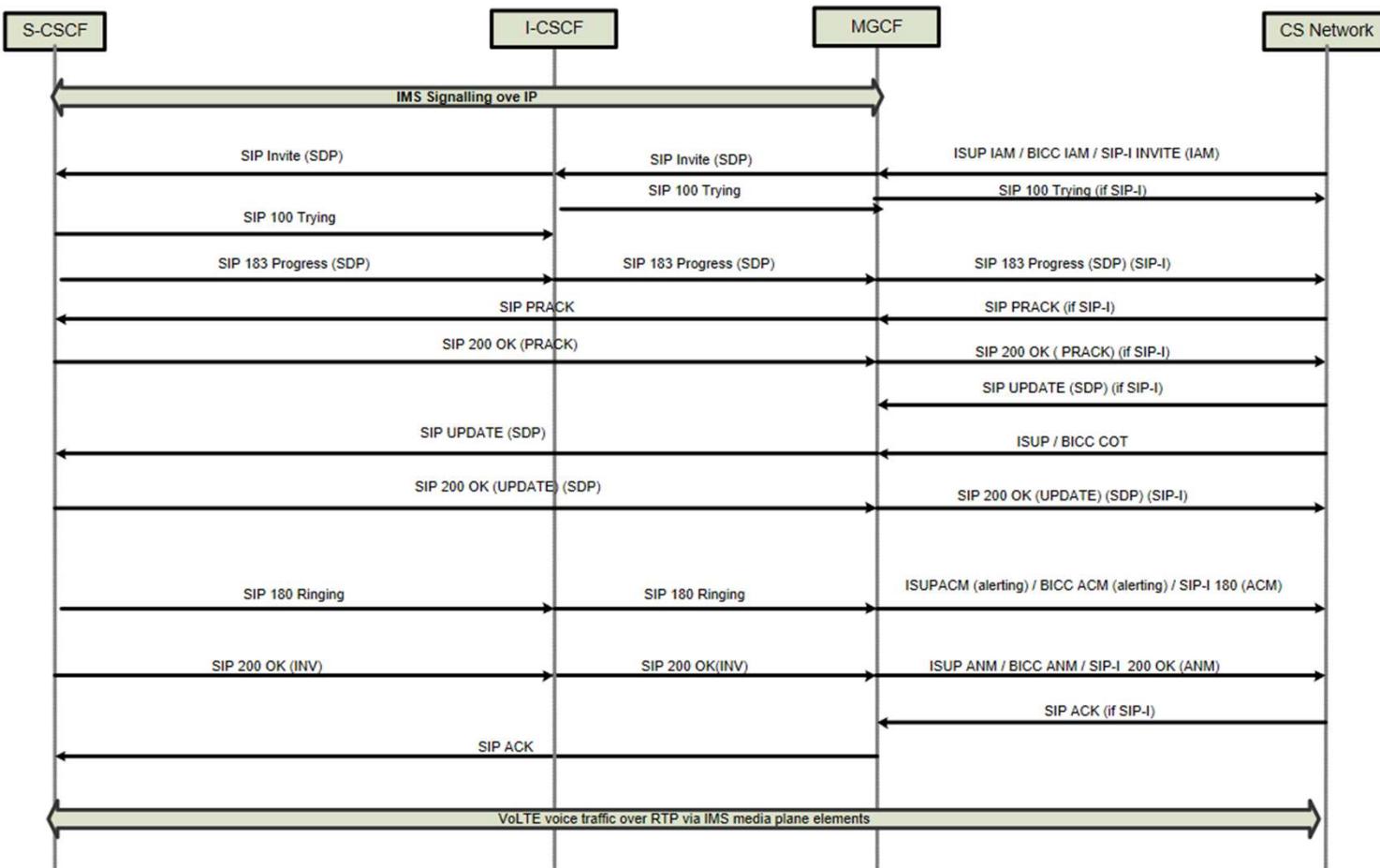
Procedure	VoLTE to VoLTE Call Clearing (Receiving Side Sequence)
Specification	<a href="https://www.gsma.com/futurenetworks/wp-content/uploads/2014/05/FCM.01-v1.1.pdf">https://www.gsma.com/futurenetworks/wp-content/uploads/2014/05/FCM.01-v1.1.pdf</a>
Section	Figure 8



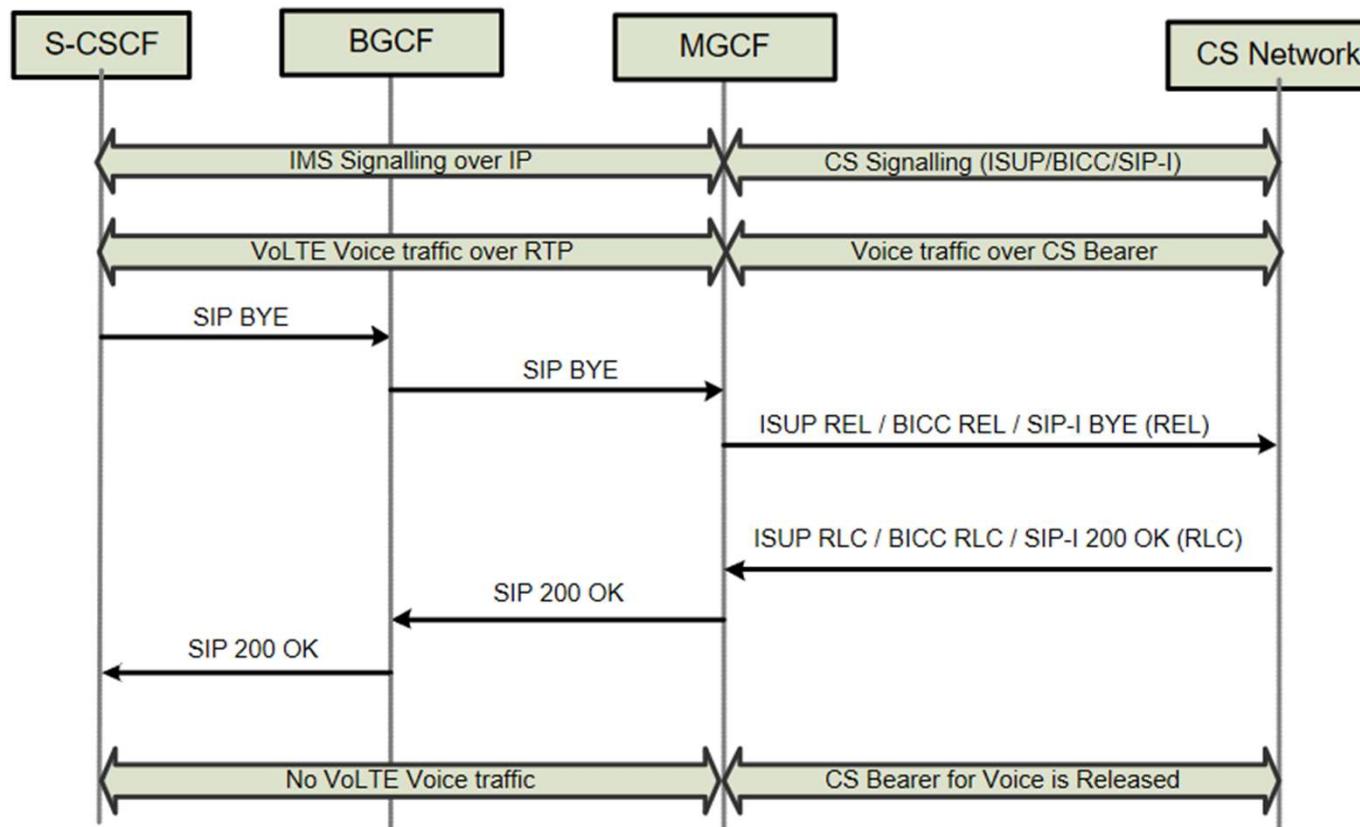
Procedure	VoLTE MO to CS Call
Specification	<a href="https://www.gsma.com/futurenetworks/wp-content/uploads/2014/05/FCM.01-v1.1.pdf">https://www.gsma.com/futurenetworks/wp-content/uploads/2014/05/FCM.01-v1.1.pdf</a>
Section	Figure 9



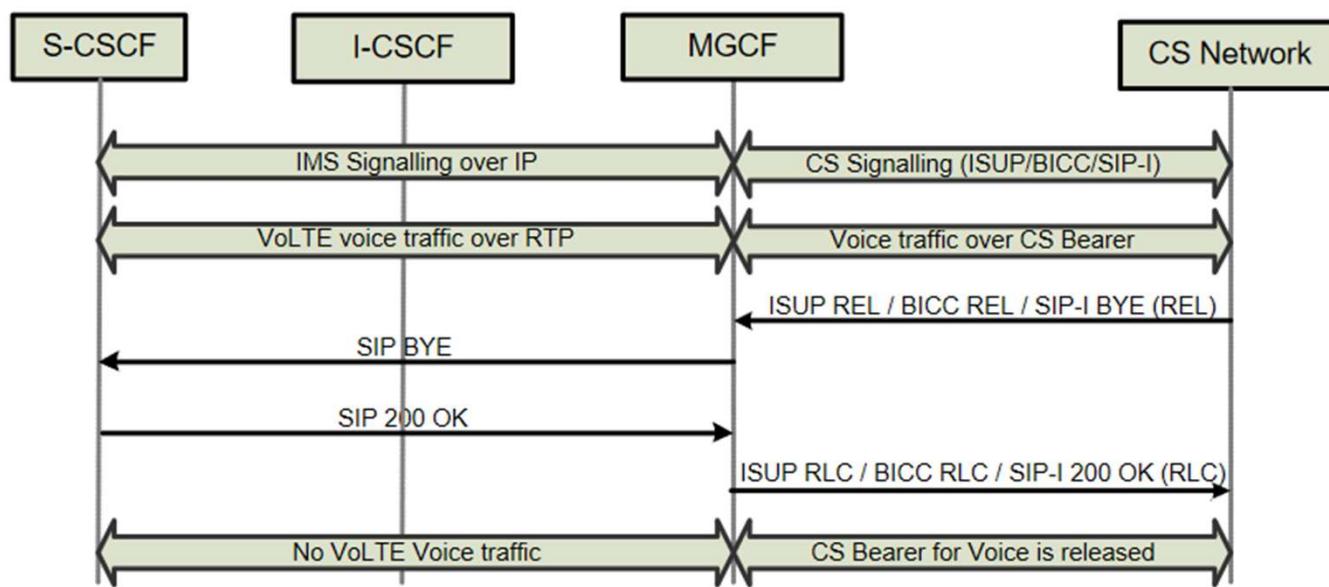
Procedure	VoLTE MT to CS Call
Specification	<a href="https://www.gsma.com/futurenetworks/wp-content/uploads/2014/05/FCM.01-v1.1.pdf">https://www.gsma.com/futurenetworks/wp-content/uploads/2014/05/FCM.01-v1.1.pdf</a>
Section	Figure 10



Procedure	VoLTE to CS Call Clearing (VoLTE Side Initiated)
Specification	<a href="https://www.gsma.com/futurenetworks/wp-content/uploads/2014/05/FCM.01-v1.1.pdf">https://www.gsma.com/futurenetworks/wp-content/uploads/2014/05/FCM.01-v1.1.pdf</a>
Section	Figure 11



Procedure	VoLTE to CS Call Clearing (VoLTE is Receiving side)
Specification	<a href="https://www.gsma.com/futurenetworks/wp-content/uploads/2014/05/FCM.01-v1.1.pdf">https://www.gsma.com/futurenetworks/wp-content/uploads/2014/05/FCM.01-v1.1.pdf</a>
Section	Figure 12



Procedure	QCI to DSCP Recommended Mapping
Specification	<a href="https://www.gsma.com/futurenetworks/wp-content/uploads/2014/05/FCM.01-v1.1.pdf">https://www.gsma.com/futurenetworks/wp-content/uploads/2014/05/FCM.01-v1.1.pdf</a>
Section	Table 3 (3.7.4)

### 3.7.4 Mapping between QCI and DiffServ

GSMA PRD IR.34 [48] section 6.2 describes the different traffic classes that are used. These are shown in Table 3.

QCI	QoS Information			IP transport	
	Traffic Class	THP	Signalling indication	Diffserv PHB	DSCP
1					
2	Conversational	N/A	N/A	EF	101110
3					
4	Streaming	N/A	N/A	AF41	100010
5					
6	Interactive	1	Yes (see note)	AF31	011010
7			No	AF32	011100
8		3	No	AF21	010010
9	Background	N/A	N/A	BE	000000

V1.0

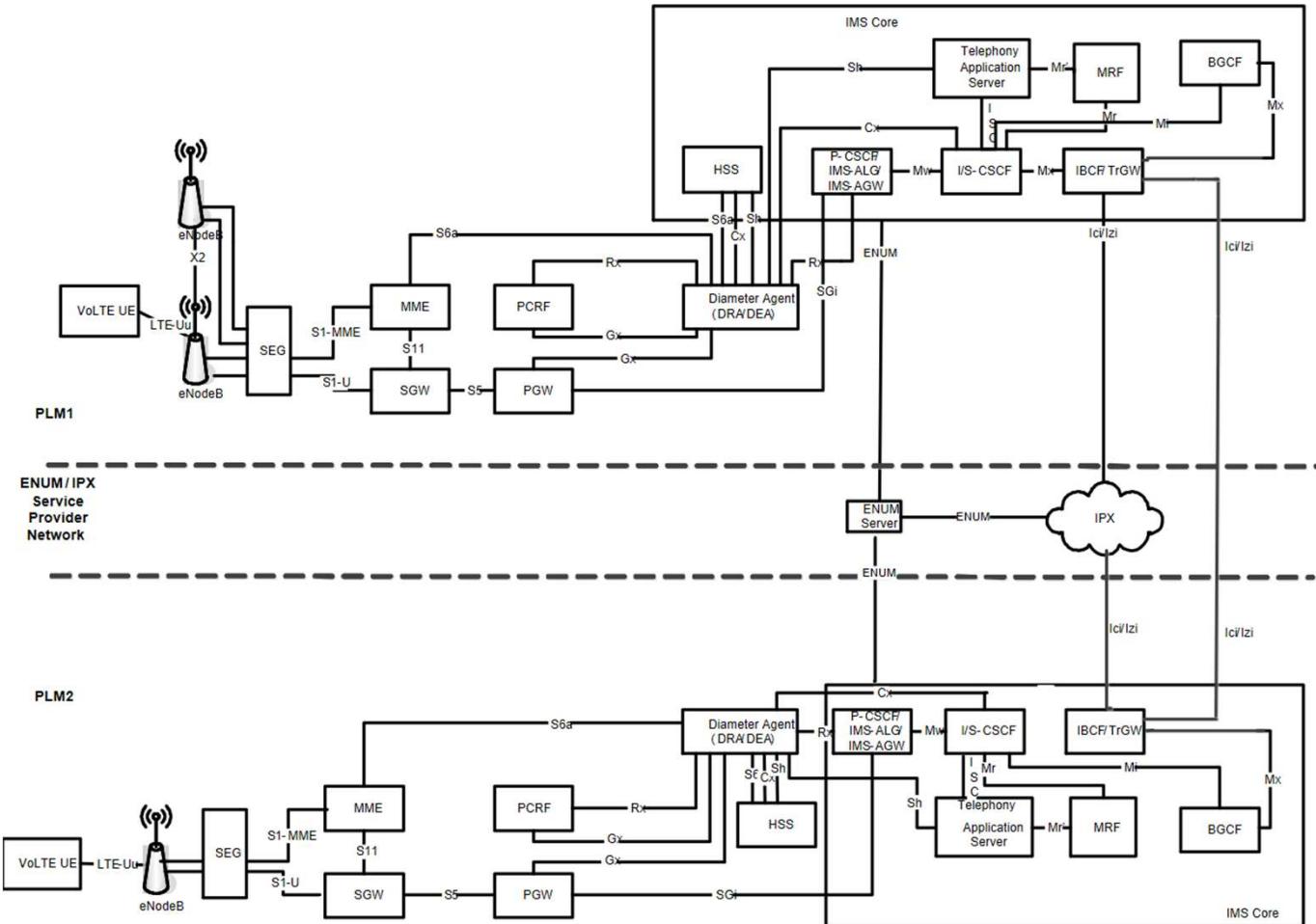
GSM Association  
Official Document

Non-Confidential

8		3	No	AF11	001010
9	Background	N/A	N/A	BE	000000

Table 3: EPC QoS information and mapping to DSCP

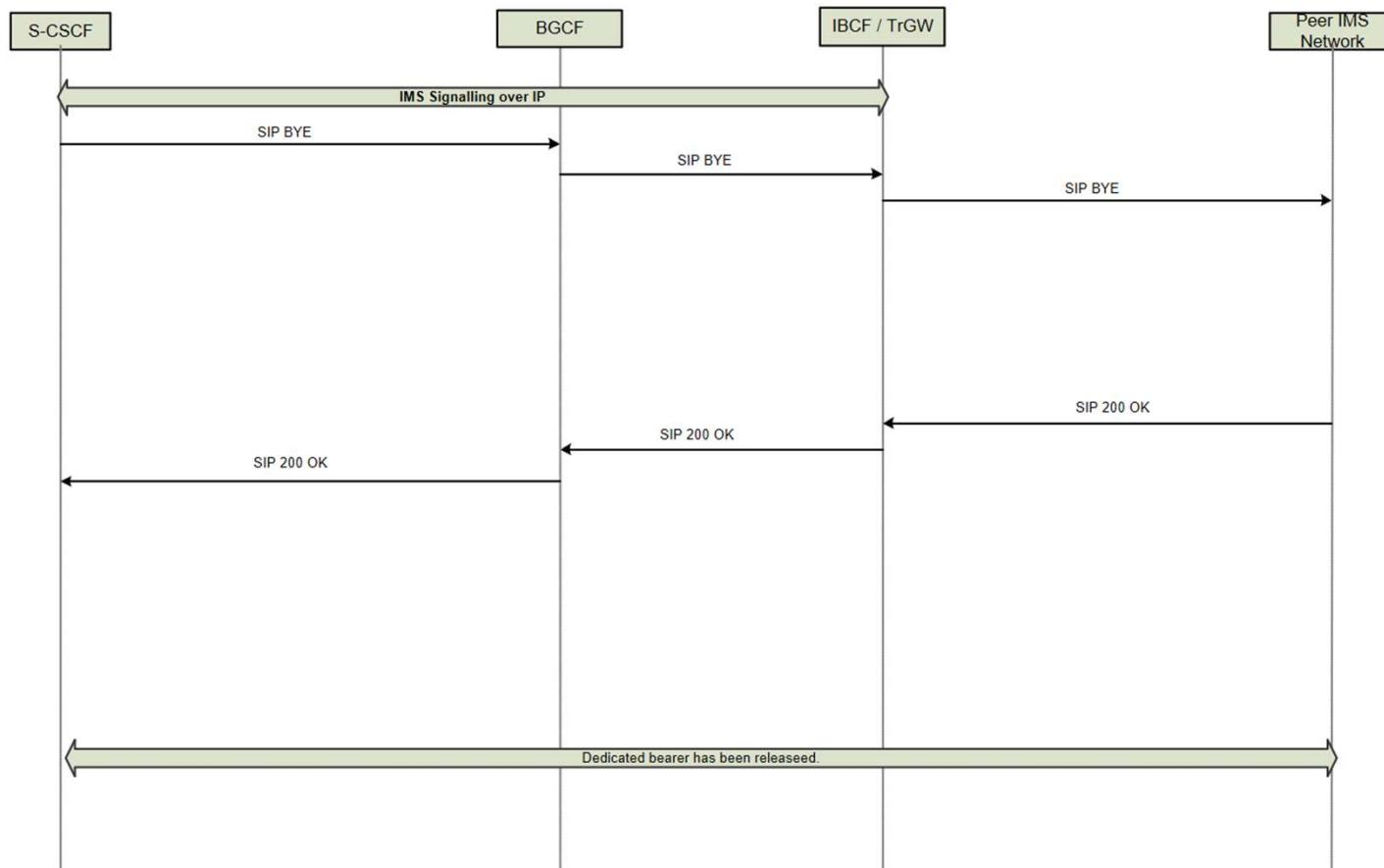
Procedure	VoLTE Interconnect Architecture
Specification	<a href="https://www.gsma.com/futurenetworks/wp-content/uploads/2014/05/FCM.01-v1.1.pdf">https://www.gsma.com/futurenetworks/wp-content/uploads/2014/05/FCM.01-v1.1.pdf</a>
Section	Figure 15



Procedure	VoLTE UE to Peer IMS Call (MO)
Specification	<a href="https://www.gsma.com/futurenetworks/wp-content/uploads/2014/05/FCM.01-v1.1.pdf">https://www.gsma.com/futurenetworks/wp-content/uploads/2014/05/FCM.01-v1.1.pdf</a>
Section	Figure 16
	<pre> sequenceDiagram     participant S_CSCF as S-CSCF     participant BGCF as BGCF     participant IBCF as IBCF/ TrGW     participant PeerIMS as Peer IMS Network      S_CSCF-&gt;&gt;BGCF: SIP Invite (SDP)     BGCF--&gt;&gt;IBCF: SIP Invite (SDP)     IBCF--&gt;&gt;PeerIMS: SIP Invite (SDP)      S_CSCF--&gt;&gt;S_CSCF: SIP 100 Trying     BGCF--&gt;&gt;BGCF: SIP 100 Trying     IBCF--&gt;&gt;IBCF: SIP 100 Trying     PeerIMS--&gt;&gt;PeerIMS: SIP 100 Trying      S_CSCF--&gt;&gt;BGCF: SIP 183 Progress)(SDP)     BGCF--&gt;&gt;IBCF: SIP 183 Progress)(SDP)     IBCF--&gt;&gt;PeerIMS: SIP 183 Progress)(SDP)      S_CSCF--&gt;&gt;S_CSCF: SIP PRACK     BGCF--&gt;&gt;BGCF: SIP PRACK     IBCF--&gt;&gt;IBCF: SIP PRACK     PeerIMS--&gt;&gt;PeerIMS: SIP PRACK      S_CSCF--&gt;&gt;BGCF: SIP 200 OK(PRACK)     BGCF--&gt;&gt;IBCF: SIP 200 OK(PRACK)     IBCF--&gt;&gt;PeerIMS: SIP 200 OK(PRACK)      S_CSCF--&gt;&gt;S_CSCF: SIP UPDATE (SDP)     BGCF--&gt;&gt;BGCF: SIP UPDATE (SDP)     IBCF--&gt;&gt;IBCF: SIP UPDATE (SDP)     PeerIMS--&gt;&gt;PeerIMS: SIP UPDATE (SDP)      S_CSCF--&gt;&gt;BGCF: SIP 200 OK(UPDATE) (SDP)     BGCF--&gt;&gt;IBCF: SIP 200 OK(UPDATE) (SDP)     IBCF--&gt;&gt;PeerIMS: SIP 200 OK(UPDATE) (SDP)      S_CSCF--&gt;&gt;S_CSCF: SIP 180 Ringing     BGCF--&gt;&gt;BGCF: SIP 180 Ringing     IBCF--&gt;&gt;IBCF: SIP 180 Ringing     PeerIMS--&gt;&gt;PeerIMS: SIP 180 Ringing      S_CSCF--&gt;&gt;S_CSCF: SIP 200 OK (INV)     BGCF--&gt;&gt;BGCF: SIP 200 OK(INV)     IBCF--&gt;&gt;IBCF: SIP 200 OK(INV)     PeerIMS--&gt;&gt;PeerIMS: SIP 200 OK(INV)      S_CSCF--&gt;&gt;S_CSCF: SIP ACK     BGCF--&gt;&gt;BGCF: SIP ACK     IBCF--&gt;&gt;IBCF: SIP ACK     PeerIMS--&gt;&gt;PeerIMS: SIP ACK      Note over BGCF, IBCF, PeerIMS: IMS Signalling over IP     Note over S_CSCF, BGCF, IBCF, PeerIMS: VoLTE voice traffic over RTP via IMS media plane elements   </pre> <p>The sequence diagram illustrates the signaling flow for a VoLTE UE to Peer IMS Call (MO). It shows the exchange of SIP messages (Invite, 100 Trying, 183 Progress, PRACK, 200 OK, UPDATE, 200 OK(UPDATE), 180 Ringing, 200 OK(INV), ACK) between the S-CSCF, BGCF, IBCF/TrGW, and Peer IMS Network. The BGCF, IBCF, and Peer IMS Network nodes are grouped under the label "IMS Signalling over IP". The S-CSCF, BGCF, IBCF, and Peer IMS Network nodes are also grouped under the label "VoLTE voice traffic over RTP via IMS media plane elements". The diagram shows a total of 14 message exchanges between the four entities.</p>

Procedure	VoLTE UE to Peer IMS Call (MT)		
Specification	<a href="https://www.gsma.com/futurenetworks/wp-content/uploads/2014/05/FCM.01-v1.1.pdf">https://www.gsma.com/futurenetworks/wp-content/uploads/2014/05/FCM.01-v1.1.pdf</a>		
Section	Figure 17		
S-CSCF	I-CSCF	IBCF/ TrGW	Peer IMS Network
		IMS Signalling over IP	
SIP Invite (SDP)	SIP Invite (SDP)		SIP Invite (SDP)
			SIP 100 Trying
SIP 100 Trying	SIP 100 Trying		
SIP 183 Progress (SDP)	SIP 183 Progress (SDP)	SIP 183 Progress (SDP)	
SIP PRACK		SIP PRACK	
SIP 200 OK (PRACK)		SIP 200 OK (PRACK)	
SIP UPDATE (SDP)		SIP UPDATE (SDP)	
SIP 200 OK (UPDATE) (SDP)		SIP 200 OK (UPDATE) (SDP)	
SIP 180 Ringing	SIP 180 Ringing	SIP 180 Ringing	
SIP 200 OK (INV)	SIP 200 OK (INV)	SIP 200 OK (INV)	
SIP ACK		SIP ACK	
VoLTE voice traffic over RTP via IMS media plane elements			

Procedure	VoLTE UE to Peer IMS Call Clearing (VoLTE side initiated)
Specification	<a href="https://www.gsma.com/futurenetworks/wp-content/uploads/2014/05/FCM.01-v1.1.pdf">https://www.gsma.com/futurenetworks/wp-content/uploads/2014/05/FCM.01-v1.1.pdf</a>
Section	Figure 18



Procedure	VoLTE UE to Peer IMS Call Clearing (VoLTE side receiving)		
Specification	<a href="https://www.gsma.com/futurenetworks/wp-content/uploads/2014/05/FCM.01-v1.1.pdf">https://www.gsma.com/futurenetworks/wp-content/uploads/2014/05/FCM.01-v1.1.pdf</a>		
Section	Figure 19		
S-CSCF	I-CSCF	IBCF / TrGW	Peer IMS Network

```

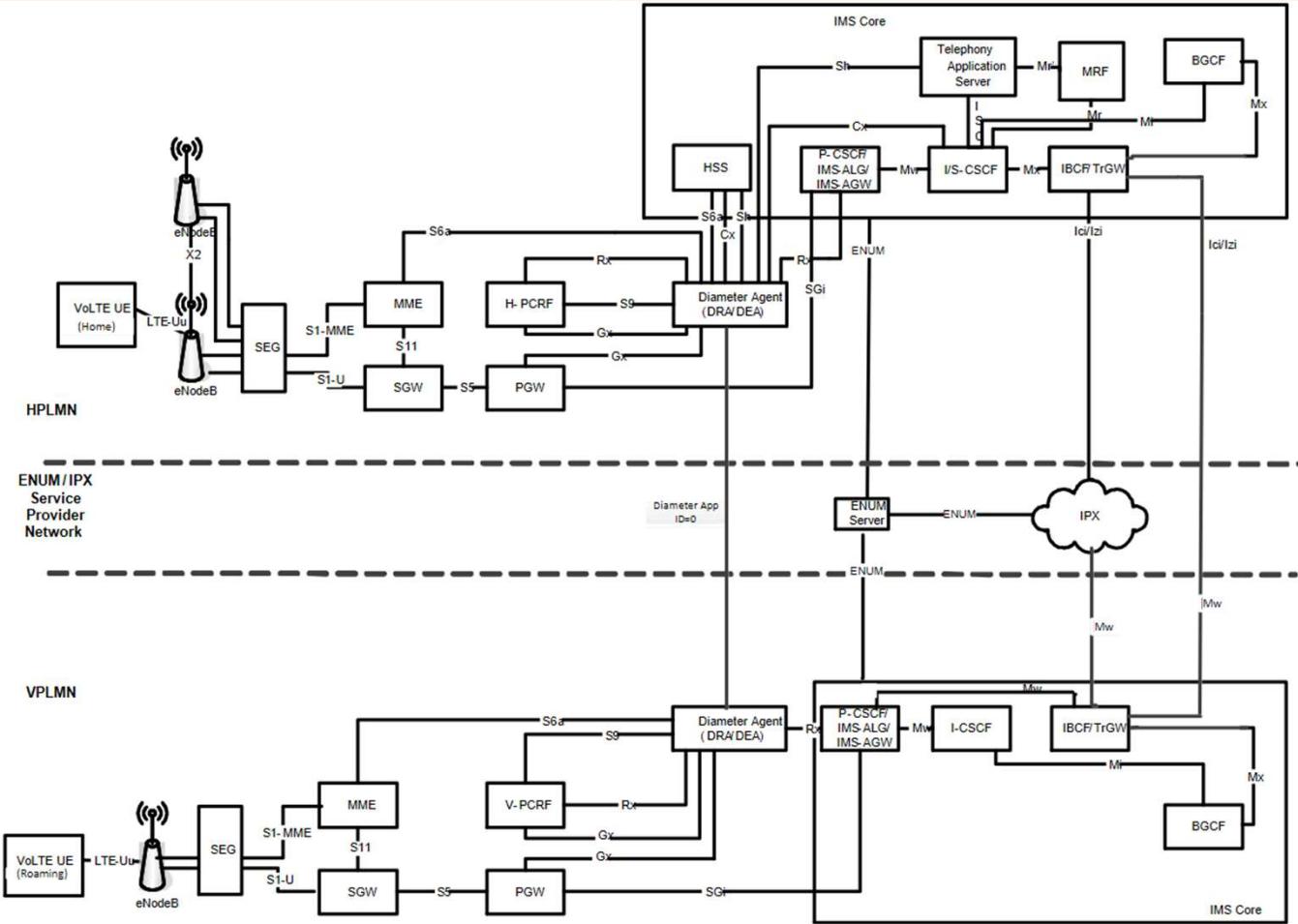
sequenceDiagram
    participant S_CSCF as S-CSCF
    participant I_CSCF as I-CSCF
    participant IBCF as IBCF / TrGW
    participant PeerIMS as Peer IMS Network
    S_CSCF->>I_CSCF: IMS Signalling over IP
    activate I_CSCF
    I_CSCF->>IBCF: SIP BYE
    activate IBCF
    IBCF->>PeerIMS: SIP BYE
    activate PeerIMS
    PeerIMS->>IBCF: 200 OK
    activate IBCF
    IBCF->>S_CSCF: SIP 200 OK
    activate S_CSCF
    S_CSCF->>IBCF: Dedicated bearer has been released
    deactivate S_CSCF
    deactivate IBCF
    deactivate PeerIMS
    deactivate I_CSCF

```

The diagram illustrates the sequence of messages for VoLTE UE to Peer IMS Call Clearing (VoLTE side receiving). It shows interactions between four entities: S-CSCF, I-CSCF, IBCF / TrGW, and Peer IMS Network.

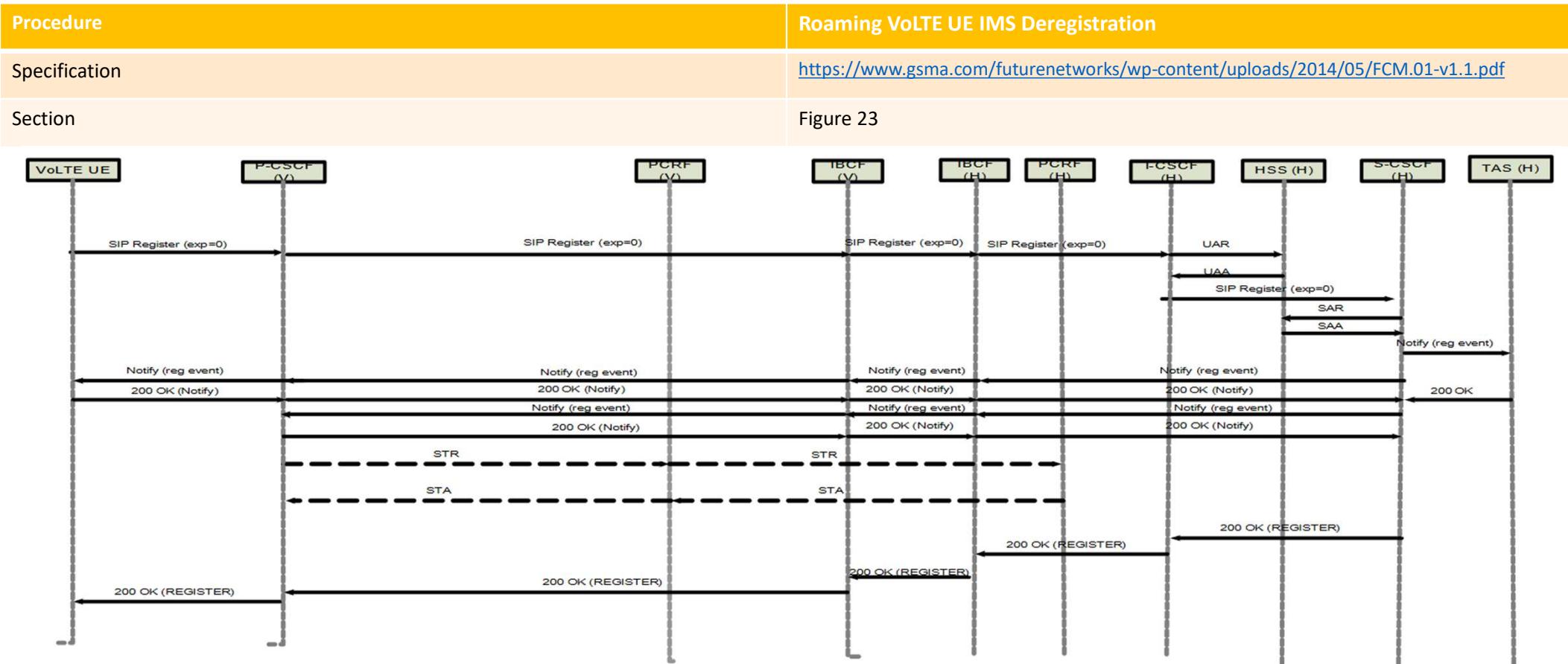
- Initial Message:** S-CSCF sends "IMS Signalling over IP" to I-CSCF.
- I-CSCF to IBCF:** I-CSCF sends "SIP BYE" to IBCF.
- IBCF to Peer IMS Network:** IBCF sends "SIP BYE" to Peer IMS Network.
- Peer IMS Network to IBCF:** Peer IMS Network sends "200 OK" to IBCF.
- IBCF to S-CSCF:** IBCF sends "SIP 200 OK" to S-CSCF.
- Final Message:** S-CSCF sends "Dedicated bearer has been released" to IBCF.

Procedure	Roaming VoLTE Architecture
Specification	<a href="https://www.gsma.com/futurenetworks/wp-content/uploads/2014/05/FCM.01-v1.1.pdf">https://www.gsma.com/futurenetworks/wp-content/uploads/2014/05/FCM.01-v1.1.pdf</a>
Section	Figure 20



Procedure	Roaming VoLTE UE Attach
Specification	<a href="https://www.gsma.com/futurenetworks/wp-content/uploads/2014/05/FCM.01-v1.1.pdf">https://www.gsma.com/futurenetworks/wp-content/uploads/2014/05/FCM.01-v1.1.pdf</a>
Section	Figure 21
	<pre> sequenceDiagram     participant VoLTEUE     participant eNB     participant MME     participant SGW     participant PGW     participant PCRF_O     participant PCRF_H     participant HSS_H      VoLTEUE-&gt;&gt;eNB: RRC Connection Request     eNB-&gt;&gt;MME: RRC Connection Setup     MME-&gt;&gt;VoLTEUE: Attach Req     VoLTEUE-&gt;&gt;eNB: Attach req - Uplink NAS Transport     Note over eNB, MME: Authentication/Security     eNB-&gt;&gt;MME: RRC Connection Setup complete [Dedicated NAS]     eNB-&gt;&gt;MME: [PDN Connectivity Request]     MME-&gt;&gt;SGW: Update Location Request     SGW-&gt;&gt;MME: Update Location Answer     MME-&gt;&gt;SGW: Create Session Request     SGW-&gt;&gt;PGW: Create Session Request     PGW-&gt;&gt;PCRF_O: Create Session Request     PCRF_O-&gt;&gt;PCRF_H: Create Session Request     PCRF_H-&gt;&gt;HSS_H: Create Session Request     HSS_H-&gt;&gt;PCRF_H: Create Session Response     PCRF_H-&gt;&gt;PCRF_O: Create Session Response     PCRF_O-&gt;&gt;PGW: Create Session Response     PGW-&gt;&gt;SGW: Create Session Response     SGW-&gt;&gt;MME: IP@: QCI5, ARP, APN AMBR     MME-&gt;&gt;SGW: E-RAB Setup Request     SGW-&gt;&gt;PGW: E-RAB Setup Request     PGW-&gt;&gt;PCRF_O: E-RAB Setup Request     PCRF_O-&gt;&gt;PCRF_H: E-RAB Setup Request     PCRF_H-&gt;&gt;HSS_H: E-RAB Setup Request     HSS_H-&gt;&gt;PCRF_H: E-RAB Setup Response     PCRF_H-&gt;&gt;PCRF_O: E-RAB Setup Response     PCRF_O-&gt;&gt;PGW: E-RAB Setup Response     PGW-&gt;&gt;SGW: E-RAB Setup Response     SGW-&gt;&gt;MME: IP@: QCI5, ARP, APN AMBR     MME-&gt;&gt;SGW: RRC Connection Reconfiguration     SGW-&gt;&gt;PGW: RRC Connection Reconfiguration     PGW-&gt;&gt;PCRF_O: RRC Connection Reconfiguration     PCRF_O-&gt;&gt;PCRF_H: RRC Connection Reconfiguration     PCRF_H-&gt;&gt;HSS_H: RRC Connection Reconfiguration     HSS_H-&gt;&gt;PCRF_H: RRC Connection Reconfiguration     PCRF_H-&gt;&gt;PCRF_O: RRC Connection Reconfiguration     PCRF_O-&gt;&gt;PGW: RRC Connection Reconfiguration     PGW-&gt;&gt;SGW: RRC Connection Reconfiguration     SGW-&gt;&gt;MME: IP@: QCI5, ARP, APN AMBR     MME-&gt;&gt;SGW: E-RAB Setup Response     SGW-&gt;&gt;PGW: E-RAB Setup Response     PGW-&gt;&gt;PCRF_O: E-RAB Setup Response     PCRF_O-&gt;&gt;PCRF_H: E-RAB Setup Response     PCRF_H-&gt;&gt;HSS_H: E-RAB Setup Response     HSS_H-&gt;&gt;PCRF_H: E-RAB Setup Response     PCRF_H-&gt;&gt;PCRF_O: E-RAB Setup Response     PCRF_O-&gt;&gt;PGW: E-RAB Setup Response     PGW-&gt;&gt;SGW: E-RAB Setup Response     SGW-&gt;&gt;MME: IP@: QCI5, ARP, APN AMBR     MME-&gt;&gt;SGW: RRC Connection Reconfiguration Complete     SGW-&gt;&gt;PGW: RRC Connection Reconfiguration Complete     PGW-&gt;&gt;PCRF_O: RRC Connection Reconfiguration Complete     PCRF_O-&gt;&gt;PCRF_H: RRC Connection Reconfiguration Complete     PCRF_H-&gt;&gt;HSS_H: RRC Connection Reconfiguration Complete     HSS_H-&gt;&gt;PCRF_H: RRC Connection Reconfiguration Complete     PCRF_H-&gt;&gt;PCRF_O: RRC Connection Reconfiguration Complete     PCRF_O-&gt;&gt;PGW: RRC Connection Reconfiguration Complete     PGW-&gt;&gt;SGW: RRC Connection Reconfiguration Complete     SGW-&gt;&gt;MME: IP@: QCI5, ARP, APN AMBR     MME-&gt;&gt;SGW: Uplink Direct Transfer     SGW-&gt;&gt;PGW: Uplink Direct Transfer     PGW-&gt;&gt;PCRF_O: Uplink Direct Transfer     PCRF_O-&gt;&gt;PCRF_H: Uplink Direct Transfer     PCRF_H-&gt;&gt;HSS_H: Uplink Direct Transfer     HSS_H-&gt;&gt;PCRF_H: Uplink Direct Transfer     PCRF_H-&gt;&gt;PCRF_O: Uplink Direct Transfer     PCRF_O-&gt;&gt;PGW: Uplink Direct Transfer     PGW-&gt;&gt;SGW: Uplink Direct Transfer     SGW-&gt;&gt;MME: IP@: QCI5, ARP, APN AMBR     MME-&gt;&gt;SGW: Attach complete - Uplink NAS Transport     SGW-&gt;&gt;PGW: Attach complete - Uplink NAS Transport     PGW-&gt;&gt;PCRF_O: Attach complete - Uplink NAS Transport     PCRF_O-&gt;&gt;PCRF_H: Attach complete - Uplink NAS Transport     PCRF_H-&gt;&gt;HSS_H: Attach complete - Uplink NAS Transport     HSS_H-&gt;&gt;PCRF_H: Attach complete - Uplink NAS Transport     PCRF_H-&gt;&gt;PCRF_O: Attach complete - Uplink NAS Transport     PCRF_O-&gt;&gt;PGW: Attach complete - Uplink NAS Transport     PGW-&gt;&gt;SGW: Attach complete - Uplink NAS Transport     SGW-&gt;&gt;MME: IP@: QCI5, ARP, APN AMBR     MME-&gt;&gt;SGW: Modify Bearer Request     SGW-&gt;&gt;PGW: Modify Bearer Request     PGW-&gt;&gt;PCRF_O: Modify Bearer Request     PCRF_O-&gt;&gt;PCRF_H: Modify Bearer Request     PCRF_H-&gt;&gt;HSS_H: Modify Bearer Request     HSS_H-&gt;&gt;PCRF_H: Modify Bearer Response     PCRF_H-&gt;&gt;PCRF_O: Modify Bearer Response     PCRF_O-&gt;&gt;PGW: Modify Bearer Response     PGW-&gt;&gt;SGW: Modify Bearer Response     SGW-&gt;&gt;MME: IP@: QCI5, ARP, APN AMBR     MME-&gt;&gt;SGW: IMS Signalling over IP     SGW-&gt;&gt;PGW: IMS Signalling over IP     PGW-&gt;&gt;PCRF_O: IMS Signalling over IP     PCRF_O-&gt;&gt;PCRF_H: IMS Signalling over IP     PCRF_H-&gt;&gt;HSS_H: IMS Signalling over IP     HSS_H-&gt;&gt;PCRF_H: IMS Signalling over IP     PCRF_H-&gt;&gt;PCRF_O: IMS Signalling over IP     PCRF_O-&gt;&gt;PGW: IMS Signalling over IP     PGW-&gt;&gt;SGW: IMS Signalling over IP     SGW-&gt;&gt;MME: IP@: QCI5, ARP, APN AMBR     </pre>

Procedure	Roaming VoLTE UE Initial IMS Registration
Specification	<a href="https://www.gsma.com/futurenetworks/wp-content/uploads/2014/05/FCM.01-v1.1.pdf">https://www.gsma.com/futurenetworks/wp-content/uploads/2014/05/FCM.01-v1.1.pdf</a>
Section	Figure 22
	<pre> sequenceDiagram     participant VoLTEUE as VoLTE UE     participant Pcs as P-CSCF (Y)     participant Pcrf as PCRF (Y)     participant Ibcf as IBCF (Y)     participant Pcf as PCF (H)     participant Pcsf as P-CSCF (H)     participant Hss as HSS (H)     participant Scs as S-CSCF (H)     participant Tas as TAS (H)      VoLTEUE-&gt;&gt;Pcs: SIP Register     Pcs-&gt;&gt;Pcrf: SIP Register     Pcrf-&gt;&gt;Ibcf: SIP Register     Ibcf-&gt;&gt;Pcf: SIP Register     Pcf-&gt;&gt;Pcsf: SIP Register     Pcsf-&gt;&gt;Hss: UAR     Hss-&gt;&gt;Pcsf: UAA     Pcsf-&gt;&gt;Scs: SIP Register     Scs-&gt;&gt;Tas: MAR     Tas-&gt;&gt;Scs: MAA     Scs-&gt;&gt;Pcsf: SIP Register     Pcsf-&gt;&gt;Pcf: SIP Register     Pcf-&gt;&gt;Ibcf: SIP Register     Ibcf-&gt;&gt;Pcrf: SIP Register     Pcrf-&gt;&gt;Pcs: SIP Register     Pcs--&gt;VoLTEUE: 401 Unauthorised     VoLTEUE-&gt;&gt;Pcs: SIP Register     Pcs--&gt;VoLTEUE: 401 Unauthorised     VoLTEUE-&gt;&gt;Pcrf: SIP Register     Pcrf--&gt;VoLTEUE: 401 Unauthorised     VoLTEUE-&gt;&gt;Ibcf: SIP Register     Ibcf--&gt;VoLTEUE: 401 Unauthorised     VoLTEUE-&gt;&gt;Pcf: SIP Register     Pcf--&gt;VoLTEUE: 401 Unauthorised     VoLTEUE-&gt;&gt;Pcsf: SIP Register     Pcsf--&gt;VoLTEUE: 401 Unauthorised     VoLTEUE-&gt;&gt;Scs: SIP Register     Scs--&gt;VoLTEUE: 401 Unauthorised     VoLTEUE-&gt;&gt;Tas: SIP Register     Tas--&gt;VoLTEUE: 401 Unauthorised     VoLTEUE--&gt;&gt;Pcs: SIP Register     Pcs--&gt;VoLTEUE: 200 OK (REGISTER)     VoLTEUE--&gt;&gt;Pcrf: SIP Register     Pcrf--&gt;VoLTEUE: 200 OK (REGISTER)     VoLTEUE--&gt;&gt;Ibcf: SIP Register     Ibcf--&gt;VoLTEUE: 200 OK (REGISTER)     VoLTEUE--&gt;&gt;Pcf: SIP Register     Pcf--&gt;VoLTEUE: 200 OK (REGISTER)     VoLTEUE--&gt;&gt;Pcsf: SIP Register     Pcsf--&gt;VoLTEUE: 200 OK (REGISTER)     VoLTEUE--&gt;&gt;Scs: SIP Register     Scs--&gt;VoLTEUE: 200 OK (REGISTER)     VoLTEUE--&gt;&gt;Tas: SIP Register     Tas--&gt;VoLTEUE: 200 OK (REGISTER)     Pcsf--&gt;&gt;Pcf: AAR     Pcf--&gt;&gt;Ibcf: AAR     Ibcf--&gt;&gt;Pcrf: AAR     Pcrf--&gt;&gt;Pcs: AAR     Pcs--&gt;&gt;VoLTEUE: 200 OK (REGISTER)     Pcrf--&gt;&gt;VoLTEUE: AAA     Ibcf--&gt;&gt;VoLTEUE: AAA     Pcf--&gt;&gt;VoLTEUE: AAA     Pcsf--&gt;&gt;VoLTEUE: AAA     Scs--&gt;&gt;VoLTEUE: AAA     Tas--&gt;&gt;VoLTEUE: AAA     VoLTEUE--&gt;&gt;Pcs: SIP Subscribe     Pcs--&gt;&gt;VoLTEUE: 200 OK (Subscribe)     VoLTEUE--&gt;&gt;Pcrf: SIP Subscribe     Pcrf--&gt;&gt;VoLTEUE: 200 OK (Subscribe)     VoLTEUE--&gt;&gt;Ibcf: SIP Subscribe     Ibcf--&gt;&gt;VoLTEUE: 200 OK (Subscribe)     VoLTEUE--&gt;&gt;Pcf: SIP Subscribe     Pcf--&gt;&gt;VoLTEUE: 200 OK (Subscribe)     VoLTEUE--&gt;&gt;Pcsf: SIP Subscribe     Pcsf--&gt;&gt;VoLTEUE: 200 OK (Subscribe)     VoLTEUE--&gt;&gt;Scs: SIP Subscribe     Scs--&gt;&gt;VoLTEUE: 200 OK (Subscribe)     VoLTEUE--&gt;&gt;Tas: SIP Subscribe     Tas--&gt;&gt;VoLTEUE: 200 OK (Subscribe)     VoLTEUE--&gt;&gt;Pcs: SIP Notify     Pcs--&gt;&gt;VoLTEUE: 200 OK (Notify)     VoLTEUE--&gt;&gt;Pcrf: SIP Notify     Pcrf--&gt;&gt;VoLTEUE: 200 OK (Notify)     VoLTEUE--&gt;&gt;Ibcf: SIP Notify     Ibcf--&gt;&gt;VoLTEUE: 200 OK (Notify)     VoLTEUE--&gt;&gt;Pcf: SIP Notify     Pcf--&gt;&gt;VoLTEUE: 200 OK (Notify)     VoLTEUE--&gt;&gt;Pcsf: SIP Notify     Pcsf--&gt;&gt;VoLTEUE: 200 OK (Notify)     VoLTEUE--&gt;&gt;Scs: SIP Notify     Scs--&gt;&gt;VoLTEUE: 200 OK (Notify)     VoLTEUE--&gt;&gt;Tas: SIP Notify     Tas--&gt;&gt;VoLTEUE: 200 OK (Notify)     </pre>

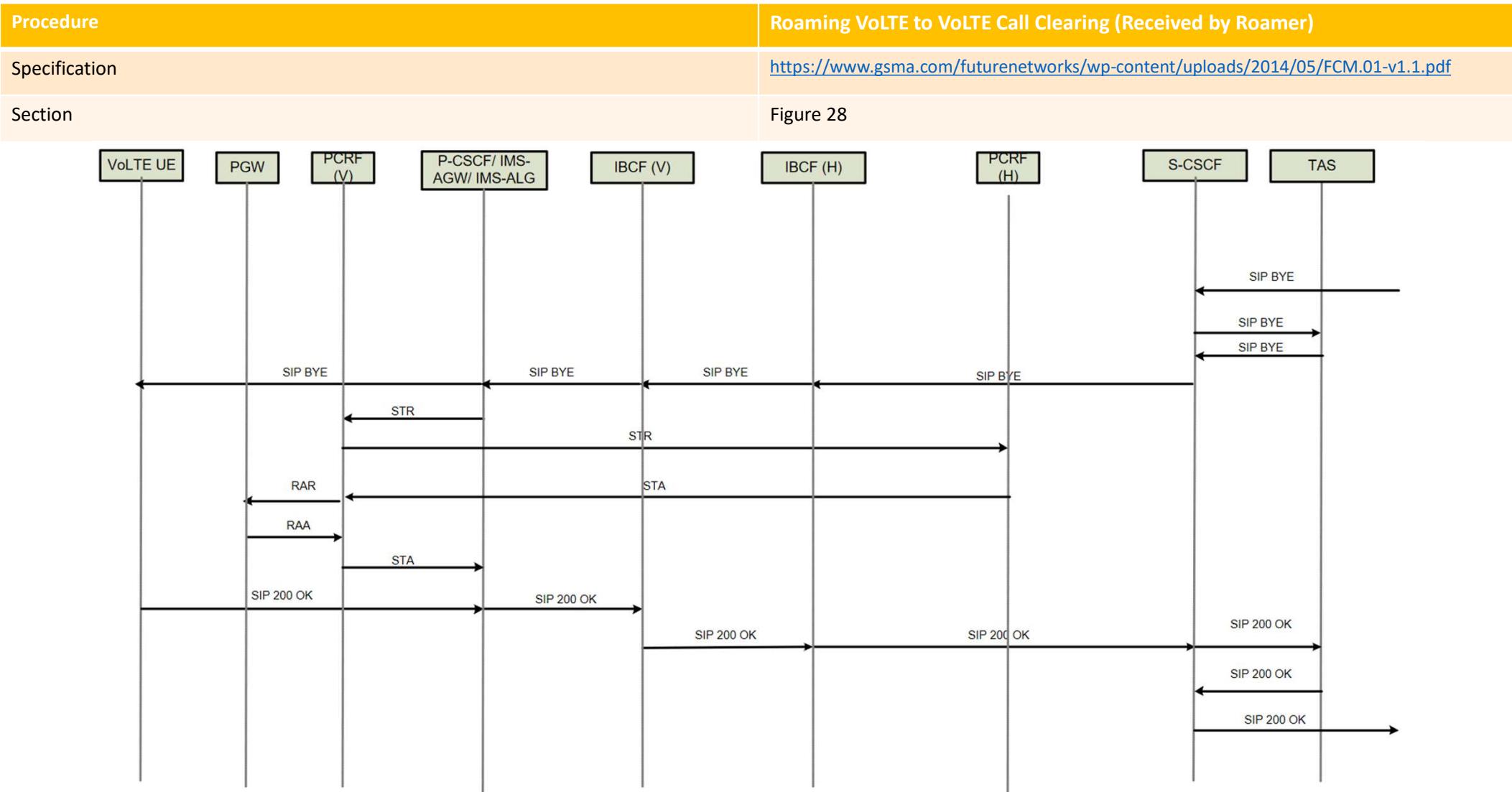


Procedure	Roaming VoLTE UE Initiated Detach
Specification	<a href="https://www.gsma.com/futurenetworks/wp-content/uploads/2014/05/FCM.01-v1.1.pdf">https://www.gsma.com/futurenetworks/wp-content/uploads/2014/05/FCM.01-v1.1.pdf</a>
Section	Figure 24
	<pre> sequenceDiagram     participant VOLTEUE as VOLTE UE     participant ENB as eNB     participant MME as MME     participant SGW as SGW     participant PGW as PGW     participant PCRFV as PCRF (V)     participant PCRFH as PCRF (H)     participant HSSH as HSS (H)      VOLTEUE-&gt;&gt;ENB: Detach Request     ENB-&gt;&gt;MME: Detach Request     MME-&gt;&gt;SGW: Delete Session Request     SGW-&gt;&gt;PGW: Delete Session Request     PGW-&gt;&gt;PCRFV: Delete Session Request     PCRFV-&gt;&gt;PCRFH: CCR     PCRFH-&gt;&gt;PCRFV: CCR     PCRFH-&gt;&gt;HSSH: CCA     PCRFV-&gt;&gt;PCRFH: CCA     MME-&gt;&gt;VOLTEUE: Detach Accept     VOLTEUE-&gt;&gt;SGW: Release Access Bearer Request     SGW-&gt;&gt;VOLTEUE: Release Access Bearer Response     VOLTEUE-&gt;&gt;ENB: UE Context Release Command     ENB--&gt;&gt;VOLTEUE: RRC Connection Release     VOLTEUE--&gt;&gt;ENB: UE Context Release Complete     </pre> <p>The sequence diagram illustrates the roaming VoLTE UE initiated detach process. It begins with the VOLTE UE sending a 'Detach Request' to the eNB. The eNB then forwards this request to the MME. The MME initiates the deletion of the session by sending a 'Delete Session Request' to the SGW. The SGW passes this request to the PGW. The PGW then sends a 'Delete Session Request' to the PCRF (V). The PCRF (V) performs a Credit Control Request (CCR) to the PCRF (H), which in turn performs a Credit Control Acknowledgment (CCA) to the PCRF (V). The PCRF (V) also performs a CCA to the HSS (H). The MME receives a 'Detach Accept' from the VOLTE UE and sends a 'Release Access Bearer Request' to the SGW. The SGW returns a 'Release Access Bearer Response' to the MME. Finally, the MME sends a 'UE Context Release Command' to the VOLTE UE, which triggers an 'RRC Connection Release' from the eNB. The process concludes with the VOLTE UE sending a 'UE Context Release Complete' message back to the eNB.</p>

Procedure	Roaming VoLTE to VoLTE MO Call
Specification	<a href="https://www.gsma.com/futurenetworks/wp-content/uploads/2014/05/FCM.01-v1.1.pdf">https://www.gsma.com/futurenetworks/wp-content/uploads/2014/05/FCM.01-v1.1.pdf</a>
Section	Figure 25
	<p>The sequence diagram illustrates the call setup process between a VoLTE UE and various network components. The process begins with the VoLTE UE sending a SIP Invite (SDP) to the PGW. The PGW then forwards this message to the PCRF (V). The PCRF (V) sends a SIP Invite (SDP) to the P-CSCF/IMS-ALG/IMS-AGW. The P-CSCF/IMS-ALG/IMS-AGW sends a SIP Invite (SDP) to the IBCF (V). The IBCF (V) then sends a SIP Invite (SDP) to the IBCF (H). The IBCF (H) sends a SIP Invite (SDP) to the PCRF (H). The PCRF (H) sends a SIP Invite (SDP) to the S-CSCF. The S-CSCF sends a SIP Invite (SDP) to the TAS. The TAS then sends a SIP Invite (SDP) back to the S-CSCF. This is followed by a series of SIP 100 Trying messages exchanged between the TAS and the S-CSCF. Subsequent steps include AAR (Authentication and Authorization Request) and AAA (Authentication and Authorization Answer) messages, SIP 183 Progress (SDP) messages, SIP PRACK (Partial Response ACK), SIP 200 OK (PRACK), SIP UPDATE (SDP), SIP 200 OK (UPDATE) (SDP), SIP 180 Ringing, SIP 200 OK (INV), and SIP ACK messages. The diagram also indicates that VoLTE voice traffic is transmitted via a dedicated bearer and over RTP via IMS media plane elements.</p>

Procedure	Roaming VoLTE to VoLTE MT Call
Specification	<a href="https://www.gsma.com/futurenetworks/wp-content/uploads/2014/05/FCM.01-v1.1.pdf">https://www.gsma.com/futurenetworks/wp-content/uploads/2014/05/FCM.01-v1.1.pdf</a>
Section	Figure 26
	<pre> sequenceDiagram     participant VoLTEUE as VoLTE UE     participant PGW as PGW     participant PCRFV as PCRF (V)     participant PCRFH as PCRF (H)     participant PIMS as P-CSCF/IMS-ALG / IMS-AGW     participant IBCFV as IBCF (V)     participant IBCFH as IBCF (H)     participant SCSF as S-CSCF     participant TAS as TAS     participant SCSCF as S-CSCF      VoLTEUE-&gt;&gt;PGW: SIP Invite (SDP)     PGW-&gt;&gt;PCRFV: SIP Invite (SDP)     PCRFV-&gt;&gt;IBCFV: SIP Invite (SDP)     IBCFV-&gt;&gt;IBCFH: SIP Invite (SDP)     IBCFH-&gt;&gt;PCRFH: SIP Invite (SDP)     PCRFH-&gt;&gt;SCSF: SIP Invite (SDP)     SCSCF-&gt;&gt;TAS: SIP Invite (SDP)     TAS-&gt;&gt;SCSF: SIP 100 Trying     SCSF-&gt;&gt;IBCFH: SIP 100 Trying     IBCFH-&gt;&gt;IBCFV: SIP 100 Trying     IBCFV-&gt;&gt;PCRFV: SIP 100 Trying     PCRFV-&gt;&gt;VoLTEUE: SIP 100 Trying     VoLTEUE-&gt;&gt;IBCFV: SIP 183 Progress (SDP)     IBCFV-&gt;&gt;IBCFH: SIP 183 Progress (SDP)     IBCFH-&gt;&gt;PCRFH: SIP 183 Progress (SDP)     PCRFH-&gt;&gt;SCSF: SIP 183 Progress (SDP)     SCSCF-&gt;&gt;TAS: SIP 183 Progress (SDP)     TAS-&gt;&gt;SCSF: SIP PRACK     SCSF-&gt;&gt;IBCFH: SIP PRACK     IBCFH-&gt;&gt;IBCFV: SIP PRACK     IBCFV-&gt;&gt;PCRFV: SIP PRACK     PCRFV-&gt;&gt;VoLTEUE: SIP 200 OK (PRACK)     VoLTEUE-&gt;&gt;IBCFV: SIP UPDATE (SDP)     IBCFV-&gt;&gt;IBCFH: SIP UPDATE (SDP)     IBCFH-&gt;&gt;PCRFH: SIP UPDATE (SDP)     PCRFH-&gt;&gt;SCSF: SIP UPDATE (SDP)     SCSCF-&gt;&gt;TAS: SIP UPDATE (SDP)     TAS-&gt;&gt;SCSF: SIP 200 OK (UPDATE) (SDP)     SCSF-&gt;&gt;IBCFH: SIP 200 OK (UPDATE) (SDP)     IBCFH-&gt;&gt;IBCFV: SIP 200 OK (UPDATE) (SDP)     IBCFV-&gt;&gt;PCRFV: SIP 200 OK (UPDATE) (SDP)     PCRFV-&gt;&gt;VoLTEUE: SIP 200 OK (UPDATE) (SDP)     VoLTEUE-&gt;&gt;IBCFV: SIP 180 Ringing     IBCFV-&gt;&gt;IBCFH: SIP 180 Ringing     IBCFH-&gt;&gt;PCRFH: SIP 180 Ringing     PCRFH-&gt;&gt;SCSF: SIP 180 Ringing     SCSCF-&gt;&gt;TAS: SIP 180 Ringing     TAS-&gt;&gt;SCSF: SIP 200 OK (INV)     SCSF-&gt;&gt;IBCFH: SIP 200 OK (INV)     IBCFH-&gt;&gt;IBCFV: SIP 200 OK (INV)     IBCFV-&gt;&gt;PCRFV: SIP 200 OK (INV)     PCRFV-&gt;&gt;VoLTEUE: SIP 200 OK (INV)     VoLTEUE-&gt;&gt;IBCFV: SIP ACK     IBCFV-&gt;&gt;IBCFH: SIP ACK     IBCFH-&gt;&gt;PCRFH: SIP ACK     PCRFH-&gt;&gt;SCSF: SIP ACK     SCSCF-&gt;&gt;TAS: SIP ACK     TAS-&gt;&gt;SCSF: SIP ACK     </pre> <p>The diagram illustrates the sequence of SIP messages exchanged between the VoLTE UE and various network components during a roaming VoLTE to VoLTE MT call. The process begins with the VoLTE UE initiating a SIP Invite (SDP) to the PGW. This triggers a chain of SIP invites through the PCRF (V) and P-CSCF/IMS-ALG / IMS-AGW, leading to the IBCF (V) and IBCF (H). The PCRF (H) then sends SIP invites to the S-CSCF, which in turn sends them to the TAS. The TAS responds with SIP 100 Trying, which is relayed back through the S-CSCF, PCRF (H), IBCF (H), IBCF (V), and PCRF (V) to the VoLTE UE. Subsequent steps include SIP 183 Progress (SDP) messages, AAA authentication, SIP PRACK and SIP 200 OK (PRACK) responses, SIP UPDATE (SDP) and SIP 200 OK (UPDATE) (SDP) messages, and SIP 180 Ringing messages. The final stage shows the VoLTE UE receiving SIP ACKs from the TAS and S-CSCF.</p>

Procedure	Roaming VoLTE to VoLTE Call Clearing (Initiated by Roamer)
Specification	<a href="https://www.gsma.com/futurenetworks/wp-content/uploads/2014/05/FCM.01-v1.1.pdf">https://www.gsma.com/futurenetworks/wp-content/uploads/2014/05/FCM.01-v1.1.pdf</a>
Section	Figure 27
	<pre> sequenceDiagram     participants VoLTEUE[VoLTE UE]      participants PGW[PGW]     participants PCRFV[PCRF (V)]     participants PCC[PCRF/IMS-AGW/IMS-ALG]     participants IBCFV[IBCF (V)]     participants IBCFH[IBCF (H)]     participants PCRPH[PCRF (H)]     participants S-CSCF[S-CSCF]     participants TAS[TAS]      VoLTEUE-&gt;&gt;PGW: SIP BYE     PGW-&gt;&gt;PCRFV: SIP BYE     PCRFV-&gt;&gt;IBCFV: SIP BYE     IBCFV-&gt;&gt;IBCFH: SIP BYE     IBCFH-&gt;&gt;PCRPH: SIP BYE     PCRPH-&gt;&gt;S-CSCF: SIP BYE     S-CSCF-&gt;&gt;TAS: SIP BYE     TAS-&gt;&gt;PCRPH: SIP 200 OK     PCRPH-&gt;&gt;S-CSCF: SIP 200 OK     S-CSCF-&gt;&gt;TAS: SIP 200 OK     TAS-&gt;&gt;PCRPH: SIP 200 OK     PCRPH-&gt;&gt;IBCFH: SIP 200 OK     IBCFH-&gt;&gt;IBCFV: SIP 200 OK     IBCFV-&gt;&gt;PCC: SIP 200 OK     PCC-&gt;&gt;IBCFV: SIP 200 OK     IBCFV-&gt;&gt;IBCFH: SIP 200 OK     IBCFH-&gt;&gt;PCRFV: SIP 200 OK     PCRFV-&gt;&gt;PGW: SIP 200 OK     PGW-&gt;&gt;VoLTEUE: SIP 200 OK     </pre> <p>The sequence diagram illustrates the roaming VoLTE to VoLTE call clearing process initiated by the Roamer. It shows the flow of SIP messages between the VoLTE UE, PGW, PCRF (V), P-CSCF/IMS-AGW/IMS-ALG, IBCF (V), IBCF (H), PCRF (H), S-CSCF, and TAS. The process begins with the VoLTE UE sending a SIP BYE to the PGW. This triggers a chain of SIP BYE messages through the PCRF (V), P-CSCF, IBCF (V), IBCF (H), PCRF (H), S-CSCF, and TAS. In response, the TAS sends SIP 200 OK messages back to the PCRF (H) and S-CSCF. The PCRF (H) then sends SIP 200 OK messages to the IBCF (H) and S-CSCF. The IBCF (H) sends SIP 200 OK to the PCRF (V). The PCRF (V) sends SIP 200 OK to the P-CSCF. The P-CSCF sends SIP 200 OK to the IBCF (V). Finally, the IBCF (V) sends SIP 200 OK to the VoLTE UE, completing the call clearing process.</p>



<b>Procedure</b>	<b>VoLTE Packet Drops</b>
<b>Specification</b>	<a href="https://www.gsma.com/futurenetworks/wp-content/uploads/2014/05/FCM.01-v1.1.pdf">https://www.gsma.com/futurenetworks/wp-content/uploads/2014/05/FCM.01-v1.1.pdf</a>
<b>Section</b>	6.1.2.2

**6.1.2.2 VoLTE UE exceeds the link MTU-size – IP Layer fragmentation – Packets dropped**

<b>Title</b>	VoLTE UE exceeds the link MTU-size – IP Layer fragmentation – Packets dropped
<b>Reference ID</b>	ID_Device_02
<b>Priority</b>	High
<b>Date Submitted</b>	08/07/2013
<b>Date Modified</b>	08/07/2013
<b>Overview</b>	IP fragmentation may occur between the UE and the PGW if the UE sends packets that exceed the maximum link MTU size that is supported in the network as part of IP configuration. IP fragmentation is not recommended by 3GPP due to significant transmission overhead. If the UE exceeds the limit and IP fragmentation is not supported in the EPC, the result is packet loss.
<b>Status</b>	Closed
<b>Detailed Description</b>	<p>3GPP TS 23.060 [3] Annex C provides information related to Link MTU considerations. The maximum size of the link MTU size is currently set to 1500 octets. Taking into account the headers for GTP packets that may be further encapsulated within an IPSec tunnel, the overall UE link MTU size is set at 1358 octets.</p> <p>The link MTU size of the network can be requested by the UE in the Protocol Configuration Options (PCO) during LTE Attach. This enables the UE to discover the link MTU size and be compatible with the network IP configuration.</p> <p>It has been discovered that not all UE's request the link MTU size, and regularly exceed this limit when sending SIP messages (e.g. particularly in downloadable clients). If the network does not support procedures for IP fragmentation, then the packets are discarded which in turn results in loss of VoLTE functionality.</p>
<b>Solution</b>	<p>VoLTE UE's shall request the link MTU size from the network (requested in the PCO during attach) and utilise this value when transmitting data packets.</p> <p>NOTE: For IPv6 implementations, the link MTU size is present in the IPv6 Router Advertisement.</p>