

# VoLTE에서 SRVCC 전환 시 오디오 통화 전송 문제 해결

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## 소개

이 문서에서는 VoLTE의 오디오 통화가 SRVCC 전환 시 원활하게 전송되지 않을 때 발생하는 문제를 해결하는 방법에 대해 설명합니다.

## 사전 요구 사항

### 요구 사항

다음 주제에 대한 지식을 보유하고 있으면 유용합니다.

- 5000/5500의 하드웨어 지식
- 스타오스

### 사용되는 구성 요소

이 문서는 특정 소프트웨어 및 하드웨어 버전으로 한정되지 않습니다.

이 문서의 정보는 특정 랩 환경의 디바이스를 토대로 작성되었습니다.

이 문서에 사용된 모든 디바이스는 초기화된(기본) 컨피그레이션으로 시작되었습니다. 네트워크가 작동 중인 경우 모든 명령의 잠재적인 영향을 이해해야 합니다.

## 약어

VoLTE  
SRVCC  
CCR  
CCA  
AVP  
PCRF  
PCEF

장기적인 진화에 대한 음성  
단일 무선 음성 통화 연속성  
신용 관리 요청  
신용 통제 응답  
특성 값 쌍  
정책 및 과금 규칙 기능  
정책 및 과금 시행 기능

SGW  
PGW  
MME

서비스 게이트웨이  
패킷 데이터 네트워크 게이트웨이  
모빌리티 관리 엔티티

## 문제

통신 사업자는 MME에서 SRVCC 전송이 성공했지만 VoLTE 통화가 기존 2G/3G 네트워크로 원활하게 전송되지 않았다고 보고했습니다. SRVCC 전송이 완료된 후 MME는 음성 전달자 플래그가 true로 표시되고 PGW의 베어러 릴리스가 성공적으로 실행되었으며 SGW에 DELETE\_BEARER\_COMMAND 메시지를 보냈습니다.

그러나 PGW에서 PCRF로의 추가 통신에서는 SRVCC가 MME에서 성공했지만 PGW가 PCRF에 PS\_to\_CS\_Transfer로 알리지 않는 것이 관찰되었습니다.

## 문제 해결

이 섹션에서는 SRVCC 전송을 통해 VoLTE에서 레거시 2G/3G 네트워크로 전송되는 오디오 통화 처리 문제를 해결하기 위한 정보를 제공합니다.

SRVCC 인계를 통해 "mon sub" 추적을 수집했습니다. 다음은 MME, SGW, PGW 및 PCRF 간에 교환되는 메시지 시퀀스입니다.

**MME에서 SGW로의 DELETE\_BEARER\_COMMAND 메시지를 음성 전달자 플래그로 true입니다.**

```
INBOUND>>>>> 12:17:24:406 Eventid:141004(3)
[SGW-S11/S4]GTPv2C Rx PDU, from 10.206.33.X:30464 to 10.206.31.Y:2123 (57)
TEID: 0x81E0418E, Message type: EGTP_DELETE_BEARER_COMMAND (0x42)
Sequence Number: 0xD2101D (13766685)
GTP HEADER
  Version number: 2
  TEID flag: Present
  Piggybacking flag: Not present
  Message Priority flag: Not present
  Message Priority: NA
  Message Length: 0x0035 (53)

INFORMATION ELEMENTS
  BEARER CONTEXT:
    Type: 93 Length: 10 Inst: 0
    Value:
      EPS BEARER ID:
        Type: 73 Length: 1 Inst: 0
        Value: 7
      BEARER FLAGS:
        Type: 97 Length: 1 Inst: 0
        Value:
          VB : 1 >> voice bearer as true

  ULI TIMESTAMP:
    Type: 170 Length: 4 Inst: 0
    Value:
      Seconds: 3766718840

  USER LOCATION INFO:
    Type: 86 Length: 13 Inst: 0
    Value:
```

Location type: TAI  
MCC: XYZ  
MNC: AB  
TAC: 0x7D5  
Location type: ECGI  
MCC: XYZ  
MNC: AB  
ECI: 0xE02F902

UE TIME ZONE:

Type: 114 Length: 2 Inst: 0  
Value:  
TZ: +5:30  
DST: +0 hour

또한 SGW는 EGTP\_DELETE\_BEARER\_COMMAND 메시지를 PGW에 전송합니다.

INBOUND>>>> 12:17:24:407 Eventid:141004(3)  
[PGW-S5/S2a/S2b]GTPv2C Rx PDU, from 223.224.X.Y:36368 to 223.224.A.B:2123 (57)  
TEID: 0x80F0E1DB, Message type: EGTP\_DELETE\_BEARER\_COMMAND (0x42)  
Sequence Number: 0xAD818E (11370894)

GTP HEADER

Version number: 2  
TEID flag: Present  
Piggybacking flag: Not present  
Message Priority flag: Not present  
Message Priority: NA  
Message Length: 0x0035 (53)

INFORMATION ELEMENTS

BEARER CONTEXT:

Type: 93 Length: 10 Inst: 0  
Value:

EPS BEARER ID:

Type: 73 Length: 1 Inst: 0  
Value: 7

BEARER FLAGS:

Type: 97 Length: 1 Inst: 0  
Value:

VB : 1

>> voice bearer as true

ULI TIMESTAMP:

Type: 170 Length: 4 Inst: 0  
Value:

Seconds: 3766718840

USER LOCATION INFO:

Type: 86 Length: 13 Inst: 0  
Value:

Location type: TAI  
MCC: XYZ  
MNC: AB  
TAC: 0x7D5  
Location type: ECGI  
MCC: XYZ  
MNC: AB  
ECI: 0xE02F902

UE TIME ZONE:

Type: 114 Length: 2 Inst: 0  
Value:  
TZ: +5:30  
DST: +0 hour

또한 PGW에서 DELETE\_BEARER를 수락하고 전달자 삭제를 시작합니다.

<<<

[PGW-S5/S2a/S2b]GTPv2C Tx PDU, from 223.224.A.B:2123 to 223.224.X.Y:36368 (17)

TEID: 0x80F3C18E, Message type: EGTP\_DELETE\_BEARER\_REQUEST (0x63)

Sequence Number: 0xAD818E (11370894)

GTP HEADER

Version number: 2  
TEID flag: Present  
Piggybacking flag: Not present  
Message Priority flag: Not present  
Message Priority: NA  
Message Length: 0x000D (13)

INFORMATION ELEMENTS

EPS BEARER ID:  
Type: 73 Length: 1 Inst: 1  
Value: 7

PGW PCRF CCR . Charging-Rule-Report AVP PGW PCRF Charging-Rule-Name,  
PCC-Rule-Status Rule-Failure-Code .PGW PCRF .MME ( true ) ,  
PGW PCRF PS\_to\_CS . PCRF Resource\_Allocation\_failure . , PCRF 4G  
IMS . IMS VoLTE . SRVCC 2G/3G .

In 3GPP TS 29.212 V13.5.0 (2016-03)

As mentioned in section 3.6, Request of IP-CAN Bearer Termination

If the IP-CAN bearer termination is caused by the PS to CS handover, the PCEF shall report related PCC rules for this IP-CAN bearer by including the Rule-Failure-Code AVP set to the value PS\_TO\_CS\_HANDOVER.

In 3GPP TS 29.212 V14.3.0 (2017-03)

As mentioned in section 4.5.6 Indication of IP-CAN Bearer Termination Implications

When the PCEF detects that a dedicated IP-CAN bearer could not be activated or has been terminated it shall remove the affected PCC rules and send a CCR command to the PCRF with CC-Request-Type AVP set to the value "UPDATE\_REQUEST", including the Charging-Rule-Report AVP specifying the affected PCC rules with the PCC-Rule-Status set to inactive and including the Rule-Failure-Code AVP assigned to the value RESOURCE\_ALLOCATION\_FAILURE.

SRVCC PS-to-CS Handover Indication Support in starOS

This feature helps in notifying the PCRF about the exact reason for PCC rule deactivation on Voice bearer deletion.

This exact cause will help PCRF to then take further action appropriately.

This feature ensures complete compliance for SRVCC, including support for PS-to-CS handover indication when voicebearers are released.

If the IP-CAN bearer termination is caused by the PS to CS handover, the PCEF may report related PCC rules for this IP-CAN bearer by including the Rule-Failure-Code AVP set to the value PS\_TO\_CS\_HANDOVER.

Charging-Rule-Report AVP PGW PCRF CCR :

<<<

Diameter message from 10.0.232.X:32933 to 10.5.40.Y:3869

Base Header Information:

Version: 0x01 (1)  
Message Length: 0x000260 (608)  
Command Flags: 0xc0 (192) REQ PXY  
Command Code: 0x000110 (272) Credit-Control-Request  
Application ID: 0x01000016 (16777238) 3GPP-Gx  
Hop2Hop-ID: 0xb7cf10ce (3083800782)  
End2End-ID: 0x3b6b4886 (996886662)

AVP Information:

[M] Session-Id

Code: 0x00000107 (263) Session-Id  
Flags: 0x40 (64) [M]  
Length: 0x00004f (79)

Data: 0003-diamproxy.asr55k.gx;1385806608;584234203;5cd9037d-1db02

[M] Auth-Application-Id  
Code: 0x00000102 (258) Auth-Application-Id  
Flags: 0x40 (64) [M]  
Length: 0x00000c (12)  
Data: 16777238

[M] Origin-Host  
Code: 0x00000108 (264) Origin-Host  
Flags: 0x40 (64) [M]  
Length: 0x00002b (43)  
Data: 0003-diamproxy.asr55k.gx

[M] Origin-Realm  
Code: 0x00000128 (296) Origin-Realm  
Flags: 0x40 (64) [M]  
Length: 0x00001a (26)  
Data: cisco.com

[M] Destination-Realm  
Code: 0x0000011b (283) Destination-Realm  
Flags: 0x40 (64) [M]  
Length: 0x00002a (42)  
Data: PCRF.MNC0AB.MCCXYZ.3GPPNETWORK.ORG

[M] CC-Request-Type  
Code: 0x000001a0 (416) CC-Request-Type  
Flags: 0x40 (64) [M]  
Length: 0x00000c (12)  
Data: UPDATE\_REQUEST (2)

[M] CC-Request-Number  
Code: 0x0000019f (415) CC-Request-Number  
Flags: 0x40 (64) [M]  
Length: 0x00000c (12)  
Data: 2

[M] Destination-Host  
Code: 0x00000125 (293) Destination-Host  
Flags: 0x40 (64) [M]  
Length: 0x000037 (55)  
Data: PCRF01.PCRF.MNC0AB.MCCXYZ.3GPPNETWORK.ORG

[M] Origin-State-Id  
Code: 0x00000116 (278) Origin-State-Id  
Flags: 0x40 (64) [M]  
Length: 0x00000c (12)  
Data: 1552081338

[M] Subscription-Id  
Code: 0x000001bb (443) Subscription-Id  
Flags: 0x40 (64) [M]  
Length: 0x000028 (40)  
[M] Subscription-Id-Type  
Code: 0x000001c2 (450) Subscription-Id-Type  
Flags: 0x40 (64) [M]  
Length: 0x00000c (12)  
Data: END\_USER\_E164 (0)

[M] Subscription-Id-Data  
Code: 0x000001bc (444) Subscription-Id-Data  
Flags: 0x40 (64) [M]  
Length: 0x000014 (20)  
Data: 121234567891

```
[M] Subscription-Id
Code:      0x000001bb (443) Subscription-Id
Flags:     0x40      (64) [M]
Length:    0x00002c  (44)
  [M] Subscription-Id-Type
    Code:    0x000001c2 (450) Subscription-Id-Type
    Flags:   0x40      (64) [M]
    Length:  0x00000c  (12)
    Data: END_USER_IMSI (1)

  [M] Subscription-Id-Data
    Code:    0x000001bc (444) Subscription-Id-Data
    Flags:   0x40      (64) [M]
    Length:  0x000017  (23)
    Data: XYZAB1234567891

[M] Framed-IPv6-Prefix
Code:      0x00000061 (97) Framed-IPv6-Prefix
Flags:     0x40      (64) [M]
Length:    0x000012  (18)
Data: Reserved: 00 Prefixlen: 64 IPv6 prefix: 2401:4900:4097:f050::

[M] User-Equipment-Info
Code:      0x000001ca (458) User-Equipment-Info
Flags:     0x40      (64) [M]
Length:    0x00002c  (44)
  [M] User-Equipment-Info-Type
    Code:    0x000001cb (459) User-Equipment-Info-Type
    Flags:   0x40      (64) [M]
    Length:  0x00000c  (12)
    Data: IMEISV (0)

  [M] User-Equipment-Info-Value
    Code:    0x000001cc (460) User-Equipment-Info-Value
    Flags:   0x40      (64) [M]
    Length:  0x000018  (24)
    Data: 9876543211234

[M] Called-Station-Id
Code:      0x0000001e (30) Called-Station-Id
Flags:     0x40      (64) [M]
Length:    0x00000b  (11)
Data: ims

[V] [M] Charging-Rule-Report
Code:      0x000003fa (1018) Charging-Rule-Report
Flags:     0xc0      (192) [V] [M]
Length:    0x00006c  (108)
Vendor-Id: 0x000028af (10415) 3GPP
  [V] [M] Charging-Rule-Name
    Code:    0x000003ed (1005) Charging-Rule-Name
    Flags:   0xc0      (192) [V] [M]
    Length:  0x00001e  (30)
    Vendor-Id: 0x000028af (10415) 3GPP
    Data: I_AD_VOLTE00F72513

  [V] [M] Charging-Rule-Name
    Code:    0x000003ed (1005) Charging-Rule-Name
    Flags:   0xc0      (192) [V] [M]
    Length:  0x00001e  (30)
    Vendor-Id: 0x000028af (10415) 3GPP
    Data: I_AD_VOLTE00F72512

[V] [M] PCC-Rule-Status
```

Code: 0x000003fb (1019) PCC-Rule-Status  
Flags: 0xc0 (192) [V] [M]  
Length: 0x000010 (16)  
Vendor-Id: 0x000028af (10415) 3GPP  
Data: INACTIVE (1)

[V] [M] Rule-Failure-Code

Code: 0x00000407 (1031) Rule-Failure-Code  
Flags: 0xc0 (192) [V] [M]  
Length: 0x000010 (16)  
Vendor-Id: 0x000028af (10415) 3GPP  
Data: RESOURCE\_ALLOCATION\_FAILURE (10)

>> failure code is incorrect. It should be PS\_CS\_Handover

[V] [M] Access-Network-Charging-Address

Code: 0x000001f5 (501) Access-Network-Charging-Address  
Flags: 0xc0 (192) [V] [M]  
Length: 0x000012 (18)  
Vendor-Id: 0x000028af (10415) 3GPP  
Data: IPv4 223.224.X.Y

rel-8 .rel-8 PS\_CS\_Transfer .  
3gpp-r10 . 3gpp-r10 PS\_CS\_Submission .  
VoLTE 2G/3G .

ims-auth-service DRA\_Gx\_SPG  
policy-control

diameter dictionary r8-gx-standard

diameter update-dictionary-avps 3gpp-r10 << diameter dictionary updated to 3gpp-r10

SGW PGW DELETE\_BEARER\_COMMAND true .

INBOUND>>>> From sessmgr:205 tpc\_interface.c:1338 (Callid 3cda3ef4) 13:28:21:659

Eventid:141004(3)

[PGW-S5/S2a/S2b]GTPv2C Rx PDU, from 223.224.M.N:39632 to 223.224.P.Q:2123 (57)

TEID: 0x845800CD, Message type: EGTP\_DELETE\_BEARER\_COMMAND (0x42)

Sequence Number: 0xE9625A (15295066)

GTP HEADER

Version number: 2  
TEID flag: Present  
Piggybacking flag: Not present  
Message Priority flag: Not present  
Message Priority: NA  
Message Length: 0x0035 (53)

INFORMATION ELEMENTS

BEARER CONTEXT:

Type: 93 Length: 10 Inst: 0

Value:

EPS BEARER ID:

Type: 73 Length: 1 Inst: 0

Value: 7

BEARER FLAGS:

Type: 97 Length: 1 Inst: 0

Value:

**VB : 1**

**>> voice bearer as true**

ULI TIMESTAMP:

Type: 170 Length: 4 Inst: 0

Value:

Seconds: 3769747091

USER LOCATION INFO:

Type: 86 Length: 13 Inst: 0

Value:

Location type: TAI

MCC: XYZ  
MNC: AB  
TAC: 0x844  
Location type: ECGI  
MCC: XYZ  
MNC: AB  
ECI: 0xDCf8C02

UE TIME ZONE:

Type: 114 Length: 2 Inst: 0  
Value:  
TZ: +5:30  
DST: +0 hour

PGW .

<<<

[PGW-S5/S2a/S2b]GTPv2C Tx PDU, from 223.224.M.N:2123 to 223.224.P.Q:39632 (17)  
TEID: 0x8064A25A, Message type: EGTP\_DELETE\_BEARER\_REQUEST (0x63)  
Sequence Number: 0xE9625A (15295066)

GTP HEADER

Version number: 2  
TEID flag: Present  
Piggybacking flag: Not present  
Message Priority flag: Not present  
Message Priority: NA  
Message Length: 0x000D (13)

INFORMATION ELEMENTS

EPS BEARER ID:  
Type: 73 Length: 1 Inst: 1  
Value: 7

PGW PCRF CCR . PS\_CS\_Transition .

<<<

Diameter message from 10.206.17.X:51119 to 10.5.40.Y:3007

Base Header Information:

Version: 0x01 (1)  
Message Length: 0x000260 (608)  
Command Flags: 0xc0 (192) REQ PXY  
Command Code: 0x000110 (272) Credit-Control-Request  
Application ID: 0x01000016 (16777238) 3GPP-Gx  
Hop2Hop-ID: 0xaebac4d3 (2931475667)  
End2End-ID: 0x19b8ec95 (431549589)

AVP Information:

[M] Session-Id

Code: 0x00000107 (263) Session-Id  
Flags: 0x40 (64) [M]  
Length: 0x00004e (78)  
Data: 0007-diamproxy.asr55k.dra.gx;1020935924;202167245;5d0747d1-cd02

[M] Auth-Application-Id

Code: 0x00000102 (258) Auth-Application-Id  
Flags: 0x40 (64) [M]  
Length: 0x00000c (12)  
Data: 16777238

[M] Origin-Host

Code: 0x00000108 (264) Origin-Host  
Flags: 0x40 (64) [M]  
Length: 0x00002b (43)  
Data: 0007-diamproxy.asr55k.dra.gx

[M] Origin-Realm

Code: 0x00000128 (296) Origin-Realm  
Flags: 0x40 (64) [M]



Length: 0x00001a (26)  
Data: cisco.com

[M] Destination-Realm

Code: 0x0000011b (283) Destination-Realm  
Flags: 0x40 (64) [M]  
Length: 0x00002a (42)  
Data: PCRF.MNC0AB.MCCXYZ.3GPPNETWORK.ORG

[M] CC-Request-Type

Code: 0x000001a0 (416) CC-Request-Type  
Flags: 0x40 (64) [M]  
Length: 0x00000c (12)  
Data: UPDATE\_REQUEST (2)

[M] CC-Request-Number

Code: 0x0000019f (415) CC-Request-Number  
Flags: 0x40 (64) [M]  
Length: 0x00000c (12)  
Data: 2

[M] Destination-Host

Code: 0x00000125 (293) Destination-Host  
Flags: 0x40 (64) [M]  
Length: 0x000037 (55)  
Data: PCRF01.NO.DC.PCRF.MNC0AB.MCCXYZ.3GPPNETWORK.ORG

[M] Origin-State-Id

Code: 0x00000116 (278) Origin-State-Id  
Flags: 0x40 (64) [M]  
Length: 0x00000c (12)  
Data: 1559087623

[M] Subscription-Id

Code: 0x000001bb (443) Subscription-Id  
Flags: 0x40 (64) [M]  
Length: 0x000028 (40)

[M] Subscription-Id-Type

Code: 0x000001c2 (450) Subscription-Id-Type  
Flags: 0x40 (64) [M]  
Length: 0x00000c (12)  
Data: END\_USER\_E164 (0)

[M] Subscription-Id-Data

Code: 0x000001bc (444) Subscription-Id-Data  
Flags: 0x40 (64) [M]  
Length: 0x000014 (20)  
Data: 121234567891

[M] Subscription-Id

Code: 0x000001bb (443) Subscription-Id  
Flags: 0x40 (64) [M]  
Length: 0x00002c (44)

[M] Subscription-Id-Type

Code: 0x000001c2 (450) Subscription-Id-Type  
Flags: 0x40 (64) [M]  
Length: 0x00000c (12)  
Data: END\_USER\_IMSI (1)

[M] Subscription-Id-Data

Code: 0x000001bc (444) Subscription-Id-Data  
Flags: 0x40 (64) [M]  
Length: 0x000017 (23)  
Data: XYZAB1234567891

[M] Framed-IPv6-Prefix

Code: 0x00000061 (97) Framed-IPv6-Prefix  
Flags: 0x40 (64) [M]  
Length: 0x000012 (18)  
Data: Reserved: 00 Prefixlen: 64 IPv6 prefix: 2401:4900:4071:32ec::

[M] User-Equipment-Info

Code: 0x000001ca (458) User-Equipment-Info  
Flags: 0x40 (64) [M]  
Length: 0x00002c (44)

[M] User-Equipment-Info-Type

Code: 0x000001cb (459) User-Equipment-Info-Type  
Flags: 0x40 (64) [M]  
Length: 0x00000c (12)  
Data: IMEISV (0)

[M] User-Equipment-Info-Value

Code: 0x000001cc (460) User-Equipment-Info-Value  
Flags: 0x40 (64) [M]  
Length: 0x000018 (24)  
Data: 9876543211234

[M] Called-Station-Id

Code: 0x0000001e (30) Called-Station-Id  
Flags: 0x40 (64) [M]  
Length: 0x00000b (11)  
Data: ims

[V] [M] Charging-Rule-Report

Code: 0x000003fa (1018) Charging-Rule-Report  
Flags: 0xc0 (192) [V] [M]  
Length: 0x00006c (108)  
Vendor-Id: 0x000028af (10415) 3GPP

[V] [M] Charging-Rule-Name

Code: 0x000003ed (1005) Charging-Rule-Name  
Flags: 0xc0 (192) [V] [M]  
Length: 0x00001e (30)  
Vendor-Id: 0x000028af (10415) 3GPP  
Data: I\_AD\_VOLTE03D4E98A

[V] [M] Charging-Rule-Name

Code: 0x000003ed (1005) Charging-Rule-Name  
Flags: 0xc0 (192) [V] [M]  
Length: 0x00001e (30)  
Vendor-Id: 0x000028af (10415) 3GPP  
Data: I\_AD\_VOLTE03D4E989

[V] [M] PCC-Rule-Status

Code: 0x000003fb (1019) PCC-Rule-Status  
Flags: 0xc0 (192) [V] [M]  
Length: 0x000010 (16)  
Vendor-Id: 0x000028af (10415) 3GPP  
Data: INACTIVE (1)

[V] [M] Rule-Failure-Code

Code: 0x00000407 (1031) Rule-Failure-Code  
Flags: 0xc0 (192) [V] [M]  
Length: 0x000010 (16)  
Vendor-Id: 0x000028af (10415) 3GPP  
Data: PS\_TO\_CS\_HANDOVER (13)

>> failure code seen as

PS\_to\_CS\_Handover

[V] [M] Access-Network-Charging-Address

Code: 0x000001f5 (501) Access-Network-Charging-Address

Flags: 0xc0 (192) [V] [M]

Length: 0x000012 (18)

Vendor-Id: 0x000028af (10415) 3GPP

Data: IPv4 223.224.X.Y

SRVCC 4G VoLTE 2G/3G . ims-auth-service diameter 3gpp-  
rel10 .