Network Working Group
Internet-Draft

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Intended status: Standard Track
Expires: July 2022
January 24, 2022

A SIP Response Code (497) for Call Transfer Failure
draft-khatri-sipcore-call-transfer-fail-response-02.txt

Status of this Memo

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Abstract

This document defines the 497 (Call Transfer Failure) SIP response code, allowing Call Pull and Call Push parties to indicate that the operation was rejected. Optional warning codes are defined to carry granular information. SIP entities may use this information to adjust how subsequent calls can be handled intelligently.

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1. Introduction

Packet switch calls for voice, video and text applications using IP Multimedia Subsystems (IMS) are anchored in the IMS core network. The signaling plane and media plane of IMS calls established on one device can be pushed ("Call Push") to another device. Similarly, IMS calls established on one device can be pulled ("Call Pull") by another device using SIP signaling.

The call status during the SIP transaction can be conveyed through SIP response codes. RFC 3261 has defined many SIP response codes. The IMS core network MAY define a policy to allow or reject the Call Pull or Call Push operation. There are numerous reasons why the Call Pull or Call Push operation can fail. In case of call transfer failure due to policy defined by the IMS core network, the IMS core network MAY want to convey the failure to the user agent (UA) through a response code. Based on the response code, the UA MAY determine whether and how to establish a subsequent call.

The existing response codes in RFC 3261 are not sufficient to convey the information about the call transfer failure to the UA. Overloading an existing response code could lead to unnecessary subsequent signaling which could burden the IMS core network. To avoid possible signaling overload in the IMS core network and to accurately convey the call transfer failure to the UA, a new response code along with associated optional warning codes to be included in a Warning header field are proposed in this RFC.

The following call flows illustrate the successful Call Pull.

```
 UA                                                    Core Network
  |                                                          |
  |                                                          |
  |     1. INVITE:                                           |
  |        Contact-Header: +g.3gpp.iut-focus                 |
  |--------------------------------------------------------->|
  |                                                          |
  |     2. 200 OK                                            |
  |<---------------------------------------------------------|
  |                                                          |
        Figure 1: Call Pull Success
```

1. The UA sends an INVITE to Pull the call from another device. Feature Tag: +g.3gpp.iut-focus [RFC6809] is added in the Contact Header field.
2. The call transfer request satisfied. The Core Network sends 200 OK.

The following call flows illustrate the successful Call Push.

```
  UA                                                   Core Network
  |                                                          |
  |     1. REFER:                                            |
  |        Contact-Header: +g.3gpp.iut-focus                 |
  |--------------------------------------------------------->|
  |                                                          |
  |     2. 202 Accepted                                      |
  |<---------------------------------------------------------|
```

```
    |                                                         |
```

Figure 2: Call Push Success

1. The UA sends a REFER to Push the call to another device. Feature Tag: +g.3gpp.iut-focus is added in the Contact Header field.
2. The call transfer request satisfied. The Core Network sends 202 Accepted.

2. Normative Language

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in BCP 14 [RFC2119] [RFC8174] when, and only when, they appear in all capitals, as shown here.

3. Motivation

Seamless transfer of the media plane of an on-going voice call between devices is a legacy behavior. The signaling plane in the legacy behavior resides on the originating device.

If the two devices can run IMS over SIP signaling, the signaling plane and media plane can be transferred between these devices with minimal media flow interruption. The control plane and media plane transfer procedures are beyond the scope of this RFC.

There are various reasons why an on-going call cannot be transferred between the devices. Some of these reasons are policy driven, for instance: the call to be transferred is in the circuit switched (CS) domain and the operator's policy does not allow transfer of a CS call, the call is an emergency call and the operator's policy does not allow transfer of an emergency call, the call is a mobile-terminated call and the operator's policy does not allow transfer of a mobile-terminated call, or the call is a video call and the operator's policy does not allow transfer of a video call.

The UA initiating the call transfer procedure will be notified of any failure through a SIP response code. However the existing SIP response codes are not suitable to adequately convey the information regarding why the call transfer request is not accepted by the network: handling of these existing response codes has already been implemented by various devices, with an associated device behavior defined for a specific purpose not related to call transfer. For instance, upon receiving some of these response code, such as 403 (Forbidden), the device MAY initiate IMS re-registration procedure, which is not needed in case of Call Pull/Call Push failure and will result in unnecessary SIP signaling.

Consequently, to accurately convey the information about the call transfer failure to the UA, a new response code is required along with an optional warning code in a Warning header field to convey the exact reason why the call could not be transferred, so that the UA can determine the subsequent steps (e.g. call termination) and optionally provide an indication of the reason for the failure to the user.

Backward compatibility is maintained in both the UE and Network side. The Network component that has not implemented this RFC shall use the existing response code. The UE that has not implemented this RFC shall handle this new response code as an unknown response code.

4. Theory of Operation

Response code:

A new SIP response code 497 is defined.

Description: Call Transfer Failure

The server understood the call transfer request but is refusing the service. The SIP response with SIP response code 497 MAY include a Warning header field [RFC3261] with a warning code set to one of the values listed below and the associated warning text conveying granular information about the reason for the call transfer failure, so as to enable the UA to develop extra logic for subsequent call transfer procedure.

Warning header:

An optional Warning header will carry more granular failure information as follows:

380. Inactive state
381. Local Receive-only state

382. Local Transmit-only state
383. Remote Receive-only state
384. Remote Transmit-only state
385. Hold state
386. Mortal state
387. Conference call
388. Emergency call
389. Video call
390. Real Time Text call
391. Circuit Switch call
392. Non existing call
393. Single Radio Voice Call Continuity in progress

Feature-tag:

media feature-tag:+g.3gpp.iut-focus [3GPP TS 24.337]

In Call Pull, INVITE method is used and media feature tag "+g.3gpp.iut-focus" is included in the Contact Header field.

In Call Push, REFER method is used and media feature tag "+g.3gpp.iut-focus" is included in the Contact Header field.

Call Transfer failure

If call transfer using INVITE or REFER method fails and response code 497 is supported by the network, the SIP response SHALL include SIP response code 497.

If a call transfer fails and response code 497 is not supported by the network, the SIP response code should be chosen from existing
SIP response codes defined in RFC 3261

Example:

Warning: 388 proxy.example.com "Call is an emergency call"

The following call flow illustrates the usage of SIP response code 497 and the associated warning codes:

```
   UA                                                 Core Network
    |                                                          |
    |                                                          |
    |     1. INVITE:                                           |
    |        Contact-Header: +g.3gpp.iut-focus                 |
    |--------------------------------------------------------->|
    |                                                          |
    |     2. 497 Call Transfer Failure                         |
    |        Warning: 388 "Call is an emergency call"          |
    |<---------------------------------------------------------|
    |                                                          |
```

Figure 3: Usage of SIP response code 497 Call Pull

1. The UA sends an INVITE to Pull the call from another device. Feature Tag: +g.3gpp.iut-focus is added in the Contact Header field.
2. The call transfer request cannot be satisfied due to the call requested to be transferred being an emergency call. Since the core network supports SIP response code 497, the core network sends a 497 Call Transfer Failure with a Warning header field set to: 388 "Call is an emergency call"

```
    UA                                             Core Network
    |                                                          |
    |     1. REFER:                                            |
    |        Contact-Header: +g.3gpp.iut-focus                 |
    |--------------------------------------------------------->|
    |                                                          |
    |     2. 497 Call Transfer Failure                         |
    |        Warning: 388 "Call is an emergency call"          |
    |<---------------------------------------------------------|
    |                                                          |
```

Figure 4: Usage of SIP response code 497 Call Push

1. The UA sends a REFER to Push the call to another device. Feature Tag: +g.3gpp.iut-focus is added in the Contact Header field.
2. The call transfer request cannot be satisfied due to the call requested to be transferred being an emergency call. Since the core network supports SIP response code 497, the core network sends a 497 Call Transfer Failure with a Warning header field set to: 388 "Call is an emergency call"

5. IANA Considerations

5.1. SIP Response Code

This document registers a new SIP response code. This response code is defined by the following information, which has been added to the "Response Codes" sub-registry under the "Session Initiation Protocol (SIP) Parameters" registry <http://www.iana.org/assignments/sip-parameters>.

Response Code: 497

Description: CALL TRANSFER FAILURE

The server understood the request to transfer the call but is refusing the service. This response MAY include a Warning header field [RFC3261] with a warning code set to one of the values listed in section 5.2 and the associated warning text conveying granular information about the reason for the call transfer failure.

Reference: [RFCxxxx]

5.2. Warning codes

This document registers new warning codes. These warning codes are defined by the following information, which has been added to the "Warning Codes (warn-codes)" sub-registry under the "Session Initiation Protocol (SIP) Parameters" registry <http://www.iana.org/assignments/sip-parameters>.

380. Inactive state

381. Local Receive-only state

382. Local Transmit-only state

383. Remote Receive-only state

384. Remote Transmit-only state

385. Hold state

386. Mortal state

387. Conference call

388. Emergency call

389. Video call

390. Real Time Text call

391. Circuit Switch call

392. Non existing call

393. Single Radio Voice Call Continuity in progress

6. Security Considerations

The general discussion in [RFC3261] applies.

7. References

7.1. Normative References

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[3GPP TS 24.337] "Universal Mobile Telecommunications System (UMTS); LTE; IP Multimedia (IM) Core Network (CN)subsystem IP Multimedia Subsystem (IMS) inter-UE transfer

8. Acknowledgments

Lena Chaponniere, Qualcomm Inc. and Waqar Zia, Qualcomm Inc. for the technical guidance.

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