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Signalling requirements and protocols for the NGN – Service and session control protocols – supplementary services

Communication diversion protocol specification as an NGN supplementary service

Recommendation ITU-T Q.3616

ITU-T Q-SERIES RECOMMENDATIONS

SWITCHING AND SIGNALLING

Recommendation ITU-T Q.3616

Communication diversion protocol specification as an NGN supplementary service

Summary

Recommendation ITU-T Q.3616 describes the protocol specification of the communication diversion (CDIV) protocol specification in NGN supplementary services. This Recommendation includes operational requirements, coding requirements, signalling requirements, interaction with other services and parameter values (timers).

This Recommendation is aligned with ETSI TS 124 604.

History

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Table of Contents

Recommendation ITU-T Q.3616

Communication diversion protocol specification as an NGN supplementary service

1   Scope

This Recommendation describes the protocol specification of the communication diversion (CDIV) protocol specification in NGN supplementary services.

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 E.164]   Recommendation ITU-T E.164 (2010), *The international public telecommunication numbering plan*.

[ITU-T Q.763]   Recommendation ITU-T Q.763 (1999), *Signalling System No. 7 – ISDN User Part formats and codes*.

[ITU-T Q.1912.5]   Recommendation ITU-T Q.1912.5 (2004), *Interworking between Session Initiation Protocol (SIP) and Bearer Independent Call Control protocol or ISDN User Part*.

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[ETSI TS 124 238]   ETSI TS 124 238 V11.2.0 (2013), *Session Initiation Protocol (SIP) based user configuration; Stage 3*.

[ETSI TS 124 315]   ETSI TS 124 315 V11.2.0 (2015), *Operator Determined Barring (ODB); Stage 3: protocol specification*.

[ETSI TS 124 604]   ETSI TS 124 604 V11.9.0 (2014), *Communication Diversion (CDIV) using IP Multimedia (IM) Core Network (CN) subsystem; Protocol specification*.

[ETSI TS 124 611]   ETSI TS 124 611 V11.3.0 (2015), *Anonymous Communication Rejection (ACR) and Communication Barring (CB) using IP Multimedia (IM) Core Network (CN) subsystem; Protocol specification*.

[ETSI TS 124 623]   ETSI TS 124 623 V11.1.0 (2013), *Extensible Markup Language (XML) Configuration Access Protocol (XCAP) over the Ut interface for Manipulating Supplementary Services*.

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[IETF RFC 3326]	IETF RFC 3326 (2002), *The Reason Header Field for the Session Initiation Protocol (SIP).* <https://datatracker.ietf.org/doc/rfc3326/>
[IETF RFC 3398]	IETF RFC 3398 (2002), *Integrated Services Digital Network (ISDN) User Part (ISUP) to Session Initiation Protocol (SIP) Mapping.* <https://datatracker.ietf.org/doc/rfc3398/>
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[IETF RFC 3966]	IETF RFC 3966 (2004), *The tel URI for Telephone Numbers.* <https://datatracker.ietf.org/doc/rfc3966/>
[IETF RFC 4458]	IETF RFC 4458 (2006), *Session Initiation Protocol (SIP) URIs for Applications such as Voicemail and Interactive Voice Response (IVR).* <https://datatracker.ietf.org/doc/rfc4458/>
[IETF RFC 4694]	IETF RFC4694 (2006), *Number Portability Parameters for the "tel" URI.* <https://datatracker.ietf.org/doc/rfc4694/>
[IETF RFC 5627]	IETF RFC 5627 (2009), *Obtaining and Using Globally Routable User Agent URIs (GRUUs) in the Session Initiation Protocol (SIP).* <https://datatracker.ietf.org/doc/rfc5627/>
[IETF RFC 6665]	IETF RFC 6665 (2012), *SIP-Specific Event Notification.* <https://datatracker.ietf.org/doc/rfc6665/>
[IETF RFC 7044]	IETF RFC 7044 (2012), *An Extension to the Session Initiation Protocol (SIP) for Request History Information.* <https://datatracker.ietf.org/doc/rfc7044/>

3 Definitions and abbreviations

3.1 Definitions

None.

3.2 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

ACM	Address Complete Message
ACR	Anonymous Communication Rejection
ANM	Answer Message
AS	Application Server
CB	Communication Barring
CCBS	Completion of Communications to Busy Subscriber
CD	Communication Deflection
CDIV	Communication DIVersion
CDIVN	Communication Diversion Notification

CFB	Communication Forwarding Busy
CFNL	Communication Forwarding on Not Logged-in
CFNR	Communication Forwarding No Reply
CFNRc	Communication Forwarding on subscriber Not Reachable
CFU	Communication Forwarding Unconditional
CN	Core Network
CONF	Conference
CPG	Call Progress message
CSCF	Call Session Control Function
CW	Communication Waiting
ECT	Explicit Communication Transfer
GRUU	Globally Routable User agent URI
HOLD	communication HOLD
IAM	Initial Address Message
IFC	Initial Filter Criteria
IM	IP Multimedia
IMS	IP Multimedia Subsystem
IP	Internet Protocol
ISDN	Integrated Service Data Network
ISUP	Integrated Service digital network User Part
MCID	Malicious Communication IDentification
MGCF	Media Gateway Control Function
NDUB	Network Determined User Busy
NNI	Network-to-Network Interface
OCB	Outgoing Communication Barring
ODB	Operator Determined Barring
OIP	Originating Identification Presentation
OIR	Originating Identification Restriction
P-CSCF	Proxy-Call Session Control Function
PSTN	Public Switched Telephone Network
S-CSCF	Server-Call Session Control Function
SDP	Session Description Protocol
SIP	Session Initiation Protocol
TIP	Terminating Identification Presentation
TIR	Terminating Identification Restriction
UA	User Agent
UE	User Equipment

URI   Universal Resource Identifier

UDUB   User Determined User Busy

XCAP   XML Configuration Access Protocol

XML   extensible Markup Language

4   Communication diversion (CDIV)

4.1   Introduction

The communication diversion (CDIV) service could enable communications addressed to a user to be diverted to another destination.

The description and document structure of this Recommendation are based on [ETSI TS 124 604].

Procedures for the CDIV application server (AS) regarding operator determined barring (ODB) are defined in [ETSI TS 124 315].

4.2   Description

4.2.1   General description

4.2.1.1 Service description

The service description of the following CDIV services: communication forwarding unconditional (CFU), communication forwarding busy (CFB), communication forwarding no reply (CFNR) and communication deflection (CD), is based on that of public switched telephone network (PSTN)/ integrated service data network (ISDN) supplementary services. The communication forwarding on not logged-in (CFNL) service is a CDIV service based on requirements for IP based networks and the communication forwarding on subscriber not reachable (CFNRc) service is based on requirements for mobile networks.

In addition, communication diversion notification (CDIVN) is a CDIV service providing the user with the capability to receive notifications about all diverted communications (CFU, CFB, CFNR, CD, CFNRc and CFNL).

Generally the following requirements are expected to be fulfilled:

–   the service provides for the user or the network to identify an alternative destination for an IP multimedia session or individual media of an IP multimedia session;

–   the service provides for redirection to be initiated at various stages of an IP multimedia session. For example:

   •   prior to the setting up of an IP multimedia session;

   •   during the initial request for an IP multimedia session (CFU);

   •   during the establishment of an IP multimedia session (CD).

–   the service provides redirection to be applied for all multimedia sessions unconditionally or redirection can be caused by any of a set list of events or conditions. Typical causes could be:

   •   identity of the originating user;

   •   presence of the originating or destination party;

   •   if the destination party is already in a session (CFB);

   •   if the destination party is unreachable or unavailable in some other way (CFNL, CFNR, CFNRc);

   •   if the destination party does not respond (CFNR);

- • after a specified alerting interval (CFNR);

- • the user's preference on routing for specific IP multimedia session based on the capabilities of multiple user equipments (UEs) sharing the same IP multimedia subsystem (IMS) service subscription;

- • the sending party, the receiving party or the network on their behalf, may initiate redirection to alternative destinations;

– the service provides for the user to subscribe to receive notifications of his/her communications diversions as dictated by the above requirements. The user will also be able to control:

- • if he/she wants to be notified of all or of a particular subset of his/her communication diversions;

- • the amount of information he/she wishes to see as a part of the notifications of his/her CDIV services;

- • the time interval or availability instance when he/she wants to be notified of his/her communication diversions.

The services described hereafter are applications based on a subset of the above-mentioned requirements to provide the user with different possibilities to divert a communication.

It should be possible that a user has the option to restrict receiving communications that are forwarded.

4.2.1.2 Communication forwarding unconditional (CFU)

The CFU service enables a served user to have the network redirect to another user, communications which are addressed to the served user's address. The CFU service may operate on all communications, or just those associated with specified services. The served user's ability to originate communications is unaffected by the CFU supplementary service. After the CFU service has been activated, communications are forwarded independent of the status of the served user.

As a service provider option, a subscription option can be provided to enable the served user to receive a reminder indication that the CFU service has been activated. This indication is provided when the served user originates a communication and if the CFU service has been activated for the served user's address and for the service requested for the communication.

The maximum number of diversions permitted for each communication is a service provider option. The service provider defines the upper limit of diversions. When counting the number of diversions, all types of diversion are included.

4.2.1.3 Communication forwarding on busy user (CFB)

The CFB service enables a served user to have the network redirect the communication to another user, when the served user is in communication and in a busy state. The CFB service may operate on all communications, or just those associated with specified services. The served user's ability to originate communications is unaffected by the CFB supplementary service.

As a service provider option, a subscription option can be provided to enable the served user to receive a reminder indication that the CFB service has been activated. This indication is provided when the served user originates a communication and if the CFB service has been activated for the served user's address and for the service requested for the communication.

The maximum number of diversions permitted for each communication is a service provider option. The service provider defines the upper limit of diversions. When counting the number of diversions, all types of diversion are included.

4.2.1.4 Communication Forwarding on no Reply (CFNR)

The CFNR service enables a served user to have the network redirect to another user, communications which are addressed to the served user's address and for which the connection is not established within a defined period of time. The CFNR service may operate on all communications, or just those associated with specified services. The served user's ability to originate communications is unaffected by the CFNR supplementary service.

The CFNR service can only be invoked by the network after the communication has been offered to the served user and an indication that the called user is being informed of the communication has been received.

As a service provider option, a subscription option can be provided to enable the served user to receive a reminder indication that the CFNR service has been activated. This indication is provided when the served user originates a communication and if the CFNR service has been activated for the served user's address and for the service requested for the communication.

The maximum number of diversions permitted for each communication is a service provider option. The service provider defines the upper limit of diversions. When counting the number of diversions, all types of diversion are included.

4.2.1.5 Communication forwarding on subscriber not reachable (CFNRc)

The CFNRc service enables a user to have the network redirect all incoming communications, when the user is not reachable (e.g., there is no IP connectivity to the user's terminal), to another user. The CFNRc service may operate on all communications, or just those associated with specified services. The user's ability to originate communications is unaffected by the CFNRc supplementary service.

As a service provider option, a subscription option can be provided to enable the user to receive an indication that the CFNRc service has been activated. This indication is provided when the user originates a communication if the CFNRc service has been activated for the user and for the service requested for the communication.

The maximum number of diversions permitted for each communication is a service provider option. The service provider defines the upper limit of diversions. When counting the number of diversions, all types of diversion are included.

4.2.1.6 Communication deflection (CD)

The CD service enables the served user to respond to an incoming communication by requesting redirection of that communication to another user. The CD service can only be invoked before the connection is established by the served user, i.e., in response to the offered communication (before ringing), i.e., CD immediate, or during the period that the served user is being informed of the communication (during ringing). The served user's ability to originate communications is unaffected by the CD supplementary service.

The maximum number of diversions permitted for each communication is a network provider option. The network provider defines the upper limit of diversions. When counting the number of diversions, all types of diversion are included.

4.2.1.7 Communication forwarding on not logged-in (CFNL)

The CFNL service enables a served user to redirect incoming communications which are addressed to the served user's address, to another user (forwarded-to address) in the case where the served user is not registered (logged-in). The CFNL service may operate on all communications, or just on those associated with specified basic services.

As a service provider option, a subscription option can be provided to enable the served user to receive an indication that the CFNL service has been activated. This indication is provided when the served user logs out according to procedures described in [IETF RFC 3261].

The maximum number of diversions permitted for each communication is a service provider option. The service provider defines the upper limit of diversions. When counting the number of diversions, all types of diversion are included.

4.2.1.8 Communication diversion notification (CDIVN)

The CDIVN service enables a served user to receive notification about the diversion of any of his/her incoming communications, which were addressed to the served user's address.

As a service provider option, a subscription option can be provided to enable the served user to receive a reminder indication that the CDIVN service has been activated. This indication is provided when the served user originates a communication and if the CDIVN service has been activated for the served user's address.

In the case where the user is not available to receive CDIVN, for example if the user is logged out or not reachable, the notification will be provided to the user following the user's registration, in the case of CFNL when the user's CDIVN activation is still valid and if the time to buffer the notification (CDIVN buffer timer) in the application server (AS) has not expired.

NOTE – In the cases of CFNL and CRNRc, CDIVN activation continues to be valid after user registration in the case where the user employs the same user's address employed before having the status of no connectivity and as long as the SUBSCRIBE dialogue has not expired in the AS.

4.3   Operational requirements

4.3.1   Provision/withdrawal

The CDIV services (communication forwarding unconditional, communication forwarding busy, communication forwarding no reply, communication forwarding not logged-in, communication deflection and communication diversion notification) are provided after prior arrangement with the service provider.

The CDIV services are withdrawn at the served user's request or for administrative reasons.

The CDIV supplementary services can be offered separately with subscription options. The notification service CDIVN is offered together with at least one CDIV supplementary service. For each subscription option, only one value can be selected. These subscription options are part of the call diversion profile for the served user. The subscription options are shown in Table 4.3.1.1.

Table 4.3.1.1 – Subscription options for CDIV services

Subscription options	Value	Applicability
The served user receives an indication that a communication has been forwarded (indication of communication diversion to the diverting user).	No (default) _____ Yes	CFU CFB CFNR CFNRc
The originating user receives notification that his communication has been diverted (forwarded or deflected).	No _____ Yes (default)	CFU CFB CFNR CFNRc CFNL CD

Table 4.3.1.1 – Subscription options for CDIV services

Subscription options	Value	Applicability
The served user allows the presentation of his/her diverted-to universal resource identifier (URI) to the originating user in the diversion notification.	No _____ Not reveal as globally routable user agent URI (GRUU) _____ Yes (default)	CFU CFB CFNR CFNRc CFNL CD
The served user receives a reminder indication on outgoing communication that CDIV is currently activated.	No (default) _____ Yes	CFU CFB CFNR CFNRc CFNL CDIVN
The served user allows the presentation of his/her URI to the diverted-to user.	No _____ Not reveal as GRUU _____ Yes (default)	CFU CFB CFNR CFNRc CFNL CD
The served user allows the presentation of his/her URI to the originating user in the diversion notification.	No _____ Not reveal as GRUU _____ Yes (default)	CFU CFB CFNR CFNRc CFNL CD

Network provider options available for the CDIV services are shown in Table 4.3.1.2.

Table 4.3.1.2 – Network provider options for CDIV services

Network provider option	Value	Applicability
Served user communication retention on invocation of diversion (forwarding or deflection).	Retain communication to the served user until alerting begins at the diverted-to user _____ Clear communication to the served user on invocation of call diversion	CFNR CD
Served user communication retention when diverting is rejected at diverted-to user.	Continue to alert the diverting user (see Note 1) _____ No action at the diverting user (see Note 2)	CFNR CD
The subscription option is provided for "served user receives reminder indication on outgoing communication that CDIV is currently activated".	No _____ Yes	CFU CFB CFNR CFNRc CFNL CDIVN

Table 4.3.1.2 – Network provider options for CDIV services

Network provider option	Value	Applicability
Served user communication retention on invocation of diversion (forwarding or deflection).	Retain communication to the served user until alerting begins at the diverted-to user _____ Clear communication to the served user on invocation of call diversion	CFNR CD
Total number of all diversions for each communication.	Maximum number of diverted connections (upper limit is based on operator policy)	CFU CFB CFNR CFNRc CFNL CD
AS behaviour when the maximum number of diversions for a communication is reached.	Reject the communication (default) _____ Deliver the communication to the latest diverting party	CFU CFB CFNR CFNRc CFNL CD
CDIV Indication Timer.	Timer duration is a service provider option	CFU CFB CFNR CFNRc CFNL CD
Communication forwarding on no reply timer.	Timer default duration is a service provider option (see Note 3)	CFNR
CDIVN Buffer Timer; Timer value for AS to store CDIVN, if it cannot be delivered as per CDIVN configuration.	Timer duration set by the service provider. Default value is 1 day	CFNL, CFNRc in case of CDIVN
NOTE 1 – This applies to the retention of the communication at invocation of communication diverting. NOTE 2 – This applies to the clearing communication option on invocation of communication diverting. NOTE 3 – As a network provider option, it shall be possible for the served user to change the timer duration.		

4.3.2 Requirements on the originating network side

No specific requirements are needed in the network.

4.3.3 Requirements in the network

No specific requirements are needed in the network.

Based on the initial filter criteria (IFC) rules, indicating that the served user is subscribed to the CDIV supplementary services, the communication is be forwarded to an AS.

4.4 Coding requirements

The messages and parameters for this supplementary service are defined in [ETSI TS 124 229]. In order to fulfil the requirements messages and parameters are used to support the communication diversion service.

4.4.1 SIP messages

4.4.1.1 SIP messages for redirection

Table 4.4.1.1 shows the session initiation protocol (SIP) messages that are used in accordance with the coding rules in [ETSI TS 124 229].

Table 4.4.1.1 – SIP header information for redirection

SIP message	Reference	SIP header
INVITE	[IETF RFC 7044] [IETF RFC 3966] [IETF RFC 4458] [IETF RFC 5627]	History-Info header Privacy header cause-param URI parameter "gr" URI parameter
180 (Ringing)	[IETF RFC 7044] [IETF RFC 3966] [IETF RFC 4458] [IETF RFC 5627]	History-Info header Privacy header cause-param URI parameter "gr" URI parameter in the Contact
181 (Call Is Being Forwarded)	[IETF RFC 7044] [IETF RFC 3966] [IETF RFC 4458] [IETF RFC 5627]	History-Info header Privacy header cause-param URI parameter "gr" URI parameter in the Contact
200 (OK) response	[IETF RFC 7044] [IETF RFC 3966] [IETF RFC 4458] [IETF RFC 5627]	History-Info header Privacy header cause-param URI parameter "gr" URI parameter in the Contact
302 (Moved Temporarily) (see Note)	[ETSI TS 124 229] [IETF RFC 4458]	Contact header cause-param URI parameter
NOTE – The 302 (Moved Temporarily) response in this Recommendation is only used for the CD services.		

An AS that implements the CDIV service shall support the REFER method defined in [IETF RFC 3515], to be able to handle the interaction with [ETSI TS 124 629].

4.4.1.2 SIP messages for CDIVN

Table 4.4.1.2 shows the SIP messages that are used for the CDIVN according to the coding rules in [ETSI TS 124 229]. SIP specific event notifications shall be used in accordance with [IETF RFC 6665].

Table 4.4.1.2 – SIP header information for notification (CDIVN)

SIP message	Reference	SIP header
SUBSCRIBE	[IETF RFC 6665]	Event:comm-div-info
NOTIFY	[IETF RFC 6665]	Event:comm-div-info

4.4.2 Parameters

The Privacy header is described in [ETSI TS 124 229]. This Recommendation refers to: for the History-Info header to [IETF RFC 7044], for the Privacy header and P-Asserted-Identity to [IETF RFC 3325], for GRUU to [IETF RFC 5627] and for the cause-param to [IETF RFC 4458].

4.5 Signalling requirements

Configuration of supplementary services by the user should:

– take place over the Ut interface using XML configuration access protocol (XCAP) as the enabling protocol as described in [ETSI TS 124 623]; or

– use SIP based user configuration as described in [ETSI TS 124 238].

NOTE – Other possibilities for user configuration, such as web-based provisioning or pre-provisioning by the operator are outside the scope of the present Recommendation, but are not precluded.

4.5.1 Activation/deactivation

The services CFU, CFB, CFNR, CFNL, CFNRc and CD are individually activated at provisioning or at the subscriber's request.

The services CFU, CFB, CFNR, CFNL, CFNRc and CD are individually deactivated at withdrawal or at the subscriber's request.

For activation of the CDIVN, the message body within the SUBSCRIBE method should be used. Deactivation of CDIVN is explicit either by sending a SUBSCRIBE message by the served user with the "Expires" header set to "zero" or upon the expiration of the timer "Expire" in the AS.

4.5.1.1 Registration/erasure

For registration of diversion information for the services CFU, CFB, CFNR, CFNL, CFNRc and CD, the configuration mechanisms specified in clause 4.5 should be used. The diverted-to party address of the services CFU, CFB, CFNR, CFNL, CFNRc and CD can individually be registered at the subscriber's request by using the configuration mechanisms specified in clause 4.5.

4.5.1.2 Interrogation

For erasure of diversion information for the services CFU, CFB, CFNR, CFNL, CFNRc and CD, the configuration mechanisms specified in clause 4.5 should be used. The diverted-to party address of the services CFU, CFB, CFNR, CFNL, CFNRc and CD can individually be erased at the subscribers request by using the configuration mechanisms specified in clause 4.5.

Registration/erasure is not applicable for CDIVN.

For interrogation of the services CFU, CFB, CFNR, CFNL, CFNRc and CD, the configuration mechanisms specified in clause 4.5 should be used.

For interrogation of the supported conditions and actions that can be used in the network the Ut interface should be used.

Interrogation is not applicable for CDIVN.

4.5.2 Invocation and operation

4.5.2.1 Actions at the originating UA

A UE supporting CDIV services shall support origination of requests in the IP multimedia (IM) core network (CN) subsystem as specified in [ETSI TS 124 229].

When communication diversion has occurred on the served user side and the subscription option "Originating user receives notification that his communication has been diverted (forwarded or

deflected)" is set to true, the originating user agent (UA) may receive a 181 (Call Is Being Forwarded) response according to the procedures described in [ETSI TS 124 229].

The information given by the History-Info header could be displayed by the UA if it is a UE.

4.5.2.2 Actions at the AS of the diverting user

If the session is subject to diversion the AS of the diverting user:

–   if modification of the To header is required as specified in the procedures of this clause, shall operate as an AS providing third party call control, and specifically as a routing back-to-back user agent (B2BUA), as specified in section 5.7.5 of [ETSI TS 124 229];

–   otherwise, shall operate as either an AS acting as a SIP proxy as specified in section 5.7.4 of [ETSI TS 124 229] or an AS providing third party call control, and specifically as a routeing B2BUA, as specified in section 5.7.5 of [ETSI TS 124 229].

NOTE – For the case when the session is not subject to diversion and CDIV is the only service being applied by the AS, according the requirements in this Recommendation, then the AS only needs to act as a SIP proxy. If additional services are applied, then the AS might need to act as a routeing B2BUA.

4.5.2.2.1 Checking of the diversion limits

When receiving an INVITE request and when the AS determines that the AS shall divert a communication the AS shall check if diverting the communication exceeds the number of diversions allowed within the network. The AS shall calculate the number of diversions by examination of the History-Info header:

–   using the entries including a cause-param URI parameter with the cause values specified in clause 4.5.2.2.2.2; or

–   examine the entries in the Index entries parameter, to see if another diversion is allowed due to the network provider allowed_limit of diversions.

If the number of diversions exceeds the given limit then:

–   if the diverted-to destination is known to be a non-retargeting destination (e.g., voicemail), then it is based on operator policy to allow the communication diversion to be executed. else;

–   if the network option "AS behaviour when the maximum number of diversions for a communication is reached" is set to "Reject the communication", then the AS shall send one of the following responses to the originating user:

    a)   if communication diversion forwarding busy a 486 (Busy Here);

    b)   if communication forwarding no reply, a 480 (Temporarily Unavailable);

    c)   if communication forwarding unconditional a 480 (Temporarily Unavailable);

    d)   if communication deflection, a 480 (Temporarily Unavailable);

    e)   if communication forwarding not logged in, a 480 (Temporarily Unavailable); or

    f)   if communication forwarding not reachable, a 480 (Temporarily Unavailable).

In all cases a Warning header field indicating that the communication is released due to the extension of diversion hops (e.g., "Too many diversions appeared") shall be sent:

–   if the network option "AS behaviour when the maximum number of diversions for a communication is reached" is set to "Deliver the communication to the latest diverting party", then the communication shall be delivered to the latest diverting party.

4.5.2.2.2 Setting of the diversion parameters by the AS

4.5.2.2.2.1 Overview

After checking the limit of diversions the following sets the retargeted INVITE request according to the procedures in clause 4.5.2.2.2.

4.5.2.2.2.2 Diversion where the served user is not last in the received History-Info header

If an AS determines that the AS shall divert a communication and if any of the following conditions apply for the received INVITE request:

– no History-Info header received; or

– a History-Info header is received in which the last history-info entry contains no hi-targeted-to-uri element for the served user.

The AS shall set the following information in the retargeted INVITE request:

– the diverting parties address;

– the diverted-to party address;

– diversion information.

The AS shall include or modify the following header fields with the specified values:

a)   The Request URI

The AS shall set the cause-param parameter (redirecting reason and redirecting indicator) included in the history-info header field according to the diversion conditions. The mapping between the diversion conditions and the coding of the cause-param parameter is as follows:

– if communication forwarding busy, the cause value "486" as defined by [IETF RFC 4458];

– if communication forwarding no reply, the cause value "408" as defined by [IETF RFC 4458];

– if communication forwarding unconditional, the cause value "302" as defined by [IETF RFC 4458];

– if communication deflection immediate response, the cause value "480" as defined by [IETF RFC 4458];

– if communication forwarding not logged in , the cause value "404" as defined by [IETF RFC 4458];

– if communication deflection during alerting, the cause value "487" as defined by [IETF RFC 4458]; and

– if communication forwarding on mobile subscriber not reachable, the cause value "503" as defined by [IETF RFC 4458].

b)   The History-Info header field – two hist-info entries that shall be generated.

1)   the first entry includes the hi-targeted-to-uri of the served user.

the AS shall include the privacy header "history" within the hi-targeted-to-uri in the escaped form, if:

– the served user wishes privacy if for example the served user is subscribed to the originating identification restriction (OIR) service; or

– the served user has the subscription option "Served user allows the presentation of his/her URI to diverted-to user" set to false;

otherwise, if the first entry contains the "gr" parameter and the subscription option "Served user allows the presentation of his/her URI to *diverted-to* user" is set to "not-reveal-as-GRUU", then the AS shall change the first entry as follows:

– replace the first entry with the public user identity of the served user;

if the diversion is based on a SIP response from the served user, a Reason header in escaped form shall be included in accordance with [IETF RFC 7044];

the Index shall be set or incremented according to the basic forwarding rules specified in section 10.3 "Indexing in the History-Info Header Field" of [IETF RFC 7044];

2) the second entry includes the new Request URI as described under bullet a) as hi-targeted-to-uri.

NOTE – In accordance with [IETF RFC 4458], hi-targeted-to-uri will contain a cause-param in non-escaped format.

c) The To header field:

If the served user does not want to reveal its identity to the diverted-to party, then the AS shall change the To header field to the URI where the communication is diverted to. The served user does not want to reveal its identity when one of the following conditions holds true:

– if the served user wishes privacy (e.g., the served user is subscribed to the OIR service); or

– if the served user has the subscription option "Served user allows the presentation of his/her URI to diverted-to user" set to "false".

Otherwise, if the To header contains the "gr" parameter and the served user has the subscription option "Served user allows the presentation of his/her URI to diverted-to user" set to "not-reveal-as-GRUU", then the AS shall change the To header field to a public user identity of the served user.

In all other cases the AS shall not change the To header.

4.5.2.2.2.3 Diversion with served user last in the received History-Info header

If an AS determines that the communication shall be diverted, the AS shall apply the procedure in this clause if the received INVITE request includes a History-Info header, which in the last history-info entry includes a hi-targeted-to-uri with an entry for the served user, encoded as in clause 4.5.2.2.2.2. In this case the AS shall add a new history-info entry to the History-Info header field according to the rules defined in [IETF RFC 7044]. The following information is added to the retargeted request:

– the diverted-to party address;

– diversion information.

The AS shall add or modify the following header fields with the specified values:

a) The Request URI header field:

The AS shall add the cause-param as defined by [IETF RFC 4458] to the request URI. The mapping between the diversion conditions and the coding of the cause-param parameter shall be as defined under bullet a) in clause 4.5.2.2.2.2.

b) The History-Info header field:

The History-Info header field shall be modified in accordance with [IETF RFC 7044]. The history entry corresponding to the previous request URI can be modified. One history entry is added.

1) The existing history entry corresponding to the previous request URI shall be treated as follows: if the Privacy header field does not contain "history", the privacy header "history" in escaped format shall be added or modified within the hi-targeted-to-uri, if:

– the served user wishes privacy (e.g., the served user is subscribed to the OIR service); or

–	the served user has the subscription option "Served user allows the presentation of his/her URI to diverted-to user" set to false.

If the history entry representing the served user contains the "gr" parameter and the subscription option "Served user allows the presentation of his/her URI to *diverted-to* user" set to "not-reveal-as-GRUU", the AS shall change the history entry to a public user identity of the served user.

If the diversion is based on a SIP response from the served user, a Reason header in escaped form shall be included in accordance with [IETF RFC 7044] user.

2)	A history entry shall be added containing the new Request URI as described under bullet a) as hi-targeted-to-uri.

NOTE – In accordance with [IETF RFC 4458], hi-targeted-to-uri will contain a cause-param in non-escaped format.

c)	The To header field:

If the served user does not want to reveal its identity to the diverted-to party, then the To header shall be changed to the URI where the communication is diverted to. The served user does not want to reveal his/her identity when one of the following conditions holds true:

–	if the served user wishes privacy (e.g., the served user is subscribed to the OIR service); or

–	if the served user has the subscription option "Served user allows the presentation of his/her URI to diverted-to user" set to false.

Otherwise, if the To header contains the "gr" parameter and the served user has the subscription option "Served user allows the presentation of his/her URI to *diverted-to* user" set to "not-reveal-as-GRUU", then the To header shall be changed to a public user identity of the served user.

In all other cases the To header shall not be changed.

#### 4.5.2.2.2.4	Overview of the operation

Figure 4.5.2.2.2.4 shows the example of a communication path for multiple diversions.
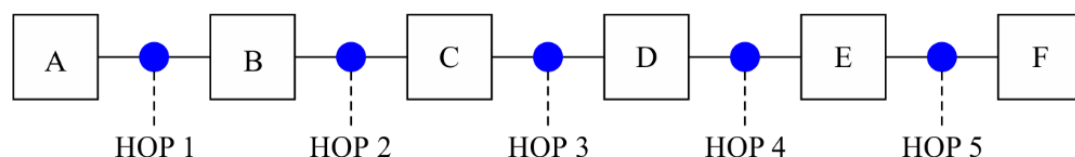
Figure 4.5.2.2.2.4 – Originally A calls B information transferred in the INVITE request

Table 4.5.2.2.2.4 shows the parameters and header fields that are added or modified in a diversion AS.

Table 4.5.2.2.2.4 – Parameter information for multiple redirections

	HOP 1	HOP 2		HOP 3			HOP 4			HOP 5		
Number Information: P-Asserted-Identity	A	A		A			A			A		
Request URI	B	C		D			E			F		
hi-entry		B	C	B	C	D	B, C	D	E	B, C, D	E	F
Information added: hi-targeted-to-uri		B	C	No changes		D	No changes		E	No changes		F
Reason header (Note 2)		V			V			V			V	
cause-param (Note 3)			U			U			U			U
Privacy		W			W			W			W	
Hi-index (Note 1)		index 1	index 2			index 3			index 4			index 5

U = Value for the cause-param parameter as specified in clauses 4.5.2.2.2 and 4.5.2.2.3.

V = Value in accordance with the rules in [IETF RFC 7044].

W = privacy value (history) or (none) or no entry.

NOTE 1 – The hi-index field shall be set or incremented according to the basic forwarding rules as specified in clause 10.3 of [IETF RFC 7044].

NOTE 2 – The encoding of the reason header and the contained protocol-cause parameter are specified in [IETF RFC 3326]. It is embedded in the hi-targeted-to-uri of the history info header in escaped format according to the rules in [IETF RFC 7044].

NOTE 3 – The cause-param is specified in [IETF RFC 4458]. It is embedded in the hi-targeted-to-uri of the history info header in non-escaped format according to the rules in [IETF RFC 4458].

4.5.2.2.3 Diversion procedures at the diverting AS

The diverting AS shall continue the communication depending on the service that is causing the diversion:

1) Communication forwarding unconditional or communication forwarding busy network determined user busy or communication forwarding on not logged in.

   The AS shall continue in the following manner:
   – if the notification procedure of the originating user is supported then the originating user shall be notified as described in clause 4.5.2.2.4;
   – an INVITE request containing the diverted-to URI shall sent to the (outgoing) server-call session control function (S-CSCF). The INVITE request shall include the parameter information as shown in Table 4.5.2.2.2.4 and described in clause 4.5.2.2.2;
   – if the served user has subscribed to the indication of communication diversion to the diverting user and/or CDIVN service, then the served user will be notified of the communication diversion as described in clause 4.5.2.2.5;
   – if the user has activated both CFNL and CDIVN and CFNL was invoked then the AS will store the CDIVN according to the CDIVN buffer timer (for a definition of this parameter, see clause 4.7.2) for a default time of one day set by the service provider. The user has the option of overwriting this timer value in the SUBSCRIBE request to the maximum value of one day.

2) Communication forwarding no reply

   After receiving the first 180 (Ringing) response the no reply timer (for a definition of this parameter, see clause 4.7.1) shall be started. If forking is provided by the S-CSCF a further received 180 (Ringing) response does not refresh the timer.

   When receiving any other final response the no reply timer shall be terminated.

   When the no reply timer defined in clause 4.7.1 expires:

- the dialogue(s) to the diverting user shall be terminated e.g., by sending a CANCEL request or BYE request according to the rules and procedures in [IETF RFC 3261], including a Reason header field (see [IETF RFC 3326]) with the protocol set to "SIP" and the cause set to "408";
- if the notification procedure of the originating user is supported then the originating user shall be notified as described in clause 4.5.2.2.4;
- an INVITE request is sent to the (outgoing) S-CSCF towards the diverted-to user. The INVITE request includes the parameter information as shown in Table 4.5.2.2.2.4;
- if the served user has subscribed to the indication of communication diversion to the diverting user and/or the CDIVN service, then the served user will be notified of the communication diversion as described in clause 4.5.2.2.5.

3) Communication forwarding no reply (ringing continues)

After receiving the first 180 (Ringing) response the no reply timer (for a definition of this parameter, see clause 4.7.1) shall be started. If forking is provided by the S-CSCF a further received 180 (Ringing) response does not refresh the timer.

When the no reply timer defined in clause 4.7.1 expires, an INVITE request is sent to the outgoing S-CSCF towards the diverted to user. The INVITE request includes the parameter information as shown in Table 4.5.2.2.2.4.

When the diverting AS receives a provisional response or 200 (OK) response to initial INVITE from diverted-to-user based on operator policy, the dialogue(s) to the diverting user shall be terminated e.g., by sending a CANCEL request or a BYE request according to the rules and procedures in [IETF RFC 3261], including a reason header field (see [IETF RFC 3326]) with the protocol set to "SIP" and the cause set to "408", and if the notification procedure of the originating user is supported, the originating user shall be notified as described in clause 4.5.2.2.4.

If the served user has subscribed to the indication of communication diversion to the diverting user and/or the CDIVN service, then the served user will be notified of the communication diversion as described in clause 4.5.2.2.5.

If diverting user accepts the communication after sending the INVITE request the communication path towards the diverted to user shall be released according to the rules and procedures in [IETF RFC 3261].

4) Communication forwarding user determined busy

The communication forwarding user determined busy is offered to the served user when the AS:
- the received 486 (Busy Here) shall be acknowledged with a ACK request;
- if the notification procedures of the originating user are supported then the originating user shall be notified as described in clause 4.5.2.2.4;
- an INVITE request containing the diverted-to URI is sent to the outgoing S-CSCF. The INVITE request includes the parameter information as shown in Table 4.5.2.2.2.4.

If the served user has subscribed to the indication of communication diversion to the diverting user and/or the CDIVN service, then the served user will be notified of the communication diversion as described in clause 4.5.2.2.5.

5) Communication deflection immediate response

The communication deflection immediate response is offered to the served user.

A 302 (Moved Temporarily) response is received.

If the notification procedures of the originating user are supported then the originating user shall be notified as described in clause 4.5.2.2.4.

An INVITE request containing the diverted-to URI is sent to the outgoing S-CSCF. The INVITE request includes the parameter information as shown in Table 4.5.2.2.2.4.

If the served user has subscribed to the indication of communication diversion to the diverting user and/or the CDIVN service, then the served user will be notified of the communication diversion as described in clause 4.5.2.2.5.

6)   Communication deflection during alerting

When communication deflection during alerting is invoked after the AS receives a 180 (Ringing) "Ringing" response, then:

–   a 302 (Moved Temporarily) response is received; and

–   if the notification procedures of the originating user are supported then the originating user shall be notified as described in clause 4.5.2.2.4; and

–   an INVITE request containing the URI received in the contact header of the 302 (Moved Temporarily) response as the diverted-to URI shall be sent as specified in [ETSI TS 124 229]. The diverted-to URI could be restricted by setting the privacy header for the entry of the diverted-to URI to "history"; and

–   the INVITE request shall include the parameter information as shown in Table 4.5.2.2.2.4 "Parameter information for multiple redirection". If the served user has subscribed to the indication of communication diversion to the diverting user and/or the CDIVN service, then the served user will be notified of the communication diversion as described in clause 4.5.2.2.5.

7)   Communication forwarding on subscriber not reachable

When the AS receives a not reachable indication (see clause 4.5.2.2.6) on the INVITE request forwarded to the served user, then the following criteria shall apply before the communication forwarding on subscriber not reachable procedure is executed:

–   the served user has an active forwarding rule containing the not-reachable condition.

The following steps shall be followed to perform communication forwarding on subscriber not reachable:

1)   If the notification procedures of the originating user are supported then the originating user shall be notified as described in clause 4.5.2.2.4.

2)   An INVITE request with the Request-URI set to the diverted-to URI is sent to the outgoing S-CSCF. The INVITE request includes the parameter information as shown in Table 4.5.2.2.2.4.

If the served user has subscribed to the indication of communication diversion to the diverting user and/or CDIVN service, then the served user will be indicated to/notified of the communication diversion as described in clause 4.5.2.2.5.

If the user has activated both CFNRc and CDIVN, and CFNRc was invoked then the AS will store the CDIVN according to the CDIVN buffer timer for a default time of one day set by the service provider. The user has the option of overwriting this timer value in the SUBSCRIBE request to the maximum value of one day.

4.5.2.2.4 Notification procedures of the originating user (subscription option)

When communication diversion occurs and if the served user has the subscription option "Originating user receives notification that his communication has been diverted (forwarded or deflected)" set to true then a 181 (Call Is Being Forwarded) response shall be sent towards the originating user.

The following header fields shall be included or modified with the specified values:

a)   The P-Asserted-Identity includes the URI of the diverting user.

b)   The Privacy header with the value "id" shall be included, if:

  –   the served user wishes privacy for example if the served user is subscribed to the terminating identification restriction (TIR) service; or

  –   the served user has the subscription option "Served user allows the presentation of his/her URI to originating user in diversion notification." set to false.

c)   The following entries shall be added to the History-Info header field:

  1)   If this is the first diversion then the first entry shall be populated with the hi-targeted-to-uri of the served user. The Index is set to index = 1 according to the rules specified in [IETF RFC 7044].

  2)   On the history entry that represents the served user:

  the privacy header with the value "history" shall be escaped within the hi-targeted-to-uri, if:

    –   the served user wishes privacy (e.g., the served user is subscribed to the TIR service); or

    –   the served user has the subscription option "Served user allows the presentation of his/her URI to originating user in diversion notification." set to false.

  If the history is already in the escaped form with the correct privacy value no modification is needed.

  If the history entry representing the served user contains the "gr" parameter and the served user has the subscription option "Served user allows the presentation of his/her URI to originating user in diversion notification" set to "not-reveal-as-GRUU", it shall be changed to the public user identity of the diverting user.

  In all other cases the history entry representing the served user shall not be changed.

  3)   A history entry shall be added according to the rules of clause 4.5.2.2.3 item 2) of bullet b). In addition, for this entry:

    1)   if the history entry representing the forwarded to URI contains the "gr" parameter and the served user has the subscription option "Served user allows the presentation of forwarded to URI to originating user in diversion notification" set to "not-reveal-as-GRUU", it shall be changed to the public user identity of the diverted-to user.

    2)   the privacy header with value "history" shall be escaped within the hi-targeted-to-uri or the hi-targeted-to-uri shall be set to an anonymous value.

Additionally, the AS may initiate an announcement to be included towards the calling user in order to inform him/her about the diversion. Announcements may be played according to procedures as are described in [ETSI TS 124 628].

4.5.2.2.5   Indication of communication diversion to the diverting user/CDIV notification (subscription option)

If the subscription option "Served user receives indication that a communication has been forwarded (indication of communication diversion to the diverting user)" has been set to "yes", then one or a combination of the following procedures are possible:

–   when the diverting user is registering to the communication system, the AS sends a MESSAGE request including the information on where his/her calls are diverted to, if any. As an option; the MESSAGE request may be sent to the user after a period of time according to the timer value CDIV indication timer as defined in clause 4.7.3 that can be provided by the user;

–   a diverting user will be informed periodically with a MESSAGE request with the information on where the call is diverted to;

NOTE 1 – A diverting user could be informed via a voicemail or message mail system in the communication states described above.

–	if the subscription option "Served user receives reminder indication on outgoing communication that CDIV is currently activated" has been set to "yes", then a diverting user will be informed with a MESSAGE request after the diverting user has initiated a new outgoing communication. The MESSAGE request includes the information on where the call is diverted to.

NOTE 2 – A diverting user could be informed via a voicemail or message mail system in the communication states described above.

The description of information text contained in the MESSAGE request is outside of the scope of the present Recommendation.

If CDIVN has been activated according to clause 4.5.1, then:

–	the diverting AS will invoke the CDIV notification to notify the diverting user when CDIV is performed. This notification is applicable for all the communication diversions which were selected by the user whilst subscribing to the CDIVN service; and

–	if a NOTIFY request is sent due to the CDIV notification, the NOTIFY request shall include a Content-Type header field set to "application/vnd.comm-div-info+xml" and a corresponding body part with the <comm-div-info-type> element with a <comm-div-ntfy-info> child element.

### 4.5.2.2.5.1	Communication diversion notification procedure of the served user

When a communication diversion occurs and if the CDIVN service of the served user is supported in the network and the user has activated the CDIVN service according to clause 4.5.1, the UE will receive a NOTIFY request according to preferences passed in a SUBSCRIBE request to an AS.

If the SUBSCRIBE request sent to the AS contains a communication diversion notification extensible markup language (XML) body part:

–	the request shall include a Content-Type header field set to "application/vnd.comm-div-info+xml"; and

–	the body part shall include a <comm-div-info-type> element with a <comm-div-subs-info> child element.

In case of CFNL and CFNRc, the AS will store the CDIVN for a period of time, see clause 4.5.2.2.3. Upon the user's registration, if the previous subscription is not valid at that point of time (see clause 4.2.1), the user may activate CDIVN by sending a SUBSCRIBE request. As a consequence, the user will receive a NOTIFY request accordingly including his stored notifications.

If the served user has subscribed to the communication diversion notification service, then the diverting AS continues in the following manner:

–	identify and match the communication diversion selection criteria as indicated by the user to select the communication diversions which have to be notified to the user. Such selection may be based on:

•	identity of the originating user;

•	identity of the served user;

•	identity of the diverted-to user;

•	time-range of the communication diversion;

•	reason for the communication diversion;

–	identify the amount of information which the served user has selected for including in the notification. By default, all the following information should be sent to the user. The served

user has the option of disabling any of the following information, if he/she is not interested in:

- information about the originating user;
- information about the served user;
- information about the diverted-to user;
- time of the communication diversion;
- reason for the communication diversion;
- information about the rule which triggered the communication diversion;

– identify the trigger criteria of sending the notification to the served user. By default, the notification should be sent immediately to the served user otherwise it may be based on the following:

- Suitable time-range for delivering the notification;
- A particular availability status of the served user.

4.5.2.2.5.2 Interaction of CDIVN and indication of communication diversion to the diverting user procedures

If the CDIVN service of the served user is not supported in the network, then the indication of communication diversion to the diverting user for the communication diversion services shall apply.

If the CDIVN service of the served user is supported in the network but has not activated the CDIVN service according to clause 4.5.1, then the indication of communication diversion to the diverting user for the communication diversion services shall apply.

4.5.2.2.6 Not reachable indication

It is recommended that the AS interprets the reception of one of the following response events as a not reachable indication:

– 408 (Request timeout) response;

– 503 (Service unavailable) response;

– 500 (Server internal error) response;

and no provisional response, other than a 100 (Trying) response, has been received on the same dialogue.

NOTE – There may be other means to discover this condition. These other means are outside of the scope of this Recommendation.

4.5.2.3 Actions at the AS of the diverted-to user

If the session is diverted, the AS of the diverted-to user shall operate either as an AS acting as a SIP proxy as specified in section 5.7.4 of [ETSI TS 124 229] or an AS providing third party call control and specifically as a routeing B2BUA, as specified in section 5.7.5 of [ETSI TS 124 229].

NOTE – For the case when the session is not subject to diversion, and CDIV, according the requirements in this Recommendation, is the only service being applied by the AS, then the AS only needs to act as a SIP proxy. If additional services are applied, then the AS might need to act as a routeing B2BUA.

The AS shall store the History-Info header of an incoming Request.

If a 180 (Ringing), 181 (Call Is Being Forwarded) or 200 (OK) response does not contain a History-Info header field, the AS shall include the stored History-Info header field. If the diverted-to user is subscribed to the TIR service, in the Privacy header field of all responses the priv-value of the last entry in the History-Info header field shall be set to "history".

NOTE – A response message that has no History-Info header Field included is from an untrusted entity. Alternatively, the History-Info header field is excluded due to the privacy status within the SIP request.

4.5.2.4 Actions at the diverted to UA

A UE supporting CDIV services shall support termination of requests in the IM CN subsystem, as specified in [ETSI TS 124 229].

4.5.2.5 Actions at the diverting UA

A UE supporting CDIV services (e.g., CFU, CFB, CFNR, CD, CFNRc and CFNL) shall support termination of requests in the IM CN subsystem, as specified in [ETSI TS 124 229]. If the UE is intended to support the user subscription option of "indication of communication diversion to the diverting user", this support shall include the receipt of MESSAGE requests, as specified in [ETSI TS 124 229].

Additionally, a UE supporting CDIVN shall support initiation of dialogues using a SUBSCRIBE request, as specified in [ETSI TS 124 229].

To invoke communication deflection the UA shall send a 302 (Moved Temporarily) response to the INVITE request including a Contact header field with the address where the communication is diverted to.

4.6 Interaction with other services

4.6.1 Communication hold (HOLD)

No impact, i.e., neither service shall affect the operation of the other service.

4.6.2 Terminating identification presentation (TIP)

When a communication has been diverted, in order to provide the originating user with information about the diverted-to identity, the diverting AS shall include a SIP or TEL URI of the diverted-to user into a History-Info header field in a 181 (Call Is Being Forwarded) response message and send it to the originating AS, unless the diverting user has selected the option to suppress the notification of diversion. As it is not known what the diverted-to user's TIR settings are, a privacy header field with a priv-value set to "history" needs to be included in escaped form in the hi-entry representing the diverted-to user; or the URI representing the diverted-to user may be set to an anonymous value.

A P-Asserted-Identity and History-Info header field received in the diverting AS is passed unmodified to the originating entity.

NOTE – The originating proxy-call session control function (P-CSCF) is responsible for the interpretation of the privacy header field as described in [ETSI TS 124 229].

4.6.3 Terminating identification restriction (TIR)

A P-Asserted-Identity and History-Info header field received in the diverting AS is passed unmodified to the originating entity. If TIR applies for the served user, the diverting AS shall add a Privacy header field set to "id" and if a Privacy header field set to "none" is received the diverting AS shall remove it. If a Privacy header field set to "id" is received from the diverted-to user the diverting AS shall pass it unchanged to the originating user.

NOTE – The originating P-CSCF is responsible of the interpretation of the privacy header field as described in [ETSI TS 124 229].

If the served (diverting) user selects the option that the originating user is notified, but without the diverted-to SIP or TEL URI, then the AS shall send a 181 (Call is Being Forwarded) response and either:

−   escape a Privacy header field with a priv-value set to "history" in the hi-entry representing the diverted-to user; or

−   anonymize the hi-entry representing the diverted-to user.

When the TIR service has been invoked by the diverted-to user, the diverted-to user's address and name shall not be presented in the CDIVN notification body in the NOTIFY request.

4.6.4   Originating identification presentation (OIP)

When a communication has been diverted and the diverted-to user has been provided with the originating identification presentation (OIP) service, normal procedures apply in the IMS network serving the diverted-to user. The diverting AS shall pass all received privacy headers unmodified. The diverting AS shall add the identity of the diverting user in the History-Info header field with an embedded Privacy header reflecting the served users privacy settings.

4.6.5   Originating identification restriction (OIR)

When the OIR service has been invoked, normal procedures apply in the IMS network serving the diverted-to user. The diverting AS shall pass all received privacy headers unmodified. The diverting AS shall add the identity of the diverting user in the History-Info header field with an embedded Privacy header reflecting the served users privacy settings.

When the OIR service has been invoked by the originating user, the diverting AS shall remove the originating user's address and name in the CDIVN notification body in the NOTIFY request.

NOTE – The P-CSCF executes the related privacy procedures as described in [ETSI TS 124 229].

4.6.6   Conference calling (CONF)

No impact, i.e., neither service shall affect the operation of the other service.

4.6.7   Communication diversion services (CDIV)

When network determined user busy (NDUB) is used CFU, CFNL and CFB are all determined immediately when an INVITE request is received and take precedence over CDIV services that are based on a response (CD, CFNRc, CFNR and CFB when user determined user busy (UDUB) is used). CFU takes precedence over all other CDIV services and the CDIV AS must evaluate the rule associated with CFU before CFNL and CFB when NDUB is used. As CFNL and CFB cannot occur simultaneously there is no interaction. For CDIV services that are based on a response, the response received first will invoke the associated CDIV service.

For the CDIVN service and the indication of communication diversion to the diverting user service, the provision and activation of at least one redirection service is a pre-requirement to provision and activation of the CDIVN service and the indication of communication diversion to the diverting user service.

4.6.8   Malicious communication identification (MCID)

No impact, i.e., neither service shall affect the operation of the other service.

4.6.9   Anonymous communication rejection and communication barring (ACR/CB)

If the user that the communication is forwarded to has subscribed to an anonymous communication rejection and communication barring (ACR/CB) service with "inhibition of incoming forwarded communication" the procedures described in [ETSI TS 124 611] shall take precedence.

If the outgoing communication barring (OCB) service has already been activated, the CDIV AS shall reject a request to activate any CDIV service if the forwarding party's communication to the diverted-to party would be barred by the OCB service.

If the CDIV service was activated before the activation of the OCB service, the OCB service can still be activated. When the two services have already been activated, the CDIV AS shall not invoke the CDIV service if the forwarding party's communication to the diverted-to party would be barred by the OCB service at the time of the invocation attempt of the CDIV service.

4.6.10 Explicit communication transfer (ECT)

4.6.10.1 Actions at the diverting AS

4.6.10.1.1 Determine whether ECT is applied to the diverted communication

For information on the criteria that determine that a REFER request is to be treated as a request for transfer of an existing communication, see [ETSI TS 124 629].

4.6.10.1.2 Handling of transfer requests

When a REFER request is received towards the originating user in the context of a call transfer scenario (see clause 4.6.10.1.1), the diverting AS shall perform the following steps:

1) Create a new CDIV session identifier URI addressed to this AS. The URI shall be created in such a way that a new dialogue set up towards this URI can be easily correlated with the current REFER dialogue.

2) The AS stores the value of the Refer-To header field (transfer target) from the REFER request and links it to the CDIV session identifier URI.

3) The AS replaces the Refer-To header field with the CDIV session identifier URI. This ensures that the diverting AS remains in the loop when the transferee sets up the communication with the transfer target.

4) The AS forwards the REFER request to the transferee using basic communication procedures [ETSI TS 124 229].

A REFER request received towards the diverted-to user is forwarded using normal procedures.

4.6.10.1.3 Actions when CDIV is invoked again by the transferred communication

When an INVITE request is received targeted at the CDIV session identifier URI created earlier when transfer of the diverted ongoing communication was requested, the AS shall perform the following actions:

1) The AS replaces the request URI with the stored Refer-To header field value linked to the specific CDIV session identifier URI.

NOTE – If needed the AS may generate charging events to charge for the extra leg.

2) The AS forwards the INVITE request towards the transfer target using basic communication procedures [ETSI TS 124 229].

4.6.11 Communication waiting (CW)

Communication forwarding unconditional (CFU): Communication waiting (CW) has no impact on the operation of CFU. The communication will be forwarded without regard to the terminating party's state. The CFU service can be activated while a call is waiting without changing the state of the waiting call. A forwarded communication can result in the communication waiting service.

Communication forwarding busy (CFB): No impact, i.e., neither service affects the operation of the other service. A forwarded communication can result in the communication waiting service.

NOTE – If the terminating party is NDUB, the CW service will not be invoked and the CFB service is invoked if it was activated.

Communication forwarding no reply (CFNR): If the terminating party has activated the CFNR service, then the CW AS shall continue to offer a communication waiting service. If the CFNR timer expires before an answer is received then the CFNR service shall be invoked and the CDIV AS shall forward the communication. The CDIV AS cancels the communication to the served user. A forwarded communication can result in the communication waiting service.

Communication forwarding on not logged-in (CFNL): No impact, i.e., neither service affects the operation of the other service.

NOTE – If a party with an active communication waiting logs out, all active and offered communications would be released.

Communication deflection (CD): When receiving the communication waiting indication, the terminating party can invoke the CD service. A deflected communication can result in the communication waiting service.

Communication forwarding on subscriber not reachable (CFNRc): No impact, i.e., neither service affects the operation of the other service.

4.6.12 Completion of communications to busy subscriber (CCBS)

The completion of communication (CC) AS shall not divert a CC recall. It shall provide the CC recall to the original originating party.

4.6.13 Advice of charge (AOC)

No impact, i.e., neither service affects the operation of the other service.

4.7 Parameter values (timers)

4.7.1 No reply timer

No reply timer: The timer default duration shall be a service provider option.

4.7.2 CDIVN buffer timer

CDIVN buffer timer: The operator's option (default = 86 400 s), may be overwritten by the user in the SUBSCRIBE message-Notification Buffer Interval.

Notification Buffer Interval: 0 s – 86 400 s.

4.7.3 CDIV indication timer

CDIV indication timer: 60 s to 00 s.

The timer is started when the diverting user is registering to the communication system. Based on operator policy the user has the possibility to choose a certain timer value within the defined range.

Appendix I

SIP message setting over the NNI

(This appendix does not form an integral part of this Recommendation.)

NOTE – This appendix clarifies the SIP message setting over the NNI.

I.1 SIP request

The initial INVITE message setting is defined in this Recommendation as the SIP request message setting of the communication diversion service over the network-to-network interface (NNI).

I.1.1 Request-URI

When invoking communication diversion services, the forwarding URI is set as the Request-URI.

In order to keep same the identity of the forwarding history information used by the last entry of the History-Info and Request-URI, the cause parameter is set as defined in clause I.1.2.4. However, when the cause parameter is not set in the Request-URI over the forwarding network, it is desirable to continue the call.

I.1.2 History-Info header

According to [IETF RFC 7044], the History-info header is supported.

The History-Info header is applied to the trusted-domain concept as described in [IETF RFC 3325]. According to this specification, connected networks must be within the trusted-domain when the communication diversion service is provided. Additionally, the History-Info header in the receiving network does not penetrate through History-Info for the terminal/user outside the trusted-domain.

I.1.2.1 Entry

History-Info has several hi-entry parameters which are aligned. Diversion history is set in History-Info in the order of source forwarding entry, destination forwarding entry.

I.1.2.2 hi-targeted-to-uri

While "hi-targeted-to-uri" is included in the entry of the History-Info header the URI format of the global ITU-T E.164 number will apply. The URI scheme consists of only the SIP URI and the tel URI parameter ("npdi", "rn") defined in [IETF RFC 4694] along with the tel URI parameter ("isub") is not set in "hi-targeted-to-uri".

In the case where other tel URI parameters are used as mentioned above, for the exception of cause parameter by the "hi-targeted-to-uri" described in clause I.1.2.4, parameters used should be decided between operators (with bilateral agreements).

I.1.2.3 Index

The "hi-index" is set according to section 10.3 of [IETF RFC 7044].

I.1.2.4 Cause parameter

The "Cause" parameter showing the reason for forwarding must be set as a "hi-targeted-to-uri" parameter of the destination forwarding entry according to [IETF RFC 4458]. The parameter settings are as follows:

–   486 (Busy Here): communication forwarding on busy user (CFB);

–   408 (Temporarily Unavailable): communication forwarding on no reply (CFNR);

–   302 (Moved Temporarily): communication forwarding unconditional (CFU);

–   480 (Temporarily Unavailable): communication deflection (CD);

–   404 (Not Found): communication forwarding on not logged-in (CFNL);

–   487 (Request Terminated): communication deflection (CD);

–   503 (Service Unavailable): communication forwarding on subscriber not reachable (CFNRc).

I.1.2.5   Presentation/restriction of forwarding History-info

In order to specify whether it is possible, or not possible to notify diversion history-info to the receiving terminal/terminated user, the Privacy header which was escaped may be set on the "hi-targeted-to-uri" of the forwarding source entry. In the case where designating notify is restricted, the Privacy header is set on history. In the case where the escaped Privacy header is not set on "hi-targeted-to-uri", the Privacy header will treat notify as being possible.

It is possible for the receiving network to notify the entry information, except for the History-Info header format to, for example, the UNI receiving terminal/terminated user, in the case where notify is possible (escaped Privacy header is not set). It is not possible to notify the receiving network's entry information on the History-Info header of the receiving terminal/terminated user when notify is not possible (Privacy = history).

I.1.2.6   Diversion time

The entry number including the cause parameter defined in [IETF RFC 4458] in the History-Info header is the diversion time. When the diversion time exceeds the upper limit, the call is released according to a response code as described in clause I.2.3.

NOTE – It is necessary to note that the integrated service digital network user part (ISUP) interconnect interface has an upper limit of 5.

I.1.3   To header

In the case where a communication diversion service subscriber does not prefer to notify his/her URI to the forwarding person, the URI of the To header to be sent to the NNI is sometimes changed from source forwarding URI to destination forwarding URI by the source forwarding network.

I.2   SIP response

As a requirement of communication diversion message setting of SIP response for the communication diversion service over NNI, message requirements are defined, except for 100 (Trying) responses, to Initial INVITE as defined in this Recommendation.

I.2.1   181 response

In order to notify the sending network of communication diversion service invoking, it is possible to use a 181 (Call Is Being Forwarded) response. However, this depends on the operators involved using 181 responses.

I.2.2   History-Info header

It is possible to notify the receiving network of diversion history by setting the History-Info header in 180 (Ringing), 181 (Call Is Being Forwarded) or 200 (OK). However, this depends on the operators involved using the History-Info header.

I.2.3   Call release response in communication forwarding time reaching upper limit

When the forwarding time (diversion time) exceeds the upper limit time defined in clause I.1.2.6, the call is released according to the response code described as follows:

–   486 (Busy Here): communication forwarding on busy user (CFB);

–   480 (Temporarily Unavailable): communication forwarding on no reply (CFNR);

–   480 (Temporarily Unavailable): communication forwarding unconditional (CFU);

- 480 (Temporarily Unavailable): communication deflection (CD);
- 480 (Temporarily Unavailable): communication forwarding on not logged-in (CFNL);
- 480 (Temporarily Unavailable): communication forwarding on subscriber not reachable (CFNRc).

It is possible to set the string (e.g., "Too many diversions appeared") on a Warning header in the above response in order to notify when the call release by diversion time has exceeded its upper limit.

Appendix II

Clarification and option lists

(This appendix does not form an integral part of this Recommendation.)

II.1   Abstract

This appendix aims to clarify requirements over NNI and option lists for smooth interconnection between network operators regarding communication diversion services based on this Recommendation.

II.2   Clarification and option lists

Table II.1 clarifies requirements over NNI and option lists based on this Recommendation. When clause numbers are not listed, this means that the prescriptive clarified item is as in the NNI provision and is interpreted from the base document.

Table II.1 – Clarification and option lists

Clause number of ITU-T Q.3616		Clarification items over NNI	Option items	Notes
Clause number	**Clause title**			
1	Scope	–	–	
2	References	–	–	
3	Definitions and abbreviations	–	–	
3.1	Definitions	–	–	
3.2	Abbreviations	–	–	
4	Communication diversion (CDIV)	–	–	
4.1	Introduction	–	–	
4.2	Description	–	–	
4.2.1	General description	CDIVN is not applicable because CDIVN is not related to requirements on NNI. Reference requirement on CFB is not applicable.	–	
4.2.1.1	Service description	–	–	
4.2.1.2	Communication forwarding unconditional (CFU)	–	–	
4.2.1.3	Communication forwarding on busy user (CFB)	–	–	
4.2.1.4	Communication forwarding on no reply (CFNR)	–	–	
4.2.1.5	Communication forwarding on subscriber not reachable (CFNRc)	–	–	

Table II.1 – Clarification and option lists

Clause number of ITU-T Q.3616		Clarification items over NNI	Option items	Notes
Clause number	**Clause title**			
4.2.1.6	Communication deflection (CD)	–	–	
4.2.1.7	Communication forwarding on not logged-in (CFNL)	–	–	
4.2.1.8	Communication diversion notification (CDIVN)	CDIVN is not applicable because CDIVN is not related with requirements on NNI	–	
4.3	Operational requirements	–	–	
4.3.1	Provision/withdrawal	GRUU is not applicable	Call forwarding notice function by 181 response Forwarding history notification function by forwarding network responding to sending network	
4.3.2	Requirements on the originating network side	–	–	
4.3.3	Requirements in the network	–	–	
4.4	Coding requirements	–	–	
4.4.1	SIP-messages	–	–	
4.4.1.1	SIP messages for redirection	GRUU is not applicable. REFER method is not used in CDIV service	–	
4.4.1.2	SIP messages for CDIVN	CDIVN is not applicable because CDIVN is not related to the requirements on NNI	–	
4.4.2	Parameters	GRUU is not applicable.	–	
4.5	Signalling requirements	User configuration in CDIV service is not applicable	–	
4.5.1	Activation/deactivation	User configuration in CDIV service is not applicable. CDIVN is not applicable because CDIVN is not related to the requirements on NNI	–	
4.5.1.1	Registration/erasure	User configuration in CDIV service is not applicable	–	
4.5.1.2	Interrogation	User configuration in CDIV service is not applicable	–	
4.5.2	Invocation and operation	–	–	

Table II.1 – Clarification and option lists

Clause number of ITU-T Q.3616		Clarification items over NNI	Option items	Notes
Clause number	**Clause title**			
4.5.2.1	Actions at the originating UA	–	–	
4.5.2.2	Actions at the AS of the diverting user	–	–	
4.5.2.2.1	Checking of the diversion limits	–	–	
4.5.2.2.2	Setting of the diversion parameters by the AS	–	–	
4.5.2.2.2.1	Overview	–	–	
4.5.2.2.2.2	Diversion where served user is not last in received History-Info header	GRUU is not applicable	–	
4.5.2.2.2.3	Diversion with served user last in received History-Info header	GRUU is not applicable	The forwarding history information presence/restrict notification function by using Privacy header (Privacy; history)	
4.5.2.2.2.4	Overview of the operation	–	–	
4.5.2.2.3	Diversion procedures at the diverting AS	CDIVN is not related to the requirements on NNI	–	
4.5.2.2.4	Notification procedures of the originating user (Subscription option)	CDIVN is not related to the requirements on NNI	The call forwarding notice function by using 181 response The providing announcement function that forwarding network notices to sending network	
4.5.2.2.5	Indication of communication diversion to the diverting user /CDIV notification (subscription option)	CDIVN is not related to the requirements on NNI	–	
4.5.2.2.5.1	Communication diversion notification procedure of the served user	CDIVN is not related to the requirements on NNI	–	
4.5.2.2.5.2	Interaction of CDIVN and indication of communication diversion to the diverting user procedures	CDIVN is not related to the requirements on NNI	–	
4.5.2.2.6	Not reachable indication	–	–	

Table II.1 – Clarification and option lists

Clause number of ITU-T Q.3616		Clarification items over NNI	Option items	Notes
Clause number	**Clause title**			
4.5.2.3	Actions at the AS of the diverted-to user	TIP/TIR is not applicable	The call forwarding notice function by using 181 response The forwarding history notice function by using forwarding responding to sending network	
4.5.2.4	Actions at the diverted to UA	–	–	
4.5.2.5	Actions at the diverting UA	–	–	
4.6	Interaction with other services	–	–	
4.6.1	Communication hold (HOLD)	–	–	
4.6.2	Terminating identification presentation (TIP)	TIP competition requirement is not applicable	–	
4.6.3	Terminating identification restriction (TIR)	TIR competition requirement is not applicable	–	
4.6.4	Originating identification presentation (OIP)	–	–	
4.6.5	Originating identification restriction (OIR)	CDIVN is not related to the requirements on NNI	–	
4.6.6	Conference calling (CONF)	–	–	
4.6.7	Communication diversion Services (CDIV)	–	–	
4.6.8	Malicious communication identification (MCID)	–	–	
4.6.9	Anonymous communication rejection and communication barring (ACR/CB)	–	–	
4.6.10	Explicit communication transfer (ECT)	–	–	
4.6.10.1	Actions at the diverting AS	–	–	
4.6.10.1.1	Determine whether ECT is applied to the diverted communication	–	–	
4.6.10.1.2	Handling of transfer requests	–	–	
4.6.10.1.3	Actions when CDIV is	–	–	

Table II.1 – Clarification and option lists

Clause number of ITU-T Q.3616		Clarification items over NNI	Option items	Notes
Clause number	**Clause title**			
	invoked again by the transferred communication			
4.6.11	Communication waiting (CW)	–	–	
4.6.12	Completion of communications to busy subscriber (CCBS)	–	–	
4.6.13	Advice of charge (AOC)	–	–	
4.7	Parameter values (timers)	–	–	
4.7.1	No reply timer	–	–	
4.7.2	CDIVN Buffer Timer	CDIVN is not related to the requirements on NNI	–	
4.7.3	CDIV Indication Timer	CDIVN is not related to the requirements on NNI	–	

Appendix III

SIP-ISUP interworking rules for the CDIV service

(This appendix does not form an integral part of this Recommendation.)

NOTE – The NGN SIP-ISUP interworking is based on [ITU-T Q.1912.5]. Since [ITU-T Q.1912.5] does not support some parameters in this Recommendation, the implementation is for further study.

III.1 Abstract

This appendix describes SIP-ISUP interworking rules for the CDIV service.

III.2 ISUP to SIP interworking

Table III.1 shows mapping from initial address message (IAM) to SIP INVITE request.

Table III.1 – Mapping from IAM to SIP INVITE request

ISUP parameter / information components		Parameter field value	SIP components	Value
IAM			INVITE	
Forwarding source number			History-Info header	In the case forwarding time is greater than 1, the second to the last hi-entry of the hi-targeted-to-uri is generated. In other cases, there are no settings.
	Nature of Address indicator	National-Number	hi-targeted-to-uri	CC (country number of media gateway control function (MGCF)) is added to forwarding source address information, and is mapped to user part of URI schema. Addr-spec " +" CC NDC SN are mapped to user part of URI schema.
		International number		Forwarding source numbering address is mapped to URI schema.
	Address signal	(In the case where "Nature of Address indicator" is "National-Number") Format of Address signal: NDC+SN. (In the case where "Nature of Address indicator" is "international number")	hi-targeted-to-uri	userinfo of URI schema is mapped to " + CC NDC SN".

Table III.1 – Mapping from IAM to SIP INVITE request

ISUP parameter / information components	Parameter field value	SIP components	Value
	Format of Address signal: CC+NDC+SN		
Address Presentation/ Restriction indicator	Presentation restricted	Privacy parameter in hi-targeted-to-uri of the second hi-entry from the last in History-Info	"history"
	Presentation allowed		No Privacy header or "none"
Communication diversion information			
Diversion indicator	Communication diversion call	Privacy parameter in hi-targeted-to-uri of the second hi-entry from the last in History-Info	"none"
	Presentation of communication diversion call and all diversion information restricted		"history"
Forwarding time	1	hi-index	Times forwarded is shown in hi-index entry number. First receiving number index: 1 Address signalling (receiving number) index: 1.1
	2		First receiving number index: 1 Forwarding source number index: 1.1 Address signalling (receiving number) index: 1.1.1
	N		First receiving number index: 1 Dummy History entry index: 1.1 … Forwarding source number index: 1+[(N-1)*".1"] Address signalling (receiving number) index: 1+N*".1 (e.g., N=3 means 1.1.1.1)
Forwarding reason First forwarding reason	Unconditional	Cause parameter in hi-targeted-to-uri defined in [IETF RFC 4458]	302
	User busy		486

Table III.1 – Mapping from IAM to SIP INVITE request

ISUP parameter / information components		Parameter field value	SIP components	Value
		No reply	Forwarding reason is mapped to the last hi-targeted-to-uri In the case that forwarding time is more than 2, the first forwarding reason is mapped to the second hi-targeted-to-uri. In the case that forwarding time is more than 3, "404" is setting into hi-targeted-to-uri of dummy History entry.	408
		Communication Deflection (in calling)		487
		Communication Deflection (immediately response)		480
		Mobile terminal receiving restricted		503
receiving number		Refer to forwarding source number	History-Info header Refer to hi-targeted-to-uri	The last hi-targeted-to-uri in History-info header
First receiving number		Refer to forwarding source number	History-Info header Refer to hi-targeted-to-uri	The first hi-targeted-to-uri in History-info header
	Address Presentation/Restriction indicator	Presentation restricted	Privacy parameter in hi-targeted-to-uri of the first hi-entry from the last in History-Info	" history"
		presentation allowed		" none"

Table III.2 shows mapping from ISUP to SIP message.

Table III.2 – Mapping from ISUP to SIP message

<- message to SIP	<- message from ISUP	
180 (Ringing)	Address complete message (ACM) meaning calling	
180 (Ringing)	Call progress message (CPG) meaning calling	Basic call procedure described in [IETF RFC 3398]
200 (OK)	ANM	

III.3 SIP to ISUP interworking

Table III.3 shows mapping from SIP to ISUP.

Table III.3 – Mapping from SIP to ISUP

<- message to ISUP	<- message from SIP	
ACM meaning diversion	181 (Call Is Being Forwarded) response	
CPG meaning diversion	181 (Call Is Being Forwarded) response	Refer to Table III.4
ACM meaning calling	180 (Ringing) response	
CPG meaning calling	180 (Ringing) response	
ANM	200 (OK) (after ACM sending)	
ACM+ANM	200 (OK) response (in case of not receiving 181 (Call is Being Forwarded) or 180 (Ringing) response. Before ACM sending)	
NOTE – in the case that ACM has already been sent, CPG is sent.		

Table III.4 shows mapping from 181 (Call Is Being Forwaded) response to CPG (in the case of ACM already sent).

**Table III.4 – Mapping from 181 (Call Is Being Forwarded)
response to CPG (in the case of ACM already sent)**

SIP header field / components	Component value	ISUP parameter	Parameter field value
181 (Call Is Being Forwarded)		CPG	
hi-targeted-to-uri in the last hi-entry including cause parameter defined in [IETF RFC 4458]	486	event	CFB
	408 (Note)		CFNR
	302		CFU
			progress display
NOTE – Appearing in the case of CNFR			

Table III.5 shows mapping from SIP to ISUP.

Table III.5 – Mapping from SIP to ISUP

-> message from SIP	-> message to ISUP
INVITE	IAM

Table III.6 shows mapping from the History-Info header to ISUP forwarding source number.

Table III.6 – Mapping from the History-Info header to ISUP forwarding source number

SIP header field / components	Component value	Forwarding source number	Parameter field value
hi-targeted-to-uri in the second hi-entry from the last one including cause parameter defined in IETF RFC4458		Forwarding source number	
hi-target-to-uri global number in part of URI " +" CC+NDC+SN	CC	Nature of Address indicator	"National-Number" is the setting when CC is same number as MGCF Nature-Number and connected node is the same node. In other cases, "international number" is the setting.
	CC, NDC, SN	Address signal	NDC+SN is setting when Nature of Address indicator is National-Number. CC+NDC+SN is setting when Nature of Address indicator is international number.
Privacy header or priv-value component of hi-entry described in this table (Note 2)	"history"	Address Presentation/ Restriction indicator	Presentation restricted
	No Privacy header or "none"		Presentation allowed
NOTE 1 – It is not possible to map to forwarding source number when including no "user=phone" in the SIP URI, it is not necessary to create a forwarding source number. NOTE 2 – It is possible to restrict the History-Info header entry or whole header.			

Table III.7 shows mapping from the History-Info header to ISUP communication forwarding information.

Table III.7 – Mapping from the History-Info header to ISUP communication forwarding information

SIP header field / components	Component value	Communication forwarding information	Parameter field value
Privacy header or priv-value component of the last hi-entry including cause parameter defined in [IETF RFC 4458].	"history" Privacy header or hi-targeted-to-uri	Forwarding indicator	Presentation of communication diversion call and all diversion information restricted
	No Privacy header and no hi-targeted-to-uri information, or "none"		Communication diversion call
cause parameter of the first hi-targeted-to-uri including cause parameter defined in [IETF RFC 4458].	404	The first forwarding reason	unconditional
	302		unconditional
	486		User busy
	408		No reply
	480		Communication deflection (immediately response)
	487		Communication deflection

Table III.7 – Mapping from the History-Info header to ISUP communication forwarding information

SIP header field / components	Component value	Communication forwarding information	Parameter field value
			(in calling)
	503		Mobile terminal receiving restricted
cause parameter of the last hi-targeted-to-uri including cause parameter defined in [IETF RFC4458].	404	Forwarding reason	Unconditional
	302		Unconditional
	486		User busy
	408		No reply
	480		Communication deflection (immediately response)
	487		Communication deflection (in calling)
	503		Mobile terminal receiving restricted
hi-index		Forwarding time	Number of hi-entry including cause parameter indicated in this table (Note)
NOTE – The maximum number of forwarding operations is 5 according to [ITU-T Q.763].			

Table III.8 shows mapping from the History-Info header to ISUP first receiving number.

Table III.8 – Mapping from the History-Info header to ISUP first receiving number

SIP header field / components	Component value	First receiving number	Parameter field value
		Numbering plan indicator	"ISDN (telecommunication) numbering plan (ITU-T E.164)"
Hi-targeted-to-uri in hi-entry before the first one including cause parameter defined in [IETF RFC4458] global number in part of URI "+"CC+NDC+SN	CC	Nature of Address indicator	"National-Number" is setting when CC is the same number as the MGCF Nature-Number and the connected node is the same node. In another case the "international number" is the setting.
	CC, NDC, SN	Address information	NDC+SN is the setting when the Nature of Address indicator is National-Number. CC+NDC+SN is the setting when the Nature of Address indicator is the international number.
priv-value of hi-entry indicated in this table (Note 2)	"history"	Address presentation/ Restriction indicator	Presentation restricted
	No Privacy header or "none"		Presentation allowed

Table III.8 – Mapping from the History-Info header to ISUP first receiving number

SIP header field / components	Component value	First receiving number	Parameter field value
NOTE 1 – It is not possible to map to ISUP first receiving number when the SIP URI does not include "user-phone". In this case, it is not necessary to generate first receiving number NOTE 2 – It is possible to restrict the History-Info header entry or whole header.			

Table III.9 shows mapping from INVITE to IAM.

Table III.9 – Mapping from INVITE to IAM

INVITE			IAM	
History-Info header	Refer to Table III.6		Forwarding source number	Refer to Table III.6
History-Info header	Refer to Table III.7		Communication diversion information	Refer to Table III.7
Cause parameter of the last hi-targeted-to-uri including cause parameter defined in [IETF RFC4458]	Cause value	404	Forwarding reason	Unconditional
		302		Unconditional
		486		User busy
		408		No reply
		480		Communication deflection (immediately response)
		487		Communication deflection (in calling)
		503		Mobile terminal receiving restricted
History-Info header	Refer to Table III.8		First forwarding reason	Refer to Table III.8

SERIES OF ITU-T RECOMMENDATIONS

Series A	Organization of the work of ITU-T
Series D	General tariff principles
Series E	Overall network operation, telephone service, service operation and human factors
Series F	Non-telephone telecommunication services
Series G	Transmission systems and media, digital systems and networks
Series H	Audiovisual and multimedia systems
Series I	Integrated services digital network
Series J	Cable networks and transmission of television, sound programme and other multimedia signals
Series K	Protection against interference
Series L	Environment and ICTs, climate change, e-waste, energy efficiency; construction, installation and protection of cables and other elements of outside plant
Series M	Telecommunication management, including TMN and network maintenance
Series N	Maintenance: international sound programme and television transmission circuits
Series O	Specifications of measuring equipment
Series P	Terminals and subjective and objective assessment methods
Series Q	**Switching and signalling**
Series R	Telegraph transmission
Series S	Telegraph services terminal equipment
Series T	Terminals for telematic services
Series U	Telegraph switching
Series V	Data communication over the telephone network
Series X	Data networks, open system communications and security
Series Y	Global information infrastructure, Internet protocol aspects, next-generation networks, Internet of Things and smart cities
Series Z	Languages and general software aspects for telecommunication systems