TTC標準
Standard

JJ-22.05

Technical Specification Call Diversion Supplementary Services Information Interface between Private SIP Networks

Version 1.2

June 9, 2016

THE TELECOMMUNICATION TECHNOLOGY COMMITTEE

Telecommunication Technology Committee

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1. Introduction

The Private Network Interface Sub-Working Group of the Private Network Special Committee has been standardizing IP protocols intended for inter-PBX (Private Branch eXchange) private networks (circuit-switched networks) and Qsig (Signaling information flows at the Qreference point). Now, taking recent trends of the market and international recommendations into consideration, it is necessary to study implementation of VoIP (Voice over Internet Protocol) technology based on SIP (Session Initiation Protocol) in operating agencies. This standard specification is stated, focusing on how the new technologies mentioned above are lately handled and how carriers are handling them.

This standard, which is referring to JS-22535 (Qsig tunneling), is a material for standardization of making Qsig-based inter-office services also available in the SIP (Session Initiation Protocol) network.

This standard is a material specially dedicated for "call diversion supplementary services".

2. Revision History

Version	Date of establishment	Description
First Version	February 25, 2009	Established
Version 1.1	December 10,2009	Revision.
Version 1.2	June 9,2016	Revision (Correction of figure 2.4.1.1)

3. Miscellaneous

(1) Recommendations, standards, etc., referenced

JS-13873 : Private Integrated Services Network(Call Diversion supplementary services) – Specifications for inter-PBX signaling protocol －

JS-11572 : Private Integrated Services Network(circuit-mode bearer services) － Layer 3 Specifications for inter-PBX signaling protocol －

JS-11582 : Private Integrated Services Network(Generic Functional Protocol for the support of supplementary services) － Specifications for inter-PBX signaling protocol －

JS-22535 : Technical Specification on "QSIG" tunneling by Session Initiation Protocol (SIP) in corporate telephonic communication network (CN)

TTC Standard : JJ-22.00 The Guideline for the Architecture of the Technical Specifications for Private SIP in TTC

TTC Standard : JJ-22.01 Technical Specifications on Inter－connection Interface between Private SIP Networks

TTC Standard : JJ-22.012 Inter-work Specifications between Private SIP Network and private ISDN Network

4. Organizational Unit Preparing Standards

First Version: Private Network Special Committee

Version 1.1 : Private Network Special Committee

Version 1.2 : Enterprise Network Working Group

1. Outline of This Standard

This specification is a material for standardization of call diversion supplementary services in conformity with the JS-22535 (Qsig tunneling) in private SIP networks.

1.1 Purpose

This standard is intended to state definitions of inter-office services used in networks connected through an IP network (SIP) in order to plot interwork affinity and expandability of inter-office services.

1.2 Summary

This standard states the conditions for tunneling with SIP (Session Initiation Protocol), based on JS-13873 (private integrated service network (call diversion supplementary services), inter-PBX signal protocol specifications).

2. Description of the Standard

2.1 Definition of the standard

This standard stipulates “call diversion supplementary services” employing inter-office service tunneling with Session Initiation Protocol (SIP) on the private telephone communication network (CN).

SIP is an application layer protocol to start, end, and change a multimedia session. SIP is usually handled with IP transmission (RFC791, RFC2460). Telephonic calls are regarded as a type of multimedia session in which audio is exchanged. SIP is defined by RFC3261.

QSIG is a signal protocol between private integrated service network exchanges (PINX) on the private integrated service network (PISN). PISN provides circuit-switched basic services and supplementary services for users. QSIG is stipulated in the domestic standards JS-11572 (basic service call control), JS-11582 (general-purpose function procedures for supplementary services), and call transfer supplementary services are stipulated in the domestic standard JS-13873 (private integrated service network (call diversion supplementary services), inter-PBX signal protocol specifications) and standards of respective supplementary services.

Note: QSIG is named after signaling at Q reference points. The Q reference point is the boundary between two PINXs.

A CN may consist of a PISN employing QSIG and IP network employing SIP. Calls and signals independent from calls are originated from users connecting with the PISN and terminated by a user connecting with the IP network, or vice versa. In either case, a gateway provides QSIG-SIP interworking at the boundary between PISN and IP network. The basic call interworking at the gateway is stated in ISO/IEC17343. In another case where calls and signals independent from calls are originated from users connecting with the PISN, calls are sent over an IP network employing SIP and terminated by a user connecting with another PISN (or another location in the same network).

2.2. Scope

QSIG tunneling with SIP on a public IP network is out of the scope of this standard.

This stipulation is also applicable to interworking units that tunnel QSIG to SIP request / response which function as a gateway between PISN employing QSIG and private IP network employing SIP.

2.3 Tunneling

This document describes user-terminated calls and signals independent from calls that are originated from users connecting with a PISN employing QSIG, routed through an IP network employing SIP, and terminated by a user connecting with another PISN (or another location in the same PISN). As shown in Figure 2.4, on the boundaries between the PISNs employing QSIG and the IP network employing SIP, gateways are placed for the connections.

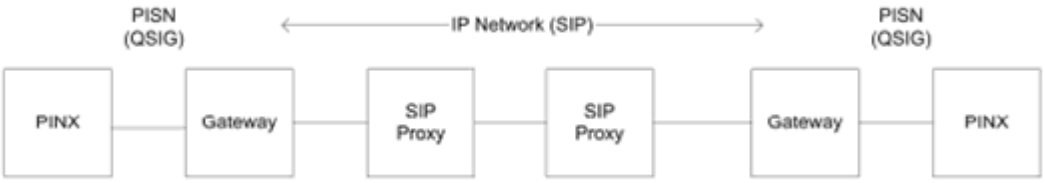


Figure 2.4 Call from QSIG to QSIG via SIP

The gateways interwork together as stated by ISO/IEC 17343. This provides basic call functions. In ISO/IEC 17343, like JS-11572, only interworking to QSIG basic calls is specified. It does not include any QSIG functions (supplementary services and additional network features) stipulated by other standards and vendor-specific specifications.

This leads to loss of functions in calls and signals independent from calls in the direction from QSIG to SIP or SIP to QSIG. Even in a case similar to that shown in Figure 2.4, loss of functions also takes place. This assumes that if the two gateways are different types only the functions common to both the gateways are available end-to-end.
As a solution to prevent loss of QSIG functions end-to-end, QSIG messages passed through the IP network are tunneled to SIP messages. Either of the two gateways starts a SIP dialog to the other gateway. By using SIP messages in the dialog, QSIG messages are tunneled. If necessary, a session is established by using SDP of RFC 3264 to transmit user information (e.g., audio) between the QSIG gateways. The two gateways function as a QSIG Transit PINX and QSIG messages are transited with little modification.

In conventional PISNs employing QSIG, associated PINXs are connected with an inter-PINX link, and it consists of one (QSIG message transmission) signal channel, and more than one user information channel for audio,modem information,or data transmission. The tunneling technique makes the IP network provide the inter-PINX link between gateways functioning as a Transit PINX. The QSIG-dedicated SIP-provided tunnel functions as a signal channel, and the media stream functions as a user information channel.

In addition to that, in case an SIP sequence failure is encountered in the QSIG-SIP interworking, it is necessary to make consideration so that no call remains on both QSIG and SIP. For example, if a timeout occurs on the SIP side, no processing is to be performed at timer-monitored locations on the end point (QSIG) side, but some processing is to be performed at other locations with an implementation-based procedure. (For example, a timeout in the middle of a sequence intended for release of a call makes it to be released and a timeout in the middle of a sequence intended for connection of a call makes it to ignore the timeout.)

As a supplementary matter, the primary response (callproc) in tunneling is to be handled as an option.

2.4. Connection Configuration

2.4.1 Basic connection configuration

This standard describes the conditions for connection interfaces to managed private SIP networks that are applicable to Interfaces C and E specified in the private SIP network interconnection model shown in Figure 2.4.1.1.

In this standard, a private SIP network that has an interface that can observe the provisions for this interface is called a “managed private SIP network”. It is assumed in the remainder of this standard that the term private SIP network refers to a “managed private SIP network”.

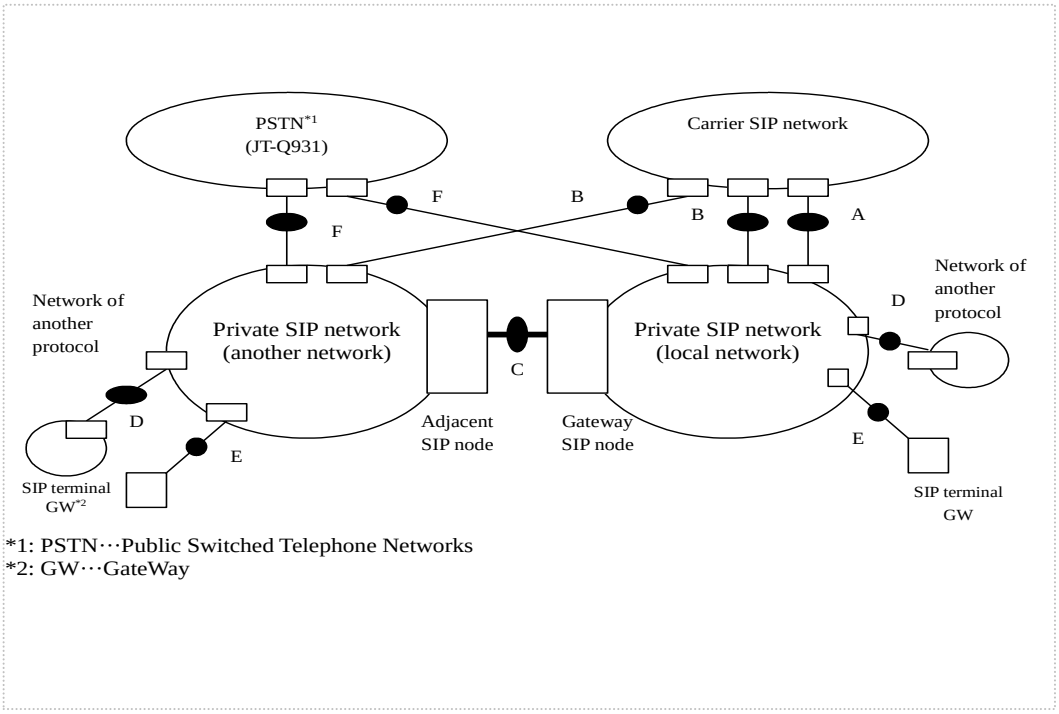


Figure 2.4.1.1 Private SIP network interconnection model

2.4.2. Procedures (normal sequences)

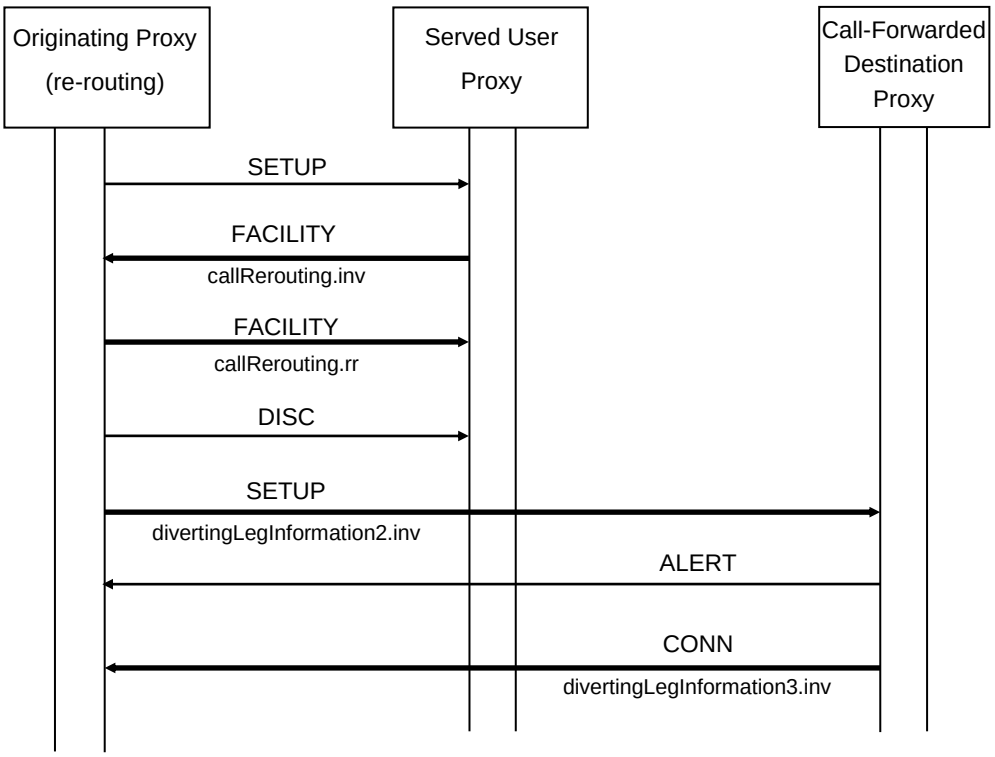
The following abbreviations are used:

CALL PROC	CALL PROCEEDING
CONN	CONNECT
CONN ACK	CONNECT ACKNOWLEDGE
DISC	DISCONNECT
REL	RELEASE
REL COMP	RELEASE COMPLETE

2.4.2.1 Call forwarding all calls (SS-CFU), call forwarding busy (SS-CFB)

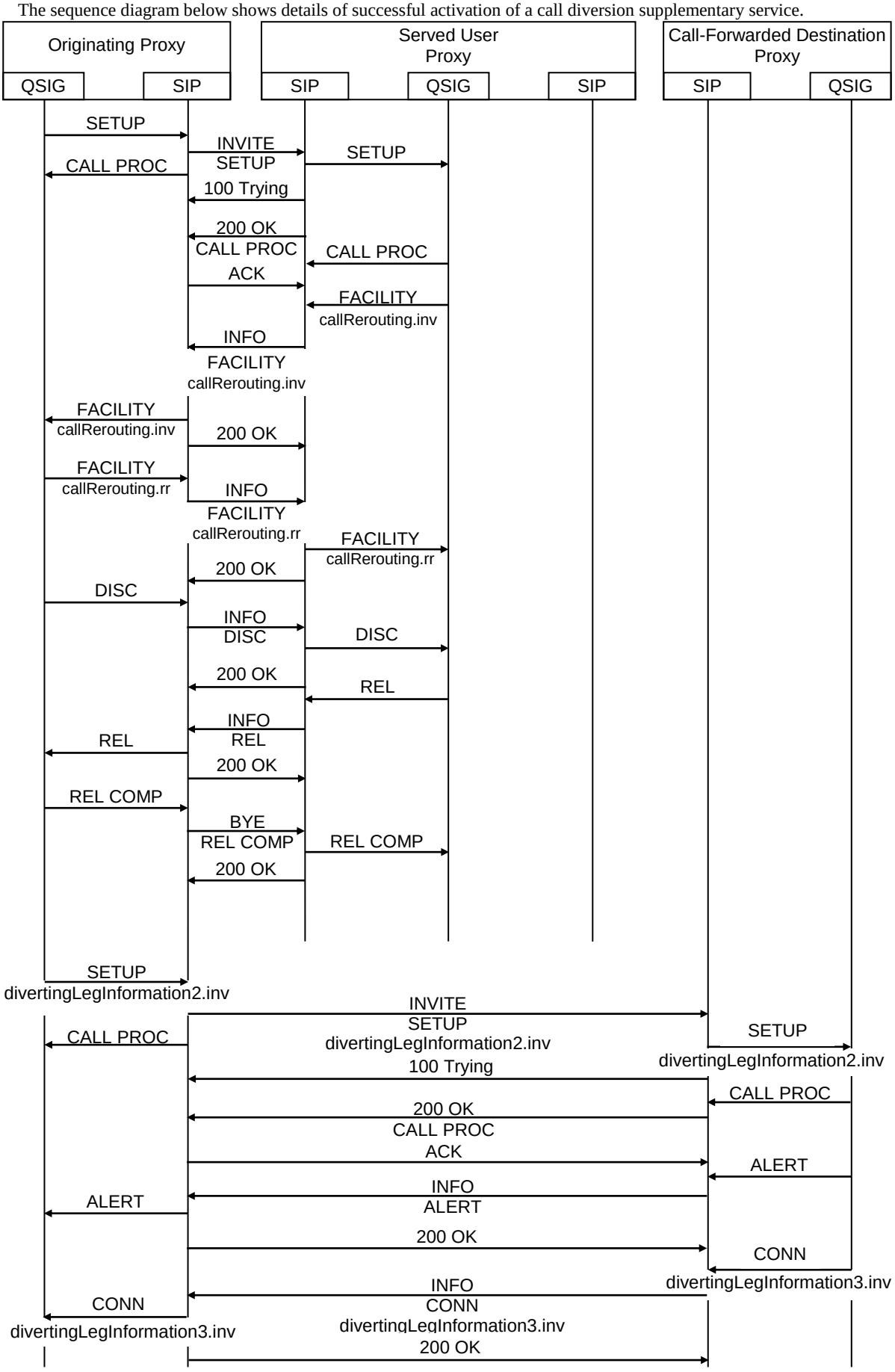
Example of the message sequence in the case of call forwarding proxy

Attached Figure 2.4.2.1.1 shows an example of SS-CFU/SS-CFB successful activation.



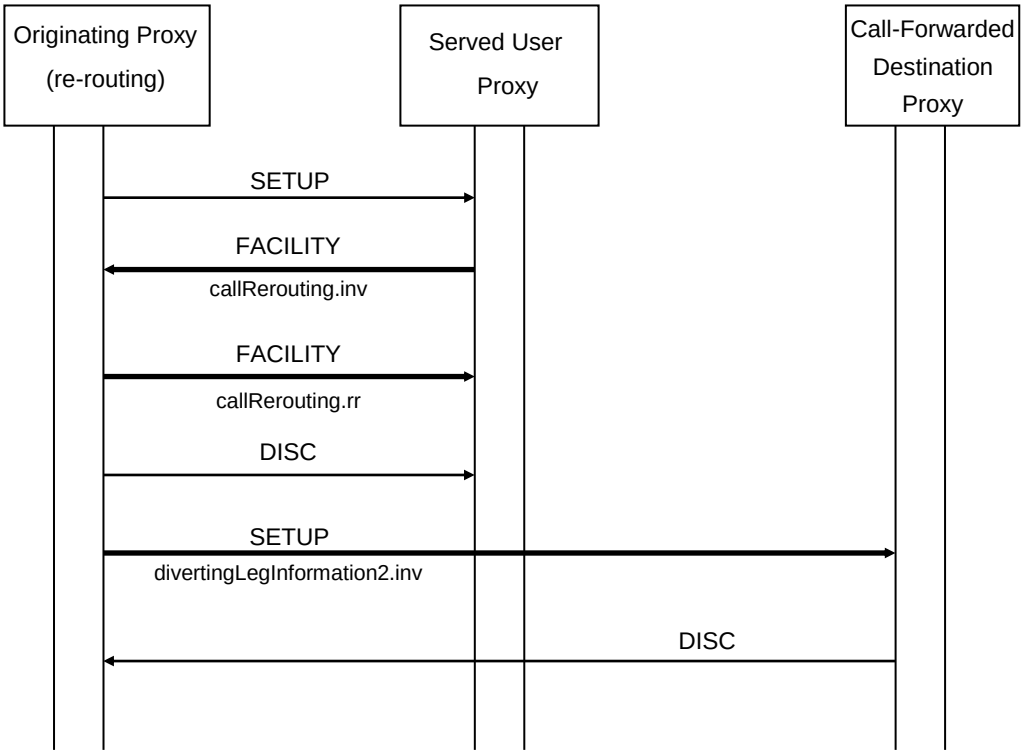
Attached Figure 2.4.2.1.1.a SS-CFU (CDI)/SS-CFB message sequence in successful activation

The sequence diagram below shows details of successful activation of a call diversion supplementary service.



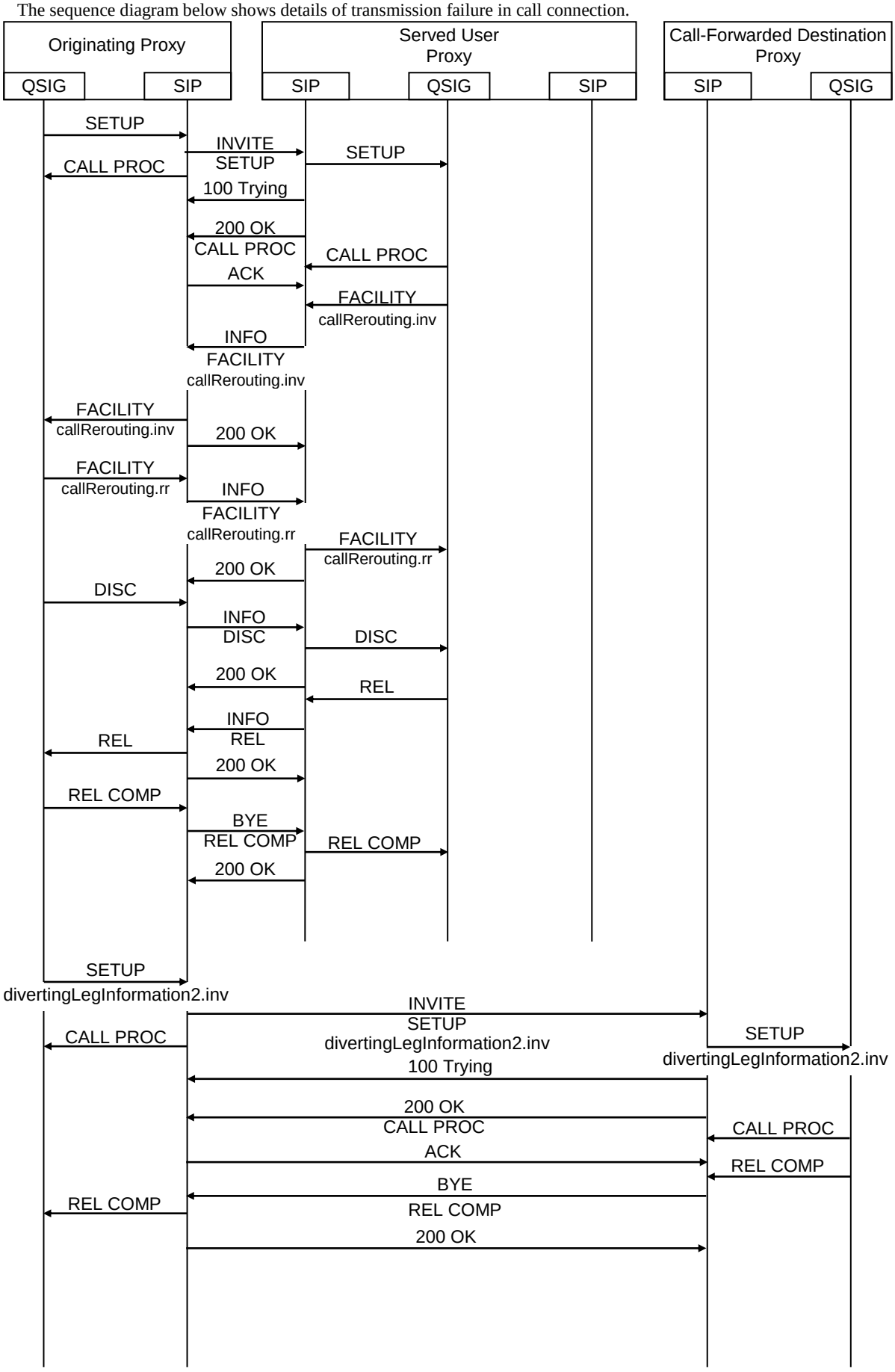
Attached Figure 2.4.2.1.1.b (Detailed) SS-CFU (CDI)/SS-CFB message sequence in successful activation

The sequence diagram below shows an example of SS-CFU (CDI)/SS-CFB unsuccessful activation.



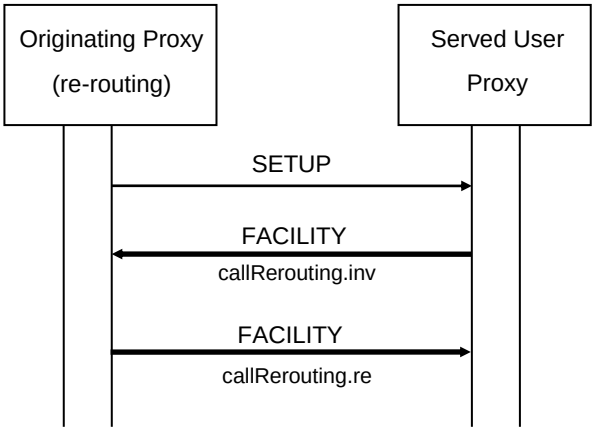
Attached Figure 2.4.2.1.2.a SS-CFU (CDI)/SS-CFB message sequence in unsuccessful activation

The sequence diagram below shows details of transmission failure in call connection.



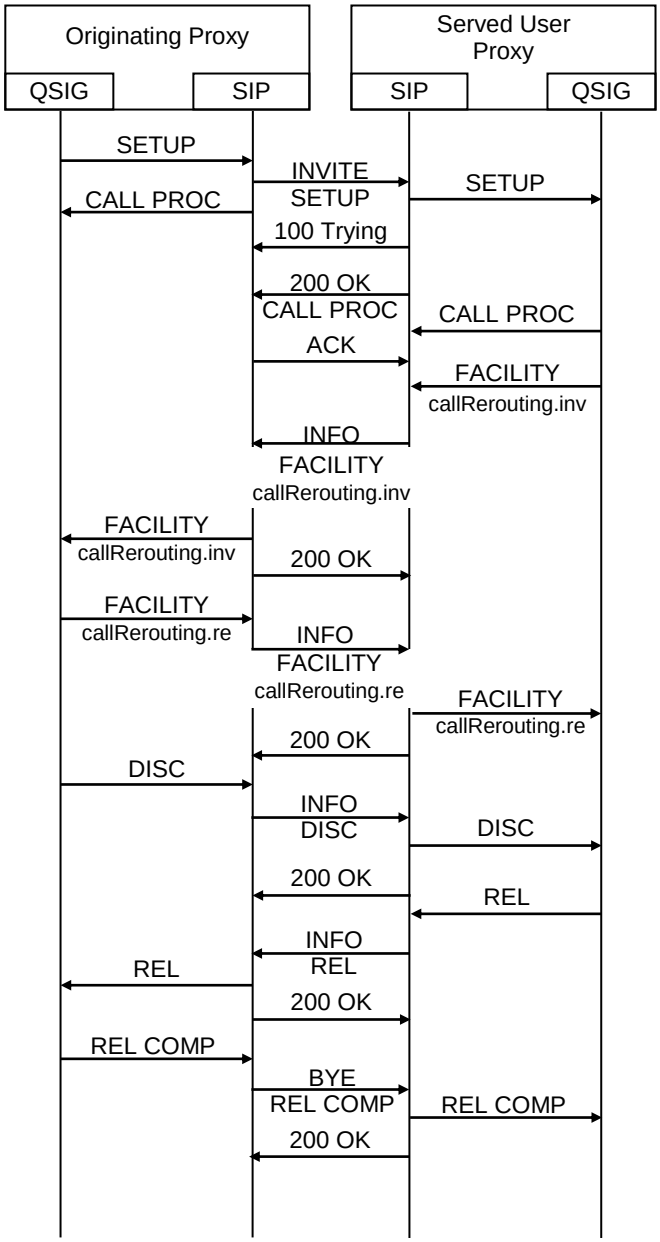
Attached Figure 2.4.2.1.2.b SS-CFU (CDI)/SS-CFB message sequence in unsuccessful activation

The sequence diagram below shows an example of SS-CFU (CDI)/SS-CFB unsuccessful activation (rejected).



Attached Figure 2.4.2.1.3.a SS-CFU (CDI)/SS-CFB message sequence in unsuccessful activation (re-routing request rejected)

The sequence diagram below shows details of transmission failure in call connection.

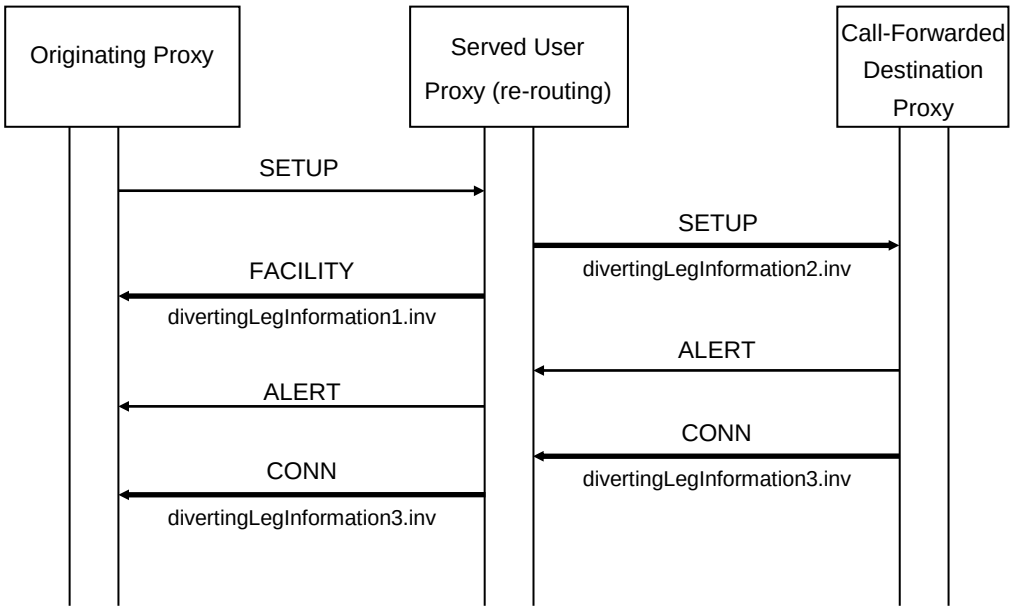


Attached Figure 2.4.2.1.3.b (Detailed) SS-CFU (CDI)/SS-CFB message sequence in unsuccessful activation (re-routing request rejected)

Example of the message sequence in the case of transit-type forwarding

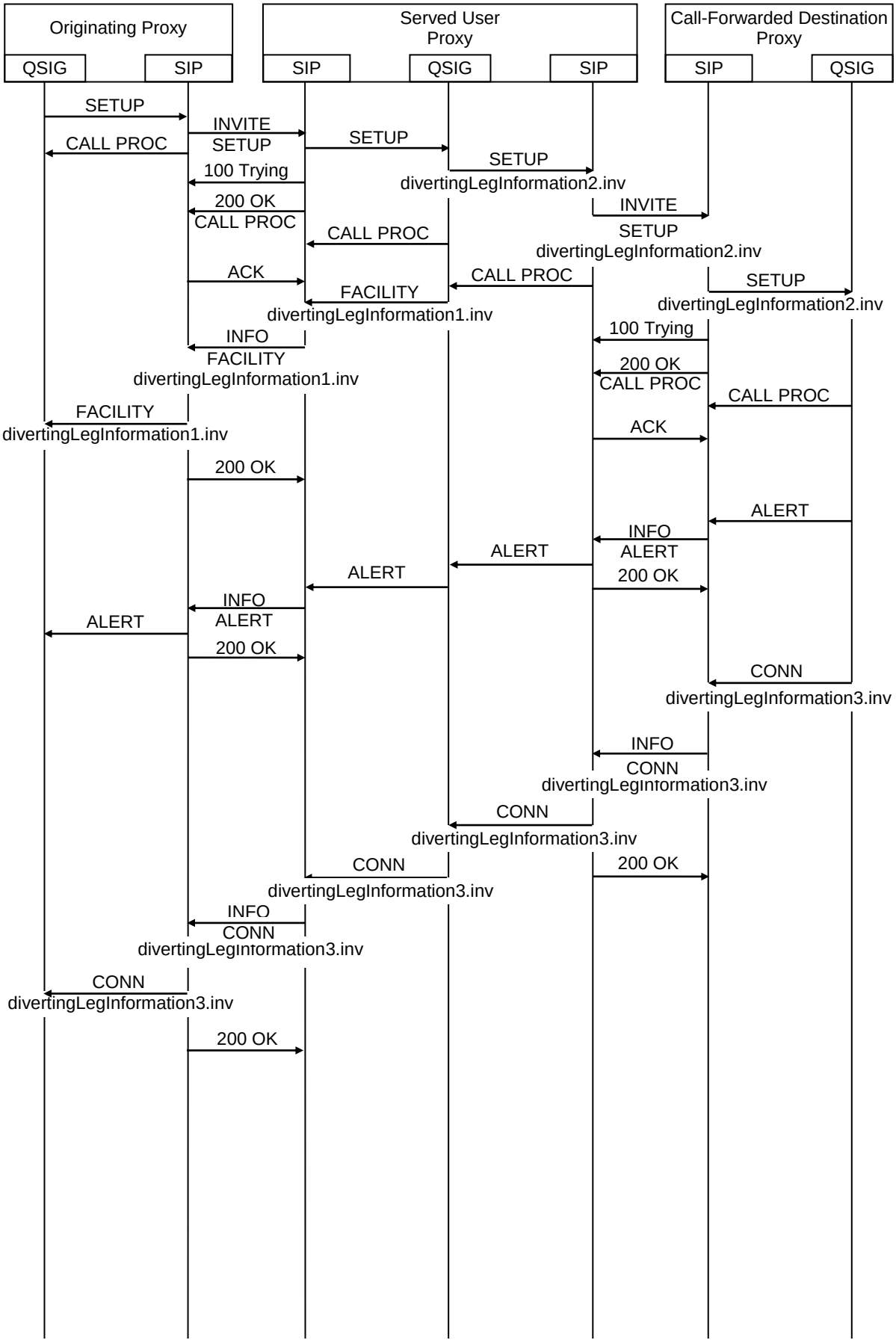
In the case of transit-type call forwarding, the function of call forwarding PINX is provided by the served user PINX.

The sequence diagram below shows an example of SS-CFU (CDI)/SS-CFB successful activation.



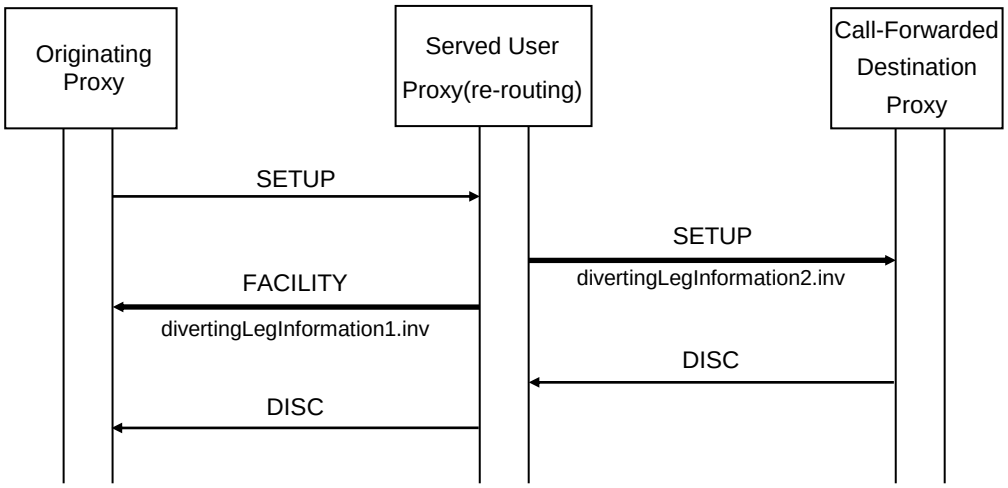
Attached Figure 2.4.2.1.4.a SS-CFU (CDI)/SS-CFB message sequence in successful activation

The sequence diagram below shows the detailed procedure in successful activation of a call diversion supplementary service.



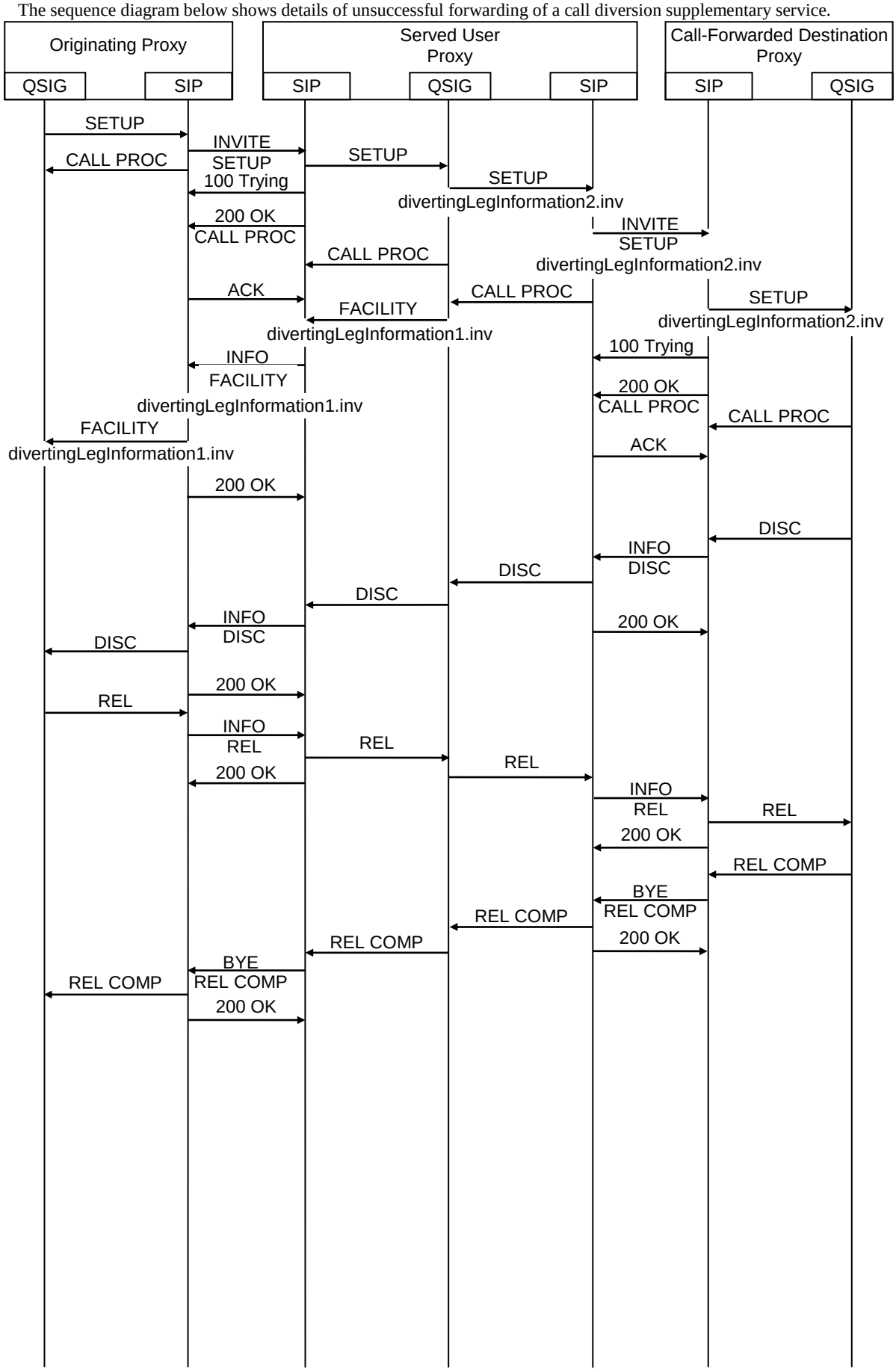
Attached Figure 2.4.2.1.4.b (Detailed) SS-CFU (CDI)/SS-CFB message sequence in successful activation

The sequence diagram below shows an example of SS-CFU (CDI)/SS-CFB unsuccessful activation.



Attached Figure 2.4.2.1.5.a SS-CFU (CDI)/SS-CFB message sequence in unsuccessful activation

The sequence diagram below shows details of unsuccessful forwarding of a call diversion supplementary service.

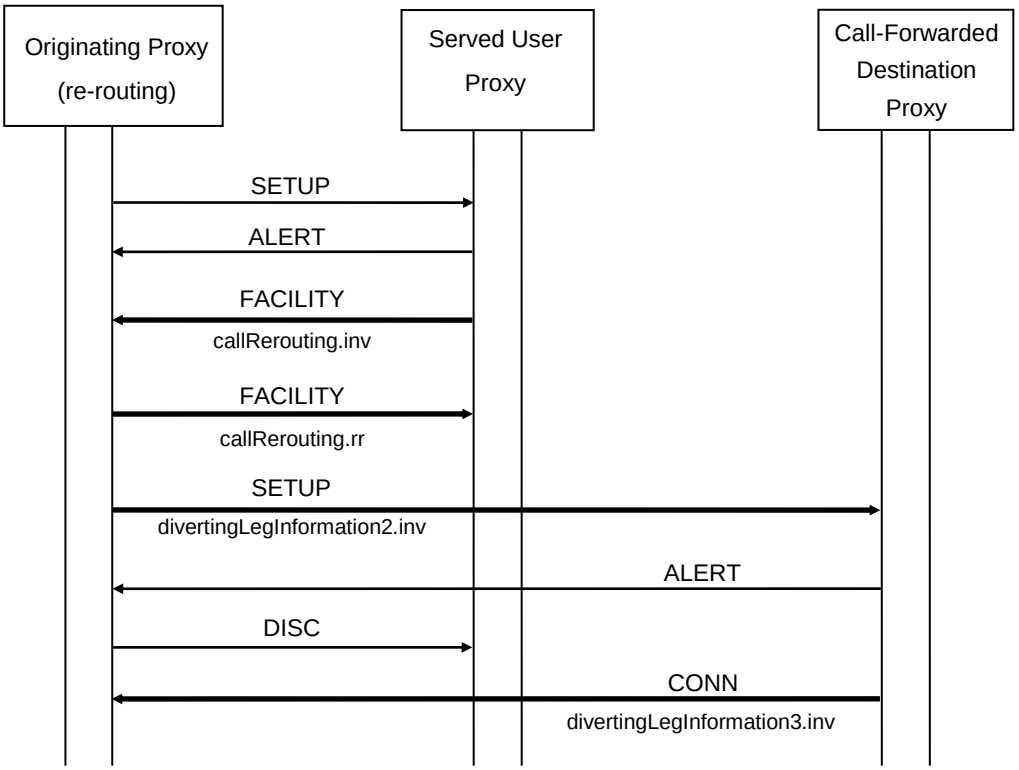


Attached Figure 2.4.2.1.5.b (Detailed) SS-CFU (CDI)/SS-CFB message sequence in unsuccessful activation

2.4.2.2 SS-CFNR (CDA) activation message sequence

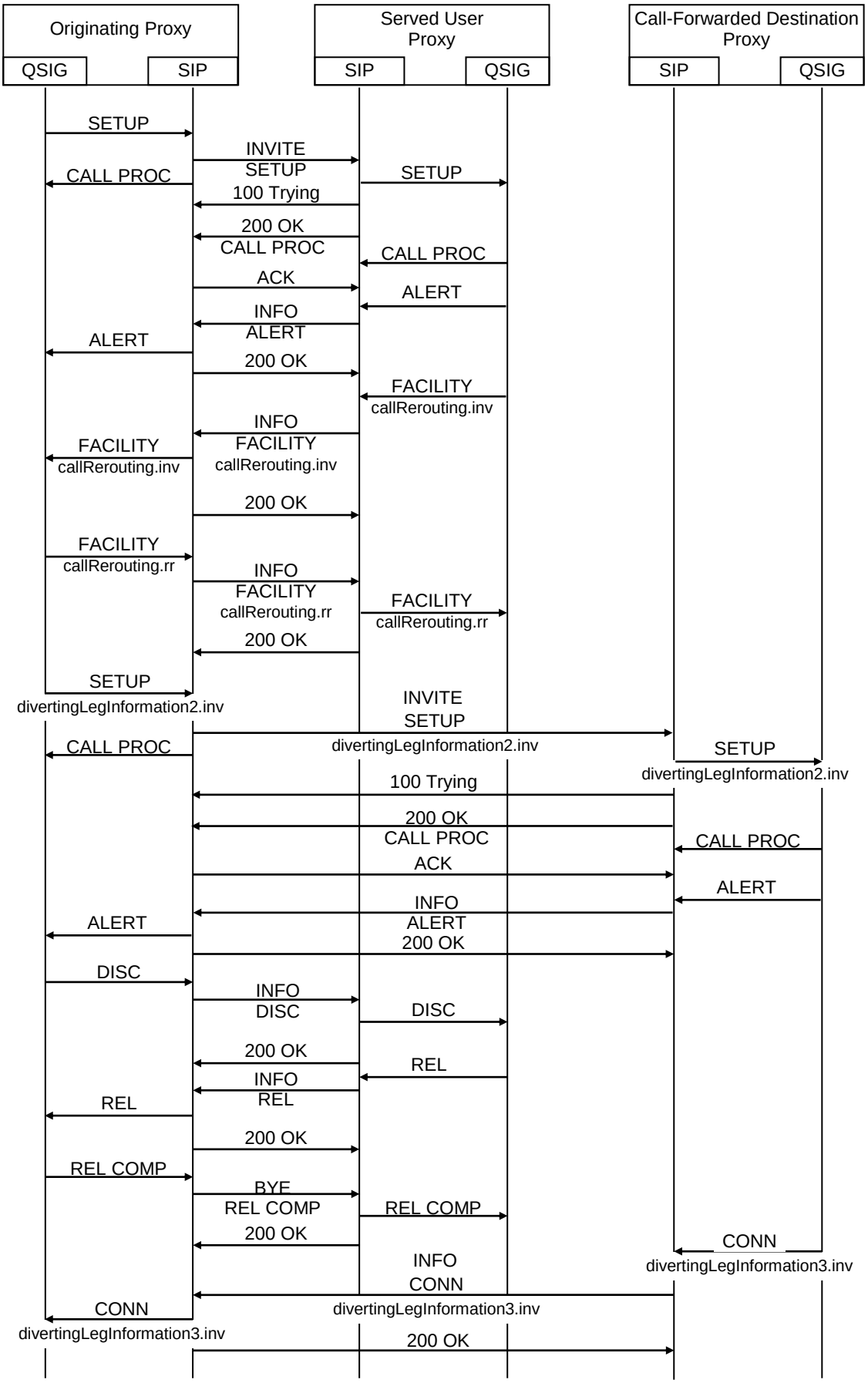
Example of the message sequence in the case of call forwarding PINX.

The sequence diagram below shows an example of SS-CFNR successful activation.



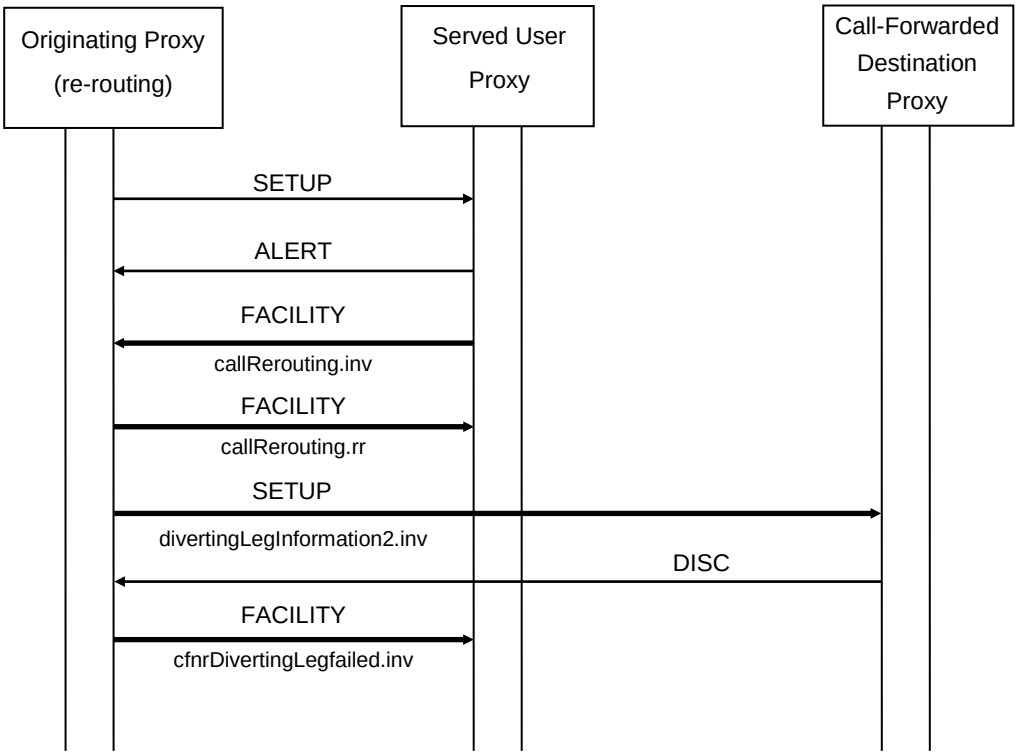
Attached Figure 2.4.2.2.1.a SS-CFNR (CDA) message sequence in successful activation

The sequence diagram below shows details of successful forwarding of a call diversion supplementary service.



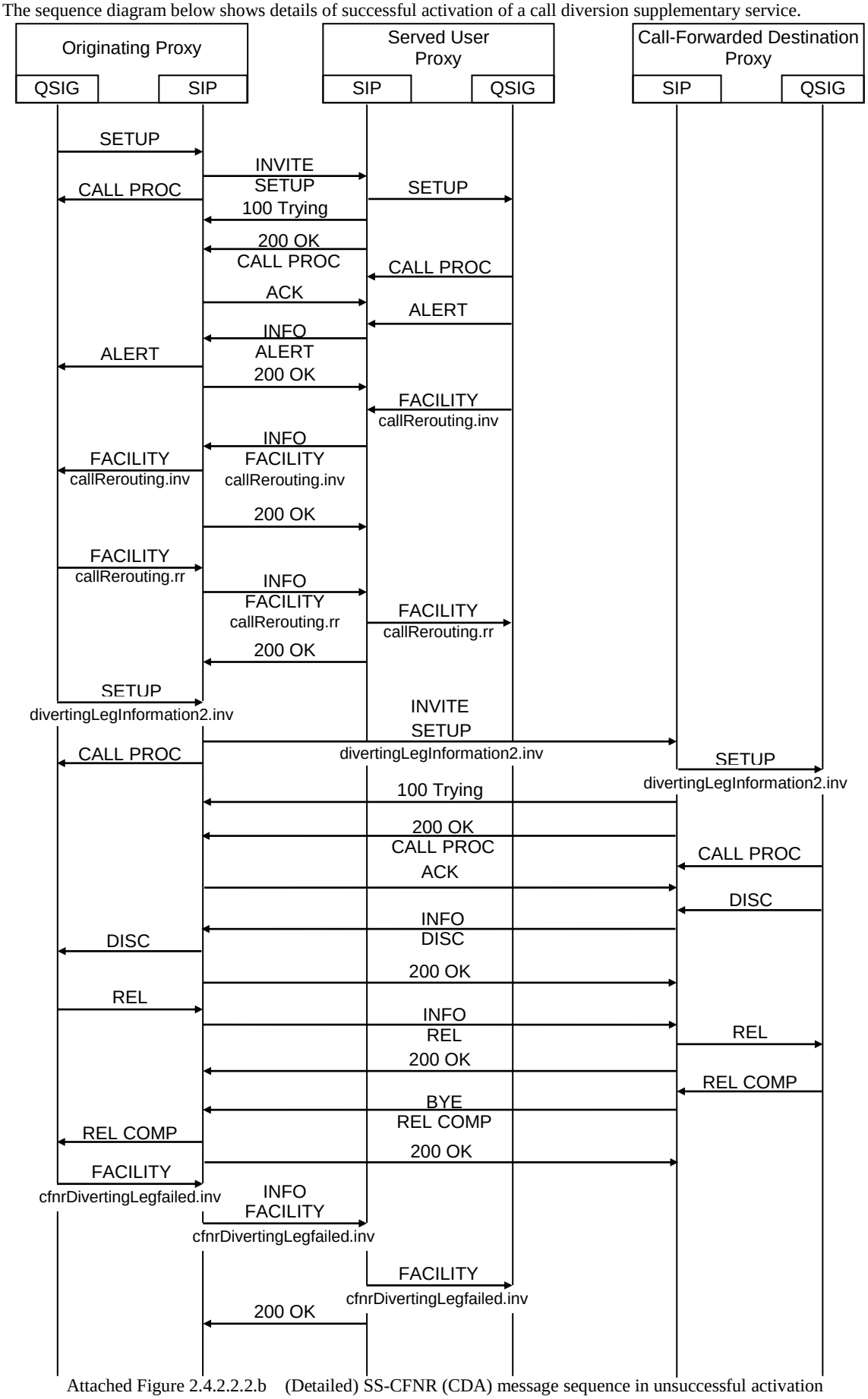
Attached Figure 2.4.2.2.1.b (Detailed) SS-CFNR (CDA) message sequence in successful activation

The sequence diagram below shows an example of SS-CFNR unsuccessful activation.



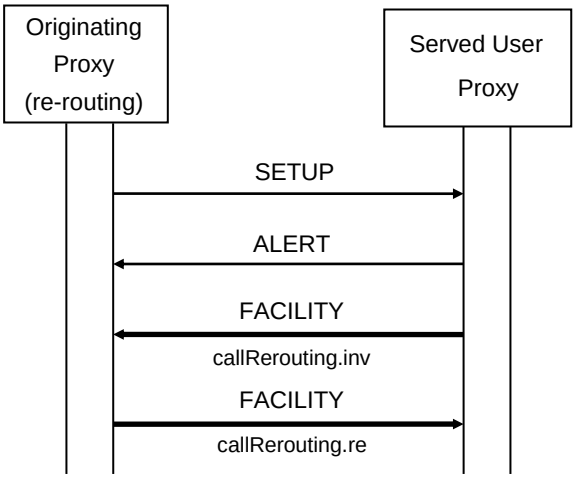
Attached Figure 2.4.2.2.2.a SS-CFNR (CDA) message sequence in unsuccessful activation

The sequence diagram below shows details of successful activation of a call diversion supplementary service.

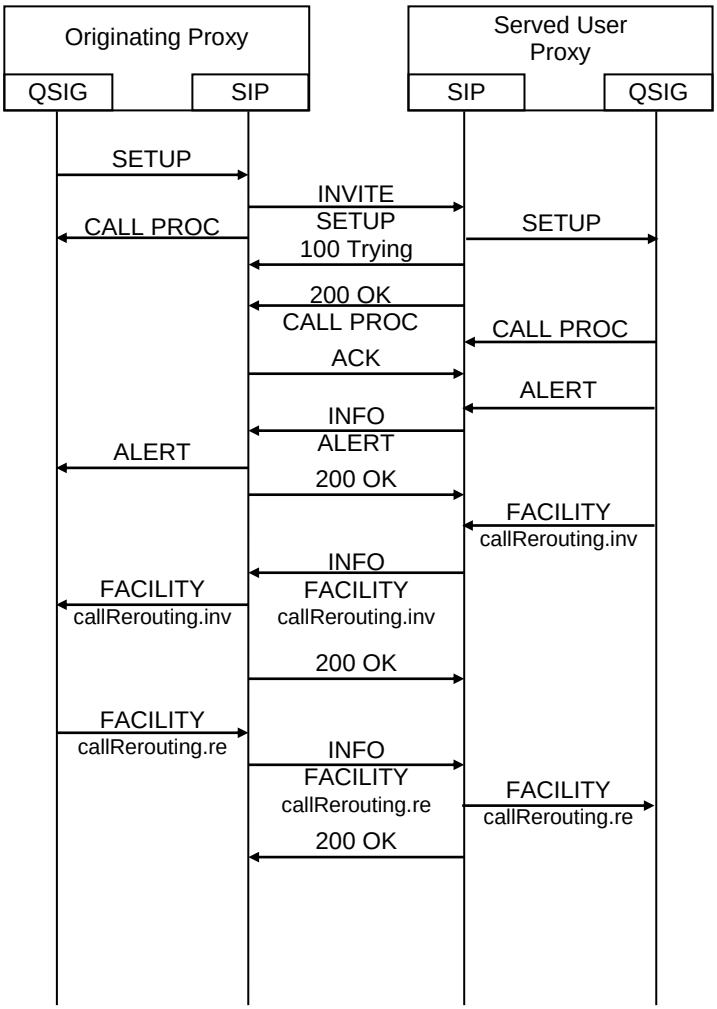


Attached Figure 2.4.2.2.2.b (Detailed) SS-CFNR (CDA) message sequence in unsuccessful activation

The sequence diagram below shows an example of SS-CFNR unsuccessful activation.

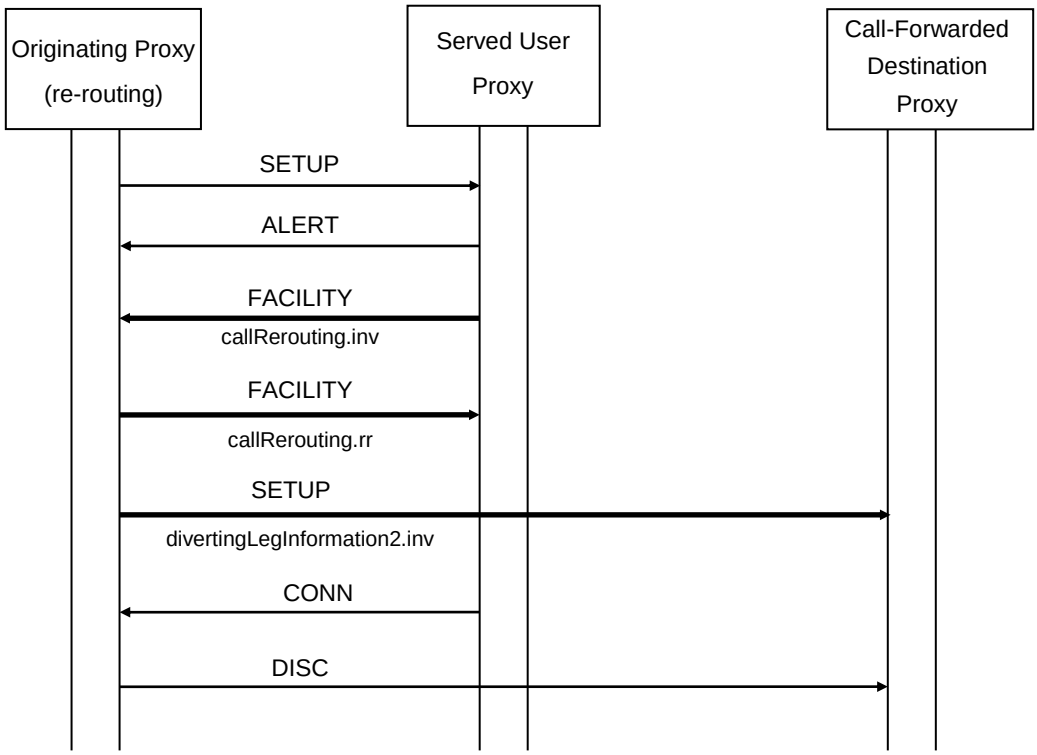


Attached Figure 2.4.2.2.3.a (Detailed) SS-CFNR (CDA) message sequence in unsuccessful activation (re-routing rejected)



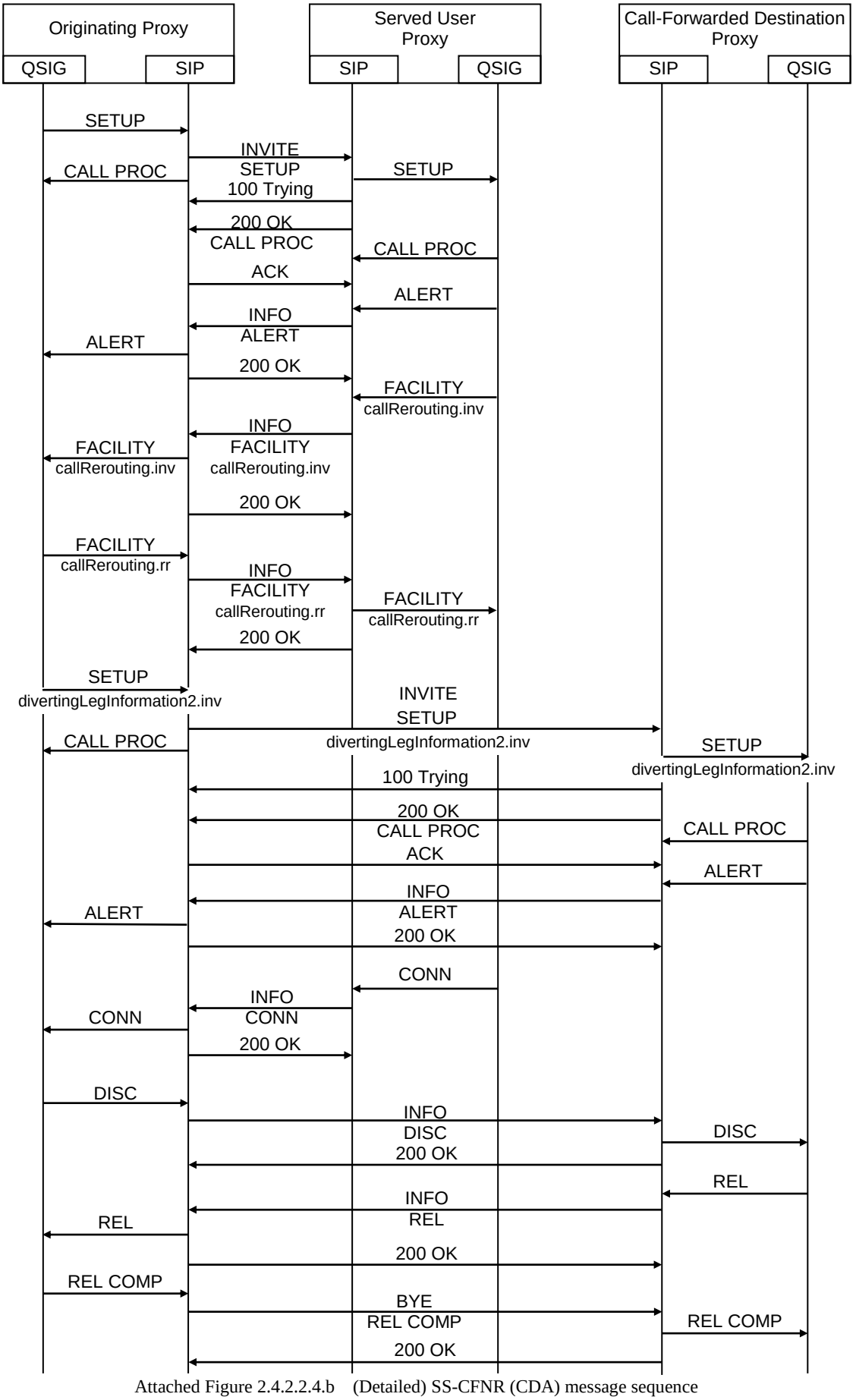
Attached Figure 2.4.2.2.3.b (Detailed) SS-CFNR (CDA) message sequence in unsuccessful activation (re-routing rejected)

The sequence diagram below shows an example of the case where User B (served user) have a connection before User C (call-forwarded destination) is alerted with SS-CFNR (CDA).



Attached Figure 2.4.2.2.4.a SS-CFNR (CDA) message sequence
CONNECT with User B before ALERT to User C

The sequence diagram below shows details of successful activation of a call diversion supplementary service.

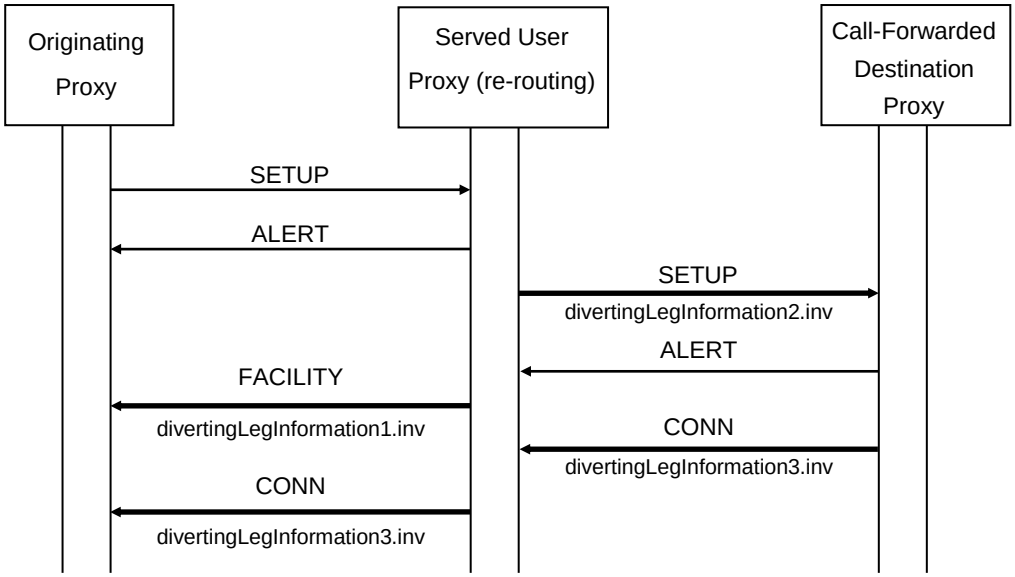


Attached Figure 2.4.2.2.4.b (Detailed) SS-CFNR (CDA) message sequence

Example of the message sequence in the case of transit-type forwarding

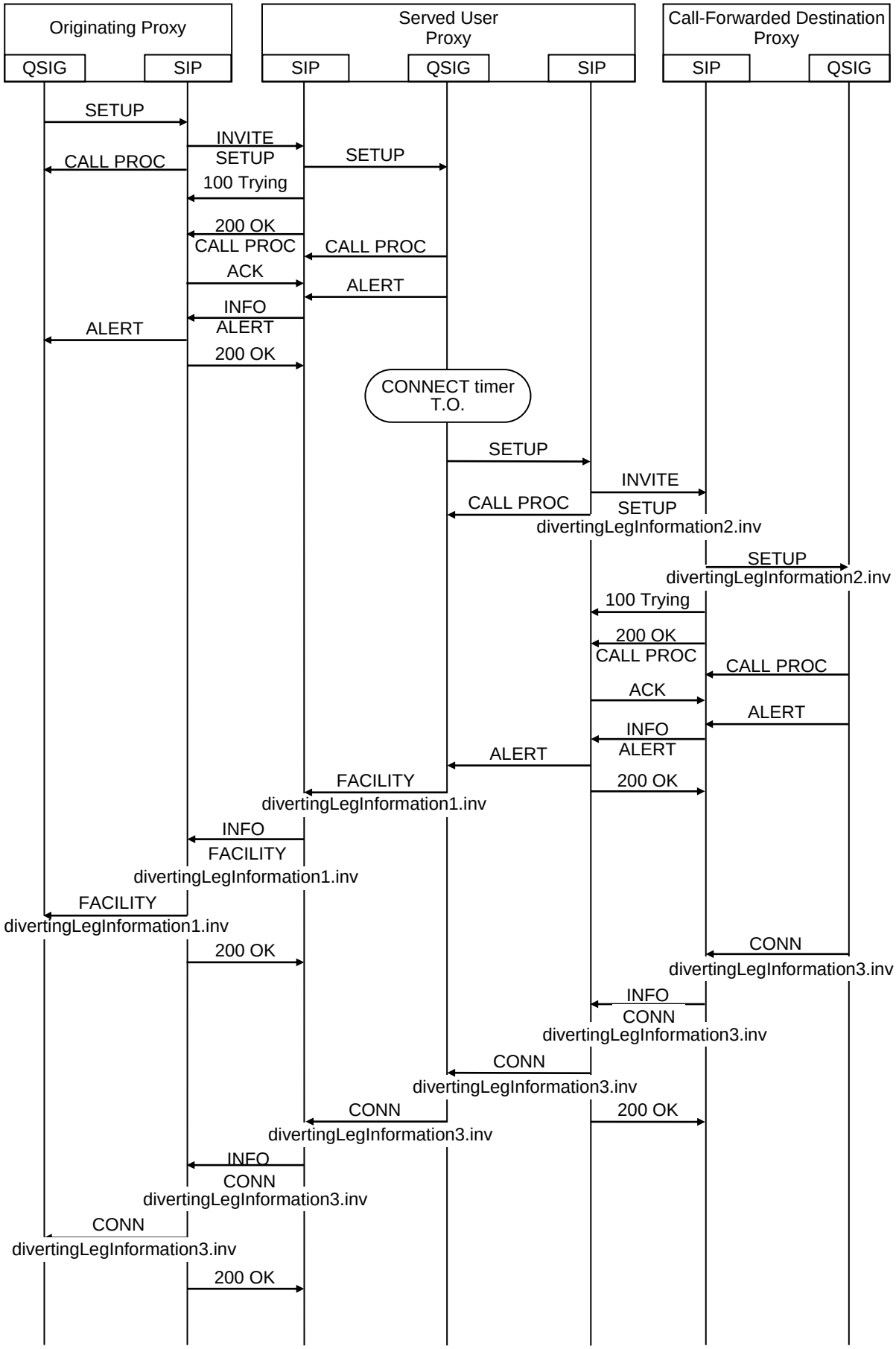
In the case of transit-type call forwarding, the function of call forwarding PINX is provided by the served user PINX.

The sequence diagram below shows an example of an example of SS-CFNR (CDA) successful activation.



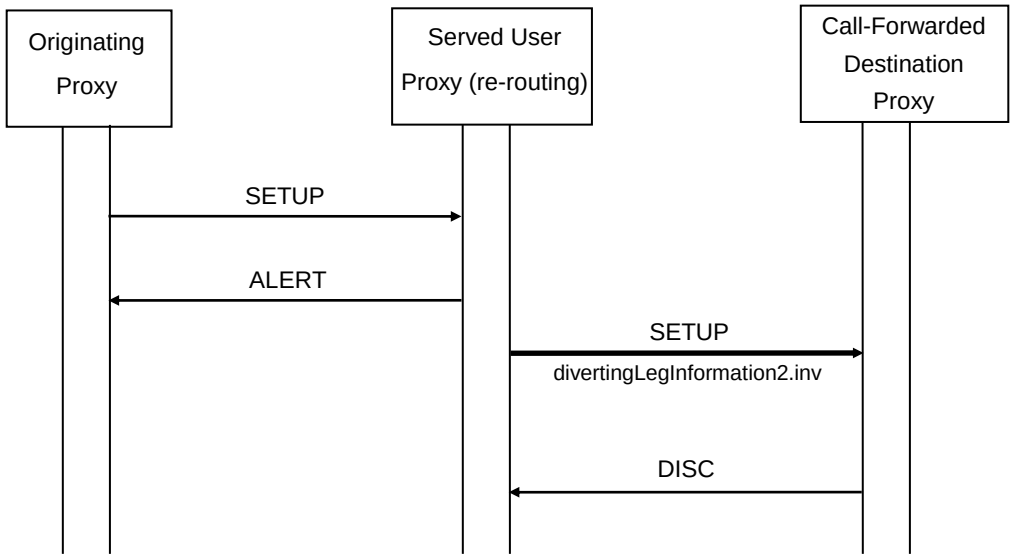
Attached Figure 2.4.2.2.5.a SS-CFNR (CDA) message sequence in successful activation

The sequence diagram below shows details of successful activation of a call diversion supplementary service.



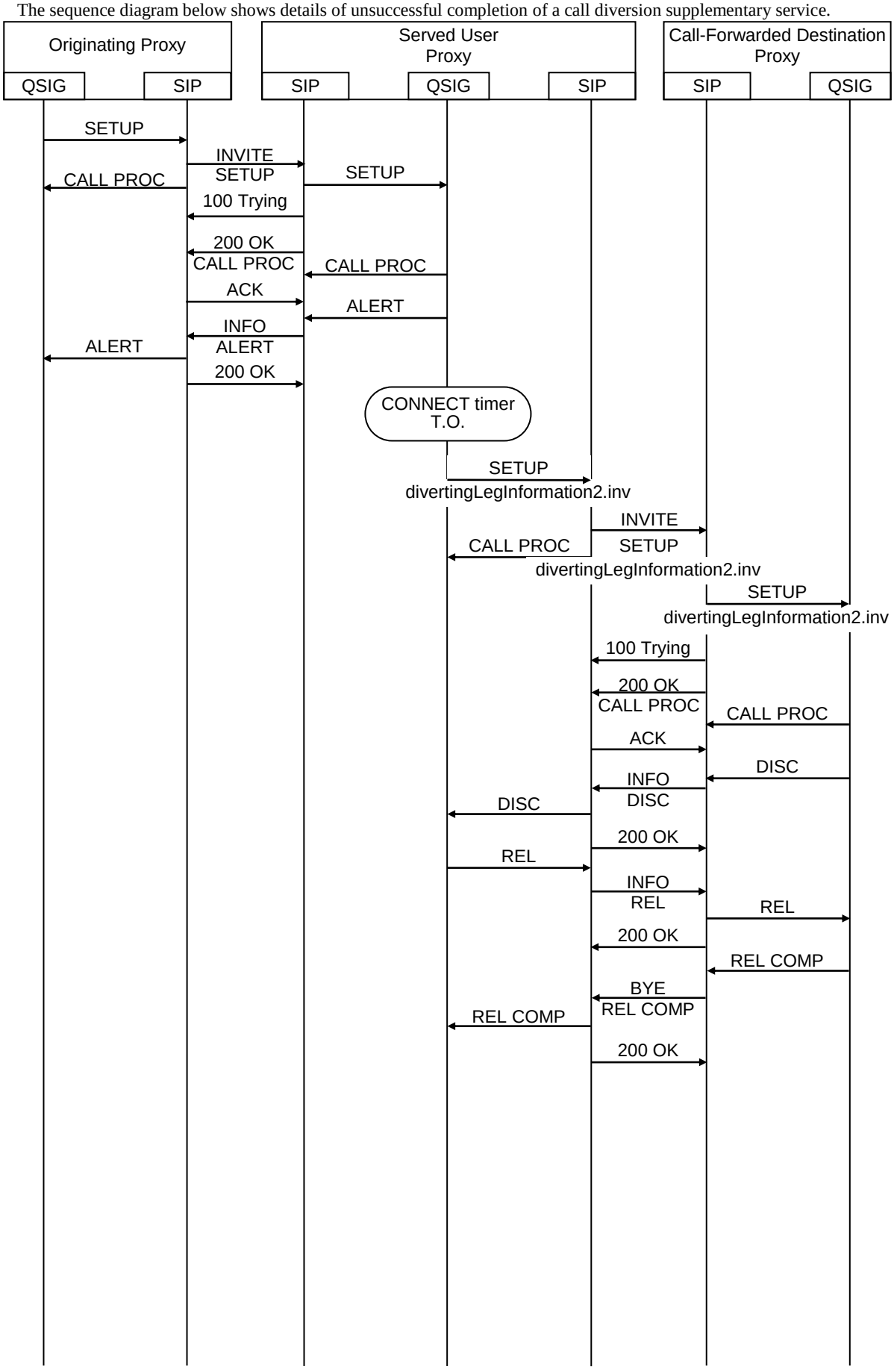
Attached Figure 2.4.2.2.5.b SS-CFNR (CDA) message sequence in successful activation

The sequence diagram below shows an example of SS-CFNR (CDA) unsuccessful activation.



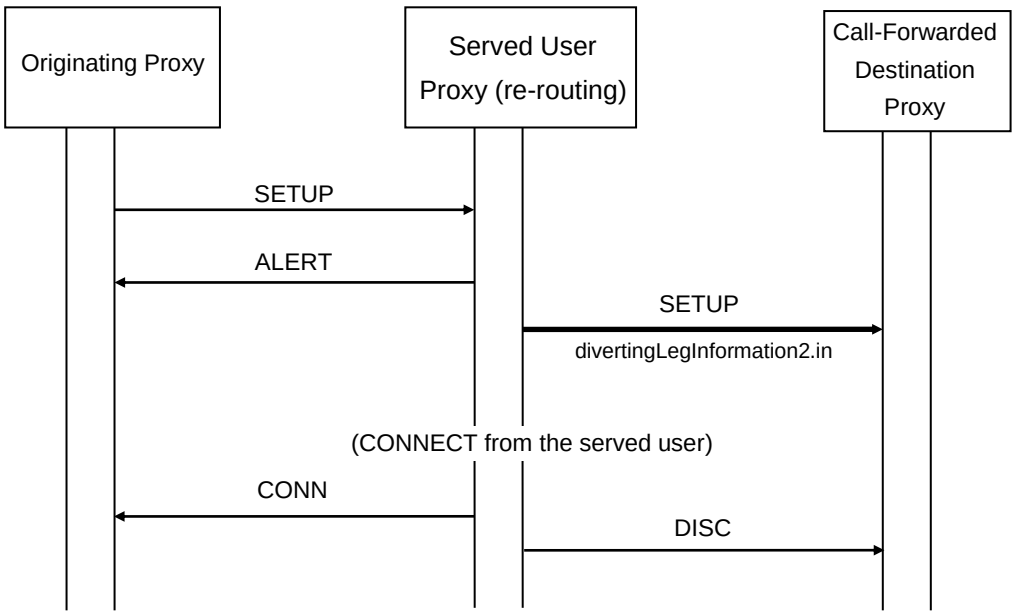
Attached Figure 2.4.2.2.6.a SS-CFNR (CDA) message sequence in unsuccessful activation (forwarding uncompleted)

The sequence diagram below shows details of unsuccessful completion of a call diversion supplementary service.



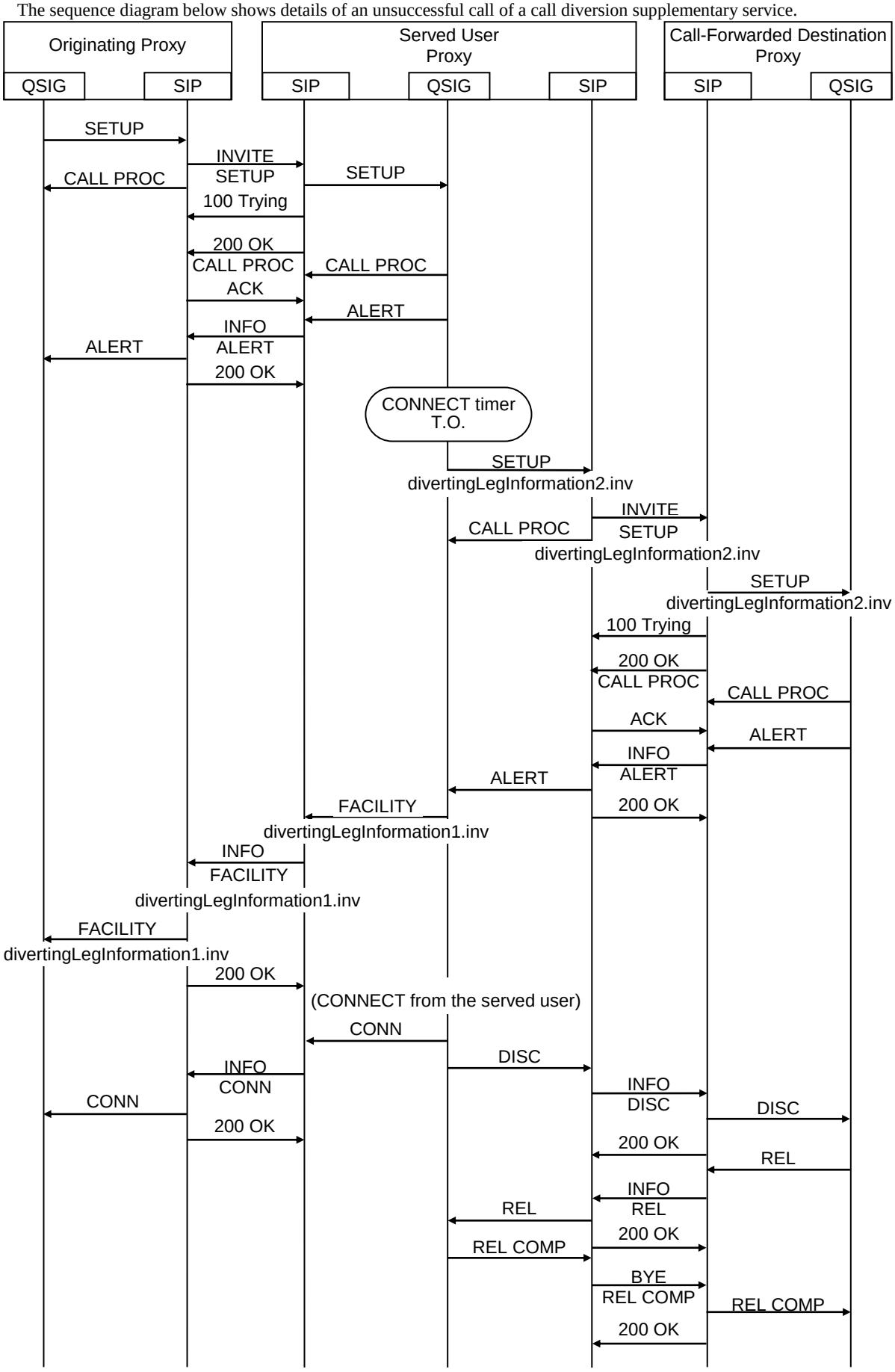
Attached Figure 2.4.2.2.6. (Detailed) SS-CFNR (CDA) message sequence in unsuccessful activation (forwarding uncompleted)

Attached Figure 2.4.2.2.7 shows the case where User B (served user) have a connection before User C (call-forwarded destination) is alerted with SS-CFNR (CDA).



Attached Figure 2.4.2.2.7.a SS-CFNR (CDA) message sequence
CONNECT with User B before ALERT to User C

The sequence diagram below shows details of an unsuccessful call of a call diversion supplementary service.

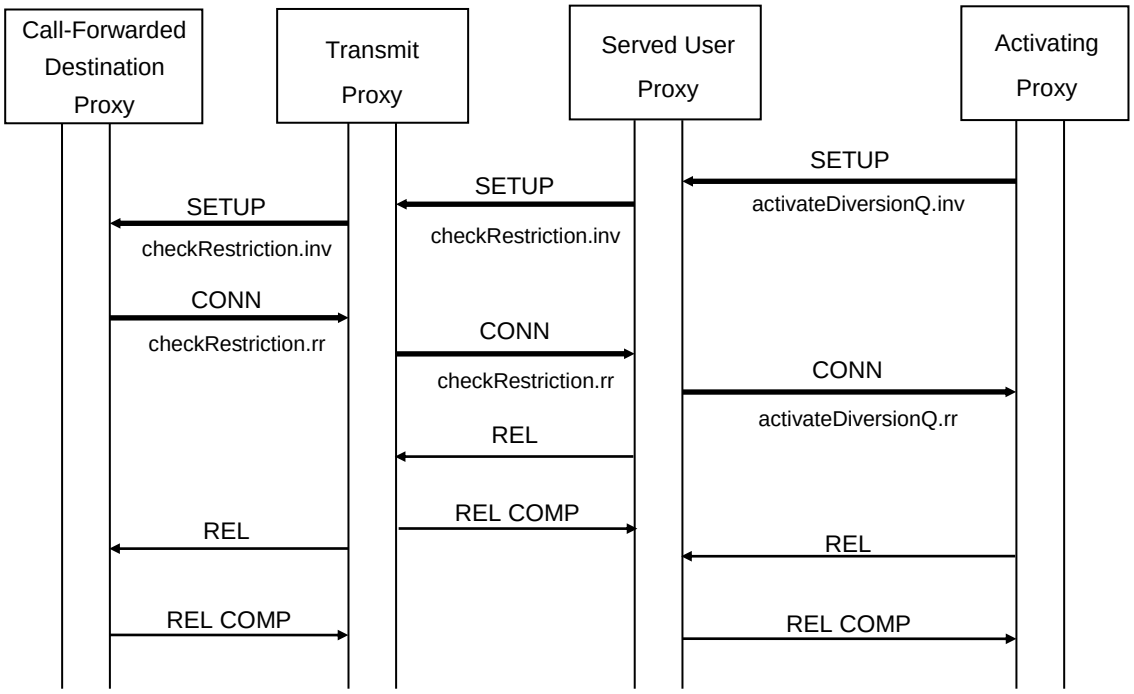


Attached Figure 2.4.2.2.7.b (Detailed) SS-CFNR (CDA) message sequence

CONNECT with User B before ALERT to User C (tunneling)

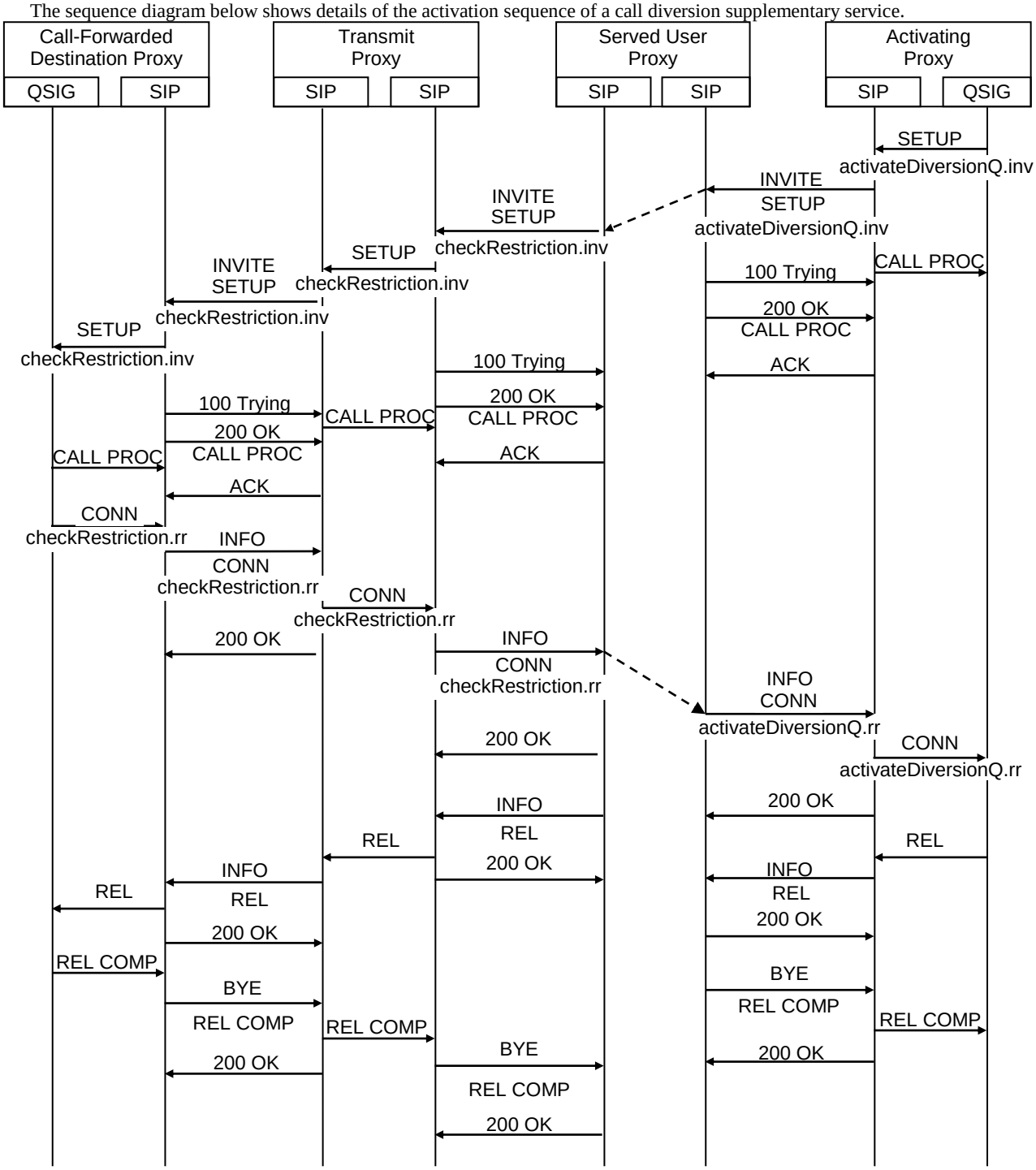
2.4.2.3 Examples of SS-CF activation/deactivation and inquiry message sequences

The sequence diagram below shows an example of successful SS-CF activation with call-forwarded destination number match. The example shows a specific transit PINX between served user PINX and call-forwarded destination PINX. In the example, a signal connection for activation and a signal connection for call-forwarded destination number match are established by the purpose and released on the end.



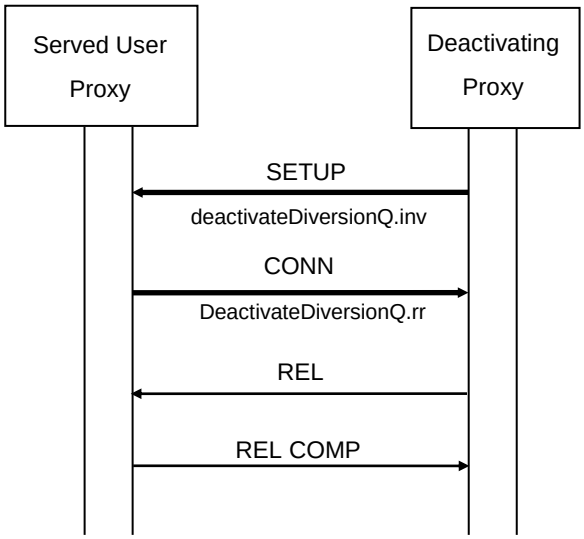
Attached Figure 2.4.2.3.1.a SS-CF activation message sequence

The sequence diagram below shows details of the activation sequence of a call diversion supplementary service.



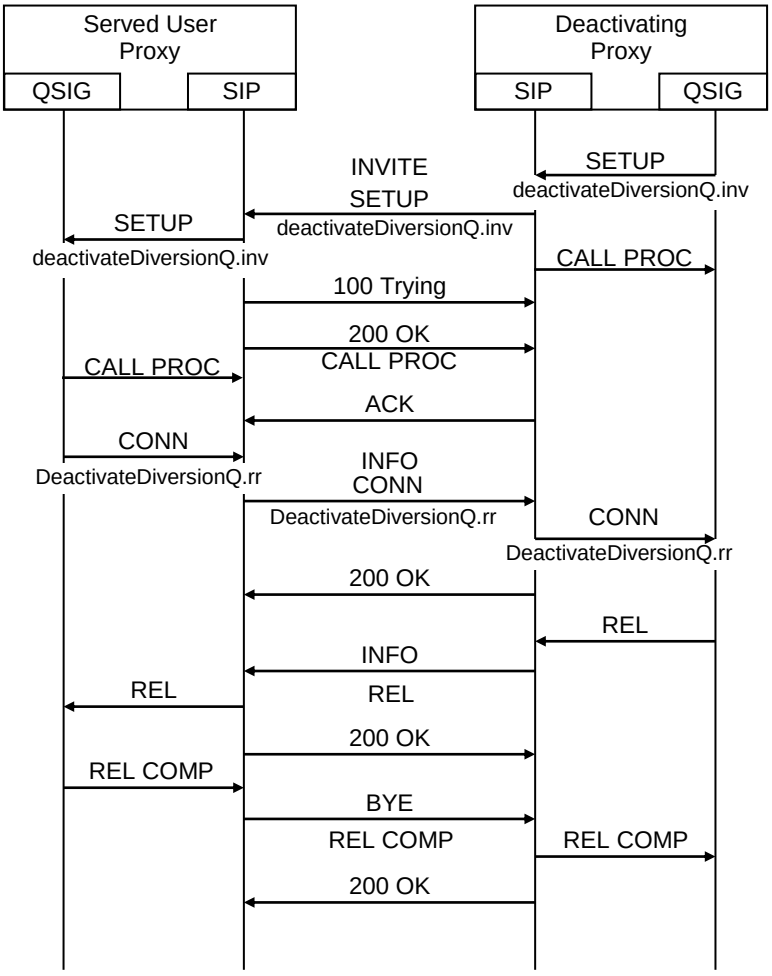
Attached Figure 2.4.2.3.1.b SS-CF activation message sequence

The sequence diagram below shows an example of SS-CF successful deactivation. In the example, a signal connection is established for deactivation and released on the end.



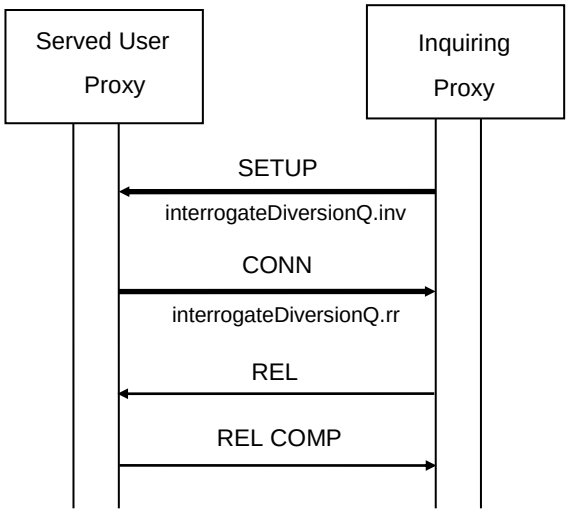
Attached Figure 2.4.2.3.2.a SS-CF deactivation message sequence

The sequence diagram below shows details of the deactivation sequence of a call diversion supplementary service.



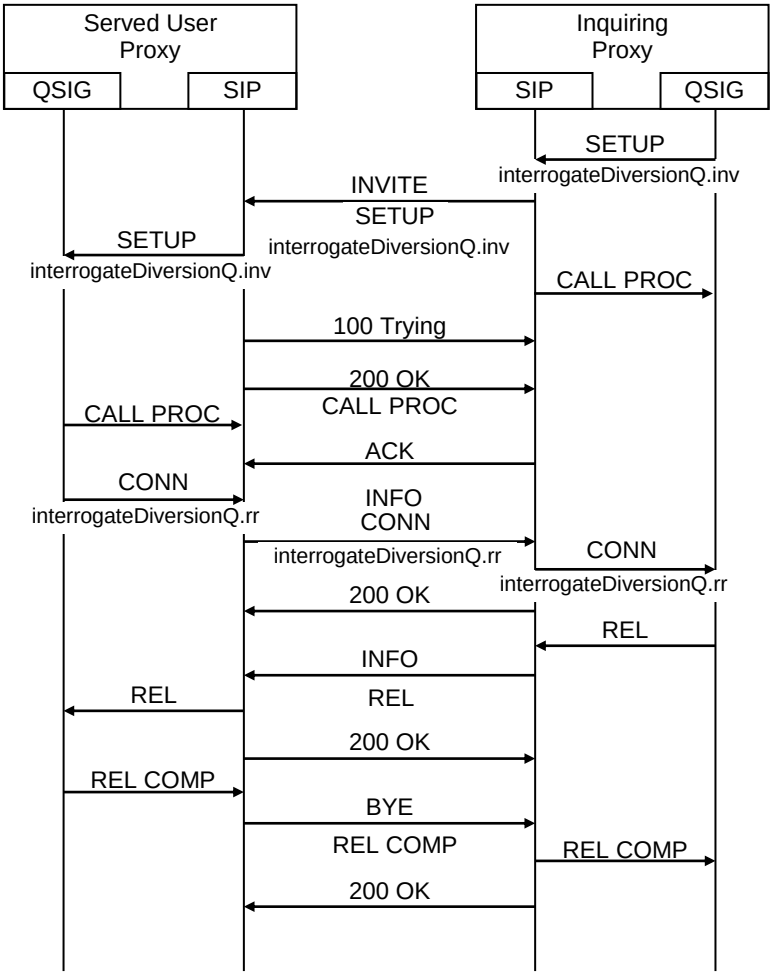
Attached Figure 2.4.2.3.2.b (Detailed) SS-CF deactivation message sequence

The sequence diagram below shows an example of SS-CF successful inquiry. In the example, a signal connection is established for inquiry and released on the end.



Attached Figure 2.4.2.3.3.a SS-CF inquiry message sequence

The sequence diagram below shows a detailed example of the sequence in SS-CF successful inquiry.



Attached Figure 2.4.2.3.3.b (Detailed) SS-CF inquiry message sequence

2.4.3. Procedures (quasi-normal sequences)

Concerning quasi-normal sequences,

"2.4.2.1 Call forwarding unconditional (SS-CFU), call forwarding busy (SS-CFB)"

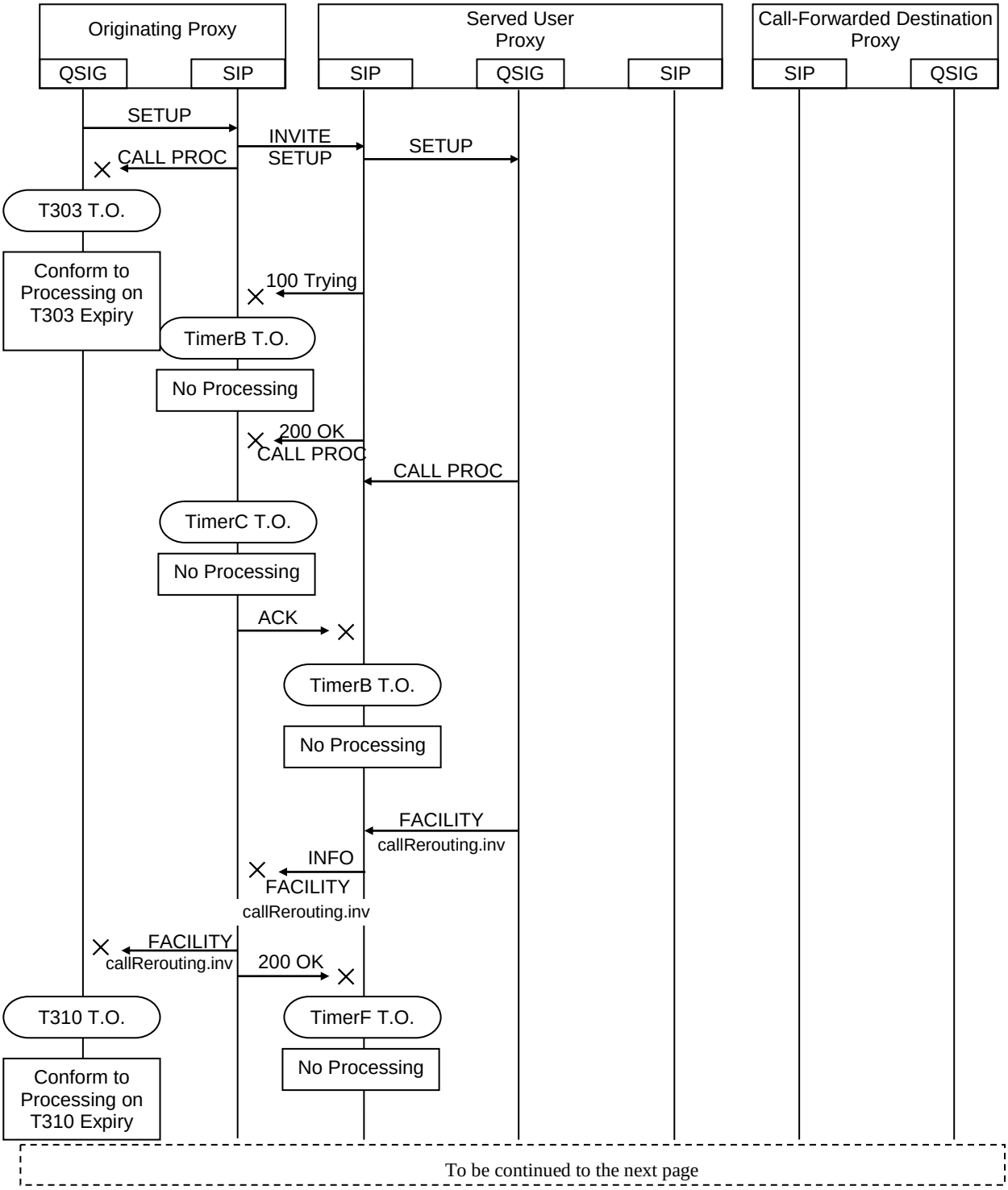
- Example of the message sequence in the case of call forwarding proxy
- Example of the message sequence in the case of transit-type forwarding

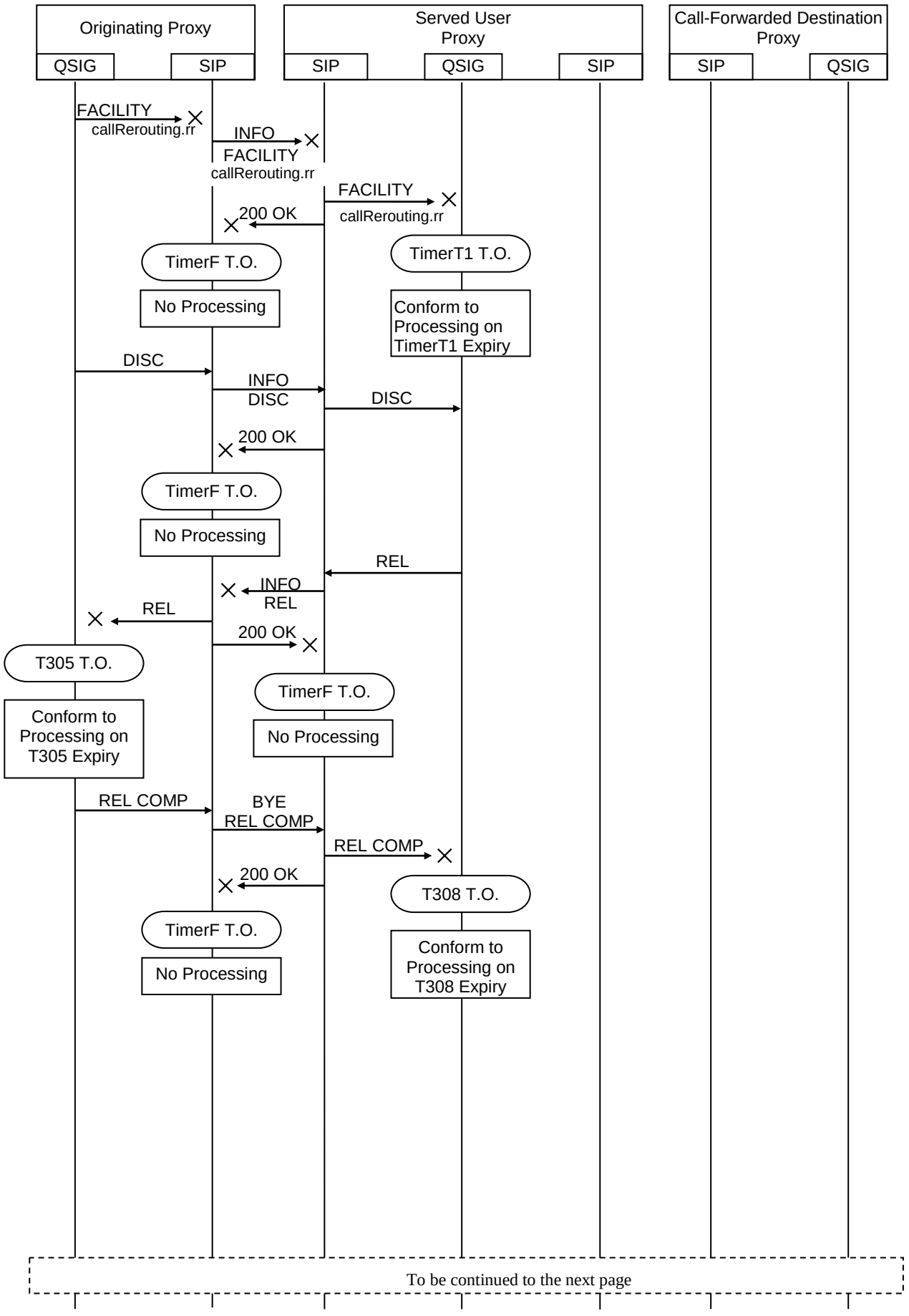
are used as typical instances.

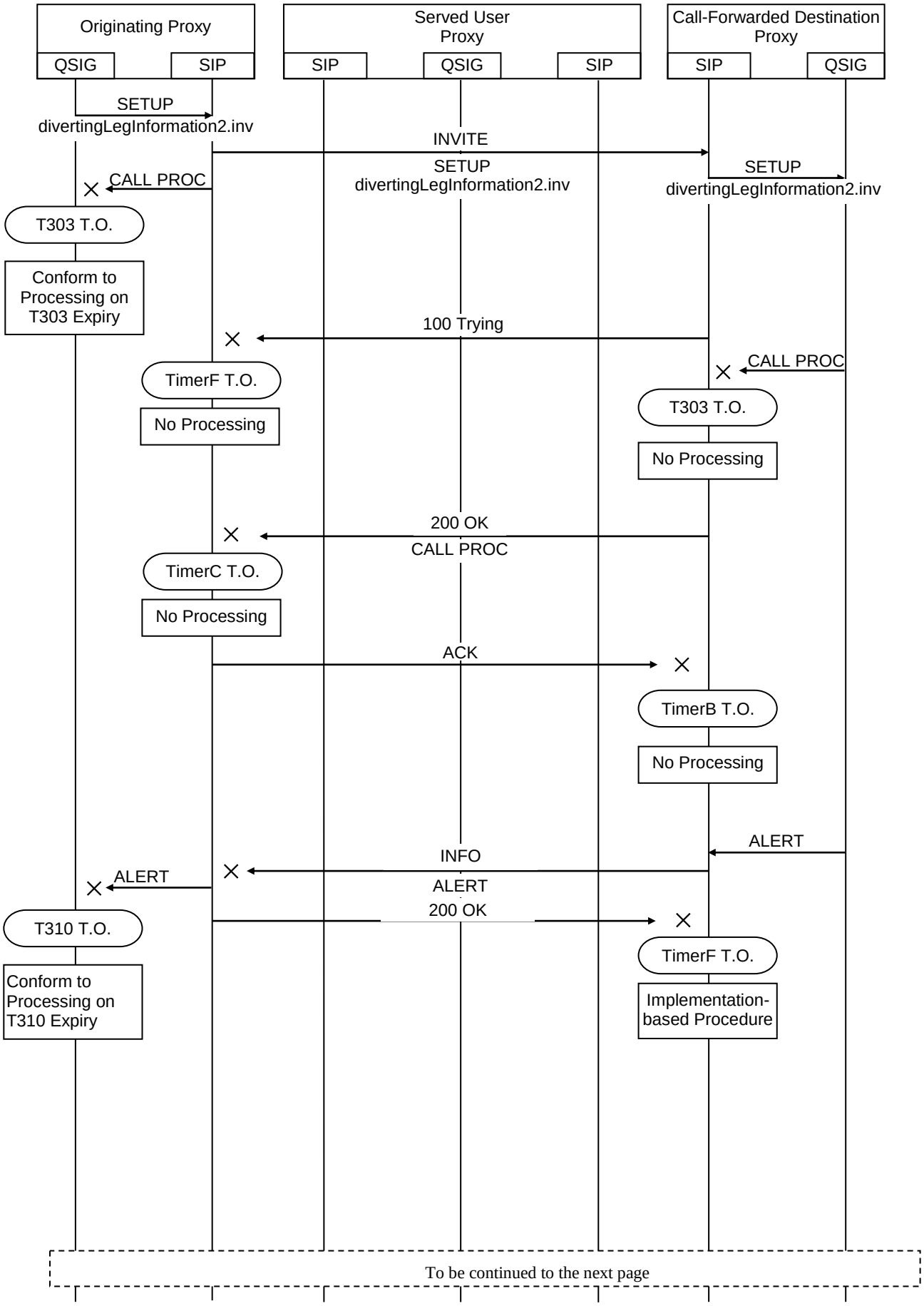
2.4.3.1 Call forwarding unconditional (SS-CFU), Call forwarding busy (SS-CFB)

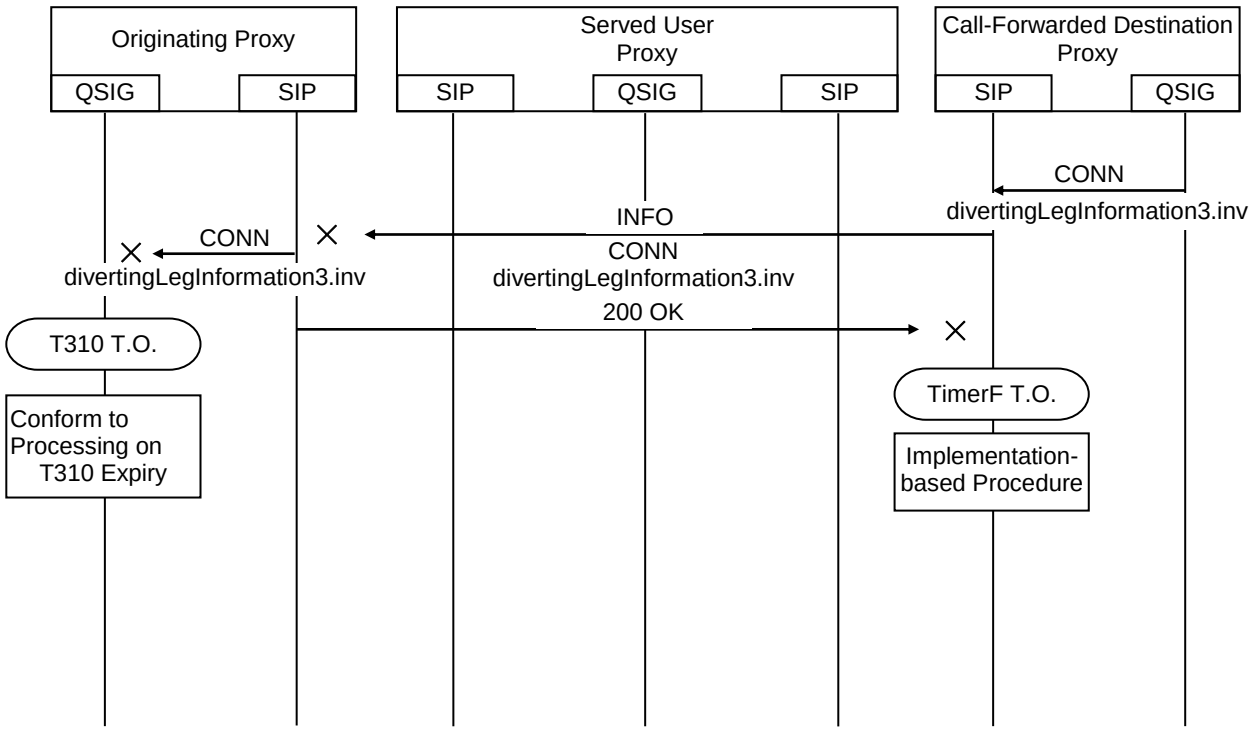
Example of the message sequence in the case of call forwarding proxy

The sequence diagram below shows an example of an SS-CFU/SS-CFB quasi-normal sequence.




Originating Proxy
QSIG
SIP
Served User Proxy
SIP
QSIG
SIP
Call-Forwarded Destination Proxy
SIP
QSIG
FACILITY
callRerouting.rr
INFO
FACILITY
callRerouting.rr
FACILITY
callRerouting.rr
200 OK
TimerF T.O.
No Processing
TimerT1 T.O.
Conform to Processing on TimerT1 Expiry
DISC
INFO
DISC
DISC
200 OK
TimerF T.O.
No Processing
REL
INFO
REL
REL
200 OK
T305 T.O.
Conform to Processing on T305 Expiry
TimerF T.O.
No Processing
REL COMP
BYE
REL COMP
REL COMP
200 OK
T308 T.O.
TimerF T.O.
No Processing
Conform to Processing on T308 Expiry
To be continued to the next page

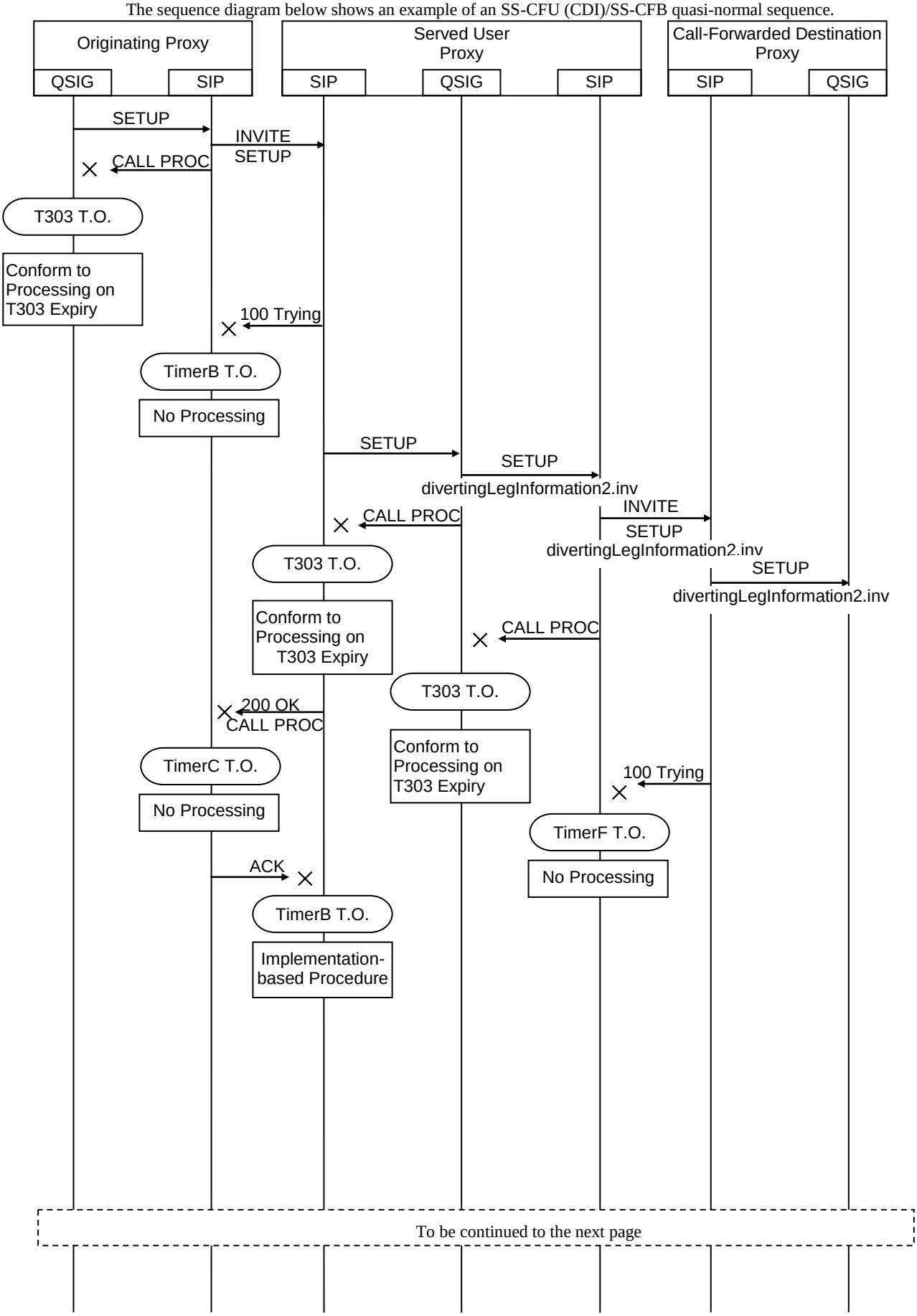

Originating Proxy
QSIG
SIP
Served User Proxy
SIP
QSIG
SIP
Call-Forwarded Destination Proxy
SIP
QSIG
SETUP
divertingLegInformation2.inv
INVITE
SETUP
divertingLegInformation2.inv
SETUP
divertingLegInformation2.inv
CALL PROC
T303 T.O.
Conform to Processing on T303 Expiry
100 Trying
CALL PROC
TimerF T.O.
No Processing
T303 T.O.
No Processing
200 OK
CALL PROC
TimerC T.O.
No Processing
ACK
TimerB T.O.
No Processing
ALERT
INFO
ALERT
ALERT
200 OK
T310 T.O.
Conform to Processing on T310 Expiry
TimerF T.O.
Implementation-based Procedure
To be continued to the next page

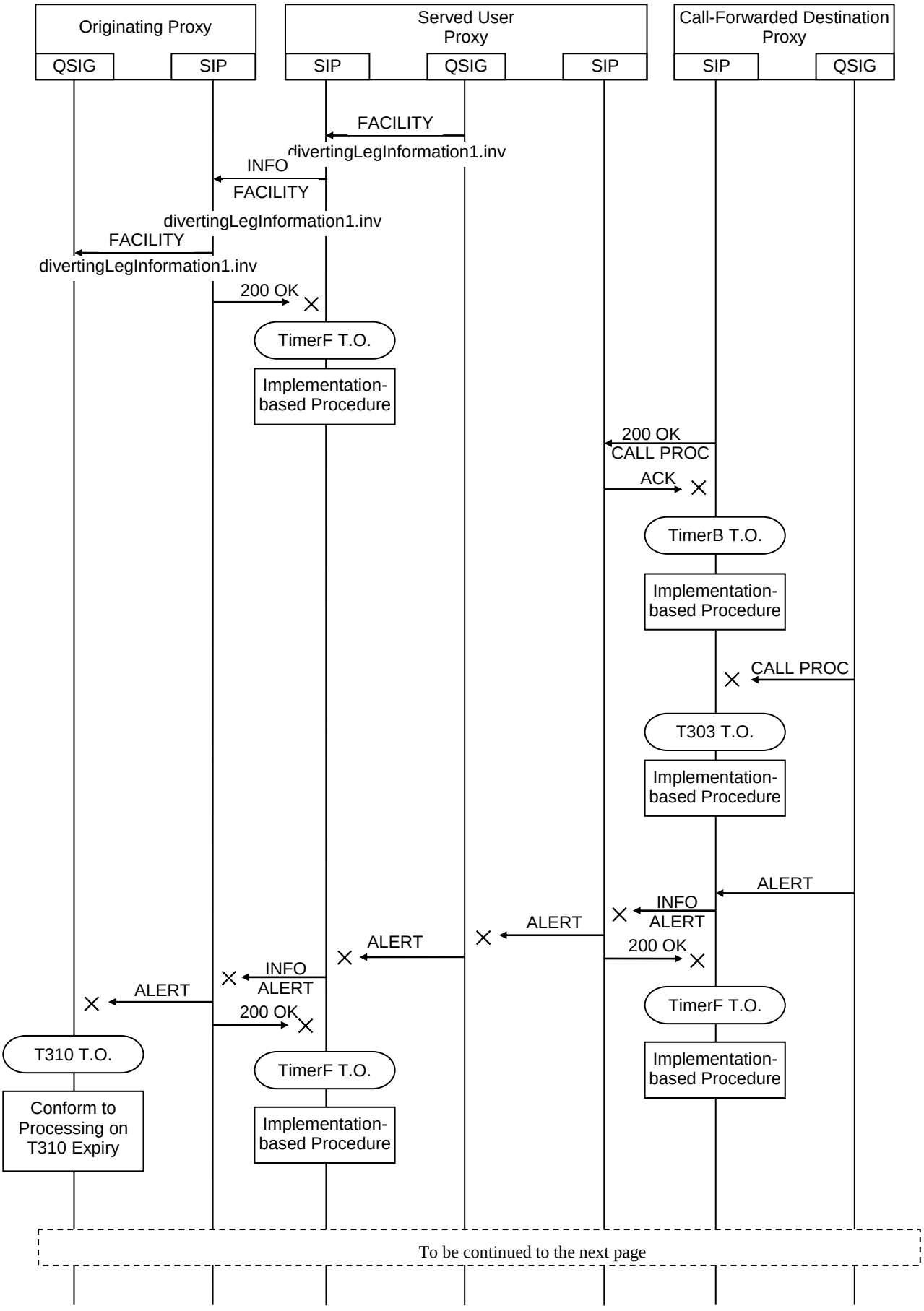


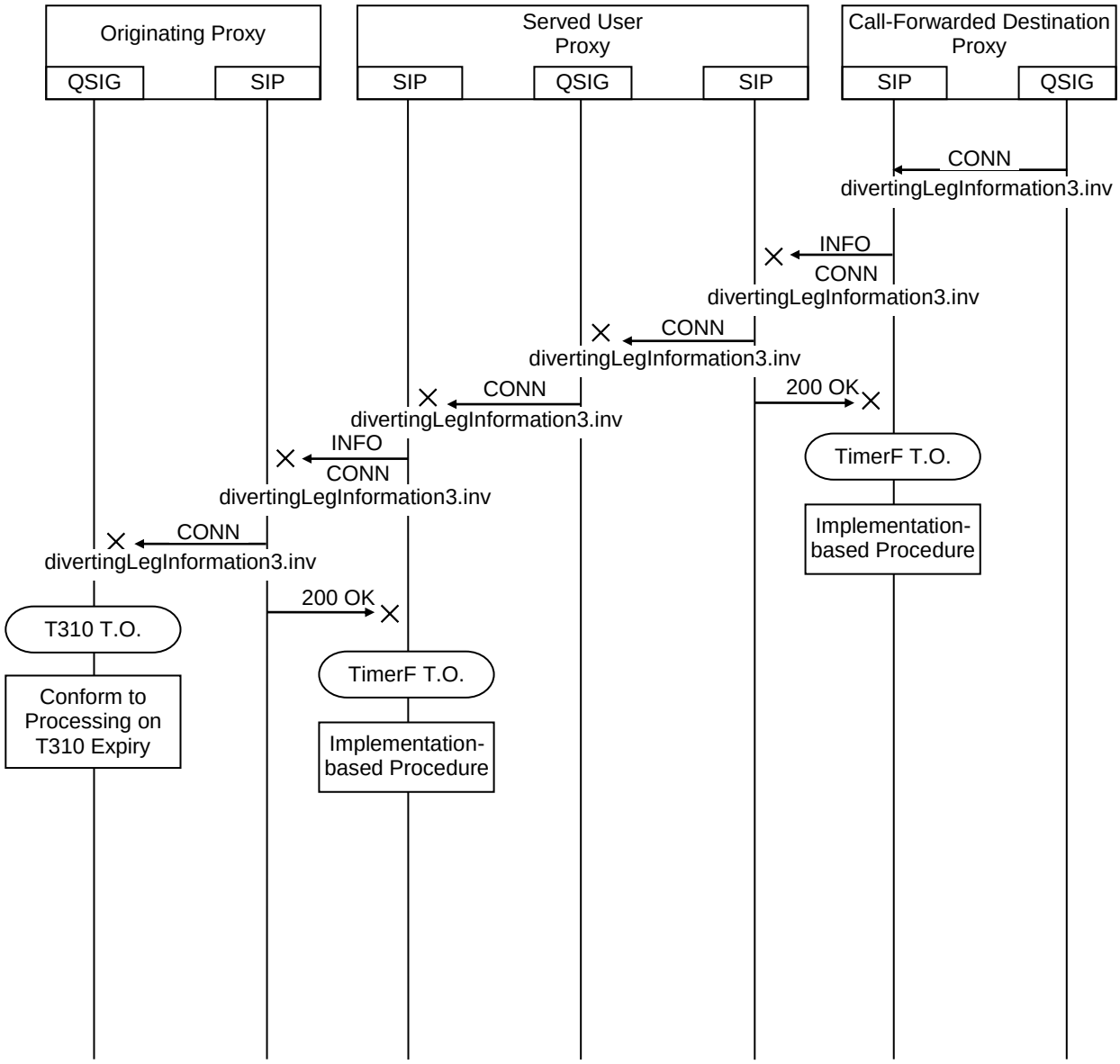
Attached Figure 2.4.3.1.1 (Detailed) SS-CFU (CDI)/SS-CFB quasi-normal message sequence

Example of the message sequence in the case of transit-type forwarding

The sequence diagram below shows an example of an SS-CFU (CDI)/SS-CFB quasi-normal sequence.




Originating Proxy
QSIG
SIP
Served User Proxy
SIP
QSIG
SIP
Call-Forwarded Destination Proxy
SIP
QSIG
FACILITY
divertingLegInformation1.inv
INFO
FACILITY
divertingLegInformation1.inv
FACILITY
divertingLegInformation1.inv
200 OK
TimerF T.O.
Implementation-based Procedure
200 OK
CALL PROC
ACK
TimerB T.O.
Implementation-based Procedure
CALL PROC
T303 T.O.
Implementation-based Procedure
ALERT
INFO
ALERT
ALERT
ALERT
200 OK
INFO
ALERT
ALERT
200 OK
TimerF T.O.
Implementation-based Procedure
T310 T.O.
Conform to Processing on T310 Expiry
TimerF T.O.
Implementation-based Procedure
To be continued to the next page



Attached Figure 2.4.3.1.2 (Detailed) SS-CFU (CDI)/SS-CFB quasi-normal message sequence