ATIS-1000642.2014**(R2019)**

Integrated Services Digital Network (ISDN) – Call Deflection Supplementary Service

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American National Standard for Telecommunications

Integrated Services Digital Network (ISDN) – Call Deflection Supplementary Service

Alliance for Telecommunications Industry Solutions

Approved June 2014

American National Standards Institute, Inc.

Abstract

This standard is one of a series that defines and describes supplementary services within the context of an Integrated Services Digital Network (ISDN). The interaction of this service with other ISDN services is also included. The purpose of the standard is to allow maximum compatibility among network – and user-owned telecommunication equipment in order to increase the attractiveness and usefulness of ISDN-based capabilities.

Foreword

The information contained in this Foreword is not part of this American National Standard (ANS) and has not been processed in accordance with ANSI's requirements for an ANS. As such, this Foreword may contain material that has not been subjected to public review or a consensus process. In addition, it does not contain requirements necessary for conformance to the Standard.

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Suggestions for improvement of this document are welcome. They should be sent to the Alliance for Telecommunications Industry Solutions, PTSC,1200 G Street NW, Suite 500, Washington, DC 20005.

At the time of consensus on this document, PTSC, which was responsible for its development, had the following leadership:

M. Dolly, PTSC Chair (AT&T)
V. Shaikh, PTSC Vice-Chair (ACS)
M. Dolly, PTSC SAC Chair (AT&T)

The **SAC** Subcommittee was responsible for the development of this document.

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1 Scope, Purpose, & Application

1.1 Scope & Purpose

This standard is one of a series that defines and describes supplementary services within the context of an Integrated Services Digital Network (ISDN). The interaction of this service with other ISDN services is also included. The purpose of the standard is to allow maximum compatibility among network- and user-owned telecommunication equipment in order to increase the attractive- ness and usefulness of ISDN-based capabilities.

This standard describes the Call Deflection (CD) service in terms of service definition, protocol, and procedures needed for implementation. CD permits a served user to request, in real time, that the network redirect an incoming call addressed to the served user's ISDN number to another number (the deflected-to number). The served user sends the network a deflection request with the deflected-to number provided in the request. The served user's originating service is unaffected.

Unlike ISDN Call Forwarding, the network will redirect a call only after receipt of a specific user request to deflect that call.

1.2 Application

The CD capability is applicable to both the Basic and Primary Rate ISDN Interfaces. It is intended to supplement the basic Circuit Mode Bearer Service contained in American National Standard for Telecommunications – Integrated services digital network (ISDN) – Circuit mode bearer service category description, ATIS-1000620. It should be used in conjunction with other American National Standards for ISDN supplementary service for complete understanding of the interactions between this and other services.

This supplementary service is applicable to the following circuit-mode bearer services:

- speech;
- 3.1-kHz audio;
- 64-kbit/s unrestricted digital information;
- multi-rate $(n \times 64 \, \text{kbit/s})$.

2 Normative References

The following standards contain provisions which, through reference in this text, constitute provisions of this American National Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this American National Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below.

ATIS-1000113.2005(R2010), Telecommunications – Signaling system number 7 (SS7) – Integrated services digital network (ISDN) user part[1]

ATIS-1000607.2000(R2009), Telecommunications – Integrated services digital network (ISDN) – Layer 3 signaling specification for circuit-switched bearer service for digital subscriber signaling system no. 1 (DSS1)[2]

ATIS-1000610.1998(R2013), Telecommunications – Digital subscriber signaling system no. 1 (DSS1) – Generic procedures for the control of ISDN supplementary services[3]

ATIS-1000620.1991(R2012), Telecommunications – Integrated services digital network (ISDN) – Circuit mode bearer service category description[4]

ATIS-1000625.1993(R2013), Telecommunications – Integrated services digital network (ISDN) – Calling line identification presentation and restriction supplementary services[5]

ITU-T Recommendation Q.71, ISDN circuit mode switched bearer services[6]

ITU-T Recommendation Q.932, Generic procedures for the control of ISDN supplementary services[2]

ITU-T Recommendation Q.950, Digital subscriber signaling system no. 1 (DSS1) – Supplementary services protocol, structure and general principles[2]

ITU-T Recommendation Q.952, Stage 3 service description for call offering supplementary services – Diversion supplementary services[2]

3 Definitions & Acronyms

For a list of common communications terms and definitions, please visit the *ATIS Telecom Glossary*, which is located at < http://www.atis.org/glossary >.

3.1 *Definitions*

The following terms are used in this document.

3.1 calling user: The user that originated a call that has been deflected.

3.2 deflecting user or served user: The user that requests an offered call or an established call be redirected to another user. This user is also referred to as the redirecting party.

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[1] This document is available from the Alliance for Telecommunications Industry Solutions (ATIS) at < https://www.atis.org/docstore/product.aspx?id=24941>

[2] This document is available from the Alliance for Telecommunications Industry Solutions (ATIS) at < https://www.atis.org/docstore/product.aspx?id=24729>

[3] This document is available from the Alliance for Telecommunications Industry Solutions (ATIS) at < https://www.atis.org/docstore/product.aspx?id=27979>

[4] This document is available from the Alliance for Telecommunications Industry Solutions (ATIS) at < https://www.atis.org/docstore/product.aspx?id=26092>

[5] This document is available from the Alliance for Telecommunications Industry Solutions (ATIS) at < https://www.atis.org/docstore/product.aspx?id=27977>

[6] This document is available from the International Telecommunications Union. < http://www.itu.int/ITU-T/ >

3.3 deflected-to user: The user to which a call is redirected by the network, at the request of the deflecting user.

3.4 network: In this standard, all telecommunications equipment that has any part in processing a call or supplementary service for the user referred to. It may include Local Exchanges, Transit Exchanges, and NT2s, but does not include ISDN terminal equipment and is not limited to the "Public" network or any other particular set of equipment.

3.5 service provider: A company, organization, administration, business, etc., which sells, administers, maintains, charges for, etc., the service. The service provider may or may not be the provider of the network.

3.2 Acronyms

ACM   Answer Complete Message

ANM   Answer Message

ASN.1   Abstract Syntax Notation 1

CCAF   Call Control Agent Function

CCF   Call Control Function

CD   Call Deflection

CD-T1   Call Return Timer

CLIP   Calling Line Identification Presentation

CLIR   Calling Line Identification Restriction

CNIP   Calling Name Identification Presentation

CNIR   Calling Name Identification Restriction

CPG   Call Progress Message

CPND   Calling Party Number Delivery

DSS1   Digital Subscriber Signaling System Number 1

DTE   Data Terminal Equipment

FE   Functional Entity

IAM   Initial Address Message

ISDN   Integrated Services Digital Network

ISO   International Standards Organization

ISUP   ISDN User Part

ITU-T   International Telecommunications Union – Telecommunications Standardization Sector

kbit/s kilobits per second

kHz   kilohertz

LE   Local Exchange

MLPP   Multi-level Precedence and Preemption

NT2   Network Termination Type 2

PBX   Private Branch Exchange

REL   Release Message

RLC   Release Complete Message

RND   Redirecting Name Delivery

RNID   Redirecting Number Information Delivery

SCF   Service Control Function

SDF   Service Data Function

SDL   Specification and Description Language

SSF   Service Switching Function

SS7   Signaling System Number 7

TCAP   Transaction Capability Application Part

TE   Terminal Equipment

TR   Transit Exchange

TSP   Terminal Service Profile

4   Description of CD Service from the User's Perspective

This clause defines the CD service in terms of procedures and other aspects that are visible to the user or users without regard to the means of implementation. It describes interworking with non-ISDNs and interactions between CD and other services. This clause does not suggest how the required functions should be divided between customer and network equipment. It does not address the protocol needed for implementing the service in a standard way. It provides a prose description and a diagrammatic description of the CD supplementary service in the form of a Specification and Description Language (SDL) Diagram.

4.1 Description

The CD service permits a served user to respond to an offered call with a request to deflect the call to another number. The served user (deflecting user) may request call clearing when invoking the deflection request, or may retain an association with the call until it is successfully offered to the user identified in the call deflection request or until the deflecting user clears the call. If the deflection request is not successful, the deflecting user may send another deflection request, answer the call, or clear the call. The deflecting user's originating service is unaffected. If the served user indicates with the deflection request that no association is to be retained with the call being deflected, the call to the served user will be cleared and the call will be offered solely to the deflected-to user.

As a subscription option, the subscriber can invoke the deflection request after answering the call. In addition, the subscriber can limit the time it takes for the deflected-to user to answer the call. If the deflected-to user does not answer within a specified time interval, the network stops the deflection attempt and returns a failure indication to the deflecting user, if the deflecting user is still associated with the call.

4.2 Procedures

4.2.1 Provision/withdrawal

The CD service is subscribed to by prior arrangements with the service provider.

Withdrawal of the service is accomplished by the service provider upon request by the subscriber or for service provider reasons.

As a service provider option, the service may be offered with the subscription options shown in table 1.

Table 1 - Subscription Options for CD (per ISDN number/ bearer service or TSP or interface)

Subscription option	Value
Call Return	• Yes, success = interworking or answer • Yes, success = answer • No
Call Return Timer	1–60 sec
Call Deflection After Answer	• Yes • No
Calling user receives notification that call is being deflected	• Yes, with deflected-to number • Yes, without deflected-to number • No
Redirecting Number Information Delivery	• Yes • No

4.2.2 Normal Procedures

4.2.2.1 Activation/deactivation

Activation and deactivation of CD are provided by subscription.

4.2.2.2 Invocation & Operation

4.2.2.2.1 Deflecting User's View

When a circuit-mode call is offered to the served user, the network retains the following information:

- bearer capability information;
- progress indicator information, if available;
- calling party number information, if available;
- called party number information;
- redirecting number information, if one redirecting number is available, or original redirecting number information, if two redirecting numbers are available;
- sequential diversion information on the number of times the call has been sequentially diverted;
- calling party subaddress, if available;
- original redirecting subaddress, if available.

This retained information, as well as parameter values signaled in a deflection request, is used to initiate call setup towards the deflected-to user. Information on an offered call is retained by the network for as long as the call can be deflected.

When a circuit-mode call is offered, the served user has the option of requesting the network to redirect the call to another user. If the served user chooses to deflect the call, the served user provides a deflected-to number in a deflection request to the network. The deflecting user may also include routing information that identifies an interexchange carrier or a network-specific facility to be used in setting up the call to the identified deflected-to user. The deflecting user may include a presentation status in the deflection request to indicate whether the deflected-to user may receive the deflecting user's number. This indication shall override any default subscriptions that are in place to present or restrict presentation of the deflecting user's number to the deflected-to user. The deflecting user may also indicate whether the call is to be locally cleared or is to remain in the current state pending other actions; if this indication is absent, the call will remain in the current call state. The deflecting user may include other information received when the call was offered, for example, user–user information. If the deflecting user is an NT2, the call may have been redirected within the NT2. In this case, the NT2 may also include a redirection counter and information about the last redirecting user in the deflection request.

If the deflecting user is subscribed to "Call Deflection After Answer", the served user may choose to deflect the call after answering it. The deflecting user may include the same information in the deflection request as defined for deflection before answer.

When the network receives the deflection request, the network screens the request to determine if redirection can be invoked. If the network determines that the request is valid, the network will redirect the call using its retained call setup information and accepted parameter values signaled in the deflection request. If the deflecting user did not request call clearing, for deflections made before answer, with the deflection request, the call continues to be offered to the deflecting user until the network determines that the deflection attempt is successful; for call deflections made after answer, the call to the deflecting user remains in the established state until the network determines that the attempt is successful.

The deflecting user may subscribe to the "Call Return" option of selecting a specific time period during which the deflected-to user must answer the call. If the deflected-to user does not answer the call within the specified time period, either because the deflected call cannot be completed or because the deflected-to user did not answer the offered call, the deflection attempt is stopped and a failure indication is sent to the deflecting user. If the deflecting user requests call clearing when invoking call deflection, the call return option will not apply to that deflection.

If the Call Return option is not used and the deflecting user retained an association with the call, a deflection attempt is considered successful when the call has been answered by the deflected-to user identified in the request or has reached alerting or interworking. If the Call Return option value is set to "Yes, success = answer", a deflection attempt is only considered successful when the call has been answered by the deflected-to user before the Call Return timer expires. If the Call Return option value is set to "Yes, success = interworking or answer", a deflection attempt is considered successful if the call has encountered interworking or has been answered by the deflected-to user before the Call Return timer expires. If the deflection attempt is successful, the network sends an indication that the attempt has been successful and clears the call to the deflecting user. If the deflecting user had requested call clearing with the deflection request, the network will clear the call to the deflecting user at the same time that it redirects it to the deflected-to user.

If call offering to the deflecting user ended (e.g., upon expiry of call control timers) or the call is cleared by the deflecting user while a call is being redirected, the redirection attempt continues,

and if the Call Return timer had been started, it shall be canceled and the call shall continue to be deflected as if Call Return had not applied.

Regardless of the setting of the deflecting user's Call Return option, if the deflected-to user answers the redirection call request, the deflected-to user and the calling user are connected.

If multiple diversions occur, a limit on the number of allowed diversions for the call is needed to prevent infinite looping. The maximum number of diversions allowed for a call should not be greater than five. The network shall keep track of the number of diversions that have occurred and this number shall be updated for an instance of either ISDN Call Deflection or Call Forwarding.

4.2.2.2.2 Deflected-to User's View

The deflected-to user may be an ISDN or non-ISDN user. The non-ISDN user may receive no notification of deflection.

If the deflected-to user is an ISDN user, the user may receive redirecting number information. If the deflecting user's "Redirecting Number Information Delivery" is set to "Yes", the network shall pass an indication that presentation of the redirecting number is allowed. If that subscription option is set to "No", the network shall pass an indication that presentation of the redirecting number is not allowed. However, if the deflecting user had included an indication of the presentation status of the redirecting number for the deflected-to user in the deflection request, this indication shall override the presentation status of the "Redirecting Number Information Delivery" subscription option.

If multiple diversions had occurred, the deflected-to user may receive two redirecting numbers. If the first, last, or both redirections occurred as a result of call deflection requests, the deflected-to user will receive an indication that the reason for redirection is call deflection with the appropriate redirecting number.

The deflected-to user may also receive subaddress information associated with the redirecting number. For multiple diversions, the deflected-to user may receive two redirecting subaddresses, one associated with the first redirection and one associated with the last redirection.

4.2.2.2.3 Calling User's View

The calling user may be an ISDN user or non-ISDN user. The calling user originates a call using the normal call setup procedures. Each time the calling user's call is deflected, the calling user may experience additional call setup delay. The calling user may also experience an interruption or change in the perceived audible ringing if it is provided by different locations. Where appropriate, the calling user should receive call progress information indicating actions at the deflected-to user's interface (e.g., alerting, interworking, etc.).

If the calling user is an ISDN user and the deflecting user has subscribed to "Calling user receives notification that call has been deflected, with deflected-to number", the network sends an indication of diversion toward the calling user with the deflected-to number when a deflection request is accepted. If the deflecting user is subscribed to "Calling user receives notification that call has been deflected, without deflected-to number", the network sends an indication of diversion toward the calling user without the deflected-to number.

If the deflecting user's "Calling user receives notification that call has been deflected" subscription option is set to "No", no indication of diversion is sent to the calling user.

If the deflecting user clears or is cleared by the network after the deflection request has been invoked, the calling user should not receive an indication of this clearing; however, the calling user

may receive call progress messages due to events at the deflected-to user's interface (e.g., alerting, interworking, etc.)

4.2.3 Exceptional Procedures

4.2.3.1 Activation/deactivation

None identified.

4.2.3.2 Invocation & Operation

When the network receives a deflection request, the network screens the request to determine if redirection can be invoked. If the network determines that the request is invalid, the network sends an indication of failure to the deflecting user and normal call processing is continued to the deflecting user. Reasons that a call deflection request may be rejected as invalid include the following examples:

- The requesting user is not subscribed to a CD feature;
- The call deflection request contains an invalid address for the deflected-to user (e.g., a special service number like 411 or 911, or a number not defined in the user's dialing plan);
- The call deflection request does not contain the number of a deflected-to user;
- The requested deflection exceeds the limit on the number of allowed diversions for a call;
- There is a protocol error in the call deflection request;
- The call deflection has been requested at an inappropriate point in the call;
- A previous call deflection request for the same call has been received and has not been concluded, either successfully or unsuccessfully.

After receiving the indication of failure, the served user may issue another deflection request if the deflecting user is still associated with the call. If the deflecting user is not still associated with the call, and the deflection request is invalid or the call cannot be completed to the deflected-to user for any other reason, the network will clear the call.

If the network determines that the request is valid, the network attempts to redirect the call to the deflected-to party. If the deflecting user is still associated with the call and the network detects that the redirected call cannot be completed, it sends an indication of failure to the deflecting user and normal call processing is continued to the deflecting user. The deflecting user may issue another deflection request.

If the deflecting user is subscribed to "Call Return" and the deflecting user is still associated with the call, and the deflected-to user does not answer the call within the specified time period either because the deflected call cannot be completed or because the deflected-to user did not answer the offered call, the deflecting user's network sends an indication that the deflection attempt has failed and normal call processing is continued to the deflecting user. The network also clears the call towards the deflected-to user, if the deflected-to user is associated with the call. The deflecting user may send another deflection request.

If the Call Return option is not used, the deflected-to user alerts or answers, or if interworking is encountered and the deflecting user is still associated with the call, the network clears the deflecting user from the call. If the Call Return option is used and the deflected-to user answers before the call return timer expires, the network clears the deflecting user from the call. If the network detects that the redirected call cannot be completed after the call is cleared to the deflecting user, then no indication of failure is sent to the deflecting user.

If the deflecting user answers a call before a call deflection attempt has been completed success-fully or unsuccessfully, the call will be connected to the deflecting user, and the call attempt to the deflected-to user will be cleared.

If the deflecting user sends another deflection request for the same call while the first request is still being processed, the network rejects this request and sends an indication of failure to the deflecting user.

4.2.4 Alternate Procedures

None identified.

4.3 Interworking Considerations

If the network receives an indication that interworking has occurred while a redirection is being processed and the network is providing audible ringing to the calling user, the network shall stop providing audible ringing and pass terminating treatment received from the deflected-to user.

If the deflecting user is subscribed to Call Return with the value set as "Yes, success = answer", and the deflection request was made after answer, the call to the deflecting user remains in the active state even after the network determines that interworking has occurred. To avoid potential confusion for the calling user, the network shall continue to pass information in the direction of the deflecting user to the calling user when interworking is encountered. The calling user receives no terminating treatment from the deflected-to user until the deflected-to user answers the call.

4.4 Capabilities for Charging

It shall be possible for a service provider to charge accurately for this service.

4.5 Interactions with Other Supplementary Services

4.5.1 Call Waiting

A served user shall be able to deflect a waiting call.

A calling user may receive an indication of diversion followed by a call waiting indication if the deflected-to user is a call waiting subscriber.

4.5.2 Call Hold

A served user shall be able to place an incoming call on hold and then send a request to deflect the held call.

A served user shall be able to deflect a call that is held by the calling user.

4.5.3 Multi-Level Precedence & Preemption (MLPP)

There are no interactions of MLPP with the CD service.

4.5.4 User-to-User Signaling

The network shall not deliver any user–user information provided by the calling user to the deflected-to user. However, a served user (subscribed to User-to-User Signaling) may include user–user information in the deflection request to be provided to the deflected-to user.

4.5.5 Message Waiting Indicator Control & Notification

There are no interactions of the Message Waiting Indicator Control and Notification with the CD service.

4.5.6 Calling Line Identification Presentation (CLIP)

When a call has been deflected, the deflected-to user subscribed to the CLIP service may receive Calling Line Identification. The deflected-to user may receive number information of the calling party, original called party, and last redirecting party, depending upon the availability of each number.

4.5.7 Calling Line Identification Restriction (CLIR)

If a call has been deflected and the deflecting user subscribes to CLIR, the deflected-to user shall not receive Calling Line Identification for the deflecting user. However, the deflected-to user may receive redirecting number information if the deflecting user includes an indication that presentation of the redirecting number is allowed in the deflection request. This indication overrides the default presentation status determined by the CLIR service.

4.5.8 Normal Call Transfer

A transferred call can be deflected.

If a transferring party sends a deflection request during the Normal Call Transfer "CTN Active" state, the network shall cancel the normal transfer request and accept the deflection request.

4.5.9 Calling Name Identification Presentation (CNIP)

When a call has been deflected, the deflected-to user may receive the names of the calling party, original called party, and last redirecting party, depending upon the availability of each name.

4.5.10 Calling Name Identification Restriction (CNIR)

A call that is deflected retains the calling user's "private" or "public" presentation status as requested by the Calling Name Restriction service.

4.5.11 Explicit Call Transfer

A transferred call can be deflected.

4.5.12 Conference Calling

A successfully deflected call is eligible for conferencing by either the calling user or the deflected- to user.

A conference call cannot be deflected.

4.6 SDLs for Call Deflection

The following terms are used in the SDL diagram (figure 1).

- User A is the calling user;
- User B is the deflecting user;
- User C is the deflected-to user.
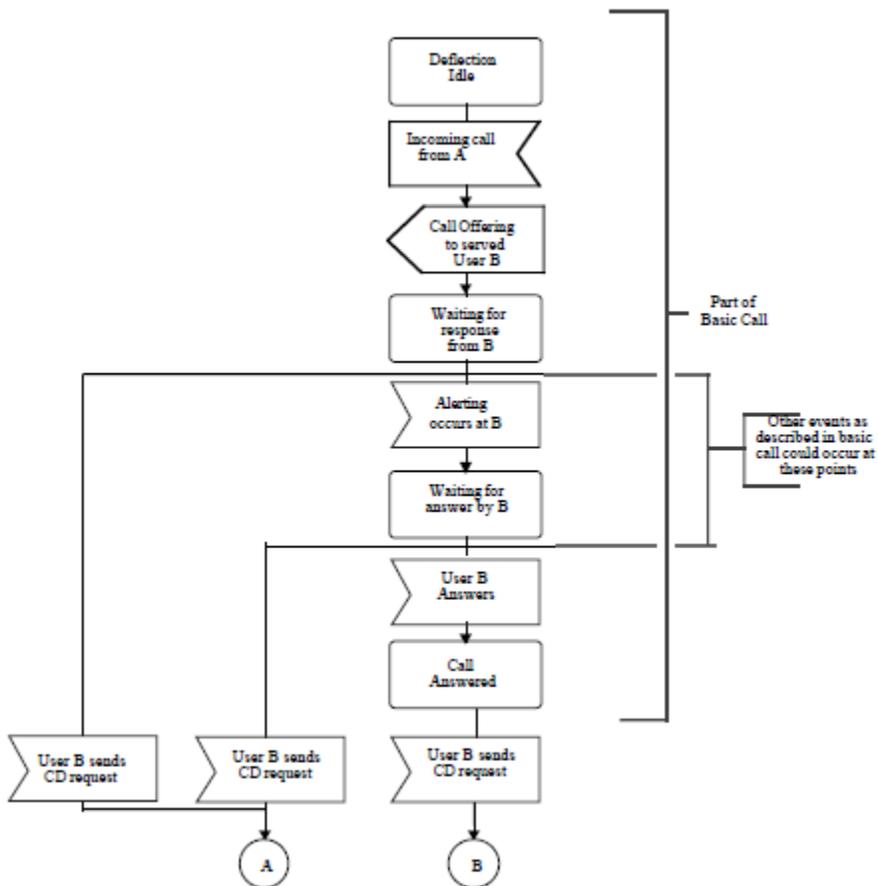
Figure 1 - Call Deflection Service

Figure 1 *(continued)*

Deflection active
CR timer idle
User B remains

Served User B
releases call

Deflection active
(User B released)

User C
answers call

Alerting at
User C

CD
return
option

No

Yes

Interworking
encountered

Release from
User C

Failure
notification
to User B

Deflection idle
(original A ↔ B
call continues)

Start call
return timer

Deflection active
CR timer active
User B remains

Interworking
encountered

CR
"Yes"
option

Success =
answer

Success =
interworking
or answer

User C
answer call

Stop call
return timer

Disconnect A ↔ B
Connect A ↔ C

CD successful
Release User B

Deflection idle
(new A ↔ C basic
call continues)

User B
releases call

Stop call
return timer

Deflection active
(user B released)

User C
rejects call

Stop call
return timer

CD failure
notification
to User B

Deflection idle
(original A ↔ B
call continues)

Return timer
expires

Clear call
to User C

Figure 1 *(continued)*

Deflection Active
(User B released)

User A
releases call

Release User C

Deflection Idle

User C
rejects call

Release User A
(with cause)

User C
answers call

Send Answer
to User A

Deflection idle
(new A ↔ C basic
call continues)

User C
alerts

Send Alerting
to User A

Deflection active
(User B released)

Sending these messages
depends on the state
of User A.

Figure 1 *(concluded)*

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5   Functional Capabilities & Information Flows

This clause identifies a way of dividing the overall functionality for the Call Deflection service into functional units, each of which could be placed in one location. The overall functionality results from communication between the functional units (called "entities") using information flows, which are also identified in this clause. An information flow is an abstraction that is subsequently realized in clauses 6 through 8 by means of additions to existing signaling system messages or by new messages. Finally, this clause identifies several ways in which the functional entities of the Call Deflection service can be located in specific network or user equipment.

5.1.1   Functional Entity Model

This subclause identifies a way of partitioning the Call Deflection service functionality into functional entities and identifies actions that occur in each functional entity. Each functional entity is an abstract representation that could be implemented in more than one kind of telecommunication equipment (e.g., in terminal equipment, in a local switching machine, or in a data base). Functional entities may be combined in a single piece of telecommunications equipment and, for some scenarios, may not exist at all.

The following abbreviations are used in the flow diagrams:

CCAF   Call Control Agent Function

CCF   Call Control Function CD   Call Deflection

FE   Functional Entity

SCF   Service Control Function SDF Service Data Function

SSF   Service Switching Function

Figure 2 shows the Call Deflection service functional model.
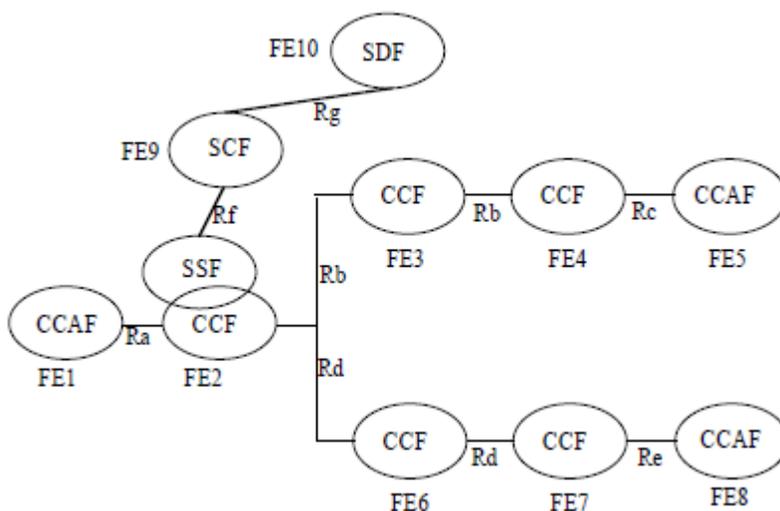
Figure 2 - Functional entity model for the Call Deflection service

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The functional entities required by the Call Deflection service over and above those of basic call are as follows:

FE1   Served user's service agent;

FE2   Served user's switching entity;

FE3   Possible Transit Network between FE1 and FE5; FE4   Caller's service control entity;

FE5   Caller's service agent;

FE6   Possible Transit Network between FE1 and FE8; FE7   Deflected-to   user's   service   control entity;

FE8   Deflected-to user's service agent;

FE9   Served user's call control entity;

FE10   Served user's database entity.

5.2 Information Flow Model for the Call Deflection Service

The figures in this subclause (figures 3–6) provide a high-level view of the sequence of and types of information passed between functional entities, and the actions performed within the functional entities to support Call Deflection.

In the definitions of the relationships (e.g., Ra), information indicated as "Mandatory" is information necessary to the receiving FE in order to carry out the intended action. "Optional" information is required in some, but not all, instances where the information is sent.

The following abbreviations are used in the flow diagrams: Alert Alerting

Act   Activation

CD   Call Deflection

Conf   Confirmation

Conn   Connect

Deact   Deactivation

Ind   Indication

Notif   Notify

Req   Request

NOTE – Broken lines are used in the flow diagrams to indicate optional message flows. Physical interfaces corresponding to relationships Rf and Rg are beyond the stated scope of standard. (See 5.4.)

Figure 3 - Call Deflection Before Answer
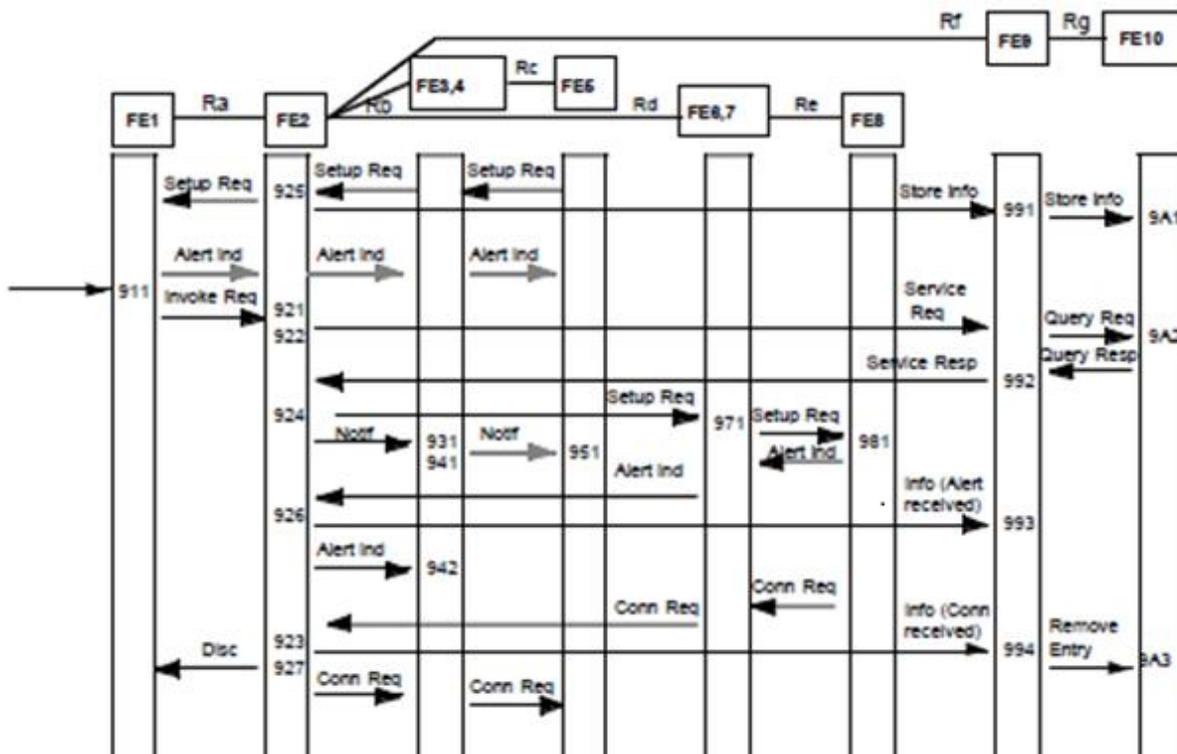
Figure 4 - Successful Call Deflection Before Answer with Cal Return
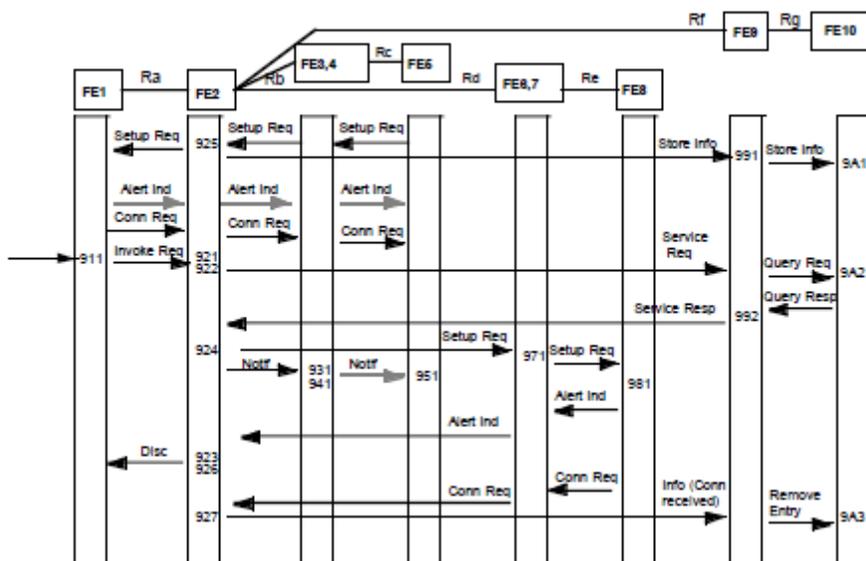
Figure 5 - Call deflection after answer
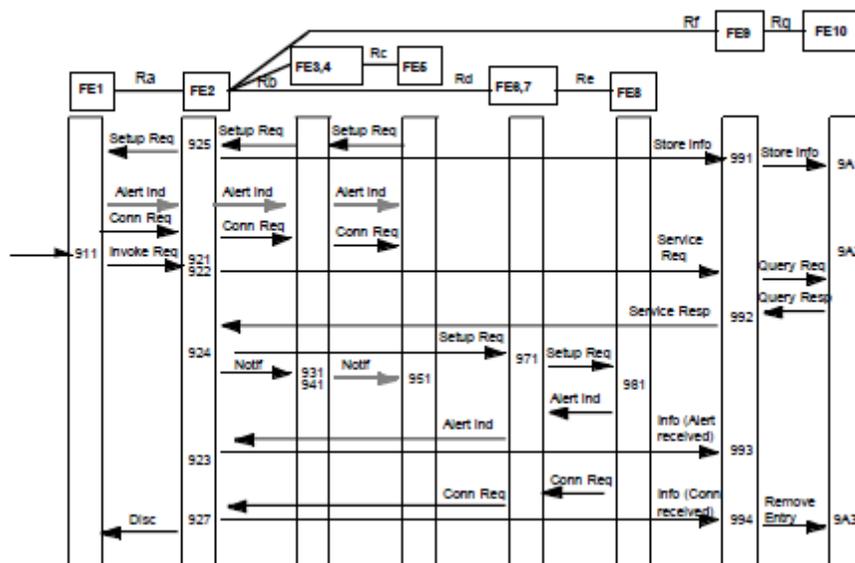
Figure 6 - Call deflection after answer with Call Return

5.2.1 Definition of Relationship Ra

In addition to the information flows defined for ISDN 64-kbit/s Circuit Mode Switched Bearer Services (Q.71), relationship Ra consists of the following information flows:

Invoke_Request

        deflected-to number   Mandatory

        reason for redirection   Mandatory

        Diversion Counter   Optional Last redirecting number Optional Deflecting Subaddress Optional Presentation status of defl #   Optional

Disconnect

Unsuccessful Deflection

Cause

        (Possible values: userNotSubscribed, notAvailable, invalidServedUserNumber, proceduralError,invalidDivertedNumber, specialServiceNumber, diversionToServedUserNumber,numberOfDiversionCounterExceeded, callFailure, uusReqAsEssential)

5.2.2 Definition of Relationship Rb

In addition to the information flows defined for ISDN 64-kbit/s Circuit Mode Switched Bearer Services (Q.71), relationship Rb consists of the following information flows:

Notification

Indication diversion has occurred	Mandatory
Presentation status of diversion indication	Mandatory
Deflected to number	Optional

5.2.3 Definition of Relationship Rc

In addition to the information flows defined for ISDN 64-kbit/s Circuit Mode Switched Bearer Services (Q.71), relationship Rc consists of the following information flows:

Notification

Indication diversion has occurred	Mandatory
Deflected to number	Optional

5.2.4 Definition of Relationship Rd

In addition to the information flows defined for ISDN 64-kbit/s Circuit Mode Switched Bearer Services (Q.71), relationship Rd consists of the following information flows:

Setup Req

deflected-to number	Mandatory
reason for last redirection	Mandatory
Last redirecting number	Optional
Last redirecting Subaddress	Optional
Presentation status of last deflecting #	Optional
Diversion Counter	Optional
First Redirecting Number	Optional
First Redirecting Subaddress	Optional
First Redirecting Reason	Optional
Presentation status of 1st deflecting #	Optional

5.2.5 Definition of Relationship Re

In addition to the information flows defined for ISDN 64-kbit/s Circuit Mode Switched Bearer Services (Q.71), relationship Re consists of the following information flows:

Setup Req

reason for last redirection	Mandatory
Last redirecting number	Optional
Last redirecting Subaddress	Optional
First Redirecting Number	Optional
First Redirecting Subaddress	Optional

First Redirecting Reason   Optional

5.2.6 Definition of Relationship Rf

In addition to the information flows defined for ISDN 64-kbit/s Circuit Mode Switched Bearer Services (Q.71), relationship Rf[7] consists of the following information flows:

Store Info

      Bearer capability information   Mandatory

      Progress indicator information   Optional

      Calling party number information   Optional

      Called party number information   Optional

      Original redirecting number info   Optional

      Sequential diversion information   Optional

      Calling party subaddress   Optional

      Original redirecting subaddress   Optional

Service Req

      Deflecting user   Mandatory

      deflected-to number   Mandatory

      reason for redirection   Mandatory

      Diversion Counter   Optional

      Last redirecting number   Optional

      Deflecting Subaddress   Optional

      Presentation status of defl #   Optional

Service Resp

      Deflection Allowed Indicator   Mandatory

      Notification contents   Optional

Info (Alert received)

Info (Conn received)

5.2.7 Definition of Relationship Rg

In addition to the information flows defined for ISDN 64-kbit/s Circuit Mode Switched Bearer Services (Q.71), relationship Rg consists of the following information flows:

---

[7] 1)   This standard does not define protocol associated with Relationship Rf; therefore, the use of "mandatory" and "optional" in this clause should be understood to refer to a possible future use of this "relationship" for other protocol definitions.

Store Info

      Bearer capability information   Mandatory

      Progress indicator information   Optional

      Calling party number information   Optional

      Called party number information   Optional

      Original redirecting number info   Optional

      Sequential diversion information   Optional

      Calling party subaddress   Optional

      Original redirecting subaddress   Optional

Query Req

      Deflecting user   Mandatory

      deflected-to number   Mandatory

      reason for redirection   Mandatory

      Last redirecting number   Optional

      Deflecting Subaddress   Optional

Query Resp

      Deflection Subscribed   Mandatory

      Call Return   Mandatory

      Call Return Timer   Mandatory

      Call Deflection After Answer   Mandatory

      Calling user notification   Mandatory

      Redirecting Number delivery   Mandatory

Remove Entry

5.3 Functional Entity Actions

The following abbreviations are used in this section:

CU   Calling User

DTU   Deflected-to User

5.3.1 Functional Entity Ections for FE1

911 – Accesses the services providing capabilities of FE2 by way of services requests by issuing a Call Deflection request.

912 – Receives and processes functional indications relating to a service request from FE2 and relays them to the served user. For example, FE1 may receive:

- an indication that the Call Deflection request has failed

- an indication that the Call Deflection request has been received and will be processed (For CD immediate)

913 – On receipt of a clearing indication from FE2 of the call (caused by completion of the deflection process), informs (relays this to) the served user.

5.3.2 Functional Entity Actions for FE2

921 – Receive Call Deflection request (Invoke Req)

922 – Send service request to FE9.

923 – Release the leg towards the served user.

924 – Set-up basic call towards the deflected-to user.

925 – Send the call establishment information to FE10 to be stored

926 – Established path in the backward direction between the DTU and the CU, so the CU receives in-band signaling from the DTU.

927 – Transmission is established in both directions between the CU and the DTU.

5.3.3 Functional Entity Actions for FE3

931 – Receive notification of deflection from FE2 and, optionally, relay it towards User A.

5.3.4 Functional Entity Actions for FE4

941– Receive notification of deflection from FE2 and, optionally, relay it towards User A.

942 – Suppress multiple alert messages.

5.3.5 Functional Entity Actions for FE5

951 – Receive optional notification of deflection from FE2 and, optionally, relay this notification information towards User A.

5.3.6 Functional Entity Actions for FE6

961 – Receives optional redirecting information in a call setup request from FE2 and relays the call setup request with the optional redirecting information towards FE8.

5.3.7 Functional Entity Actions for FE7

971 – Receives optional redirecting information in a call setup request from FE2 and relays the call setup request with the optional redirecting information towards FE8.

5.3.8 Functional Entity Actions for FE8

981 – On receipt of a call setup request possibly containing redirecting address information from FE2, FE8:

- informs (relays to) User C the call setup request, and

- optionally informs (relays to) User C the Call Deflection redirecting address information.

5.3.9 Functional Entity Actions for FE9

991 – Request FE10 to store the call establishment information

992 – Screen the Call Deflection request to see if allowed and valid 993 – Start timer CD-T1

994 – Cancel timer CD-T1

995 – Indicate to FE2 that timer has expired

5.3.10 Functional Entity Actions for FE10

9A1 – Store the call establishment information

9A2 – Retrieve subscription parameters

9A3 – Clear all registers of call establishment information

5.4 Allocation of functions of equipment

The equipment configurations supported by this standard are depicted in figure 7. In each case in which a TR is shown, additional configurations having no TR or having multiple TRs are also possible. In each case in which an NT2 is shown, any configuration of equipment "behind" that NT2 is possible, including other NT2s or no additional equipment.
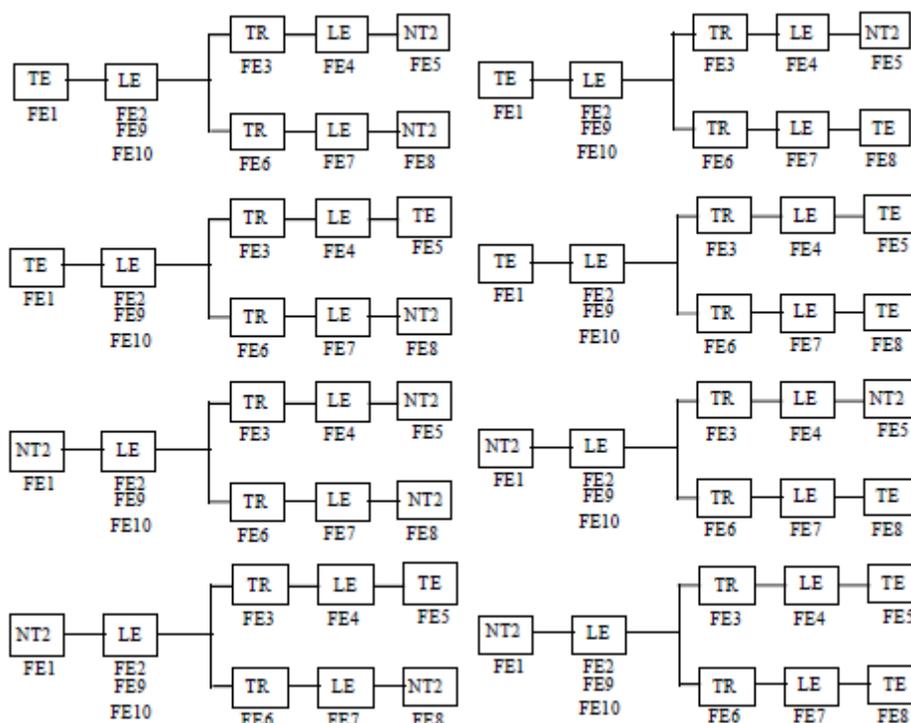
Figure 7 - Configuration supported

6 Switching & Signaling Specifications for the Call Deflection Service at the User–Network Interface

This clause contains the detailed specifications of switching and signaling capabilities for the Call Deflection service. This clause identifies the Digital Subscriber Signaling System No. 1 (DSS1) messages and procedures needed to support the functional entity actions for the scenarios described in clause 5.

6.1 Formats & Coding

This subclause identifies the D-channel call control messages, information elements, and code-points needed for the Call Deflection service. A "*" denotes an undefined maximum length, which may be network or service dependent.

6.1.1 Messages

A description of the message structure can be found in clause 3 of ATIS-1000607 and clause 7 of ATIS-1000610.

The following messages, which are defined in ATIS-1000607, are used for the Call Deflection service : DISCONNECT and RELEASE.

The FACILITY message, which is defined in ATIS-1000610, is used for the Call Deflection service. To support the Call Deflection service, the DISCONNECT, FACILITY, and RELEASE messages may contain a Facility information element as defined in subclause 6.3 of ATIS-1000610.

6.1.1.1 NOTIFY Message

The Notification Description "call is diverting" contained in the Notification Indicator information element may be sent to the calling party in a NOTIFY message (figure 8). In addition, the calling party may receive redirection information in a NOTIFY message. This message may be sent in the network-to-user direction.

Message type : NOTIFY

Significance : global

Direction: n → u

Information element	Reference	Type	Length
Protocol Discriminator	4.2/ATIS-1000607	M	1
Call Reference	4.3/ ATIS-1000607	M	2-*
Message Type	4.4/ ATIS-1000607	M	1
Notification Indicator	6.1.3.2	M	3
Redirection Number	8.2.12/ATIS-1000610	O	2-*
Redirection Subaddress	8.2.13/ ATIS-1000610	O	2-*
Other information elements as described in 3.1.7/ ATIS-1000607			

Figure 8 - NOTIFY Message Content (n→ u)

6.1.1.2 SETUP Message

If the deflected-to user subscribes to the delivery of redirecting number information, the SETUP message (figure 9) to the deflected-to user may contain the Redirecting Number and Redirecting Subaddress information element(s). The SETUP message may contain a maximum of two redirecting numbers and two redirecting subaddresses.

Message type : SETUP

Significance : global

Direction : both

Information element	Reference	Type	Length
Protocol Discriminator	4.2/ATIS-1000607	M	1
Call Reference	4.3/ ATIS-1000607	M	2-*
Message Type	4.4/ ATIS-1000607	M	1
Redirecting Number	8.2.10/ ATIS-1000610	O	2-*
Redirecting Subaddress	8.2.11/ ATIS-1000610	O	2-*
Other information elements as described in 3.1.11/ ATIS-1000607			

Figure 8 - NOTIFY message content (n→u)

6.1.2 Information Elements

The following information elements, which are defined in ATIS-1000607, are used for the Call Deflection service: Protocol Discriminator, Call Reference, Message Type, and Cause.

The following information elements, which are defined in ATIS-1000610, are used for the Call Deflection service: Facility, Redirecting Number, Redirecting Subaddress, Redirection Number, Redirection Subaddress, and Notification Indicator.

6.1.3 Codepoints

6.1.3.1 Facility Information Element

In addition to ATIS-1000610, see 6.1.4, which contains the ASN.1 representation of the operation for the functional protocol of the Call Deflection service. For this service, the protocol profile value of "ROSE" shall be used in the Facility information element.

6.1.3.2 Notification Indicator Information Element

The codepoint "call is diverting" as defined in 8.2.8 of ATIS-1000610, is used for the Call Deflection service in the Notification Indicator information element to indicate to the calling party that the call has been deflected.

Bits

7 6 5 4 3 2 1   Meaning

1 1 1 1 0 1 1   call is diverting

6.1.3.3 Redirecting Number Information Element

The Call Deflection service uses the codepoint "call deflection" in the reason for redirection field as defined in ATIS-1000610to indicate to the deflected-to user that the call has been deflected.

6.1.4 Definition of Operations & Errors

The ASN.1 description below aligns with the ITU-T Recommendation Q.952 "call rerouting" opera- tion with the following exceptions. The optional arguments, "subscription option" and "routing information" are not supported. In addition, the valid choices for the "party number" data element are limited to unknown party number, public party number, and private number.

BEGIN

EXPORTS   CallRerouting

IMPORTS

OPERATION, ERROR FROM Remote-Operation-Notation {joint-iso-ccitt remote- operations (4) notation (0)} userNotSubscribed, notAvailable, invalidServedUserNumber, proceduralError, invalidDivertedNumber, specialServiceNumber, diversionToServedUserNumber, numberOfDiversionCounterExceeded, callFailure, uusReqAsEssential FROM General-Errors-List {ccitt recommendation q 950 general-error-list (1)} Q931InformationElement FROM Embedded-Q931-types {ccitt recommendation q 932 embedded-q931-types (5)} PartyNumber, PartySubaddress, Address, PresentationAllowedIndicator, PresentedAddressScreened, PresentedAddressUnscreened, RoutingInformation, PresentedNumberUnscreened FROM Addressing-Data-Elements {ccitt recommen- dation q 932 addressing-data-elements (7)}

CallReroutingType ::=OPERATION

ARGUMENT SEQUENCE {

reroutingReason   DiversionReason,

calledAddress   Address,

reroutingCounter   DiversionCounter OPTIONAL,

q931InfoElement	Q931InformationElement OPTIONAL,
	as defined in 8.2.2.9 of ITU-T Recommendation Q 932, may contain redirecting subaddress, user–user information, high-layer compatibility, low-layer compatibility, network-specific facilities, transit network selection
lastReroutingNumber	[1]PresentedNumberUnscreened OPTIONAL,
subscriptionOption	[2] SubscriptionOption DEFAULT noNotification- *not supported*
callingPartySubaddress	[3] PartySubaddress OPTIONAL, presentationAllowed
DivertedToUser	[4] PresentationAllowedIndicator OPTIONAL,
reroutingInformation	[5] RoutingInformation OPTIONAL- *not supported*

} RESULT

– *an empty parameter indicates successful operation*

ERRORS {

userNotSubscribed, notAvailable, invalidServedUserNumber, proceduralError, invalidDivertedNumber, specialServiceNumber, diversionToServedUserNumber, numberOfDiversionCounterExceeded, callFailure, uusReqAsEssential

}

callRerouting   CallReroutingType ::= 14

DiversionCounter ::=INTEGER (0..127)

DiversionReason ::= ENUMERATED {unknown (0), cfu (1), cfb (2), cfnr (3), cd (4),

cdImmediate (5)}

END

6.2 Support Assumptions

6.2.1 Assumptions on the Terminal Equipment

Terminals used with the Call Deflection supplementary service shall support the basic call control procedures as specified in ATIS-1000607 and the functional signaling procedures (specifically, the common information element category) as specified in ATIS-1000610

6.2.2 Assumptions on the Network

The network serving the Call Deflection subscriber shall maintain the subscription parameters for the Call Deflection service. These subscription parameters are defined in table 1.

6.2.3 Service States & Timers

6.2.3.1 States

No states beyond those defined in ATIS-1000607 are needed for the Call Deflection service operation.

6.2.3.2 Timers

The Call Return Timer (Timer CD-T1) is a network-side timer with a range of 1–60 seconds.

CD-T1 shall be started by the network to monitor for an indication of answer from the deflected-to user after alerting or interworking has begun.

6.3 Procedures for Call Deflection

This subclause specifies the detailed switching and signaling procedures for the invocation, notification, and operation of the Call Deflection service.

6.3.1 Activation/deactivation Procedures

Call Deflection is activated and deactivated by subscription. No activation/deactivation procedure is needed to support the Call Deflection service.

6.3.2 Invocation & Operation

If a call is directed to a user who subscribes to the Call Deflection service, the network shall offer or terminate the call to the served user as defined in clause 5 of ATIS-1000607. The Call Deflection service may be invoked during call offering or after answer if the "Call Deflection After Answer" subscription option of the served user is set to "Yes".

The served user invokes Call Deflection by sending a "call rerouting" operation carried in an Invoke component in a Facility information element of a FACILITY message. The network sends an acknowledgment pertaining to the deflection request by sending a Return Result or Return Error component in a Facility information element.

The call reference value in the FACILITY message is the established call reference value associated with the incoming call to the served user. The Invoke component shall contain the mandatory argument "rerouting reason" that differentiates call deflection with continued call association with the call from call deflection with clearing to the deflecting user and the mandatory argument "called address", which identifies the number of the deflected-to user and may optionally include subaddress information. All other arguments for the "call rerouting" operation are provided at the deflecting user's option.

Below is a list of arguments for the

"call rerouting" operation.

"rerouting reason (mandatory)"

"called address (mandatory)"

"rerouting counter (optional)" "q931 info element (optional)"

"last rerouting number (optional)"

"calling party subaddress (optional)"

"presentation allowed indicator (optional)"

The optional arguments, "last rerouting number" and "rerouting counter", are intended for deflect- ing users which are NT2s. If a call has been redirected within an NT2 before a deflection request is made to the network, the NT2 may use these arguments to specify information relating to the internal redirection.

The "q931 info element" argument provides the deflecting user the ability to include information (e.g., high-layer compatibility, low-layer compatibility) that was received when the call was offered. These information elements can be embedded in the "q931 info element". The "q931 info element" argument also provides the deflecting user the ability to specify routing information for redirecting the call to the deflected-to user. Transit network selection or network specific facility selection information can be embedded in the "q931 info element".

The "calling party subaddress" is an optional argument that identifies a subaddress associated with the calling number. The optional "presentation allowed indicator" argument allows the deflecting user to specify a presentation status to allow or restrict the presentation of redirecting number information to the deflected-to user for this call. If this optional argument is not included in the deflection request, the network shall use the default subscriptions (as described in ATIS-1000625) which are in place to present or restrict redirecting number information to the deflected-to user.

6.3.3 Notification

If the service provider supports the notification of diversion option, the network shall check the value of the served user's subscription option "Calling user notification of deflected call" when a call is deflected.

If this parameter is set to "No", the network shall not send an indication of diversion to the calling user. If this parameter is set to "Yes, with deflected-to number" or "Yes, without deflected-to number", then the network shall send an indication of diversion to the ISDN calling user in a NOTIFY message. The NOTIFY message shall contain a notification indicator coded as "call is diverting". If this parameter is set to "Yes, with deflected-to number", the network shall also include a Redirection Number information element in the NOTIFY message. The Redirection Number information element shall identify the number of the deflected-to user, which is provided by the deflecting user in the deflection request. The redirecting reason in the Redirection Number information element shall be coded as "call deflection". If the deflecting user includes a subaddress associated with the deflected-to user in the deflection request, the NOTIFY message shall also include a Redirection Subaddress information element.

6.3.4 Normal Operation

The call deflection service shall not affect the served user's call originations. If a call is directed to an ISDN user that subscribes to Call Deflection, the network shall offer the call as described in clause 5 of ATIS-1000607. In addition, the network shall retain the following information associated with the call:

- Bearer Capability information;
- Progress Indicator information, if available;
- Calling Party Number, if available;
- Called Party Number;
- Redirecting Number associated with the initial instance of redirection (i.e., original redirect- ing number), if available;
- Number of times the call has been sequentially diverted;
- Calling Party Subaddress, if available;
- Original Redirecting Subaddress, if available.

The network shall retain all the information on a call until the call is cleared from the served user's interface. If the served user's "Call Deflection After Answer" option is set to "No", the net- work may discard the information when the served user answers the call.

During call offering, the network shall be able to accept a deflection request in an Invoke component in a Facility information element of a FACILITY message. If the served user's "Call Deflection After Answer" option is set to "Yes", the network shall accept a deflection request after the served user has answered the call.

Upon receipt of a deflection request, the network shall screen the request to determine if the request is valid as described in 6.3.5.1 and 6.3.5.2. If the request is valid, the network shall use the information that was accepted in the deflection request and retrieve any additional information stored for the call in setting up the call to the deflected-to user. The deflected-to user is identified in the "called address" argument in the "call rerouting" invoke operation.

If the "rerouting reason" in the deflection request is not "cd immediate", the network shall continue offering the call to the deflecting user as described in 5.2 of ATIS-1000607. If the "rerouting rea-son" in the deflection request is "cd immediate", the network shall initiate call clearing to the deflecting user as described in 5.3 of ATIS-1000607 upon determining that the request is valid.

For deflections made after answer, the network shall maintain the established call between the calling user and deflecting user if the "rerouting reason" in the deflection request is not "cd immediate". If the "rerouting reason" in the deflection request is "cd immediate", the network shall initiate call clearing to the deflecting user as described in 5.3 of ATIS-1000607 upon determining that the request is valid.

The network shall terminate the call to the deflected-to user using the procedures described in clause 5 of ATIS-1000607 and as defined in the following subclauses, including passing of call progress information in the direction of the calling user as appropriate.

If a redirection counter is not associated with the call that is being deflected, the network shall start a redirection counter for the call. If deflection was made after answer, the network shall set the redirection counter to one. Otherwise, the network shall set the counter to one, or increment the counter by one or by the contents of the optional "rerouting counter" argument if included in the deflection request.

The network shall further process the deflection request depending upon: (a) the value of the "rerouting reason" argument in the deflection request; (b) detection of one of the following conditions (i.e., alerting, interworking, or answered) and (c) the settings of the Call Deflection After Answer and Call Return options.

If the call attempt to the deflected-to user fails, the network shall follow the error handling procedures described in 6.3.5.3 and 6.3.5.4.

6.3.4.1 Successful Invocation of Call Deflection Immediate

This subclause shall apply if the "rerouting reason" in the deflection request is "cd immediate", regardless of whether the deflection takes place before or after answer. The Call Return option does not apply to call deflection when the deflecting user is cleared immediately.

If the call deflection request is properly coded and valid, as described in 6.3.5.1 and 6.3.5.2, the network shall set up the call to the deflected-to user and initiate call clearing to the deflecting user as described in 6.3.4. If the "rerouting reason" in the deflection request is "cd immediate", the network shall return an indication of success to the deflecting user in the first call clearing message (DISCONNECT or RELEASE message). The indication of success shall be a Return Result component in a Facility information element.

If the call deflection attempt is made before answer, the network shall pass all appropriate call progress information, both in-band and out-of-band, in the direction of the calling user. If the call deflection attempt is made after answer, the network shall pass in-band call progress information in the direction of the calling user when available.

6.3.4.2 Call Deflection with No Call Return

This subclause shall apply if the "rerouting reason" in the deflection request is not "cd immediate".

6.3.4.2.1 Call Deflection Before Answer

This subclause shall apply when the "Call Return" option is configured as "No", and the call is deflected before answer.

6.3.4.2.1.1 Successful Deflection: Answered

If the deflected-to user answers the call, the network shall return an answer indication to the calling user and send an indication of success in a clearing message to the deflecting user. The indication of success shall be a Return Result component of a Facility information element. The net- work shall include the Facility information element in the first call clearing message (DISCON- NECT or RELEASE message). The network shall also complete the transmission path between the calling and deflected-to users.

6.3.4.2.1.2 Successful deflection: Alerting or interworking

If alerting occurs at the deflected-to user or interworking is encountered, the network shall send an indication of success in a DISCONNECT or RELEASE message to the deflecting user as described in 6.3.4.2.1.1. The network shall pass to the calling user terminating treatment received from the deflected-to user, including both signaling messages appropriate to the state of the calling user's interface and inband information where appropriate. The network shall continue to wait for the deflected-to user to answer the call. If the deflected-to user subsequently answers, the network shall return an answer indication to the calling user, and complete the transmission path between the calling and deflected-to users if the transmission path has not yet been completed in either the forward or backward direction.

6.3.4.2.2 Call Deflection After Answer

This subclause shall apply when the "Call Deflection After Answer" option is configured as "Yes" and the "Call Return" option as "No", and the call is deflected after answer.

6.3.4.2.2.1 Successful Deflection: Answered

If the deflected-to user answers the call, the network shall send an indication of success in a DIS-CONNECT message to the deflecting user. The indication of success shall be a Return Result component in a Facility information element. The network shall also complete the transmission path between the calling and deflected-to users.

6.3.4.2.2.2 Successful Deflection: Alerting or Interworking

If alerting occurs at the deflected-to user or interworking is encountered, the network shall send an indication of success in a DISCONNECT message to the deflecting user as described in 6.3.4.2.2.1. The network shall pass to the calling user terminating treatment received in-band from the deflected-to user or the network serving the deflected-to user, if available. The network shall continue to wait for the deflected-to user to answer the call. If the deflected-to user subsequently answers, the network shall complete the transmission path between the calling and deflected-to users.

6.3.4.3 Call Deflection with Call Return

This clause shall apply if the "rerouting reason" in the deflection request is not "cd immediate".

6.3.4.3.1 Successful Deflection: Answered

This subclause shall apply when the "Call Return" option is configured as "Yes, success = inter-working or answer" or "Yes, success = answer".

If the deflected-to user answers the call, the network shall follow the procedures described in 6.3.4.2.1.1 (deflection before answer) or 6.3.4.2.2.1 (deflection after answer).

6.3.4.3.2 Successful Deflection: Alerting

This subclause shall apply when the "Call Return" option is configured as "Yes, success = inter-working or answer" or "Yes, success = answer".

If alerting occurs at the deflected-to user, the network shall start the Call Return timer (CD-T1). The network shall wait for the deflected-to user to answer the call attempt.

If the deflection request was received before answer, the network shall pass to the calling user terminating treatment received from the deflected-to user, including both signaling messages appropriate to the state of the calling user's interface and in-band information where appropriate. If the deflected-to user subsequently answers before timer CD-T1 expires, the network shall stop CD-T1. The network shall return an answer indication to the calling user and send an indication of success in a clearing message to the deflecting user as described in 6.3.4.2.1.1. The network shall also complete the transmission path between the calling and deflected-to users in the for- ward direction.

If the deflection request was received after answer, the network shall continue to maintain the established call between the calling and deflecting users, and shall pass no call progress information towards the calling user. If the deflected-to user subsequently answers before timer CD-T1 expires, the network shall stop CD-T1 and send an indication of success in a DISCONNECT message to the deflecting user as described in 6.3.4.2.2.1. The network shall complete the transmission path in both directions between the calling and the deflected-to users.

6.3.4.3.3 Successful Deflection: Interworking

If the "Call Return" option is configured as "Yes, success = interworking or answer" and interworking is encountered, the network shall follow the procedures described in 6.3.4.2.1.2 (deflection before answer) or 6.3.4.2.2.2 (deflection after answer).

If the "Call Return" option is configured as "Yes, success = answer" and interworking is encountered, the network shall start the Call Return timer (CD-T1). The network shall wait for the deflected-to user to answer the call attempt and follow the procedures described in 6.3.4.3.2 (deflection before answer and after answer).

6.3.4.4 SETUP Message to Deflected-to User

The SETUP message to the deflected-to user shall contain the same Bearer Capability information element as the original call to the deflecting user. The Calling Party number information element in the SETUP message shall contain the same number as received in the call information from the calling user. The network shall use the "called address" argument to code the Called Party Number information element. If the "called address" argument also contains subaddress information, the network shall use this information to code the Called Party Subaddress information element.

If the original call to the deflecting user included a Calling Party Subaddress information element or if the deflection request includes an optional "calling party subaddress" argument, the network may transfer and deliver this information to the deflected-to user according to the procedures defined in ATIS-1000625. If the original call to the deflecting user included the Progress Indicator information element, the network shall include this information element in the SETUP message.

If the deflected-to user is allowed to receive redirecting number information in accordance with ATIS-1000625, the network shall include the Redirecting Number information element in the SETUP message to the deflected-to user. If the deflection request contains the optional argument, "presentation allowed indicator", and the value is set to "True", the network shall pass an indication that the presentation of the redirecting number is allowed and include the redirecting number in the Redirecting Number information element. If the value of the "presentation allowed indicator" argument is set to "False", the network shall pass an indication that the presentation of the redirecting number is not allowed. The network shall not include the redirecting number in the Redirecting Number information element in the SETUP message to the deflected-to user. If the deflection request does not contain the "presentation allowed indicator" argument, the network shall use the value of the "Redirecting Number Information Delivery" subscription option to deter- mine the presentation status of the redirecting number. The network shall use the contents of the mandatory "rerouting reason" argument to set the reason for redirection field. If the "rerouting rea- son" argument is coded as either "cd immediate" or "cd", the reason for redirection field in the Redirecting Number information element shall use the coding "call forwarding by the called DTE or call deflection".

The contents of the Redirecting Number shall depend on the inclusion of the optional "last rerouting number" argument in the deflection request. If the deflection request does not contain the optional argument for "last rerouting number", the network shall use the Called Party Number included in the original SETUP message sent to the deflecting user as the Redirecting Number. If the deflection request includes the optional argument for "last rerouting number", the network shall use the contents of this argument to set the Redirecting Number. If the "q931 Info Element" argument contains an embedded subaddress information element, the network shall include a Redirecting Subaddress information element in the SETUP message to the deflected-to user.

If the network receives high-layer compatibility information or low-layer information embedded in the "q931 Info Element", the network shall include this information in the SETUP message only if the deflecting user subscribes to transfer of this information.

6.3.4.5 Sequential Diversion

The network shall allow sequential diversions to occur. The network shall maintain a redirection counter associated with the number of diversions that have occurred. This redirection counter shall be incremented for an instance of Call Deflection before answer or any other call diversion

service. For an instance of Call Deflection after answer, the network shall reset the redirection counter to one.

In the event of sequential diversions, the network shall pass only the redirecting number information associated with the original and last diversions to the diverted-to user. The network shall also pass redirecting subaddress information associated with the original and last diversions if they are available.

If the redirecting number information is to be delivered, the Redirecting Number information element that identifies the original diverted-to user shall be listed first in the SETUP message and the Redirecting Number information element that identifies the last diverted-to user shall be listed second in the SETUP message. If redirecting subaddress information for both the original and last diversions is available, the SETUP message shall contain two Redirecting Subaddress information elements. The first Redirecting Subaddress information element shall identify the subaddress associated with the original diverted-to user. The second Redirecting Subaddress information element shall identify the subaddress associated with the last diverted-to user.

If the redirecting subaddress information is associated with the original diverted-to user but is not associated with the last diverted-to user, the SETUP message shall still contain two Redirecting Subaddress information elements. The first Redirecting Subaddress information element shall identify the subaddress associated with the original diverted-to user. The second Redirecting Subaddress information element shall contain a "dummy" redirecting subaddress associated with the last diverted-to user. The format of the "dummy" Redirecting Subaddress information element shall be as specified in 6.1.3.8 of ATIS-1000625.

If the redirecting subaddress information is not associated with the original diverted-to user but is associated with the last diverted-to user, the SETUP message shall still contain two Redirecting Subaddress information elements. The first Redirecting Subaddress information element shall contain a "dummy" redirecting subaddress for association with the original diverted-to user. The format of the dummy Redirecting Subaddress information element shall be as specified in 6.1.3.8 of ATIS-1000625. The second Redirecting Subaddress information element shall identify the sub-address associated with the last diverted-to user.

The network that diverts the call (i.e., the served user's network) shall generate the dummy redirecting subaddress. The diverting network shall use the dummy redirecting subaddress format as specified in 6.1.3.8 of ATIS-1000625to code the "absent" redirecting subaddress values in sequential call diversion cases where an original diverting number, a last diverting number, and a single redirecting subaddress is available. In these cases, the diverting network shall use the dummy redirecting subaddress format to explicitly indicate whether the single redirecting subaddress is associated with the original diverting user or the last diverting user.

In sequential diversion cases where the diverted-to user's network receives an original diverting number, a last diverting number, and a single instance of redirecting subaddress with no accompanying instance of dummy redirecting subaddress information, the diverted-to user shall assume that this redirecting subaddress information is associated with the original diverting user. The diverted-to user's network shall still include Redirecting Subaddress information element in the SETUP message sent to the diverted-to user. The first Redirecting Subaddress information element shall contain the received redirecting subaddress information, which shall now be associated with the original diverting number. In this case, the diverted-to user's network may include an additional Redirecting Subaddress information element in the SETUP message sent to the diverted-to user. When included, this second Redirecting Subaddress information element shall contain the "dummy" redirecting subaddress (as defined in 6.1.3.8 of ATIS-1000625). The "dummy" Redirecting Subaddress information element shall be generated by the diverted-to user's network and associated with the last diverting user.

6.3.5 Error Handling

Subclauses 6.3.5.1 and 6.3.5.2 describe procedures to handle errors if the deflection request is improperly coded or is invalid. These procedures apply regardless of the coding of the "rerouting reason" argument in the deflection request.

Subclauses 6.3.5.3 and 6.3.5.4 describe error handling procedures regarding the redirection attempt to the deflected-to user. These procedures apply only if the "rerouting reason" argument in the deflection request is not "cd immediate".

6.3.5.1 Protocol Error

If the network receives an Invoke component with the "call rerouting" operation and determines that the Invoke component is not coded properly in accordance with ATIS-1000610, the network shall reject the request and send an error indication in a Facility information element in a FACILITY message. The Facility information element shall contain a Reject component with a problem value corresponding to the specific protocol problem as described in ATIS-1000610.

6.3.5.2 Invalid Deflection Request

If the network receives a call deflection request from a user served by an interface that does not subscribe to the Call Deflection service, the network shall reject the request and send an indication in a Facility information element of a FACILITY message. The Facility information element shall contain a Return Error component with the error value coded as "user not subscribed".

If the network receives a call deflection request from a user after the call has been answered and the "Call Deflection After Answer" option on the user interface is set to "No", the network shall reject the request and send an indication in a Facility information element of a FACILITY message. The Facility information element shall contain a Return Error component with the error value coded as "user not subscribed".

If the network receives a call deflection request from a user and the request is received in a message with a call reference value that corresponds to a call originated by that user, the deflection request is rejected. The network sends the error indication in a Return Error component with the error value coded as "not available" in a Facility information element of a FACILITY message.

If the network receives a call deflection request from a user and the network determines that the current value of the redirection counter associated with the call equals to the maximum number of diversions allowed for the call in the network, the network shall return a failure indication to the deflecting user. The indication shall contain a Return Error component with the error value coded as "number of diversion counter exceeded" in a Facility information element of a FACILITY message.

If the network receives a call deflection request and the "called address" argument of the Invoke component does not contain a valid number that the network can use to complete the call, the network shall reject the request and send an indication in a Facility information element of a FACILITY message. The Facility information element shall contain a Return Error component with the error value coded as "invalid diverted number".

If the network receives a call deflection request and the "called address" argument of the Invoke component corresponds to the number of the deflecting user, the network shall return to the user an indication that the request is invalid. The indication shall contain a Return Error component with the error value coded as "diversion to served user number" in a Facility information element of a FACILITY message.

If the network receives a call deflection request and the request included an embedded Transit Network Selection information element (in the q931 InfoElement), the network shall determine

whether the information is coded properly. If the network determines that the information is incorrectly coded or it identifies a facility that is not recognized by the network, the network shall return a failure indication to the deflecting user. The indication shall contain a Return Error component with the error value coded as "call failure" in a Facility information element of a FACILITY message. The "call failure" shall contain an embedded parameter that contains the appropriate cause information as defined in 4.5.11 of ATIS-1000607.

If the network receives a call deflection Invoke component in a message other than the FACILITY message, the network shall return an error indication with the error value coded as "procedural error" in a Return Error component to the deflecting user. The Facility information element of a FACILITY message shall carry the Return Error component.

If the network receives a subsequent call deflection Invoke component sent by the deflecting user for the same call while the first request is still being processed, the network shall reject the request, send an error indication to the deflecting user, and continue processing the original deflection request. The indication shall contain a Return Error component with the error value coded as "not available" in a Facility information element of a FACILITY message.

6.3.5.3 Call Return Timer

If timer CD-T1 expires while redirection is occurring, the network shall clear the call attempt to the deflected-to user. The network shall return an error indication to the deflecting user with the error value coded as "call failure" and the embedded cause value #102, "recovery on timer expiry" in a Return Error component. The Facility information element of a FACILITY message shall carry the Return Error component.

If the deflected-to user rejects the call setup attempt while timer CD-T1 is running, the network shall stop timer CD-T1. The network shall return an error indication to the deflecting user with the error value coded as "call failure" in a Return Error component. The "call failure" shall contain an embedded parameter that contains the appropriate cause information as defined in 4.5.11 of ATIS-1000607. The Facility information element of a FACILITY message shall carry the Return Error component.

If the deflecting user clears the call while timer CD-T1 is running, the network shall stop and cancel timer CD-T1. The network shall continue to process the deflection request as if the deflecting user does not have the Call Return option.

6.3.5.4 Abnormal Error Conditions

If the deflecting user answers the call while the network is processing a deflection request for that call, the network shall cancel the deflection attempt. The network shall clear the call to the deflected-to user.

If a normal call control timer (as defined in ATIS-1000607) expires while a deflection request is pending, the network shall initiate call clearing as described in 5.3 in ATIS-1000607to the deflecting user without interfering with the redirection attempt.

If the call cannot be offered to the deflected-to user (e.g., deflected-to user is busy or network congestion occurs), the network shall return an error indication to the deflecting user. The indication shall contain a Return Error component with the error value coded as "call failure" in a Facility information element in a FACILITY message. The call failure shall contain an embedded parameter that contains the appropriate cause information as defined in 4.5.11 of ATIS-1000607.

If the deflecting user initiates call clearing while a deflection request is pending, the network shall continue to process the deflection request. The network shall not send any information to the deflecting user regarding the status of the deflection request during the call clearing procedures.

6.4 DSS1 Interactions with Other Supplementary Services

6.4.1 Call Waiting

Call Deflection procedures may apply to a waiting call if the Call Waiting subscriber sends a CALL PROCEEDING, ALERTING, or CONNECT message in response to a SETUP message from the network.

If a call is deflected to a Call Waiting subscriber with the option "Calling user receives notification their call is waiting," set to "Yes", the network shall pass the notification "call is a waiting call" in an ALERTING or NOTIFY message to the calling user.

6.4.2 Call Hold

The DSS1 procedures for Call Hold have no interaction with the DSS1 procedures for Call Deflection.

6.4.3 Multi-Level Precedence & Preemption (MLPP)

The DSS1 procedures for MLPP have no interaction with the DSS1 procedures for Call Deflection.

6.4.4 User-to-User Signaling

The deflecting user can send user-to-user information in the "q931 info element" argument of the "call rerouting" operation as an encapsulated User–user information element in a Facility information element. See 8.2.3.1.3 of ANSI ATIS-1000610 for the encapsulation procedures. If the user sub- scribes to UUS, as defined in ATIS-1000621, the network shall deliver the User–user information element in the SETUP message. If the user does not subscribe to UUS, the user–user information is discarded and no notification is provided to the user.

If UUS delivery subscription option (for the deflecting user) is set to "Required" and UUS cannot be delivered according to 6.3.3.1, then the network shall return the error indication in a Return Error component with the error value coded as "uus req as essential" in a Facility Information element of a FACILITY message. In the case of Call Deflection Immediate, the call is cleared with cause #31, "normal, unspecified." In this case, the deflecting exchange shall clear towards the deflected-to user.

6.4.5 Message Waiting Indicator Control & Notification

The DSS1 procedures for Message Waiting Indicator Control and Notification have no interaction with the DSS1 procedures for Call Deflection.

6.4.6 Calling Line Identification Presentation (CLIP)

If a call is deflected and the deflected-to user subscribes to Calling Party Number Delivery (CPND), then the network shall deliver the calling number information in the SETUP message to the deflected-to user. If the deflected-to user subscribes to Redirecting Number Information Delivery (RNID), the network shall also deliver redirecting number information in the SETUP message to the deflected-to user. The redirecting number information may include a second redirecting number

associated with the original redirecting user if the call has been diverted more than once and/or a redirecting subaddress if the deflecting user had indicated such subaddress in the deflection request.

6.4.7 Calling Line Identification Restriction (CLIR)

If the calling user's number is determined to be presentation restricted in CLIR, the network shall not deliver the calling number in the SETUP message to the deflected-to user. If the deflecting user subscribes to presentation restricted in CLIR, the network shall not deliver any redirecting number in the SETUP message to the deflected-to user. The deflecting user may override this restriction if the deflection request contains an indication to present the redirecting number.

6.4.8 Normal Call Transfer

If the transferring party sends an INFORMATION message that contains the Feature Activation information element coded to "feature identifier = transfer" placing the primary call on hold and immediately sends a deflection request, the network shall process the deflection request and abort the transfer service operation. The network shall send an INFORMATION message with Cause information element coded to national-specific cause #53, "service operation violated", and the Feature Indication information element coded to "feature identifier = transfer, status = deactivated."

6.4.9 Calling Name Identification Presentation (CNIP)

If a call is deflected and the deflected-to user subscribes to CNIP, then the network shall deliver the calling name information in the SETUP, INFORMATION, or FACILITY message to the deflected-to user. If the deflected-to user subscribes to Redirecting Name Delivery (RND), the network shall deliver the original called name information in the SETUP, INFORMATION, or FACILITY message to the deflected-to user. If the call has been diverted more than once, the network may also include the redirecting name associated with the last deflecting user.

6.4.10 Calling Name Identification Restriction (CNIR)

If the calling user's name is determined to be presentation restricted in CNIR, the network shall not deliver the calling name characters in the SETUP, INFORMATION, or FACILITY message to the deflected-to user. If the deflecting user subscribes to presentation restricted in CNIR, the net- work shall not deliver any redirecting name characters in the SETUP, INFORMATION, or FACILI- TY message to the deflected-to user.

6.4.11 Explicit Call Transfer

The DSS1 procedures for Explicit Call Transfer have no interaction with the DSS1 procedures for Call Deflection.

6.4.12 Conference Calling

The DSS1 procedures for Conference Calling have no interaction with the DSS1 procedures for Call Deflection.

7 Switching & Signaling Specifications for the Call Deflection Service at Interex- Change Interfaces

Only ISDN User Part (ISUP) protocol has been identified in association with Signaling System No. 7 (SS7) procedures supporting Call Deflection. No Transaction Capabilities Application Part (TCAP) procedures have been identified for this service.

The functional description, formats and codes, and general procedures for the ISDN User Part are contained in ATIS-1000113.

7.1 *Formats & Codings for Call Deflection*

7.1.1 Messages

ISDN User Part messages are described in detail in ATIS-1000113.

No new ISUP messages are required for this service. An indication that the service has been invoked may be carried in the existing ISUP message, Call Progress Message (CPG). In addition, the redirecting number information may be carried in the Initial Address Message (IAM).

7.1.2 Parameters

7.1.2.1 Event Information

When notification of Call Deflection is to be sent, the Event Information parameter is used in the CPG. This parameter carries the indication that the call is being deflected and the presentation status of this information.

Call Deflection uses the following new coding for the Event Information parameter.

8	7	6	5	4	3	2	1
Restriction	Event Indicator						

Event Indicator

0	0	0	0	1	1	1	call deflected

Event Presentation Restricted Indicator

0   no indication

1   presentation restricted

7.1.2.2 Notification Indicator

When notification of Call Deflection is to be sent, the Notification Indicator parameter is used in the CPG to carry the indication that the call is being redirected.

Call Deflection uses the following existing coding for the Notification Indicator parameter.

8	7	6	5	4	3	2	1
Ext.	Notification Indicator						

Notification Indicator

1	1	1	1	0	1	1	call is forwarded/deflected

7.1.2.3 Redirection Information

When deflection occurs, the Redirection Information parameter is used in the IAM to carry the redirecting reason to the deflected-to user.

Call Deflection uses the following new coding for the redirecting reason fields.

8   7   6   5   4   3   2   1

Original Redirecting Reason	Reserved	Redirecting Indicator
Redirecting Reason	Redirection Counter	

Original Redirecting Reason

0 1 0 0 deflection

Redirecting Reason

0 1 0 0 deflection

7.2 Procedures for Call Deflection

There are no identified TCAP procedures associated with the Call Deflection service. This sub-clause details the ISUP procedures to support the redirection attempt to the deflected-to user and the notification of deflection to the calling user.

7.2.1 Checking the diversion limit

When an exchange deflects a call, the exchange first examines the value of the redirection counter to determine if deflecting the call would make the counter exceed the number of diversions allowed within the network.

7.2.2 Setting the parameters

Given that the diversion limit was not exceeded, the deflecting exchange sets the parameters in the IAM for the outgoing circuit toward the deflected-to exchange. The setting of the parameters depends upon the inclusion of certain optional arguments in the deflection request and the number of diversions that the call has already undergone.

7.2.2.1 First diversion

If this is the first diversion, the deflecting exchange shall set the following parameters:

- *Redirection Information*: If the deflection request includes the optional "redirection counter" argument and the deflection occurs before answer, the exchange shall use the contents of this argument to set the redirection counter field. If the deflection request does not include the optional "redirection counter" argument, the exchange shall set the redirection counter field to one. If the deflection occurs after answer, the exchange shall set the redirection counter field to one. The original redirecting reason and redirecting reason fields are set according to the mandatory "rerouting reason" argument in the deflection request;
- *Original Called Number*: This is the directory number of the called party (i.e., deflecting user);

- *Called Number*: This is the directory number of the deflected-to user that is specified in the mandatory "called address" argument in the deflection request;
- *Redirecting Number*: If the deflection request includes the optional "last rerouting number" argument, the exchange shall use the contents of this argument to set the Redirecting Number. If the deflection request does not include the optional "last rerouting number" argument, the Redirecting Number parameter is equal to the Original Called Number parameter;
- *Access Transport Parameter*: If the deflection request includes the optional "calling party subaddress" argument, the exchange shall use the contents of this argument to set a Calling Party Subaddress information element to be included in the Access Transport Parameter.

If the deflection request includes the optional "q931 Info Element" argument with either the low- layer compatibility or high-layer compatibility information element, the exchange shall insert this information element into the Access Transport Parameter.

If the deflection request includes optional called subaddress information in the "called address" argument, the exchange shall use this information to set a Called Party Subaddress information element to be included in the Access Transport Parameter.

If the deflection request includes a redirecting number in the optional "last rerouting number" argument and a redirecting subaddress information element embedded in the optional "q931 Info Element" argument, the exchange shall use the subaddress information to set a Redirecting Subaddress information element to be included in the Access Transport Parameter.

7.2.2.2 Second or Greater Diversion

If the received IAM contains the redirection counter in the Redirection Information parameter set to one or greater than one, the deflecting exchange shall set the following parameters:

- *Redirection Information*: If the deflection request includes the optional "redirection counter" argument and the deflection occurs before answer, the exchange shall increment the redirection counter field with the contents of the optional "redirection counter" argument. If the deflection request does not include the optional "redirection counter" argument, the exchange shall increment the redirection counter field by one. If the deflection occurs after answer, the exchange shall set the redirection counter field to one. The redirecting reason field is set according to the mandatory "rerouting reason" argument in the deflection request.
- *Called Number*: This is the directory number of the deflected-to user that is specified in the mandatory "called address" argument in the deflection request.
- *Redirecting Number*: If the deflection request includes the optional "last rerouting number" argument, the exchange shall use the contents of this argument to set the Redirecting Number. If the deflection request does not include the optional "last rerouting number" argument, the exchange shall use the directory number of the current called party (i.e., current deflecting user) to set the Redirecting Number.
- *Access Transport Parameter*: If the deflection request includes the optional "calling party subaddress" argument, the exchange shall discard the contents of this argument.

If the deflection request includes the optional "q931 Info Element" argument with either the low- layer compatibility or high-layer compatibility information element, the exchange shall insert this information element into the Access Transport Parameter.

If the deflection request includes optional called subaddress information in the "called address" argument, the exchange shall use this information to set a Called Party Subaddress information element to be included in the Access Transport Parameter.

If the deflection request includes a redirecting number in the optional "last rerouting number" argument and a redirecting subaddress information element embedded in the optional "q931 Info Element" argument, the exchange shall use the subaddress information to set a second Redirecting Subaddress information element to be included in the Access Transport Parameter. If the received IAM does not contain a subaddress associated with the first redirection, the exchange shall also generate a dummy redirecting subaddress to be included as the first Redirecting Subaddress information element in the Access Transport Parameter.

If the received IAM contains the Original Called Number parameter, the deflecting exchange shall insert this parameter unchanged into the IAM for the outgoing circuit. In addition, the deflecting exchange shall pass the original redirecting reason field in the Redirection Information parameter unchanged into the IAM for the outgoing circuit.

7.2.3 Procedures at the Deflecting Exchange

If the deflected-to number resides at another exchange, an IAM is sent to redirect the call onto that exchange. The IAM includes information described in 7.2.2.

7.2.3.1 Call Deflection Immediate

When sending the IAM, the deflecting exchange shall connect the incoming circuit to the chosen outgoing circuit immediately in the backward direction. The connection to the deflecting user is released. (See figure 10.)

7.2.3.2 Call Deflection Before Answer with No Call Return

When sending the IAM, the incoming circuit shall not be connected to the chosen outgoing circuit in the backward direction. If audible ringing was provided to the calling user as a result of the call to the deflecting user, it shall continue.

- If the deflecting exchange receives an Address Complete Message (ACM) on the outgoing circuit, it shall examine the contents of the message. If the ACM indicates alerting or interworking (as shown in table 2), the deflecting exchange shall connect the incoming circuit to the chosen outgoing circuit immediately in the backward direction. The connection to the deflecting user is released.
  If the deflecting exchange has not received an ACM for the call on the outgoing circuit, it shall return the ACM for the incoming circuit. If the deflecting exchange has received an ACM for the call on the outgoing circuit, it shall map the information in the received ACM to a CPG as shown below in table 2 and return the CPG for the incoming circuit. Table 2 is consistent with section 4A.4 in chapter T1.113.4 of ATIS-1000113. The CPG shall contain every parameter that was included in the received ACM.

Table 2 - Mapping of information received in an ACM

ACM	CPG
Called party's status indicator in the Backward Call Indicators parameter set to "subscriber free"	Event indicator in the Event Information parameter set to "ALERTing"
Inband information indicator in the Optional Backward Call Indicator parameter set to "inband information or appropriate pattern is now available", interworking indicator in the Backward Call Indicators parameter set to "no interworking encountered", and called party's status indicator in the Backward Call Indicators parameter set to "no indication"	Event indicator in the Event Information parameter set to "in-band information or appropriate pattern is now available"
For all other cases, e.g., interworking indicator in the Backward Call Indicators parameter set to "interworking encountered"	Event indicator in the Event Information parameter set to "PROGress"

For each of the cases in table 2, the event presentation restricted indicator in the Event Information parameter shall be coded as "no indication".

If the deflecting exchange subsequently receives an Answer Message (ANM) on the outgoing circuit, it shall complete the through connection of the transmission path in both directions, if not already connected, and return an ANM for the incoming circuit. (See figure 11.)

- If the deflecting exchange receives an ANM on the outgoing circuit, it shall connect the incoming circuit to the chosen outgoing circuit immediately in both directions. The connection to the deflecting user is released. The deflecting exchange shall return an ANM for the incoming circuit.

7.2.3.3 Call Deflection After Answer with No Call Return

When sending the IAM, the incoming circuit shall not be connected to the chosen outgoing circuit in the backward direction.

- If the deflecting exchange receives an ACM on the outgoing circuit, it shall examine the contents of the message. If the ACM indicates alerting or interworking, the deflecting exchange shall connect the incoming circuit to the chosen outgoing circuit immediately in the backward direction. The connection to the deflecting user is released.

  If the deflecting exchange subsequently receives an ANM on the outgoing circuit, it shall complete the through connection of the transmission path in both directions, if not already connect- ed. (See figure 12.);

- If the deflecting exchange receives an ANM on the outgoing circuit, it shall connect the incoming circuit to the outgoing circuit immediately in both directions. The connection to the deflecting user is released.

7.2.3.4 Call Deflection Before Answer with Call Return

When sending the IAM, the incoming circuit shall not be connected to the chosen outgoing circuit in the backward direction. If audible ringing was provided to the calling user as a result of the call to the deflecting user, it shall continue.

- If the deflecting exchange receives an ACM on the outgoing circuit, it shall examine the con- tents of the message. If the ACM indicates alerting, the deflecting exchange shall connect the incoming circuit to the chosen outgoing circuit immediately in the backward direction. If the ACM indicates interworking and the "Call Return" option is set to "Yes, success = answer", the deflecting exchange shall also connect the incoming circuit to the chosen outgoing circuit immediately in the backward direction. In both cases, the deflecting exchange shall start timer CD-T1.
  If the deflecting exchange has not received an ACM for the call on the outgoing circuit, it shall return the ACM for the incoming circuit. If the deflecting exchange has received an ACM for the call on the outgoing circuit, it shall map the information in the received ACM to a CPG as shown in table 2 and return the CPG for the incoming circuit. The CPG shall contain every parameter that was included in the received ACM. For each of the cases in table 2, the event presentation restricted indicator in the Event Information parameter shall be coded as "no indication".
  If the deflecting exchange subsequently receives an ANM on the outgoing circuit before timer CD-T1 expires, it shall stop timer CD-T1 and complete the through connection of the transmission path in both directions, if not already connected. The connection to the deflecting user is released. The deflecting exchange shall return an ANM for the incoming circuit. (See figure 13.);
- If the deflecting exchange receives an ACM on the outgoing circuit, it shall examine the contents of the message. If the ACM indicates interworking and the "Call Return" option is set to "Yes, success = interworking or answer", the deflecting exchange shall connect the incoming circuit to the outgoing circuit immediately in the backward direction. The connection to the deflecting user is released.
  If the deflecting exchange has not received an ACM for the call on the outgoing circuit, it shall return the ACM for the incoming circuit. If the deflecting exchange has received an ACM for the call on the outgoing circuit, it shall map the information in the received ACM to a CPG as shown in table 2 and return the CPG for the incoming circuit. The CPG shall contain every parameter that was included in the received ACM. For each of the cases in table 2, the event presentation restricted indicator in the Event Information parameter shall be coded as "no indication".
  If the deflecting exchange subsequently receives an ANM on the outgoing circuit, it shall complete the through connection of the transmission path in the forward direction. The deflecting exchange shall return an ANM for the incoming circuit;
- If the deflecting exchange receives an ANM on the outgoing circuit, it shall connect the incoming circuit to the outgoing circuit immediately in both directions. The connection to the deflecting user is released. The deflecting exchange shall return an ANM for the incoming circuit.

7.2.3.5 Call Deflection After Answer with Call Return

When sending the IAM, the incoming circuit shall not be connected to the chosen outgoing circuit in the backward direction.

- If the deflecting exchange receives an ACM on the outgoing circuit, it shall examine the contents of the message. If the ACM indicates alerting, the deflecting exchange shall start timer CD-T1. If the ACM indicates interworking and the "Call Return" option is set to "Yes. success = answer", the deflecting exchange shall also start timer CD-T1.
  If the deflecting exchange subsequently receives an ANM on the outgoing circuit before timer CD- T1 expires, it shall stop timer CD-T1 and connect the incoming circuit to the outgoing circuit immediately in both directions. The connection to the deflecting user is released. (See figure 14.);
- If the deflecting exchange receives an ACM on the outgoing circuit, it shall examine the contents of the message. If the ACM indicates interworking and the "Call Return" option is set to "Yes, success = interworking or answer", the deflecting exchange shall connect the incoming circuit to the chosen outgoing circuit immediately in the backward direction. The connection to the deflecting user is released.
  If the deflecting exchange subsequently receives an ANM on the outgoing circuit, it shall complete the through connection of the transmission path in the forward direction;
- If the deflecting exchange receives an ANM on the outgoing circuit, it shall connect the incoming circuit to the outgoing circuit immediately in both directions. The connection to the deflecting user is released.

7.2.4 Notification Procedures

When the deflecting exchange sends the IAM on the outgoing circuit, the deflecting exchange shall also send a CPG in the backward direction. The CPG shall include the notification indicator parameter set to "call is forwarded/deflected". The CPG shall also include the event indicator in the Event Information parameter set according to the mandatory "rerouting reason" argument in the deflection request. The coding of the event presentation restricted indicator in the Event Information parameter depends upon the notification subscription option of the deflecting user. If the deflecting user's "Calling user notification of deflected call" subscription option is set to "No", the CPG shall contain the event presentation restricted indicator set to "presentation restricted". If the deflecting user's "Calling user notification of deflected call" subscription option is set to "Yes, with deflected-to number" or "Yes, without deflected-to number", the CPG shall contain the event presentation restricted indicator set to "no indication".

If the deflecting user's "Calling user notification of deflected call" subscription option is set to "Yes, with deflected-to number", the deflecting exchange shall also include the Redirection Number parameter in the CPG. The redirection number field is set to the mandatory "called address" argument in the deflection request. The address presentation restricted indicator is set to "presentation allowed".

7.2.5 Error Treatment

If the deflecting exchange receives an ACM on the outgoing circuit, it shall examine the contents of the message. If the ACM indicates that the call cannot be completed, the deflecting exchange shall maintain the current incoming connection. The deflecting exchange may receive another deflection request for the call. The deflecting exchange shall release the call toward the deflected-to exchange and send a Release Message (REL) for the outgoing circuit.

Except in the case of CD Immediate, if the deflecting exchange receives a REL on the outgoing circuit indicating that the call cannot be completed, it shall maintain the current incoming connection.

(See figure 15.) The ISUP procedures introduce no new cause codes in the REL message. The deflecting exchange may receive another deflection request for the call. The deflecting exchange shall complete the release procedure toward the deflected-to exchange and send a Release Complete (RLC) for the outgoing circuit. (See figure 16.)

If timer CD-T1 expires before the deflecting exchange receives an ANM on the outgoing circuit, the deflecting exchange shall stop timer CD-T1 and maintain the current incoming connection. The deflecting exchange may receive another deflection request for the call. The deflecting exchange shall clear the call toward the deflected-to exchange and send a REL for the outgoing circuit.

If the deflecting user answers the call while the deflecting exchange is processing the deflection request, the deflecting exchange shall cancel the redirection attempt. The deflecting exchange shall clear the call toward the deflected-to exchange and send a REL for the outgoing circuit.

7.3 ISUP Interactions with Other Supplementary Services

7.3.1 Call Waiting

If a call is deflected to a call waiting subscriber and the deflecting exchange receives an ACM or CPG with the Notification Indicator parameter coded to "call is a waiting call", the deflecting exchange shall return this message for the incoming circuit toward the exchange serving the calling user.

7.3.2 Call Hold

The ISUP procedures for Call Hold have no interaction with the ISUP procedures for Call Deflection.

7.3.3 Multi-Level Precedence & Preemption (MLPP)

The ISUP procedures for MLPP have no interaction with the ISUP procedures for Call Deflection.

7.3.4 User-to-User Signaling

If the network receives a deflection request with User-to-User Signaling (UUS) embedded in the "Q931 info element" argument and if the deflecting user subscribes to UUS as defined in ANSI ATIS-1000621, the deflecting exchange shall insert this information into the user–user Information Parameter.

7.3.5 Message Waiting Indicator Control & Notification

The ISUP procedures for Message Waiting Indicator Control and Notification have no interaction with the ISUP procedures for Call Deflection.

7.3.6 Calling Line Identification Presentation (CLIP)

See 7.2.2.1 and 7.2.2.2 for ISUP procedures in the transport of calling party and redirecting party information.

7.3.7 Calling Line Identification Restriction (CLIR)

If the deflection request includes a "presentation allowed indicator" argument, the deflecting exchange shall use this information to set the Presentation Restricted Indicator in the Redirecting Number parameter.

7.3.8 Normal Call Transfer

The ISUP procedures for Normal Call Transfer have no interaction with the ISUP procedures for Call Deflection.

7.3.9 Calling Name Identification Presentation (CNIP)

The ISUP procedures for CNIP have no interaction with the ISUP procedures for Call Deflection.

7.3.10 Calling Name Identification Restriction (CNIR)

The ISUP procedures for CNIR have no interaction with the ISUP procedures for Call Deflection.

7.3.11 Explicit Call Transfer

The ISUP procedures for Explicit Call Transfer have no interaction with the ISUP procedures for Call Deflection.

7.3.12 Conference Calling

The ISUP procedures for Conference Calling have no interaction with the ISUP procedures for Call Deflection.

8   Specifications for Protocol Interworking

8.1   Interworking between SS7/ISUP & DSS1

8.1.1 Notification

When the deflecting exchange receives a deflection request that can be honored and the deflecting user's subscription option "Calling user notification of deflected call" is set to "Yes, with deflected-to number" or "Yes, without deflected-to number", the deflecting exchange shall send a notification to the calling user. The deflecting exchange shall code the ISUP Notification Indicator parameter to "call is forwarded/deflected" in the CPG message. The deflecting exchange shall also code the ISUP Event Information parameter to "call deflected" with no presentation restriction in the CPG message. Upon receiving the CPG message, the exchange serving the calling user shall map the notification information received in the ISUP Notification Indicator parameter to the Notification Indicator information element in the NOTIFY message. The notification indicator in the NOTIFY message shall be coded as "call is diverting".

In addition, if the deflecting user's subscription option "Calling user notification of deflected call" is set to "Yes, with deflected-to number", the deflecting exchange shall use the deflected-to number specified in the deflection request to code the ISUP Redirection Number parameter in the CPG message. If the deflection request includes subaddress information associated with the deflected- to number, the deflecting exchange shall map the information to a Redirection Subaddress information element in

the Access Transport Parameter. Upon receiving the CPG message, the exchange serving the calling user shall map the information received in the ISUP Redirection Number parameter to the Redirection Number information element in the NOTIFY message. The exchange serving the calling user may include the Redirecting Subaddress information element in the NOTIFY message if received in the Access Transport Parameter.

The following summarizes the mapping:

SS7/ISUP	**DSS1**
CPG	NOTIFY

SS7 (ISUP Parameter)	**DSS1 (Information Element)**
Notification Indicator	Notification Indicator
Redirection Number	Redirection Number
ATP with Redirection Subaddress	Redirection Subaddress

The exchange serving the calling user may send multiple NOTIFY messages to the calling user if multiple diversions occur.

8.1.2 Call offering to Deflected-to User

The contents of the SETUP message sent toward the deflected-to user depends on the information received in the IAM at the exchange serving the deflected-to user. If the redirecting number is to be delivered to the deflected-to user, the deflected-to exchange shall map the information received in the ISUP Original Called Number parameter to the Redirecting Number information element. The coding of the reason for redirection field in the Redirecting Number information element shall be based on the original redirecting reason field in the received ISUP Redirection Information parameter.

If the redirection counter in the received ISUP Redirection Information parameter is set to 2 or more, then the exchange serving the deflected-to user shall also map the information received in the ISUP Redirecting Number parameter to a second Redirecting Number information element. The coding of the reason for redirection field in the second Redirecting Number information element shall be based on the redirecting reason field in the received ISUP Redirection Information parameter.

The exchange serving the deflected-to user may include Redirecting Subaddress information element if received in the Access Transport Parameter.

The following summarizes the mapping:

SS7 ISUP	**DSS1**
IAM	SETUP

SS7 (ISUP Parameter)	**DSS1 (Information Element)**
Original Called Number, Redirection Information	Redirecting Number
Redirecting Number, Redirection Information	second Redirecting Number
ATP with Redirecting Subaddress(es)	Redirecting Subaddress(es)

8.1.3 Failure Indication

If the deflecting exchange receives a ISUP REL message indicating that the redirected call can- not be completed (e.g., deflected-to user is busy, network congestion, or deflected-to user rejects the call), the deflecting exchange shall map the information received in the ISUP Cause Indicators parameter to a Facility information element. The Facility information element shall contain the Return Error component with the error value coded as "call failure". In addition, the "call failure" error shall contain the contents of the cause that would have been provided as part of the normal call processing if the call had been originated by the deflecting user.

The following summarizes the mapping:

SS7/ISUP	**DSS1**
REL	FACILITY

SS7 (ISUP Parameter)	**DSS1 (Information Element)**
Cause Indicators	Facility (Return Error)

8.1.4 Suppression of Multiple DSS1 Messages

The exchange serving the calling user shall suppress repetitive ALERTING and CONNECT messages toward the calling user.

## 8.2 Interworking Between SS7/ISUP & MF Signaling

8.2.1 Between the Deflecting Exchange & Calling Exchange

If interworking is encountered (from the deflecting exchange toward the calling exchange), the CPG message containing the notification information and redirection information will be discarded. No further action will be taken to convey the notification information or redirection information to the exchange serving the calling user.

8.2.2 Between the Deflecting Exchange & Deflected-to Exchange

If interworking is encountered (from the deflecting exchange toward the deflected-to exchange), the redirecting information contained in the IAM will be discarded. No further action will be taken to convey the redirecting information to the deflected-to exchange.
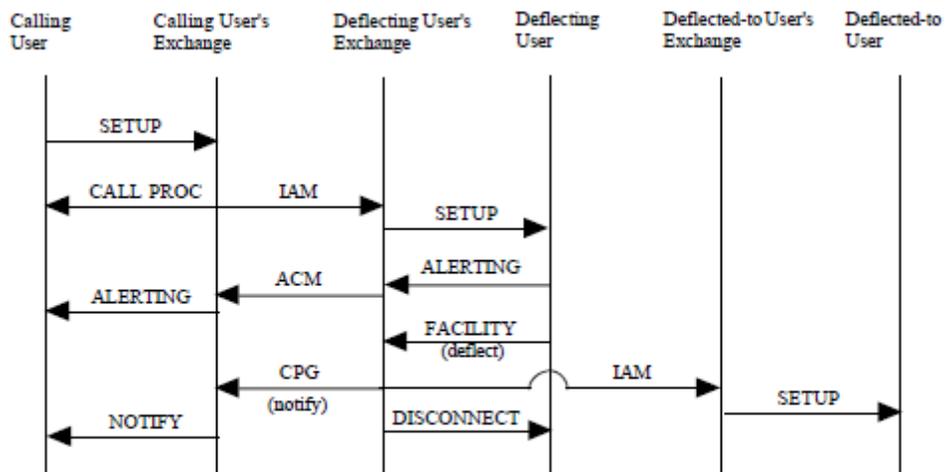
NOTE – In figures 10 through 16, the ALERTing message is optional and the FACILITY message may be the first response to the SETUP message.
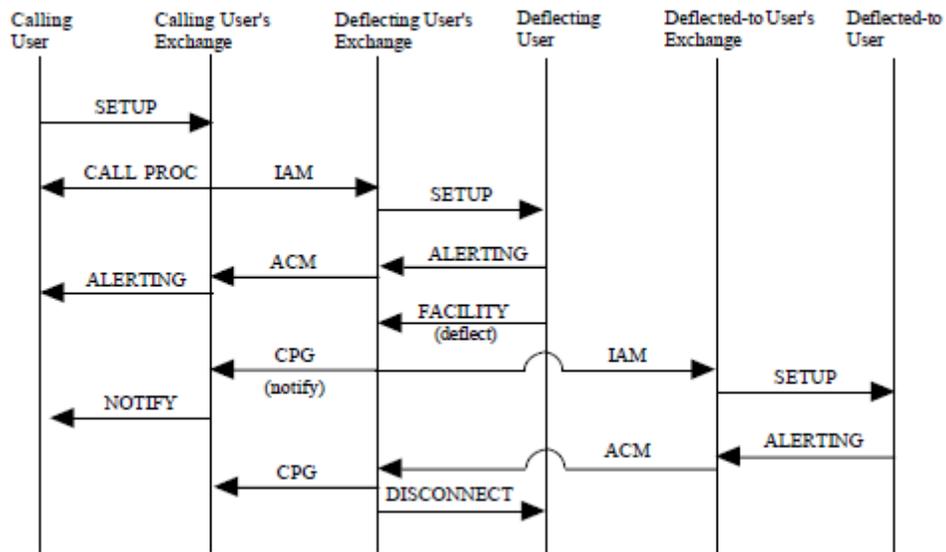
Figure 10 - Successful Call Deflection immediate

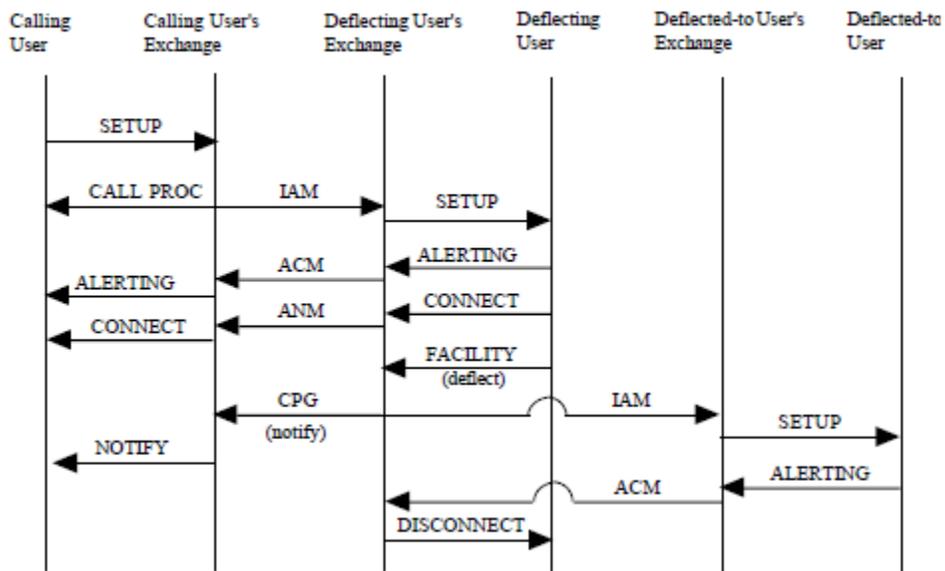**Figure 11 - Successful Call Deflection before answer, no Call Return**

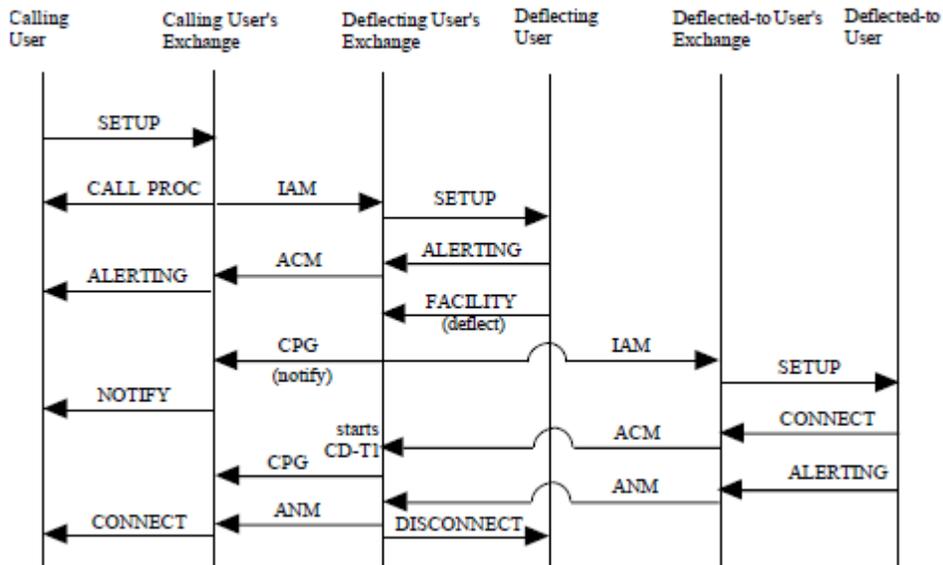**Figure 12 - Successful Call Deflection after answer, no Call Return**

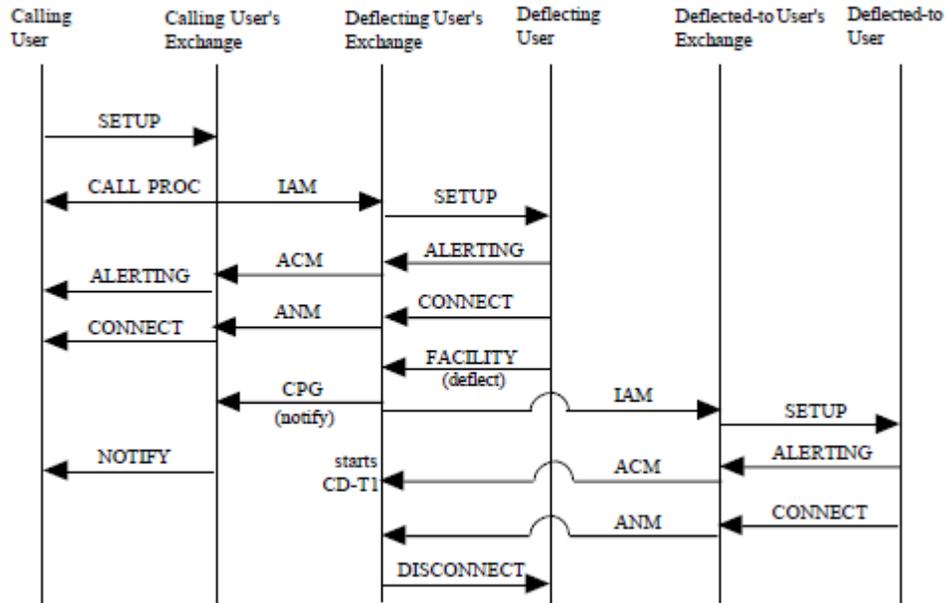**Figure 13 - Successful Call Deflection before answer, Call Return**

Figure 14 - Successful Call Deflection after answer, Call Return

Figure 15 - Unsuccessful Call Deflection before answer, no Call Return
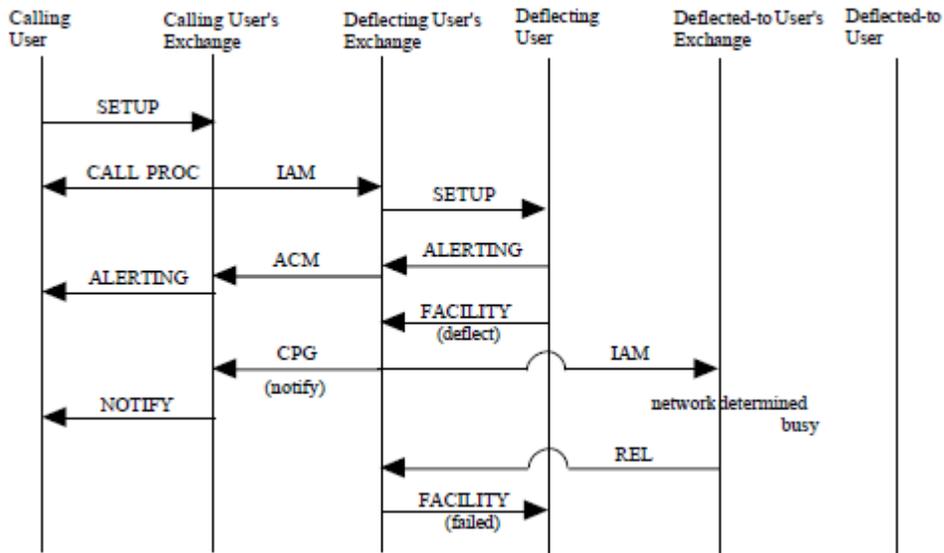
Figure 16 - Unsuccessful Call Deflection before answer, Call Return

Annex A: Bibliography

(informative)

At the time of publication, the editions indicated were valid. All standards are subject to revision, and users of this document are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below.

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ATIS-1000616.1992(R2009), Telecommunications – Integrated services digital network (ISDN) – Call hold supplementary service[9]

ATIS-1000612.1992(R2010)[10], Telecommunications – Integrated services digital network (ISDN) – Multi- level precedence and preemption (MLPP) service capability

ATIS-1000619.a.1994(R2012), Telecommunications – Integrated services digital network (ISDN) – Multi- level precedence and preemption (MLPP) service capability (MLPP service domain and cause value changes)[11]

ATIS-1000621.1992(R2009)[12], Telecommunications – Integrated services digital network (ISDN) – User-to- user signaling supplementary service

ATIS-1000622.1999(R2013), Telecommunications – Message waiting indicator control and notification supplementary services and associated switching and signaling specifications[13]

ATIS-1000632.1993(R2014), Telecommunications – (ISDN) – Supplementary service normal call transfer[14]

ATIS-1000639.1995(R2011), Telecommunications – Integrated services digital network (ISDN) – Calling name identification restriction supplementary service[15]

ATIS-1000641.1995(R2009) Telecommunications – Integrated services digital network (ISDN) – Calling name identification presentation supplementary service[16]

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[8] This document is available from the Alliance for Telecommunications Industry Solutions (ATIS) at < https://www.atis.org/docstore/product.aspx?id=26095>

[9] This document is available from the Alliance for Telecommunications Industry Solutions (ATIS) at < https://www.atis.org/docstore/product.aspx?id=24740>

[10] This document is available from the Alliance for Telecommunications Industry Solutions (ATIS) at < https://www.atis.org/docstore/product.aspx?id=24948>

[11] This document is available from the Alliance for Telecommunications Industry Solutions (ATIS) at < https://www.atis.org/docstore/product.aspx?id=26093>

[12] This document is available from the Alliance for Telecommunications Industry Solutions (ATIS) at < https://www.atis.org/docstore/product.aspx?id=24746>

[13] This document is available from the Alliance for Telecommunications Industry Solutions (ATIS) at < https://www.atis.org/docstore/product.aspx?id=27972>

[14] This document is available from the Alliance for Telecommunications Industry Solutions (ATIS) at < https://www.atis.org/docstore/product.aspx?id=24757>

[15] This document is available from the Alliance for Telecommunications Industry Solutions (ATIS) at < https://www.atis.org/docstore/product.aspx?id=25490>

ATIS-1000643.1998(R2013), Telecommunications – Integrated services digital network (ISDN) – Explicit call transfer supplementary service[17]

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[16] This document is available from the Alliance for Telecommunications Industry Solutions (ATIS) at < https://www.atis.org/docstore/product.aspx?id=24766>

[17] This document is available from the Alliance for Telecommunications Industry Solutions (ATIS) at < https://www.atis.org/docstore/product.aspx?id=27975>