Private Integrated Services Network (PISN) - Inter-Exchange Signalling Protocol - Call Intrusion Supplementary Service
Private Integrated Services Network (PISN) - Inter-Exchange Signalling Protocol - Call Intrusion Supplementary Service (QSIG-CI)
Brief History

This Standard is one of a series of ECMA Standards defining services and signalling protocols applicable to Private Integrated Services Networks (PISNs). The series uses ISDN concepts as developed by ITU-T and conforms to the framework of International Standards for Open Systems Interconnection as defined by ISO/IEC. It has been produced under ITSTC work item M-IT-05 5.1.2.3 and under ETSI work item DE/ECMA-00053.

This particular Standard specifies the signalling protocol for use at the Q reference point in support of the Call Intrusion supplementary service. The protocol defined in this Standard forms part of the PSS1 protocol (informally known as QSIG).

This Standard is based upon the practical experience of ECMA member companies and the results of their active and continuous participation in the work of ISO/IEC JTC1, ITU-T, ETSI and other international and national standardization bodies. It represents a pragmatic and widely based consensus.


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1 Scope

This Standard specifies the signalling protocol for the support of the Call Intrusion supplementary service (SS-CI) at the Q reference point between Private Integrated Services Network Exchanges (PINXs) connected together within a Private Integrated Services Network (PISN).

SS-CI is a supplementary service which, on request from the calling user, enables the calling user to establish communication with a busy called user by breaking into an established call between the called user and a third user (unwanted user).

The Q reference point is defined in ISO/IEC 11579-1.

Service specifications are produced in three stages and according to the method specified in ETS 300 387. This Standard contains the stage 3 specification for the Q reference point and satisfies the requirements identified by the stage 1 and stage 2 specifications in ISO/IEC 14845.

The signalling protocol for SS-CI operates on top of the signalling protocol for basic circuit switched call control, as specified in ECMA-143, and uses certain aspects of the generic procedures for the control of supplementary services specified in ECMA-165.

This Standard also specifies additional signalling protocol requirements for the support of interactions at the Q reference point between SS-CI and other supplementary services and ANFs.

NOTE 1 Additional interactions that have no impact on the signalling protocol at the Q reference point can be found in the relevant stage 1 specifications.

This Standard is applicable to PINXs which can interconnect to form a PISN.

2 Conformance

In order to conform to this Standard, a PINX shall satisfy the requirements identified in the Protocol Implementation Conformance Statement (PICS) proforma in annex B.

3 References (normative)

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

In the case of references to ECMA Standards that are aligned with ISO/IEC International Standards, the number of the appropriate ISO/IEC International Standard is given in brackets after the ECMA reference.

<table>
<thead>
<tr>
<th>ECMA-142</th>
<th>Private Integrated Services Network - Circuit-mode 64 kbit/s Bearer Services - Service Description, Functional Capabilities and Information Flows (International Standard ISO/IEC 11574)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECMA-174</td>
<td>Private Integrated Services Network - Inter-Exchange Signalling Protocol - Call Diversion Supplementary Services (International Standard ISO/IEC 13873)</td>
</tr>
</tbody>
</table>
4 Definitions
For the purposes of this Standard, the following definitions apply.

4.1 External definitions
This Standard uses the following terms defined in other documents:

- Application Protocol Data Unit (APDU) (ECMA-165)
- Basic Service (ITU-T Rec. I.210)
- Call, Basic Call (ECMA-165)
- Coordination Function (ECMA-165)
- Connection (ECMA-175)
- Cooperating PINX (ECMA-176)
- Established call (ECMA-202)
- Forced release (ECMA-202)
- Incoming Gateway PINX (ECMA-143)
- Inter-PINX link (ECMA-143)
- Interpretation APDU (ECMA-165)
- Intruding call (ECMA-202)
- Network Facility Extension (NFE) (ECMA-165)
- Notification (ECMA-165)
- Originating PINX (ECMA-143)
- Outgoing Gateway PINX (ECMA-143)
- Private Integrated Services Network (PISN) (ISO/IEC 11579-1)
- Private Integrated Services Network Exchange (PINX) (ISO/IEC 11579-1)
- Rerouting PINX (ISO/IEC 11573)
- Served user (ECMA-202)
- Signalling (ITU-T Rec. I.112)
- Supplementary Service (ITU-T Rec. I.210)
- Supplementary Services Control Entity (ECMA-165)
- Terminating PINX (ECMA-143)
- Transit PINX (ECMA-143)
- User (ECMA-142)

4.2 Other definitions

4.2.1 Busy
A property of a user for whom either a Network Determined User Busy or User Determined User Busy condition exists.

4.2.2 Conference type connection
A connection between the served user, the wanted user and the unwanted user, where all users have user information connection with each other.

4.2.3 Impending intrusion warning notification
A notification provided before communication is established between the served user and the wanted user.

4.2.4 Isolation
The breaking of the user information connection to and from the unwanted user during intrusion.

4.2.5 Path retention
The retaining of the network connection between the Originating PINX and the Terminating PINX so that a supplementary service (such as SS-CI) can be invoked without establishing a new connection.

4.2.6 Served User PINX
The PINX serving the served user.

4.2.7 Wanted user
The called user in the intruding call.

*NOTE 2*
This user is known as user B in ECMA-202.

4.2.8 Unwanted user
The user other than the wanted user in the established call.

*NOTE 3*
This user is known as user C in ECMA-202.

4.2.9 Unwanted User PINX
The PINX of the unwanted user.

4.2.10 Wait on busy
A condition in which the intruding call is disconnected from the wanted user and is waiting for the wanted user to become not busy.
6 Signalling protocol for the support of SS-CI

6.1 SS-CI description
SS-CI is a supplementary service which, on request from the calling user, enables the calling user to establish communication with a busy called user breaking into an established call between the called user and a third user (unwanted user).

SS-CI is applicable to all circuit mode basic services defined in ECMA-142.

6.2 SS-CI operational requirements

6.2.1 Requirements on an Originating PINX
Call establishment procedures for the outgoing side of an inter-PINX link and call release procedures, as specified in ECMA-143, shall apply.

Generic procedures for the call-related control of supplementary services, as specified in ECMA-165 for an End PINX, shall apply. In addition, the generic procedures for notification, as specified in ECMA-165 for an End PINX, shall apply.

6.2.2 Requirements on a Terminating PINX
Call establishment procedures for the incoming side of an inter-PINX link and call release procedures, as specified in ECMA-143.

Generic procedures for the call-related control of supplementary services, as specified in ECMA-165 for an End PINX, shall apply. In addition, the generic procedures for notification, as specified in ECMA-165 for an End PINX, shall apply.

6.2.3 Requirements on a Transit PINX
Basic call procedures, as specified in ECMA-143 for a Transit PINX, shall apply.

Generic procedures for the call-related control of supplementary services, as specified in ECMA-165 for a Transit PINX, shall apply. In addition, the generic procedures for notification, as specified in ECMA-165 for a Transit PINX, shall apply.

For SS-CI the requirements are limited to the passing on of Facility information elements for which the destination, as indicated in the NFE, is not the Transit PINX.
6.2.4 Requirements on an Unwanted User PINX

Generic procedures for the call-related control of supplementary services, as specified in ECMA-165 for an End PINX, shall apply. In addition, the generic procedures for notification, as specified in ECMA-165 for an End PINX, shall apply.
6.3 SS-CI coding requirements

6.3.1 Operations

The operations defined in Abstract Syntax Notation number 1 (ASN.1) in table 1 shall apply.

Table 1 - Operations in support of SS-CI

<table>
<thead>
<tr>
<th>Call-Intrusion-Operations</th>
</tr>
</thead>
<tbody>
<tr>
<td>{iso(1) standard(0) pss1-call-intrusion(14846) call-intrusion-operations(0) }</td>
</tr>
</tbody>
</table>

DEFINITIONS EXPLICIT TAGS ::=

BEGIN

IMPORTS OPERATION, ERROR FROM Remote-Operation-Notation
{joint-iso-ccitt(2) remote-operations(4) notation (0)}

Extension FROM Manufacturer-specific-service-extension-definition
{iso(1) standard(0) pss1-generic-procedures(11582) msi-definition(0)}

notAvailable, supplementaryServiceInteractionNotAllowed
FROM General-Error-List
{ccitt recommendation q 950 general-error-list (1)};

PathRetain ::= OPERATION
ARGUMENT PathRetainArg
-- this operation may be used by other supplementary services
-- using other values of argument

ServiceAvailable ::= OPERATION
ARGUMENT ServiceAvailableArg
-- this operation may be used by other supplementary services
-- using other values of argument

CallIntrusionRequest ::= OPERATION
ARGUMENT CIRequestArg
RESULT CIRequestRes
ERRORS {notAvailable, notBusy, temporarilyUnavailable, notAuthorized, unspecified, supplementaryServiceInteractionNotAllowed}

CallIntrusionGetCIPL ::= OPERATION
ARGUMENT DummyArg
RESULT CIGetCIPLRes

CallIntrusionForcedRelease ::= OPERATION
ARGUMENT DummyArg
RESULT DummyResult
ERRORS {notAvailable, unspecified, supplementaryServiceInteractionNotAllowed}

CallIntrusionIsolate ::= OPERATION
ARGUMENT DummyArg
RESULT DummyResult
ERRORS {notAvailable, unspecified, supplementaryServiceInteractionNotAllowed}
### Table 1 - Operations in support of SS-CI (continued)

<table>
<thead>
<tr>
<th>Operation</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>CallIntrusionWOBRequest</td>
<td><code>::= OPERATION</code></td>
</tr>
<tr>
<td></td>
<td>ARGUMENT DummyArg</td>
</tr>
<tr>
<td></td>
<td>RESULT DummyResult</td>
</tr>
<tr>
<td></td>
<td>ERRORS {notAvailable, unspecified, supplementaryServiceInteractionNotAllowed}</td>
</tr>
<tr>
<td>CallIntrusionCompleted</td>
<td><code>::= OPERATION</code></td>
</tr>
<tr>
<td></td>
<td>ARGUMENT DummyArg</td>
</tr>
<tr>
<td>PathRetainArg</td>
<td><code>::= CHOICE {serviceList ServiceList, extendedServiceList SEQUENCE{ serviceList ServiceList, extension Extension } }</code></td>
</tr>
<tr>
<td>ServiceAvailableArg</td>
<td><code>::= CHOICE {serviceList ServiceList, extendedServiceList SEQUENCE{ serviceList ServiceList, extension Extension } }</code></td>
</tr>
<tr>
<td>ServiceList</td>
<td><code>::= BIT STRING (ci-low(4), ci-medium(5), ci-high(6)) (SIZE(1..32))</code></td>
</tr>
<tr>
<td></td>
<td>-- bits other than ci-low, ci-medium, ci-high are reserved</td>
</tr>
<tr>
<td></td>
<td>-- for other supplementary services</td>
</tr>
</tbody>
</table>
Table 1 - Operations in support of SS-CI (concluded)

| CICapabilityLevel ::= ENUMERATED{                       |
| intrusionLowProt(1),                                   |
| intrusionMediumProt(2),                                 |
| intrusionHighProt(3)}                                |
| CIProtectionLevel ::= ENUMERATED{                        |
| lowProtection(0),                                      |
| mediumProtection(1),                                   |
| highProtection(2),                                     |
| fullProtection(3)}                                     |
| CIUnwantedUserStatus ::= ENUMERATED{                    |
| unwantedUserIntruded(0),                                |
| unwantedUserIsolated(1)}                               |
| CfbOverride ::= OPERATION                                |
| ARGUMENT DummyArg                                      |
| -- used in the interaction with Call Forwarding Busy    |
| pathRetain PathRetain ::= 41                           |
| serviceAvailable ServiceAvailable ::= 42               |
| callIntrusionRequest CallIntrusionRequest ::= 43        |
| callIntrusionGetCIPL CallIntrusionGetCIPL ::= 44        |
| callIntrusionIsolate CallIntrusionIsolate ::= 45        |
| callIntrusionForcedRelease CallIntrusionForcedRelease ::= 46 |
| callIntrusionWOBRequest CallIntrusionWOBRequest ::= 47  |
| callIntrusionCompleted CallIntrusionCompleted ::= 48    |
| cfbOverride CfbOverride ::= 49                         |
| notBusy ERROR ::= 1009                                  |
| -- used when an SS-CI request is received in            |
| -- a Terminating PINX and the called user is not busy  |
| temporarilyUnavailable ERROR ::= 1000                   |
| -- used when conditions for invocation of SS-CI        |
| -- are momentarily not met                             |
| notAuthorized ERROR ::= 1007                            |
| -- used when a SS-CI request is rejected                |
| -- because of insufficient CI CL                       |
| Unspecified ::= ERROR PARAMETER Extension               |
| unspecified Unspecified ::= 1008                       |
| END -- of Call-Intrusion-Operations                     |
6.3.2 Notifications

The following notification, defined in Abstract Syntax Notation number 1 (ASN.1) in table 2 shall apply.

Table 2 - Notifications in support of SS-CI

<table>
<thead>
<tr>
<th>Call-Intrusion-Notifications</th>
<th>{iso(1) standard(0) pss1-call-intrusion(14846) call-intrusion-notifications(1)}</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEFINITIONS EXPLICIT TAGS</td>
<td>=:</td>
</tr>
<tr>
<td>BEGIN</td>
<td></td>
</tr>
<tr>
<td>IMPORTS</td>
<td>NOTIFICATION FROM Notification-Data-Structure {iso(1) standard(0) pss1-generic-procedures(11582) notification-data-structure(7)};</td>
</tr>
<tr>
<td>RemoteUserAlerting</td>
<td>NOTIFICATION ARGUMENT NULL</td>
</tr>
<tr>
<td>IntrusionIsImpending</td>
<td>NOTIFICATION ARGUMENT NULL</td>
</tr>
<tr>
<td>IntrusionIsEffective</td>
<td>NOTIFICATION ARGUMENT NULL</td>
</tr>
<tr>
<td>IsolationThroughIntrusion</td>
<td>NOTIFICATION ARGUMENT NULL</td>
</tr>
<tr>
<td>ForcedReleaseAfterIntrusion</td>
<td>NOTIFICATION ARGUMENT NULL</td>
</tr>
<tr>
<td>EndOfIntrusion</td>
<td>NOTIFICATION ARGUMENT NULL</td>
</tr>
<tr>
<td>remoteUserAlerting</td>
<td>2000</td>
</tr>
<tr>
<td>intrusionIsImpending</td>
<td>2003</td>
</tr>
<tr>
<td>intrusionIsEffective</td>
<td>2004</td>
</tr>
<tr>
<td>isolationThroughIntrusion</td>
<td>2005</td>
</tr>
<tr>
<td>forcedReleaseAfterIntrusion</td>
<td>2006</td>
</tr>
<tr>
<td>endOfIntrusion</td>
<td>2007</td>
</tr>
<tr>
<td>END</td>
<td>--of Call-Intrusion-Notifications</td>
</tr>
</tbody>
</table>

6.3.3 Information elements

6.3.3.1 Facility information element

The operations defined above shall be coded in the Facility information element in accordance with ECMA-165.

When conveying an APDU of operations callIntrusionRequest, callIntrusionGetCIPL, callIntrusionForcedRelease, callIntrusionIsolate, callIntrusionWOBRequest, callIntrusionCompleted, the NFE shall be included.

When conveying an invoke APDU of operations callIntrusionRequest, callIntrusionGetCIPL, callIntrusionForcedRelease, callIntrusionIsolate, callIntrusionWOBRequest, callIntrusionCompleted, the destinationEntity data element of the NFE shall contain value endPTNX.
When conveying the invoke APDU of operation callIntrusionCompleted, the Interpretation APDU shall be included and have the value discardAnyUnrecognisedInvokePdu.

When conveying the invoke APDUs of operations callIntrusionRequest, callIntrusionGetCIPL, callIntrusionForcedRelease, callIntrusionIsolate and callIntrusionWOBRequest, the Interpretation APDU shall be omitted.

*NOTE 4*
Additional requirements for the conveyance of APDUs of operations pathRetain and serviceAvailable are given in A.3.2 of annex A.

6.3.3.2 Notification indicator information element
The notification defined above shall be coded in the Notification indicator information element in accordance with ECMA-165.

6.3.3.3 Other information elements
Any other information elements (e.g. Progress indicator) shall be coded in accordance with the rules of ECMA-143.

6.3.4 Messages
Messages used for call establishment and release shall be as specified in ECMA-143.

The Facility information element and the Notification indicator information element shall be conveyed in the messages as specified in ECMA-165.

6.4 SS-CI state definitions

6.4.1 States at the Originating PINX
The procedures for the Originating PTNX are written in terms of the following conceptual states existing within the SS-CI Supplementary Service Control entity in that PTNX in association with a particular call.

6.4.1.1 State CI-Idle
SS-CI is not operating.

6.4.1.2 State CI-Wait-Ack
The Originating PINX has requested SS-CI and is waiting for an acknowledgement from the Terminating PINX.

6.4.1.3 State CI-Orig-Invoked
SS-CI has been invoked successfully and the unwanted user has not been isolated.

6.4.1.4 State CI-inForcedRelease-Request
Following intrusion, the Originating PINX has requested the forced release of the unwanted user and is waiting for an acknowledgement from the Terminating PINX.

6.4.1.5 State CI-Isolation-Request
Following intrusion, the Originating PINX has requested the isolation of the unwanted user and is waiting for an acknowledgement from the Terminating PINX.

6.4.1.6 State CI-inWOB-Request
Following intrusion, the Originating PINX has requested WOB.

6.4.1.7 State CI-Orig-Isolated
SS-CI has been invoked successfully and the unwanted user has been isolated.

6.4.1.8 State CI-IsForcedRelease-Request
Following isolation, the Originating PINX has requested the forced release of the unwanted user and is waiting for an acknowledgement from the Terminating PINX.

6.4.1.9 State CI-isWOB-Request
Following isolation, the Originating PINX has requested WOB.
6.4.1.10 State CI-Orig-WOB
Wait on busy is in progress.

6.4.1.11 State CI-Wait-Ack-WOB
While wait on busy is in progress, the Originating PINX has requested intrusion again and is waiting for an acknowledgement from the Terminating PINX.

6.4.2 States at the Terminating PINX
The procedures for the Terminating PINX are written in terms of the following conceptual states existing within the SS-CI Supplementary Service Control functional entity in that PINX in association with a particular call.

6.4.2.1 State CI-Idle
SS-CI is not operating.

6.4.2.2 State CI-GetCIPL-I
The Terminating PINX has requested the CIPL of the unwanted user after intrusion has been requested and is waiting for the result.

6.4.2.3 State CI-Dest-Notify
Following invocation of intrusion, the Terminating PINX has notified an impending intrusion to the unwanted user and is waiting the end of the impending phase before starting intrusion.

6.4.2.4 State CI-Dest-Invoked
SS-CI has been invoked successfully and the unwanted user has not been isolated.

6.4.2.5 State CI-Dest-Isolated
SS-CI has been invoked successfully and the unwanted user has been isolated.

6.4.2.6 State CI-Dest-WOB
Wait on busy is in progress.

6.4.2.7 State CI-GetCIPL-WOB
The Terminating PINX has requested the CIPL of the unwanted user after intrusion has been requested again during wait on busy and is waiting for the result.

6.4.2.8 State CI-Dest-Notify-WOB
Following invocation of intrusion during wait on busy, the Terminating PINX has notified an impending intrusion to the unwanted user and is waiting for the end of the impending phase before starting intrusion.

6.5 SS-CI signalling procedures for activation, deactivation and registration
Not applicable.

6.6 SS-CI signalling procedures for invocation and operation
The following procedures are call-associated.

SS-CI may be invoked in two ways depending on whether the network connection is retained when a call encounters a busy called user. Retention of the network connection makes use of a generic path retention mechanism, which is specified in annex A.

Some examples of message sequences are shown in annex C.

6.6.1 Actions at the Originating PINX
For a given call, the Originating PINX may choose one of the two following methods for invocation of SS-CI:
- invocation without path retention;
- invocation with path retention.

For invocation with path retention, the procedures specified below apply in conjunction with the procedures specified in A.5.1 of annex A.
For each method, if the basic call clears in circumstances other than those covered below, SS-CI shall terminate, any SS-CI timer shall be stopped, and state CI-Idle shall be entered (e.g. on calling user release, call failure, etc.).

The SDL representation of procedures at the Originating PINX is shown in D.1 of annex D.

6.6.1 Procedure for invocation of SS-CI

6.6.1.1 Normal procedure

To invoke SS-CI, the Originating PINX shall send a callIntrusionRequest invoke APDU, start timer T1 and enter state CI-Wait-Ack. For invocation without path retention, the APDU shall be sent in the SETUP message that establishes the call. For invocation with path retention, the APDU shall be sent in a FACILITY message using the call reference of a call for which the network connection has been retained in accordance with A.5.1 of annex A (path retention state PRTO-Retained) and for which the received serviceAvailable invoke APDU indicated that SS-CI is invokable. The argument shall convey the CICL of the calling user.

In state CI-Wait-Ack, on receipt of a CONNECT message including a callIntrusionRequest return result APDU with a result indicating intrusion on the unwanted user (value "unwantedUserIntruded"), the Originating PINX may confirm invocation of SS-CI to the calling user, shall stop timer T1 and shall enter state CI-Orig-Invoked.

In state CI-Wait-Ack, on receipt of a CONNECT message including a callIntrusionRequest return result APDU with a result indicating isolation of the unwanted user (value "unwantedUserIsolated"), the Originating PINX may confirm invocation of SS-CI to the calling user, shall stop timer T1 and shall enter state CI-Orig-Isolated.

6.6.1.2 Exceptional procedure

In state CI-Wait-Ack, on receipt of:
− any message containing a callIntrusionRequest return error or reject APDU, or
− an ALERTING, CONNECT or DISCONNECT message without a callOfferRequest return result, return error or reject APDU,
the Originating PINX shall stop timer T1 and enter state CI-Idle. Failure of SS-CI may be indicated to the calling user and the call shall continue in accordance with ECMA-143.

On expiry of timer T1, the Originating PINX shall enter state CI-Idle. Failure of SS-CI may be indicated to the calling user and the call shall continue in accordance with ECMA-143.

6.6.1.3 Optional procedure for invocation of isolation

6.6.1.3.1 Normal procedure

In state CI-Orig-Invoked, if isolation of the unwanted user is requested, the Originating PINX shall send a callIntrusionIsolate invoke APDU in a FACILITY message, start timer T2 and enter the state CI-Isolation-Request.

In state CI-Isolation-Request, on receipt of a callIntrusionIsolate return result APDU in a FACILITY message, the Originating PINX may indicate the result of the isolation request to the calling user, shall stop timer T2 and enter state CI-Orig-Isolated.

6.6.1.3 Exceptional procedure

In state CI-Isolation-Request, on receipt of a FACILITY message containing a callIntrusionIsolationRequest return error or reject APDU, the Originating PINX may indicate failure of the isolation request to the calling user, shall stop timer T2 and return to state CI-Orig-Invoked; upon expiry of timer T2, the Originating PINX may indicate the rejection of the isolation request to the calling user and shall return to state CI-Orig-Invoked.

6.6.1.4 Optional procedure for invocation of forced release

6.6.1.4.1 Normal procedure

In state CI-Orig-Invoked or state CI-Orig-Isolated, if forced release of the unwanted user is requested, the Originating PINX shall send a callIntrusionForcedRelease invoke APDU in a FACILITY message, start timer T3 and enter respectively state CI-inForcedRelease-Request or state CI-isForcedRelease-Request.
In state CI-inForcedRelease-Request or state CI-isForcedRelease-Request, on receipt of a callIntrusionForcedRelease return result APDU in a FACILITY message, the Originating PINX may indicate the result of the forced release request to the calling user, shall stop timer T3 and shall enter the state CI-Idle.

6.6.1.3.2 Exceptional procedure
In state CI-inForcedRelease-Request or state CI-isForcedRelease-Request, on receipt of a FACILITY message containing a callIntrusionForcedRelease return error or reject APDU, the Originating PINX may indicate failure of the forced release request to the calling user, shall stop timer T3 and return to previous state CI-Orig-Invoked or state CI-Orig-Isolated; upon expiry of timer T3, the Originating PINX may indicate the rejection of the forced release request to the calling user and shall return to previous state CI-Orig-Invoked or state CI-Orig-Isolated.

6.6.1.4 Optional procedure for invocation of wait on busy

6.6.1.4.1 Normal procedure
In state CI-Orig-Invoked or state CI-Orig-Isolated, if wait on busy is requested, the Originating PINX shall send a callIntrusionWOBRequest invoke APDU in a FACILITY message, start timer T4 and enter respectively state CI-inWOB-Request or state CI-isWOB-Request.

In state CI-inWOB-Request or state CI-isWOB-Request, on receipt of a callIntrusionWOBRequest return result APDU in a FACILITY message, the Originating PINX may indicate the result of the wait on busy request to the calling user, shall stop timer T4 and shall enter the state CI-Orig-WOB.

6.6.1.4.2 Exceptional procedure
In state CI-inWOB-Request or state CI-isWOB-Request, on receipt of a FACILITY message containing a callIntrusionWOBRequest return error or reject APDU, the Originating PINX may indicate failure of the wait on busy request to the calling user, shall stop timer T4 and return to previous state CI-Orig-Invoked or state CI-Orig-Isolated; upon expiry of timer T4, the Originating PINX may indicate the rejection of the WOB request to the calling user and shall return to previous state CI-Orig-Invoked or state CI-Orig-Isolated.

6.6.1.5 Procedure for reinvocation of intrusion during wait on busy

6.6.1.5.1 Normal procedure
In state CI-Orig-WOB, if call intrusion is requested again, the Originating PINX shall send a callIntrusionRequest invoke APDU in a FACILITY message. The Originating PINX shall start timer T1 and enter state CI-Wait-Ack-WOB.

In state CI-Wait-Ack-WOB, on receipt of a FACILITY message including a callIntrusionRequest return result APDU with a result indicating intrusion on the unwanted user (unwantedUserIntruded), the Originating PINX may confirm invocation of SS-CI to the calling user, shall stop timer T1 and shall enter state CI-Orig-Invoked.

In state CI-Wait-Ack-WOB, on receipt of a FACILITY message including a callIntrusionRequest return result APDU with a result indicating isolation of the unwanted user (unwantedUserIsolated), the Originating PINX may confirm invocation of SS-CI to the calling user, shall stop timer T1 and shall enter state CI-Orig-Isolated.

6.6.1.5.2 Exceptional procedure
In state CI-Wait-Ack-WOB, on receipt of a FACILITY message containing a callIntrusionRequest return error or reject APDU, the Originating PINX may indicate the failure of SS-CI to the calling user, shall stop timer T1 and return to state CI-Orig-WOB.

On expiry of timer T1, the Originating PINX shall enter state CI-Orig-WOB. Failure of SS-CI may be indicated to the calling user.

6.6.1.6 Procedure for completion of SS-CI

6.6.1.6.1 Normal procedure
In any state except CI-Idle and CI-Wait-Ack, on receipt of a callIntrusionCompleted invoke APDU in a FACILITY message, the Originating PINX may indicate completion of SS-CI to the calling user, shall stop any SS-CI timer and shall enter state CI-Idle.
6.6.1.6.2 Exceptional procedure
None.

6.6.2 Actions at the Terminating PINX
The Terminating PINX shall support the two methods of invocation.

For invocation with path retention, the procedures specified below apply in conjunction with the procedures specified in A.5.2 of annex A.

For each method, if the basic call clears in circumstances other than those covered below, SS-CI shall terminate, any SS-CI timer shall be stopped, and state CI-Idle shall be entered.

The SDL representation of procedures at the Terminating PINX is shown in D.2 of annex D.

6.6.2.1 Procedure for invocation of SS-CI

6.6.2.1.1 Normal procedure

If, while processing an incoming SETUP message in accordance with the procedures of ECMA-143, the called user is found to be busy, and if the SETUP message contained a callIntrusionRequest invoke APDU, the Terminating PINX shall not send a DISCONNECT message but shall check whether SS-CI is possible.

If, having retained a network connection in accordance with A.5.2 of annex A and having indicated in the serviceAvailable invoke APDU that SS-CI is invokable, a FACILITY message is received containing a callIntrusionRequest invoke APDU, the Terminating PINX shall check again whether the called user is busy and if so shall check whether SS-CI is still possible.

To check whether SS-CI is possible, the Terminating PINX shall check that the called user is involved in a compatible established call in basic call state Active, that the CIPL of the called user is lower than the received CICL of the calling user, and that there are no other reasons for denying intrusion (e.g. if the established call is already being intruded on). If as far as the Terminating PINX is concerned, SS-CI is possible, the Terminating PINX shall send a callIntrusionGetCIPL invoke APDU in a FACILITY message to the Unwanted User PINX, start timer T5 and enter the state CI-GetCIPL-I.

NOTE 5
The method by which the Terminating PINX checks whether an established call is compatible with the intruding call is outside the scope of this Standard.

In state CI-GetCIPL-I, on receipt of callIntrusionGetCIPL return result APDU in a FACILITY message, the Terminating PINX shall stop timer T5 and check that the CIPL of the unwanted user is lower than the CICL of the calling user.

If all conditions are met, the Terminating PINX may provide a notification of impending intrusion to users in the established call. If notification of impending intrusion is not to be given, execution of intrusion shall take place immediately. If notification of impending intrusion is to be given, the Terminating PINX shall send on the call reference of the established call a NOTIFY message containing notification value "intrusionIsImpending", may send on the call reference of the intruding call a NOTIFY message containing notification value "intrusionIsImpending", shall start timer T6 and shall enter state CI-Dest-Notify. Execution of intrusion shall commence on expiry of timer T6 in state CI-Dest-Notify.

Execution of intrusion shall result either in a conference type connection involving all three users (the calling user, the called user and the unwanted user) or in isolation of the unwanted user (disconnection of the unwanted user and connection of the calling user and the called user).

If a conference type connection is established, the Terminating PINX shall send using the call reference of the intruding call a CONNECT message containing a callIntrusionRequest return result APDU containing value "unwantedUserIntruded". The Terminating PINX shall also send a NOTIFY message containing notification value "intrusionIsEffective" using the call reference of the established call. The Terminating PINX shall enter state CI-Dest-Invoked.

If the unwanted user is isolated, the Terminating PINX shall send using the call reference of the intruding call a CONNECT message containing a callIntrusionRequest return result APDU containing value "unwantedUserIsolated". The Terminating PINX shall also send a NOTIFY message containing
notification value "isolationThroughIntrusion" using the call reference of the established call. The Terminating PINX shall enter state CI-Dest-Isolated.

6.6.2.1.2 Exceptional procedure

On receipt of a SETUP or FACILITY message containing a callIntrusionRequest invoke APDU, if the called user is not busy the call shall continue in accordance with ECMA-143. The Terminating PINX shall return a callIntrusionRequest return error APDU containing error notBusy in the resulting ALERTING or CONNECT message and shall remain in state CI-Idle.

On receipt of a SETUP or FACILITY message containing a callIntrusionRequest invoke APDU, if the called user is busy but invocation of SS-CI is not possible (including the case where the received callIntrusionGetCIPL return result APDU indicates a CIPL that is too high) the intruding call shall be released in accordance with ECMA-143 or, if continued retention of the path is required, shall continue in accordance with A.5.2 of annex A. The Terminating PINX shall contain a callIntrusionRequest return error APDU containing an error other than notBusy in the resulting DISCONNECT or FACILITY message and shall remain in or enter state CI-Idle.

In the state CI-GetCIPL-I, on receipt of a callIntrusionGetCIPL reject APDU containing problem code "unrecognizedOperation" in a FACILITY message from the Unwanted User PINX, the Terminating PINX shall stop timer T5, and shall apply the procedures described in 6.6.2.1.1 for receipt of a return result APDU with the lowest value of CIPL.

On expiry of timer T5 or on receipt of a callIntrusionGetCIPL reject APDU containing a problem code other than "unrecognizedOperation", the Terminating PINX shall apply the procedures specified when the called user is busy and invocation of SS-CI is not possible. The error value used shall be "temporarilyUnavailable".

If, during state CI-Dest-Notify or state CI-GetCIPL-I, the called user becomes not busy and presentation of the intruding call becomes possible, a callIntrusionRequest return error APDU containing error notBusy shall be sent in the resulting ALERTING or CONNECT message, timer T6 or T5 shall be stopped and state CI-Idle shall be entered.

If, during state CI-Dest-Notify or state CI-GetCIPL-I, the established call is released but the called user remains busy, a callIntrusionRequest return error APDU containing error temporarilyUnavailable shall be sent in the resulting DISCONNECT message, timer T6 or T5 shall be stopped and state CI-Idle shall be entered.

6.6.2 Optional procedures for invocation of isolation

6.6.2.2 Optional procedures for invocation of isolation

6.6.2.2.1 Normal procedure

In state CI-Dest-Invoked, on receipt of a callIntrusionIsolate invoke APDU in a FACILITY message from the Originating PINX, the Terminating PINX shall disconnect the unwanted user from the conference type connection and leave the calling and called users connected together. The Terminating PINX shall also send a callIntrusionIsolate return result to the Originating PINX, shall send to the Unwanted User PINX the notification description value "isolationThroughIntrusion" in a NOTIFY message and enter the state CI-Dest-Isolated.

6.6.2.2.2 Exceptional procedure

In the state CI-Dest-Invoked, on receipt of a callIntrusionIsolate invoke APDU in a FACILITY message from the Originating PINX, if isolation is not possible, the Terminating PINX shall send a callIntrusionIsolate return error APDU in a FACILITY message to the Originating PINX and remain in the state CI-Dest-Invoked.

6.6.2.3 Optional procedures for invocation of forced release

6.6.2.3.1 Normal procedure

In state CI-Dest-Invoked or CI-Dest-Isolated, on receipt of a callIntrusionForcedRelease invoke APDU in a FACILITY message from the Originating PINX, the Terminating PINX shall initiate release of the established call in accordance with the procedures of ECMA-143. From state CI-Dest-Invoked, the Terminating PINX shall disconnect the unwanted user from the conference type connection and leave the calling and called users connected together. The Terminating PINX shall also send a callIntrusionForcedRelease return result APDU to the Originating PINX, shall send to the Unwanted User
PINX the notification description value "forcedReleaseAfterIntrusion" in the DISCONNECT message and enter the state CI-Idle.

6.6.2.3.2 Exceptional procedure

In the state CI-Dest-Invoked or CI-Dest-Isolated, on receipt of a callIntrusionForcedRelease invoke APDU in a FACILITY message from the Originating PINX, if forced release is not possible, the Terminating PINX shall send a callIntrusionForcedRelease return error APDU in a FACILITY message to the Originating PINX and remain in existing state CI-Dest-Invoked or CI-Dest-Isolated.

6.6.2.4 Optional procedures for invocation of wait on busy

6.6.2.4.1 Normal procedure

In state CI-Dest-Invoked or CI-Dest-Isolated, upon receipt of a callIntrusionWOBRequest invoke APDU in a FACILITY message from the Originating PINX, if WOB is possible the Terminating PINX shall disconnect the calling user from the conference type connection or from the called user, and shall reconnect the unwanted user to the called user. The Terminating PINX shall also send a callIntrusionWOBRequest return result APDU to the Originating PINX, shall send to the Unwanted User PINX the notification description value "endOfIntrusion" in a NOTIFY message and enter the state CI-Dest-WOB. The established call shall no longer be associated with the waiting intruding call and shall continue as if SS-CI had not occurred.

6.6.2.4.2 Exceptional procedure

In the state CI-Dest-Invoked or CI-Dest-Isolated, on receipt of a callIntrusionWOBRequest invoke APDU in a FACILITY message from the Originating PINX, if wait on busy is not possible, the Terminating PINX shall send a callIntrusionWOBRequest return error APDU in a FACILITY message to the Originating PINX and remain in respective states CI-Dest-Invoked or CI-Dest-Isolated.

6.6.2.5 Procedures for reinvocation of intrusion during wait on busy

6.6.2.5.1 Normal procedure

In state CI-Dest-WOB, on receipt of a callIntrusionRequest invoke APDU in a FACILITY message, the Terminating PINX shall check whether reinvocation of intrusion is possible.

To check whether reinvocation of intrusion is possible, the Terminating PINX shall check that the called user is involved in a compatible established call in basic call state Active, that the CIPL of the called user is lower than the received CICL of the calling user, and that there are no other reasons for denying intrusion (e.g. if the established call is already being intruded on). If, as far as the Terminating PINX is concerned, reinvocation of intrusion is possible, the Terminating PINX shall send a callIntrusionGetCIPL invoke APDU in a FACILITY message to the Unwanted User PINX, start timer T5 and enter the state CI-GetCIPL-WOB.

In state CI-GetCIPL-WOB, on receipt of callIntrusionGetCIPL return result APDU in a FACILITY message, the Terminating PINX shall stop timer T5 and check that the CIPL of the unwanted user is lower than the CICL of the calling user.

If all conditions are met, the Terminating PINX may provide a notification of impending intrusion to users in the established call. If notification of impending intrusion is not to be given, execution of intrusion shall take place immediately. If notification of impending intrusion is to be given, the Terminating PINX shall send on the call reference of the established call a NOTIFY message containing notification value "intrusionIsImpending", may send on the call reference of the intruding call a NOTIFY message containing notification value "intrusionIsImpending", shall start timer T6 and shall enter state CI-Dest-Notify-WOB. Execution of intrusion shall commence on expiry of timer T6 in state CI-Dest-Notify-WOB.

Execution of intrusion shall result either in a conference type connection involving all three users (the calling user, the called user and the unwanted user) or in isolation of the unwanted user (disconnection of the unwanted user and connection of the calling user and the called user).

If a conference type connection is established, the Terminating PINX shall send using the call reference of the intruding call a FACILITY message containing a callIntrusionRequest return result APDU containing value "unwantedUserIntruded". The Terminating PINX may also send a NOTIFY message containing notification value "intrusionIsEffective" using the call reference of the established call. The Terminating PINX shall enter state CI-Dest-Invoked.
If the unwanted user is isolated, the Terminating PINX shall send, using the call reference of the intruding call, a FACILITY message containing a callIntrusionRequest return result APDU containing value "unwantedUserIsolated". The Terminating PINX shall also send a NOTIFY message containing notification value "isolationThroughIntrusion" using the call reference of the established call. The Terminating PINX shall enter state CI-Dest-Invoked.

6.6.2.5.2 Exceptional procedure

On receipt of a FACILITY message containing a callIntrusionRequest invoke APDU while in state CI-Dest-WOB, if reinvocation of intrusion is not possible (including the case where the received callIntrusionGetCIPL return result APDU indicates a CIPL that is too high) the Terminating PINX shall send back a callIntrusionRequest return error APDU containing an appropriate error in a FACILITY message and shall remain in or reenter state CI-Dest-WOB.

In the state CI-GetCIPL-WOB, on receipt of a callIntrusionGetCIPL reject APDU containing problem code "unrecognized operation" in a FACILITY message from the Unwanted User PINX, the Terminating PINX shall stop timer T5, and shall apply the procedures described in 6.6.2.5.1 for receipt of a return result APDU with the lowest value of CIPL.

On expiry of timer T5 or on receipt of a callIntrusionGetCIPL reject APDU containing a problem code other than "unrecognizedOperation", the Terminating PINX shall send a callIntrusionRequest return error APDU containing error value "temporarilyUnavailable" in a FACILITY message to the Originating PINX and shall reenter state CI-Dest-WOB.

6.6.2.6 Procedures for completion of SS-CI

6.6.2.6.1 Normal procedure

In state CI-Dest-Invoked, or CI-Dest-Isolated, if the established call is released, the Terminating PINX shall send a callIntrusionCompleted invoke APDU in a FACILITY message to the Originating PINX and enter the state CI-Idle. The intruding call shall continue as a basic call in state Active and the calling and called users shall remain connected together.

In state CI-Dest-WOB, if the called user answers the waiting intruding call (having made available the necessary resources, e.g. by releasing or placing on hold another call), the Terminating PINX shall send a callIntrusionCompleted invoke APDU in a FACILITY message to the Originating PINX and enter state CI-Idle. The intruding call shall continue as a basic call in state Active and the calling and called users shall be connected together.

In state CI-Dest-WOB, if the called user becomes not busy and alerting commences, the Terminating PINX shall send a NOTIFY message containing notification value "remoteUserAlerting" and remain in the same state.

If the intruding call is released in any state, the Terminating PINX shall enter state CI-Idle and stop any SS-CI timer. If release occurs during state CI-Dest-Notify, CI-Dest-Notify-WOB, CI-Dest-Invoked or CI-Dest-Isolated, the established call shall be restored to the state that existed prior to intrusion and a NOTIFY message containing notification description value "endOfIntrusion" shall be sent on the call reference of the established call.

6.6.2.6.2 Exceptional procedure

In state CI-GetCIPL-WOB or CI-Dest-Notify-WOB, if the called user answers (having made available the necessary resources, e.g. by releasing or placing on hold another call), the Terminating PINX shall stop timer T5 or T6, send a callIntrusionRequest return error APDU containing error notBusy together with a callIntrusionCompleted invoke APDU in a FACILITY message and enter state CI-Idle. The intruding call shall continue as a basic call in state Active and the calling and called users shall be connected together.

In state CI-Get-CIPL-WOB or CI-Dest-Notify-WOB, if the called user becomes not busy and alerting commences, the Terminating PINX shall stop timer T5 or T6, send a callIntrusionRequest return error APDU containing error notBusy together with notification value "remoteUserAlerting" in a FACILITY message and enter state CI-Dest-WOB.
6.6.3 **Actions at the Unwanted User PINX**

On receipt of a callIntrusionGetCIPL invoke APDU in a FACILITY message, the Unwanted User PINX shall send a FACILITY message to the Terminating PINX. The FACILITY message shall include a callIntrusionGetCIPL return result APDU with the CIPL of the unwanted user.

6.6.4 **Actions at a Transit PINX**

No special actions are required in support of SS-CI.

6.7 **SS-CI impact of interworking with public ISDNs**

On a call to a PISN from a public ISDN that does not support an equivalent service, SS-CI will not be requested.

On a call from a PISN to a public ISDN that does not support an equivalent service, the Outgoing Gateway PINX shall behave as specified in 6.6.2 for a Terminating PINX at which conditions for invocation of SS-CI are not met.

If the unwanted user is in a public ISDN, the Gateway PINX shall respond to the callIntrusionGetCIPL invoke APDU by supplying a CIPL on behalf of the unwanted user.

**NOTE 6**

A Gateway PINX can supply the same CIPL for all calls or can introduce some discrimination, e.g. according to the direction of the call.

If the unwanted user is in a public ISDN that does not support an equivalent service, the Gateway PINX shall discard any SS-CI notification.

**NOTE 7**

At the time of publication of this Standard, no equivalent service has been specified for public ISDNs.

6.8 **SS-CI impact of interworking with non-ISDNs**

When interworking with a non-ISDN which does not support an equivalent service, the procedures defined in 6.7 for interworking with a public ISDN that does not support an equivalent service shall apply.

When interworking with a non-ISDN which supports an equivalent service, the two networks may cooperate in the operation of SS-CI. In this case, either the Originating PINX functionality or the Terminating PINX functionality or the Unwanted User PINX functionality will be provided in the non-ISDN. The Incoming or Outgoing Gateway PINX shall provide conversion between the signalling protocol specified in this Standard and the signalling protocol of the other network.

6.9 **Protocol interactions between SS-CI and other supplementary services and ANFs**

This clause specifies protocol interactions with other supplementary services and ANFs for which stage 3 standards had been published at the time of publication of this Standard. For interactions with supplementary services and ANFs for which stage 3 standards are published subsequent to the publication of this Standard, see those other stage 3 standards.

**NOTE 8**

Additional interactions that have no impact on the signalling protocol at the Q reference point can be found in the relevant stage 1 specifications.

**NOTE 9**

Simultaneous conveyance of APDUs for SS-CI and another supplementary service or ANF in the same message, each in accordance with the requirements of its respective stage 3 standard, does not, on its own, constitute a protocol interaction.

6.9.1 **Interaction with Calling Name Identification Presentation (SS-CNIP)**

No protocol interaction.

6.9.2 **Interaction with Connected Name Identification Presentation (SS-CONP)**

No protocol interaction.

6.9.3 **Interaction with Call Completion to Busy Subscriber (SS-CCBS)**

No protocol interaction.
6.9.4 Interaction with Call Completion on No Reply (SS-CCNR)
No protocol interaction.

6.9.5 Interaction with Call Transfer (SS-CT)
The following protocol interactions shall apply if SS-CT is supported in accordance with ECMA-178.

6.9.5.1 Notifications to User B of SS-CT
6.9.5.1.1 Actions at the Transferring PINX for transfer by join
If call transfer by join is performed at the SS-CI Originating PINX during state CI-Orig-WOB, the Transferring PINX shall initiate the normal procedures for transfer by join except that the behaviour shall be as if the secondary call basic call protocol control state were "Call Delivered". On receipt of a callIntrusionCompleted invoke APDU from the Secondary PINX, the Transferring PINX shall act as if a CONNECT message had been received, i.e. send a FACILITY message with a callTransferActive invoke APDU to the Primary PINX and enter state CT-Idle.

6.9.5.1.2 Actions at the Secondary PINX for transfer by join
If call transfer by join is performed and the Secondary PINX is also a SS-CI Terminating PINX in state CI-Dest-WOB, the Secondary PINX may send a "call is a waiting call" notification, as defined in ECMA-165, in a Notification indicator information element in a NOTIFY message to the Primary PINX using the call reference on which the callTransferComplete invoke APDU was received. If this notification is not sent, then when User C of SS-CT becomes not busy, no remoteUserAlerting notification shall be sent.

6.9.5.1.3 Actions at the Secondary PINX for transfer by rerouteing
If call transfer by rerouteing is performed and the SS-CI Terminating PINX is in state CI-Dest-WOB, the Secondary PINX shall act as if the secondary call had been in basic call protocol control state Call Received, i.e. send the callTransferSetup return result APDU in an ALERTING message. The ALERTING message may contain a notification "call is a waiting call", as defined in ECMA-165. If this notification is not sent, then when User C of SS-CT becomes not busy, no remoteUserAlerting notification shall be sent. When User C of SS-CT answers and a CONNECT message is sent, no callIntrusionCompleted invoke APDU shall be sent.

6.9.6 Interaction with Call Forwarding Unconditional (SS-CFU)
The following protocol interactions shall apply if SS-CFU is supported in accordance with ECMA-174.

6.9.6.1 Actions at the Rerouteing PINX
On receiving a callRerouting invoke APDU, the Rerouteing PINX shall include in the SETUP message to the Diverted-to PINX any callIntrusionRequest invoke APDU or pathRetain invoke APDU with bit ci-low, ci-medium or ci-high set to ONE that has been sent in the original SETUP message.

6.9.6.2 Actions at the Originating PINX
In order to invoke SS-CI without path retention after a call has encountered a busy diverted-to user, the Originating PINX shall include a callIntrusionRequest invoke APDU in addition to the divertingLegInformation2 invoke APDU in the SETUP message of the new call to the diverted-to user.

6.9.7 Interaction with Call Forwarding Busy (SS-CFB)
The following protocol interactions shall apply if SS-CFB is supported in accordance with ECMA-174.

6.9.7.1 Actions at the Rerouteing PINX
On receiving a callRerouting invoke APDU, the Rerouteing PINX shall include in the SETUP message to the Diverted-to PINX any callIntrusionRequest invoke APDU or pathRetain invoke APDU with bit ci-low, ci-medium or ci-high set to ONE that has been sent in the original SETUP message.

6.9.7.2 Actions at the Originating PINX
In order to invoke SS-CI without path retention directly at the last busy diverted-to user after a call has encountered two or more busy users that have been reached as a result of one or more invocations of SS-CFB, the Originating PINX shall include a callIntrusionRequest invoke APDU in addition to the divertingLegInformation2 invoke APDU in the SETUP message of the new call to the busy diverted-to user.
If SS-CI is to be invoked at the first busy user after a call has encountered two or more busy users that have been reached as a result of one or more invocations of SS-CFB, the Originating PINX shall act in one of the following ways:

- In order to invoke SS-CI without path retention at the first busy user, thereby overriding SS-CFB at that user, the Originating PINX shall include a callIntrusionRequest invoke APDU and a cfbOverride invoke APDU in a Facility information element in the SETUP message of the new call. When conveying the invoke APDU of operation cfbOverride, the NFE shall be included as defined for operation callIntrusionRequest and the Interpretation APDU shall be included with value discardAnyUnrecognisedInvokePdu.

- In order to invoke SS-CI with path retention at the first busy user, thereby overriding SS-CFB at that user, the Originating PINX shall include a pathRetain invoke APDU with bit ci-low, ci-medium or ci-high set to ONE and a cfbOverride invoke APDU in a Facility information element in the SETUP message of the new call. When conveying the invoke APDU of operation cfbOverride, the NFE shall be included as defined for operation pathRetain and the Interpretation APDU shall be included with value discardAnyUnrecognisedInvokePdu.

6.9.7.3 Actions at the Served (Called) User PINX

On receiving a SETUP message containing a callIntrusionRequest invoke APDU together with a cfbOverride invoke APDU, if the called user is busy, SS-CFB shall be overridden and the procedures of SS-CI shall apply.

On receiving a SETUP message containing a pathRetain invoke APDU with bit ci-low, ci-medium or ci-high set to ONE together with a cfbOverride invoke APDU, if the called user is busy, SS-CFB shall be overridden and the procedures of SS-CI shall apply.

6.9.8 Interaction with Call Forwarding No Reply (SS-CFNR)

No protocol interaction.

6.9.9 Interaction with Call Deflection (SS-CD)

No protocol interaction.

6.9.10 Interaction with Path Replacement (ANF-PR)

The following protocol interactions shall apply if ANF-PR is supported in accordance with ECMA-176.

6.9.10.1 Actions at an ANF-PR Requesting PINX

6.9.10.1.1 Sending of callIntrusionGetCIPL invoke APDU

As part of invocation of SS-CI, the SS-CI Terminating PINX may send a FACILITY message containing a callIntrusionGetCIPL invoke APDU while also acting as an ANF-PR Requesting PINX.

NOTE 10
If the ANF-PR state is PR-Req-Initiating, the Requesting PINX should take steps to protect against release of the old connection before a response to the callIntrusionGetCIPL invoke APDU has been received. This can be achieved by responding to a pathReplaceSetup invoke APDU with a return error APDU containing error value temporarilyUnavailable, thereby causing ANF-PR to fail and ensuring that the old connection is kept. ANF-PR can be attempted again later.

If the ANF-PR state is PR-Req-Completing, the callIntrusionGetCIPL invoke APDU shall be sent using the new connection.

6.9.10.1.2 Receipt of callIntrusionGetCIPL invoke APDU

The response to a callIntrusionGetCIPL invoke APDU shall be sent on the connection on which the invoke APDU was received.

6.9.10.1.3 Sending of Notification to the unwanted user

An SS-CI Terminating PINX may send a NOTIFY message containing a notification to the unwanted user while also acting as an ANF-PR Requesting PINX.
NOTE 11
If the ANF-PR state is PR-Req-Initiating, the Requesting PINX should take steps to protect against release of the old connection before the notification reaches the unwanted user's PINX (the ANF-PR Cooperating PINX). This can be achieved by responding to a pathReplaceSetup invoke APDU with a return error APDU containing error value temporarilyUnavailable, thereby causing ANF-PR to fail and ensuring that the old connection is kept. ANF-PR can be attempted again later.

If the ANF-PR state is PR-Req-Completing, the notification shall be sent using the new connection.

6.9.10.2 Actions at an ANF-PR Cooperating PINX

6.9.10.2.1 Sending of callIntrusionGetCIPL invoke APDU
As part of invocation of SS-CI, the SS-CI Terminating PINX may send a FACILITY message containing a callIntrusionGetCIPL invoke APDU while also acting as an ANF-PR Cooperating PINX.

If the ANF-PR state is PR-Coop-Establishment, the callIntrusionGetCIPL invoke APDU shall be sent using the old connection.

NOTE 12
The Cooperating PINX should postpone release of the old connection until a response has been received.

If the ANF-PR state is PR-Coop-Retain, the Cooperating PINX shall postpone sending of the callIntrusionGetCIPL invoke APDU until completion of ANF-PR or send it again if no response is obtained.

6.9.10.2.2 Receipt of callIntrusionGetCIPL invoke APDU
The response to a callIntrusionGetCIPL invoke APDU shall be sent on the connection on which the invoke APDU was received.

6.9.10.2.3 Sending of Notification to the unwanted user
An SS-CI Terminating PINX may send a NOTIFY message containing a notification to the unwanted user while also acting as an ANF-PR Cooperating PINX. If the ANF-PR state is PR-Coop-Establishment, the notification shall be sent using the old connection.

If the ANF-PR state is PR-Coop-Retain, the Cooperating PINX shall postpone sending of the notification until completion of ANF-PR.

6.9.11 Interaction with Call Offer (SS-CO)
The following protocol interactions shall apply if SS-CFNR is supported in accordance with ECMA-192.

6.9.11.1 Actions at the Originating PINX
While SS-CO is in progress, the Originating PINX may request SS-CI by sending a callIntrusionRequest invoke APDU in a FACILITY message during basic call protocol state Outgoing Call Proceeding or Call Delivered, starting timer T1 of SS-CI and entering state CI-Wait-Ack. The procedures of SS-CI shall then apply.

6.9.11.2 Actions at the Terminating PINX

6.9.11.2.1 Normal Procedures
After SS-CO has been successfully invoked and prior to completion of SS-CO, on receipt of a callIntrusionRequest invoke APDU in a FACILITY message, the Terminating PINX shall act in accordance with SS-CI.

NOTE 13
If SS-CI is successfully invoked, SS-CO returns to state CO-Idle, since a CONNECT message is sent.

6.9.11.2.2 Exceptional Procedures
The procedures of SS-CI shall apply. If SS-CI is rejected, SS-CO shall continue.

6.9.12 Interaction with Do Not Disturb (SS-DND)
No protocol interaction.
6.9.13 Interaction with Do Not Disturb Override (SS-DNDO)

The following protocol interactions shall apply if SS-CFNR is supported in accordance with ECMA-194.

6.9.13.1 Actions at the Terminating PINX

On receiving a SETUP message containing a callIntrusionRequest invoke APDU together with a doNotDisturbOverrideQ invoke APDU, the procedures of SS-DNDO shall apply and, if DND is not active or is successfully overridden, the procedures of SS-CI shall apply.

6.10 SS-CI parameter values (timers)

6.10.1 Timer T1

Timer T1 shall operate at the Originating PINX during state CI-Wait-Ack and CI-Wait-Ack-WOB. Its purpose is to protect against an absence of response to a request for invocation or reinvocation of intrusion.

Timer T1 shall have a value not less than 30 s.

6.10.2 Timer T2

Timer T2 shall operate at the Originating PINX during state CI-Isolation-Request. Its purpose is to protect against an absence of response to a request for isolation.

Timer T2 shall have a value not less than 30 s.

6.10.3 Timer T3

Timer T3 shall operate at the Originating PINX during states CI-inForcedRelease-Request or CI-isForcedRelease-Request. Its purpose is to protect against an absence of response to a request for forced release.

Timer T3 shall have a value not less than 30 s.

6.10.4 Timer T4

Timer T4 shall operate at the Originating PINX during states CI-inWOB-Request or CI-isWOB-Request. Its purpose is to protect against an absence of response to a request for wait on busy.

Timer T4 shall have a value not less than 30 s.

6.10.5 Timer T5

Timer T5 shall operate at the Terminating PINX during states CI-GetCIPL-I and CI-GetCIPL-WOB. Its purpose is to protect against an absence of response to a request for the CIPL of the unwanted user.

Timer T5 shall have a value not less than 10 s.

6.10.6 Timer T6

Timer T6 shall operate at the Terminating PINX during state CI-Dest-Notify or CI-Dest-Notify-WOB. Its purpose is to control the delay between the impending intrusion warning notification and the execution of intrusion.

Timer T6 shall have a value not higher than 10 s.
A.1 Path Retention description

Path retention is a generic mechanism which can be used by supplementary services during call establishment. Path retention is invoked by the Originating PINX either for one supplementary service or for several supplementary services at the same time. Invocation for a particular supplementary service means that the network connection is to be retained if the Terminating PINX encounters conditions in which it is appropriate to invoke that supplementary service. The Originating PINX is informed of the reason for retaining the connection so that it can decide (e.g. by consulting the calling user) whether to invoke the supplementary service. Under some circumstances in which the network connection is retained, more than one of the supplementary services for which path retention has been invoked may be applicable.

Successive retentions of the network connection by the Terminating PINX following a single invocation of path retention by the Originating PINX are possible as a result of different conditions being encountered at the Terminating PINX. When an attempt is made to invoke a supplementary service for which the network connection has been retained, a further condition can be encountered that can cause the network connection to be retained again for the same supplementary service or a different supplementary service.

Path retention is specified in terms of a Path Retention entity existing within the Coordination Function at the Originating PINX and at the Terminating PINX.

A.2 Path Retention operational requirements

A.2.1 Requirements on the Originating PINX

Call establishment procedures for the outgoing side of an inter-PINX link, as specified in ECMA-143, shall apply. Generic procedures for the call-related control of supplementary services, as specified in ECMA-165 for an End PINX, shall apply.

A.2.2 Requirements on the Terminating PINX

Call establishment procedures for the incoming side of an inter-PINX link, as specified in ECMA-143, shall apply. Generic procedures for the call-related control of supplementary services, as specified in ECMA-165 for an End PINX, shall apply.

A.2.3 Requirements on a Transit PINX

Call establishment procedures, as specified in ECMA-143, shall apply. Generic procedures for the call-related control of supplementary services, as specified in ECMA-165 for a Transit PINX, shall apply.

A.3 Path Retention coding requirements

A.3.1 Operations

The operations pathRetain and serviceAvailable as defined in 6.3.1 shall apply. Within the ARGUMENT of operation pathRetain, the element of type ServiceList may contain bits other than those named in 6.3.1, in order to request path retention for other supplementary services. Within the ARGUMENT of operation serviceAvailable, the
element of type ServiceList may contain bits other than those named in 6.3.1, in order to indicate retention of the network connection for other supplementary services.

A.3.2 Information elements
APDUs of the operations pathRetain and serviceAvailable shall be coded in the Facility information element in accordance with ECMA-165.

When conveying an APDU of operation pathRetain or serviceAvailable, the NFE shall be included. In the case of an invoke APDU the destinationEntity data element of the NFE shall contain value endPINX.

When conveying an invoke APDU of operation pathRetain or serviceAvailable, the Interpretation APDU shall contain value discardAnyUnrecognisedInvokePdu.

A.3.3 Messages
The Facility information element shall be conveyed in the messages as specified in clause 10 of ECMA-165. The basic call messages shall be used for call establishment as specified in ECMA-143.

A.4 Path Retention state definitions
A.4.1 States at the Originating PINX
The procedures at the Originating PINX are written in terms of the following conceptual states existing within the Path Retention entity in that PINX in association with a particular call.

A.4.1.1 PRTO-Idle
Path retention is not operating.

A.4.1.2 PRTO-Requested
A pathRetain invoke APDU has been sent and the Originating PINX is waiting for a serviceAvailable invoke APDU from the Terminating PINX.

A.4.1.3 PRTO-Retained
A serviceAvailable invoke APDU has been received and the network connection is retained.

A.4.1.4 PRTO-Invoking
Invocation of a supplementary service is being attempted using a retained network connection.

A.4.2 States at the Terminating PINX
The procedures at the Terminating PINX are written in terms of the following conceptual states existing within the Path Retention entity in that PINX in association with a particular incoming call.

A.4.2.1 PRTT-Idle
Path retention is not operating.

A.4.2.2 PRTT-Requested
A pathRetain invoke APDU has been received and the Terminating PINX is waiting until conditions for retaining the network connection are encountered.

A.4.2.3 PRTT-Retained
A serviceAvailable invoke APDU has been sent and the network connection is retained.

A.4.2.4 PRTT-Invoking
Invocation of a supplementary service is being attempted using a retained network connection.

A.5 Path Retention signalling procedures for invocation and operation
A.5.1 Actions at the Originating PINX
The SDL representation of procedures at the Originating PINX is shown in A.9.1.

On sending a SETUP message for call establishment, if path retention is required for allowing the possibility of invoking one or more supplementary services on encountering certain conditions at the Terminating PINX, the
Originating PINX shall include a pathRetain invoke APDU in the SETUP message and shall enter state PRTO-Requested. In the element of type ServiceList in the ARGUMENT, any bit corresponding to a supplementary service for which path retention is required shall be set to ONE and all other bits shall be set to ZERO.

On receipt of a serviceAvailable invoke APDU in a PROGRESS or a FACILITY message in state PRTO-Requested, the Originating PINX shall enter state PRTO-Retained.

In state PRTO-Requested, if the Originating PINX determines that retention of the network connection can no longer occur (e.g. on receipt of a CONNECT message), it shall enter state PRTO-Idle.

During state PRTO-Retained, invocation of any of the supplementary services indicated in the serviceAvailable invoke APDU may be requested. If invocation is requested (by sending the appropriate APDU in a FACILITY message), the Terminating PINX shall enter state PRTO-Invoking.

In state PRTO-Invoking, if the supplementary service concerned is successfully invoked, the Originating PINX shall either:

i) if there is a possibility of the network connection being retained again prior to completion of call establishment (e.g. to allow for the possibility of invoking another supplementary service or for the possibility of invoking the same supplementary service again), enter state PRTO-Requested again; or

ii) enter state PRTO-Idle.

In state PRTO-Invoking, if the supplementary service concerned fails to be invoked successfully, the Originating PINX shall either:

i) if the network connection is still retained to allow the possibility of invoking another supplementary service, enter state PRTO-Retained again; or

ii) enter state PRTO-Idle.

If, in any state other than PRTO-Idle, the call is released, state PRTO-Idle shall be entered.

A.5.2 Actions at the Terminating PINX

The SDL representation of procedures at the Terminating PINX is shown in A.9.2.

On receipt of a pathRetain invoke APDU in a SETUP message, the Terminating PINX shall enter state PRTT-Requested and record the list of supplementary services for which path retention has been requested, as indicated by the element of type ServiceList.

If, during state PRTT-Requested, a condition is encountered in which it is appropriate to invoke one or more of the supplementary services for which path retention has been requested, the Terminating PINX shall retain the network connection, send a serviceAvailable invoke APDU to the Originating PINX, start timer PRT1 and enter state PRTT-Retained. In the element of type ServiceList in the ARGUMENT, any bit corresponding to a supplementary service that can be invoked at this stage and for which path retention has been requested shall be set to ONE and all other bits shall be set to ZERO. This procedure replaces the normal procedure appropriate to the condition that has been encountered.

The serviceAvailable invoke APDU shall be sent either in a FACILITY message or, if a PROGRESS message is to be sent at the same time, in the PROGRESS message. A PROGRESS message containing a Progress indicator information element with CCITT Progress description no. 8 (in-band information or appropriate pattern now available) shall be sent if this Progress description has not already been sent for this call.

NOTE

It is necessary that this Progress description be sent, as a means of ensuring that basic call timer T310 is stopped at other PINXs. However, if this Progress description has already been sent in conjunction with an earlier serviceAvailable invoke APDU for this call, it need not be repeated.

In state PRTT-Requested, if the Terminating PINX determines that retention of the network connection can no longer occur (e.g. on sending a CONNECT message), it shall enter state PRTT-Idle.

In state PRTT-Retained, on receipt of an invocation request from the Originating PINX for any of the supplementary services for which the network connection has been retained, the Terminating PINX shall stop timer PRT1 and enter state PRTT-Invoking.
In state PRTT-Invoking, if the supplementary service concerned is successfully invoked, the Terminating PINX shall either:

i) if there is a possibility of the network connection being retained again prior to completion of call establishment (e.g. to allow for the possibility of invoking another supplementary service or for the possibility of invoking the same supplementary service again), enter state PRTT-Requested again; or

ii) enter state PRTT-Idle.

In state PRTT-Invoking, if the supplementary service concerned fails to be invoked successfully, the Terminating PINX shall either:

i) continue to retain the network connection, return to state PRTT-Retained and start timer PRT1 if there are other supplementary services for which the network connection has been retained and that are still able to be invoked; or

ii) enter state PRTT-Idle and allow the call to proceed as specified for failure of the supplementary service concerned (e.g. initiate release of the call).

In case i), any APDU sent to the Originating PINX to indicate failure of the requested supplementary service shall be sent in a FACILITY message.

On expiry of timer PRT1, the Terminating PINX shall enter state PRTT-Idle and initiate call clearing in accordance with ECMA-143.

If, in any state other than PRTT-Idle, the call is released, state PRTT-Idle shall be entered and timer PRT1, if running, shall be stopped.

A.5.3 Actions at a Transit PINX

No special actions are required in support of path retention.

A.6 Path Retention impact of interworking with public ISDNs

On a call from a public ISDN that does not support an equivalent mechanism, path retention shall not be requested by the Incoming Gateway PINX.

On a call from a PISN to a public ISDN that does not support an equivalent mechanism, the Outgoing Gateway PINX shall, on encountering a condition in the public ISDN in which it is appropriate to invoke one or more of the supplementary services for which path retention has been requested, either:

i) proceed as if path retention had not been requested; or

ii) retain the network connection and allow invocation of the supplementary services concerned in accordance with A.5.2.

NOTE

If invocation of a supplementary service is requested while the network connection is retained, the Outgoing Gateway PINX is responsible for establishing a new network connection through the public ISDN in order to request invocation of the supplementary service. Failure to establish a new network connection (e.g. because of network congestion) can cause the Outgoing Gateway PINX to reject the supplementary service and release the call.

NOTE

At the time of publication of this Standard, no equivalent mechanism has been specified for public ISDNs.

A.7 Path Retention impact of interworking with non-ISDNs

When interworking with a non-ISDN that does not support an equivalent mechanism, the procedures defined in A.6 for interworking with a public ISDN that does not support an equivalent mechanism shall apply.

When interworking with a non-ISDN that does support an equivalent mechanism, the two networks may cooperate in the operation of path retention. In this case, either the Originating PINX functionality or the Terminating PINX functionality will be provided in the non-ISDN. The Incoming or Outgoing Gateway PINX shall provide conversion between the signalling protocol specified in this Standard and the signalling protocol of the other network.
A.8 **Path Retention parameter values (timers)**

Timer PRT1 operates at the Terminating PINX during state PRTT-Retained. Its purpose is to protect against absence of a supplementary service invocation request as a response to the serviceAvailable invoke APDU.

Timer PRT1 shall have a value not less than 60 s.

A.9 **Specification and Description Language (SDL) - Representation of procedures (informative)**

The diagrams in this annex use the Specification and Description Language defined in ITU-T Rec. Z.100 (1993).

Each diagram represents the behaviour of a Path Retention entity at a particular type of PTNX. In accordance with the protocol model described in ECMA-165, the Path Retention entity as a part of the Coordination Function uses the services of Generic Functional Procedures Control and Basic Call Control and provides services to the various SS Control entities.

Where an output symbol represents a primitive to other parts of the Coordination Function, and that primitive results in a PSS1 message being sent, the output symbol bears the name of the message and any remote operations APDU contained in that message. In the case of a message specified in ECMA-143, basic call actions associated with the sending of that message are deemed to occur.

Where an input symbol represents a primitive from other parts of the Coordination Function, and that primitive results from receipt of a PSS1 message, the input symbol bears the name of the message and any remote operations APDU contained in that message. In the case of a message specified in ECMA-143, basic call actions associated with the receipt of that message are deemed to occur.

The following abbreviation is used:

inv. invoke APDU.
A.9.1 SDL representation of Path Retention at the Originating PINX

Figure A.1 shows the behaviour of a Path Retention entity within the Originating PINX.

Output signals to the right represent messages sent via protocol control, input signals from the right represent messages received via protocol control, and input signals from the left represent internal primitives.

Figure A.1 (sheet 1 of 2) - SDL representation of Path Retention at the Originating PINX
Figure A.1 (sheet 2 of 2) - SDL representation of Path Retention at the Originating PINX
A.9.2 SDL representation of Path Retention at the Terminating PINX

Figure A.2 shows the behaviour of a Path Retention entity within the Terminating PINX.

Output signals to the left represent messages sent via protocol control, input signals from the left represent messages received via protocol control, and input signals from the right represent internal primitives.
Figure A.2 (sheet 2 of 2) - SDL representation of Path Retention at the Terminating PINX
Annex B
(normative)

Protocol Implementation Conformance Statement (PICS) proforma

B.1 Introduction
The supplier of a protocol implementation which is claimed to conform to this Standard shall complete the following Protocol Implementation Conformance Statement (PICS) proforma.

A completed PICS proforma is the PICS for the implementation in question. The PICS is a statement of which capabilities and options of the protocol have been implemented. The PICS can have a number of uses, including use:

- by the protocol implementor, as a check list to reduce the risk of failure to conform to the Standard through oversight;
- by the supplier and acquirer, or potential acquirer, of the implementation, as a detailed indication of the capabilities of the implementation, stated relative to the common basis for understanding provided by the Standard's PICS proforma;
- by the user or potential user of the implementation, as a basis for initially checking the possibility of interworking with another implementation - while interworking can never be guaranteed, failure to interwork can often be predicted from incompatible PICSs;
- by a protocol tester, as the basis for selecting appropriate tests against which to assess the claim for conformance of the implementation.

B.2 Instructions for completing the PICS proforma

B.2.1 General structure of the PICS proforma
The PICS proforma is a fixed format questionnaire divided into sub-clauses each containing a group of individual items. Each item is identified by an item number, the name of the item (question to be answered), and the reference(s) to the clause(s) that specifies (specify) the item in the main body of this Standard.

The "Status" column indicates whether an item is applicable and if so whether support is mandatory or optional. The following terms are used:

m mandatory (the capability is required for conformance to the protocol);
o optional (the capability is not required for conformance to the protocol, but if the capability is implemented it is required to conform to the protocol specifications);
o.<n> optional, but support of at least one of the group of options labelled by the same numeral <n> is required;
x prohibited;
c.<cond> conditional requirement, depending on support for the item or items listed in condition <cond>;
<iitem>:m simple conditional requirement, the capability being mandatory if item number <iitem> is supported, otherwise not applicable;
<iitem>:o simple conditional requirement, the capability being optional if item number <iitem> is supported, otherwise not applicable.

Answers to the questionnaire items are to be provided either in the "Support" column, by simply marking an answer to indicate a restricted choice (Yes or No), or in the "Not Applicable" column (N/A).
B.2.2 Additional information

Items of Additional Information allow a supplier to provide further information intended to assist the interpretation of the PICS. It is not intended or expected that a large quantity will be supplied, and a PICS can be considered complete without any such information. Examples might be an outline of the ways in which a (single) implementation can be set up to operate in a variety of environments and configurations.

References to items of Additional Information may be entered next to any answer in the questionnaire, and may be included in items of Exception information.

B.2.3 Exception information

It may occasionally happen that a supplier will wish to answer an item with mandatory or prohibited status (after any conditions have been applied) in a way that conflicts with the indicated requirement. No pre-printed answer will be found in the Support column for this. Instead, the supplier is required to write into the support column an x.<i> reference to an item of Exception Information, and to provide the appropriate rationale in the Exception item itself.

An implementation for which an Exception item is required in this way does not conform to this Standard. A possible reason for the situation described above is that a defect in the Standard has been reported, a correction for which is expected to change the requirement not met by the implementation.
B.3 PICS proforma for ECMA-203

B.3.1 Implementation identification

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<tr>
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<tr>
<td>Other information necessary for full identification, e.g. Name(s) and Version(s) for machines and/or operating systems; system name(s)</td>
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Only the first three items are required for all implementations; other information may be completed as appropriate in meeting the requirement for full identification.

The terms Name and Version should be interpreted appropriately to correspond with a suppliers terminology (e.g. Type, Series, Model).

B.3.2 Protocol summary

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<td>Amendments implemented</td>
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<td>(The answer Yes means that the implementation does not conform to this Standard)</td>
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| Date of statement |  |
### B.3.3 General

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<td>o.1</td>
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<td>A4</td>
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<tr>
<td>A5</td>
<td>Behaviour as gateway to support SS-CI from user in PISN to user in other network</td>
<td>6.8</td>
<td>o</td>
<td></td>
<td>Yes [ ] No [ ]</td>
</tr>
<tr>
<td>A6</td>
<td>Behaviour as gateway to support SS-CI from user in other network to user in PISN</td>
<td>6.8</td>
<td>o</td>
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<tr>
<td>A7</td>
<td>Behaviour as gateway to support CIPL request from Terminating PINX to another network</td>
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<td>For which basic services can SS-CI be invoked?</td>
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**NOTE**

*Procedures of the Unwanted User PINX need not be supported if the unwanted users are to receive no protection.*
### B.3.4 Procedures

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<td>B6</td>
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<tr>
<td>B14</td>
<td>Reinvocation of SS-CI after wait on busy in Originating PINX</td>
<td>6.6.1.4, B12:m</td>
<td></td>
<td>Yes [ ]</td>
<td></td>
</tr>
<tr>
<td>B15</td>
<td>Reinvocation of SS-CI after wait on busy in Terminating PINX</td>
<td>6.6.2.4, B13:m</td>
<td></td>
<td>Yes [ ]</td>
<td></td>
</tr>
<tr>
<td>B16</td>
<td>SS-CI invocation in Unwanted User PINX</td>
<td>6.6.4, A3:m</td>
<td></td>
<td>Yes [ ]</td>
<td></td>
</tr>
</tbody>
</table>
### B.3.5 Coding

<table>
<thead>
<tr>
<th>Item</th>
<th>Question/feature</th>
<th>Reference</th>
<th>Status</th>
<th>N/A</th>
<th>Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>Sending of callIntrusionRequest invoke APDU and receipt of callIntrusionRequest return result and error APDU in Originating PINX</td>
<td>6.3.1</td>
<td>A1:m</td>
<td>[]</td>
<td>Yes [ ]</td>
</tr>
<tr>
<td>C2</td>
<td>Sending of pathRetain invoke APDU and receipt of serviceAvailable invoke APDU in Originating PINX</td>
<td>6.3.1</td>
<td>B3:m</td>
<td>[]</td>
<td>Yes [ ]</td>
</tr>
<tr>
<td>C3</td>
<td>Receipt of callIntrusionRequest invoke APDU and sending of callIntrusionRequest return result and error APDU in Terminating PINX</td>
<td>6.3.1</td>
<td>A2:m</td>
<td>[]</td>
<td>Yes [ ]</td>
</tr>
<tr>
<td>C4</td>
<td>Receipt of pathRetain invoke APDU and sending of serviceAvailable invoke APDU in Originating PINX</td>
<td>6.3.1</td>
<td>A2:m</td>
<td>[]</td>
<td>Yes [ ]</td>
</tr>
<tr>
<td>C5</td>
<td>Sending of callIntrusionGetCIPL invoke APDU and receipt of callIntrusionGetCIPL return result APDU in Terminating PINX</td>
<td>6.3.1</td>
<td>A2:m</td>
<td>[]</td>
<td>Yes [ ]</td>
</tr>
<tr>
<td>C6</td>
<td>Receipt of callIntrusionGetCIPL invoke APDU and sending of callIntrusionGetCIPL return result APDU in Unwanted User PINX</td>
<td>6.3.1</td>
<td>A3:m</td>
<td>[]</td>
<td>Yes [ ]</td>
</tr>
<tr>
<td>C7</td>
<td>Sending of callIntrusionForcedRelease invoke APDU and receipt of callIntrusionForcedRelease return result APDU in Originating PINX</td>
<td>6.3.1</td>
<td>B8:m</td>
<td>[]</td>
<td>Yes [ ]</td>
</tr>
<tr>
<td>C8</td>
<td>Receipt of callIntrusionForcedRelease invoke APDU and sending of callIntrusionForcedRelease return result APDU in Terminating PINX</td>
<td>6.3.1</td>
<td>B9:m</td>
<td>[]</td>
<td>Yes [ ]</td>
</tr>
<tr>
<td>C9</td>
<td>Sending of callIntrusionIsolate invoke APDU and receipt of callIntrusionIsolate return result APDU in Originating PINX</td>
<td>6.3.1</td>
<td>B10:m</td>
<td>[]</td>
<td>Yes [ ]</td>
</tr>
<tr>
<td>C10</td>
<td>Receipt of callIntrusionIsolate invoke APDU and sending of callIntrusionIsolate return result APDU in Terminating PINX</td>
<td>6.3.1</td>
<td>B11:m</td>
<td>[]</td>
<td>Yes [ ]</td>
</tr>
<tr>
<td>C11</td>
<td>Sending of callIntrusionWOBRequest invoke APDU and receipt of callIntrusionWOBRequest return result APDU in Originating PINX</td>
<td>6.3.1</td>
<td>B12:m</td>
<td>[]</td>
<td>Yes [ ]</td>
</tr>
<tr>
<td>C12</td>
<td>Receipt of callIntrusionWOB invoke APDU and sending of callIntrusionWOBRequest return result APDU in Terminating PINX</td>
<td>6.3.1</td>
<td>B13:m</td>
<td>[]</td>
<td>Yes [ ]</td>
</tr>
<tr>
<td>C13</td>
<td>Receipt of callIntrusionCompleted invoke APDU in Originating PINX</td>
<td>6.3.1</td>
<td>A1:m</td>
<td>[]</td>
<td>Yes [ ]</td>
</tr>
<tr>
<td>C14</td>
<td>Sending of callIntrusionCompleted invoke APDU in Terminating PINX</td>
<td>6.3.1</td>
<td>A2:m</td>
<td>[]</td>
<td>Yes [ ]</td>
</tr>
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</table>
### B.3.6 Timers

<table>
<thead>
<tr>
<th>Item</th>
<th>Question/feature</th>
<th>Reference</th>
<th>Status</th>
<th>N/A</th>
<th>Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1</td>
<td>Support of timer T1</td>
<td>6.10</td>
<td>A2:m</td>
<td></td>
<td>Yes [ ] Value [ ]</td>
</tr>
<tr>
<td>D2</td>
<td>Support of timer T2</td>
<td>6.10</td>
<td>B10:m</td>
<td></td>
<td>Yes [ ] Value [ ]</td>
</tr>
<tr>
<td>D3</td>
<td>Support of timer T3</td>
<td>6.10</td>
<td>B8:m</td>
<td></td>
<td>Yes [ ] Value [ ]</td>
</tr>
<tr>
<td>D4</td>
<td>Support of timer T4</td>
<td>6.10</td>
<td>B12:m</td>
<td></td>
<td>Yes [ ] Value [ ]</td>
</tr>
<tr>
<td>D5</td>
<td>Support of timer T5</td>
<td>6.10</td>
<td>A2:m</td>
<td></td>
<td>Yes [ ] Value [ ]</td>
</tr>
<tr>
<td>D6</td>
<td>Support of timer T6</td>
<td>6.10</td>
<td>B6:m</td>
<td></td>
<td>Yes [ ] Value [ ]</td>
</tr>
<tr>
<td>D7</td>
<td>Support of timer PRT1</td>
<td>A.8</td>
<td>A2:m</td>
<td></td>
<td>Yes [ ] Value [ ]</td>
</tr>
</tbody>
</table>

### B.3.7 Protocol interaction with Call Transfer (SS-CT)

<table>
<thead>
<tr>
<th>Item</th>
<th>Question/feature</th>
<th>Reference</th>
<th>Status</th>
<th>N/A</th>
<th>Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>E1</td>
<td>Support of SS-CT (transfer by join)</td>
<td>o</td>
<td></td>
<td>Yes [ ] No [ ]</td>
<td></td>
</tr>
<tr>
<td>E2</td>
<td>Support of SS-CT (transfer by rerouting)</td>
<td>o</td>
<td></td>
<td>Yes [ ] No [ ]</td>
<td></td>
</tr>
<tr>
<td>E3</td>
<td>Interactions between SS-CT by join and SS-CI for notification at Transferring PINX</td>
<td>6.9.5.1.1</td>
<td>c.1</td>
<td></td>
<td>m: Yes [ ]</td>
</tr>
<tr>
<td>E4</td>
<td>Interactions between SS-CT by join and SS-CI for notification at Secondary PINX</td>
<td>6.9.5.1.2</td>
<td>c.2</td>
<td></td>
<td>m: Yes [ ]</td>
</tr>
<tr>
<td>E5</td>
<td>Interactions between SS-CT by rerouting and SS-CI for notification at Secondary PINX</td>
<td>6.9.5.1.3</td>
<td>c.3</td>
<td></td>
<td>m: Yes [ ]</td>
</tr>
</tbody>
</table>

c.1: if (A1 and E1) then mandatory, else N/A  
c.2: if (A2 and E1) then mandatory, else N/A.  
c.3: if (A2 and E2) then mandatory, else N/A.
B.3.8 Protocol interactions with Call Forwarding Unconditional (SS-CFU)

<table>
<thead>
<tr>
<th>Item</th>
<th>Question/feature</th>
<th>Reference</th>
<th>Status</th>
<th>N/A</th>
<th>Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1</td>
<td>Support of SS-CFU (Rerouteing PINX)</td>
<td>o</td>
<td>Yes [ ]</td>
<td>No [ ]</td>
<td></td>
</tr>
<tr>
<td>F2</td>
<td>Support of SS-CFU (Originating PINX)</td>
<td>o</td>
<td>Yes [ ]</td>
<td>No [ ]</td>
<td></td>
</tr>
<tr>
<td>F3</td>
<td>Interactions at Rerouteing PINX</td>
<td>6.9.6.1</td>
<td>F1:m</td>
<td>[ ]</td>
<td>m: Yes [ ]</td>
</tr>
<tr>
<td>F4</td>
<td>Interactions at Originating PINX</td>
<td>6.9.6.2</td>
<td>c.1</td>
<td>[ ]</td>
<td>m: Yes [ ]</td>
</tr>
</tbody>
</table>

  c.1: if (A1 and F2) then mandatory, else N/A.

B.3.9 Protocol interactions with Call Forwarding Busy (SS-CFB)

<table>
<thead>
<tr>
<th>Item</th>
<th>Question/feature</th>
<th>Reference</th>
<th>Status</th>
<th>N/A</th>
<th>Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>G1</td>
<td>Support of SS-CFB (Originating PINX)</td>
<td>o</td>
<td>Yes [ ]</td>
<td>No [ ]</td>
<td></td>
</tr>
<tr>
<td>G2</td>
<td>Support of SS-CFB (Rerouteing PINX)</td>
<td>o</td>
<td>Yes [ ]</td>
<td>No [ ]</td>
<td></td>
</tr>
<tr>
<td>G3</td>
<td>Support of SS-CFB (Served User PINX)</td>
<td>o</td>
<td>Yes [ ]</td>
<td>No [ ]</td>
<td></td>
</tr>
<tr>
<td>G4</td>
<td>Interactions at Rerouteing PINX</td>
<td>6.9.7.1</td>
<td>c.1</td>
<td>[ ]</td>
<td>m: Yes [ ]</td>
</tr>
<tr>
<td>G5</td>
<td>Interactions at Originating PINX</td>
<td>6.9.7.2</td>
<td>c.2</td>
<td>[ ]</td>
<td>m: Yes [ ]</td>
</tr>
<tr>
<td>G6</td>
<td>Interactions at Served User PINX</td>
<td>6.9.7.3</td>
<td>c.3</td>
<td>[ ]</td>
<td>m: Yes [ ]</td>
</tr>
</tbody>
</table>

  c.1: if ((A1 or A2) and G2) then mandatory, else N/A.
  c.2: if (A1 and G1) then mandatory, else N/A.
  c.3: if (A2 and G3) then mandatory, else N/A.
### B.3.10 Protocol interactions with Path Replacement (ANF-PR)

<table>
<thead>
<tr>
<th>Item</th>
<th>Question/feature</th>
<th>Reference</th>
<th>Status</th>
<th>N/A</th>
<th>Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1</td>
<td>Support of ANF-PR (Requesting PINX)</td>
<td>o</td>
<td>Yes [ ]</td>
<td>No [ ]</td>
<td></td>
</tr>
<tr>
<td>H2</td>
<td>Support of ANF-PR (Cooperating PINX)</td>
<td>o</td>
<td>Yes [ ]</td>
<td>No [ ]</td>
<td></td>
</tr>
<tr>
<td>H3</td>
<td>Sending of callIntrusionGetCIPL invoke APDU (actions at ANF-PR Requesting PINX)</td>
<td>6.9.10.1.1 c.1</td>
<td>[ ]</td>
<td>m: Yes [ ]</td>
<td></td>
</tr>
<tr>
<td>H4</td>
<td>Receipt of callIntrusionGetCIPL invoke APDU (actions at ANF-PR Requesting PINX)</td>
<td>6.9.10.1.2 c.2</td>
<td>[ ]</td>
<td>m: Yes [ ]</td>
<td></td>
</tr>
<tr>
<td>H5</td>
<td>Sending of Notification to the unwanted user (actions at ANF-PR Requesting PINX)</td>
<td>6.9.10.1.3 c.1</td>
<td>[ ]</td>
<td>m: Yes [ ]</td>
<td></td>
</tr>
<tr>
<td>H6</td>
<td>Sending of callIntrusionGetCIPL invoke APDU (actions at ANF-PR Cooperating PINX)</td>
<td>6.9.10.2.1 c.3</td>
<td>[ ]</td>
<td>m: Yes [ ]</td>
<td></td>
</tr>
<tr>
<td>H7</td>
<td>Receipt of callIntrusionGetCIPL invoke APDU (actions at ANF-PR Cooperating PINX)</td>
<td>6.9.10.2.2 c.4</td>
<td>[ ]</td>
<td>m: Yes [ ]</td>
<td></td>
</tr>
<tr>
<td>H8</td>
<td>Sending of Notification to the unwanted user (actions at ANF-PR Cooperating PINX)</td>
<td>6.9.10.2.3 c.3</td>
<td>[ ]</td>
<td>m: Yes [ ]</td>
<td></td>
</tr>
</tbody>
</table>

- c.1: if (A2 and H1) then mandatory, else N/A.
- c.2: if (A3 and H1) then mandatory, else N/A.
- c.3: if (A2 and H2) then mandatory, else N/A.
- c.4: if (A3 and H2) then mandatory, else N/A.

### B.3.11 Protocol interactions with Call Offer (SS-CO)

<table>
<thead>
<tr>
<th>Item</th>
<th>Question/feature</th>
<th>Reference</th>
<th>Status</th>
<th>N/A</th>
<th>Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>I1</td>
<td>Support of SS-CO (Originating PINX)</td>
<td>o</td>
<td>Yes [ ]</td>
<td>No [ ]</td>
<td></td>
</tr>
<tr>
<td>I2</td>
<td>Support of SS-CO (Terminating PINX)</td>
<td>o</td>
<td>Yes [ ]</td>
<td>No [ ]</td>
<td></td>
</tr>
<tr>
<td>I3</td>
<td>Interactions at the Originating PINX</td>
<td>6.9.11.1 c.1</td>
<td>[ ]</td>
<td>Yes [ ]</td>
<td>No [ ]</td>
</tr>
<tr>
<td>I4</td>
<td>Interactions at the Terminating PINX</td>
<td>6.9.11.2 c.2</td>
<td>[ ]</td>
<td>Yes [ ]</td>
<td>No [ ]</td>
</tr>
</tbody>
</table>

- c.1: if (A1 and I1) then optional, else N/A.
- c.2: if (A2 and I2) then optional, else N/A.

### B.3.12 Protocol interactions with Do Not Disturb Override (SS-DNDO)

<table>
<thead>
<tr>
<th>Item</th>
<th>Question/feature</th>
<th>Reference</th>
<th>Status</th>
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<th>Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>J1</td>
<td>Support of SS-DNDO (Terminating PINX)</td>
<td>o</td>
<td>Yes [ ]</td>
<td>No [ ]</td>
<td></td>
</tr>
<tr>
<td>J2</td>
<td>Interactions at the Terminating PINX</td>
<td>6.9.13.1 c.1</td>
<td>[ ]</td>
<td>m: Yes [ ]</td>
<td></td>
</tr>
</tbody>
</table>

- c.1: if (A2 and J1) then mandatory, else N/A.
Annex C
(informative)

Examples of message sequences

This annex describes some typical message flows for SS-CI. The following conventions are used in the figures of this annex.

1 The following notation is used:
- Basic call message containing SS-CI information
- Basic call message without SS-CI information
- Symbolic primitive carrying SS-CI information
- Symbolic primitive without SS-CI information

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>xxx.inv</td>
<td>Invoke APDU for operation xxx</td>
</tr>
<tr>
<td>xxx.res</td>
<td>Return result APDU for operation xxx</td>
</tr>
<tr>
<td>xxx.err</td>
<td>Return error APDU for operation xxx</td>
</tr>
<tr>
<td>xxx.rej</td>
<td>Return reject APDU for operation xxx</td>
</tr>
</tbody>
</table>

2 The figures show messages exchanged via Protocol Control between PINXs involved in SS-CI. Only messages relevant to SS-CI are shown.

3 Only the relevant information content (i.e. remote operation APDUs) is listed below each message name. The Facility information elements containing remote operation APDUs are not explicitly shown. Information with no impact on SS-CI is not shown.

4 Some interactions with users are included in the form of symbolic primitives. The actual protocol at the terminal equipment interface is outside the scope of this Standard.

5 CONNECT ACKNOWLEDGE, RELEASE, RELEASE COMPLETE messages are not shown.

6 The examples assume en-bloc sending.

7 The following abbreviations are used:

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ciRequest</td>
<td>SS-CI request</td>
</tr>
<tr>
<td>ciCompleted</td>
<td>SS-CI is impending</td>
</tr>
<tr>
<td>ciGetCIPPL</td>
<td>SS-CI is effective</td>
</tr>
<tr>
<td>ciForcedRelease</td>
<td>SS-CI is invokable</td>
</tr>
<tr>
<td>ciIsolate</td>
<td>SS-CI is rejected</td>
</tr>
<tr>
<td>ciWOBRequest</td>
<td>SS-CI is completed</td>
</tr>
<tr>
<td>ci request</td>
<td>wait on busy is requested</td>
</tr>
<tr>
<td>ciWOB confirm</td>
<td>wait on busy is confirmed</td>
</tr>
<tr>
<td>ciWOB indication</td>
<td>wait on busy is indicated</td>
</tr>
</tbody>
</table>
C.1 Example message sequence for normal operation of SS-CI without Path Retention

In this example all users are notified that the intrusion is impending. The intrusion results in a conference type connection involving all users.

Figure C.1 - Message sequence for normal operation of SS-CI without Path Retention
C.2 Example message sequence for normal operation of SS-CI with Path Retention

In this example the called user and the unwanted user are notified that the intrusion is impending. The intrusion results in the isolation of the unwanted user.

Figure C.2 - Message sequence for normal operation of SS-CI with Path Retention
C.3 Example of unsuccessful invocation of SS-CI without Path Retention

In this example the request for SS-CI is rejected by the Terminating PINX on account of the CIPL of the unwanted user.

Figure C.3 - Message sequence for unsuccessful invocation of SS-CI
C.4 Examples of completion of SS-CI

C.4.1 The established call is released
In this example, subsequent to successful invocation of call intrusion, the unwanted user releases the established call and a simple call is established between the calling user and the called user.

![Message sequence for completion of SS-CI / established call is released](image)

C.4.2 The intruding call is released
In this example the Originating PINX releases its call and the call is reestablished between the unwanted user and the called user.

![Message sequence for completion of SS-CI / intruding call is released](image)
C.5 Examples of invocation of SS-CI options

C.5.1 The Originating PINX forced releases the unwanted user

C.5.2 The Originating PINX isolates the unwanted user
C.5.3 The Originating PINX invokes wait on busy

In this example, after invocation of WOB, the called user becomes not busy and answers.

![Message sequence for invocation of wait on busy](image-url)

**Figure C.8 - Message sequence for invocation of wait on busy**
C.5.4 The Originating PINX reinvokes intrusion during wait on busy

In this example, the called user and the unwanted user are notified that the intrusion is impending. The intrusion results in a conference type connection involving all users.

Figure C.9 - Message sequence for reinvocation of intrusion during wait on busy
Annex D
(informative)

Specification and Description Language (SDL) representation of procedures

The diagrams in this annex use the Specification and Description Language defined in ITU-T Rec. Z.100 (1993). Each diagram represents the behaviour of an SS-CI Supplementary Service Control entity at a particular type of PINX. In accordance with the protocol model described in ECMA-165, the Supplementary Service Control entity uses, via Coordination Functions, the services of Generic Functional Procedures Control and Basic Call Control.

Where an output symbol represents a primitive to the Coordination Functions, and that primitive results in a message being sent, the output symbol bears the name of the message and any remote APDU(s) or notification(s) contained in that message. In the case of a message specified in ECMA-143, basic call actions associated with the sending of that message are deemed to occur.

Where an input symbol represents a primitive from the Coordination Functions, and that primitive is the result of a message being received, the input symbol bears the name of the message and any remote operations APDU(s) or notification(s) contained in that message. In the case of a message specified in ECMA-143, basic call actions associated with the receipt of that message are deemed to have occurred.

The following abbreviations are used:

inv. invoke APDU
res. return result APDU
err. return error APDU
rej. reject APDU
ciRequest callIntrusionRequest
ciGetCIPL callIntrusionGetCIPL
ciCompleted callIntrusionCompleted
ciIsolate callIntrusionIsolate
ciForcedRelease callIntrusionForcedRelease
ciWOBRequest callIntrusionWOBRequest
D.1 SDL representation of SS-CI at the Originating PINX

Figure D.1 shows the behaviour of an SS-CI Supplementary Service Control entity within the Originating PINX.

Input signals from the left and output signals to the left represent primitives from and to the user, or an entity acting on behalf of the user.

Input signals from the right and output signals to the right represent primitives from and to the coordination functions in respect of messages sent and received. Protocol timer expiry and basic call release are also indicated by an input signal from the right.

Figure D.1 (sheet 1 of 6) - Originating PINX SDL
Figure D.1 (sheet 2 of 6) - Originating PINX SDL
Figure D.1 (sheet 3 of 6) - Originating PINX SDL
Figure D.1 (sheet 4 of 6) - Originating PINX SDL
Figure D.1 (sheet 5 of 6) - Originating PINX SDL
D.2 SDL representation of SS-CI at the Terminating PINX

Figure D.2 shows the behaviour of an SS-CI Supplementary Service Control entity within the Terminating PINX.

Input signals from the left and output signals to the left represent primitives from and to the coordination functions. Protocol timer expiry and basic call release are also indicated by an input signal from the left.
Figure D.2 (sheet 2 of 6) - Terminating PINX SDL
Figure D.2 (sheet 3 of 6) - Terminating PINX SDL
Figure D.2 (sheet 4 of 6) - Terminating PINX SDL
Figure D.2 (sheet 5 of 6) - Terminating PINX SDL
Figure D.2 (sheet 6 of 6) - Terminating PINX SDL
Annex E

(informative)

Imported ASN.1 definitions

This annex shows ASN.1 definitions of types and values that are imported from other ISO/IEC or ITU-T publications. However, definitions that are specified or reproduced in ECMA-165 are omitted.

Table E.1 is an extract from module General-Error-List in ITU-T Recommendation Q.950 showing the definition of imported error values.

<table>
<thead>
<tr>
<th>Error Value</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>notAvailable</td>
<td>ERROR ::= 3</td>
</tr>
<tr>
<td>supplementaryServiceInteractionNotAllowed</td>
<td>ERROR ::= 10</td>
</tr>
</tbody>
</table>
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