INTERNATIONAL STANDARD

ISO/IEC 15056

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Information technology — Telecommunications and information exchange between systems — Private Integrated Services Network — Inter-exchange signalling protocol — Transit counter additional network feature

Technologies de l'information — Télécommunications et échange d'information entre systèmes — Réseau privé à intégration de services — Protocole de signalisation d'interéchange — Facilité de réseau additionnelle de compteur de transfert

Reference number
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Contents

Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

International Standard ISO/IEC 15056 was prepared by ECMA (as ECMA-225) and was adopted, under a special "fast-track procedure", by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, in parallel with its approval by national bodies of ISO and IEC.

Annex A forms an integral part of this International Standard.

Introduction

This International Standard is one of a series of standards defining services and signalling protocols applicable to Private Integrated Services Networks. The series uses the ISDN concepts as developed by ITU-T (formerly CCITT) and is also within the framework of standards for open systems interconnection as defined by ISO.

This International Standard specifies the signalling protocol for use at the Q reference point in support of the Transit Counter additional network feature.

The International 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 JTC 1, ITU-T, ETSI and other international and national standardization bodies. It represents a pragmatic and widely based consensus.

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Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Inter-exchange signalling protocol - Transit counter additional network feature

1 Scope

This International Standard specifies the signalling protocol for the support of the Transit Counter additional network feature (ANF-TC) at the Q reference point between Private Integrated Services Network Exchanges (PINXs) connected together within a Private Integrated Services Network (PISN).

ANF-TC is a feature that limits the number of Transit PINXs that a call setup request may be routed through e.g., to protect the network against indefinite looping.

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 CCITT Recommendation I.130. This International 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 15055.

The signalling protocol for ANF-TC operates in association with the signalling protocols for basic circuit switched call control (as specified in ISO/IEC 11572) and call independent (connection oriented) signalling connections (as specified in ISO/IEC 11582).

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

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

2 Conformance

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

Conformance to this International Standard includes conforming to those clauses that specify protocol interactions between ANF-TC and other supplementary services and ANFs for which signalling protocols at the Q reference point are supported in accordance with the stage 3 standards concerned.

3 Normative references

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

ISO/IEC 11572:1997, *Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Circuit mode bearer services - Inter-exchange signalling procedures and protocol.*

ISO/IEC 11574:1994, *Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Circuit-mode 64 kbit/s bearer services - Service description, functional capabilities and information flows.*

ISO/IEC 11579-1:1994, *Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Part 1: Reference configuration for PISN Exchanges (PINX).*

ISO/IEC 11582:1995, *Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Generic functional protocol for the support of supplementary services - Inter-exchange signalling procedures and protocol.*

ISO/IEC 13869:1995, *Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Inter-exchange signalling protocol - Call transfer supplementary service.*

ISO/IEC 13870:1995, *Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Inter-exchange signalling protocol - Call completion supplementary services.*

ISO/IEC 13873:1995, *Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Inter-exchange signalling protocol - Call diversion supplementary services.*

ISO/IEC 13874:1995, *Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Inter-exchange signalling protocol - Path replacement additional network feature.*

ISO/IEC 15054:1997, *Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Inter-exchange signalling protocol - Call interception additional network feature.*

ISO/IEC 15055:1997, *Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Specification, functional model and information flows - Transit counter additional network feature.*

CCITT Rec. I.112:1988, *Vocabulary of terms for ISDNs.*

CCITT Rec. I.130:1988, *Method for the characterization of telecommunication services supported by an ISDN and network capabilities of an ISDN.*

CCITT Rec. I.210:1988, *Principles of telecommunication services supported by an ISDN and the means to describe them.*

4 Definitions

For the purposes of this International Standard, the following definitions apply.

4.1 External definitions

This International Standard uses the following terms defined in other documents:

- Basic Service (CCITT Rec. I.210)
- Call, Basic Call (ISO/IEC 11582)
- Call Independent Signalling Connection (ISO/IEC 11582)
- CC Call (ISO/IEC 13870)
- Cooperating PINX (ISO/IEC 13874)
- Diverted-to PINX (ISO/IEC 13873)
- Diverted-to User (ISO/IEC 13873)
- Incoming Gateway PINX (ISO/IEC 11572)
- Incoming Side (ISO/IEC 11572)
- Inter-PTNX Link (ISO/IEC 11572)
- Originating PINX (ISO/IEC 11572)
- Outgoing Gateway PINX (ISO/IEC 11572)
- Outgoing Side (ISO/IEC 11572)
- Path Reservation (ISO/IEC 13870)
- Preceding PINX (ISO/IEC 11572)
- Primary PINX (ISO/IEC 13869)
- Private Integrated Services Network (PISN) (ISO/IEC 11579-1)
- Private Integrated Services Network Exchange (PINX) (ISO/IEC 11579-1)
- Requesting PINX (ISO/IEC 13874)
- Rerouteing PINX (ISO/IEC 13873)
- Secondary PINX (ISO/IEC 13869)
- Signalling (CCITT Rec. I.112)
- Subsequent PINX (ISO/IEC 11572)
- Supplementary Service (CCITT Rec. I.210)
- Terminating PINX (ISO/IEC 11572)
- Transit PINX (ISO/IEC 11572)

5 List of acronyms

ANF	Additional Network Feature
ANF-PR	Path Replacement Additional Network Feature
ANF-TC	Transit Counter Additional Network Feature
ISDN	Integrated Services Digital Network
PICS	Protocol Implementation Conformance Statement
PINX	Private Integrated Services Network Exchange
PISN	Private Integrated Services Network
SS-CC	Call Completion Supplementary Services
SS-CCBS	Completion of Calls to Busy Subscribers Supplementary Service
SS-CCNR	Completion of Calls on No Reply Supplementary Service
SS-CD	Call Deflection Supplementary Service
SS-CFU	Call Forwarding Unconditional Supplementary Service
SS-CFB	Call Forwarding Busy Supplementary Service
SS-CFNR	Call Forwarding No Reply Supplementary Service
SS-CT	Call Transfer Supplementary Service
SS-DIV	Diversion Supplementary Services

6 Signalling protocol for the support of ANF-TC

6.1 ANF-TC description

ANF-TC is invoked when it is desired to limit the number of Transit PINXs that a call setup request may be routed through.

ANF-TC may be used in conjunction with either a Basic call setup request or a setup request for a call independent (connection oriented) signalling connection.

Use of ANF-TC is a network option. The criteria for determining:

- when ANF-TC should be invoked;
- the number of PINXs through which a call may be routed; and,
- the means by which the feature is activated or deactivated

are network dependent and outside the scope of this International Standard.

6.2 ANF-TC operational requirements

6.2.1 Requirements on the Originating PINX

Call establishment procedures for the outgoing side of an inter-PINX link and call release procedures, as specified in ISO/IEC 11572, shall apply.

If the PINX supports connection-oriented APDU transport, then the generic procedures for the call independent control (connection oriented) of supplementary services, as specified in ISO/IEC 11582 for an Originating PINX, shall apply.

6.2.2 Requirements on the Terminating PINX

Call establishment procedures for the incoming side of an inter-PINX link and call release procedures, as specified in ISO/IEC 11572, shall apply.

If the PINX supports connection-oriented APDU transport, then the generic procedures for the call independent control (connection oriented) of supplementary services, as specified in ISO/IEC 11582 for a Terminating PINX, shall apply.

6.2.3 Requirements on a Transit PINX

Basic call procedures for call establishment and call clearing at a Transit PINX, as specified in ISO/IEC 11572 shall apply.

If the PINX supports connection-oriented APDU transport, then the generic procedures for the call independent control (connection oriented) of supplementary services, as specified in ISO/IEC 11582 for a Transit PINX, shall apply.

6.3 ANF-TC coding requirements

6.3.1 Transit counter information element

ANF-TC shall be encoded as a discrete information element (called Transit counter) within codeset 4 (ISO codeset), according to the rules for the general format and coding of variable length information elements defined in 14.5.1 of ISO/IEC 11572.

The Transit counter information element shall be a variable length category 1 (see 10.4.11.2 of ISO/IEC 11572) information element with the format shown in figure 1 and coded as shown in table 1.

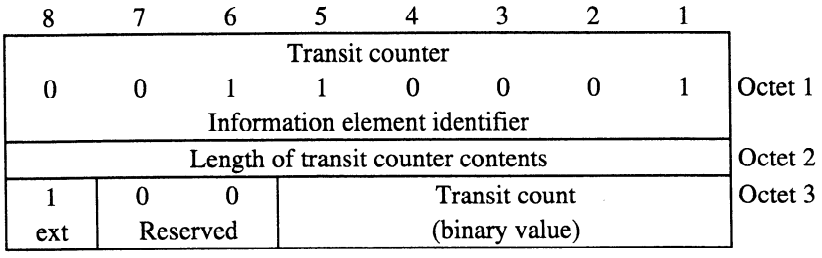

Figure 1 - Transit counter information element

Table 1 - Transit counter information element

Transit count (octet 3)
A binary value (in the range 0 - 31) that indicates the number of Transit PINXs through which the SETUP request has already passed. The maximum number of Transit PINXs through which a SETUP request may pass is a network dependent value.

6.3.2 Messages

If used, the Transit counter information element shall be conveyed in a SETUP message.

One of the shift information elements (see 14.5.3 and 14.5.4 of ISO/IEC 11572) shall precede the Transit counter information element in the SETUP message.

6.4 ANF-TC signalling procedures

The signalling protocol for Transit counter functionality operates in association with the signalling protocols for basic circuit switched call control (as specified in ISO/IEC 11572) and call independent (connection oriented) signalling connections (as specified in ISO/IEC 11582).

Note - The actions specified in the following subclauses are applicable to both cases.

Where a reference is made to procedures specified in ISO/IEC 11572 and ISO/IEC 11582, the interpretation of such reference should be made according to whether the call concerned is a basic call or a call independent signalling connection.

6.4.1 Actions at the Originating PINX

An Originating PINX may include a Transit counter information element in the SETUP message sent across an inter-PINX link. The value of the transit count field shall be set to zero.

6.4.2 Actions at the Terminating PINX

A Terminating PINX shall ignore the Transit counter information element if it is contained in any received SETUP message.

6.4.3 Actions at a Transit PINX

6.4.3.1 Normal procedures

On receipt of a SETUP message from the Preceding PINX, the call request shall be processed according to the procedures specified in ISO/IEC 11572 and ISO/IEC 11582.

If the received SETUP message contains a Transit counter information element in which the transit count field has a value that is less than the acceptable (network dependent) limit, that information element shall be included in the SETUP message sent to the Subsequent PINX. The value of the transit count field in the outgoing Transit counter information element shall be set to one greater than the value received.

If the received SETUP message does not contain a Transit counter information element, the Transit PINX may include a Transit counter information element in the SETUP message sent to the Subsequent PINX. The value of the transit count field in this element shall be set to a value not less than 1.

6.4.3.2 Exceptional procedures

If the SETUP message received from the Preceding PINX contains a Transit counter information element in which the transit count field has a value that is greater than or equal to the acceptable (network dependent) limit of Transit PINX's through which the call may be routed, and the PINX is unable to become a Terminating or Outgoing Gateway PINX, the call shall be rejected. The acceptable limit shall not exceed 31.

6.4.4 Actions at an Incoming Gateway PINX

When routeing a call entering the PISN an Incoming Gateway PINX may include a Transit counter information element in the SETUP message sent across the inter-PINX link. The value of the transit count field shall be set to an initial value. This initial value shall be zero unless knowledge of the history of the call enables a higher value to be chosen.

6.4.5 Actions at an Outgoing Gateway PINX

An Outgoing Gateway PINX may make use of a Transit counter information element received in a SETUP message for interworking with another network that supports an equivalent feature. Otherwise an Outgoing Gateway PINX shall ignore a Transit counter information element received in a SETUP message.

6.5 Protocol interactions between ANF-TC and other supplementary services and ANFs

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

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.

Note 2 - Simultaneous conveyance of a Transit counter information element and APDUs for other supplementary services or ANFs 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.

In each of the interactions specified in this subclause, a Transit PINX shall behave as described in 6.4.3.

6.5.1 Interaction with Calling Name Identification Presentation (SS-CNIP)

No protocol interaction.

6.5.2 Interaction with Connected Name Identification Presentation (SS-CONP)

No protocol interaction.

6.5.3 Interaction with Completion of Calls to Busy Subscribers (SS-CCBS)

An Originating PINX initiating the CC Call (with or without path reservation, see ISO/IEC 13870) may include a Transit counter information element in the SETUP message, as described in 6.4.1.

6.5.4 Interaction with Completion of Calls on No Reply (SS-CCNR)

An Originating PINX initiating the CC Call (with or without path reservation, see ISO/IEC 13870) may include a Transit counter information element in the SETUP message, as described in 6.4.1.

6.5.5 Interaction with Call Transfer (SS-CT)

When using transfer by rerouteing (see ISO/IEC 13869), a Primary PINX may include a Transit counter information element in the SETUP message sent to establish the new connection to the Secondary PINX. The transit count field of the Transit counter information element shall be set to zero.

A Secondary PINX shall ignore the Transit counter information element if it is contained in the received SETUP message.

6.5.6 Interaction with Call Forwarding Unconditional (SS-CFU)

A Rerouteing PINX (see ISO/IEC 13873) may include a Transit counter information element in the SETUP message sent to establish a new call to the Diverted-to User. The transit count field of the Transit counter information element shall be set to zero.

A Diverted-to PINX shall ignore the Transit counter information element if it is contained in the received SETUP message.

6.5.7 Interaction with Call Forwarding Busy (SS-CFB)

The protocol interactions with Call Forwarding Busy shall be as specified in 6.5.6 for interaction with SS-CFU.

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

The protocol interactions with Call Forwarding No Reply shall be as specified in 6.5.6 for interaction with SS-CFU.

6.5.9 Interaction with Call Deflection (SS-CD)

The protocol interactions with Call Deflection Immediate shall be as specified in 6.5.6 for interaction with SS-CFU.

The protocol interactions with Call Deflection from Alert shall be as specified in 6.5.8 for interaction with SS-CFNR.

6.5.10 Interaction with Path Replacement (ANF-PR)

A Cooperating PINX (see ISO/IEC 13874) may include a Transit counter information element in the SETUP message sent to establish a new connection to the Requesting PINX. The transit count field of the Transit counter information element shall be set to zero.

A Requesting PINX shall ignore the Transit counter information element if it is contained in the received SETUP message.

A Transit PINX involved in the new connection shall act in accordance with the procedures specified in 6.4.3 above.

A Transit PINX involved in the retained connection, that is unable to retain the old connection as far as the Subsequent PINX in the direction of the Requesting PINX, may include a Transit counter information element in the SETUP message sent to establish a new connection to the Requesting PINX. The transit count field of the Transit counter information element shall be set to not less than 1.

Note - There are no interactions for a Transit PINX involved in the replaced connection.

6.5.11 Interaction with Call Offer (SS-CO)

No protocol interaction.

6.5.12 Interaction with Do Not Disturb (SS-DND)

No protocol interaction.

6.5.13 Interaction with Do Not Disturb Override (SS-DNDO)

No protocol interaction.

6.5.14 Interaction with Call Intrusion (SS-CI)

No protocol interaction.

6.5.15 Interaction with Call Interception (ANF-CINT)

An Intercepting PINX (see ISO/IEC 15054) may include a Transit counter information element in the SETUP message sent to establish a new call to the new intercepted-to user. The transit count field of the Transit counter information element shall be set to zero.

6.5.16 Interaction with Recall (SS-RE)

No protocol interaction.

6.5.17 Interaction with Advice of Charge (SS-AOC)

No protocol interaction.

Annex A

(normative)

Protocol Implementation Conformance Statement (PICS) proforma

A.1 Introduction

The supplier of a protocol implementation which is claimed to conform to this International 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 International 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 International 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 inter-work 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.

A.2 Instructions for completing the PICS proforma

A.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(s) in the main body of this International 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>;
<item>:m	simple conditional requirement, the capability being mandatory if item number <item> is supported, otherwise not applicable;
<item>:o	simple conditional requirement, the capability being optional if item number <item> 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).

A.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.

A.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 International 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.

A.3 PICS Proforma

A.3.1 Implementation identification

Supplier	
Contact point for queries about the PICS	
Implementation name(s) and version(s)	
Other information necessary for full identification, e.g. name(s) and version(s) for machines and/or operating systems; system name(s)	

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).

A.3.2 Protocol summary

Protocol version	1.0
Addenda implemented (if applicable)	
Amendments implemented	
Have any exception items been required (see A.2.3)?	No [ ] Yes [ ] (The answer Yes means that the implementation does not conform to this International Standard)

Date of statement	

A.3.3 General

Item	Question/feature	Reference	Status	N/A	Support
A1	Behaviour as an Originating PINX for ANF-TC in association with basic circuit switched call control (ISO/IEC 11572)	6.2.1, 6.4.1	o.1		Yes [ ] No [ ]
A2	Behaviour as an Originating PINX for ANF-TC in association with call independent signalling connections (ISO/IEC 11582)	6.2.1, 6.4.1	o.1		Yes [ ] No [ ]
A3	Behaviour as a Terminating PINX for ANF-TC in association with basic circuit switched call control (ISO/IEC 11572)	6.2.2, 6.4.2	o.1		Yes [ ] No [ ]
A4	Behaviour as a Terminating PINX for ANF-TC in association with call independent signalling connections (ISO/IEC 11582)	6.2.2, 6.4.2	o.1		Yes [ ] No [ ]
A5	Behaviour as a Transit PINX for ANF-TC in association with basic circuit switched call control (ISO/IEC 11572)	6.2.3, 6.4.3	o.1		Yes [ ] No [ ]
A6	Behaviour as a Transit PINX for ANF-TC in association with call independent signalling connections (ISO/IEC 11582)	6.2.3, 6.4.3	o.1		Yes [ ] No [ ]
A7	Behaviour as an Incoming Gateway PINX for ANF-TC in association with basic circuit switched call control (ISO/IEC 11572)	6.4.4	o.1		Yes [ ] No [ ]
A8	Behaviour as an Incoming Gateway PINX for ANF-TC in association with call independent signalling connections (ISO/IEC 11582)	6.4.4	o.1		Yes [ ] No [ ]
A9	Behaviour as an Outgoing Gateway PINX for ANF-TC in association with basic circuit switched call control (ISO/IEC 11572)	6.4.5	o.1		Yes [ ] No [ ]
A10	Behaviour as an Outgoing Gateway PINX for ANF-TC in association with call independent signalling connections (ISO/IEC 11582)	6.4.5	o.1		Yes [ ] No [ ]

A.3.4 Protocol interactions with SS-CC

Item	Question/feature	Reference	Status	N/A	Support
B1	Support of SS-CCBS		o		Yes [ ] No [ ]
B2	Support of SS-CCNR		o		Yes [ ] No [ ]
B3	Interactions with SS-CCBS	6.5.3	c.1	[ ]	m: Yes [ ]
B4	Interactions with SS-CCNR	6.5.4	c.2	[ ]	m: Yes [ ]

c.1: if B1 and A1 then m, else N/A
c.2: if B2 and A1 then m, else N/A