INTERNATIONAL STANDARD

ISO/IEC 15055

First edition
1997-05-15

Information technology — Telecommunications and information exchange between systems — Private Integrated Services Network — Specification, functional model and information flows — Transit counter additional network feature

Technologies de l'information — Télécommunications et échange d'information entre systèmes — Réseau privé à intégration de services — Spécification, modèle fonctionnel et flux d'informations — Facilité de réseau additionnelle de compteur de transfert

Reference number
ISO/IEC 15055:1997(E)

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 15055 was prepared by ECMA (as ECMA-224) 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.

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 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.

There is currently no equivalent service/feature specified by ITU-T or ETSI for public ISDNs.

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Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Specification, functional model and information flows - Transit counter additional network feature

1 Scope

This International Standard specifies the Transit Counter additional network feature (ANF-TC), which is applicable to various basic services supported by Private Integrated Services Networks (PISN). Basic services are specified in ISO/IEC 11574.

ANF-TC is an additional network feature which limits the number of network exchanges that a call request may transit during call establishment, e.g. to protect the network against indefinite looping. There is no user involved in the provision or operation of ANF-TC.

Additional network feature specifications are produced in three stages, according to the method described in CCITT Rec. I.130. This International Standard contains the stage 1 and stage 2 specifications of ANF-TC. The stage 1 specification (clause 6) specifies the general feature principles and capabilities. The stage 2 specification (clause 7) identifies the functional entities involved in the feature and the information flows between them.

2 Conformance

In order to conform to this International Standard, a stage 3 standard shall specify signalling protocols and equipment behaviour that are capable of being used in a PISN which supports the feature specified in this International Standard. This means that, to claim conformance, a stage 3 standard is required to be adequate for the support of those aspects of clause 6 (stage 1) and clause 7 (stage 2) which are relevant to the interface or equipment to which the stage 3 standard applies.

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 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 13863:1995, *Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Specification, functional model and information flows - Path replacement additional network feature.*

ISO/IEC 13865:1995, *Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Specification, functional model and information flows - Call transfer supplementary service.*

ISO/IEC 13866:1995, *Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Specification, functional model and information flows - Call completion supplementary services.*

ISO/IEC 13872:1995, *Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Specification, functional model and information flows - Call diversion supplementary services.*

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.*

CCITT Rec. Z.100:1988, *Specification and description language.*

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)
- Private Integrated Services Network (PISN) (ISO/IEC 11579-1)
- Private Integrated Services Network Exchange (PINX) (ISO/IEC 11579-1)
- Service (CCITT Rec. I.112)
- Signalling (CCITT Rec. I.112)
- Supplementary Service (CCITT Rec. I.210)
- User (ISO/IEC 11574)

This International Standard refers to the following basic call functional entity (FE) defined in ISO/IEC 11574:

- Call Control (CC)

This International Standard refers to the following basic call inter-FE relationship defined in ISO/IEC 11574:

- r2

This International Standard refers to the following basic call information flows defined in ISO/IEC 11574:

- Setup request/indication
- Setup-Reject request/indication

4.2 Other definitions

additional network feature : A capability over and above that of a basic call, but not provided directly to a user.

call, basic call : An instance of the use of a basic service.

signalling connection : A connection used to exchange information between peer supplementary service protocol control entities independently of a basic call.

transit counter : A counter for the number of transit exchanges involved in a call or signalling connection during the establishment phase.

5 List of acronyms

ANF(-TC)	Additional Network Feature (Transit Counter)
CC	Call Control (functional entity)
FE	Functional Entity
ISDN	Integrated Services Digital Network
PINX	Private Integrated Services Network Exchange
PISN	Private Integrated Services Network
SDL	Specification and Description Language
SS	Supplementary Service

6 ANF-TC stage 1 specification

Throughout this clause, the term "call" shall be interpreted as meaning "call or signalling connection".

6.1 Description

6.1.1 General description

ANF-TC may be invoked in conjunction with a call request when it is desired to limit the number of network exchanges that the call can transit. The maximum number of network exchanges that the call can transit is network dependent, in the range 1 to 31.

6.1.2 Qualifications on applicability to telecommunication services

ANF-TC is applicable to all basic services defined in ISO/IEC 11574.

6.2 Procedure

6.2.1 Provision/withdrawal

ANF-TC shall be generally available for all calls that involve more than one network exchange.

6.2.2 Normal procedures

6.2.2.1 Activation/deactivation/registration/interrogation

Not applicable.

6.2.2.2 Invocation and operation

ANF-TC may be invoked in conjunction with a call request. When invoked, the transit counter shall be set to an initial value and then incremented with every network exchange that the call request transits. The initial value shall be zero unless any knowledge available about the history of the call (e.g. route taken, interworking, diversions) is used to choose a higher initial value.

ANF-TC shall terminate when the call request reaches its destination, is released, or leaves the PISN.

6.2.3 Exceptional procedures

6.2.3.1 Activation/deactivation/registration/interrogation

Not applicable.

6.2.3.2 Invocation and operation

If the transit counter exceeds a PISN specific limit (which takes any value in the range 1 to 31) before the call reaches its destination or leaves the PISN, the call shall be aborted.

Note - Other actions that the PISN may take are outside the scope of this International Standard.

6.3 Interaction with other supplementary services and ANFs

Interactions with other supplementary services and ANFs for which PISN standards were available at the time of publication of this International Standard are specified below.

6.3.1 Calling Line Identification Presentation (SS-CLIP)

No interaction.

6.3.2 Connected Line Identification Presentation (SS-COLP)

No interaction.

6.3.3 Calling/Connected Line Identification Restriction (SS-CLIR)

No interaction.

6.3.4 Calling Name Identification Presentation (SS-CNIP)

No interaction.

6.3.5 Connected Name Identification Presentation (SS-CONP)

No interaction.

6.3.6 Calling/Connected Name Identification Restriction (SS-CNIR)

No interaction.

6.3.7 Completion of Calls to Busy Subscriber (SS-CCBS)

ANF-TC may apply to a call resulting from the use of SS-CCBS.

6.3.8 Completion of Calls on No Reply (SS-CCNR)

ANF-TC may apply to a call resulting from the use of SS-CCNR.

6.3.9 Call Transfer (SS-CT)

ANF-TC may apply to the establishment of the new connection during transfer by rerouteing.

6.3.10 Call Forwarding Unconditional (SS-CFU)

ANF-TC may be invoked when establishing the diverted call.

6.3.11 Call Forwarding Busy (SS-CFB)

6.3.10 shall apply.

6.3.12 Call Forwarding No Reply (SS-CFNR)

6.3.10 shall apply.

6.3.13 Call Deflection (SS-CD)

6.3.10 shall apply.

6.3.14 Path Replacement (ANF-PR)

ANF-TC may apply to the establishment of the new connection.

6.3.15 Call Interception (ANF-CINT)

ANF-TC may be invoked when establishing the intercepted call.

6.3.16 Advice of Charge (SS-AOC)

No interaction.

6.3.17 Recall (SS-RE)

No interaction.

6.3.18 Call Offer (SS-CO)

No interaction.

6.3.19 Call Intrusion (SS-CI)

No interaction.

6.3.20 Do Not Disturb (SS-DND)

No interaction.

6.3.21 Do Not Disturb Override (SS-DNDO)

No interaction.

6.4 Interworking considerations

ANF-TC may apply to calls entering the PISN from another network or to calls going to another network.

6.5 Overall SDL

Figure 1 contains the dynamic description of ANF-TC using the Specification and Description Language (SDL) defined in CCITT Rec. Z.100 (1988). The SDL process represents the behaviour of the PISN in providing ANF-TC. Input symbols from the left and output symbols to the left represent internal stimuli.

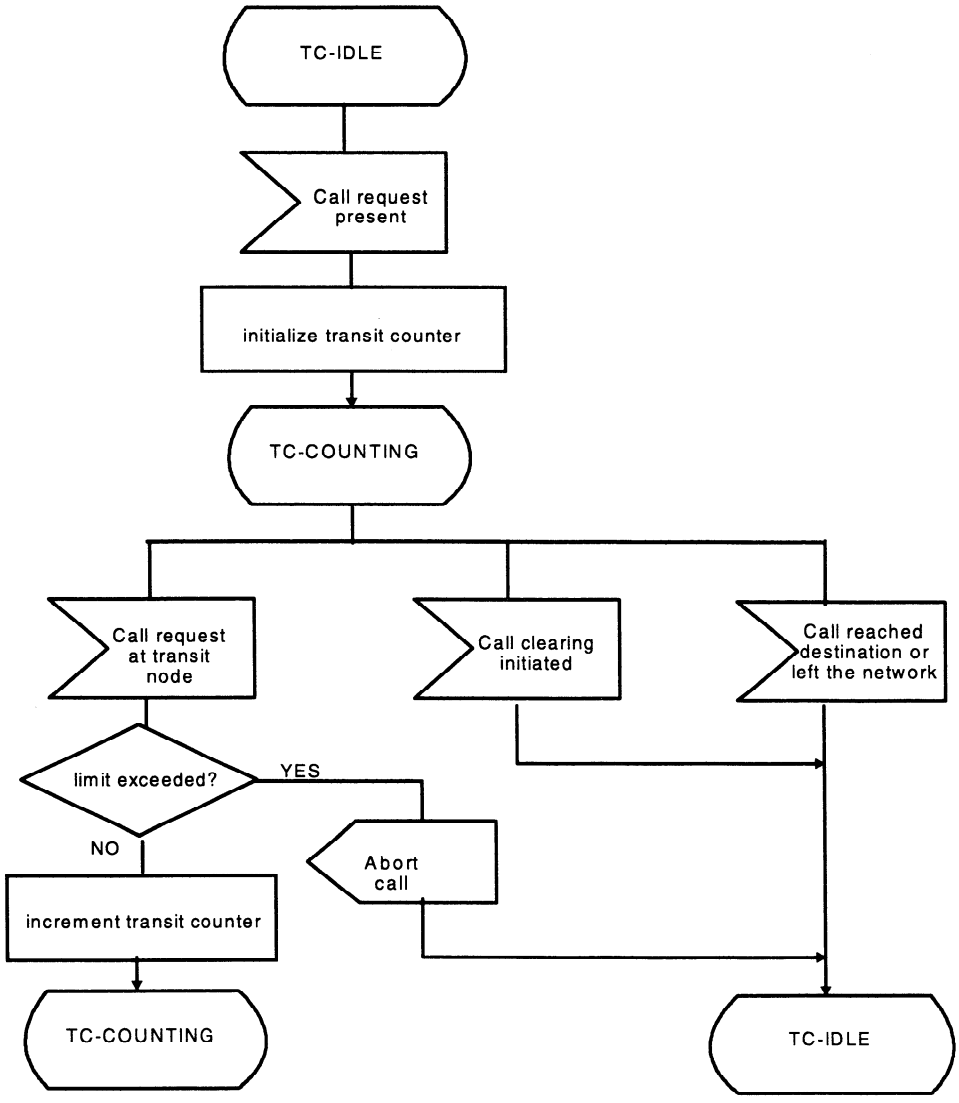

Figure 1 - ANF-TC, overall SDL

7 ANF-TC stage 2 specification

Throughout this clause, the term "call" shall be interpreted as meaning "call or signalling connection".

7.1 Functional model

7.1.1 Functional model description

The functional model shall comprise the following functional entities:

FE1 TC Initialize

FE2 TC Execute

The following functional relationship shall exist between these FEs:

ra between FE1 and FE2 and between consecutive FE2s

Figure 2 shows these FEs and relationship.

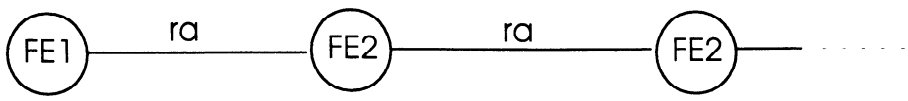

Figure 2 - Functional model for ANF-TC

7.1.2 Description of functional entities

7.1.2.1 TC Initialize, FE1

This FE recognises the invocation of ANF-TC, sets the transit counter to its initial value and passes it to FE2.

7.1.2.2 TC Execute, FE2

This FE receives the transit counter from FE1 or from another FE2. The following two types of FE2 exist:

Intermediate FE2

An intermediate FE2 compares the transit counter to the allowed limit. If below the limit, FE2 increments the transit counter and passes it to the next FE2; otherwise it requests rejection of the call request.

Final FE2

The final FE2 terminates ANF-TC.

7.1.3 Relationship of functional model to basic call functional model

FE1 shall be collocated with the Originating CC, an Incoming Gateway CC, or a Transit CC.

An intermediate FE2 shall be collocated with a Transit CC.

The final FE2 shall be collocated with the Terminating CC or an Outgoing Gateway CC.

Figure 3 shows an example of the relationship with the basic call functional model.

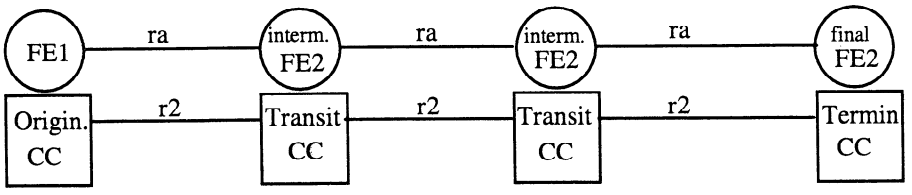

Figure 3 - Example relationship between models for ANF-TC and basic call

7.2 Information flows

7.2.1 Definition of information flows

7.2.1.1 ra-TC

ra-TC is an unconfirmed information flow across ra from FE1 to FE2 and between FE2s.

Table 1 lists the service elements within the ra-TC information flow. 'M' in the column headed "Request" indicates that the service element is mandatory.

Table 1 - Content of ra-TC

Service element	Allowed Value	Request
Transits count	Integer (Note)	M
Note: The allowed range is (0, .., *max*) where *max* is a network dependent maximum value.		

Service element Transits count shall always be included in the ra-TC request/indication information flow and contain the current value of the transit counter.

7.2.2 Relationship of information flows to basic call information flows

ra-TC shall be sent in conjunction with an r2-Setup request/indication flow.

7.2.3 Examples of information flow sequences

A stage 3 standard for ANF-TC shall provide signalling procedures in support of the information flow sequences specified below. In addition, signalling procedures should be provided to cover other sequences arising from error situations, interactions with other supplementary services, different topologies, etc.

In the figures, ANF-TC information flows are represented by solid arrows and basic call information flows are represented by broken arrows. An ellipse embracing two information flows indicates that the two information flows occur simultaneously. Within a column representing an ANF-TC functional entity, the numbers refer to functional entity actions listed in 7.3. The following abbreviations are used:

req	request
ind	indication

7.2.3.1 Normal operation of ANF-TC

Figure 4 shows the information flow sequence for normal operation of ANF-TC.

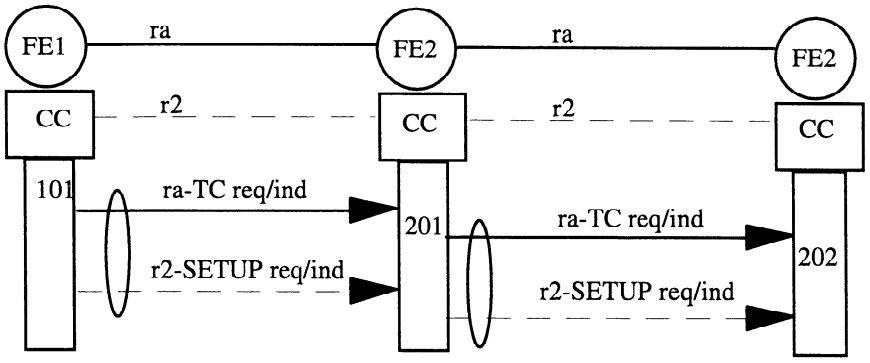

Figure 4 - Information flow sequence - normal operation of ANF-TC

7.2.3.2 Transit counter limit exceeded

Figure 5 shows the information flow sequence for the case that the allowed limit of the transit counter is exceeded.

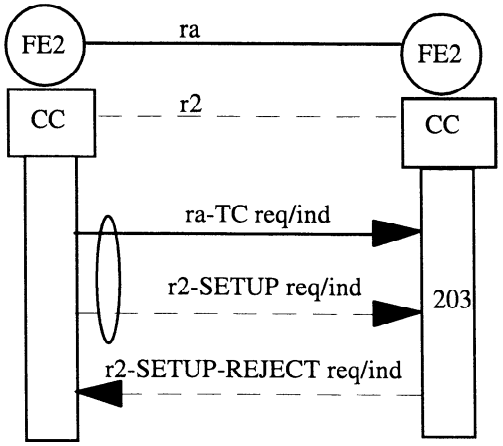

Figure 5 - Information flow sequence - transit counter limit exceeded

7.3 Functional entity actions

The following FE actions shall occur at the points indicated in the figures of 7.2.

7.3.1 Functional entity actions of FE1

101 Recognize the invocation of ANF-TC, set the transit counter to the initial value and send ra-TC request/indication to FE2.

7.3.2 Functional entity actions of FE2

201 Acting as an intermediate FE2, on receiving ra-TC request/indication with a transit counter value below the limit, increment the value and send ra-TC request/indication to the next FE2.

202 Acting as the final FE2, on receiving ra-TC request/indication, terminate ANF-TC.

203 Acting as an intermediate FE2, on receiving ra-TC request/indication with a transit counter value equal to or higher than the allowed limit, reject the call setup request.

7.4 Functional entity behaviour

The FE behaviours shown below are intended to illustrate typical FE behaviour in terms of information flows sent and received.

The behaviour of each FE is shown using the Specification and Description Language (SDL) defined in CCITT Rec. Z.100 (1988).

7.4.1 Behaviour of FE1

Figure 6 shows the normal behaviour of FE1. Input symbols from the left represent internal stimuli. Output symbols to the right represent information flows to FE2.

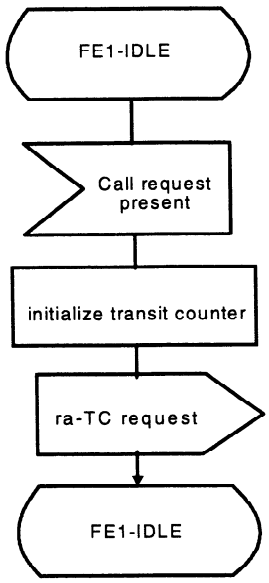

Figure 6 - ANF-TC, SDL for functional entity FE1

7.4.2 Behaviour of FE2

Figure 7 shows the normal behaviour of FE2. Input symbols from the left represent information flows from other FEs. Output symbols to the right represent information flows to another FE2. Output symbols to the left represent internal stimuli.

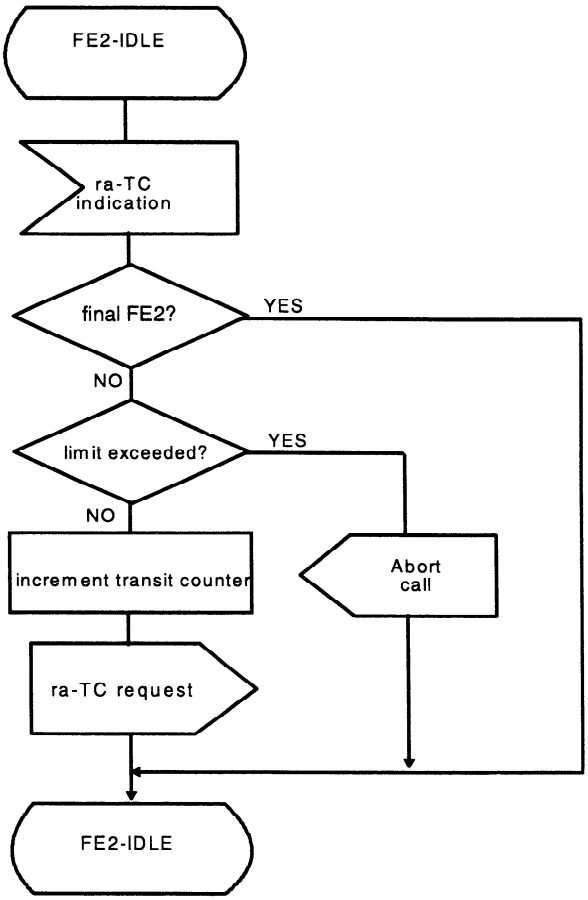

Figure 7 - ANF-TC, SDL for functional entity FE2

7.5 Allocation of functional entities to physical equipment

Table 2 shows the allocation of functional entities to physical equipment.

Table 2 - Scenarios for the allocation of FEs to physical equipment

	FE1	FE2 (intermediate)	FE2 (final)
Scenario 1	Originating PINX	Transit PINX	Terminating PINX
Scenario 2	Transit PINX	Transit PINX	Terminating PINX

7.6 Interworking considerations

ANF-TC applies only to portions of a call that lie within the PISN. For calls to and from other networks the functional entities are allocated to physical equipment as shown in table 3.

Table 3 - Scenarios for the allocation of FEs to physical equipment in interworking situations

	FE1	FE2 (intermediate)	FE2 (final)
Scenario 3	Originating PINX	Transit PINX	Outgoing Gateway PINX
Scenario 4	Transit PINX	Transit PINX	Outgoing Gateway PINX
Scenario 5	Incoming Gateway PINX	Transit PINX	Terminating PINX
Scenario 6	Incoming Gateway PINX	Transit PINX	Outgoing Gateway PINX

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ICS 35.110

Descriptors: data processing, information interchange, telecommunications, network interconnection, telecommunication network, private network, ISDN, data transmission, services.

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