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Integrated Services Digital Network (ISDN); Signalling System No.7; Transaction Capabilities (TC); Application Service Element (ASE) for User Signalling Bearer Service (USBS)

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Foreword

This European Standard (Telecommunications series) has been produced by ETSI Technical Committee Signalling Protocols and Switching (SPS), and is now submitted for the Public Enquiry phase of the ETSI standards Two-step Approval Procedure (TAP).

The present document details the stage three aspects (signalling system protocols and switching functions) needed to support the User Signalling Bearer Service (USBS) supplementary service. The stage 1 aspects are detailed in ETS 300 716.

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1 Scope

The present document specifies the stage three of the User Signalling Bearer Service (USBS) for the pan-European Integrated Services Digital Network (ISDN) as provided by European public telecommunications operators across the internodal network. Stage three identifies the signalling and protocol functions and procedures required to support a telecommunications service (see CCITT Recommendation I.130 [1])

The present document does not specify the additional protocol requirements where the service is provided via a telecommunications network that is not an ISDN.

The USBS provides the unrestricted transfer (without alteration) of user information, on the D-channel, in a packetized manner over virtual circuits between end nodes with basic and primary rate access.

Charging principles are outside the scope of the present document.

Other standards specify the method of testing required to identify conformance to the present document.

2 Normative references

References may be made to:

a) specific versions of publications (identified by date of publication, edition number, version number, etc.), in which case, subsequent revisions to the referenced document do not apply; or

b) all versions up to and including the identified version (identified by "up to and including" before the version identity); or

c) all versions subsequent to and including the identified version (identified by "onwards" following the version identity); or

d) publications without mention of a specific version, in which case the latest version applies.

A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

[1] CCITT Recommendation I.130 (1988): "Methods for the characterization of telecommunications services supported by an ISDN and network capabilities of an ISDN".

[2] ITU-T Recommendation I.112 (1993): "Vocabulary of terms for ISDNs".

[3] CCITT Recommendation E.164 (1991): "Numbering plan for the ISDN era".

[4] ETS 300 716: "Integrated Services Digital Network (ISDN); User Signalling Bearer Service (USBS); Service description".

[5] EN 300 356-1: "Integrated Services Digital Network (ISDN); Signalling System No.7; ISDN User Part (ISUP) version 3 for the international interface; Part 1: Basic services [ITU-T Recommendations Q.761 to Q.764 (1997), modified]".

[6] ETS 300 009 (1991): "Integrated Services Digital Network (ISDN); Signalling System No.7; Signalling Connection Control Part (SCCP) [connectionless service] to support international interconnection".

[7] ETS 300 287 (1993): "Integrated Services Digital Network (ISDN); Signalling System No.7; Transaction Capabilities Application Part (TCAP) version 2".

[8] ITU-T Recommendation X.680 ¦ ISO/IEC 8824-1 (1994) including amendment 1 (1995): "Information technology - Abstract Syntax Notation One (ASN.1): Specification of basic notation".

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document the following definitions apply:

Integrated Services Digital Network (ISDN): See ITU-T Recommendation I.112 [2].

ISDN number: See CCITT Recommendation E.164 [3].

network determined user busy: The situation pertaining when the maximum allowable number of USBS calls has been reached for a given user.

served user: The user which invokes the USBS.

Service Data Unit (SDU): Information whose content is preserved from the sending user to the receiving user.

service, telecommunication service: See ITU-T Recommendation I.112 [2].

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

ASE	Application Service Element
ASN.1	Abstract Syntax Notation one
GT	Global Title
IAM	Initial Address Message
ISDN	Integrated Services Digital Network
ISUP	ISDN User Part
PLMN	Public Land Mobile Network
PSTN	Public Switched Telephone Network
SCCP	Signalling Connection Control Part
SDU	Service Data Unit
SSN	Sub System Number
TC	Transaction Capabilities
USBS	User Signalling Bearer Service

4 Description

The USBS allows the receiving user and sending user to exchange information, SDUs, on virtual packet-mode connections on the D-channel. No circuit-mode B-channel connection is involved in this bearer service.

The connection is established on a per call basis from the originating served user to a destination user identified by the ISDN number.

Once the connection has been established, the users' information within the SDUs are passed transparently through the network. The probability of SDUs being delivered in sequence is expected to be high and the probability of mutilation or duplication is expected to be very low. However, the network does not provide mechanisms that guarantee recovery in the case of loss of SDUs.

NOTE: Such mechanisms should be part of end-to-end high layer protocols.

SDUs transmitted by this bearer are limited to 252 octets.

As a network option, the USBS can be provided as a pre-registered on demand mode service. In this case the destination of the USBS call is registered in the network. The size of the list of the pre-registered numbers is a network option.

Limitation is placed on the number of SDUs a user is permitted to transfer in a given time period and also on the permitted maximum number of simultaneous USBS calls per D-channel.

5 Operational requirements

5.1 Provision and withdrawal

This service is provided on basic and primary rate bearers on a subscription basis, or as a network option it may be made generally available, after prior arrangements with the network operator.

When subscription to the service is required, then both the originating and terminating users shall subscribe to the service.

As a network provider option, the USBS can be provided as a pre-registered on demand mode. In this case the USBS call shall only be allowed to the destination number of the USBS call registered in the network, and the maximum size of this register is a network option.

The maximum number of USBS calls within a given time period and the maximum number of simultaneous USBS call requests is a network option.

This service may be withdrawn at the request of either the customer or for administrative purposes.

5.2 Requirements on the originating network side

The originating exchange needs the capability of the Signalling Connection Control Part (SCCP) (see ETS 300 009 [6]) and the Transaction Capabilities (TC) (see ETS 300 287 [7]) with a USBS-ASE. Any intermediate exchanges in the originating network used by the USBS need the capability of the SCCP (see ETS 300 009 [6]).

5.3 Requirements on the destination network side

The destination needs the capability of the SCCP (see ETS 300 009 [6]) and the TC (see ETS 300 287 [7]) with a USBS-ASE. Any intermediate exchanges in the originating network used by the USBS need the capability of the SCCP (see ETS 300 009 [6]).

5.4 Requirements on intermediate exchanges

The intermediate exchanges involved in the transmission of the USBS operation need the capability of SCCP (see ETS 300 009 [6]).

6 Coding requirements

6.1 Application Service Element (ASE) for USBS

6.1.1 Protocol element list

From the calling user's exchange to the called user's exchange:

a) USBSSet (invoke) class 3;

b) USBSReset (invoke) class 1;

c) USBSInfo (invoke) class 3;

d) USBSInfo (invoke, error) class 3.

From the called user's exchange to the calling user exchange:

a) USBSSet (invoke, error) class 3;

b) USBSReset (invoke) class 1;

c) USBSInfo (invoke) class 3;

d) USBSInfo (invoke, error) class 3.

6.1.2 List of parameter types

a) Called user number;

b) Calling user number.

6.1.3 Error types

a) Called user unavailable;

b) Supplementary Service Interaction.

6.1.4 Abstract syntax, general

Subclause 6.2 specifies the abstract syntax for the USBS-ASE protocol, using ASN.1, as defined in ITU-T Recommendation X.680 [8].

The mapping of OPERATION, RESULT and ERROR components to TC primitives is described in subclause 8.8.

The ASN.1 data type which follows the keywords "PARAMETER" or "RESULT" (for OPERATION and ERROR) is always optional from a syntactic point of view. However, except when explicitly specified otherwise, it has to be considered as mandatory from a semantic point of view.

When a mandatory element is missing in any component or inner data structure, a reject component shall be returned (if the dialogue still exists). The problem cause to be used is "Mistyped parameter".

6.2 ASN.1 module

The operations, errors and types required for the USBS supplementary service are defined in ASN.1 as specified in ITU-T Recommendation X.680 [8] using the OPERATION and ERROR macros as defined in ETS 300 287 [7].

The formal definition of the component types to encode these operations, errors and types is provided in ETS 300 287 [7].

```
USBS-Protocol  {ccitt identified-organisation etsi(0) ??? modules(2) operation-and-errors(1)
version1(1)}
DEFINITIONS EXPLICIT TAGS ::=
BEGIN
IMPORTS OPERATION,
ERROR
FROM TCAPMessages
{ccitt recommendation q 773 modules(2) messages(1) version2(2)};
--   Specification of USBSSet.
--   Class: 1.
--   Timer: USBS-Tsup2.
USBSSet ::= OPERATION
PARAMETER SEQUENCE   {
calledUserNumber            CalledPartyNumber,
callingUserNumber           CallingPartyNumber,
...   }
RESULT
ERRORS   {

supplementaryServiceInteraction,calledUserUnavailable,
...   }
--   Specification of USBSInfo
--   Class: 2.
--   Timer: Tusbs.
USBSInfo ::=    OPERATION
PARAMETER SEQUENCE   {
calledUserNumber            CalledPartyNumber,
callingUserNumber           CallingPartyNumber,
```

```
sdu                 SDU,
ERRORS   {
supplementaryServiceInteraction,
calledUserUnavailable,
...   }
--   error type definitions
calledUserUnavailable           ::= ERROR
supplementaryServiceInteraction ::= ERROR
--   constants and data type definitions
CalledPartyNumber  :: = OCTET STRING (SIZE(1..10))
--  the number shall be coded as described in ETS 300 356 - 1 called party number.
CallingPartyNumber  :: = OCTET STRING (SIZE(1..10))
--  the number shall be coded as described in ETS 300 356 - 1 calling party number.
uSBSOID OBJECT IDENTIFIER   :: = {ccitt identified-organization etsi(0) ??? operations-and-
errors(1)}
uSBSSet         USBSSet         :: = globalValue  : {uSBSOID 1}
uSBSInfo            USBSInfo            :: = globalValue  : {uSBSOID 2}
supplementaryServiceInteraction SupplementaryServiceInteraction :: = globalValue  : {uSBSOID 3}
calledUserUnavailable       CalledUserUnavailable       ::=gloobalValue  : {uSBSOID 4}

END
```

7 State definitions

No specific state definitions are required.

8 Signalling procedures

8.1 Activation, deactivation and registration

8.1.1 Activation

8.1.1.1 Actions at the originating local exchange

8.1.1.1.1 Normal procedure

On receipt a request for a USBS call from the access, the served user shall send to the destination exchange an uSBSSet invoke component; this component shall contain the called number parameter and the calling number parameter. The supervision timer USBS-Tsup is started.

The request for this service from the access will be in the call establishment phase of a call (Alerting, Connect, Call proceeding and Setup).

The TC-INVOKE primitive shall include the value of the USBS supervision operation timers USBS-Tsup. If this exchange receives from the destination exchange an uSBSSet return result component, then further uSBSInfo invoke components shall be sent to the destination user’s exchange, this component shall contain the called number parameter, the calling number parameter, and the SDU.

The SDUs may be transferred from the access within the User Information messages and will have the same call reference as the original USBS call establishment messages.

The TC-resources shall be released when the maximum number of SDUs has been reached or timer Tusbs has expired.

8.1.1.1.2 Exceptional procedure

a) uSBSSet error component is received

If a uSBSSet return error component is received from the destination exchange that indicates that the service cannot be activated then this exchange shall notify the user via the access, indicating "called user unavailable" or "supplementary service interaction" as a reason and the TC-resources shall be released.

b) Supervision timer expiry

If after a time period USBS-Tsup a uSBSSet component has not been received from the calling user's network register then this exchange shall notify the user via the access, indicating "called user unavailable" as a reason and the TC-resources shall be released.

b) Congestion

The congestion controls are outlined in the ISUP basic service description ETS 300 356-1 [5] and should be applied if a congestion indication is received either from the MTP/SCCP layer protocols or from the receiving user in a congestion control message with a congestion level information element indicating "receiver not ready".

d) TC cancellation or SCCP routing failure

On receipt of either a TC-ABORT, TC-U-ABORT, TC-U-REJECT, TC-L-Cancel or a TC-NOTICE primitive as a response to the uSBSSet invoke component, the exchange shall consider the activation request as not successful; this exchange shall then notify the user via the access, indicating "called user unavailable" as a reason and the TC-resources shall be released.

8.1.1.2 Actions at the destination local exchange

8.1.1.2.1 Normal procedure

On receipt a uSBSSet invoke component, and no call has been initiated to or from this user or none of the supplementary services are invoked, then this exchange shall send to the originating exchange a uSBSSet return result component and the access be notified.

The called user may then also send SDUs to the calling user and they may be transferred from the access in the User Information messages and they should be treated in the same way as in subclause 8.1.1.1.1.

8.1.1.2.2 Exceptional procedure

If the USBS supplementary service cannot be activated, the called user's exchange shall send an uSBSSet return error component to the calling user's exchange and indicate one of the following reasons:

- "calledUSerUnavailable", if a call is occurring when USBS service is requested;
- "invalidCalledUserNumber", if the ISDN number provided to identify the called user is not a valid number;
- "invalidCallingUserNumber", if the ISDN number provided to identify the calling user is not a valid number;
- "supplementaryServiceInteraction", if the deactivation of the USBS supplementary service is precluded due to an interaction with one or more other supplementary services;
- "remoteResourceUnavailable", if the resources required to perform USBS supplementary service adequately are nor available.

8.1.2 Deactivation

8.1.2.1 Actions at the originating local exchange

8.1.2.1.1 Normal procedure

On receipt of USBS supplementary service deactivation request, the calling user's exchange shall send a uSBSReset invoke component to the called user's exchange and the TC resources shall be released. The invoke component shall contain the calling user number parameter, the called number parameter, and the basic or primary service parameter.

On receipt of the uSBSReset invoke component from the called user's exchange, this exchange shall send a deactivation request to the calling user's access and the TC resources shall be released.

8.1.2.1.2 Exceptional procedure

a) TC cancellation or SCCP routing failure

On receipt of any of TC-P-ABORT, TC-U-ABORT, TC-U-REJECT, TC-L-Cancel or a TC-NOTICE primitive as a response to the uSBSReset invoke component, this exchange shall consider the deactivation request has not been successful and the calling user is notified via the access, indicating "remote resource unavailable" as a reason and the TC-resources shall be released.

8.1.2.2 Actions at the destination local exchange

8.1.2.2.1 Normal procedure

On receipt of an USBS supplementary service deactivation request the called user's exchange shall send a uSBSReset invoke component to the calling user's exchange and the TC-resources shall be released. The invoke component shall contain the calling user number parameter, the called number parameter, and the basic or primary service parameter.

On receipt of the uSBSReset invoke component from the calling user's exchange, this exchange shall send a deactivation request to the called user's access and the TC resources shall be released.

8.1.3 Registration

8.1.3.1 Actions at the originating local exchange

8.1.3.1.1 Normal procedure

The subscription or preregistration option service shall be provided after prior arrangement with the service provider.

8.1.3.1.2 Exceptional procedure

None identified.

8.1.3.2 Actions at the destination local exchange

8.1.3.2.1 Normal procedure

The subscription or preregistration option service shall be provided after prior arrangement with the service provider.

8.1.3.2.2 Exceptional procedure

None identified.

8.2 Use of TC and SCCP

The service monitoring and management signals are defined as TC-based (ETS 300 287 [7]) application messages (i.e. operations and corresponding results). The coding of these messages are given in subclause 6.2.

8.2.1 Routeing in the SCCP network

For routeing based on the Global Title (GT) translation mechanism within the national network, the coding of the called party address and the calling party address in SCCP, ETS 300 009 [6], shall comply with the following restrictions:

SSN indicator	1	(SSN for ISDN supplementary services is always included)
GT indicator	0100	(includes a translation type, numbering plan, encoding scheme and nature of address)
Translation type	00010001	(translation table)
Numbering plan	0001	(ISDN/Telephony Numbering plan, CCITT Recommendation E.164 [3])
Routing indicator	0	(Routing on global title)

8.2.2 Number information used for routeing

The exchange which initiates a dialogue using the GT translation mechanism shall give its E.164 number as GT in the SCCP calling party address field and the receiving user's E.164 number as the GT in the SCCP called party address field.

The exchange which responds to the USBS dialogue may give its E.164 number as the GT in the SCCP calling party address field and shall give the received SCCP GT calling party address as the GT in the SCCP called party address field.

8.2.3 SCCP message return procedure

The SCCP message return procedure is always requested by means of TC primitives between the USBS-ASE and the TC protocols.

8.3 ASE for USBS

8.3.1 Subsystem number

The subsystem number 000 1011 is dedicated to the ISDN supplementary services ASEs.

8.4 Dialogue

8.4.1 General

The dialogues defined for the USBS supplementary service between peer-to-peer entities (TC users) are structured dialogues. The dialogue ID parameter is used in operation handling and transmission (dialogue) handling primitives to determine which component(s) pertain(s) to which dialogue.

Each TC user has its own reference for a given dialogue. These references are local references and mapping of these local references into protocol references transaction ID, included in the messages, is done by TC.

Each TC message conveys only a single USBS operation.

8.4.2 Dialogue beginning

The calling user's exchange establishes the dialogue by using a TC-BEGIN request primitive with a TC-INVOKE request primitive to transmit either a uSBSSet invoke component, or a uSBSInfo invoke component to the called user's exchange.

8.4.3 Dialogue ending

a) Basic end

The dialogue end is requested by the called user's exchange by using a uSBSReset invoke component or with a TC-END request primitive upon the following cases:

- with TC-U-ERROR request primitive to transmit either a uSBSSet, or uSBSInfo return error component;
- with TC-U-REJECT request primitive if the component check fails.

The maximum number of allowed SDUs has been reached within the specified time period for that call.

b) Abnormal end

- The TC user may abandon the service. In this case the peer-to-peer information shall be delivered at the time the abort is issued, to the remote user, by sending a TC-END request primitive to transmit the TC-U-ABORT request primitive without an abort reason.

- When either of the USBS supervision timers uSBS-Tsup expires at the calling or called user's exchange, the USBS-ASE receives a TC-L-CANCEL indication primitive as a response to either a activation or deactivation request. In this case the request shall be rejected with the reason "register unavailable".
- When the timer Tusbs expires before the maximum allowed number of SDUs has reached, the USBS-ASE receives a TC-L-CANCEL indication primitive as a response to either an activation or a deactivation request. In this case the request shall be rejected without reason.
- On receipt of TC-P-ABORT or a TC-NOTICE indication primitive, the TC dialogue shall be terminated.

9 Interaction with other networks

9.1 Interworking with a network without USBS-ASE capability

In the case when SCCP/TC capability is available from the calling user network to a called user's network that does not support the USBS supplementary service is not relevant, as the calling user's network to be able to offer this service to the calling user has to ensure that the USBS-ASE capability is in the calling and called user's networks as described in subclause 5.2.

9.2 Interworking with a network without SCCP/TC capability

In the case where either the calling or called user's network does not support SCCP/TC capability is not relevant. In the case where an intermediate network does not support SCCP/TC capability then the message return procedure is invoked. The calling user's exchange will then receive a TC-NOTICE indication. This may happen when either the uUSBSet or uSBSReset invoke component is sent. At the reception of this indication, the calling user shall be notified via the access.

9.3 Interworking with a Public Switched Telephone Network (PSTN)

This interworking scenario is a national network matter.

9.4 Interworking with a Public Land Mobile Network (PLMN)

For further study.

9.5 Interworking with private ISDNs

When interworking with private ISDNs the public network shall not process the received USBS information and SDUs, but forward the incoming USBS requests towards the private network.

10 Interaction with other supplementary services

10.1 Advice of charge services

10.1.1 Charging information at call set-up time

No impact; this supplementary service is not available with this service.

10.1.2 Charging information during the call

No impact; this supplementary service is not available with this service.

10.1.3 Charging information at the end of call

No impact; this supplementary service is not available with this service.

10.2 Call waiting

No impact on the supplementary services but the USBS call shall be rejected if this service has been initiated with an indication of "supplementary service interaction" as a reason, and the TC resources released.

10.3 Call hold

No impact on the supplementary services but the USBS call shall be rejected if this service has been initiated with an indication of "supplementary service interaction" as a reason, and the TC resources released.

10.4 Call transfer

10.4.1 Explicit call transfer

No impact on the supplementary services but the USBS call shall be rejected if this service has been initiated with an indication of "supplementary service interaction" as a reason, and the TC-resources released.

10.5 Number identification services

10.5.1 Calling line identification presentation

No impact.

10.5.2 Calling line identification restriction

No impact.

10.5.3 Connected line identification presentation

No impact.

10.5.4 Connected line identification restriction

No impact.

10.6 Closed user group

No impact on the supplementary services but the USBS call shall be rejected if this service has been initiated with an indication of "supplementary service interaction" as a reason, and the TC-resources released.

10.7 Completion of calls to busy subscriber

No impact on the supplementary services but the USBS call shall be rejected if this service has been initiated with an indication of "supplementary service interaction" as a reason, and the TC-resources released.

10.8 Conference services

10.8.1 Conference call, add-on

No impact on the supplementary services but the USBS call shall be rejected if this service has been initiated with an indication of "supplementary service interaction" as a reason, and the TC resources released.

10.8.2 Meet-me conference

No impact on the supplementary services but the USBS call shall be rejected if this service has been initiated with an indication of "supplementary service interaction" as a reason, and the TC resources released.

10.9 Direct dialling in

No impact on the supplementary services but the USBS call shall be rejected if this service has been initiated with an indication of "supplementary service interaction" as a reason, and the TC resources released.

10.10 Diversion services

No impact on the supplementary services but the USBS call shall be rejected if this service has been initiated with an indication of "supplementary service interaction" as a reason, and the TC resources released.

10.11 Freephone

No impact on the supplementary services but the USBS call shall be rejected if this service has been initiated with an indication of "supplementary service interaction" as a reason, and the TC resources released.

10.12 Malicious call identification

No impact.

10.13 Multiple subscriber number

No impact on the supplementary services but the USBS call shall be rejected if this service has been initiated with an indication of "supplementary service interaction" as a reason, and the TC resources released.

10.14 Subaddressing

No impact on the supplementary services but the USBS call shall be rejected if this service has been initiated with an indication of "supplementary service interaction" as a reason, and the TC resources released.

10.15 Terminal portability

No impact on the supplementary services but the USBS call shall be rejected if this service has been initiated with an indication of "supplementary service interaction" as a reason, and the TC resources released.

10.16 Three party

No impact on the supplementary services but the USBS call shall be rejected if this service has been initiated with an indication of "supplementary service interaction" as a reason, and the TC resources released.

10.17 User-to-user signalling

No impact on the supplementary services but the USBS call shall be rejected if this service has been initiated with an indication of "supplementary service interaction" as a reason, and the TC resources released.

11 Parameter Values (timers)

USBS-Tsup: 10 seconds

Tusbs: 10 seconds

Annex A (informative): Signalling flows

This annex contains arrow diagrams showing the USBS - ASE signal flows for the different cases of the USBS supplementary service.

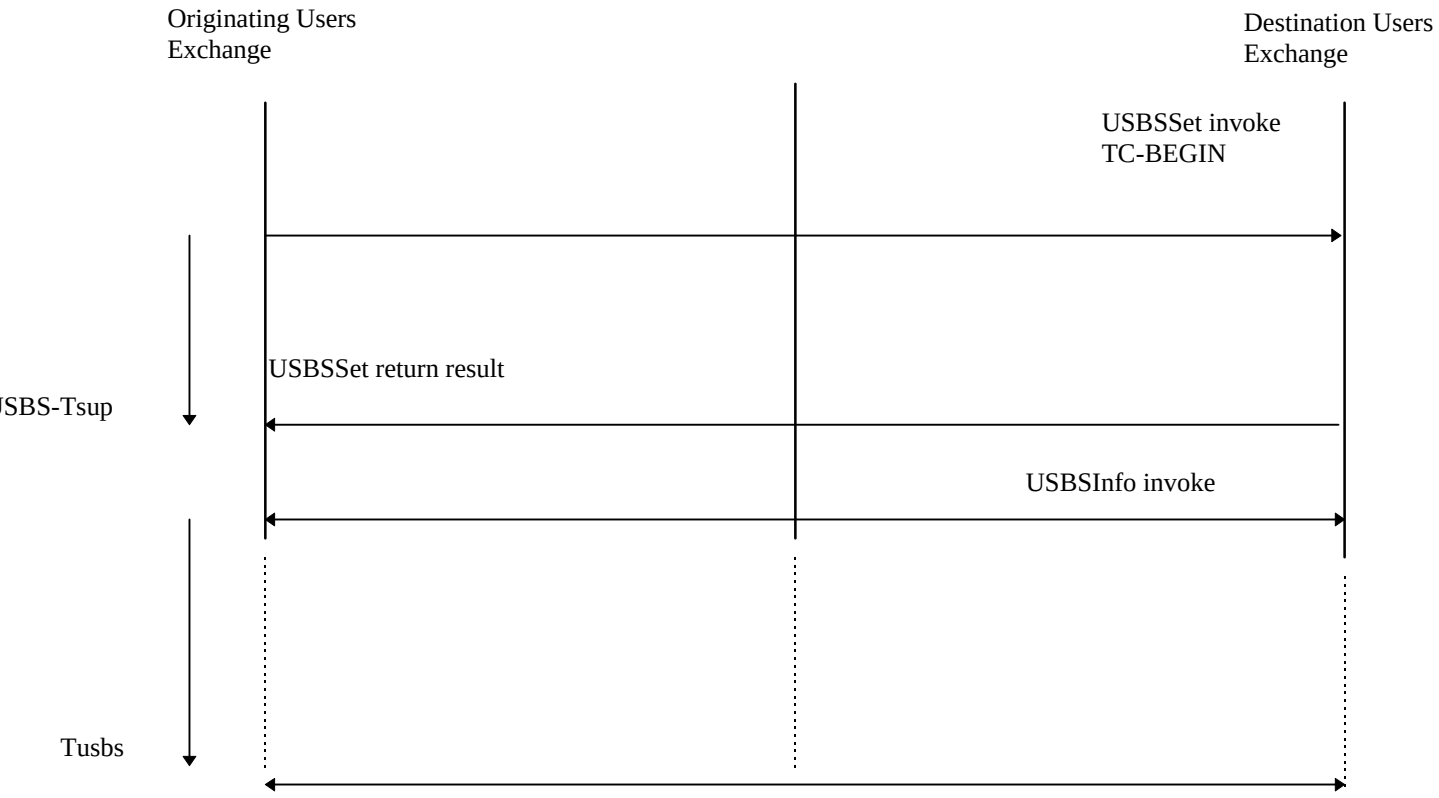

Figure A.1: Successful USBS call

History

Document history				
V1.1.1	January 1998	Public Enquiry	PE 9822:	1998-01-30 to 1998-05-29