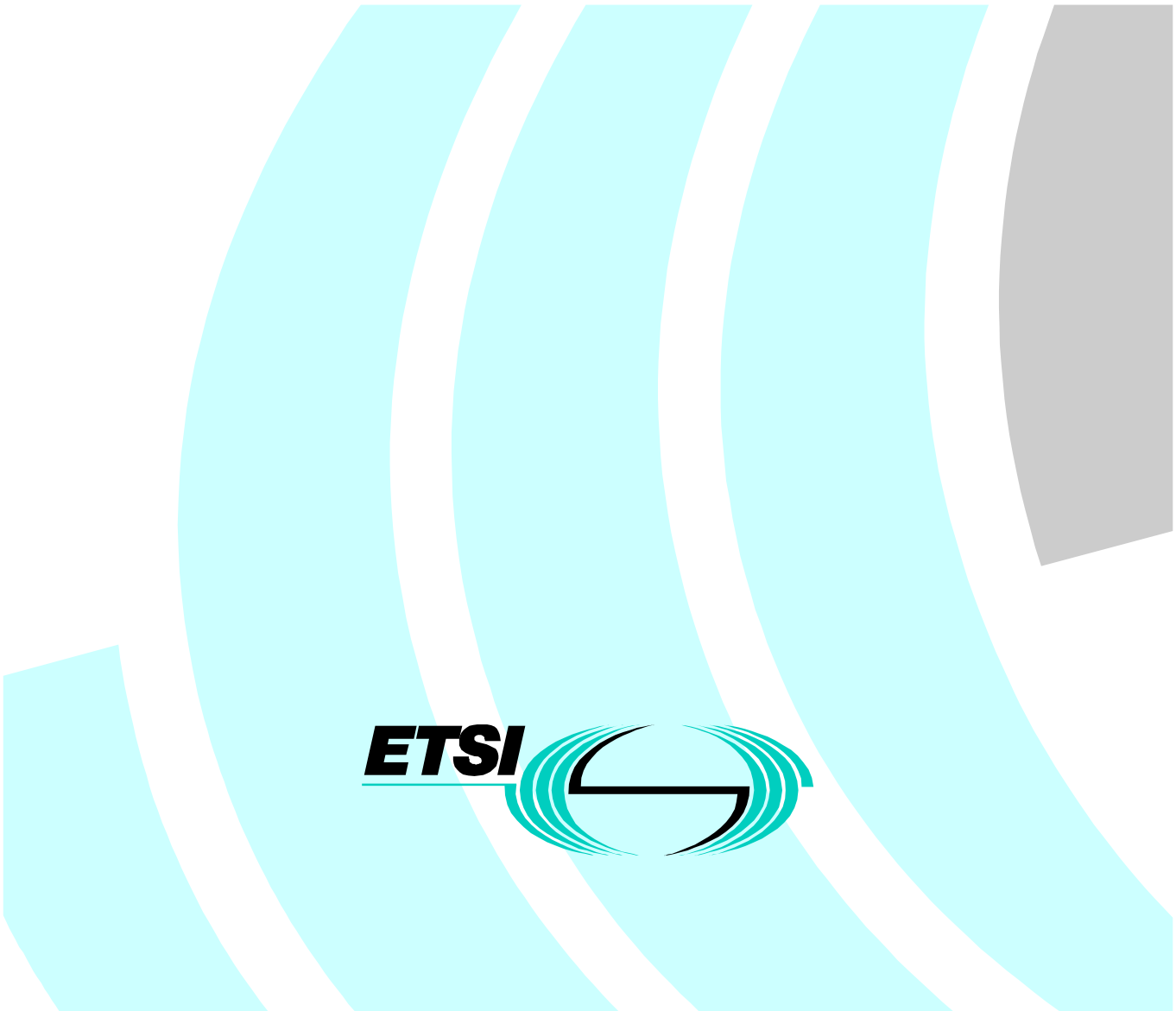
ETSI TS 101 482-1 V1.1.1 (1999-12)

Technical Specification

Integrated Services Digital Network (ISDN); DSS1 based protocol for call control & resource management over a TCP/IP network; Part 1: Protocol specification



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Contents

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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Services and Protocols for Advanced Networks (SPAN).

The present document is part 1 of a multi-part TS covering Integrated Services Digital Network (ISDN); DSS1 based protocol for call control & resource management over a TCP/IP network, as identified below:

Part 1: "Protocol specification";

Part 2: "PICS proforma";

Part 3: "Test Suite Structure and test Purposes (TSS&TP) specification for the user";

Part 4: "Abstract Test Suite (ATS) and partial Protocol Implementation eXtra Information for Testing (PIXIT) proforma specification for the user";

Part 5: "Test Suite Structure and test Purposes (TSS&TP) specification for the network";

Part 6: "Abstract test Suite (ATS) and partial Protocol Implementation eXtra Information for Testing (PIXIT) proforma specification for the network".

1 Scope

The present document describes the DSS1 based protocol for call control and resource management over an Internet Protocol (IP) based network to a Network Access Server (NAS). The protocol runs between a NAS and a Media Gateway Controller (MGC) as defined by the N reference point in ETSI TIPHON TS 101 313 [1]. The scope of application of the protocol excludes Voice over IP (VoIP), Fax over IP (FoIP) or anything else which is not strictly internet dial-up access. The protocol uses infull (DSS1) with additional messages and information elements.

The transport mechanism for the IP based messages is outside the scope of the present document.

The protocol uses all standard DSS1 procedures with the consideration that the network entity is the Media Gateway Controller (MGC) and the user entity is the NAS. The present document only specifies those procedures that have been added to fit the architectural requirements.

The present document applies to narrowband bearer services in the Switched Circuit Network (SCN) used for modem and ISDN calls to NASs.

NOTE: Dial out access is for further study.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, 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] TS 101 313: "Telecommunications and Internet Protocol Harmonization Over Networks (TIPHON); Network architecture and reference configurations; Phase II: Scenario 1 + Scenario 2".

[2] ITU-T Recommendation I.112 (03/93): "Vocabulary of terms for ISDNs".

[3] EN 300 403-1: "Integrated Services Digital Network (ISDN); Digital Subscriber Signalling System No. one (DSS1) protocol; Signalling network layer for circuit-mode basic call control; Part 1: Protocol specification [ITU-T Recommendation Q.931 (1993), modified]".

[4] ITU-T Recommendation Q.699: "Interworking between ISDN access and non-ISDN access over ISDN User Part of Signalling System No. 7".

[5] EN 300 899-1: "Integrated Services Digital Network (ISDN); Signalling System No.7; Interworking between ISDN User Part (ISUP) version 2 and Digital Subscriber Signalling System No. one (DSS1); Part 1: Protocol specification [ITU-T Recommendation Q.699, modified]".

[6] ITU-T Recommendation Q.931: "SDN user-network interface layer 3 specification for basic call control".

3 Definitions

For the purposes of the present document, the following terms and definitions apply:

Integrated Services Digital Network (ISDN): see ITU-T Recommendation I.112 [2], subclause 2.3, definition 308.

Media Gateway Controller: see TS 101 313 [1], subclause 3.1.

Network: the DSS1 protocol entity at the network side of the user-network interface.

Network Access Server: the device that acts as a Media Gateway (see TS 101 313 [1], subclause 3.1).

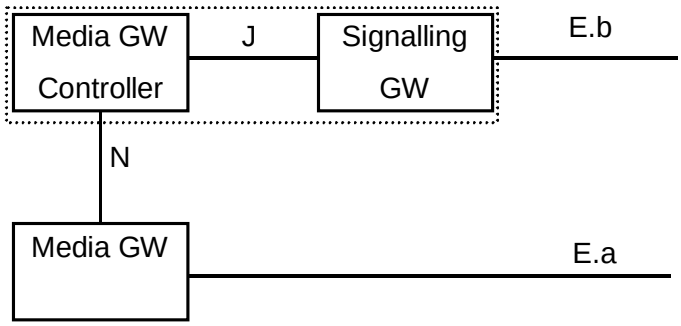
4 Abbreviations

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

DSS1	Digital Subscribe Signalling System Number 1
ISDN	Integrated Services Digital Network
IP	Internet Protocol
MGC	Media Gateway Controller
NAS	Network Access Server
SCN	Switched Circuit Network
SGW	Signalling Gateway
SS7	Signalling System No. 7

5 Description

This protocol is used at the N reference point defered in TS 101 313 [1] as shown in figure 1. The TIPHON architecture is functional rather than physical. However the NAS is a physical media gateway. The MGC could be a function of a combined Signalling Gateway (SGW)/MGC Controller or it could be a standalone device.



NOTE 1: The E.a reference point is between the gateway (Media Gateway) and the SCN. The E.b reference point is between the gateway (Signalling Gateway) and the SCN. The J reference point is between the SGW and the MGC.
NOTE 2: The transport mechanism for the IP based messages is outside the scope of the present document. This transport mechanism shall be reliable and shall support redundant paths.
NOTE 3: Dial out access is for further study.

Figure 1: TS 101 313 [1] functional architecture

6 Operational Requirements

The primary requirement is call control as per EN 300 403-1 [3] over an IP based network. Additionally, the MGC needs to be made aware of the state of the resources in the NAS. The continuity test procedure for incoming calls shall be supported.

7 Coding requirements

7.1 Messages

This subclause defines the messages the MGC and NAS use for call processing, maintenance and management. These messages are based on the "DSS1" message set, and in most cases are simply specific codings of standard DSS1 messages. However, because the requirements of the MGC based systems differ from those of ISDN access for which the DSS1 message set was developed, some messages described in this subclause are extensions of standard DSS1 messages. Table 1 lists the extended Control Protocol message set. The Protocol Discriminator used for new all messages is 0 x 4A.

Table 1: Control Protocol message set

Message	Value
LOGON	0x10
LOGON ACKNOWLEDGE	0x11
RESOURCE REGISTRATION	0x38
RESOURCE REGISTRATION ACKNOWLEDGE	0x39
SERVICE	0x3A
SERVICE ACKNOWLEDGE	0x3B

The LOGON and LOGON ACKNOWLEDGE messages use a global call reference. The RESOURCE REGISTRATION, RESOURCE REGISTRATION ACKNOWLEDGE, SERVICE and SERVICE ACKNOWLEDGE messages use a unique call reference.

NOTE: Even though some messages use a unique call reference, these messages are not call related. These messages have to be uniquely identified and the call reference is the best mechanism in DSS1 to guarantee the uniqueness of the message.

7.1.1 LOGON

This message is sent by the NAS to the MGC to indicate a cold restart or a link level reset. See table 2.

Table 2: LOGON message content

Message type: LOGON Significance: local Direction: NAS to MGC				
Information element	Reference (subclause)	Direction	Type	Length
Protocol discriminator	4.2/Q.931 [6]	NAS → MGC	M	1
Call reference	4.3/Q.931 [6]	NAS → MGC	M (note)	2-*
Message type	4.4/Q.931 [6]	NAS → MGC	M	1
NOTE: This message is sent with the global call reference defined in 4.3/Q.931 [6].				

7.1.2 LOGON ACKNOWLEDGE

This message is sent to acknowledge the receipt of the LOGON message and to indicate that the requested logon is completed. See table 3.

Table 3: LOGON ACKNOWLEDGE message content

Message type: LOGON ACKNOWLEDGE **Significance: local** **Direction: MGC to NAS**				
Information element	Reference (subclause)	Direction	Type	Length
Protocol discriminator	4.2/Q.931 [6]	MGC → NAS	M	1
Call reference	4.3/Q.931 [6]	MGC → NAS	M (note)	2-*
Message type	4.4/Q.931 [6]	MGC → NAS	M	1
NOTE: This message is sent with the global call reference defined in 4.3/Q.931 [6].				

7.1.3 RESOURCE REGISTRATION

This message is sent by the NAS to register associated trunk (E1 interfaces) and user port resources. See table 4.

Table 4: RESOURCE REGISTRATION message content

Message type: RESOURCE REGISTRATION **Significance: local** **Direction: NAS to MGC**				
Information element	Reference (subclause)	Direction	Type	Length
Protocol discriminator	4.2/Q.931 [6]	NAS → MGC	M	1
Call reference	4.3/Q.931 [6]	NAS → MGC	M (note 1)	2-*
Message type	4.4/Q.931 [6]	NAS → MGC	M	1
Resource	7.2.1	NAS → MGC	M (note 2)	3-5
Channel identification	4.5.13/Q.931 [6]	NAS → MGC	O (note 3)	2-*
Call state	4.5.7/Q.931 [6]	NAS → MGC	O (note 4)	3
NOTE 1: This message is sent with a unique call reference defined in 4.3/Q.931 [6]. NOTE 2: When an entire E1 trunk interface or a host resource is specified, the *status* (octet 3) may be coded as available or unavailable. When one or more channels of an E1 trunk interface are specified, the *status* shall be coded as available if the Call state information element is included and the status shall be coded as unavailable if the Call state information element is not included. NOTE 3: Included when necessary to identify a trunk resource. May be repeated to identify multiple trunk interfaces. NOTE 4: Included when one (or more) channels of a trunk resource are identified. Omitted in other cases. Applies for all channels identified in the Channel identification information element.				

7.1.4 RESOURCE REGISTRATION ACKNOWLEDGE

This message is sent by the MGC to acknowledge the registration of associated trunk (E1 interfaces) and user port resources. See table 5.

Table 5: RESOURCE REGISTRATION ACKNOWLEDGE message content

Message type: RESOURCE REGISTRATION ACKNOWLEDGE Significance: local Direction: MGC to NAS				
Information element	Reference (subclause)	Direction	Type	Length
Protocol discriminator	4.2/Q.931 [6]	MGC → NAS	M	1
Call reference	4.3/Q.931 [6]	MGC → NAS	M (note)	2-*
Message type	4.4/Q.931 [6]	MGC → NAS	M	1
NOTE: This message is sent with a unique call reference defined in 4.3/Q.931 [6].				

7.1.5 SERVICE

This message is sent by the MGC to request a change of status for one or more channels and by the NAS to indicate a change of status for one or more channels. See table 6.

Table 6: SERVICE message content

Message type: SERVICE Significance: local Direction: both				
Information element	Reference (subclause)	Direction	Type	Length
Protocol discriminator	4.2/Q.931 [6]	both	M	1
Call reference	4.3/Q.931 [6]	both	M (note 1)	2-*
Message type	4.4/Q.931 [6]	both	M	1
Channel identification	4.5.13/Q.931 [6]	both	M (note 2)	2-*
Channel status	7.2.2	both	M	3
NOTE 1: This message is sent with a unique call reference defined in 4.3/Q.931 [6]. NOTE 2: May be repeated to change/indicate status of channel(s) of multiple interfaces.				

7.1.6 SERVICE ACKNOWLEDGE

This message is sent by the MGC or the NAS to acknowledge the change of status of one or more channels. See table 7.

Table 7: SERVICE ACKNOWLEDGE message content

Message type: SERVICE ACKNOWLEDGE Significance: local Direction: both				
Information element	Reference (subclause)	Direction	Type	Length
Protocol discriminator	4.2/Q.931 [6]	both	M	1
Call reference	4.3/Q.931 [6]	both	M (note 1)	2-*
Message type	4.4/Q.931 [6]	both	M	1
Channel identification	4.5.13/Q.931 [6]	both	M (note 2)	2-*
Channel status	7.2.2	both	M	3
Continuity indicator	7.2.3	NAS → MGC	O (note 3)	3
NOTE 1: This message is sent with a unique call reference defined in 4.3/Q.931 [6]. NOTE 2: May be repeated to indicate status of channel(s) of multiple interfaces. NOTE 3: Included when necessary to indicate the result of a loopback request.				

7.2 Information elements

This subclause describes the information elements that are the building blocks of the MGC Control Protocol messages. These information elements are based on the EN 300 403-1 [3] and, in most cases, are simply specific codings of standard Q.931 [6] information elements. The information elements used in the Control Protocol are specified in table 8. All information elements which are not described in the present document are described in EN 300 403-1 [3] document.

Table 8: MGC Control Protocol information elements

Information Element	IE Value
Channel Status	0x11
Continuity Indicator	0x19
Resource	0x1A

7.2.1 Channel status

The purpose of the Channel status information element is to change the operational state of a specified trunk channel or of a related resource.

The Channel status information element is coded as shown in Figure 2 and Table 9. The maximum length of this information element is 3 octets.

	Bits							
8	7	6	5	4	3	2	1	Octets
0	0	0	1	0	0	0	1	1
Length								2
1	Device			Status				3

Figure 2: Channel status information element

Table 9: Channel status information element

Device (octet 3)
bits
7 6 5
0 0 0 Trunk interface resource
0 0 1 Host resource
0 1 0 DSP resource
Status (octet 3)
bits
4 3 2 1
0 0 0 0 In service
0 0 0 1 Loopback
0 0 1 0 Out of service (immediate termination of call(s) on the device)
0 0 1 1 Testing
0 1 0 0 Graceful shutdown (wait for call termination)
0 1 0 1 Reserve DSP
1 0 0 0 Reservation DSP failure
All other values are reserved.

7.2.2 Continuity Indicator

The purpose of the Continuity indicator information element is to indicate the outcome of an outgoing continuity test.

The Continuity indicator information element is coded as shown in Figure 3 and Table 10. The maximum length of this information element is 3 octets.

Bits								
8	7	6	5	4	3	2	1	Octets
0	0	0	1	1	0	0	1	1
Length								2
1	0 Spare						Indicator	3

Figure 3: Continuity indicator information element

Table 10: Continuity indicator information element

Indicator (octet 3)
bit
1
0 Failed
1 Successful

7.2.3 Resource

The Resource information element is used to identify a local interface resource and its status between the NAS and the MGC.

The Resource information element is coded as shown in Figure 4 and Table 11. The maximum length of this information element is 5 octets.

Bits								
8	7	6	5	4	3	2	1	Octets
0	0	0	1	1	0	1	0	1
Length								2
1	Category		Resource type			Status		3
0/1	Capacity							3a (Note 1)

NOTE: This octet may be present only if octet 3 indicates a host resource as indicated in Table 11.

Figure 4: Resource information element

Table 11: Resource information element

Category (octet 3) bits 7 6 0 0 Trunk interface resource 1 0 Host resource *Resource type (octet 3)* bits 5 4 3 0 0 1 E1 trunk interface 1 0 0 HDLC controller port 1 0 1 Modem port NOTE 1: When the resource type HDLC controller port or modem port is used, the coding of the category shall be coded as host resource. When the resource type E1 trunk interface is used, the coding of the category shall be coded as trunk interface resource. NOTE 2: An HDLC controller port is used for ISDN calls, and a modem port for analogue calls. *Status (octet 3)* bits 2 1 0 0 Available 0 1 Unavailable *Capacity (octet 3a)* Shall be included if the category specifies a host resource. Octet 3a shall be either one or two octets depending on the size of the capacity value and shall indicate the number of modem ports. If it is one octet the most significant bit (MSB) is 1 and the remaining seven digits contain the capacity value (0-127). If it is two octets the MSB of the first octet is 0 and the MSB of the second octet is 1, the combined 14 bits of these two octets contain the capacity value (0-16383), the 7 bits from the first octet is on the higher order side and the 7 bits from the second octet is on the lower side of the 14 bits.

8 State Definitions

The standard Q.931 [6] state machine shall be used for call control. For the logon, resource registration and service procedures, a new state machine is used, based on the new states defined below. The Q.931 [6] state machine and these new state machine shall work in parallel.

8.1. States at the NAS side of the interface

Null (NAS-U0): no controls are performed.

Logon initiated (NAS-U1): the NAS informs the MGC it had a cold restart or a link level reset.

Resource registration (NAS-U2): the NAS had a cold restart or a link level reset and will register its resources to the MGC.

Resource registration initiated (NAS-U3): the NAS registers resources to the MGC.

Service initiated (NAS-U4): the NAS has detected an operational status change and informs the MGC of that change.

8.2. States at the MGC side of the interface

Null (MGC-N0): no controls are performed.

Logon initiated (MGC-N1): the MGC is informed of a NAS cold restart or link level reset.

Resource registration initiated (MGC-N2): the MGC is informed of resources to register.

Service initiated (MGC-N3): the MGC requests a change of status of a channel.

9 Call related signalling procedures

EN 300 403-1 [3] describes all call related signalling procedures, subclauses 10.2 and 10.3 describe the resource registration and service procedures. Q.931 [6] exception procedures apply to all call-related exceptions.

10 Resource related signalling procedures

10.1 Logon procedure

10.1.1 Normal procedure

When a NAS has a cold restart or a link level reset, it shall send a LOGON message to the MGC and start timer Tlogon. On receipt of a LOGON message, the MGC shall send a LOGON ACKNOWLEDGE message to the originating entity and shall take the appropriate actions to take into account the restart or reset indication of the originating entity. When the originating NAS receives the LOGON ACKNOWLEDGE message, timer Tlogon shall be stopped. On expiry of timer Tlogon, the NAS shall resend the LOGON message to the MGC.

NOTE: When a NAS has a system (re)initialization it shall be considered has a cold restart. In that case all the calls are lost. After a cold restart, the NAS shall register all the resources. A link level reset shall be considered as a data link reset as defined in 5.8.8.1/Q.931 [6].

The NAS shall register all its resources after a cold restart or a link level reset. It shall use the resource registration procedure described in subclause 10.2 to register its resources.

10.1.2 Exceptional procedure

As an implementation option, the NAS entity may go into a maintenance status on expiry of timer Tlogon.

10.2 Resource registration

10.2.1 Normal procedure

When a NAS entity detects that a resource has changed operational state, the NAS shall send a RESOURCE REGISTRATION message to the MGC and shall start timer T350.

The Resource information element shall be encoded as in subclause 7.2.5.

If the Resource information element indicates a trunk resource, the Channel identification information element shall be included and encoded as in subclause 4.5.13/Q.931 [6] using the channel type encoding.

The Channel identification information element may be repeated to register multiple interfaces within the same message. If the Channel information element is repeated, each information element shall have the same semantic.

The Call state information element shall be included when at least one channel of a trunk resource is identified and shall be encoded as in subclause 4.5.7/Q.931 [6], it shall be omitted in other cases.

On receipt of a RESOURCE REGISTRATION message, the MGC shall take the appropriate actions to take into account the indicated resource states and shall send a RESOURCE REGISTRATION ACKNOWLEDGE message to the originating entity.

When the NAS receives the RESOURCE REGISTRATION ACKNOWLEDGE message timer T350 shall be stopped.

On expiry of timer T350, the NAS shall resend the RESOURCE REGISTRATION message.

10.2.2 Exceptional procedure

As an implementation option, the NAS entity may go into a maintenance status on expiry of timer T350.

10.3 Service procedure

10.3.1 Normal procedure

When a NAS entity requests an operational status change of a channel, it shall send a SERVICE message to the MGC and start timer Tserv. When a MGC entity requests a change status of a channel, it shall send a SERVICE message to the NAS and start timer Tserv.

The Channel status information element shall be encoded as in subclause 7.2.1. The indicated status shall apply to the channels identified in the Channel identification information element.

The Channel identification information element shall be encoded as in subclause 4.5.13/Q.931 [6] using the channel type encoding.

The Channel identification information element may be repeated to indicate a change status of channel of multiple interfaces. If the Channel information element is repeated, each information element shall have the same semantics.

On receipt of a SERVICE message, the MGC or NAS entity shall send a SERVICE ACKNOWLEDGE message including the Channel status and Channel identification information elements received in the SERVICE message. If the NAS is the destination entity of the SERVICE message, it shall take the appropriate actions to change status of the identified channels in the message. The Continuity indicator information element shall be included in the SERVICE ACKNOWLEDGE message sent by the NAS if the SERVICE message received by the destination entity includes a loopback status.

On receipt of a SERVICE ACKNOWLEDGE message, the destination entity shall check the Channel identification information elements against the one sent in the SERVICE message. If the information element received is identical, time Tserv shall be stopped. If the Channel identification information element received in a SERVICE ACKNOWLEDGE message differs from the one sent in the SERVICE message, the SERVICE message shall be resent.

On expiry of timer Tserv, the originating entity shall resend the SERVICE message.

10.3.2 Exceptional procedure

As an implementation option, the originating entity may go into a maintenance status on expiry of timer Tserv.

11 Parameter values (timers)

The timers implemented by the Control Protocol are based on the timers defined in EN 300 403-1 [3], and in most cases are defined specifically like the corresponding timer in EN 300 403-1 [3]. All timers used in the Control Protocol are defined in table 12.

Table 12: MGC Control Protocol timer definitions

Timer Number	Default Timeout Value	State of Call	Cause for Initiation	Normal Timer Stop	At First Expiry	At Second Expiry
T350	4 sec	Not call related	RESOURCE REGISTRATION sent	RESOURCE REGISTRATION ACKNOWLEDGE received	Send REGISTRATION and restart T350	Same as at first expiry or go into a maintenance procedure
Tlogon	4 sec	Not call related	LOGON message sent	LOGON ACKNOWLEDGE received	Send LOGON and restart Tlogon	Same as at first expiry or go into a maintenance procedure
Tserv	4 sec	note	SERVICE sent	SERVICE ACKNOWLEDGE received	resend SERVICE and restart Tserv	Same as at first expiry or go into a maintenance procedure
NOTE: Call related when IAM message is received with continuity check required. Call unrelated in other cases.						

12 Dynamic description (SDL diagrams)

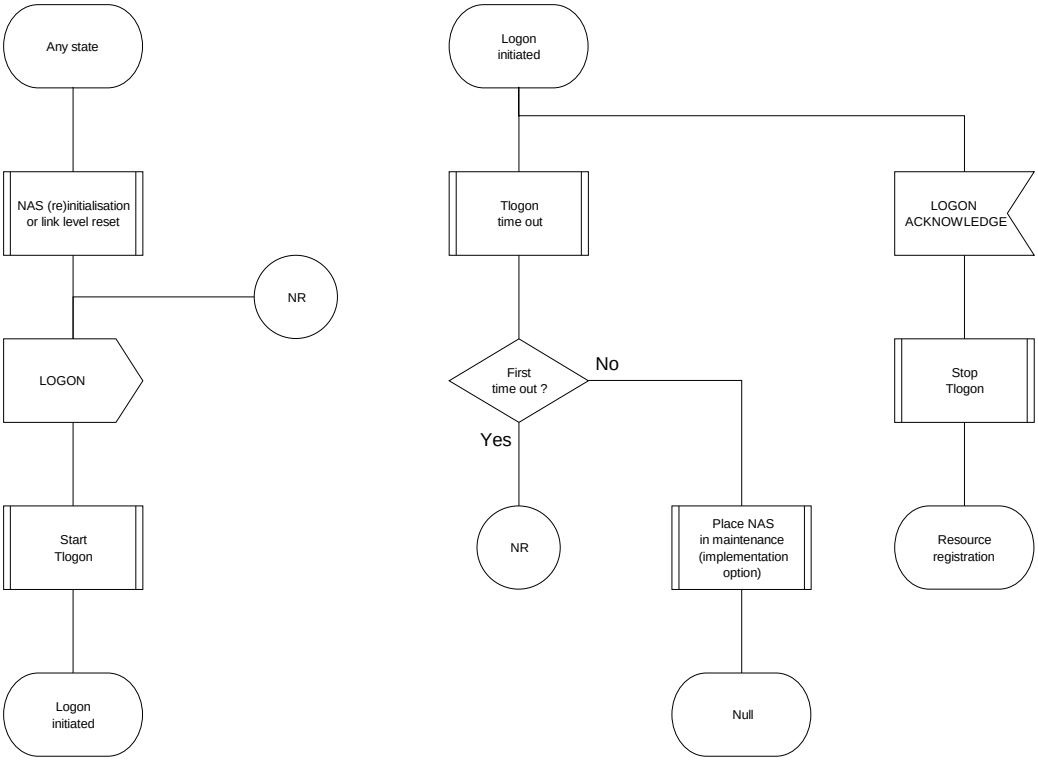


Figure 5: Logon procedure (NAS side)

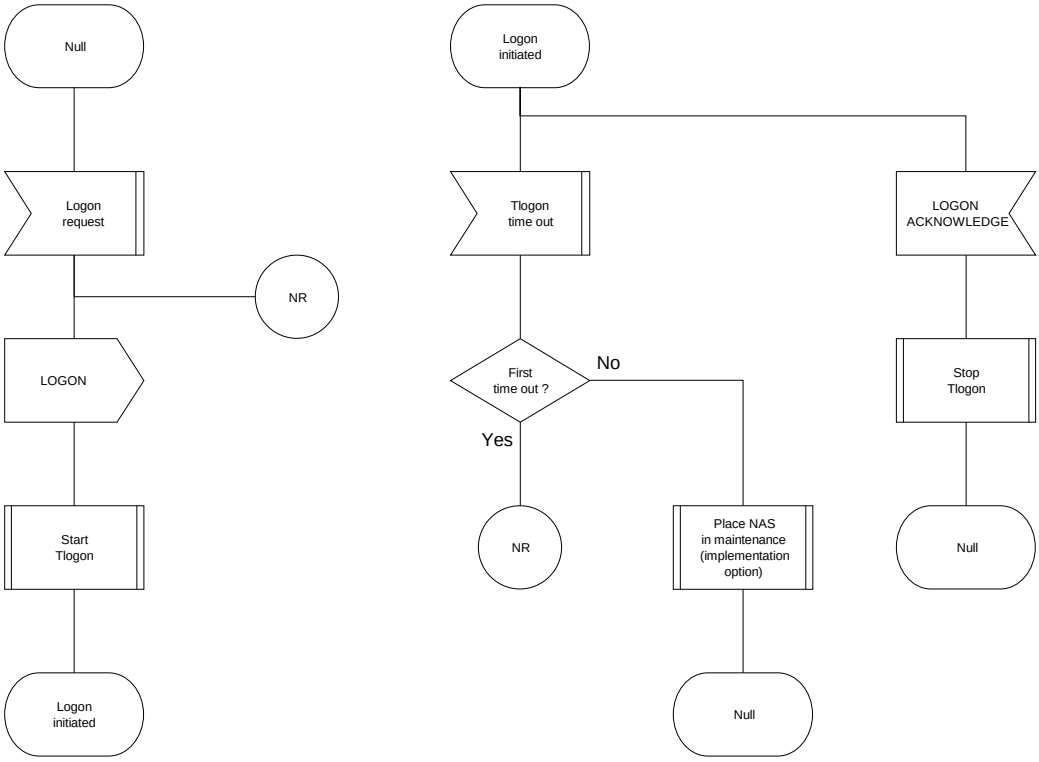


Figure 6: Resource registration procedure (NAS side)

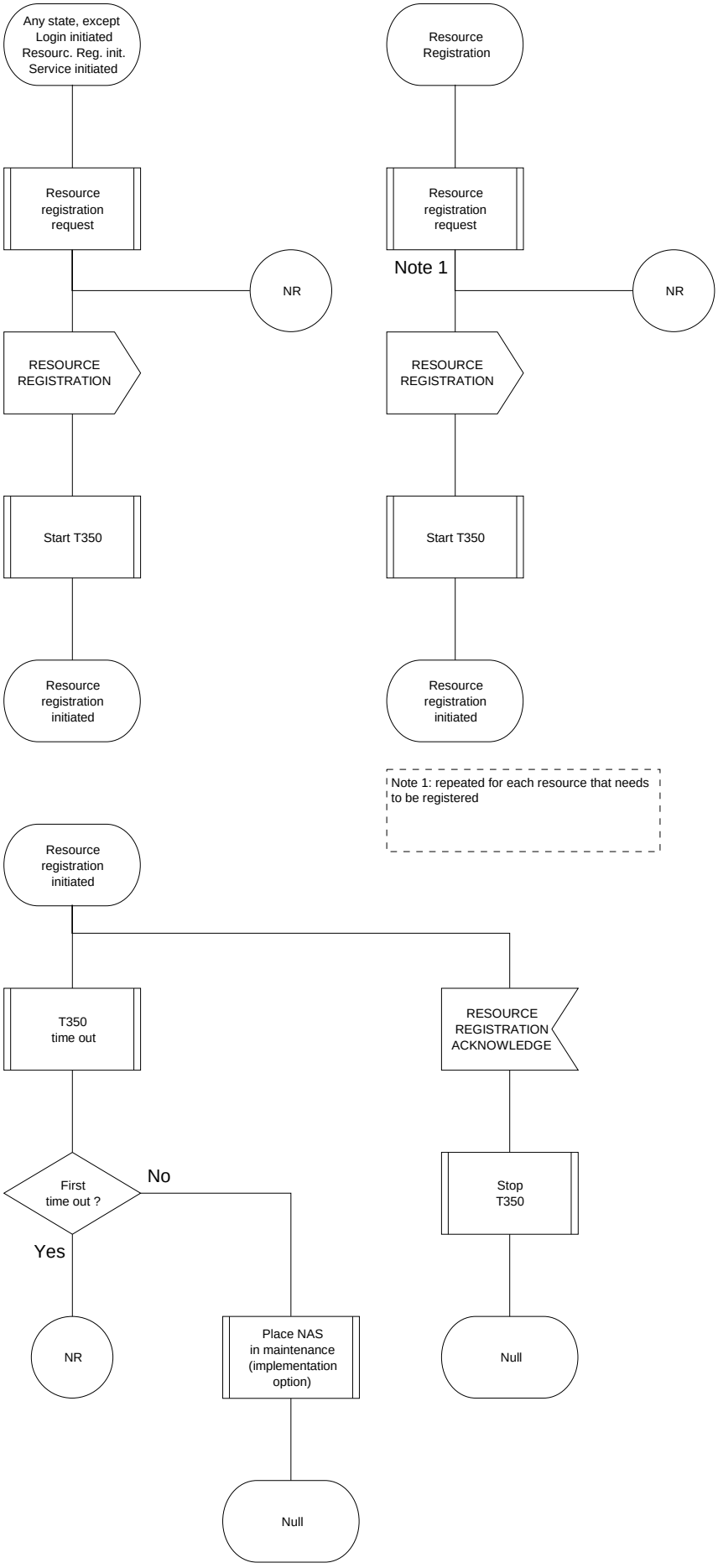
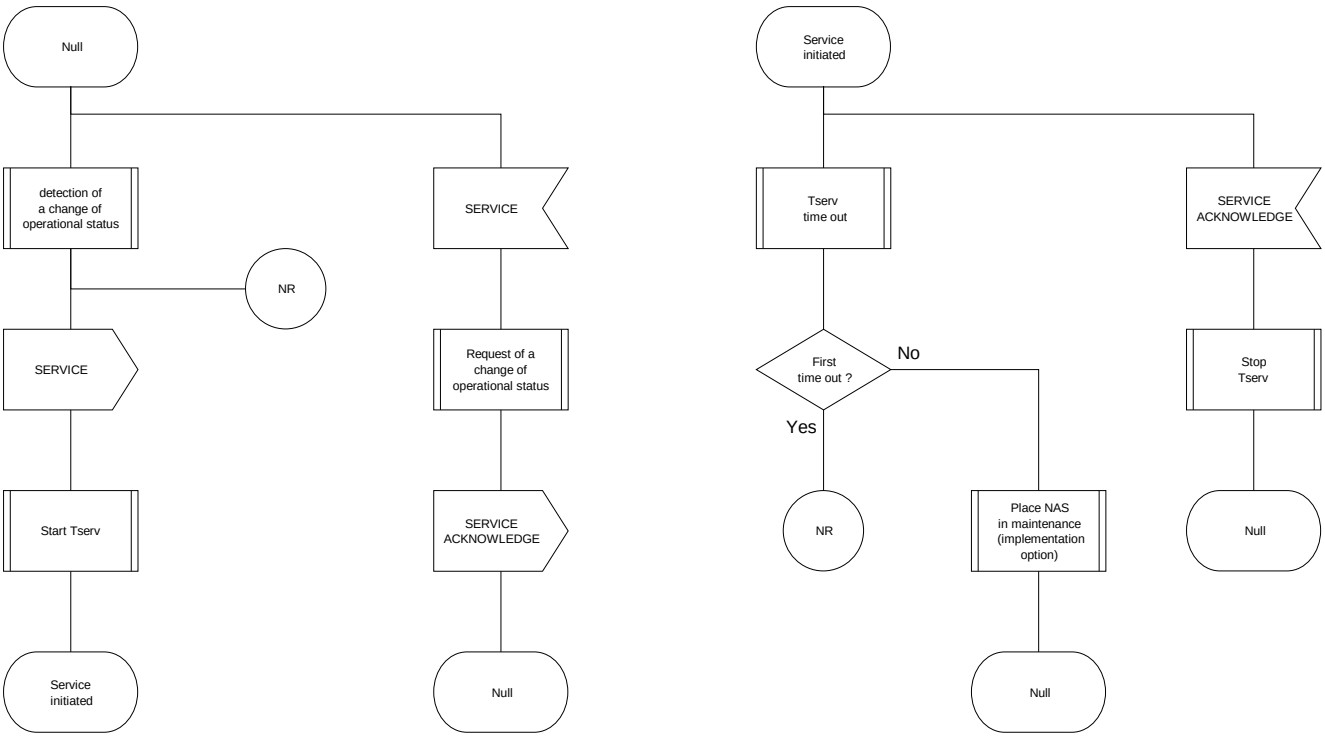


Figure 7: Service procedure (NAS side)



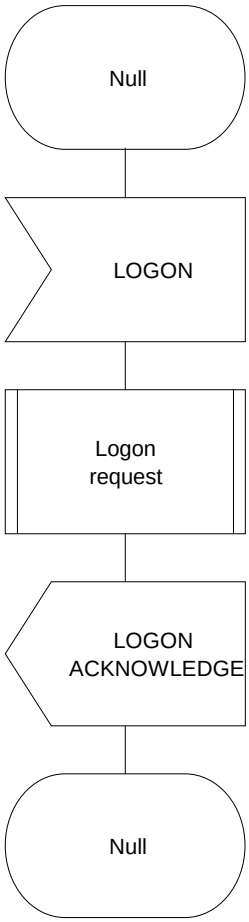


Figure 8: Logon procedure (MGC side)

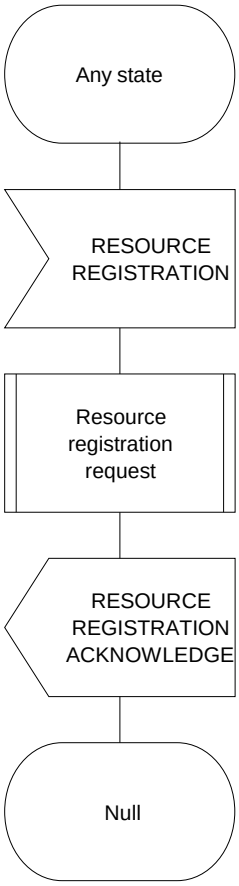


Figure 9: Resource registration procedure (MGC side)

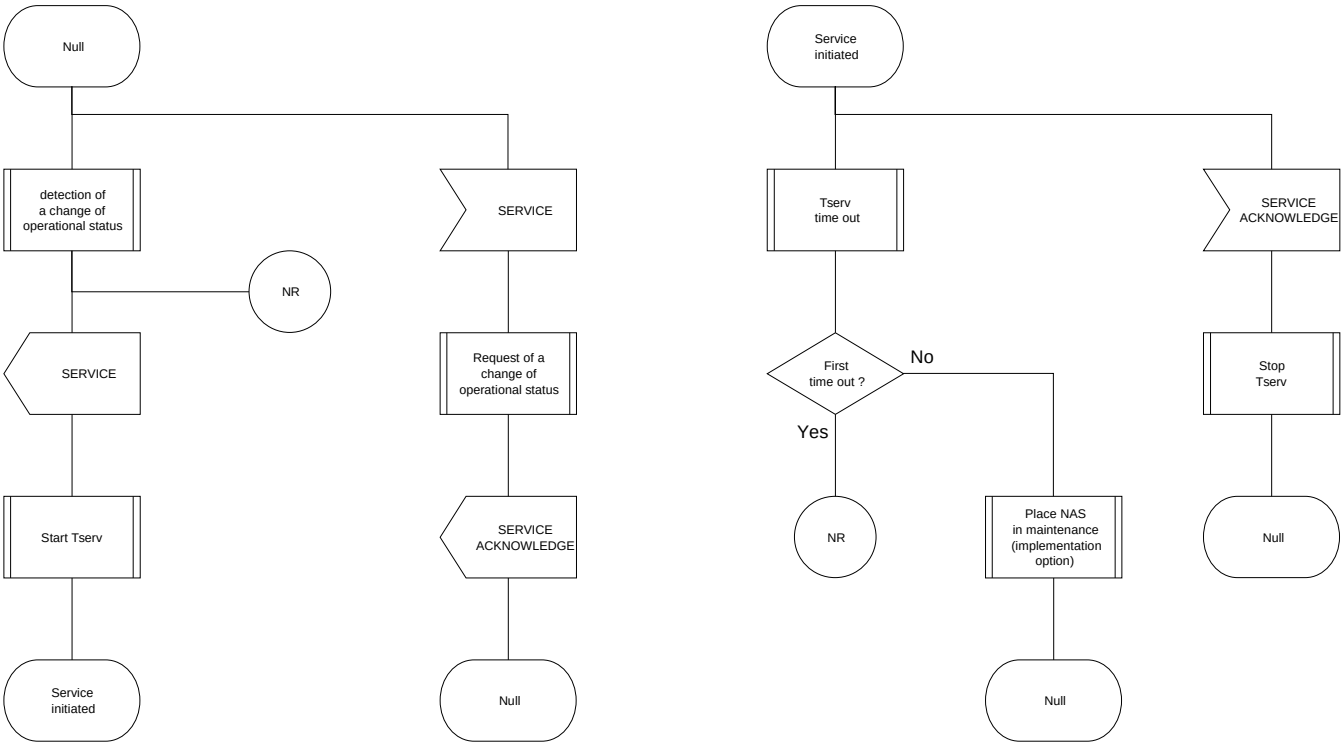


Figure 10: Service procedure (MGC side)

Annex A (normative): Media Gateway (MGC) interworking with SS7 network

A.1 Interworking from ISUP to DSS1 based protocol for call control and resource management over a TCP/IP network

Interworking from ISUP to DSS1 based protocol for call control and resource management over a TCP/IP network shall follow subclause 3.1 of Q.699 [4] endorsed by EN 300 899-1 [5]. The following description is an application of this principle for specific call configurations.

A.1.1 IAM message received with continuity check required

If the continuity check indicator of the nature of connection indicators is coded 01, *continuity check required on this circuit*, the MGC shall send a SERVICE message to the NAS indicating that the specified circuit should be placed in a loopback mode (octet 3 of Channel status information element shall be coded *loopback*) and start timer Tserv.

Upon receipt of the SERVICE message, the NAS shall connect a continuity-check loop to the specified circuit, and send a SERVICE ACKNOWLEDGE message to the MGC indicating that the continuity-check loop connection was successful (octet 3 of Continuity information element shall be coded *Successful*). If the NAS is unable to connect the continuity-check loop for the specified circuit, the NAS shall send a SERVICE ACKNOWLEDGE message to the MGC indicating that the connection of the continuity-check loop failed (octet 3 of Continuity information element shall be coded *Failed*).

Upon receipt of the SERVICE ACKNOWLEDGE message, the MGC shall stop timer Tserv and check octet 3 of the Continuity information element received:

- if octet 3 of the Continuity information element is coded *Successful*, the MGC shall wait for a COT message from the SS7 network. If the COT message from the SS7 network indicates a successful continuity check, the MGC shall send a SERVICE message to inform the NAS, and the circuit shall be placed in the appropriate state (octet 3 of Channel status information element coded *in service*) following subclause 10.3, then procedures for basic call in EN 300 899-1 [5] shall apply. If the COT message from SS7 network indicates that the continuity check failed, the MGC shall send a SERVICE message to the NAS, place the circuit in the corresponding state (octet 3 of Channel status information element coded *out of service*) following subclause 10.3;

- if octet 3 of the Continuity information element is coded *failed*, the MGC shall wait for the COT message from SS7 network and indicate the NAS to place the specified circuit in the corresponding state by sending a SERVICE message to the NAS (octet 3 of Channel status information element coded *out of service*) following subclause 10.3.

Upon expiry of Tserv, as an implementation option, the MGC shall either resend the SERVICE message to the NAS or go into a maintenance status.

A.1.2 Continuity Check Request received

Upon receipt of the Continuity Check Request (CCR) message from the SS7 network, the MGC shall send a SERVICE message to the NAS indicating that the specified circuit is to be placed in a loopback mode (octet 3 of Channel status information element shall be coded *loopback*) and start timer Tserv.

Upon receipt of the SERVICE message, the NAS shall connect a continuity-check loop to the specified circuit, and send a SERVICE ACKNOWLEDGE message to the MGC indicating that the continuity-check loop connection was successful (octet 3 of Continuity information element shall be coded *Successful*). If the NAS is unable to connect the continuity-check loop for the specified circuit, the NAS shall send a SERVICE ACKNOWLEDGE message to the MGC indicating that the connection of the continuity-check loop failed (octet 3 of Continuity information element shall be coded *Failed*).

Upon receipt of the SERVICE ACKNOWLEDGE message, the MGC shall stop timer Tserv and check octet 3 of the Continuity information element received:

- if octet 3 of the Continuity information element is coded *Successful* and the MGC receives a REL message from the SS7 network, the MGC shall send a SERVICE message to the NAS for placing the circuit in service (octet 3 of Channel status information element coded *in service*) following subclause 10.3, then procedures for basic call in EN 300 899-1 [5] shall apply;

- if octet 3 of the Continuity information element is coded *Failed* and the MGC receives a COT message from the SS7 network, the MGC shall send a SERVICE message to the NAS for placing the circuit in out of service (octet 3 of Channel status information element coded *out of service*) following subclause 10.3, then procedures for basic call in Q.699 [4] shall apply;

- if octet 3 of the Continuity information element is coded *failed*, the MGC shall wait for the COT message indicating failure from SS7 network and indicate the NAS to place the specified circuit in the corresponding state by sending a SERVICE message to the NAS (octet 3 of Channel status information element coded *out of service*) following subclause 10.3.

Upon expiry of Tserv, as an implementation option, the MGC shall either resend the SERVICE message to the NAS or go into a maintenance status.

A.2 Interworking from DSS1 based protocol for call control and resource management over a TCP/IP network to ISUP

Interworking from DSS1 based protocol for call control and resource management over a TCP/IP network to ISUP shall follow subclause 3.2 of Q.699 [4] as endorsed by EN 300 899-1 [5] restrictions).

Annex B (informative): Message sequence charts, typical examples

This following examples show the message flow associated with a continuity test initiated by the SS7 network.

B.1 Continuity test successful (initiated with IAM)

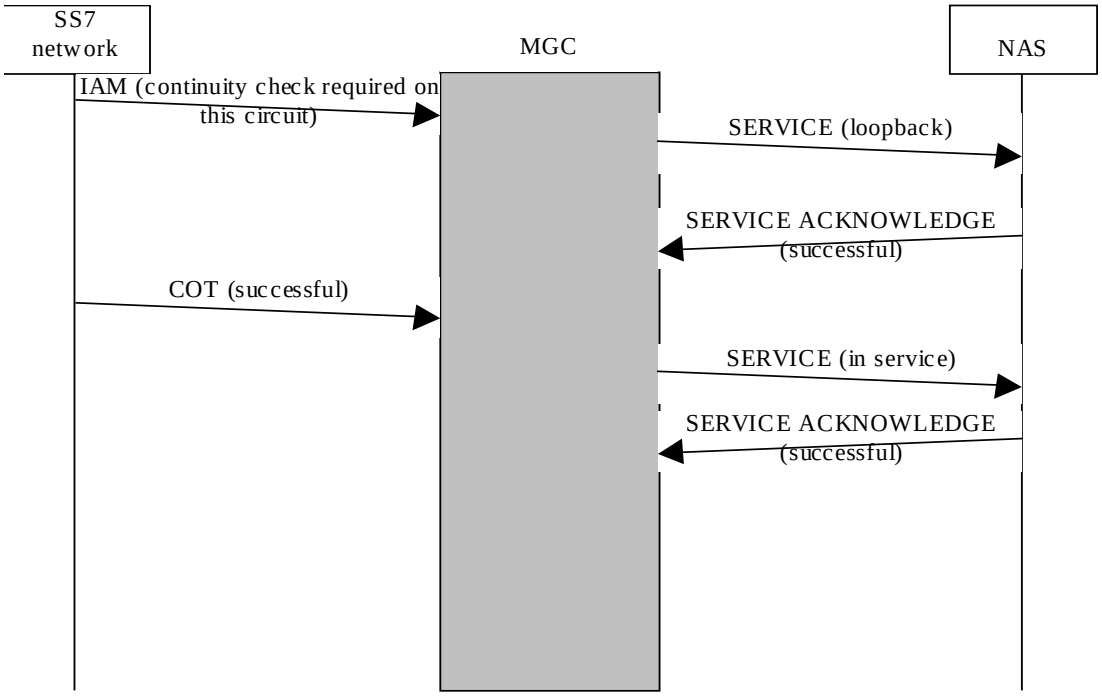


Figure B1: Continuity test successful (initiated with IAM)

B.2 Unsuccessful continuity test (initiated with IAM)

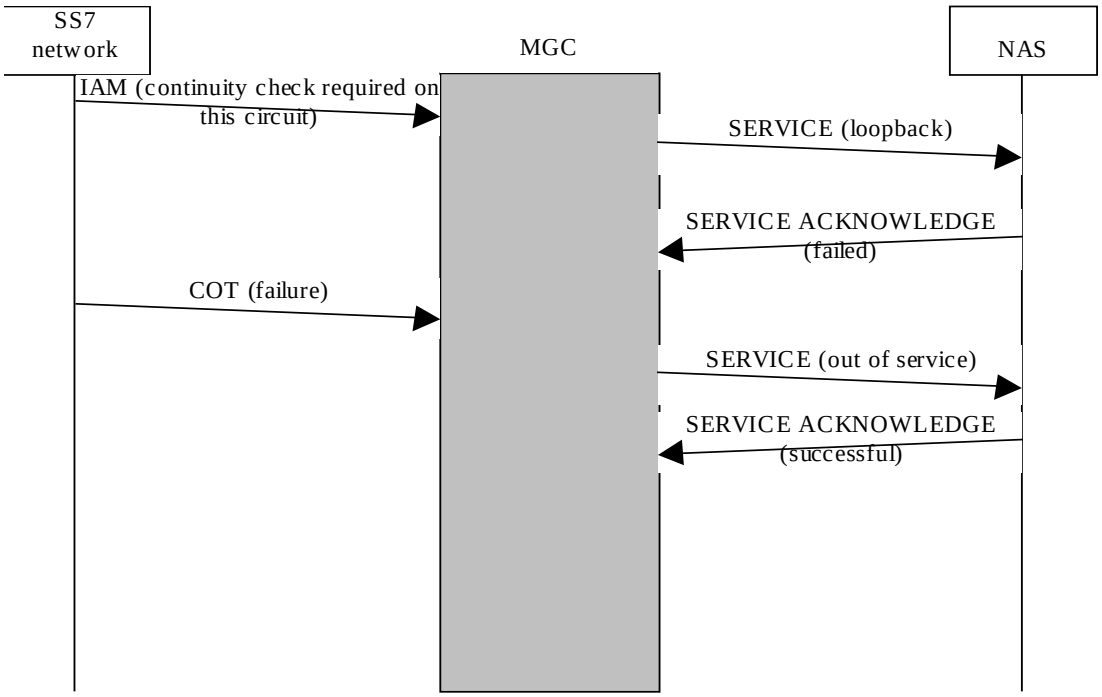


Figure B.2: Unsuccessful continuity test (initiated with IAM), unable to connect a continuity check loop to the specified circuit

B.3 Continuity test successful (initiated with CCR)

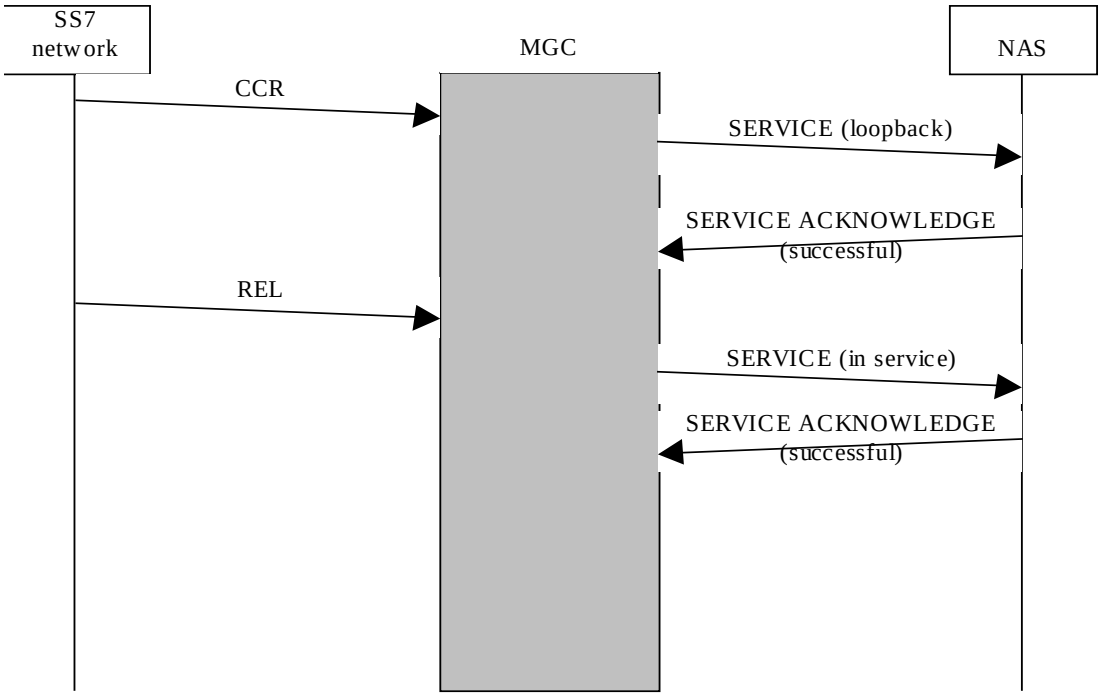


Figure B.3: Continuity test successful (initiated with CCR)

B.4 Unsuccessful continuity test (initiated with CCR)

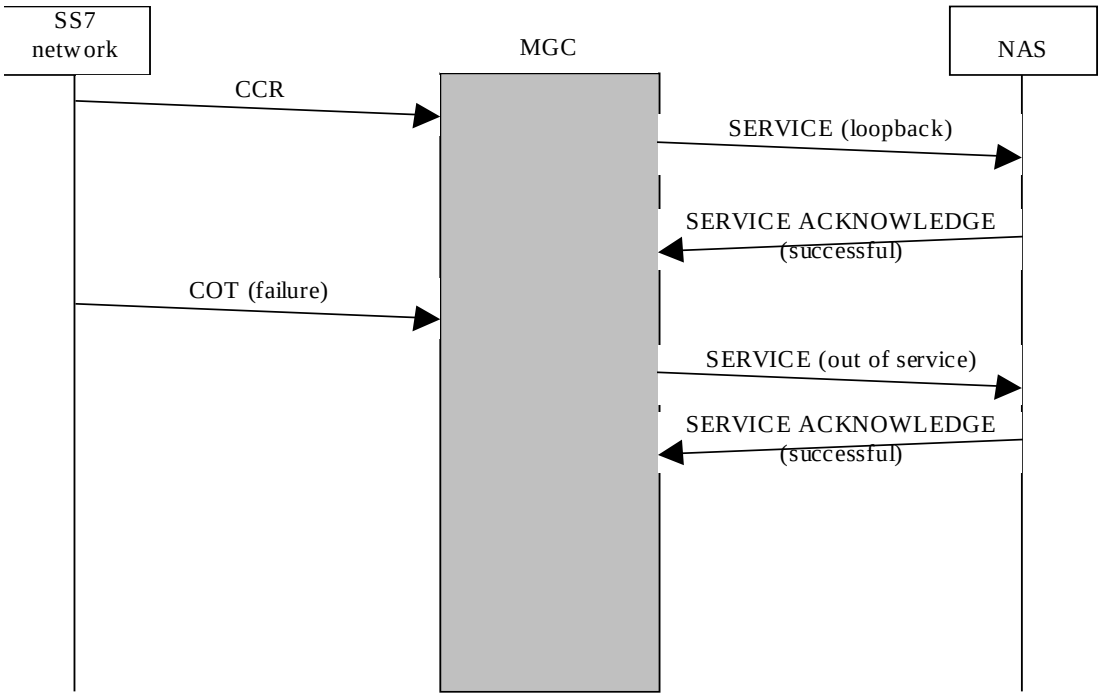


Figure B.4: Unsuccessful continuity test (initiated with CCR), continuity check failed

History

Document history		
V1.1.1	December 1999	Publication