

Interworking Aspects Related to Priority Services in Swedish Public Communications Networks

This Application Guide details interworking aspects for priority services between operators and service providers of public communications networks in Sweden. The guide is an addendum to the Swedish standard SS 63 63 93, PSTN-ISDN-PLMN ISUP.

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1 Introduction

In a crisis situation, the ability to communicate is a vital capability. This capability is needed not only for the general public but also for authorized users who in some way are involved in the prevention, mitigation or in some other capacity resolving a crisis situation. Public communication networks form an integral part of this capability beside private networks or other means of communications.

The communication needs of the authorized users can be regarded as essential and will be needed at the same time as the public will be attempting an increased number of calls during the period when the public communications networks may be restricted due to damage, congestion or faults. The purpose of a national priority service is to allow preferential treatment to fulfill these needs. This priority service is only intended for use by authorized users to be able to place voice calls with priority. Public emergency services, on the other hand, are intended for use by members of the general public to request services such as fire, police, and medical. Public emergency services are invoked by a short code (i.e. 112).

2 Scope

A priority service contains several mechanisms that together increase the call-completion rate for authorized users. This Application Guide addresses those features that affect a priority voice call that utilizes more than one operator's network, leaving aside other issues as described in the following sections.

2.1 Within scope of the Application Guide

In scope of this Application Guide are national voice calls between public communications networks in Sweden that interconnect using ISUP as specified in Swedish Standard SS636393, 2000, release 1 [1] and then also applicable as specified in Telia's specifications 8211-A335 rev C [10]; and 8211-A325 rev B [9].

All references to ISUP in this Application Guide are based on the White Book-level ISUP implementation (version 09/97 or later of references [2], [3], [4] and [5]).

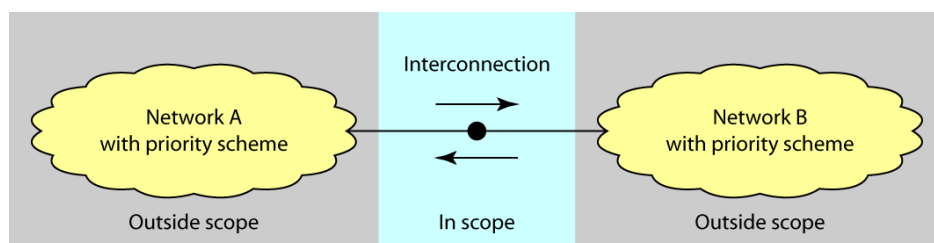


Figure 1 The Application Guide is devoted to facilitating network traversal of priority voice calls between networks.

To ensure end-to-end treatment of priority voice calls that involve more than one operator's network, it is necessary to specify interworking principles. The interworking principles addressed in this Application Guide are:

- Procedures to be used in calling between different operators within, as well as between, PLMN and PSTN/ISDN
- Parameters and information elements needed to support a national priority service
- Actions the sending operator (of a priority voice call) should take in cases where the receiving operator fails to support the signaling requirements in this Application Guide
- Description of actions the receiving operator (of a priority voice call) should take in case of failing to support the signaling requirements in this Application Guide

2.2 Outside the scope of the Application Guide

A national priority service generally includes a number of features that together increase the probability of call-completion for calls that are made using the service. The specific features/mechanisms that each participating operator uses locally and do not affect the interworking with other operators are outside the scope of this Application Guide. Examples of such mechanisms are:

- User verification where a user is verified as having rights to use the priority service
- Enhanced alternate routing where priority voice calls can be given extended capabilities to avoid network damage, congestion or faults
- Exemption from restrictive network management controls, such as

call gapping

- Trunk queuing where priority voice calls are placed in a queue in case of no available trunk resources

Private networks and Internet/IP-based networks are also out of scope of this Application Guide.

Use of priority mechanisms to avoid congestion in the signaling network using MTP or other measures where routes between operators are designed with two or more independent signaling links, or with a suitable capacity to handle overloads even with link failures are also out of scope.

3 Normative and informative references

The following normative and informative documents contain provisions, which, through reference in this text, constitute provisions of this Application Guide. For undated references, the latest edition of the normative document referred to applies.

Normative references

1. SS 63 63 93:2000 release 1 PSTN/ISDN-PLMN (GSM)/ISDN signaling interface for Sweden
2. ITU-T Rec. Q.761 ISDN User Part - Functional description
3. ITU-T Rec. Q.762 ISDN User Part - General functions of messages and signals
4. ITU-T Rec. Q.763 ISDN User Part - Formats and codes
5. ITU-T Rec. Q.764 ISDN User Part - Signaling Procedures

Informative references

6. ITU-T Rec. Q.730 ISDN User Part supplementary services
7. ITU-T Rec. Q.735 Stage 3 Description for Community of Interest Supplementary Services
8. 3GPP TS 22.067 enhanced Multi-Level Precedence and Pre-emption service, (eMLPP) - Stage 1
9. Telia's specification 8211-A325 rev B ISDN-PLMN (GSM) signalling interface for Sweden
10. Telia's specification 8211-A335 rev C ISDN-ISDN signalling interface for Sweden
11. 3GPP TR 22.952 Priority service guide
12. PTS dnr 03-9853 Utgångspunkter för utarbetande av ITS Report 22: Interworking Aspects Related to Priority Services in Swedish Public Communications Networks (in Swedish)

4 Terms and definitions

This Application Guide defines the following terms:

4.1 Interworking

Interworking in the sense of this Application Guide is defined as a set of principles and actions used to interconnect networks and make them

interoperate so that a priority service can be extended across national interconnections.

4.2 Interconnection

Interconnection is set to mean the linking of two networks for the mutual exchange of traffic.

4.3 Priority service

A priority service is a set of technical features, implemented in public communications networks, which together give authorized users preferential access to network resources and thus increase the probability of call completion when networks may be restricted due to damage, congestion or faults.

4.4 Queuing priority

Queuing priority is the application of queuing mechanisms so that selected calls are not released when a call encounters congestions during its progression in the network or networks. For example, instead of sending a release notification from an exchange with a congested trunk the exchange can cease to accept new call-setup requests for the trunk during a period of time. If a circuit in the trunk becomes idle before the queue time expires, the circuit is allocated to the prioritized call.

4.5 Pre-emption priority

When a call initiated and marked as a call with pre-emption priority encounter congestions, the network can initiate actions to release ongoing, non-prioritized calls and allocate these resources to said call.

4.6 Priority calls

Voice calls that are made utilizes the priority service with either queuing or pre-emption priority.

5 Symbols and abbreviations

Symbols and abbreviations used in this Application Guide are given in table 1 below.

Table 1 List of symbols and abbreviations.

ISDN	Integrated Service Digital Network
ISUP	ISDN User Part
MLPP	MultiLevel Precedence and Preemption
IAM	Initial Address Message
ACM	Address Complete Message
T7	Timer that measures the time between IAM and ACM
eMLPP	enhanced Multi-Level Precedence and Pre-emption service

6 General assumptions

If in the future other protocols than ISUP will be used in national interconnections, the Application Guide needs to be updated accordingly. In the same manner, the current Application Guide is restricted to voice calls.

A priority service will contain some means of authentication and authorization to ensure that a user is an approved user of the priority service.

In this document, it is assumed that such means exists and is used within the originating operator's network and that no additional method is needed in interconnections to verify the validity of a call using the priority service.

The national priority service that implements the network actions in PLMN is assumed to follow the eMLPP [8] standard to the extent that is required for the formulation of this Application Guide. It is also assumed that there are two levels of priority voice calls in the national priority service so that there is no service differentiation between, for example, calls made with queuing priority. For PSTN/ISDN it is assumed that future implementations of the national priority service are capable of interacting with the MLPP signaling parameters as described in this Application Guide.

7 Marking of priority calls

The priority service uses the standard ISUP call control messages to set up the call.

A priority voice call uses **MLPP** parameter in the ISUP IAM message to convey the fact that the call has been authorized to receive priority treatment. The parameter consists of the following four fields:

- The **Precedence Level** is set by the originating network to the priority level that corresponds to the user's requests. The parameter should be propagated through the network.
- The **Network Identity** points out the Country Code of the originating network and will have the value 0460 (indicating networks in Sweden, coded according to Q.735 [7]).
- The **MLPP Service Domain** points out the Service Domain. The MLPP Service Domain indicator field is set to identify the specific Service Domain subscribed to by the call originator. This value is used to identify within networks, where multiple MLPP services may exist, the MLPP calls of the same domain. The value used for a national priority service should indicate the whole of the exchange. The actual value should be agreed on by participating operators during the implementation process.
- The **Look Ahead for Busy** indicating whether a TCAP message may be sent prior to call setup to determine whether the called party's line is busy. The parameter is as part of this Application Guide to be encoded 10 (Look Ahead for Busy not allowed).

To ensure that a priority call is not lost in networks that do not recognize and accept the MLPP parameter, the **parameter compatibility information** parameter should be included in the IAM and coded in the following manner:

- The **upgraded parameter name** is set to the decimal value 58 (MLPP).
- The **Instruction indicators** consists of several sub values which should be coded in the following manner:
 - Bit A (**Transit at intermediate exchange indicator**)
Value 0 = transit interpretation
 - Bit B (**Release call indicator**)
Value 0 = do not release call
 - Bit C (**Send notification indicator**)
Value 0 = do not send notification
 - Bit D (**Discard message indicator**)
Value 0 = do not discard message (pass on)
 - Bit E (**Discard parameter indicator**)
Value 0 = do not discard parameter (pass on)
 - Bits G and F (**Pass on not possible indicator**)
Value 1 0 = discard parameter
 - Bit H (**Extension indicator**)
value 1 = last octet

7.1 Calls with queuing priority

The indication that a call is entitled to queuing priority is that the **Precedence Level** in the MLPP parameter is set to **3**.

In the event of queuing of the call during call-setup at an transit or terminating exchange, an ISUP ACM message shall be sent back to cancel T7 at the originating exchange so that the originating exchange does not release the call while the call is queued.

In both PLMN and PSTN/ISDN, the ISUP ACM message sent by the transit exchange or the terminating exchange will include the mandatory **Backward Call Indicators** parameter with the **Called Party's Status Indicator** field coded as 00 ("no indication") if the call is queued for an outgoing trunk at the transit exchange *or* the call is queued for internal resources at the terminating exchange. Table 1 shows the complete coding of the **Backward Call Indicators** parameter in the ISUP ACM message sent for a queuing call.

Table 2 Backward Call Indicators Parameter Encoding at transit and/or terminating exchange if queuing takes place.

Field	Value
Called Party's Status Indicator	00 (no indication)
Called Party's category indicator	00 (no indication) (default)
End-to-End Method Indicator	according to the capability available at the switch
Interworking Indicator	0 (no interworking encountered)
End to end information indicator	0 (no end to end information) (default)
ISDN User Part Indicator	1 (ISDN User Part used all the way)
Holding indicator	0 (Holding not requested) (default)
ISDN Access Indicator	0 (terminating access non-ISDN)
Echo Control Device Indicator	according to echo control procedures
SCCP method indicator	00 (no indication, default)

7.2 Calls with pre-emption priority

The indication that a call is entitled to pre-emption priority is that the **Precedence Level** in the MLPP parameter is set to 1.

All calls that are to be released should be marked with proper Cause indicator values in REL messages as specified in Q.735 [7]. This means that a call that is to be released, as a result of a prioritized call demanding pre-emption, is to be disconnected with a REL message containing a Cause indicator with value 9 (preemption - circuit reserved for reuse) toward the receiving operator. The part of the pre-emptive call that should not be used by the priority call is disconnected with a REL message containing a Cause indicator with value 8 (preemption). If pre-emption of a circuit between the sending and receiving operator is not possible, the priority call is released by sending a REL message, toward the originating operator, containing a Cause indicator with value 46 (precedence call blocked).

8 Abnormal cases

If the receiving operator does not support priority voice calls and do not react on the information in the parameter compatibility information parameter for MLPP in the expected manner, the result could be that the call is released from the receiving operator or that the receiving operator sends a Confusion

message. The actions taken by the sending operator in such cases are regarded as service specific and outside the scope of this document.

9 Other interworking aspects

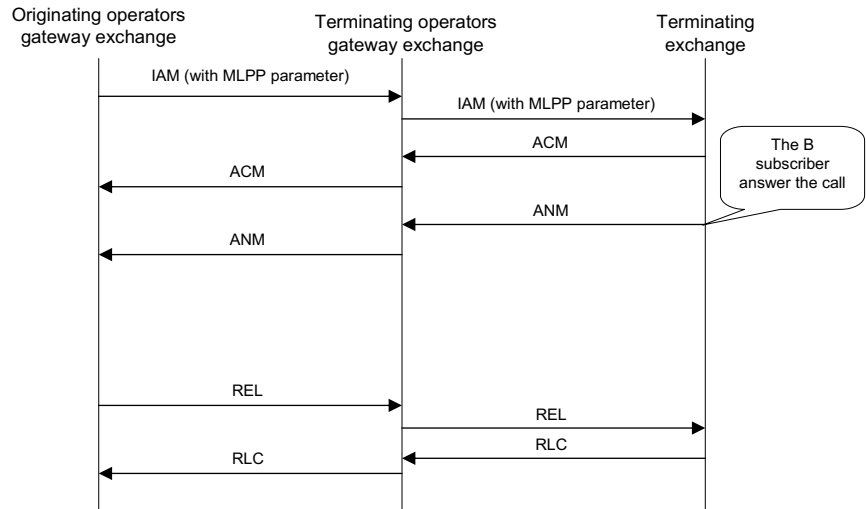
The interworking principles specified in this Application Guide are:

- The originating network informs all following networks that the call is prioritized by including a properly configured MLPP parameter in the IAM.
- The originating network informs all following networks how to behave if they do not recognize or understand the MLPP parameter by including a properly configured **parameter compatibility information** parameter for MLPP in the IAM.
- A receiving network should look for MLPP parameter in all received IAMs.
- If a receiving network puts a call with queuing priority in a queue in search for an idle circuit, the receiving network shall inform the preceding network about the action by sending an early ACM.
- If a receiving network fails to complete a call within the priority service, the receiving network shall release the call with a REL message with relevant Cause indicator indicating congestion, busy or no answer. No sending of in-band voice messages is allowed.
- If the operator on the sending side releases an ongoing call to free the circuit for a priority call, no information about the real release cause other than specified in Q.735 [7] shall be sent to the receiving operator.

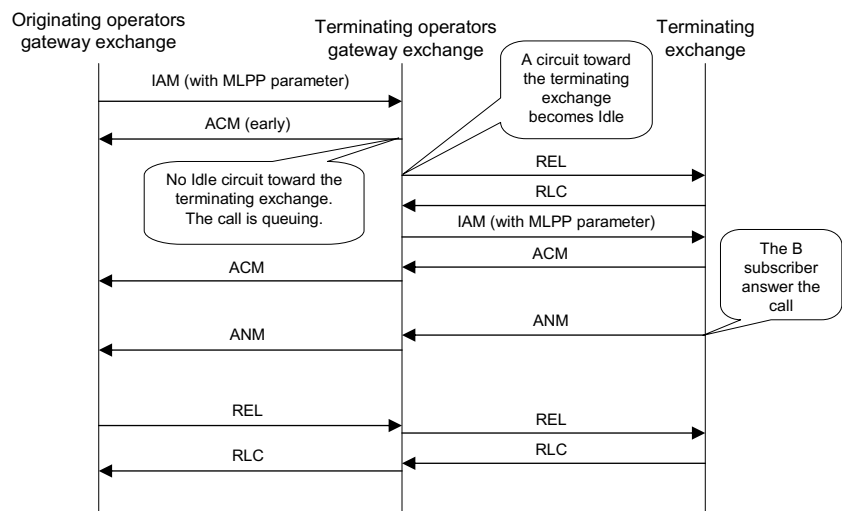
10 Schematic message diagrams

This chapter contains message flow charts for some typical priority voice calls. Only basic ISUP messages and messages directly related to priority functions are displayed.

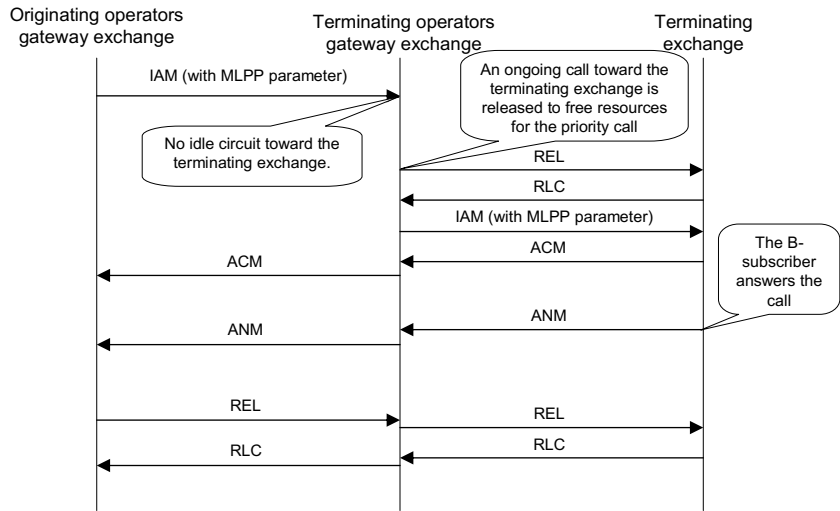
10.1 A priority call during normal traffic condition



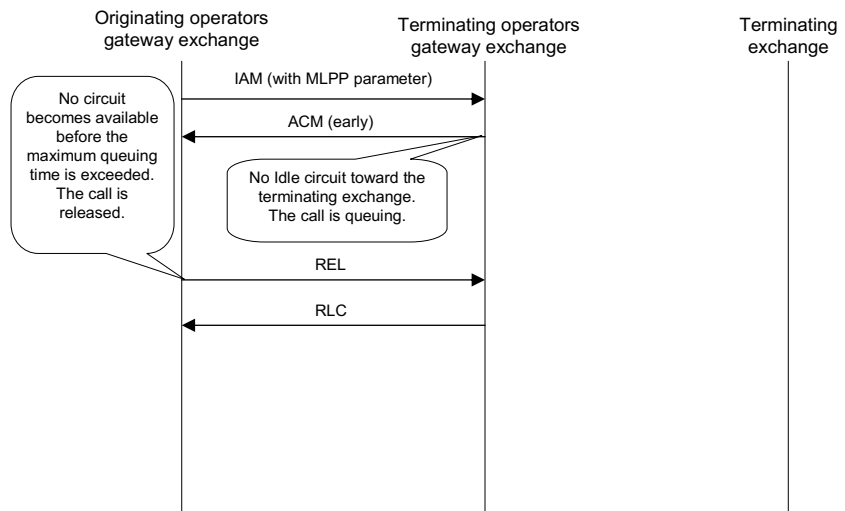
10.2 A call with queue priority encounters congestion in terminating network



10.3 A call with pre-emption priority encounters congestion in terminating network



10.4 A queuing call is released after exceeding max queue time



11 Deviations from and additions to Swedish standard 636393

This application guide deviates from and amends to the Swedish standard 636393 [1] in the following paragraphs:

- In chapter 13 (Exceptions and clarifications to ITU-T Rec.Q.761) the “Multi-Level Precedence and Preemption (MLPP)” are to be withdrawn from the list of not applicable supplementary services under paragraph 3 (Capabilities supported by the ISDN User Part) in table 9.
- In chapter 15 (Exceptions and clarifications to ITU-T Rec.Q.763) the “MLPP precedence” is to be withdrawn from the list of not applicable parameters under paragraph 3.1 (Parameter names) in table 10.
- In chapter 15 (Exceptions and clarifications to ITU-T Rec.Q.763) paragraph 3.34 (MLPP precedence) in table 10 should no longer be marked “Not applicable”.
- In chapter 15 (Exceptions and clarifications to ITU-T Rec.Q.763) paragraph 3.37 (Optional backward call indicators) in table 10 the value 1 for MLPP user indicator should no longer be marked “Not applicable”.
- In chapter 15 (Exceptions and clarifications to ITU-T Rec.Q.763) paragraph 4 (ISDN user part messages) in table 10, the statement that the parameter MLPP is not applicable for IAM message is no longer valid.