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## **Digital cellular telecommunications system (Phase 2+); enhanced Multi-Level Precedence and Pre-emption service (eMLPP) - Stage 1 (GSM 02.67)**

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## Foreword

This Global System for Mobile communications Technical Specification (GTS) has been produced by the Special Mobile Group (SMG) Technical Committee (TC) of the European Telecommunications Standards Institute (ETSI).

This GTS defines the stage 1 of the enhanced Multi-Level Precedence and Pre-emption Service (eMLPP) within the digital cellular telecommunications system (Phase 2/Phase 2+).

GTS are produced by TC-SMG to enable the GSM Phase 2+ specifications to become publicly available, prior to submission for the formal ETSI standards approval procedure to become European Telecommunications Standards (ETS). This ensures the earliest possible access to GSM Phase 2+ specifications for all Manufacturers, Network operators and implementors of the Global System for Mobile communications.

The contents of this GTS are subject to continuing work within TC-SMG and may change following formal TC-SMG approval. Should TC-SMG modify the contents of this GTS it will then be republished by ETSI with an identifying change of release date and an increase in version number as follows:

Version 5.x.y

where:

- y the third digit is incremented when editorial only changes have been incorporated in the specification;
- x the second digit is incremented for all other types of changes, i.e. technical enhancements, corrections, updates, etc.

Reference is made within this GTS to GSM-TSs (note).

NOTE: TC-SMG has produced documents which give the technical specifications for the implementation of the digital cellular telecommunications system. Historically, these documents have been identified as GSM Technical Specifications (GSM-TSs). These TSs may have subsequently become I-ETTs (Phase 1), or ETs/ETSI Technical Reports (ETRs) (Phase 2). TC-SMG has also produced ETSI GSM TSs which give the technical specifications for the implementation of Phase 2+ enhancements of the digital cellular telecommunications system. These version 5.x.x GSM Technical Specifications may be referred to as GTs.

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## 1 Scope

This GSM Technical Specification (GTS) specifies the stage 1 description of the enhanced Multi-Level Precedence and Pre-emption Service (eMLPP). This service has two parts: precedence and pre-emption. Precedence involves assigning a priority level to a call in combination with fast call set-up. Pre-emption involves the seizing of resources, which are in use by a call of a lower precedence, by a higher level precedence call in the absence of idle resources. Pre-emption can also involve the disconnection of an on-going call of lower precedence to accept an incoming call of higher precedence.

The eMLPP service is provided as a network operator's option to a domain of a network. The domain can be the whole network or a subset of the network. The eMLPP service applies to all network resources in the domain that is in common use. The eMLPP service is applicable to all mobile stations in the domain with all or some mobile stations having a respective subscription assigning precedence according to the eMLPP service.

eMLPP is a supplementary service and shall be provided to a subscriber for all basic services subscribed to and for which eMLPP applies.

NOTE: It is under study whether normal GSM phase 2 mobile stations will be able to be used for this service.

The service is described from the service subscriber's and user's point of view, in particular:

- the procedure for normal operation with successful outcome;
- the action to be taken in exceptional circumstances;
- the interaction with other GSM services and features.

This specification does not deal with the Man-Machine Interface (MMI) requirements, but makes reference to the appropriate Global System for Mobile communications (GSM) specifications.

This specification is applicable to teleservices 1x and 6x and to all bearer services used in a mobile network according to the digital cellular telecommunications system GSM if eMLPP is provided. Any interaction with other services and/or networks not dealt with in sections 8 or 9 are outside the scope of this specification.

## 2 References

This specification incorporates by dated and undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this specification only when incorporated in it by the amendment or revision. For undated references, the latest edition of the publication referred to applies.

- [1] GSM 01.04 (ETR 100): "Digital cellular telecommunications system (Phase 2); Abbreviations and acronyms".
- [2] GSM 02.24 (ETS 300 510): "Digital cellular telecommunications system (Phase 2); Description of Charge Advice Information (CAI)".
- [3] GSM 02.40 (ETS 300 512): "Digital cellular telecommunications system (Phase 2); Procedures for call progress indications".
- [4] GSM 02.68: "Digital cellular telecommunications system (Phase 2+); Voice Group Call Service (VGCS) - Stage 1".
- [5] GSM 02.69: "Digital cellular telecommunications system (Phase 2+); Voice Broadcast Service (VBS) - Stage 1".
- [6] GSM 03.05 (ETR 102): "Digital cellular telecommunications system (Phase 2); Technical Performance Objectives".

- [7] GSM 03.68: "Digital cellular telecommunications system (Phase 2+); Voice Group Call Service (VGCS) - Stage 2".
- [8] GSM 03.69: "Digital cellular telecommunications system (Phase 2+); Voice Broadcast Service (VBS) - Stage 2".
- [9] ITU-T Recommendation I.255.3; "ISDN Multi-Level Precedence and Pre-emption (MLPP) stage 1".

### 3 Definitions and abbreviations

#### 3.1 Definitions

**calling subscriber:** Service subscriber which invokes the eMLPP service.

**network operator:** Entity which provides the network operating elements and resources for the execution of the enhanced Multi-Level Precedence and Pre-emption service (eMLPP).

**precedence:** Precedence is the priority associated with a call.

**service provider:** Entity which offers the eMLPP service for subscription. The network operator may be the service provider.

**service subscriber:** Mobile subscriber which subscribes to the eMLPP service. In principle, if a network provides eMLPP service, all users are able to subscribe to this service.

#### 3.2 Abbreviations

Abbreviations used in this specification are listed in GSM 01.04.

eMLPP enhanced Multi-Level Precedence and Pre-emption

### 4 Description

- a) The enhanced Multi-Level Precedence and Pre-emption service (eMLPP) provides different levels of precedence for call set-up and for call continuity in case of handover.

eMLPP shall be applicable also in case of roaming if supported by the related networks.

The maximum precedence level of a subscriber is set at the subscription time by the service provider, based on the subscriber's need. The subscriber may select a precedence level up to and including the maximum precedence level subscribed to, on a per call basis.

There are at maximum 7 priority levels. The two highest levels are reserved for network internal use, e.g. for emergency calls or the network related service configurations for specific voice broadcast or voice group call services. These two levels can only be used locally, i.e. in the domain of one MSC. The other five priority levels are offered for subscription and can be applied globally, e.g. on inter switch trunks, if supported by all related network elements, and also for interworking with ISDN networks providing the MLPP service.

The seven priority levels are defined as follows:

A	(highest, for network internal use)
B	(for network internal use)
0	(for subscription)
1	(for subscription)
2	(for subscription)
3	(for subscription)
4	(lowest, for subscription).

Levels A and B shall be mapped to level 0 for priority treatment outside of the MSC area in which they are applied.



- b) Priorities shall be treated in the network as defined for the following call scenarios:
- Mobile originated calls:
    - The priority level depends on the calling subscriber.
    - If the user has no eMLPP subscription, the call shall have a default priority level defined in the network.
    - If the user has an eMLPP subscription, the call shall have the priority level selected by the user at set-up or the priority level predefined by the subscriber as default priority level by registration.
  - Mobile terminated calls:
    - The priority level depends on the calling party. For this, interworking with the ISDN MLPP (Multi-Level Precedence and Pre-emption) service is required.
    - If the call is not an ISDN MLPP call, i.e. no priority level is defined, the call shall be treated in the mobile network with a default priority level.
    - If the call is an ISDN MLPP call, the call shall be treated with the priority level provided by the interfacing network.
  - Mobile-to-mobile calls in case of roaming:

The priority shall be treated for the calling subscriber as for mobile originated calls and for the called subscriber as for mobile terminated calls.
  - Mobile-to-mobile calls in one network:

The priority shall be treated for the calling subscriber as for mobile originated calls and for the called subscriber as for mobile terminated calls.
  - Voice broadcast (VBS) and voice group calls (VGCS):

At the first instances of the voice broadcast or voice group call, when there is only a link between the calling mobile station and the network, the call shall be treated as defined for mobile originated calls. Then, for the set-up of the voice broadcast or voice group call links in the related cells, the call shall have the priority level as defined for the related voice broadcast or voice group call in the network.
- c) There are three classes of set-up time performance and examples of the call set-up times are:
- class 1      fast set-up      1-2s;
  - class 2      normal set-up      < 5s;
  - class 3      slow set-up      < 10s.

The achievement of the set-up times depends on technical realizations and network planning. Mechanisms shall be implemented to provide the performance defined by the service provider under normal circumstances (no congestion). They do not include any allowance for user reaction times. The call set-up time is considered to be the time from pressing the "send" button to the point at which the called party, or at least one called party in the case of a multi-party, voice group or voice broadcast call, can receive information.

The class 1 figures depend on the required connection type and service and will have to be considered accordingly. It is assumed that for calls which originate or terminate in external networks, 25% of the set-up time is spent in these external networks. The procedures assume normal operating conditions apply, e.g. GSM reference loads as defined in GSM 03.05, the mobile station is in an area of sufficient coverage, the mobile station is not busy, no call redirection is in place, etc.

- d) Calls with a high priority requiring a class 1 set-up may not require authentication at call set-up nor confidentiality on the radio link.

- e) For precedence calls, the network shall have the possibility to pre-empt on-going calls with lower priority, in ascending order of priority, in case of congestion at set-up on the radio interface or the GSM network side, respectively, or at handover of the precedence call to a congested cell. In case of necessary pre-emption of another on-going call at set-up, the successful call set-up may exceed the set-up time performance defined under c) but shall be completed as soon as possible.

A call can be pre-empted any time after the precedence level of the call has been established and before call clearing has begun.

Pre-emption shall only be performed to provide precedence for those priority levels which have a pre-emption capability allocated by the network operator. Priority levels with no pre-emption capability allocated shall only have queuing priority.

- f) A subscriber shall be able to set her mobile station to automatic answer a call if the incoming call is of or exceeds a defined priority level, respectively.

In case of called mobile subscriber busy, the on-going call shall be pre-empted (or set automatically on call hold by the mobile station in case of telephony and if the subscriber is entitled to call hold services) to accept the incoming call with the priority defined for automatic answering. If the on-going call is a point-to-point call, this function is only possible if the subscriber has a subscription for Call Waiting (CW).

NOTE: A pre-emption of an on-going call is not possible if the on-going call is a TS12 call (emergency call).

The definition of the priority level which shall cause automatic answering of an incoming call or pre-emption of another on-going call shall be stored in the mobile station and can be changed by the subscriber.

If a mobile station does not automatically accept an incoming call while being idle and the user does not accept the call, the call may be forwarded to another party if Call Forwarding on No Reply (CFNRy) applies.

If a mobile station does not pre-empt an on-going point-to-point call to accept an incoming call of higher priority, the call is indicated by CW and the user may still accept the incoming call. If the user rejects CW or after time out, the call may be forwarded to another party if Call Forwarding on mobile station Busy (CFB) applies.

If the mobile station does not pre-empt an on-going voice broadcast or voice group call to accept an incoming call of higher priority, the call may be forwarded to another party if CFNRy applies.

- g) The network operator can allocate set-up classes and resource pre-emption capabilities to each priority level. Table 1 presents an example for the assignment of priority levels and the corresponding parameters.

**Table 1: Example on eMLPP service composition**

Priority level	Set-up time	Pre-emption	Examples
A	class 1	yes	VBS/VGCS emergency applications
B	class 2	yes	Operators calls
0	class 2	yes	TS12 Emergency calls
1	class 3	yes	Premium rate calls
2	class 3	no	Standard rate calls
3	class 3	no	Default for no eMLPP subscription
4	class 3	no	Low tariff calls

Network operators which provide the eMLPP service for subscription need to consider the interrelation of the number of subscriptions offered (possibly restricted for particular users), the technical performance and the network planning issues in order to guarantee the service performance for the subscriber.

- h) In case of pre-emption the pre-empted subscriber shall be provided with a suitable indication.

#### **4.1 Applicability to telecommunication services**

The eMLPP service is applicable, for the eMLPP service subscriber, to teleservices 1x and 6x and all bearer services used in a GSM network where the eMLPP service is provided. The effects of the eMLPP service are applicable, potentially, to all subscribers in a network, should a precedence call set-up or handover occur and pre-emption be necessary.

### **5 Normal operation with successful outcome**

#### **5.1 Provision**

For a given MSISDN number, a maximum authorized precedence level is provided to a service subscriber after prior arrangements with the service provider. Service subscribers without an eMLPP subscription are assigned to a default priority level (in case of emergency calls, TS12, exceptions shall be possible).

#### **5.2 Withdrawal**

The maximum authorized precedence level can be changed or the complete eMLPP service withdrawn at the subscriber's request or for administrative reasons.

#### **5.3 Registration**

The definition of the priority level to be used as default level at mobile originated call establishment shall be registered in the network. This default level will be used if a subscriber has a subscription for a priority level higher than the lowest priority level and has not selected a priority level at call set-up.

Registration can take place either by the service provider or with an appropriate control procedure by the subscriber.

#### **5.4 Erasure**

Erasure of a default priority level is done as a result of a new registration overruling, and thus effectively erasing the previous registration.

#### **5.5 Network related service configuration**

The allocation of eMLPP priority levels to the call set-up classes and the possibility of pre-emption of on-going calls in case of congestion will be arranged by the network operator for a specific composition of the eMLPP service in a network. This is not related to one specific service subscriber.

An example is given in table 1 of section 4.

#### **5.6 Activation**

Not applicable.

#### **5.7 Deactivation**

Not applicable.

## 5.8 Invocation

The eMLPP shall be invoked automatically by the network at call set-up.

The precedence level may be selected by the user on a per call basis. The user may select any precedence level up to and including her maximum authorized precedence level. The maximum authorized precedence level shall be stored on the SIM and the mobile station shall check that only an authorized level is used for set-up. In addition, it shall be possible to verify in the network the level used at set-up against the maximum authorized level.

If the user has not selected a precedence level at set-up, the network shall apply the subscriber specific default precedence level.

If the user has selected a precedence level higher than the maximum authorized level, the maximum authorized precedence level shall be applied for the call.

## 5.9 Normal operation

At invocation of the eMLPP on a call set-up, the network notes the call priority related to the call and decides on the respective actions to be taken, i.e. on queuing priority, fast call set-up procedures and possibly pre-emption in case of congestion of network resources. In case of pre-emption the network shall release the lowest lower priority call and seize the necessary resources that are required to set-up the higher priority call.

Once set for a call, the precedence level cannot be changed.

In the case of automatic answering of an incoming call with a sufficient priority level, the alerting indication to the calling party may not be provided in order shorten the set-up time. In case of called mobile subscriber busy, the on-going call shall be released if automatic answering applies (or set on call hold in case of a telephony call) to accept an incoming call of higher priority.

When pre-emption applies, at handover to a congested cell, higher priority calls shall replace those of the lowest priority. The pre-empted user shall receive an indication for congestion as defined in GSM 02.40.

## 5.10 Interrogation

A service subscriber may interrogate the range of priority levels he can use and the default priority level used for mobile originated call establishment.

## 5.11 Charging requirements

The utilized precedence level shall be able to be extracted from the event records if different from the default precedence level.

## 6 Exceptional procedures or unsuccessful outcome

When a service subscriber makes a call, he expects the network to automatically invoke the eMLPP service according to her subscription. If the network cannot provide the service for some reason an indication shall be provided to the service subscriber to notify her of the absence or modification of the priority handling.

Exceptional procedures for voice group call and voice broadcast call establishment durations exceeding the specified times are given in GSM 02.68 and GSM 02.69, respectively.

## 7 Alternate procedures

None identified.

## **8 Interaction with other supplementary services**

### **8.1 Calling Line Identification Presentation (CLIP)**

No interaction.

### **8.2 Calling Line Identification Restriction (CLIR)**

No interaction.

### **8.3 Connected Line Identification Presentation (COLP)**

No interaction.

### **8.4 Connected Line Identification Restriction (COLR)**

No interaction.

### **8.5 Call Forwarding Unconditional (CFU)**

The CFU service takes precedence over the eMLPP service. The precedence level of calls shall be preserved during the forwarding process.

No interaction except for voice broadcast and voice group calls (see the respective stage 1 descriptions GSM 02.69 and GSM 02.68).

### **8.6 Call Forwarding on mobile subscriber busy (CFB)**

An incoming call with higher priority level shall override CFB in case of CW (see item f of section 4).

If the mobile station does not pre-empt the on-going call of lower priority and the user rejects the CW or after time out, the call may be forwarded to another party if CFB applies.

### **8.7 Call Forwarding on No Reply (CFNRy)**

If a mobile station does not automatically accept an incoming call while being idle and the user does not accept the call, the call may be forwarded to another party if CFNRy applies.

### **8.8 Call Forwarding on mobile subscriber Not Reachable (CFNRc)**

No interaction.

### **8.9 Call Waiting (CW)**

Applicable for point-to-point calls to a service subscriber.

Pre-emption of on-going point-to-point calls to accept incoming calls of higher priority is only possible if the subscriber has a CW subscription.

The CW indication to the mobile station shall imply the precedence level in order to enable the mobile station to decide on automatic accepting of the waiting call.

### **8.10 Call Hold**

A held call may be pre-empted due to lack of network resources. The call is cleared and the pre-empted user shall receive an appropriate indication.

### **8.11 Multi-party Service (MPTY)**

eMLPP shall apply to MPTY as for other calls.

### **8.12 Closed User Group (CUG)**

No interaction. eMLPP shall not override CUG restrictions.

### **8.13 Advice of Charge (AoC)**

No interactions. [Remark: Different charge meters for different priorities can be obtained e.g. by variation of the e1 or e2 parameters of the charge advice information according to GSM 02.24]

### **8.14 Barring of Outgoing Calls (BAOC)**

High priority calls shall override BAOB as a network option.

### **8.15 Barring of Outgoing International Calls (BOIC)**

High priority calls shall override BOIC as a network option.

### **8.16 Barring of Outgoing International Calls except those to the Home PLMN country (BOIC-exHC)**

High priority calls shall override BOIC-exHC as a network option.

### **8.17 Barring of All Incoming Calls (BAIC)**

An incoming high priority call shall override BAIC as a network option.

### **8.18 Barring of Incoming Calls when Roaming outside the home PLMN country (BIC-Roam)**

See section 8.17.

### **8.19 Call Transfer (ECT)**

For a normal call transfer, the precedence level of calls is preserved during the transfer process.

### **8.20 Completion of Calls to Busy Subscriber (CCBS)**

Applicable in case of non pre-empting calls.

## **9 Interworking considerations**

Interworking of the eMLPP service with other networks shall be provided based on the MLPP service specified in ITU-T Recommendation I.255.3 or a possibly future ETS related to MLPP.

For this interworking it shall be considered that

- precedence levels A and B shall be mapped to precedence level 0 (see section 4);
- pre-emption of network resources and on-going calls in the interfacing network will be performed according to the MLPP service, i.e. pre-emption will only affect other MLPP subscribers;
- other details in the treatment of precedence calls as specified for MLPP which are different to eMLPP.

The precedence level of a call except levels A and B shall not be changed when interworking with networks providing MLPP.

## History

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