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Contents

Foreword.....	4
1 Scope	4
2 References	4
3 Definitions and abbreviations.....	5
3.1 Definitions	5
3.2 Abbreviations.....	5
4 Description	5
4.1 Applicability to telecommunication services	8
5 Normal operation with successful outcome	8
5.1 Provision	8
5.2 Withdrawal	8
5.3 Registration	8
5.4 Erasure	9
5.5 Network related service configuration	9
5.6 Activation	9
5.7 Deactivation	9
5.8 Invocation	9
5.9 Normal operation	9
5.10 Interrogation	10
5.11 Charging requirements.....	10
6 Exceptional procedures or unsuccessful outcome.....	10
7 Alternate procedures	10
8 Interaction with other supplementary services	10
8.1 Calling Line Identification Presentation (CLIP).....	10
8.2 Calling Line Identification Restriction (CLIR).....	10
8.3 Connected Line Identification Presentation (COLP)	10
8.4 Connected Line Identification Restriction (COLR).....	10
8.5 Call Forwarding Unconditional (CFU).....	10
8.6 Call Forwarding on mobile subscriber busy (CFB)	11
8.7 Call Forwarding on No Reply (CFNRy).....	11
8.8 Call Forwarding on mobile subscriber Not Reachable (CFNRc).....	11
8.9 Call Waiting (CW).....	11
8.10 Call Hold.....	11
8.11 Multi-party Service (MPTY)	11
8.12 Closed User Group (CUG)	11
8.13 Advice of Charge (AoC).....	11
8.14 Barring of Outgoing Calls (BAOC).....	11
8.15 Barring of Outgoing International Calls (BOIC)	11
8.16 Barring of Outgoing International Calls except those to the Home PLMN country (BOIC-exHC)	12
8.17 Barring of All Incoming Calls (BAIC)	12
8.18 Barring of Incoming Calls when Roaming outside the home PLMN country (BIC-Roam).....	12
8.19 Call Transfer (ECT)	12
9 Interworking considerations	12
Annex A (informative) : Change history	13

Foreword

This Technical Specification has been produced by the 3rd Generation Partnership Project (3GPP).

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

x the first digit:

- 1 presented to TSG for information;
- 2 presented to TSG for approval;
- 3 or greater indicates TSG approved document under change control.

y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.

1 Scope

The present document 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.

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 services and features.

The present document does not deal with the Man-Machine Interface (MMI) requirements, but makes reference to the appropriate specifications.

The present document is applicable to teleservices 1x and 6x and to all bearer services used in a mobile network if eMLPP is provided. Any interaction with other services and/or networks not dealt with in clauses 8 or 9 are outside the scope of the present document.

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. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

- | | |
|------|---|
| [1] | 3GPP TR 21.905: "Vocabulary for 3GPP Specifications". |
| [2] | 3GPP TS 22.004: "General on supplementary services". |
| [3] | 3GPP TS 22.024: "Description of Charge Advice Information (CAI)". |
| [5] | 3GPP TS 42.068: "Voice Group Call Service (VGCS) - Stage 1". |
| [6] | 3GPP TS 42.069: "Voice Broadcast Service (VBS) - Stage 1". |
| [7] | 3GPP TS 43.005: "Technical performance objectives". |
| [8] | VOID |
| [9] | VOID |
| [10] | ITU-T Recommendation I.255.3: "ISDN Multi-Level Precedence and Pre-emption (MLPP) stage 1". |

3 Definitions and abbreviations

3.1 Definitions

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

called-party pre-emption: Termination of a call to a particular user when a higher priority call is directed towards that specific user. Called party pre-emption is decided by the User Equipment without interaction of the user.

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

For the purposes of the present document, the following abbreviations apply, in addition to those listed in GSM 01.04 and 3GPP TR 21.905 [1]:

eMLPP	enhanced Multi-Level Precedence and Pre-emption
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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 highest level (A) is 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. The second highest level (B) may be used for network internal use or, optionally, depending on regional requirements, for subscription. These two levels (A and B) may only be used locally, i.e. in the domain of one MSC. The other five priority levels are offered for subscription and may 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 or, optionally, for subscription).
- 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 received for the calling party, then the call shall be treated in the terminating mobile network with a default priority level defined in the terminating mobile network, or as an operator option may be treated with the priority level predefined by the called party subscriber as default priority level by registration.
 - 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 at the defined priority level of this voice broadcast or voice group call if this information is available. If the information is not available 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 this 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 1-2 s;
- class 2 normal set-up < 5 s;
- class 3 slow set-up < 10 s.

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. reference loads as defined in 3GPP TS 43.005, 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 core 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).

In public networks the capability to pre-empt an on-going TS12 call (emergency call) shall be subject to national regulations.

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, 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 applicability of this supplementary service is defined in 3GPP TS 22.004.

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

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.

If the subscriber requests a priority level higher than the maximum entitled one then the network shall reject this registration with an appropriate indication to 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 clause 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/USIM 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 3GPP TS 22.001.

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 3GPP TS 42.068 [5] and 3GPP TS 42.069 [6], 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 3GPP TS 42.069 [6] and 3GPP TS 42.068 [5]).

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 clause 4).

If the mobile station does not pre-empt the on-going call of lower priority and the user rejects the CW, 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)

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 the different call legs of a MPTY as for other calls.

8.12 Closed User Group (CUG)

No interaction. eMLPP shall not override CUG restrictions, except high priority calls shall override CUG restrictions as a network option.

8.13 Advice of Charge (AoC)

No interactions.

NOTE: Different charge metres for different priorities can be obtained e.g. by variation of the e1 or e2 parameters of the charge advice information according to 3GPP TS 22.024.

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 subclause 8.17.

8.19 Call Transfer (ECT)

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

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 EN related to MLPP.

For this interworking it shall be considered that:

- precedence levels A and B shall be mapped to precedence level 0 (see clause 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.

Annex A (informative) :

Change history

Change history											
TSG SA#	SA Doc.	SA1 Doc	Spec	CR	Rev	Rel	Cat	Subject/Comment	Old	New	WI
Jun 1999			GSM 02.67					Transferred to 3GPP SA1	7.0.0		
SA#04			22.067					Transferred to 3GPP SA1		3.0.0	
SP-05	SP-99479	S1-99622	22.067	0001		R99	D	Editorial changes for alignment	3.0.0	3.0.1	Editorial changes
SP-10	SP-000543	S1-000846	22.067	0002		Rel-4	B	Introduces definition of called party pre-emption	3.0.1	4.0.0	ASCI
SP-15	SP-020045	S1-020457	22.067	0003		Rel-4	F	Editorial CR to correct terms and references	4.0.0	4.1.0	Correct
SP-16	SP-020267	S1-021043	22.067			Rel-5		Updated from Rel-4 to Rel5	4.1.0	5.0.0	
SP-18	SP-020656	S1-022377	22.067	0004		Rel-6	C	CR to 22.067 for Priority Service	5.0.0	6.0.0	PRIOR-FS
SP-20	SP-030251	S1-030381	22.067	0005	-	Rel-6	F	Changes to align with 23.067 for Priority Service	6.0.0	6.1.0	PRIOR-FS
SP-31	SP-060029	S1-060199	22.067	0006	-	Rel-7	F	EPRT - Correction to priority requirement on setting up group call	6.1.0	7.0.0	TEI-7
SP-34	SP-060772	S1-061407	22.067	0007	-	Rel-8	F	Restriction on pre-emption of TS12 calls in non-public networks	7.0.0	8.0.0	TEI8
SP-46	-	-	-	-	-	-	-	Updated to Rel-9 by MCC	8.0.0	9.0.0	
2011-03	-	-	-	-	-	-	-	Update to Rel-10 version (MCC)	9.0.0	10.0.0	
SP-53	SP-110582	S1-112196	22.067	0008	1	Rel-11	F	Priority at Mobile terminated calls	10.0.0	11.0.0	TEI11
SP-62	SP-130592	S1-135287	22.067	0009	1	Rel-11	F	TS reference corrections	11.0.0	11.1.0	TEI11
2014-10	-	-	-	-	-	-	-	Update to Rel-12 version (MCC)	11.1.0	12.0.0	-
2015-12	-	-	-	-	-	Rel-13	-	Update to Rel-13 version (MCC)	12.0.0	13.0.0	-
2017-03	-	-	-	-	-	-	-	Updated to Rel-14 by MCC	13.0.0	14.0.0	
2018-06	-	-	-	-	-	-	-	Updated to Rel-15 by MCC	14.0.0	15.0.0	
SA#88e	-	-	-	-	-	-	-	Updated to Rel-16 by MCC	15.0.0	16.0.0	