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Railways Telecommunications (RT);
GPRS/EGPRS requirements for
European Train Control System (ETCS)

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Contents

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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Railway Telecommunications (RT).

Introduction

Railway undertakings are facing the challenge to evolve their networks to support the ETCS operation in high density railway traffic areas. The limited GSM-R spectrum resources put additional pressure on air interface traffic capabilities and as well radio spectrum efficiency. Also, the continuous development of further voice services e.g. GSM-R based shunting communication using circuit switched technology requires increased traffic resource capabilities.

When ETCS is using circuit switched data mode, radio traffic channel capacity utilization is low compared to the requested/assigned bandwidth. Having more than one ETCS session multiplexed to one radio resource using packet switched mode is therefore desirable. Taking into account GSM evolution GPRS/EGPRS bearer services provide packet oriented data transmission that allocates transmission resources on demand and release those resources if no further data are to be exchanged. ETCS message sizes are rather small and the typical message frequency are in the range of several seconds. This allows to multiplex several ETCS sessions to one transmission resource and facilitating use of ETCS level 2 in high density rail traffic areas.

The present document identifies the features required to allow the support of ETCS using GPRS/EGPRS bearer services, in particular the basic ones and those needed to fulfil End-to-End performance requirements.

1 Scope

The present document defines the minimum set of 3GPP GPRS features to support ETCS application and to guarantee QoS required. Two operational cases are applicable in GSM-R networks:

- GSM-R GPRS packet switched bearer service is only utilized by ETCS PS-mode operation - **ETCS only operation**.
- GSM-R GPRS packet switched bearer service is utilized by simultaneous ETCS and other packet data oriented applications - **Simultaneous operation of ETCS and non-ETCS applications**.

Both operational scenarios require basic GPRS features but in case of simultaneous ETCS and non-ETCS operation, ETCS packet data session requires priority over non-ETCS packet data traffic.

The present document is focussing on the relevant references needed for the GSM-R PS-domain. It does not describe the detailed requirements for each of the referred GSM feature.

The minimum requirements on ETSI/3GPP for the use of GSM for application on railway networks are based on the Release 99 version of the Technical Specifications and are described in ETSI EN 301 515 [i.1]. The features serving as the basis for GSM-R PS-domain are described in releases later than Release 99. So the present document is referring to specifications versions later than Release 4 but is not mandating any other functionality than covered by the applicable 3GPP Work Items and referenced in the applicable clauses as listed in clauses 5.1.10 and 5.2.2.

2 References

2.1 Normative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at http://docbox.etsi.org/Reference.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

The following referenced documents are necessary for the application of the present document.

[1] ETSI TS 123 002 (V4.8.0): "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Network architecture (3GPP TS 23.002 version 4.8.0 Release 4)".

[2] ETSI TS 123 060 (V4.11.0): "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); General Packet Radio Service (GPRS); Service description; Stage 2 (3GPP TS 23.060 version 4.11.0 Release 4)".

[3] ETSI TS 123 107 (V4.6.0): "Universal Mobile Telecommunications System (UMTS); Quality of Service (QoS) concept and architecture (3GPP TS 23.107 version 4.6.0 Release 4)".

[4] ETSI TS 123 207 (V5.10.0): "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); End-to-end Quality of Service (QoS) concept and architecture (3GPP TS 23.207 version 5.10.0 Release 5)".

[5] ETSI TS 124 008 (V4.17.0): "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Mobile radio interface Layer 3 specification; Core network protocols; Stage 3 (3GPP TS 24.008 version 4.17.0 Release 4)".

[6] ETSI TS 103 368 (V1.1.1): "Railway Telecommunications; Commands necessary for mobile radio equipment operation on railways".

[7] ETSI TS 129 002 (V4.18.0): "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Mobile Application Part (MAP) specification (3GPP TS 29.002 version 4.18.0 Release 4)".

[8] ETSI TS 129 060 (V4.11.0): "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); General Packet Radio Service (GPRS); GPRS Tunnelling Protocol (GTP) across the Gn and Gp interface (3GPP TS 29.060 version 4.11.0 Release 4)".

[9] ETSI TS 129 061 (V4.10.1): "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Interworking between the Public Land Mobile Network (PLMN) supporting packet based services and Packet Data Networks (PDN) (3GPP TS 29.061 version 4.10.1 Release 4)".

[10] ETSI TS 143 064 (V4.5.0): "Digital cellular telecommunications system (Phase 2+); Overall description of the GPRS radio interface; Stage 2 (3GPP TS 43.064 version 4.5.0 Release 4)".

[11] ETSI TS 144 018 (V4.23.0): "Digital cellular telecommunications system (Phase 2+); Mobile radio interface layer 3 specification; Radio Resource Control (RRC) protocol (3GPP TS 44.018 version 4.23.0 Release 4)".

[12] ETSI TS 144 060 (V4.23.0): "Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); Mobile Station (MS) - Base Station System (BSS) interface; Radio Link Control / Medium Access Control (RLC/MAC) protocol (3GPP TS 44.060 version 4.23.0 Release 4)".

[13] ETSI TS 144 064 (V4.4.0): "Digital cellular telecommunications system (Phase 2+); Mobile Station - Serving GPRS Support Node (MS-SGSN); Logical Link Control (LLC) Layer Specification (3GPP TS 44.064 version 4.4.0 Release 4)".

[14] ETSI TS 144 065 (V4.3.0): "Digital cellular telecommunications system (Phase 2+); Mobile Station (MS) - Serving GPRS Support Node (SGSN); Subnetwork Dependent Convergence Protocol (SNDCP) (3GPP TS 44.065 version 4.3.0 Release 4)".

[15] ETSI TS 148 018 (V4.7.0): "Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); Base Station System (BSS) - Serving GPRS Support Node (SGSN); BSS GPRS Protocol (3GPP TS 48.018 version 4.7.0 Release 4)".

[16] ETSI TS 145 001 (V4.5.0): "Digital cellular telecommunications system (Phase 2+); Physical layer on the radio path; General description (3GPP TS 45.001 version 4.5.0 Release 4)".

[17] ETSI TS 145 002 (V4.8.0): "Digital cellular telecommunications system (Phase 2+); Multiplexing and multiple access on the radio path (3GPP TS 45.002 version 4.8.0 Release 4)".

[18] ETSI TS 145 003 (V4.4.0): "Digital cellular telecommunications system (Phase 2+); Channel coding (3GPP TS 45.003 version 4.4.0 Release 4)".

[19] ETSI TS 145 004 (V4.2.0): "Digital cellular telecommunications system (Phase 2+); Modulation (3GPP TS 45.004 version 4.2.0 Release 4)".

[20] ETSI TS 145 005 (V4.19.0): "Digital cellular telecommunications system (Phase 2+); Radio transmission and reception (3GPP TS 45.005 version 4.19.0 Release 4)".

[21] ETSI TS 145 008 (V4.19.0): "Digital cellular telecommunications system (Phase 2+); Radio subsystem link control (3GPP TS 45.008 version 4.19.0 Release 4)".

[22] ETSI TS 145 010 (V4.5.0): "Digital cellular telecommunications system (Phase 2+); Radio subsystem synchronization (3GPP TS 45.010 version 4.5.0 Release 4)".

[23] ETSI TS 148 016 (V4.4.0): "Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); Base Station System (BSS) - Serving GPRS Support Node (SGSN) Interface; Network Service (3GPP TS 48.016 version 4.4.0 Release 4)".

2.2 Informative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

[i.1] ETSI EN 301 515: "Global System for Mobile communication (GSM); Requirements for GSM operation on railways".

3 Definitions and abbreviations

3.1 Definitions

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

ETCS application: comprises the EuroRadio protocol suite

non-ETCS application(s): comprises any other protocol suites than EuroRadio

3.2 Abbreviations

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

ARP	Allocation Retention Priority
BSS	Base Station Subsystem
CS	Coding Schemes
EGPRS	Evolved GPRS
ETCS	European Train Control System
ETSI	European Telecommunication Standards Institute
GERAN	GSM/EDGE Radio Access Network
GGSN	Gateway GPRS Support Node
GPRS	General Packet Radio Service
GSM	Global System Mobile
GSM-R	Global System for Mobile communication for Railway application
HARQ	Hybrid Automatic Repeat Request
IP	Internet Protocol
LLC	Logical Link Control
MCS	Modulation Coding Schemes
NACC	Network Assisted Cell Change
NSE	Network Service Entity
PCU	Packet Control Unit
PDP	Packet Data Protocol
PDU	Protocol Data Unit
PFC	Packet Flow Context
PS	Packet Switched
QoS	Quality of Service
RAN	Radio Access Network
RIM	RAN Information Management
RLC	Radio Link Control
SGSN	Serving GPRS Support Node
TBF	Temporary Block Flow

4 General requirements

4.1 ETCS application characteristics

GPRS and EGPRS are the available packet switched bearer services based on GSM, and are applicable for GSM-R too. These bearer services are to be considered for the transport of the ETCS application and in addition, certain features are required to adapt to the ETCS characteristics and to prioritize the ETCS application against other non-ETCS applications while sharing the radio and network resources.

ETCS application is safety related and therefore requires reactive processing and highly reliable transport along the transmission path. One of the GPRS main principles is that radio transmission resources are allocated based on the demand principle and released after a short guard time if no further data are to be transmitted. The message periodicity (inter arrival frequency of application user data packets) between the involved communication entities inside the ETCS application can vary between one and several seconds (see example in Figure 1). This can result in the release of allocated transmission resources too early which causes additional ETCS user data transfer delay.

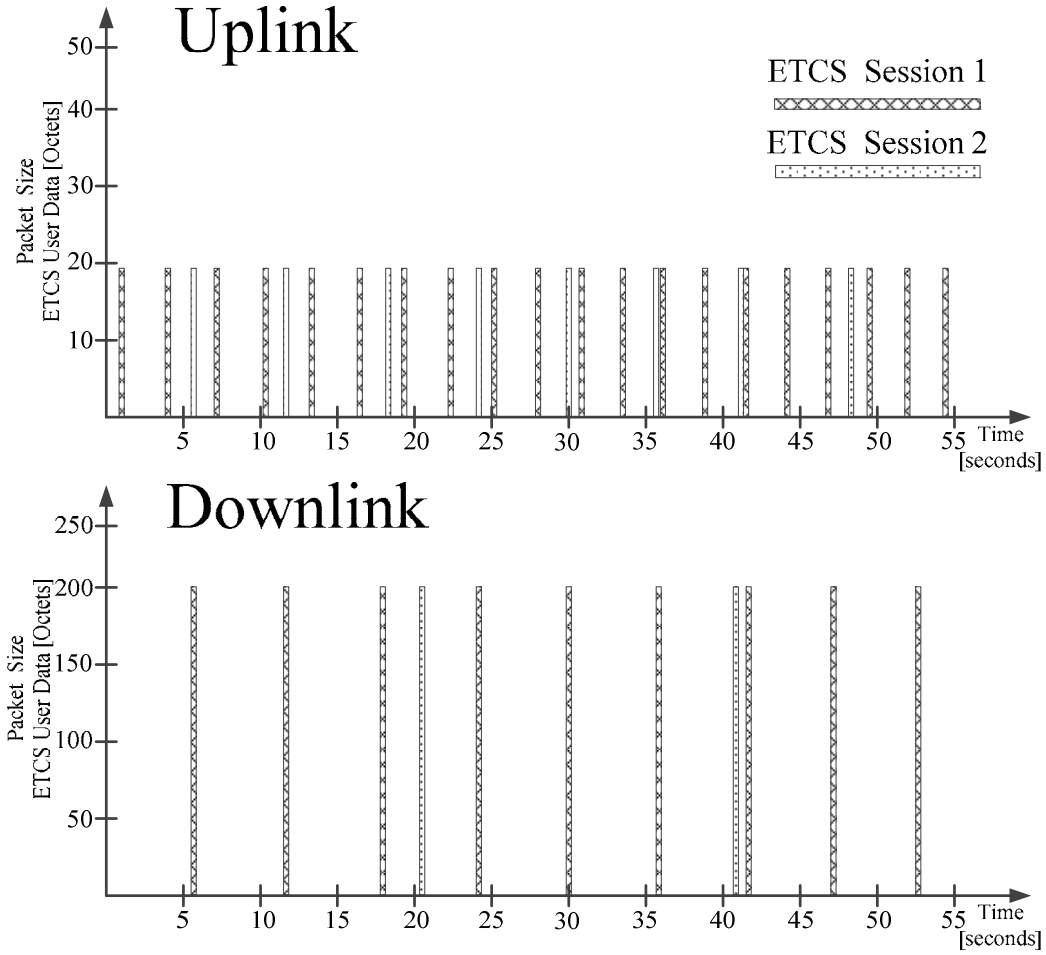

Figure 1: Example Inter-Transmission and arrival intervals in ETCS

4.2 Coexistence between ETCS and non-ETCS applications

ETCS application can be the only service using GPRS/EGPRS bearer or together with other non-ETCS applications (simultaneous operation of ETCS/non-ETCS applications). Latter scenario requires a strict separation of the different traffic types using different QoS profile parameters as part of the subscription and the processing of the QoS parameters within the radio access domain and core network domain.

In particular, the radio access domain has to prioritize the ETCS traffic over the non-ETCS traffic if those are operated simultaneously. In addition to the prioritization of ETCS traffic in both traffic scenarios, guaranteed transmission bandwidth should be provided to fulfil the QoS requirements.

4.3 Reference 3GPP Release

All GSM GPRS features that are referenced in the present document shall be implemented to fulfil in minimum 3GPP Release 4 GERAN, based on A/Gb mode operation.

Specific timer and counter specification of the normative references shall be supported, except the subsequent chapters indicating specific values for the operation of ETCS.

4.4 Applicability

The present document shall only apply to Mobile Terminals of an ETCS Data Only Radio.

5 Bearer services and features for ETCS operation

5.1 Basic features

5.1.0 General

The features that are listed in this clause are considered for ETCS operation.

5.1.1 Network - Bearer Service capabilities

The GSM-R network shall support all mandatory GPRS bearer services capabilities in the radio access domain (BSS) according to:

- ETSI TS 123 002 [1]
- ETSI TS 123 060 [2]
- ETSI TS 123 107 [3]
- ETSI TS 143 064 [10]
- ETSI TS 144 018 [11]
- ETSI TS 144 060 [12]
- ETSI TS 145 001 [16]
- ETSI TS 145 002 [17]
- ETSI TS 145 003 [18]
- ETSI TS 145 004 [19]
- ETSI TS 145 005 [20]
- ETSI TS 145 008 [21]
- ETSI TS 145 010 [22]

and in the packet core network domain according to:

- ETSI TS 123 002 [1]
- ETSI TS 123 060 [2]
- ETSI TS 123 107 [3]
- ETSI TS 123 207 [4]
- ETSI TS 124 008 [5]
- ETSI TS 129 002 [7]
- ETSI TS 129 060 [8]
- ETSI TS 129 061 [9]
- ETSI TS 143 064 [10]
- ETSI TS 144 064 [13]
- ETSI TS 144 065 [14]
- ETSI TS 148 018 [15]
- ETSI TS 148 016 [23]

In addition, EGPRS bearer services shall be supported by the network to enhance the bandwidth across the air interface.

EGPRS bearer services should comprise the enhancements i.e. HARQ including Incremental Redundancy that are available in acknowledged RLC operation mode according to ETSI TS 144 060 [12].

GSM-R packet domain shall support interworking according to ETSI TS 129 061 [9] with networks based on the Internet Protocol. The operation of ETCS requires an End-to-End QoS transmission resources management. Thus, it is necessary to interwork with external IP bearer services beyond the GSM-R packet domain reference point. For that reason, the GGSN shall support the DiffServ edge functionality according to ETSI TS 123 207 [4] which can be used for external bearer service QoS management.

The radio access network (BSS) shall support GPRS/EGPRS bearer services up to an absolute speed of 500 km/h accepting certain limitations of the robustness i.e. level of forward error correction.

5.1.2 Mobile - Bearer Service capabilities

The Mobile Stations to be used for ETCS operation shall provide GPRS and EGPRS bearer service capabilities which comply to:

- ETSI TS 123 002 [1]
- ETSI TS 123 060 [2]
- ETSI TS 123 107 [3]
- ETSI TS 124 008 [5]
- ETSI TS 103 368 [6]
- ETSI TS 143 064 [10]
- ETSI TS 144 018 [11]
- ETSI TS 144 060 [12]
- ETSI TS 144 064 [13]
- ETSI TS 144 065 [14]

- ETSI TS 145 001 [16]
- ETSI TS 145 002 [17]
- ETSI TS 145 003 [18]
- ETSI TS 145 004 [19]
- ETSI TS 145 005 [20]

GPRS/EGPRS bearer services shall be operated by the Mobile Station up to an absolute speed of 500 km/h accepting certain limitations of the robustness i.e. level of forward error correction.

5.1.3 Quality of Service Management

In order to allow basic QoS management, Mobile Stations and the Network shall support 3GPP QoS concept and architecture according to ETSI TS 123 107 [3]. The relevant network entities and the Mobile Stations shall be able to process non-Guaranteed Bitrate traffic classes, Interactive and Background, between the specified reference points in ETSI TS 123 060 [2] including the associated parameters.

5.1.4 Multislot Operation

GPRS and EGPRS bearer services offers Multislot operation. Possible Multislot configuration/classes shall be implemented according to ETSI TS 145 002 [17].

5.1.5 Optimized LLC-PDU delivery

During the lifetime of an ETCS data communication, the ability of cell change processing and the related GPRS Mobility Management is a basic requirement to the Mobile Stations and the network. Due to Mobile Station controlled cell reselection, downlink user data which are not delivered, shall be forwarded to the new serving cell within the same NSE/PCU [15]. For this reason, the network shall support the functionality of LLC-PDU forwarding inside the same NSE/PCU before user data get deleted.

The process of cell reselection between cells which belong to different PCU/NSE may cause additional packet transfer delay in the downlink. It concerns those downlink user data (LLC-PDU) which are not delivered when the Mobile Station decides or is commanded to reselect to another cell.

To lower the impact of system limitations or to support specific track architectures Inter-NSE LLC-PDU re-routing according to ETSI TS 148 018 [15] may be supported by the network.

5.1.6 Mobility

Mobility Management is one of the key features in GSM. Cell change under GPRS conditions is supported by the cell reselection procedure determined by the Mobile Station.

To lower the impact of cell reselection process to the user data packet transfer delay at least Network Assisted Cell Change (NACC) processing according to ETSI TS 143 064 [10] and ETSI TS 144 060 [12] shall be provided by the network and the applicable Mobile Stations.

Further GPRS Mobility Management features e.g. Network Controlled Cell Reselection or PS-Handover may be considered as further performance enhancing options.

PCU/NSE capacity limitations or specific track side GSM-R architectures may require to distribute cells across different PCU/NSE. For this reason, the serving PCU/NSE need to retrieve cell specific system information from another network entity i.e. target PCU/NSE than the serving cell is assigned. The RAN-Information Management (RIM) feature supports the exchange of cell specific system information between different PCU network entities for such reason. To support NACC in case of cells belonging to different NSE, RAN Information Management (RIM) as described in ETSI TS 148 018 [15] may be supported by the network.

For the operation of NACC Network_Control_Order "0" (NC0) shall be supported by the network whilst the processing of enhanced Network_Control_Order functionalities (NC1 and NC2) may be considered as further options.

NACC belongs to GERAN features package 1 and shall be supported together with extended uplink TBF mode.

5.1.7 Gathering radio resources

Regardless of the ETCS user data exchange characteristics, other features are of interest to improve the overall data transfer delay performance. During the phase of gathering Uplink resources, the network assigns the access to the network either in a two phase packet access or in an one phase packet access procedure according to ETSI TS 144 060 [12]. Latter one reduces the interaction between Mobile station and network. Therefore both packet access procedures shall be supported by the network and the Mobile Stations used for ETCS purposes.

5.1.8 Radio resource allocation

GPRS Radio Resource (TBF Management)

Allocation and release follows the "On demand" principle according to ETSI TS 143 064 [10]. If no further user data are to be exchanged, GPRS radio resources get released after a certain guard time. The inter arrival time of ETCS application messages is rather low and would cause additional ETCS user data transfer delay if GPRS radio resources are released too frequently. To lower the impact of a too early radio transmission resource release (TBF), GPRS Radio Resource management shall be adapted to ETCS application message frequency. Hence, following features shall be supported by the network and if applicable by the Mobile Stations.

Uplink transmission

Extended uplink TBF mode according to ETSI TS 144 060 [12] increases the uplink-TBF allocation time. The inactivity period, which defines the uplink TBF holding time while the Mobile Station is in extended uplink TBF mode, shall support an adjustable range between 0 and 20 seconds (see note 1 and note 2). The feature is applicable to the network and the Mobile Station.

Extended uplink TBF mode belongs to GERAN feature package 1 and shall be supported together with NACC.

Downlink transmission

Delayed downlink TBF release according to ETSI TS 144 060 [12] increases the downlink TBF allocation time. The inactivity period, which defines the downlink TBF holding time after successful radio block acknowledgement, shall support an adjustable range between 0 and 20 seconds (see notes 1 and 2). The feature is only applicable to the network.

NOTE 1: Further extension beyond the upper timer limit is implementation specific.

NOTE 2: To achieve efficient radio resource utilization, the allocation of TBF radio resources should be considered. This is an implementation specific matter e.g. timer based TBF allocation control at cell level.

5.1.9 Automatic GPRS Attach

GPRS Attach procedure according to ETSI TS 124 008 [5] is used to register the Mobile Station towards the applicable Mobility Management node in the network. According to ETSI TS 103 368 [6], the procedure can be ordered manually by using the applicable command or initiated automatically when GPRS is supported in the serving cell.

For the operation of ETCS, automatic GPRS Attach feature according to ETSI TS 103 368 [6] shall be supported by the specified type of Mobile Station (see clause 4.4).

5.1.10 Summary basic features

Table 1 summarizes the basic feature requirements for the operation of ETCS in PS-mode using GPRS/EGPRS bearer services which shall be met by Mobile Stations and network as indicated.

Table 1: Basic features

Service/Feature	Applicable for Network M - Mandatory O - Optional NA - Not Applicable	Applicable for Mobile Station M - Mandatory O - Optional NA - Not Applicable	Remarks
GPRS Bearer Service Capabilities - Radio Access Network	M Clause 5.1.1	M Clause 5.1.2	All mandatory bearer service features are required
GPRS Bearer Service Capabilities - Coding Schemes (CS)	CS-1 (M) CS-2 (M) CS-3 (O) CS-4 (O)	CS-1 (M) CS-2 (M) CS-3 (M) CS-4 (M)	
GPRS Bearer Service Capabilities - Packet Core Network	M Clause 5.1.1	NA	
EGPRS Bearer Service Capabilities	M Clause 5.1.1	M Clause 5.1.2	All mandatory bearer service features are required
EGPRS Bearer Capabilities - Modulation Coding Schemes (MCS)	MCS-1 - MCS-9 (O)	MCS-1 - MCS-9 (M)	
EGPRS enhanced RLC operation - HARQ including Incremental Redundancy	O Clause 5.1.1	M Clause 5.1.2	
End-to-End QoS transmission resources management	M Clause 5.1.1	N/A	
QoS Management of Non-Guaranteed Bitrate Traffic classes (i.e. Interactive, Background) including associated parameters	M Clause 5.1.3	M Clause 5.1.3	
Multislot operation	O Clause 5.1.4	M Clause 5.1.4	
Intra NSE LLC-PDU re-routing	M Clause 5.1.5	NA Clause 5.1.5	
Inter NSE LLC-PDU re-routing	O Clause 5.1.5	NA Clause 5.1.5	
Network Assisted Cell Change (NACC)	M Clause 5.1.6	M Clause 5.1.6	Part of GERAN feature package 1 (see ETSI TS 144 060 [12])
RAN Information Management (RIM) for NACC	O Clause 5.1.6	NA Clause 5.1.6	
One phase packet access	M Clause 5.1.7	M Clause 5.1.7	
Extended uplink TBF mode	M Clause 5.1.8	M Clause 5.1.8	Part of GERAN feature package 1 (see ETSI TS 144 060 [12])
Extended uplink TBF mode - TBF release timer; adjustable timer range 0 - 20 seconds	M Clause 5.1.8	NA Clause 5.1.8	
Delayed downlink TBF release	M Clause 5.1.8	NA	
Delayed downlink TBF release - TBF release: adjustable timer range 0 - 20 seconds (see note)	M Clause 5.1.8	NA	
Automatic GPRS Attach	NA	M Clause 5.1.9	
NOTE: Further extension beyond the upper timer limit is implementation specific.			

5.2 Mixed packet data traffic operation

5.2.0 General

The features that are listed in this clause are considered for simultaneous operation of ETCS and non-ETCS applications.

5.2.1 Quality of Service Management

Simultaneous operation of ETCS and non-ETCS applications may cause unexpected transfer delay to ETCS if the QoS profile parameters are treated always as best effort or best effort with priority. The concept of Packet Flow Context (PFC) according to ETSI TS 123 060 [2] and ETSI TS 148 018 [15] improves the QoS handling of transmission resource allocation within the radio access domain. It allows the exchange of QoS information between the SGSN and the BSS already during the PDP context activation phase. All applicable QoS profile parameters according to ETSI TS 123 107 [3] are considered to allocate the appropriate radio resources. In such an operational scenario, Packet Flow Context shall be supported by network and the Mobile Stations used for ETCS operation. Features which enhance PFC may be considered as further performance enhancing options.

To guarantee that the ETCS PDP context will get the highest importance of resource allocation and retention Allocation Retention Priority (ARP) in ETSI TS 123 207 [4] shall be taken into account and processed in the radio access and core network domain up to the applicable reference points.

ETCS operation shall make use of streaming traffic class according to ETSI TS 123 107 [3]. If GPRS/EGPRS radio transmission resources are limited and a certain utilization of these resources may restrict the allocation of the requested guaranteed bitrate, following applies:

- New requests for Streaming traffic class, which supports guaranteed bitrate, shall be reclassified to the interactive traffic class (see ETSI TS 123 107 [3]) applying the highest traffic handling priority.
- If transmission resource utilization in a cell allowing again the allocation of the requested guaranteed bitrate, a re-negotiation to the requested Streaming traffic class and related parameters shall be automatically initiated between the applicable network entities.

5.2.2 Summary mixed packet data traffic operation

Table 2 summarizes the required features for simultaneous operation of ETCS and non-ETCS applications which shall be met by mobile stations and network as indicated.

Table 2: Performance enhancing features part 2

Service/Feature	Applicable for Network M - Mandatory O - Optional NA - Not Applicable	Applicable for Mobile Station M - Mandatory O - Optional NA - Not Applicable	Remarks
Packet Flow Context (PFC)	M ETSI TS 123 060 [2], ETSI TS 144 060 [12], and ETSI TS 148 018 [15]	M ETSI TS 123 060 [2] and ETSI TS 144 060 [12]	
Support and processing of Allocation Retention Priority	M ETSI TS 123 107 [3], ETSI TS 129 002 [7], and ETSI TS 148 018 [15]	NA	
QoS Management of Guaranteed Bitrate Traffic class Streaming including associated parameters	M (see note) ETSI TS 123 107 [3], ETSI TS 129 002 [7], ETSI TS 129 060 [8], and ETSI TS 148 018 [15]	M ETSI TS 123 107 [3]	
NOTE: Comprises the re-classification to interactive traffic class by the network.			

Annex A (informative): Bibliography

- ETSI TS 102 281: "Railways Telecommunications (RT); Global System for Mobile communications (GSM); Detailed requirements for GSM operation on Railways".

Annex B (informative): Change History

Date	Version	Information about changes
December 2015	V 1.1.1	
October 2016	V 1.2.1	Normative reference ETSI TS 127 007 replaced by ETSI TS 103 368. Clause 5.1.9 adapted to ETSI TS 103 368. A few clarifications were added and some editorial corrections were done.

History

Document history		
V1.1.1	December 2015	Publication
V1.2.1	October 2016	Publication