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Technical Specification

Railways Telecommunications (RT);
Global System for Mobile communications (GSM);
Usage of the User to User Information Element
for GSM Operation on Railways

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650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
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Foreword

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

Introduction

The User to User Signalling Supplementary Service is widely used in the operation of GSM for Railways (GSM-R). The applications "Presentation of Functional Numbers" [2], [3] and "Confirmation of High Priority Calls" [4], [5] have been specified, implemented and tested in the framework of national GSM-R schemes. In defining layouts for the new features DSD Alarm Notification and Alerting Dispatcher care has been taken to ensure that existing implementations are not compromised or invalidated when laying out a framework for flexible further extension. For any such further extension, therefore, it is mandatory to define the use of UUIE in these various applications to avoid interoperability issues in the future.

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1 Scope

The present document defines the contents of the User to User Information Element when used in the GSM-R environment. This includes the basic EIRENE features Functional Addressing, Location Dependant Addressing, Confirmation of High Priority Calls and Presentation of Functional Numbers. In addition the present document defines layouts for further features: Enhanced Presentation of Functional Numbers, Enhanced Location Dependent Addressing, Driver Safety Device alarm, Plain Text Messages, Presentation of the Functional Number of the initiator of a Railway Emergency Call and Alerting Dispatcher. Finally, the present document describes the requirements to be followed by network operators to ensure compatibility and interoperability if they wish to define specific fields for national and/or network use. The details of such fields are outside the scope of the present document.

2 References

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2.1 Normative references

The following referenced documents are indispensable for the application of the present document. For dated references, only the edition cited applies. For non-specific references, the latest edition of the referenced document (including any amendments) applies.

[1] EIRENE PSA167D006 (Version 15): "UIC Project EIRENE System Requirements Specification".

NOTE: Available at http://gsm-r.uic.asso.fr/docs/specifications/gsmr_srs_v15.pdf.

[2] MORANE F 10 T 6003 4: "FFFS for Presentation of Functional Numbers to Called and Calling Parties".

NOTE: Available at http://gsm-r.uic.asso.fr/docs/specifications/f10t6003_4_pfn_fffs.pdf.

[3] MORANE F 12 T 6003 4: "FIS for Presentation of Functional Numbers to Called and Calling Parties".

NOTE: Available at http://gsm-r.uic.asso.fr/docs/specifications/f12t6003_4_pfn_fis.pdf.

[4] MORANE F 10 T 6002 4: "FFFS for Confirmation of High Priority Calls".

NOTE: Available at http://gsm-r.uic.asso.fr/docs/specifications/f10t6002_4_fffs_chp_calls.pdf.

[5] MORANE F 12 T 6002 4: "FIS for Confirmation of High Priority Calls".

NOTE: Available at http://gsm-r.uic.asso.fr/docs/specifications/f12t6002_4_fis_chp_calls.pdf.

[6] ETSI TS 123 008: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Organization of subscriber data (3GPP TS 23.008 version 7.0.0 Release 7)".

[7] ETSI TS 124 007: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Mobile radio interface signalling layer 3; General Aspects (3GPP TS 24.007 version 7.0.0 Release 7)".

[8] Void.

[9] Void.

[10] ETSI TS 143 068: "Digital cellular telecommunications system (Phase 2+); Voice Group Call Service (VGCS); Stage 2 (3GPP TS 43.068 version 7.8.0 Release 7)".

[11] ETSI TS 144 068: "Digital cellular telecommunications system (Phase 2+); Group Call Control (GCC) Protocol (3GPP TS 44.068 version 7.2.0 Release 7)".

[12] eLDA IRS (V5.0): "Interface Requirements Specification enhanced Location Dependent Addressing".

NOTE: Available at http://gsm-r.uic.asso.fr/docs/elda_irs_v5.0.pdf.

[13] Void.

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3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in the ETSI directives and the following apply:

cab radio: radio and associated user and other interfaces installed in the cab of a locomotive and for use principally by the locomotive driver

call type: prefix used to identify the type of user number dialled

coach number: number assigned to an item of rolling stock on a permanent basis

NOTE: The coach number may form a component of a functional number used to address users/systems on an item of rolling stock.

controller: individual at a fixed location responsible for the conduct and co-ordination of some aspect of train operations

NOTE: Also known as a dispatcher.

dispatcher: individual at a fixed location responsible for the conduct and co-ordination of vehicle movements and operations

NOTE: In railway operations, the dispatcher is usually known as a controller.

driver safety device: on-train system which monitors the alertness of the driver and provides warning and alarms to other systems as appropriate

engine number: number assigned to an item of traction stock on a permanent basis

NOTE: The engine number may form a component of a functional number used to address users/systems on an item of traction stock.

functional addressing/numbering: term used to describe the process of addressing a call using a number representing the function a user is performing, rather than a number identifying the user's terminal equipment

functional identity: full alphanumeric description of the function performed by a called or calling party within the functional numbering scheme, identifying them by function or role rather than by a specific item of radio equipment or user subscription

NOTE: The functional identity can include characters and/or numbers.

functional number: full number used within the functional addressing scheme to contact an end user/system by function or role rather than by a specific item of radio equipment or user subscription

group call: call made to all members of a pre-defined group within a local geographical area

NOTE: Only one member of the group may talk at any instant with all other group members listening only.

international code: prefix used to identify an EIRENE network outside the network the in which the calling party is operating

location dependent addressing: term used to describe the process of addressing a particular function (typically a controller) based on the current location of the user (typically a train)

railway emergency call: high priority call for informing drivers, controllers and other concerned personnel of a level of danger requiring all Railway movements in a pre-defined area to stop

NOTE: Two types of Railway emergency calls are defined:

- train emergency calls (for railway emergencies whilst not involved in shunting operations);
- shunting emergency calls (for railway emergencies whilst involved in shunting operations).

train number: number given to a train by operational staff for a particular journey

NOTE: A train number may form a component of the functional number used to address users or systems on a train.

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3.2 Abbreviations

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

BCD	Binary Coded Decimal
CBS	Cell Broadcast Service
CHPC	Confirmation of High Priority Call
CT	Call Type
DSD	Driver Safety Device
EIRENE	European Integrated Railway radio Enhanced Network
eLDA	enhanced Location Dependent Addressing
ePFN	enhanced Presentation of Functional Number
FC	Function Code
FFFS	Form Fit Functional Specification
FIS	Functional Interface Specification
FN	Functional Number
GSM-R	Global System for Mobile-Rail
IC	International Code
IE	Information Element
MCC	Mobile Country Code
MNC	Mobile Network Code
MORANE	Mobile radio for Railway Networks in Europe
MSC	Mobile Switching Centre

OTDI	Originator-To-Dispatcher-Information
PFN	Presentation of Functional Number
REC	Railway Emergency Call
TLV	Tag Length Value
UIC	Union Internationale des Chemins de fer
UIN	User Identifier Number
UUI	User-to-User Information
UUIE	User-to-User Information Element
UUS	User-to-User Signalling
UUS1	User-to-User Signalling Service 1
VGCS	Voice Group Call Service

4 General UUIE Format

4.1 Encoding protocol and information capacity

The general format of the User to User Information Elements used in GSM-R is shown in table 1.

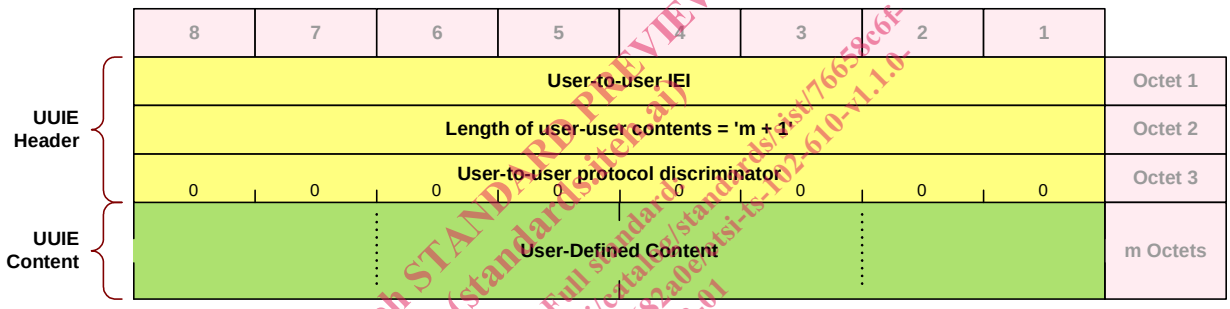

Figure 1: General ETSI coding format for User to User Information Elements (UUIE)

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The maximum length of user-defined information (m octets in figure 1) is limited to 32 octets (35 octets for the overall maximum length of the UUIE) to ensure transparency through all mobile and fixed elements of a GSM-R network. Binary encoding should generally be used to maximize the data content in this limited space. This requires the "protocol discriminator" to be set to "User-Specific Protocol".

< User-to-User protocol discriminator >: 00000000 User Specific Protocol.

NOTE: In one special case, "Presentation of the Functional Identity of the Initiator of a Railway Emergency Call", the ETSI specifications for VGCS make necessary the use of a different encoding and protocol discriminator (see clause 6).

4.2 General encoding of the user defined content

The UUIE provides a limited space of 32 information octets. Therefore an efficient coding scheme, which also allows for easy decoding of received information, must be employed. This scheme must allow correct decoding even when information not understood by the receiving application is mixed with the desired information. In order to keep the information content flexible, the structure "Tag-Length-Value" (TLV) is used. This supports the inclusion of multiple user information fields of variable lengths. This general structure is illustrated in figure 2.

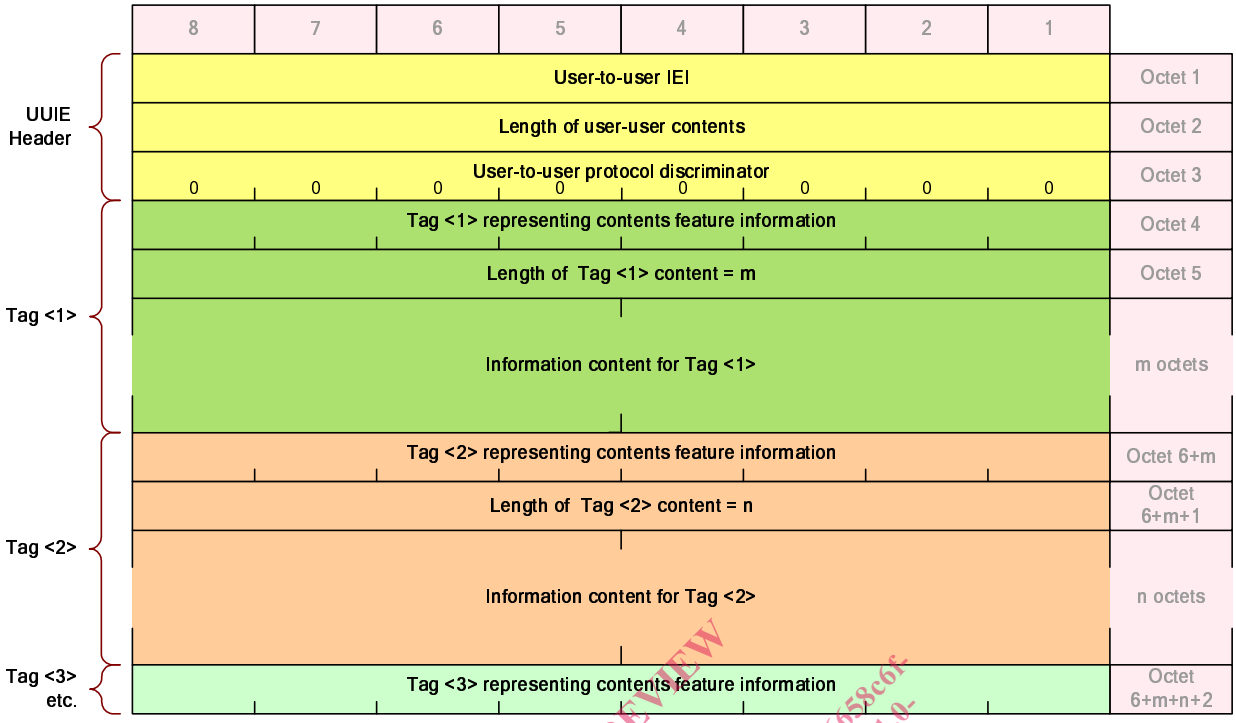

Figure 2: Generic coding format for User to User Information Elements (UUIE) using user specific protocol in GSM-R context

The structure of Tag, Length, Value is repeated as many times as there are tags in the message and enough room for them. This is the TLV structure. Restrictions on the order of TLV tags is as defined in clause 7.1.1.

4.3 Definition of tag values

The number of different tags for UUIE content complying with the TLV structure is limited to 255 where the tag range 0 to 127 is reserved for international use and the range 128 to 255 is reserved for national use.

The tags that are defined for international use are listed in table 1.

Table 1: Identification of GSM-R specific tags for international use

Tag Value	Feature
2	Acknowledgement by Receiver of a High Priority Call and response from device accepting the acknowledgement
3	Acknowledgement by Initiator of a High Priority Call
5	Presentation of Functional Number
6 to 8	enhanced Location Dependent Addressing
9	ePFN Information
10	User specific plain text according to alphabet indicator
11	DSD Alarm Notification
12	Alerting Dispatcher Notification

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5 Definition of individual tag contents

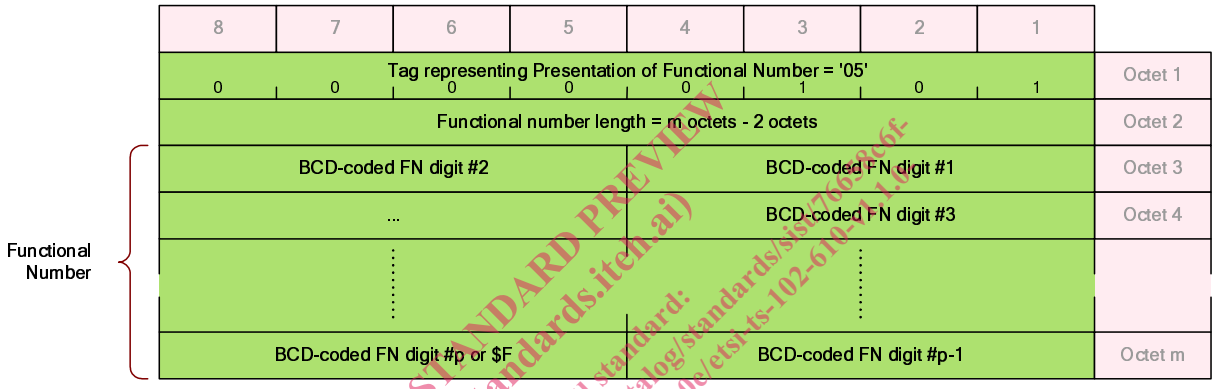
This clause defines the content of each of the Tags listed in table 1. The tags may be combined with other tags in specific applications, and such uses are described in clause 7. Because tags may be combined, the illustrations in this clause only contain the tag definition and do not illustrate the complete UUIE structure and content. Clause 7 contains complete examples of that kind.

5.1 Presentation of functional number tag

According to [2] and [3], the Functional Number (FN) is always transferred in the UUS1 as an International FN, that is:

FN = IC + CT + UIN + FC

This tag can be included in any allowed call control message where it is required to transfer the FN of the sending party to the other party in the call. The general layout of the PFN tag is given in figure 3.



NOTE 1: The FN length field specifies the number of octets present to carry the FN. Each digit of a FN is encoded as a BCD digit (one nibble). The first FN digit is in bits 1 to 4 and the next digit is in bits 5 to 8 of octet 3 of the tag; the following digit is in bits 1 to 4 of next octet and so on. If the FN consists of an odd number of digits, then the last half octet (bits 4 to 7) of the FN should contain "$F" as a filler. Therefore "$F" can never be a valid digit within the FN.

NOTE 2: The hexadecimal value "$F" represents the binary value of 4 bits, all set to "1".

Figure 3: General Format of PFN Tag Content

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Octets consisting of two half octets, both set to "$F", shall not be used in PFN tags as a filler; only octets containing valid BCD digits, or a single "$F" nibble shall be included. If no valid FN is available for transmission, then a PFN tag encoded as shown in figure 4 shall be used.

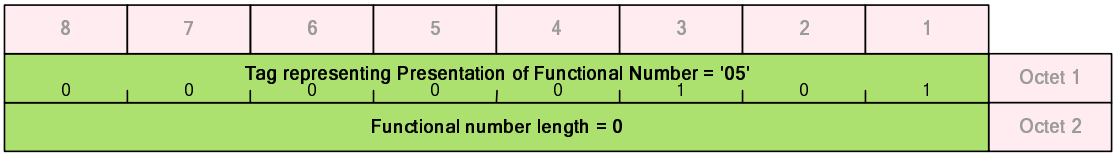

Figure 4: PFN Tag Content to Indicate "No FN Available"

5.2 Confirmation of High Priority Calls tags

The procedure for the Confirmation of a High Priority Call is defined in [4] and [5]. UUS1 tags are used by the mobiles involved in the call and also by the network device that is responsible for collecting the confirmation messages. The tags involved are defined below.