SLOVENSKI STANDARD
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Digital cellular telecommunications system (Phase 2) (GSM); General on Terminal
Adaptation Functions (TAF) for Mobile Stations (MS) (GSM 07.01)

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GLOBAL SYSTEM FOR
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Digital cellular telecommunications system (Phase 2);
General on Terminal Adaptation Functions (TAF)
for Mobile Stations (MS)
(GSM 07.01)

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Contents

Foreword

This fourth edition European Telecommunication Standard (ETS) has been produced by the Special Mobile Group (SMG) Technical Committee of the European Telecommunications Standards Institute (ETSI).

This ETS describes the functions required for the terminal adaptation of terminal equipment to the Mobile Termination (MT) within the European digital cellular telecommunications system (Phase 2).

This ETS is based upon the principles of terminal adaptor functions presented in the CCITT I-series of recommendations (I.460 - I.463).

This ETS corresponds to GSM 07.01 version 4.10.0.

The specification from which this ETS has been derived was originally based on CEPT documentation, hence the presentation of this draft ETS may not be entirely in accordance with the ETSI/PNE rules.

Reference is made within this ETS to GSM Technical Specifications (GSM-TS) (note).

Reference is also made within this ETS to GSM 0x.xx. series. The specifications in the series can be identified, with their full title, within the normative reference Clause of this ETS by the first two digits of their GSM reference number e.g. GSM 09.xx series, refers to GSM 09.01, GSM 09.02, etc.

NOTE: TC-SMG has produced documents which give the technical specifications for the implementation of the European digital cellular telecommunications system. Historically, these documents have been identified as GSM Technical Specifications (GSM-TSs). These TSs may have subsequently become I-ETSs (Phase 1), or ETSs (Phase 2), whilst others may become ETSI Technical Reports (ETRs). GSM-TSs are, for editorial reasons, still referred to in current GSM ETSs.

Transposition dates	
Date of adoption of this ETS:	30 April 1996
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1 Scope

This European Telecommunication Standard (ETS) is based on the principles of terminal adaptor functions presented in the CCITT I-series of recommendations (I.460 - I.463) [32].

The GSM PLMN supports a wide range of voice and non-voice services in the same network. In order to enable non-voice traffic in the GSM PLMN there is a need to connect various kinds of terminal equipments to the Mobile Termination (MT). The target of this Specification is to outline the functions needed for the terminal adaptation.

In the GSM 02.02 [2] the bearer services are described. The general network configuration is described in GSM 03.02 [4] and the GSM PLMN access reference configuration is defined in GSM 04.02 [6]. The various connection types used in the GSM PLMN are presented in GSM 03.10 [5]. Terminology used in this Specification is presented in GSM 01.04 [1]. For support of data services between GSM PLMN and other networks see GSM 09-series of Specifications.

2 Normative references

This ETS 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 draft ETS only when incorporated in it by amendment or revision. For undated references, the latest edition of the publication referred to applies.

[1]   GSM 01.04 (ETR 100): "European digital cellular telecommunication system (Phase 2); Abbreviations and acronyms".

[2]   GSM 02.02 (ETS 300 501): "European digital cellular telecommunication system (Phase 2); Bearer Services (BS) supported by a GSM Public Land Mobile Network (PLMN)".

[3]   GSM 02.03 (ETS 300 502): "European digital cellular telecommunication system (Phase 2); Teleservices supported by a GSM Public Land Mobile Network (PLMN)".

[4]   GSM 03.02 (ETS 300 522): "European digital cellular telecommunication system (Phase 2); Network architecture".

[5]   GSM 03.10 (ETS 300 528): "European digital cellular telecommunication system (Phase 2); GSM Public Land Mobile Network (PLMN) connection types".

[6]   GSM 04.02 (ETS 300 551): "European digital cellular telecommunication system (Phase 2); GSM Public Land Mobile Network (PLMN) access reference configuration".

[7]   GSM 04.08 (ETS 300 557): "European digital cellular telecommunication system (Phase 2); Mobile radio interface layer 3 specification".

[8]   GSM 04.21 (ETS 300 562): "European digital cellular telecommunication system (Phase 2); Rate adaption on the Mobile Station - Base Station System (MS - BSS) interface".

[9]   GSM 04.22 (ETS 300 563): "European digital cellular telecommunication system (Phase 2); Radio Link Protocol (RLP) for data and telematic services on the Mobile Station - Base Station System (MS - BSS) interface and the Base Station System - Mobile-services Switching Centre (BSS - MSC) interface".

[10]   GSM 05.05 (ETS 300 577): "European digital cellular telecommunication system
                            (Phase 2); Radio transmission and reception".

[11]   GSM 07.02 (ETS 300 583): "European digital cellular telecommunication system
                            (Phase 2); Terminal Adaptation Functions (TAF) for services using asynchronous
                            bearer capabilities".

[12]   GSM 07.03 (ETS 300 584): "European digital cellular telecommunication system
                            (Phase 2); Terminal Adaptation Functions (TAF) for services using synchronous
                            bearer capabilities".

[13]   GSM 07.05 (ETS 300 585): "European digital cellular telecommunication system
                            (Phase 2); Use of Data Terminal Equipment - Data Circuit terminating Equipment
                            (DTE - DCE) interface for Short Message Service (SMS) and Cell Broadcast
                            Service (CBS)".

[14]   GSM 09.01 (ETR 109): "European digital cellular telecommunication system
                            (Phase 2); General network interworking scenarios".

[15]   GSM 09.02 (ETS 300 599): "European digital cellular telecommunication system
                            (Phase 2); Mobile Application Part (MAP) specification".

[16]   GSM 09.03 (ETS 300 600): "European digital cellular telecommunication system
                            (Phase 2); Signalling requirements on interworking between the Integrated
                            Services Digital Network (ISDN) or Public Switched Telephone Network (PSTN)
                            and the Public Land Mobile Network (PLMN)".

[17]   GSM 09.04 (ETS 300 601): "European digital cellular telecommunication system
                            (Phase 2); Interworking between the Public Land Mobile Network (PLMN) and
                            the Circuit Switched Public Data Network (CSPDN)".

[18]   GSM 09.05 (ETS 300 602): "European digital cellular telecommunication system
                            (Phase 2); Interworking between the Public Land Mobile Network (PLMN) and
                            the Packet Switched Public Data Network (PSPDN) for Packet
                            Assembly/Disassembly (PAD) facility access".

[19]   GSM 09.06 (ETS 300 603): "European digital cellular telecommunication system
                            (Phase 2); Interworking between a Public Land Mobile Network (PLMN) and a
                            Packet Switched Public Data Network/Integrated Services Digital Network
                            (PSPDN/ISDN) for the support of packet switched data transmission services".

[20]   GSM 09.07 (ETS 300 604): "European digital cellular telecommunication system
                            (Phase 2); General requirements on interworking between the Public Land
                            Mobile Network (PLMN) and the Integrated Services Digital Network (ISDN) or
                            Public Switched Telephone Network (PSTN)".

[21]   GSM 09.08 (ETR 110): "European digital cellular telecommunication system
                            (Phase 2); Application of the Base Station System management Application Part
                            (BSSMAP) on the E-interface".

[22]   GSM 09.10 (ETS 300 605): "European digital cellular telecommunication system
                            (Phase 2); Information element mapping between Mobile Station - Base Station
                            System and BSS - Mobile-services Switching Centre (MS - BSS - MSC)
                            Signalling procedures and the Mobile Application Part (MAP)".

[23]   GSM 09.11 (ETS 300 606): "European digital cellular telecommunication system
                            (Phase 2); Signalling interworking for supplementary services".

[24]   GSM 09.90 (ETR 111): "European digital cellular telecommunication system (Phase 2); Interworking between Phase 1 infrastructure and Phase 2 Mobile Stations (MS)".

[25]   CCITT Series V Recommendations: "Data communication over the Telephone network".

[26]   CCITT Series X Recommendations: "Data communication networks".

[27]   CCITT Recommendation X.25 "Interface between data terminal equipment (DTE) and data circuit - terminating equipment (DCE) for terminals operating in the packet mode and connected to public data networks by dedicated circuit".

[28]   CCITT Recommendation X.150: "Data Communication Networks:Transmission, Signalling and Switching, Network Aspects, Maintenance and Administrative Arrangements".

[29]   CCITT Recommendation V.25bis: "Automatic Calling and/or Answering Equipment on the General Switched Telephone Network (GSTN) using the 100-Series Interchange Circuits".

[30]   CCITT Recommendation V.54: "Loop Test Devices for Modems".

[31]   CCITT Recommendation V.110: "Support of data terminal equipments (DTEs) with V-Series interfaces by an integrated services digital network".

[32]   CCITT Recommendation I.460-I.464: "ISDN Overall Network Aspects and Functions, User Network Interfaces".

[33]   ETS 300 102-1: "Integrated Services Digital Network (ISDN); User-network interface layer 3 specifications for basic call control".

[34]   ETR 018: "Integrated Services Digital Network (ISDN), Application of the BC-,HLC-,LLC-Information elements by terminals supporting ISDN services".

[35]   ISO/IEC 6429: "Information technology - Control functions for coded character sets".

3   Definitions and abbreviations

In addition to those below, abbreviations used in this ETS are listed in GSM 01.04 [1].

```
CALL PROC          CALL PROCEEDING
CALL CONF          CALL CONFIRMED
CONNACK            CONNECT ACKNOWLEDGEMENT
```

4 Access reference configuration

Figure 1 presents the reference configuration for access to a GSM PLMN (see GSM 04.02).

```
                             MS
        :<------------------------------------------------->:
        :                                                    :
        :                                    +--------+      :     +----------+
        :                                    |  MT0   |------+-----| BSS/MSC  |
        :                                    +--------+      :     +----------+
        :                                                    :
        :                     +--------+     +--------+      :     +----------+
        :                     |  TE1   |--+--|  MT1   |------+-----| BSS/MSC  |
        :                     +--------+  :  +--------+      :     +----------+
        :                                 :                  :
 +--------+     +--------+     +--------+  :  +--------+      :     +----------+
 |  TE2   |--+--|   TA   |-----|  MT1   |------| BSS/MSC  |
 +--------+  :  +--------+     +--------+  :  +--------+      :     +----------+
             :                            :                  :
 +--------+  :                            :  +--------+      :     +----------+
 |  TE2   |--+---------------------------+---|  MT2   |------+-----| BSS/MSC  |
 +--------+  :                            :  +--------+      :     +----------+
             :                            :                  :
             :                            :                  :
             R                            S                  Um
```
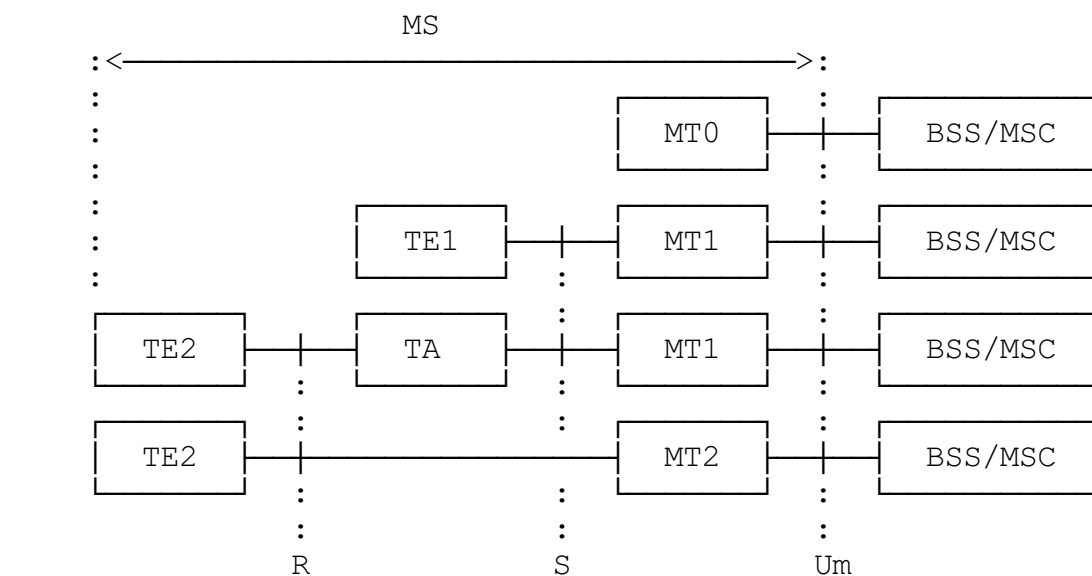
—┼— = reference point

TE1 = ISDN terminal
TE2 = V- or X-type terminal
TA = Terminal Adaptor
BSS = Base Station System
MSC = Mobile Switching Centre

Figure 1: GSM PLMN Access Reference Configuration

Within the scope of this Specification the Mobile Termination MT0 means a fully integrated MS including data terminal and its adaptation functions. MT1 includes ISDN terminal adaptation functions and MT2 includes CCITT V- or X-series terminal adaptation functions among other MT functions.

5 Functions to support data services

The main functions of the MT to support data services are:

- functions to ensure conformity of terminal service requests to network capability
- physical connection of the reference points R and S
- flow control of signalling and mapping of user signalling to/from GSM PLMN access signalling
- rate adaptation of user data (see GSM 04.21)
- flow control of non-transparent user data and mapping of flow control for asynchronous data services
- support of data integrity between the MS and the interworking function in the GSM PLMN
- end-to-end synchronization between terminals
- filtering of status information
- functions to support non-transparent bearer services e.g. termination of the Radio Link Protocol (RLP) and the Layer 2 Relay function (L2R) (where applicable)
- terminal compatibility checking
- optional support of local test loops

In addition, functions to support autocalling and auto-answering are optionally specified in accordance with CCITT Rec. V.25 bis (although the use of other autocalling/auto-answering procedures are not prohibited provided that mapping in a functionally equivalent way to GSM 04.08 call control is also provided).

Other functional entities can be envisaged apart from the TAF. One of the physical interface to all these functions is the DTE/DCE interface to the MT. Normally, this DTE/DCE interface is associated with the TAF, if available. Therefore the access to any of these other functional entities, if implemented, via the DCE/DTE interface must be triggered by appropriate command sequences which are described in the applicable specifications (although the use of other procedures is not prohibited provided that mapping in a functionally equivalent way is also provided). These command sequences can be issued by the DTE only when the MT is in the appropriate command status and there is no data connection pending. They are interpreted by an MT internal control function and result in an association of the DTE/DCE interface with the addressed function, if available.
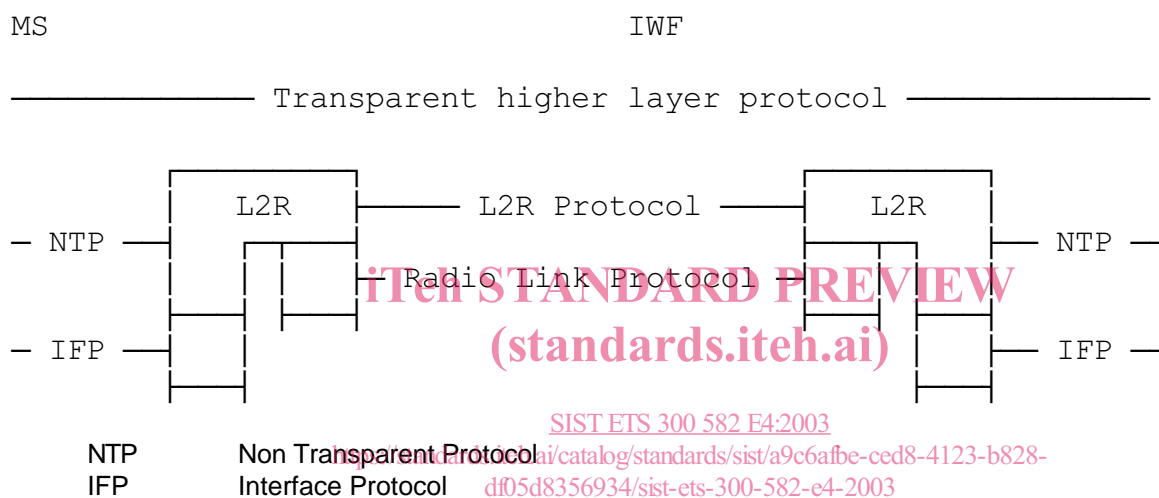
6 Support of non transparent Bearer Services

In order to support non transparent bearer services a Layer 2 Relay (L2R) function is included in the mobile termination. The details of the particular L2R function for the different non transparent bearer services are contained in the appropriate GSM 07-series Specification. This section describes the general aspects of the L2R function.

The Layer 2 Relay (L2R) function provides for the reliable transportation of known, i.e. non transparent, user protocols across the radio interface of a GSM PLMN. The L2R functions are located in the Mobile Termination (MT) and the Interworking Function (IWF) associated with a Mobile Switching Centre (MSC). The L2R uses the services provided by the Radio Link Protocol (RLP) to transport the non transparent protocol information between the MS and the IWF.
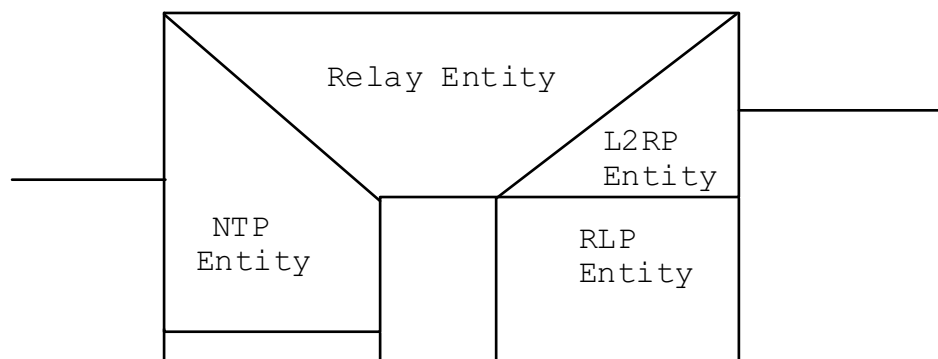
6.1 Functions of the Layer 2 Relay

The complete protocol reference models for data and telematic services are described in GSM 03.10. The subset of those protocol reference models relating to the L2R function is reproduced in Figure 2.

```
MS                                         IWF


——————————————————— Transparent higher layer protocol ———————————————


        ┌─────────┐                    ┌─────────┐
        │   L2R   │ ———— L2R Protocol ———— │   L2R   │
— NTP — │         │                    │         │ — NTP —
        │         │ — Radio Link Protocol — │         │
        │         │                    │         │
— IFP — │         │                    │         │ — IFP —
        └─────────┘                    └─────────┘

    NTP        Non Transparent Protocol
    IFP        Interface Protocol
```

Figure 2   Protocol model

The Non Transparent Protocol (NTP) will normally be a layer 2 protocol for OSI conformant protocols or an equivalent in the case of non OSI protocols. The Interface Protocol (IFP) will normally be a layer 1 protocol for OSI conformant systems or equivalent for non OSI systems.

The L2R can be considered to consist of 3 sub-functions, see figure 3.

```
        ┌──────────────────────────────────────┐
        │             Relay Entity              │
        │                         ┌─────────────┤
        │                         │    L2RP     │
        │                         │    Entity   │
        ├──────────────┬──────────┼─────────────┤
        │    NTP       │          │    RLP      │
        │    Entity    │          │    Entity   │
        └──────────────┴──────────┴─────────────┘
```

Figure 3   sub-functions of L2R

The 3 sub-functions are:
- A Non Transparent Protocol Entity
- A L2R Protocol Entity
- A Relay Entity

The NTP-entity interfaces the L2R to the IFP-entity and provides an interface to the particular NTP.

The L2RP-entity interfaces the L2R to the RLP-entity and provides an interface to the appropriate L2R protocol.

The Relay-entity provides the mapping between the NTP-entity and the L2R-entity.

It should be noted that the inter-layer interfaces within the MS and the IWF and within the L2R will not be specified by GSM, any description given is for explanatory purposes only and is not intended to indicate a method of implementation. Therefore, the specification of the L2R is in terms of the peer-peer protocols. Generally, the non transparent and interface protocols will be specified elsewhere, e.g. CCITT Recommendation X.25 Layer 2 and 1. Thus the main specification for the L2R will consist of the L2R peer-peer protocols.

6.2   Radio Link Services Used

The L2R function uses services defined in GSM Specification 04.22 (Radio Link Protocol).

6.3   Flow Control - General Description

A flow control active condition can take place under a number of circumstances:
- End to end flow control (DTE to DTE matter)
- Backpressure (buffers filling)
- Receive not ready (RLP condition)

It is possible that there will be an interaction between flow control active and inactive conditions in each circumstance.

6.3.1   End to End Flow Control

A DTE may wish to send a flow control active condition to another DTE.

Provisions exists in the L2R entity to transfer a flow control active condition (sent by its associated DTE) to the other L2R entity as soon as possible. This mechanism in the L2R entities allows such a flow control condition to be put ahead of any queuing which exists in the L2R entities.

Such a mechanism avoids build up of data in buffers which can be undesirable.

The L2R entity, receiving a flow control active condition from its associated DTE, stops sending data to that associated DTE immediately.

6.3.2   Back Pressure

The L2R and RLP entities have buffers which may become full to a predetermined threshold for a number of reasons, e.g.severe radio fading, failure or slowness of DTE to react to end to end flow control, certain RNR conditions. When this predetermined threshold is reached, a flow control active condition is sent to the associated DTE which is then prevented from sending any data, subsequently, the flow control inactive condition is sent to the associated DTE when the L2R or RLP entities have indicated that there is sufficient free capacity in their buffers for data flow from the associated DTE to proceed.

The corresponding peer-layer procedure to assess the respective buffer conditions are a layer management matter and are not dealt with here. It is also considered an implementation matter to ensure that such procedure do not result in loss of data or considerable reduction in throughput.