



SLOVENSKI STANDARD

SIST EN 301 344 V7.3.1:2005

01-februar-2005

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Digital cellular telecommunications system (Phase 2+) (GSM); General Packet Radio Service (GPRS); Service description; Stage 2 (GSM 03.60 version 7.3.1 Release 1998)

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Ta slovenski standard je istoveten z: [EN 301 344 Version 7.3.1](https://standards.iteh.ai/catalog/standards/sist/e114c5f4-7e27-4bc8-8c7e-a58779a12663/sist-en-301-344-v7-3-1-2005)

ICS:

33.070.01 Mobilni servisi na splošno Mobile services in general

SIST EN 301 344 V7.3.1:2005 en

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ETSI EN 301 344 V7.3.1 (2000-07)

European Standard (Telecommunications series)

**Digital cellular telecommunications system (Phase 2+);
General Packet Radio Service (GPRS);
Service description;
Stage 2
(GSM 03.60 version 7.3.1 Release 1998)**

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Reference

REN/SMG-030360Q7R1

Keywords

Digital cellular telecommunications system,
Global System for Mobile communications
(GSM), GPRS

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Sous-Préfecture de Grasse (06) N° 7803/88

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Foreword

This European Standard (Telecommunications series) has been produced by the Special Mobile Group (SMG).

The present document defines the stage-2 service description for a General Packet Radio Service (GPRS) within the digital cellular telecommunications system (Phase 2+).

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

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National transposition dates

| | |
|--|-------------------|
| Date of adoption of this EN: | 16 June 2000 |
| Date of latest announcement of this EN (doa): | 30 September 2000 |
| Date of latest publication of new National Standard or endorsement of this EN (dop/e): | 31 March 2001 |
| Date of withdrawal of any conflicting National Standard (dow): | 31 March 2001 |

1 Scope

The present document defines the stage-2 service description for a General Packet Radio Service (GPRS) on GSM. CCITT I.130 [28] describes a three-stage method for characterisation of telecommunication services, and CCITT Q.65 [30] defines stage 2 of the method.

This version of the stage-2 service description covers the first phase of GPRS, and does not meet all the services and functionality described in GSM 02.60 [3].

The present document does not cover the lower layers of the GPRS GSM radio interface. GSM 03.64 [9] contains an overall description of the radio interface.

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.
- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.
- For this Release 1998 document, references to GSM documents are for Release 1998 versions (version 7.x.y).

- [1] GSM 01.04: "Digital cellular telecommunications system (Phase 2+); Abbreviations and acronyms".
- [2] GSM 01.61: "Digital cellular telecommunications system (Phase 2+); GPRS ciphering algorithm requirements".
- [3] GSM 02.60: "Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); Service description; Stage 1".
- [4] GSM 03.03: "Digital cellular telecommunications system (Phase 2+); Numbering, addressing and identification".
- [5] GSM 03.07: "Digital cellular telecommunications system (Phase 2+); Restoration procedures".
- [6] GSM 03.20: "Digital cellular telecommunications system (Phase 2+); Security related network functions".
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- [9] GSM 03.64: "Digital cellular telecommunications system (Phase 2+); Overall description of the General Packet Radio Service (GPRS) Radio interface; Stage 2".
- [10] GSM 04.07: "Digital cellular telecommunications system (Phase 2+); Mobile radio interface signalling layer 3; General aspects".
- [11] GSM 04.08: "Digital cellular telecommunications system (Phase 2+); Mobile radio interface layer 3 specification".

- [12] GSM 04.60: "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".
- [13] GSM 04.64: "Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); Mobile Station – Serving GPRS Support Node (MS - SGSN) Logical Link Control (LLC) layer specification".
- [14] GSM 04.65: "Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); Mobile Station (MS) – Serving GPRS Support Node (SGSN); Subnetwork Dependent Convergence Protocol (SNDCP)".
- [15] GSM 07.60: "Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); Mobile Station (MS) supporting GPRS".
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- [17] GSM 08.14: "Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); Base Station System (BSS) - Serving GPRS Support Node (SGSN) interface; Gb interface layer 1".
- [18] GSM 08.16: "Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); Base Station System (BSS) - Serving GPRS Support Node (SGSN) interface; Network Service".
- [19] GSM 08.18: "Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); Base Station System (BSS) - Serving GPRS Support Node (SGSN); BSS GPRS Protocol (BSSGP)".
- [20] GSM 08.60: "Digital cellular telecommunications system (Phase 2+); Inband control of remote transcoders and rate adaptors for Enhanced Full Rate (EFR) and full rate traffic channels."
- [21] GSM 09.02: "Digital cellular telecommunications system (Phase 2+); Mobile Application Part (MAP) specification".
- [22] GSM 09.16: "Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); Serving GPRS Support Node (SGSN) - Visitors Location Register (VLR); Gs interface network service specification".
- [23] GSM 09.18: "Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); Serving GPRS Support Node (SGSN) - Visitors Location Register (VLR); Gs interface layer 3 specification".
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- [25] GSM 09.61: "Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); Interworking between the Public Land Mobile Network (PLMN) supporting GPRS and Packet Data Networks (PDN)".
- [26] GSM 11.11: "Digital cellular telecommunications system (Phase 2+); Specification of the Subscriber Identity Module - Mobile Equipment (SIM - ME) interface".
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- [31] CCITT Recommendation V.42 bis: "Data communication over the telephone network – Data compression procedures for data circuit-terminating equipment (DCE) using error correction procedures".
- [32] CCITT Recommendation X.3: "Packet assembly disassembly facility (PAD) in a public data network".
- [33] 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".
- [34] CCITT Recommendation X.28: "DTE / DCE interface for a start-stop mode data terminal equipment accessing the packet assembly / disassembly facility (PAD) in a public data network situated in the same country".
- [35] CCITT Recommendation X.29: "Procedures for the exchange of control information and user data between a packet assembly / disassembly (PAD) facility and a packet mode DTE or another PAD".
- [36] CCITT Recommendation X.75: "Packet-switched signalling system between public networks providing data transmission services".
- [37] CCITT Recommendation X.121: "International Numbering Plan for Public Data Networks".
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3 Definitions, abbreviations and Symbols

3.1 Definitions

Refer to GSM 02.60.

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply. Additional applicable abbreviations can be found in GSM 01.04 [1].

| | |
|--------|--|
| AA | Anonymous Access |
| APN | Access Point Name |
| ATM | Asynchronous Transfer Mode |
| BG | Border Gateway |
| BSSAP+ | Base Station System Application Part + |
| BSSGP | Base Station System GPRS Protocol |
| BVCI | BSSGP Virtual Connection Identifier |
| CCU | Channel Codec Unit |
| CDR | Call Detail Record |
| CGF | Charging Gateway Functionality |
| CGI | Cell Global Identification |

| | |
|-----------|---|
| CS | Circuit Switched |
| DNS | Domain Name System |
| GGSN | Gateway GPRS Support Node |
| GMM/SM | GPRS Mobility Management and Session Management |
| GSN | GPRS Support Node |
| GTP | GPRS Tunnelling Protocol |
| ICMP | Internet Control Message Protocol |
| IETF | Internet Engineering Task Force |
| IHOSS | Internet-Hosted Octet Stream Service |
| IP | Internet Protocol |
| IPv4 | Internet Protocol version 4 |
| IPv6 | Internet Protocol version 6 |
| IPX | Internet Packet eXchange |
| ISP | Internet Service Provider |
| L2TP | Layer-2 Tunnelling Protocol |
| LL-PDU | LLC PDU |
| LLC | Logical Link Control |
| MAC | Medium Access Control |
| MNRF | Mobile station Not Reachable Flag |
| MNRG | Mobile station Not Reachable for GPRS flag |
| MNRR | Mobile station Not Reachable Reason |
| MTP2 | Message Transfer Part layer 2 |
| MTP3 | Message Transfer Part layer 3 |
| NGAF | Non-GPRS Alert Flag |
| NS | Network Service |
| NSAPI | Network layer Service Access Point Identifier |
| NSS | Network SubSystem |
| OSP | Octet Stream Protocol |
| P-TMSI | Packet TMSI |
| PCU | Packet Control Unit |
| PDCH | Packet Data CHannel |
| PDN | Packet Data Network |
| PDP | Packet Data Protocol, e.g. IP or X.25 [33] |
| PDU | Protocol Data Unit |
| PPF | Paging Proceed Flag |
| PPP | Point-to-Point Protocol |
| PVC | Permanent Virtual Circuit |
| RA | Routeing Area |
| RAC | Routeing Area Code |
| RAI | Routeing Area Identity |
| RLC | Radio Link Control |
| SGSN | Serving GPRS Support Node |
| SM | Short Message |
| SM-SC | Short Message service Service Centre |
| SMS-GMSC | Short Message Service Gateway MSC |
| SMS-IWMSC | Short Message Service Interworking MSC |
| SN-PDU | SNDCP PDU |
| SNDC | SubNetwork Dependent Convergence |
| SNDCP | SubNetwork Dependent Convergence Protocol |
| TCAP | Transaction Capabilities Application Part |
| TCP | Transmission Control Protocol |
| TID | Tunnel Identifier |
| TLLI | Temporary Logical Link Identity |
| TRAU | Transcoder and Rate Adaptor Unit |
| UDP | User Datagram Protocol |

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3.3 Symbols

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

| | |
|--------|--|
| Ga | Charging data collection interface between a CDR transmitting unit (e.g., an SGSN or a GGSN) and a CDR receiving functionality (a CGF). |
| Gb | Interface between an SGSN and a BSS. |
| Gc | Interface between a GGSN and an HLR. |
| Gd | Interface between a SMS-GMSC and an SGSN, and between a SMS-IW MSC and an SGSN. |
| Gf | Interface between an SGSN and an EIR. |
| Gi | Reference point between GPRS and an external packet data network. |
| Gn | Interface between two GSNs within the same PLMN. |
| Gp | Interface between two GSNs in different PLMNs. The Gp interface allows support of GPRS network services across areas served by the co-operating GPRS PLMNs. |
| Gr | Interface between an SGSN and an HLR. |
| Gs | Interface between an SGSN and an MSC/VLR. |
| kbit/s | Kilobits per second. |
| R | Reference point between a non-ISDN compatible TE and MT. Typically this reference point supports a standard serial interface. |
| Um | Interface between the mobile station (MS) and the GPRS fixed network part. The Um interface is the GPRS network interface for providing packet data services over the radio to the MS. The MT part of the MS is used to access the GPRS services through this interface. |

4 Main Concepts

GPRS uses a packet-mode technique to transfer high-speed and low-speed data and signalling in an efficient manner. GPRS optimises the use of network and radio resources. Strict separation between the radio subsystem and network subsystem is maintained, allowing the network subsystem to be reused with other radio access technologies. GPRS does not mandate changes to an installed MSC base.

New GPRS radio channels are defined, and the allocation of these channels is flexible: from 1 to 8 radio interface timeslots can be allocated per TDMA frame, timeslots are shared by the active users, and up and downlink are allocated separately. The radio interface resources can be shared dynamically between speech and data services as a function of service load and operator preference. Various radio channel coding schemes are specified to allow bitrates from 9 to more than 150 kbit/s per user.

Applications based on standard data protocols are supported, and interworking is defined with IP networks and X.25 networks. GPRS allows SMS transfer over GPRS radio channels.

GPRS is designed to support from intermittent and bursty data transfers through to occasional transmission of large volumes of data. Several quality of service profiles are supported. GPRS is designed for fast reservation to begin transmission of packets, typically 0,5 to 1 second. Charging should typically be based on the amount of data transferred.

Three GPRS MS modes of operation are supported: An MS in class-A mode of operation operates GPRS and other GSM services simultaneously. An MS in class-B mode of operation monitors control channels for GPRS and other GSM services simultaneously, but can only operate one set of services at one time. An MS in class-C mode of operation exclusively operates GPRS services.

GPRS introduces two new network nodes in the GSM PLMN: The Serving GPRS Support Node (SGSN), which is at the same hierarchical level as the MSC, keeps track of the individual MSs' location and performs security functions and access control. The SGSN is connected to the base station system with Frame Relay. The Gateway GSN (GGSN) provides interworking with external packet-switched networks, and is connected with SGSNs via an IP-based GPRS backbone network. The HLR is enhanced with GPRS subscriber information, and the SMS-GMSCs and SMS-IW MSCs are upgraded to support SMS transmission via the SGSN. Optionally, the MSC/VLR can be enhanced for more-efficient co-ordination of GPRS and non-GPRS services and functionality: e.g., paging for circuit-switched calls that can be performed more efficiently via the SGSN, and combined GPRS and non-GPRS location updates.

GPRS security functionality is equivalent to the existing GSM security. The SGSN performs authentication and cipher setting procedures based on the same algorithms, keys, and criteria as in existing GSM. GPRS uses a ciphering