3GPP TSG CN Plenary Meeting #15 **NP-020040**
6th – 8th March 2002. Jeju, Korea.

Source: **TSG CN WG 1**

Title: **CRs to Rel-4 (with mirror CR) on Work Item TEI4 towards 24.011, 44.064 and 44.065**

Agenda item: **8.12**

Document for: **APPROVAL**

Introduction:

This document contains **4** CRs on **Rel-4 (with mirror CR) to** Work Item **"TEI4"**, that have been agreed by **TSG CN WG1**, and are forwarded to TSG CN Plenary meeting #15 for approval.

Spec	CR	Rev	Phase	Subject	Cat	Version-Current	Version-New	Doc-2nd-Level
24.011	023		Rel-4	Fixing references to 04.08 and to other GSM TS/TRs	F	4.0.0	4.1.0	N1-020266
44.064	005		Rel-4	Correction of references	F	4.2.0	4.3.0	N1-020276
44.064	006		Rel-5	Correction of references	A	5.0.0	5.1.0	N1-020277
44.065	002		Rel-4	Correction of references	F	4.1.0	4.2.0	N1-020278

3GPP TSG-CN1 Meeting #22

Tdoc N1-020266

Sophia Antipolis, France, 28. January - 1. February 2002

CR-Form-v5

CHANGE REQUEST

⌘ **24.011** **CR** **023** ⌘ **rev** **-** ⌘ Current version: **4.0.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM [ ] ME/UE [X] Radio Access Network [ ] Core Network [X]

Title:	⌘	Fixing references to 04.08 and to other GSM TS/TRs
Source:	⌘	NTT Comware
Work item code:	⌘	TEI4
Date:	⌘	18-Jan-02
Category:	⌘	**F**
Release:	⌘	REL-4

Use one of the following categories:
- ***F*** *(correction)*
- ***A*** *(corresponds to a correction in an earlier release)*
- ***B*** *(addition of feature),*
- ***C*** *(functional modification of feature)*
- ***D*** *(editorial modification)*

Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:

2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
REL-4	*(Release 4)*
REL-5	*(Release 5)*

Reason for change: ⌘

As CN#13 requested, all references to 04.08 to point to 24.008 or 44.018 as appropriate should be corrected. In addition to this, a general Release 4 problem of specification references not being updated to reflect the 3GPP document numbering scheme should be fixed.
Investigating 24.011v4.0.0, it includes only one reference to 04.08 that should be replaced to a 24.008 reference. Also references to 01.04, 02.17, 04.06, 04.18 and 04.64 were found and they should be corrected.

Summary of change: ⌘

- A reference to 04.08 is corrected to one to 24.011.
- References to 01.04 are just deleted because 21.905 that would be the substitution for 01.04 was already referred.
- References to 02.17, 04.06, 04.18 and 04.64 were corrected to 42.017, 44.006, 44.018 and 44.064 respectively.
- Reference list in clause “References” is updated to stand for TSs referred in the main body but not listed in clause “References”.

Consequences if not approved: ⌘

Wrong references would make the specification inconsistent.

Clauses affected: ⌘ 1.1; 1.2; 2; 2.3; 2.4; 8.2.5.1

Other specs affected: ⌘
- [ ] Other core specifications ⌘
- [ ] Test specifications
- [ ] O&M Specifications

Other comments: ⌘

How to create CRs using this form:

Comprehensive information and tips about how to create CRs can be found at: http://www.3gpp.org/3G_Specs/CRs.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

1.1 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 TS 01.04: "Digital cellular telecommunications system (Phase 2+); Abbreviations and acronyms".~~[void]

[1a] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 23.040: "Technical realization of the Short Message Service (SMS) Point-to-Point (PP)".

[3a] 3GPP TS 23.060: "General Packet Radio Service (GPRS); Service description; Stage 2".

[3] 3GPP TS ~~04.06~~44.006: "~~Digital cellular telecommunications system (Phase 2+);~~ Mobile Station - Base Station System (MS - BSS) interface; Data Link (DL) layer specification".

[4] 3GPP TS 24.007: "Mobile radio interface signalling layer 3; General aspects".

[5] 3GPP TS 24.008: "Mobile radio interface layer 3 specification".

[5a] 3GPP TS 25.331: "Radio Resource Control (RRC); Protocol Specification".

[5b] 3GPP TS 33.102: "3G Security; Security Architecture".

[5c] 3GPP TS 42.017: "Subscriber Identity Modules (SIM); Functional characteristics".

[6a] 3GPP TS ~~04.64~~44.064: "~~Digital cellular telecommunications system (Phase 2+);~~ General Packet Radio Service (GPRS); Logical Link Control (LLC) layer specification ".

[6] ISO 7498: "Information processing systems - Open Systems Interconnection - Basic Reference Model".

[7] 3GPP TS ~~04.18~~44.018: "~~Digital cellular telecommunications system (Phase 2+);~~ Mobile radio interface layer 3 specification; Radio Resource Control Protocol".

1.2 Abbreviations

Abbreviations used in the present document are listed in ~~3GPP TS 01.04 and~~ 3GPP TR 21.905, except below:

RR connection: A RR connection is a dedicated physical circuit switched domain connection used by the two RR or RRC peer entities to support the upper layers' exchange of information flows.

PS signalling connection: is a peer to peer UMTS connection between MS and CN packet domain node.

GPRS: Packet Services for GSM and UMTS system.

The label **(**A/Gb mode **only):** indicates this section or paragraph applies only to GSM system. For multi system case this is determined by the current serving radio access network.

The label **(Iu mode only):** indicates this section or paragraph applies only to UMTS system. For multi system case this is determined by the current serving radio access network.

In A/Gb mode,...: Indicates this paragraph applies only to GSM System. For multi system case this is determined by the current serving radio access network.

In Iu mode,...: Indicates this paragraph applies only to UMTS System. For multi system case this is determined by the current serving radio access network.

SIM: Subscriber Identity Module (see 3GPP TS ~~02.17~~42.017). This specification makes no distinction between SIM and USIM.

MS: Mobile Station. This specification makes no distinction between MS and UE.

2 Overview of Short Message Service (SMS) support

The purpose of the Short Message Service is to provide the means to transfer messages between a GSM PLMN Mobile Station (MS) and a Short Message Entity via a Service Centre, as described in 3GPP TS 23.040. The terms "MO" - Mobile Originating - and "MT" - Mobile Terminating - are used to indicate the direction in which the short message is sent.

The present document describes the procedures necessary to support the Short Message Service between the MS and the MSC or SGSN and vice versa, as described in 3GPP TS 23.040.

The procedures are based on services provided by the Mobility Management sublayer as described in 3GPP TS 24.007/24.008 for CS in A/Gb mode and CS/PS services in Iu mode and the Logical Link Control layer described in 3GPP TS ~~04.64~~44.064 for GPRS services.

***** Next Modification *****

2.3 Layer 2 SAPI 3 handling for circuit switched in A/Gb mode

General rule:

The Radio Resource Management (RR reference 3GPP TS ~~04.18~~44.018) in the Mobile Station and on the network side (i.e. in the BSC) shall establish the acknowledged mode of operation on SAPI 3 whenever needed, i.e. when a message requiring SAPI 3 transfer shall be transmitted.

RR shall control the layer 2 also for SAPI 3, and keep knowledge of the mode.

The network side may initiate release of the acknowledged mode for SAPI 3 either explicitly (by the use of DISC- and UA-frames, see 3GPP TS ~~04.06~~44.006) or indirectly by channel release (see 3GPP TS ~~04.18~~44.018).

This means:

- the Mobile Station side will initiate establishment of SAPI 3 acknowledged mode in the case of mobile originating short message transfer;
- the network side will initiate establishment of SAPI 3 acknowledged mode in the case of mobile terminating short message transfer;
- the network side may choose to keep the channel and the acknowledged mode of operation to facilitate transfer of several short messages for or from the same Mobile Station. The queuing and scheduling function for this should reside in the MSC.

2.4 Layer 2 (LLC) GPRS support (A/Gb mode only)

It shall be possible for a GPRS-attached MS of any class (A, B, C) to send and receive short messages over GPRS radio channels.

GPRS shall use the unacknowledged mode of LLC frame transfer as described in 3GPP TS ~~04.64~~44.064, and shall use SAPI 7 to identify the SMS Logical Link Entity within the LLC layer.

A description of the different GPRS MS classes can be found in 23.060, and a brief overview is given below:-

- Class A/B MSs may be able to send and receive short messages using either the MM sublayer (using SACCH or SDCCH) or the LLC layer (using PDTCH).
- Class C MSs may be able to send and receive short messages using only the LLC layer (using the PDTCH). The capability for GPRS-attached class-C MSs to receive and transmit SMS messages is optional.

The GSMS entity for GPRS class A/B MS is shown in Figure 2.2. The GSMS shall communicate with the MM entity via the GMMSMS-SAP for GPRS Class A/B MO SMS, in order to ascertain which transport service to use.

SMS delivery via GPRS is normally a more radio resource efficient method than SMS delivery via CS in A/Gb mode. The delivery path for MO SMS is selected by the MS.

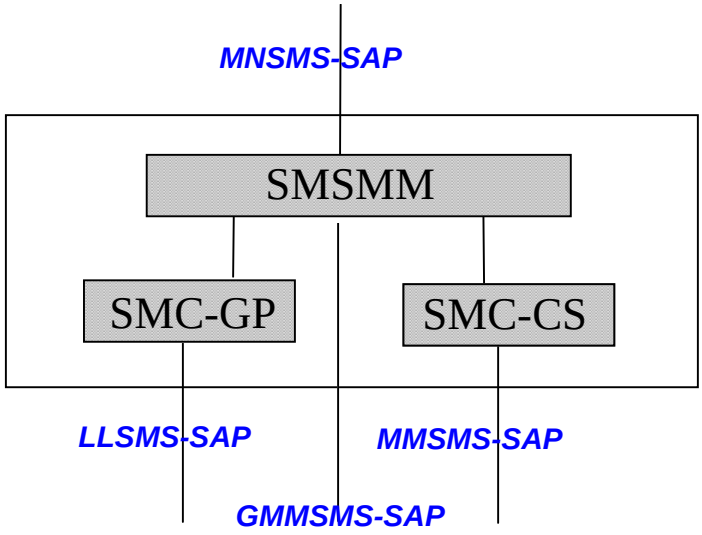

Figure 2.2/3GPP TS 24.011: GSMS entity for GPRS Class A/B MS

***** Next Modification *****

8.2.5 Other required information elements

8.2.5.1 Originator address element

In the case of MT transfer this element contains the originating Service Centre address.

The RP-Originator Address information element is coded as shown in figure 8.5/3GPP TS 24.011.

The RP-Originator Address is a type 4 information element. In the network to mobile station direction the minimum value of the length octet is 2 and the maximum value is 11. In the mobile station to network direction the value of the length octet of the element is set to 0.

8	7	6	5	4	3	2	1	
	RP-Originator Address IEI							octet 1
Length of RP-Originator Address contents								octet 2
1 ext	type of number		Numbering plan identification					octet 3
Number digit 2				Number digit 1				octet 4
Number digit 4				Number digit 3				octet 5
								:
								:

Figure 8.5/3GPP TS 24.011: RP-Originator Address information element

If the RP-Originator Address contains an odd number of digits, bits 5 to 8 of the last octet shall be filled with an end mark coded as "1111".

The contents of octets 3, 4, etc. are the same as those defined for the Called Party BCD Number IE defined in 3GPP TS ~~04.08~~24.008.

***** End *****

3GPP TSG CN WG1 Meeting #22 ***Tdoc N1-020278***
Sophia Antipolis, France, 28 January - 1 February 2002

CR-Form-v3

CHANGE REQUEST

⌘ **44.065** **CR** **002** ⌘ rev ⌘ Current version: **4.1.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☐ Radio Access Network ☐ Core Network ☐

Title:	⌘	Correction of references
Source:	⌘	Motorola
Work item code:	⌘	TEI4
Date:	⌘	2002-01-22
Category:	⌘	**F**
Release:	⌘	Rel-4

Use one of the following categories:
F *(essential correction)*
A *(corresponds to a correction in an earlier release)*
B *(Addition of feature),*
C *(Functional modification of feature)*
D *(Editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:

2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
REL-4	*(Release 4)*
REL-5	*(Release 5)*

Reason for change:	⌘	References need to be updated.
Summary of change:	⌘	The correct references are added throughout the document.
Consequences if not approved:	⌘	

Clauses affected:	⌘			
Other specs affected:	⌘	☐ Other core specifications ☐ Test specifications ☐ O&M Specifications	⌘	
Other comments:	⌘			

FIRST REVISION

1 Scope

The present document provides the description of the Subnetwork Dependent Convergence Protocol (SNDCP) for the General Packet Radio Service (GPRS).

The user of the services provided by SNDCP is a packet data protocol (PDP) at the mobile Station (MS) or the Relay at the Serving GPRS Support Node (SGSN). Additionally, a control entity, e.g., AT command interpreter, may be an SNDCP user. SNDCP uses the services provided by the Logical Link Control (LLC) layer [4] and the Session Management (SM) sub-layer [2].

The main functions of SNDCP are:

- Multiplexing of several PDPs.
- Compression / decompression of user data.
- Compression / decompression of protocol control information.
- Segmentation of a network protocol data unit (N-PDU) into Logical Link Control Protocol Data Units (LL-PDUs) and re-assembly of LL-PDUs into an N-PDU.

3GPP TS ~~04.65~~44.065 is applicable to GPRS MS and SGSN.

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".~~3GPP TS 01.04: "Digital cellular telecommunications system (Phase 2+); Abbreviations and acronyms".~~

[2] 3GPP TS ~~02.60~~22.060: "~~Digital cellular telecommunication system (Phase 2+);~~ General Packet Radio Service (GPRS); Service Description, Stage 1".

[3] 3GPP TS ~~03.60~~23.060: "~~Digital cellular telecommunication system (Phase 2+);~~ General Packet Radio Service (GPRS); Service Description, Stage 2".

[4] 3GPP TS ~~04.07~~24.007: "~~Digital cellular telecommunications system (Phase 2+);~~ Mobile radio interface signalling layer 3; General aspects".

[5] 3GPP TS ~~04.08~~44.018: "~~Digital cellular telecommunications system (Phase 2+),~~ Mobile radio interface layer 3 specification; Radio Resource Control Protocol ".

[5a] 3GPP TS 24.008: "Mobile radio interface layer 3 specification; Core Network Protocols – Stage 3".

[6] 3GPP TS ~~04.64~~44.064: "~~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".

[7] 3GPP TS ~~09.60~~29.060: "~~Digital cellular telecommunications system (Phase 2+),~~ General Packet Radio Service (GPRS); GPRS Tunnelling Protocol (GTP) across the Gn and Gp Interface".

[8] ITU-T, Recommendation V.42 bis: "Data compression procedures for data circuit- terminating equipment (DCE) using error correcting procedures".

[9] RFC-1144, V. Jacobson: "Compressing TCP/IP Headers for Low-Speed Serial Links".

[10] RFC-2507, M. Degermark, B. Nordgren, S. Pink: "IP Header Compression".

[11] ITU-T, Recommendation V.44: “Data Compression Procedures”.

3 Definitions and abbreviations

3.1 Definitions

In addition to abbreviations in 3GPP TS ~~01.04~~ 21.905 [1] and 3GPP TS ~~02.60~~22.060 [2] the following abbreviations apply:

N201 LLC layer parameter (see 3GPP TS ~~04.64~~44.064 for clarity). Defines maximum number of octets in the information field of LL-PDU. Separate values are applicable for I (see N201-I), U and UI (see N201-U) LL-PDUs.

N201-I LLC layer parameter (see 3GPP TS ~~04.64~~44.064 for clarity). Defines maximum number of octets available to a SN-DATA PDU for a specific SAPI.

N201-U LLC layer parameter (see 3GPP TS ~~04.64~~44.064 for clarity). Defines maximum number of octets available to a SN-UNITDATA PDU for a specific SAPI.

N-PDU number A sequence number assigned to N-PDUs per NSAPI.

NSAPI For each SN-PDU the NSAPI is an index to the PDP context of the PDP that is using the services provided by the SNDCP layer.

Receive N-PDU number The value of the N-PDU number expected in the next N-PDU received by an NSAPI using acknowledged peer-to-peer LLC operation.

Recovery state A state for an NSAPI in which duplicated received N-PDUs shall be detected and discarded. The recovery state only applies to NSAPIs using acknowledged peer-to-peer LLC operation.

SAPI SAPI identifies the Service Access Point that the SN-PDU is using at the LLC layer.

Segment number A sequence number assigned to SN-UNITDATA PDUs carrying segments of an N-PDU.

Send N-PDU number The value to be assigned as the N-PDU number to the next N-PDU received from the SNDCP user by an NSAPI using acknowledged peer-to-peer LLC operation.

Send N-PDU number (unacknowledged) The value to be assigned as the N-PDU number to the next N-PDU received from the SNDCP user by an NSAPI using unacknowledged peer-to-peer LLC operation.

SNDCP entity The SNDCP entity handles the service functions provided by the SNDCP layer. The SNDCP entity is temporary logical link identity specific.

SNDCP management entity The SNDCP management entity handles communication with SM sub-layer and controls the operation of the SNDCP entity.

SNDCP user Protocol entity that is using the services provided by the SNDCP layer. PDP entities and

control entities, e.g., AT command interpreter, are the SNDCP users at the MS. Relay entity is the SNDCP user at the SGSN.

SNDCP XID block The collection of SNDCP XID parameters being negotiated. It is transferred by the LL-XID and LL-ESTABLISH primitives between SNDCP and LLC.

Refer to 3GPP TS ~~02.60~~22.060 [2] for further GPRS definitions.

3.2 Abbreviations

In addition to abbreviations in 3GPP TS ~~01.04~~21.905 [1], 3GPP TS ~~02.60~~22.060 [2], and 3GPP TS ~~03.60~~23.060 [3], the following abbreviations apply:

DCOMP	Identifier of the user data compression algorithm used for the N-PDU
F	First segment indicator bit
GMM	GPRS Mobility Management
IP	Internet Protocol
LLC	Logical Link Control
M	More bit used to indicate the last segment of N-PDU
N-PDU	Network Protocol Data Unit
NSAPI	Network Layer Service Access Point Identifier
P	Propose bit
PCOMP	Identifier of the protocol control information compression algorithm used for the N-PDU
PDP	Packet Data Protocol e.g., IPv4 or IPv6
PDU	Protocol Data Unit
PTP	Point to Point
QoS	Quality of Service
SAPI	Service Access Point Identifier
SDU	Service Data Unit
SGSN	Serving GPRS Support Node
SM	Session Management
SNDCP	Subnetwork Dependent Convergence Protocol
SNSM	SNDCP-SM
TCP	Transmission Control Protocol
TLLI	Temporary Logical Link Identifier
X	Spare bit

4 General

The present document describes the functionality of the GPRS SNDCP. The overall GPRS logical architecture is defined in 3GPP TS ~~03.60~~23.060 [3]. Location of the SNDCP in GPRS protocol stack can be seen in Figure 1.

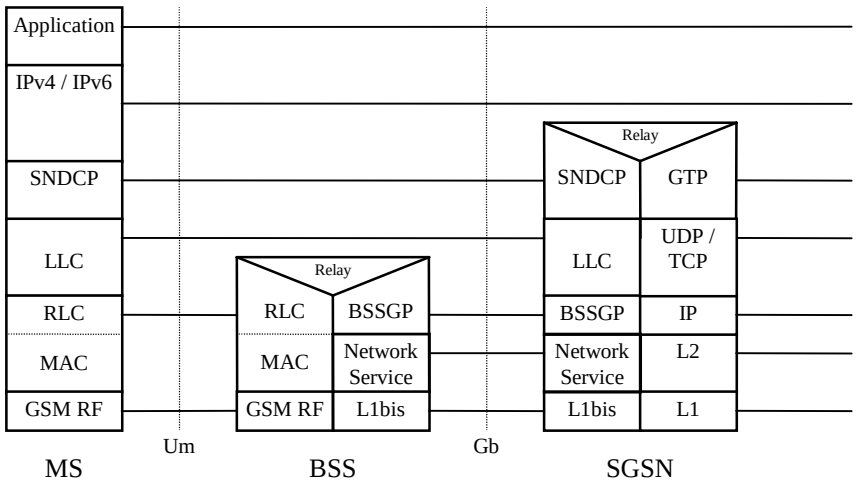

Figure 1: GPRS protocol stack

Network layer protocols are intended to be capable of operating over services derived from a wide variety of subnetworks and data links. GPRS supports several network layer protocols providing protocol transparency for the users of the service. Introduction of new network layer protocols to be transferred over GPRS shall be possible without any changes to GPRS. Therefore, all functions related to transfer of Network layer Protocol Data Units (N-PDUs) shall be carried out in a transparent way by the GPRS network entities. This is one of the requirements for GPRS SNDCP.

Another requirement for the SNDCP is to provide functions that help to improve channel efficiency. This requirement is fulfilled by means of compression techniques.

The set of protocol entities above SNDCP consists of commonly used network protocols. They all use the same SNDCP entity, which then performs multiplexing of data coming from different sources to be sent using the service provided by the LLC layer (Figure 2). The Network Service Access Point Identifier (NSAPI) is an index to the PDP context (see 3GPP TS ~~03.60~~ 23.060 [3]) of the PDP that is using the services provided by SNDCP. One PDP may have several PDP contexts and NSAPIs. However, it is possible that each allocated NSAPI is used by separate PDP. Each active NSAPI shall use the services provided by the Service Access Point Identifier (SAPI) in the LLC layer. Several NSAPIs may be associated with the same SAPI.

Since the adaptation of different network layer protocols to SNDCP is implementation dependent, it is not defined in the present document.

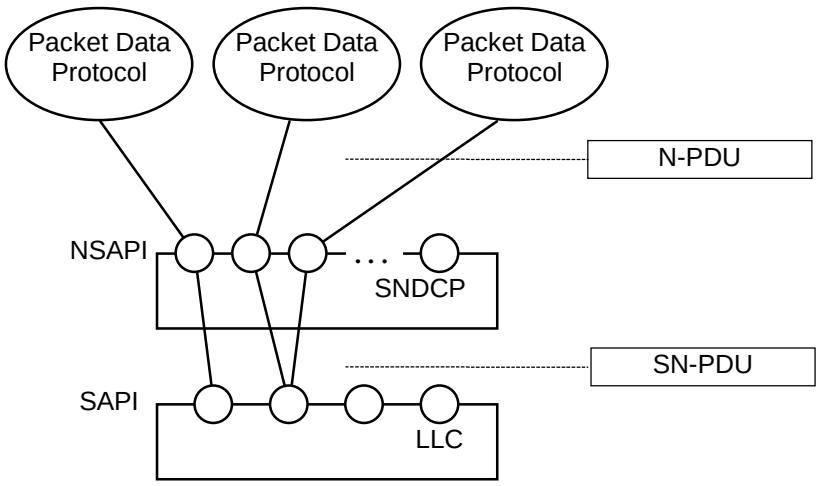

Figure 2: Example for multiplexing of different protocols

5 Service primitives and functions

5.1 Service primitives

This subclause explains the service primitives used for communication between the SNDCP layer and other layers. See also 3GPP TS ~~04.07~~24.007 [4] to get an overall picture of the service primitives. Figure 3 illustrates the service access points through which the primitives are carried out.

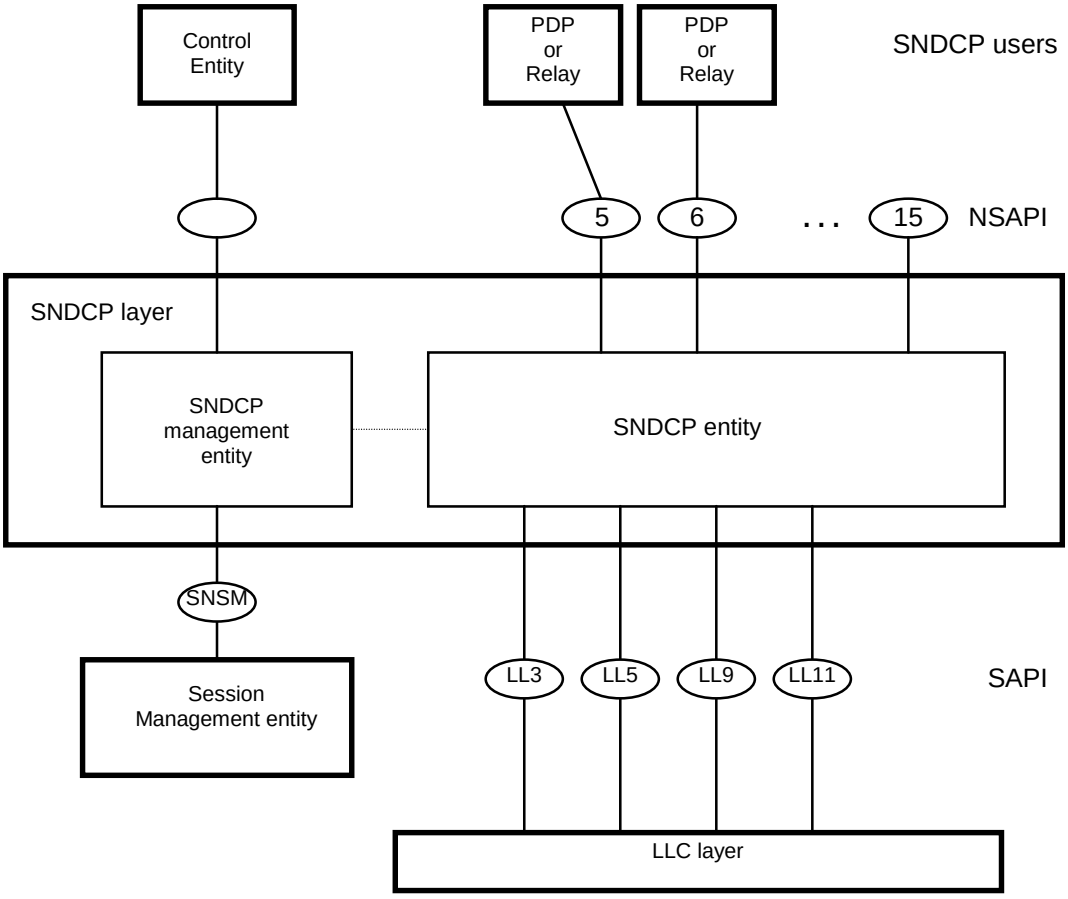

Figure 3: Service Access Points provided and used by SNDCP

NEXT REVISION

5.1.2 Service primitives used by SNDCP layer

The SNDCP layer uses the service primitives provided by the SM sublayer and the LLC layer (see Table 2). SM is specified in 3GPP TS ~~04.08~~24.008 [5a] and LLC in 3GPP TS ~~04.64~~44.064 [6].

NEXT REVISION

5.1.2.13 LL-DATA.request

Request used by the SNDCP layer for acknowledged transmission of an SN-PDU. The SNDCP entity shall associate a reference parameter for each LL-DATA.request. QoS Parameters in the SGSN includes precedence class, delay class, and peak throughput. QoS Parameters in the MS includes peak throughput. QoS Parameters is defined as part of the Quality of Service information element in 3GPP TS ~~04.08~~24.008 [5a]. Radio Priority is included only in the MS, and indicates the radio priority level to be used by RLC/MAC.

Acknowledged peer-to-peer LLC operation for the SAPI used shall be established using the LL-ESTABLISH primitives, before the LL-DATA.request may be used.

NEXT REVISION

5.1.2.19 SNSM-ACTIVATE.indication

Indication used by the SM entity to inform the SNDCP entity that an NSAPI has been activated for data transfer. It also informs the SNDCP entity about the negotiated QoS profile (see 3GPP TS ~~04.08~~24.008 [5a]), the SAPI assigned for this NSAPI, and, in the MS, the radio priority level to be used by RLC/MAC.

If the NSAPI activated uses the acknowledged peer-to-peer LLC operation, the NSAPI shall enter the recovery state.

Upon reception of the SNSM-ACTIVATE.indication from the SM sublayer, the SNDCP entity shall, if necessary, establish the acknowledged peer-to-peer LLC operation for the indicated SAPI. The establishment criteria and procedure are described in subclause 6.2.1.

5.1.2.20 SNSM-ACTIVATE.response

Response used by the SNDCP layer to inform SM entity that the indicated NSAPI is now in use and that the acknowledged peer-to-peer LLC operation for the indicated SAPI is established, if necessary.

5.1.2.21 SNSM-DEACTIVATE.indication

Indication used by the SM entity to inform the SNDCP entity that an NSAPI has been deallocated and cannot be used by the SNDCP entity anymore. All buffered N-PDUs corresponding to this NSAPI are deleted.

Upon reception of the SNSM-DEACTIVATE.indication, the SNDCP entity shall, if necessary, release the acknowledged peer-to-peer LLC operation for the associated SAPI. The release criteria and procedure are described in subclause 6.2.2.

5.1.2.22 SNSM-DEACTIVATE.response

Response used by the SNDCP layer to inform SM entity that the NSAPI indicated is no longer in use and that the acknowledged peer-to-peer LLC operation for the associated SAPI is released, if necessary.

5.1.2.23 SNSM-MODIFY.indication

Indication used by the SM entity to trigger change of the QoS profile (see 3GPP TS ~~04.08~~24.008 [5a]) for an NSAPI and indication of the SAPI to be used. It is also used by the SM entity in the SGSN to inform the SNDCP entity that an NSAPI shall be created, together with the (re-)negotiated QoS profile, the SAPI assigned, and, in the MS, the radio priority level to be used by RLC/MAC.

…

NEXT REVISION

5.2 Service functions

SNDCP shall perform the following functions (see Figure 3):

- Mapping of SN-DATA primitives onto LL-DATA primitives.
- Mapping of SN-UNITDATA primitives onto LL-UNITDATA primitives.
- Multiplexing of N-PDUs from one or several network layer entities onto the appropriate LLC connection.
- Establishment, re-establishment and release of acknowledged peer-to-peer LLC operation.

- Supplementing the LLC layer in maintaining data integrity for acknowledged peer-to-peer LLC operation by buffering and retransmission of N-PDUs.
- Management of delivery sequence for each NSAPI, independently.
- Compression of redundant protocol control information (e.g., TCP/IP header) at the transmitting entity and decompression at the receiving entity. The compression method is specific to the particular network layer or transport layer protocols in use.
- Compression of redundant user data at the transmitting entity and decompression at the receiving entity. Data compression is performed independently for each SAPI, and may be performed independently for each PDP context. Compression parameters are negotiated between the MS and the SGSN.
- Segmentation and reassembly. The output of the compressor functions is segmented to the maximum length of LL-PDU. These procedures are independent of the particular network layer protocol in use.
- Negotiation of the XID parameters between peer SNDCP entities using XID exchange.

Figure 4 shows the transmission flow through SNDCP layer. The order of functions is the following:

- Protocol control information compression.
- User data compression.
- Segmentation of compressed information into SN-DATA or SN-UNITDATA PDUs.

The order of functions is vice versa in the reception flow:

- Reassembly of SN-PDUs to N-PDUs.
- User data decompression.
- Protocol control information decompression.

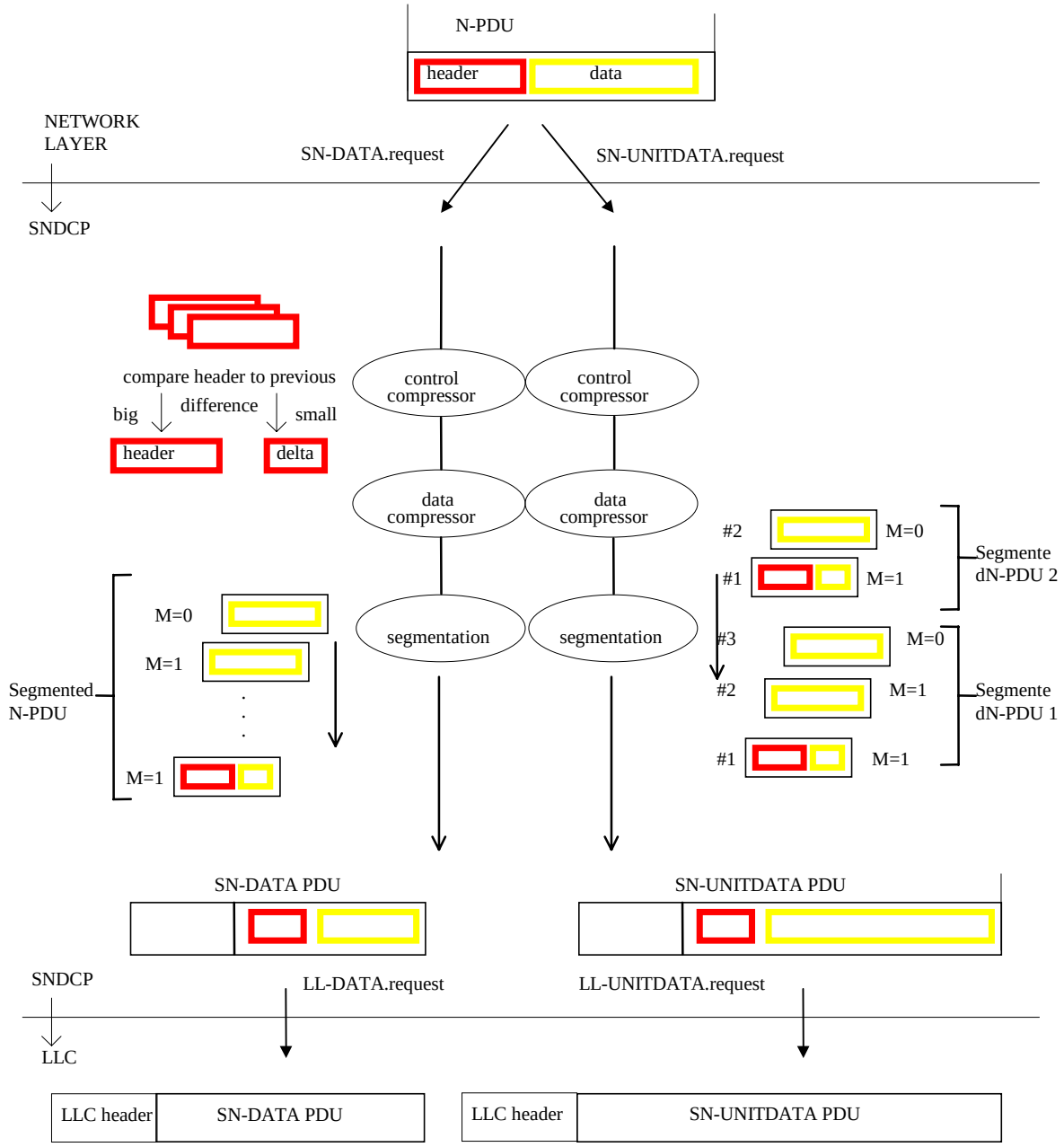

Figure 4: SNDCP model

The SNDCP layer expects the following services to be provided by the LLC layer. LLC layer functionality is defined in 3GPP TS ~~04.64~~44.064 [6]:

- Acknowledged and unacknowledged data transfer.
- Point-to-point and point-to-multipoint data transfer.
- In-order delivery of SN-PDUs per SAPI (i.e., SN-PDUs using the same SAPI shall appear at the receiving end in the same order as transmitted). This is required only for acknowledged service.
- QoS profile-based transfer of SN-PDUs.
- Support for variable length SN-PDUs.
- Transfer of SNDCP XID parameters.

The SNDCP layer expects the following services to be provided by the SM sublayer. SM sublayer functionality is defined in 3GPP TS ~~04.08~~24.008 [5a]:

- Activation and deactivation of PDP Contexts and informing the SNDCP layer when change in PDP context has happened.
- Carrying out Inter SGSN Routing Area Update and informing the SNDCP layer in the SGSN when the N-PDUs shall be tunnelled to the new SGSN.
- Notifying the SNDCP layer when there is need to change the QoS profile parameters of the PDP contexts.

6 Protocol functions

6.1 Multiplexing of N-PDUs

The NSAPI field shall be used for the identification of the specific PDP type and PDP address pair that is using the services provided by the SNDCP layer. The MS allocates NSAPIs dynamically at the PDP Context Activation. The NSAPI is delivered by the SM sub-layer to the SNDCP layer with the SNSM-ACTIVATE.indication primitive. The transmitting SNDCP entity shall insert the NSAPI value for each N-PDU. The peer SNDCP entity uses the NSAPI to identify the SNDCP user the N-PDU is targeted. Table 3 shows an example for the allocation of the NSAPIs.

Table 1: Example of the NSAPI allocation

PDP type	Allocated NSAPI	PDP address
IPv4	12	133.12.75.111 (4 octets)
IPv6	13	133.12. … .11.123 (16 octets)

6.2 Establishment and release of acknowledged peer-to-peer LLC operation

The SNDCP layer shall be responsible for establishing, re-establishing and releasing the acknowledged peer-to-peer LLC operation.

Re-establishment and release of the acknowledged peer-to-peer LLC operation may also be initiated by the LLC layer. The conditions under which this may happen are described in 3GPP TS ~~04.64~~44.064.

Negotiation of SNDCP XID parameters may be carried out in conjunction with the establishment or re-establishment procedure. It is also possible to negotiate SNDCP XID parameters independently from the establishment or re-establishment procedure, by using the LL-XID primitives.

6.2.1 Establishment of acknowledged peer-to-peer LLC operation

6.2.1.1 Establishment criteria

If acknowledged peer-to-peer LLC operation is required by an NSAPI (as indicated by the QoS profile) but is not yet established for the SAPI used by the NSAPI, then the SNDCP layer shall initiate the establishment procedure.

The SNDCP layer at the MS shall initiate the establishment, using the procedure in subclause 6.2.1.3, upon receipt of the SNSM-ACTIVATE.indication primitive.

The SNDCP layer at the SGSN shall initiate the establishment upon receipt of the SNSM-MODIFY.indication primitive.

6.2.1.2 Re-establishment of the acknowledged peer-to-peer LLC operation

The SNDCP layer may initiate re-establishment of the acknowledged peer-to-peer LLC operation for a SAPI under

certain situations, for example when an error is detected by a V.42 bis data compression entity used for acknowledged data transfer.

The LLC layer may also initiate re-establishment of the acknowledged peer-to-peer LLC operation for a SAPI under situations described in 3GPP TS ~~04.64~~44.064. The LLC layer informs the SNDCP layers of link re-establishment using the LL-ESTABLISH.indication primitive. This is shown in Figure 5.

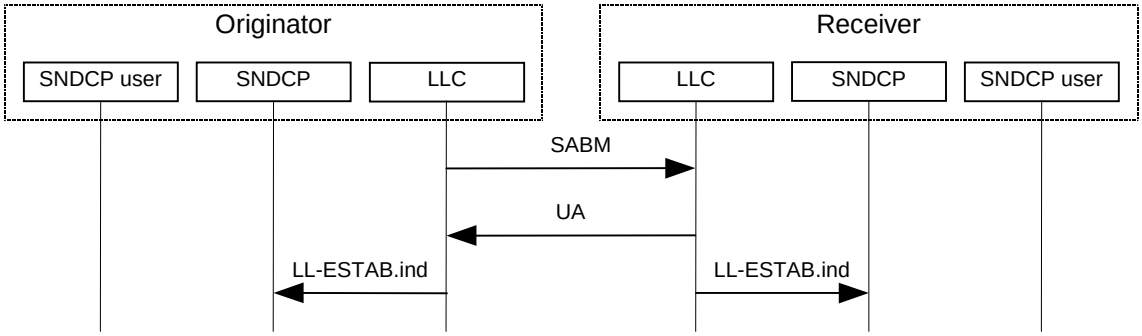

Figure 5: LLC-initiated re-establishment

NEXT REVISION

6.2.2.3 Release initiated by the LLC layer

The LLC layer may initiate release of the acknowledged peer-to-peer LLC operation for a SAPI under situations described in 3GPP TS ~~04.64~~44.064. The LLC layer shall inform the SNDCP layers of the release of acknowledged peer-to-peer LLC operation using the LL-RELEASE.indication primitive. SNDCP shall process the LL-RELEASE.indication primitive as described in subclause 6.2.1.4.

6.3 N-PDU buffering

The N-PDUs shall be buffered in the SNDCP layer before they are compressed segmented and transmitted to the LLC layer. The reception of an SNSM-DEACTIVATE.indication shall trigger the deletion of the buffer for the related NSAPI.

For acknowledged data transfer, the SNDCP entity shall buffer an N-PDU until successful reception of all SN-PDUs carrying segments of the N-PDU have been confirmed. The confirmation is carried out using the LL-DATA.confirm primitive from the LLC layer or the SNSM-SEQUENCE.indication primitive from the SM layer. Buffered N-PDUs which have been completely received as indicated by the acknowledgements in an LL-DATA.confirm primitive shall be discarded. During the Inter-SGSN RA Update, buffered N-PDUs whose complete reception by the MS has been confirmed in the SNSM-SEQUENCE.indication primitive shall be discarded, as defined in 3GPP TS ~~09.60~~29.060 [7] and 3GPP TS ~~03.60~~23.060 [3].

For unacknowledged data transfer, the SNDCP shall delete an N-PDU immediately after it has been delivered to the LLC layer.

NEXT REVISION

6.7 Segmentation and reassembly

Segmentation shall be performed by the SNDCP entity to ensure that any SN-PDU transmitted is no longer than N201 (see 3GPP TS ~~04.64~~44.064 [6]). The receiving SNDCP entity shall reassemble the segments back to the original (possibly compressed) N-PDU.

The segmentation and reassembly procedures are different for acknowledged and unacknowledged mode of operation.

NEXT REVISION

6.8 XID parameter negotiation

Negotiation of XID parameters between peer SNDCP entities may be carried out to ensure optimal information transfer. The parameters are called SNDCP exchange identity (XID) parameters.

SNDCP XID parameter negotiation may be initiated by the SNDCP entity at the MS or at the SGSN. If SNDCP XID parameters are to be changed, SNDCP XID negotiation shall be initiated prior to data transfer - the MS shall initiate SNDCP XID negotiation upon receipt of SNSM-ACTIVATE.indication; the SGSN shall initiate SNDCP XID negotiation upon receipt of the SNSM-MODIFY.indication primitive if an NSAPI has been put into use (in the case of an Inter-SGSN Routeing Area Update), or if the change in QoS profile to an existing NSAPI results in a change in compressor(s) used by the NSAPI.

When an NSAPI no longer uses a compression entity due to a PDP context deactivation or a PDP context modification, an SNDCP XID negotiation shall be performed to remove the NSAPI from the Applicable NSAPIs of the compression entity. The negotiation shall be initiated by the MS upon receipt of the SNSM-DEACTIVATE.indication in the case of PDP context deactivation, or by the SGSN upon receipt of the SNSM-MODIFY.indication in the case of PDP context modification.

The XID negotiation is a one-step procedure; i.e., the initiating end proposes parameter values, and the responding end either accepts these or offers different values in their place according to the XID negotiation rules described in the present document; the rules limit the range of parameter values as well as the sense of negotiation. The initiating end accepts (or rejects) the values in the response; this concludes the negotiation.

The block format for the SNDCP XID parameter negotiation is shown in Figure 10. Not all parameters have to be included in the XID block, only parameters that are negotiated. Parameters may be included in any order. Also it shall be possible to negotiate parameters for more than one NSAPI in one XID block since more than one NSAPI can use the same SAPI.

Bit	8	7	6	5	4	3	2	1
Octet 1	Parameter type=0							
Octet 2	Length=1							
Octet 3	Version number							
Octet 4	Parameter type=1							
Octet 5	Length=n-5							
Octet 6	P	X	X	Entity number				
Octet 7 (optional)								
Octet 8	Length=k-8							
Octet 9 … (optional)								
Octet j	High-order octet							
…	…							
Octet k	Low-order octet							
Octet k+1	P	X	X	Entity number				
Octet k+2 (optional)								
Octet k+3	Length=m-(k+3)							
Octet k+4… (optional)								
Octet k+y	High-order octet							
…	…							
Octet m	Low-order octet							
…	…							
Octet n	Low-order octet							
Octet n+1	Parameter type=2							
Octet n+2	Length=r-(n+2)							
Octet n+3	P	X	X	Entity number				
Octet n+4 (optional)								
Octet n+5	Length=p-(n+5)							
Octet n+6… (optional)								
Octet n+w	High-order octet							
…	…							
Octet p	Low-order octet							
Octet p+1	P	X	X	Entity number				
Octet p+2 (optional)								
Octet p+3	Length=q-(p+3)							
Octet p+4… (optional)								
Octet p+v	High-order octet							
…	…							
Octet q	Low-order octet							
…	…							
Octet r	Low-order octet							

Figure 6: Example of SNDCP XID block format

The SNDCP user uses SN-XID.request to initiate the negotiation of the XID parameters. The SNDCP entity sends the proposed SNDCP XID parameters to the LLC SAP with the LL-XID.request or LL-ESTABLISH.request. The LLC SAP shall issue an XID command containing the SNDCP XID parameters (see 3GPP TS ~~04.64~~44.064). The peer LLC SAP shall, upon receipt of the XID command, indicate the SNDCP XID parameters to SNDCP entity using LL-XID.indication or LL-ESTABLISH.indication. The peer SNDCP entity shall select appropriate values for the proposed parameters or negotiate the appropriate values with the SNDCP user entity with the SN-XID.indication and SN-XID.response primitives. When the appropriate parameter values are known by the peer SNDCP entity, it shall use the LL-XID.response or LL-ESTABLISH.response primitive to continue negotiation. Upon reception of the response, the LLC SAP shall send the received parameters to the SNDCP entity using the LL-XID.confirm or LL-ESTABLISH.confirm primitive. The SNDCP entity delivers the negotiated parameters to the SNDCP user. This is illustrated in Figure 11. The originator of the negotiation shall apply the new parameter values after it has received the 'confirm' primitive. The responding end of the negotiation shall apply the new parameter values after it has sent the replying 'response' primitive.

…

3GPP TSG CN WG1 Meeting #22 ***Tdoc N1-020277***
Sophia Antipolis, France, 28 January - 1 February 2002

CR-Form-v3

CHANGE REQUEST

⌘ **44.064** **CR** **006** ⌘ rev ⌘ Current version: **5.0.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☐ Radio Access Network ☐ Core Network ☐

Title:	⌘	Correction of references
Source:	⌘	Motorola
Work item code:	⌘	TEI4
Date:	⌘	2002-01-22
Category:	⌘	**A**
Release:	⌘	Rel-5

Use one of the following categories:
F *(essential correction)*
A *(corresponds to a correction in an earlier release)*
B *(Addition of feature),*
C *(Functional modification of feature)*
D *(Editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:

2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
REL-4	*(Release 4)*
REL-5	*(Release 5)*

Reason for change:	⌘	References need to be updated.
Summary of change:	⌘	The correct references are added throughout the document.
Consequences if not approved:	⌘	

Clauses affected:	⌘			
Other specs affected:	⌘	☐ Other core specifications ☐ Test specifications ☐ O&M Specifications	⌘	
Other comments:	⌘			

FIRST REVISION

1 Scope

The present document defines the Logical Link Control (LLC) layer protocol to be used for packet data transfer between the Mobile Station (MS) and Serving GPRS Support Node (SGSN).

It defines the frame structure, elements of procedure, format of fields, and procedures for the proper operation of the logical link control layer. It is based on ideas contained in IS-130 [21], ISO 3309 [16], ISO 4335 [17], and ISO 7809 [18, 19, 20] (HDLC of ISO), as well ITU-T Q.920 [13] and Q.921 [14] (LAPD). The concepts, the overview description of LLC layer functions and procedures, and the relationship with other Technical Specifications are described in general terms in 3GPP TS ~~03.60~~23.060 [5].

….

NEXT REVISION

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".~~TS 01.04: "Digital cellular telecommunications system (Phase 2+); Abbreviations and acronyms".~~

[2] 3GPP TS ~~01.61~~41.061: "~~Digital cellular telecommunications system (Phase 2+);~~ General Packet Radio Service (GPRS); GPRS ciphering algorithm requirements".

[3] 3GPP TS ~~02.60~~22.060: "~~Digital cellular telecommunications system (Phase 2+);~~ General Packet Radio Service (GPRS); Service description; Stage 1".

[4] 3GPP TS ~~03.40~~23.040: "~~Digital cellular telecommunications system (Phase 2+);~~ Technical realization of the Short Message Service (SMS); Point-to-Point (PP)".

[5] 3GPP TS ~~03.60~~23.060: "~~Digital cellular telecommunications system (Phase 2+);~~ General Packet Radio Service (GPRS); Service description; Stage 2".

[6] 3GPP TS ~~03.64~~43.064: "~~Digital cellular telecommunications system (Phase 2+);~~ General Packet Radio Service (GPRS); Overall description of the General Packet Radio Service (GPRS) Radio interface; Stage 2".

[7] 3GPP TS ~~04.01~~44.001: "~~Digital cellular telecommunications system (Phase 2+);~~ Mobile Station - Base Station System (MS - BSS) interface; General aspects and principles".

[8] 3GPP TS ~~04.08~~44.018: "~~Digital cellular telecommunications system (Phase 2+);~~ Mobile radio interface layer 3 specification; Radio Resource Control Protocol".

[8a] 3GPP TS 24.008: "Mobile radio interface layer 3 specification; Core Network Protocols – Stage 3".

[9] 3GPP TS ~~04.11~~24.011: "~~Digital cellular telecommunication system (Phase 2+);~~ Point-to-Point (PP) Short Message Service (SMS) support on mobile radio interface".

[10] 3GPP TS ~~04.22~~24.022: "~~Digital cellular telecommunications system (Phase 2+);~~ Radio Link Protocol (RLP) for circuit switched bearer and teleservices".~~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".~~

[11] 3GPP TS ~~04.65~~44.065: "~~Digital cellular telecommunications system (Phase 2+);~~ General Packet Radio Service (GPRS); Mobile Station (MS) – Serving GPRS Support Node (SGSN); Subnetwork Dependent Convergence Protocol (SNDCP)".

[12] 3GPP TS ~~08.18~~48.018: "~~Digital cellular telecommunications system (Phase 2+);~~ General Packet Radio Service (GPRS); Base Station System (BSS) - Serving GPRS Support Node (SGSN); BSS GPRS Protocol (BSSGP)".

[13] ITU-T Q.920 (1988): "ISDN user-network interface data link layer – general aspects".

[14] ITU-T Q.921 (1988): "ISDN user-network interface – data link layer specification".

[15] ITU-T Z.100 (1988): "CCITT specification and description language (SDL)".

[16] ISO 3309 (1984): "Information processing systems – Data communications – High-level logical link control procedures – Frame structure".

[17] ISO 4335 (1987): "Information processing systems – Data communication – High-level logical link control procedures – Consolidation of elements of procedures".

[18] ISO 7809 (1984): "Information processing systems – Data communication – High-level logical link control procedures – Consolidation of classes of procedures".

[19] ISO 7809 (1984): "Information processing systems – Data communication Add. 1: 1987 – High-level logical link control procedures – Consolidation of classes of procedures – Addendum 1".

[20] ISO 7809 (1984): "Information processing systems – Data communication Add. 2: 1987 – High-level logical link control procedures – Consolidation of classes of procedures – Addendum 2: Description of optional functions".

[21] TIA IS-130 (1995): "800 MHz Cellular System – TDMA Radio Interface – Radio Link Protocol 1" Arlington: Telecommunications Industry Association.

[22] TIA/EIA-136 (1999): "TDMA Cellular / PCS"; Arlington: Telecommunications Industry Association.

[23] 3GPP TS 44.060: “General Packet Radio Service (GPRS); Mobile Station (MS) - Base Station System (BSS) interface; Radio Link Control/ Medium Access Control (RLC/MAC) protocol”.

[24] 3GPP TS 44.031: “Mobile Station (MS) - Serving Mobile Location Centre (SMLC) Radio Resource LCS Protocol (RRLP)”.

[25] 3GPP TS 43.059: "Functional Stage 2 Description of Location Services (LCS) in GERAN".

[26] 3GPP TS 29.018: "General Packet Radio Service (GPRS); Serving GPRS Support Node (SGSN) – Visitors Location Register (VLR); Gs interface layer 3 specification".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply. Additional applicable definitions can be found in 3GPP TS 21.905 [1] and 3GPP TS ~~02.60~~ 22.060 [3].

frame rejection condition: a condition that results from the receipt of an undefined or incorrect frame.

inquiry process: a process performed in the peer receiver busy condition in which the LLE checks that the peer LLE is still in the own receiver busy condition.

invalid frame condition: a condition that results from the receipt of an invalid frame.

logical link connection: the logical connection between two LLE peers. A logical link connection is identified with a Data Link Connection Identifier (DLCI). A logical link connection is always in one of three states: TLLI Unassigned, TLLI Assigned / ADM, or ABM.

logical link control layer: the protocol layer between an MS and an SGSN consisting of one or more logical link management entities, one or more logical link entities, and a multiplex procedure.

logical link entity: the LLC layer protocol state machine controlling one logical link connection.

own receiver busy condition: a condition that results from the inability to accept additional I frames from the peer logical link entity.

peer receiver busy condition: a condition that results from the reception in of a RNR frame from the peer logical link entity.

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply. Additional applicable abbreviations and symbols can be found in 3GPP TS ~~01.04~~21.905 [1] and 3GPP TS ~~03.60~~23.060 [5].

ABM	Asynchronous Balanced Mode
ACK	ACKnowledgement
ADM	Asynchronous Disconnected Mode
CNF	Confirm
DISC	DISConnect
DM	Disconnected Mode
FRMR	FRaMe Reject
GMM	GPRS Mobility Management
GRR	GPRS Radio Resources service access point
I	Information
IOV	Input Offset Value
IND	Indication
LAPD	Link Access Procedure on the D-channel
LCS	Location Services
LL	Logical Link
LLC	Logical Link Control
LLE	Logical Link Entity
LLGMM	LLC to GPRS Mobility Management service access point
LLM	Logical Link Management
LLME	Logical Link Management Entity
REQ	Request
RES	Response
RNR	Receive Not Ready
RR	Receive Ready
RRLP	Radio Resource LCS Protocol
S	Supervisory
SABM	Set Asynchronous Balanced Mode

SACK	Selective ACKnowledgement
TIA	Telecommunications Industry Association
TOM	Tunnelling Of Messages
UA	Unnumbered Acknowledgement
UI	Unconfirmed Information
XID	eXchange IDentification

NEXT REVISION

4.1 Reference model

A model of layering the protocols in GPRS is illustrated in Figure 1.

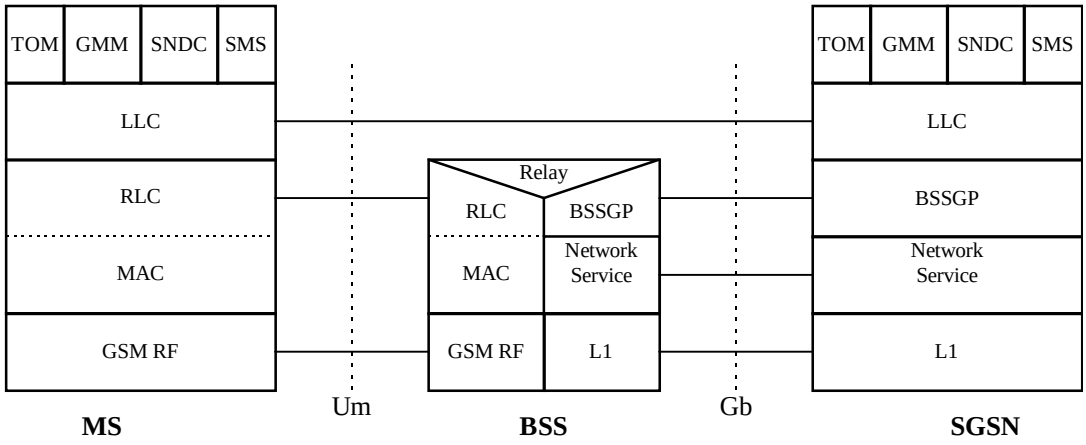

Figure 1: Protocol layering in GPRS

The LLC layer operates above the RLC and BSSGP layers in the reference architecture to provide logical links between an MS and its SGSN.

Above the LLC layer is located the SubNetwork Dependent Convergence (SNDC) layer, that controls the transfer of user data network layer PDUs (N-PDUs) between the MS and SGSN. The SNDC functionality is described in 3GPP TS ~~03.60~~ 23.060 [5] and specified in 3GPP TS ~~04.65~~ 44.065 [11].

The logical link control layer Service Access Points (SAPs) are the points at which the LLC layer provides services to the layer-3 protocols in Figure 1. In addition to the SNDC protocol, LLC provides service to the GPRS Mobility Management (GMM) protocol, to the SMS protocol, and to the Tunnelling of Messages (TOM) protocol.

An LLC layer connection is identified by the DLCI consisting of the SAP Identifier (SAPI) and the MS's Temporary Logical Link Identifier (TLLI).

Each LLC frame consists of the header, trailer, and information field. The header and trailer fields contain information such as SAPI, frame number and checksum, that are used to identify the frame and to provide reliable transmission. The information field is variable length. Both transmission and retransmission of each frame are controlled by the LLC layer.

Many of the formats and procedures are similar to the reference protocols, and differences are introduced only where needed to reflect the unique aspects of the GPRS architecture and requirements.

NEXT REVISION

4.5 Establishment of information transfer modes

4.5.1 Data link connection identification

A logical link connection is identified by a DLCI consisting of two identifiers: a SAPI and a TLLI.

The SAPI is used to identify the service access point on the SGSN side and the MS side of the LLC interface. SAPI is carried in the address field of each LLC frame.

The TLLI is used to identify a specific MS. TLLI assignment is controlled by GMM. TLLI is not carried in LLC frames, but in BSSGP messages as defined in 3GPP TS 48.018 ~~08.18~~ [12], and in RLC/MAC blocks as defined in 3GPP TS 44.018 ~~04.08~~ [8].

NEXT REVISION

4.7.2 Multiplex procedure

On frame transmission, the multiplex procedure generates and inserts the FCS, performs the frame ciphering function, and provides SAPI-based logical link control layer contention resolution between the various LLEs.

On frame reception, the multiplex procedure performs the frame decipher function and checks the FCS. If the frame passes the FCS check, the multiplex procedure distributes the frame to the appropriate logical link entity based on the DLCI.

3GPP TS 41.061 ~~01.61~~ [2] contains the requirements for the GPRS ciphering algorithm.

4.7.3 Logical Link Management

The Logical Link Management Entity (LLME) manages the resources that have an impact on individual connections. There is one LLME per TLLI. Functions provided by the LLME are:

- parameter initialisation;
- error processing; and
- connection flow control invocation.

The RLC/MAC layer functions are described in 3GPP TS 43.064 ~~03.64~~ [6]. BSSGP is specified in 3GPP TS ~~08.18~~48.018 [12]. SNDCP is specified in 3GPP TS ~~04.65~~44.065 [11].

4.8 GPRS Mobility Management

GPRS Mobility Management (GMM) uses the services of the LLC layer to transfer messages between the MS and the SGSN. GMM includes functions such as attach and authentication, and transport of session management messages for functions such as PDP context activation and deactivation. GMM procedures are defined in 3GPP TS ~~04.08~~24.008 [8a] and are beyond the scope of the LLC layer. Interaction between GMM and LLC is defined in terms of service primitives, see clause 7.

4.9 Short Message Service

The Short Message Service (SMS) uses the services of the LLC layer to transfer short messages between the MS and

the SGSN. SMS procedures are defined in 3GPP TS ~~03.40~~23.040 [4] and 3GPP TS ~~04.11~~24.011 [9] and are beyond of the scope of the LLC layer. Interaction between SMS and LLC is defined in terms of service primitives, see clause 7.

NEXT REVISION

5.5 Frame Check Sequence (FCS) field

The FCS field shall consist of a 24 bit cyclic redundancy check (CRC) code. The CRC-24 is used to detect bit errors in the frame header and information fields.

The FCS field contains the value of a CRC calculation that is performed over the entire contents of the header and information field, except for UI frames transmitted in unprotected mode, in which case the FCS field contains the value of a CRC calculation that is performed over the frame header and the first N202 octets (see subclause 8.9.6) of the information field only (see subclause 6.3.5.5.2). The information over which the CRC is calculated is referred to as the dividend in this subclause. Bit (1, 1) of the dividend is the highest-order term in the calculation (see subclause 5.7.3). CRC calculation shall be done before ciphering at the transmitting side, and after deciphering at the receiving side.

NOTE: The definition below is different from that in 3GPP TS ~~04.22~~24.022 [10] only with respect to the variable dividend length k of the LLC frames. In 3GPP TS ~~04.22~~24.022, the RLP frame has a fixed dividend length, but the LLC frame has a variable dividend length.

The CRC shall be the ones complement of the sum (modulo 2) of:

- the remainder of x^k ($x^{23} + x^{22} + x^{21} + \ldots + x^2 + x + 1$) divided (modulo 2) by the generator polynomial, where k is the number of bits of the dividend; and
- the remainder of the division (modulo 2) by the generator polynomial of the product of x^{24} by the dividend.

The CRC-24 generator polynomial is:

$$G(x) = x^{24} + x^{23} + x^{21} + x^{20} + x^{19} + x^{17} + x^{16} + x^{15} + x^{13} + x^8 + x^7 + x^5 + x^4 + x^2 + 1$$

The result of the CRC calculation is placed within the FCS field as described in subclause 5.7.3.

NOTE: As a typical implementation at the transmitter, the initial content of the register of the device computing the remainder of the division is pre-set to all "1's" and is then modified by division by the generator polynomial (as described above) of the dividend; the ones complement of the resulting remainder is put into the FCS field.

As a typical implementation at the receiver, the initial content of the register of the device computing the remainder of the division is pre-set to all "1's". The final remainder, after multiplication by x^{24} and then division (modulo 2) by the generator polynomial of the received frame, will be (in the absence of errors):

$$C(x) = x^{22} + x^{21} + x^{19} + x^{18} + x^{16} + x^{15} + x^{11} + x^8 + x^5 + x^4$$

NEXT REVISION

6.4.1.7 NULL command

The NULL unnumbered command shall be used by an MS LLE to indicate a cell update. The NULL unnumbered command is only allowed if the Cell Notification is indicated by the SGSN (see 3GPP TS 23.060 [5] and 3GPP TS 24.008 [8a]).

No information field is permitted with the NULL command.

NEXT REVISION

7.1.1 Primitives types

The primitives types defined in the present document are:

NOTE: For the action sequence of these primitive types, see 3GPP TS ~~04.01~~44.001 [7].

7.1.1.1 Request

The Request primitive type is used when a higher layer is requesting a service from the next lower layer.

7.1.1.2 Indication

The Indication primitive type is used by a layer providing a service to notify the next higher layer of activities related to the Request primitive type of the peer.

7.1.1.3 Response

The Response primitive type is used by a layer to acknowledge receipt, from the next lower layer, of the Indication primitive type.

7.1.1.4 Confirm

The Confirm primitive type is used by the layer providing the requested service to confirm that the activity has been completed (successfully or unsuccessfully).

NEXT REVISION

7.2.1.3 LLGMM-TRIGGER

LLGMM-TRIGGER-REQ shall be used in the MS to order LLC to transmit any single frame. If there is a frame waiting to be transmitted in the MS, then this frame shall be transmitted. Otherwise if Cause indicates Cell Update and if Cell Notification is indicated by the SGSN (see 3GPP TS 24.008 [8a]), then a NULL frame with P=0 shall be transmitted. Otherwise, and if the LLE is in ABM state, a supervisory frame shall be transmitted according to subclause 8.6.4.1, Or if the LLE is in ADM state a UI frame with no information field shall be transmitted. There is only need to transmit a frame on one SAPI. Which SAPI to choose is implementation dependent.

LLGMM-TRIGGER-REQ is normally used for cell updates or for page responses, and the reason shall be indicated in the Cause parameter. If Cause indicates page response, then the GRR-DATA-REQ Cause parameter shall also indicate page response.

NEXT REVISION

8.9.9 LLC layer parameter default values

Table 1: LLC layer parameter default values

LLC Parameter	SAPI 1 GMM	SAPI 2 TOM 2	SAPI 3 User Data 3	SAPI 5 User Data 5	SAPI 7 SMS	SAPI 8 TOM 8	SAPI 9 User Data 9	SAPI 11 User Data 11
Version	0							
IOV-UI	0							
IOV-I	Note 2	Note 2	2^{27} • SAPI	2^{27} • SAPI	Note 2	Note 2	2^{27} • SAPI	2^{27} • SAPI
T200 and T201	5 s	5 s	5 s	10 s	20 s	20 s	20 s	40 s
N200	3	3	3	3	3	3	3	3
N201-U	400	270	500	500	270	270	500	500
N201-I	Note 2	Note 2	1 503	1 503	Note 2	Note 2	1 503	1 503
mD	Note 2	Note 2	1 520	760	Note 2	Note 2	380	190
mU	Note 2	Note 2	1 520	760	Note 2	Note 2	380	190
kD	Note 2	Note 2	16	8	Note 2	Note 2	4	2
kU	Note 2	Note 2	16	8	Note 2	Note 2	4	2

NOTE 1: Proper LLC operation requires that timer T200 be greater than the maximum time between transmission of command frames and the reception of their corresponding response or acknowledgement frames.

NOTE 2: This parameter applies to ABM procedures. ABM operation is not allowed for GMM, SMS, and TOM that use only UI frames for information transfer.

NOTE 3: The default values for SAPIs 3, 5, 9, and 11 have been chosen to correspond with the four GPRS quality of service delay classes, see 3GPP TS ~~02.60~~22.060 [3]. However, there is no fixed relationship between SAPI and delay class. The LLC layer parameters for any SAPI can be negotiated to support any QoS profile, see 3GPP TS ~~03.60~~23.060 [5].

NOTE 4: Proper LLC operation requires that the values for N201-U and N201-I are not greater than the maximum number of octets in an information field that can be transmitted or retransmitted over the Gb interface, see 3GPP TS ~~08.18~~48.018 [12]. It is the responsibility of the SGSN to negotiate N201-U and N201-I to values compatible with the usage of the Gb interface.

Annex A (normative): Ciphering

A.1 General

This annex specifies how LLC shall interface with the GPRS ciphering algorithm. The requirements for the GPRS ciphering algorithm are contained in 3GPP TS ~~01.61~~41.061 [2].

NEXT REVISION

Annex B (normative): Tunnelling of Messages (TOM)

Tunnelling of Messages (TOM) is a generic protocol layer used for the exchange of TOM Protocol Envelopes (see Figure B.1) between the MS and the SGSN. TOM uses two LLC SAPs, one for high-priority messages and another for low-priority messages. The TOM Protocol Envelope is composed of a TOM Protocol Header (containing one or more octets) and a Message Capsule. The TOM Protocol Header contains information about the specific application using the TOM protocol layer and any other TOM Protocol Discriminator-specific information. The Message Capsule is the actual payload of information in the TOM Protocol Envelope. One of the uses of the TOM protocol layer is to tunnel signalling messages between an MS and a non-GSM MSC/VLR when GPRS network elements are used in non-GSM networks. See 3GPP TS ~~03.60~~23.060 [5] and 3GPP TS ~~09.18~~29.018 [26]. The TOM protocol layer is also used to tunnel Radio Resource LCS Protocol (RRLP) messages. See 3GPP TS 43.059[25] and 3GPP TS 44.031[24].

3GPP TSG CN WG1 Meeting #22 ***Tdoc N1-020276***
Sophia Antipolis, France, 28 January - 1 February 2002

CR-Form-v3

CHANGE REQUEST

⌘ **44.064** **CR** **005** ⌘ rev ⌘ Current version: **4.2.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☐ Radio Access Network ☐ Core Network ☐

Title:	⌘	Correction of references
Source:	⌘	Motorola
Work item code:	⌘	TEI4
Date:	⌘	2002-01-22
Category:	⌘	**F**
Release:	⌘	Rel-4

Use one of the following categories:
F *(essential correction)*
A *(corresponds to a correction in an earlier release)*
B *(Addition of feature),*
C *(Functional modification of feature)*
D *(Editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:

2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
REL-4	*(Release 4)*
REL-5	*(Release 5)*

Reason for change:	⌘	References need to be updated.
Summary of change:	⌘	The correct references are added throughout the document.
Consequences if not approved:	⌘	

Clauses affected:	⌘			
Other specs affected:	⌘	☐ Other core specifications ☐ Test specifications ☐ O&M Specifications	⌘	
Other comments:	⌘			

FIRST REVISION

1 Scope

The present document defines the Logical Link Control (LLC) layer protocol to be used for packet data transfer between the Mobile Station (MS) and Serving GPRS Support Node (SGSN).

It defines the frame structure, elements of procedure, format of fields, and procedures for the proper operation of the logical link control layer. It is based on ideas contained in IS-130 [21], ISO 3309 [16], ISO 4335 [17], and ISO 7809 [18, 19, 20] (HDLC of ISO), as well ITU-T Q.920 [13] and Q.921 [14] (LAPD). The concepts, the overview description of LLC layer functions and procedures, and the relationship with other Technical Specifications are described in general terms in 3GPP TS ~~03.60~~23.060 [5].

….

NEXT REVISION

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".~~TS 01.04: "Digital cellular telecommunications system (Phase 2+); Abbreviations and acronyms".~~

[2] 3GPP TS ~~01.61~~41.061: "~~Digital cellular telecommunications system (Phase 2+);~~ General Packet Radio Service (GPRS); GPRS ciphering algorithm requirements".

[3] 3GPP TS ~~02.60~~22.060: "~~Digital cellular telecommunications system (Phase 2+);~~ General Packet Radio Service (GPRS); Service description; Stage 1".

[4] 3GPP TS ~~03.40~~23.040: "~~Digital cellular telecommunications system (Phase 2+);~~ Technical realization of the Short Message Service (SMS); Point-to-Point (PP)".

[5] 3GPP TS ~~03.60~~23.060: "~~Digital cellular telecommunications system (Phase 2+);~~ General Packet Radio Service (GPRS); Service description; Stage 2".

[6] 3GPP TS ~~03.64~~43.064: "~~Digital cellular telecommunications system (Phase 2+);~~ General Packet Radio Service (GPRS); Overall description of the General Packet Radio Service (GPRS) Radio interface; Stage 2".

[7] 3GPP TS ~~04.01~~44.001: "~~Digital cellular telecommunications system (Phase 2+);~~ Mobile Station - Base Station System (MS - BSS) interface; General aspects and principles".

[8] 3GPP TS ~~04.08~~44.018: "~~Digital cellular telecommunications system (Phase 2+);~~ Mobile radio interface layer 3 specification; Radio Resource Control Protocol".

[8a] 3GPP TS 24.008: "Mobile radio interface layer 3 specification; Core Network Protocols – Stage 3".

[9] 3GPP TS ~~04.11~~24.011: "~~Digital cellular telecommunication system (Phase 2+);~~ Point-to-Point (PP) Short Message Service (SMS) support on mobile radio interface".

[10] 3GPP TS ~~04.22~~24.022: "~~Digital cellular telecommunications system (Phase 2+);~~ Radio Link Protocol (RLP) for circuit switched bearer and teleservices".~~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".~~

[11] 3GPP TS ~~04.65~~44.065: "~~Digital cellular telecommunications system (Phase 2+);~~ General Packet Radio Service (GPRS); Mobile Station (MS) – Serving GPRS Support Node (SGSN); Subnetwork Dependent Convergence Protocol (SNDCP)".

[12] 3GPP TS ~~08.18~~48.018: "~~Digital cellular telecommunications system (Phase 2+);~~ General Packet Radio Service (GPRS); Base Station System (BSS) - Serving GPRS Support Node (SGSN); BSS GPRS Protocol (BSSGP)".

[13] ITU-T Q.920 (1988): "ISDN user-network interface data link layer – general aspects".

[14] ITU-T Q.921 (1988): "ISDN user-network interface – data link layer specification".

[15] ITU-T Z.100 (1988): "CCITT specification and description language (SDL)".

[16] ISO 3309 (1984): "Information processing systems – Data communications – High-level logical link control procedures – Frame structure".

[17] ISO 4335 (1987): "Information processing systems – Data communication – High-level logical link control procedures – Consolidation of elements of procedures".

[18] ISO 7809 (1984): "Information processing systems – Data communication – High-level logical link control procedures – Consolidation of classes of procedures".

[19] ISO 7809 (1984): "Information processing systems – Data communication Add. 1: 1987 – High-level logical link control procedures – Consolidation of classes of procedures – Addendum 1".

[20] ISO 7809 (1984): "Information processing systems – Data communication Add. 2: 1987 – High-level logical link control procedures – Consolidation of classes of procedures – Addendum 2: Description of optional functions".

[21] TIA IS-130 (1995): "800 MHz Cellular System – TDMA Radio Interface – Radio Link Protocol 1" Arlington: Telecommunications Industry Association.

[22] TIA/EIA-136 (1999): "TDMA Cellular / PCS"; Arlington: Telecommunications Industry Association.

[23] 3GPP TS 44.060: “General Packet Radio Service (GPRS); Mobile Station (MS) - Base Station System (BSS) interface; Radio Link Control/ Medium Access Control (RLC/MAC) protocol”.

[24] 3GPP TS 29.018: "General Packet Radio Service (GPRS); Serving GPRS Support Node (SGSN) – Visitors Location Register (VLR); Gs interface layer 3 specification".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply. Additional applicable definitions can be found in 3GPP TS 21.905 [1] and 3GPP TS ~~02.60~~ 22.060 [3].

frame rejection condition: a condition that results from the receipt of an undefined or incorrect frame.

inquiry process: a process performed in the peer receiver busy condition in which the LLE checks that the peer LLE is still in the own receiver busy condition.

invalid frame condition: a condition that results from the receipt of an invalid frame.

logical link connection: the logical connection between two LLE peers. A logical link connection is identified with a Data Link Connection Identifier (DLCI). A logical link connection is always in one of three states: TLLI Unassigned, TLLI Assigned / ADM, or ABM.

logical link control layer: the protocol layer between an MS and an SGSN consisting of one or more logical link management entities, one or more logical link entities, and a multiplex procedure.

logical link entity: the LLC layer protocol state machine controlling one logical link connection.

own receiver busy condition: a condition that results from the inability to accept additional I frames from the peer logical link entity.

peer receiver busy condition: a condition that results from the reception in of a RNR frame from the peer logical link entity.

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply. Additional applicable abbreviations and symbols can be found in 3GPP TS ~~01.04~~21.905 [1] and 3GPP TS ~~03.60~~23.060 [5].

ABM	Asynchronous Balanced Mode
ACK	ACKnowledgement
ADM	Asynchronous Disconnected Mode
CNF	Confirm
DISC	DISConnect
DM	Disconnected Mode
FRMR	FRaMe Reject
GMM	GPRS Mobility Management
GRR	GPRS Radio Resources service access point
I	Information
IOV	Input Offset Value
IND	Indication
LAPD	Link Access Procedure on the D-channel
LL	Logical Link
LLC	Logical Link Control
LLE	Logical Link Entity
LLGMM	LLC to GPRS Mobility Management service access point
LLM	Logical Link Management
LLME	Logical Link Management Entity
REQ	Request
RES	Response
RNR	Receive Not Ready
RR	Receive Ready
S	Supervisory
SABM	Set Asynchronous Balanced Mode
SACK	Selective ACKnowledgement
TIA	Telecommunications Industry Association

TOM	Tunnelling Of Messages
UA	Unnumbered Acknowledgement
UI	Unconfirmed Information
XID	eXchange IDentification

NEXT REVISION

4.1 Reference model

A model of layering the protocols in GPRS is illustrated in Figure 1.

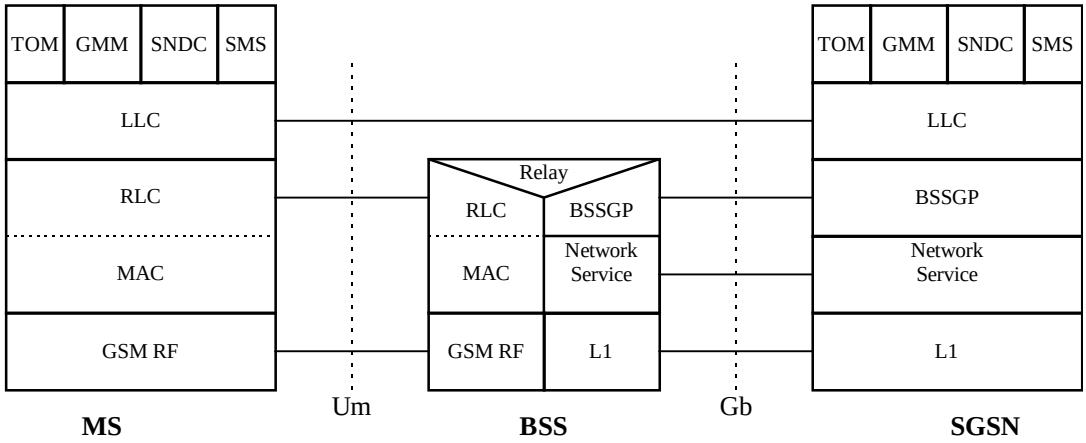

Figure 1: Protocol layering in GPRS

The LLC layer operates above the RLC and BSSGP layers in the reference architecture to provide logical links between an MS and its SGSN.

Above the LLC layer is located the SubNetwork Dependent Convergence (SNDC) layer, that controls the transfer of user data network layer PDUs (N-PDUs) between the MS and SGSN. The SNDC functionality is described in 3GPP TS ~~03.60~~ 23.060 [5] and specified in 3GPP TS ~~04.65~~ 44.065 [11].

The logical link control layer Service Access Points (SAPs) are the points at which the LLC layer provides services to the layer-3 protocols in Figure 1. In addition to the SNDC protocol, LLC provides service to the GPRS Mobility Management (GMM) protocol, to the SMS protocol, and to the Tunnelling of Messages (TOM) protocol.

An LLC layer connection is identified by the DLCI consisting of the SAP Identifier (SAPI) and the MS's Temporary Logical Link Identifier (TLLI).

Each LLC frame consists of the header, trailer, and information field. The header and trailer fields contain information such as SAPI, frame number and checksum, that are used to identify the frame and to provide reliable transmission. The information field is variable length. Both transmission and retransmission of each frame are controlled by the LLC layer.

Many of the formats and procedures are similar to the reference protocols, and differences are introduced only where needed to reflect the unique aspects of the GPRS architecture and requirements.

NEXT REVISION

4.5 Establishment of information transfer modes

4.5.1 Data link connection identification

A logical link connection is identified by a DLCI consisting of two identifiers: a SAPI and a TLLI.

The SAPI is used to identify the service access point on the SGSN side and the MS side of the LLC interface. SAPI is carried in the address field of each LLC frame.

The TLLI is used to identify a specific MS. TLLI assignment is controlled by GMM. TLLI is not carried in LLC frames, but in BSSGP messages as defined in 3GPP TS 48.018 ~~08.18~~ [12], and in RLC/MAC blocks as defined in 3GPP TS 44.018 ~~04.08~~ [8].

NEXT REVISION

4.7.2 Multiplex procedure

On frame transmission, the multiplex procedure generates and inserts the FCS, performs the frame ciphering function, and provides SAPI-based logical link control layer contention resolution between the various LLEs.

On frame reception, the multiplex procedure performs the frame decipher function and checks the FCS. If the frame passes the FCS check, the multiplex procedure distributes the frame to the appropriate logical link entity based on the DLCI.

3GPP TS 41.061 ~~01.61~~ [2] contains the requirements for the GPRS ciphering algorithm.

4.7.3 Logical Link Management

The Logical Link Management Entity (LLME) manages the resources that have an impact on individual connections. There is one LLME per TLLI. Functions provided by the LLME are:

- parameter initialisation;
- error processing; and
- connection flow control invocation.

The RLC/MAC layer functions are described in 3GPP TS 43.064 ~~03.64~~ [6]. BSSGP is specified in 3GPP TS ~~08.18~~48.018 [12]. SNDCP is specified in 3GPP TS ~~04.65~~44.065 [11].

4.8 GPRS Mobility Management

GPRS Mobility Management (GMM) uses the services of the LLC layer to transfer messages between the MS and the SGSN. GMM includes functions such as attach and authentication, and transport of session management messages for functions such as PDP context activation and deactivation. GMM procedures are defined in 3GPP TS ~~04.08~~24.008 [8a] and are beyond the scope of the LLC layer. Interaction between GMM and LLC is defined in terms of service primitives, see clause 7.

4.9 Short Message Service

The Short Message Service (SMS) uses the services of the LLC layer to transfer short messages between the MS and the SGSN. SMS procedures are defined in 3GPP TS ~~03.40~~23.040 [4] and 3GPP TS ~~04.11~~24.011 [9] and are beyond of the scope of the LLC layer. Interaction between SMS and LLC is defined in terms of service primitives, see clause 7.

NEXT REVISION

5.5 Frame Check Sequence (FCS) field

The FCS field shall consist of a 24 bit cyclic redundancy check (CRC) code. The CRC-24 is used to detect bit errors in the frame header and information fields.

The FCS field contains the value of a CRC calculation that is performed over the entire contents of the header and information field, except for UI frames transmitted in unprotected mode, in which case the FCS field contains the value of a CRC calculation that is performed over the frame header and the first N202 octets (see subclause 8.9.6) of the information field only (see subclause 6.3.5.5.2). The information over which the CRC is calculated is referred to as the dividend in this subclause. Bit (1, 1) of the dividend is the highest-order term in the calculation (see subclause 5.7.3). CRC calculation shall be done before ciphering at the transmitting side, and after deciphering at the receiving side.

NOTE: The definition below is different from that in 3GPP TS ~~04.22~~24.022 [10] only with respect to the variable dividend length k of the LLC frames. In 3GPP TS ~~04.22~~24.022, the RLP frame has a fixed dividend length, but the LLC frame has a variable dividend length.

The CRC shall be the ones complement of the sum (modulo 2) of:

- the remainder of x^k ($x^{23} + x^{22} + x^{21} + \ldots + x^2 + x + 1$) divided (modulo 2) by the generator polynomial, where k is the number of bits of the dividend; and
- the remainder of the division (modulo 2) by the generator polynomial of the product of x^{24} by the dividend.

The CRC-24 generator polynomial is:

$G(x) = x^{24} + x^{23} + x^{21} + x^{20} + x^{19} + x^{17} + x^{16} + x^{15} + x^{13} + x^8 + x^7 + x^5 + x^4 + x^2 + 1$

The result of the CRC calculation is placed within the FCS field as described in subclause 5.7.3.

NOTE: As a typical implementation at the transmitter, the initial content of the register of the device computing the remainder of the division is pre-set to all "1's" and is then modified by division by the generator polynomial (as described above) of the dividend; the ones complement of the resulting remainder is put into the FCS field.

As a typical implementation at the receiver, the initial content of the register of the device computing the remainder of the division is pre-set to all "1's". The final remainder, after multiplication by x^{24} and then division (modulo 2) by the generator polynomial of the received frame, will be (in the absence of errors):

$C(x) = x^{22} + x^{21} + x^{19} + x^{18} + x^{16} + x^{15} + x^{11} + x^8 + x^5 + x^4$

NEXT REVISION

6.4.1.7 NULL command

The NULL unnumbered command shall be used by an MS LLE to indicate a cell update. The NULL unnumbered command is only allowed if the Cell Notification is indicated by the SGSN (see 3GPP TS 23.060 [5] and 3GPP TS 24.008 [8a]).

No information field is permitted with the NULL command.

NEXT REVISION

7.1.1 Primitives types

The primitives types defined in the present document are:

NOTE: For the action sequence of these primitive types, see 3GPP TS ~~04.01~~44.001 [7].

7.1.1.1 Request

The Request primitive type is used when a higher layer is requesting a service from the next lower layer.

7.1.1.2 Indication

The Indication primitive type is used by a layer providing a service to notify the next higher layer of activities related to the Request primitive type of the peer.

7.1.1.3 Response

The Response primitive type is used by a layer to acknowledge receipt, from the next lower layer, of the Indication primitive type.

7.1.1.4 Confirm

The Confirm primitive type is used by the layer providing the requested service to confirm that the activity has been completed (successfully or unsuccessfully).

NEXT REVISION

7.2.1.3 LLGMM-TRIGGER

LLGMM-TRIGGER-REQ shall be used in the MS to order LLC to transmit any single frame. If there is a frame waiting to be transmitted in the MS, then this frame shall be transmitted. Otherwise if Cause indicates Cell Update and if Cell Notification is indicated by the SGSN (see 3GPP TS 24.008 [8a]), then a NULL frame with P=0 shall be transmitted. Otherwise, and if the LLE is in ABM state, a supervisory frame shall be transmitted according to subclause 8.6.4.1, Or if the LLE is in ADM state a UI frame with no information field shall be transmitted. There is only need to transmit a frame on one SAPI. Which SAPI to choose is implementation dependent.

LLGMM-TRIGGER-REQ is normally used for cell updates or for page responses, and the reason shall be indicated in the Cause parameter. If Cause indicates page response, then the GRR-DATA-REQ Cause parameter shall also indicate page response.

NEXT REVISION

8.9.9 LLC layer parameter default values

Table 1: LLC layer parameter default values

LLC Parameter	SAPI 1 GMM	SAPI 2 TOM 2	SAPI 3 User Data 3	SAPI 5 User Data 5	SAPI 7 SMS	SAPI 8 TOM 8	SAPI 9 User Data 9	SAPI 11 User Data 11
Version	0							
IOV-UI	0							
IOV-I	Note 2	Note 2	2^{27} • SAPI	2^{27} • SAPI	Note 2	Note 2	2^{27} • SAPI	2^{27} • SAPI
T200 and T201	5 s	5 s	5 s	10 s	20 s	20 s	20 s	40 s
N200	3	3	3	3	3	3	3	3
N201-U	400	270	500	500	270	270	500	500
N201-I	Note 2	Note 2	1 503	1 503	Note 2	Note 2	1 503	1 503
mD	Note 2	Note 2	1 520	760	Note 2	Note 2	380	190
mU	Note 2	Note 2	1 520	760	Note 2	Note 2	380	190
kD	Note 2	Note 2	16	8	Note 2	Note 2	4	2
kU	Note 2	Note 2	16	8	Note 2	Note 2	4	2

NOTE 1: Proper LLC operation requires that timer T200 be greater than the maximum time between transmission of command frames and the reception of their corresponding response or acknowledgement frames.

NOTE 2: This parameter applies to ABM procedures. ABM operation is not allowed for GMM, SMS, and TOM that use only UI frames for information transfer.

NOTE 3: The default values for SAPIs 3, 5, 9, and 11 have been chosen to correspond with the four GPRS quality of service delay classes, see 3GPP TS ~~02.60~~22.060 [3]. However, there is no fixed relationship between SAPI and delay class. The LLC layer parameters for any SAPI can be negotiated to support any QoS profile, see 3GPP TS ~~03.60~~23.060 [5].

NOTE 4: Proper LLC operation requires that the values for N201-U and N201-I are not greater than the maximum number of octets in an information field that can be transmitted or retransmitted over the Gb interface, see 3GPP TS ~~08.18~~48.018 [12]. It is the responsibility of the SGSN to negotiate N201-U and N201-I to values compatible with the usage of the Gb interface.

Annex A (normative): Ciphering

A.1 General

This annex specifies how LLC shall interface with the GPRS ciphering algorithm. The requirements for the GPRS ciphering algorithm are contained in 3GPP TS ~~01.61~~41.061 [2].

NEXT REVISION

Annex B (normative): Tunnelling of Messages (TOM)

Tunnelling of Messages (TOM) is a generic protocol layer used for the exchange of TOM Protocol Envelopes (see Figure B.1) between the MS and the SGSN. TOM uses two LLC SAPs, one for high-priority messages and another for low-priority messages. The TOM Protocol Envelope is composed of a TOM Protocol Header (containing one or more octets) and a Message Capsule. The TOM Protocol Header contains information about the specific application using the TOM protocol layer and any other TOM Protocol Discriminator-specific information. The Message Capsule is the actual payload of information in the TOM Protocol Envelope. One of the uses of the TOM protocol layer is to tunnel signalling messages between an MS and a non-GSM MSC/VLR when GPRS network elements are used in non-GSM networks. See 3GPP TS ~~03.60~~23.060 [5] and 3GPP TS ~~09.18~~29.018 [24].