



---

**Technical Document – Confidential**

**GSM PROTOCOL STACK**

**G23**

**L2R**

**DESIGN SPECIFICATION**

---

Document Number:	8411.602.99.001
Version:	0.3
Status:	Draft
Approval Authority:	
Creation Date:	1998-Oct-26
Last changed:	2015-Mar-08 by XGUTTEFE
File Name:	l2r.doc

## Important Notice

Texas Instruments Incorporated and/or its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products, software and services at any time and to discontinue any product, software or service without notice. Customers should obtain the latest relevant information during product design and before placing orders and should verify that such information is current and complete.

All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment. TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI products, software and/or services. To minimize the risks associated with customer products and applications, customers should provide adequate design, testing and operating safeguards.

Any access to and/or use of TI software described in this document is subject to Customers entering into formal license agreements and payment of associated license fees. TI software may solely be used and/or copied subject to and strictly in accordance with all the terms of such license agreements.

Customer acknowledges and agrees that TI products and/or software may be based on or implement industry recognized standards and that certain third parties may claim intellectual property rights therein. The supply of products and/or the licensing of software does not convey a license from TI to any third party intellectual property rights and TI expressly disclaims liability for infringement of third party intellectual property rights.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products, software or services are used.

Information published by TI regarding third-party products, software or services does not constitute a license from TI to use such products, software or services or a warranty, endorsement thereof or statement regarding their availability. Use of such information, products, software or services may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

No part of this document may be reproduced or transmitted in any form or by any means, electronically or mechanically, including photocopying and recording, for any purpose without the express written permission of TI.

## Change History

Date	Changed by	Approved by	Version	Status	Notes
1998-Oct-26	MG		0.1		1
1999-May-06	MG		0.2		2
2003-May-15	XGUTTEFE		0.3	Draft	

### Notes:

1. Initial version
2. Renumber

## Table of Contents

1.1	References .....	4
1.2	Abbreviations .....	4
<b>2</b>	<b>Overview .....</b>	<b>4</b>
<b>3</b>	<b>Software Architecture .....</b>	<b>5</b>
<b>Appendices.....</b>		<b>8</b>
A.	Acronyms .....	8
B.	Glossary .....	8

## List of Figures and Tables

## List of References

- [ISO 9000:2000]** International Organization for Standardization. Quality management systems - Fundamentals and vocabulary. December 2000

## 1.1 References

- [1] Rec. V.42 bis Data compression procedures for data circuit terminating equipment (DCE) using error correction procedures;  
(CCITT-V.42 bis, 1990)
- [2] European digital cellular telecommunications system (Phase 2);  
Radio Link Protocol (RLP) for data and telematic services on the Mobile Station - Base Station System (MS - BSS) interface and the Base Station System - Mobile-service Switching Centre (BSS - MSC) interface  
(GSM 4.22, September 1994, version 4.3.0)
- [3] European digital cellular telecommunications system (Phase 2);  
General on Terminal Adaptation Functions (TAF) for Mobile Stations (MS);  
(GSM 7.01, December 1995, version 4.10.0)
- [4] European digital cellular telecommunications system (Phase 2);  
Terminal Adaptation Functions (TAF) for services using asynchronous bearer capabilities;  
(GSM 7.02, September 1994, version 4.5.1)
- [5] MCU-DSP Interfaces for Data Applications;  
Specification S844  
(C. Bianconi, Texas Instruments, March 1998, version 0.1)
- [6] Message Sequence Charts L2R  
8411.202.98.100; Condat GmbH

## 1.2 Abbreviations

ACI	Application Control Interpreter (AT-Commands)
DCE	Data Communication Equipment (Mobile Station)
DPM	Dual Ported Memory
DTE	Data Terminal Equipment (Terminal, PC)
L2R	Layer 2 Relay entity
L2RCOP	L2R Character Oriented Protocol
RLP	Radio Link Protocol

## 2 Overview

G23 is a software package implementing Layers 2 and 3 of the ETSI-defined GSM air interface signalling protocol, and as such represents that part of a GSM Phase 2 compliant mobile station's protocol software which is both, platform and manufacturer independent. Therefore, G23 can be viewed as a building block providing standardised functionality through generic interfaces for easy integration.

The G23 suite of products consists of the following items:

- Layers 2 and 3 for speech & short message services,
- Layers 2 and 3 for fax & data services,
- Application control interface,
- Basic public MMI [02.30] and
- Test and integration support tools.

This document describes the design specification of the Layer 2 Relay entity (L2R).

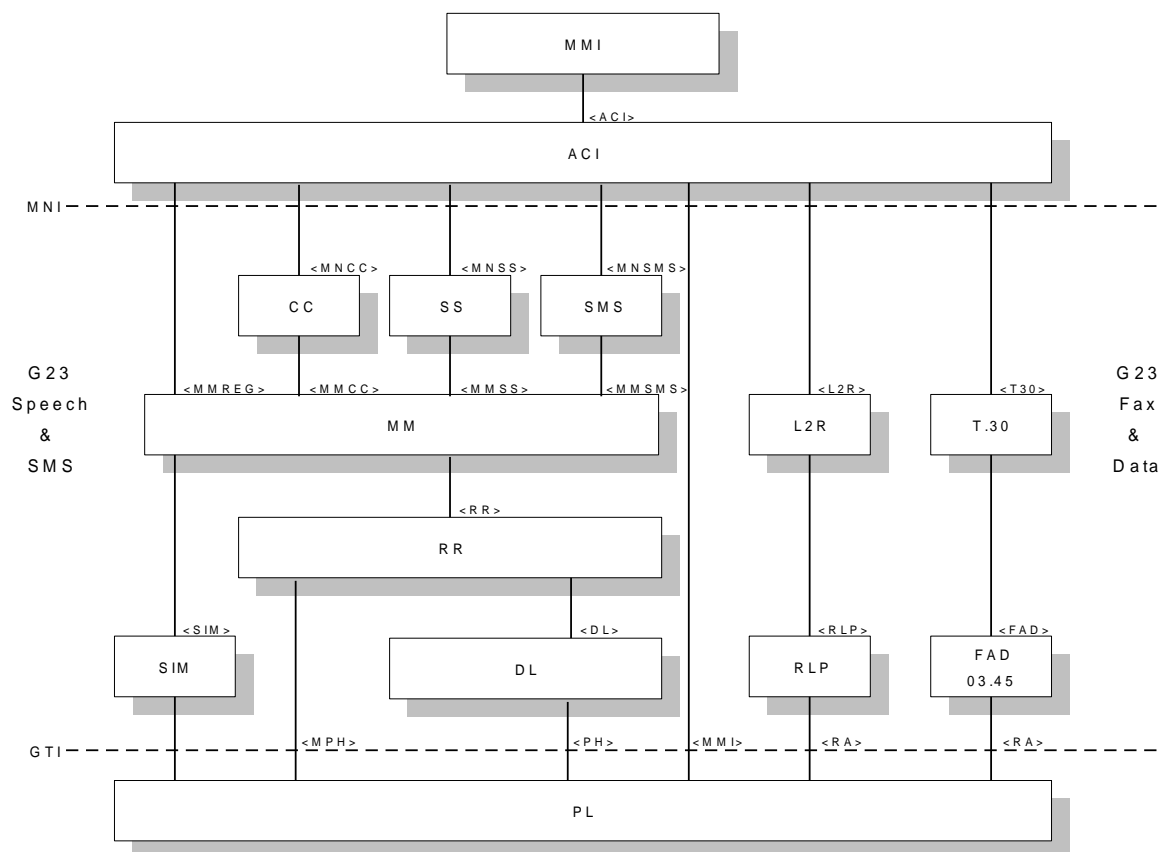


Fig. 1: G23 Software Architecture

### 3 Software Architecture

The main functions of the L2R entity are:

- Support of the L2RCOP.
- Relaying the character stream to the L2RCOP.
- Buffering of data in both directions.
- Data compression according to V42.bis.
- Flow control.
- Transfer of status bits.
- Transfer of BREAK condition.

The L2R entity consists of three sub-entities as shown in Figure 3-1.

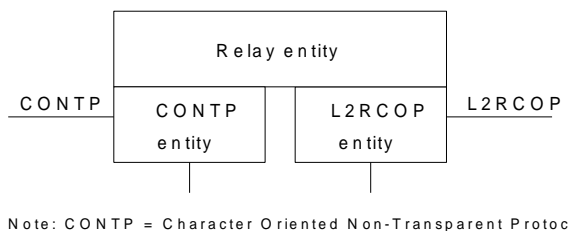


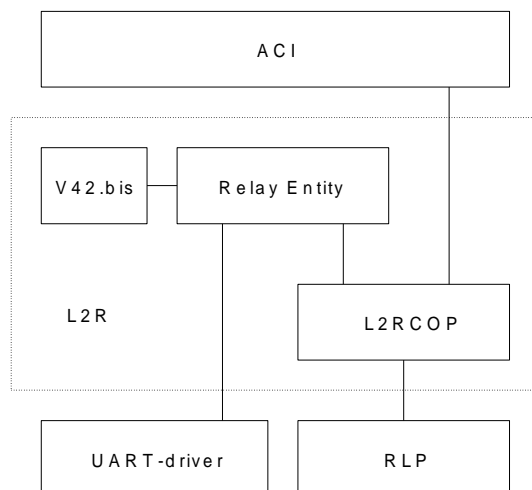
Figure 3-1: L2R sub-entities

The relay entity transfers data and status information between the CONTP entity and the L2RCOP entity. There is no direct communication between the CONTP entity and the L2RCOP entity. Moreover the relay entity performs the data compression function.

The L2RCOP entity is responsible for handling the L2RCOP. Moreover it is responsible for buffering the data and for flow control, transfer of status bits and the BREAK condition. The L2RCOP entity uses the services of the RLP entity.

In the current implementation no protocol is supported on the TE interface. Therefore the CONTP entity is void and the relay entity communicates directly with the lower layer, i.e. with the USART driver. If a protocol will be implemented, it will be handled by the CONTP entity.

The following diagram shows, how the L2R entity is implemented and how it is related to other entities.



**Figure 3-2: L2R Software Architecture**

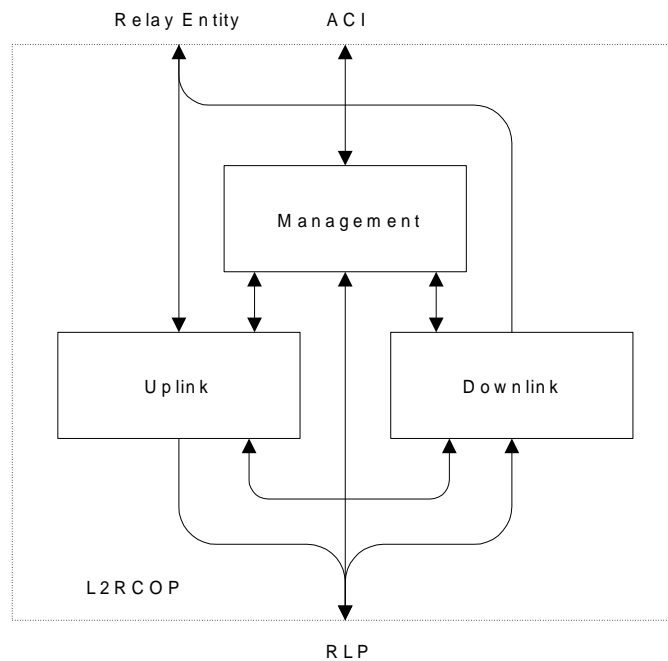
ACI controls the L2R entity, but data transfer is done independently from ACI. Data are passed from the UART-driver to the RLP entity and vice versa by L2R without the help of ACI.

The data compression function V42.bis is part of the L2R, but physically it is performed in the DSP. The communication with the V42.bis function in the DSP is done via the DPM (Dual Ported Memory). When data compression is used, in uplink direction all data are moved by the relay entity from the UART driver to the V42.bis buffer in the DPM. The compressed data are moved by the relay entity from a second buffer in the DPM to the L2RCOP. The downlink direction is implemented in a similar way.

The DPM access must be synchronised with the DSP. Therefore the relay entity is running in the context of the TDMA interrupt and not as part of the L2R task. At each interrupt a function of the relay entity is called, which does all the copying of data to and from the DPM buffers.

If no data compression is used, the relay entity is still running in the TDMA interrupt context. But the data are copied directly from the UART driver to the L2RCOP.

The L2RCOP part of the L2R entity is a regular task. It communicates with RLP by the primitives of the RLP SAP and with ACI by the primitives of the L2R SAP. In order to increase the performance the data transfer to and from the relay entity is not done by primitives, but via a functional interface. Primitives are only used from the relay entity to the L2RCOP task, when the task must be activated, i.e. after enough data have been copied, so that a RLP data request can be sent to RLP (uplink) or a RLP data indication has been completely transferred, so that the primitive may be freed.



**Figure 3-3: Structure of the L2RCOP task**

The L2RCOP task is split again in 3 processes. One performs the data transfer in uplink direction, one in downlink direction and the management process supervises everything and handles the co-ordination of BREAK requests.

In the test environment (simulation) only the L2RCOP task can be tested, but not the relay entity, which is running in the context of the TDMA interrupt. In this case the functional interface of the L2RCOP is not used, but all data transfer to and from L2RCOP is done by primitives.

## Appendices

### A. Acronyms

**DS-WCDMA** Direct Sequence/Spread Wideband Code Division Multiple Access

### B. Glossary

**International Mobile Telecommunication 2000 (IMT-2000/ITU-2000)** Formerly referred to as FPLMTS (Future Public Land-Mobile Telephone System), this is the ITU's specification/family of standards for 3G. This initiative provides a global infrastructure through both satellite and terrestrial systems, for fixed and mobile phone users. The family of standards is a framework comprising a mix/blend of systems providing global roaming. <URL: <http://www.imt-2000.org/>>