3GPP GERAN TSG#12 ***GP-023436***
Sophia Antripolis, France, 18-22 November 2002

Source: Rapporteur

3G TR 50.099 V0.23 (2002-11)

Project schedule

GSM/EDGE RAN (GERAN)
Project scheduling and open issues for GERAN

Contents

Foreword

New due to the change to 3GPP

Scope

The purpose of this document is to describe the schedule of the GSM/EDGE radio access network (GERAN) standardisation process and to view it's current state and open issues that are still under discussion. It also lists the new standards and necessary amendments to the 3GPP specifications for the technical realisation of the functions. GERAN is a term used to describe a GSM and EDGE based 200 kHz radio access network. The GERAN is based on GSM/EDGE release 99, and covers all new features for GERAN R4 and subsequent releases, with full backward compatibility to previous releases. This document focuses in the standardization activities around the issues of:

- IP Multimedia (real-time end-to-end IP)
- Alignment with UMTS/UTRAN architecture, bearer services and QoS handling
- Spectrum efficiency and performance improvements
- Specification flexibility for future enhancements

which are seen as the essential parts of the GERAN and have been identified by TSG GERAN. Other activities are handled in separate project plans and are not covered here.

Abbreviations

EDGE	Enhanced data rates for GSM Evolution
GERAN	GSM/EDGE radio access network
COMPACT	Deployment of services in spectrum below 1 MHz

Support of specification work

This document is a 'living document' and permanently updated by the editor. Proposals for change shall be forwarded to editor (direct contact details are on the last page), where the latest version can be obtained at any time. The specification rapporteurs should make sure that this document always reflects the latest status of work.

Latest versions of the material are available to interested parties within 3GPP. Specification and Change Request rapporteurs should ensure the latest versions of their material is made available for review and comment.

General

- The GERAN work item(s) will provide a platform to provide the four UMTS bearer classes: conversational, streaming, interactive and background. This includes IP end to end voice and multimedia services. IP Multimedia (real-time end-to-end IP)
    - Support for simultaneous, multiple radio access bearers with different QoS profiles
    - New protocol stack to support the four radio access bearer classes
        - Conversational (including optimized voice service using AMR)
        - Streaming
        - Interactive

- Background

- Development / adaptation of a PDCP-based protocol
- Development / adaptation of a RLC/MAC protocol, including an evaluation of:
  - Separation of the RLC and MAC
  - Fast resource allocation procedures
- Optimized physical layer design for radio bearers (with a priority on voice for existing and future AMR modes)
- Development of a control plane protocol stack
  - Hand over for the PS domain
    - Design of new control channels for hand over signalling
    - Design of new hand over procedures
    - Design of new messages and measurements
    - Apart from the above radio interface related changes, hand over has to be supported in the remainder of the network and is RAN controlled.
  - Development of other RR signaling procedures and support for MM
    - e.g. on attach and access procedures, as well as broadcast messages.

- Alignment with UMTS/UTRAN architecture, bearer services and QoS handling
  - The same type of services as offered by UTRAN should be offered with GERAN
    - Alignment of bearer classes with UTRAN
    - Alignment of QoS mechanism with UTRAN.
  - Common RAN – CN interface and functional split for UTRAN and GERAN
  - Support of inter system hand over
- Spectrum efficiency and performance improvements
- Specification flexibility for future enhancements

Requirements

The radio requirements for GERAN have been approved and are attachted to appendix 2.

Functional description

The concept proposal for the GERAN is available as a first draft in 43.051, the GERAN stage 2 description. For normative information review the specifications named in the sections below.

Technical realisation and amendments

Documentation Structure Overview

With the introduction of GERAN the bearer concept of UMTS is being introduced. Therefore GERAN will be introduced mainly in the existing specifications and stage descriptions. When it comes to the protocol layers and connection to the core network a few new specifications might be necessary to be introduced.

Phased Introduction of Capability

In order to allow a fast introduction of GERAN in the specifications, GERAN has been split in two phases. Release R5 will establish the new bearer classes and provide basic voice over IP capability, release R6 will provide larger performance enhancements.

Work item status and approval time frame

This list reflects the work items running under the responsibility of TSG GERAN.

Feature	Building block	Work task	Level of completion	Date of completion	Status
GERAN/UTRAN interface evolution 1 GP-000481	Evolution of Iu ps	• Identification of GERAN requirements on Iu ps • Update of specifications		Nov 2001 Mar 2002	Ready for R5. Closed
GERAN/UTRAN interface evolution 2 GP-010417	Evolution of Iu cs GP-000430	• Identification of GERAN requirements on Iu cs • Update of specifications		Apr 2002 Jun 2002	Ready for R5. Closed
Low chip rate TDD option (UTRAN)	Low chiprate TDD interworking with GERAN GP-000432	• Handover and Cell Selection / Reselection to UTRA 1.28Mcps TDD			Ready for R4. Closed
GERAN improvements 1 GP-000433	Gb over IP GP-000434	IP-fication of Gb • Concept • Changes to 08.16, 08.18			Ready for R4. Closed
GERAN improvements 2 GP-012812	Gb enhancements GP-000436	Intra BSC NACC • Concept • Changes in 03.64 • Changes in 04.60 • Changes in 44.008			Ready for R4. Closed
	MS conformance test for Intra BSC NACC GP-012811	• Changes in 51.010	50%	Dec 2002	Started
GERAN improvements 3 GP-010909	Evolution of the transport for A GP-010910	• Definition of a new A/Ater Interface Transport Layer option based on the Iu Interface Transport Layer • Adaptation of the Layer 3 BSSMAP procedures as required.	0%	Dec 2002	Termimated. Not standardised
GERAN Improvements 4 GP-010363	Gb enhancements 2 GP-010363	Stage 2 Stage 3 (changes in 44.060) • Definition of enhanced countdown procedure • Definition of enhanced TBF release procedure			Ready for R4. Closed
GERAN Inter BSC NACC improvements over the Gb Interface GP-012313	Modification of Gb protocols for GERAN Inter BSC NACC over the Gb interface GP-012314	Stage 3 (changes to) • 48.018		Apr 2002	Ready for R5. Closed
	Modification of core network protocols for GERAN Inter BSC NACC for Gb interface GP-011877	Stage 2 • Concept • 23.060 change – Definition of Inter BSC NACC Stage 3 (changes to) • 29.060		Nov 2001 Apr 2002	

GERAN support for IP multimedia GP-010420	GERAN Header adaptation GP-010421	Header adaptation: • Definition of compression for PDCP protocol • Conceptual description in stage 2 • Necessary changes on stage 3	100%	Sept 2000 Oct 2001 Dec 2002	Ready for Rel-5. Closed
	GERAN Radio access bearer design for IP multimedia GP-010422	MuM control signalling for conversational multimedia services. • Identification of requirements • Necessary modifications due to SIP	?%	 Feb 2002 Dec 2002	Termimated. Not standardised
	GERAN MS Conformance test for support of IP multimedia GP-010424	• MS test	0%	Dec 2002	Termimated. Not standardised
	GERAN BTS Conformance test for support of IP multimedia GP-010425	• BTS test	0%	Dec 2002	Termimated. Not standardised
Alignment of 3G functional split and Iu GP-021256	GERAN user / control plane GP-021255	Alignment w ith UMTS bearer concept • Stage 2		Jun 2001	Ready for R5.
		• Adoption of the UTRAN PDCP		Dec 2001	
		• Development of RLC / MAC		Aug 2002	
		• Development of GERAN RRC		Jun 2002	
		• Ciphering and integrity protection concept paper		Apr 2002	
		• Multiple TBF or equivalent Concept paper		Feb 2002	
		• Paging concept		Apr 2002	
		• Dedicated physical subchannels. Includes traffic and control channels		Nov 2001	
		• Iu support and broadcast concept		Apr 2002	
		• Impact of using RLC instead of LAPDm concept		Feb 2002	
		• Contention resolution, mobile-station identity, and access concept		Nov 2001	
		• PDCP concept		Apr 2002	
		• Dow nlink delayed TBF release		Aug 2002	
		• Add transparent RLC Concept		Feb 2002	
		• Handover concept		Feb 2002	

		• Physical layer alignment with UMTS bearer concept • Control channels in 45.003 • Receiver performance in 45.005 for PDTCH/TCH and control channels		Jun 2001	
	Iu rg interface GP-010428	Inter BSS interface Identification of requirements Stage 2 Adoption of relevant parts from Iu r Complementation with GERAN specifics New stage 3		Jun 2002	Ready for R5. Closed
		Inter BSS-RNS interface Identification of requirements Stage 2 Adoption of relevant parts from Iu r Complementation with GERAN specifics New stage 3		Jun 2002	Ready for R5. Closed
	Voice over GERAN PS and CS concept GP-021252	Voice over GERAN PS and CS concept • Architecture for A, Iu cs and Iu ps • Handover • RTP payload		Nov 2001	Ready for R5. Closed
	GERAN MS Conformance test for GERAN interface evolution GP-021253	• MS test	0%	Dec 2002	Not started
	GERAN BTS Conformance test for GERAN interface evolution GP-021254	• BTS test	0%	Dec 2002	Not started
Enhanced A/Gb feasibility study GP-022565	Enhanced A/Gb feasibility study GP-022565	• Requirements for the support of conversational services • Identification of the different building blocks for the provision of conversational services on the existing A/Gb protocol stack • Outline of impact and feasibility of these building blocks and their different solutions • Impact on 3GPP architecture and requirement to co-ordinate with other TSGs (CN, SA) • Standardisation effort • Dependency to other features	75%	Nov 2002	Started

Enhancement of Broadcast and Introduction of Multicast (in responsibility of TSG SA1)	Support of the Multimedia Broadcast Multicast Service (MBMS) in GERAN GP-022566	• Impact on the logical and physical channels • Simultaneous support of MBMS services • Simultaneous support of MBMS and non-MBMS services • Resynchronisation at cell change • Decision making process between point-to-point or point-to-multipoint configurations • MBMS channel allocation procedures to multiple MSs • Changes to the Gb interface • GERAN-specific changes to the Iu-ps interface • Interaction between MBMS and Iu-flex • Security aspects • MS conformance tests	10%	June 2003	Started
Flow control supporting an MS with multiple data flows with different QoS over the Gb interface GP-021767	Update of stage 2 specifications	• Concept document 23.060 (changes to) – Flow Control		June 2002 June 2002	Closed
	Modification of BSSGP protocol GP-021508	Stage 3 (changes to) • 48.018		June 2002	Ready for release 5. Closed
Multiple TBF in A/Gb mode GP-021263	Multiple TBF in A/Gb mode GP-021263	• Multiple TBF Concept paper • Multiple TBF Stage 2 (43.064) CRs • Multiple TBF Stage 3 (44.060) CRs	50%	Nov 2002	Started
	Multiple TBF in A/Gb mode – MS testing GP-022098	• MS conformance tests	0%	Jun 2003	Started
Seamless support of streaming services in A/Gb mode GP-022561	Identification of requirements for streaming GP-022564	• Requirements	20%	Feb 2003	Started
	Performance study of cell change mechanisms GP-022562	• Performance of NACC • Performance of cell change in DTM for the PS domain • Handover	10%	Feb 2003	Started
	Reduction of service interruption times and packet loss during mobility procedures GP-022563	• Optimisations of existing mechanisms/procedures • Inter-system NACC • PS Handover (within GERAN and between GERAN and UTRAN) • Dependency to other features	0%	June 2003	Started

	MS conformance testing GP-023424	• MS conformance tests	0%	December 2003	Not Started
Flexible Layer One for GERAN GP-021018	Realisation of a Flexible Layer One GP-021019	Technical Report Architecture in 45.001 and 43.051 Multiplexing in 45.002 Channel Coding in 45.003 Performance Requirements in 45.005 Radio subsystem link control in 45.008 Requirements in 44.004	30%	Jan 2003	Started
	Signalling and protocol support for a Flexible Layer One GP-021020	Modifications to RLC/MAC in 44.060 and 44.160 Modifications to RRC in 44.118 and 44.018	10%	Jan 2003	Started
	Security for a Flexible Layer One GP-021021	Ciphering in 44.160,44.118, 44.060 and 44.018	0%	Jan 2003	Started
	GERAN MS Conformance test for the Flexible Layer One GP-021022	MS Test in 51.010	0%	Jun 2003	Started
	GERAN BTS Conformance test for the Flexible Layer One GP-021023	BTS Test in 51.021	0%	Jun 2003	Started
Addition of frequency bands to GSM GP-022072	Addition of frequency bands to GSM – Changes to core specs GP-022073	45.005 New frequency ranges 45.050 Scenarios for new frequencies 24.008 Classmark information elements 45.008 Add frequency ranges 45.001 Add frequency and channels 43.030 Add frequency ranges 43.022 Add channels to be searched	80%	Dec 2002	Ongoing
	Addition of frequency bands to GSM – Changes for conformance tests GP-022074	51.010-1 Add testing	0%	Dec 2002	Started
Enhanced Power Control GP-012748	Realization of Enhanced power control and signaling support GP-012749	Concept Changes to 43.051 Changes to 44.004 Changes to 44.018 Changes to 48.058 Changes to 45.001 Changes to 45.002 Changes to 45.003 Changes to 45.008		Nov 2001	Ready for Rel 5. Closed
	GERAN MS Conformance test for Enhanced Power Control GP-012750	• MS test	0%	Dec 2002	Not started

Comment [SBe1]: Do we need to update the Building Block if we change that ?

	GERAN BTS Conformance test for Enhanced Pow er Control GP-012751	• BTS test	0%	Dec 2002	Not started
8PSK AMR HR GP-012752	Definition of channel coding, performance requirements and signaling support GP-012753	• Concept • Changes to 44.018 • Changes to 45.001 • Changes to 45.002 • Changes to 45.003 • Changes to 45.005 • Changes to 24.008 • Changes to 48.058		Jun 2002	Ready for R5. Closed
	GERAN MS Conformance test for 8PSK HR GP-012754	• MS test	0%	Dec 2002	
	GERAN BTS Conformance test for 8PSK HR GP-012755	• BTS test	100%	Dec 2002	
GERAN enhancements for streaming services 1 GP-010430	GERAN enhancements for streaming services 1 GP-010430	• Concept • RLC protocol enhancement (SDU Discard)		Oct 2001 Nov 2001????	Ready for R5. Closed
GERAN enhancements for streaming services 2 GP-010429	GERAN enhancements for streaming services 2 GP-010429	Usage of ECSD Stage 2 Stage 3 • RLC PDU formats • MAC header		Jun 2001 Jun 2002	Ready for R5. Closed
Intra Domain Connection of RAN Nodes to Multiple CN Nodes: Overall System Architecture SA2 Feature	GERAN w ork for Intra Domain Connection of RAN Nodes to Multiple CN Nodes GP-020492	Stage 2 (changes to) • 43.051 Introduction of support for IDNNS in GERAN Iu mode Stage 3 (changes to) • 48.016 Use of Gb interface concepts w hen a netw ork applies IDNNS • 48.018 Include MSC/VLR identity in CS IMSI paging		Jun 2002	Ready for R5. Closed, accept changes for Gb over IP
700 MHz spectrum support GP-000449	GERAN support for the 700 MHz band	• Signaling support • Physical layer definitions • Receiver performance and RF budget			Ready for R4. Closed
	GERAN MS Conformance test for 700 MHz band GP-000451	• MS test		Jun 2001	Closed
	GERAN BTS Conformance test for GERAN interface evolution GP-000452	• BTS test	100%	Dec 2002	Ongoing

Comment [Eric2]: To be closed at GERAN #13

Comment [EU3]: Page: 1
Can be closed

Comment [Eric4]: Will be closed at GERAN #13

Real Time QoS for packet services including VoIP (UTRAN)	HOs: maintenance of real-time QoS while moving between cells in the PLMN including inter-SGSN change and SRNS relocation or possibly other mechanisms (UTRAN) GP-010431	Handover for the packet switched domain • Stabile RT handover report 25.936 including header removal • Update of stage 2 • Update of relevant stage 3 specs		Nov 2001	Closed
Wideband telephony services (UMTS)	Support of WB AMR in GERAN GP-000453	GMSK and 8PSK WB FR / HR support • Channel coding in 45.003 • Signalling for A interface • Signalling for Iu • Link adaptation in 45.009 • Receiver performance in 45.005		Apr 2002 Nov 2001 Jun 2002	Ready for R5. Closed
	GERAN MS Conformance test for WB AMR GP-000454	• MS test	0%	Dec 2002	Not started
	GERAN BTS Conformance test for WB AMR GP-000455	• BTS test	100%	Dec 2002	Ongoing
Location service (UMTS)	LCS interoprability aspects to GERAN GP-000456	• Co-ordinated development of GSM LCS Phase 2 and UMTS LCS, S2 and GERAN			Ready for R5. Closed
	Location service for GERAN R4 GP-010932	• Work for aligning LCS R4 CN and GERAN			Ready for R4. Closed
	Location Services (LCS) for GERAN in A/Gb Mode GP-011925	• GERAN LCS Stage Two • Gb interface support for LCS • L3 protocol support for LCS • Stage 3 specifications		Feb. 2002	Ready for Rel-5. Closed
	Location Services (LCS) for GERAN in Iu Mode GP-011926	• GERAN LCS stage 2 • Iu interface support for LCS • Iur-g interface support for LCS • RRC protocol support for LCS • Additional impacts on Broadcast of LCS data on packet channels • Stage 3 specifications		Stage 2- GERAN #8 Feb. 2002 Stage 3 – GERAN #9 Jun 2002	Ready for R5. Closed

Comment [EU5]: Page: 1

Comment [EU6]: Page: 1

Comment [Eric7]: To be closed at GERAN #13

	GERAN MS Conformance test for LCS GP-000458	• Develop LCS MS test case work plan (Release 98/99/4) • Develop LCS MS test cases	?%	Dec 2002 (#11)	Ongoing
	GERAN BTS Conformance test for LCS GP-000459	• Develop LCS BTS test case work plan (Release 99/99/4) • Develop LCS BTS test cases	?%	Dec 2002	Work has not started
Uplink TDOA feasibility study GP-012794	Uplink TDOA feasibility study GP-012794	• Performing of a feasitibility study		Jun 2002	Closed.
MS Conformance Testing of Dual Transfer Mode GP-023226	MS Conformance Testing of Dual Transfer Mode	• MS Conformance Testing of Dual Transfer Mode	100%	Feb 2003	Ongoing
Single Antenna Receiver Interference Cancellation (SAIC) GP-023316	Single Antenna Receiver Interference Cancellation (SAIC)	• Determine feasibility of SAIC for GMSK and 8PSK scenarios under realistic synchronized and non-synchronized network conditions. Using a single Feasibility Study, both GMSK and 8PSK scenarios will be evaluated individually. • Realistic DIR (Dominant-to-rest of Interference Ratio) levels and distributions based on network simulations and measurements. • Robustness against different training sequences. • Determine method to detect/indicate SAIC capability.	10%	April 2003	Ongoing
Uplink TDOA location determination for GSM/GPRS GP-023316	Uplink TDOA location determination for GSM/GPRS	• Addition of U-TDOA in the CS domain • Addition of U-TDOA in the PS domain		April 2003 Nov 2003	Ongoing

	Closed work items

New Specifications

GSM No.	TDOC	CR	Subject	CR Comp. Resp.	TSG	Completion Date
43.051			**GERAN overall description**	**S. Gillaume (Nokia)**	**GERAN**	**Nov 00**

43.059			**Functional Stage 2 Description of Location Services in GERAN**	**M. Livingston (Nokia)**	**GERAN**	**April 2001**
44.118			**GERAN Iu mode RRC**	**S. Hamiti**	**GERAN**	**June 2002**
44.160			**GERAN Iu mode RLC/MAC**	**?**	**GERAN**	**June 2002**
50.099		**TR**	**GERAN project schedule and open issues**	**F. Mueller**	**GERAN**	**Dec 2002**
xx.xxx		**TR**	**Optimized speech in the IMS domain**	**B. Guarino**	**GERAN**	**?**

Approved **Set on hold** **#29 Send to SMG #29** ~~**CR0000A000**~~ **CR has been cancelled**

A-1 GERAN radio requirements

A-1.1 Introduction

The GERAN provides a range of bearer services to mobile and stationary users in a variety of application areas and operating environments. The radio access network will be connected to the third generation core network and will as far as possible extend the services of the fixed networks to mobile users.

This document outlines the overall requirements for GERAN release 2000, which includes all GSM/EDGE work items of release 2000. More specific radio requirements, such as radio requirements for the AMR wide band speech codec, are included as references, if available, and are not discussed in this document. The requirements should be used as guidelines for the design of the radio access network.The requirements should be aligned with the requirements on UTRAN.

A-1.2 Definitions and Abbreviations

A-1.2.1 Definitions

GSM/EDGE RAN GERAN is a term used to describe a GSM and EDGE based 200 kHz radio access network. The GERAN is based on GSM/EDGE release 99, and covers all new features for GSM Release 2000 and subsequent releases, with full backward compatibility to previous releases.

A-1.2.2 Abbreviations

3G	Third Generation
BER	Bit Error Rate
CN	Core network
CS	Circuit Switched
GERAN	GSM/EDGE Radio Access Network
RAN	Radio Access Network
RAB	Radio Access Bearer
RB	Radio Bearer
QoS	Quality of Service
PS	Packet Switched
UMTS	Universal Mobile Telecommunications System
UTRAN	UMTS Terrestrial Radio Access Network

A-1.3 High Level Requirements

The following high level requirements have been initially identified for the GERAN in responsibility of SMG2:

- All bearer classes (conversational, streaming, interactive and background) as defined for UTRAN shall be provided
- The same quality of service handling and radio access bearer service attributes shall be supported as required for UTRAN (as described in TS 23.107). Whether the same range of values of the service attributes as supported by UTRAN shall be supported by GERAN in Release 2000 is for further study
- Support for multiple QoS profiles in parallel shall be provided in the GERAN.

A-1.4 Bearer Definition

A-1.4.1 Radio Access Bearers

GERAN shall provide the same radio access bearers as UTRAN. However, voice is foreseen to be important future service and therefor it seen as important to optimize the conversational radio access bearer class for IP voice services.

It is required to have the GERAN support Adaptive Multi-Rate (AMR) CODEC speech and to be consistent with S2 requirements. Further, it is desired to have the GERAN support Tandem Free Operation (TFO) services. Further, voice radio access bearers should be provided with quality and delay comparable to current digital cellular systems.

Figure 1 shows the UMTS QoS architecture. As illustrated in the figure the Radio Access Bearer Service is realized by a Radio Bearer Service and an Iu-Bearer Service.

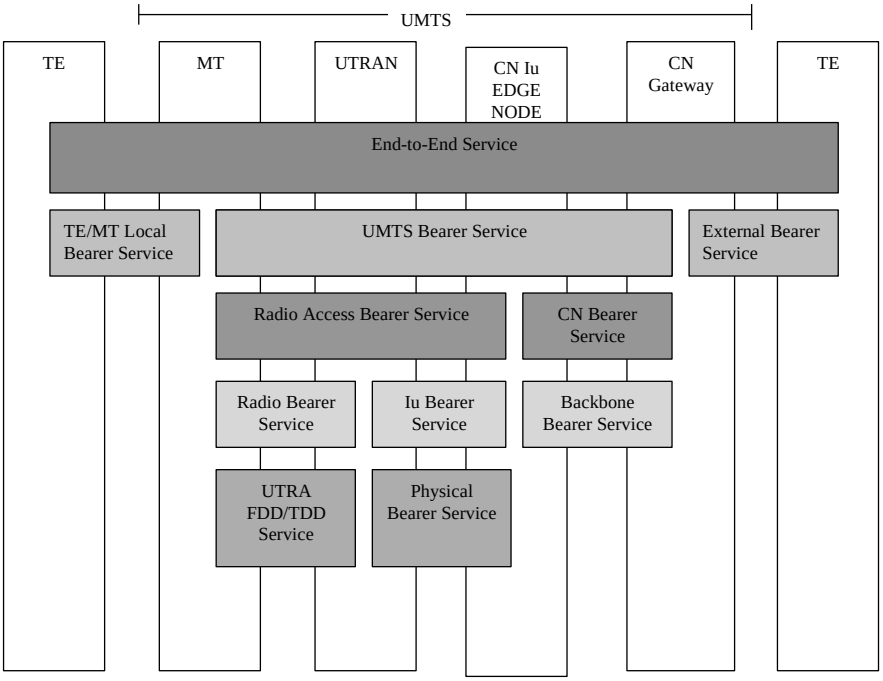

Figure 1. UMTS QoS architecture.

A-1.4.1.1 **Radio Access Bearer Attributes**

A set of attributes and their possible values are used to describe a radio access bearer capability. This set has been chosen so that a radio access bearer capability can be entirely defined by giving a value to each attribute of the set. In particular, the set and the associated allowed values enable characterization of future (not yet used or foreseen) transfer needs. For the GERAN the same set of attributes are chosen as for the UTRAN, which are defined in 23.107 [1]. The support of the different values may vary from the radio environment the user is in (indoor, urban, rural and etc.), see section A-1.4.2.1.

The values used by the 3G CN are as follows:

Table 1. Value ranges of the radio access bearer service attributes in UMTS.

Traffic class	**Conversational class**	**Streaming class**	**Interactive class**	**Background class**
Maximum bitrate [kbps]	<2000 (1) (2)	<2000 (1) (2)	< 2000 – overhead (2) (3)	<2000 - overhead (2) (3)
Delivery order	Yes/No	Yes/No	Yes/No	Yes/No

Maximum SDU size [octets]	<1500 (4)	<1500 (4)	<1500 (4)	<1500 (4)
SDU format information	(5)	(5)		
Delivery of erroneous SDUs	Yes/No/-	Yes/No/-	Yes/No/-	Yes/No/-
Residual BER	$5*10^{-2}$, 10^{-2}, 10^{-3}, 10^{-4} (6)	$5*10^{-2}$, 10^{-2}, 10^{-3}, 10^{-4}, 10^{-5}, 10^{-6} (6)	$4*10^{-3}$, 10^{-5}, $6*10^{-8}$ (6) (7)	$4*10^{-3}$, 10^{-5}, $6*10^{-8}$ (6) (7)
SDU error ratio	10^{-2}, 10^{-3}, 10^{-4}, 10^{-5} (6)	10^{-2}, 10^{-3}, 10^{-4}, 10^{-5} (6)	10^{-3}, 10^{-4}, 10^{-6} (6)	10^{-3}, 10^{-4}, 10^{-6} (6)
Transfer delay [ms]	80 – maximum value(6)	500 – maximum value (6)		
Guaranteed bit rate [kbps]	<2000 (1) (2)	<2000 (1) (2)		
Traffic handling priority			1,2,3 (8)	
Allocation/Retention priority	1,2,3 (8)	1,2,3 (8)	1,2,3 (8)	1,2,3 (8)
Source statistic descriptor	Speech/unknown	Speech/unknown	Speech/unknown	Speech/unknown

1) Bitrate of 2000 kbps requires that UTRAN operates in transparent RLC protocol mode, in this case the overhead from layer 2 protocols is negligible.

2) The granularity of the bit rate parameters must be studied. Although the UMTS network has capability to support a large number of different bitrate values, the number of possible values must be limited not to unnecessarily increase the complexity of for example terminals, charging and interworking functions. Exact list of supported values shall be defined together with S1, N1, N3 and R2.

3) Impact from layer 2 protocols on maximum bitrate in non-transparent RLC protocol mode shall be estimated.

4) Maximum SDU size shall at least allow UMTS network to support external PDUs having as high MTU as Internet/Ethernet (1500 octets). The need for higher values must be investigated by N1, N3, S1, R2, R3.

5) Definition of possible values of exact SDU sizes for which UTRAN can support transparent RLC protocol mode, is the task of RAN WG3.

6) Values are indicative. Exact values on Residual BER, SDU error ratio and transfer delay shall defined together with S1, N1, N3 and R2.

7) Values are derived from CRC lengths of 8, 16 and 24 bits on layer 1.

8) Number of priority levels shall be further analysed by S1, N1 and N3.

A-1.4.2 Radio Bearers

Mapping of radio access bearers onto radio bearers is up to the RAN as long as the requested QoS is achieved.

Each radio bearer will be mapped to one or more radio interface logical channels for the purposes of transmission over the GERAN. Suggested properties of the GERAN:

- The design of GERAN should allow for several radio bearers to be used simultaneously with single user equipment. This could be used for instance to provide support for multiple QoS profiles in parallel
- The design of GERAN should allow for optimised voice radio bearers in both the PS and the CS domain. The handling of TFO is for further study.

The design of GERAN should allow efficient support of the wide variety of services, including future services, which have yet to be defined.

A-1.4.2.1 Minimum radio bearer capabilities

Giving one of the possible values to each RAB service attribute defines a possible radio access bearer service. However, not all combinations are necessarily supported by the GERAN system. The following table shows potential combinations for the attributes that are expected to change dependent on the radio environment. The values given under the different QoS classes are Maximum bitrate/BER/Max Transfer Delay [1].

Table 2. Minimum radio bearer capabilities.

Operating environment	Propagation conditions	Conversational	Streaming	Background	Interactive
Rural outdoor (Terminal relative speed to ground up to 250 km/h)	HT100 850/900 Mhz: RA250 1800/1900 Mhz: RA130	T.B.D.	T.B.D.	T.B.D.	T.B.D.
Urban/ Suburban outdoor (Terminal relative speed to ground up to 120 km/h)	HT100 TU50	T.B.D.	T.B.D.	T.B.D.	T.B.D.
Indoor/ Low range outdoor (Terminal relative speed to ground up to 10 km/h)	Indoor TU3	T.B.D.	T.B.D.	T.B.D.	T.B.D.

A-1.4.2.2 RTP/UDP/IP Header adaptation

GERAN shall support header adaptation in order to provide an increase in spectral efficiency. In particular the header adaptation mechanism should not degrade the hand over performance and user perceived quality (e.g. header adaptation mechanism should not degrade the speech quality). Error propagation due to header adaptation should be kept to a minimum or avoided, if at all possible. In addition the header adaptation mechanism should operate under all expected BER and delay conditions.

A-1.5 Handover requirements

This section deals with both intra and inter GERAN handover and cell re-selection requirements. Cell re-selection refers to cell change when in idle mode or ready state, whereas handover refers to change of physical channel (in the same or possibly in a new cell) when in non-idle state.

The overall requirements on GERAN handover and cell re-selection are:

---

[1] To complete the requirements the percentile for the values given in the table should be defined.

- For support of pre release 2000 terminals the GERAN should provide cell re-selection in the same way as (E)GPRS;
- For support of pre release 2000 terminals the GERAN should provide handover in the same way as GSM;
- Cell re-selection and handover should be in the responsibility of the radio access network[2];
- GERAN should support intra- (within a cell) and inter- (between cells) cell handovers;
- For the GERAN release 2000, handover performance should be no worse than for GSM circuit switched services. In particular, the transmission gap should be no more than 150 ms;
- In GERAN release 2000, other requirements related to the HO function shall be of same quality as in GSM release 99 (e.g. neighbourcell measurement rate).

Table on Intra GERAN handover and cell reselection

	GERAN R00 PS	GERAN R99 PS	GERAN R00 CS	GERAN R99 CS
GERAN R00 PS	HO CRS	CRS	No	No
GERAN R99 PS	CRS	CRS	No	No
GERAN R00 CS	No	No	HO	HO
GERAN R99 CS	No	No	HO	HO

HO is for RT services
CRS is for NRT services
„No" means neither HO or CRS is supported

A-1.5.1 Interworking with other systems

Specific requirements are expected from SA2. The following table should be seen as the working assumption on required handover scenarios between different systems while waiting input from SA2.

Table on Inter GERAN handover and cell reselection

	ANSI 136	UTRAN R99 PS	UTRAN R99 CS	UTRAN R00 PS	UTRAN R00 CS
GERAN R00 PS	No	CRS	No	HO CRS	No
GERAN R00 CS	FFS	No	HO	No	HO

HO is for RT services
CRS is for NRT services
„No" means neither HO or CRS is supported

A-1.6 Security issues

Specific requirements are expected from SMG10.

[2] Network controlled cell re-selection refers to cell re-selection as in GSM, where the cell selection procedure is controlled by broadcasted parameters.

A-1.7 Operational requirements

A-1.7.1 Architecture requirements

Specific requirements are expected from SA2.

A-1.7.2 Radio operation environments

GERAN should support all Radio Access Bearers in the radio environments specified in current GSM 05.05.

A-1.7.3 Radio access network planning

For a comparable services, GERAN should provide cell range at least as good as GSM Release 99. GERAN systems should not affect the performance of existing EGPRS/GSM systems.

GERAN should support frequency planning similar to GSM Release 99.

Note: Coverage for RT services of GERAN needs to be defined.

A-1.7.4 Interference Management

GERAN should support interference management at least similar to GSM Release 99. The GERAN solution should not preclude the use of smart antennas.

A-1.7.5 Frequency bands and licensing

GERAN systems should be deployable in at least those frequency bands defined in GSM 05.05 release 99.

A-1.8 Efficient spectrum usage

A-1.8.1 Spectral efficiency

For comparable services, GERAN systems should have significantly higher spectral efficiency as compared to Release 99. It is understood that implementation of increased spectral efficiency may be restricted by the requirement of creating a Release 2000 Standard.

A-1.8.2 Spectrum utilization

For initial deployment GERAN shall support all services in at least 2.4 MHz of spectrum. GERAN shall support all packet domain services (real and non real time) in COMPACT mode deployment. It is recognized that spectrum efficiency may be greater with larger spectrum deployments.

A-1.9 Deployment requirements

A-1.9.1 Deployment

GERAN should be flexible to support a variety of initial deployments.

It should be possible to deploy GERAN with a minimum of upgrades to GSM Release 99 radio equipment. GSM/EDGE RAN may be deployed as a contiguous coverage, Island coverage, or Spot coverage system. It is anticipated that GERAN will also be deployed on a city-by-city basis.

A-1.9.2 Backward compatibility

It should be possible to deploy GERAN in spectrum shared with GSM Release 99, as well as other GSM systems. GERAN should be deployable in carriers and time slots adjacent to those supporting GSM Release 99, at least with fixed division of time slots between GERAN and the other systems.

It is recognized that there may be advantages to dedicating radio resources system-wide to some types of GERAN operation.

A-1.9.3 Complexity / cost

It should be possible to provide a variety of MS as well as Base Station types of varying complexity, cost and capabilities in order to satisfy the needs of different types of operator and user scenarios. The Release 2000 is expected to imply the same RF properties as a Release 1999.

A-1.9.4 Terminal

GERAN systems should support a variety of terminal types, including advanced feature phones, PDA's, PCMCIA cards, and other terminal types. Hand portables and PCMCIA card sized GERAN terminals should be optimized in terms of size, weight, operating time, range, and the effective radiated power and cost/performance ratio.

A-1.9.5 Network

For further study

A-1.10 Requirements from bodies outside SMG

A-1.10.1 Electromagnetic compatibility

GERAN systems should cause no more interference to other equipment than current GSM-based systems.

A-1.10.2 RF radiation

GERAN systems should operate at RF emission power levels consistent with applicable recommendations and specifications for electromagnetic radiation.

A-1.10.3 Security

For further study

A-1.11 Evolution of GERAN

Release 2000 of GERAN should include efficient support of RT services in the PS domain and it should be aligned with UMTS. The GERAN shall be defined so that it can be implemented in phases with increasing functionality (for example making use of new technology), while allowing the maximum possible backwards compatibility. The introduction of new functions should be done in a manner that maximizes forward compatibility with enhancements expected in subsequent releases. The definition of GERAN should allow evolution to higher bit rates.

A-1.12 Open Issues

This section summerizes the open issues that have been identified in this document.

1. Is there support for multiple QoS profiles in parallel in R99

2. A discussion on the relation of TFO to the Transcoder (TRAU) position in the architecture highlighted the issue of how UTRAN deals with TFO. The following questions arose:
   1. Clarification on how TFO is handled in UMTS (This is a question for 3GPP TSG S4))
   2. What voice requirements will come from S2

3. Input from SA2 is expected on the RAB attribute value ranges.

4. The T.B.D. in table 2 need to be resolved. Another open issue in the table is whether other propagation models should be included, e.g. BUx.

5. Verify that the speech gap during handover should be no more than 150 ms is a GSM requirement.

6. The delay and data loss requirements on different handovers and cell re-selection shall be specified further. The requirements depend on the service and that should be reflected as well.

A-1.13 References

[1] TSG SA2, 23.107, "QoS Concept and Architecture".

A-2 History

Document history	
23th February 2000	First draft (V0.0.1)
2nd April 2000	Updated after GERAN #1 and EDGE WS #13 (V0.0.2)
8th May 2000	Updated after SMG2 #35 (V0.0.3)
22nd May 2000	Updated after SMG2 GERAN WS #2 (V0.0.4)
24th May 2000	Updated during SMG2 #36 (V0.0.5)
2nd August 2000	Updated for 3GPP S3 meeting (V0.0.6)
28th August 2000	Updated after SMG2 GERAN release 2000 and beyond Adhoc #1
9th October 2000	Updated after TSG GERAN #1 as 50.099 (V0.0.1)
6th November 2000	Updated after TSG GERAN Adhoc on release 2000 and beyond #2 as 50.099 (V0.0.2)
12th February 2001	Updated after TSG GERAN #3 (V0.0.5)
April 2001	Updated for TSG GERAN #4 (V0.06)
7th May 2001	Updated for TSG GERAN Adhoc on released 2000 and beyond #5 (V0.07)
11th May 2001	Updated during TSG GERAN Adhoc on release 2000 and beyond #5 (V0.08)
28th May 2001	Updated for TSG GERAN #5 (V0.09)
27th August 2001	Updated for TSG GERAN #6 (V0.10)
26th Nov 2001	Updated for TSG GERAN #7 (V0.11)
30th Nov 2001	Updated for TSG GERAN #7 (V0.12)
30th Nov 2001	Updated for TSG GERAN #7 (V0.13)
15th April, 2002	Updated for TSG-GERAN #9 (v0.15)
19th April, 2002	Updated for TSG-GERAN #9 (v0.16)
24th June 2002	Updated for TSG-GERAN #10 (V0.17)
28th June 2002	Updated during TSG GERAN #10 (V0.18)
25th August 2002	Updated for TSG GERAN #11 (V0.19)
30th August 2002	Updated during TSG GERAN #11 (V0.20)
20th November 2002	Updated during TSG GERAN #12 (V0.21)

Editor: David Bladsjö, Ericsson

Email: david.bladsjo@era.ericsson.se

Tel: +46-8-4048657