



## Digital cellular telecommunications system (Phase 2+); Feasibility Study on generic access to A/Gb interface (3GPP TR 43.901 version 13.0.0 Release 13)

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## Introduction

This document captures the results of the feasibility study of enabling generic access to A/Gb interface using alternate access means such as ADSL, Cable, Bluetooth, etc. Mobile stations obtain services from the GSM core network using such generic access means rather than through the traditional GERAN radio interface. The goal is to ensure no impact to the current A/Gb interface specifications.

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# 1 Scope

This document studies the feasibility of generic access to A/Gb interface. Specific areas of study are:

- Architecture to enable generic access.
- Access interface protocols required to provide connectivity to A/Gb interface and GSM/GPRS services.
- Security mechanisms to support generic access architecture.
- Determining feasibility for support of services currently supported through GERAN.

The focus of the study shall be on establishing the feasibility for supporting generic access in the home network case, while also identifying issues with extending the solution to the roaming scenarios.

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# 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.
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- 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 22.011: "Service accessibility".
- [2] 3GPP TS 23.234: "3GPP system to Wireless Local Area Network (WLAN) interworking; System description".
- [3] 3GPP TS 26.103: "Speech codec list for GSM and UMTS".
- [4] ITU-T Recommendation V.110: "Support by an ISDN of data terminal equipments with V-Series type interfaces".
- [5] IETF RFC 791: "Internet Protocol".
- [6] IETF RFC 793: "Transmission Control Protocol".
- [7] IETF RFC 2406: "IP Encapsulating Security Payload (ESP)".
- [8] IKEv2
- [9] EAP SIM
- [10] IPSec NAT
- [11] IETF RFC 768: "User Datagram Protocol".
- [12] IETF RFC 3550: "A Transport Protocol for Real-Time Applications".
- [13] 3GPP TS 33.234: "3G security; Wireless Local Area Network (WLAN) interworking security".
- [14] IETF RFC 2406: "IP Encapsulating Security Payload (ESP)".
- [15] 3GPP TS 23.122: "Non-Access-Stratum functions related to Mobile Station (MS) in idle mode".

## 3 Definitions, symbols and abbreviations

### 3.1 Definitions

For the purposes of the present document, the following terms and definitions apply.

**Generic Access Network:** an access network providing access to A/Gb interfaces using broadband IP network.

**Generic Access Network Controller:** the network node that connects to the MSC and SGSN via the A-interface and Gb interface respectively and mimics the functionality of the GERAN BSS.

**Roving:** the action of re-selection between 3GPP access technology and GAN for a mobile station in idle mode.

**Rove in:** the mobile station reselects from GERAN/UTRAN to GAN.

**Rove out:** the mobile station reselects from GAN to GERAN/UTRAN.

**Handover:** a mobile station engaged in a call moves between GERAN/UTRAN and GAN.

**Handover in:** the mobile station moves from GERAN/UTRAN to GAN.

**Handover out:** the mobile station moves from GAN to GERAN/UTRAN.

**Seamless:** free from noticeable transitions (i.e., no end-user action is required; speech interruptions are short; service interruptions are short; incoming calls are not missed; packet sessions are maintained; services work identically).

### 3.2 Symbols

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

A	GSM A Interface : the A interface is located between the MSC (Mobile service Switching Centre) and the BSS (Base station system or radio Sub-System).
Gb	GSM Gb Interface : the Gb interface connects the Base Station System (BSS) to the Serving GPRS Support Node (SGSN)
Up	Interface between MS and GAN
Wm	Reference point between a Packet Data Gateway and a 3GPP AAA Server or 3GPP AAA proxy

### 3.3 Abbreviations

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

A-GPS	Assisted-GPS
AAA	Authentication, Authorisation and Accounting
ADSL	Asymmetric Digital Subscriber Line
ARFCN	Absolute Radio Frequency Channel Number
BCCH	Broadcast Control CHannel
BSIC	Base transceiver Station Identity Code
BSS	Base Station Subsystem
BSSAP	Base Station Subsystem Application Part
BSSGP	Base Station Subsystem GPRS Protocol
BSSMAP	Base Station Subsystem Management Application Part
CBS	Cell Broadcast Service
CC	Call Control
CGI	Cell Global Identity
CI	Cell Identity
CM	Connection Management
CN	Core Network
CS	Circuit Switched
DSL	Digital Subscriber Line
DTAP	Direct Transfer Application Part



DTM	Dual Transfer Mode
ESP	Encapsulating Security Payload
FFS	For Further Study
GAN	Generic Access Network
GANC	Generic Access Network Controller
GERAN	GSM EDGE Radio Access Network
GMM	GPRS Mobility Management
GMMRR	GPRS Mobility Management Radio Resource
GRR	GPRS Radio Resource
HLR	Home Location Register
HO	Handover
HPLMN	Home Public Land Mobile Network
HTTP	Hyper Text Transfer Protocol
IMS	IP Multimedia Subsystem
IMSI	International Mobile Subscriber Identity
IP	Internet Protocol
L1	Layer 1 (physical layer)
LA	Location Area
LA	Location Area Identity
LCS	Location Services
LLC	Logical Link Control
MAC	Medium Access Control (protocol layering context)
MBMS	Multimedia Broadcast and Multicast Service
MM	Man Machine
MMI	Man Machine Interface
MMS	Multimedia Messaging Service
MO	Mobile Originated
MS	Mobile Station
MSC	Mobile Switching Centre
MVNO	Mobile Virtual Network Operator
NACC	Network Assisted Cell Change
NAS	Non-Access Stratum
NC2	Network Control mode 2
OTDOA	Observed Time Difference Of Arrival (positioning method)
PCM	Pulse Code Modulation
PDP	Packet Data Protocol
PDU	Protocol Data Unit
PLMN	Public Land Mobile Network
PS	Packet Switched
RAN	Radio Access Network
RR	Radio Resources
RRC	Radio Resource Control
RTCP	Real-Time Transport Control Protocol
RTP	Real Time Protocol
SAP	Service Access Point
SAPI	Service Access Point Identifier
SCCP	Signalling Connection Control Part
SGW	Security Gateway
SGSN	Serving GPRS Support Node
SID	Silence Descriptor
SIM	GSM Subscriber Identity Module
SM	Session Management
SMS	Short Message Service
SS	Supplementary Service
SSL	Secure Sockets Layer
TBF	Temporary Block Flow
TCP	Transmission Control Protocol
TFO	Tandem Free Operation
TLLI	Temporary Logical Link Identity
TMSI	Temporary Mobile Subscriber Identity
TrFO	Transcoding Free Operation
UDP	User Datagram Protocol

UNC	Universal Naming Convention
UTRAN	Universal Terrestrial Radio Access Network
VBS	Voice Broadcast Service
VGCS	Voice Group Call Service
VPLMN	Visited Public Land Mobile Network

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## 4 Assumed high level requirements

This clause summarizes the various assumed requirements for the feasibility study, when providing generic access to A/Gb interfaces:

- GAN interfaces to the core network shall use existing standard A interface to the MSC and Gb interface to the SGSN. Non-access stratum (NAS) protocols shall not be impacted.
- GAN shall reuse the existing GERAN identifiers toward the core network.
- GAN should support all telecommunication services supported using the A/Gb interfaces.
- GAN shall be able to operate over existing generic IP access networks (e.g. Cable, DSL, etc.). GAN-specific functionality shall not be required in the generic IP access network.
- Multi-mode terminals shall be able to perform automatic roving between GERAN/UTRAN and GAN, subject to the policies of the operator.
- Multi-mode terminals shall be able to perform seamless handover between GERAN/UTRAN and GAN, subject to the policies of the operator.
- PLMN selection and mechanisms for the avoidance of ping-pong between GERAN/UTRAN and GAN modes shall follow the principles enunciated in 3GPP TS 22.011.
- The home operator providing GAN service shall control access to Generic Access in all scenarios, including roaming.
- GAN shall provide security at least as good as GERAN for all traffic between mobile station and GANC. This includes support of bilateral authentication and encryption of all signalling and user plane traffic between mobile station and GANC.
- GAN should not require any change to existing standards e.g. the behaviour of MS in GERAN. Non-GAN capable MSs shall not be impacted due to GAN deployment.
- GAN shall be easily scaled with increasing users and traffic. It should efficiently use the resources of the generic IP access network.
- Existing charging mechanisms should be used for GAN.

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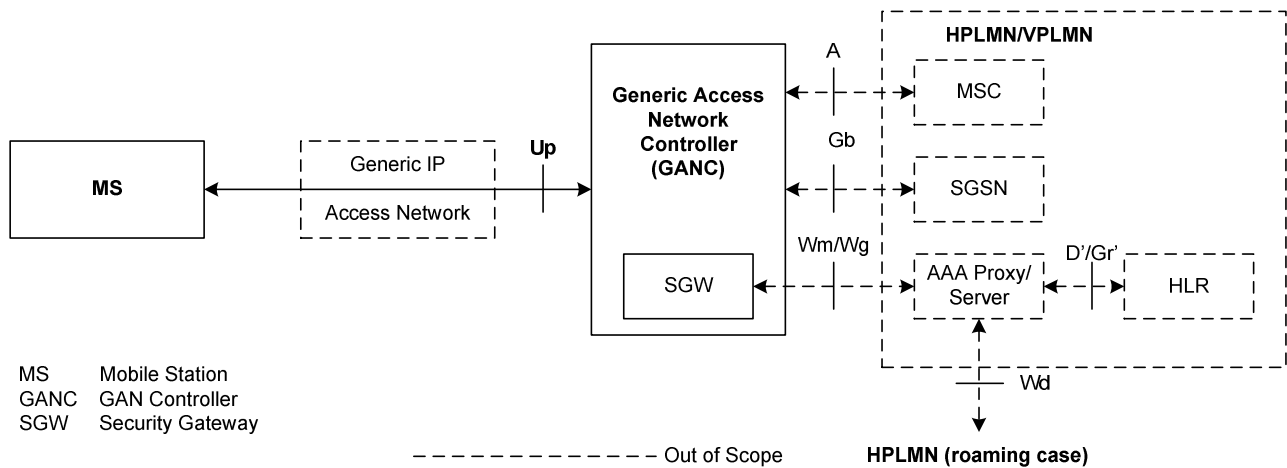
## 5 Study results

### 5.1 Architecture

#### 5.1.1 Architecture for generic access interface

##### 5.1.1.1 Functional architecture

An option for the Generic Access Network architecture is illustrated below.



**Figure 5.1.1.1.1: GAN Functional Architecture**

## 5.1.1.2 Functional entities

### 5.1.1.2.1 Mobile Stations (MS)

The MS contains a new functional block to access a generic access network (GAN).

### 5.1.1.2.2 Generic Access Network Controller (GANC)

The Generic Access Network Controller (GANC) appears to the core network as a GERAN base station subsystem (BSS). This entity mimics the role of the BSC in the GERAN architecture as seen from the perspective of the A/Gb interface. Thus the CN to which the GANC is connected to, is unaware of the different access mechanism being supported by the GANC compared to the BSC. A generic IP access network provides connectivity between the MS and the GANC.

The functionality provided by the GANC includes the following:

- User plane circuit switched services:  
Inter-working circuit switched bearers over Up interface to circuit switched bearers over A-interface, including transcoding voice to/from the MS to PCM voice from/to the MSC (when TFO/TrFO features are not being utilized).
- User plane packet switched services:  
Inter-working data transport channels over Up interface to packet flows over Gb interface
- Control plane functionality
  - Security Gateway (SGW) for the set-up of secure tunnel with MS for mutual authentication, encryption and data integrity
  - Registration for GAN service access and providing system information
  - Set-up of GAN bearer paths for CS and PS services. This includes establishment, management, and teardown of signalling and user plane bearers between the MS and the GANC.
  - GAN functions equivalent to GSM RR and GPRS RLC such as for paging and handovers.
  - Transparent transfer of L3 messages between the MS and core network.

**NOTE:** The AAA server is out of scope of the current study. It is used to authenticate the MS when it first sets up a secure tunnel to the GAN, specifically to the SGW.