ETSI TS 143 130 V13.1.0 (2017-10)

Digital cellular telecommunications system (Phase 2+) (GSM);
GSM/EDGE Iur-g interface;
Stage 2
(3GPP TS 43.130 version 13.1.0 Release 13)

A GLOBAL INITIATIVE

GLOBAL SYSTEM FOR
MOBILE COMMUNICATIONS

Reference

RTS/TSGR-0643130vd10

Keywords

GSM

ETSI

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Contents

Foreword

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1 Scope

The present document provides an overview of the Iur-g interface. It describes the motivation, principles and functionality of this interface. It does not contain the detailed description, which it is included in the stage 3 Technical Specifications.

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, “3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Vocabulary for 3GPP Specifications”.

[2] 3GPP TS 23.236, “3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Intra-domain connection of Radio Access Network (RAN) nodes to multiple Core Network (CN) nodes”.

[3] 3GPP TS 25.331, “3rd Generation Partnership Project; Technical Specification Group Radio Access Network; RRC Protocol Specification”.

[4] 3GPP TS 25.420, “3rd Generation Partnership Project; Technical Specification Group Radio Access Network; UTRAN Iur Interface General Aspects and Principles”.

[5] 3GPP TS 25.423, “3rd Generation Partnership Project; Technical Specification Group Radio Access Network; UTRAN Iur Interface RNSAP Signalling”.

[6] 3GPP TS 43.051, “Technical Specification 3rd Generation Partnership Project; Technical Specification Group GSM/EDGE Radio Access Network; Overall description - Stage 2; (Release 5)”.

[7] Void.

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in 3GPP TR 21.905 [1] and the following ones apply:

A/Gb mode: mode of operation of the MS when connected to the Core Network via GERAN and the A and/or Gb interfaces.

MS: Unless stated otherwise, this refers with no distinction to both MS and UE.

Iu mode: mode of operation of the MS when connected to the Core Network via GERAN or UTRAN and the Iu interface.

RAN node: a BSS or a RNC.

3.2 Symbols

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

A	Interface between a BSS and an MSC
Gb	Interface between a BSS and an SGSN
Iu	Interface between a BSS/RNC and the CN
Iur	Interface between two RNSs
Iur-g	Interface between two BSSs or between a BSS and an RNS
Um	Interface between a GERAN MS and a BSS
Uu	Interface between a UE and the RNS

3.3 Abbreviations

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

BSC	Base Station Controller
BSS	Base Station Sub-system
CBSS	Controlling Base Station Sub-system
CN	Core Network
CRNC	Controlling Radio Network Controller
GERAN	GSM/EDGE Radio Access Network
GPRS	General Packet Radio Service
GRA	GERAN Registration Area
LA	Location Area
MS	Mobile Station
MSC	Mobile Switching Centre
NACC	Network Assisted Cell Change
NNSF	NAS Node Selection Function
RA	Routeing Area
RAN	Radio Access Network
RNC	Radio Network Controller
RNS	Radio Network Sub-system
RNSAP	Radio Network Subsystem Application Part
RNTI	Radio Network Temporary Identity
RRA	RAN Registration Area
RRM	Radio Resource Management
SBSC	Serving BSC
SBSS	Serving BSS
SGSN	Serving GPRS Support Node
SRNC	Serving RNC
TBSS	Target BSS
UE	User Equipment
UMTS	Universal Mobile Telephony System
URA	UTRAN Registration Area
UTRAN	UMTS Terrestrial Radio Access Network

4 Motivation, principles and assumptions

4.1 Motivation

As part of the work to connect GERAN via the Iu interface to the CN, the GRA and RNTI concepts have also been adopted for the GERAN. With these concepts, an inactive mobile in the RRC-GRA_PCH state will perform signalling to the network whenever it changes the GRA. Since GRAs need not be constrained by BSC coverage areas, it is possible that the MS reselects a cell on a different BSC but on the same GRA. In order maintain the ability to page the mobile in the GRA with the correct RNTI, as well as to enable a path for a GRA update procedure with the serving BSC, it is necessary to have an Iur-g interface between the BSSs.

The same principle applies for dual-RAN capable mobiles. The architecture specifications permit network operators to design networks that alleviate the potential problem caused by dual mode mobiles frequently toggling between UTRAN and GERAN coverage areas (e.g. in indoor coverage situations): for instance, common LAIs and RAIs for GERAN and UTRAN cells in the same geographical area. Defining GERAN and UTRAN cells in common LAs and RAs permits an inactive mobile to change from GERAN to UTRAN coverage or, vice versa, without any signalling to the network. Prior to Release 5, this is possible because GSM/GPRS is does not use the connection oriented Iu interface. From Release 5 on, an *inactive* MS would signal to the network when a cell change involving change of RAN takes place. To prevent this, operators may configure GRA IDs and URA IDs to indicate the same registration area. To enable paging across these registration areas, as well as to enable the possibility to perform GRA/URA update procedures with the serving BSC/RNC, it is necessary to have an Iur-g interface between the BSS and the RNC.

The definition of GRAs/URAs has the following benefits:

- It increases the MT call success rate: by reducing the frequency of updates, it reduces the time during which the MS is believed by the RAN to be in the old registration area, when paging requests would fail.

- It reduces the amount of signalling on the radio interface, since the mobile does not need to indicate cell changes when moving within a GRA/URA.

- For the same reason, it reduces the amount of signalling in the network, thus decreasing the number of updates and of SRNC/SBSC relocation procedures.

The Iur-g may bring other benefits:

- Support for the SRNC/SBSC relocation procedure: the current SRNS relocation procedure defined for UTRAN using the Iur interface could be reused, improving the performance of the procedure. The Cell Update and Relocation Commit messages could be transferred over this interface.

4.2 Principles

The Iur-g interface shall be designed based on the following principles:

- The Iur-g interface shall be open.

- From a logical standpoint, this interface is a point to point interface between one BSS and one BSS or RNC within a PLMN. From a physical point of view, the interface could share Iu or other transmission resources.

- The Iur-g interface is optional. The presence of the Iur-g shall be transparent to the MS: the 3GPP specifications shall ensure that all mobiles function correctly irrespective of the presence or absence of the Iur-g interface.

- This interface shall support the exchange of signalling information between a BSS and a BSC/RNC. The Iur-g interface shall not carry user information.

- A GRA contains one or more GERAN cells and zero or more UTRAN cells. A URA contains one or more UTRAN cells and zero or more GERAN cells.

NOTE: The term RAN Registration Area (RRA) is used in this document to refer to a registration area irrespective of whether it contains GERAN cells, UTRAN cells or both types of cells. The terms GRA and URA will be used in GERAN and UTRAN specifications, respectively, where GRAs may contain UTRAN cells and URAs may contain GERAN cells.

- In *Iu mode*, the BSC has been allocated an identifier (BSC-Id) from the same pool of numbers as the RNC-Id.

4.3 Void

5 General aspects

5.1 Network architecture

5.1.1 General

The Iur-g interface is the logical interface between two BSSs in *Iu mode* or between an RNS and a BSS in *Iu mode* or between a BSS in *A/Gb mode* and a UTRA-NTDD RNS. The different Iur-g interface combinations are depicted in Figure 1 and Figure 1a.

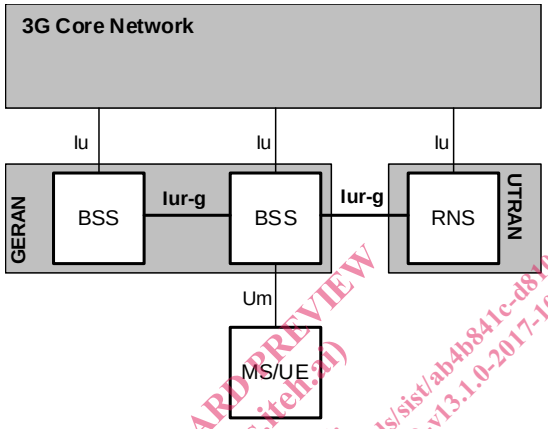

Figure 1: Reference architecture for the Iur-g interface (BSS in Iu mode).

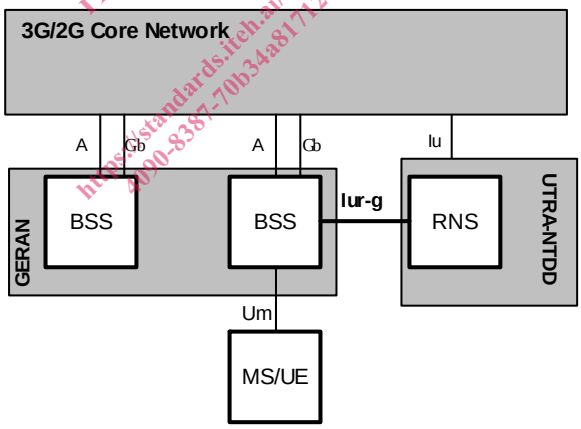

Figure 1a: Reference architecture for the Iur-g interface (BSS in *A/Gb* mode)

5.1.2 MS Identifiers in Iu mode

The Radio Network Temporary Identities (RNTI) are used as MS/UE identifiers within the GERAN/UTRAN and in signalling messages between MS/UE and GERAN. Four types of RNTI exist:

1) Serving BSS/RNC RNTI (S-RNTI);

2) Drift BSS/RNC RNTI (D-RNTI);

3) Cell RNTI (C-RNTI);

4) UTRAN RNTI (U-RNTI) or GERAN RNTI (G-RNTI);

The S-RNTI is used:

- by the MS/UE to identify itself to the Serving BSS/RNC;
- by the SBSS/SRNC to address the MS/UE; and
- by the DBSS/DRNC to identify the MS/UE to serving BSS/RNC.

The S-RNTI is allocated for all MSs/UEs having an RRC connection. It is allocated by the serving BSS/RNC and it is unique within the serving BSS/RNC. The S-RNTI is reallocated always when the serving BSS/RNC for the RRC connection is changed.

The D-RNTI is used by the serving BSS/RNC to identify the MS/UE to the drift BSS/RNC.

NOTE: The D-RNTI is never used on the Um/Uu interface.

The D-RNTI is allocated by the drift BSS/RNC upon drift MS/UE contexts establishment and it shall be unique within the drift BSS/RNC. Serving BSS/RNC shall know the mapping between the S-RNTI and the D-RNTIs allocated in the drift BSS for the same MS/UE. The drift BSS/RNC shall know the S-RNTI and SBSS-ID/RNC-ID related to the existing D-RNTI within the drift BSS/RNC.

The C-RNTI is used this identifier is used only in UTRAN:

- in case of the Iur-g interface between UTRAN and GERAN (specifically the case of a SBSS and DRNC);
- by the UE to identify itself to the controlling RNC; and
- by the controlling RNC to address the UE.

The C-RNTI is allocated by the controlling RNC upon UE accessing a new cell. The C-RNTI shall be unique within the accessed cell. The controlling RNC shall know the D-RNTI associated to the C-RNTI within the same logical RNC (if any).

The G-RNTI/U-RNTI is allocated to an MS/UE having an RRC connection and it identifies the MS/UE within GERAN/UTRAN. The G-RNTI/U-RNTI is composed of:

- SBSS/SRNC identity; and
- S-RNTI.

Each BSS/RNC has a unique identifier within the GERAN/UTRAN part of the PLMN, denoted by BSS/RNC identifier (BSS-ID/RNC-ID). This identifier is used to route GERAN/UTRAN interface messages to the correct BSS/RNC. The BSS-ID/RNC-ID of the serving BSS/RNC together with the S-RNTI is a unique identifier of the MS/UE in the GERAN/UTRAN part of the PLMN.

From this architecture, there are three possible scenarios for a particular MS/UE:

a) Both the serving and the controlling RAN nodes are BSCs.

b) The serving RAN node is a BSC and the controlling RAN node is an RNC.

c) The serving RAN node is an RNC and the controlling RAN node is a BSC.