S3-000472

GSM/EDGE Radio Access Network

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Overview

- GERAN Architecture & Interfaces
- GERAN Protocol Structure
- Logical Channels
- GERAN HO Scenarios
- Ciphering for GERAN (Tdoc S3-000408)

GERAN R00 Architecture

- It was agreed that PS domain real time service to be supported by release 2000 GERAN will only be supported on an Iups interface. This decision was made with the following constraints :

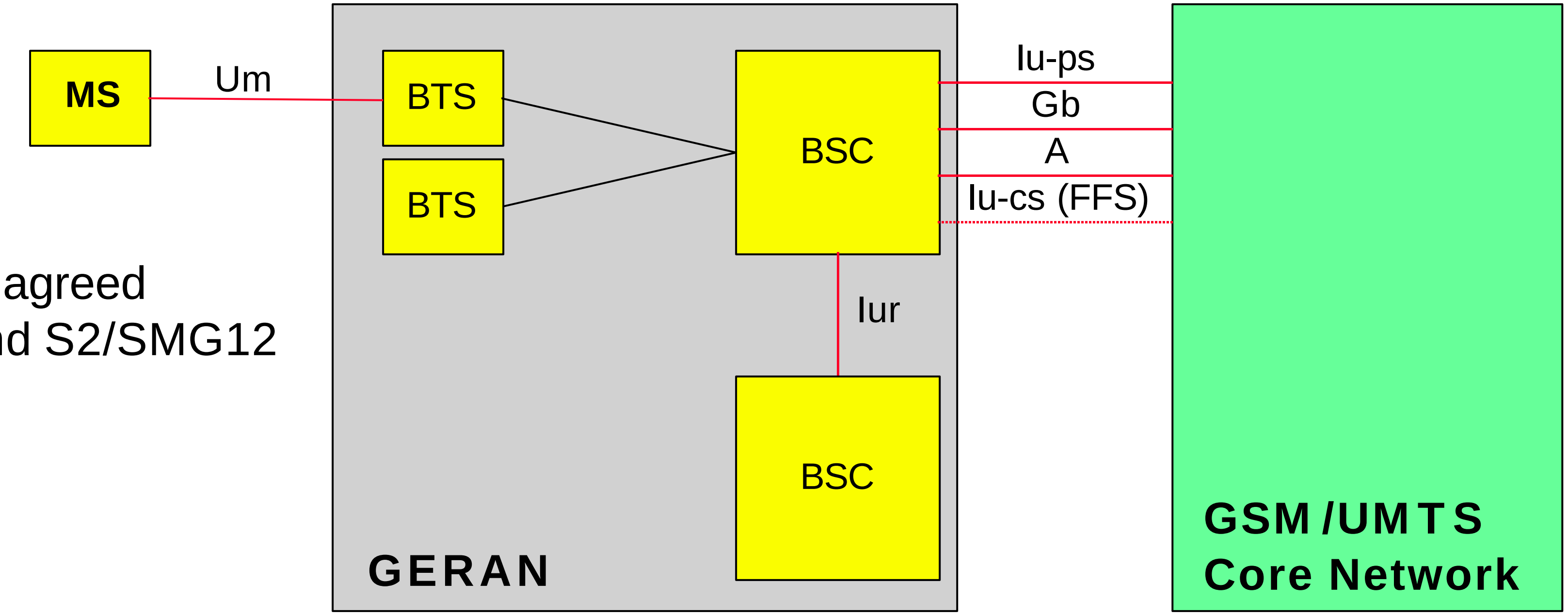
  A GERAN connected to the CN via the Iups interface shall on legacy transceivers as minimum be able to support the conversational class for the following speech codecs: FR, HR, EFR, AMR.

  A GERAN connected to CN via the Iups interface might need new transceivers to support some of the GERAN R00 radio access bearers.

  Current possibilities for multi vendor operation, such as overlaying BSSs, must be maintained. To ensure this, it is believed to be necessary that an Iur interface is specified for the GERAN.

  It was agreed that the Gb interface will not be enhanced to support real time services

GERAN Architecture & Interfaces



Architecture agreed
by SMG2 and S2/SMG12

- Interfaces

Iu-ps: Packet switched RT and NRT to 3G CN

Gb: Packet switched, only NRT to 2G SGSN

A: Circuit switched RT towards 2G MSC

Iu-cs: Circuit switched RT towards 3G CN (FFS)

Iur': Only control plane from UTRAN

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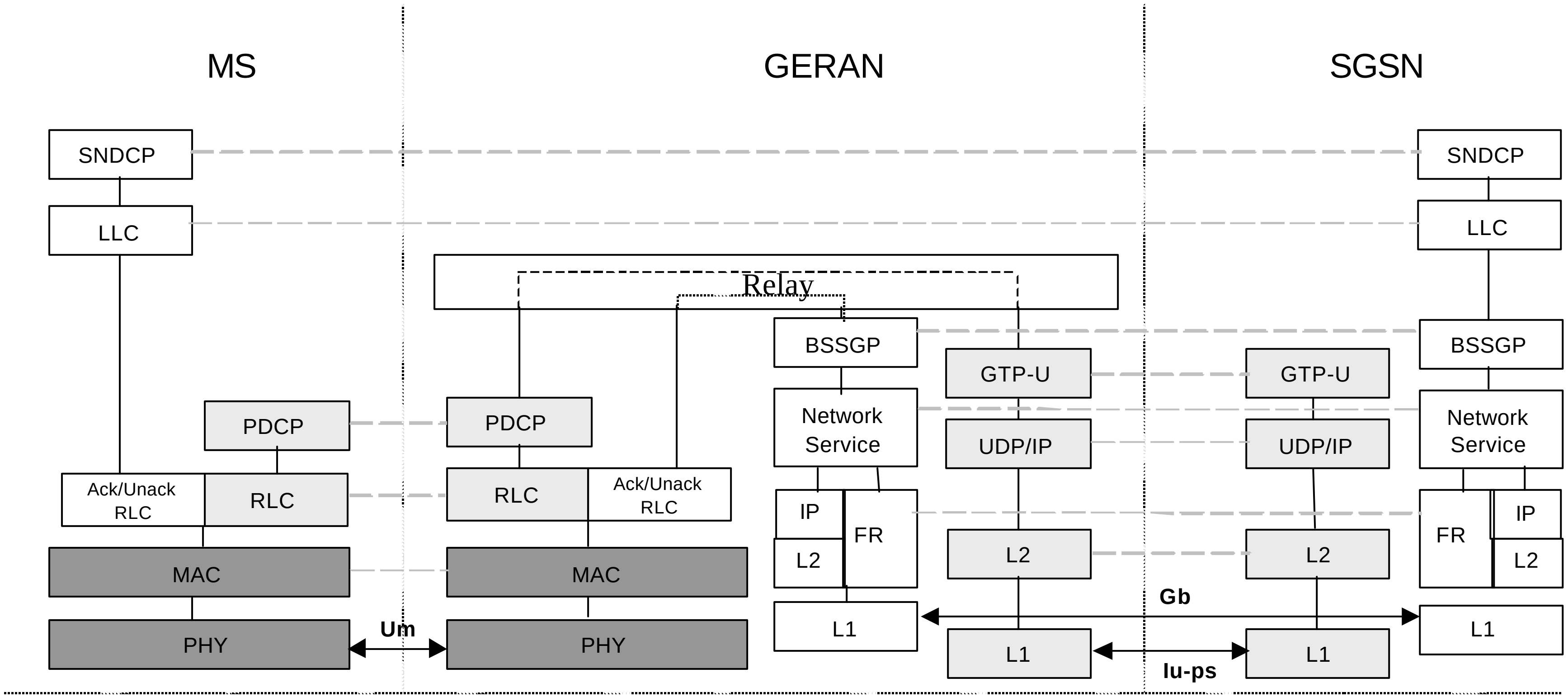
GERAN Protocol Stack (User Plane)



Common protocols

Iu influenced protocols

Gb influenced protocols

Protocol Structure and functionalities

PDCP

- Non-Transparent
  - Header Removal
  - Stripping
  - Compression
  - No adaptation
- Transparent

T: Transfer of user data, SDU Buffering, Relocation PDCP buffer
NT: Above tasks + Header adapt, multiplexing,

RLC

- Transparent
- UNACK
- ACK

Segmentation and reassembly, H-ARQ, In-Sequence Delivery, Link adaptation, padding

MAC

- Dedicated
- Shared

Mapping between logical and physical channels, priority, mux/demux higher layer PDUs
Adding identification to different flows

PHY

- TCH
- PDTCH

Access, error detectione, measurements, cell reselection

Logical Channels

- Traffic Channels

  Traffic channels (TCH's) are intended to carry either encoded speech or user data in dedicated MAC mode. TCH's can either be full rate (TCH/F) or half rate (TCH/H). Quarter rate TCH's (TCH/Q) are FFS.

  Packet data traffic channels (PDTCH's) are intended to carry user data in either dedicated or shared MAC mode. PDTCH's can either be full rate (PDTCH/F) or half rate (PDTCH/H).

- Control Channels

  Four categories of control channel are defined: broadcast, common, dedicated control channels and cell broadcast channel.

  GERAN R00 broadcast and common control channels shall be based on R99 broadcast and common control type channels.

Dedicated Control Channels

- On a dedicated physical subchannel:
  - The Fast Associated Control channel (FACCH) associated to one TCH.
  - The Packet Associated Control channel (PACCH) associated to one PDTCH.
  - The Slow Associated Control channel (SACCH) associated to one TCH and/or PDTCH.
  - Inband signalling associated to one TCH is for FFS
- On a shared physical subchannel:
  - The Packet Associated Control channel (PACCH).
  - The Packet Timing advance Control CHannel uplink (PTCCH/U).
  - The Packet Timing advance Control CHannel downlink (PTCCH/D).

Inter and intra GERAN HO scenarios

	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

	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: Handover (applicable to RT bearers)

CRS: Cell re-selection (applicable to NRT bearers)

Ciphering for GERAN

(Tdoc S3-000408)

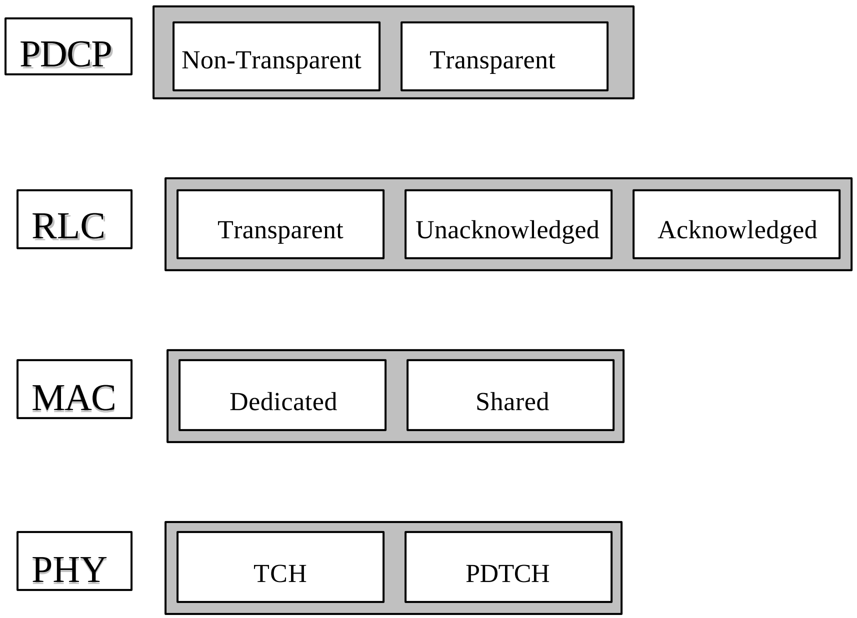
Introduction

- Functionality split across Iu interface requires ciphering to be performed in BSS, which is different from the functionality split across Gb interface.
- In GSM and EDGE, the ciphering algorithm that is implemented uses a ciphering key (Kc) and a count variable as input to get the crypto message which is modulo-2 added to the payload.

The UMTS ciphering algorithm

- For UMTS, the ciphering is done at the RLC or MAC layer.
- The payload part of a packet is modulo-2 added with the ciphering bits.
- For the non-transparent services there is a sequence number present at the RLC layer, which can be used as input to the ciphering algorithm.
- For the transparent services, the ciphering is done at the MAC layer. There is no sequence number present at the MAC layer for transparent services so a radio frame number which is updated every 10 ms is introduced here for this case.

Protocol Stack in GERAN



- Radio Access Bearers are realized through combination of different modes of protocol stack
- The ciphering algorithm needs some kind of sequence number to generate the ciphering bits.
- This sequence number has to be known at both the transmitting and the receiving side. In the case of transparent RLC, there is no sequence number present at the RLC and MAC layers, so to be able to have ciphering for these cases some kind of numbering has to be introduced.

Proposed solution for GERAN

- In order to align with UMTS and to allow service transparency also from a security point of view it is proposed to use the UMTS 128bit f8 algorithm also for GERAN. The UMTS algorithm is designed to handle blocks of up to 5000 bits.
- Regarding the ciphering location it is proposed to implement the ciphering algorithm at the RLC protocol layer for non-transparent services and at the MAC protocol layer for the transparent services. The main advantage of this is the alignment with UMTS.

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