GSM, EDGE & LTE Interworking – What is GELTE?

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GERAN Overview

GERAN Overview (1/2)

The TSG **GSM/EDGE Radio Access Network (GERAN)** specifically has responsibility for the following areas:
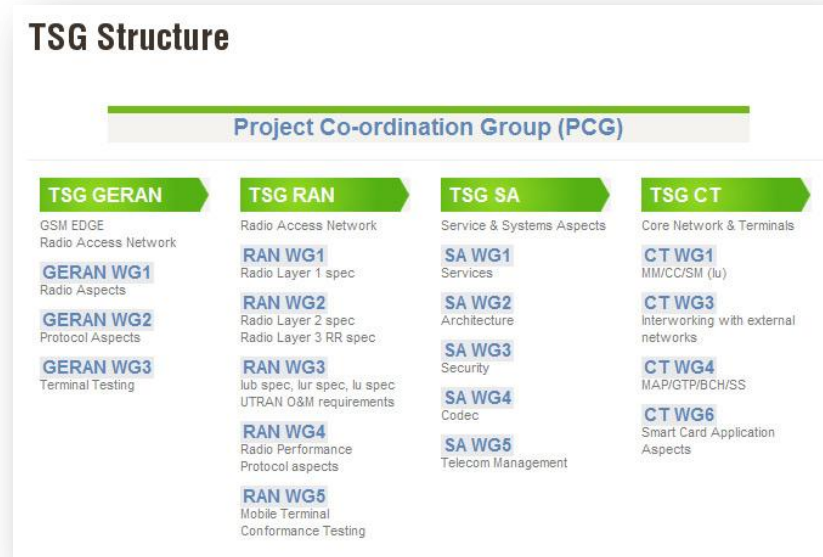
- RF aspects of GERAN, including radio performance specification and RF system aspects
- GERAN Radio specifications (L1, L2, RR L3)
- A interface specification, Gb interface specification
- Internal GERAN interface specifications such as Abis
- Conformance test specifications for testing of all aspects of GERAN terminals and base stations
- GERAN specific O&M specifications for the nodes in the GERAN

THE Mobile Broadband Standard

TSG Structure

Project Co-ordination Group (PCG)

TSG GERAN	TSG RAN	TSG SA	TSG CT
GSM EDGE Radio Access Network	Radio Access Network	Service & Systems Aspects	Core Network & Terminals
GERAN WG1 Radio Aspects	**RAN WG1** Radio Layer 1 spec	**SA WG1** Services	**CT WG1** MM/CC/SM (Iu)
GERAN WG2 Protocol Aspects	**RAN WG2** Radio Layer 2 spec Radio Layer 3 RR spec	**SA WG2** Architecture	**CT WG3** Interworking with external networks
GERAN WG3 Terminal Testing	**RAN WG3** Iub spec, Iur spec, Iu spec UTRAN O&M requirements	**SA WG3** Security	**CT WG4** MAP/GTP/BCH/SS
	RAN WG4 Radio Performance Protocol aspects	**SA WG4** Codec	**CT WG6** Smart Card Application Aspects
	RAN WG5 Mobile Terminal Conformance Testing	**SA WG5** Telecom Management	

- 3GPP TSG GERAN is one of the four 3GPP TSGs:

- Operators of GSM/GPRS/EDGE systems need a strategy for future growth and interoperability, the evolution of GSM/GPRS/EDGE radio access technologies offers such a path.

- As part of the interoperability work GERAN is actively involved in GERAN – E-UTRAN interworking issues

GERAN-LTE interworking

GERAN-LTE interworking (1/5)

- Work items for the evolution of the 3GPP radio-access technology (RAT) towards a high-data-rate, low-latency and packet-optimized radio access on-going

- Many GSM/GPRS/EDGE networks deployed worldwide

- Need to provide continuity of service across an operator's network, no matter which RAT is in use

- At the start of the E-UTRAN work on interworking with GERAN networks was foreseen

GERAN-LTE interworking (2/5)

📶 General requirements for the co-existence and interworking between Long Term Evolution (LTE) and existing 3GPP RATs (including GERAN) were captured in TR 25.913.

📶 A couple of the key requirements for interworking;

- E-UTRAN Terminals supporting GERAN operation should be able to support measurement of, and handover from and to, 3GPP GERAN systems
- There needs to be efficient support for inter-RAT measurements with acceptable impact on terminal complexity and network performance

GERAN-LTE interworking (3/5)

To support the required functionality in the GERAN system the following areas had to be considered:

- (P)BCCH System Information
- MS capabilities
- Packet Switched handover
- Session continuity
- Inter-RAT Network Assisted Cell Change (NACC)
- Idle Mode measurements and cell (re)selection
- Connected and GPRS mode MS measurements on LTE, and measurement reporting;
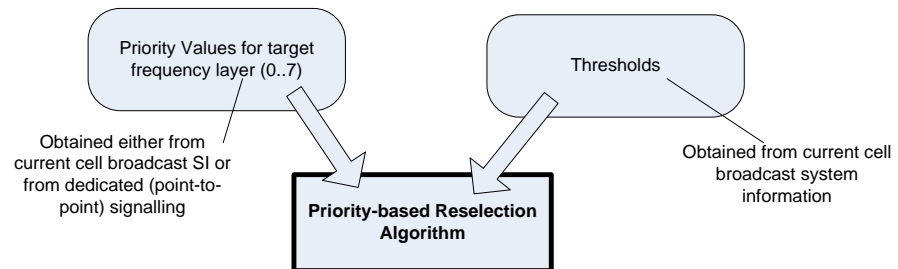- MS timing aspects of inter-RAT change

GERAN-LTE interworking (4/5)

Cell reselection

- 3GPP TS 45.008 "3rd Generation Partnership Project; Technical Specification Group GSM/EDGE Radio Access Network; Radio subsystem link control"

- Requirements for monitoring of E-UTRAN cells

- Requirements for measurement / reporting of E-UTRAN cells

- Priority-based reselection algorithm to UTRAN /E-UTRAN

Priority Values for target frequency layer (0..7)

Thresholds

Obtained either from current cell broadcast SI or from dedicated (point-to-point) signalling

Obtained from current cell broadcast system information

Priority-based Reselection Algorithm

GERAN-LTE interworking (5/5)

PS handover

- 3GPP TS 44.060: "General Packet Radio Service (GPRS); Mobile Station (MS) - Base Station System (BSS) interface; Radio Link Control (RLC) / Medium Access Control (MAC) protocol".

- Introduction of inter-RAT PS handover between GERAN and E-UTRAN.

- Timing requirements for PS handover from GERAN to E-UTRAN
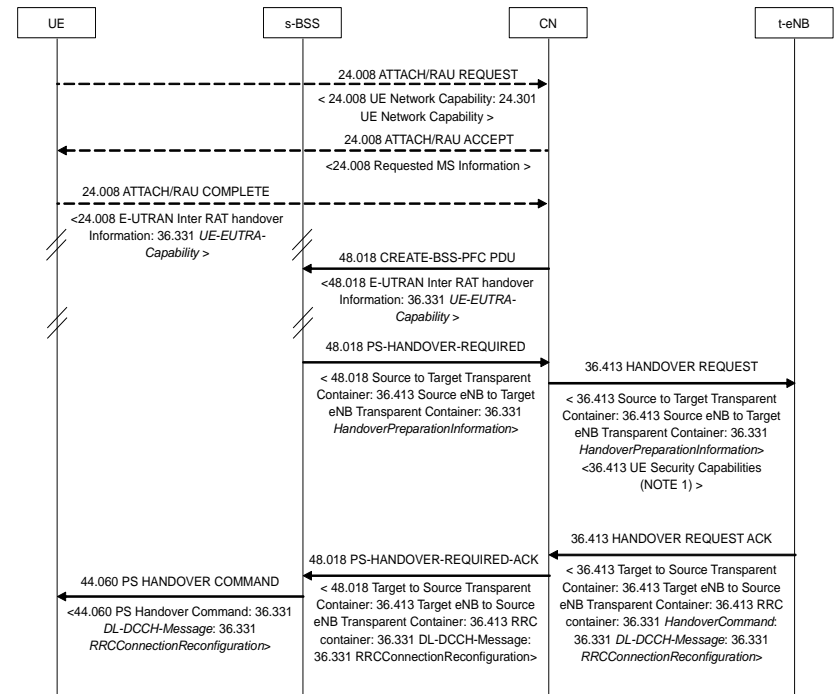
NOTE 1: The information included in this IE is derived from the information provided in the "UE Network Capability" IE during network attach / RAU

GERAN Priorities - Release 10 onwards

GERAN Developments (1/7)

The GERAN system continues to evolve to meet the needs of operators:

- GERAN Improvements for Machine Type Communications
- Support for Local Call Local Switch (LCLS)
- Tightened Link Level Performance Requirements for Single Antenna MS
- Full support of multi-operator core network by GERAN
- Study on BTS Energy Savings
- Study on GERAN Enhancements for Mobile Data Applications

GERAN Developments (2/7)

Improvements for Machine Type Communications

- Objective is to analyze and specify solutions relating to the support of MTC devices (e.g. Smart Meters) within GERAN networks to cater for signaling congestion and overload control.

- The following areas are being considered:
  - Provide the network the ability to discriminate between MTC devices and non-MTC devices to help reduce loading on the radio interface
  - Specify access control mechanisms so that up to 100% of MTC devices can be prevented from attempting system access at any given point in time.
  - Review MTC related GERAN impacted measures proposed by other 3GPP TSGs related to signalling congestion and overload control.

Support for Local Call Local Switch (LCLS)

- In some areas operators face difficulties in developing services and/or deployment of networks due to the lack of or cost of fast and reliable backhaul transport resources.

- Many calls in a mobile communication network are local calls.

    - Calls are generated and terminated by users served by the same BTS, the same BTS cluster or the same BSC.

- For local calls, if local switch (voice data in user plane is looped in a BTS or a BSC) is performed, then transmission resource of Abis and/or A interface can be saved

- The GERAN system supports LCLS

GERAN Developments (4/7)

Tightened Link Level Performance Requirements for Single Antenna MS

- The performance of single antenna MS have continuously improved over time

- Tightening of the DL performance requirements for reference sensitivity and interference limited scenarios ensure a set of performance requirements reflecting "today's" possible DL single antenna MS performances

- Improvements in the link level performance for single antenna GSM terminals lead to improved radio network capacity, for all GSM services, when terminals are operating in areas which are limited by sensitivity or interference

GERAN Developments (5/7)

📶 Full support of multi-operator core network

- Situations exists where operators share their networks
- GERAN already provides limited support for this
    - Single Common PLMN
- Full support needs to be provided in GERAN
    - Multiple PLMNs
    - Network to supply supporting terminals with information about the PLMN IDs of the different operators
- TSG GERAN is working on the 3GPP Specifications in order to allow networks to manage supporting MSs/UEs sharing a GERAN network

GERAN Developments (6/7)

Study on BTS Energy Savings

- Energy consumption within operators' networks is critical
- There are a large number of GSM/GPRS/EDGE networks deployed around the world
- TSG GERAN is studying potential solutions to enable energy saving within the BTS , for example:
  - Reduction of Power on the BCCH carrier
  - Reduction of power on DL common control channels
  - Deactivation of cells when not needed
  - Deactivation of other RATs in areas with multi-RAT deployments
- Solutions that are non-backwards compatible towards legacy mobile stations are out of the scope of the study

Study on GERAN Enhancements for Mobile Data Applications

- Mobile networks are experiencing a significant increase in mobile data traffic

- This has introduced new challenges to the mobile networks

- TSG GERAN are studying ways of supporting extended usage of mobile data applications by multi-tasking capable mobile stations

  - Identify relevant traffic profiles from GERAN perspective

  - Review impacts on GERAN networks

 - Identify possible solutions to alleviate the impacts without effecting CS services

Conclusions
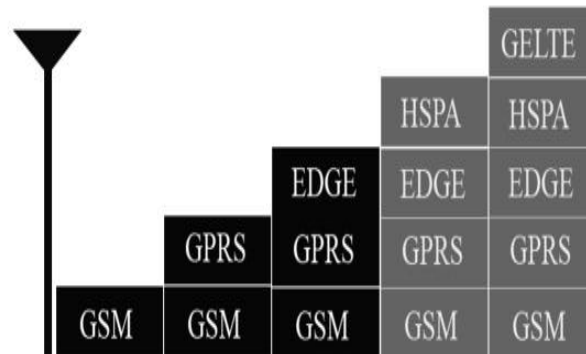
Conclusions

- The GERAN specifications continue to be evolved and extended to meet the needs of operators

- TSG GERAN continues to evolve GSM EDGE technology towards services that approach UMTS and LTE levels

- Support is provided for interoperability between GERAN and other Radio Access Technologies to enable service continuity

- GERAN based systems will continue to be a significant part of the mobile landscape for the foreseeable future
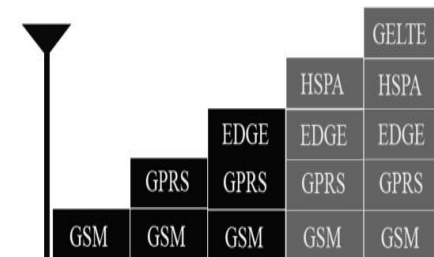
Thank You

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