Future Railway Mobile Communication Solutions

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90’s: GSM-R standards were developed based on GSM technology, and included *all railways specific requirements* and an *allowance of a specific additional frequency range*

- Voice Communication Train-Controller
- Shunting and group communication
- ETCS Data communication
- Other applications

- Functional Numbering and addressing
- Location Dependent Addressing
- High speed – up to 500 km/h

- Voice Group Call Service (VGCS)
- Voice Broadcast Service (VBS)
- Priority handling (eMLPP)
- Specific GSM-R spectrum

- All functionalities available for GSM-R
- General Packet Radio Service (GPRS)
GSM-R Applications

ETCS  
Data

Train Radio  
Voice calls, FN, LDA, REC...

Shunting  
Point to Point, & Group Calls

Voice Communication for Railway Staff  
Point to Point, Group Calls, REC, Data

Increasing additional applications: Diagnostics, Energy Data, Maintenance

Fall back for GSM-R

GSM-R - One single Platform for Voice and Data

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UIC Conference  
10-11 September 2013 Paris
EIRENE: what’s in the box

- Railway Voice Applications
- Railway Emergency Call
- ETCS
- Other voice and data applications

- Specific Voice Services
  - VGCS, VBS
- Addressing features
  - LDA, FA
- Priority features
  - eMLPP

- Standard Voice Services
- Standard Data services

- GSM-based Radio Access Network
- Fixed Access Network

WHAT IS USED NOW?
ONE SYSTEM FITS ALL
WHAT WILL CHANGE?
SPECTRUM?
The world around us is changing

Future Railway Communication Solutions

- Telecom Market Evolution
- Technology Evolution (IP, LTE, SDR, etc.)
- Spectrum Shortage -> Efficiency
- Broadband for Critical Communications
- End of Life GSM technology
- EU Spectrum policy
- Expansion of ETCS
- Increase of mobile applications
- Cost Reduction
- Increase of mobile applications

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UIC Conference
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Main Questions

- **What do Railways use today**
  - Dedicated: GSM-R, analog radio, Tetra
  - Commercial/shared: public networks
  - What kind of applications (voice/data)

- **What is needed in the future**
  - Railway operation and supportive applications
  - Voice data, messaging, video?

- **What technologies are candidate**
  - One technology, or a multi-technology approach
  - Co-existence with GSM-R is essential (long migration period)

- **What architecture?**
  - Separation of Application Layer and Network/bearer layer
  - Migration of existing applications towards IP (like ETCS)

- **Radiosystem needs spectrum:**
  - own / shared / public?
- Investigation of LTE
- Many items to be studied

User Requirement Specification 2010
- Description of Applications
- Terminal Requirements
- Description of Services
- Performance Requirements
- Service Requirements
- Configuration Management
Railways Context

- **Europe: relation with Commission/ERA**
  - Commission: strategy regarding spectrum, asset sharing, etc.
  - ERA: concentrate on Interoperability: functions and air-interface
  - Introduction of new Baseline, migration strategy

- **UIC: Europe only or worldwide?**
  - One standard suitable for all railways?
  - Synchronous planning or very different?
  - How to organise?

- **Standardisation bodies 3GPP/ETSI**
  - Developments for PPDR are ongoing: how to monitor/influence?
  - Technical and functional connection with GSM-R during migration
  - How to organise?

- **Critical Communication Broadband Group**
  - Cooperation on standards and spectrum
Critical Communications

- **Critical Communication Broadband Group:**
  - Public Safety (PPDR), Transport, Rail, Utilities, Defense
  - Worldwide scope

- **Public Safety: urgent need for reliable broadband:**
  - Database queries, Real time video (security, events, calamities)
  - Commercial public networks: availability and QoS is questioned

- **General Spectrum issues**
  - Public Safety Spectrum is on the WRC-15 agenda, but:
  - Huge demands from commercial networks
  - Push for spectrum efficiency: sharing??

- **EU studies:**
  - « Governmental sectors »
The UIC FRMCS Project

- UIC has initiated a Project to provide information for decisions on the successor of GSM-R. The Project will cover the period 2013 – 2016

- The Project contains the following main work packages:
  - Functionality
  - Spectrum
  - Technology and architecture

- Actions in 2013:
  - Define scope and deliverables
  - Define study-items to be included in the deliverables
  - Define supporting actions
  - Funding (UIC, TEN-T)
  - Organisation
  - Synchronisation with ERA (Europe) and UIC outside Europe
WP1: Functionality

Main goal is to describe the railway needs on the long term, but also taking into account the continuation of the actual applications and interoperability requirements.

- Evaluate usage of GSM-R
  - Questionnaires, interviews, desktop research

- Investigate future trends and applications
  - Questionnaires, interviews, desktop research

- Deliverables:
  - Reports
  - Use Cases for Train related communication
  - User Requirement Specification 2.0
WP2: Spectrum

Main goal is to define the needed spectrum and conditions.

- **Candidate subjects to be studied:**
  - Spectrum opportunities
  - Availability and usage conditions of GSM-R and ER-band
  - Co-existence of new technology and GSM-R in these bands
  - Radio planning aspects
  - Spectrum size calculation (actual, mid term, long term)
  - Coordinated actions with PPDR?
  - Possibilities for « networks with governmental tasks »

- **Deliverables:**
  - Reports
  - Spectrum Requirement Specification
Main goal is to prepare the decision on the future technology(ies) and the conditions.

- Candidate subjects to be studied:
  - Network Architecture evolution
  - On-board Architecture
  - Railway specific architecture items
  - IP based railway specific voice applications
  - Radio aspects
  - Evolution/migration scenarios

- Deliverables:
  - Reports
  - System Requirement Specification
UIC and ERA

- Scope of ERA and UIC is different, but with a certain overlap.
- The activities and interfaces between UIC and ERA are defined.
Overview:

UIC and ERA: specs  ERA: baseline, legislation

UIC + 3GPP/ETSI: standardisation  CEPT: spectrum

UIC + Industry: development and pilots

UIC: guidelines, coordination  Users: contract and operate

Conclusion

- Work on succession of GSM-R has really started
- All needed parties are involved
- Cooperation is essential
- UIC will contribute in the different phases

But:

- GSM-R will be the only solution for many years
- GSM-R has set the Reference for interoperability