GSM-R Interoperability - Technical Perspective

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www.gsm-rail.com
Agenda

1. GSM-R Interoperability and benefits for the Railways
2. The GSM-R multivendor InterOperability Testing (IOT)
3. Current GSM-R IOT projects co-financed by the European Commission
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GSM-R Interoperability

Interoperability of on-board GSM-R Cab radio with track-side GSM-R network
GSM-R Interoperability

Interoperability of Operational & Shunting Handhelds with GSM-R network
GSM-R Interoperability
Integration of different Train Controller Systems (Dispatcher Systems)
GSM-R Interoperability

Interoperability of interconnected GSM-R networks

1. CAB radio to GSM-R Network
2. Handheld radios to GSM-R Network
3. Train Controller to GSM-R Network
4. MSC/VLR/HLR/… to GSM-R Network
GSM-R Interoperability

Interoperability of interconnected GSM-R networks

... with border crossing traffic
GSM-R Interoperability

Radio (BSS) and Core (MSC) from different suppliers

1. CAB radio
2. Handheld radios
3. Train Controller
4. MSC/VLR/HLR/…
5. BSS

GSM-R Network
ERTMS Memorandum of Understanding

Interoperability testing and Certification

- Initiative by the European Commission
- Signed in Copenhagen on 16 April 2012 by
  - the Commission, CER, EIM, ERFA, UIC, UNIFE (UNISIG) and
  - GSM-R Industry Group
- in 75 paragraphs jointly declare how to move GSM-R and ETCS into a continued, successful future

- Includes **Process Improvements** regarding **Interoperability Testing and Certification** of GSM-R subsystem
GSM-R Interoperability testing

Benefits for Railway Operators

- Certification of functionality according to technical specifications
  ...keeping the pace with the technology advances and specifications upgrades
  ...therefore **guaranteed interoperability**, higher quality and reliability

- Cost efficiency for the Railway operators
  ...as interoperability tests are already performed at a global level

- Industry competition
  ...as interoperability tests are performed in multi-vendor configurations
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EIRENE Interconnected GSM-R networks
EIRENE multi-vendor (KCC-NSN) interconnected GSM-R networks
GSM-R multi-vendor InterOperability Testing
Performed regularly by NSN and KCC

- GSM-R InterOperability Testing performed regularly by manufacturers since 2002
- All essential interfaces tested: MSC to MSC and MSC to BSS
- Financing: 50% suppliers and 50% EU
GSM-R Interoperability Testing between NSN and KCC
(supported and co-funded by EU)

**EIRENE 5/13**  
Issued 2000

**EIRENE 6/14**  
Issued 2003

**EIRENE 7/15**  
Issued 2006

**EIRENE 7.3.0/15.3.0 7.4.0/15.4.0**

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**Q2/ Q4 2004**

Global IOT Phase 1 & 2
- Nortel and NSN - NSS / NSS & NSS / BSS EIRENE 5/13
- Static roaming functionality
- GSM services
- Advanced Rail services

**Q1/ Q4 2005**

Global IOT Phase 3 Initial & Regression
- Nortel NSS to NSS / NSS & NSS / BSS EIRENE 5/13
- Inter PLMN connections tested
- Additional features tested

**Q1 2007**

Global IOT & Field Phase 4.1
- Nortel NSS to NSS EIRENE 6/14

**Q1 2011**

Global IOT Phase 9.3
- KCC NSS to NSN NSS EIRENE 7/15

**Q2 2011**

Global IOT Phase 9.2
- KCC NSS to NSN NSS EIRENE 7/15

**Q3 2011**

Global IOT Phase 9.1
- KCC NSS to NSN EIRENE 7/15

**2012 - 14**

Global IOT Phase X
- GSM-R NSS / NSS & NSS / BSS & E2E
- GPRS
- QoS
- Validation of Test Specs

**IOT Phase 3 extension**
- Focus on additional features (late entry, eMLPP, Call barring and Access Matrix, Class of Registration, …)
Radio (BSS) and Core (MSC) from two different suppliers: KCC and NSN

Essential tested Interfaces

- CAB radio
- GSM-R Network
- GSM
- 18
- MSC/VLR/HLR/
- 18
- BSS
- Train Controller
- Handheld radios
Radio (BSS) and Core (MSC) from two different suppliers: KCC and NSN

Essential tested Interfaces
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1. GSM-R Interoperability and benefits for the Railways
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Latest completed EU funding program

TEN MAP 1st Call until end 2011

- IOT campaign NSN - KCC based on EIRENE 7/15 during 2011
  - NSN Core (R99) interconnected with KCC Core (R4)
  - NSN Core (R99) interconnected with KCC BSS
  - NSN BSS interconnected with KCC Core (R4)
- Reports were approved by ERA
- Joint NSN and KCC IOT Declaration “To whom it may concern” dated May 2012 about the successful outcome of all three phases has been issued
- Publication of test plans and results on ERA web site
IOT campaign NSN - KCC based on EIRENE 7/15 during 2011

Test configuration

GSM-R Network
MSC/VLR/HLR/…
BSS

GSM-R Network
MSC/VLR/HLR/…
BSS
IOT campaign NSN - KCC based on EIRENE 7/15 during 2011

Test configuration
Current EU funding program

TEN MAP 3rd Call until end 2014

- Validation of ERA test specs for GSM-R network interoperability assessment (WP5)
- Continued GSM-R InterOperability/Compatibility Testing IOT (WP10)
  - CAB /EDOR e2e testing
  - EIRENE 7.4.0/15.4.0
- ETCS over GPRS (WP9)
Validation of ERA test specification for GSM-R network interoperability assessment (WP5)

2013

- Test specification for the certification of the GSM-R infrastructure … to be included in the Application Guide from ERA
- Lab testing of the selected test cases … performed by KCC and NSN with ERA supervision … to verify that they are proving the “Mandatory for Interoperability” requirements of the EIRENE specification and that they can be executed …will bring the benefit of a certified test specification for GSM-R equipment:
  - a guide for the tests to be performed by the Notified Bodies to prove the GSM-R equipment interoperability
  - will guarantee continued and improved GSM-R interoperability
Validation of ERA test specification for GSM-R network interoperability assessment

Test configuration
Validation of ERA test specification for GSM-R network interoperability assessment

Test configuration

GSM-R Network

MSC/VLR/HLR/…

BSS

GSM-R Network

MSC/VLR/HLR/…

BSS
GSM-R interoperability testing for upcoming EIRENE 7.4.0/15.4.0 specification (WP10)

2014

• Test of GSM-R Infrastructure
  • …to validate the network elements Interoperability
  • …will prove that the networks supplied by the two vendors NSN and KCC are compatible and support the GSM-R functionality specified as mandatory for interoperability
  • …test activities will verify all the relevant interfaces: MSC to MSC and BSS to MSC

• Test of GSM-R Cab Radios
  • …to validate end-to-end functionality and interoperability with track side
Thank you