

# The future of Railway Mobile Communications

## Chiel Spaans UIC



# UIC: the International Union of Railways

- **200 members on all continents**
  - Integrated (State) Railways
  - Train Operators
  - Infrastructure Managers
  - Railway Service Providers
  - Public Transport Companies
- **Main tasks: standardization, coordination, lobbying**

# Today's standard: GSM-R

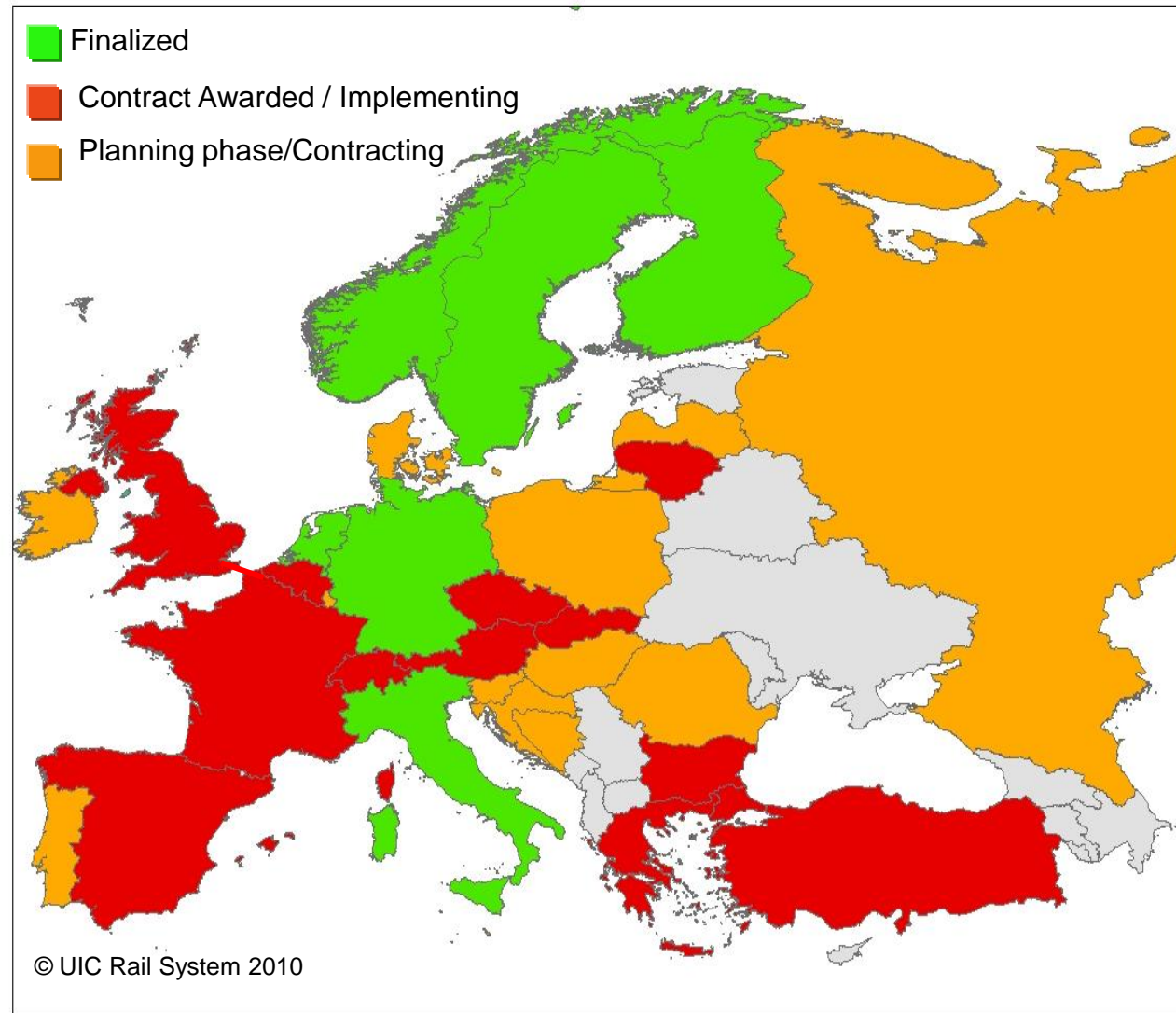
- **Standard GSM voice and data features, plus:**
  - Groupcalls, Broadcast calls, Fast call setup
  - Location dependent addressing, Functional addressing
  - 5 priority levels
  - Tested up to 350 km/h
  - GPRS/EDGE
- **Mandatory in Europe for Interoperability**
  - TSI: Technical standard for interoperability
  - Eirene FRS and SRS
- **2x4 MHz in 900 MHz band (EU, Asia) or 1800 MHz**
- **First full operational network in 2003 (NL)**
- **Railway internal usage only (no public service)**

# Railway specific applications

- **Safety related voice communication:**
  - Traindriver – Traffic Control
  - Traindriver – Shunting staff (train movements on yards)
  - Railway Emergency Call in case of immediate danger
- **European Train Control System for signalling**
  - Circuit switched and GPRS data communication
  - Continuous connection Train- Ground
  - High QoS demands
- **Operational Support Communication**
  - Onboard, station and security staff
- **Data communication applications**
  - Passenger information(displays etc.) on platforms
  - Remote Train diagnostics
  - Stationary telemetry and infra status monitoring

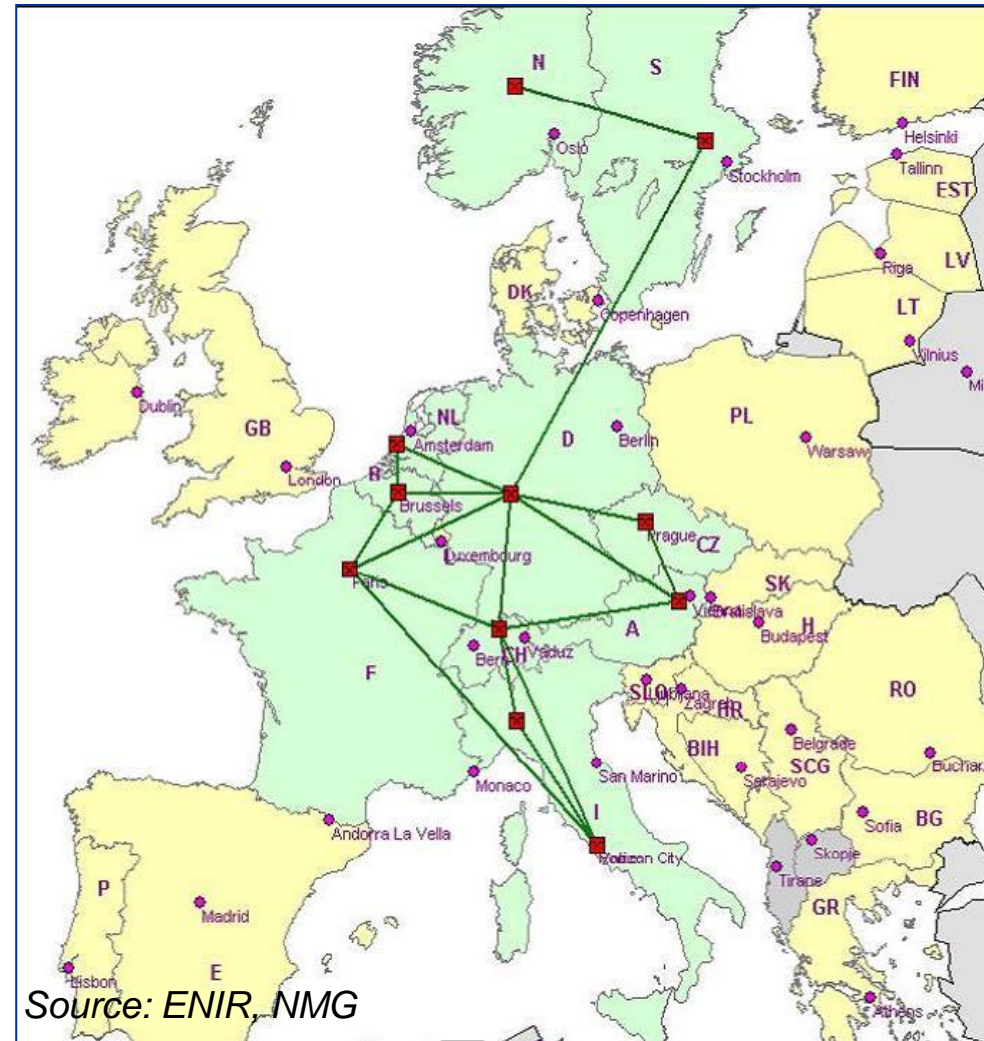
# GSM-R Today

- **GSM-R is in an implementation phase all over Europe**
  - Approx 70.000 of 150.000 km of railway lines are covered in 2011
  - “only” 200.000 mobile users of which approx 50.000 mounted in trains
- **Also deployed in Asia, Australia**
  - Another 150.000 km potential



# GSM-R International Operations

- All European GSM-R networks are interconnected
- GSM-R Roaming is essential for border crossing traffic
- Coordinated by UIC
- Roaming with public networks is also used for fallback or coverage extension



# Other Railway Mobile Comms

- **Short range radio**
  - Shunting
  - train staff, station staff, security staff
- **Tetra**
  - Mainly used by other public transport
- **Public mobile networks:**
  - Train staff, station staff
  - Passenger information displays in trains
  - Tracking and tracing of trains
  - Support data applications for train operators
  - Passengers using voice and mobile internet
- **Overall conclusion: very fragmented mobile communication playing field**

# Future Developments (1)

- **Phasing out of GSM-R**
  - GSM-R will be supported up to 2025
  - Migration towards Successor takes approx 5 years in EU
  - Specification, development and legal position (TSI) takes at least 5 years
  - So the work on successor has started in 2010
- **Railway Specific application developments:**
  - Railway Safety Voice comms and ETCS data will remain: low profile but mission critical, also on the long term
  - Support data applications for train, station and security staff will expand: capacity limitations in existing GPRS/EDGE
  - Video surveillance, Driver look ahead real time video will come and are the most demanding applications for Broadband
  - ***Video cannot be supported by GSM-R/GPRS: broadband is needed within a couple of years. Mission Critical?***

# Future Developments (2)

- **Scenario 1: Dedicated network Railways**
  - Supports MC Voice and data
  - Supports broadband
  - Available from 2018
  - Realistic?
- **Scenario 2: Public networks only, fully standard:**
  - MC voice is simplified: no group calls but eg multipartycalls
  - MC data and all other applications will be supported
- **Scenario 3: Hybrid solution**
  - Dedicated application layer; MC voice is transferred into an app
  - Radio access layer is mixture of dedicated (on critical locations and lines) and public
  - *Variant: also access layer is dedicated, but shared with other Critical Communication communities*

# Next Steps (1)

- **Evaluate existing Railway Specific needs**
  - Group/broadcast/emergency calls still needed on long term?
  - Define minimum QoS, performance, capacity
  - ETCS data will migrate towards IP
- **Define Future needs**
  - What capacity/performance of the radio access layer is needed, where and when
  - Problem: poor vision on future at Train Operators and other customers
  - ***Result: Draft User Requirement Specification (November 2011)***

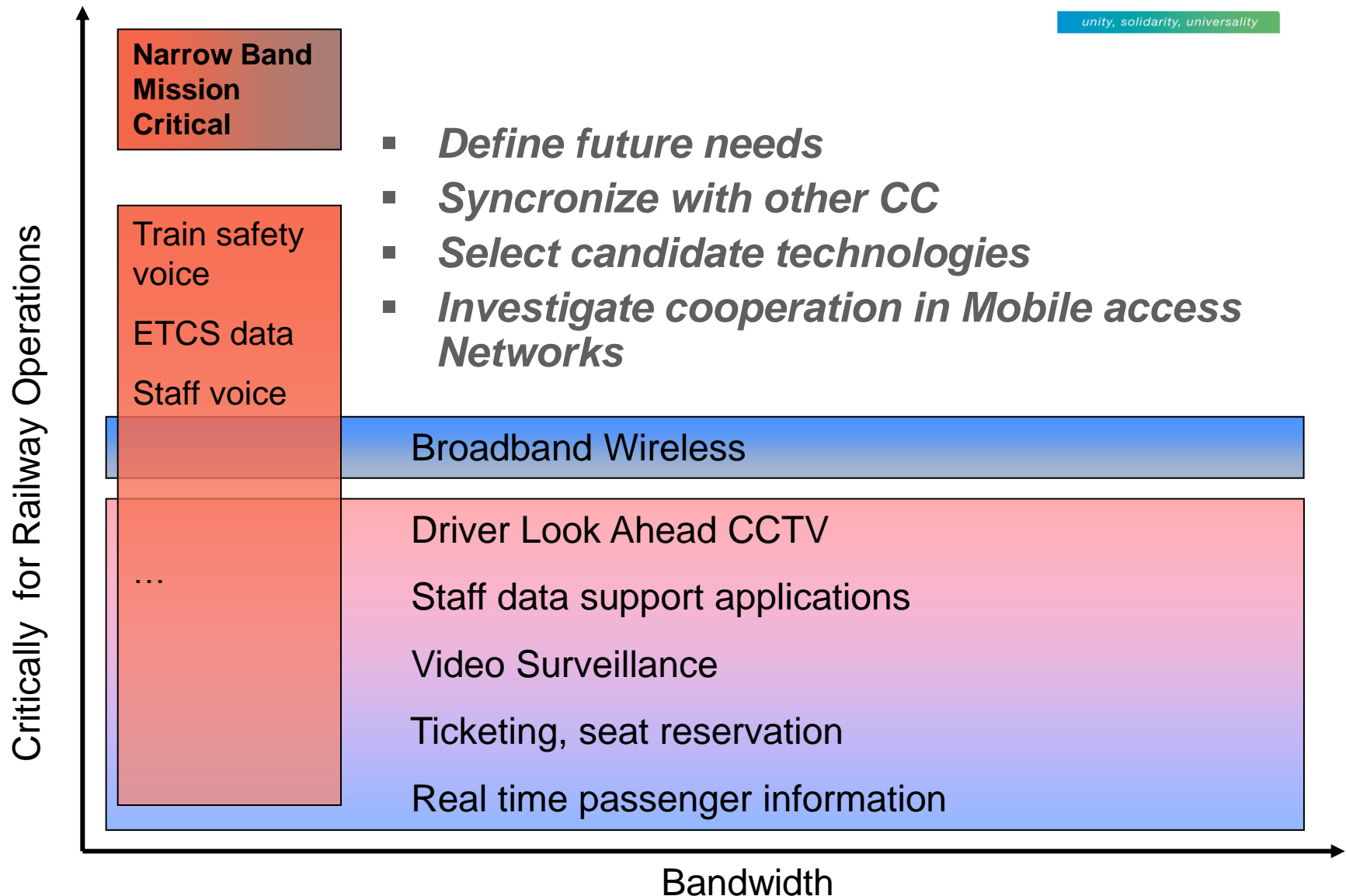
# Next Steps (2)

- **Investigate the overall architecture**
  - Strict separation of Application layer and Mobile Access layer
  - Mission Critical voice transferable into an App?
  - Own network? Hybrid with Public? Shared with other PMR
  - Why not one European network?
- **Select candidate technologies**
  - Single or Multi technology?
  - What Spectrum? Own spectrum or shared? Single spectrum or a multispectrum all over Europe?
  - *Study: Report on LTE for Railways (December 2009)*
  - *Workshops on Future Railway Comms (2009, 2010, 2011)*

# Next Steps (3)

- **Investigate synchronization with other PMR**
  - Common Functional Requirements?
  - Mission critical voice long term needs (when TETRA and GSM disappears)?
  - Common Broadband needs?
  - Time schedule?
- **Investigate potential cost optimization**
  - One non-commercial dedicated network, sponsored by Government?
  - At least: sharing of infrastructure
  - Potential: sharing of frequencies (only railways coverage needed)
  - Are public networks candidate for non-critical broadband or as fallback? Costs/risks

# Summary



# Questions?

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