



GSM-R – the only approved world telecom standard for railways

Agenda

- ❑ Why GSM-R
- ❑ GSM-R market
- ❑ GSM-R Community & GSM-R Industry group
- ❑ GSM-R key advantages
- ❑ Conclusion

Why GSM-R? In A Nutshell...



❑ Interoperability: Railway communication without system borders

- ❑ Increase average travel speeds through optimized breaking points
- ❑ Increase maximum speeds with line of sight signals replaced with radio
- ❑ Increase track capacity through minimized inter train distance
- ❑ Guaranteed high speed (500 km/h) and conventional lines operation
- ❑ Seamless border crossing

❑ Efficiency: Railway communication at reduced cost

- ❑ Reduce infrastructure cost by using widely adopted GSM technology
- ❑ Only one Radio system for all applications including ETCS
- ❑ Reduce infrastructure cost through competition
- ❑ Standard products available off the shelf

GSM-R standardized by railways and industry in EIRENE, validated in MORANE and in commercial operation since more than 10 years - provides operational and commercial advantages to railways and makes them more competitive in a changing environment.

GSM – A Solid and Mature System

□ GSM - Solid platform

- Standardized by 3GPP/ETSI
- In commercial operation since 1992 with more than 3 billion user
- Expected to grow even further
- Significant development towards IP almost finished



GSM-R – A Solid and Mature System



❑ GSM-R - Solid communication platform for Railways

- ❑ Based on GSM
- ❑ Standardized by railways to perform their operational needs – EIRENE
- ❑ Validated and approved in the field - MORANE
- ❑ In daily commercial operation since 2000
- ❑ Specified for voice and data (CS and PD) services
- ❑ Radio bearer for the European ERTMS standard
- ❑ Continuously adaption of EIRENE considering new applications, services and railway operational rules
- ❑ Future oriented technology (IP) based on ETSI/ TC-RT standardization for new functionalities and capabilities



Extensive standardization and validation to prove GSM-R



Study
UIC decided for
GSM – (R)
against TETRA

Specification phase - EIRENE

ASCI features are specified by EIRENE & ETSI
Specification of railway operational features

Trial phase - Morane

Test tracks are deployed to prove the standard
GSM-R End-to-End system validated & approved
First products available

As result of MORANE
railways approved GSM-R
as future voice and data
bearer in 2000

Network implementation phase
Deployment and operation in all European railways
at high speed and conventional lines
Deployment and operation abroad Europe

1992

1995

2000

2005

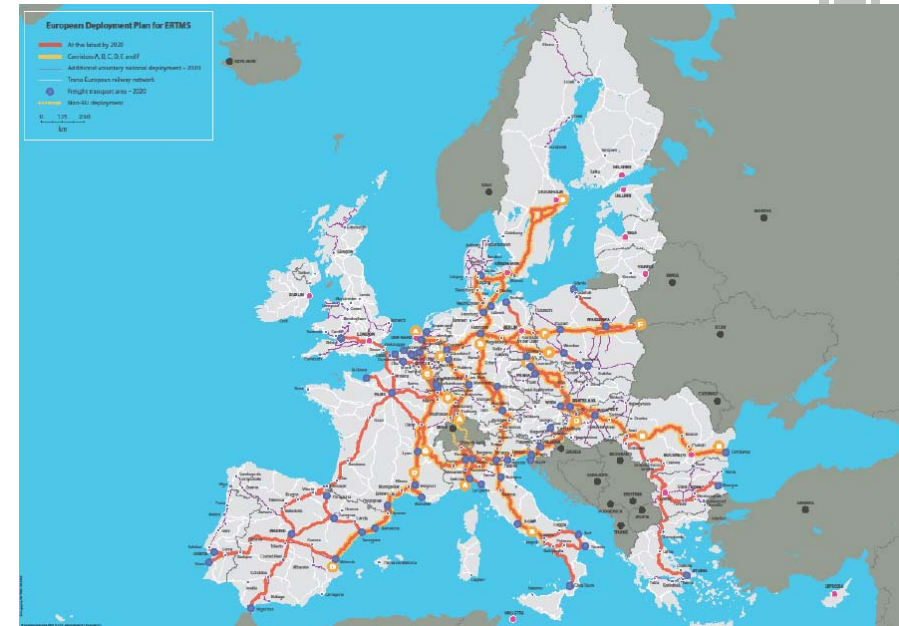
GSM-R Market

Europe market status (source: UIC/ December 2011)

- ❑ The overall European railway network is 221.100 km and 159.966 km are planned to be covered by GSM-R (70%)
- ❑ GSM-R as part of European Union ERTMS program has to be implemented in all EU countries based on EU decisions (law)
- ❑ December 2011 appr. 85.000 km constructed and 68.000 km of them are in commercial service including appr. 115.000 GSM-R handhelds, 40.000 cab radios, 2.000 EDOR's, dispatch systems, etc.

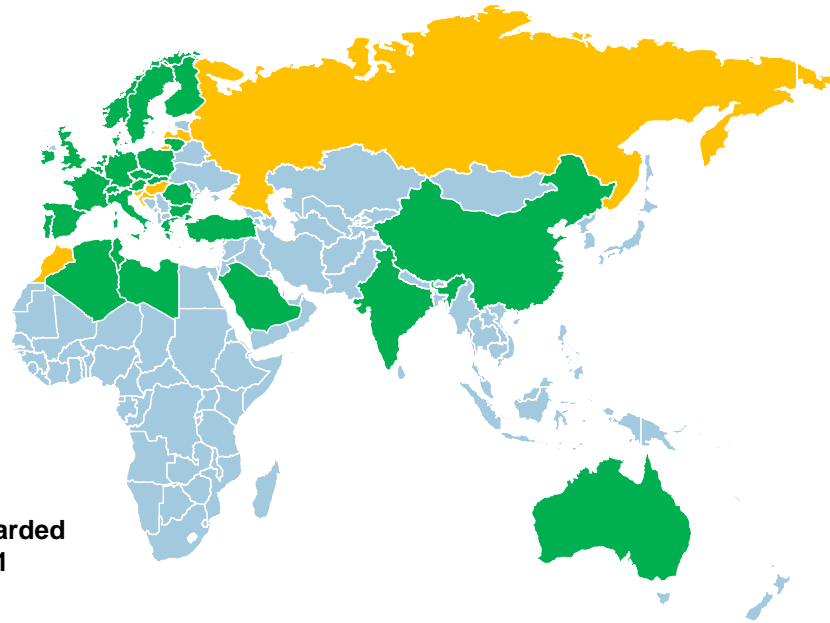
Market status abroad Europe

- ❑ Some thousand of track km are in service in China, India and Turkey already
- ❑ Other railways are in deployment or tender processes, e.g. Saudi Arabia, UAE, Algeria, Tunisia, Libya, Morocco, Australia, Russia, Turkmenistan, etc.



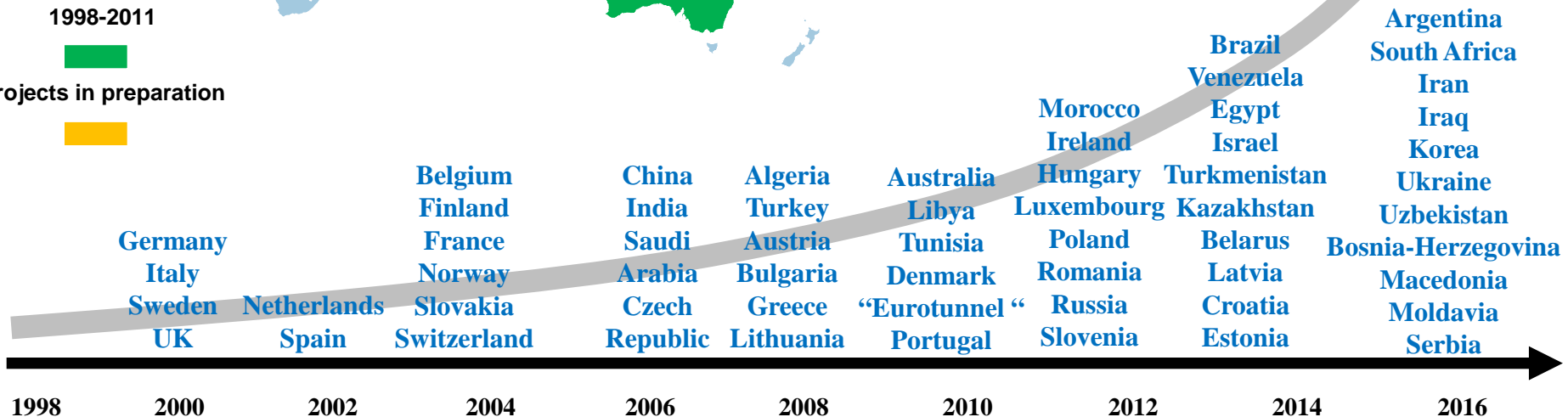
GSM-R, in commercial operation since more than 10 years, is the voice and data radio system for all European railways and abroad Europe as well.

GSM-R – A World Railway Standard



56 countries in 5 continents
expected to select GSM-R until 2016

Contracts awarded
1998-2011
Projects in preparation



GSM-R Community (main player)

❑ UIC/ ERIG

- ❑ Dedicated team of railway telecom experts to update EIRENE standard
- ❑ Define new applications and services based on their daily GSM-R system operation experiences
- ❑ Working in several working groups related to specific topics
- ❑ Updating GSM-R considering future strategies and needs

❑ ETSI TC-RT

- ❑ ETSI sub group for railway specific feature implementation into GSM/ GSM-R standards

❑ ERA

- ❑ European Commission entity with the system authority for ERTMS/ GSM-R
- ❑ Owner of TSI (technical Specification for Interoperability) – transform EU directives into railway law

❑ GSM-R Industry Group

- ❑ Association of the nine GSM-R industry key suppliers
- ❑ Regular technical and marketing meetings to take care and develop/ update the GSM-R components/ system in line with GSM-R standards and TSI standard updates

❑ ERTMS Users Group

- ❑ Coordinator of TEN ERTMS/ GSM-R research, development and interoperability projects

GSM-R Industry Group portfolio



	Network R99/R4	Cab Radio	EDOR	Transportable Radio 8W	GPH	OPH	OPS	Radio Module 8W	Dispatcher Terminal System	E2E System Integration
	√									√
	√									√
		√	√							√
									√	√
		√	√	√		√	√	√		√
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GSM-R Industry Group commitment



- ❑ Safeguard of the Railways investment is at the heart of the GSM-R Industry Group strategy.
- ❑ The active global promotion of the GSM-R technology.
- ❑ Strong cooperation with GSM-R bodies and partners – UIC/ERIG, ETSI, ERA, ERTMS Users Group, etc.
- ❑ Minimize integration efforts and railway migration costs.
- ❑ All the GSM-R IG members are committed to support and develop GSM-R at least until 2025.
- ❑ GSM-R IG is also committed to support Railways in identifying and selecting a new technology beyond GSM-R for a Future Railway Mobile Radio System (FRMRS)
- ❑ Migration to FRMRS with uninterrupted and undisturbed Railway operation and sufficient capacity is a key target to be worked out by Railways and GSM-R IG using their combined expertise.

GSM-R – Economic and Future Oriented



□ GSM-R guaranties economical advantages

- Based on GSM as a mass market product oriented towards IP
- Future evolution based on GSM/ ETSI & 3 GPP roadmap
- No operational risk – approved and in operation on high speed and conventional lines since more than 10 years and several 10.000 km
- No product risk – products based on GSM product roadmaps and are available off the shelve



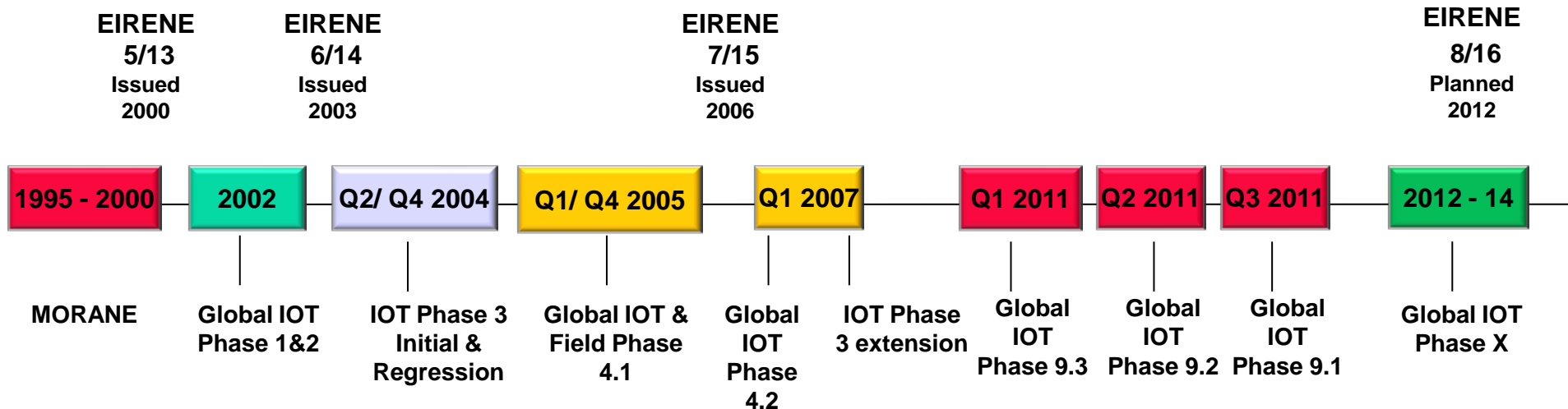
The Railway system for mobile communication

GSM-R – Interoperable from the beginning on



□ GSM-R guarantees Interoperability

- Standardized at main system interfaces
- Between suppliers (infrastructure/ track side, mobile terminals, dispatcher systems)
- Periodical interoperability test (IOT) campaigns since 2002 supported by EU to guaranty EIRENE conformance
- Enables seamless roaming between national infrastructures/ border crossing
- Guarantee shared GSM-R infrastructure networks between different suppliers



GSM-R – A Reliable System



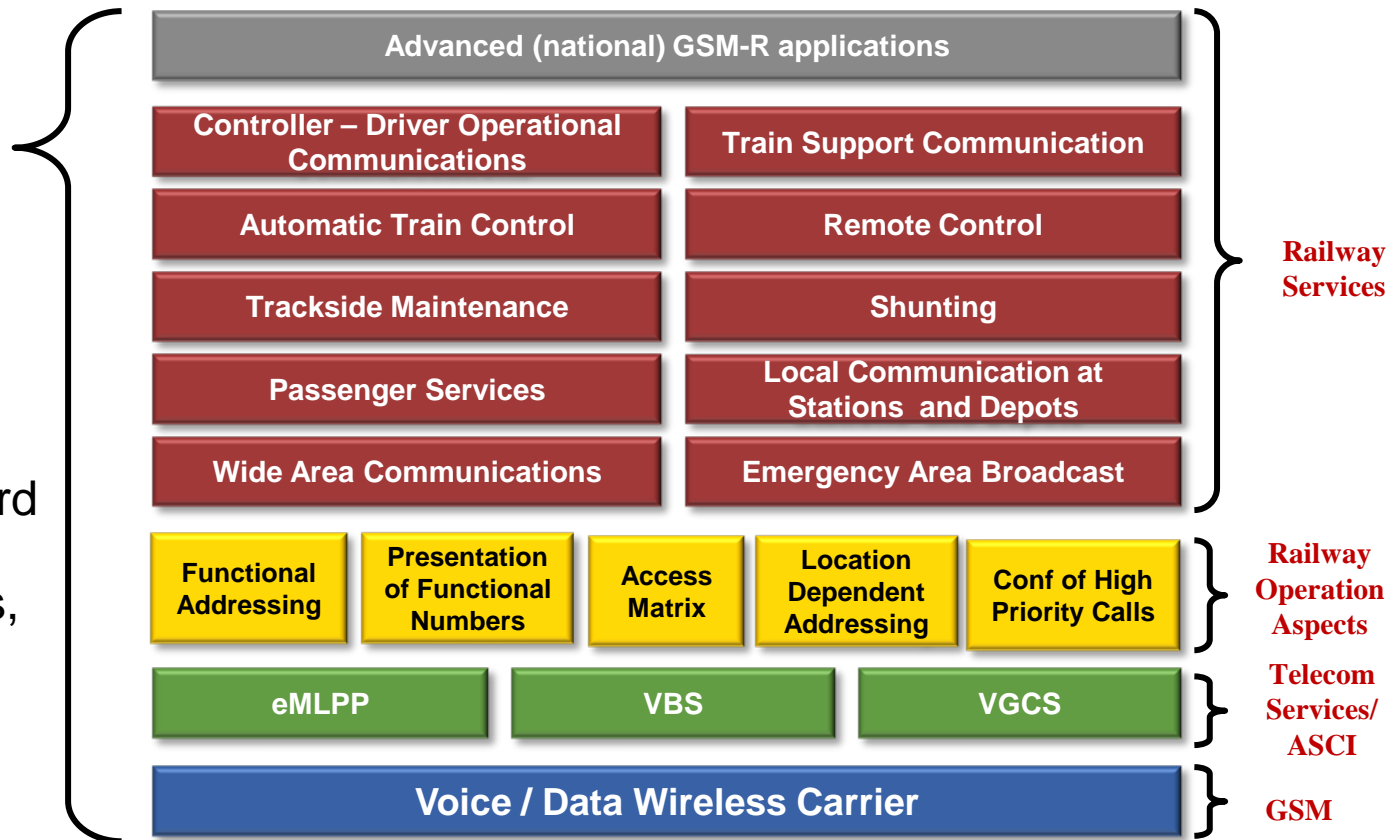
□ GSM-R guaranties reliability and availability

- Very high reliability and availability of products and networks based on long term experience and proved in public systems and railway networks
- Dedicated engineering and system optimization processes
- Superior internal redundancy and full geographical redundant solutions
- Network management system incl. real time fault and disaster management
- Double coverage functionality, particular for very high ETCS reliability
- Fall back available into public networks – GSM-R terminals are operating in entire 900 & 1800 MHz GSM band (manual or automatic switch over)

EIRENE GSM-R Services



- ❑ Only GSM-R fulfils the entire railway services as standardized in EIRENE
- ❑ TETRA and other digital trunking systems are only regular PMR standard solutions to support basic PMR functions, but doesn't support railway specific requirements and QoS parameters



The Railway system for mobile communication

GSM-R as bearer for European Train Control System ETCS – approved and in operation

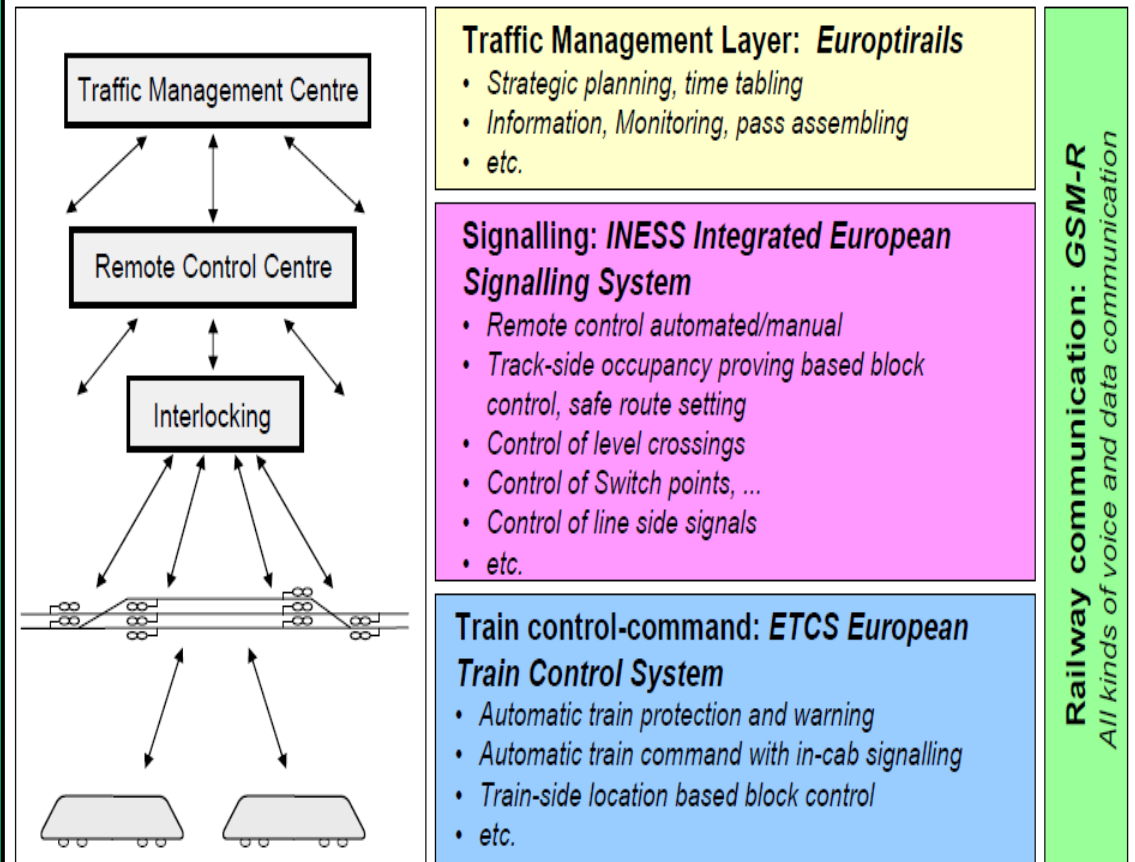
Integration of independent subsystems into a single train control and command solution

- ETCS and GSM-R (voice and data) are the building blocks of the European Railway Traffic Managements System (ERTMS)
- ERTMS is designed for International communication and signaling

International standardizations and interoperability

- Increase competition in the signalling market
- Speed up of border crossing travel reduces travel time and cost
- Integrate existing ATP systems

Functional structure of ERTMS and associated European activities



Conclusions

GSM-R is a mature and widely used system...

... a world standard for railways in successful operation

... interoperable and stable for all rail track versions including high speed

... reliable as bearer for ETCS

... open for improvement and future development

Industry is committed to long term support

Industry in close cooperation with UIC for the definition of the next generation and migration strategies



Thank you