INTERNATIONAL UNION
OF RAILWAYS

unity, solidarity, universality

Future Railway Mobile Communication Solutions

Chiel Spaans, UIC
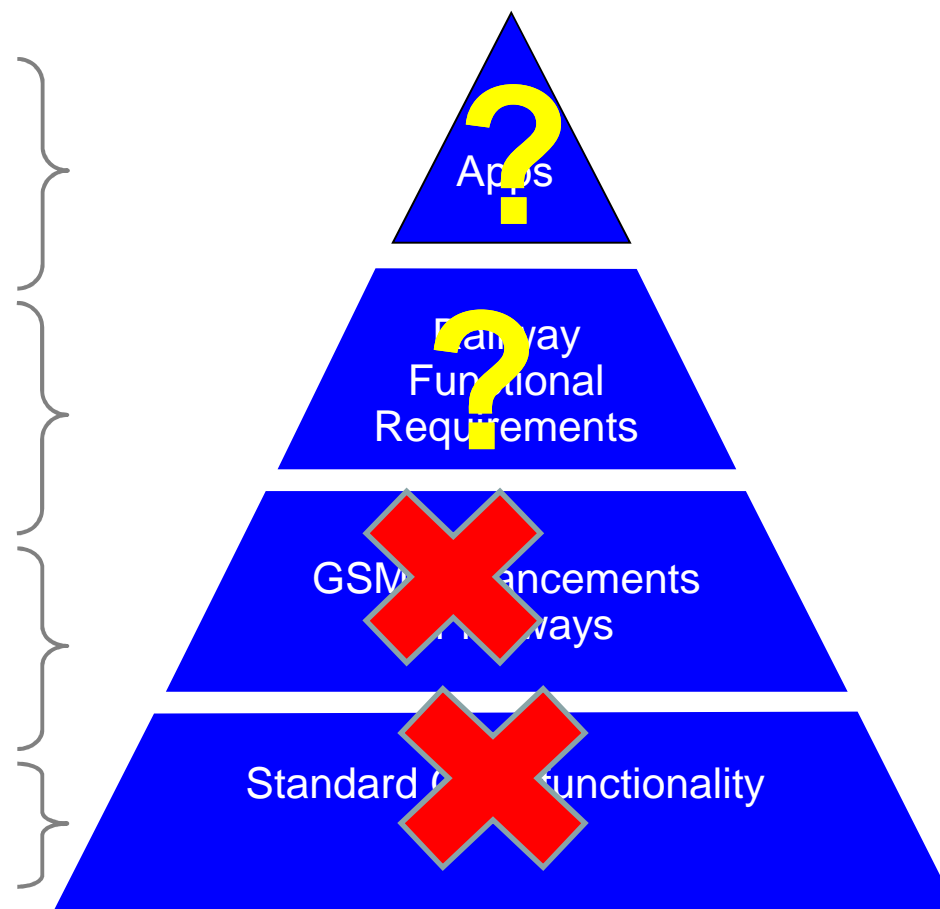## Projectleader FRMCS project

GSM-R: What's in the box?

- 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 CommunicationTrain-Controller
- Shunting and group communication
- ETCS Datacommunication
- 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
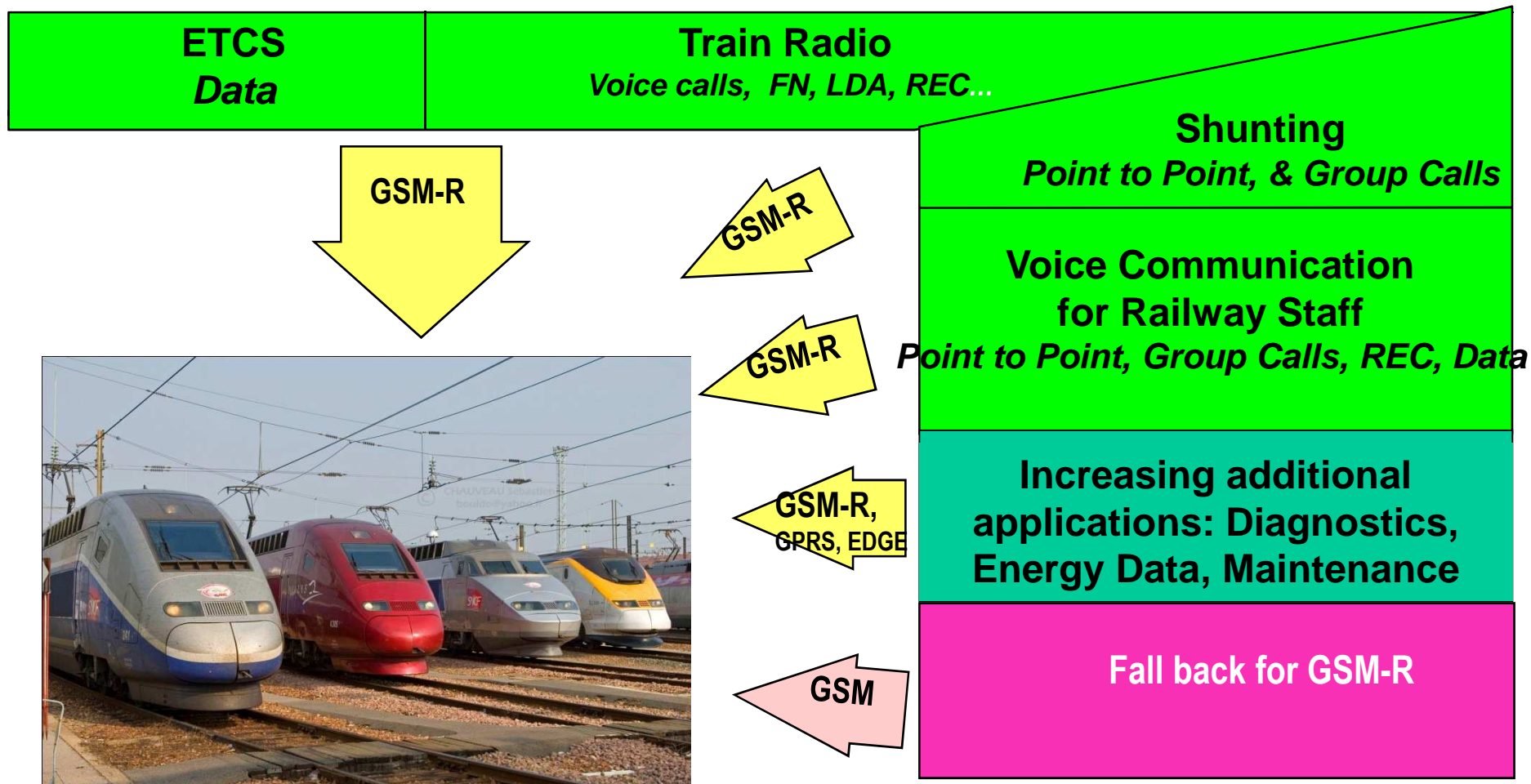- General Packet Radio Service (GPRS)

Apps

Railway Functional Requirements

GSM Enhancements for Railways

Standard GSM functionality

GSM-R Applications

ETCS
Data

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

GSM-R

GSM-R

GSM-R

GSM-R, GPRS, EDGE

GSM

Shunting
Point to Point, & Group Calls

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

**Increasing additional
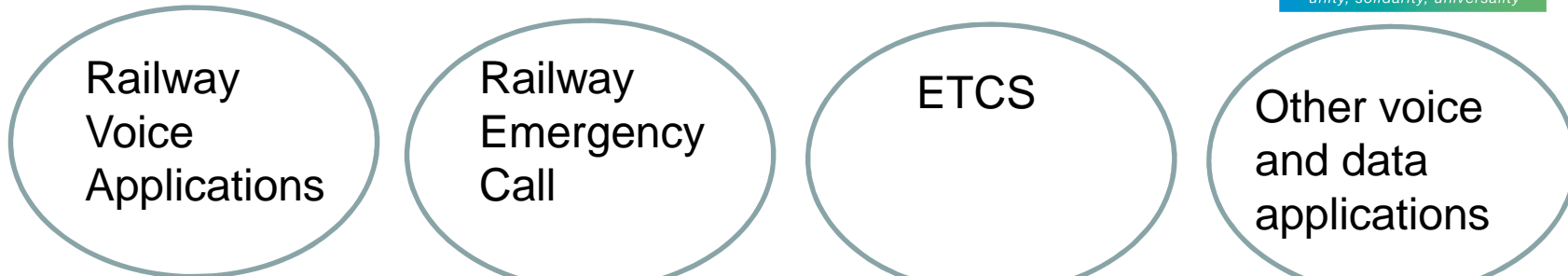applications: Diagnostics,
Energy Data, Maintenance**

Fall back for GSM-R

GSM-R - One single Platform for Voice and Data

EIRENE: what's in the box

Railway Voice Applications

Railway Emergency Call

ETCS

Other voice and data applications

WHAT IS USED NOW? **ONE SYSTEM FITS ALL** **WHAT IS NEEDED LONG TERM?**

Specific Voice Services VGCS, VBS

Addressing features LDA, FA

Priority features eMLPP

Standard Voice Services

Standard Data services

SPECTRUM? **WHAT WILL CHANGE?**

GSM-based Radio Access Network

Fixed Access Network
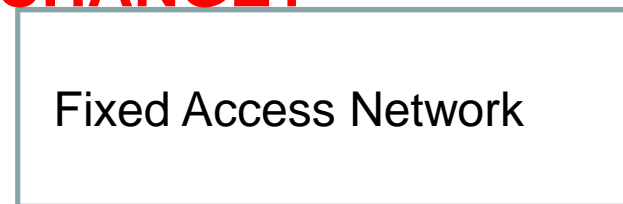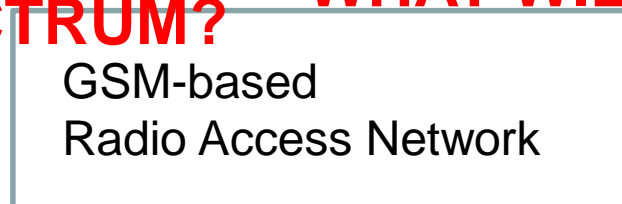
The world around us is changing

Telecom Market Evolution

Technology Evolution (IP, LTE, SDR, etc.)

Spectrum Shortage -> Efficiency

Cost Reduction

Future Railway Communication Solutions

Broadband for Critical Communications

End of Life GSM technology

EU Spectrum policy

Expansion of ETCS

Increase of mobile applications

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?

UIC Studies 2009-2010

- **Technical Report on LTE, 2009**
  - 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
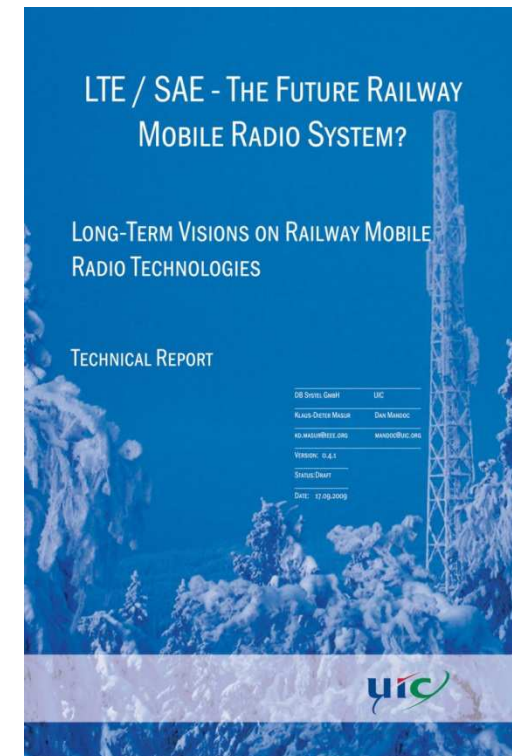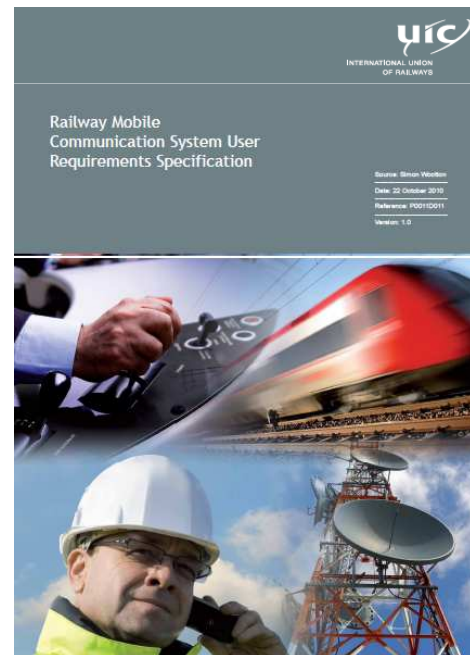
Railways Context

- **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?
  - Synchronuous 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:**
  - Data base 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

WP3: Technology & Architecture

Main goal is to prepare the decision on the future technolog(y)(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:**
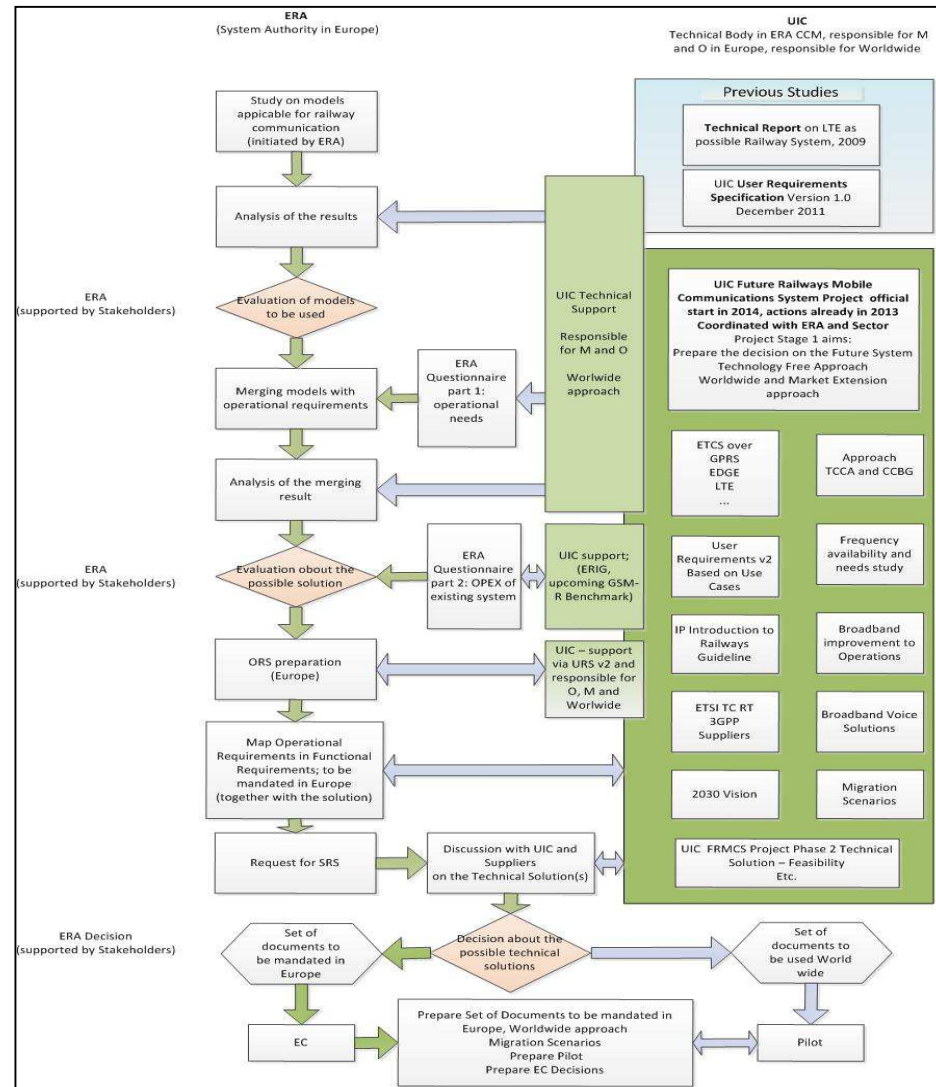 - Reports
  - System Requirement Specification

UIC and ERA

- **Scope of ERA and UIC is different, but with a certain overlap.**

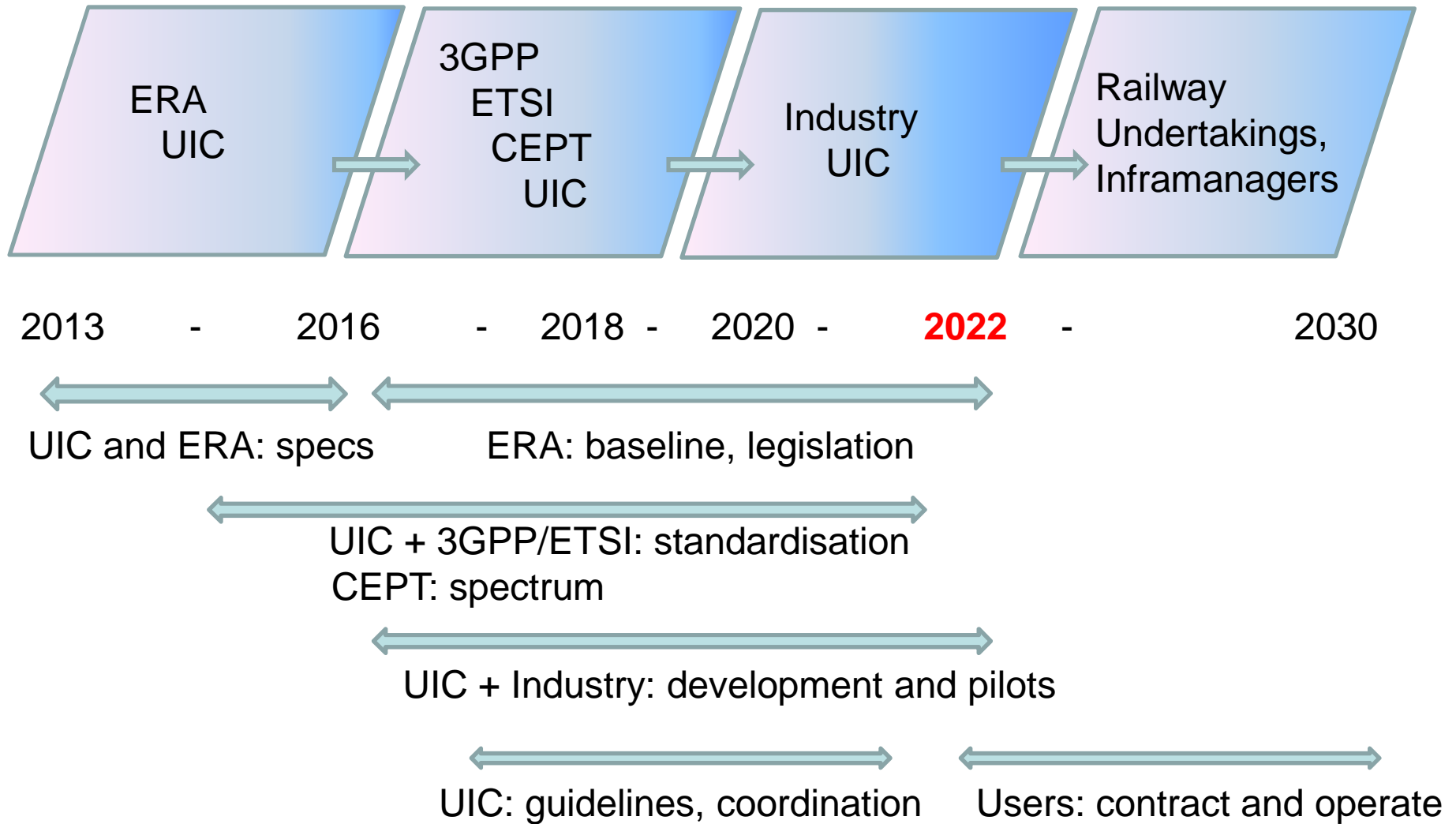- **The activities and interfaces between UIC and ERA are defined.**

Overview:

ERA UIC	3GPP ETSI CEPT UIC	Industry UIC	Railway Undertakings, Inframanagers

2013 - 2016 - 2018 - 2020 - **2022** - 2030

↔ 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

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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**