Managing a shared railway system to deliver safety and Interoperability – The European Experience
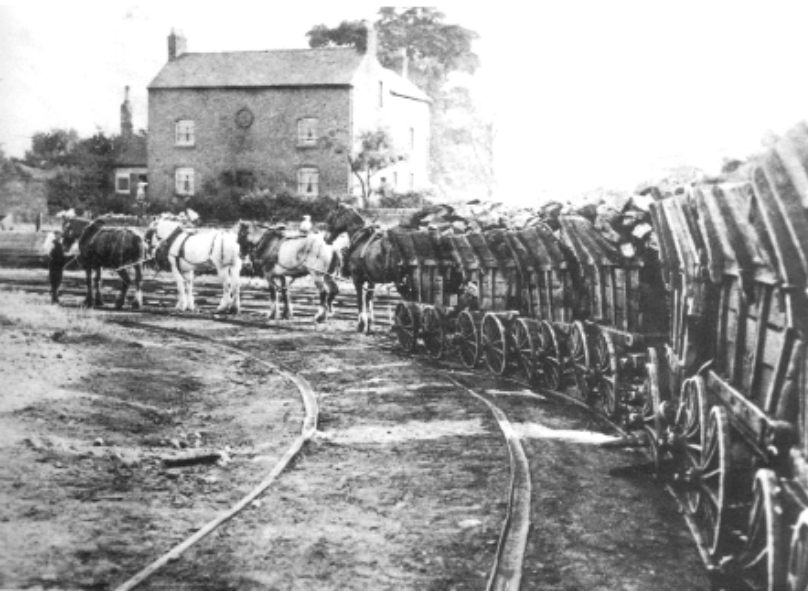
Washington, 27/09/2012
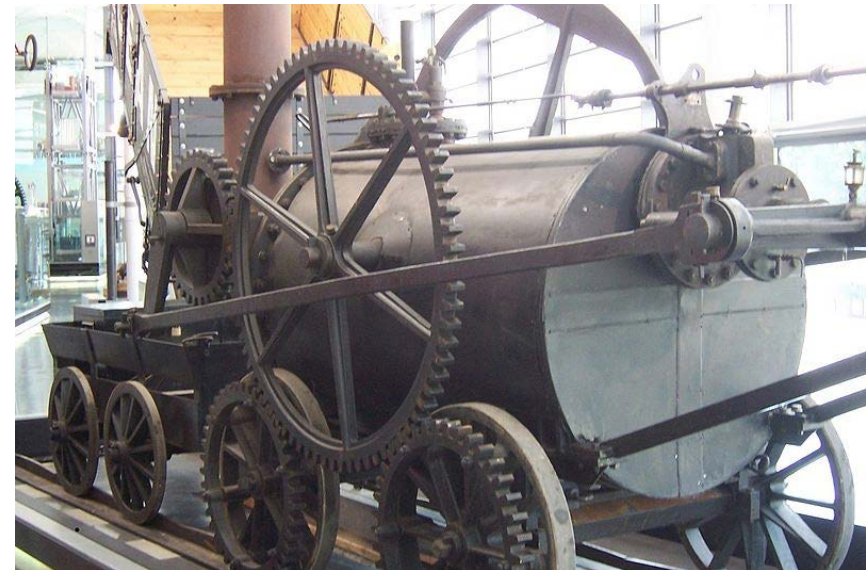
- **History**
- **European Standardisation**
- **The Agency**
- **ERTMS**
- **Key lessons**

Expansion and interconnection of rail systems demanded more precise standards for track gauge

Different competing engineering solutions:

- **7' Brunel**
- **5'   Whistler**
- **4' 8 1/2" Stephenson**

Kings, Presidents and Parliaments take a keen interest in technical rules:

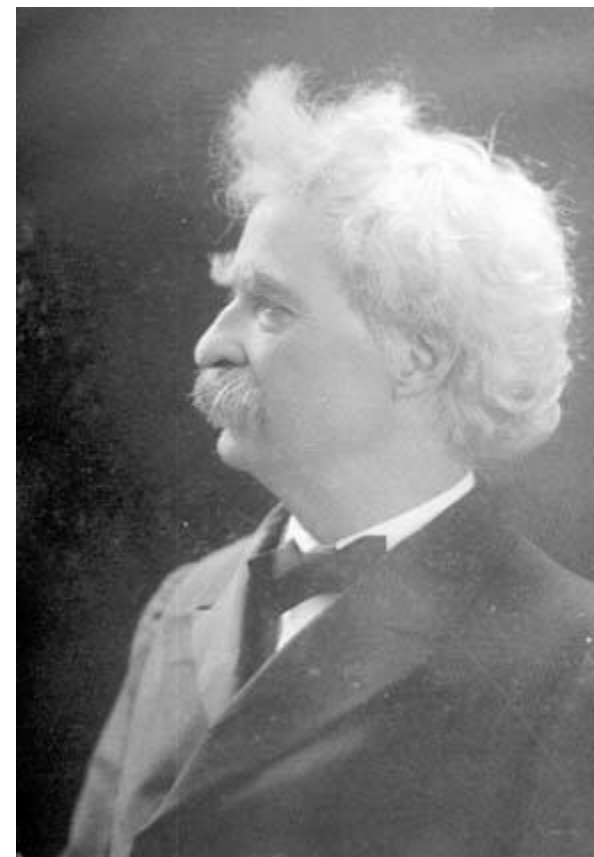| |
|---|
| **1846 UK Railway Regulation Act** |
| **1862 US Railway Pacific Act** |
| **1845 Spain (6 "castilian" feet)** |
| **1878 Italy** |

Technical harmonization at national level

Now comes a singular thing: the oddest thing, the strangest thing, the most baffling and unaccountable marvel that Australia can show….All passengers fret at the double gauge; all shippers of freight must of course fret at it; un-necessary expense, delay and annoyance are imposed on everybody concerned, and no-one is benefited

Mark Twain 1897

International agreements among rail companies guaranteed interoperability, but limited to coaches and wagons:

- 1882 Bern: International Conference on the technical unity of the Railways
- CIM, CIV
- 1922 UIC
- RIV and RIC

After WWII, national configurations with big integrated railways: monopoly situation, self-regulated at technical level. National technical "rivalry" developed

- **Different electrification voltages**
- **French TGV articulated German ICE not**
- **German ICE distributed power. French TGV =2xpower cars**

Commission's first White Paper on the future development of the common transport policy was published in December 1992. Revitalization of rail transport: Objective - Market opening for operation and supply

-separation of infrastructure / train operating companies

-mechanisms for capacity allocation;

-competition in freight and later in passenger services

…. needs a European wide interoperable standard system
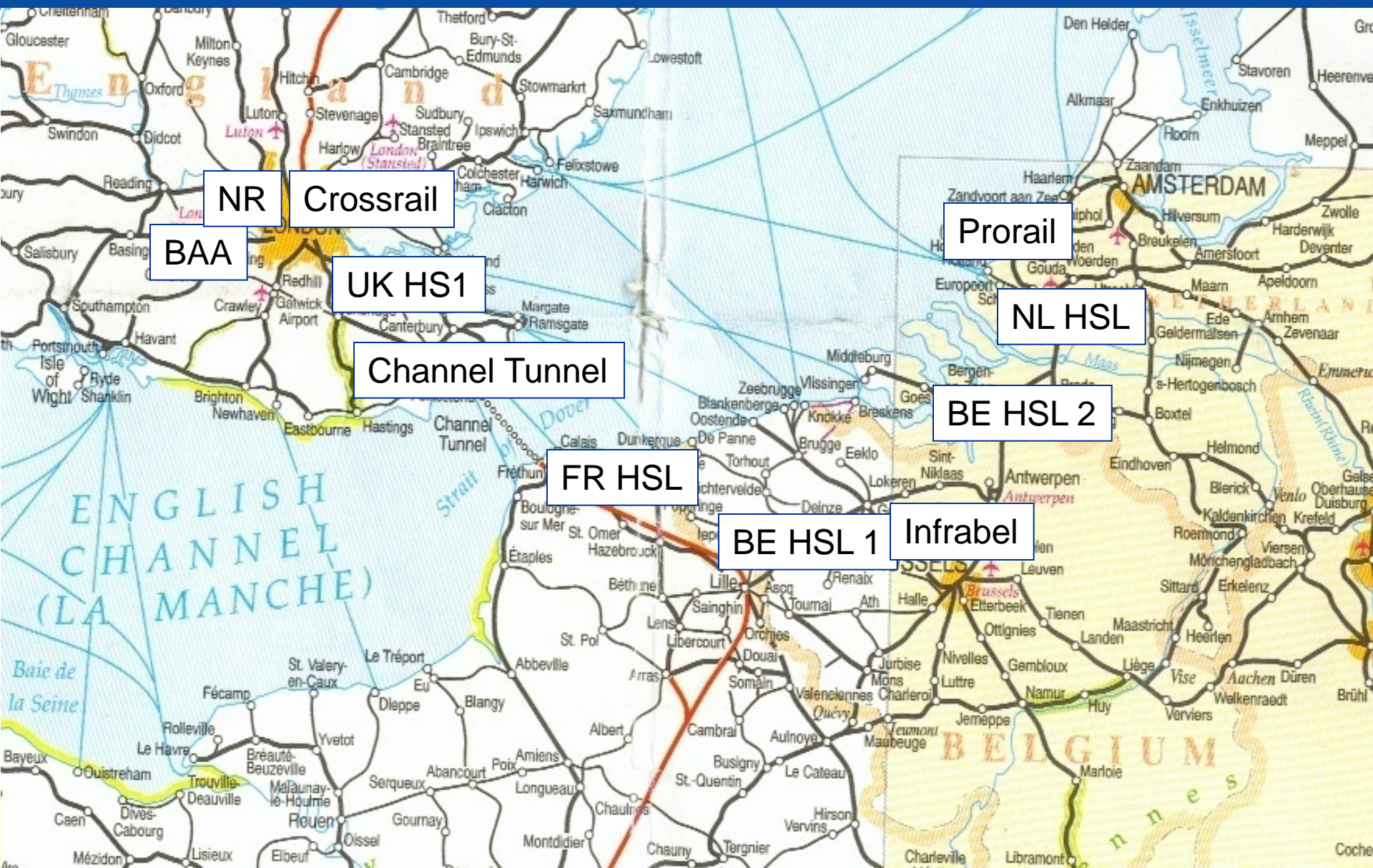
EU Directive on interoperability (1996 High Speed, 2001 Conventional)

- **20 years after the first Member States had constructed the first high speed networks**
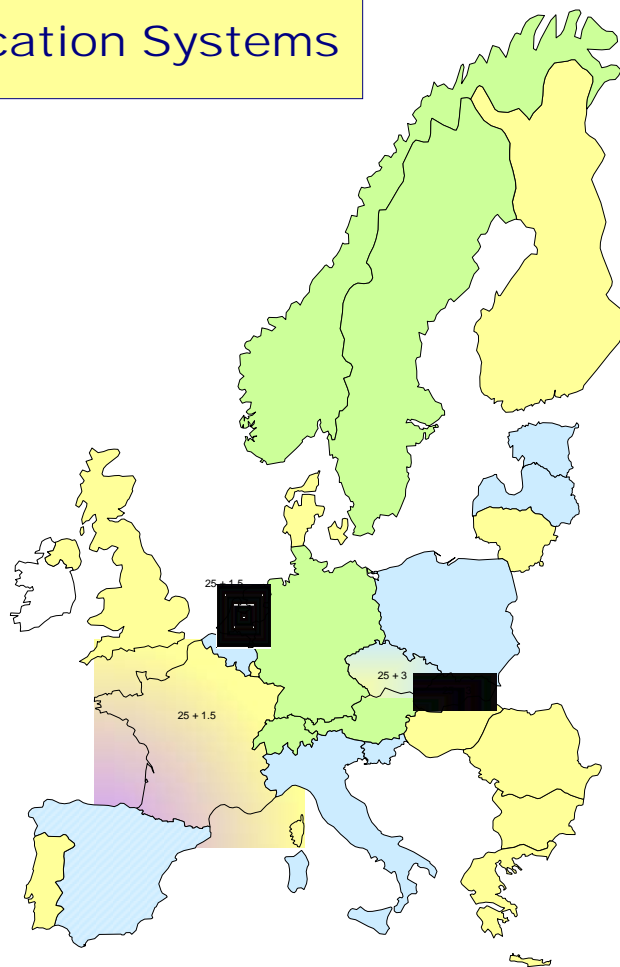
Railways in Europe

Operational Rules

Axle Load - Gauges

Electrification Systems

- 5 types of electrification
- 21 signaling systems
- 5 track gauges
- 5 classes of axles load
- 6 line gauges
- national operational rules

Main voltages

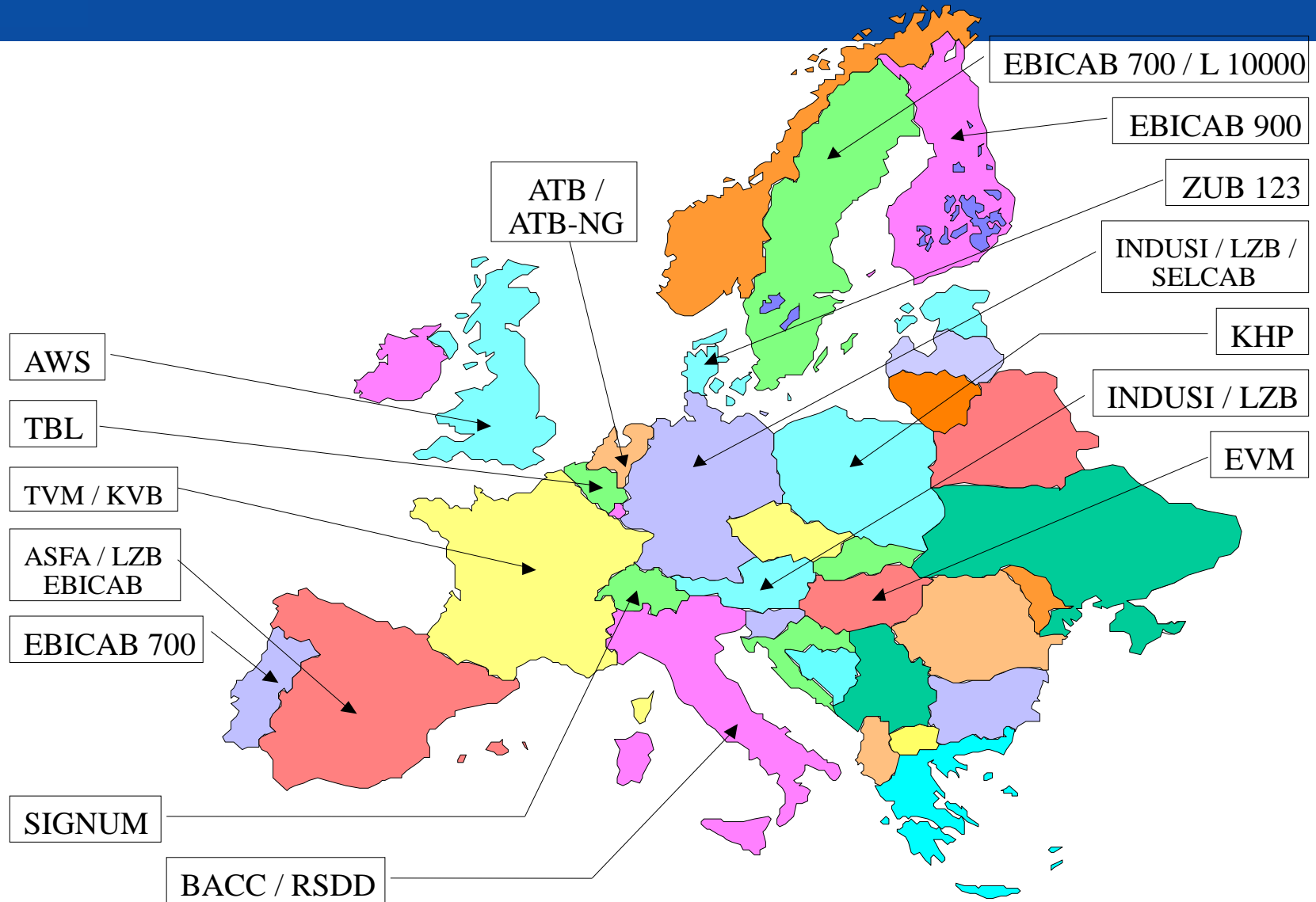25kV 50Hz

15 kV 16 2/3Hz

3kV DC

1.5kV DC

25 + 1.5

25 + 3
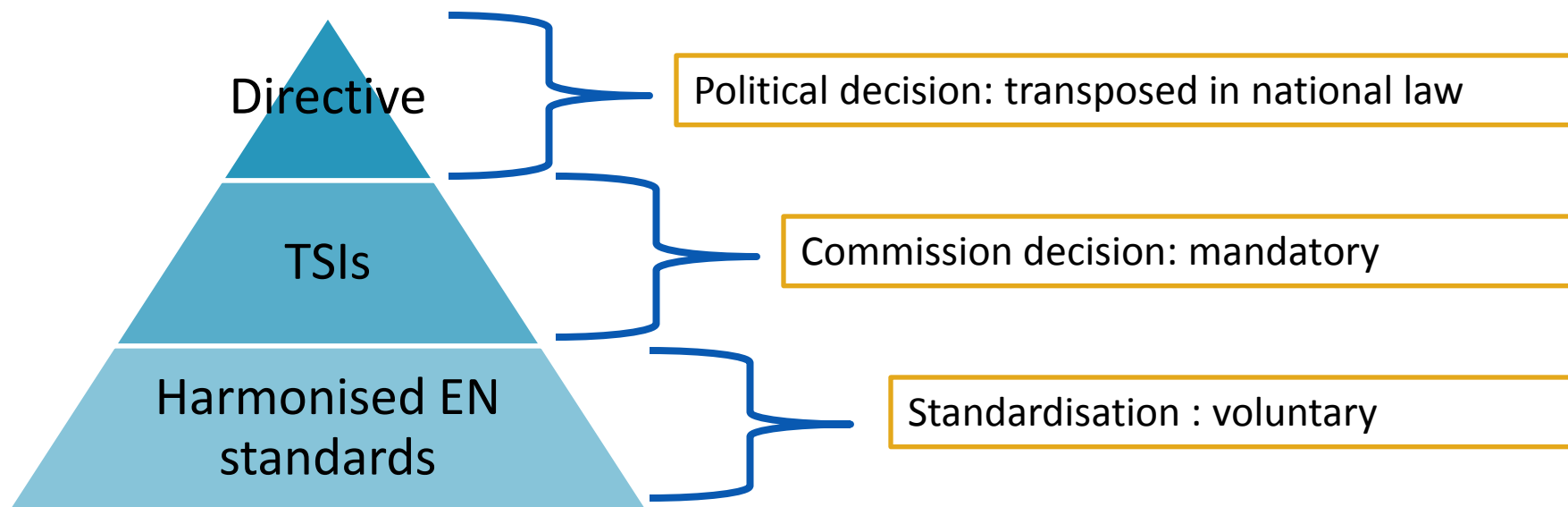
25 + 1.5

EBICAB 700 / L 10000

EBICAB 900

ZUB 123

ATB /
ATB-NG

INDUSI / LZB /
SELCAB

KHP

AWS

INDUSI / LZB

TBL

EVM

TVM / KVB

ASFA / LZB
EBICAB

EBICAB 700

SIGNUM

BACC / RSDD

Directive — Political decision: transposed in national law

TSIs — Commission decision: mandatory

Harmonised EN standards — Standardisation : voluntary
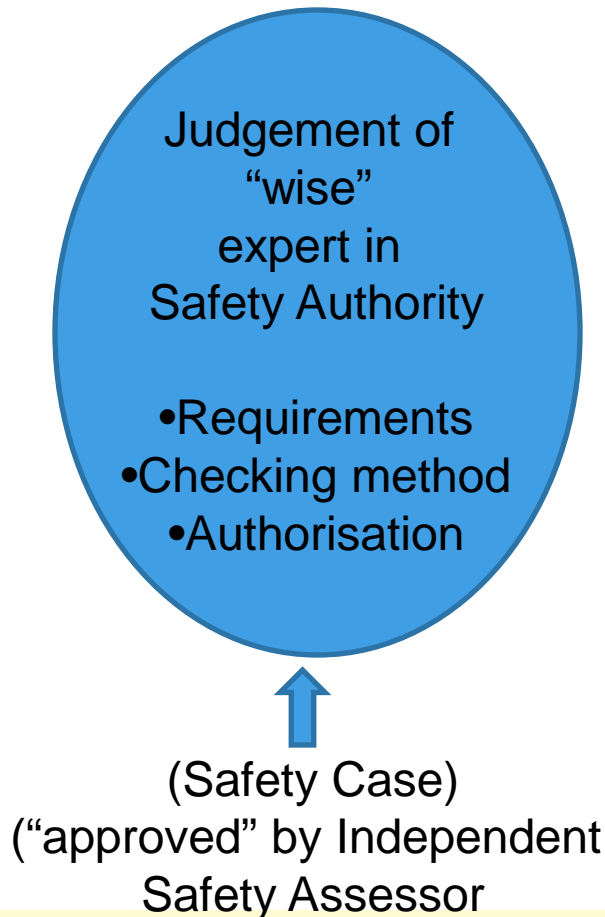
Entity	Reference /input	Result
Notified Body	TSI assessment using the assessment modules	Certificate of verification of conformity
Applicant	Certificate of verification	EC Declaration of verification
National safety Authority	EC Declaration of verification +	Authorisation for placing into service (administrative check)

**From expert Judgement
(single point of decision)**

**3rd party verification of conformity
to transparent, repeatable rules**

Judgement of
"wise"
expert in
Safety Authority

- Requirements
- Checking method
- Authorisation

(Safety Case)
("approved" by Independent
Safety Assessor
based on "judgement")

Rule setter
(Ministry on Safety Authority advice)

Transparency

3rd party
Checking Body
(NoBo or DeBo)

Authorising
Authority (SA)

14

- **At shared interfaces**

  - Everything necessary to meet the essential requirements - Safety, Health, Availability, Reliability, Environmental protection **ESPECIALLY Technical Compatibility**.

- **Elsewhere**

  - That which is necessary to ensure mutual recognition of vehicle authorisation and Safety Management Systems

  - Where market opening for common components adds value

- **Everything else – Beware!**

  - Too much standardisation (e.g. couplings, design technical solutions) inhibits innovation and market entry.

  - Interchangeability of vehicles and components
    - Is not necessary for interoperability
    - Can often be achieved voluntarily

ERA

The European Railway Agency
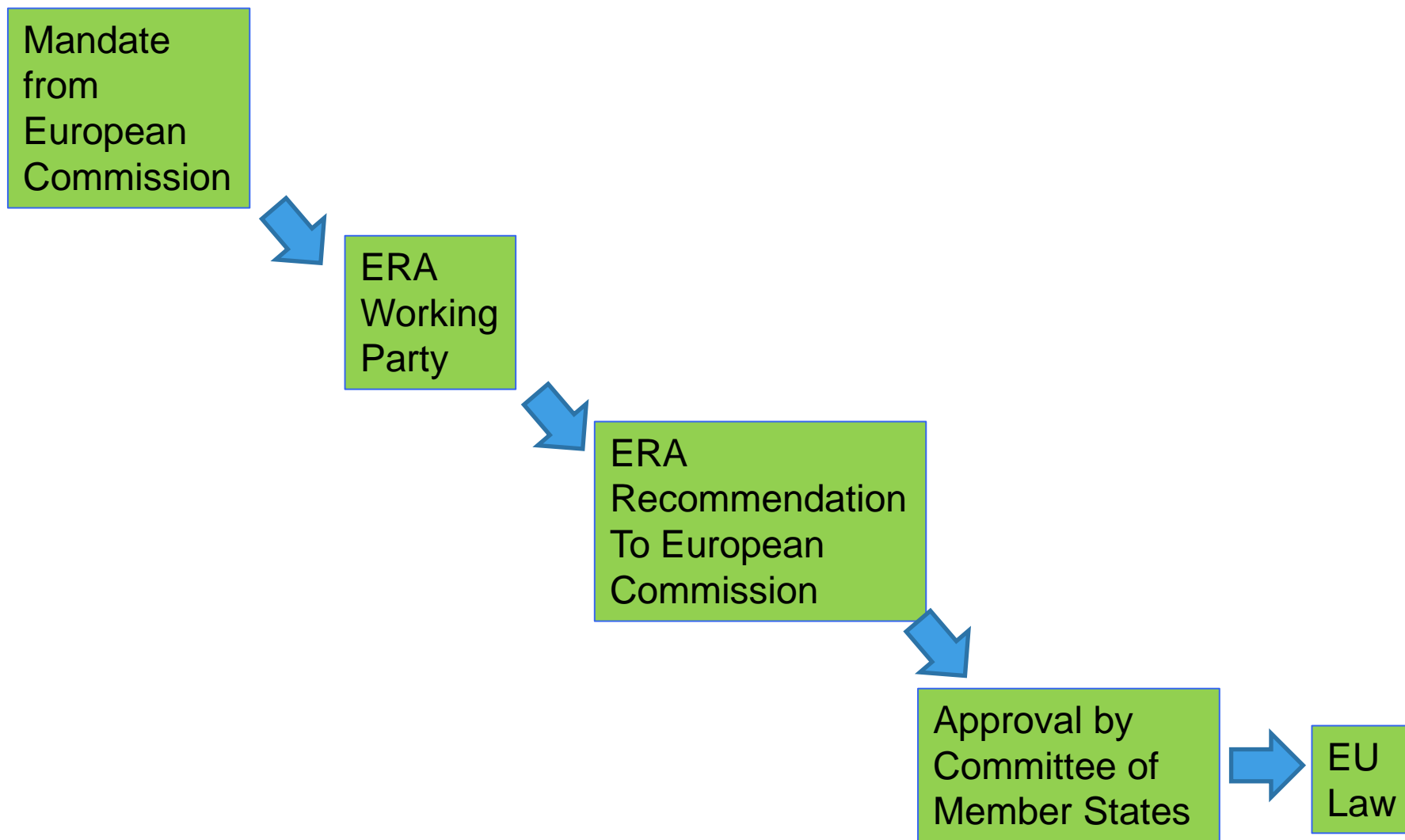
The European Railway Agency - ERA

- **Agency of the European Commission**

- **Based in Valenciennes/Lille France**

- **150 Staff**

- **Tasks**
  - Drafting Technical Specifications for Interoperability (TSIs)
  - Drafting Common Safety Methods
  - Collecting and publishing national rules and their equivalence
  - Registers
  - Reports and Opinions on Railway Technical and Safety Issues
  - Training and Dissemination of legal framework & standards

- *"The place where all the actors meet"*

- **50 working parties involving approx. 1500 experts representing**

  - National Safety Authorities

  - UNIFE (Manufacturers)

  - CER (Train Operators and Infrastructure Managers)

  - EIM (Infrastructure Managers)

  - EPPTOLA (leasing Companies)

  - UITP (Public Transport Association – metros etc)

  - Wagon Lessors

  - Combined Transport Association

  - Unions

Mandate from European Commission

→

ERA Working Party

→

ERA Recommendation To European Commission

→

Approval by Committee of Member States

→

EU Law

…an additional challenge for Signalling:

not just to inventory and take stock of the existing systems, but rather to specify a new system, design it, test it and make it a standard for every network

Designed to deliver interoperability including performance:
- i.e. every network will support the operation of a "standard" vehicle without any checks

Maximum speed up to 500 km/h;

Detailed specification to enable competitive open supply market

1996 Pilot projects in France, Germany and Italy

1998 technical specs responsibility to consortium of suppliers - UNISIG: (Alstom, Ansaldo, Bombardier, Invensys, Siemens, Thales)

April 2000, Madrid – European Commission endorsement of the ETCS specifications

April 2006 – ERA takes role as "system authority

20 years too late?

ERTMS is a major European industrial project, started and supported by the European Commission

***EU Political support*:**
nomination of the European Coordinator for ERTMS

***EU Financial support*:**
hundred M€for initial development;
500 M€reserved in 2007-13
up to 50%; Rolling Stock costs eligible
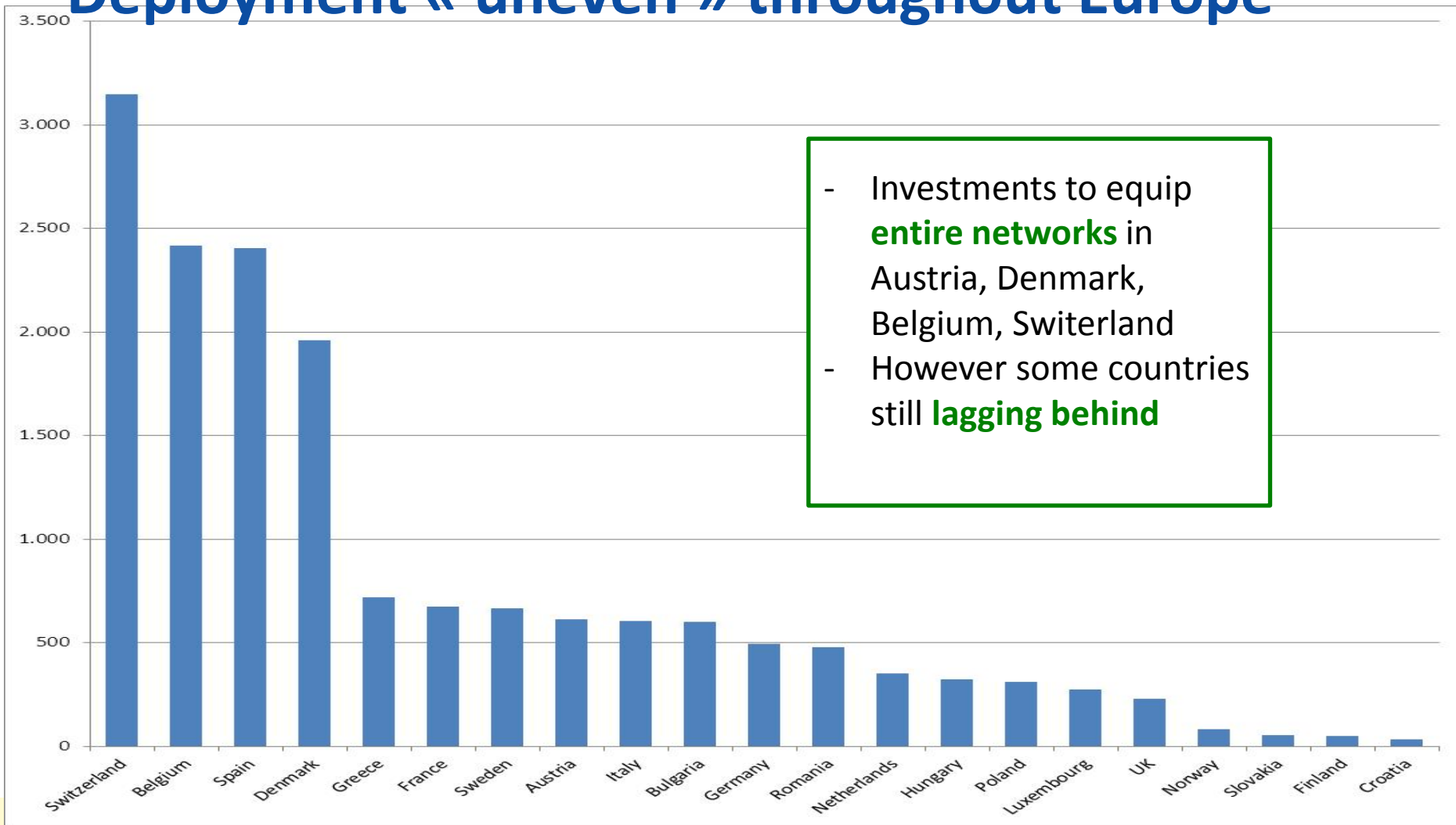
EU Legal Framework:
High Speed railway system: mandatory in case of new construction, renewal or upgrade
Conventional railway system: route specific obligations in the European Deployment Plan

Deployment « uneven » throughout Europe

- Investments to equip **entire networks** in Austria, Denmark, Belgium, Switerland
- However some countries still **lagging behind**

ERTMS trackside contracts, in tracks km (excluding frame contracts), April 2012 – Source: UNIFE

- **Spain – High Speed Network**
  - 600 miles in service at 186mph
  - Open market - interoperability between 5 on-board suppliers and 5 trackside suppliers

- **Switzerland**
  - High density mixed traffic railway 140mph
  - More reliable than lineside signals
  - 2 on board suppliers, 3 trackside

- **Italy – High Speed**
  - 500miles level 2 no signals, 186mph
  - 2 on-board, 2 trackside suppliers
  - 2 train operators in competition

- **Belgium – Netherlands**
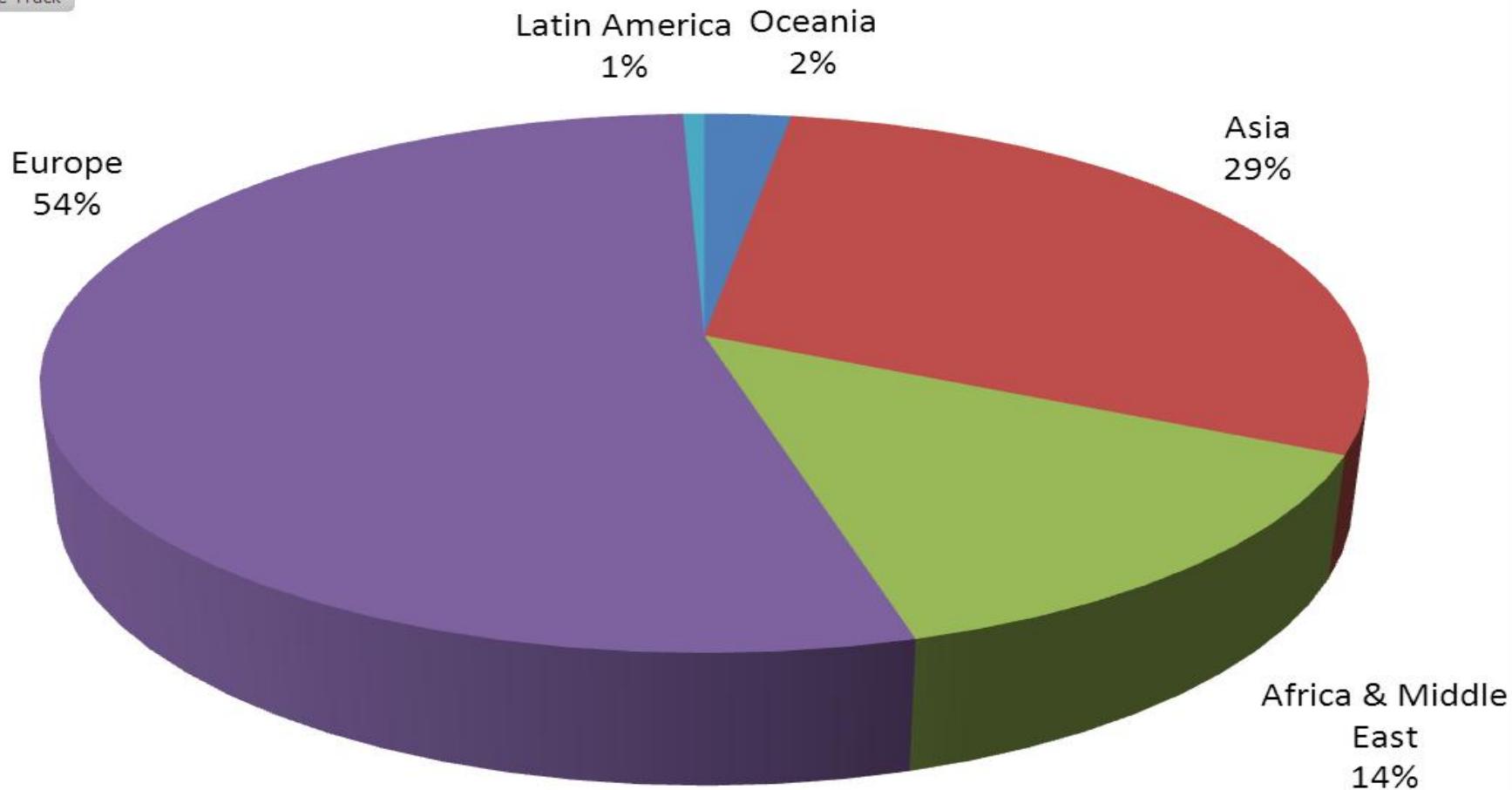 - First cross border operation

- **Interoperability between projects**
  - Between all countries
  - Within some countries

  - (The "Twain effect")

Trackside Trainborne Contract type
Somme de Track

Latin America 1%
Oceania 2%
Europe 54%
Asia 29%
Africa & Middle East 14%

ERTMS trackside contracts, in tracks km (excluding frame contracts), April 2012 – Source: UNIFE

ERTMS is not a product

ERTMS is not a solution

ERTMS is the decision to embrace a single European approach to design, install and maintain the signalling system in order to open the market and deliver safety and interoperability

ERTMS is less power, less autonomy for individual Infrastructure Managers and Train Operators.

Today,

Unified technology

… parametrized for different signalling principles

Standardised functions

… employed in different operational contexts

Defined safety requirements for subsytem

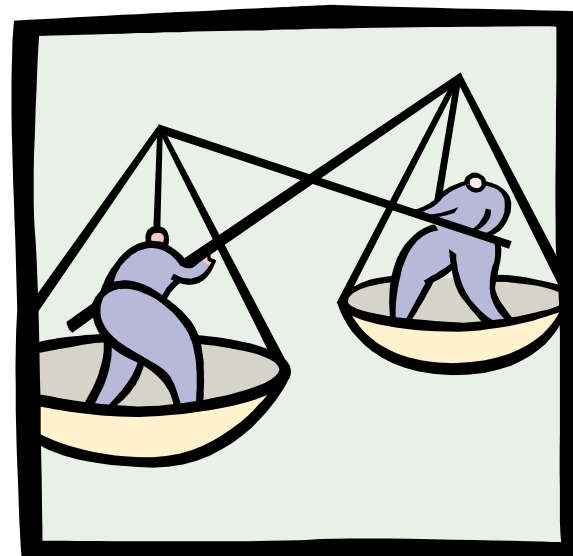**… part of overall safety assessment**

Proactive approach from all parties

Change Control is not day-to-day technical routine:

strategic balancing:

protection of investments

evolution of ERTMS

Enabling technology allows exploitation of new business opportunities,   operational improvements and better efficiency.

Evolution must not become a constraint or a barrier, but interoperability investments must be protected

ETCS Level 2: shifting the balance trackside-onboard

no signals, less cabling along the tracks:

LCC savings for the Infrastructure Managers

more software onboard:

LCC must be managed

proactively by Train

Operators!

Historically all ATP/ATC systems have been developed, installed and optimised by integrated railways for their own interests…

Separation of roles and accounting between Infrastructure Managers and Train Operators…

ERTMS generates substantial net benefits for the whole railway system, but how to apportion cost/benefit between Infrastructure Manager and Train Operator?

Need to ensure full Technical Compatibility between different network installations in different projects – central government role (to avoid the "Twain effect")

There is the need for stable transparent deployment planning, to allow coordination of migration strategies and investments between projects.

Reality of business case for Train Operators

In some cases the Operators face the prospect of having to fund the costs of installing a new on-board train protection system (ERTMS) <u>without actually being able to remove existing systems</u> and thus meeting also higher operating costs and reduced competitiveness.

Depending on the migration strategy (replacement or overlay) here may be <u>no immediate savings on infrastructure CCS costs to be passed back to operators</u> as reduced access charges

Therefore to "kick start" the roll out, the European Commission <u>co-funds onboard</u> ERTMS fitment of applicants.

Remaining Issues:

- Component specs and interfaces based on cost/benefit
- Defined acceptance steps
- Engineering best practices
- Harmonisation of operating rules
- Level 3 (no trackside train detection)
- Traffic management layer

Right mix of regulation and voluntary standardisation

- **The "Twain effect" must be prevented by central intervention**
    - Defining the system
    - Enforcing compliant installation
    - Managing evolution

- **Better to do this before the projects are implemented.**
    - (not 20 years after)

- **At shared interfaces (vehicle-network)Standards must be exhaustive and mandatory**

We make the railway system work better for society.

era.europa.eu