JOINT UIC – FSR TRANSPORT WEBINAR
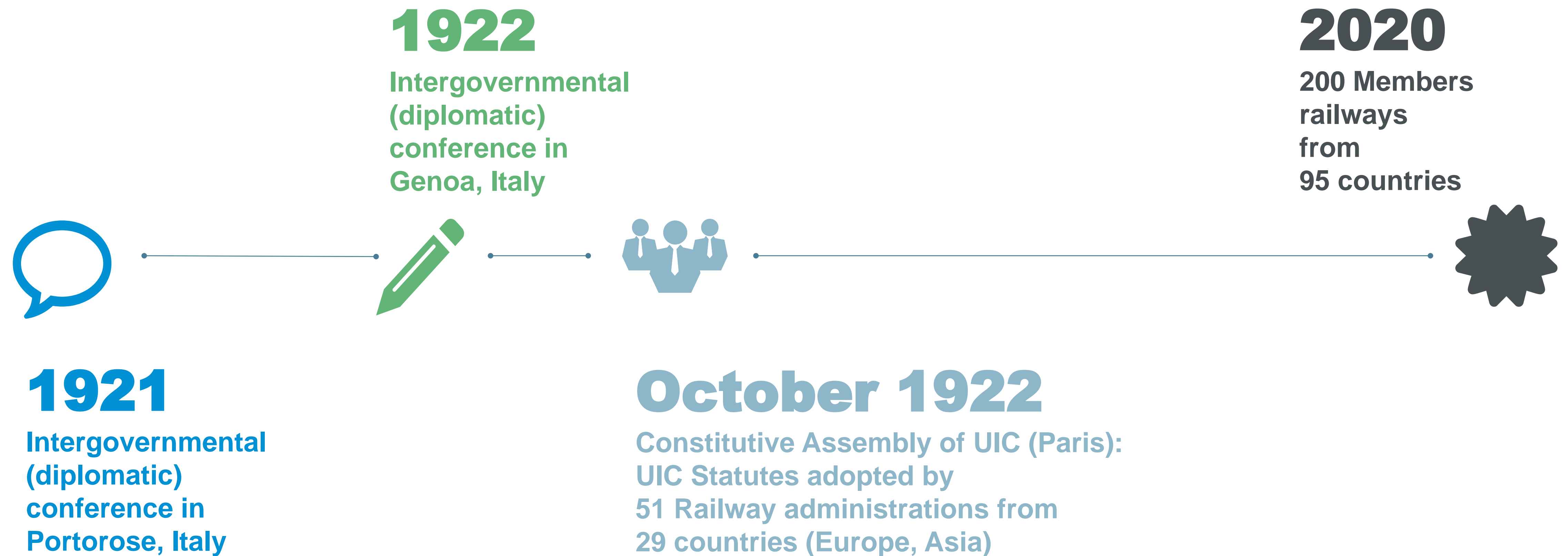
HANDBOOK ON RAILWAY REGULATION

Christian CHAVANEL

Director for Rail System

UIC IN A NUTSHELL

UIC, A LONG HISTORY AT THE SERVICE OF MEMBER RAILWAYS AND INTERNATIONAL RAILWAY COOPERATION

1922

Intergovernmental
(diplomatic)
conference in
Genoa, Italy

2020

200 Members
railways
from
95 countries

1921

Intergovernmental
(diplomatic)
conference in
Portorose, Italy

October 1922

Constitutive Assembly of UIC (Paris):
UIC Statutes adopted by
51 Railway administrations from
29 countries (Europe, Asia)

UIC TODAY

200 members in 95 countries

3,000 billion passenger kilometres

10,000 billion tonnes kilometres

1 million kilometres of lines

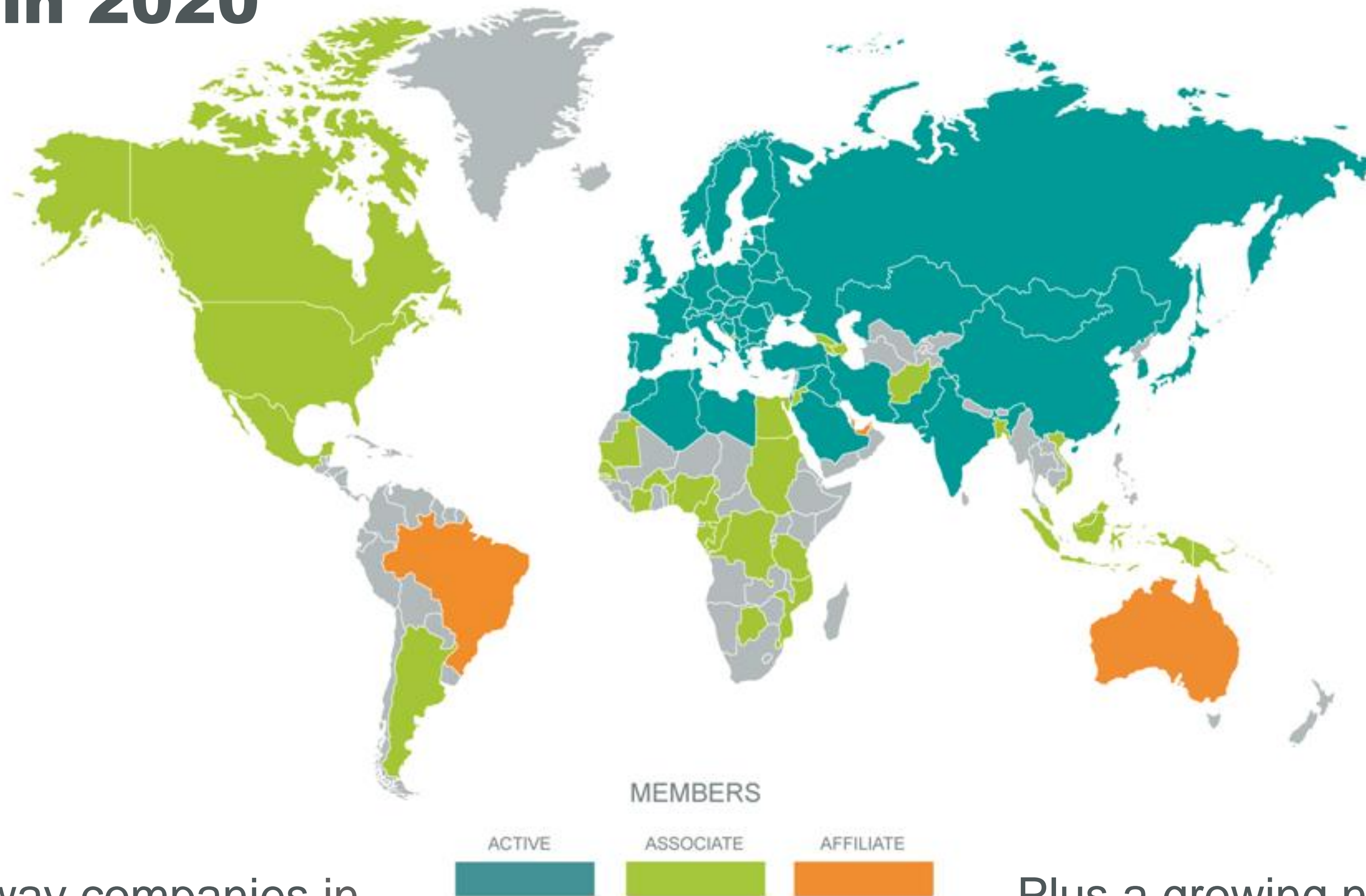**7** million rail personnel

Cooperation with over **100** institutions

700 UIC Leaflets - New International Railway Solutions (IRS)

85 congresses, conferences, workshops

UIC in 2020

MEMBERS

ACTIVE ASSOCIATE AFFILIATE
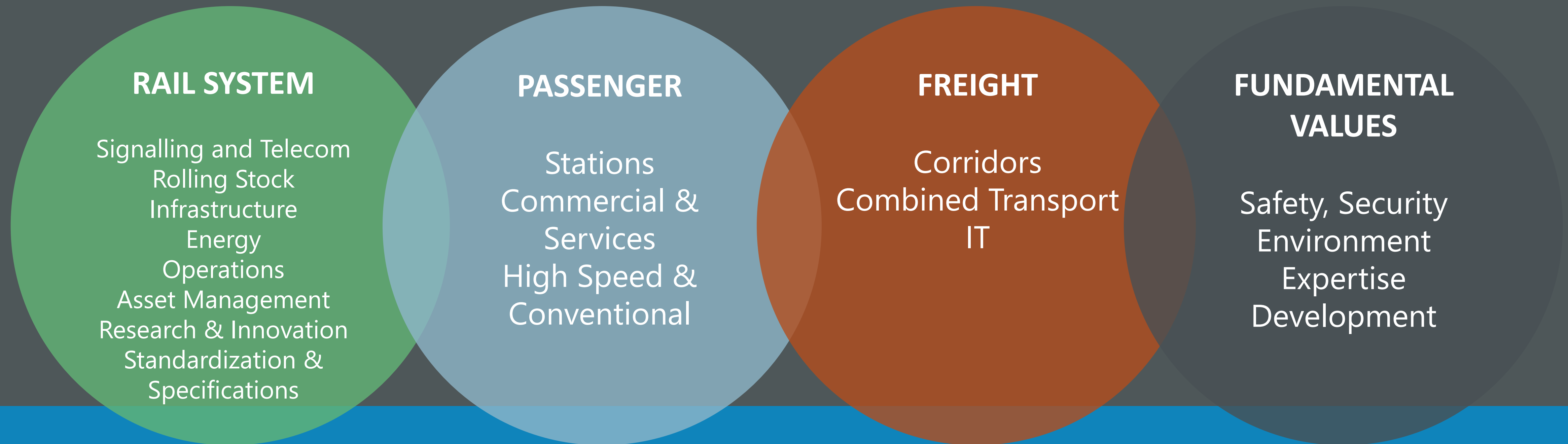
200 railway companies in more than 90 countries

Plus a growing network of research bodies and universities

UIC ORGANISATION STRUCTURE

RAIL SYSTEM

Signalling and Telecom
Rolling Stock
Infrastructure
Energy
Operations
Asset Management
Research & Innovation
Standardization &
Specifications

PASSENGER

Stations
Commercial &
Services
High Speed &
Conventional

FREIGHT

Corridors
Combined Transport
IT

FUNDAMENTAL VALUES

Safety, Security
Environment
Expertise
Development

COMMUNICATIONS · **INSTITUTIONAL RELATIONS** · **HR & SOCIAL** · **FINANCE**

SYNERGIES DEVELOPED BY UIC WITH LEADING INSTITUTIONS
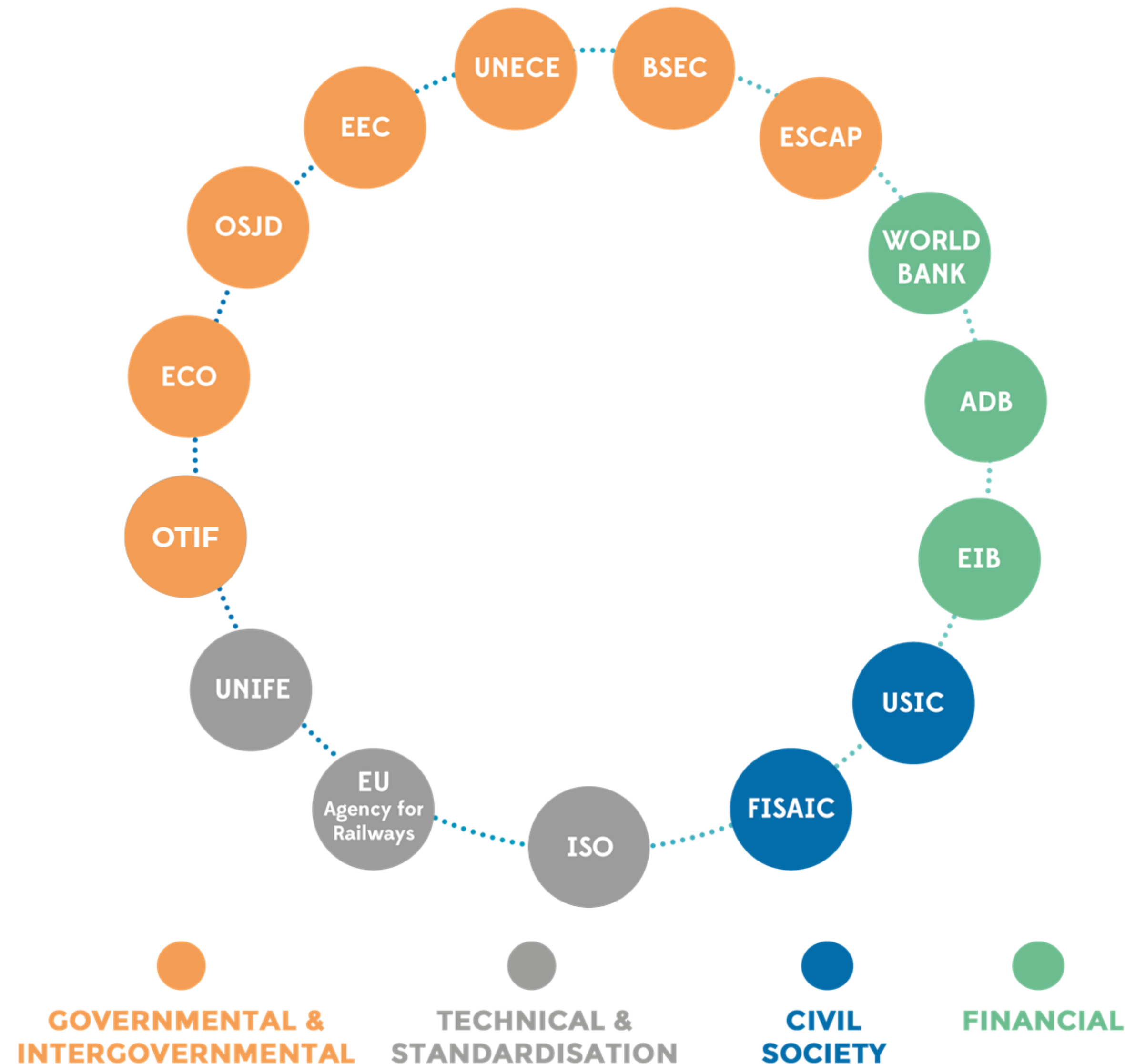
ADB: Asian Development Bank

BSEC: Black Sea Economic Cooperation

EEC: Eurasian Economic Commission

ECO: Economic Cooperation Organisation

EIB: European Investment Bank

ESCAP: The Economic and Social Commission for Asia and the Pacific

FISAIC: Fédération Internationale des Sociétés Artistiques et Intellectuelles de Cheminots

ISO: International Organization for Standardization

OSJD: Organisation for Cooperation between railways

OTIF: Intergovernmental Organisation for International Carriage by Rail

UNECE: Economic Commission for Europe

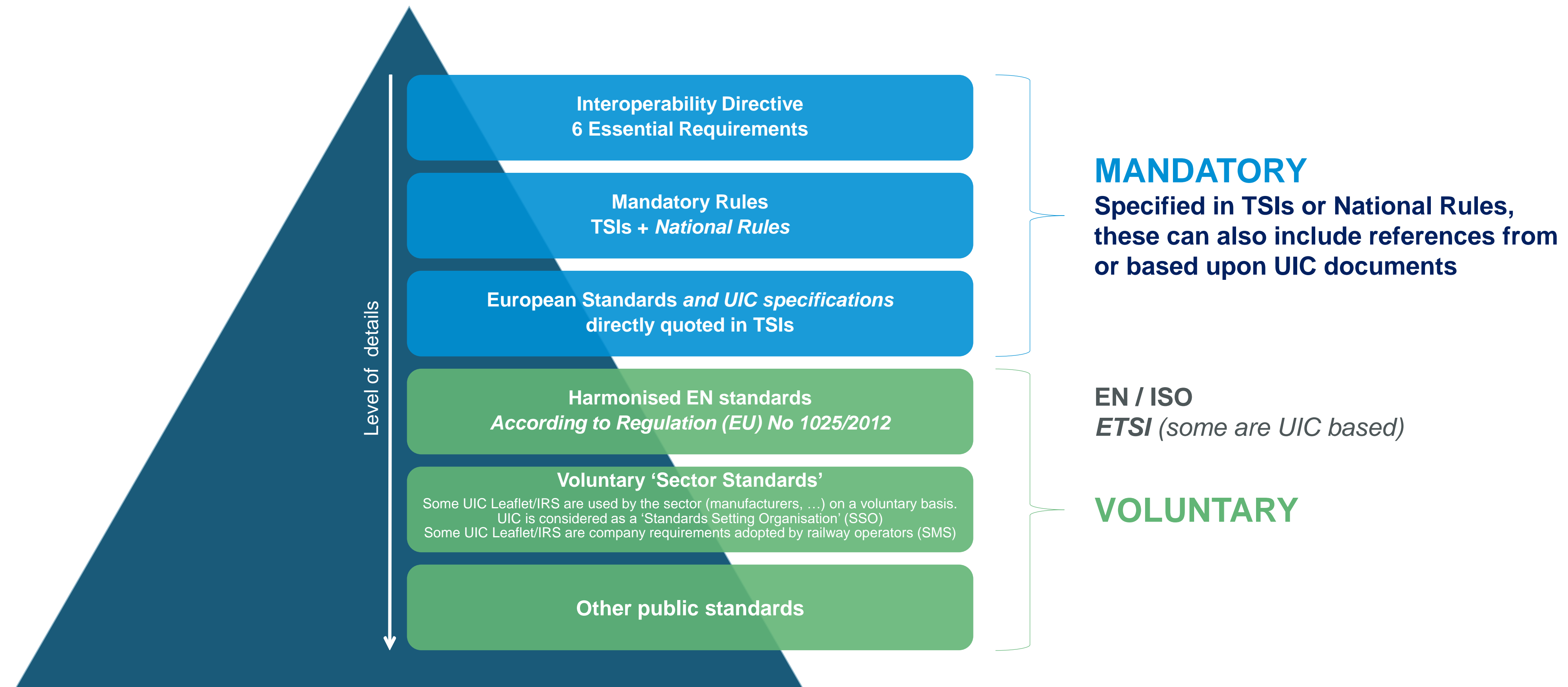**UNIFE**: Union des Industries Ferroviaires Européennes

USIC: International Railway Sports Association

FROM A CLASSICAL REGULATORY FRAMEWORK ...
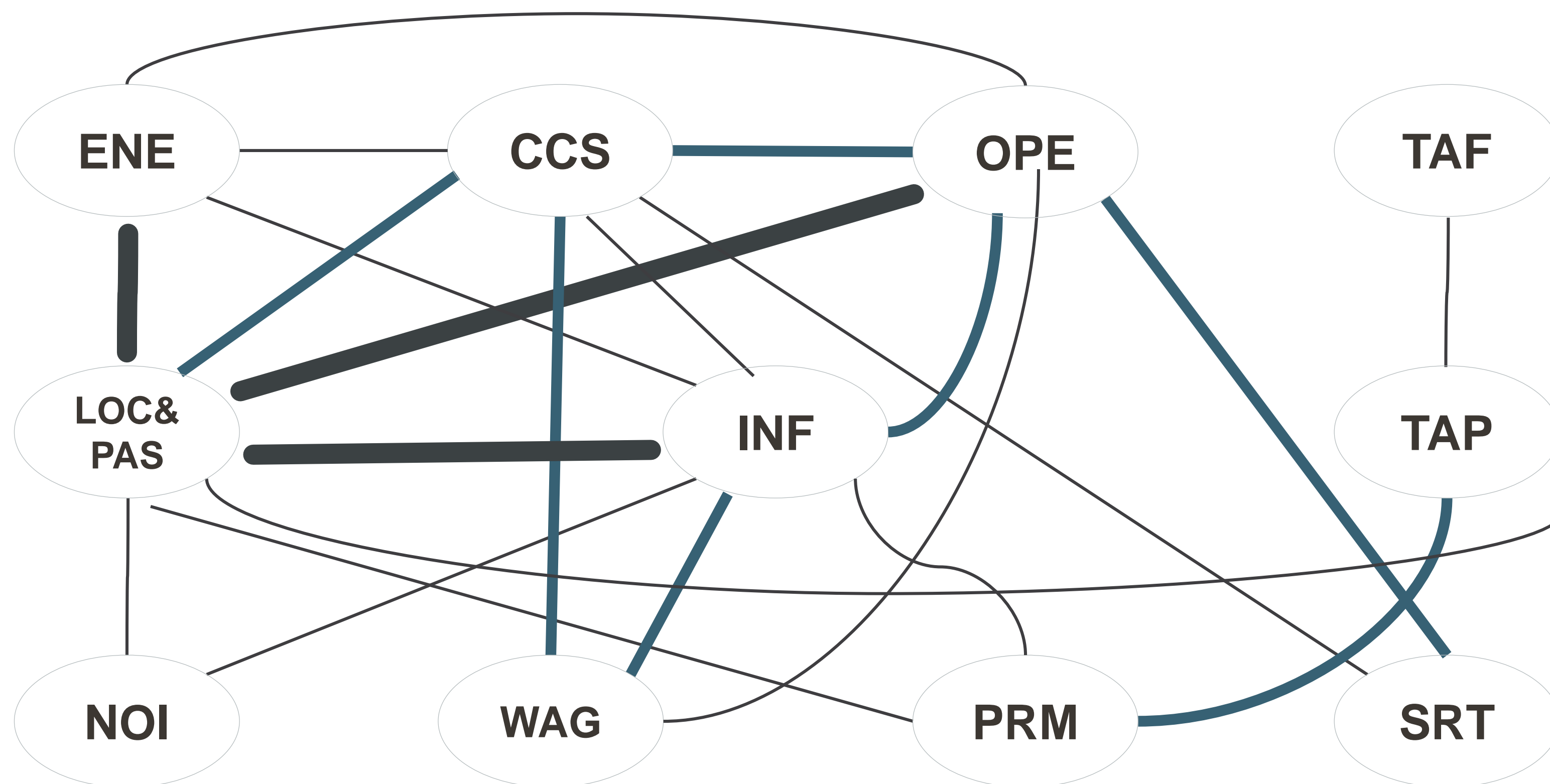
EUROPEAN RAILWAY REGULATORY FRAMEWORK
CURRENT STATE (1/3)

Level of details

Interoperability Directive
6 Essential Requirements

Mandatory Rules
TSIs + *National Rules*

European Standards *and UIC specifications*
directly quoted in TSIs

Harmonised EN standards
According to Regulation (EU) No 1025/2012

Voluntary 'Sector Standards'
Some UIC Leaflet/IRS are used by the sector (manufacturers, …) on a voluntary basis.
UIC is considered as a 'Standards Setting Organisation' (SSO)
Some UIC Leaflet/IRS are company requirements adopted by railway operators (SMS)

Other public standards

MANDATORY
Specified in TSIs or National Rules, these can also include references from or based upon UIC documents

EN / ISO
ETSI (some are UIC based)

VOLUNTARY

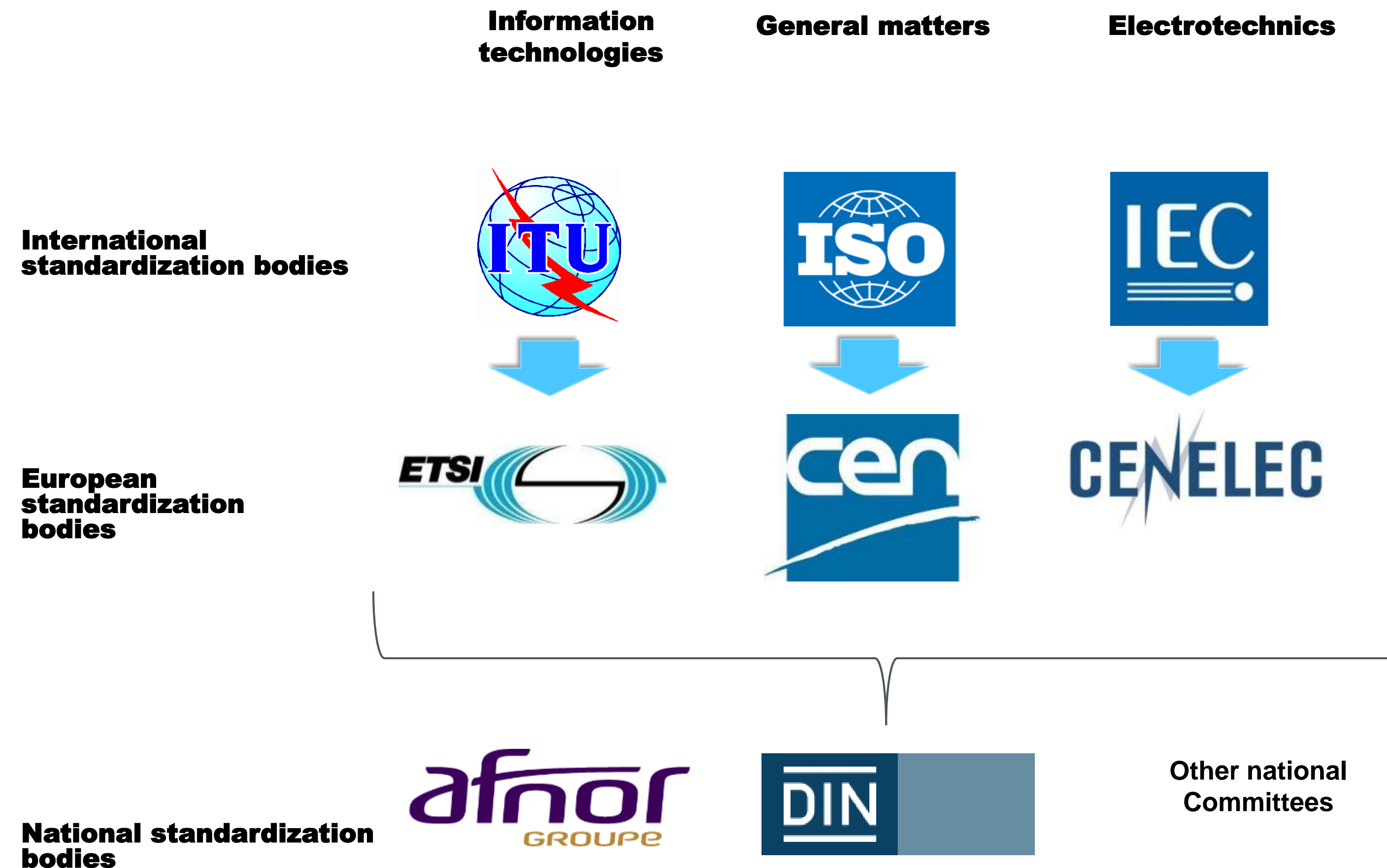# INTERFACES BETWEEN THE DIFFERENT TSIs

CURRENT STATE (2/3)

More than 10 basic parameters at the interface

Between 5 et 10 basic parameters at the interface

Less than 5 basic parameters at the interface

EUROPEAN RAILWAY REGULATORY FRAMEWORK

CURRENT STATE (3/3)

... TOWARDS A NEW ARCHITECTURE FOR TECHNICAL REGULATION OF EUROPE'S RAILWAYS

THE OBJECTIVES OF THE EUROPEAN SECTOR

INTEGRATING MAJOR TECHNICAL BREAKTHROUGHS

- **Digitalisation**

- **5G**

- **Automation**

- **Artificial Intelligence**

- **Overcoming cyber risks**

THE OBJECTIVES OF THE EUROPEAN SECTOR

INTEGRATING MAJOR TECHNICAL BREAKTHROUGHS

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ACCELERATING THE CYCLE OF INNOVATION

THE OBJECTIVES OF THE EUROPEAN SECTOR

INTEGRATING MAJOR TECHNICAL BREAKTHROUGHS

- **Digitalisation**
- **5G**
- **Automation**
- **Artificial Intelligence**
- **Overcome cyber risks**

ACCELERATING THE CYCLE OF INNOVATION

RAILWAY BECOMES THE BACKBONE OF THE LAND MOBILITY

- **Offer the end-users (passengers and freight) an easier and seamless access to a portfolio of sustainable mobility**
- **For passengers: Mobility as a Service (MaaS)**
- **For freight: to transform rail freight into a high-performing, efficient and sustainable backbone transport system for a European multimodal logistics industry (Rail Freight Forward 2018) [1]**

(1): Rail Freight Forward (2018), '30 by 2030 – Rail Freight strategy to boost modal shift', accessed 13 December 2018 at
https://www.sncf.com/sites/default/files/press_release/WHITE_PAPER_30by2030.pdf

BUILDING A NEW ARCHITECTURE OF THE RAIL SYSTEM

THE CONCEPT OF BACKBONE COMES FROM THE WORLD OF INFORMATION AND COMMUNICATION TECHNOLOGY

BUILDING A NEW ARCHITECTURE OF THE RAIL SYSTEM

THE CONCEPT OF BACKBONE COMES FROM THE WORLD OF INFORMATION AND COMMUNICATION TECHNOLOGY

SIMILARITIES BETWEEN RAILWAY TRANSPORT AND DATA TRANSMISSION

Data travel through information network

Passengers and goods travel on railway networks

BUILDING A NEW ARCHITECTURE OF THE RAIL SYSTEM

THE CONCEPT OF BACKBONE COMES FROM THE WORLD OF INFORMATION AND COMMUNICATION TECHNOLOGY

The concept of backbone has been standardized through a basic reference model: Open Systems Interconnection (OSI) [1]

The OSI reference model:
- aims to **give the end-users of data transmissions the impression of seamless or uninterrupted transmission**, whereas in fact, some complex interfaces are involved
- Breaks down the various protocols required to transmit the data into 7 **different layers**
- **Each layer:**
  - **resolves specific problems** concerning the data transmission
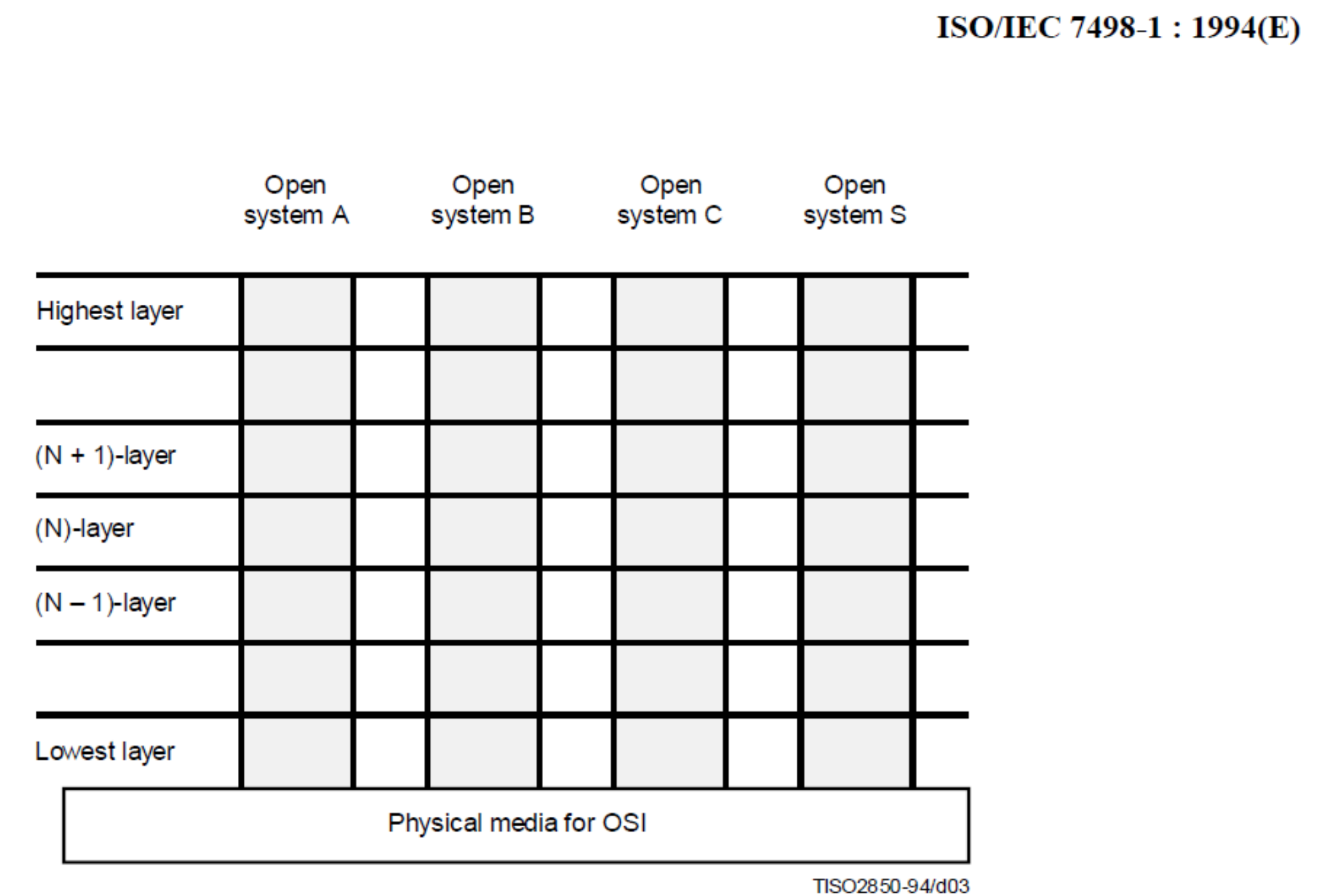 - **Provides well-defined services to the layers above**

ISO/IEC 7498-1 : 1994(E)

Figure 3 – Layering in cooperating open systems

# BUILDING A NEW ARCHITECTURE OF THE RAIL SYSTEM

THE CONCEPT OF BACKBONE COMES FROM THE WORLD OF INFORMATION AND COMMUNICATION TECHNOLOGY

The advantages of OSI reference model
- **Only the interfaces**
  - between the modules of a layer
  - Between the different layers

  need to be described

- **Concept of modularity** is introduced
  - Able to accommodate advances in technology and expansion in user demands
  - **Easier and faster innovation** thanks to a **plug-and-play approach**
    Provided that innovation impacts only one module in one specific layer

- **Strong enabler for multimodality**
  if the different modes of transport adopt the same layers

ISO/IEC 7498-1 : 1994(E)
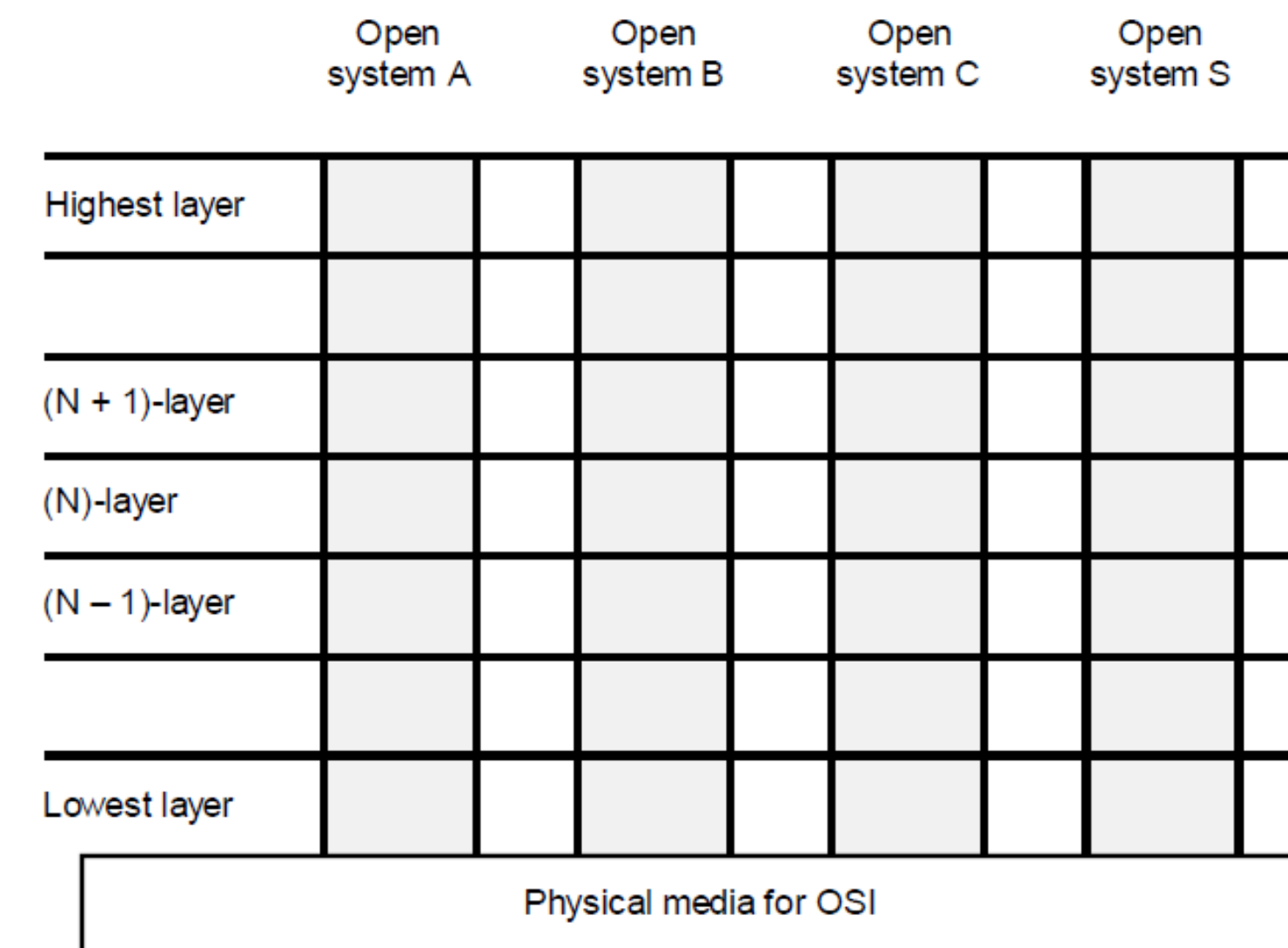
Figure 3 – Layering in cooperating open systems

TOWARDS A FOUR-LAYER ARCHITECTURE OF THE RAILWAY REGULATION AND STANDARDISATION

THE RAILWAY SECTOR HAS ALREADY IMPLEMENTED SOME ASPECTS OF THE OSI MODEL

The functional approach of the TSIs is based on the definition of interfaces between the different TSIs
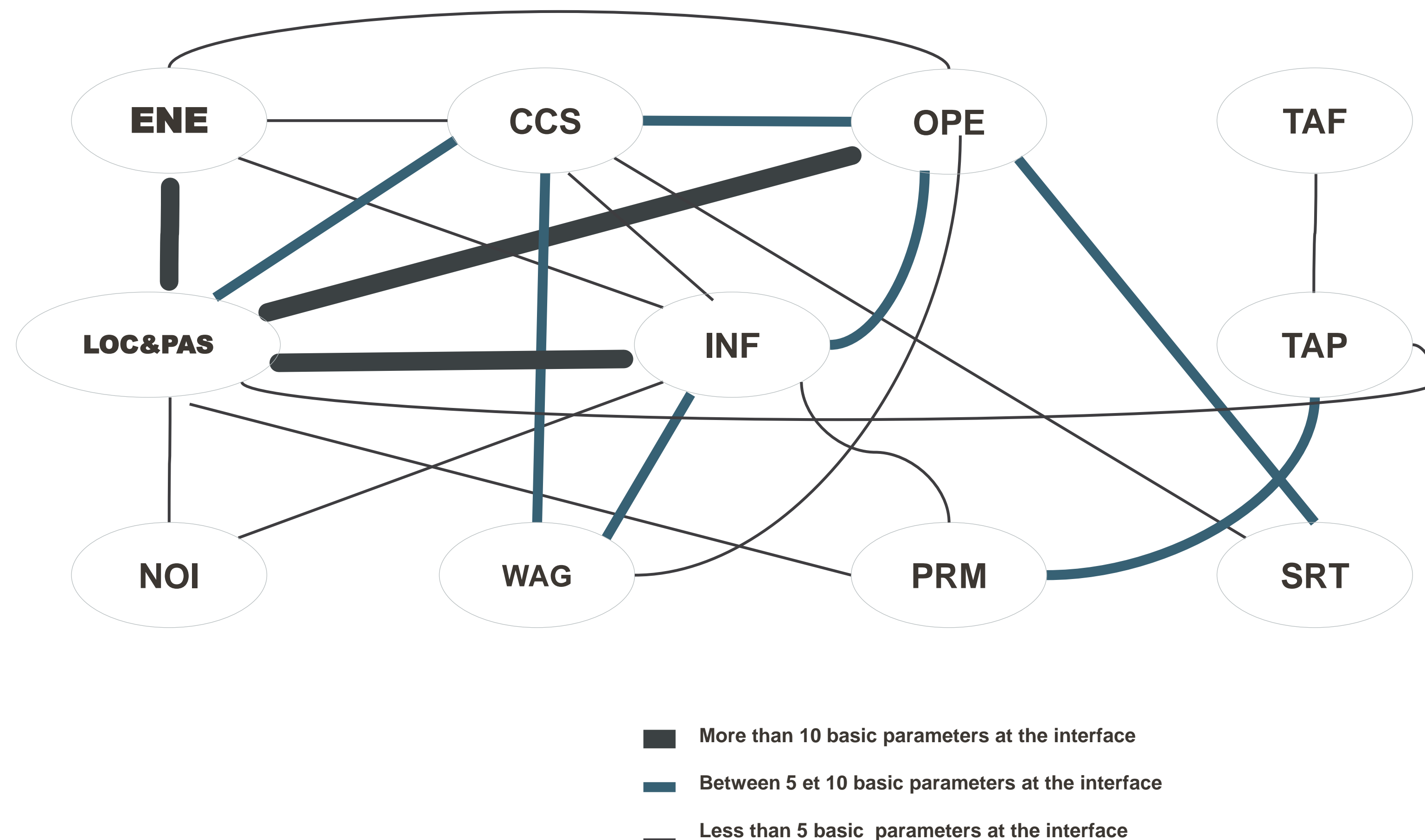
More than 10 basic parameters at the interface

Between 5 et 10 basic parameters at the interface

Less than 5 basic parameters at the interface

TOWARDS A FOUR-LAYER ARCHITECTURE OF THE RAILWAY REGULATION AND STANDARDISATION

RAIL FREIGHT   **RAIL PASSENGERS**

TOWARDS A FOUR-LAYER ARCHITECTURE
OF THE RAILWAY REGULATION AND STANDARDISATION

RAIL FREIGHT   **RAIL PASSENGERS**

SERVICE
LAYER

Enables:
- door-to-door journeys
  for passengers
- Seamless end-to-end
  freight transport

TOWARDS A FOUR-LAYER ARCHITECTURE OF THE RAILWAY REGULATION AND STANDARDISATION

RAIL FREIGHT   **RAIL PASSENGERS**

SERVICE LAYER

NETWORK LAYER

Enables:
- door-to-door journeys for passengers
- Seamless end-to-end freight transport

Procedures that enable rail traffic to be managed from end-to-end

TOWARDS A FOUR-LAYER ARCHITECTURE OF THE RAILWAY REGULATION AND STANDARDISATION

RAIL FREIGHT   **RAIL PASSENGERS**

SERVICE LAYER	Enables: - door-to-door journeys for passengers - Seamless end-to-end freight transport
NETWORK LAYER	Procedures that enable rail traffic to be managed from end-to-end
TRANSPORT LAYER	Ensures the compatibility between the rolling stock and the infrastructure

TOWARDS A FOUR-LAYER ARCHITECTURE OF THE RAILWAY REGULATION AND STANDARDISATION

RAIL FREIGHT   **RAIL PASSENGERS**

SERVICE LAYER

NETWORK LAYER

TRANSPORT LAYER

PHYSICAL LAYER
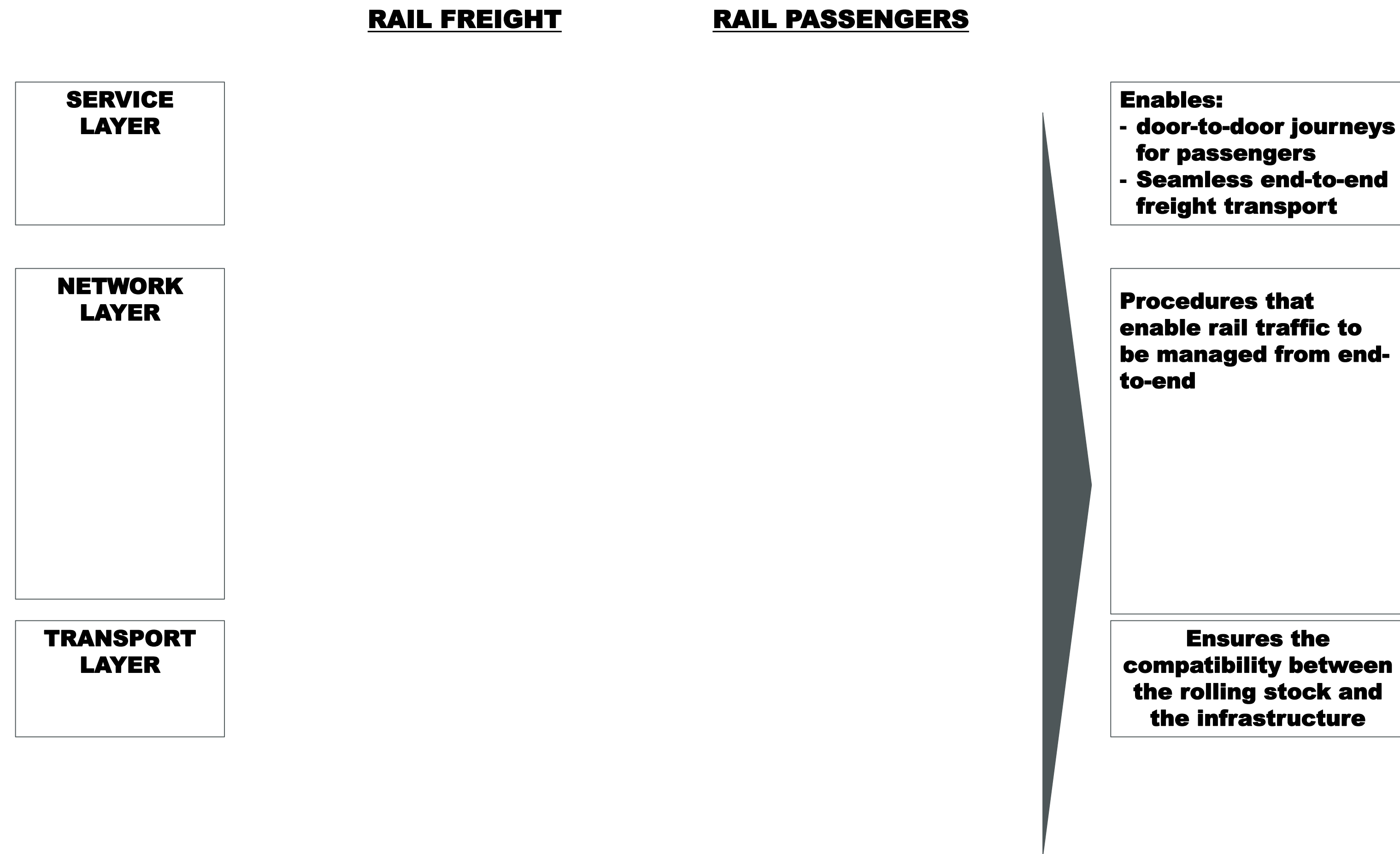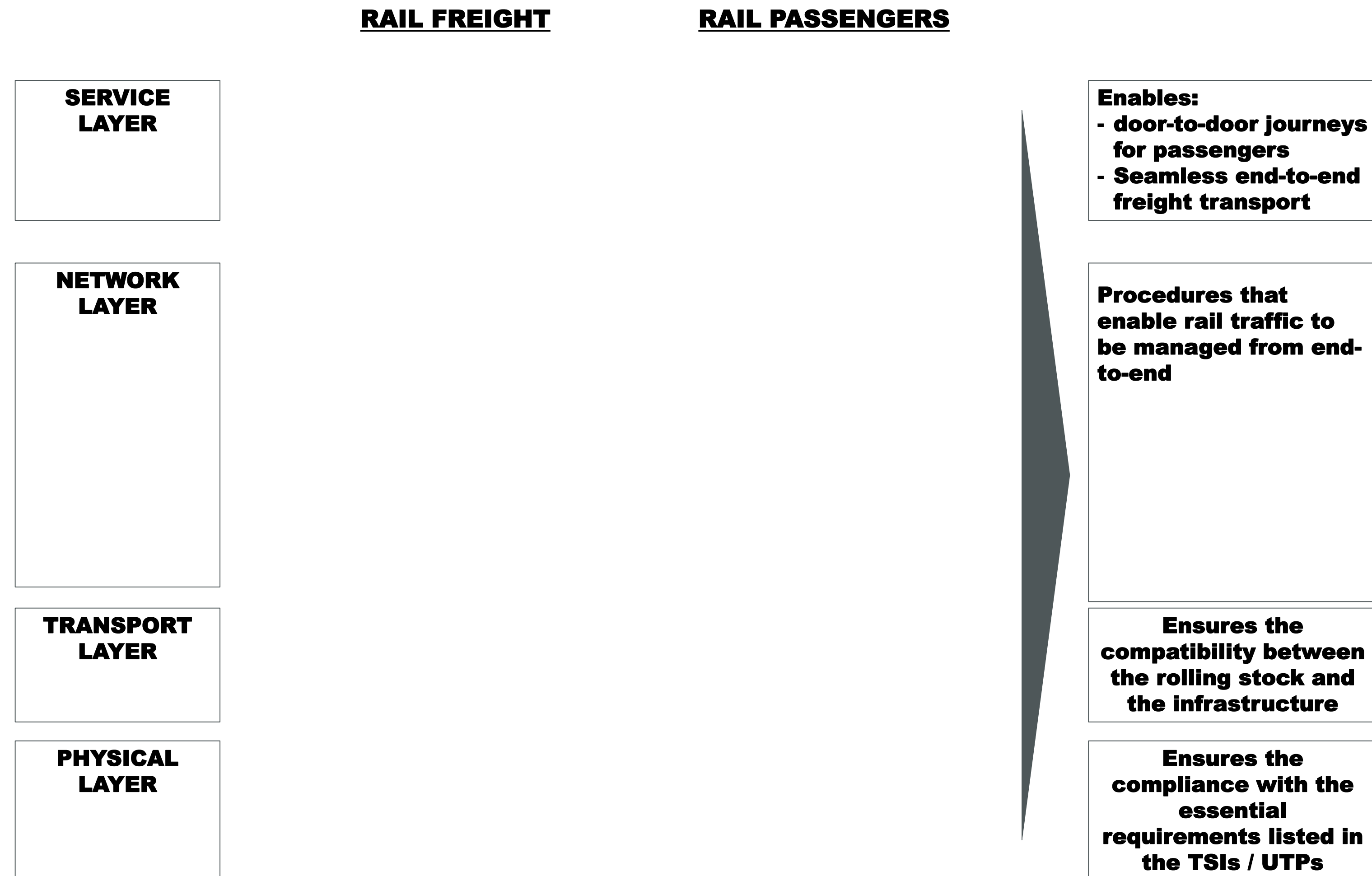
Enables:
- door-to-door journeys for passengers
- Seamless end-to-end freight transport

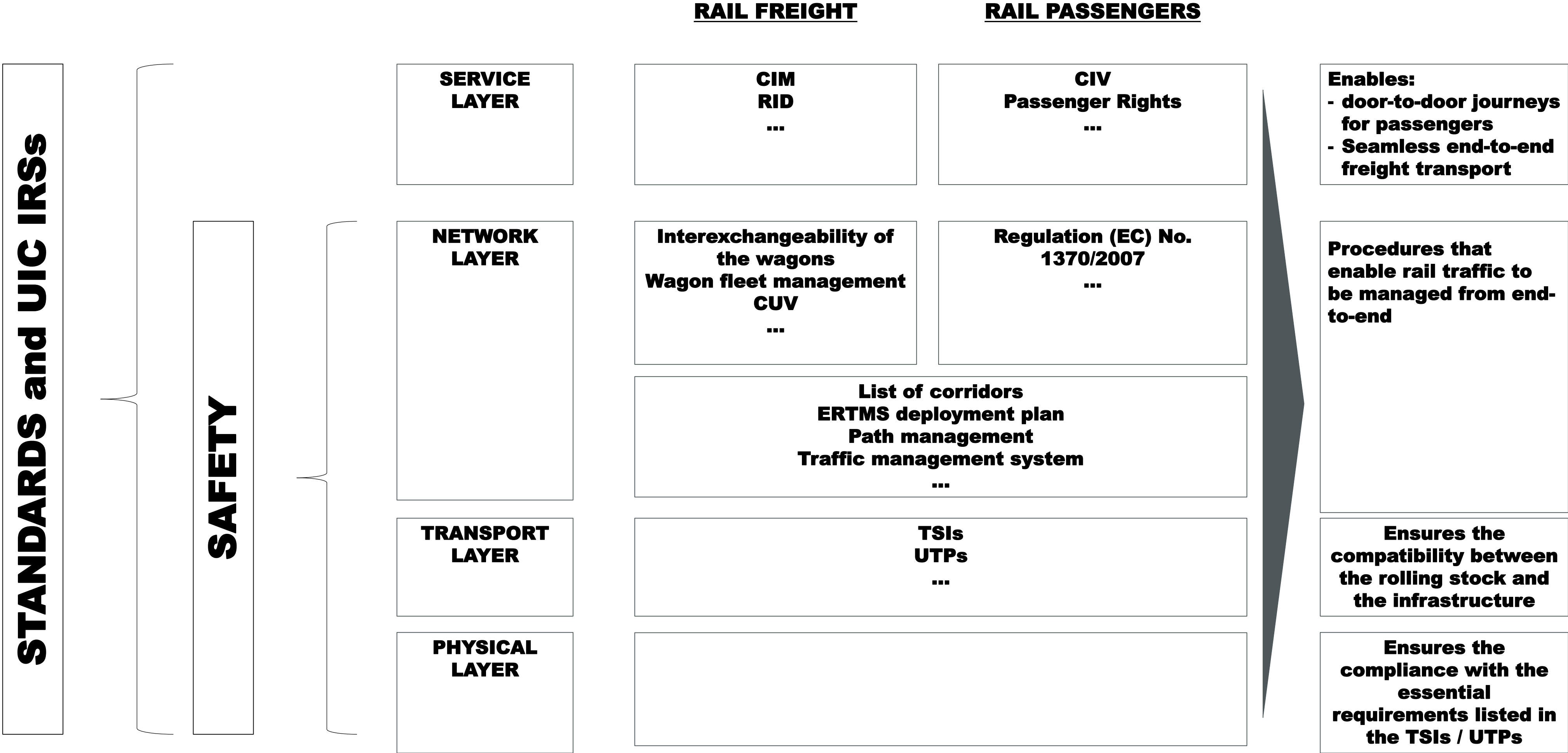**Procedures that enable rail traffic to be managed from end-to-end**

Ensures the compatibility between the rolling stock and the infrastructure

Ensures the compliance with the essential requirements listed in the TSIs / UTPs

TOWARDS A FOUR-LAYER ARCHITECTURE OF THE RAILWAY REGULATION AND STANDARDISATION

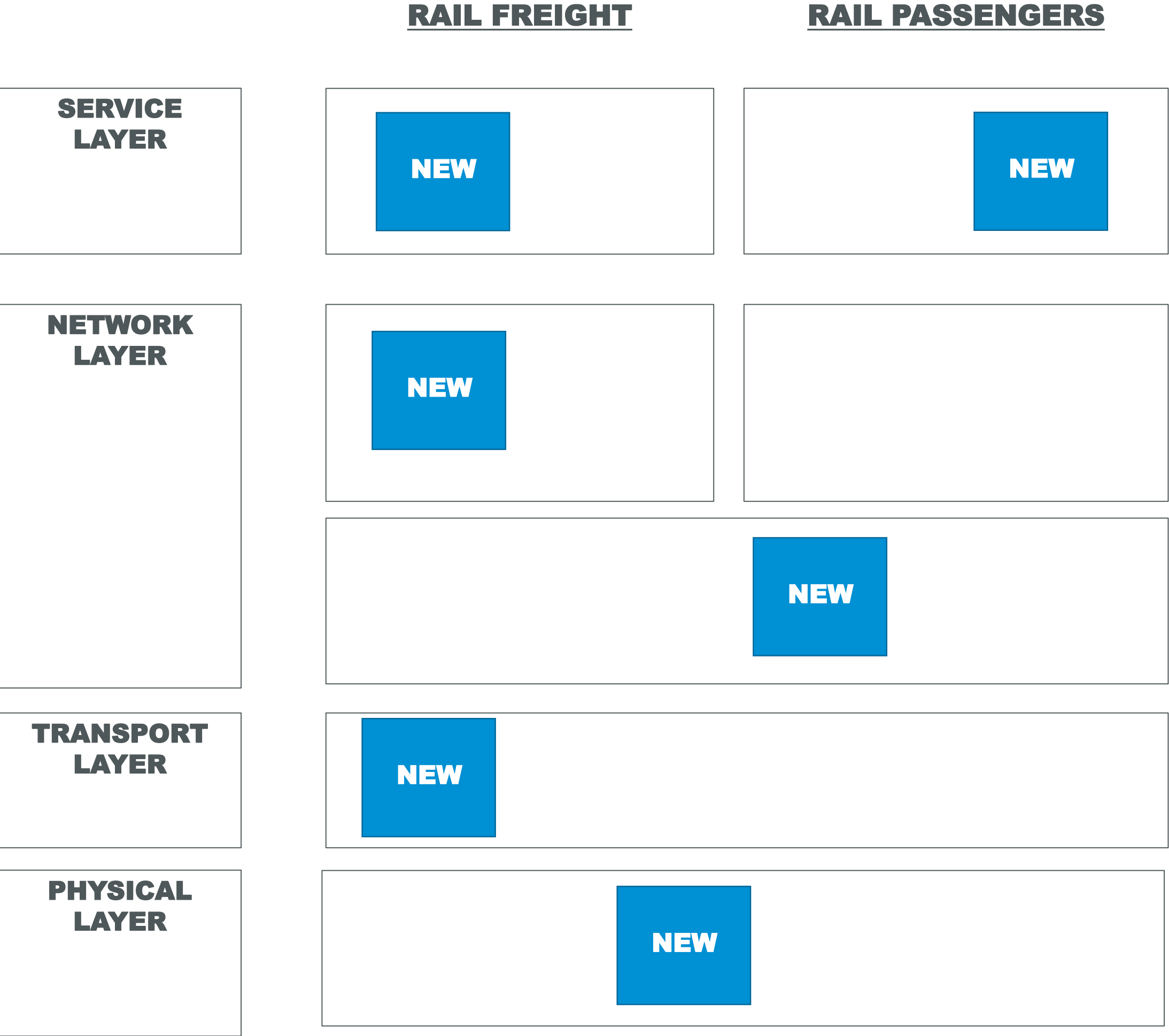| STANDARDS and UIC IRSs	SAFETY		RAIL FREIGHT	RAIL PASSENGERS	
		SERVICE LAYER	CIM RID ...	CIV Passenger Rights ...	**Enables:** - door-to-door journeys for passengers - Seamless end-to-end freight transport
		NETWORK LAYER	Interexchangeability of the wagons Wagon fleet management CUV ...	Regulation (EC) No. 1370/2007 ...	**Procedures that enable rail traffic to be managed from end-to-end**
			List of corridors ERTMS deployment plan Path management Traffic management system ...		
		TRANSPORT LAYER	TSIs UTPs ...		**Ensures the compatibility between the rolling stock and the infrastructure**
		PHYSICAL LAYER			**Ensures the compliance with the essential requirements listed in the TSIs / UTPs**

THE BENEFITS

Simplification of regulations, standards and other technical documents,

making it easier to draft texts focusing on a single layer

	RAIL FREIGHT	**RAIL PASSENGERS**
SERVICE LAYER	CIM RID ...	CIV Passenger Rights ...
NETWORK LAYER	Interexchangeability of the wagons Wagon fleet management CUV ...	Regulation EC No 1371/2007 ...
	List of corridors ERTMS deployment plan Path management Traffic management system ...	
TRANSPORT LAYER	TSIs UTPs ...	
PHYSICAL LAYER		

SIMPLIFICATION

THE BENEFITS

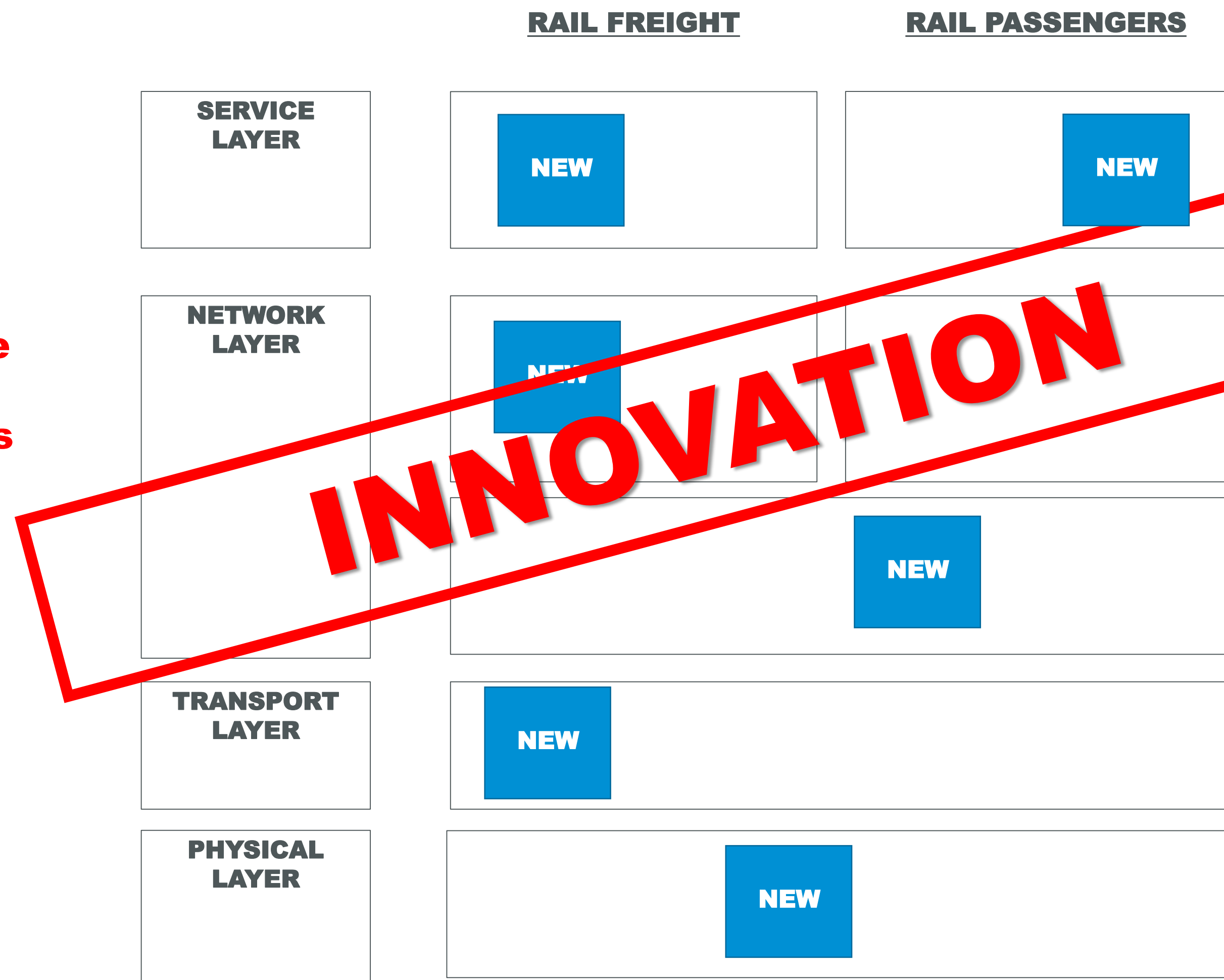|	**RAIL FREIGHT**	**RAIL PASSENGERS**
SERVICE LAYER	NEW	NEW
NETWORK LAYER	NEW	
	NEW	
TRANSPORT LAYER	NEW	
PHYSICAL LAYER	NEW	

THE BENEFITS

Flexibility for adopting innovations

The interfaces between the different layers are specified, so it is possible to innovate within one layer without any changes to the other layers
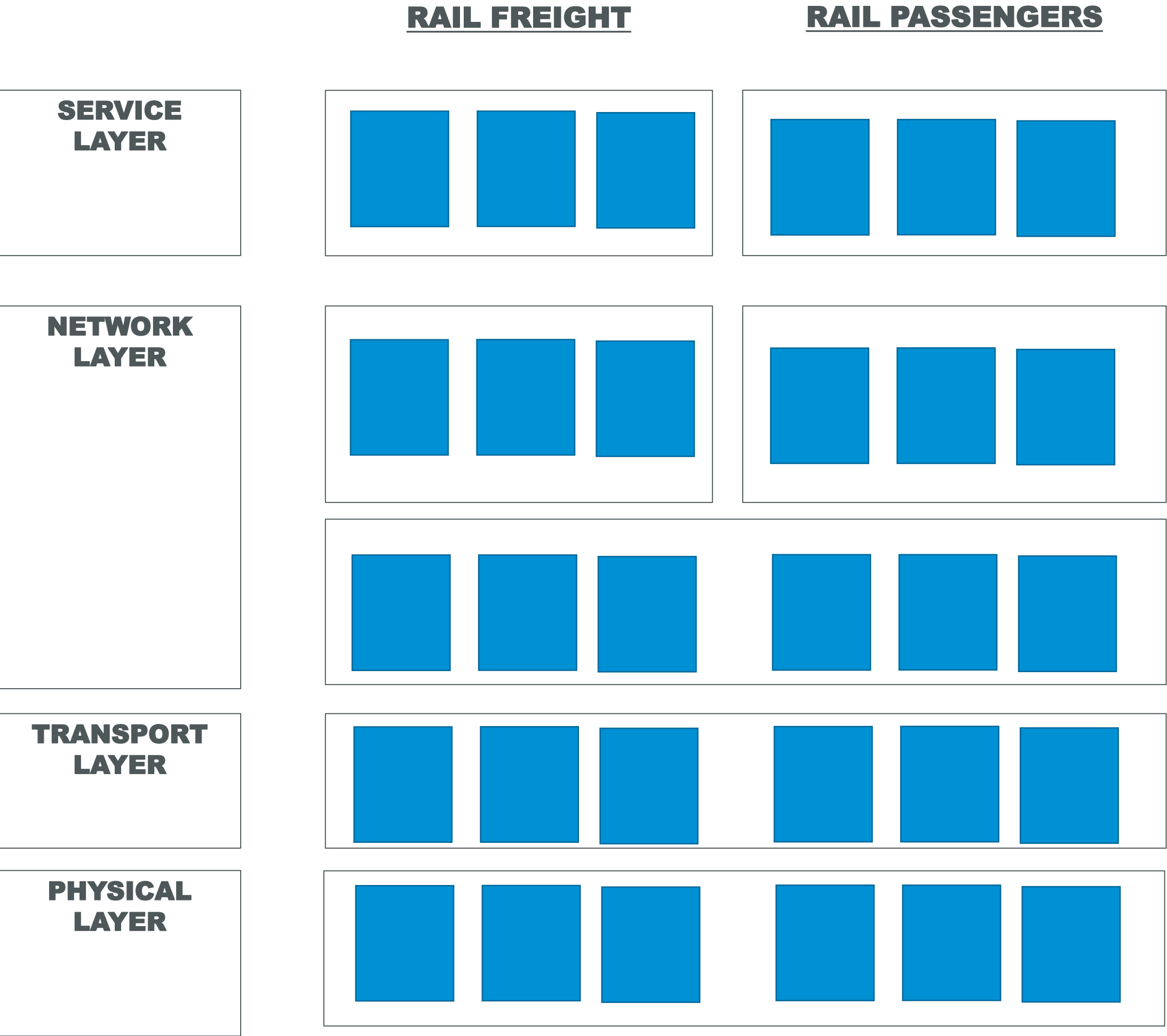
Innovation implemented on a plug-and-play basis

Staged approach to protect investments

Acceleration of the market uptake

RAIL FREIGHT   RAIL PASSENGERS

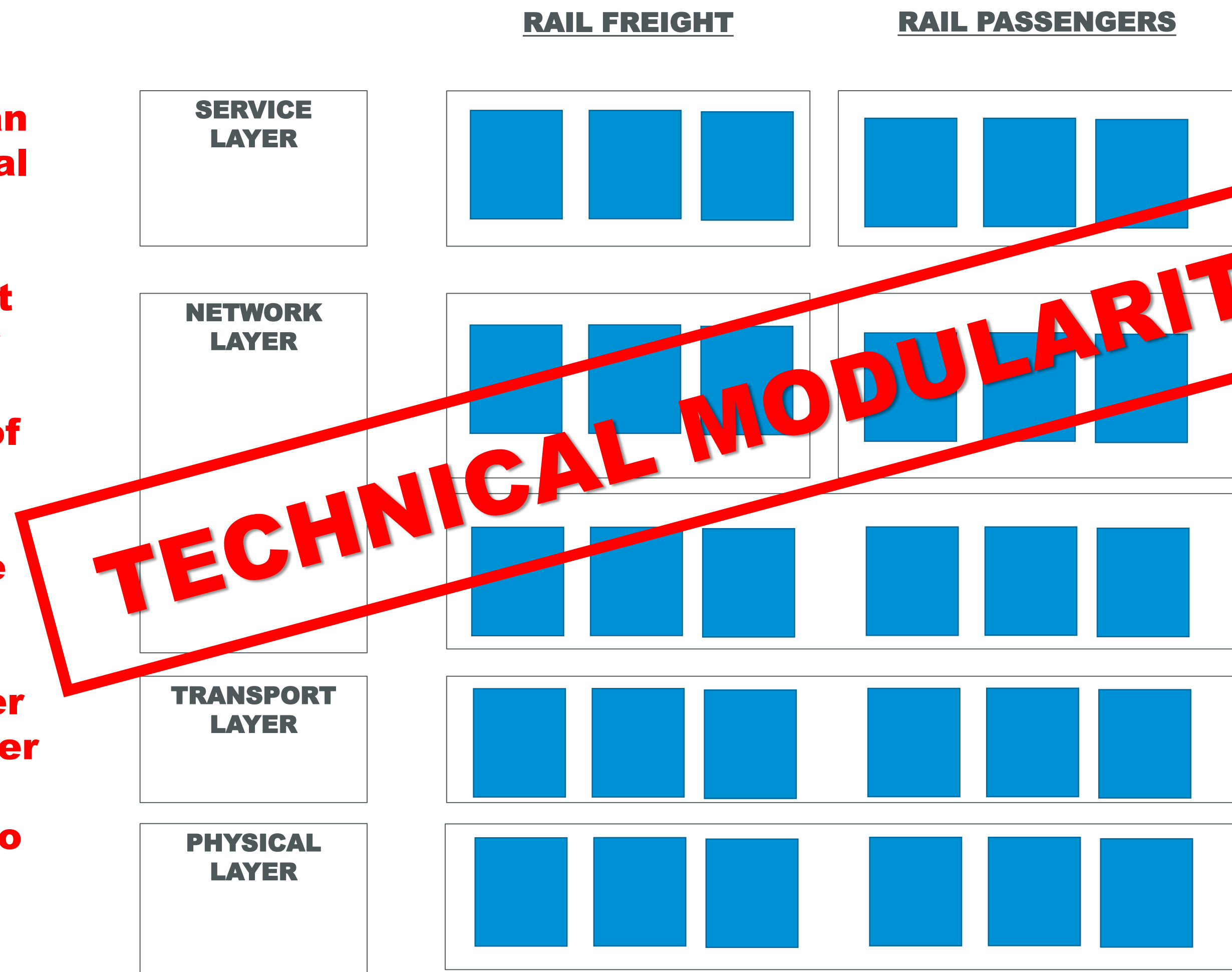|	RAIL FREIGHT	RAIL PASSENGERS
SERVICE LAYER	NEW	NEW
NETWORK LAYER	NEW	
		NEW
TRANSPORT LAYER	NEW	
PHYSICAL LAYER	NEW	

INNOVATION

THE BENEFITS

THE BENEFITS

Technical modularity can be promoted in individual layers
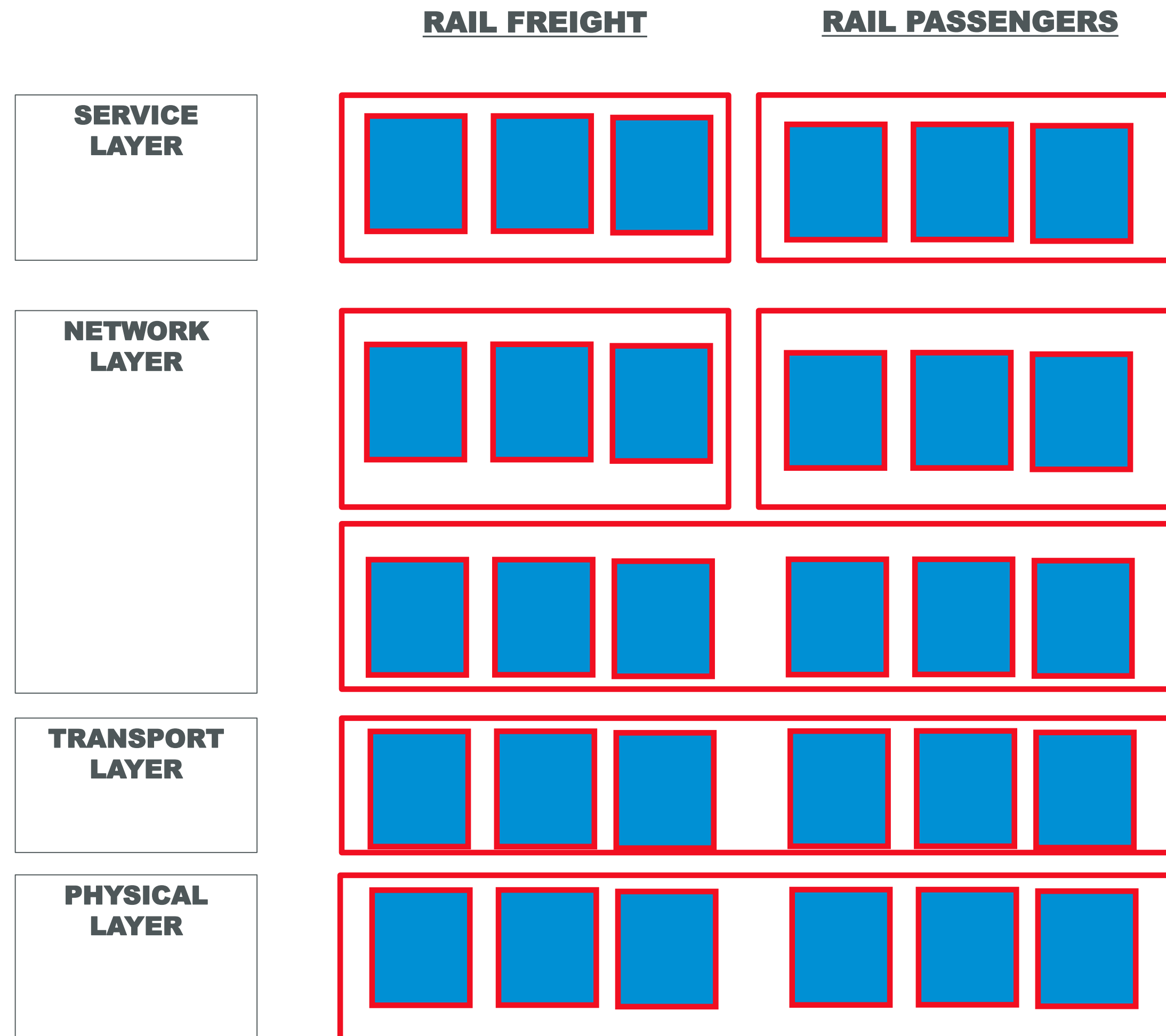
The modularity concept can be used to specify interfaces between neighbouring modules of similar layers

Each module should be described by its own features and by its interfaces with the other modules in the same layer

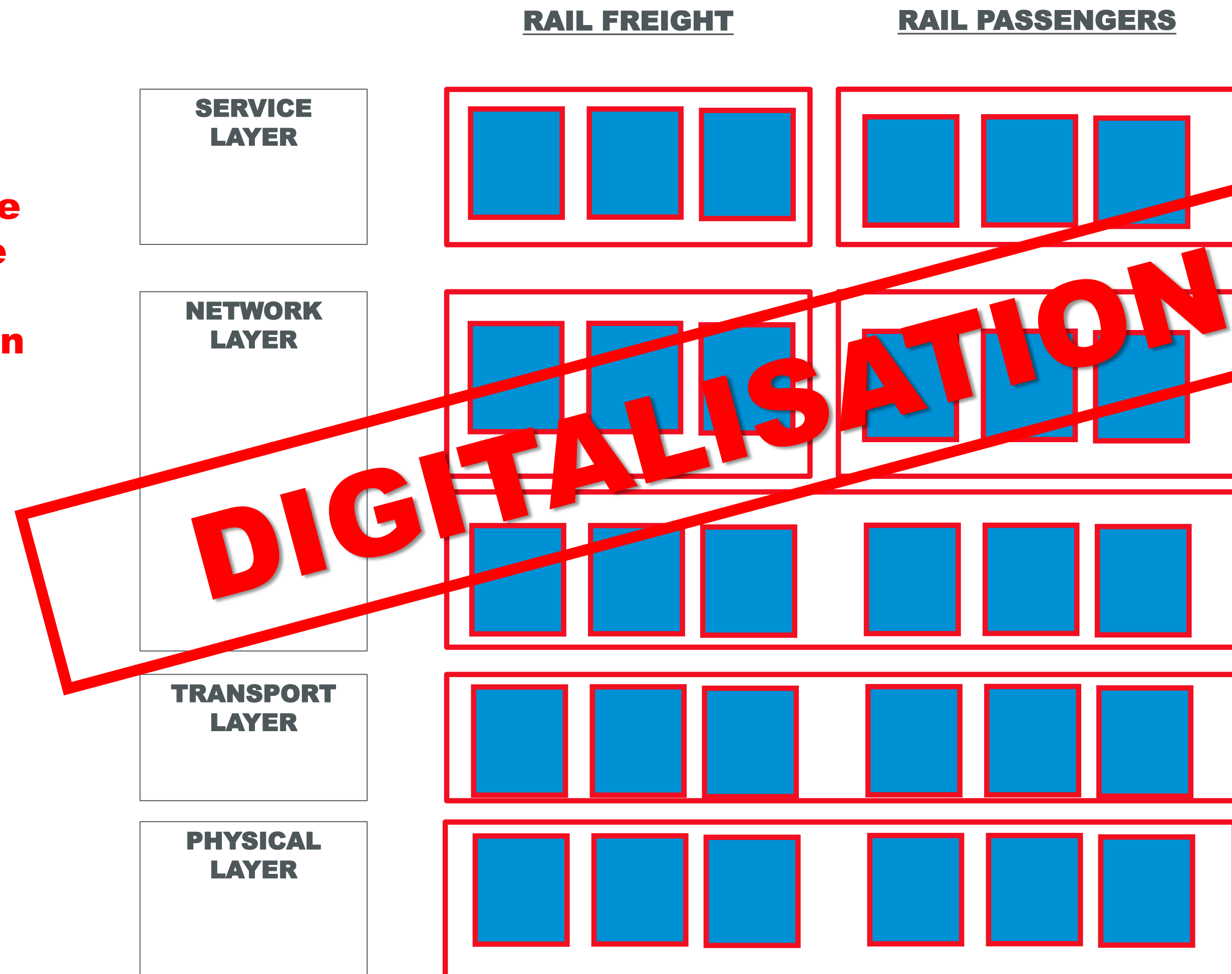**No single module on two different layers**

RAIL FREIGHT   **RAIL PASSENGERS**

SERVICE LAYER

NETWORK LAYER

TRANSPORT LAYER

PHYSICAL LAYER

TECHNICAL MODULARITY

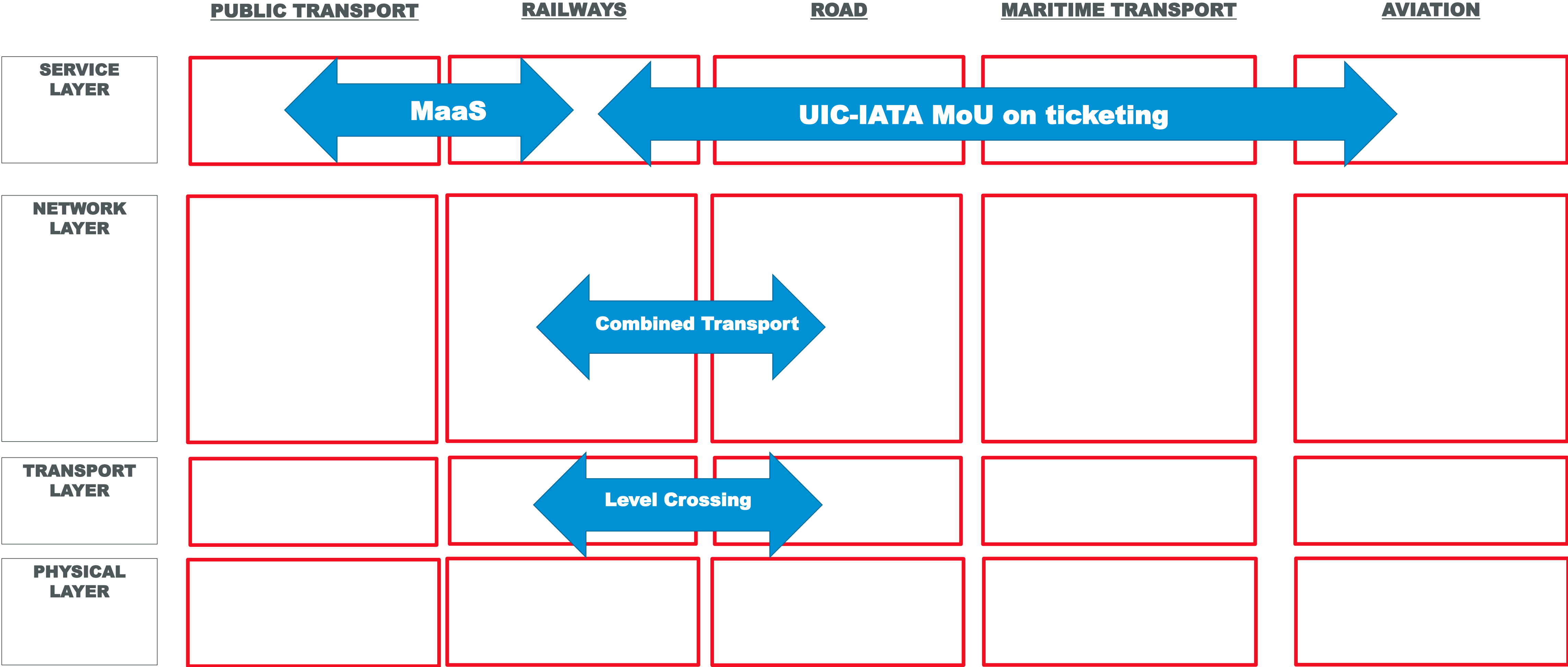# THE BENEFITS

THE BENEFITS

It is easier to create accurate protocols for data exchange when the interfaces between the different modules and layers have already been standardised and specified

RAIL FREIGHT RAIL PASSENGERS

SERVICE LAYER

NETWORK LAYER

TRANSPORT LAYER

PHYSICAL LAYER

DIGITALISATION

THE BENEFITS

	PUBLIC TRANSPORT	RAILWAYS	MARITIME TRANSPORT	ROAD	AVIATION
SERVICE LAYER					
NETWORK LAYER					
TRANSPORT LAYER					
PHYSICAL LAYER					

THE BENEFITS

	PUBLIC TRANSPORT	RAILWAYS	ROAD	MARITIME TRANSPORT	AVIATION
SERVICE LAYER	MaaS		UIC-IATA MoU on ticketing		
NETWORK LAYER		Combined Transport			
TRANSPORT LAYER		Level Crossing			
PHYSICAL LAYER					

THE BENEFITS

	PUBLIC TRANSPORT	RAILWAYS	ROAD	MARITIME TRANSPORT	AVIATION
SERVICE LAYER					
NETWORK LAYER					
TRANSPORT LAYER					
PHYSICAL LAYER					

MaaS

UIC-IATA MoU on ticketing

Combined Transport

Level Crossing

WORKING HYPOTHESIS MULTIMODALITY

NEXT STEPS WITH UIC ...

TECHNICAL SOLUTIONS FOR THE OPERATIONAL RAILWAY

available at: https://uic.org/IMG/pdf/20201126_uic_technical_solutions.pdf

As the main technical body serving not only railway operators, but the entire community of railway stakeholders, including research centres and universities, **UIC is a natural forum for bringing together all stakeholders and for developing collaborative global solutions**.

This document, ranging from architecture to financial arrangements, provides an overview of the main achievements and developments in UIC. Depending on one's different interests, it will give a synthetic description of operational solutions suited to market needs.

It will be an efficient tool for summarising in a few pages the added value of UIC spread in different instruments and workflows:

- 700 leaflets describing the entire railway system (with progressive conversion to +/- 300 International Railway Solutions)
- Technical Specifications
- Qualitative and quantitative guidelines
- 118 working groups and more than 1,000 experts drawn from member companies
- Regularly updated procedures, with a dedicated supervisory platform for standardisation.

TECHNICAL SOLUTIONS
FOR THE OPERATIONAL RAILWAY

uic
INTERNATIONAL UNION
OF RAILWAYS