THALES

unife
THE EUROPEAN RAIL INDUSTRY ™

The use of Big-Data for rail

… *in the CCS evolution context*

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Shift2Rail

The Rail sector is facing big challenges

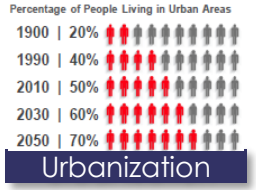
"Transport and mobility need to meet growing demand for mobility in a sustainable manner and helping Europe to achieve ambitious climate goals, and rail is well placed to play a major role",

Henrik Hololei, Digital Transport Days - 7 October 2019

Connectivity

Environment

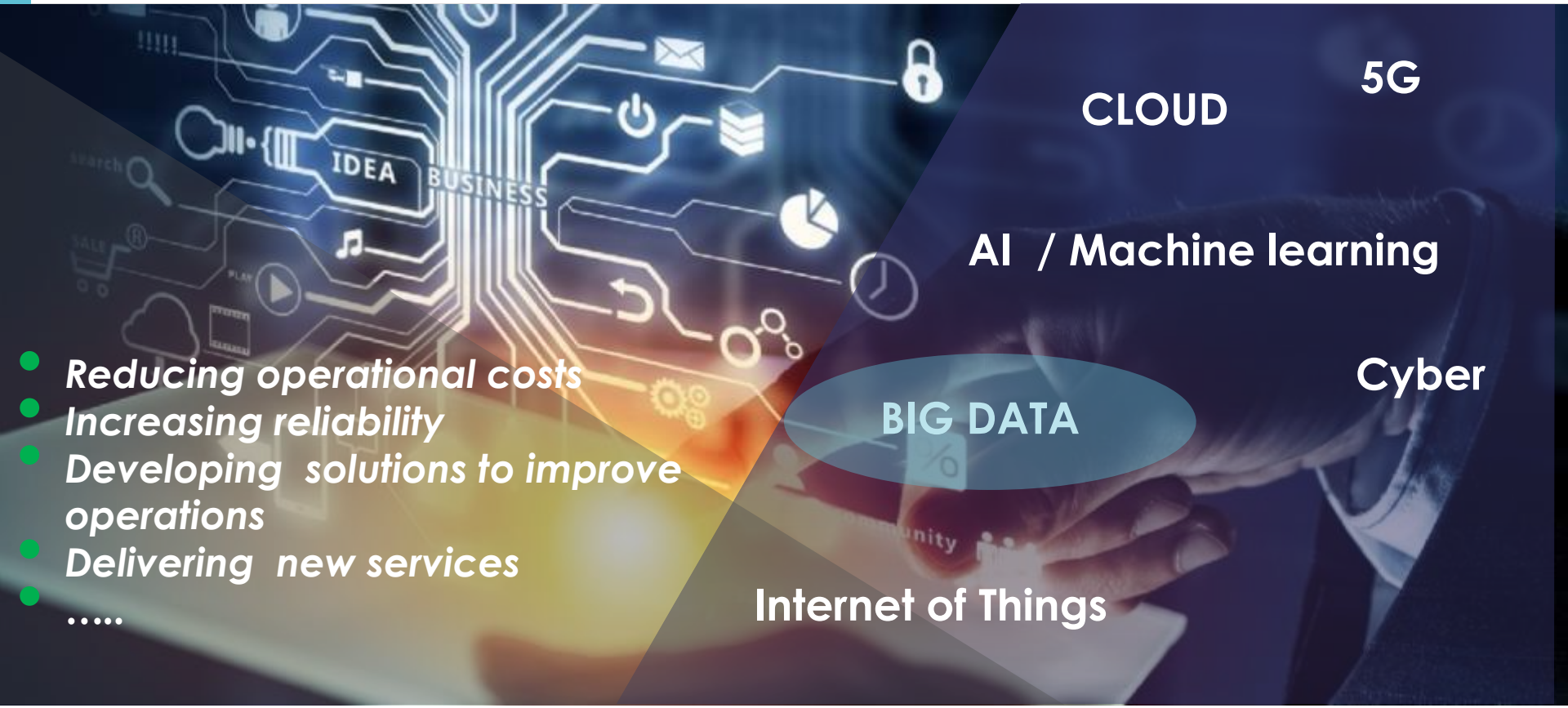
Sharing Economy



Urbanization

DIGITAL TRANSFORMATION OF THE RAIL IS A MUST

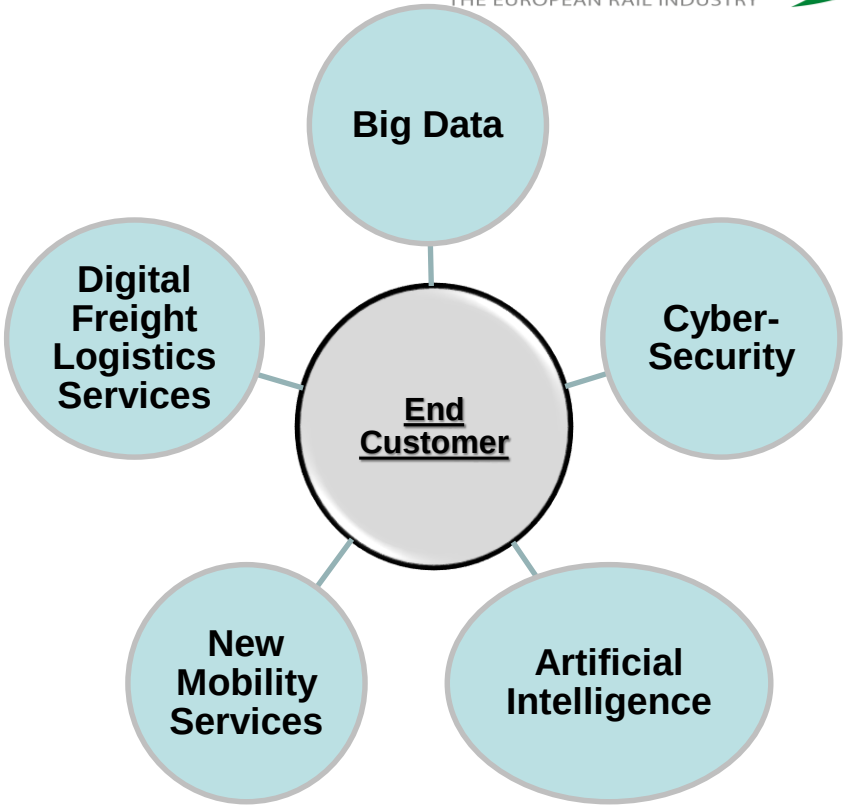
The power of Digital technologies for the rail



- *Reducing operational costs*
- *Increasing reliability*
- *Developing solutions to improve operations*
- *Delivering new services*
- …..

UNIFE's vision on Digitalisation

- UNIFE "Digitalisation Platform" created in 2015 to feed the current & future debates on digitalisation of the rail transport.
- On 15th April 2019, UNIFE has updated its ''vision'' on digitalisation '***'Digital Trends in the Rail Sector''***
  - **<u>Five majors focus areas</u>** have been identified as priorities for the rail supply industry.
  - Bringing the European rail supply industry's views and objectives into the centre of the digital debate.
  - Engaging in a fruitful dialogue with decision-makers and other key stakeholders – in the transport sector and beyond.



What is BIG DATA ?

In a nutshell :

With specific challenges :

- Data format, data storage (data lake, locally or in the cloud), [data transmission, data protection]
- Associated to various processes :
  - Business analytics (statistical algorithms): to find correlations, identify hidden trends in the flow of heterogeneous data
  - Machine learning: often using historical data, to understand how the system went in order to predict how it'll behave
  - Digital twin: digitize the reality to map it in a "virtual" world, then simulate in the virtual world before to apply in the real one

When to use BIG DATA ?

A few examples from the rail sector

- Maintenance (predictive, prescriptive): monitor assets (train or trackside) using sensors, identify status (compare to a threshold), predict failure, and call maintenance before it happen
- Improving operation by connecting various data sources :
  - Collecting flow of passengers (using video, ticketing, …) to adapt time tables
  - Autonomy : obstacle detection or lateral signal recognition (machine learning)
  - Improve traffic management taking into account the maintenance
- Use of digital twin:
  - Validate the deployment of new systems, in the case of migration,
  - Position an asset on a certified map of the tracks
  - System of system approach and simulation : evaluate the overall performance of a system starting with performance of sub-systems

Benefit of Big Data in the CCS context (workshops feedback)

Digital Twin, a key component for the digitalization of a system of system

- **Different levels of digital twin addressing different levels of complexity**
  - Configuration of the train with versioning of the equipment's and functional flows
  - Digital map of the track
- **The digital twin is proven/certified, the reality will just be its instantiation**
  - For positioning, the mapping of the track has to be maintained and certified
- **A key support for migration, assuring easy interchangeability of a sub-system**
  - The new sub-system is verified in the digital twin, and the overall performance is checked
- **Maintain a certified Digital Twin is costly,**
  - but it is certainly the price to pay to get modularity, and ensure the overall system consistency

Benefit of Big Data in the CCS context (workshops feedback)

Data is the new oil, but

CCS architecture must be "ready for data"

- Start looking at the impact of Big data and the data flows at the same time than the architecture, defining what are the key data to be shared between sub-systems and how.
- Breakdown in smaller building blocks should not mean that the functions are considered in a silo

To ensure interchangeability, we need data model

- representing the components of the railway system
- Data exchange linking the sub-systems
- The pre-requisite is open standards, open interfaces,
- Common data model to ensure interoperability of data, with common Ontologies,
- But not a frozen standard, something living and open to innovation

Accces to data :

- From ownership to user rights (Violeta Bulc), but also condition of usage
- Not only open data
- How to ensure the right quality of data (KPI, SLA)