S2R JU EU Rail R&I; next EU Rail institutional partnership

4rd TC on Rail

Belgrade 4-5 March 2020

Monique van Wortel, Seconded National Expert at S2R JU

@Shift2Rail_JU
#Horizon2020

28 MEMBERS

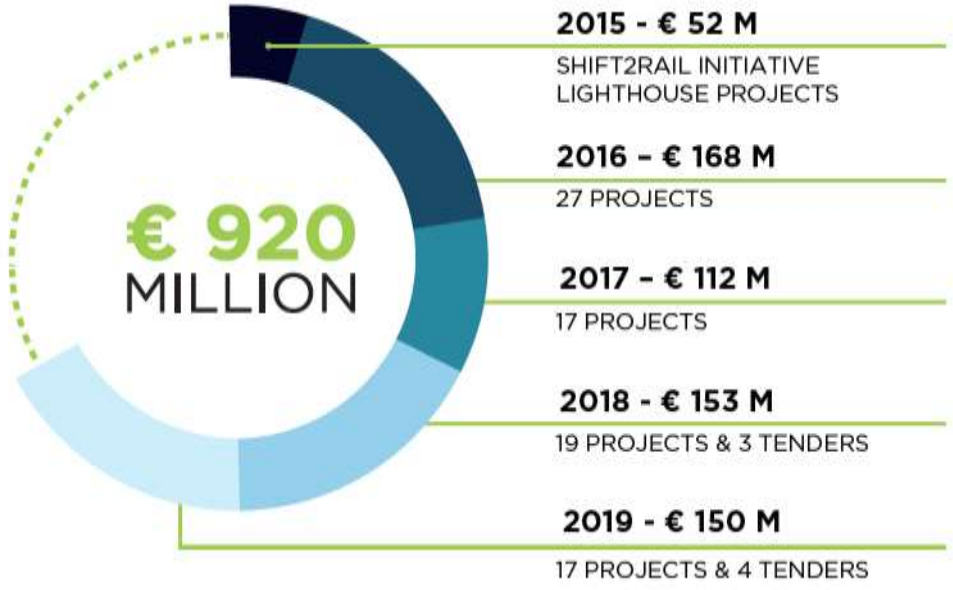
412 PARTICIPANTS

29 COUNTRIES

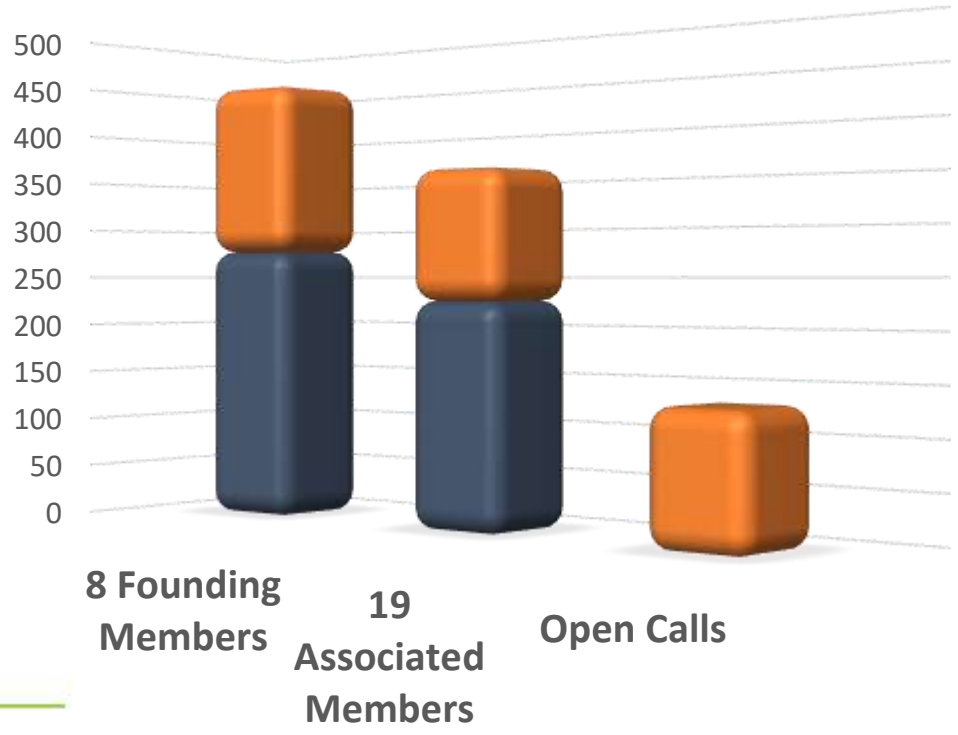
109 SMEs

113 RESEARCH CENTRES AND UNIVERSITIES

AN OPEN and ACTIVE ORGANISATION



*incl. at least 120M€
of additional activities



Values as at 1 Sept 2016 in Million EUR

AN OPEN and ACTIVE ORGANISATION

…opening up new Capabilities coming from emerging technologies or concepts!

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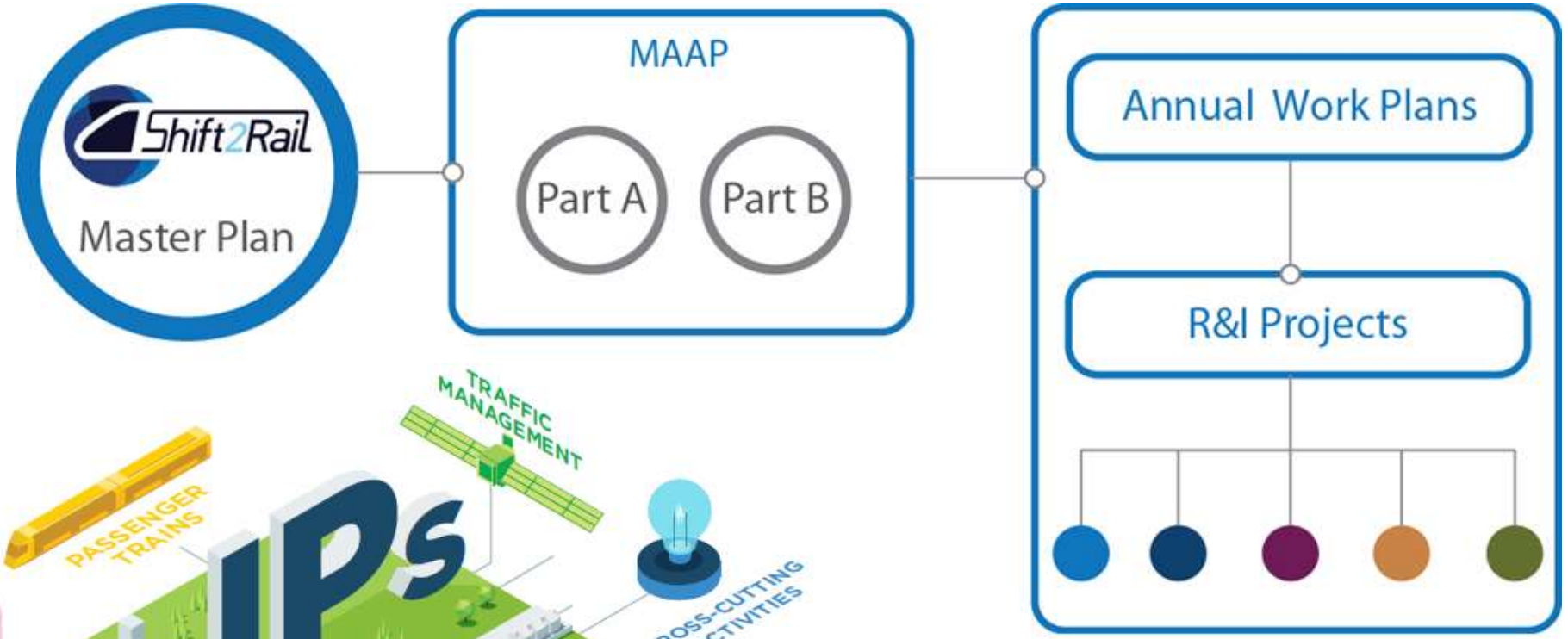
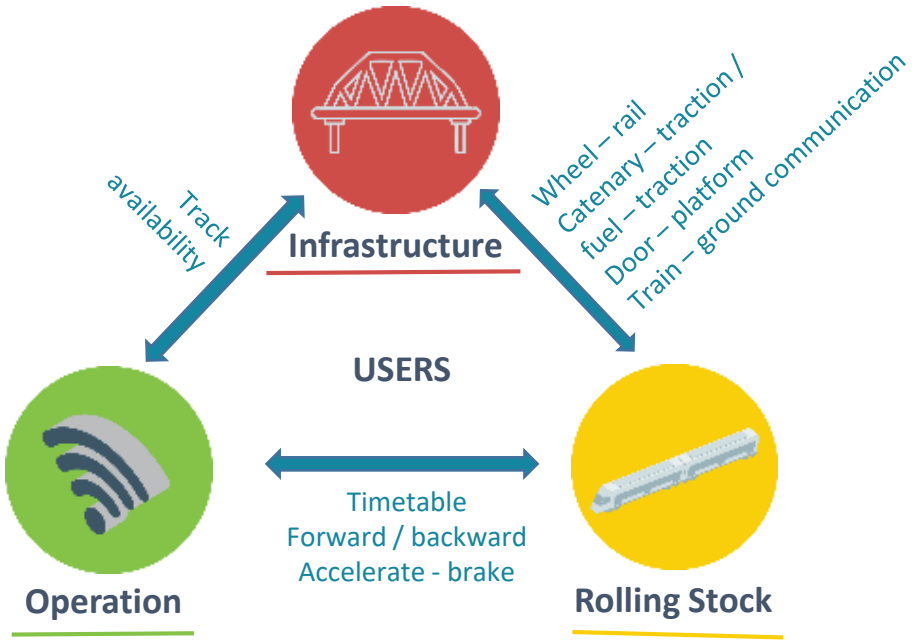
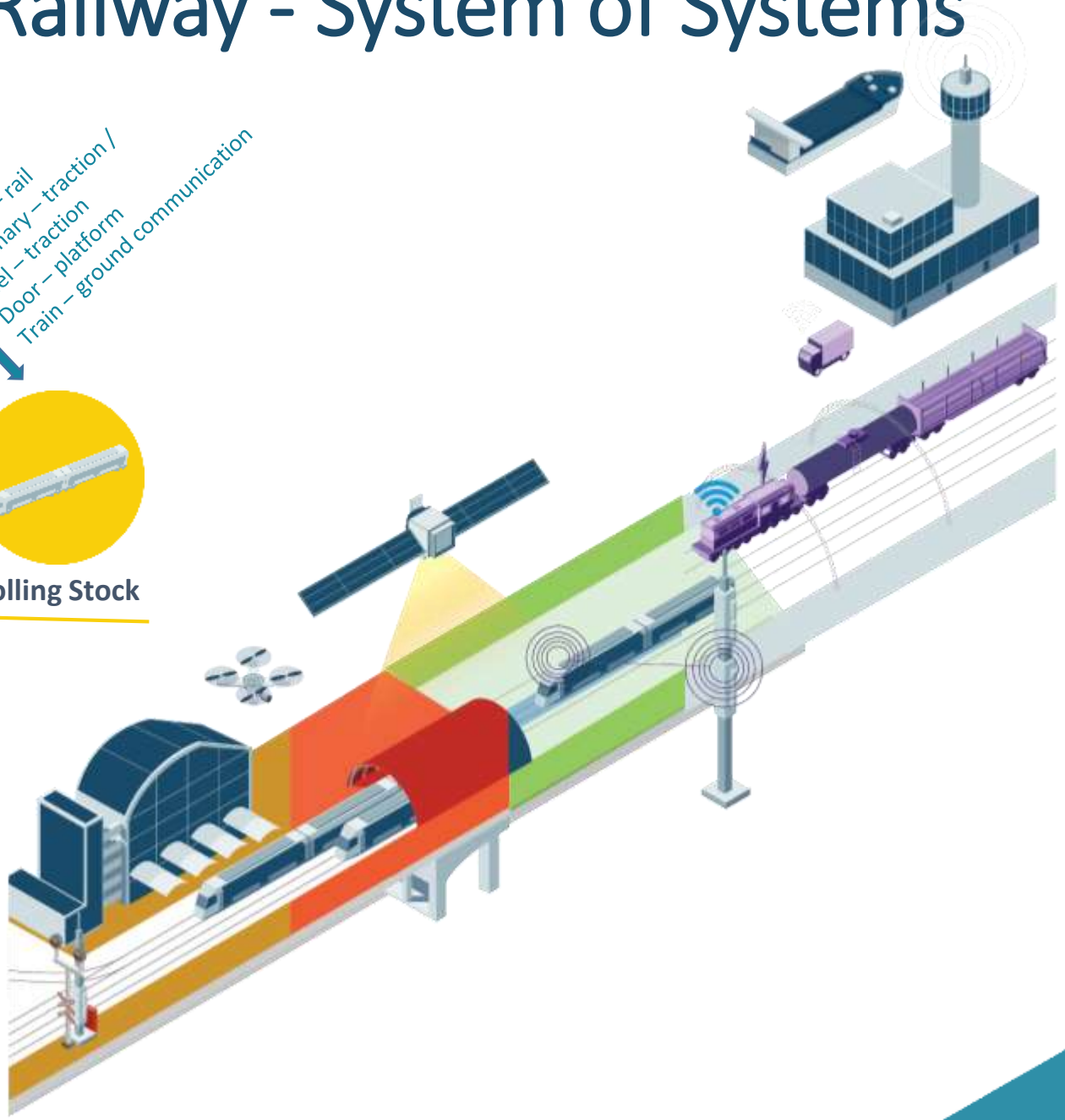
Programme approach

The S2R Programme implementation



Railway - System of Systems





IP1 Cost-efficient and Reliable Trains, including high-capacity trains and high speed trains

IP2 Advanced Traffic Management and Control System

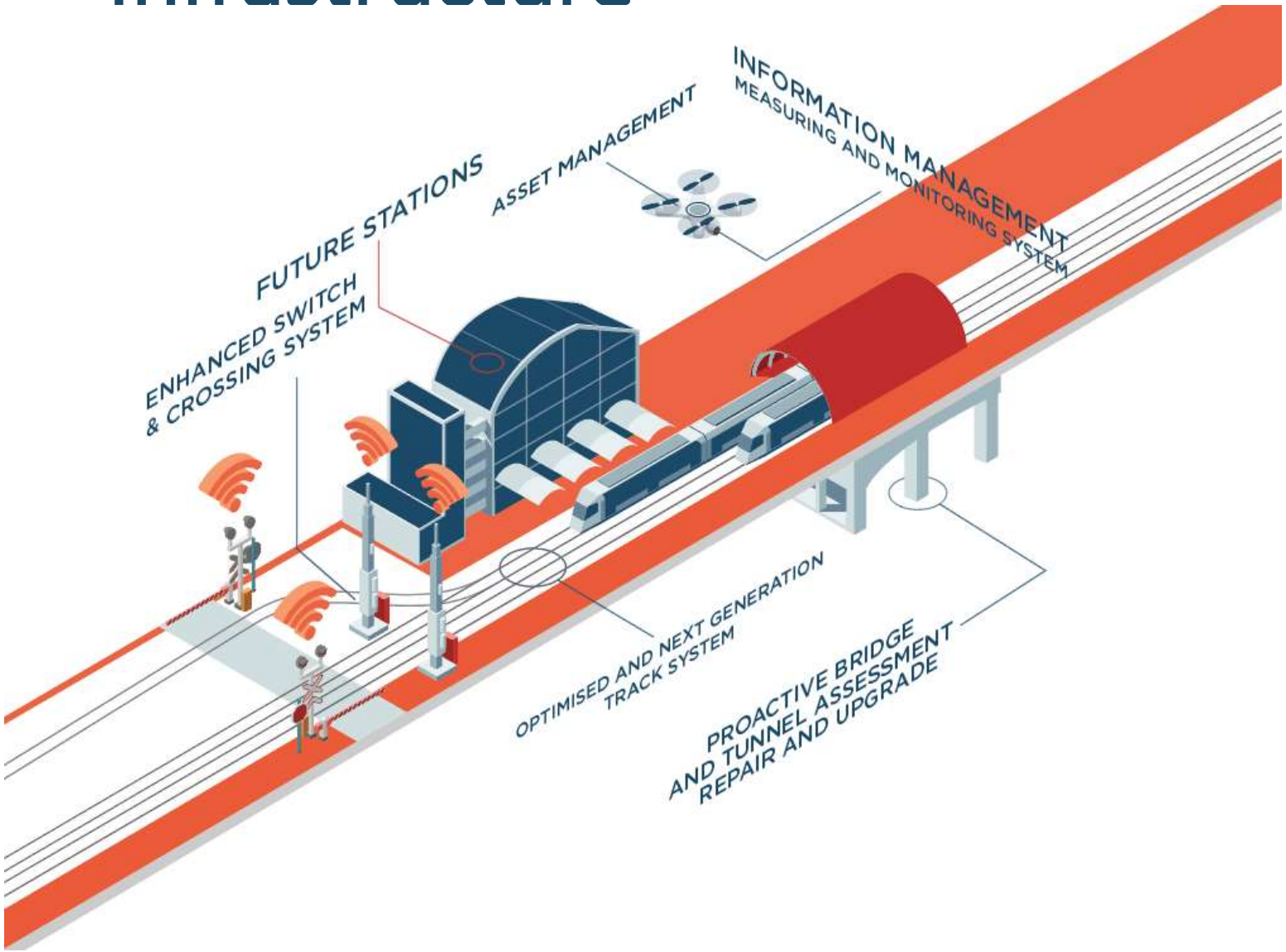
IP3 Cost-efficient, Sustainable and Reliable High Capacity Infrastructure

IP4 IT Solutions for Attractive Railways Services

IP5 Technology for Sustainable and Attractive European Rail Freight

CCA Cross Cutting Activities

IP3: Cost Efficient and Reliable High Capacity Infrastructure



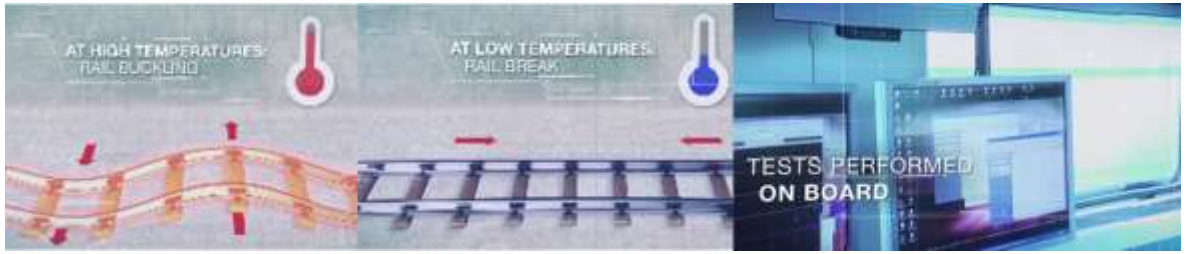
Infrastructure:
tracks, S&C,
bridges und tunnels,
new station design

Asset Management

Energy Management

IP3: key achievements and ongoing activities

- **Intelligent Asset Management:** Shift from reactive to proactive maintenance based on innovative monitoring/ measuring & processing technologies
  - Innovative technologies in asset measuring & monitoring (satellite, drones, robotics), data processing & decision support (IoT, Artificial Intelligence)
  - Demonstration & evaluation of asset management, maintenance strategies: Thermal Stress Monitoring, and Lean Tamping



- **Intelligent Energy Management:** mapping of all energy flows in railway system for management strategies. Future traction power supply system in integration with public grid
  - Proof-of-Concept in light-train environment (tramway)
  - Design of an intelligent substation, 66% savings on transmission losses, 25% reduction on dimensioning

IP3: key achievements and ongoing activities

✔ **Optimized & Future Infrastructure Design:**

✓**Track and S&C System:** Analysis of deformation mechanisms & introduction of advanced capabilities to existing systems. Design of radically new designs & systems

- Novel concept for locking & detection capabilities
- Conceptual designs for radical switch actuation, locking and detection

✓**Bridges & Tunnels:** Improved inspection & repair methods → service life extension, disruption time reduction, N&V reduction

- Digital Imaging for asset monitoring + BIM-based asset management for remaining life estimation & bridge prediction behavior
- Investigation of bridge-rolling stock interface & contribution to standards

✓**Stations:** New designs enhancing mobility, accessibility & crowd management

- Analysis of the passenger needs and expectations at railway stations
- Conceptual design of Platform-Train Interface (PTI) solution

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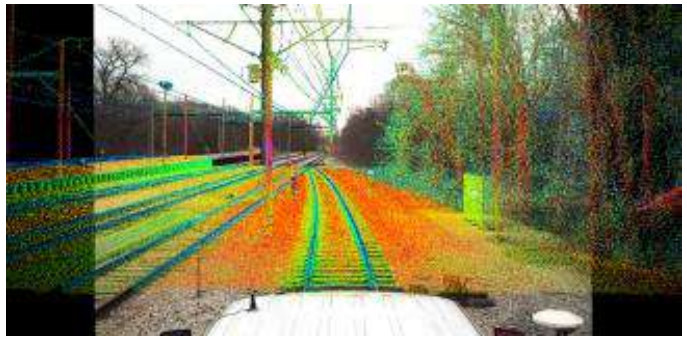
S2R GoSafe Rail project

- The GoSAFE RAIL project aims to implement machine learning approaches to aid decision making in rail infrastructure management.
- WP4: New techniques for object detection have been demonstrated in Norway, Ireland and Croatia.
- Case study for Croatia and Ireland public available
- Use of advanced technologies, such as AI and machine learning methods, to predict potential infrastructure issues
- http://www.gosaferail.eu/workplan/wp4

GoSafe Rail detection technologies

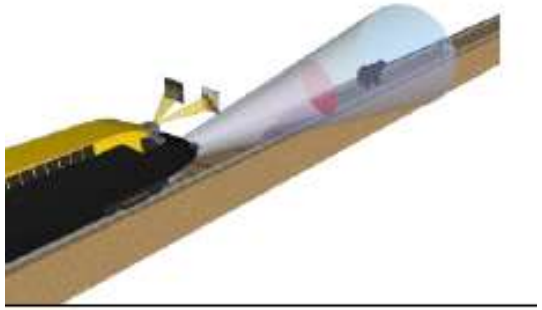
Automatic Radar system

Lidar (3-D laser scanning)



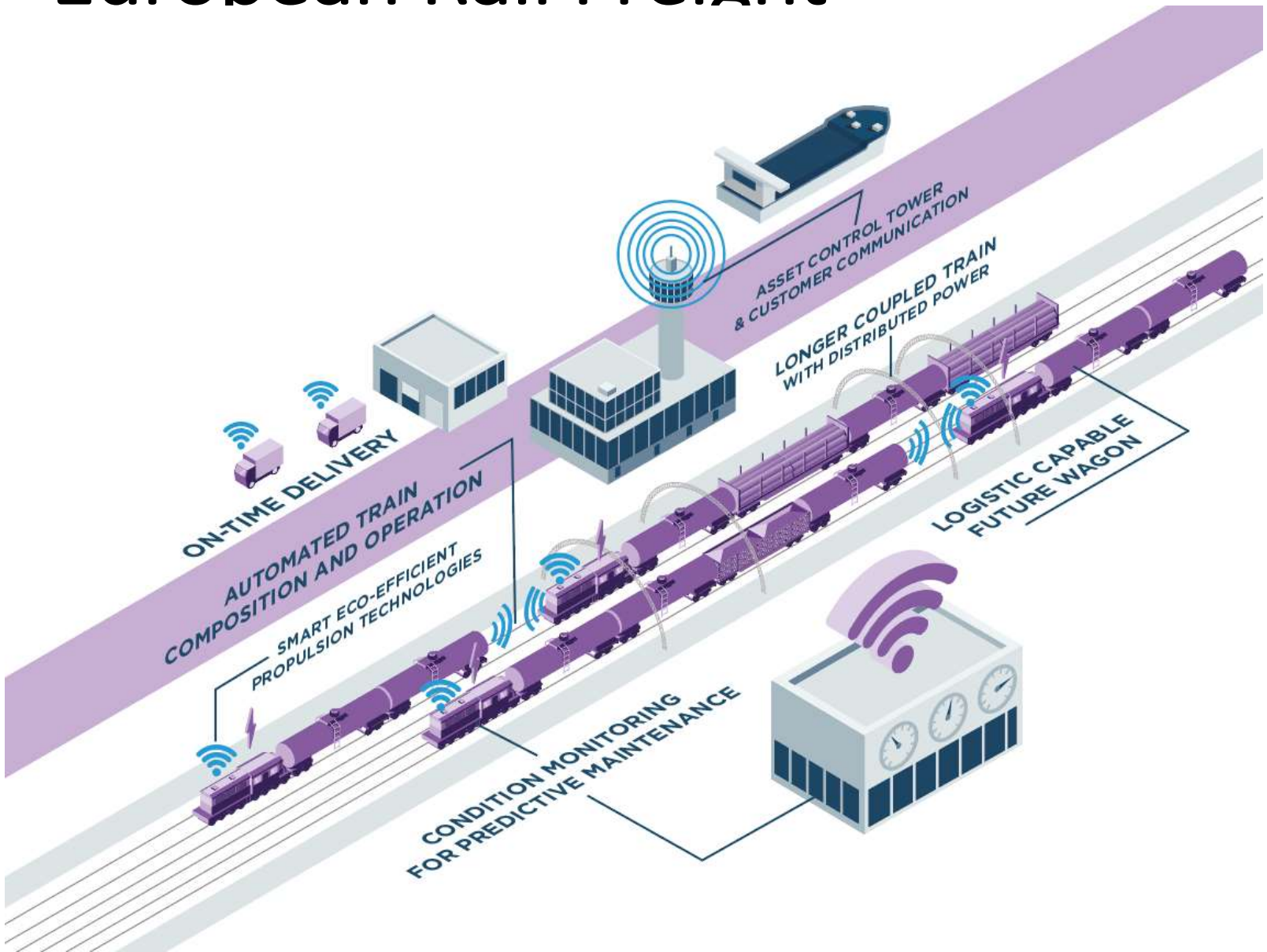
Train mounted thermal camera

Drones equipped with high resolution cameras flying in front of the train



Multi-sensor train mounted system

IP5: Technologies for Sustainable & Attractive European Rail Freight



IP5: key achievements and ongoing activities

- **TD5.1 Fleet Digitalisation/Automation:** digital automatic coupling (flexible wagon composition), CBM (data handling, analytics and dashboards), ATO/DAS (testing of ATO developed in IP2)

  - SMART: Multi-sensor obstacle detection system prototype development: based on on-board CCTV technologies assisting the ATO system used for detection up to 1 km
    Dynamic field tests in May 2019 for integrated Object Detection System
    System installed in SERBIA CARGO locomotives series 444
    Test trials on 2 sections of Serbian Railways: Nis Junction and Serbian part RFR to Thessaloniki
    Outcome of testing: **good results**
    Follow up: SMART2 project (dec 2019-dec 2022): assessing new requirements for obstacle detection and track intrusion detection up to 2 km
    https://projects.shift2rail.org/s2r_ip5_n.aspx?p=S2R_SMART2

  - Automatic brake test and a new silence wheelset

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AWP and Call 2020: Open Calls IP3

S2R-OC-IP3-01-2020: Next Generation Track Transition Zones

- TD3.4 Next Generation Track System: aims to improve the track system substantially, targeting a time horizon of some 40 years beyond current state-of-the art
- Provide optimum track support conditions within transition zones, e.g. S&C, change of track construction, underbridges
- Topic of the OC: Deliver detailed design and technical specification for physical transition zone demonstrators (output->CFM for real scale demo TRL 6/7)
- Deliver prototypes and small-scale demonstrators of next generation transition zone components and sub-systems - TRL 5
- Complementary to CFM project IN2TRACK2: Next Generation Track
- EU funding: 1,350,000 €
- Impact: ↓ in delays due to less defects, N&V, lifecycle costs

S2R-OC-IP3-02-2020: Technology Development for Railway Systems Asset Management

- TD3.6 Dynamic Railway Information Management System (DRIMS) Demonstrator
- The DRIMS aims to define an innovative system for the management, processing and analysis of railway data.
- New technologies for prescriptive analysis: prediction of future issues, provide preventive solutions
- Topic of the OC: Prescriptive data analytics tools (statistics, machine learning, AI) to implement a Decision Support System, with man in the loop, for Intelligent Asset Management Systems – prototype TRL 4-5
- Multi-objective decisions' optimization tools (models, AI) for Intelligent Asset Management Strategies – prototype TRL 4-5
- Complementary to CFM project IN2SMART2
- EU funding: 1,710,000 €
- Impact: ⬆ operational reliability, optimise maintenance, ⬇ costs

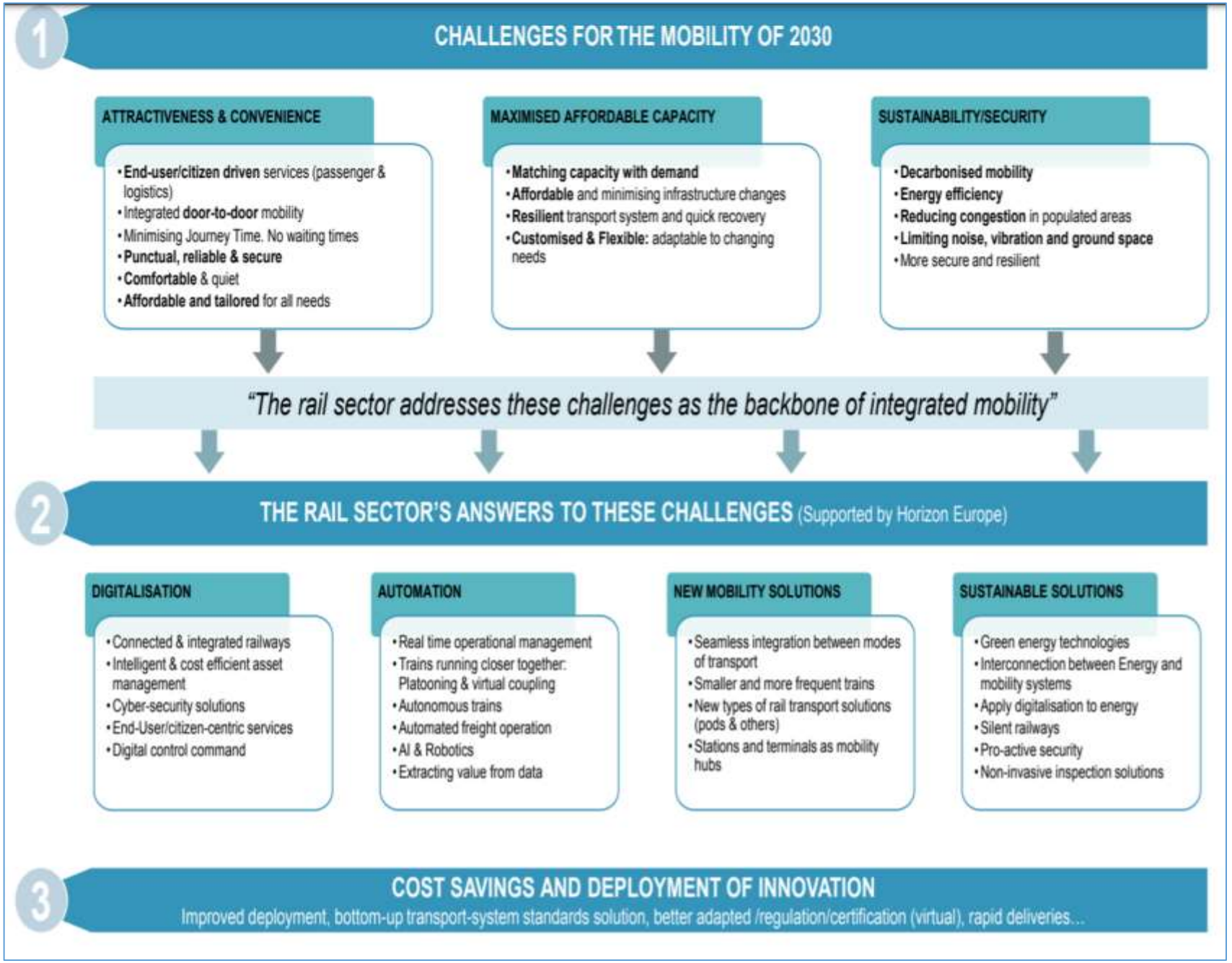
S2R-OC-IP3-03-2020: Advanced tools and equipment: collaborative robots & wearable mobile machines

- TD3.8 Intelligent Asset Management Strategies Demonstrator (IAMS)
- The TD aims to deliver new working methods, tools and equipment
- Topic of the OC : Development of standalone demonstrator of an improved existing plant (machines and equipment) by integrating robot technology to support future inspection and execution of maintenance actions – TRL 5-6
- Development and validation of a prototype of exoskeleton suitable for outside conditions which can perform a set of different maintenance tasks– TRL 5-6
- Complementary to CFM project IN2SMART2
- EU funding: 2,700,000 €
- Impact: ⬆ workers safety, accuracy of results, ⬇ costs of working method

Information on TD and AWP 2020 topics

- https://projects.shift2rail.org/s2r_ip_TD_r.aspx?ip=3&td=0bacb768-862f-4382-bc4d-b9629d0fa9d8
- https://shift2rail.org/wp-content/uploads/2019/11/ANNEX-GB-Decision-8-2019-Annual-Work-Plan-and-budget-for-2020-REV-20191128.pdf

Union Institutional Partnership for Transforming Europe's Rail System



ERRAC

challenges and answers towards 2030 mobility and transport

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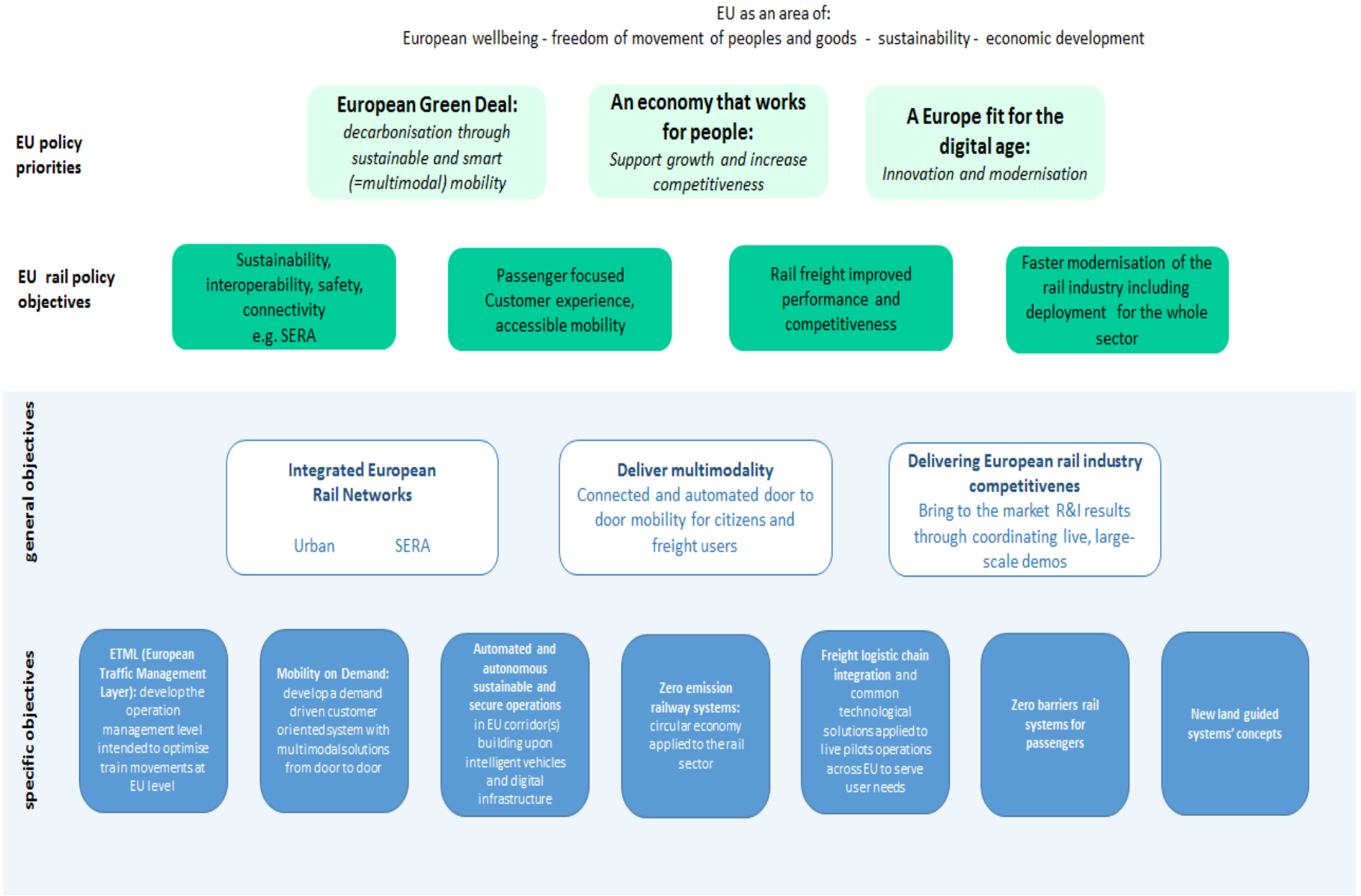
New Rail iPPP

vision objectives expected impacts



R&I BEYOND 2020

HORIZON EUROPE

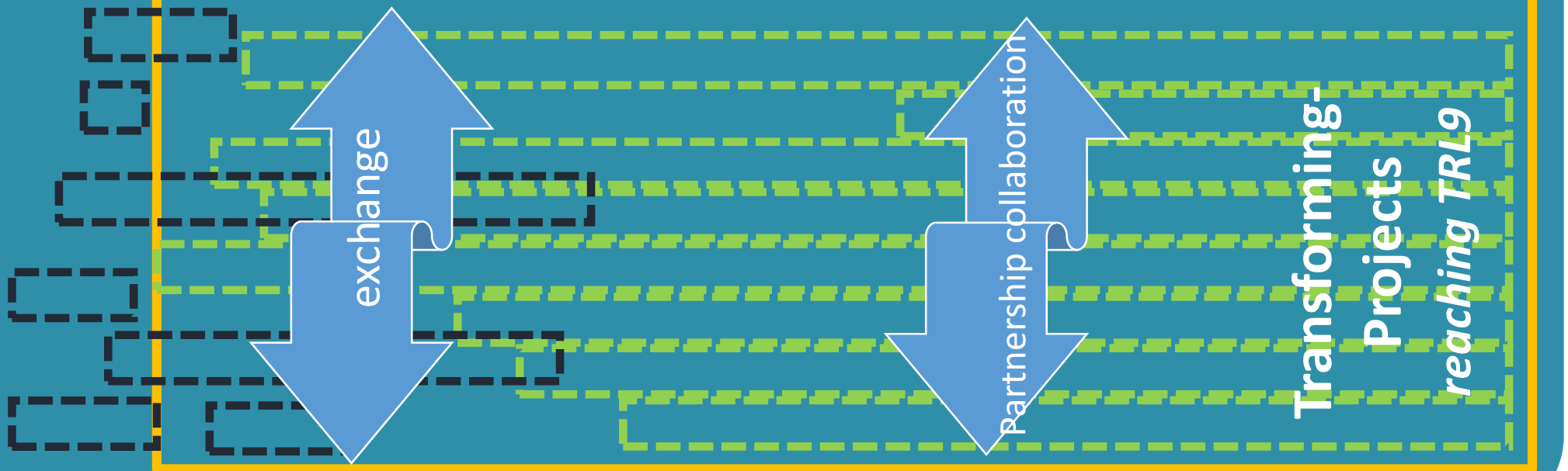
Fundamental research and « blue sky »	R&I	DEMO	S2R solutions with S2R JU supervision

BREAKTHOUGH IDEAS
TRL: 0 -> 2

APPLIED RESEARCH
TRL: 3 -> 7

LARGE SCALE OPERATIONAL DEMOS
TRL: -> 9

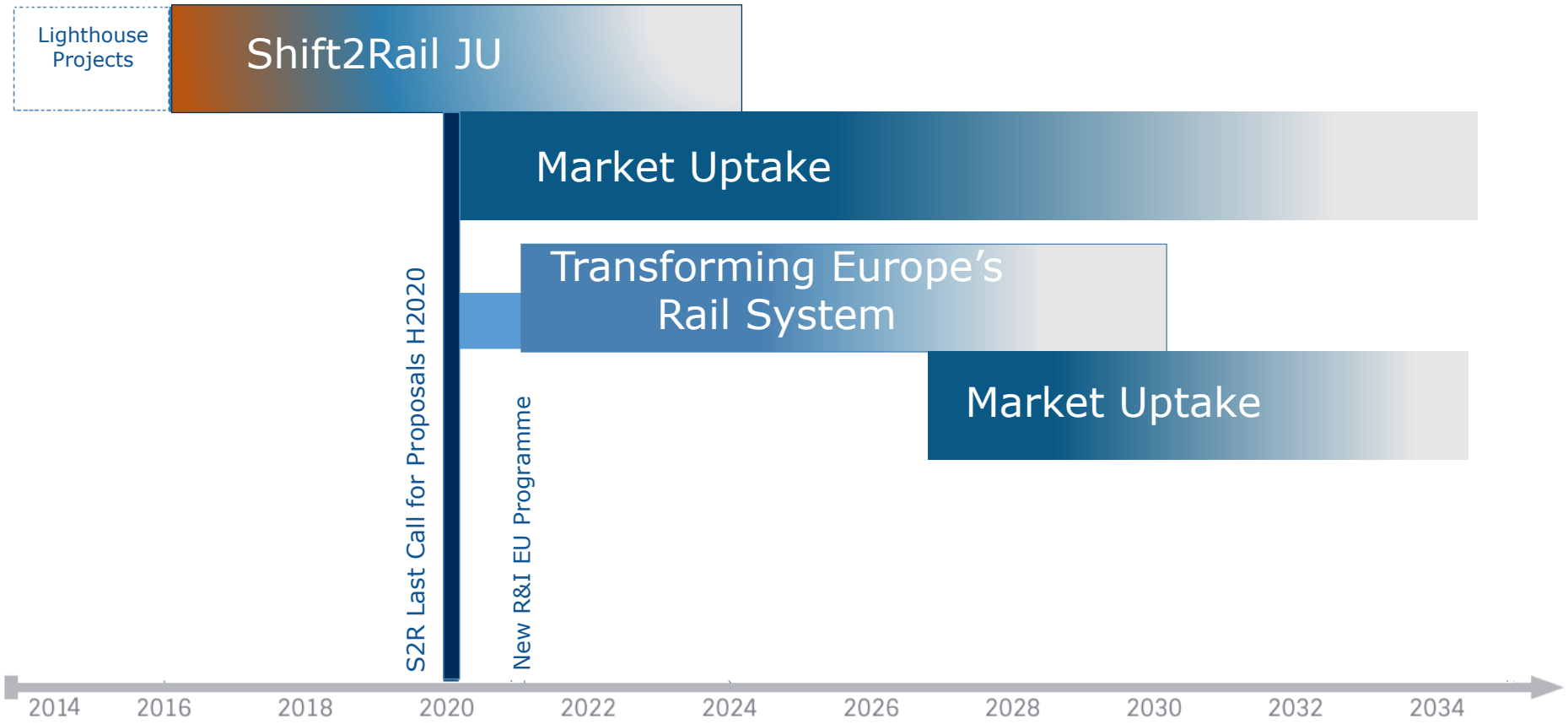
Transforming overarching project:
Future Railway System as a whole, with connection with other transport modes



DEPLOYMENT ACTIVITIES CEF / BLENDING / OTHER

- Deployment Proj
- Deployment Proj
- Deployment Proj
- Deployment Proj

RAIL R&I BEYOND 2020



S2R JU and Western Balkans

- MoU between S2R JU and South East Europe Strategic Alliance for Rail Innovation (SEESARI) signed in 2018 to promote mutual cooperation
- Exchange of information, experience and best practice on railway system transformation, focus on digitalisation and interoperability
- Creation of opportunities for testing demonstrators resulting from S2R R&I in SEESARI area
- Joint Declaration: “Engage in R&I regarding the deployment of digital, autonomous, connected and sustainable rail systems and operations”
- Possible areas of S2R of interest for Western Balkans: IP3 (predictive and condition based maintenance of IF), IP5 rail freight (digital, autonomous solutions), IP2 ERTMS
- Possible MoU S2R JU and Western Balkan Transport Community

FOUNDING MEMBERS

ASSOCIATED MEMBERS

Virtual Vehicle Austria consortium+ (VVAC+)

European Rail Operating community Consortium (EUROC)

Swi'Tracken consortium

Smart DeMain (SDM) consortium

AERFITEC

Competitive Freight Wagon Consortium (CFW)

Smart Rail Control (SmartRaCon) consortium

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