



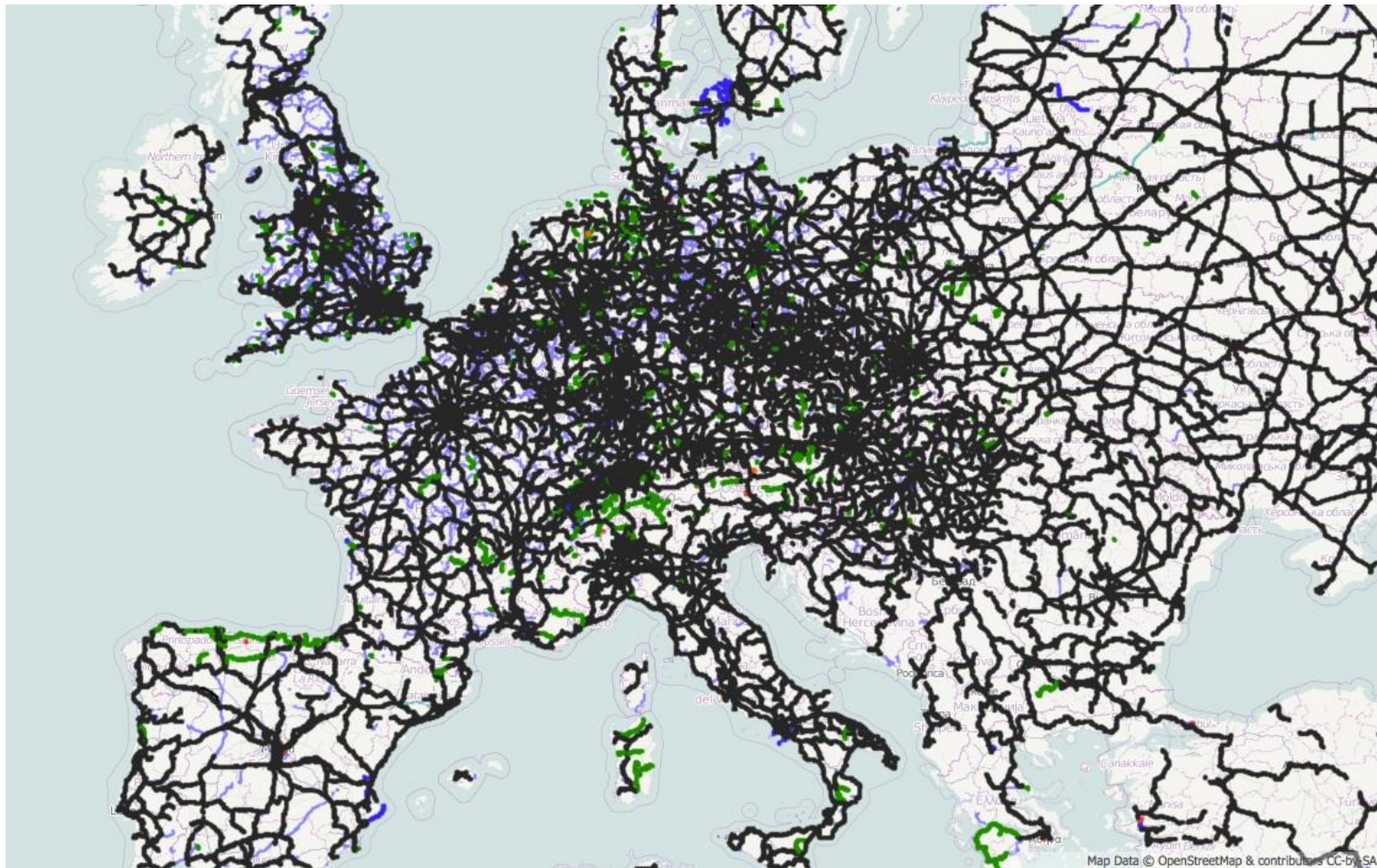
Background and motivation of the project

1st Open Workshop, Brussels 16.11.16

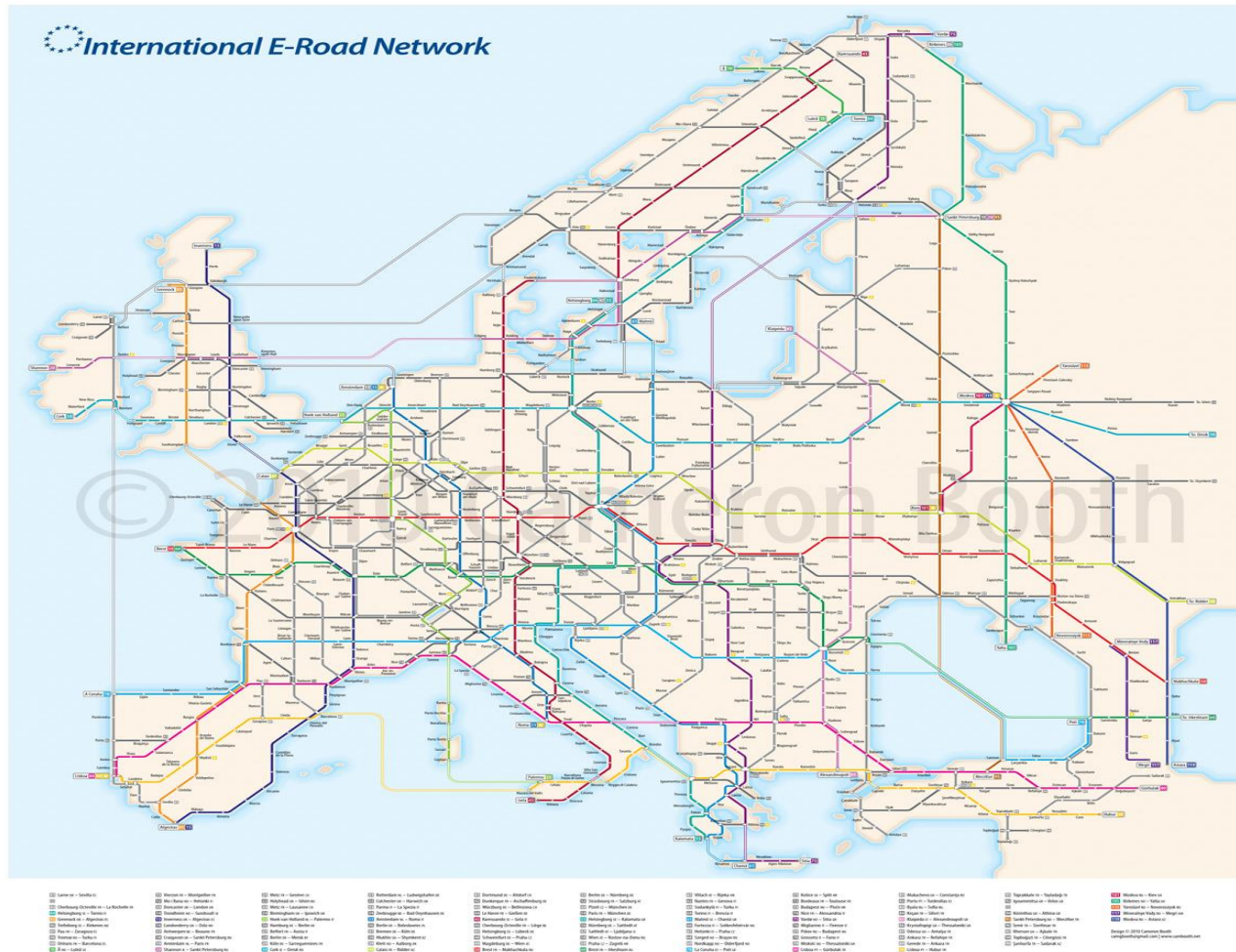
Speaker: Cesare Santanera



RAILWAYS EU NETWORK



ROAD EU NETWORK



EUROPEAN TRAFFIC



(*) Excluding powered two-wheelers. Cyprus, Malta and Iceland: railways not applicable.

(*) Includes estimates or provisional data.

(*) The railway in Liechtenstein is owned and operated by the Austrian ÖBB and included in their statistics.

Source: Eurostat (online data code: tran_hv_psm0d)



DELAYS ISSUES



BACKGROUND



- Shinkansen, TGV, ICE,
Trends toward 1 train /3 min
- Metros spacing is close to 1 min



- The current financial situation means that the construction of new infrastructures is not on the horizon, at least for the next few years.
- Therefore the only way to adapt the existing infrastructures to the growing needs and demands in this sector is to optimize them (capacity becomes the hottest issue).
- This issue is addressed by INFRA ALERT: it will develop, deploy, and exploit solutions that enhance the land transport network infrastructure performance in terms of lower cost and higher capacity.



- Mans at work for railways maintenance: such activities need to be optimised for better results.



HOW TO ACHIEVE THE GOAL?

- Through accurate assessment (by means of measurements) of the infrastructure status.
- By the use of consistent methods to create an efficient planning.



Accurate assessment of the infrastructure status immediately recalls the very fashionable “BIG DATA” concept.



Consuming the data immediately recalls the very fashionable “Internet of Things” concept.

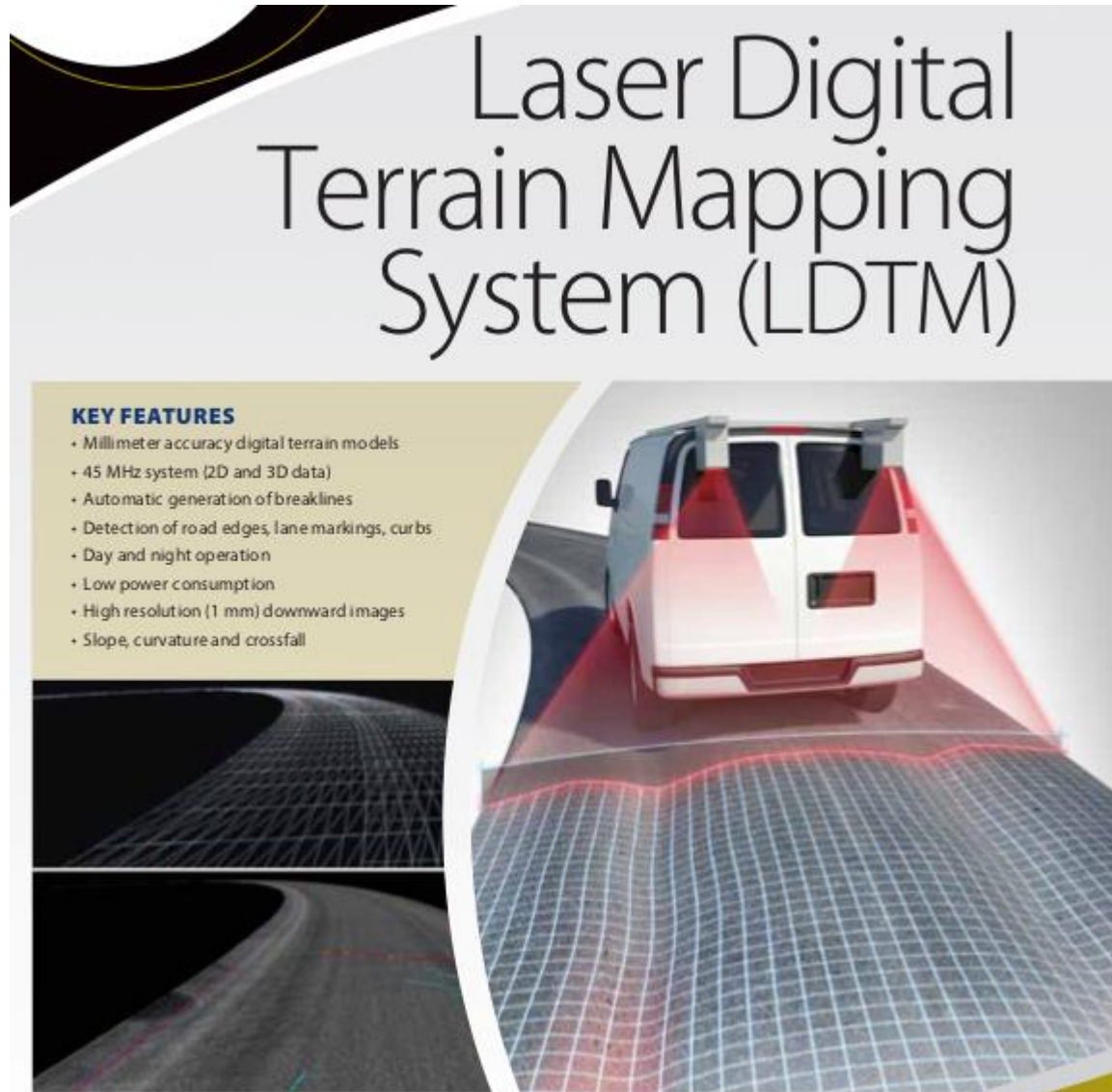
Why? Because our data consumers are the maintenance teams, and they are spread over the territory and the Internet is the obvious vehicle to let them have the information they need available where they are.



- INFRA ALERT is aware that the large amount of data currently collected by measurement systems will needs of Big Data and IoT technologies.
- Reason is that the measurement equipment available nowadays is able to supply a huge amount of useful data about the infrastructure status.
- Let's see a couple of examples in the following two slides.



- A single vehicle can map the road surface in 3D, at 1x1 mm resolution, running at 100 km/h. Add the video images.
- The result is easily in the TeraBytes size every few tens of km.



MEASUREMENT VEHICLE



- This vehicles creates 1 to 2 TeraBytes of data in a single shift, e.g. completely mapping a station composed by 100 turn outs and the tracks in between.



NO MORE HUGE «MONOBLOCK» SOFTWARE SYSTEMS:

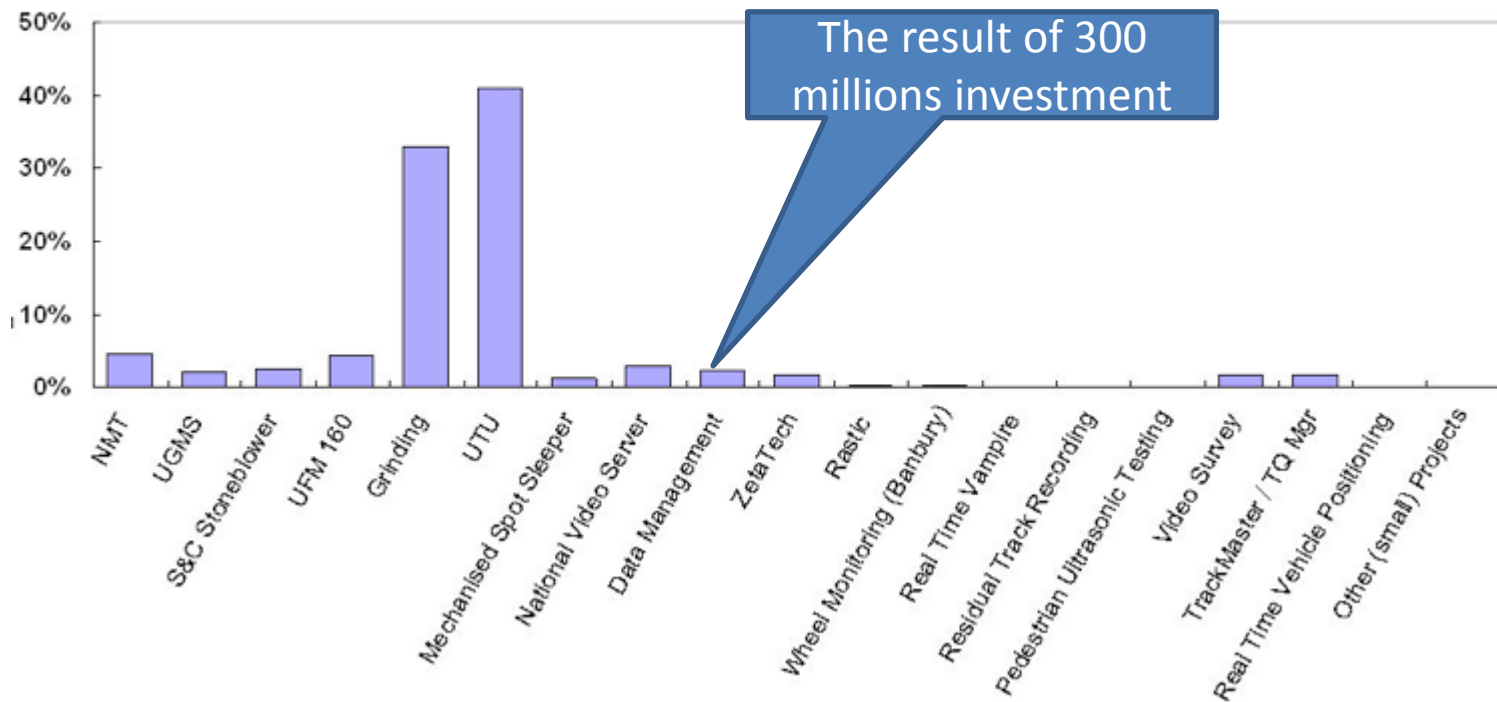
- Rigid: rather than adapting the software to the reality, the reality is supposed to adapt to the software (quite often still true in different areas, e.g. SAP for the ERP, etc.).
- Extremely expensive, because difficult to manage and configure, due to their complex architecture.
- Frustrating for the users.
- Creating captive customers.

The railways industry has not been immune: billions have been dilapidated for software developed by the big players: the net result has often been **zero**.



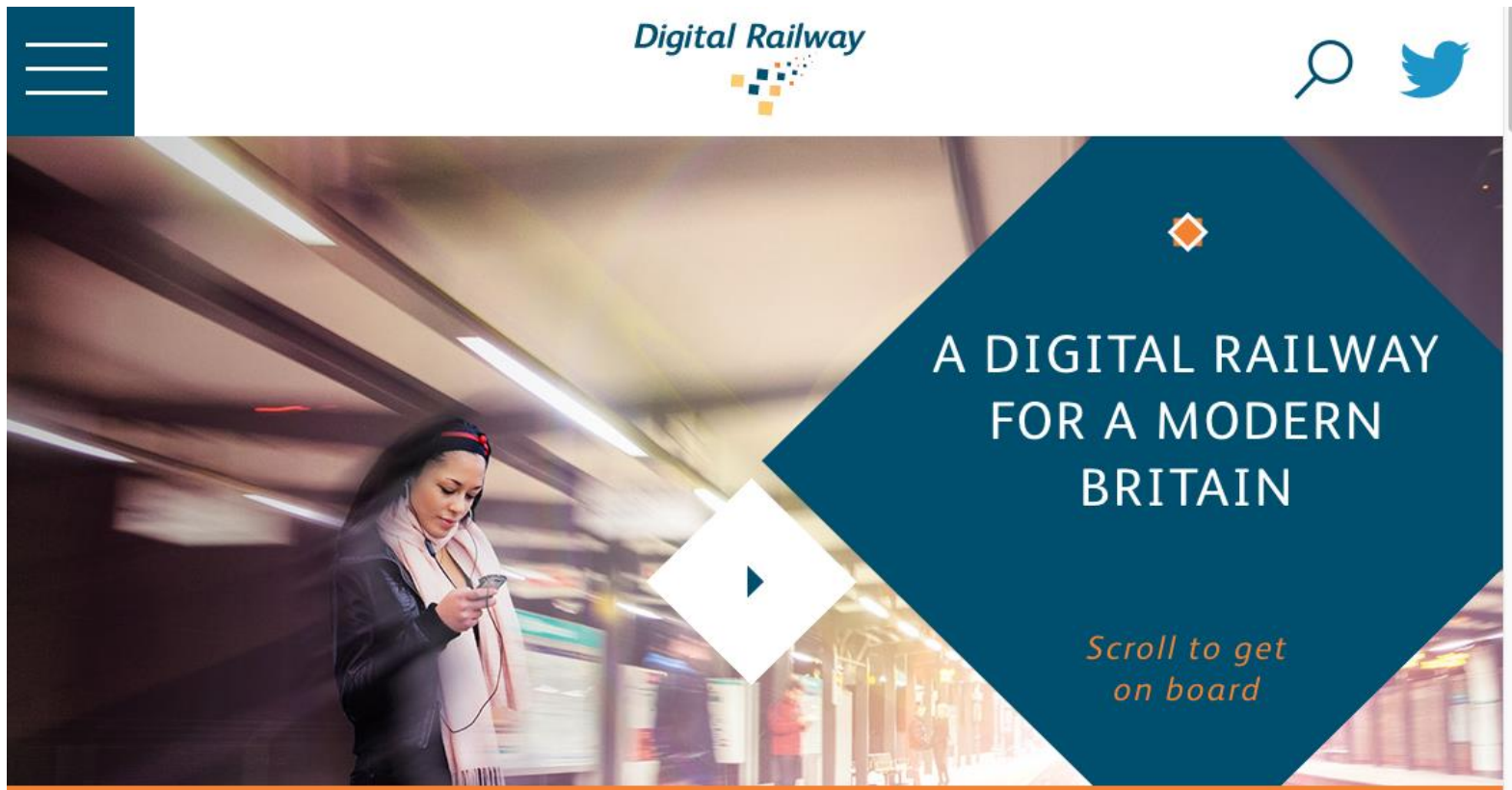
THE BENEFIT OF AN OLD «MONOBLOCK» SOFTWARE SYSTEM

Percentage of Benefits per Project



The approach is changing: it seems the “Digital Railway Initiative” in the UK is a potentially successful example.

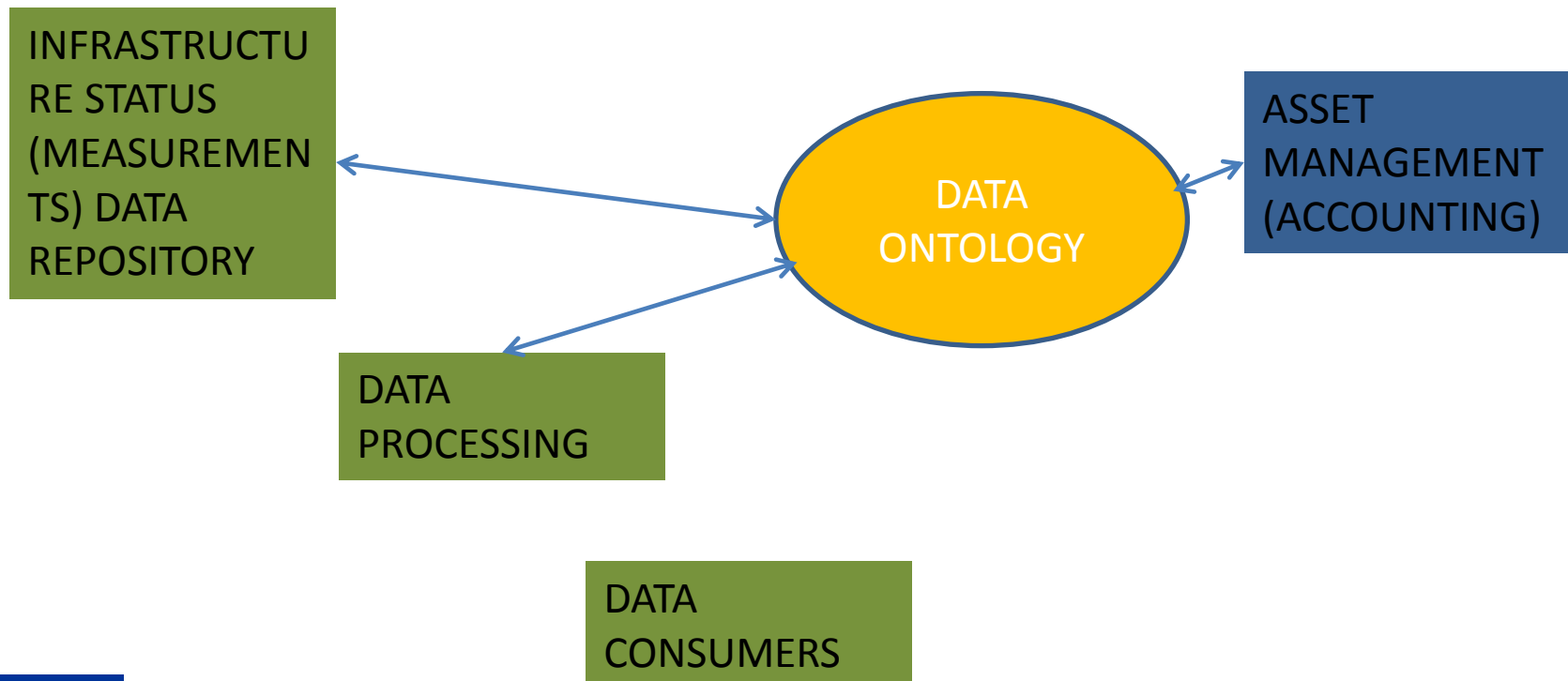
The idea is that many different, completely independent modules, can communicate to create the whole.



- DATA ONTOLOGY is the key technique to let heterogeneous systems communicate, based on the real concepts rather than on any software technology unification.
- Standards are emerging: e.g. RailML in the railways, for letting heterogeneous systems communicate. ISO standards for datatypes in computer systems. ...



The INFRA ALERT projects aims to create a collection of interoperating modules, working together as a system and open to the external world (in the widest sense: the real world and the virtual world of the software applications).



INFRA ALERT project goals:

- Optimise network functionality under traffic disruptions, ensuring in this way the transport infrastructure operability.
- Keep and increase the availability of the infrastructures by optimising tactical and operational maintenance interventions and assessing strategic long-term decisions on new constructions.
- Ensure infrastructure service reliability and safety by minimising incidents and failures.



- Wise decision making about new constructions or renewals based on historical infrastructure data (rather than political reasons).
- Summing up, the overall goal of INFRA ALERT is to improve the operability and functionality of linear asset transport infrastructures based on automating predicting, determining, and planning of maintenance and renewal interventions.



- Reducing maintenance costs of linear infrastructures.
- Extending the life span of road/rail assets.
- Increase in the availability transport infrastructure (possible reducing the number and optimizing the time of maintenance interventions).
- Enhancing the reliability of infrastructure assets in total.

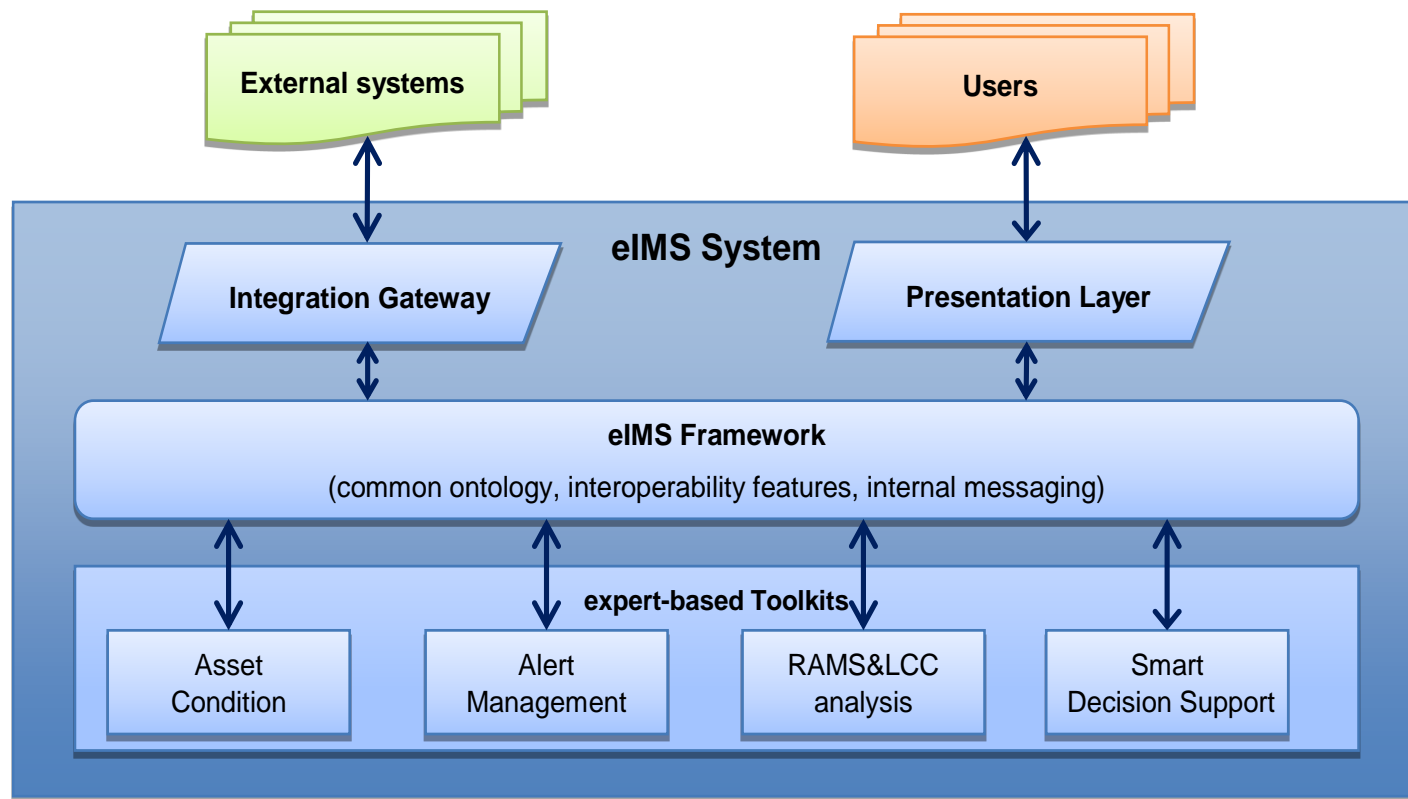


- Reducing energy and resource consumption in maintenance and operational interventions, with the objective to reduce the impact on the environment.
- Reducing drastically traffic disruption (avoiding delays and other social discomforts connected to it).
- Improving safety and comfort levels for travellers and maintenance workers.
- Enhancing the flexibility and quality of interventions planning process.



THE eIMS SYSTEM

- INFRA ALERT aims to develop an expert-based information system to support and automate infrastructure management from measurement to maintenance.



- A key factor in improving maintenance activities is to reduce the number of interventions, making them faster and more sustainable.
- Rail traffic, which is constantly growing nowadays, will benefit from the optimisation of maintenance interventions, as traffic disruption will be drastically reduced.
- As huge amount of data are generated in every measurement campaign, INFRA ALERT aims to take full advantage of all data collected, which is currently not done for various reasons. As DMA instruments (e.g. SIM 10) collect up to 1TB/h of data, the ability to use every single one of them is crucial to optimize maintenance.



- Example of an instrument allowing a very detailed assessment of the infrastructure status.
- It operates in NL, FR, BE, DE, IT and soon in other countries.



- For achieving its tasks, INFRA ALERT has to face some critical challenges:
 1. Developing the information technologies and procedures applicable to linear transport systems.
 2. Developing expert-based toolkits to support decision making in maintenance planning, renewal and new construction of infrastructures.
 3. Integrating all previous models and tools in a cloud-based framework compatible with existing asset management systems (see slide 18).



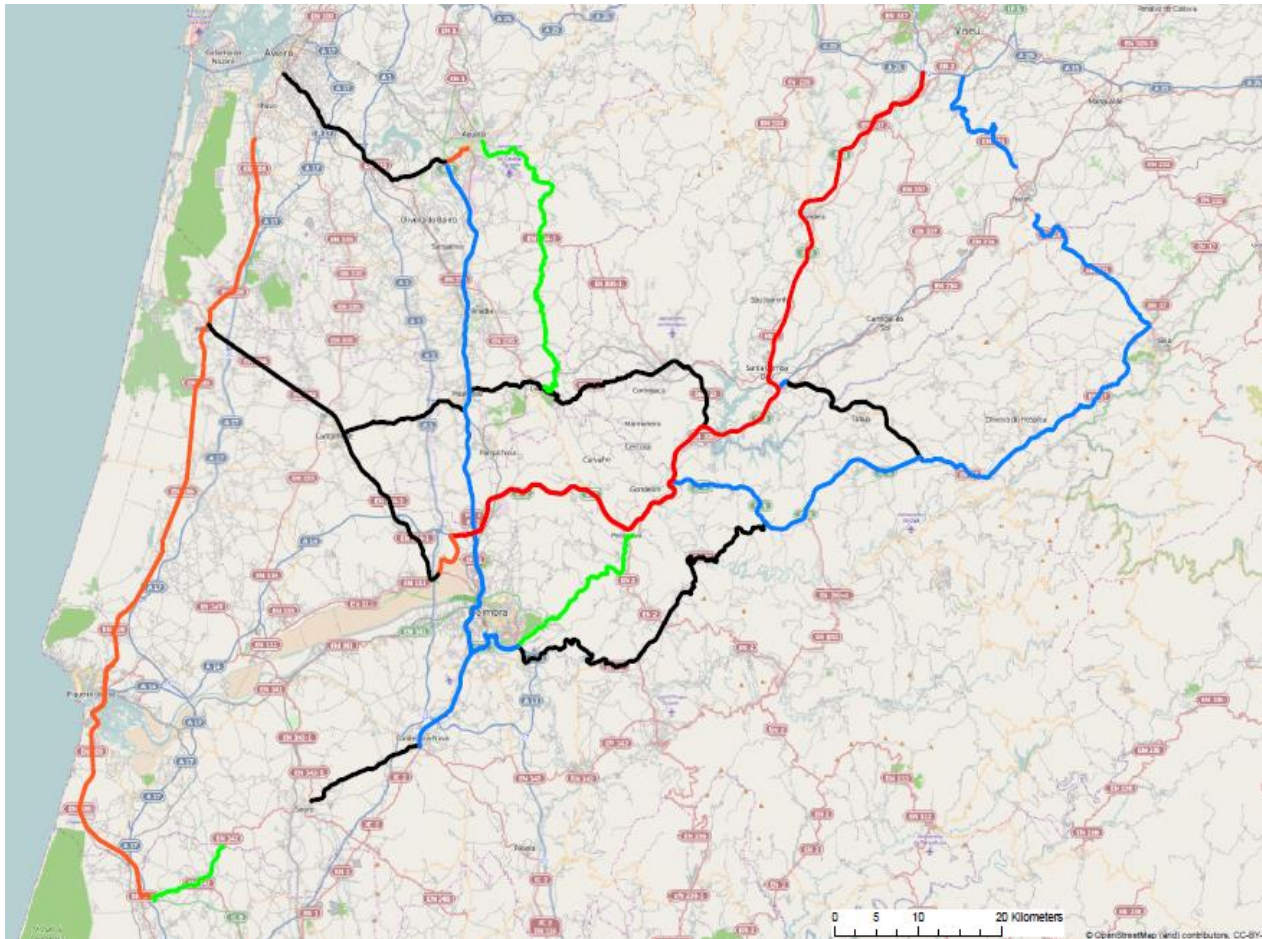
- The result of this project is a set of tools and methodologies able to be implemented and integrated with existing information systems in order to fulfil INFRALERT's aims.
- INFRALERT will develop an eIMS (expert-based Infrastructure management System) able to manage all maintenance aspects and tasks.
- It will be an open tool that can be easily used by different existing management systems that different Infrastructure Managers may have.



- INFRALERT will exploit the existing similarities among different linear infrastructures to standardise and unify concepts for data management, data analytics and decision support.
- INFRALERT research activities and results will be tested on two real pilots cases: road infrastructures in Portugal and railway lines in Sweden (high speed lines are highlighted in the following images).



ROAD TEST CASE



Sveriges järnvägsnät

Kiruna

BDL 112 (Stad)

Gällivare

Boden

Trafikplatsanmärkingar

Teckenförklaring

BDL 111 (Stad)

BDL 116 (Stad)

BDL 117 (Stad)

BDL 118 (Stad)

BDL 114 (Stad)

BDL 161 (Stad)

BDL 137 (Stad)

BDL 136 (Stad)

BDL 132 (Stad)

BDL 133 (Stad)

BDL 122 (Stad)

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BDL 119 (Stad)

BDL 124 (Stad)

BDL 151 (Stad)

BDL 164 (Stad)

BDL 165 (Stad)

BDL 152 (Stad)

BDL 143 (Stad)

BDL 126 (Stad)

Trafikverket





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