MOBILITY MEETS BIG DATA

7 PILOT DOMAINS AND THEIR EXPECTED IMPACTS

- Smart Highways
- Sustainable Connected Vehicles
- Proactive Rail Infrastructure
- Ports as Intelligent Logistics Hubs
- Smart Airport Turnaround
- Integrated Urban Mobility
- Shared Logistics for E-commerce

Initial Pilot Results
TT will demonstrate, in a **realistic, measurable, and replicable** way the transformations that **big data** will bring to the **mobility and logistics sector**.
One of the most-used industries in the world and in EU...

- **15%** of GDP
- **3,768 billion** tonne-kilometres
- **6,391 billion** person-kilometres
- **11.2 million** employment
- **4,824 megatonnes** of CO₂

*source: DG MOVE*
... and growing

Business and Tourism Travel
expected to grow significantly over the next decades

Freight Transport
slated to increase

40%  80%
2030  2050

* source: ALICE ETP
Need for paradigm shift!

10% = 100 billion €

- Efficiency improvement
- EU cost savings

But currently...

19%

- EU transport and logistics companies employ Big Data solutions

Big Data

500 billion USD
- Time and fuel savings
- 380 megatons of CO2
- Transport and logistics savings

70%

- EU transport and logistics companies do not plan to employ Big Data solutions in the future

* Source: ALICE ETP; PWC
Project Objectives

- Piloting
- Market Impact
- Value
- Engagement
- Scalability
Piloting of transformative nature that existing and very-near-to market big data technologies can bring about in the mobility and logistics sector

13 Pilots
7 Pilot Domains
Value

Three key value dimensions for Big Data in Transport and Logistics covered

Operational Efficiency
- Delivery mileage reduction of 5%-15%
- Rail maintenance cost reductions by up to 12%
- ...

Customer Experience
- Less missed connections, decreased passenger waiting times
- Delivery cost and time reductions
- ...

New Business Models
- Oriented retailing (knowing expected preferences of passengers before arrival)
- Trip patterns for advertising, tourism, ...
Scalability

of TT solutions for anticipated mobility and logistics processes and
data characteristics at end of TT project
(135 data sheets, > 55,000 GB, > 25 GB/day)
Engagement

At least 120 organizations participating actively in demonstrations
47 project partners (20 BDVA members)
> 50 persons from core business operations
Post project replication (15 expressions of interest)
High-level Advisory Board (9 members) acting as multipliers (e.g., OpenGroup, ALICE, ERTICO)
Dedicated stakeholder events and outreach activities (e.g., BDVASG "Transport & Logistics")
Market Impact

Increase of market share of Big Data technology providers of 72% on average (absolute market share of up to 12%) if implemented commercially.

Estimated increase of market share and size of TransformingTransport industry members: up to 600% individually (72% on average) by 2020.

TT results relevant for the whole mobility and logistics sector and market, covering EU market size of 1305 BEUR.
MOBILITY MEETS BIG DATA

7 PILOT DOMAINS AND THEIR EXPECTED IMPACTS

Smart Highways
Proactive Rail Infrastructures
Sustainable Connected Vehicles
Ports as Intelligent Logistics Hubs
Smart Airport Turnaround
Integrated Urban Mobility
Shared Logistics for E-commerce
Smart Highways Domain

1. Understand Road Traffic
   - Manage traffic flow along the corridors and the efficiency of the current infrastructure
   - Improve the user experience by mitigating congestion

2. Optimize Highway Operations
   - Optimize the infrastructure management by scheduling road maintenance tasks
   - Optimize the routes of the staff

3. Guarantee Safer Roads
   - Reduce the number of accidents
   - Improve the response time to accidents to reduce impacts on traffic flows

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**Oporto-Caminha-Ponte de Lima**
- A28, A27 – Euroscut / 119 km
- Electronic toll system with total absence of obstacles for users

**Málaga-Estepona-Guadiaro**
- AP-7: part of European route E15 / 105 km
- Three toll stations along the road (barriers)
- Highly-congested semi-urban corridor
Proactive Rail Infrastructure

The purpose of this domain is to allow better diagnostics and prognostics of the underlying rail infrastructure assets (Track Circuits, Point Machines, Traffic Management System, etc) to:

- Reduce unscheduled service downtime through a reduction in asset failure on the infrastructure

Pilot: Mainline Railway Line (UK)
Reduction in assets faulting unexpectedly:
- To determine future asset behaviours
- To improve rail assets maintenance

Pilot: High-speed Railway Line (Spain)
To provide better adherence to published train schedule:
- Optimized the rail traffic
- Optimize train plans with less cyclic maintenance site visits
- Optimized schedule to reduce infrastructure degradation
Sustainable Connected Vehicles

The purpose of this domain is to demonstrate how Big data real-time analytics can greatly contribute to make road transport more sustainable and safe:

- **Provide added value services powered (predictive maintenance, traffic accidents identification, etc), empowering efficient driving and CO2 emissions reduction.**

- **Optimize the management of vehicle fleets through continuous monitoring, vehicles dataset analysis and decision support systems.**

- **Increase efficiency and competitiveness by optimally defining routes based on predictive analysis and mobility patterns.**

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**Pilot: Sustainable Connected Cars**

Efficient management of their vehicles fleets
- To achieve predictive maintenance
- To promote eco-friendly driver behaviours

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**Pilot: Sustainable Connected Trucks**

Optimized train schedule in order to reduced degradation of infrastructure
- To assess traffic flow for trucks journeys
- To detect and analyse logistic hotspots
Ports as Intelligent Logistics Hubs

This domain aims to allow the reduction of the time to leave or pick up containers at the lowest possible cost by decision-making tools and predictive Maintenance approaches:

**Enabling terminal operators / dispatchers to proactively manage terminal and port operations based on real-time predictive monitoring and analytics to avoid unscheduled production downtime**

**Predictive maintenance of terminal equipment (e.g. cranes, reach stackers) to reduce the number of failures during operation**

**Optimization of equipment usage and configuration (e.g., which types of components showed better performance in the field) to provide the shortest possible time to leave or pick up containers at the lowest possible cost**

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**Pilot: Valencia Port**
- Reduction in assets faulting unexpectedly:
  - To determine future asset behaviors
  - To improve rail assets maintenance

**Pilot: Duisport Port**
- Reduction in assets faulting unexpectedly:
  - To determine future asset behaviors
  - To improve rail assets maintenance
Smart Airport Turnaround

The main target in the aviation domain is to keep the plan. There are many processes running in parallel so any disruption in one provoke a knock-on effect in the rest.

**Pilot: Athens International Pilot**
Analyzing and describing the passenger behaviors:
- To anticipate the number of resources
- To predict when passenger process might impact on the departure times

**Pilot: Milano International Pilot**
Analyzing and predicting ETAs
- To predict turnaround processes and aircraft delays
- To enable fleet wide turnaround predictability
Integrated Urban Mobility

Urban traffic management centres (TMC) aims to have an accurate knowledge to manage traffic on road network and to ensure the viability of urban logistics.

**Pilot: Tampere Pilot**
- To improve the situational awareness regarding traffic context
  - By providing solutions to improve the access of goods delivery vehicles to parking place
  - By providing tools for traffic status and for selection of alternative solutions

**Pilot: Valladolid Pilot**
- To generate a traffic model for specific areas in the city where freight transport has more impact
Shared Logistics for e-commerce

This domain aims to use big data technologies to decrease the logistics costs and to optimize the warehouses logistic processes.

The pilot will:
- Quantify the impact of shared logistics scenarios among 3PLs in e-commerce
- Expand the shared logistics concept at the reverse logistics supply chain of 3PLs
- Identify patterns of problematic processes based on previous data and forecast problematic situations
- Explore alternative shipping methods and the click and collect option at the Attika urban area
- Dynamically identify alternative delivery options by taking into consideration various routing and customer preference
- Identify online consumers’ problems and preferences, relevant with logistics procedure, extracting information by social media
Initial Pilot Results

- Proactive Rail Infrastructure
- Smart Highways
- Smart Passenger Flow
Smart Passenger Flow

Implemented descriptive models related to passengers behaviors:

- Arrival at Airport / daily distribution, segmentation
- Check-In Channels used
- Waiting times in Terminal (after security, airside)
- Transfer passengers
- Long haul / short haul (Business, Leisure)

Passenger behaviours is similar on Tuesday, Wednesday and Thursday. Some differences on behaviour are appreciated the rest of the days.

The behaviours of passengers on transit are heterogeneous because it is highly determined by the arrival time.

Tools for better situational awareness to support:
- Airlines
- Airport authorities
- Ground Handlers
Smart Highways

First Results of the Distributed Acoustic Sensing that process
- Deep buried fiber cable (15-3 meters) generates 40GB/day.
  - Initial analysis show good sensitivity for 40km
    - Heavy vehicles monitored individually
    - Road condition detected
    - Accidents (guardrail, traffic slowing) detected

Initial Predictive Traffic Algorithms

Vehicle tracking
- Faster than average vehicle
- Vehicle enters highway slower and makes another one brake
Proactive Rail Infrastructure

Problem
Cable breaks stops the rail service!
Rail infrastructure manager does not accurately know where the break is, hence better visibility of location will help in organising repair.

Investigating on raising visibility of cable meta data such as thickness over time and length. This has the potential to show where breaks may occur in the future if correlations can be found!

First results show that rail infrastructure close to Euston Station (London) are less damaged and prone to incidents than other areas.

The red and green lines are boundaries that indicate the upper and lower 25th percentiles respectively.
Open Data Portal & Data Management Plan

All metadata information from these data assets to uploaded to the Open Data Portal - http://data.transformingtransport.eu/
(Data Volume, Update Frequency, Technology, License, Personal Data, Access level)

All pilots have identified their data assets – 135 data assets identified (Sept. 2017)
Thanks!

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