IoT e la digitalizzazione nel settore ferroviario

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Ansaldo STS
A leading international technology company which specializes in railway signalling and integrated transport systems for mass transit and passenger and freight rail operations.

We plan, design, manufacture, install and commission signalling components, systems and integrated mobility solutions for the management and control of new and upgraded Railway, Transit and Freight lines worldwide; and act as a lead contractor and turnkey provider on major projects worldwide.

Ansaldo STS is a Hitachi Group company listed on the Milan Stock Exchange.
Expert in rail signalling and turnkey projects, Ansaldo STS manages all phases of a rail line project, including the design, manufacture and installation, commissioning, operation and maintenance, independently of network size and complexity.
Business Lines

Ansaldo STS delivers a full range of Railway & Mass Transit and Freight Solutions, such as…

- **HIGH SPEED RAIL**
- **MAIN LINES**
- **SUBURBAN**
- **FREIGHT**
- **DRIVERLESS UTO METRO**
- **CONVENTIONAL METRO**
- **TRAMWAY**
- **TRAMWAVE®**
Ansaldo STS: a global company

Backlog-Orders-Revenue at the end of 2016

Backlog 6,48M €
Orders 1,47M €
Revenue 1,32M €
IOT and Digitalization
IoT: an enabler for the digitalization

Digitalization relies on the availability of manageable data.

Data are generated by different IoT sources (sensors, equipment, people, operating machines, vehicles, etc..) Their usability requires the possibility to aggregate and transport these data.

Digitalization can occur only if adequate and dependable communication means are available to transport the data.

Aggregation, analysis and elaboration of the collected data allows their transformation into information.
What can we get from using IoT devices?

The availability of new data is expected to bring benefits in multiple sectors:

- **Enhanced customer experience** by offering better and added value for customers
  - Smart Ticketing and intermodal mobility
  - Human Flow
  - Passenger information and "On-board" management systems
  - Security
- **Integrated Rail Operations** by integrating information about resources and services
  - Intelligent Traffic Management System embedding Rolling Stock and Crew management
  - Dynamic Headway
  - Higher safety for workers
- **Cost reduction** by collecting real time information about asset status
  - Asset Management and Predictive Maintenance
  - Spare parts and stock management
  - Maintenance training
A «digital» station

Monitoring of people behaviour and security conditions

Real-time demand based staff scheduling and communication

Due to the weather and high demand, an additional train will arrive in 8 mins

Centralized signaling control with automated decisions based on train and infrastructure conditions

Integration of train, station and infrastructure information allows for demand based dynamic timetabling and train schedule adjustment

Smart ticketing machines based on personal account

Go to platform X in 7 mins due to increased demand

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Cameras in trains and stations capture images of people and feed congestion level analysis and prediction tools.
Video Analytics for Security Applications

Unattended Object Detection

Security Alert by unattended object detection

Background Image

Intensive Movement Detection

Real time image processing analytics detects anomaly situation such as passenger’s intensive movement and unattended object inside trains
Smart Security Applications – Multi Perspective Search

Application for security servicer to detect and track person of interest using combination of over 100 features using trains, stations and city CCTV cameras.
Dynamic Headway

Congestion monitoring, human flow and demand forecast enable dynamic train operation according to the real-time demand captured by several sensors.

- Regulating passenger congestion rates by real-time data
- Extra / Remove train based on the congestion rates
- Future demand prediction by AFC
- Value creation by stored data

Extra trains

Capture Current and history data
Make Plan
Assess and Predict future
Execution

AFC: Automated Fare Collection
Smart ticketing
Be-in / Be-out technology

Front-end
- Interoperable one ticketing solutions
- Passenger position detection via GPS and Beacon communication
- Dynamic Pricing

Back-end
- Central Computing System
  - Clearing Management
  - Revenue Management
  - Seat Reservation
  - ID Management
  - Fare Calculation
  - Position Detection
  - Route Detection
  - Delays and real time notifications

Human Tracking (part of Human Flow Application)
- Passenger Journey Management
- Location based Advertisement

Data Base
Many railway operators are currently managing their networks with a combination of:

- traditional train control systems (manual route setting, manual point moves, and manual train adding at the boundaries, etc.),
- paper train graphs and
- offline scheduling and crew management systems.
User Interfaces evolution
Asset Management & Infrastructure monitoring
3.4 Asset Management

Condition Based / Reliability Centered Maintenance based on big data analytics reduces maintenance cost and increase system availability.

The goals of these processes are:

- Gathering vast quantities of data
- Using predictive analytics to increase reliability
- Improving Train and components design
- Optimising maintenance operations and logistics
- Minimizing spares stock
Rolling Stock diagnostic
A rowing fleet collecting data

Most railways have equipped special trains with onboard diagnostic equipment that run on the network to collect data regarding track, geometry, catenary status, etc.

RFI has a fleet of diagnostic trains (Archimede, Talete, Aldebaran, Galileo e Caronte 1 e 2) for Conventional lines and High Speed Lines (Diamante) and is now planning to spend 65M Euro to upgrade this fleet.

SNCF has a fleet of diagnostic trains that runs on the network and every two weeks is able to survey the entire High Speed Network…

…. But what if every commercial train could become a diagnostic train?
A rowing fleet collecting data

Inspection systems fitted to revenue cars means substantial amounts of data are obtained continuously with no effect on scheduled train services.
A rowing fleet collecting data

Railway side equipment monitoring

Inspection systems fitted to revenue cars means substantial amounts of data are obtained continuously with no effect on scheduled train services.
A rowing fleet collecting data

Roof Mounted overhead catenary and pantograph monitoring

Inspection systems fitted to revenue cars means substantial amounts of data are obtained continuously with no effect on scheduled train services
A rowing fleet collecting data

On board EVC able to monitor:
- Track circuit levels
- Balises
- Radio signal

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IoT challenges

1. High implementation costs of new technologies
2. Data Security breaches
3. Continuous availability of data
4. Not enough skilled employee to manage new technologies
5. Lack of interoperability between system and chain reaction
6. Conservatism in embracing new technologies and operating procedures

Source: Roland Berger survey
Digitalization trend in rail supply industry

92% of the industry is planning investments in the digitalization in the next 3 years

.. and 89% expect their business model to change following these investments

Source: Roland Berger survey
Thank you for your kind attention...

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