

Manage infrastructure

The case of Autostrade per l'Italia

How IBM and MOVYON leveraged Maximo for CI to create ARGO: the extended platform for managing and monitoring the life cycle of infrastructures.

Speaker



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Agenda

ARGO – An Innovative Infrastructure Management System

Reason to Act

Risk Management
Asset Management Strategy

ARGO Implementation

Inventory Strategy
BIM Integration
Mobile Apps
IoT and AI
New assets under implementation

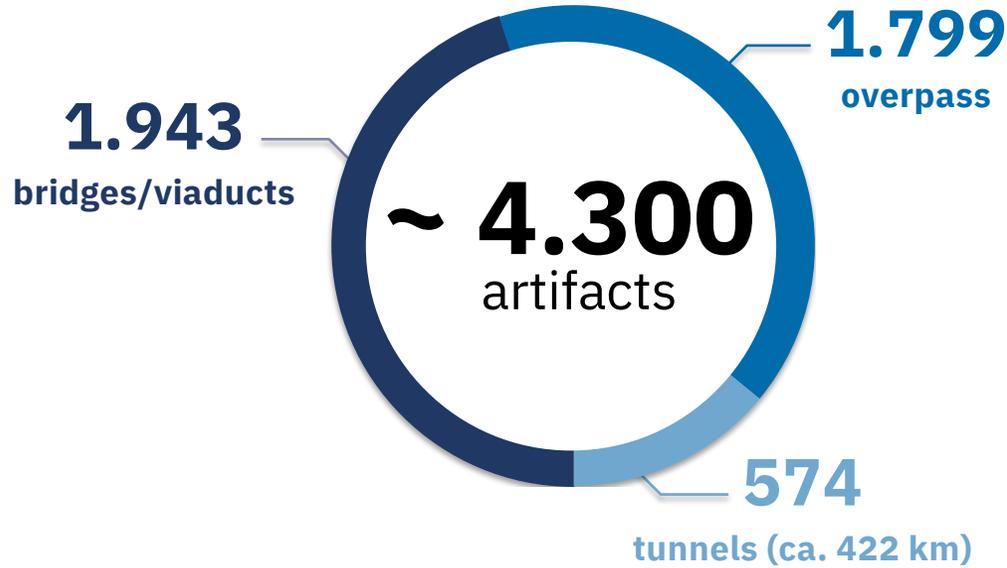
Achieved Value

Data Quality
Near Real-Time Input and Process
Management
Compliancy with New Regulation
Inspection Plan and Prioritization



Autostrade per l'Italia Group

The largest toll road operator in Europe



2,855 km
motorway
network



218
service
areas



271
toll
stations



16
toll highway



2,7 M
daily
users



2,1 M
daily vehicle
transits



575 M
investments
in operations

The challenge



Critical infrastructures like bridges, **need to be inspected and maintained** throughout their life-cycle to ensure their safety and serviceability.



The infrastructure inspection and maintenance processes have evolved over time, passing from **manual inspections to inspections carried out partly manually and partly supported by technological aid.**



Emerging technologies can be applied **to support proactive monitoring and maintenance processes.**

Autostrade per l'Italia Reason to act



Consolidate

data and expertise created through decades of motorway's asset management



Innovate

instruments introducing state-of-the-art technologies and tools



Increase

capabilities of key-figures operating in an increasingly demanding environment



Share

and guarantee traceability of information with stakeholders in total transparency

Autostrade per l'Italia

Asset Management Strategy

1. Importance of having all data into one single platform to generate actionable information
 - i.e. priority of intervention
2. Collected data must have a link to the asset they are referring to
 - i.e. IoT sensors linked to the component of the asset
3. Define in advance the relevant data that must be gathered for monitoring, inspection and maintenance and define a dictionary valid for the overall company



One single system - One asset registry to create a **Digital Inventory**

3,800

Bridges/Overpasses

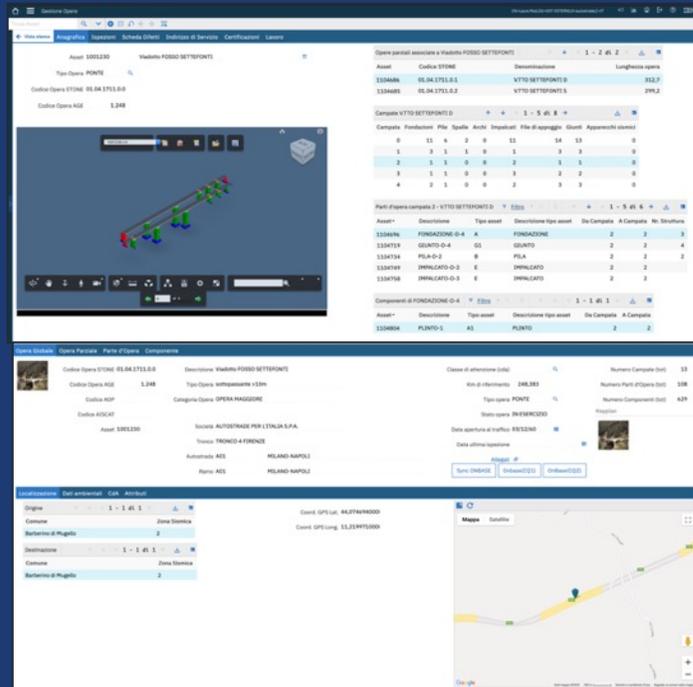
2,000+

BIM

650,000

components

1. Infrastructure **hierarchy** and asset taxonomy is defined
2. Real **digital infrastructure data model** archive based on IBM Maximo
3. Data governance tools **data and process controls**
4. **BIM Model** generated from **data stored** in the platform
5. Improved controlling: **inspection plan** and – in a while – maintenance plan, assuring “**near real time**” data update
6. Natively integrated with **AINOP – Ministry of Transportation database of Opere d’Arte**
7. **Risk Rating calculation:** CdA (Class of Attention) calculation from asset data in line with local regulations



Dedicated **Mobile App** to support on-site inspection

4,000+

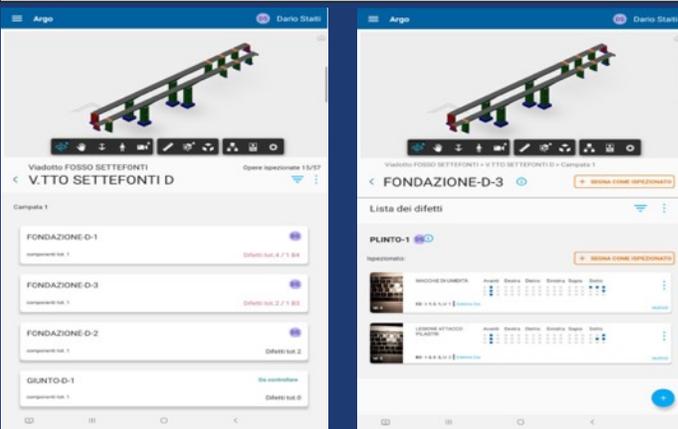
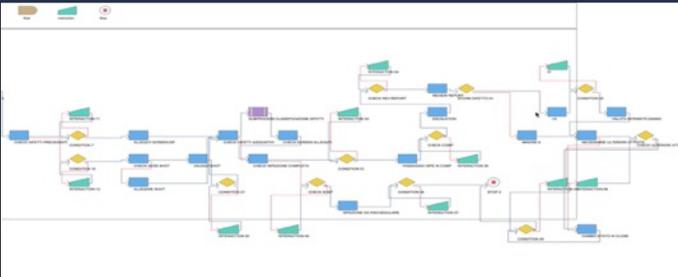
Inspection
performed

150,000+

Photographs
taken

300+

Inspector using the
mobile App



1. Inspection process based on Italian regulations
2. Each process step is controlled by an approved workflow and can only be taken in charge by designed roles
3. Mobile Application supports the inspector showing the activities that are to be performed, controlling each process step
4. Each element to be inspected is proposed to the inspector who need to record/review either existing defects or absence of any defects
5. Each registered defect must have a precise localization and must have its own associated picture as a proof
6. Real-time control of the execution – the inspection cannot be closed if each component has not been inspected
7. The BIM Model helps the inspector to identify and locate the assets to be inspected and to position the defect

Connected IoT Sensors on selected infrastructure

1. Infrastructure characterization through **international experts** and in collaboration with Italian Universities
2. Scientific Committee organized from top Italian universities to coordinate experimental activities and structural monitoring
3. Analytic Model defined by the **Scientific Committee**
4. Data flow in the system, monitoring the infrastructure health and supporting the decision making process

Figura 9.1 Impalcato_PRE-intervento su Selle Gerber

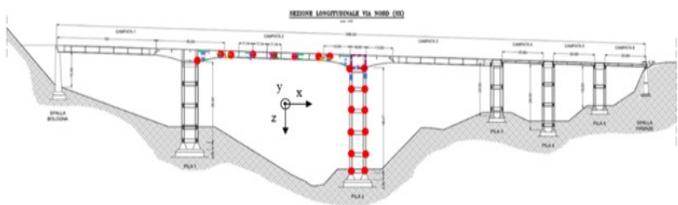
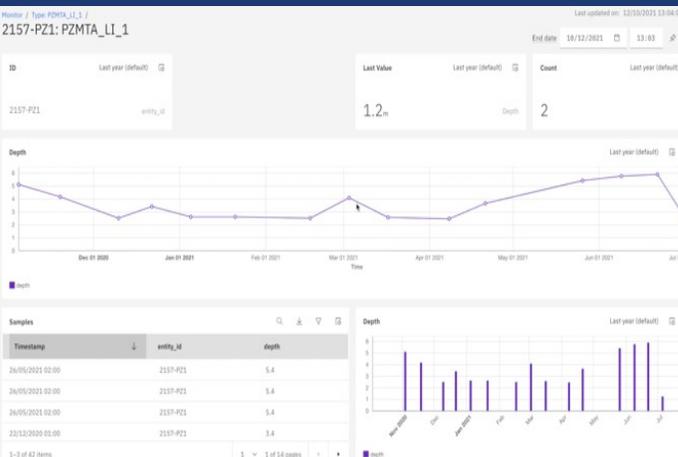
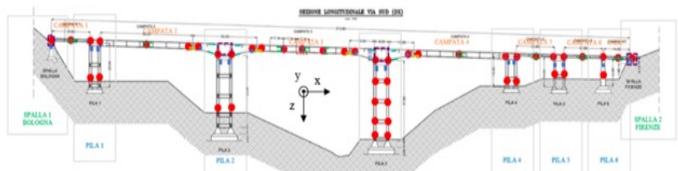


Figura 9.2 Sezione longitudinale Via NORD (SX)_PRE-intervento su Selle Gerber



Monitoring and IoT

Settefonti viaduct Pilot



13 Types of sensors



630 sensors installed



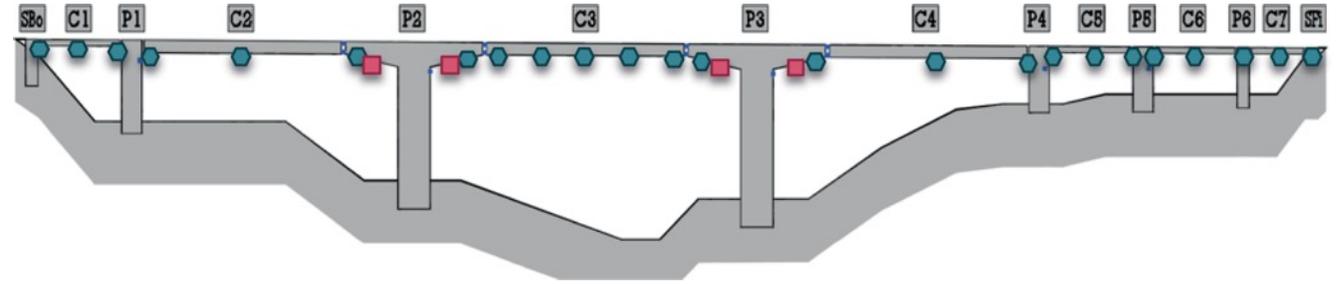
Defined the **optimal layout** of the monitoring system



Identified **most significant structural parameters**



Monitoring the **dynamic and static behavior** of the structure as well as **global and local phenomena**



Digital Twin



Drones are equipped with **high-definition cameras and LIDAR lasers**

3d-scan of viaduct turned into millions of georeferenced points associated to **each component**



Digital Twin integrated with the existing simplified BIM



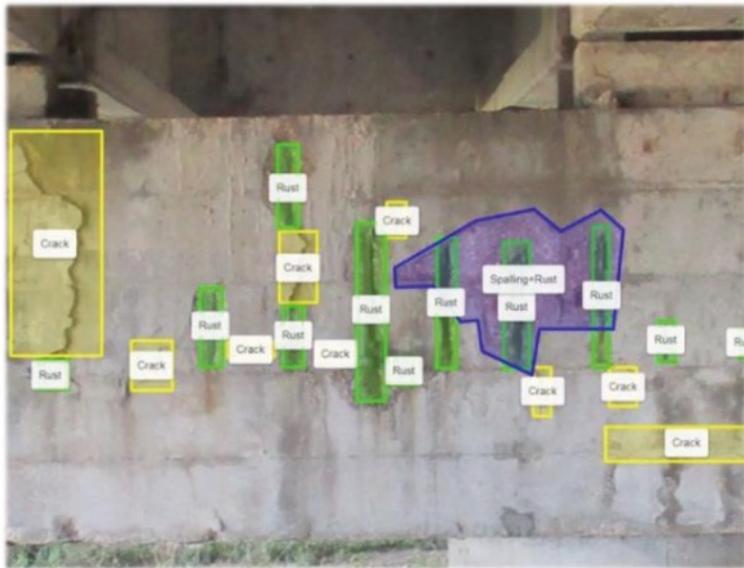
The inspector is able to **carry out inspections remotely**



Artificial Intelligence for Damage Recognition



The operator's decisions are supported by the applications of **Image Recognition algorithms. Timely analysis of pictures and defects identification and classification**



New Features under development in ARGO

Inventory is extending to new assets



- **Tunnels** – comprehensive of simplified BIM Model
- **Equipment** in and around the highway premises (e.g. message panels, firefighting systems, ..)
- **Service Areas** – buildings and service quality
- **Geotechnical Structures** (walls, rock slope scaling)
- **Pavements** – monitoring surface consumption
- **Environmental** monitoring



ARGO DEMO

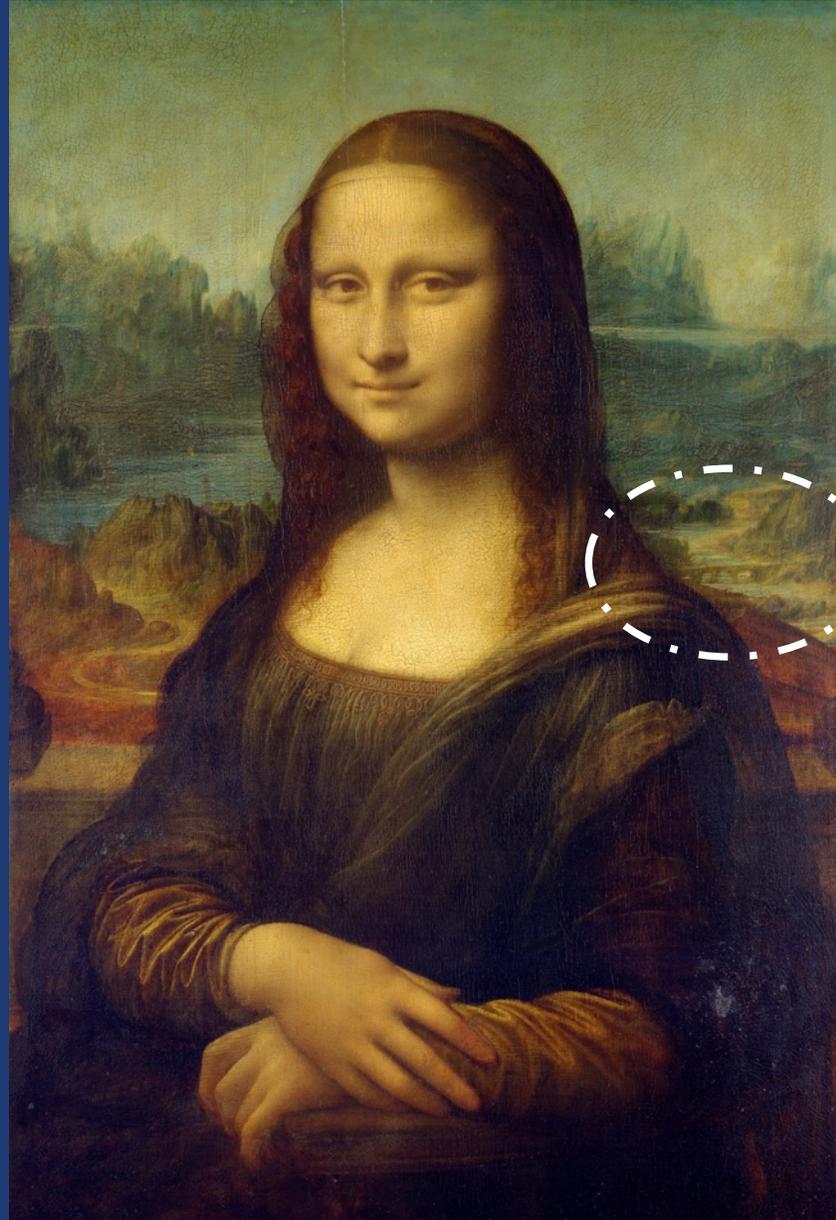
DEMO

Maximo e Mobile app



DEMO

Maximo e Mobile app



All in a single integrated platform



Achieved value



Full digitization
of inspection
process



Transparency
and **data control**



Increased
productivity and
efficiency of
inspection processes



Health monitoring
of infrastructures



Modular and
scalable platform



Analytics
and **reporting**
on assets and defects

Thank you



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Thank you



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