Bonfiglioli and IoTwins

Bologna, October 1st 2020
Francesco Millo (francesco.millo@bonfiglioli.com)
We have a relentless commitment to excellence, innovation and sustainability. Our team creates, distributes and services the world-class power transmission and drive solutions that keep the world in motion.

“FULL SPEED AHEAD!”

Clementino Bonfiglioli
Mobility and Wind

Gearboxes and gearmotors for applications in Mobile Machinery (wheels, slews, winches, cranes, concrete mixers) and Wind applications.

Wind

36% Market share worldwide

Construction

60% Market share in Europe
Industrial applications

Gearboxes, gearmotors and electric motors
for Industrial applications
in more than 20 different sectors.
Mechatronics

Integrated mechatronics packages
(Precision gearboxes, Servo motors and Drives,
Motion and HMI)
for Industrial applications.
Electromobility

Gearboxes, gearmotors for applications in Electromobility

Marine

Gearboxes, gearmotors for Marine applications (winch drives, planetary drives, steering gears, jacking gears)
Bonfiglioli Global footprint: 14 Production facilities and 21 commercial branches
We have ~4,000 employees around the world, of which 60% abroad.
In 6 years our sales grew by ~50%, reaching almost 1Bn€.
IoTwins Project

Distributed Digital Twins for industrial SMEs: a big-data platform

Francesco Millo

Bonfiglioli Riduttori (Project Coordinator)
TYPE OF ACTION
INNOVATION ACTION

PROJECT REFERENCE
857191

START/END
SEPTEMBER 2019 – AUGUST 2022

TOTAL COSTS
€ 20,029,818.75

EU CONTRIBUTION
€16,422,552.01

CALL IDENTIFIER
H2020-ICT-2018-2020

TOPIC

COORDINATOR
BONFIGLIOLI RIDUTTORI
IoTwins is an European project that will work to **lower the barriers for the uptake of Industry 4.0 technologies** to optimize processes and increase productivity, safety, resiliency, and environmental impact.

IoTwins approach is based on a **technological platform** allowing a simple and low-cost access to big data analytics functionality, AI services and edge cloud infrastructure for the **delivery of digital twins in manufacturing and facility management sectors**.

The approach is demonstrated through the development of **12 large scale testbeds**, organized in three application areas: **manufacturing, facility management** and **replicability/scale up of such solutions**.
The project: a technological platform to feed 12 pilots

- **IoT-edge-cloud infrastructure and Big Data services for SMEs**
  - AI services for Digital Twins
- **Manufacturing Test-Beds**
- **Facility management Test-beds**
- **Platform for Replicability, Scalability and Business Model**
<table>
<thead>
<tr>
<th>WP N°</th>
<th>Title</th>
<th>Participants</th>
<th>Short Description</th>
<th>Activity</th>
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<tbody>
<tr>
<td>2</td>
<td>IoT-Edge-Cloud infrastructure and big data services for SMEs</td>
<td></td>
<td>Definition of the technology and user requirements to design the IoTwins platform</td>
<td>Platform</td>
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<td>3</td>
<td>AI services for distributed Digital Twins</td>
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<td>Development of AI services (Machine learning, simulation…) and methodologies for the application on the Test-beds</td>
<td>Platform</td>
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<td>4</td>
<td>Manufacturing test-beds</td>
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<td>1. Predictive maintenance of wind turbines</td>
<td>4 Pilots</td>
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<td>2. Monitoring the behaviour of machines for automotive</td>
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<td>3. Optimization of crankshaft manufacturing systems</td>
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<td>4. Predictive maintenance of closure systems</td>
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<td>5</td>
<td>Facility management test-beds</td>
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<td>5. Management of crowd flows in the Camp Nou facility</td>
<td>3 Pilots</td>
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<td>6. Improving the environmental footprint of Data Centers</td>
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<td>7. Management of a wide-scale Smart Grid in a living lab</td>
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<td>6</td>
<td>Platform replicability, scalability and business models</td>
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<td>8. Identifying patterns for reuse for manufacturing SMEs</td>
<td>5 Pilots</td>
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<td>9. Performance homogenization over different plants</td>
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<td>10. Testing Test-bed 6 on other IT facilities (BSC and INFN)</td>
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<td>11. Testing Test-bed 5 on smaller stadiums</td>
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<td>12. Testing an innovative business model to exploit the Platform</td>
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WP 1, 7 and 8 will deal with the Coordination of the Consortium, the Exploitation and the Dissemination of the results generated by IoTwins.

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<tr>
<td>1</td>
<td>Project Management</td>
<td>Bonfiglioli</td>
<td>Coordinating and monitoring the activities of Partners, administrating European funds</td>
<td>Coordination</td>
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<tr>
<td>7</td>
<td>Exploitation of the project developments and knowledge management</td>
<td>beWARRANT</td>
<td>Defining business models to adopt the IoTwins platform/methodology, managing IPR and exploitable results</td>
<td>Exploitation</td>
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<td>8</td>
<td>Outreach activities – dissemination and communication</td>
<td>ART-ER</td>
<td>Communicating and disseminating project Results: - Events, international conferences, workshops, open days, exhibitions...</td>
<td>Dissemination</td>
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Digital Twins concept in IoTwins

Digital Twin Enabled Services:
- Predictive Maintenance & Production Optimization
- Facility Management & Facility Planning

Components for Digital Twins:
- Training of ML models
- Agent-based modelling
- Physics system modelling
- System Characterization for off line optimization
- Empirical model learning

High performance computing and storage resources
- HPC-Big Data infrastructure
Platform and services.

All the IoTwins testbeds share the same methodology, grounded on the concept of distributed IoT-/edge-/cloud-enabled hybrid twins, to replicate complex systems, with the ambition of predicting their dynamics and temporal evolution.

Key elements:

- **A full-fledged platform** enabling easy and rapid access to heterogeneous cloud HPC-based resources for advanced big data services.
- **Intelligent services** to simplify and accelerate the integration of advanced Machine Learning algorithms, physical simulation, on-line and off-line optimization into distributed digital twins.
- Advanced edge-oriented mechanisms, tools, and orchestration to support Quality of Service in the runtime execution of the distributed digital twins.
4 industrial testbeds providing predictive maintenance services that exploit sensors data to forecast the time to failure and produce maintenance plans to optimize maintenance costs

- Wind turbine predictive maintenance | Bonfiglioli Riduttori, KK Wind Solutions
- Machine tool spindle predictive behaviour | FILL
- Predictive maintenance for a crankshaft manufacturing system | ETXE-TAR
- Predictive maintenance and production optimization for closure manufacturing | GCL International
Testbeds.

facility management

3 testbeds for identification of criticalities, optimization techniques to provide efficient facility management plans, operation optimal schedules, and renovation/maintenance plans

- NOU CAMP - Sport facility management and maintenance | Futbol Club Barcelona
- EXAMON - Holistic supercomputer facility management | CINECA
- Smart Grid facility management for power quality monitoring | SIEMENS
Testbeds.

replicability

5 testbeds to demonstrate the replicability and the scalability of the IoTwins platform and of the former manufacturing and facility management testbeds

- Patterns for smart manufacturing for SMEs | Centre Technique des Industries Mécaniques
- EXAMON replication to other datacentres facilities | Istituto Nazionale di Fisica Nucleare, Barcelona Supercomputing Center
- Standardization/homogenization of manufacturing performance | GCL International
- NOU CAMP replicability towards smaller scale sport facilities | Futbol Club Barcelona
- Innovative business models for IoTwins PaaS in manufacturing | Marposs
Thank you