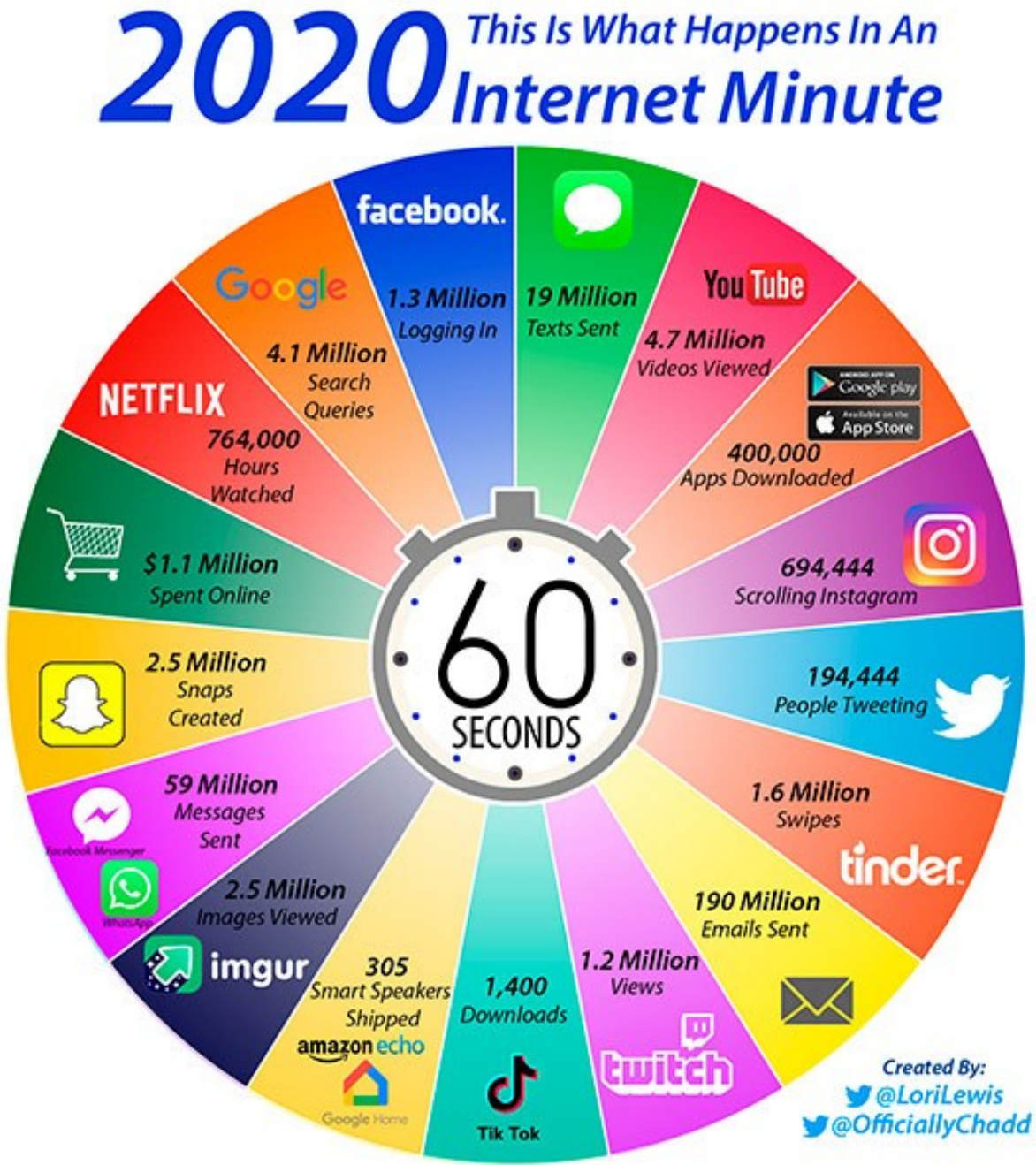
[WednesdAIs]
Real-world industrial data.
Never assume that bigger is better.

Paolo Bellavista

Dept. Computer Science and Engineering (DISI), University of Bologna

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020
RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT № 857191

Real-world industrial data: is it really big?



Che cosa significa «big»?

- Nel 2020 si raggiungerà la quantità totale di 40 trillion (10^{12}) GB di dati, ovvero 40 ZB ($40 * 10^{21}$); nel 2010 il totale era di “soli” 1.2 ZB), notare trend di crescita…
- 90% del totale dei dati ora disponibili è stato creato negli ultimi 2 anni
- Utenti Twitter inviano in media 0.5 milioni di tweet al minuto
- Entro la fine del 2020, ogni persona genererà 1.7 MB al secondo

Non sempre bigger is better…

- *Similar but diverse*
- *In similar operational conditions (context)*

Non sempre…

Similar but diverse

- Esempio di grandi raccolte cv per job placement e sistemi automatici di talent management

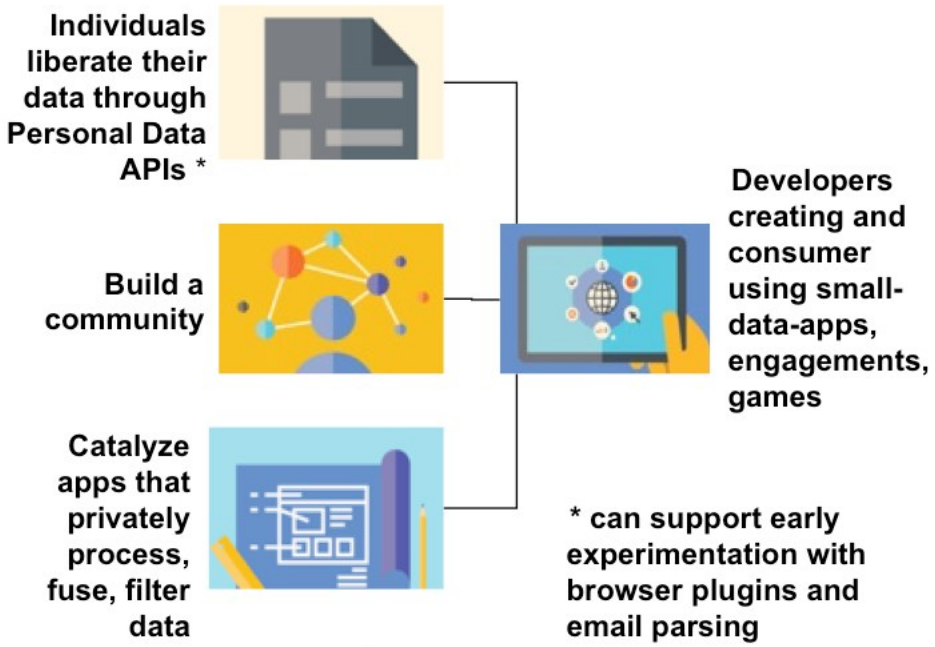
In similar operational conditions (context)

- Esempio di fault detection e predictive maintenance ma in condizioni di «***contesto***» che possano essere considerate simili

Small Data

Extracting value also from “small data” (D. Estrin, Cornell)

by building and promoting the emergence of communities, ecosystems, … **fueled by companies in the manufacturing domain**



- Stimolare raccolta di dataset anche piccoli ma estremamente *significativi per diversity, contesto simile*, …
- *Segmentare utenti e datasource* su base di profilazione con caratteristiche e obiettivi simili
- Creare una comunità di attori capace di *estrarre valore* da small dataset o da segmenti significative di dati
- Comunicare efficacemente il valore di questa opportunità vera di data sharing

IoTwins

Future opportunities

Business and technical challenges are future opportunities!

- **Extracting value also from "small data"**
  - Specialization national/EU districts and the emergence of communities, ecosystems, … which allow also SMEs to reach "the critical mass"
  - Big data for manufacturing in Emilia Romagna?

- **Technical challenges of fog computing – for example towards an EU-based cloud continuum for the manufacturing industry**
  - Interoperability and common APIs
  - Distributed and portable orchestration
  - **Support for quality requirements, such as latency, reliability, scalability, …**
    - **Integration with resource slicing, 5G/6G, Time Sensitive Networking, …**
  - Generating trust around the idea of an EU-based cloud continuum, in particular in some specific vertical domains

IoTwins

IoTwins

BIG DATA OPTIMIZE INDUSTRY AND SERVICES

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
ICT-11-2018-2019 - HPC AND BIG DATA ENABLED LARGE-SCALE TEST-BEDS AND APPLICATIONS

COORDINATOR
BONFIGLIOLI RIDUTTORI

Concept and approach

- IoTwins is an EU 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

20	16	23	1	12	3
M€ total value	M€ EU Funding	Partners	Platform	Testbeds	Application areas

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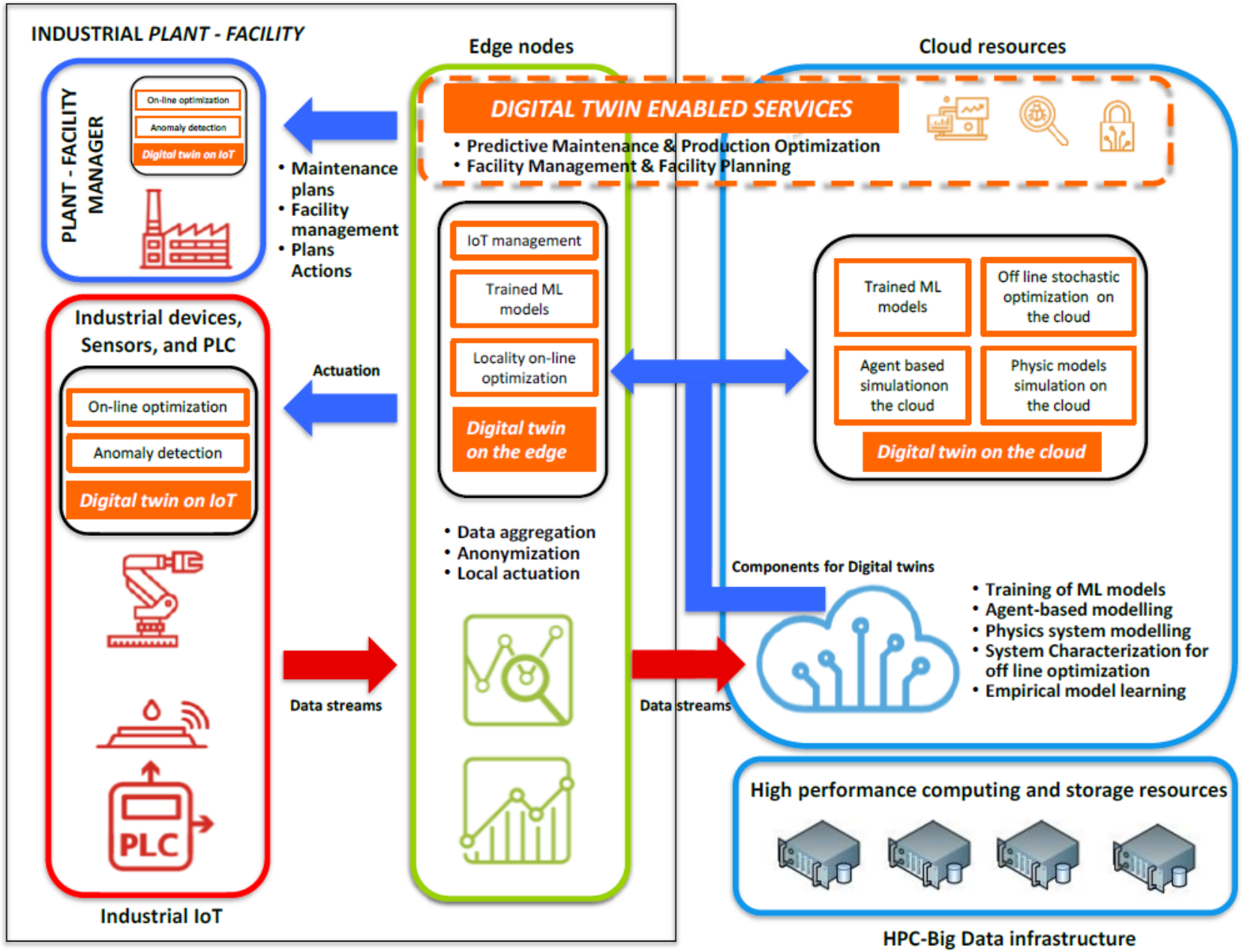
Platform and services

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

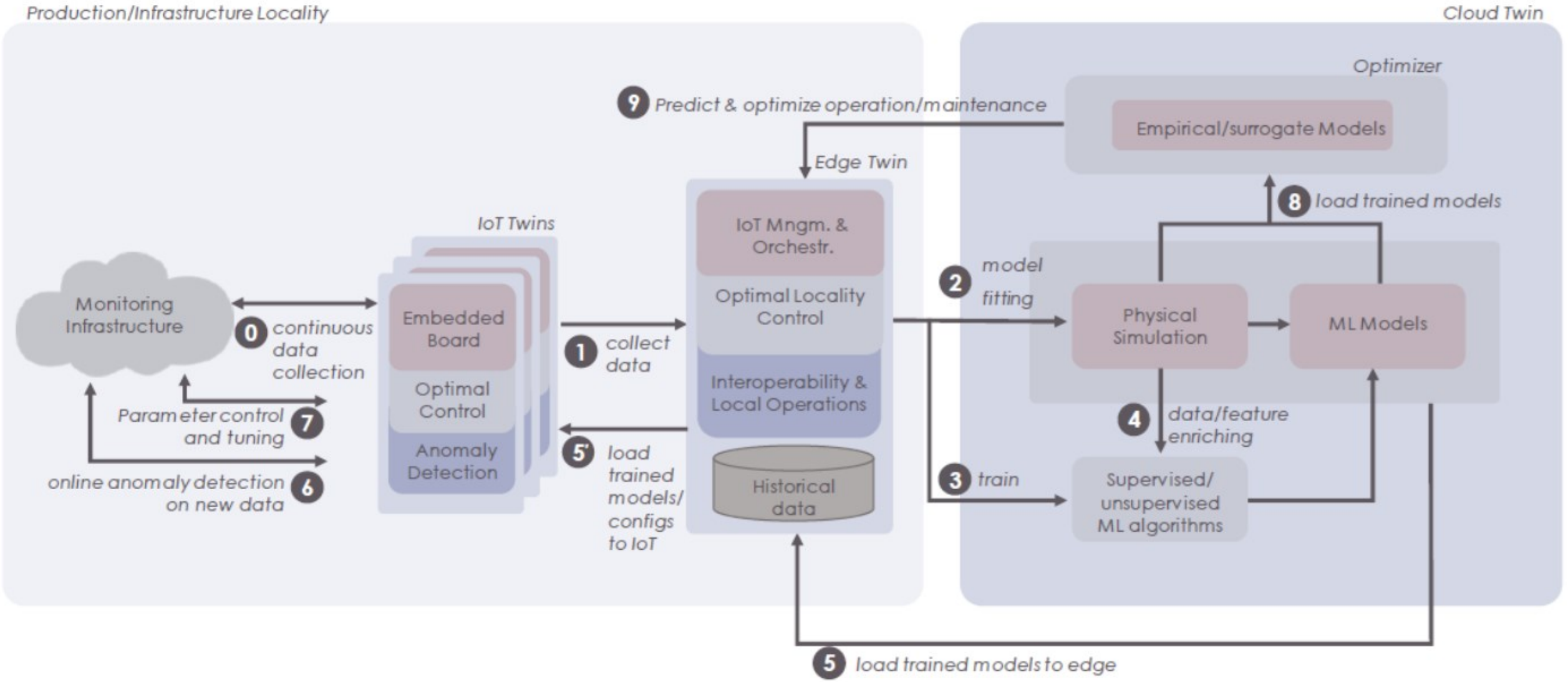
Key elements:

- A full-fledged platform enabling **easy and rapid access to heterogeneous cloud HPC-based resources** for advanced big data services
- **AI 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

Digital Twins concept in IoTwins



Distributed Training and Control in IoTwins



Testbeds

manufacturing

4 industrial testbeds calling for predictive maintenance services (time to failure forecasting and generation of maintenance plans to optimize costs)

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

facility management

3 testbeds calling 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**

replicability

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

- Patterns for smart manufacturing for SMEs | **Centre Technique des Industries Mécaniques**
- EXAMON replication to other datacenters 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**

Partners.

IoTwins

Bonfiglioli

Coordinator

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ART-ER ATTRACTIVENESS RESEARCH TERRITORY

Barcelona Supercomputing Center Centro Nacional de Supercomputación

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