FULL FORCE AHEAD

NIDays 2019

Embedded digital twin for manufacturing

Lower testing time, increase accuracy,
thanks to a twin in your testing device

Gianluca Bacchiega - I.R.S. srl
www.irsweb.it

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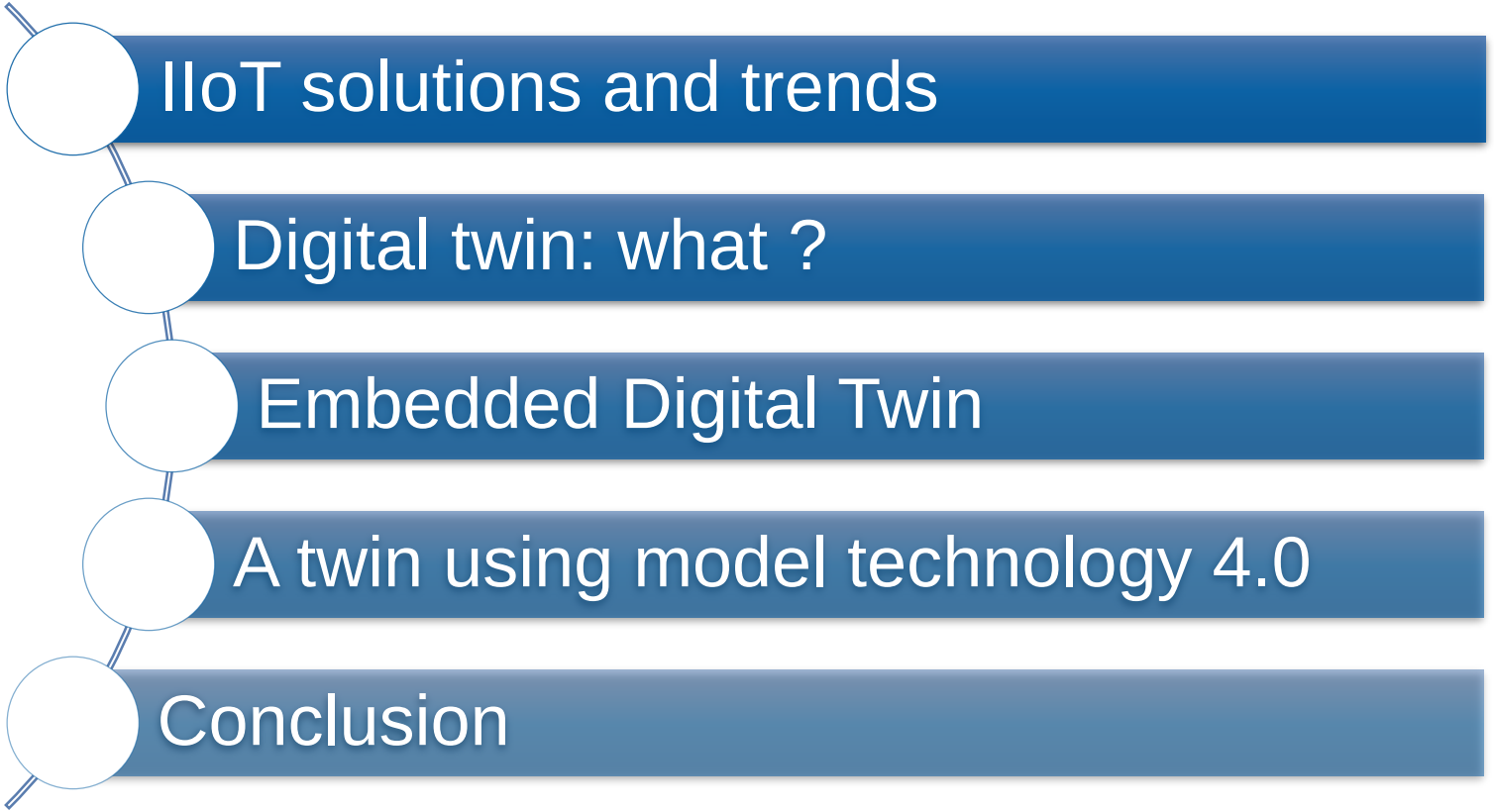

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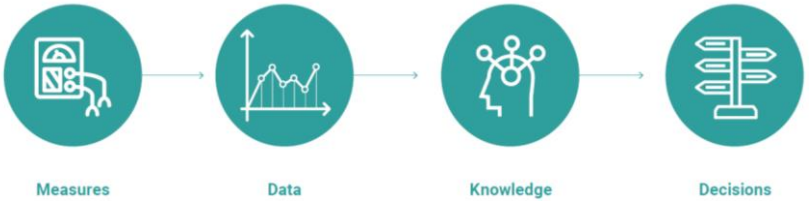
20 years of experience

Home appliances, HVAC, Structural Health Monitoring, Automotive components

2500 test systems deployed

Why?



It can be done better.

How ?

Innovation.
Increase customer value generation going beyond traditional solutions.

What?

Think to your daily life. Chances are that you saw a product tested using our systems.

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I.R.S. mission and vision

Our mission and vision

Deliver augmented measurement, test and control solutions. IRS aims to be the company leader in development, manufacturing and delivery of test, measurement and control systems. IRS systems translate into value for customers thanks to technological innovation, advanced modeling and design as well as professional production and after sale services.

Increase customer value generation going beyond traditional solutions. We enable our clients to increase their value generation, going beyond traditional monitoring and control solutions, by providing self-intelligent subsystems for embedded industrial applications at a highly competitive cost of ownership.

Client focus

Innovation

We are uncovering a better ways of developing solutions and systems. Through our agile organization we have come to get efficiency, flexibility and customer satisfaction. Agile principles we apply are:

Customer first

Value driven iterative system developments

Customers, developers and testers continuous interaction

Continuous attention to technical excellence and good design

Team work

Efficiency

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IIoT solutions and trends

INDUSTRIAL
Internet of Things

CONSUMER
Internet of Things

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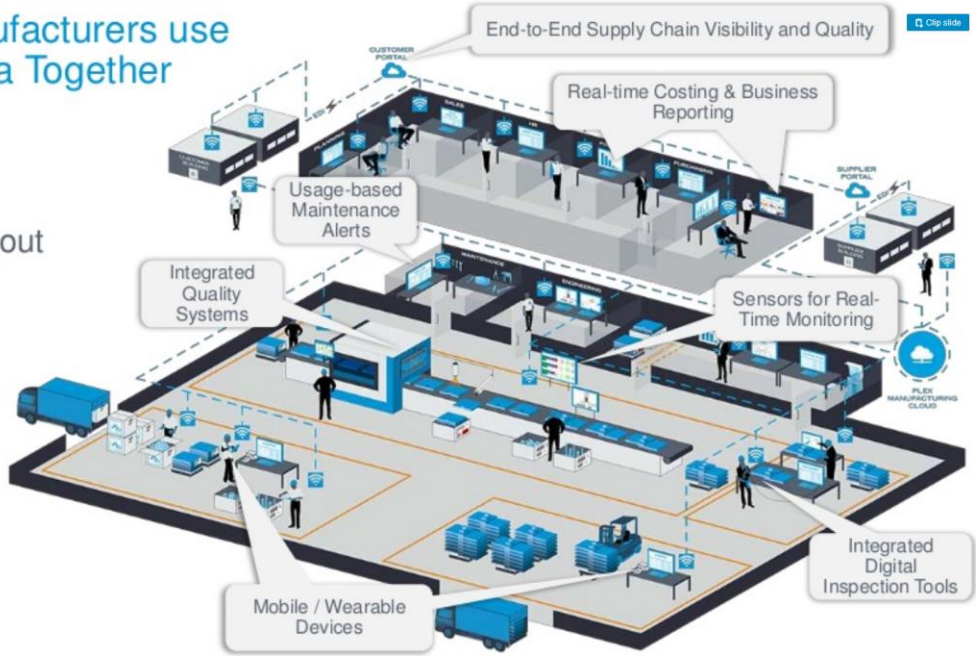
Based on Moor Insights & Strategy's report "Segmenting the Internet of Things (IoT)"

Connected Manufacturers use Cloud to Tie Data Together

Fully connected enterprise delivers data points throughout the enterprise



Manufacturing is the #1 IoT Opportunity

- $1.2-$3.7 trillion of economic impact
- IIoT isn't "technology looking for a problem" – this is a solution to existing needs

NI's End-To-End Solution Architecture for IIoT

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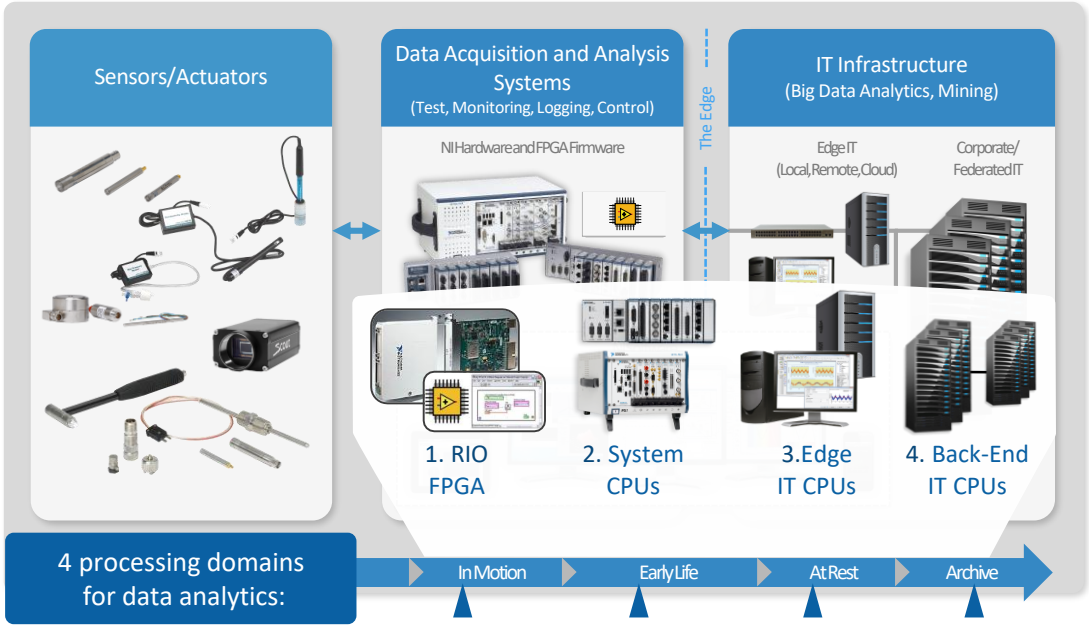
NI's End-to-End Solution Architecture for IIoT



Trade Off: *Faster Insight – vs.-- Deeper Analytics*

Data analytics executed throughout the data flow

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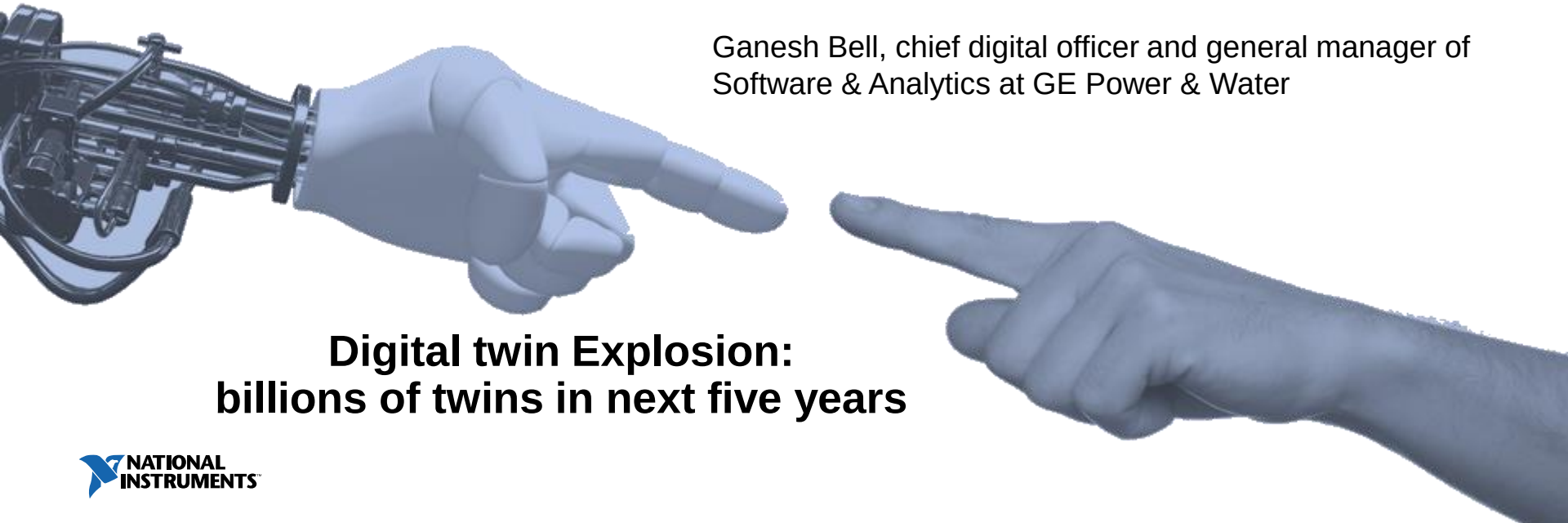
Digital twin: what ?

“Digital twins are becoming a business imperative, covering the entire lifecycle of an asset or process and forming the foundation for connected products and services. Companies that fail to respond will be left behind.”

Thomas Kaiser, SAP Senior Vice President of IoT

“For every physical asset in the world, we have a virtual copy running in the cloud that gets richer with every second of operational data

Ganesh Bell, chief digital officer and general manager of Software & Analytics at GE Power & Water



Digital twin Explosion: billions of twins in next five years

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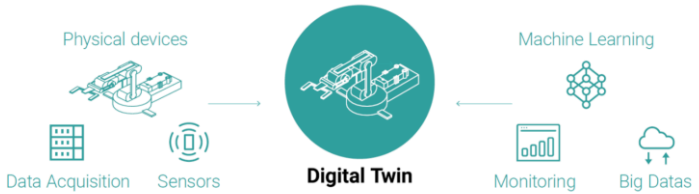
A Digital Twin is a real-time digital replica of a physical device



It is a bridge between the physical and digital world.

It is more than just a digital replica

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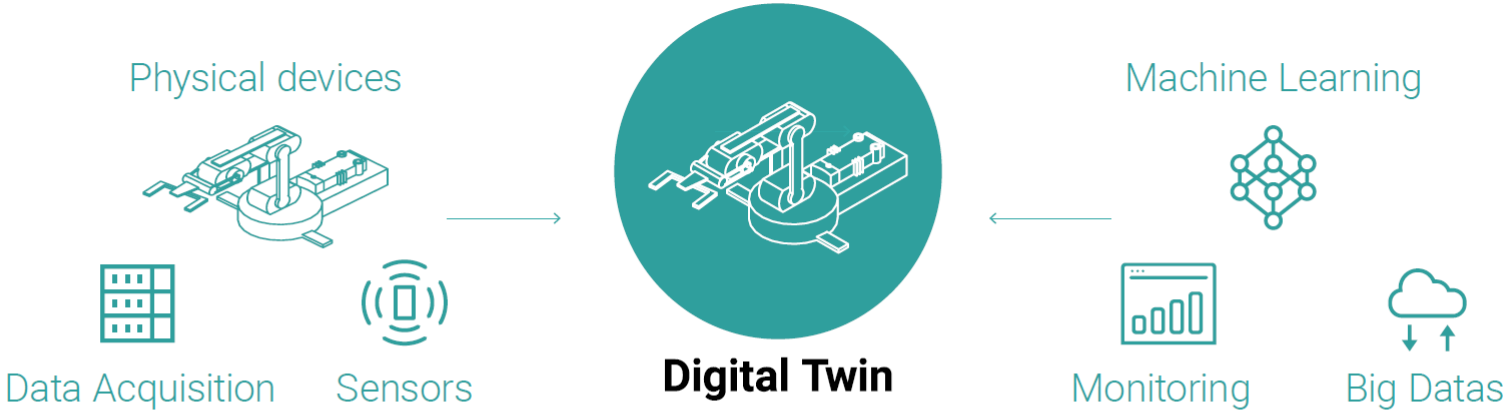
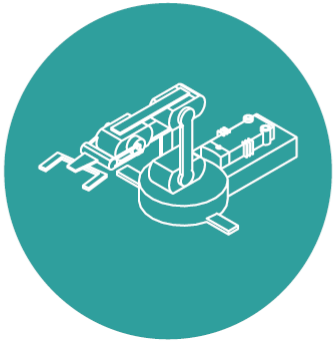


It is a bridge between the physical and digital world.

History
Logs the history of all devices and products.



Digital Twin

Future
- Forecast failure and maintenance need
- Predict user interaction
- Insight for your next products and service

It is more than just a digital replica

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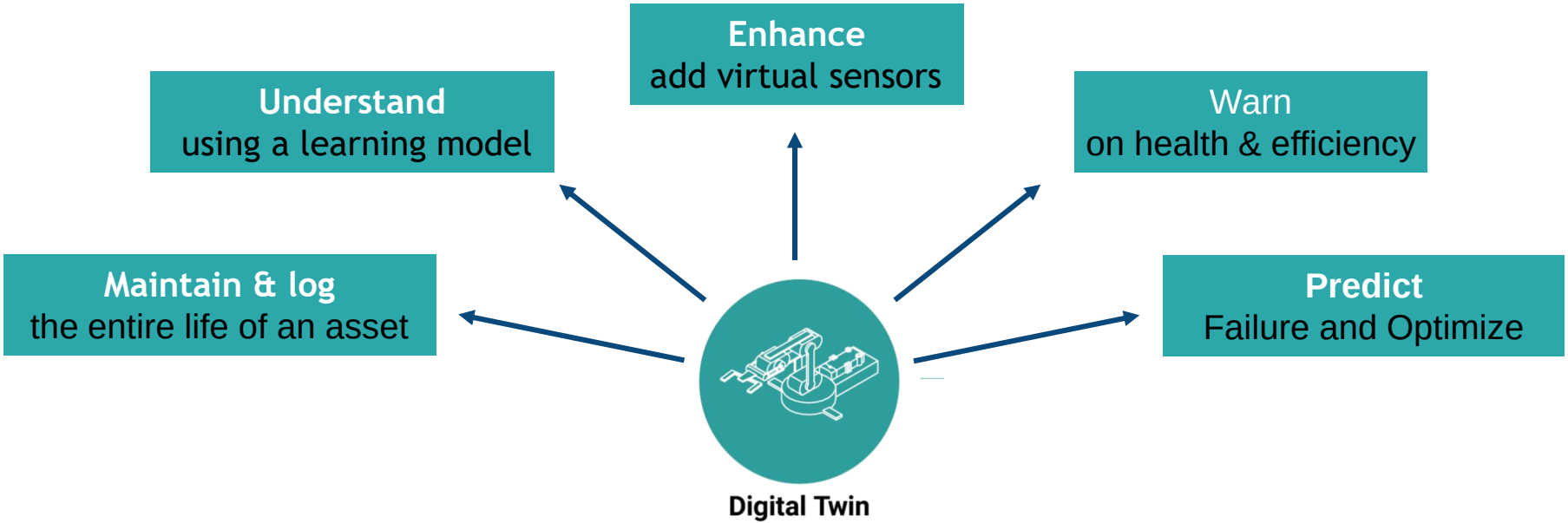
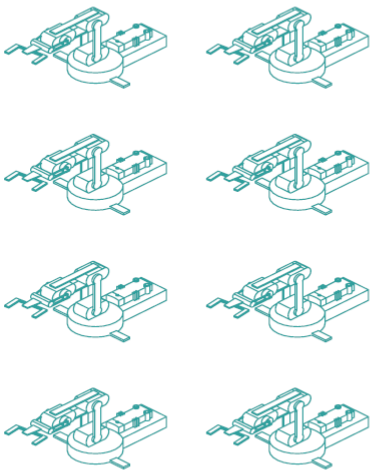


Digital Twin value and ROI

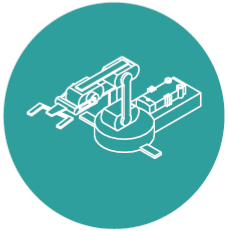
/// Beneficiaries

Physical products



Different customers
Different models
Different locations

Digital Twin



A twin
for each device

Market

Performance
Geographies

Design

Features
Usage

Quality

Suppliers
Procedures

Operation

Efficiency
Reliability

Service

Events
Incidents

Sales & Marketing

Manufacturing

Engineering

Customer Support

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Embedded Digital Twin

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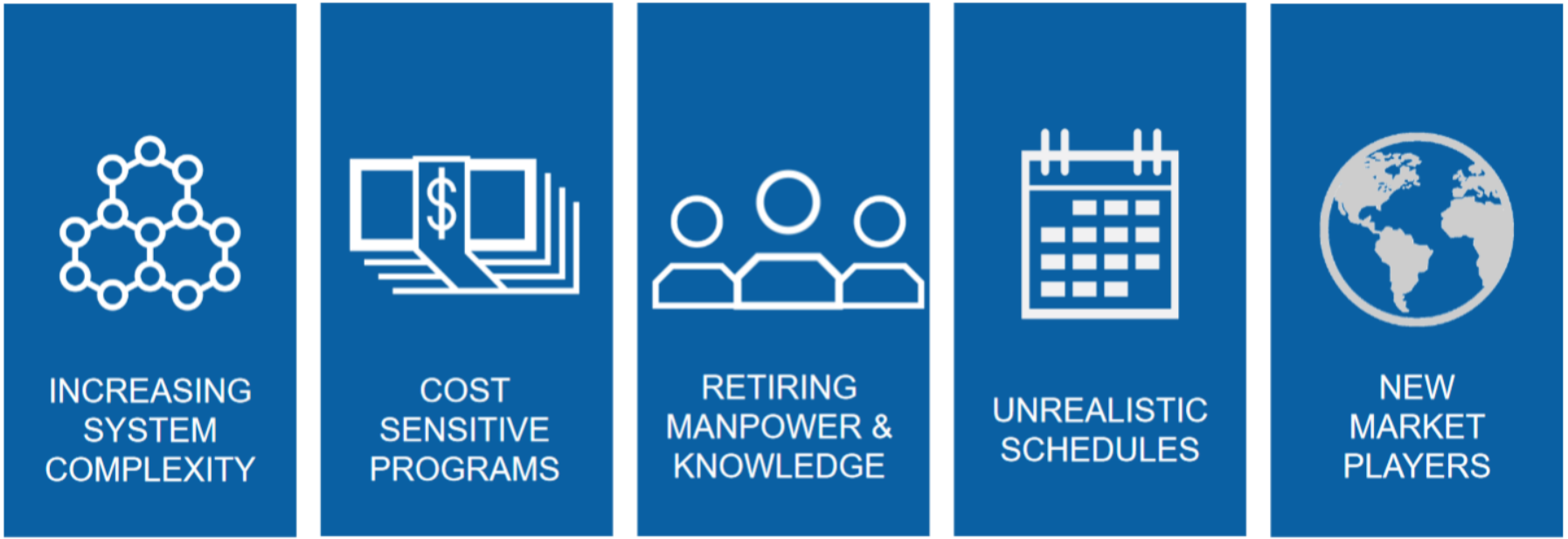
Drivers of increasing cost & risk in manufacturing test



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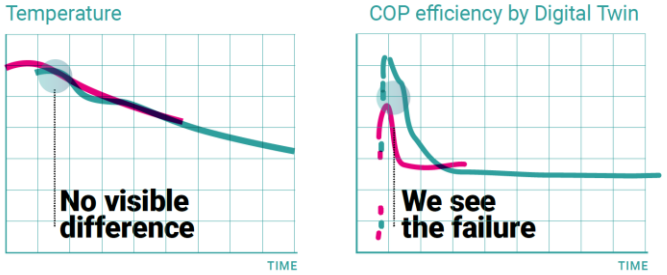
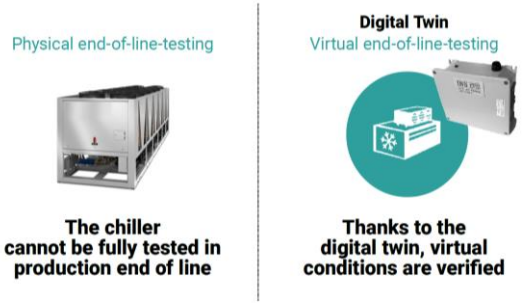
Embedded digital twin benefit

Shorter testing time



Better accuracy and quality



Testing in unfeasible conditions

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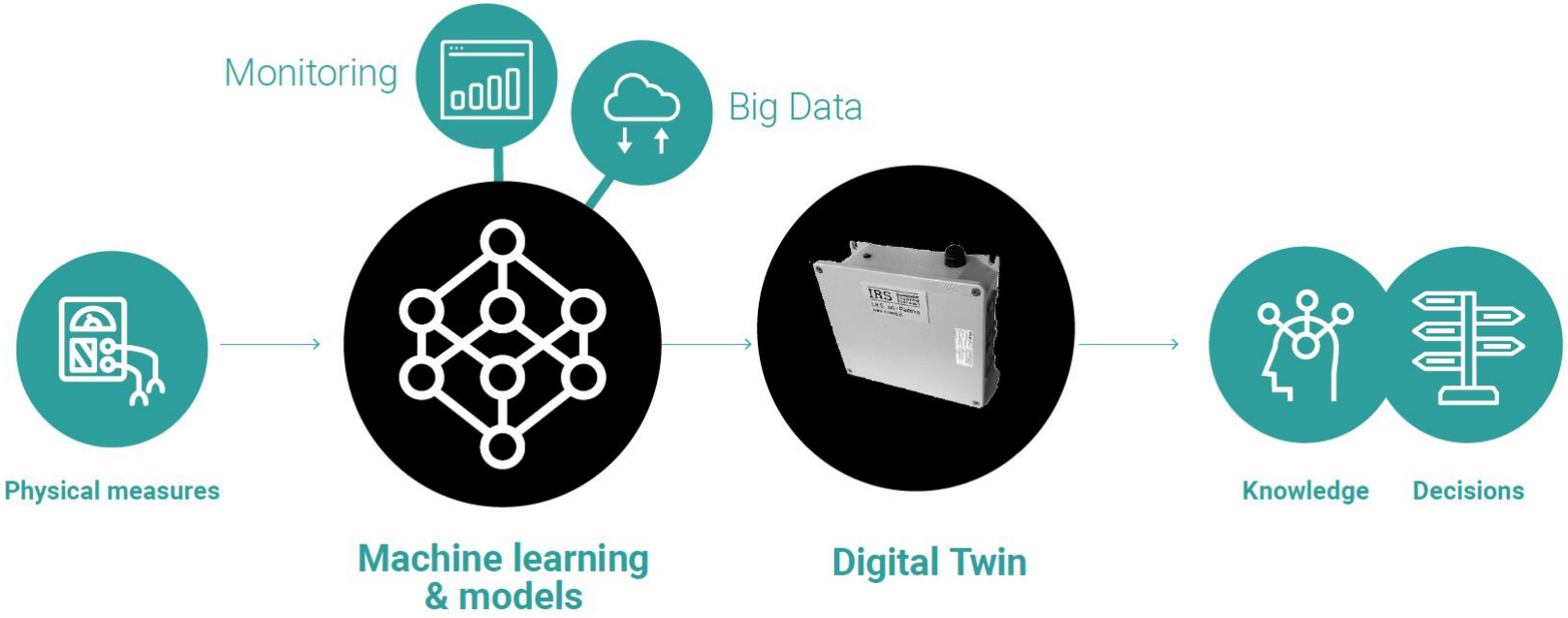

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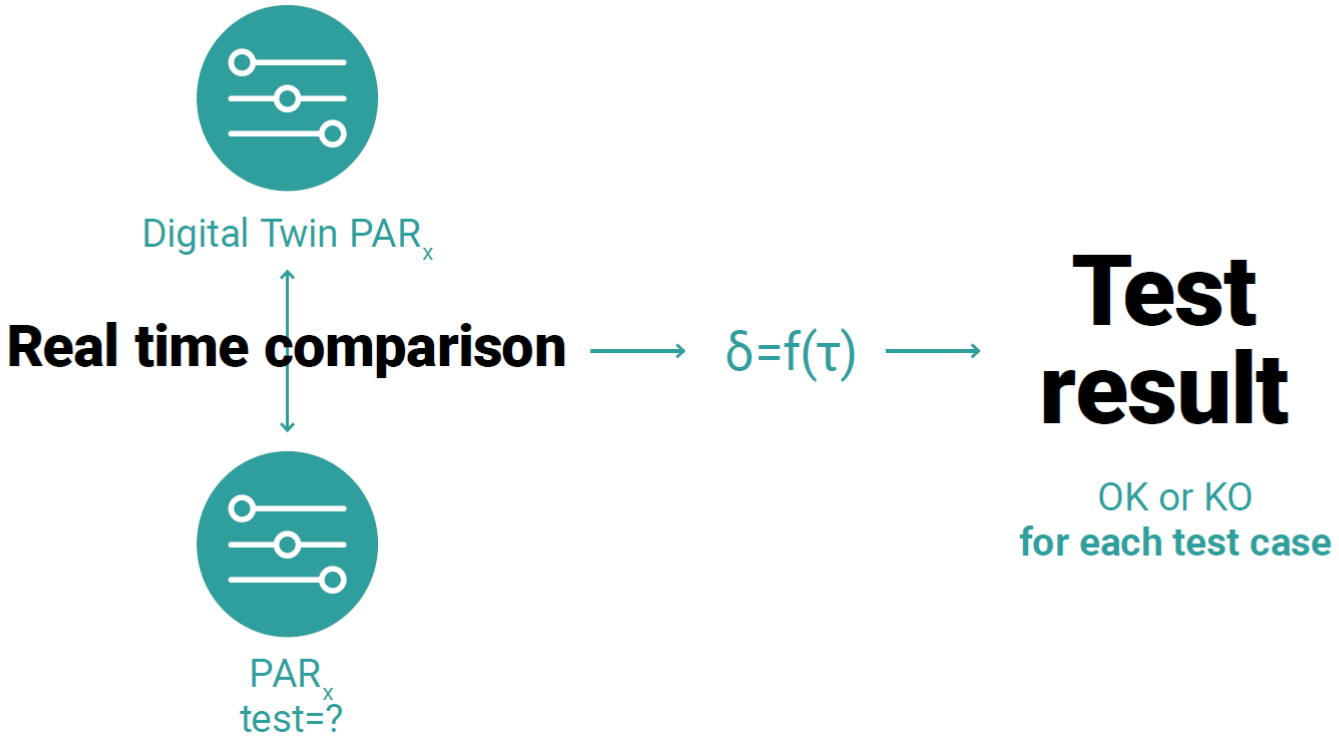

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A platform ready for change

Productive Software

Our extensive portfolio of software, from LabVIEW to TestStand, helps you translate your programming ideas into reality, reduce project development times, improve system performance, and deliver business insights based on collected data.

Flexible, Modular Hardware

NI modular hardware, which ranges from high-performance RF instrumentation to low-cost measurement devices, has flexible I/O that helps you to reconfigure hardware in software and avoid buying new equipment every time application needs change.

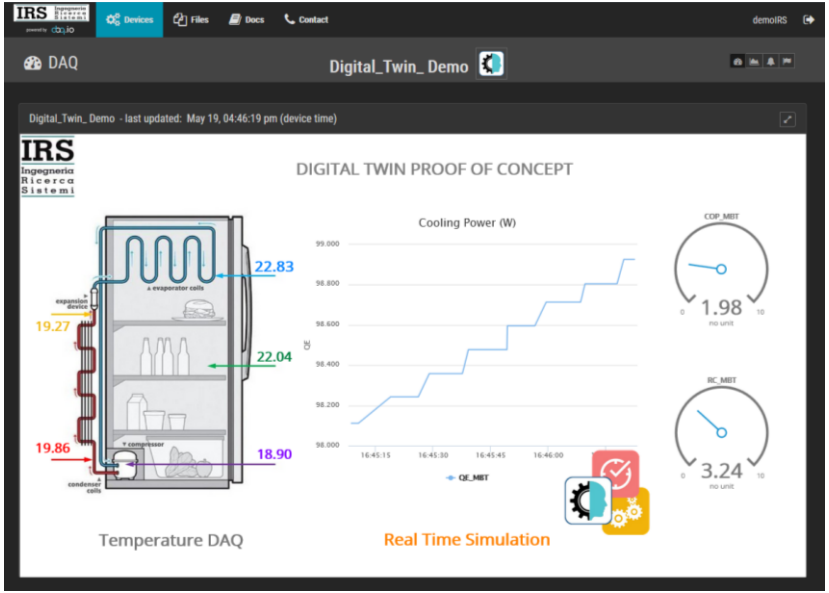
Seamless Integration

With seamless integration of flexible hardware and productive software from one vendor, you can design measurement and control systems more rapidly. NI software and I/O hardware work together so you can stop sweating the details and focus on designing better systems faster.

Openness and Interoperability

The openness and flexibility of the NI platform allows you to choose to use NI software and hardware or third-party tools in multiple different combinations. You can accelerate your system design to reduce complexity, innovate faster, and continually integrate new technologies based on the tools that you prefer.

From monitoring to embedded digital twin



1. Lifelong Device history
2. Real time model computed virtual sensor
3. Real Time predictive alert

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NI embedded hardware

Real time online measurement platform

TwinMind®

Machine learning models

CompactRIO
Single-Board inside

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A twin using model technology 4.0

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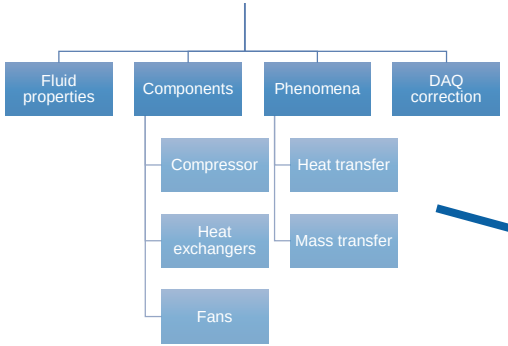
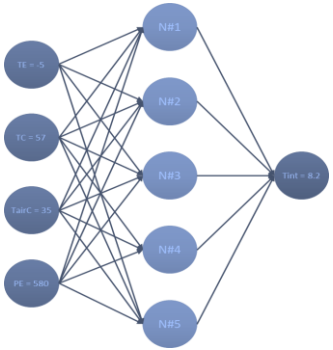
Model technology 4.0

Physical Model



Machine learning



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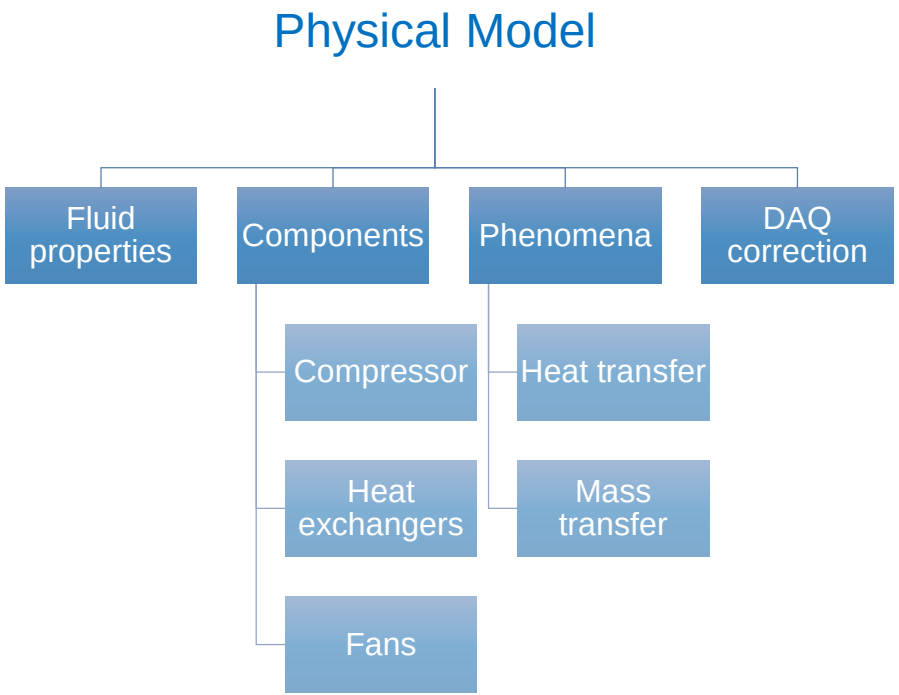
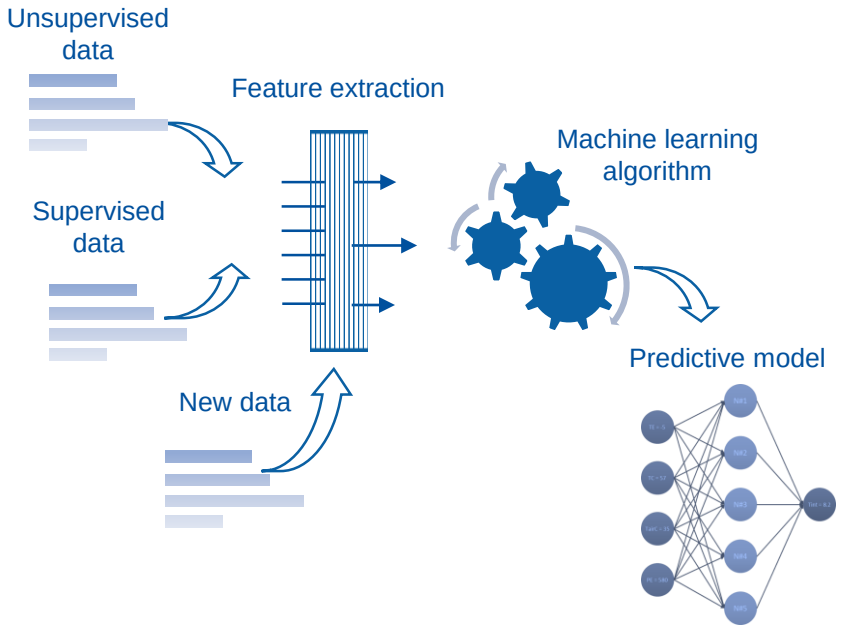
Physical Model



The **phenomenological model**, based on equations,

can **identify the causes** of a possible malfunction

Machine learning



The **machine learning approach** needs no detailed knowledge about machine operation.

It needs a learning phase to be able to predict the system performance.

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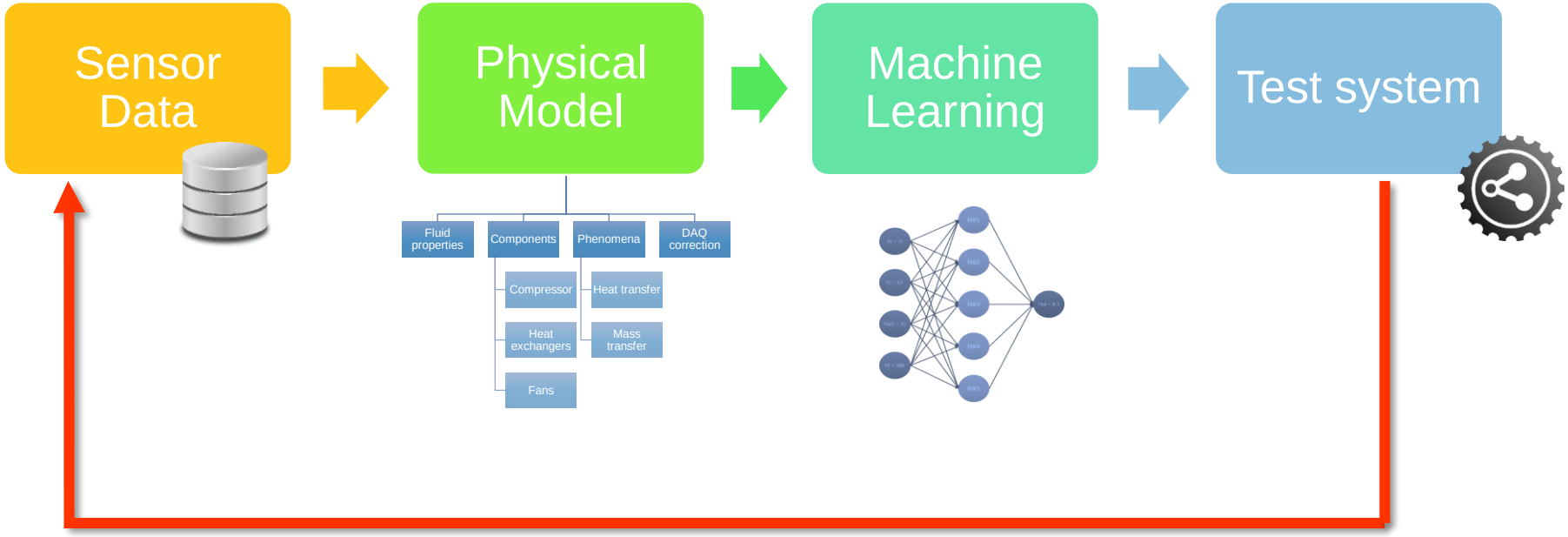
Diagnostic detail and easy implementation



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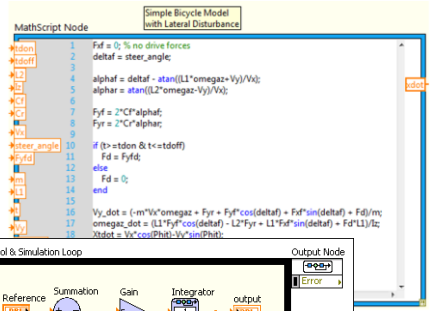
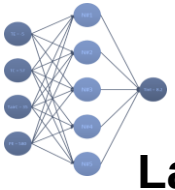
Merging model technology using NI platform





LabVIEW Machine Learning Toolkit

embedded digital twin

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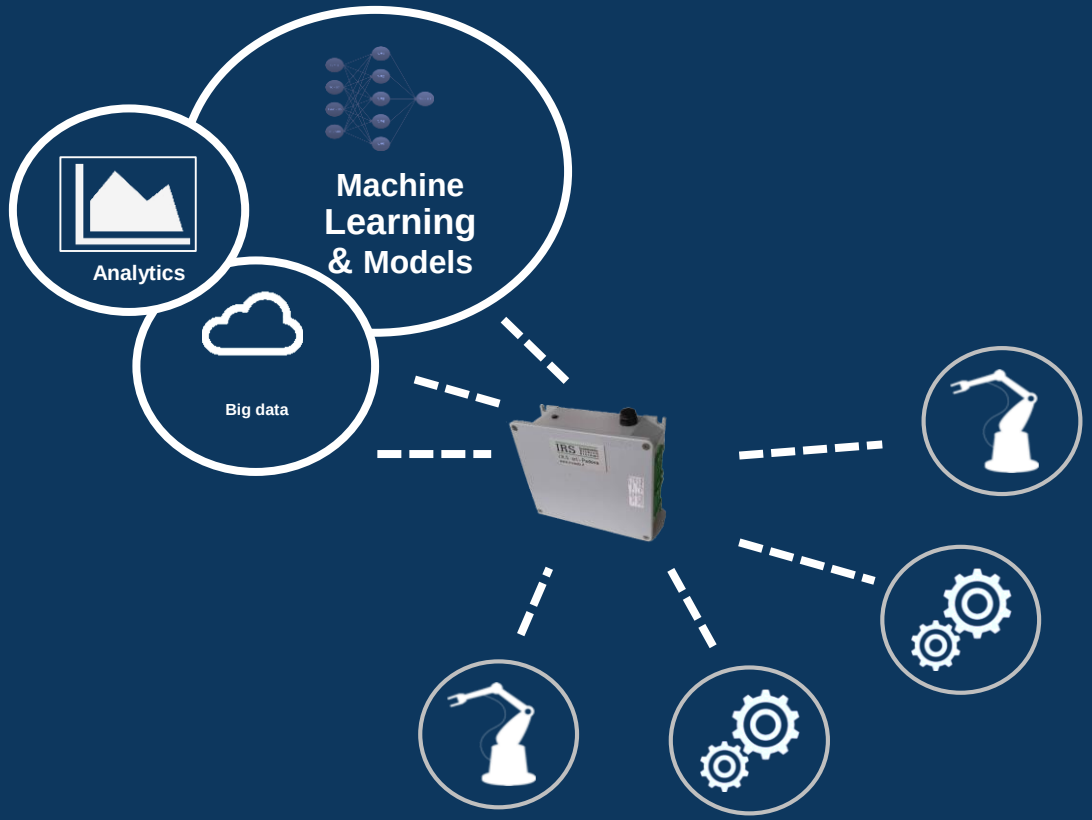

IRS TwinMind

A smart box, featuring linux real-time, FPGA hardware acceleraration, that executes at the same time standard manufacturing tests and digital twin models in order to get better (shorter time, better fault accuracy, higher reliability, ..)

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Test systems for fridge testing on 100 % production

- NI CompactRIO testing 4 appliance simultaneously
- Better understanding of test operations with LabVIEW NXG Web dashboards
- Digital twin for shortening testing time and get better fault accuracy

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Automated test systems for washing machine on 100 % production

- Fully automated tests based on NI CompactRIO and NI LabVIEW
- Real-time telemetry data offer insights to people in different roles
- Adaptive testing sequence and algorithm

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Implement digital twin using NI platform
and partner like IRS Ingegneria Ricerca Sistemi

Conclusions

Shorter testing time, better fault detection accuracy, higher reliability using NI platform and digital twin technology

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Thank you for your attention.

any question or inquiry

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