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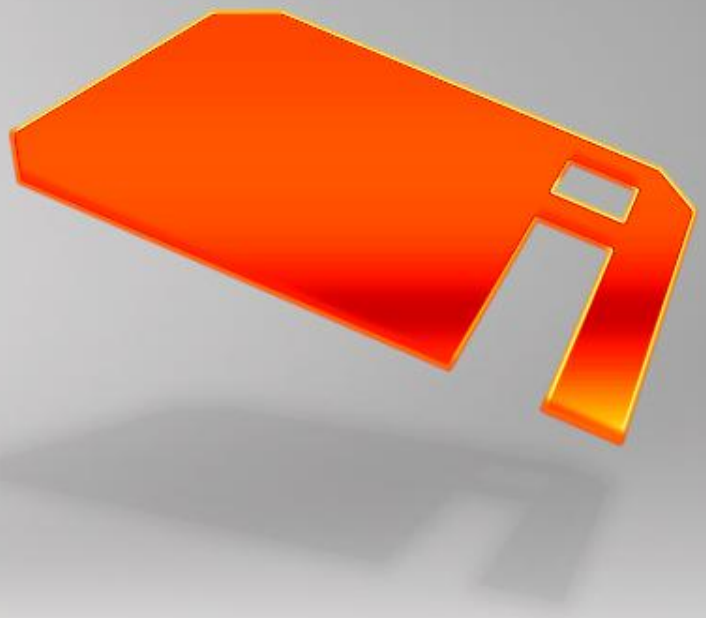
sistemi intelligenti per l'industria



# Industry 4.0

> Vision and solutions

Monday, June 25, 2018

# Industry 4.0 – a brand new objective for industry

- Industry 4.0 is the integration between cyber-physical systems with production and logistics. […] Industry 4.0 will have a direct impact on the value chain of the products, on business models, and on the work organization. […] Intelligent machinery will exchange information autonomously with the goal to auto-optimize their initial working process.
  - [McKinsey & Company (2014) The future of German mechanical engineering – Operating successfully in a dynamic environment]

- Industry 4.0 is not a product. It is more a capacity which has to be assimilated in a process. It should be seen as a philosophy trend regarding the Industry of tomorrow.

**Industry 4.0**

# Overview

> “The most important motive for work in school and in life is pleasure in work, pleasure in its result, and the knowledge of the value of the result to the community”

Albert Einstein

- Quick Overview
- Where to start?
- Intelligentia & Industry 4.0
- Contacts

# Industry 4.0

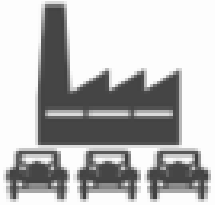
## QUICK OVERVIEW

# The Industrial Revolutions

## 1.0

Introduction of Mechanical production facilities supported by water and steam power

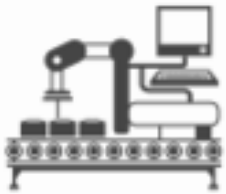
**1784**



## 2.0

Mass production and assembly lines, supported by electricity

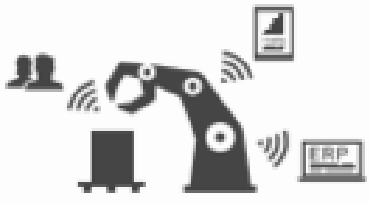
**1870**



## 3.0

Mass production automated by computer and automation

**1969**




## 4.0

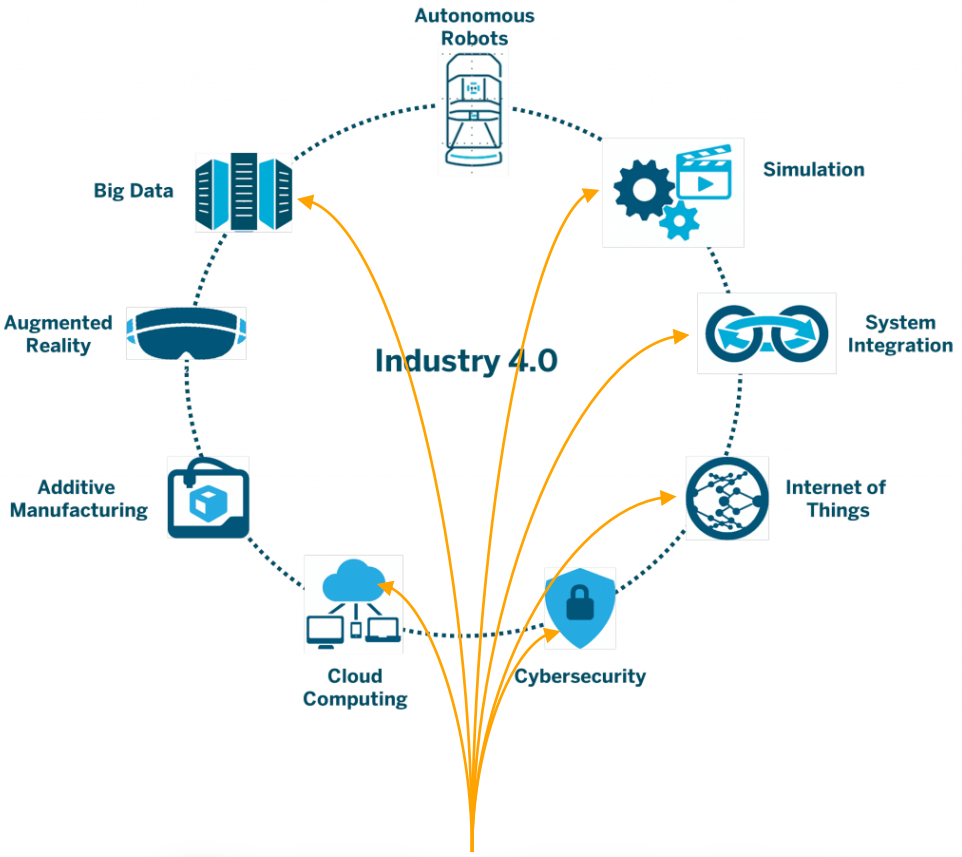
Cyber physical systems, connecting production chains with IoT and Big Data Analysis

**2011**

# Enabling technologies

Abstraction Level

- Cybersecurity
- Cloud Computing
- Big Data
- Internet of Things (IoT)
- Augmented Reality
- Simulation
- System Integration
- Autonomous Robots
- Additive Manufacturing

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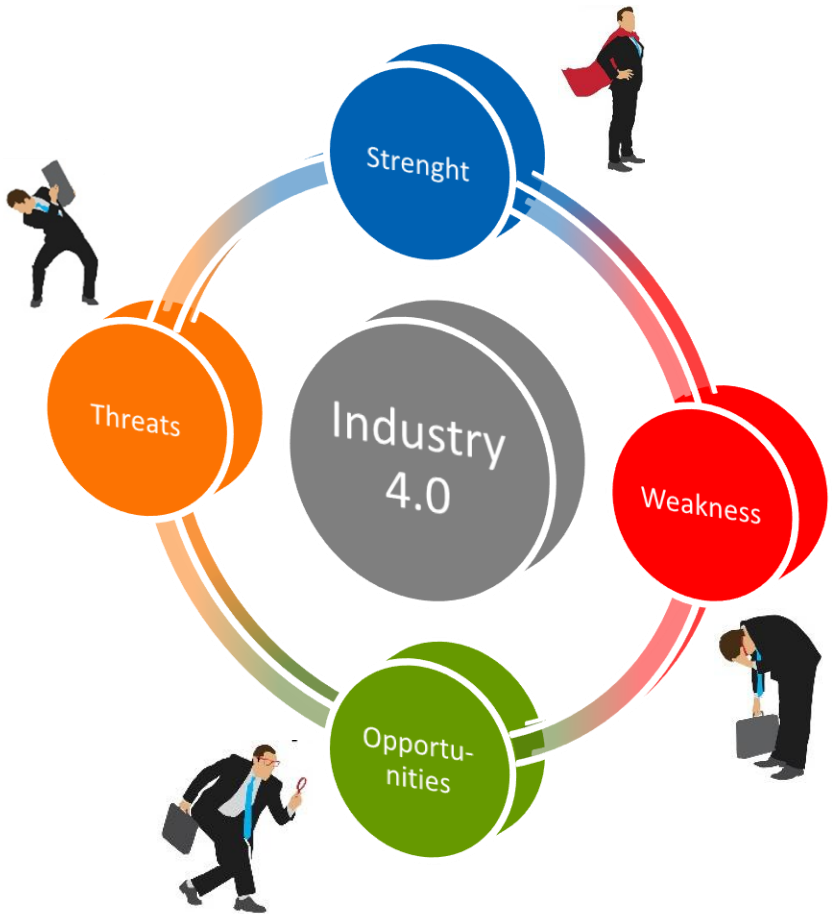
# SWOT Analysis… from the Manufacturing perspective

« Is really Industry 4.0 something amazing and problem-free for SME and Manufacturing industries? »



# Industry 4.0: Strenght

- All big players are investing in this area (2016)
- Maturity of cloud computing and pervasiveness of Internet
- Maturity of Business Intelligence solutions and data-processing algorithms
- Low cost of cloud computing resources (CPU, RAM, persistent memory, I/O, Bandwidth)
- Robustness, availability, scalability, security, and abstraction of public cloud infrastructure (e.g. Amazon, Microsoft, Google)
- Middle-term/middle-sized Investment needed to start with your own Industry 4.0 project
- Open source solutions for data acquisition, storage, processing, and representation
- Important investments from private Venture Capitalist /Governments

# Industry 4.0: Weakness

- Security and Privacy of the data sent in the Cloud
  - Secure communications to the cloud
  - Secure access to the data sent
- Third Party usage of our information
  - The value of your data are valuable also for your providers
- Security of IoT and Internet gateways to the cloud
  - Are my data managed properly?
- Unknown «value» of data produced and retrieved by the producer
  - Who knows “today” the value of your data for your Business?
- Exploitation from Big Data of relevant and non-common data
  - Aggregating your data, is it possible to derive private, relevant data?
- Resell of aggregated data to concurrent companies will enforce their performances using results and experience of others
  - Universities, companies, R&D studies will access your data (aggregated) to determine new information

# Industry 4.0: Opportunities

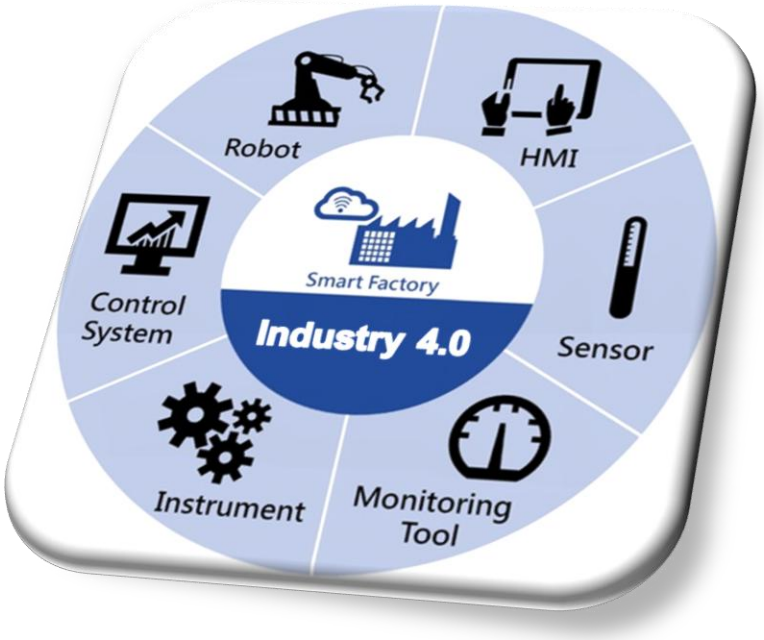
- Discover the value of internal data retrieved by a production environment
- Analysis of the environment not just of a machine
- Predictive maintenance (this is the right time)
- Real-time monitoring and production adaptation
- External studies for determining new possibilities for a business
- Discover inefficiency and monitor the maturity production model from comparison with others OEM
- New products (IoT enabled) and new services to the final customer (customer-centric approach)
- Government investment and financial benefits from the investments in R&D activities regarding Industry 4.0

# Industry 4.0: Threats

- Security
  - Are my data secure? (Governance and security models of cloud players)
- Privacy
  - Who will read my performances and my data? (imagine a niche Market with just few players)
- ROI over the time
  - When I will see the first monetary benefit? Industry 4.0 means change the processes, the way of working, the IT systems, the external cooperation.. It can take years and a change over the complete supply chain…
- Personnel competences
  - Who will be responsible of the QoS for my Industry 4.0 business?
- Management Vision
  - Do we have a clear vision of the Goal to reach or we are just following the crown?
- Change rate of Business Goals
  - How often we change model and goals over the years?

# Industry 4.0

## WHERE TO START?



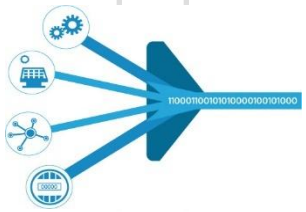
# A path to the Smart Factory

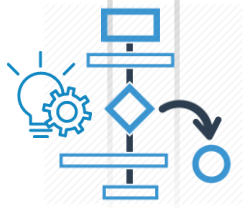
Timeline

| | |
|---|---|
| Data Acquisition | • Enable data acquisition from your production with sensors |
| Data Analysis | • Understand your data and define KPIs |
| Real-time monitoring | • Enable real-time monitoring for your production |
| Use Intelligence | • Learn from your data adopting BI and RT systems |
| Smart Factory and Logistic | • Improve efficiency and integrate other services |
| IoT products | • Create IoT-Enabled products that can give back insight |
| Remote Assets Monitoring | • Monitor your sold assets with comprehensive dashboards |

# Bring your production to the next stage

| Fast Data Ingestion | Contextual awareness | Situational awareness | Predictive Analytics | Prescriptive Analytics |
|---|---|---|---|---|
| **Ingest data at speed and volume** | **Correlate and enrich with contextual data** | **Correlate with real-time situational data** | **Predict threats and opportunities** | **Trigger next better decision** |
| e.g. 1 Million records per second | e.g. type of production and source asset | e.g. «location» in a production chain | e.g. Analysis and machine learning | e.g. Adaptive processes and business rules |



**Time** (e.g. 1 production cycle)

# Expected benefits

- Increased knowhow on your own production
  - Productivity increase
  - Lesson learned and design insight
  - Maintenance effectiveness
- Quality
  - Measure your QoS (Quality of Service) and QoP (Quality of Production) in real-time will let you reduce inefficiencies
- Productivity
  - Monitor your productivity reducing risks, improving delivery time and market changes
  - Produce small lots at cost of big mass production

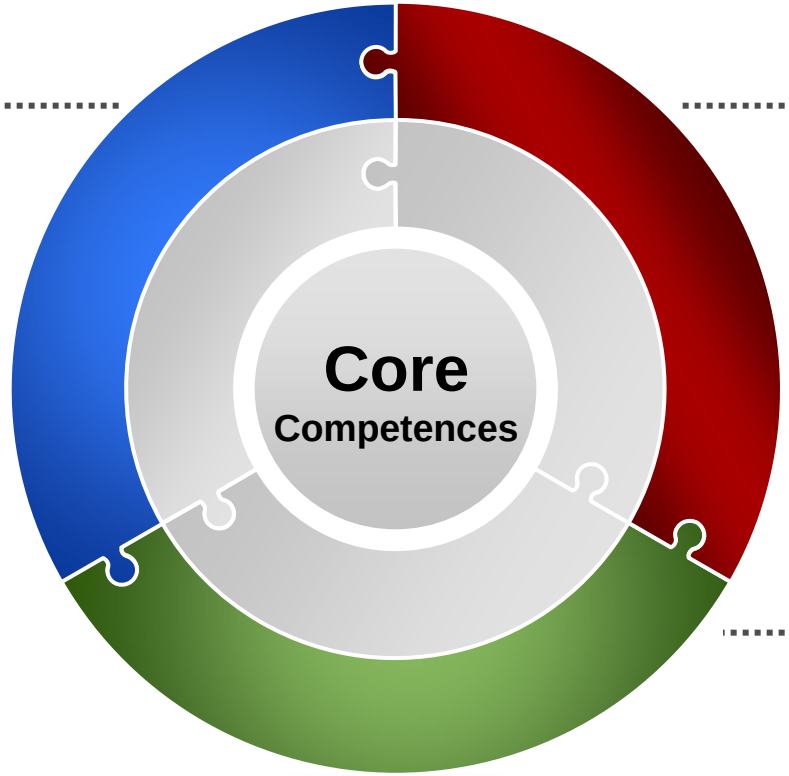

# Intelligentia & Industry 4.0

## MORE INTELLIGENTIA IN YOUR BUSINESS

# Lines of interest

## Products

Intelligentia develops and provide innovative solutions for the Industry 4.0 and Customer Centricity applications




## Consultancy

Intelligentia offer all its best knowledge to help you in the development of your project

## Full-custom Solutions

Intelligentia develops fully specific solutions for your particular Business

# Lines of interest

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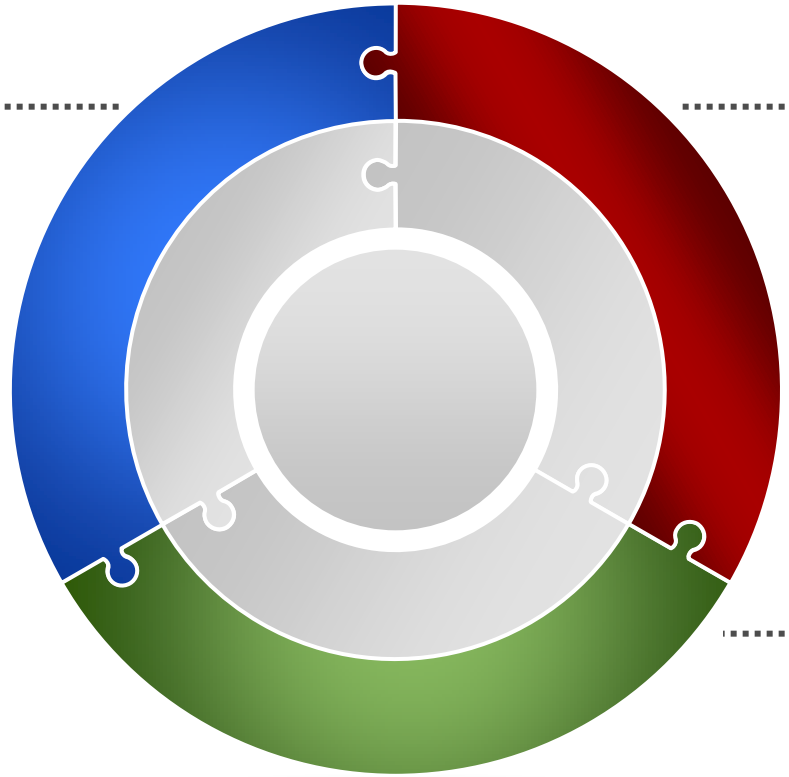

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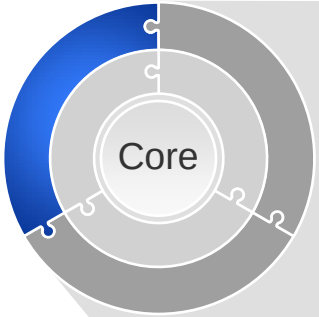
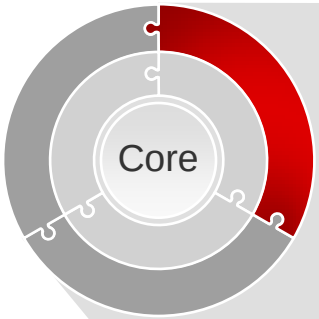



## Products

- SAM: Smart Asset Management for monitoring and locate assets, laboratory instruments, and in general Assets over company premises
- ASSIOMA: Information System for Maintenance Activities Management and Post-Sell Service activities
- QARadar tool for tracking and monitoring in real-time the Quality Issues for several production chains per time
- Dygnose: Dynamic Diagnosis an intelligent Decision Making support for FDIR operations, fully integrated with techniques like FMEA/FMECA

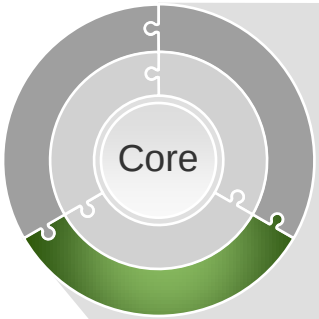
# Lines of interest




## Consultancy

- Intelligent algorithms supporting Data Analysis, and Processing
- Extern & Intern support in solution selection and technology adoption for your internal projects and R&D activities
- Rapid Prototyping of specific software solutions aimed at demonstrate the feasibility of a given approach to solve your specific business need
- Set-up, configuration, management, adoption and monitoring of a dedicated cloud for your premises using technologies such as OpenStack, Virtualization and hybrid cloud architectures

# Lines of interest




## Full-custom Solutions

- Customization of products and prototypes in our portfolio
  - Assioma for your Service activities
  - User portals for your customer centric products and services
  - SAM for asset management and monitoring
  - Dygnose for use predictive models in determining new insight from maintenance activities
- Analysis of Business processes (e.g. Operation, Configuration Management, Testing activities) aimed at improving your productivity and digitalization of your data to create a first stage of your Smart Factory

# Architecture behind the scene

- **ELISA** (**Enterprise Light Information System Architecture**) is the basic brick of our solutions
- ELISA is a cutting-edge platform aimed at rapid prototyping and implementing Enterprise class information systems:
  - On Cloud, SaaS, On Premise
  - Rest API
  - Compatible with Java Enterprise Edition (JEE)
  - Business Process Management & Workflow Configuration
  - Multi-user/multi-role granular permissions

# ELISA for IoT: conceptual architecture

- **On-Demand**
  - Customer access its application based on ELISA through the web whenever he needs to get new information.
- **Real-Time**
  - Customer access its own application directly linked to the ELISA platform data container by getting data in real-time.
- **Proxy**
  - Customer uses ELISA as a buffer for IoT events from the object network. Data are routed to another Data Center for processing.
- **Objects, Devices, and Sensors**
  - ELISA IoT will be compatible with the most common devices on the market. We are going to develop physical bridge connectors that will be able to translate information acquired by sensors into data compatible for ELISA.
- **Secure Connections**
  - ELISA will allow customers to use the best encryption algorithms on the market for grant a secure, reliable connection between objects and Data Center.

# IoT – DATA VALUE

- Result you can achieve
  - OEE (Overall Equipment Efficiency) monitoring and certification
  - Detection of bad synchronism in production chain
  - Configuration issues on batch production change
  - Predictive maintenance and preventive maintenance assessment
  - Real-time quality control
  - Real-time production insight
  - Personnel skill measure and progress monitoring
  - Bad environment condition for your assets during production
- Need more? Let's discuss…

Managing unstructured raw data is not just about collecting data, but

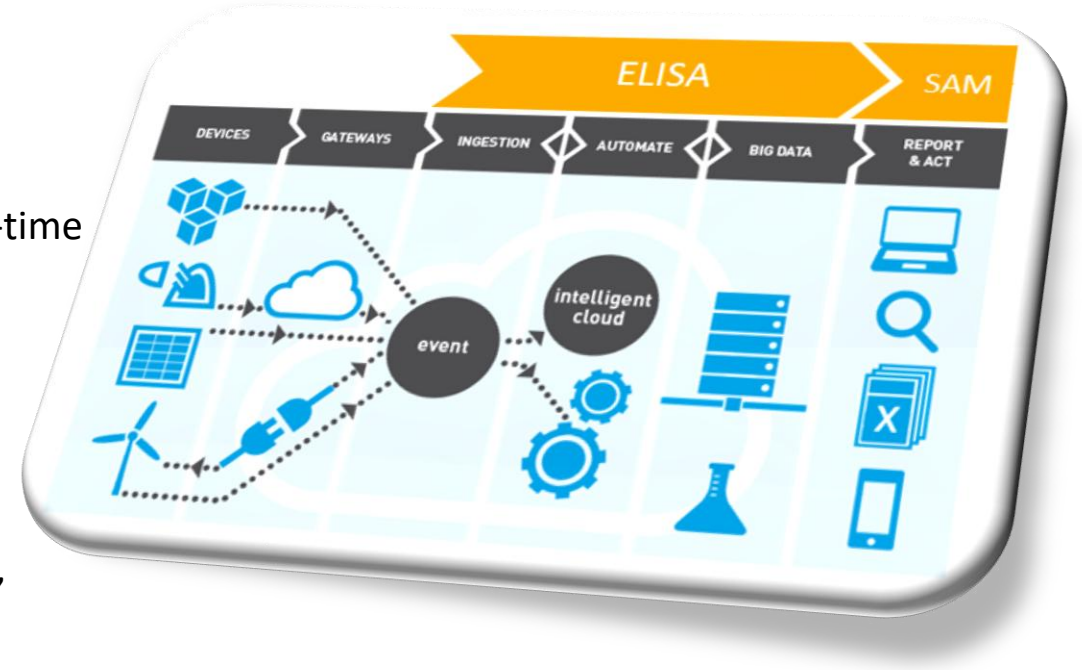
- looking at the "right" data in your systems, and
- creating reports that provide effective decision making information for productivity improvements

# Monitoring operativity with SAM

Connected and monitored assets may generate new value for your Business!

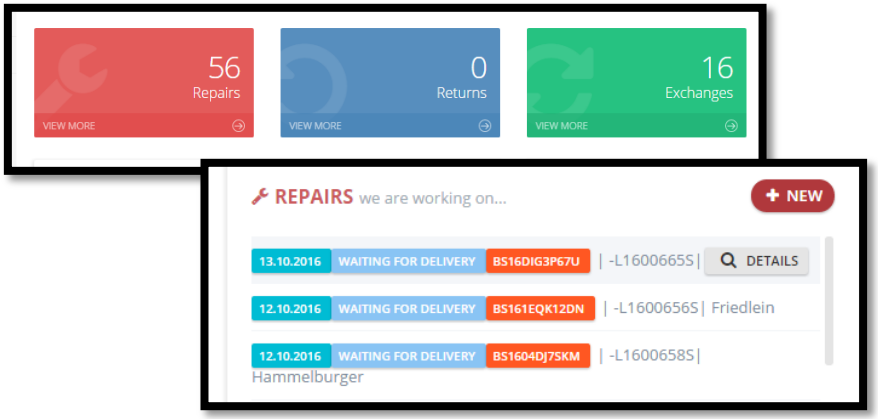
A good strategy will lead you to:

- Measure
  - Acquire raw data from the field in real-time or sampled time, in push or poll
- Analyse
  - Aggregate and format your data for Analytics, KPI, Monitoring
- Predict
  - Maintenance, Consumption, Efficiency, Trend detection, Quality
- Automate
  - Alerts, Notifications, Reports and KPI generation

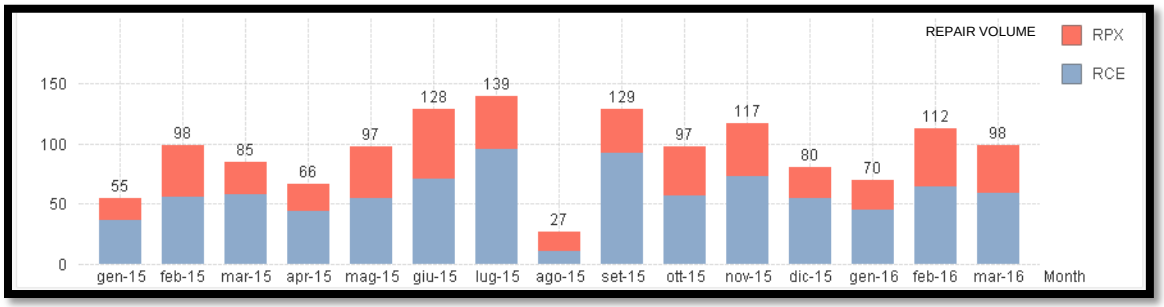


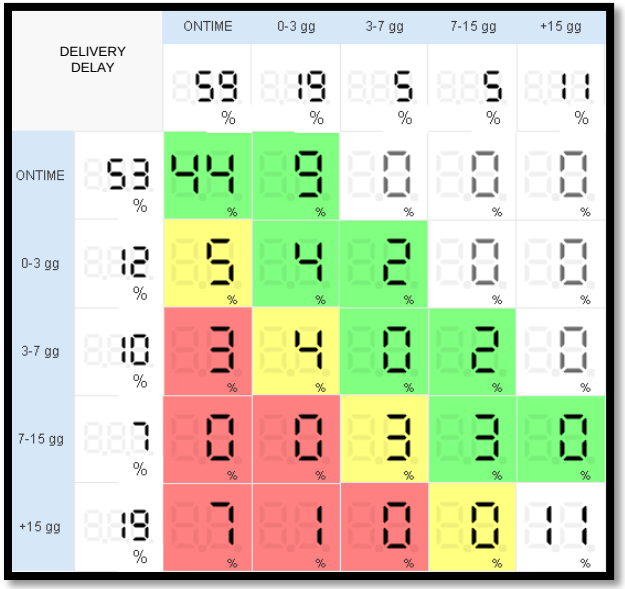
# Monitoring examples

- **STAKEHOLDERS WEB PORTAL**
  - Facilitate participation from key stakeholders in the field service operation:
    - TECHNICIANS
    - BRANCH OFFICE
    - CUSTOMERS




- **SERVICE REPORTING & ANALYTICS**
  - Real-time data monitoring
  - Data export: XLSX, PDF, CSV
  - KPI monitoring



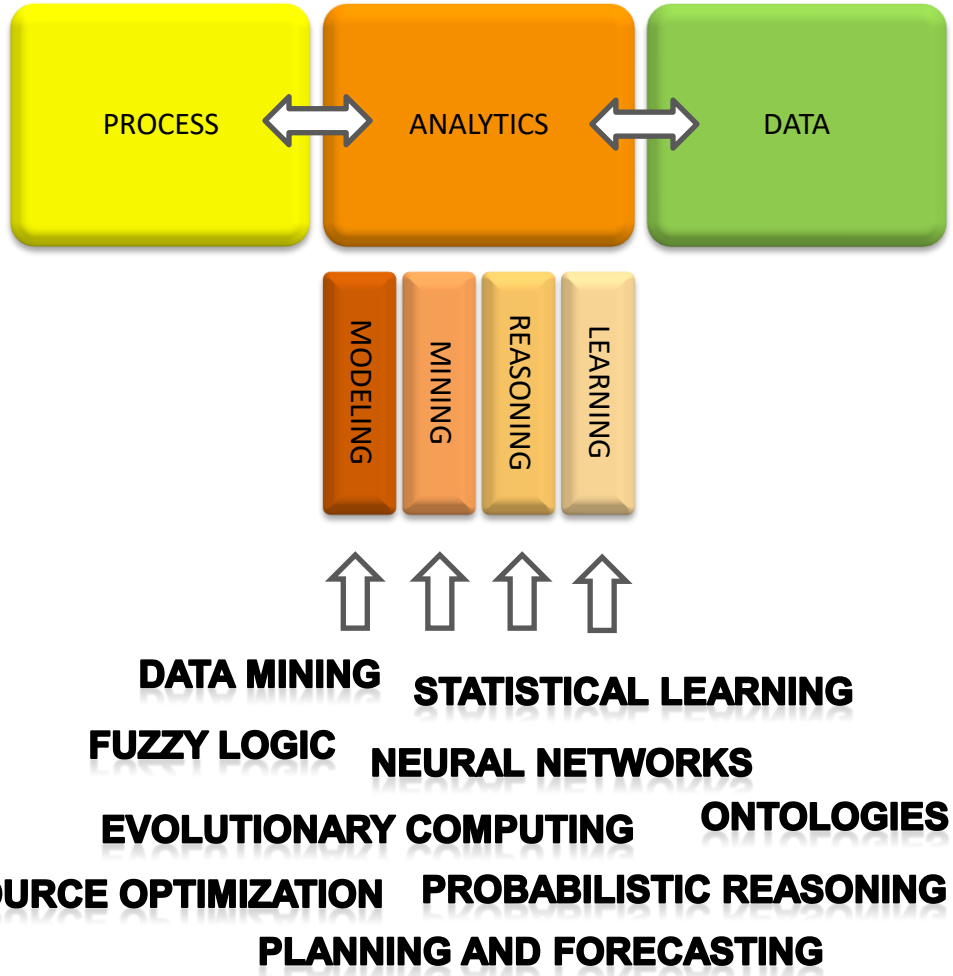



# ANALYTICS

Applications can use ELISA's intelligent algorithms in order to foreseen and monitor the status of an asset using logs or streams of actions.

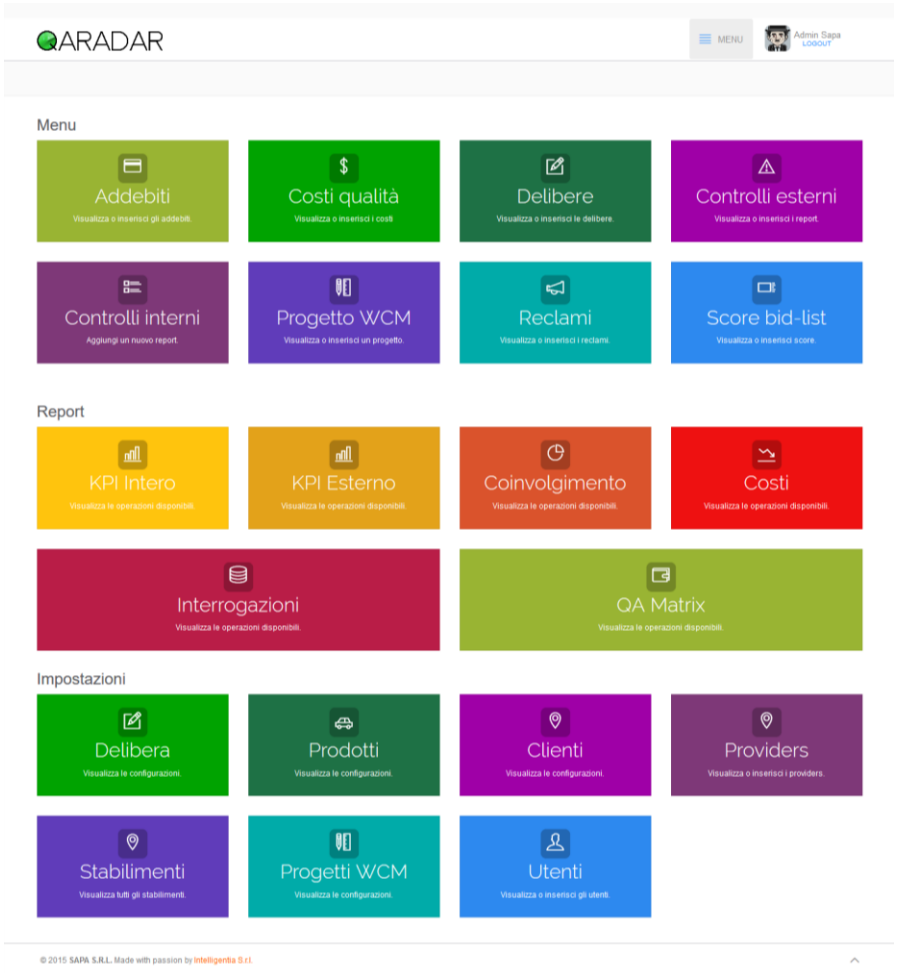
These are collected, pre-processed, distributed to the different algorithms, analysed, and the result is integrated to determine the current status of the asset, in real-time.

Information can be retrieved by analytics dashboards that you can require for the specific SAM instance.



# Quality tracking

- Collecting quality data from your production is useful to determine:
  - Correlation between production phases and customer issues
  - Monitoring of personnel and department quality
  - Monitoring QoS and KPIs
  - Review Supplier & Customers
  - Cost & Performance reports
  - Correlation between Products, Issues, Versions/Production blocks, Customer applications



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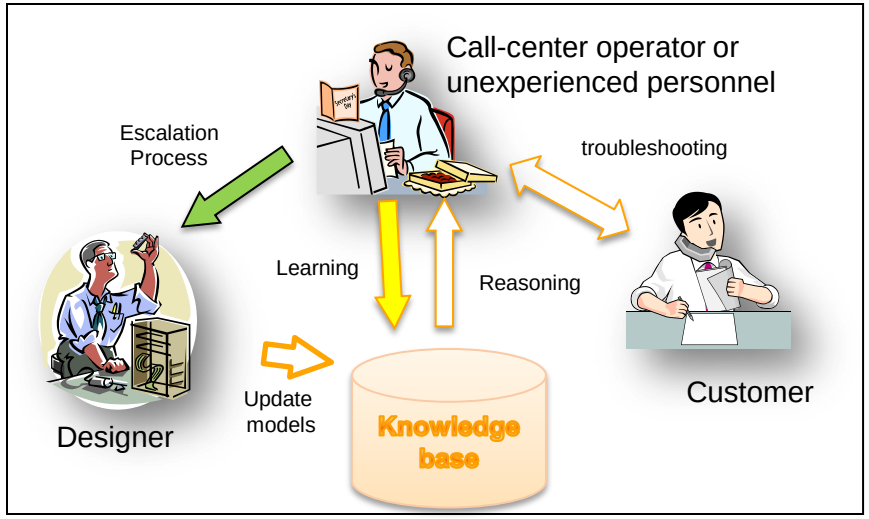
intelligent systems at work

# Dygnose (*Dynamic Diagnosis*)

- Dygnose wants to support an innovative support to Decision Making during Maintenance Activities, in particular for Remote assistance
- It uses advanced probabilistic models to drive the identification and insulation of faults on complex plants and systems
- It operates in an adaptive way by improving the reasoning strategy collecting and learning from field data
- The ambition is to create a decisor completely independent from the competences and experience of the personnel that is operating on the machinery

dygnose
troubleshooting complexity

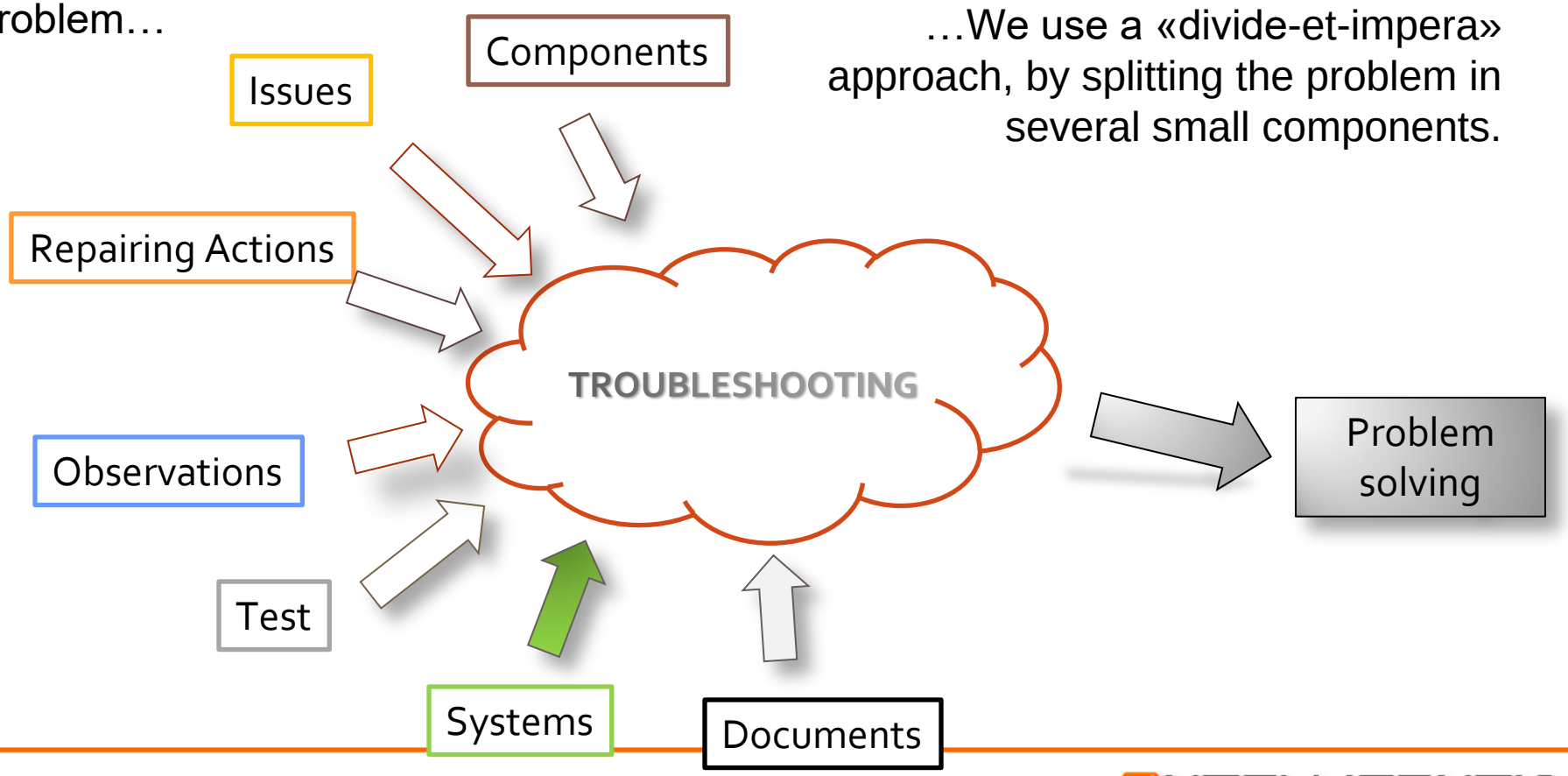
Conceptual Schema



# The approach

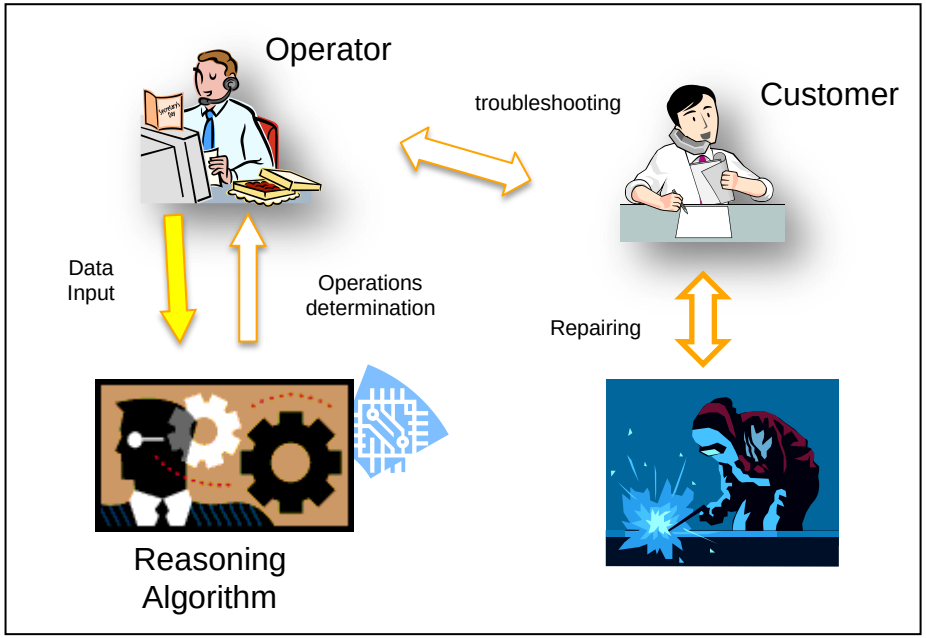
The troubleshooting is not a static process and is not always possible to determine the right algorithm for a deterministic resolution of the problem…

…We use a «divide-et-impera» approach, by splitting the problem in several small components.



# The approach

- Procedure:
  1. The operator answer to a ticket/call on a specific asset/component/plant
  2. A new Dygnose session is started indicating to Dygnose to load the particular model from the Knowledge Base
  3. The algorithm run and retrieve insight and operation to perform to the operator
  4. The operator submit an operation from the list of suggested options to the customer
  5. The customer perform the operation and give back to the operator feedbacks that are provided to the algorithm
  6. The algorithm process the input and retrieve new suggestions and operations to perform for the next cycle
  7. Restart from point 3.

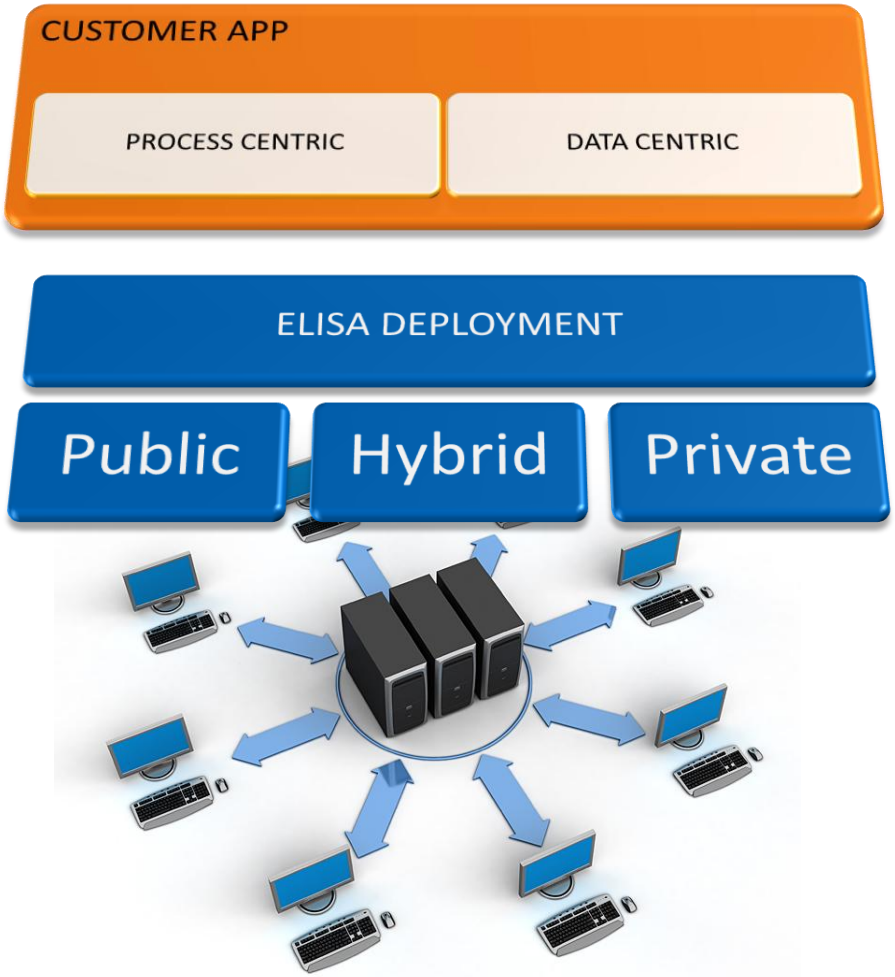



The algorithm is decomposable in two parts:

1. A Bayesian network performing calculation of conditional probabilities of an issue
2. An elaboration engine of produced data for the generation of the set of suggested operations

# Deploy wherever you need...

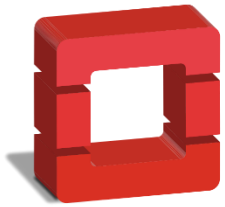
Thanks to the integration with ELISA, **your application** should be deployed on the Cloud, on both PaaS (Platform As A Service) and IaaS (Infrastructure As A Service) infrastructures.




... Or, if you like, on your own servers at home

# … Build your own private cloud!

- Intelligentia can help you to create your dedicated cloud infrastructure
  - Private or hybrid using your servers or Intelligentia's private cloud customized for you
- A scalable investment that should be driven by our reference implementations
  - E.g. OpenStack, VMWare
- Always scalable and portable to the public cloud in case of goal change in your company or additional resources are needed
  - E.g. Amazon, Microsoft Azure, Google Cloud Platform
- Possibility to temporarily enlarge your cloud using a private scalable cloud platform at Intelligentia
  - secured, dedicated servers just for your application, always open for customer review



openstack
CLOUD SOFTWARE

vmware

Microsoft
Azure

Google Cloud Platform

amazon web services™ | EC2

# Let’s discuss

CONTACTS

# WHERE YOU CAN FIND US

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# Intelligentia

- **Intelligentia** is an INNOVATIVE SME born from the collaboration between University and Industry. Founded in 2010, it is focalized in promoting innovations of products and processes.

- Our vision looks at a world in which software and hardware technologies together with advanced mathematical models, will be able to change our planet in a smarter place, supporting human decisions and improving the efficiency and productivities.

- Our team is composed by highly skilled professionals, coming from industrial and academic world.

- Our experience and our enthusiasm are at your service for innovate your Business.


www.intelligentia.eu

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