Augmented reality to enhance digital twin effectiveness

GDS ANIPLA/AIS/ISA Italian Section

Le potenzialità delle connessioni wireless e i sistemi IOT - 28 febbraio 2019

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Saipem Drilling Offshore

Agenda

Saipem Drilling intro

Digital twin for the division

Data infrastructure

Our “IoT Strategy”

Augmented Reality to access the digital twin

AR Pilot Project

Electronics for AR

Building blocks for AR

Saipem Drilling Offshore

Digital Twin
Definition & Roadmap

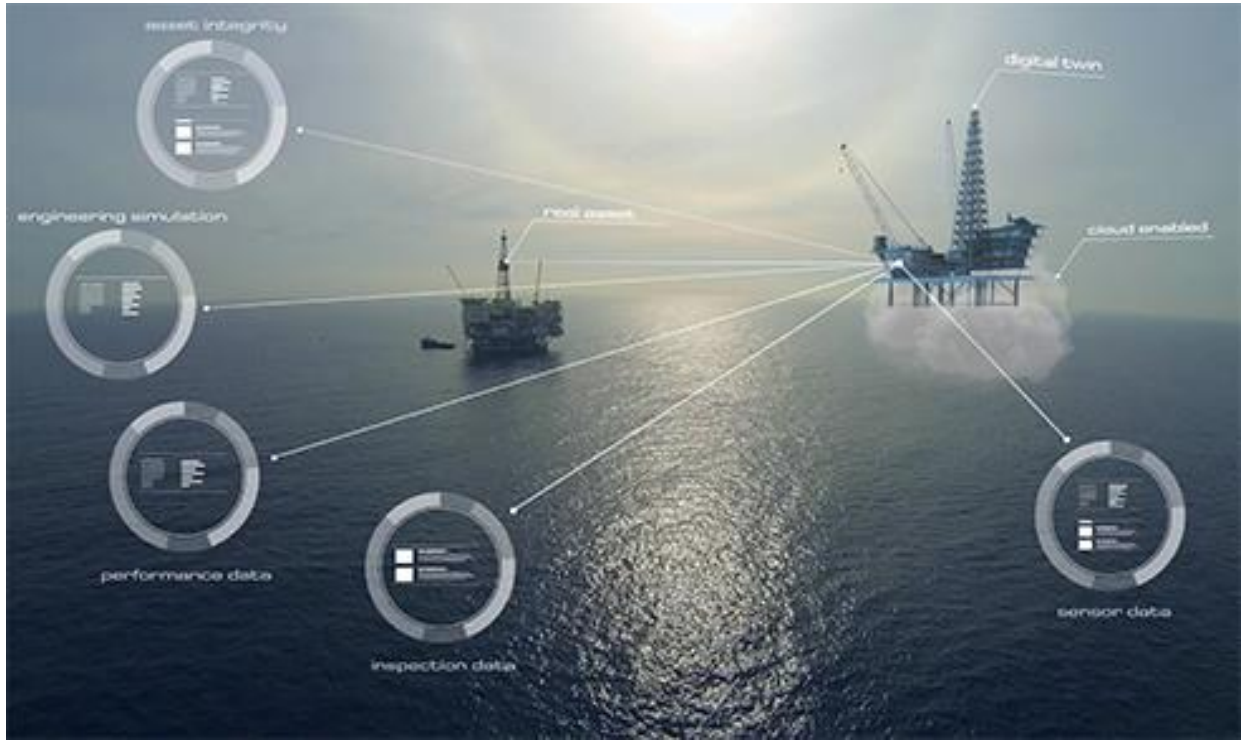
Unique platform to access all types of information related to an asset.

Why? To improve knowledge on the plant

First release, integration of:
- Existing document systems
- Maintenance data
- 3D model

Second release, add:
- Machine data
- Engineering simulation

Third release, include:
- Continuous update of the model



www.dnvgl.com/article/making-your-asset-smarter-with-the-digital-twin-63328

Digital Twin - IoT

Data Infrastructure onboard

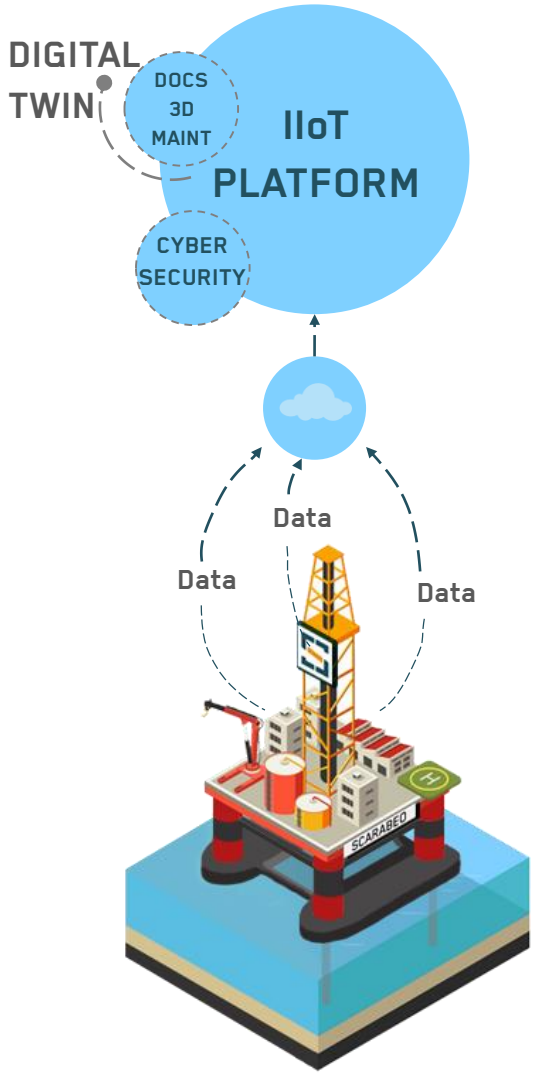
A new dedicated infrastructure is necessary:

- Data Integrator
- Cloud Mirroring
- IIoT Platform

Key features:

- Cybersecurity

Each step causes difficulties in the offshore environment!



Digital Twin - IoT

Before installing new IoT, think about PLC data

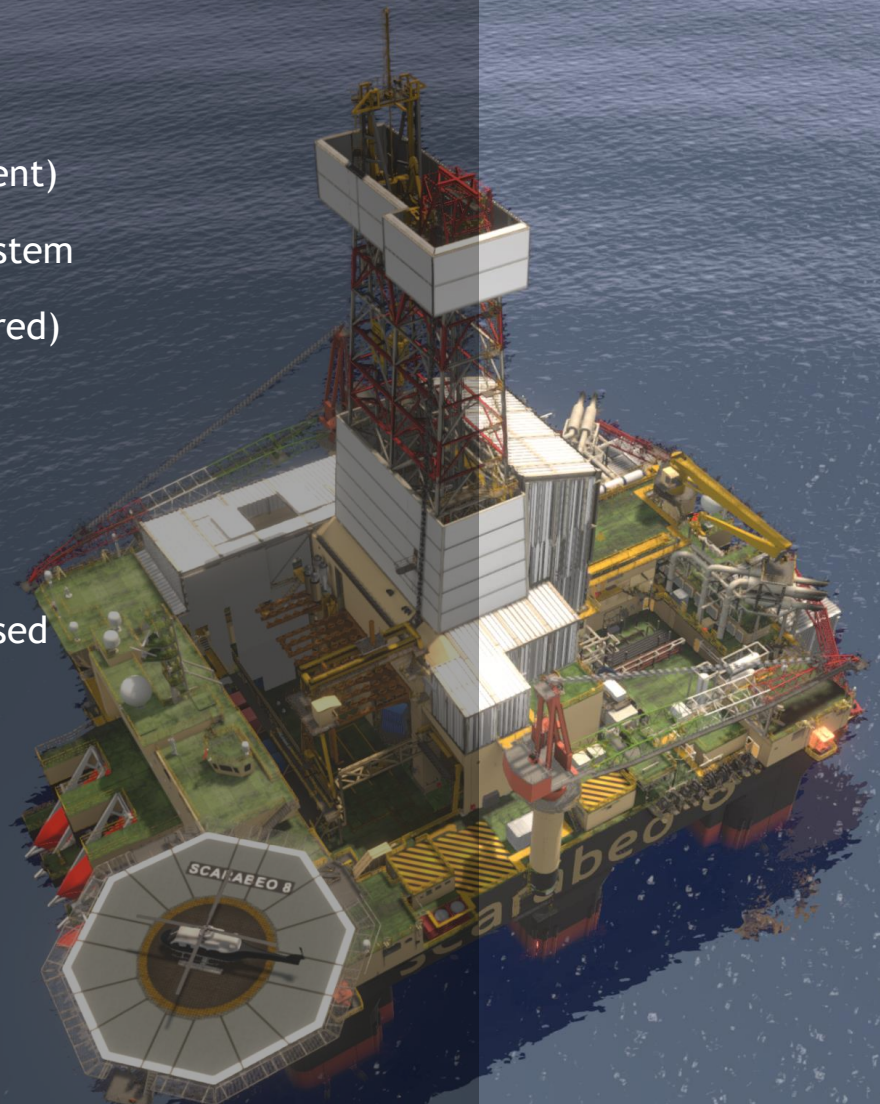
Why not just install new sensors?

- Installation costs (high for harsh environment)
- Software integration costs with existing system
- Hardware integration costs (wireless or wired)

This slows down the implementation of the IoT.

Equipment installed onboard has already plenty of sensors and measures which can be used to feed the digital twin.

The first step is to integrate the digital twin with existing PLC data.



Access to the Digital Twin

Augmented reality

Virtual Reality will be used to assist onboard operators through internal and of OEM knowledge experts.

What is Augmented Reality for the offshore drilling?

Real time visualization of information on physical asset, through electronic devices.

Augmented Reality is key to enhancing information available to operators while onboard. Advantages:

- Quick overview of the systems
- Onsite access to existing information
- Ease tasks of engineers through innovative maintenance procedures

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HMT-1 Device via RealWear Inc.

Access to the Digital Twin

AR - object recognition

Recognition of objects can be done through:

- tags
- RFID
- computer vision

Machine learning looks to be the most promising to avoid increasing efforts to create and maintain the digital twin.

However, it implies several difficulties:

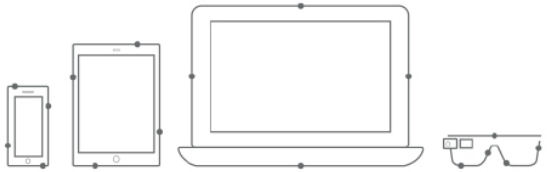
- Relative motion of the vessel can cause issues with the ML algorithms
- ML algorithms require heavy computation, not so easy on edge
- Several pieces of equipment in a small area, not fully visible

Access to the Digital Twin

Augmented reality - Pilot Project (1/2)

Android application available on tablet, smartphone and AR glasses, based on Client- Server Wi-Fi architecture

Recognize **moving** objects



Object recognition algorithm shall **use machine learning** and deep learning solutions “trained” on video and photos provided by Saipem operators

Multiple objects recognized at the same time

Access to the Digital Twin

Augmented reality - Pilot Project (2/2)

Tablet Application used to send image to ML Algorithm and display info provided by external service

Machine Learning Algorithm process installed on Vessel Server used to recognize equipment

INTERNET

Cloud will be used to improve and update ML Algorithm in asynchronous way

Same Machine different process

Web application/Web Server/**System integrator** used to collect data from Tag number

Access to the Digital Twin

Electronic devices for AR

Real value is brought only if the augmented reality can be accessed in mobile mode by the personnel onboard.

The following difficulties shall be addressed:

- Limited connectivity
- Noise presence
- Ex Proof
- 12-hr shifts
- Hands-free operations

The technology is ready, but does not address all difficulties:

- Rugged tablet/smartphones are widely available on the market
- Some suppliers are proposing wearable tablets
- Mixed reality headsets (e.g. Microsoft HoloLens) are envisaged for the future

GETAC Z710

HMT-1 Device via RealWear Inc.

Microsoft HoloLens on Helmet

www.heavyequipmentguide.ca/article/27383/trimble-connect-and-hard-hat-solution-for-microsoft-hololens-improves-mixed-reality-in-the-field

Building block for the Digital Twin

Digitalization of onboard processes

FROM

Process streamlining

Enhanced **HSE**

Dynamic Schedule

Efficient **REPORTING**

TO

QUESTIONS?

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