



SHARING INFORMATION BETWEEN SURVEY, DREDGING AND MARINE PILING BY USE OF AN AUTOMATIC PILE DRIVE POSITIONING SYSTEM (APPS)

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Contents

- Piling industry tech-history in a nutshell
- Industry 4.0: Today
- Industry 4.0.: The future
- Conclusion

Introduction

A pile driver is a mechanical device used to drive piles in a certain time into soil to provide a foundation for constructions.

Marine pile driving is a small part of this.





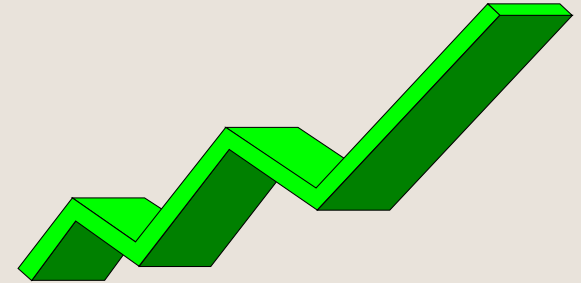
Modern marine piling



EFFICIENCY

PRICE PER PILE

PILES PER HOUR





Industry 4.0 Today

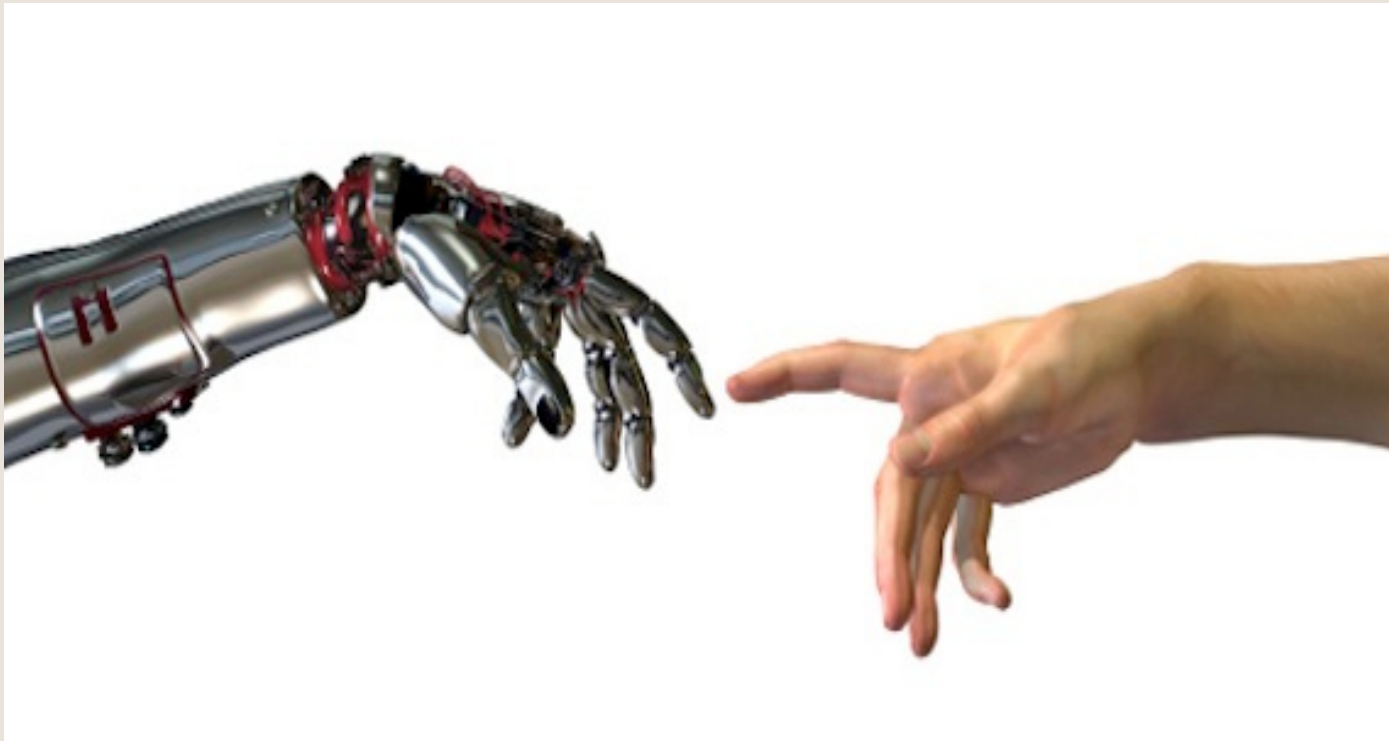
- Computer power
- 4G and Satellite connectivity
- World Wide Web (Internet)

Context: History to Industry 4.0

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- A light blue world map is positioned in the background of the slide, showing the outlines of continents and countries. It is centered behind the text on the left side of the slide.
- **Industry 1.0**
 - **Mechanization**
 - **Water and steam powered serial production**
 - **Industry 2.0**
 - **Mass production**
 - **Electric powered**
 - **Industry 3.0**
 - **Digital revolution by electronics**
 - **Automation**
 - **Industry 4.0**
 - **Internet, World Wide Web**
 - **Intelligent networks control each other autonomously**

Context: Industry 4.0

- **Meet your machine**
 - Autonomous machines
 - People



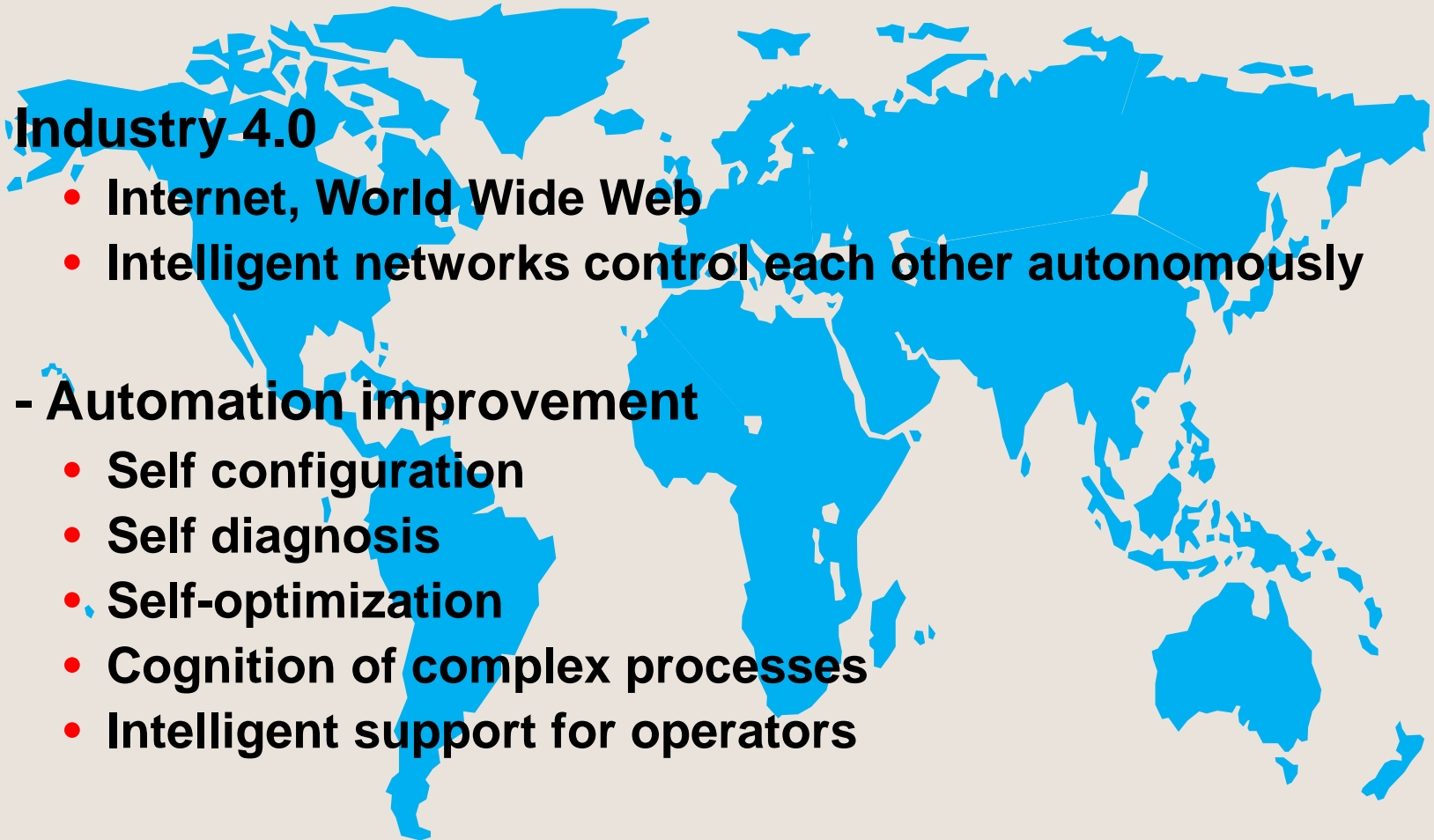
Context: Industry 4.0

- Industry 4.0

- Internet, World Wide Web
- Intelligent networks control each other autonomously

- - Automation improvement

- Self configuration
- Self diagnosis
- Self-optimization
- Cognition of complex processes
- Intelligent support for operators



Reliability of electronics



Marine piling control status

- **Integrated I/O build up**
 - **All transducers to central system**
 - **Power management**
- **Automation**
 - **Positioning of the piles**
 - **Process sub automation (number of blows)**
- **Artificial intelligence**
 - **Process memory & forward looking capability software**
 - **Advise system**
- **Simulation in the office environment**
 - **Train and experience before the piling starts**
 - **Virtual Piling project tool**

Common PC platform









Connecting software packages

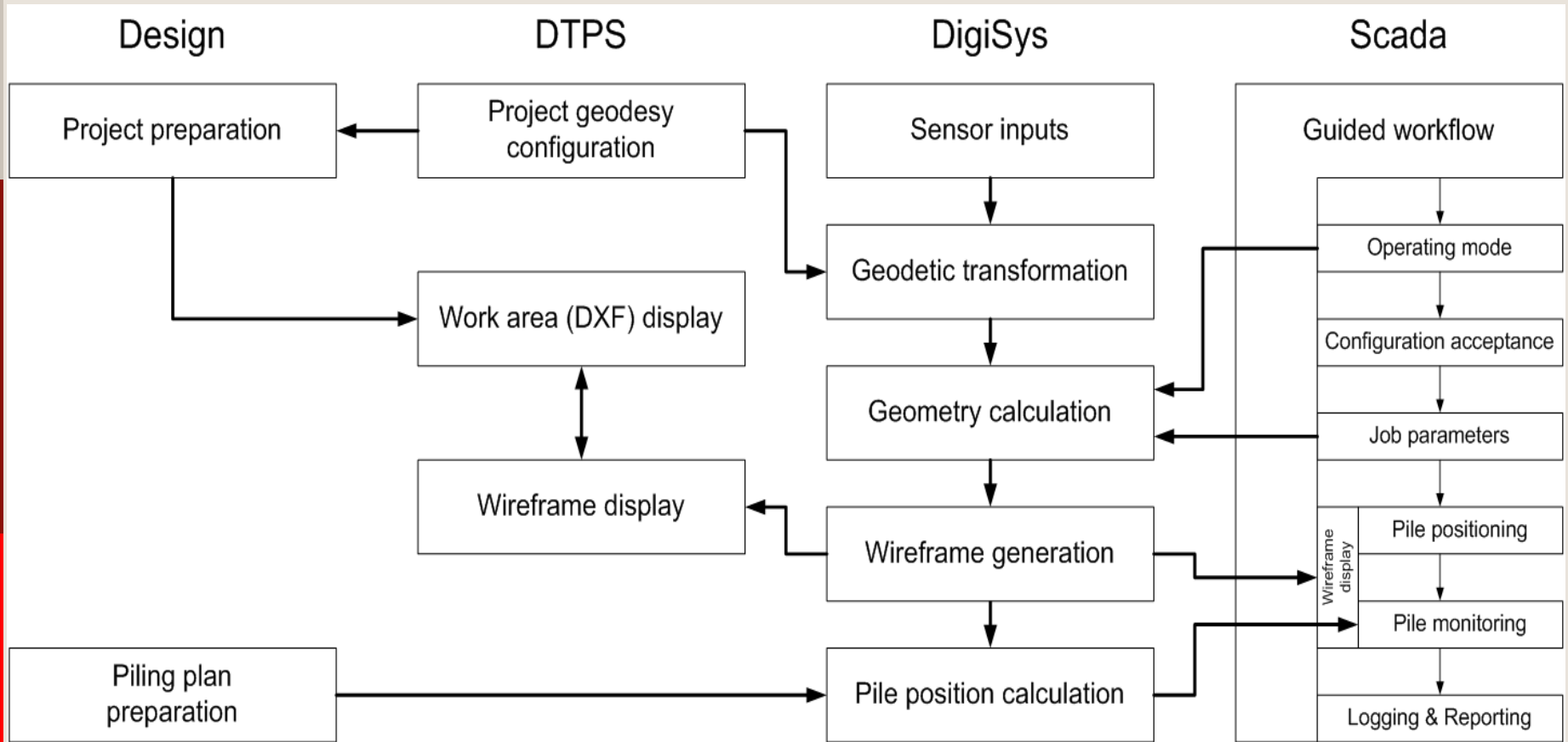
- Design
 - Survey
 - Piling project data

- DTSPS
 - Work area
 - Positioning of the piles

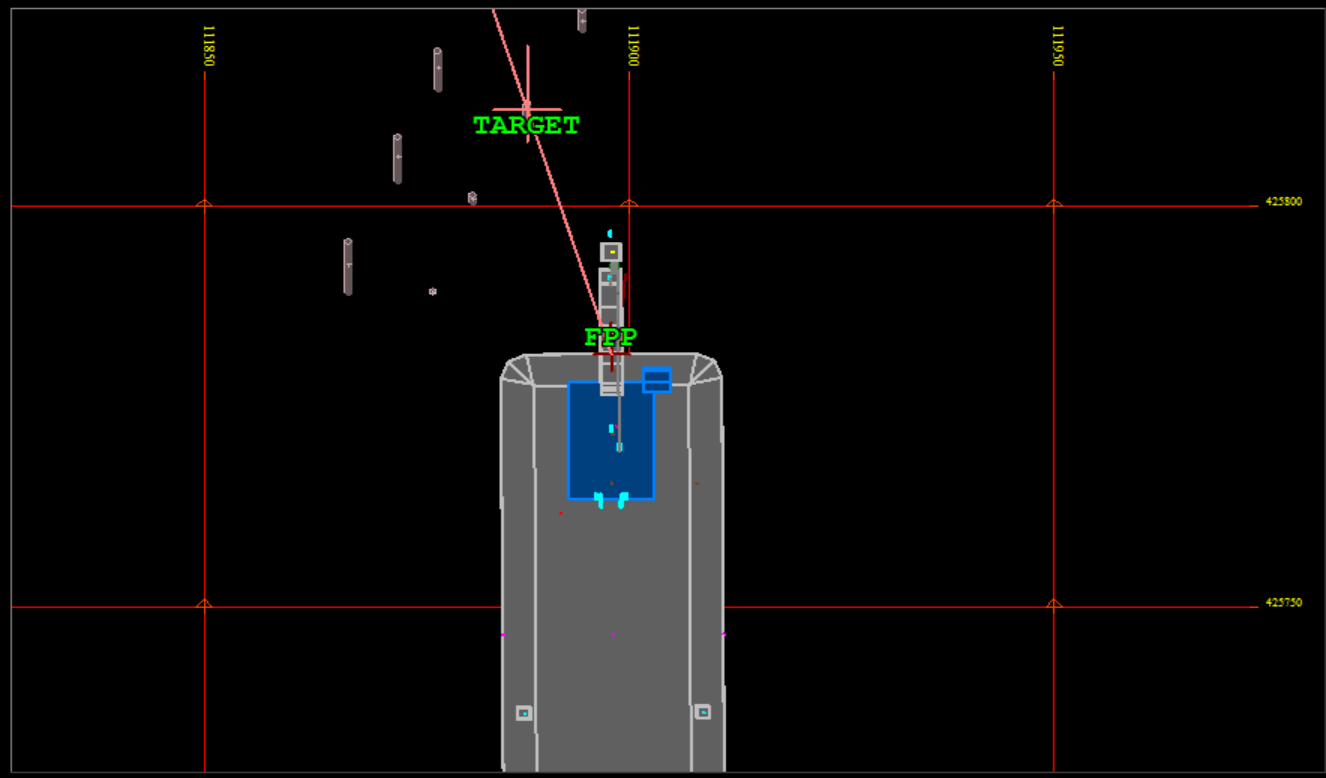
- DIGISYS (Input / Output)
 - Transducers
 - Calculations

- SCADA (Windows Platform)
 - Visualization
 - Man Machine interface

Piling workflow for APPS



Target: **Pile 3**



Pontoon

Horizontal		
	Northing	Easting
GPS	425761.74 m	111891.94 m
FPP	425781.62 m	111897.96 m
APP	425711.62 m	111898.34 m

Vertical w.r.t. SWL	
Deck level (above)	2.69 m
Draught	2.01 m

Heading	
True heading	359.20 deg
Grid heading	359.69 deg

Spuds	
PS above deck	1.00 m
SB above deck	10.00 m
PS tip in ground	0.32 m
SB tip in ground	-8.73 m

Crane cabin

Anemometer	
Wind speed	0.00 m/s

Boom	
Angle measurement	Calculated
Angle	70.68 deg

Orientation	
Grid heading	0.01 deg
Tilt	0.25 deg
List	0.14 deg

Pontoon position monitoring

	Northing	Easting	Heading
Actual (FPP)	425781.62 m	111897.96 m	359.69 deg
Target Pile	425812.13 m	111888.08 m	0.00 deg

Delta	-30.51 m	9.88 m	359.69 deg
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Accept

Control locations

- Crane Cabin
- Crane master Office
- Shore office

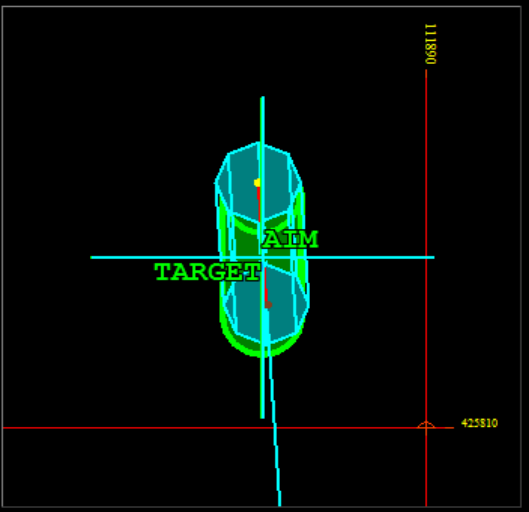
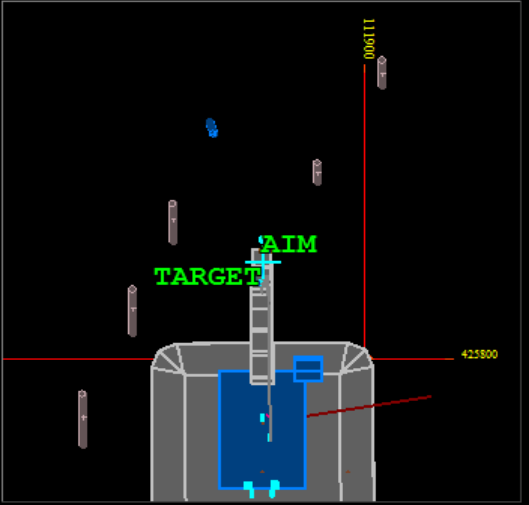
Office Support by IHC Connect



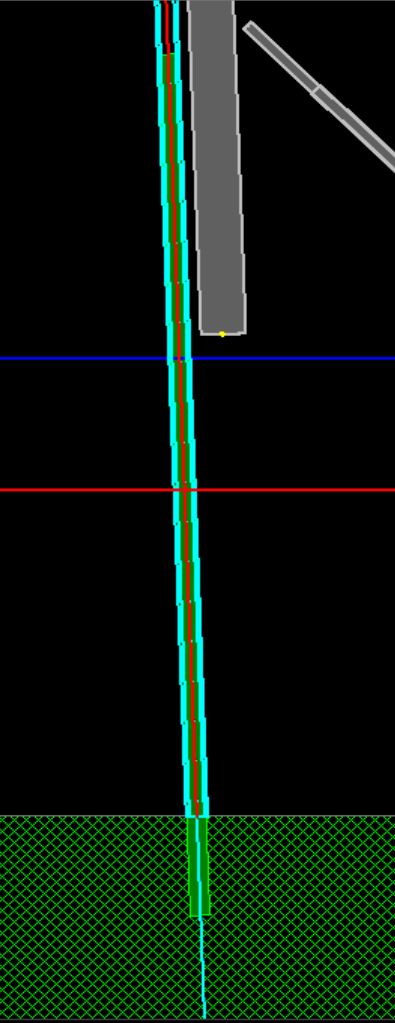
Operating mode Positioning **Piling** Geometry Calibration Help  

Overview Setup **Positioning** Monitoring 

Reference: Cut-off level



Pile identifier: **Pile 3**



Project description

Project	Test Project near IHCS		
Code	22140532_01	Location	Sliedrecht, Industrieweg

Pile axis

	Northing
Actual	425812.14 m
Target	425812.13 m
Delta	0.01 m

	Easting
Actual	111888.09 m
Target	111888.08 m
Delta	0.01 m

	Heading
Actual	0.01 deg
Target	0.00 deg
Delta	0.01 deg

	Rake
Actual	2.02 deg
Target	2.00 deg
Delta	0.02 deg

Vertical

	Actual pile
Top to cut-off	26.62 m
Penetration	0.05 m

Crane cabin

Anemometer	
Wind speed	0.00 m/s
Boom	
Angle measurement	Calculated
Angle	74.37 deg
Orientation	
Grid heading	0.00 deg
Tilt	0.26 deg
List	0.13 deg

Spotter

Length	0.00 m
Angle measurement	Sensor
Angle	44.82 deg
Leader	
Above SWL	1.20 m
Angle measurement	Calculated
Angle	2.02 deg

Winches

Winch	Configuration	Value
LUF	Boom	207.84 m
1	Leader	0.00 m
4	None	
5	Hammer	197.79 m

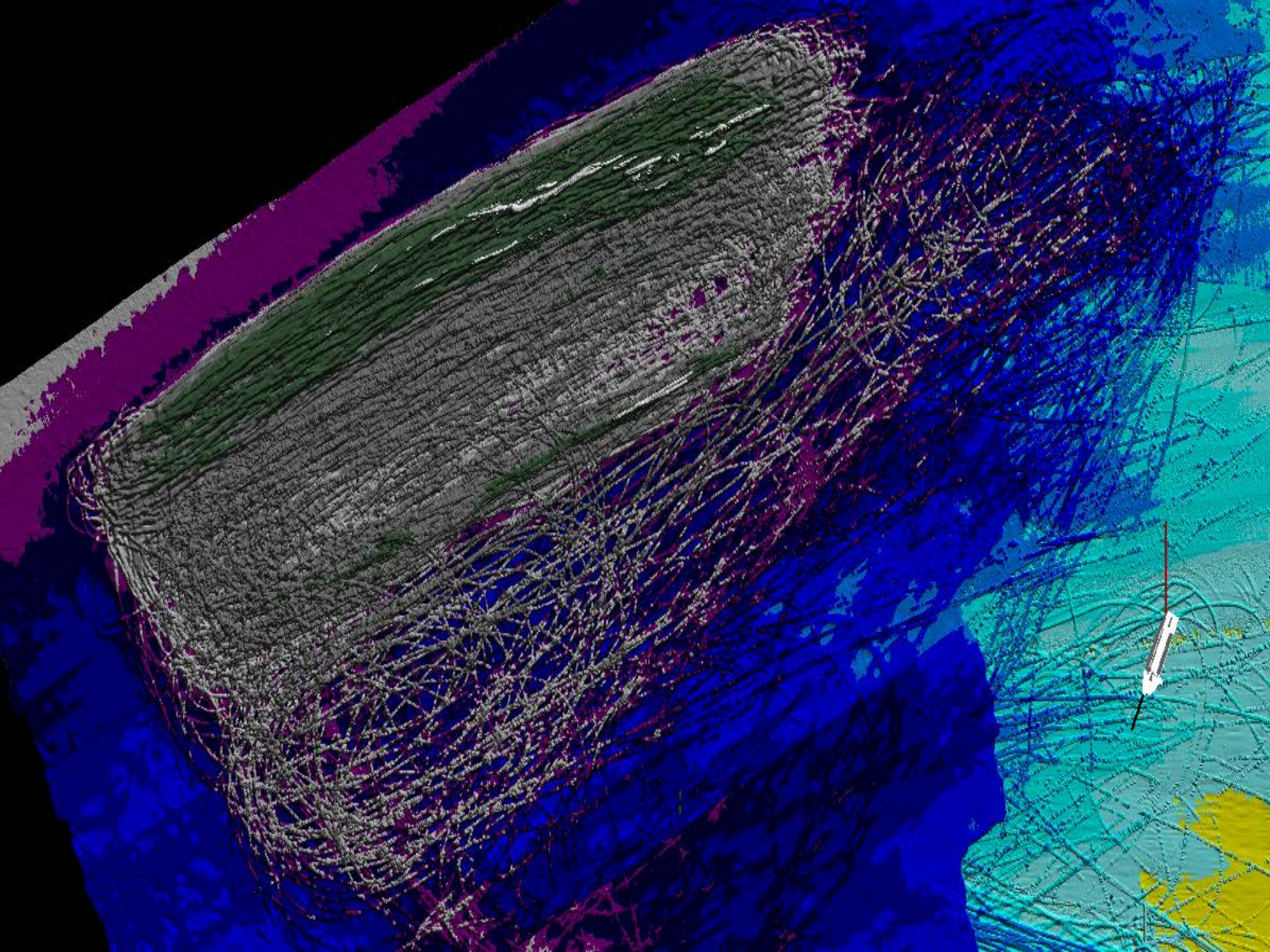
Accept

Real Time Quality Control System

- A +/- 10 cm verifiable work accuracy
- Meeting contract obligations
- Progress monitoring by the principal

Industry 4.0: The future

- Connectivity to 5G (bandwidth x 100)
- Machines move to autonomous operation
- Robot piling machine?



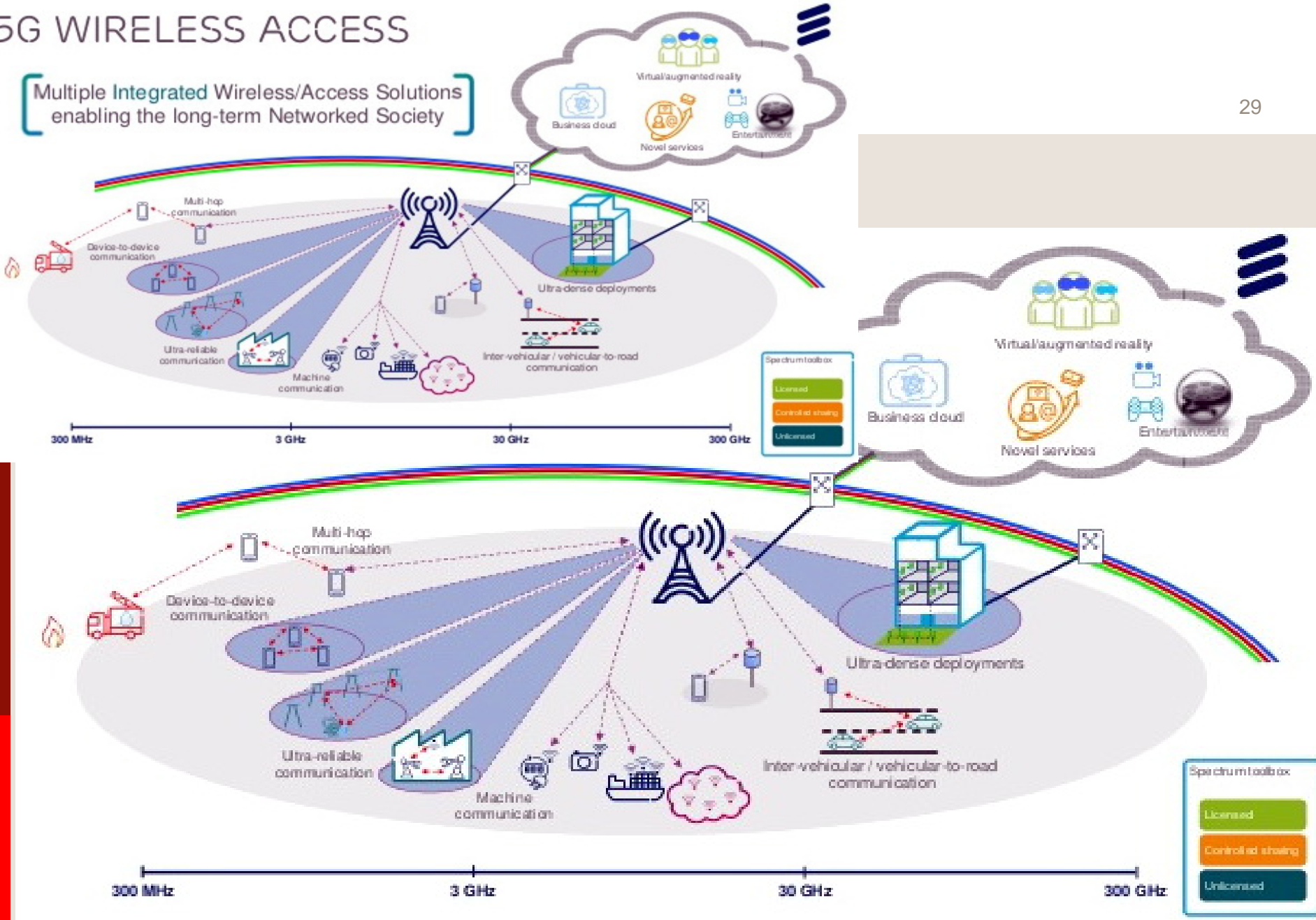


Connectivity

- Safety
- Reliable real time data
- Year 2020

5G WIRELESS ACCESS

Multiple Integrated Wireless/Access Solutions enabling the long-term Networked Society





The End



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