SUSTAINABLE PLACES 2023

Dig_IT

A Human-centred Internet of Things Platform for the Sustainable Digital Mine of the Future

Project duration: from 01/05/2020 to 31/04/2024

GRANT AGREEMENT NUMBER: *869529*

Project Coordinator: María García-Camprubí (ITAINNOVA)

Technical Manager: David de Paz (SUBTERRA)

Speaker: Lorenzo Bortoloni (Ro Technology)

Dig_IT Partners

Project Details Summary

Partners 16	**Project Number** 869529
Person Months total 843	**Project Acronym** Dig_IT
Number of Work Packages 10	**H2020-SC5-2018-2019-2020**
Number of Tasks 45	**Starting Date 1.5.2020**
Number of Deliverables 65	**Duration in months 48**
Number of Use Cases 5	**Website** http://digit-h2020.eu
Topic SC5-09-2018-2019	

Countries by name and partners per country
Italy (3), Spain (2), United Kingdom (2), Norway (2), Greece (2), Finland (2), Serbia (1), Belgium (1), Cyprus (1).

Coordinator

ITAINNOVA INSTITUTO TECNOLÓGICO DE ARAGÓN

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Dig_IT Partners: 16 Organisations from 9 Countries (6 EU members)

1. ITAINNOVA
2. CORE INNOVATION
3. BRUNEL
4. TAU
5. ROTECH
6. ICCS
7. SUBTERRA
8. STRATAGEM
9. EUROCORE
10. LIBRA
11. MARINI
12. TAPO
13. SINTEF
14. TITANIA
15. SEI
16. ZENTRIX LAB

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Concept

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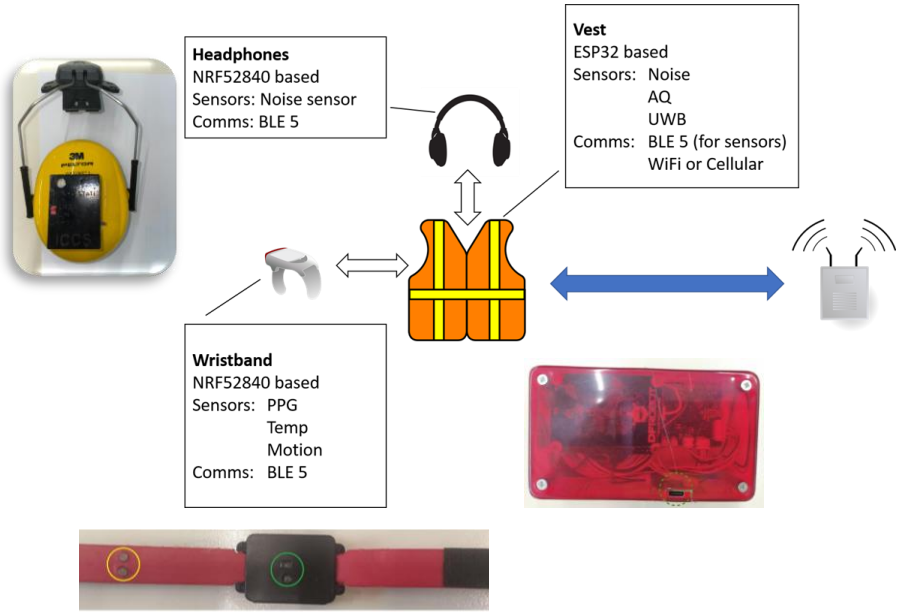
Concept

Data

People

- Worker: Location, Biometrics
- OHSE parameters



WP2

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Concept

Data

- People
- Assets

	Kemi Use Case			Titania Use Case
Asset type	**Volvo FMX Truck**	**Scania Truck**	**Gradall Scaler**	**Komatsu Loader**

WP2

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Concept

Data

- People
- Assets
- Environment

Geotechnics

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Concept

Data

- People
- Assets
- Environment

Air & Water quality

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Concept

Data

- People
- Assets
- Environment

Anemometers

Weaher stations

Legacy sensors

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Concept

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Concept

IIoT platform

- ARCHITECTURE
- SOFTWARE

WP3
WP6

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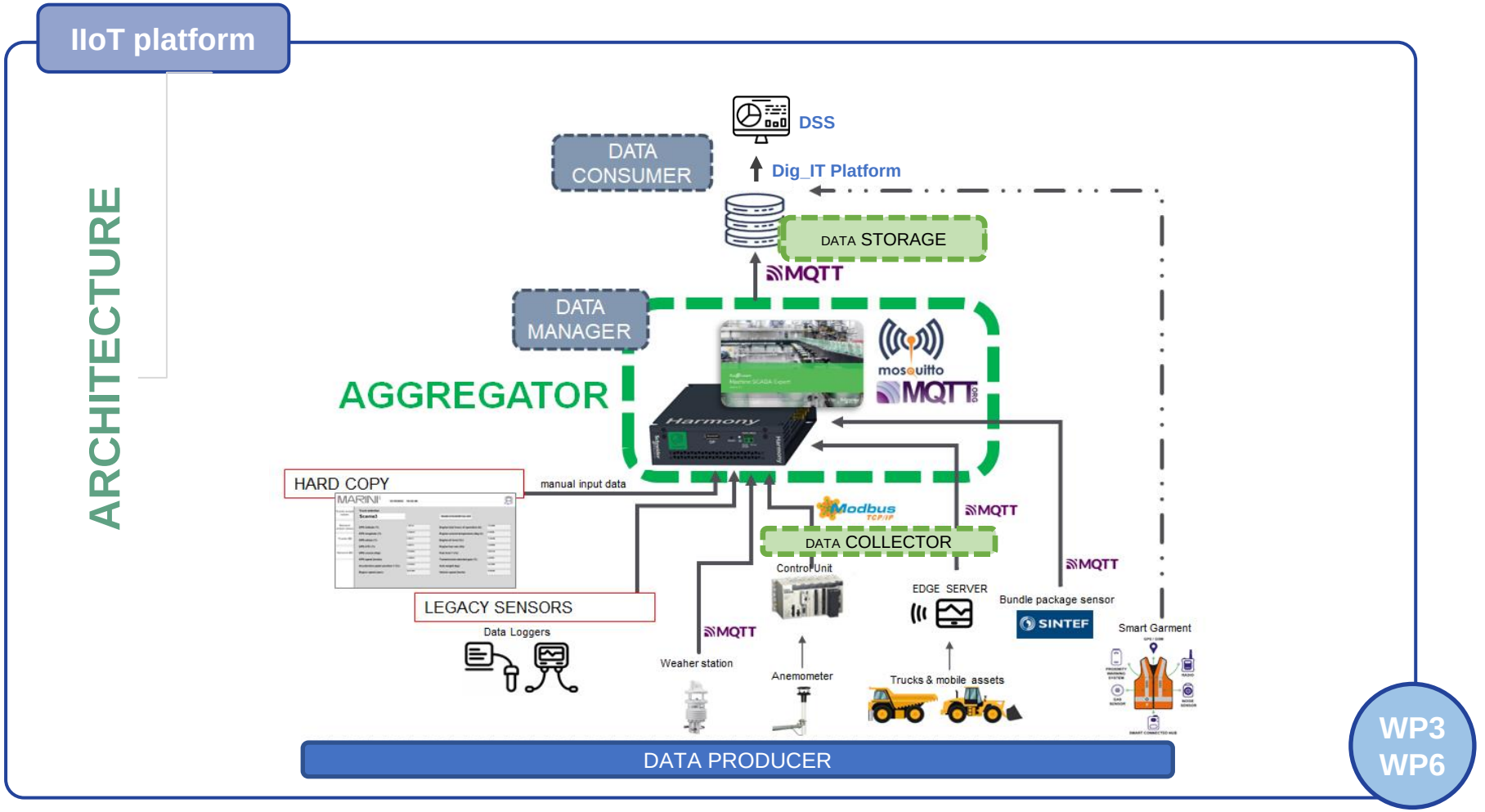
Concept



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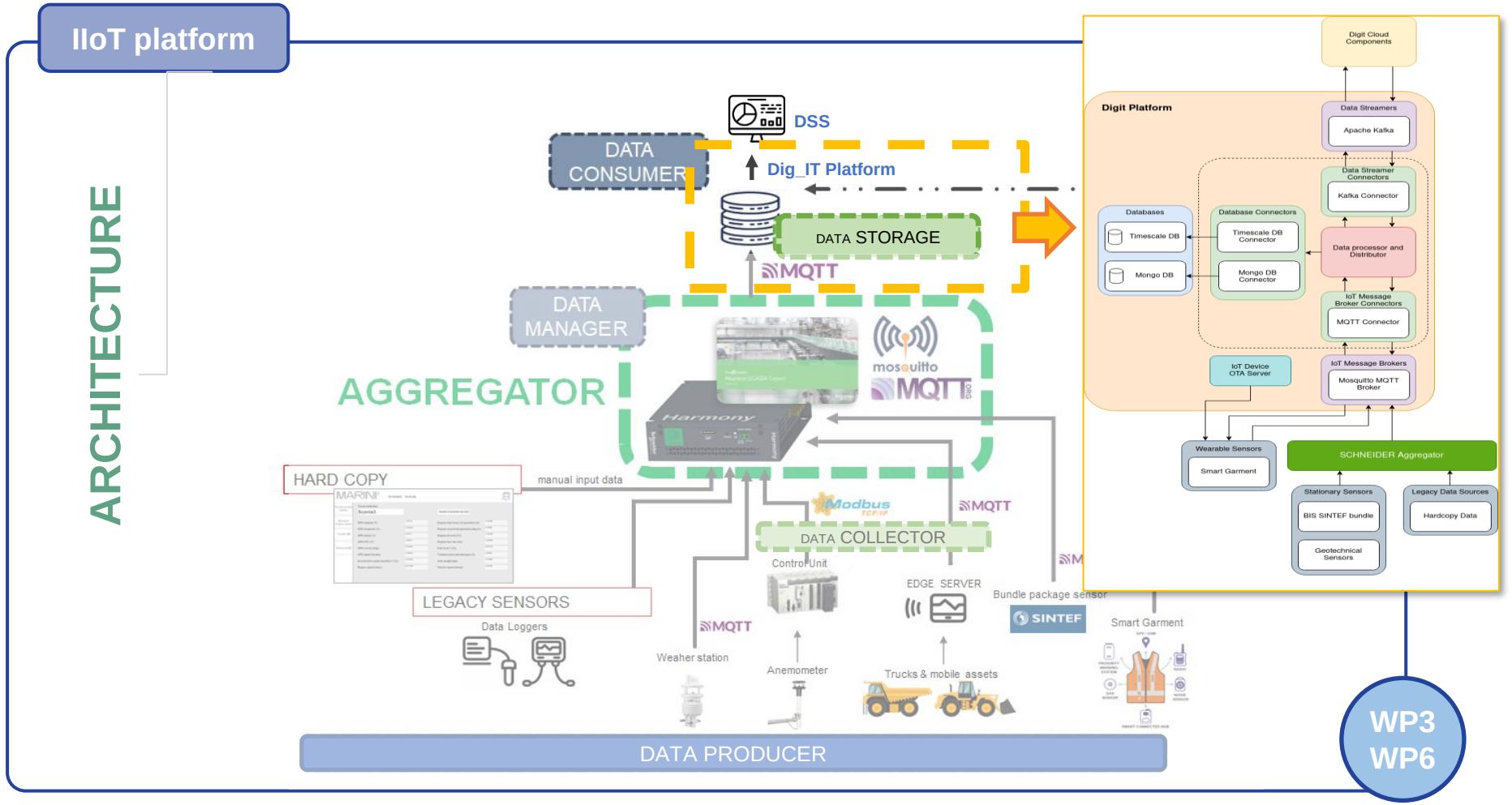
Concept



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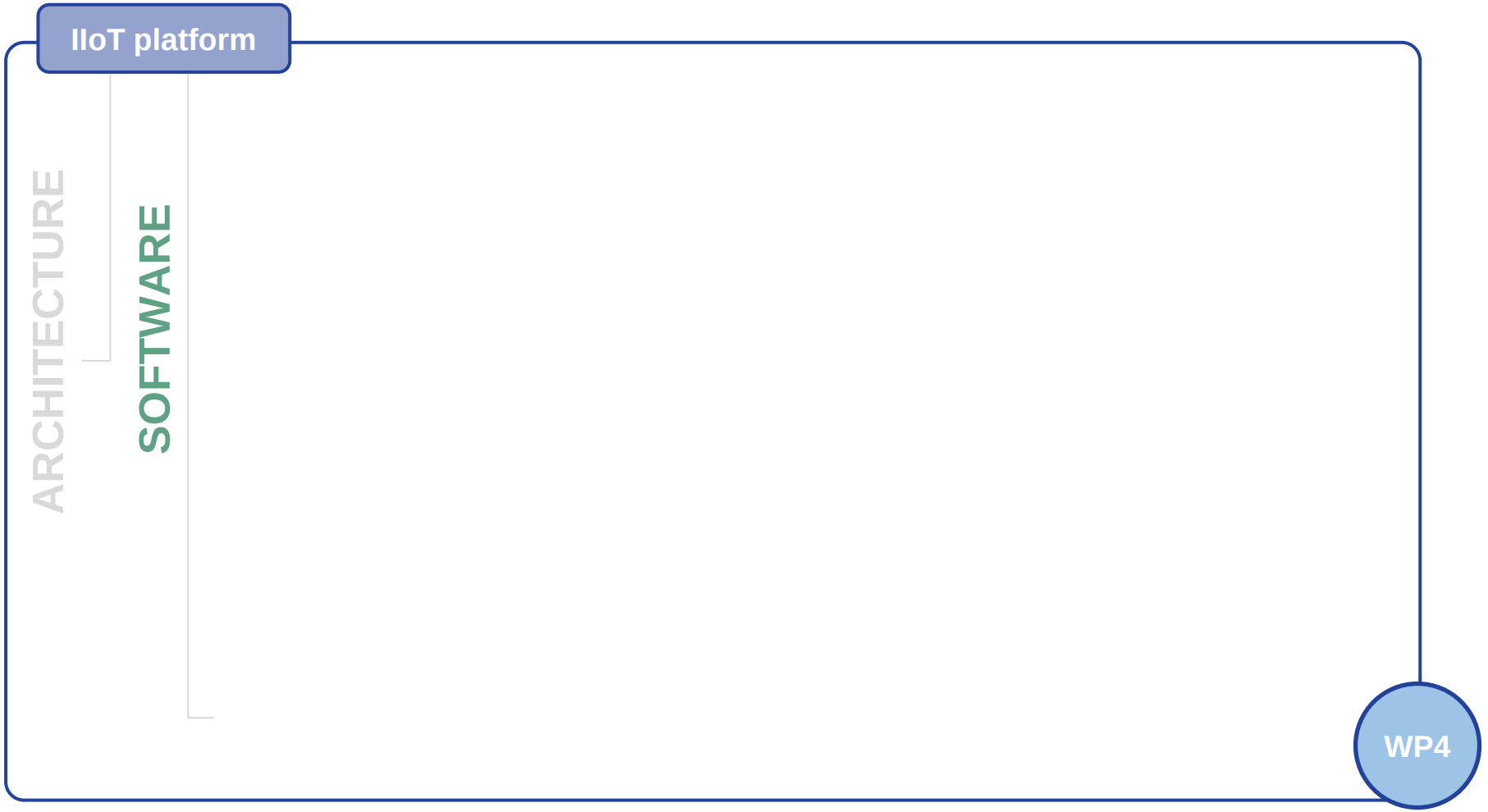
Concept



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Concept

IIoT platform

ARCHITECTURE

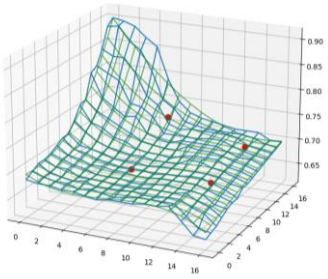
SOFTWARE

Digital Twin Layer

Real time models of operations/ground/fluid-dynamics to predict:

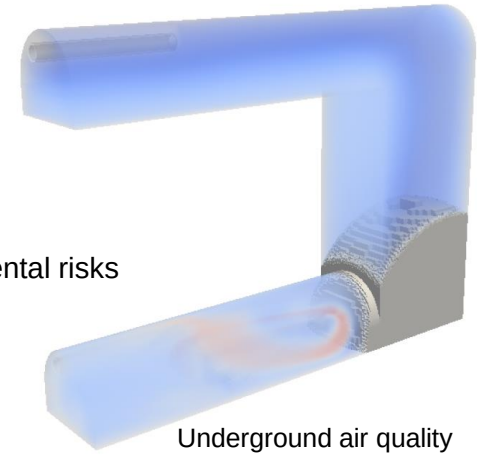
1. Operation & Manteinance

Machine localization/tracking



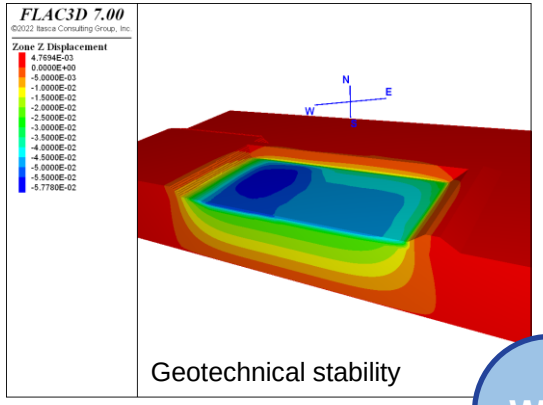
Ground Digital Twin

2. Geotechnical risks



Underground air quality

1. Health and Environmental risks



Geotechnical stability

WP4

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Concept

IIoT platform

ARCHITECTURE

SOFTWARE

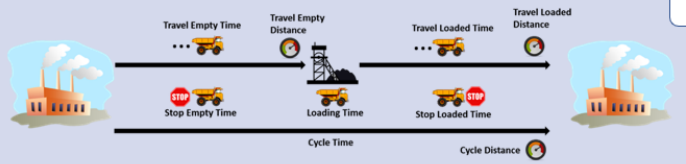
Digital Twin Layer

Intelligence Layer

1. Smart Scheduling Tool
2. Big Data Analysis
3. Predictive Maintenance Agent
4. Predictive Operation Agent
5. Intelligent toolbox for Ocupational Safety, Health and Environment (OSHE)

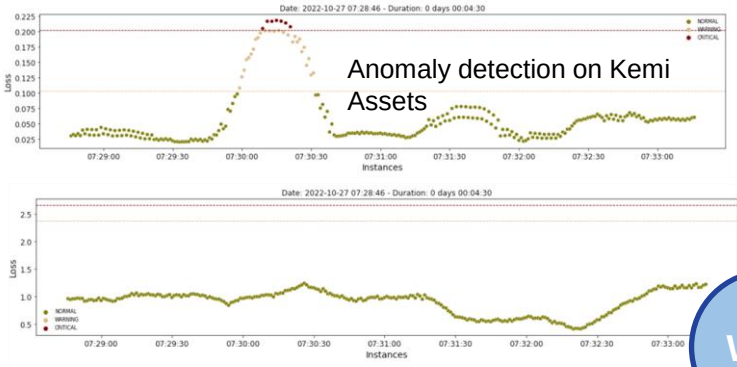
Smart Scheduling Tool

TITANIA



Multi Objective Optimization (2 - 3 Objectives) / Many Objective Optimization (More than 3 Objectives)

No	Conflicting Objectives	Description	Datasets	Status
1	Minimizing Queuing Time	To minimize the average queuing time per work cycle	Process Flow + Truck Payload	OK
2	Maximizing Production	To maximize the production in a worker shift cycle	Process Flow + Truck Payload	OK
3	Minimizing Financial Cost	To minimize the fuel cost and the worker payment	Process Flow + Truck Payload	OK
4	Minimizing Machine Downtime	To minimize the event of truck failure in a worker shift cycle.	Process Flow + Truck Payload + Truck Datalogger + Abnormal Event	Pending



WP5

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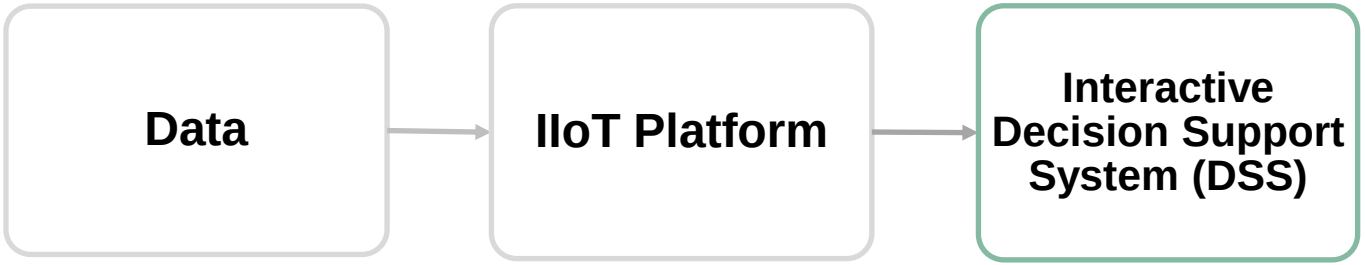
Concept



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Concept

Data → IIoT Platform → **Interactive Decision Support System (DSS)**

Interactive DSS

FRONT-END

Fully interactive & customizable dashboards

- Exploration
- Operation
- EHS monitoring
- Alerts

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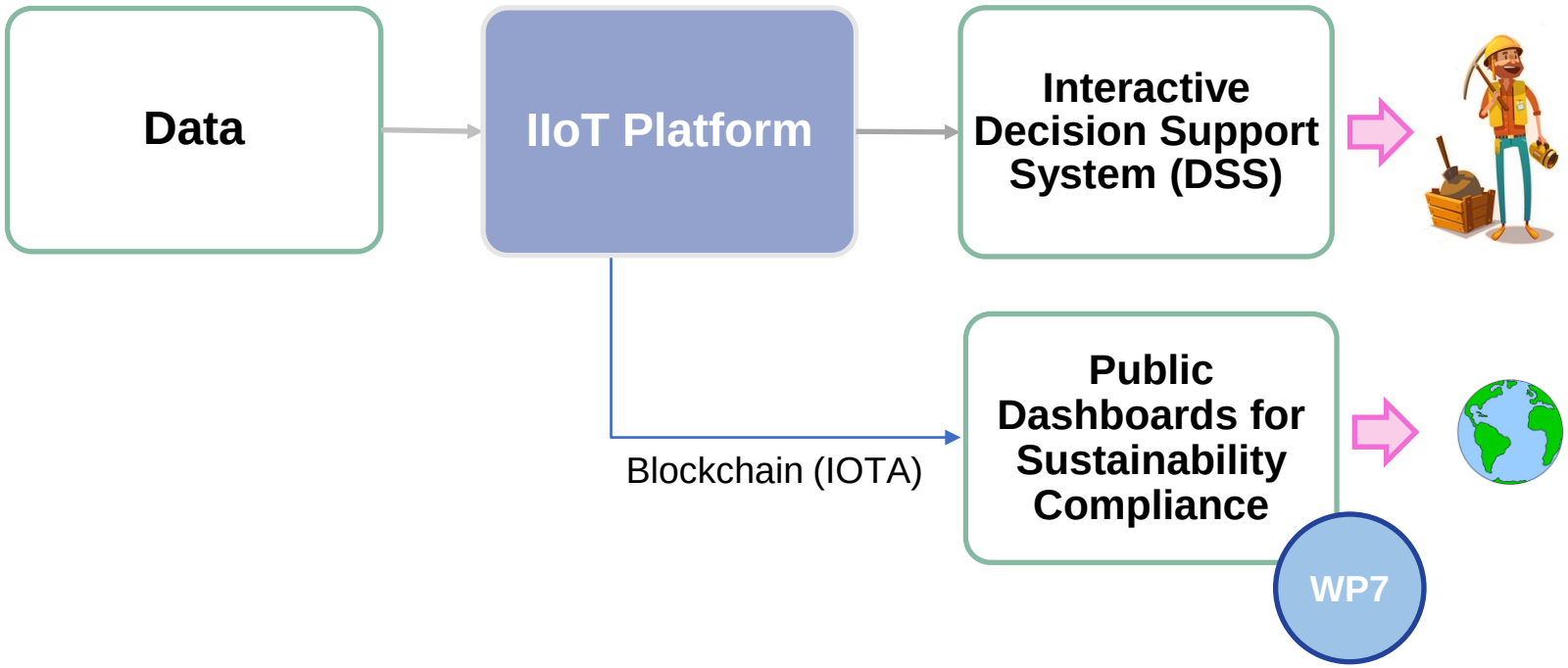
Concept



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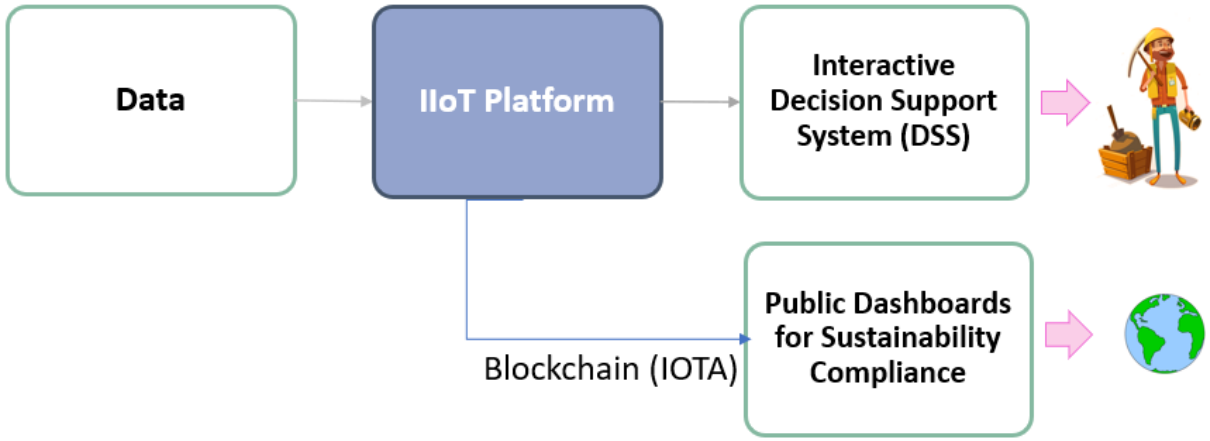
Goals



Workers:
- ↑ Health
- ↑ Safety

Company:
- ↑ Efficiency
- ↑ OEE
- ↑ ROI

Environment:
- ↓ Mining impact

Community:
- ↑ Trust in Mining

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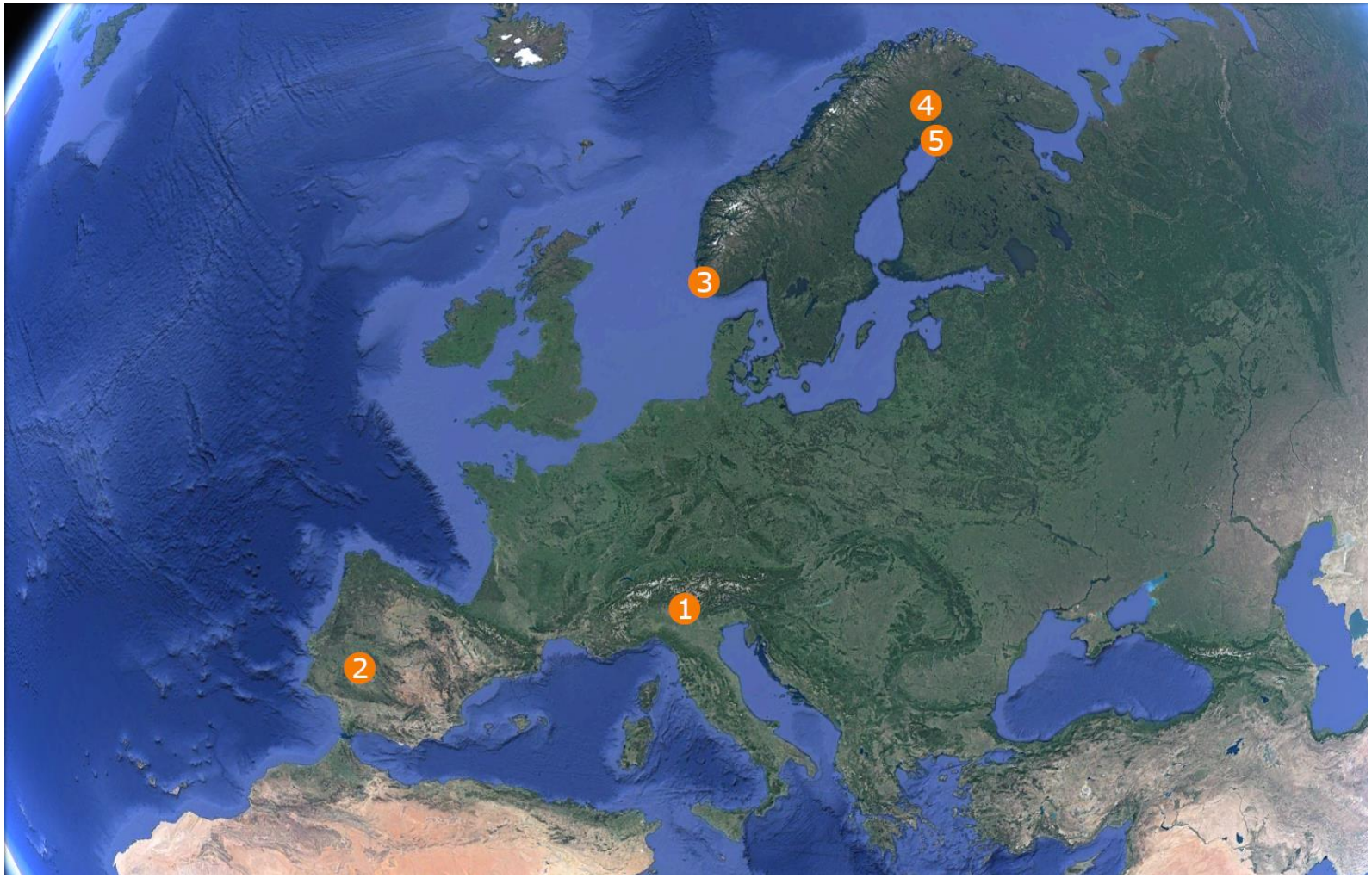
Use Cases

1. Marini
2. La Parrilla
3. Titania
4. Hannukainen
5. Kemi



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Use Cases: MARINI MARMI (Italy)

- Underground quarry
- Exclusive stones:
  - **Ceppo di Gré** (on the right) is a monogenic dolomitic breccia.
  - **Nuvolato di Gré** (on the left) is a sedimentary, carbonatic, veined and breccia textured.

MARINI 1897

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Use Cases: MARINI MARMI (Italy)

- Underground quarry
- Exclusive stones:
  - **Ceppo di Gré** (on the right) is a monogenic dolomitic breccia.
  - **Nuvolato di Gré** (on the left) is a sedimentary, carbonatic, veined and breccia textured.

MARINI 1897

- **Challenges and Needs:**
  - Safety of personnel.
  - Air quality.
  - Unplanned downtime.
  - Waste.

- **How Dig_IT addresses the needs**
  - Dig_IT predictive operation.
  - Predictive maintenance agent.
  - Dig_IT EHS online monitoring.
  - Smart Garment.

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Use Cases: LA PARRILLA (Spain)

- Open-pit
- Tungsten mine

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Use Cases: LA PARRILLA (Spain)

- Open-pit
- Tungsten mine

- **Challenges and Needs:**
  - Lack of maintenance.
  - Overall slope angle .

- **How Dig_IT addresses the needs**
  - Dig_IT geotechnical DT component.
  - Monitoring the main parameters of the slop behaviour .
  - Providing the framework for decision making based on the requirements .

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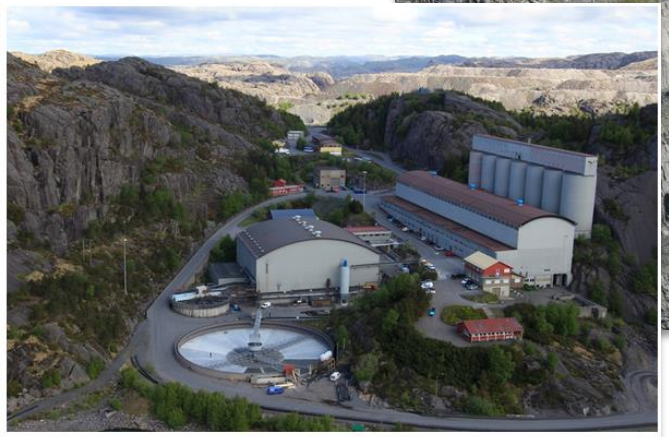
Use Cases: TITANIA (Tellnes mine, Norway)

- Open-pit
- Ilmenites

TITANIA
- a KRONOS Company

Jøssingfjord Drying plant



Hommedal Mineral Processing plant

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Use Cases: TITANIA (Tellnes mine, Norway)

- Open-pit
- Ilmenites.

- **Challenges and Needs:**
  - Water discharge monitoring.
  - Slope stability.
  - Personnel safety and equipment security.
  - Predictive maintenance of mine equipment.
  - Overall operation monitoring and scheduling

- **How Dig_IT addresses the needs**
  - Dig_IT EHS online monitoring.
  - Dig_IT geotechnical DT.
  - Dig_IT will assess the feasibility of implementation of POM.
  - Dig_IT smart scheduling component.

TITANIA
- a KRONOS Company

Jøssingfjord Drying plant

Hommedal Mineral Processing plant

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Use Cases: KEMI (Finland)

- Underground mine
- Chrome

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Use Cases: KEMI (Finland)

- Underground mine
- Chrome

- **Challenges and Needs:**
  - Real-time information on machine operation.
  - Air quality in vehicle cabins
  - Mine's air quality at work sites

- **How Dig_IT addresses the needs**
  - Dig_IT geotechnical DT component.
  - Air quality information.
  - Dig_IT EHS online monitoring.

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Use Cases: HANNUKAINEN (Finland)

- Open pit mine
- Iron concentrate & Cu-Au concentrate

TAPOJÄRVI

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Use Cases: HANNUKAINEN (Finland)

- Open pit mine.
- Iron concentrate & Cu-Au concentrate.

- **Challenges and Needs:**
  - Lack of digitalization of OEHS.

- **How Dig_IT addresses the needs**
  - Dig_IT develops and tests EHS online monitoring.
  - Sustainability compliance Labelling (SCL) will be envisioned online.

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Use Cases: tecnologies summary

Table 1-4 Use-case scenario validation chart

Dig_IT technologies	Dig_IT Use Cases Validation				
	MARINI	LA PARRILLA	TITANIA	KEMI	HANNUKAINEN
IIoT Platform	✓	✓	✓	✓	✓
Cyber Security Layer	✓	✓	✓	✓	✓
RT DT- Geotechnical	✓	✓	✓		
RT DT FD Risk Maps	✓		✓	✓	
RT DT Assets			✓	✓	
Big Data optimisation		✓	✓	✓ (2)	
Smart Scheduling		✓	✓		
Sustainability Compliance			✓		✓
Smart Garment OSH	✓		✓	✓	
Online OHS measurements	✓		✓	✓	
Online measurements ambient environment	✓ (1)		✓	✓	✓
Predictive Operation	✓		✓	✓	
Predictive Maintenance	✓		✓	✓	
Intelligent toolbox for OHSE	✓		✓	✓	
Business Intelligence	✓	✓	✓	✓	✓
(1) Only measurements required to support RT DT FD (2) Only data analysis to support RT DT Assets					

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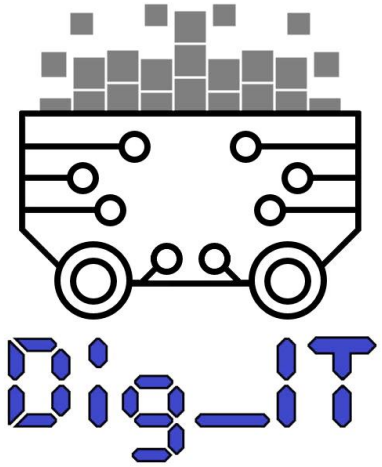

A Human-centred Internet of Things Platform for the Sustainable Digital Mine of the Future

Thanks for your Attention

http://digit-h2020.eu/

https://www.linkedin.com/company/digitproject/

https://twitter.com/digitproject

https://www.facebook.com/digitproject2020

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