INTELLIGENT ASSET MANAGEMENT FOR OPERATION AND MAINTENANCE BY USING DIGITAL TWIN OF RAILWAY SYSTEM

Rail Infrastructure Asset Management Summit

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AIM!

MAKING A RAILWAY SYSTEM DIGITAL TWIN FOR INTELLIGENT ASSET MANAGEMENT

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WP6

Digital twin for railway asset management.

1

STEP 1

Setting the requirements to make a digital twin of railway system for operation and maintenance sectors.

2

STEP 2

Architecture of infrastructure network's system digital twin, Making a skeleton of this digital twin and a data model.

3

STEP 3

Data acquisition from different sources and processing.

4

STEP 4

Data visualisation Dashboard for decision-making.

5

STEP 5

Use cases for asset management.

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STEP 1

Setting the requirements to make a digital twin of railway system for operation and maintenance sectors.

AMBITION

- Have more train, which arrives on time and safe.
- Carry out asset management for our railway assets.

Design	Build	Operating	Maintenance
+ Designers + Assets managers Decide and design the works should be carry out on the infrastructure.	+ Work company + Project Manager Carry out the work to be done on the infrastructure.	+ Assets managers + Operators + Maintainers Ensure system reliability and availability.	+ Assets managers + Maintainers + Operators Ensure the maintenance of the railway network.
Short comparing to other phases	Relatively long	Too long	

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STEP 1 - 1

Setting the requirements to make a digital twin of railway system for operation and maintenance sectors.

DÉFINITION OF THE DIGITAL TWIN

A digital twin is a digital replica of a physical system that connects with railway infrastructure and working practices. Its input comes from the reference databases and sensors fitted in the infrastructure that serve to keep this data up-to-date in real time throughout the system lifecycle.

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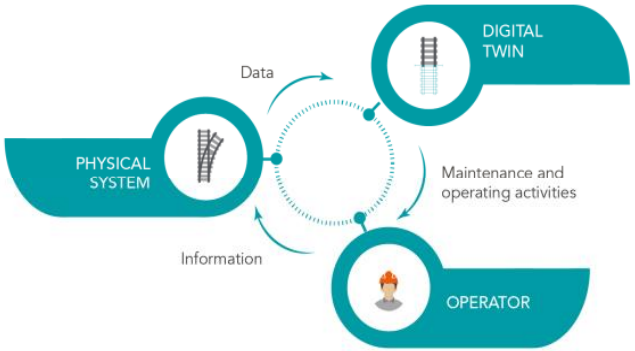

Interaction between physical system, digital twin and operator.
aims to a global cyber physical system (CPS)

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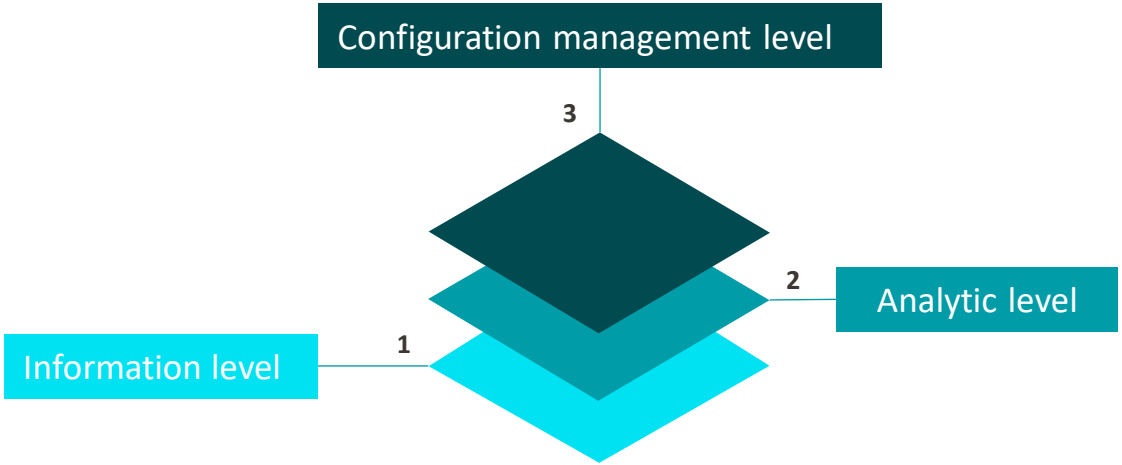
STEP 2

Architecture of infrastructure network's system digital twin, Making a skeleton of this digital twin and a data model.



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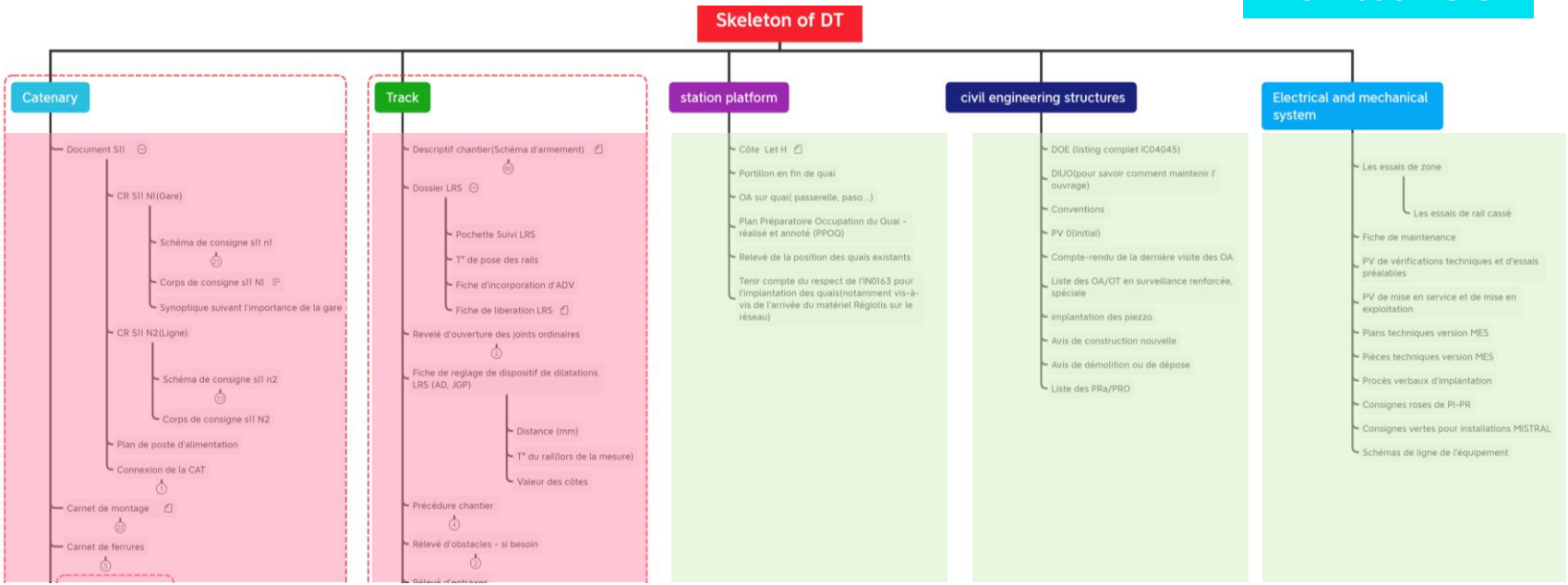
STEP 2 - 2

Architecture of infrastructure network's system digital twin, Making a skeleton of this digital twin and a data model.

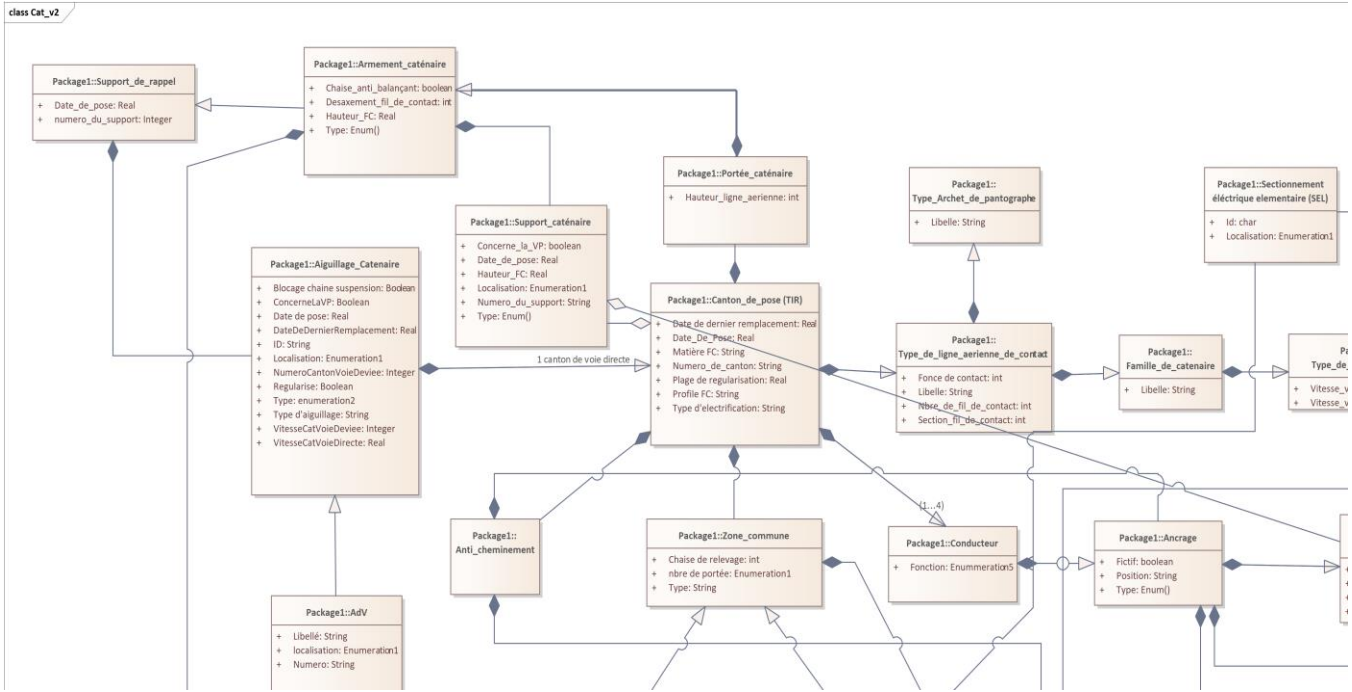
Information level



STEP 2 - 3

Architecture of infrastructure network's system digital twin, Making a skeleton of this digital twin and a data model.

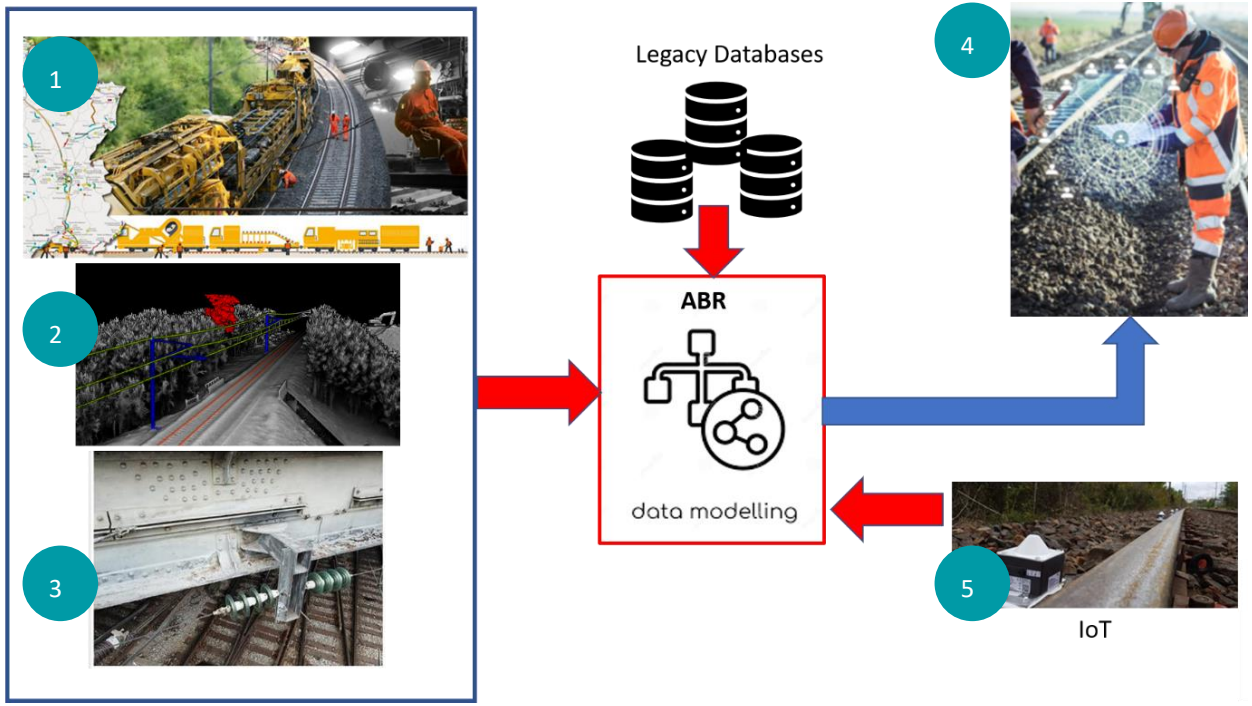
Data model for Track and catenary model.



Catenary data model

STEP 3

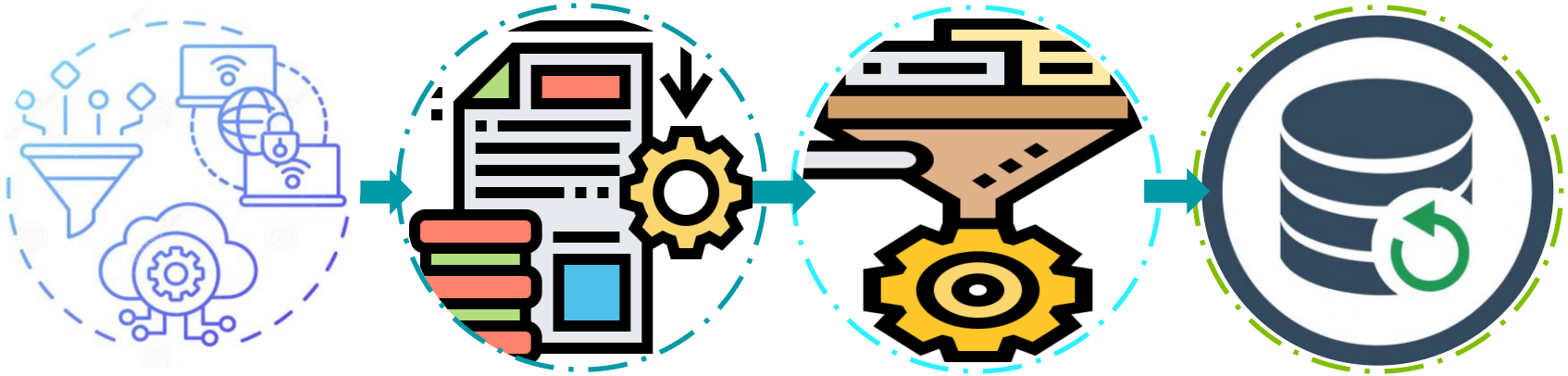
Data acquisition from different sources and processing.



1. *Track and catenary High Output Renewal train*
2. *3D points cloud*
3. *Drone pictures*
4. *Operator on site*
5. *IoT, sensors*

STEP 3 - 1

Data acquisition from different sources and processing.



Data collection

Collecting different information from different data sources.

Structuring data

Organize data for easier processing.

Processing data

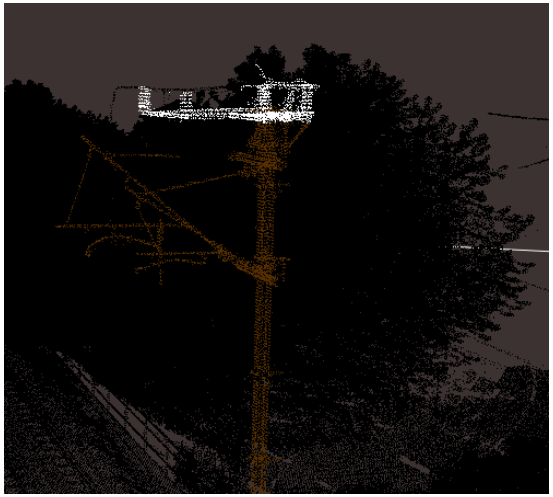
Extract information from raw structured data.

Updating databases

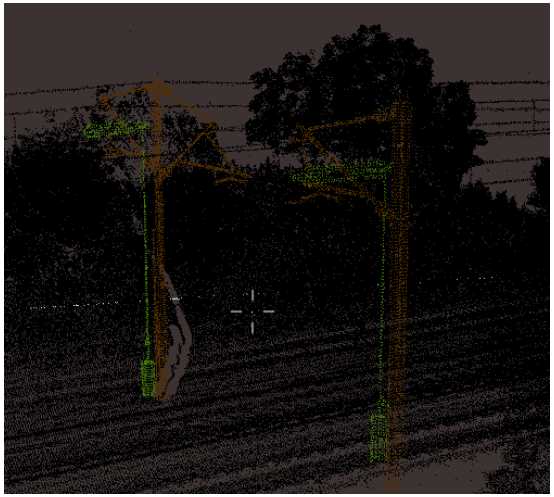
Update the digital twin databases.

STEP 3 - 2

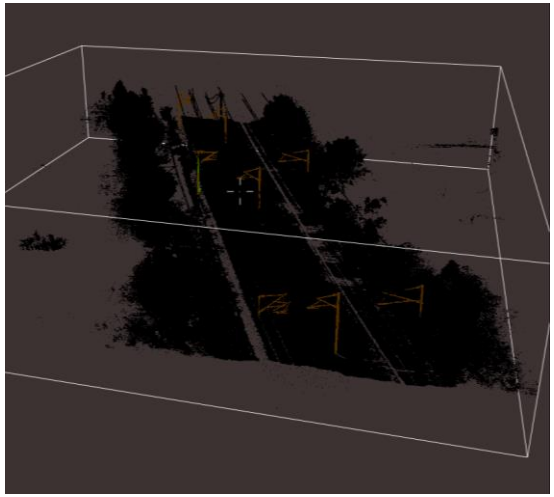
Data acquisition from different sources and processing.



Interrupting device



Tensioning equipment



Catenary pole

Example of 3D point cloud data processing

Deep Learning for Object Detection in Point Clouds

STEP 4

Data visualisation Dashboard for decision-making.

STEP 5

Use cases for asset management.

Asset Management covers all the activities of an organization which contribute to optimize the risks, the costs, and the performances of physical assets, regarding its strategic and business objectives.

The asset manager, based on the digital twin updated may have several possible services depending on its needs.

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Data collection | Data structuring | Data processing | Update the DT

STEP 5

Use cases for asset management.

Before work

AS IS

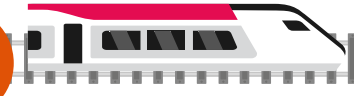
During work

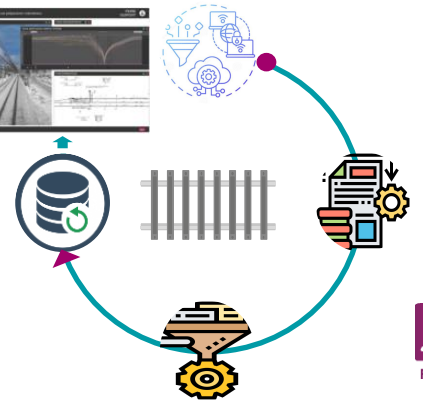
After work

DT for IAM

The asset manager can see all new changes after construction and compare them with what was designed at the beginning.

AS Build





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MORE DETAILS

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