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Linear infrastructure efficiency improvement by automated learning and optimized predictive maintenance techniques

INFRALERT Deliverable D3.1 **Summary Sheet**

DELIVERABLE TITLE:

D3.1 Segregation of linear asset information in different hierarchies for nowcasting and forecasting

WORK PACKAGE:

WP3. Asset Condition

- **T3.1.** Hierarchy of condition information

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EXECUTIVE SUMMARY:

This deliverable explains the needs and challenges of a linear asset. Typical linear assets include roadways, railways, cables and pipelines. This deliverable gives examples of the various types of linear assets and defines the relevant terminology. It explains the tasks of the asset manager, as well as the use of referencing and segmentation.

Several topologies in the literature identify the taxonomies of different types of linear assets: ISO 14224 for pipelines; MIMOSA architecture for roadways or railways; RailTopo for railways; standards from department of New South Wales for roadways. These are explained in the deliverable.

The case studies describe the assessment of condition by accessing maintenance records and work orders. In condition monitoring, the linear assets are segmented to identify the hierarchical taxonomy and the relations among their various component assets. This procedure helps to monitor and utilise different technologies for carrying out maintenance.

The prediction of the asset condition can be categorised in two ways: nowcasting and forecasting. Nowcasting methods are used to identify faults that will lead to failure within a few hours; this is done for safety reasons and also to extend remaining useful life (RUL). Several inspection methods and Non Destructive Testing (NDT) techniques can be used to identify weak locations within the linear asset. This deliverable suggests several techniques for a railway linear asset.

Forecasting can be useful to assess the condition of a linear asset for the remaining useful life in the long run. Condition monitoring techniques can find the degradation of the component and extrapolate it to the operating conditions using different types of methods. There are three types of methods to quantify remaining useful life: data driven, symbolic and physical models. Data driven methods are purely based on the data acquired by sensors; they carry out classification and clustering techniques to identify anomalies. Symbolic methods make use of work orders and other empirical records of maintenance

activities to identify the condition. Finally, physical methods exploit the physical structure of the component to analyse degradation. The combination of symbolic, data driven and physical models into hybrid models is demonstrated to be a good solution for nowcasting and forecasting of asset condition.

There are different performance indicators defined and further segregated on the hierarchical structure of linear infrastructures. The different stakeholders in railways and roads are provided in this deliverable, in particular those who are responsible for decision making and make use of condition indicators. The mapping is carried out for end-users with hierarchical linear asset infrastructure by mentioning each of different performance indicators. By combining the information, the mapping of end users and infrastructure asset hierarchy with conditional factors for both nowcasting and forecasting is provided.

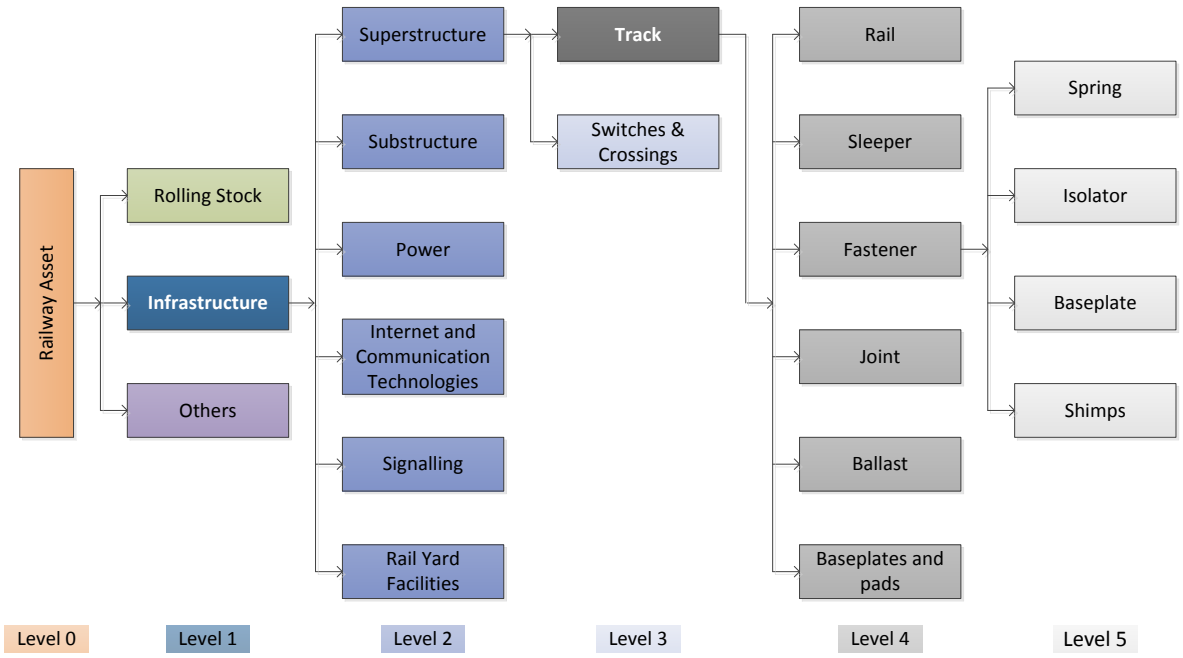

Figure 1. Hierarchical representation of railway infrastructure

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