



# Decision Support for Rolling Stock – Infrastructure Cooperation in the UK

Demonstration Scenario 2 of the InteGRail Project

Integration of information is key for further growth of railway transport volume. InteGRail defined a standard approach for architecture and communication. Using this standard approach a number of example applications were developed. InteGRail has chosen three demonstration scenarios where the chosen methodology proposed by InteGRail is shown to work, the developed functions are demonstrated and proven and that these functions demonstrate the potential to improve the performance of Railway operations.



## Railway processes in Demonstration Scenario 2: Decision support for Rolling Stock - Infrastructure co-operation in the UK.

This demonstration scenario was specifically aimed at dealing with two issues from the UK perspective: the interoperability of information systems within the domain, including the integration of data from those systems; and the accessibility/availability of data, providing maximum benefit from existing resources, to support decision making processes.

The main objective is to demonstrate that these systems, of which there are various types, can be integrated using a standardised technological solution, i.e. the semantic web. The Railway Domain Ontology<sup>1</sup> (RDO) was proposed as a solution for the transport and integration of data from these systems. In this approach the ontology became the information standard to which applications could subscribe in order to exchange data. DS2 aimed at using the available technology (the Web, the Ontology Web Language (OWL), reasoner application (Pellet<sup>2</sup> or RacerPro<sup>3</sup> or other) and a Service Oriented Architecture (SOA) to demonstrate the solution.

In the current prototype, Wheel Impact Load Measurement systems (WILM), Hot Axle Box Detectors (HABD), train movement loggers, vehicle borne track monitors and on vehicle borne Train Management Systems (TMS) are considered. The demonstration aims to illustrate that different systems, producing similar data - such as WILD and HBD, can use the same ontology model. In addition, the extensible features of the approach means that news systems can be appended without the disruption of a major re-design. This is proposed as major benefit over database approaches.

<sup>1</sup> See *Railway Domain Ontology fact sheet*

<sup>2</sup> <http://pellet.owldl.com/>

<sup>3</sup> <http://www.racer-systems.com/>

## Who can benefit?

Using the tools created in Demo 2, the Infrastructure Operator or Maintainer can receive an integrated view of the status of the infrastructure that is driven by track side and vehicle side monitoring systems. This enables decision

making to be based on all of the measurement data that is available. This can be viewed through the Event Analyser Application.

From the Train Operator/Maintainer perspective, the status of the asset can be derived from both on board systems and line side monitors. This is believed to be a step in right direction for the industry as this type of integration was not available prior to Integrail.

The Event Analyser is a simplified graphical user interface intended to demonstrate what can be achieved through a basic ontology integration. It should be noted the underlying application is the focus. A stakeholder can apply this approach to suit their own requirements, creating their own front end to display results.

The target audience of DS2 is big players who have multiple information systems and wish to standardise the approach to information integration. Information systems vendors who aim to sell systems to the industry may also benefit from creating an interface which subscribes to a pre-defined ontology. It is foreseen that this would make the system more desirable to the user.

### How is the benefit realised?

The important feature of DS2 is the underlying reasoning application. Currently in DS2, the ontology contains rudimentary ontology concepts. However, the ontology also captures logic that enables the recognition of data concepts by an application, and also the inference of the consequences of the appearance of those data concepts. This means that the relationship between components, functions and measurements can be stored in the ontology model and the context of measurements, stored in logic, can be used at run time. The aim is to show that tacit information, used by domain experts to problem solve, can be captured and used autonomously in the decision making process. The demonstration of this feature was one of the key aims of the InteGRail research.

The value of this feature can only be realised through the concerted effort of industry partners to test and further develop the available applications.

### Present status, availability and future possibilities

Currently DS2 has working applications – Event Analyser, Wheel Trend Analyser and Track Trend Analyser<sup>t4</sup>. However the scope of these applications has been limited by concerns over data sharing and security. It is foreseen that partners who have understood the requirement for and benefits of a standard for information interchange will pick up where InteGRail started. Therefore, in future it is hoped that the potential of the technology researched in DS2 will be realised by these partners.

<sup>t4</sup> See individual fact sheets for application description

#### Other results of InteGRail

Architecture definition of integrated information systems: IGRIS

Semantic data structure of the railway domain, the InteGRail ontology

Example user applications: ODSS for on-line operational decision support, IAC for on-line infrastructure availability, IDT for on-line vehicle maintenance information

Description of interdependence of performance of railway processes: the railway KPI tree, and a tool to assess and visualise performance

#### InteGRail - Facts and Figures

InteGRail started on 1/1/2005 and ends on 31/12/2008

Total project budget: 20 million Euros

EC funding : 11 million Euros

Total effort over 125 person-years

39 partners from 11 countries

### Partners of InteGRail:

UNIFE • Alstom Transport • AnsaldoBreda • Bombardier Transportation • Siemens Mobility • UIC • Trenitalia • D'Appolonia • TSB-FAV • DeltaRail • ATSF • CAF • Nortel Networks • Laboratori Guglielmo Marconi • FAR Systems • MER MEC • Italcertifer • ATOC • České dráhy • MAV • UNICONTROLS • Strukton Railinfra • Deuta-Werke • Heriot-Watt University • IMEC • OFFIS • Televic • Seebyte • Kontron • University of Chile • INRETS • Wireless Future • University of Birmingham • ADiF • RFF • ARGE Corridor X • Network Rail • ProRail • SNCF

### More information:

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