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**Project[1] Number:** 672265

**Project Acronym:** WARNTRAK

**Project title:** Rail track monitoring system - Wireless Autonomous On-Board System measuring vibration with continuous reporting to reduce maintenance costs and enhance reliability and safety

http://cordis.europa.eu/project/rcn/197947_en.html

Railways today must battle between the demands of ever increasing operations and the corresponding rising maintenance workload that follows - more passengers or freight means more trains, more mileage, more asset wear, more maintenance and therefore less time in the timetable to deliver the increased services. The traditional approach of operate during the day and maintain at night have been under threat since the resurgence of freight services but the situation going forward means a new approach will be necessary. We must look to maintaining assets when their condition requires it and not based on a one-size-fits–all approach based on time or mileage

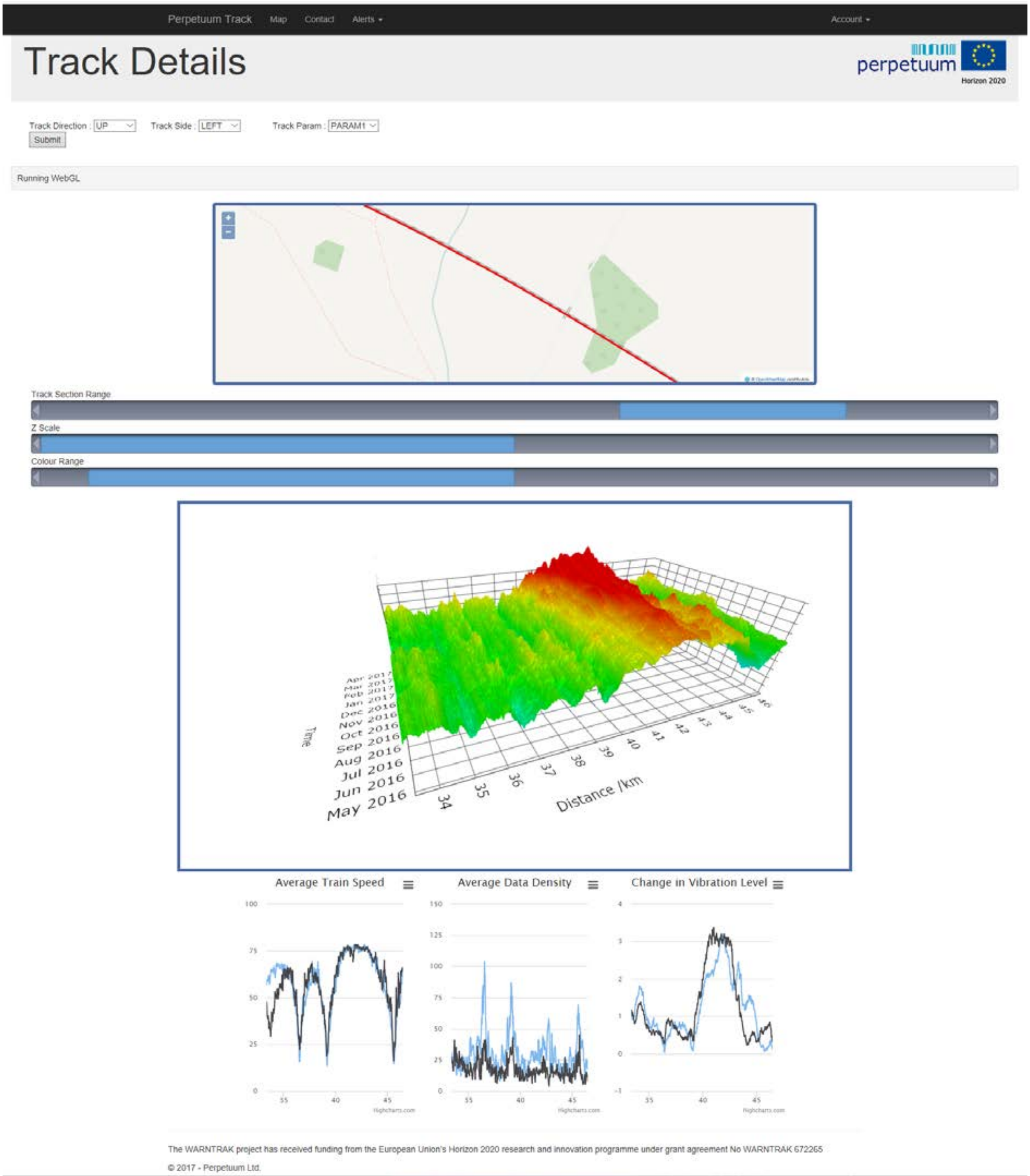
Track maintenance is particularly disruptive for obvious reasons. Track asset condition is monitored principally through two methods – specialist measurement trains and manual inspections. Both of these require dedicated access to the railway and displace revenue generating services. They also provide two very extreme levels of inspection – an infrequent, network wide, highly accurate, fully loaded operation from the measurement train, and a more frequent, low accuracy, small scale, unloaded operation from the track teams. Another consequence of the complexity of track works is that they are often postponed until the “11th hour” in a bid to buy time to identify priorities between the competing programmes of work. Sadly prioritisation cannot be done on a real-time factual basis due to the operational conflicts mentioned above – meaning poor prioritisation of work, inefficiencies and therefore a lower all round quality of track condition than would have been achieved if the rate of deterioration and location was known months in advance.

By mounting vibration sensors to the unsprung areas of passenger and freight units, information on the actual condition of the rail, track and trackbed across the network can be communicated to the maintenance teams in real time and months ahead of any urgent corrective measures, resulting in huge cost savings and considerably enhancing passenger safety. Instrumentation using this principle is being deployed by Perpetuum today for axle bearing and wheel condition monitoring, using the same core components and so has been technically de-risked. Extracting specific track related information, and accurately interpreting that information so that appropriate remedial work can be scheduled without direct (manual) track inspection is a new and exciting application for this data stream. In addition to the savings in track maintenance, track inspection team safety will be improved and measurement trains can remain doing what they are designed for – very detailed infrequent audits of the infrastructure asset status.

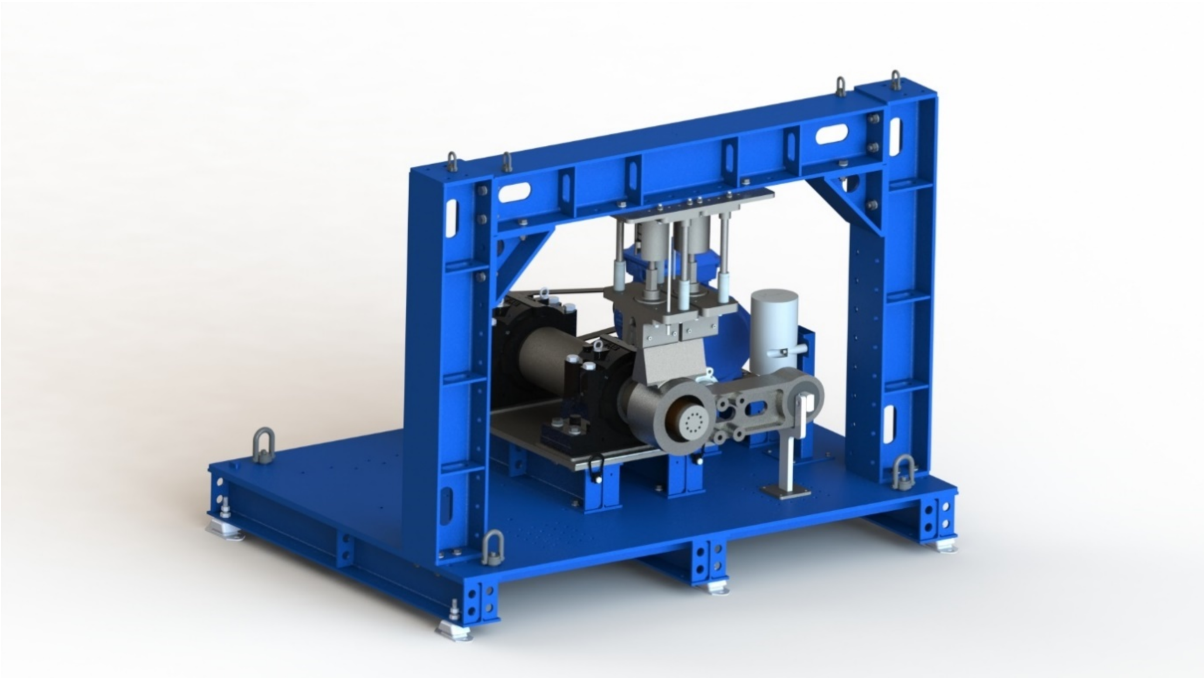
In all cases the asset condition information must be completely reliable, simple to interpret so that it can be acted upon immediately – there is a critical distinction in this market between communicating data and providing information. Users are not expected to have specialised skills to use the information and the products have been designed to be maintenance free. System outputs should therefore fit seamlessly into the users existing processes.

The objective of this work is to provide real time information on track condition derived from axle box mounted vibration sensors. The visible output of the project will be a usable data stream, with rigorous analytical backing from a number of physical and numerical modelling tools that will be used to build our understanding of how bogies react to track defects, and how axle box mounted sensors respond.

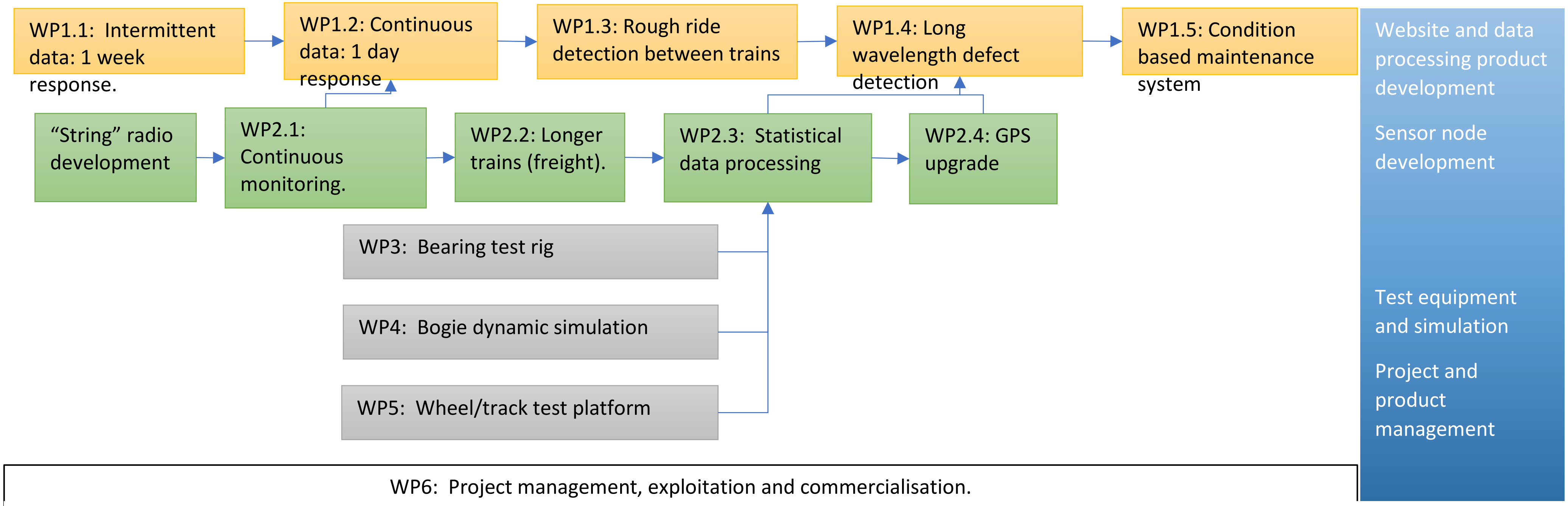
In parallel with development of data processing and modelling, the sensing and communication capabilities of the sensor nodes will be extended to provide continuous data from much longer trains. The existing product, which is optimised for passenger unit bearing and wheel condition monitoring, is limited to short range communication and intermittent reporting, which increases the response time of the track monitoring system.




*Example webpage output, showing long term localised trends in rail condition*



*Bearing test rig for characterising vibration under load and at speed.*




*Project diagram*