Technology Strategy Board
Driving Innovation

Results of competition: Enabling the digital railway - Collaborative R&D competition

Total available funding for this competition was £8.6m from the Technology Strategy Board and RSSB

Note: These proposals have succeeded in the assessment stage of this competition. All are subject to grant offer and conditions being met.

Participant organisation names	Project title	Proposed project costs	Proposed project grant
Aimes Grid Services Community Interest Company (lead) Containerport Limited Glow New Media Limited Placr Limited BT PLC	i-TRACS (Internet-based Train and Railway Applications Collaboration System)	£733,950	£430,308

Project description (provided by applicants)
The i-TRACS project will build a new and innovative three-tier demonstrator for the rail industry in which strategic data sets will be ingested into an open-access and interoperable platform, upon which a number of 'apps' will be created to improve both the operations and customer service for train operating companies and freight operating companies. The project will demonstrate the concept of a digital 'ecosystem' in which value will be created by a community of app developers using a range of data sources and hosted on a resilient and cost-effective platform. The initial use cases will be in container freight transport, passenger transport and transport service analytics, and the project will be carried out in Liverpool in collaboration with Freightliner Ltd and with Merseyrail Ltd.   The data layer will include GPS data from hauliers and container consignment data from shipping lines, real-time train location data from Network Rail and passenger location data in the form of off-call mobile data from INRIX. The interoperable information platform will be provided by BT, based upon their Information Spine technology, and the project will be hosted at the AIMES ISO 27001 data centre campus at Liverpool Innovation Park. Applications will be developed by the consortium partners who include Containerport Ltd, Glow New Media Ltd and Placr Ltd, to optimise inter-model container operations, to provide improved end-to-end journey information to passengers and to create new analytics services for rail operating companies.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
Avonwood Developments Limited (lead) Avanti Communications Limited University of Birmingham	Intelligent Rail Defect Detection and Reporting in Real-time via Electromagnetics (i-R3D2)	£1,254,568	£787,535
Project description (provided by applicants)			
Rail flaw detection is of paramount importance for the safe and reliable operation of rail networks. The Intelligent Rail Defect Detection and Reporting in Real-time via Electromagnetics (i-R3D2) project is aimed at developing an integrated rail defect detection system capable of complementing existing non-destructive techniques. The project will employ advanced data management and predictive analytics to provide rail maintenance personnel with timely rail defect information to enhance rail maintenance effectiveness, as well as improve efficiency and safety. The project is led by Avonwood Development Ltd, in partnership with Avanti Communications Ltd and Birmingham University.			

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Balbour Beatty Rail Limited (lead) Zircon Software Limited Nomad Digital Limited University of Huddersfield Heriot-Watt University Newcastle University	Drone train	£1,225,006	£790,150
Project description (provided by applicants)			

This project will demonstrate a solution which takes time based data in close to real time and broadcasts off measurement trains to a cloud and (in parallel) the facility for a measurement train to be managed remotely (whilst being hauled by a manned traction unit), i.e. the operator can be in any remote centre. One operator team can then manage many measurement vehicles around the world. Data quality from unmanned vehicles will be improved, crew costs reduced and data access improved. Analysis will be carried out in the cloud: more than one analysis can be used, and the results distributed. Fault reports, statistics and alerts are taken from the cloud by users with mobile apps or office systems. More than one display tool can use the data, and the users can be anywhere in the world; in an office or on the line side.

This combination of features, as well as improving the efficiency of the national railways, has the potential to change the way in which this technology is delivered and will allow access to the type of technology for smaller organisations such as tram and light rail infrastructure operators. It is envisaged that the creation of this rich dataset, and controlled access to it, will act as a stimulus for future system and product development from both within and outside the consortium.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
CISCO Systems Limited (lead) Telent Technology Services Limited Workware Systems Limited Abellio Transport Holdings Limited	The station of the future: Providing an integrated passenger and consumer experience	£1,932,468	£986,076
Project description (provided by applicants)			

Working with Network Rail, the project will deliver 21st Century station facilities, responding in a unified manner to the connectivity demands of four functional groups: security providers, operators, retailers and travellers. It will converge discrete, separate communications and mobile subsystems in a station to create a single, IP infrastructure to develop and test a holistic architecture called Stations as a Service (StaaS). StaaS empowers a step change, and provides an open architecture needed to unlock future investment and innovation in the UK Rail Sector. StaaS deliver benefits from a convergence of various systems & technologies: building management, Internet of Things and Big Data. It enables operators to move from closed systems and networks which have impacted the rail sector negatively to a cooperative shared structure. It creates a new management and commercial model for future stations, and provides a blueprint to improve customer experience as data and its value becomes visible and exploitable.

StaaS will support innovation in the four main stakeholder functions: security, real-time operations, commercial estate and passenger service innovation. The project will develop a StaaS architecture based on clear user-scenarios. The involvement formally of Abellio and the self-financing observer status of Network Rail and Scotrail provides the window of opportunity to develop and demo StaaS eco-systems. The project will be open and allow other UK SMEs to innovate on the StaaS platform ensuring the reference architecture is extensible.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
Datasys Limited (lead) Manchester Metropolitan University First Greater Western Limited	Rail incident manager	£882,447	£618,215
Project description (provided by applicants)			

Improved levels of customer satisfaction and operational safety are two of the most prolific challenges facing the UK's rail industry. The lack of information and its timely communication in particular remain universal themes in passenger satisfaction surveys. Much can be attributed to the mechanisms for the recording and reporting of incident and quality information by rail personnel, with no current system allowing for the capture of information from mobile devices, limiting the ability to supply real-time information.

The project consortium, which comprises Datasys (supplier of railway management software), two departments from Manchester Metropolitan University (MMU) - which include specialists in behavioural economics and in app development - and First Great Western Limited, aim to develop a novel rail incident management technology, based around two applications for use in mobile devices. The first application will be designed as an interface for the passenger, enabling them to report any issues associated with the railway network, as well as a means of receiving automatic updates about their journey. The second application will be designed for rail staff to record and report any service/safety critical/quality issues in real time.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
Guidance Navigation Limited (lead) Rail Vision Europe Limited Oxford Mobile Robotics Group Network Rail Limited	High speed railway asset mapping system using enhanced 3D imaging and automated visual analytics	£1,606,620	£1,120,291
Project description (provided by applicants)			
This project aims to prove the feasibility of producing a high-impact advance in surveying of the railway network, through the development of a novel device capable of high-speed asset monitoring and automated asset identification for the railways. It is aimed to support the work of Network Rail and their sub-contractors who require detailed asset maps of the rail infrastructure. The project builds on recently patented IP from Oxford University Mobile Robotics Group. The combination of laser scanning and HD camera hardware will combine with satellite navigation systems to create a 3D topometrically correct asset map of the rail network, which is automatically analysed with the latest visual analytics techniques. Trial units will be developed and outputs displayed.			

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
Laing O'Rourke PLC (lead) WS Atkins Plc Imperial College London DHP11 Limited	Digitally enabling electrification	£1,120,785	£676,837
Project description (provided by applicants)			

The aim of the 'Digitally enabled electrification' project is to develop an integrated digital electrification delivery solution for Overhead Line Equipment (OLE). It will do this by analysing and streamlining current practice and requirements for the data exchange interfaces and process involved. This promotes the government's £310bn infrastructure plan, Construction Strategy for the use of Level 2 Building Information Modelling (BIM) by 2016, intelligent asset management as identified in the Rail Technology Strategy (RTS) and the 'asset themes' within the Network Rail Technical Strategy (NRTS). In order to drive the ability to reduce infrastructure and operations costs, the project will research and leverage emerging digital technology available to establish and map the survey, design, manufacture and on-site assembly, and delivery processes, and enable integration of each from the currently fragmented sub-processes.

Digital models can then be used to inform decisions, reduce design and construction risk and, once commissioned, will enable effective asset management of not only the OLE elements but also the related civils, power supply and programme management. The team will include Laing O'Rourke (a major UK civil engineering enterprise and manufacturer), Atkins (a worldwide consulting firm), Imperial College (leading on surveying technology and data integration) and DHP11 (software developers for infrastructure and utility organisations).

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
Omnicom Engineering Limited (lead) Cybula Limited University of Huddersfield University Of York	Asset Monitoring Platform (AMP)	£805,316	£564,582
Project description (provided by applicants)			

With a large, distributed asset base, the rail industry is eager to use advances in condition monitoring (CM) to achieve its efficiency, safety and service goals. There is no shortage of new monitoring techniques, but these often fail to achieve their aim of reducing operational down time by driving proactive maintenance due to a silo approach to data management, generation of large data sets rather than information and limited prognostic analytical tools.

This proposal aims to combine a range of recently available computing technologies to deliver a web-based portal within which software written in any computing language for any operating system can be run as a service. Whilst web portal technologies have been available for some time, this new level of flexibility will allow users access to a range of current, legacy and in-development services at relatively low cost, allowing for rapid evaluation and adoption of technology.

The proposed project consists of two key elements: 1) Development of a web-based, diagnostic platform for railway infrastructure asset monitoring, and 2) A demonstrator showing how the asset monitoring platform (AMP) can be used to improve the forecasting of track condition based on the use of track geometry data.

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Tedipay (UK) Limited (lead) General Information Systems ltd ECEBS LIMITED GuestLogix Europe Limited Imperial College London Global Travel Ventures Limited	MultiPass - an integrated multi-interface platform for smart ticketing to provide seamless multi-modal travel and increased revenue collection	£1,761,431	£1,086,325
Project description (provided by applicants)			
MultiPass is an 18-month, collaborative project, which will implement an integrated, low-cost multi-protocol smart ticketing and digital uber-wallet platform. MultiPass will provide seamless multi-modal travel for passengers and tourists, together with reduced Opex and increased revenue collection for transit operators. MultPass will integrate several proven technologies (incl. ITSO, EMV, NFC, cloud TVM and BLE) into a single end-to-end platform, which will comprise low-cost, easy and cheap to install, station-based hubs, cloud-based server/services and passenger-carried smart cards. MultiPass will uniquely solve key transit operator & DfT problems: Capex and Opex reduction via remote delivery and validation of ITSO-compliant tickets, improved fare collection, capacity utilisation and customer experience via 'virtual gating', 'cloud TVM' and 'fares virtualization'. Project lead is an SME: TEDIPAY (UK) Limited. Project partners include SME organisations (GuestLogix Europe Limited, Ecebs Limited, General Information Systems Limited, Global Travel Ventures Ltd) and academia (Centre for Transport Studies at Imperial College London), plus rail operators (Abellio & Strathclyde Partnership for Transport) as access to field trials, stations and end-users and in market advisory roles. Consult Hyperion are engaged as supervisory project managers.			

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Telent Technology Services Limited (lead) London Underground Universal Pipe Enterprises Limited t/a Humaware University of Nottingham Loughborough University	Health and prognostic assessment of railway assets for predictive maintenance	£725,189	£473,772
Project description (provided by applicants)			

The objective of this project is to use Remote Condition Monitoring (RCM) data to provide a reliable and dependable health assessment of the asset, to manage asset degradation and undertake maintenance intervention at the optimum time, in advance of failure. The project will provide an open architecture system that integrates data from a number of RCM sources. Condition indicators will be derived from the RCM data, based on detection of incipient defects and trends to develop an automated approach to introducing prognostics assessment via a risk-based Remaining Useful Life (RUL). This approach will significantly improve on current state detection methods which are based on simple thresholds. The technology developed will assess the RUL via a dynamic scheduler to determine the optimum maintenance period in order to minimise the risk of failure to the asset and maximise its availability.

The project deliverable is to provide the end user with advisories (actionable information) relevant to their needs. This will ensure that 'information overload' is minimised and addresses security of information issues by only displaying information relevant to the rank and role of the user. The project will also address the process re-engineering and human factor issues resulting from the paradigm shift of moving from a schedule and demand-based maintenance management regime to a condition-based forecasting approach where static schedules and depth of maintenance regimes are replaced with dynamic processes.

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Thales Research & Technology (UK) Limited (lead) Thales Transport and Security Limited Smart Component Technologies Limited Universal Pipe Enterprises Limited t/a Humaware University of Nottingham University of Birmingham Chrome Angel Solutions Limited	A People Centred Approach to Intelligent, Proactive, Predictive (PCIPP) asset management using Remote Condition Monitoring (RCM) data	£1,544,975	£1,061,044
Project description (provided by applicants)			

PCIPP (A People Centred Approach to Intelligent, Proactive, Predictive asset management) will advance a state-of-the-art Enterprise Wide (Any asset type, Any sensor type, Any Manufacturer), Enterprise Class (Robust, Flexible, User Friendly, Scalable, Future Proof) solution for intelligent asset management that goes beyond conventional Remote Condition Monitoring (RCM) and existing systems. PCIPP will eliminate the need for asset managers to maintain multiple vertically integrated RCM systems, reduce user training needs by providing a common interface for all assets and unlock the potential of true intelligence by fusing and correlating data across multiple assets and legacy systems to create actionable, prognostic information.

PCIPP builds on the highly successful solution Thales provides to Network Rail in their Intelligent Infrastructure programme, which monitors over 22,000 assets and has removed the need for 15,000 site visits since it went live in 2009. PCIPP is structured around a human-centric design process, using capabilities from world-recognised human factors experts, ensuring that operators have access to relevant information, despite the increasing amount of data available within PCIPP. PCIPP's open architecture will enable an ecosystem to develop that will expand the range of assets covered; incorporate train, track and station data; integrate to maintenance systems; substantially increase diagnosis and prognosis capabilities and nurture a new market for the incorporation of third-party analytics modules.