

COMPENDIUM OF CASE STUDIES ON EMERGING TOPICS FOR RAILWAYS IN CAREC

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18–20 April 2018 | Istanbul, Turkey

17-е заседание Координационного комитета по транспортному сектору (ККТС)

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Case Studies Information Technologies



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IT – United Kingdom: Offering Rail Better Information System (Orbis)

- The British infrastructure manager Network Rail (NR) is investing £12bn in infrastructure renewals and £12.8bn in enhancements during the current 2014-2019 five-year funding period, and further investments are included in proposals for the next five-year plan.
- As well as new projects, NR is placing significant faith in new digital technologies through its **Digital Railway** programme to deliver the costsavings and improvements in efficiency and capacity that it is seeking. The Digital Railway was launched in 2015, and has since been updated to focus on three core areas: capacity, performance, and safety.



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IT – United Kingdom:Offering Rail Better Information System (Orbis)

- A major initiative in this area is the Offering Rail Better Information System (Orbis), NR's £330m seven-year programme to create a detailed digital model of Britain's railway network.
- Launched in 2012, Orbis is aiming to save up to £1bn over the next 10 years. And ahead of its conclusion in 2019, it is already producing encouraging results.
- Various apps and tools are now in use to capture high-quality asset data while offering new ways of viewing the railway. This includes arming track workers with iPads and iPhones to capture data on site, which is supporting NR's predict and prevent asset maintenance strategy, and informing project management planning.



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IT – United Kingdom: Offering Rail Better Information System (Orbis) RINM project

- A key component of Orbis is the Rail Infrastructure Network Model (RINM) project, the objective of which is to provide project planners and engineers with a clear picture of the entire railway network and how it relates to the wider environment from the comfort and safety of their office.
- The foundation of RINM is the National Aerial Survey, conducted in summer 2014, and which aimed to map Britain's entire 16,000km network. This ambitious undertaking required the use of both aerial surveys through overhead images and LiDAR imaging to provide a cross section of the track in order to assess potential hazards to the railway.



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IT – United Kingdom: Offering Rail Better Information System (Orbis)

- The surveys took place at more than 250m above the railway, and more than 100 terabytes of aerial data was generated, which translates into over 110,000 individual image tiles and hundreds of millions of LiDAR points.
- The RGB images cover a 50m area either side of NR's ownership area and present a true representation of the railway and its surroundings. Critically, they are available at a resolution of up to 4cm, meaning that any object larger than 4cm in diameter is visible when using the system.



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IT – United Kingdom: West Coast Main Line HealthHub™ for Trains

In 1999 Virgin awarded Alstom a contract to design, build and maintain a new fleet of high-speed tilting Pendolino trains untill 2022. Within the full maintenance contract of the 56 Class 390 trains operated by Virgin Trains, the private operator of the West Coast Mainline, Alstom strives to optimize maintenance cost, while increasing the fleet performance.





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IT – United Kingdom: West Coast Main Line HealthHub™ for Trains

2006 - Alstom has implemented **TrainTracer™** to remotely monitor the trains condition in realtime and to anticipate the needs for corrective maintenance ("pit-stop" approach), train movements and troubleshooting.

2014 - Alstom commissioned the first **TrainScanner**[™] as a data capture solution enabling predictive maintenance for wheels, brake pads and pantograph carbon strips.

2016 - a new **HealthHub** release has been commissioned utilising Alstom's rule engine. It is a webbased supervision tool providing a deeper insight into the fleet usage and its availability. Then still in 2016, Alstom has revealed a second **TrainScanner** device will be installed at Oxley depot near Wolverhampton.

Recently, Alstom has implemented its train-mounted system, **TrackTracer**, inspecting the condition of the track thanks to a laser beam and accelerometers, while the train is in revenue service.



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IT – United Kingdom: West Coast Main Line HealthHub™ for Trains

KEY BENEFITS

- Immediate access to information via a website
- Decision-making assistance for operators and drivers
- Reduced downtimes through anticipated interventions
- Decreased failures rates thanks to reliable troubleshooting based on predictive analytics
- Accurate train condition data
- Reduced manual inspections



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Chiltern Railways, train operating

company owned by Arriva Trains UK,

wanted to deliver a truly connected

IT – United Kingdom: Chiltern Railways Case Study: Free Train WiFi



Continuously Connected Passenger Journey





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IT – United Kingdom: Chiltern Railways Case Study: Free Train WiFi

Continuously Connected Passenger Journey

- The development team at <u>WiFi SPARK</u> collaborated with Chiltern Railways and Icomera, the WiFi provider for the trains, to create a totally new product to enable the passengers to enjoy continuous connectivity. Passengers only have to sign on once to access free WiFi. The WiFi automatically switches from station to train, or train to station for the passengers without them needing to authenticate again.
- In addition, as the train approaches the station, the train connectivity is temporarily offloaded onto the station WiFi, ensuring passengers have the best connection available thus reducing the 4G costs. Passengers do not experience a loss of connection.



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IT – United Kingdom: Chiltern Railways Case Study: Free Train WiFi

- WiFi SPARK completed an overhaul of 28 stations and 3 depots' WiFi provision and installed state of the art Ruckus technology to deliver premium digital connectivity. Separate networks were provided for the public and for Chiltern Railways' corporate and guest access, to ensure security.
- Passengers authenticate their free WiFi via email, which ensures that the data collected is robust. Authentication allows passengers to access the free WiFi for 365 days and upon returning, passengers will be greeted with a personalised 'welcome back' message. Passengers are then digitally connected continuously through every enabled journey with Chiltern Railways.



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IT – Germany:DB Cargo plans digital, low-noise wagon fleet by 2020

GERMANY: The DB Cargo management board has approved a 'high double-digit million' programme to fit its entire German wagon fleet with tracking, monitoring and telematics equipment.

More than 1 000 wagons are currently equipped with telematics, a further 19 000 are scheduled to be retrofitted by the end of 2018, and the remaining 50 000 vehicles would follow by 2020.

The GPS would enable more precise determination of arrival times, while monitoring equipment would provide information about the wagon's loading status, internal temperature and humidity.





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IT – Germany: DB Cargo plans digital, low-noise wagon fleet by 2020

- 'In a world of ever-increasing digitalisation, today's customers expect a high level of service. They want to know, in real time, where their freight is, when it will arrive and what condition it is in. This is why we are retrofitting our entire fleet with digital technology.' - DB Cargo CEO Dr Roland Bosch
- DB Cargo will also fit its entire German fleet with quieter brakes by 2020. Around two-thirds of the fleet has already been converted, and a further 11 000 wagons are to be converted this year.



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Automatic management systems



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AMS – Japan: Hitachi's traffic management systems



Kyoto/Kobe



Kyushu



Tokyo Area



Hanwa



Nagoya Area



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AMS – Japan: Hitachi's traffic management systems

- Hitachi's traffic management system enables station staff to communicate a wide variety of information to passengers through indicator boards to improve ridership convenience.
 - At times of disruption, Hitachi's system automatically readjusts the train's operations to recover the planned timetable as quickly as possible. If there is a serious diagram disruption, Hitachi's system can also deal with extreme diagram disrputions by interlinking updated train operation and automated passenger information with current line information.
 - The system status is monitored to ensure prompt recovery in case of failure or an accident, and functions are included to give warnings to maintenance staff if problems arise. Also, current information status can be checked to ensure that correct information is provided to passengers.



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AMS – Japan: Hitachi's traffic management systems



Tokyo Area Traffic Management System (ATOS)

Country / Area	Japan
Customer	East Japan Railway Company
Route length	Approx. 1,000 km
Number of control stations	Target lines: 17 Target stations: approx. 300
Features	Wide-area decentralized traffic management system for ultra-high-density lines.



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AMS – Japan: Hitachi's traffic management systems



Country / Area	Japan					
Customer	Kyushu Railway Company					
Route length	Approx. 1,041 km					
Number of control stations	Target lines: 21 Target stations: 210					
Features	Centralized operations management system combining management of ultra-large scale, high-density routes.					

Kyushu JACROS



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AMS – Japan: Hitachi's traffic management systems

Train Operation Management

The traffic control realizes optimum route control in case of train diagram disruptions, by automatic route setting and real-time diagram modification. The basic functions are route tracking, traffic control, and priority decision functions.

1. Automatic Route-Setting Control

Real-time Train Diagram Alterations Using Path Manipulation
 Optimized Traffic Planning and Route Setting



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Automatic Control of Signals and Switches in Accordance with the Diagram





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AMS – Spain: The ADIF Experience Sp



The Railways Infrastructure Manager (known by its Spanish acronym ADIF) is a public company with a broad experience in technologic developments and system installation. The traffic control high requirements of high-speed lines require a traffic management integrated platform. For this, the Spanish Railway Infrastructure Administration (ADIF) has a new system called "International Rail System DaVinci". At the moment, ADIF has installed this system in all Spain's high-speed lines (Madrid-Barcelona, Madrid-Valladolid, Córdoba-Málaga, etc), and is also going to be installed Spanish high-speed lines, when their in new construction is finished.



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AMS – Spain: The ADIF Experience

"International Rail System DaVinci" is one of the most advanced traffic management systems in the world, able to adapt to all kinds of railway traffic: conventional lines, underground, low traffic density railways and so on.

At present, this system is being implanted in narrow track traffic management centres (FEVE), in Medellin's subway (Colombia), etc. DaVinci platform implies an evolution in the railway environment integration, as it groups different subsystems of different technologies and manufactures in the same system.



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AMS – Spain: The ADIF Experience

Nowadays, this system integrates significant companies' subsystems:

- Centralized Traffic Control (CTC): Alcatel and Dimetronic.
- Interlocks: Alcatel, CSEE and Dimetronic.
- Wind prediction and detection: Eliop.
- Objects drop detection: Logitel and Cobra.
- Fixed and mobile telecommunications: Alcatel, Siemens y CSEE Transport.
- Energy: Telvent and Siemens.
- ERTMS System: Alcatel, Dimetronic and CSEE Transport.
- Other detection and video vigilance systems: Alcatel and Siemens.



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AMS – Finland: TAKO traffic control system

Mipro's traffic management system manages over 4000 rail track kilometres in Finland when the TAKO traffic control system is commissioned on Western Finland's track sections.

The TAKO project, Modernisation of Western Finland's remote control, covers the existing and new track sections in the area covering about a quarter of the Finnish railway network - that is about 1400 track kilometres (875 miles).

The operating area under the new system includes over 10 000 elements to be controlled and monitored; for example 1900 signals and 1250 points.





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AMS – Finland: TAKO traffic control system

INTERFACES WITH EXTERNAL SYSTEMS

- To increase automation and data transparency, the system supports interfaces to several other traffic and maintenance management systems, for example nationwide information systems for maintenance, track work, telephone and timetable management.
- The following interfaces are supported, for example:
- Power control centres
- ERP systems for marshalling yards
- Operative timetable systems
- Timetable planning systems (e.g. RailML)
- SMS (Short Message Service) and IVR (Interactive Voice Response) systems
- Train number transfer interfaces to other suppliers' remote controls
- Passenger information systems.



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Case Studies Environmental issues



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Environmental issues - Netherlands: Noise pollution from railways



Noise pollution from railways

 Railways are another major source of environmental noise in the Netherlands. That is why there are statutory limits for rail traffic noise. The authorities take measures to reduce this form of noise pollution.

Noise standards for railways

• If a railway line no longer complies with permissible noise emission levels, the responsible authority must take measures to ensure that it does, for instance by installing a noise barrier.



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Environmental issues - Netherlands: Noise pollution from railways

- Measures to reduce noise nuisance caused by freight trains
- The authorities and the private sector have taken various measures to reduce the noise nuisance caused by passing freight trains, such as:
- Rail dampers
- Low-noise trains
- LL brake blocks



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Environmental issues – Hong Kong, China: Environmental Measures for New Railway Projects

- A number of environmentally-friendly design and measures have already been put in place in the railway system in Hong Kong to enhance energy efficiency.
- Railway Alignment Optimization
- Ventilation System
- Comprehensive Energy Consumption Monitoring
- Regenerative Braking
- Power Transmission, Distribution & Conversion



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Environmental issues – Hong Kong, China: Environmental Measures for New Railway Projects

Environmentally-friendly Designs & Measures for New Railway Projects

- Enhancement of Energy Efficiency
- Reduction in Energy Loss
- Utilisation of Regenerated Energy
- Mitigation of Environmental Impacts



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Environmental issues – Hong Kong, China: Environmental Measures for New Railway Projects



Mitigation of Dust Impact

Mitigation measures will be implemented to reduce dust impact during railway construction:

- Wheels of vehicles are washed before leaving construction site to prevent dust from spreading around.
- Spoil is transported to the temporary barging point through a fully-enclosed conveyor belt (marked in red) to suppress dust.



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Environmental issues – Hong Kong, China: Environmental Measures for New Railway Projects



Mitigation of Noise Impact

Mitigation measures will be implemented to reduce noise impact during railway construction:

• Water was used as blast ballast in the excavation of the construction adit of the West Island Line at King George V Memorial Park.



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Environmental issues – Hong Kong, China: Environmental Measures for New Railway Projects



Visual Impact & Greening

- Greening features, such as vertical greening and green roof, will be adopted for railway facilities to integrate with the surrounding environment and urban context.
- Vertical greening will be adopted for Hin Keng Station of the Shatin to Central Link.
- A green roof will be introduced to the ventilation building of the Shatin to Central Link at Ma Chai Hang.



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Environmental issues – India: Energy Efficiency in Mass Transportation System



Improvement in Specific Energy Consumption in Electric Traction

- Adoption of 3 phase TGBT Technology for EMUs in Mumbai Suburban area is expected to reduce emission of 600 tonnes of C02 per annum per train due to regenerative braking features.
- Introduction of latest energy efficient Locomotive technology is expected to reduce 500 tonnes of C02 annually due to regenerative braking features of new 6000 HP locomotives.

Other Technological improvements in electric locos

- Fitment of 1000 KVA hotel Load converter to supply to the utilities in trains.
- Provision of Energy-cum-speed monitoring system (ESMON) on all electric locomotives to monitor the driver performance leading to energy conservation.



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Environmental issues – India: Energy Efficiency in Mass Transportation System

Improvement in Fuel efficiency in Diesel Traction

Following measures are undertaken / planned to improve Specific Fuel Consumption (SFC) and fuel savings:

- Provision of Auxiliary Power Units (APU) on all diesel locos.
- Common Rail Electronic Direct Injection (CREDI) / Electronic Fuel Injection (EFI) system.
- Guidance for Optimized Locomotive Driving (GOLD).
- Multi Genset locomotives.
- MillerCycleTurbocharger.
- Smart Multiple Units.

Hotel load on diesel locomotives to reduce power car fuel consumption.



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Environmental issues – India: Energy Efficiency in Mass Transportation System

Improving Energy efficiency on account of trailing Rolling Stock

- Pay load to tare ratio will be increased to 4.0 for ARI Gondola wagons and 4.21 lor BOXN25 Design.
- Commodity specific wagons are also being developed. These measures will enable higher throughput and result in reduced GHG emissions for the same freight traffic.
- Improved design Stainless Steel Coaches also provide higher carrying capacity. With increasing share of such coaches, PKM to GTKM ratio will improve resulting in reduced GHG emissions for carrying the same passenger traffic.



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Case Studies Unified Bills



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Unified bills - Electronic common CIM/SMGS consignment note

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Common CIM/SMGS consignment note

- "Sum" of the CIM- and SMGS consignment notes
- Based on the United Nations Layout Key for Trade Documents
- Recognition as
 - 1. customs document
 - 2. letter of credit



17-е заседание Координационного комитета по транспортному сектору (ККТС)

18–20 April 2018 | Istanbul, Turkey

18-20 апреля 2018 года | Стамбул, Турция

Unified bills - Electronic common CIM/SMGS consignment note

The use of the common CIM/SMGS consignment note introduces three main advantages:

- Reduction of costs of consignors for reconsignment (approx 40 EUR/CN)
- Acceleration of transport (approx 40 min/CN)
- Increases the quality of the transport process by preventing errors during the CN transcription (the errors cannot be objectively avoided during the CN transcription in case of large volumes).



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Unified bills - Electronic common CIM/SMGS consignment note

The next step is the electronic common CIM/SMGS consignment note

- Data flow
- Content of messages
- Legal specifications
- Functional specifications
- Technical implementation



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Unified bills - Electronic common CIM/SMGS consignment note It really works!

Electronic common CIM/SMGS consignment notes are used on the longest trans-continental railway lines:

- Chongqing-Duisburg railway line
- Yiwu-London railway line
- Yiwu–Madrid railway line
- And others



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Chongqing-Duisburg railway line The Chongqing-Xinjiang-Europe (Yuxinou International Railway) is a 11,179 km rail route stretching from Chongqing to Duisburg, Germany. It takes an average of 14 days to reach Duisburg from Chongqing, compared to the 36-day container sea transport time.





17th Transport Sector Coordinating Committee (TSCC) Meeting 18–20 April 2018 | Istanbul, Turkey 17-е заседание Координационного комитета по транспортному сектору (ККТС)

18–20 апреля 2018 года | Стамбул, Турция

Unified bills - Electronic common CIM/SMGS consignment note First freight train from China to UK

Yiwu-London railway line

 The Yiwu – London Railway Line is a freight railway route from Yiwu, China, to London, United Kingdom, covering a distance of roughly 12,000 km (7,500 miles).





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Yiwu–Madrid railway line

The Yiwu - Madrid Railway line is a railway route taken by container trains from the Chinese city of Yiwu to the Spanish city of Madrid, a distance of approximately 13,000 kilometers, and the longest in the world.





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THANK YOU!