

ATO & DIGITAL RAILWAY MAGAZINE



TESTING RESULTS OF **A NEW
SENSING SYSTEM** FOR
AUTONOMOUS TRAINS

LIBOR LOCHMAN:
**"EUROPEAN RAILWAYS
HAVE NO FUTURE** WITHOUT
COST-EFFECTIVE DIGITALISATION"

DB CARGO FITS **68,000** FREIGHT
CARS WITH NEW DIAGNOSTIC
TECHNOLOGY



INTRODUCTION

EVOLUTION OF ATO & DIGITAL RAILWAY TECHNOLOGY

I am happy to present to you the first edition of the ATO & Digital Rail Railway magazine that will give you the latest insights on digitalisation in rail. To keep pace with other transport modes and modern technologies, the international railway industry has to push forward digitalisation. Digitalisation covers a range of applications that will contribute to a safe and efficient railway network. International cooperation is key to make cross-border operation run smoothly.

An example of an international digitalisation project is the initiative EULYNX that replaces a mosaic of different national signalling interfaces by unified interface specifications in a standard reference system architecture.

Automatic Train Operation (ATO) is another digital technology that has been in operation on metro lines for decades, but in the last few years is starting to be implemented on heavy rail networks as well.

Shift2Rail is making sure different countries can use the same technology by developing and validating a standard for ATO up to GoA3/4 over ETCS, which aims to be applicable for all railway market segments (mainline/high speed, urban/suburban, regional and freight lines).

In this magazine you can find the latest news on the Digital Railway and Automatic Train Operation in the run up to the forthcoming Intelligent Rail Summit 2019 on 19, 20 and 21 November at the UIC Headquarters in Paris. Moreover, you can find speakers interviews of railway experts that will address these topics at the conference.

Marieke van Gompel
Editor-in-chief RailTech.com



SNCF CARRIES OUT A TEST WITH A SELF-DRIVING TRAIN WITHOUT A DRIVER

THE FRENCH RAILWAY COMPANY SNCF RECENTLY CARRIED OUT A SUCCESSFUL TEST WITH A SELF-DRIVING TRAIN WITHOUT TRAIN DRIVER. THE VEHICLE WAS OPERATED REMOTELY AND COVERED A DISTANCE OF FOUR KILOMETERS. SNCF WANTS A PROTOTYPE OF AN AUTONOMOUS FREIGHT AND A PASSENGER TRAIN WITHIN FOUR YEARS.

The tests with Automatic Train Operation (ATO) were carried out between the Villeneuve-Saint-Georges (Val-de-Marne) and Juvisy (Essonne) stations. The test drive was preceded by an eighteen-month development process. SNCF cooperates with the technical research institute Railenium, technology companies Actia Telecom and Thales and the French aerospace laboratory CNES.

All parties involved will continue to work the coming period on improving the efficiency of the technology and hardware. Tests with autonomous freight trains are planned for this fall.

According to Luc Laroche, director of the ATO project at SNCF, the tests are a crucial step towards the implementation of self-driving trains. "Now that we have succeeded in taking this step, we can make a

lot of progress on various technical aspects. The first is the visualization system at the front of the train, then the communication systems between the train and the control center and finally the train control and digital

signalling. But the use of remote control is also a very important step to take your hands off the controls and let the train run completely independently in certain situations," says Laroche.





“EMERGENCY STOP ONE OF THE BIGGEST CHALLENGES FOR ATO”



Foto: Hollandse Hoogte



Richard Plokhaar.

“INSTEAD OF LOOKING AT COMPLEX TECHNICAL ISSUES WE SHOULD START WITH THE MORE BASIC CHALLENGES OF AUTOMATIC TRAIN OPERATION, LIKE THE EMERGENCY PARKING BRAKES FOR INSTANCE”, SAYS RICHARD PLOKHAAR, SENIOR RAIL OPERATIONS ANALYST AT THE CANADIAN ENGINEERING COMPANY GANNETT FLEMING.

Plokhaar will discuss the opportunities and challenges for autonomous trains at the Intelligent Rail Summit 2019. “ATO is in principle not as complicated as it seems. One of the best examples in the world is the Vancouver SkyTrain. Their trains run completely autonomous since 1986, have a 96.38 percent on-time performance and even a higher reliability. Interesting is that they use no platform screen doors. The Toronto Subway also has started with highly automated trains, the only difference is that it still has an operator on board of the train to open and close the doors but not actively driving train. It works flawless. In the UK there are also some lines that run autonomous. Though the Jubilee Line saw on 1 september an accident, between Finchley Road and West

Hampstead, where it was not clear to the train operator what he had to do when it started to go wrong. In this case the operator, who was no longer actively driving the train, started to override safety features and worsened the situation, resulting in the train running with some doors opened.”

EMERGENCY STOP

The most important question according to Richard Plokhaar is not so much how to detect obstacles on the track and prevent train collisions. “That’s just a matter of the proper camera’s and LIDAR systems.” The train detects an obstacle and comes automatically to a complete standstill. It does not know what is on the track. It only knows how big it is. If the control room plays back the video and sees it was a deer crossing the

track for instance, the control room can restart the train and the train moves on. The technical challenge to make this possible is not that big and is technically solved already.” A much bigger challenge is finding the right solution for keeping a train immobilized that has made an emergency stop. “The automatic airbrake keeps the train stopped regularly for at least one hour if the airsupply falls out for whatever reason. The last thing you want to happen is that a train starts rolling away uncontrolled. For instance, when it has stopped while running uphill or downhill. Do you send a crew that applies the parking brakes by hand? This requires emergency crews to be available within a reasonable distance of the stranded train anywhere on the network. Or do you build a spring activated system? This would result

in major operational and practical constraints. Such basic issues are much more important and more difficult to solve. These are the challenges I would like to discuss with and provide guidance to the audience in Paris.”

SHARE EXPERIENCES

At the Intelligent Rail Summit 2019, Plokhaar is going to share his experiences with ATO and train simulation in several countries. After a career with the Dutch railway operator NS in the 80’s and 90’s, Plokhaar moved to Germany to work at Deutsche Bahn. Several railway related jobs followed at companies like the Microsoft Trainsimulator Franchise and rail companies in the United Kingdom, the Middle East, South Africa and now in North America for Gannett Fleming Canada ULC.



“Russian Railways strives for implementing of the self-driving technology, primarily because it will provide an improved level of safety and reliability of transportation, especially for passengers.”

RUSSIAN AUTONOMOUS TRAIN MAKES FIRST TEST RUN

THE FIRST RUSSIAN AUTONOMOUS TRAIN HAS MADE ITS INITIAL TRIAL RUN ON THE SHCHERBINKA RAILWAY TEST RING IN THE ENVIRONS OF MOSCOW. DURING THE SHORT TRIP, AN EMERGENCY SITUATION WAS EXAMINED. THE VEHICLE AUTOMATICALLY STOPPED AFTER DETECTING A DUMMY LYING ON THE TRACKS.

For Russian Railways, this trial run is the first step in implementing Automatic Train Operation (ATO). It was performed on Thursday, 29 August, during the PRO//Motion. Expo railway trade fair. The Lastochka train equipped with ATO has transported the railway top managers and officials including CEO of Russian Railways Oleg Belozyorov and the Deputy Prime Minister of Russia Maxim Akimov.

“Today is a historic day for Russian Railways, we have got closer to the

unmanned technology. Russian Railways strives for implementing the self-driving technology, primarily because it will provide an improved level of safety and reliability of transportation, especially for passengers,” Oleg Belozyorov said.

COMPUTER VISION

In June the Lastochka electric train was equipped with the ultrasonic

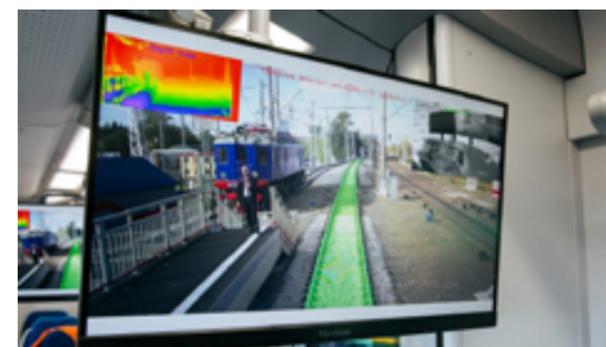
sensors and video cameras to provide computer vision. The technology was developed and installed by the experts of Russian Railways, JSC NIIAS and Ural Locomotives. The train positioning system allows the vehicle to brake smoothly at the station and to stop automatically at the exact place with an accuracy of up to 50 centimetres. The automated Lastochka vehicle can be controlled automatically from the cab by the train driver or from the control centre by the traffic controller. CEO of Ural Locomotives Oleg Spai noted the train positioning system and computer vision are the initial stages for introducing ATO. The development team will test and monitor the technology for several months. Afterwards, the obtained results will be used to improve the algorithms.

Currently, Ural Locomotives has already equipped 30 Lastochka trains running on the Moscow Central Circle with positioning system. By the end of the year, 20 more vehicles will be equipped with

the same technology. It will be used to correct the train braking at railway stations. Passenger transportation by autonomous trains is not planned at this stage. However, Russian Railways intends to implement ATO in the future. This will change the role of train drivers. “Their functionality will change a little but the monitoring of the systems will stay the responsibility of the train driver,” CEO of Russian Railways Oleg Belozyorov stressed.

LASTOCHKA TRAINS

The Lastochka (‘Swallow’ in Russian) electric multiple unit is based on the Desiro train family developed by Siemens Mobility. Initially, the first vehicles of this type were produced at the Siemens facility in Krefeld, Germany. In 2013 Siemens Mobility and Sinara Group established Ural Locomotives, a joint venture to produce passenger trains and locomotives. More than 200 Lastochka trains were manufactured at the facility. They are currently running on intercity routes in Russia.



Computer vision of Lastochka autonomous train, source: Sinara Group.



Test run of Lastochka autonomous train, source: Russian Railways (RZD).



19 - 21 November Paris, France

INTELLIGENT RAIL SUMMIT 2019

The Intelligent Rail Summit 2019 will prepare the railway industry for the 'digital future'. The events covers the topics:

- AUTOMATIC TRAIN OPERATION (ATO)
- THE DIGITAL RAILWAY

EVENT SCHEDULE

This event will follow the successful Intelligent Rail Summit in Vienna (2017). The programme of the Intelligent Rail Summit is as follows:

DAY 1 (NOVEMBER 19):

TECHNICAL VISITS TO AUTOMATIC TRAIN OPERATION PROJECTS

DAY 2 (NOVEMBER 20):

CONFERENCE DAY 1 - AUTONOMIC TRAIN OPERATION

| | |
|----------------------|---|
| 08.30 - 09.00 | Registration and welcoming coffee/tea |
| 09.00 - 10.30 | SESSION 1: OPENING SESSION WITH KEYNOTES |
| 10.30 - 11.00 | Coffee break |
| 11.00 - 12.30 | SESSION 2: CURRENT ATO PROJECTS |
| 12.30 - 13.30 | Lunch |
| 13.30 - 15.15 | SESSION 3: DRIVER ADVISORY SYSTEMS |
| 15.15 - 15.45 | Coffee break |
| 15.45 - 17.00 | SESSION 4: CHALLENGES |
| 19.00 - 22.00 | Optional Networking Dinner |

DAY 3 (NOVEMBER 21):

CONFERENCE DAY 2 - THE DIGITAL RAILWAY

| | |
|----------------------|---|
| 08.30 - 09.00 | Registration & welcoming coffee/tea |
| 09.00 - 10.30 | SESSION 1: OPENING SESSION WITH KEYNOTES |
| 10.30 - 11.00 | Coffee break |
| 11.00 - 12.30 | SESSION 2: STANDARDISATION |
| 12.30 - 13.30 | Lunch |
| 13.30 - 15.00 | SESSION 3: CYBERSECURITY |
| 15.15 - 15.45 | Coffee break |
| 15.45 - 17.00 | SESSION 4: DATA COLLECTING AND COMMUNICATION SYSTEMS |



DB CARGO WANTS INTELLIGENT FLEET BY 2020

DB CARGO IS PUSHING AHEAD WITH THE DIGITALISATION OF ITS WAGON FLEET. BY 2020, THE ENTIRE FLEET OF AROUND 68,000 CARS WILL BE CONNECTED TO THE DIGITAL WORLD. THE COMPANY IS INVESTING MILLIONS IN THE TRANSFORMATION OF ITS ANALOG RAILCARS.

The entire wagon fleet will be equipped with GPS and various sensors. Through a telematics module, such as GPS, RFID and NFC tags, the analog freight cars will be transferred to the fully networked digital world. The equipped car transmits signals via mobile radio while driving and during events such as the start, stop or an impact. This can be used to determine useful information about the load condition, temperature, humidity or movement of sensitive goods.

SHIFT TO RAIL

"The intelligent freight cars make rail freight transport more modern and sustainable. Our customers benefit from better controllable logistics chains, higher transport

"The intelligent freight cars make rail freight transport more modern and sustainable."

quality and predictable arrival times. In doing so, we want to permanently shift more traffic to the environmentally friendly freight railways and make our contribution to 'strong railway' in Germany and Europe", commented Marek Staszek, DB Cargo's Production Director. In 2017, DB Cargo announced its goal of fitting 2,000 locomotives with new diagnostic technology by 2020. At that time, nearly 1,000 of its hi-tech locomotives, which are in active service around Europe, provided information about the engine's condition.

Would you like learn more about the latest innovations on the digitalisation of the railway sector and stay up-to-date with the challenges in ATO?

Join us on 19, 20 and 21 November. More information and registration:
www.intelligentrailsummit.com



‘EULYNX REPLACES MOSAIC OF NATIONAL SIGNALLING INTERFACES’

THE MOVEMENT OF EUROPEAN RAILWAYS TOWARDS A JOINT ERTMS NETWORK IS IMPOSSIBLE WITHOUT THE UNIFICATION OF STANDARDS IN SIGNALLING ARCHITECTURE. TO MEET THIS CHALLENGE, THE EULYNX INITIATIVE HAS BEEN LAUNCHED IN 2014. SINCE THAT TIME, THREE MAJOR SPECIFICATIONS IN SIGNALLING WERE RELEASED. THE LATEST ONE, BASELINE 3, WILL BE COMPLETED AT THE END OF THIS YEAR.

Initially, EULYNX was launched as a project, now it has become a permanent organisation. “This is to ensure that infrastructure managers get support with implementation and to maintain and keep the standard future proof because of what we call game changers in the world of signalling, i.e. ERTMS hybrid Level 3, ATO, FRMCS, migration and so on,” says Bob Janssen, Senior Data Architect at EULYNX who will present the initiative at the

Intelligent Rail Summit 2019 to take place on 19-21 November in Paris, France.

SIGNALLING MOSAIC
Currently, European countries have a diverse number of signalling systems. Soon, it will change totally. “Modern signalling systems are basically nationwide IT systems and EULYNX ensures that these will be protected with state of the art and future-proof techniques. EULYNX

“Suppliers, also the niche players, can expect to cover a bigger market at lower development cost.”

replaces a mosaic of different national signalling interfaces by unified interface specifications in a standard reference system architecture. Signalling equipment that meets the EULYNX standards will become commodities. Infrastructure managers expect less need for customisation and less obsolescence problems resulting in lower life cycle costs. Suppliers, also the niche players, can expect to cover a bigger market at lower development cost,” the railway expert explains.

The implementation of EULYNX specifications has made some success in Europe. “All EULYNX members are participating actively in the specification development and preparing for tendering with EULYNX specifications,” Mr Janssen states. However, if we take a close look at each European country, this process is going at a different speed. “BaneNor has based their nationwide ERTMS rollout on EULYNX, as the first large scale project applying EULYNX. ProRail is preparing the

path towards EULYNX projects in the Netherlands. Deutsche Bahn is preparing for a large scale EULYNX rollout with the implementation of the pre-series projects,” he says.

EULYNX BENEFITS
“European infrastructure managers initiated EULYNX because they strongly believe in the advantages it brings,” Janssen explains. The first of them is the simplicity in the usage of EULYNX standards. First of all, the EULYNX interfaces don’t affect the rules and regulations that apply to the signalling systems. “Signals, points and other field elements will behave in exactly the same way as before; the innovation sits in between these distributed field elements and increasingly centralised interlockings,” Mr Janssen specifies. The other advantage is the transformation of the signalling system into the modular ones. “As EULYNX is a modular system, several migration paths are possible and in preparation by the infrastructure managers,” Janssen adds.



Foto: Hollandse Hoogte



‘EUROPEAN RAILWAYS HAVE NO FUTURE WITHOUT COST EFFECTIVE DIGITALISATION’

NEW CHALLENGES REQUIRE FROM THE RAIL SECTOR TO KEEP PACE WITH NEW TECHNOLOGIES AND MOVE TOWARDS DIGITALISATION. WHAT SHOULD THE PROCESS INCLUDE? AT THE INTELLIGENT RAIL SUMMIT 2019 LIBOR LOCHMAN, EXECUTIVE DIRECTOR OF THE COMMUNITY OF EUROPEAN RAILWAY AND INFRASTRUCTURE COMPANIES (CER), WILL SPECIFY THE POLICY PRIORITIES IN RAIL DIGITALISATION. IN THE RUN UP TO THE INTELLIGENT RAIL SUMMIT HE SHARED HIS VIEW ABOUT THIS TOPIC.

DO YOU THINK THAT EUROPEAN RAILWAYS ARE READY FOR DIGITALISATION?

EU Railways are already well engaged in the digitalisation of the rail sector, in fact, both Infrastructure Managers and Train Operators are gradually deploying high performing computers and strengthening the telecommunication infrastructures (today based on the GSM-R standard, going toward the Future Railway Mobile Communication

System / FRMCS), to allow more efficient use of infrastructure capacity, improve reliability and punctuality, maximise safety and make the best use of their assets.

The progressive introduction of ERTMS (the standard European Rail Traffic Management System), based on radio communication (Level 2/3), is well known, but in fact, digitalisation is a cornerstone for the development of the whole railway sector.

WHAT DEVELOPMENTS IN RAIL DIGITALISATION CAN YOU HIGHLIGHT?

Amongst main developments going to be made possible by digitalisation we can mention:

- Enhancing customer care and offering the passengers a performant data connection & internet access, also when running at 350 kilometres per hour, the new commercial speed limit for high-speed services. We call it the “Gigabit train” because we estimate at 1 gigabyte per second the typical traffic demand that a train with 1,000 passengers will need in 2030.
- Shaping and sustaining shared mobility and better integration of the different passenger’s transport modes;
- Seamless and paperless logistics chain for freight transport; optimisation of train capacity and the traffic flows in a different mix of freight services (full trainload, single wagonload, lorries on board...).

We call it the “Gigabit train” because we estimate at 1 gigabyte per second the typical traffic demand that a train with 1,000 passengers will need in 2030.

- “Digital Freight Trains”: gathering information on the status of goods and train itself (Temperature, Shocks, Security alerts...); sharing them onboard & with trackside control centres.
- Automation of driving (Automatic Train Operation over ETCS) and control of traffic flow in the big nodes/hubs.
- “Predictive maintenance of infrastructure” tackling the challenge of infrastructure managers’ cost reductions, it will rely on the digitalisation of control, supervision and management of infrastructure components (switch points, level crossings, train detection systems...) via a large scale adoption of remote wireless connected sensors (IoT) for detecting temperatures, pressures, vibrations, security alerts in critical points and in real-time, automatic collection and organization of all those trackside sensors’ data, immediate analysis by automatic systems based on Artificial Intelligence.

IN FEBRUARY CER ADOPTED THE POLICY PRIORITIES FOR 2019-2024, AMONG THEM IS DIGITALISATION. WHY DID THE ORGANISATION DEFINE DIGITALISATION AS A PRIORITY?
We consider further digitalisation of

rail sector among the enablers of the Vision 2019-2024. In fact, we need to change the way railway services are performing, are offered and marketed. New digital support and digital integrated solutions will let railways to provide better services, make a commercial offer more visible and attract new customers.

WHAT WILL CER DO IN ORDER TO PUSH FORWARD DIGITALISATION?

In line with our mission, CER will continue to collaborate with EU institutions, heavily promoting the interest of the rail sector and its customers. In particular, we will:

- Sustain the development of EU wide initiatives looking for Sustainable financing models for railways (CEF, CEF-Blending, Green Funding).
- Monitor the interoperability of new installation projects and products put on the market across the entire EU rail system.
- Strengthen the collaboration with EC and the sector for the smooth introduction of new 5G Digital Infrastructure. Following the EC Digital Agenda, three “Digital Work-Streams” have been created and are now in full activity, respectively: “5G Connectivity and Spectrum”- led by CER/EIM;

“Cybersecurity”-led by UNISIG and “Blockchain and HPC”-led by Shift2Rail.

WHAT OBSTACLES CAN YOU IDENTIFY FOR THE RAIL DIGITALISATION?

The financial sustainability of the railway digitalization overall does require highly standardised, cost-effective approaches and a suitable EU legal framework.

A right balance between the regulated mandatory requirements that should enable interoperability within the railway sector, as well as with other transport modes and the freedom of the transport businesses appears an essential condition to make the best use of ICT technology, with particular reference to the coming 5G communication.

On the technical side, the cybersecurity threats are at the moment the most critical issue, needing a clear answer from the supply industry and concrete technical proposals, able to guarantee the e-business and e-management of the rail sector in a more and more connected ecosystem, based on the internet standard TCP/IP protocol, with plenty of possible entry points for hackers or even terrorists.

WILL THE EUROPEAN RAILWAYS HAVE A FUTURE WITHOUT DIGITALISATION?

That’s an easy answer: no, nobody can rationally look at the future of Railways without a sound and cost-effective digitalisation of the rail-system overall.

Establishing a digital ICT network as the backbone of a seamless and integrated transport system (modal integration, linking city centres with peripherals, optimising rail operation and maintenance) is one of the most important challenges railways are facing nowadays. A sine qua non rail future!



Cybersecurity, source: ENIFA.



INTELLIGENT RAIL SUMMIT 2019

DAY 1 (NOVEMBER 19):

Site visit to ATO project in Paris

DAY 2 (NOVEMBER 20):

Automatic Train Operation (ATO, Driver Advisory Systems, ETCS)

DAY 3 (NOVEMBER 21):

Digital Railway: (Cybersecurity, standardisation of data, collecting and analyzing of data)

Venue:

Headquarters UIC in Paris

Commercial possibilities:

Rob Vos, e-mail: rob.vos@promedia.nl

More information and registration:

www.intelligenttrailsummit.com

**ATO & DIGITAL RAILWAY MAGAZINE IS
PUBLISHED BY PROMEDIA GROUP.**

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