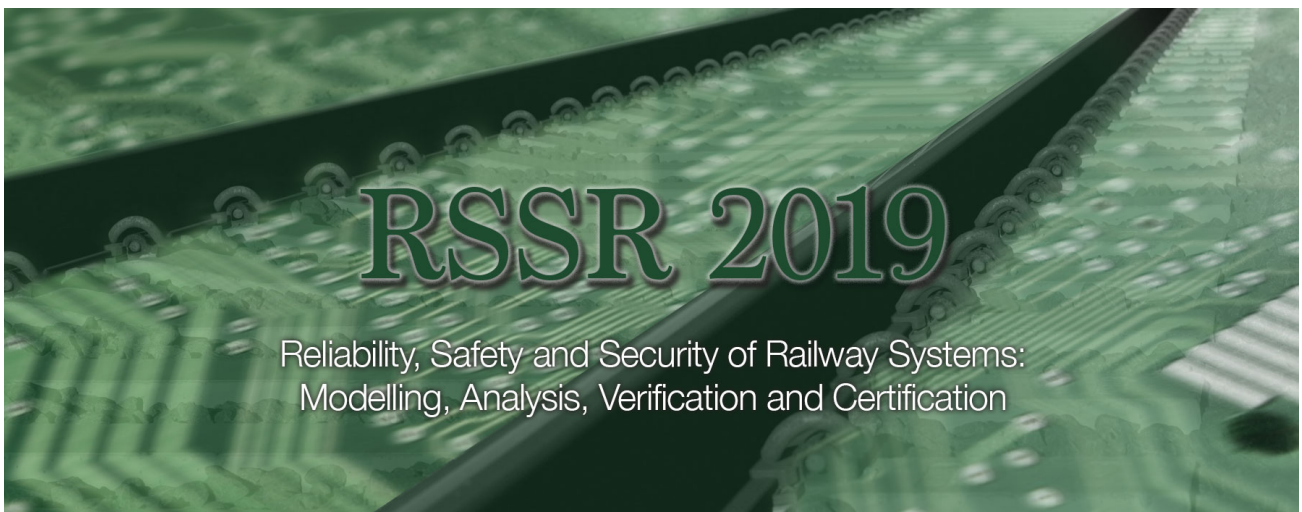


International Conference
Reliability, Safety and Security of
Railway Systems:
Modelling, Analysis, Verification and
Certification



Programme

4th – 6th June, 2019

Lille Grand Palais

1 boulevard des Cités Unies

Lille, France

<http://conferences.ncl.ac.uk/rssrail2019/>

Tuesday 4th June

- 08.00** **Early Registration and Coffee**
- 09.00 **Tutorial 1: Julien Ordioni; Benjamin Blanc (RATP)**
HLL formal language and associate tools for safety assessment activities
- Tutorial 2: Kate Habgood (Altran)**
Can “agile” be “high-integrity”? Systems and software engineering lessons from the front-line
- 10.50 Coffee break
- 11.10 **Tutorial 3: Dominic Taylor (SYSTRA); Alexei Iliasov (Newcastle University)**
SafeCap automated formal verification of railway signalling interlocking
- Tutorial 4: Eric Perlade (AdaCore)**
AdaCore technologies for CENELEC EN 50128:2011
- 13.00 **Sandwich lunch for tutorial delegates**
- 12.00** **Main Conference Registration and Coffee**
- 13.30 Introduction and welcome from the Programme Chairs and IFSTTAR
- Keynote Session. Chair Thierry Lecompte**
- 13.45 **Airy Magnien, UIC, France**
RailTopoMode
– a cornerstone to foster the federation of railway digital models
- 14.45 **Coffee break**
- Special Session, organised by Railenium**
Railways System and Infrastructure Advanced Modelling
- 15.20 *Introduction – Session Chair: Matthieu Perin*
- 15.30 **Akram Idani, Yves Ledru, Abderrahim Ait Wakrime, Rahma Ben Ayed and Philippe Bon.**
Towards a tool-based domain specific approach for railway systems modeling and validation
- 16.00 **Davide Basile, Alessandro Fantechi, Luigi Rucher and Gianluca Mandò.**
Statistical model checking of hazards in an autonomous tramway positioning system
- 16.30 **Nathalie Bertrand, Benjamin Bordais, Loic Helouet, Thomas Mari, Julie Parreaux and Ocan Sankur.**
Performance Evaluation of Metro Regulations Using Probabilistic Model-checking
- 17.00 **Conference reception in Exhibition and Poster space**
- 18.00** **Close of day 1**

Wednesday 5th June

Keynote Session. Chair Alexander Romanovsky

09.00 **Alessandro Fantechi, University of Florence, Italy**
Connected or autonomous trains?

10.00 **Coffee break**

Scheduling and Track Planning – Session Chair: Alessandro Fantechi

10.30 **Stefan Dillmann and Reiner Hähnle**
Automated Planning of ETCS Tracks

11.00 **Muhammad Chenariyan Nakhaee, Djoerd Hiemstra, Mariëlle Stoelinga and Martijn van Noort**
The Recent Applications of Machine Learning in Rail Track Maintenance: A Survey

11.30 **Shayam Lal Karra, Kim G. Larsen, Florian Lorber and Jiri Srba**
Safe and Time-Optimal Control for Railway Games

12.00 **Lunch**

Safety Process and Validation – Session Chair: Mariëlle Stoelinga

13.10 **Faiz Ul Muram, Barbara Gallina and Samina Kanwal**
A Tool-supported Model-based Method for Facilitating the EN50129-compliant Safety Approval Process

13.40 **Jan Peleska, Niklas Krafczyk, Anne E. Haxthausen and Ralf Pinger**
Efficient Data Validation for Geographical Interlocking Systems

14.10 **Tomas Fischer and Dana Dghyam**
Formal Model Validation through Acceptance Tests

14.40 **Coffee break**

Modelling – Session Chair: Colin Snook

15.10 **Yves Ledru, Akram Idani, Rahma Ben Ayed, Abderrahim Ait Wakrime and Philippe Bon**
A Separation of Concerns Approach for the Verified Modelling of Railway Signalling Rules

15.40 **Naim Aber, Benjamin Blanc, Nathalie Ferkane, Mohand Ameziane Meziani and Julien Ordioni**
RBS2HLL: A formal modelling of railway-based interlocking

16.10 **Mathieu Comptier, Michael Leuschel, Luis-Fernando Mejia, Julien Molinero Perez and Mareike Mutz**
Property-Based Modelling and Validation of a CBTC Zone Controller in Event-B

16.40 **Close of day 2**

19.30 **Conference Dinner – L’Hermitage Gantois**

Thursday 6th June

Keynote Session. Chair Simon Collart-Dutilleu

09.00 **Cédric Blin, Hitachi Rail STS, France**
Scientific and technological obstacles to achieve the autonomy

10.00 **Coffee Break**

Formal Verification – Session Chair: Klaus Reichl

10.30 **Camille Parillaud, Yoann Fonteneau and Fabien Belmonte**
Interlocking Formal Verification at Alstom Signalling

11.00 **Alessio Ferrari, Maurice H. ter Beek, Franco Mazzanti, Davide Basile, Alessandro Fantechi, Stefania Gnesi, Andrea Piattino and Daniele Trentini**
*Survey on Formal Methods and Tools in Railways:
The ASTRail Approach*

11.30 **Dalay Israel de Almeida Pereira, David Deharbe, Matthieu Perin and Philippe Bon**
B-specification of Relay-based Railway Interlocking Systems Based on the Propositional Logic of the System State Evolution

12.00 **Lunch**

Security – Session Chair: Jan Peleska

13.00 **Christoph Schmittner, Peter Tummeltshammer, David Hofbauer, Abdelkader Magdy Shaaban, Michael Meidlinger, Markus Tauber, Arndt Bonitz, Reinhard Hametner and Manuela Brandstetter**
Threat Modelling in the Railway Domain

13.30 **Thorsten Schulz, Frank Golatowski and Dirk Timmermann**
Integration Approach for Communications-based Train Control Applications in a High Assurance Security Architecture

14.00 **Christian Schlehuber and Dominik Renkel**
Merging Worlds – Aligning Safety and Security

14.30 **Eurnex: Best student paper award**

14.40 **Wrap-up and closing remarks**

14.50 – 15.30 Coffee break and close of conference

15.15 – 18.00 Standards Workshop

Railway Applications – Cybersecurity: CENELEC TS 50701

CyberSecurity is a relatively new topic which has become very important, not only for railways, but for all Critical Infrastructures. CENELEC has therefore decided to work on a railway specific adaptation and interpretation of the emerging IACS CyberSecurity Standard IEC 62443. The upcoming prTS 50701 will be released as a draft in mid 2019, which will make available a CyberSecurity standard that covers not just Signalling, Rolling Stock, or Fixed Installations but the whole Railway System. After release of the TS, a good tool for fulfilling the NIS directive (and also the national embodiments of it) will be made available, due to the participation of ERA and ENISA in the working group.

In the workshop, experts from the working group responsible for TS 50701 will present and discuss various key aspects such as: life cycle, system definition, risk analysis and security, operation and maintenance requirements.

This workshop will be held after the close of RSSRail 2019, at Lille Grand Palais, from 15.15 to 18.00.

For further information, or to enquire about participation, please e-mail the contact person for this follow on event –

Christian Schlehuber <Christian.Schlehuber@deutschebahn.com>

Keynote Speakers

Airy Magnien, UIC, France

RailTopoModel – a cornerstone to foster the federation of railway digital models

Abstract: RailTopoModel (RTM) stands for a project initiated in 2013 by several European railway companies. It led to the publication of RTM 1.0 by UIC in April 2016. Its kernel addresses the issue of providing a single repository for railway infrastructure description that is scalable, extensible and platform-independent.

Current developments are oriented by urgent business needs, namely Building Information Modelling (BIM) level 3: replicating the rail domain in IT, in the interest of prompt system certification and handover to operating and maintenance companies. This extension of the application scope to all components of the railway transport system is taking place by joining forces with the IFC Rail project coordinated by buildingSMART.

In parallel, UIC drives the expansion of the technical scope of RTM to operations, for the purpose of traffic planning, autonomous driving, or for disturbance recovery optimization.

Another obvious challenge is no less exciting, namely governance. Given the complexity and long life of railway systems, RTM aims at becoming one useful piece in a set of cooperating models with well-defined responsibilities and a clear evolution path.

Alessandro Fantechi, University of Florence, Italy

Connected or autonomous trains?

Abstract: Connected cars and autonomous car driving occupy the newspapers highlights as a bright and promising future where safety and full automation of car transportation are globally ensured by vehicle-to-vehicle and vehicle-to-infrastructure communication and by artificial intelligence, in one or two decades to come. When looking at railways, we can observe that the wide deployment of ERTMS-ETCS systems on high speed lines as well as on freight corridors is already a working witness to the possible achievement of high safety standards by means of distributed control algorithms that span over geographical areas and are able to safely control large physical systems.

But still, crucial decisions needed to guarantee safety are taken at centralized places (such as the Radio Block Centre - RBC), that concentrate communications with mobile objects. Several proposed advancements in these schemes, aimed at increasing capacity and automation of rail transport, go in the direction of a more dynamic network connection among mobile component, in which decisions are actually taken in a distributed way. An example is the virtual coupling concept, in which the strict cross-control between coupled trains has to be negotiated locally.

Distributed consensus algorithms, as well as distributed configuration and reconfiguration, are needed in such dynamic contexts. On the other hand, the increasing importance of communication introduces sources of uncertainty that must be addressed so that they do not harm; cybersecurity is another main issue induced by communication-based control schemes. A concept of a dynamic safety envelope within which a train can safely move then emerges, to shape and size continuously varies with the availability of reliable information coming from the infrastructure and from other trains, as well as autonomously harvested by on-board “intelligent” sensors.

This talk will present some challenging scenarios of this kind and will discuss basic concepts needed to address such challenges.

Cédric Blin, Hitachi Rail STS, France

Scientific and technological obstacles to achieve the autonomy

Abstract: The railway adventure is first and foremost a series of technological leaps that make it possible to improve mobility. Today, the new technologies brought by the digital revolution are opening up new opportunities for the world of transport, and the next technological leap for the railways is now the Autonomy.

With the autonomous train, all the advantages are added up, it improves safety, performances and quality of service and at the same time it reduces investment and operational costs while saving energy. Indeed, since machines are faster than human being and easier to coordinate, more autonomous trains will be able to follow each other on the same line. More passengers and goods can be transported while limiting braking and energy-intensive acceleration.

However, achieving autonomy requires overcoming technical difficulties as well as technological and scientific obstacles. Therefore, the development of these complex systems requires not only the use of new technologies, but also collaboration with railways operators, other manufacturers as well as public and private research organizations.

This talk will present Hitachi Rail STS experience with autonomy projects and highlight the technical difficulties encountered and the technological and scientific obstacles identified, as well as the partnerships put in place to overcome them.

Poster Programme

A set of informative posters will be on display, located within the exhibitor area next to the main presentation room. A detailed listing will be available on the conference website by 10th April.

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