## THE TRain TOPICAL DAY — A FOREWORD

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## Prologue

Welcome to the papers presented at the first **TRain** presentation of its plans — as well as its scientific and technological background — for gathering a worldwide consortium of researchers and technologists "united" around an attempt to initialise focused research on an emerging domain theory for railways.

The papers are listed below and brought in this volume in the sequence they are to be, respectively were presented at the August 26, 2004 Topical Day of the IFIP World Computer Congress 2004, Toulouse, France.

## The Papers

1 Dines Bjørner: TRain: The Railway Domain — A "Grand Challenge" for Computing Science and Transportation Engineering.

Sets the stage for the TRain effort.

2 Denis Sabatier: Reusing Formal Models: Domain capitalization via formalization.

A careful discussion is presented of the benefits of developing, studying and using formal models. After a careful analysis of two kinds of uses, a discussion follows of how to reuse and (thus) capitalize on formal models.

3 Alistair A. McEwan and J.C.P.Woodcock: A calculated, refinement-based approach to building fault-tolerance into a railway signaling device.

Exemplifies the concept of integrating formal techniques in the provably correct development of software for a railway real-time embedded system.

\*On sabbatical at NUS from the Technical University of Denmark, Institute for Informatics and Mathematical Modeling, the Computer Science and Engineering Section, DK–2800 Kgs.Lyngby, Denmark <sup>†</sup>The author acknowledges the support received from the EU 5th Framework Programme IST: The CoLogNET Computational Logic Network of Excellence. 4 Martin Penicka: From Railway Resource Planning to Train Operation.

Illustrates, in survey fashion, a number of railway models: From nets, via scheduling and allocation of resources (net development, time tables, rolling stock deployment, staff rostering, rail car maintenance planning, to station interlocking, line direction monitoring & control, automatic line signaling.

5 Wolfgang Reif: Integrated Formal Methods for Safety Analysis of Train Systems.

An approach is shown in which correct functioning, analysis of failures and their effects, and quantitative analyses of the risks of systems and subsystems, all based on formal techniques, are applied, in a coherent fashion, to a railway example.

6 Theo C. Giras and Zhongli Lin: *Stochastic Train Domain Theory Framework*.

The axiomatic safety-critical assessment process (ASCAP) is briefly analysed as a stochastic, Monte Carlo simulation model. The rail line taxonomy is thus characterised as a stochastic domain that provides for either a design-for-safety, or a risk-assessment framework — and these are seen as dual. The need for formal validation, verification and certification is presented.

7 Takahiko Ogino: CyberRail: Information Infrastructure for New Intermodal Transport Business Model.

Outlines dramatic new paradigms for passenger transport.

8 Dines Bjørner, Peter Chiang, Morten S.T. Jacobsen, Jens Kielsgaard Hansen, Michael P. Madsen, and Martin Penicka: *Towards a Formal Domain Model of CyberRail*.

Attempts to formalise an essence of the CyberRail idea presented in the previous paper.

Paper # 8 is currently not planned for presentation.

## 1. Acknowledgement

The organiser of this topical day, the current author of this Foreword, thanks his colleagues, listed above, for their perseverance, under strict deadlines and page limitations, to yet have written the following extended abstracts.

Please enjoy them. Should you think so, then please join TRain. Details are given in Paper # 1.

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