Innovative train operations enabled by the Rail Transport Service Environment (RTSE) - A multiple component simulation framework

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Based on a multiple component simulation framework we implement a complete operation environment for railway networks. Railway network operators are enabled to investigate

- time table and scenario generation,
- infrastructure and rolling stock scheduling,
- train traffic operation
- operational decision support
- operational performance criteria

The chosen simulator architecture is used to investigate the effect of migrating from a distributed, event driven train control system where operational actors are weakly coupled towards an increasingly integrated, time controlled and automated operation concept. This concept of tight time control requires all operational processes to be continuously monitored with respect to the production schedule. Each deviation exceeding predetermined tolerance thresholds results in the re-adjustment of the production plan in real time. A dedicated rescheduling algorithm will be implemented to achieve this goal. This algorithm will be based on a resource-constrained multi-commodity flow model for conflict-free train scheduling recently developed at ETH Zurich.

The system can be configured such that it behaves according to existing or imaginary actor profiles. For instance train drivers might be technically enabled to react to new operational targets like re-adjusted train speeds while approaching conflict points.

Scenarios with different operational and technical conditions as well as internal or external disturbances can be configured and the resulting performance differences with regard to customer satisfaction (measured in overall train delay or in time availability of customer information) can be evaluated.

The RTSE consists of module components with standard communication interfaces so that they can easily be exchanged in different user environments.