Chapter 70
Integrated Traffic Management Using Data from Traffic, Asset Conditions, Energy and Emissions

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ABSTRACT

The traffic management is the core of the railway operations control technology. It receives the timetable information as a target definition and advises the command control and signaling systems to execute the rail traffic. Hence the traffic management system (TMS) has to take into account many sources of requests towards the traffic operation e.g. coming from the maintenance planning or the power supply system and to optimize the operation with respect to many criteria as e.g. punctuality, energy consumption, capacity and infrastructure wear. This chapter shows the sources of information for the TMS as well the resulting criteria. The final approach to configure a specific has to be done with respect to a specific application.

INTRODUCTION

Railways face several new and growing challenges. On the one hand, railway has to play an essential part in meeting the future mobility demands. This is especially true, when it comes to sustainable and environmentally friendly solutions. Therefore, the offered connections and services have to meet the demand at every level. Growth has to take place and the modal split has to develop in favor of railways. On the other hand, in many countries such as Germany, there are very limited possibilities to expand

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the infrastructure accordingly. In order to fulfil those targets anyway, the existing infrastructure has to be utilized in the best possible way.

The traffic management in public transport has the task to ensure operation according to the timetable. This is at least the classical understanding. Today the traffic management widens. A suitable Traffic Management System (TMS) is crucial for the successful introduction of new technologies in order to meet future demands. One example is higher automated rail traffic using an ATO (Automatic Train Operation) and a moving block operation supported by a moving block interlocking and train-borne integrity supervision. To become effective all these technologies need a suitable TMS. As long as the TMS schedules the traffic in a classical operation, no improvement of performance or capacity can be achieved. The TMS is the link between the traffic planning in the different stages from network structure to the timetable adaptation on the one hand and the command, control and signaling systems on the other hand. Today the traffic management needs to incorporate more and more information and has to be enabled to proactively adapt in this system of increasing complexity. It is also a main source for passenger information and guidance.

The goals of the future TMS are utilize the track capacity, enable economical and sustainable operations and to ultimately ensure to meet the travelers expectations. In the following, a structure for such a TMS is proposed and key elements are identified. Also, the additional functionality is presented and future research areas are pointed out.

BACKGROUND: PROPOSED STRUCTURE AND ELEMENTS OF A (FUTURE) TMS

Modern TMS and even more future TMS are receiving or requesting more and more data from different sources. Age, quality and content of those data will be spread more than in past. The Figure 1 shows some of the sources and receivers of information of the TMS in the real-time environment. Naturally the TMS receives the timetable and network structure from the planning and collects data for the later analysis and controlling. The TMS is the core of the integrated mobility management in middle of Figure 1. It receives and sends information to individual customer interfaces as smart phones as well as public ones as the information pages in the internet. On the other side of the middle column it exchanges information with the control, command and signaling systems which are the interlocking and train control systems. Those systems can be trackside or onboard of the trains, too.

To make the optimal decision in the case of deviations from the original timetable the TMS has to take into consideration information from many other sources. Four examples are given in Figure 1. The timetables or – if available – the real-time information from other transportation systems have to be used to ensure the best service for the traveler. The maintenance management can deliver information about the status of the infrastructure and vehicles. It will be able in the future to give a prognosis, too. The power and energy management can support the TMS to decide in an energy-efficient way. Finally the interface for collaborative decision making can help to bridge the gap to other decision processes. Therefore the traffic management of public transport systems has to ensure that the transport system delivers the best quality of service to the customer. It has to take into account influences from many sources: