Real-time recovery is receiving a fast growing interest in an increasingly competitive railway operation market. This thesis considers the area of rolling stock dispatching which is one of the typical real-time railway dispatching problems. All work of the thesis is based on the network and planning processes of the railway operator DSB S-tog a/s. In the thesis the problems existing in the railway planning process from the strategic to real-time level are briefly sketched. Network planning, line planning, timetabling, crew and rolling stock planning is outlined and relevant references are given. Specifically the thesis references the operation research studies based on the railway operation of DSB S-tog a/s. Subsequently the process of dispatching is outlined with a specific emphasis on rolling stock. The rolling stock recovery problem is the problem of assigning train units to train departures in a disrupted rolling stock schedule so that operation returns quickly to the originally planned schedule. Different network structures and mathematical formulations for the problem are discussed. Based on prior work on network structures a decomposed approach for the rolling stock recovery problem is put forward. The main contributions of the thesis are contained in four papers included as appendices. The papers deal with respectively an analysis of robustness in timetables, the mathematical model behind a decision support tool for reinsertion of a train line, a survey on the dispatching problems of passenger railway transportation and the decomposed solution process of the rolling stock recovery problem. The paper on the robustness analysis has been accepted for submission in the International Journal of Operations Research. Two of the papers have been submitted to journals and are being reviewed. The last paper will be submitted. Furthermore, the work of the two papers on the robustness analysis respectively the reinsertion model have formed the basis of practical projects in DSB S-tog. The applicability of the decomposed process will be further investigated in the future.