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# The Federal Express Local Sort Facility Employee Scheduling Problem

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**Summary.** In this paper, we consider the problem of developing daily and weekly schedules for the employees at a Federal Express local sort facility. We define the key data components in this analysis, describe the work rules, present a mathematical programming formulation of the daily scheduling problem as an extension of a set partitioning problem, and present a simplification of the weekly scheduling problem. Although this paper describes a work in progress, this study has defined the key issues that will have to be considered when implementing the final system. This system has the potential to be used at hundreds of FedEx local sort facilities if the final testing of the final system is successful.

**Key words:** Personnel scheduling; integer programming; set partitioning.

## 1 Introduction

The problem described in this paper concerns the development of daily and weekly work schedules for the couriers, Customer Service Agents (CSA) and handlers at a sort facility for the Express Division of Federal Express Corporation (FedEx). This sort facility carries out the local delivery and pickup of packages for FedEx Express.

The operations of a FedEx local sort facility can be outlined as follows. Packages arrive at the sort facility primarily from airports in the early morning. These packages are then sorted at the sort facility and loaded onto local delivery vehicles. Couriers then deliver the packages that required delivery before 10:30 am. After these deliveries are completed, the courier delivers other packages that are scheduled for delivery later in the day and picks up packages that are to be delivered in the next couple of days at some other location. The couriers then return to the sort facility.

The packages that were picked up by the couriers are sorted, loaded onto vehicles, and most of these packages are delivered to airports for transshipping at FedEx's central sort facilities (or *hubs*). Additional checks such as international certification have to be performed on some of the packages at the local sort facility before they are delivered to the airports. In principal, therefore, one can regard the overall FedEx Express operations as a combination of deliveries and pickups at the local sort facilities and the resorting of the packages at the hubs. The effective and efficient operation at the local sort facilities is critical in ensuring that the overall FedEx Express delivery and pickup services run smoothly.

The personnel that work at a local sort facility are either regular employees or casual employees. *Regular employees* at the local sort facility sort the packages, run the routes, maintain the sort facility and act as the customer service agents. The regular employees that are going to work on a given week are known in advance and there is no guarantee that the same set of regular employees will be available two weeks in a row. Thus, the procedure described in this paper may have to be run weekly since the regular employees available on any day in two consecutive weeks may be different. Regular employees are called *employees* in the remainder of this paper.

*Casual employees* are additional employees that FedEx Express can employ as needed. Both casual employees and regular employees can be used to work some extra days; this creates a situation called the extended workweek for an employee (see Section 6.2). Casual employees and employees that have their workweek extended are not considered in the daily scheduling problem, since the need for casual employees and extended workweek employees is determined after the daily scheduling procedure described in this paper has been run.

Currently, FedEx has over 700 local sort facilities that carry out FedEx Express's local delivery and pickup operations. These facilities can have anywhere from under 20 to over 300 employees handling the sort facility's daily operations. Nationwide, tens of thousands of FedEx employees are involved in these local sort operations daily. Currently, schedulers using the FedEx's Compass System form the daily and weekly schedules for the employees at the sort facility without any optimization. It is envisioned that the optimization system that evolves from this study will become a module in the Compass System.

In this paper, we will describe the procedures we developed for forming the daily and weekly schedules for the employees at a FedEx Express sort facility. This project is a work in progress. We wanted to present this preliminary description of our analysis of this project in this volume for Saul Gass, because we believe that this analysis encompasses many of the modeling and analysis