

**UNITED STATES POSTAL SERVICE:
SCHEDULING MAIL SHIPMENTS BETWEEN LOCAL
SORTING FACILITIES**

FACULTY: JOHN VANDE VATE, PHD
STUDENT: RICARDO GATICA

LEADERS IN LOGISTICS REPORT

The Logistics Institute
Georgia Institute of Technology
Atlanta, Georgia 30332
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1. INTRODUCTION

The United States Postal Service (USPS) originated with the establishment of the American Post Office Department in 1775, when Benjamin Franklin was appointed as the first Postmaster General by the Continental Congress. It has grown over more than two centuries to become largest provider of mail delivery services in the world, delivering in excess of 200 billion pieces of mail annually, including nearly half of the world's cards and letters (see www.usps.gov). USPS turned to researchers at The Logistics Institute (TLI), Georgia Tech, for assistance in studying the transportation of mail products between USPS processing plants serving the Atlanta, Georgia metropolitan area.

Consider the set of major sorting facilities located in a metropolitan area. Mail arriving at one facility is often addressed to a ZIP code served by another facility, requiring mail to be transported between facilities during the day. Therefore, regional postal managers are faced with the following problem:

Find a schedule of shipments between each pair of plants that minimizes the total transportation cost.

In addition, the solution must lead to a feasible sorting schedule at every facility. In other word, the right mail, of the right type, must arrive at the right facility in time to meet fixed mail delivery requirements.

This is an important day-to-day problem for local USPS managers across the United States. Managers must often contract out to costly third-party shippers to move mail between facilities, when additional shipping capacity is needed. Therefore, small local improvements may lead to large overall savings for USPS. Improvements in shipping schedules are also likely to increase the reliability of the system, and hence result in better service levels.

2. ISSUES

There are 4 major USPS sorting facilities in the Atlanta metropolitan area, viz., the Crown Road facility in Hapeville, the North Metro facility, the Bulk Mail Center (BMC), and the Airmail Center (AMC) at Hartsfield International Airport. Each USPS sorting facility operates according to a fixed sorting schedule that is based on:

- Average flows in and out of the facility;
- Expected delivery times to customers;
- Cut-off times;
- Other USPS policies and service level goals.

Mail arrives at sorting facilities throughout the day from a variety of sources, including: shipments from domestic and international sources, local post office collections, bulk mailers (at the BMC), as well as from the other local sorting facilities.

Sorting operates on a fixed schedule. This is necessary because each sorting facility serves fixed downstream schedules; the most important of these are:

- The schedules upon which mail carriers depend – mail must arrive at the local postal station on time, so that the carrier can pick it up on time, so that it can be delivered on time.
- Scheduled shipments out of Atlanta of mail destined for domestic and international addresses.

Although mail is sorted on a fixed schedule, it is not shipped between sorting facilities on a pre-determined schedule. It is difficult to build a stable inter-facility shipping schedule *a priori* since mail volumes change considerably from day to day. Consequently, it is difficult to predict the amount of mail that must be shipped between sorting facilities on any given day.

Therefore, an important logistics decision for facility managers is to schedule mail shipments between the 4 major facilities. They may wait until a full truckload is ready, or they may send partial loads. If deliveries between facilities are not well timed, then machines at various locations will not be optimally utilized – they may be idle/underutilized while waiting for mail shipments, or they may be overwhelmed when multiple shipments arrive at the same time – and this may result in excess costs or cause delays leading to unmet service goals.

3. SOLUTION APPROACHES

One promising approach to timing mail deliveries between sorting facilities is to trigger shipments based on certain predetermined mail volume threshold levels. In this approach, if some facility A needs mail, and some other facility B has more than some threshold quantity of mail destined for A, then B ships the mail to A.

The problem can also be viewed within a broader context, by considering it within a larger segment of the USPS logistics chain. One way that this can be done is by removing the direct shipment requirement. Another approach is to combine the shipment scheduling decisions with the creation of sorting schedules at the various plants.

We develop a discrete optimization model for the problem, and attack it using decomposition techniques that exploit the network structure of the model. We also study some simplified versions of the problem that will help us to understand basic properties of good shipment schedules.

Insights based on analysis of our simplified models will provide transportation and facility managers at USPS with a better understanding of the problem, as well as a set of criteria that they can use to plan daily operations. These will hopefully lead to modifications that are effective, yet simple and easy to implement.

E-mail address: `john.vandevate@isye.gatech.edu`