1.258J/11.541J/ESD.226J **Public Transportation Systems** **Spring 2010**

Assignment 4

Out: April 15, 2010 **Due: May 7, 2010**

SCHEDULING

Notes: This is a group assignment for pre-defined groups of 3-4. It is based on a data set for two Somerville bus routes (94 and 96), which is available on the course website. The following data are available for both routes for Fall 2009: APC counts, AVL timepoint records, summarized AVL data for 3 weeks in October, and the CTPS ride checks for both routes.

This problem set focuses on scheduling these two MBTA routes, using the available information. Currently the two routes are "interlined" during a portion of the day which the MBTA feels results in a more cost-effective schedule. The challenge is to use the information you have on the routes to develop a new operating plan which meets or exceeds the MBTA Service Policies. The current schedule requires approximately 8-9 peak-period buses and 3 off-peak buses, so you should justify any proposed change in resources used. The existing span of service should be maintained.

Your task is to develop weekday-only timetables and a set of driver duties for Routes 94 and 96, satisfying the MBTA Service Policy in terms of passenger crowding and service reliability, and you should attempt to improve the customer "friendliness" of the schedule, where this doesn't result in significant additional cost. These duties must also satisfy the terms of the Carmen's Union labor contract, summarized in Attachment #1.

To accomplish this you will have to do the following:

1. Determine running (book) times over the course of the day. In this respect you should not be bound by the time periods specified by the MBTA or, of course, their book times.
2. Determine recovery/layover times over the course of the day.
3. Determine service frequencies over the course of the day.
4. Develop the timetable showing the departure and arrival times at the terminals.
5. Develop bus blocks showing the activities of each bus operating on the route.
6. Determine the driver runs so as to satisfy the contract terms and minimize the driver wage cost. When splitting and recombining bus blocks into driver duties you *must* proceed within the constraints of the attached work rules.
7. Determine the total driver pay (per day) for the new operating plan.

The general aim is to minimize total driver pay, although major changes from current levels of service should be justified. For those who are ambitious and who have taken 1.200 and are interested in optimization, you might consider using OPL studio on Athena, but this is not expected -- and certainly not required.

Although this is not included in the labor contract, there is an MBTA policy of part-timers being no more than 25% of all operators. You should treat this as a soft constraint for this assignment.

You may assume that all buses assigned to this route are regular 40' long buses and have 39 seats.

Additional information important to this assignment is:

1. All buses start and end their days at Fellsway Garage, and the travel time between Fellsway and Medford Square is 6 minutes, and between Fellsway and Davis Square is 15 minutes. Buses cannot be parked anywhere away from the garage except for normal layovers.
2. You can interline these two routes in any fashion that you deem cost-effective.
3. Drivers may start or end any piece of work at the garage, at Medford Square, or at Davis Square, but don't forget Attachment #1, clause 8.

Each student will submit an individual evaluation (via email) of the contributions they and their teammates provided to the assignment. First, write 1 to 3 sentences describing your personal contribution to your team. Next, write 1 to 2 sentences for each of your teammates to describe their contributions. Make sure to include both tangible and intangible help that people provided.

Attachment 1

The wage rate is $25 per hour for both full time and part time drivers.

A. Full-Time Drivers

1. All full-time drivers are guaranteed 8 hours pay which includes 15 minutes pay for report time: 10 minutes of non-productive time at the start of the first piece and 5 minutes at the start of the second piece.

2. On-duty hours (including report time) can be no more than 8 hours 15 minutes and any time over 8 hours is paid at an overtime rate of 150% of the wage rate.

3. Spread penalties: If a full-time driver's assignment (or "run") requires clocking off at the end of the day more than a specified number of hours after clocking on at the start, a bonus known as a spread penalty is paid. This results in the driver being paid 1-1/2 times the basic wage rate for time worked in the 11th hour after the run begins and double pay for work in the 12th and 13th hours. No run can have a spread time of greater than 13 hours. The 15-minute report time does not affect spread penalties.

4. No more than 30% of full-time driver runs can have a spread time of greater than 11 hours.

5. Any run with a report time before 5 am must be straight.

6. Any straight shifts must receive a *paid* meal break of at least 20 minutes and any break less than 30 minutes must be paid.

7. No shift may have more than two pieces (i.e., only one unpaid break is allowed in any run).

8. Any driver who does not start and end each piece of work at the same location is paid a 20 minute “swing time” bonus for the duty.

B. Part-Time Drivers

1. Part-time drivers can work up to 6 hours per day across any spread of hours without receiving any spread penalty pay. Part-timer runs are not subject to a guaranteed minimum length, but can have no more than two parts and must include the 15-minute report time. Clause 8 (above) also applies to part time drivers.

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