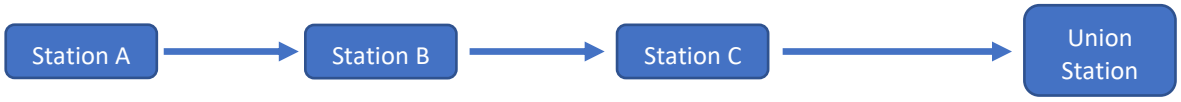
RailVision McHacks Challenge 2022

Challenge

Your challenge is to develop a train schedule to **minimize the average passenger wait time** for a typical suburban metro commuter line. The schedule is for the morning commuter peak travel time. The commuter line has multiple stations with a standard travel time between stations and a standard dwell time at each station. There can only be one train in a station at a time. Each station has a given distribution of passenger arrival times at the station. If an arriving train cannot accommodate all waiting passengers, the assumption can be made that the passengers board the train in order of descending wait time. All passengers are assumed to be traveling to Union Station the end of the line.



Passenger wait time: difference between passenger arrival time at station and train arrival time for the train they depart on.

Constraints

Schedule time period: 7am to 10am
Number of trains available to schedule: 4 L4 trains & 12 L8 trains
L4 Trains have 4 passenger cars
L8 Trains have 8 passenger cars
Passenger car max capacity: 50 passengers
Station dwell time: 3 minutes
Travel time Station A to Station B: 8 minutes
Travel time Station B to Station C: 9 minutes
Travel time Station C to Union Station: 11 minutes

Solution Format

Deliverables

1. Example formatted result.csv file
2. The average wait time per passenger in minutes:seconds format
    a. (ie "6:14" 6 minutes 14 seconds)
3. Visual representation of solution (i.e. an animation of the trains moving solution)

The Comma Separated Value (CSV) results file detailing the train schedule covering the 7:00am to 10:00am period.

The csv file should contain the following fields:

1. TrainNum Number of the train should be a value from 1 to 16.
2. TrainType Train type which is either a L4 or an L8
3. A_ArrivalTime The time the train arrives at Station A
4. A_AvailCap The available capacity of the train when arriving at Station A
5. A_Boarding The number of passengers to board the train at Station A
6. B_ArrivalTime The time the train arrives at Station B
7. B_AvailCap The available capacity of the train when arriving at Station B
8. B_Boarding The number of passengers to board the train at Station B
9. C_ArrivalTime The time the train arrives at Station C
10. C_AvailCap The available capacity of the train when arriving at Station C
11. C_Boarding The number of passengers to board the train at Station C
12. U_Arrival The time the train arrives at Union Station
13. U_AvailCap The available capacity of the train when arriving at Union Station
14. U_Offloading The number of passengers off loading from the train at Union Station

The file line of the CSV file should be a header line with the defines field names

There should be 16 rows after the header row, one for each of the 16 available trains that can be scheduled.

The visual representation is completely open to interpretation!

How to Win

Judging Criteria
50% - Optimal Solution

- Deliverable of csv
- Lowest average wait time
- Quality of submitted code
- Elegance of solution

50 % - Visual Representation

- Ability to accurately represent the solution
- Aesthetics of solution

Prizes
First Place Team Prize:

1 Ipad
1 Oculus VR Headset
1 pair of tickets on Via Rail within the Quebec – Windsor corridor
+ $500 cash

Passenger arrival time distributions

Station	Arrival Time	# Passengers
A	7:00	25
A	7:10	50
A	7:20	75
A	7:30	100
A	7:40	125
A	7:50	150
A	8:00	125
A	8:10	100
A	8:20	75
A	8:30	50
A	8:40	45
A	8:50	40
A	9:00	35
A	9:10	30
A	9:20	25
A	9:30	20
A	9:40	15
A	9:50	10
A	10:00	5
B	7:00	50
B	7:10	75
B	7:20	100
B	7:30	125
B	7:40	150
B	7:50	175
B	8:00	150
B	8:10	125
B	8:20	100
B	8:30	100
B	8:40	75
B	8:50	75
B	9:00	50
B	9:10	45
B	9:20	35
B	9:30	25
B	9:40	20
B	9:50	15
B	10:00	10
C	7:00	50
C	7:10	100
C	7:20	150
C	7:30	200
C	7:40	250
C	7:50	200
C	8:00	175
C	8:10	150
C	8:20	150
C	8:30	125
C	8:40	100
C	8:50	75
C	9:00	50
C	9:10	50
C	9:20	45
C	9:30	40
C	9:40	35
C	9:50	30
C	10:00	25

Total passengers per station

Station A:	1100
Station B:	1500
Station C:	2000
TOTAL	4600

Example formatted result.csv file

TrainNum	TrainType	A_ArrivalTime	A_AvailCap	A_Boarding	B_ArrivalTime	B_AvailCap	B_Boarding	C_ArrivalTime	C_AvailCap	C_Boarding	U_Arrival	U_AvailCap	U_Offloading
1	L4	7:00	200	25	7:11	175	125	7:23	50	50	7:37	0	200
2	L8	7:10	400	50	7:21	350	100	7:33	250	250	7:47	0	400
3	L8	7:15	400	0	7:26	400	0	7:38	400	200	7:52	200	200
4	L8	7:20	400	75	7:31	325	125	7:43	200	200	7:57	0	400
5	L8	7:30	400	100	7:41	300	150	7:53	150	150	8:07	0	400
6	L8	7:40	400	125	7:51	275	175	8:03	100	100	8:17	0	400
7	L8	7:50	400	150	8:01	250	150	8:13	100	100	8:27	0	400
8	L8	8:00	400	125	8:11	275	125	8:23	150	150	8:37	0	400
9	L8	8:10	400	100	8:21	300	100	8:33	200	200	8:47	0	400
10	L8	8:20	400	75	8:31	325	100	8:43	225	225	8:57	0	400
11	L8	8:30	400	50	8:41	350	75	8:53	275	100	9:07	175	225
12	L8	8:45	400	45	8:56	355	75	9:08	280	50	9:22	230	170
13	L8	9:10	400	105	9:21	295	130	9:33	165	135	9:47	30	370
14	L4	9:30	200	45	9:41	155	45	9:53	110	65	10:07	45	155
15	L4	9:40	200	15	9:51	185	15	10:03	170	25	10:17	145	55
16	L4	10:00	200	15	10:11	185	10	10:23	175	0	10:37	175	25

Example raw result.csv file

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TrainNum,TrainType,A_ArrivalTime,A_AvailCap,A_Boarding,B_ArrivalTime,B_AvailCap,B_Boarding,C_ArrivalTime,C_AvailCap,C_Boarding,U_Arrival,U_AvailCap,U_Offloading
1,L4,7:00,200,25,7:11,175,125,7:23,50,50,7:37,0,200
2,L8,7:10,400,50,7:21,350,100,7:33,250,250,7:47,0,400
3,L8,7:15,400,0,7:26,400,0,7:38,400,200,7:52,200,200
4,L8,7:20,400,75,7:31,325,125,7:43,200,200,7:57,0,400
5,L8,7:30,400,100,7:41,300,150,7:53,150,150,8:07,0,400
6,L8,7:40,400,125,7:51,275,175,8:03,100,100,8:17,0,400
7,L8,7:50,400,150,8:01,250,150,8:13,100,100,8:27,0,400
8,L8,8:00,400,125,8:11,275,125,8:23,150,150,8:37,0,400
9,L8,8:10,400,100,8:21,300,100,8:33,200,200,8:47,0,400
10,L8,8:20,400,75,8:31,325,100,8:43,225,225,8:57,0,400
11,L8,8:30,400,50,8:41,350,75,8:53,275,100,9:07,175,225
12,L8,8:45,400,45,8:56,355,75,9:08,280,50,9:22,230,170
13,L8,9:10,400,105,9:21,295,130,9:33,165,135,9:47,30,370
14,L4,9:30,200,45,9:41,155,45,9:53,110,65,10:07,45,155
15,L4,9:40,200,15,9:51,185,15,10:03,170,25,10:17,145,55
16,L4,10:00,200,15,10:11,185,10,10:23,175,0,10:37,175,25
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