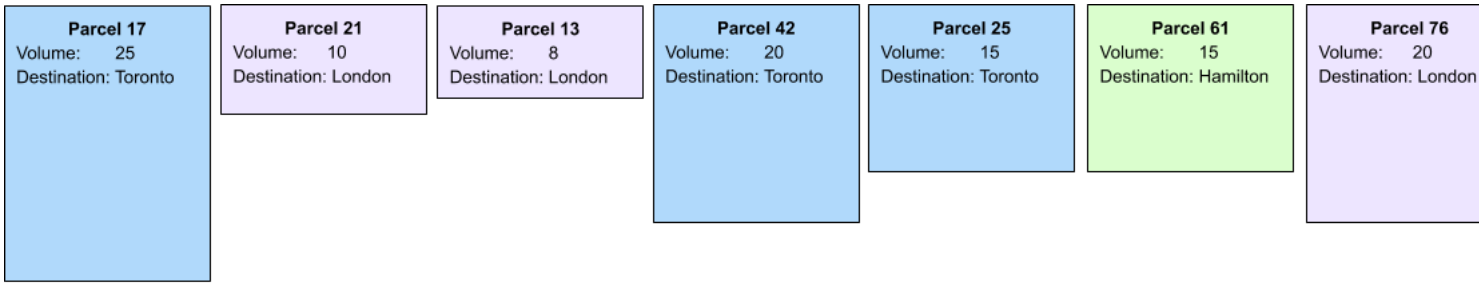
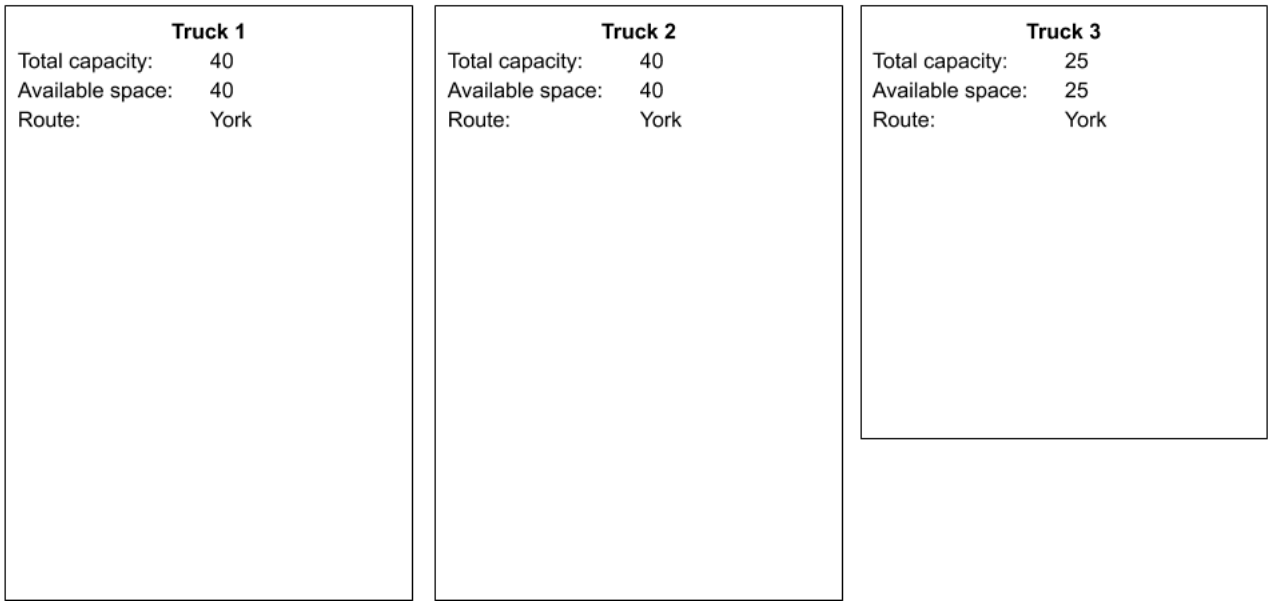
GreedyScheduler Algorithm

Let's work through an example of how the greedy algorithm works. For this example, we'll assume the depot is York, and we'll use the following properties for our greedy algorithm:

- Parcels will be chosen in order of **non-increasing destination** (e.g., Toronto would go before London)
- Trucks will be chosen in order of **most available space** (e.g., a truck with 40 cc of space available would be chosen over one with 15)

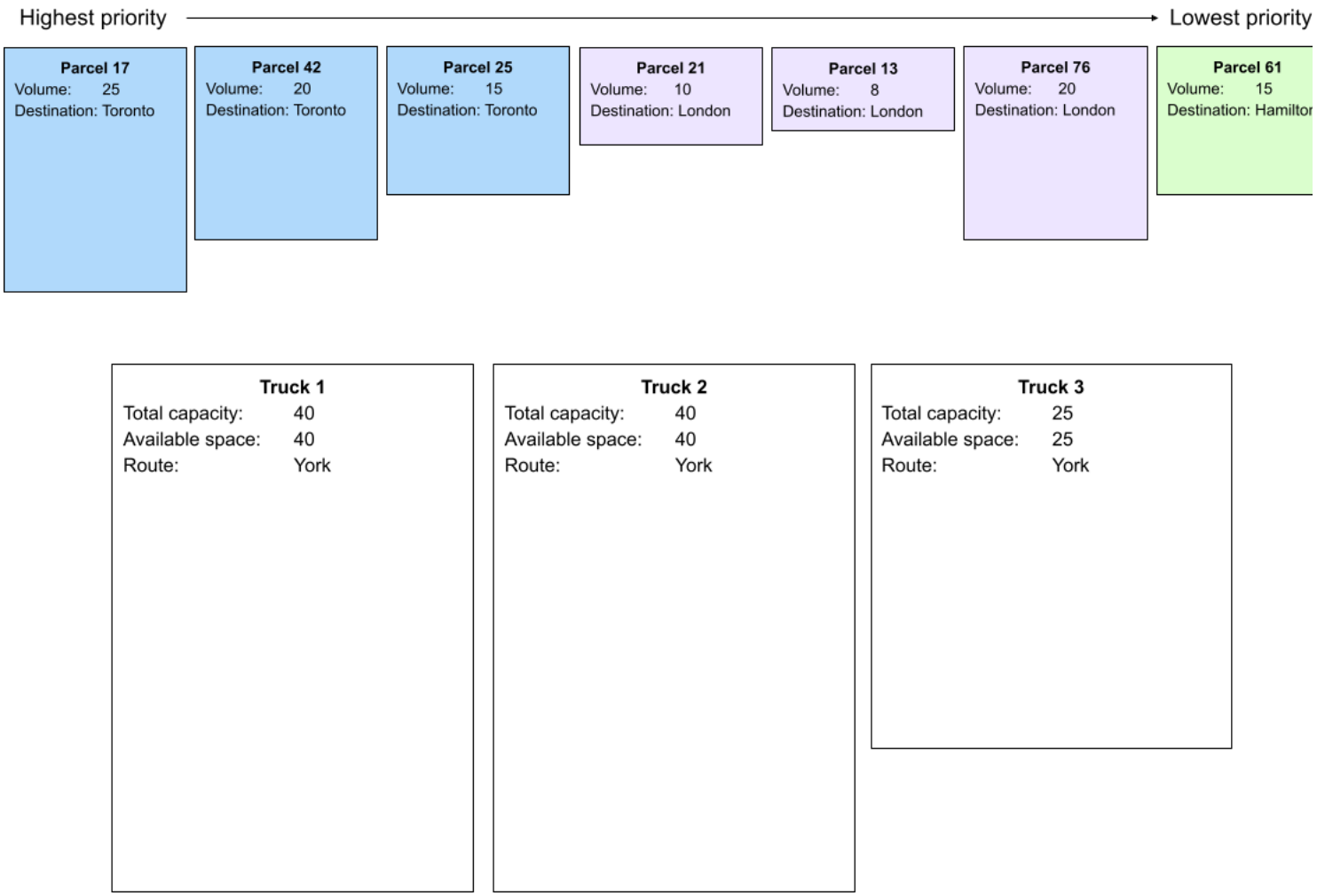
Suppose we have the Parcels and Trucks below, with the left-side representing the first ones read in our data.





We have omitted the parcel's source location, since it makes no difference to the algorithm, and have shown the remaining available space for each of the trucks.

As we're using **non-increasing destination** for our order, our highest **priority** parcels are those with the destination Toronto, followed by those with the destination London, and lastly, Hamilton. Thus, we will process the parcels in this order:



We will refer to this list of parcels as our priority queue: a queue of parcels in order of priority. Parcels that are tied for priority, for instance all the parcels with destination Toronto, are in order by when they were read in (and went into the priority queue). By coincidence, they ended up in order by volume, but notice that the parcels headed for Hamilton did not; we disregarded volume entirely.

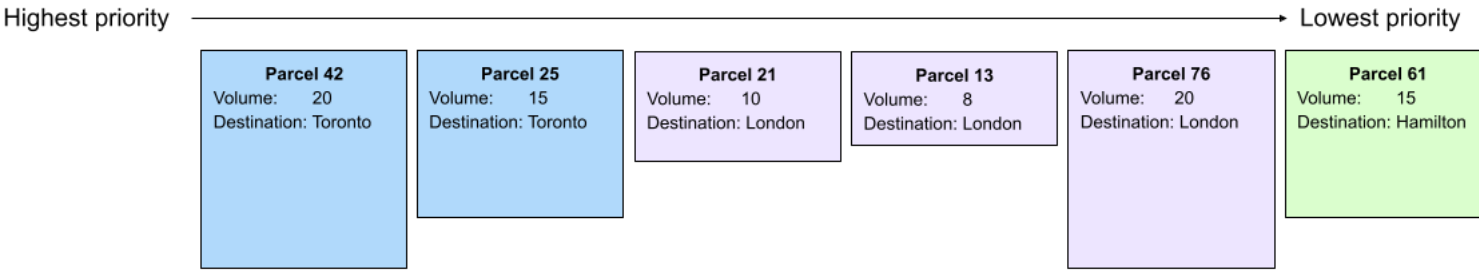
Now we are ready to process parcels, in order starting with the one at the front of the priority queue. Thus, we need to find a truck for Parcel 17. When selecting trucks, we use the following steps:

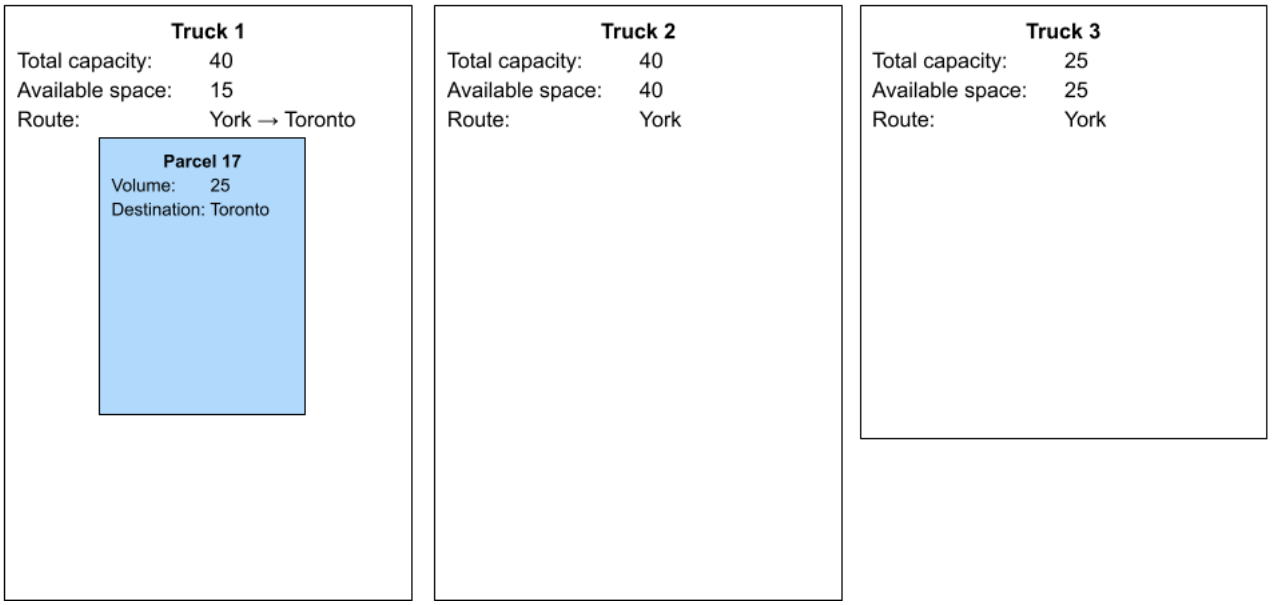
1. Find the trucks that have enough unused volume for our parcel. In our example, all trucks (Truck 1, Truck 2, and Truck 3) have enough space.
2. Among those trucks, if there are any that already have the parcel's destination at the end of their route, only those trucks are considered. In this case, none of the trucks end at Toronto.

At this point, our *eligible trucks* are Truck 1, Truck 2, and Truck 3. Now we use our truck priority to choose among the eligible trucks. As we're picking trucks by order of **most available space**, there are two trucks tied with the same amount of space available:

- Truck 1 (Available space: 40)
- Truck 2 (Available space: 40)

As we break ties based on the order in which our trucks were read in, we pick **Truck 1**. Thus Parcel 17 is placed on Truck 1:

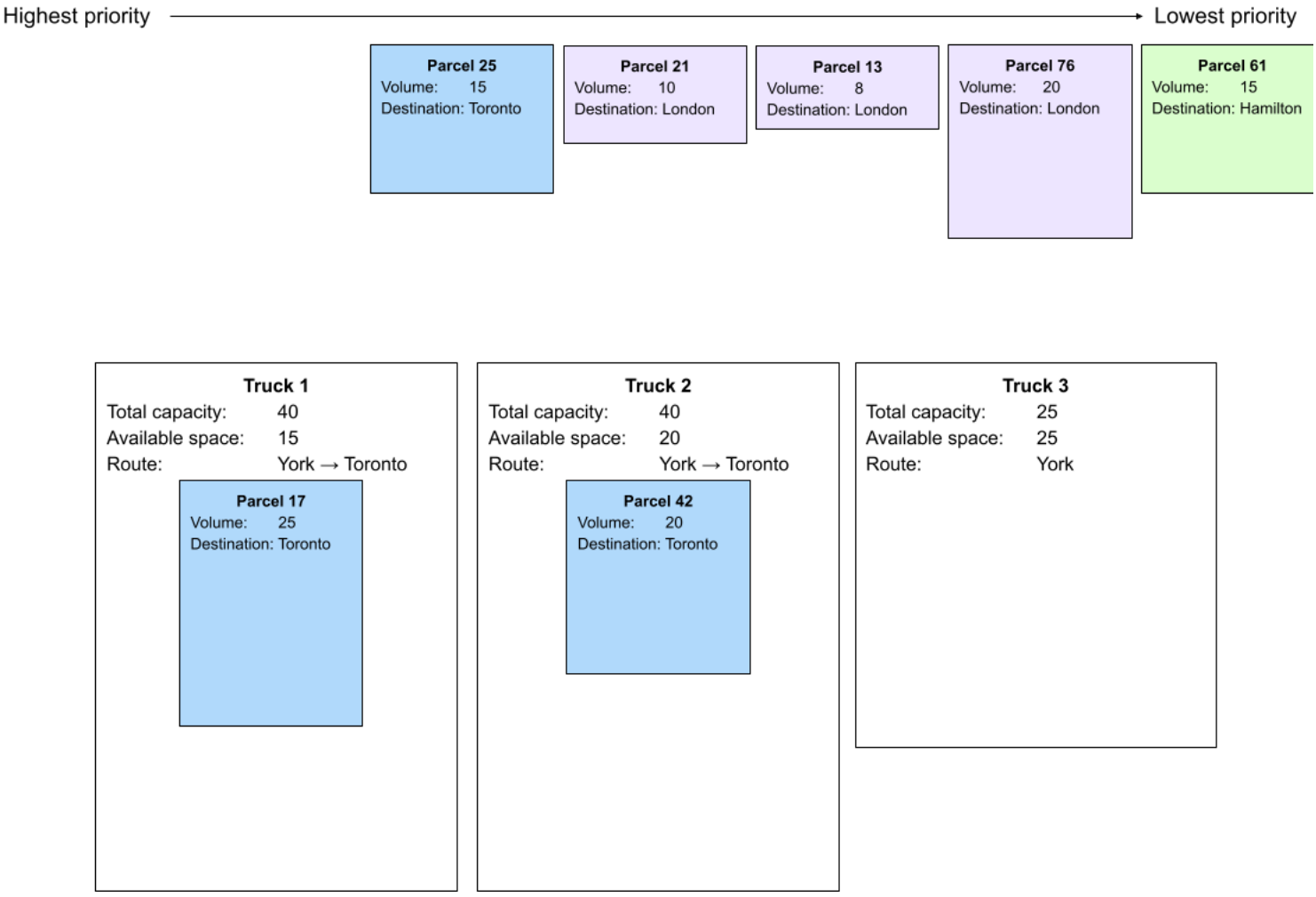




The next parcel in our priority queue is Parcel 42. Once again, we follow the same steps to select a truck:

1. The trucks with enough space for our parcel are Truck 2 and Truck 3.
2. Among the trucks from (1), none have Toronto at the end of their route, so our eligible trucks are still Truck 2 and 3.
3. Of the eligible trucks (Trucks 2 and 3), the one with the most available space is Truck 2.

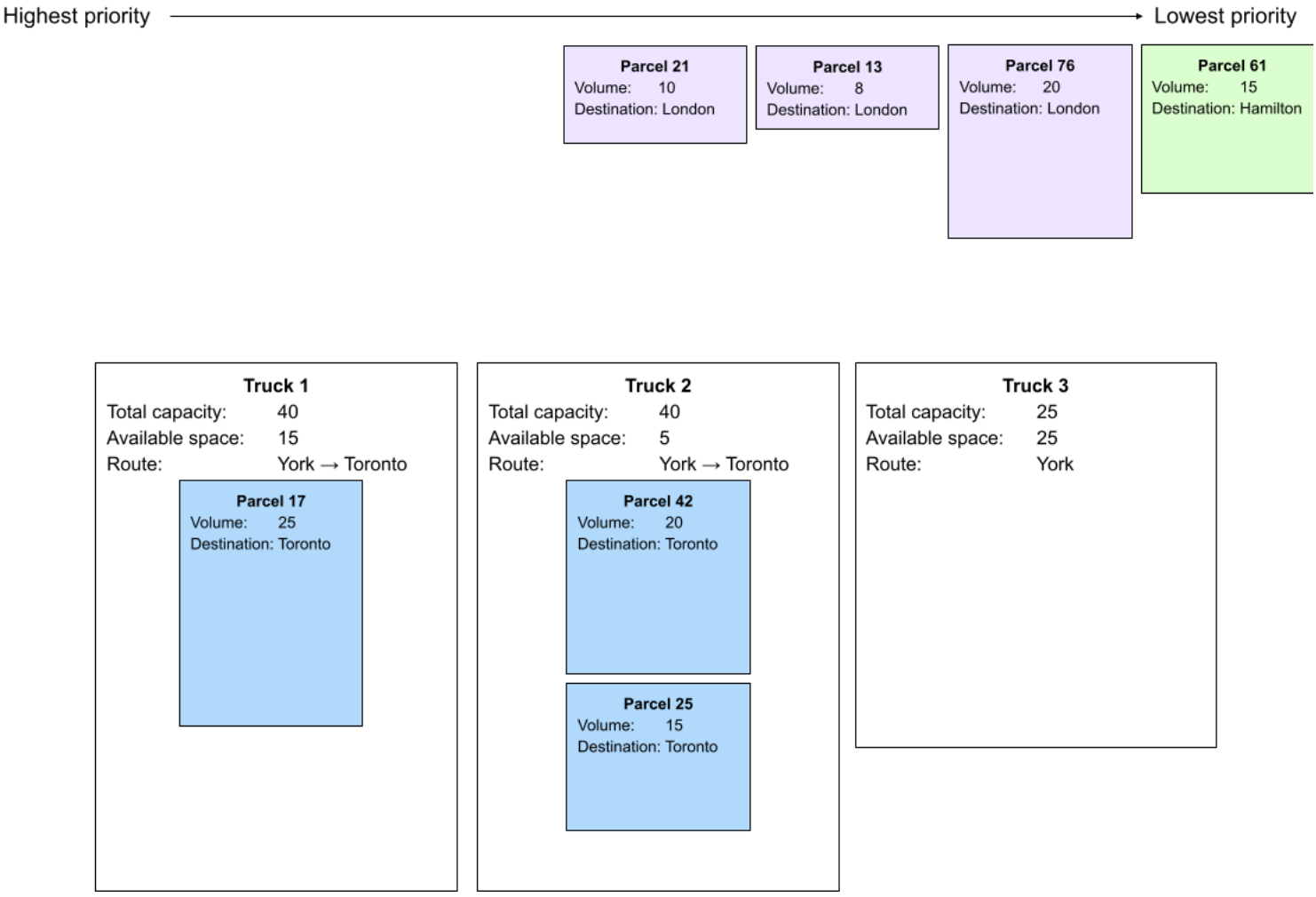
Thus Parcel 42 goes to Truck 2:



Next is Parcel 25. Following the same steps once again:

1. The trucks with enough space for our parcel are Truck 1, Truck 2, and Truck 3.
2. Among the trucks from (1), Truck 1 and Truck 2 have Toronto at the end of their route already. Thus, our eligible trucks are Truck 1 and 2.
3. Of the eligible trucks from (2), the one with the most available space is Truck 2.

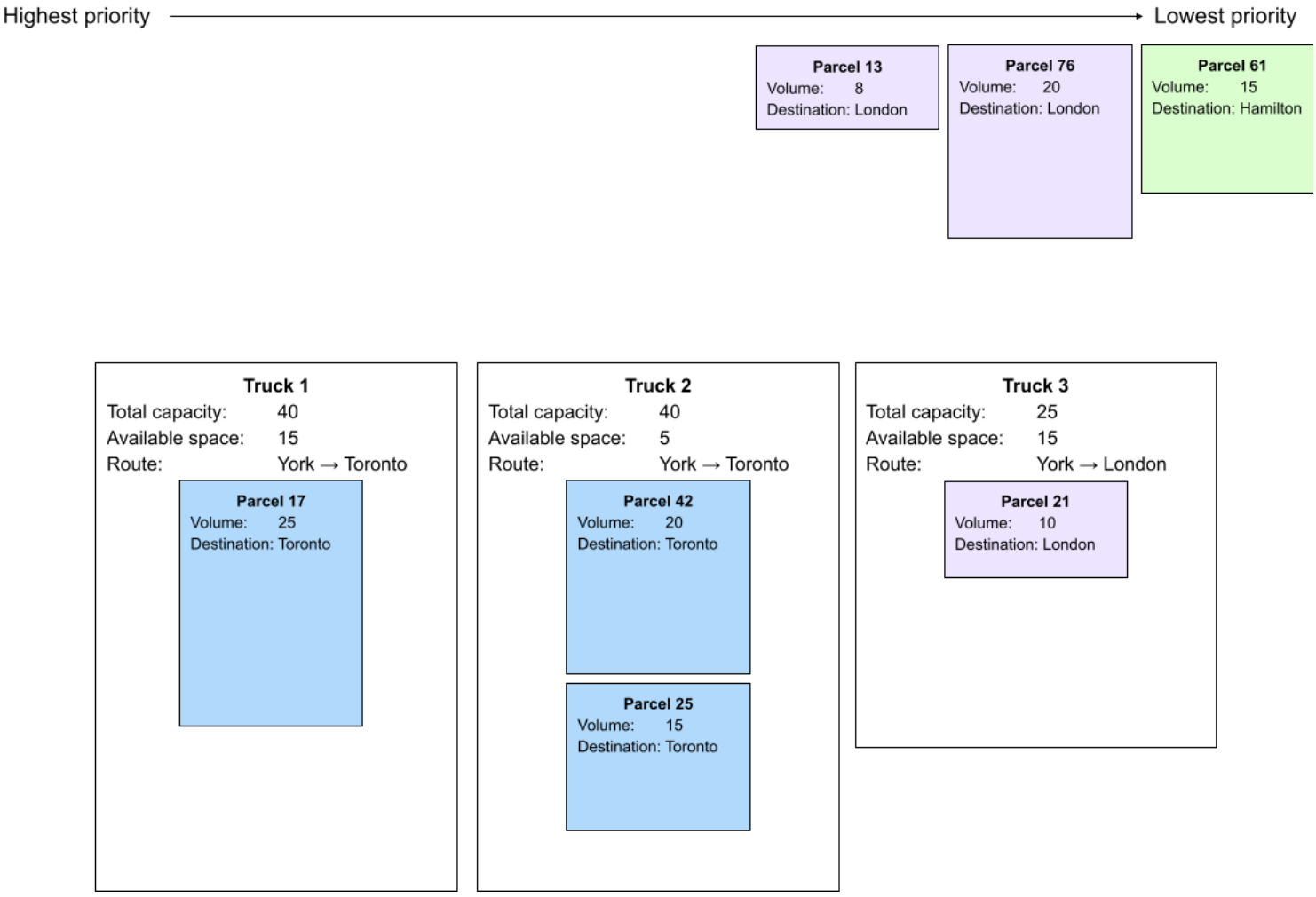
Parcel 25 goes to Truck 2:



Next is Parcel 21:

1. The trucks with enough space for our parcel are Truck 1 and Truck 3.
2. Neither of the trucks from (1) have London at the end of their route, so our eligible trucks are still Truck 1 and Truck 3.
3. Of the eligible trucks from (2), the one with the most space is Truck 3.

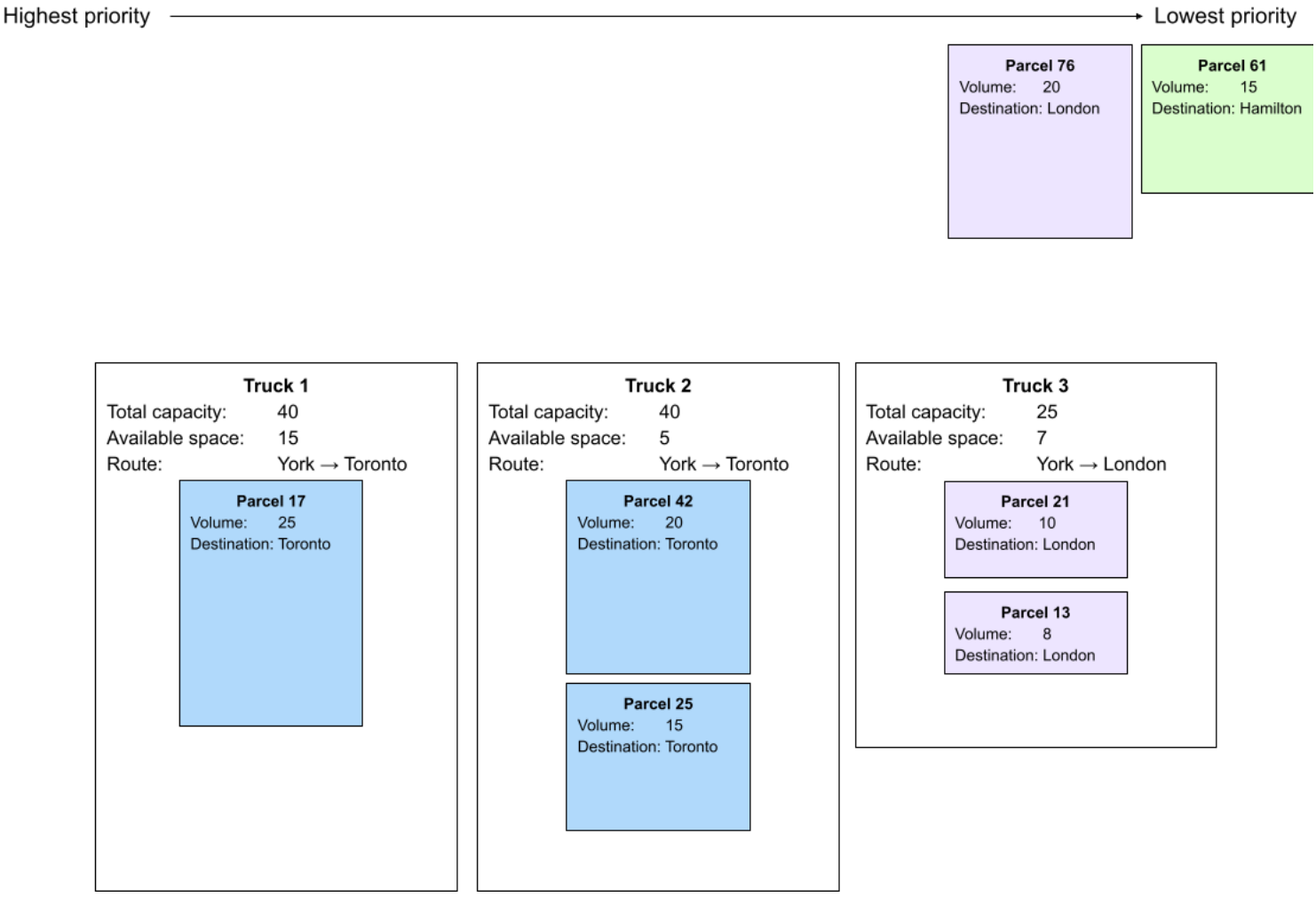
Parcel 21 goes to Truck 3:



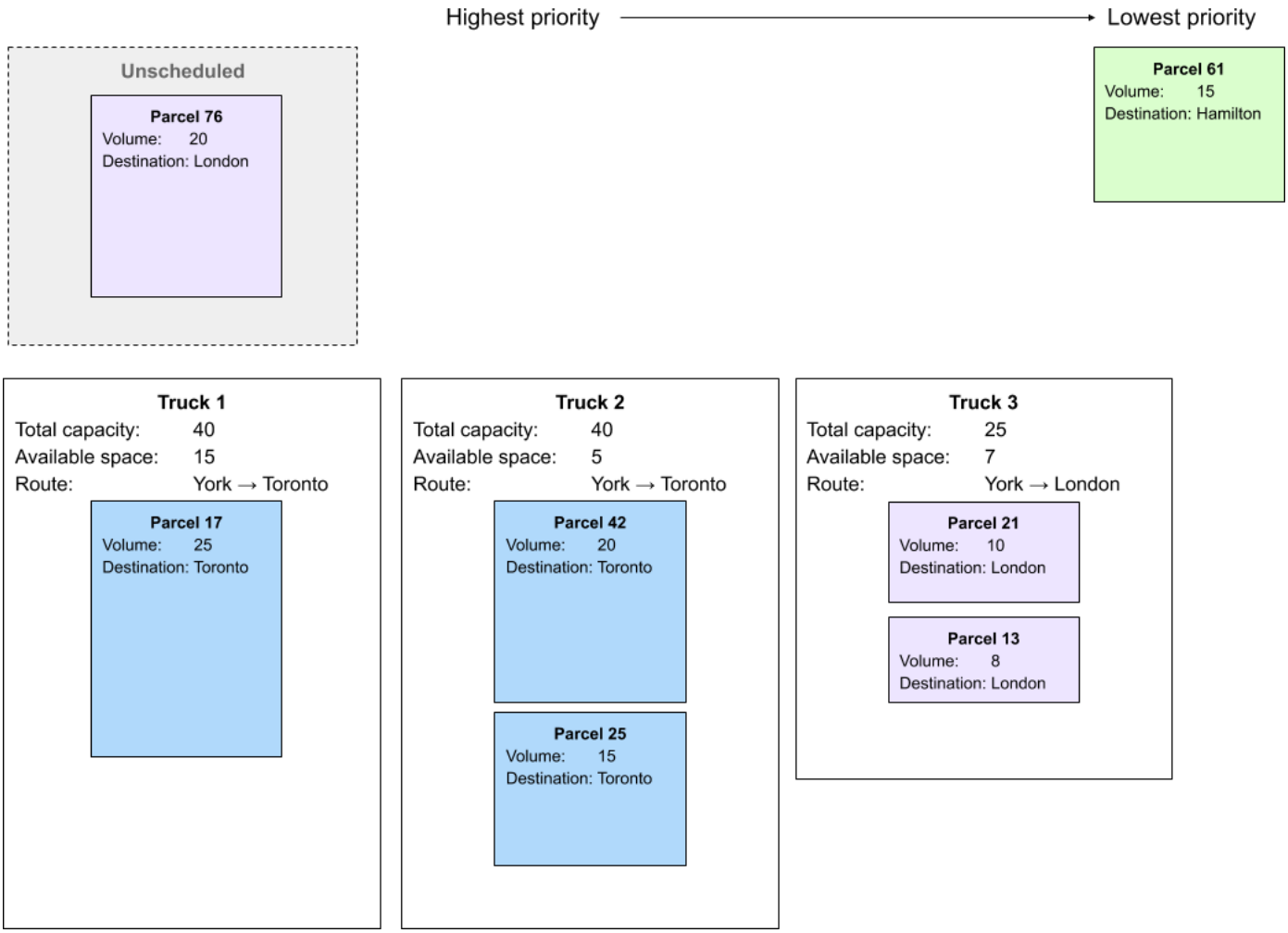
For Parcel 13:

1. The trucks with enough space for our parcel are Truck 1 and Truck 3.
2. Among the trucks from (1), Truck 3 has London at the end of the route already. Thus our only eligible truck is Truck 3.

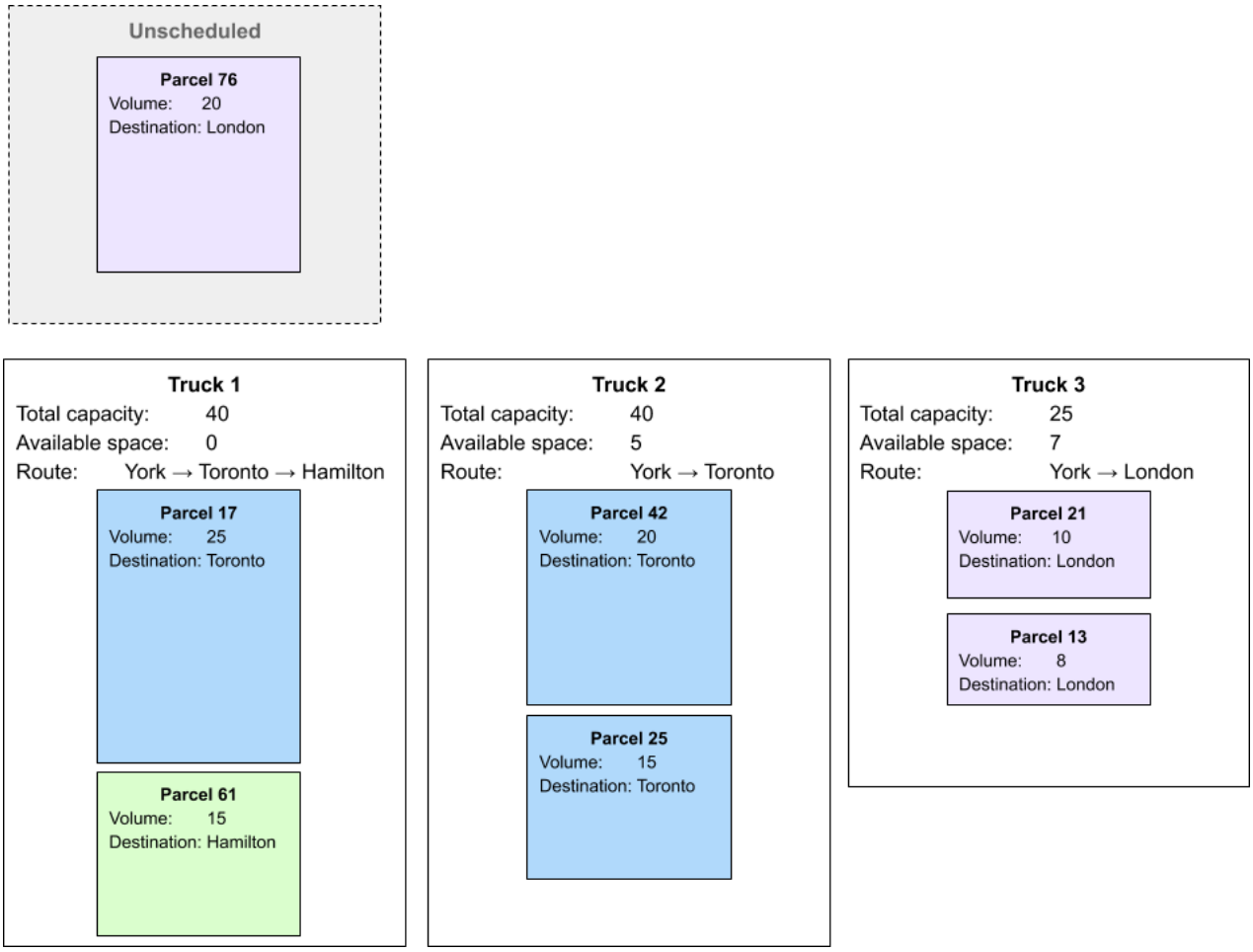
As we only have one choice for our eligible truck, we schedule Parcel 13 onto Truck 3:



Next is Parcel 76: there are no trucks with enough space for this Parcel. Thus we do not schedule it.



Finally, we get to our last parcel: Parcel 61. Truck 1 is the only truck with enough space for this parcel. Thus, Parcel 61 is scheduled onto Truck 1:



As we have no more parcels left in our priority queue, we're done with our scheduling algorithm!

Keep in mind that this is only one of the possible configurations for the greedy scheduling algorithm. If we used any other configuration, our final result for this same dataset would likeley be different.

Also, note that this algorithm was *deterministic*: we'll always get the same result if we have the same data and configuration. There was nothing random about our choices!