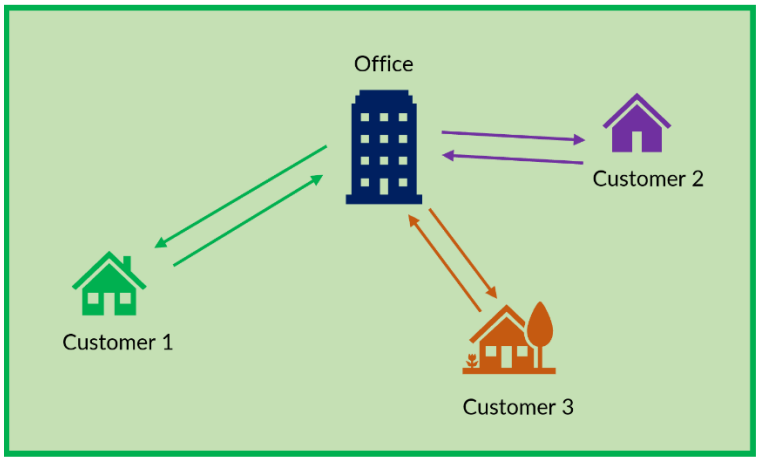
The offices of an online used car retailer are responsible for last-mile delivery from the market to customers' homes. The used car retailer has offices in many cities across the United States, and each office is responsible for delivering customers' cars in the region. Every office has several one-car haulers, which are used to transport cars from the office to each customer, and also several employees who can drive the haulers to deliver cars. A one-car hauler can take one car at a time, as shown in the following figure. A one-car hauler takes one employee to drive and operate.

Each employee has his/her shift start/end time, i.e., not all employees start/end simultaneously. An employee can do multiple deliveries a day. For example, an employee can start the day by first driving the one-car hauler with the purchased car to Customer 1, delivering the car and coming back to the office; then move onto the second delivery - take the 2nd customer's car, drive it to Customer 2, and come back, and move to the third delivery. This example is shown in the figure below.



In this exercise, we provide you with a dataset (the excel file), which only includes the data of the Dallas office. The excel file has three tabs, and each tab is a table. In this dataset, the office in Dallas has 19 employees working tomorrow, and there are 49 customer cars to be delivered tomorrow. You can find the deliveries data in the ***events*** tab, ***resources*** tab for employees' shift start/end time in the excel file, and driving duration in the ***duration*** tab.

For example, EventId 8366991 is a customer's delivery. The address of this customer is A1, the driving time from office to A1 is 30 minutes, as shown in the duration tab. We assume the driving time from the office to address A1 is the same as the driving time from A1 to the office. The total driving time to/from A1 is one hour (30 minutes one way). Together with the time needed to spend with the customer on paperwork and test drive, this delivery event will take 2 hours. In other words, the employee will drive from the office to A1 (30 min), then spend time with the customer doing paperwork and test drive (2 hours), then drive back to the office (30 min). The time window from the start of the trip to the end of the trip is fixed, i.e., from 8:15 to 10:15, as shown in the events tab. In the resources tab, each row is an employee with his/her shift time; e.g., ResourceId 9454310 is an employee who works from 7:00 to 19:00.

Please use mathematical modeling and the provided dataset to generate an optimal assignment schedule for tomorrow, i.e., who should take what delivery events. You do not have to use all the data provided in this exercise. Please use Python and the CPLEX library of Python (DOcplex) to provide the following outputs:

1. An optimal assignment table of which delivery is assigned to which employee.

2. A visualization of the assignment.

If you have any questions or if you think you need additional data or information, please do not hesitate to reach out to us.