

CS5592- Project Report

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Emergency Vehicle Dispatching System
Fall -2017

Project Description:

Emergency Vehicle Dispatching System:

We applied the dispatching system on 48 ZipCodes with 82 connections between them. Our system serves the user requests based on vehicles availability.

We import the inputs from .csv files that contain the needed information.

The basic system scenario:

- 1- Ask the user to specify his location by asking for the ZipCode.
- 2- print list of options for the user to choose the desired Emergency Vehicle.
- 3- after collecting the request from the user, check if the user location can provide the needed vehicles or not. If not, then help will be asked from the nearest ZipCode by Applying Dijkstra Algorithm to calculate the distances between the user location as a source node and the other zipCodes as the other vertices.
4. then pick the needed vehicles from the nearest locations and send them to the user.
- 5- print all the information in a text file for the user.

Our System Details:

Programming Language: C#.

Programming IDE: Visual Studio.

Input: Data.csv , Edge.csv , Node.csv

Classes Description:

1. Vertex Class:

This class used to represent Vertex/Node in a graph.

Contains (AddEdge) method to add a link between vertices.

2. Edge Class:

To represent a link to a destination vertex.

Graph Class:

The last data structure class is Graph. Objects of this type hold entire graphs including vertices and edges.

3. Dijkstra Class:

After setting up the needed data structures. Dijkstra Algorithm could be applied.

Has three main functions:

LoadGraph: which is the first step to set all of the node distances except the starting point to infinity.

CalculateDijkstra: contains the code that traverses the graph until all vertices processed or only unreachable vertices remain. A "queue" of processed vertices is used. Originally, this contains all of the vertices. As vertices processed, they are removed from the collection.

RetrieveDistances: creates the output results in a dictionary that can be used by the calling method without awareness of the other classes.

4. ZipCode and Info classes:

These classes were used to store data. Importantly, every ZipCode holds a collection of his Info(Vehicle Types).

5. InfoRepository:

This class is used for data access. The central dictionary is of type IDictionary<string, Student> with the ZipCodes name as key and hidden inside the repository.

6. Request Class:

Is the class where the user interacts with the system, and we use it to collect the needed information so we can process them.

Used Methodology:

Dijkstra Algorithm:

Dijkstra's algorithm has five steps that calculate the distance of each vertex in a graph. The steps are:

1. build the graph by setting the cost for each vertex to infinity, except for the source vertex, which has a cost of zero. Mark every vertex in the graph as unprocessed.
2. Choose the current vertex. This is the unprocessed vertex with the smallest, non-infinite cost. the algorithm has completed if every vertex in the graph has been processed, or only vertex with an infinite cost remains unprocessed.
3. Calculate the cost for all of the current vertex's unprocessed neighbors by adding the current cost to the length of the edge to the neighbor. For each neighbor, if the calculated cost is smaller than the neighbor's current cost, set the cost to the new value.
4. Mark the current vertex as processed.
5. Repeat the process from step 2.

Initialize the cost of each node to ∞

Initialize the cost of the source to 0

While there are unknown nodes left in the graph

 Select the unknown node with the lowest cost: n

 Mark n as known

 For each node a which is adjacent to n

a 's cost = $\min(a$'s old cost, n 's cost + cost of (n, a))

➤ **Efficiency of Algorithms:**

Priority queue then the complexity is $O(|E| + |V|^2)$

➤ **Assumptions (Use case):**

- **Use case 1:**

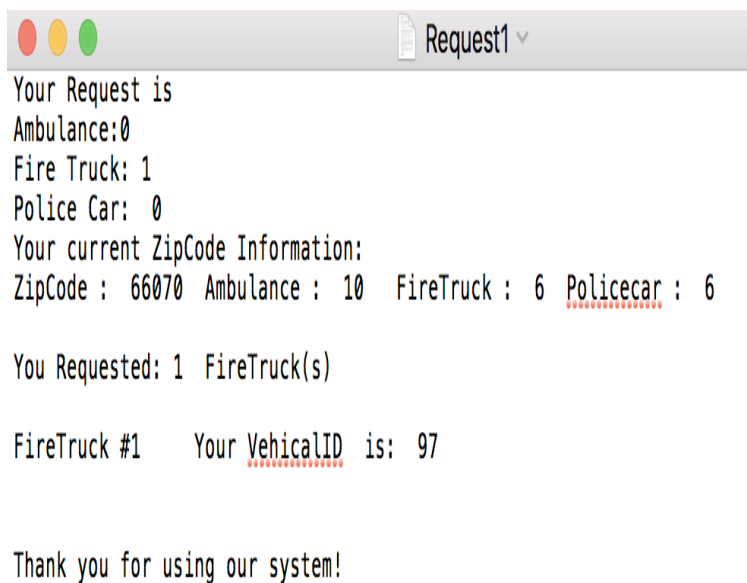
Request: single type at a time for single vehicle.

```
Please Enter Your Zip Code: 66070

Enter 1 for Ambulance
Enter 2 for Fire Truck
Enter 3 for Police Car
Enter 0 to quit
[ Please Enter Request Type : 2
How many vehicle you need:      1

Enter 1 for Ambulance
Enter 2 for Fire Truck
Enter 3 for Police Car
Enter 0 to quit
[ Please Enter Request Type : 0
Plrase wait, Your Request will processed
Your Request is
Ambulance:0
Fire Truck: 1
Police Car: 0
ZipCode : 66070  Ambulance : 10  FireTruck : 6  Policecar : 6

You Requested: 1  FireTruck(s)
FireTruck #1    Your VehicalID is: 97
```



```
Your Request is
Ambulance:0
Fire Truck: 1
Police Car: 0
Your current ZipCode Information:
ZipCode : 66070  Ambulance : 10  FireTruck : 6  Policecar : 6

You Requested: 1  FireTruck(s)

FireTruck #1    Your VehicalID is: 97

Thank you for using our system!
```

- **Use case 2:**
Request: multi type at a time for single vehicle.

```
noufalrasheed — Visual Studio External Console — -bash — 80x44
Please Enter Your Zip Code: 66101
Enter 1 for Ambulance
Enter 2 for Fire Truck
Enter 3 for Police Car
Enter 0 to quit
[ Please Enter Request Type : 1
How many veihcle you need: 1
Enter 1 for Ambulance
Enter 2 for Fire Truck
Enter 3 for Police Car
Enter 0 to quit
[ Please Enter Request Type : 2
How many veihcle you need: 1
Enter 1 for Ambulance
Enter 2 for Fire Truck
Enter 3 for Police Car
Enter 0 to quit
[ Please Enter Request Type : 3
How many veihcle you need: 1
Enter 1 for Ambulance
Enter 2 for Fire Truck
Enter 3 for Police Car
Enter 0 to quit
[ Please Enter Request Type : 0
Plrase wait, Your Request will processed
Your Request is
Ambulance:1
Fire Truck: 1
Police Car: 1
ZipCode : 66101 Ambulance : 9 FireTruck : 7 Policecar : 14
You Requested: 1 Ambulance(s)
Ambulance #1 Your VehicalID is: 17
You Requested: 1 FireTruck(s)
FireTruck #1 Your VehicalID is: 83
You Requested: 1 PoliceCar(s)
PoliceCar #1 Your VehicalID is: 88
```

```
Request1
Your Request is
Ambulance:1
Fire Truck: 1
Police Car: 1
Your current ZipCode Information:
ZipCode : 66101 Ambulance : 9 FireTruck : 7 Policecar : 14
You Requested: 1 Ambulance(s)
Ambulance #1 Your VehicalID is: 17
You Requested: 1 FireTruck(s)
FireTruck #1 Your VehicalID is: 83
You Requested: 1 PoliceCar(s)
PoliceCar #1 Your VehicalID is: 88
Thank you for using our system!
```

- **Use case 3:**

Request: single type at a time for multi vehicle.

```
noufalrasheed — Visual Studio External Console — -bash — 80x34
[Please Enter Your Zip Code: 66075

Enter 1 for Ambulance
Enter 2 for Fire Truck
Enter 3 for Police Car
Enter 0 to quit
[ Please Enter Request Type : 3
[How many vehiclc you need:      11

Enter 1 for Ambulance
Enter 2 for Fire Truck
Enter 3 for Police Car
Enter 0 to quit
[ Please Enter Request Type : 0
Plrase wait, Your Request will processed
Your Request is
Ambulance:0
Fire Truck: 0
Police Car: 11
ZipCode : 66075  Ambulance : 9  FireTruck : 7  Policecar : 11

You Requested: 11  PoliceCar(s)
PoliceCar #11  Your VehicalID is: 69
PoliceCar #10  Your VehicalID is: 68
PoliceCar #9   Your VehicalID is: 67
PoliceCar #8   Your VehicalID is: 66
PoliceCar #7   Your VehicalID is: 65
PoliceCar #6   Your VehicalID is: 64
PoliceCar #5   Your VehicalID is: 63
PoliceCar #4   Your VehicalID is: 62
PoliceCar #3   Your VehicalID is: 61
PoliceCar #2   Your VehicalID is: 60
PoliceCar #1   Your VehicalID is: 59
```

```
Request1 v
Your Request is
Ambulance:0
Fire Truck: 0
Police Car: 11
Your current ZipCode Information:
ZipCode : 66075  Ambulance : 9  FireTruck : 7  Policecar : 11

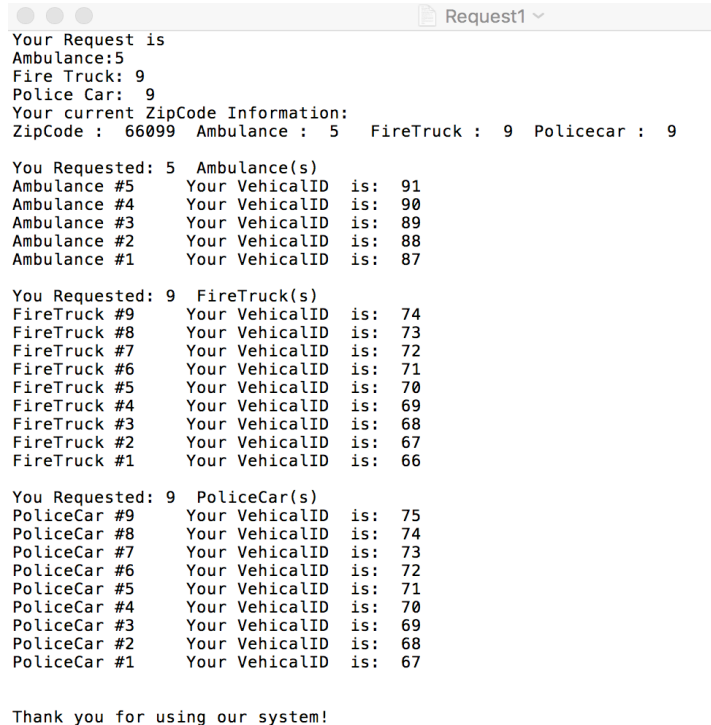
You Requested: 11  PoliceCar(s)

PoliceCar #11  Your VehicalID is: 69
PoliceCar #10  Your VehicalID is: 68
PoliceCar #9   Your VehicalID is: 67
PoliceCar #8   Your VehicalID is: 66
PoliceCar #7   Your VehicalID is: 65
PoliceCar #6   Your VehicalID is: 64
PoliceCar #5   Your VehicalID is: 63
PoliceCar #4   Your VehicalID is: 62
PoliceCar #3   Your VehicalID is: 61
PoliceCar #2   Your VehicalID is: 60
PoliceCar #1   Your VehicalID is: 59

Thank you for using our system!
```

- **Use case 4:**

Request: multi type at a time for multi vehicle all available at same zip code.



```

Your Request is
Ambulance:5
Fire Truck: 9
Police Car: 9
Your current ZipCode Information:
ZipCode : 66099  Ambulance : 5  FireTruck : 9  Policecar : 9

You Requested: 5  Ambulance(s)
Ambulance #5    Your VehicalID is: 91
Ambulance #4    Your VehicalID is: 90
Ambulance #3    Your VehicalID is: 89
Ambulance #2    Your VehicalID is: 88
Ambulance #1    Your VehicalID is: 87

You Requested: 9  FireTruck(s)
FireTruck #9    Your VehicalID is: 74
FireTruck #8    Your VehicalID is: 73
FireTruck #7    Your VehicalID is: 72
FireTruck #6    Your VehicalID is: 71
FireTruck #5    Your VehicalID is: 70
FireTruck #4    Your VehicalID is: 69
FireTruck #3    Your VehicalID is: 68
FireTruck #2    Your VehicalID is: 67
FireTruck #1    Your VehicalID is: 66

You Requested: 9  PoliceCar(s)
PoliceCar #9    Your VehicalID is: 75
PoliceCar #8    Your VehicalID is: 74
PoliceCar #7    Your VehicalID is: 73
PoliceCar #6    Your VehicalID is: 72
PoliceCar #5    Your VehicalID is: 71
PoliceCar #4    Your VehicalID is: 70
PoliceCar #3    Your VehicalID is: 69
PoliceCar #2    Your VehicalID is: 68
PoliceCar #1    Your VehicalID is: 67

Thank you for using our system!

```

```

noufalrasheed — Visual Studio External Console — -bash — 80x35
Please Enter Your Zip Code: 66099

Enter 1 for Ambulance
Enter 2 for Fire Truck
Enter 3 for Police Car
Enter 0 to quit
[ Please Enter Request Type : 1
How many vehicls you need:      4

Enter 1 for Ambulance
Enter 2 for Fire Truck
Enter 3 for Police Car
Enter 0 to quit
[ Please Enter Request Type : 2
How many vehicls you need:      5

Enter 1 for Ambulance
Enter 2 for Fire Truck
Enter 3 for Police Car
Enter 0 to quit
[ Please Enter Request Type : 3
How many vehicls you need:      9

Enter 1 for Ambulance
Enter 2 for Fire Truck
Enter 3 for Police Car
Enter 0 to quit
[ Please Enter Request Type : 0
Plrase wait, Your Request will processed
Your Request is
Ambulance:4
Fire Truck: 5
Police Car: 9
ZipCode : 66099  Ambulance : 5  FireTruck : 9  Policecar : 9

```

```

noufalrasheed — Visual Studio External Console — -bash — 80x27
ZipCode : 66099  Ambulance : 5  FireTruck : 9  Policecar : 9

```

```

You Requested: 4  Ambulance(s)
Ambulance #4      Your VehicalID is: 46
Ambulance #3      Your VehicalID is: 45
Ambulance #2      Your VehicalID is: 44
Ambulance #1      Your VehicalID is: 43

```

```

You Requested: 5  FireTruck(s)
FireTruck #5      Your VehicalID is: 42
FireTruck #4      Your VehicalID is: 41
FireTruck #3      Your VehicalID is: 40
FireTruck #2      Your VehicalID is: 39
FireTruck #1      Your VehicalID is: 38

```

```

You Requested: 9  PoliceCar(s)
PoliceCar #9      Your VehicalID is: 17
PoliceCar #8      Your VehicalID is: 16
PoliceCar #7      Your VehicalID is: 15
PoliceCar #6      Your VehicalID is: 14
PoliceCar #5      Your VehicalID is: 13
PoliceCar #4      Your VehicalID is: 12
PoliceCar #3      Your VehicalID is: 11
PoliceCar #2      Your VehicalID is: 10
PoliceCar #1      Your VehicalID is: 9

```


Use case 5:

Request: single type at a time for multi vehicle that not available in the same zip code.

● ● ● Request1 ▾

Your Request is
Ambulance:0
Fire Truck: 0
Police Car: 16
Your current ZipCode Information:
ZipCode : 66083 Ambulance : 9 FireTruck : 9 Policecar : 5
FireTruck #5 Your VehicalID is: 92
FireTruck #4 Your VehicalID is: 91
FireTruck #3 Your VehicalID is: 90
FireTruck #2 Your VehicalID is: 89
FireTruck #1 Your VehicalID is: 88
Unfortunately, your current ZipCode does not has sufficient PoliceCar(s) vehicles.
we'll ask help from the nearest ZipCodes

Getting help from nearest ZipCodes

66089 has total:4PoliceCar
PoliceCar#11 Your VehicalID is: 66089.82
PoliceCar#10 Your VehicalID is: 66089.45
PoliceCar#9 Your VehicalID is: 66089.77
PoliceCar#8 Your VehicalID is: 66089.74
66082 has total:9PoliceCar
PoliceCar#7 Your VehicalID is: 66082.13
PoliceCar#6 Your VehicalID is: 66082.74
PoliceCar#5 Your VehicalID is: 66082.99
PoliceCar#4 Your VehicalID is: 66082.69
PoliceCar#3 Your VehicalID is: 66082.83
PoliceCar#2 Your VehicalID is: 66082.38
PoliceCar#1 Your VehicalID is: 66082.30

Thank you for using our system!

- **Use case 6:**

Request: multi type at a time for multi vehicle all type not available at same zip code.

```

● ● ● Request1 v
Your Request is
Ambulance:9
Fire Truck: 10
Police Car: 10
Your current ZipCode Information:
ZipCode : 66105 Ambulance : 4 FireTruck : 4 Policecar : 8
Ambulance #4 Your VehicalID is: 19
Ambulance #3 Your VehicalID is: 18
Ambulance #2 Your VehicalID is: 17
Ambulance #1 Your VehicalID is: 16
Unfortunately, your current ZipCode does not has sufficient Ambulance vehicle(s).
we'll ask help from the nearest ZipCodes

FireTruck #4 Your VehicalID is: 28
FireTruck #3 Your VehicalID is: 27
FireTruck #2 Your VehicalID is: 26
FireTruck #1 Your VehicalID is: 25
Unfortunately, your current ZipCode does not has sufficient FireTruck(s) vehicles.
we'll ask help from the nearest ZipCodes

FireTruck #8 Your VehicalID is: 13
FireTruck #7 Your VehicalID is: 12
FireTruck #6 Your VehicalID is: 11
FireTruck #5 Your VehicalID is: 10
FireTruck #4 Your VehicalID is: 9
FireTruck #3 Your VehicalID is: 8
FireTruck #2 Your VehicalID is: 7
FireTruck #1 Your VehicalID is: 6
Unfortunately, your current ZipCode does not has sufficient PoliceCar(s) vehicles.
we'll ask help from the nearest ZipCodes

Getting help from nearest ZipCodes

66106 has total:11Ambulance
Ambulance#5 Your VehicalID is: 66106.86
Ambulance#4 Your VehicalID is: 66106.17
Ambulance#3 Your VehicalID is: 66106.79
Ambulance#2 Your VehicalID is: 66106.29
Ambulance#1 Your VehicalID is: 66106.20

Getting help from nearest ZipCodes

66106 has total:12FireTruck
FireTruck#6 Your VehicalID is: 66106.39
FireTruck#5 Your VehicalID is: 66106.46
FireTruck#4 Your VehicalID is: 66106.50
FireTruck#3 Your VehicalID is: 66106.51
FireTruck#2 Your VehicalID is: 66106.65
FireTruck#1 Your VehicalID is: 66106.22

Getting help from nearest ZipCodes

66106 has total:8PoliceCar
PoliceCar#2 Your VehicalID is: 66106.39
PoliceCar#1 Your VehicalID is: 66106.46

Thank you for using our system!

```

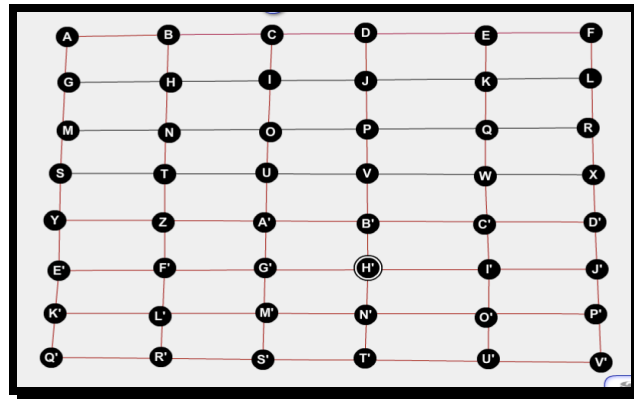
• Use case 7:

worst case when user request all vehicle type in the system. same zip code.

Request1	Request1	Request1	Request1 copy 4
<p>Your Request is</p> <p>Ambulance:0</p> <p>Fire Truck: 300</p> <p>Police Car: 0</p> <p>Your current ZipCode Information:</p> <p>ZipCode: 66066 Ambulance: 2 FireTruck: 3</p> <p>FireTruck #3 Your VehicalID is: 44</p> <p>FireTruck #2 Your VehicalID is: 43</p> <p>FireTruck #1 Your VehicalID is: 42</p> <p>Unfortunately, your current ZipCode does not have enough vehicles, we'll ask help from the nearest ZipCodes</p> <p>Getting help from nearest ZipCodes</p> <p>66067 has total:2FireTruck</p> <p>FireTruck#297 Your VehicalID is: 66067.66</p> <p>FireTruck#296 Your VehicalID is: 66067.35</p> <p>66072 has total:4FireTruck</p> <p>FireTruck#295 Your VehicalID is: 66072.63</p> <p>FireTruck#294 Your VehicalID is: 66072.29</p> <p>FireTruck#293 Your VehicalID is: 66072.48</p> <p>FireTruck#292 Your VehicalID is: 66072.74</p> <p>66068 has total:4FireTruck</p> <p>FireTruck#291 Your VehicalID is: 66068.63</p> <p>FireTruck#290 Your VehicalID is: 66068.62</p> <p>FireTruck#289 Your VehicalID is: 66068.30</p> <p>FireTruck#288 Your VehicalID is: 66068.44</p> <p>66073 has total:8FireTruck</p> <p>FireTruck#287 Your VehicalID is: 66073.1</p> <p>FireTruck#286 Your VehicalID is: 66073.68</p> <p>FireTruck#285 Your VehicalID is: 66073.90</p> <p>FireTruck#284 Your VehicalID is: 66073.81</p> <p>FireTruck#283 Your VehicalID is: 66073.73</p> <p>FireTruck#282 Your VehicalID is: 66073.9</p> <p>FireTruck#281 Your VehicalID is: 66073.37</p> <p>FireTruck#280 Your VehicalID is: 66073.78</p> <p>66078 has total:4FireTruck</p> <p>FireTruck#279 Your VehicalID is: 66078.65</p> <p>FireTruck#278 Your VehicalID is: 66078.66</p> <p>FireTruck#277 Your VehicalID is: 66078.81</p> <p>FireTruck#276 Your VehicalID is: 66078.14</p> <p>66079 has total:10FireTruck</p> <p>FireTruck#275 Your VehicalID is: 66079.80</p> <p>FireTruck#274 Your VehicalID is: 66079.92</p> <p>FireTruck#273 Your VehicalID is: 66079.62</p> <p>FireTruck#272 Your VehicalID is: 66079.14</p> <p>FireTruck#271 Your VehicalID is: 66079.25</p> <p>FireTruck#270 Your VehicalID is: 66079.83</p> <p>FireTruck#269 Your VehicalID is: 66079.81</p> <p>FireTruck#268 Your VehicalID is: 66079.90</p> <p>FireTruck#267 Your VehicalID is: 66079.80</p> <p>FireTruck#266 Your VehicalID is: 66079.2</p> <p>66069 has total:5FireTruck</p> <p>FireTruck#265 Your VehicalID is: 66069.20</p> <p>FireTruck#264 Your VehicalID is: 66069.56</p> <p>FireTruck#263 Your VehicalID is: 66069.24</p> <p>FireTruck#262 Your VehicalID is: 66069.62</p> <p>FireTruck#261 Your VehicalID is: 66069.62</p> <p>66074 has total:5FireTruck</p> <p>FireTruck#260 Your VehicalID is: 66074.9</p> <p>FireTruck#259 Your VehicalID is: 66074.35</p>	<p>FireTruck#259 Your VehicalID is: 66074.35</p> <p>FireTruck#258 Your VehicalID is: 66074.97</p> <p>FireTruck#257 Your VehicalID is: 66074.76</p> <p>FireTruck#256 Your VehicalID is: 66074.39</p> <p>66085 has total:5FireTruck</p> <p>FireTruck#255 Your VehicalID is: 66085.58</p> <p>FireTruck#254 Your VehicalID is: 66085.46</p> <p>FireTruck#253 Your VehicalID is: 66085.45</p> <p>FireTruck#252 Your VehicalID is: 66085.80</p> <p>FireTruck#251 Your VehicalID is: 66085.83</p> <p>66075 has total:7FireTruck</p> <p>FireTruck#250 Your VehicalID is: 66075.62</p> <p>FireTruck#249 Your VehicalID is: 66075.96</p> <p>FireTruck#248 Your VehicalID is: 66075.52</p> <p>FireTruck#247 Your VehicalID is: 66075.86</p> <p>FireTruck#246 Your VehicalID is: 66075.69</p> <p>FireTruck#245 Your VehicalID is: 66075.66</p> <p>FireTruck#244 Your VehicalID is: 66075.17</p> <p>66080 has total:5FireTruck</p> <p>FireTruck#243 Your VehicalID is: 66080.27</p> <p>FireTruck#242 Your VehicalID is: 66080.53</p> <p>FireTruck#241 Your VehicalID is: 66080.54</p> <p>FireTruck#240 Your VehicalID is: 66080.71</p> <p>FireTruck#239 Your VehicalID is: 66080.66</p> <p>66084 has total:8FireTruck</p> <p>FireTruck#238 Your VehicalID is: 66084.34</p> <p>FireTruck#237 Your VehicalID is: 66084.49</p> <p>FireTruck#236 Your VehicalID is: 66084.79</p> <p>FireTruck#235 Your VehicalID is: 66084.80</p> <p>FireTruck#234 Your VehicalID is: 66084.40</p> <p>FireTruck#233 Your VehicalID is: 66084.64</p> <p>FireTruck#232 Your VehicalID is: 66084.99</p> <p>FireTruck#231 Your VehicalID is: 66084.48</p> <p>66086 has total:7FireTruck</p> <p>FireTruck#230 Your VehicalID is: 66086.35</p> <p>FireTruck#229 Your VehicalID is: 66086.57</p> <p>FireTruck#228 Your VehicalID is: 66086.12</p> <p>FireTruck#227 Your VehicalID is: 66086.47</p> <p>FireTruck#226 Your VehicalID is: 66086.28</p> <p>FireTruck#225 Your VehicalID is: 66086.43</p> <p>FireTruck#224 Your VehicalID is: 66086.68</p> <p>66070 has total:6FireTruck</p> <p>FireTruck#223 Your VehicalID is: 66070.89</p> <p>FireTruck#222 Your VehicalID is: 66070.43</p> <p>FireTruck#221 Your VehicalID is: 66070.55</p> <p>FireTruck#220 Your VehicalID is: 66070.35</p> <p>FireTruck#219 Your VehicalID is: 66070.47</p> <p>FireTruck#218 Your VehicalID is: 66070.82</p> <p>66076 has total:8FireTruck</p> <p>FireTruck#217 Your VehicalID is: 66076.31</p> <p>FireTruck#216 Your VehicalID is: 66076.63</p> <p>FireTruck#215 Your VehicalID is: 66076.87</p> <p>FireTruck#214 Your VehicalID is: 66076.30</p> <p>FireTruck#213 Your VehicalID is: 66076.4</p> <p>FireTruck#212 Your VehicalID is: 66076.11</p> <p>FireTruck#211 Your VehicalID is: 66076.35</p> <p>FireTruck#210 Your VehicalID is: 66076.3</p> <p>66091 has total:7FireTruck</p> <p>FireTruck#209 Your VehicalID is: 66091.29</p> <p>FireTruck#208 Your VehicalID is: 66091.71</p> <p>FireTruck#207 Your VehicalID is: 66091.8</p>	<p>FireTruck#206 Your VehicalID is: 66091.8</p> <p>FireTruck#205 Your VehicalID is: 66091.90</p> <p>FireTruck#204 Your VehicalID is: 66091.43</p> <p>FireTruck#203 Your VehicalID is: 66091.2</p> <p>FireTruck#202 Your VehicalID is: 66091.48</p> <p>66077 has total:3FireTruck</p> <p>FireTruck#201 Your VehicalID is: 66077.97</p> <p>FireTruck#200 Your VehicalID is: 66077.59</p> <p>66081 has total:2FireTruck</p> <p>FireTruck#199 Your VehicalID is: 66081.81</p> <p>FireTruck#198 Your VehicalID is: 66081.46</p> <p>66087 has total:10FireTruck</p> <p>FireTruck#197 Your VehicalID is: 66087.32</p> <p>FireTruck#196 Your VehicalID is: 66087.49</p> <p>FireTruck#195 Your VehicalID is: 66087.5</p> <p>FireTruck#194 Your VehicalID is: 66087.84</p> <p>FireTruck#193 Your VehicalID is: 66087.6</p> <p>FireTruck#192 Your VehicalID is: 66087.59</p> <p>FireTruck#191 Your VehicalID is: 66087.26</p> <p>FireTruck#190 Your VehicalID is: 66087.98</p> <p>FireTruck#189 Your VehicalID is: 66087.27</p> <p>FireTruck#188 Your VehicalID is: 66087.84</p> <p>66090 has total:5FireTruck</p> <p>FireTruck#187 Your VehicalID is: 66090.98</p> <p>FireTruck#186 Your VehicalID is: 66090.20</p> <p>FireTruck#185 Your VehicalID is: 66090.24</p> <p>FireTruck#184 Your VehicalID is: 66090.83</p> <p>FireTruck#183 Your VehicalID is: 66090.3</p> <p>66097 has total:5FireTruck</p> <p>FireTruck#182 Your VehicalID is: 66097.86</p> <p>FireTruck#181 Your VehicalID is: 66097.92</p> <p>FireTruck#180 Your VehicalID is: 66097.50</p> <p>FireTruck#179 Your VehicalID is: 66097.37</p> <p>FireTruck#178 Your VehicalID is: 66097.54</p> <p>66088 has total:3FireTruck</p> <p>FireTruck#177 Your VehicalID is: 66088.65</p> <p>FireTruck#176 Your VehicalID is: 66088.45</p> <p>FireTruck#175 Your VehicalID is: 66088.6</p> <p>66092 has total:10FireTruck</p> <p>FireTruck#174 Your VehicalID is: 66092.86</p> <p>FireTruck#173 Your VehicalID is: 66092.4</p> <p>FireTruck#172 Your VehicalID is: 66092.56</p> <p>FireTruck#171 Your VehicalID is: 66092.85</p> <p>FireTruck#170 Your VehicalID is: 66092.42</p> <p>FireTruck#169 Your VehicalID is: 66092.20</p> <p>FireTruck#168 Your VehicalID is: 66092.92</p> <p>FireTruck#167 Your VehicalID is: 66092.84</p> <p>FireTruck#166 Your VehicalID is: 66092.36</p> <p>FireTruck#165 Your VehicalID is: 66092.53</p> <p>66071 has total:10FireTruck</p> <p>FireTruck#164 Your VehicalID is: 66071.2</p> <p>FireTruck#163 Your VehicalID is: 66071.50</p> <p>FireTruck#162 Your VehicalID is: 66071.82</p> <p>FireTruck#161 Your VehicalID is: 66071.58</p> <p>FireTruck#160 Your VehicalID is: 66071.3</p> <p>FireTruck#159 Your VehicalID is: 66071.24</p> <p>FireTruck#158 Your VehicalID is: 66071.45</p> <p>FireTruck#157 Your VehicalID is: 66071.85</p> <p>FireTruck#156 Your VehicalID is: 66071.36</p>	<p>FireTruck#49 Your VehicalID is: 66103.14</p> <p>FireTruck#48 Your VehicalID is: 66103.24</p> <p>FireTruck#47 Your VehicalID is: 66103.59</p> <p>FireTruck#46 Your VehicalID is: 66103.37</p> <p>FireTruck#45 Your VehicalID is: 66103.94</p> <p>66110 has total:5FireTruck</p> <p>FireTruck#44 Your VehicalID is: 66110.21</p> <p>FireTruck#43 Your VehicalID is: 66110.2</p> <p>FireTruck#42 Your VehicalID is: 66110.81</p> <p>FireTruck#41 Your VehicalID is: 66110.42</p> <p>FireTruck#40 Your VehicalID is: 66110.57</p> <p>66105 has total:4FireTruck</p> <p>FireTruck#39 Your VehicalID is: 66105.97</p> <p>FireTruck#38 Your VehicalID is: 66105.47</p> <p>FireTruck#37 Your VehicalID is: 66105.48</p> <p>FireTruck#36 Your VehicalID is: 66105.30</p> <p>66109 has total:3FireTruck</p> <p>FireTruck#35 Your VehicalID is: 66109.70</p> <p>FireTruck#34 Your VehicalID is: 66109.91</p> <p>FireTruck#33 Your VehicalID is: 66109.81</p> <p>66106 has total:12FireTruck</p> <p>FireTruck#32 Your VehicalID is: 66106.90</p> <p>FireTruck#31 Your VehicalID is: 66106.65</p> <p>FireTruck#30 Your VehicalID is: 66106.1</p> <p>FireTruck#29 Your VehicalID is: 66106.73</p> <p>FireTruck#28 Your VehicalID is: 66106.15</p> <p>FireTruck#27 Your VehicalID is: 66106.48</p> <p>FireTruck#26 Your VehicalID is: 66106.77</p> <p>FireTruck#25 Your VehicalID is: 66106.98</p> <p>FireTruck#24 Your VehicalID is: 66106.75</p> <p>FireTruck#23 Your VehicalID is: 66106.30</p> <p>FireTruck#22 Your VehicalID is: 66106.46</p> <p>FireTruck#21 Your VehicalID is: 66106.75</p> <p>66108 has total:9FireTruck</p> <p>FireTruck#20 Your VehicalID is: 66108.34</p> <p>FireTruck#19 Your VehicalID is: 66108.24</p> <p>FireTruck#18 Your VehicalID is: 66108.24</p> <p>FireTruck#17 Your VehicalID is: 66108.52</p> <p>FireTruck#16 Your VehicalID is: 66108.13</p> <p>FireTruck#15 Your VehicalID is: 66108.38</p> <p>FireTruck#14 Your VehicalID is: 66108.96</p> <p>FireTruck#13 Your VehicalID is: 66108.9</p> <p>FireTruck#12 Your VehicalID is: 66108.35</p> <p>66107 has total:10FireTruck</p> <p>FireTruck#11 Your VehicalID is: 66107.33</p> <p>FireTruck#10 Your VehicalID is: 66107.95</p> <p>FireTruck#9 Your VehicalID is: 66107.3</p> <p>FireTruck#8 Your VehicalID is: 66107.12</p> <p>FireTruck#7 Your VehicalID is: 66107.4</p> <p>FireTruck#6 Your VehicalID is: 66107.43</p> <p>FireTruck#5 Your VehicalID is: 66107.67</p> <p>FireTruck#4 Your VehicalID is: 66107.76</p> <p>FireTruck#3 Your VehicalID is: 66107.24</p> <p>FireTruck#2 Your VehicalID is: 66107.64</p> <p>66111 has total:6FireTruck</p> <p>FireTruck#1 Your VehicalID is: 66111.92</p> <p>} </p> <p>Thank you for using our system!</p>

➤ **Data:**

In our system we make 48 nodes as zip code and 82 edges



1	Source	Zipcod	Cost
2	66066	66067	6
3	66067	66068	5
4	66068	66069	8
5	66069	66070	7
6	66070	66071	9
7	66071	66077	3
8	66070	66076	2
9	66069	66075	7
10	66068	66074	12
11	66067	66073	9
12	66066	66072	6
13	66072	66073	6
14	66073	66074	7
15	66074	66075	3
16	66075	66076	4
17	66076	66077	4
18	66077	66083	12
19	66076	66082	10
20	66075	66081	9
21	66074	66080	3

This table represent the edges information(source,destination,cost)

1	ZipCode	Ambulance	FireTruck	Policecar
2	66066	2	3	10
3	66067	12	2	9
4	66068	5	4	4
5	66069	14	5	5
6	66070	10	6	6
7	66071	9	10	7
8	66072	20	4	9
9	66073	5	8	3
10	66074	10	5	5
11	66075	9	7	11
12	66076	6	8	12
13	66077	11	3	14
14	66078	8	4	4
15	66079	3	10	5
16	66080	5	5	6
17	66081	12	2	7
18	66082	10	3	9
19	66083	9	9	5
20	66084	5	8	4
21	66085	3	5	9

This table represent the availability information for each type

GitHub:

<https://github.com/noufcs/AlgorithmProject>

References:

Books:

[data structures and algorithms using c# michael mcmillan](#)

Website:

<http://www.marcinkossakowski.com/finding-shortest-path-using-dijkstras-algorithm/>

https://en.wikipedia.org/wiki/Dijkstra%27s_algorithm

<http://www.geeksforgeeks.org/greedy-algorithms-set-6-dijkstras-shortest-path-algorithm/>