

Contact Graph Routing Report

```
import heapq

# Define Contact class to store contact information
class Contact:
    def __init__(self, contact_id, start, end, sender, receiver, owlt):
        self.contact_id = contact_id
        self.start = start
        self.end = end
        self.sender = sender
        self.receiver = receiver
        self.owlt = owlt

try:
    with open("C:/Users/suman/Desktop/ContactList.txt", 'r') as file:
        contacts = []
        for line in file:
            fields = line.strip().split()
            contact = Contact(int(fields[0]), float(fields[1]), float(fields[2]), int(fields[3]), int(fields[4]), float(fields[5]))
            contacts.append(contact)
except IOError:
    print("Error reading file. Please check the file path and try again.")
    exit()
```

```
# Define PriorityQueue class using heapq module
class PriorityQueue:
    def __init__(self):
        self.elements = []

    def empty(self):
        return not self.elements

    def put(self, item, priority):
        heapq.heappush(self.elements, (priority, item))

    def get(self):
        return heapq.heappop(self.elements)[1]
```

```

# Define Dijkstra's search algorithm
def dijkstra_search(graph, start, end):
    # Initialize variables
    frontier = PriorityQueue()
    frontier.put(start, 0)
    came_from = {start: None}
    cost_so_far = {start: (0, None)}

    # Iterate until frontier is empty
    while not frontier.empty():
        current = frontier.get()
        if current == end:
            break
        for next_contact in graph[current]:
            # Skip if contact has already ended
            if next_contact.end <= cost_so_far[current][0]:
                continue
            # Calculate new cost of reaching the next contact
            new_cost = cost_so_far[current][0] + next_contact.owl if next_contact.start <= cost_so_far[current][0] else next_contact.start + next_contact.owl
            # Update cost and priority of reaching the next contact
            if next_contact.receiver not in cost_so_far or new_cost < cost_so_far[next_contact.receiver][0]:
                cost_so_far[next_contact.receiver] = (new_cost, next_contact.contact_id)
                priority = new_cost
                frontier.put(next_contact.receiver, priority)
                came_from[next_contact.receiver] = current

    # Construct and print optimal path
    current, path = end, [(cost_so_far[end][1], end)]
    while current != start:
        current = came_from[current]
        path.append((cost_so_far[current][1], current))
    path.reverse()

```

Creating the Graph: The code creates a dictionary representation of the graph from the list of contacts. The keys of the dictionary represent the sender nodes, and the values represent the list of contacts from that node.

Running Dijkstra's Algorithm: The Dijkstra's search algorithm is called with the graph, starting node, and ending node as inputs.

```

print("The following is the Optimal Path:")
for contact_id, receiver in path:
    print(f"Contact ID: {contact_id}\nNodes: {receiver}", end="")
    if receiver != end:
        print(" -> ", end="")
print(f"\nBest Arrival Time: {cost_so_far[end][0]}")

# Create graph dictionary from contacts
graph = {contact.sender: [] for contact in contacts}
for contact in contacts:
    graph[contact.sender].append(contact)

# Run Dijkstra's search algorithm on graph
dijkstra_search(graph, 1, 12)

```

Output:

```
The following is the Optimal Path:  
Contact ID: None  
Nodes: 1 -> Contact ID: 41  
Nodes: 4 -> Contact ID: 34  
Nodes: 2 -> Contact ID: 97  
Nodes: 8 -> Contact ID: 96  
Nodes: 6 -> Contact ID: 135  
Nodes: 12  
Best Arrival Time: 127.37628799999999  
  
Process finished with exit code 0
```