Business Requirements – updated over time

1. Package Size Validation

Description: Validate that the function `IsValidSize` correctly validates the size of a package, ensuring it is within the valid size options of ¼, ½, or 1 cubic meter. This validation is crucial to ensure that the package size meets the requirements for proper handling and storage during delivery. It guarantees that the package can fit within the truck’s capacity and avoids any potential issues related to oversized or undersized packages.

1. Package Weight Validation

Description: Validate that the function `IsValidWeight` correctly validates the weight of a package, ensuring it falls within the valid weight range of 1kg to 1000kg. This validation is important to prevent overloading the trucks and ensures safe transportation of the packages. It guarantees that the weight of the package is within the truck’s weight capacity and avoids any potential issues related to exceeding the maximum weight limit.

1. Package Destination Validation

Description: Validate that the function `IsValidDestination` correctly validates the destination of a package, ensuring it is not an invalid destination. This validation is necessary to verify that the specified destination is a valid location within the city map and be reached by the delivery trucks without encountering any obstacles. It will be used in other algorithms to ensure that the package is assigned to a truck that can effectively reach the destination, taking into consideration the shortest path algorithm and the restrictions on the city map.

1. Package Allocation to Trucks

Description: The system should allocate each package to the most suitable truck based on the available space, weight, capacity, and proximity to the destination. The allocation process should consider truck’s routes, capacity limitations, and minimize the distance diverted from the assigned routes. If multiple trucks are equally close to the destination, the system should prioritize the truck with more available space. This requirement ensures efficient utilization of trucks and optimized package allocation.

1. Shortest Path Calculation

Description: The system should calculate the shortest path from each truck’s current position on its route to the package destination, it should take into account the city map. The calculation should use an algorithm, this requirement ensures that the trucks take the most efficient path to deliver packages, minimizing distance traveled and optimizing delivery time.

1. Delivery Route Optimization

Description: The system should optimize the delivery routes for each truck based on the assigned packages. It should rearrange the order of deliveries to reduce travel distance and minimize the need for diversions. The optimization process should consider the package destinations, the truck’s current positions, and the delivery sequence. This requirement aims to improve overall delivery efficiency and reduce fuel consumption.

1. Package Storage and Delayed Shipping

Description: If no truck is available to pick up a package due to full capacity or unavailability of a suitable route, the system should store the package at the depot. The package should be scheduled for shipping the next available delivery day when trucks return empty. The system should indicate that the package will be shipping the following day. This requirement ensures that packages are not left undelivered and allows for proper handling of overflow or delayed shipments.