A Shipment Problem

Problem Statement

Apple is releasing several new products: the iThing1, iThing2, ..., iThing15. Pre-orders have come flooding in from across the world, and Apple wants to fulfill these pre-orders in the most cost-effective way possible. Apple has multiple warehouses worldwide (W1, W2, ..., W10) where the products are stocked. Apple needs to determine the optimal shipping plan - i.e., the number of units of each product to be shipped from each warehouse to each customer.

Data

The following data are given:

- The number of pre-ordered units of each product by each customer (*pre_order_matrix.xlsx*)

- The stock of each product at each warehouse (*stock_matrix.xlsx*)

- The distance from each warehouse to each customer (*distance_matrix.xlsx*)

For the purposes of our model, we'll consider the cost of shipping to be directly proportional to the distance from the warehouse to the customer. Thus, we can consider the distance as our cost matrix.

Please formulate this model and help Apple find the optimal shipment scenario using Gurobi.