Problem Brief: Design of a Drone Delivery System

You are a part of a team for a new company that specializes in package and food delivery using drones. Your new company is the first entrant in a market. To be successful in the market, your company must maximize profit by designing and implementing a drone fleet.

An example of an initial customer location map is shown in Figure 1. The white blocks represent each customer location. The red and black bars represent the food and payload demands at each location. The brown block shows the company's new warehouse where the drone system will be managed. Each customer can order either one package or one food order. Each package must be delivered within 24 hours, and each food order must be delivered within 4-6 hours from the start of the day.

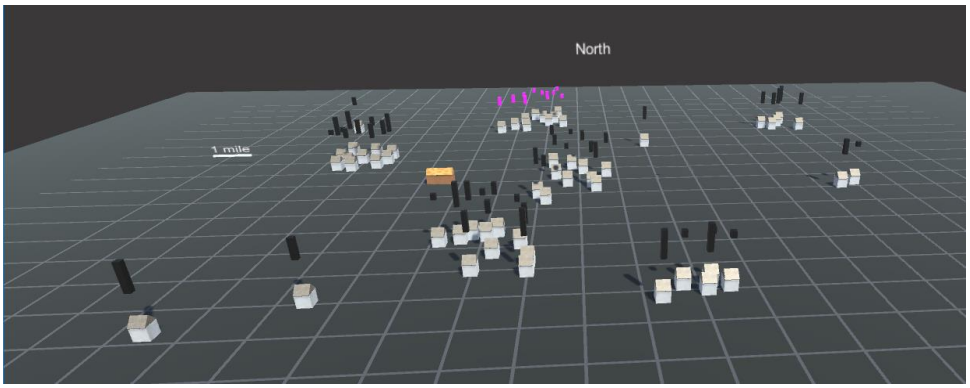

Figure 1 - Initial Customer Location Map

Your company has an initial budget of $15,000 to build and operate a drone fleet. As part of your business strategy, your company can choose to provide service to any customers on the map you want to acquire. Your company will receive $100 in profit per each pound of package delivered and $200 in profit per each pound of food order delivered.

The duration of your design session will simulate one business year. During the year, the market for food delivery will keep expanding, and the demand for package delivery keeps shrinking. Your session will be broken into two equal time periods (30 min), and each time period will simulate one typical day in the six months.

Team Structure, Roles, and Capabilities

There will be six people on your team, and each person will be assigned one role. The team structure is shown in Figure 2. The arrows in the figure represent the communication channels between team members. Team members will communicate through a text-only chat tool during the design sessions. Team members are not allowed to communicate verbally. ***Operations Specialists*** can only communicate with each other and with the ***Operations Manager*** through the chat tool. Similarly, the ***Design Specialist*** can only communicate with the ***Design Manager***.

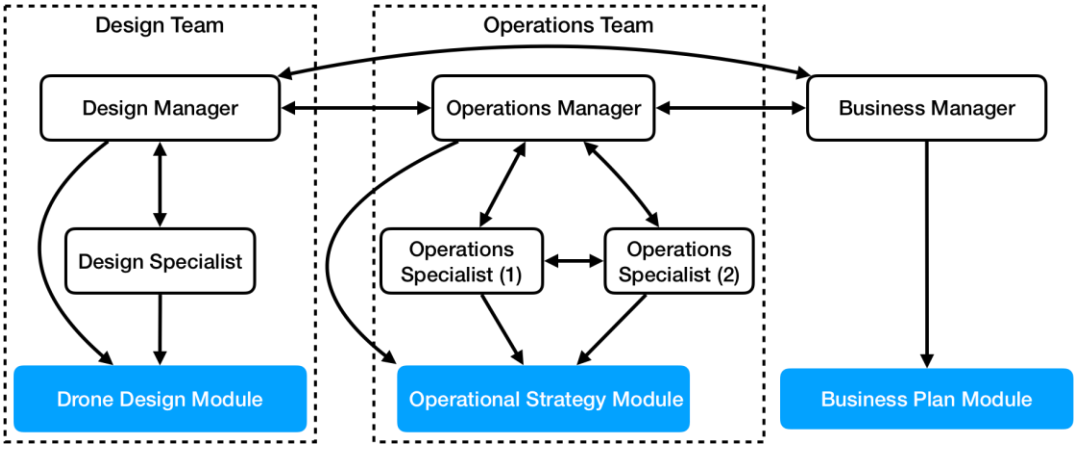

Figure 2 - Team Structure with Communications Links

- The Design Manager is responsible for managing the design team and communicating its progress.
- The Design Specialist is responsible for designing drones using the Drone Design Module (with Design Manager) and submitting completed designs to the operations team.
- The Operations Manager is responsible for managing the Operations team and communicating its progress.
- The two Operations Specialists are responsible for developing operation plans by generating delivery routes with designed drones to deliver parcels.
- The Business Manager is responsible for handling the company budget, choosing the customers using the Business Plan Module, and communicating its progress. The Business Manager can decide to approve or reject the operation plans.

Depending on their role, team members have access to one of three interface modules:

- The drone design module enables members of the design team to construct drones. Designers can check the drone feasibility, assess the cost, and assess the performance of the design by running a simulation.
- The operational strategy module enables the operations team can determine an operation plan that aligns with the company' s business strategy, and the customers' constraints. This module rapidly evaluates routes and schedules, and provides estimates for time-to-deliver, the number of vehicles required, time on/off station, among others.
- The business plan module enables the business manager to construct and simulate their market plans. The market plan includes the number of customers for whom service should be provided, the locations of the customers, and the type of incentives each customer requires.

Company Role: Design Specialist

- Your role in the team is ***Design Specialist***. The Design Specialist is responsible for designing drones using the Drone Design Module and informing the status and capabilities of the drones to the Design Manager.
- You can communicate with Design Manager
- You can use: Drone Design Module

Drone Design Module – For Design Manager and Design Specialist

Using the configurational design module shown in the Figure, designers can construct drones by adding building blocks such as connecting rods and proper components. You can use pre-designed components such as motor-rotor pairs, connecting rods, batteries, and controllers. Each component can be scaled in size, and you can select different options for the electric controller. Designers can check the drone feasibility, assess the cost and the performance (including flying range, endurance, and speed) of the design by running a simulation. Simulations can be run with specified payload weights. Designers can submit feasible drone designs together with their cost and performance information to the Operation Strategy Module.

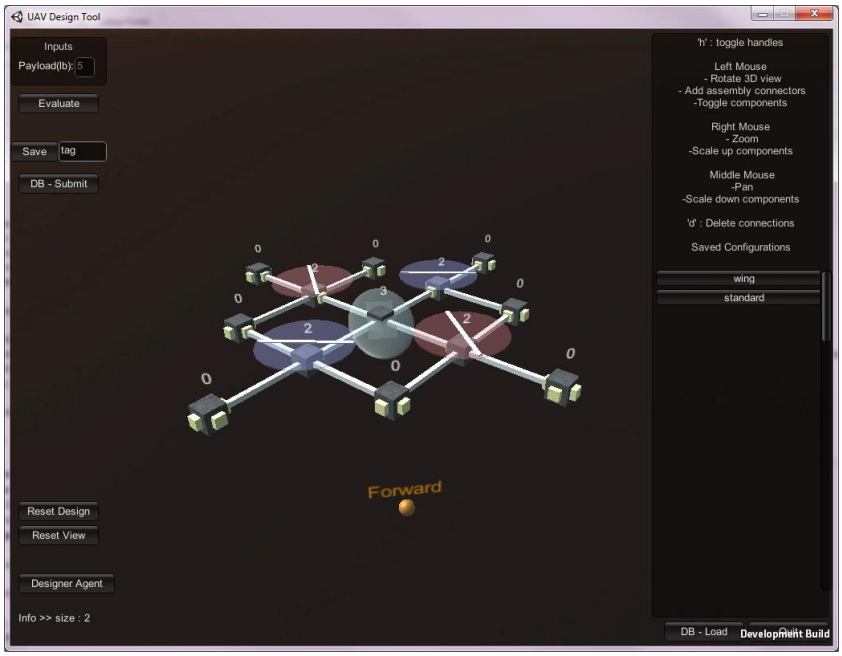

Figure 3 - Drone Design Interface