**Mini Project**

**Title: Decentralized Vehicle Routing Across Organizational Boundaries with Digital Twins and Multi-Agent System**

**Project Description**

Consider a map with several locations connected via various routes. Some locations are occupied by supply depots and other may be occupied by consumers. The vehicles of different logistics operators can drive between the various locations on the map. These vehicles are requested by suppliers to deliver loads from the depots to the consumer locations.

\*add a simple figure showing a map with depots, consumer locations and vehicles\*

Each vehicle is represented both a dedicated digital twin and agent. The digital twin of the vehicle can communicate with the “physical” vehicle (e.g. instructing the vehicle to drive to a specific location, obtaining data on the vehicle’s fuel consumption, etc.) and the agent representing the vehicle (e.g. providing estimates of the duration or fuel consumption of a specific journey). The vehicle’s agent operates within a multi-agent system, along with agents representing the various suppliers, and can communicate with these supplier agents (e.g. negotiating “service contracts”) as well as the vehicle digital twin (e.g. requesting estimates for duration or fuel consumption for a specified journey).

The movement and data of the “physical” vehicles are simulated by a simulation program. The simulation program provides a bi-directional interface by which the movement of vehicles can be instructed by external programs, and vehicle data can be provided to external programs.

**Architectural Design**

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**Detailed Interactions**

Agent-to-agent interactions follow the contract net protocol

