**Challenge**

Dynamic freight management is intended for environments in which information is dynamically revealed to the decision maker (carrier). This information may not be known at the initial planning stage, and/or may change during plan execution. The principal focus of this research is to devise good and computationally efficient approaches that a commercial vehicle fleet operation manager, or dispatcher, can use to take advantage of real-time information and dynamically manage available resources to serve time-sensitive customer requests while recognizing prevailing and anticipated traffic conditions on the road network.

**Approach**

The methodological framework provides for the integration of both known and still uncertain customer requests along with the real-time predictions of unfolding traffic conditions. It consists of the following key modules, also illustrated in Figure 1.

- **A Priori Routing Planner:** this module uses time-dependent travel times and a priori requests to generate the initial work plan (schedules and routes) for each truck before the service day.
- **Online Booking Processor:** decides whether a request is accepted or not into the system during the service day.
- **State Estimation Module:** simulates the traffic flows including passenger cars and the fleets and incidents on the network. It provides traffic conditions such as time-dependent travel times, incident information and current locations of the trucks at different time intervals.
- **State Prediction Module:** projects the network state for a period into the future (in a rolling horizon fashion) and thus provides predicted travel times that reflect current and forecast conditions to the **online re-routing planner**.
- **Service Network:** Represents an abstraction of the network formed by the loads to be served and the transportation network that connects them; it differs from the physical road network in that links consist of subpaths corresponding to shortest paths between nodes. It evolves dynamically as loads are progressively revealed.
- **Online Re-routing Planner:** receives all real-time and anticipated information and updates and/or re-optimizes current work plans for all vehicles in the fleet during the service day.

**Findings**

The study addressed the real-time fleet management problem in congested urban networks with significant sources of uncertainty. To handle the inherent dynamism of the system, we integrate real-time information and utilize the dynamic traffic assignment model and simulator to obtain prevailing and anticipated traffic conditions on the network. A heuristic approach and real-time policies are developed to find good and computationally efficient routing plans that dynamically manage available resources to serve time-sensitive customer requests while recognizing the prevailing and anticipated traffic information on the road network. The potential benefits of this research include:

- Improve information utilization: the efficiency of the fleet management system is greatly reliant on the quality of available information. The GPS can track the status and location of vehicles and help in constructing routing plans for new customer requests. The real-time information provides prevailing states on the road network and also serves as the basis for anticipated traffic conditions;
- Reduce operation cost: with better planning and operation guidance, the fleets operate more efficiently at higher performance levels;
- Increase customer service: with the aid of the proposed model, carriers are able to respond to new requests in a timely manner with more reliable routing plan, thus fewer delays at the customer locations;
- Evaluate the efficiency and effectiveness of services: the proposed model is capable of modeling various operational components with considerable realism and recording most of necessary information needed for evaluation, so as to improve the performance in the future.

**More**

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Figure 1: Modeling Framework