CPS: Synergy: Cyber Physical Regional Freight Transportation System

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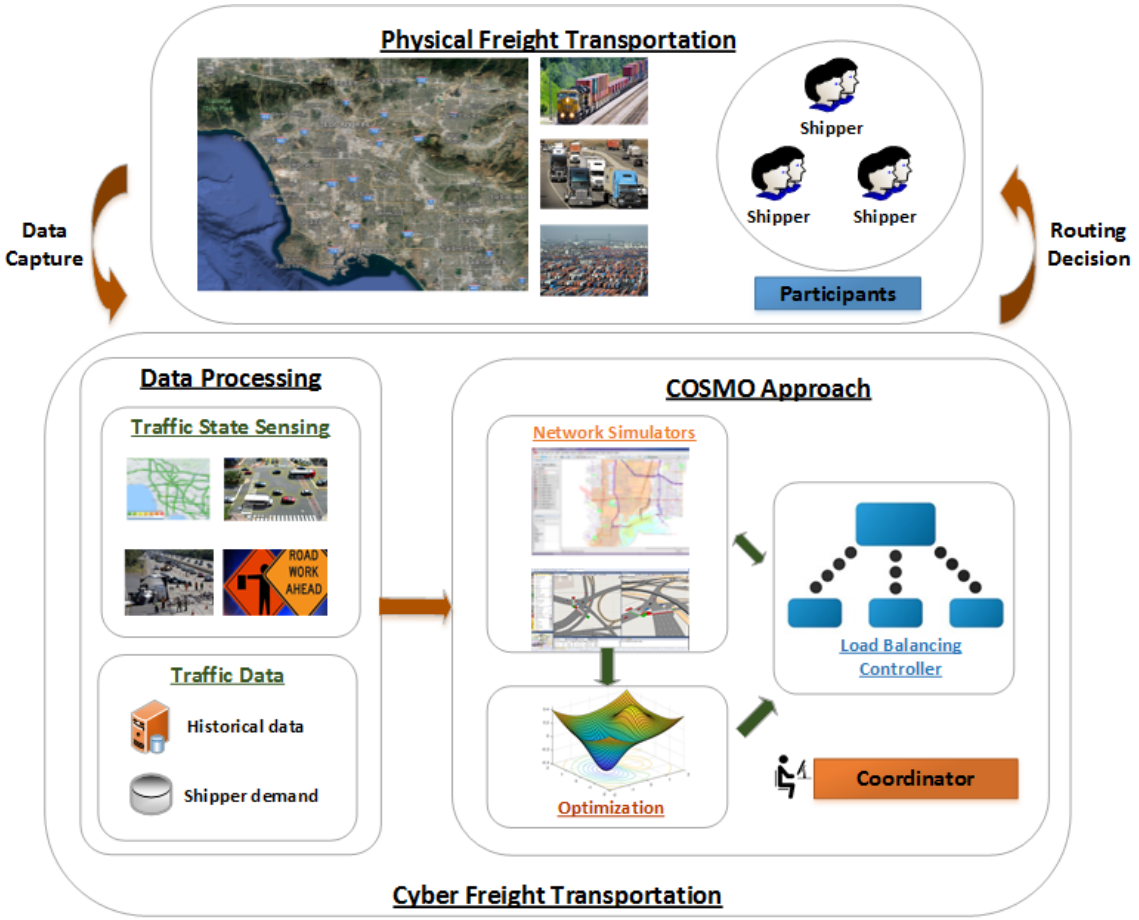
Project Description

Objective:
(1) Develop a CPS Freight Routing system for load balancing using a Co-SiMulation Optimization (COSMO) approach that generates routes of participated shippers by balancing traffic loads and minimizing an overall cost;

(2) Investigate the mechanisms of giving incentives for participation by making sure individual user cost is less than one incurred if they do not participate using a game theoretic approach



Key Findings

1. Fast computer processors allow us to replace traditional simple mathematical models with more accurate simulation models in feedback loops to provide better control actions. We developed such an approach for a CPS freight load balancing system in a multimodal network.
2. The system involves a coordinator that generates routing instructions to all participants by minimizing an overall cost that balances the freight loads across the transportation networks.
3. The issue of system optimal cost versus individual user cost is addressed by formulating the problem as a game theoretic problem and by generating incentive mechanisms which guarantee that the user cost in the case of no participation cannot be exceeded by the cost incurred as a result of participation.