Agentic AI for Adaptive and Resilient Middle-Mile Freight Operations

Objective

Open, multi-tier agentic AI framework for real-time, coordinated routing, loading, scheduling

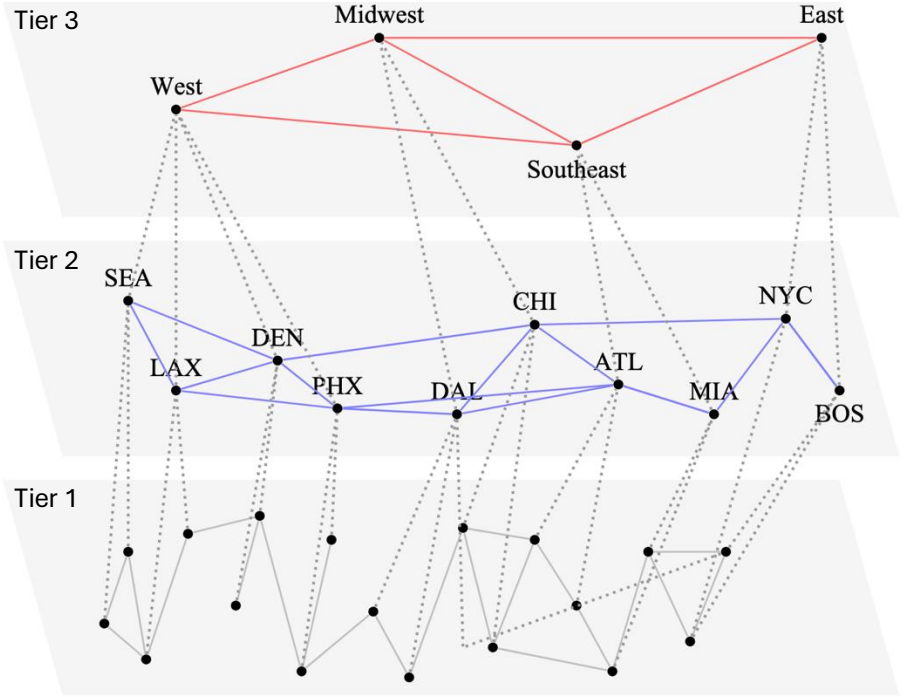
State-of-Practice

- Sequential planning, siloed ML →30-60 min lag, 65% utilization.
- Barriers: scalability, lack of coordination, fragmented IT.

Targets

- ✓ On-time delivery: 97-98%
- ✓ Utilization rates: 90-95%
- ✓ Response latency: < 5 min

Proposed Agentic AI Framework



- **Tier 1**: Perception agents (sensors, telematics, WMS).
- **Tier 2**: Hybrid optimization + ML (MIP, RL, LLM/VLM).
- **Tier 3**: Human oversight, XAI dashboards, governance.

Plan

- **Phase 1** (0-18 mo): Prototypes
- **Phase 2** (18-36 mo): Multi-hub testbeds
- **Phase 3** (36-48 mo): Pilots with partners

Impact

- Improved freight resilience and efficiency
- Lower operational costs
- Enhanced U.S. freight network reliability and responsiveness