Multi-level production under dynamic and stochastic environment

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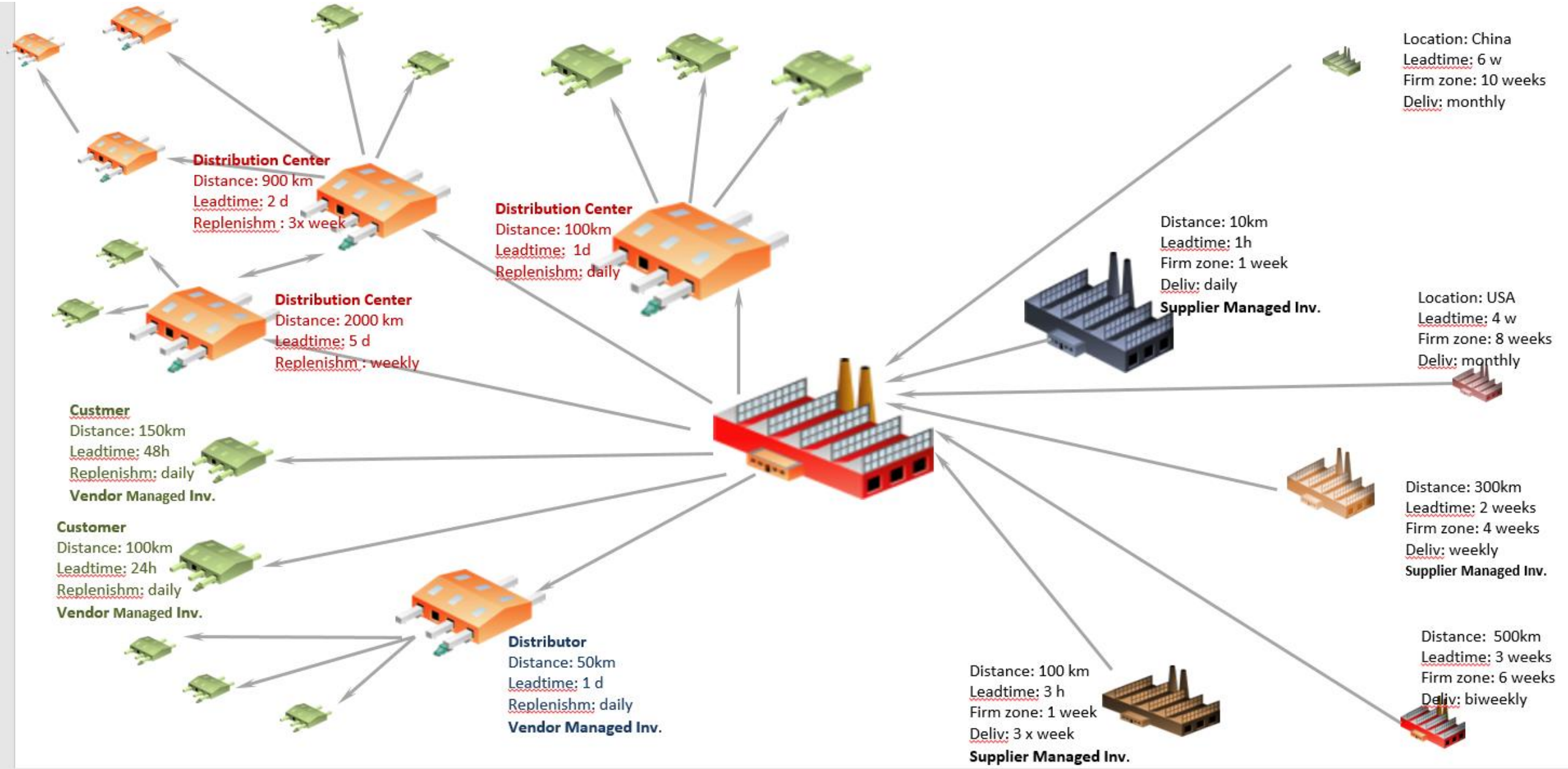

Distribution Center
Distance: 900 km
Leadtime: 2 d
Replenishm : 3x week
Distribution Center
Distance: 100km
Leadtime: 1d
Replenishm: daily
Distribution Center
Distance: 2000 km
Leadtime: 5 d
Replenishm : weekly
Custmer
Distance: 150km
Leadtime: 48h
Replenishm: daily
Vendor Managed Inv.
Customer
Distance: 100km
Leadtime: 24h
Replenishm: daily
Vendor Managed Inv.
Distributor
Distance: 50km
Leadtime: 1 d
Replenishm: daily
Vendor Managed Inv.
Location: China
Leadtime: 6 w
Firm zone: 10 weeks
Deliv: monthly
Distance: 10km
Leadtime: 1h
Firm zone: 1 week
Deliv: daily
Supplier Managed Inv.
Location: USA
Leadtime: 4 w
Firm zone: 8 weeks
Deliv: monthly
Distance: 300km
Leadtime: 2 weeks
Firm zone: 4 weeks
Deliv: weekly
Supplier Managed Inv.
Distance: 100 km
Leadtime: 3 h
Firm zone: 1 week
Deliv: 3 x week
Supplier Managed Inv.
Distance: 500km
Leadtime: 3 weeks
Firm zone: 6 weeks
Deliv: biweekly

Problem to solve

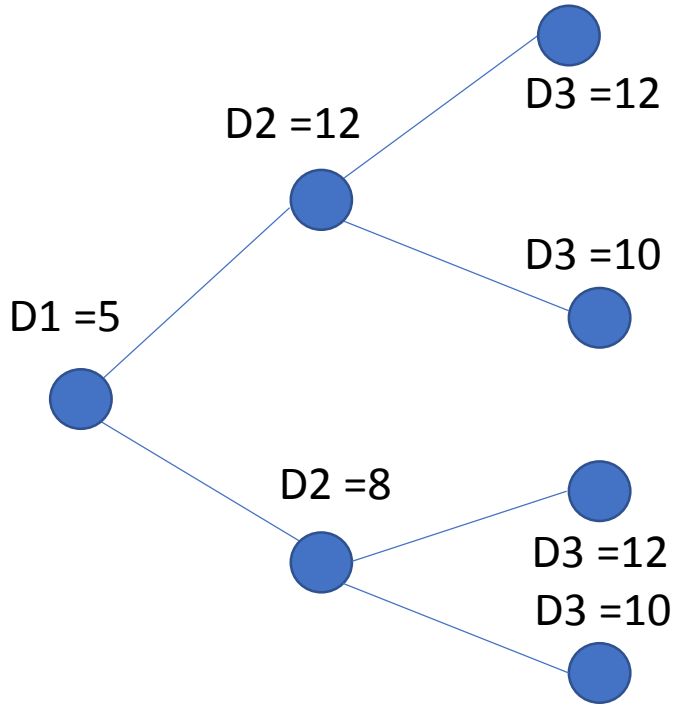
Decisions: Quantities to produce / transport

Objective: Inventory cost, setup-cost, back-order cost.

Constraints: Flow conservation, capacity

Multi-stage stochastic optimization

- The problem is solve over a certain time horizon.
- The demand forecast is update at each time period, and the problem can be resolved.



Machine learning

- Use machine learning to compute the **cost-to-go function**

- Detect situations in the supply chain where the **desired service level** is not reached.