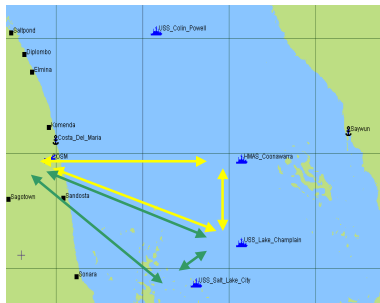




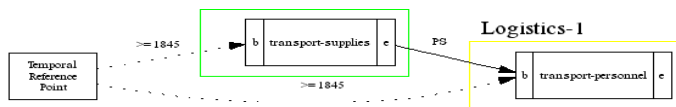
# Multilevel Coordination Agent (MCA)

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One Simple Deconfliction Result

Logistics-2

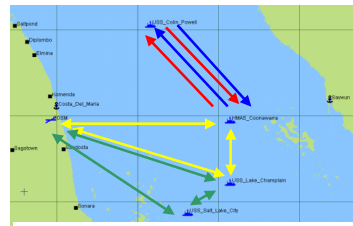


## Deconfliction:

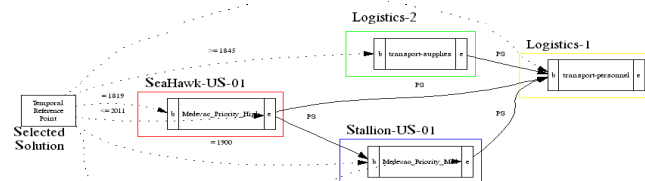
- ◆ Collects together abstract descriptions of coalition agents' plans.
- ◆ Identifies potential unintended conflicts.
- ◆ Formulates possible resolutions at current level of plan detail:
  - ◆ Synchronization to avoid demands on same assets at same time.
  - ◆ Selection to strictly assign assets.
- ◆ Collects together more details about plan steps involved in conflicts.
- ◆ Iteratively identifies and resolves conflicts at the deeper levels.
- ◆ Presents options as they are found.
- ◆ Commander can choose to act on an option that has been found, or to wait for possibly better choices.

## Avoiding Disruption:

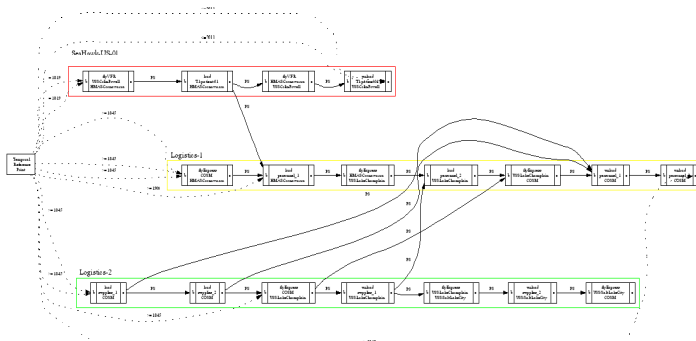
- ◆ As more coalition partners formulate plans, coordinating them could involve changing coordination commitments already agreed to by partners that began sooner.
- ◆ Revoking commitments and implementing new ones can incur downstream costs.
- ◆ All else being equal, should prefer coordination solutions that minimally disrupt commitments already in place.
- ◆ MCA capabilities support:
  - ◆ Providing estimates on the amount of disruption associated with a solution.
  - ◆ Sorting solutions based on disruption.
  - ◆ Biasing the top-down search to find less disruptive solutions sooner.



Minimal Disruption after adding Evac Agents



## Least Duration & Lowest Cost after adding Evac Agents



## Finding and Exploiting Synergies:

- ◆ Deconfliction is based on finding actions of agents that achieve contradictory effects.
- ◆ Synergies are based on finding actions that achieve similar effects.
- ◆ Simple case:
  - ◆ Discover that agents are planning actions with redundant effects.
  - ◆ Determine which of the agents can drop unnecessary actions.
  - ◆ Insert synchronization constraints between agents to assure that agent takes action when others need it to.
- ◆ Top-down search finds big merges faster.
- ◆ Deeper solutions partition assignments.
- ◆ Sort by estimates of execution efficiency and present options to commander as they are found.

