Multilevel Mission Coordination for Coalition Operations
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Description:
Joint mission with objectives/responsibilities distributed among multiple functional teams comprised of human and computer agents
Operational choices by a functional team can unintentionally (infrequently) interact with what others can or should do

Negative interactions: conflict over coalition assets, friendly fire
Positive interactions: piggybacking tasks

Multilevel Coordination Agent is a grid-aware service to ensure that these interactions are efficiently predicted and effectively resolved

Resulting joint plan balances:
Efficient (fast, parallel) execution
Flexibility for local run-time improvisation
Avoidance of unnecessary or costly actions
Realistic runtime messaging load
Minimal disruption to prior commitments

Prototype capabilities:
Finds serialization constraints to avoid conflicts (e.g., collisions over helipads),
Discovers opportunities for having one plan accomplish (part of) mission for another.
Estimates costs, overall time needs, and expected impact on prior commitments for informed command decisions.
Given more time, explores at more detailed levels to find more parallelism.

Future directions:
More complicated kinds of plan merging to maximize utilization of assets.
Modeling and coordinating interactions among agent teams.
Caching and reuse of coordination decisions.
Distribution of coordinator functionality leading to efficient parallel implementations.

Results:
Analyzes the alternative plan spaces of coalition functional teams that plan independently and act asynchronously
Works top-down with plans chosen by teams to predict unintended interactions.
Identifies candidate resolutions (merging steps that duplicate effort, inserting timing or action constraints to deconflict plans).
Notifies operator of possible plan conflicts and synergies, and computed resolutions.
Estimates quality of alternative resolutions, including action costs, parallelization, and disruption to prior commitments
Operationalizes/enforces coordination decisions selected.
Given more time, isolates and resolves interactions more precisely and efficiently.
Allows postponing coordination decisions until runtime conditions are better known.
Packaged as a Grid-aware component that supports coalition commanders.

Before Coordination: Four independent helo transport tasks

After Coordination: Three equivalent coordinated helo transport tasks: Reordered some tasks to enable merger of others