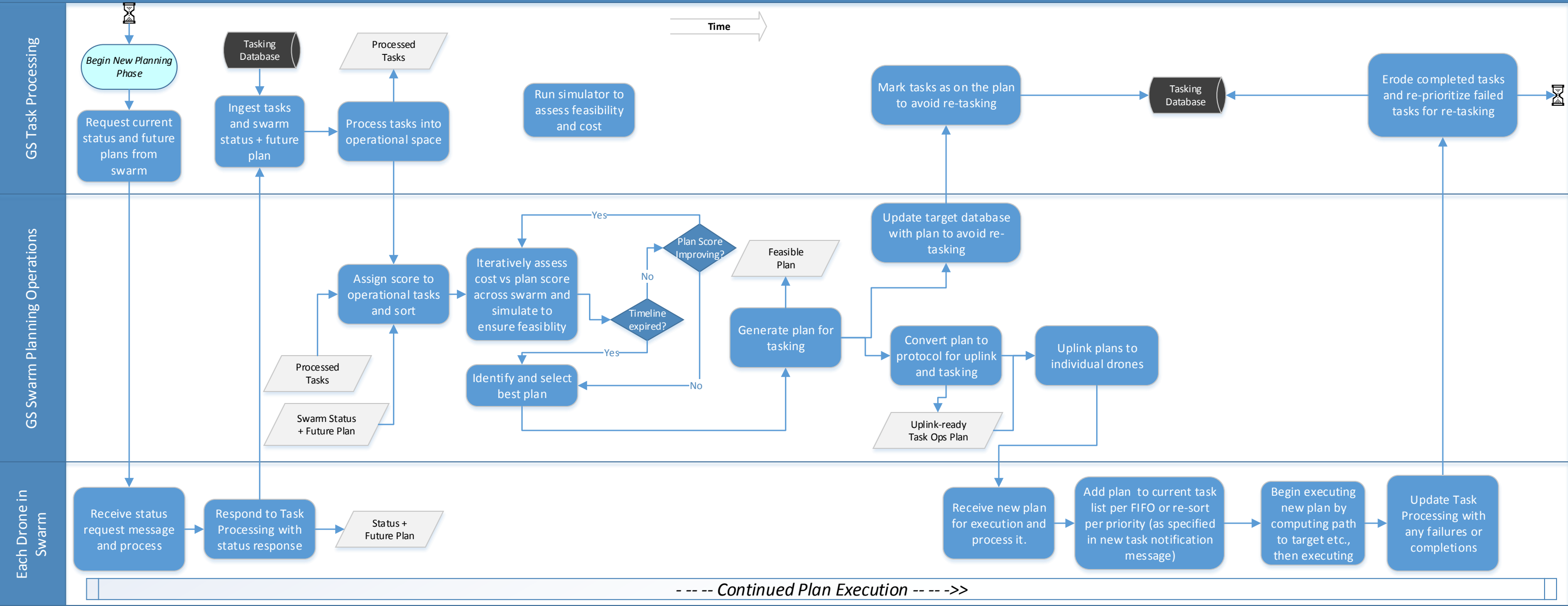


Mission Planning and Dynamic Swarm Execution

Swarm Planning Operations



Ground System Task Processing

The GS task processing functionality processes tasks into assignable portions that can be analyzed and assessed by the planning system. For example, a broad area search target would be broken into individual targets, or imaging events, that can be laid onto the swarm plan. Several target types are supported (see further documentation).

Ground System Swarm Planner

The processed events are then passed to the Swarm Planner that evaluates their priority/value against the cost under different scenarios, which are simulated using the swarm model. (The swarm model will run the same path planning algorithms that each drone carries to attempt to accurately predict how each drone will execute the tasks. The actual simulator will be built to try to model how each drone flies to each target in the prioritized lists.) Once the plan score stops getting better, or the configurable planning time expires, a final plan is generated and converted into a language that the drone swarm can understand. This plan is then uploaded to the swarm by sending drone-specific messages out with assignments for execution.

Drones

Each drone receives a stack of tasks listed in order of execution and guidelines that layout how the tasks should be collected (imaging constraints, timing, locations, etc.). With this information, each drone is able to find a path to the target and execute each operation. If a plan is currently being executed, the tasks will be placed in a FIFO queue for execution unless the appropriate "Immediate" flag is set on one of the tasks. If the immediate flag is set, the drone finishes the current tasks and then addresses the immediate task and returns to the original plan.

Whenever an operation is fulfilled, a success status message is relayed back to the Task Processor for update in the database. This allows for an up to date view of the entire mission which will then feed into the next planning sequence. Note that during the swarm planning operations, the planner has a simulator that it uses to estimate how each drone will execute their mission operations. Actual tactical results are required for later analysis in order to improve the simulator.

Some operational events require coordination among drones. For example, if a cooperative task like Multi-Intercept is placed on the plan for a given drone, that operation causes the drone to reach out for status to the other drone being tasked. These drones exchange messages prior to executing the target intercept.