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# Mission Scenario Generation and Characterization to Support Acquisition Decisions for Long Range Precision Fires-Maritime (LRPF-M)

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# Mission Scenario Generation and Characterization to Support Acquisition Decisions

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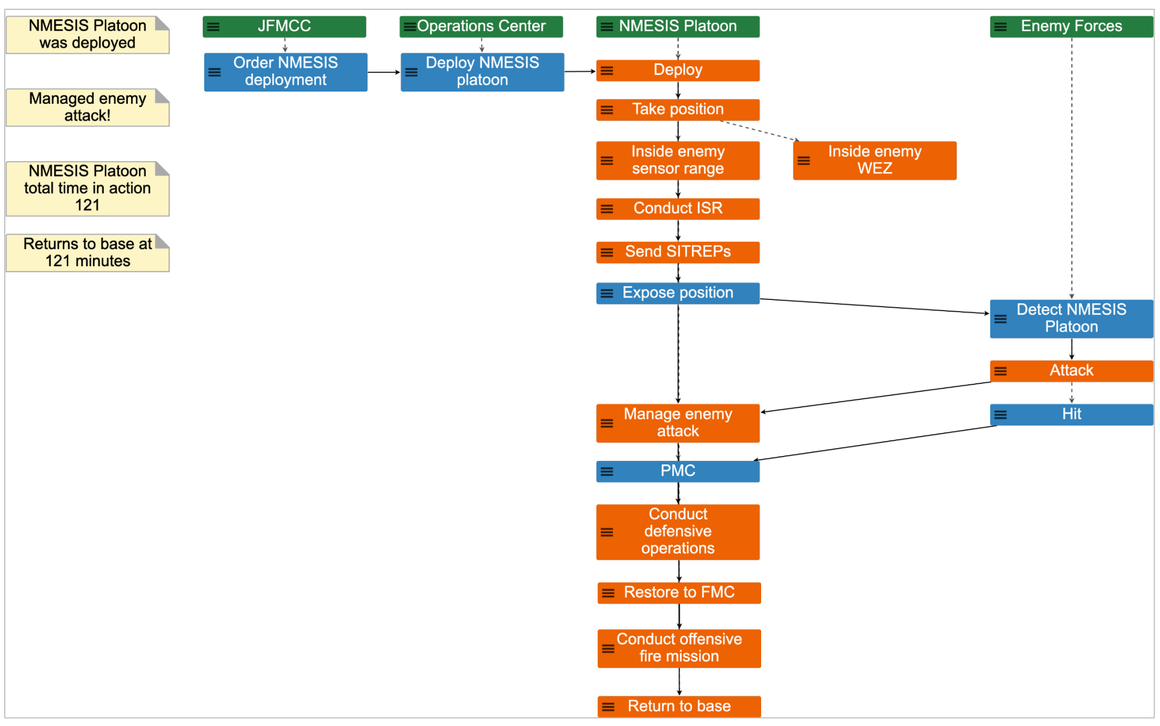
## Research Questions

- What are the alternative possible flows for a baseline mission, given events that can occur in the system's environment?
- Can the mission scenarios be characterized with durations, probabilities and/or costs to support acquisition decisions?


*A behavior model formally captured communication and decision flows among operations and control entities of a Navy/Marine Expeditionary Ship Interdiction System (NMESIS) Platoon operating in a littoral environment.*



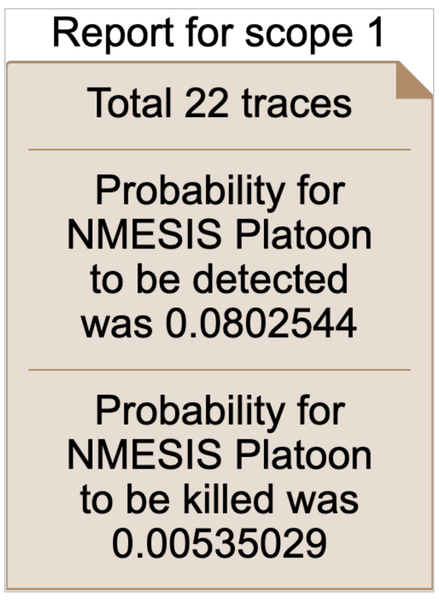

*Example Flow (Trace 6)*

## 1 Mission, 105 Alternative Flows

- A Monterey Phoenix (MP) behavior model exhaustively generated all possible combinations of alternative flows, e.g., how platoon:
  - deploys or fails to deploy
  - position remains concealed or exposed
  - is fully mission capable or partially mission capable

## From 105 to 22 Alternative Flows, and Characterization

- Logical and simplifying constraints reduced the number of valid scenarios while keeping a formal record of important assumptions
- Implicit assumptions can be made explicit for all to understand
- Constraints can be toggled on or off to admit or reject different combinations of events during validation of the scenarios
- Assigned notional durations and probabilities to key events to estimate whole scenario characteristics
  - MP-Firebird calculations exclude zero-probability scenarios rejected by constraints (Quartuccio 2019)
  - Notional values were used to test the approach instead of experiential or historical data




*A "Global View" computes resulting model statistics.*

## Conclusions & Further Research

- MP modeling supports requirements discovery and analysis by providing scenario combinations that are unavailable in such numbers in a manual scenario generation process.
- Quantify the value/savings (e.g., in time or dollars) of having exposed the assumptions, constraints and/or requirement needs for a system or program office.



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Quartuccio, J. (2019.) Identification of behavior patterns in system of systems architectures (Doctoral dissertation).