System Effectiveness Analysis Simulation (SEAS) Overview

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Overview

- **Need for credible, quantitative military worth analysis is a given**
- **SEAS:**
  - **Proper modeling of C4ISR as Prerequisite to Space Worth Analysis**
    - Force planning centers around C4ISR issues (eg., Sim Based Acquisition)
    - Non-linear conceptual model of combat is essential
    - Conceptual model framework brigdes gaps in DoD community
    - SEAS data model supports non-linear combat
    - Comparison of SEAS "vertical slice" to aggregated, legacy models : very different results
  - **Quick Reaction Analysis (QRA) approach--existence proofs of sensitivity to C4ISR**
    - Processing, Exploitation, Dissemintation (Comm) delay
    - Comm outage
    - Concealment & Deception (SATRAN phasing, decoys)
    - Sensor Cuing
    - Model behavioral/functional validation
  - **In detail**
    - SEAS unique features
    - Where SEAS fits in DoD set of models

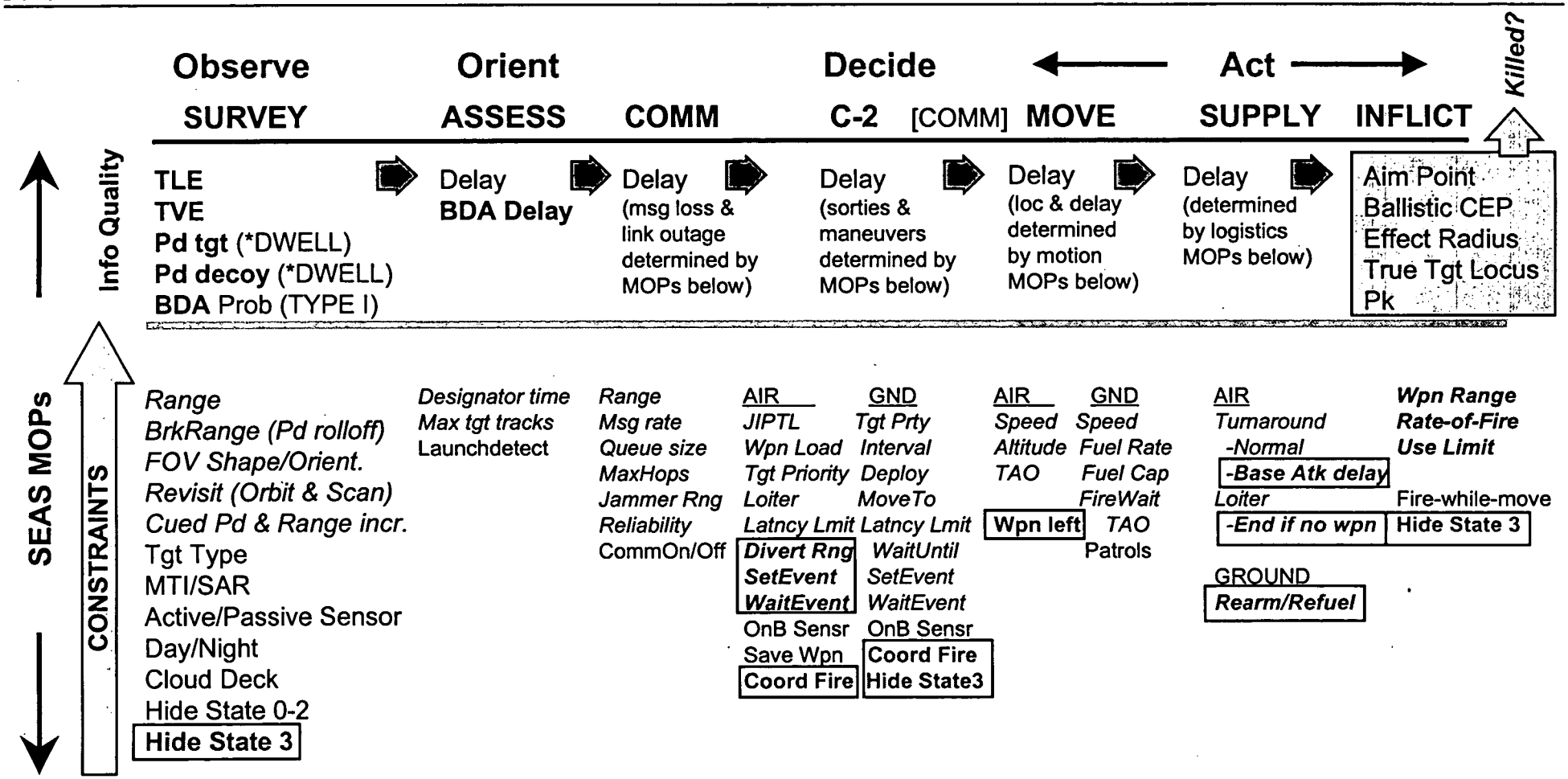
SEAS Unique QRA Features

- **Balanced representation of C4ISR functions & "Information War" with weapons effects**
  - **Dynamic "Tactical Pictures" for each Blue & Red force element**
    - Explicit sensor geometries and sensor platform revisit/gap times
    - "On the Fly" Air Tasking Order--diversion with in-flight update
    - Decoy/Deception for high value targets
  - **Explicit end-to-end C-3 connections & time lines**
    - Modeling of future weapons follows JMEM logic but not limited by historical data (eg., ATCAL tables)
    - Processing delay
    - Commander's perception vs decision threshold (doctrine/rules)
    - Commander's orders to field units--planning cycle delay
    - Maneuver warfare via automata rules--emergent behavior
  - **Interaction of tactical doctrine & new system capabilities**
    - Permits new CONOPs & doctrine to optimize exploitation of space

SEAS Unique QRA Features (2)

- **Explores broad scope of outcome space consistent with high risk nature of warfare**
  - Multi-run stochastic model for Exploratory Analysis
  - Interface to COTS analysis tools (eg., JMP) for visualizaing probabilistic outcomes
  - Feeds response surface method to link architecture MOPs to campaign MOEs
- **Architecture consistent with Military Worth Framework**
  - Based on widely accepted "Strategy-to-Task" method
  - Interface to Strategy-to-Task MOEs & C4ISR & space system MOPs
  - Balanced context for credible space--air--ground ISR comparison

SEAS Data Model



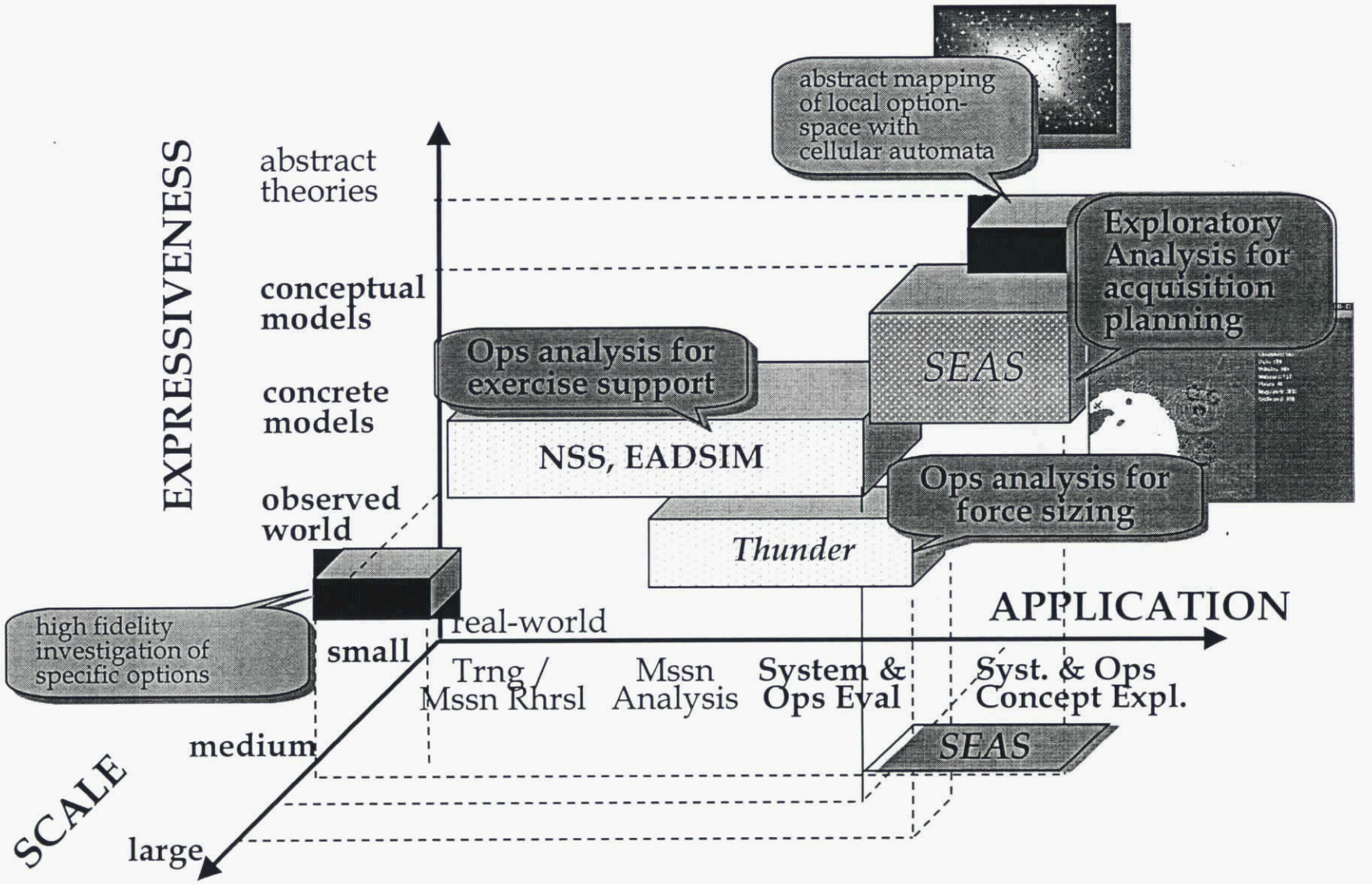
Blue Font = Info elements propagated via comm links to shooters where effect on attrition occurs

Black Italic Font = Continuously variable MOP constraints which control the flow info elements

Black Regular font = 2 or 3 valued logical constraints which control flow of info elements

Pink Bold font = variables which generate reactive/adaptive behaviors

Simulation Domains



Bottom Line

- **SEAS developed for over 5 yrs to meet goals of next generation combat models**
  - Guided by Sante Fe Institute Complex Adaptive System concept
  - Consistent with MORS SIMTECH 2007 & "New Sciences" Symposium
- **SEAS provides capabilities for C4ISR and Info War analysis not possible with aggregate combat models**