

Planning
Modeling and Simulation
Support to
Systems Engineering

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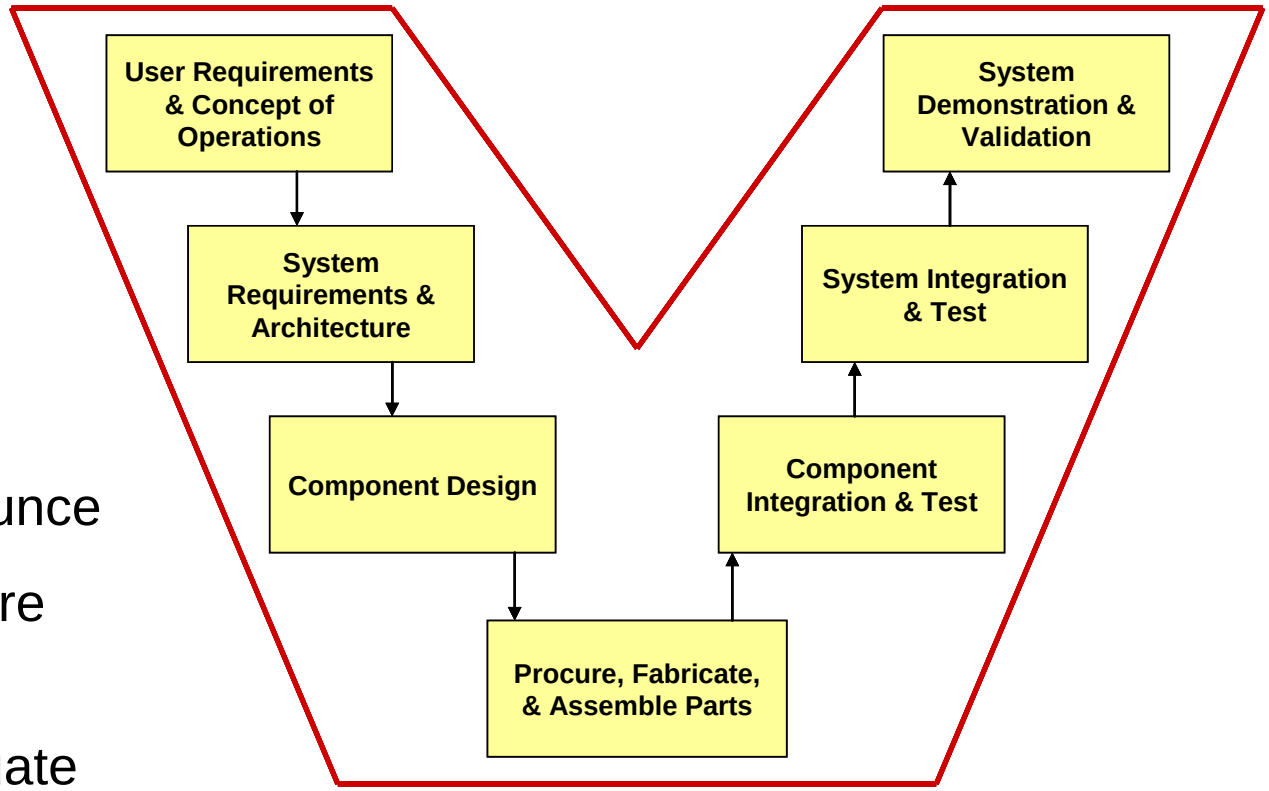
Background

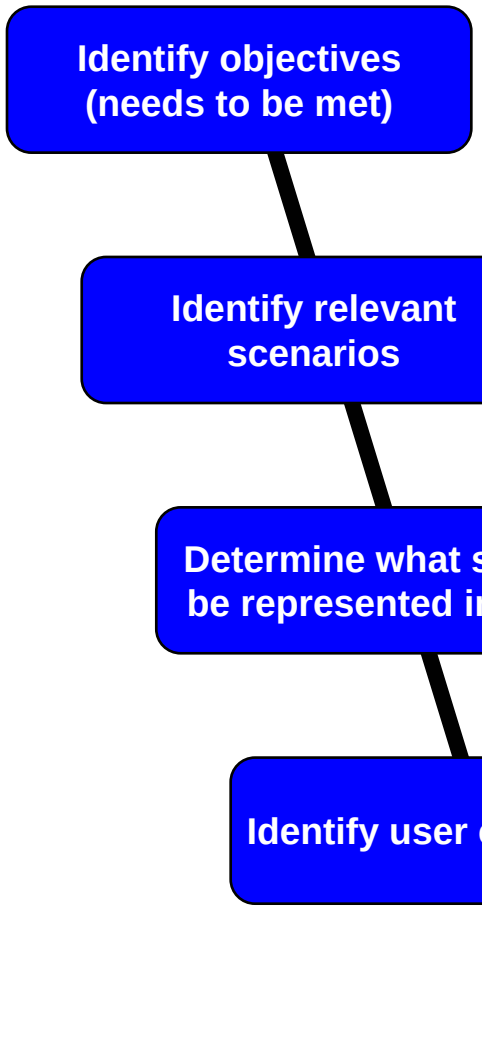
- Modeling and simulation (M&S) is an increasingly important means to support the systems engineering process
- Typical programs use many (100's) modeling environments, models, simulations, and simulation federations to:
  - Develop the system concept
  - Design the system, including its sustainment
  - Assess the merits of alternative concepts and designs
  - Integrate the system
  - Verify the system meets requirements
  - Support system introduction, sustainment and evolution
- M&S is often seen as an incomprehensible "black art"
- M&S decisions tend to be ad hoc, undisciplined and biased by the past experience and economic interests of the parties

Needed: A Disciplined M&S Planning Process

- Modeling environments, models, simulations and federations are systems
- A disciplined systems engineering process should be applied
  - Analyze requirements
  - Investigate alternative solutions
  - Select best solution, announce
  - Develop/procure and integrate
  - Test and evaluate



Planning M&S Support to Acquisition (1 of 4)
Requirements Analysis



For instance, to design product and answer questions about system KPPs, MOE and MOPs, cost, supportability, safety, or "anything that keeps the PM up at night." Also identify training objectives to be met, orientation/PR needs, etc.

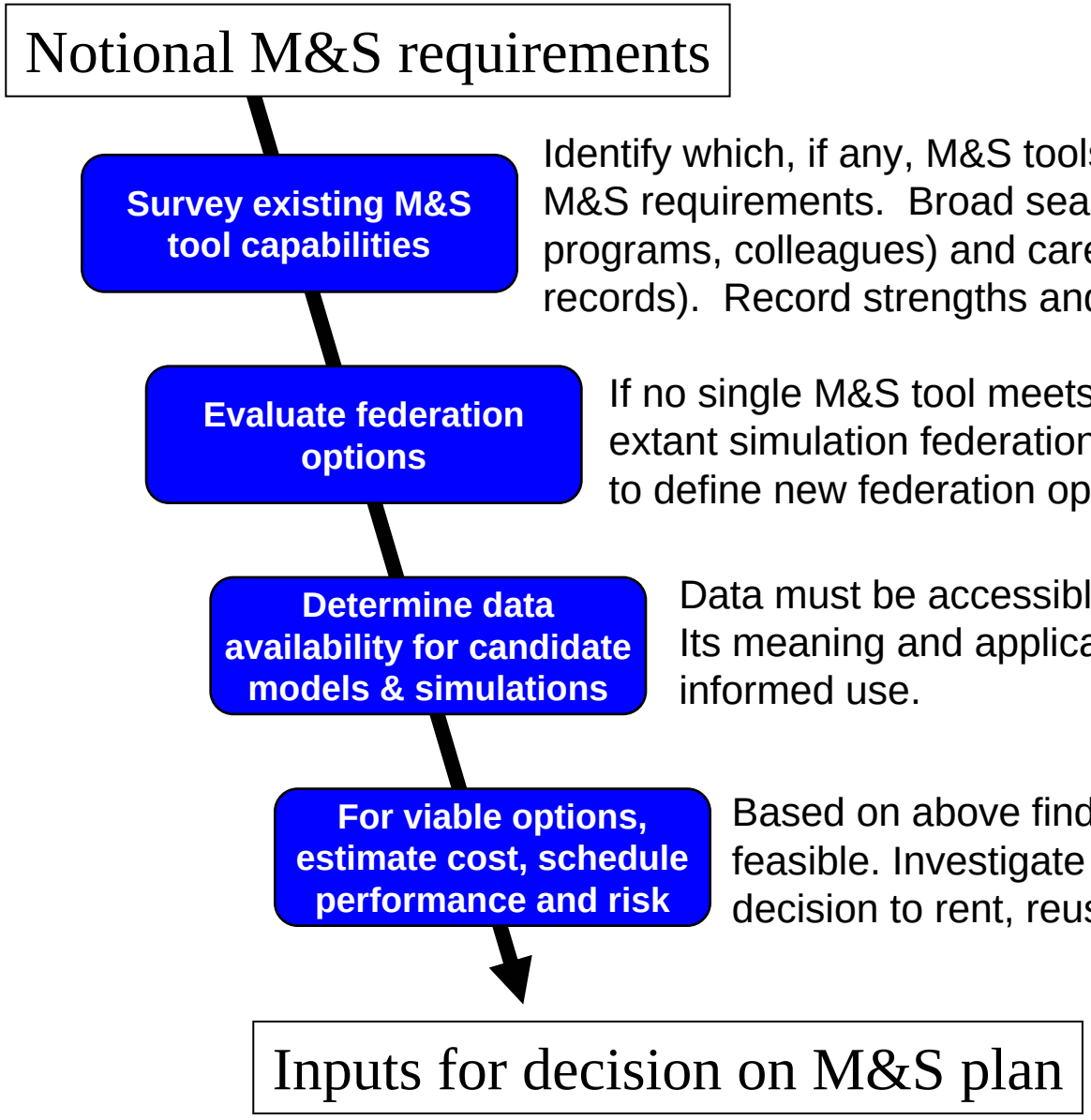
Expected system operating environments as documented in Defense Planning Scenarios, Multi-Service Force Deployments, Analytical Baselines, Design Reference Missions, STARs, use cases, etc.

Acquire domain knowledge for each objective-scenario set. Decide what entities, attributes, interactions, have significant impact on objective. Decide at what level of granularity and fidelity they should be represented. This is a "conceptual model."

Consider constraints such as schedule, allowable response time, run speed, security classification, ITAR, staff limitations, funding limitations, computing platforms, networks, policies, applicable DOD standards, etc.

Notional M&S requirements to meet each objective

Planning M&S Support to Acquisition (2 of 4)
Investigate Alternatives



Planning M&S Support to Acquisition (3 of 4)
Decide, Publish Plan, and Initiate

Inputs for decision on M&S plan

Coordinate with all key stakeholders

Inform stakeholders of options being considered and related factors. Resolve any issues and solicit their recommendations to PM.

Select best M&S course of action

Decide whether to rent M&S services, reuse someone else's M&S resource, modify an existing resource, buy a COTS product, build a new one, or punt (pursue a non-M&S solution).

Document M&S plans

Document M&S plans in SEP, TES, and TEMP, and optionally in an MSSP.

Obtain required funds, personnel, etc.

With decision and plans in hand, coordinate as required to obtain/program the required funds and people.

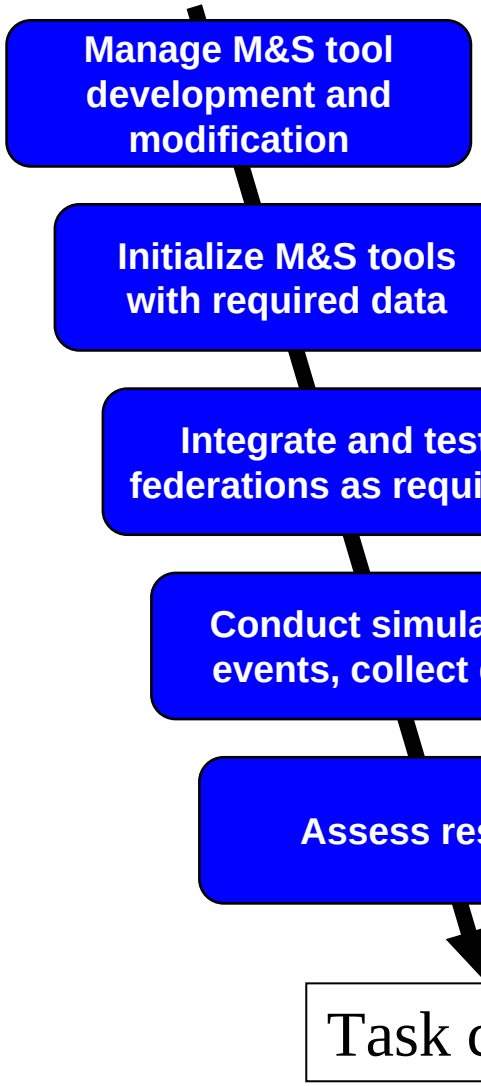
Execute required RFPs, contracts, and/or MIPRs

Follow applicable polices and guidance. Pay attention to details of any contract (e.g., standards, data rights)

M&S plan implementation underway

Planning M&S Support to Acquisition (4 of 4)
Develop, Employ and Evaluate M&S

M&S plan implementation underway



Follow procurement/SE best practices guidance. Enforce verification and validation (risk reduction). Comply with applicable standards.

Transform data as required to ensure proper semantics & syntax. Comply with all applicable policy and guidance (security, etc.)

Per IEEE 1516 FEDEP, obtaining technical support services as needed. Obtain Information Assurance Certification.

Coordinate and orchestrate M&S use. Collect needed data.

Follow sound analysis practices (evaluation anomalies, statistical significance, etc.). Identify any needed M&S tool changes.

Task complete

Discussion