

"Using Executable Architectures to better assess C2 for net-centric weapons"

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Agenda

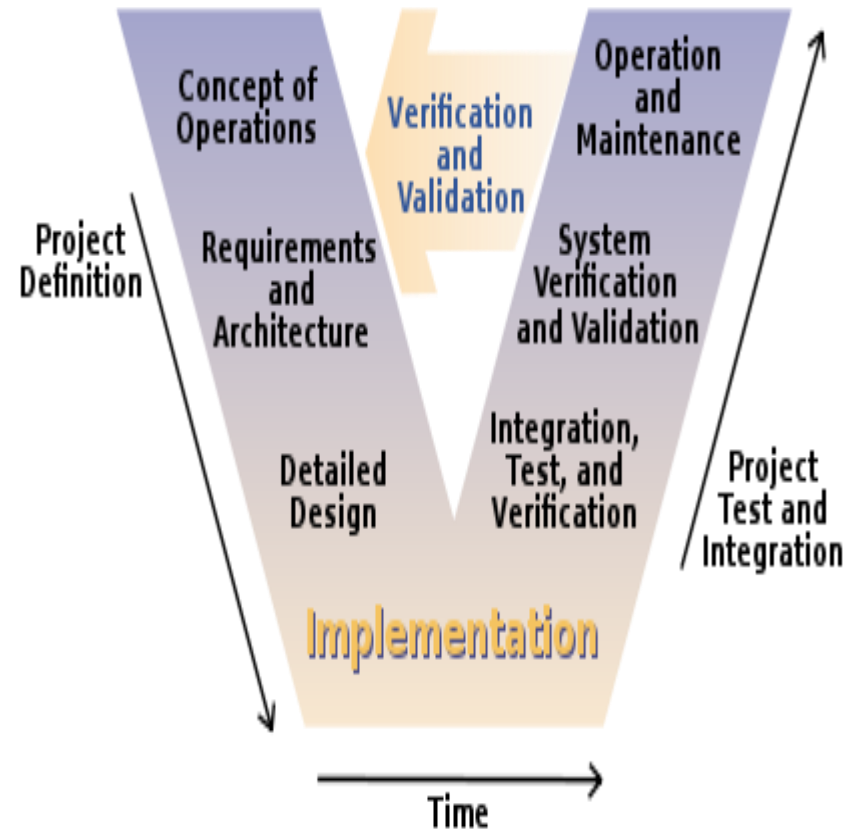
- Motivation
- Research: Executable Context
- The Method
- Solution
- Results
- Conclusion
- Questions

Motivation

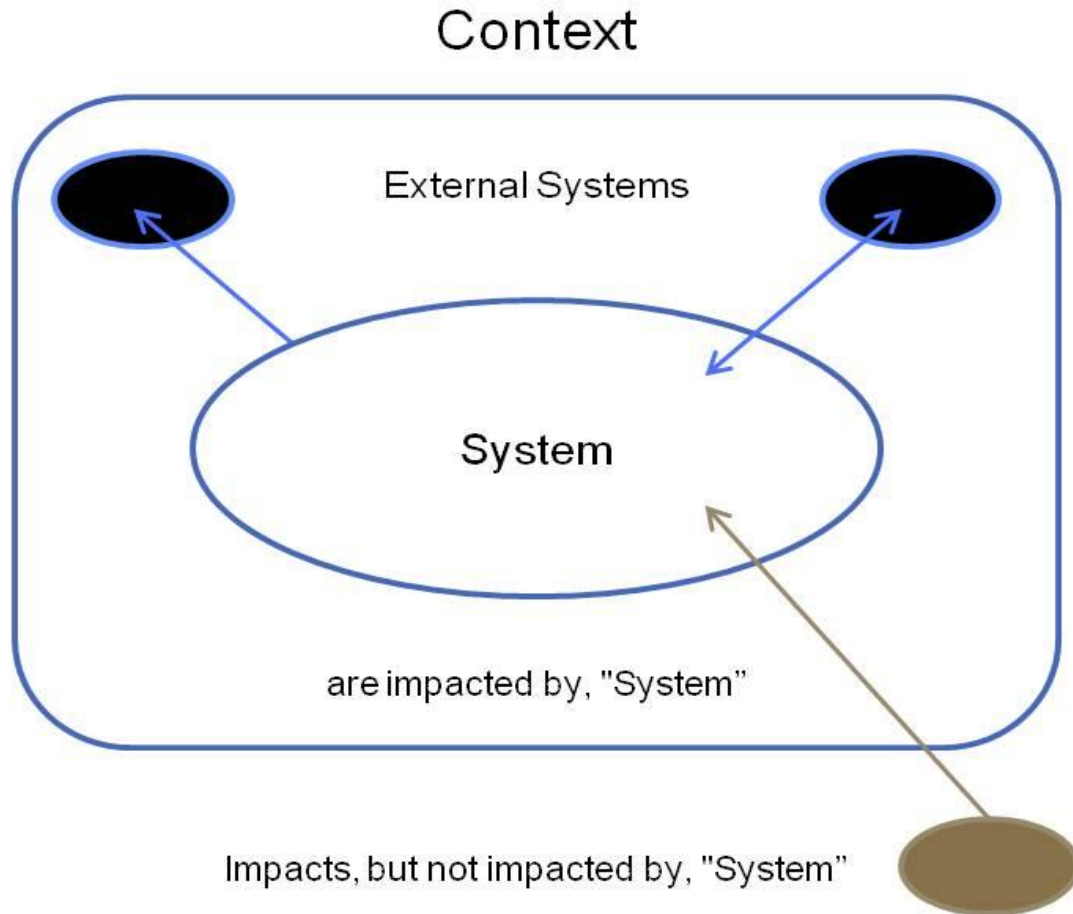
Observations

- What are the systems that are affected by this system?
- What are the systems that affect this system?
- What environment does this system operate in?
- Will this system execute within its intended environment as predicted?

How do we model a system?



Establishing a Context

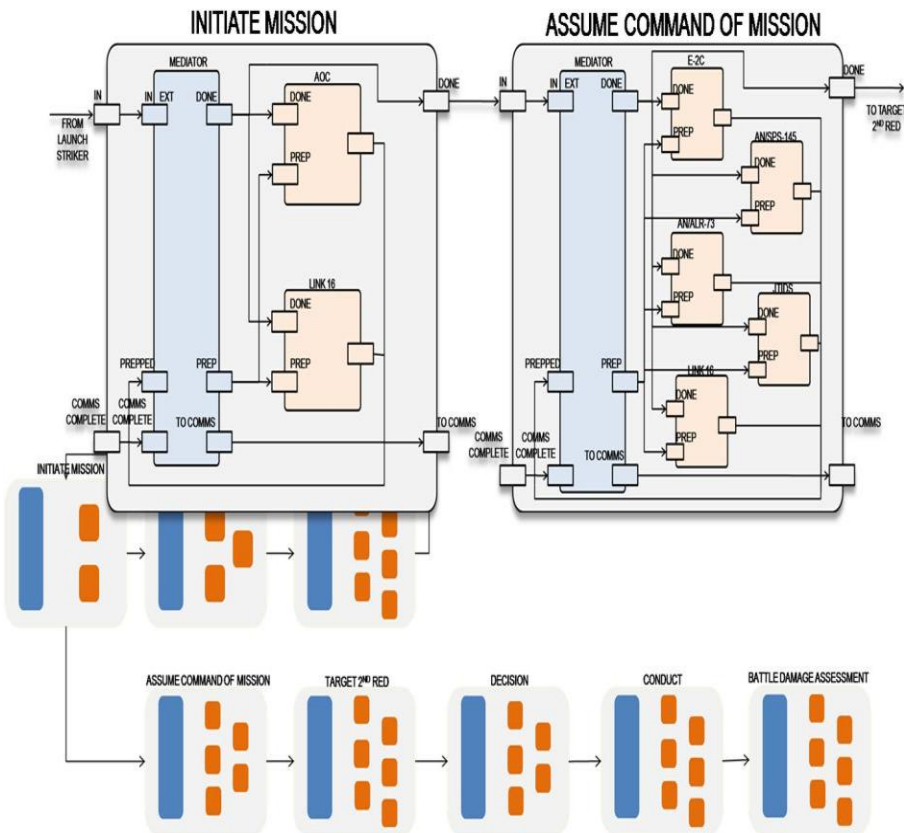


A context is:

“Set of systems that can or can not impact the system”

All Systems reside within a Context

Establishing Executable Architecture



An Executable

Architecture is:

“a semi-automatic way of generating System artifacts”

“So an Executable Context” =

Context +

Executable Architecture

Solution

- **Does incorporating the context affect the evaluation of the system?**
- **Does incorporating the context lead to different decisions?**

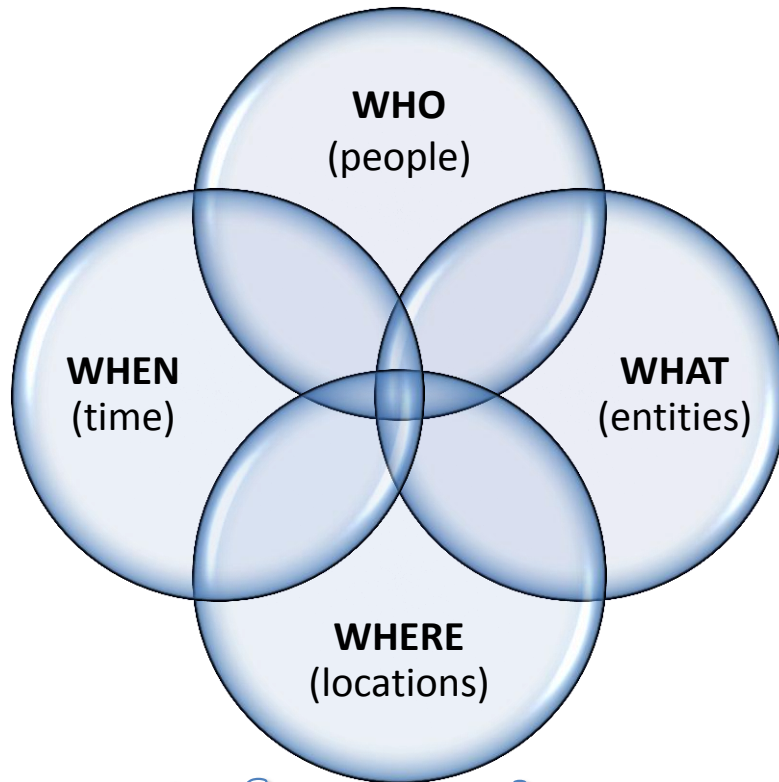
In order to answer these type of questions we need to capture and execute the system in context.

Proposed Solution – “Executable Context”

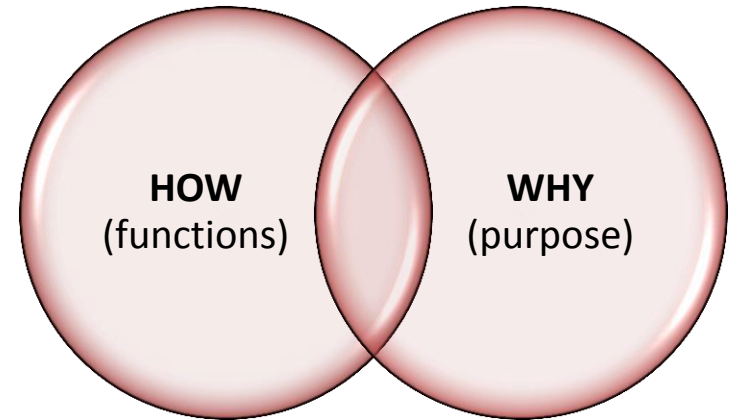
“How to capture and execute the system in context?”

From Information to Knowledge

Research is defined by **six interrogatives** which are disseminated into two groups: those that relate to **information** and those that relate to **knowledge**.
This research focuses on the knowledge-based approach.



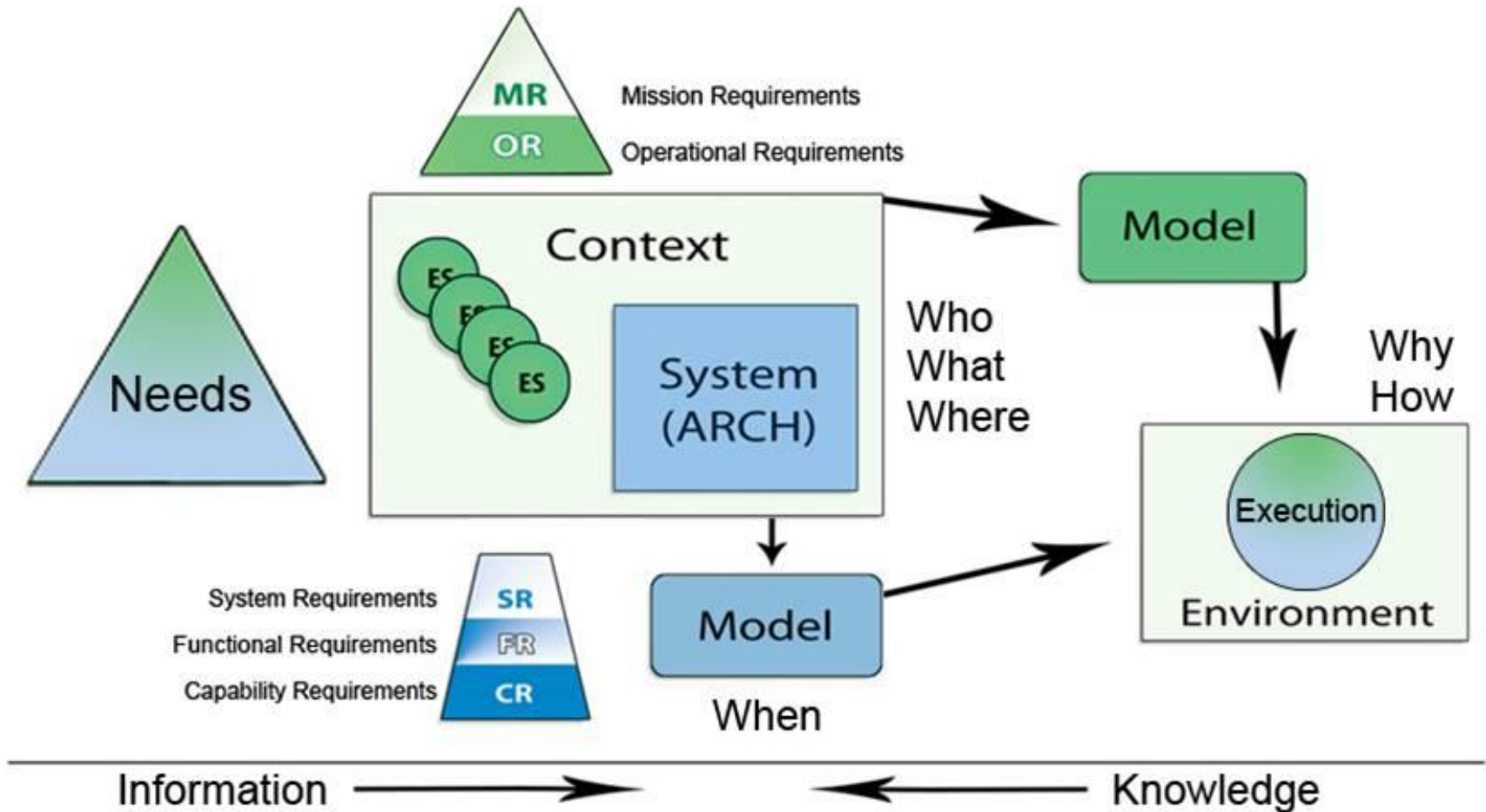
Information



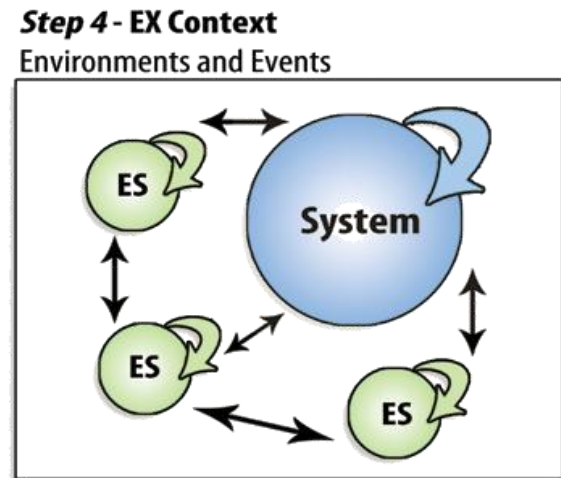
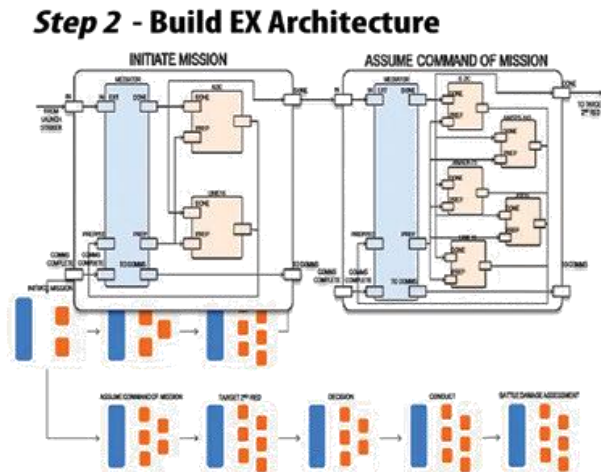
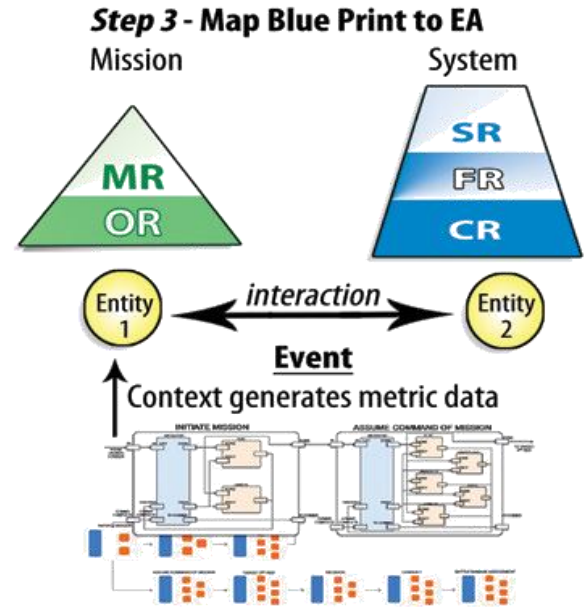
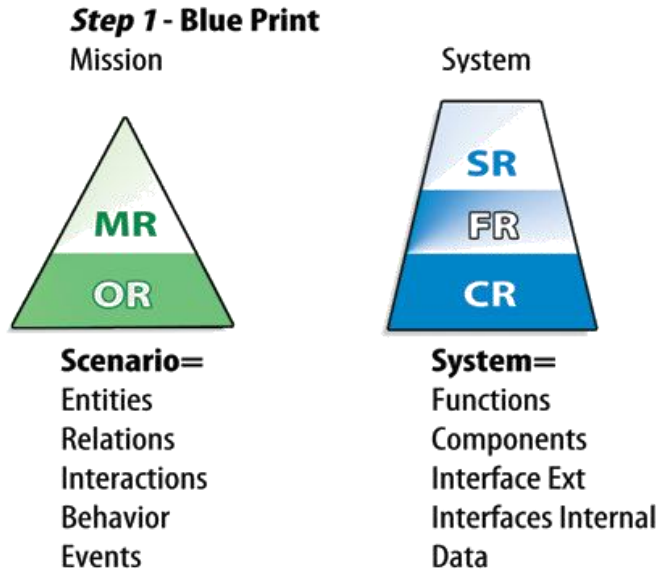
Knowledge

Method: “Executable Context”

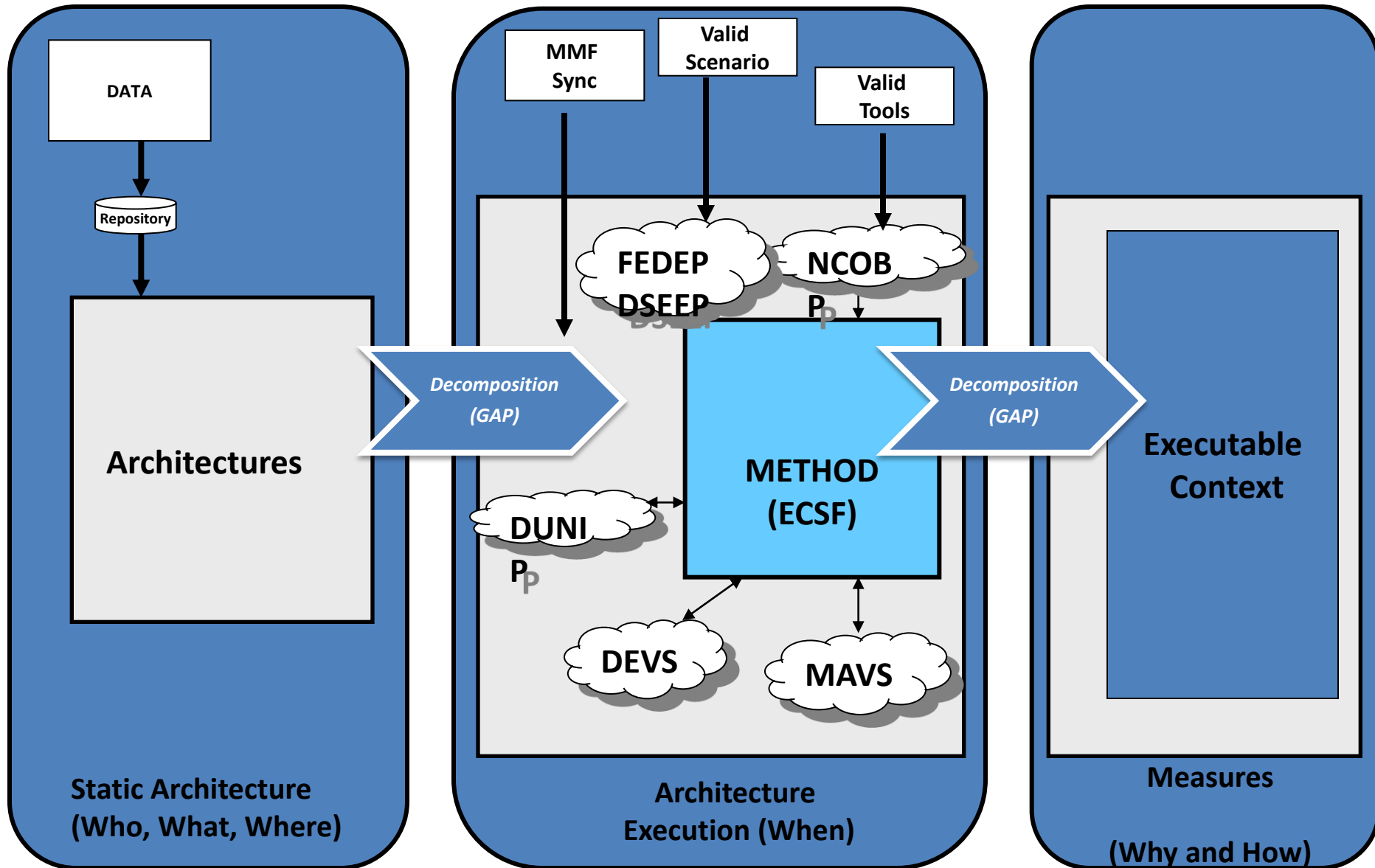
The experimental frame specifies conditions under which architectures are experimented with and evaluated.



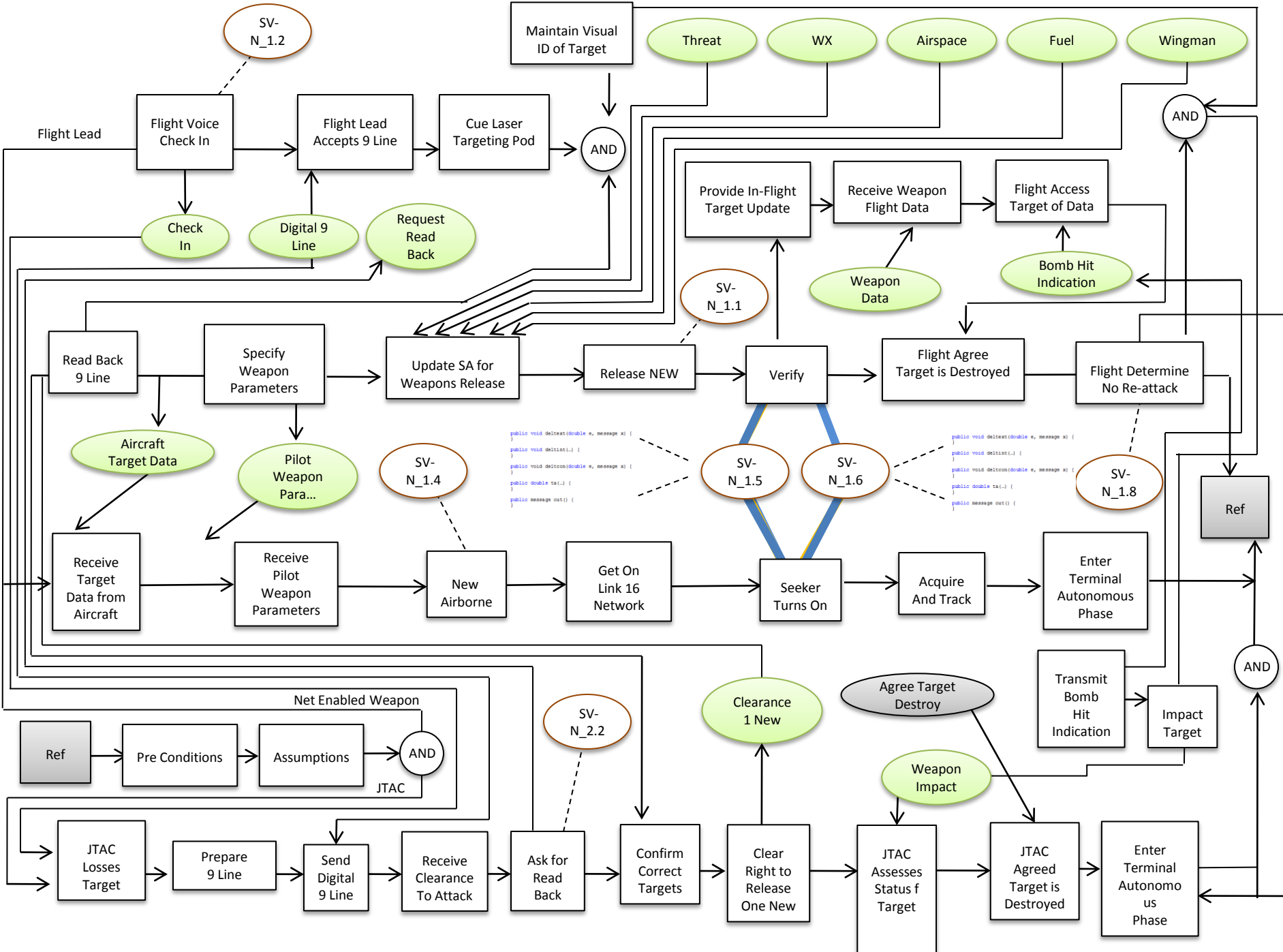
Solution: Executable Context Simulation Framework (ECSF)



Step 4 Executable Context Simulation Framework



Dead Lock Model (Theoretical)



```

public void deinterleave(double s, message m) {
}
public void deinterleave(...) {
}
public void deinterleave(double s, message m) {
}
public double ta(...) {
}
public message out() {
}
  
```

```

public void deinterleave(double s, message m) {
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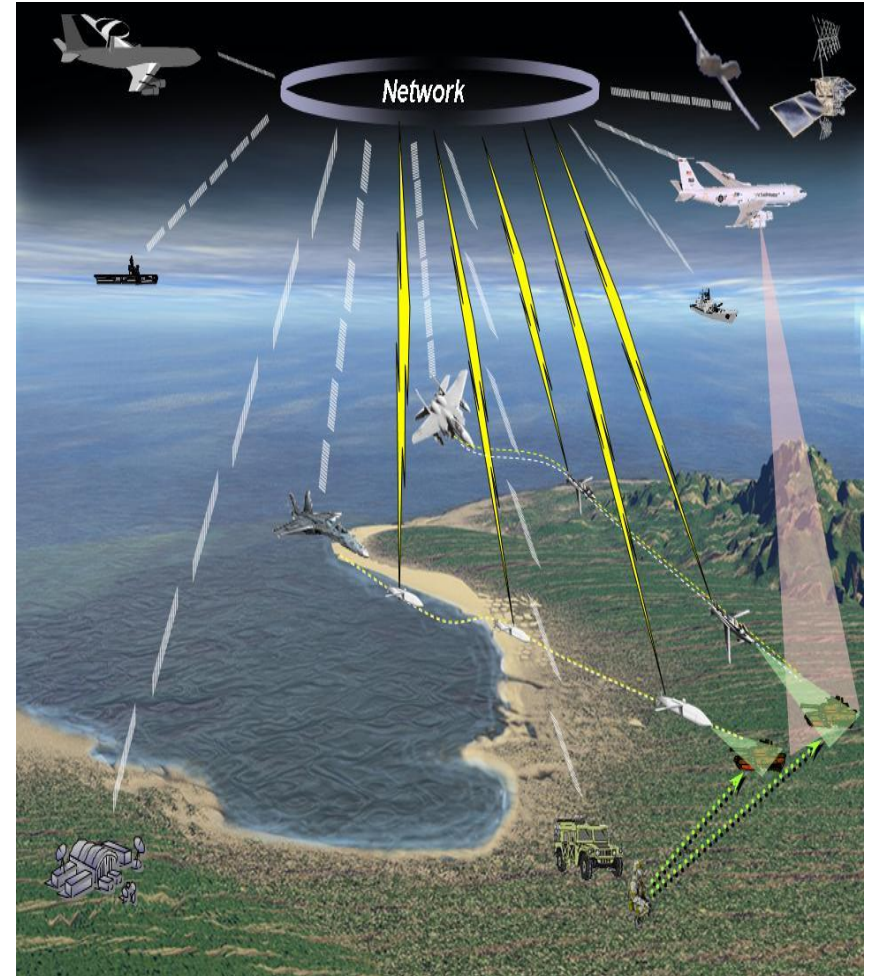
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EC Solution for System-of-Systems (Operational Feasibility)



The figure at left depicts a JAS operation currently.
The figure at right depicts the same JAS operation using network-enabled weapons (NEW).

Results

Incorporating the context affects evaluation of the system within its operation.

Incorporating the context enables different operational and system development decisions.

Contributions

- **Proof of Necessity (Theory)**
 - Executable Context is needed for the evaluations of systems as System of Systems
- **Proof of Feasibility (Engineering)**
 - Executable Context is feasible using both M&S and combine it with Systems Engineering
 - Systems and Operational Requirements

Contributions

- Further Applicability:
 - Mission and Means Framework (MMF) to identify Scenario and Measures
 - DUNIP to create Executable Context + Executable Architecture Federate
 - Federation Development and Execution Process FEDEP and Distributed Simulation Engineering and Execution Process (DSEEP) to enable the Executable Context Simulation Framework (ECSF)
 - Evaluated Method for Architecture Evaluation (MAVS)

Future Research

- Department of Defense
 - Portfolio management
 - Effective model evaluation for DoDAF
 - Meta Model
- Model and Simulation Driven Systems Engineering
 - Capture integration complexity
 - Level of effort required to connect individual components.
 - Technology change: replaced throughout the system life
 - System of Systems Engineering (SoSE) methodology
 - Enterprise architecture (EA)
 - Enterprise systems engineering (ESE)



Questions



<http://www.vmasc.odu.edu>