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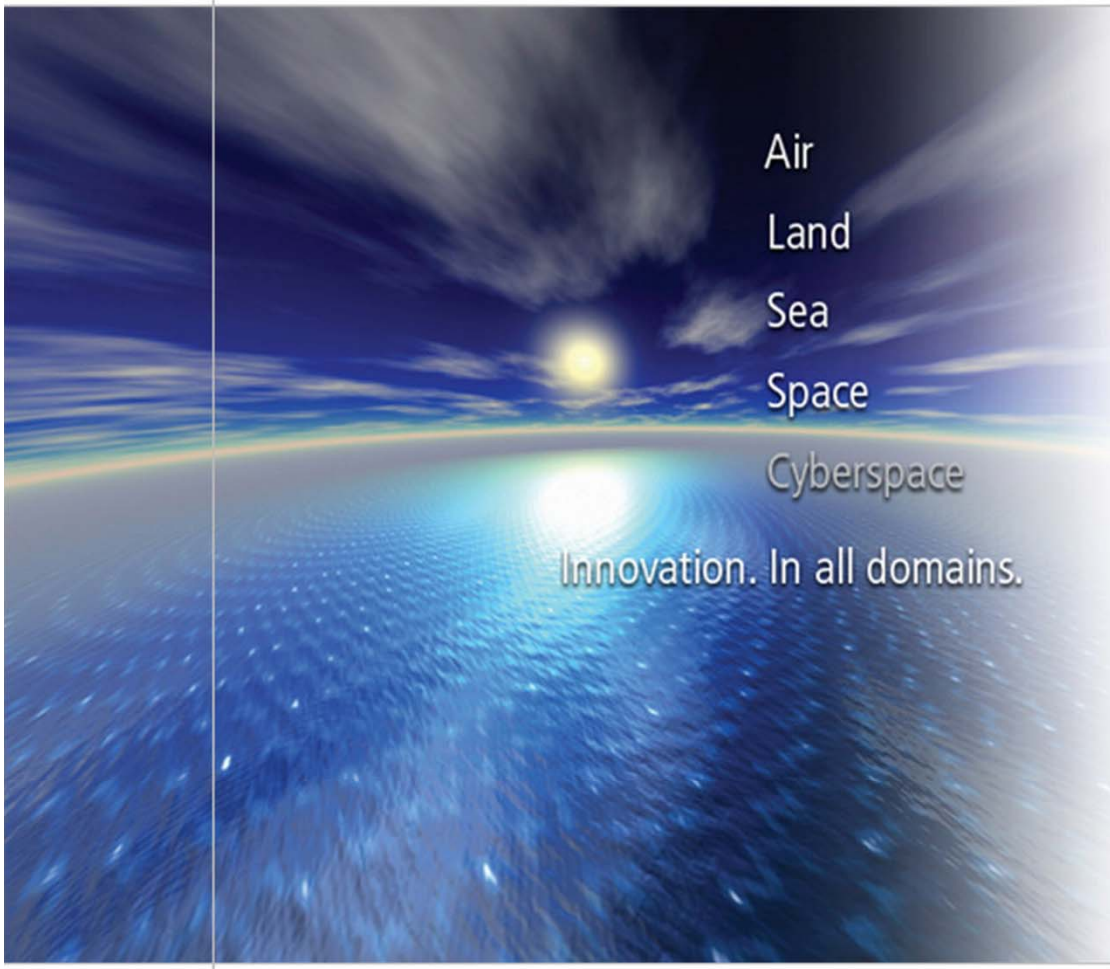
Customer Success Is Our Mission



Mission Architecture: The Key To Successful Pre-milestone A Systems Engineering

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Agenda

- Problem Statement
- Mission Architecture
- Elements Of A Mission Architecture
- Support Of Early Acquisition
- Summary

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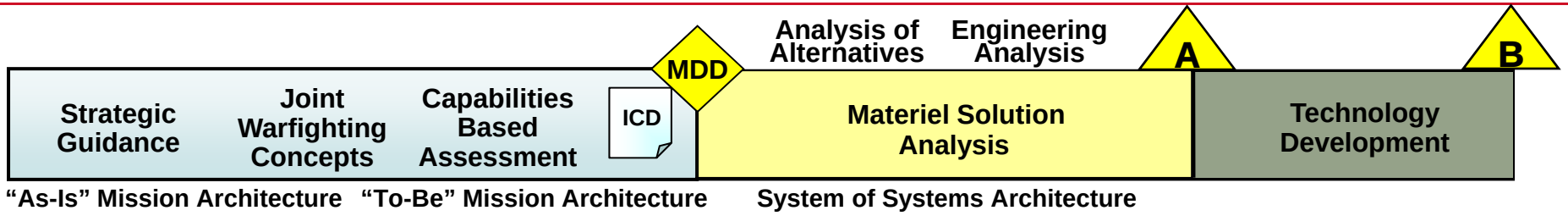
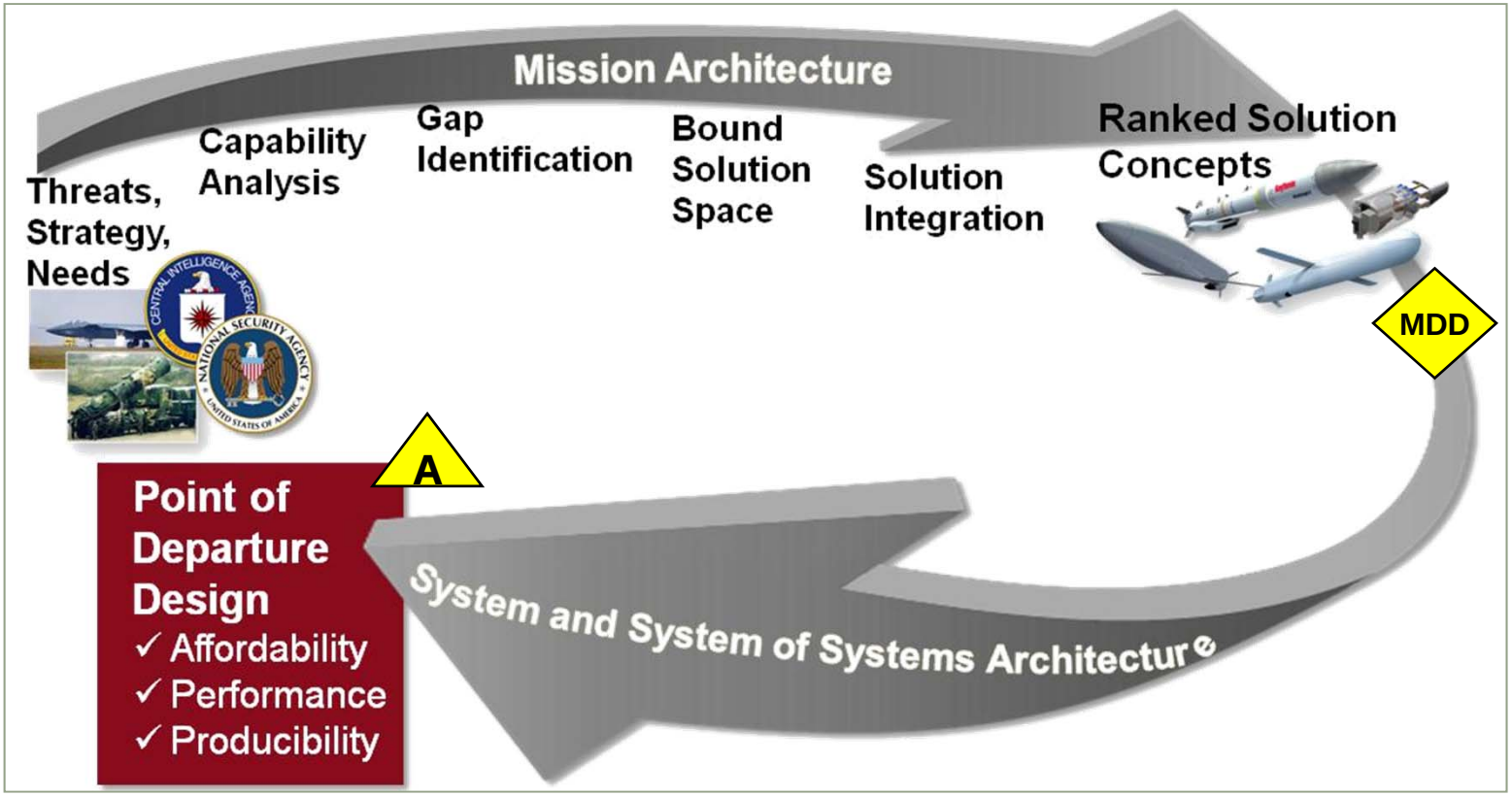
Early Development





Mission Architecture Supports Early Acquisition

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Problem Statement

Many acquisition programs are deemed operationally ineffective. One primary cause for this is a lack of early mission analysis, resulting in:

- Poor operational assessment pre-MDD
  - Solution does not address the right problem
  - Poor understanding of the reason for the capability gap
  - Solutions do not address the capability gaps which solve a mission need
  - Systems developed where other solutions are more feasible
- Gaps in mission capabilities not addressed
  - Focuses on the wrong mission tasks
    - Fixes tasks that are not broken, and neglects some that are
  - Inadvertently creates new mission capability gaps
- Materiel solution to non-materiel problems
  - Attempts to fix policy or doctrine gaps with materiel solutions
  - Drives complex solutions to simple problems

Mission Architecture Addresses These Issues

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Mission Architecture: A Problem Solution

Mission Architecture informs acquisition decision makers through an understanding and focus on the **"mission needs"**. This results in:

- Strong operational effectiveness
  - Addresses the right problem
  - Provides good understanding of the cause of capability gap
  - Develops the systems that are needed to fill the capability gap
  - Addresses capability gaps that solve a mission need
- Gaps in mission capabilities addressed
  - Addresses mission gaps at the appropriate tasks
  - Clean integration with existing capabilities
- Materiel solutions to materiel problems
  - Facilitates proper conclusions in the DOT_LPF Study

Mission Architecting
Is The First Step In The Architecting Process

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Why Mission Architecture

Mission Architecture:

The first step in the architecting process. It allows one to understand customer's desired capabilities, to analyze requirements & needs, to analyze operations, to analyze quality attributes, to identify reuse assets, to identify key performance goals and measures, to initiate technical standards list and to understand customer's architecture.

- Applicable to a wide range of problems
- Objective is to communicate the job to be done
- Defines constraints on how the job can be done
- Empowers investigation into gaps and potential solutions
- Starts at problem definition
- Can be represented in multiple architectural formats

Defines and Communicates The Job

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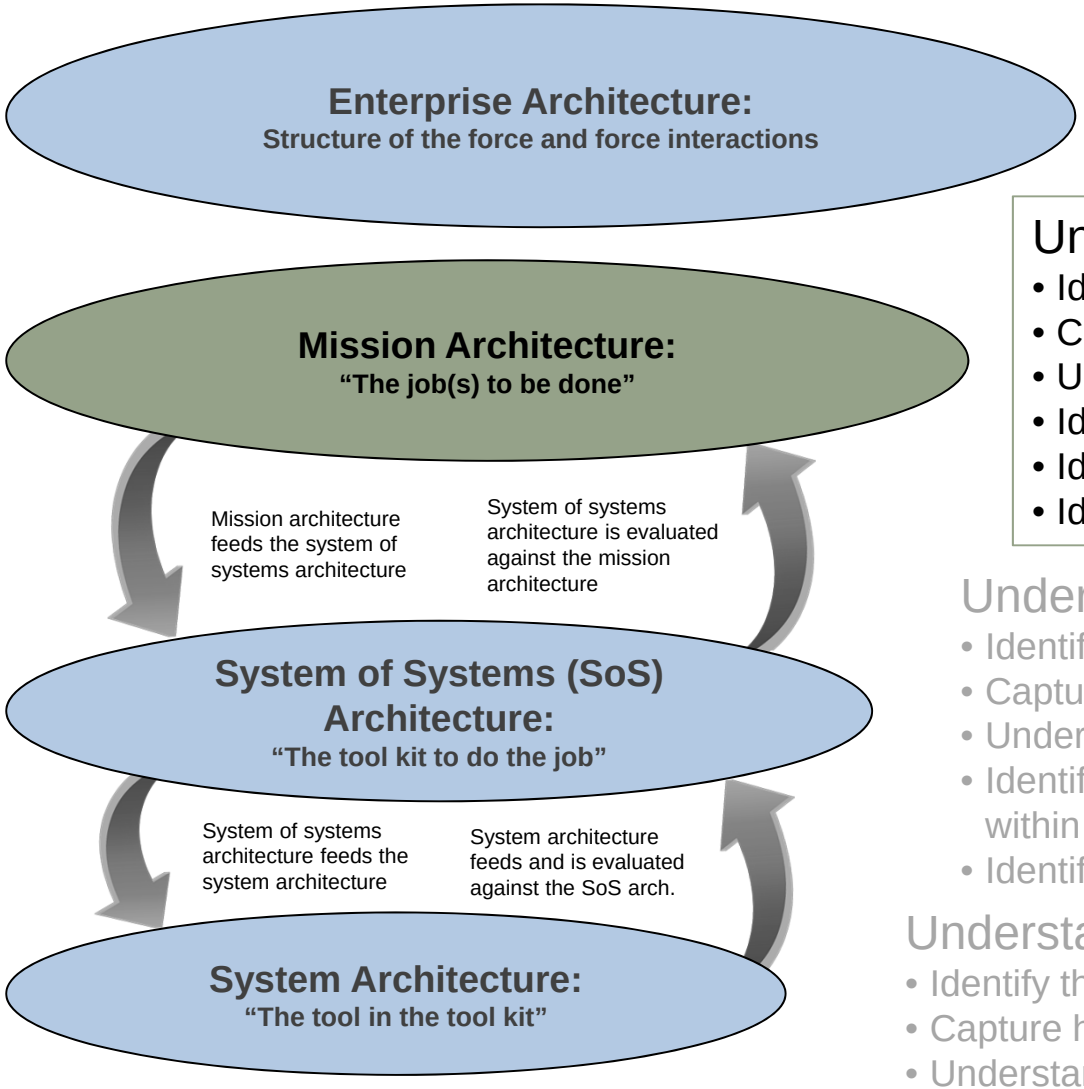
Levels Of Architecture



Understand the Force

- How Services and Units structured
- How Services interact
- What is the command structure

Understand the Job

- Identify mission capabilities/needs
- Capture how operations are executed
- Understand the mission flow
- Identify mission interactions
- Identify mission nodes/relationships
- Identify information exchanges

Understand SoS Interactions

- Identify SoS capabilities and needs
- Capture SoS interaction
- Understand the system flow within the SoS
- Identify system nodes/interactions/relationships within the SoS
- Identify message exchange

Understand the System

- Identify the system capabilities/gaps
- Capture how the components interact
- Understand the internal system flow

Mission Architecture Focuses On The Job

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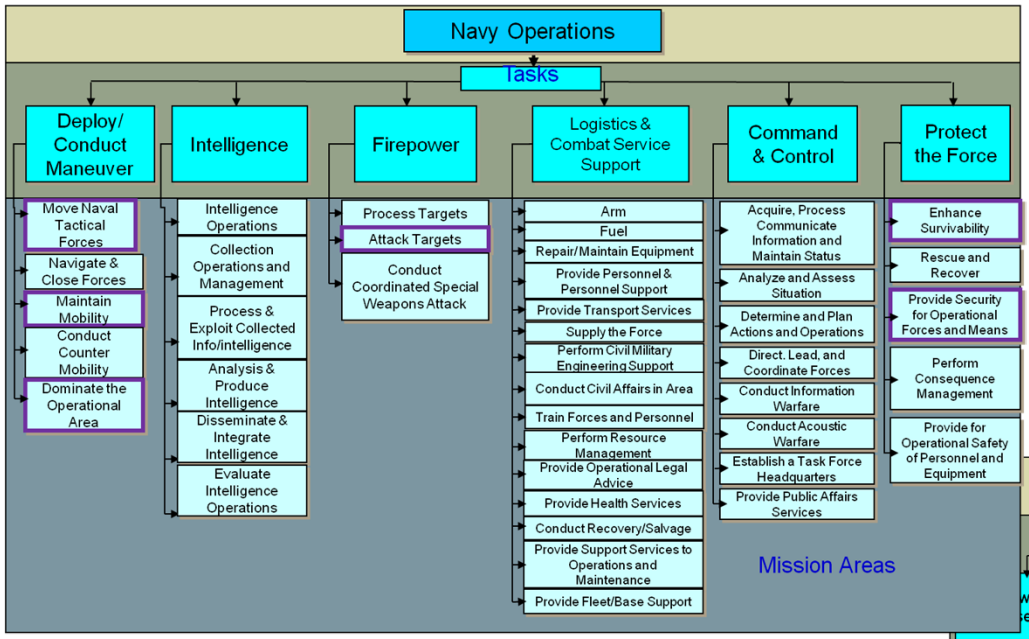
Key Elements Of A Mission Architecture

Element	What it Provides
Mission Definition / Objective	Focus on the job
Threat Definition	Focus on the why
Graphical Overview	The vision
Functional Flow	How the job is done
Timelines	Urgencies
Nodes and Interactions	The who
Function Node Task Table	Mapping of the who to the what
Operation Resource Flow	Focus on the interactions
Attributes and Measures	How well the job is done

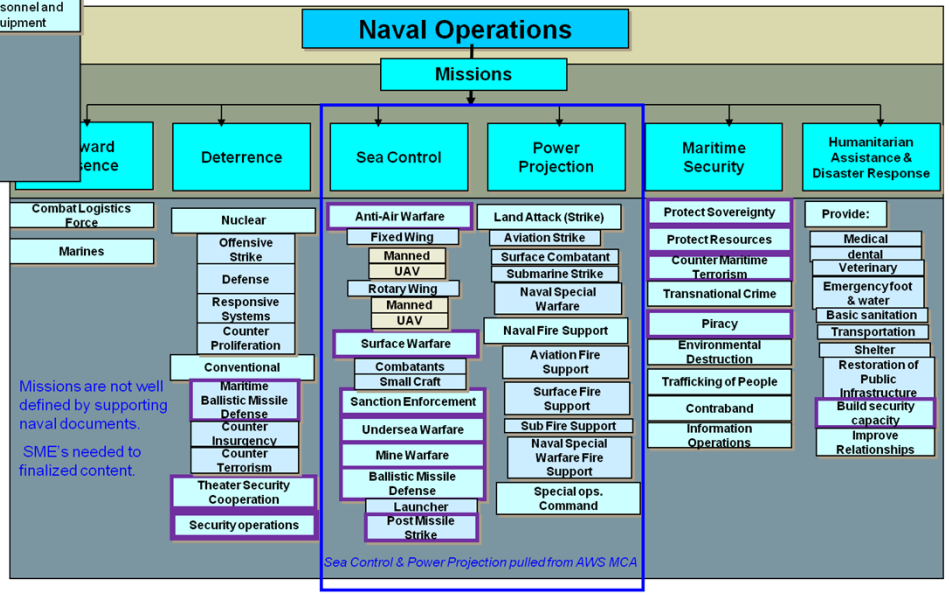
Mission Definition / Objective



- A single mission area touches multiple tasks and operations
- Broad system capability is the goal

Understanding the tasks and operations is essential

- Ensures a robust system design
- Ensures capability across the Range of Military Operations



Mission Definition Provides Focus On The Job to be done

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Threat Definition

Pirates
- **Craft:** Anything. Range from small speedboats, to fast patrol craft, to larger stolen ships
- **Weapons:** Crew served weapons, small arms and RPGs
- **Tactics:** Conceal with fishing boats, Mothership two / escort, Swarm to board
- **Goal:** To board and capture vess

Scenario A Country
- **Craft:** Fast Attack Craft, patrol cr
- **Weapons:** Guided missiles, torp
- **Tactics:** Harass to de-sensitize,
- **Goal:** Further political goals thro

Scenario B Country
- **Craft:** Fast Attack Craft, patrol cr
- **Weapons:** Guided missiles, torp
- **Tactics:** Loiter and harass. Indiv
- **Goal:** Project power relatively close to coastal borders

Scenario C Country
- **Craft:** Fast Attack Craft, large patrol craft. All with much longer range of operations
- **Weapons:** Guided missiles, torpedoes, unguided rockets, naval guns
- **Tactics:** High speed ingress and shot with high speed egress
- **Goal:** Project power offshore, protect perceived sovereignty

Threats Defined by:
- Class (country vs group)
- Objective/ Motive
- Weaponry
- Probability of Occurrence
- Level of Danger

Pirates and the Scenario A Country are Primary CSM Targets. Most Scenario B and C Countries Carry Longer Ranged Weapons

Provides the need and foundation of requirements

Threat Definition Provides Focus on Why

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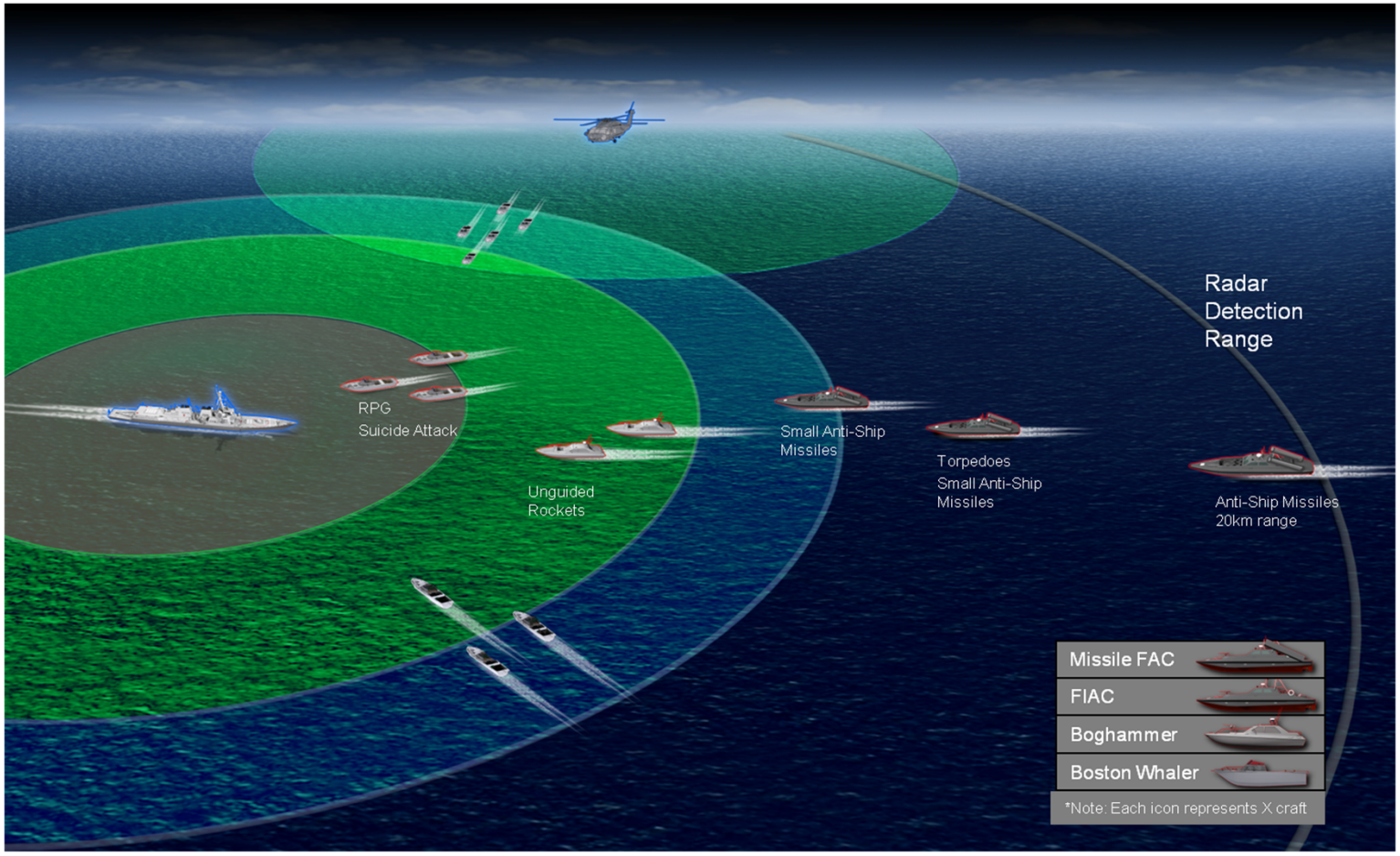
Graphical Overview



Provides A top level understanding of the mission and problem

Graphical Overview Provides The Vision

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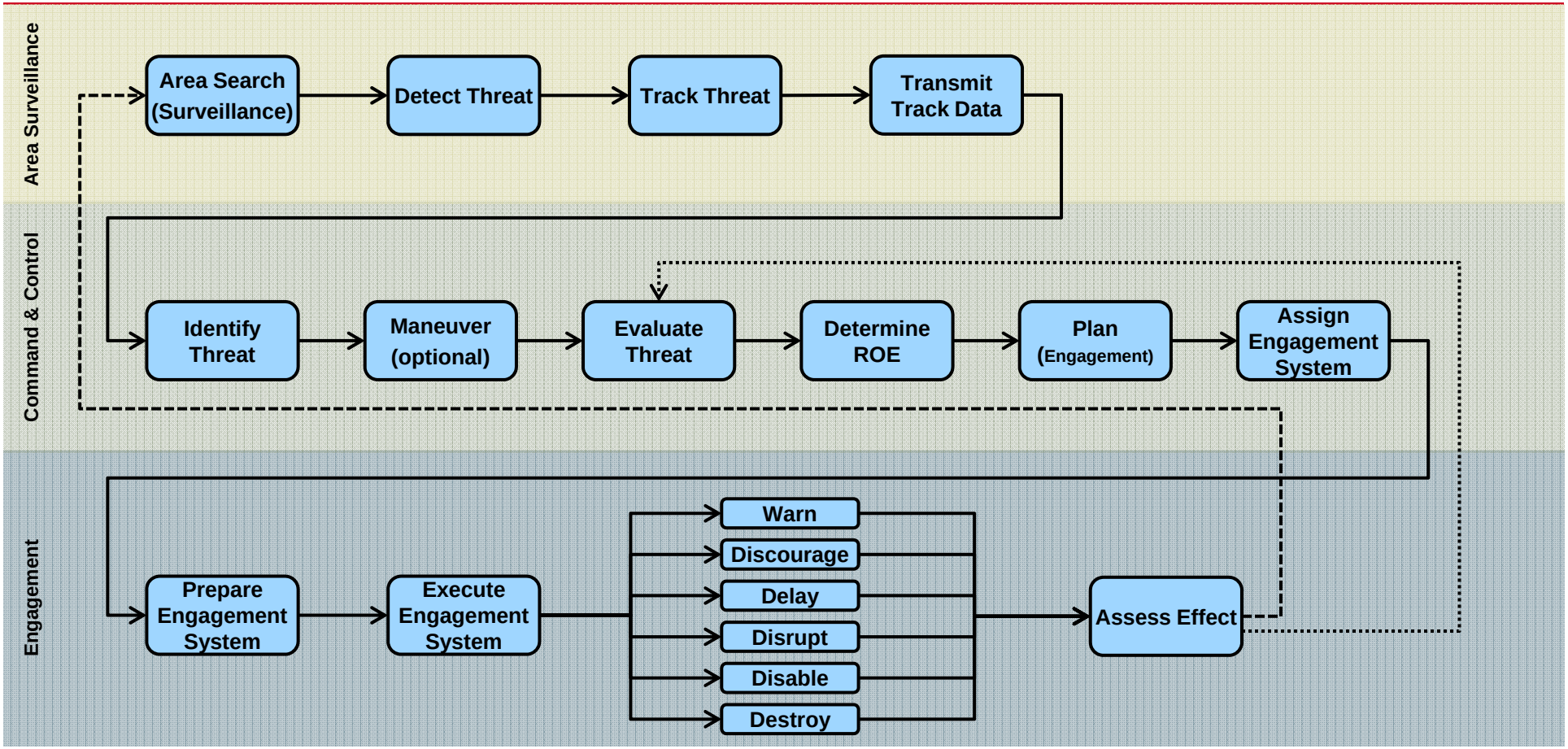
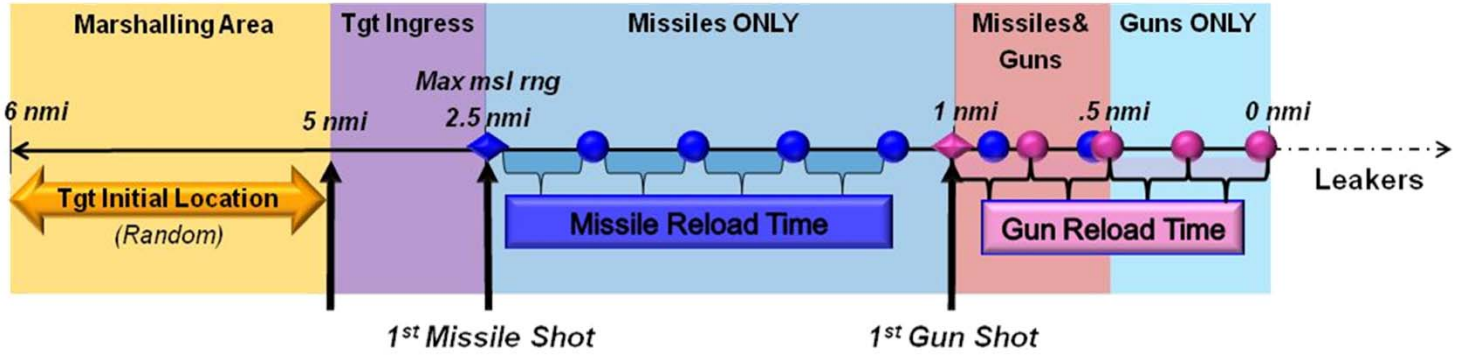
Functional Flow

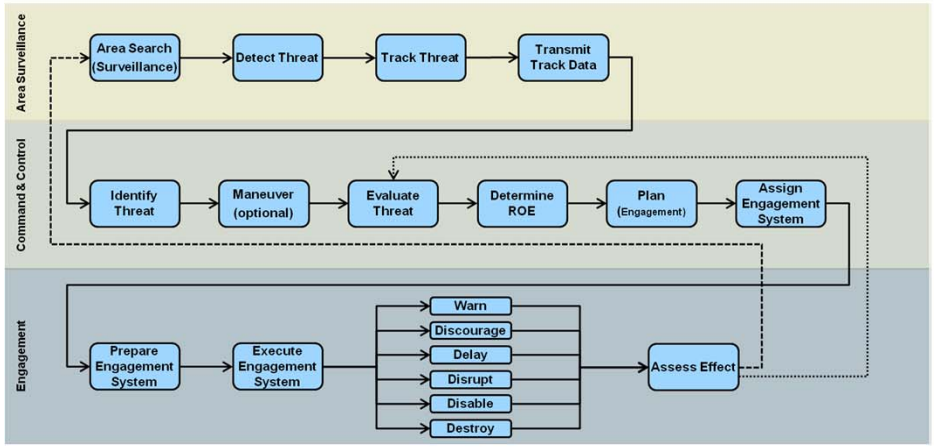


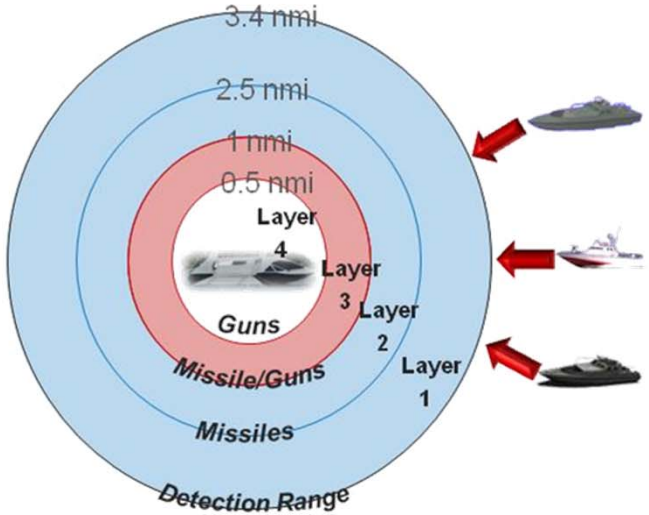
- Breaks down the steps in the execution of the mission
- Foundation of capability analysis and mission modeling/simulations

Functional Flow Provides Focus On How It Is Done

Timelines







Mission timelines are based on the threat and required reaction

Timelines Provide Focus On The Functional Urgencies

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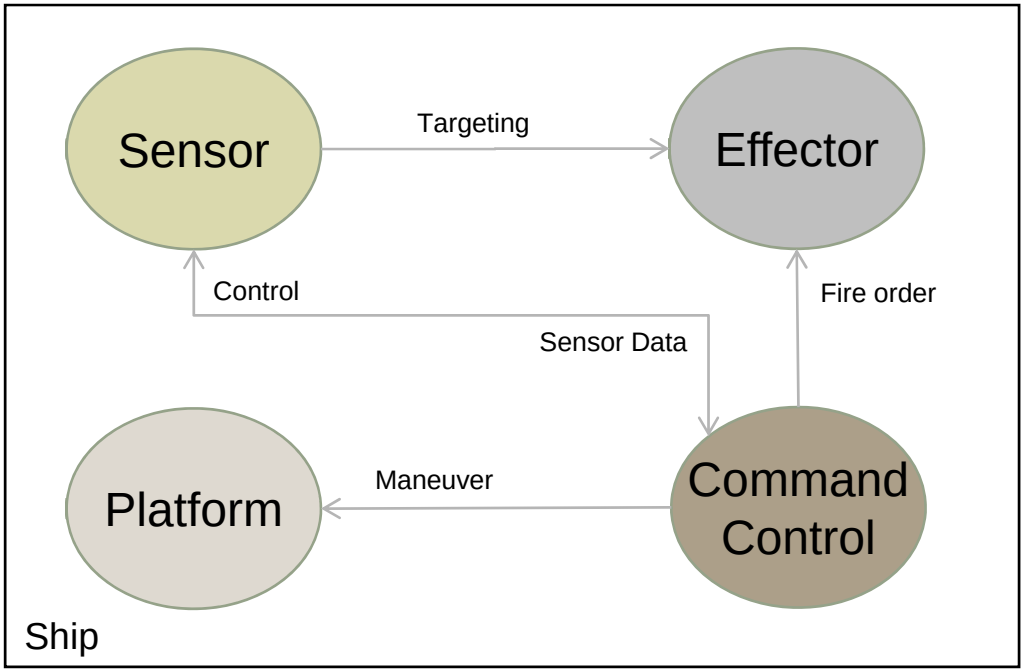
Nodes

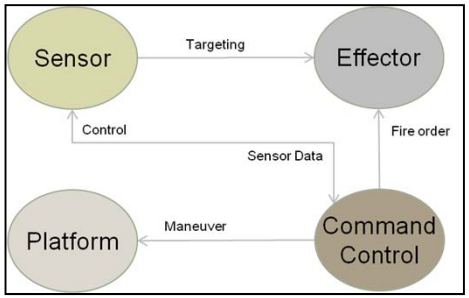


- Identifies functional nodes
- Identifies interactions between nodes
- Provides understanding of change impacts

Nodes are the elements responsible for execution of the mission

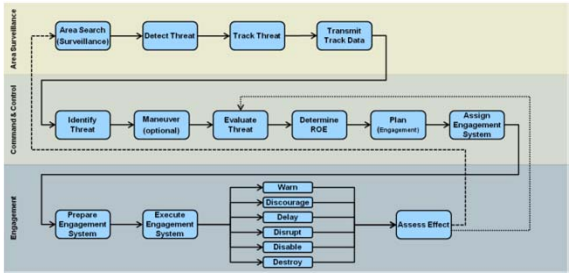
Nodes and Interactions Provides Focus on Who

Function Node Task Table



Relating Nodes to Functions

Nodes Task Table maps Nodes to the Function Flow



	Area Search	Detect	Track	ID	Assess	ROE / C2 Approvals	Plan	Engage	Transmit / Communication	Maneuver
Platform	✓							✓		✓
Command & Control	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Effector								✓		
Sensor	✓	✓	✓	✓	✓			✓		

Nodes are mapped to tasks to identify who is responsible for each step of the job

Node Task Table Provides Maps the Who to the What

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Operational Resource Flow

Node	Sub Function	Inputs	Sources	Outputs	Receiver
Sensor	Search	•Search Sector •Search Pattern	•C2 Node	•Target Contact	•C2 Node
	Detect	•Target Contact •Detection Criteria	•Search Function •C2 Node	•Target Detection	•ID Function •C2 Node
	ID	•Target Detection •Target Data / Parameters (database)	•Detect Function •C2 Node	•Target Declaration •Target ID •ID Confidence •Location Cue	•C2 Node •Track Function
	Track	•Location/Velocity Vector Cue •Target Parameters	•Detect Function •C2 Node	•Target Acquisition	•C2 Node •Effector Node •Engage Function

- Provides details of the Nodes interactions
- Identifies the information flow
- Identifies the inputs required for each function
- Identifies the inputs sources
- Identifies the outputs of each function and receivers of the outputs

Maps inputs and outputs to sources and receivers

Resource Flow provides Focus on Interactions

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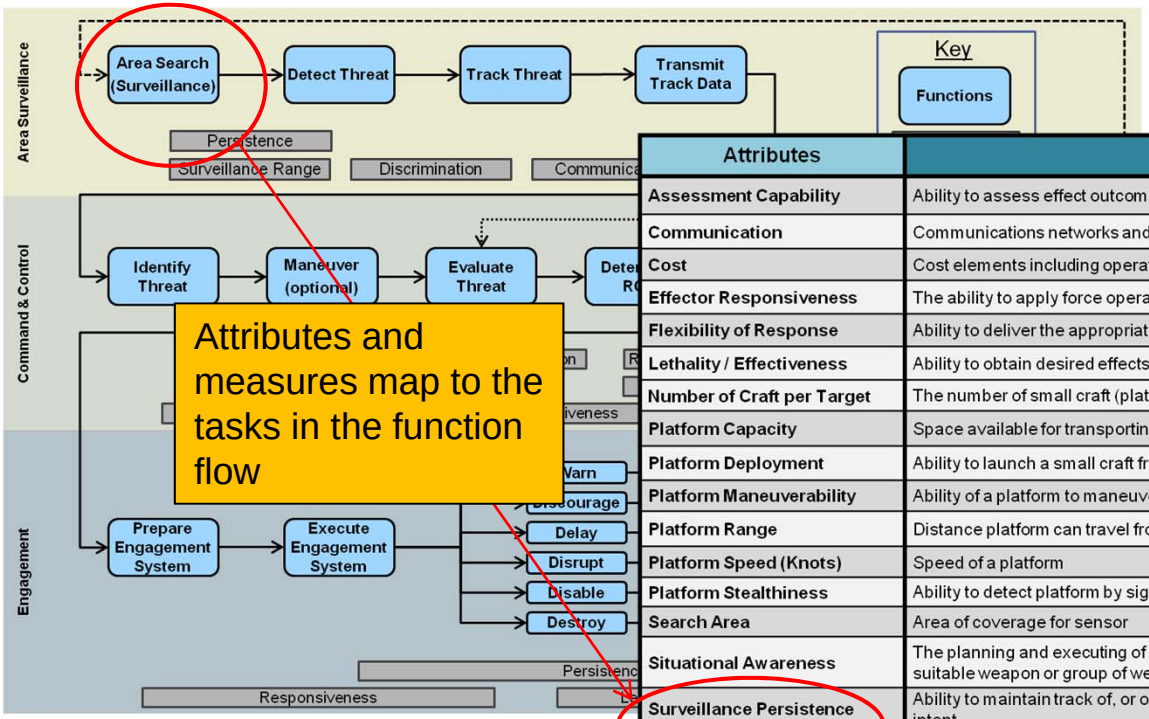
Attributes and Measures



An Attribute is a Characteristic that is Graded by a Measure

Attributes	Definitions
Assessment Capability	Ability to assess effect outcome, possibly in the form of Battle Damage Indicate (BDI) or Assessment (BDA).
Communication	Communications networks and information services that enable joint and multinational warfighting capabilities.
Cost	Cost elements including operating, procurement, and maintenance
Effector Responsiveness	The ability to apply force operationally and tactically through all domains of the battlespace at will.
Flexibility of Response	Ability to deliver the appropriate response (warn, discourage, delay, disrupt, destroy, neutralize)
Lethality / Effectiveness	Ability to obtain desired effects.
Number of Craft per Target	The number of small craft (platforms) required to engage a target
Platform Capacity	Space available for transporting personnel and cargo
Platform Deployment	Ability to launch a small craft from a larger ship
Platform Maneuverability	Ability of a platform to maneuver in narrow waterways and shallow waters
Platform Range	Distance platform can travel from logistics support elements
Platform Speed (Knots)	Speed of a platform
Platform Stealthiness	Ability to detect platform by sight and / or sound, as well as ability to operate at night
Search Area	Area of coverage for sensor
Situational Awareness	The planning and executing of fire in conjunction with other combat units so that targets are adequately covered by a suitable weapon or group of weapons without endangering other combat units.
Surveillance Persistence	Ability to maintain track of, or otherwise pursue, moving targets continuously and indefinitely to meet the Commander's intent.
Surveillance Range	Size of Battle Space Awareness radius, i.e. distance at which threat can be detected.
Target ID / Weapon Target ID	The capability to provide target descriptions, target locations, assign target-weapon pairing and specify methods of fire – Flexibility and accuracy. *{Derived from Joint Fires ICD Dec 2005}*
Transfer Personnel	Ability to transfer personnel and cargo from one craft to another.
Weapon Range	Range at which available onboard or offboard weapons are effective.

Attributes and measures provide the method for evaluating the capability

Attributes And Measures Provides Focus On How Well It Is Done

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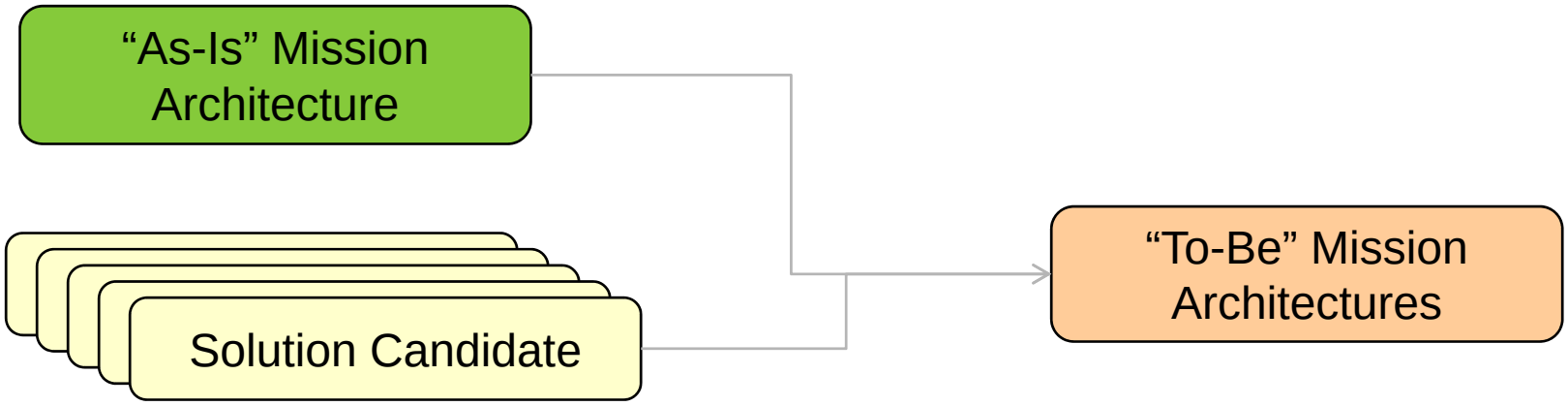
‘To Be’ Mission Architecture



“As-Is” Mission Architecture provides:

- Basis for evaluation of the current capabilities to define capability gap
- Foundation for the “To-Be” Mission Architecture

“To-Be” Mission Architecture provides:

- Understanding of integration of solution candidates and current capabilities
- Basis for evaluation of solution candidates

The integration of the “As-Is” and the candidates generates the “To-Be” Architectures

Each Solution Candidate generates a “To-Be” Architecture

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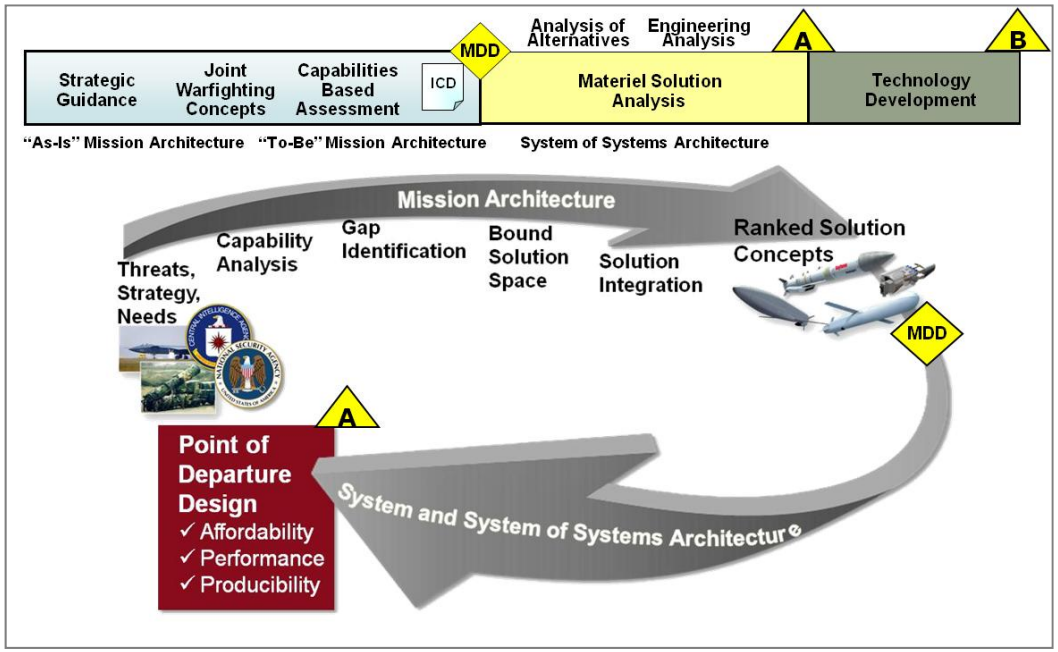
Support of Early Acquisition

Mission architectures provide:

- User needs
  - Mission
  - Tasks
  - Threats
  - Flow
- Mission solution analysis
  - Attributes and measures for evaluation
  - Bounds of the solution space
  - Interactions
- Vision
  - Graphical representation
  - Urgency



Supports the development of:

- Initial Capability Document (ICD)
- DOT_LPF Change Request (DCR)
- Materiel Development Decision

Mission Architectures Provide The Foundation

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Summary

Mission Architecture

- Informs acquisition decision makers
- Develops an understanding and focus on the mission needs

Aids Acquisition In

- Identifying the right problem
- Understanding the cause of capability gap
- Addressing a capability gap
  - Addresses mission gaps at the appropriate tasks
  - Clean integration with existing capabilities
  - Addresses material gaps with material solutions

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Questions?