RDECOM

Scalable Network Effects Protection Tailored to Unique Naval Engagements (NEPTUNE™) – A Systems Engineering Approach to Integrated Waterside Security

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TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

14th Annual Systems Engineering Conference

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Military Deputy, Weapons and Software Engineering Center

Armament Research, Development and Engineering Center

Port Protection Scenarios (Notional)

NEPTUNE™ Objective

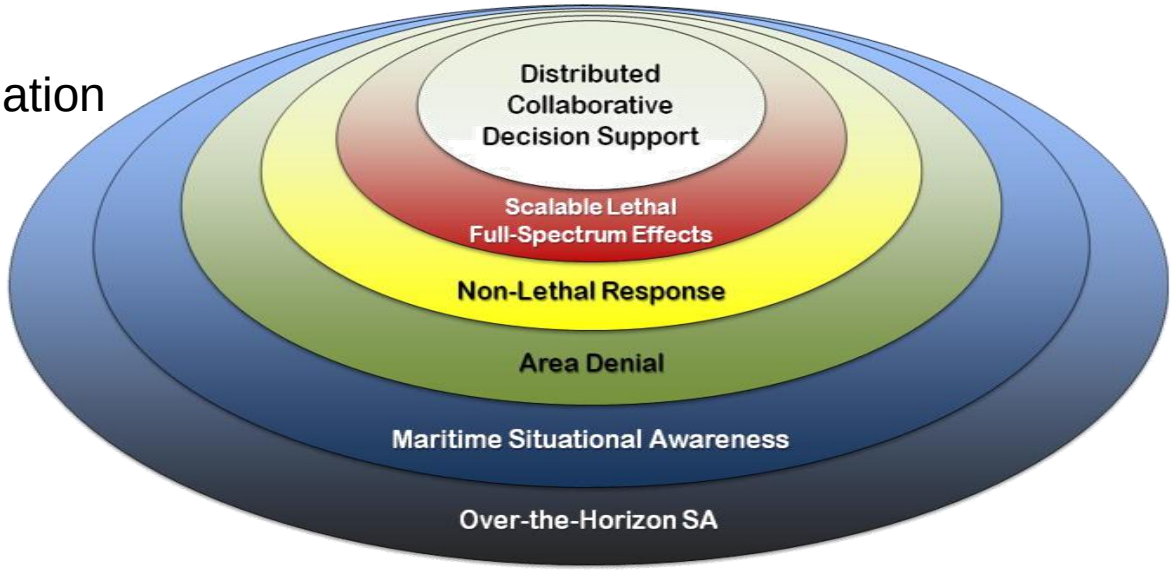
- Establish a systematic process that focuses on the development of an optimized System of Systems solution tailored to specific applications

- Approach addresses:
  - Dynamic management of technology trade space
  - Force Protection technologies to effectively counter threats across the span of current Forward Operating Site (FOS) and future FOS designs
  - Rapid fielding of available and emerging “best of breed“ technologies

NEPTUNE™ Notional Concept

"Network Effects Protection…

- A layered approach for warning and protection
- Awareness through information engagement



…Tailored to Unique Naval Engagements"

- Addresses escalating threats from insurgents and piracy
- Enhances Anti-Terrorism Force Protection (ATFP) of High-Value Assets
- Tailors effects from scalable lethal force to non-lethal response and area denial

Systems of Systems Engineering Approach

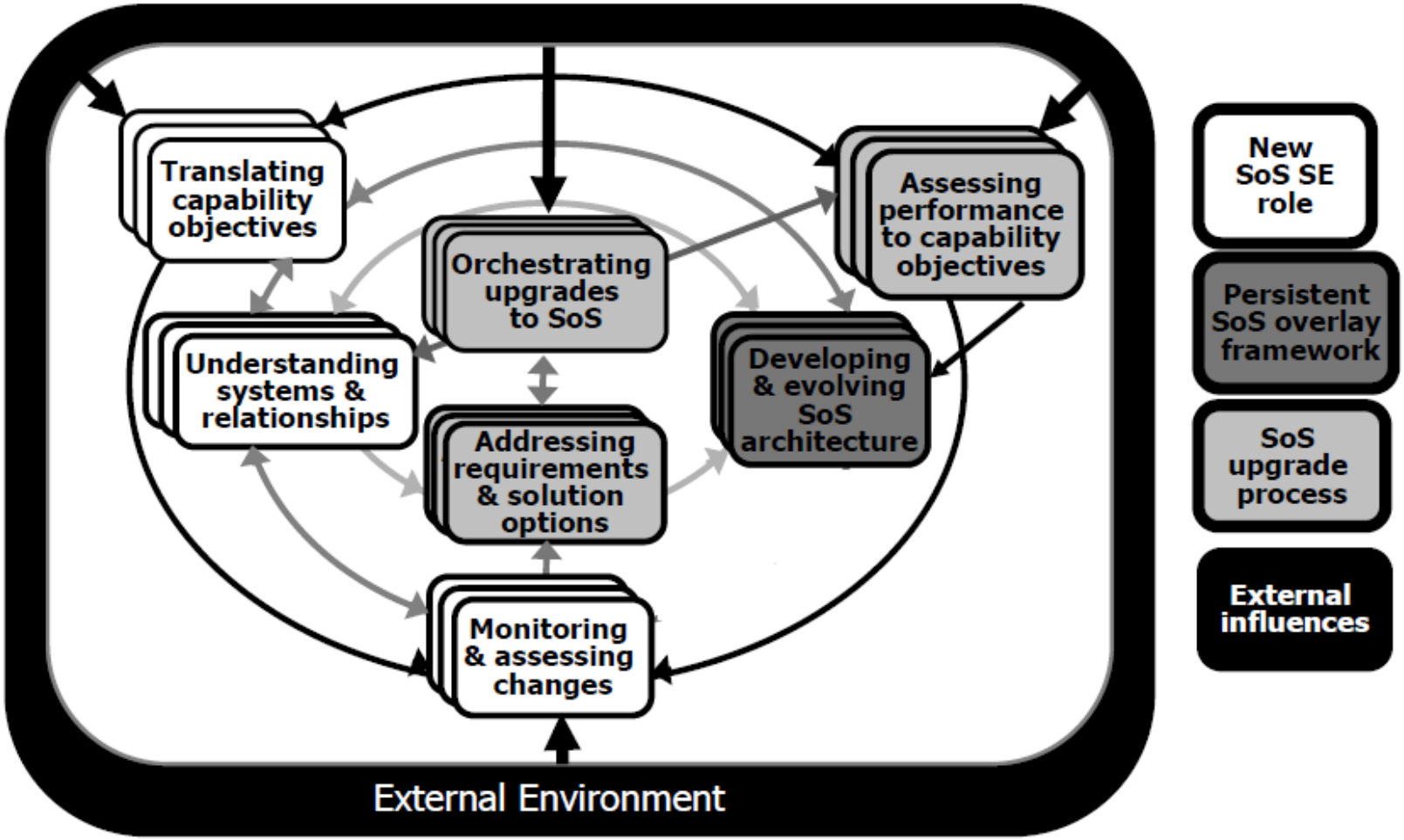


Figure 4-1. Core SoS SE Elements and Their Relationships

Systems Engineering Guide for Systems of Systems, Ver 1.0, August 2008, p. 30.

Translating Capability Objectives

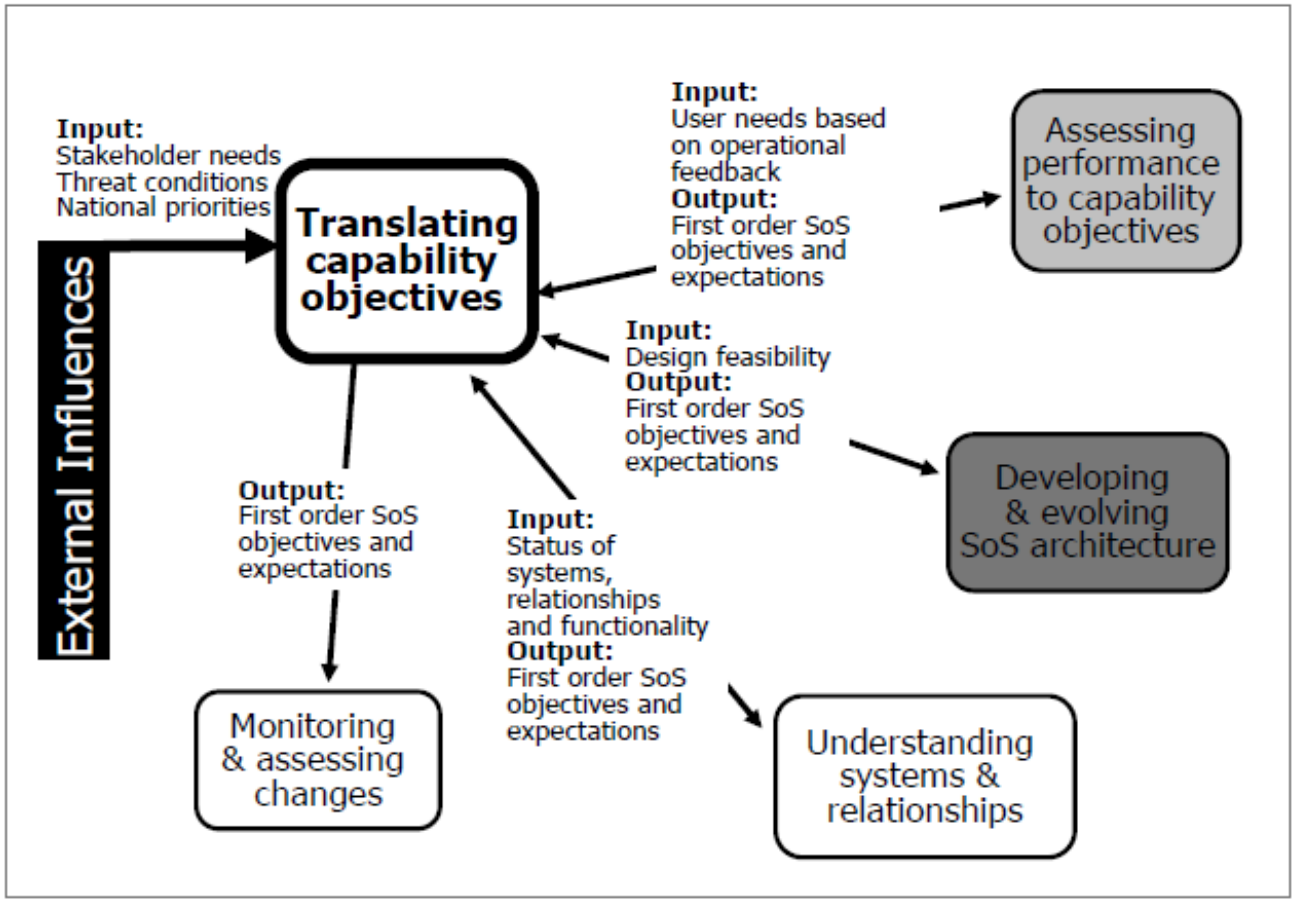


Figure 4-3. Relationship between Translating Capability Objectives and Other SoS SE Core Elements

Systems Engineering Guide for Systems of Systems, Ver 1.0, August 2008, p. 35.

Translating Capability Objectives

Defining the Problem Space

Stakeholder Need: Integrated, Layered Force Protection System

Environment

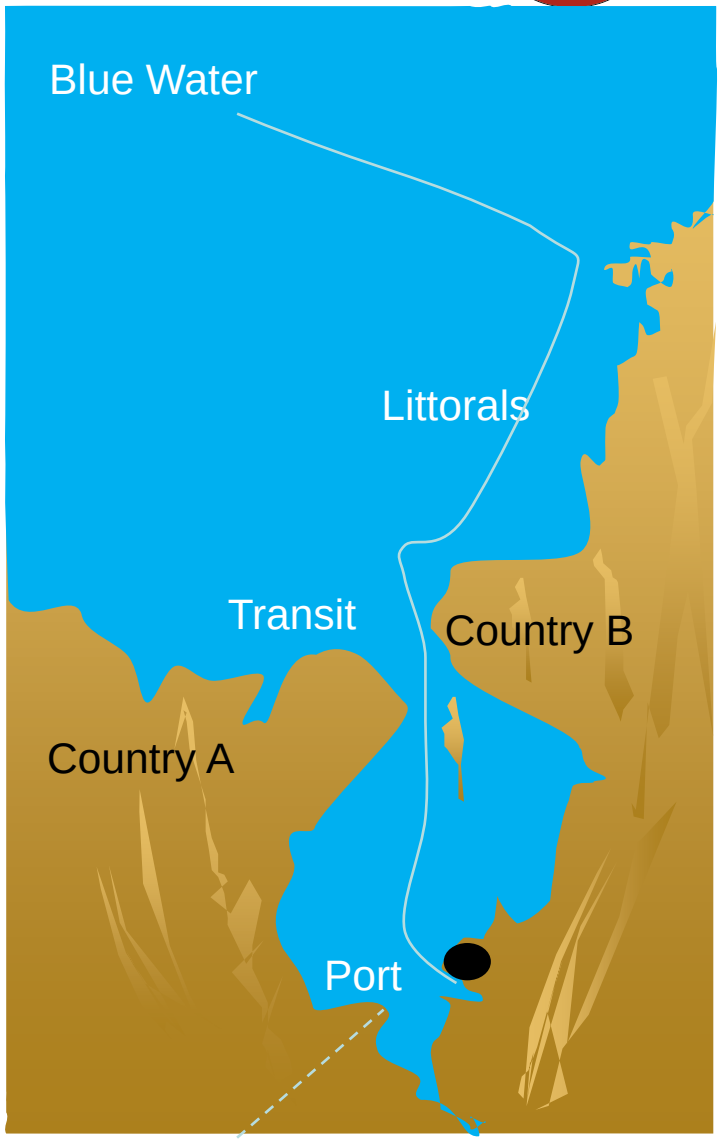
- Blue water
- Littorals
- Transiting
- Port

Potential Threats to High-Value Assets

- Small Arms
- Indirect Fire
- Maritime Vehicles
- Unmanned/Manned Aerial Vehicles
- Asymmetric Threats

Functional Analysis

- Maritime Situational Awareness
- Active Denial
- Non-Lethal Response
- Scalable Lethal Effects
- Distributed Collaborative Decision Support



Understanding Systems & Relationships

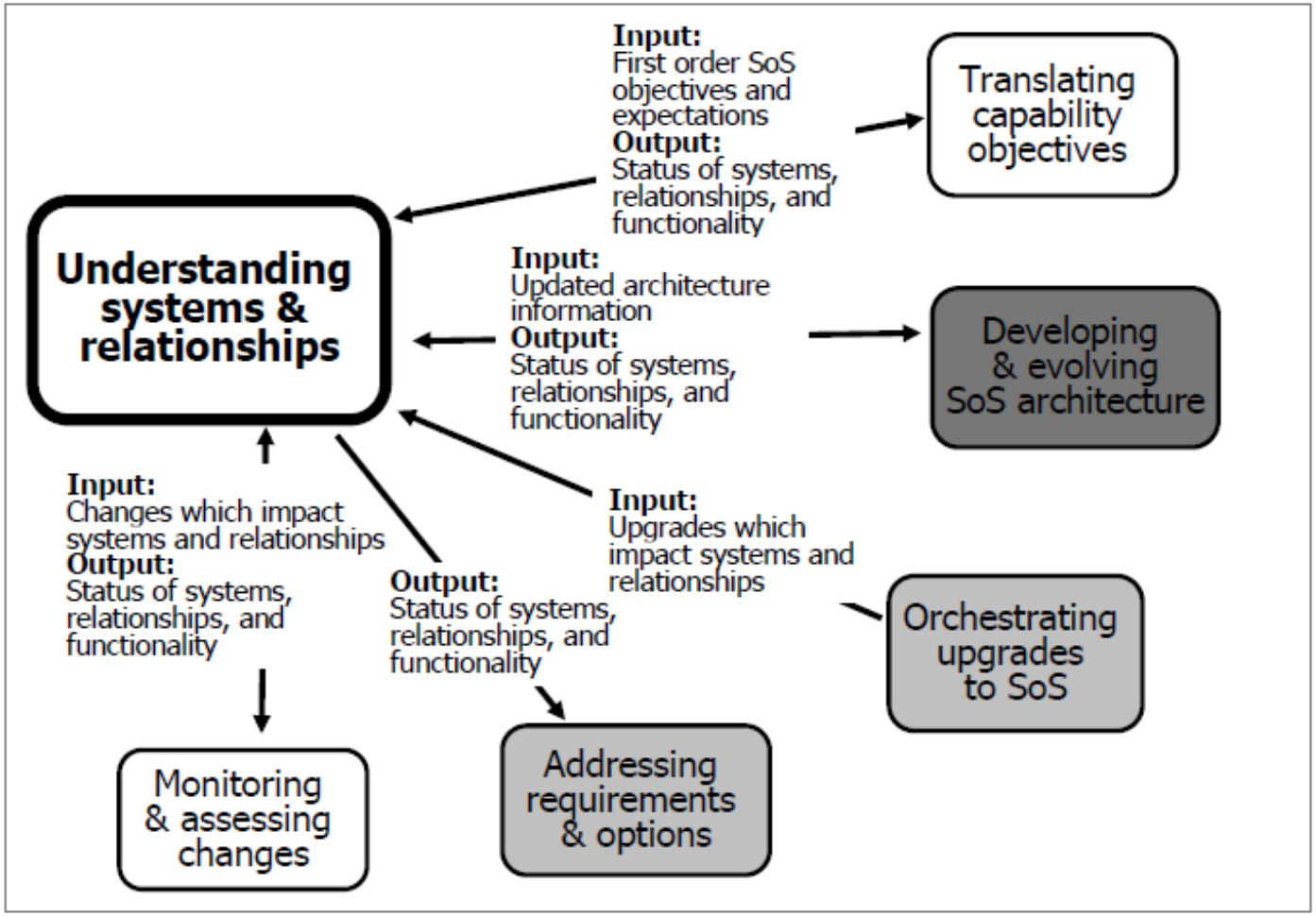


Figure 4-8. Relationship between Understanding Systems and Relationships and Other SoS SE Elements

Systems Engineering Guide for Systems of Systems, Ver 1.0, August 2008, p. 41.

Understanding Systems & Relationships

Market Surveys

- Commercial-off-the-Shelf
- Government-off-the-Shelf

Candidate System Capability Analysis

- Situational Awareness/Detection Sensors
  - Electro-Optical
  - Infrared
  - Thermal
  - Advanced Radar
  - Acoustic
- Lethal/Non-Lethal Weapons
- Unmanned Systems
- Manned Systems
- Decision Support Software

Assessing Performance to Capability Objectives

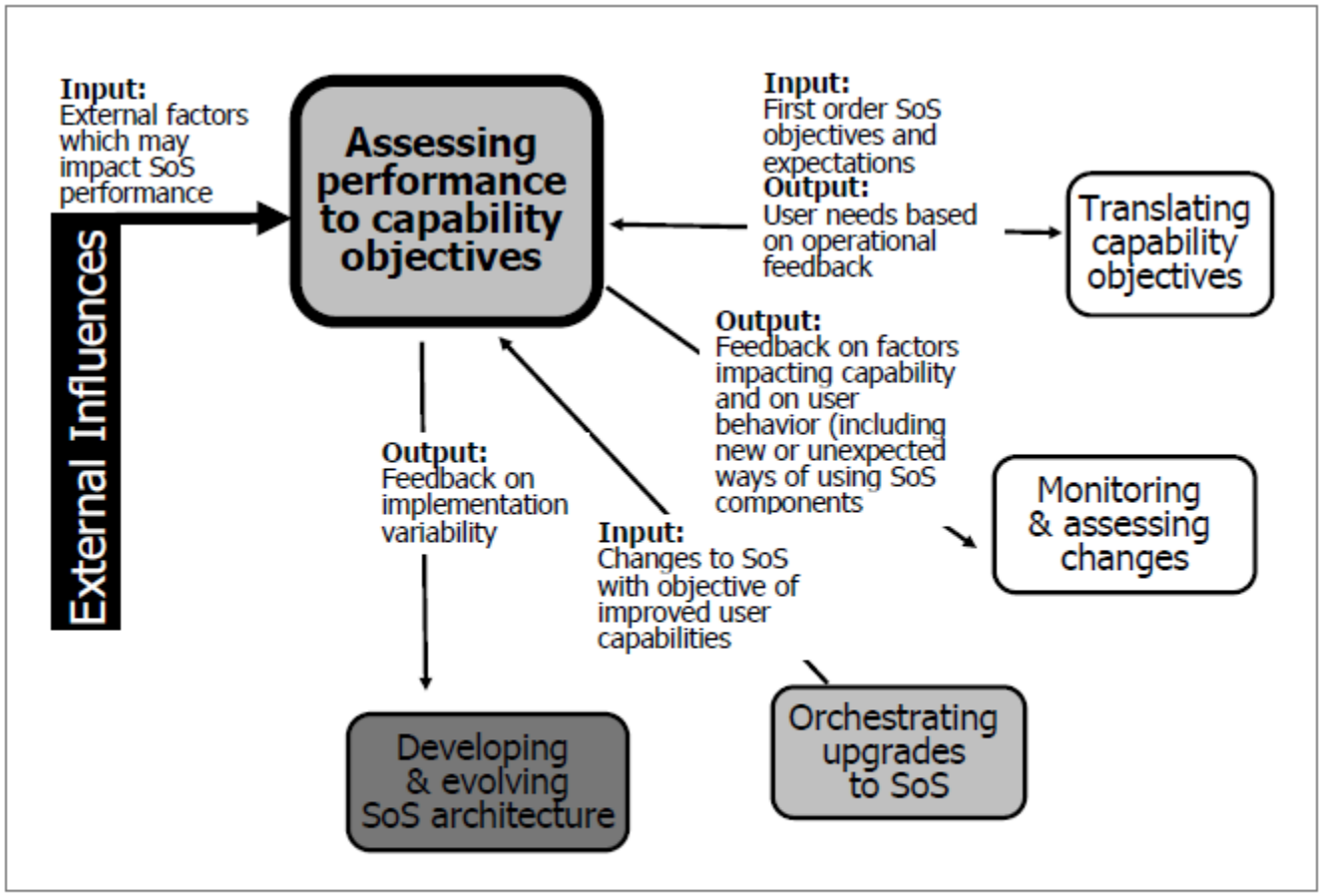


Figure 4-9. Relationship between Assessing Performance to Capability Objectives and Other SoS SE Core Elements

Systems Engineering Guide for Systems of Systems, Ver 1.0, August 2008, p. 45.

Assessing Performance to Capability Objectives

Trade Studies

- Mission Thread Analysis
- Functional Allocation
- Modeling and Simulation
- Metric Based Assessment

Baseline Systems (Notional)

- Situational Awareness/Detection Sensors
  - Gunfire Detection System
  - Sniper Optics Detection System
  - Gimbaled E/O Sensor
  - Unmanned Aerial System
  - Sonar
  - Advanced Radar
- Lethal/Non-Lethal Response
  - Manned Maritime System
  - Lethal/Non-Lethal Remote Weapons Station
- Decision Support Software

  Firestorm™ Decision Support Software

Developing & Evolving SoS Architecture

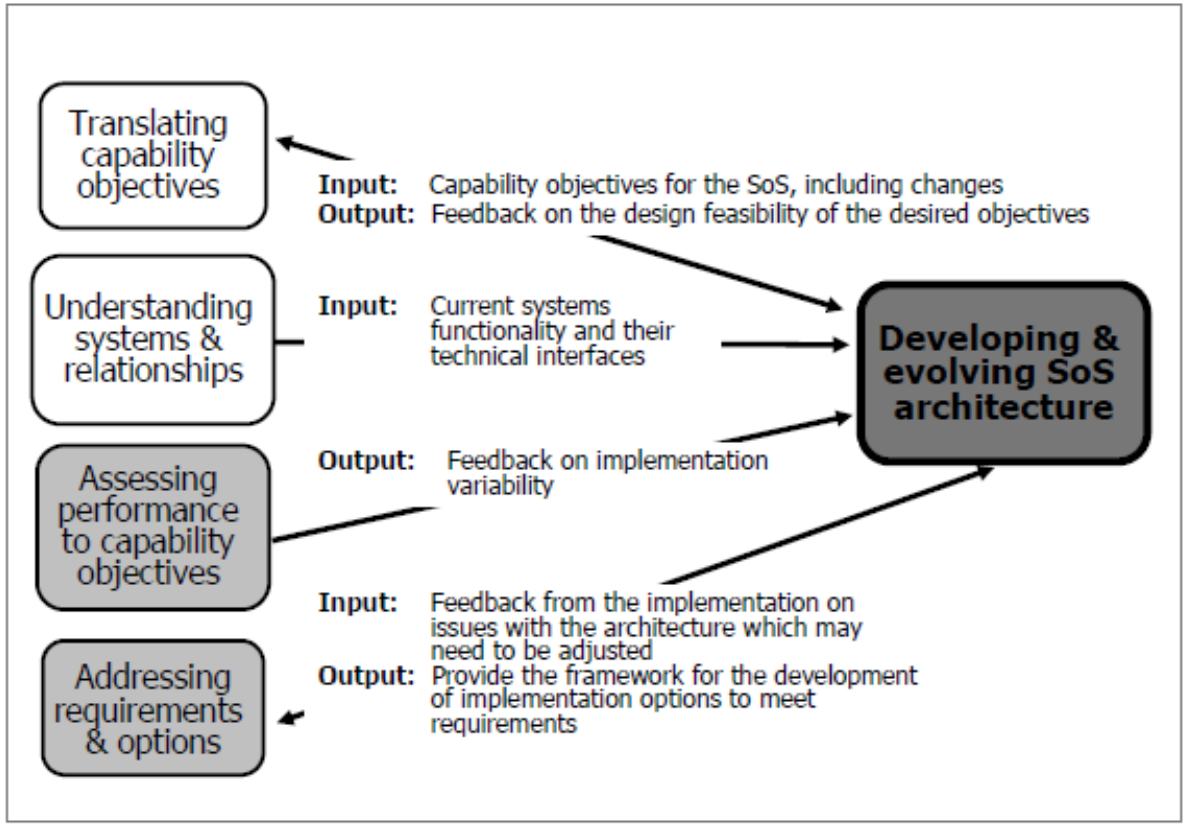
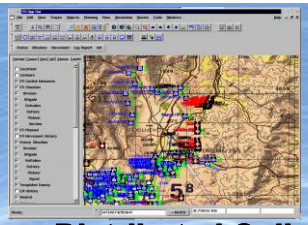


Figure 4-13. Relationship between Developing and Evolving an SoS Architecture and Other SoS SE Core Elements

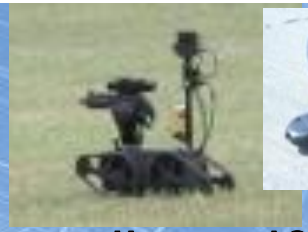
Systems Engineering Guide for Systems of Systems, Ver 1.0, August 2008, p. 51.

NEPTUNE™ Open Architecture (Notional)


Sniper/Gunfire Detection Systems



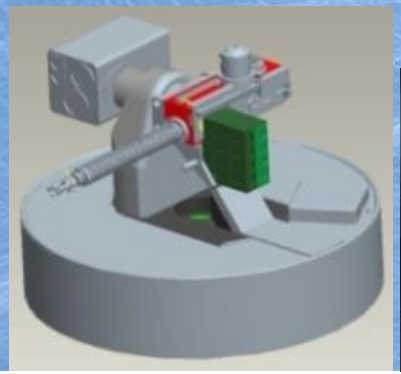

Distributed Collaborative Decision Software




Unmanned Systems/ Sensors

SA Sensor

Lethal/non-lethal remote Weapon Systems




Manned Systems

Advanced Radar

Monitoring & Assessing Changes

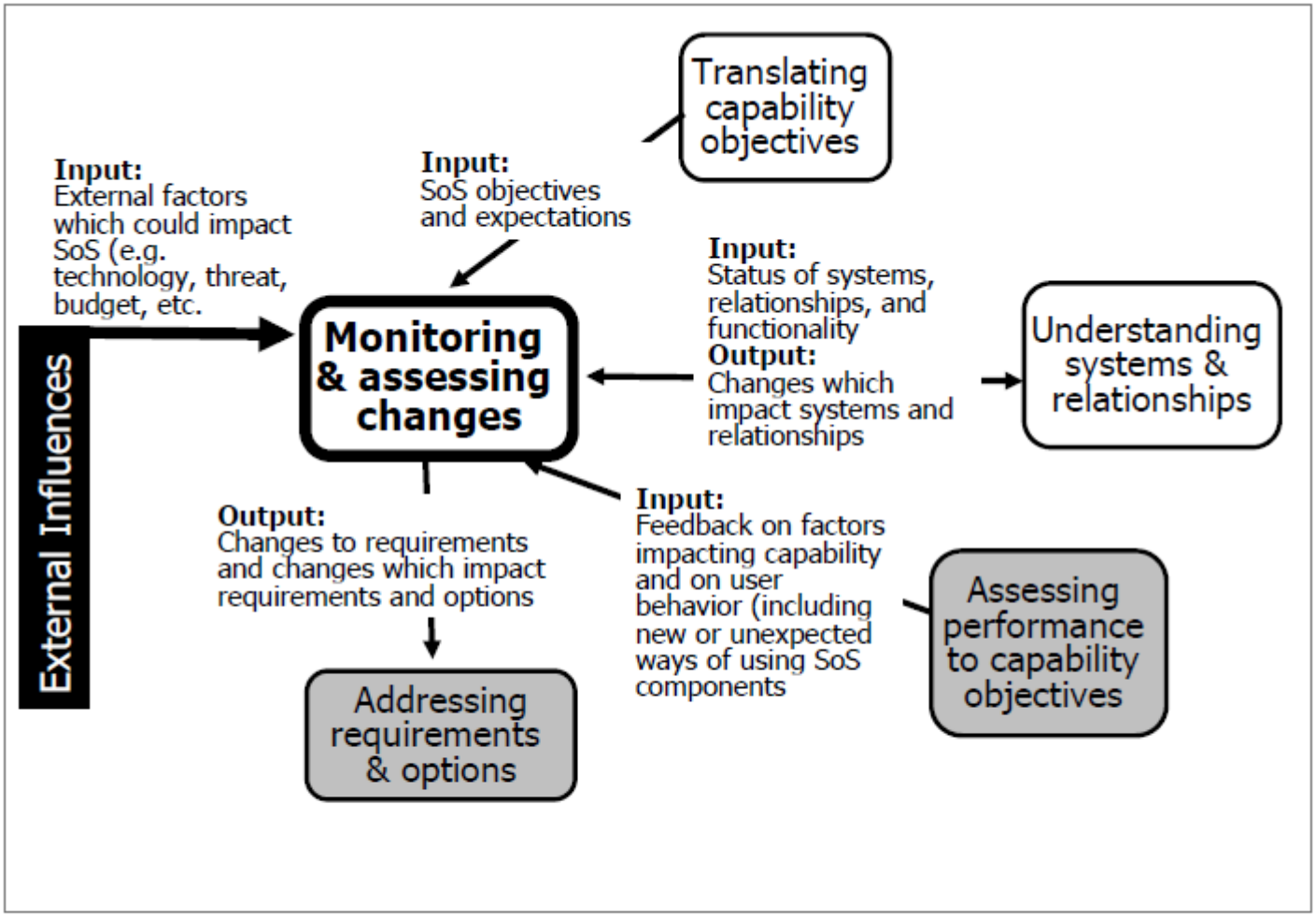


Figure 4-15. Relationship of Monitoring and Assessing Changes to Other SoS SE Core Elements

Systems Engineering Guide for Systems of Systems, Ver 1.0, August 2008, p. 57.

Addressing Requirements & Options

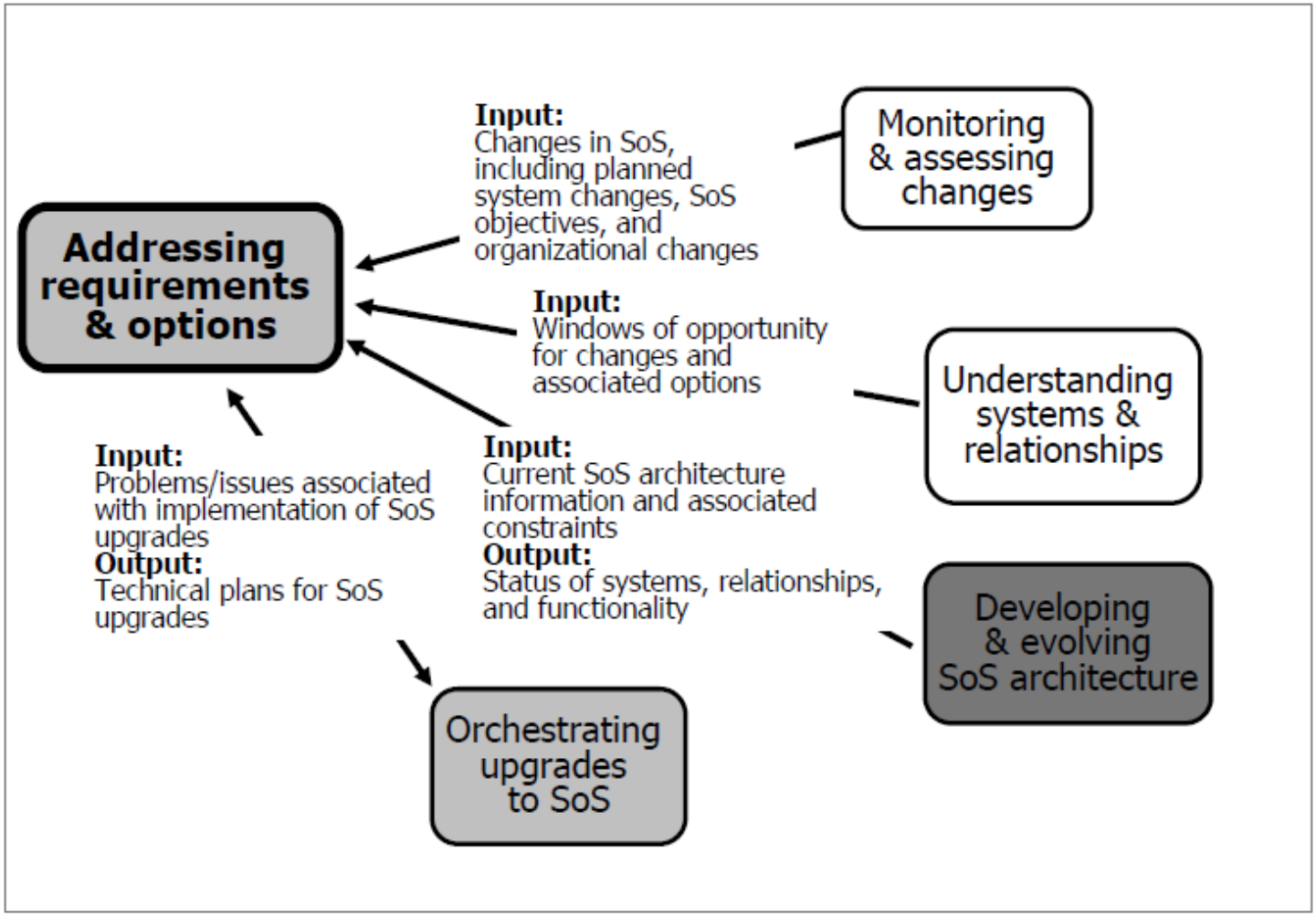


Figure 4-17. Relationship between Addressing Requirements and Solution Options and Other SoS SE Core Elements

Systems Engineering Guide for Systems of Systems, Ver 1.0, August 2008, p. 60.

Orchestrating Upgrades to SoS

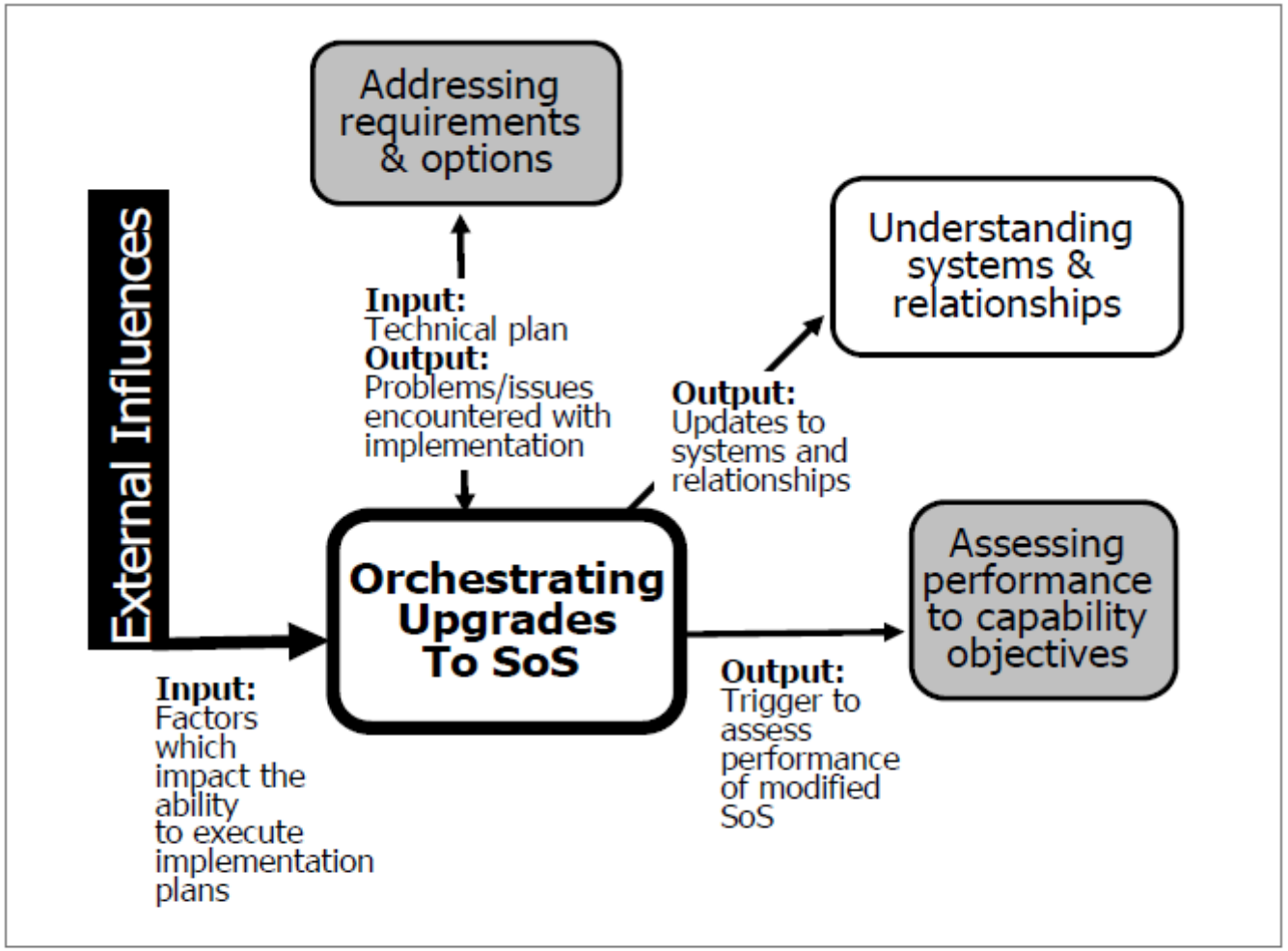


Figure 4-18. Relationship between Orchestrating Upgrades to SoS and Other SoS SE Core Elements

Systems Engineering Guide for Systems of Systems, Ver 1.0, August 2008, p. 67.

Essential Elements of NEPTUNE™ Testbed Implementation

- An open architecture which facilitates integration of both foreign and domestic defense and commercial technologies with open interfaces
  - Affords the ability to rapidly integrate mature component systems and to tailor solutions in response to urgent operational needs, driven by dynamic threats
  - Open architecture reduces cycle time and cost

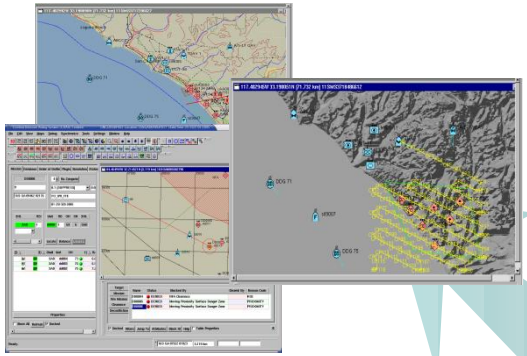
- Ability to provide unbiased system trades
  - Ability to assess emerging technologies and shape future capabilities
  - Honest broker, not influenced by company-owned , proprietary solutions

- Establishment of key strategic partnerships with government, industry, and academia

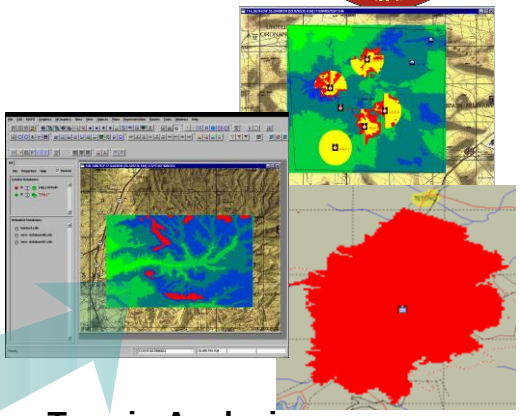
Back-Up

NEPTUNE's Core Infrastructure
Firestorm™

Firestorm is a U.S. Government owned and maintained family of re-usable, open architecture decision aiding components and tools enabling rapid creation of next generation network centric fire control & full-spectrum effects decision support systems

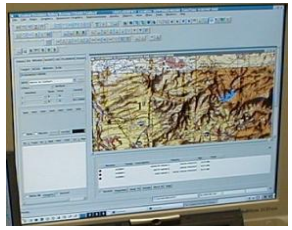


- Effects planning/tasking/targeting
- Weapon-Target pairing & de-confliction
- Weapon system knowledge base

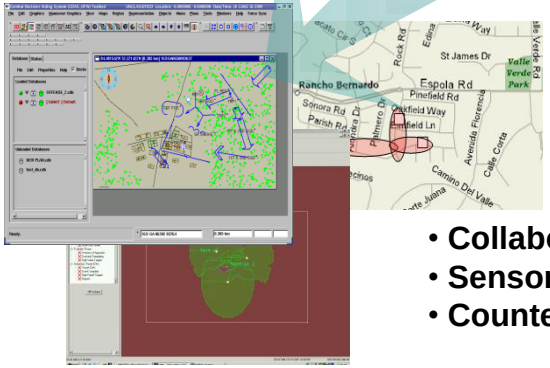


- Terrain Analysis
- LOS
- Range rings
- Elevation profiles/contour maps

- JVMF Msg
- Curser on Target



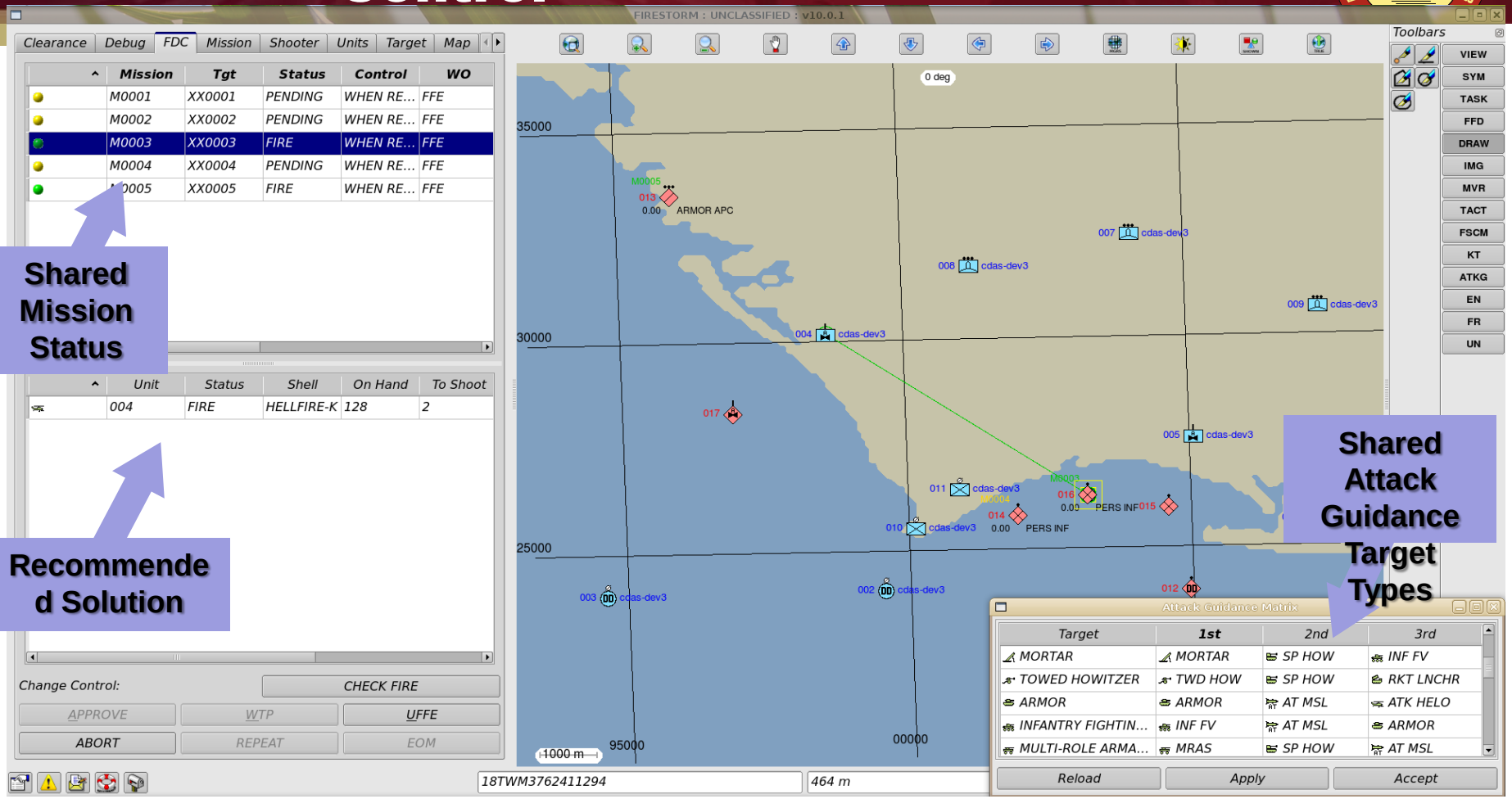
Digital Mapping/GIS
2525B Symbology



- Collaborative Planning
- Sensor planning/tasking
- Counter IED

- DTOP
- ArcView™ Shape
- ArcInfo™ Exchange
- DXF
- USGS DEM, DLG
- GeoTiff
- US Census Bureau Tiger Line
- CADRG
- ADRG
- CIB 5m & 10m
- DTED 0-2
- VMAP 0-2
- Urban Vector Map

Netted Fires/Tactical Fire Control



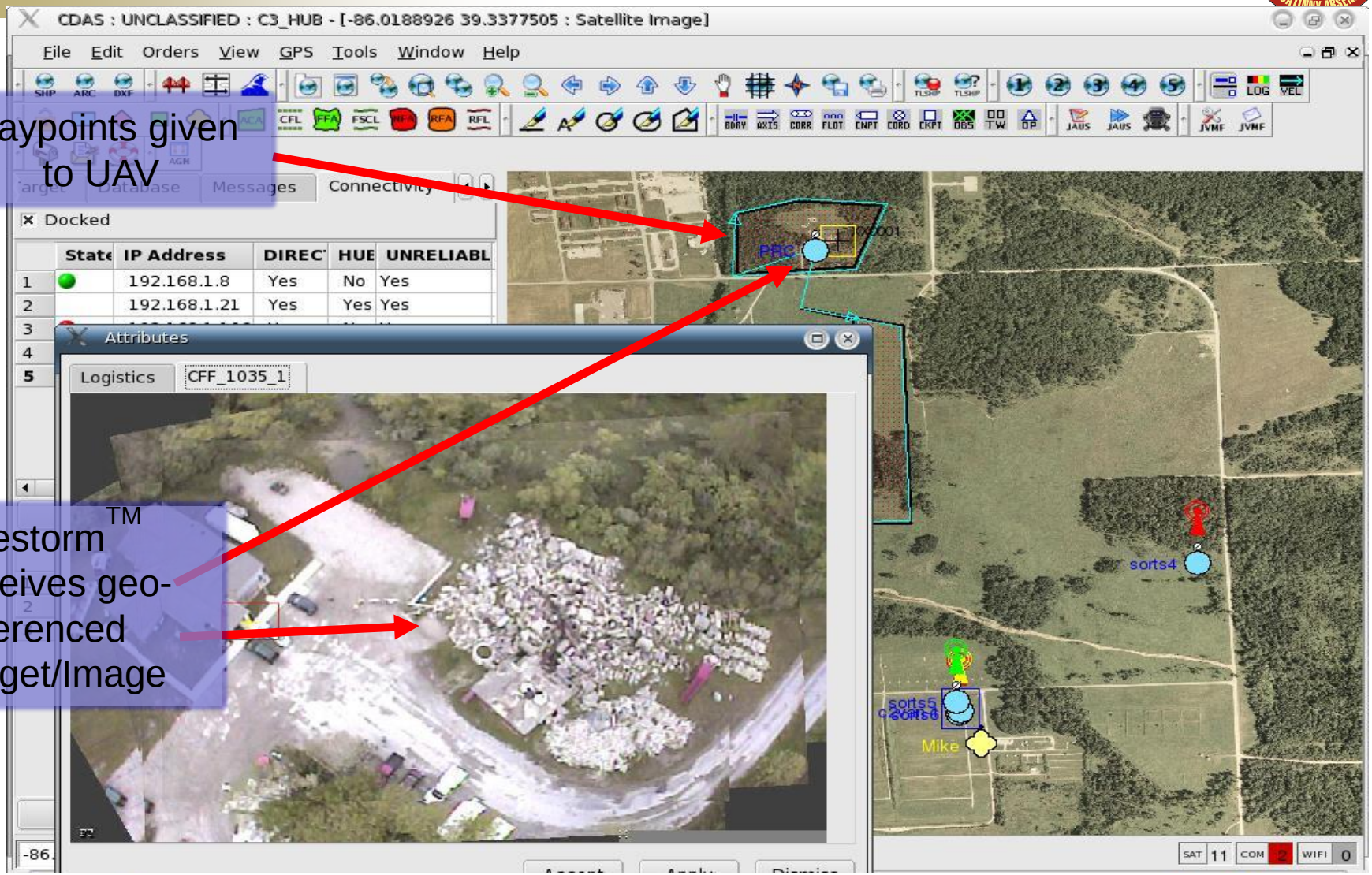
Shared Mission Status

Recommended Solution

Shared Attack Guidance Target Types

Attack Guidance can be tailored to provide prioritized tiered weapon system preferences against target types.

Firestorm™ Receiving UAV Image



Waypoints given to UAV

Firestorm™ receives geo-referenced Target/Image