Mobile Distributed C4ISR Architecture (MDCA)

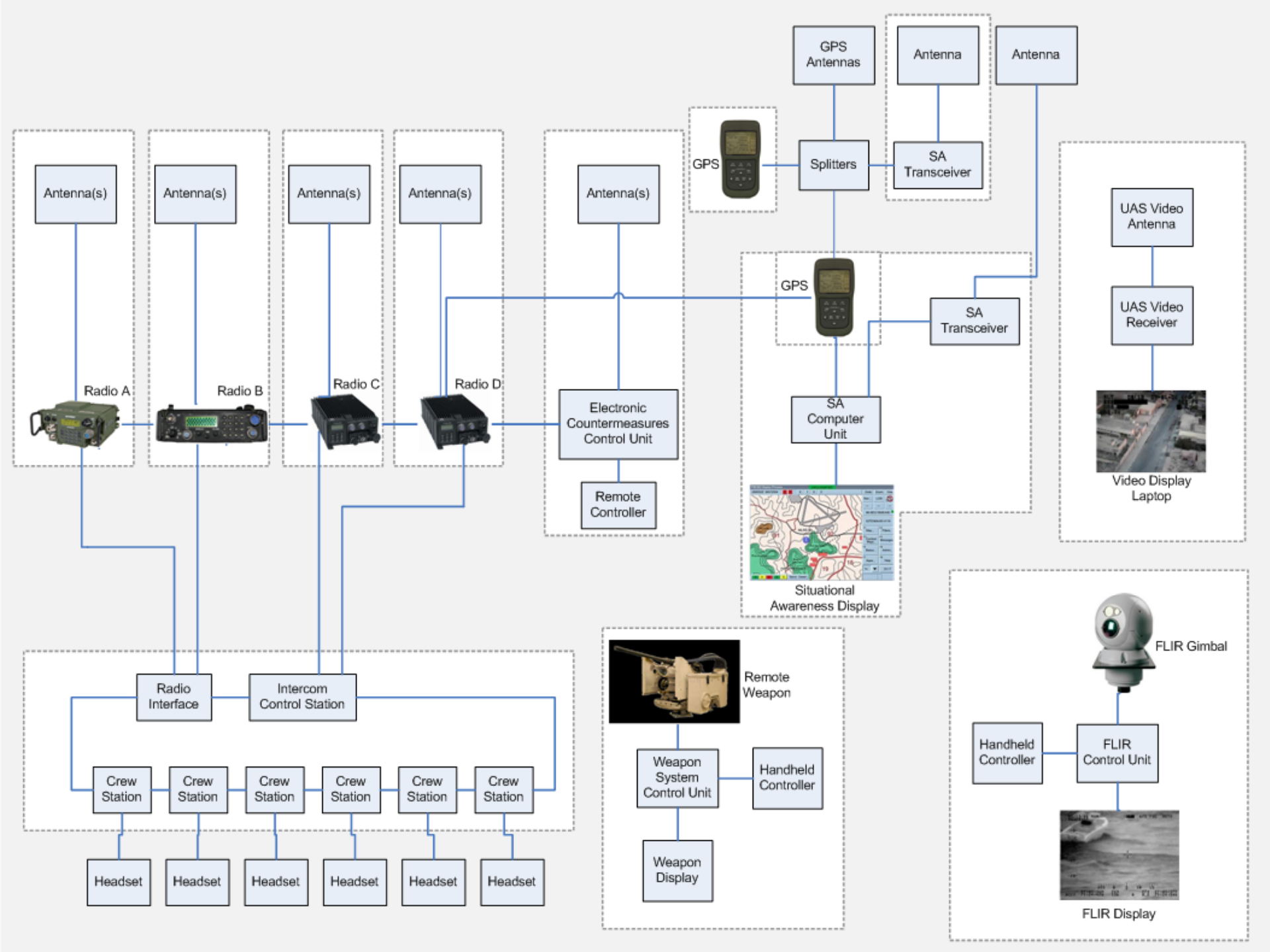
Presentation to NDIA

14th Systems Engineering Conference 2011

What does the Warfighter Need?

- Warfighters have to deal with layers of black boxes, controls and displays --in different formats and interfaces, with disparate capabilities and functionalities—on one platform.
- Developers build similar capabilities repeatedly ---we buy platform-unique, “closed architecture” hardware and software.
- Training becomes less applicable “platform to platform”
- **The operator , who often works across different systems and platforms on a single mission--“is” the integrator**
- We are designing in “scheduled obsolescence” and increasing the cost of sustaining and upgrading legacy systems.
- Not planning for the utility and adaptability that future automated and networked platforms and systems will enable

We need a different approach


GPS Antennas
Antenna
Antenna
GPS
Splitters
SA Transceiver
Antenna(s)
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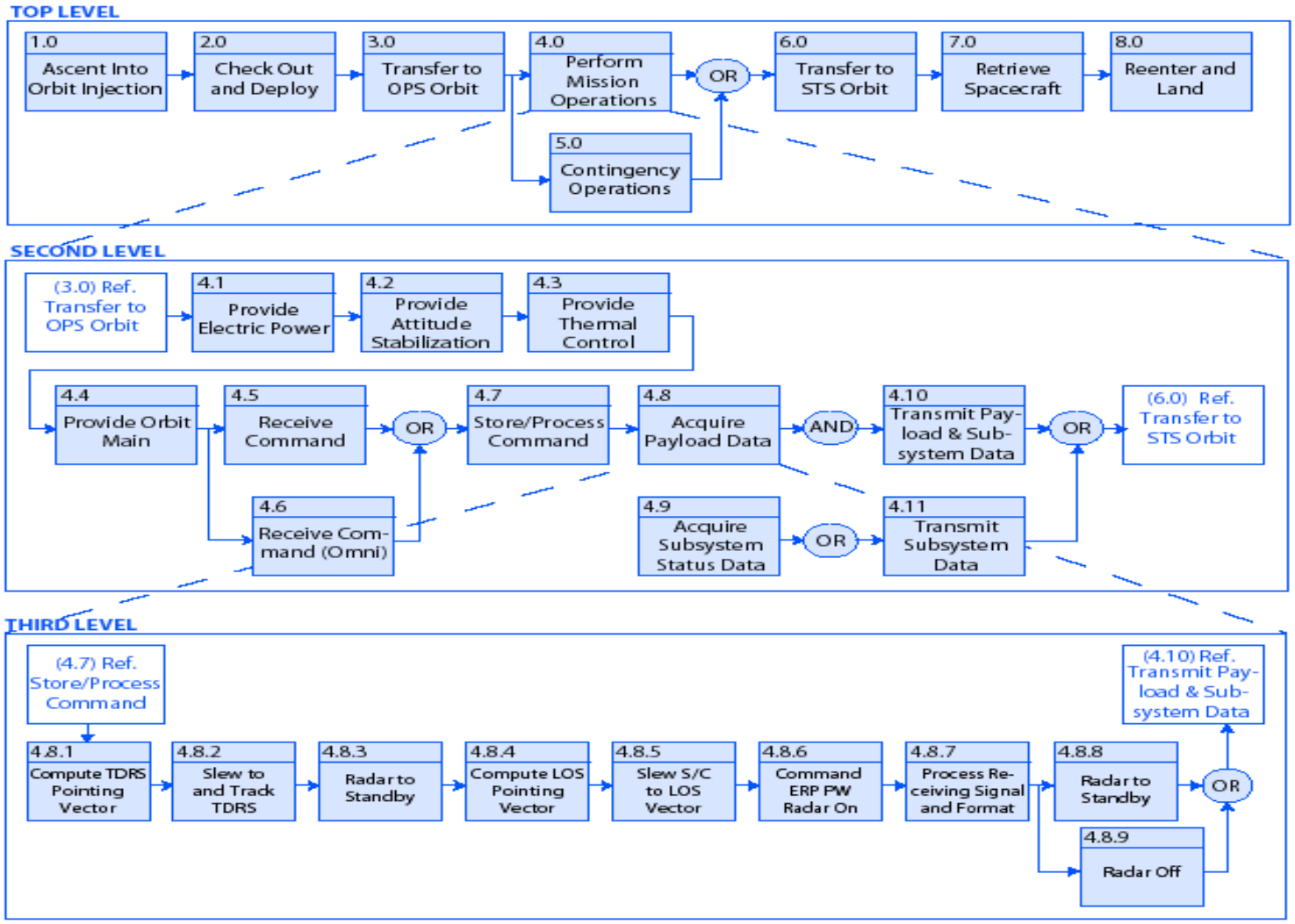
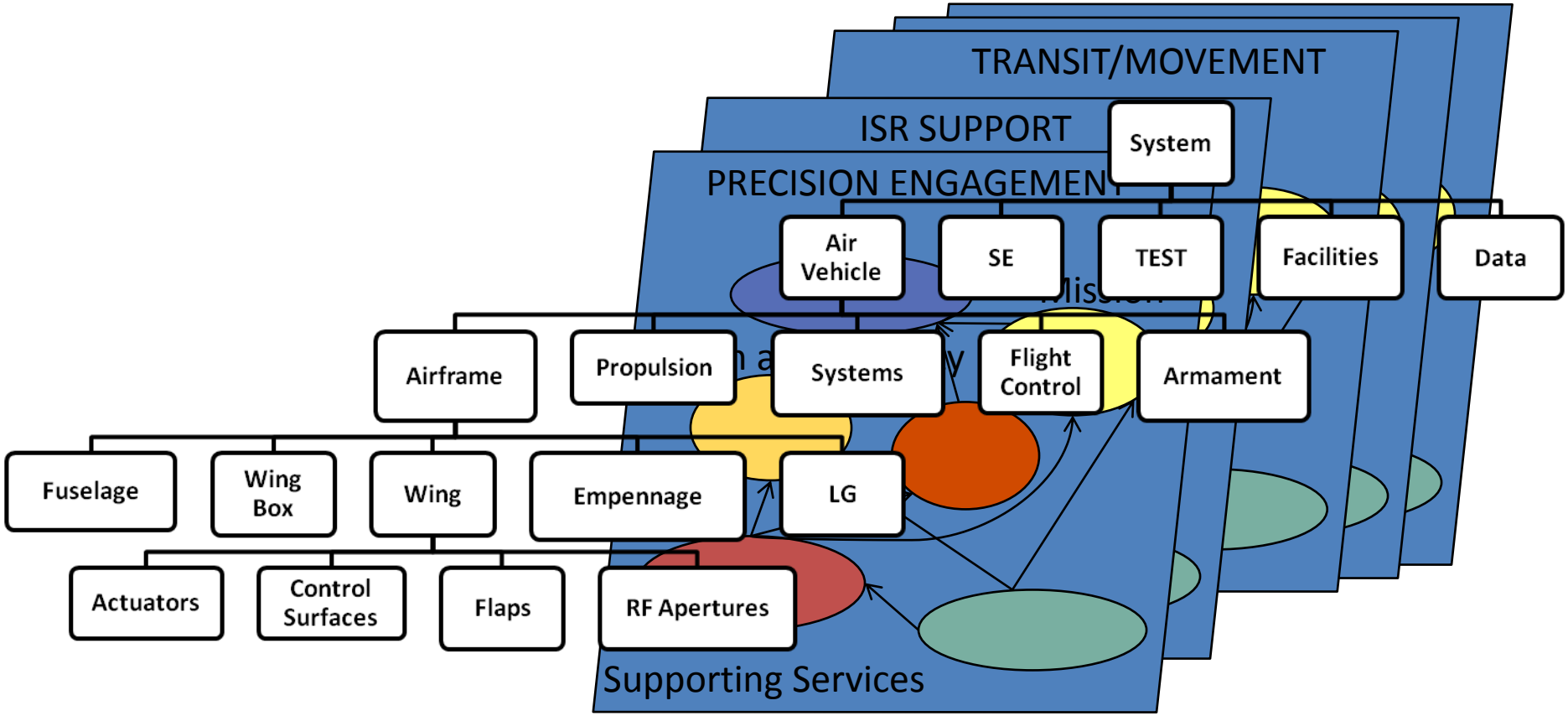
Antenna(s)
GPS
SA Transceiver
UAS Video Antenna
UAS Video Receiver
Radio A
Radio B
Radio C
Radio D
Electronic Countermeasures Control Unit
SA Computer Unit
Remote Controller
Video Display Laptop
Situational Awareness Display
Radio Interface
Intercom Control Station
Crew Station
Crew Station
Crew Station
Crew Station
Crew Station
Crew Station
Headset
Headset
Headset
Headset
Headset
Headset
Remote Weapon
Weapon System Control Unit
Handheld Controller
Weapon Display
FLIR Gimbal
Handheld Controller
FLIR Control Unit
FLIR Display

Functional Flow Block Diagram (Shuttle Radar)



Source: NASA Systems Engineering Handbook

Problem:



Need to link Functional Hierarchy to Physical Domain

What Capabilities are "Inbound"?

- 4G Wireless Base Stations
- "The Cloud" and "Land ISR Net"
- Defensive systems (GPR, EMP, Interceptors)
- Bridges to Dismounts
- Helmet Mounted Displays
- Shared SA
- Geo Location
- UAS local control
- Advanced Weapon FCS
- "Pilot Advocates"

What is Needed

1. Systems built with the “Operator” as the “Customer”

2. An architecture to accommodate different platforms, environments, capabilities, missions

3. “Attributes”—

    a. Standards which industry will embrace
        IEEE, NEMA, others

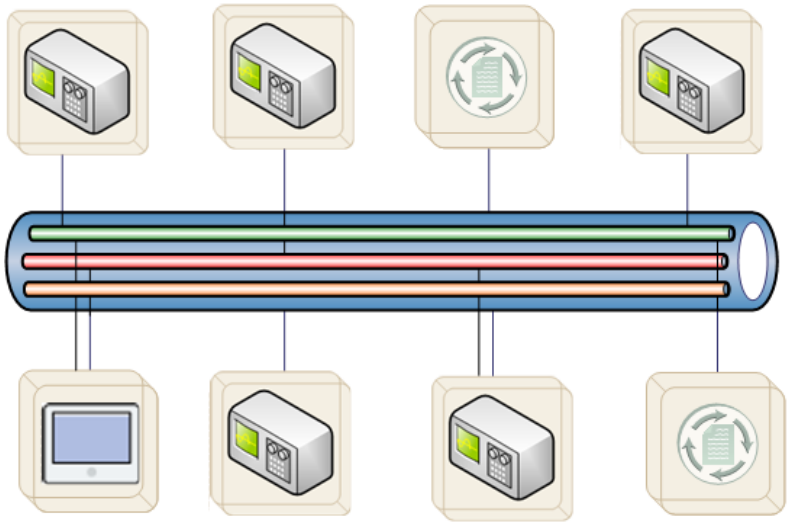
    b. A “taxonomy” --- Common definitions

    c. Open Architecture to describe systems and platform capabilities

    d. Propelled by Commercial markets and applications

    e. Easy to certify and introduce changes

Mobile Distributed C4ISR Architecture (MDCA)



- Distributed processing and control
- Scalable
- Abstraction of devices and software as services with standard interfaces
- Loose coupling of services
- Modular User Interface decoupled from devices

Goals and Objectives

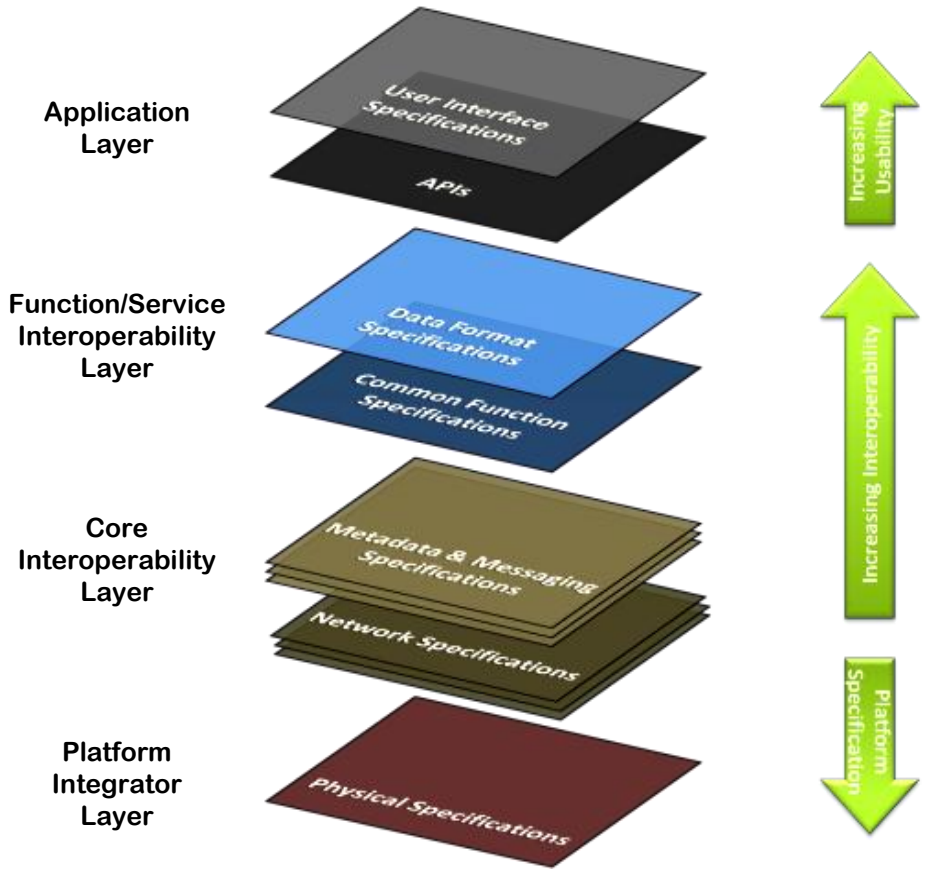
- Common Architecture design for C4ISR integration on various platforms
- Open industry standards
- SWAP reduction
- Lifecycle cost savings
- Increased Interoperability

Outputs

- Technical Data Package (TDP)
- Development and Test Lab

MDCA Layers

- **Application Layer**
  - User Interface Specifications
- **Functional Layer**
  - Utility Services (Time, Location, Velocity, etc.)
  - Data Storage & Data Recording
- **Core Interoperability Layer**
  - Plug and Play
  - Discovery
  - Management & Configuration
- **Physical Layer**
  - Connectors & Cabling
  - SWAP & Environmental Requirements



NAVAIR Testbed

- Testbed available to government and industry for integration, compliance and performance testing

- Make it easy to develop, test, certify and introduce changes
  - Capabilities and components “purple” tested

Benefits of MDCA Approach

- Allows new capabilities—across multiple platforms and programs
  - Location aware applications
  - Sensor fusion
  - “Slew to cue”
  - Augmented reality
  - User-defined operator interfaces
  - Automated logistics
  - Supporting unintended uses – “Mashups”
- Better Tools, Training
- More Sustainable and Upgradable
- Supports future Conventional + Irregular Warfare capabilities

More Performance from Crews and Systems

Challenges

- Imperfect and evolving operational requirements
- Mixing/Separating physical and functional constraints among subsystems
  - Multiple program of record systems
- Alignment of government-led open architecture initiatives
  - Avoiding format wars
- Choice vs. complexity
- Interoperability vs. Flexibility
- Defining “Open”
- Developing attractive business models
  - Equipment manufacturers
  - System integrators
  - Application developers

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