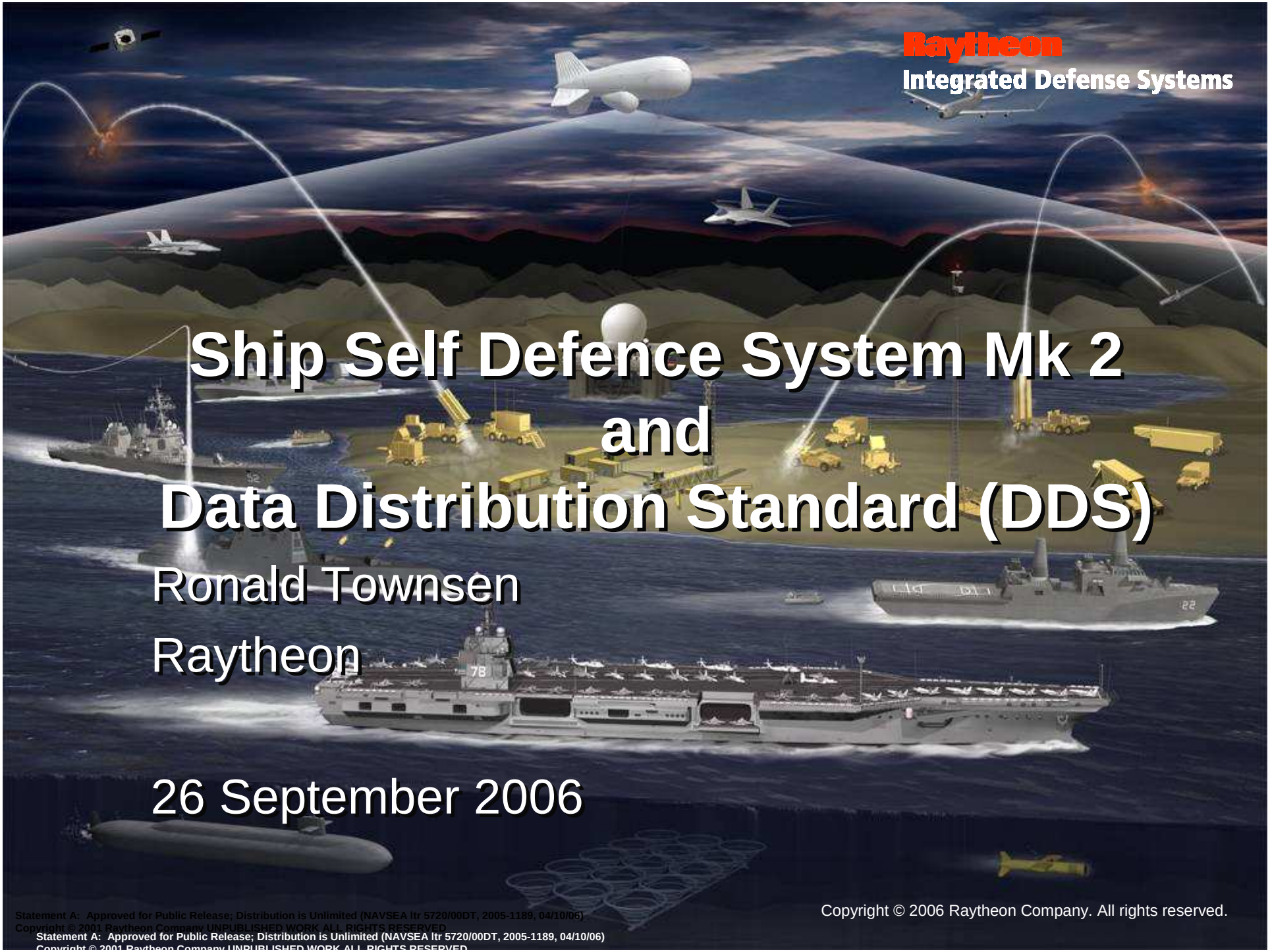

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Ship Self Defence System Mk 2
and
Data Distribution Standard (DDS)

Ronald Townsen
Raytheon

26 September 2006

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Evolving USN Functionality

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SSDS MK 1

Standalone Self Defense

- LSD 41 Class
- 3 Operators
- 10 External Interfaces

SSDS MK 2 Mod 0

Weapon Control Integrated with existing CMS

- CVN 68 Only
- ACDS BLK 1 and CEC are Primary CS Elements
- 1 Operator
- 7 External Interfaces

SSDS MK 2 Mod 1/2/3

Multi-Warfare Combat Management System

- CVN 76/LPD 17/LHD 8
- CEC Fully Integrated
- Air/Sea/Under Sea/Land Track Picture
- 24 Operators
- 16 External Interfaces
- Includes C4I Connectivity, Data Links, Air Control, Force Orders, Etc.
- Mod 1A/2A/3A Have Hardware Technology Upgrade

Today's Littoral Operations

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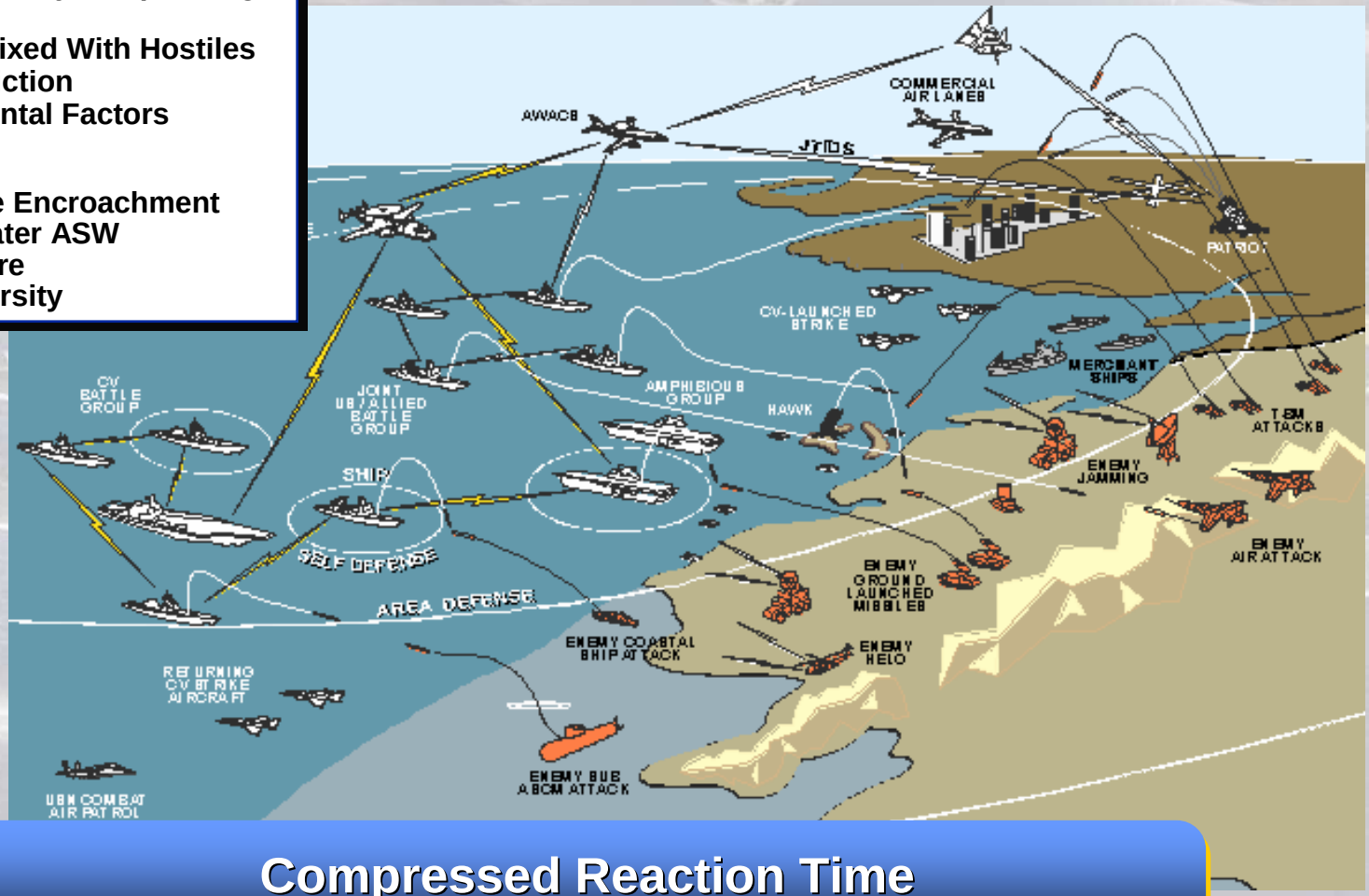
- Close Proximity of Operating Forces
- Neutrals Mixed With Hostiles
- ID Deconfliction
- Environmental Factors
  - Ducting
  - Clutter
- Battlespace Encroachment
- Shallow Water ASW
- Mine Warfare
- Threat Diversity

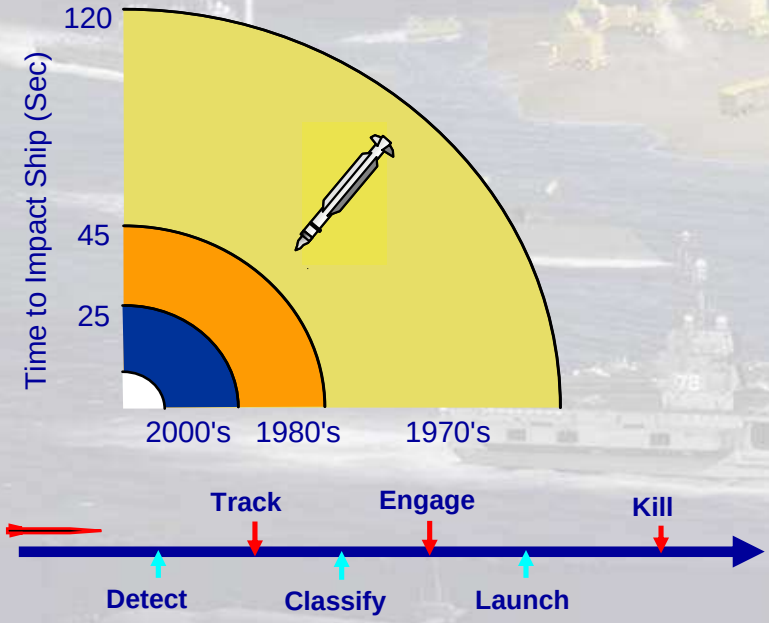


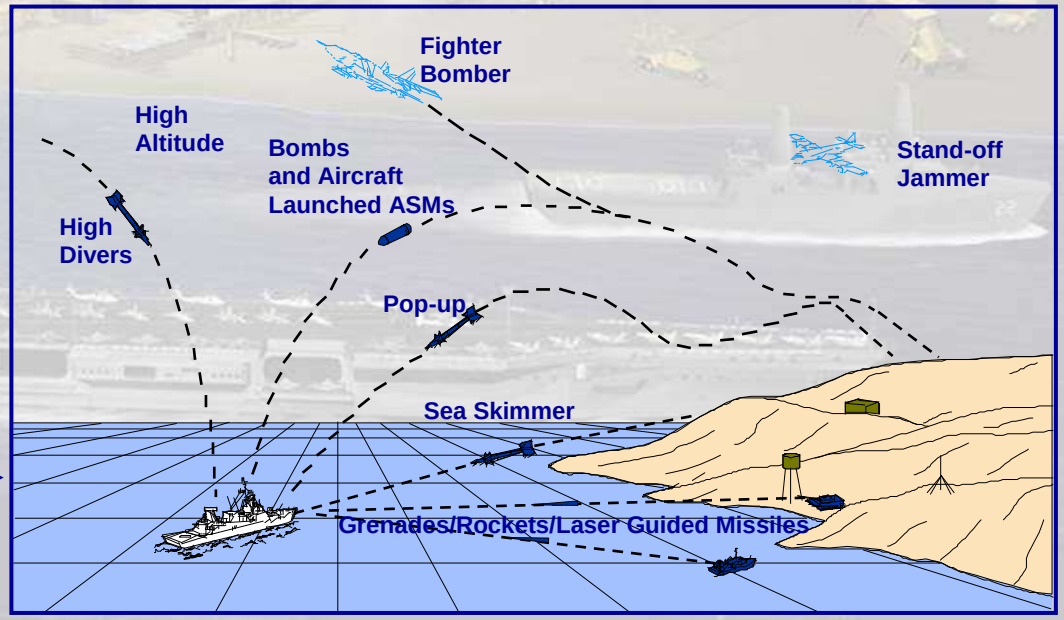
Compressed Reaction Time

Degraded Situational Awareness

Anti-Air Warfare Threat

- Ownship must be capable of defending itself in the modern Anti-Ship Missile environment:
  - Less time to react
  - Larger raids of threats
  - Littoral Environment





The Evolving Threat

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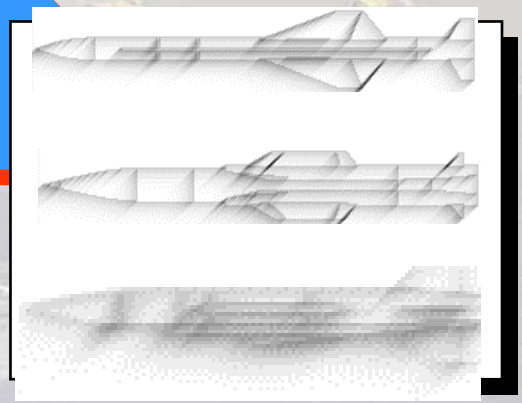
1998-2005
Near-Term is *TOUGH*

2006-2011
Mid-Term is *HARDER*

- ***Faster***
- ***Advanced Seeker***
- ***More Maneuverable***
- ***Increased Lethality***
- ***Low Altitude***
- ***Stealthy***

2012+
Far Term is *DEADLY*



THE RESPONSE

SSDS Layered/Automated Detect-Control-Engage

Layered Ship Self Defense

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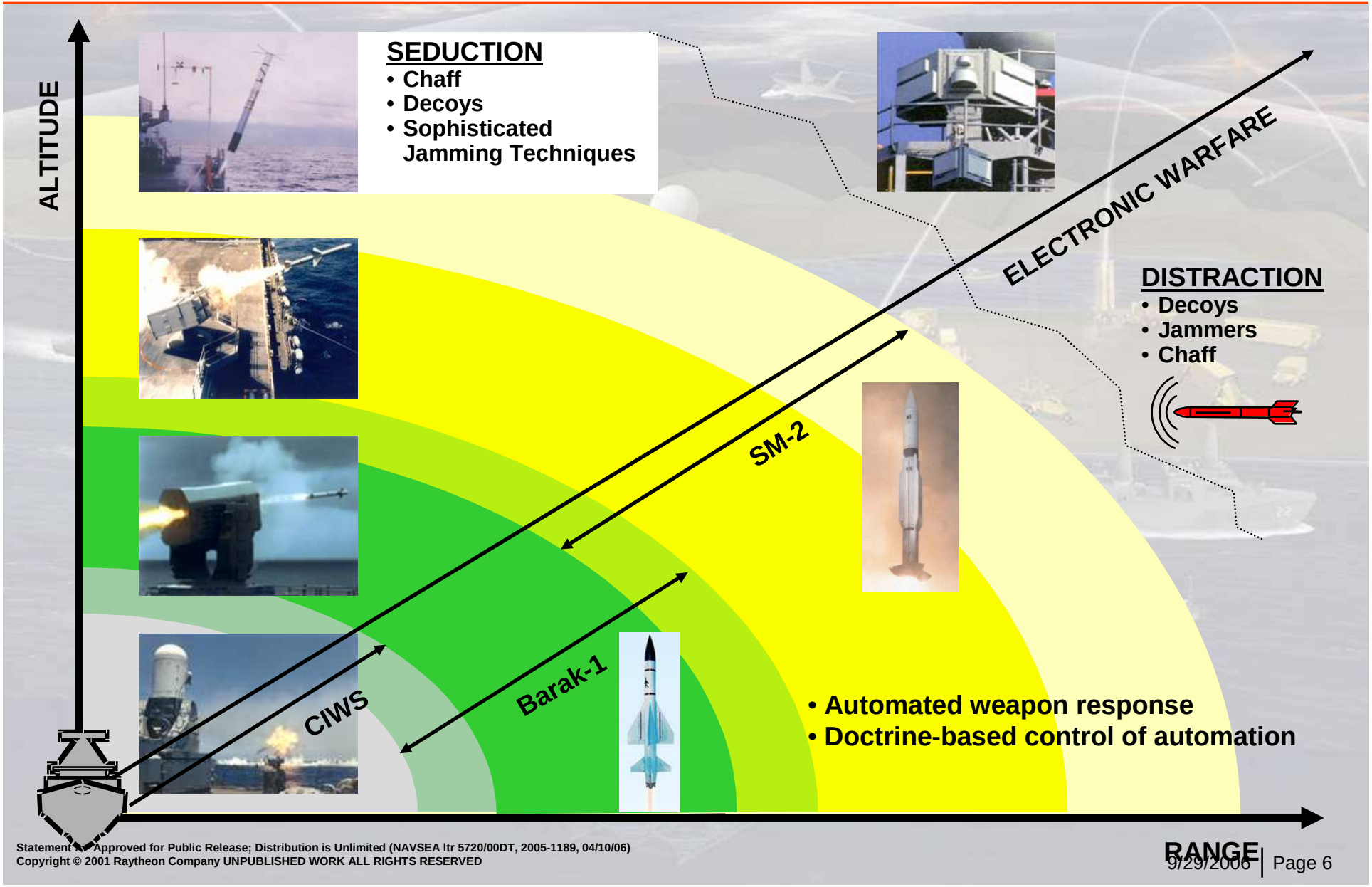

TECHEVAL Results

- First Successful Demonstration of a Fully Distributed, Open Architecture Combat System Utilizing:
  - Multi-Sensor Integrated Tactical Picture
  - Doctrine-based Defense Decisions
  - Automatic Detect - through - Engage Processing
  - Integrated Scheduling of Hard Kill and Soft Kill Weapons
- Detected, Tracked and Destroyed Multiple Missile Threats With RAM and CIWS
- Four Target Kills in Four Attempts




Physical Distribution and Redundancy Achieves Readiness Requirements

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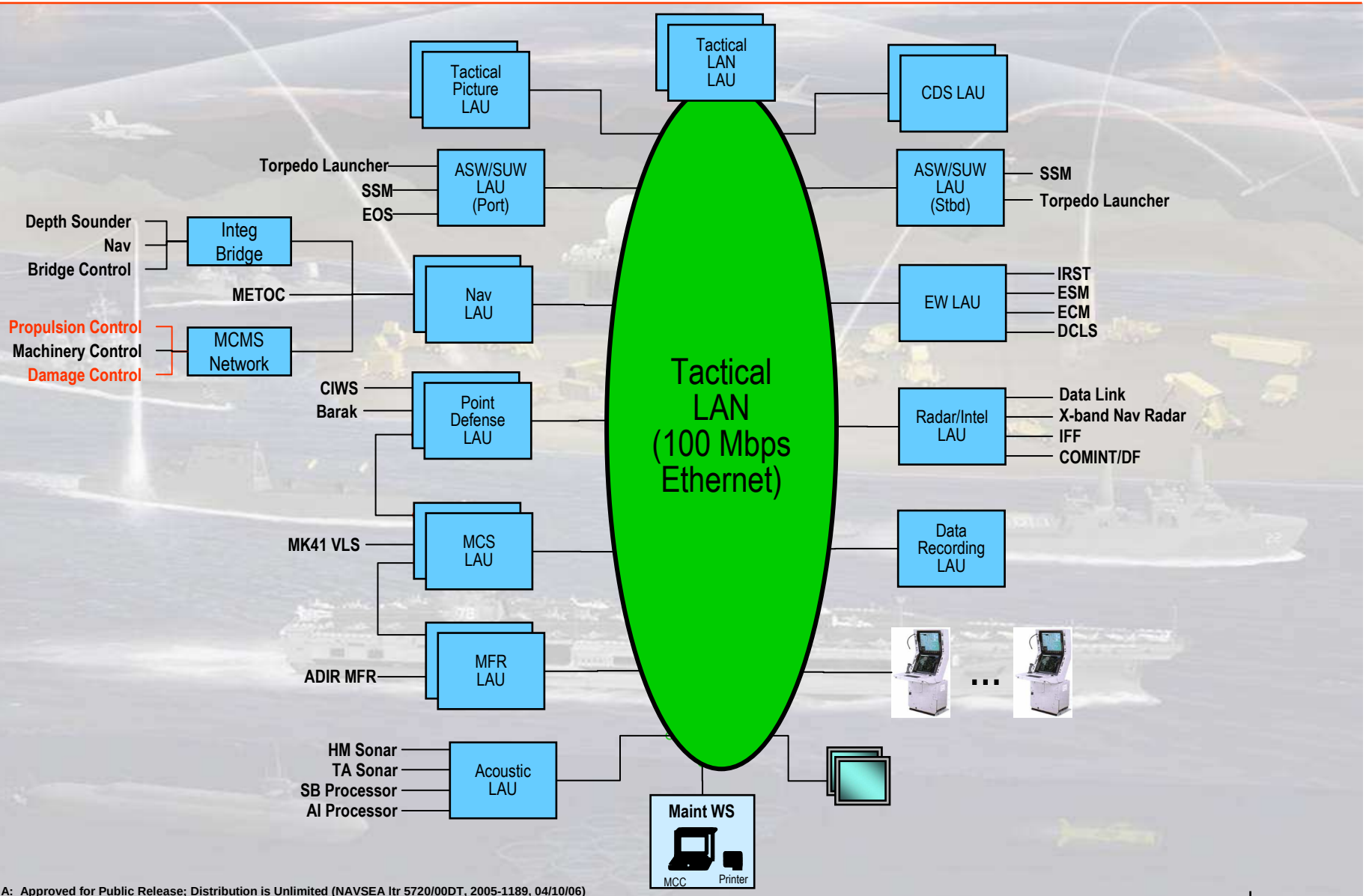
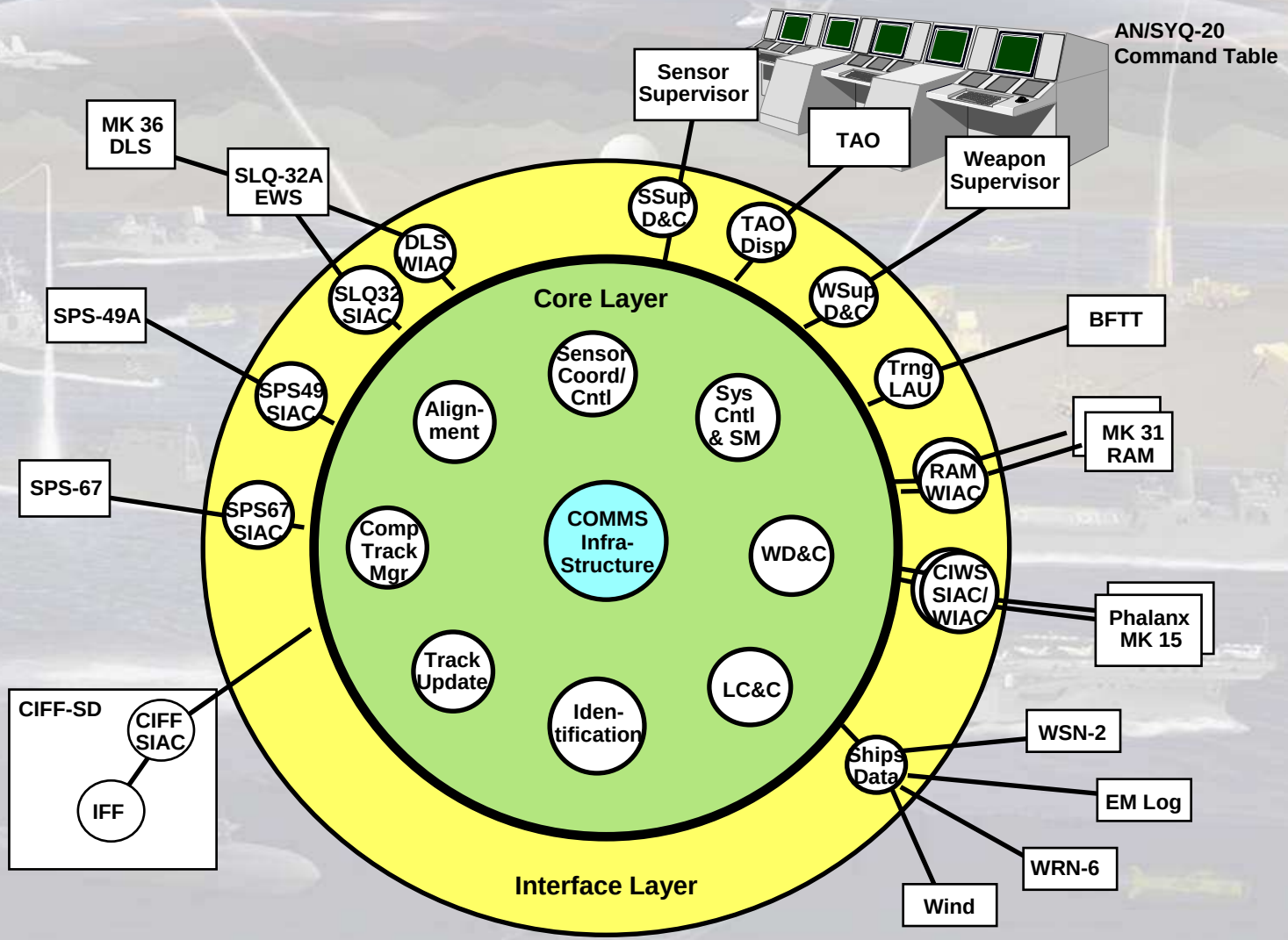


Layered Distributed Architecture



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SSDS Open Architecture

- Open Architecture Precepts
  - Designed in from the ground up
  - Evolved from architecture established in SSDS MK 1
  - COTS processor and network technology
  - C++, CORBA, ACE, POSIX OS
  - Common data communications standards
  - Physically distributed for expansion
- Extensible application design
  - Information-driven
  - Object-oriented
  - Component-based
  - Layered architecture
  - Survivable
  - Fault tolerant
- Single Source Baseline
  - Supports three ship configurations
  - Supports three hardware configurations

SSDS Layered Architecture
Pre-Tech Refresh

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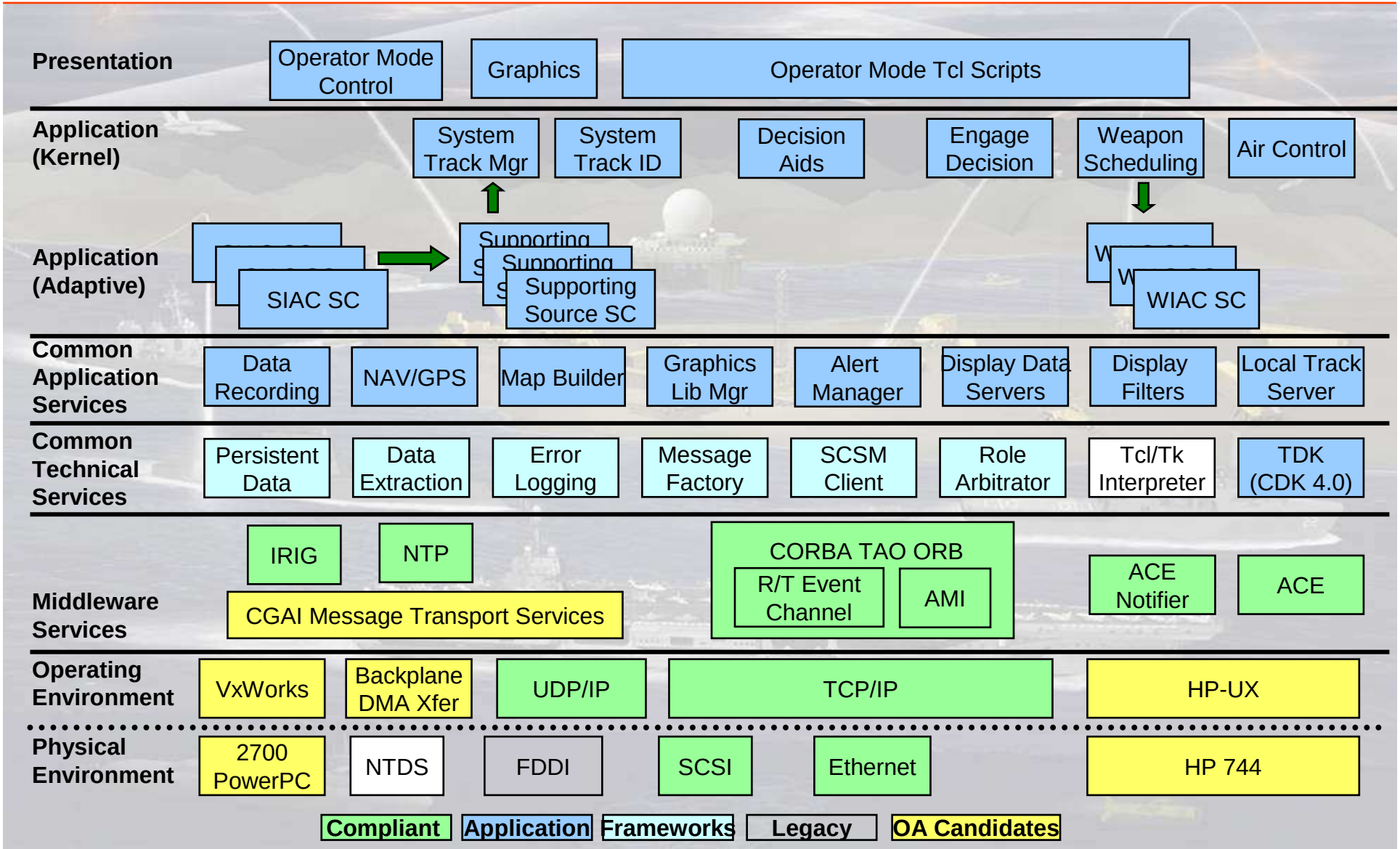

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SSDS MK 2 Open Architecture Migration

- U.S. Navy Open Architecture Computing Environment (OACE) Standards Compliance
  - Publish/subscribe middleware replacement with OACE compliant COTS (DDS)
  - OACE compliant processors and operating system (Intel/LynxOS)
- Elimination of Multiple LANs
- Gigabit Redundant Core Switch
- General Processing and External I/O Processing in Separate Cabinets

SSDS Layered Architecture
Open Architecture with TSCE-I

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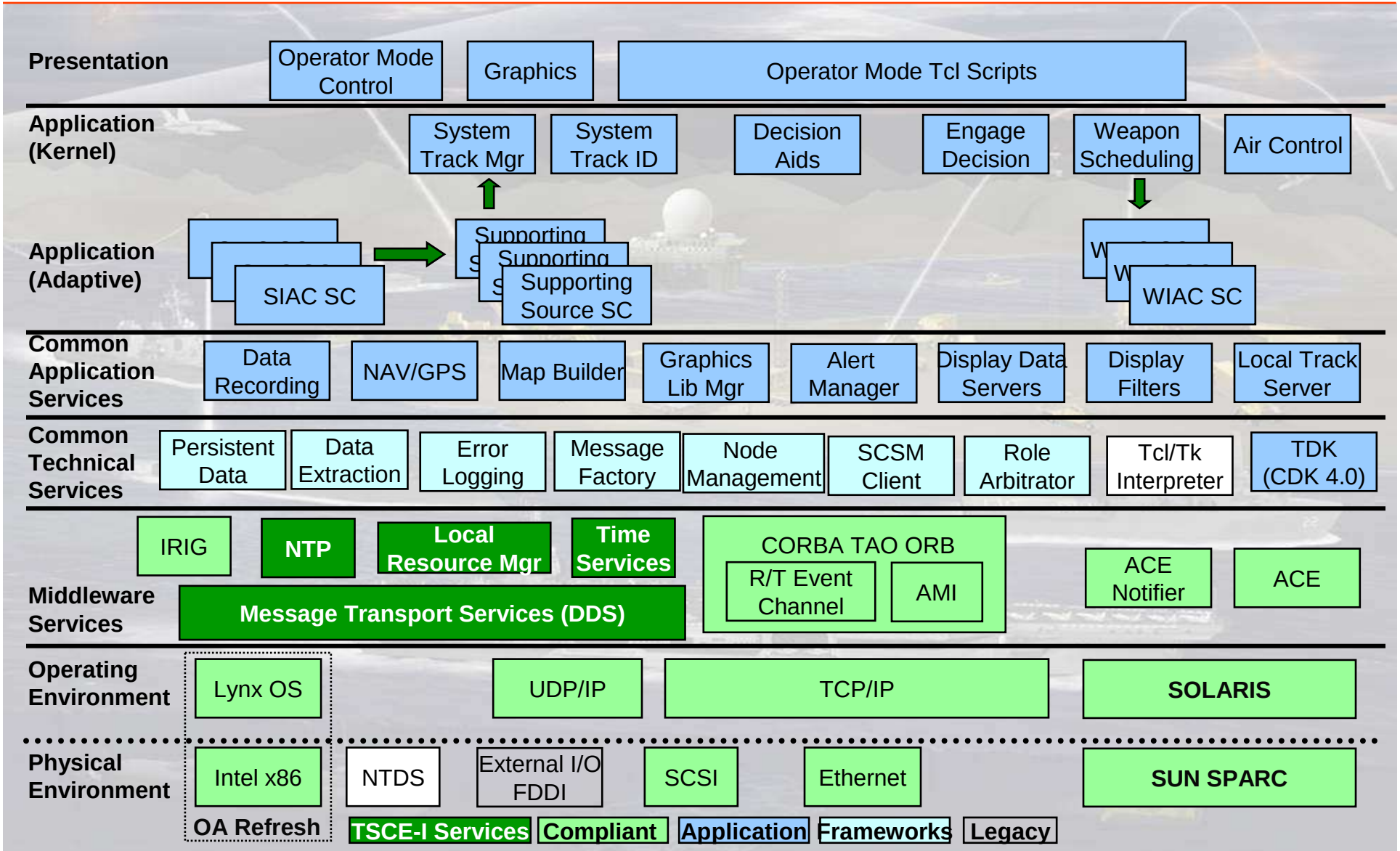

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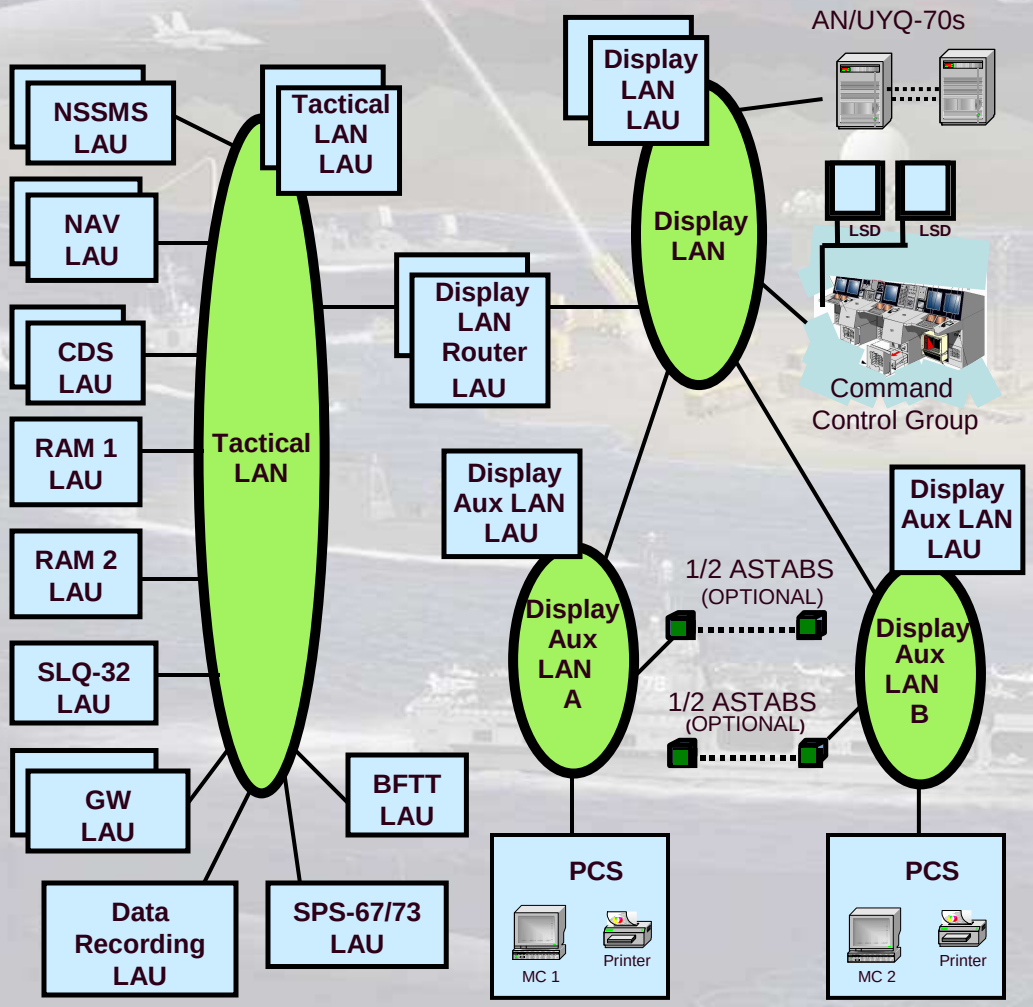
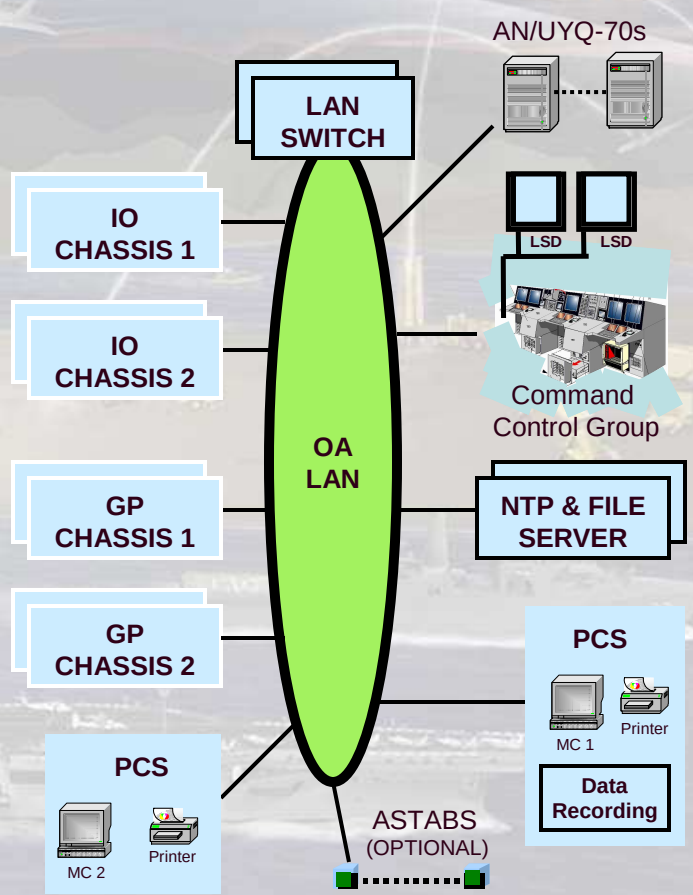
Hardware Configurations

SSDS MK 2 Mod 1A/2A/3A



SSDS MK 2 OA



Single SSDS OA LAN
I/O processors separate from general processing
Data Recording moved to PCS

Publish/Subscribe Common Information Model

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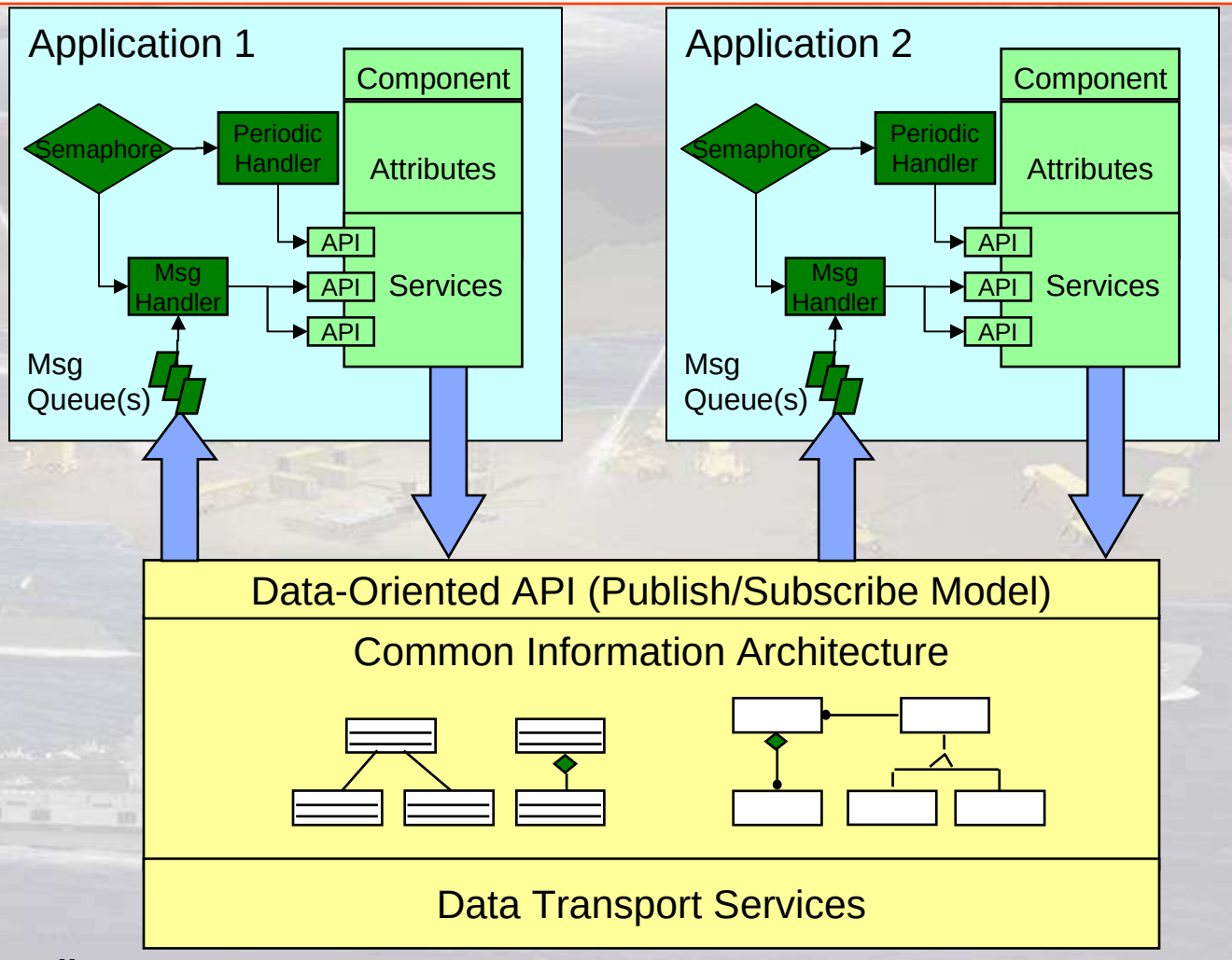

Components:

- **manage subset of system attributes**
- **reporting changes in state of attributes**
- **triggered by changes in system state**
- **conform to common message definitions**

OA Software Component Layered Abstraction Model

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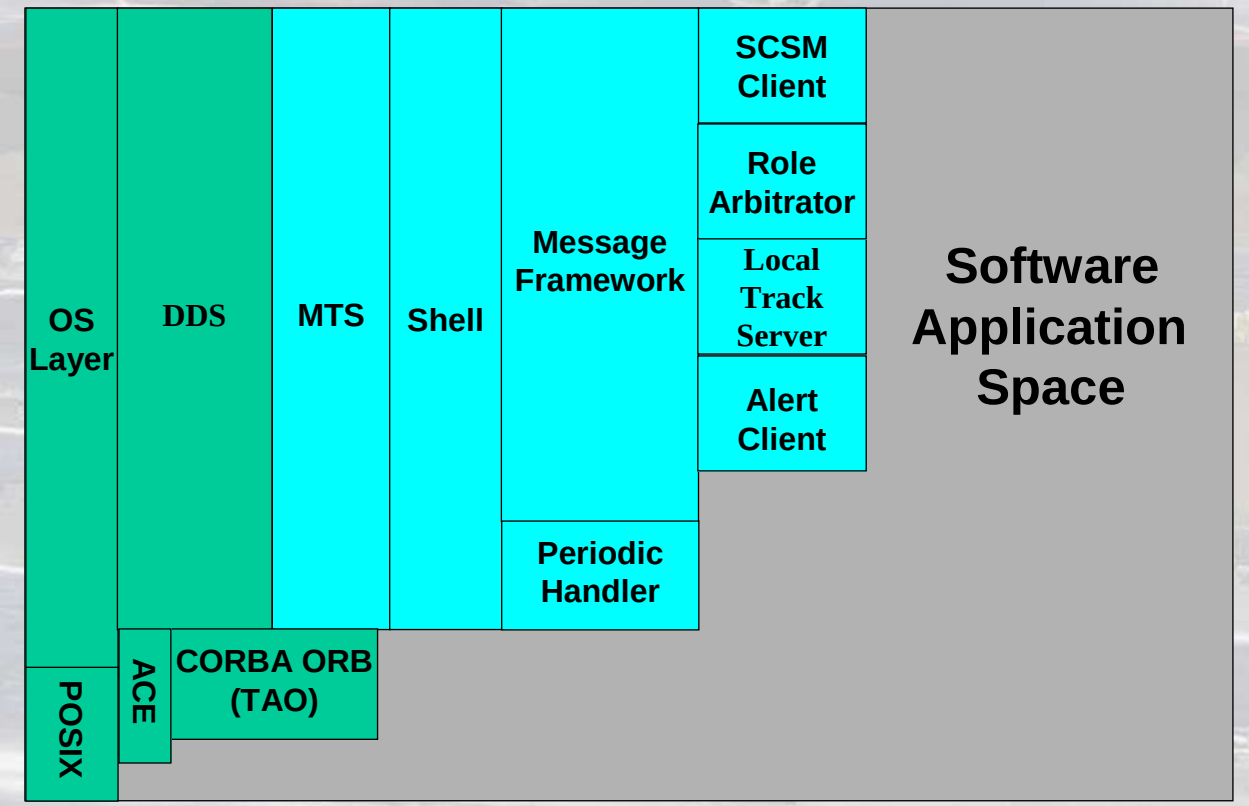

- SC Framework
- COTS

Software component structure is independent of OS platform

Model Driven Design

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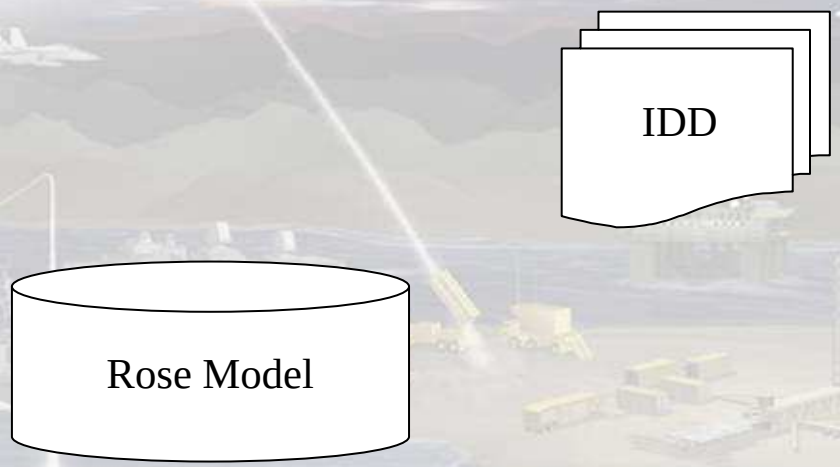

- Object Oriented Design
- Common message definition classes
- SC specific behavior added to derived class
- Auto-generation of skeleton code

Common Software Component Framework

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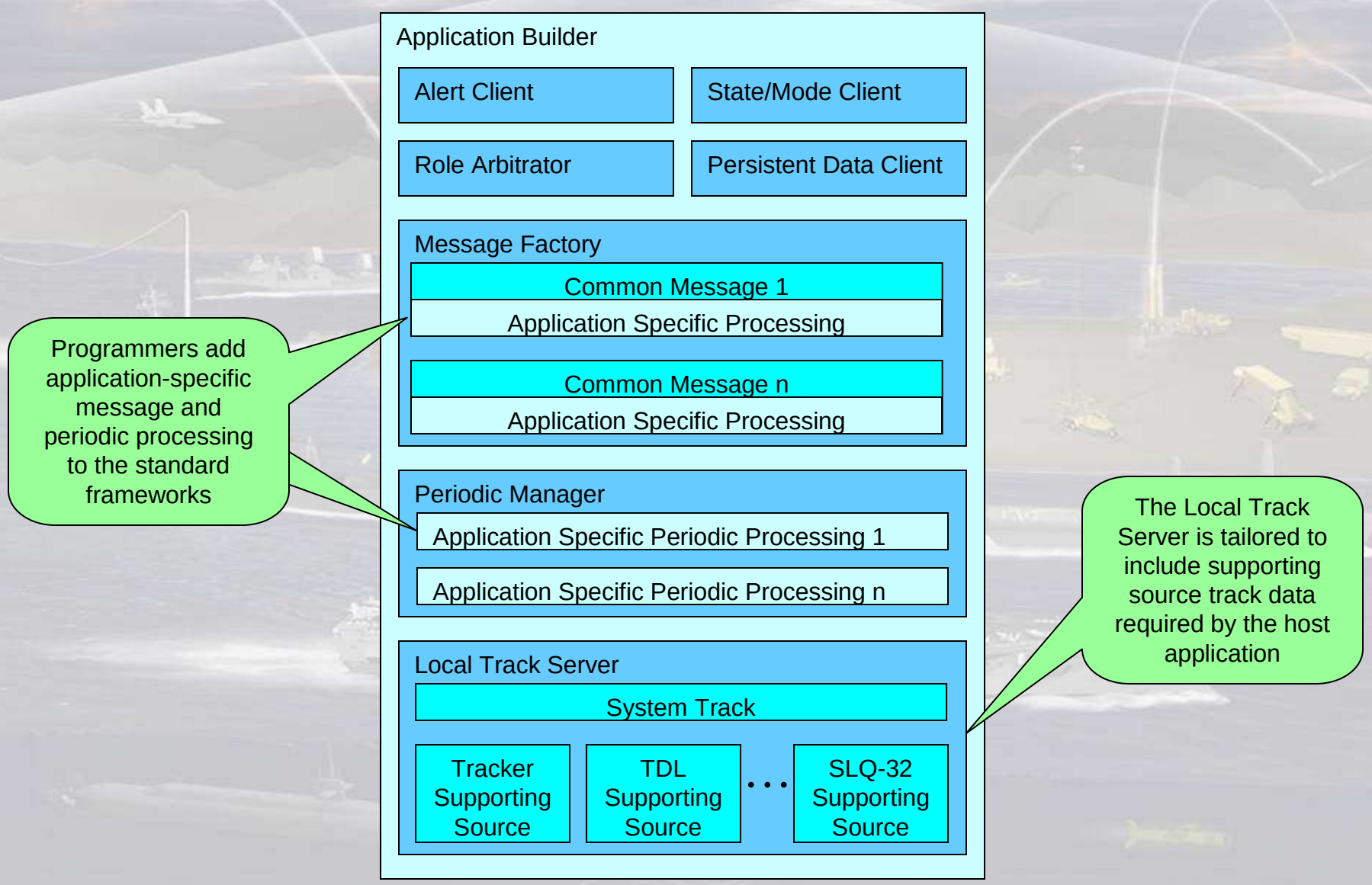

U.S. Navy Standard Command and Control

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- Establish a Common Architecture for all Navy Command and Control Systems
- Core Extensible Infrastructure to Provide Common Services and Capability
  - Resource Management
  - Navigation Data
  - Time Services
- Compile Inventory of Reusable/Configurable Functional Components
  - Track Management
  - Weapons Management
- Cooperation with Industry
  - Raytheon
  - Lockheed Martin

Extensibility Was Major SSDS Architectural Driver

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- Open computing architecture
  - COTS processor and network technology
  - C++, CORBA, ACE, POSIX OS
  - Common data communications standards
  - Physically distributed for expansion
- Extensible application design
  - Information-driven
  - Object-oriented
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  - Layered architecture
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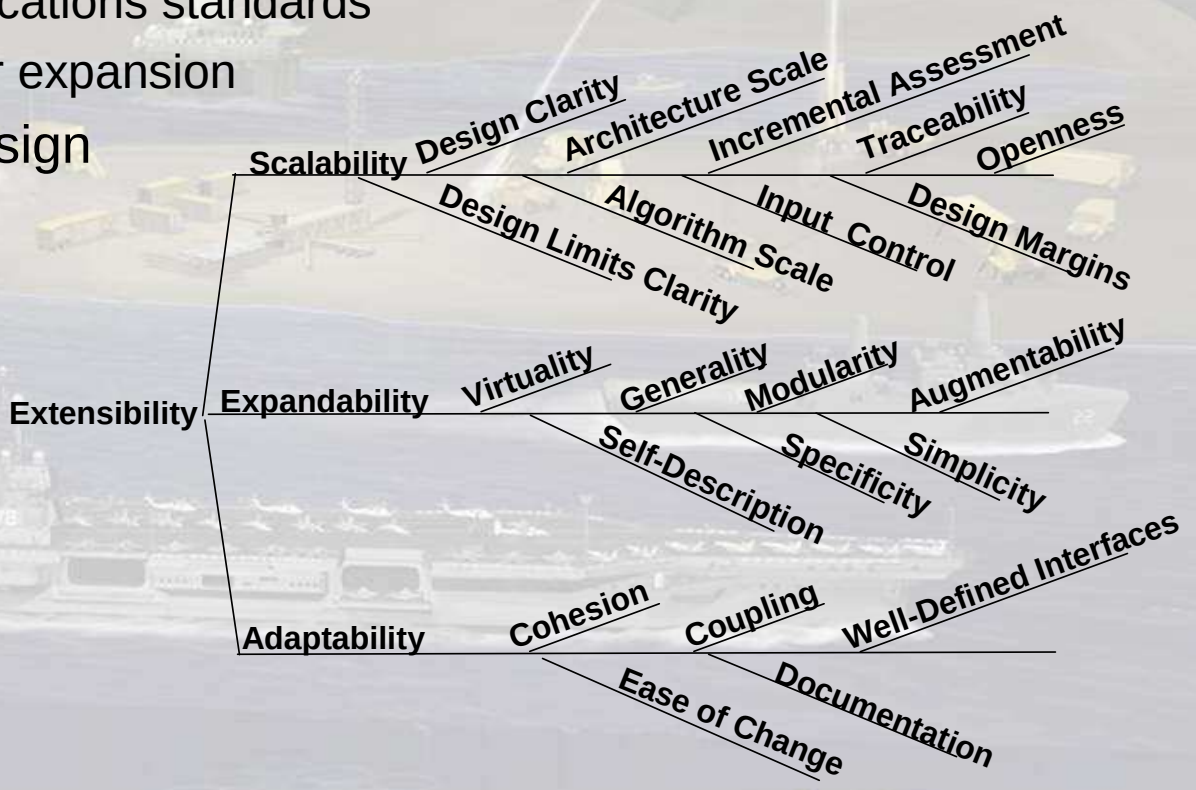
  - Fault Tolerant



When Seconds Count

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When Seconds Count....
SSDS Provides Cost Effective Ship Self-Defense With High Probability of Raid Annihilation Through:

- **State of the Art Sensor Integration**
- **Quick Reaction Through Automation & Efficient Human / Machine Interface**
- **Coordination of Weapons**
- **Based on Industry Standards**