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Port Security
Advanced Technology Initiatives
At
SPAWAR Systems Center Pacific

Presented to:
American Association of Port Authorities
Port Security Seminar and Expo

Presented by:
CAPT Mike Carter
SSC Pacific Unmanned Systems Branch

23 July 2009

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SSC Pacific
A National Resource for Homeland Security S&T

C4ISR & IT: Our Core Competencies

- Network Systems & Support
- Physical & Computer Security
- Command & Control
- Information Assurance
- Information Technologies
- Sensor Systems
- Communications
- Image Processing
- Visual Information Systems
- Wireless Technologies
- Cryptologic & Intelligence
- Command Center Services
- Anti-Terrorism / Force Protection
- Expeditionary C4I Systems
- Modeling & Simulation
- Navigation Systems
- Meteorology
- ATC Engineering/ Technical Services
- Radiation Detection

What We Do

Deliver Knowledge Superiority to the Warfighter Through Engineering Excellence

Speed to Capability ***Rapid Prototyping*** ***Leveraging Technology***

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SSC Pacific Homeland Security/Defense Sponsors

- Department of Homeland Security (DHS)
  - Office of Emergency Communications
  - S&T Operations Analysis Division
  - S&T Infrastructure & Geophysical Division
  - USCG
  - CBP
  - FEMA
- Support to the Assistant Secretary of Defense for Homeland Defense and Americas' Security Affairs Section 1401 (Technology Transfer) Office
- Department of Commerce, NTIA
- Department of Justice
  - National Institute of Justice, National Law Enforcement and Corrections Technology Center
- Office of National Drug Control Policy

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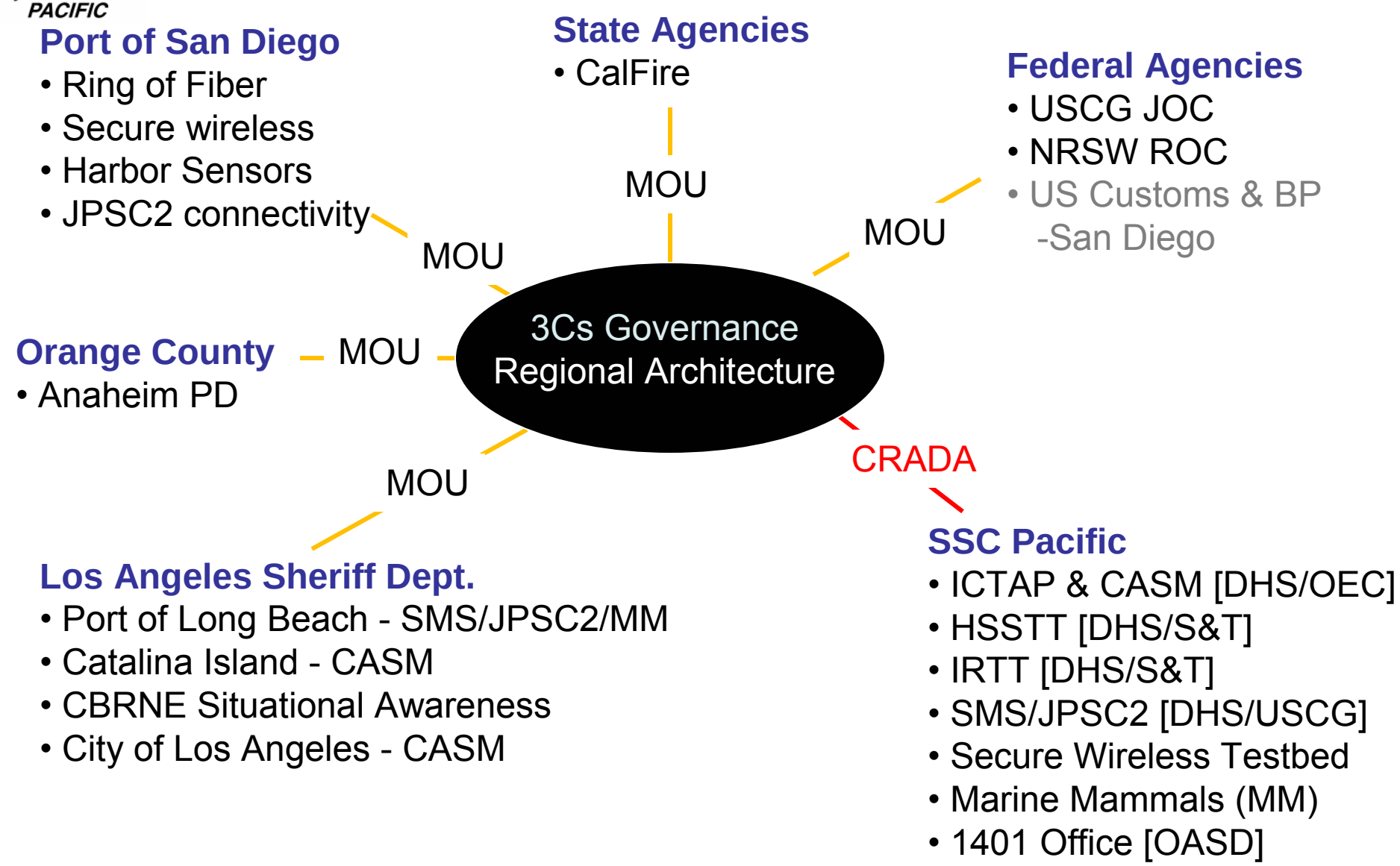
Example Initiative:
SSC Pacific's Regional Collaboration through 3Cs



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Participating 3Cs agencies

Local Agencies
- San Diego Police Department
- San Diego Sheriff Department
- Chula Vista Police Department
- Carlsbad Police Department
- San Diego Fire-Rescue
- CAL Fire
- North County Fire JPA
- County of Riverside
- County of Yuma
- 18 local governments or fire districts

State Agencies
- Cal Trans
- California Highway Patrol

Critical Infrastructure Sites
- San Diego Convention Center
- Metropolitan Transit System
- San Onofre Nuclear Generating Station

Federal Government / Military
- Navy Region SW
- USMC Base Camp Pendleton
- USCG Joint Harbor Operations Center
- Federal Bureau of Investigation SD FO
- Drug Enforcement Agency
- US Customs and Border Protection - SD

Emergency Operations Centers
- SD County Office of Emergency Services
- City of SD Office of Homeland Security
- SD State Visualization Laboratory
- SD County Hazardous Materials Department Operations Center
- City of Chula Vista
- City of Carlsbad

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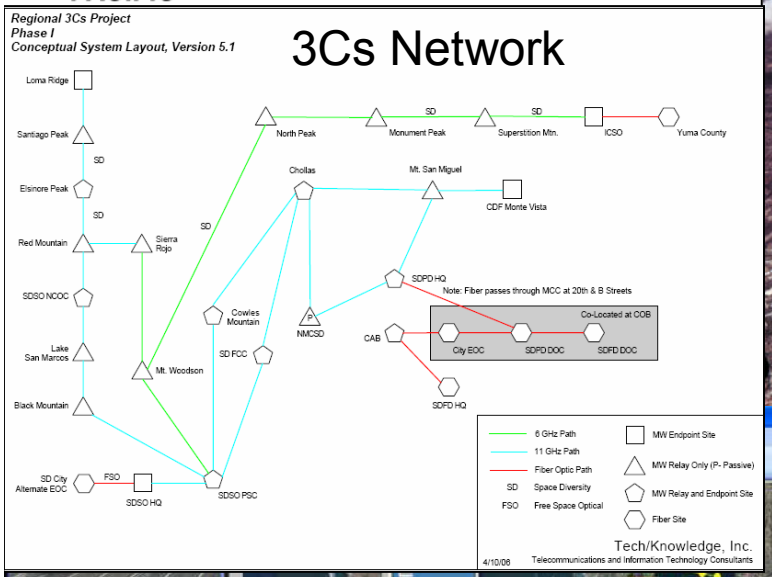
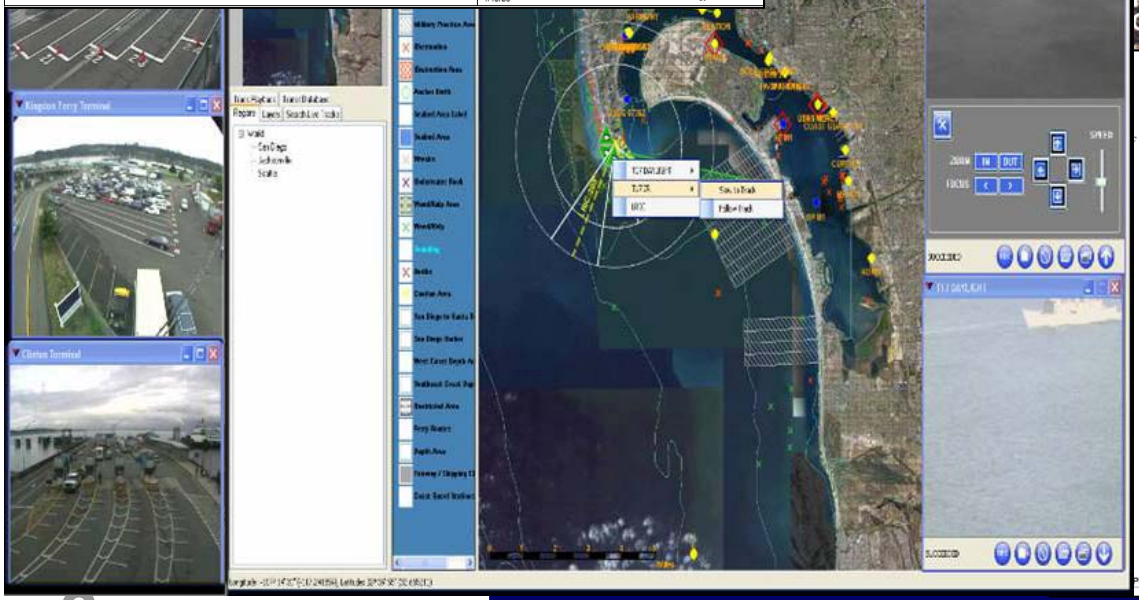
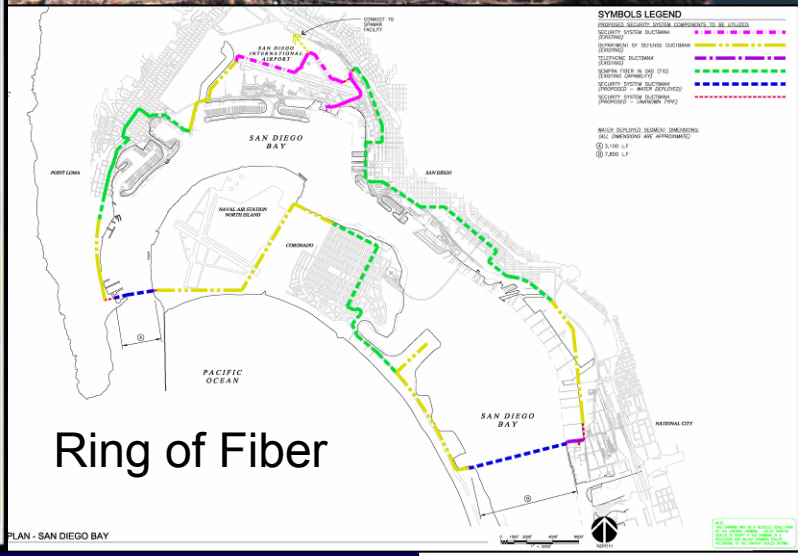
Emerging architecture elements will affect how the all agencies will leverage C4ISR in the region







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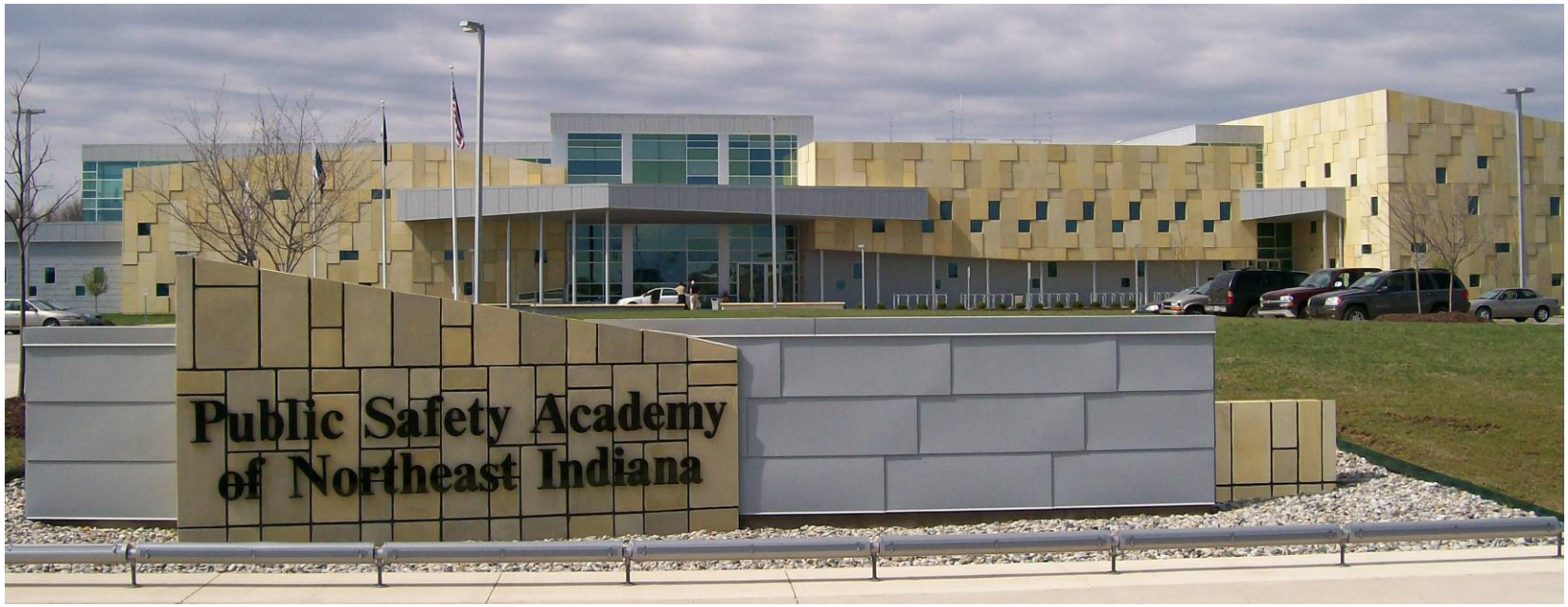
First DoD Technology Outreach Center

- Sponsored by 1401 Technology Transfer Program (OASD Homeland Defense and America's Security Affairs)
- Managed by SSC Pacific
- Hosted by the Public Safety Academy of Northeast Indiana (Ft Wayne)
- Within 250 miles of 17% of US population



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Outreach Center National Outlook

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1401 Product Showcase

- Unmanned Vehicles
- Night vision devices
- Hand-held language translators
- Advanced first aid dressings
- Personal chemical detectors
- Personal decontamination kits

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Unmanned Systems Branch

- 25 years in unmanned ground vehicles
- OSD Joint Ground Robotics Enterprise (JGRE)-designated *Center of Excellence for Small Robots*
- Over 20 active robotics R&D projects
- Infrastructure for UGV, UAV, USV, UUV RDT&E
- Funding from:
  - OSD JGRE, RS-JPO, NAVSEA, PM-FPS, FCS, MANSCEN, CECOM NVESD, ARL, DARPA, DTRA, ONR, NSWG, SOCOM, and others

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Technology Development For Air, Land, and Sea

Unmanned Aerial Vehicles

UGV/UAV Collaborative Behaviors

Unmanned Ground Vehicles

Miniature sensors for man-portable systems

Unmanned Surface Vehicles

Autonomous Navigation

Unattended Sensors

Distributive vision sensors for automated surveillance

Unattended Munitions

Remote response for security operations

Mobile Detection Assessment Response System (MDARS)

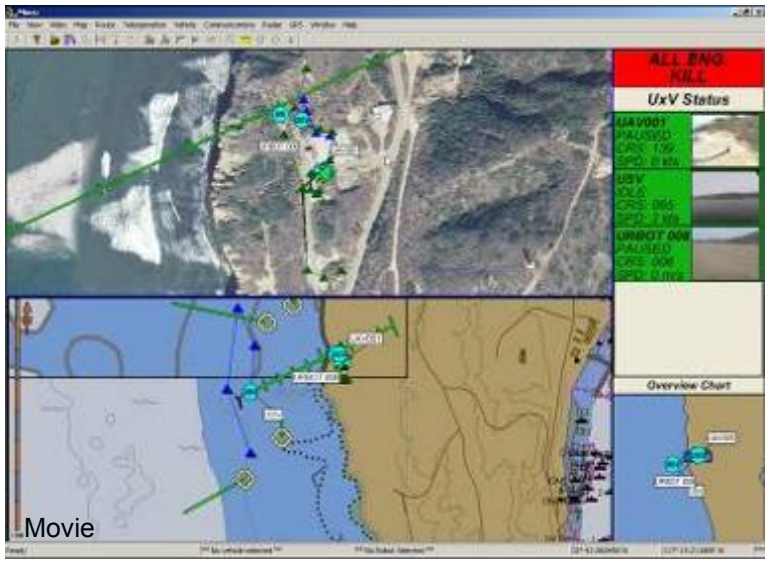
Operational Relevance

- Robotic platforms, under supervised autonomy, patrol DoD storage sites and air bases, along pre-programmed paths using differential GPS.
- Obstacle Avoidance via multi-layer sensor fusion of laser, stereo vision cameras, and radar.
- Robots detect and assess potential intruders, monitor inventory, and check the status of Interior Locking Devices on munitions storage bunkers.
- Multiple Resource Host Architecture (MRHA) allows C^2 for multiple robots

Accomplishments & Milestones

- Army PM-FPS selected SPAWAR as Technical Director in 1993.
- BAA contract for platform development awarded in 1993.
- BAA Final Demonstration successfully conducted in October 1998.
- Passed Technical Feasibility Testing (TFT) in May 2000.
- SDD contract awarded in 2001.
- Early User Appraisal (EUA) at Hawthorne Army Depot in 2004 – 2005.
- Passed Milestone C in December 2006.
- Currently leading the MDARS Modernization Effort—incorporating user-requested capabilities: detection on the move, weaponization, ICIDS, etc.

Multi-Robot Operator Control Unit (MOCU)

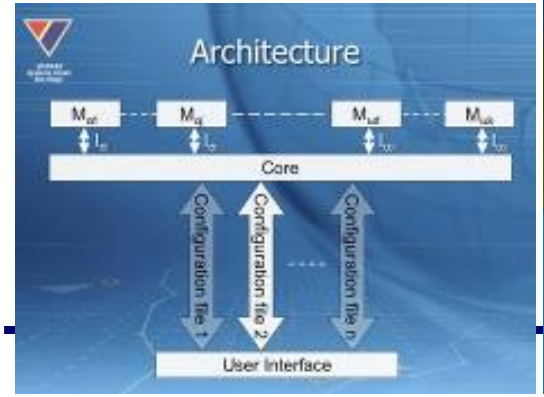


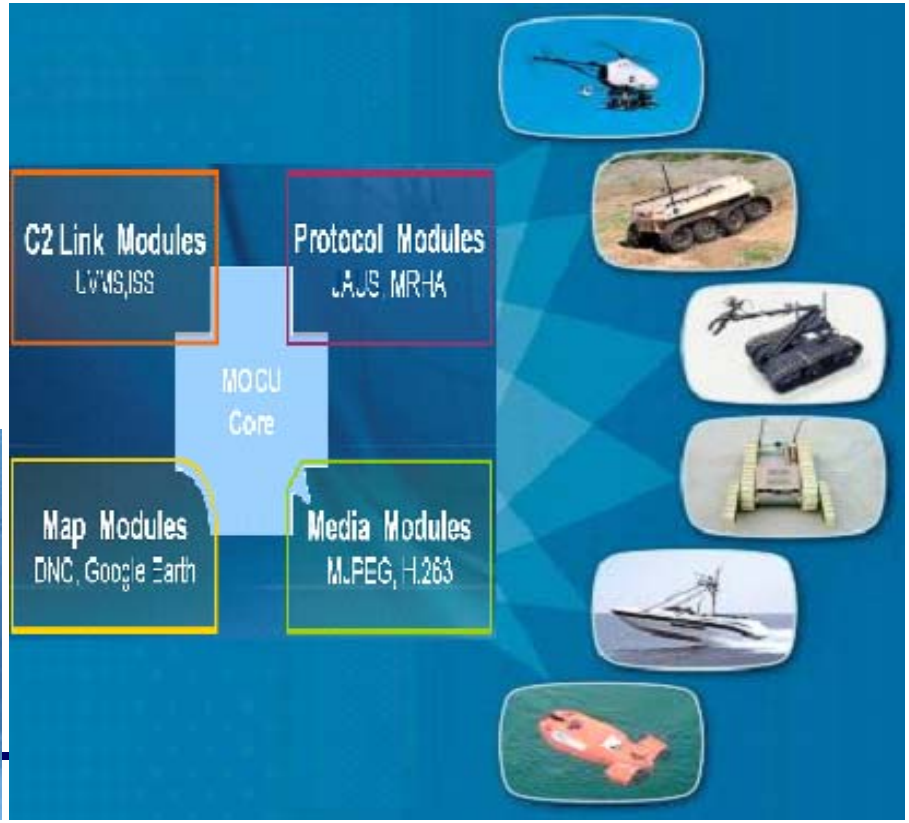
The Common OCU for:

- Littoral Combat Ship USV programs (ASW and MIW)
- Army's MDARS program
- Joint EOD AEODRS program
- R3V and Spartan ACTDs
- Wide variety of other government, industry and academic organizations

Characteristics

- Control multiple sets of heterogeneous vehicles
- Vehicle and protocol type independent
- Modularity
- Scalability
- Flexible User interface





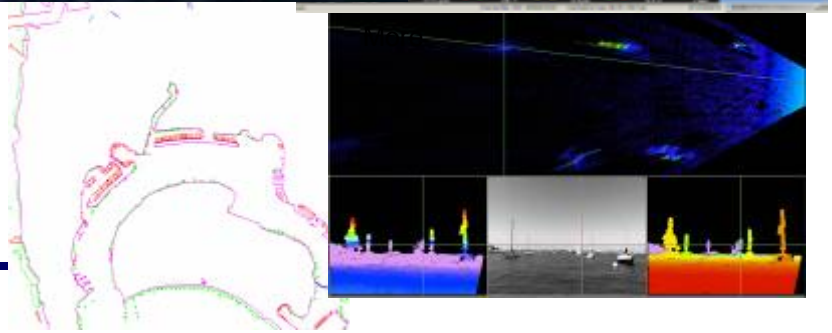
Unmanned Surface Vehicle

Operational Relevance

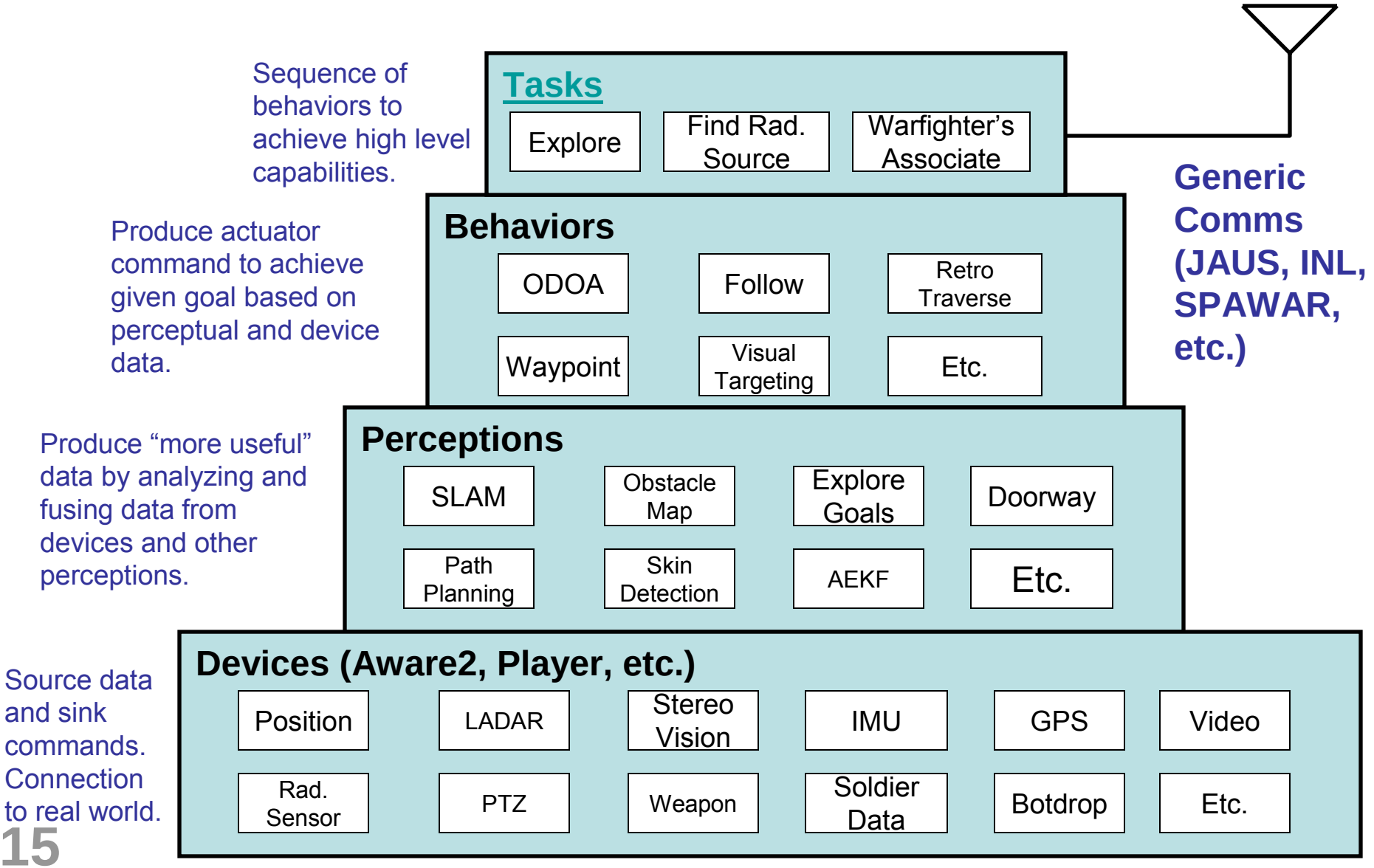
- Used to remove the warfighter from dangerous environments and for force multiplication.
- Intended for Tactical and Force Protection:
  - Special Warfare force projection and reconnaissance
  - MCM: detection, inspection, classification and possible neutralization
  - Port and harbor surveillance and security
  - Marine Hydrographic Surveying
  - Environmental/chemical Sensing

Accomplishments

- Ported UGV hardware/software for teleoperation and waypoint navigation.
- Developed obstacle avoidance capability for fully autonomous navigation
  - Deliberative path planning
  - Reactive obstacle avoidance (following Rules of the Road)
- Develop and integrate sensor technologies to support autonomous operation
  - Digital ARPA Radar
  - Vision (stereo and monocular)



Autonomous Capabilities Suite



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Maritime Autonomous Robotics Cluster Initiative

- Regional industry clusters offer an effective tool for stimulating growth of regional economies at a critical stage in the recovery of the United States economy
- Maritime Autonomous Robotics Cluster Initiative began in Hawaii with a focus on maritime applications
  - Mission areas include underwater UXO, harbor security, and Persistent ISR
  - Barbers Point (BRAC site) selected as campus for academia, industry, government collaboration
  - Regional cooperation and outreach with Hawaii Technology Development Venture, Center for Excellence in Research in Ocean Sciences and AUVSI
  - Builds on the success of the Mentor Protégé Robotics Initiative and offers partnership with the SBA and other Federal Agencies
- Model emerging for application to other regions of the United States

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Building a Collaborative Technology Cluster: Hawaii Maritime Autonomous Robotics Initiative

Small, low cost UGS

ATFP UGV

Agile Operator Interface

Hardened Displays

Mission Planning

UxS Architecture

Light Mfg

Rapid Prototyping

Brain Based Devices

Tech Outreach Center

Integrated UV
Health Management

Position Location

Precision
Manipulation

LAWS

Integrated
Manned/Unmanned
C2

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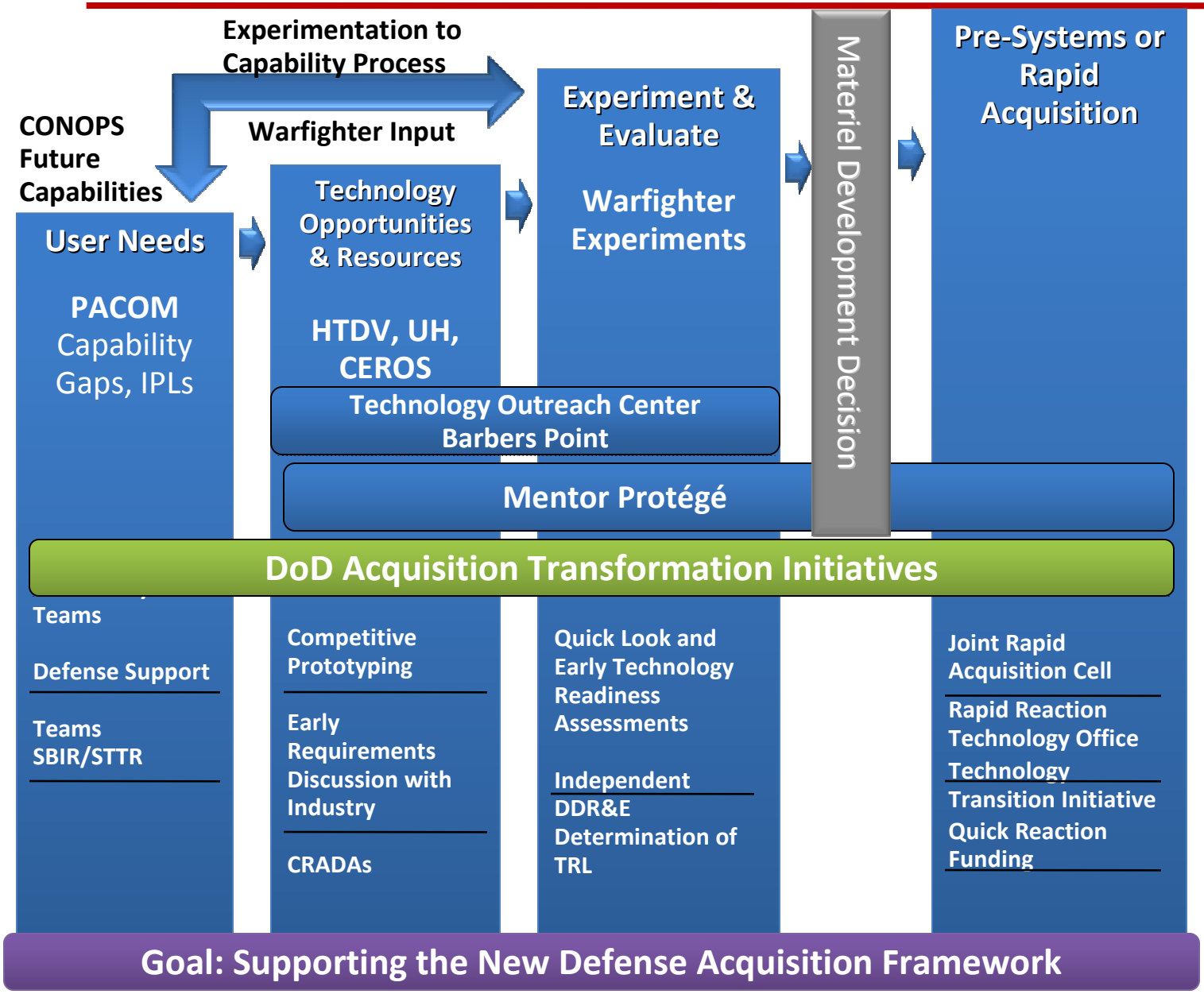
Building a Collaborative Technology Cluster: Hawaii Maritime Autonomous Robotics Initiative



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Underwater Unexploded Ordnance (UUXO)

- Underwater Munitions have created significant environmental and social issues in Hawaii and other locations
  - Currently forty-nine Hawaii Formerly Used Defense Sites identified under the Military Munitions Response Program (MMRP)
  - Systematic surveys of underwater munitions sites have not been conducted generally because of technology and cost limitations
- Capability Areas
  - Wide area survey
  - Detailed Survey, Monitoring
  - Response Alternatives

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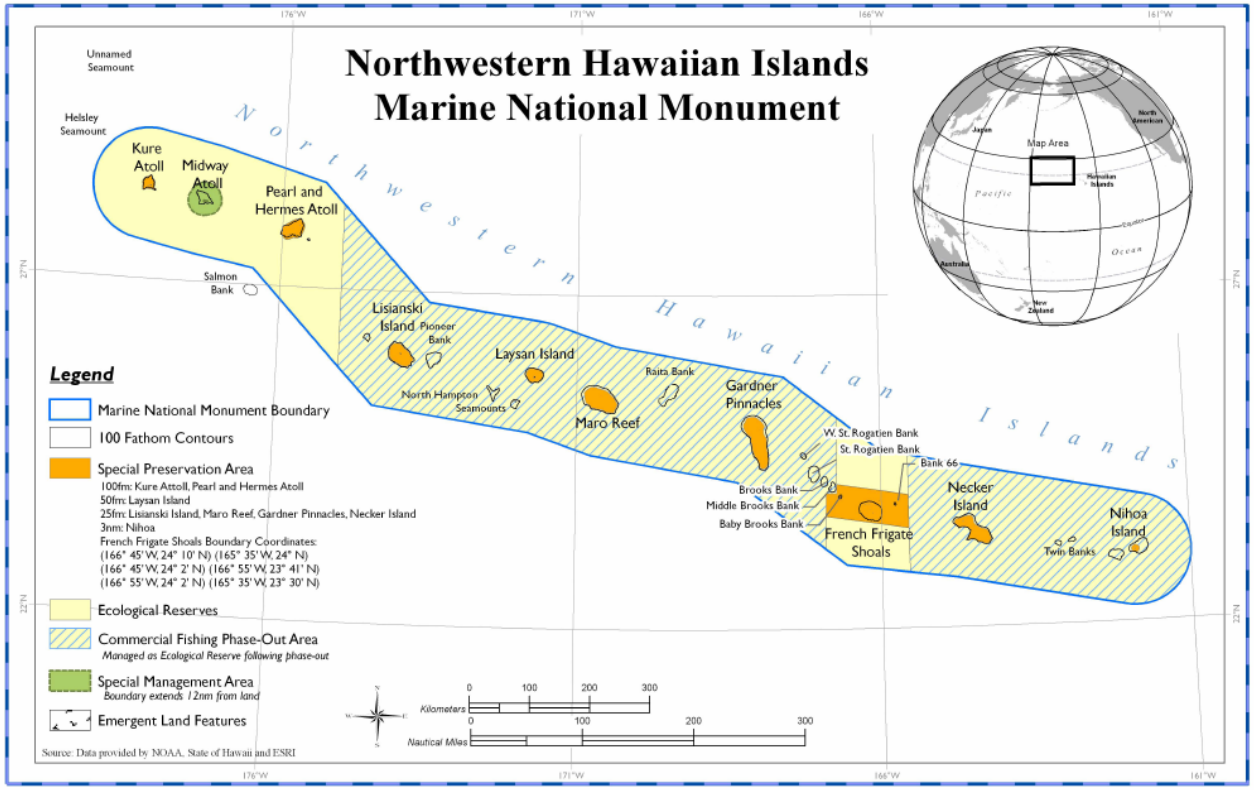
Antiterrorism/Force Protection (ATFP)

- Capability Areas
  - Monitoring/Protection/Deterrence
    - Ports
    - Oil terminals
    - Pipeline
    - Other maritime areas
  - Disaster Response

Unmanned and remote systems can act as force multipliers, cost savers

Environmental Monitoring And Protection (NOAA)

- Papahānaumokuākea Marine National Monument
- Managed by DoI US Fish and Wildlife Service and DoC National Oceanic and Atmospheric Administration



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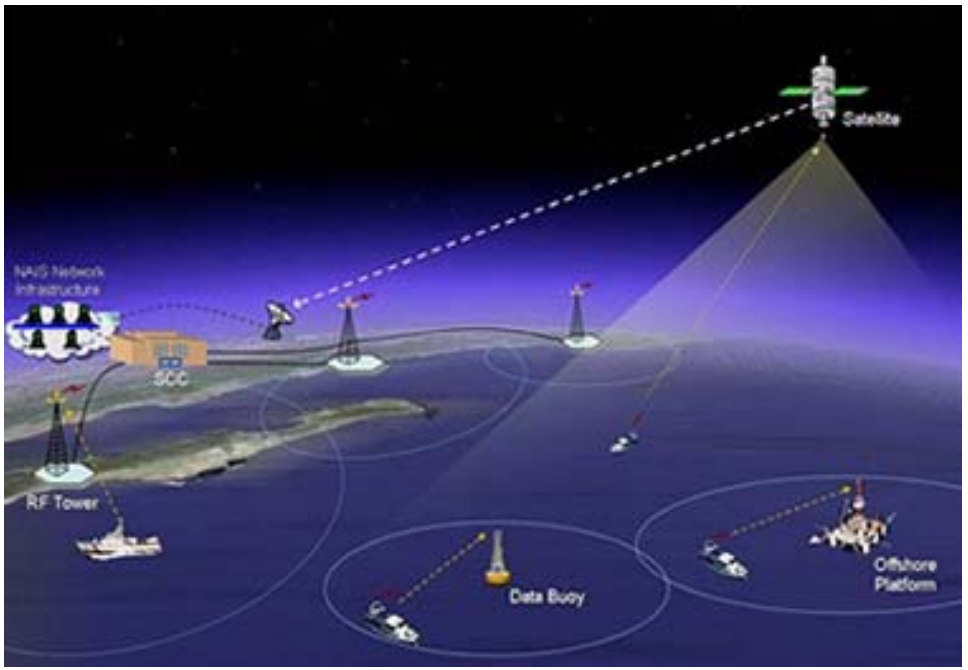
Maritime Domain Awareness (MDA)

- Capability Areas
  - Persistent ISR
    - Intelligence
    - Surveillance
    - Reconnaissance
  - Tracking
  - Interdiction
  - Ship Hull Inspection



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October UUXO Demonstration
Kaneohe Bay, HI

- Bring stakeholders for Maritime Cluster Initiative together
- Discuss overlapping capabilities
- Demonstrate the utility of collaboration
- Identify common standards and architecture
- Plot path ahead for collaboration

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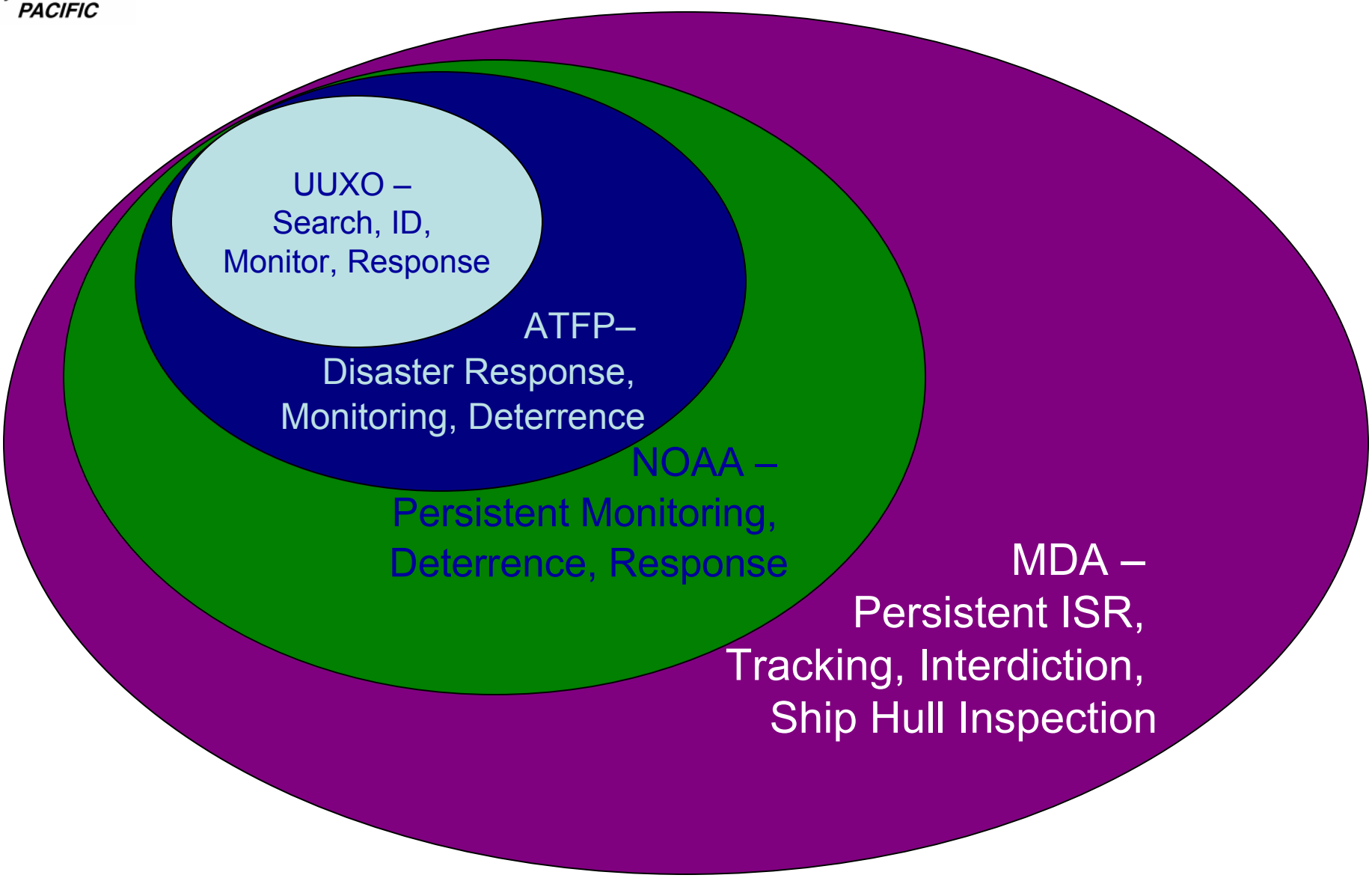
Stakeholder Mission Areas



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Robotics Initiative: Critical Technologies

- Sensor Processing
  - Automated detection, classification, identification
  - Self Diagnosis
- Data Fusion
  - Mission level COP
  - 4D Visualization
- Sensing Technologies
- Net-Centric Architecture
  - Service Oriented Architecture
  - Data Management
  - Scalable
- Alternative Energy Sources
- Autonomous and Collaborative Systems
  - Dynamic reconfiguration
    - Mid mission
    - Between missions
  - Environmental response
  - Mission level control
  - Self diagnosis
- Secure Wireless Networks
- Modularity
- Open Standards
- Autonomous Launch, Recovery, Maintenance

For Additional Information

General Info

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Autonomous Robotics Cluster Initiatives

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