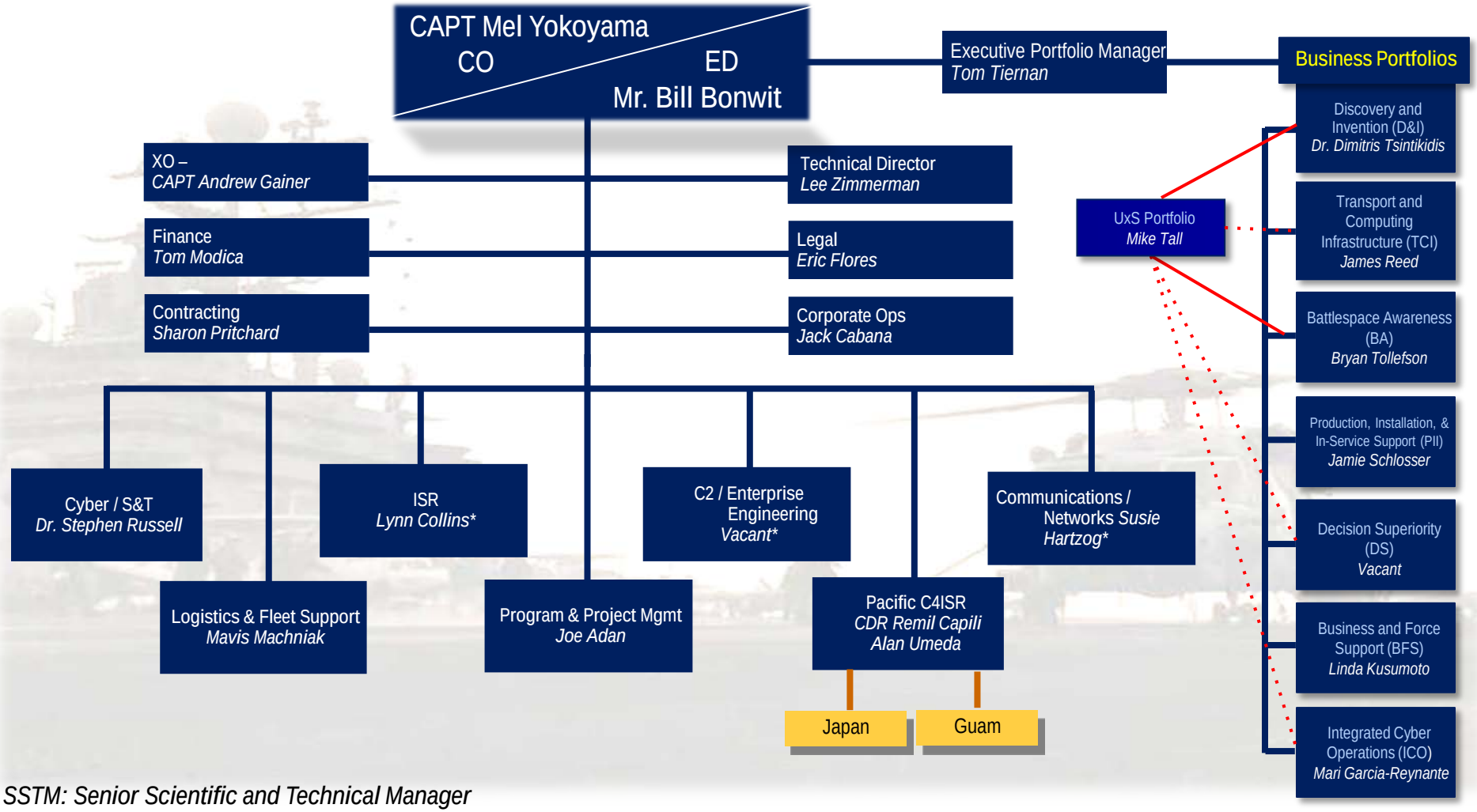
SPAWAR
Systems Center
PACIFIC

SSC Pacific
C4ISR for Unmanned Systems

Mike Tall
UxS Capability Portfolio Manager
OCT 2017

SSC Pacific: Organization (as of 1 Oct 17)

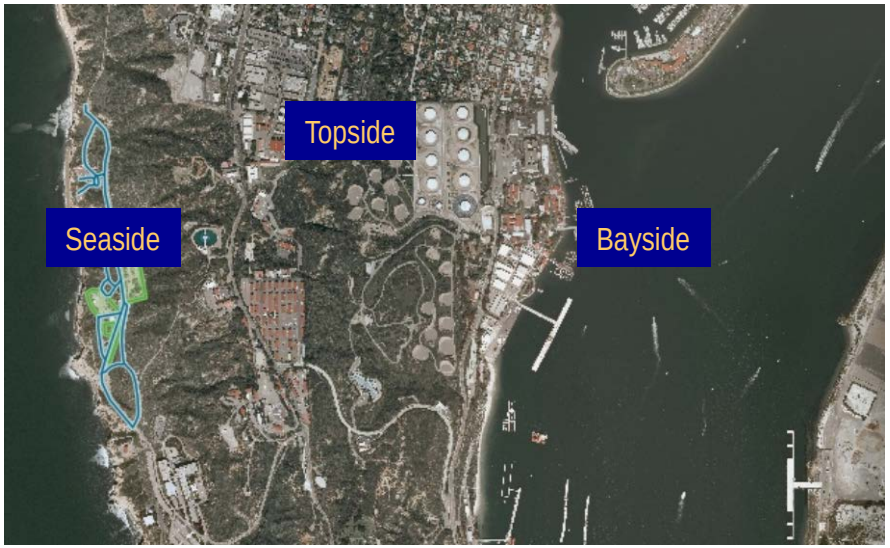


** SSTM: Senior Scientific and Technical Manager*

SSC Pacific UxS History

Unmanned Systems at SSC Pacific

- UxS C4ISR for all 4 domains of
  - 40+ active robotic projects
    - Advanced Autonomy
    - Human Machine Teaming
    - Sensor Fusion
    - Communications
    - Payloads
    - Operational T&E
    - S&T Research
- Location allows us to leverage test ranges in all domains.
- Expert Personnel
  - 500+ government scientists and engineers
  - 50+ years in unmanned systems



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UxS Facilities

Navy Strategic Guidance – *Go FAST!*

"Fundamentally, the world has become dramatically more globalized, and this trend is accelerating."

"The pace at which potential competitors are moving demands that we, in turn, increase The speed at which we act. Our advantage is shrinking – **we must start today and we must improve faster**."

"We need a new, faster way to align, allocate and accelerate scientific discoveries to naval programs of record and deployment as new capabilities."

ALIGN – ALLOCATE - ACCELERATE

SPAWAR Strategic Objectives

- Accelerate and Streamline Delivery
- Drive Cyber Resiliency
- Optimize our Organization, Operations, and Workforce

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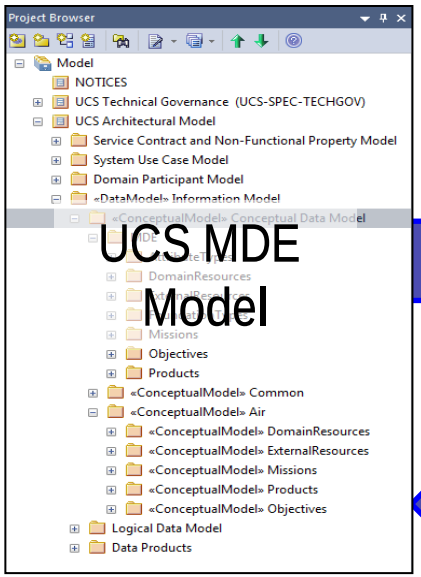
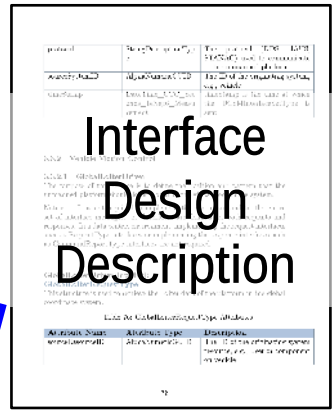
Inform Model through Experimentation

- Reference Implementation
  - Validates and informs the architecture through demonstration
- Tool Development
  - UCS-MDE model and Neya's UxSDK
  - Generate DDS IDL to generate source code for backbone
  - Generate LaTeX files to produce IDD



UCS MDE Model

neya SYSTEMS UxSDK™ for UCS



Interface Design Description

MOCU Software

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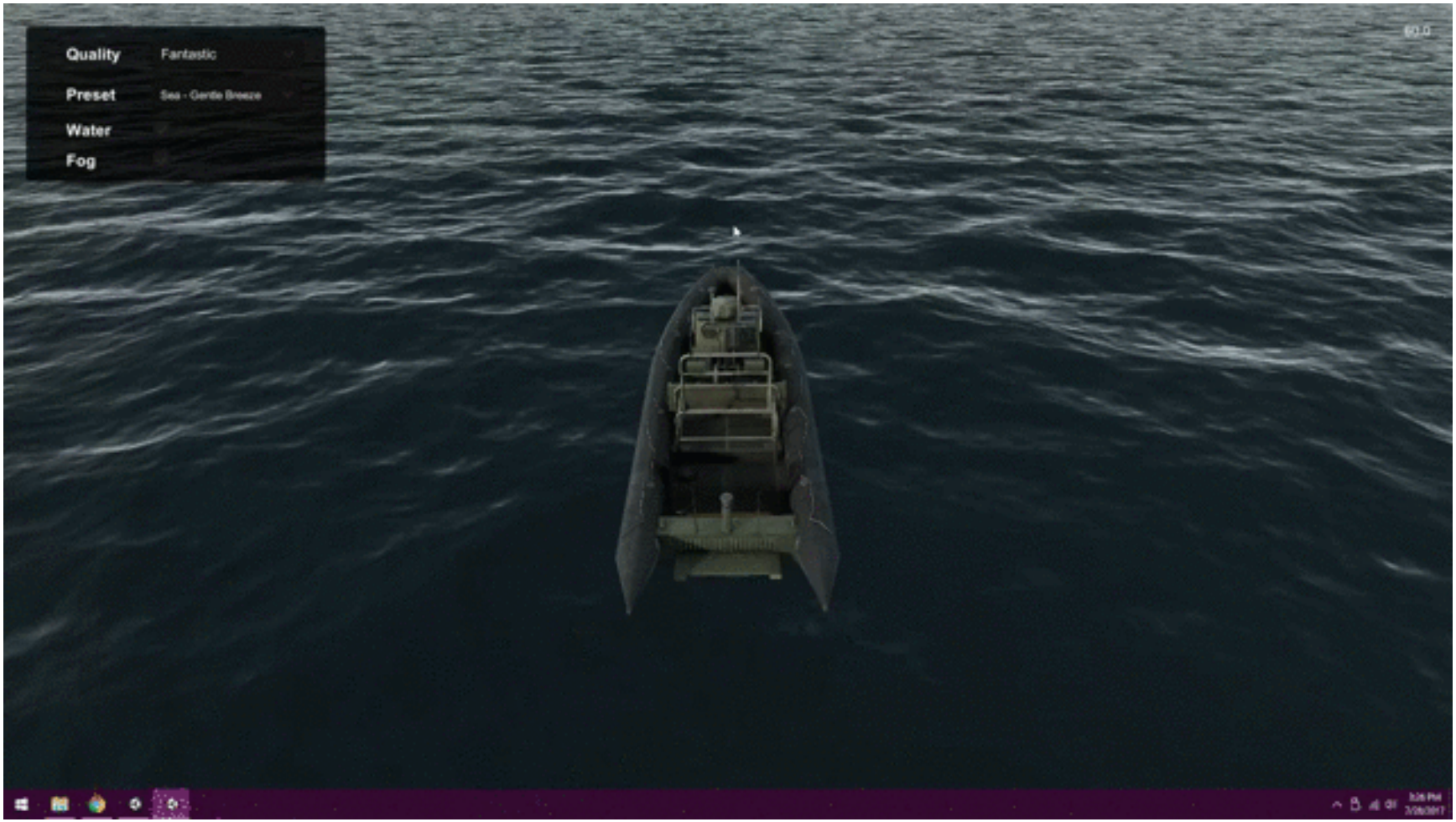
UxS Simulators



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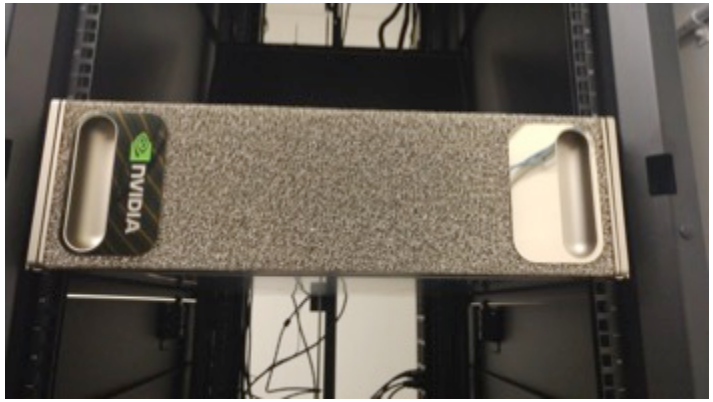
Sharing and processing data

- Networked Attached Storage Solution (NAS)
  - Facilitates the sharing of large amounts of data.
- NVIDIA DGX-1
  - Processing for large amounts of data



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UXS TECHNOLOGY

Software Defined Acoustic Modem

- Implement and test new and advanced ACOMMS algorithms
- Hardware and Software Patent
  - U.S. Navy Case No. 103087

Stationary ambient acoustic noise

- Allows the communicator to freely choose signal band to meet range requirements
- Does not permit intercept detection performance beyond that of in-band energy detection.
- Solves very near-range interceptor problem

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EgoMotion
Background – Motion Detection

Static Camera

Active Camera

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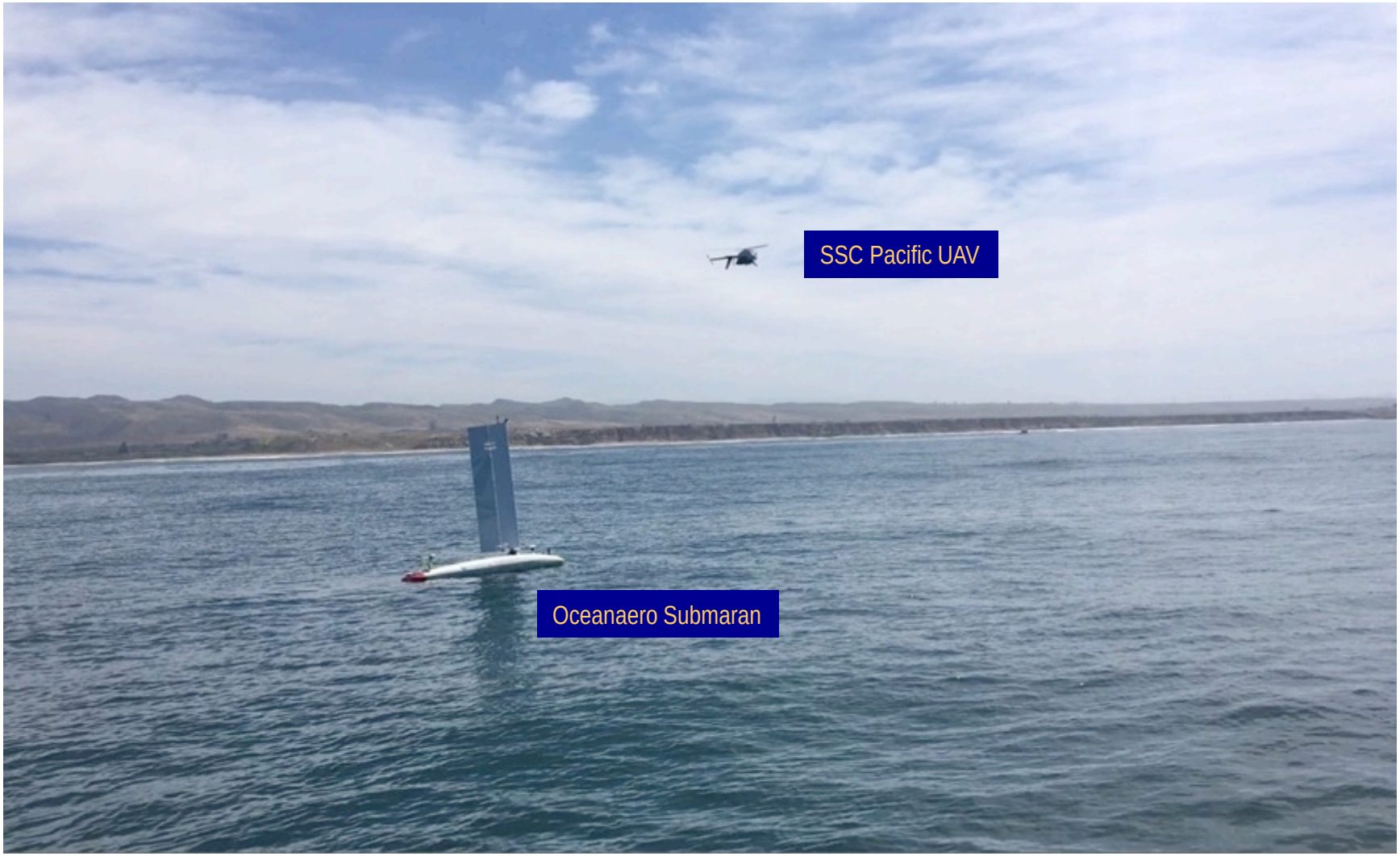
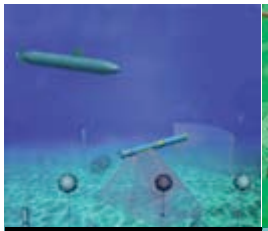
Industry teaming (S2ME2)

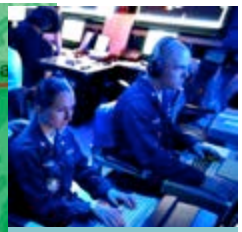


Human-Autonomy Teaming



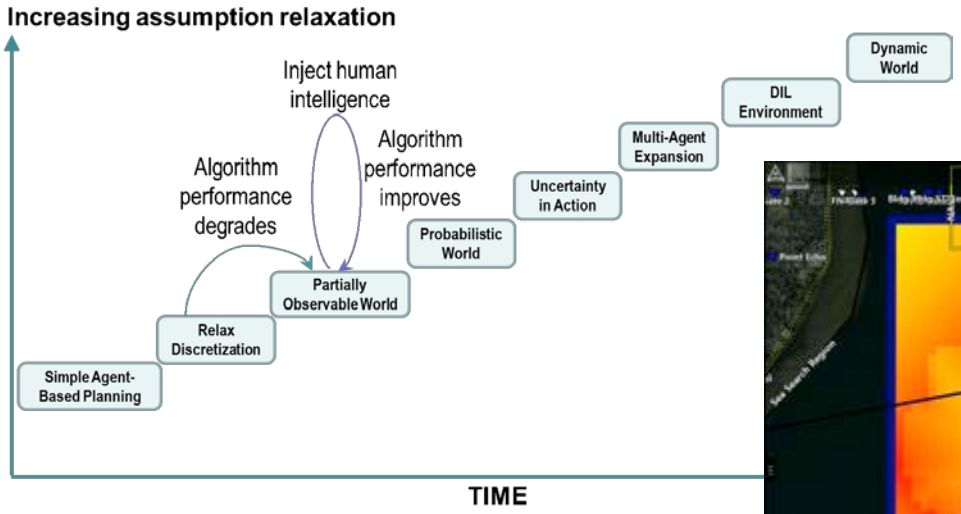
UUV Mine Detection

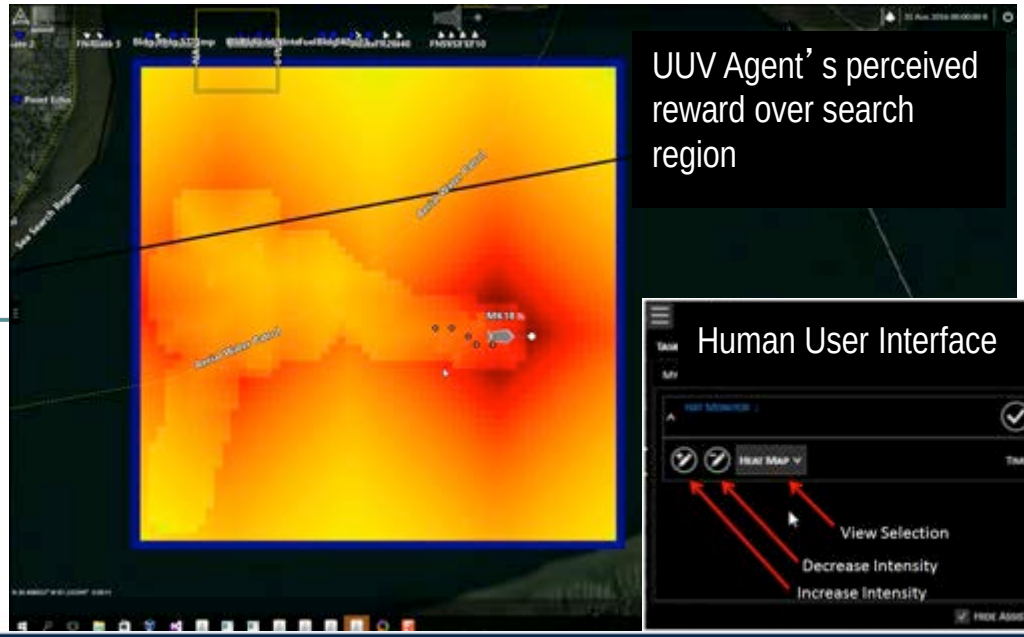
Littoral Interdiction



AI Planning Tools

- To team with an autonomous agent, a human must influence the agent's goal-based decision-making (planning) process
- Analyze and evaluate state of the art planning algorithms, modeling methods as applied to naval-relevant scenarios
- Relax an assumption and reevaluate algorithms
- Improve algorithm performance by incorporating human intelligence into the planning algorithm





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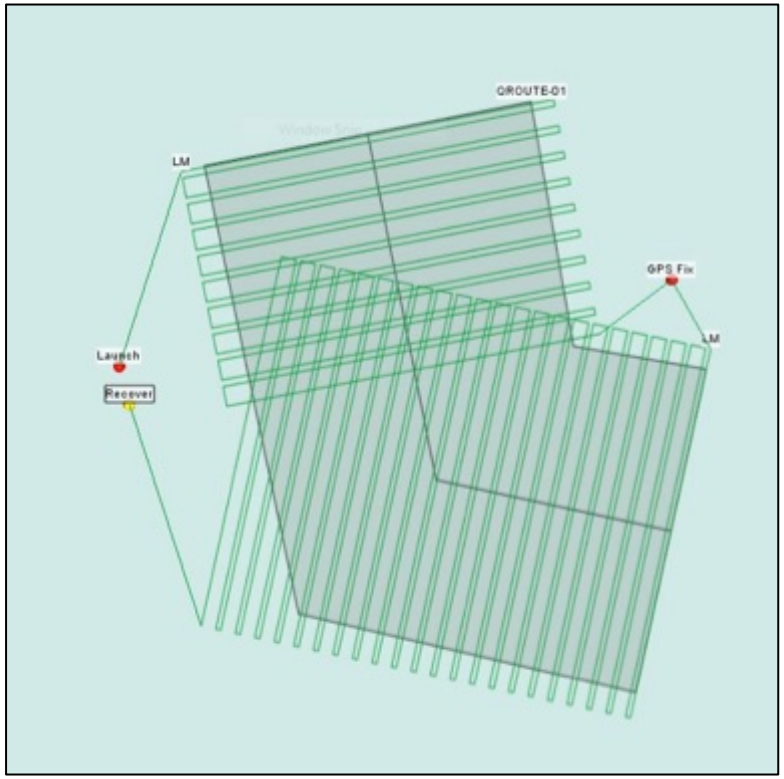
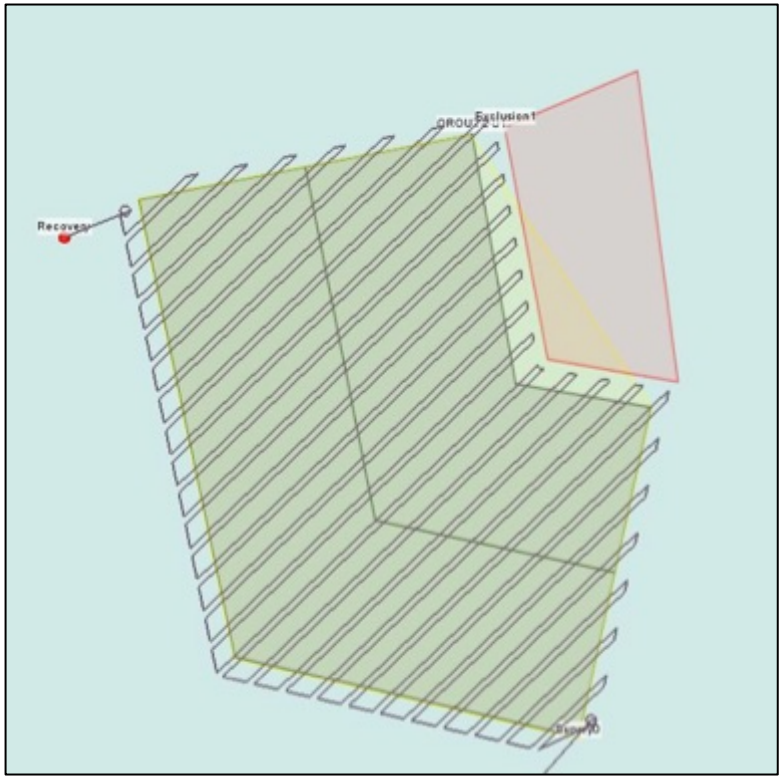
MK18 UUV Autonomy

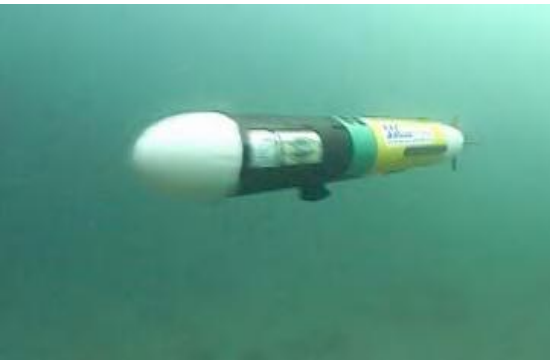
Previous VIP/COIN .RMF Planning



Neptune Mission Planning



Summary



- Expertise to Develop, Integrate, Test, and Evaluate Unmanned Systems technologies from Basic Research to Operations.
- Currently implementing common themes from UxS Roadmaps and 3rd offset strategy.
  - Basic and applied research with Machine Learning & Human Machine Teaming
  - Contested environment work with advanced algorithms, payloads, and perception.
  - Cross domain C4 + Cyber ISR UxS work

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We make Unmanned Vehicles smarter

Questions?