

UUV Core Technologies

Autonomy

Presented to:

The Patuxent Partnership

Unmanned Systems in Every Domain: Challenges and Opportunities for
Industry: Is Autonomy the New Cyber?

Strategic Navy/Marine Autonomous Capabilities

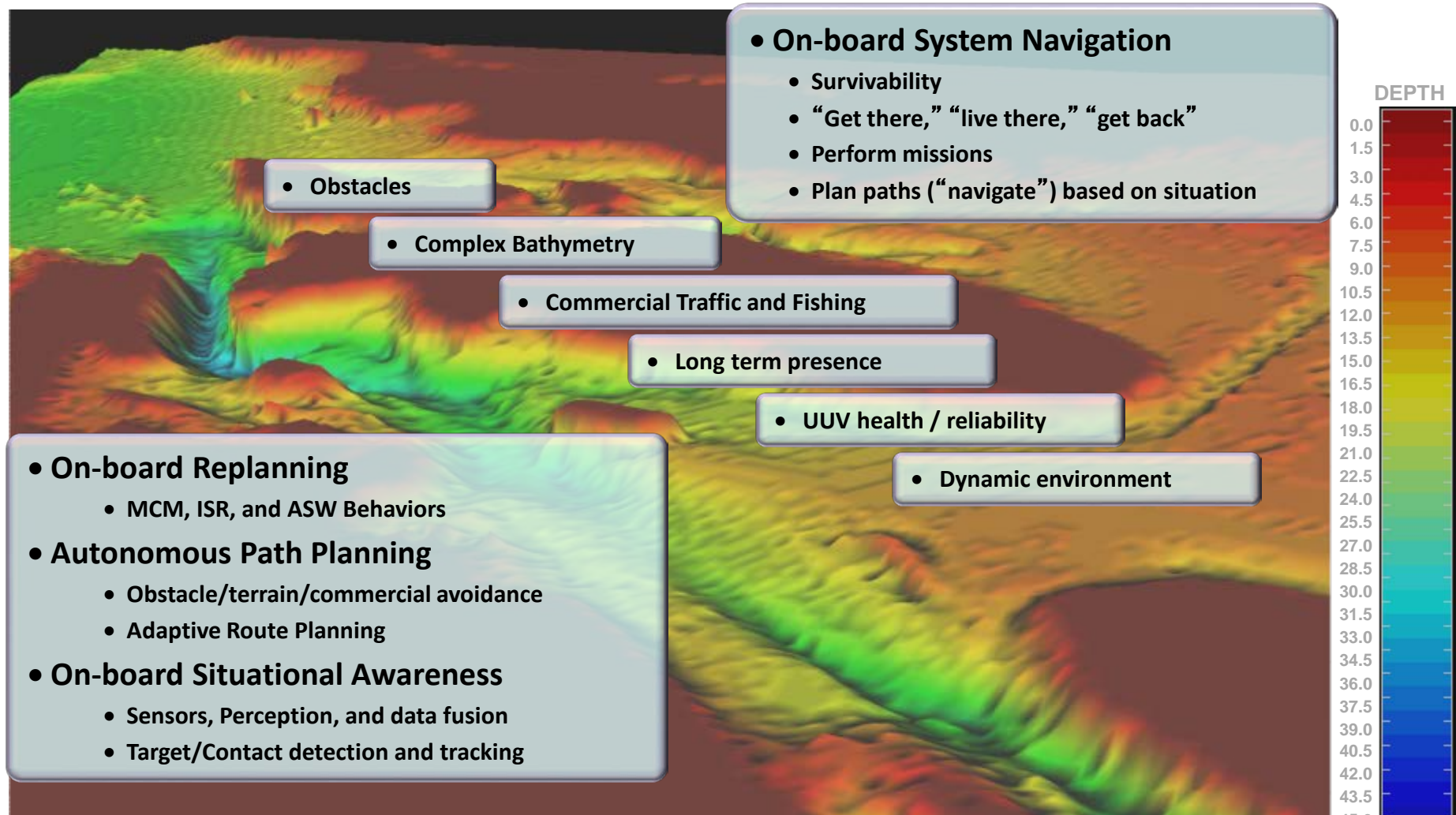
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20 March 2018. Other requests shall be referred to NUWCDIVNPT Code 85 or higher DoD Authority.

The UUV Autonomy Challenge



Difficult environment, hard problem to solve.

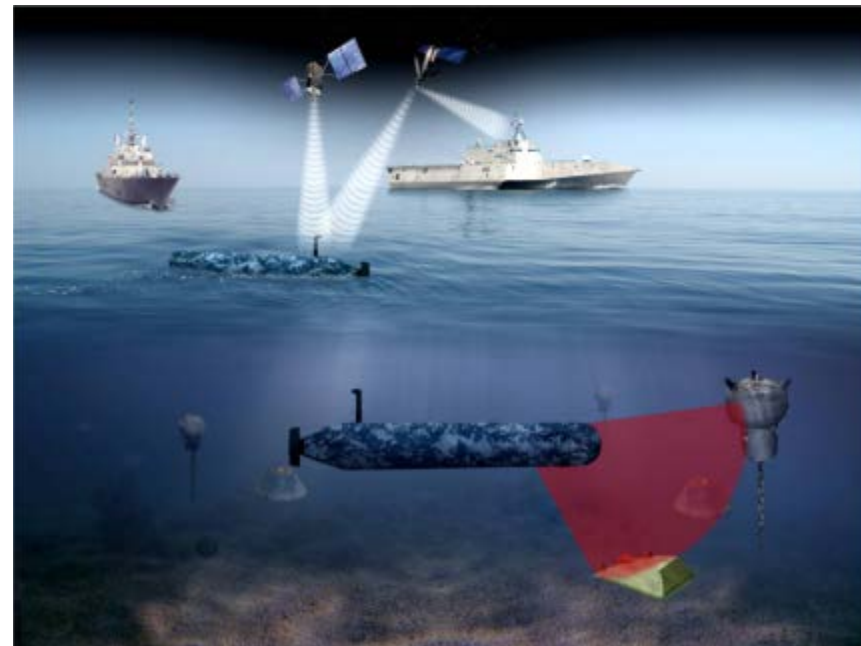
Autonomy – Today

- Limited “autonomy” in current COTS unmanned systems
 - GPS/Doppler-aided Inertial navigation or Transponder Navigation
 - Limited if any Obstacle Avoidance
 - Single sensor down looking Terrain following (from Doppler Velocity Log)
 - Vendor owned Software

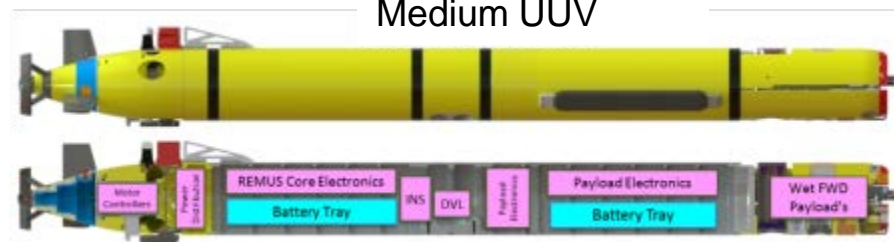
- Vehicle actions are well understood and planned prior to mission
 - Tell the vehicle exactly what to do (i.e. if this happens, do this)
 - No automated mission re-planning to account for new information on the environment, sensor performance, or component/system failure

- Vehicle level mission planning

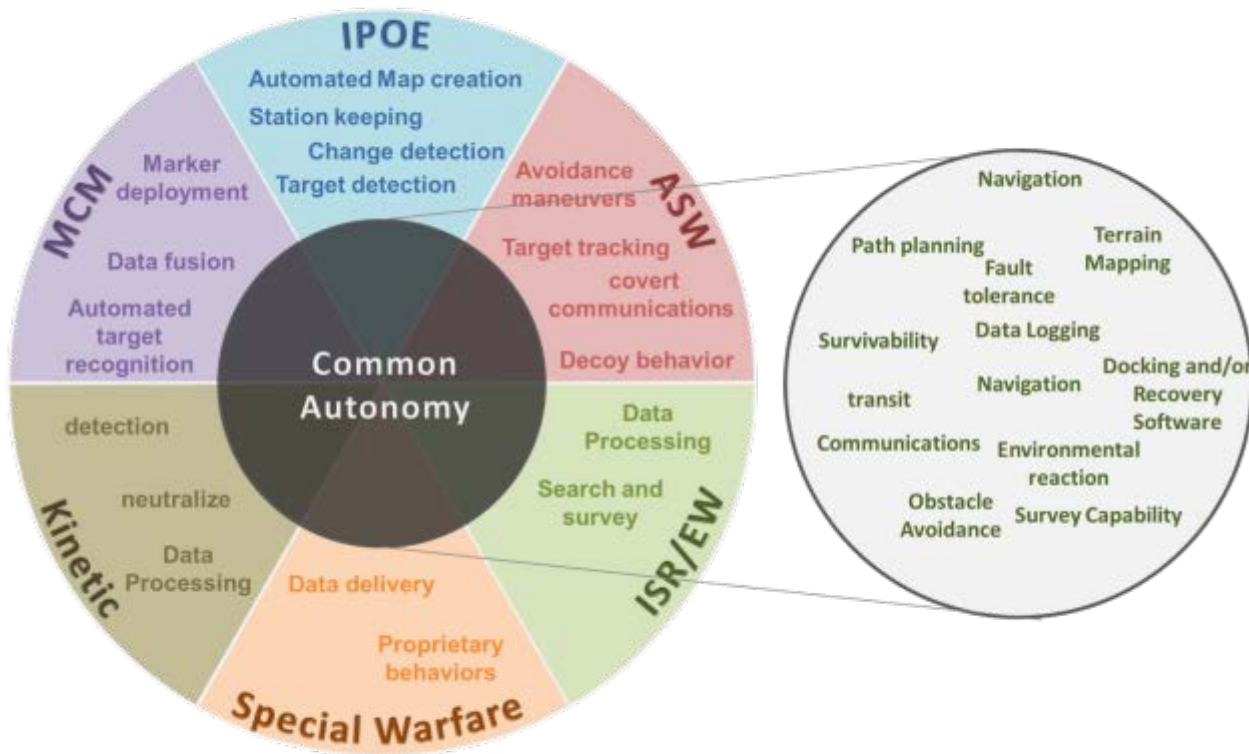
- Mission abort if something goes wrong



Medium UUV



UUV Autonomy



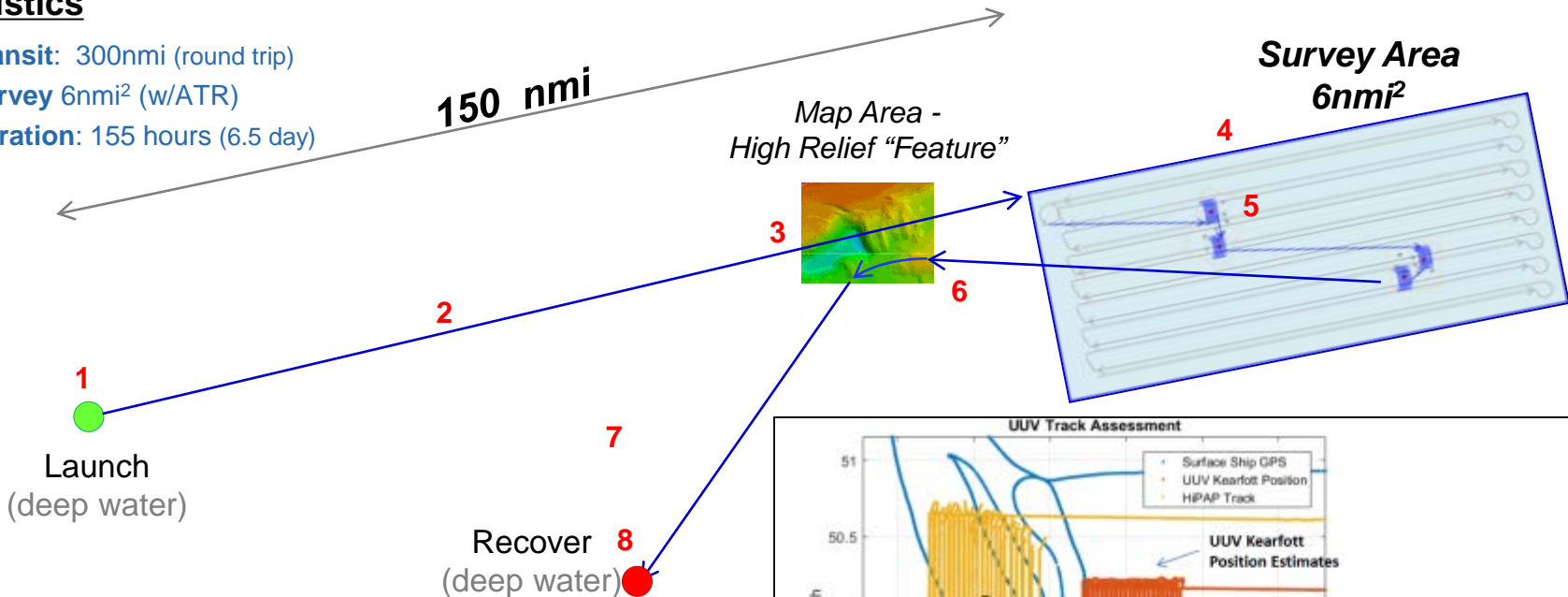
Goal Architecture

- Core Autonomy Software Re-use
- Supports any Mission, Vehicle, Sensor Software “Cross-decking”
- Goal driven
- 3rd party application development
- Standard interfaces
- Government owned Common Open Architecture across platforms

Proving Capability/Reliability

Statistics

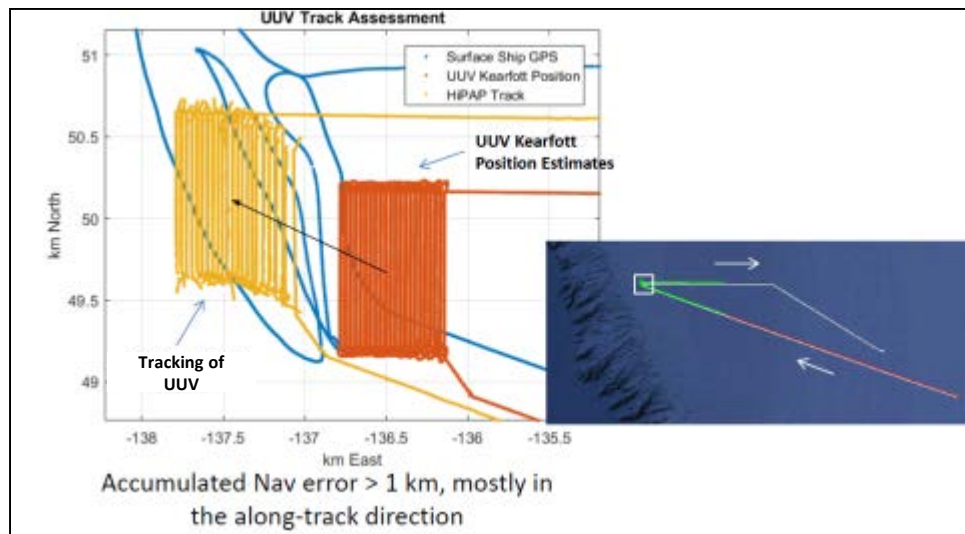
- **Transit:** 300nmi (round trip)
- **Survey** 6nmi² (w/ATR)
- **Duration:** 155 hours (6.5 day)



Not to scale

Advances in Navigation

1. Utilizing external sensors for aiding
2. Map based navigation resets
3. Using non traditional sensors to derive navigation information
4. Overhead imagery used to navigate.
5. Navigation fusion engine



Build system level trust to "Get there, perform the mission, get back"

Focus on Our Efforts on Autonomy

- Definition
- Interface Standards
- Education
- Research
- Best of Breed Awareness (APB Like?)
- Build Trust