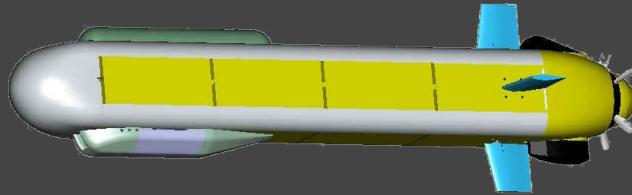


An Investigation into Trust and Reputation frameworks for AUV applications.

Andrew Bolster, QUB
Presented to Digi-Comms Cluster Meeting
25/11/2011





Autonomous Underwater Vehicles

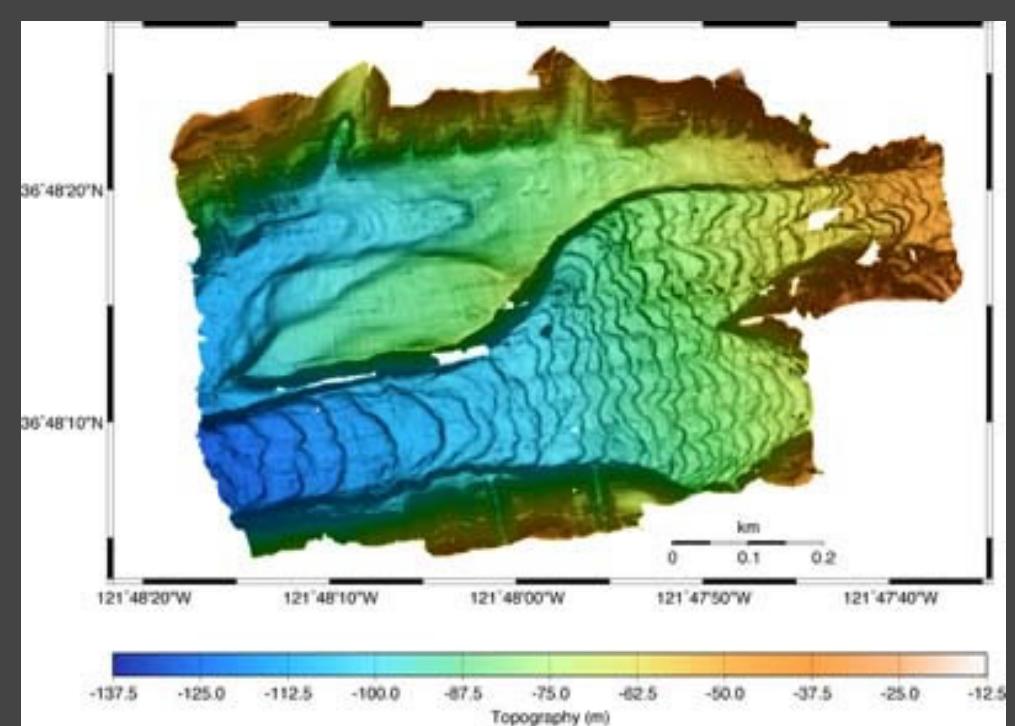
AUVs





Example UAV Operations

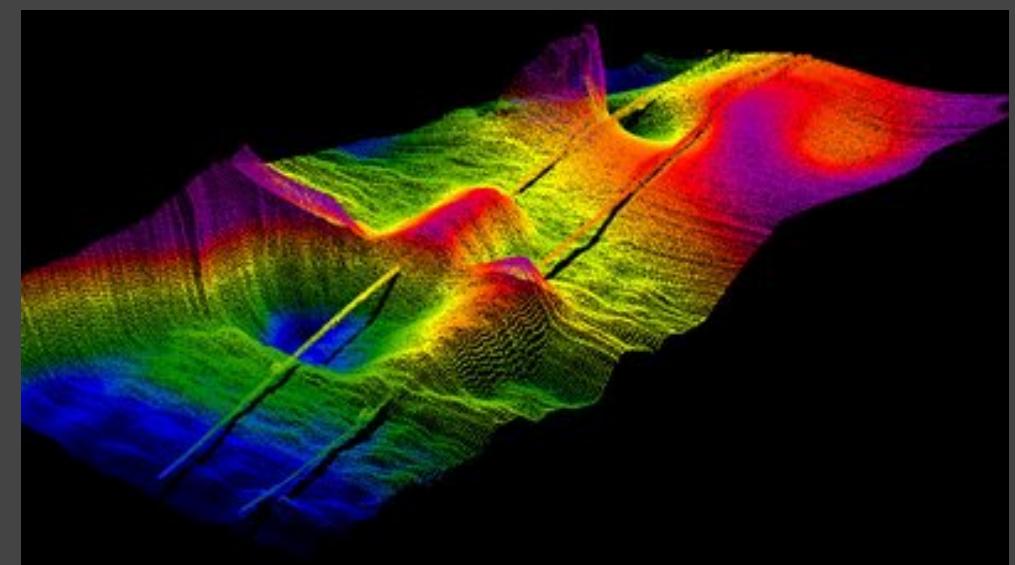
- Swarming Behaviours
- Human-Guided Fleets
- Inter-dependant Task-Operation



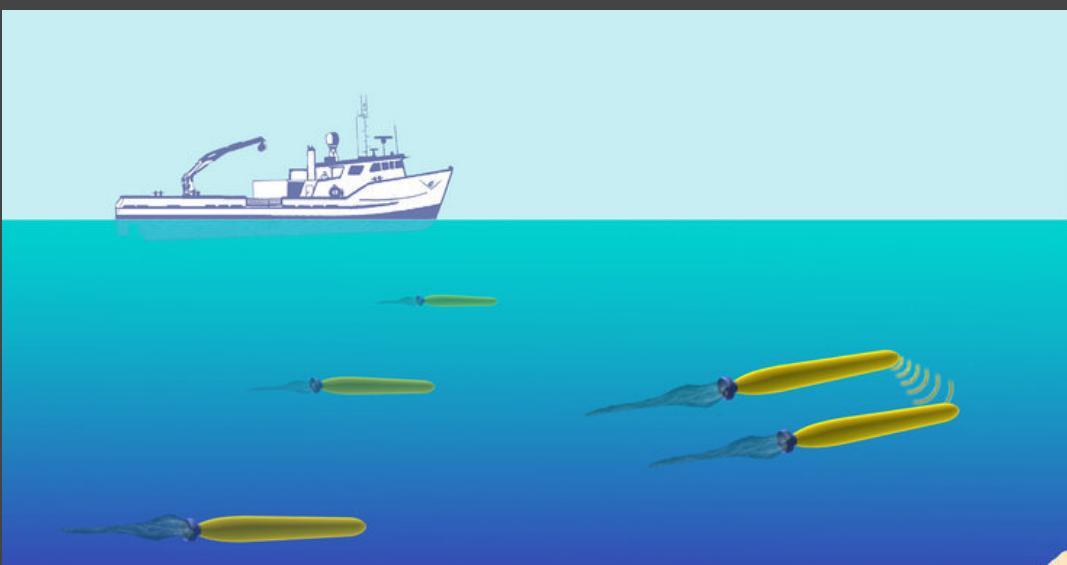
Hydrographic survey of Monterey Canyon in CA generated from AUV data



Saab AUV62-MR uploading mine reconnaissance data to 'mothership'



Collaboratively generated multibeam survey of two North Sea Oil pipelines (Ormen Lange)



Example fleet with friendly surface uplink vessel



The Research So Far

Individuals

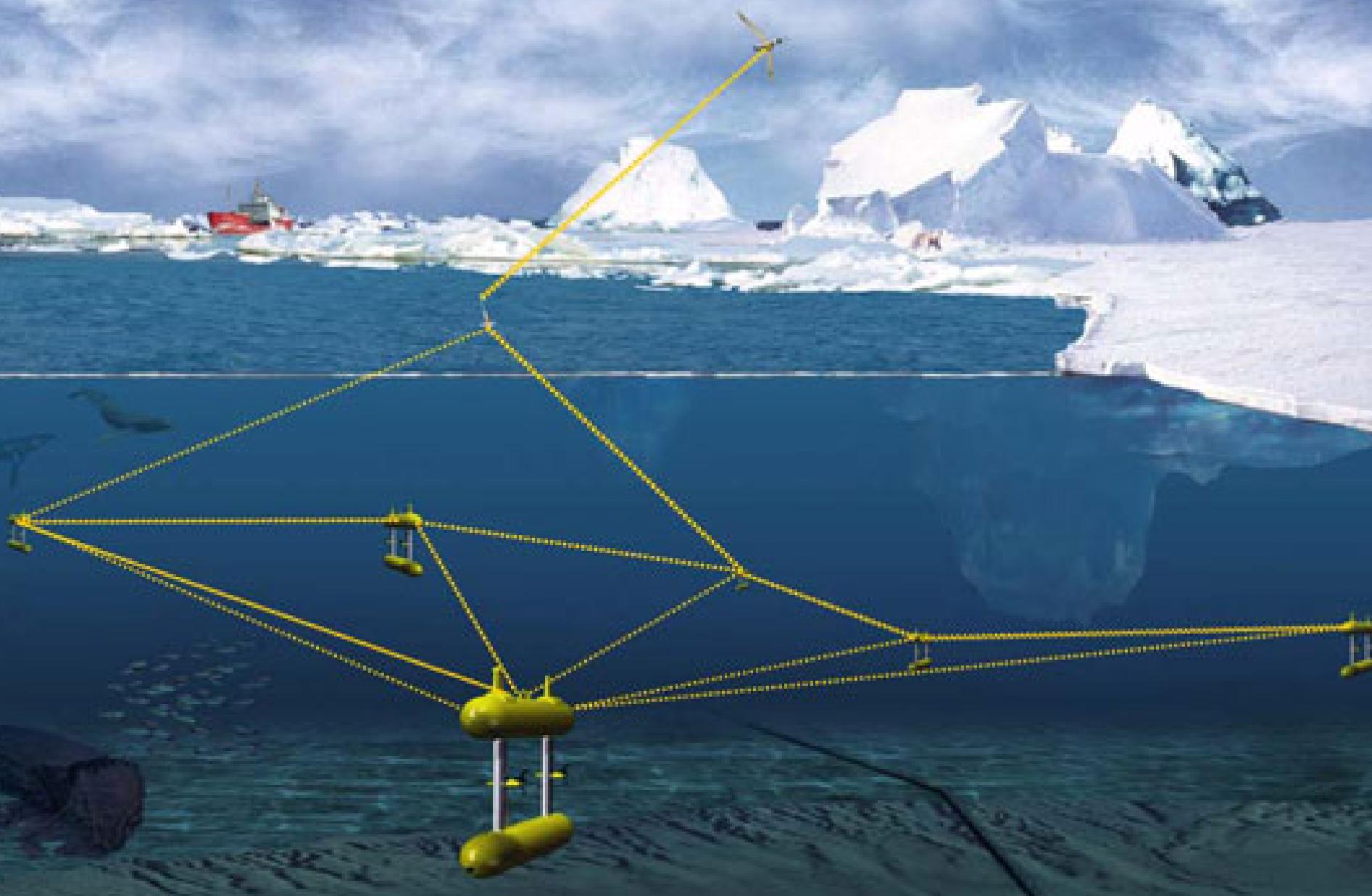
Pre-programmed teams

Reach-back comms

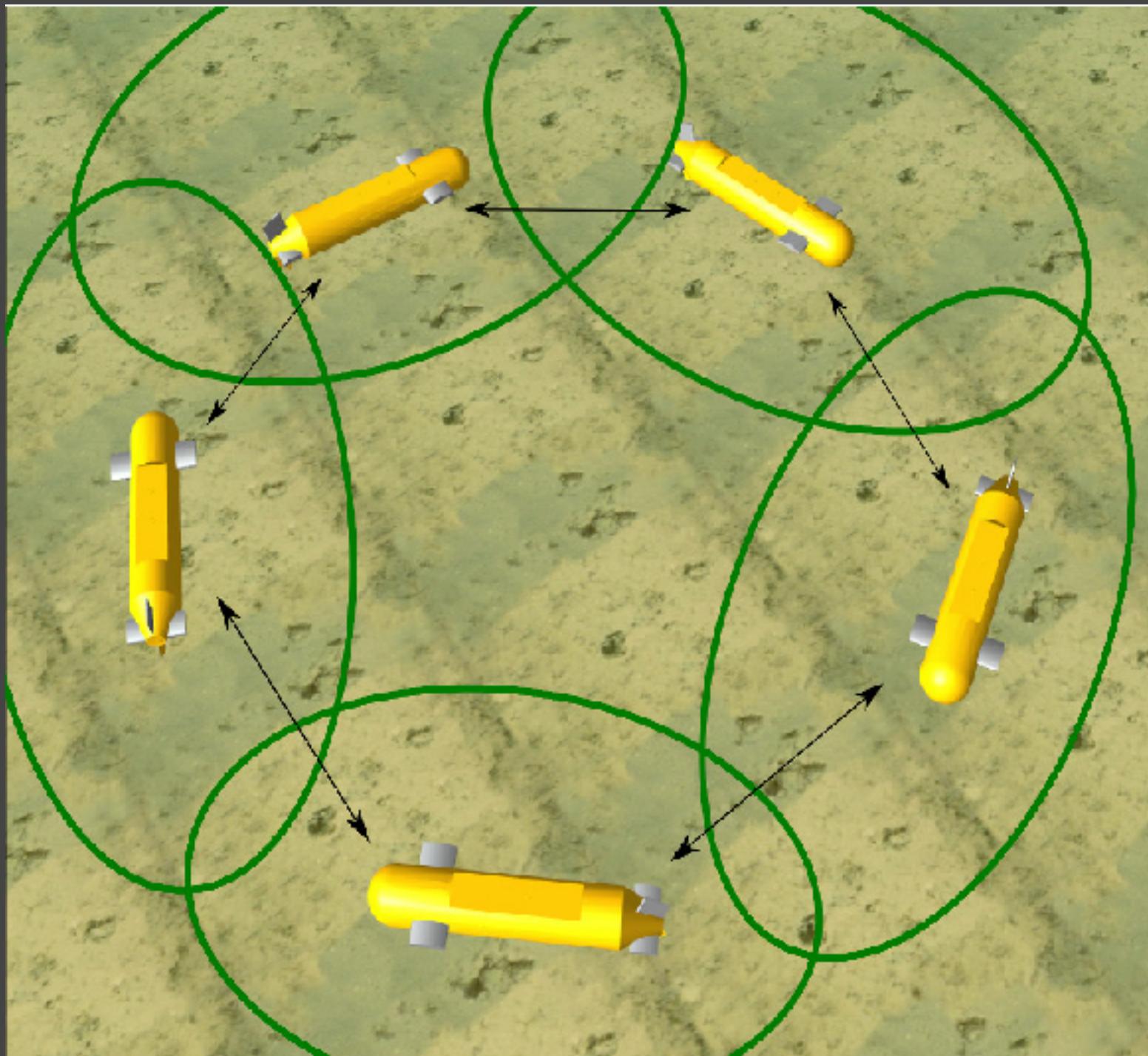
Single 'master' entity

Trust and Reputation

Within the Marine Communications
Space



Courtesy General Dynamics Canada Ltd.



Multiple Physical Layers of Communication

- Optical

Multiple Physical Layers of Communication

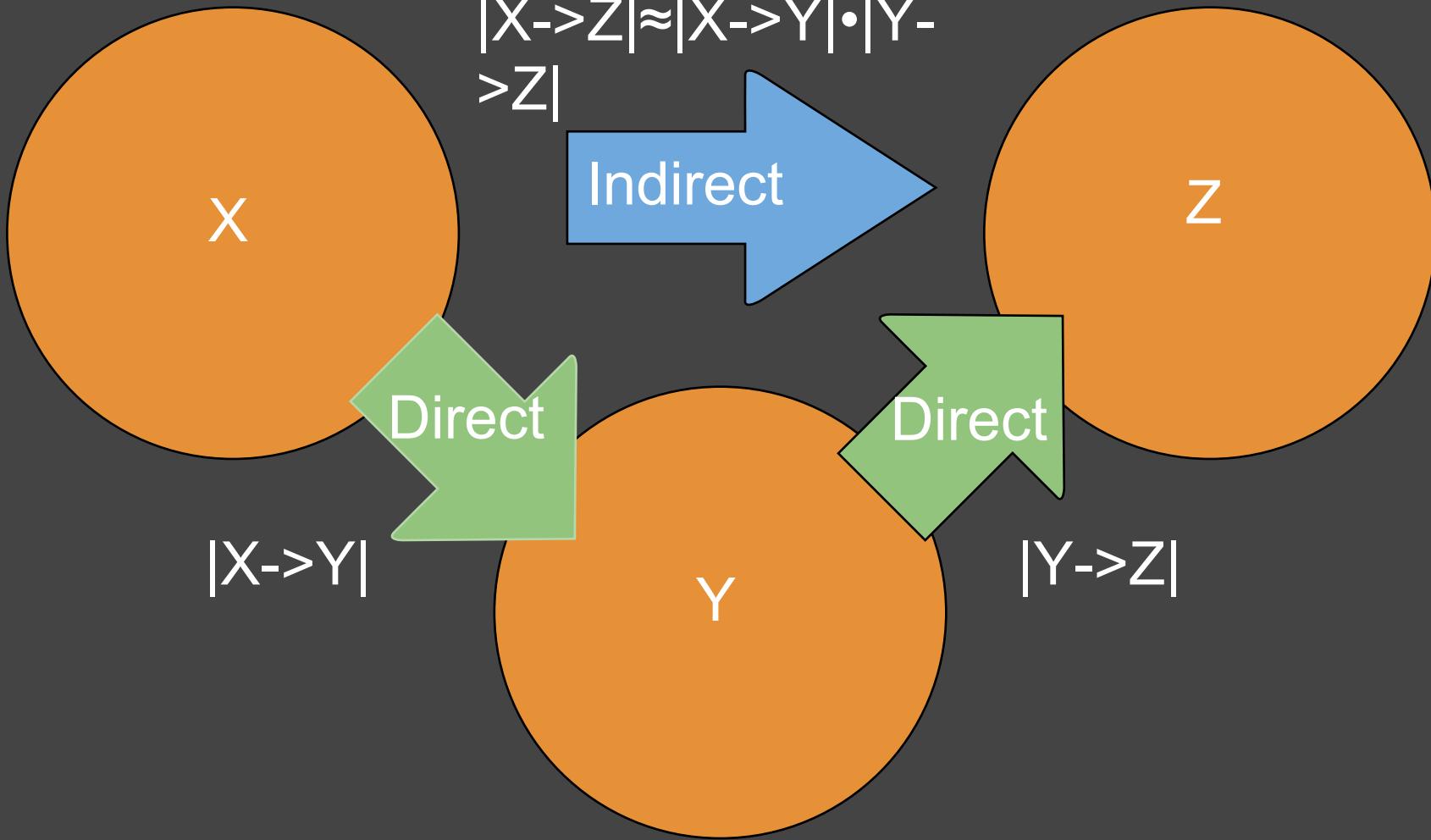
- Optical
- Acoustic

Multiple Physical Layers of Communication

- Optical
- Acoustic
- Radio

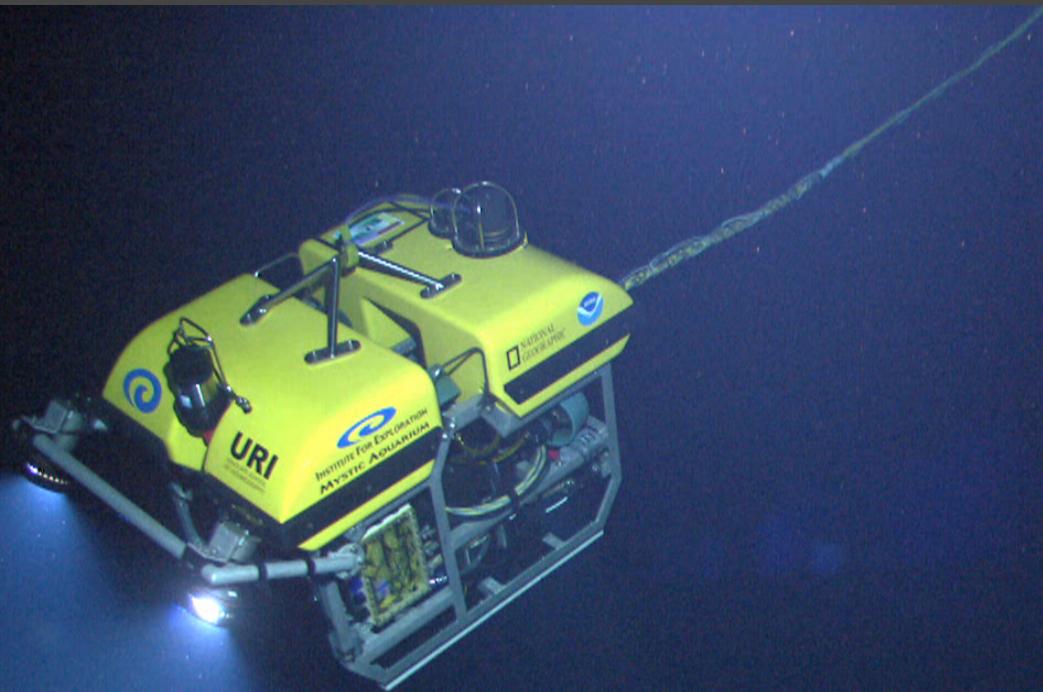
Trust And Reputation for Fleets of AUV

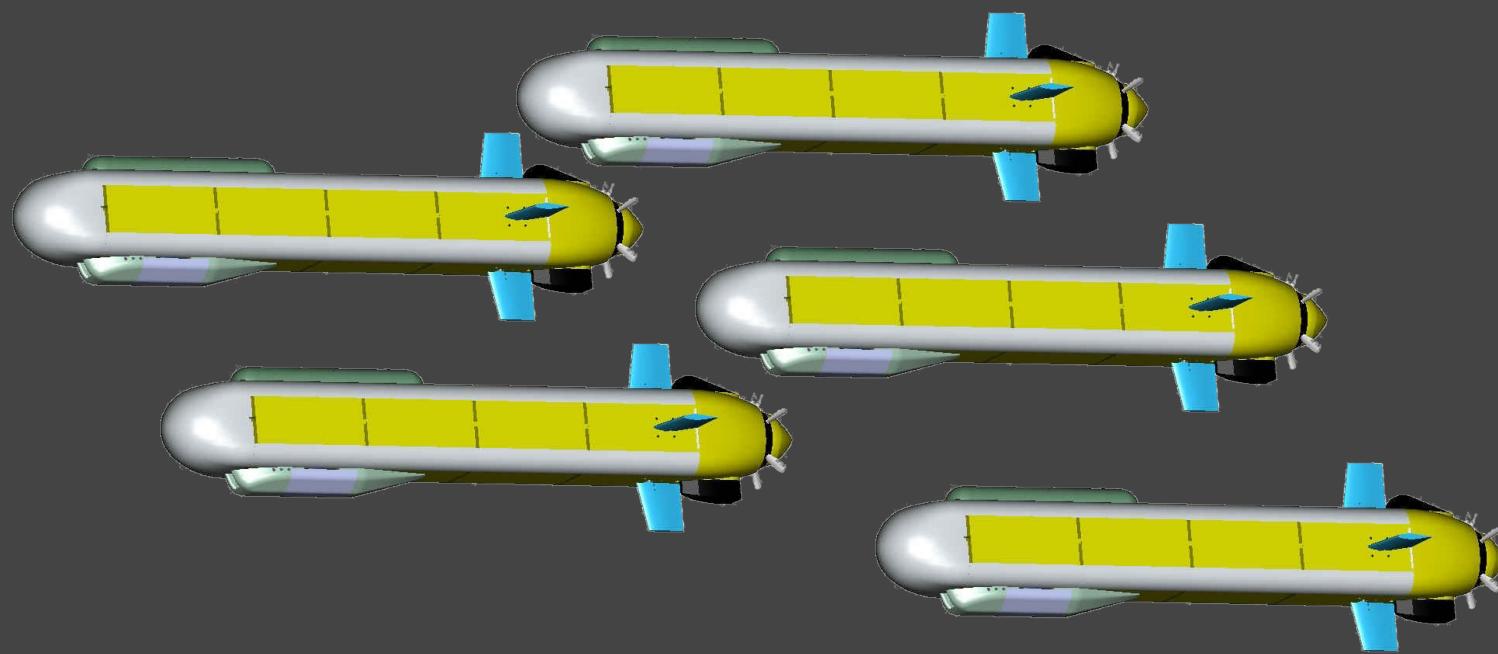
- Why is Trust Important? Avoids compromising of mission, AUVs etc
- Trust mechanisms Direct, indirect, recommendations
- Reputation How can we trust surface platforms of which we have no experience?

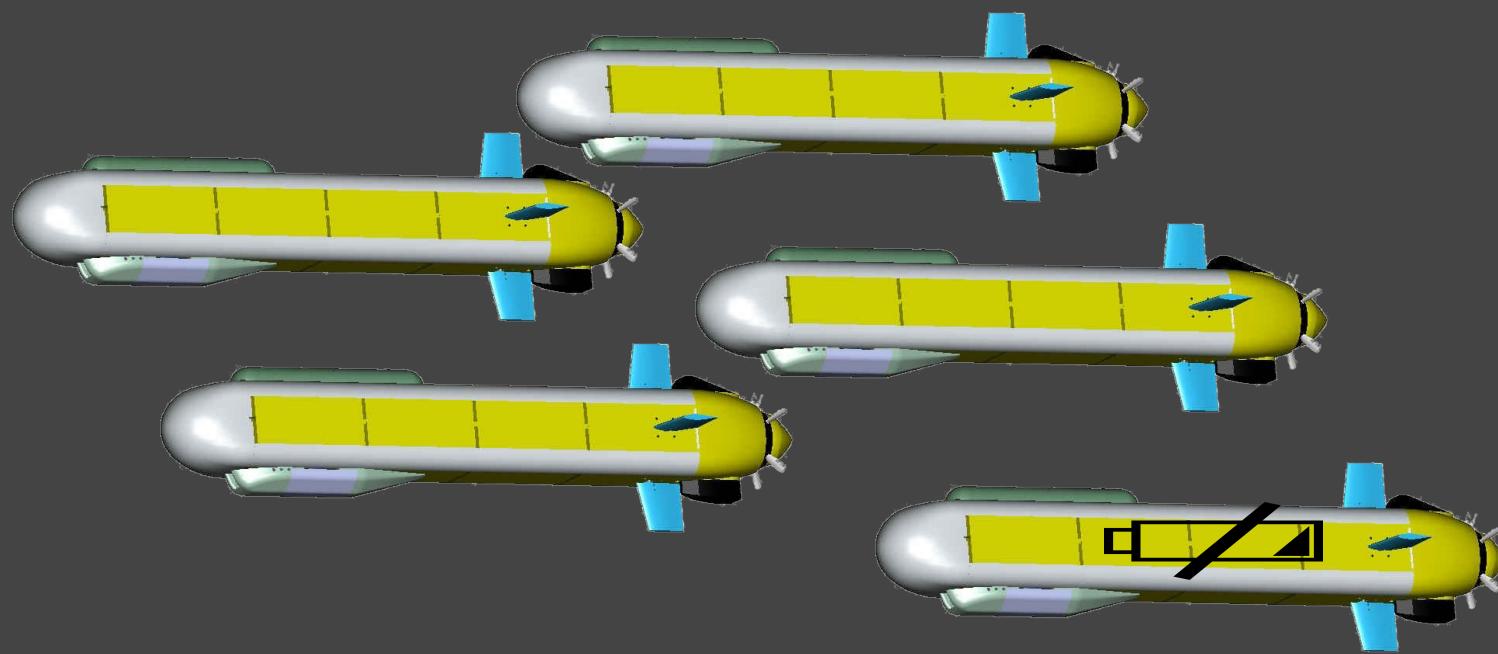


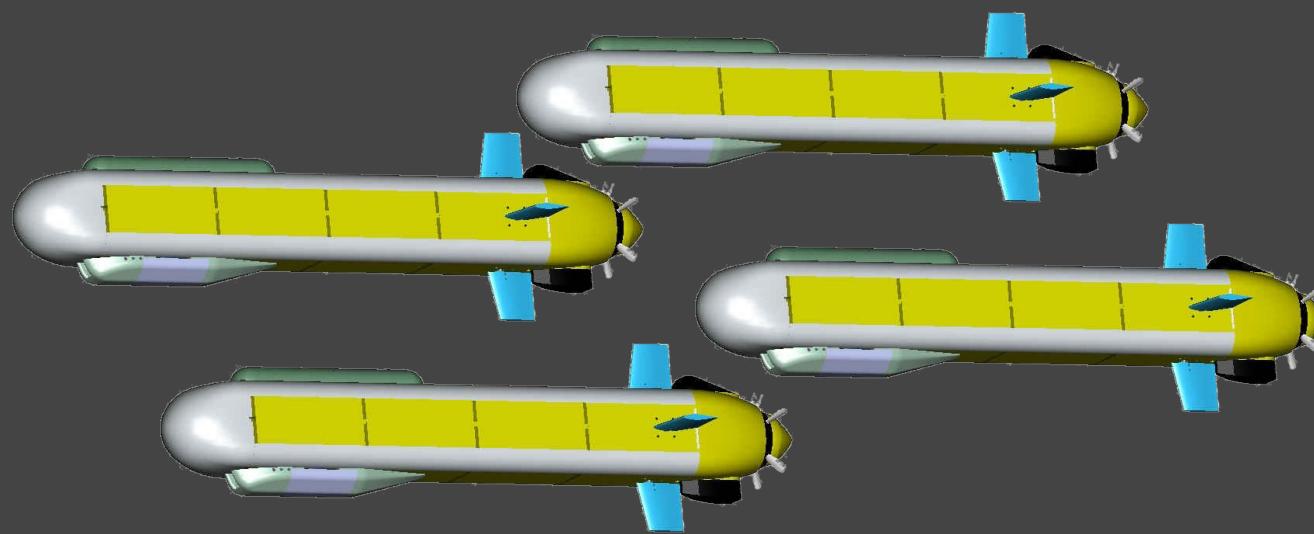
Trust And Reputation for Fleets of AUV

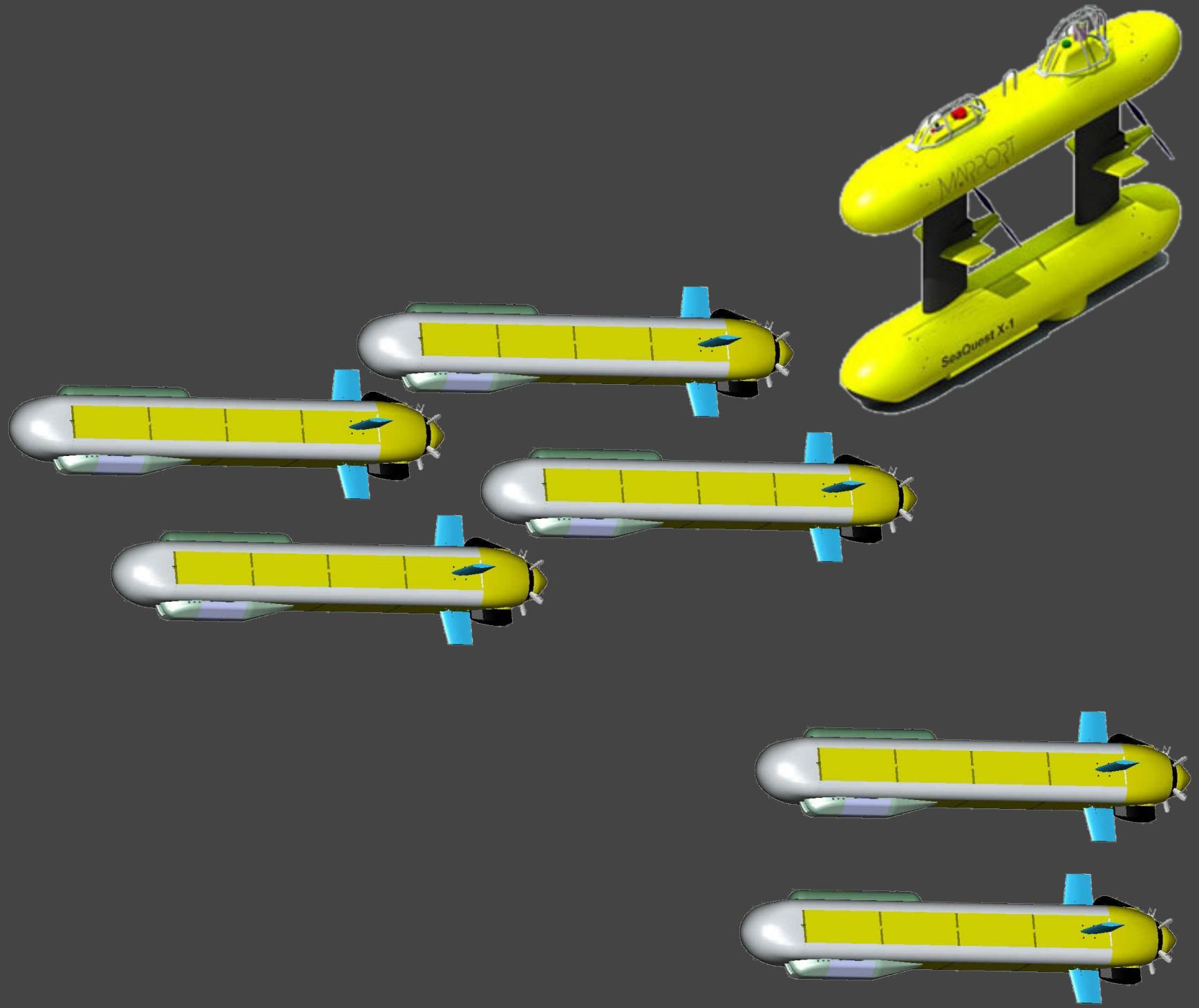
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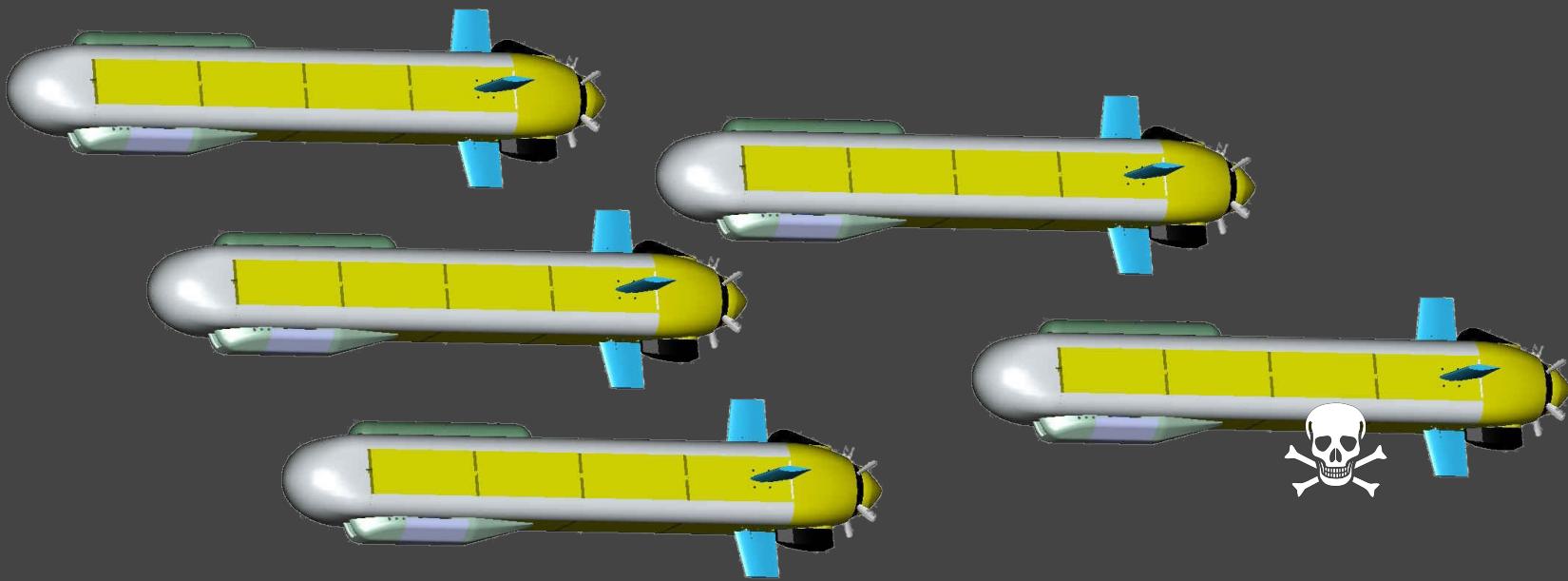


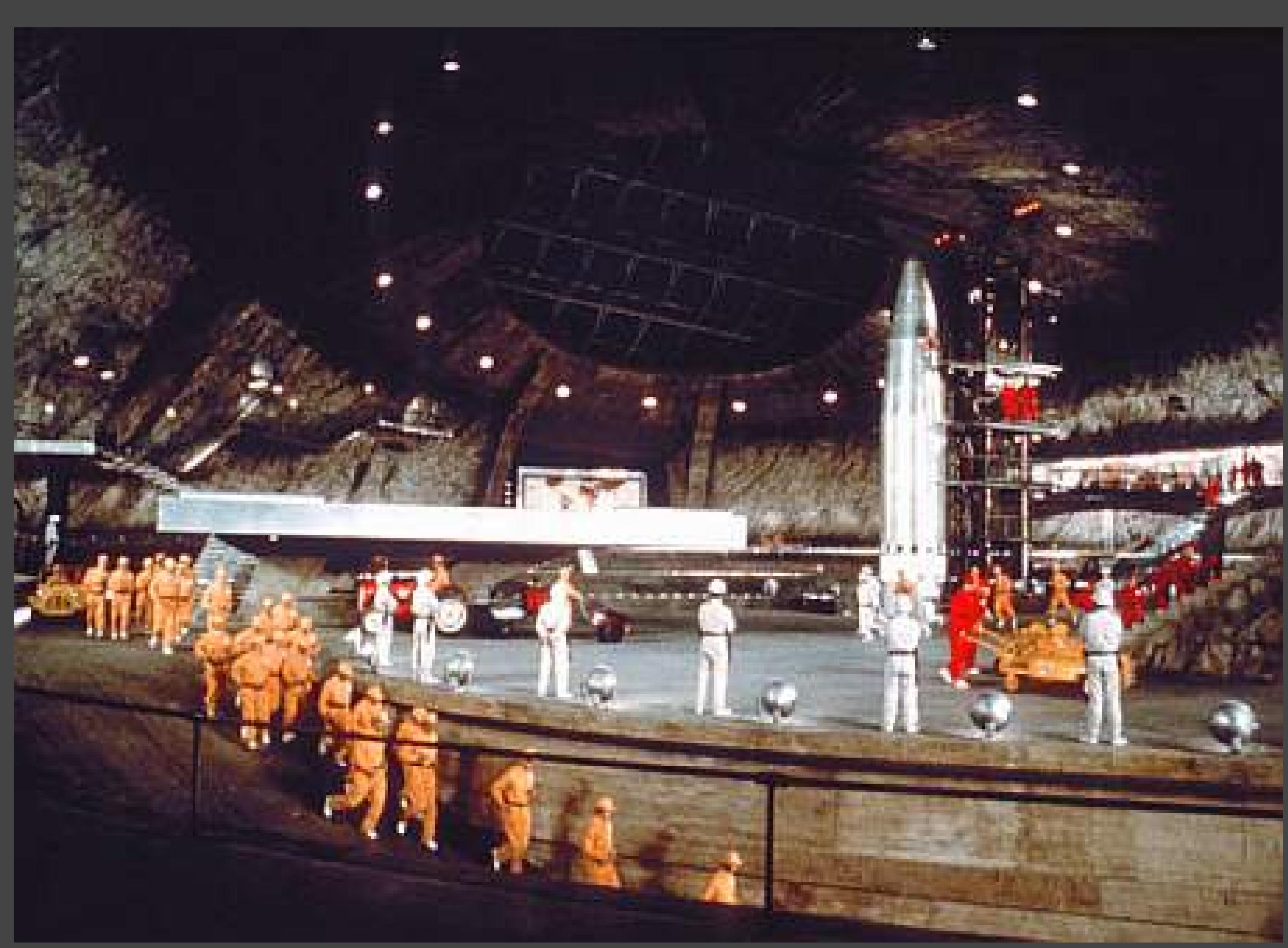






WAREYE.COM





In case you were wondering; it was
'You Only Live Twice'
1967, Connery

What can we learn from MANETS?

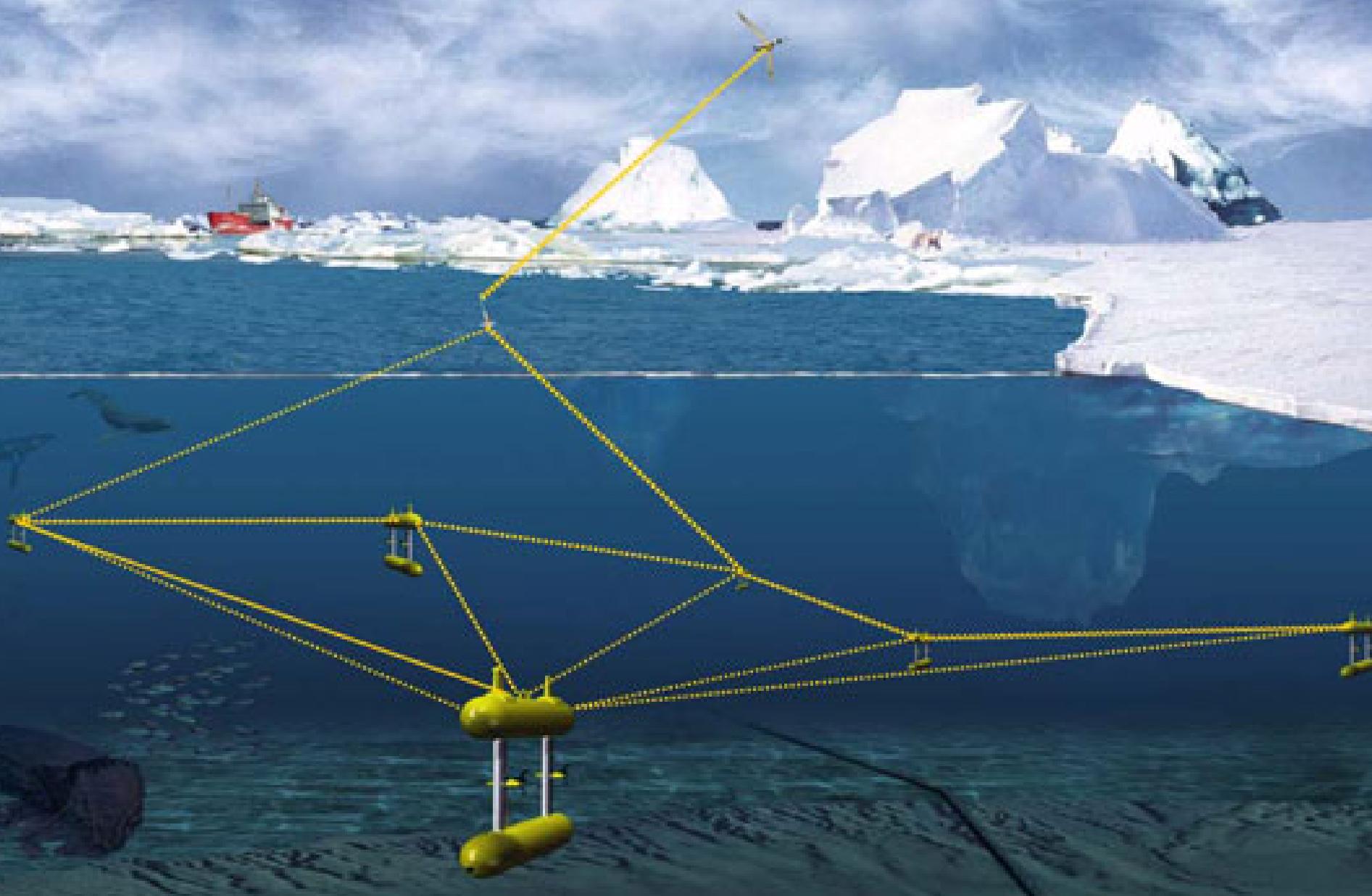
- Existing Threat Modelling Techniques and conventions
- For Example: **CIAAA**
 - Confidentiality
 - Integrity
 - Availability
 - Authentication
 - Anonymity

Existing Threat Mitigation systems and protocols, etc

Objective Trust Management Framework (OTMF) Single Variable Detection

Grey Theory

Multi-variable classification



Courtesy General Dynamics Canada Ltd.

Development Considerations

- Threat Modelling

Development Considerations

- Threat Modelling
- Metric-set Development

Development Considerations

- Threat Modelling
- Metric-set Development
- DTMF Development

Development Considerations

- Threat Modelling
- Metric-set Development
- DTMF Development
- Operational Feasibility Analysis



Project Team

Andrew Bolster,

- MEng Electronics & Software Engineering, QUB



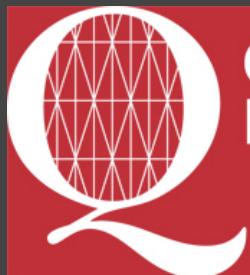
Prof Alan Marshall

- Director of Advanced Networks Lab, ECIT



Prof Jean-Guy Fontaine

- Research Director, TERA



Queen's University
Belfast





Queen's University
Belfast



Three Month Report

- Background
- Objectives
- Methodology





Queen's University
Belfast



Three Month Report

- Background
- Objectives
- Methodology



Differentiation

- Literature Review
- Methodology
- Panel Review



Defence Context



- Certification of Autonomous Systems
- Security & Vulnerability
- Shallow Oceanic Zone & Coastal Environment
- Human Operator Control of UxVs

Added Value of Research

- Widened Scope of AUV Operations
- Increased AUV Operational Time & Distance
- Improved Fleet Reliability
- Enhanced Fleet Security
- Applications across U(x)V and DTN space

Thank you for your time