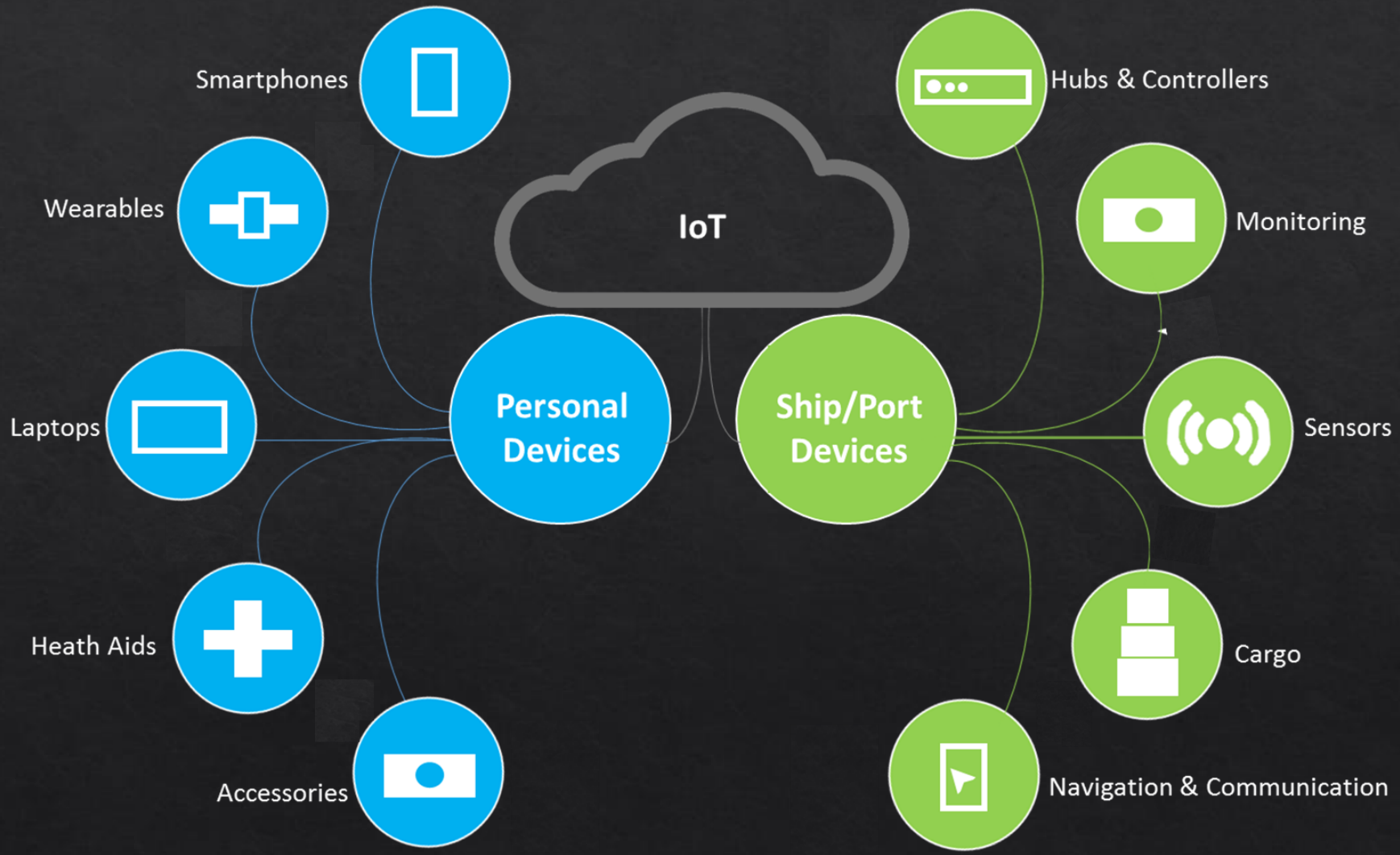
Cyber-SHIP: Developing Next Generation Maritime Cyber Research Capabilities

ICMET Oman 2019, 5-6 November

Prof Kevin Jones


world
ports
nature
trustworthiness
growth
investigation
mariners
ship
research
tools
quantitative
framework
IT
factors
cyber
digitization
evidence
trade
readiness
hackers
configurations
Classified
forensic
risk
IoT
efficient
OT
data
post-analysis
cyber-threats
threats
range
sector
issue
cyber-risks
cyber-physical
maritime
operational
Training
users
unique
equal
capabilities
cyber-risk
mitigation
cybersecurity
operators
global
digital
represent
operations
aware
autonomous
functionalities
economy
industry
dynamic
vulnerabilities
ships
assessment
measure
support
owners
shipping
decisions
maritime-cyber
regulators
sector
community
automation
technological
analysis
safety
methods
Simulation
environmental
profiles
insurers
importance
hazards
scenarios
model-based

More Devices and Connectivity



Maritime-Cyber Research Challenges

- Risk assessment/management of maritime cyber threats (cyber, and cyber-physical)
- Find/fix vulnerabilities from hardware, software, and human-computer interactions
- Work with stakeholders to improve resiliency and cyber-safety of individual systems
- Analyse the cybersecurity of a collection of bridge systems (System-of-Systems), connected in real world configurations
- Discover maritime-cyber threats that can be used to educate future mariners and Navies
- Determine future cyber threats to assets, economy, human lives, and environment.

Next generation research capabilities are needed.

Simulation vs Emulation Vs Live systems

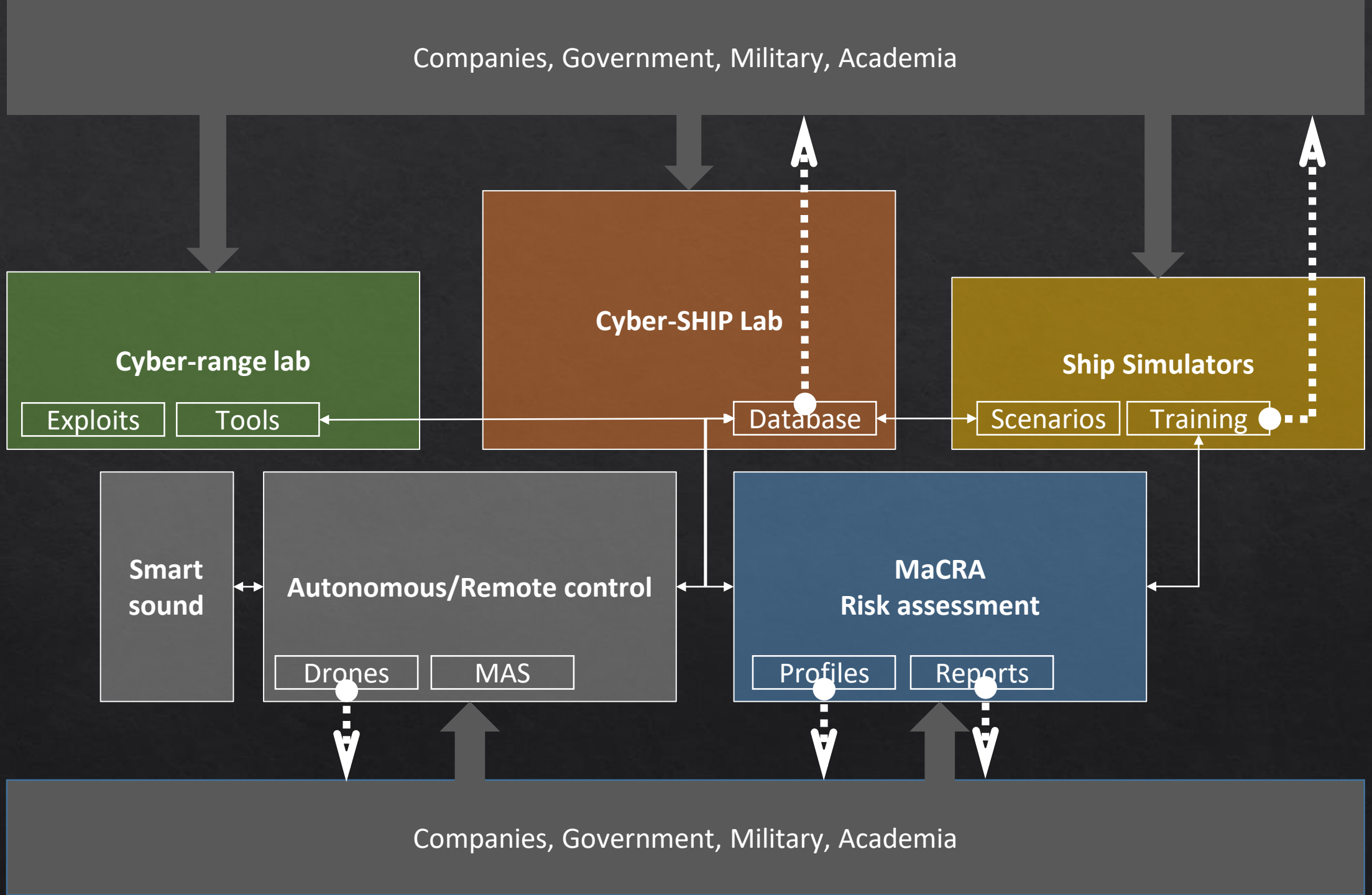
	Simulation	Emulation	Live Systems
Positive	• Quick to develop • Cheaper • Training tools	• More realistic • Repeatable Experiments	• Entierly realistic for training & research
Negative	• Limited by conceptual model	• Costly • Not entirely realistic	• Real world consequences can be costly

Cyber-SHIP Lab at Plymouth
(Software, Hardware, Information and Protection)

Join with or growing community of Maritime stakeholders that includes Ship Builders, Operators, Equipment Manufacturers, Class Societies and Insurers to:

- Make use of our specialist facilities for equipment ruggedization
- Partner with differing aspects of the value chain for collaborative projects
- Engage with all aspects of the Maritime sector to shape the future research agenda and influence policy

UNIVERSITY OF PLYMOUTH
Marine Institute


Companies, Government, Military, Academia
Cyber-range lab
Exploits
Tools
Cyber-SHIP Lab
Database
Ship Simulators
Scenarios
Training
Smart sound
Autonomous/Remote control
Drones
MAS
MaCRA
Risk assessment
Profiles
Reports
Companies, Government, Military, Academia

Research Aims

Awareness/Body of Knowledge

- Who are the attackers & targets?
- What is the current security landscape?

Vulnerability and Risk Analysis

- Individual systems
- Ship/Fleet/Port (infrastructure) security
- Supply Chain
- Future technology (Autonomy, IoT, augmented reality)

Maritime Cyber-Security Training, Certification

- Regional & International

Maritime Cyber-Security Policy, Insurance, and Law

- Regional & International

Malware/Intrusion detection and defences/mitigation

Security Lab / Cyber Range

Marine Navigation Centre

Related Projects

Proposal Title: Cyber-MAR

- State of the art analysis regarding simulation environments based on Cyber-ranges
- OT real/virtual coupling
- Cyber-range for Intrusion Detection and Prevention
- Piloting networked Cyber-ranges and interoperability
- Data analytics and intelligence extraction
- Situational awareness and knowledge platform

Maritime Cyber Threats research group

Investigating marine cyber threats and researching solutions

Overview

As a Tier1 National UK threat, a maritime cyber-attack can cost companies millions of pounds.

As the world heavily depends on maritime operations, we at the University of Plymouth have been researching maritime cyber-threats as few organisations have the capability, connections and facilities to do so.

This group is uniquely placed to make significant contributions in maritime cyber-security and brings together leading-edge multidisciplinary research and practical expertise from across the University and beyond.

Current project opportunities

We continuously engage in discussions and collaborative research with academia, government, and industry in areas related to maritime cyber-threats. We have access to the University ship simulators, and the team is in active collaboration to secure the Mayflower Autonomous Ship project and creating relevant maritime-security training.

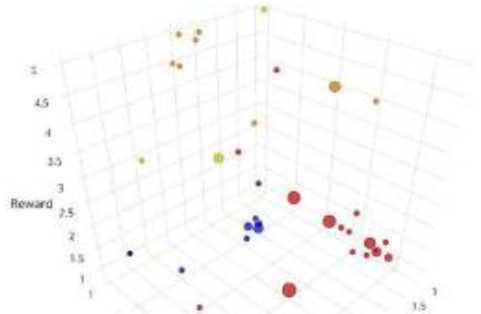
Help us by taking this survey on maritime cyber [open until March 2019]

Join us in creating the Cyber-SHIP Lab

CyMar'19 [details to come]

Research objectives

- Compiling a **body of knowledge** for maritime cyber-threats.
- **Vulnerability and risk analysis** for existing ship-based systems (IT&OT).
- **Threat assessment** for ship operations and human decision making.
- **Supply chain vulnerability** for maritime operations.
- Cyber-security for **autonomous vessels, ports,** and **offshore structures**.
- **Process and training** to protect mariners and ships against cyber-attacks.
- Understanding **psychological perceptions** of, and responses to, threats.
- Develop effective **recovery strategies** in the event of an attack.
- Analyse **ship-to-port cyber and cyber-physical** interactions.



Recent publications, talks, and news*

Tam K, Jones K. MaCRA: A Model-Based Framework for Maritime Cyber-Risk Assessment, Technical Report, WMU Journal of Maritime Affairs, Jan 2019 [AM]

Fairplay survey results and what they mean for shipping [webinar]

CyMar'2018 London 2 November 2018

Tam K, Jones K. Maritime cybersecurity policy: the scope and impact of evolving technology on international shipping [AM]. Journal of Cyber Policy, Accepted 3 Aug 2018, Published online: 29 Aug 2018

Thank You

Prof Kevin Jones

Kevin.Jones@plymouth.ac.uk

UoP Website :

https://www.plymouth.ac.uk/research/maritime-cyber-threats-research-group

www.Cyber-MAR.eu

Cyber_MAR

Cyber-MAR