Australian Maritime College

Australia's national institute for maritime education, research and training

UNIVERSITY of TASMANIA | AMC Australian Maritime College

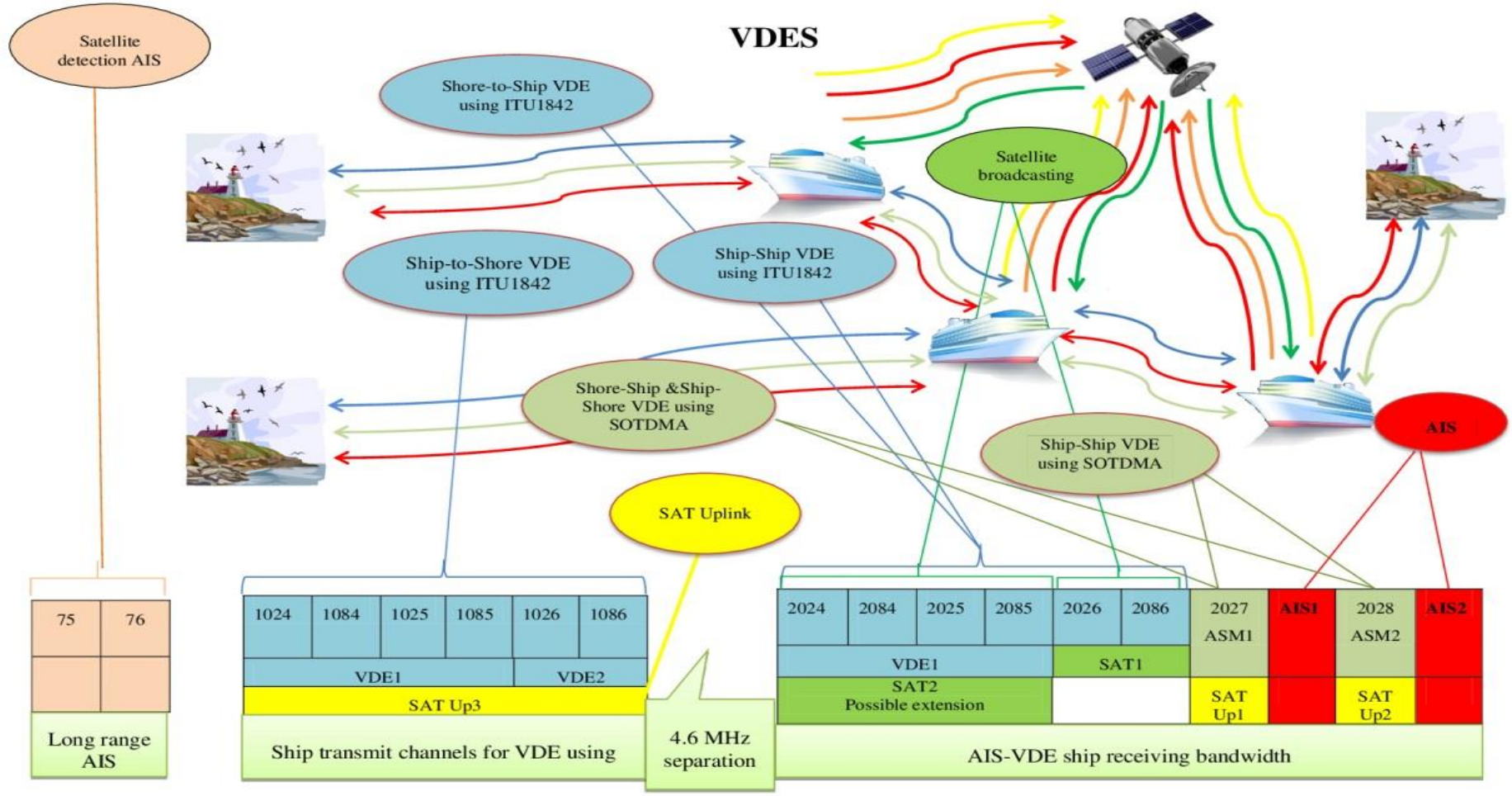
Using Digital Communication to Build, Maintain & Improve Shared Mental Models in Maritime Navigation

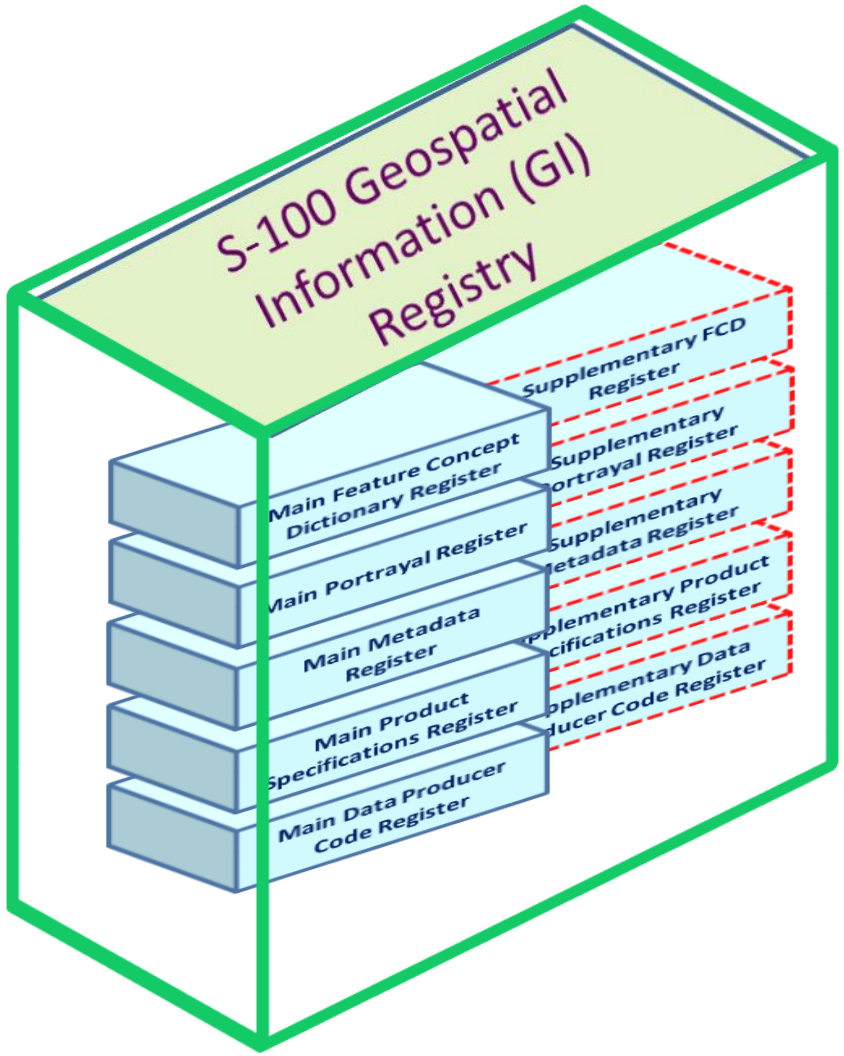
To Build, Maintain & Improve Shared Mental Models in maritime navigation

Q1: Do we have the technology infrastructure?
Q2: Is the international regulation ready?
Q3: Do we understand human communication?

Effective communication is communication that is clearly and successfully delivered, received and understood and leads to the desired outcomes/goals.

There are a range of technological issues associated maritime communication that relate to bandwidth, content, integrity, integration and cost.


VDES
Satellite detection AIS
Shore-to-Ship VDE using ITU1842
Satellite broadcasting
Ship-to-Shore VDE using ITU1842
Ship-Ship VDE using ITU1842
Shore-Ship &Ship-Shore VDE using SOTDMA
Ship-Ship VDE using SOTDMA
AIS
SAT Uplink
75
76
Long range AIS
1024
1084
1025
1085
1026
1086
VDE1
VDE2
SAT Up3
Ship transmit channels for VDE using
4.6 MHz separation
2024
2084
2025
2085
2026
2086
2027 ASM1
AIS1
2028 ASM2
AIS2
VDE1
SAT1
SAT2 Possible extension
SAT Up1
SAT Up2
AIS-VDE ship receiving bandwidth



Do we have the international regulation in the maritime industry to support innovation in communications technologies?

IALA

“The present SIP is based on the five prioritized e-navigation solutions including S4 and S9 -

S4: integration and presentation of available information in graphical displays received via communication equipment;

S9: improved Communication of VTS Service Portfolio (not limited to VTS stations).”

NCSR 1/28 Annex 7, page 1

S4.1.4: Identifying the currently available communications systems and how they can be used (range, bandwidth, etc.) and what systems are being developed and will be in use when e-navigation is live (e.g., VHF, 4G and 5G).

TASK: Identify and **draft guidelines on seamless integration of all currently available communications infrastructure** and how they can be used (e.g. range, bandwidth, etc.) and what systems are being developed (e.g. maritime cloud) and could be used for e-navigation.

Due: 2019.

S9: Improved communication of VTS service portfolio (not limited to VTS stations)

This task needs to identify the possible communications methods that might be used and test-beds need to be built to demonstrate which systems are best in different areas of operation. (e.g. deep sea, coastal and port).

1.1.4. Produce a Guideline on Maritime Service Portfolios for VTS
1.3.1. Produce a Recommendation / Guideline on VTS Communications
3.3.1. Develop guidance on human factors and ergonomics in VTS

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Attend the IALA Workshop in Bali in February 20-24 2017.

IALA

20 – 24 Februarv 2017

WORKSHOP ON COMMON PHRASEOLOGY AND PROCEDURES FOR VTS COMMUNICATIONS

Denpasar, Bali, Indonesia

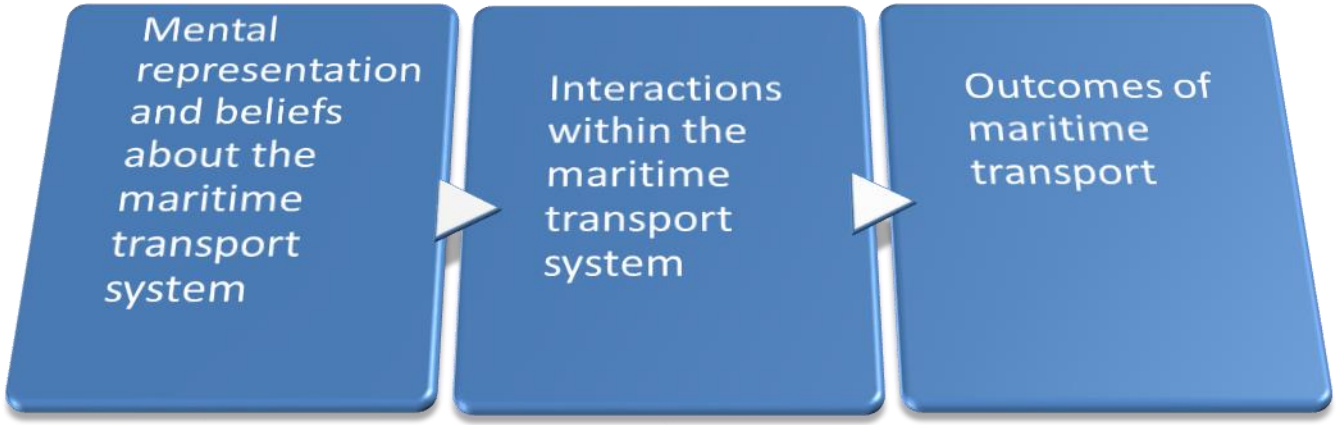
Grand INNA KUTA Hotel

MINISTRY OF TRANSPORTATION
REPUBLIC OF INDONESIA

- Identify the implications of future technology (e.g.VDES) for VTS Communications and associated human performance.
- Explore VTS message construction and the development of common phraseology to facilitate the clear and unambiguous gathering and transfer of information.

What is a Mental Model?

They have been described as working models of the world that humans *cognitively construct* as a means for understanding their environment (Johnson-Laird, 1985).

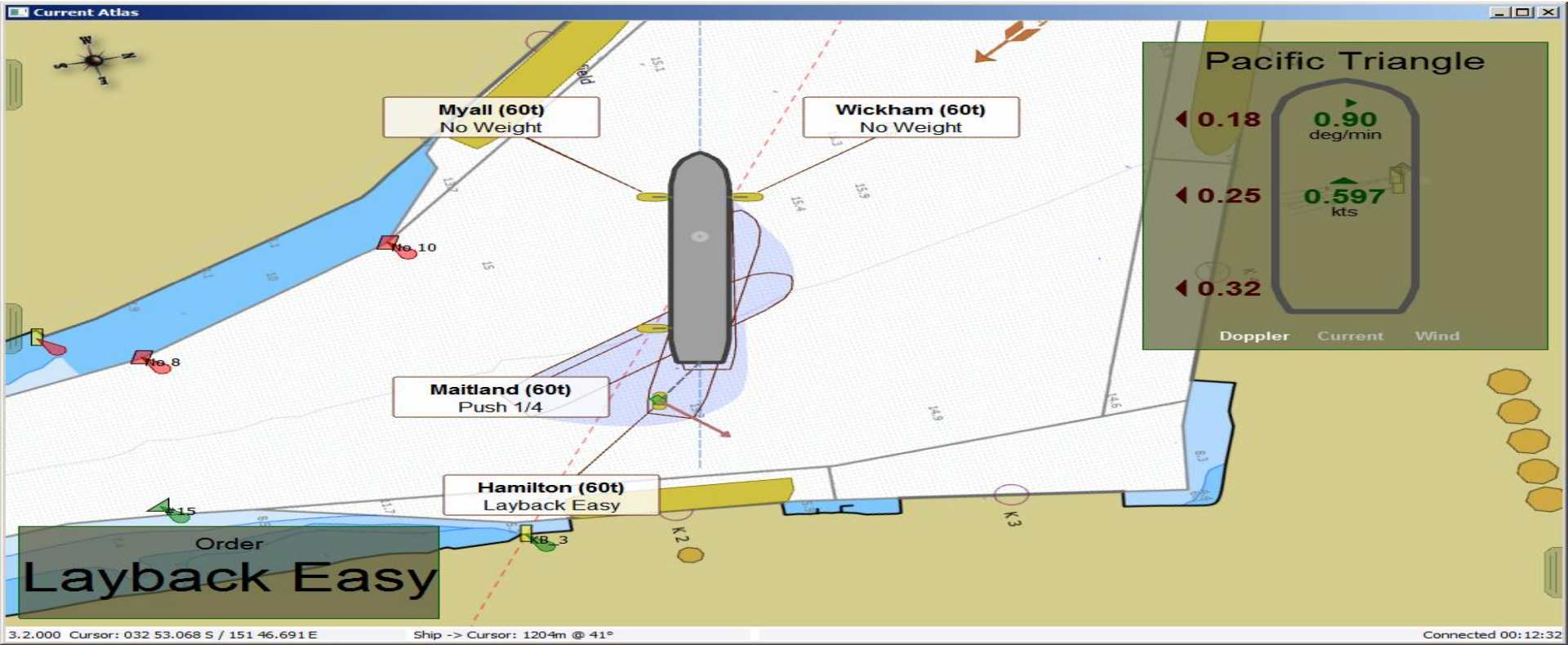


In complex, dynamic, high-risk environments it is not sufficient for an individual to hold a mental model – that mental model must be **shared** with others involved in the MTS.

This leads to the concept of Team Mental Models (TMM), also known as Shared Mental Models.

Well Shared + High Quality = Good SMM

A **Common Operating Picture (COP)** is a single identical display of relevant (operational) information shared by more than one participant in the system.



Nightmare Machine:

"Our main goal is obviously not to scare people — this is just a Halloween fun goofy project," he said. "What we are very interested in is how to instil particular emotion in people — so can we feel positive emotions, like warmth friendliness, a machine telling the human 'work with me, trust me'.

Application Area

ASR4Maritime

Automatic speech recognition to enhance safety in maritime communication

The technology infrastructure is either in place or being developed.

The international regulation is being developed, but why wait.

Our understanding of human communication will grow as we innovate.

The technology infrastructure is either in place or being developed.

- IDMT ASR4Maritime
  3 R&D areas:

  - Develop ASR-supported training systems

  - Transcribing maritime communication for logging purposes (VTS, VDR, ...)

  - Develop Human-Maschine interfaces for on-board and simulation systems (Radar, ECDIS, AIS, ...)

The international regulation is being developed, but why wait.

- Offering technical solutions which may become the industry standard

- Participating in maritime conferences & workshops:
  - International Maritime Organization (IMO)
  - International Association of Light-house Authorities (IALA)
  - International Telecommunications Union (ITU)

- Developing best practice examples with selected industry partners

Our understanding of human communication will grow as we innovate.

- Development of a specific speech corpus for maritime communication
- Empirical speech data can provide big data research approach
- ASR-supported computer dialogue systems can simulate human verbal interaction in a totally controlled environment for studying

  - inter-personal communication strategies
  - cognitive load levels
  - shared mental models