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ANZAC Ship
Combat System Simulator (CSSim)

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DXC.technology

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Agenda

1. History and Facts
2. The Objectives
3. The Locations
4. The Architecture and Principles
5. The Functionalities
6. The Capabilities
7. The Limitations
8. The Evolutions

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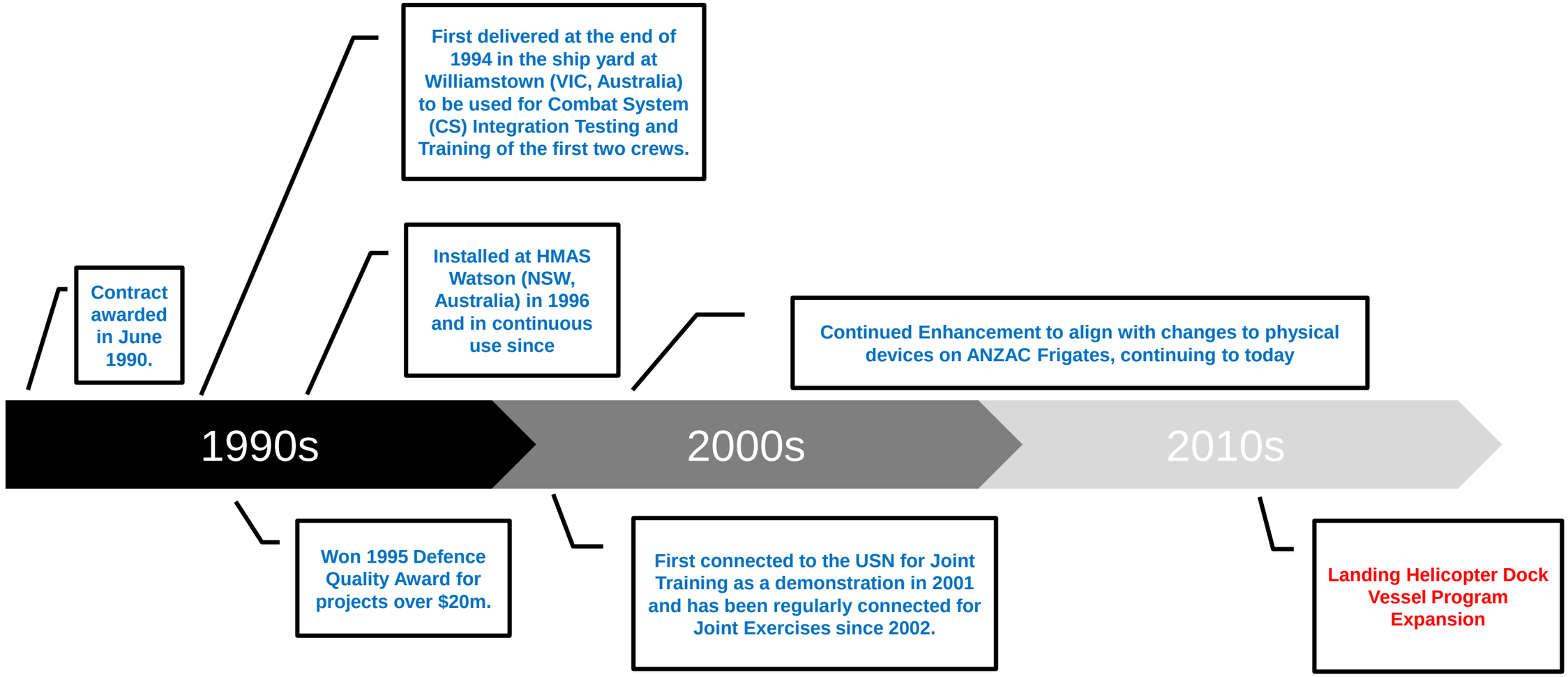
History and Facts



ANZAC CSSim – What are its objectives?

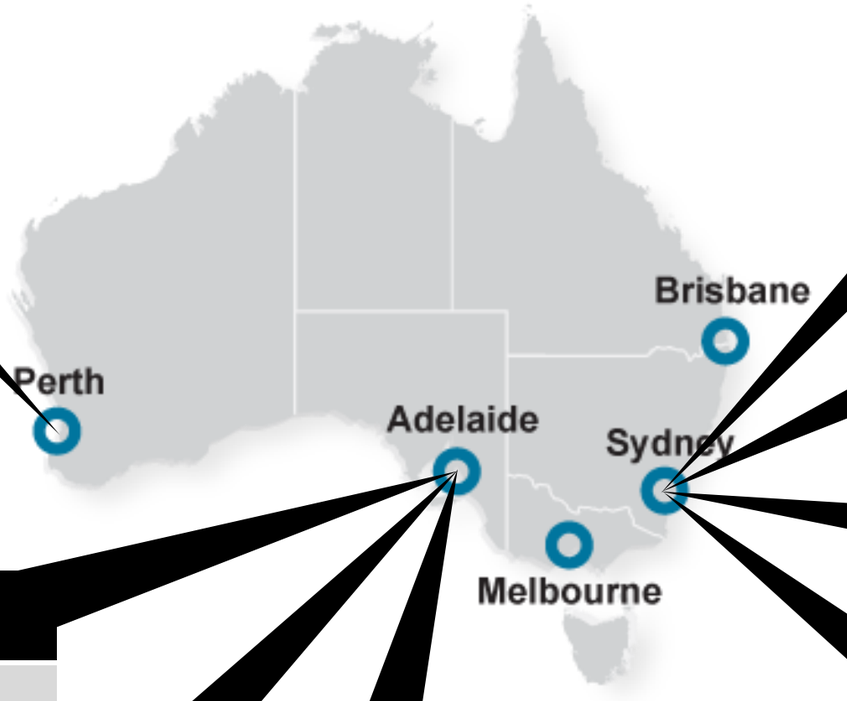
1st Objective

Training
- Support full Command Team Training
- Support some Operator Training

2nd Objective

Combat System Land Based Test Site
- Interface Testing
- Fault Injection
- Support Development

ANZAC CSSim – Where is it used?



HMAS STIRLING

- For Combat System Command Team, Operator and Maintainer Training
- For Combat Management System Integration and Testing
- For On Board Combat System Command Team Training

DXC Technology

- DXC Software Development Facility

Defence Science and Technology Group

- For evaluations of Operational Concept Development
- For evaluations of operations room layout - Future Frigate (SEA 5000)

Saab Australia

- For Combat Management System Development and Testing

DXC Technology

- DXC Software Development Facility

HMAS WATSON

- For Combat System Command Team and Operator Training

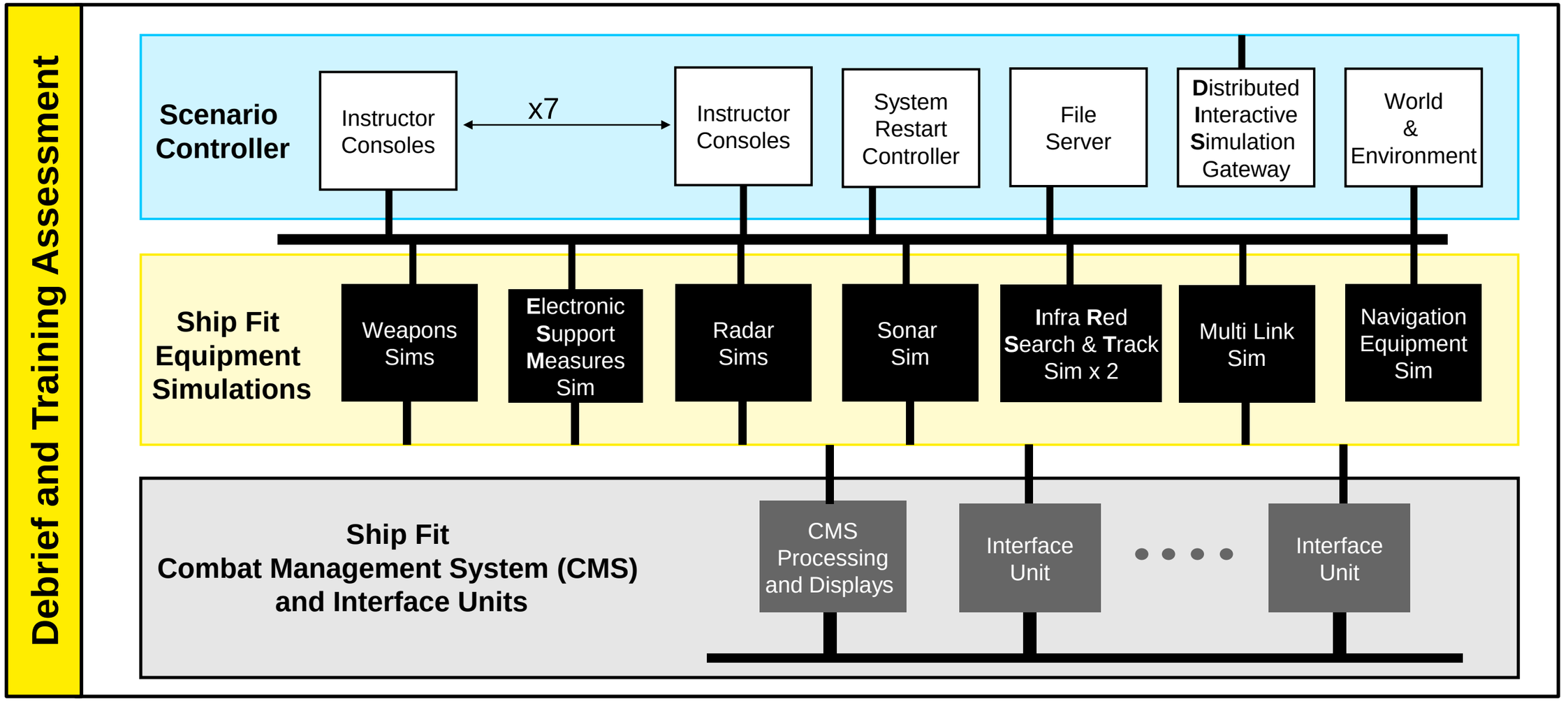
Garden Island (Fleet Base East)

- For On Board Combat System Command Team Training

Combat Systems Engineering Group

- Participation in Coalition Distributed Engineering Plant events for evaluation of Combat System performance

ANZAC CSSim High Level Architecture



ANZAC CSSim Architecture Principles

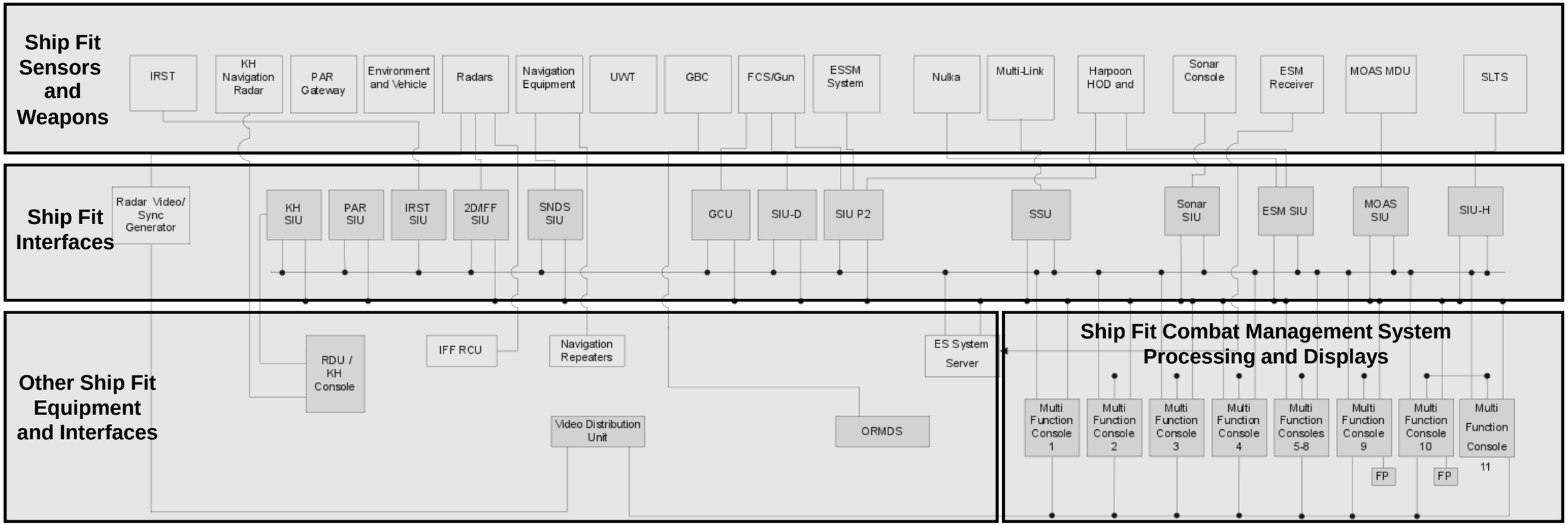
The ANZAC CS Simulator Architecture Principles

- Interface with the Ship Fit 9LV Combat Management System built by Saab.
- Simulates the Ship Fit Interfaces for all the Sensors and Weapons.
- Simulates the Ship Fit Interfaces for all Data Links.
- Simulates the Ship Fit Internal and External Communication functions.
- Provide Internal and External Simulation Communication functions.
- Provide adequate fidelity for Command Team Training.

The ANZAC CSSim Physical Architecture Principles

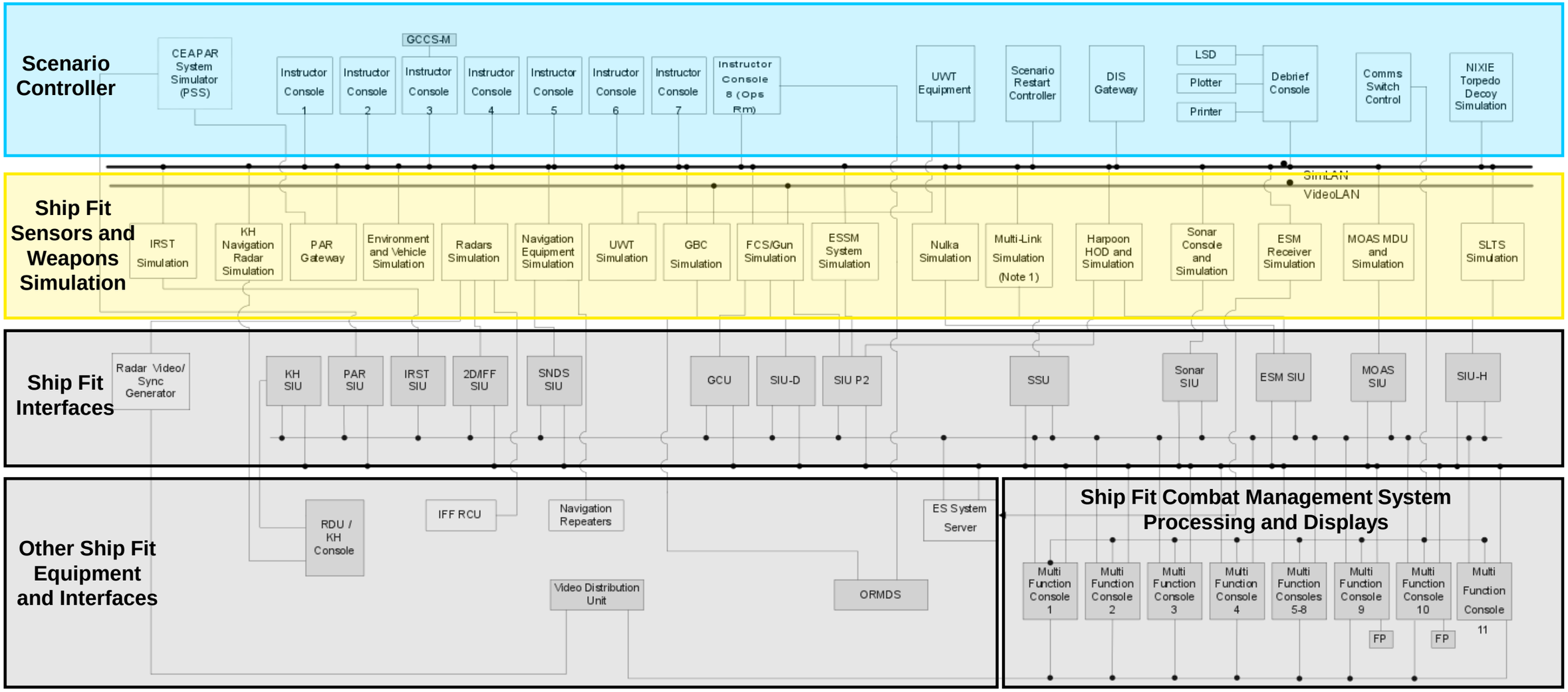
- Uses distributed processing: one for each equipment type (e.g. one per radar) or per function (e.g. target navigation, DIS gateway).
- Uses computers connected by Ethernet. No need to locate in a central rack. Open for extension.
- Uses hardware driven by modern commercial grade technology.

ANZAC Ship CS Architecture



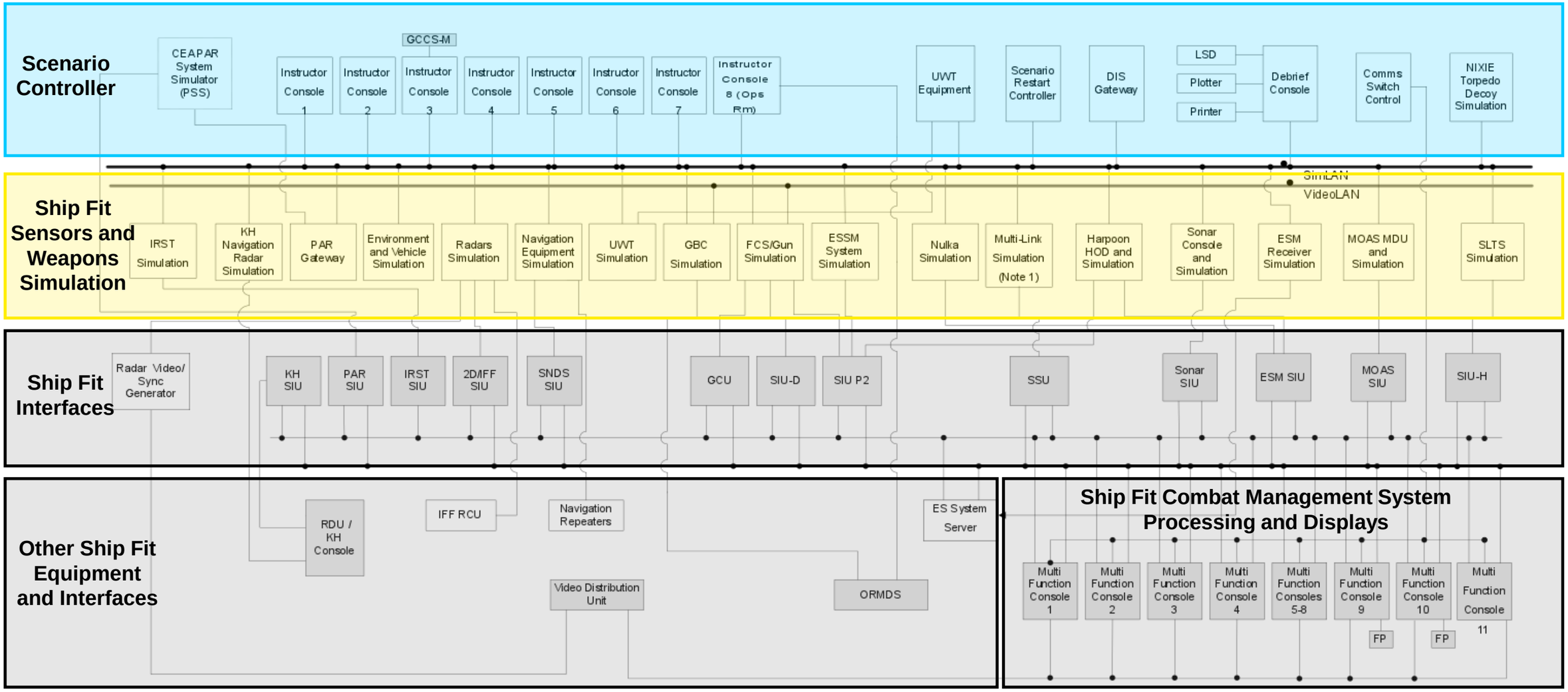
ANZAC CSSim used for CS Integration

Identical configuration as for CS Maintainer Training – One solution serving joint purposes…

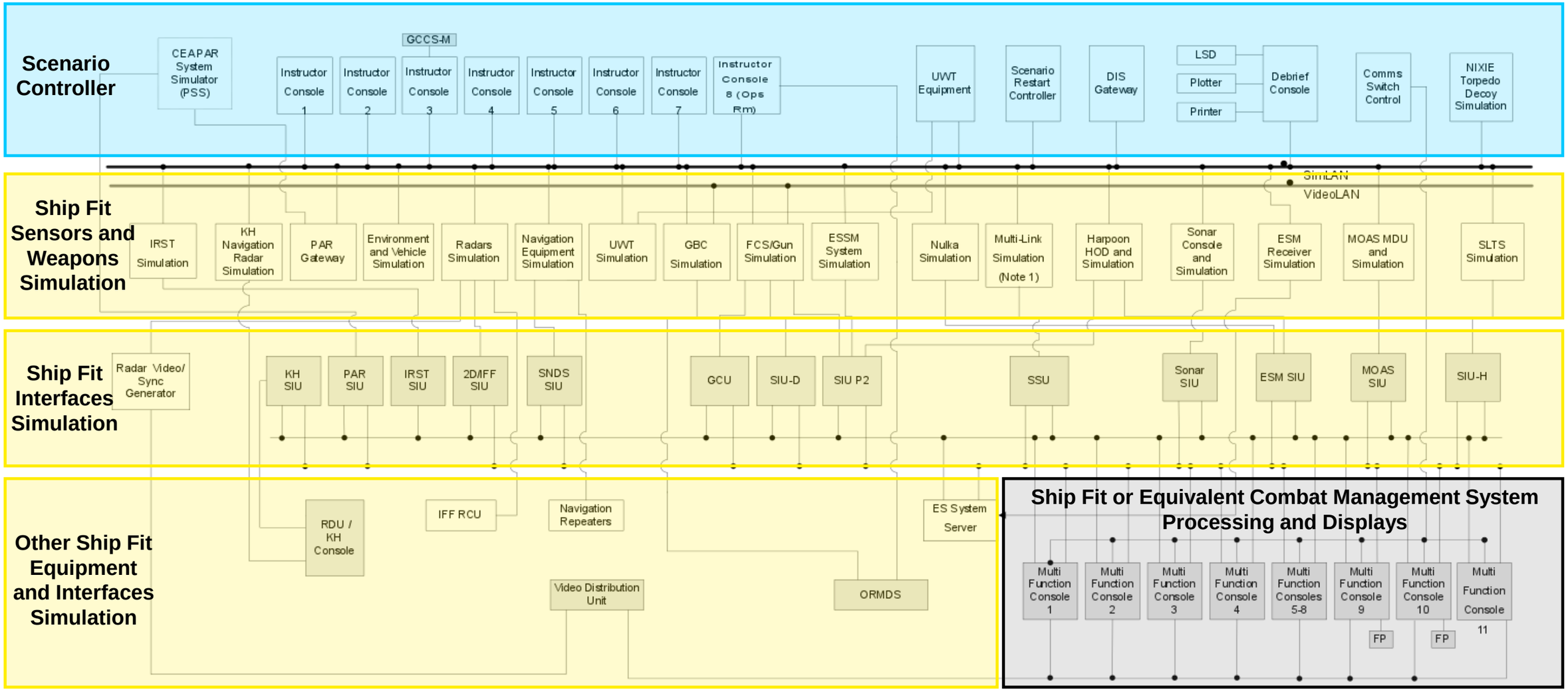


ANZAC CSSim used for CS Maintainer Training

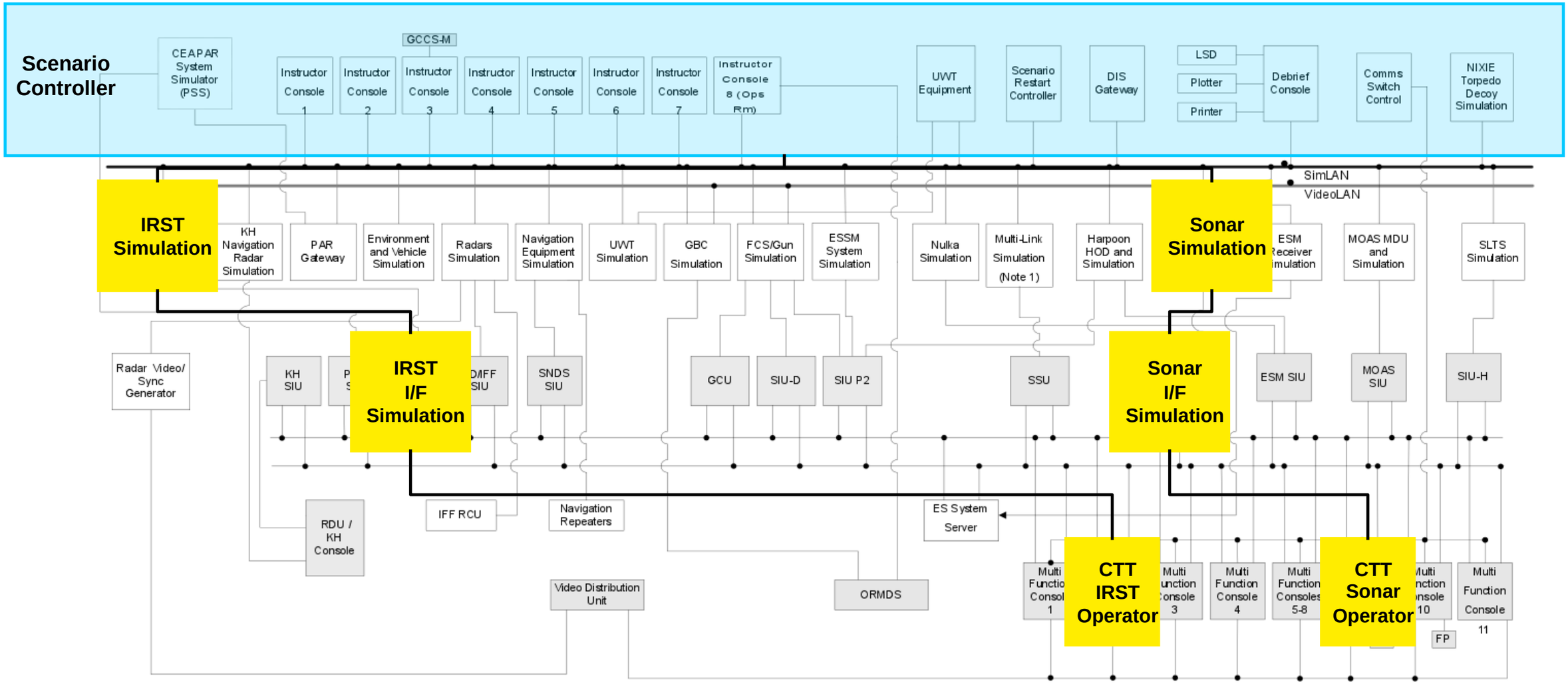
Identical configuration as for CS Integration – One solution serving joint purposes…



ANZAC CSSim used for CS Full Command Team Training

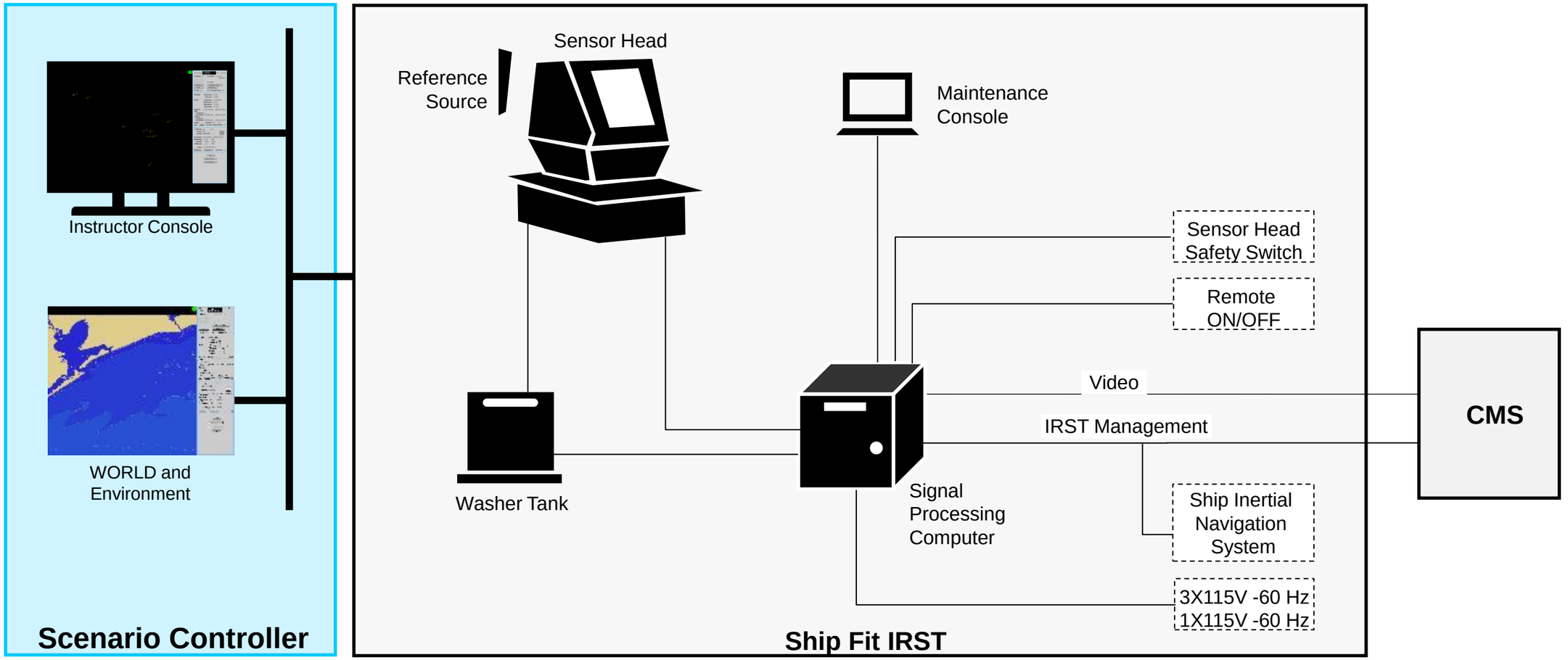


ANZAC CSSim used for CS Individual Operator CTT



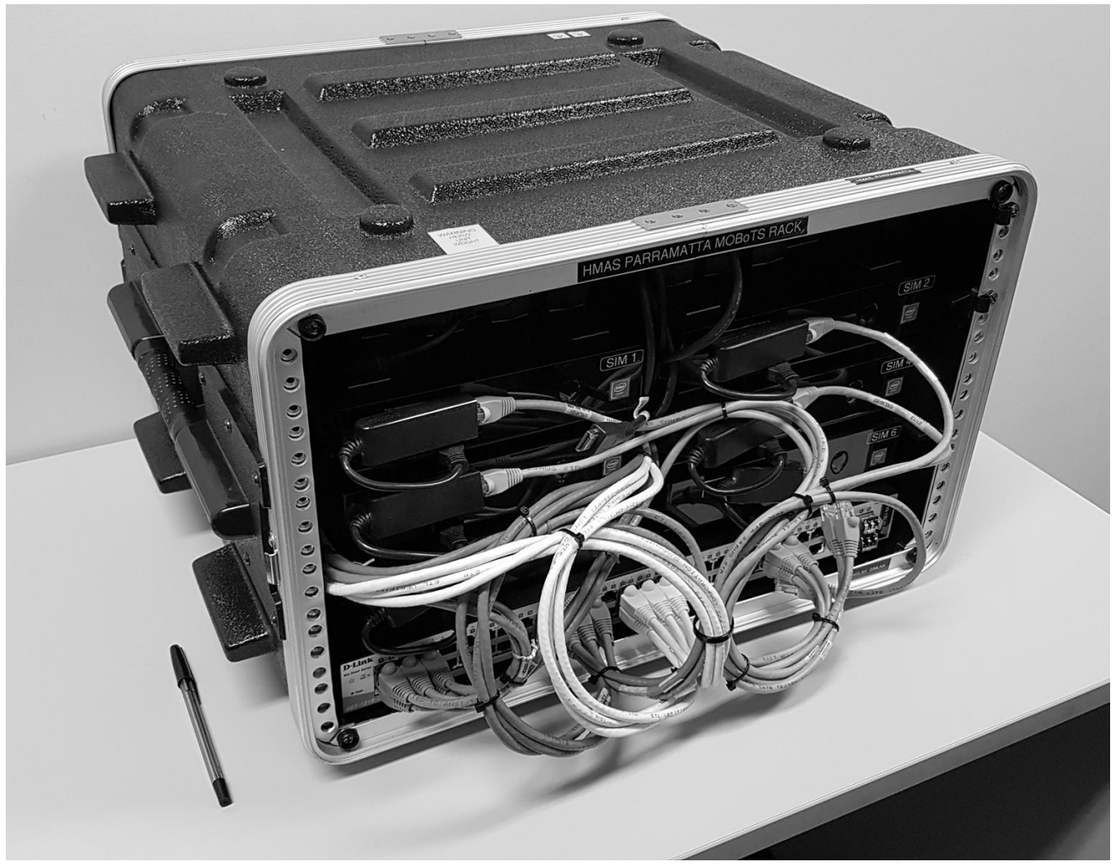
ANZAC CSSim used for CS SFE Integration with CMS

Example based on Ship Fit IRST Block Diagram



ANZAC CSSim used for CS On Board Training CTT

Mobile On Board Trainer (MoBOTS) rack



- MoBOTS run the full ANZAC CSSim
- All diskless boot from the fileserver
- Constrained in weight and size: being hand carried and through hatchways

ANZAC CSSim used for CS Combined Training

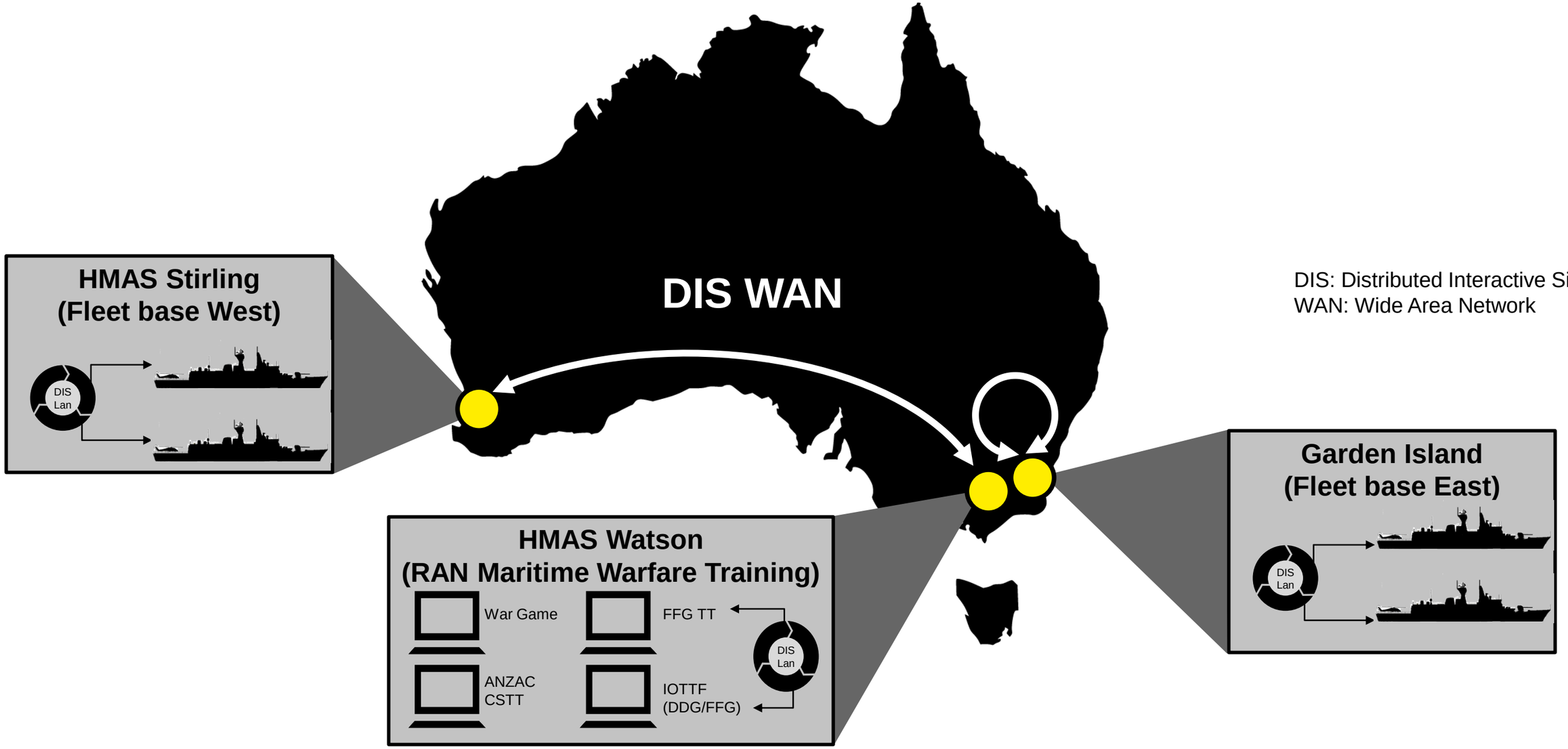
ANZAC Class Simulator at HMAS WATSON

DIS Tactical data

DIS Voice comms

Adelaide Class Simulator at HMAS WATSON

ANZAC CSSim used for CS Simulators Collaboration



DIS: Distributed Interactive Simulation
WAN: Wide Area Network

ANZAC CSSim used for Coalition Exercise

ANZAC Class Simulator at HMAS STIRLING

ANZAC Class Simulator at HMAS WATSON

DIS Tactical and voice

Adelaide Class Simulator at HMAS WATSON

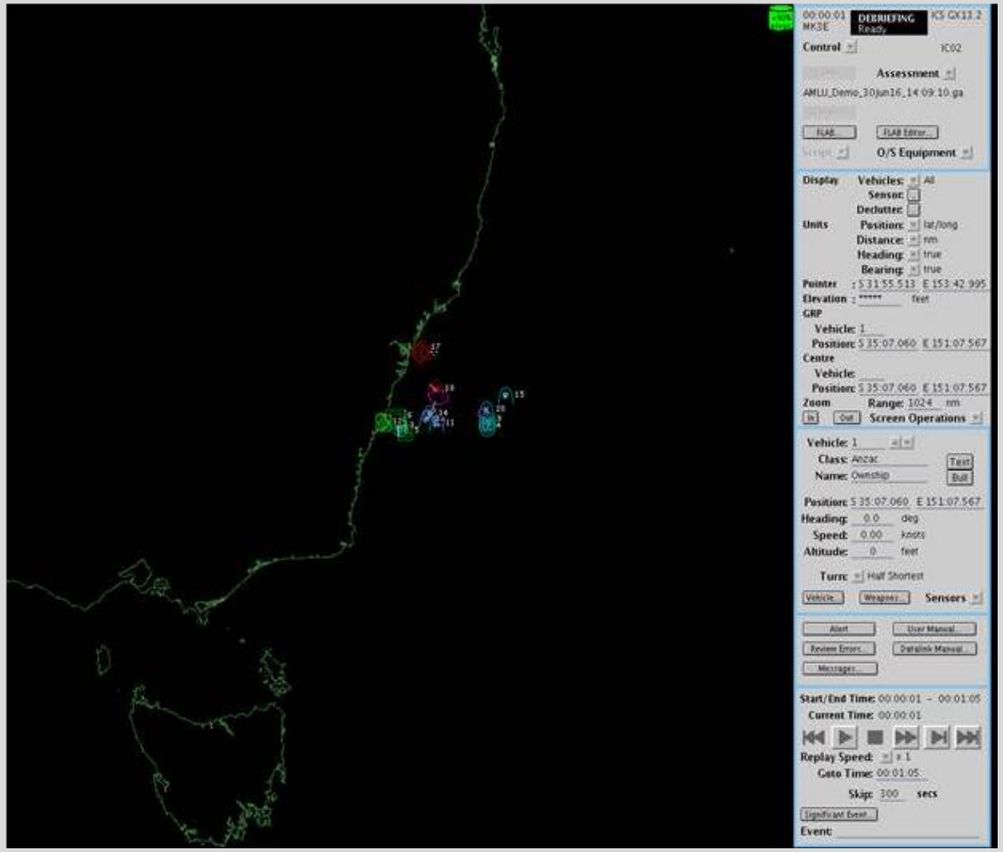
US Navy
at San Diego (USA) and Yokosuka (Japan)

To other potential simulators

ANZAC Ship CSSim Capabilities

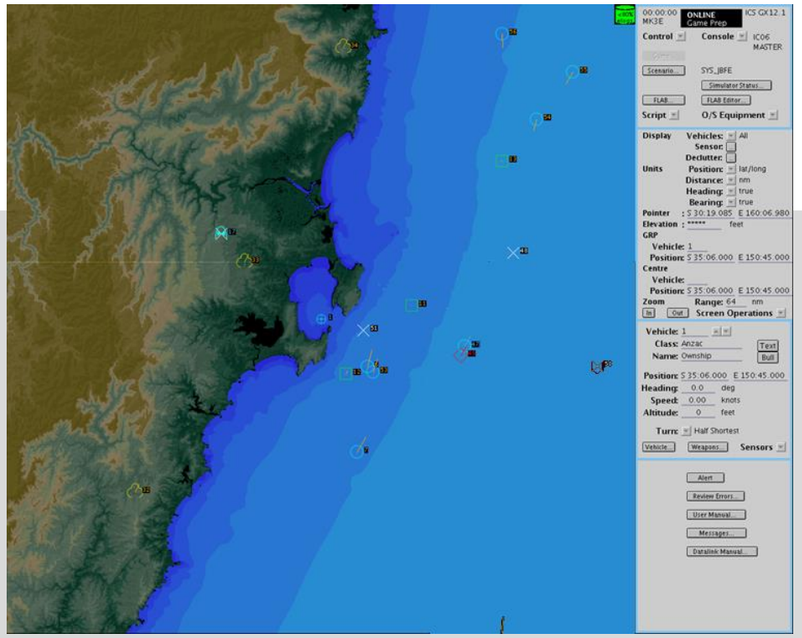
ANZAC CSSim Capabilities

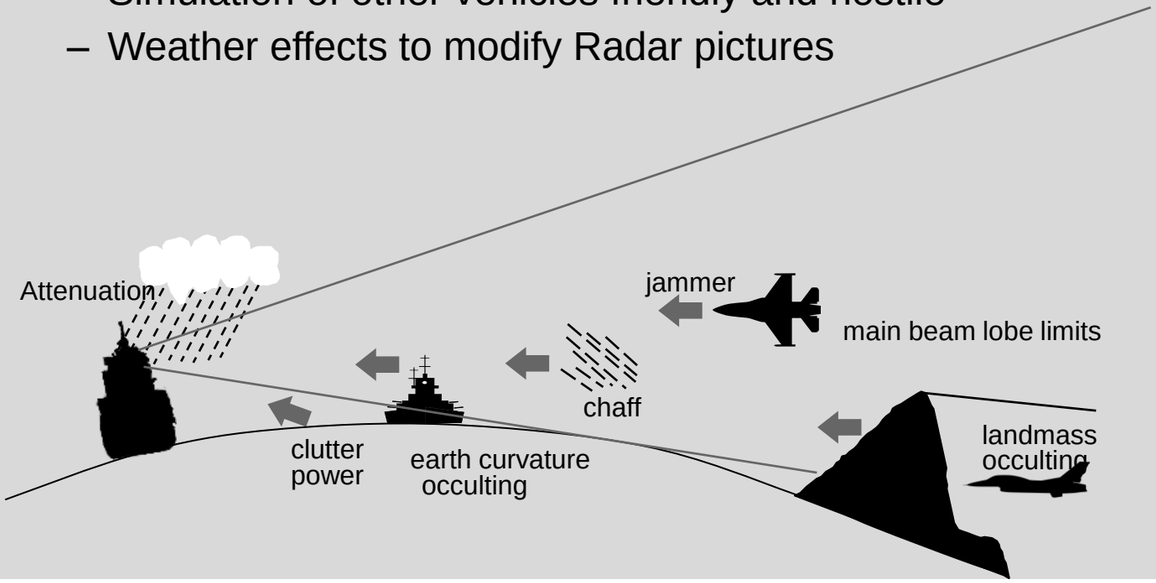
- **Instructor Consoles** to:
  - Add or delete new targets at any time
  - Control the motion and detectability of the targets
  - Fire weapons from/to Ownship
  - Respond to non-auto Link-11 messages
  - Respond on voice comms for other locations on the ship, and as other vehicles over radio
  - Control the response to, and generation of DIS messages

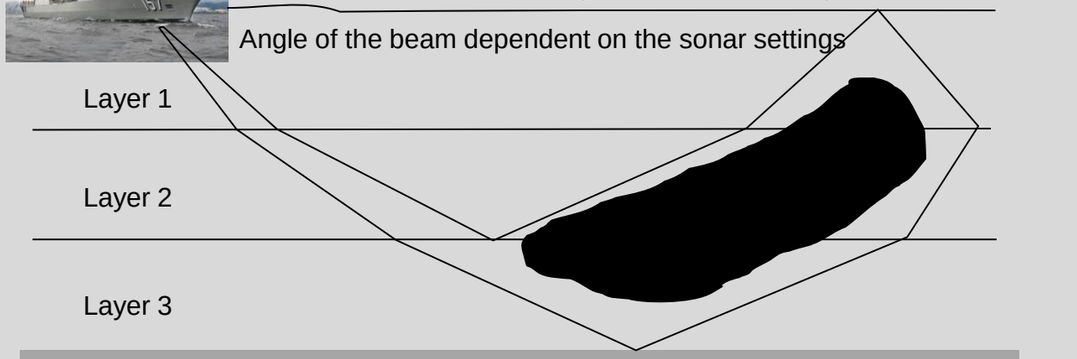


ANZAC CSSim Capabilities

- **World and Environment**
  - Landmass simulation for Radar, Electronic Support Measures (ESM), Gun and Infra Red Search and Track (IRST)
  - Underwater Ray Path and sea floor type
  - Simulation of the Ownship kinematics
  - Simulation of other vehicles friendly and hostile
  - Weather effects to modify Radar pictures



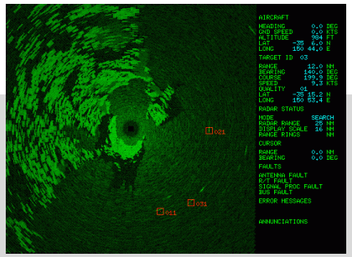


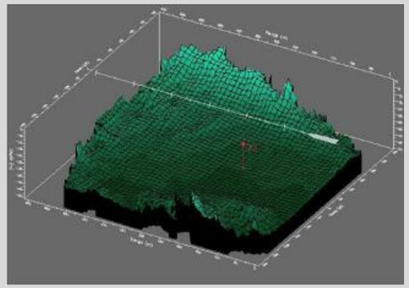


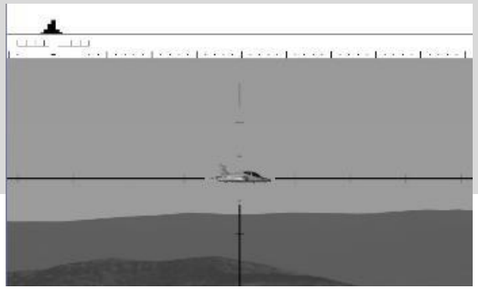
Bottom – material determines the reflection or absorption

ANZAC CSSim Capabilities

- **Sensors Simulation**
  - Radars: SPS-49, CEAFAR Phased Array, Identification Friend and Foe (IFF), Navigation and Fire Control
  - Sonar: Spherion, Mine and Obstacle Avoidance Sonar (MOAS) and Under Water Telephone (UWT)
  - Infra Red Search and Track (IRST)
  - Electronic Support Measures (ESM)
  - Automatic Identification System (AIS)
  - All Navigation sensors including Inertial and GPS



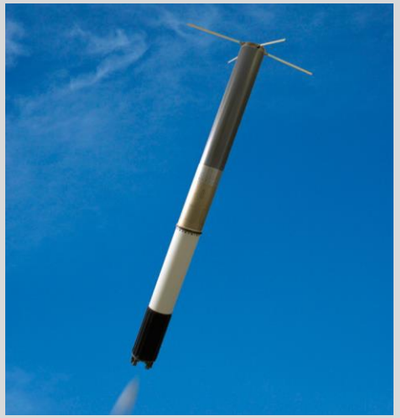




ANZAC CSSim Capabilities

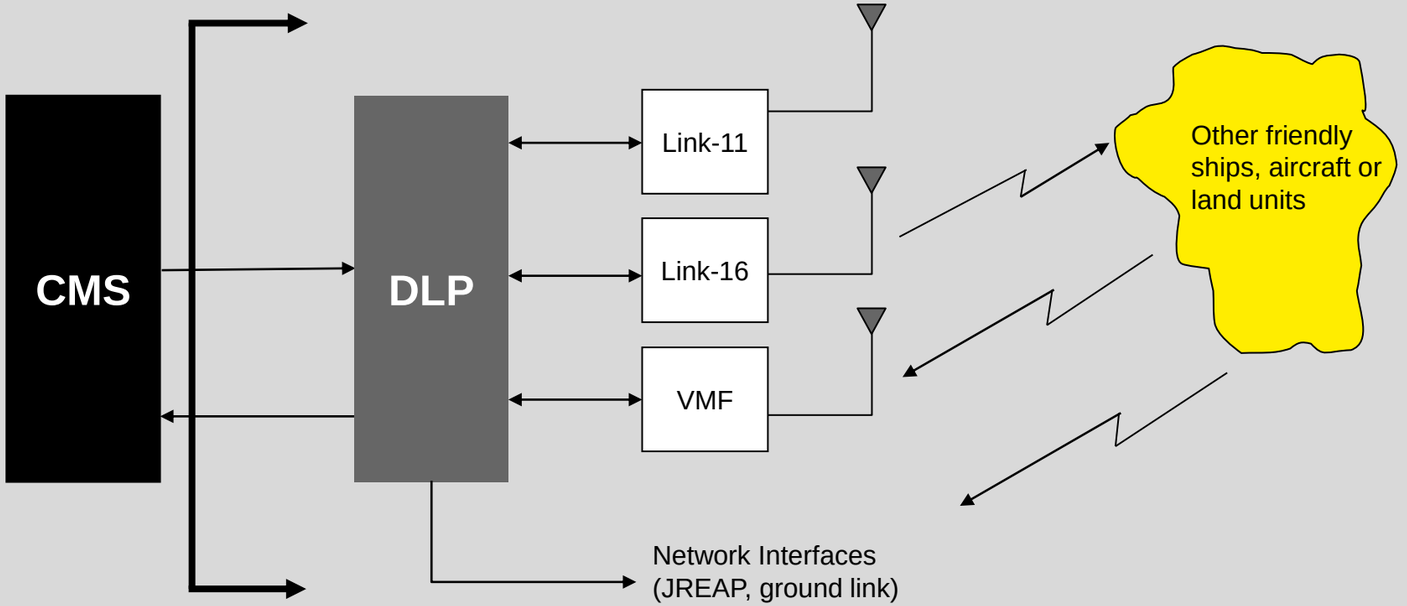
- **Weapons Simulation**
  - ESSM
  - MK45 Gun
  - Harpoon
  - Torpedo

- **Decoy Simulation**
  - Nulka
  - Nixie
  - Chaff



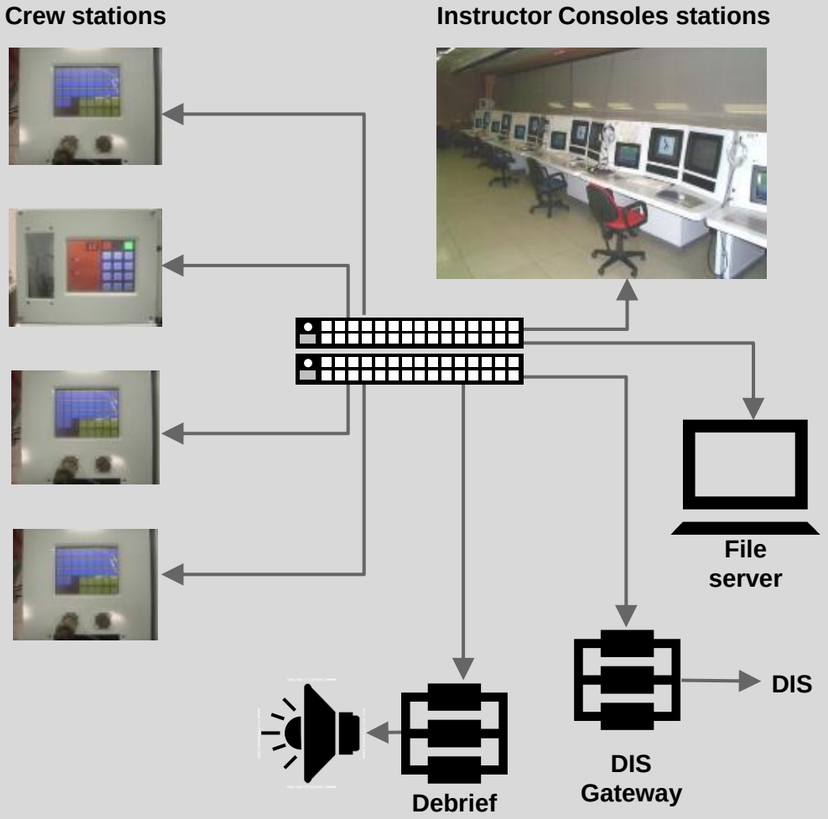
ANZAC CSSim Capabilities

- **Multi-Link Simulation**
  - SIMPLE to allow communication between simulators
  - LINK Neutral supporting:
    - Link-11
    - Link-16
    - JREAP
    - VMF



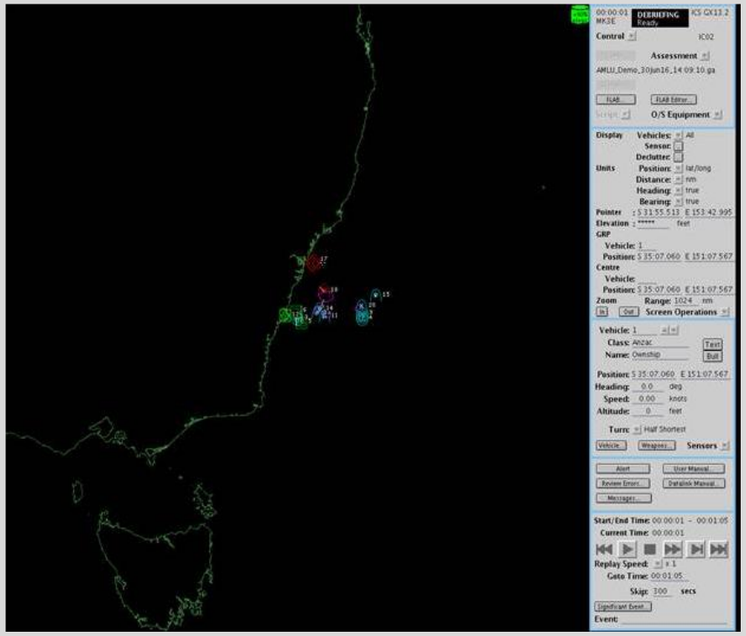
ANZAC CSSim Capabilities

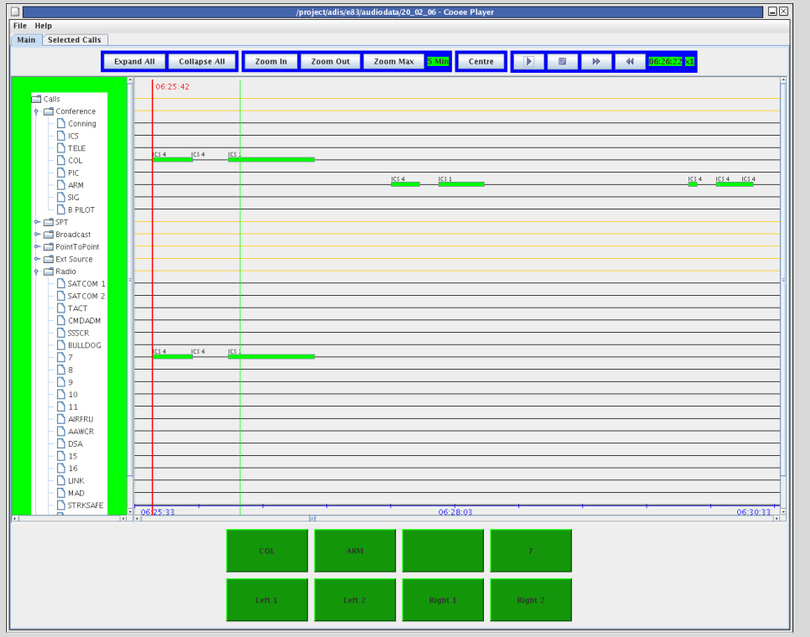
- **Voice Comms**
  - Internal Ship Communications
  - External Radio Communications via DIS
- **Support functions**
  - DIS Gateway for adding and removing vehicles as well as radio voice communication to/from simulators
  - Live Track Interface
  - Sound Effects
  - File Server
  - Start and Restart Scenario Controller
  - Visuals Models and Generation
  - Lesson Plans
  - Generation of Fault Injection within the simulator
  - Error Injection in messages sent to the CMS



ANZAC CSSim Capabilities Cont’d

- **Debrief (After Action Review)**
  - Tactical Replay (Play, Pause, Fast Forward, Fast Rewind)
  - Voice Communication Replay
  - Training Assessment to assist RAN for the Crew Training Need Analysis Assessment





ANZAC CSSim Hardware configuration

The latest permanent Fit ANZAC CSSim run on 2 x 1U Rack mounted Deltacom SuperServer 5018GR-T built with:

- 1 x Intel® Xeon® processor E5-2697A V4 2.6Ghz 16 Core
- 1 x 32GB RAM
- 1 x 4 Ports 1Gb Ethernet
- 2 x Graphics Cards Gigabyte GTX 1050 Ti
- 2 x SSD 960G 2.5” SATA3

Limitations

- The ANZAC CSSim does not provide the level of fidelity to conduct e.g. Sonar or Radar Operator Training. This type of training is usually provided by the supplier of the equipment.

Evolutions

- New Sonar Displays to be developed following upgrade of the Ship Fit Sonar Displays
- New CEA Long Range Air Search Radar (LRASR) to be implemented following upgrade of the legacy Ship Fit SPS-49 LRAS Radar
- The Mobile On Board Training System (MoBOTS) is already been deployed on some ships and going to be extended as a permanent On Board Training System (OBTS) on all 8 ANZAC Frigates
- The ANZAC ESM Simulation is going to be used by the Submarine Training School at HMAS Stirling to be integrated for Command Team Training using an HLA interface and to allow up to 8 operators to be trained in a Class Room Training
- Similar Combat System Simulation architecture will be used and delivered to support the Landing Helicopter Dock (LHD) Command Team Training

- Introduction of Artificial Intelligence capability to provide automatic control (tactical and/or strategic) of vehicles in the game reacting to the conditions in the game
- Introduction of Voice recognition and synthesis to control the game or to communicate with sensors or weapons which requires voice to operate

Testimonials

- Lieutenant Commander Andrew Erven, from the RAN Sea Training Group stated:

  “The simulated environment provided by MOBOTS is sufficiently realistic to allow more complex and intense training that is gaining higher quality results. The ship’s company are now able to progress through the unit readiness workup process faster, in particular with Air Warfare and Anti-Ship missile defence training. We have therefore been able to reduce the total time of a workup which has saved the Navy sea days and money”.

- Philip Springer, Simulation Co-ordinator, DXC commented:

  “While working onboard during a simulation, the senior operations room supervisor mentioned the exercises are so realistic and asset rich which often can’t be duplicated at sea. He had warned operation room staff they may be bored during the following training week at sea.”

Any question?

Thank you!

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