



SUBMARINETRAINING

**SCTT – SUBMARINE COMMAND TEAM TRAINER
FOR NAVAL SUPREMACY**

PASSION FOR **TECHNOLOGY.**

 **RHEINMETALL**

INTRODUCTION

The Submarine Command Team Trainer will provide training on command team level, operational level and operator level covering all vital functions in the CIC of the submarine. The scope of training includes:

- Mission planning
- Considering various environmental and scenario conditions
- Use of sensors
- Special emphasis on the main sensors of the submarine (sonar and periscope)
- Assessment of target signatures (fingerprints)
- Tactical picture compilation
- Assessment of tactical situation
- Decision making
- Internal communication (subteams and operators, instructor)

The complete functional chains for the operation of sensors and weapons are realized with highly sophisticated sensor- and weapon simulation models and a replica implementation of sensor- and weapon HMIs.

SCTT CONFIGURATION

- Replica of the submarine environment
- Integrated original equipment and/or Integrated equipment replicas or re-hosted software
- Simulation of sensors and equipment
- Command & control
- Sonar sensors (passive, active, intercept)
- Non acoustical sensors (Radar, ESM, Link)
- Periscope
- Communication
- Navigation, ship control
- Weapons (torpedoes, missiles, mines)
- Torpedo counter measure
- Exercise control
- Briefing/Debriefing

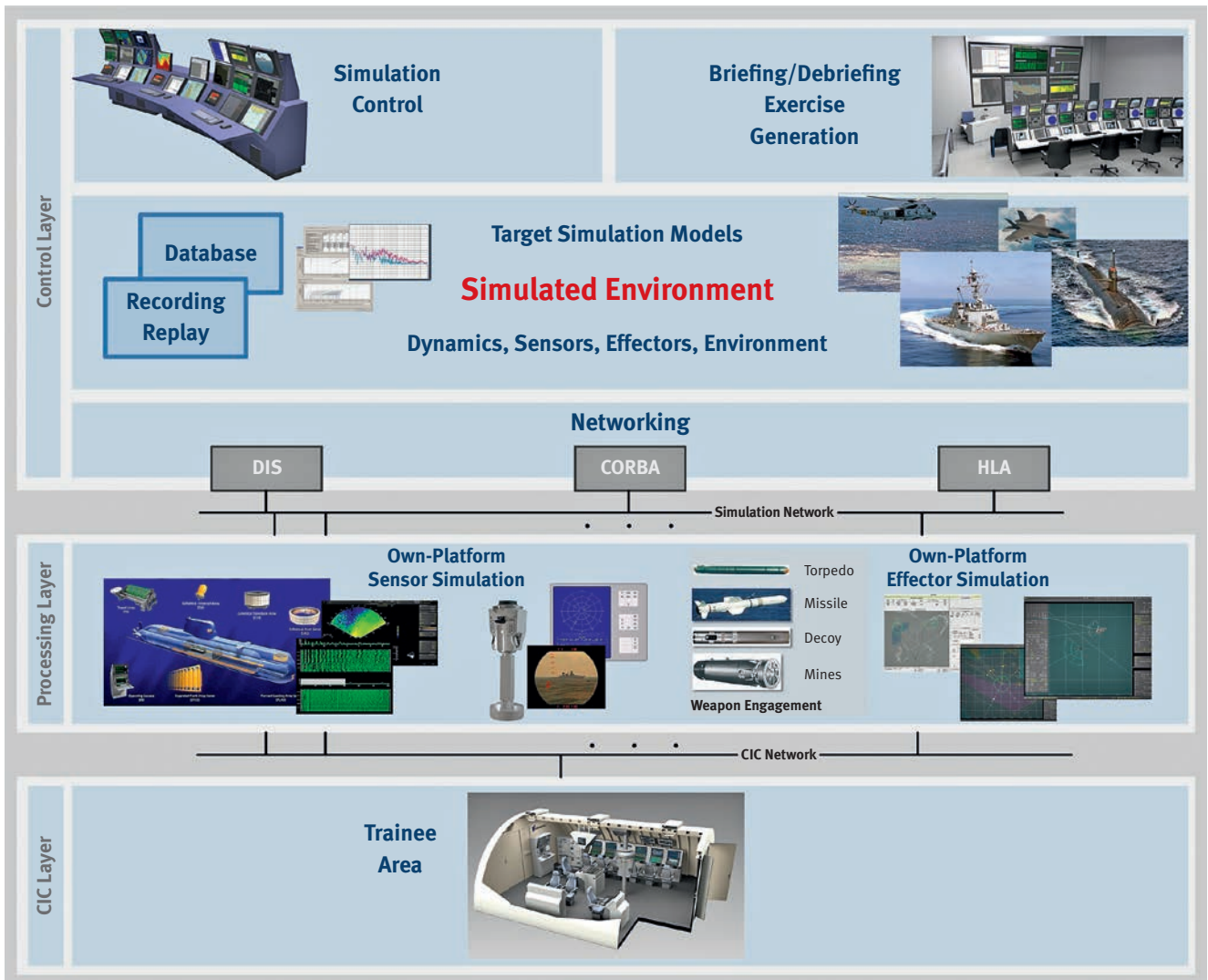


SCTT ARCHITECTURE

The **SIMULATION CONTROL** layer is responsible for the preparation, control and replay of an exercise. While the operation of targets, target sensors and weapons is controlled by instructor operations, the own ship and all own ship sensors and weapons are directly operated by the training crews in the CIC cubicle.

The **SIMULATION PROCESSING** layer contains the software simulation models for the simulated objects and devices e.g. sonar, radar, etc. Each simulation model calculates output data for display generation, acoustic or tracking data, taking into account scenario objects, environmental conditions and of course the signal processing of the simulated device.

The simulated data are presented at the assigned operator mock-up consoles in the **CIC EQUIPMENT** layer. Operator settings which may have effects in the simulation model are transferred via LAN to the related objects in the simulation processing layer.



Auditorium & Debrief

SONAR SIMULATION

The sonar simulator (SISO) generates the typical underwater noise scenario. The sonar noise of the following hydrophones arrays will be simulated:

- Cylindrical Array
- Sonar (CAS)
- Flank Array Sonar (FAS)
- Passive Ranging Sonar (PRS)
- Intercept Passive Sonar (IPS)
- Active Sonar (AOS)
- Own Noise Analysis (ONA)
- Towed Array Sonar (TAS)
- Obstacle Avoidance Sonar (OAS)

Main purpose of the sonar equipment is the surveillance of sea areas and passive and active detection of contacts. Furthermore, several signal processing methods permit tracking, measurement and analysis of detected targets.

DETECTION

By means of the sonar sensors, radiated target noises and intercept pulses are detected over a large frequency range. The broadband energy as well as the spectrum of the incoming signals are analyzed and are displayed on the screen of the assigned MFC consoles in the CIC. Furthermore, the sonar signals are made audible via loudspeaker by means of the audio channel.

TRACKING

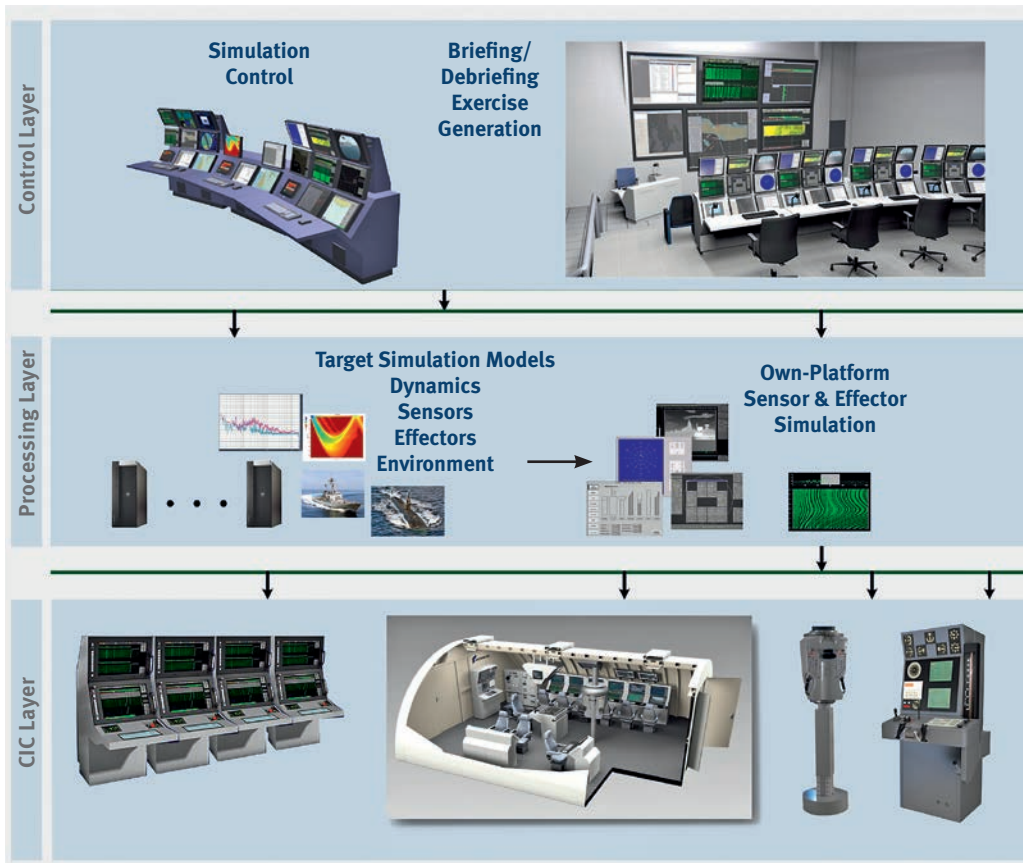
Contacts will be tracked automatically to get bearing information. The sonar internal track management automatically associates ATT channels to contacts and is responsible for track handling in critical and non-critical sonar situations. Data transfer to Command & Control is provided for all ATT channels.

ANALYSIS

By means of the noise analysis function, the DEMON and the LOFAR spectrums of selected ATT channels can be analysed and the results are displayed on the assigned MFC consoles. The sonar processing modules simulate the complete functional chain of the signal flow.

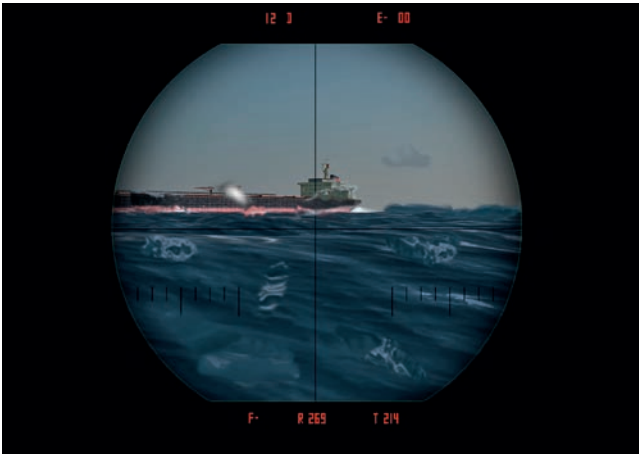
For each sensor the main sonar sections consist of the following simulation modules:

- Sonar Basic System, including the noise generation of all contacts and target and the own ship
- Sonar Propagation Model based on SeaSnap
- Sonar Ambient Noise
- Sonar Signal Processing
- Sonar Display Generation
- Sonar Audio Processing



FURTHER SIMULATIONS MODULES ARE

- ESM Simulation
- Radar Simulation
- Periscope and Optical Mast Simulation
- Link Simulation
- Command & Control Simulation
- Weapon Simulation
- Ship Control Simulation
- Navigation Simulation
- Communication Simulation



The high fidelity visualisation of the latest generation of the Rheinmetall Electronics image generator 'DISI' guarantees a most realistic representation of the current situation.



Command & Control Simulation includes:

- Contact Association
- Target/Track Management
- Target Identification
- Multi-Sensor Fusion
- Target Motion Analysis
- Tactical Situation Compilation
- Tactical Navigation
- Threat Analysis

GENERIC SYSTEM CONCEPT

In order to provide a cost effective and future orientated system approach, RME provides a PC-based commercial-off-the-shelf (COTS) system architecture.

Instead of stimulating real on-board equipment, which requires dedicated and expensive signal generators as well as extensive on-board devices, a selection of typical front panels are displayed on the screens of multifunction display consoles.

This modern generic device emulation approach provides superior advantages:

- very cost effective
- very modular
- very flexible
- easy future upgrades for new platforms, sensors or weapons

Most SCTT tasks are highly context dependent. This implies that training on the SCTT will be scenario-based.

Scenarios are training environments that comprise of naturally occurring submarine warfare events.

Realistic combat scenarios can be created and run in real-time, allowing sensor operators to interact and respond in a simulated environment. Instructors can monitor the progress of the trainees, intervene and change the scenario in real-time.

Each console within the CIC cubicle is configured for an operations room role, for example as sensor operator, command role or weapon operator. In team training mode, a cubicle will allow the full interaction of different CIC roles, allowing threat evaluation and assessment, weapon assignment and weapon engagement.

The particular configuration to use during an exercise will be defined during exercise preparation and can be stored for later use in the database.



THE REAL CIC APPROACH

- Replica of the submarine environment
- Integrated original equipment and/or Integrated equipment replicas
- Simulation of sensors and equipment
- Command & control
- Sonar sensors (passive, active, intercept)
- Non acoustical sensors (Radar, ESM, Link)
- Periscope
- Communication
- Navigation, ship control
- Weapons (torpedoes, missiles, mines)
- Torpedo counter measure
- Land-based test facility
- Maintenance training
- R & D



BENEFITS OF REAL CIC APPROACH:

- Real Software and Hardware as on board
- No differences except simulated parts (wet end antennas)
- Real Sensor Signal Processing SW/HW (Sensors are stimulated)
- All Interfaces to on board components as On Board
- All Interfaces between On Board components as in the real system
- Simulator/Test configuration is not affected by HW/SW updates



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