

## DOLPHIN simulation software

MARIN has been an independent and innovative service provider for the maritime industry since 1932. Our services incorporate a unique combination of simulation, model testing, full-scale measurements and training programs. MARIN's goal is to bring these activities closer together. The DOLPHIN simulation software is one of the results.

### Purpose

DOLPHIN proceeded from in-house developments and it is the successor of MERMAID simulation software. DOLPHIN is designed for interactive simulations of many types of nautical operations. Due to its open and scalable architecture it can be used for Full Mission Bridges or smaller simulator set-ups with its most compact form on a single laptop, for example for on board use. In addition, DOLPHIN can be used as an engineering tool (eDOLPHIN), bridging the gap between engineers and operators.



### Simulation tool

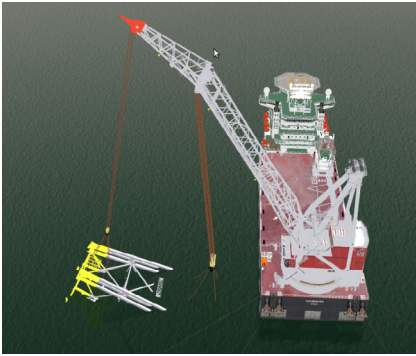
DOLPHIN is used for nautical safety studies and trainings such as:

- Ship-handling operations:
  - Manoeuvring with tugs, lines, winches, bollards
  - Seakeeping in various challenging environmental conditions
  - Nautical safety and operability studies
- Offshore operations
  - FPSO offloading (tandem or side by side)
  - Anchor handling
  - Float-over operations
  - Heavy single or dual lift operations
  - Mooring buoys (BTM, STP and SPM)

The great benefit of DOLPHIN is that it provides maximum flexibility for inserting and controlling objects (such as ships) in scenarios, even during simulation, due to its HLA based architecture. Also repositioning (multiple times) is incorporated for time effective use during trainings.

### Engineering tool

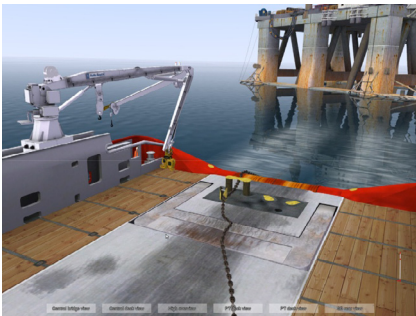
Over the past years MARIN has migrated its engineering calculation tools into MARIN's eXtensible Modelling Framework (XMF) platform. The result is that different XMF based tools can be integrated in one another, functioning as one software tool. This means, for example, that when MARIN's multi-body time domain simulation tool aNySIM XMF and DOLPHIN are integrated in one and the same simulation framework, conceptual studies can be approached from both an engineering and an operator perspective. In short, the aNySIM calculation can be simulated real-time on the DOLPHIN simulator. This is what we call "Bridging the gap".



### Main software components

DOLPHIN consists of three main layers:

- Full 6DOF hydrodynamic engine (XMF based calculation kernel)
- Flexible middle layer (HLA)
- Main components of the outer layer:
  - Visualisation
  - Instructor Operator Station (IOS)



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Once the design is completed, a Full Mission Bridge can be used for training of the operations and fine tune the operational procedures, followed up by Bridge Resource Management (BRM) course.

### Full 6DOF hydrodynamic engine

In nautical simulations the mathematical model of the ship is of major importance. Its quality highly determines the outcome of a research/design project. In training projects, the versatility of the model and the mathematical integrity are important in order to present realistic manoeuvring characteristics in all situations.

Within DOLPHIN a wide range of ships can be modelled with corresponding seakeeping behaviour and controls. The models are based on extensive research of MARIN into the field of ship hydrodynamics and port and waterway design. The ship models are six-degrees-of-freedom using the XMF calculation kernel. It takes into account the influence of all external effects like wind, waves (first-order motions, wave drift), tidal currents, shallow water, bank suction, ship-ship interaction, tug and berthing line forces, collision forces etc. The models are water depth/draft dependent.

### High Level Architecture (HLA)

HLA is an interoperability standard for distributed simulation used to support analysis, engineering and training in a number of different domains. HLA serves as the middle layer of the DOLPHIN simulation framework. Through this middle layer the Dolphin simulation platform is able to interact (i.e. communicate data and synchronise actions) with other computer simulations. One can think of offshore ROV and crane simulators, but also aircraft and combat simulation systems.

### Visualisation

Visualisation plays an important role in live simulations. The Dolphin simulation technology integrates with a high-end, modular visualisation technology. Being completely modular in set-up and configuration, it can be used successfully on small, medium and large bridge simulators by adding visual channels according to the client's needs.

Note: All 3D pictures in this leaflet are screenshots of the actual visualisation during simulation.

### Instructor Operator Station (IOS)

The IOS is a Windows based intuitive, user friendly interface. Basically, it consists of a 2D area view that uses genuine ENCs and an ECDIS-kernel and a set of control GUIs for creating, monitoring, controlling and debriefing the simulation. This modular set-up gives the instructor the ability to obtain an immediate situational awareness and allows for modifying essential elements such as ships, lines, winches, wind, wave and current fields as well as the weather in a straightforward manner.

Any of the parameters, such as line forces, speed, UKC or otherwise, can be put into a time graph for better monitoring over a longer period. This can be done during run-time and serves for debriefing purposes as well.