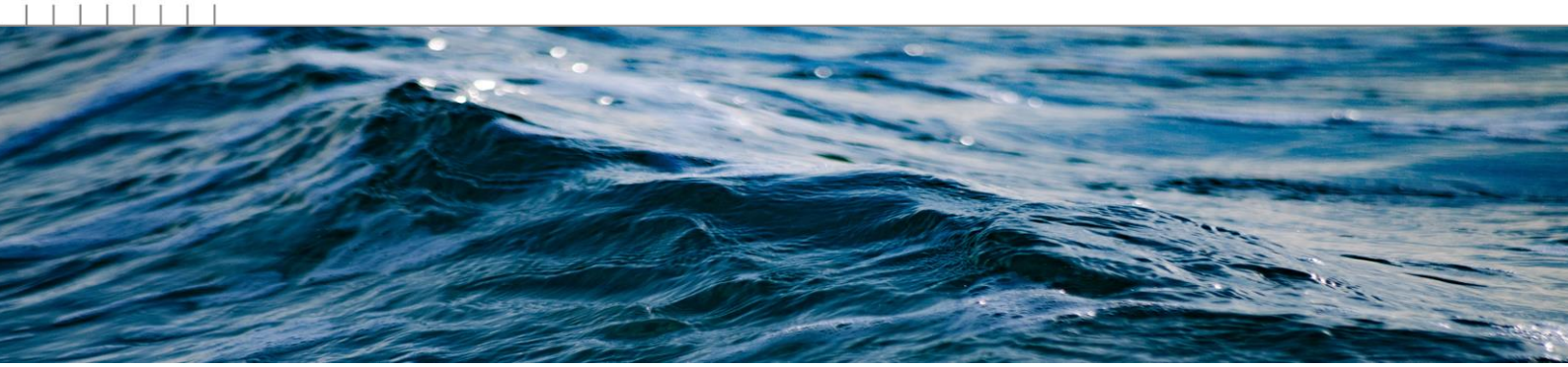


aNySIM XMF

Time Domain Simulations for Ships and Offshore Vessels

Available modules

At present the following modules are available in aNySIM XMF:

- Linear and non-linear hydrostatics
- Coefficient based current loads and wind loads
- Hull manoeuvring models (slender body theory, cross-flow drag theory, coefficients-based series)
- Propellers, rudders, PODs and thrusters
- Linear and non-linear 1st order wave forces
- Linear 2nd order wave forces
- Wave radiation (including hydrodynamic interaction between bodies at zero speed)
- Morison loads
- Spring lines, catenary lines and lumped-mass lines
- Winches, Fenders, and Joints
- DP controllers
- Kalman filter

Time domain simulation tool

aNySIM XMF is a time domain software that simulates the motions of both stationary offshore vessels and sailing ships. aNySIM computes the motions of these vessels resulting from non-linear hydrodynamic and mechanical loading. Using aNySIM XMF, engineers can analyse and optimise their designs for:

- Operability (such as mooring performance, heavy lift operations, dynamic positioning, at terminals, on-board safety and comfort)
- Manoeuvring and sailing performance
- Safety and survivability in harsh weather

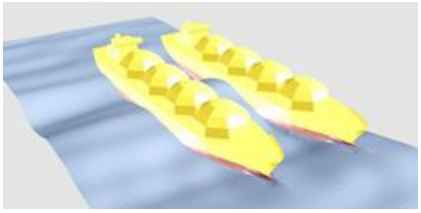
Maritime contractors, shipyards, engineering consultants, energy companies, and certification societies use aNySIM XMF. MARIN uses aNySIM XMF for engineering studies as well as simulator studies (in real-time).

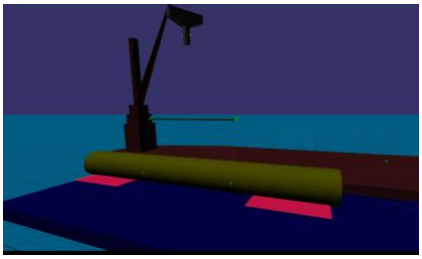
The modular structure of aNySIM XMF makes it easy to combine different functionalities. In this way, you can model simple to complex configurations. Typical applications:

- Turret moored FPSO in changing weather conditions
- Offloading from a CALM buoy
- Lifting of a jacket structure with a crane vessel keeping position by using a Dynamic Positioning (DP) system
- Monopile installation with a motion compensated pile gripper
- LNG bunkering of a cruise vessel
- FLNG on a soft yoke in short crested wave conditions
- Operability assessment of a ship sailing in wind, wave and current
- IMO manoeuvres: turning circles, zig-zag, crash stops
- Harbour manoeuvring with and without tugs' assistance
- Navy assessment: turn on the spot, turn from rest, dynamic positioning, track and course keeping
- IMO intact stability: Parametric roll, weather criteria, loss of stability, broaching, extreme accelerations

Documentation and user guidance

The modular design of aNySIM XMF is a key feature of the software. Since aNySIM XMF is an engineering tool, it focusses on providing an optimal workflow for engineers as opposed to a nice graphical user interface. This workflow is facilitated through extensive documentations and tutorial cases. Finally, a responsive team of expert users at MARIN allow new users to get their simulations up and running.





Input

Input parameters (example):

- Geometry, inertia and stability
- A (multi-body) hyd-file resulting from diffraction flow calculations
- Wind, wave and current
- Method for station keeping

Output

Time traces and basic statistics for different properties, for example:

- vessel motions, velocities and accelerations
- mooring loads
- fender forces

For more information contact MARIN:
Email anysimsupport@marin.nl

Extensible Modelling Framework (XMF)

aNySIM XMF is part of MARIN's Extensible Modelling Framework (XMF). XMF is a C++ software toolkit on which all MARIN's fast-time and real-time simulation software is based.

The XMF system reads the model from the file, loads the related dynamic content libraries and starts executing a fast-time, or scaled wall-clock time simulation. The XMF core libraries focus on reusability, extensibility, I/O and Newtonian dynamics. The shared computational core of XMF makes it easy to switch between a fast-time engineering study and a real-time operational training on the bridge simulator.

Computational approach

The mathematical model is based on a time-step solution of the system of coupled differential equations of motion. Vessel specific results from linear diffraction calculations, consisting of frequency dependent wave forces, added mass and damping are typically used to model the hydrodynamics. The impulse response method is then applied to determine the time domain response. Other elements such as rudders, propellers, mooring lines, fenders, thrusters, etc are modelled in time domain. Depending on the application, one of the available generic solvers is used to solve the equations of motions.

User defined scripting

aNySIM XMF offers an interface through which external subroutines can be called. In this way, the user can extend the functionality of aNySIM XMF by developing additional modules in other programming languages, such as LUA or Python. This feature allows prototype development or coupling to other software.

Verification, Validation and Benchmarking

Reliable physics modelling is the main objective of aNySIM XMF. Validation and verification are an essential part of the development. aNySIM XMF is developed by implementing the functionalities systematically making sure that every step is verified and benchmarked against analytic solutions. Furthermore, a unique benefits of aNySIM XMF is its validation against high quality model test, full scale trials and other simulation software. This feature is not easily found in other competing software.

aNySIM*pro* and aNySIM User Group

A project-based version of aNySIM XMF (called aNySIM*pro*) is available. In this case, MARIN prepares the initial set-up of the project-based aNySIM*pro.* Further information about the possibilities can be found in the aNySIM*pro* leaflet.

Often, after a project-based aNySIM*pro*, the user decides to become a member of the aNySIM User Group. Members of the User Group express the intention to be long-term users. During User Group Meetings, experience is exchanged and future developments are discussed. Members of the User Group have a voice in the course of the developments. Current members are Bluewater, GustoMSC, Heerema, Royal Haskoning DHV, Saipem and Shell.

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