NAVAL GROUP

NAVAL & DEFENSE

From Document-Driven to Digital-Native Engineering

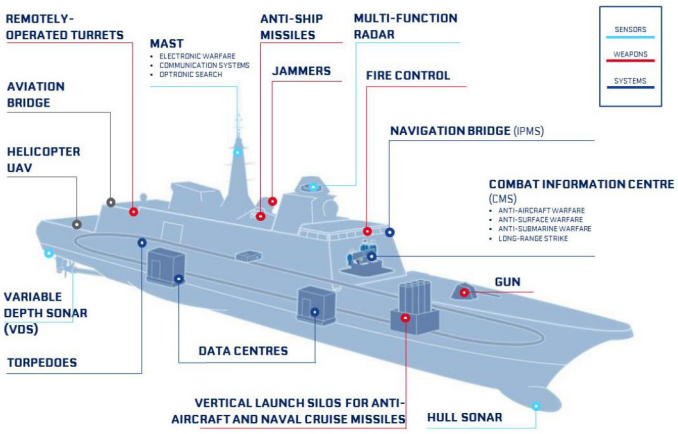
> *Capella's open architecture and technology has enabled us to implement digital continuity between our specialists in various engineering fields.*

Context

As an industrial prime contractor, designer, and integrator of combat systems and arm ships ranging from corvettes, to aircraft carriers and ballistic-missile nuclear submarines, Naval Group is a leading international player in the field of naval defense. With 16,000 employees working for 50 client navies around the world, the company faces the challenge of keeping pace with its increasingly complex and constantly evolving systems.

New business capabilities must be continuously integrated while ensuring a consistent system performance. The incorporation of new technologies must be managed effectively to minimize technical debt over the 45-year lifespan of a warship. The end-product must also be optimized to reduce its environmental footprint throughout its lifecycle by reducing raw material and energy consumption. Additionally, interoperability must be enhanced to facilitate collaborative combat operations.

Confronted with these constraints, Naval Group must minimize the risk of discovering performance and design issues late in the construction process. The company's approach to addressing these challenges is to move from a document-based engineering to a digital-native engineering, by enabling short-engineering loops between multiple actors based on output from simulated system behaviors.



Guillaume LELEU

Guillaume Leleu is the Corporate Manager for Methods and Tools at Naval Group, responsible for both systems and system of systems engineering. He has over 9 years of experience in the Defence industry, improving Systems Engineering techniques, methods, and tools by coupling them with simulation. He is also a seasoned enterprise architect with a strong background in driving business transformation and a deep expertise in services, microservices, and stream-based oriented architecture.

Solution

Naval Group has established a model-driven engineering approach based on the MBSE tool Capella. This allows systems engineers to clearly describe ships for mutual understanding among all the parties involved. The description is housed in a digital model that provides views ranging from operational and system needs to logical and physical solutions, in accordance with the Arcadia methodology.

Thanks to Capella's open-source license (EPL), Naval Group has been able to create a customized product distribution that extends the default version available on the tool's website. This distribution integrates various open-source add-ons, such as those for HTML generation, Python scripting, system to sub-system transition, and cybersecurity, as well as new add-ons developed by Naval Group. Some of these new add-ons, such as those for cross-level analysis and CSV conversion, have been contributed to the Capella ecosystem through Labs for Capella, while others, such as exports to Modelica and Neo4J, remain the property of Naval Group.

The Capella tool is at the core of the simulation-driven engineering platform, acting as a single source of truth that uses standards to interoperate with different types of simulation tools: operational (overall performance, product line and variants, system of system optimisation, etc), functional (early validation of the system design, SiL and HiL early validation, etc), dysfunctional (safety analysis), and multi-physics (mechanics, fluids, acoustic, etc).

Result

The capability to quickly deploy Capella combined with an easy learning-curve and effective interoperability, have fostered its adoption in Naval Group's R&D organization. This relies on several factors: the embedded Arcadia method that guides the users, the productivity tools that hide complexity, the open architecture and technology that enables the tool's customization and integration, and an affordable cost that makes it available to anyone.

The solution facilitates the collaboration among field specialists, systems engineers, and partners by providing a shared input for understanding the system's specifications and purpose. Additionally, traceability with requirements allows for design justification.

Furthermore, the use of digital models and integration with simulation tools allows for more simulations to be conducted earlier, resulting in improved design and fewer issues detected at a later stage.