

# Simulation Based Design and Virtual Prototyping

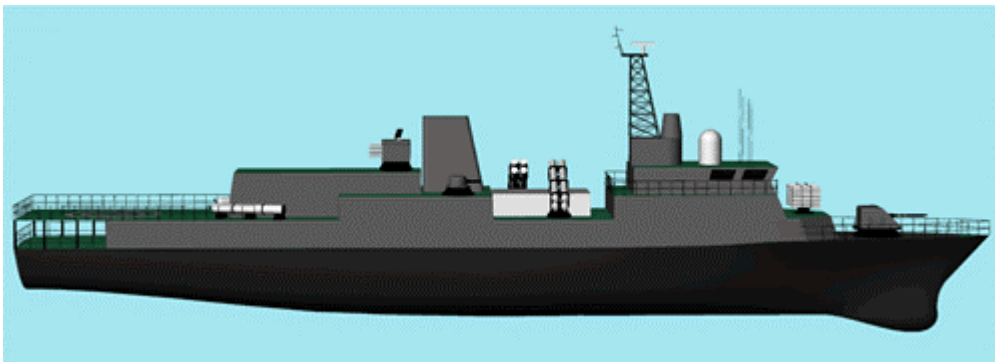
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In 1997, recognizing the necessity of increasing effectiveness of multi-nation operations at sea through interoperability and harmonization of operational procedures, a NG6 Specialist Team was mandated to establish guidelines for progressive investment, development, re-use and interoperability of virtual warship prototypes, in order to reduce costs and timescales, to increase levels of confidence during design and to achieve optimized capability. The ST comprises 13 NATO/PfP nations, among them Bulgaria, the only partner from Eastern Europe, and BSHC was authorized by Bulgarian government as a national representative. The SBDVP project appears as an important item in the National Program for integration within NATO structures.

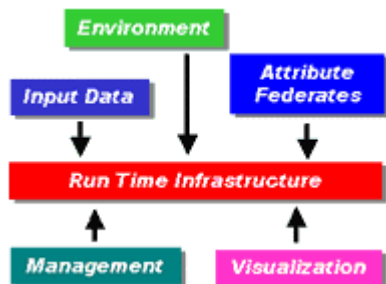


**Modeling and simulation** can offer significant savings in time and resources over life testing, revolutionize traditional design evaluation methods and overcome a number of safety, environmental and security constraints. The underlying concept for using simulation, modeling, analysis and visualization in an integrated way is that of the "**Virtual Prototype**", which is further used in the procurement process as a basis for the **Simulation Based Design**. It requires verified capability to model system geometry, attributes and performance as well as operating environment, to support design management and human interaction with design.

VP is intended for further use by all stakeholders and members of integrated project teams for life-cycle management & certification, re-design, wargaming and training, thus should be based on standard techniques and procedures to allow re-use, rapid communication and visualization, to support inter-operability of geographically-distributed teams.



As a test case for multi-nation VP collaboration, modeling and simulation of helicopter landing on warship was targeted, being an unsolved problem of common interest and of military importance. Physics-based, engineering-level models were applied to describe and simulate the system components, such as ship and air vehicle, ship motion in time domain, short instance motion prediction, coupled air wake and flight dynamics, touch down and tie down processes, etc. Advanced commercial as well as government software was used in module development for distributed simulation. Complete operational scenario was narrated and implemented for different ship/heli configurations suggested by project partners, demonstrating major benefits of international collaboration.



According to distributed simulation principles, the virtual ship model consists of independent federates, exchanging data via the Run Time Infrastructure. Federation development is based on High Level Architecture (HLA), now an IEEE standard, which ensures re-use and interoperability.