



# Tool Integration

## Flexible and tailored CAE

In Computer Aided Engineering (CAE) you closely combine modeling and simulation to improve both your processes and your products. Modeling is the creation of forms while simulation is the prediction of system behavior. By utilizing Computer Aided Design (CAD) you realize suitable shape representations. By applying advanced codes of Computational Fluid Dynamics (CFD), for instance, you determine and analyze the flow characteristics for your products. Bring together your tools in a flexible CAE environment, tailored to your needs and resources, in order to enhance your productivity. The *FRIENDSHIP-Framework* is your ideal platform for coupling CAD to CFD and other tools.

## Streamlined processes: Tool Integration

In competitive design situations you often combine quite many different tools so as to understand the performance of your product completely. Typically, the designer relies on a range of systems, from spreadsheets to simulation codes. Spreadsheets may be rather simple or quite sophisticated. They capture the specific experience and know-how that your team accumulated over years. Simulation codes might be in-house developments or commercial systems. In any case you have spent considerable resources in being able to benefit from them. Furthermore, as soon as confidence is built up you would like to carry on with their usage. With the right tool for integration you will be able to do so. The

*FRIENDSHIP-Framework* is a flexible workbench with easy-to-use mechanisms for integrating diverse applications so as to streamline your processes. The *FRIENDSHIP-Framework* offers several powerful interfaces. The three most prominent interfaces are based on XML, a generic integration and Microsoft® COM, respectively.

The XML interface gives you strong handles for data exchange between the *FRIENDSHIP-Framework* and your codes as soon as input and output files follow standardized formats.

The generic integration interface supports project specific integration and can be realized and reused by the users themselves with ease and comfort. The COM interface, finally, allows the ready exchange of data between Windows applications. A prominent example is Microsoft® Excel which can be connected to the *FRIENDSHIP-Framework* in order to fill out spreadsheets and obtain calculated values automatically.

## General structure for the integration of arbitrary tools

The *FRIENDSHIP-Framework* provides you with a dedicated object structure for tool integration. Both the XML integration interface and the generic integration interface use the same general object structure but differ in the way of data exchange. All integrations consist of at least four objects you can determine: *definition, configuration, computation and results.*



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In the *definition* you can specify all possible input data for the external tool – both required and optional. Here, you define the type of an entry and, too, how often it must and may occur in a *configuration*. You can also, if appropriate, assign default values. Each entry may receive its individual documentation. Usually, you need to set up the *definition* for an external tool only once. You can then use it again and again for various projects. Owing to your comfort, you can create and maintain *definitions* directly in the Graphical User Interface (GUI). There, you may save them to XML files and distribute them to team members and customers.

*Configurations* always build on their corresponding *definition*. While you specify all possible entries in the *definition*, you determine only those entries in the *configuration* which are actually needed for a specific run. Here, you provide all input data with existing values. A *configuration* might thus be interpreted as a representation of the external tool's input file(s).

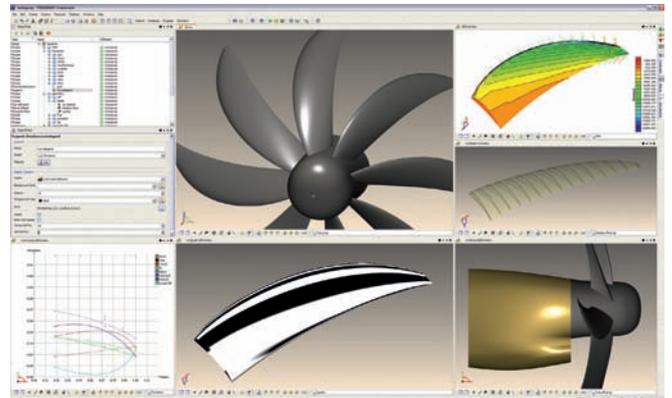
A *computation*, finally, is the actual control element for your external tool. You may set up a *computation* on the basis of a corresponding *configuration*. This requires that you determine the path to the tool's executable, for instance by browsing through the file system and selecting the relevant binary. If the external tool expects arguments with which to start you can attach them here. When carrying out a *computation* several consecutive steps are taken: the tool's input file(s) are written based on the chosen *configuration*, the tool is launched and, finally, the *results* are read and made available to the *FRIENDSHIP-Framework*. *Computations* can be triggered either manually or automatically, the latter being the prerequisite for formal optimizations.

All results computed by the external tool and offered to the *FRIENDSHIP-Framework* are handled by internal result objects. Results serve for data access and visualization. Usually, you would not directly work with result objects. Rather, you would manage data access via a computation. The respective data are presented in type specific viewers, e.g., double values are

displayed in tables, geometric data such as panel meshes are displayed in three-dimensional graphic windows. You can evaluate the relevant data quickly, professionally and efficiently.

## Tighter coupling – faster design cycles – better insight

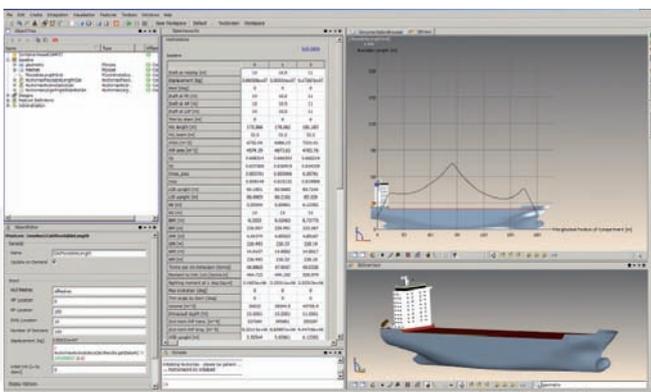
Running your tools from the *FRIENDSHIP-Framework* will put you a decisive step ahead. As the leading provider for simulation-driven design solutions, FRIENDSHIP SYSTEMS offers you a cutting-edge system for tighter coupling of tools, faster design cycles in a highly competitive environment and better insights in balancing your product performance to full satisfaction of your customers.



## How you benefit

How much effort do you spend on taking care of data transfer, finding the correct information, keeping track of design changes, identifying errors in input files and compiling results for comparison in tables? According to our experience a lot of time is lost in doing these things, queuing up the resources of your precious work force. Making use of the *FRIENDSHIP-Framework* as your individual integration environment will help you to advance your productivity. It allows you to set up your CAE flexibly, tailored to your needs and resources.

**The *FRIENDSHIP-Framework*. Better Products. Faster Processes. Higher Profits.**



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