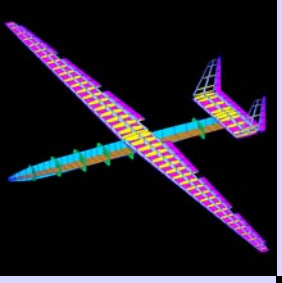
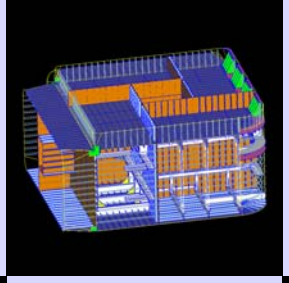
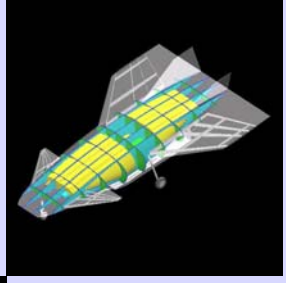
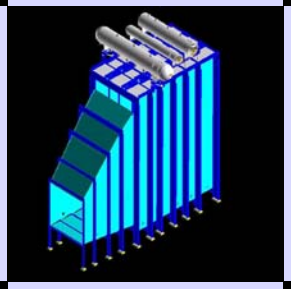
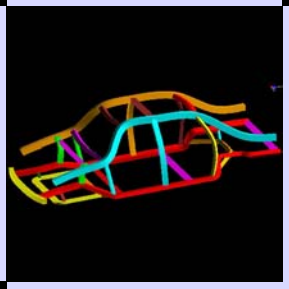
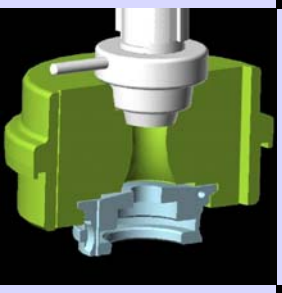
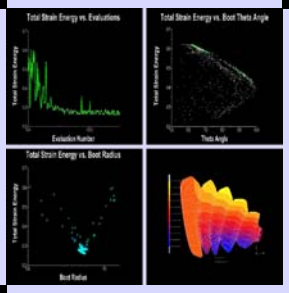
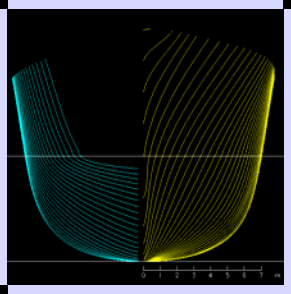
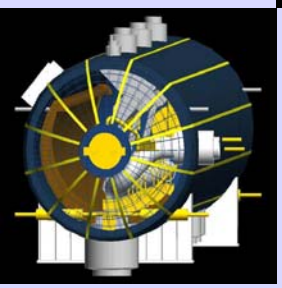








TECHNOSOFT

[*Solutions*]

www.technosoft.com

Rapid Development

[*Engineering Applications*]

TECHNOSOFT *offers an advanced object-oriented engineering framework with an underlying modeling language, the* ***Adaptive Modeling Language*** *(AML).*

Whether through products or services, TechnoSoft brings extraordinary value to its customers. Often, customers who perform benchmarking experiments determine that their TechnoSoft solutions ***reduce cycle time and cost by over 90%****, while simultaneously improving the quality of designs and the collaboration within their engineering organizations.*

Since its initial release in 1992, the AML framework has successfully been applied in the development and deployment of applications for a multitude of challenging engineering problems, including ***automotive, aerospace, marine, and industrial applications****. AML has since evolved to incorporate advanced computing technology including distributed dynamic object computing and multidisciplinary design optimization.*

AML provides an object-oriented development environment which includes a rich suite of classes, functions, and methods for ***plug-and-play*** *definition of user interfaces, geometry models, automated meshes, multi-physics analysis integration, legacy code integration, optimization, mathematical models, cost models, requirements management, detailed drawings, manufacturing plans, and operations models.*

All AML classes, functions, and methods can be customized and reused within TechnoSoft's ***robust and modular architecture****. A common syntax and consistent, object-oriented methodology is employed throughout.*

The deployment environment includes a suite of end-user oriented products.

- *The* ***AML Runtime*** *environment allows engineers to use custom integrated design and analysis environments that were compiled from the AML Development framework.*
- *The* ***Tool Integration Environment*** *(TIE) is a visual application built on AML that provides a completely graphical environment for product modeling, process integration, and design optimization.*
- **AM*Sketcher*** *is a visual environment for knowledge-based geometry modeling.*
- **AM*Opt*** *is a suite of design exploration and visualization tools that are compatible with both AML and TIE.*
- **AM*Enterprise*** *provides a complete off-the-shelf solution for managing product and process data and making it easily accessible to distributed stakeholders in the design process, including engineers, managers, accountants, suppliers, and customers.*

TECHNOSOFT
ADAPTIVE MODELING

Value Added

[*Return on Investment*]

The TechnoSoft team includes a very dedicated and innovative group of engineers and computer scientists with broad experience in a wide range of engineering domains. Our core competency is our ability to efficiently implement our customers' ***product and process knowledge*** *in the object-oriented Adaptive Modeling Language. Once this knowledge is captured, our customers are able to work at a higher level of abstraction, resulting in faster investigation of more design alternatives.*

Customer relationships with TechnoSoft often start with a relatively small ***pilot project****. These projects focus on the development of an application, in which our team of AML experts works closely with the customer's team of engineering experts on a specific product and its associated processes. Pilot projects typically last between two and six months, normally providing ample time for the customer to deploy the application and achieve a* ***positive return on investment*** *in the first year. Pilot projects are also an excellent opportunity for our customers' AML developers to build their skills by working alongside TechnoSoft.*

Top 6 Investment Areas for
Better, Faster, Cheaper Designs[1]

1. Develop techniques to support the automated generation of models at various levels of abstraction
2. Complete awareness of cost factors, supporting decision making early and throughout the design and manufacturing life cycle
3. Develop and deliver a scaleable, comprehensive product life-cycle model with enabling architecture and data structures tailorable to all sectors and integratable across all levels of the supply chain
4. Establish seamless integration of modeling systems to enable multi-discipline optimization delivering impact early in the design process
5. Establish rigorous mathematical models to analyze uncertainty, and provide validation and certification in M&S including the quantification of uncertainty in models
6. Develop object-driven data schema from which models are generated, assuring interoperability and reuse

[1] *60 professionals from 41 organizations in industry, government, and academia developed a prioritized list of investment areas for modeling and simulation for the U.S. Air Force Research Laboratory's Manufacturing Technology Division (2001).*

"Our relationship [with TechnoSoft] has resulted in *revolutionary* innovations within our domain of missile and fire control design. Most pronounced of the accomplishments of this team is our Interactive Missile Design (IMD) system, enabling us to integrate geometry, propulsion, aerodynamics, structural dynamics, thermal, guidance, and cost models, thus providing the ability to trade performance versus cost.
...The IMD system has been used...to facilitate profound improvement in our design process (over a factor of 10), and provides substantial reduction of risk and cost..."

Dr. Richard Zarda
Manager, Engineering Methods Group, Lockheed Martin Missiles and Fire Control

TECHNOSOFT
ADAPTIVE MODELING

Adaptive Modeling Language

[AML]

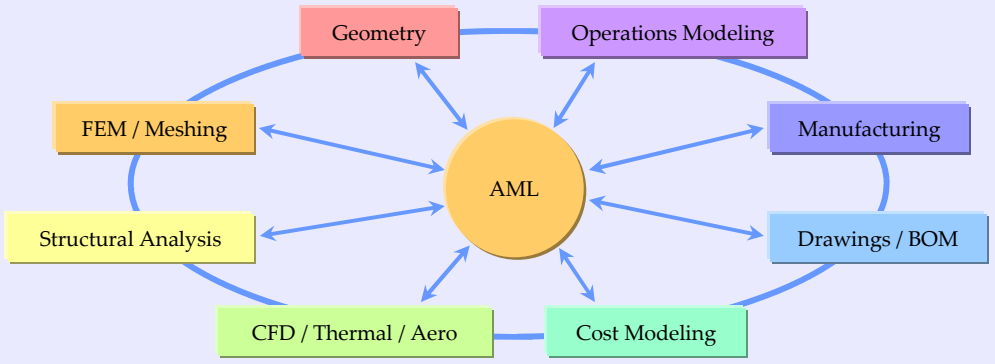
AML *is an object-oriented, knowledge-based engineering* ***modeling framework****. AML enables multidisciplinary modeling and integration of the entire* ***product and process*** *development cycle. No other commercial framework or development environment provides the full range of capabilities that AML includes out of the box.*

In the design and analysis phases, ***geometry*** *is often the center of a product's definition. AML provides a geometry-centric environment with support for both manifold and non-manifold solid, surface, and wireframe modeling capabilities.*

Computation in AML is innately ***demand-driven****, utilizing automatic* ***dependency tracking*** *between objects and properties to compute only that which is required. As a result, AML makes the most of the computing resources that are available.*

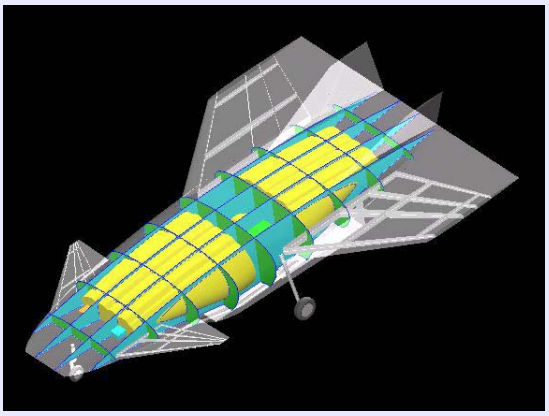
AML enables ***generative modeling****, which leaps beyond the present CAD/CAM/CAE approach to integrated design and analysis processes. In a generative modeling environment, knowledge of the engineer's tools and the intricacies associated with executing them is captured within a modeling language. This* ***empowers the engineer*** *to search a broader set of product design configurations, rather than being limited to simple parameter changes.*

AML provides methods for automating finite element modeling and ***mesh generation*** *based on either native or imported geometry, including both structured and unstructured approaches. Interfaces to pre- and post-processors and solvers such as MSC.Patran®, Nastran, ANSYS®, LS-DYNA®, and MARC® are available.*



The AML Common Computational Model.

TECHNOSOFT
ADAPTIVE MODELING



"The advanced software program called Adaptive Modeling Language (AML) offers an improved understanding of what is needed in an integrated conceptual design environment to optimize cost and reduce trial and error production to test conceptual engineering designs…

…The Adaptive Modeling Language program offers the benefit of an efficient and user friendly environment in which to develop integrated product and process designs."

Air Force Research Laboratory
www.afrl.af.mil/successstories

*A complete **mathematical modeler** is built into AML, providing access to logical operators, mathematical functions, matrix manipulation, and looping constructs.*

*Pre-defined classes are provided to quickly create custom interfaces to ODBC-compliant **databases** utilizing SQL.*

*Integration to **third-party applications** is accommodated through a number of standard methodologies, including shared memory, pipes, sockets and TCP/IP, file transfer, and foreign functions (C and Fortran).*

*Options are available within AML for import and export to industry-standard file formats, including **IGES, STEP, STL, and DXF**.*

*Built-in **XML** export capability enables a "snapshot" of the AML model hierarchy and geometry to be automatically exported to an XML file, which is viewable using TechnoSoft's **AML Viewer**. The available "Net Conference" mode enables **real-time collaboration** between distributed team members.*

*A suite of **graphical user interface** (GUI) classes is provided to allow developers to create customized front-ends for their AML applications. In addition, a visual "GUI-builder" can be used, making it easier to layout forms and controls, and assign their associated methods and properties.*

AML provides native support for multiple operating systems (including Microsoft Windows, SGI, HP, IBM, and Sun), parallel processing, and cross-platform distributed computation.

Knowledge-Based Engineering

[Modeling Framework]

TECHNOSOFT
ADAPTIVE MODELING

Tool Integration Environment

[*Process Integration and Design Optimization*]

TIE *provides a completely graphical environment for product and process modeling, integration, and optimization.*

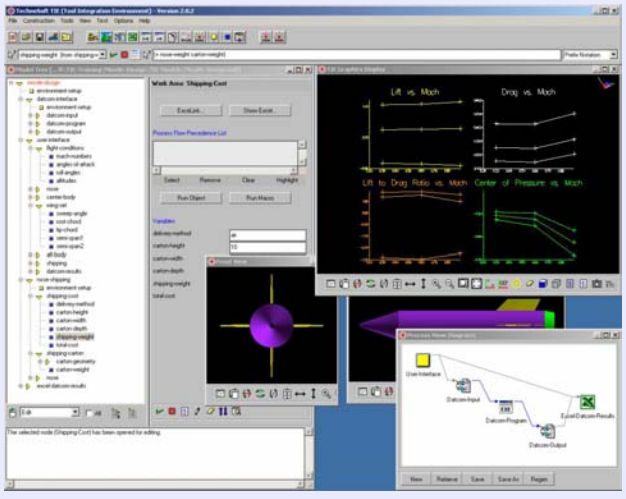
TIE includes a host of intuitive modules to make it easy to interface with common engineering tools.

- ***ExceLink*** *to interface to data and macros in Microsoft Excel© spreadsheets*
- ***VisualParse*** *to "wrap" text files for proprietary or legacy programs*
- ***ProgramLink*** *to automate execution of local or remote programs or batch files*
- ***FunctionLink*** *to run functions or subroutines in external libraries (DLLs).*
- ***CADLink*** *to interface with dimensions, parameters, and geometry in CAD models.*

Built on proven AML technology, TIE enables engineers to integrate their tools, automate their processes, perform multidisciplinary trade studies and optimization, and ultimately ***design better products, faster****.*

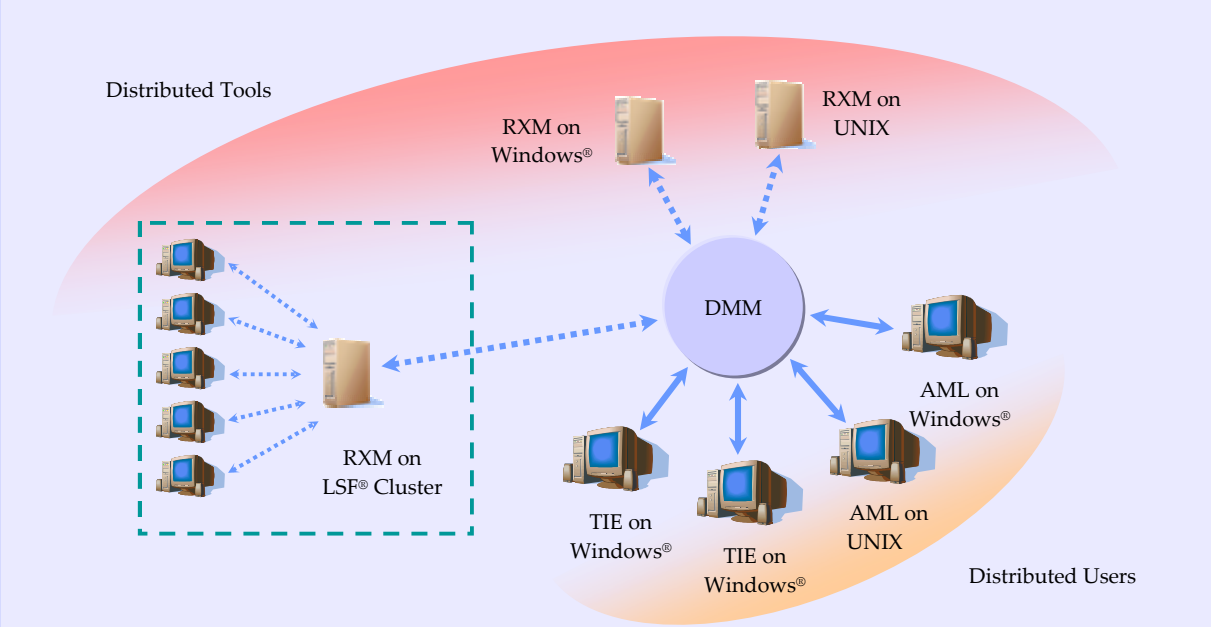
TIE is bundled with **AMOpt***, a suite of tools for optimization, probabilistic design, and design of experiments.* AMOpt *provides a variety of methods, including gradient-based optimization, genetic algorithm, design of experiments, Monte Carlo simulation, and response surface methodology, all within an easy to use graphical environment, consistent with TIE.*

TIE also comes standard with **AMSketcher***, a visual environment for knowledge-based geometry modeling, including solid, surface, and wireframe.*



The TIE user interface.

TECHNOSOFT
ADAPTIVE MODELING



The TIE distributed modeling architecture.

*Multiple TIE (or AML) models residing on distributed, disparate computing platforms can easily be linked together using TechnoSoft's Distributed Modeling Manager (sold separately). The **DMM** enables engineers to expose a selection of variables from a model over the network so that they can be interfaced with other models. When changes are made to these linked variables, the DMM automatically updates any associated models in **real-time**. This allows engineers to collaborate on design projects that span organizational or corporate boundaries without exposing proprietary information.*

*TechnoSoft's Remote eXecution Manager (**RXM**) is used to automate and control the execution of batch programs through the DMM. For example, a legacy program running on a UNIX machine can be executed by a TIE model running on Microsoft Windows®, and all of the associated input and output files can be sent and retrieved to and from the remote machine automatically. To protect proprietary or sensitive data, access to the RXM can be controlled by DMM authentication settings, and all data passed between machines is encrypted.*

*RXM and TIE can submit jobs directly to Platform Computing LSF® **computer clusters** to help take advantage of under-utilized computing power and speed up computation of high-fidelity analyses or parallelize runs of trade studies, design of experiments, stochastic simulations, or genetic algorithms.*

*TIE also provides a convenient environment for **deploying powerful AML objects**. AML developers can create generative interfaces to complex tools, and TIE users can easily link them into a TIE model in a plug-and-play fashion. For example, the parameters of an interface to Nastran can be linked within TIE to an Excel® based cost model, a file-based FORTRAN code, and a Pro/ENGINEER CAD model, and then driven using a DLL-based optimization code.*

TECHNOSOFT
ADAPTIVE MODELING

AMSketcher

[Knowledge-Based Geometry Modeling]

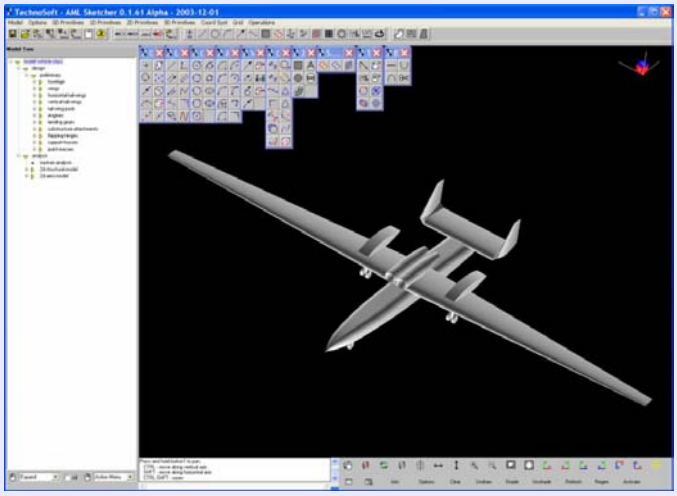
AMSketcher *is a visual application for building knowledge-based geometry models using the underlying Adaptive Modeling Language.*

Knowledge-based geometry modeling *enables engineers to embed complex intelligence within geometry models, such as rules, logic, standards, and mathematical formulas. Since* AMSketcher *is built on AML, this intelligence can even be linked to external applications, such as physics-based analysis programs.*

Parametric modeling*, which is common in CAD programs, is a subset of knowledge-based geometry modeling. As such,* AMSketcher *includes parametric modeling, and makes it very easy to define relationships between geometry features. This ensures that when changes are made anywhere in the model, all dependent features will be regenerated correctly.*

With the AML Advanced Geometry module, AMSketcher *can be used to* ***generate meshes*** *for structural and aerodynamic analysis.*

In conjunction with AMOpt, AMSketcher *is a powerful tool for* ***optimizing a product's shape*** *and configuration. Gradient-based optimization methods can be used for shape optimization, while a genetic algorithm can be used to automatically search through thousands of discrete design configurations and ultimately present a set of good alternatives to the engineer for further study.*



The AMSketcher *user interface.*

TECHNOSOFT
ADAPTIVE MODELING

AMOpt

[Design Exploration]

AMOpt *is a suite of tools for performing* ***optimization and probabilistic design*** *studies within AML applications and TIE models. Using* AMOpt, *engineers can easily quantify interactions among disciplines and intelligently search the design space. In conjunction with AML or TIE,* AMOpt *enables* ***multidisciplinary system-level trade studies*** *such as cost versus performance.*

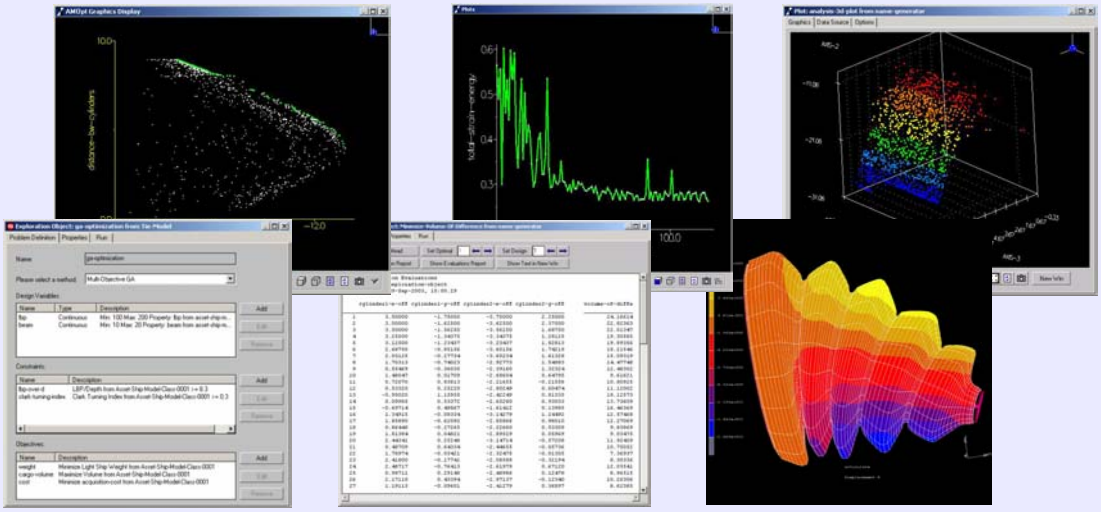
The AMOpt *suite includes:*

- *Multi-Objective Genetic Algorithm*
- *Design of Experiments (DOE)*
- *Powell Gradient-Based Optimization*
- *Nelder-Mead Simplex Method*
- *Monte Carlo Simulation*
- *Response Surface Methodology (RSM)*

In addition to these built-in methods, user-defined or ***third-party algorithms*** *can easily be plugged in via linked libraries or integrated through stand alone executables. For example, an interface to the Design Optimization Tools (DOT) library from Vanderplaats R&D, Inc. is provided with* AMOpt.

To help engineers ***visualize*** *the results of trade studies and optimizations, a complete suite of plotting classes including surface, contour, bar, pie, and scatter plots is provided.*

AMOpt *is built on AML, and therefore it is seamlessly* ***interoperable*** *with all AML applications and TIE models.*



TechnoSoft
Adaptive Modeling

AM*Enterprise*

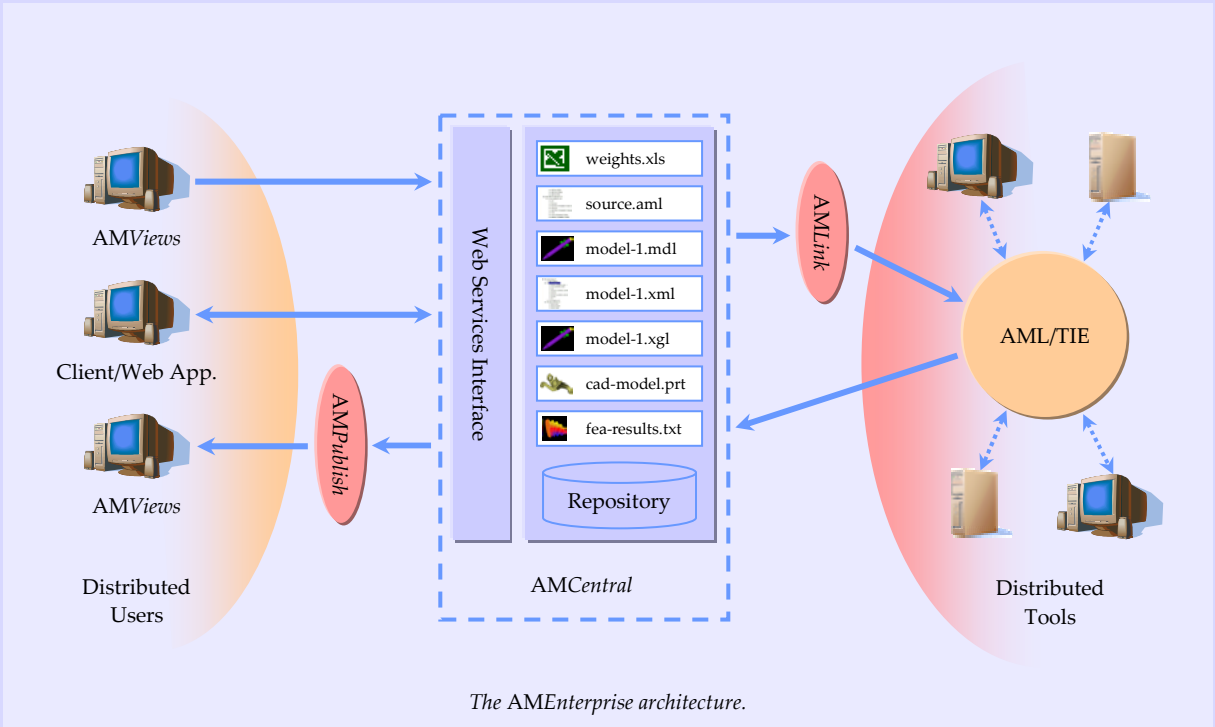
[*Product and Process Data Management*]

AM*Enterprise* *provides a complete off-the-shelf solution for managing product and process data and making it easily accessible to distributed stakeholders in the design process, including engineers, managers, accountants, suppliers, and customers.*

AM*Enterprise is an integrated suite of application tools that seamlessly link with the AML framework as well as third-party applications. This suite consists of four integral modules for managing, viewing, publishing and executing complete product engineering data models:* AM*Central*, AM*Views*, AM*Publish*, *and* AM*Link.*

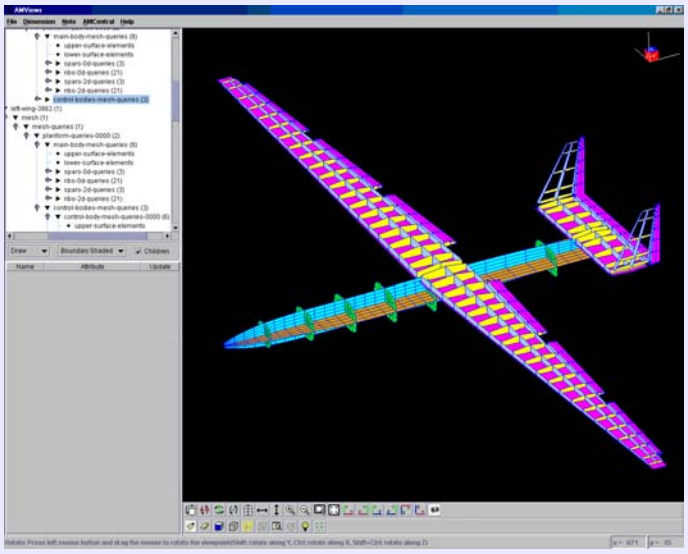
AM*Central is a* ***web services*** *based repository for managing all types of engineering data, including analysis results, spreadsheets, CAD models, FEA models, documentation, as well as AML models and source code. Configuration management functionality includes access control, version tracking, release management, and workflow automation. In summary,* AM*Central provides the ability to:*

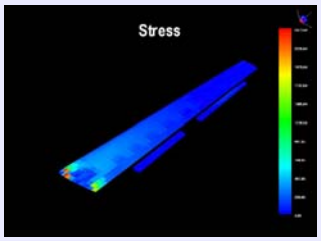
- *Access product and process data over the web*
- *Define workflow events and triggers*
- *Manage models and data access privileges*
- *Track activity at user and project levels*

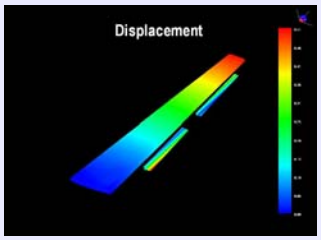


The AM*Enterprise architecture.*

TECHNOSOFT
ADAPTIVE MODELING







Use of AMViews for inspecting an airplane model and analysis results.

AM*Views is an* ***XML-based*** *model browser and inspection environment. It is an easy to use tool for viewing and annotating product and process model data, geometry, analysis results, and simulations. In addition, the available "Net Conference" mode enables* ***real-time collaboration*** *among distributed team members.*

AM*Publish enables the export of XML-based models out of* AM*Central. It provides the ability to publish a model's object hierarchy, properties, and associations to linked applications, such as CAD models, spreadsheets, documents, AML systems, or TIE models.*

Both AM*Views and* AM*Publish can be extended to support the data formats of third-party applications.*

AM*Link automates the execution of workflow events associated with external applications. Through AML or TIE, foreign applications can be integrated so that their inputs and outputs can be automatically managed in* AM*Central, exported via* AM*Publish, and viewed in* AM*Views. In essence,* **AM*Link closes the loop*** *in the execution of workflow processes that involve external applications, allowing even non-technical personnel to drive the most sophisticated engineering design and analysis models across the Internet or within a secure intranet.*

In summary, the AM*Enterprise suite enables* ***rapid collaborative evaluation****, study, and comparison of design alternatives, reducing the time for processing engineering product changes.*

Share Engineering Information

[*Across the Enterprise*]

TECHNOSOFT
ADAPTIVE MODELING

TechnoSoft, Inc.
11180 Reed Hartman Highway
Cincinnati, OH 45242
Ph. (513) 985-9877
Fax (513) 985-0522

www.technosoft.com

info@technosoft.com