Advanced PLM Solutions
Next Generation PLM Platform

The Aras Innovator Model-based SOA for Enterprise PLM
Combining the Model-based Approach with the Service-Oriented Architecture
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Aras Innovator® model-based enterprise SOA is running in production at Fortune 500 companies such as Motorola, Delphi, Rolls-Royce, and XEROX.

For additional information visit www.aras.com
Executive Summary

Aras® provides suite of business software solutions in an enterprise open source format. The Aras product, Aras Innovator®, delivers comprehensive, full-featured enterprise applications that are optimized for global deployments.

This paper does not cover the functional details of specific Aras solutions, and instead concentrates on the underlying technology innovation developed by Aras for creating and running these solutions.

Aras Innovator has a run-time Web application framework that is a set of loosely coupled / federated services that are optimized for performance and scalability and which form a service-oriented architecture (SOA). Then, we use meta-data templates to describe everything; application functionality, business logic, data schema, screens, workflows, etc, etc, etc... literally everything. Some people call this as a “pure meta-data architecture”. Others refer to it as a system with “dynamic schema”. We call it a “model-based SOA”.

The model-based SOA is our unique innovation. It is also what makes our enterprise software so powerful. And we came up with it for a reason: Agility.

Aras is based on a simple premise. Large-scale enterprise applications must be capable of quickly adapting to dynamic and unpredictable business requirements AND heavy customization must not impede upgradability.

Aras Innovator was designed to provide highly scalable, flexible and supportable solutions that adapt quickly while upgrading easily regardless of the level of customization. The entire purpose is to support continual change in a company’s strategic business processes.

We use standard commercial technologies and proven infrastructure to ensure that our platform is secure, robust and reliable. We use open Internet standards to ensure compatibility and interoperability across the diverse & heterogeneous technologies that exist in large companies.

What we have done dramatically reduces the time, cost, and effort to customize & deploy enterprise applications, adapt them to changing business conditions, and upgrade them to new technology versions.

The result of our innovation is unmatched business agility... and a dramatically lower Total Cost of Ownership (TCO).

Conventional Approach Creates Problems

Enterprise applications have contributed significant value to businesses over the last few decades. Unfortunately, businesses have paid a high price for these achievements, most often in the form of multi-million dollar system implementations and upgrades due the technology
limitations of hard coded schema and business logic.

Gartner Research estimates that over a five year period more than 50% of the TCO for an enterprise application is spent on consultants and internal resources necessary to implement, maintain, and update the system. Years later many companies are still unsure if they have achieved an actual Return On Investment (ROI).

Conventional enterprise system vendors mask the rigid nature of their software by convincing customers to deploy “best practice” solutions. However, you will inevitably be confronted with situations where the vendor’s “best practices” do not exactly match your company’s specific competitive practices. At this point you must pick one of two unattractive options:

Do not change the system – If you opt not to customize the system’s “best practices” your competitive position is ‘at risk’ because in less than a year the market conditions will change and your company will be stuck without the ability to adapt, to innovate, to improve, to compete.

Customize the system – If you opt to customize the system then complex recoding and schema changes will typically be required. As most companies know first-hand, these customizations are complicated, time consuming and very expensive. And you are locked into the custom code which creates a significant upgrade obstacle.

Both of these options are unacceptable today given the volatile nature of the global economy. So, what can you do?

**The Need for Greater Flexibility**

Businesses need flexible enterprise applications that can be quickly tailored to support company-specific competitive processes and easily changed to adapt to the business environment. In order to meet this challenge a new level of enterprise application flexibility is required.

Improved software adaptability means that your company can support new and unique processes that deliver:

- Differentiated products and service offerings that excite customers
- Shorter process cycle times that improve responsiveness to customers
- Better profit margins that ultimately increase shareholder value

In addition to the strategic benefits that greater enterprise software flexibility provides your company will realize a significant reduction in the amount of time and IT resources necessary to deploy and maintain applications translating into significant cost savings.

**Introducing Aras Innovator**

Aras has taken a fundamentally different approach to create the Aras Innovator® enterprise application framework.
Instead of identifying an object model and hard coding the schema, we chose to focus on programming only the services (which is unusual, believe me... ask anyone in your app dev group).

The result of this approach is a run-time Web application framework that is a set of loosely coupled / federated services (Web Services to be precise) that are optimized for performance and scalability and which form a service-oriented architecture (SOA).

The SOA's web services are 100% written and managed by Aras and are implemented in the Microsoft .NET CLR languages.

Then, we use meta-data templates to describe everything; application functionality, business logic, data schema, screens, workflows, etc, etc, etc... literally everything. The meta-data templates define the objects (we call them Items instead of Objects) in the system and those objects then “subscribe” to the services that they need. Voila!

Some people call this as a “pure meta-data architecture”. Others refer to it as a system with “dynamic schema”. We call it a “model-based SOA”.

For those architects looking for a generic description, Aras Innovator is a Web-based, n-tier, service-oriented architecture composed of web clients, application server(s), database(s) and file server(s) and is based entirely on standard Internet protocols including HTTP / HTTPS, XML and SOAP (Simple Object Access Protocol).

Currently, we use the Microsoft technologies for our infrastructure (which is considered a bit odd in the open source world). To run Aras Innovator requires only Windows Server, SQL Server, and the .NET Framework.

Our reasoning is simple: Microsoft technologies are typically “qualified” in the enterprise, your company already has lots of people on staff with Microsoft skill sets, and most companies have an existing buying agreement in place for Microsoft products. 1, 2, 3... makes it easy for you to use Aras Innovator. Plus, the costs of the Microsoft infrastructure are significantly less than most enterprise-class J2EE-based systems.
The truly unique innovation that Aras has developed is the model-based approach for enterprise solutions. Aras Innovator is a pure meta-data architecture that takes the premise of defining business processes within enterprise software using graphical models to the next level by running the system directly from the model in real-time.

As opposed to “model-driven” systems in which a model is created graphically and traditional source code is generated which is then compiled, linked, tested, debugged, and ultimately deployed, Aras Innovator’s model-based approach uses a run-time model to define the business objects. The advantage of the Aras model-based approach over the model-driven approach is considerable. Changes to enterprise applications in Aras Innovator are made in real-time as opposed to weeks or months using conventional compiled code-based systems including model-driven systems. Benefits of the model-based approach include:

- Real-time changes to business rules, forms, workflows, lifecycles, and the data model without complex programming
- Graphical drag & drop solution development with dynamic schema modification for fast and easy application creation and extension
- Separation of business logic and technology simplifies upgrades and enables solution portability
- No proprietary languages to learn
An important point that requires clarification is that Aras Innovator is not running interpreted code. Interpretation of code never occurs, because the models themselves in Aras Innovator are stored in a predefined schema that is utilized by a set of compiled Web services in the SOA. These Web services perform dynamic evaluation of the business object model. This critical difference is central to Aras Innovator’s ability to deliver solid performance while enabling unmatched flexibility.

**Figure 2: Model-based Approach Simplifies the Change Process**

Delivering Unmatched Flexibility

Aras Innovator’s model-based approach enables the rapid creation, modification, and extension of enterprise solutions through the combination of forms, workflows, file vaulting functions, relationships structures, security access, and numerous other application capabilities at a business level. Forms, flow charts, and process diagrams are used to define applications. An application is modified by changing a diagram in a graphical solution studio editor instead of programming a block of code. When a change is made the running system is updated instantaneously.

The same browser-based editors that Aras developers use are available to anyone with the appropriate permissions. Intuitive solution studio editors make working with applications straightforward. Developers can also use VisualStudio to create external solution components such as Microsoft Office Smart Clients and solution add-ons.

Because Aras Innovator is delivered by a common framework, applications inherently interoperate. Every application developed with Aras Innovator shares a consistent feature set and capability structure with the familiar Microsoft look & feel.

Another important aspect of the Aras Innovator model-based approach is that the models are defined entirely in XML and stored as XML templates. The XML templates subscribe to the SOA Web services in Aras Innovator. The use of XML templates to describe the models that define the business objects, workflows, and screens is significant for several
reasons. Working with XML is widely understood and XML files are easy to manipulate at the text level as well as with graphical editors such as those in Aras Innovator, and most notably, XML files are portable.

**The Power of Portability**

Portability is of specific importance because the sharing of enterprise applications is made fast and easy. All that is required to move an application between two different Aras Innovator systems is simply export the XML file from one system and import it to the other system. The file can be FTP’ed, emailed, or put on a memory stick. This capability is useful for a number of situations such as:

- Migrating customized business logic for an upgrade to a new release of the underlying Aras Innovator SOA technology
- Moving new features from a development environment to a production environment
- Creating a new application and moving it to an existing system instance
- Sharing a business process between two different divisions of a business

The portability of Aras Innovator applications is significant because even extensively tailored applications can be moved from one environment to another quickly and with minimal effort. In contrast conventional enterprise applications require months and sometimes years of complex and costly work to move which creates significant issues for upgrade.

**Making Upgrades Easy**

Regardless of the amount of tailoring an Aras Innovator enterprise application has undergone, upgrades are straightforward and easy. The combination of the model-based approach with the SOA results in a complete separation of system description and underlying technology. The entire system definition is described in the model’s XML template. For persistent store the XML template is normalized into tables and columns within the database and stored along with the end user instance data. The compiled code of the SOA web services which defines the behaviors and actions available to the model is .NET managed code.

The significance of the separation is profound. Upgrades to new releases of the underlying Aras Innovator SOA technology are straightforward entailing only the installation of the files.

**Simplifying Integration**

Aras Innovator’s open interfaces enable seamless interaction with other enterprise systems. Integration is simplified by open Application Programming Interfaces (APIs) federation services that link deep into the architecture.
The APIs send and receive XML / SOAP messages and publish a complete data dictionary providing a standard interface that makes the exchange of data with other systems or integration products, such as Microsoft BizTalk Server, straightforward.

The federation capabilities enable the incorporation of data from other enterprise systems without directly managing the data within Aras Innovator.

In addition, .NET integration capabilities are available for direct integration with ADO, ODBC, flat file, or direct to another system’s API.

Aras Innovator enables companies to openly connect to applications across the enterprise to leverage existing IT infrastructure such as integrating with other business solutions or legacy systems such as ERP systems like SAP and Oracle and PDM/PLM systems like Siemens Teamcenter, Dassault ENOVIA, and PTC Windchill. Desktop systems connectors are also available for all of the major MCAD and EDA/ECAD packages as well as the Microsoft Office products and others.

Integration adapters for SAP and other ERP systems as well as a wide variety of CAD and PDM systems are available as commercial solutions.

**Microsoft Platform Certified**

Aras is the only enterprise PLM solution that has ever been certified for the entire Microsoft platform including Windows Server, SQL Server, and the .NET Framework. In fact, Aras is the only enterprise PLM solution to achieve certification on any of the Microsoft platform products.

“Certified for” testing is the most comprehensive testing Microsoft conducts comprising approximately 100 test cases for each Microsoft product tested to independently confirm a solution’s compliance.

The certifications achieved by Aras provide the highest level of corporate confidence available for mission-critical enterprise solutions.

![Certification Logos](image)

**Customer and Partner Value Creation**

The flexible nature of Aras Innovator enterprise applications enables unique value creation potential for Aras customers and partners.

For customers Aras Innovator enables previously unattainable business process innovation and dramatically accelerates continuous improvement. By enabling progressive business practices a company can attack competitors in new ways to capture market share.
Another valuable benefit Aras Innovator provides is the ability to consolidate and rationalization legacy and point applications into a single, modern solution environment. The ability to quickly create powerful, new enterprise solutions that seamlessly interoperate and easily integrate with mission-critical applications provides a cost-effective way to retire legacy systems.

For consulting companies that deliver enterprise software solutions for complicated business processes, Aras Innovator provides a vehicle to both deliver greater value to the client and increase revenue generation. A larger proportion of the consulting engagement can be spent on strategic business consulting because fewer programming resources are require to create, integrate, and modify applications. With Aras Innovator the senior consultants are able to spend more time working with the client on the critical business issues and still come in on budget.

In addition, consultants and systems integrators can create and package specific industry solutions and unique high-value applications to provide new revenue opportunities by productizing domain expertise.

**Closing Summary**

Today successful companies are seeking new advantages in the marketplace through business processes and technologies to outmaneuver the competition. However, many are struggling to achieve the level of agility required to execute quickly and capitalize on business opportunities. One of the primary obstacles for today’s companies lies in the rigid and cumbersome nature of their conventional enterprise applications and the excessive costs to change and support the systems.

Aras believes that to meet the challenges of the future, enterprise solutions must serve as an agent of change, as opposed to an obstacle. Aras Innovator combines proven, secure and scalable technologies using an innovative approach that delivers the first truly supportable, flexible enterprise applications resulting in a dramatically lower ownership cost.
About Aras

Aras provides advanced enterprise open source Product Lifecycle Management (PLM) software solutions.

Freedom from licensing eliminates up-front expenses and per user costs significantly reducing the budget required to attain a comprehensive enterprise PLM strategy.

Businesses achieve a process-oriented approach to innovation and collaboration with Aras solutions for product lifecycle management, enterprise quality management, and global supplier management.

Aras can be utilized as an end-to-end PLM system or can complement existing ERP, PLM, and PDM legacy systems through open integrations to leverage previous investments and avoid further license expenses.

Aras Delivers Results – Better Decisions, Better Processes, Better Software.