# Integration Across The Complex Enterprise

## Artix ESB Overview

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# Executive Summary

Of the many challenges encountered when integrating enterprise systems, one of the most difficult is dealing with the multitudes of technologies, products, and standards found in a heterogeneous environment. For most organizations, rip-and-replace is not an option, and custom integration code is too expensive.

IONA's Artix product is an Enterprise Service Bus (ESB) designed for the more complex organization, and integrates multiple generations of systems without disrupting legacy systems and with little or no custom integration work.  Artix is unique for its:

> **Extensibility** - For application specifications that are not met by Artix's out-of-the-box platform support, Artix is easily extended through its patented plug-in architecture.

> **Broad Platform Support** - From mainframes to mobile devices, Artix runs natively inside a wide range of operating and application platforms and bridges the protocols and data formats of diverse, legacy systems.

> **Enterprise Quality of Service** – Security, manageability, availability, performance, and reliability are the most important concerns for these customers. IONA's heritage ensures that even the most taxing integration projects are durable and resilient.

Artix is mature and proven technology, and has created the robust and resilient infrastructure to support mission-critical applications at companies such as BellSouth, AT&T, Marconi, and DHL (Deutsche Post).

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# The Enterprise: Lessons in Complexity

Less, is more.

Certainly that is one perspective when reflecting on the number of systems, standards, tools, and platforms currently deployed in any thriving business.

The Global 2000 has been investing in technology for many years, and today their enterprises are comprised of a diverse collection of technologies supporting a range of disparate applications. Where these applications could once operate as isolated silos, they must now interoperate or risk curtailing future growth and profits. Coping with the heterogeneity is one of the largest obstacles for IT, and not all vendors are equipped to support the complexities of their endeavors.

For established businesses, replacing all infrastructure with new technology is not an option and deploying a monolithic platform is too cumbersome an undertaking. Ironically, those who tried installing an integration platform to address the problems of heterogeneity now find themselves with yet another legacy system and even more proprietary technology in their enterprise. What IT departments are looking for now is an incremental and open approach to integration that allows them to reuse their existing investments.

IONA's Artix, a result of more than a decade of experience in developing enterprise integration solutions, is a robust and flexible Enterprise Service Bus (ESB). Gartner defines an ESB is a Web-services-capable middleware infrastructure that supports intelligent program-to-program communication and mediates the relationships among loosely coupled and uncoupled business components.

The Artix ESB is unique in its support of heterogeneous environments. It has broad platform support to work in most diverse enterprises, and its extensible architecture allows the infrastructure to be updated and modified to easily accommodate unique project requirements.

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"With Artix, we can achieve seamless, non-invasive Web service enablement of our products with minimal code changes. And because of Artix's extensibility, we can be confident of our ability to support any standards we face in a deployment environment."

Graham Francis, Network Intelligence Product Manager, Marconi

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# Integration is a Priority

Integration is a major priority for IT organizations, and corporations are spending over $80 billion annually in an effort to make their systems work together. Corporate officers are backing this level of spend because IT integration is central to most strategic initiatives, including:

**Increasing operational efficiency** – corporations look to automate common business processes without large-scale investments

**New business opportunities** – competitive pressures force organizations to constantly provide new and better service to customers without disrupting existing services

**Reducing IT expenses** – with over 75% of IT budgets consumed by fixed-cost expenses, any infrastructure decisions that reduce these costs liberate funds for new initiatives

Integration has been a priority for IT organizations for decades, and it has grown in importance from being a component of isolated projects to being the heart of strategic corporate directives. Throughout, there have been many standards, many platforms, and many flavors of investments designed to address the changing needs presented over the years. Much of this technology is proprietary and thoroughly entrenched – further complicating ongoing integration efforts.

Since IONA was founded over ten years ago, its approach was never to adopt yet another proprietary solution but to develop architecture that is non-invasive and built on open standards. IONA has been developing distributed, standards-based infrastructure long before Web Services and the formalization of this approach as a Service-Oriented Architecture (SOA). This heritage includes developing the famed Credit Suisse application, often touted by Gartner as the first SOA deployment. Through an open and distributed approach, IONA establishes platform-neutral integration infrastructure that bridges legacy systems, proprietary standards, and the best of what new innovation has to offer.

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"Our ability to deploy a robust and highly extensible Service BackBone infrastructure is one of the ways in which we see information technology supporting our international growth strategy. To have a service-based platform into which we can very easily plug both newly developed and existing IT systems, and those that may result from mergers or acquisitions is a very attractive value proposition."

Michael Herr, Senior Director of IT, Deutsche Post

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# Business Challenges

The business incentives for integration are compelling.  One IONA customer is relying on IT integration to deliver unrivaled customer service as a way to differentiate themselves in a commoditized market.  Another customer worked with IONA to repurpose their wide range of technical assets to be a first mover in a competitive market.  Yet a third is implementing an aggressive acquisition plan to become the leader in their industry, prompting a stream of IT consolidation projects.

Business plans like these require agile infrastructure to support line-of-business objectives without incurring unmanageable expenses.  To support these long-term goals, IT departments are making systematic changes across all systems to avoid having to make sporadic and ad hoc upgrades one integration project at a time.  Paradigms include:

> **System Migration –** replacing all outdated systems at once is disruptive and impractical, so organizations look to a service-oriented architecture (SOA) to migrate systems one at a time. IONA uses Artix to migrate from TIBCO™ to MQ™, for example, and encapsulate deprecated software assets for either permanent encapsulation or for incremental testing to facilitate a phased migration.

> **Process Automation –** automation of business processes enables organizations to react much more quickly to changing business requirements or market conditions, but including older infrastructure, such as BEA Tuxedo or CORBA, is difficult.  Artix allows systems old and new to interoperate without forcing development teams to learn another new technology.

> **Single Customer View** – many client-server installations have highly functional and reliable back-end systems, but are suffering from antiquated presentation layers. IONA is helping organizations replace green-screen terminals and the like with a service-based front end such as .NET or J2EE without disturbing legacy servers.

Each objective challenges businesses to move their infrastructure forward at a minimum cost, without invading or destabilizing technology that supports operations.  Success in any of these objectives requires a flexible and practical approach.

# Technical Challenges

The majority of integration costs come from the custom work necessary to connect to legacy systems, and from supporting unique requirements of demanding applications.  Integration projects often come in over budget and late because of unexpected amounts of work to bridge between heterogeneous systems, and to deliver:

**An Open System** – the most important characteristic of any integration infrastructure is to remain open, extensible, and flexible so today's investment does not become a legacy system later. Extensibility ensures that infrastructure can be updated and modified on demand.

**Support for Standards in Use** – in addition to standards for transport, there are many standards involved in interoperability including ones for security, management, and transactions, among others.  A standards-based solution may not support all of the standards or technologies currently deployed in a heterogeneous environment.  XML-based standards may be the choice moving forward, but legacy systems present the need to support others:

| Characteristic | New Standards | Existing Applications |
|---|---|---|
| **Platform** | .NET Framework<br>J2EE | CORBA<br>CICS/IMS<br>BEA Tuxedo<br>TIBCO |
| **Language** | C#<br>Java | COBOL<br>C++ |
| **Transport** | HTTP | IIOP<br>MQ<br>TIBCO<br>JMS<br>BEA Tuxedo |
| **Payload** | XML | Binary (fixed, IIOP, TipMsg, FML) |
| **Security** | WS-Security<br>Kerberos<br>JAAS | LDAP<br>RACF<br>Homegrown |
| **System Management** | WSDM<br>Web services management tools | BMC Patrol<br>Tivoli<br>CA Unicenter<br>Homegrown |

**Reliability and Performance** – adopting the latest development paradigm does not require young and fragile technology.  Enterprises that cannot tolerate errors, disruptions, or poor performance cannot afford unproven technology.

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Creative workarounds for these challenges create integration dilemmas later, but forcing too many guidelines onto project teams threatens line-of-business deliverables.  If an integration solution is not broad enough and flexible enough to accommodate these requirements it will pit chief architects against project leaders.

# Integration Architecture for the Heterogeneous Enterprise

All large enterprises have had similar integration experiences:

> First stage integration networks comprise a few custom connections between a small number of systems. Eventually networks grow uncontrollably as n(n-1) additional custom adaptors are created every time a system is added to the network. The unmanageable collections of point-to-point connections soon demand the hiring of new staff just to maintain the status quo.

> The first attempt to take a systematic approach to integration involves replacing custom point-to-point adaptors with a hub-and-spoke system. Because there is a single point of integration for each system, the n(n-1) growth problem is eliminated, but for larger enterprises the hub introduces a single point of failure as well as a performance bottleneck. It also requires every system to conform to a closed and proprietary set of message and transport standards - an expensive proposition when legacy systems are involved.

Service-oriented architectures (SOA) and Enterprise Service Bus (ESB) products represent a new integration style designed to address enterprise challenges. In an SOA, loosely coupled systems communicate across an ESB, creating a back plane of services across the enterprise. This distributed approach removes the restrictions and the bottleneck of a centralized hub.

An ESB is a middleware subsystem that facilitates and manages communication, routing, Web services support, payload metadata, and mediation between business entities. These features allow components to be added, moved, swapped or deleted with minimal disruption to other components for easier and less-costly integration. By being able to plug and play with diverse systems, IT departments can more easily address the business challenges in their organization.

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"The very nature of a carrier's infrastructure is complex. By using a platform-independent and standards-based integration solution like Artix, we plan to reduce the overall complexity of our IT infrastructure while at the same time leveraging it to build and deploy new business applications."

Georges Perez, CTO, 3 Italy

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# Artix: The Extensible ESB

Artix is an extensible ESB that meets the needs of large, heterogeneous enterprise environments. IONA has incorporated its fifteen years of enterprise integration experience in Artix. The resulting ESB accommodates diversity and complexity, with robustness and resiliency.

The Global 2000 companies who are using Artix today – BellSouth, AT&T, Marconi, and DHL (Deutsche Post) among others – are consistent in their description of Artix's value:

- **Extensibility** - For unique application specifications that are not met by Artix's out-of-the-box platform support, Artix is easily extended through its patented plug-in architecture.  The extensibility of Artix makes it possible to meet and futureproof even the most extreme requirements quickly and efficiently.

- **Broad Platform Support** - Artix successfully leverages IONA's history to deliver an ESB with the broadest support for enterprise technology.  From mainframes to mobile devices, Artix runs natively inside a wide range of operating and application platforms and bridges the protocols and data formats of diverse, legacy systems.

- **Enterprise Quality of Service** – security, manageability, availability, performance, and reliability – are the most important concerns for these customers, and IONA's maturity and proven track record ensure that even the most taxing integration projects are durable and resilient.  Artix's high performance meets the throughput needs of demanding enterprise systems, including even mainframe applications.

## Artix's Unique Plug-In Architecture

The most expensive part of an integration project is the custom work required to support legacy systems.  Artix is designed so that even the most complex integration projects can be completed with a majority of out-of-the-box functionality and minimal customization, and with the resiliency to stand up to the most demanding environments.

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"It is critically important to us to be able to connect seamlessly to a variety of technical environments from numerous client devices.  We were impressed with how quickly we were able to solve such a potentially complex integration problem with Artix."

Niels Husted Kjæ, Manager of R&D, Medical Insight

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Artix is able to support numerous existing systems and multiple generations of architecture and technology without sacrificing performance or quality of service because of its extensible plug-in architecture.  Rather than force applications to conform to predetermined transport and payload standards, Artix service-enables existing systems by extending the endpoint with targeted plug-ins, where an endpoint is defined as a service provider or a service consumer.
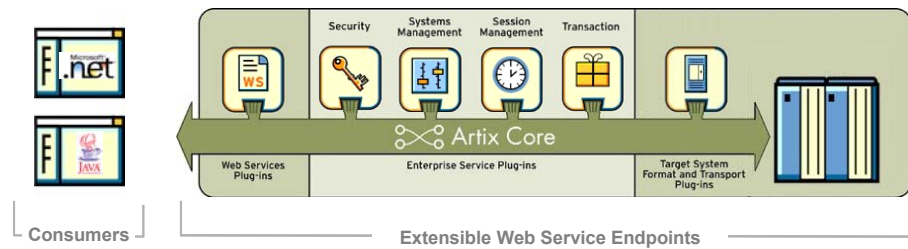


Plug-ins add support for any protocol, transport, data model, security standard, development platform, etc., with a minimum footprint and little deployment overhead, while protecting the systems sovereignty as shown below:

Endpoints are extended and customized by adding only those plug-ins required to support the unique requirements of the system.  This makes it possible to support virtually any system while keeping endpoints small and efficient.  Artix is packaged with over 25 different plug-ins out of the box and custom plug-ins can be created using the Artix Plug-In Software Developers Kit (SDK). The SDK provides the core code and documentation on how to create user-defined plug-ins.

The key to making this level of flexibility work within an SOA is the Web service definition language (WSDL) file that defines every endpoint.  The WSDL file serves as a contract between the endpoint and the Artix core to preserve interoperability.  This layer of abstraction preserves the autonomy of the system while simultaneously exposing it as a universally accessible service.

## Artix Inside: Open at Every Level

In practice, the Artix plug-in architecture is open at every level, making it easy to incorporate existing infrastructure, customize for unique requirements, and to ensure that any investment today will not become the legacy system of tomorrow.  From the foundation, Artix is open and supports:

**Any Transport System** – Most enterprises have a transport system currently deployed, and unilateral replacement destabilizes operations.  Artix supports any transport system – from TIBCO to HTTP to MQ to JMS among others – so organizations can apply the value-add of Artix to existing infrastructure, and project teams are free to deploy the transport system of their choice for new projects.

**Any Transaction** – Most SOA transactions are "fire and forget" in nature, but many enterprise transactions require the ACID reliability of 2-phase commit and still others require the performance of a point-to-point connection.  Through transaction management plug-ins,

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Artix supports any type of transaction so corporations do not have to choose between proper architecture and application requirements.

**Any Payload Format** – XML has many useful attributes, but forcing applications to convert data into XML slows performance and can introduce errors.  Artix allows data to be sent in any format, including binary, simply by adding a plug-in to any endpoint that receives the payload.

**Any Security, Management, or Platform Tool –** To further preserve the autonomy of back-end systems, any security standard, system management suite, or development platform is supported at individual endpoints rather than forcing all applications to adhere to the same configuration.

Artix's plug-in architecture allows systems to interoperate with each other while continuing to use the standards and technologies that best meet individual application requirements.  This strategy not only makes it possible to integrate across heterogeneous systems, but futureproofs incremental investment as well.

## Artix: Designed for Performance

By shifting support for multiple standards and technologies to the endpoints, and by making endpoints fully customizable, Artix creates integration solutions that operate at maximum efficiency.

Most ESBs add support for additional technology by building it into the infrastructure at every endpoint or by placing a centralized service on the bus.  Supporting multiple technologies at the endpoint adds unwieldy deployment overhead; each additional standard or technology increases the footprint at every endpoint. A centralized service creates a bottleneck, and defeats the purpose of moving to a distributed SOA architecture.

IONA has the advantage of being able to draw on its wealth of mature and sophisticated infrastructure assets.  Behind the plug-in architecture is Adaptive Runtime Technology (ART), IONA's patented microkernel application infrastructure. ART is an extensible framework that introduces plug-ins to the microkernel to implement protocols and message format translations.  It is mature and reliable technology that has been in production for over 7 years and is at the core of IONA's Orbix product.

ART makes it possible for each endpoint to be customized to include only what is needed at each individual endpoint.  Consequently, Artix is able to support virtually any system requirement without imposing additional overhead elsewhere.

In addition to keeping endpoints small, the configurability supported by ART allows for change to occur within any system without destabilizing the integration infrastructure.  Plug-ins are swapped in and out quickly and easily to accommodate the unstoppable forces of business change.

# Artix Value at Work

IONA's ESB-based integration solutions drive business value for customers. One Fortune 500 company eliminated tens of millions of dollars in operational expenses by using Artix, another reduced costs by over $10M to enter a strategic new market, and still another reported savings of over $500,000 in a new business unit alone.

Each project benefited from Artix's unique extensibility:

**Global Provider of Mobile Services:** *Amplified Efficiencies through System Migration*
The business endeavored to increase efficiencies by eliminating aging infrastructure components with more cost-efficient systems. They used Artix to encapsulate and connect applications so they could incrementally test and replace components. The result is flexible infrastructure that was deployed without disruption of service.

**Leading Logistics Provider:** *Increased Profits through Process Automation*
The firm manages over 2 billion packages annually, across 250 shipping hubs in 190 countries. They made process improvements across the entire organization despite the wide range of technologies and platforms deployed in their 12,000 locations. The results include an increase in profitability linked directly to process improvements and assimilation of acquisitions.

**Large Telecommunications Service Provider:** *Improved Customer Service Through Single Customer View*
In an effort to focus on customer service and retention in the competitive telecommunications markets, this IONA customer deployed Artix ESB to create a customer-centric presentation of information for call center representatives. Consolidating business servers and exposing mission critical order management applications as a service eliminated tens of millions of dollars of infrastructure costs.

# Summary

Global 2000 companies, with their heterogeneous systems and application silos, are using Artix to reduce the complexity within their enterprises.  IONA, with its history of delivering high performance, mission critical applications for over ten years is helping these companies repurpose their current investments and incrementally move towards an open architecture.

IONA customers - including BellSouth, AT&T, Marconi, and DHL (Deutsche Post) – use the extensible ESB to service-enable existing systems and establish a scalable, adaptable, SOA architecture.  They chose Artix for its broad platform support, extensibility, and enterprise quality of service, and today they are building new business applications and process flows on common platforms such as Microsoft's .NET Framework, IBM's WebSphere, or BEA WebLogic.

IONA's experience in working with complex and heterogeneous systems coupled with Artix's extensible and open technology give organizations an advantage in delivering on new business initiatives while simultaneously lowering operational costs.

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