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White Paper

ArchestrA – A Proven Industrial Service Oriented Architecture

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ArchestrA – A Proven Industrial Service Oriented Architecture

1. Background

Industrial automation evolved from multiple related, but different, disciplines such as instrumentation, electronics, information technology, and software development. The result was a number of different products and systems that would not effectively interoperate. A number of technical solutions to facilitate communication between these systems have been implemented over the decades, including Manufacturing Automation Protocol (MAP) from General Motors which merged into the Ethernet standard. While most of these networking solutions offered a degree of improved integration, industry was searching for more.

A new approach was required that would enable different classes of business, plant and factory automation systems to work as a single system. This could only be effectively accomplished by moving above mere connection-based networking to an even more comprehensive and productive environment known as a Service Oriented Architecture (SOA). The Organization for the Advancement of Structured Information Standards (OASIS) defines a Service Oriented Architecture as, "A paradigm for organizing and utilizing distributed capabilities that may be under the control of different ownership domains. It provides a uniform means to offer, discover, interact with and use capabilities to produce desired effects consistent with measurable preconditions and expectations." As such, SOAs provide a set of software services over and above the network connection level. These services provide the ability to develop composite applications across diverse automation and information systems in which the systems interoperate through the SOA. The services are made available through defined software interfaces, including industry standard protocols, COM/DCOM interaces and web services, such as XML interfaces.

2. ArchestrA Technology

Invensys identified the requirement for a real time or industrial SOA (ISOA) a decade ago. In light of the fact that Microsoft.NET was rapidly becoming the preferred application integration environment for industrial operations, Invensys approached Microsoft with the concept of extending the .NET services with industrial software system service extensions to develop a true ISOA. Microsoft agreed, and a development team was established that included consulting professionals from Microsoft, Wonderware® and the Process Systems Divisions of Invensys who had the specific charter of developing the world's first ISOA. A number of industrial software system services (Figure 1) were defined by the team to provide the system capabilities that industrial automation and information customers have come to expect, as well as a number of additional services for which industrial users had previously only wished.

Figure 1

Some of the industrial system services that were identified and developed as part of this initiative were distributed real-time object management, distributed real-time interprocess communications, common name space services, component application object management services, remote software deployment, industrial security services, application configuration services, high-availability and redundancy services, plant connection services, enterprise connection services, user interface services, systems management services and web portal services. Once these industrial services were identified, they were jointly developed by the team to operate as an industrial wrapper built around the Microsoft.NET and Windows operating system environment. This combination provided Microsoft's open application environment with Wonderware's ease of use and Invensys Process Systems' industrial hardening and domain knowledge, resulting in an unparalleled ISOA.

The resulting ISOA has been marketed under the "technology inside" brand of ArchestrA®. The ArchestrA technology has become the basis for the design of both the Wonderware System Platform software offerings and the world's first enterprise control system (ECS) by Invensys Process Systems – the InFusion™ ECS. One of the key services included in ArchestrA is a component object-based application development environment to be used to develop standard composite applications that operate across diverse system domains, including the domains of third-party systems. Without starting with the development of the ArchestrA ISOA, neither of these world-leading industrial offerings would have been possible.

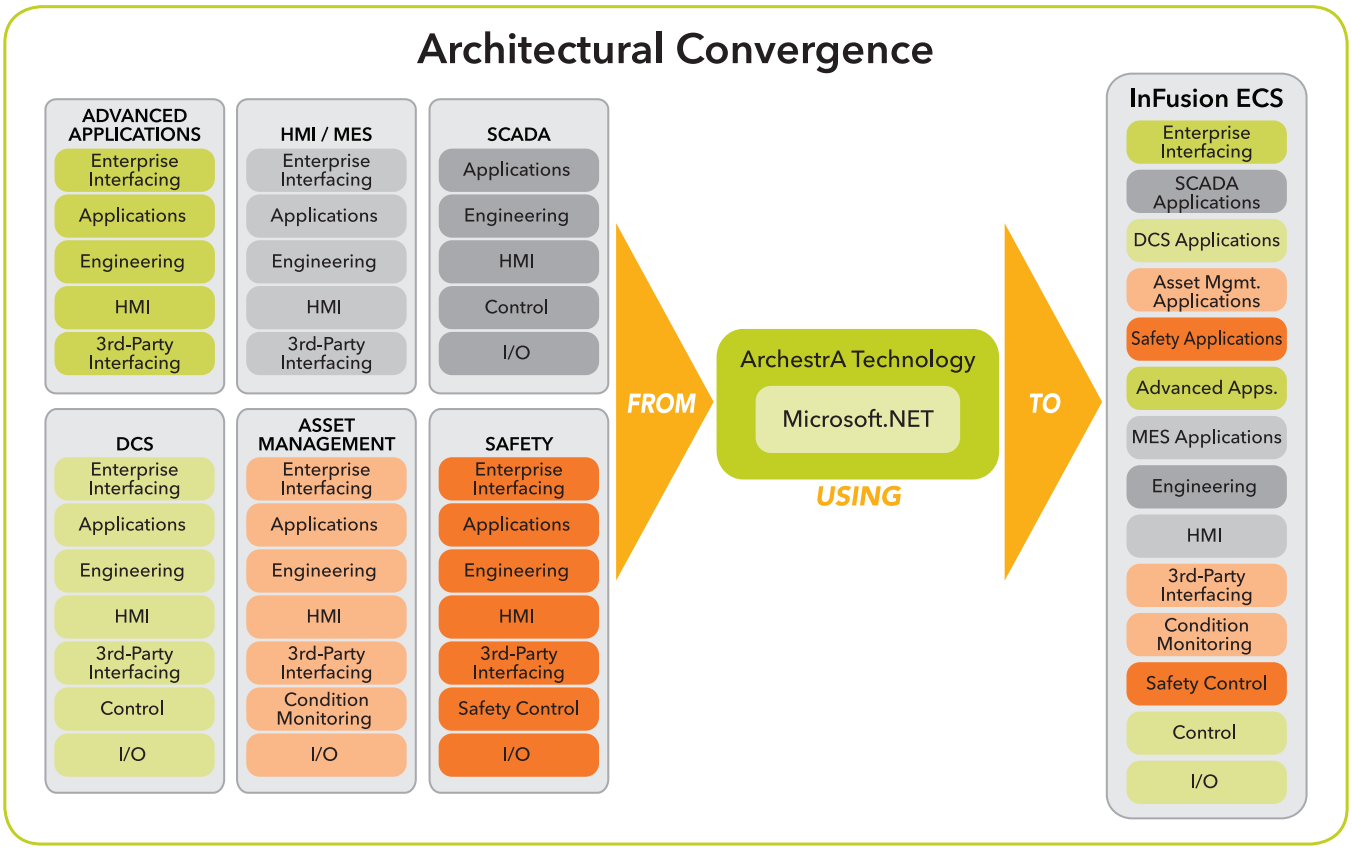

Figure 2

Invensys Process Systems utilized the ArchestrA ISOA to pull together the software excellence across Invensys Process Systems and Wonderware into the unified automation and information system platform – the InFusion ECS (Figure 2). InFusion ECS combines Invensys' deep process domain expertise via proven ECS components that include: industry applications and hardware in the areas of instrumentation (Foxboro®), safety (Triconex®), distributed control (Foxboro), asset management (Avantis®), and manufacturing execution (Wonderware), and advanced control and optimization (Simsci-Esscor™), to create a rich and open system solution that provides a single application and compute space throughout manufacturing and production enterprises. For the first time, a single system solution covers all of these traditionally separate domains and offers interoperation with existing business and plant systems. Therefore, the ECS concept is to provide a more productive 'system of systems' that is easier to apply and manage in order to offer the lowest Total Cost of Ownership (TCO).

The development of InFusion ECS provided the technological basis for the joining of the traditionally separate Invensys organizations of Invensys Process Systems (IPS), Wonderware, Eurotherm and IMServ into a single organizational entity called Invensys Operations Management in April 2009. Although ArchestrA technology continues to evolve in a number of key areas, including future extensions to incorporate even more web services, more than 220,000 software product licenses that incorporate ArchestrA technology have been successfully installed – providing customers with a higher standard for industrial interoperability, and the technology still serves as the first and market leading example of a proven ISOA.

3. Benefits to Users

ArchestrA technology offers benefits in both development and runtime environments over and above other vendor's technologies. First, is the ability to create standards in both application functions and in run-time displays or work processes. This allows for the re-use of engineering across the plant and the enterprise, saving significant application development cost on future customer projects. Standardization also means that employees can be trained to operate other parts of the plant or other plants in the enterprise with little effort because the system behaves the same wherever the standard is used. This cuts training costs and staffing requirements. The second area of savings is in integration. Leveraging the broad set of device drivers and communications servers from Wonderware, coupled with the standard connectors of .NET and other industry standards like OPC, the technology allows any system, device, database or software application to participate as part of the InFusion ECS. The third area of savings is in flexibility and easier change propogation. Because changes from templates in the component object-based development environment are linked to derived application objects running in the system, changes can be made centrally and then easily propagated across a broad network of operating computers. This is extremely valuable during FAT testing and whenever the system must be scaled up or down to take advantage of new business opportunities.

4. Conclusion

With the development of ArchestrA technology as the world's first and proven ISOA, along with the resulting development and release of the InFusion ECS as the world's first Enterprise Control System - encompassing the entire Invensys portfolio as well as most all 3rd party systems, industrial computing has finally evolved to the point at which technology constraints no longer limit performance-based applications. The proven track record of ArchestrA ISOA technology enables a new movement toward improved bottom line value for industrial operations.