SAP® Integration

With B2MML

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Integration with SAP NetWeaver®
SAP Integration with B2MML

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Overview

Integrating third-party manufacturing plant floor applications with the SAP® R/3® and SAP ECC Enterprise Resource Planning (ERP) systems can be an extremely complex undertaking. Application vendors face a considerable challenge trying to satisfy their manufacturing customers’ demands for vendor-supported turn-key integrations solutions between their MES applications and SAP. Utilizing industry standards such as B2MML certainly help, although many people still underestimate the enormity of the task. Successful solutions must have enough flexibility to meet the almost infinite variation in requirements and deployment scenarios that will be encountered in the SAP world.
What is B2MML?

B2MML or Business To Manufacturing Markup Language is an XML implementation of the ANSI/ISA 95 family of standards (ISA-95), known internationally as IEC/ISO 62264. B2MML consists of a set of XML schemas written using the World Wide Web Consortium's XML Schema language (XSD) that implement the data models in the ISA-95 standard.

B2MML is meant to be used as a common data format to link ERP and supply chain management systems with manufacturing systems such as control systems and Manufacturing Execution Systems.

Functional Coverage

The major functional areas covered by the Version 3.0 B2MML schemas include:

- **Equipment** - equipment classes, equipment, and capability tests that may be exchanged between business systems and manufacturing operations systems.

- **Maintenance** - maintenance requests, maintenance work orders, and maintenance responses that may be exchanged between business systems and manufacturing operations systems.

- **Material** - material definitions, material classes, material lots, material sublots, and QA (Quality Assurance) tests that may be exchanged between business systems and manufacturing operations systems.

- **Personnel** - persons, personnel class, and qualification tests that may be exchanged between business systems and manufacturing operations systems.

- **Process Segment** - a logical grouping of personnel resources, equipment resources, and material required to carry out a production step that may be exchanged between business systems and manufacturing operations systems.

- **Product Definition** – which includes references to the Product Production Rules, Bill Of Materials, and Bill Of Resources that may be exchanged between business systems and manufacturing operations systems.

- **Production Capability** - information about capability by resource, and by process segment, that may be exchanged between business systems and manufacturing operations systems.

- **Production Performance** – a production performance report is made up of a set of production responses plus contextual information such as start time, end time, location, and published date.
Production Schedule - a set of production requests plus the contextual information that defines the context of the schedule, such as start time, end time, location, and published date.

Current Version

The current version of B2MML is v3.0. WBF and ISA recently announced that the Business To Manufacturing Markup Language (B2MML) v04 Release Candidate 2 is available for comment and review. This is a major enhancement to B2MML that includes support for ISA-95 Part 5 Transactions, OAGIS messages and UN/CEFACT core components while maintaining backward compatibility to v3.0.

ISA-95

ISA-95 is the international standard for the integration of enterprise and control systems. ISA-95 consists of models and terminology. These can be used to determine which information, has to be exchanged between systems for sales, finance and logistics and systems for production, maintenance and quality. This information is structured in UML models, which are the basis for the development of standard interfaces between ERP and MES systems. The ISA-95 standard can be used for several purposes, for example as a guide for the definition of user requirements, for the selection of MES suppliers and as a basis for the development of MES systems and databases.

The Enterprise Control System Integration Standard consists of a number of separate parts:

Part 1: Models and Terminology

Provides standard terminology and a consistent set of concepts and models for integrating control systems with enterprise systems that will improve communications between all parties involved. The models and terminology emphasize good integration practices of control systems with enterprise systems during the entire life cycle of the systems.

Part 2: Object Model Attributes

Contains additional details and examples to help explain and illustrate the Part 1 objects.

Part 3: Activity Models of Manufacturing Operations Management

Presents models and terminology for defining the activities of manufacturing operations management.
Part 4: Object Models and Attributes for Manufacturing Operations Management

This is currently under development and is currently scheduled for publication in the first quarter of 2007.

Part 5: Business-to-Manufacturing Transactions

This is currently under development and is currently scheduled for publication in the first quarter of 2007.

ISA-95 should be used as a way to model and conceptualize the partitioning of functionality between the various systems in the plant floor environment. Most end users would expect to draw a logical interface at the boundary between level 3 and 4, but it does not necessarily have to be there. In fact, where you draw the boundary depends upon the end user’s particular Industry vertical (rolled products, pharmaceutical, etc.) and the amount of customization of their SAP system.

In short, the ISA-95 model is a functional abstraction rather than a technical architecture. This is a point that often gets lost. Application vendors and end users have a tremendous amount of freedom in where they draw that boundary, and any deployed solution must be mindful of this.
Other Industry Standards

To the uninitiated there are a bewildering array of seemingly competing standards bodies, initiatives and working groups. Making sense out of all this information isn’t easy. Understanding it all well enough to make intelligent choices about which ones are important and which ones should be adopted is harder still.

Although many separate standards exist today, we see various consortiums working to consolidate these definitions. While the manufacturing industry will certainly benefit from this convergence, keep in mind that the current standards will continue to evolve in order to accommodate these changes.

MIMOSA

MIMOSA (Machinery Information Management Open Systems Alliance) is an alliance of Operations & Maintenance (O&M) solution providers and end-user companies who are focused on developing consensus-driven open data standards to enable Open Standards-based O&M Interoperability.

The primary contribution to interoperability in the context of this white paper is the development and distribution of the Open System Architecture for Enterprise Application Integration (OSA-EAI) Version 3.0g Production.

WBF

The WBF (World Batch Forum) is dedicated to supporting the process automation and operations needs of the technical and management professions in process manufacturing. WBF facilitates the interchange and development of information and knowledge in order to help its members succeed and to exert a positive influence on industry. Automation processing is a common manufacturing method in the chemical, pharmaceutical, pulp and paper, and food and beverage industries.

The WBF are primarily responsible for the creation the following two XML implementations of the ANSI/ISA family of standards:

- ISA S95 / B2MML
- ISA S88 / BatchML

OAGi

The Open Applications Group (OAGi) is an open standards group building process-based XML standards for integration. The Open Applications Group was formed in late 1994 as the first post-EDI organization focusing on improving the state of application integration.
Their OAGIS XML solution provides a rich and extensible set of process definitions and XML message definitions to enable integration.

**OPC Foundation**

OPC (Ole for Process Control) is a series of standards specifications. The first standard (originally called simply the OPC Specification and now called the Data Access Specification) resulted from the collaboration of a number of leading worldwide automation suppliers working in cooperation with Microsoft. Originally based on Microsoft's OLE COM (component object model) and DCOM (distributed component object model) technologies, the specification defined a standard set of objects, interfaces and methods for use in process control and manufacturing automation applications to facilitate interoperability. The COM/DCOM technologies provided the framework for software products to be developed. There are now hundreds of OPC Data Access servers and clients.

- OPC Data Access
- OPC Alarms & Events
- OPC Historical Data Access
- OPC Unified Architecture

**Consolidation & Cooperation Efforts**

With so many disparate standards efforts it is not surprising that a good deal of consolidation and cooperation has emerged. Well, perhaps it is surprising but nevertheless it does seem to be happening.

**Open O&M Initiative**

Founded by MIMOSA and the OPC Foundation, the Open O&M (Open Operations & Maintenance) Initiative is a collaboration of multiple industry standards organizations to provide a harmonized set of information standards for the exchange of Operations & Maintenance (O&M) data.

As part of the OpenO&M Initiative the ISA’s SP95 committee and MIMOSA are working together to develop enhanced standards and XML schemas for the exchange of maintenance, inventory and quality data between business and manufacturing systems. It is widely anticipated that when these standards become available that they will become the de facto standard.
Manufacturing Interoperability Guideline Working Group

The Manufacturing Interoperability Guideline Working Group is a Collaborative Venture of OAGi, WBF, ISA, MIMOSA, and OPC and its stated objective is to develop an industry guideline that defines generic business process models between the operations management and business layers of the manufacturing support system.

Fig 2.1 – OAGIS, B2MML and ISA-95 Relationships

The Manufacturing Interoperability Guideline Working Group will first attack the convergence of OAGIS, B2MML and ISA-95. Next, they will focus on converging MIMOSA and OPC with those results. Finally, they will address the convergence of OMAC and Make2Pack with the above results.

Make2Pack

Make2Pack the joint working group of WBF, the OMAC Packaging Workgroup and the ISA-SP88 committee, is chartered with better integrating “making” and “packing.” They are leveraging the ISA-88 batch standard and PackML state model to develop ISA-88 Part 5. There are also clear ties to MES information access and ISA-95.

OMAC

As an ISA organization, OMAC brings member companies together to collectively derive common solutions for both technical and non-technical issues in the development, implementation, and commercialization of open, modular architecture control (OMAC) technologies. All OMAC member companies have a vested interest in developing and implementing open control technologies for manufacturing applications.
Convergence

ISA and OAGi recently announced they have entered into an agreement to cooperate on joint projects and exchange standards documentation. The first step taken under this cooperative agreement includes OAGi’s commitment to express the ISA-95 data models in the OAGIS standard as both UML data models and OAGIS XML Schema definitions known as BODs, and to recommend enhancements to the ISA-95 standard based on the content and experience of the OAGi constituency. The two organizations have also agreed to share the official minutes of all working group meetings associated with the program, which will help to increase communication and keep all parties updated on the status of the projects.

Because ISA’s standard has been historically used in process manufacturing, and the OAGIS standard has typically been utilized in discrete manufacturing, an opportunity exists to further both standards through cooperation and refinement.
**A Real-World Example**

Junot Systems recently worked with an MES vendor to design a B2MML-compliant interface between their MES product and SAP. The approach taken was to create a “baseline” set of SAP interfaces that address the majority of their customer requirements. This baseline set of interfaces are modified as necessary to deploy at each customer site.

The SAP baseline interface uses web services to pass standards based content to and from the SAP system. The application content is based on the ISA-95 Enterprise-Control System Integration Standard (ISA-95) and the Business To Manufacturing Markup Language (B2MML).

**Production Management**

The baseline production management interface functions are:

1) Send production schedules from the ERP system to the MES system

2) Send production performance data from the MES to the ERP system

These interfaces work with the SAP PP or PP-PI modules, although one or the other is used for a given application. Both the PP module’s routing and BOM (Bill of Material) data as well as the PP-PI module’s control recipe data are mapped to the ISA-95/B2MML production schedule XML schema. This provides a single, standards-based, data format on the manufacturing system side of the interface.
Fig 3.1 - Production Management Interfaces

Production Schedules

Production schedules contain process (or production) orders. As a minimum, process/production orders have start/end times, identification of the product to produce and the amount to produce. Additional information is often included in a production schedule.

Depending upon business rules, process/production orders in a production schedule may be directly associated with customer orders or may be internal company orders for inventory.

A production schedule message may contain one or more production requests. The granularity of a production request is application specific. Examples of production schedule granularity are:

- A production schedule may contain high level process/production orders for a plant or process cell.
- A production schedule may contain process/production orders which are subdivided into multiple segments and each segment may address production requirements for a part of plant or process cell such as a process unit.

The baseline production management interface must handle either type of schedule orientation (time based or process/production run based), order (customer or internal) or schedule granularity.

Asset Management

The baseline asset management interface functions are:

1) MES downloads the equipment list from the SAP PM module
2) MES sends runtime data for equipment to the SAP PM module
3) MES sends the SAP PM module a request to initiate a maintenance order
4) The SAP PM module sends work order information to the MES on a maintenance order status change
5) The SAP PM module sends work order response for completed maintenance orders to the MES
The SAP PM module contains the master list of equipment to be tracked for maintenance purposes. A subset of the master list is downloaded by the MES upon demand. The scope of the equipment list subset is determined by the equipment types to be included.

Send Runtime Data for Equipment to SAP

Equipment (asset) performance data will be accumulated by the MES for defined equipment and periodically uploaded to the SAP PM module. The MES uses the downloaded equipment list to determine the equipment to accumulate data for.

Data that can be collected and sent must be pre-defined (e.g., equipment run time).

Data is accumulated during the day, 24 hour totals passed to SAP PM by the MES at the end of day.

Maintenance Request

The MES can send a request for maintenance on a piece of equipment to the SAP PM module which creates a maintenance notification. PM module end users can then
authorize the maintenance thereby creating a work order or deny the request thereby causing the notification to be closed.

**Maintenance Work Order**

SAP sends maintenance work order data to the MES when there is a change in a work order’s status.

**Maintenance Response**

SAP sends information about completed maintenance notifications when work orders are closed out in the PM module.

**Inventory Management**

The baseline inventory management interface functions are:

1) MES downloads purchase order receipts for material
2) MES downloads material master data from SAP’s MM module
3) MES uploads inventory data to SAP’s MM module
4) MES uploads batch characteristics to SAP’s MM module
Fig 3.3 – Inventory Management Interfaces

**Download Material Master**

Material master data is downloaded to the MES to allow the manufacturing system to include information such as costs in real-time displays. The material master download messages are initiated by the SAP system and can be received at any time.

**Upload Inventory Data**

The MES can send periodic spot inventory levels or updates when inventory status (e.g., location, amount, lot ID) has changed to the SAP MM on an hourly or daily basis.

**Upload Batch Characteristics for Material**

When material is batch managed in an SAP system it is often necessary for the MES system to send the MM module batch characteristic data (e.g., expiration date, operating temperature range) for material lots and to associate this data with a batch ID.

**Quality Data Management**

The baseline quality data management interface functions are:

1) MES downloads inspection lot information from the SAP QM module

2) MES uploads inspection point results to the SAP QM module
Fig 3.4 – Quality Management Interfaces

These interfaces may involve the use of laboratory analysis and/or in-line process analyzers.

**Download Inspection Lot Information**

The MES receives SAP QM module inspection lot messages. The messages contain lists of lot IDs that require inspections along with the inspection data requirements for each lot.

**Upload Inspection Point Result Information**

Using the inspection lot information downloaded from the SAP QM module, the MES can send quality test result data for specific lots to the QM module.
Bridging the B2MML Gap

Once B2MML has been chosen for the data format, someone still has to handle the mapping, routing transformation and business logic between the systems that are exchanging data. So, the best interface solution must not only support B2MML, it must also be flexible and easy to modify because every deployment will require some amount of change. The key to success is to adopt a delivery and deployment method that provides the necessary flexibility which strongly implies a configuration-based approach.

The SAP Side

To start, let us examine some of the complexities of the SAP side of the interface equation. SAP is an extremely sophisticated, configuration-based business application that is never run “out-of-the-box” and is always customized to fit the end customer's unique business needs. Two SAP customers, in the same industry vertical, manufacturing the same basic products, can have SAP implementations that differ so much that one implementation bears little or no resemblance to the other. It is safe to say that the SAP product line is not like anything else you have had to deal with.

You have to know every release of SAP. The major releases of SAP include 3.1H, 4.0B, 4.5B, 4.6C and 4.7. And, if that’s not enough you now have to know SAP ECC 5.0 and ECC 6.0. In fact, with the latest releases of the SAP Business Suite the built-in application “stack” you need to master has increased significantly and includes: SAP Solution Manager, SAP NetWeaver (ABAP and Java), SAP ERP and SAP GUI.

Consider also the accelerating rate of change of complexity in the more recent releases of SAP ECC. The following table compares some metrics between the most widely deployed release of SAP R/3 (4.6C) and the most recent release of SAP ECC 6.0 (EHP1).

<table>
<thead>
<tr>
<th></th>
<th>SAP R/3 4.6C</th>
<th>SAP ECC 6.0 (EHP 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Data Dictionary Tables</td>
<td>96,896</td>
<td>312,004</td>
</tr>
<tr>
<td>Number of Data Dictionary Views</td>
<td>17,797</td>
<td>41,416</td>
</tr>
<tr>
<td>Number of Function Modules</td>
<td>137,247</td>
<td>379,236</td>
</tr>
<tr>
<td>Number of Remote Callable Function Modules (includes BAPIs)</td>
<td>10,544</td>
<td>29,344</td>
</tr>
<tr>
<td>Number of IDocs</td>
<td>610</td>
<td>1,696</td>
</tr>
<tr>
<td>Number of Transaction Codes</td>
<td>57,928</td>
<td>105,132</td>
</tr>
</tbody>
</table>

Table 4.1 – Comparison of SAP R/3 4.6C and SAP ECC
Regardless of the particular release of SAP that you are dealing with, you have to know which is the most appropriate connectivity method to use for your end customer. SAP supports a large number of native connectivity methods, including Idoc, RFC/BAPI, NetWeaver/XI and most recently NetWeaver/xMII. Unfortunately, application vendors rarely get to dictate to their end customers how they will interface their MES products to the SAP system. End customers have usually invested too heavily in SAP (in terms of money, time and expertise) to allow them to do that. Rather, vendors need to be flexible in their ability to deploy their interfaces.

Regardless of the particular release of SAP and the chosen connectivity method, you have to know the difference between customers that use the SAP PP (Production Planning and Control) Module and those that use the SAP PP-PI (Production Planning for Process Industries) module. Most MES vendors have a clear understanding of the differences in functional processes employed by end customers in different Industry Verticals (for example, Rolled Products vs. Pharma). What they must also understand is how those industry verticals are supported within SAP and how each one differs from the other.

Even if you know everything you need to know about the various releases of SAP, the intricacies of the different communication mechanisms, the nuances of the various functional modules, etc. it is vital that you have access to your own in-house SAP systems so that you can perform research and development away from the customer site. Without access to your own systems it will be very difficult to maintain and extend your SAP functional and technical knowledge.

**The Application Side**

Some MESs are aimed at a single industry vertical but most are not. Typically, the MES will be built upon a commercial database that is, at a minimum, configured differently to support the requirements of each of the end customers. This means that in many cases the way that the MES operates (and the specific data it needs) will vary by deployment.

The plant-floor application vendors probably don’t just need to connect their MESs to SAP, they also need to connect to Oracle Applications and other ERPs. In fact, the MES probably needs to also be able to connect to HMIs, Historians and custom applications. It would be nice to use the same basic mechanism for those connectivity requirements that is used for SAP. So, the optimal interface solution should be easily adaptable to other delivery methods and data formats.

In short, application vendors need to provide a standards-based consistent interface to the outside world that the MES can treat in the same way no matter what it is being connected to; regardless of ERP product, version, interface technology and unique deployment customizations.
Mapping, Routing, Transformation & Business Logic

Due to the functional and semantic differences between the MES and the ERP it is clear that the interface needs to be able to provide a rich and robust set of mapping, routing, transformation and business logic to successfully bridge the divide.

It should also be clear by now that this functionality must be fast to implement and easy to change. This strongly implies that the Interface should not be hard-coded in any way and should be driven through configuration.

The application vendor needs to not only create the Interfaces and modify them to suit the particular requirements of the end customer, but perhaps most importantly, the application vendor needs to be able to efficiently and effectively support and maintain what was deployed. The post-deployment support and maintenance aspect of this is not easy and is perhaps the most overlooked aspect any integration project.

Finally, application vendors must be able to migrate either side of the interface equation independent of the other in order to adapt to product release schedules of the MES and the customer’s ERP that are not synchronized. This strongly implies that there is a loose coupling between the MES side of the Interface and the ERP side of the Interface.

The Practical Reality

So what does this mean to the plant-floor application vendor and the manufacturing end customer? There are several areas of concern to be considered:

- **Product Development (B2MML)** - The plant-floor application will need to be modified by the application vendor in order to support the ability to send and receive XML if it does not already have this capability (or if its existing support of XML is not flexible enough).

- **Product Development (Web Services)** - The plant-floor application will also need to be modified to support web services if it does not already do so. The plant-floor application needs to be able to act as a web services client and a web services server. And, the web services implementation needs to be able to work with the ERP's implementation of the web services (non) standard.

- **Avoid Tightly-Coupled Systems** - Either the plant-floor application or the SAP system will need to handle the mapping, routing, transformation and business logic. If this capability is not handled by the plant-floor application then it must, by definition, be built into the SAP system. In reality, some parts of these functions will end up in both systems which, without careful planning and flawless execution, can create an inflexible and tightly-coupled system.
Avoid Narrow Technical Solutions - If the only way that the plant-floor application can connect to SAP is via B2MML-based web services, the manufacturing end-customer will need to have SAP NetWeaver deployed in their SAP landscape. Next, the NetWeaver deployment must also have the SAP Exchange Infrastructure (XI) configured or xMII must be deployed and configured. Once these pre-conditions are met then the end customer's SAP support staff will be ready to either start writing Java code to handle the interfaces via XI or to start configuring xMII to handle the interfaces. But it must be said that for some end customers this may be perfectly acceptable.

Limited or No SAP Experience - Most plant-floor application vendors do not have any SAP functional or technical experts on staff. Nor do they have easy access to, or experience of, the full range of SAP systems that they may need to integrate to.

Avoid Expensive Solutions - All this product development cost on the part of the application vendor will inevitably be passed on to the manufacturing end customer. The end customer is also responsible for the SAP side of the interface equation. To understand the true cost you have to include both sides of the interface equation and then factor in ongoing support and maintenance costs as the business processes change over time and the SAP and plant-floor applications are upgraded to new releases.

A Practical Solution

Deployed worldwide across a variety of industries since 1998, NLINK is a mature product that was designed from the ground-up to provide a total solution to the plant-floor to SAP integration problem. Fast to Implement and easy to change, NLINK's patented architecture and SAP Certified interfaces deliver a configuration-driven solution requiring no end-user programming and no in-depth knowledge of communications protocols or data formats.

Simple & Pre-Built - NLINK is a configuration-based product; no end-user programming is required. Underlying details of the data formats, protocols, transports, encoding methods and application interfaces are hidden from the end-user. The NLINK Configuration Module presents the integration task in a logical and consistent manner guiding the end-user through the entire process. NLINK has comprehensive built-in support for both B2MML and SAP-compatible web services.

Loosely-Coupled - NLINK handles all of the mapping, routing, transformation and business logic needed to bridge the functional gap between the plant-floor application and the SAP system. No matter what version of SAP the end customer is using. The plant-floor application and SAP are loosely-coupled providing the most flexible and adaptable interface possible.
**Broad Technical Solution** - NLINK’s support of SAP integration is not simply limited to B2MML. NLINK can connect to SAP in a multitude of ways including BAPIs, RFCs, IDocs, BDCs and via its Query capability. Successful plant-floor integration is not about forcing a one-size-fits-all solution on the end customer; it’s about being flexible, agile and applying the most appropriate integration technology to the problem at hand. If that's B2MML then we have you covered but if it's not then NLINK still has the solution.

**Easy to Find Skill Set** - NLINK allows business users and IT staff alike to design, build and deploy interfaces between systems. No programming knowledge or in-depth information technology skill set is required to successfully complete an SAP integration project, on-time and within budget. Experience has shown us that most new users become productive almost immediately upon successful completion of initial NLINK Training.

**Small Footprint** - NLINK installs in minutes and once installed, allows rapid-prototyping of integration interfaces. NLINK is configuration-based so changes to existing interfaces can be made quickly and easily. NLINK’s small footprint still delivers an enterprise class integration solution that is reliable, scalable, flexible and manageable.

**Deep SAP Experience** - Junot Systems is a 12-year SAP ISV Partner and we have full-time on-staff SAP functional and technical experts with years of SAP integration experience. We also use SAP ourselves and so have easy access to the full range of SAP systems that are deployed in the manufacturing market space.

**B2MML Experience** - Junot Systems specializes in plant-floor to SAP integration and has significant B2MML project experience. Our in-house functional and technical experts have already helped several of our technology partners support standards-based B2MML to SAP integration in their plant-floor applications.

**Cost-Effective** - NLINK is component-based. NLINK CoNNectors, eXtenders and Modules can be mixed and matched to create the optimal integration solution. NLINK customers pay only for the components that they actually use. Over time, as the integration project evolves, incremental costs are added only when significant new functionality is required.

**Advanced Capabilities**

There are a number of so-called advanced capabilities that are rarely included in the interface design but that are really essential components of a world-class SAP interface solution.
**Store & Forward**

Store and Forward is where an application provides persistent local data storage that allows transactional information to be temporarily stored during unscheduled external systems or network downtime. Once the external system comes back online and re-establishes communications with the application, the transactional data is processed and forwarded onto the now functional external system. The application must ensure that there is no loss of data and that the messages are processed once and only once and sent in the correct sequence.

NLINK provides built-in Store & Forward capability as part of the base product functionality.

**Automatic Failover & Recovery**

Automatic Error Recovery is the process whereby all messages received by and sent from the ERP Interface are stored in a local Transaction Log. If for any reason the ERP Interface engine shuts down in an uncontrolled manner, say because of an operating system or hardware fault, it can automatically recover its internal state. When the ERP Interface is started with automatic error recovery enabled, it searches for a local Transaction Log at startup and, if present, reads it and uses the data contained within to recreate its last known state.

This hardware/software solution delivers simple, affordable, business continuity for any Windows application. Industry-standard Intel based servers continue processing with no interruption in service, no loss of application state, and no data loss. If a failure occurs, the client-users never know it. You can repair or replace the failed hardware component while continuously online.

NLINK has been tested on, and Junot Systems has business relationships with, the two leading commercial systems that provide Automatic Failover capabilities to the manufacturing market space.

**Management & Reporting**

The MES is an enterprise-class application designed to function as an integral component in your mission-critical 24x7 business operational environment. The ERP Interfaces must provide the tools needed to observe, maintain and troubleshoot each of the Interfaces across the end customer's network. Without the this capability end user IT departments would be forced to shoulder the burden of providing centralized monitoring and control of networked ERP Interfaces by developing their own in-house methods and solutions.

For example, the NLINK Management Module (NMM) provides the out-of-the-box ability to monitor, manage and troubleshoot the NLINK Server both locally and remotely across a network. With the NLINK Management Module, administrators can quickly observe the
state of NLINK installations, monitor system event log messages and view or record detailed system statistics. The NLINK Management Module also provides the ability to easily reset NLINK CoNNectors or update operational settings of the NLINK Server as it runs, without the need to restart the service.

Automated Operational Alerts

The MES is an enterprise-class application designed to function as an integral component in the end customer’s mission-critical 24x7 business operational environment. The ERP interface must contain sophisticated error detection and handling capabilities that can be used to alert the manufacturing IT staff or business users of error conditions should they occur. Without proactive notification of error conditions support staff can be unaware of systems or business process problems until it is too late.

The NLINK Alert Module provides e-mail or pager alerts and notifications from NLINK to business analysts and IT support staff using the Simple Mail Transport Protocol (SMTP). In addition, support staff can also subscribe to an RSS (Really Simple Syndication) feed of NLINK Information, Warning and/or Error messages. With the NLINK Alert Module, NLINK can proactively notify your staff of any error or potential error condition, keeping your systems running smoothly and keeping systems outages to an absolute minimum.

Automated Interface Documentation

We have already made a clear and compelling case for the need to have a flexible and configurable solution that can be easily changed. That said, how are changes to the interface tracked when they are made at the customer site? How can the application vendor’s customer support group be expected to assist the customer to keep the interfaces running 24x7? The answer is to provide an automated, self-documenting capability in the interface to ensure that the actual interfaces running in production are accurately documented.

The NLINK Auto-Doc Module automatically generates either Hypertext documents or flowchart-style drawings that represent the configuration of an NLINK integration project. Since these hypertext documents and flowchart-style drawings are created from the NLINK configuration itself, they are always accurate and complete.
Fig 4.1 The NLINK Auto-Doc Module FlowChart Output

The NLINK Auto-Doc Module can be used for a variety of purposes:

- Use the Visual Component as a Diagnostic and Customer Support Tool, as a Design Aid or as an Implementation Guide.

- Use the Hypertext Component for Knowledge Capture and Transfer, Archiving and Change Tracking or as an aid for Customer Support Troubleshooting.
Summary

Manufacturing end customers are demanding that application vendors provide a standards-based, turn-key integration solution between their applications and SAP that is deployed and (more importantly) supported by the application vendor. Many people underestimate the inherent complexities of providing real-time or asynchronous, loosely-coupled bi-directional business process integration between two sophisticated and configurable systems, like SAP and today’s generation MES products. Vendors need to provide an SAP certified solution that is flexible enough to easily meet the almost infinite variation in requirements and deployment scenarios that they will encounter in the SAP world. B2MML is emerging as a vital ingredient in this arena but it is by no means the whole story.

Disclaimer

The information contained in this document is, by definition, Marketing material and although it does absolutely represent the honest view of Junot Systems it is not supposed to be completely impartial. Nevertheless, we do genuinely believe that we have an excellent product that provides one of the few completely coding-free business integration tools that is ideally suited to the difficult task of plant floor to SAP business integration. And, we have amassed enough real-world SAP integration experience over the past 12 years to know that although plant-floor integration standards such as B2MML represent a significant step forward, they are not by themselves a silver bullet nor do they represent a complete solution. Whether you choose to use NLINK or not, go into your plant-floor to SAP integration projects with your eyes open.
Appendix A – References

ISA

WBF
http://www.wbf.org

MIMOSA
http://www.mimosa.org

OPC Foundation
http://www.opcfoundation.org

OAGi
http://www.openapplications.org

OMAC
http://www.omac.org

Make2Pack
http://www.make2pack.org

Open O&M Initiative
http://www.openoandm.org

Manufacturing Interoperability Guideline Working Group
http://www.isa.org/mnfginterop