Solumina Best Practices

Integration

Reporting

Organizational Change Management

Configurations vs. Extensions Vs. Customizations

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iBase-t

Aerospace & Defense Experts

Revision History

Date	Revision	Description	Author
February 12, 2025	0	Release 1	Michel Gadbois

Table 1. Revision History

1 – Solumina Integration –

Solumina is a digital software platform for Aerospace and Defense companies. Solumina establishes a Digital Foundation that links your PLM(s) to your Operations environment. Solumina will eliminate 50+ existing and often disparate systems used on the Shop Floor. Solumina is a single, integrated platform for MES (Manufacturing Execution Systems), MRO (Maintenance, Repair, and Overhaul, EQMS (Enterprise Quality Management System), and SQM (Supplier Quality Management).

Within the "Golden Triangle" of PLM (Product Lifecycle Management) systems, MES / MRO systems (Solumina), and ERP (Enterprise Resource Planning) systems, Solumina manages the following processes:

- **Process Description** (with Unit Effectivities)
- **Process Execution** (Discrete, Batch, Lot, Maintenance, Rework/Repair)
- **Enterprise Quality Management** (Control Plans, Discrepancies, Corrective Action, Audits, Customer and Supplier Portals)
- **MRO Task Planning and Execution** (A set of Unique Component Repair and Overhaul Functions)

To handle these processes, Solumina uses a combination of over 40 pre-developed integrations to PLM, ERP, Time and Attendance, Machines, Sensors and Metrology equipment.

---Access the Integrations List

These integrations are either Real-time Synchronous (JSON messages) or Near-Real-Time Asynchronous (XML Business object Documents BODs via Active MQ) and enable seamless Integrations 24x7x365.

Integration REST APIs (JSON payload)

JSON Messages are designed for PLM Integrations but are also offered in XML BoDs if the customer prefers. Partner products such as eQ Technologic offer a complete set of plug-and-play PLM to Solumina adapters to accelerate integration to Siemens, Dassault or PTC PLM Systems. Customers can also choose to connect directly to our integration REST APIs should they prefer.

BIS Messaging (XML payload)

When a message can take 20-40 seconds to process AND there is a chance that the integrated system may go down from time to time for maintenance periods, we recommend using messaging-based integration through our XML Business Integration Services (BIS) module and Active MQ message Broker. We have used this technology for over 20 years with billions of messages transmitted successfully between Solumina and SAP using iDocs, PLM Systems, Time and Attendance tools, and Machines.

We continually update and add to the list of standard interface offerings.

---Access the List of Inbound and Outbound Interfaces (validated MQ messages)

SAP End-to-end Integration (ECC 6.0 and S/4HANA)

With over 90 percent of our user-base using an SAP ERP system, we decided in 2004 to create an end-to-end Connector that can connect directly to ActiveMQ from both Solumina BIS and SAP PI/PO or, if necessary, can

be routed through a Corporate Integration Platform, Unified Name-Space UNS (interoperability framework) for data replication and extraction and/or transformation. These optional middleware solutions can be commercial or can be specialized/home-grown (typically for larger customers). These are not mandatory but can add value if desired.

2 – Reporting –

Solumina's most important value lies in the strict control it allows in building and or sustaining assets with a precise set of Work Instructions that incorporate data collections requirements, calculations, sign-off requirements and complete part genealogy tracking and control. One of the important bi-products of this execution platform is the richness of the data we collect:

- Complete As-Built verification and tracking by end unit ID (includes removals)
- Complete dimensional and non-dimensional parameter collections
- Time-phased Machine and sensor data during the build process
- Complex scientific calculated results based on data collected above
- Thousands of detailed timestamps for all completed activities (cycle times)
- Complete signature logs for all controlled signoffs and witness stamps
- Complete Labor utilization data for all operations activities
- Real-time SPC (Statistical Process Control) Analysis and Western Electric Process Control Rules and events
  - Planned Cost vs actual cost analysis in a drillable form
  - Defect rates and details
  - Tool Utilization rates and events

To manage all this data and turn it into actionable intelligence, Solumina offers the following approaches:

Manufacturing Intelligence ETL (Extract, Transform, Load)

Solumina offers a multi-dimensional data warehouse with 10 Fact Tables and 8 Dimension tables to transform Solumina historical data into insights. This happens every 15 minutes when our ETL server extracts, transforms, and loads our data tables with data that can be filtered and sorted in a variety of ways. Customers can use their own dashboarding tool such as Clik or Tableau or can take advantage of our pre-configured dashboards in Microsoft Power BI. The customer is free to either use our data warehouse as a feed to a larger Big-Data schema or can use our ETL to expand the schema. The customer is wholly responsible for the data warehouse and any ITAR regulations that may be invoked by the expanded data loads.

---Access the List of 34 Dashboards

Real-Time Reports

Solumina offers over 70 real-time views, dashboards, tabular and graphical reports inside the transactional system to manage and review:

- Defect Rates (Paretos and Sigma Charts)
- Statistical Process Control (SPC) via X-Bar MR Charts and Out-of-Control alerts
- Cost-of-Goods-Sold Analysis (Drillable)
- DPPM and DPMO Analysis
- First-Pass-Yield Analysis
- Etc.

---Access the List of Reports Catalog

JSReports

jsreport is an open-source JavaScript-based reporting platform included with our iSeries web platform that allows developers to design reports using HTML and JavaScript templating. It supports various output formats, including HTML, PDF, CSV, and others.

3 – Organizational Change Management (OCM) –

Deploying and properly utilizing Solumina is not an IT project. In fact, IT team involvement has become a minor part of the resources and transformational requirements. Deploying Solumina is truly an ORGANIZATIONAL CHANGE process because many shop floor users currently use paper and Excel Spreadsheets. Moving to a fully integrated digital MES / MRO system for the shop floor is a full digital transformation. Solumina brings over 4,900 standard A&D capabilities and functions to the Operations teams. They will most likely be deployed in targeted "Value" phases. Phases 1 and 2 provide funding for the latter phases. By the completion of phase 2, the customer should already be well in the black on the license subscription fees and contributing to increasing the corporate EBITDA.

In order to manage the breadth and complexity of change, we recommend a phased approach for both functions and programs. The iBase-t services team or Solumina Systems Integrators will work with you to create a detailed roadmap that will identify which programs or plant lines will be deployed for each separate phase. Within a phase, the functions contained will be broken down in a logical progression. Here is a recommended breakdown for MES, MRO and SQM:

Phase 1, Master Data, Planning, Execution and SF Quality:

- Master Files Management (non PLM)
- PLM Integration
- Process/Quality Planning (Gate 1)
- ERP BASIC Integration (Items & BOMs Sync,Routing Sync, Order Create, Order Update)
- Order Creation & Execution (Includes Supercede)
- Discrepancy Management & MRB (Gate 2)

Phase 2, Audits, Corrective Actions, Supplier Conformity

- First Article Management & Reports
- Process and ISO Audits
- 4D and 8D Corrective Actions (Gate 3)
- Supplier Portal and In-Process/Source Inspections (Gate 4)

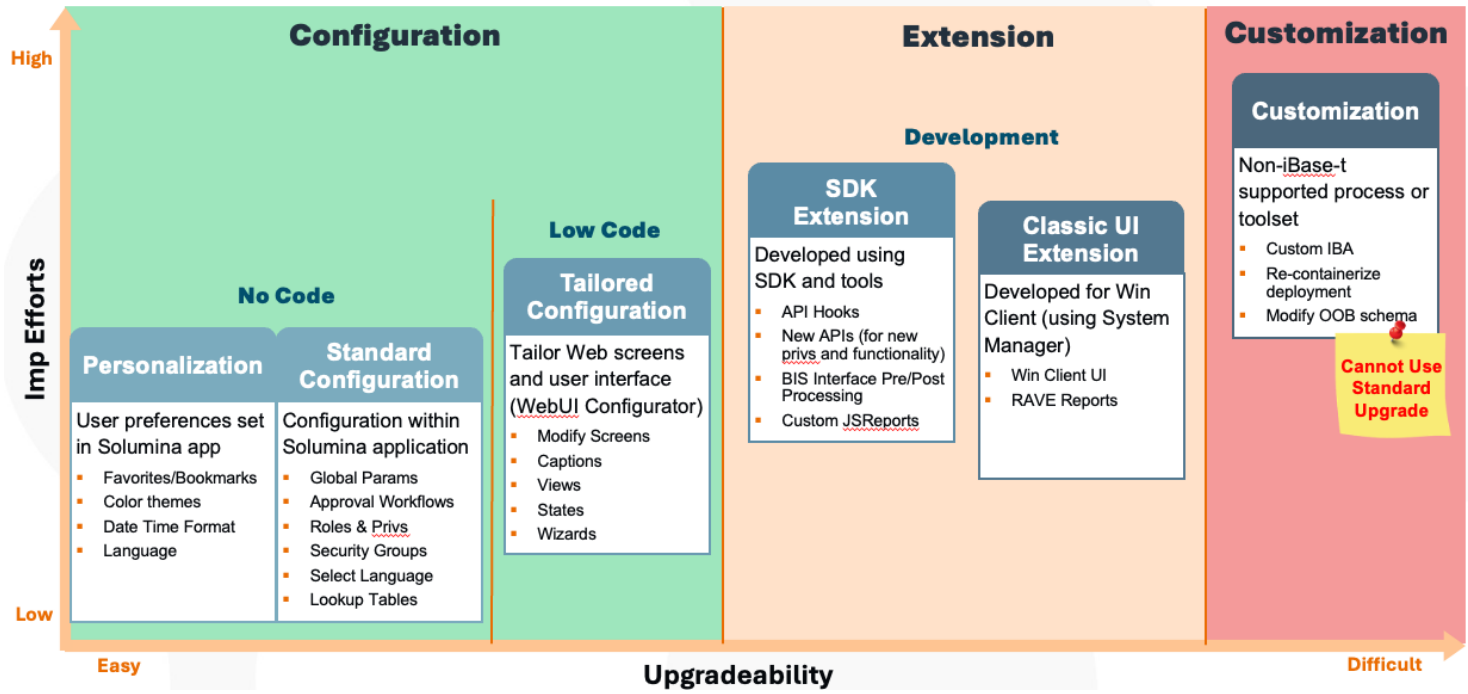
Phase 3, Model-Based Continuity

- Model-Based Artifact Sync (Models, BoC, BoP, BoM)
- Model-Based Work Instructions
- Model-Based Data Collections (Manual, CMM and In-Machine Probes)

The sooner Change agents are brought into the project, the better. Some SIs will offer broad OCM capabilities, some customers may have their own OCM/Transformation group to assist. In comprehensive Adoption and Change Management plans are key elements of effective enterprise solution programs. iBase-t offers insights into best practices for Solumina adoption and change management to help customers and prospects understand the necessary plans and activities for effective solution adoption focusing on Value Management, OCM practices, and Adoption support.

4 – Configurations vs. Extensions vs. Customizations –

Solumina stands out by offering unparalleled value through its ability to be configured and extended to meet diverse business objectives. With a focus on upgradability, iSeries ensures that customers can seamlessly adopt new features and improvements without disruption. The configurability aspect allows users to tailor Solumina to their specific needs using intuitive low-code and no-code tools, empowering them to make changes without deep technical expertise. Additionally, our software development kit (SDK) approach provides extensibility, enabling developers to build custom functionalities and integrations that enhance the core capabilities of the solution. This combination of upgradability, configurability, and extensibility ensures that Solumina evolves with our customers' businesses, driving sustained success and innovation.



Configurations:

No Code Configurations:

No-Code configurations include System preferences and Global parameters as well as document type definitions, workflow definitions, Role and privilege mapping as well as translations for menus and error messages. These require no tools and are privilege controlled.

Low Code Configurations:

Low-Code configurations are performed using our WebUI Configuration Tool and include Dispatch List creation or additions (new tabs and commands), Changes to the objects (User Defined Views) within a document/instruction type such as substituting or changing the field content of a sub-screen on a work order or tab grid. These require some JSON knowledge but can greatly accelerate functional tailoring while remaining fully on the upgrade path,

Extensions:

1. ### Back-End Extensions:
   Back-end extensions may include new APIs for business rules, Error Messages, Transformations or additional processes. These are completed using our licensed and subscribed back-end SDK (Software Development Kit). SIs or Solumina Services engineers can train, assist, or perform these back-end configurations. These are fully upgradeable.
2. ### Front End Extensions
   Front-end extensions can be performed using our Web Configuration tool. This includes:
   i. New Dispatch Screens or Tabs
   ii. New User-Defined Views
   iii. Surfacing or editing a User-Configured Field
   iv. Additional Languages for menus and error messages

   Front-end extensions should ONLY be done in approved areas of the code.

Customizations:

Customizations involve making a change to the application stack that changes one or more iBase-t-delivered objects. Although some things can be extended such as our Database Schema, no changes to any object should be performed. This incudes:

- Delivered Libraries
- React Base Code
- Delivered Tables, Views, Functions, Packages etc.

Customizations will increase the complexity, cost and timeline for any upgrade and will require the standard upgrade scripts and processes to be modified. This practice is NOT recommended.

In Addition to altering core code, Solumina categorizes all functions into three levels of complexity. Our surface layer (Level 1) is the most accessible and editable. For some more complex functions (Level 2) customers may want to add a business rule. iBase-t Experts are available to help and advise for level 2 new APIs. Highly complex functions such as Order Supercede or Alteration Propagation (level 3), are areas where customers may not attach any new functions, business rules or screens. Level 3 changes are accomplished via enhancement requests and are reviewed and delivered in subsequent software releases

2. ### New Modules
   New modules can be written to live alongside and integrate with many of the Solumina microservices by a duly trained and certified iBase-t consultant or Solumina Systems Integrator. They can be very simple such as leveraging handheld barcode handlers or as extensive as entirely new modules. These can ONLY use iBase-t approved APIs.