Implementation Scenarios & Architectural Considerations for SAP MII Implementations

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3 Key Learning Points

• Industry scenarios for SAP MII implementation

• Architectural options and best practices for SAP MII implementation

• Implementation approach for global SAP MII deployment
1. Implementation Scenarios & Use Cases for SAP MII
2. Determining the Right Deployment Scenario
3. Handling Complex Integration & Messaging
4. Managing Plant Data
5. Making the UI That Engages
6. Delivering the Solution For Global Deployment
Manual filling and packing line data collection process to be automated
Integration with multiple SCADA, Historian, MES for process data collection
User-friendly operator dashboards

Integration with MES, LIMS, SCADA for process monitoring and transaction updates
Relationship of process data points in Historian Tags with Enterprise assets
Process event management on data point deviation

Complex manufacturing process automation by integrating ERP and MES
Multiple systems for master and transactional data (BOM, routing) to be integrated with MES
High volume of data transfer from each system requires guaranteed delivery

Real-time process & asset visualization
Real-time analytics on process data
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1 – Sensing the production process, manipulating the production process

2 – Monitoring, supervisory control and automated control of the production process

3 – Work flow / recipe control, stepping the process through states to produce the desired end products. Maintaining records and optimizing the production process

4 – Establishing the basic plant schedule – production, material use, delivery, and shipping. Determining inventory levels

Time Frame

- Months, weeks, days, shifts
- Shifts, hours, minutes, seconds

SAP MII

Positioning of SAP MII in Enterprise Hierarchy

Level 4
ERP

Level 3
MES

Level 2
Batch Control
Continuous Control
Discrete Control

Level 1

Level 0

Business Planning and Logistics
Plant Production scheduling, operational Management

Manufacturing Operations Management
Dispatching Production, Detailed Production, Scheduling, Reliability, Assurance, …

SFAC (SCADA / Historian / DCS)*

* SFAC – Shop-Floor Automation Control
SCADA - Supervisory Control And Data Acquisition
DCS - Distributed Control System
SAP ERP

- Materials Management
- Production Planning
- Quality Management
- Plant Maintenance
- Human Resources

SAP MII

Integration

Inelligence Dashboards

MES

- Plant A
- Plant B
- Plant C
- Plant X

Suitable for plants having standard MES packages and/or lesser integration need in individual plants

Suitable for similar ERP-MES integration across multiple plants

Ideal for cross-plant analytics scenarios
Suitable for plants having multiple shop-floor systems and large facilities
Easier to cater to the plant-specific integration and analytics requirements
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Sample Scenario – ERP-MES
Manufacturing Order Synchronization & Plant System Integration

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SAP MII Integration Architecture – How to Handle Complex Integration

- Process categorized message by scheduler
- Persist Message Header and ID in MDO
- Correlate stored messages by key fields
- Use asynchronous message processing

Maps SAP Message with Legacy and vice versa

Queries and processes categorized messages

Monitor messages with Business Context

Persist message header and message id to correlate messages

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SAP MII Integration Architecture – Guaranteed Delivery of Outbound Messages

- Store outbound messages in MDO
- Query and send message to target systems periodically

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SAP MII Integration Architecture – Process Data As Event Notifications

- Generate process events on tag value change in Level 2 systems
- Trigger follow-up action on event generation
- Store events and analyze with process data
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Managing Plant Data – Persisting Transactional, Master & Configuration Data

- Persist transaction and master data in MDO from Message Services
- Persist configuration data in Shared Memory

Diagram:
- SAP ERP
- MDO
- Message Services
- BOM/Routing
- PLM/EMC
- MES
- Shared Memory
- Transactional Data with Header Information, Master Data
- Plant specific configuration data

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Semantic Mapping is used to define relationship between the tags present in the Historian/SCADA systems with the corresponding business data entities typically maintained in SAP ERP, to provide a business context to the raw process data.

As tag values in Historian are plain time-series data with no business context attached to it, it is not possible to analyze them and readily understand the business impact of the data.

To enable the visibility and deliver intelligence on the raw process data captured from the machines, mappings are defined between the tags and business data objects.

The mapping can be maintained in MDO along with the hierarchy information in Plant Information Catalog (PIC), which can be queried at runtime to get the corresponding tag and subsequently process data from Historian/SCADA for enterprise data objects e.g. equipments.
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- Create user interfaces in MII depending on the user role and method of access (minimal user inputs & process intelligence)
- Leverage AJAX & XSLT transformation to deliver dynamic user experience
- Use SAPUI5 to develop device-independent and engaging UI
- Use OData interface in MII with SUP to develop mobile apps
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Delivering the Solution For Global Deployment
- IBM’s Approach for SAP MII Implementation

<table>
<thead>
<tr>
<th>Evaluate</th>
<th>Project Preparation</th>
<th>Blueprint</th>
<th>Realize</th>
<th>Final Preparation</th>
<th>Go-Live &amp; Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Review Client Environment</td>
<td>• Initiate Project Planning &amp; Kick-off</td>
<td>• Collect Detail Requirement</td>
<td>• Prepare Functional Specification</td>
<td>• Setup Production</td>
<td>• Go-Live</td>
</tr>
<tr>
<td>• Prepare Proposal</td>
<td>• Finalize Scope &amp; SoW</td>
<td>• Define Implementation Roadmap</td>
<td>• Prepare Technical Specification</td>
<td>• Perform Hand-Over</td>
<td>• Monitor</td>
</tr>
<tr>
<td></td>
<td>• Finalize Quality Plan</td>
<td>• Define Architecture</td>
<td>• Develop Technical Object</td>
<td>• Prepare for Go-Live</td>
<td>• Support</td>
</tr>
<tr>
<td><strong>Accelerators:</strong></td>
<td><strong>Accelerators:</strong></td>
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<td><strong>Accelerators:</strong></td>
</tr>
</tbody>
</table>

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Solution Design

• Create a common template solution which can be customized for each plant
• For decentralized (plant-specific) deployment create cross-reference project structure in MII workbench, the top-level project consisting of the core and common functionalities and the child projects consisting of the plant-specific functionalities
• Use different software component for each project in MII workbench so that those can be deployed/transported individually
• Use MII Shared Memory of type map to store system connection information corresponding to different plants

Change Management & Transport

• Use NWDI for content management
• Use CTS+ for transport/deploy from DEV->QA->PRD
• Use single DEV instance with plant-specific QA and PRD instances for de-centralized installations
• Use separate development and correction systems post go-live
• Need **monitoring of different events in plants** e.g. - Machine breakdown, Valve opening, Process parameter changes etc
• Need **early warning** where it may prevent the loss and can help to take decision much before the actual event occurred
• Need actions automatically **without any manual intervention**

**Features & Value Proposition**

- The solution provides a framework to detect physical events by change in tag values in SCADA/Historian
- SAP MII records the event and provides dashboards for monitoring and predictive and process analysis of events
- The events are contextually linked with the enterprise data and process by semantically mapping the tags with enterprise data objects
- Each event instance can be configured to trigger chain of events or sequence of processes in external systems
- Event analytics on assets provides information about assets affected by events and help in root-cause analysis
Delivering the Solution For Global Deployment
- Accelerating By Solution Assets (Visual Plant)

- Need **real-time visibility** and awareness of the state of an asset in the plant-floor.
- Need a **visual representation of asset** e.g. how the workcenters are related to each other
- Need **real-time information** of the machine state, order execution, inventory, process parameters, etc

**Features & Value Proposition**

- The solution provides a framework using which the user can define the asset hierarchy or can import the same from external systems such as SAP ERP or third-party MES and persist the same in SAP MII
- For each asset (equipment/workcenter-functional location) the user can define the info-collector services for both basic and detail view which can be developed and plugged-in at deployment time or later
- The asset hierarchy will be visually displayed to the user in SAP MII portal
- The basic information of individual assets will be displayed along with the asset hierarchy view with periodic auto-refresh and detail information on drill-down in real-time
- A visual representation of the asset layout in plant floor along with real-time information of the machine state, order execution, inventory, etc can be used as a monitoring solution and alerting dashboard

**IBM Visual Plant & Asset Monitoring Framework**
• Need **monitoring** of system properties and connections in production support of SAP MII
• Need **root-cause analysis** of system performance issues
• Need **alerts** on connection downtimes

**Features & Value Proposition**

- Using this asset MII administrator can check all the statuses and system properties along with the messages and user and BLS/query stats in a single screen

- The solution provides the following monitoring features:
  - Displays the status of all the configuration objects e.g. Scheduler, Data Server, Message Service, etc.
  - Displays the BLS/Query stats and user stats
  - Displays the failed message in the message service.
  - Displays the NetWeaver log of the system and Java System Reports
  - Provides consolidated system performance reports
  - Displays System connection downtime stats and sends email alerts
Questions?

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