SAP Manufacturing Execution (ME) Deep Dive

Tracy Wiese
Executive Solution Engineer
October 2, 2012
Agenda

- SAP Manufacturing
- Solution Architecture
- What’s new in 6.1 and what’s on the horizon?
- Let’s Define Mobile
Information Driven, Real-time Enterprise Service-enabled, Agile, Flexible

PLANT INPUTS
- Planned Orders
- Bills of Material
- Production & Process Orders
- Material Inventory Levels
- Inspection Lots Data
- Master Recipes
- Material Details
- Batch Details
- Resources & Functional Locations
- Maintenance Work Order & Notification details
- Material & Order Costs

PLANT OUTPUTS
- Production Confirmations
- Process Messages
- Material Receipts
- Material Consumptions
- Material transfers
- Inspection results recording
- Quality Notifications
- Batch Characteristic recording
- Work Orders & results recording
- Maintenance Notifications

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MES Deployment: Collect Locally, Report Globally

Plants

SAP ME* Plant 1
SAP ME* Plant 2
SAP ME* Plant 3

SAP MII**
server

SAP MII**
server

SAP MII**
server

SAP MII** Web
services

Corporate

Central
SAP ERP

Dashboards

*SAP ME = SAP Manufacturing Execution
**SAP MII = SAP Manufacturing Intelligence and Integration
Functional ME ERP Integration Features

- **PP**
  - Production Order
  - Planned Order
  - Routing
  - Work Center
  - BOM
  - Serial Number

- **MM**
  - Material Master
  - Inventory Staging
  - Inventory Reserve
  - Batch Managed
  - Classifications
  - Storage Location

- **PM**
  - Equipment
  - Measurement Points
  - Scheduled Downtime
  - Maintenance Order
  - RMA Service Order

- **HR**
  - User Master Record

- **QM**
  - CAPA Processes

- **SAPMEINT**

- **Dashboards**
  - Yield Confirmation
  - Order Backflush
  - WIP Scrap Confirmation
  - Component Consumption

- **Batch Numbers**
  - Unscheduled Downtime
  - Equipment Usage
  - Inventory Return

- **Inventory Scrap**
  - Inventory Release
  - RMA Order Complete
  - Quality Notifications
SAP Manufacturing Application Stack

Enterprise & Supply Network Planning
Order Fulfillment

Enterprise Integration

Process & Production data

Real-time Process Monitoring & Visualization

WIP
Work in Progress

ODS
Aggregation, Audit Log, Archive

User Interface

Machine & Equipment Integration

ME
MII
PCo
Business Objects

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ME Equipment Integration with Plant Connectivity (PCo) and MII

- Event trapped and validated against trigger criteria.
- Custom Notification created and dispatched to Destination.
- MII processes the event message received from Plant connectivity.
- All SAP capabilities like dashboard, alerting or further process trigger can be enabled

Standards: OPC DA / HDA / AE / UA Socket, File, OLEDB

Historian
Scada
Machine
Tool
LIMS

Dashboard

Alerts, etc.
Business Process Transparency - Delivering the Advantage
Suite of Products to Manage, Align, Understand and Improve Performance

Executives & Program Managers
Trending, Graphics, & Performance Management

Business Analysts
Flexible Analytic Tools

Shop-Floor Support Personnel
Actionable Data, Alerts, Dashboards, Transactions

Shop-Floor Users
Operational Awareness, Product Visualization
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SAP ME Product Roadmap
2011-13 Planned Product Release Timeline

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  - New Production Operator Dashboard
  - Shop Work Bench
  - Visual Test & Repair
  - Floor Stock Management
  - Sampling
  - Electronic Time Sheet
  - NW ADS Integration (Printing)
  - Extensive API library
  - Earned Standards
  - Message Board
  - 2D Barcode
  - Operation Standard Labor Time Recording
  - Phantom BOM Support
  - Data Field List
  - DHR Improvements
  - SAPMEINT Interfaces

- **SAP ME 6.1 (RTC Nov, 2012)**
  - Touch Screen POD UI
  - SAPMEINT Interfaces
  - ME and MII NW co-location
  - Modularization and connect APIs
  - NWDI/DS support
  - Extensibility Architecture
  - NW CTC & CTS+ Support
  - Enhanced Documentation
  - Product Standard Compliance

TCO, SCALABILITY, USER EXPERIENCE, EXTENSIBILITY
SAP ME and MII NetWeaver Co-location

Features
- ME & MII co-deployment on one common NetWeaver stack
  - Migration will be well documented
- Redesigned communication to use JAVA API
- Co-locate NetWeaver and ME database schemas on shared database instance
- Recommend system landscape to optimize uptime for both ME and MII (i.e. safeguards)

Benefits
- Lower solution landscape TCO
- Offers a combined application architecture that:
  - Improves supportability – common mechanisms for administration and monitoring
  - Up to 2x increase in communication performance
  - Delivers greater system stability – minimizes the points of failure
NetWeaver CTC & CTS+ Integration
Central Technical Configuration
Change and Transport System

**Features**

- **CTC**
  - Automating creation of ME schema for fresh installation
  - Automating update of ME schema/content for upgrade
  - Automating all NetWeaver configuration

- **CTS+**
  - Transporting ME configuration
  - Supports multiple target systems
  - Both have support for custom extensions

**Benefits**

- Automates the technical configuration of ME thereby reducing setup time.
- Enable volume readiness by simplified and mass enabled configuration
- Lower support costs through reduced number of incidents caused by "wrong configuration"
NWDI/DS Support

**Features**

- Common development environment with other SAP products including MII
- Replaces legacy SDK as primary custom development infrastructure
  - Legacy SDK will be forward compatible and existing customizations can be migrated
- Full access to features provided NWDI/DS development infrastructure
  - Transport via CTS+
  - Built in source code control
  - Full access to SAP libraries, etc.

**Benefits**

- Reduces TCO related to development training and support
- Shift to a more standardized and robust development process
- Integration w/other SAP tools
Modularize SAP ME and Connect APIs

**Features**
- The built-in extensibility of APIs in service framework
- Increased offering of extendable APIs
- Increased API Connection in core application
- Improved Javadoc for APIs

**Benefits**
- Increased APIs for enhanced extensibility
- Increased ability to build market specific solutions
- Reduces development risk when making code modifications
SAP ME Extensibility Architecture

Features

- Separately deployable SCA for custom extensions
- Creation of a unified extension mechanism (collaboration, hooks, print plug-ins)
- Added capability to call APIs from MII transactions with new new action (MEINT)

Benefits

- Reduce TCO by minimizing manual steps and potential errors by merging customer and ME core SCAs
  - Ease of deployment of new service packs and patches for ME
  - Increases scalability
- Simplifies administration, management and flexibility of custom extensions through single programming model
- Narrow expertise and leverage power of MII to create custom solutions
SAP ME Documentation Improvements

**Features**
- Revamping documentation to help the field, customers, and partners to acquire ME knowledge more quickly and efficiently
  - How-to-guides
  - Enhanced web service and API documentation
  - SAPMEINT documentation,…etc.

**Benefits**
- Accelerate knowledge transfer
- Increase customer satisfaction

http://wiki.sdn.sap.com/wiki/display/ME/How-To+Guides
SAP ME Touch Screen POD UI

Features

- Newly designed, streamlined, Touch Screen PODs which incorporate the latest touch screen friendly design concepts to make the shop floor operation’s navigation and use simple and easy on a touch device.
- Touch Screen designed user interfaces of the most widely used POD activities to complete the ME Touch POD for use on the manufacturing floor.

Benefits

- Ergonomic touch screen design which incorporates simplified navigation and fewer actions, promote an easier and faster interaction with the system.
- Newly designed touch controls and features ensure an accurate and smooth experience on a touch monitor or large touch tablet.
Quality Inspection Integration

**SAP ERP**
- Create Inline Inspection Plan with Routing
- Create and Release Production Order
- QI Inspection Result for Characteristic Saved
- Read QI Characteristic Valuation Status

**SAPMEINT**
- Production Order Workflow
- QI Result Recording Workflow
- QI Valuation Retrieval Workflow

**SAP ME**
- Shop Order with QI Inspection information
- Created/ DC Group for QI result recording created
- Release Shop Order
- Execute Order and Perform QI Sampling on Complete at relevant Operation
- For Sampled SFCs capture QI result using Data Coll.
- Update QI Valuation Status
- If Overall status is ‘Accepted’, the SFCs move to next operation. If ‘Rejected’, then NC ‘QM_INSPECT_REJECT’ is logged

User Action
System Action
Quality Inspection Integration

In ERP, the Inspection Plan is created with Routing

One or more operations can be assigned inspection characteristics

Order is created using this Routing, Inspection Lot is automatically assigned to the Order on Release
Quality Inspection Integration

The Shop Order in ME is created with the Quality Inspection Information from ERP:

- SFC Group Size: Order Quantity minus Scrap Quantity
- Inspection Lot
- Inspection Operation
- Sample Size at Inspection Operation
Quality Inspection Integration

Characteristic are stored as parameters of Data Collection Group

- Enable read only QM Inspection Group
- DC Group attached to specific Production/Shop Order
- DC Group will be archived with Shop Order Close
- Collection Method – read only to Manual-Single

Data Collection – Parameter Detail

- Field label change – Required Number of SFCs
- New field – QM Critical
QM Inspection Runtime Collection

- Shop Order SFC Group Size arrives at Inspection Step and SFCs are started
- Inspection is triggered – ME will randomly select inspection SFCs from Shop Order
- SFC members are placed in Complete Pending
- Inspection Characteristics are collected for Inspection SFCs which are placed in complete pending
- Once all inspection characteristics are collected for an SFC they are sent to QM
- Final SFC indicator sent to QM to trigger QM
Create Routing in SAP ME and Export to SAP ERP

**SAP ERP**
- Create Material Master and Send to ERP
  - Routing Master Created

**SAPMEINT**
- Material Workflow
  - Routing Export Workflow
  - Production Order Workflow

**SAP ME**
- Material Master Created
- Create Routing
  - Assign Routing to Material
  - Background Job Triggers Export of Routing to ERP
  - Shop Order is created which uses the routing created in ME
  - Create New Version of Routing or Change Material Assignment
  - Background Job Triggers Export of Routing to ERP
Work Instructions Integration

- **SAP ERP**
  - Create and Release Documents
  - Attach Document to Routing Operation
  - Export Routing to SAP ME
  - Create Production Order and attach additional documents
  - Release Production Order

- **SAPMEINT**
  - Routing Workflow
  - Production Order Workflow

- **SAP ME**
  - Routing and Work Instruction Created
  - Shop Order, Work Instructions and its attachments created
  - Release Shop Order
  - Use work instructions in Operator POD
Direct Labor Integration

SAP ERP
- Create Work center and select a Standard Value Key
- Create Routing with Standard Values for Operations
- Create and Release Production Order

Production Order Confirmation Saved

Production Order Activity Confirmation Saved

SAPMEINT
- Production Order Workflow
- Production Order Activity Confirmation Workflow

SAP ME
- Create Standard Value Key
- Maintain Scheduling Standard
- Shop Order Created
- Release Shop Order
- Execute Order/Collect Labor Time
- Perform Labor Rollup
- Approve Rolled-up Labor Records for the Order
Direct Labor Integration

Standard Value Key can have maximum 6 activities

Standard Values can be defined either for Routing or Material - Routing using Scheduling Standard Maintenance
Direct Labor Integration

Operator is prompted to collect work time on Labor-Off in the POD

The standard values defined are shown to the user as Planned values. The actual values can be entered by Operator
Direct Labor Integration

Using Supervisor/User Time Edit, any adjustment to recorded time can be done.

On approval of labor record, the activity confirmation is sent to ERP.
Integration of Phantom, By-Product and Co-Product Components

The Phantom Component, Phantom Members, By-Product and Co-Product are created in ME.

The hierarchy of Phantom Component is exploded and available along with parent BOM itself.
Integration of Alternate Component for BOM

**BOM Maintenance**
- **Site:** MEQ1
- **BOM Type:** Master
- **BOM:** DPK-BLR-ALTCOMP-1-1
- **Version:** A

**Component Details**
- **Component:** BLR-ROH002
- **BOM/Version:** DPK-BLR-ALTCOMP

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**Enable BOM Alternate Use**
- **Alternate Component:** BLR-ROH001
- **Version:** 12/31/1999
- **Valid From:** 12/30/2010
- **Valid To:**
SAPMEINT Interfaces

SAP Enterprise Resource Planning
- Plant Maintenance
- Inventory and Warehouse Management
- Quality Management
- Master Data Authoring and Engineering Change Management
- Production Planning

SAP Manufacturing Execution
- WIP (Lot and Serial #) Tracking and Genealogy
- Manufacturing Process Control
- Defect Tracking and Resolution
- Data Collection
- Labor Tracking

- Production Yield Confirmation
- Production Scrap Confirmations
- Planned Order Backflush
- Planned Order Scrap
- Service Order Confirmation
- Component Goods Movement
- Component Consumption
- Parent Batch Number
- Quality Notifications
- Equipment Unscheduled Downtime
- Equipment Usage
- Inventory¹ Return
- Inventory¹ Scrap
- Inventory¹ Unreserved
- Inventory¹ Locations
- DC Batch and Batch Characteristics
- Serial Number
- Inspection Lot Results
- Direct/Indirect Labor
- Operation Std. Labor Results
- Routing

¹ Inventory is referred to as Floor Stock in SAP ME.

Some interfaces are dependent upon Ehp 5/6

ME 6.1
Change Management for Master Data Replication

The new framework provides a mechanism to:

- Mark which fields are owned by ERP
- For these fields whether the changes from ERP warrants update or create new version of the master data object or whether the changes to the field is restricted or not

Objects covered are Material, Work Center, Resource, BOM, Routing and Shop Order.
SAPMEINT Queue Monitor Profiler

Queue Monitor

Message Detail

Trend Profile
Shop Floor Dispatching and Monitor Integration

Shop Floor Dispatcher is an add on solution for ERP Production Planning.

It enables interactive dispatching of operations on individual machines.

Support different types of scheduling viz. Insert Operation, Find Slot, Infinite Planning etc.

Provide several usability features to alert about conflicting situations while scheduling

The result of SFD scheduling is imported by ME and the POD Worklist is prioritized as per the schedule
Shop Floor Dispatcher Integration

SAP ERP
- Create and Release Production Order
- Perform Tactical Scheduling for Order in SFD

SAPMEINT
- Production Order Workflow
- Yield Confirmation Workflow

SAP ME
- Create Shop Order
- Shop Order updated with the new schedule
- Release Shop Order
- Operator Work-List Prioritized based on SFD results
- Execute WIP

User Action
- System Action

Yield Confirmation
## Architecture

### Front End Application
- “Intelligent Client” for information and interaction in real time with good performance
- Windows application based on .NET

### Backend Application
- Persistency layer (data base)
- >= ECC 6.0
Functionality - Overview

**Dispatching**

• Interactive dispatching of operations on individual machines

• Support of the following scheduling functions:
  ■ Dispatch / Deallocate
  ■ Insert, Find Slot and Infinite
  ■ Interrupt already started operation
  ■ Display of operation splits
  ■ Creation of capacity requirement groups
  ■ Fix / unfix

• Visualization of alerts related to
  ■ Capacity overload
  ■ Violation of operation relationships within one order
  ■ Operations in the past
  ■ Confirmed operations in the future
  ■ Violation of planned date/time
  ■ Propagation
  ■ Changed machine capacity offering

**Monitoring**

• Visualization of critical or unexpected issues such as
  ■ Machine breakdown
  ■ Delay of operations
  ■ High-priority order
  ■ Confirmation status of operations

• Display important due dates/times

• Display related capacity requirements

• Order view to visualize complete order

**Others**

• Refresh Functionality

• Interactive setting of the frontend layout

• Search Monitor

• Alert Monitor

• Log Monitor
General Structure

- Ribbon Area
- Dispatching Area
- Work Load Area
- Control Area
Dispatching - Overview

Customizable visualisation of order & operation dates

Visualization of alternative machines

Alert Indicator

Overlapping Production Tasks

Wait Time

Detailed Information
Monitoring - Overview

- Refresh
- Confirmation status
- Manipulation of colors
- Visualization of wait time
- Visualization of non-working time
- Visualization of machine events
Positioning

Basis for the production supervisor is the production plan created by the production planner.

The production supervisor decides in detail where to produce the production tasks.

In addition, in case of unforeseen manufacturing events such as machine breakdowns, reduced capacity offering, high-priority orders, the supervisor has to adjust this plan.

Reflects the reality on the shop floor

No heuristics and optimization functionality supported

Typical end-users are production supervisors, shift leads, foremen
## SAP ME Product Roadmap

### 2011-2014 Planned Product Release Timeline

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- Extensibility Architecture
- NW CTC & CTS+ Support
- Enhanced Documentation
- Product Standard Compliance

### SAP ME Future* (planning)
- Continuous Innovation/Renovation
- SAPMEINT Interfaces
- Product Standards
- New Industry Segments
- Multi-industry
  - After Market Services
  - Nonserialized Fab
  - Batch/Hybrid MFG
  - Industry Config Templates, etc.
  - Visual Assembly (RH)
- MFG Product Alignment & Extensibility
  - UI Composition Environment
  - Reporting, etc.
- SAP Tech Adoption (Mobile, HANA, etc)

*Projected release dates and scope are not yet in planning stage therefore is subject to change.*

TCO, SCALABILITY, USER EXPERIENCE, EXTENSIBILITY
Efficient Operations Manufacturing

✔ ME 6.1 Touch Screen

Internet Explorer

Safari – on IPAD

ME Admin 6.1
Thank You!

Next Session:
Quality Issue Mgmt – Manfred Schultz

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