Disclaimer

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1. SAP Manufacturing Direction
2. SAP MII Past, Present, Future
3. SAP MII 12.2 + Plant Connectivity 2.1 + Composites
4. SAP MII 12.3 + Plant Connectivity 2.3 + Composites
5. SAP MII 14.0 + Plant Connectivity 2.4 + Composites
Manufacturers must make the leap
... from collaboration across islands of production
Manufacturers must make the leap
to co-innovating across a global plant floor

Network Coordination, Network Visibility, Network Execution
Old Architecture

New Architecture

Core idea:
“Smaller pieces of reusable software components provide greater flexibility”

Manufacturing 2.0

“Manufacturing 2.0 capitalizes on service-based and collaboration-based architectures to let manufacturers dynamically reconfigure [...] supply networks to make products right first time and on demand.”

Source: AMR (July 2007)
The Challenge: Coordination, Visibility, Execution

Process Coordination

- PLAN
- MAKE
- DELIVER

Visibility

Point to Point Integration
Monolithic Environment
Not Scalable, High TCO

Local Execution

- Point Solutions
- Best of Breed
- Custom Development

Operations

IT

Manufacturing
Solution: Foundation + Applications

- **Processes**: Extended across Network
- **Foundation**: Standardization, Reusability, Scalability (SAP MII)
- **Production**: Demand Driven Execution

**Mfg Composition Environment**
- **Reusable Components**
- **Integration / Intelligence**

**Operations**
**IT**
**Manufacturing**

**Plan**
**Make**
**Deliver**

**Packaged Apps**
**Industry Expertise**
**Templates**
The “Perfect Plant” is the ultimate goal - to optimize utilization of your manufacturing assets, drive increased performance and world-class execution in concert with the Enterprise Plan & Objectives.

The Perfect Plant – SAP’s Portfolio for Manufacturing

- Leverage the investment in your (existing) Enterprise Applications
- Radically simplify business processes delivered to the front-line operator
- Exploit the existing manufacturing infrastructure and data sources
- Seamlessly Integrate shop floor information with the enterprise
- Provide actionable intelligence through role-based portals
- Support the Operational Excellence Teams in Real-time
- Deliver a platform for world-class execution
Your Perfect Plant with SAP: Efficiency combined with Responsiveness

Composites
- Equipment status visualization
- Order GANTT Chart
- Production Line Visualization
- Production Order Details
- MII Integration Templates
- PP, QM, PPPI, IDOC Templates
- ISA 88, SP 95 Spec Sheets
- Sample Projects

SAP COMMUNITY NETWORK

Co-Innovation Ecosystem

LPO
- Mfg Composition Environment
- MII

ERP
SCM
PLM

APO

Connectivity, SCADA, HMI

Shop Floor Process Control

ME

NRX

Meridium

Sample Projects
Manufacturing Challenges Today
...Disconnect Between the Plan, Execution and Assets

Less-Than-Agile Supply Chain
- Blind Spots – Insufficient data about what’s happening (Demand, WIP, Quality, Cost)
- Disconnects – Silos of information, fragmented views, lack of business context
- Latency – Not working with the most current information
- Inconsistent business process enforcement - Who, what, when, where, and how
- Responsiveness - Delayed communication of critical manufacturing events

Limited Enforcement of Customer Quality Processes
- Inadequate containment of quality issues that impact customer
- Slow enforcement of quality standards
- Poor Visibility to Real Time yields and trends on rework and out of flow product
- Delayed response in executing customer changes on the shop floor

Aggressive Asset Management Improvement Targets
- Poor resource utilization resulting from lack of visibility to real time KPI’s such as OEE, Utilization
- Plant maintenance schedules not enforced resulting in unnecessary downtime and efficiency loss
- Ineffective, manual processes do not support uptime, yield, and through-put goals and maintenance cycles

Inefficient Execution
- Lack of supply chain synchronization effects on time delivery
- Change management - poor visibility to new market demands and pending product/process changes
- Time to volume - Manual processes slow product ramp up
- Poor compliance - Inconsistent enforcement

RAW TEXT END
The Perfect Plant
Visibility, Integration & Enforcement

Real-time End-to-End Supply Chain Visibility & Control
- Real time WIP visibility at batch and operation level to Customer Service Processes
- Real time integration of manufacturing conditions from manufacturing assets into supply planning and demand management process
- Systematic enforcement of build requirements: Who, What, When, Where, and how to meet customer request
- Dynamic operator visibility to demand changes, build requirements, and new demand

Efficient Execution
- Synchronized supply chain provides real time visibility of changes
- Automated change compliance with complete visibility of pending changes
- Automation of product ramp accelerates time to volume
- Consistent enforcement of product changes to ensure supply chain, schedule, and customer satisfaction

Customer Compliant Quality Processes
- Isolated quality issues minimizing customer impact
- “Baked in” enforcement of quality standards on communication on variance
- Real time execution of customer changes directly to the shop floor
- Rapid adoption of new quality standards

Streamlined Asset Management
- Real time KPI’s such as OEE and Utilization enable proactive management of KPI targets
- Consistent enforcement of maintenance schedules to eliminate unplanned downtime
- Automation of maintenance processes to drive yield and overall throughput
SAP MII: Manufacturing Integration & Intelligence

Delivering High Value Manufacturing Applications

Positioning
- Delivers manufacturing applications for performance management, continuous improvement, user interface and manufacturing analytics
- Integrates existing plant floor applications to the enterprise
- Extends and simplifies SAP Business Processes to shop floor workers in context to their role
- Composite Application Development Environment for Manufacturing based on SOA Principles
- Enabling Global Planning, Inter-Networked Integration, Local Execution

Highlights
- Data – connectors to the shop floor
- Business Logic Services – advanced data integration and composition layer
- Visualization – role based content creation
- Manufacturing Analytics – SPC/SQC
- Service Based Architecture meets SAP ESA strategy
- Integrates with SAP Business Suite as well as Competitive ERP Solutions
- Applications are developed very quickly – time to benefit in weeks
- Includes pre-built templates for integrating to SAP Business Suite
- Partners, SAP, and Customers to deliver composites to meet customer needs and specific vertical integrated scenarios

Pre-requisite
- Runs on SAP NW CE (Java)
3 Year Manufacturing High-Level Solution Roadmap

Manufacturing Network Planning and Execution
- Exchange of WIP and Traceability data in Outsourced/Distributed Manufacturing
- Subcontracting Enhancements
- Exchange of Quality Manufacturing
- Content management integration
- Data Service Integration for Business Processes Management
- Business Process Management

Manufacturing Composition
- Event-based connectivity framework
- Manufacturing Execution capabilities
- Support for Semi-conductor Industry coverage
- Lean Manufacturing
- LPO-ERP Integration
- ESOA-based Lean Composite application

Manufacturing Execution
- Manufacturing Execution capabilities
- Support for Complex Medical Device)
- Industry coverage
- Lean Manufacturing
- LPO-ERP Integration
- ESOA-based Lean

Plant-level Operations
- Exchange of WIP and Traceability data in Outsourced/Distributed Manufacturing
- Subcontracting Enhancements
- Exchange of Quality Manufacturing
- Content management integration
- Data Service Integration for Business Processes Management
- Business Process Management

Enterprise Planning & Control
- Production order enhancements
- Task & Process Management
- Digital Manufacturing (Handover Management)
- ISA S95 Integration Management dashboard

Product & Process Quality
- Enhancements for complaint
- Enhancements for quality inspections
- Quality Activity Management
- Process Compliance

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SAP Manufacturing and MII
Think Globally, Act Locally

Global Planning, Inter-Networked Integration, Local Execution for both Intra and Extra Net

Deliver a full set of plant operations management capabilities through both ERP data and processes as well as local integrated execution systems

Enable a true Composite Development and Execution model based on a manufacturing service oriented architecture

Outcome of this evolution: Manufacturing Operations Management Server in an SOA Environment

- This will enable:
  - Partners, SAP, and Customers to deliver composites to meet customer needs and specific vertical integrated scenarios
    - Complete solution map through a combination of partners products and SAP products
  - True global thinking and planning, fully integrated with local execution systems
    - Regardless of physical deployment, one single architecture
  - Provide a full breadth of applications on common platform that can be assembled for vertical packaged solutions – “SAP Mfg Operations Mgt for Discrete Industries” – (plant deployment unit of MII, SAP ME, and complimentary composites)
### Breaking the Functionality Silos

**Manufacturing Style Emphasis, Extendable “Composite” MES**

<table>
<thead>
<tr>
<th>Scale (Automation)</th>
<th>Scope (Enforcement)</th>
</tr>
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<tbody>
<tr>
<td>Low</td>
<td>Low</td>
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<td>High</td>
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- **Lightweight Composites with MII integrated with Packaged MES**
  - Endicott

- **Packaged Industry Specific MES with limited customization**
  - Harman-Becker

- **Scalable, Lightweight Functional MES Composites using MII**
  - PepsiCo, Whirlpool, Rexam

*With the acquisition of Visiprise, SAP is deliberately expanding market share into a specific ‘manufacturing style’*

*Roy Wildeman, Forrester Research*
SAP MII Logical Architecture

HTTP/HTTPS/Web Service Interface Layer

MII Core Services

Business Logic Services

Data Aggregation and Transformation Services

Data Connectivity Services

MII Plant Application Composition Environment

Browser Enabled Clients

Enterprise Applications

Data Integration

Data Rendering

MII Plant Application Composition Environment

SCADA
DCS/PLC
MES
LIMS
Plant Historian
EAM
Plant Data Collection
Plant DB
Deployments of SAP MII have been from a single site production server to as many as 60 production servers globally.
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SAP MII Strategy for Plant Deployment –
Summary of NetWeaver Technology Convergence

1. Maintain MII as an “extension toolkit” to react to changing Mfg Operations Mgt landscape, providing solutions for:
   - Data integration
   - Data enrichment and transformation
   - Plant specific event processing
   - Operational composites
   - Manufacturing Intelligence dashboards
   - Service enable legacy plant operations applications

2. Converge with core SAP architecture solutions, specifically:
   - NW CE Platform
   - Development Environment (Eclipse & NWDI)
   - Analytics (BOBJ +BW, VC)
   - BPM
   - Process Integration

   It is important to note that NWDI, PI, ERP, Galaxy, and BOBJ are all OPTIONAL integration points. Customers can still implement lean MII solutions (MII only on NW CE) with no dependence on other SAP Suite components. This allows plants with minimal IT infrastructure and staff to implement MII solutions, and provides an evolutionary approach for those customers to embrace deeper integration scenarios.

3. Develop integrated industry specific deployment models for simple selling and delivery

   “SAP Mfg Operations Mgt for Discrete Industries” – (plant deployment unit)
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Manufacturing Data Objects (MDO) - SAP MII v12.2

New Semantic Layer for content development/support of composite applications
- Friendlier namespace
- Full WSDL enabled namespace
- Global, common namespace (fully transportable)
- Project based namespace for deployment with a project
- Easier to create content centrally, then “wire it in” at the plant

New Object Modeling environment with persistence
- Ability to put any data object (XML, query object, simple scalar data points, etc.) into model/namespace
  - Production Orders from ERP
  - Query (on-demand or cached) from plant systems
  - “Temporal” Data staging (material consumption for reporting back to ERP at end of run)
- Rules for data persistence and cleanup (replace, append, update, delete when, on-demand only)

New Query Type to support use of objects in Content
- Similar to SQL Query
- Ability to track usage of objects
- Security model consistent with all query types
Service Repository Integration with enhanced local service browsing
- Browse SR by classification and search pattern via BLS action
- Improved integration within MII for consuming ESOA services
- Ability to publish MII services to Central or local SR

WSDL Interface for all MII data services through Query Templates
- Generic Rowsets/Rowset/Row definition that can be used to call any template
Applet Updates
- SAP MII 12.2

Grid
- Check boxes for Boolean values
- Embedded gifs/pngs for other values (strings/numeric)
- Configurable settings for representation of null values and empty values

SPC Chart
- Ability to identify Nelson rule violation through label on chart point
- Configurable authorization for Point Suppression
- Configurable authorization for Comment
- Can show limit values in chart or on legend

Standard Charts
- New “Limit” Chart: Simple line chart with control limits, violations for 1-32 pens
- Regions / color banding in line charts
New Features

- Try/Catch construct in BLS transaction through new actions
- Value Mapping
  - Define rules for data value lookup and transformation
  - Rules can have expressions
  - Change document values based on rule
  - Lookup values based on a rule (Find the tag for material consumption based on the line)
  - Import/Export rules into csv for editing in Excel
- Time Zone conversion in expression editor
- JCo Action has timeout
- Localize return messages via localization file
- Sort and Filter action updated to include Message element if present
Design Time Updates

- Step Through Debug
  - Break Points
  - Color Coding of action success/failure/not executed
  - Watch variables
  - Ability to modify variable value at break point
  - The ability to take debug output and view in another editor to help when looking at large strings / XML docs, etc (watch variables)

- Custom action SDK updated to allow:
  - Use of Connection Store
  - Use of Credential Store
Projects:
- Manage and export/import/deploy roles with a project
- Manage and export/import/deploy role navigation with a project
- Manage and export/import/deploy MDO model with a project
- Ability to have applet “skins” per project – deployable with project
- Meta Data for a project (for informational purposes)

Administration:
- Ability to track usage of queries in transactions – “Where Used”
- Runtime Content Usage Statistics
General Enhancements
- SAP MII v12.2

Security
- Credentials are locked to a specific role or locked to creator
- Additional lock down configuration capability for URL queries
  - For example, only allow Param.n parameters to be overwritten in a SQL Query

Rewrite all MII Administration pages in Web Dynpro

Updates to Query Caching
- Auto update of cache (can be scheduled)
- New query script methods to help manage data set (isCached(), getCachTime())

Application Management
- Where used for MII Content (ie: SQL Query using in transaction)
- Usage statistics for MII Transactions (Min, Max, Avg., Count) per Day
SAP MII Connectivity Layer Enhancements
SAP Plant Connectivity (PCo) v2.1

Integration of ME Specific Agents into core PCo capability with ME 5.2
- File Monitor Agent
- ME Destination and Agent

Integration to SAP System Landscape Directory (SLD)
Remote Health Monitoring through MII or through local admin console
SDK for customers and partners to develop their own agents

Query Execution Capability
- Query capability equivalent to old UDS query capability
- Better exception management
- Ability to query tag attributes – select in query

Specifically, new event agents for:
- OPC-UA Current Values (historical spec has been delayed), OPC-HDA, OSISoft PI Native Connector, GE Fanuc Proficy Historian

New Query Agents for:
- OPC-DA, OPC-UA Current Values, OPC-HAD, GE Fanuc Proficy Historian, OSISoft PI Historian, OLE-DB
MII Composites Delivery for 2009 & 2010

- MII v12.1 (2009)
  - SAP ME Integration to ERP
  - ESOA enabled quality inspections
- MII v12.2 (2010)
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4. **SAP MII 12.3 + Plant Connectivity 2.2 + Composites**
5. SAP MII 14.0 + Plant Connectivity 2.3 + Composites
Planned Applet Runtime and Design Updates
- SAP MII v12.3

Web Development Environment (NW Developer Studio)
- Java Script Wizard
- Enhance current wizards in workbench to be the equivalent of older FP plug-ins
- Improved ability to format data output (including nulls, blanks, significant figures, etc.)
- Additional features per customer input

Grid
- Interactive editing in grid
- Pivot Table applet
- Collapsible tree in grid

Charting
- New interactive charting capabilities – annotation with markers, etc

First Delivery of MII UI components in standard SAP UI Technology
- Critical for delivery of new SAP Composite Applications for Mfg
Planned Feature Updates
- SAP MII v12.3

Tighter integration of BOBJ and MII (Manufacturing Reporting option pack)

BOBJ Content Integration
- Ability to embed BOBJ content into an MII JSP or IRPT page
- Crystal Reports “Connector”

Business Logic Services Updates:
- Access to connection store for custom actions
- Remove Copy of XML Dom from action to action to reduce memory footprint
- Complete the XML action rewrite for performance

Application Management
- Content index to include HTML/IRPT/JSP web pages
Planned Enhancements
SAP Plant Connectivity (PCo) v2.2

Integration of ME Specific Agents into core PCo capability
- File Monitor Agent
- ME Destination and Agent

Enhanced remote administration and monitoring of plant connectivity installations from MII server pages

Improved monitoring of PCo (message failures, connection status, agent state change, etc)

New protocol between MII and PCo for improved performance

Enhanced alerting capabilities, including:
- Noise eliminating rules for generating alerts
- Generate event based on number of triggers in a specified time

Scripting Engine (C#) Workflow Activity
- Provides for flexible logic processing of Agent data
Planned Enhancements
SAP Plant Connectivity (PCo) v2.2

New event agents and query execution for:
- Aspen Tech IP 21
- GE Fanuc iFix
- Citect
- Rockwell RS View
- Archestra
- OPC-UA History
- OSISoft AF interface and namespace browsing

New agents specifically for SAP ME scenarios
- Target specific CNC vendors to complement SAP ME business process scenarios
Composites Delivery for 2010

- MII v12.3
  - OEE Application Framework
  - KPI Application Framework
Manufacturing Performance Management: Phase 1 – Overall Equipment Effectiveness

Phase 1 of Manufacturing Performance Management (MPM)

- KPI Manager
- Alert Manager
- Event Notification and Alerting
- Dashboard Configuration

Overall Equipment Effectiveness (OEE) Application

- OEE Configuration based on standard data model
- Optional Integration to ERP EAM/Asset Management
- Ability to map to current automation and/or database systems for automated data collection
- Standard delivery of Downtime and Quality Reporting
- Filter & Drill Down capability
- Trend Analysis
- Optional BW Content for plant to plant comparison and historical analysis
Agenda

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Continued Core Updates to support SAP Manufacturing Strategy

- SOA Strategy - PI Integration continues: AAE Platform Support, Integration of key PI capabilities into MII native environment
- Deeper NetWeaver CE BPM Integration (Local & Enterprise Model)

Continuous Improvement of MII Product

- Usability
- Performance
- Feature requests from user base / Influence Councils
- Improved governance and management model to lower TCO, such as a master-slave deployment model

NetWeaver Convergence

- Continued integration of MII design time into NW Developer Studio
- Improved NetWeaver CE Portal Integration
- Deliver of UI components in standard SAP technology for Manufacturing

Enterprise Service Repository Integration

- Ability to centrally define a service interface in the ESR
- Export that service interface to MII BLS – MII will create a transaction skeleton to conform to the service definition (WSDL contract)
- Content developer can then complete the transaction design and build to meet the service needs
DDVN Coordination: Customer demand, Demand visibility, Suppliers and Partners, S&OP
Enterprise MDM, ERP, SCP

OPERATIONS EXCELLENCE

OPERATIONS SERVICE BUS

Role-Based User Interaction

SERVICE ENABLEMENT LAYER

Change Management and Change Control

Manufacturing Master Data

OPERATIONS SERVICE BUS

Manufacturing Process control and Execution applications (MES, QMS, LIMS, FCS, EAM, EWI, etc)

Physical machine automation and control (motion control/drivers, DCS, PLC, RFID (OPC))

Site A  Site B  Site C  Site D  Site E  Site F
Manufacturing Performance Management Phase 2
- SAP MII v14.0

KPI and Alert Manager Updates – build upon OEE Foundation

Additional Capabilities for Manufacturing Performance Management Applications:
- Content Subscription, Personalization & Scheduling
- BPM Workflow Delivered Content (i.e. Preventative Maintenance Scheduling)
- Collaboration Capabilities (teams, blogs, continuous improvement/MOM framework, KM Integration)
- Corrective Action traceability
- Mobile UI capabilities + analytics

Integration to CPM/SCPM Applications (Phase 3?)
- Corporate & Supply Chain Performance Management
Planned Enhancements
SAP Plant Connectivity (PCo) v2.3

- Additional connectors as market demand dictates
- Phase 2 of PCo Workflow – graphical user interface
- Large partner ecosystem for specific connectivity solutions
- Complete remote administration and monitoring of plant connectivity installations from MII/NW Administration pages
- Full OPC-UA functionality
S95 Phase 2 – Message Management

Integrated Shop Floor Operator Dashboard
Thank you for participating.

Please remember to complete and return your evaluation form following this session.

For ongoing education on this area of focus, visit the Year-Round Community page at www.asug.com/yrcc

SESSION CODE: 3705
Manufacturing Performance Management - Solution Roadmap

2010

- OEE
  - OEE Configuration
  - Event Notification & Alerting
  - Dashboard Configuration
  - Downtime and Quality Reporting
  - Filter & Drill Down capability
  - Trend Analysis
- GHO – O&G Upstream Composite
  - Covered under O&G Business Case, Delivery by MI team on plant components

2011

- MPM (OEE Phase II)
  - Content Subscription, Personalization & Scheduling
  - BPM Workflow Delivered Content
  - Collaboration Capabilities (teams, blogs, continuous improvement/MOM framework, KM Integration)
  - Corrective Action traceability
  - Team Collaboration
  - Mobile UI

2012

- MPM Phase 3
  - Complete integration with SCPM
  - Alignment of local KPIs with corporate goals, integration with CPM
  - Performance Improvement closed feedback loop with historical analysis

Composite Applications

- MPM Feature / Function

- OEE
- MPM (OEE Phase II)
- MPM Phase 3

Technology

- BOBJ Dashboard Integration Phase 2
- CE Portal Integration
- Manufacturing UI Phase 1
- NW CE BPM Integration Phase 2
- PI SOA Integration Phase 2
- Standard Manufacturing UI
- Full Integration with CPM and SCPM thru BW

- BW Content
- ESR Integration, PI Adapter Engine Integration (PI SOA Integration Phase 1)
- BOBJ Dashboard Integration
- NW CE BPM Integration Phase 1
- Plant Data Models to support applications
Roadmap Investment Areas
Manufacturing Collaboration

Streamline processes for efficient information exchange in distributed manufacturing scenarios

2008

Key Functionality:
- Production order enhancements (Rework, Order Split)
- Subcontracting Enhancements
- Exchange of WIP and Traceability data in Outsourced Manufacturing

Manage and monitor work progress in contractor plant

2009

Key Functionality:
- Subcontracting Enhancements
- PLM-QM integration (Recipe Management)
- Exchange of Quality Notifications in Outsourced Manufacturing

Fully-integrated complaints processing

2010

Key Functionality:
- Digital Manufacturing (Handover Engineering to Production)
- Quality Activity Management (CAPA)
- Exchange of Quality Certificates in Outsourced Manufacturing

Traceability of quality criteria
Roadmap Investment Areas
Manufacturing Integration & Intelligence

Align MII capabilities with SAP NetWeaver and Business Objects

2008
Key Functionality:
- Content management (versioning, transport)
- Enhanced PI integration
- Event-based connectivity framework

Alert-and event-based connectivity from shop floor to enterprise

2009
Key Functionality:
- Data Service integration for Business Objects (Crystal Reports, WebDesigner)
- Model-based composition with abstracted semantics-layer

Productivity enhancements for manufacturing composite app development

2010
Key Functionality:
- NW Business Process Management integration for workflow and process orchestration
- NW Developer Studio Integration

TCO reduction through harmonized design environment

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Roadmap Investment Areas
Manufacturing Execution (Visiprise)

Functional coverage across industries,
with seamless integration into the enterprise world

2008

Key Functionality:
- Manufacturing Execution capabilities for High-volume fabrication (High-Tech, Auto / IMC/ A&D Components, Medical Device)

2009

Key Functionality:
- Support for Semi-conductor (backend) industry
- Enhanced ERP integration

2010

Key Functionality:
- Assembly industries (A&D, Machinery, Shipbuilding)
- Enhanced ERP integration

Demand-driven local execution
Manage process deviations
Keep production in sync with design

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SAP ME – Manufacturing Execution
Packaged Execution for Discrete Manufacturing

Improve Product and Process Quality
- Labor Tracking
- Engineering Change Management
- Nonconformance
- Production Metrics
- Real-time SPC
- Test & Repair
- Traceability

Plus
- Routing control, WIP Tracking

Manage Compliance
- Traceability
- Real-time SPC
- Production Metrics
- Nonconformance
- Engineering Change Management
- Return & Repair

Meet Unpredictable Demand
- Real-time SPC
- Production Metrics
- Production Transfer
- Engineering Change Management
- Integrated with SAP ERP