



**EXPERIENCE
INDUSTRY 4.0 NOW**



**04
ASSEMBLY
STATIONS**

02

**05
FUNCTIONAL TEST
AND DIGITAL TWIN**

**06
OUTBOUND
LOGISTICS**

Rusty Baldwin

The Industry 4.0 Revolution

Powered by SAP Digital Manufacturing – DMC Overview

Rusty Baldwin – Global Solution Manager, Manufacturing

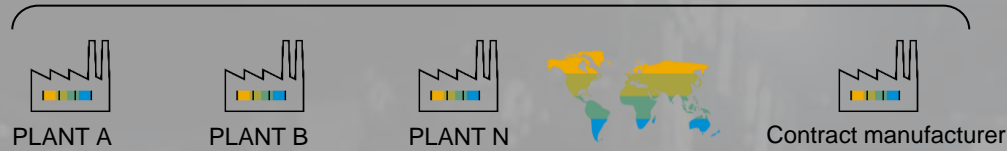
May 2021

Challenges in Manufacturing

Silos, disconnected systems and manual processes across manufacturing

GLOBAL

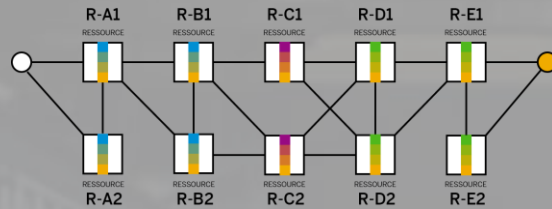
COMPANY



Lack of **data transparency** for consistent **performance measurement** across plants and contract manufacturers

PLANT

Resource network and modular manufacturing



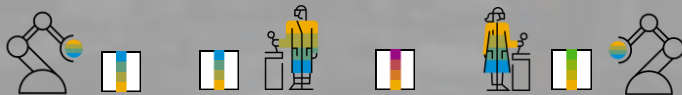
Hard to optimize **existing labor and equipment capacity** to deliver on production plan to meet demand. Lack of agility to adopt **modular and hybrid manufacturing**.

LINE



Manually intensive production line and machine operation with automation silos.

ASSET



Inconsistent and low **asset uptime** and performance. No integrated actors and sensors.

Industry 4.0 – by SAP

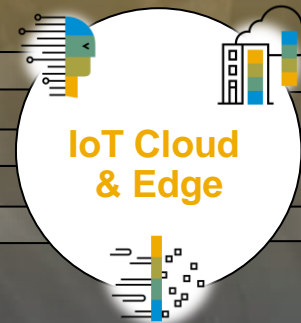
Leveraging Intelligent Enterprise Technologies and Applications



INDUSTRY4.NOW
by SAP

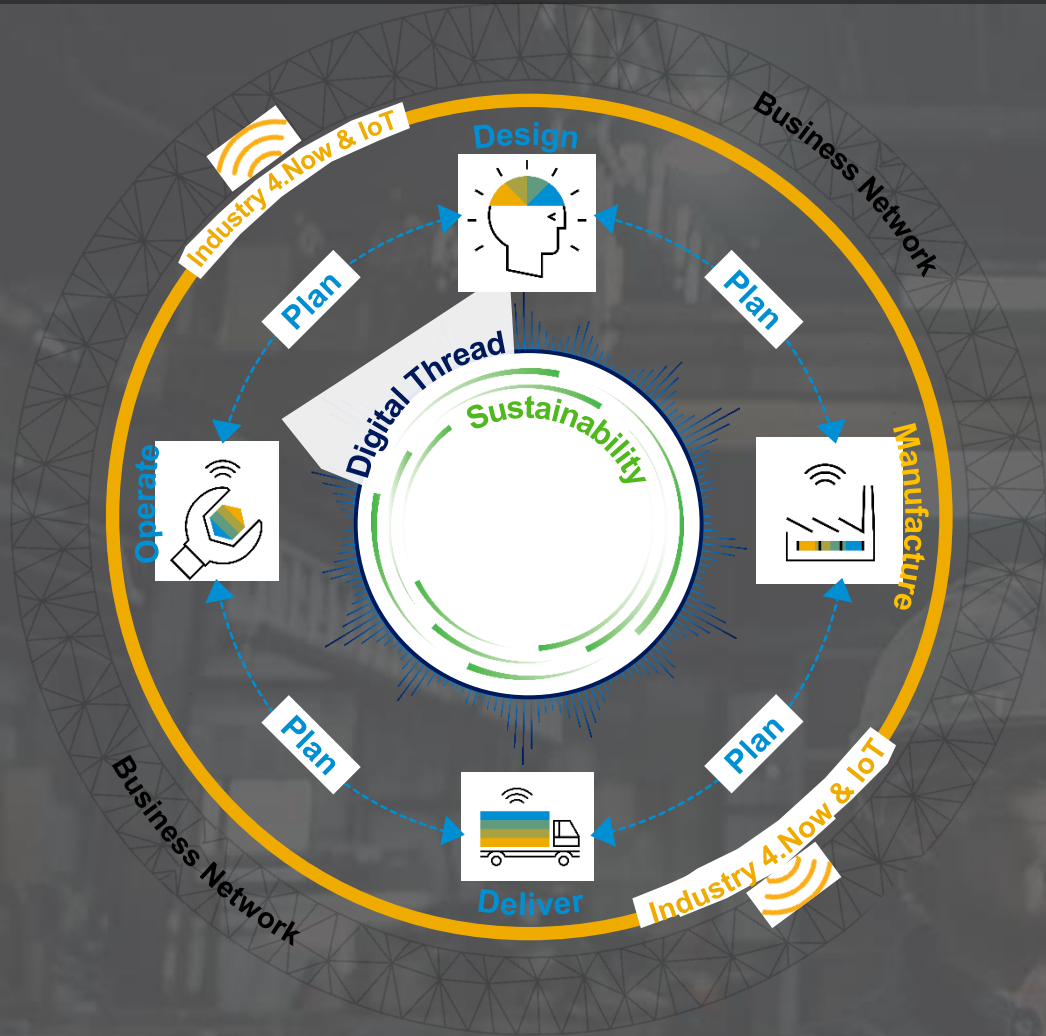


Intelligent Decisions
Data Driven Processes
IT/OT Integration



Technology
Enablers

Achieving a Resilient Supply Chain from **Design to Operate**



Synchronized Planning

Planning as a continuum across the supply chain

Industry 4.Now

Automate for productivity

Business Network

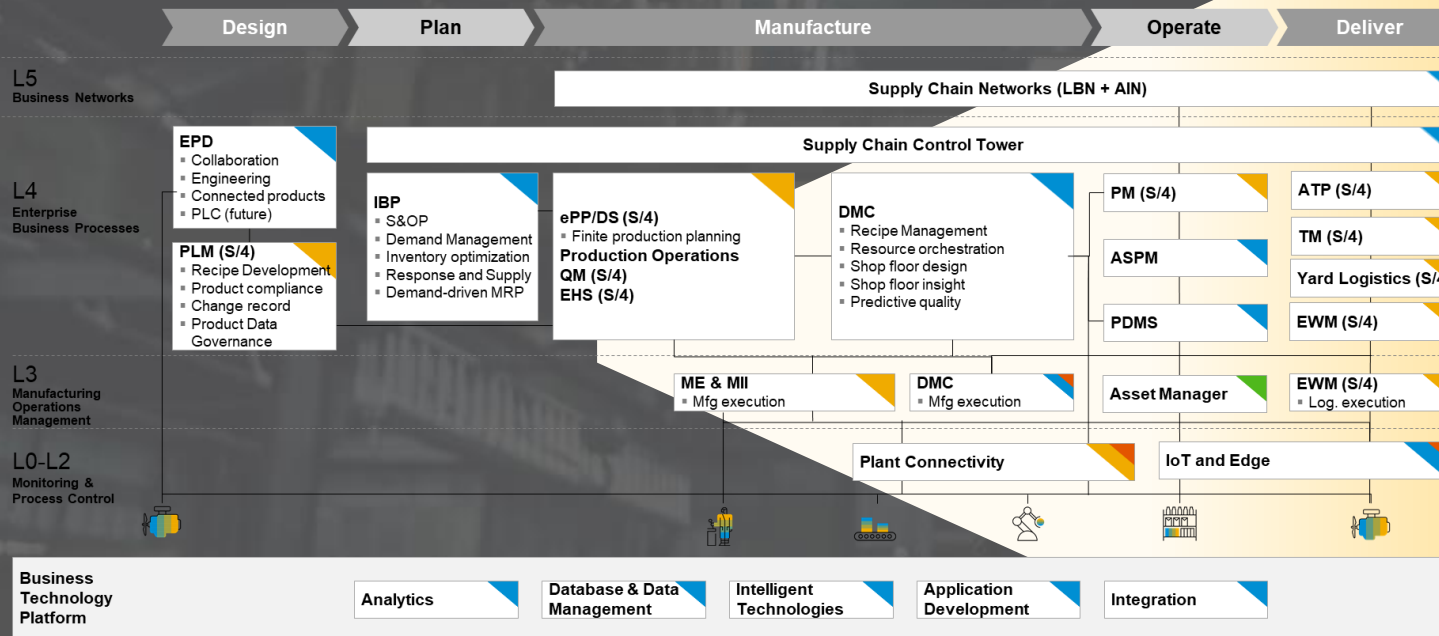
Connect for next-level business collaboration

Sustainable Supply Chain

Circular Economy for zero waste

SAP Digital Manufacturing Solution Strategy

A complete portfolio of manufacturing solutions to support digitalization and Industry 4.0



SAP Digital Manufacturing Cloud (DMC)

- Manufacturing Insights
- Manufacturing Execution
- Industrial Internet of Things



SAP Manufacturing Suite

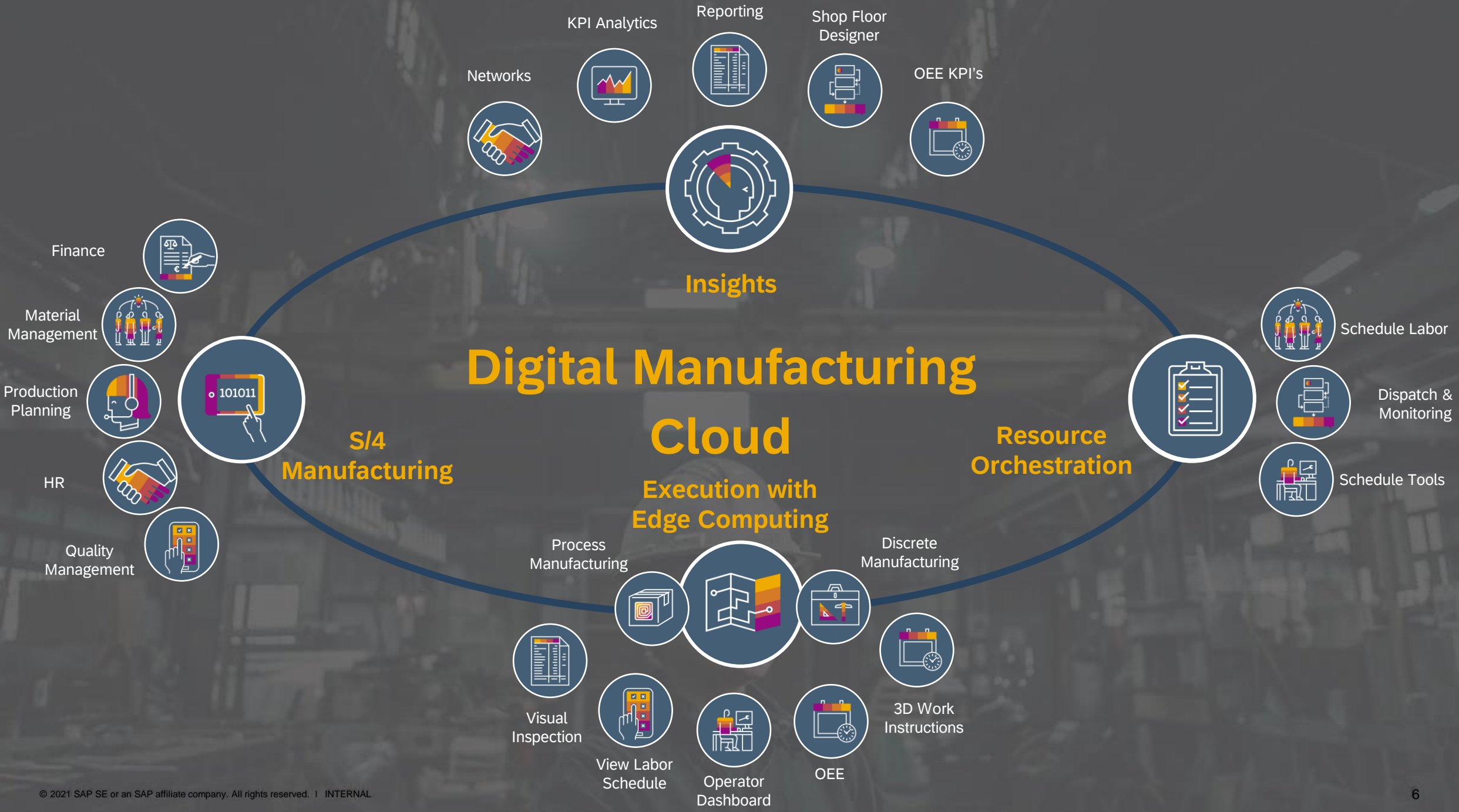
- SAP Manufacturing Integration and Intelligence
- SAP Manufacturing Execution
- SAP Plant Connectivity



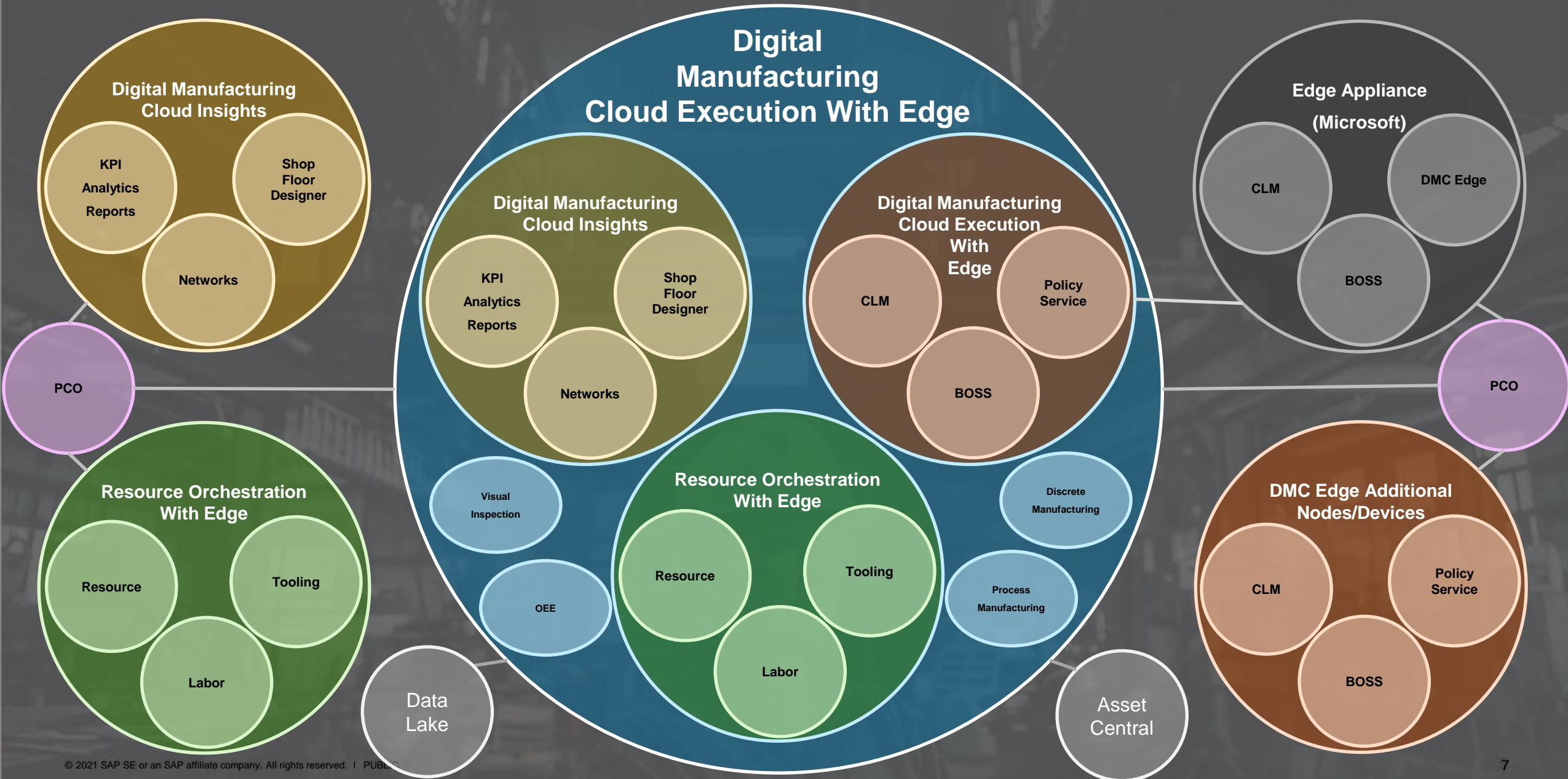
SAP S/4HANA Manufacturing

- for Production Engineering and Operations
- for Planning and Scheduling
- for Quality Management
- for Environmental, Health & Safety

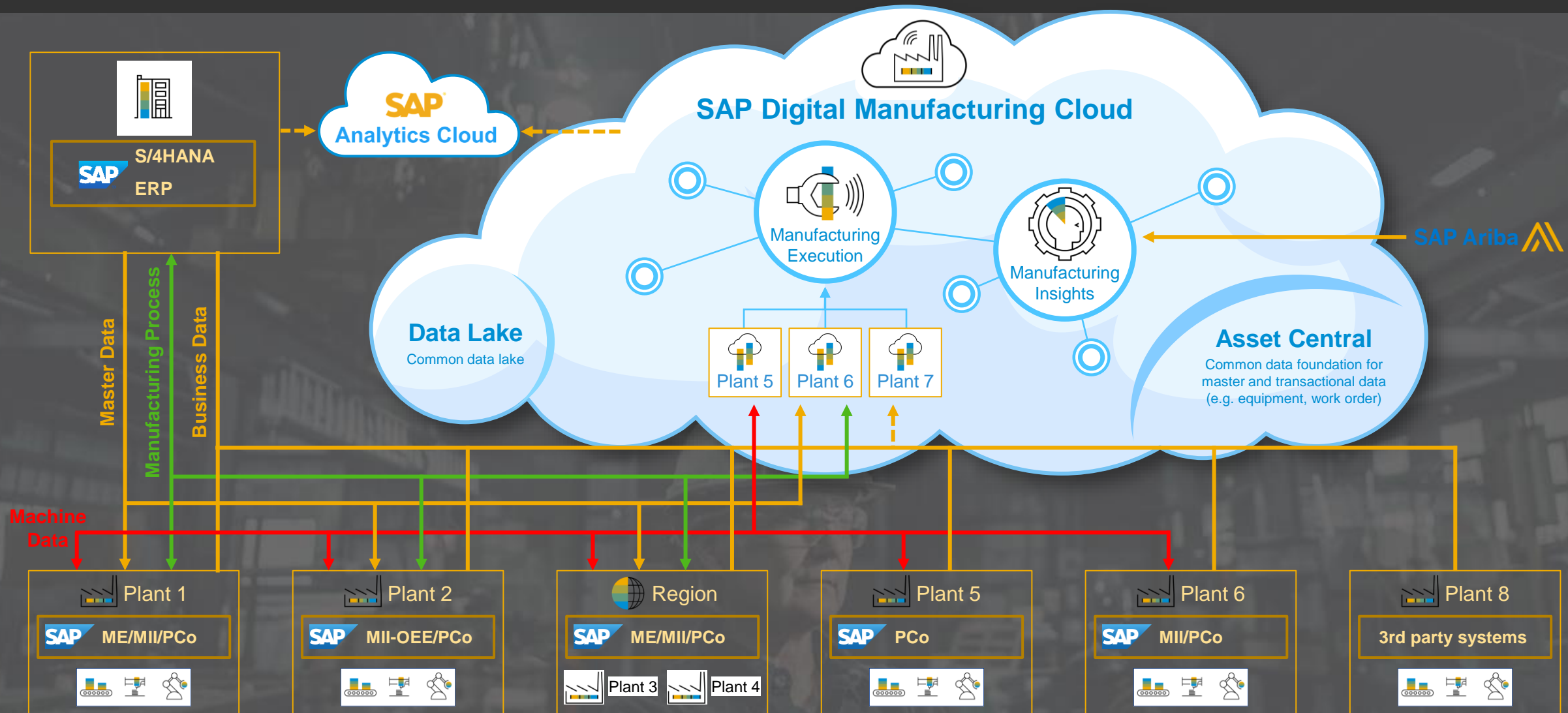




Digital Manufacturing Cloud Breakdown



Example for Hybrid Digital Manufacturing Landscape



SAP Digital Manufacturing Cloud

Automate processes and resources to improve manufacturing efficiency, quality and productivity



Paperless production with intuitive user interfaces for production operators, automatic data collections and set machine parameters, thereby lowering cost, increasing productivity and quality.



Design, distribute and dynamically control manufacturing shop floor activities enabling a smart factory.



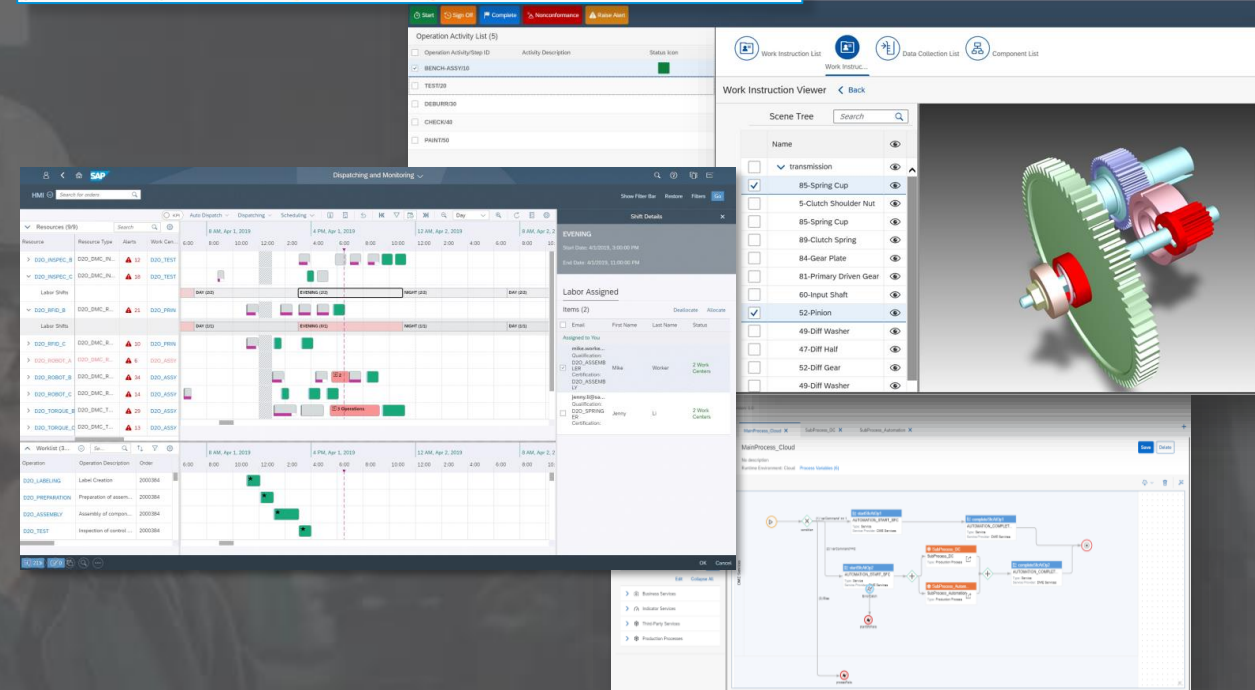
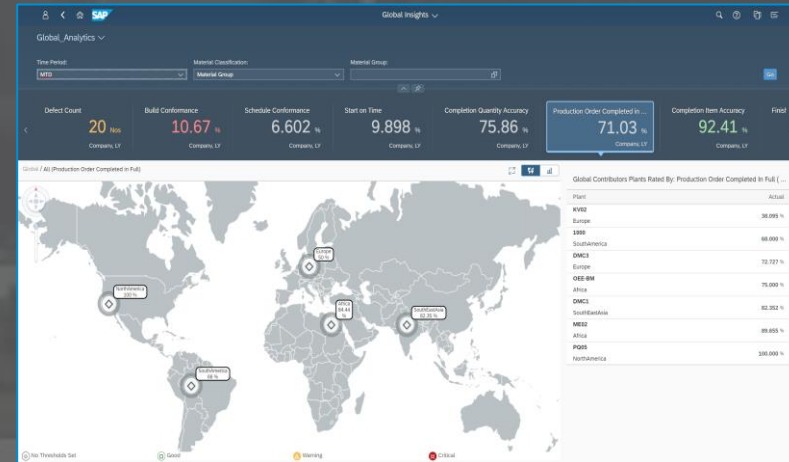
Shift and Labor planning to ensure business operations with right qualifications. Production Order scheduling and dispatching considering labor, resource and maintenance constraints to plan operations and adopt to short term changes.



Cross plant real-time analytics for manufacturing performance e.g. Perfect Order Fulfillment, Overall Equipment Effectiveness, loss analysis along with machine data to identify improvement opportunities.



Ability to collect and share product genealogy data between members of the network to trace accountability and provide transparency.



SAP Digital Manufacturing Cloud for Execution: Schedule, automate processes and resources to improve manufacturing efficiency, quality and productivity

SAP Digital Manufacturing Cloud for execution (DMCe) – Discrete Industry



Enable resource orchestration by dispatching and sequencing operations to compress the manufacturing lifecycle and provide real-time production performance tracking



Implement top-floor to shop-floor scenarios to achieve rapid return-on-investment through out-of-the-box integration to SAP solutions



Utilize intuitive user interfaces (UI) for production operators and transform to paperless production, lowering cost and increasing productivity.



React quickly to unexpected events by monitoring the entire manufacturing process to optimize resources and speed execution utilizing built-in intelligence



Machine learning models assist operator on the shop floor to execute visual inspection tasks of manufactured products.

The screenshots illustrate various SAP DMCe capabilities: 1) Work Center POD for activity management and work instruction viewing with 3D models. 2) Visual Inspection interface for quality control. 3) Resource Scheduling (SRS) Gantt chart for resource optimization. 4) Shift Details view for labor management.

SAP Digital Manufacturing Cloud for Execution: Schedule, automate processes and resources to improve manufacturing efficiency, quality and productivity

SAP Digital Manufacturing Cloud for execution (DMCe) – Process Industry



Provision of the new Order POD to support order-based execution of process orders with single batches



Implement top-floor to shop-floor scenarios to achieve rapid return-on-investment through out-of-the-box integration to SAP solutions



Utilize intuitive user interfaces (UI) for production operators and transform to paperless production, lowering cost and increasing productivity.



React quickly to unexpected events by monitoring the entire manufacturing process to optimize resources and speed execution utilizing built-in intelligence



Collaborative integration to allow you to respond quickly to unexpected events

The screenshot displays the SAP DMCe interface for a production order. Key elements include:

- Order Information:** Order ID 1000076, Batch DEMO-49-A, Phase 0013 - Mixing Phase, Material D2C_C_104, Planned Date: May 29 - Jun 2, 2020.
- Phases (3):** A table listing phases with IDs, statuses, and actions (Start).
- Components (3):** A table listing materials, descriptions, planned batches, and quantities.
- ShopFloorDesign:** A detailed view of the production process with a status of Draft.
- MainProcess_Cloud:** A graphical representation of the production process with various steps and controls.
- OEE Insights:** A dashboard showing Overall Equipment Effectiveness (OEE) metrics: 36.26% (Availability), 78.24% (Performance), and 93.71% (Quality).
- Downtime Distribution:** A bar chart showing unscheduled downtime of 4032.00 min for All Materials.
- Downtime Occurrences:** A scatter plot showing 15 total events for All Materials.
- Downtime Distribution (Scheduled):** A bar chart showing 0 scheduled downtime events for All Materials.

SAP Digital Manufacturing for insights: Intelligent insights and analysis across global plant operations

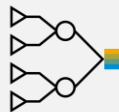
SAP Digital Manufacturing Cloud for insights (DMCi)



Adaption to any manufacturing process and global visibility and analytics for key performance indicators across a single plant or global operations



Full integration to combined business and operational data from ECC, S/4HANA and the Manufacturing Suite for improved decisions



Manage and view harmonized data acquired from disparate sources for better visibility into your plant operations



Business logic orchestration to enable customer-specific processes for planning, execution, maintenance and quality



Manufacturing Performance Management with OEE insights, production performance KPIs (standard and customized) to lower operational costs and target CAPEX and OPEX investments

ISA-95 & ISA-88

Enterprise – global

CxO

SAP Digital
Manufacturing
Insights

Regional – site

Plant & unit heads

SAP Digital Manufacturing Insights

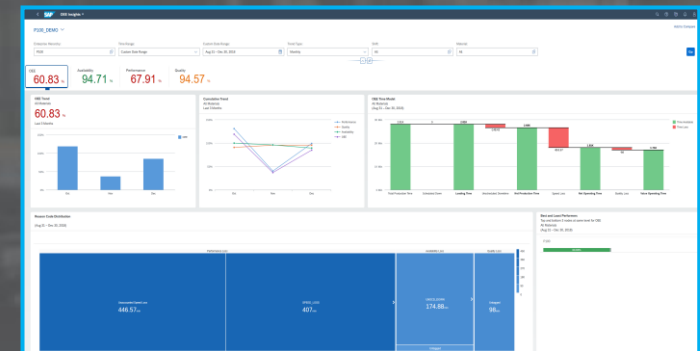
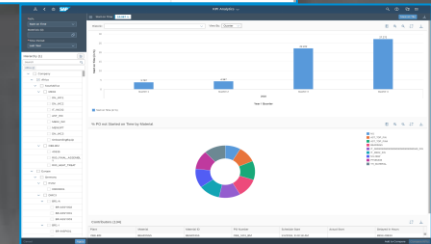
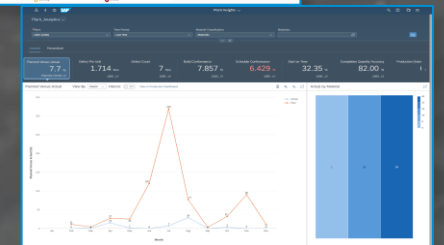
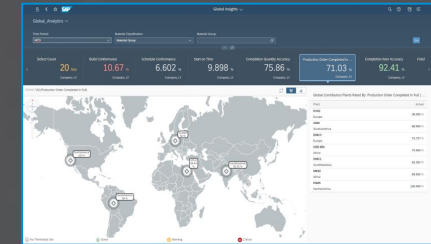
Site – line

Supervisors and operators

SAP Digital Manufacturing Insights
SAP MII, SAP Manufacturing Execution, SAP OEE Management

Machines

SAP Plant Connectivity



SAP Digital Manufacturing Cloud for Execution

Solution Details - Discrete



SAP Digital Manufacturing Cloud for Execution

Discrete Industry – Production Operator Dashboard(POD)

Production Operator Dashboard

- Support operators with a highly flexible and intuitive user interface (POD)
- Configure and design the POD based on user requirements
- Display execution-relevant information of production orders
- Guide operators through work instructions in the POD
- Support of data collections
- Logging of defects and subsequent rework and repair actions using the nonconformance functionality
- Recording of assembled components for traceability and to trigger goods movements
- Monitor OEE using established KPIs in the POD
- Post operation activity-level yield confirmations happen automatically as well as goods receipts as units are completed

The image displays three overlapping screenshots of the SAP Digital Manufacturing Cloud Production Operator Dashboard (POD) interface. The top screenshot shows a 'DME WORK CENTER POD' with a search bar for SFC, Work Center, and Resource, and a table of work orders. The middle screenshot shows a 'Default Work Center POD' for 'FABRICATION49' with a status bar and a 'Data Collection List (4)' table. The bottom screenshot shows a 'Default Work Center POD' for 'FABRICATION50' with a 'Work Instruction Viewer' and a 3D model of a gear assembly.

SFC	Order	Material Description	SFC Qty	Status	Order Planned Start Date	Order Planned Completion Date
FABRICATION32	BRACKET_ASSY5	Bracket Assemble	1	Green	Feb 17, 2019, 9:24:39 PM	Feb 17, 2019, 9:25:39 PM
FABRICATION33	BRACKET_ASSY5	Bracket Assemble	1	Green	Feb 17, 2019, 9:24:39 PM	Feb 17, 2019, 9:25:39 PM
FABRICATION34	BRACKET_ASSY5					
FABRICATION38	BRACKET_ASSY5					
FABRICATION4	BRACKET_ASSY1					
FABRICATION47	CEL_DEMO2					

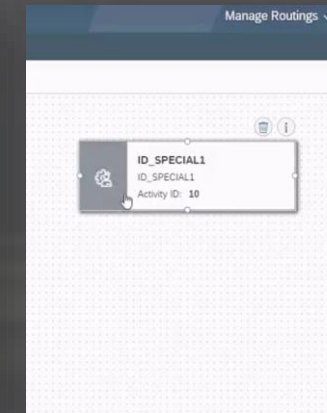
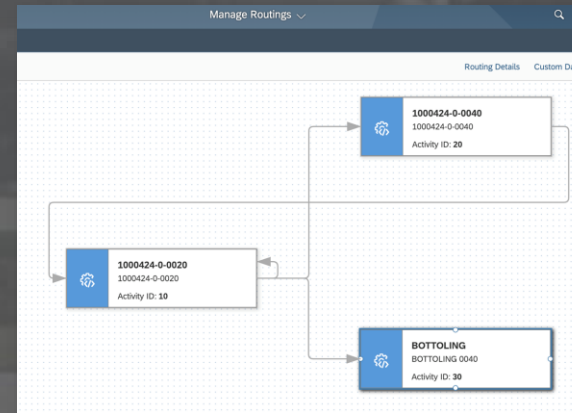
Data Collection Group / Version	Group Description	Parameters	Collect
PASSFAIL_DC3IA	Pass Fail DC Group #1	01	Collect
TESTIA	Test test	01	Collect
TESTDC3IA	TESTDC1	01	Collect
TORQUE_MEASUREMENTSIA	Torque Measurements	01	Collect

Name	Expand
transmission	Expand
85-Spring Cup	Expand
5-Clutch Shoulder Nut	Expand
85-Spring Cup	Expand
89-Clutch Spring	Expand
84-Gear Plate	Expand
81-Primary Driven Gear	Expand
60-Input Shaft	Expand
52-Pinion	Expand
49-Off Washer	Expand
47-Off Half	Expand
52-Off Gear	Expand
49-Off Washer	Expand

SAP Digital Manufacturing Cloud for Execution

Discrete Industry - Work in process management routing

- Linking an operation activity to the next operation activity as well as linking to operation activities further down the routing
- **Loops, multiple next steps and operation activity groups**
 - Linking of an operation activity to 1 or more subsequent operation activities (Next Step)
 - Linking an operation activity to itself or previous operation activity (Loop)
 - Any Order and Simultaneous Operation Activity groups are available to enhance flexibility in processing WIP
- **Special Operation Activity Routing**
 - A Special Operation Activity routing can be created via the Manage Routings app or via the Manage Operation Activity Master app.
 - Generally used for exception processing, a Special Operation Activity is the first step on the special routing. An SFC can be started at this special operation even if in queue at another operation on another routing.
- **Nonconformance Routing**
 - A nonconformance routing can be created via the Manage Routings and can also contain loops and multiple steps for conditional SFC processing.
 - SFCs can be sent to nonconformance routings via the Nonconformance logging. Upon completion of the nonconformance routing, the SFC can be returned to the production routing.



Routing Details Custom Data

Create Cancel

Details

*Routing Name:
SPECIAL_SR2

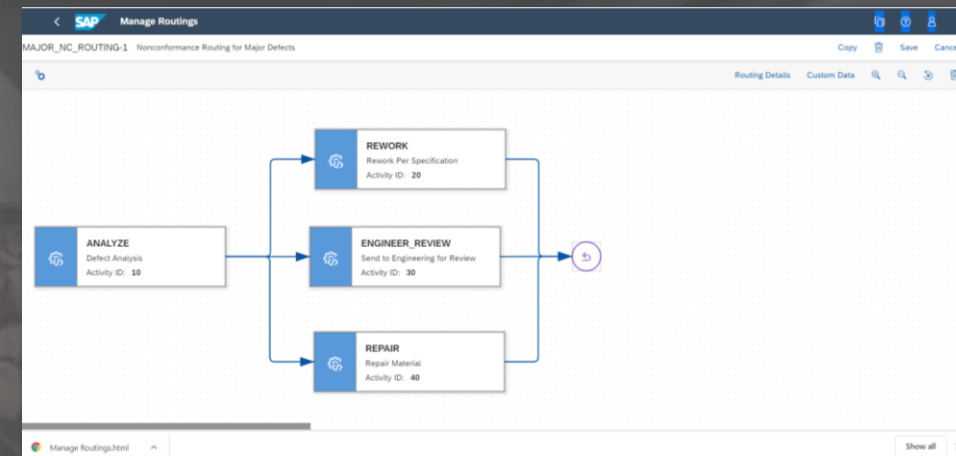
*Version:
A

Routing Type:
Special Routing

Description:
SPECIAL_SR2

Status:
Releasable

Current Version:
YES



SAP Digital Manufacturing Cloud for Execution

Tooling - Integration of tools from SAP S/4HANA with tool planning, scheduling, and logging

- Integration of tool materials (PRT) from SAP S/4HANA and the ability to create tools locally in SAP Digital Manufacturing Cloud for execution
- Enhanced production order integration to include material and equipment PRTs assigned to operation activities. These assignments can be used for scheduling in Resource Orchestration (REO) and tool logging.
- Planning and scheduling of tools in Resource Orchestration (REO) including tool reservations for a work center and visualization of tool assignments in the Gantt Chart
- Logging of tool usage in the production operator dashboard (POD) as well as automated logging of tool usage assigned to Resources

The image displays three screenshots from the SAP Digital Manufacturing Cloud for Execution interface, illustrating tool management and scheduling capabilities.

Top Screenshot: Load Resources with Tool Assignments
 This screen shows the configuration for resource WC001. It includes an "Import Data from REO" button and a table of assigned orders. The "Assigned Orders (2)" table is as follows:

Order ID	Material	Assigned Date
1874898	ANGLE02	2021-01-27 8:48:00 PM
1874973	ANGLE02	2021-01-29 12:06:38 PM

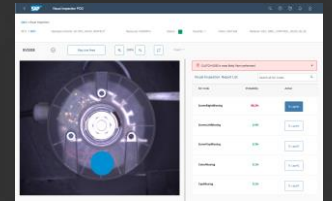
Middle Screenshot: Manage Tools
 This screen displays a list of tools. The "Tools (1)" table is as follows:

Tool Number	Description	PRT Number	Status
TL1	Angle Drill Guide	DRILL_TEMPLATE	Enabled

Bottom Screenshot: Dispatching and Monitoring
 This screen shows a Gantt chart for tool scheduling. The chart displays tool assignments for various resources (BR-ASSY002, BR-ASSY003, BR-INSP001) across a timeline from Sep 21 to Sep 26. The "Tools Assigned" panel on the right shows a list of tools and their assigned dates and times.

SAP Digital Manufacturing Cloud for Execution

AI/ML Scenario: Visual Inspection - Assist Nonconformance Logging



Machine learning models assist operator on the shop floor to execute visual inspection tasks of manufactured products. Using a **Production Operator Dashboard**, it simplifies the identification of defects and logging the right **Nonconformance** to ensure defective parts are handled as business requires.

Key Capabilities

- Upload pre-trained machine learning model and deploy it to shop floor supporting the operator on visual inspection tasks.
- Operator can capture images with connected cameras or can inspect images from industrial cameras provided by the data collection API
- Assist operator to identify defects and log the right Nonconformance using the machine learning model and highlight regions with defects
- Create custom production operator dashboard with visual inspection plugin.
- Automated collection of images and inspection results which can be downloaded as analytical data sets to train new machine learning models.

Visual Inspection POD

Main / Visual Inspection

SFC: 1 SFC Operation Activity: Inspection Resource: Xplanar Test Status: ■ Quantity: 1 Order: 1145 Material: CONTROL_HEAD__KIT

DMC_Control_Head_1192

Play Live Feed 100% Source

DMC_Control_Head_1192 is most likely 'Non-conformant'.

NC Code	Probability	Action
Defective Sticker	99.3%	Log NC
QR Code Missing	0.3%	Log NC
Card Missing	0.2%	Log NC
Wrong Sticker Position	0.2%	Log NC

Mark as Conformant Mark Nonconformance Cancel

[Watch the Video on how Visual Inspection works](#)

SAP Digital Manufacturing Cloud for Execution

Solution Details - Process



SAP Digital Manufacturing Cloud for Execution

Capabilities for Consumer and Process Industries

- **Extend Master Recipes** integrated from S/4HANA with Work Instructions, Data Collections and Process Parameters
- **Execute Batch** related **Process Orders** in the Production Order Dashboard (POD)
- **Create and Value Batches** for Main-Products as well as for **Co-Products and By-Products** during Production and search and **Consume batches** based on characteristics
- **Confirm process order phases** with Yield, Scrap and Activities integrated with S/4HANA
- Post **goods movements** for goods issues and receipts seamlessly integrated with S/4HANA
- **Record inspection results** integrated with S/4HANA QM
- **Integrate with the Shop Floor** in a **bi-directional** way using Equipment Connectivity (Production Process Designer) and Plant Connectivity (PCo)
- Enable **Post Production Reporting**
- **Customize** your application with the POD Designer
- Print customized **Labels**
- **View product history report** for produced batches



SAP Digital Manufacturing Cloud for Execution

Process Industry - Production Operator Dashboard (POD)

- Integrate process orders with S/4HANA
- Provision of the new Order POD to support order-based execution of process orders with single batches
- Support Operators with a highly flexible and intuitive user interface (POD)
- Configure and design the POD based on user requirements
- Start and Complete Phases
- Guide operators using Work Instructions in the POD
- Support of Data Collections to collect execution related data
- Display Long text for Process Order Phases
- Record inspection results for process order operation/phase (inspection lot type 03) and integrate with S/4HANA

The screenshot shows the 'Default Order POD' interface. At the top, there are search filters for 'Work Center' (T_FILL1), 'Material' (empty), and 'Planned Start Date Range' (Mar 17, 2020). Below the filters is a table titled 'Process Orders (3)' with columns: Order ID, Batch, Material, Material Description, Order Quantity, Planned Date Range, and Status. The table contains three rows of data, each with a progress bar indicating the quantity consumed relative to the order quantity.

Order ID	Batch	Material	Material Description	Order Quantity	Planned Date Range	Status
1002865	000001089	T_POWDER000	Powder (bulk) - 000	850.00 KG / 1,000.00 KG	Mar 17 – 24, 2020	Active
1002866	000001090	T_POWDER000	Powder (bulk) - 000	0.00 KG / 1,000.00 KG	Mar 17 – 24, 2020	InQueue
1002871	CHEM0317	T_POWDER000	Powder (bulk) - 000	0.00 KG / 1,200.00 KG	Mar 17 – 24, 2020	InQueue

The screenshot shows the 'Main Page / PHASES' interface for Order ID - 1000076. It displays details for the selected phase: 0013 - Mixing Phase. The interface includes a 'Phases (3)' table on the left and a 'Components (3)' table on the right. The 'Components' table shows the material consumption for three different base components, each with a progress bar and 'Postings' and 'Consume' buttons.

Phase ID	Status	Action
0010 - Paint Mixing	Green	Start
0012 Add Premix	Green	Start
0013 Mixing Phase	Green	Start
0014 Cleaning	Grey	Start

Material	Description	Planned Batch	Default Storage Location	Threshold	Posted Quantity
D2C_C_104	Red base component		201A		100.00 L / Target: 120.00 L
D2C_C_105	Green base component		201A		Target: 40.00 L
D2C_C_106	Blue base component		201A		Target: 40.00 L

SAP Digital Manufacturing Cloud for Execution

Process Industry – Integrate goods movements from the POD to S/4HANA

- **Confirm quantities and activities** on phase level
- Record **consumption of components and batches** to trigger goods movements in S/4HANA
- **Create batches for Main and Co-/By-Products** in S/4HANA triggered from DMC
- Post **Goods Receipts** and integrate with S/4HANA

The screenshot displays the SAP Digital Manufacturing Cloud for Execution interface. The main view shows a table of components with columns for Material, Description, Planned Batch, Default Storage Location, Threshold, and Posted Quantity. Two components are listed: T_RM01 (Base Powder) and T_RM02 (Pigment Powder). The T_RM01 row shows a target quantity of 300.00 KG and a 'Consume' button highlighted with a yellow box. A yellow arrow points from this button to a 'Consume Material' dialog box.

The 'Consume Material' dialog box shows the material T_RM01 (Base Powder) and the batch ID 000000989. A yellow box highlights the batch ID field, with a yellow arrow pointing to a 'Select batch for consumption' dialog box. This dialog box shows a search for '181C' and a table of items with columns for Batch ID, Quantity, and Default Storage Location. The table lists two items: 000000989 (1,000.000 KG) and 000000990 (2,000.000 KG), both at storage location 181C.

A yellow arrow points from the 'Consume Material' dialog box to a 'Create Goods Receipt' dialog box. This dialog box shows the material number D2C_C_001, a quantity of 200 L, batch number DEMO-AHM-1, and storage location 101B. It also includes fields for 'Posted By' (Isac) and 'Posting Date' (August 27, 2020), and a 'Comments' field.

SAP Digital Manufacturing Cloud for Execution

Post-Production-Reporting POD

- **Report Production** e.g. after a shift in one common UI
- Report **Actual Start/End Data**
- Consume Materials, Confirm Quantities and Activities in one step

SAP Post-Production Reporting POD (Default)

Main / Post-Production Reporting 17:21:00

Order ID: 1029603
D2C_C_001

Default Settings Operation Activity 0010 - Phase 0011 **Operation Activity 0010 - Phase 0012** Operation Activity 0010 - Phase 0013

Material Components Save Data Clear Data Add Non-BOM Components

Material	Threshold	Posted Value	Action	Batch Number	Storage Location	Quantity	Unit	Posting Date Time	Posted By
D2C_C_104 Red Base Component	54.000 - 66.000 L	<input type="text" value="0 of 60.000 L"/>	View Posts	<input type="text"/>	<input type="text"/>	<input type="text"/>	L - l	Nov 15, 2020, 19:00:00	isac.mica@yopmai...
D2C_C_105 Green Base Component	18.000 - 22.000 L	<input type="text" value="0 of 20.000 L"/>	View Posts	<input type="text"/>	<input type="text"/>	<input type="text"/>	L - l	Nov 15, 2020, 19:00:00	isac.mica@yopmai...
D2C_C_106 Blue Base Component	108.000 - 132.000 L	<input type="text" value="0 of 120.000 L"/>	View Posts	<input type="text"/>	<input type="text"/>	<input type="text"/>	L - l	Nov 15, 2020, 19:00:00	isac.mica@yopmai...
D2C_C_104B Carbonate water		<input type="text" value="10.000 of 0 L"/>	View Posts	<input type="text"/>	<input type="text"/>	<input type="text"/>	L - l	Nov 15, 2020, 19:00:00	isac.mica@yopmai...

Quantity Confirmation Save Data Clear Data

Quantity Type	Posted Value	Action	Confirmation	Quantity	Unit	Posting Date Time	Posted By
Yield	0	View Posts	Final	<input type="text"/>	L - l	Nov 15, 2020, 19:00:00	isac.mica@yopmail.com
Scrap	0	View Posts	Final	<input type="text"/>	L - l	Nov 15, 2020, 19:00:00	isac.mica@yopmail.com

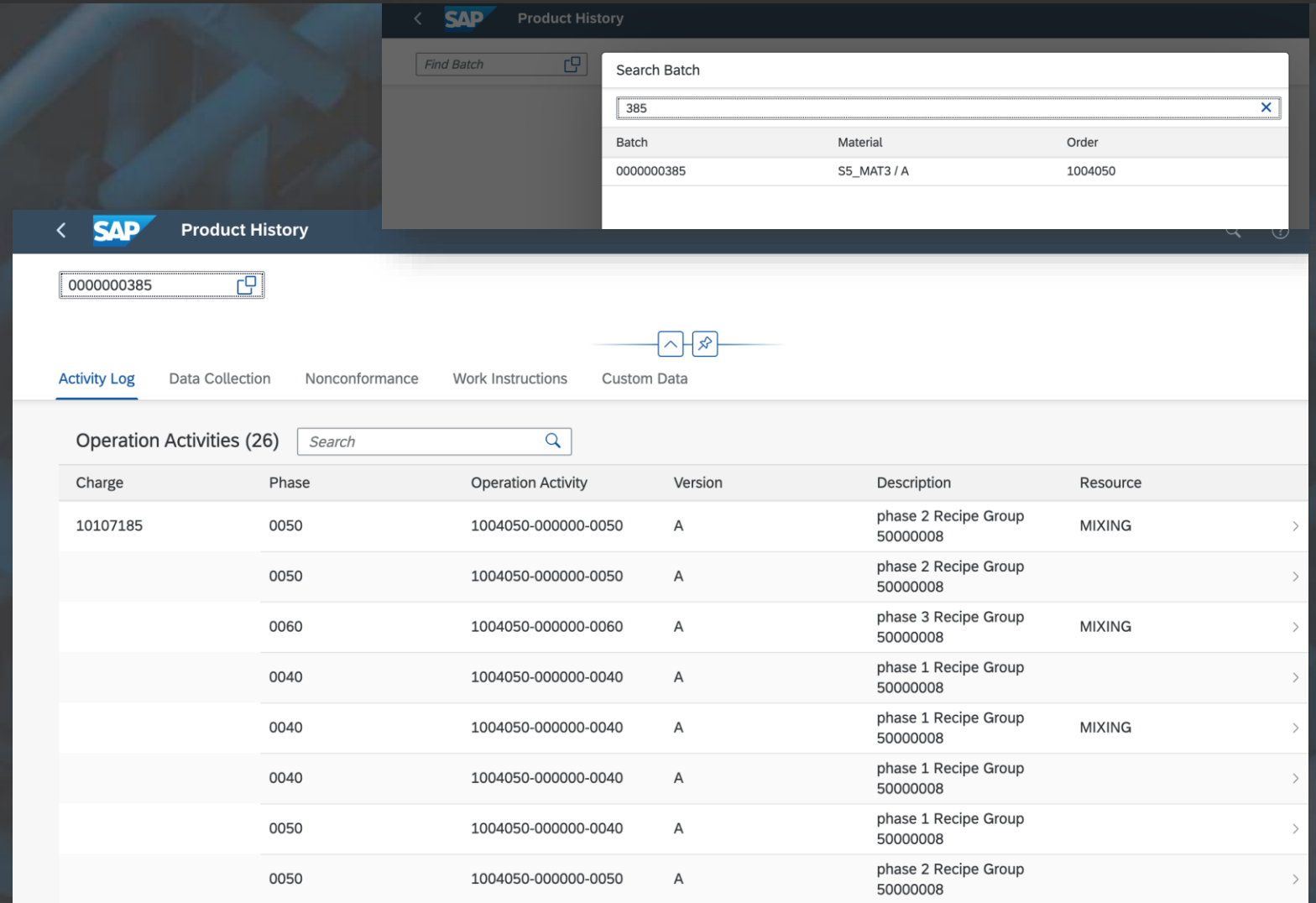
Activity Confirmation Save Data Clear Data

Activity Type	Posted Value	Action	Value	Unit	Posting Date Time	Posted By
SAP_02 (Machine)	0 HR	View Posts	<input type="text"/>	HR - Hours	Nov 15, 2020, 19:00:00	isac.mica@yopmail.com
SAP_03 (Labor)	0 HR	View Posts	<input type="text"/>	HR - Hours	Nov 15, 2020, 19:00:00	isac.mica@yopmail.com

SAP Digital Manufacturing Cloud for Execution

Product History Report for Process Industry

- Existing PHR report has been enhanced to enable using by Process Industry Customers.
- Input parameters and report terminology will be set automatically either to Process or Discrete based on industry type for Plant specified in User profile.
- User can search by Batch, Material or Order after pressing a value help button.



Product History

Find Batch

Search Batch

385

Batch	Material	Order
000000385	S5_MAT3 / A	1004050

Product History

000000385

Activity Log Data Collection Nonconformance Work Instructions Custom Data

Operation Activities (26) Search

Charge	Phase	Operation Activity	Version	Description	Resource
10107185	0050	1004050-000000-0050	A	phase 2 Recipe Group 50000008	MIXING
	0050	1004050-000000-0050	A	phase 2 Recipe Group 50000008	
	0060	1004050-000000-0060	A	phase 3 Recipe Group 50000008	MIXING
	0040	1004050-000000-0040	A	phase 1 Recipe Group 50000008	
	0040	1004050-000000-0040	A	phase 1 Recipe Group 50000008	MIXING
	0040	1004050-000000-0040	A	phase 1 Recipe Group 50000008	
	0050	1004050-000000-0040	A	phase 1 Recipe Group 50000008	
	0050	1004050-000000-0050	A	phase 2 Recipe Group 50000008	

SAP Digital Manufacturing Cloud for Execution

Product History Report for Process Industry - Timeline screen

- User has to select an Operation Activity to get a detailed timeline screen for it.
- This screen is available for single Operation Activity / Charge combination only.

The screenshot displays the SAP Product History interface for a specific operation activity. The header shows the SAP logo and the title "Product History". Below the header, there is a search bar containing the number "0000000385".

The main content area is divided into two sections. The top section displays key information about the order and material:

- Order: 1004050
- Order Type: Production
- Work Center: MIXING
- Material / Version: S5_MAT3 / A
- Description: Copy from SG24-English
- BOM / Version: 1004050-S5_MAT3-1-2 / A
- Description: S5_MAT3
- Routing / Version: 1004050 / A
- Description: S5_MAT3

Below this information, there are navigation tabs: "Activity Log", "Data Collection", "Nonconformance", "Work Instructions", and "Custom Data". The "Activity Log" tab is currently selected.

The main content area shows a timeline of operation activities. The current view is for "Operation Activities / Phase 0040, Operation 1004050-000000-0040". There is an "Expand All" button on the right.

The timeline displays several completed activities, each with the following details:

- Status: Complete
- Timestamp: 10/09/2020, 01:11:12
- Routing / Version: 1004050 / A
- Phase: 0040
- Work Center: MIXING
- User: isabelle.xu01@sap.com

SAP Digital Manufacturing Cloud

Resource Orchestration

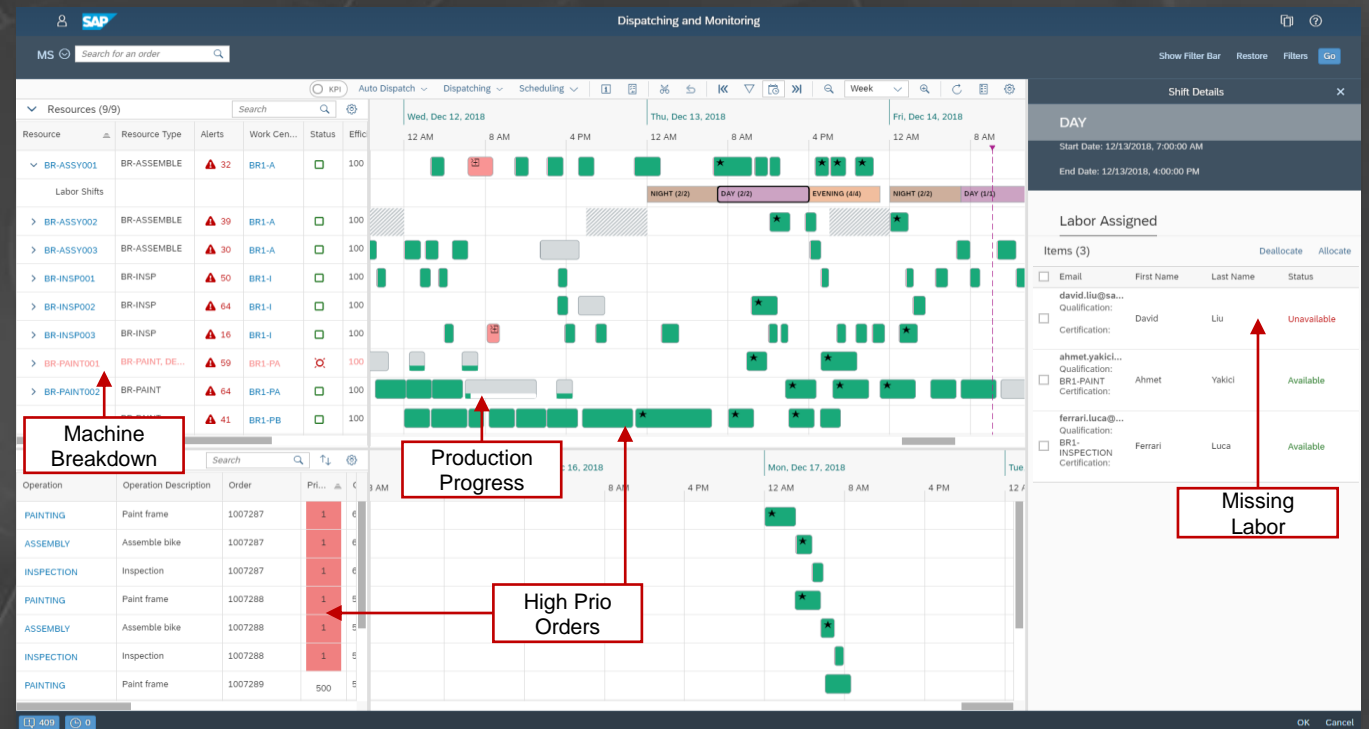


SAP Digital Manufacturing Cloud for Resource Orchestration

Discrete Industry – Resource Orchestration & Dispatching

Resource Orchestration & Dispatching

- Orchestrate labor and resources on the shop floor to achieve maximum availability
- React quickly to unexpected events utilizing built-in intelligence
- Dispatch and sequence operations to reflect the “real world” on the shop floor
- Provides multiple options for dispatching
- Operations can be dispatched on Resource level (e.g. for Job Shop scenarios)
- Operations can be dispatched on Work Center level (e.g. for Production lines or Production cells)
- Monitor the entire manufacturing process to optimize resources and execution
- Reflect the reality on the shop floor by visualizing high priority orders, machine breakdowns, missing labor and production progress



SAP Digital Manufacturing Cloud for Resource Orchestration

Resource Orchestration – Operation Merge in Planning Board

- The supervisor can click “**Related operation splits**” which will have the details of the related operations in the Info area along with Merge button
- The supervisor can select any operations and click on “**Merge**” to perform the merge operation
- The selected operations are automatically merged

The screenshot displays the SAP Dispatching and Monitoring interface, divided into several key sections:

- Resources (9/9):** A table listing resources with their types, material groups, alerts, work centers, and health status.

Resource	Resource Type	Material Group	Alerts	Work Ce...	Status	Health
BR-ASSY001	BR-ASSY		18	BR1-A	good	good
BR-ASSY002	BR-ASSY		12	BR1-A	OK	OK
BR-ASSY003	BR-ASSY		5	BR1-A		
BR-INSP001	BR-INSP		13	BR1-I		
BR-INSP002	BR-INSP		8	BR1-I		
BR-INSP003	BR-INSP		7	BR1-I		
BR-PAINT001	BR-PAINT		17	BR1-PA	Good	Good
- Worklist (41/41):** A table listing operations with their descriptions, orders, priorities, quantities, and materials.

Operation	Operation Description	Order	Priority	Quantity	Material
1018829-0-0010	Paint	REO_1018829...	2	10 EA	BR1-F3000
1018829-0-0010	Paint	REO_1018829	2	10 EA	BR1-F3000
1018829-0-0020	Assemble	REO_1018829...	2	10 EA	BR1-F3000
1018829-0-0020	Assemble	REO_1018829	2	10 EA	BR1-F3000
- Operation Details:** A pop-up window showing details for a selected operation, including order information, material description, and dates. A "Related Operation Splits" button is highlighted in orange.
- Operations Merged:** A Gantt chart view showing the timeline of operations. A vertical dashed line indicates a merge point, and a label "Operations Merged" is shown.
- Related Operation Splits:** A table showing the results of the merge operation, listing the original operations and their split sequences. A "Merge" button is highlighted in orange.

Operation	Sequence	Split Sequence	Order Quantity	Split Quantity	Status
REO_1018829_1					
1018829-0-0030	3	0	10	5	Dispatched
1018829-0-0030	3	1	10	3	Dispatched
1018829-0-0030	3	2	10	2	Dispatched

SAP Digital Manufacturing Cloud for Resource Orchestration

Discrete Industry – Labor Management

Labor Management

- Manage shifts and labor considering labor qualification and certification
- Assign labor to work centers and if required to time intervals
- In the situation where workers are not available, the unavailability of the worker(s) can be entered for the corresponding day or week
- Unavailability can also be entered in time slices if the unavailability is only for few hours
- Assignments are considered during dispatching in the Gantt Chart of the scheduling and dispatching app
- KPIs visualize the status for selected week:
- Capacity reflects available labor capacity
- Demand reflects demand coming from the orders
- Send emails to operators using the Schedule Labor app

The screenshot displays the SAP Labor Shift Planning interface. At the top, it shows summary statistics for Capacity (576 hrs), Demand (15322 hrs), and various shift types (Evening: 160 hrs, Night: 192 hrs, Day: 224 hrs, Absent: 104 hrs). Below this, a grid shows labor assignments for 'Shiffs Plan for CW 50 - 2018' across days from Sun 9 to Sat 15. Workers listed include Ahmet Yakici, Antoine Noir, Daniela Camba, David Liu, Erhuia Yin, Ferrari Luca, Frank Smith, Halil Cevirc, Jenny Lin, John Miller, Kumar Singh, Michael Schmidt, Rajeev Kasana, and Rex Mo. A context menu is open over a shift assignment, showing options like 'Assign Unavailability', 'Assign Shift', 'Assign Work Center', and 'Unassign'. A 'Current Selection' dialog is also visible, listing work centers like BR1-PA and BR1-PB with their respective time slots.

Below the first screenshot, a second screenshot shows the 'Shiffs Plan for CW 45 - 2019' interface. It displays summary statistics for Capacity (480 hrs), Demand Hours (472 hrs), and shift types (Day: 80 hrs, Evening: 40 hrs, Night: 40 hrs, Absent: 0 hrs, Shift overtime: 0 hrs). The grid shows labor assignments for days from Sun 3 to Sat 9. Workers listed include Ahmet Yakici, Albert Jose, Anshah Shah, Anamika Sharma, Anastasia Tsapenko, Andreas Fuchs, Anil Kumar Tota, Annette Garcia, and Annie Lin. The worker 'ahmet.yakici@sap.com' is highlighted with a red box in the worker list.

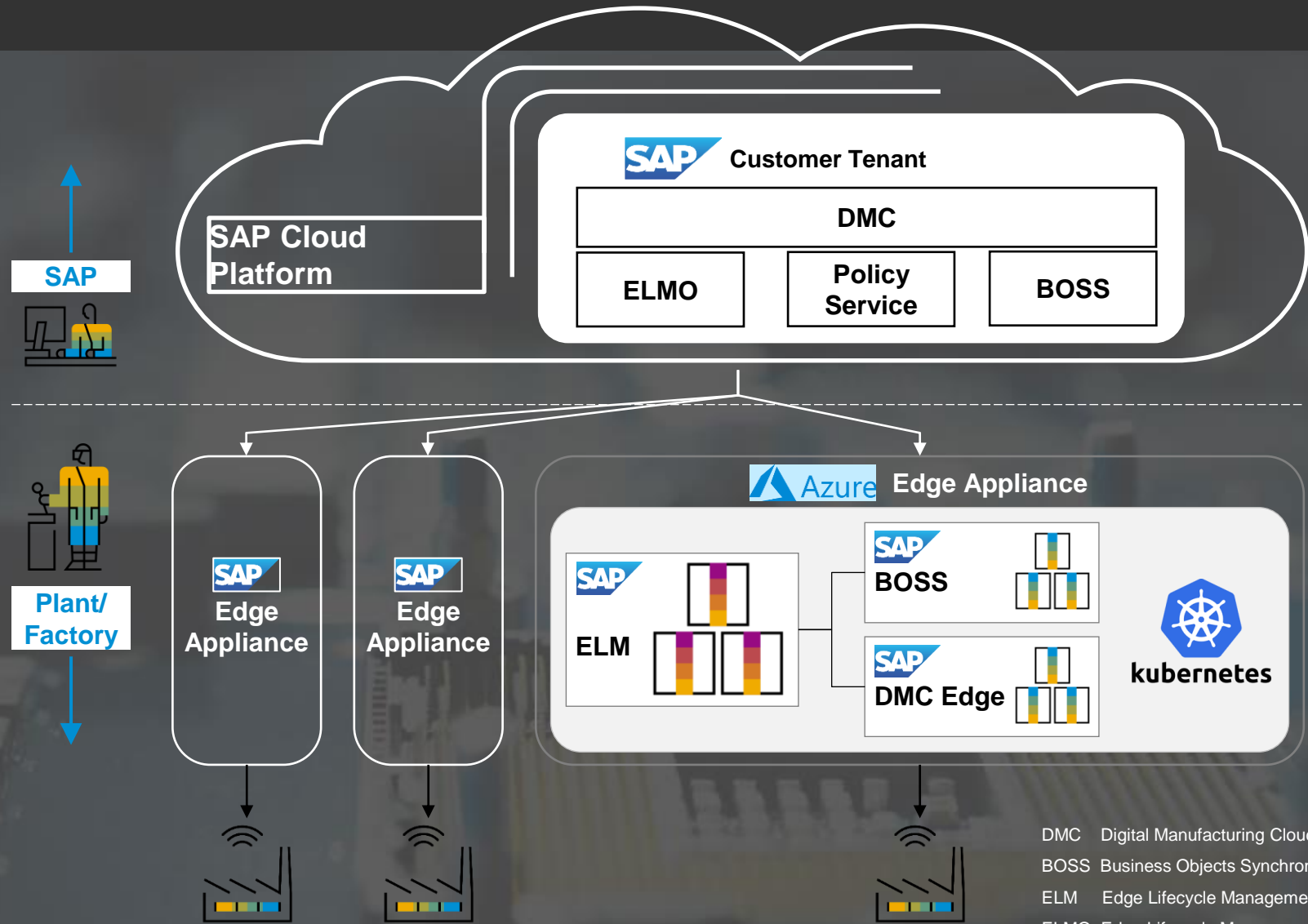
SAP Digital Manufacturing Cloud

Edge Computing



Industry 4.NOW: DMC Edge + Edge Services + Edge LM = Edge Computing

- Setup + Onboarding
- Azure Stack Edge
 - Order Appliance through Azure Portal
 - Receive and Configure Appliance
- Edge Node Configuration
 - Cluster Registration
 - Configuration (BOSS)
 - Application Deployment
 - Trigger Initial Data Synchronization
 - Access to DMC Edge Launchpad & Monitoring / Logging
- Usage + Operations
- DMC Application Scenario
 - Create and execute shop order
- Monitoring / Logging
 - Monitor DMC application and logs



DMC Digital Manufacturing Cloud
 BOSS Business Objects Synchronization Service
 ELM Edge Lifecycle Management
 ELMO Edge Lifecycle Management Orchestrator

SAP Digital Manufacturing Cloud EDGE – Lifecycle Management

Central Operator



Edge Services Management

Edge Nodes

ID	Name
75	ASE_Waterloo_2
88	ase-atlanta
76	ASE-Waterloo3
89	ASE-WDF
54	ASW-Waterloo
68	DMC-Pipeline
85	WDF2-Gardener-Matth...

Initial Setup

1) Setup Hardware + Registration with Azure

SAP Cloud Connector

components

Plant Operator

Limited Offline Lifecycle Management Capabilities for emergency situations with local UI on Edge, e.g. start/stop

Azure Stack Edge

Overview

System

- Health status: ✔ Healthy
- Software version: 2.0.1102.096
- Notzulare Kapazität: 0.04 TB
- Vorflughare Kapazität: 7.95 TB

Edge Node: ASE-WDF

ID: 89

General Settings Applications **Partition Tags**

Add Partition Tags to apply Data Synchronization Service.

Application Name	Tag Name	Tag Value
DMC Edge	plant	AWDF

Add Partition Tags

Application Name	Tag Name	Tag Value	
<input checked="" type="checkbox"/>	DMC Edge	plant	AWDF

Deploy Application

Choose Application

Application:*

- DMC Edge
- NGX Reference

Deploy Cancel

SAP Digital Manufacturing Cloud for Insights

Solution Details

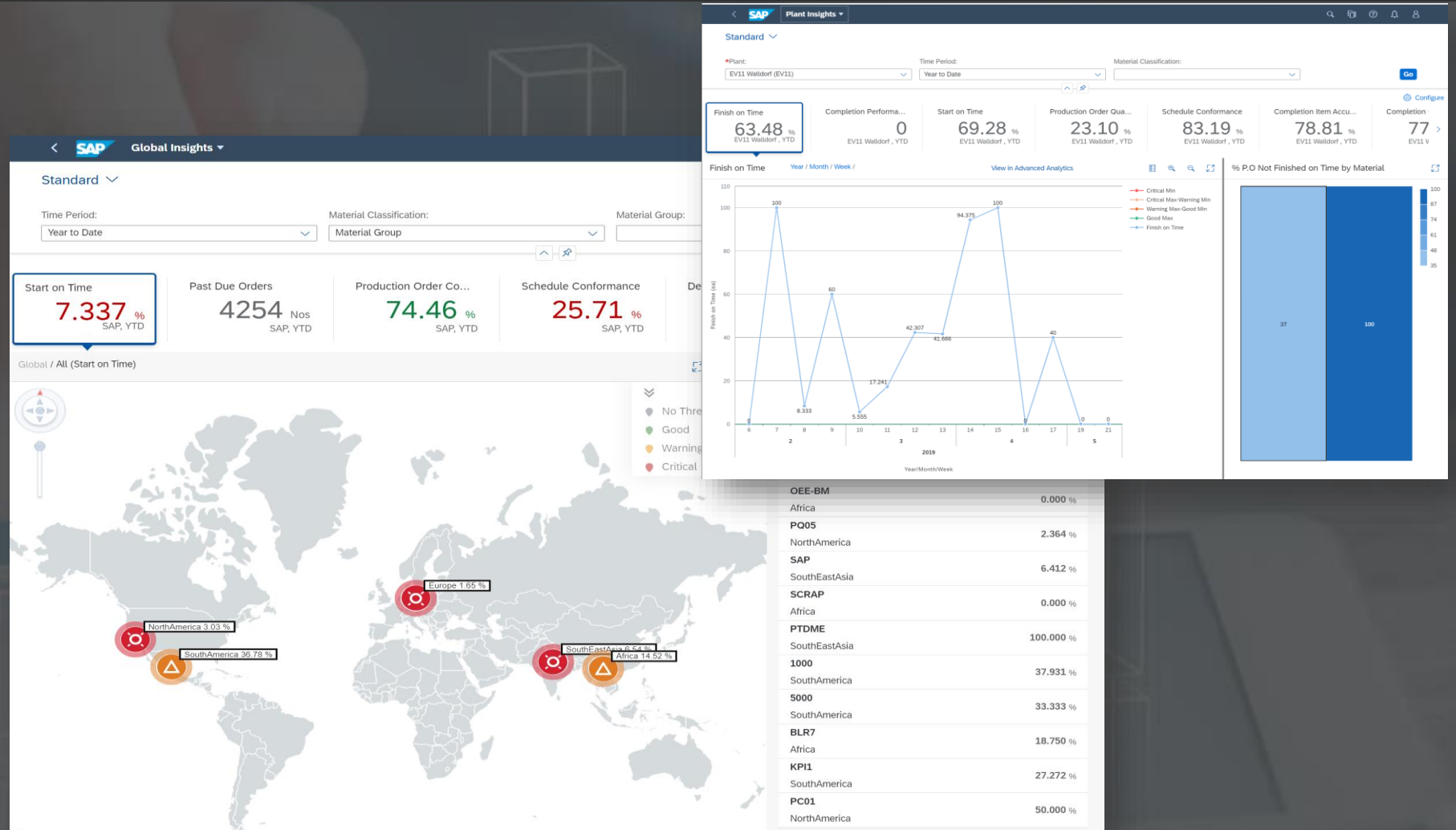


SAP Digital Manufacturing Cloud for Insights

Global Level and Plant Level Insights

Global Level and Plant Level Insights

- Use out-of-the box standard pre-delivered manufacturing KPIs fed with ERP, ME and DMC execution data
- Gain real-time visibility and monitor the performance of the production process from a regional level through geographic mapping
- Compare the performance between regions, between plants within and across regions, between work centers and resources
- Get quick visibility of personalized KPI's in "Global Insight" to identify non-performing regions, countries and plants

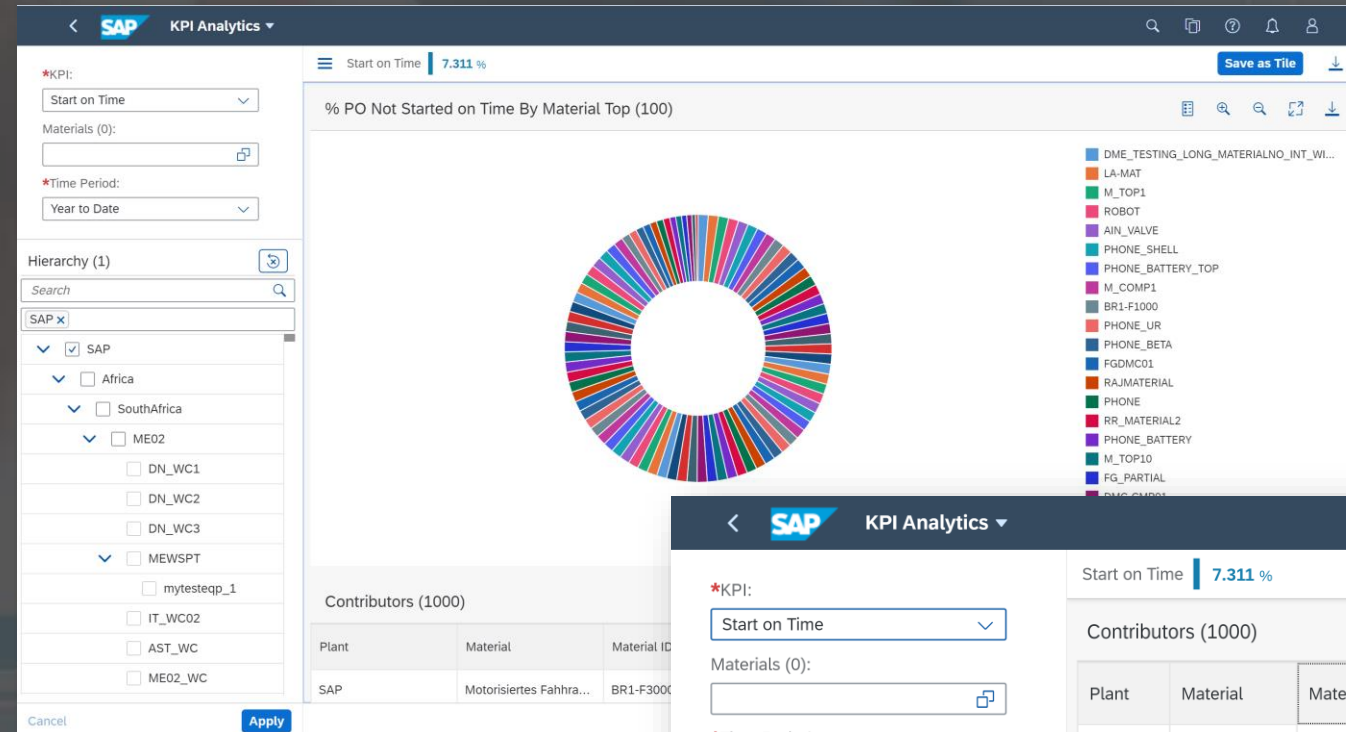


SAP Digital Manufacturing Cloud for Insights

KPI Analytics

KPI Analytics

- Detailed analysis using KPI analytics application to identify contributors impacting the production performance
- Visibility of key areas impacting the performance of any selected KPI
- Drill-down to find the root cause pointing to which material, work center, or order is causing the loss in KPI values
- Compare various KPI's across different nodes of the enterprise hierarchy
- Save the comparison result as a tile for instant access



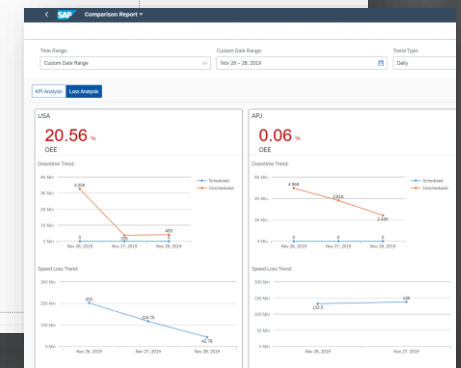
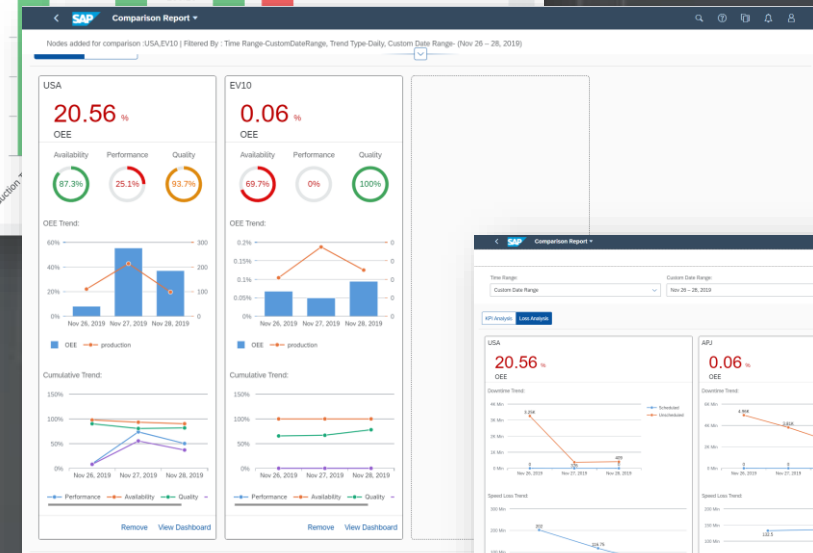
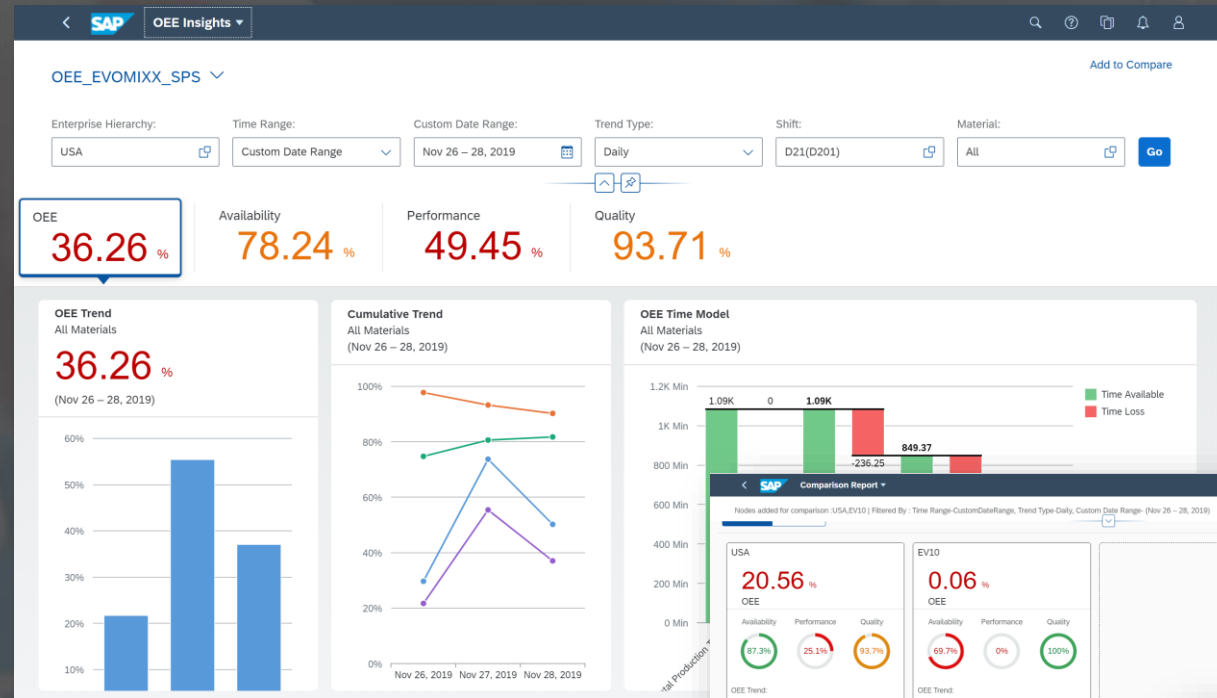
Plant	Material	Material ID	PO Number	Schedule ...	Ac
SAP	Motorisierte...	BR1-F3000	1007333	1/2/2019, 1...	
SAP	Motorisierte...	BR1-F3000	1007319	1/2/2019, 5...	
PQ05		BODY001	1007415	1/8/2019, 1...	
PQ05		BODY001	1007414	1/8/2019, 1...	
PQ05		BODY001	1007413	1/8/2019, 1...	

SAP Digital Manufacturing Cloud for Insights

Overall Equipment Effectiveness

Overall Equipment Effectiveness

- Overall equipment effectiveness (OEE) analytics based on SAP ME-OEE, SAP DMC Execution OEE and SAP MII-OEE
- Complete visibility of time losses happening in different buckets
- Analyze OEE over any defined level of the enterprise hierarchy across a custom time range, across materials, and across shifts
- Root cause analysis for all OEE losses (availability losses, performance losses, and quality losses)
- Perform OEE comparison and loss analysis between work centers, resources, and plants across different time zones of the world

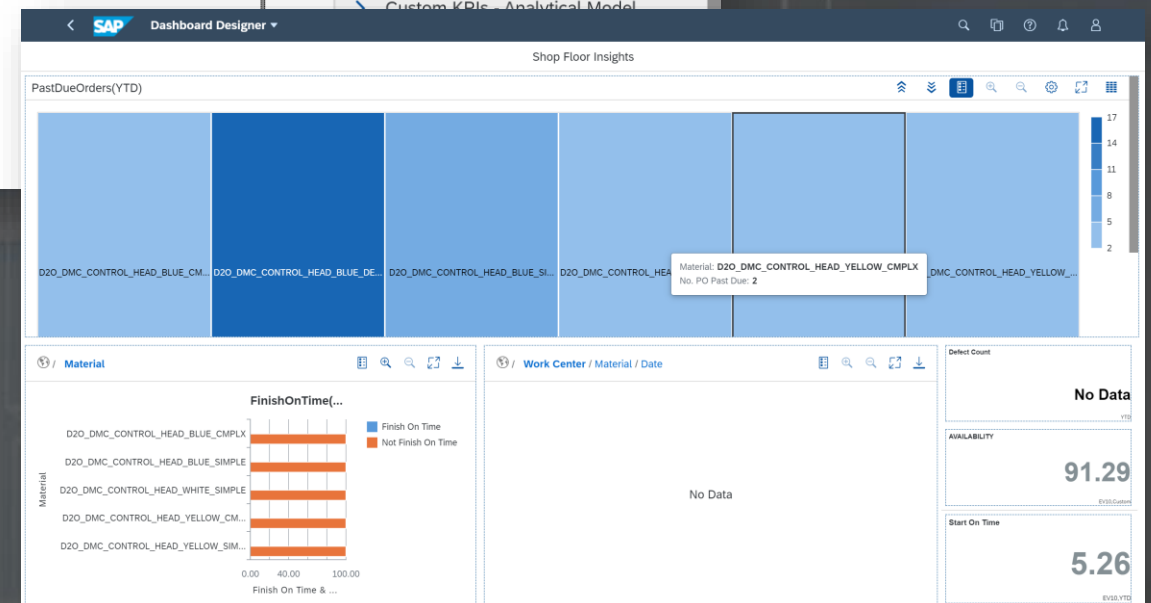
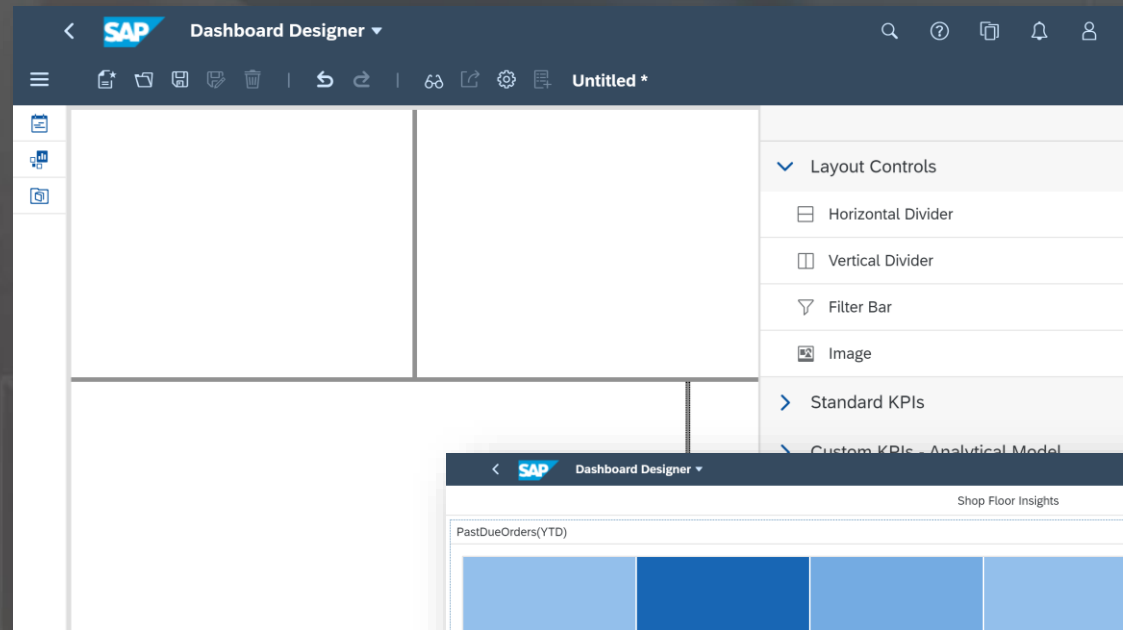


SAP Digital Manufacturing Cloud for Insights

Design and Customize Dashboards

Design and Customize Dashboards

- Compose instant interactive dashboards using user-friendly features and filtering capabilities
- Define layouts of your choice
- Drag and drop KPIs for instant visualization and integrate them grouped by any of the defined dimensions
- Multiple visualizations, i.e. charts (line, bar, pie, donut, horizontal bar, stacked bar, heatmap) and tiles
- Choose decimal format, colors, target lines, etc.
- Personalize the filter option for quick access of data in dashboard
- Value help for all the dimensions available for filtering in the filter bar
- Store multiple filter variants and choose to have one as your default
- Enhanced with drill charts to perform root cause analysis



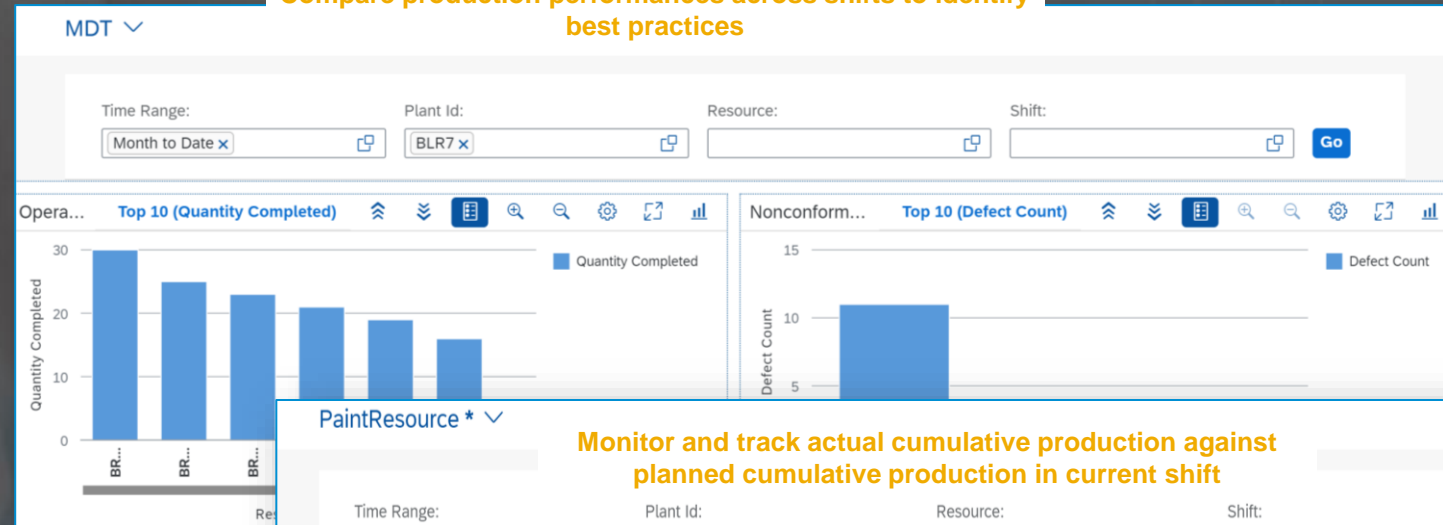
SAP Digital Manufacturing Cloud for Insights

Shift Based Production Analytics

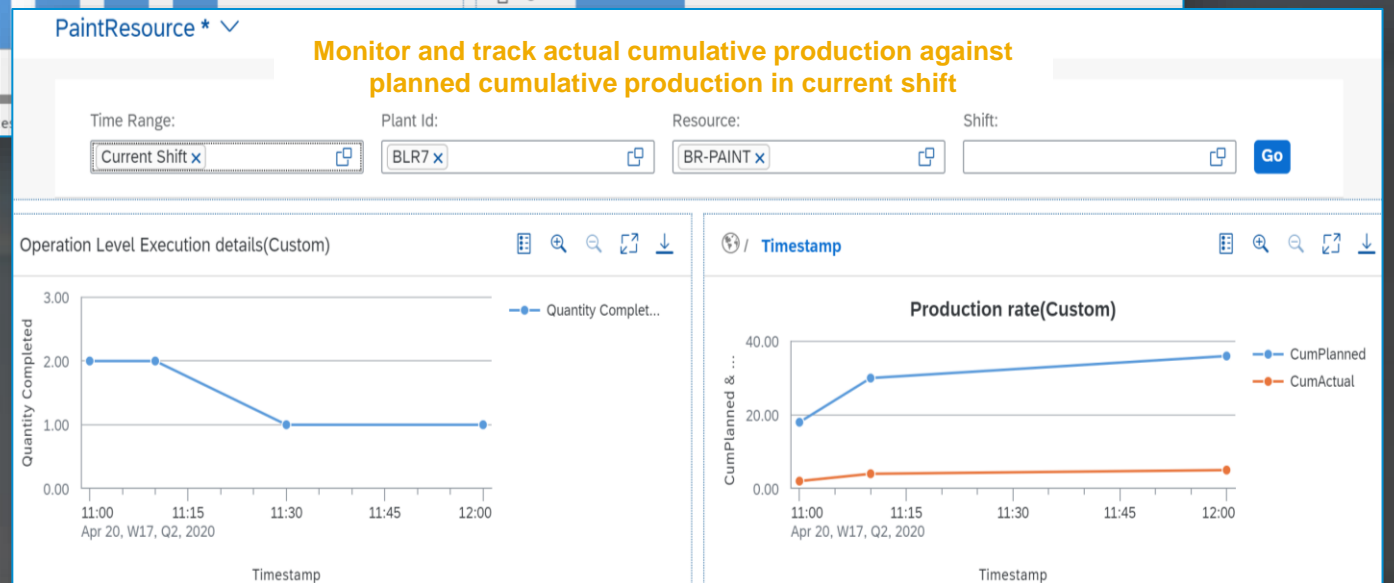
Shift Based Production Analytics

- Monitor manufacturing data for resource level transactions across defined and maintained shifts
- Enhance the analysis of productivity and performance on resources on a shift level to gain insight on its influence
- Compare production performance across shifts to identify best run shifts and trigger actions to collect best practices
- Monitor and track actual cumulative production against planned production in current shift to deduce action plans against any deviation
- Slice and dice across shifts over performance indices and other dimensions (such as resources, changeovers, etc.)

Compare production performances across shifts to identify best practices



Monitor and track actual cumulative production against planned cumulative production in current shift

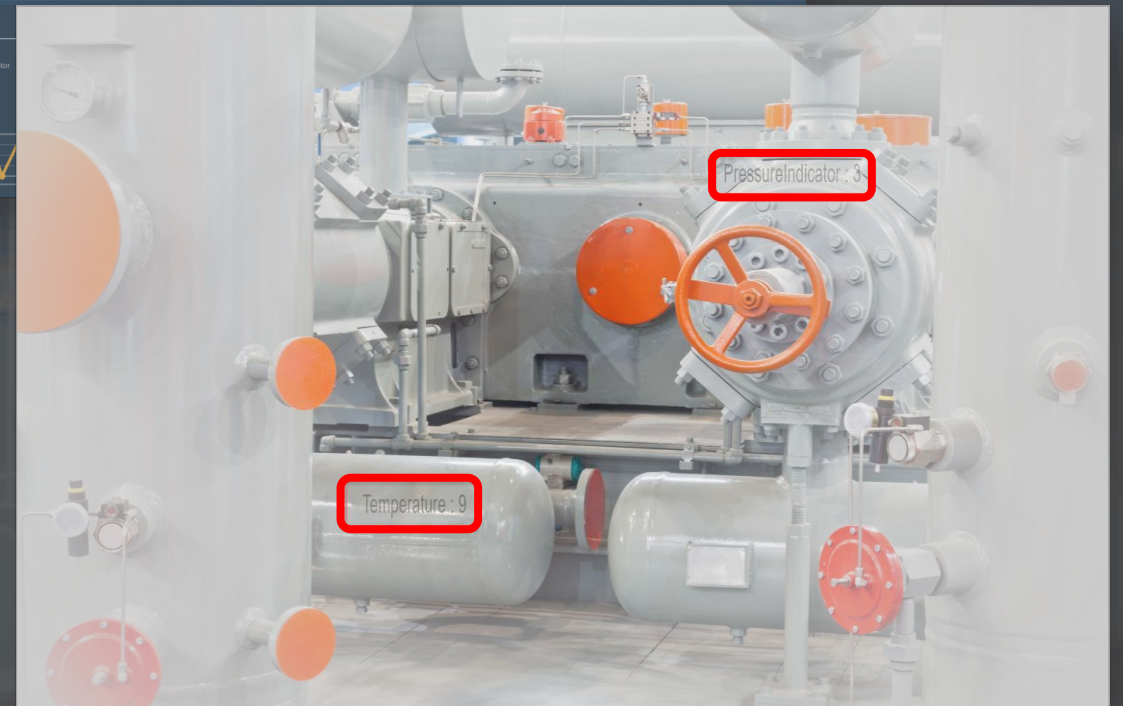
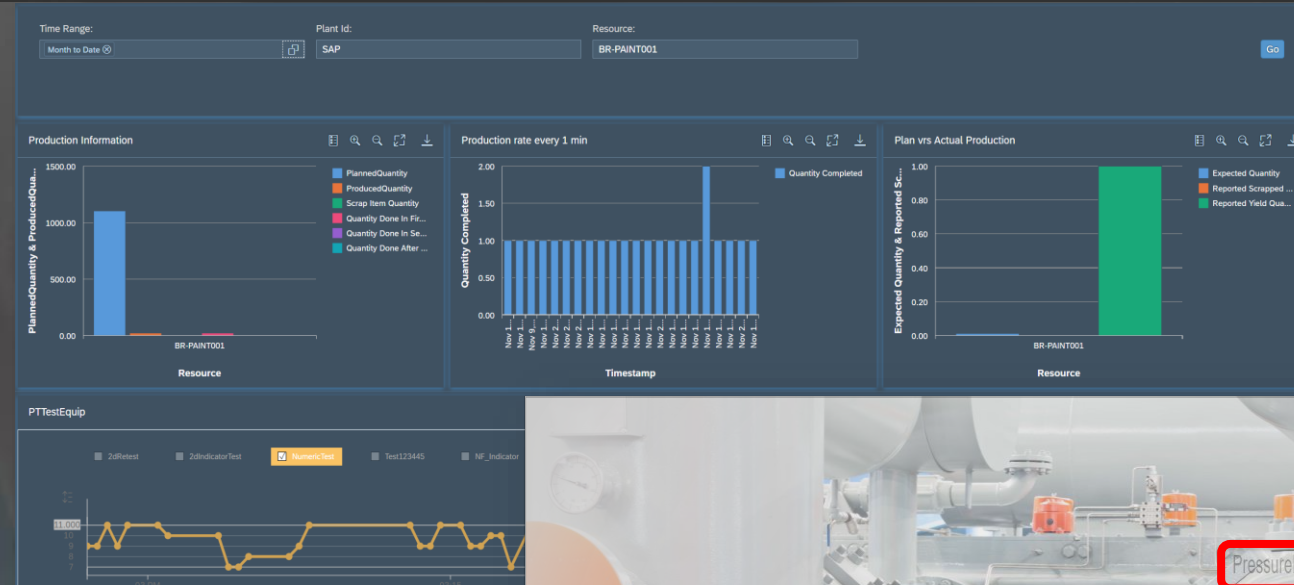


SAP Digital Manufacturing Cloud for Insights

Live Data Visibility

Live Data Visibility

- Get near real-time visibility of key production information (e.g. yield, scrap, production rate, etc.) for any selected duration
- Calculate measure on live transactional data (e.g. defect per unit, quantity variance, etc.)
- Get near real-time visibility of machine parameters to get operational visibility
- Get to monitor and check current value and trends
- Overlay tag values & business KPIs on top of an image providing more contextual real-time insight
- Associate sensor data with business data for better production insights



SAP Digital Manufacturing Cloud

Shop Floor Designer

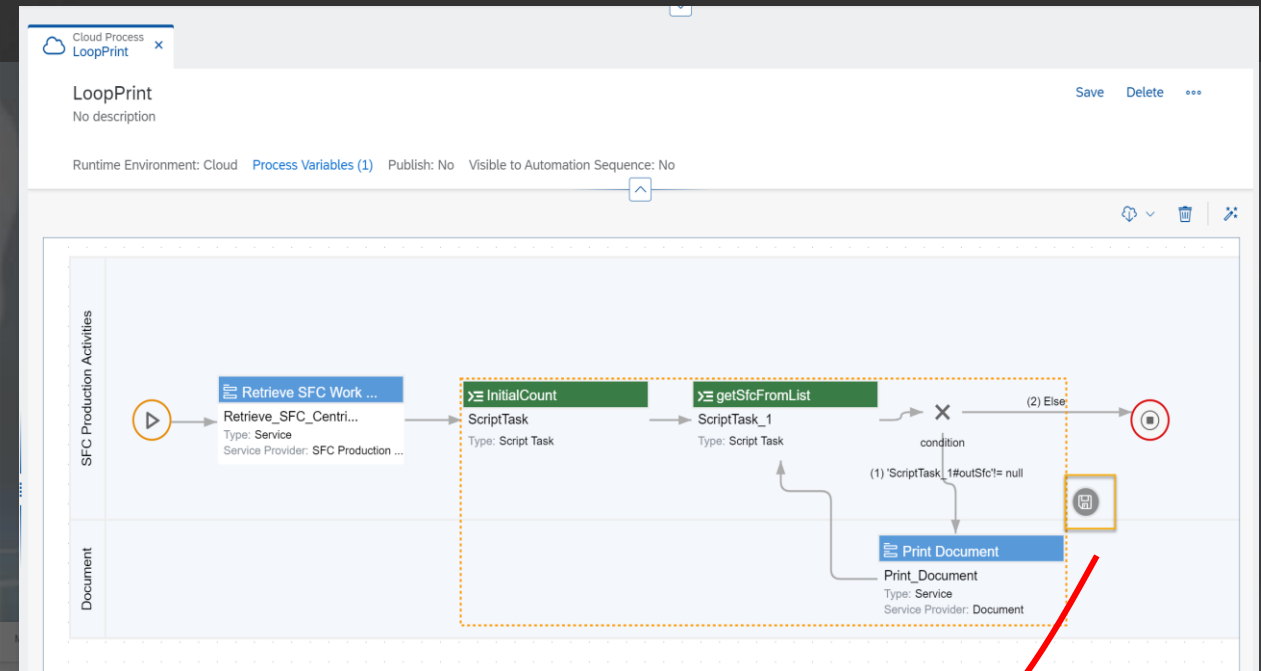


SAP Digital Manufacturing Cloud

Reusability across production processes

Reuse parts of a production process across designs by creating snippets

- Copy the selected services and control components to a central place
- Derive the attributes across designs
- View snippets created by all users
- Capability of managing snippets



The 'Select Services' dialog box is shown, with the 'Snippets' section expanded. The 'My Snippets' and 'Other Snippets' options are selected. A red arrow points from the 'Print Document' service in the process diagram to the 'My Snippets' option in the dialog.

SAP Digital Manufacturing Cloud

Machine and Process Orchestration – Production Process Debugger

The screenshot shows the SAP Design Production Processes interface. A process diagram is visible with several steps. A red box highlights the 'Debug' button in the top right corner. A red arrow points from this button to a 'Production Process' dialog box that is open in the foreground.

Name	Category	Data Type	Value
sfc	Input	String	
operation	Input	String	
version	Input	String	

Start a debugging session from the “Design Production Processes” app after the deployment of the production process

The screenshot shows the SAP Monitor Production Processes interface for a specific process instance (main#12). It displays a detailed view of the 'Start SFCs' step, including its input and output data, a log of system events, and a list of parameters and variables.

Processing Step - Input

Name	Data Type	Expression	Value
quantity	Double		
plant	String	"SAP"	SAP
sfc	StringArray	[sfc]	["SAP8177"]
operation	String	'operation'	1007557-0-0010
resource	String	"P_DEFAULT_1"	P_DEFAULT_1

Processing Step - Output

Name	Data Type	Value
sfc	String	SAP8177
operation	String	1007557-0-0010
version	String	ERP001

Parameters and Variables

Name	Data Type	Value
sfc	String	SAP8177
version	String	ERP001
operation	String	1007557-0-0010

Processing Step - Log

- [Info] Started process instance with id 1b5e9e5c-d1d0-426f-8824-b7b780133aa1
- [Info] Variable sfc is created with value: SAP8177
- [Info] Variable version is created with value: ERP001
- [Info] Variable operation is created with value: 1007557-0-0010
- [Debug] Executing async job for 23417d92-4f90-4729-bcb7-3e977ef9302e, with job id ac5:773f-11eb-8985-eeee0a99c161
- [Info] In StartEvent, executing NoneStartEventActivityBehavior
- [Info] Sequence flow will be taken for 23417d92-4f90-4729-bcb7-3e977ef9302e --> 0d144e4b2-419c-a15f-a79d4625e6cd
- [Debug] Created async job for 0d1444d0-e4b2-419c-a15f-a79d4625e6cd, with job id aff8b773f-11eb-8985-eeee0a99c161
- [Debug] Locking job for 0d1444d0-e4b2-419c-a15f-a79d4625e6cd, with job id aff8b70-7711eb-8985-eeee0a99c161
- [Debug] Executing async job for 0d1444d0-e4b2-419c-a15f-a79d4625e6cd, with job id aff8b70-773f-11eb-8985-eeee0a99c161
- [Debug] Unlocking job for 0d1444d0-e4b2-419c-a15f-a79d4625e6cd, with job id aff8b70-773f-11eb-8985-eeee0a99c161
- [Info] In ScriptTask, executing SecureJavascriptTaskActivityBehavior
- [Info] Variable sfc is updated with value: SAP8177
- [Info] Variable operation is updated with value: 1007557-0-0010
- [Info] Variable version is updated with value: ERP001
- [Info] Sequence flow will be taken for 7353d6f6-0eb8-41d5-9b20-9807694dda54, 0d1444e4b2-419c-a15f-a79d4625e6cd --> ccb6aad0-1f94-4ebc-9b66-4ae0190d4d32
- [Info] In ParallelGateway, executing ParallelGatewayActivityBehavior
- [Info] Sequence flow will be taken for 69ee25ea-b7b5-474e-b8b6-d6f867386341, ccb6aad194-4ebc-9b66-4ae0190d4d32 --> 96b65c81-cbda-4cdc-a62a-98f927f52314
- [Info] Sequence flow will be taken for 861d753a-e957-4ba9-84e8-dd4e3ec44776, ccb6aad194-4ebc-9b66-4ae0190d4d32 --> f25dc05a-09b6-4d00-9432-44cc8882a454

SAP Digital Manufacturing Cloud

Machine and Process Orchestration – Production Process Debugger

- Switch on the Edit Breakpoint toggle and click on the step on which you want to add a breakpoint
- When debug a parallel execution, you can choose which branch you want to execute by clicking the step with icon **B**, and then click “Next Breakpoint” or “Next Step”
- The step view shows the selected step's name, description, step ID, input and output parameter information
- Process Execution Control
 - Next Breakpoint:** Let the debugging process stop at the next breakpoint. The previous steps are executed.
 - Next Step:** Let the debugging process stop at the next step. The previous step is executed.
 - Restart Debugging:** Terminate the current debugging process and start another one.
 - Exit Debugging:** End the debugging session and go back to the normal design time of shop floor designer.
- The parameter view shows the current processing step name, input parameter name, type, expression and value and additionally the same of the previous step name. You can edit the previous step output parameter value to update the next step's values.
- The log view shows real-time log information with debug log level.
- The “Parameter and Variable” pane lists selected process variables, output parameters of previous steps, input parameters of the process instance. You can edit the value of each parameter

You can configure which variable or parameter to display by choosing Select Variables

The screenshot displays the SAP Production Process Debugger interface for a process instance named 'main#12'. The interface is divided into several panes:

- Process Flow:** A central diagram showing the process flow with steps like 'Start SFCs', 'readindicators', 'Script Task', and 'Log DC Values'. Breakpoint icons (B) are placed on various steps.
- Control Panel:** Located at the top right, it includes buttons for 'Next Breakpoint', 'Next Step', 'Restart Debugging', and 'Exit Debugging'.
- Selected Step - Start SFCs:** A pane on the right showing the description of the selected step and its input/output parameters. The 'Input (5)' section lists parameters like 'quantity', 'plant', 'sfc', 'operation', and 'resource'.
- Processing Step - Input:** A table showing the current step's input parameters.

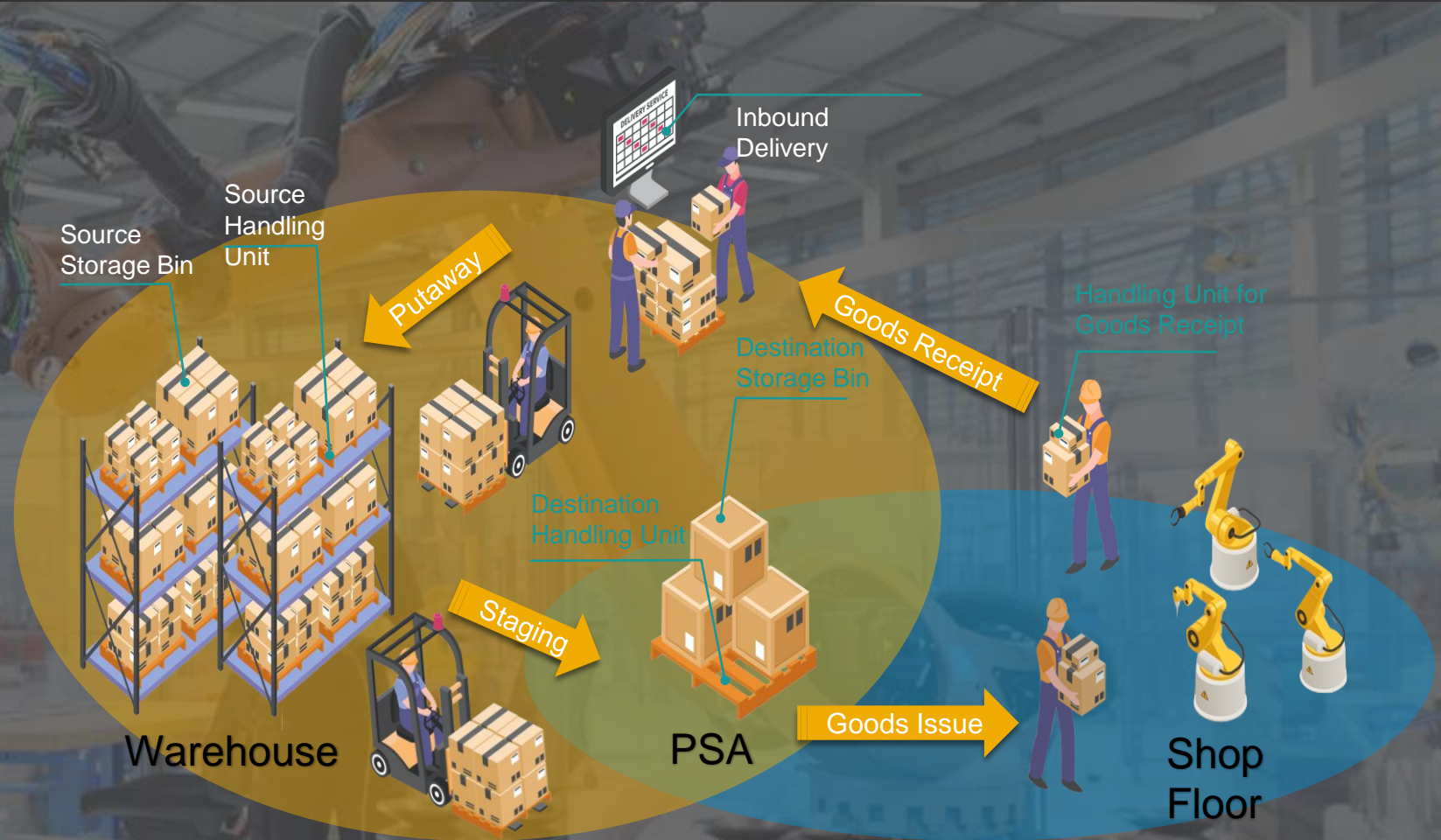
Name	Data Type	Expression	Value
quantity	Double		
plant	String	"SAP"	SAP
sfc	StringArray	[sfc]	["SAP8177"]
operation	String	'operation'	1007557-0-0010
resource	String	"P_DEFAULT_1"	P_DEFAULT_1
- Processing Step - Log:** A pane showing real-time log messages, including information about process instance creation, variable updates, and task execution.
- Parameters and Variables:** A table listing selected process variables and their values.

Name	Data Type	Value
sfc	String	SAP8177
version	String	ERP001
operation	String	1007557-0-0010
- Select Variables:** A dialog box that allows users to select which variables to display in the Parameters and Variables pane. It shows a list of variables with checkboxes: 'sfc', 'version', and 'operation' are selected.

SAP Digital Manufacturing Cloud for Execution

Extended Warehouse Management (EWM) Integration

- The ERP integration has been enhanced to enable scenarios related to integration with EWM and shop floor inventory in DMCE:
- Single Order Staging Request** provides for sending a request for the components to be staged for a specific order. The staging request can be sent by “Release Order” in DMCE or “Auto_Stage” service configured in production process. You can stage packed or unpacked materials pallet-wise (handling unit after handling unit) from a warehouse managed with SAP Extended Warehouse Management (EWM) to a production supply area (PSA).
- Single Order Staging Confirmation** will allow the transfer of shop floor inventory data from SAP EWM to SAP DMCE when the warehouse task of component staging is confirmed by the warehouse operator in SAP EWM.
- Component Consumption to EWM** supports the reporting/reverse of Component Consumption w/o yield/scrap confirmation directly to SAP EWM.
- Goods Receipt Upon Packing Unit Completion** will transfer a goods receipt message from DMCE to SAP EWM.

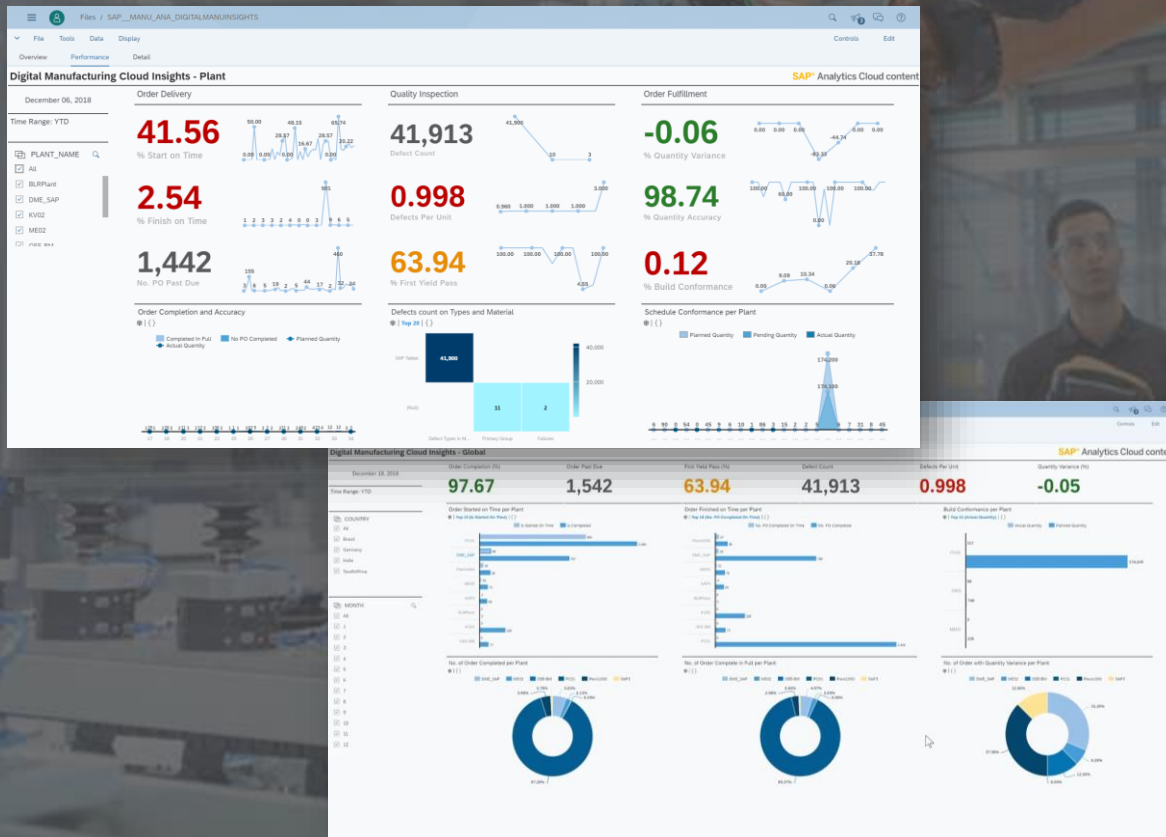


SAP Digital Manufacturing Cloud for Insights

Core - SAP Analytics Cloud Integration

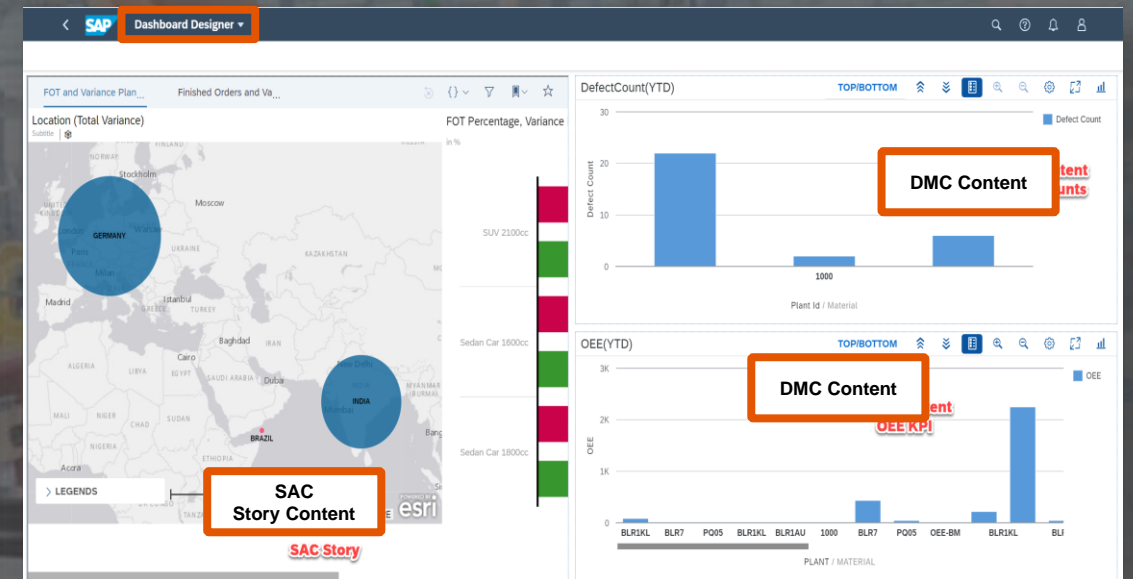
Manufacturing data in SAP Analytical Cloud (SAC)

- Set up live connection from SAC to Digital Manufacturing Cloud for Insights
- Use DMC Insights KPIs in SAC stories and combine with other data in Digital Boardroom



SAC Stories in Dashboard Designer for Enhanced Insights

- Drag-and-drop SAC stories with ease into dashboard designer
- Contextualize SAC story content with production performance management KPI's and content available from DMCi
- Leverage the complementary strengths of SAC and DMCi



Manufacturing Quick Links

QUICK LINKS

Industry 4.0 & Application Related:

- [SAP Digital Manufacturing Solutions in SAP.com](#)
- [SAP Industry 4.Now](#)
- [SAP Industry 4.Now Maturity Assessment](#)

Videos:

- [Visual Inspection by SAP](#)
- [Open Integrated Factory - Generation 2019 \(EN\)](#)
- [iFashion Cloud reference video](#)
- [Kennametal reference video](#)
- [SAP SIA 3rd modular production showcase](#)
- [Artificial Intelligence in SAP Digital Manufacturing](#)
- [SAP MOM on YouTube](#)

Industry 4.0 Blogs:

[Industry 4.0 – An elusive starting point!](#)

Thank you.

Contact information:

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Global Solution Owner

Rusty.Baldwin@sap.com

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