



# Digital Manufacturing Cloud

Mike Hayes

April 2023



## Introduction to presenter – Mike Hayes



- **Role / Title:** Director, Solution Architecture
- **Residence:** Rockton, IL
- **SAP / Industry Experience:** Over 25 years – with multiple manufacturing implementations in varying industries
- **Contact:** [mhayes@illumiti.com](mailto:mhayes@illumiti.com)

# Agenda

## SAP Digital Manufacturing Cloud Overview

## SAP Digital Manufacturing Cloud for Execution

- Solution details
- Execution tasks
- Discrete/Process industries
- Resource Orchestration
- Artificial Intelligence/Machine Learning
- Extensibility

## SAP Digital Manufacturing Cloud for insights

- KPI Analytics & OEE
- Alert Management

## SAP Digital Manufacturing Integration



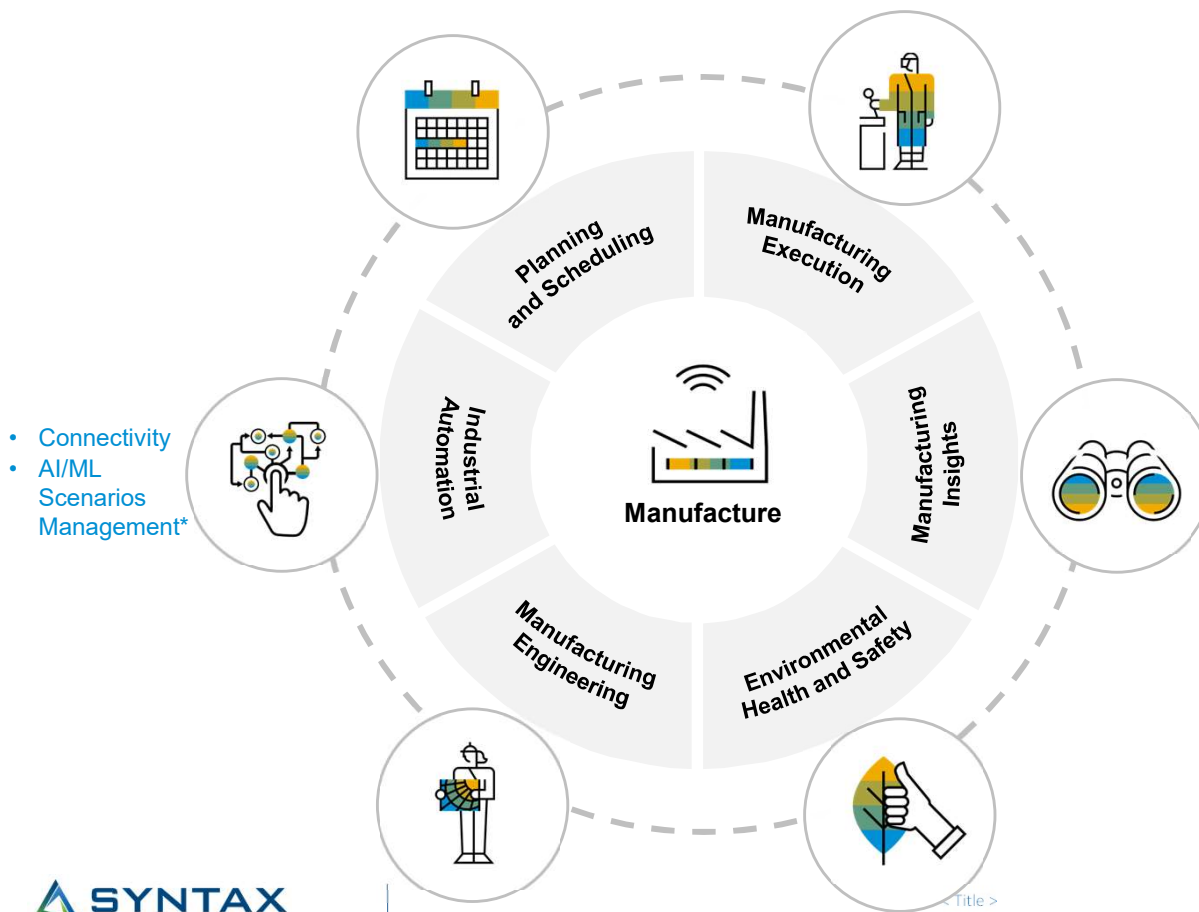
# SAP Digital Manufacturing Cloud

## Solution Overview



# SAP Digital Manufacturing Solutions

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



## SAP Digital Manufacturing Cloud

- Manufacturing Execution
- Manufacturing Insights
- SAP Plant Connectivity



## SAP S/4HANA Manufacturing

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



## SAP Manufacturing Suite

- SAP Manufacturing Integration and Intelligence
- SAP Manufacturing Execution

# SAP Digital Manufacturing Cloud for Execution

## Solution Details



# SAP Digital Manufacturing Cloud

## Product overview

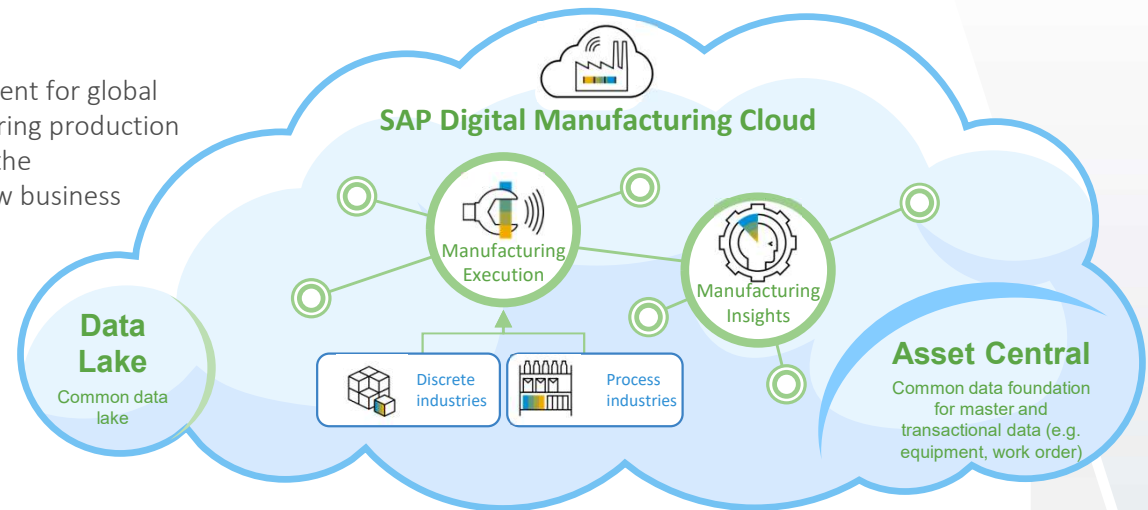
Connect your top floor business systems to your shop floor equipment for global visibility across all plants while orchestrating execution and monitoring production operations down to the individual work center. Take advantage of the manufacturing network to achieve greater flexibility and realize new business models.

### Manufacturing Execution\*

- Manage your production using the latest technology built on the SAP Cloud Platform
- Orchestrate and control the shop floor with out-of-the box integration to SAP ERP and S/4HANA

### Manufacturing Insights

- Take informed decisions to increase productivity and performance of your production systems with real-time insights and root cause analysis
- Detect product quality defects early in production with prediction models using machine learning
- Act as the digital twin of the physical world, including any equipment as well as any kind of automation devices
- Enables processes and an easy exchange of data between Information Technology and Operational Technology in a manufacturing environment



\* The Digital Manufacturing Cloud for execution license includes all functionalities of Digital Manufacturing Cloud for insights.

# 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.



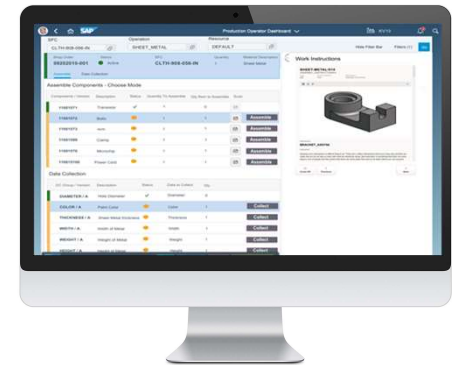
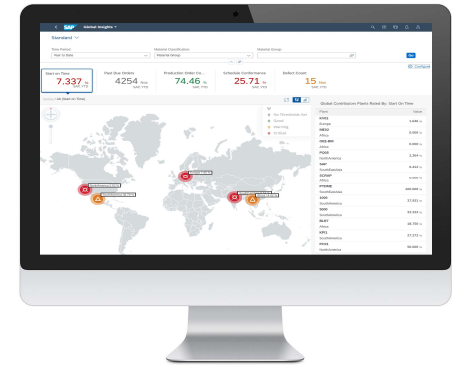
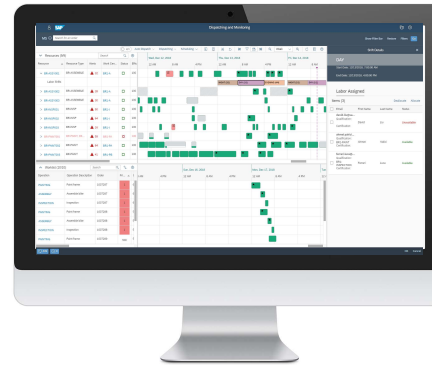
Design, distribute and dynamically control manufacturing shop floor activities enabling a smart factory.



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.





# Manufacturing Insights

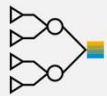
Intelligent insights and analysis across global plant operations



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



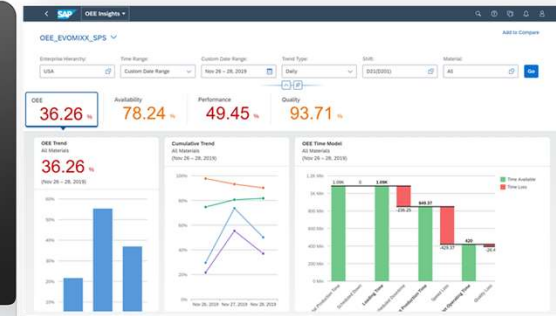
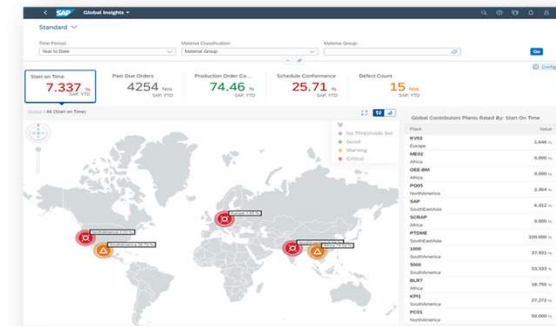
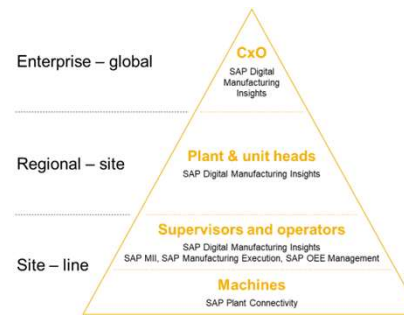
Manage and view harmonized data acquired from disparate sources for better visibility into your plant operations



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



Manufacturing Performance Management with OEE Energy Management to lower operational costs through an intuitive tailored Worker UI



# Benefits of a Public Cloud Solution like Digital Manufacturing Cloud



Lower Total Cost of Ownership (TCO)



Modern User Experience - Latest technology



Speed of Implementation



Expanded Portfolio



Speed of Subsequent Rollouts



Always on the Latest release



Return On Investment(ROI)



Quicker Rollout of New Functionality



Resource Driven, not by Plant



Labor Flexibility

# SAP Digital Manufacturing Cloud for Execution

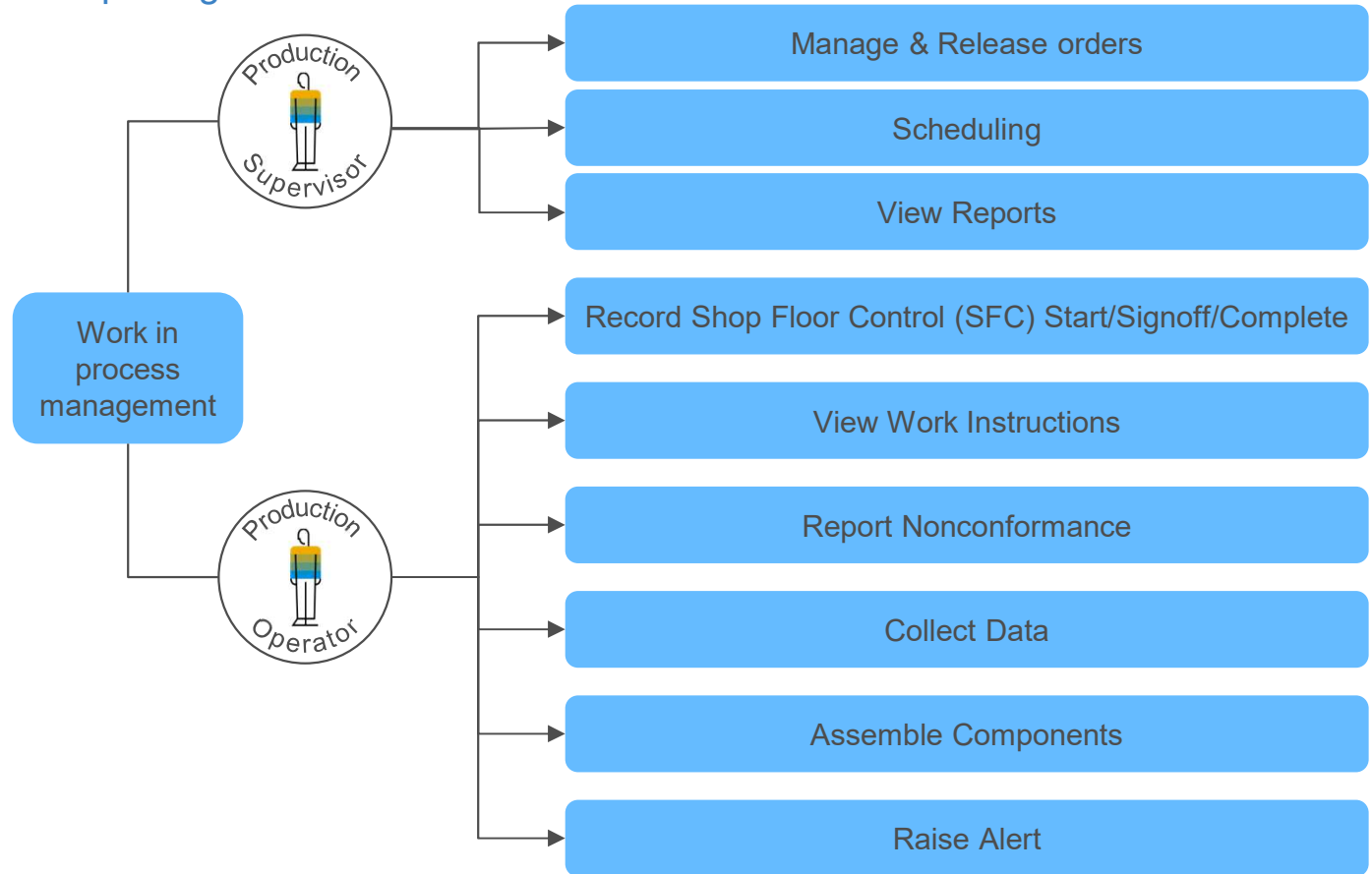
## Execution Tasks



# SAP Digital Manufacturing Cloud for Execution

## Work in process management and reporting

- Manage and release orders for execution on the shop floor
- Production operators use the configurable PODs (Production Operator Dashboards) that were created in the POD Designer to capture and report execution data
- An SFC is a unique WIP identifier representing a specific instance of the material being built during the manufacturing process and allows for full traceability of the product.
- The SFC represents a quantity of the product to be produced, depending on the lot size of its material. An SFC can be a serialized or non-serialized (lot).



# Manufacturing Execution (ME)

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



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



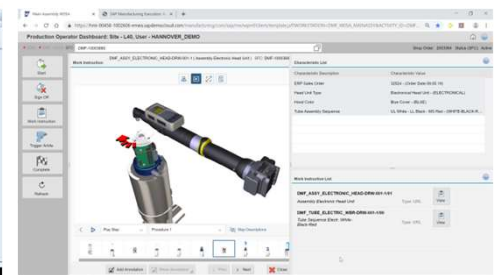
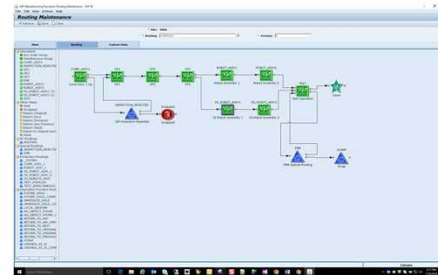
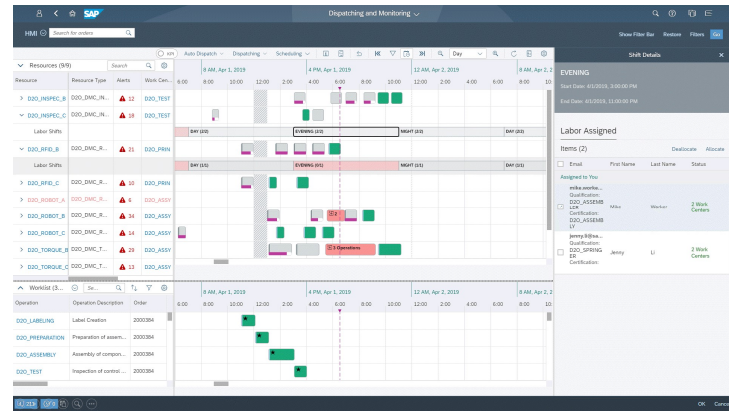
Utilize intuitive user interfaces (UI) for production operators and transform to paperless production, lowering cost and increasing productivity.



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



Collaborative integration to allow you to respond quickly to unexpected events



# SAP Digital Manufacturing Cloud for Execution Discrete Industry - Production Operator Dashboard (POD)

- 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
- Provides product serialization and re-identification
- 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

## SAP Digital Manufacturing Cloud for Execution Execute Production Order in Order POD

- Operator can see the details of the order (including batch) and execute the following activities:
  - Start Operation
  - Report Activities
  - Report Yield and Scrap
  - Report Material Consumption
  - Data Collection
  - Complete Operation
  - Report Goods receipt header material
  - Report Goods Receipt for Co-products and Batch-products
  - Valuate batch during Goods receipt (update batch characteristics)
- Operator can execute the following activities in Post-Production POD:
  - Report Goods receipt for Production Order
  - Report Data Collection for Production Order

**Main / Details**

Order ID - 1006545  
 Batch:  
 Operation ID:  
 Material: SG25\_PRODUCTION\_B - SEMI25.PD,EM  
 Planned Date: May 5, 2021

**Operations (1)**

Operation ID	Status
1006545-000000-0010	
Operation 1	

**Create New Batch**

Material: SG25\_PRODUCTION\_B  
 Description: SG25\_PRODUCTION\_B NORMAL  
 SG25\_PRODUCTION\_CO CO\_PRODUCT  
 SG25\_PRODUCTION\_BY BY\_PRODUCT

Buttons: Create, Cancel

---

**SAP Post-Production Reporting POD (Default)**

Main / Post-Production Reporting

Order ID: 1006574 (AUTO-GR ENABLED)  
 Material Description: SG24\_AZSYSHC  
 Planned Batch: SG24\_AZSYSHC Desc  
 Planned Date: May 11 - 17, 2021  
 Goods Receipt Quantity: 500,000 of 100,000 CCM  
 Status: In Queue

Default Settings Operation Activity 0010 - Phase 0020 **Goods Receipt**

Material	Posted Value	Action	Batch Number	Storage Location	Quantity
<b>Finished Goods</b>					
SG24_AZSYSHC SG24_AZSYSHC Desc	0 of 0	View Posts		101B	
<b>Co-Products</b>					
SG24CO_AZSYSHC SG24CO_AZSYSHC Desc	0 of 0	View Posts		101B	
<b>By-Products</b>					
SG24BY_AZSYSHC SG24BY_AZSYSHC Desc	0 of 0	View Posts		101B	

**Create Goods Receipt**

Material Number: SG\_OKJ\_01  
 Quantity / Unit: [ ] [id] CCM...  
 Batch Number: 0004342867  
 Storage Location: BL6A  
 Posted By: Sumanta  
 Posting Date: May 12, 2021  
 Comments:

Buttons: Confirm, Cancel

# Production Operator Dashboards

## PODs

- Operation Activity POD
- Work Center POD
- Custom PODs

## Plugins

- Assembly Point
- Complete
- Component List
- Data Collection
- Header Information
- Operation List
- Order Schedule Information
- Sign Off
- Start
- Tool Usage Logging
- Work List
- Work Instruction List
- Work Instruction Viewer
- Packing List
- Log Buyoff
- Clock/Cycle Timer
- Stopwatch

SFC	Order	Material Description	SFC Qty
No records found			

SFC	Operation Activity	Order	Material Description	SFC Qty	Status
No records found					



# Apps

## Apps

- Monitor Production Processes
- Dispatching and Monitoring
- Schedule Labor
- View Labor Schedule
- Manage Orders
- Manage Holds
- Manage Tool Assignments

The screenshot shows the SAP Operation Activity POD (Default) interface. At the top, there is a navigation bar with the SAP logo and the title "Operation Activity POD (Default)". Below the navigation bar, there is a search bar and a user profile icon labeled "ms". The main content area features a search filter section with three input fields: "SFC:" containing "SFC", "Operation Activity:\*" containing "Operation Activity", and "Resource:\*" containing "Resource". There are "Clear" and "Go" buttons next to these fields. Below the search filter, there is a row of action buttons: "Start" (green), "Sign Off" (orange), "Complete" (blue), "Order Schedule" (grey), "Activities" (teal), "Nonconformance" (red), and "Actions" (orange). Below the action buttons, there is a "Work List (0)" section with a table header containing "SFC", "Order", "Material Description", and "SFC Qty". The table body is empty, and a message "No records found" is displayed below the table.

The screenshot shows the SAP Work Center POD (Default) interface. At the top, there is a navigation bar with the SAP logo and the title "Work Center POD (Default)". Below the navigation bar, there is a search bar and a user profile icon labeled "ms". The main content area features a search filter section with three input fields: "SFC:" containing "SFC", "Work Center:\*" containing "Work Center", and "Resource:\*" containing "Resource". There are "Clear" and "Go" buttons next to these fields. Below the search filter, there is a "Work List (0)" section with a table header containing "SFC", "Operation Activity", "Order", "Material Description", "SFC Qty", and "Status". The table body is empty, and a message "No records found" is displayed below the table.

# SAP Digital Manufacturing Cloud for Execution

## Overall Equipment Effectiveness

- Optimizing the machine efficiency by utilizing the Overall Equipment Effectiveness (OEE) functionality
- Real-time visibility via related KPIs
- Production Operator Dashboard (POD) is configured showing OEE KPIs.
- Straightforward user interface allows production operators to easily report machine status change
- Detailed OEE insights and root cause analysis

The screenshot displays the SAP Digital Manufacturing Cloud interface for Overall Equipment Effectiveness (OEE) analysis. At the top, the work center is identified as BK-PA01. The OEE KPIs are shown as follows:

- OEE: 43%
- Availability: 98.36%
- Performance: 43.72%
- Quality: 100%

Below the KPIs, a table lists work orders for Motorized Bikes. An 'Untagged Events for BK-PA001' section provides a breakdown of downtime:

- Scheduled Downtime: 15.00 Minutes
- Unscheduled Downtime: 10.00 Minutes
- Speed Loss: 1.42 Minutes

Two orange arrows point from the 'Speed Loss' and 'Unscheduled Downtime' sections to a detailed 'Speed Loss List / Speed Loss Details' view. This view shows the following data for Order: NUMCHECK2:

- Start Time: Aug 15, 2019 19:10:12
- End Time: Mar 10, 2020, 09:58:00
- Standard Rate: 1 Unit/ 10 Seconds
- Net Production Time: 3.05 Minutes
- Planned Production: 18.3 Units
- Produced in Current Shift: 8 Units
- Reported Speed Loss: 0.30 Minutes
- Tagged Minor Stoppage: 0 Minutes
- Untagged Minor Stoppage: 0 Minutes
- Untagged Speed Loss: 1.42 Minutes

The 'Speed Loss Events' section shows a reason code of 'ReasonCode\_295' with a tagged time of 0.30 Minutes.

Main / Downtime

Work Center: Paint for BLR7-WCC Date: Mar 10, 2020

Downtimes

Resource Name	Time Element Type	Start Time	End Time
BK-PA001	Scheduled Downtime	Mar 10, 2020, 09:41:00	Mar 10, 2020, 09:58:00
BK-PA001	Unscheduled Downtime	Mar 10, 2020, 09:46:00	Mar 10, 2020, 09:58:00

Main / Downtime

Work Center: Paint for BLR7-WCC Date: Mar 10, 2020

Downtimes

Resource Name	Time Element Type	Start Time	End Time
BK-PA001	Scheduled Downtime	Mar 10, 2020, 09:41:00	Mar 10, 2020, 09:58:00
BK-PA001	Unscheduled Downtime	Mar 10, 2020, 09:46:00	Mar 10, 2020, 09:58:00

# SAP Digital Manufacturing Cloud for Execution

## Work in process management and reporting

- Capture the digital twin of the production process presented by the following reports:
  - The *Product Genealogy Report* displays the details of the component data collected for an SFC
  - The *Product History Report\** displays the activity of
    - an SFC over a period of time for Discrete Industries
    - a Batch over a period of time for Process Industries ([see more details](#))

\* The two styles of report (Discrete/Process) with different input parameters and report terminology will be set automatically based on the industry type of Plant configured in User profile.

SAP1234		Material / Version: MINICH2 / A Description: MINICH2		BOM / Version: M_BOM2 / A Routing / Version: MINICH / A	
Components (12)					
Sequence	BOM Components	Description	Qty Assembled / Required	Operation Activity	
<input type="checkbox"/>	10	M_COMP1	<div style="width: 100%;"><div style="width: 100%;"></div></div> 1/1	M_OPER1	
<input type="checkbox"/>	20	M_COMP2	<div style="width: 100%;"><div style="width: 100%;"></div></div> 1/1	M_OPER1	
<input type="checkbox"/>	30	M_COMP3	<div style="width: 100%;"><div style="width: 100%;"></div></div> 5/5	M_OPER1	
<input type="checkbox"/>	40	M_COMP4	<div style="width: 25%;"><div style="width: 25%;"></div></div> 0/8	M_OPER1	
<input type="checkbox"/>	50	M_COMP5	<div style="width: 20%;"><div style="width: 20%;"></div></div> 0/5	M_OPER1	
<input type="checkbox"/>	60	M_COMP6	<div style="width: 100%;"><div style="width: 100%;"></div></div> 1/1	M_OPER1	
<input type="checkbox"/>	70	M_COMP7	<div style="width: 100%;"><div style="width: 100%;"></div></div> 3/3	M_OPER1	
<input type="checkbox"/>	80	M_COMP8	<div style="width: 25%;"><div style="width: 25%;"></div></div> 0/2	M_OPER1	
<input type="checkbox"/>	90	M_COMP9	<div style="width: 25%;"><div style="width: 25%;"></div></div> 1/5	M_OPER1	

The top screenshot displays a 'Product History Report' for a Discrete Industry. It shows a component that is 'Complete' with a status of '100%'. The report includes details for the material (SAP1234) and routing (MINICH2/A). The activity log shows the component was completed on 2023-10-27 at 10:00 AM by user cfnose.gam@sap.com.

The bottom screenshot displays a 'Product History Report' for a Process Industry. It shows a component that is 'Complete' with a status of '100%'. The report includes details for the material (SAP1234) and routing (MINICH2/A). The activity log shows the component was completed on 2023-10-27 at 10:00 AM by user cfnose.gam@sap.com.

# SAP Digital Manufacturing Cloud for Execution

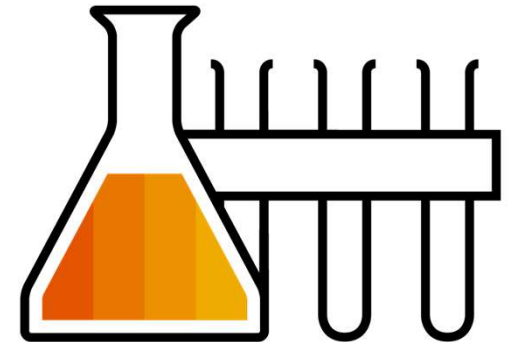
## Process Industries



\*1 Shop Floor Designer (SFD) gets renamed to Production Process Designer (PPD) in 2111.

## 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 and Split Batch related Process Orders** in the Process Order Dashboard (POD)
- **Create and Valuate 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 and Cancel **goods movements** for goods issues and receipts seamlessly integrated with S/4HANA
- **Record inspection results with Inspection Points** 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



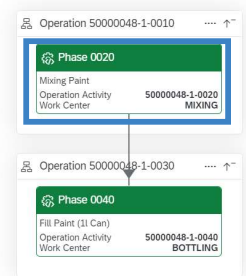
# SAP Digital Manufacturing Cloud for Execution Process Industry – “Manage Recipe” App

- Integrate **Master Recipes** with S/4HANA
- Maintain execution relevant data such as **Work Instructions or Data Collection** parameters in DMC
- Graphical interface for recipe display
- Integrate **Production Versions** with S/4HANA Cloud

Manage Recipes

Recipe Name: 50000128 Material: Material / Version: Created On: yyyy/MM/dd - yyyy/MM/dd Usage: Master Current Version Only: NO

Recipe Name	Description	Material / Version / Description	Production Version / Description	Status	Created On	Usage	Version
50000128-1	SG24UOM-X2 Mixing	SG24UOM-X2 / A	MIX2 SG24UOM-X2 Mixing	Releasable	Feb 7, 2020, 2:00:48 PM	Master	A (Current)
		SG24UOM-X2 / A	MIX1 SG24UOM-X2 Mixing	Releasable	Feb 7, 2020, 2:00:48 PM	Master	A (Current)



Phase Details 0020

Work Instruction (1)

Work Instruction Name	Description	Version
PH_PAINT001	Mixing Paint	A (Current)

Work Instruction Elements (1)

Type	Content	Date Created
TEXT	Ensure Shovel is cleaned. Set Mixer to 30 rpm Set temperature between 32° and 33° Mix for fix 30 Min Drain Vessel to Filling Line	10/7/2019, 1:33:06 PM

Phase Details 0020

DC Groups (1)

Name	Description
DC_PAINTMIX001	Mixing Paint Parameters

DC Parameters (3)

Parameter Name	Description	Type	Value	Unit of Measure
ROTOR SPEED	Rotor Speed	Numeric		rpm
TEMPERATURE	Temperature	Numeric		°C
SHOVEL CLEAN	Shovel CLEAN	Boolean		

# 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 and batch-based execution of process orders with batches
- Guide Operators with a highly flexible and **intuitive user interface (POD)**
- Configure and **design the POD** based on user requirements
- Support of **Data Collections** to collect execution related data
- Record inspection results** for process order operation/phase (inspection lot type 03) and integrate with S/4HANA
- Log Defects** for an Order which can be viewed in the Product History Report
- Report downtimes from POD to calculate OEE availability

The screenshot displays the SAP Digital Manufacturing Cloud for Execution Production Operator Dashboard (POD) interface. The interface is divided into several sections:

- Top Navigation:** SAP logo, user information (SK), and time (10:03:57).
- Search and Filter:** Fields for Work Center (MIXING), Material, and Planned Start Date Range (Jul 18 - 24, 2021).
- Process Orders (18):** A table listing process orders with columns: Order ID, Batch, Material, Material Description, Order Quantity, Planned Date Range, Order Status, Charge Default Batch, Charge ID, Charge Quantity, and Charge Status.
- Order ID - 1000076:** Detailed view of a process order, including:
  - Batch: DE140-49-A
  - Phase: 0013 - Mixing Phase
  - Material: B2C\_C\_094
  - Planned Date: May 29 - Jun 2, 2020
  - Goods Receipt Quantity: 0 of 200.00
  - Phases (3): 0010 - Paint Mixing, 0012 - Add Premix, 0013 - Mixing Phase, 0014 - Cleaning.
  - Components (3): B2C\_C\_104 (Red base component), B2C\_C\_105 (Green base component), B2C\_C\_106 (Blue base component).
- CUSTOM\_ORDER\_POD\_2108:** Detailed view of a custom order, including:
  - Order ID - 1007189 / Charge ID - 000000068
  - Batch: 0000003547
  - Phase: 0020 - Phase\_01 of Operation\_01
  - Material: SG24\_AZSYSHC - SG24\_AZSYSHC Desc
  - Planned Date: Jun 18 - 24, 2021
  - Goods Receipt Quantity: 0 of 10.00 CCM
  - Charge Quantity: 0 of 10.00 CCM
  - Phases (4): 0010 - Operation\_01, 0020 - Phase\_01 of Operation\_01, 0030 - Phase\_02 of Operation\_01, 0040 - Operation\_02, 0050 - Phase\_01 of Operation\_02.
  - General Information: Phase ID: 0020, Scheduled Start Date and Time: Jun 21, 2021, 11:00:00 PM, Description: Phase\_01 of Operation\_01, Scheduled End Date and Time: Jun 21, 2021, 11:50:00 PM, Planned Work Center: MIXING, Status: In Queue.

# 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.

**SAP Product History**

0000000385

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

Activity Log | Data Collection | Nonconformance | Work Instructions | Custom Data

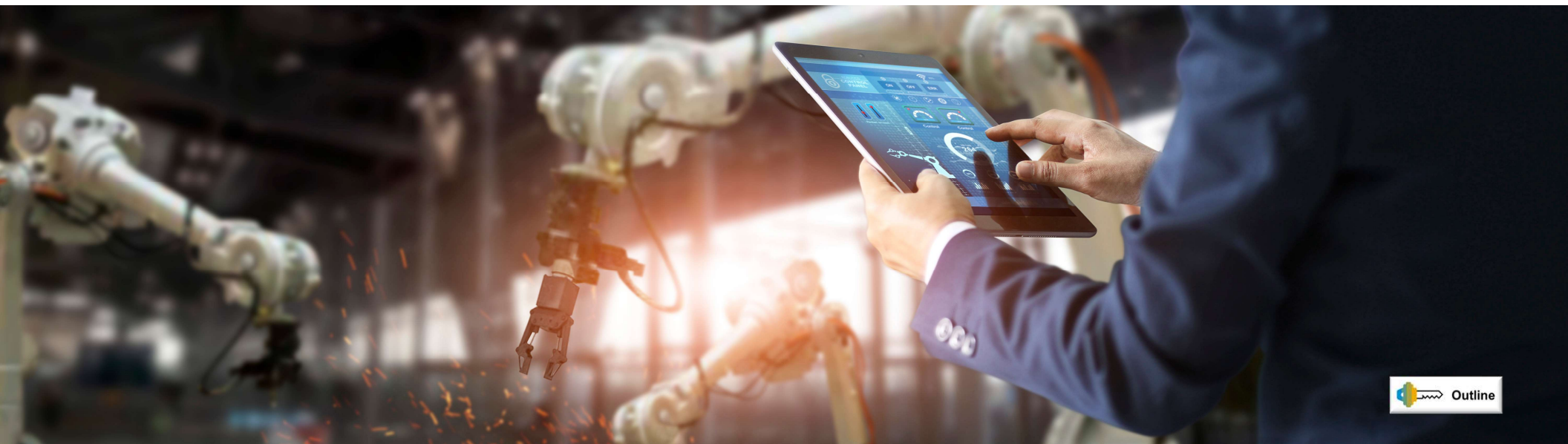
Operation Activities / Phase 0040, Operation 1004050-000000-0040

Complete	Routing / Version:	Phase:	Work Center:	User:
10/09/2020, 01:57:34	1004050 / A	0040	MIXING	isabelle.xu01@sap.com
10/09/2020, 01:11:12	1004050 / A	0040	MIXING	isabelle.xu01@sap.com
10/09/2020, 01:11:12	1004050 / A	0040	MIXING	isabelle.xu01@sap.com
10/09/2020, 01:11:12	1004050 / A	0040	MIXING	isabelle.xu01@sap.com



# SAP Digital Manufacturing Cloud for Execution

## Resource Orchestration

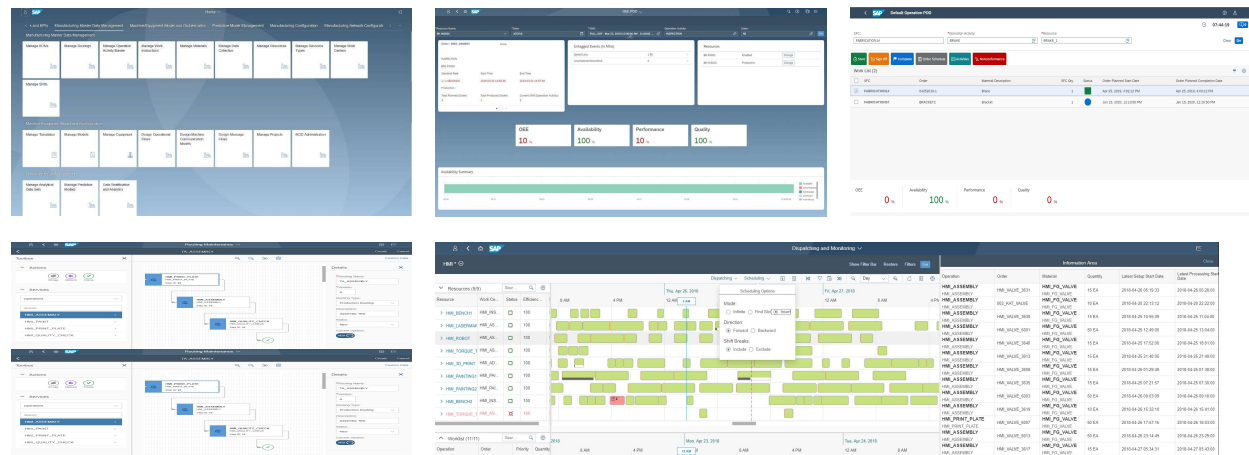
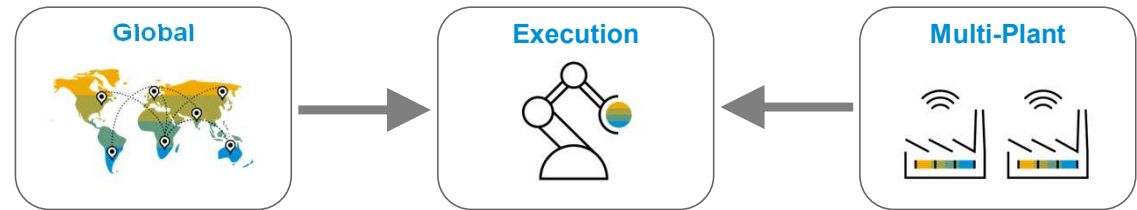


# SAP Digital Manufacturing Cloud for Execution

## Orchestrate and control the shop floor

### Key capabilities

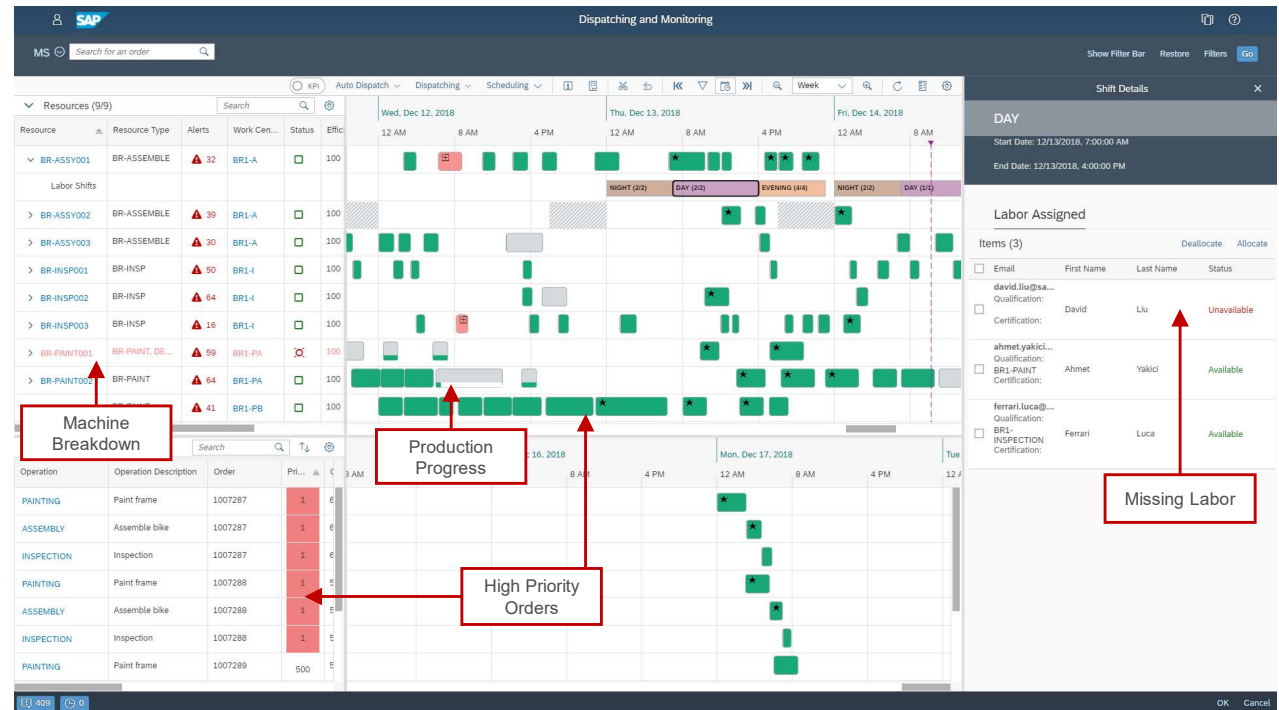
- Monitor the entire manufacturing process to optimize resources and execution
- Role-specific Fiori and operator dashboards
- Fully configurable Production Operator Dashboard (POD) that supports drag & drop and preview
- Monitor OEE and manage downtime events
- Resource Orchestration to manage shop floor workflow and labor assignments
- Automation interfaces to provide for shop-floor-driven manufacturing events and data collection



# SAP Digital Manufacturing Cloud for Execution

## Resource Orchestration & Dispatching

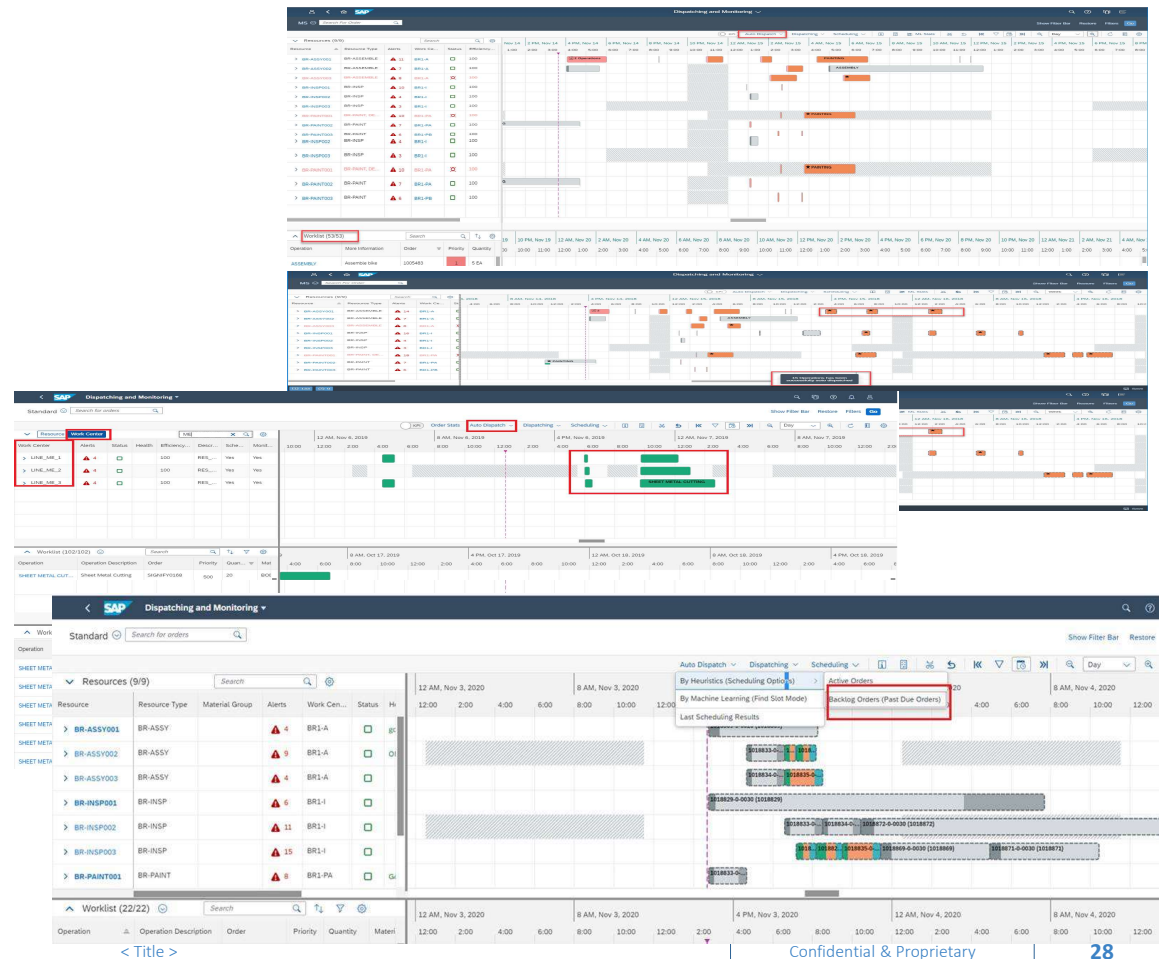
- Orchestrate labor and resources on the shop floor to achieve maximum availability
- React quickly to unexpected events utilizing built-in intelligence
- Dispatch and sequence operations to reflect the “real world” on the shop floor
- Provides multiple options for dispatching
  - Operations can be dispatched 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 Execution

## Resource Orchestration & Dispatching

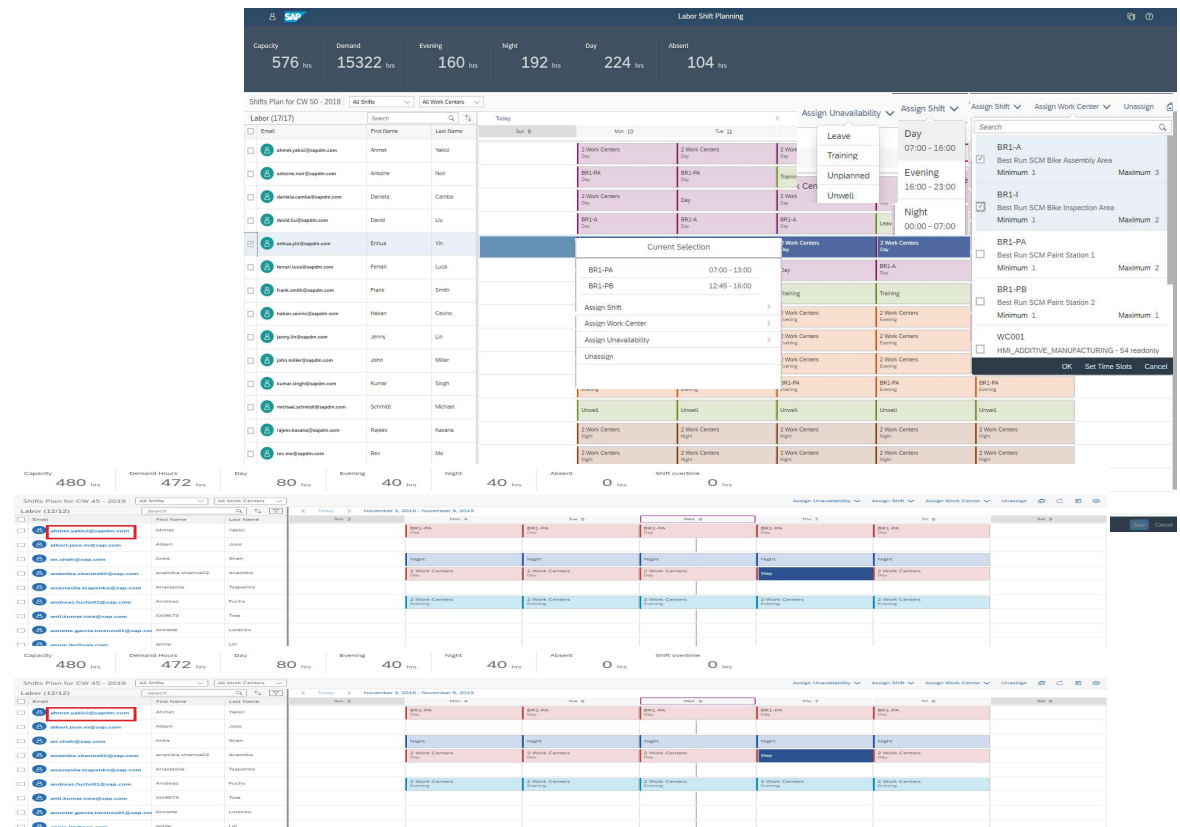
- Automatically dispatch operations from the Work List
- Trigger order release from order view and Gantt Chart and show created SFCs
- Operations can be split, merge and distributed to alternative resources
- Split quantities are shown in the order schedule information of the POD
- Tight POD integration to reflect planning situation on the shop floor and to visualize changes from execution in planning and vice versa
- Automatically or manually dispatch operations using Work Center view
- Check and reserve tools from the planning board
- Automatically schedule the backlog orders with advanced heuristics



# SAP Digital Manufacturing Cloud for Execution

## Resource Orchestration- Labor Scheduling

- 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



# SAP Digital Manufacturing Cloud for Execution

## AI/ML Scenario Management



# 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 code using the machine learning model
- Allow the machine learning model to log the Nonconformance automatically based on the prediction and under operator's control
- Automated collection of images and inspection results which can be reviewed, analyzed and downloaded as analytical data sets to train new machine learning models.

The screenshot displays the SAP Visual Inspection POD interface. At the top, it shows the SAP logo and the title 'Visual Inspection POD'. Below this, there are navigation and status indicators: 'Main / Visual Inspection', 'SFC: 1 SFC', 'Operation Activity: Inspection', 'Resource: Xplanar Test', 'Status: [Green]', 'Quantity: 1', 'Order: 1145', and 'Material: CONTROL\_HEAD\_KIT'. The main area features a dropdown menu for 'DMC\_Control\_Head\_1192' and a 'Play Live Feed' button. A central image shows a product with a defect highlighted by a red box. To the right, a notification states 'DMC\_Control\_Head\_1192 is most likely Non-conformant.' Below this is a search bar for 'Nonconformance' and a table of results:

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]

At the bottom of the interface, there are buttons for 'Mark as Conformant', 'Mark Nonconformance', and 'Cancel'.

# SAP Digital Manufacturing Cloud

## Extensibility





# SAP Digital Manufacturing Cloud

## UI Extensions (Custom POD Plugin, Custom Application)

- Provides mechanism to allow customers/partners to develop custom SAP UI5 based POD plugins using SAP Web-IDE
- Step by step guide is available in sap help portal
- Custom POD plugin becomes available inside POD Designer thereby allowing them to be consumed inside POD
- Alternatively, the customer/partner might make use of the public API's available in the SAP Business API Hub to create a full SAPUI5 Custom Application in customer/partner PaaS tenant.
- Template Assembly POD is provided by SAP including step by step guide on sap help portal

The screenshot displays the SAP Web IDE interface. The top section shows the 'New SAPUI5 Application' template selection screen with filters for Environment (Neo), Category (Featured), and Sort By (name). Below this, there are options to create a project or import an application. The bottom section shows a detailed view of a component named 'SFC: FABRICATION26 Bracket Assembly'. This view includes a 3D model of the bracket, production order details (BRACKET\_ASSY4), material (BRACKET\_ASSY), and start/end times. A table lists the sequence of operations for the assembly:

Sequence	Description	Type	Action
10	BRACKET/A 1   1	SERIAL_NUMBER	⊗
20	NUTPLATE/A 1   1	LOT_NUMBER	⊗
30	SHIM/A 2   2	COMMENTS	⊗
40	RIVET/A 4   4	NONE	⊗

# SAP Digital Manufacturing Cloud Machine Learning Extensions

## Bring your own model for Visual Inspection Scenarios

- Download image and inspection results collected through usage of POD Plugin Visual Inspector
- Train your own classification or defect detection model using preferred machine learning tools and convert it to Tensorflow Javascript model files
- Upload you own model files using wizard for creation of new visual inspection scenarios
- Activate visual inspection scenarios with the own model to be used by POD Plugin Visual Inspector

```

1488/1488: [#####] - ETA: 0s - loss: 0.2365 - acc: 0.8957
Epoch 80012: val_acc did not improve from 0.8895
1488/1488: [#####] - 21s 2ms/sample - loss: 0.2547 - acc: 0.8866 - val_loss: 0.2810
Epoch 80012: early stopping
Numbers of trained epochs: 12

In [42]: print(params)
print('Numbers of trained epochs: ', len(history.history['loss']))
{'params_CNN': {'input_shape': (32, 32, 3), 'kernel_shape': (3, 3), 'filter_size': 32, 'pool_size': (2, 2), 'activation': 'relu', 'param_model': {'loss': 'categorical_crossentropy', 'optimizer': 'adam', 'accuracy': 1}, 'param_train': {'epochs': 100, 'monitor': 'val_acc', 'mode': 'max', 'min_delta': 0, 'save_model_name': 'data/models/2019024_CATL_model_886.h5', 'experiment': ' '}}, 'Numbers of trained epochs': 12}

In [43]: # plot training history
from matplotlib import pyplot
pyplot.plot(history.history['acc'], label='train')
pyplot.plot(history.history['val_acc'], label='test')
pyplot.legend()

0.89
0.88
0.87
0.86
0.85
0.84
0.83
0.82
0.81
0.80
0
2
4
6
8
10
12
    
```

Manage Predictive Model

Visual Inspection: Predictive Quality (BYOM)

1 Scenario Definition | 2 Scenario Configuration | 3 Scenario Deployment | 4 Scenario Testing

NAME: D2O\_WORKBENCH\_A

### 2. Scenario Configuration

Please upload model files (model.json and one or more model.bin files) and define model input.

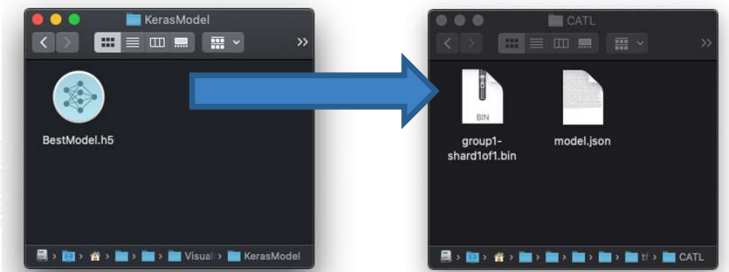
Model File Uploads (2) Clear All +

- weights.bin (2.1 MiB)
- model.json (89.7 KiB)

Define Model Input

Input Type	*Height (Pixels)	*Width (Pixels)	Mode	Scale Ratio
Image	224	224	RGB color (3 ...)	-1 to 1 Scaling

Step 3



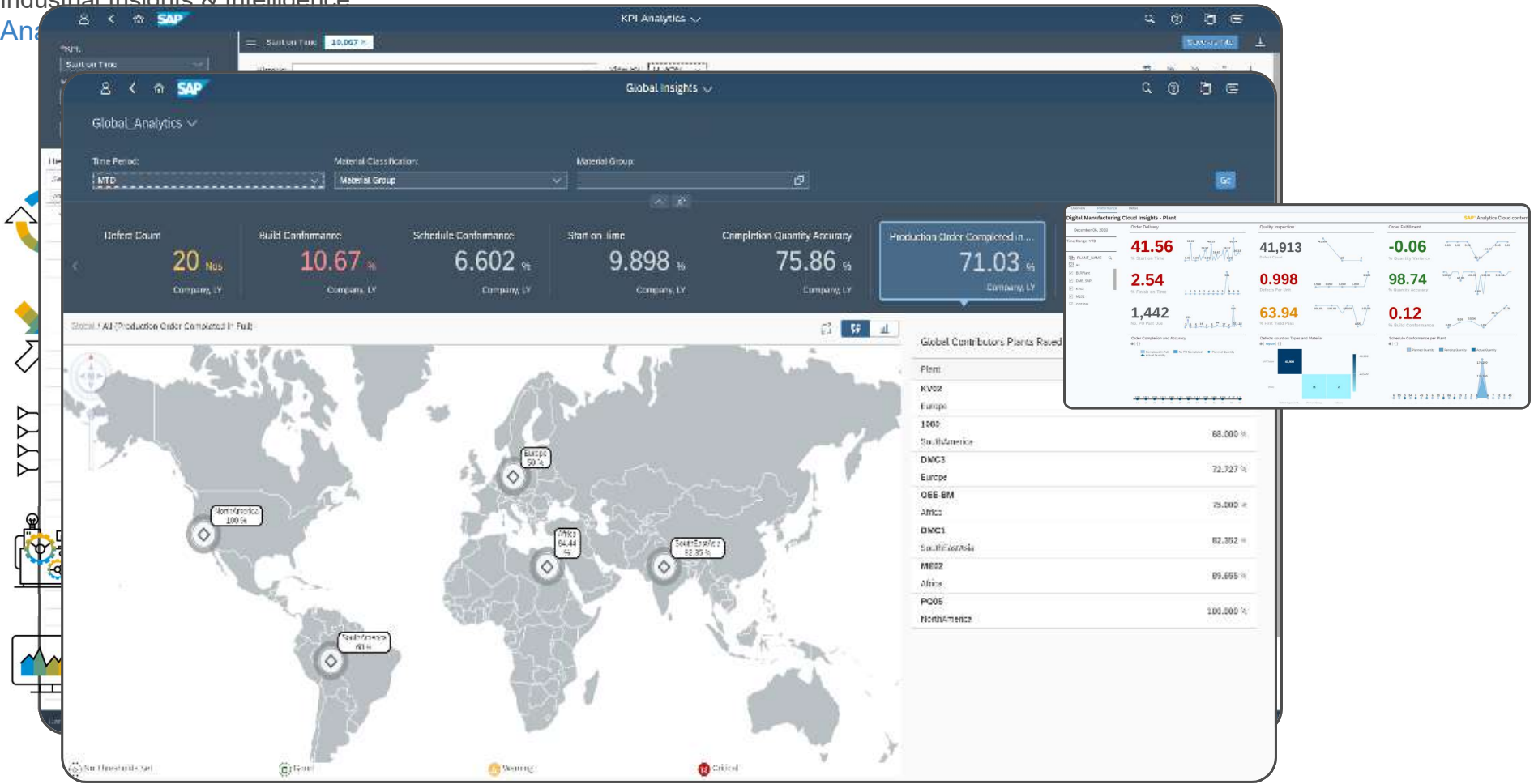
# SAP Digital Manufacturing Cloud for Insights

## Solution Details



# Industrial Insights & Intelligence

Anal



# Insights

## From Plant Level down to the lowest production unit

- Use standard KPIs fed via technology
- Gain real-time insights of the production geographies
- Compare and across resources
- Get quick performance



# Deep Dive - KPI Analytics

## Exploration of contributors

**Quadrant 1 - (First Pass Yield %)**

Date	First Pass Yield %
28 Jan	100
29 Jan	100
30 Jan	100
03 Feb	90.909
05 Feb	100
06 Feb	100
17 Feb	100
20 Feb	100
21 Feb	80
22 Feb	75
23 Feb	100
24 Feb	83.333
25 Feb	85.714
26 Feb	75
27 Feb	93.023

**Quadrant 2 - (Start on Time (in %))**

Year / Quarter	Start on Time (in %)
Quarter 1 2020	100

**Quadrant 3 - (Past Due Orders)**

Date	Past Due Orders
01 Jan	8
02 Jan	23
03 Jan	22
04 Jan	9
05 Jan	7
06 Jan	5
07 Jan	19
08 Jan	6
09 Jan	11
10 Jan	40
11 Jan	8
12 Jan	6
13 Jan	113
14 Jan	24
15 Jan	15
16 Jan	11
17 Jan	9
18 Jan	8
20 Jan	200
21 Jan	8
22 Jan	4
23 Jan	11
24 Jan	10
27 Jan	6

**Quadrant 4 - (Finish on Time (in %))**

Date	Finish on Time (in %)
01 Jan	0
02 Jan	0

**Contributors (1000)**

Start on Time: **7.311 %** Save as Tile

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...	

**Hierarchy (1)**

Search:

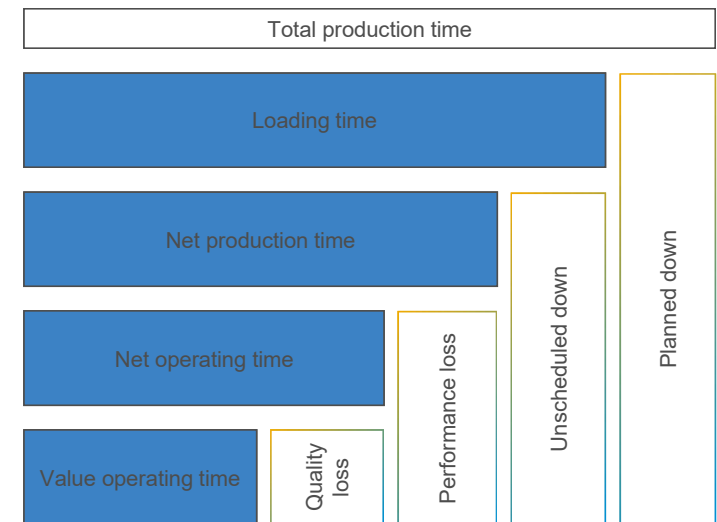
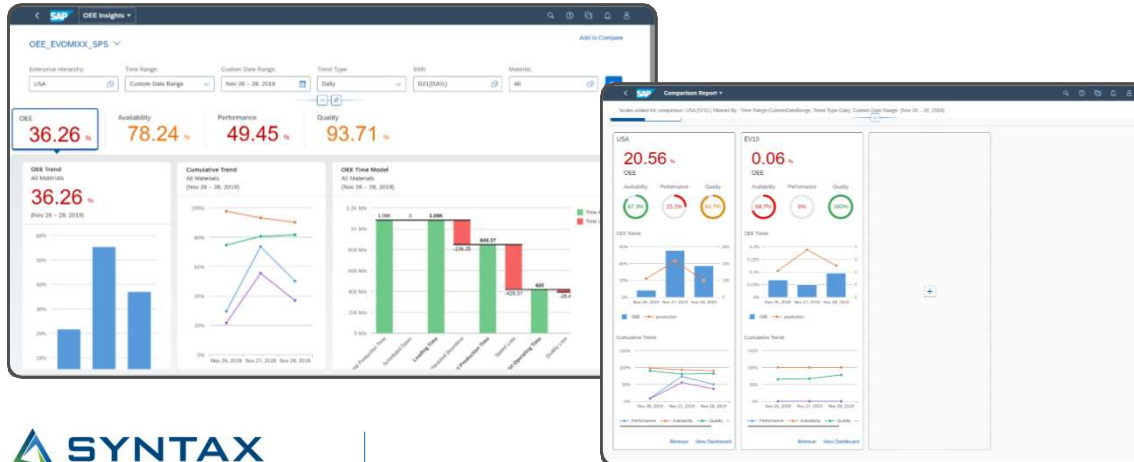
SAP  Africa

Cancel Apply Add to Compare Compare KPIs

# Insights on Overall Equipment Effectiveness

## Standard metric for measuring manufacturing productivity

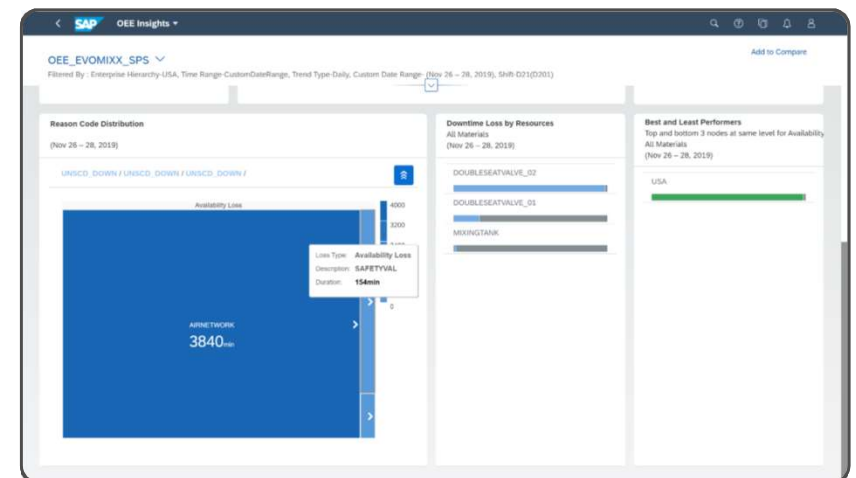
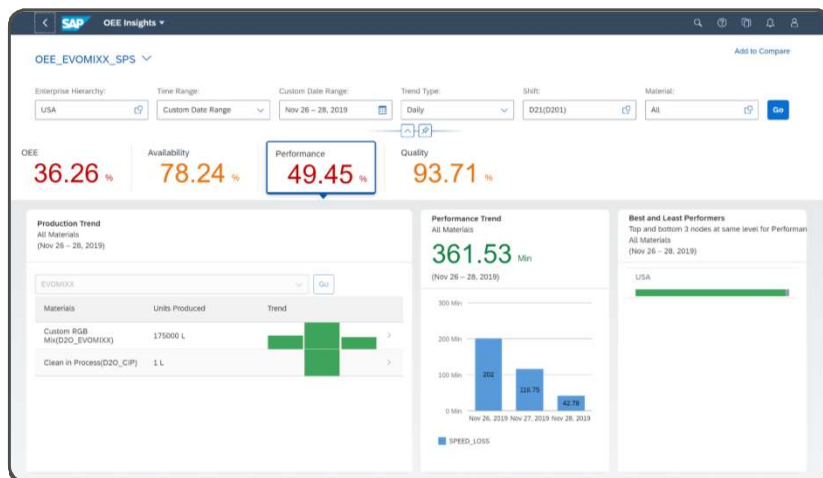
- Measure productivity with standard pre-delivered OEE calculations
- Analytics on identified losses captured during execution
- Normalization of various losses into time lost
- Analyze OEE across a custom time range, across materials, and across shifts
- Root cause analysis for all OEE losses (availability, performance, and quality losses)
- Perform OEE comparison and loss analysis between work centers, resources, and plants across different time zones of the world



# Root Cause Identifier for OEE Losses

## Helps to focus on the reasons for sub-optimal performance

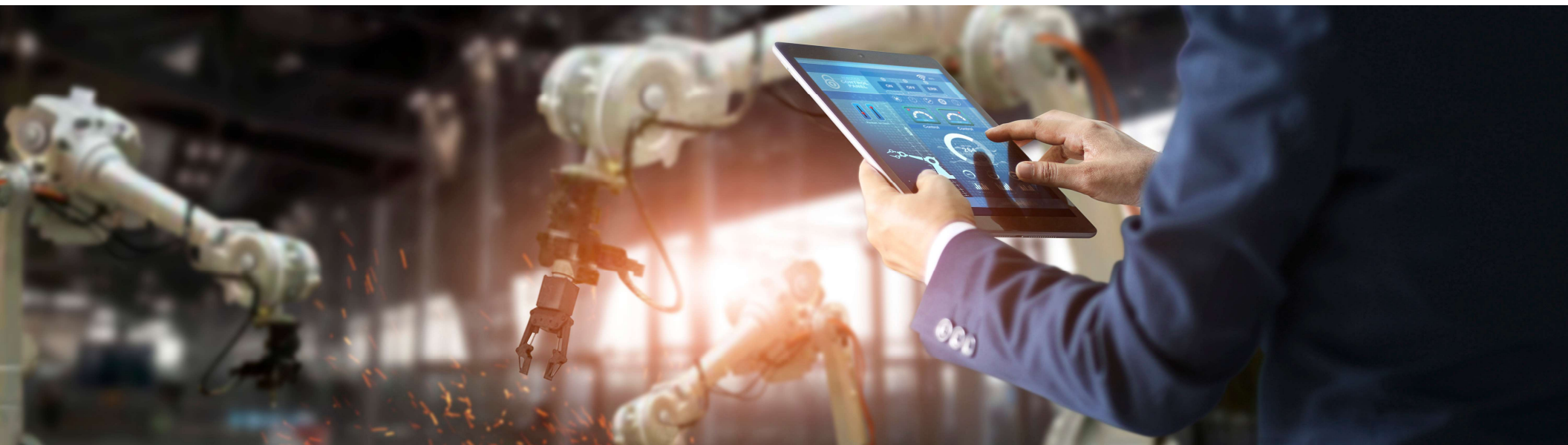
- Root cause analysis for all OEE loss types, e.g. unscheduled down, schedule down, performance loss and quality loss
- Identify major contributors for losses
- Multi-level reason code drill-down to identify root cause of the issue





# SAP Digital Manufacturing Cloud for Insights

## Alert Management



# SAP Digital Manufacturing Cloud for Insights

## Alert Management – KPI Threshold Violation

### Alert Overview

Alert Type: All | Status: All | Severity: All | Created By: | Date Range: Oct 15, 2020 - Oct 22, 2020 | Clear | Adapt Filters (4) | Go

416 Error | 196 Warnings | 27 Information | 624 New | 1 Acknowledged | 13 In Process | 1 Completed

Alert ID	Alert Type	Severity	Status	Count	Processor	Created On	Created By
31df2895-bf97-4032-9aac-4f268f35100c	KPI THRESHOLD VIOLATED	Warning	New	10		Oct 15, 2020, 12:30:12 PM	TECHNICAL_USER
b900b446-4ac7-49d6-8e7c-c5ae3506848b	KPI THRESHOLD VIOLATED	Warning	New	9		Oct 15, 2020, 12:30:12 PM	TECHNICAL_USER
b5533a45-699a-4873-b331-257598c5f90c	KPI THRESHOLD VIOLATED	Error	New	10		Oct 15, 2020, 12:30:12 PM	TECHNICAL_USER
50b95342-101c-48f9-966b-572d24731e	KPI THRESHOLD VIOLATED	Warning	New	10		Oct 15, 2020, 12:30:12 PM	TECHNICAL_USER
22cc3190-578a-48eb-845e-b4eb03ec5ee3	KPI THRESHOLD VIOLATED	Error	New	10		Oct 15, 2020, 12:30:14 PM	TECHNICAL_USER
71c8a8ba-45c5-4f80-8549-f9699702a7ff	KPI THRESHOLD VIOLATED	Warning	New	10		Oct 15, 2020, 12:30:14 PM	TECHNICAL_USER
683a80c-848a-405e-b8e5-62aade444441	KPI THRESHOLD VIOLATED	Error	New	10		Oct 15, 2020, 12:30:14 PM	TECHNICAL_USER
87656b49-8fec-4702-	KPI THRESHOLD VIOLATED	Error	New	10		Oct 15, 2020, 12:30:14 PM	TECHNICAL_USER

- Visualize the alerts with appropriate filters
- Complete alert lifecycle to make it to in process, acknowledge and complete

Enterprise Hierarchy

- SAP
  - Africa
    - SouthAfrica
      - MEQ2
        - DN\_WC1
        - DN\_WC2
        - IT\_WC02
        - AST\_WC
        - MEQ2\_WC
        - MEWSPT

KPI Details

- KPI
- PAST DUE ORDERS
- OEE
- QUANTITY ACCURACY
- COMPL PERFORM PROD ORD
- DEFECT COUNT
- COMPL ITEM ACC
- DEFECT PER UNIT
- PROD ORD COMP FULL
- AVAILABILITY
- SCHEDULE CONFORMANCE
- START ON TIME
- FINISH ON TIME
- PERFORMANCE
- AVAILABILITY
- SCHEDULE CONFORMANCE
- START ON TIME
- FINISH ON TIME
- PERFORMANCE
- PROD QNTY VARIANCE
- BUILD CONFORMANCE
- FIRST PASS YIELD
- ACTUAL CYCLE TIME
- QUALITY

### KPI violation

- Personalized subscription for alerts on KPI threshold breach at any hierarchy node as per personal responsibility

SAP Home

Manufacturing Insights | Manufacturing Network | Personalized Dashboards and KPIs | Manufacturing Master Data Management

Global Insights | Plant Insights | KPI Analytics | Production Insights | OEE Insights | Manage Alerts

Manufacturing Network

Collaboration Rooms | Parts Analysis Additive Manufacturing | Request for Quotation SAP ERP Integration | View Collaboration Rooms Past and Present

PAST DUE ORDERS target not met for Company 51 minutes ago

PAST DUE ORDERS target not met for Company 1 hour ago

PAST DUE ORDERS target not met for Company 2 hours ago

PAST DUE ORDERS target not met for Company 3 hours ago

SYNTAX

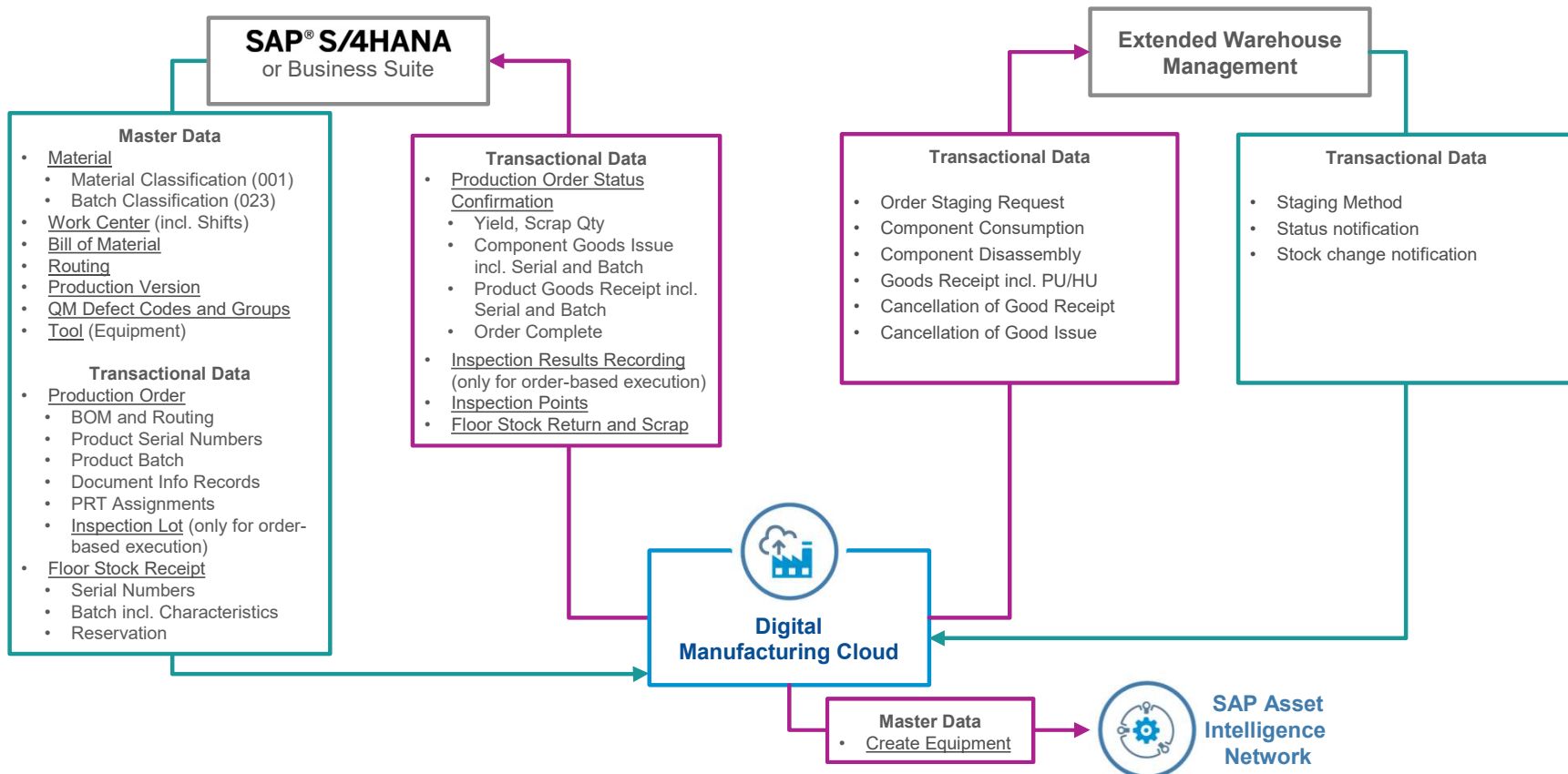
### Push Notification

- Contextualize view of alerts; categorized by date, type and priority
- Push notification without refreshing the page

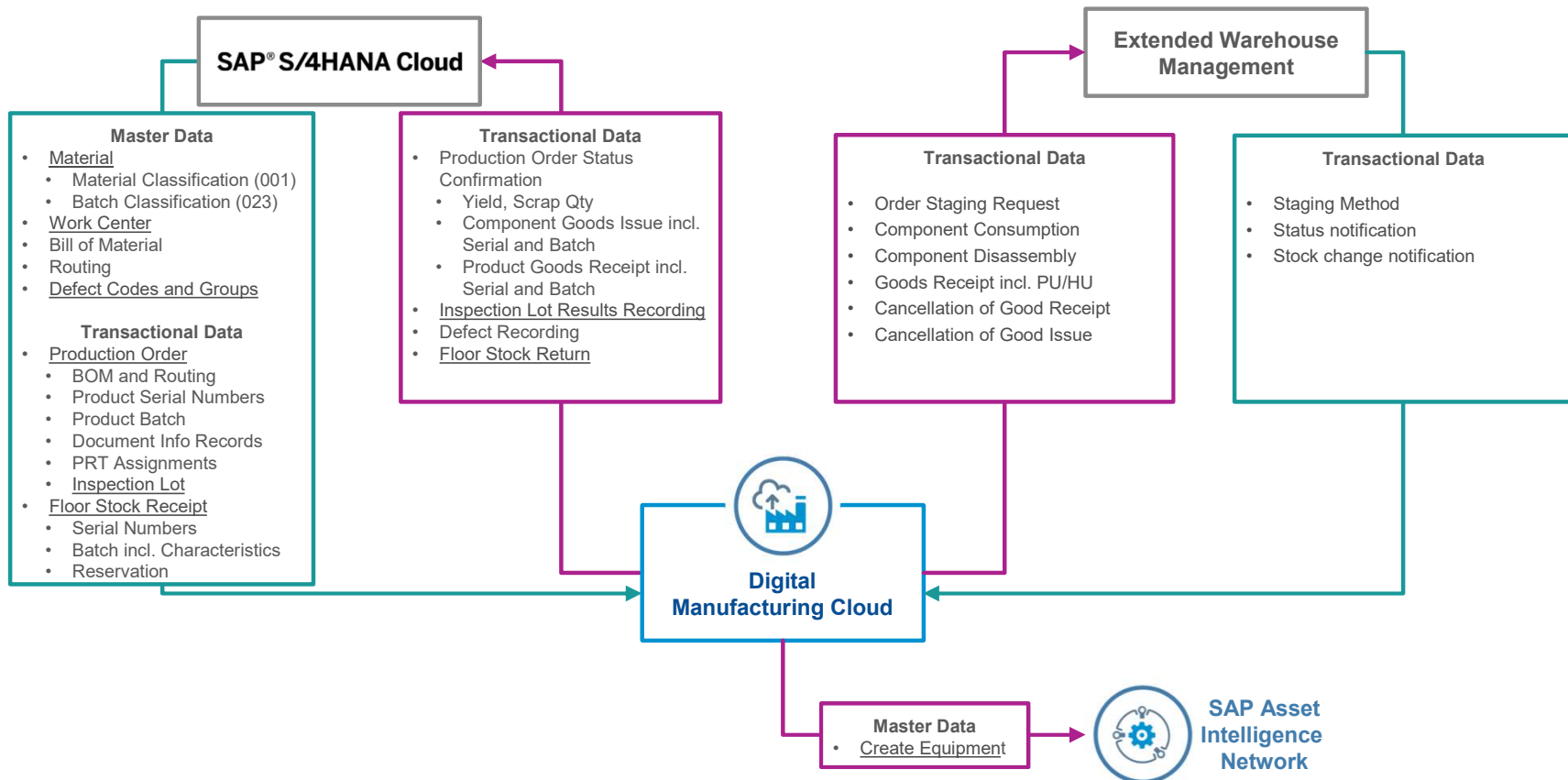
# SAP Digital Manufacturing Cloud Integration



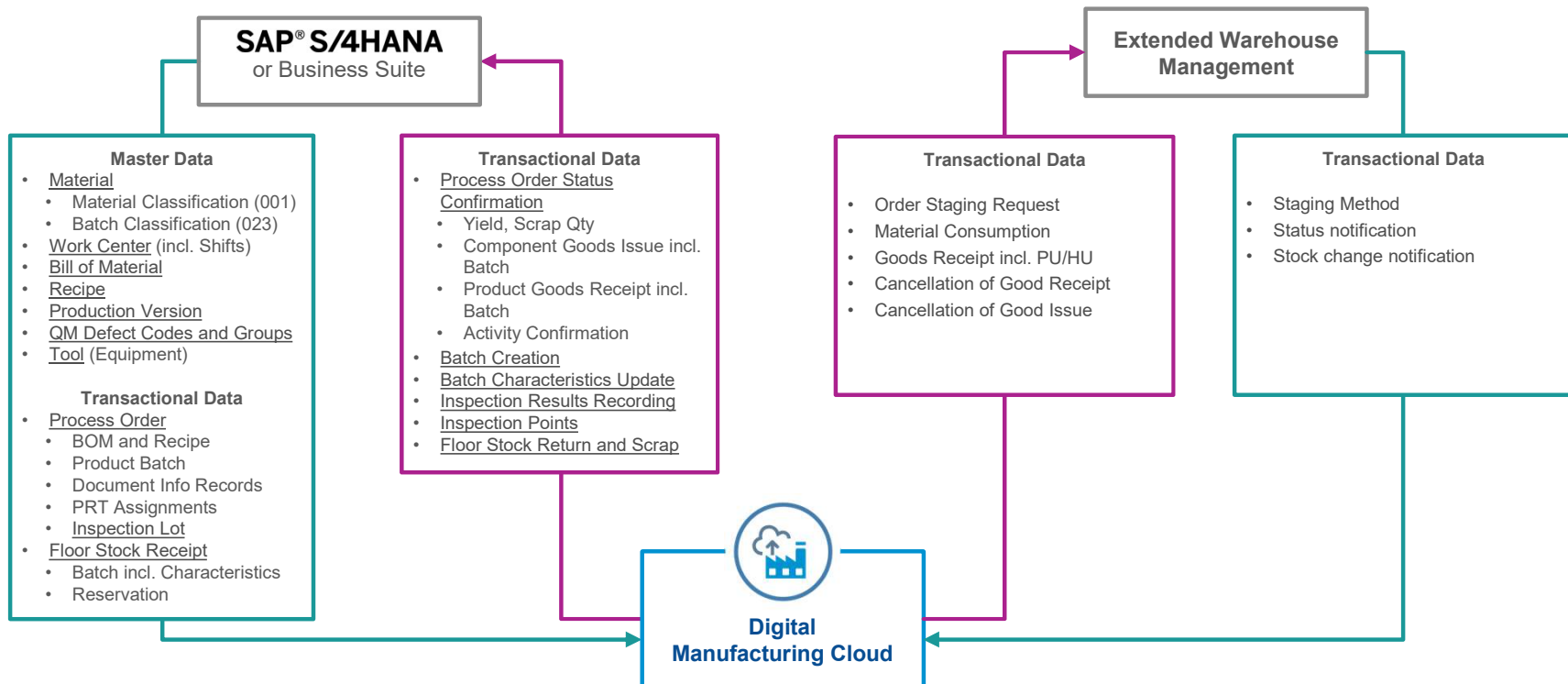
# Discrete Industries Integration Scenarios for DMC – S/4HANA or Business Suite



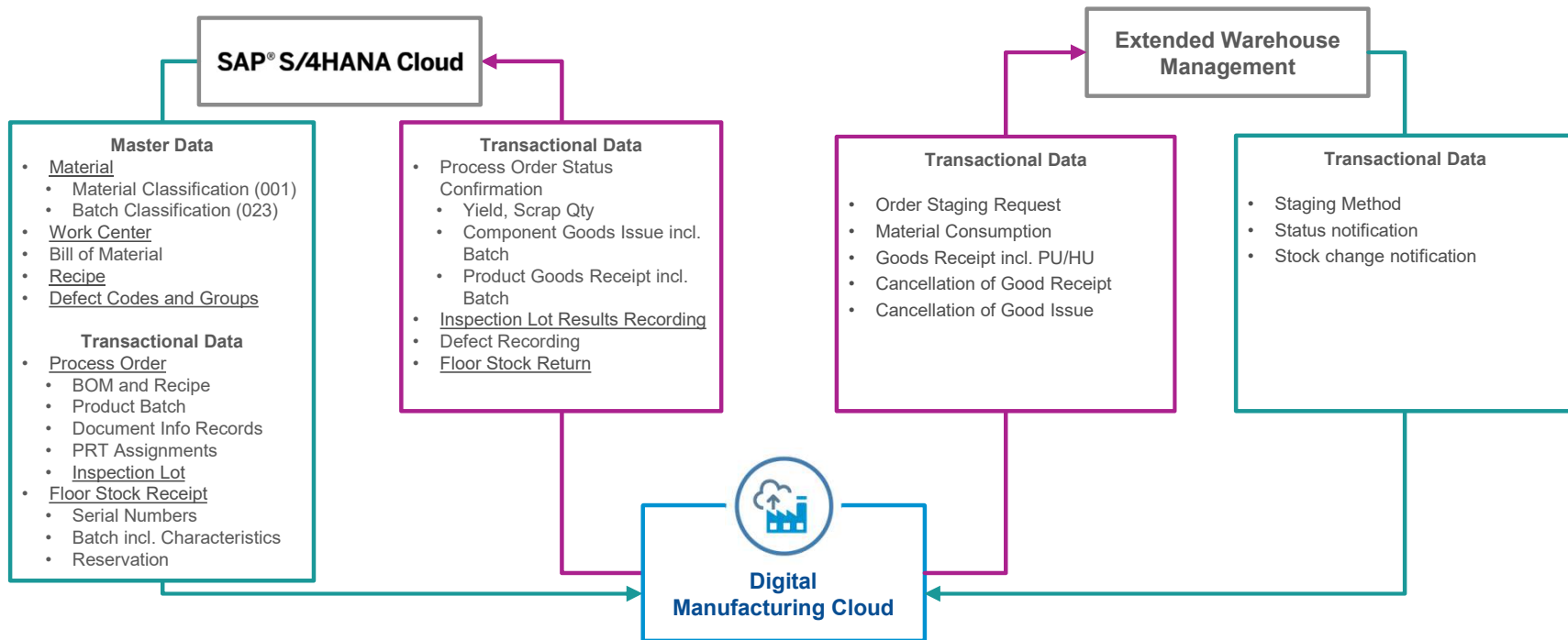
# Discrete Industries Integration Scenarios for DMC – S/4HANA Cloud Edition



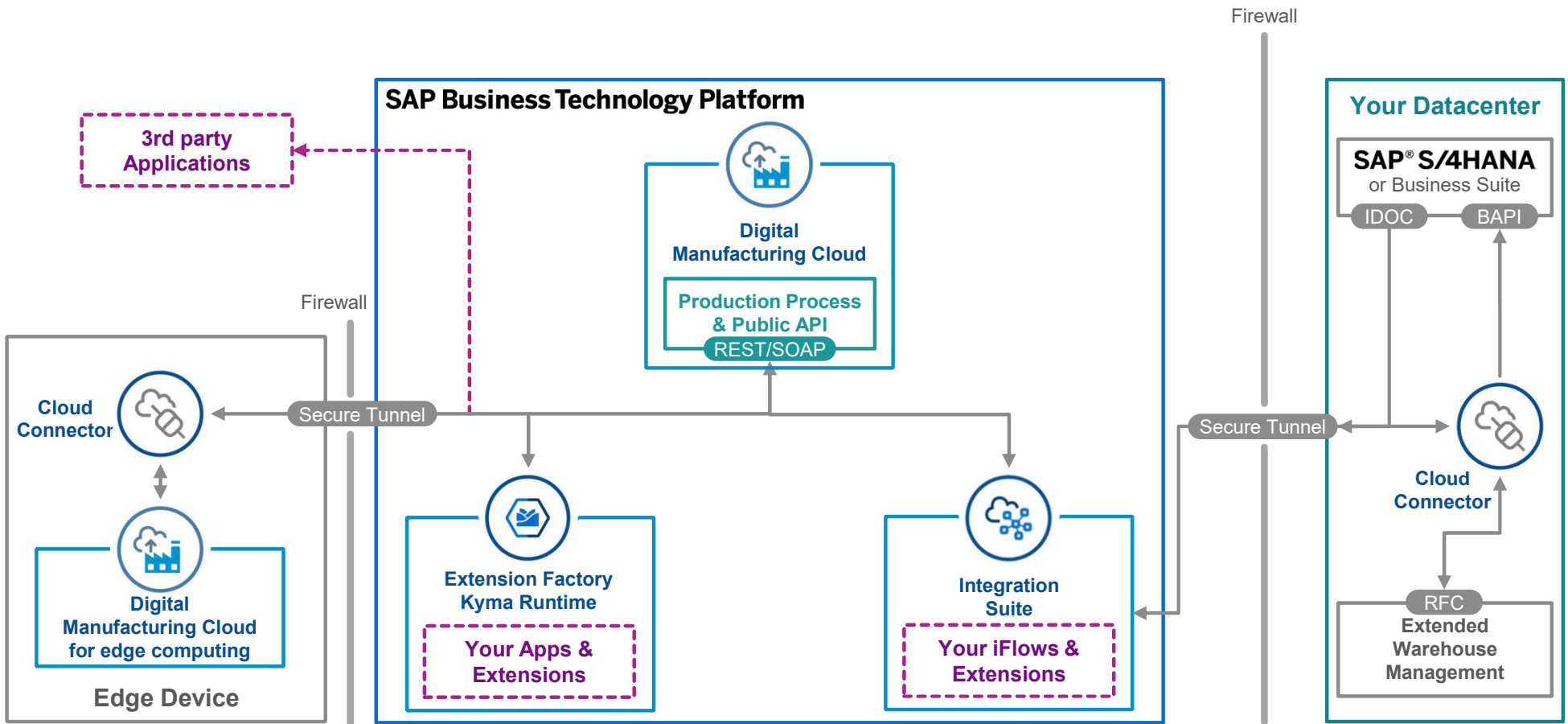
## Process Industries Integration Scenarios for DMC – S/4HANA or Business Suite



## Process Industries Integration Scenarios for DMC – S/4HANA Cloud Edition

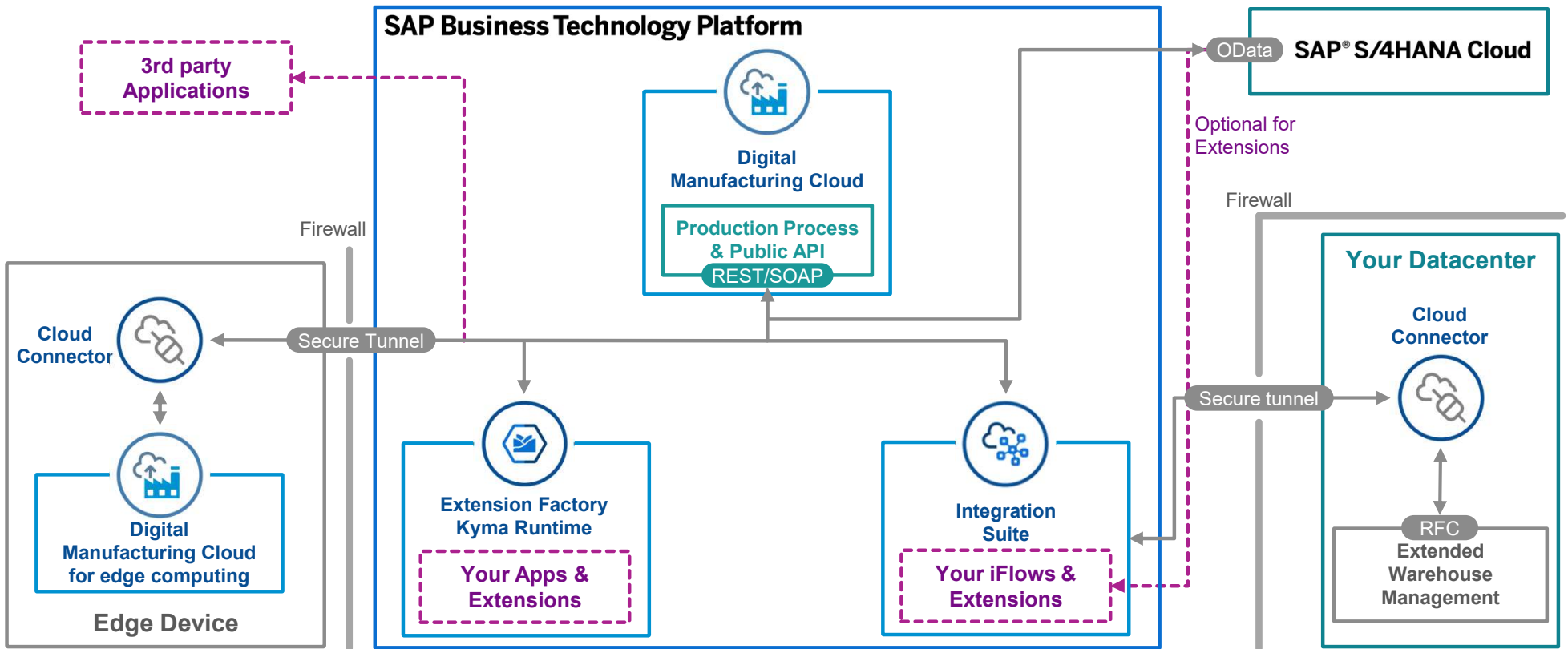


# Integration Architecture for DMC – S/4HANA or Business Suite





# Integration Architecture for DMC – S/4HANA Cloud Edition



# SAP Plant Connectivity on edge

- SAP Plant Connectivity is available as SAP Plant Connectivity on edge (PCo on edge) as a containerized version.
- PCo on edge is integrated with the SAP Edge Lifecycle Management approach employed by SAP Digital Manufacturing Cloud for edge computing and is fully managed from the cloud. The focus is on ease of scalability, availability, and upgradability.
- PCo on edge is offered as a part of SAP Digital Manufacturing Cloud for edge computing and is deployed in one cluster on an edge device with SAP Digital Manufacturing for edge computing.
- Model and configure the manufacturing processes used by PCo on edge in SAP Digital Manufacturing Cloud using features provided by the Production Process Designer\*) and Machine Model.
- When using PCo on edge, you connect to an OPC UA server as the data source for shop floor data. You can use subscriptions and queries to monitor tag changes.

\*) Shop Floor Designer (SFD) gets renamed to Production Process Designer (PPD) in 2111.

The screenshot displays the SAP Machine Model and Connectivity configuration page for 'DMC\_Edge\_Plant\_Connectivity\_MM003'. It shows various settings such as 'Internal Host URL', 'Plant', 'Description', and 'Type'. Below this, there are sections for 'Web Servers (148)', 'Certificates', and 'User Groups'. A detailed view of the 'LI\_2108\_PCO\_ON\_EDGE' process is shown, including its status, description, and configuration parameters.

Equipment	Template	Indicator Group	Indicator	Alias	Subscribed
HL_Equipment	HL_EquipmentTemplate	HL_IndicatorGroup	HL_Temperature	HL_Temperature	Yes

Name	Data Type	Expression
int	Integer	%I_Temperature
inString	String	%I

< Title >

Confidential & Proprietary

50

# Comparison of Upgrade Procedures for Cloud and Edge

## Digital Manufacturing Cloud (add. differentiation Q/P landscape)

### Major Upgrade

- Every 3 Month
- Fixed quarterly schedule (typically time window on Saturday)
- Planned downtime (ambition to minimize impact continuously)

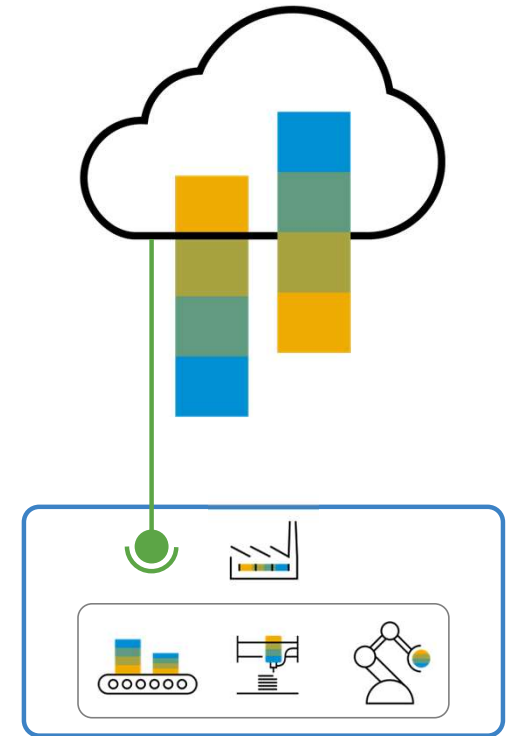
### Minor Upgrades

- Regular between major Upgrades

## Edge

- Maximum of 3 month time to perform upgrade (before next cloud release)
- Flexible upgrade triggered by Customer

- Delivered Frequently
- Provided only for current Release
- Flexible upgrade triggered by Customer



## Further Information

### Key Links:



[SAP Road Maps](#)



[SAP Manufacturing Community](#)



[SAP Support](#)



[SAP Partner Portal](#)



[SAP Innovation Discovery](#)



[SAP Help Portal](#)

### Where to go to Provide Product Feedback and Ideas:



[SAP Idea Place](#)



[Influence Programs](#)



[SAP User Groups](#)



| Thank You

