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AVEVA Model Driven MES

MES Overview

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AVEVA

Agenda

01 What is MES?

02 An Introduction to AVEVA Model Driven MES

03 AVEVA MES – Cloud Integration

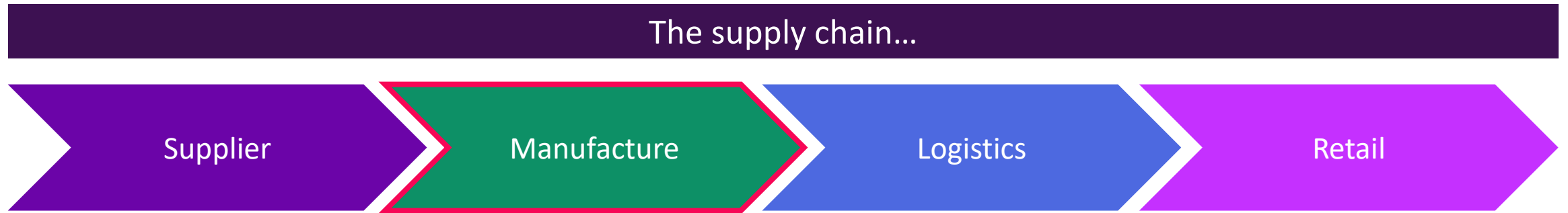
04 Demo

What is MES?

An Introduction to AVEVA Model Driven MES



What is MES.... Manufacturing Execution System



“Software to drive **operation execution** since the Production Order is launched until the finished product is delivered, **reports** about plant activities **in real time** and allows bidirectional communication with the rest of the **supply chain**”

What is MES... Manufacturing Execution System

Standards groups for MES: Manufacturing Execution Systems

Manufacturing Enterprise Solutions Association



MESA is a consortium of vendors, consultants, services providers & end users.

- Goal is to deliver information that enables the optimization of production activities, from order launch to finished goods.



Developed ISA S-95 Standard for MES to ERP integration.

- **MES layer** focuses on key manufacturing activities—operations, inventory, quality, labor and maintenance activities—corresponding to the “**Level 3**” in the Perdue Hierarchy Model.

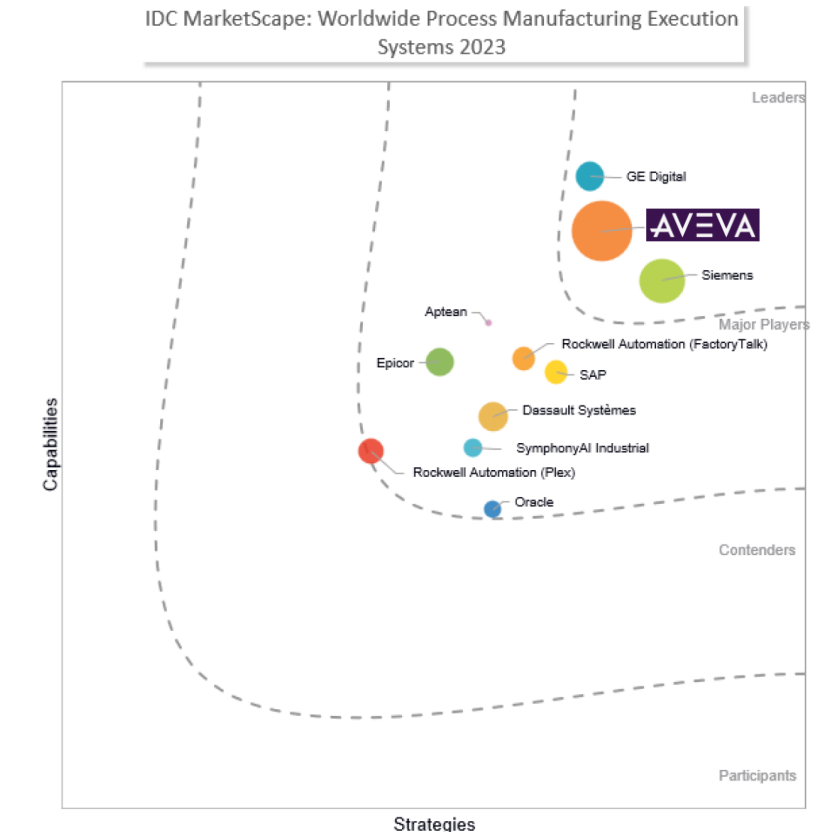
International Society of Automation

AVEVA MES is Leader for Manufacturing Excellence

Providing a broad set of functions for manufacturing operations

- **Model-based approach.** AVEVA's MES includes a built-in full business process management (BPM) functionality for execution of business logic in standard operator workflows.
 - This enables **multisite** standardization and deployment, standardization of global key performance indicators (KPIs), industrial best practices, and continuous improvement.
- **Production optimization analysis.** AVEVA Insight is a cloud-based tool in which native AI cloud capabilities/models sit and data is analyzed to provide predictive warnings and prescriptive actions.
- **Hybrid architecture** with data publishing to CONNECT to support enterprise-wide visualization and data sharing community.
- **Breadth of adjacent solutions.** AVEVA provides a broad range of solutions to complement its MES product functionalities, including asset performance management and value chain optimization (integrated production planning, scheduling, and execution capabilities).

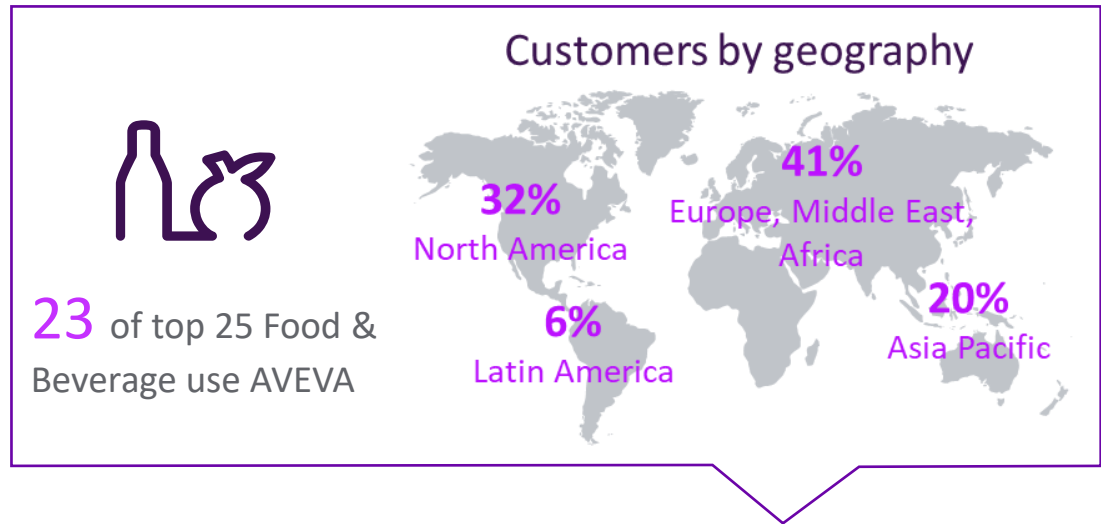
IDC MarketScape: Worldwide Process Manufacturing Execution Systems Vendor Assessment



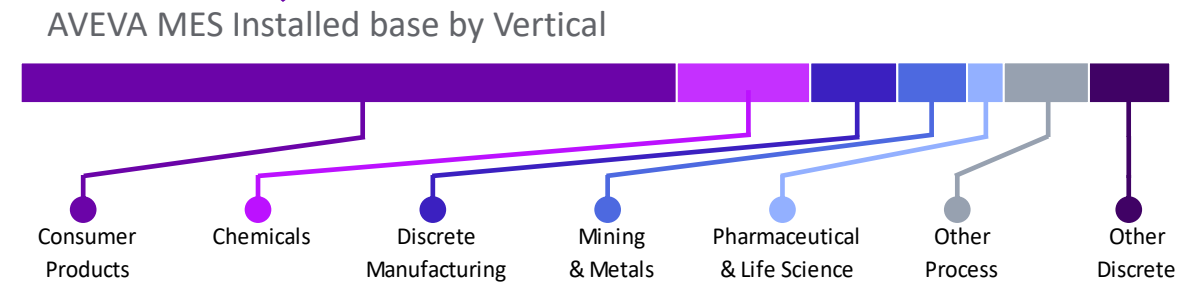
Source: IDC, 2023

AVEVA MES verticals

Focused on food, beverage & CPG, also spec chem, general manufacturing and metals



F&B/CPG market leadership
acknowledged by ARC and Gartner



* Wood (boards/tiles), Furniture, Fabricated Metals, Household appliance, Textile/ Fibers, Plastic products, Ceramic products, Automotive.....

AVEVA MES in Hybrid industries

★ multi-site standardizations

“Consider AVEVA when companies in *continuous process* or batch and *hybrid manufacturing* sectors with *advanced functional needs* are looking to deploy their MES solutions *across multiple facilities and locations*”

IDC Research
April 2023

2,600+
MES Customers

5,150+
Sites deployed and under support

Coffee

Ingredients

Bakery / Grocery

CPG

Beverage

Brewery

Wine & Spirits

Specialty Chemicals

Dairy

Protein

AVEVA™

Proven Outcomes in Hybrid Industries

Asset Efficiency



Operational Efficiency

“With AVEVA MES coupled with our CI strategy, we extended our packaging area capacity to about 1.3 million barrels each year.”

Scheduled runtime Efficiency up by 25-30%
DT Decreased by >50%



Network Agility



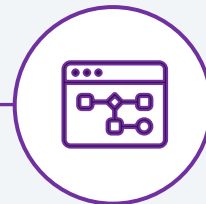
Schedule Optimization

6% cost reduction per unit
\$16M annual savings

Scheduling decisions based on trusted real-time data



Quality



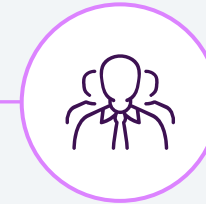
Product quality and NPI

“...integrated order, quality and specification management enabling increased CI projects ...”

25% Reduced Giveaway
Improved NPI cycle
3% reduced Mtl. Costs



Optimization



Predictive Analytics (AI/ML)

“we were able to narrow down ideal settings based on best output days per product.”

Increased gross profit by 10-12% by reducing waste in slicing, overcooking, quality and yield



Energy



Energy Management

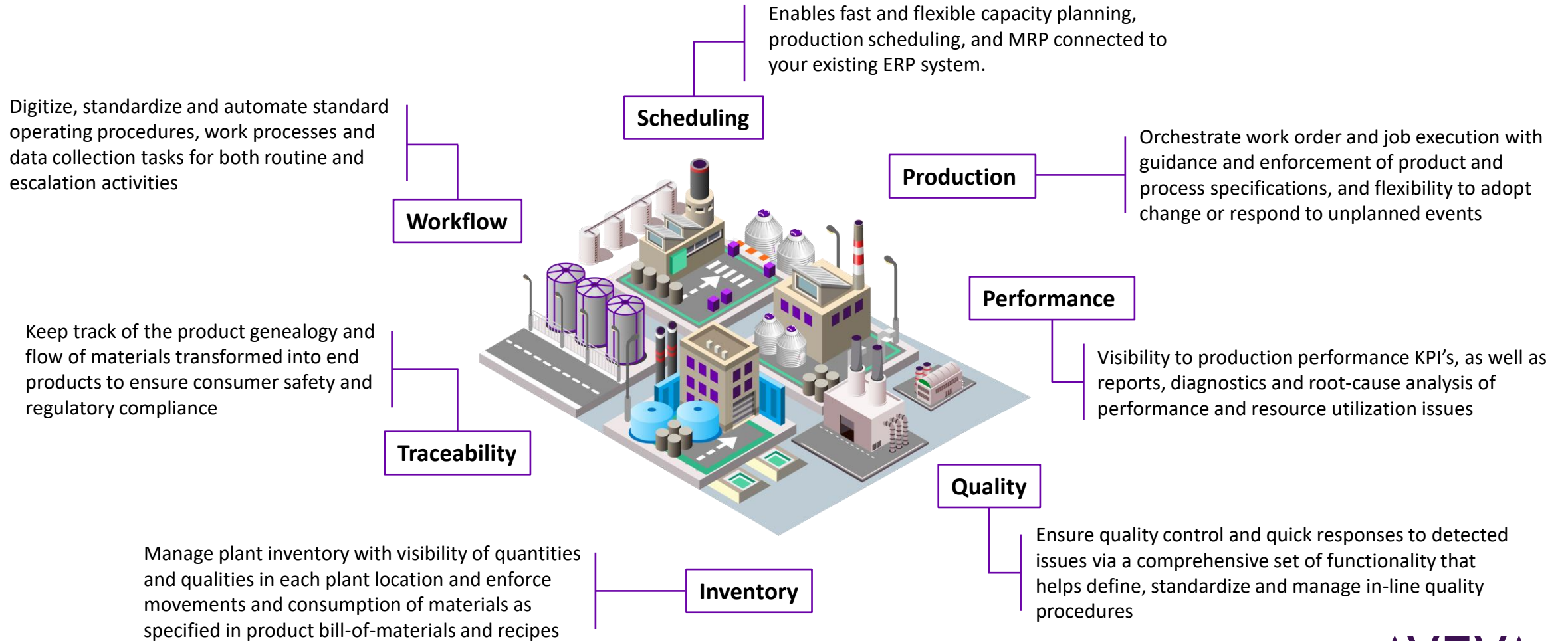
“With AVEVA, we can check in re efficiency, power, pressure, & flow & see efficiency values for last 24 hours, last week.”

Data collection time decreased by up to 70%



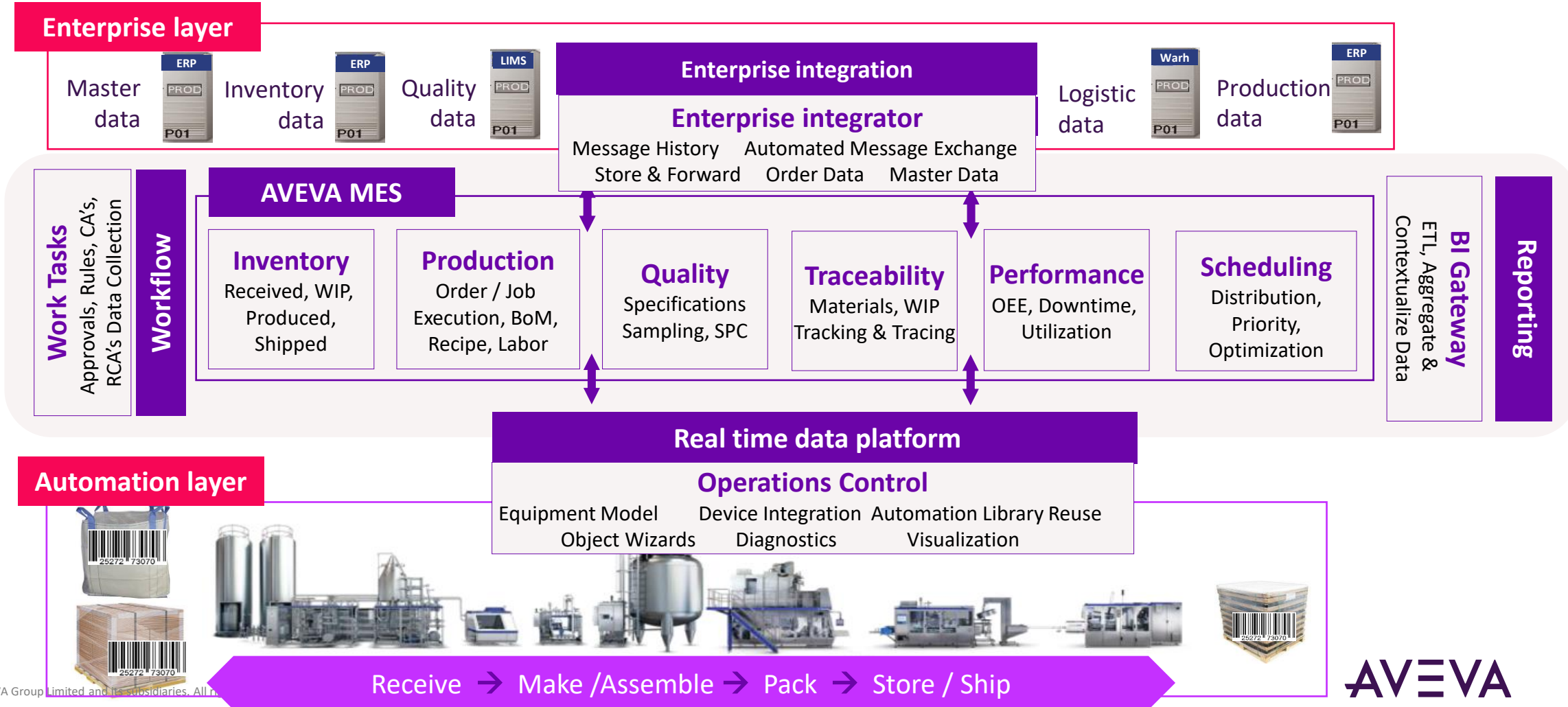
AVEVA Manufacturing Execution System

Increase manufacturing flexibility while securing quality and consumer safety by providing product and process guidance



AVEVA MES Technology System Layers

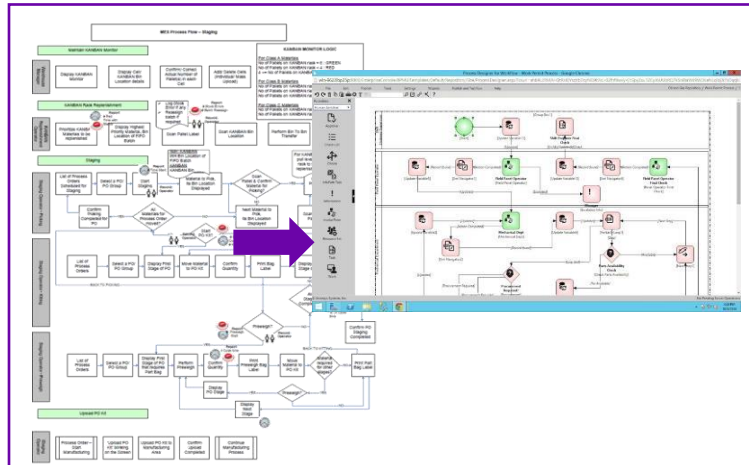
Bridging the gap between business systems and the production environment



AVEVA Model Driven MES



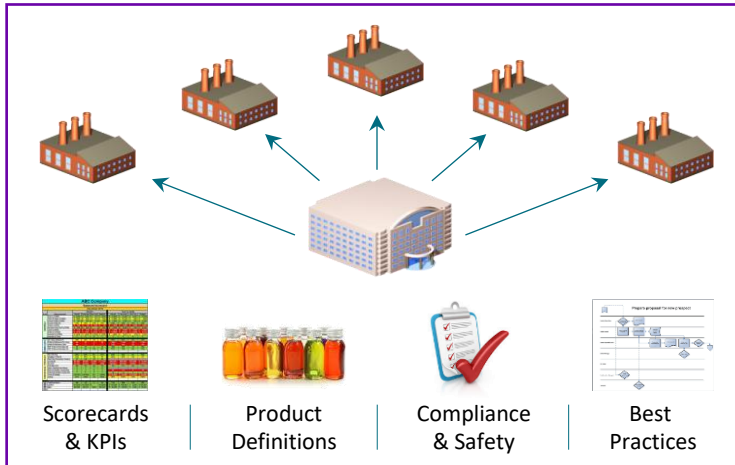
AVEVA's Model Driven Approach to MES



1

DIGITALIZE

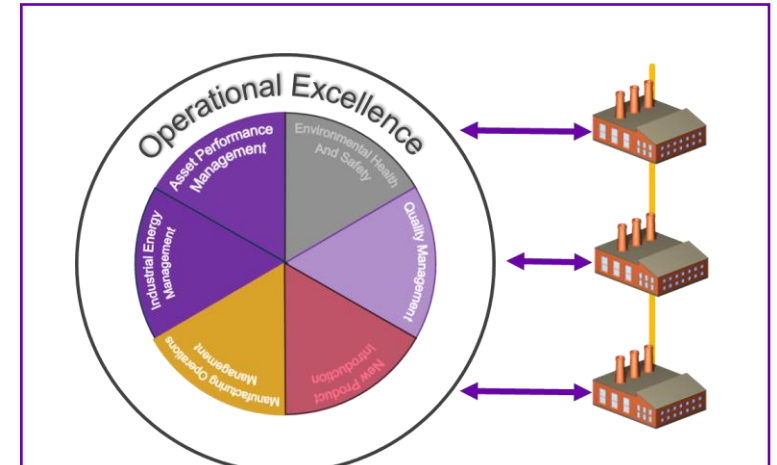
Capture manufacturing processes & collaborations and digitalize them using low code technology. Transform how work is done in the plant



2

STANDARDIZE

Manage best practices, KPIs, product specifications and compliance and safety between sites



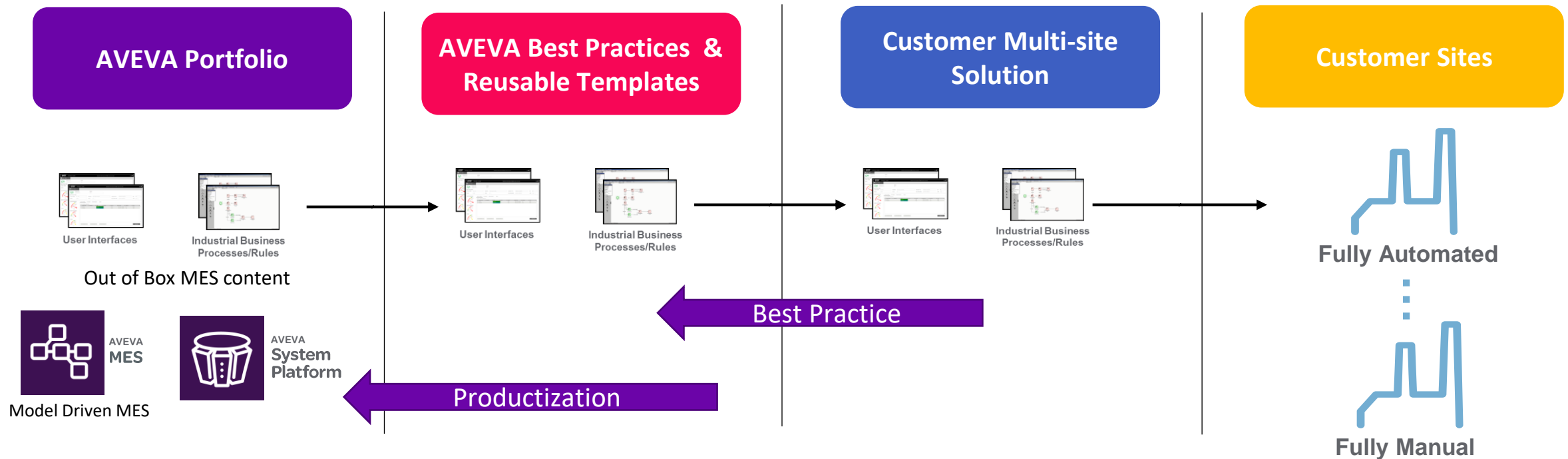
3

IMPROVE

Continuous improvement of processes based on rich data collection with governed change management

Engineering Efficiency and Reuse

Leverage maximum reuse of efforts



- Industry best practices captured and curated as reusable and adoptable templates
- Deployed into multiple, multi-site programs at different customers. Meat, Poultry, Coffee, Adhesives, Nutrition, Dairy, Bakery
- Continuous improvement
 - New template content distilled from actual deployments
 - Productization of template content into the core product

Model driven MES, a configurable modeling approach

Operational Activities Modeling for Digital Execution, Standardization and Continuous Improvement

Operational Activities Framework:



AVEVA Workflow Management



AVEVA Manufacturing Execution System



AVEVA System Platform

- **Workflow model** defining the procedures and collaboration of work execution and data collection tasks
- **Configurable and sustainable User Interface** to meet our customers operational activity practice

↕ Integration

- **Production Process model** with execution and data collection rules, and specification data
- **Information model** for accessing and storing work planning and execution data + KPI's in real time

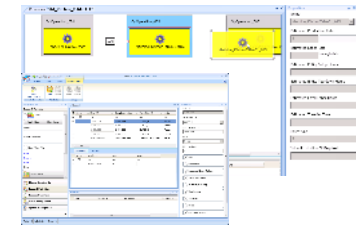
↕ Integration

- **Equipment model** with integration to process data for automatic data collection, recipe parameter download and enforcement of process rules and specifications (BOM) through e.g. Barcode or RFID

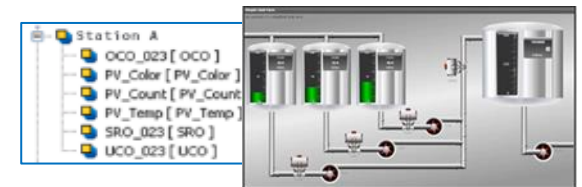


User Interfaces

Business Rules



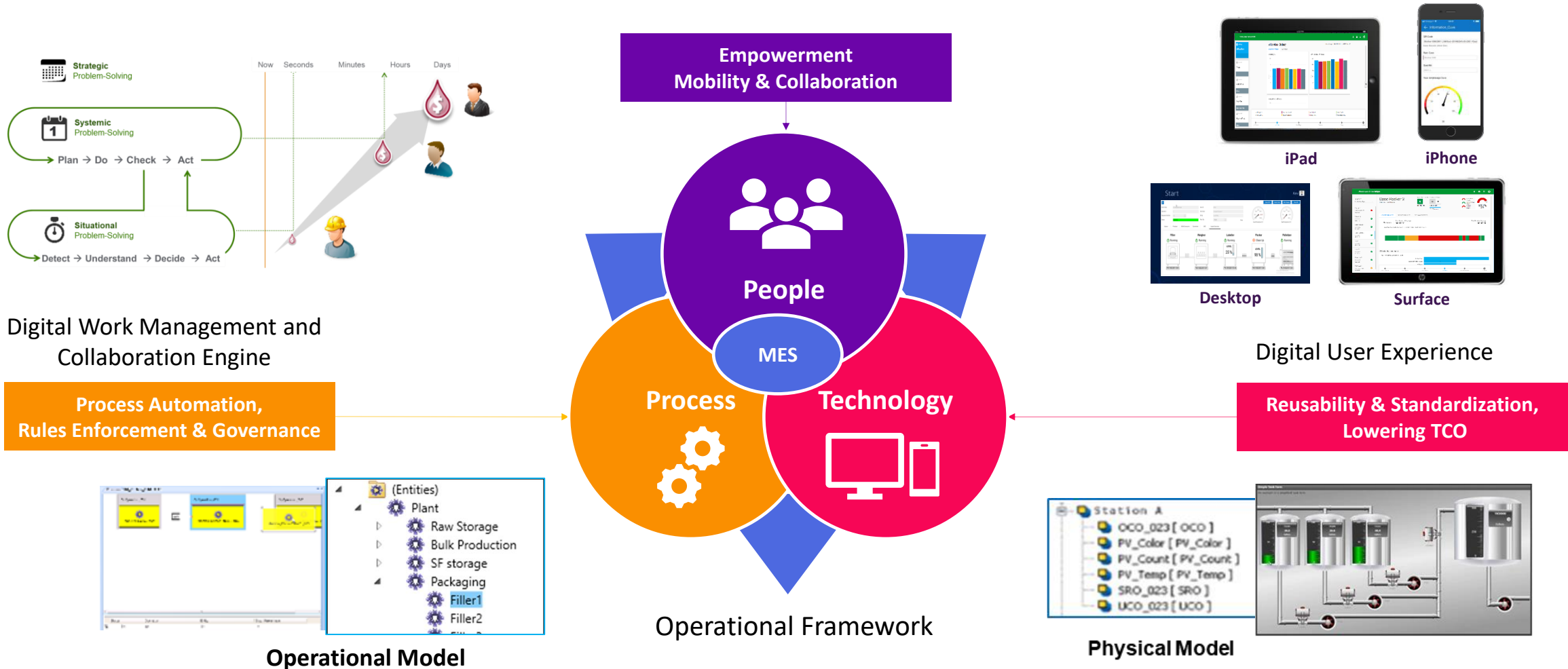
Process Model, Product and Work Specifications



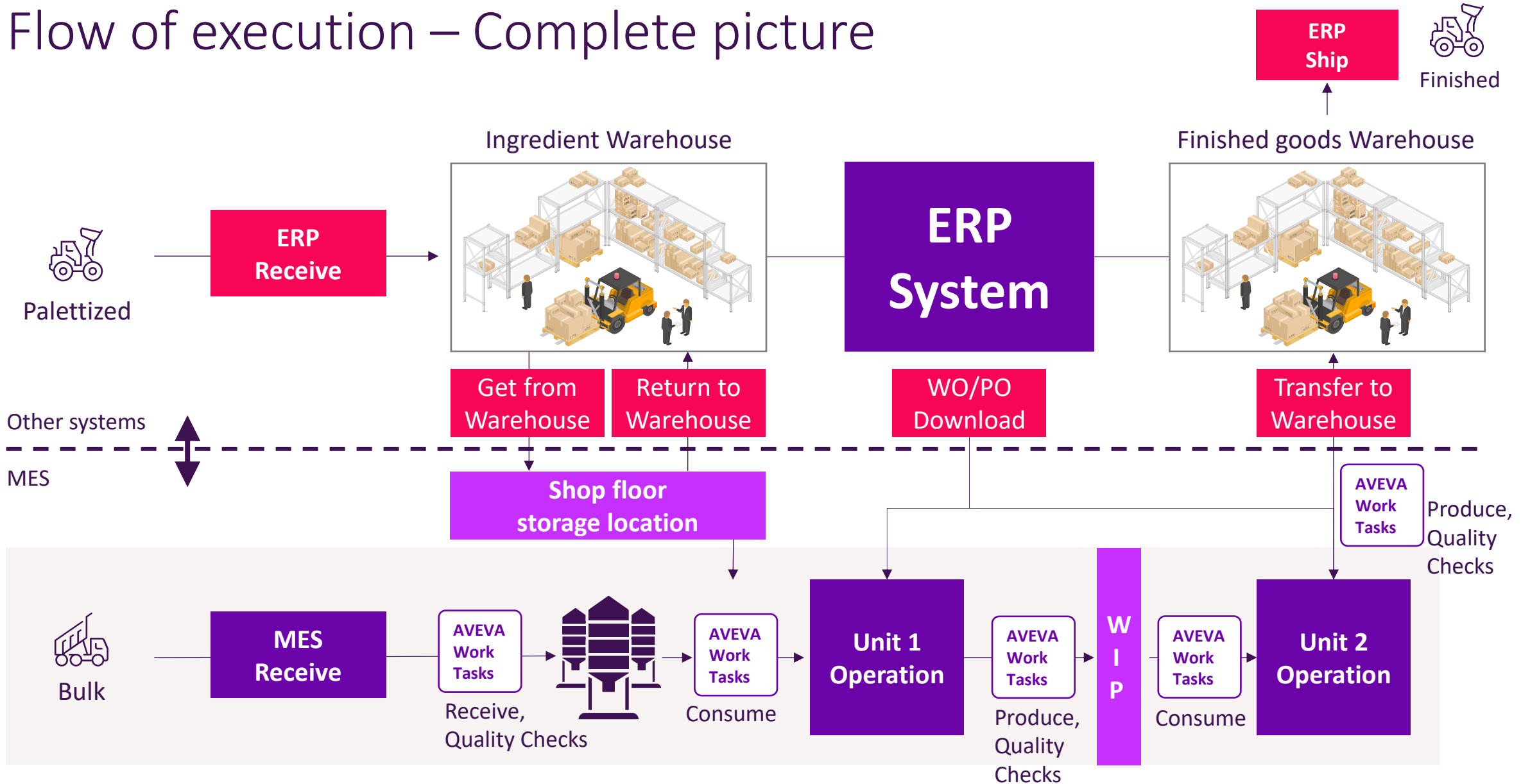
Physical Model and Process Visualization

AVEVA MES

A Model Driven Approach to Managing Manufacturing Processes across the Business



Flow of execution – Complete picture

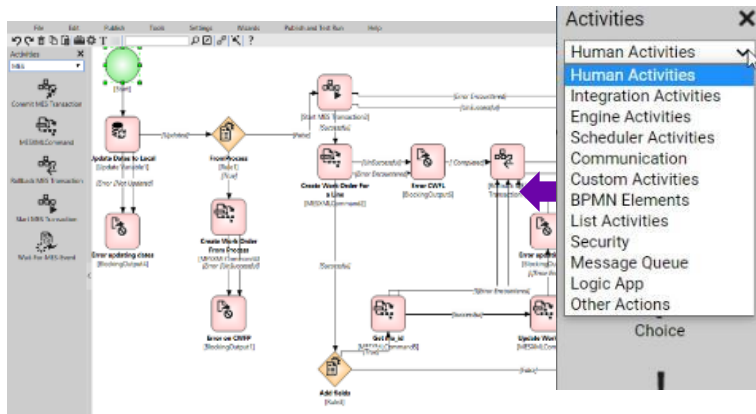


AVEVA Work Tasks

AVEVA Work Tasks Overview

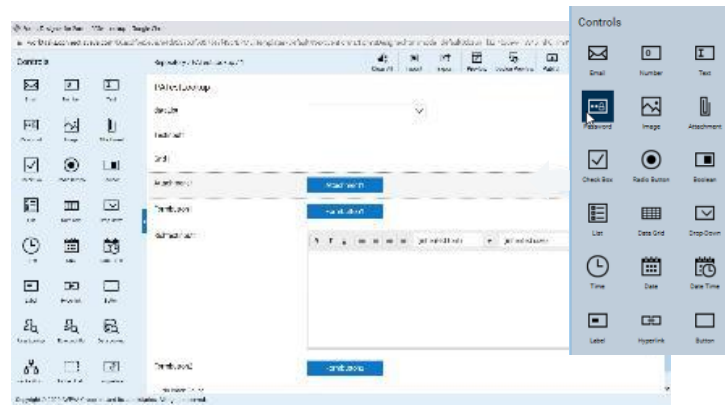
Workflows

- Intuitive, **visual workflow modeling** environment and automation engine
- Application **business rules, such as inspections and alerts**, are modeled in graphical environment



Forms

- User interfaces are modeled in a **simple, easy to use forms layout** environment with smart controls
- Adaptive layout and responsive design **supports browsers and mobile devices**



Mobile app

- Native mobile app for **executing work tasks and data collection** procedures
- Assigned work tasks are downloaded on to the mobile device to be executed on and offline

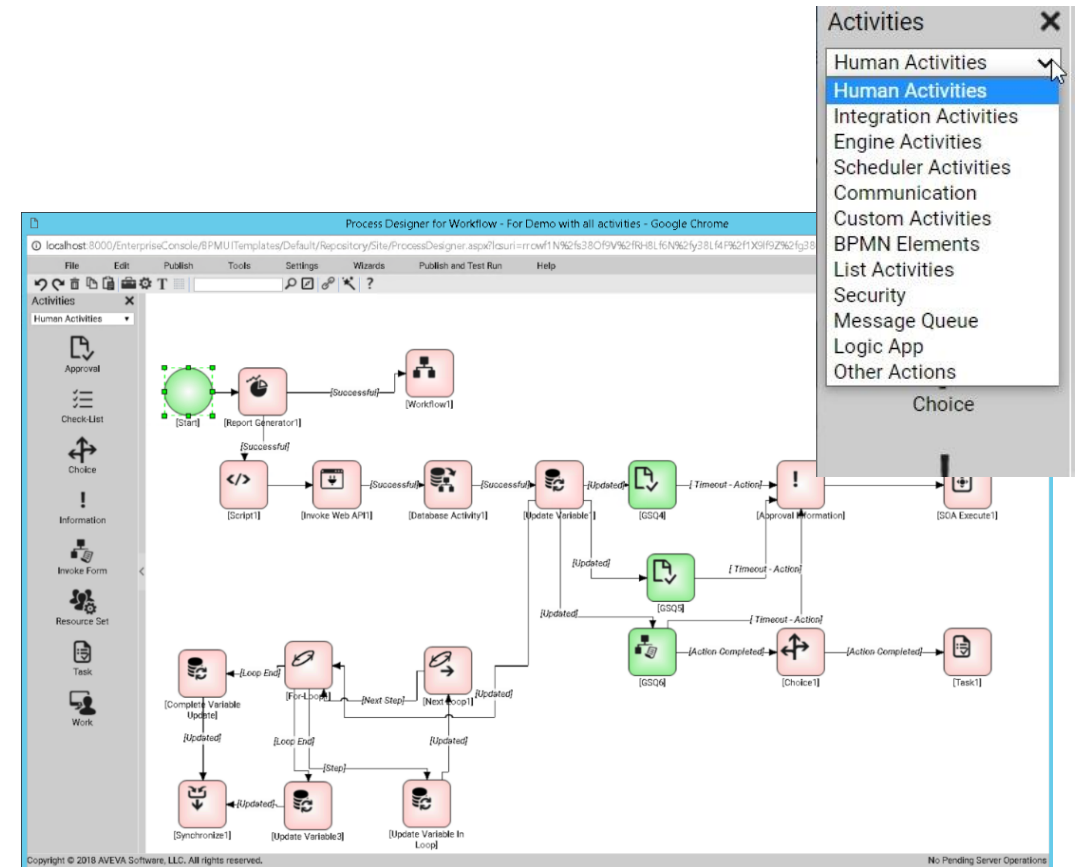


AVEVA Work Tasks Pro, a native Mobile device App available for iOS, Android and Windows

AVEVA Work Tasks

Process Designer

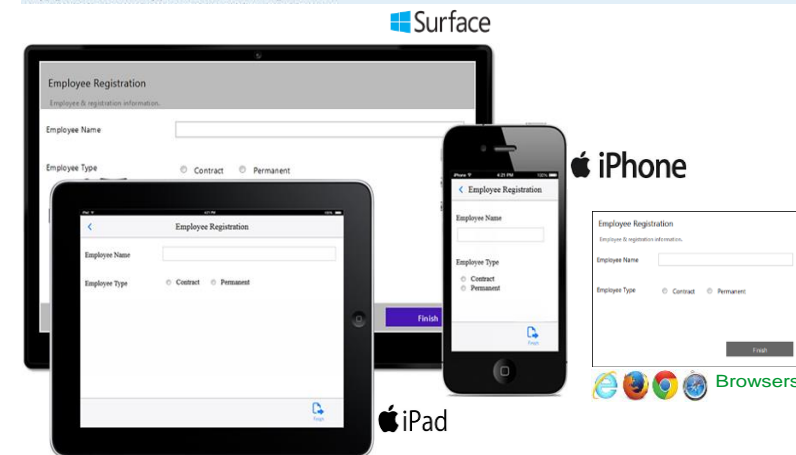
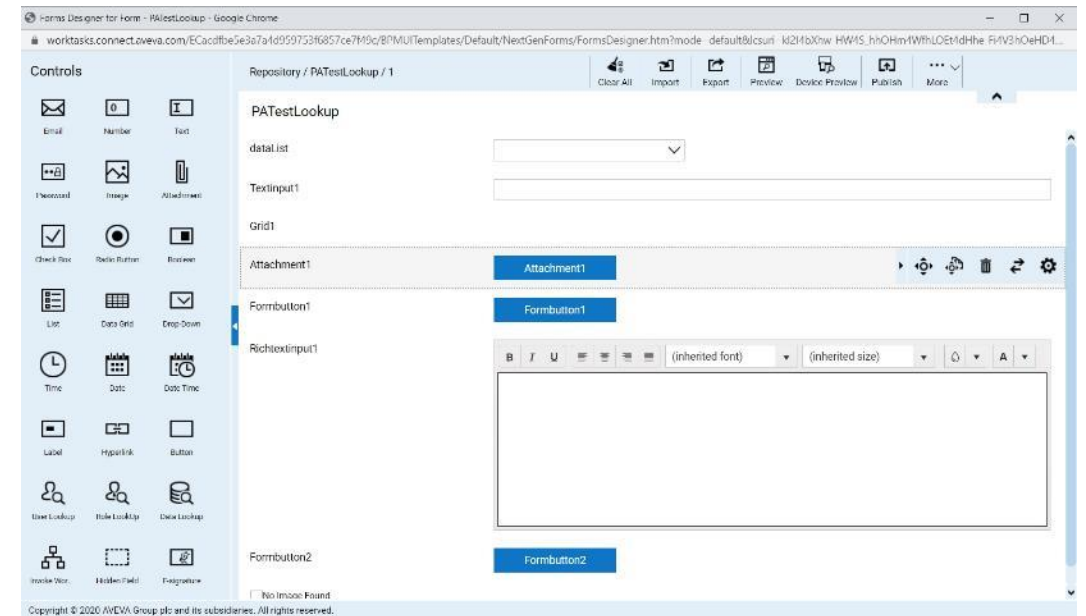
- Explorer many out-of-the-box configurable workflow activities for human interaction, and integration with systems and data sources
- Right click on the input and output branching for insights of configurable properties
- Explore MES based Activities
- Explorer Orchestra based Activities



AVEVA Work Tasks

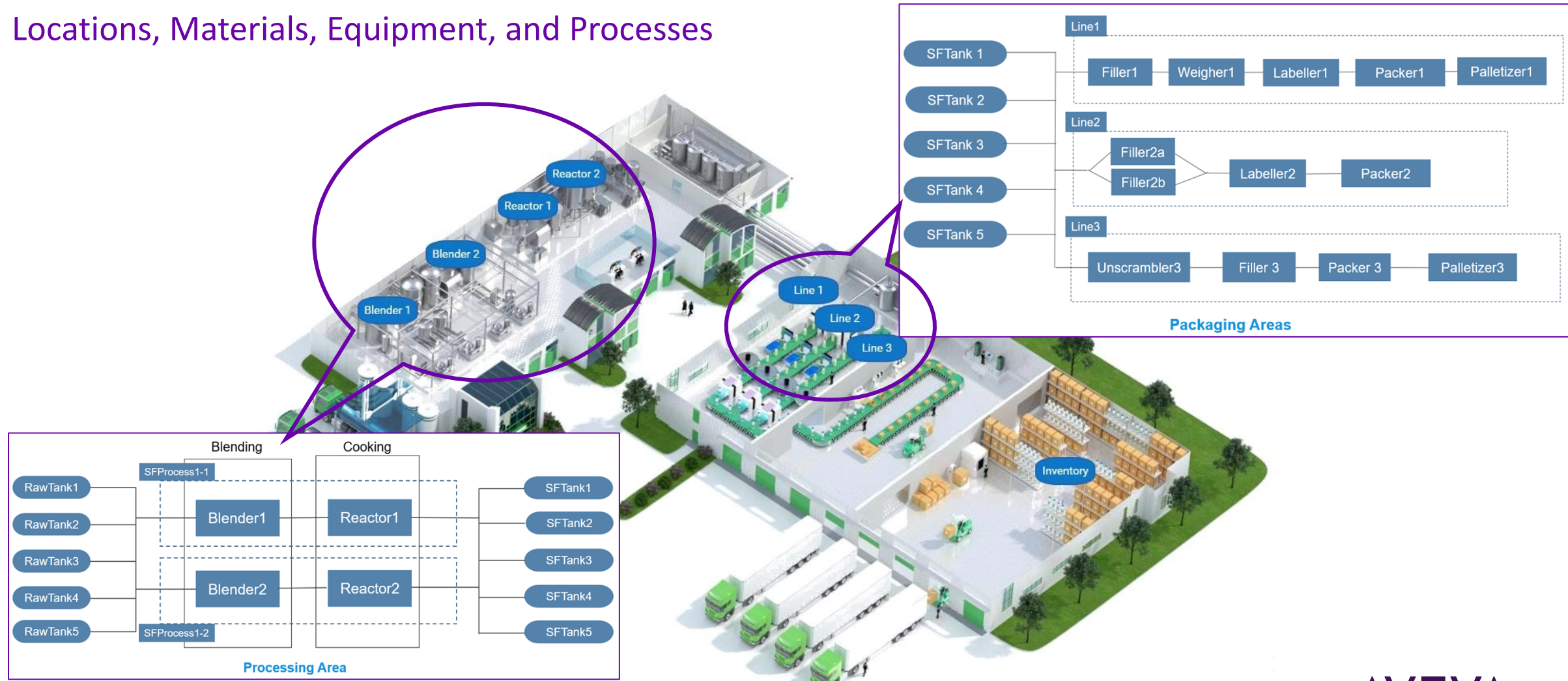
Forms Designer

- Explore the WYSIWYG controls and properties of the selected objects in the layout where you see a patented low code forms design tool used to create form layouts with drag and drop smart controls. Scripting for data entry validation or more advanced user interface logic is possible.
- Click on the Device Preview to show adaptive screen on a mobile phone in vertical and horizontal mode to show unify user experience across all devices with an adaptive layout and responsive design



AVEVA MES Plant Modeling

Locations, Materials, Equipment, and Processes



AVEVA MD MES Application Content

Order management

The screenshot displays the 'Order Management' interface in AVEVA MD MES. It features a table of work orders with columns for WO/PO, BOM, Spec, Status, Item, Qty, Units, Process ID, and Due Date. A 'Filter' button is visible above the table. The interface also includes a 'Work Order Details' section on the right, showing information for a specific work order (B322907044206).

Inventory management

The screenshot shows the 'Inventory Management' interface. It displays a detailed view of a work order (Blender1) with a table of inventory items. The table includes columns for Item, Item Desc, Unit, Qty, Units, Item Grade, Item State, Location, and Expiry Date. The interface also includes a 'Recalculate' button and a 'Filter' button.

Job management

The screenshot displays the 'Job Management' interface. It shows a detailed view of a work order (Blender1) with a table of job details. The table includes columns for Item ID, Work Order, Operat., Sequen., Req. Qty, Start Qty, Status, Entity, and Sched. The interface also includes a 'Job Details' section on the right, showing information for a specific job (Blending).

Efficiency management

The screenshot shows the 'Efficiency Management' interface. It displays a KPI for the selected time range (78.8 OEE %) and a bar chart of OEE performance. The chart shows OEE performance for different items (Blender1 and Filler) over a period of time. The interface also includes a 'View All KPI' button and a 'Show Durations' button.

Extended templates

The screenshot displays the 'Extended Templates' interface. It shows a dashboard with various charts and graphs, including a bar chart of OEE performance and a line chart of production history. The interface also includes a 'Material' section with a table of material quantities and a 'Production History' section with a line chart.

Quality management

The screenshot shows the 'Quality Management' interface. It displays a detailed view of a work order (Blender1) with a table of quality results. The table includes columns for Requested Time, Location, Sample Name, Result Status, Sample Status, Work Order, and Item ID. The interface also includes a 'Quality Results' section on the right, showing information for a specific quality result.

AVEVA MD MES Application Content

Orders dashboard

Equip. efficiency

Inventory

Quality samples

SPC options

Job List & details

Job List & details

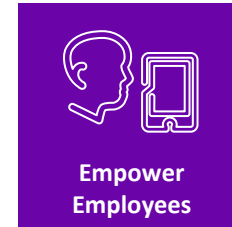
SPC options

SPC options

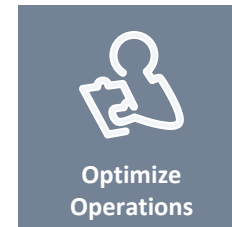
Multi-site transformation with a model driven approach

The Value Delivered

- Digital Work Management
 - *Increases workforce productivity*
- Visualization & Mobility
 - *Empowers & Connects the mobile workforce*
- Systematic Collaboration across People and Systems
 - *Protects investment in existing systems*
- Standardization of Operational Processes
 - *Safeguards Quality and Compliance of Work*
- Reusable and sustainable Application Development
 - *Rapid multi-site deployment with reduced time to value*
- Consistent Multi-Site Management & visibility
 - *Agility to adopt to changing demand and business conditions*



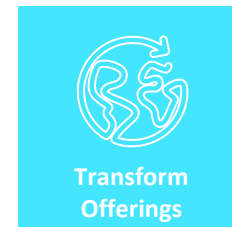
- Transform the way work is executed across a team of roles
- Enable Collaboration between teams and roles naturally



- Measure and improve process and operations performance
- Ability to continuously improve efficiency and adopt change



- Safety / Regulation compliance
- End to end traceability
- New products, formulations, packaging



- Demand Driven
- Resilient
- Increased value add
- New Business models

Understanding of MD MES Application Content and Demo VM

Readily a preinstalled Model Driven MES virtual machine which is being provided to System Integrators, Distributors and Presales Consultants in order to demonstrate the features and capabilities of the Model Driven approach to implementing AVEVA's MES software.

Optionally, in a form of Application Content consists of packaged file downloadable at Software Support portal for importing into your MDM server.

The training environment today is a preinstalled MDM 5.0 VM provided by training department for multi-user access.

AVEVA Model Driven Roadmap Summary

MDM 4.0	MDM 5.0	MDM 5.5	MDM 6.0	MDM 7.0
(July 2021) Work order, Inventory, Job and quality sample management	(March 2022) Known or reported issues and minor enhancements No changes to supported versions (MES 2020 & Work Tasks 2020U1)	(September 2022) Support for Work Tasks 2020U2 Addresses OMI integration	(November 2023) Support for MES 2023 , WT2023 SP1 & SP2023 P03 Remove use of MES Connector + UI updates + Web Widgets	(???) Will depend on 2023 R2 Support testing (SP, MES & WT)

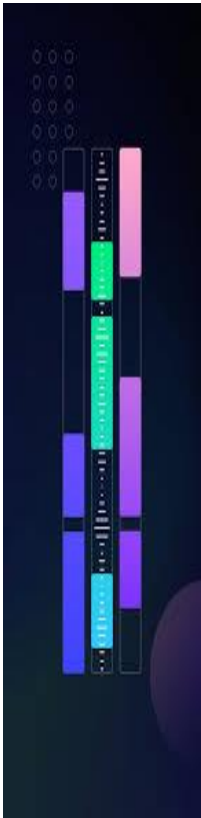
AVEVA Manufacturing Execution System

Cloud integration

AVEVA

AVEVA MES Strategic Investment Initiatives

Overview



Our AVEVA MES investment initiatives have been established to **align with the strategic imperatives** that have been set forth by **modern enterprises to digitally transform their business operations** to become more **agile, optimized, sustainable and customer-focused**.

Adopting AVEVA Connect cloud services to deliver more advanced insights and production optimization with AI/ML...



Data Service

Aggregate, contextualize, analyze & share MES operations data across the enterprise to improve decision support.



Visualization Service

Empower the connected worker with data, insights and guidance to improve operations performance and product quality.



Advanced Analytics

Infuse advanced analytics and machine learning into MES offerings to enable continuous production optimization.

Delivering Native SaaS MES/MOM capabilities to reduce TCO and accelerate time to value...



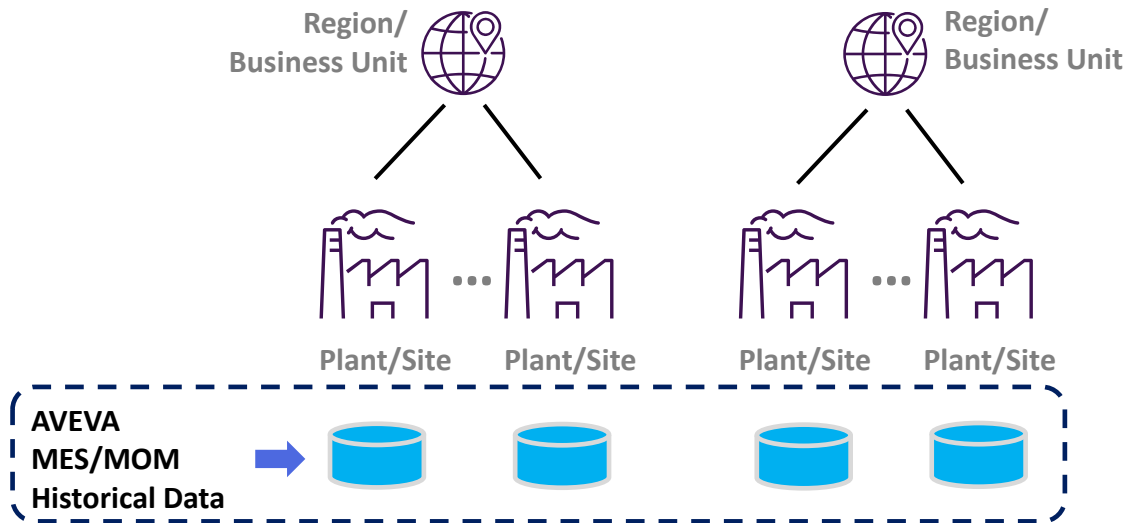
MES/MOM Capabilities

Deliver modern cloud and edge-based offerings that range from simple productivity apps to more complex manufacturing operations management (MOM) applications.

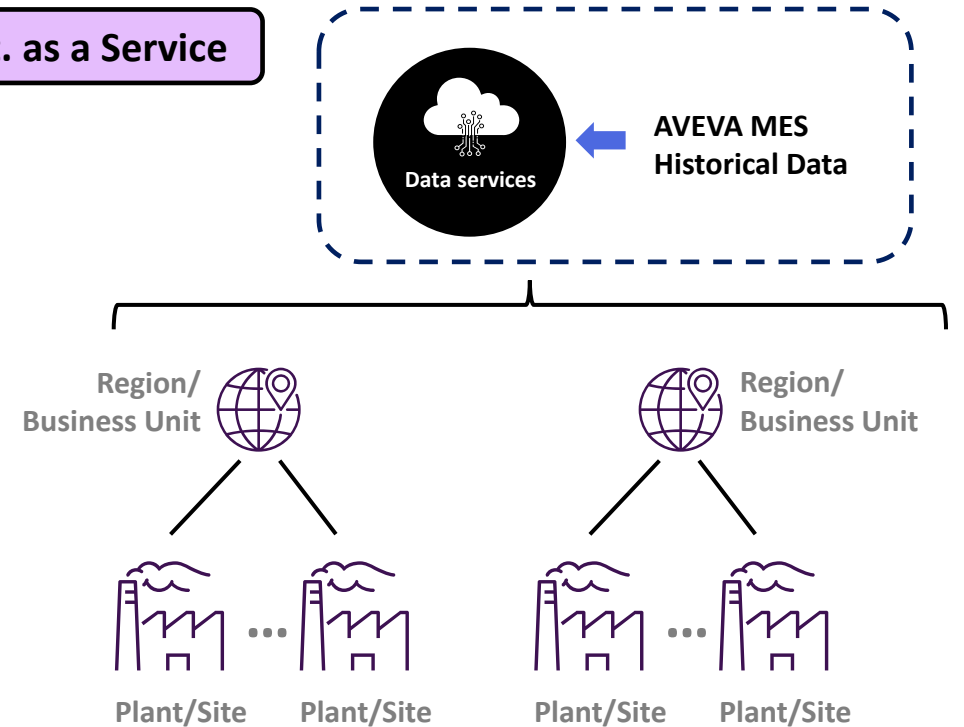
Enterprise data management services

Transitioning long term production history to the cloud

Current State

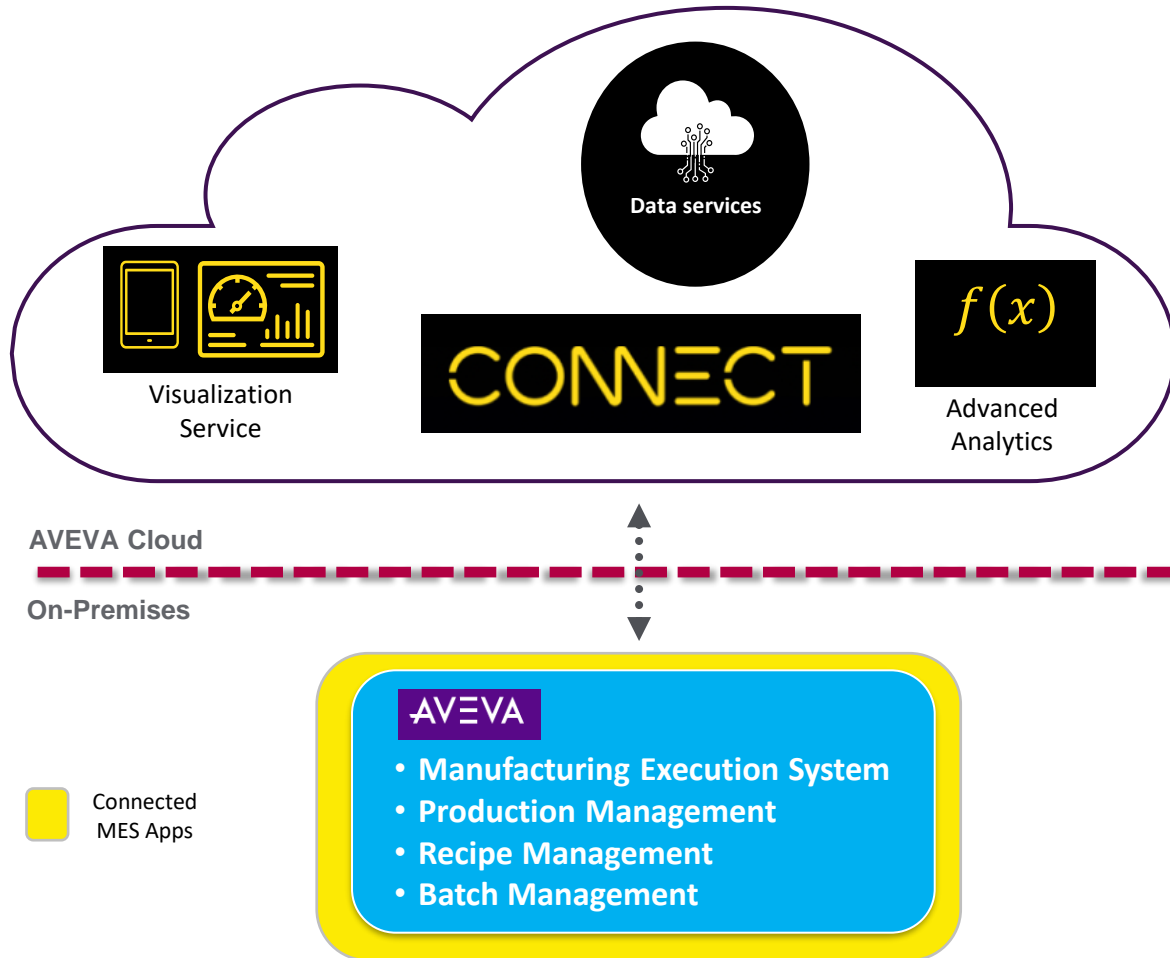


Data Mgt. as a Service



AVEVA MES & CONNECT data services

MES Portfolio evolving to a Hybrid Cloud Architecture



Native Cloud Capabilities...

Connected applications that provide integration with CONNECT, the AVEVA cloud platform.

Value-Add Cloud Apps & Services...

These cloud-based apps & services extend our on-premise (edge) and cloud-based capabilities with:

- **Data Services** - enterprise data historization & sharing
- **Visualization Services** - enterprise visualization & dashboarding
- **Advanced Analytics/AI** - predictive & prescriptive analytics

Commercial MES Offerings...

Transition all our MES products to cloud “Connected” MES apps

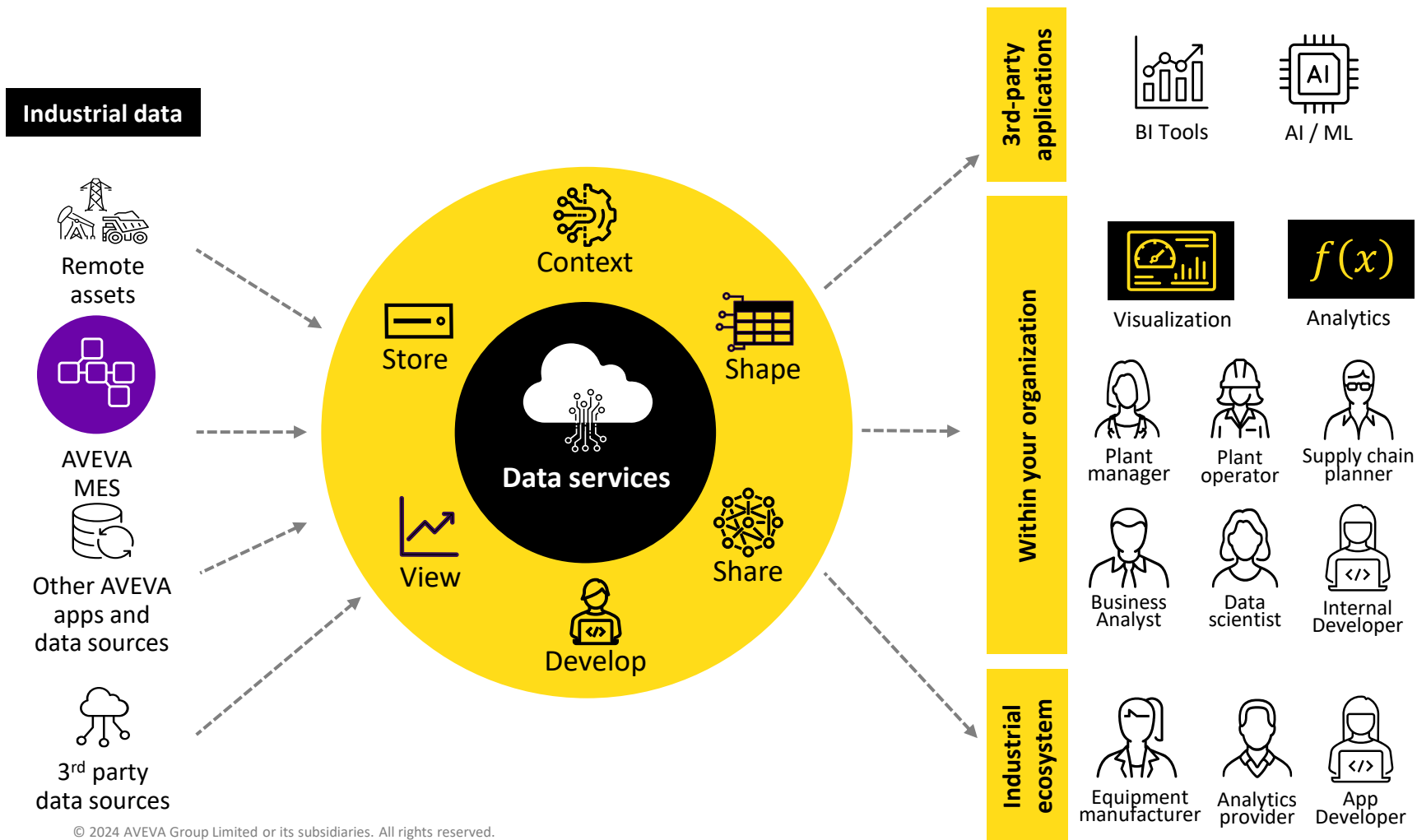
Initial offerings:

AVEVA Manufacturing Execution System – hybrid

Production Management 2024 - hybrid

AVEVA MES & CONNECT data services

AVEVA MES adopts CONNECT for enterprise data management



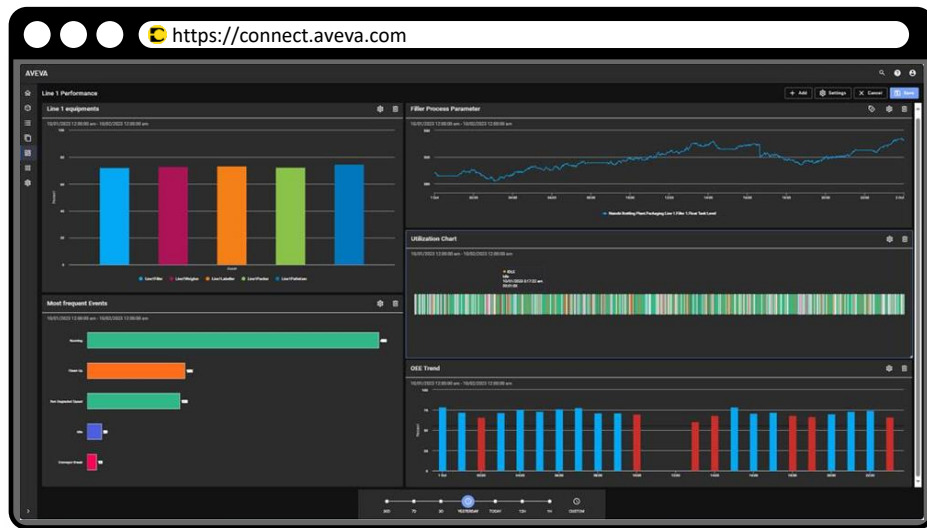
Provides a single source of truth across distributed production plant networks

A central data repository for BI, AI and ML tools

Securely share your industrial information with authorized users, beyond your organization's four walls

AVEVA MES & CONNECT visualization services

Visualize MES data using self-service and pre-defined dashboards



Self-service

- Editable dashboards
- Arrange various content types
- No code experience
- Search for content
- Adjustable historical view

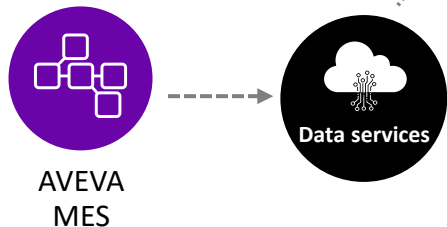
Pre-defined

- Custom developed experiences
- Rich animations and dynamic styling
- Asset driven navigation
- Complex interactions
- Holistic operations view

Visually relate distributed plants data in context to each other

Relate and gather insights between across different data types quickly and easily

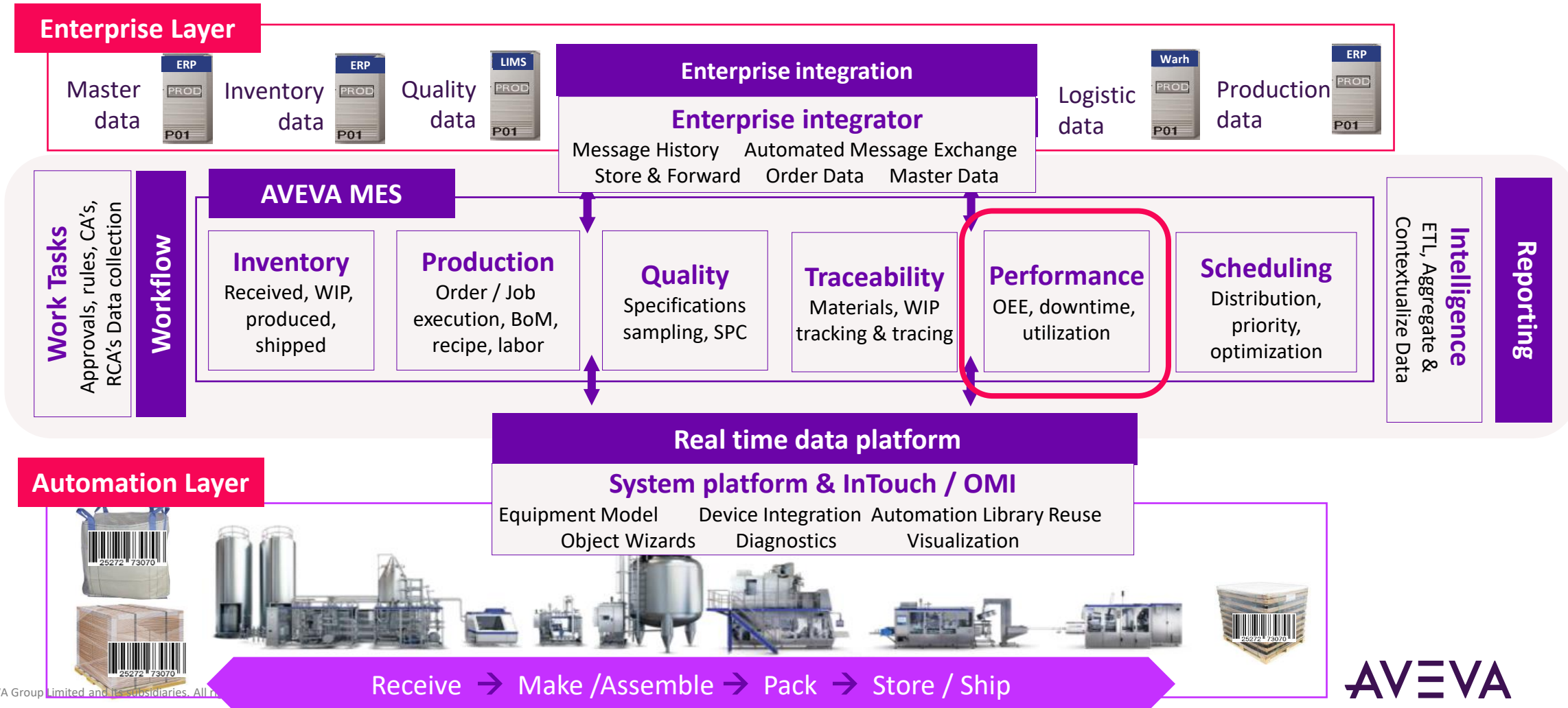
Share actionable information with plant and supply chain operations, and other teams, anywhere through a browser



The Industrial Standard OEE KPI Metric(s)

AVEVA MES Technology System Layers

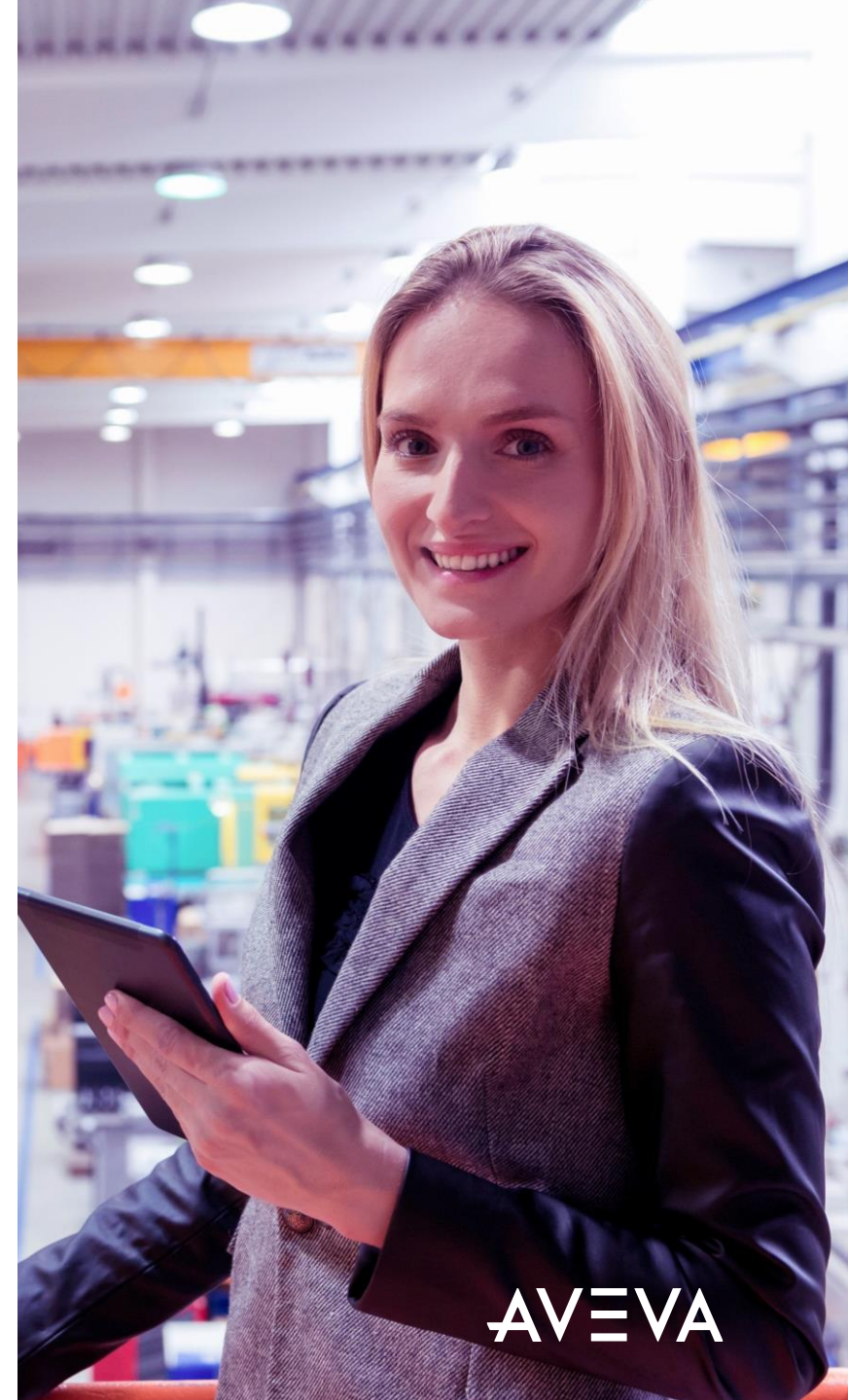
Bridging the gap between business systems and the production environment



Overall Equipment Effectiveness (OEE)

Asset / equipment / line efficiency metric

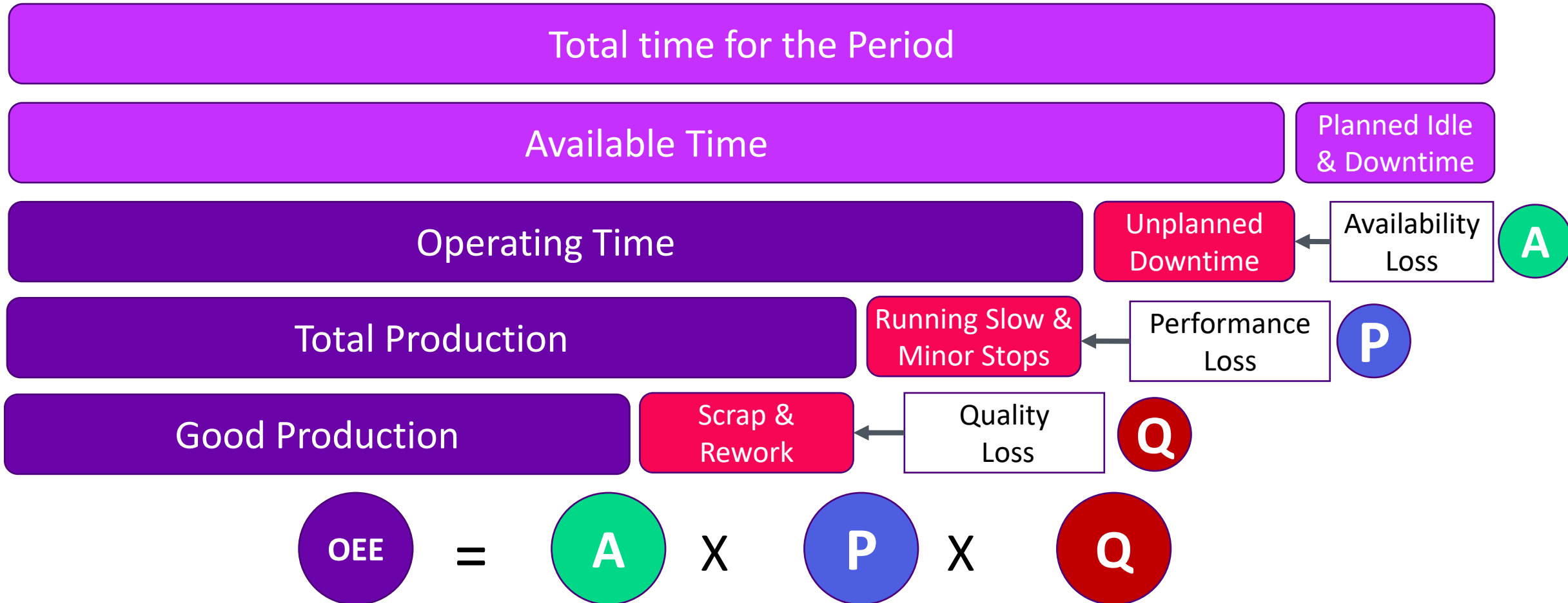
- OEE is a very powerful metric and an industry standard for calculating manufacturing operation effectiveness
- In a perfect world 100% OEE means that the equipment is running 100% of the time at 100% capacity and produce 100% good quality
 - Availability (%) = Operating Time / Available Time
 - Performance (%) = Total Production / (Target Production Rate x Operating Time)
 - Quality (%) = Good Production / Total Production
- World Class OEE is 85%



AVEVA

Production time summary and OEE concept

Measuring productivity – Identifies the % of manufacturing time that is truly productive



Performance management

Performance/efficiency monitor

Manufacturing Execution System

Wondershare by AVEVA Manufacturing Execution System WWDC/mdadmin

Home

Lines Entities Utilization Work Orders

Manufacturing Execution System wwdc/mdadmin

Work Orders Add Work Order Filter

Work Orders

Work Order ID	Line Assignment	Item ID	Status
PA220907041136	Line 1	FP01	RUNNING
PA220907042651	Line 1	FP01	READY
PA220907044206	Line 1	FP01	READY
PA220907045721	Line 1	FP01	READY
PA220907051236	Line 1	FP01	READY

5 Records Found
Current Filter: Status=[NEW,READY,RUNNING,SUSPENDED,ONHOLD]

Manufacturing Execution System wwdc/mdadmin

Entities

Line1Weigher

Line	Work Order	Batch Size	Default Production Rate
Line 1	PA220907041136	1,000 Pounds	1,400.000 batches/hour

Utilization Events Work Queue Monitor Configuration

Reporting Period: Current Shift

Currently Running Jobs

PA220907041136
2
110.44 Case (+110.00) [-0.44]

Utilization States - Counts

KPI

- OEE %: 0.00
- Performance %: 0.00
- Availability %: 100.00
- Quality %: 100.00

Current Filter: Current Shift

This presentation may include predictions, estimates, intentions, beliefs and other statements that are or may be construed as being forward-looking. While these forward-looking statements represent our current judgment on what the future holds, they are subject to risks and uncertainties that could result in actual outcomes differing materially from those projected in these statements. No statement contained herein constitutes a commitment by AVEVA to perform any particular action or to deliver any particular product or product features. Readers are cautioned not to place undue reliance on these forward-looking statements, which reflect our opinions only as of the date of this presentation.

The Company shall not be obliged to disclose any revision to these forward-looking statements to reflect events or circumstances occurring after the date on which they are made or to reflect the occurrence of future events.

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ABOUT AVEVA

AVEVA is a world leader in industrial software, providing engineering and operational solutions across multiple industries, including oil and gas, chemical, pharmaceutical, power and utilities, marine, renewables, and food and beverage. Our agnostic and open architecture helps organizations design, build, operate, maintain and optimize the complete lifecycle of complex industrial assets, from production plants and offshore platforms to manufactured consumer goods.

Over 20,000 enterprises in over 100 countries rely on AVEVA to help them deliver life's essentials: safe and reliable energy, food, medicines, infrastructure and more. By connecting people with trusted information and AI-enriched insights, AVEVA enables teams to engineer efficiently and optimize operations, driving growth and sustainability.

Named as one of the world's most innovative companies, AVEVA supports customers with open solutions and the expertise of more than 6,400 employees, 5,000 partners and 5,700 certified developers. The company is headquartered in Cambridge, UK.

Learn more at www.aveva.com