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2025 Users Conference

Accelerating Digital Transformation in Semiconductor Manufacturing

Ranjan Chatterjee

December 3, 2025

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Agenda

1. Overview
2. Deloitte Presentation
3. Global Foundries Presentation
4. Costing Solution Rapid Demo
5. Panel Discussion

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01.

Overview

SAP + PDF Solutions – The Big Picture for Semiconductor Manufacturing

Seamless Business Process Integration to Engineering and Manufacturing Context and Data

Enterprise Business Processes

Top Floor

Shop Floor

Manufacturing (Fab, Assembly, Test)

1. A common logical model for Product / Assets supporting next generation E2E scenarios
2. Extend business process, logic, and data to the manufacturing edge
3. Semantic data model for standard pre-packaged content ready for consumption
4. Derive business, product, and service insights from manufacturing

Opportunity

- Simplification
  - Business Processes, Information Systems…
- Closed-loop business processes
- Greater visibility across supply chain
- Improved throughput, yield, test efficiency, asset management, factory planning, NPI, TTM…

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Automated Orchestration

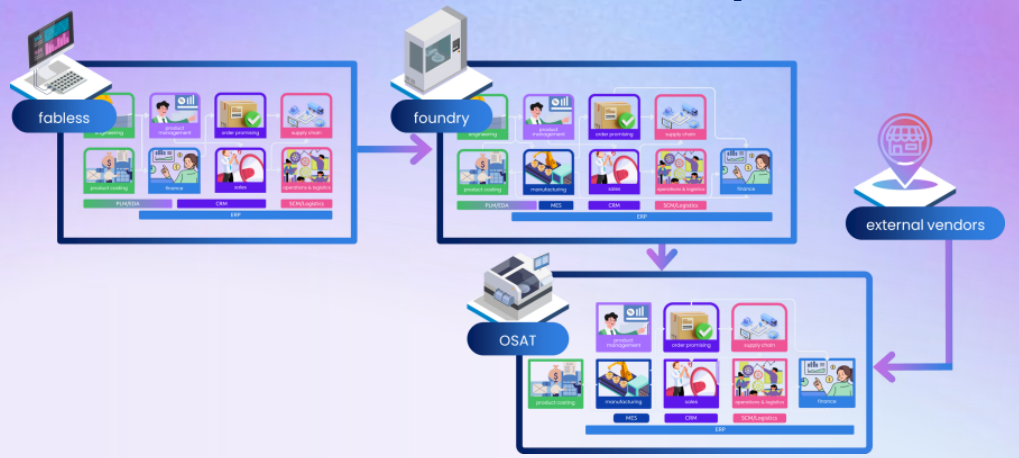
INTERNAL OPERATIONS

01 **Product Costing:** Accurate and up-to-date costing information based on actual resource consumption

02 **Order Status:** Real-time updates on order status and yield

03 **Quality:** Rapid identification and isolation of at-risk materials.

EXTERNAL OPERATIONS / OSAT



01 **Test Flow:** automate test flow management

02 **Quality:** Streamline & automate quality assurance

03 **WIP:** real time WIP tracking & management

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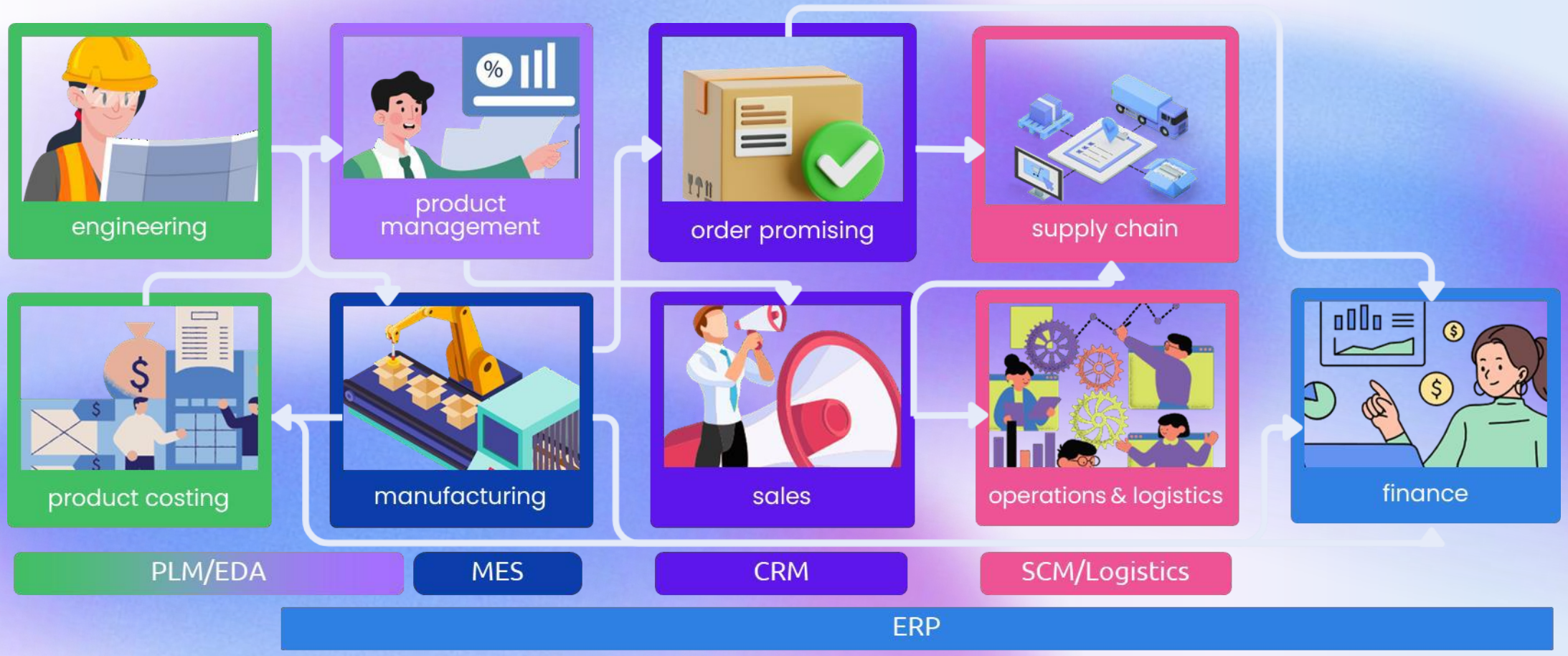
From systems of record to systems of action



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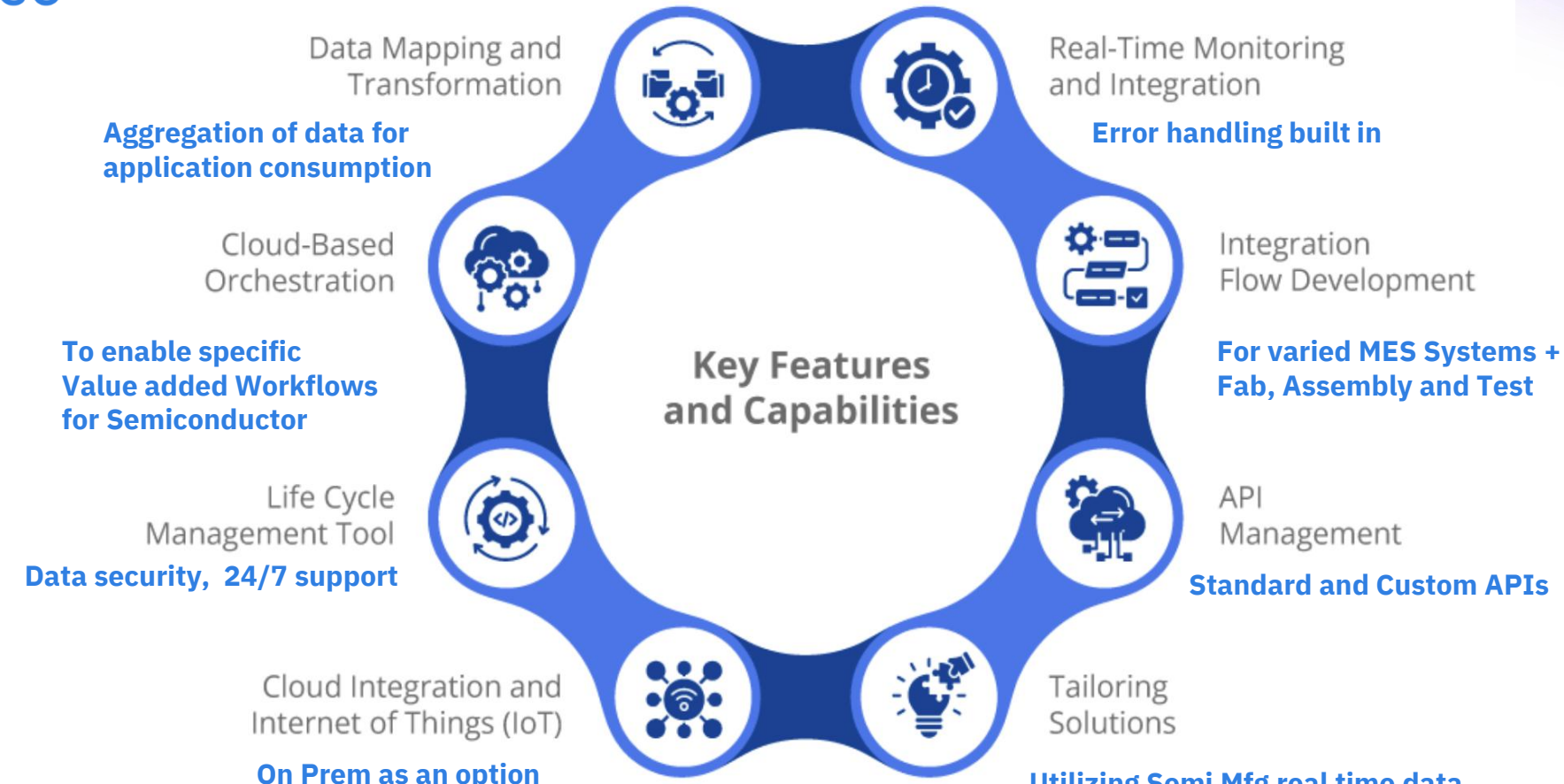
sapience™ Manufacturing Hub Enterprise



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Sapience Manufacturing Hub for Collection to Registration

and everything in between

SOURCE LAYER

- Factory Applications
- Process & Metrology Tools
- Custom Applications
- Data Warehouses
- Devices & TEST
- 3rd Party Systems
- CRM

Data Collection from MES systems

Data Registration to SAP

Sapience Manufacturing Hub

ORCHESTRATION LAYER

- Data Flow Management
- Data Governance
- Job Assignment
- Data Routing

Connectivity Layer

TRANSFORMATION LAYER

- User interface & configuration
- Data transformation
- Job definition
- Security

DATA STORAGE LAYER

Semantic Data Storage DB

Streaming Data

Connectivity Layer

Data Extraction & Load

APPLICATIONS LAYER

SAP S/4 HANA

- Product Costing
- Cost of Yield Analytics
- Custom & 3rd Party Applications
- Data Warehouse

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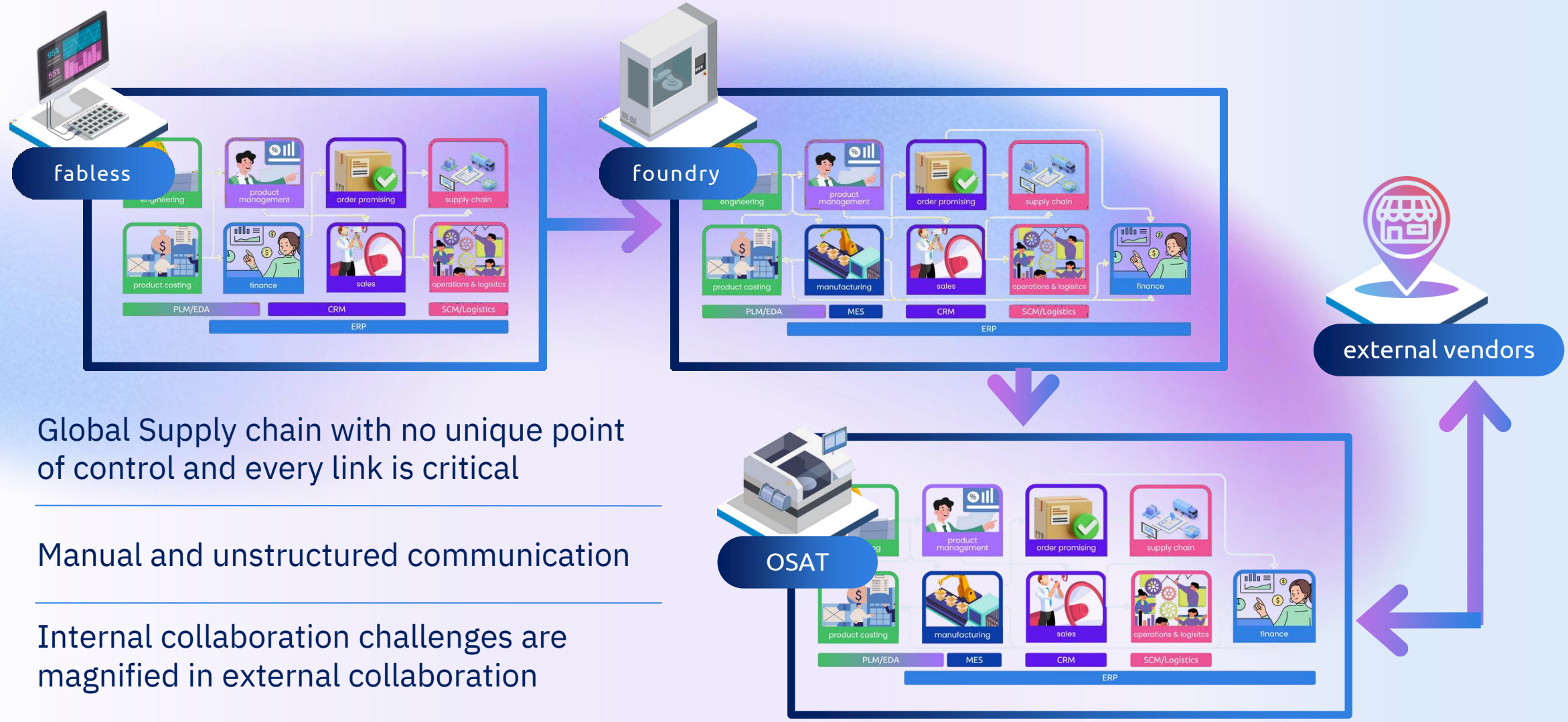
COLLABORATION ACROSS THE SUPPLY CHAIN



Global Supply chain with no unique point of control and every link is critical

Manual and unstructured communication

Internal collaboration challenges are magnified in external collaboration

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The Secured Data Acquisition Network is Already in Place

+300 manufacturing locations

OVER **100** OEMS CONNECTED

ISO: **27001**

0 SECURITY BREACH IN OVER **20** YEARS

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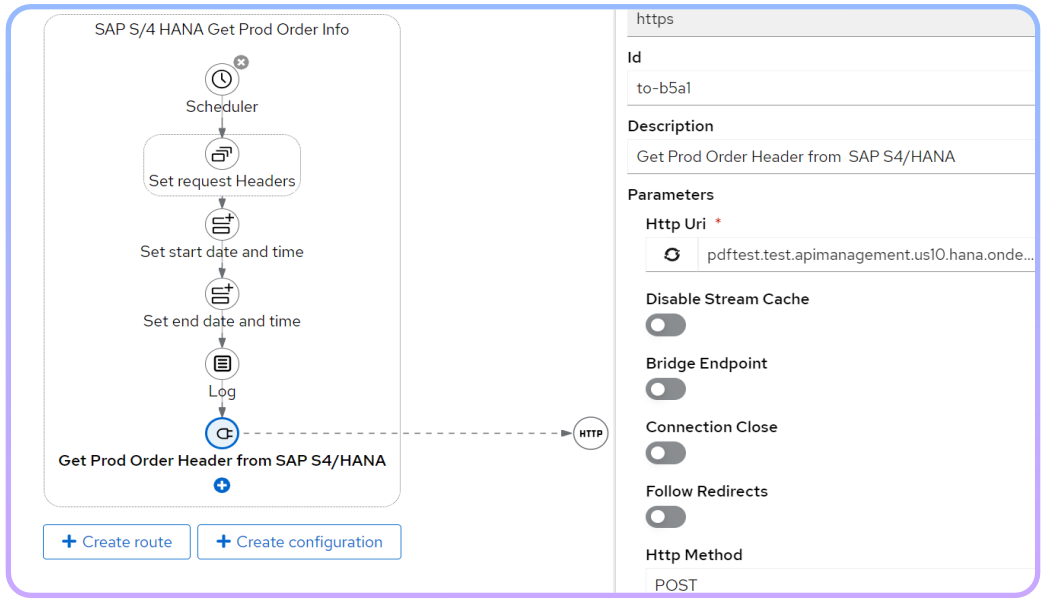
02.

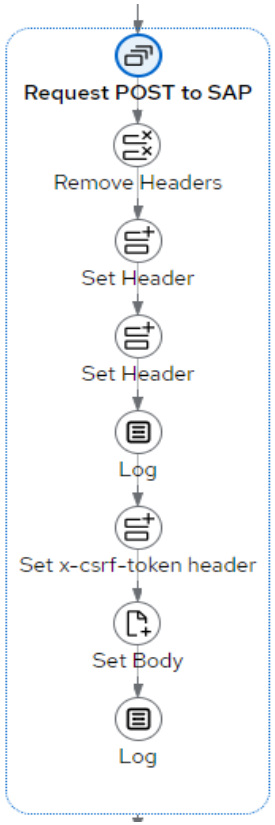
sapience™
Manufacturing Hub
Enterprise

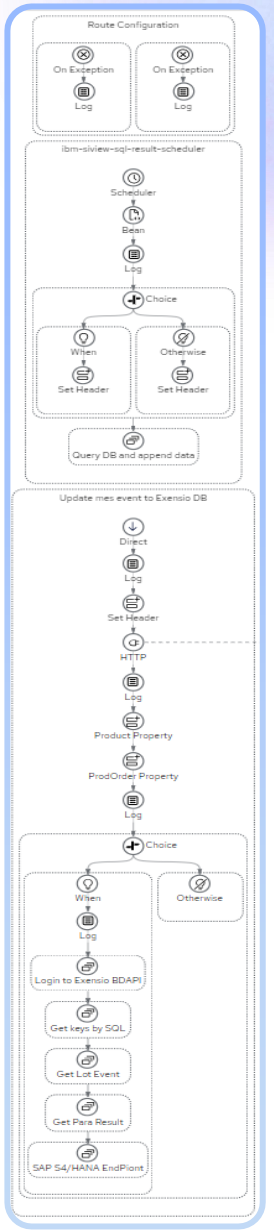
Features

sapience™ Manufacturing Hub Orchestration Project Editor



Orchestration editor allows users to **model complex data flows** and **mappings** to develop workflows





System **automatically aggregates** milestone **key parameters** and provides **workflow node** to access milestone aggregated data

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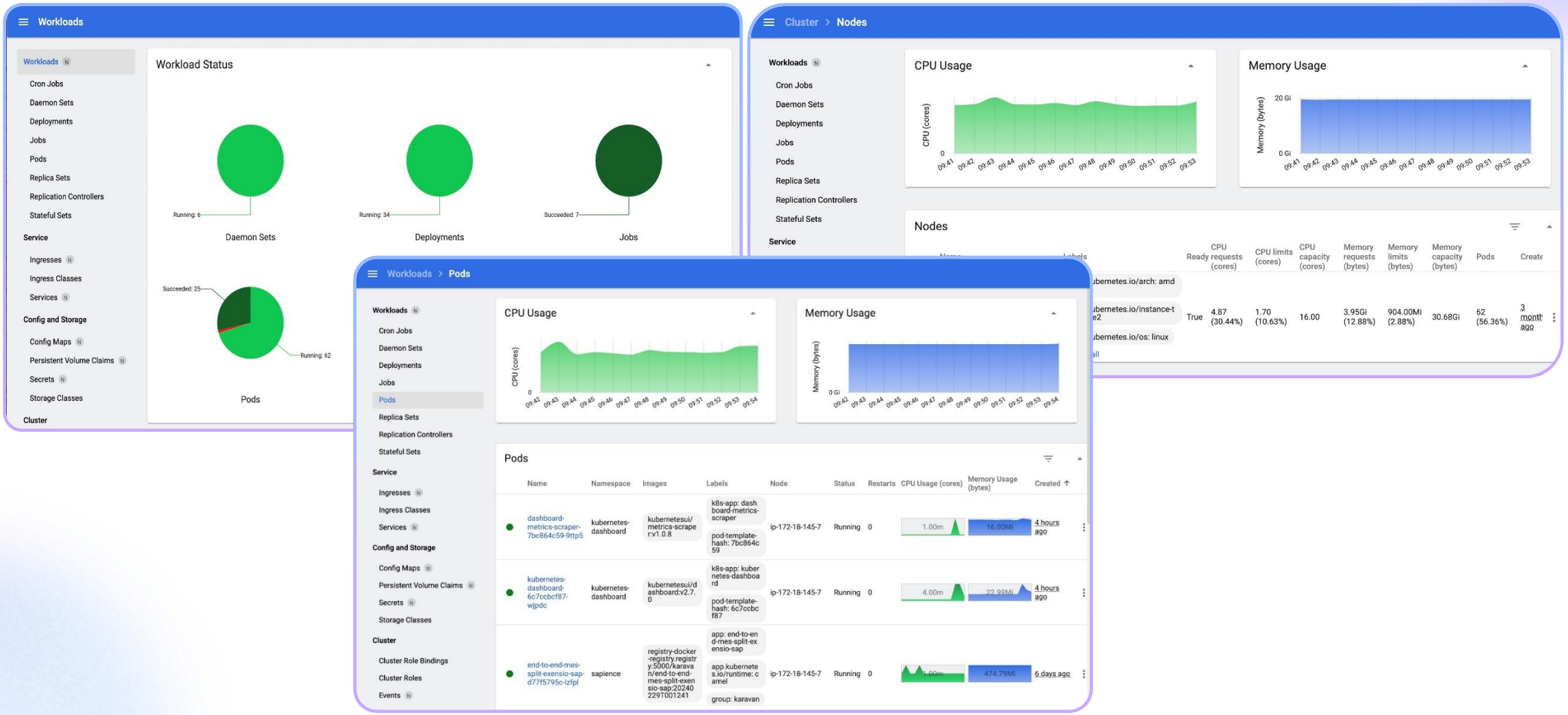
SMHe – Dashboard Monitoring of Workloads, Pods, & Nodes



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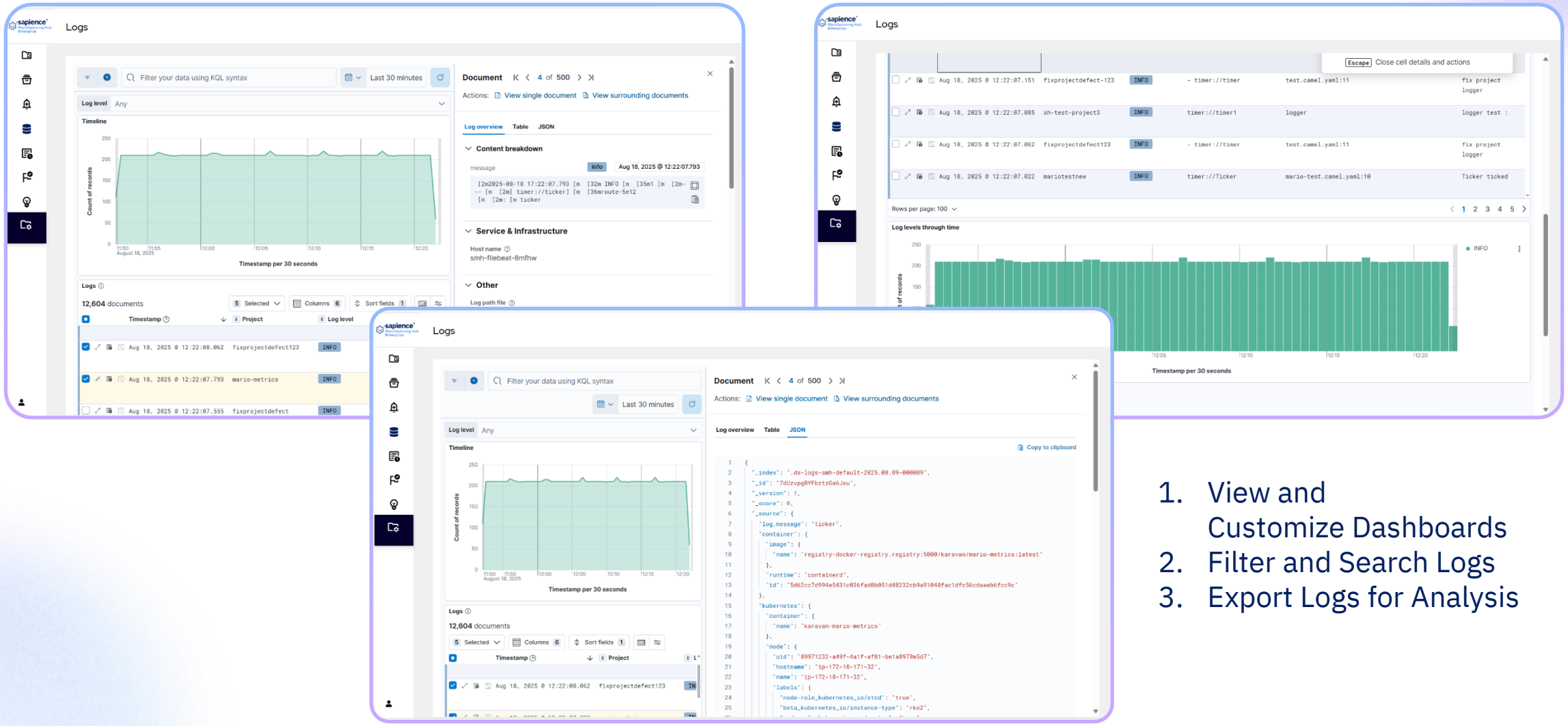
Detailed Log Views



1. View and Customize Dashboards
2. Filter and Search Logs
3. Export Logs for Analysis

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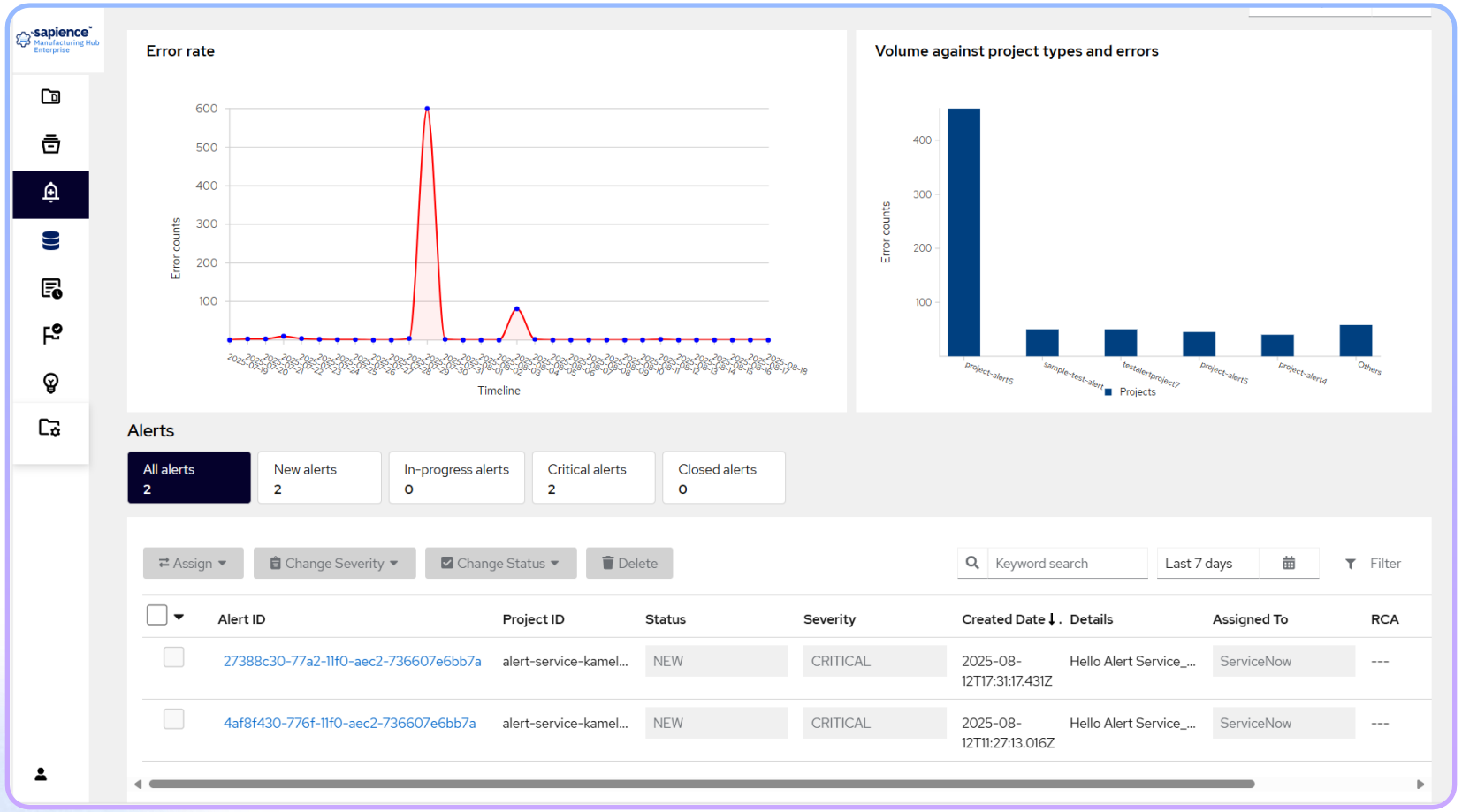
Error Lifecyle Management



1. Visualize Error Trends
2. Enable Error Reprocessing
3. Integrate with External Ticketing System

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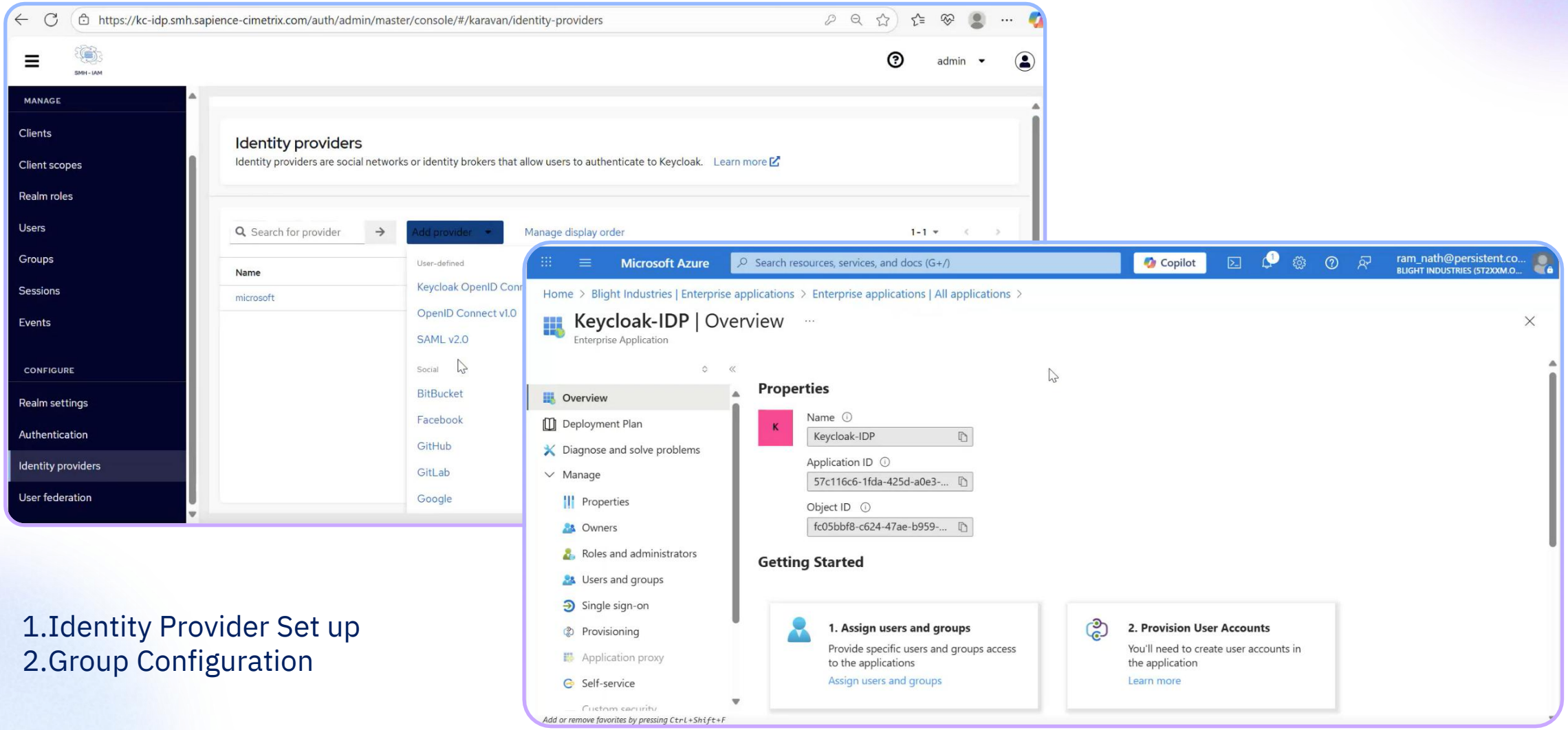
RBAC: Identity Provider Configuration



1.Identity Provider Set up
2.Group Configuration

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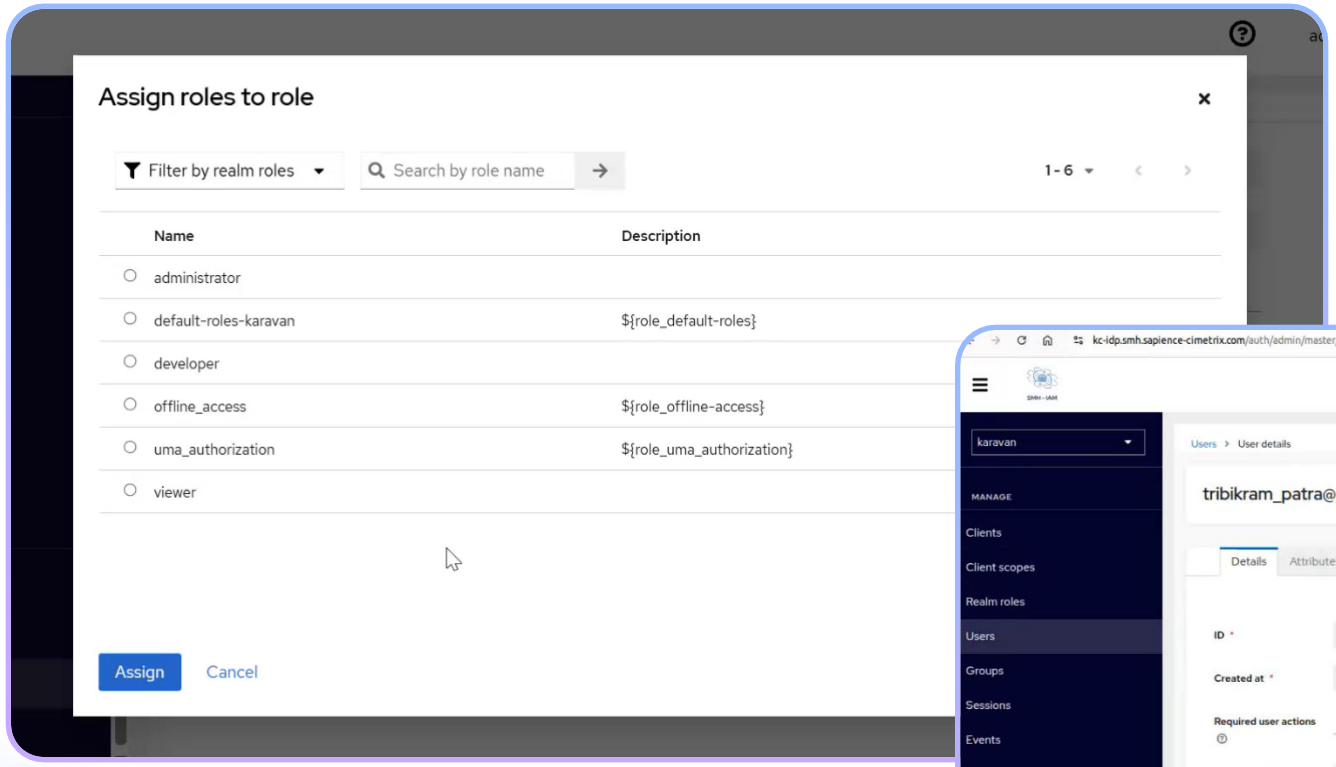
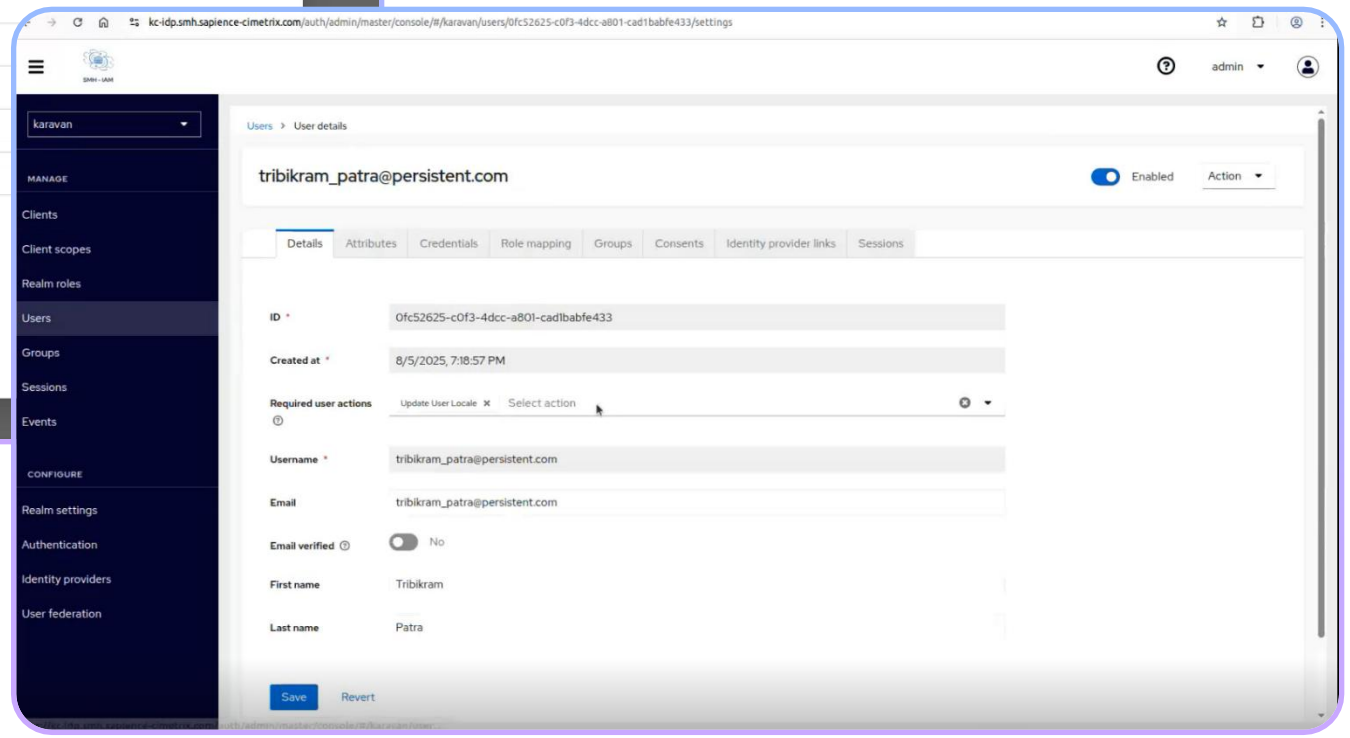
RBAC: Role Mapping and Assignment





1. Map Roles Intra ID and Keycloak
2. Assign Roles to Groups
3. Sync RBAC data between Systems

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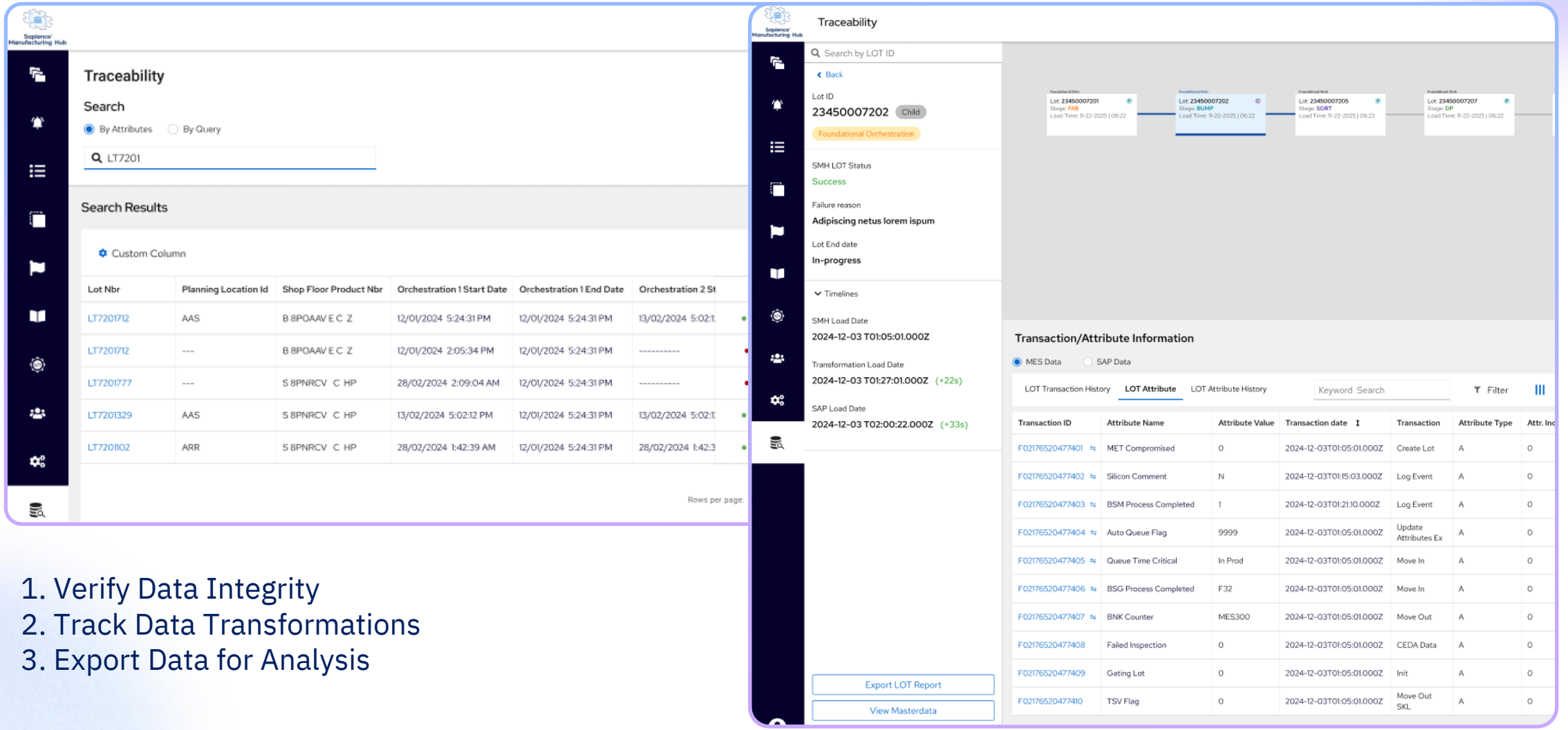
Traceability: Search and View Details



1. Verify Data Integrity
2. Track Data Transformations
3. Export Data for Analysis

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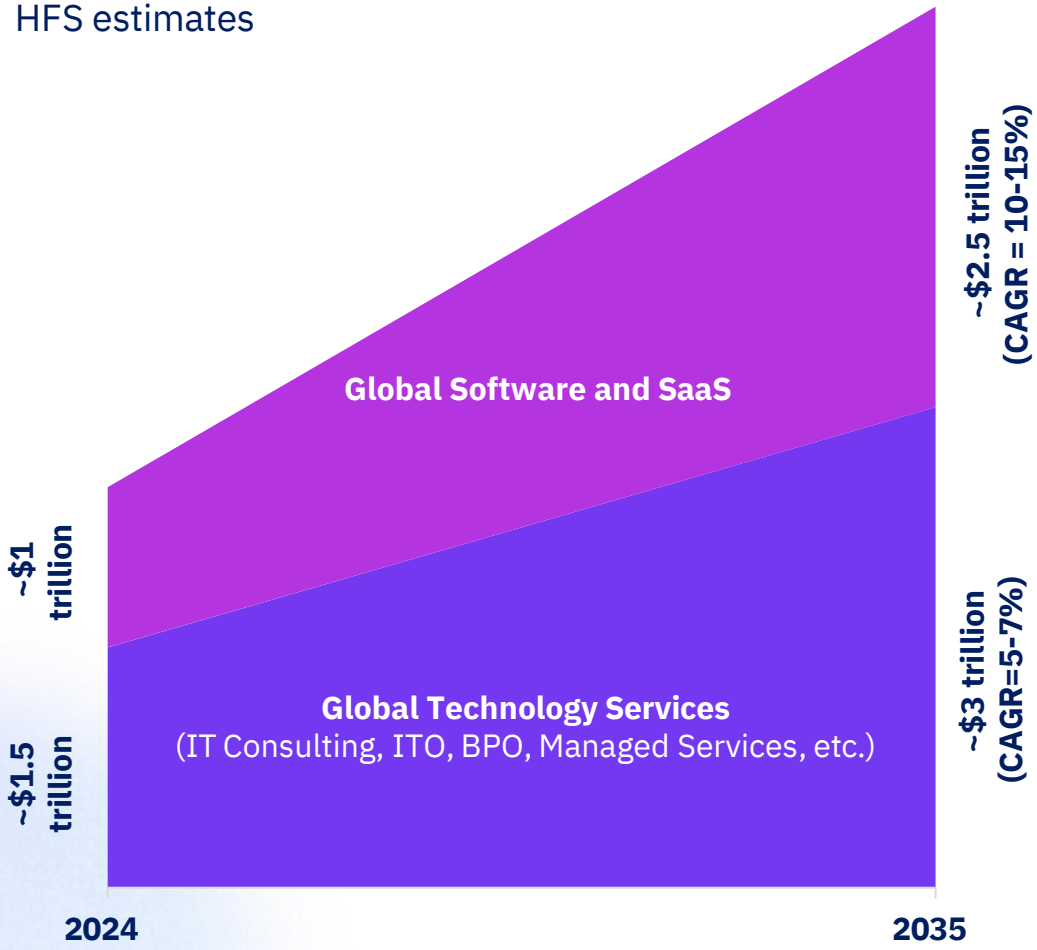
03.

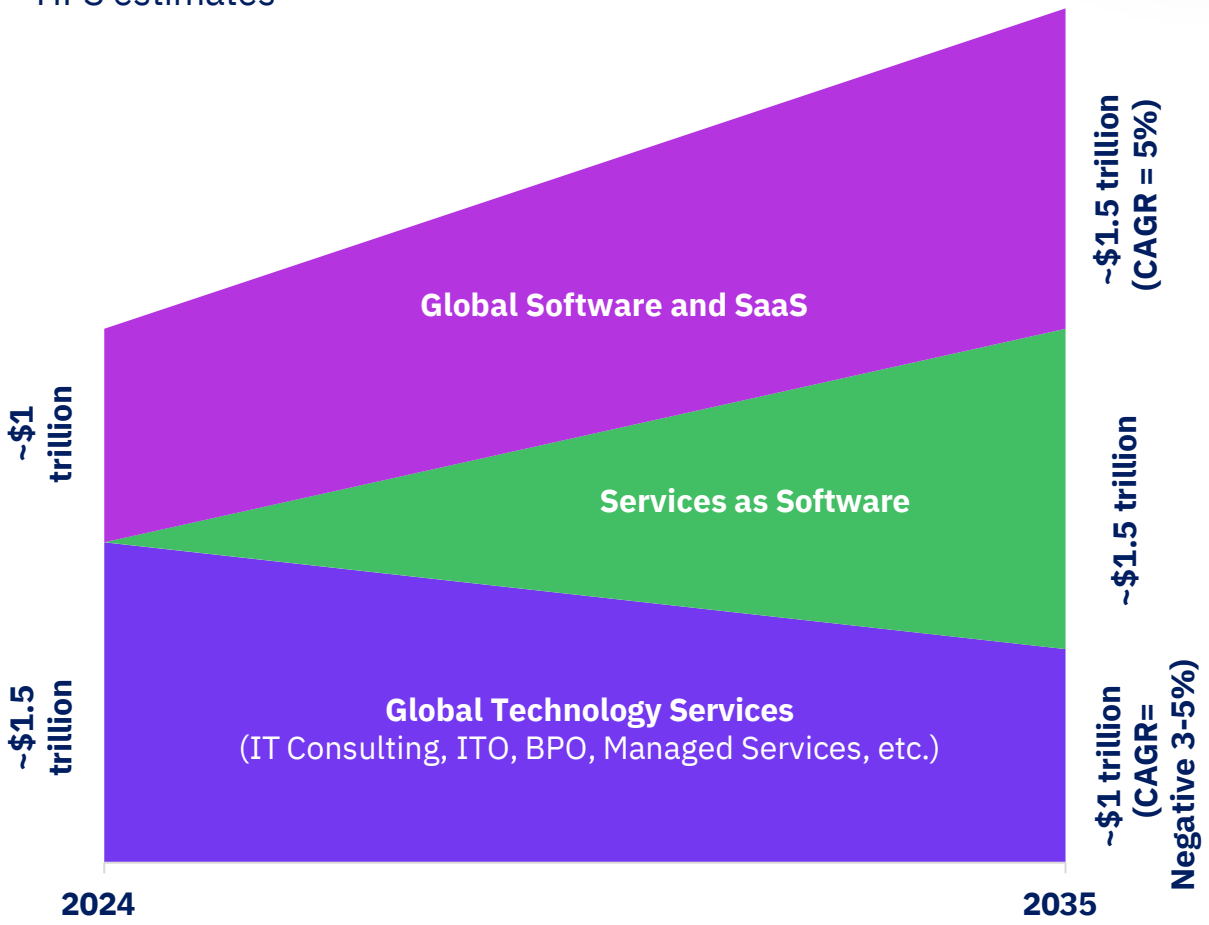
Services as Software

Services as Software – Emerging Market

Current market forecast for Software and Services (Excluding Services as Software)
HFS estimates



Projected market forecast for Software and Services (Including Services as Software)
HFS estimates



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Service as Software

Unlike traditional software-as-a-service (Saas), this model focuses on **delivering services primarily through technology**, minimizing human intervention, and maximizing efficiency.

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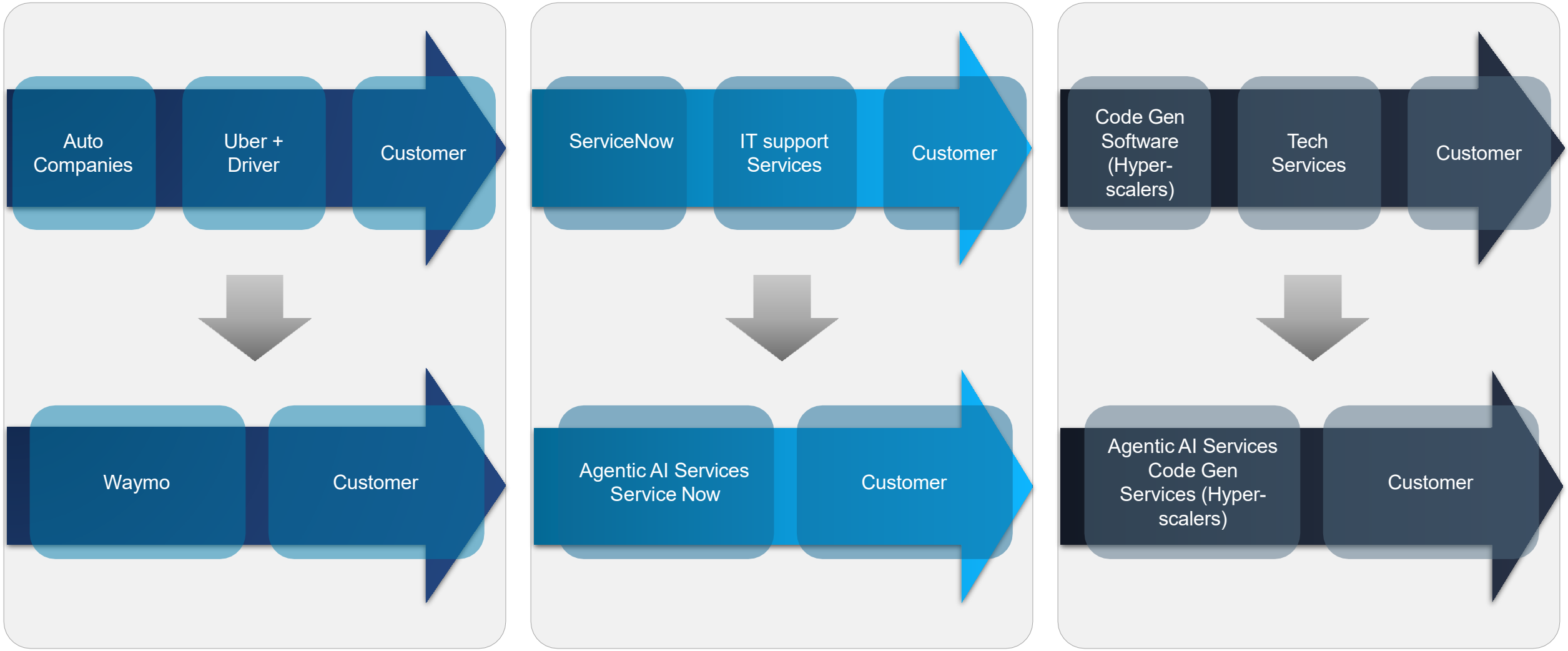
The rise of “service-as-a-software”: AI agents to deliver systems of action



Source : Zinnov Research & Analysis

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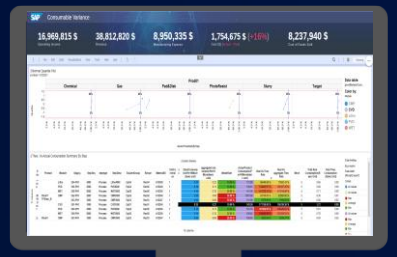
Enterprise SMHe Solutions - Examples

Op Product Costing

- Monitor actual cost at process and equipment level
- Reduce cost of non quality

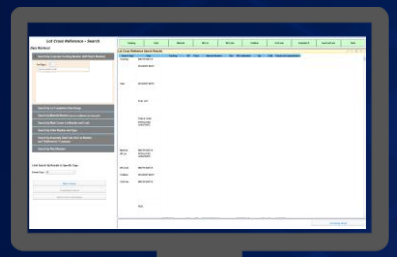
Product Costing Dashboard
(SAP ERP)



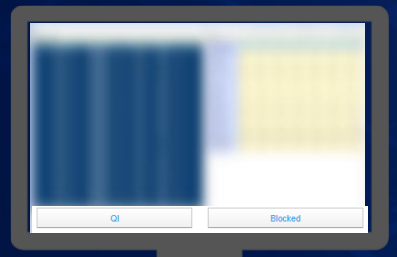
Consumable Variance
(PDF Solutions)

Quality Shield

- Reduce defect root cause identification time
- Contain risky material and Improve customer satisfaction



Lot Genealogy / xRef
(PDF Solutions)

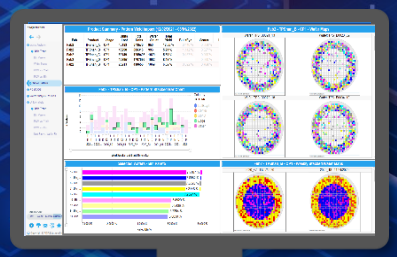


Lot Containment
(PDF & SAP ERP)

Cost of Yield Analytics

- Improve yield ramp to reduce cost of non-quality
- Increase revenue from new products

Finance
(SAP ERP)

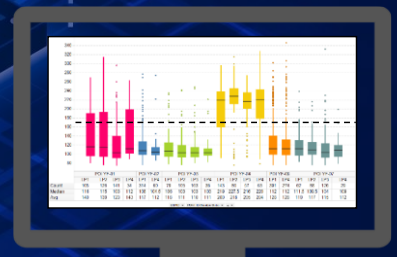


Operations
(PDF Solutions)

WIP Management

- Real-time production control with integration to MES at shopfloor
- Identify bottle-neck operations and improve on-time order fulfillment

Operation / Step Time



Operation / Equipment / Step Time

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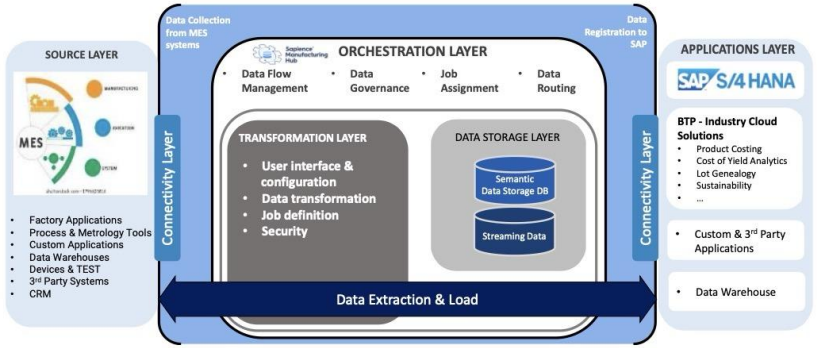
Ref: Jon Holt, PDF Solutions, Inc.. Sunil Gandhi, SAP. AI Enterprise Solutions. PDF AI Executive Conference, December 2024

SMHe Roadmap with AI Use Cases:

First products with SMH & S/4HANA & BTP



Incorporation of Deep Learning and Machine Learning for industry cloud solutions

N-2

- Cloud Interface
- Sapience Manufacturing Hub / S4 HANA
- BTP Integration

N-1

- HA and DR Improvements
- Integrated workflow
- Custom Components and Reuse

NOW

- Multi-AZ Cluster Deployments
- Centralized Error and Logging Mgt
- Orchestration workflow

N+1

- LLM Architecture
- Traceability and Error Mgt Dashboard
- Config Mgt
- Enhanced RBAC
- MDM Management

N+2

1. AI Assisted Orchestrations
2. AI Assisted Data Quality and Error Monitoring
3. AI Assisted Mock Data and Improved testing

- Standardized OS

sapience™
Manufacturing Hub Enterprise

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04.

Value Proposition and Summary

Quantifying Business Value of the Use Cases

#	Benefit Type	SMH - Value Driver	Improvement	Value Realization
1	Financial	Improve product throughput	**1% - 2%**	Annual Recurring
2	Strategic	Improve on-time delivery through real-time WIP insight and control/feedback to manage production orders	**3% - 5%**	Non-quantified
3	Financial	Accelerate value realization from faster deployment of MES/ERP interfaces - gain 2 years on a typical 5-year deployment	**60% - 80%**	Time to Value
4	Financial	Reduce cost of building MES/ERP interfaces (Build vs. Buy)	**30% - 50%**	One Time
5	Financial	Reduce cost of maintaining MES/ERP interfaces	**70% – 80%**	Annual Recurring

#	Benefit Type	APPS - Value Driver	Improvement	Value Realization
6	Financial	Improve profitability / Margin with accurate operational cost insight and analysis	**1% - 2%**	Annual Recurring
7	Financial	Improve product costing efficiency	**20% - 40%**	Annual Recurring
8	Financial	Improve batch traceability/lot genealogy management efficiency	**20% - 40%**	Annual Recurring
9	Strategic	Yield loss impact - understand yield loss impact to revenue	**0.5% - 1%**	Non-quantified

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Summary SMHe Value Proposition for Semiconductor

Supply Chain Integration

Streamlines communications across the supply chain, integrating suppliers, manufacturers and distributors. Real-time data sharing enables efficient data management, production management and order fulfillment, leading to reduced lead times and improved customer satisfaction.

ERP and CRM Integration

By connecting ERP and CRM systems, will ensure seamless data flows between sales, production and finance departments. This seamless views provides a holistic view of Operations and customer interactions, enabling informed decision- making and enhanced customer service.

Equipment / Tool (IoT) Integration

Integrate semiconductor end-end tools and devices, capturing machine data in real time. This data can trigger alerts for equipment issues, feed into predictive maintenance, and contribute to improvin production efficiency. Also, providing an infrastructure that enable the deployment and running of AI models at the edge across the manufacturing global factory network.

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08.

Panel Discussion

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Helena Chong
SAP

Gopala Krishna
Global Foundries

Viswa Anakkara Vadakkath
Deloitte

Dev Srivastava
INTEL

Randy Hierbaum
PDF Solutions

Ranjan Chatterjee
PDF Solutions

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