AVEVAWORLD

PARIS

Presentation Agenda

01 Digital Transformation Strategy

02 Data Centric Engineering

03 Digital Twin to support Data-Driven

04 Digital Twin Journey

05 Q & A

Presentation
Agenda

01 **Digital Transformation Strategy**

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Corporate Profile

Comprehensive Engineering Company established **in 1961.**

Process Plants

- ●Oil & Gas Production
- ●FPSO / Offshore Platform
- ●LNG

...

Non-Process Plants

- ●Power Plants
- ●Transportation
- ●Environmental
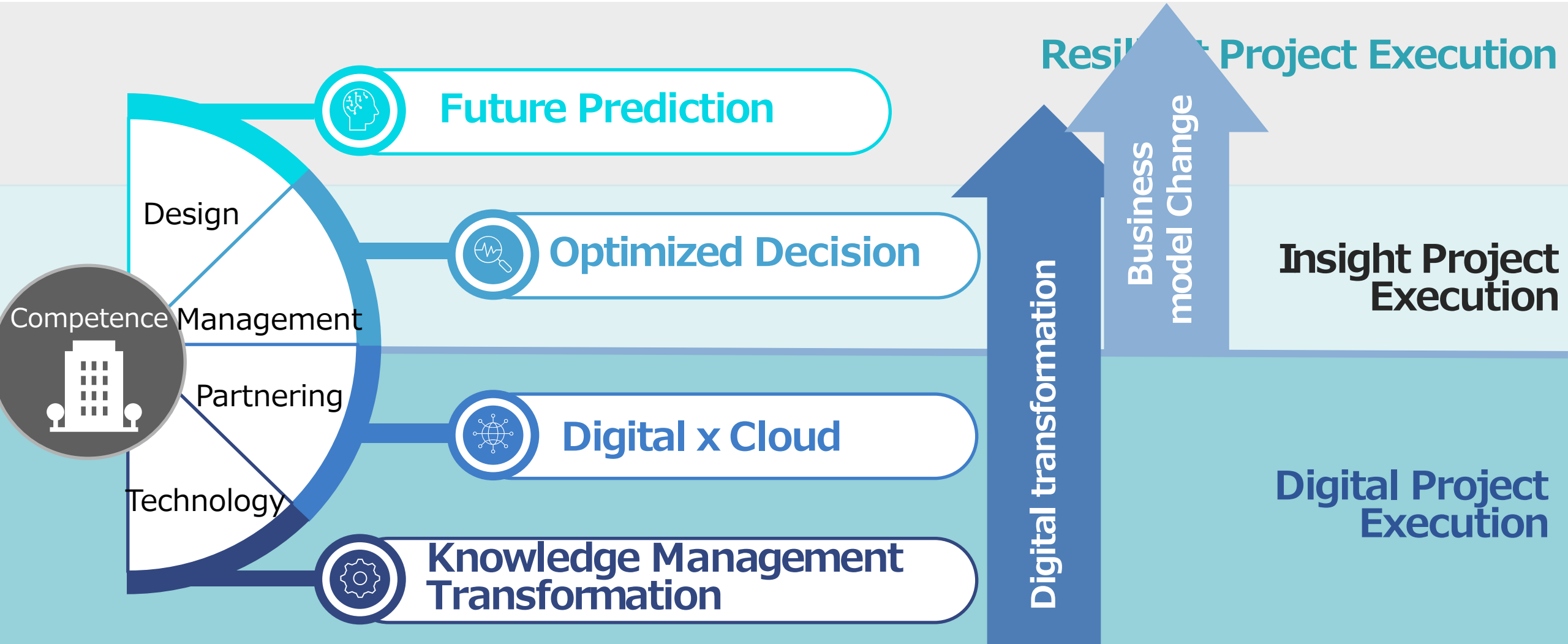- ●Pipeline Water Treatment

...

Global Network (10 Countries)

Number of employees: 7,243

(Including 182 employees at domestic affiliates)
As of June 2024

Digital Transformation Strategy

Core competence x **Digital Transformation** to evolve project execution methods.

Presentation Agenda

01 Digital Transformation Strategy

02 **Data Centric Engineering**

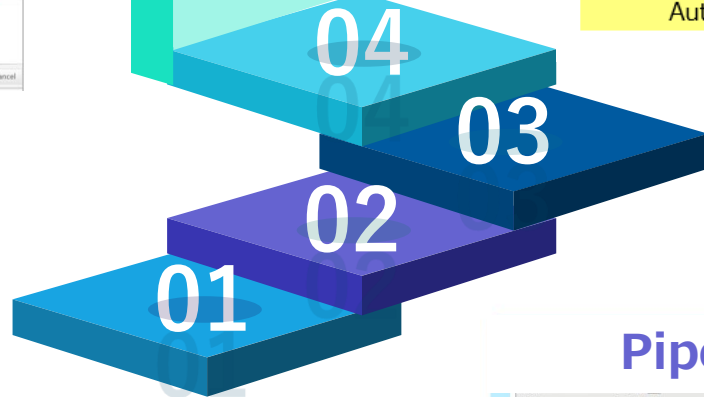**03** Digital Twin to support Data-Driven

04 Digital Twin Journey

05 Q & A

Engineering Digital Transformation

04 Digital Twin
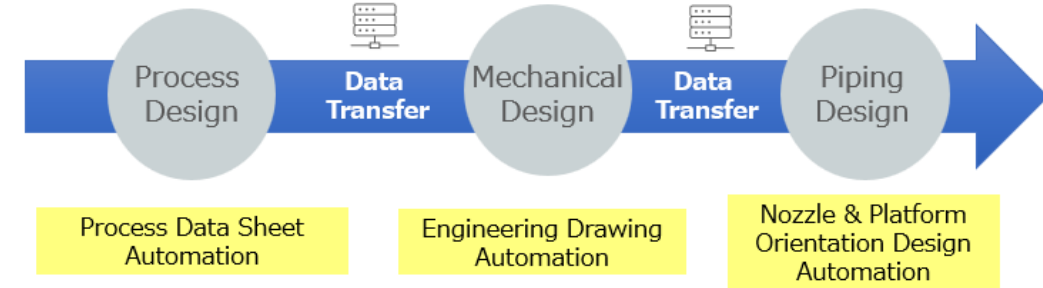### Engineering Quality Visualization in Real Time

AVEVA™ Asset Information Management

Design Maturity

01 Quality Improvement
Digital Design Quality Check

Support Type Check

◆ SPT-455-E02: Support type is not matched

Thermal Stress Analysis Model

3D model

alteryx → Integrity Report "NG"

100 rules established

To 6 Times Productivity

04
03
02
01

03 BPR Value
BPR combining Individual automations

Process Design → Data Transfer → Mechanical Design → Data Transfer → Piping Design

Process Data Sheet Automation

Engineering Drawing Automation

Nozzle & Platform Orientation Design Automation

02 High Efficiency
Design Automation

Pipe support design MH 50% reduction

alteryx

Approx. 200 automation model

8
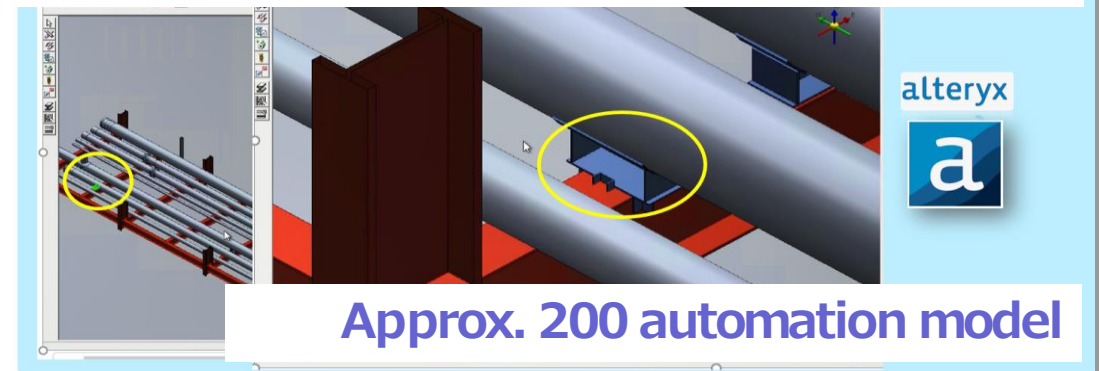
Demonstration

Construction Equipment Position Information

RFID Website Supplied Materials

Worker Location Information

Construction Status
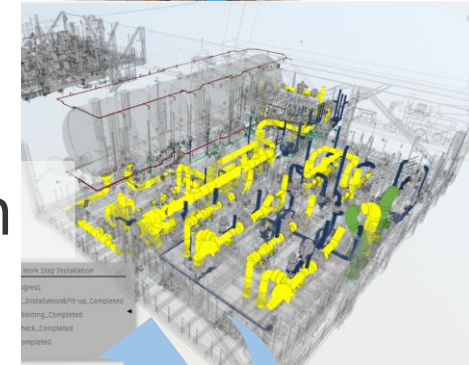
Real-time data acquisition

Cyber World

Real World

Feedback

Digital Twin

Synchronization with the virtual construction model

3D Model
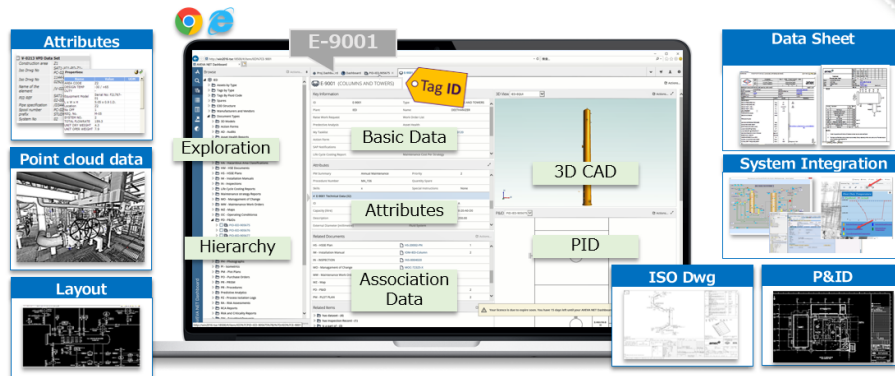
Data-Centric Engineering   (Cloud Native)

Engineering Digital Twin Overview

Integration - Digital Twin -
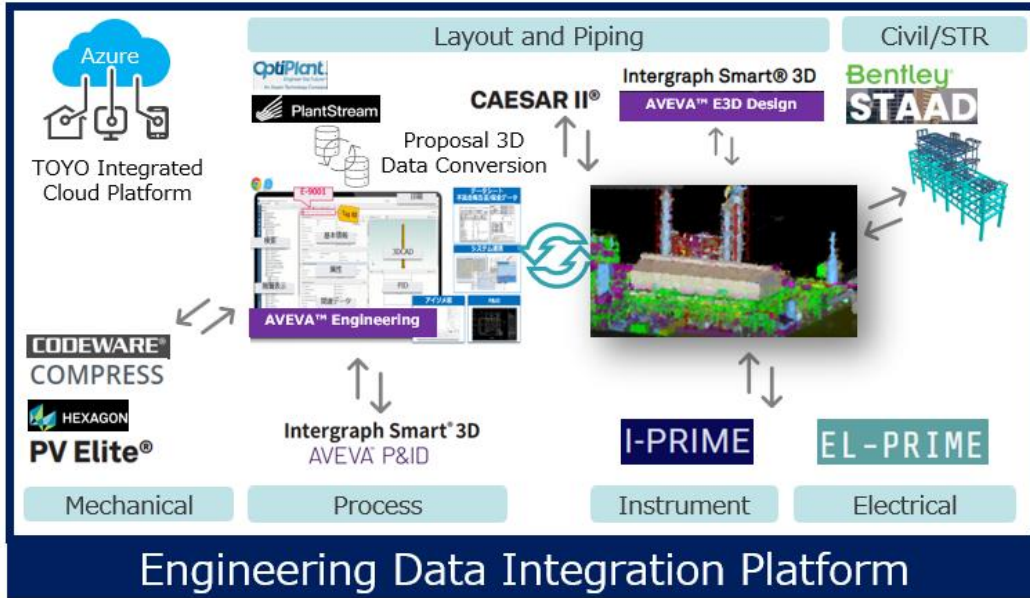
AVEVA™ Asset Information

Engineering Data Integration Platform
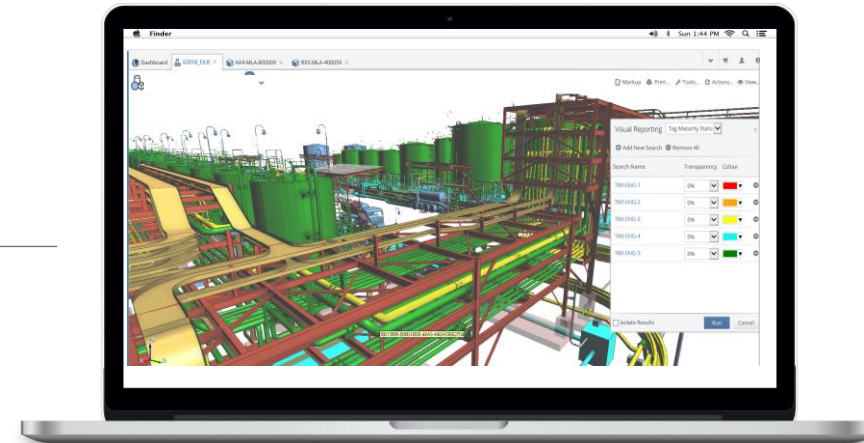
Engineering Status 3D Visualization

Planning
Basic Design Automation

Execution
Design Automation

Monitoring & Control
WP Progress
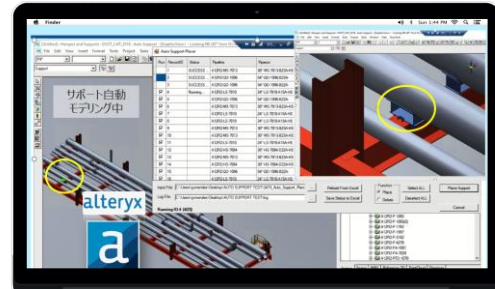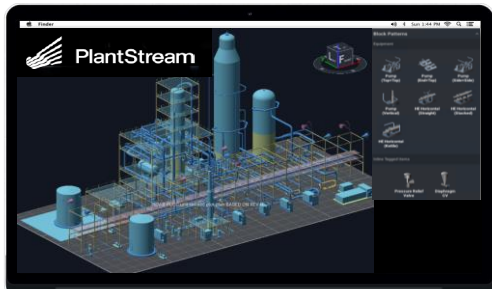
Audit & Inspection
Design QC Tool

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Data-driven strategies to improve the decision-making quality

Enables accurate visualization of the current situation, improves predictive accuracy through data-driven hypothesis-testing, and supports decision-making through "rule of thumbs".

Visualization →	Digital Twin Powered by AI			
Aggregation and Course of Events	**Prediction and Simulation**	**Optimization**	**Dynamic Planning**	**Diversity Assessment**
Questions: What are the current and future risks and challenges?	What would be happened when you do this?	What needs to be done to achieve the strategy?	Do we need to back on track? How to fix it?	What measures and risks do you see without bias?
Technology to answer: BI tools	**Machine Learning**	**Mathematical Optimization**	**Scenario Planning**	**Generative AI**

Engineering Digital Twin powered by AI

Implementation of data-driven methods, prediction and simulation, optimization, dynamic planning, and diversity assessment as accurate decision support.
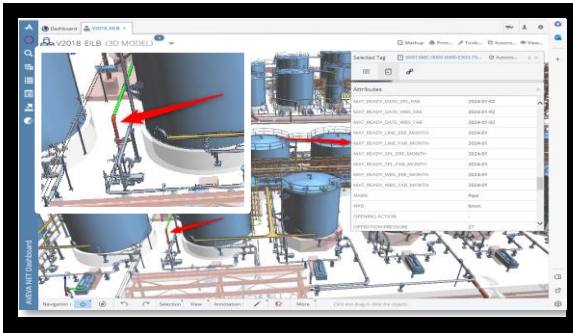
Prediction and Simulation	Optimization	Dynamic Planning	Diversity Assessment
Workfront stability prediction	**Multiple schedule options per project strategy**	**Dynamic constraint management by 3D information**	**Generative AI summarizes each output data from various perspectives**
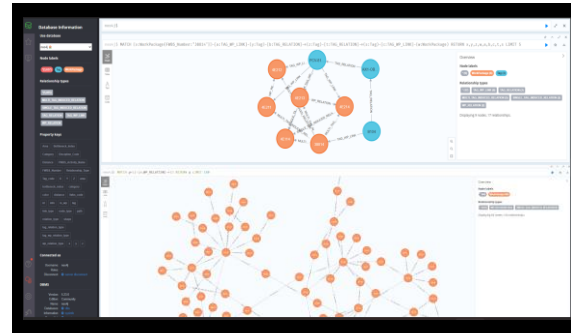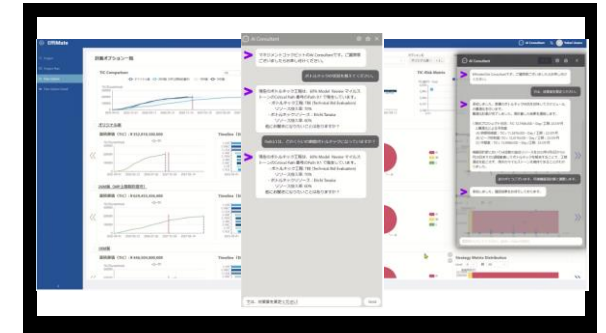
Customized AI   Generative AI

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Simulation at Engineering Digital Twin

Achieving simulation of past, present, and future by the aggregated data.

Engineering Systems

PRS-PRIME (In-house)
- Tag Status Management

System Design

Intelligent P&ID
- Tagging
- Hydraulics

Correlation

Layout Design

Caesar II

Automation

3D

Automation

Control System Design

Construction Design

I/EL-PRIME (In-house)

E&I Design Tool

- Stanchion Model
- Cable Routing
- Cable Support
- CV Sizing

MDM Systems

AVEVA Engineering

- Tag/List Management
- Revision Control
- Data Validation

EDM Systems

TeamBinder
- Engineering Deliverable
- Vendor Deliverable

1D

2D

3D

Engineering Digital Twin

Automation

Simulation

AVEVA AIM

EPC-HUB

- Project Schedule
- CWP Priority (ROS)
- Material Delivery

Past & Present: Quality & Progress

Future: Workfront Simulation (Material Shortage Analysis)

Engineering X Schedule Optimization Simulator

Effimate is an schedule optimizer and generate various optimized schedule scenarios and resource loading plan.

INPUT	PROCESS (Auto)	OUTPUT

BoQ

Case-1 Case-2 Case-3

AVEVA Engineering

Productivity

STD FWBS relations

Dependence

WP WP
WP
WP
E-101
WP WP
Constraint
WP
PG-101

EffiMate™

co-developed with
accenture

Automatic schedule creation

Case-1 Case-2 Case-3

Resource loading simulation

CASE-1 Case-2 Case-3
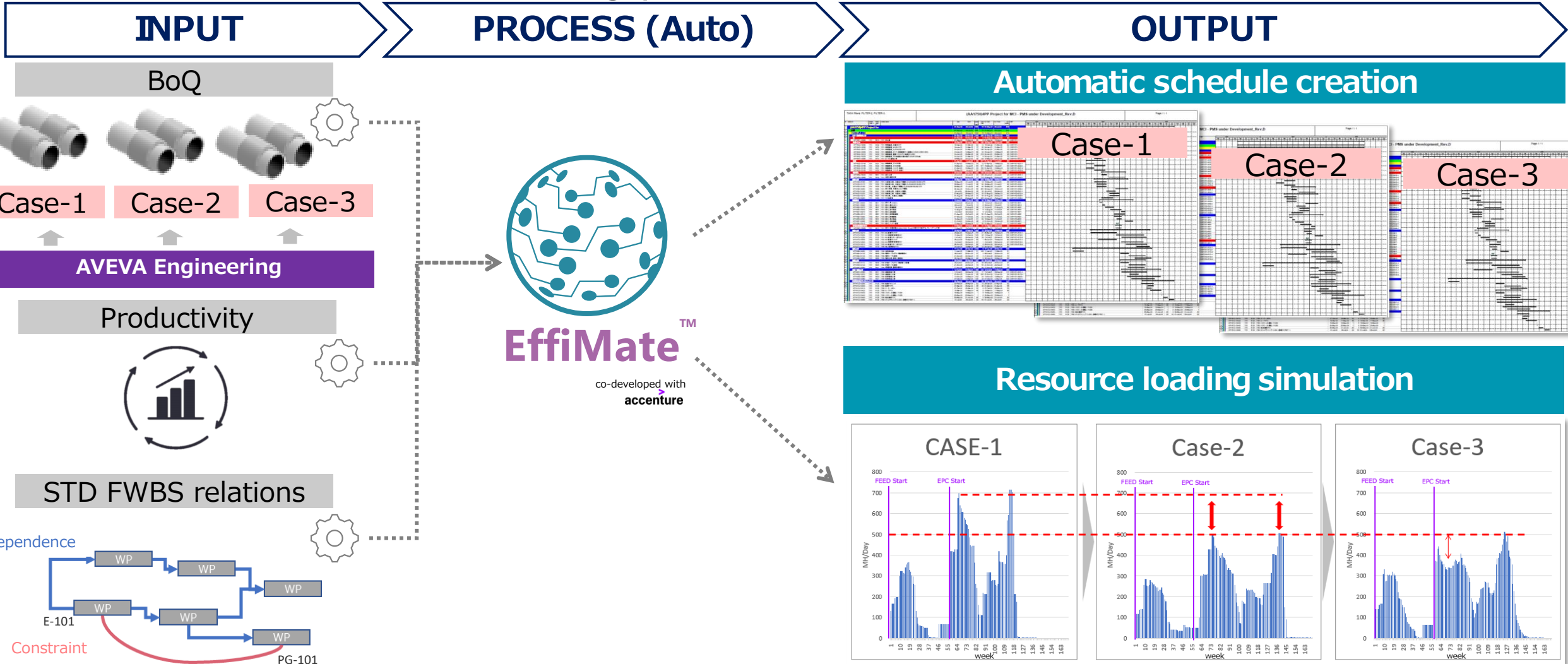
Dynamic Engineering Schedule Management

Work package relation for schedule management is created through WP-Tag, Tag-to-Tag relation data maintained in AVEVA ENG/AIM. Work package relation is utilized for schedule management in REDMINE/P6.
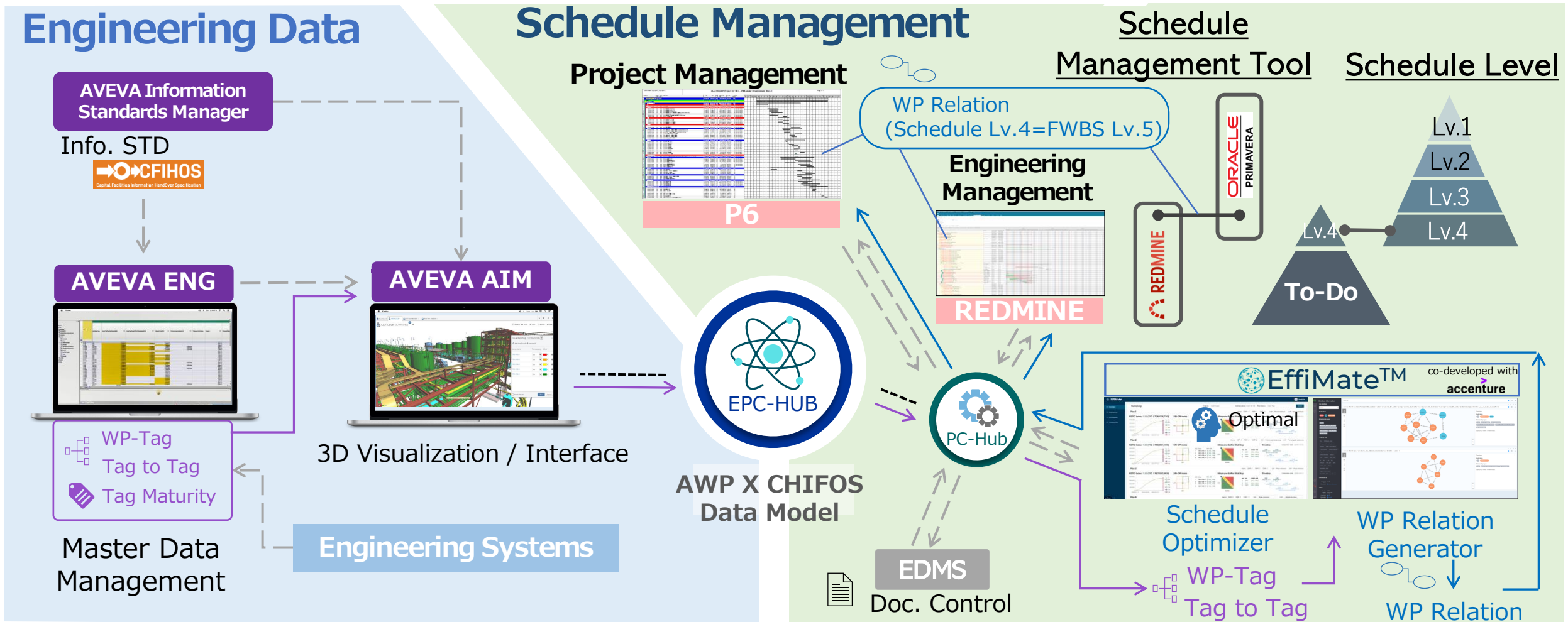
Dynamic Engineering Constraint Analysis by AI
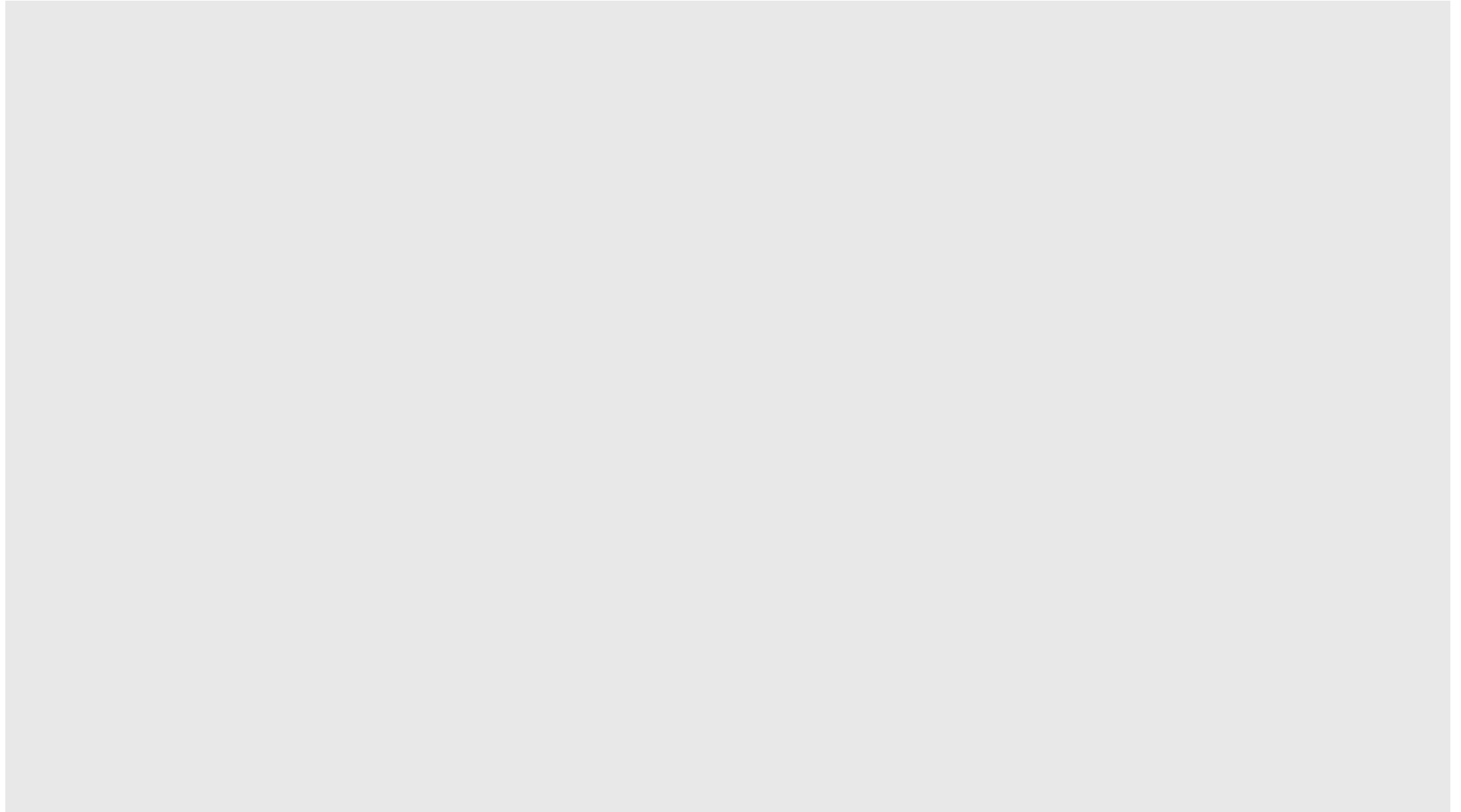
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Digital Twin to realize Plant Life Cycle

Engineering (System) → Engineering (Layout) → Procurement / construction → Commissioning → Operation and Maintenance

Intelligent P&ID

AVEVA™ Asset Information Management — **Engineering Digital Twin**

Construction Digital Twin (workpacks)

AVEVA™ Asset Information Management — **Commissioning Digital Twin** (Digital Handover)

DX-PLANT®
- ● Information Integration Service — Engineering Digital Twin (E)
- ● Operation Support Service — Real-time Mirror Plant (O)
- ● Maintenance Support Service — Predictive Maintenance (M)
- ● Business Support Service — Vertical Integration with ERP (B)
- Virtual Plant

EPCC Project Digital Twin

Manage the Tags in EPC-Hub/Dashboard
Tag Maturity / Tag Quality   WP Progress   EPC-HUB

Create/Modify the Tags in Systems of Record
ORACLE PRIMAVERA   Polaris   HEXAGON   AVEVA   ORACLE ERP   workpacks

Define the Tags
Data Hierarchies   Data Governance   Standard Code   CHIFOS Code

Ecosystems / Engineering ⇔ Construction

Digital twin has expanded into the construction domain by integrating engineering data with construction processes.

SUCCESSFUL
1 Year
Pilot Project

Demonstrated the full capabilities of **WorkPacks**, integrating seamlessly with **TeamBinder**, **iCon**, and **FRMS** applications.

Administrator Proficiency

Toyo administrators have achieved proficiency in independently operating **WorkPacks**, ensuring long-term sustainability and efficiency.

Processed more than
0.5 TB
of TOYO Data

In 10 months, alongside TOYO we redefined efficiency. Fully Automated DTs.

100's
OF HOURS OF MANUAL WORK SAVED.

We have around
35+
flows to capture input and Output Data from and To Digital Threads

Dramatic
Time Reduction

WorkPacks has dramatically reduced the time required for creating packages, cutting down from several hours to just minutes, leading to increased productivity and faster project delivery.
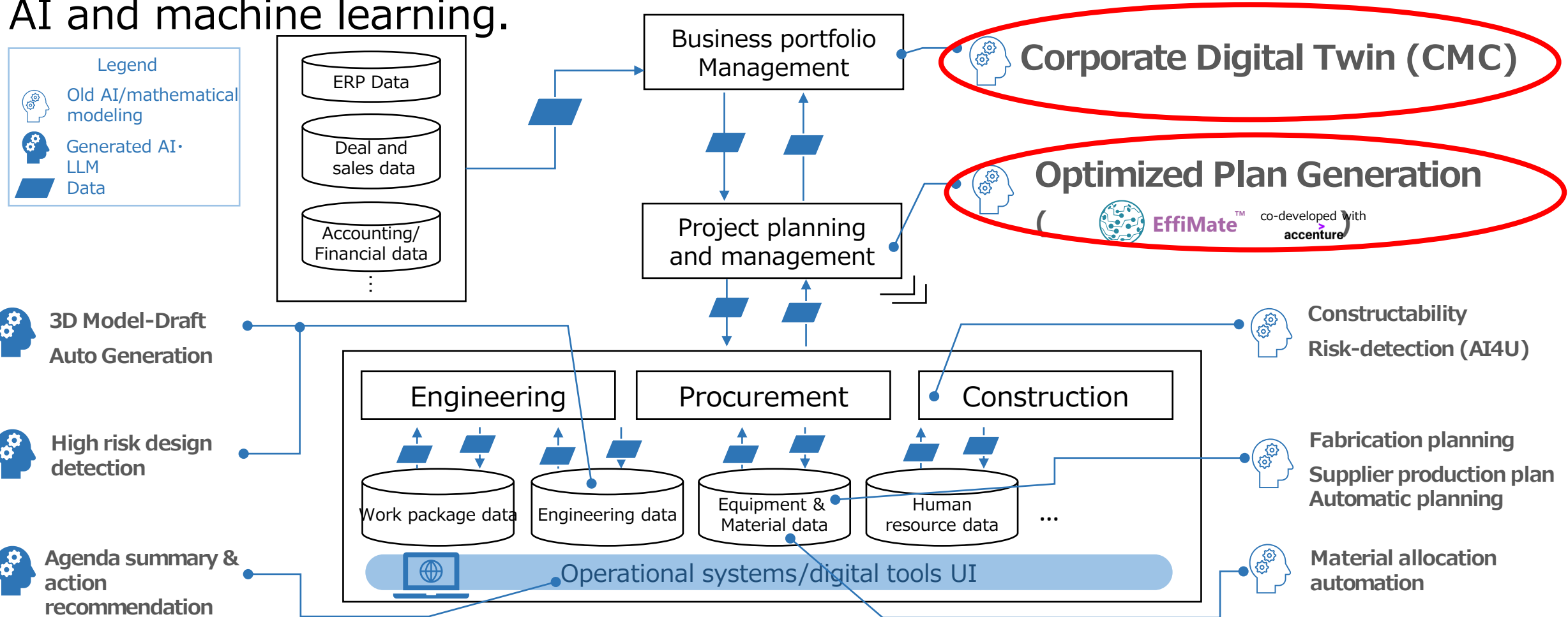
India's Project

First production deployment of **WorkPacks** in **India** on the Project, marking a significant milestone in **TOYO's digital transformation journey.**

Corporate Digital Twin

Digital twins is enabled by digitalizing business processes and creating standardized data models, which support advanced data utilization through AI and machine learning.

Legend

- Old AI/mathematical modeling
- Generated AI·LLM Data

ERP Data

Deal and sales data

Accounting/Financial data

Business portfolio Management

Corporate Digital Twin (CMC)

Project planning and management

Optimized Plan Generation (EffiMate™ co-developed with accenture)

3D Model-Draft Auto Generation

High risk design detection

Agenda summary & action recommendation

Engineering

Procurement

Construction

Constructability Risk-detection (AI4U)

Fabrication planning

Supplier production plan Automatic planning

Material allocation automation

Work package data

Engineering data

Equipment & Material data

Human resource data

...

Operational systems/digital tools UI

At present, more than dozens of AI·ML and mathematical models are incorporated into the business and all data is integrated.

6 Times Productivity up Challenge by 2025

Now 50% Progress Realized

Challenge

- Integrated multi-dimensional data (1D to 7D) across various divisions and disciplines.
- Achieved vertical penetration of the value chain within the corporate hierarchy, including branch companies.
- Expanded the value chain horizontally beyond traditional external companies.

Solution

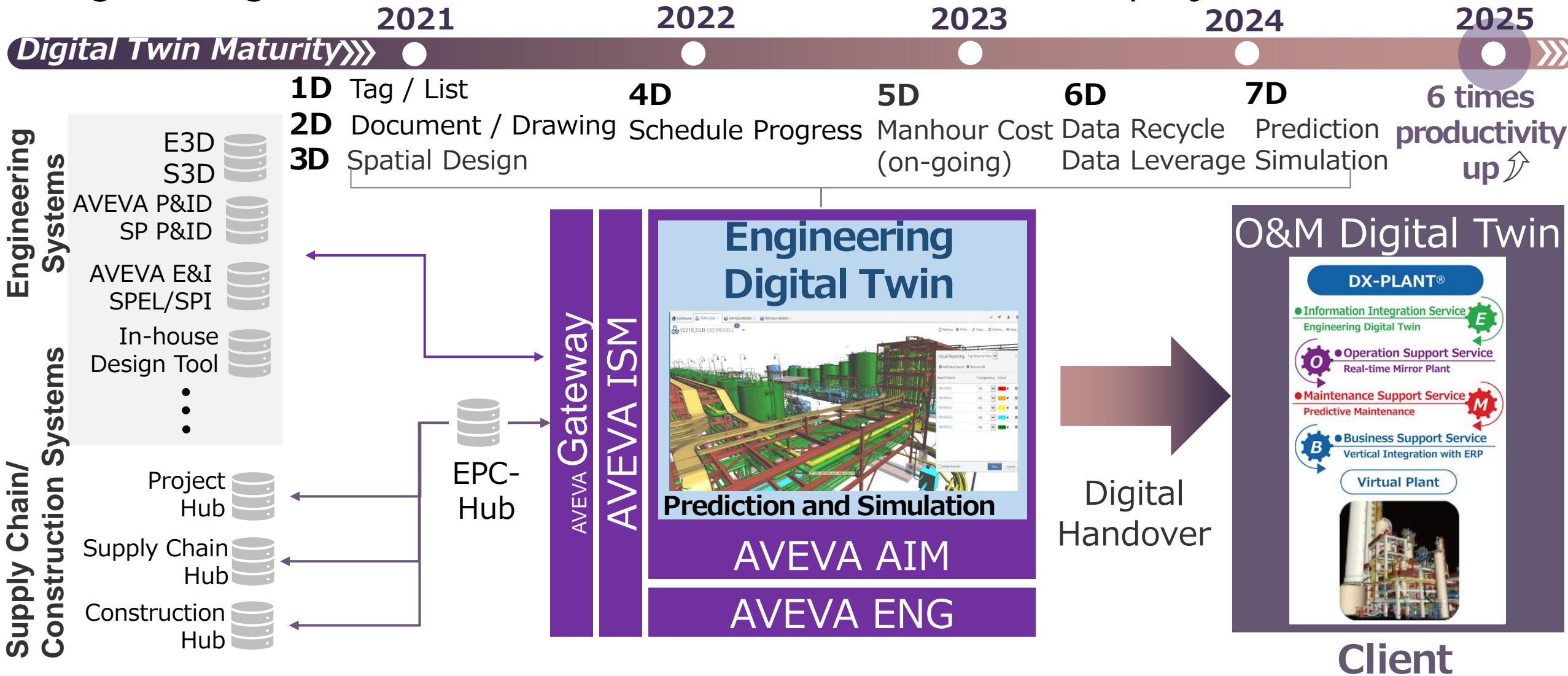- Introduced AVEVA Suites (AVEVA ENG/AIM, E3D, P&ID, E&I) with Customization
- Integrated External, In-house software with AVEVE ENG/AIM with Optimization

Results

- Realized Data Centric Engineering Foundation by AVEVA Suites
- Realized 26% Engineering MH Reduction by AVEVA Suites with Other Solution
- Currently, dozens of AI/ML models and mathematical models are integrated into operations and data consolidation

Digital Twin Load Map

3D Model is linked to EPCC data, visualizing the linked data including engineering status with risk and schedule simulation for project execution.
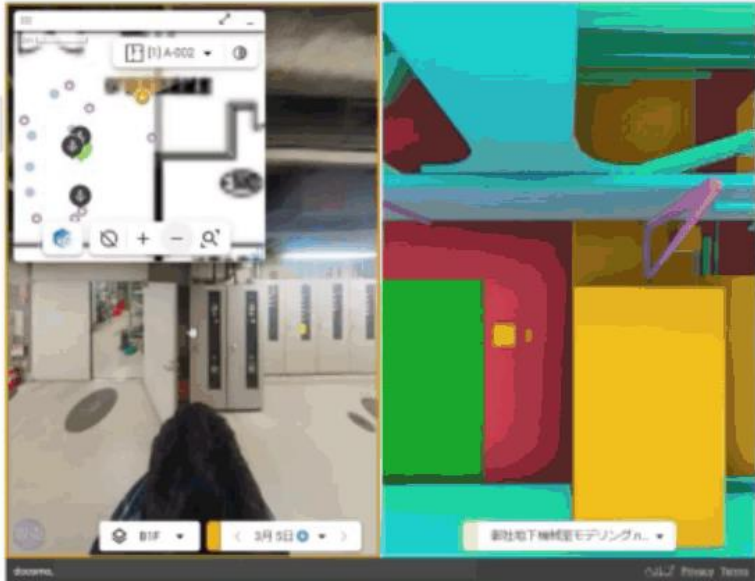

Timeline: 2021 — 2022 — 2023 — 2024 — 2025

Digital Twin Maturity »»»

1D Tag / List
2D Document / Drawing
3D Spatial Design

4D Schedule Progress

5D Manhour Cost (on-going)

6D Data Recycle Data Leverage

7D Prediction Simulation

6 times productivity up ⇧

Engineering Systems
- E3D
- S3D
- AVEVA P&ID
- SP P&ID
- AVEVA E&I SPEL/SPI
- In-house Design Tool
- ⋮

Supply Chain/ Construction Systems
- Project Hub
- Supply Chain Hub
- Construction Hub

EPC-Hub

AVEVA Gateway

AVEVA ISM

Engineering Digital Twin

Prediction and Simulation

AVEVA AIM

AVEVA ENG

Digital Handover

O&M Digital Twin

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Virtual Plant

Client

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05 **Q & A**

Thank you

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