First steps toward a digital twin for existing plants in the process industry

Tom Jacobs
Stephan Leufke

AVEVA PI World Amsterdam

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No product is so perfect that you can't improve it.

more fuel-efficient	fluffier	bouncier	healthier	more effective

TIRES   **TOWELS**   **MATTRESSES**   **NUTRITION**   **TABLETS**
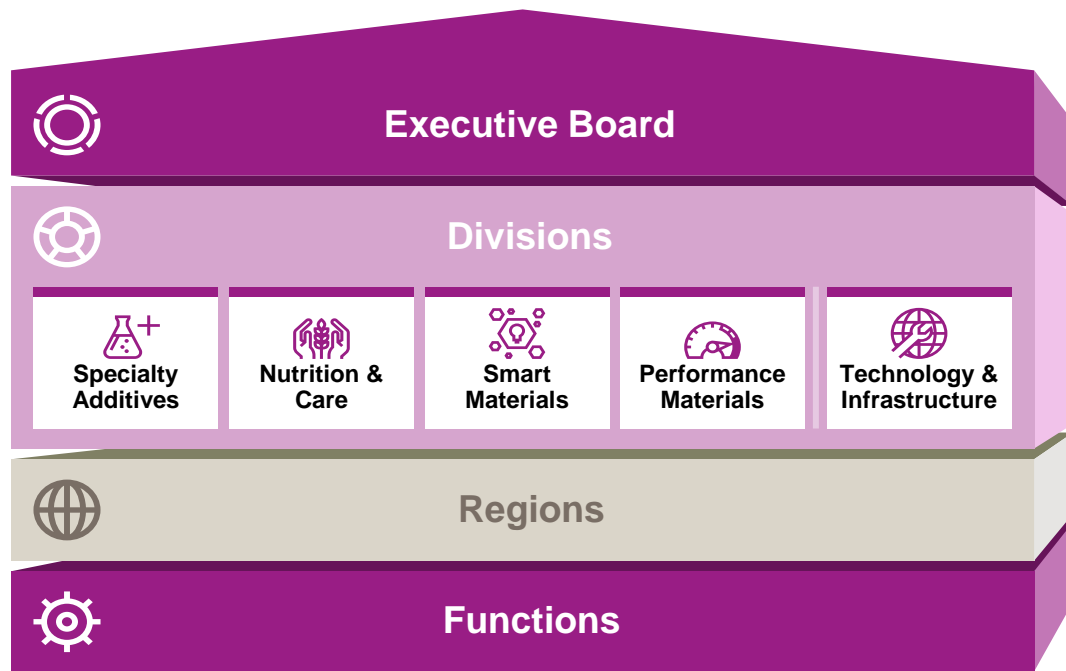
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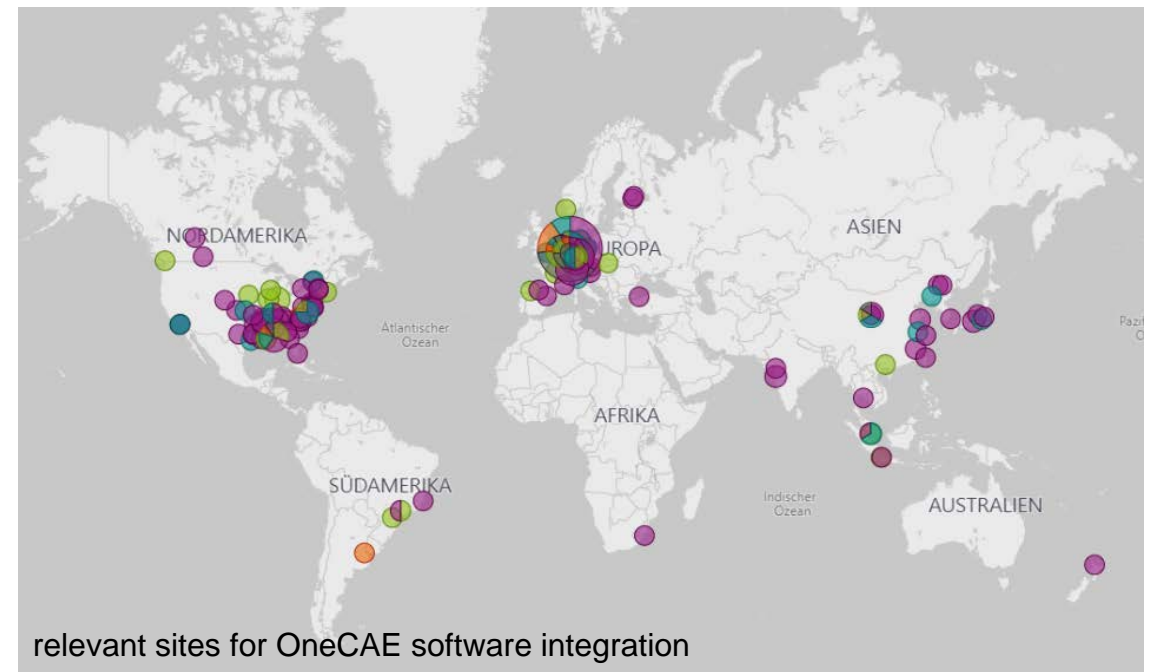Leading Beyond Chemistry

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The Evonik Structure

The Specialty Additives, Nutrition & Care, Smart Materials, and Performance Materials divisions are our engines for profitable growth.

They are supported by the Technology & Infrastructure division.

> 33.000 Mitarbeiter

106 Nationalitäten

Executive Board

Divisions

| Specialty Additives | Nutrition & Care | Smart Materials | Performance Materials | Technology & Infrastructure |

Regions

Functions

relevant sites for OneCAE software integration

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Agenda

- **Current situation at Evonik → Digital Twin**

- OneCAE : definition of the future and harmonized CAE landscape

- What about existing plants ?

- Example of a pilot migration project

- challenges

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The Digital Twin is the foundation for future ways-of-working and an enabler for the generation of savings along the Asset Lifecycle

Current situation

- **No harmonized** data model in the processes along the Asset-Lifecycle.
- Heterogeneous and complex system landscape with **>164 IT-systems** for process development, engineering and technical services.
- In some parts: Work with **paper and excel.**
- Media- and structure breaks between creation and application of plant documentation.
- **Decentralized support** for applied systems (high headcount, high cost for licensing and IT infrastructure).
- No common IT-supported processes, no data governance

Technological Vision

- A Digital Twin that **extracts valuable information** from legacy documentation and transforms it into a catalogued, linked set of information and data.
- Newly established data driven processes and data quality assurance will be ensured through local **data governance**.
- Through the additional **integration of systems**, the Digital Twin can offer the benefit of creating (potentially for the first time) an alignment between the 'Physical Plant' and the associated digital information.
- Establishment of a Digital Twin as an **enabler** for more **value contribution** through innovation within the digitalization (e.g. IIOT, life data visualization, AR/VR, simulation) will drive **future benefits**.

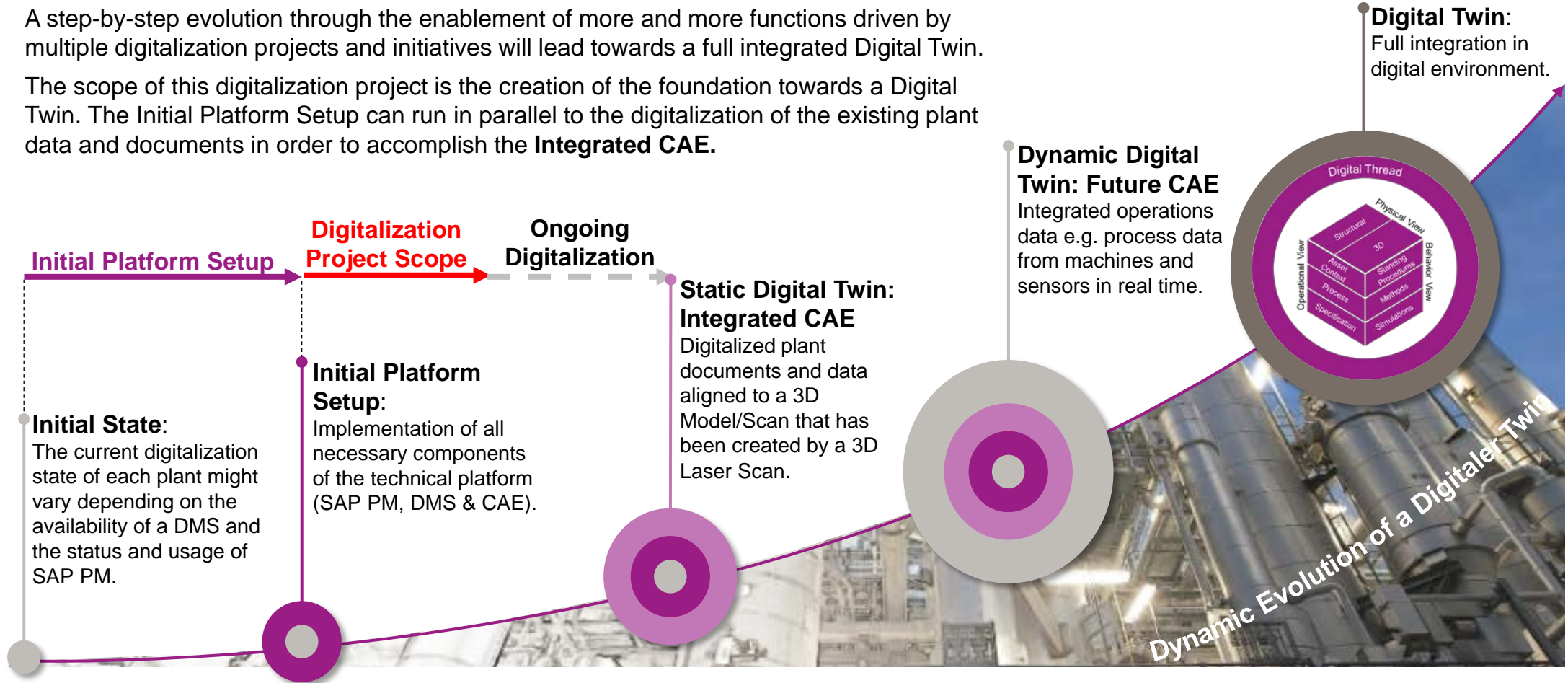## Digitalization of existing plant Data – Project Objectives

- Implementation of the digitalization target platform of CAE – SAP – DMS.
- Migration and digitalization of existing plant documents and data.
- Laser Scanning of the existing plant assets to create a virtual as-build representation of the plant.
- Combination of the 3D scan with the migrated plant information.

Use data as a strategic asset

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Evolutionary steps towards a Digital Twin throughout digitalization projects

A step-by-step evolution through the enablement of more and more functions driven by multiple digitalization projects and initiatives will lead towards a full integrated Digital Twin.

The scope of this digitalization project is the creation of the foundation towards a Digital Twin. The Initial Platform Setup can run in parallel to the digitalization of the existing plant data and documents in order to accomplish the **Integrated CAE.**

Initial Platform Setup → **Digitalization Project Scope** → **Ongoing Digitalization**

Digital Twin: Full integration in digital environment.

Dynamic Digital Twin: Future CAE Integrated operations data e.g. process data from machines and sensors in real time.

Static Digital Twin: Integrated CAE Digitalized plant documents and data aligned to a 3D Model/Scan that has been created by a 3D Laser Scan.

Initial Platform Setup: Implementation of all necessary components of the technical platform (SAP PM, DMS & CAE).

Initial State: The current digitalization state of each plant might vary depending on the availability of a DMS and the status and usage of SAP PM.

Dynamic Evolution of a Digitaler Twin

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OneCAE Starting Point   ALC Data Model

- Legacy software: many different CAD/DMS/ERP solutions and configurations due to Evonik's history (Degussa, Goldschmidt, Huels, Roehm, SKW, Stockhausen, …)

- PlantXML©, starting 2003

- DEXPI, starting 2012

  - https://dexpi.org/

  - DEXPI P&ID Specification 1.3 released 2021-07-15

  - Aspects of planning (plant items, specs) and realization (assets) introduced

- **ALC Data Model**, starting 2016
  - For the entire Asset Life Cyle
  - From process development to deconstruction
  - According international standards
  - Continuously ongoing development
  - Public available
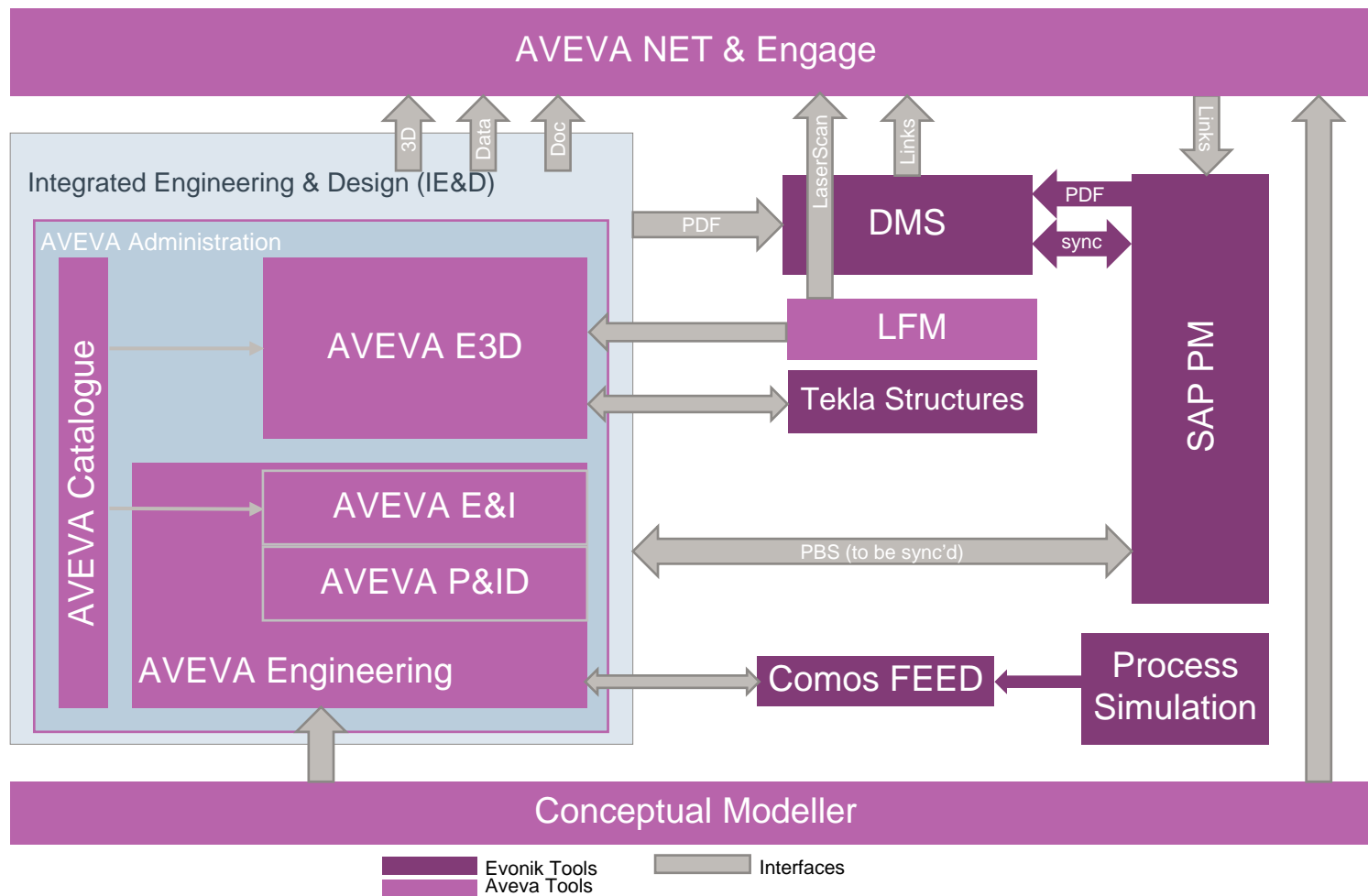
OneCAE Digitalization of existing Plants _ Aveva PI World Amsterdam
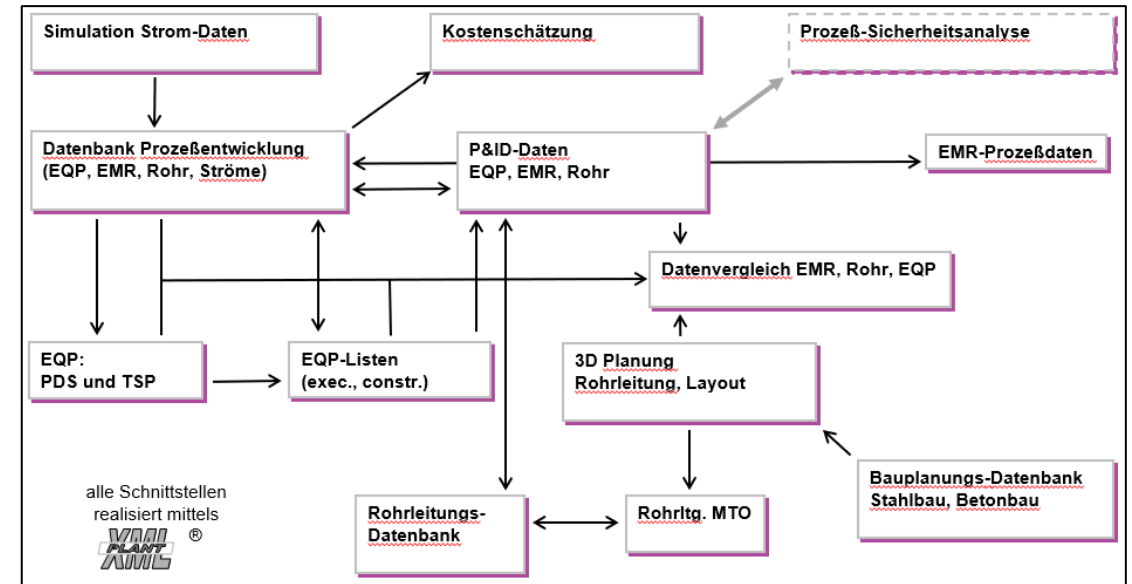
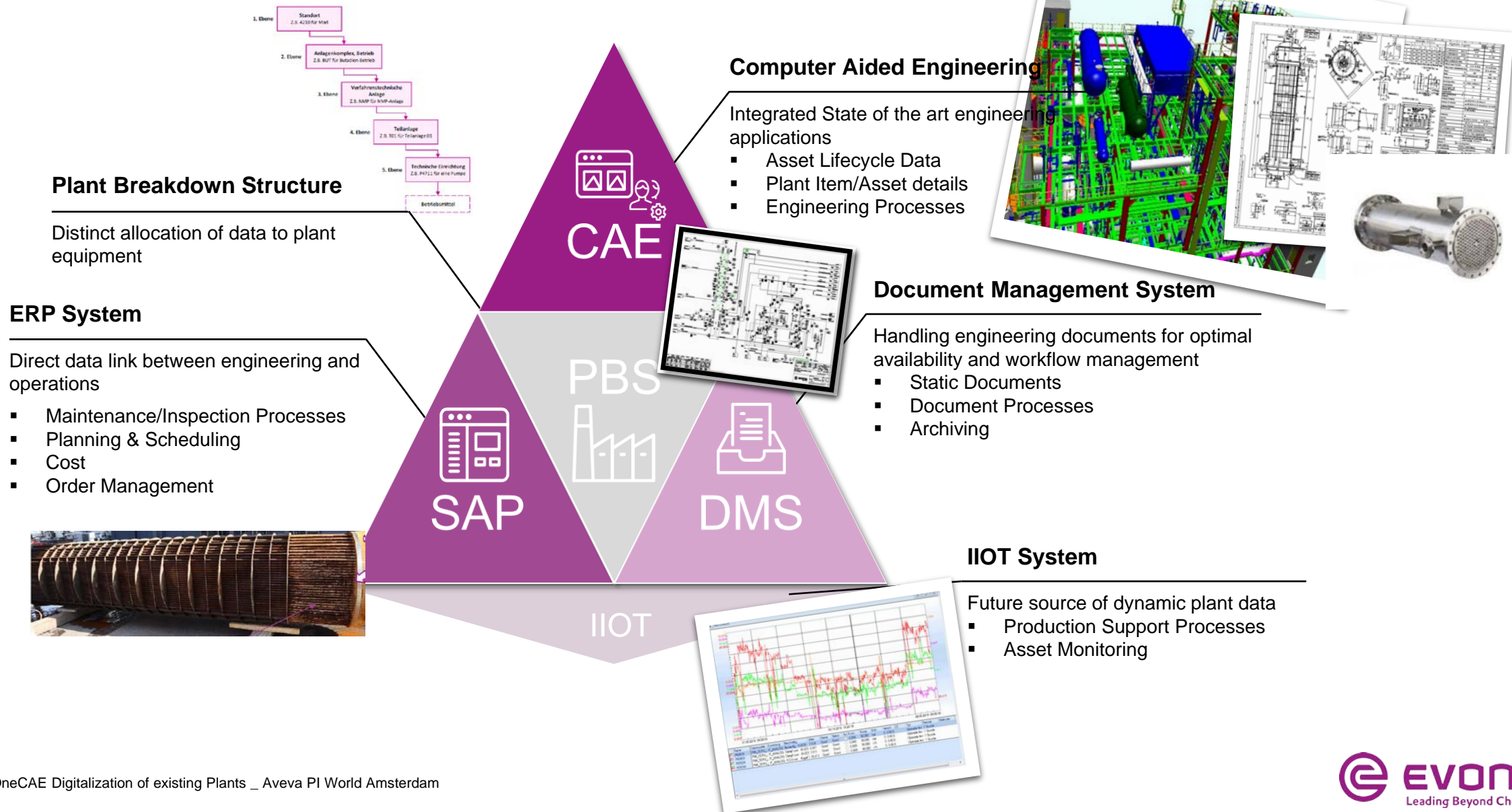DEXPI Instrumentation – P&ID Objects with RDL2 Classes
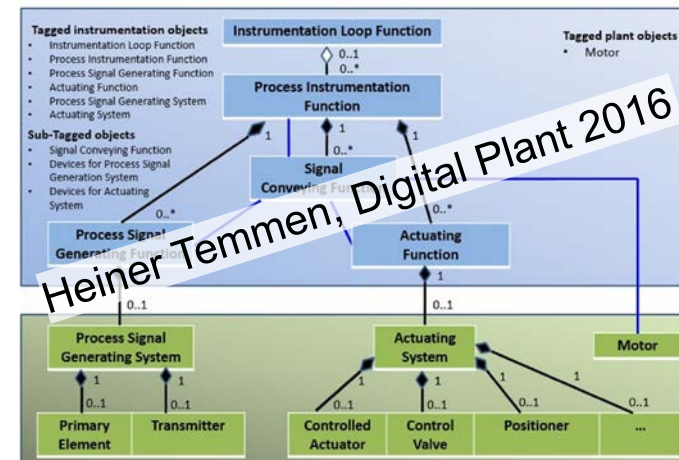
Target landscape OneCAE (high level)

ALC Principles :

- ✓ Data model
- ✓ consistent data
- ✓ Compare and Update
- ✓ Single Source of truth
- ✓ Integrated landscape/engineering
- ✓ Data driven

The targeted ecosystem utilizes the CAE, DMS and SAP into one integrated system which will be the foundation of the futures Digital Twin
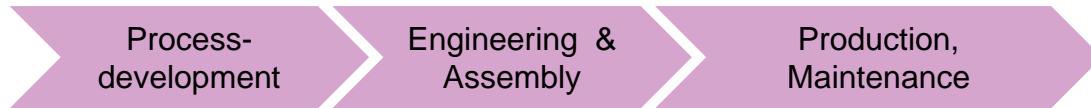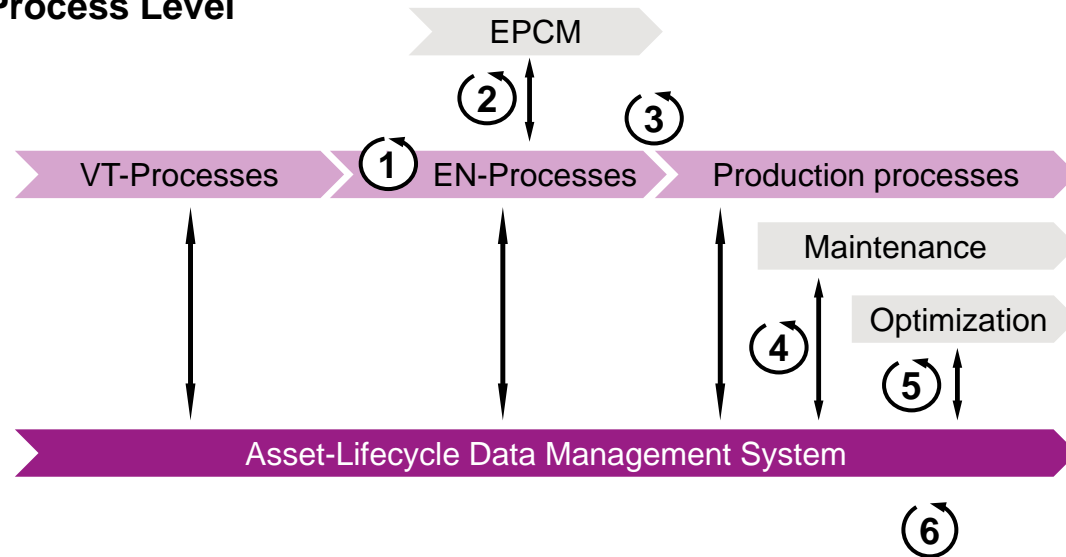
Plant Breakdown Structure

Distinct allocation of data to plant equipment

ERP System

Direct data link between engineering and operations

- Maintenance/Inspection Processes
- Planning & Scheduling
- Cost
- Order Management

Computer Aided Engineering

Integrated State of the art engineering applications
- Asset Lifecycle Data
- Plant Item/Asset details
- Engineering Processes

Document Management System

Handling engineering documents for optimal availability and workflow management
- Static Documents
- Document Processes
- Archiving

IIOT System

Future source of dynamic plant data
- Production Support Processes
- Asset Monitoring

CAE

PBS

SAP

DMS

IIOT

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OneCAE as integrated solution for greenfield and brownfield projects, will provide significant benefits along the ALC

Asset-Lifecycle

Process-development → Engineering & Assembly → Production, Maintenance

Process Level

EPCM

② ③

VT-Processes → ① EN-Processes → Production processes

Maintenance

④ Optimization ⑤

Asset-Lifecycle Data Management System

⑥

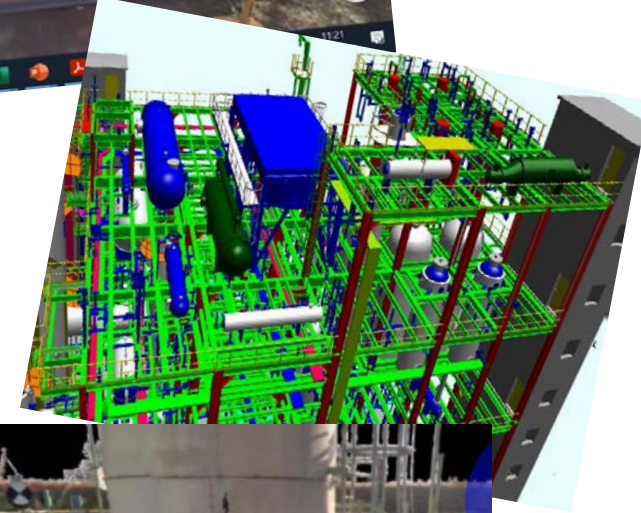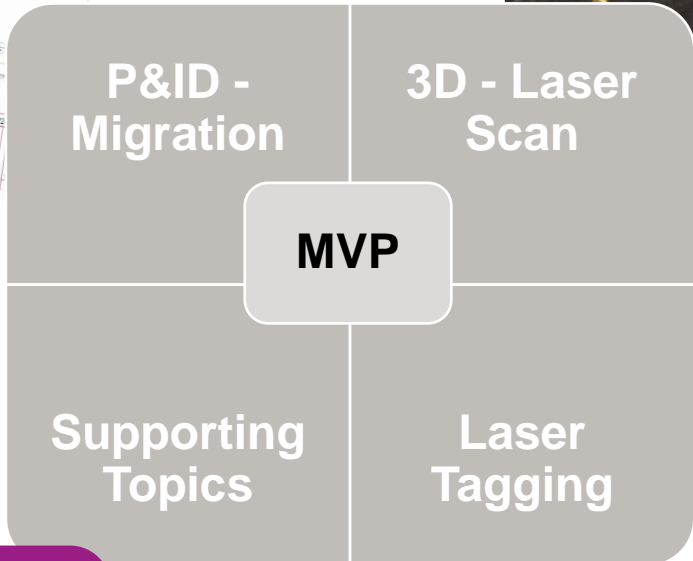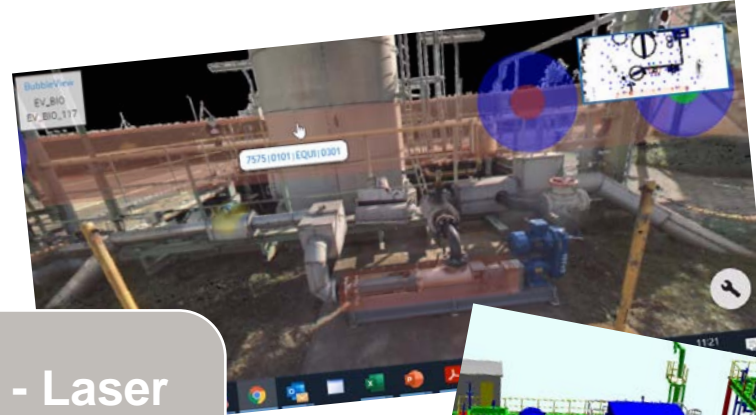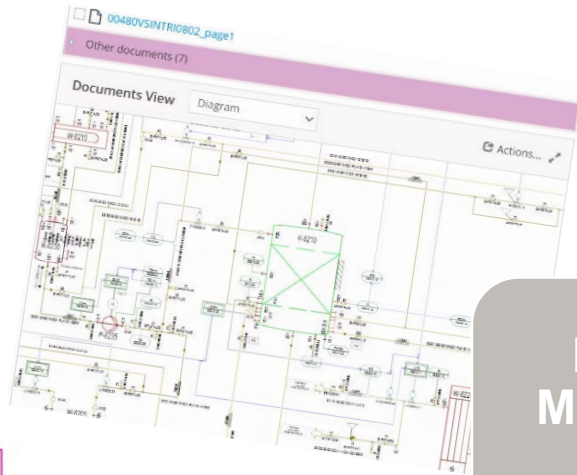## Value Contributions along the Asset-Lifecycle

- Invest and Fix Cost reduction based on more efficient planning processes based on a holistic Asset LifeCycle Data and Document Management:

  ① – Integrated engineering for new projects

  ⑤ – Existing and consistent data for optimization projects

- Investment reduction through harmonized CAE-Landscape and optimized interfaces

  ② – Data exchange with external partners based on international standards

  ③ – Automated data handover to production

- OPEX Reduction through more efficient information management

  ④ – Maintenance order management

  ⑥ – Future applications* (e.g. IIoT, VPS, AR/VR)

* Application based potential not included in ALC business model

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1D-2D-3D Engineering Information

Schematics

Laser Scans

DMS

Databases

Information Management Tools
- Connect Information Together
- Easily Accessed & Navigated
- Checked for Completeness & Consistency

3D Models

TAG

2D Fabrication

Isometrics

Datasheets

Planning

O&M

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Actual MVP Migration

P&ID - Migration

3D - Laser Scan

MVP

Supporting Topics

Laser Tagging
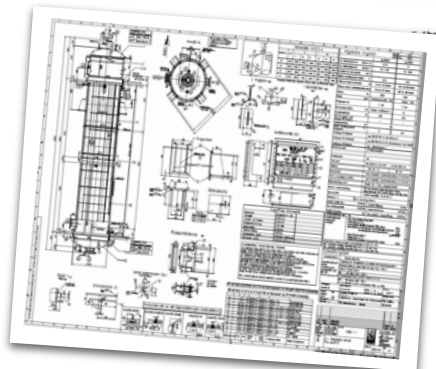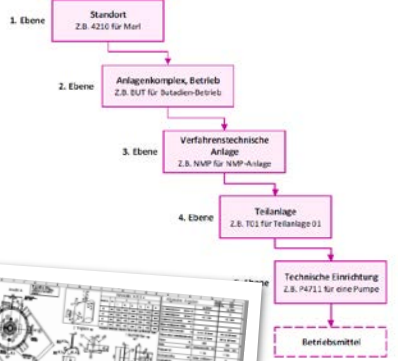
- PBS
- DMS & SAP
- Data Import
- Gateways

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Project Overview & MVP migration

- PBS
  - Extension of the PBS with pipes and Instrumentation Equipments
  - Import in Aveva.Engineering
- P&IDs
  - Intelligent migration from microstation to Aveva.Diagrams
- Laserscan
  - Tagging Instrumentation and Apparatus completed
  - No tagging of pipelines
- Gateways
  - SAP with deeplinks (test on R11 done)
  - LiveDok (licenses) with deeplink
  - OpenText (not available at this time in ANT)
  - MyFeed (extra data import from Oracle and SAP)
- Migration of data and documents
  - Piping (Oracle)
  - Physical documents (metadata-sharepoint)

P&ID - Migration
- P&ID: External Services
- Coordination: OneCAE
- QA: internal – plant
- 14 P&Ids
- 7535 € + (9500 €)

3D - Laser Scan
- Laser Scan: External
- No 3D Migration: External
- QA: internal – plant

MVP
- Coordination: TS-ANT
- QA: TS-ANT

Supporting Topics
- PBS: TS-ANT
- No DMS
- Data Import from Oracle (pipes) and MyFEED (apparatus and Instrumentation from prodok)
- Gateways: LiveDoc, SAP plantdocumentation, MyFEED

Laser Tagging
- internal – plant / TS
- 200 tagged EQ, 250 tagged Instrumentation EQ, no pipelines
- 15 t€ laserscan
- X h tagging /TS-ANT and production)

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Pilot Project MVP Migration

- **Demo Video**

Migration pilotproject
OneCAE
TI-EU-ANT

Status update

24 Nov 2021

Michiel Meulemans
Tom Jacobs

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Project Activities & Status : MVP Approach
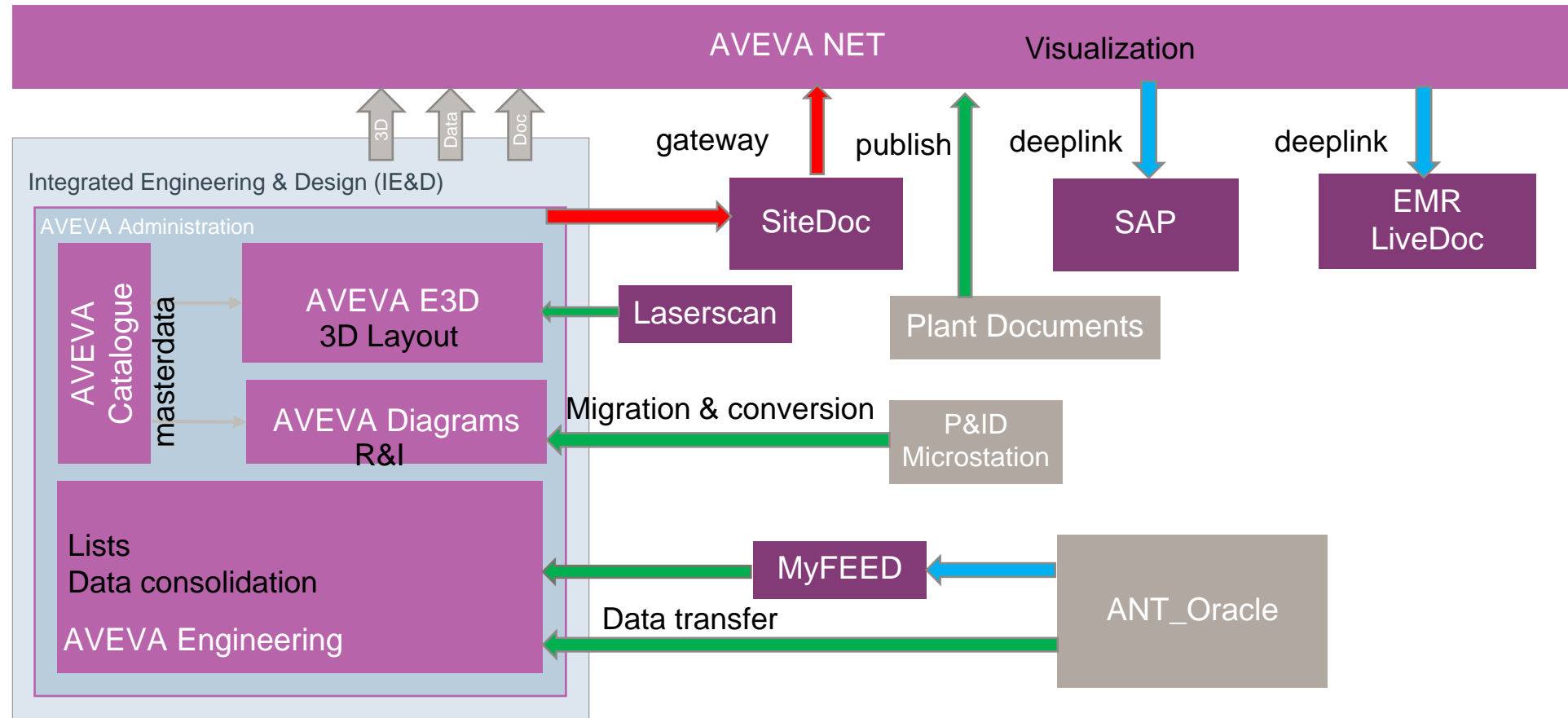
- Laser scan : performance (tagging ?), new features for tagging
- Aveva.NET : 3D laserscan
- Interface with document management system (Single sign-on / I-frame)

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Lessons learned

➢ Continuously ongoing improvement and completion of the data model (assets in Operations) and the CAE landscape (Aveva NG P&ID and E&I)

➢ Migration project is dependent on the availability of operations

➢ Intelligent migration of P&IDs is depending of the quality of the initial P&ID

➢ Future developments our Cloud based

✓ **After migration (MVP) better quality of the data**

✓ **All Business cases show a pay back time < 3 years**

✓ **More and more understanding to move into a data driven way of work**

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Tom Jacobs

- Evonik Operations GmbH / Technology & Infrastructure
- tom.jacobs@evonik.com

Stephan Leufke

- Evonik Operations GmbH / Technology & Infrastructure
- Stephan.leufke@evonik.com

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NGIYABONGA   GRÀCIES   БАЯРЛАЛАА   MISAOTRA ANAO   SALAMAT

TEŞEKKÜR EDERIM   WHAKAWHETAI KOE

DANKIE   TERIMA KASIH   DANKON   TANK   TAPADH LEAT

СПАСИБО   GRAZIE   MATUR NUWUN   ХВАЛА ВАМ   MULŢUMESC

KÖSZÖNÖM   PAKMET CI3FE   고맙습니다   GRAZIE شكرا   HVALA   FAAFETAI

GO RAIBH MAITH AGAT   MAHADSANID   ESKERRIK ASKO

БЛАГОДАРЯ   GRACIAS   THANK YOU   HVALA

ТИ БЛАГОДАРАМ   DANK JE   ΕΥΧΑΡΙΣΤΩ   GRATIAS TIBI   ДЗЯКУЙ   OBRIGADO

TAK   DANKE   AČIŪ   SALAMAT   MAHALO IĀ ʻOE   TAKK SKAL DU HA   MERCI

RAHMAT   MERCI   GRAZZI   ÞAKKA ÞÉR   ありがとうございました   DI OU MÈSI   ĎAKUJEM

HATUR NUHUN   PAXMAT CAFA   FALEMINDERIT   SIPAS JI WERE   TERIMA KASIH

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in linkedin.com/company/aveva

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