Virtual Plant Engineering:
Closing the loop from design to operations

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Content

- Digi@GEA Journey
- Lighthouse Project “Digital Twin”
- Platform Solution “Forge”
- Creating Customer Value
- Lessons learned & Outlook

From Business to Digital Transformation @ GEA

The Start

GEA's Strategic Business Transformation

Portfolio review and subsequent **disposal** of HX business

Applications, **R**egions, **T**echnology, **E**xcellence set as strategic pillars

Further leverage of OneGEA organization for **growth & efficiency**

2012 | 2013 | 2014 | 2015 | 2016 | After 2016

Formulation of GEA's overall strategic direction & **priorities**

In-depth analysis of >20 industries and prioritization of focus **growth** areas

Transformation into **OneGEA**

Guiding principles for GEA's digitalization

Think BIG

Start small

Scale fast

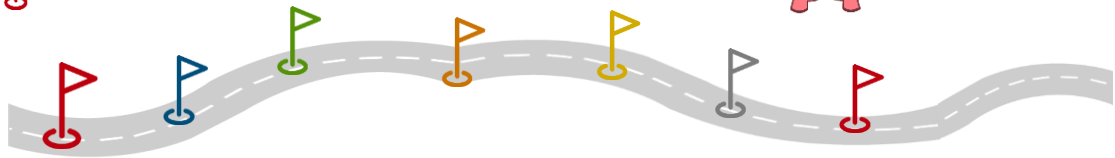
Define the why – the Digital Journey

Combined top-down and bottom-up approach

Top-Down vs Bottom-Up

Application of Top-Down vs. Bottom-Up Approach

- What is our overall **AMBITION**?
- Which digital fields shall we **FOCUS** on in a 1st step?
- Which **LIGHTHOUSE** projects shall we select?
- Which set-up do we need to **EXECUTE** the lighthouses?
- What are **EXISTING** initiatives & **NEW** ideas on those fields?
- What are the digital fields **RELEVANT** for us?
- What do we **MEAN** by Digitalization?

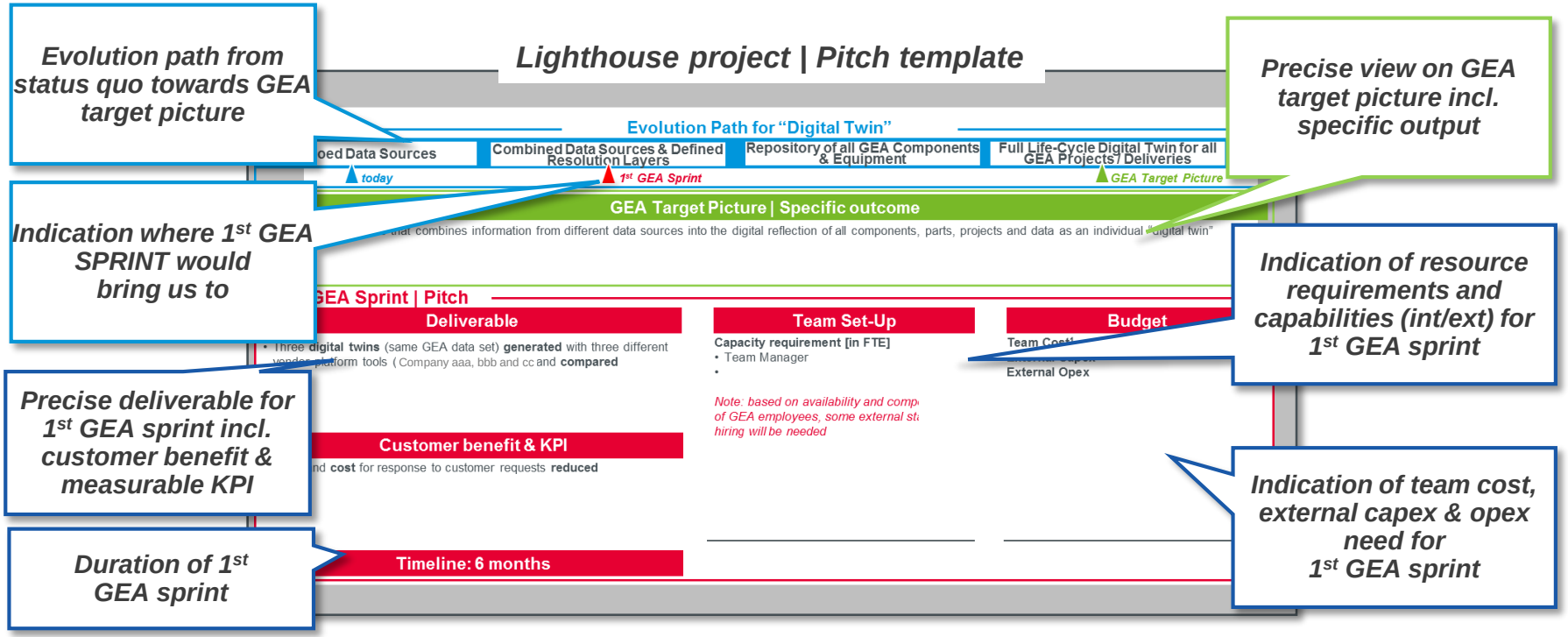


Determine the how

Agile / sprint based implementation approach

- Customer journey
- Design thinking
- Value Proposition Canvas
- Lean startup
- Scrum

Start small – **GEA Sprints**



Only 1st GEA sprint detailed & quantified for recommended lighthouse projects

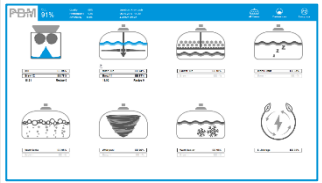
Select the what – GEA lighthouse projects

Turning ideas into sellable products

OPTIPARTNER

Operate production lines optimally using **big data**, **machine learning**, and **advanced algorithms**

PROCESS BUS. MODELING



Enable customers to take **information driven decisions** based on **dashboard**

DIGITAL TWIN

Prototype, test and validate asset design before and during its physical existence

SERVICEME

serviceME

Market place for on demand **B2B services** of engineered products

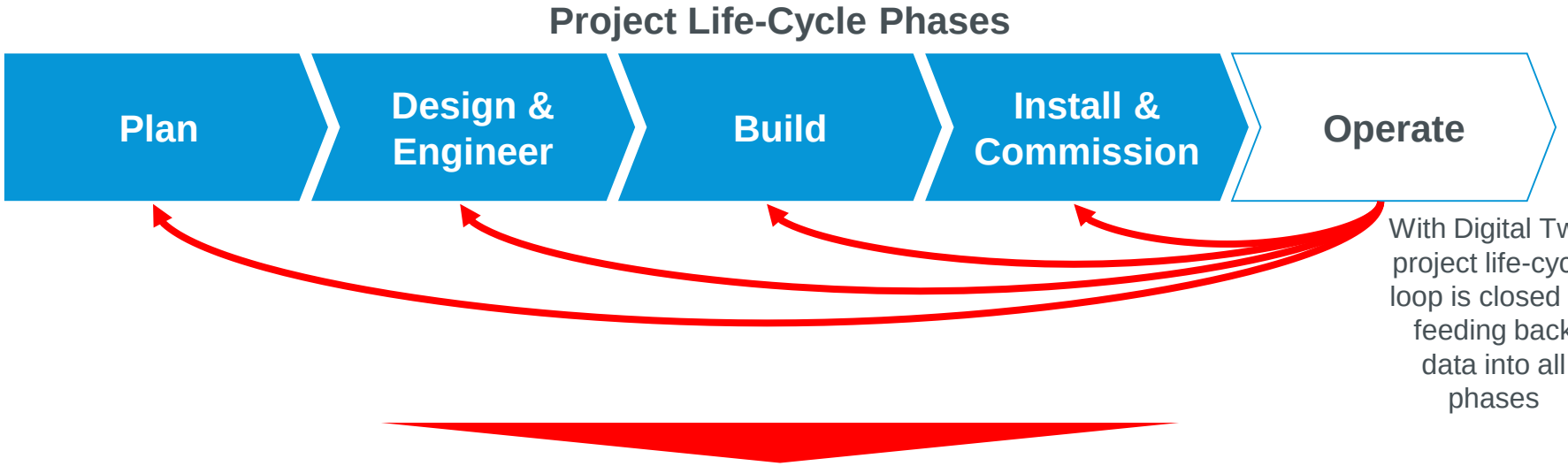
BIG DATA ANALYTICS

Data analytics supported by **data science function** and **fit for purpose infrastructure**

Outcome of lighthouse projects: we already sell products

Digital Twin – how we see it

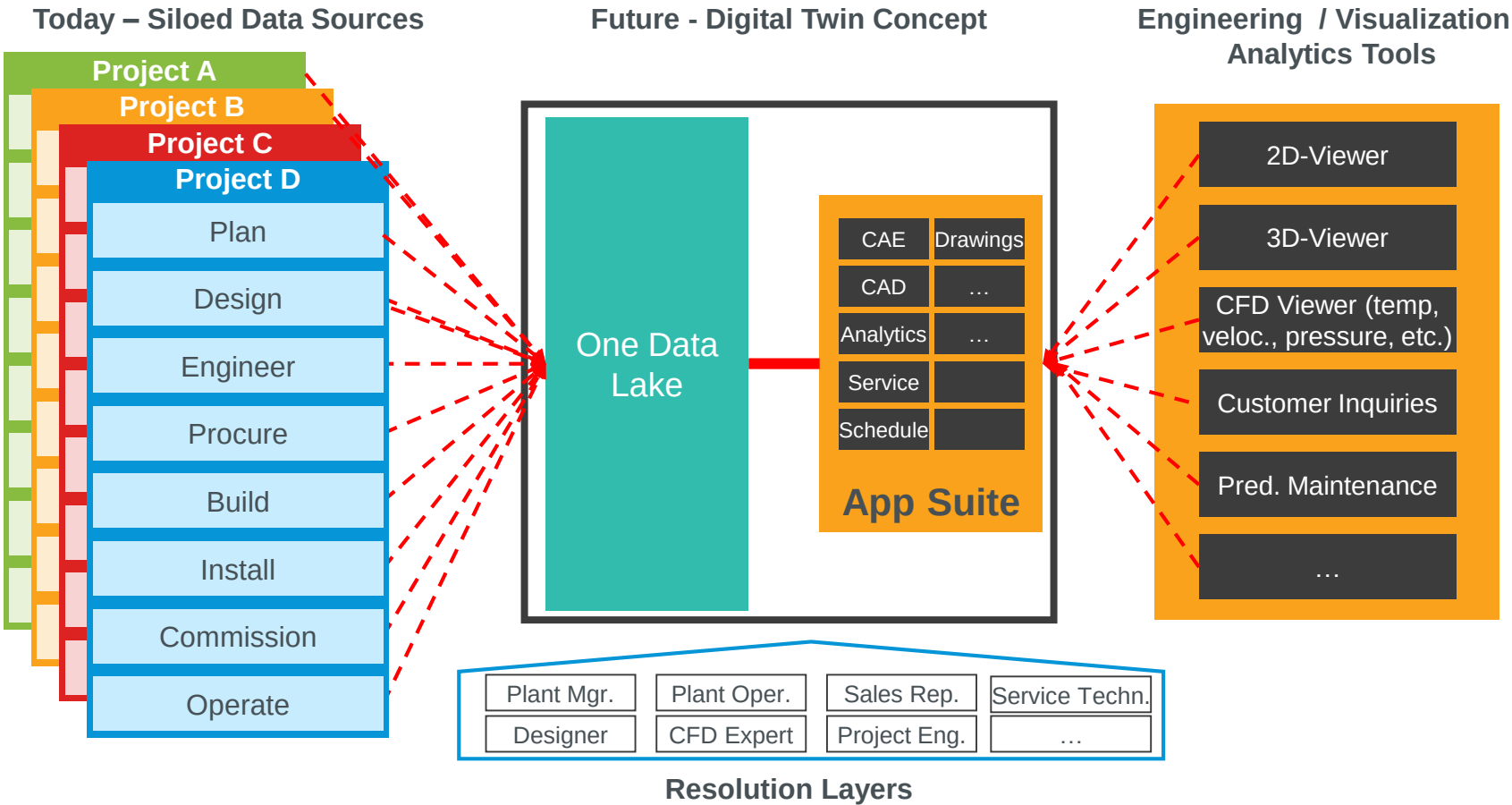
Close project life-cycle loops and seamlessly connect the past, present and future



Shorter lead times in all project phases through higher degree of virtualization

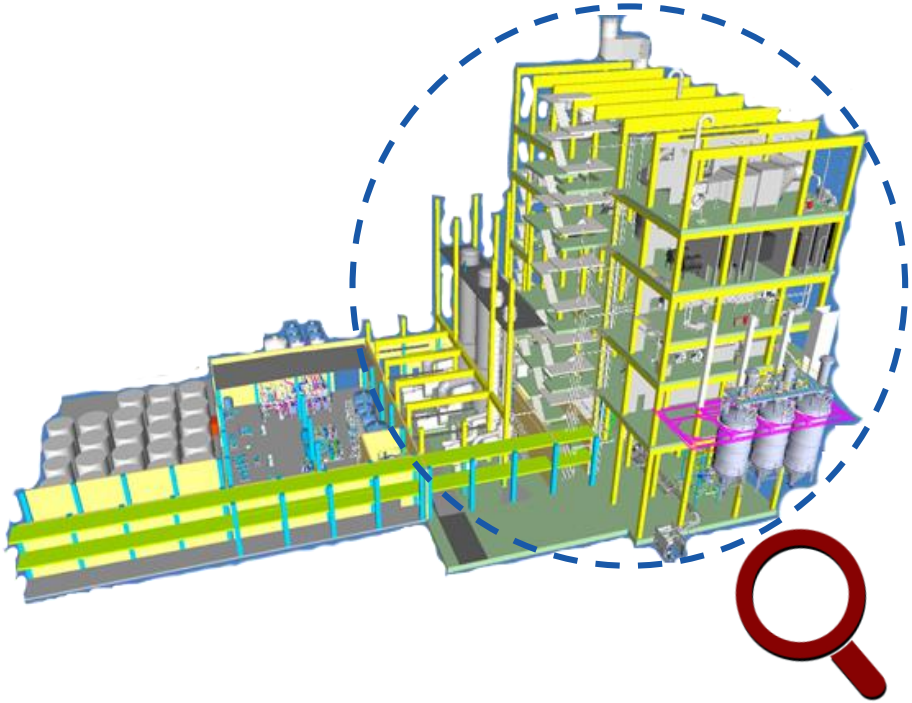
Enhanced products & production processes through pass on of gained knowledge

Combination of ONE Data Lake and ONE App Suite

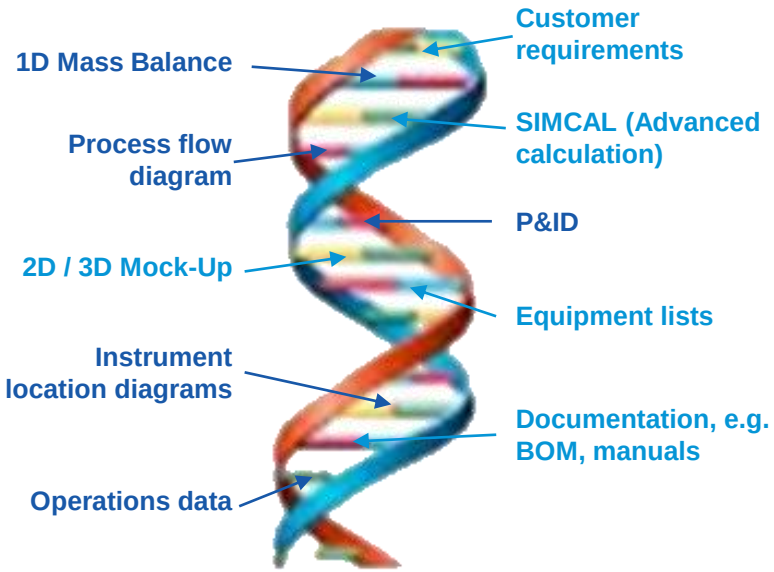


Digital Twin real-life application

Complete Plant Digital Mock-Up



Selected Digital Twin DNA



Design thinking – deriving Digital Twin use cases

Asking our customers

What our customers say

… need to better understand what is driving cleaning cycle requirements of our key components

… address operator fluctuation
… high automation degree negatively impacts hands-on experiences of operators
… train extreme situations in safe environment

… very cumbersome to find failed equipment in large plants
… relevant information not at hand, very time consuming to find them

Which product offerings we designed

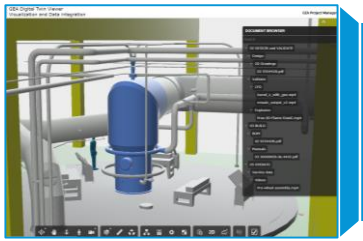
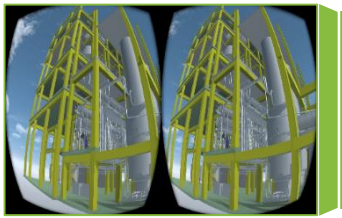
Detailed Component Simulation

Operator Training Simulation

Failure Detection & Resolution

Design thinking – deriving Digital Twin use cases

Asking our internal colleagues

What internal colleagues say	Which tools we designed	
… information in many locations stored *… no intuitive accessibility of information* *… same access for internal and external*		**One Place for All Information**
… fit of plant design into brownfield environment *… accessibility to dismantle/assemble equipment* *… multi-person collaboration from different physical locations*		**Virtual Reality Readiness**
… how are plants actually being operated and performing with regards to design parameters		**Validate Design with Operations Data**

Partnership with Autodesk – building the use cases

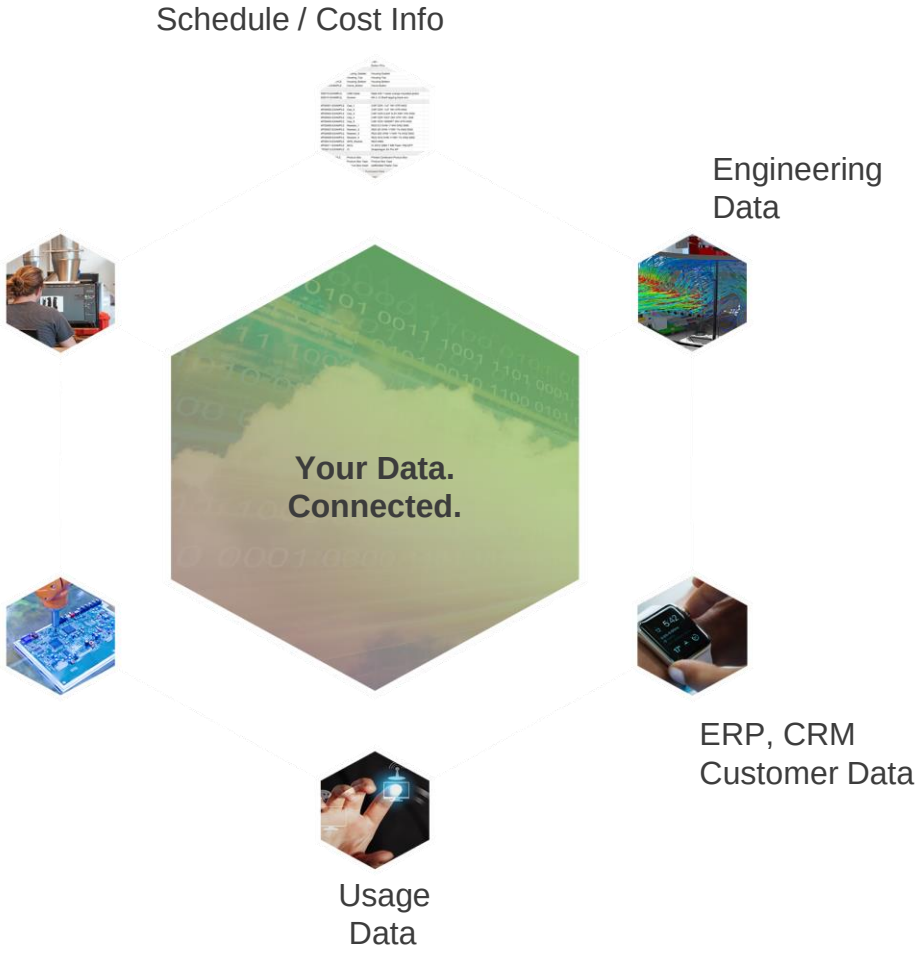
Leveraging synergies

Use Case Implementation Strategy

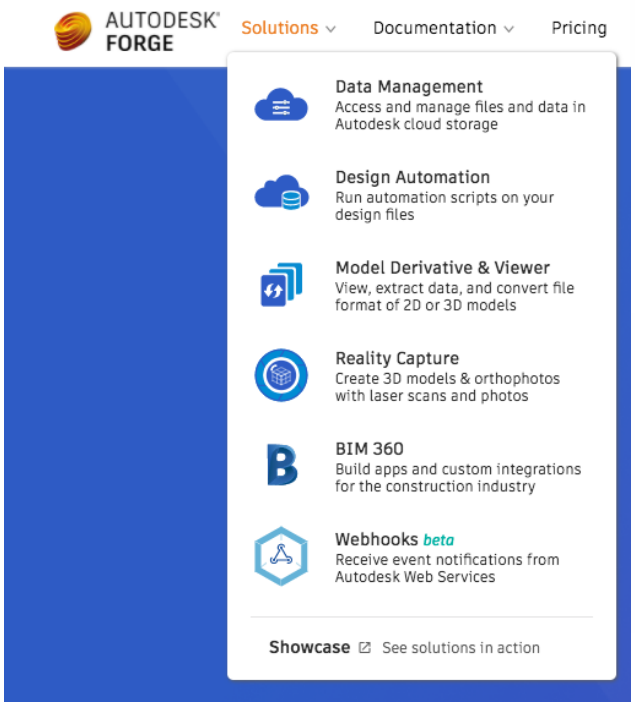
- Leverage internal capabilities in GEA core competencies
- Addressing capability gaps, form a partnership network to leverage external capabilities

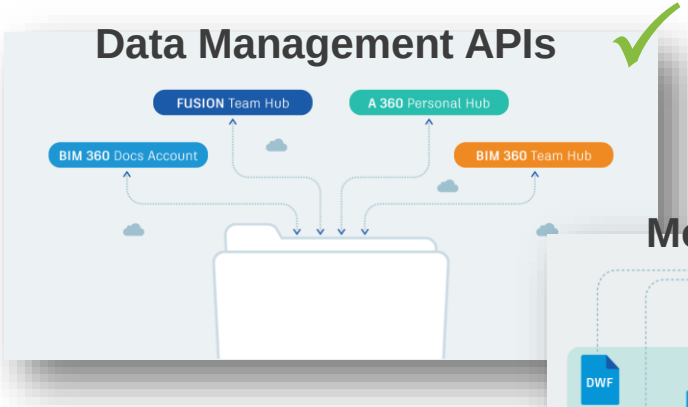
FORGE integration

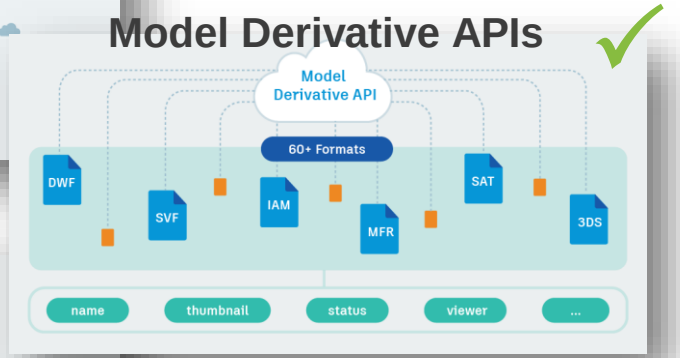
The Forge platform improves processes and breaks down silos by connecting information and streamlining workflows.

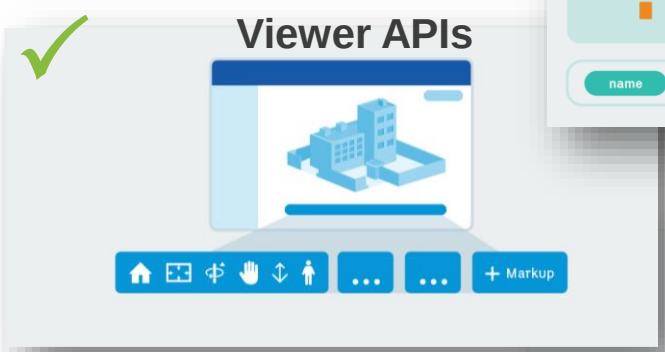


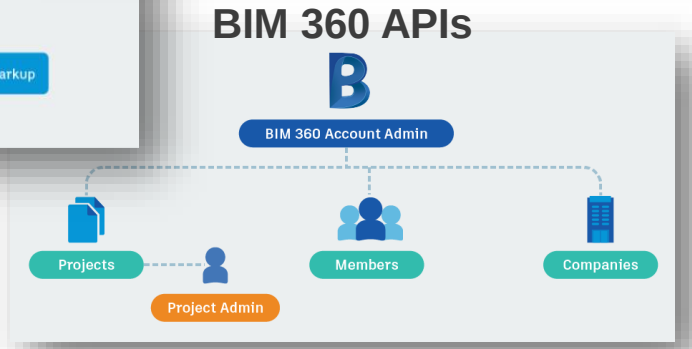
Forge API

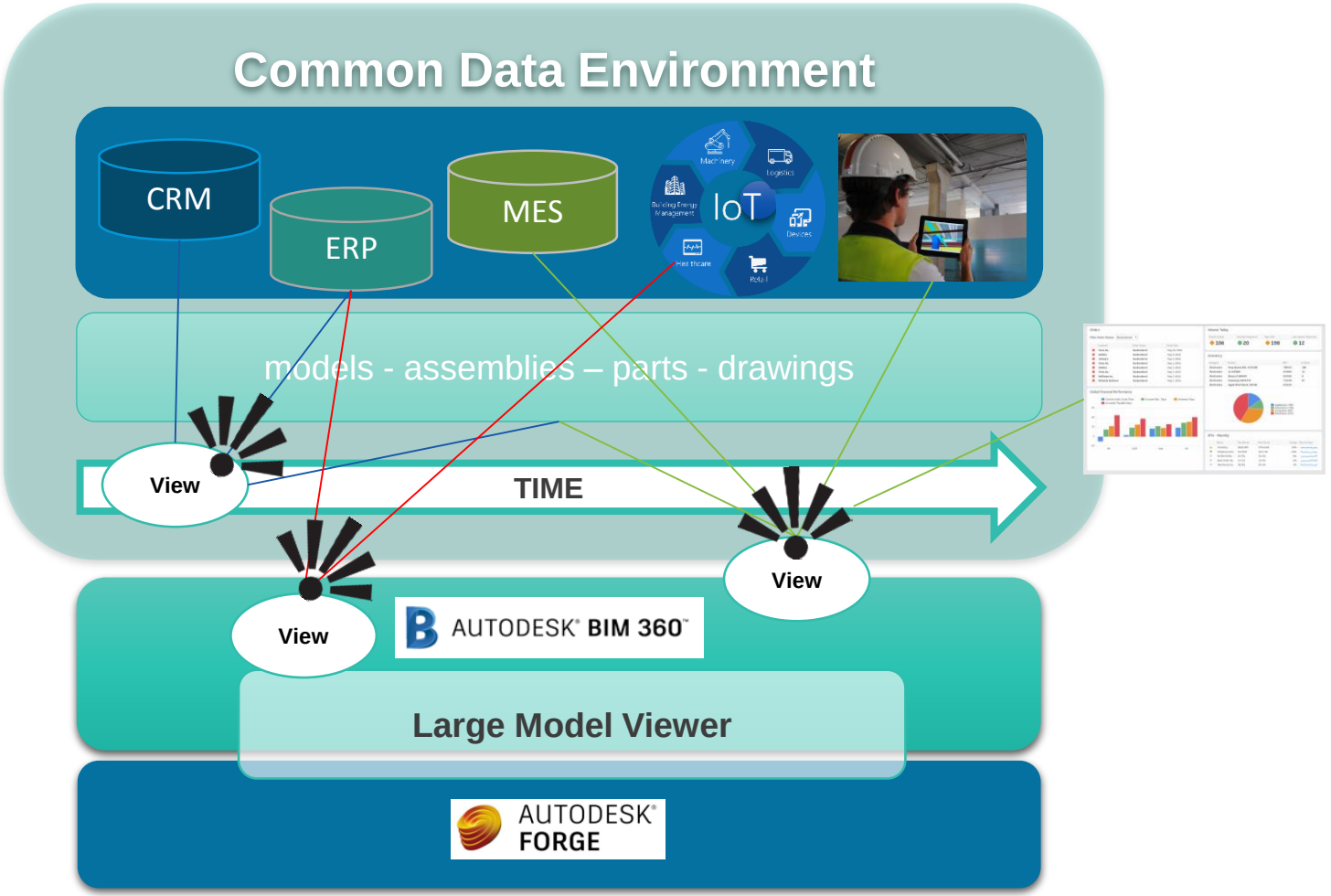

AUTODESK FORGE
Solutions
Documentation
Pricing
Data Management
Access and manage files and data in Autodesk cloud storage
Design Automation
Run automation scripts on your design files
Model Derivative & Viewer
View, extract data, and convert file format of 2D or 3D models
Reality Capture
Create 3D models & orthophotos with laser scans and photos
BIM 360
Build apps and custom integrations for the construction industry
Webhooks beta
Receive event notifications from Autodesk Web Services
Showcase
See solutions in action


Data Management APIs
FUSION Team Hub
A 360 Personal Hub
BIM 360 Docs Account
BIM 360 Team Hub


Model Derivative APIs
Model Derivative API
60+ Formats
DWF
SVF
IAM
MFR
SAT
3DS
name
thumbnail
status
viewer
...


Viewer APIs
...
...
+ Markup


BIM 360 APIs
BIM 360 Account Admin
Projects
Project Admin
Members
Companies


Common Data Environment
CRM
ERP
MES
IoT
models - assemblies – parts - drawings
View
TIME
View
View
AUTODESK BIM 360
Large Model Viewer
AUTODESK FORGE

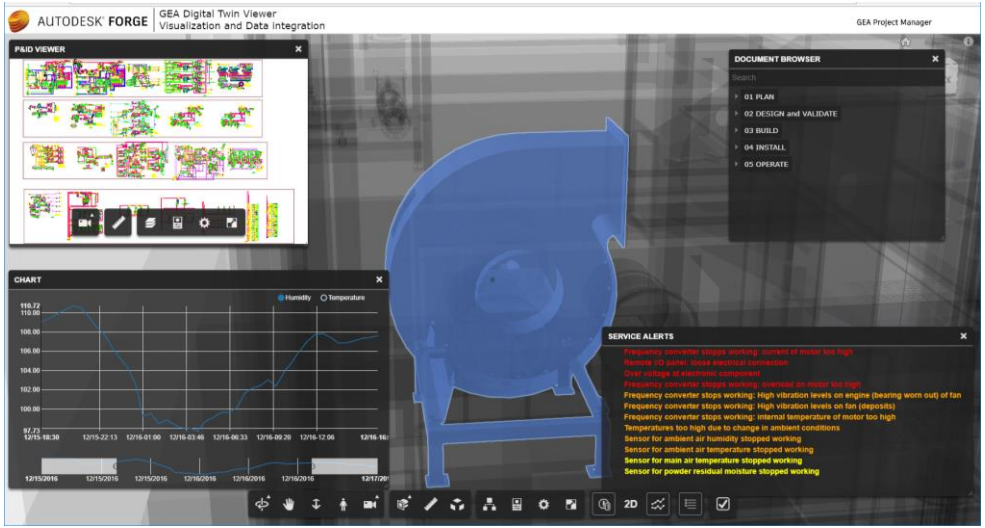
Forge – the fit for purpose solution (1/2)

Built for reuse

Improving Operational Efficiency via Integration	Better Decision Making with Products Visualization and Analytics	Enabling Custom Workflows

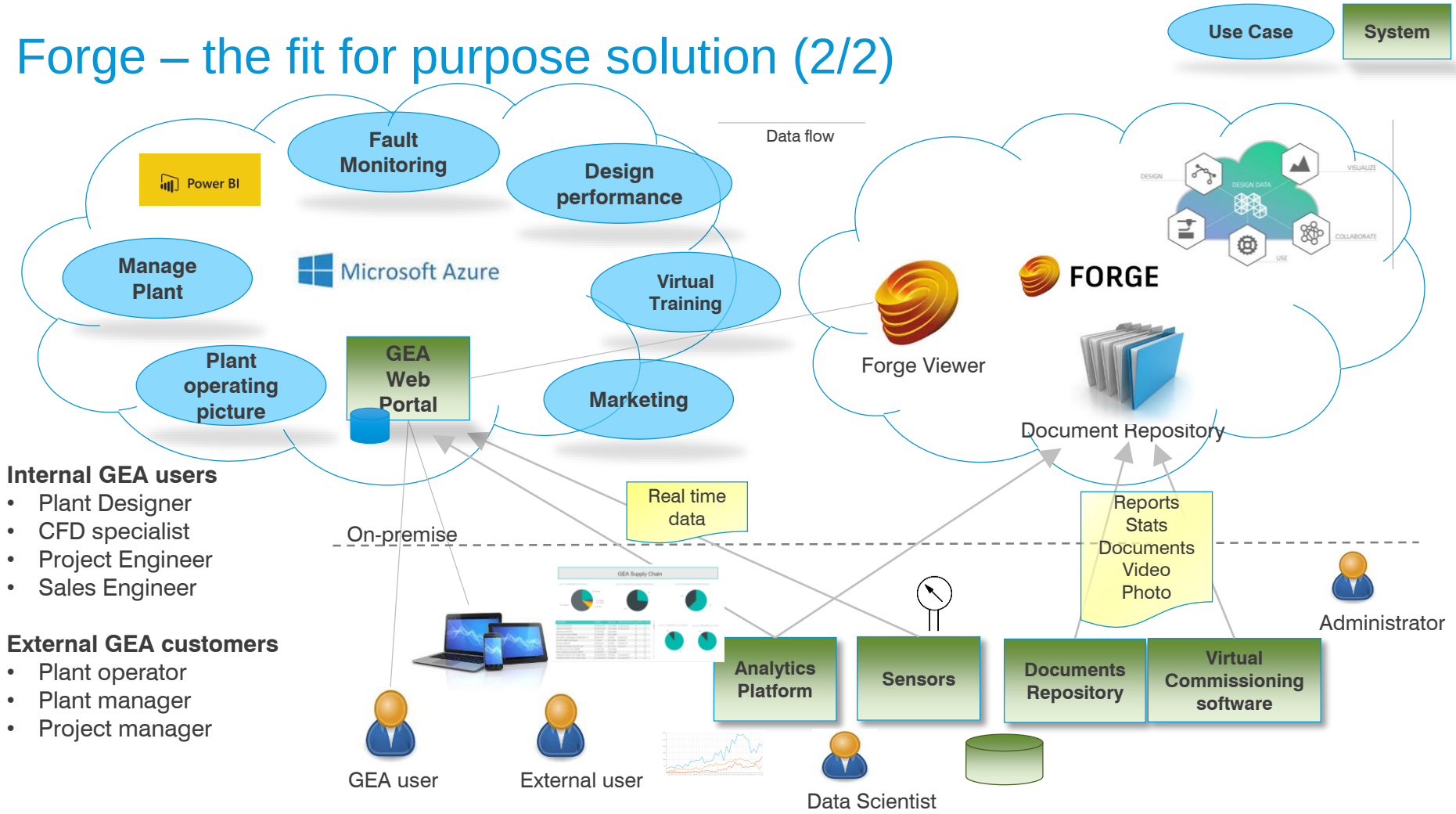
Benefits

- Faster delivery
- Pre-defined technology stack
- Product based UI
- Capped effort
- A stepping stone for rapid delivery
- Reusable across business domains
- Risk reduction
- “try-before-buy” enabler
- Virtually no infrastructure setup needed
- Re-deployable within days



Forge Toolkit for Information Hubs

Forge – the fit for purpose solution (2/2)



Internal GEA users

- Plant Designer
- CFD specialist
- Project Engineer
- Sales Engineer

External GEA customers

- Plant operator
- Plant manager
- Project manager

Validating customer benefits to ensure success

- Close collaboration throughout the development
- Regular feedback touchpoints
- Granted customer access
- And received very positive feedback
- Hurdles to overcome: wifi access, user affinity to mobile tablets

Creating tangible customer value

- Productivity → do the right things
- Service cost → maintain faster and more
- Revenue → increase production time
- Process reliability → first time right
- Lead time reduction → Ramp-up revenue
- Operator performance → Push performance limits out

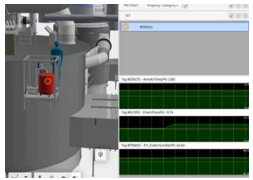
Profit

Lessons Learned

- Think big, start small, be fast
- Close customer involvement key
- Short review cycles with team, product owner, customers
- Leverage partner networks – don’t do everything on your own
- Pursue a pragmatic rather than perfect approach (“done beats perfect”)
- Implement incrementally but very agile - transition from ppt to tangible stuff asap

Outlook

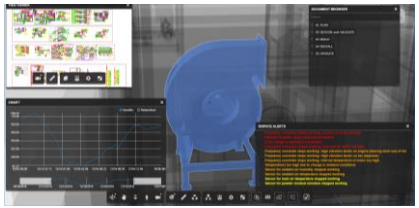
PoC



Pilot

2018 Q1 GEA Information Hub Pilot

A comprehensive pilot aimed at delivering value without hindering an Agile approach to solution discovery



2017 Forge PoC

Throw-away prototype to illustrate the capabilities of the platform

MVP

2018 Q4 Connected MVP

Solution deployed @GEA
Live alerts, sensor data
Link to the ERP
Enterprise dashboard
Document Management

Future

Integrated hybrid solution

Predictive analytics
Virtual Training & Servicing (MR)
Expanding integration

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