Capgemini

REFLECT^{IOD}

Digital Twin For Asset Operators

2021

REFLECT[IOD]

REMOVING SILOES TO FOSTER OPERATIONAL EFFICIENCY

CHALLENGE

Industrial assets such as buildings, factories or infrastructure networks, produce a **lot of data**, at different times of their lifecycle, in different formats, by different actors, and especially hosted in IT **silos**. This **minimizes the efficiency of operators** in their day-to-day activities (supervision, maintenance…), the **time to access data**, or the creation of **new digital services**.

SOLUTION

A platform that federates data from multiple sources to equip Operators and their management with modeling, visualization, performance measurement, analysis and operational tools (360° view of all assets' data, alerts, switch view, color reports, dashboards, analytics tools…)

APPROACH

Deploy a **Digital Twin platform** by adopting a **value-driven approach** "Identify data & critical problems - Solve it locally and Record gains – Consolidate and Deploy".

Prove the value in **real data conditions** : **4 months** to get results, 6-12 month for at scale use-cases deployments & ROI.

BENEFITS

INCREASE

- Workforce **efficiency** by 10%-30%
- Asset **reliability** by 10-20%
- **Compliance** to standard

DECREASE

- Time to **find the right data** by 35%
- **Handover** time by 10%-30%
- **Maintenance** costs by 5-20%

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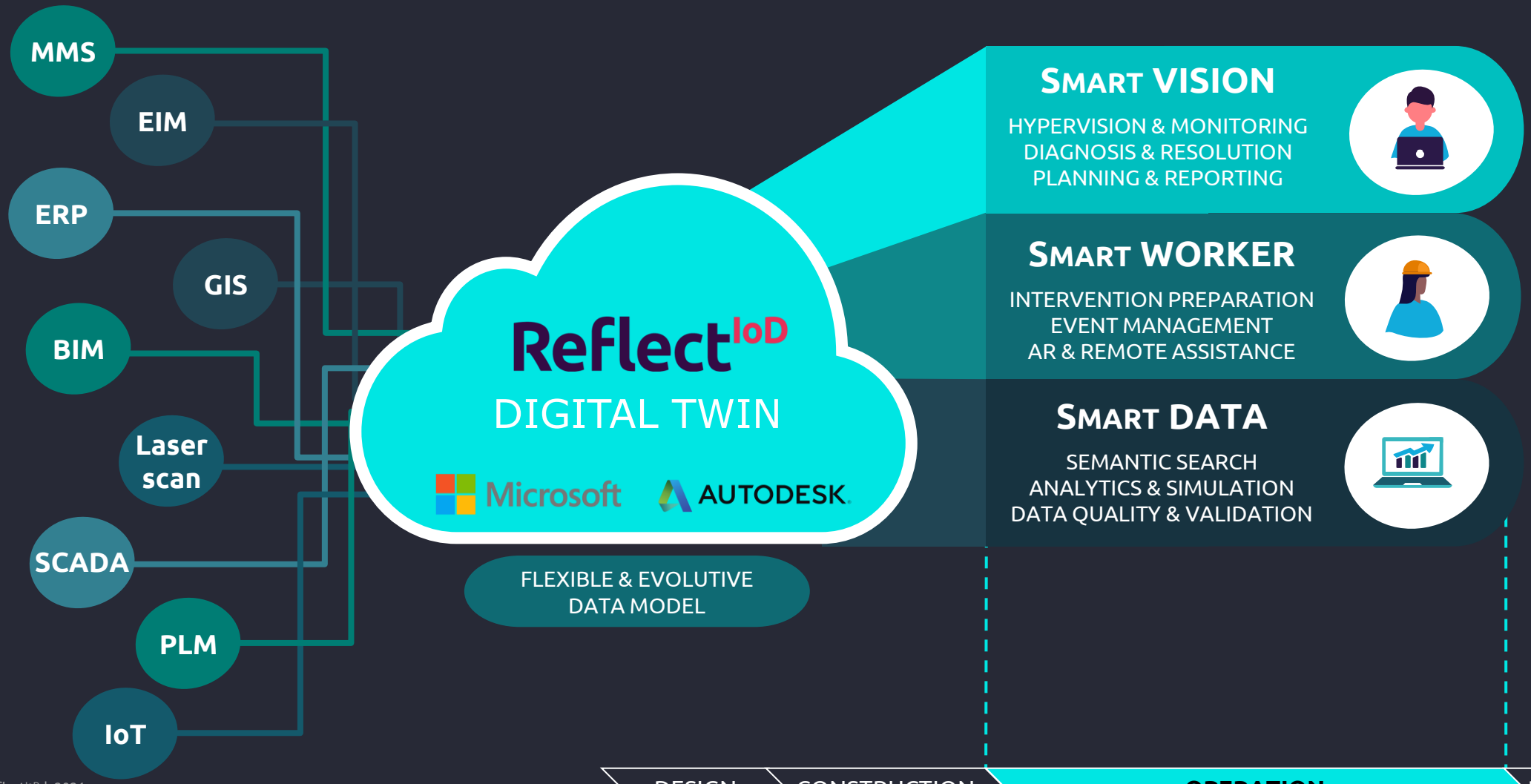
A PLATFORM AGGREGATING DATA FROM MULTIPLES SOURCES TO BETTER OPERATE, PREDICT, SIMULATE



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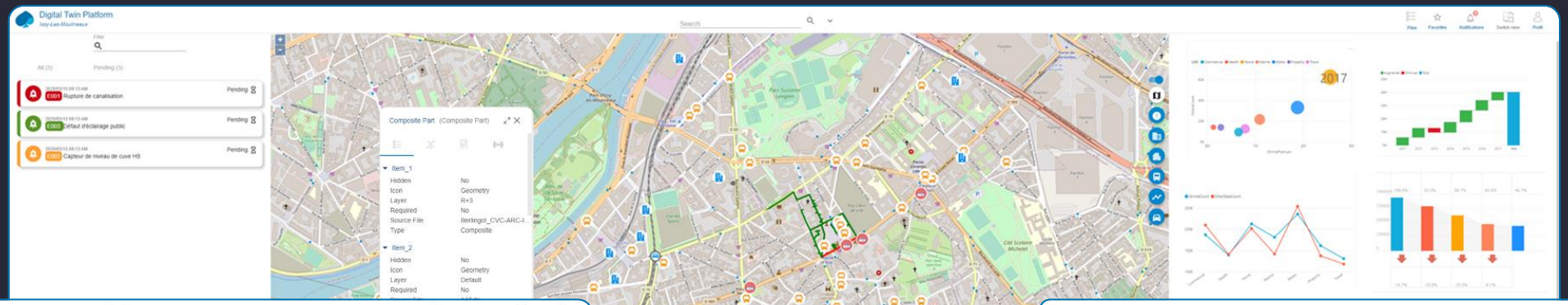
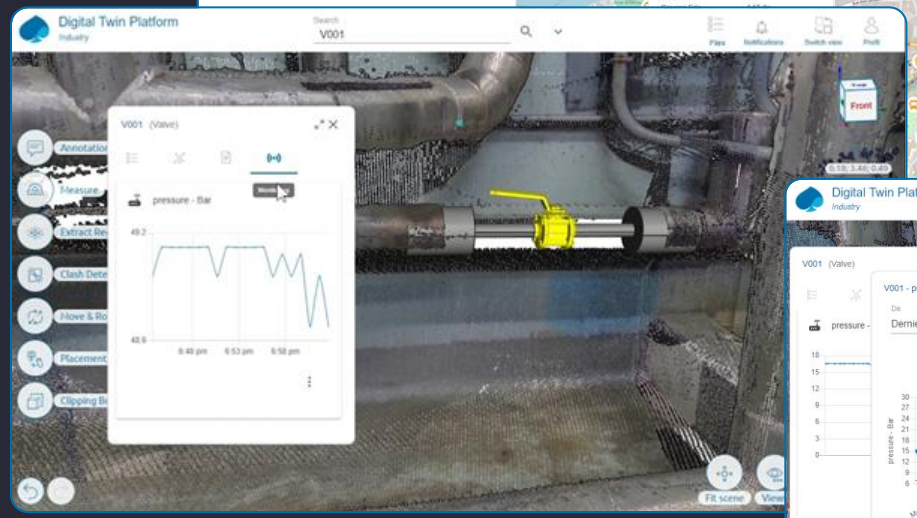
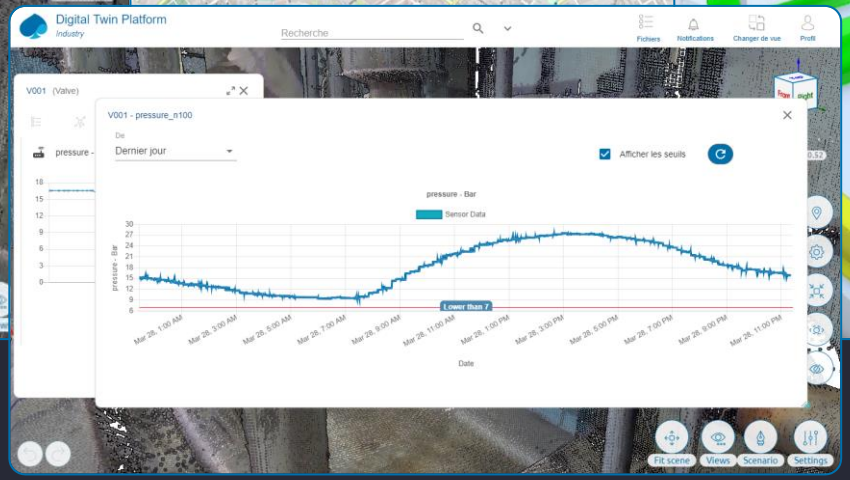
DEMONSTRATION !

Hypervision, Geographical integration, analytics





Hybrid 3D (BIM & Point Cloud)



IoT/Sensor values

Semantic searches

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REFERENCES

CLIENT	ASSETS	BENEFITS	APPROACH
SUEZ	60 sites managed Expansion in linear	Federation of data in a Digital Twin of infrastructures, for a better efficiency of operation and maintenance entities, and the creation of new services for managers and citizens.	Capgemini assisted their client with their roadmap and the implementation of their Digital Twin program for water treatment facilities.
VEOLIA	2 stations	Digital Twin of the dangerous waste treatment facilities, to monitor and control the environmental impact compliance, and the operations efficiency.	Roadmap and prototype of the Digital Twin (Proof of Value): prioritization of use cases based on accessible data, integration architecture, implementation roadmap, benefits.
ALSTOM	Linear infrastructure network	Digital Twin roadmap (Proof of Value) and experimentation with Reflect^{IoD} for the operation of the automatic subway project REM (Réseau Express Métropolitain) in Montreal.	Roadmap and prototype of the Digital Twin (Proof of Value): prioritization of use cases based on accessible data, integration architecture, implementation roadmap, benefits.
syctom	Waste treatment facilities	Digital twin of waste treatment facilities in the Paris region, to optimize operations and maintenance.	Roadmap and prototype of the Digital Twin (Proof of Value): prioritization of use cases based on accessible data, integration architecture, implementation roadmap, benefits.
T.EN TECHNIP ENERGIES	20 offshore sites	TechnipFMC deploys 3D construction methods to facilitate job packaging, construction monitoring and decision making through multiple data visualization on 3D models.	Capgemini industrialized the existing pilot application, defining the scalable and secure architecture for this Autodesk Forge-based application.

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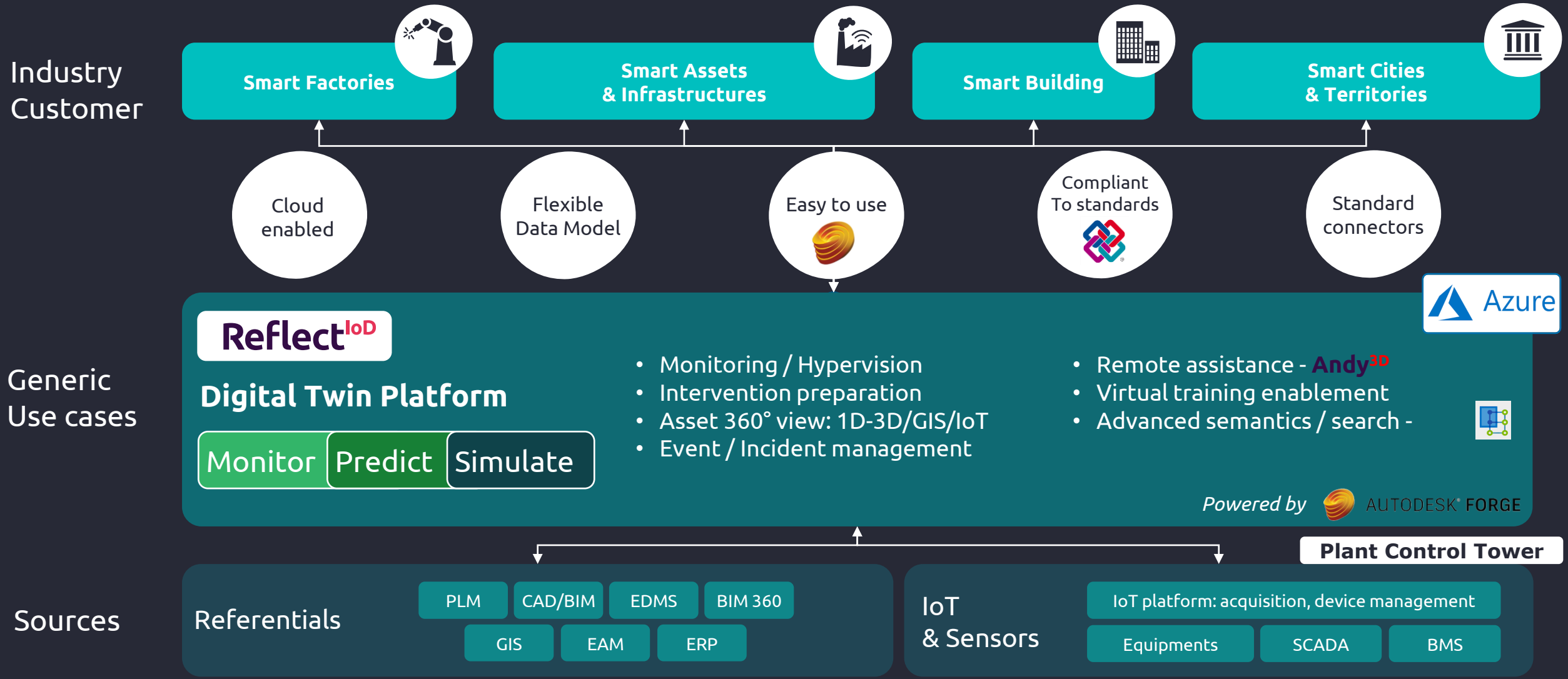
FUNCTIONAL ARCHITECTURE



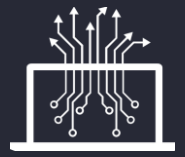
REFLECT[IOD]
KEY CHARACTERISTICS

Flexible & evolutive

- **Flexible data models** by industry, company
- **Incremental deployment**
- Linked to **predictive & simulation tools**
- **White label** for the application

Compliant to standards

- Data **format agnostic**, more than 60 different formats read natively
- **BIM IFC compliant**
- Support **ISO55000** certification & asset register



Configurable & user-friendly

- Web & mobile
- **Opensource** based
- State-of-the-art ergonomics
- **Full-text** and advanced **semantic** search
- **Customization** of interfaces to address specific use cases

Standard connectors

- **EAM** / CMMS systems
- GIS, EDMS systems
- Capgemini **Plant Control Tower** platform
- Capgemini **Andy3D immersive remote** applications
- REST **APIs** to access federated database

Cloud enabled

- **Securely** available on AWS and Azure
- **Cloud native**, scalable by design
- Leveraging Autodesk Forge cloud API
- Integration of **Azure Digital Twins** for the data model creation & semantic search

CAPGEMINI
TECHNOLOGICAL PARTNERSHIPS

AUTODESK.

Autodesk Forge & Construction Cloud (BIM360)

Leverage ACC (BIM360) and the flexibility of Forge to develop products & industrialize solutions

- Develop **custom features** for a tailored solution, with a modular Forge capacity
- Deploy **Reflect**^{IoD}, a Forge-based Digital Twin platform for Operations & Maintenance
- **Integrate ACC** in a broader IT landscape
- Provide **industry knowledge** and understanding of industrial constraints

FORGE

Microsoft

Azure & Azure Digital Twin

Leverage key Azure components for a highly scalable, cloud native, serverless solution

- Native integration of **Azure Digital Twin** enabling Semantic Search and Color Reports
- Integration of **PowerBI reports**, visualization and bi-directional integration with 3D models
- **Real-time video & audio** components embedded
- Integration with Azure-based Capgemini's **Plant Control Tower** platform

Azure

REFLECT[IOD]
A VALUE-DRIVEN AND INCREMENTAL APPROACH

PROOF OF VALUE

Pilot

OBJECTIVES

- Demonstrate **benefits** of candidate use cases in **real data** context
- Get **REX** from key users

DELIVERABLES

- Reflect[IoD] solution, with **integrated** data
- Success Report: high-level business case, deployment **roadmap** & **backlog**

+

Assessment

OBJECTIVES

- Identify & **prioritize** use cases according to data **reachability** & **quality**
- Define how users access, interact and interrogate data and **models**
- Assess **architecture** & infrastructure requirements

DELIVERABLES

- Use case identification & prioritization
- Technology maturity level assessment

SCALE-UP

Deployment

OBJECTIVES

- **Expand** number of **use cases**
- **Expand** scope of **data**
- Create **new services**

DELIVERABLES

- **White label** platform
- **Training**
- **Roadmap** & backlog

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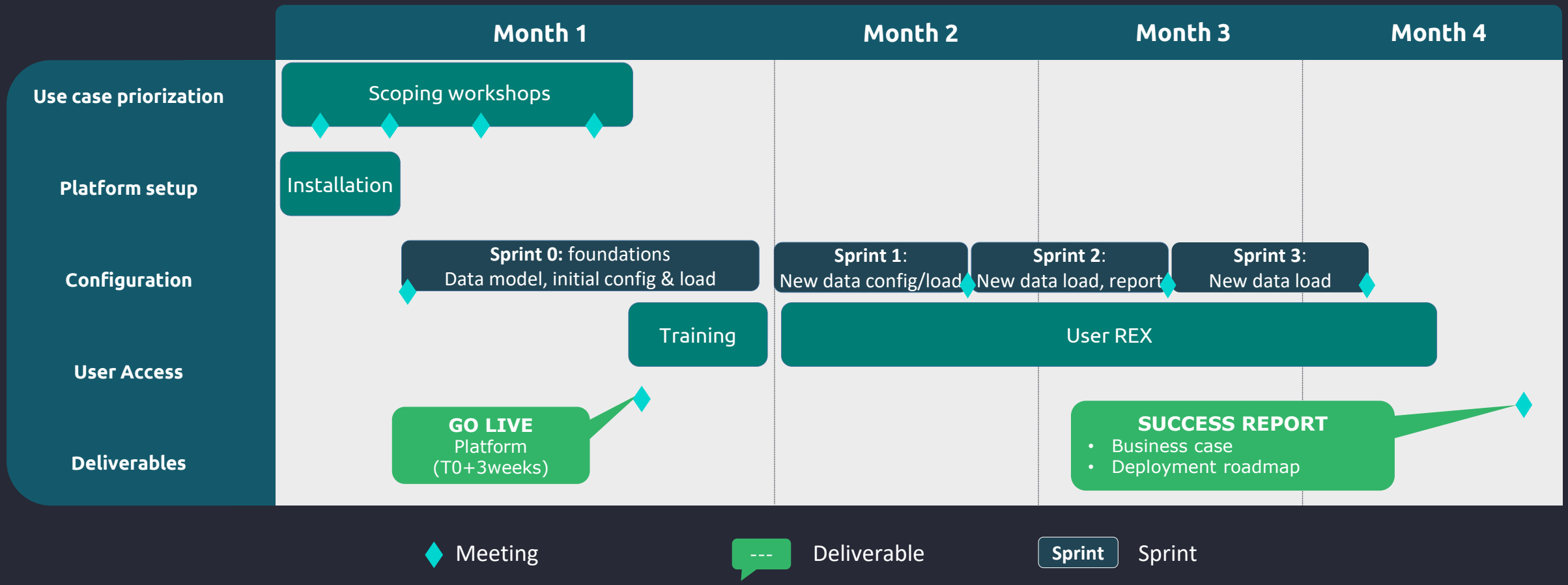
PROOF OF VALUE ACTIVITIES & DELIVERABLES



REFLECT[IOD]
A COLLABORATIVE ENGAGEMENT MODEL

	Accelerator	First 3 years		After 3 years	
	ReflectIoD	BUILD	RUN	BUILD	RUN
Capgemini	Brings ReflectIoD Accelerator (exe/code/doc) License contract ReflectIoD IP remains Capgemini	Builds the Client solution based on ReflectIoD	Does the corrective and evolutive maintenance		Reversibility, if required
Client	One shot Technology Access Fee for ReflectIoD Fee by geography No recurring license fee Client is in charge of Cloud & other subscriptions	Foreground IP of the solution belongs to the Client Pays regular Professional Services		Is free to choose any supplier for Professional Services (build & run) Usual service contracts	
	Technology access fee	Professional Services			

REFLECT^{IOD} TEAM

Thomas PERPÈRE

Head of Reflect^{IoD}

Business development & industry 4.0
INSEAD graduate, 11 years abroad (US, China, UK)

Ajay VERMA

Reflect^{IoD} Lead North America

Linda ANNAD

Engagement Manager Reflect^{IoD}
10 years of experience in delivery project of complex projects
5 years of experience as Engagement Manager

Amine BOUZIR

Product Owner Reflect^{IoD}

9 years of experience in Digital Asset Management
Build & Run of digital twin platforms

REFLECT^{IOD}
DIGITAL TWIN FOR ASSET OPERATORS

Contact: digital.manufacturing.global@capgemini.com

Reflect^{IoD} landing page

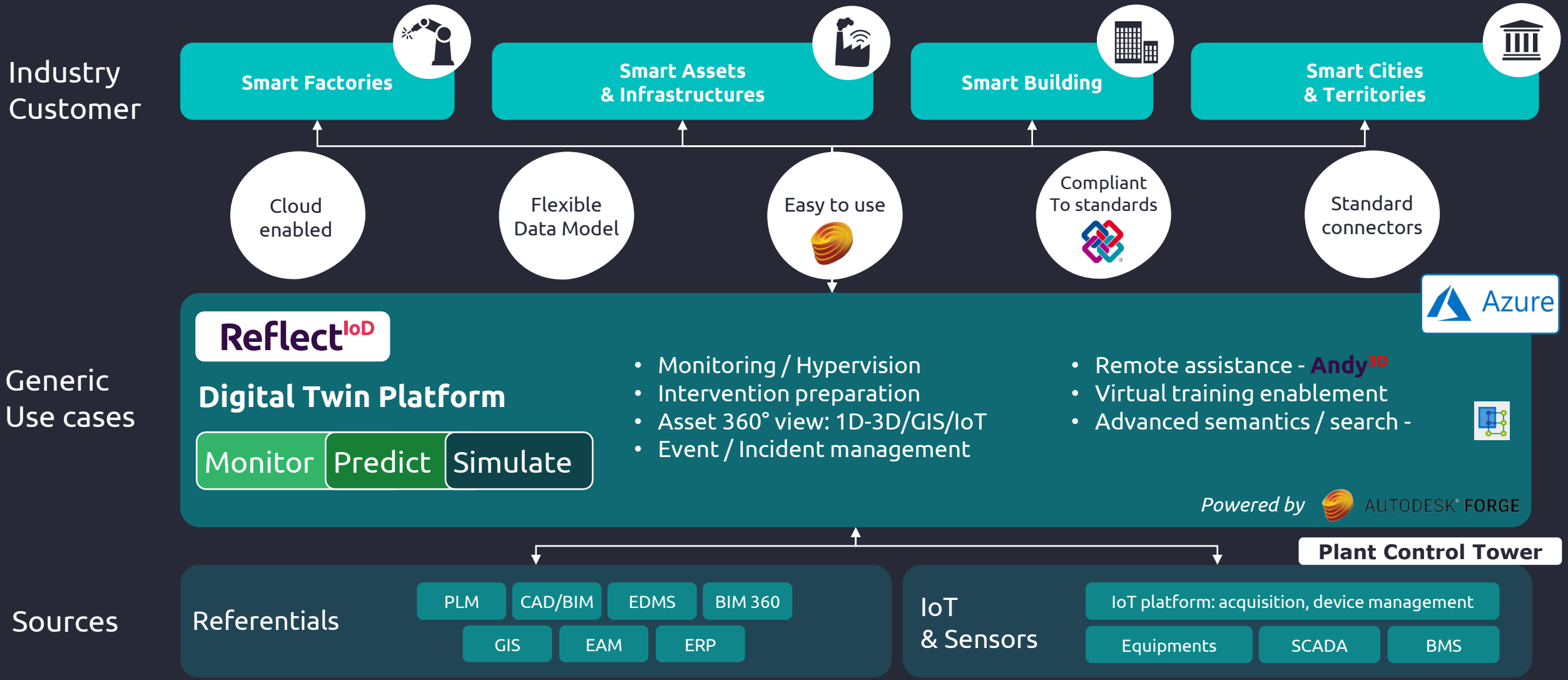
Reflect^{IoD} demonstration video

Partnership with Autodesk announcement

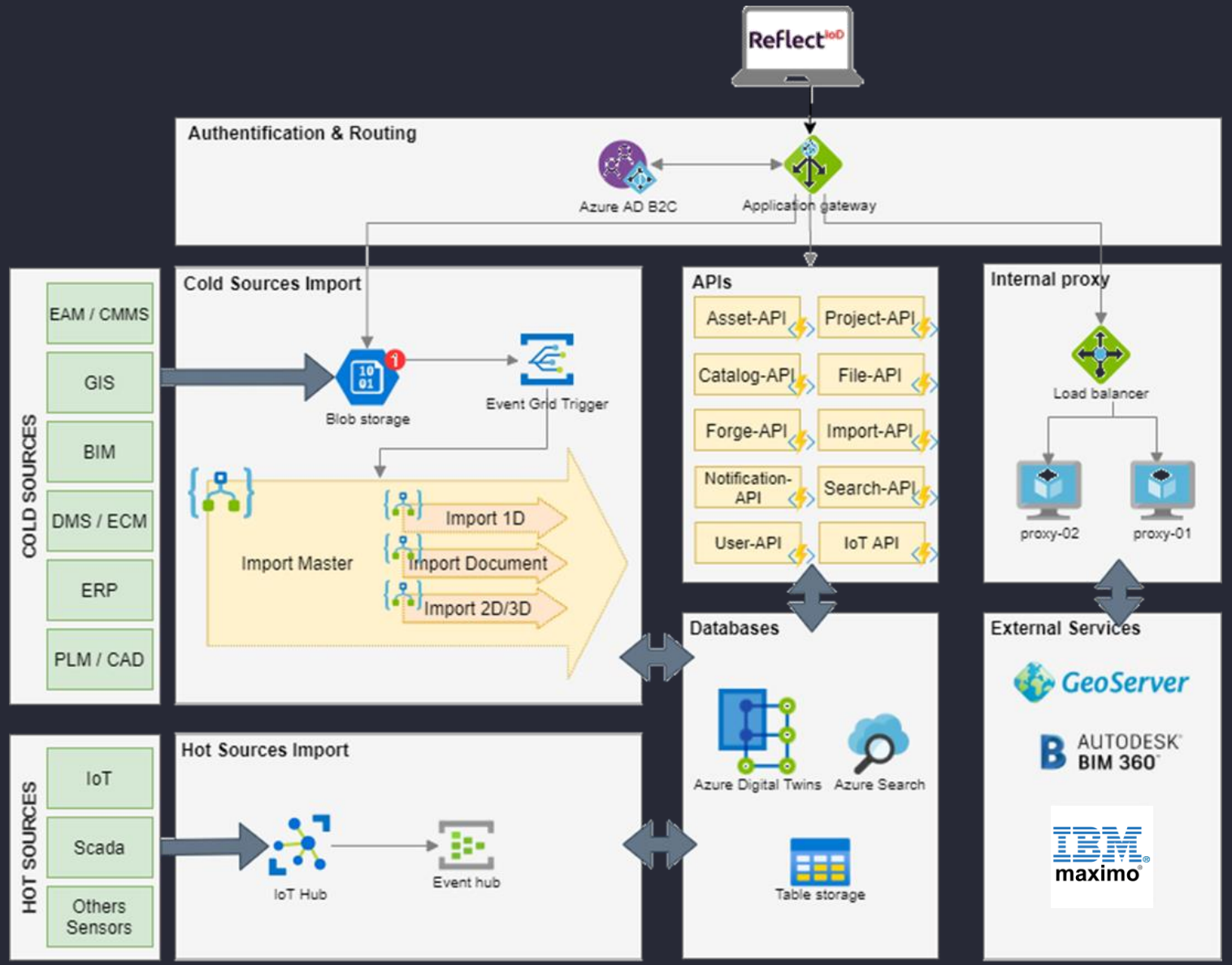
ReflectIoD

ARCHITECTURE

REFLECT[IOD]
FUNCTIONAL ARCHITECTURE



REFLECT[IOD]
TECHNICAL ARCHITECTURE (AZURE)



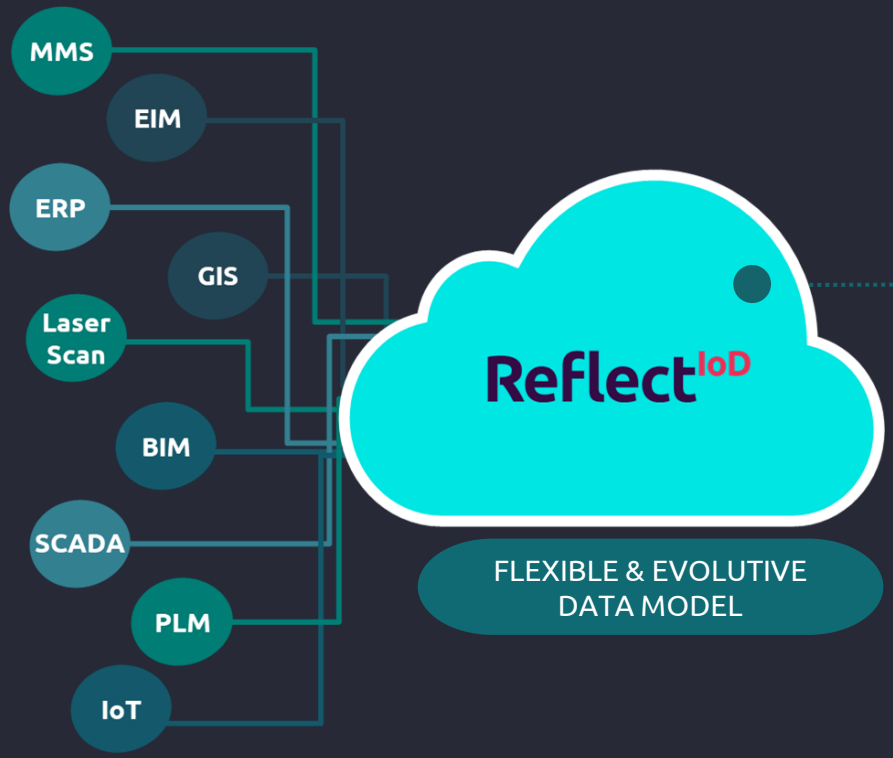
ReflectIoD

KEY FEATURES

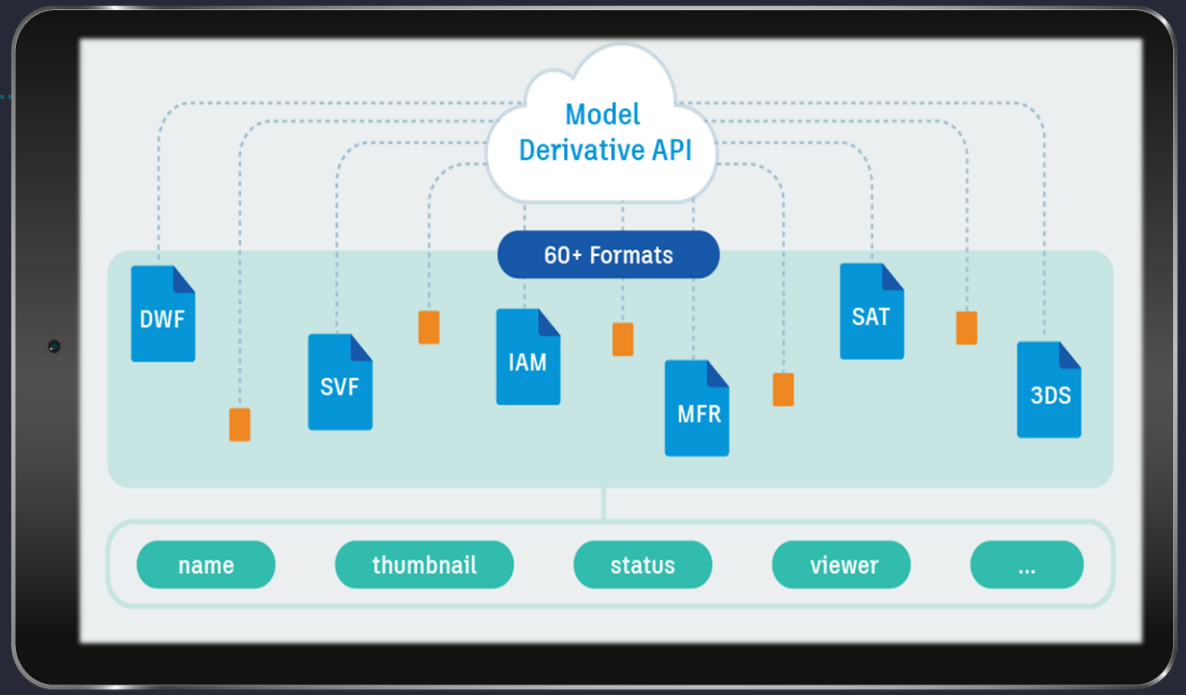
- Multiformat collection capability
- Configure your own data model and semantic
- Create your Digital Twin
- Hypervision & Monitoring
- Diagnosis & resolution
- Prepare field interventions
- Alerts Management
- Remote assistance

- Data Quality & Validation
- Data exposition
- Improved handover
- Commissioning
- Asset revamping
- Virtual training enablement
- SAP integration
- 3D color reports
- OEE integration

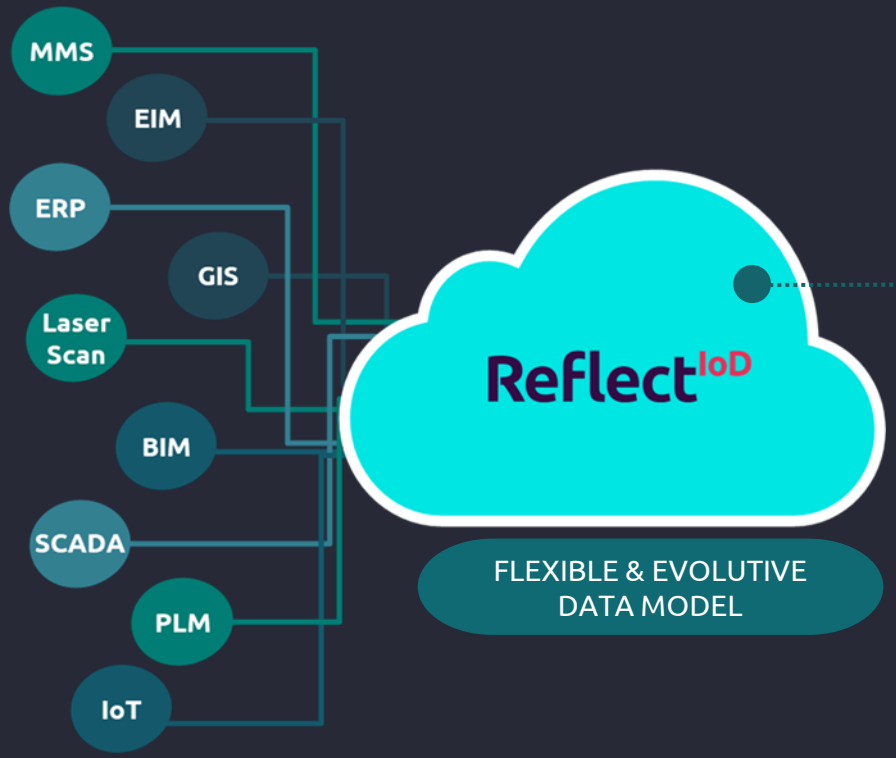
REFLECT[IOD]
MULTIFORMAT COLLECTION CAPABILITY



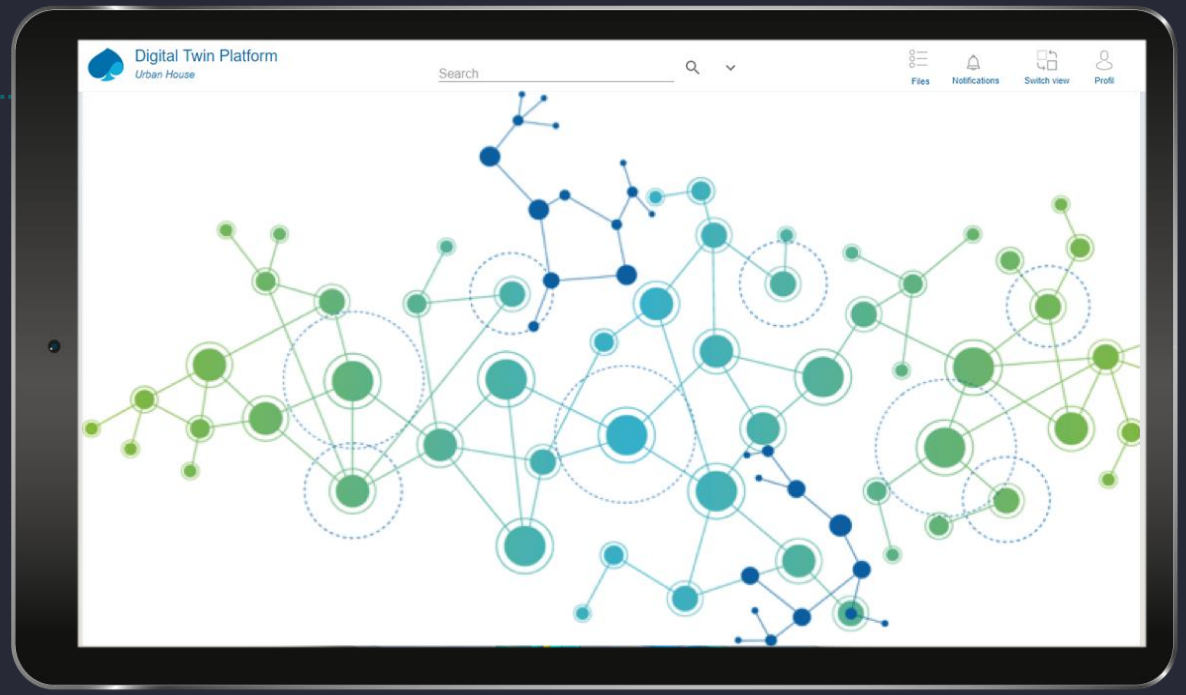
Data is **collected** from authoring and live source systems, whatever the **data formats**



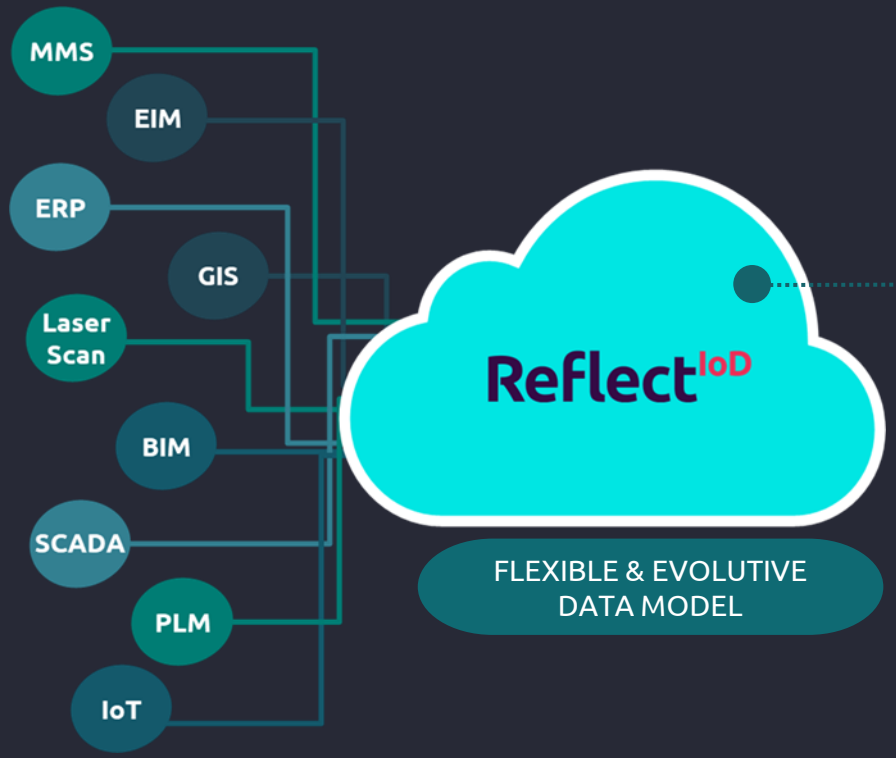
REFLECT[IOD]
CONFIGURE YOUR OWN DATA MODEL AND SEMANTIC



Data is aggregated according to a flexible data model that represents the business semantic, leveraging graph database capabilities.



REFLECT[IOD]
CREATE YOUR DIGITAL TWIN



Reflect[IoD] therefore creates the **Single Source of Truth** of your Buildings and Infrastructures: your Digital Twin.

REFLECT^{IOD}
HYPERVISION & MONITORING

Hypervise the buildings, assets and territories, 360° view of their near real time status:

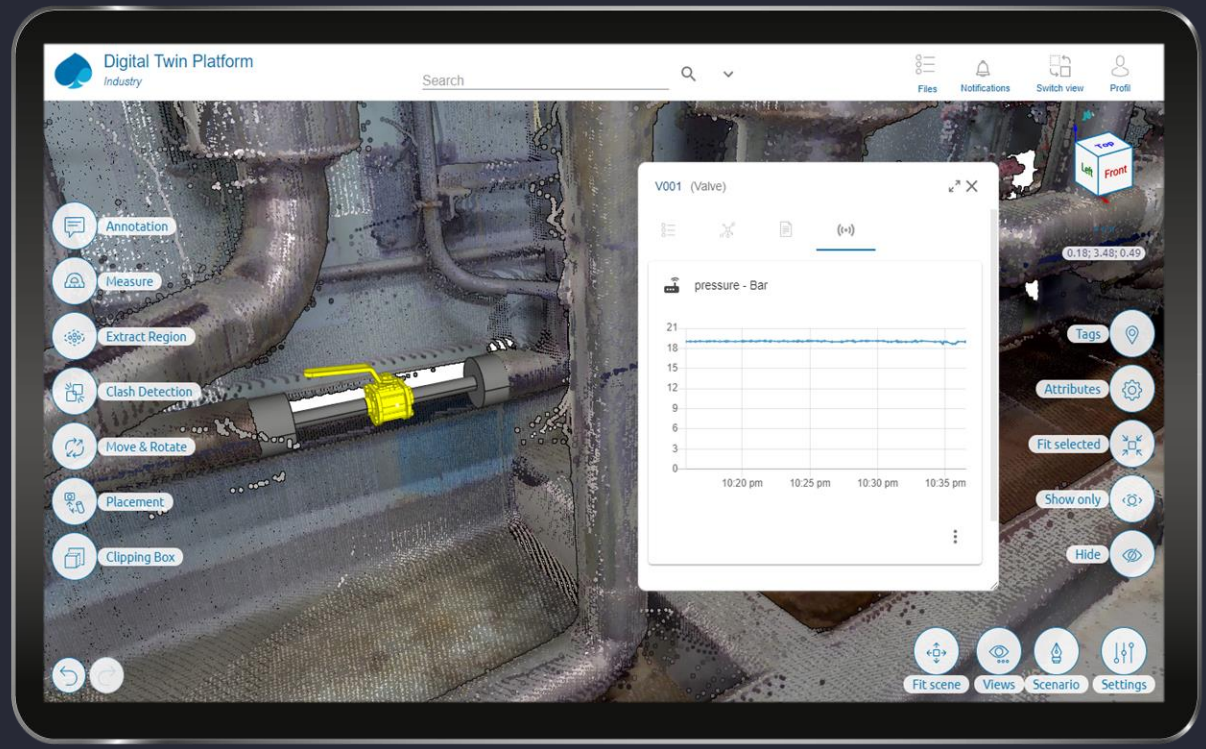
- Notifications and alerts on 2D / 3D views
- Split views 2D / 3D
- Event management with lifecycle and default operation procedures by event type

REFLECT[IOD]
DIAGNOSIS & RESOLUTION

Enable automatic or manual pairing of IoT / sensors to equipment.

Define alerts on sensor values:

- Threshold conditions
- Simple rule engine conditions
- Machine learning



REFLECT[IOD]
PREPARE FIELD INTERVENTIONS

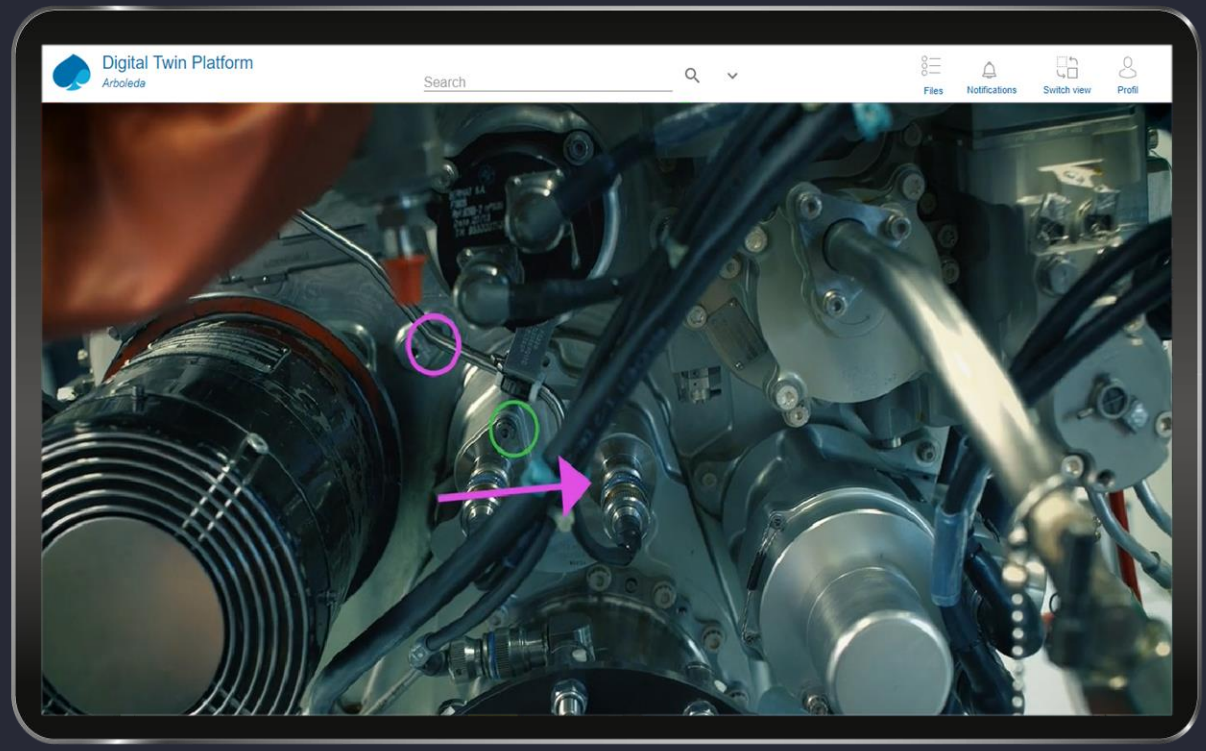
Prepare an inspection in context, with 360° awareness of the asset history and live status.

Provide operator on the field with extended knowledge on past operations, asset reference data and behavior.

REFLECT[IOD]
REMOTE ASSISTANCE

Remotely assist a field operator with augmented reality:

- Audio and video live stream
- Chat, digital twin data sharing
- Annotations on operator's or augmented reality tablet or glasses



REFLECT^{IOD}
ALERTS MANAGEMENT

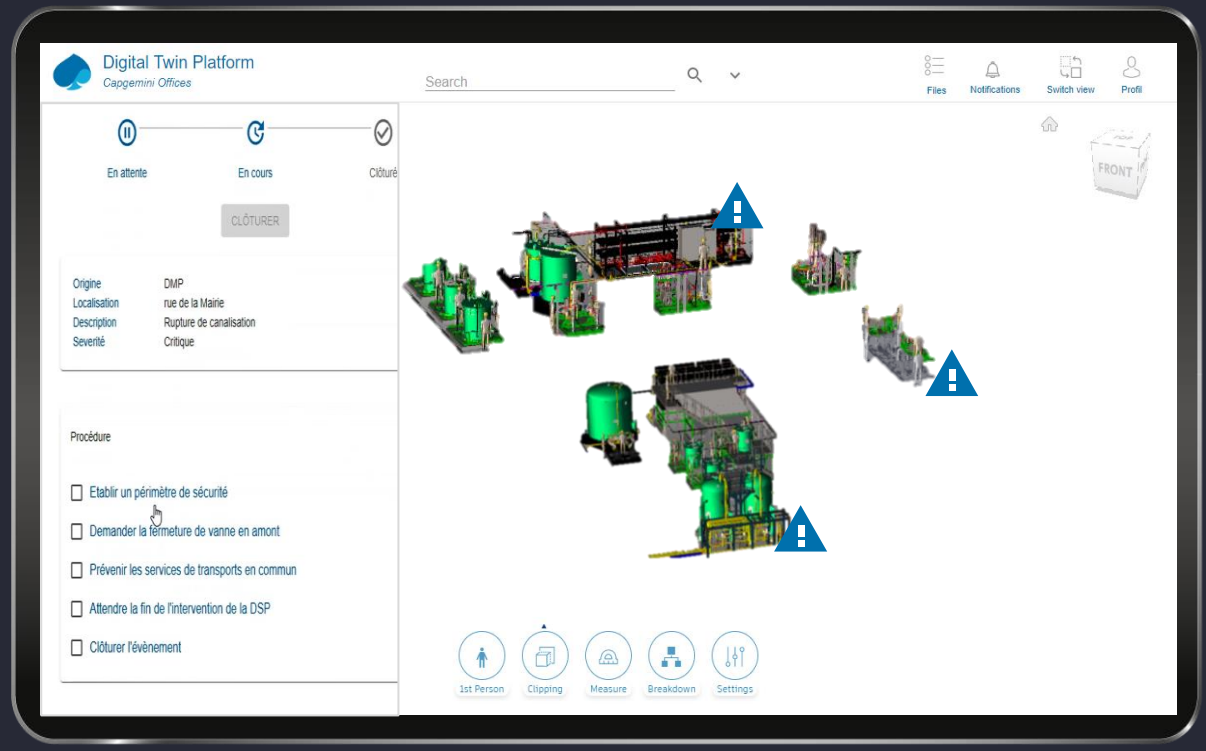
Display all the alerts in your asset and create events to manage its resolution workflow in Reflect IoD.

Alert

- Display an alert lists (date/time, asset, alert, description, criticity)
- Create an event attached to an alert and a tag
- Display Alert on 3D

Event

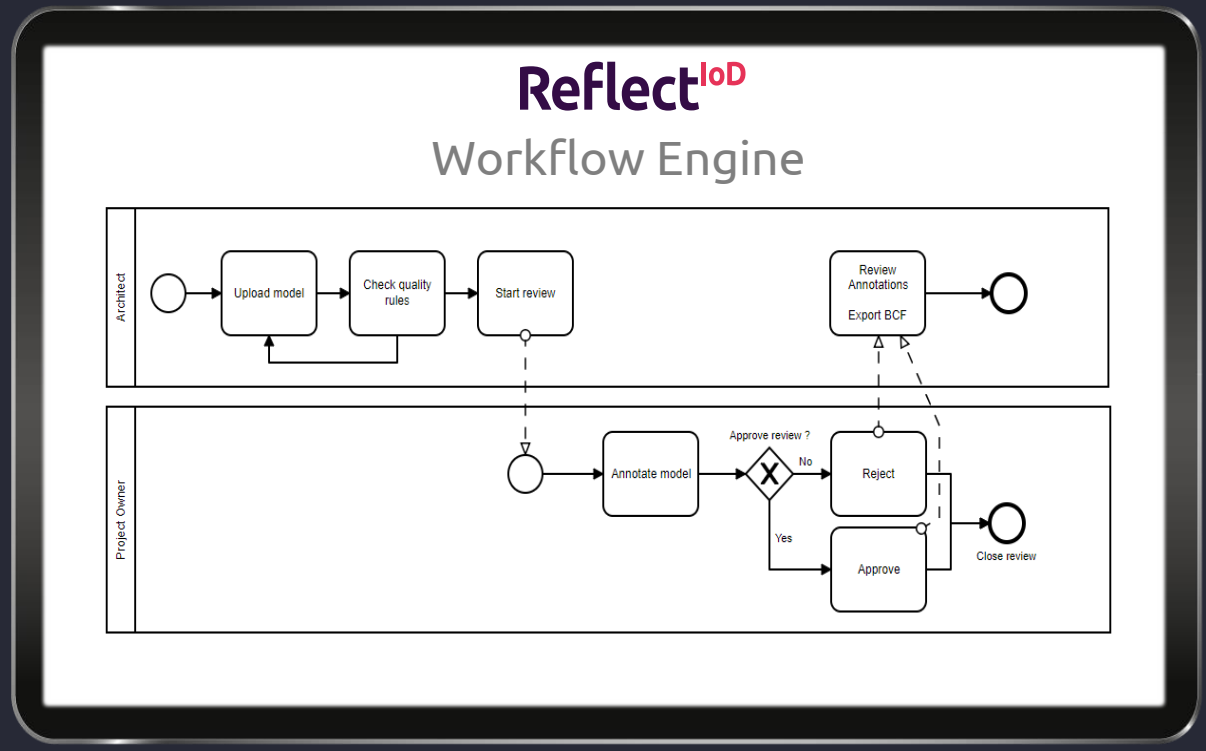
- Event type administration (procedure resolution creation)
- Event as a retractable panel



REFLECT[IOD]
DATA QUALITY & VALIDATION

Controlling and improving Data Quality:

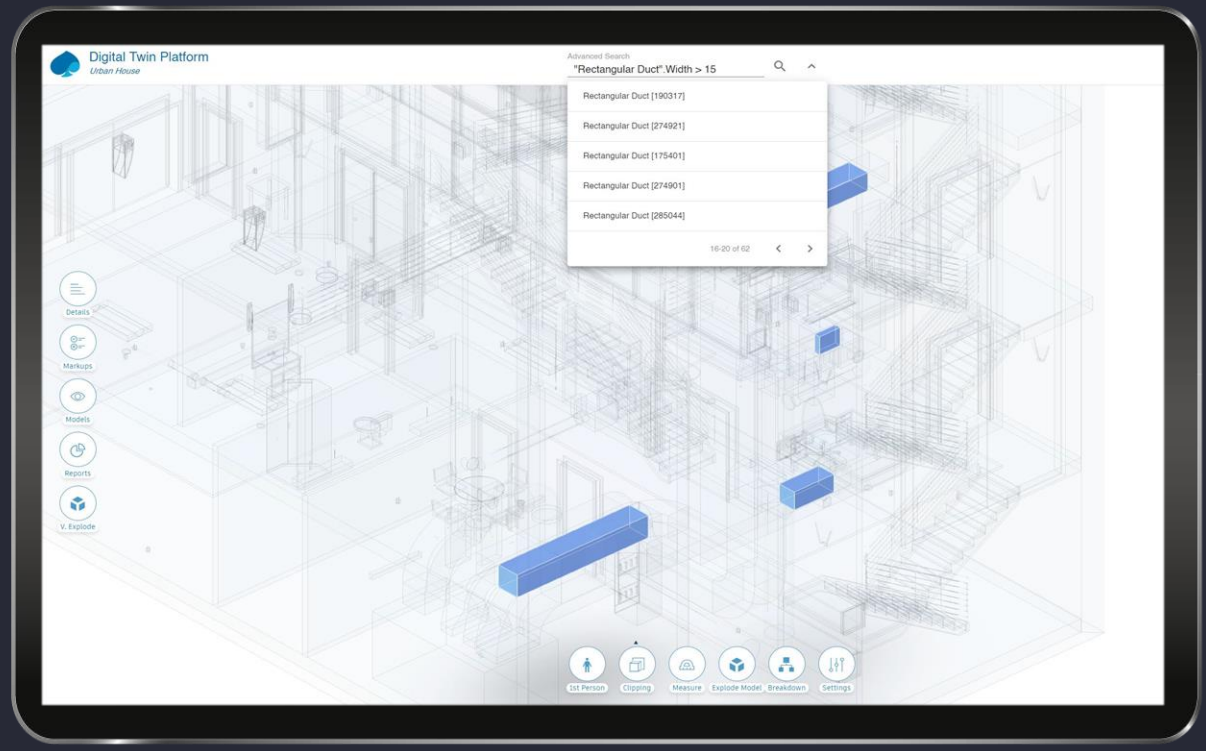
- Data quality dashboards
- Data consistency report
- Data Validation workflows



REFLECT[IOD]
DATA EXPOSITION

Data is exposed across the extended enterprise, with:

- Profile-based data segregations
- Multiple views and APIs
- Web and Mobile
- Full text and Semantic search



REFLECT[IOD]
IMPROVED HANDOVER

Monitor asset data completeness during design & construction phases towards operation phase expectations.

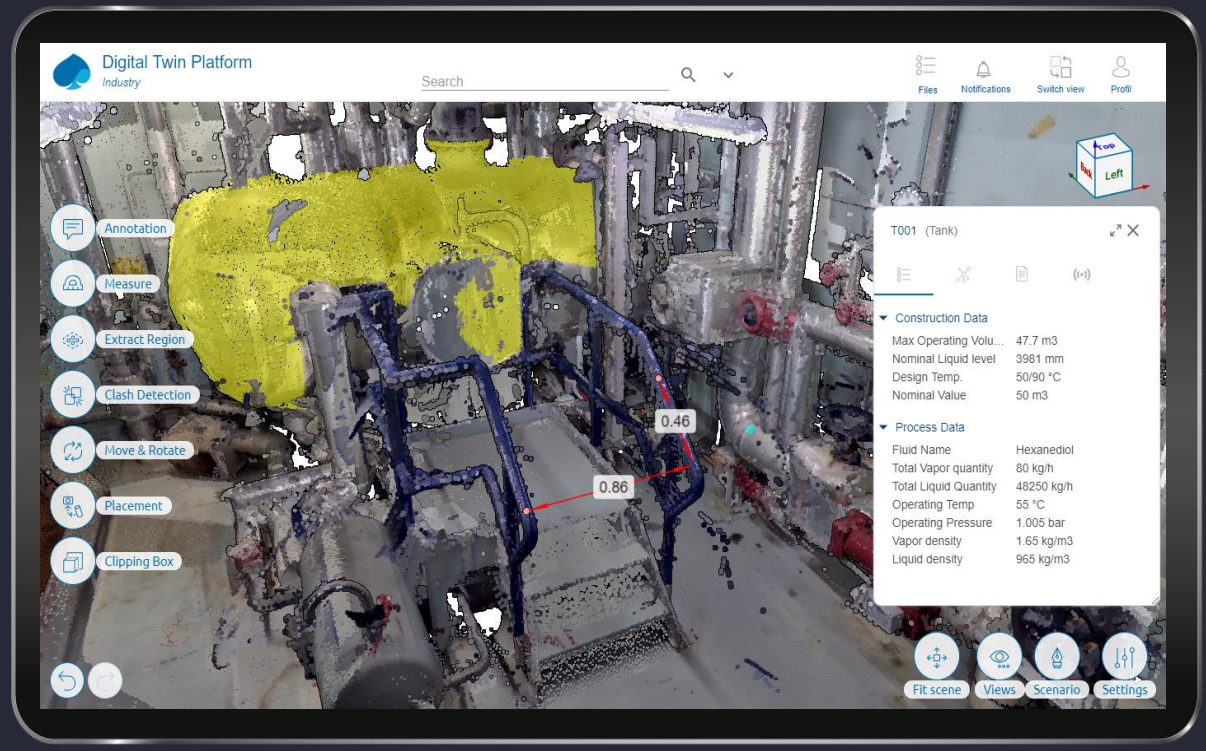
REFLECT[IOD]
COMMISSIONING

Report commissioning results from the field. Aggregate tests results and punch list to digital twin data for better traceability.

REFLECT[IOD]
ASSET REVAMPING

Prepare or simulate a revamping or space planning in hybrid 3D with 360° awareness of the asset state and history:

- Measures distances & diameters
- Isolate / move cloud point regions
- Perform clash detection
- Access to maintenance history and live status (IoT)



REFLECT[IOD]
VIRTUAL TRAINING ENABLEMENT

Enable training on real asset data, with 360° asset awareness of past history data (Design, Built and Operation) completed by live status (IoT).

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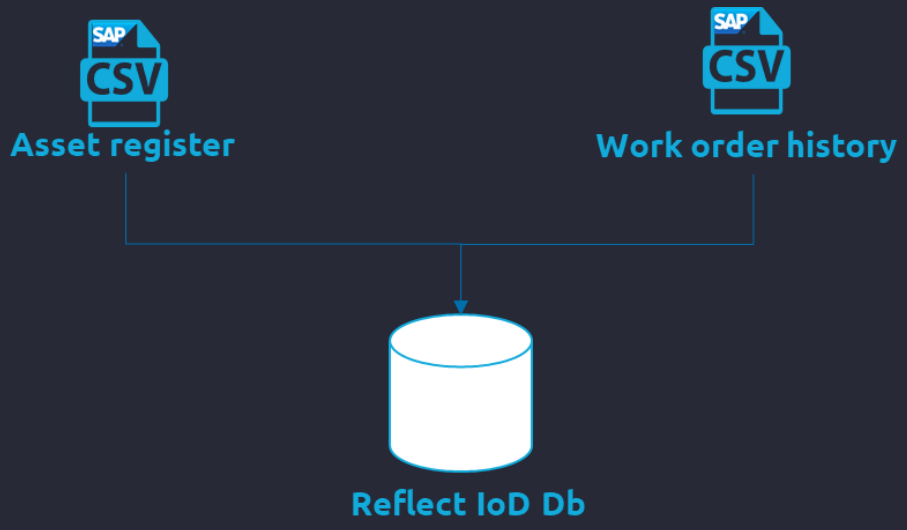
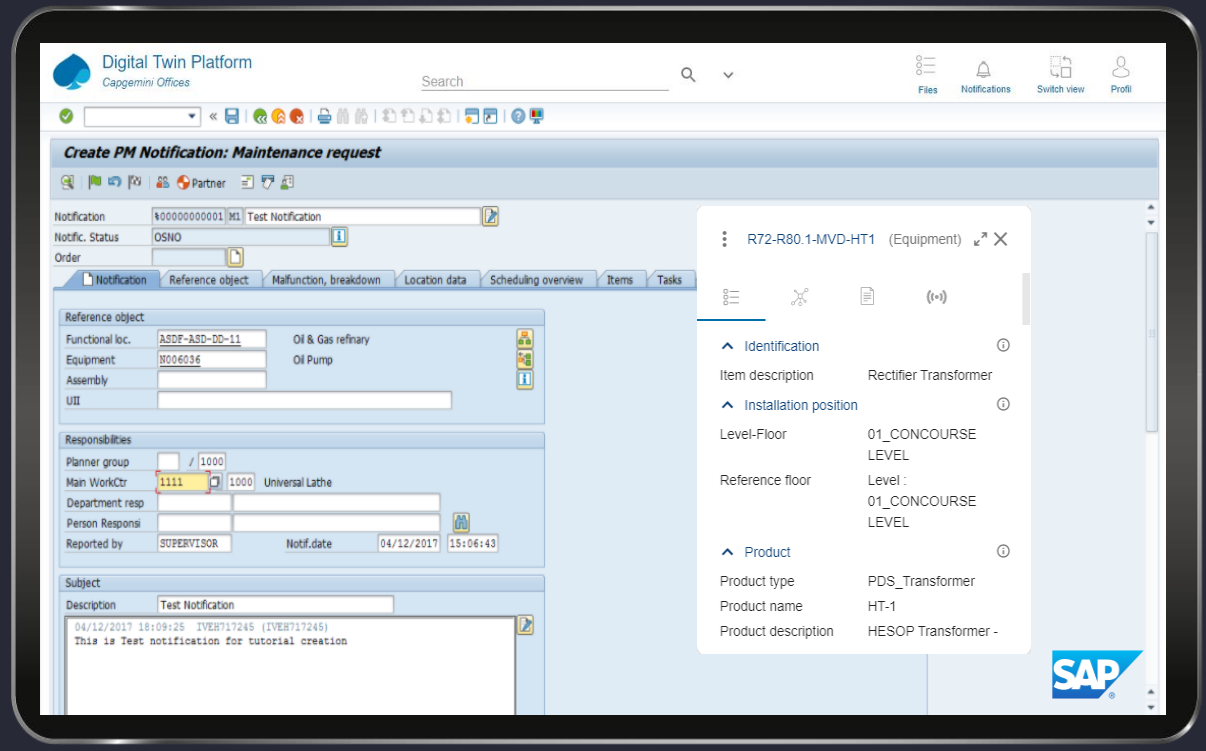
SAP INTEGRATION

- Switch from an asset selected in Reflect IoD to the SAP PM asset page
- Import Asset register from SAP Standard export
- Import WO history from SAP Standard export

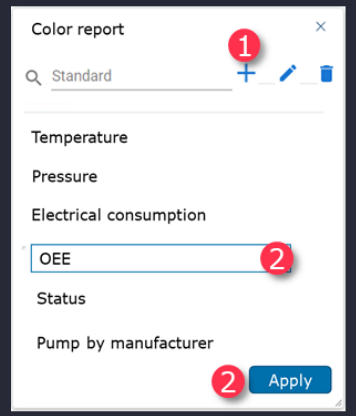


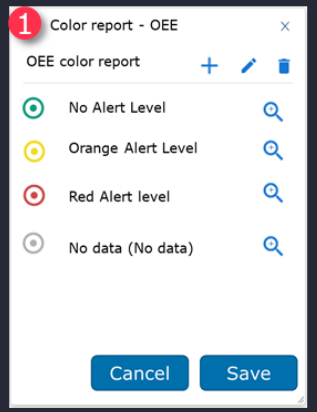


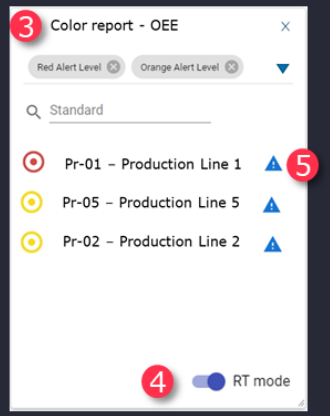
REFLECT[IOD]
3D COLOR REPORTS

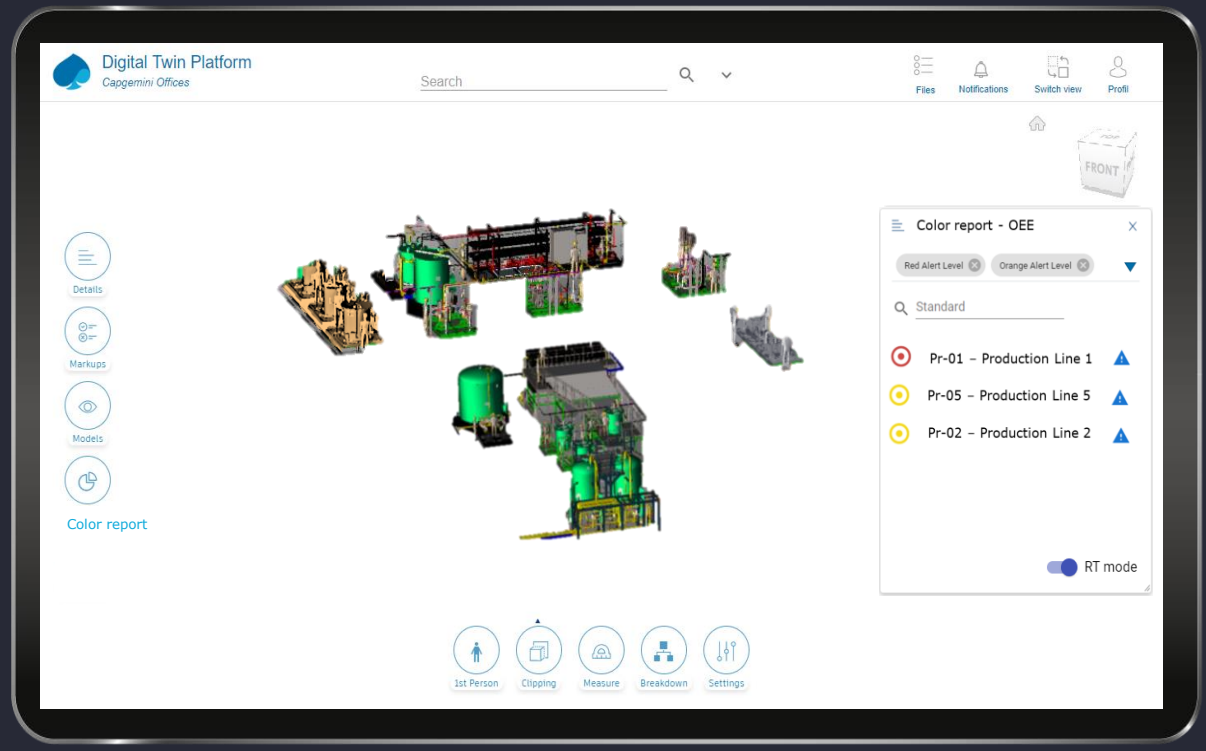
Use the semantic search capabilities on Azure Digital Twin to color the 3D model.
Color reports are transversal, shared by all users, only feature-autorized users can edit/delete.

- Create, define & edit color report (1)
- Apply color report on a 3D model (2)
- List tags on each report category (3)
- Hypervision mode to refresh 3D and tag list (4)
- Create an event associated to a tag (5)





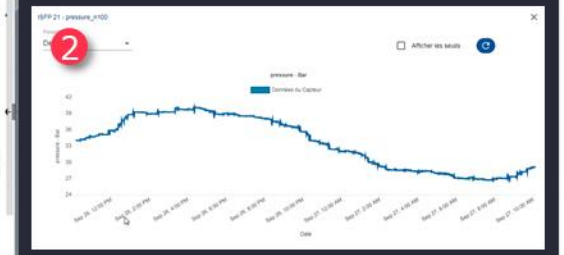


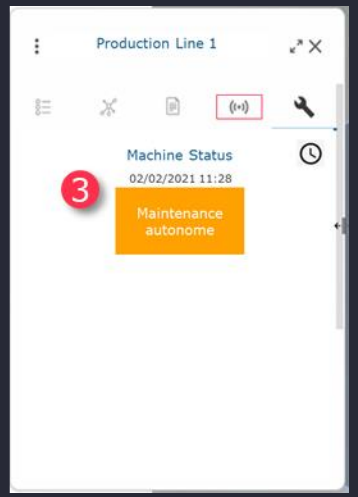


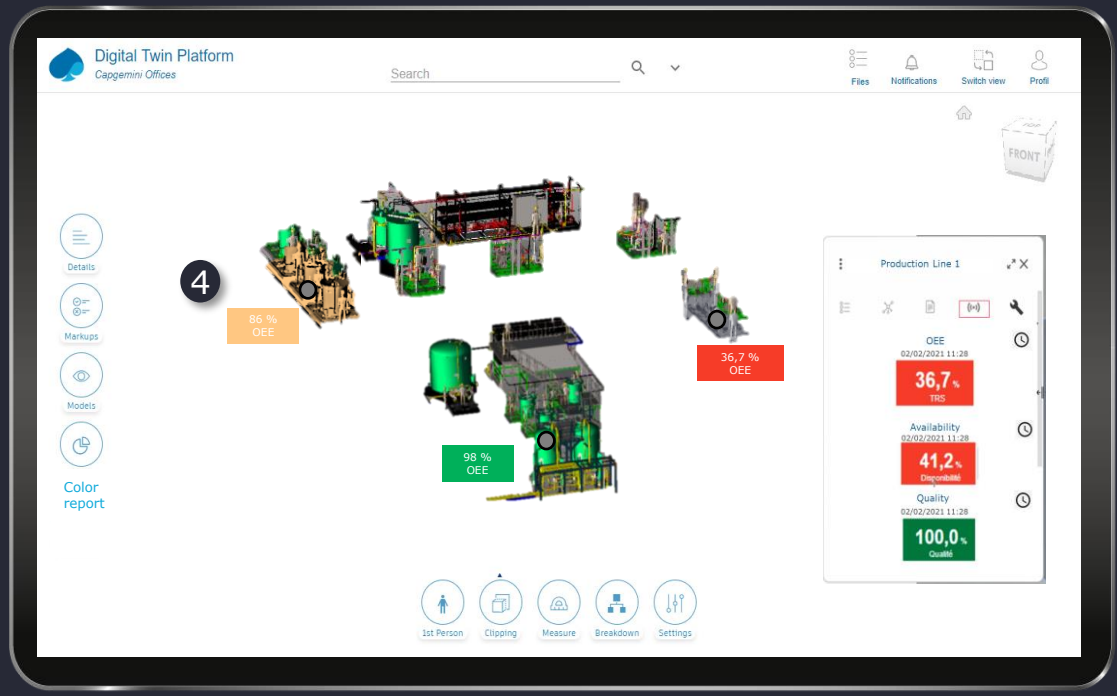
REFLECT[IOD]
OEE INTEGRATION

Create an integration with IOP and specific display for OEE and machine status storing the last updated value in Reflect IoD.

- Display OEE, Availability, Quality, Peformance value on 360 view (1)
- Display OEE, Availability, Quality, Performance historical value (2)
- Display Machine status on 360 view (3)
- Display floating value on 3D model (4)







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Capgemini is a global leader in partnering with companies to transform and manage their business by harnessing the power of technology. The Group is guided everyday by its purpose of unleashing human energy through technology for an inclusive and sustainable future. It is a responsible and diverse organization of 270,000 team members in nearly 50 countries. With its strong 50 year heritage and deep industry expertise, Capgemini is trusted by its clients to address the entire breadth of their business needs, from strategy and design to operations, fuelled by the fast evolving and innovative world of cloud, data, AI, connectivity, software, digital engineering and platforms. The Group reported in 2020 global revenues of €16 billion.

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