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Unified data collect for Digital Twin

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Summary : Data collection is the pivot between the real world and the virtual world of the digital twin. How to facilitate the deployment and use of data collection for a digital twin at scale? We propose the uDC ecosystem which includes a set of tools and services to unify the collection on assets and easily instantiate them repeatedly in your shop floors. This is fed by industrial use-cases , R&D projects such as MADIT and a survey of scientific literature.

Digital Twin

Definitions:

"The Digital Twin concept model [...] contains three main parts: a) **physical products** in Real Space, b) **virtual products** in Virtual Space, and c) **the connections** of data and information that ties the **virtual and real products together**."

M. Grieves, « Digital Twin: Manufacturing Excellence through Virtual Factory Replication », 2014.

"<manufacturing> fit for purpose **digital representation** of an **observable manufacturing element** with synchronization between the element and its digital representation"

ISO 23247-1:2021,
 Digital twin framework for manufacturing, 2021

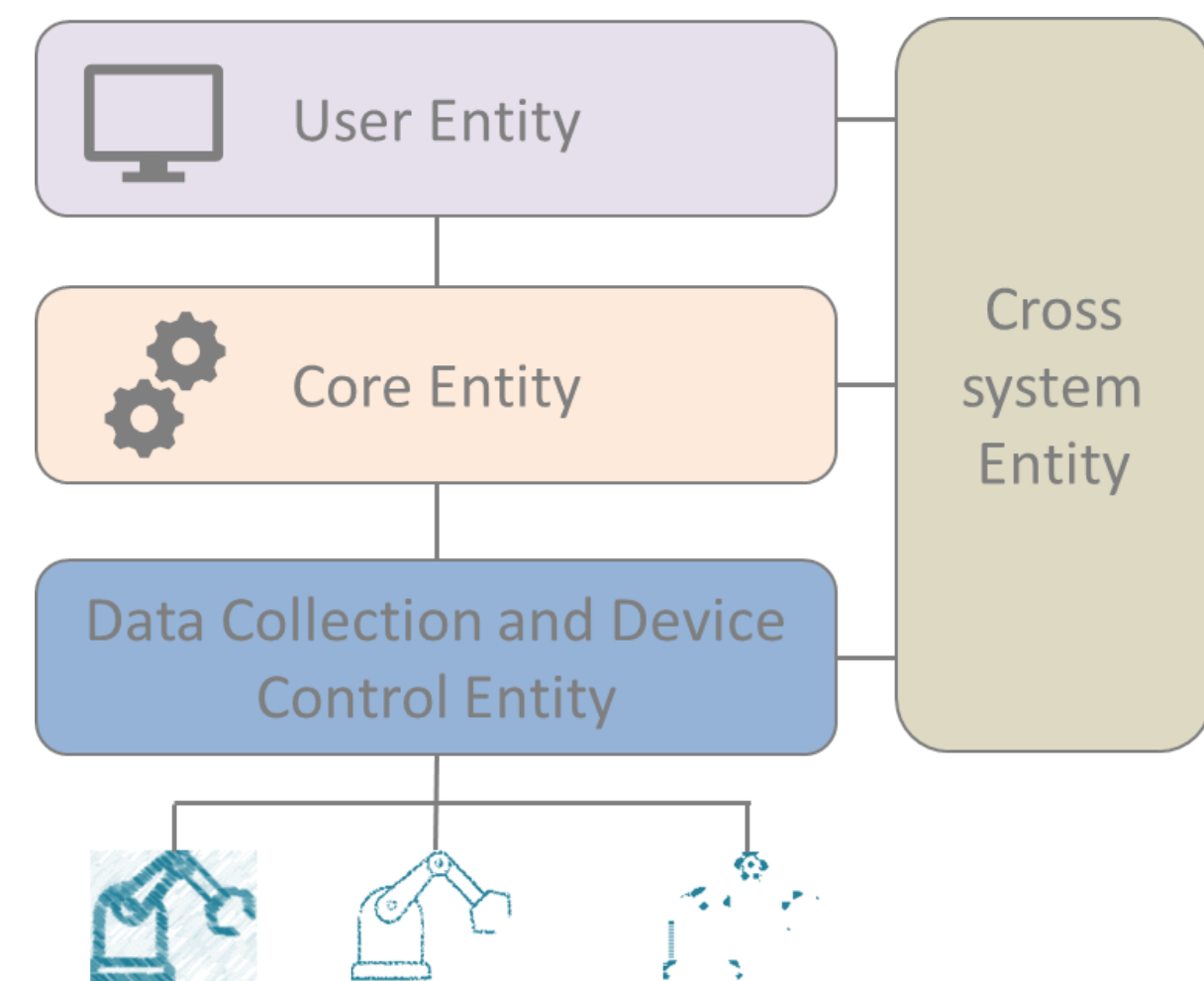


fig 1 : Reference architecture - ISO 23247

Data collect is a key point in the digital twin architecture (fig 1):

So, to create a digital twin you need :

- Human resources trained and available
- Knowledge of its equipment
- Technical collection capacity for the need
- Consider the use-case for which the digital twin has been designed

→ For large-scale implementation and cost reduction, standardization of digital twin and its data collect becomes necessary

First Prosynt Digital Twin Application : MADIT

Railway Machinery Digital Twin Application :

MADIT is a R&D project based on the creating of a digital twin model (fig 2). It has enabled a first approach to this exciting technology.

Prosynt was involved in the data collection and data publication part of the project. Feedback and technological barriers have shown the importance of tools to easily deploy large-scale data collection to meet the needs of digital twins.

2018-2019 → MADIT Project :
 Machine Digital Twin concept

Technological barriers:
 How do I resynchronize the system after a connection loss ?

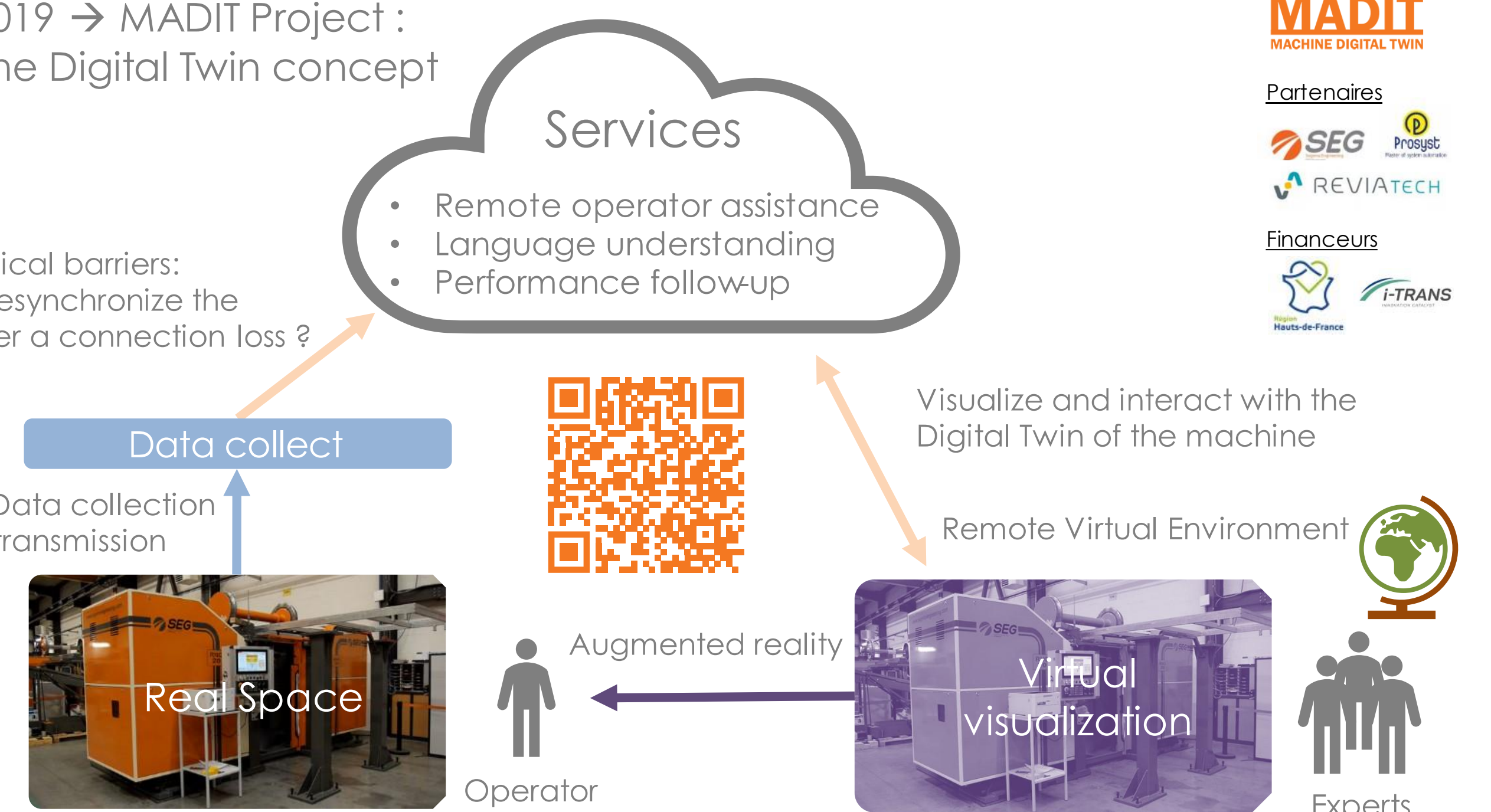


fig 2 : Machine Digital Twin Project

Unified data collect for Digital Twin

Unified Data Collector (uDC):

uDC server and its ecosystem are designed for the deployment of **standardized** and **contextualized** data collection and their associated services (fig 3) . It is based on the OPC UA standard IEC 62541. The uDC ecosystem includes self-configurable monitoring services.

uDC ecosystem can be considered as a digital twin because there are :

- A Real Space
- A Bidirectional Communication
- Data and Models
- Services

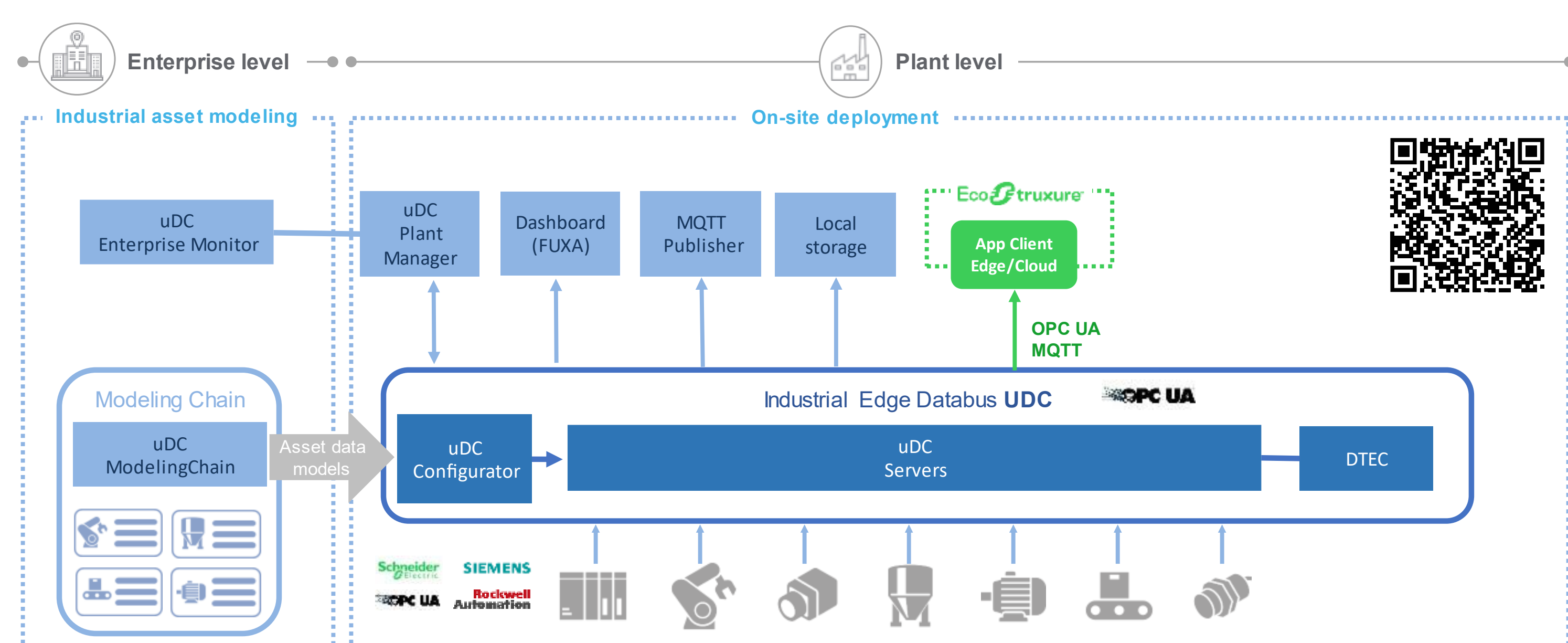


fig 3 : uDC Framework

Easy deployment of data collect:

Asset modeling allows a standard data structure, presets for variable mapping, information necessary for the connection, etc. (fig 4). Edge computing operations can be integrated into assets.

This makes it **easier to scale up** data collection and use contextualized data via standard services, for example.

Duplicating instances of digital twin facilitates the return on investment of this promising technology.

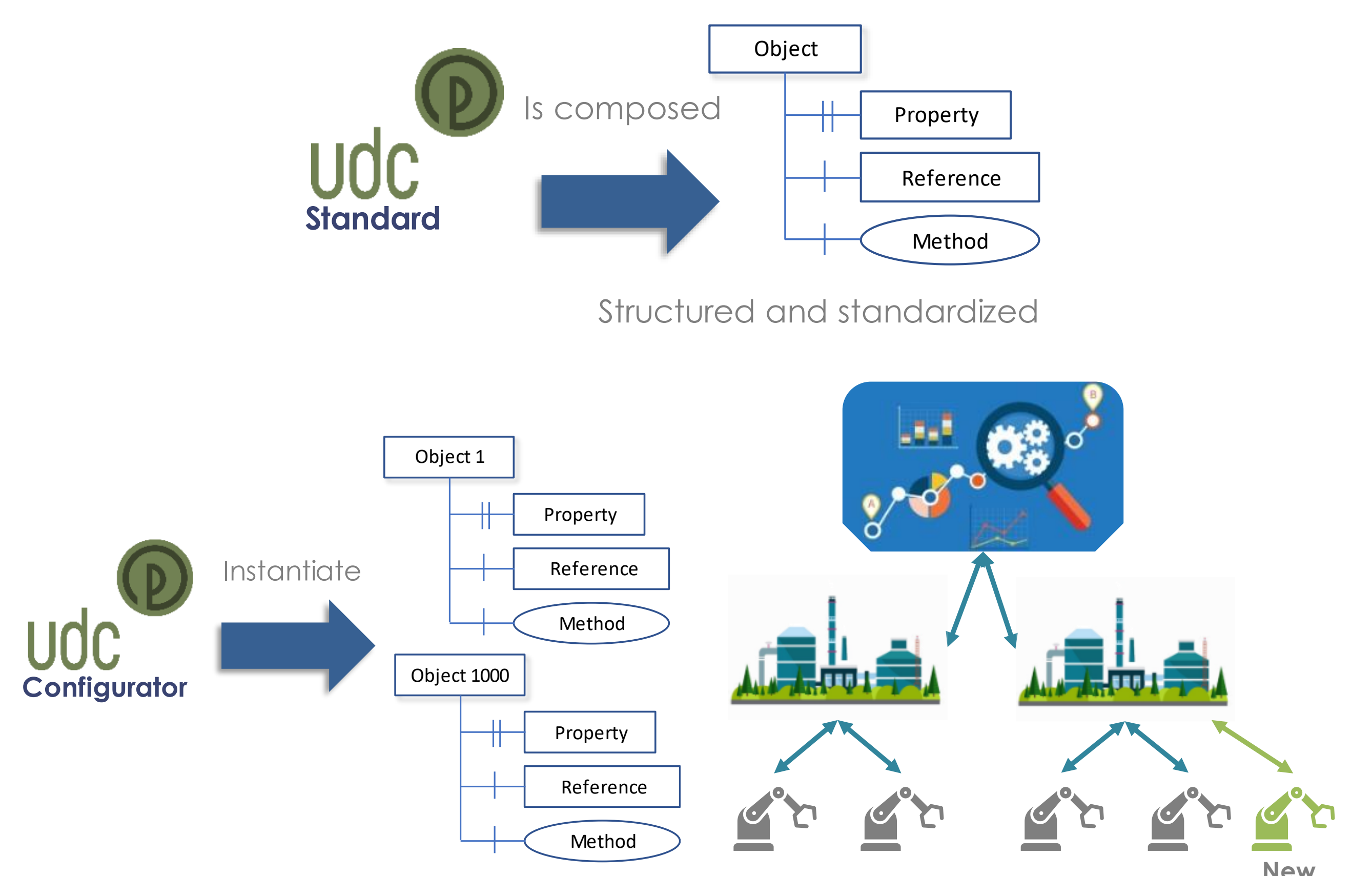


fig 4 : Standard Asset for easily deployment

Conclusion

- Data Collect is the **basis of the digital twin** for the connection between real and virtual
- Unified and contextualized data collection offers **scalability** to develop your digital twins
- Digital twin requires large skills to be designed and deployed

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