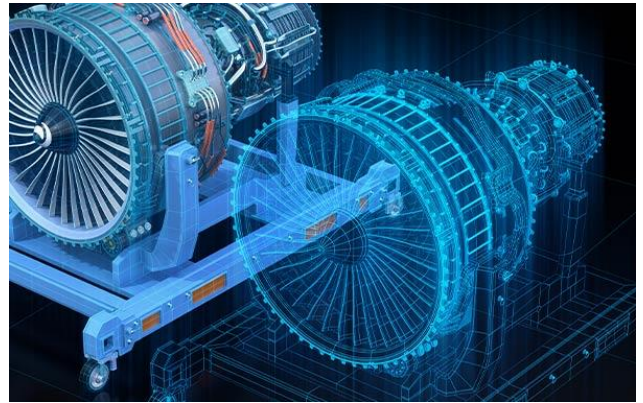


## Digital Twin

A digital twin is a virtual representation of a particular physical entity or a process with data connections that enable convergence between the physical and digital states at an appropriate rate of synchronization, and provides an integrated view throughout the lifecycle of the physical entity or the process that helps to optimize the overall performance.



Based on definitions proposed in [ISO 23247-1:2021](#) Automation systems and integration -- Digital twin framework for manufacturing -- Part 1. Overview and general principles

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### Technical Committees working on Digital Twin standardization

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#### - International level -

##### **ISO/IEC JTC 1/SC 41** - [IoT and Digital Twin](#)

- **Scope:**  
Standardization in the area of Internet of Things and Digital Twin, including their related technologies to:
  - serve as the focus and proponent for JTC 1's standardization programme on the Internet of Things and Digital Twin, including their related technologies;
  - provide guidance to JTC 1, IEC, ISO and other entities developing Internet of Things and Digital Twin related applications.
- 44 published standards and 27 ongoing projects
- 5 Working Groups (including WG 6 - Digital Twin) and 3 Joint Working Groups (including JWG 24 - IIoT and digital twin applications in power systems management)
- 13 national delegates

##### **ISO/TC 184/SC 4** - [Industrial data](#)

- **Scope:**  
Standardization of the content, meaning, structure, representation and quality management of the information required to define an engineered product and its characteristics at any required level of detail at any part of its life-cycle from conception through disposal, together with the interfaces required to deliver and collect the information necessary to support any business or technical process or service related to that engineered product during its life-cycle.
- 792 published standards and 78 ongoing projects
- 9 Working Groups and 3 Joint Working Groups

#### - European level -

##### **ETSI/ISG CIM** - [Cross Cutting Context Information Management](#)

- **Scope:**  
The main objective of ISG CIM continues to be to create technical specifications and reports to enable multiple organizations to develop interoperable software implementations of a cross-cutting Context Information Management (CIM) Layer. The standards work is designed to bridge the gap between abstract standards and concrete implementations.
- 30 published standards and 15 ongoing projects

## Digital Twin standards

The following table lists the published and ongoing Digital Twin related standards at the international and European levels.

### Standards published by ISO/TC 184/SC 4

#### ISO 23247-1:2021

Automation systems and integration – Digital twin framework for manufacturing – Part 1: Overview and general principles

##### Scope:

This document provides an overview and general principles of a digital twin framework for manufacturing including:

- terms and definitions;
- requirements of the digital twin framework for manufacturing.

##### Overview:

The ISO 23247 series intends to define a framework to support the creation of digital twins of observable manufacturing elements including personnel, equipment, materials, manufacturing processes, facilities, environment, products, and supporting documents.

- ISO 23247-1: General principles and requirements for developing digital twins in manufacturing;
- ISO 23247-2: Reference architecture with functional views;
- ISO 23247-3: List of basic information attributes for the observable manufacturing elements;
- ISO 23247-4: Technical requirements for information exchange between entities within the reference architecture.

#### ISO 23247-2:2021

Automation systems and integration – Digital twin framework for manufacturing – Part 2: Reference architecture

##### Scope:

This document provides a reference architecture for the digital twin in manufacturing including;

- reference model from domain and entity point of view;
- functional view specifying functional entities supported by the entity-based reference model.

##### Overview:

This document has provided domain-specific reference model in several domains, such as domains of digital twin for manufacturing, observable manufacturing domain, device communication domain, digital twin domain, and user domain, which are further elaborated with functional view specifying several functional entities.

#### ISO 23247-3:2021

Automation systems and integration – Digital twin framework for manufacturing – Part 3: Digital representation of manufacturing elements

##### Scope:

This document provides a list of basic information attributes for the Observable Manufacturing Elements (OMEs):

- examples of information attributes are given;
- standards that can define these information attributes.

##### Overview:

Digital representation of OMEs can have both static and dynamic information. For example, the information that does not change during manufacturing is static information whereas if the shape of the material changes during manufacturing process is dynamic. This document provides a list of basic information attributes, such as personnel, equipment, material, process, facility, environment, product for the OMEs within the reference architecture given in ISO 23247-2.

#### ISO 23247-4:2021

Automation systems and integration – Digital twin framework for manufacturing – Part 4: Information exchange

##### Scope:

This document identifies technical requirements for information exchange between entities within the reference architecture.

##### Overview:

The requirements for information exchange in the following networks are within the scope of this document:

- user network that connects the user entity and the digital twin entity;
- service network that connects sub-entities within the digital twin entity;
- access network that connects the device communication entity to the digital twin entity and to the user entity;
- proximity network that connects the device communication entity to the observable manufacturing elements.

## Projects developed by ISO/IEC JTC 1/SC 41

### ISO/IEC 30173

Digital Twin -- Concepts and terminology

#### Scope:

This project is intended to establish digital twin and related concept including the terms and definitions, terminologies related to its ecosystem and lifecycle as well as classifications of digital twin.

#### Overview:

The purpose of this project is expected to provide:

- a common understanding of the concept of digital twin
- an overview of the lifecycle of a digital twin
- a foundation for the development of standards and specifications based on specific digital twin use cases

### ISO/IEC 30172

Digital Twin -- Use cases

#### Scope:

This project is intended to provide a standardized generic Digital Twin maturity model, definition of assessment indicators, guidance for a maturity assessment, and other practical classifications of Digital Twin capabilities.

#### Overview:

This technical report intends to collect several use cases of digital twin applications in various domains using the template modified from IEC 62559-2 use case template and ISO/IEC TR 22417 use case template. This standard is under development within ISO/IEC JTC 1/ SC 41/WG 6.

### ISO/IEC 30186

Digital twin – Maturity model and guidance for a maturity assessment

#### Scope:

This project is intended to provide a standardized generic Digital Twin maturity model, definition of assessment indicators, guidance for a maturity assessment, and other practical classifications of Digital Twin capabilities, etc.

#### Overview:

A digital twin deployed in various application domains is expected to cooperate with other digital twins for better convergence and integration. In this context, this standard intends to define the features of implementations that should be supported by a digital twin from a low level to a high in which the maturity model of digital twin consists of maturity levels where each level comprises of a maturity level indicator, descriptive name, and characteristics relevant to the desired assessment information. This standard is under development within ISO/IEC JTC 1/SC 41/WG 6.

### ISO/IEC 30188

Digital Twin -- Reference Architecture

#### Scope:

This document intends to specify a general Digital Twin Reference Architecture (DTw RA).

#### Overview:

A reference architecture is considered as an architecture for making architectures that exhibit known commonalities. This standard is expected to develop a commonly agreed digital twin reference architecture by its all stakeholders. The minimum requirements for standard reference architectures are expected to be interoperability by design, and composability by design. This standard is under development within ISO/IEC JTC 1/SC 41/WG 6.

### ISO/IEC 30194

Internet of Things (IoT) and Digital Twin – Best practices for use case projects

#### Scope:

This project is intended to:

- define a conceptual model for the building of use cases;
- specify a use case template ontology, i.e. vocabulary as well as conventions for describing and representing use case contents;
- provide guidance on building use case templates and on extending a use case ontology to cover the targeted standard;
- provide examples of use case templates and use cases; and
- specify an implementation scheme that will allow use cases to be stored and shared in a repository.

**Overview:**

This project is expected to provide a guideline while collecting digital twin related use cases where it details a good practice to develop a conceptual model for the building of use cases and their categories depending on their purpose. This project is under development within ISO/IEC JTC 1/SC 41/WG 6.

**Standards published by ETSI/ISG CIM****ETSI GR CIM 017 V1.1.1 (2022-12)**

Feasibility of NGSI-LD for Digital Twins

**Scope:**

The document is intended to identify the various definitions and types and characteristics of Digital Twins (e.g. in areas of representing human actions, in health/biological areas, for smart manufacturing, etc.) and considers the usage of the Next Generation Service Interfaces – Linked Data (NGSI-LD) information model and API for realizing such systems.

**Overview:**

This document is expected to show to what extent various Digital Twin types can be realized and facilitated by NGSI-LD in order to identify new features for NGSI-LD which would make it more useful for such areas of usage.



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