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IEC Secretariat
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

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FOREWORD

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ISO/IEC 30188 has been prepared by subcommittee 41: Internet of Things and Digital Twin, of ISO/IEC joint technical committee 1: Information technology. It is an International Standard.

The text of this International Standard is based on the following documents:

Draft	Report on voting
JTC1-SC41/598/FDIS	JTC1-SC41/621/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1, and the ISO/IEC Directives, JTC 1 Supplement available at www.iec.ch/members_experts/refdocs and www.iso.org/directives.

INTRODUCTION

The term digital twin can be used to refer to a technology domain. This is the case in the title of this document. Digital twin as a technology joins the real world and the digital world now found in many domains of manufacturing, cities, agriculture, energy, buildings, healthcare, etc., and product categories such as appliances, automobiles, machine tools, and building security. This technology is applied, for example, by the following:

– manufacturing companies to simulate and predict products and product lines, resulting in production cycle reduction and cost reduction;

– city planners to optimize city development based on simulation models, and realize visualization, convenience and intelligent city management;

– agricultural producers to monitor and optimize production operations, and perform predictive diagnosis on agricultural machinery and equipment;

– energy managers to achieve visual monitoring and management of energy production and transmission processes, as well as fault analysis and remote operation and maintenance;

– building operators to achieve energy conservation, environmental protection, lower operation cost and intelligent management of constructed buildings;

– doctors to monitor patients' real-time conditions, providing personalized medical solutions, dynamically optimizing medical resources.

Relevant application domains and standardization bodies for digital twin technology include, among others, the following:

– smart energy with IEC TC 57, IEC SyC Smart Energy;

– smart cities with IEC SyC Smart Cities, ISO/TC 268, ISO/IEC JTC 1/WG 11;

– farming with ISO/TC 23/SC 19, ITU-T;

– building with ISO/TC 59/SC 13;

– healthcare with ISO/TC 215;

– manufacturing with ISO/TC 184/SC 4, IEC TC 65/JWG 21, IEC SyC Smart Manufacturing, IEEE Computer Society Smart Manufacturing Standards Committee – Digital Representation Working Group.

Specific technical areas and related standardization bodies for a digital twin include, among others, the following:

– architecture (and lifecycle management) with ISO/IEC JTC 1/SC 7;

– modelling (and product properties) with ISO/IEC JTC 1/SC 7, ISO TC 184/SC 4, IEC SC 3D;

– simulation with IEEE 1516, SISO (Simulation Interoperability Standards Organization);

– automatic identification (and data capture) with ISO/IEC JTC 1/SC 31;

– augmented reality and virtual reality with ISO/IEC JTC 1/AG 13, ISO/IEC JTC 1/SC 24, IEEE P2048;

– Internet of Things with ISO/IEC JTC 1/SC 41;

– artificial intelligence with ISO/IEC JTC 1/SC 42;

– information technology security with ISO/IEC JTC 1/SC 27;

– privacy with ISO/IEC JTC 1/SC 27, and ISO/IEC JTC 1/SC 44;

– cloud computing with ISO/IEC JTC 1/SC 38.

The term digital twin can also be used to refer to the digital representation of a target entity. This is the case in a reference architecture description of a system of interest which involves digital twins.

Figure 1 depicts conceptual artefacts involved in the development of a system involving digital twin technologies:

– input and output items (ellipses in Figure 1):
  - stakeholder expectations and concerns as input, and
  - the system involving digital twin technologies as output;

NOTE 1 Stakeholder expectations and concerns can include requirements for governance models.

– standard items (round rectangles in Figure 1) which enable architecture processes:
  - ISO/IEC/IEEE 42010 [1][1],
  - this document, and
  - associated architecture patterns;

NOTE 2 Architecture patterns can include other reference architecture standards such as ISO/IEC 30141 [2].

– work product items or output of processes (rectangles in Figure 1):
  - stakeholder needs and requirements,
  - system requirements and
  - the architecture description;

– processes (horizontal bars in Figure 1).

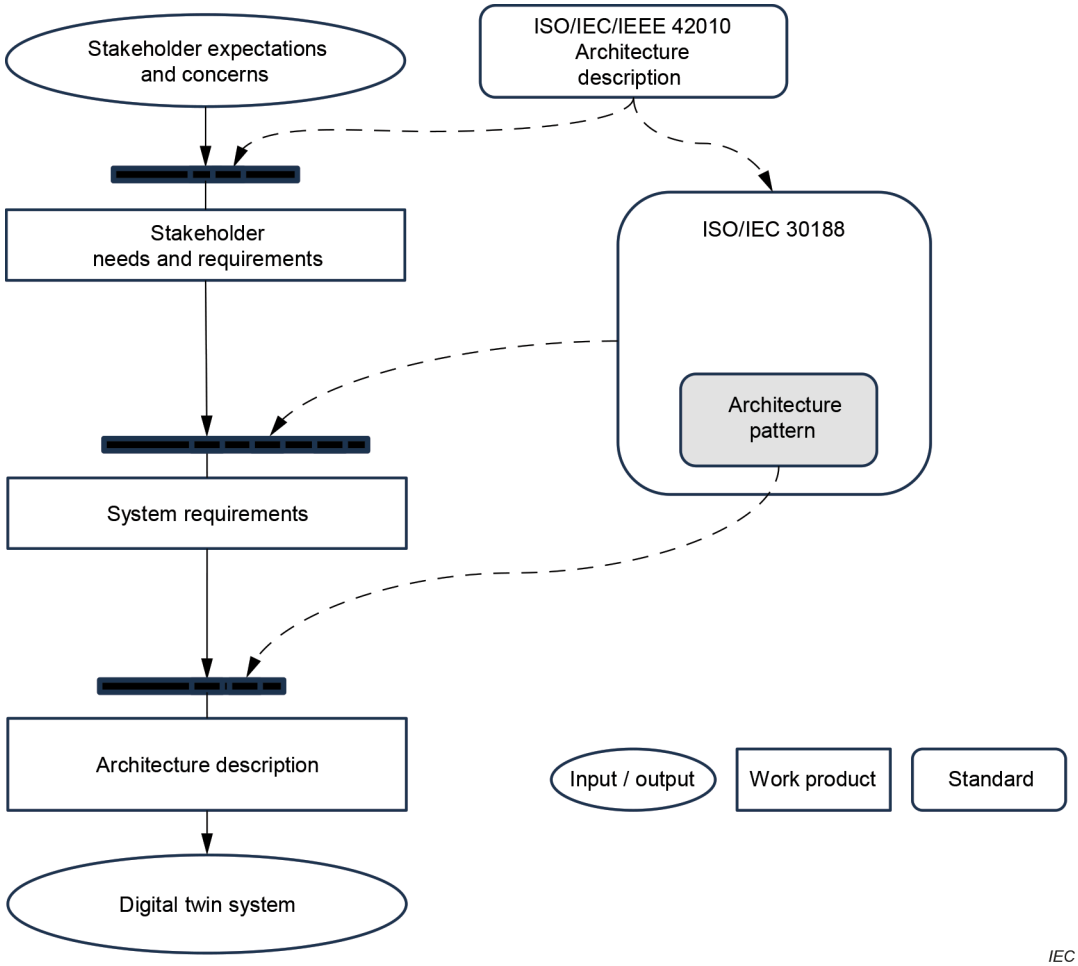

Figure 1 – How to use this document

[1] Numbers in square brackets refer to the Bibliography.

The target audience of this document are digital twin architects and engineers, digital twin project or programme managers, digital twin business managers, or digital twin owners, of all domains (application domains or technology domains).

Figure 2 shows the architecture views that are defined in this document:

– the foundational view covers the conceptual models (twinning model, synchronization model) and the lifecycle model;
– the functional view covers capabilities in the design and development, the deployment, the operation and the retirement stages;
– the implementation view covers the implementation of the usage and business interface, the implementation of interoperability, and the implementation of models;
– the architecture pattern view covers the construction model which can be used to extend an architecture.

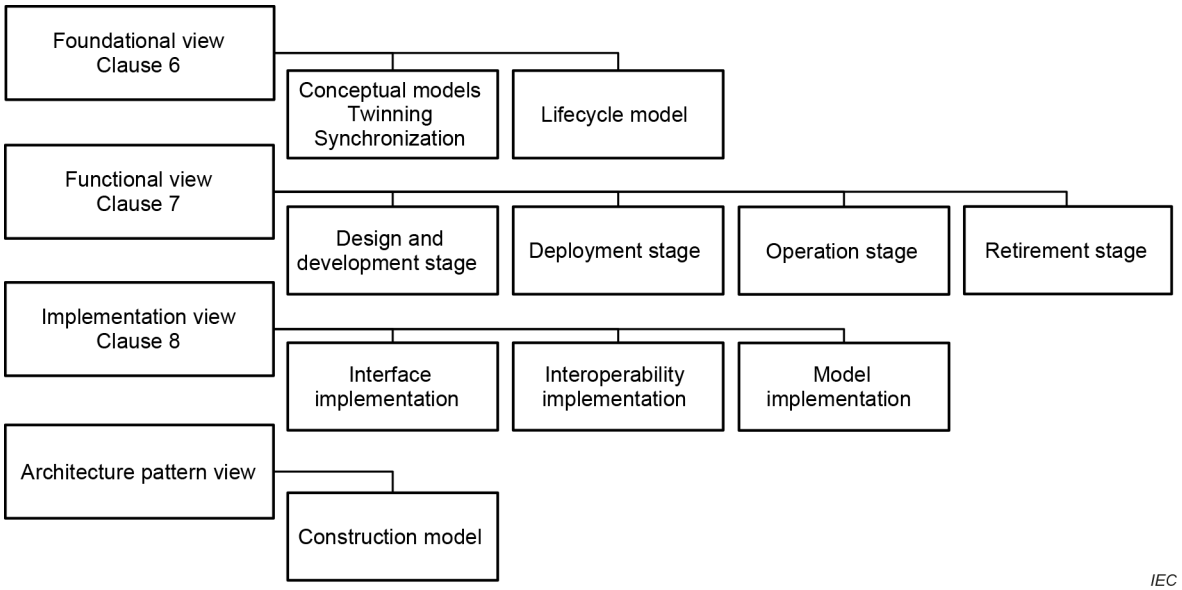

Figure 2 – Used architecture views

NOTE 3 While this document focuses on reference architecture considerations related to digital twins, it does not elaborate on concept relationships (e.g. digital twin as a technology, digital twin as a representation, digital twin in a system).

NOTE 4 This document does not address security and privacy of digital twins. These can be addressed in specific architecture patterns.

1 Scope

This document specifies a general reference architecture for a digital twin system in terms of defining system fundamentals through the use of architecture views.

2 Normative references

There are no normative references in this document.

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