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Information technology — Metaverse —

Part 1: Concepts, characteristics and technology

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Partie 1: Concepts, caractéristiques et technologie

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Foreword

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Introduction

The metaverse is a conceptual extension of the internet envisioned as a persistent, universal, immersive, interactive and socially engaging virtual environment that can be facilitated by virtual reality (VR) and augmented reality (AR)[1]. The term metaverse was first introduced in the 1992 science fiction novel Snow Crash[2] where people access a virtual urban environment from VR goggles or public terminals.

The metaverse comprises a set of digitally-constructed virtual worlds that can be accessed via various modalities. The metaverse is intended to be a decentralized 3D virtual environment, in contrast to the current predominantly 2D internet. Similar to the internet, it is always operational even though some parts can be non-operational for maintenance reasons.

VR provides immersion into the metaverse while AR enables metaverse elements to be layered onto the real world. In addition to these immersive technologies, access can also be achieved using conventional devices like keyboards, mice and screens to provide a less immersive and interactive experience.

Numerous organizations are actively engaged in shaping and establishing the metaverse. This document is intended to provide a general overview of the metaverse and define the foundational terms and concepts. It is intended to be the first of a series on aspects of the metaverse. Future parts are planned for framework and architecture, use cases, reference model, information model and governance.

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Information technology — Metaverse —

Part 1:
Concepts, characteristics and technology

1 Scope

This document provides an overview and defines fundamental terms and concepts for the metaverse.

This document specifies the following functionalities:

a) overview of the metaverse with description of its characteristics and technologies;

b) fundamental concepts;

c) terminology and definitions;

d) participation and oversight.

2 Normative references

There are no normative references in this document.

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1.1
reality
set of facts, beliefs and rules that are accepted as true

[SOURCE: ISO 9241-820:2024, 3.2.1]

3.1.2
real world
physical world
natural world as experienced by the user

[SOURCE: ISO 9241-820:2024, 3.2.3]

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3.1.3
virtual world
virtual environment
spatial organization of multiple *virtual objects* (3.1.5), potentially including global behaviour

Note 1 to entry: The simulated environments are often interactive and can be accessed by multiple users through online interfaces.

Note 2 to entry: The physical world in which people live and its related characteristics is referred to as the *real world* (3.1.2) to differentiate it from a virtual world.

[SOURCE: ISO/IEC 18039:2019, 3.1.25]

3.1.4
virtual space
any digital environment or interface, whether interactive or non-interactive

Note 1 to entry: A virtual space is a broader concept than a *virtual world* (3.1.3). It can refer to any computer-generated setting.

3.1.5
virtual object
computer-generated entity that is designated for augmentation in association with a *physical object* (3.1.6) data representation

Note 1 to entry: In the context of MAR, it usually has perceptual (e.g. visual, aural) characteristics and, optionally, dynamic reactive behaviour.

[SOURCE: ISO/IEC 18039:2019, 3.1.24]

3.1.6
physical object
real object
object that exists in the *real world* (3.1.2)

[SOURCE: ISO/IEC 18039:2019, 3.1.15]

3.1.7
virtual reality
VR
set of artificial conditions created by computer and dedicated electronic devices that simulate visual images and possibly other sensory information of a user's surroundings with which the user is allowed to interact

Note 1 to entry: The artificial conditions do not reflect a user's real-time physical environment.

[SOURCE: ISO 9241-394:2020, 3.8]

3.1.8
augmented reality
AR
interactive experience of a *real world* (3.1.2) environment whereby the objects that reside in the *real world* (3.1.2) are augmented by computer-generated perceptual information

[SOURCE: ISO/IEC 18038:2020, 3.2]

3.1.9
mixed and augmented reality
MAR
integration of *real world* (3.1.2) and *virtual worlds* (3.1.3) including *mixed reality* (3.1.10) and *augmented reality* (3.1.8)

Note 1 to entry: MAR is often used interchangeably with *MR* (3.1.10).

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[SOURCE: ISO/IEC 18038:2020, 3.13]

3.1.10
mixed reality
MR
display continuum in which both real and virtual images are combined in some way and in some proportion

Note 1 to entry: *Augmented reality (AR)* (3.1.8) and *virtual reality (VR)* (3.1.7) are considered to be on the mixed reality continuum[7].

[SOURCE: ISO/IEC TR 23843:2020, 3.4]

3.1.11
XR
real-and-virtual combined environments and human-machine interactions generated by computer technology and wearables

Note 1 to entry: Within this document, XR is used as an umbrella term encapsulating *AR* (3.1.8), *VR* (3.1.7), *MR* (3.1.10) and other environments.

[SOURCE: ISO/IEC 5927:2024, 3.1.5]

3.1.12
simulation
use of a similar or equivalent system to imitate a real system, so that it behaves like or appears to be the real system

[SOURCE: ISO 16781:2021, 3.1.9]

3.1.13
physics engine
software component that models the laws of physics inside a digital environment so objects behave in a way that feels physically plausible

3.1.14
presentation engine
real time rendering component or components of a game, rendering, or other software engine relevant for creating the visual, audio and/or tactile representations of the media on behalf of the system

Note 1 to entry: The presentation engine is especially relevant for immersive display processing systems that leverage the capabilities of the engine to provide visual rendering capabilities of an immersive display.

[SOURCE: ISO/IEC TR 23090-27:2025, 3.17]

3.1.15
game engine
relevant libraries for functions such as a *physics engine* (3.1.13) and *presentation engine* (3.1.14) for the presentation of visual, audio and or haptic aspects of the media comprising the games

[SOURCE: ISO/IEC TR 23090-27:2025, 3.10]

3.1.16
presence
psychological sense of being in a particular environment

Note 1 to entry: Presence is about physical engagement, while *virtual presence* (3.1.17) is about engaging with others via digital *interaction* (3.1.57).

[SOURCE: ISO 9241-820:2024, 3.1.2, modified — Note 1 to entry has been added]

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3.1.17
virtual presence
ability of a user to feel that they are present in a virtual location such as an immersive simulation using technologies such as *virtual reality (VR)* (3.1.7) or *augmented reality (AR)* (3.1.8)

Note 1 to entry: Refer to *presence* (3.1.16) for the distinction between presence and virtual presence.

3.1.18
telepresence
set of technologies that allows a person to feel as if they are present at a place other than their true location

Note 1 to entry: Telepresence typically involves technologies such as video conferencing and *VR* (3.1.7) to create a realistic experience for users interacting with remote locations or other users. These remote locations and users are generally real environments and people, in contrast to *virtual presence* (3.1.17) where simulated environments are involved.

3.1.19
immersion
<metaverse> experience and participation in a particular environment

[SOURCE: ISO 9241-820:2024, 3.1.1]

3.1.20
agent
entity that takes programmed actions, such as software or a device

Note 1 to entry: Agents can provide recommendations, help with tasks, or facilitate *interactions* (3.1.57). Agents operate behind the scenes, unlike *avatars* (3.1.23), using *AI* (3.1.42) to analyse user behaviour and preferences [see *AI agent* (3.1.22)]. They can also manage environments and automate processes, making the *metaverse* (3.1.29) more dynamic.

Note 2 to entry: A *chatbot* (3.1.25) is an example of an agent.

Note 3 to entry: *Software agent* (3.1.21) is an example of an agent.

[SOURCE: ISO 27789:2021, 3.4, modified — Notes to entry added.]

3.1.21
software agent
agent (3.1.20) that perceives its environment and takes actions that maximise its chance of successfully achieving its goals

[SOURCE: ISO/IEC TR 29119-11:2020, 3.1.73, modified — "Digital entity" replaced with agent.]

3.1.22
AI agent
automated entity that senses and responds to its environment and takes actions to achieve its goals

Note 1 to entry: A *chatbot* (3.1.25) is an example of an AI agent.

[SOURCE: ISO/IEC 22989:2022, 3.1.1, modified — Note 1 to entry added.]

3.1.23
avatar
entity that can be used as a (visual) representation of the user inside the virtual environments

EXAMPLE A player's representation in a video game and human or fantastic representation of a person's self in online worlds.

Note 1 to entry: Avatars may represent humans, non-humans (aliens) and other living creatures (e.g. animals including pets).

[SOURCE: ISO/IEC 23005-4:2018, 3.1.1, modified — Note 1 to entry added.]

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3.1.24
AI avatar
avatar (3.1.23) controlled by an *AI system* (3.1.43)

Note 1 to entry: AI avatars are interactive, personalised and adaptable, making them suitable for a variety of applications whereas *NPCs* (3.1.26) are primarily designed to enrich the gaming experience with fixed roles and behaviours.

3.1.25
chatbot
software application that is designed to mimic human conversation through text or voice *interactions* (3.1.57)

3.1.26
non-player character
NPC
digital character controlled by software, sometimes including *AI* (3.1.42), and not by a human

Note 1 to entry: NPCs are designed to populate the *metaverse* (3.1.29) and engage users in various ways. They can serve specific roles to enrich the narrative.

Note 2 to entry: NPCs often have scripted behaviours.

3.1.27
hologram
three-dimensional photographic representation produced by an arranged interference between coherent light beams

[SOURCE: ISO 5127:2017, 3.3.3.23]

3.1.28
holographic display
three-dimensional display that renders a complex optical wavefront

Note 1 to entry: A holographic display can use a *hologram* (3.1.27).

[SOURCE: ISO/IEC 21794-1:2020, 3.15]

3.1.29
metaverse
set of universal, immersive *virtual worlds* (3.1.3) that can be enhanced by *virtual reality (VR)* (3.1.7) and *augmented reality (AR)* (3.1.8)

Note 1 to entry: As the metaverse concept continues to evolve, a range of definitions has emerged across different domains and stakeholder communities[18].

Note 2 to entry: Common metaverse themes are industrial, commercial, gaming, education and enterprise. A metaverse *virtual world* (3.1.3) can combine several of these themes.

Note 3 to entry: *VR* (3.1.7) and *AR* (3.1.8) offer novel interaction modalities, however their adoption has been constrained by user comfort, accessibility and physiological factors. Accordingly, anchoring metaverse implementations to 3D vision — rather than supporting inclusive 2D renderings of 3D environments — can limit accessibility and market viability.

3.1.30
metaverse system
group of interacting or interrelated elements that act according to a set of rules to form a unified whole within the *metaverse* (3.1.29)

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3.1.31
metaverse platform
persistent, real-time rendered 3D world and simulation that supports continuity of identity, objects, history, payments, and entitlements, and can be experienced synchronously by an effectively unlimited number of users, each with an individual sense of *presence* (3.1.16)

Note 1 to entry: There are many prototype metaverse platforms.

3.1.32
digital twin
DTw
digital representation of a target entity with data connections that enable convergence between the physical and digital states at an appropriate rate of synchronization

Note 1 to entry: Digital twin has some or all of the capabilities of connection, integration, analysis, simulation, visualization, optimization and collaboration.

Note 2 to entry: A digital twin can provide an integrated view of the target entity throughout its life cycle.

Note 3 to entry: A digital twin manifests when data is exchanged between an existing *physical object* (3.1.6) and its digital model in both directions and is fully integrated. The digital model acts as a controlling representation of the *physical object* (3.1.6). Within the *physical object* (3.1.6) or digital model, there can be objects, real or virtual, that induce changes of state. Hence, a change in the *physical object* (3.1.6) immediately leads to a change in the digital model or *virtual environment* (3.1.3), and vice versa[19].

[SOURCE: ISO/IEC 30173:2023, 3.1.1, modified — Note 1 to entry added collaboration, Note 2 to entry modified, Note 3 to entry added.]

3.1.33
liminal space
boundary between two points in time, space, or both

Note 1 to entry: In the *metaverse* (3.1.29), liminal spaces will be required to enable users to transition smoothly between *virtual spaces* (3.1.4) without experiencing psychological issues such as anxiety.

3.1.34
walled garden
closed ecosystem in which only a limited set of users have access to their software or hardware technology

Note 1 to entry: Most current social media platforms can be considered walled gardens since users are restricted to the specific platform's environment.

3.1.35
Web 1.0
first version of the internet mainly serving the use of e-mail and the posting and consultation of static HTML pages

[SOURCE: ISO 5127:2017, 3.1.9.04]

3.1.36
Web 2.0
loosely defined model of interactive internet services and information sharing

Note 1 to entry: See *Web 1.0* (3.1.35).

[SOURCE: ISO 5127:2017, 3.1.9.05, modified — Note 1 to entry added.]

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3.1.37
Web 3.0
semantic web
version of the internet following *Web 2.0* (3.1.36) which rather than simply connecting internet addresses and data in their formal form additionally does effect data linking through and in favour of their semantic content or meaning thus providing enriched and enlarged information answering requests

Note 1 to entry: ISO refers to Web 3.0 as the semantic web.

[SOURCE: ISO 5127:2017, 3.1.9.06, modified — "Web 3.0" made the preferred term and Note 1 to entry replaced.]

3.1.38
Web3
version of internet where users control their data and identity, free from centralised authorities

Note 1 to entry: Web3 incorporates concepts such as decentralisation, *blockchain* (3.1.76) and *NFTs* (3.1.83).

Note 2 to entry: Web3 is focussed on decentralisation concepts, whereas *Web 3.0* (3.1.37) aims for a linked and intelligent internet.

Note 3 to entry: A proposed Web 4.0 will integrate Web3 and *Web 3.0* (3.1.37) and also include advanced *AI* (3.1.42), immersive technologies and real time contextual awareness.

3.1.39
content creation
<metaverse> act of developing content for the *metaverse* (3.1.29)

Note 1 to entry: This content can take many forms ranging from single 3D *assets* (3.1.84) such as *avatars* (3.1.23) to large events such as concerts that are wholly online.

3.1.40
content creator
<metaverse> person who develops content for the *metaverse* (3.1.29)

3.1.41
user generated content
UGC
content created by users rather than professionals

3.1.42
artificial intelligence
AI
<discipline> research and development of mechanisms and applications of *AI systems* (3.1.43)

Note 1 to entry: Research and development in AI can take place across any number of fields such as computer science, data science, humanities, mathematics and natural sciences.

[SOURCE: ISO/IEC 22989:2022, 3.1.3, modified — "in AI" added to Note 1 to entry.]

3.1.43
artificial intelligence system
AI system
engineered system that generates outputs such as content, forecasts, recommendations or decisions for a given set of human-defined objectives

Note 1 to entry: The engineered system can use various techniques and approaches related to artificial intelligence to develop a model to represent data, knowledge, processes, etc. which can be used to conduct tasks.

Note 2 to entry: AI systems are designed to operate with varying levels of automation.

[SOURCE: ISO/IEC 22989:2022, 3.1.4]

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3.1.44
large language model
LLM
computer *AI* (3.1.42) model that can achieve general purpose language understanding and generation

3.1.45
generative AI
AI (3.1.42) that can generate content such as text, imagery or video by learning patterns from huge datasets

Note 1 to entry: Most generative AI systems use *large language models* (3.1.44).

Note 2 to entry: *LLMs* (3.1.44) are trained on vast amounts of data, enabling them to perform a wide range of natural language processing (NLP) tasks such as text generation, translation, summarization and question answering.

3.1.46
cloud computing
paradigm for enabling network access to a scalable and elastic pool of shareable physical or virtual resources with self-service provisioning and administration on demand

[SOURCE: ISO/IEC 22123-1:2023, 3.1.1]

3.1.47
edge computing
distributed computing in which processing and storage take place at or near the edge, where the nearness is defined by the system's requirements

[SOURCE: ISO/IEC TR 17903:2024, 3.25]

3.1.48
spatial computing
human *interaction* (3.1.57) with a machine in which the machine retains and manipulates referents to real objects and spaces

Note 1 to entry: The term spatial computing comes from Greenwold's 2003 Yale thesis[24].

3.1.49
microservice
independently deployable artefact providing a service implementing a specific functional part of an application

[SOURCE: ISO/IEC TS 23167:2020, 3.15]

3.1.50
Internet of Things
IoT
infrastructure of interconnected entities, people, systems and information resources, together with services which process and react to information from the *physical world* (3.1.2) and the *virtual world* (3.1.3)

[SOURCE: ISO/IEC 20924:2024, 3.2.8]

3.1.51
access point
device, technology, or interface that enables users to enter or interact with the *metaverse* (3.1.29)

Note 1 to entry: Access point, *gateway* (3.1.52) and *portal* (3.1.53) are frequently used interchangeably.

Note 2 to entry: An access point includes the physical device (for example a *VR* (3.1.7) headset) and also the firmware and software (for example a games platform) to integrate the user into a *metaverse* (3.1.29) *virtual world* (3.1.3).

Note 3 to entry: Typical access points are shown in Figure 6.

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3.1.52
gateway
means of connecting to, and interacting with, the *metaverse* (3.1.29)

Note 1 to entry: *Access point* (3.1.51), gateway and *portal* (3.1.53) are frequently used interchangeably. However, *gateway* is a broader concept that refers to any interface or system that connects to the *metaverse* (3.1.29), while *portal* refers to accessing a particular area of the metaverse generally through a *metaverse platform* (3.1.31).

Note 2 to entry: An example of a gateway is a specific *virtual reality* (3.1.7) platform that can provide access to other *virtual spaces* (3.1.4) or digital experiences, including games, social spaces, or *digital marketplaces* (3.1.95).

3.1.53
portal
entry or exit point into or from a *virtual world* (3.1.3) or *virtual space* (3.1.4) within the broader *metaverse* (3.1.29)

Note 1 to entry: In a virtual game world, a portal may lead a player from one area or level to another, or from a social space into a specific interactive game zone.

3.1.54
human computer interaction
HCI
discipline concerned with the design, evaluation and implementation of interactive computing systems for human use and with the study of major phenomena surrounding the interaction between humans and computers

[SOURCE: ISO/TR 4419:2026, 3.13]

3.1.55
user interface
UI
set of all components of an interactive system that provide information and controls for the user to accomplish specific tasks with the interactive system

[SOURCE: ISO 9241-110:2020, 3.10]

3.1.56
brain-computer interface
BCI
brain-machine interface
BMI
<engineered systems> technology designed to enable direct exchange of information between the central nervous system and the software and/or hardware

Note 1 to entry: A BCI allows single or bi-directional communication between the brain and external devices, enabling controlling and/or feedback capabilities.

Note 2 to entry: BCIs can be set up between human-human or human-animal(s) through software and/or hardware.

Note 3 to entry: Non-invasive systems are generally referred to as BCIs and invasive systems using implanted sensors are often referred to as BMIs.

[SOURCE: ISO/IEC 8663:2025, 3.1.2, modified — Definition slightly adjusted and Note 3 to entry added.]

3.1.57
interaction
exchange of information between a user and a system via the human-system interface to achieve the intended goal

[SOURCE: ISO 11064-5:2008, 3.20, modified — Term "dialogue" was removed.]

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3.1.58
interaction
<metaverse> *interaction* (3.1.57) in the *metaverse* (3.1.29)

3.1.59
social interaction
process by which people communicate, respond and relate to one another through shared behaviours, expressions and social cues

3.1.60
interoperability
<metaverse> ability of two or more systems or applications to exchange information and to mutually use the information that has been exchanged

Note 1 to entry: Interoperability is a critical enabler for the *metaverse* (3.1.29) where many different systems will be required to interact seamlessly.

[SOURCE: ISO/IEC 19941:2017, 3.1.1, modified — Note 1 to entry added.]

3.1.61
scalability
<metaverse> ability of infrastructure to support expanding numbers of uses, applications and immersive experiences without degradation of service

3.1.62
open source
freely available for modification and distribution

Note 1 to entry: open source generally refers to computer software that is developed as a public, open collaboration and made freely available to the public.

Note 2 to entry: Open source software can be used to: (1) create 3D *assets* (3.1.84), *virtual environments* (3.1.3) or *user interfaces* (3.1.55), (2) provide infrastructure for asset management and (3) enable user engagement.

Note 3 to entry: Since open source software is free of licensing fees, its use may encourage greater participation in *metaverse* (3.1.29) *content creation* (3.1.39).

[SOURCE: ISO/IEC 20243-1:2023, 3.31]

3.1.63
photogrammetry
technique of measurement using photographs, for example aerial photographs, to determine, primarily, geometric properties such as size, location and form of objects

Note 1 to entry: Photogrammetric measurement is often used for mapping, but also has some engineering applications.

[SOURCE: ISO 7078:2020, 3.1.5]

3.1.64
Light Detection and Ranging
LiDAR
terrestrial or airborne system to collect data to develop ground elevations or profiles using lasers

[SOURCE: ISO 10903:2025, 3.1.16]

3.1.65
gaussian splat
three-dimensional gaussian function used as an explicit, spatially-located element for representing and rendering a scene, typically characterised by a position, shape, colour, and opacity, and projected into two dimensions for real-time visualization

Note 1 to entry: Gaussian splatting was introduced by Lee Westover in the early 1990s[34].

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3.1.66
binaural sound
method of recording sound that uses two microphones, arranged with the intent to create a 3D stereo sound sensation for the listener of actually being in the room with the performers or instruments

Note 1 to entry: Binaural sound is also known as binaural audio.

3.1.67
binocular parallax
apparent difference in the direction of a point as seen separately by one eye and the other, while the head remains in a fixed position

Note 1 to entry: Binocular parallax is equivalent to the optic angle between the visual axes of both eyes, when they are fixated to a single point.

[SOURCE: ISO/TR 9241-331:2012, 2.21]

3.1.68
haptics
tactile sensations

[SOURCE: ISO/IEC 23090-31:2025, 3.1.8]

3.1.69
haptic feedback
technology that allows users to feel tactile sensations through their devices

3.1.70
wearable device
IoT (3.1.50) device designed for operation near to, on, or inside a body

Note 1 to entry: Wearable devices often have a variety of sensing abilities, but limited power capacity constraining communication and data processing abilities. As critical devices of the *IoT* (3.1.50), it is considered that the communication between wearable devices and a network may not require any human intervention. Wearable devices include electronic devices usable by humans, animals and other organisms.

[SOURCE: ISO/IEC 20924:2024, 3.1.35]

3.1.71
stereoscopic display
3D display where depth perception is induced by *binocular parallax* (3.1.67)

[SOURCE: ISO/TR 9241-331:2012, 2.1]

3.1.72
olfaction
ability to detect and interpret airborne compounds through sensory cells in the nose

3.1.73
motion base
mechanical platform designed to simulate real-world movement by physically displacing users or equipment in various directions

Note 1 to entry: Motion bases are used in flight and driving training simulators to replicate the sensation of movement.

3.1.74
distributed ledger
ledger that is shared across a set of *distributed ledger technology* (*DLT)* (3.1.75) nodes and synchronised between these nodes using a consensus mechanism

Note 1 to entry: A distributed ledger is designed to be immutable, tamper-resistant, tamper-evident and append-only, containing final and definitive ledger records of confirmed and validated transactions.

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[SOURCE: ISO 22739:2024, 3.23]

3.1.75
distributed ledger technology
DLT
technology that enables the operation and use of *distributed ledgers* (3.1.74)

[SOURCE: ISO 22739:2024, 3.25]

3.1.76
blockchain
distributed ledger (3.1.74) with *confirmed blocks* (3.1.80) organized in an append-only, sequential chain using *cryptographic links* (3.1.86)

Note 1 to entry: Blockchains are designed to be tamper-resistant and to create final, definitive and immutable ledger records.

[SOURCE: ISO 22739:2024, 3.6, modified — "Hash links" replaced with "cryptographic links", Note 1 to entry added.]

3.1.77
block
sequence of bits whose length is the *block size* (3.1.79) of the *block cipher* (3.1.78)

[SOURCE: ISO/IEC 29167-10:2026, 3.1.16, modified — Preferred term "data block" removed from term]

3.1.78
block cipher
family of permutations that is parameterised by a cryptographic key and, optionally, the *block size* (3.1.79)

[SOURCE: ISO/IEC 29167-22:2018, 3.1.2]

3.1.79
block size
length of a block

Note 1 to entry: The block size is typically measured in bytes.

3.1.80
confirmed block
block (3.1.77) that has been confirmed

Note 1 to entry: “Confirmed” means accepted as authentic by the *blockchain* (3.1.76) network.

[SOURCE: ISO 22739:2024, 3.10, modified — Note 1 to entry added.]

3.1.81
token
asset (3.1.84) that represents a collection of entitlements

[SOURCE: ISO 22739:2024, 3.92]

3.1.82
non-fungible
not capable of mutual substitution among individual units

Note 1 to entry: The individual units can be *digital assets* (3.1.85), e.g. *tokens* (3.1.81).

[SOURCE: ISO 22739:2024, 3.63]

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3.1.83
non-fungible token
NFT
token (3.1.81) that is *non-fungible* (3.1.82)

Note 1 to entry: An NFT cannot be copied, substituted, or subdivided.

Note 2 to entry: An NFT is stored on a *distributed ledger* (3.1.74) or *blockchain* (3.1.76).

[SOURCE: ISO 22739:2024, 3.64, modified — Notes to entry added.]

3.1.84
asset
anything that has value to a stakeholder

[SOURCE: ISO 22739:2024, 3.1]

3.1.85
digital asset
asset (3.1.84) that exists only in digital form or which is the digital representation of another *asset* (3.1.84)

[SOURCE: ISO 24165-1:2025, 3.3]

3.1.86
cryptographic link
reference to data, constructed by applying a *hash function* (3.1.87) to the data

Note 1 to entry: A cryptographic link is used in the *block* (3.1.77) header to reference the previous block in order to create the append-only, sequential chain that forms a *blockchain* (3.1.76).

Note 2 to entry: A cryptographic link allows for the detection of changes in the data to which it refers.

[SOURCE: ISO 22739:2024, 3.47, modified — Preferred term "hash link" removed.]

3.1.87
hash function
cryptographic hash function
function that maps strings of bits of variable (but usually upper bounded) length to fixed-length strings of bits, satisfying the following properties:

— for a given output, it is computationally infeasible to find an input which maps to this output;

— for a given input, it is computationally infeasible to find a second input which maps to the same output;

— it is computationally infeasible to find any two distinct inputs that map to the same output

Note 1 to entry: Computational feasibility depends on the specific security requirements and environment. Refer to ISO/IEC 10118-1:2016, Annex C.

[SOURCE: ISO/IEC 10118-1:2016, 3.46; ISO 22739:2024, 3.46]

3.1.88
cryptoasset
crypto-asset
digital asset (3.1.85) implemented using cryptographic techniques

Note 1 to entry: A *distributed ledger technology (DLT)* (3.1.75) system can be used to manage or transfer cryptoassets.

[SOURCE: ISO 22739:2024, 3.14]

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3.1.89
cryptocurrency
cryptoasset (3.1.88) designed to work as a medium of payment or value exchange

Note 1 to entry: Cryptocurrency uses decentralised control and cryptography to secure transactions, manage the creation of additional *assets* (3.1.84) and verify the transfer of *assets* (3.1.84) in a *distributed ledger technology (DLT)* (3.1.75) system.

[SOURCE: ISO 22739:2024, 3.15]

3.1.90
digital money
digital currency
digital representation of monetary value

Note 1 to entry: *Cryptocurrency* (3.1.89) is one form of digital money or digital currency that uses cryptography for enhanced financial security.

[SOURCE: ISO/TS 23526:2023, 3.5]

3.1.91
virtual economy
emergent economy existing in a *virtual world* (3.1.3), usually exchanging virtual goods

3.1.92
digital economy
economic and social activities reliant on, or significantly enhanced by, the use of digital inputs

Note 1 to entry: Digital economy includes digital technologies, digital infrastructure, digital services and data.

Note 2 to entry: Digital economy refers to all producers and consumers, including governments, utilising these digital inputs in their economic activities.

[SOURCE: ISO 25556:2025, 3.6]

3.1.93
decentralised finance
DeFi
system that provides financial instruments without relying on intermediaries such as brokerages, exchanges, or banks by using smart contracts on a *blockchain* (3.1.76)

3.1.94
digital product
product offered by one party to another party by means of digital hardware or software technology, or both, including communication over a network

Note 1 to entry: Many products are available in digital form such as documents, music and video.

Note 2 to entry: An *NFT* (3.1.83) is another example of a digital product.

[SOURCE: ISO/IEC 25389:2025, 3.10]

3.1.95
digital marketplace
decentralised platform where users can trade *digital products* (3.1.94)

3.1.96
digital wallet
application that stores and manages digital credentials and keys and can use them upon request

Note 1 to entry: An application is a software component that can be installed and run on hardware such as a smartphone, a tablet, or other electronic device. It issues commands and receives responses to the commands within a system.

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Note 2 to entry: A digital wallet is also known as a mobile wallet.

[SOURCE: ISO/IEC 27565:2026, 3.10]

3.1.97
dataspace
data space
governance (3.1.104) framework and supporting services to build trustworthiness and enable data sharing through an agreed set of policies, semantic models, protocols and processes

Note 1 to entry: Dataspace technologies are implemented in various ways, often using open-source protocols like *Data Space Protocol (DSP)* (3.1.98) and *Distributed Claims Protocol (DCP)* (3.1.99) from the Eclipse Dataspace Components under the Eclipse Foundation. These provide a shared platform for diverse services and business models—including *metaverse* (3.1.29) applications and the *Trusted Data Transaction (TDT)* (3.1.100) framework being developed by CEN/CENELEC in Europe[47].

Note 2 to entry: *DSP* (3.1.98), *DCP* (3.1.99) and *TDT* (3.1.100) are defined below.

[SOURCE: ISO/IEC 20151-1:20—,[1] 3.1]

3.1.98
data space protocol
DSP
standardized set of specifications that governs how data is securely shared, negotiated and accessed within a *dataspace* (3.1.97)

3.1.99
distributed claims protocol
DCP
specification that provides a trust and identity layer for *dataspaces* (3.1.97)

3.1.100
trusted data transaction
TDT
emerging framework that defines how data can be exchanged in a way that is legally valid, technically secure and auditable across different organizations and jurisdictions

3.1.101
directed acyclic graph
DAG
collection of nodes and links such that no node is an ancestor (or descendant) of itself

Note 1 to entry: Each node in a DAG-based model can have more than one parent root, meaning multiple new transactions can be validated simultaneously. Instead of referencing only the last *block* (3.1.77) like *blockchain* (3.1.76), DAG nodes reference previous transactions from any node in the network.

[SOURCE: ISO/IEC 25389:2025, 3.11.17]

3.1.102
directed infinity
decentralised system that channels infinite potential through structured, rule-based progression

3.1.103
hashgraph
next-generation *distributed ledger technology (DLT)* (3.1.75) that uses a *DAG* (3.1.101) based model

3.1.104
governance
human-based system comprising directing, overseeing and accountability

[SOURCE: ISO/IEC 38500:2024, 3.3]

1) Under preparation. Stage at the time of publication: ISO/IEC FDIS 20151-1.

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3.1.105
governance
<metaverse> human-based system comprising directing, overseeing and accountability for the *metaverse* (3.1.29)

3.1.106
digital identity
information used by computer systems to represent an external agent (person, organization, application, or device)

Note 1 to entry: Digital identity is a safe, secure and convenient way to prove one's identity online

Note 2 to entry: Digital identity can be expressed at multiple levels, ranging from a basic tier where users provide only minimal details such as an email address, through intermediate tiers that require additional verified information such as a driver's licence or social security number, to advanced tiers that incorporate biometric, audio, or video-based identification

3.1.107
decentralised autonomous organization
DAO
collectively owned organization that runs on contracts agreed by members

Note 1 to entry: DAOs are discussed in the context of *metaverse* (3.1.29) in [51].

3.2 Abbreviated terms

2D	two dimensional
3D	three dimensional
5G	5th generation cellular technology
6G	6th generation cellular technology
AI	artificial intelligence
API	application programming interface
AR	augmented reality
BCI	brain-computer interface
BMI	brain-machine interface
CPU	central processing unit
DAG	directed acyclic graph
DAM	digital asset management
DAO	decentralised autonomous organization
DCP	distributed claims protocol
DeFi	decentralised finance
DLT	distributed ledger technology
DSP	data space protocol
DTw	digital twin

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