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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

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Foreword

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Introduction

Technologies such as cloud computing are supporting the evolution of digital business and accelerating the shift to living and working (in part) online, in ways that would have been impossible a few years ago.

Increased debate about socio-technical developments always runs the risk of multi-disciplinary terminological confusion, due to the potential for the same word to be used for two or more distinct concepts. Moreover, polysemy (the capacity for a word or phrase to have multiple related meanings) is an attribute of many words. Any attempt to provide a single definition for a polysemic word needs to be sufficiently broad to account for all potential meanings.

Terms with alternative meanings in economic, societal, political, regulatory and technical contexts are being labelled with the same or similar names.

Adding clarity on concepts and definitions can assist in the formulation of well-informed policies in important areas such as security, privacy and governance. One of the terms that has been at the forefront of these changes is “platform”.

Note that the economic, societal, political, regulatory and technical uses of the word “platform” predate cloud computing by many years.

Taxonomic structures serve many purposes and their topological structure, incorporation (or not) of orthogonal dimensions, levels of refinement, and the decision about the order and approach in which to apply the structuring factors lead to very different outcomes. The terminology and concepts presented in this document can be combined in different ways, depending on the problem being considered, and the factors that potentially influence the decisions driving such structuring are presented with the related concepts.

In a situation where two or more distinct interpretations of the word “platform” are relevant, but only one is taken into account, or where collaborators used two distinct interpretations at cross-purposes, confusion can arise.

Therefore, it is important to understand the difference between the technical, economic and general uses of the word platform in the context of digital services.

The audience for this document is technologists, economists, policy makers, social scientists and others who wish to precisely and unambiguously use these terms (e.g. in multi-disciplinary conversations).

Information technology — Cloud computing and distributed platforms — Taxonomy for digital platforms

1 Scope

This document specifies a taxonomy related to digital platforms, by providing definitions and supporting information that disambiguates different uses of the term platform as it applies to digital services (such as cloud computing and other distributed computing systems).

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 22123-1, *Information technology — Cloud computing — Part 1: Vocabulary*

ISO/IEC TS 23167, *Information technology — Cloud computing — Common technologies and techniques*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 22123-1, ISO/IEC TS 23167 and the following 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 Basic terms

3.1.1
digital service
service 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: In the context of this document, a service comprises one or more digital capabilities such as a cloud computing, edge computing, or some other distributed computing capability. Such a service will be subject to contract and typically have defined qualities of service, terms, and conditions for use.

Note 2 to entry: Cloud service, edge service, network service, broadcast service, and mobile service are all types of digital service. Not all types are discussed in this document.

3.1.2
digital platform
distributed platform
set of *digital services* (3.1.1) that collectively exhibits the characteristics of either (or both) a *digital economic platform* (3.4.2) creating a multi-sided market, or a *digital technology platform* (3.3.1) providing a means to create applications

Note 1 to entry: A digital platform enables and assists other participant digital services in conducting business with their customers, either by creating and facilitating a multi-sided market for those services, or by enabling the technological creation and operation of those services, or both.

Note 2 to entry: "Distributed platform" is often used as a synonym to emphasise those elements of a digital service, such as edge computing and mobile computing that go beyond classical datacentres of cloud computing.

3.2 Terms relating to platform participation

3.2.1
platform participant
<digital platform> party that makes use of or otherwise engages with a *digital platform* (3.1.2)

Note 1 to entry: A party can be an individual end user or organisation.

Note 2 to entry: A platform participant can be a member of one or more *participant groups* (3.2.2).

3.2.2
participant group
group of *platform participants* (3.2.1) that share a common set of business requirements that differ significantly from the requirements of one or more other groups of *platform participants* (3.2.1)

Note 1 to entry: Participant groups are not specific to digital services.

Note 2 to entry: Examples of such participant groups include purchasers, vendors, and developers. Purchasers are platform participants seeking to acquire something, vendors are platform participants seeking to offer something, while developers are platform participants seeking to create and sell (or operate) software (or services). Thus, the members of each group have a common objective which is not shared with members of the other participant groups.

3.3 Terms related to digital technology platforms

3.3.1
digital technology platform
<technology> *digital platform* (3.1.2) that provides engineering components required to support applications and services

Note 1 to entry: Elements provided can include cloud computing resources (see ISO/IEC 22123 and ISO/IEC 17789), which can include execution environments, storage, networking, location and mapping services, graphics rendering and specialist processing (such as machine learning or quantum computing).

Note 2 to entry: Popular examples of such digital technology platforms include varieties of the cloud service categories "infrastructure capabilities type" and "platform capabilities type" (see ISO/IEC 22123-1).

Note 3 to entry: This definition is distinct from those in ISO/IEC TS 25025:2021 and ISO/IEC TS 25011:2017.

3.3.2
software development platform
<technology> *digital technology platform* (3.3.1) that enables or assists the development of software code

3.4 Terms related to digital economic platforms

3.4.1
economic platform
<economics> set of services that provide market intermediation to reduce search and/or transactions costs

Note 1 to entry: Platforms are environments, computing or otherwise, that connect different groups and derive benefits from others participating in the platform (Azoulay & Tucker)

Note 2 to entry: A shopping mall provides a non-computing economic platform, connecting merchants (participant group) with visiting customers (participant group) and providing distinct services to each participant group such as a pleasant environment, electricity, storage, parking, network connectivity, and security.

3.4.2
digital economic platform
<economics> one or more *digital platforms* (3.1.2) which provide goods, services or licensed rights to two or more distinct *participant groups* (3.2.2) who need each other in some way

Note 1 to entry: Examples of licensed rights can include the right to view a movie, to use commercial business data, or to use specific software, each delivered as a license.

Note 2 to entry: While a digital economic platform is constructed with digital technology, often on top of a digital technology platform (3.3.1), this does not mean that the digital economic platform is a subtype of digital technology platform (any more than a car is a subtype of a road); these two terms are orthogonal.

Note 3 to entry: A digital economic platform can optionally comprise more than one digital platform. For instance, an exchange platform can be combined with a payment platform and appear to the end-user as a single digital economic platform.

3.4.3
ad-funded platform
<economics> *digital economic platform* (3.4.2) where a platform generates revenue by charging advertisers to show advertisements to customers of the service

Note 1 to entry: Advertisers are one participant group, those who view the advertisements are a second, and those who display the advertisements alongside their own content are a third.

3.4.4
exchange platform
<economics> *digital economic platform* (3.4.2) which brings together vendors and potential purchasers and enables them to sell and buy goods and services, potentially generating value for the platform provider by intermediating the transaction

3.4.5
payment platform
<economics> *digital economic platform* (3.4.2) which facilitates the secure completion of payments between *platform participants* (3.2.1)

3.4.6
application marketplace
<economics> *digital economic platform* (3.4.2) where the platform provides means for software developers and publishers to provide applications to customers via the platform

Note 1 to entry: This document describes this concept in the economic platform domain. See also ISO/IEC 19944-1:2020, 3.2.2 for the definition in the device platform domain.

4 Abbreviated terms

AIaaS	artificial intelligence as a service
CaaS [a]	communications as a service
CaaS [a]	containers as a service
CSC	cloud service customer
CSP	cloud service provider
DSaaS	data storage as a service
FaaS	function as a service
GPU	graphics processing unit

IaaS	infrastructure as a service
MLaaS	machine learning as a service
PaaS	platform as a service
QCaaS	quantum computing as a service
SaaS	software as a service
SME	Small- or medium-sized enterprise

[a] The acronym CaaS is unfortunately used by industry for multiple purposes, two of which are listed here, so it is best to use the expanded term to ensure the reader has the correct context.

5 Digital platform overview

5.1 General

The term "platform" is used in the English language with a very wide range of meanings, and some of these uses are ambiguous in the context of online or digital services.

This document defines a taxonomy of terms for digital platforms of various kinds and shows how these terms can be structured into a hierarchy (see Annex A).

5.1.1 Meanings of "platform"

These uses include but are not limited to the following. These groupings are potentially overlapping, they are not mutually exclusive.

— The traditional non-ICT uses of the term, such as a wooden platform to stand on, a political platform of policies, or a railway platform from which trains will depart, highlight the highly context-dependent use of the word "platform".

— There are online, broadcast and printed media and public discourse settings, that serve as platforms for free expression, expression of political and social viewpoints, artistic and musical expression, discussion and debate. This includes social media.

— There are what can be defined as "economic platforms", which is a way to describe certain business approaches that create multi-sided markets, where two or more distinct groups of participants can do some kind of business together via an intermediary platform. This means that the platform brings together two or more different participant groups and provides a meeting place to facilitate interactions between the participant groups through the platform. Platforms serving two participant groups are called two-sided platforms, and more generally platforms serving two or more such groups are called multi-sided platforms.

— There are many examples of two-sided markets supported by intermediary platforms, including but not limited to: publishers, academic journals and conferences; airports and ports; stock markets, auction houses and real estate brokers; dating and employment agencies; and credit card payment cloud computing systems. An economic platform does not need to involve any technology.

EXAMPLE A bricks-and-mortar department store or shopping mall creates a multi-sided market between a group of merchants and a group of customers. This type of economic platform existed long before modern digital technology.

— There have also been "technology platforms" for many years, long predating the arrival of online services. Early computer operating systems such as on mainframes were often described as providing a platform for customer programme development. Specialised systems such as telephone networks provided platforms for the deployment of (then) advanced services such as free-phone

and premium-rate telephone lines. PBX systems provided platforms for customer development of early call-centre services. All of these existed long before the arrival of the World Wide Web.

— For these technology products and services, the term “platform” is widely used, both as a simple indicator of layering – with many distinct products and services built on a single underlying base – and to articulate a specific purpose for a product (e.g. providing a platform for self-expression or social interaction).

5.1.2 Meanings of “digital platform”

With the arrival of the World Wide Web, many of the platform concepts described above were adapted to the world of online services, such as online shopping services, online dating, online social networks, and many others. Some of these competed with the pre-online service equivalents, while others were wholly new.

In particular, a market demand rapidly emerged for technology companies to provide means for their customers to rapidly enter the online business world without having to develop everything from scratch themselves. In the same way that companies adopted common operating systems on which to build their applications without having to write specific code for every printer and other device, so the online services need platforms that provided the components common to all or most online services, allowing them to concentrate on those components that were unique to their own service offering.

Thus, the parallel development of digital platforms include both digital economic platforms (business models for multi-sided markets) and digital technology platforms (services and components providing customers with the tools to build their own services).

This document is focused on digital platform as it is used in the context of online or digital services of these two types.

5.2 The ambiguity of “platform” for digital services

Within the realm of digital technologies there are specific situations in which the use of “platform” of even “digital platform” becomes ambiguous.

Both terms are sometimes used for both digital economic platforms and digital technology platforms.

— Digital economic platform is described as one or more digital platforms which provide goods, services or licensed rights to two or more distinct participant groups who need each other in some way. The term “platform” in association to economics, is meant to identify multi-sided business relationships.

— Digital technology platform is described as any kind of system that supports the creation, modification, or addition of significant software functionality by the platform customer rather than by the platform service provider.

These two terms are orthogonal, and either, both, or neither may apply to a digital service (see Table 1).

Table 1 — Contrasting examples of digital economic platforms and digital technology platforms

	Digital Technology platform **(supports the customer building their own application[a])**	**Other** **(does not support the customer building their own application)**
Digital Economic platform **(creates a multi-sided market)**	PaaS or CaaS service that includes a third-party component store	Ad-funded service Exchange service App store Payment service
Other **(does not create a multi-sided market)**	Basic PaaS, CaaS, or IaaS service with no "store"	Basic websites Non-platform cloud services Many more …

[a] For cloud computing, this includes either infrastructure or platform capabilities type(s), or both (see ISO/IEC 22123-1).

Digital economic platforms and digital technology platforms are thus orthogonal concepts. Neither is a subset of the other. A given digital service can be one or the other, or both, or neither.

While many digital economic platforms are built to run on top of a digital technology platform, this does not mean they are a subtype of it, just as a car is not a subtype of the road it runs on.

Parties offering digital economic platforms can select different strategies, based on their perceived business interests. Platform strategies, including pricing, are strongly affected by the economic characteristics of digital platform markets.

A digital technology platform which also brings together two or more groups of customers can also be a digital economic platform.

— A digital service provided to only one group of customers, such as data storage or app development tools, is not a digital economic platform.

— Nonetheless, there are some digital technology services that can be described as both digital technology platforms and digital economic platforms. A digital technology platform which brings together two or more groups of customers (or "platform participants") can be a digital economic platform.

Note that an individual platform can sometimes pursue more than one of the business models described in this document.

EXAMPLE 1 In a discussion of hydroelectricity, the term "current" could apply to either water current or electrical current, so it would be foolish to use the term in isolation without making clear the context and specific usage of the word. In the language of cloud computing, the same situation pertains to the ambiguous use of "digital platform" or just "platform", so care is needed to avoid incorrect interpretation of the isolated term by readers.

EXAMPLE 2 Referring to European Commission policy statements shown as "Online platform" under the "Shaping Europe's digital future", documents such as "COM/2016/0288 final" frequently mentions "platforms", but seems to be entirely focussed on digital economic platforms. It reads as if this is the only meaning of the term platform and makes no obvious mention of digital technology platforms such as Platform as a Service. This raises the concern that digital technology platforms could be unintentionally brought within scope when this was not really the writers' intent.

5.3 Characteristics of digital platforms

Digital platforms exhibit various characteristics that can boost their value to customers and potentially affect the competition landscape within an industry.

5.3.1 Network effects

Network externalities, which often arise in platforms, describe the value for a platform participant arising from the size of the network using the product or service, which may arise from participants of the same participant group ("same-side" network effects) or participants from a different participant group ("cross-side" network effects). Cross-side network effects only arise in multi-sided markets because there are different participant groups involved.

Network effects can be beneficial or detrimental to platform participants, sometimes both arising at the same time. This document does not make any value judgements on these effects.

Network effects between different participant groups can potentially create a barrier to entry. Each side values the other, and it is difficult for a platform provider to attract one side without the other (the "chicken and egg" problem). Entrants can employ different strategies to try to overcome the barrier to entry, such as focusing on a niche group of users, taking advantage of a technological shift to offer a tailored product, or shifting a group of users from another platform.

The concept is further explored in Clause 8.

See Annex B for a consideration of possible monetisation approaches and network effects for various types of digital platform services.

5.3.2 "Private" vs "Open" platforms

Platforms can exist in both private and open forms. Neither of these is exclusive to either digital economic platforms or digital technology platforms.

A "private" platform implies closed membership of some kind, such that only specific customers and users will be able to obtain service. The most obvious would be in a private cloud or community cloud which is only available to employees, departments, or affiliates of the company or government which is acting as cloud service provider. In general, the operating CSP determines the policies that are applicable for using their platform, subject to overriding local legal requirements.

An "open" platform implies that membership is open to anyone who chooses to subscribe to it. This is true for most but not all public cloud services.

An open platform can carry specific national or regional obligations of law, such as consumer protection rules on sale of goods.

In all such cases, these are matters of law for the local jurisdiction and out of scope for this document.

EXAMPLE 1 There are platforms where membership is limited to members of the public who meet certain criteria, such as ethnicity, age, industry affiliation, political or religious affiliation, etc.

EXAMPLE 2 There are platforms which are only open to users of a specific brand of product, such as a brand of television or smartphone. Whether such a platform is treated in law as "open" or "private" will depend on the law of the applicable jurisdiction.

5.3.3 Cross-cutting considerations

When considering the term "platform" in settings which combine both economic and technical considerations, many related factors need to be considered simultaneously irrespective of the specific type of platform under consideration.

These cross-cutting considerations include economic concepts, such as

— matchmaking (see 7.2.1)

— cost of market entry

— various forms of payment