

# XaaS (Anything as a Service) Glossary

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**A Discussion Paper from the OMG Cloud Working Group**

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This paper presents a discussion of technology issues considered in a Subgroup of the Object Management Group. The contents of this paper are presented to foster wider discussion on this topic; the content of this paper is not an adopted standard of any kind. This paper does not represent the official position of the Object Management Group.

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## Executive Overview

The NIST Cloud Computing Reference Model [1] defined three cloud service models: infrastructure as a service (IaaS), platform as a service (PaaS), and software as a service (SaaS).

In the following decade, the suffix “as a service” became a popular shorthand to describe solutions offered on a pay-as-you-go basis with characteristics of elasticity and self-service procurement. This phrase has since been used for an increasing variety of services, not all related to information and communication technologies (ICT), to the point that the abbreviations XaaS and AaaS, both meaning “anything as a service” have surfaced to denote this trend.

This proliferation creates a risk of confusion among end users, especially since the same abbreviation is sometimes used with different meanings.

This Glossary was written to dispel this potential confusion. It consists of a list of forty-eight terms and their definitions, and a set of references to the sources or definitions of those terms:

- AaaS (3 entries)
- AlaaS
- BaaS (3)
- BPaaS
- CaaS (4)
- CCaaS
- CMaaS
- CPaaS
- DaaS (2)
- DBaaS
- DRaaS
- DSaaS
- EaaS
- FaaS (2)
- HPCaaS
- HSMaaS
- IaaS
- IAMaaS
- IDaaS
- IPaaS
- KaaS
- LaaS (2)
- MaaS (2)
- MBaaS
- MLaaS
- NaaS
- PaaS
- RaaS (2)
- SaaS
- SDWANaaS
- SecaaS
- Staas
- UCaaS
- VaaS
- WaaS
- XaaS

Preliminary sections explain the rationale in more detail, as well as the principles followed by the Cloud Working Group in deciding which terms to include. Appendix A provides a mapping of the glossary entries to the three basic cloud service models, and Appendix B explains which terms were excluded and why.

## Background and Rationale

Karolyn Schalk, formerly with IBM and a co-chair of the OMG Cloud Working Group, introduced in 2021 the need to help end users of cloud computing understand the variety of offerings covered by the abbreviation “XaaS,” which is taken to mean “anything as a service or “everything as a service.”

The use (and possibly *excessive* use, in some cases) of the phrase “as a service” is creating confusion among users in multiple ways:

- first, customers may not understand the meaning of a term until it is explained to them;
- second, there are now multiple instances of the same abbreviation being used by different sources to mean different things (see for example BaaS, CaaS, DaaS, FaaS, etc., in the Glossary);
- third, it is not always clear that the offering that is being given an “XaaS” abbreviation meets the recognized criteria for this designation; that is, it may not be a service that can be consumed using a pay-as-you-go model, or it may not be an elastic service (where the level of usage can wax or wane and the cost varies accordingly), or it may not be available through a self-service portal.

The lack of an authority to create or validate those terms is part of the problem. Only a few services beyond the three original models codified by NIST (IaaS, PaaS and SaaS) [1] benefit from such an authoritative source and definition. ISO/IEC 22123-1 defines four additional services, but in such generic terms that they aren’t very useful [2]. In the absence of such an authority, the invention and definition of new terms is often an act of marketing by suppliers. Calling one’s offering “<something> as a service” is seen as giving it an aura of modernity and respectability, especially when larger customer organizations, including governments, mandate a “cloud-first” IT procurement policy.

This Glossary does not have the authority of an official standard either (at least until it is possibly submitted to and adopted by a *de jure* standards body), but as a collective product created and sanctioned by OMG’s Cloud Working Group, it will help the reader make sense of the actual concepts covered by the various abbreviations, analyze how much is truly novel in each of them, and as importantly, understand whether there is a type of service they are not using and should look into. As such, this Glossary is one of many papers and guides issued by OMG’s Cloud Working Group to complement its *Practical Guide to Cloud Computing* [3].

# Principles and Inclusion Criteria

## IT vs. non-IT

The phrase “as a service” has been adopted in various non-IT-related contexts. For example:

- ride hailing services, such as Uber or Lyft, are sometimes called “Transportation as a Service” (TaaS) or “Mobility as a Service” (MaaS);
- the virtualization of what a business owner needs to run an office (including phone and teleconferencing services, remote printing, etc.) has been called “office as a service”;
- the form of management consulting in which the consultant fills a “fractional” management role when a full-time position is not justified has also received this appellation – for example, “CISO as a service” (Chief Information Security Officer).

In fact, NIST initially discussed this scope issue and decided that the many forms of XaaS could be considered as sub-services under one of the three original service models of IaaS, PaaS and SaaS. It never anticipated the extent to which the “as a Service” terminology was going to be embraced, even for services unrelated to cloud computing.

Services such as ride-hailing usually rely on IT capabilities, especially smartphone apps, to access them, but the service itself is not an IT one. While imitation is said to be the sincerest form of flattery, we chose to exclude such terms, the main reason being that our constituency consists of people and organizations that specifically seek to procure IT capabilities, systems, and applications. Appendix B provides more details about why some terms, found in the literature, have been excluded.

## Characteristics of a Service

The intent of the Glossary is to limit itself to terms describing services that meet the key characteristics initially specified for cloud computing, namely:

- Network-based: there is broad availability of the service via the Internet, so that the actual location of the resources that support the service is generally unimportant and can be changed from time to time at the provider’s discretion.
- Multi-tenancy: generally, the resources involved in supplying the service are shared between multiple customers (or “tenants”).
- Rapid elasticity and scalability: the customer can increase or decrease their use of the resource as needed without having to sign a new agreement.
- Metered usage: the charges vary (up as well as down) according to actual usage.
- On-demand self-service: the initial agreement can be obtained and subsequent service level changes managed online through a web portal.

Some of the services that receive “XaaS” designations may not perfectly meet all of the criteria. We have tried to limit ourselves to those that meet most of them, and to mention any deviations or limitations.

## References to Providers

Indicating the names of specific organizations, especially commercial technology suppliers, is fraught with the risk of appearing to play favorites (or to have ignored other organizations due to incomplete research on the subject). However, providers are sometimes the minting new “XaaS” terms, or have repurposed existing ones; in those cases, mentioning the provider’s name provides useful context to the reader. Any omission is accidental and is not an indication of favoritism. Errors and omissions can be corrected in future revisions, and should be reported to [cloud-chair@omg.org](mailto:cloud-chair@omg.org).

## Glossary

Note: abbreviations that have alternative meanings are identified as such through suffixes. See AaaS below as an example.

### ***AaaS<sub>1</sub> – Analytics as a Service***

“Analytics-as-a-Service (AaaS) provides subscription-based data analytics software and procedures through the cloud. AaaS typically offers a fully customizable BI solution with end-to-end capabilities, organizing, analyzing, and presenting data in a way that lets even non-IT professionals gain insight and take action.” [4]

“AaaS could come bundled with multiple business-intelligence-related services. Primarily, the service includes (1) services for data warehouses; (2) services for visualizations and reports; and (3) services for predictive analytics, artificial intelligence (AI) and machine learning (ML).” [5]

Note: Providers of Analytics as a Service include Adverity, Domo, Scnsoft, Sisense, Toucan Toco, and more.

### ***AaaS<sub>2</sub> – Anything as a Service***

The phrase “anything as service” is how the abbreviation XaaS is usually read; the abbreviation AaaS (in this sense) has generally been superseded by XaaS.

### ***AaaS<sub>3</sub> – Authentication as a Service***

“Authentication as a Service (AaaS) provides authentication services like multi-factor authentication, single sign-on, and password management in the cloud. With Authentication as a Service, organizations can control access to their applications and servers from various devices and networks. AaaS enables organizations to track password usage, comply with strict password requirements, and provide employees with a secure way to log in to resources. AaaS ensures a high level of security as it’s based on security standards including OAuth, WS-Federation, and Security Assertion Markup Language (SAML).” [6]

Note: Providers of Authentication as a Service include Auth0, Frontegg, JumpCloud, Okta, OneSpan, Stych, Veriff, and more.

### ***AlaaS – Artificial Intelligence as a Service***

“Refers to off-the-shelf AI tools that enable companies to implement and scale AI techniques at a fraction of the cost of a full, in-house AI. [...] Common types of AlaaS include:

- Chatbots and digital assistants
- Cognitive computing APIs
- Machine learning frameworks
- Fully managed machine learning services.” [7]

Note: the AlaaS market is dominated by large companies such as Amazon Web Services, Google, IBM, and Microsoft. In Asia, Alibaba is a notable provider. Smaller companies in this field include Cyxtera and MonkeyLearn. In some cases, the offering is essentially a form of IaaS targeted at the deployment of computing nodes that are particularly suited for AI/ML workloads.

### ***BaaS<sub>1</sub> – Blockchain as a Service***

“The third-party creation and management of cloud-based networks for companies in the business of building blockchain applications.” [8]

Note: BaaS can be provided by cloud service providers that have added this service to their portfolio, or by blockchain-focused companies that are moving from a product-based business model to a service-based one.

### ***BaaS<sub>2</sub> – Backend as a Service***

See *Mobile Backend as a Service (MBaaS)*

### ***BaaS<sub>3</sub> – Backup as a Service***

Backup as a service (BaaS) is an approach to backing up data that involves purchasing backup and recovery services from an online data backup provider. Instead of performing backup with a centralized, on-premises IT department, BaaS connects systems to a private, public or hybrid cloud managed by the outside provider.” [9]

Note: Backup as a Service at the enterprise level usually includes features such as deduplication, because multiple users may hold a copy of the same file on their personal computers, and only one backup copy needs to be made. BaaS may also be offered to individuals and independent workers, providing greater protection than an external drive that could be affected by the same disaster as the original data. The service may offer the ability to retrieve backed-up files from a different device (e.g., a smartphone). Continuous protection, in which the backup process always running in the background, is a frequent feature. Some of the companies providing BaaS services include Acronis, Carbonite, Duva, Flexential, Metallic, N-able Backup, NinjaOne, Rewind, Rubrik, and many others. Most BaaS providers rely in turn on a large cloud storage provider such as Amazon, Google, or Microsoft to store the backups.

### ***BPaaS – Business Process as a Service***

“The delivery of business process outsourcing (BPO) services that are sourced from the cloud and constructed for multi-tenancy. Services are often automated, and where human process actors are required, there is no overtly dedicated labor pool per client. The pricing models are consumption-based or subscription-based commercial terms.” [10]

Note: Examples of BPaaS might be payroll management, accounting, recruiting, benefits administration, or e-commerce.

### ***CaaS<sub>1</sub> – Communications as a Service***

“Communications as a Service (CaaS) is an outsourced enterprise communications solution that can be leased from a single vendor. Such communications can include voice over IP (VoIP or Internet telephony), instant messaging (IM), collaboration and videoconference applications using fixed and mobile devices.” [11]

Note: Also see *Unified Communications as a Service (UCaaS)*. Not all CaaS service meet the definition of UCaaS. The Gartner Glossary includes “presence and notification” within CaaS offerings, but they would typically be considered specific to UCaaS. Providers are increasingly using the UCaaS label, with perhaps more marketing than technical reality behind this shift.



### ***CaaS<sub>2</sub> – Compute as a Service***

“Compute services are also known as Infrastructure-as-a-Service (IaaS). Compute platforms [...] supply a virtual server instance and storage and APIs that let users migrate workloads to a virtual machine. Users have allocated compute power and can start, stop, access, and configure their computer resources as desired.” [12]

Note: This term is defined in ISO/IEC 22123-1 [2] and mostly appears in marketing literature from Amazon and IBM. Some sources state that Amazon invented the concept and the term when releasing the Elastic Compute Cloud (EC2) service in 2006. Most authors use the term IaaS instead.

### ***CaaS<sub>3</sub> – Container[s] as a Service***

“A cloud service that manages containers at large scale, including starting, stopping, scaling, and organizing containerized workloads. Examples of CaaS services are Amazon Elastic Container Service (ECS), Amazon Fargate, and Azure Container Instances (ACI). CaaS container platforms are a middle ground between container engines like Docker, which let you manage individual containers without orchestration capabilities, and full-featured orchestrators like Kubernetes, which provide powerful cluster management capabilities, but are complex to setup and maintain.” [13]

“Platform flexibility is the primary use case for CaaS. Customers may not want to be locked into a PaaS due to the restrictions on development languages and limitations on platform tools. On the other hand, the complexity and cost of managing containers is prohibitive. CaaS provides the customers with a container-based environment they can control (security, scalability, and availability) without significant effort, and does not limit them to the languages, middleware, and tools offered by the PaaS platform.” [14]

### ***CaaS<sub>4</sub> – Content as a Service***

Content as a Service “provides raw content for other platforms to consume and make use of according to their particular needs.” [15]

Note: this term is not widely adopted and its definition comes from one specific provider of Content Management System (CMS). The definition appears to combine the pre-existing notion of CMS with a syndication business model, using APIs to serve common content to multiple consuming organizations.

### ***CCaaS – Contact Center as a Service***

“A SaaS-based application that enables customer service organizations to manage multichannel customer interactions holistically (using self- and assisted service) from both customer experience and an employee experience perspective.” [16]

Note: According to Gartner, CCaaS usually includes the following functions [17]. One should note, however, that those functions should also be present in a non-cloud-based contact center application:

- Automated call distribution
- Interactive voice response (IVR) / Virtual Attendant
- Advanced analytics and reporting
- Call recording feature suite
- Live monitoring and agent coaching feature suite
- Inbound and outbound dialing with a softphone application.

### ***CMaaS – Continuous Monitoring as a Service***

A form of Monitoring as a Service (see MaaS<sub>2</sub>) that focuses on “enabl[ing] rapid detection of compliance issues and security risks within the IT infrastructure.” [18]

### ***CPaaS – Communications Platform as a Service***

“A cloud-based platform that enables developers to add real-time communications features to their own applications without needing to build backend infrastructure and interfaces.” [19]

Note: Examples of providers include Cloudonix, Nexmo, SignalWire, and Twilio.

### ***DaaS<sub>1</sub> – Data as a Service***

“An information provision and distribution model in which data files (including text, images, sounds, and videos) are made available to customers over a network.” [20]

Note: “Hundreds of DaaS vendors, with various pricing models, exist worldwide. Pricing can be volume-based (a fixed cost per megabyte of data in the entire repository) or format-based (for example, a fixed price per text file and another fixed price per image file).” Examples of data served in this manner include parts catalogs, geography data, financial data, and business listings. [20]

### ***DaaS<sub>2</sub> or DTaaS – Desktop as a Service***

A form of desktop virtualization in which the software applications and data that traditionally reside on a desktop computer are made available remotely by a cloud provider to a user’s device, typically via a web browser interface.

Note: Desktop as a Service is an evolution of the “virtual desktop” product, for which the best-known original provider was Citrix.

### ***DBaaS – Database as a Service***

“DBaaS (also known as managed database service) [...] lets users access and use a cloud database system without purchasing and setting up their own hardware, installing their own database software, or managing the database themselves.” [21]

### ***DRaaS – Disaster Recovery as a Service***

“A productized service offering in which the provider manages server image and production data replication to the cloud, disaster recovery run book creation, automated server recovery within the cloud, automated server failback from the cloud, and network element and functionality configuration, as needed.” [22]

Note: Also called RaaS (Recovery as a Service), including in earlier Gartner publications.

### ***DSaaS – Data Storage as a Service***

See *Storage as a Service (StaaS)*.

Note: DSaaS appears in ISO 22123-1 [2] but omitting the word “data” is more common.

### ***EaaS – Entropy as a Service***

“A novel Internet service architecture providing secure time and quantum entropy sources to IoT devices.” [23]

Note: EaaS delivers seed values for the generation of independent and identically distributed (IID) random numbers, used in the generation of cryptographic keys. True randomness is best obtained from unpredictable phenomena, such as quantum effects, which traditional deterministic computers or resource-constrained devices (e.g., IoT devices) are unable to collect. The EaaS architecture was proposed by NIST in 2016 – see [24]. Several companies offer EaaS, including Qrypt and Quantropi.

### ***FaaS<sub>1</sub> – Finance as a Service***

“An offering of “fully integrated accounting, financial, and business strategy streams.” [25]

A “future-focused service delivery model [that] combines best-in-class finance operations management practices with advanced technologies – such as cloud-based ERPs, artificial intelligence, and intelligent automation – to make finance more agile and forward-looking.” [26]

Note: Consero, GenPact and GrowthLab are three companies promoting this offering. The definition barely meets our criteria for inclusion, since this is largely a business process outsourcing offering supported by SaaS.

### ***FaaS<sub>2</sub> – Function as a Service***

FaaS and Serverless computing are synonymous [27]. FaaS/serverless computing enables customers to run server-side software in ephemeral, stateless containers without the need to manage the underlying servers. FaaS/serverless applications have the following basic characteristics:

- Event-based architecture – code runs in response to some event. The code may initiate other events, which could trigger further code to run.
- The unit of deployment is the code and configuration to run in a managed environment.
- Functions running in FaaS are stateless. [28]

### ***HPCaaS – High-Performance Computing as a Service***

“The provision of high-level processing capacity to customers through the cloud. HPCaaS provides the resources required to process complex calculations, working with massive amounts of data through existing platforms. The model makes compute-intensive processing possible for those without the investment capital required for the skilled staff, hardware and development of a high-performance computing platform.” [29]

Note: The phrase Supercomputing as a Service can also be found in the literature, but less frequently (perhaps because of the abbreviation clash with SaaS). See [30]. AWS, Google, HPE, IBM, Microsoft Azure, Oracle all offer access to their supercomputing platforms, often based on the NVIDIA A100 processors, and smaller companies have also entered this market.

### ***HSMaaS – Hardware Security Module as a Service***

A service whose provider owns and maintains hardware security modules (HSMs) and rents the encryption key storage space needed by customers. Also called “Cloud HSMs.”

Note: Cloud HSMs allow customers to outsource the provisioning and maintenance, and ensure the scalability, of HSMs used for encryption key storage, which are validated against standards such as FIPS 140-2. Providers include Amazon Web Services (AWS CloudHSM), Fortanix (Fortanix HSM Gateway), and Thales (Luna Cloud HSM).

### ***IaaS – Infrastructure as a Service***

“The capability provided to the consumer is to provision processing, storage, networks, and other fundamental computing resources where the consumer is able to deploy and run arbitrary software, which can include operating systems and applications. The consumer does not manage or control the underlying cloud infrastructure but has control over operating systems, storage, and deployed applications; and possibly limited control of select networking components (e.g., host firewalls).” [1]

Note: This is one of the three original service models defined by NIST.

Note: In subsequent NIST publications, the words “consumer” and “providers” have been replaced by “cloud service customer” (CSC) and “cloud service provider” (CSP) respectively. This also applies to the definitions of PaaS and SaaS below. We have kept here the original publication’s terminology.

### ***IAMaaS – Identity and Access Management as a Service***

See IDaaS.

Note: The abbreviation IAMaaS is mostly found in the Gartner Glossary, with a tautological definition that does not help understand what the service is about. Searches for IAMaaS usually result in finding IDaaS.

### ***IDaaS – Identity as a Service***

“IDaaS is cloud-based authentication built and operated by a third-party provider.” [31]

IDaaS “comprises cloud-based solutions for identity and access management (IAM) functions, such as single sign-on (SSO). These methods allow all users (customers, employees, and third parties) to more securely access sensitive information both on and off-premises. IDaaS also means collecting intelligence (i.e., logging events and reporting on which users accessed what information and when) to better understand, monitor, and improve their behaviors. Multi-factor authentication (MFA), including biometrics, are core components of IDaaS.” [32]

Note: According to the Forrester Wave™ report for 2021, the key providers of IDaaS include CyberArk, IBM, JumpCloud, Microsoft, Okta, OneLogin, OpenText, Optimal IdM, Oracle, Ping Identity, and SecureAuth.

### ***IPaaS – Integration Platform as a Service***

“A suite of cloud services enabling development, execution and governance of integration flows connecting any combination of on premises and cloud-based processes, services, applications and data within individual or across multiple organizations.” [33]

### ***KaaS – Knowledge as a Service***

“A new computing paradigm in which a knowledge service provider, via its knowledge server, answers queries presented by some knowledge consumers. The knowledge server’s answers are based on knowledge models that may be expensive or impossible to obtain for the knowledge consumers.” [34]

Note: While the above quote is from a 2005 paper, more recent mentions update the definition of KaaS by referring to the extraction and delivery, through web services, of information contained in knowledge graphs (KGs).

### ***LaaS<sub>1</sub> – Location as a Service***

“A data delivery model that brings privacy-protected physical location data to enterprise customers. Data that is collected via carriers, Wi-Fi, landlines and even IP addresses are made available through APIs to clients.” [35]

Note: Typical users of LaaS are retail organization that need detailed but anonymized demographic data in order to, for example, determine where to locate a new store in order to maximize sales.

### ***LaaS<sub>2</sub> – Logging as a Service***

A service that lets a customer send its IT system logs to a provider, which stores them securely, aggregates them, correlates them, analyzes them, and makes the results available for the customer to take appropriate action or provides predictive alerts about potential incidents.

Note: This is also called Cloud Logging Services or Cloud Log Management Services. The phrase “observability platform” can also be found. Some of the providers are mentioned in [36].

### ***MaaS<sub>1</sub> – Malware as a Service***

“The lease of software and hardware for carrying out cyberattacks. Owners of MaaS servers provide paid access to a botnet that distributes malware. Typically, clients of such services are offered a personal account through which to control the attack, as well as technical support.” [37]

Note: MaaS may be offered by private or state-sponsored cybercriminals. The usage fee is generally paid using hard-to-trace cryptocurrencies such as Monero.

### ***MaaS<sub>2</sub> – Monitoring as a Service***

A framework that facilitates the deployment of monitoring functionalities for various other services and applications within the cloud. The most common application for MaaS is online state monitoring, which continuously tracks certain states of applications, networks, systems, instances or any element that may be deployable within the cloud. [38]

Note: MaaS is often offered by a Managed Service Provider (MSP) to its customers. MSPs can run the MaaS server within their data center that manages the customers data. Individual software probes are installed within endpoints of each customer's site to gather data and transmit it back (preferably encrypted) to the server. Also see CMaaS.

### ***MBaaS – Mobile Backend as a Service***

A set of services offered to developers of mobile applications (via software development kits [SDKs] or APIs) to link the app to certain common services such as data storage in the cloud, integration with social networking services, push notifications, location services, messaging and chat functions, etc.

“MBaaS is a mobile middleware substitute.” [39]

### ***MLaaS – Machine Learning as a Service***

“Machine learning as service is an umbrella term for collection of various cloud-based platforms that use machine learning tools to provide solutions that can help ML teams with:

- out-of-the box predictive analysis for various use cases,
- data pre-processing,
- model training and tuning,
- run orchestration,
- model deployment.” [12]

Note: also see AlaaS.

### ***NaaS – Network as a Service***

“The technical and business realization of Software-Defined Networking (SDN) applied to the physical transport and logical connectivity of the Enterprise network to cloud(s) and Data Center Outsourcers (DCO)” [40]

Note: In the above definition, the meanings of SDN and DCO have been added for clarity.

Note: NaaS is an architecture that unifies and extends previously known concepts including SDN and Virtual Private Networks (VPN). It overlaps with terms such as Communications as a Service (CaaS<sub>1</sub> in this glossary).

### ***PaaS – Platform as a Service***

“The capability provided to the consumer is to deploy onto the cloud infrastructure consumer-created or acquired applications created using programming languages, libraries, services, and tools supported by the provider. The consumer does not manage or control the underlying cloud infrastructure including network, servers, operating systems, or storage, but has control over the deployed applications and possibly configuration settings for the application-hosting environment.” [1]

Note: This is one of the three original service models defined by NIST.

### ***RaaS<sub>1</sub> – Ransomware as a Service***

“A subscription-based model that enables users, also known as affiliates, to use ransomware tools to execute attacks. As opposed to normal ransomware, RaaS is a provider of out-of-the-box ransomware tools to subscribers who pay to be an affiliate of the program.” [41]

Note: Ransomware as a Service is a form of Malware as a Service (see MaaS<sub>1</sub>). In a typical ransomware attack, the victim’s data is encrypted and unrecoverable until the decryption key is obtained upon payment of a ransom in cryptocurrency. The RaaS provider typically gets paid a percentage of the ransom by the affiliate, who is the actual attacker.

## **RaaS<sub>2</sub> – Recovery as a Service**

See *Disaster Recovery as a Service (DRaaS)*

## **SaaS – Software as a Service**

“The capability provided to the consumer is to use the provider’s applications running on a cloud infrastructure. The applications are accessible from various client devices through either a thin client interface, such as a web browser (e.g., web-based email), or a program interface. The [Cloud Service Customer] does not manage or control the underlying cloud infrastructure including network, servers, operating systems, storage, or even individual application capabilities, with the possible exception of limited user-specific application configuration settings.” [1]

Note: This is one of the three original service models defined by NIST.

## **SDWANaaS – Software-Defined Wide Area Network (SD-WAN) as a Service**

“SD-WAN as a Service refers to software-defined wide area network connectivity delivered to customers as a managed service using software orchestration.” [42]

Note: Most of the references to SDWANaaS, including the one above, are from vendor literature, not from independent authorities. Managed service providers (MSPs) offering SD-WAN deployment and monitoring appear to be adding the words “as a service” for marketing reasons. Those companies include Burwood, Cognizant, Huawei, and IFX Networks.

## **SecaaS – Security as a Service**

A set of services delivered by a security provider on a pay-as-you-go basis and typically without the installation of on-premises hardware. These security services often include authentication, anti-virus, anti-malware/spyware, intrusion detection, penetration testing, and security event management.

Note: The Cloud Security Alliance provides a more complete list of 12 categories of security services offered using this model, with their definitions [43].

## **StaaS or STaaS – Storage as a Service**

“Cloud storage that you rent from a Cloud Service Provider (CSP) and that provides basic ways to access that storage.” [44]

Note: Storage as a Service is a form of Infrastructure as a Service. The fact that it has been given its own name attests to the high demand for this specific form of cloud-based infrastructure.

## **UCaaS – Unified Communications as a Service**

“A cloud-delivered unified communications model that supports six communications functions:

- Enterprise telephony
- Meetings (audio/video/web conferencing)
- Unified messaging
- Instant messaging and presence (personal and team)
- Mobility
- Communications-enabled business processes [45]

Note: Also see *Communications as a Service (CaaS<sub>1</sub>)*.

### ***VaaS – Video[conferencing] as a Service***

Cloud-hosted videoconferencing services.

Note: The term is rarely used, perhaps because such services are not limited to the enterprise market but have pervaded the consumer space, especially since the start of the COVID-19 pandemic in 2020. Additionally, the brand name “Zoom” is being used generically – and more concisely – to designate such services (even when people are in fact using Cisco Webex, Microsoft Teams, LogMeIn’s GoToMeeting, etc.), to the point that this has become a new accepted meaning of the verb “to zoom.” In the enterprise space, VaaS is one of the services offered as part of UCaaS.

### ***WaaS – Workspace as a Service***

See *Desktop as a Service*.

### ***XaaS – “X” as a Service***

Anything as a service. Denotes the IT industry’s evolution toward offering many different services using cloud computing principles. This abbreviation has generally superseded the use of AaaS (see that entry). The letter “X” is to be taken in the sense of the mathematical symbol for an unknown value.

Note: see the Introduction and Rationale for a discussion of the emergence and scope of this term. Various glossaries and catalogs of variable quality have appeared in recent years. See in particular [46] and [47]. A web search on “XaaS” will surface many more.



## Appendix A: Mapping to the NIST Cloud Computing Reference Model

Some of the services defined in this Glossary fit neatly within the three service models (IaaS, PaaS, SaaS) initially defined in the NIST Definition of Cloud Computing [1]. Others don't. This Appendix provides the reader with a tentative mapping of the Glossary terms to those three models.

To assign a service to one of the service models, we asked the question: who are the main users?

- If the service is mostly used by IT operations personnel, we classified it as IaaS
- If used mostly by developers, we classified it as PaaS
- If accessed by end users to do their (non-IT) work, we assigned it to SaaS.

For simplification, we omitted the “as a service” suffix below.

Infrastructure as a Service	Platform as a Service	Software as a Service
Backup	Authentication	Analytics
Communications	Blockchain	Artificial Intelligence
Compute	Backend	Business Process
Desktop	Container(s)	Content
Database	Communications Platform	Contact Center
Disaster Recovery	Entropy	Continuous Monitoring
Data Storage	Function	Data
High-Performance Computing	Identity and Access Management	Finance
Hardware Security Module	Identity	Knowledge
Logging	Integration Platform	Logging
Monitoring	Location	Monitoring
Network	Malware	MLaaS
Recovery	Mobile Backend	Unified Communication
SD-WAN	Ransomware	Video[conferencing]
Security		Workspace
Storage		

## Appendix B: Excluded Terms

The following “XaaS” terms, which can be encountered in various sources (including Wikipedia, which is a useful initial source but not an authoritative one [48]) were excluded from this Glossary for the reasons explained in the Introduction. The purpose of this Appendix is to make it clear to the reader that the terms in questions were not inadvertently omitted, but that they were considered and deemed out of scope. In many cases, the phrase “as a service” seems to be nothing more than an attempt to capitalize on a trend.

Abbreviation	Meaning	Reason for Exclusion
<b>BaaS<sub>4</sub></b>	Banking as Service	<p>“Banking as a Service describes a model in which licensed banks integrate their digital banking services directly into the products of other non-bank businesses. This way, a non-bank business [...] can offer its customers digital banking services such as mobile bank accounts, debit cards, loans and payment services, without needing to acquire a banking license of their own.” [49]</p> <p>Therefore, this is indeed a service, but not one that meets the criteria for inclusion (no mention of pay-as-you-go, elasticity, web-based self-provisioning, etc.)</p>
<b>BCaaS</b>	Business Continuity as a Service	<p>“Business continuity as a service is the act of partnering with a third party that offers to design, create, implement, and maintain the resiliency program of the business.” [50]</p> <p>Per this definition, BCaaS is indeed a service, similar to any other management or IT consulting offering, but is not a capability delivered “as a service” according to the NIST criteria.</p>
<b>CaaS<sub>5</sub></b>	Crypto as a Service	<p>A term invented by Mercuryo to designate “an easy plug-and-play solution for businesses looking to offer cryptocurrency services to their users. [...] With CaaS, regulated banks and fintech businesses can enable their users to invest, hold, trade, and pay in crypto.”</p> <p>It is possible that this offering would eventually meet some of the XaaS criteria, becoming a subtype of Finance as a Service (FaaS<sub>1</sub>) but there is no evidence that it is offered by more than one company.</p>
<b>DGaaS</b>	Data Governance as a Service	A form of Governance as a Service. See GaaS <sub>2</sub> in this table.
<b>EaaS<sub>2</sub></b>	Energy as a Service	Based on definitions such as “a business model whereby customers pay for an energy service without having to make any upfront capital investment,” this offering is neither an IT service nor is it more than what individual electricity consumers have been enjoying for over a century.

Abbreviation	Meaning	Reason for Exclusion
<b>EVaaS</b>	Electric Vehicle as a Service	This term can be traced back to two IEEE papers by the same authors about using electric vehicle batteries to support microgrids, with blockchain supporting the energy trading. This is not an IT service.
<b>GaaS<sub>1</sub></b>	Games as a Service	Online video games with a “continuous revenue model” as opposed to an initial fully paid purchase are a commercial evolution of massive multiplayer online games, with players being enticed to keep spending to acquire periodic updates. This is not an IT service.
<b>GaaS<sub>2</sub></b>	Governance as a Service	This term appears in the description of the offerings of one UK company to the UK Government, and in the writings of one consultant.  This is similar to other management or IT consulting offerings, but is not a capability delivered “as a service” according to the NIST criteria.
<b>HaaS<sub>1</sub></b>	Hardware as a Service	This is simply the leasing of computer hardware. The new phrase is rarely seen and is part of the “as a service” fad.
<b>HaaS<sub>2</sub></b>	Health[care] as a Service	New models of healthcare delivery, including telemedicine, aim to provide a health service in a more effective and less costly manner, but these are not IT capabilities (although they may rely heavily on IT).
<b>IaaS<sub>2</sub></b>	Ink as a service	This term was coined, somewhat facetiously, to designate a subscription program launched by printer manufacturers (initially HP, then Brother, possibly others) to delivers ink or toner cartridges to the customer by postal mail, automatically, when needed, based on the monitoring of ink levels or printed pages by a network-connected printer. This has characteristics of elasticity (the price is based on a quota of printed pages that can be raised or lowered at will from month to month) and self-provisioning, but the product is obviously delivered physically. This model has been extended to the delivery of printer paper.
<b>ITaaS</b>	IT as a Service	This term appears in literature from EMC, Citrix, and VMware to designate an operational model in which an IT department delivers services to lines of business based on a service catalog and a pay-per-use model. Neither the notion that an IT department needs to act as a service organization, nor the offering of SaaS services in a private cloud, are novel.
<b>LaaS<sub>3</sub></b>	Lighting as a Service	This is a business model in which lighting equipment remains the property of (and is maintained by) a provider, which charges the customer for the service. This is not an IT service, is not delivered via the Internet, and may not have self-provisioning features. It is basically an equipment leasing service.

Abbreviation	Meaning	Reason for Exclusion
<b>MaaS<sub>3</sub></b>	Mobility as a Service	Rideshare services, such as Uber and Lyft or driverless taxis, aim to transport people and goods from point A to point B. MaaS may refer to a more comprehensive service that combines multiple modes of transportation to provide A-to-B transport for a single payment. The use of apps, geolocation, and a pay-per-use model are a means, not a goal of those services.
<b>OaaS</b>	Operations as a Service	This is just a (rare) new name for a Managed Service Provider, or MSP, capitalizing on the “as a service” fad.
<b>PaaS<sub>2</sub></b>	Payment as a Service	According to Wikipedia, this is “a marketing phrase used to describe a software as a service to connect a group of international payment systems.” According to McKinsey, “PaaS players operate cutting-edge cloud-based platforms to provide specialized services, such as card issuing, payments clearing, cross-border payments, disbursements, and e-commerce gateways.” This PaaS uses cloud platforms but it is a financial service, not an IT service.
<b>PaaS<sub>3</sub></b>	Policy as a Service	This phrase is not usually encountered in that form, but may be shorthand for “IT policy as a service,” “policy management as a service,” or “policy engine as a service.” The first two of these describe a consulting offering – writing policies for clients, communicating them, and monitoring compliance. The third time appears in a 2016 research paper from Germany that advocates an architecture similar to OMG’s Information Exchange Framework (IEF).
<b>QaaS</b>	Quality Assurance as a Service	A form of outsourced software quality assurance in which the service provider typically employs crowdsourcing to marshal many individuals in the testing process. This is a business model, not an IT service per se.
<b>RaaS<sub>3</sub></b>	Robot as a Service	The literature describes RaaS as essentially the leasing of robots, where the robots remain the property of, and are maintained by, their manufacturer. Leasing models predated the “as a service” fad and RaaS is not an IT service.
<b>SaaS<sub>2</sub></b>	Sustainability as a Service	A set of services offered by IT companies to help their customers improve their use of resources in order to comply with self-imposed or externally imposed sustainability goals. These services include traditional cloud services (in order to minimize wasted server resources), and recycling/re-certifying older IT assets. This meets almost none of the cloud service defining criteria and boils down to gluing together two fashionable words.

Abbreviation	Meaning	Reason for Exclusion
<b>SPaaS</b>	Solar Power as a Service	Also called “solar as a service,” this is a leasing model for solar panels. The supplier installs panels on a house or commercial building, but owns them and manages them, and sells the electricity to the property owner.
<b>TSDBaas</b>	Time Series Data Base as a Service	This phrase has only been used to describe the Ceilometer project, “a data collection service that provides the ability to normalize and transform data across all current OpenStack core components.” The data “Its data can be used to provide customer billing, resource tracking, and alarming capabilities.” While this can be considered a subset of both Data Base as a Service (DBaaS) and Continuous Monitoring as a Service (CMaaS), its narrow application and the lack of adoption by anyone else than this specific project justify its exclusion.

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