OpenFog Consortium

Glossary of terms related to Fog Computing & Networking

Compiled and edited by members of the OpenFog Consortium

Glossary of Industry Terms

Term	Definition	Source
Access Control	Means to ensure that access to assets is authorized and restricted based on business and security requirements. *Note:* Access control requires both authentication and authorization.	International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC) 27000:2014
Actuators	"An actuator is a mechanical device for moving or controlling a mechanism or system. It takes energy, usually transported by air, electric current, or liquid, and converts that into some kind of motion."	Sclater 2007
Address	An address is used for locating and accessing – "talking to" – a Device, a Resource, or a Service. In some cases, the ID and the Address can be the same, but conceptually they are different.	IoT-A Architectural Reference Model (IOT-A) by the IoT European Research Cluster
Analytics	Synthesis of knowledge from information.	NIST Interagency Publication 8401-1
Appliance	A computer appliance is generally a separate and discrete hardware device with integrated software, specifically designed to provide a specific computing resource.	Wikipedia
Application Software	Software that provides an application service to the user. It is specific to an application in the multimedia and/or hypermedia domain and is composed of programs and data.	European Telecommunications Standards Institute (ETSI) - ETR173
Architecture	The fundamental organization of a system embodied in its components, their relationships to each other, and to the environment, and the principles guiding its design and evolution.	Institute of Electrical & Electronics Engineers (IEEE) 1471-2000
Architecture Description	Work product used to express architecture.	ISO/IEC 42010:2011

Architecture Framework	Conventions, principles and practices for the description of architectures established within a specific domain of application and/or community of stakeholders	ISO/IEC 42010:2011
Architecture Vision	A high-level, aspirational view of the target architecture.	The Open Group Architecture Framework (TOGAF9)
Aspiration	Stakeholder Aspirations are statements that express the expectations and desires of the various stakeholders for the services that the final [system] implementation will provide.	E-FRAME
Authentication	Authentication is the process of verifying a user's true identity. This may involve the use of one or more means of proof of identification, also known as factors, such as PIN codes and smart cards.	Nexus IoT Glossary
Authorization	Granting of rights, which includes the granting of access based on access rights.	ISO 7498-2:1989
Autonomy	The ability of an intelligent system to independently compose and select among different courses of action to accomplish goals based on its knowledge and understanding of the world, itself, and the situation.	Institute for Human & Machine Cognition (IHMC)
Availability	Property of being accessible and usable upon demand by an authorized entity.	ISO/IEC 27000:2014
Business Logic	Goal or behavior of a system involving Things serving a particular business purpose. Business Logic can define the behavior of a single Thing, a group of Things, or a complete business process.	IOT-A
Choreography	Type of composition whose elements interact in a non-directed fashion with each autonomy part knowing and following an observable predefined pattern of behavior for the entire (global) composition.	ISO/IEC DIS 18834-1
Collaboration	Type of composition whose elements interact in a non-directed fashion, each according to their own plans and purposes without a predefined pattern of behaviour	ISO/IEC DIS 18834-1
Confidentiality	Property that information is not made available or disclosed to unauthorized individuals, entity, or processes	ISO/IEC 27000:2014
Cloud	Or, "The Cloud," is generally used as shorthand for Cloud Computing. The name "Cloud" comes from the fluffy cloud typically used in Visio-style network diagrams to represent a connection to the Internet.	IoT Guide
Cloud Computing	A general term for the delivery of various hosted services over the Internet. The "as-a-Service" moniker is used for cloud services such as Software-as-a-Service, Platform-as-a-Service and	IoT Guide

	Infrastructure-as-a-Service. The back-end for many IoT devices may be delivered via the Cloud.	
Communication Model	The communication model aims at defining the main communication paradigms for connecting elements. This model provides a set of communication rules to build interoperable stacks, together with insights about the main interactions among the elements of the domain model.	IOT-A
Composition	Result of assembling a collection of elements for a particular purpose	ISO/IEC DIS 18834-1
Constrained Network	A constrained network is a network of devices with restricted capabilities regarding storage, computing power, and / or transfer rate.	IOT-A
Controller	Anything that has the capability to affect a Physical Entity, like changing its state or moving it.	IOT-A
Credentials	A credential is a record that contains the authentication information (credentials) required to connect to a resource. Most credentials contain a user name and password.	IOT-A
Cryptography	Discipline that embodies principles, means, and mechanisms for the transformation of data in order to hide its information content, prevent its undetected modification and/or prevent its unauthorized use	ISO/IEC 18014-2:2009
Data-centricity	Scalable, real-time, dependable, high-performance and interoperable data exchanges between publishers and subscribers.	Object Management Group
Device	Physical entity embedded inside, or attached to, another physical entity in its vicinity, with capabilities to convey digital information from or to that physical entity	Industrial Internet Consortium
Device Endpoint	Endpoint that enables access to a device and thus to the related physical entity.	Industrial Internet Consortium
Digital Entity	Any computational or data element of an IT-based system.	IOT-A
DIKW	**D**ata gathered becomes **I**nformation when stored and retrievable becomes **K**nowledge. Knowledge enables **W**isdom for autonomous IoT.	
Discovery	Discovery is a service to find unknown resources/entities/services based on a rough specification of the desired result. It may be utilized by a human or another service. Credentials for authorization are considered when executing the discovery.	IOT-A
Edge Gateway	Endpoint that provides an entry point into enterprise or service provider core networks	Industrial Internet Consortium

Element	Unit that is indivisible at a given level of abstraction and has a clearly defined boundary Note: An element can be any type of entity	ISO/IEC DIS 18834-1
Endpoint	One of two components that either implements and exposes an interface to other components or uses the interface of another component.	ISO/IEC 24791-1:2010
Enterprise	Segment of computing mostly focused at traditional IT and Industrial IT.	OpenFog Consortium
Edge Computing	Also referred to as Mesh Computing, this concept places applications, data and processing at the logical extremes of a network rather than centralizing them. Placing data and data-intensive applications at the Edge reduces the volume and distance that data must be moved.	IoT Guide
Fog Computing	Fog computing is a system-level horizontal architecture that distributes resources and services of computing, storage, control and networking anywhere along the continuum from Cloud to Things. It is a: • Horizontal architecture: Support multiple industry verticals and application domains, delivering intelligence and services to users and business • Cloud-to-Thing continuum of services: Enable services and applications to be distributed closer to Things, and anywhere along the continuum between Cloud and Things • System-level: Extend from the Things, over the network edges, through the Cloud, and across multiple protocol layers – not just radio systems, not just a specific protocol layer, not just at one part of an end-to-end system, but a system spanning between the Things and the Cloud	OpenFog Consortium
Fog Node	The physical and logical network element that implements fog computing services. It is somewhat analogous to a server in cloud computing.	OpenFog Consortium
Gateway	A Gateway is a forwarding element, enabling various local networks to be connected.	IOT-A
Global Storage	Storage that contains global information about many entities of interest. Access to the global storage is available over the internet.	IOT-A
Identity	Properties of an entity that makes it definable and recognizable.	IOT-A
Industry 4.0	Refers to the fourth industrial revolution, following the first (mechanization of production	Nexus

	through water and steam power), second (use of electricity for mass production), and third (use of electronics and IT for automation). Experts believe that the fourth revolutionary leap will entail full computerization of traditional industries. A key element of Industry 4.0 is the Smart Factory marked by adaptability, resource efficiency and ergonomics as well as intelligent processes and communication. Technological basis are cyber-physical systems and the Internet of Things.	
Industrial Internet	An Internet of things, machines, computers and people, enabling intelligent industrial operations using advanced data analytics for transformational business outcomes.	Industrial Internet Consortium
Information Model	An information model is a representation of concepts, relationships, constraints, rules, and operations to specify data semantics for a chosen domain of discourse. The advantage of using an information model is that it can provide sharable, stable, and organized structure of information requirements for the domain context. The information model is an abstract representation of entities, which can be real objects such as devices in a network, or logical, such as the entities used in a billing system. Typically, the information model provides formalism to the description of a specific domain without constraining how that description is mapped to an actual implementation. Thus, different mappings can be derived from the same information model. Such mappings are called data models.	AutoI
Infrastructure Services	Specific services that are essential for any IoT implementation to work properly. Such services provide support for essential features of the IoT.	IOT-A
Internet	The Internet is a global system of interconnected computer networks that use the standard Internet protocol suite (TCP/IP) to serve billions of users worldwide. It is a network of networks that consists of millions of private, public, academic, business, and government networks of local to global scope that are linked by a broad array of electronic and optical networking technologies. The Internet carries a vast array of information resources and services, most notably the inter-linked hypertext documents of the World Wide Web (WWW) and the infrastructure to support electronic mail. Most traditional communications media, such as	Wikipedia

	telephone and television services, are reshaped or redefined using the technologies of the Internet, giving rise to services such as Voice over Internet Protocol (VoIP) and IPTV. Newspaper publishing has been reshaped into Web sites, blogging, and web feeds. The Internet has enabled or accelerated the creation of new forms of human interactions through instant messaging, Internet forums, and social networking sites. The Internet has no centralized governance in either technological implementation or policies for access and usage; each constituent network sets its own standards. Only the overreaching definitions of the two principal name spaces in the Internet, the Internet-protocol address space and the domain-name system, are directed by a maintainer organization, the Internet Corporation for Assigned Names and Numbers (ICANN). The technical underpinning and standardization of the core protocols (IPv4 and IPv6) is an activity of the Internet Engineering Task Force (IETF), a non-profit organization of loosely affiliated international participants that anyone may associate with by contributing technical expertise.	
Internet of Things (IoT)	The digital network is soon going to connect physical objects ("things"), persons, machines, devices and processes. It is expected that 50 Billion devices will be connected to the Internet by 2020. Contrary to the Internet as we know it, where only persons have digital identities, the Internet of Things equips physical objects with digital identities. The objects are embedded with software, electronics and sensors that allow them to communicate with other objects or persons in the digital or physical world. IoT will transform all industries – it is expected that the new connectivity will set off automation in almost all fields of business. Establishing secure infrastructures and trustworthy identities is vital for the successful deployment of this new kind of network.	Nexus
Interoperability	The ability to share information and services. The ability of two or more systems or components to exchange and use information. The ability of systems to provide and receive services from other systems and to use the services so interchanged to enable them to operate effectively together.	TOGAF 9
IoT Service	Software component enabling interaction with resources through a well-defined interface. Can be orchestrated together with non-IoT services	IOT-A

	(e.g., enterprise services). Interaction with the service is done via the network.	
Local Storage	Special type of resource that contains information about one or only a few entities in the vicinity of a device.	IOT-A
LTE	Long Term Evolution commonly used in 4G.	3rd Generation Partnership Project (3GPP)
Microservices	Microservices can be considered a specialization or extension of service-oriented architectures (SOA) used to build distributed software systems. As with SOA, services in a microservice architecture are processes that communicate with each other over a network in order to fulfill a goal. Also, like SOA, these services use technology-agnostic protocols. The microservices' architectural style is a first realization of SOA that followed the introduction of DevOps and is becoming more popular for building continuously deployed systems. SOA is more focused on reusability and segregation whereas microservices focus on replacing a large application(s), with a system that can incrementally evolve and is easier to manage.	Wikipedia
Middleware	Middleware is computer software that provides services to software applications beyond those available from the operating system. It can be described as "software glue". Middleware makes it easier for software developers to implement communication and input/output, so they can focus on the specific purpose of their application.	Wikipedia
Mobile Edge Computing (MEC)	A standard mostly concerned with equipping computational resources at or near base stations in mobile / cellular networks	ETSI Multi-access Edge Computing (MEC)
Modularity	A property of network elements where individual capabilities can be added or removed without substantial impact of other components.	OpenFog Consortium
Multi-tenancy	Software Multitenancy refers to a software architecture in which a single instance of a software application runs on a server and serves multiple tenants. A tenant is a group of users who share a common access with specific privileges to the software instance. With a multitenant architecture, a software application is designed to provide every tenant a dedicated share of the instance including its data, configuration, user management, tenant individual functionality and non-functional properties.	Wikipedia
Network resource	Resource hosted somewhere in the network, e.g., in the cloud.	IOT-A
On-device	Resource hosted inside a Device and enabling	IOT-A

Resource	access to the Device and thus to the related Physical Entity.	
On-Premises Software	On-premises software (sometimes abbreviated as "on-prem") is installed and runs on computers on the premises (in the building) of the person or organization using the software, rather than at a remote facility such as a server farm or cloud.	
Operational Technology	Operational Technology (OT) is the use of computers (or other processing devices) to monitor or alter the physical state of a system, such as the control system for a power station or the control network for a rail system. The term has become established to demonstrate the technological and functional differences between traditional IT systems and Industrial Control Systems environment, the so-called "IT in the non-carpeted areas".	Wikipedia
Orchestration	Type of composition where one particular element is used by the composition to oversee and direct the other elements. *Note:* the element that directs an orchestration is not part of the orchestration.	ISO/IEC DIS 18834-1
Private Cloud	Private cloud is cloud infrastructure operated solely for a single organization, whether managed internally or by a third-party, and hosted either internally or externally.	Wikipedia
Reference Architecture	A Reference Architecture (RA) is an architectural design pattern that indicates how an abstract set of mechanisms and relationships realizes a predetermined set of requirements. It captures the essence of the architecture of a collection of systems. The main purpose of a Reference Architecture is to provide guidance for the development of architectures. One or more reference architectures may be derived from a common reference model, to address different purposes/usages to which the Reference Model may be targeted.	IOT-A
Reference Model	A reference model is an abstract framework for understanding significant relationships among the entities of some environment. It enables the development of specific reference or concrete architectures using consistent standards or specifications supporting that environment. A reference model consists of a minimal set of unifying concepts, axioms and relationships within a particular problem domain, and is independent of specific standards, technologies,	The Organization for the Advancement of Structured Information Standards (OASIS-RM)

	implementations, or other concrete details. A reference model may be used as a basis for education and explaining standards to non-specialists.	
Reliability	Ability of a system or component to perform its required functions under stated conditions for a specified period of time.	ISO/IEC 27040:2015
Resilience	The condition of the system being able to avoid, absorb and/or manage dynamic adversarial conditions while completing assigned mission(s), and to reconstitute operational capabilities after casualties.	Industrial Internet Consortium
Resource	Computational element that gives access to information about or actuation capabilities on a Physical Entity.	IOT-A
Requirement	A quantitative statement of business need that must be met by a particular architecture or work package.	TOGAF9
Scalability	A property of networks where their capabilities can grow or shrink without undue expense of loss of efficiency	OpenFog Consortium
Sensor	A sensor is a special Device that perceives certain characteristics of the real world and transfers them into a digital representation.	IOT-A
Security	The correct term is 'information security' and typically information security comprises three component parts: ▪ Confidentiality. Assurance that information is shared only among authorized persons or organizations. Breaches of confidentiality can occur when data is not handled in a manner appropriate to safeguard the confidentiality of the information concerned. Such disclosure can take place by word of mouth, by printing, copying, e-mailing or creating documents and other data etc.; ▪ Integrity. Assurance that the information is authentic & complete. Ensuring that information can be relied upon to be sufficiently accurate for its purpose. The term 'integrity' is used frequently when considering information security as it represents one of the primary indicators of information security (or lack of it). The integrity of data is not only whether the data is 'correct', but whether it can be trusted and relied upon; ▪ Availability. Assurance that the systems responsible for delivering, storing and processing information are accessible when needed, by those who need them.	ISO-27001

Service	Services are the mechanism by which needs and capabilities are brought together	OASIS-RM
Smart Gateway	A Gateway is a forwarding element, enabling various local networks to be connected. A Smart (or Intelligent) Gateway additionally provides more resources for local (edge) computing. These resources can include middleware, microservices and applications. As such, a Smart (or Intelligent) Gateway begins to resemble a fog Node, as a network element that provides some fog computing services. Smart Gateways and fog Nodes are thus also Appliances.	OpenFog Consortium
Storage	Special type of Resource that stores information coming from resources and provides information about Entities. They may also include services to process the information stored by the resource. As Storages are Resources, they can be deployed either on-device or in the network.	IOT-A
System	A collection of components organized to accomplish a specific function or set of functions.	IEEE -1471-2000
Thing	Generally speaking, any physical object. In the term 'Internet of Things' however, it denotes the same concept as a Physical Entity.	IOT-A
Unconstrained Network	An unconstrained network is a network of devices with no restriction on capabilities such as storage, computing power, and / or transfer rate.	IOT-A
View	The representation of a related set of concerns. A view is what is seen from a viewpoint. An architecture view may be represented by a model to demonstrate to stakeholders their areas of interest in the architecture. A view does not have to be visual or graphical in nature.	TOGAF 9
Viewpoint	A definition of the perspective from which a view is taken. It is a specification of the conventions for constructing and using a view (often by means of an appropriate schema or template). A view is what you see; a viewpoint is where you are looking from - the vantage point or perspective that determines what you see.	TOGAF 9
Virtual Entity	Computational or data element representing a Physical Entity. Virtual Entities can be either Active or Passive Digital Entities.	IOT-A
Wireless communication technologies	Wireless communication is the transfer of information over a distance without the use of enhanced electrical conductors or "wires". The distances involved may be short (a few meters as in television remote control) or long (thousands or millions of kilometers for radio communications). When the context is clear, the term is often shortened to "wireless". Wireless communication is generally considered to be a branch of telecommunications.	Wikipedia WI

Wire line communication technologies	A term associated with a network or terminal that uses metallic wire conductors (and/or optical fibers) for telecommunications.	setzer-messtechnik2010
Wireless Sensors and Actuators Network	Wireless sensor and actuator networks (WSANs) are networks of nodes that sense and, potentially, control their environment. They communicate the information through wireless links enabling interaction between people or computers and the surrounding environment.	Organisation for Economic Co-operation and Development (OECD2009)

NOTE: The terms in this guide are provided for purposes of clarifying usage of terms specific to distributed computing environments. These terms are subject to revision based on future industry input.

We welcome the creation of additional terms to this list. To submit a term for consideration, please contact us at info@openfogconsortium.org.