Glossary

Amazon EC2 Interface: A de facto standard in IaaS cloud while it was not designed as an industry-standard API.

Amazon EC2’s Spot Instance Mechanism: Shares many similarities with the standard uniform price auction mechanism. The provider assigns resources to bidders in decreasing order of their bids until all available resources have been allocated or all resource requests have been satisfied.

Amazon Web Services (AWS): A public cloud infrastructure made available to the public users in a pay-as-you-go model. AWS is the most popular and the first public utility computing.

Analytical Hierarchical Process: Multi-criteria decision making technique, introduced and developed by the mathematician Thomas L. Saaty.

Big Data: Large data set that is a data set with size greater than the capacity of the traditional databases.

Climate Change and Global Warming: The two most important challenging problems for the earth. These problems pertain to a general increase in world temperatures caused by increased amounts of carbon dioxide around the earth. Researchers in various fields of science and technology in recent years started to carry out research in order to address these problems by developing environmentally friendly solutions.

Cloud Industrialization: The anatomy and ubiquity of cloud computing make it a key technology to advance and accelerate innovations in industry and manufacturing sectors.

Cloud Manufacturing: The manufacturing version of cloud computing. In cloud manufacturing, distributed resources are encapsulated as cloud services and managed in a centralized way. Users can use cloud services according to their requirements. They can request services ranging from product design, manufacturing, testing, to management, and all other stages of a product life cycle.

Cloud Security Alliance: A not-for-profit organization with a mission to promote the use of best practices for providing security assurance within cloud computing, and to provide education on the uses of cloud computing to help secure all other forms of computing.

Cloud Standardization: Will bring interoperability, integration and portability to the cloud computing landscape. With these three features, the main elements of IT, i.e., computation and data, can move from one cloud provider to another.

Clustering: A data mining technique that mainly aims to group the data/objects into clusters according to their similarities and features.

Cumulus: An Open Source Storage Cloud for Science; it is like Amazon S3.

Data Mining: The process of analyzing databases with the aim of extracting the relevant and useful information.

Data Privacy: Multi-tenancy feature of public clouds introduces data privacy concerns.

Database Management System: Software system to handle an organized collection of intercorrelated data (database).
Deployment Options: Categorized as public, private, community, and hybrid. A cloud is deployed as one of them, depending on how the cloud infrastructure is operated.

Distributed Database Management System: Provides the mechanisms for accessing and managing the distributed databases.

Distributed Database: A database with storage services distributed on a computer network.

Dynamic Sharing and Collaboration: Specific security issues emerge during dynamic sharing and collaboration across multiple clouds. Particularly, trust, policy, and privacy concerns pertain to multi-cloud models.

Economic Denial of Sustainability (EDoS): A specific type of attack for cloud computing. The elasticity of cloud computing allows users to scale servers up and down in order to service request demands. This opens a new avenue of approach for attackers, which originally was labeled an economic denial of sustainability attack. This type of attack is directly connected with a DoS attack, but its target is to inflate the cloud services budget.

Economies of Scale: A resource gets shared and the volume of service is huge, it will always be better than own infrastructure.

Elasticity: With elasticity, users can rapidly increase or decrease the capacity of their resources, companies can ramp capacity up and down.

Electronic Health Record (EHR): Integrates data and information generated from the different healthcare organizations involved in the patient’s care. It contains information that can be shared among the authorized stakeholders and clinicians and the patients him/herself.

Electronic Medical Record (EMR): The legal documentation managed and owned by a healthcare organization. It basically aims to describe what happened to a patient during an encounter. It contains information that can be shared among laboratories and staff that belong to the organization.

Energy Efficiency: Green IT denotes energy efficiency in all components of computing systems to make the use of computers and the Internet as energy efficient as possible.

Extensible Messaging and Presence Protocol (XMPP): The next generation of HTTP for cloud computing. XMPP is not based on HTTP, thus there is doubt about its widespread adoption.

Federated Cloud: The management, interconnection, interoperation, deployment, and coordination of multiple public and private cloud computing services to function as a single entity, and to match business needs and spikes in demand.

Globus Online: A hosted service to automate the tasks associated with moving files between sites. It does not require custom infrastructure, Globus Online is software-as-a-service that can be used today without building these features yourself.

Google AppEngine: An application development environment and deployment container without the cost of deploying infrastructure.

Green Computing: Climate change and global warming are the two most important challenging problems for the earth. These problems pertain to a general increase in world temperatures caused by increased amounts of carbon dioxide around the earth. Researchers in various fields of science and technology in recent years started to carry out research in order to address these problems by developing environmentally friendly solutions. Green IT and in particular green computing are two new terms introduced mainly in ICT community to address these problems.

Green IT: Green IT and, in particular green computing, are two new terms introduced mainly in ICT community to address climate change and global warming.

Grid Computing: Coordinated resource sharing and problem solving in dynamic, multi-institutional virtual organization. Grids have been the center of attention from scientific and High Performance Computing communities (HPC), especially for the distributed and large scale scientific applications, and also in collaborative style of work.
**Hardware and Software Co-Design:** Mostly being used for exascale development. It implies user/vendor collaborative development for a particular application space.

**HelixNebula:** A recent cloud computing project for Science Clouds; it has been launched by some of Europe’s biggest research such as CERN along with European IT companies.

**High Performance Computing (HPC):** The use of advanced parallel processing systems (usually, above a teraflop or 1012 floating-point operations per second) for running complicated and huge processes quickly, efficiently, and reliably.

**Homomorphic Encryption:** This security scheme allows data to be processed without being decrypted. This is a huge advancement in cryptography, and it will have a significant positive impact on cloud computing as soon as it moves into deployment.

**Hybrid Cloud:** A deployment model, as a composition of both public and private clouds. A hybrid cloud consists of multiple internal and external providers.

**Infrastructure Security:** The scope of infrastructure security in public cloud is limited to the layers of infrastructure that are outsourced to third-party service providers, that is moved beyond the organization’s control and into the hands of service providers.

**Infrastructure-Adapted-to-Applications:** In the cloud computing world, infrastructure is adapted to the applications by the means of enabling technologies i.e virtualization and shared hosting technologies coupled with multicore processors.

**Integrated Home Care (IHC):** Characterized by the integration of various services offered by multidisciplinary professionals such as doctors, nurses, psychologists, physiotherapists, pharmacists, social workers and caregivers who share objectives, responsibilities and resources to ensure Patients continuity of care.

**Intelligent Computation:** Done with the techniques and mechanisms of new computing technologies such as hardware and software co-design, application profiling, and virtual machine consolidation to optimize resource consumption, and pay-as-you-go business model to reduce costs, etc.

**Internet of Things:** Another breakthrough, omnipresent and transformative technology with a futuristic vision perhaps over a span of one thousand years. It is predicted that 50 to 100 billion things will be electronically connected by 2020. This Internet of Things (IoT) will fuel technology innovation by creating the means for machines to communicate many different types of information with one another.

**Interoperability:** Minimize cloud fragmentation. We need interoperability and portability to achieve cloud federation and to build hybrid cloud.

**Liquid Cooling:** A heat removal method based on liquids as the heat conductor, as opposed to air cooling that uses air for heat removal. The main mechanism for liquid cooling is convective heat transfer.

**Magellan:** One of the first projects to conduct an exhaustive evaluation of the use of cloud computing for science in the US. The Magellan project is funded through the U.S. Department of Energy (DOE) Office of Advanced Scientific Computing Research (ASCR).

**Managed Security Services (MSSs):** MSS provider (MSSP) assigns security personnel to its clients to administer the security mechanisms, in particular related to cloud services using a pay-per-use model. With this, the customer is in charge of the security policies and it is his responsibility to monitor the efficiency of the services provided by the MSSP.

**Manufacturing Industry:** Cloud computing is emerging as one of the major enablers for the manufacturing industry to transform the traditional manufacturing business model.

**Microsoft Windows Azure:** Provides a development, service hosting, and service management environment. Windows Azure provides on-demand compute and storage resources for hosting applications to scale costs.
**Multicore Processors:** A single physical processor of multicore design type contains the core logic of more than one processor. The multicore design puts several cores (multicore) together and packages them as a single physical processor. The main goal is to enable a system to run more tasks simultaneously and thereby achieve greater overall system performance.

**Multi-Tenancy:** A business model that provides a secure, exclusive virtualized computing environment in which servers, databases, and other resources are shared by multiple users in a cloud environment.

**National Institute of Standards and Technology (NIST):** A non-regulatory federal agency whose mission is to promote U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology. NIST has started a program to develop a set of cloud computing standards, with the first results being already published as NIST Cloud Computing Program.

**Network Overlay:** Categorized as part of network virtualization in cloud computing. It provides facilities to build a network on top of another network. For example, many peer-to-peer networks are overlay networks on top of the Internet and dial-up Internet is an overlay upon the telephone network.

**Network Virtualization:** Virtual device adapter (Ethernet adapters), VLANs, and virtual switches. A VM can be configured with one or more virtual Ethernet adapters with their own IP addresses and MAC addresses. As a result, VMs have the same properties as physical machines from a networking point of view.

**Networked Manufacturing (NM):** Cloud manufacturing is a multi-disciplinary domain and a computing and service oriented manufacturing model developed from existing advanced manufacturing technologies and models such as networked manufacturing (NM), virtual manufacturing, agile manufacturing (AM), Application Service Provider (ASP), Manufacturing Grid (MGrid), and enterprise information technologies under the support of cloud computing, Internet of Things (IoT), virtualization, service oriented technologies, and advanced computing technologies.

**Nimbus Infrastructure:** An open source EC2/S3-compatible Infrastructure-as-a-Service implementation specifically targeting features of interest to the scientific community such as support for proxy credentials, batch schedulers, best-effort allocations and others.

**Nimbus Toolkit:** An Infrastructure-as-a-Service cloud computing for science. Nimbus platform is an integrated set of tools that deliver the power and versatility of infrastructure clouds to scientific users. Nimbus platform allows you to combine Nimbus, OpenStack, Amazon, and other clouds.

**Non-Disclosure Agreement (NDA):** Under a non-disclosure agreement (NDA), customers can request information related to the provider’s security practices. This information encompasses design, architecture, development, black- and white-box application security testing, and release management.

**Nvidia GPUs:** Will be among the main building blocks of future exascale systems. Accelerator-based supercomputers now occupy the top eight slots of the most recent the Green500 list.

**On-Demand:** Users can provision cloud infrastructure components such as servers and networks with little human intervention and through automation whenever they want.

**Open Cloud Computing Interface (OCCI):** A general-purpose set of specifications for cloud-based interactions with resources in a way that is explicitly vendor-independent, platform-neutral and can be extended to solve a broad variety of problems in cloud computing.

**Open Grid Forum (OGF):** A leading standards development organization operating in the areas of grid, cloud and related forms of advanced distributed computing. The OGF community pursues these technologies through an open process for development, creation and promotion of relevant specifications and use cases.
Open Virtualization Format (OVF): Describes an open, secure, portable, efficient and extensible format for the packaging and distribution of software to be run in virtual machines.

Operations Research: Aims to define theoretical foundation and mathematical methods for modeling and simulation, of complex, challenging optimization, organization, management, planning problems and to devise the relevant computational algorithms and software for their numerical solution.

Organization for the Advancement of Structured Information Standards: Drives the development, convergence and adoption of open standards for the global information society. OASIS as the source of many of the foundational standards in use today sees cloud computing as a natural extension of SOA and network management models.

Outsourcing: Software companies are rapidly moving more and more of their services, software, and applications to cloud computing due to users’ radical, urgent, growing, fluctuating, seasonal, competing, enormous, and economic demands.

Over-Provisioning: Cloud computing transfers the risks of over-provisioning or under-provisioning to the cloud provider, who mitigates that risk by statistical multiplexing over a much larger set of users and who offers relatively low prices due to better utilization and from the economy of purchasing at a larger scale.

Pay Per Use: Payment of resource consumption is like utilities that are paid for by the hour. With pay per use model, service consumption is metered and measured.

Personal Health Record (PHR): Denotes the health documentation managed and populated by an individual. It aims to give a comprehensive view on the health and medical history of an individual. Data is gathered from different sources and it is accessible to only those who have permissions.

Private Cloud: Operated for an organization. It may be managed by the organization or a third party and may exist on premise or off premise. A private cloud is an offering of cloud computing on private sector.

Public Cloud: The main cloud computing model. Public cloud is hosted, operated and managed by a third-party vendor from one or more data centers. The service is offered to multiple customers, that is called multiple tenants over a common infrastructure.

Public Cloud Security: In this deployment option, some security aspects are provided by cloud providers while the rest have to be provided by the customers. Public cloud security address and incorporate how an organization’s existing network topology interacts with public cloud provider’s network topology.

Renewable Energy Sources: The demand for clean energy generation is driving the use of non-dispatchable power sources such as solar and wind.

Salesforce.com: One of the best Software as a Service (SaaS) provider. It is a classic example of cloud computing. Salesforce.com has made cloud computing a reality by offering Customer Relationship Management (CRM) as a SaaS.

Science Clouds: Have been emerged as a result of scientific application needs for outsourced compute and storage infrastructures. Science Clouds provided by Open Source Nimbus Toolkit, and Commercial Amazon Elastic Compute Cloud (EC2) that provide computational capabilities for computing are often referred as IaaS. They provide compute cycles in the cloud for scientific communities using Nimbus.

Seal-Bid Uniform Price Auction: A truthful auction, providing the supply level is adjustable ex post, i.e., after the bids have been decided.

Secure Socket Layer (SSL): Provides standard encryption and authentication for the communication.

Security Groups: The traditional model of network zones and tiers has been replaced in public cloud computing with security groups, security domains, and virtual data centers. They have logical separation between tiers but are less precise and afford less protection than the formerly established model.

Service Delivery: Cloud offerings are typically categorized as Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as
a Service (SaaS). These are three main service delivery models in cloud computing.

**Smart City:** Makes a conscious effort to use innovative ICT based solutions to improve conditions of living and working and to support a more inclusive and sustainable urban environment.

**Smart Grid:** Emerging to address the electricity grid challenges. The smart grid is an intelligent electricity grid network to deliver sustainable, reliable, storage, ubiquitous, decentralized, flexible, economic, autonomic and secure electricity supplies.

**Spot Markets:** Amazon EC2 runs one spot market for each VM type in each availability zone. All spot markets share the free data center capacity, which is the remaining capacity after serving all the guaranteed instances.

**Spot Price:** Based on the provider’s spot pricing policy, the selling price, i.e. the spot price, is equal to the lowest winning bid, or the selling price depends on the supply and the demand. You get the instance only when your bid exceeds the spot price.

**Stochastic Programming:** A branch of Operations Research that allows to explicitly deal with the random nature that characterizes a lot of the real world applications.

**Supply Chain:** A network of interdependent trading partners who are geographically dispersed. Each trading partner has many upstream and downstream trading partners with whom they need to coordinate plans, schedules, deliveries, etc.

**UberCloud Experiment:** Has brought together four categories of participants: the industry end-users, the computing and storage resource providers, the software providers, and the experts. Participants have voluntary contribution to their individual teams and thus to the whole Experiment. This is an experimental research and study to address roadblocks on the way of transitioning to cloud solutions for industries.

**Vendor and Technology Lock-In:** Standardization eliminates vendor and technology lock-in that is one of the barriers in cloud adoption.

**VENUS-C (Virtual Multidisciplinary Environments Using Cloud Infrastructures):** Aims to develop, test and deploy an industry-quality, highly-scalable and flexible cloud infrastructure to empower researchers through the easy deployment of end-user services.

**Virtual Firewall:** Network firewall service or appliance running entirely within a virtualized environment and which provides the usual packet filtering and monitoring provided via a physical network firewall.

**Virtual Machine Hypervisor Interfaces (VMHI):** A framework of interfaces based on virtualization products to accelerate the development of open standards in a neutral way.

**Virtual Private Network (VPN):** A private network that uses a public network such as the Internet to connect remote networks, sites, and users together. It uses virtual connections through the public network, instead of using dedicated connections such as leased or owned lines to connect private networks via tunneling and/or encryption over the public Internet, thus resulting in a much lower cost.

**Virtualization:** The primary enabler for cloud computing. Virtualization technology provides techniques and conditions to run multiple Virtual Machines (VMs) on top of a single physical machine.

**Vitaever ®:** A cloud technology, developed by Nethical s.r.l., in collaboration with the ANT Foundation and with the contribution of the Department of Informatics, Science and Engineering, University of Bologna, that combines the software and the hardware, flexible and reliable, which you pay as you go, in order to manage in an efficient and intuitive way the home care services.

**Web Services:** Executed on a remote system hosting the requested service. Interaction between services, resources and agents in a heterogeneous environment that is based on Web Services Technologies would be more interoperable. SOA is highly based on Web Services technologies.