Cloud Computing Architectural Model

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Private Clouds

- Public clouds are appealing and provide a viable option to cut IT costs and reduce capital expenses, but they are not applicable in all scenarios. For example, a very common critique to the use of cloud computing in its canonical implementation is the loss of control
- In the case of public clouds, the provider is in control of the infrastructure and, eventually, of the customers' core logic and sensitive data. Even though there could be regulatory procedure in place that guarantees fair management and respect of the customer's privacy, this condition can still be perceived as a threat or as an unacceptable risk that some organizations are not willing to take
- In particular, institutions such as government and military agencies will not consider public clouds as an option for processing or storing their sensitive data

Private Clouds

- The risk of a breach in the security infrastructure of the provider could expose such information to others; this could simply be considered unacceptable
- In other cases, the loss of control of where your virtual IT infrastructure resides could open the way to other problematic situations. More precisely, the geographical location of a datacenter generally determines the regulations that are applied to management of digital information
- As a result, according to the specific location of data, some sensitive information can be made accessible to government agencies or even considered outside the law if processed with specific cryptographic techniques

Private Clouds

- For example, the USA PATRIOT act provides its government and other agencies with virtually limitless powers to access information, including that belonging to any company that stores information in the U.S. territory
- Finally, existing enterprises that have large computing infra-structures or large installed bases of software do not simply want to switch to public clouds, but they use the existing IT resources and optimize their revenue
- All these aspects make the use of a public computing infrastructure not always possible. Yet the general idea supported by the cloud computing vision can still be attractive

Private Clouds

- More specifically, having an infrastructure able to deliver IT services on demand can still be a winning solution, even when implemented within the private premises of an institution
- This idea led to the diffusion of private clouds, which are similar to public clouds, but their resource-provisioning model is limited within the boundaries of an organization
- Private clouds are virtual distributed systems that rely on a private infrastructure and provide internal users with dynamic provisioning of computing resources
- Instead of a pay-as-you-go model as in public clouds, there could be other schemes in place, taking into account the usage of the cloud and proportionally billing the different departments or sections of an enterprise

Private Clouds

- Private clouds have the advantage of keeping the core business operations in-house by relying on the existing IT infrastructure and reducing the burden of maintaining it once the cloud has been set up
- In this scenario, security concerns are less critical, since sensitive information does not flow out of the private infrastructure. Moreover, existing IT resources can be better utilized because the private cloud can provide services to a different range of users
- Another interesting opportunity that comes with private clouds is the possibility of testing applications and systems at a comparatively lower price rather than public clouds before deploying them on the public virtual infrastructure

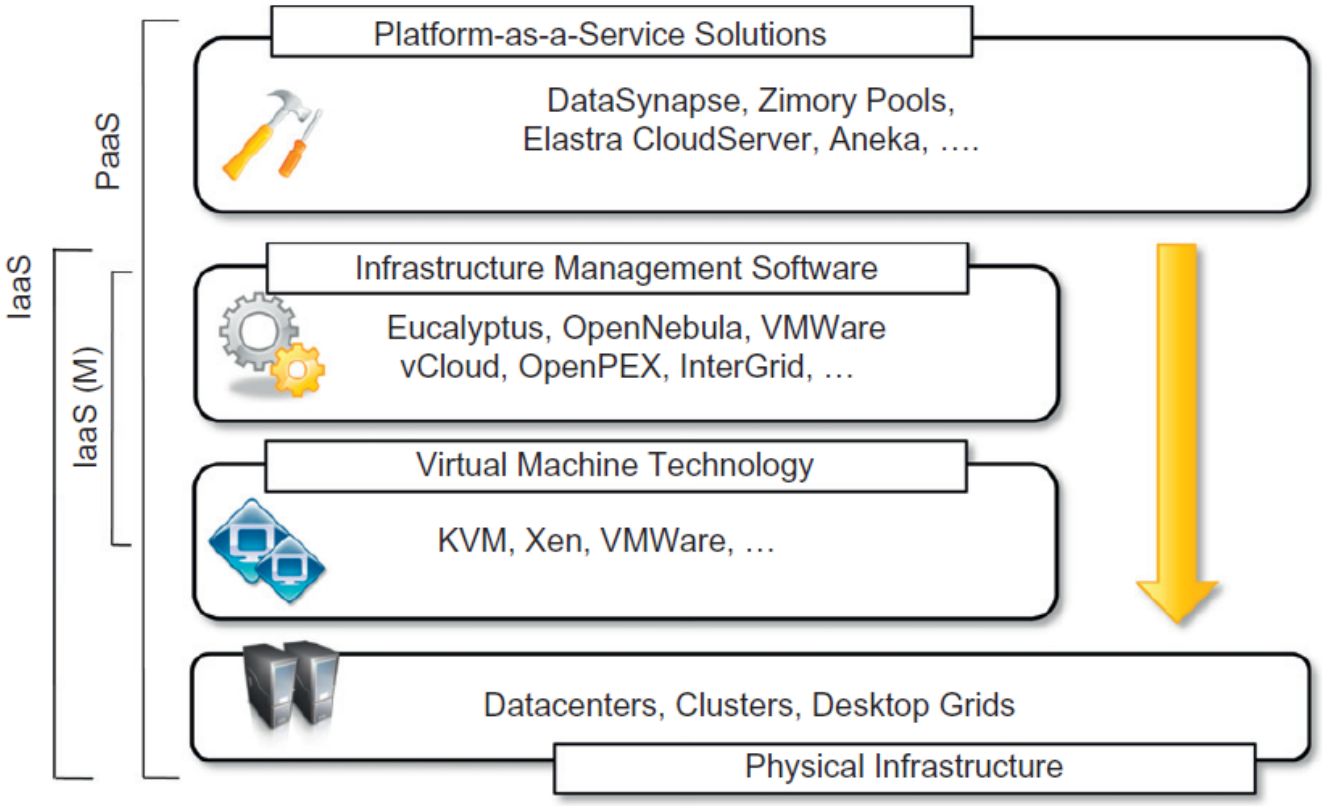
Key Advantages

- **Customer information protection:** Despite assurances by the public cloud leaders about security, few provide satisfactory disclosure or have long enough histories with their cloud offerings to provide warranties about the specific level of security put in place on their systems. In-house security is easier to maintain and rely on.
- **Infrastructure ensuring SLAs:** Quality of service implies specific operations such as appropriate clustering and failover, data replication, system monitoring and maintenance, and disaster recovery, and other uptime services can be commensurate to the application needs. Although public cloud vendors provide some of these features, not all of them are available as needed
- **Compliance with standard procedures and operations:** If organizations are subject to third-party compliance standards, specific procedures have to be put in place when deploying and executing applications. This could be not possible in the case of the virtual public infrastructure

Key Advantages

- From an architectural point of view, private clouds can be implemented on more heterogeneous hardware: They generally rely on the existing IT infrastructure already deployed on the private premises. This could be a datacenter, a cluster, an enterprise desktop grid, or a combination of them. The physical layer is complemented with infrastructure management software or a PaaS solution, according to the service delivered to the users of the cloud

Private Clouds Hardware and Software Stack



Private Clouds

- DataSynapse provides a flexible environment for building private clouds on top of datacenters. Elastra Cloud Server is a platform for easily configuring and deploying distributed application infrastructures on clouds
- Zimory provides a software infrastructure layer that automates the use of resource pools based on Xen, KVM, and VMware virtualization technologies. It allows creating an internal cloud composed of sparse private and public resources and provides facilities for migrating applications within the existing infrastructure.
- Aneka is a software development platform that can be used to deploy a cloud infrastructure on top of heterogeneous hardware: datacenters, clusters, and desktop grids. It provides a pluggable service-oriented architecture that's mainly devoted to supporting the execution of distributed applications with different programming models: bag of tasks, MapReduce, and others