Cloud Computing

Cloud computing: is the delivery of different services through the Internet. These resources include tools and applications like data storage, servers, databases, networking, and software.

Rather than keeping files on a proprietary hard drive or local storage device, cloud-based storage makes it possible to save them to a remote database. As long as an electronic device has access to the web, it has access to the data and the software programs to run it.

A. Cloud Implementation Types

- **Cloud Implementation –** Cloud implementation type is defined according to where the infrastructure for the deployment resides and who has control over that infrastructure. There are three types of cloud deployments categorized based on an organization's ability to manage and secure assets as well as business needs.
- **Public cloud –** This type of cloud infrastructure is built by a third-party organization to sell cloud services to the general public. The public cloud is the most common type of cloud implementation; examples include Amazon Web Services (AWS), Google Application Engine, and Microsoft Azure. In this model, cloud consumers share resources with other consumers transparently. Despite high reliability, lower costs, zero maintenance, and on-demand scalability, the public cloud is not suitable for organizations operating with sensitive information as they have to comply with stringent security regulations.
- **Private cloud –** This type of internal cloud is built by an organization for the sole purpose of servicing its own needs. Private clouds are often used by large, geographically dispersed organizations to add agility and flexibility to internal IT services. The cloud infrastructure could be managed by internal IT staff or an external third party.
- **Hybrid cloud –** Hybrid cloud is the combination of a private and public cloud, providing for more flexibility to businesses while having control over critical operations and assets, coupled with improved flexibility and cost-efficiency. The hybrid cloud architecture enables companies to take advantage of the public cloud as and when necessary due to their easy workload migration. For instance, businesses can use the public cloud for running high-volume applications like emails and utilize private clouds for sensitive assets like financials, data recovery, and during scheduled maintenance and rise in demand.

B. Types of Cloud Services

- **Cloud services** come in different shapes and forms; no single type of service works for all consumers. In fact, cloud services often follow an à la carte model; consumers can choose multiple service options according to their individual needs. These services can build on top of each other to provide sophisticated solutions. Based on the types of services provided, cloud services can be classified by the following categories:
- **Software as a Service (SaaS) –** The cloud service provider offers turnkey applications that run in the cloud. Consumers can run the provider's applications internally in their organizations via the web or any mobile device. The consumer can customize certain aspects of the application but cannot make changes to the application itself. The application is actually shared among users from multiple organizations. Examples of SaaS include MS Office 365, Google Docs, Intuit's TurboTax Online, and SCALA digital signage.
- **Platform as a Service (PaaS) –** The cloud service provider offers the capability to build and deploy consumer-created applications using the provider's cloud infrastructure. In this scenario, the consumer can build, deploy, and manage applications using the provider's cloud tools, languages, and interfaces. However, the consumer does not manage the underlying cloud infrastructure. Examples of PaaS include the Microsoft Azure platform with .NET and Java.
- **Infrastructure as a Service (IaaS)** – In this case, the cloud service provider offers consumers the ability to provision their own resources on demand; these resources include storage, servers, databases, processing units, and even a complete virtualized desktop. The consumer then can add or remove the resources as needed. For example, a consumer can use Amazon Web Services (AWS) and provision a server computer that runs Linux and Apache Web server using 16 GB of RAM and 160 GB of storage.

Benefits of Cloud Computing

1. **Instant scalability**: Cloud computing enables immediate scalability of infrastructure capacity depending on the business need. It is like having an unlimited IT resource, which can be scaled up and/ or down to meet user demands.
2. **Anywhere accessibility**: A lot of factors have enabled globalization, and a key one is a technology and high-speed internet connectivity.

Cloud empowers enterprises to deploy their applications across the globe so they can service their customers at a fraction of the cost of traditional brick-and-motor businesses. Due to lower latency, customers around the world get an identical digital experience while using the applications

3. **Increased speed and operational agility**: Today, to cope with competition, businesses must have the ability to instantly scale their cloud capacity by accessing bandwidth demands from remote servers of a particular cloud service provider. If the business demand is more, the enterprise can turn up its computing capacity and IT resources availability with the click of a button. Such an ability improves organizational agility, productivity, and efficiency, making scope to experiment with new ideas and thereby offering competitive advantage and the ability for the organization of any size to disrupt the market.
4. **Reduced expenditure**: With the cloud, enterprises can focus on building their business rather than investing in hardware infrastructure and data centers that either remain idle or underutilized. Cloud costs, however, depend on the consumption -- a variable expense.
5. **Automatic updates/patches**: When enterprises deal with several different kinds of software, operating systems, and applications from various vendors for their everyday operations, they have to have software and security updates rolled out from time to time. This is a very time-consuming process, and the downtime for system maintenance means loss of productivity. A cloud service provider or a managed service provider can take care of these automatically, saving time and manual effort on maintenance.
6. **Disaster recovery**: The world is going digital, making robust backup and disaster recovery crucial for businesses of all sizes. However, on-premises investments for disaster recovery are things of the past today. Especially since cloud computing helps both large corporations and small enterprises save time and effort involved in this exercise.
7. **High security**: Protecting sensitive, personally identifiable, and/ or financial information is a considerable challenge for CIOs. Advanced cloud security features, however, have reduced the risks of information loss and cyber stealth.
8. **Reduced carbon footprint**: Cloud infrastructure significantly reduces power, IT infrastructure, and resource consumption by offering resources as per demand, thereby reducing e-waste and adverse impact on the environment.
9. **Flexibility**: From closed cabins to bringing your internet-enabled devices to work, irrespective of the device type and/ or global location, the cloud offers vast flexibility and empowerment to businesses as well as to their employees
10. **Enterprise Collaboration**: Company information no longer exists in silos (except confidential ones, of course). Centralized documentation control on cloud-based, file-sharing and social communication apps (like Slack, Yammer, etc.) offers transparency and visibility into work processes, streamlining information flow and enabling better collaboration between teams, departments, and employees seated in different time zones -- all of which leads to improved productivity and bottom line.

C. Cloud-based Connectivity

MongoDB Compass – MongoDB Compass is the GUI for MongoDB. Compass allows you to analyze and understand the contents of your data without formal knowledge of MongoDB query syntax.
MongoDB Atlas – MongoDB Atlas provides an easy way to host and manage your data in the **cloud**.

To store our data in the cloud, we can use these two (2) applications by performing the steps below.
1. Open MongoDB Compass, and click "*CREATE FREE CLUSTER*".
2. You will then be redirected to the MongoDB Atlas website, click "*GET STARTED FREE*".
3. Fill up the form/information needed to create an account.
4. Put the name of the organization, and the project name as "*Personal*", then click "*Continue*".
5. Choose the "*Shared Cluster*" by clicking the "*Create a Cluster*".
6. For the cloud provider option, you can choose *AWS* or *Google cloud*, then choose the "*Singapore*" region. Leave the rest as default, then click "*Create Cluster*".
7. Wait for the cluster to be created; it usually takes 3-10 minutes.
8. From the newly created cluster, click "*CONNECT*".
9. For the "*Setup connection security*" tab, perform the following:
    9.1. In the "Add a connection IP Adress" section, click "*Add Your Current IP Address*". Your IP address will be automatically filled in the field, then click "*Add IP Address*".
    9.2. In the "*Create a Database User*" field, type your preferred username and password for the database authentication, then click "Create Database User".

10. If sections 1 and 2 are already done, click "choose a connection method". Click "Connect using MongoDB Compass" > click "I have MongoDB Compass" > click "*Copy*" to copy the connection string.
11. In MongoDB compass, paste the previously copied string connection from MongoDB Atlas, then click "*Connect*", (**Note**: remove this "<>" symbol in the password.) See the connection string example below.
   mongodb+srv://smith:123456@cluster0.01iql.mongodb.net/test
12. If the given connection string is successfully connected, you can now create a database in the cloud using MongoDB Atlas.

REFERENCES

Chodorow, K., Brazil, E., and Bradshaw, S. (2019). *MongoDB: The definitive guide* (3rd ed.). O'Reilly Media, Inc.

MongoDB (n.d.). *MongoDB Atlas.* Retrieved from https://docs.atlas.mongodb.com/