Assignment-1

Course: Distributed Systems
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Cloud Computing System

1. Introduction

What is cloud computing exactly? As a beginning here is the definition
“An emerging computer paradigm where data and services reside on massively scalable data centers in the cloud and can be accessed from any connected devices over the internet.”

Like other definitions of topics like these, an understanding of the term cloud computing requires an understanding of various other terms which are closely related to this. While there is a lack of precise scientific definitions for many of these terms, general definitions can be given.
Cloud computing is an emerging paradigm in the computer industry where the computing is moved to a cloud of computers. It has become one of the buzzwords of the industry. The core concept of cloud computing is, quite simply, that the vast computing resources that we need will reside somewhere out there in the cloud of computers and we‘ll connect to them and use them as and when needed.

Computing can be described as any activity of using and/or developing computer hardware and software. It includes everything that sits in the bottom layer, i.e. everything from raw compute power to storage capabilities. Cloud computing ties together all these entities and delivers them as a single integrated entity under its own sophisticated management.

2. Cloud Computing - The Concept

Cloud computing is Internet ("cloud") based development and use of computer technology ("computing"). It is a style of computing in which dynamically scalable and often virtualized resources are provided as a service over the Internet. Users need not have knowledge of, expertise in, or control over the technology infrastructure "in the cloud" that supports them. The concept incorporates infrastructure as a service (IaaS), platform as a service (PaaS) and software as a service (SaaS) as well as Web 2.0

and other recent technology trends which have the common theme of reliance on the Internet for satisfying the computing needs of the users. Examples of SaaS vendors include Salesforce.com and Google Apps which provide common business applications online that are accessed from a web browser, while the software and data are stored on the servers. The term cloud is used as a metaphor for the Internet, based on how the Internet is depicted in computer network diagrams, and is an abstraction for the complex infrastructure it conceals.

3. Need for Cloud Computing

If we have 10000 times more data and CPU we could do a lot with these. There are lots of other things we could do with so much CPU power and data capabilities. But what is keeping us back. One of the reasons is the large scale architecture which comes with these are difficult to manage. There may be many different problems with the architecture we have to support. The machines may start failing, the hard drives may crash, the network may go down and many other such hardware problems. The hardware has to be designed such that the architecture is reliable and scalable. This large scale architecture has a very expensive upfront and has high maintenance costs. It requires different resources like machines, power, cooling, etc. The system also cannot scale as and when needed and so is not easily reconfigurable.

The cloud computing works on the cloud - so there are large groups of often low-cost servers with specialized connections to spread the data-processing chores among them. Since there are a lot of low-cost servers connected together, there are large pools of resources available. So these offer almost unlimited computing resources. This makes the availability of resources a lesser issue. The cloud computing applications also provide automatic reconfiguration of the resources based on the service level agreements. When we are using applications out of the cloud, to scale the application with respect to the load is a mundane task because the resources have to be gathered and then provided to the users. If the load on the application is such that it is present only for a small amount of time as compared to the time its working out of the load,

but occurs frequently, then scaling of the resources becomes tedious. But when the application is in the cloud, the load can be managed by spreading it to other available nodes by making a copy of the application on to them

4. Key Characteristics

- ➢ Cost
- ➢ Device and Location Independency
- ➢ Multi-tenancy
- ➢ Reliability
- ➢ Scalability
- ➢ Security
- ➢ Sustainability

5. Components of Cloud Computing

5.1 Application

A cloud application leverages the Cloud in software architecture, often eliminating the need to install and run the application on the customer's own computer, thus alleviating the burden of software maintenance, ongoing operation, and support. For example:

- P2P/Volunteer computing (Bittorrent, Skype)
- Web application (Facebook)
- Software as a Service- SaaS(Google Apps, SAP and Salesforce)
- Software plus services (Microsoft Online Services)

5.2 Client

A cloud client consists of computer hardware and/or computer software which relies on cloud computing for application delivery. For example:

- Mobile
- Thin Client
- Thick Client

5.3 Infrastructure

Cloud infrastructure, such as Infrastructure as a service, is the delivery of computer infrastructure, typically a platform virtualization environment, as a service

5.4 Platform

A cloud platform, such as Platform as a service, the delivery of a computing platform, and/or solution stack as a service, facilitates deployment of applications without the cost and complexity of buying and managing the underlying hardware and software layers

5.5 Service

A cloud service includes "products, services and solutions that are delivered and consumed in real-time over the Internet".

5.6 Storage

Cloud storage involves the delivery of data storage as a service, including database-like services, often billed on a utility computing basis, e.g., per gigabyte per month.

6. Types

6.1 Public Cloud

Public cloud or external cloud describes cloud computing in the traditional mainstream sense, whereby resources are dynamically provisioned on a fine grained, self-service basis over the Internet, via web applications/web services, from an off-site third-party provider who shares resources and bills on a fine grained utility computing basis.

6.2 Private Cloud

Private cloud and internal cloud are neologisms that some vendors have recently used to describe offerings that emulate cloud computing on private networks. These products claim to "deliver some benefits of cloud computing without the pitfalls", capitalizing on data security, corporate governance, and reliability concerns.

6.3 Hybrid Cloud

A hybrid cloud environment consisting of multiple internal and/or external providers"will be typical for most enterprises".

7. Advantages and disadvantages

Advantages:

- ➢ Lower Computer Costs
- ➢ Reduced Software Costs
- ➢ Improved Performance
- ➢ Instant Software Updates
- ➢ Increased Data Reliability
- ➢ Unlimited Storage Capacity
- ➢ Improved Compatibility
- ➢ Device Independence
- ➢ Availability
- ➢ Universal Document Access
- ➢ Easier Group Collaboration

Disadvantages:

- ➢ Can be Slow
- ➢ Features might be Limited
- ➢ Stored data might not be secured
- ➢ Data can be lost
- ➢ Requires Constant Internet Connection

8. Conclusion

Cloud Computing is a vast topic and the above report does not give a high level introduction to it. It is certainly not possible in the limited space of a report to do justice to these technologies. What is in store for this technology in the near future? Well, Cloud Computing is leading the industry‘s endeavor to bank on this revolutionary technology. Cloud Computing is a technology which took the software and business world by storm. The much deserved hype over it will continue for years to come.

A Report on Blockchain

1.What is Blockchain?

A blockchain is a growing list of records, called blocks, that are linked using cryptography. Each block contains a cryptographic hash of the previous block, a timestamp, and transaction data (generally represented as a Merkle tree).

By design, a blockchain is resistant to modification of its data. This is because once recorded, the data in any given block cannot be altered retroactively without alteration of all subsequent blocks. For use as a distributed ledger, a blockchain is typically managed by a peer-to-peer network collectively adhering to a protocol for inter-node communication and validating new blocks. Although blockchain records are not unalterable, blockchains may be considered secure by design and exemplify a distributed computing system with high Byzantine fault tolerance. The blockchain has been described as "an open, distributed ledger that can record transactions between two parties efficiently and in a verifiable and permanent way".

2.Types of Blockchain

- **Public blockchains**: A public blockchain has absolutely no access restrictions. Anyone with an Internet connection can send transactions to it as well as become a validator (i.e., participate in the execution of a consensus protocol). Usually, such networks offer economic incentives for those who secure them and utilize some type of a Proof of Stake or Proof of Work algorithm.

- **Private blockchains**: A private blockchain is permissioned. One cannot join it unless invited by the network administrators. Participant and validator access is restricted. To distinguish between open blockchains and other peer-to-peer decentralized database applications that are not

open ad-hoc compute clusters, the terminology Distributed Ledger (DLT) is normally used for private blockchains.

- ➢ **Hybrid blockchains**: A hybrid blockchain has a combination of centralized and decentralized features. The exact workings of the chain can vary based on which portions of centralization decentralization are used.

- ➢ **Sidechains**: A sidechain is a designation for a blockchain ledger that runs in parallel to a primary blockchain. Entries from the primary blockchain (where said entries typically represent digital assets) can be linked to and from the sidechain; this allows the sidechain to otherwise operate independently of the primary blockchain (e.g., by using an alternate means of record keeping, alternate consensus algorithm, etc.).

3. Uses

- ➢ Cryptocurrencies
- ➢ Financial services
- ➢ Video games
- ➢ Smart contracts
- ➢ Supply chain
- ➢ Domain Names
- ➢ Energy trading
- ➢ Health Care

4. Advantages

- ➢ It allows for verification without having to be dependent on third-parties.
- ➢ The data structure in a blockchain is append-only. So, the data cannot be altered or deleted.
- ➢ It uses protected cryptography to secure the data ledgers.
- ➢ It allows for anonymous transfers of value.
- ➢ It provides 24/7 access to your funds.
- ➢ It allows users to be in full control over their information.
- ➢ It offers a greater level of transparency.
- ➢ It offers a certain level of process integrity.

- ➢ The transactions are recorded in chronological order. Thus, all the blocks in the blockchain are time stamped.
- ➢ The ledger is distributed across every single node in the blockchain who are the participants. So, it is distributed.
- ➢ The transactions stored in the blocks are contained in millions of computers participating in the chain. Hence it is decentralized. There is no possibility that the data if lost cannot be recovered.

5. Disadvantages

- ➢ It is not a technology which is 100% secure.
- ➢ It is not a recognized technology for international value.
- ➢ It offers irreversible transactions.
- ➢ It can offer very slow transaction times.
- ➢ It offers a high cost for access.
- ➢ It requires every request to be individually verified.
- ➢ It has an uncertain regulatory status.
- ➢ Scalability Is An Issue
- ➢ Consume Too Much Energy