

1.3 Evolution of Cloud Computing

Evolution of Cloud Computing

- Cloud Computing Leverages dynamic resources to deliver a large number of services to end users.
- It is High Throughput Computing (HTC) paradigm
- It enables users to share access to resources from anywhere at any time

II Hardware Evolution

- In 1930, binary arithmetic was developed
 - computer processing technology, terminology, and programming languages.
- In 1939, Electronic computer was developed
 - Computations were performed using vacuum-tube technology.
- In 1941, Konrad Zuse's Z3 was developed
 - Support both floating-point and binary arithmetic.

There are four generations

- First Generation Computers
- Second Generation Computers
- Third Generation Computers
- Fourth Generation Computers

a.First Generation Computers

Time Period : 1942 to 1955

Technology : Vacuum Tubes

Size: Very Large System

Processing: Very Slow

Examples:

- 1.ENIAC (Electronic Numerical Integrator and Computer)
- 2.EDVAC(Electronic Discrete Variable Automatic Computer)

Advantages:

- It made use of vacuum tubes which was the advanced technology at that time
- Computations were performed in milliseconds.

Disadvantages:

- very big in size, weight was about 30 tones.

- very costly.
- Requires more power consumption
- Large amount heat was generated.

b.Second Generation Computers

Time Period : 1956 to 1965.

Technology : Transistors

Size : Smaller

Processing : Faster

o Examples

Honeywell 400

IBM 7094

Advantages

- Less heat than first generation.
- Assembly language and punch cards were used for input.
- Low cost than first generation computers.
- Computations was performed in microseconds.
- Better Portability as compared to first generation

Disadvantages:

- A cooling system was required.
- Constant maintenance was required.
- Only used for specific purposes

c.Third Generation Computers

Time Period : 1966 to 1975

Technology : ICs (Integrated Circuits)

Size : Small as compared to 2nd generation computers

Processing : Faster than 2nd generation computers

Examples

- PDP-8 (Programmed Data Processor)
- PDP-11

Advantages

- These computers were cheaper as compared to generation computers.
- They were fast and reliable.

- IC not only reduce the size of the computer but it also improves the performance of the computer
- Computations was performed in nanoseconds

Disadvantages

- IC chips are difficult to maintain.
- The highly sophisticated technology required for the manufacturing of IC chips.
- Air Conditioning is required

d.Fourth Generation Computers

Time Period : 1975 to Till Date

Technology : Microprocessor

Size : Small as compared to third generation computer

Processing : Faster than third generation computer

Examples

- IBM 4341
- DEC 10

Advantages:

- Fastest in computation and size get reduced as compared to the previous generation of computer. Heat generated is small.
- Less maintenance is required.

Disadvantages:

- The Microprocessor design and fabrication are very complex.
- Air Conditioning is required in many cases

III Internet Hardware Evolution

- Internet Protocol is the standard communications protocol used by every computer on the Internet.
- The conceptual foundation for creation of the Internet was significantly developed by three individuals.
 - Vannevar Bush — MEMIX (1930)
 - Norbert Wiener
 - Marshall McLuhan

- Licklider was founder for the creation of the AR PANET (Advanced Research Projects Agency Network)
- Clark deployed a minicomputer called an Interface Message Processor (IMP) at each site.
- Network Control Program (NCP)- first networking protocol that was used on the ARPANET

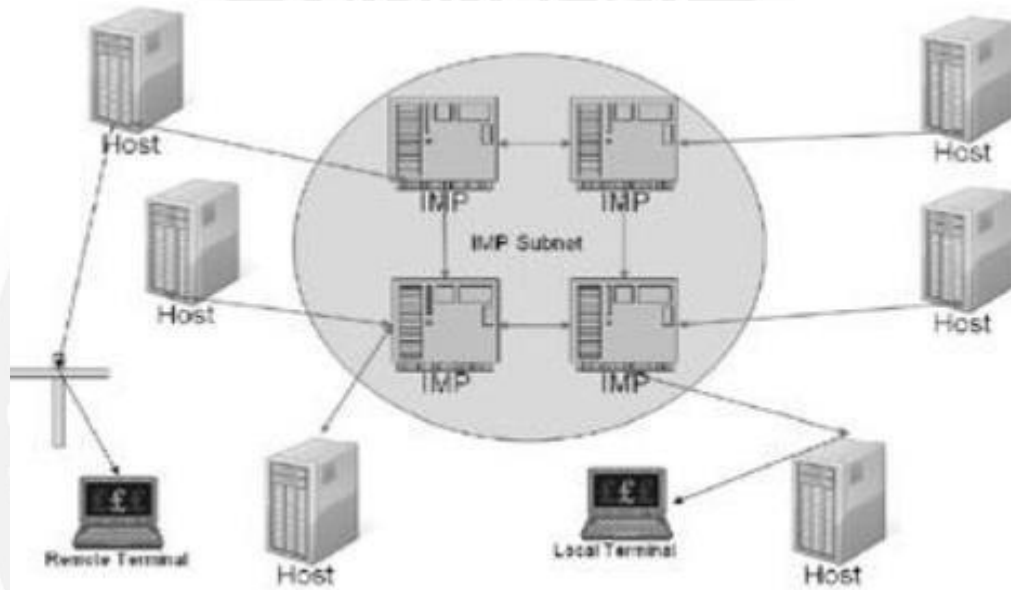


Figure 1.7 IMP Architecture

Internet Hardware Evolution

- Establishing a Common Protocol for the Internet
- Evolution of Ipv6
- Finding a Common Method to Communicate Using the Internet Protocol
- Building a Common Interface to the Internet
- The Appearance of Cloud Formations From One Computer to a Grid of Many

a.Establishing a Common Protocol for the Internet

- NCP essentially provided a transport layer consisting of the ARPANET Host-to-Host Protocol (AIIIP) and the Initial Connection Protocol (ICP)
- Application protocols
 - File Transfer Protocol (FTP), used for file transfers,
 - Simple Mail Transfer Protocol (SMTP), used for sending email

Four versions of TCP/IP

- TCP v1
- TCP v2

- TCP v3 and IP v3,
- TCP v4 and IP v4

b.Evolution of Ipv6

- IPv4 was never designed to scale to global levels.
- To increase available address space, it had to process large data packets (i.e., more bits of data).
- To overcome these problems, Internet Engineering Task Force (IETF) developed IPv6, which was released in January 1995.
- Ipv6 is sometimes called the Next Generation Internet Protocol (IPNG) or TCP/IP v6.

c.Finding a Common Method to Communicate Using the Internet Protocol

- In the 1960s, the word ktpertext was created by Ted Nelson.
- In 1962, Engelbart's first project was Augment, and its purpose was to develop computer tools to augment human capabilities.
- He developed the mouse, Graphical user interface (GUI), and the first working hypertext system, named NLS (oN-Line System).
- NLS was designed to cross-reference research papers for sharing among geographically distributed researchers.
- In the 1980s, Web was developed in Europe by Tim Berners-Lee and Robert Cailliau

d.Building a Common Interface to the Internet

- Berners-Lee developed the first web browser featuring an integrated editor that could create hypertext documents.
- Following this initial success, Berners-Lee enhanced the server and browser by adding support for the FTP (File Transfer protocol)

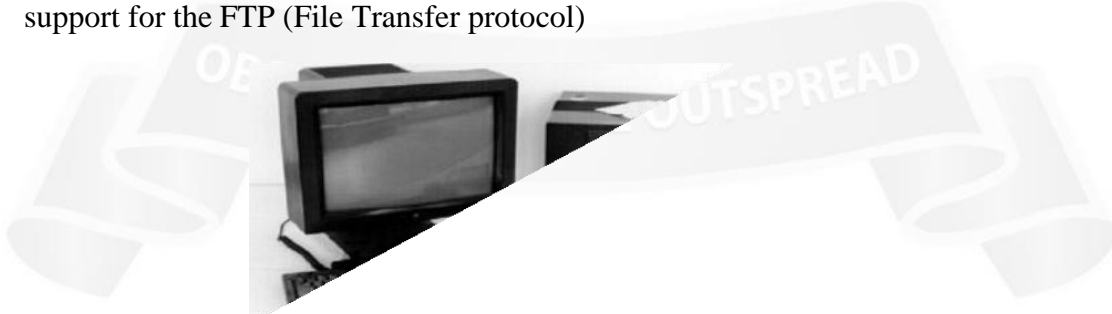


Figure 1.8 First Web Browser

- Mosaic was the first widely popular web browser available to the general public. Mosaic support for graphics, sound, and video clips.
- In October 1994, Netscape released the first beta version of its browser, Mozilla 0.96b,

over the Internet.

- In 1995, Microsoft Internet Explorer was developed that supports both a graphical Web browser and the name for a set of technologies.
- Mozilla Firefox. released in November 2004, became very popular almost immediately.

e.The Appearance of Cloud Formations From One Computer to a Grid of Many

- Two decades ago, computers were clustered together to form a single larger computer in order to simulate a supercomputer and greater processing power.
- In the early 1990s, Ian Foster and Carl Kesselman presented their concept of "The Grid." They used an analogy to the electricity grid, where users could plug in and use a(metered) utility service.
- A major problem in clustering model was data residency. Because of the distributed nature of a grid, computational nodes could be anywhere in the world.
- The Globus Toolkit is an open source software toolkit used for building grid systems and applications

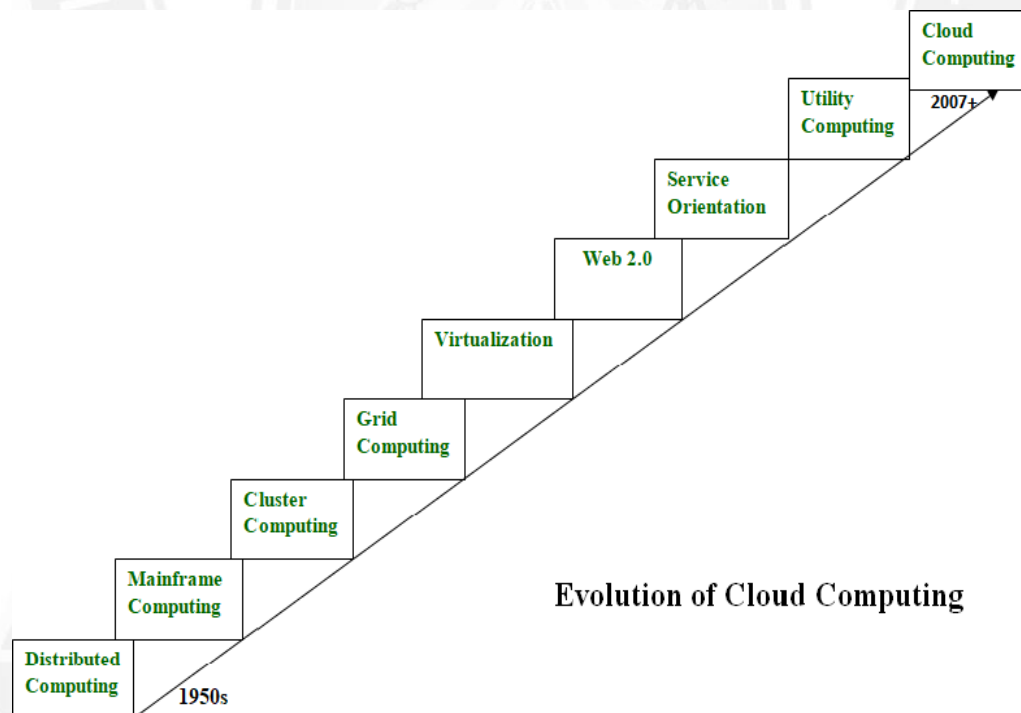


Figure 1.9 Evolution

Evolution of Cloud Services

2008-2009	Google Application Engine Microsoft Azure
2006	S3 launches EC2
2002	Launch of Amazon Web Services
1990	The first milestone of cloud computing arrival of salesforce.com
1960	Super Computers Mainframes

IV. SERVER VIRTUALIZATION

- Virtualization is a method of running multiple independent virtual operating systems on a single physical computer.
- This approach maximizes the return on investment for the computer.
- Virtualization technology is a way of reducing the majority of hardware acquisition and maintenance costs, which can result in significant savings for any company.
 - Parallel Processing
 - Vector Processing
 - Symmetric Multiprocessing Systems
 - Massively Parallel Processing Systems

a.Parallel Processing

- Parallel processing is performed by the simultaneous execution of program instructions that have been allocated across multiple processors.
- Objective: running a program in less time.
- The next advancement in parallel processing-multiprogramming
- In a multiprogramming system, multiple programs submitted by users but each allowed to use the processor for a short time.
- This approach is known as "round-robin scheduling"(RR scheduling)

b.Vector Processing

- Vector processing was developed to increase processing performance by operating in a multitasking manner.
- Matrix operations were added to computers to perform arithmetic operations.
- This was valuable in certain types of applications in which data occurred in the form of

vectors or matrices.

- In applications with less well-formed data, vector processing was less valuable.

c.Symmetric Multiprocessing Systems

- Symmetric multiprocessing systems (SMP) was developed to address the problem of resource management in master/slave models.
- In SMP systems, each processor is equally capable and responsible for managing the workflow as it passes through the system.
- The primary goal is to achieve sequential consistency

d.Massively Parallel Processing Systems

- In Massively Parallel Processing Systems, a computer system with many independent arithmetic units, which run in parallel.
- All the processing elements are interconnected to act as one very large computer.
- Early examples of MPP systems were the Distributed ArrayProcessor, the Goodyear MPP, the Connection Machine, and the Ultracomputer
- MPP machines are not easy to program, but for certain applications, such as data mining, they are the best solution
- bling quick composition of services in distributed environment.