# EVOLUTION OF STORAGE TECHNOLOGY FROM PUNCH CARDS TO CLOUD COMPUTING

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***Abstract:*** The era we live in is driven by technology. Exponential programs in the technology are observed on a daily basis. It has been extended to other fields in terms of contribution, including the healthcare sector and agriculture sector. Industries from all over the globe are now shifting their businesses to the world-wide-web. Modern-age technologies like artificial intelligence are replacing old traditional methods. The currency is now digitalized through modified technologies like Bitcoin. Cybersecurity awareness has risen as a result. Social media ethics are now a part of everyday life. With the enormous use of technology, there is a need to store and handle data. Computer generations have evolved from analog to digital to hybrid. The data storage methodologies have also evolved in a similar way. Storage methods have seen an evolution in security, portability, facilities, speed, size, etc. over the years. The purpose of this research paper is to provide an overview of the beginning and current progress.

***Index Terms*** **- Storage, Memory, Cloud, Computer, Technology.**

## I. INTRODUCTION

The size of the first-generation computer was as big as the size of a room. The composition consisted of hundreds of electronic components. The use of transistors led to a decrease in components and a decrease in size in the second generation. Integrated circuits (IC) led to the evolution of the third generation. In recent years, everyone has a smartphone, which is a computer that is small and can be carried in their pocket. Additionally, there are laptops and personal computers that are not simply made up of one processor. They are made up of four (quads), with some even reaching eight, and they are also known as octas. The development of computers led to the evolution of storage methods. Punch cards were used as a starting point. As we know, computers can understand binary numbers, which are zeros and ones. Below is an example of numbers 1 to 10 in a binary.

| Number | Binary |
|--------|--------|
| 1 | 1 |
| 2 | 10 |
| 3 | 11 |
| 4 | 100 |
| 5 | 101 |
| 6 | 110 |
| 7 | 111 |
| 8 | 1000 |
| 9 | 1001 |
| 10 | 1010 |

Table 1: Binary Numbers

Similarly, for alphabets, images, videos, emojis, etc., encoding schemes are used, such as ASCII (American standard code for information interchange) and Unicode which are universally recognized. In the case of punch cards, the holes represent zeroes and no hole represents ones. Today, punching cards are used in certain voting machines for the purpose of recording votes. After punching cards, the storage mechanisms revealed a new technological advancement. This is a testimony to the brilliant minds of engineers, technicians, and others who are behind the invention of it. Computer memory can be categorized into two groups.

1. Primary memory
2. Secondary memory

Primary memory, is also known as internal memory or main memory, and secondary memory, is also known as external memory or auxiliary memory. On the basis of this, three storage methods have been discovered and widely recognized. The nature of the approach behind all three mediums is unique. Each of them has its own merits and demerits. They are widely used by organizations across the globe according to their requirements and needs. They are as follows;

1. Magnetic
2. Optical
3. Flash

In the event of a magnetic medium of storage, there are magnetic tapes. They are in the shape of a wheel and are used for the purpose of storing, backing up, archiving, and retrieving data. Cassette tapes, which coated the magnetic tapes, added an extra layer of protection to them. Tape has seen almost six orders of magnitude density increase since its introduction as a computer data storage device in the early 1950's with 1 terabyte native capacity tape cartridges being introduced into the market. [1] Most of the world's data is stored and archived on magnetic tape primarily because of its long shelf life and favorable cost factors. [1] Next, we will have floppy disks. A floppy disk drive (FDD) is necessary for a user to access a floppy disk. They come in a variety of sizes, starting from 8 inches to 5.5 inches to 3.5 inches. Floppy disks were considered as revolutionary media for transporting data from one computer to another. [2] They could not store as much data as hard disks, but, being much cheaper and more flexible, they became very widespread. [2] Finally, there is the hard disk drive (HDD), the most popular magnetic storage medium. The purpose of it was to store a substantial amount of data. They are compact and reliable, and widely used by organizations in today's day and age. The data is recorded on concentric circles, which are called "tracks". [3] The tracks are numbered for each plate individually, starting from zero (the outermost work track) to the last (the innermost one having the largest number). [3] Normally there are several spare tracks after it. [3] The tracks themselves are divided into smaller blocks of data called sectors. [3] The sectors are numbered starting with 1, and are the smallest addressable blocks of data on disk drives. [3]

Optical storage is the second medium. CDs (compact disks) and DVDs (digital versatile disks) are the most popular examples of optical. To access a CD/DVD, a CD/DVD player is necessary. In most personal computers, there is an installed CD/DVD player. The most common use of them is to store audio and video files. Generally, a DVD has much more space than a CD. A DVD has a space of around 4.7 GB (gigabytes), while a CD has around 700 MB (megabytes). There is a third option besides CD/DVD, which is a blue-ray disk that offers a space of up to 25 GB. The three are different in terms of quality and not just in space. The continuous and rapid evolution in the field of computing, and in particular in the field of storage devices, has led to the obsolescence of optical discs in favour of mass storage devices. [4] In that sense, a large number of CDs and DVDs become obsolete each day in the world. [4]

Flash is the third storage medium. The most relevant phenomenon of this past decade in the field of semiconductor memories has been the explosive growth of the flash memory market, driven by cellular phones and other types of electronic portable equipment (palm top, mobile PC, mp3 audio player, digital camera, and so on). [5] It is the most portable of the lot and it includes USB flash drives, memory cards, solid-state drives (SSDs), etc. USB flash drives can be easily connected to USB ports, and most smartphones have memory card slots that can be used to insert a memory card and expand their device memory. SSD is the most popular one. The motive to support IT sector with the information they needed to most efficiently take benefit of the different cost and capacity, performance, characteristics supported by SSDs and HDDs. [6]

The cloud, a new storage medium, has emerged as a result of technological advancement and can be referred to as the fourth medium of storage. To put it simply, the cloud is the internet. In this medium of storage, the data is uploaded to the cloud and then can be remotely accessed by the user using the internet. Examples of cloud storage include Google Drive by Google, Microsoft One Drive, and others. Most organizations offer free cloud storage for initial use. For example, One Drive gives its users up to 5 GB of storage, while Google Drive gives up to 15 GB. Whenever free storage runs out, the user can always opt for premium plans. This helps the user get familiar with cloud setup and environment and get a hands-on

experience. Similarly, Microsoft Azure and Amazon Web Services (AWS) are also popular cloud-based services, primarily used for hosting purposes. Most of the services and resources are almost the same, but they differ in terminology. For example, to name a few of them;

| Azure | AWS |
|---|---|
| Azure DNS Traffic Manager | Route 53 |
| Azure Blob Storage | Amazon S3 |
| Azure Virtual Machines | Amazon EC2 |
| Azure Functions | Lambda |
| RBAC | IAM |
| AKS | EKS |
| Azure Backup | AWS Backup |
| ExpressRoute | Direct Connect |

Table 2: Azure vs AWS [7]

The several benefits associated with the usage of the cloud are as follows; [8][9]

1. Fast paced
2. Cost efficient
3. Scalability
4. Flexibility
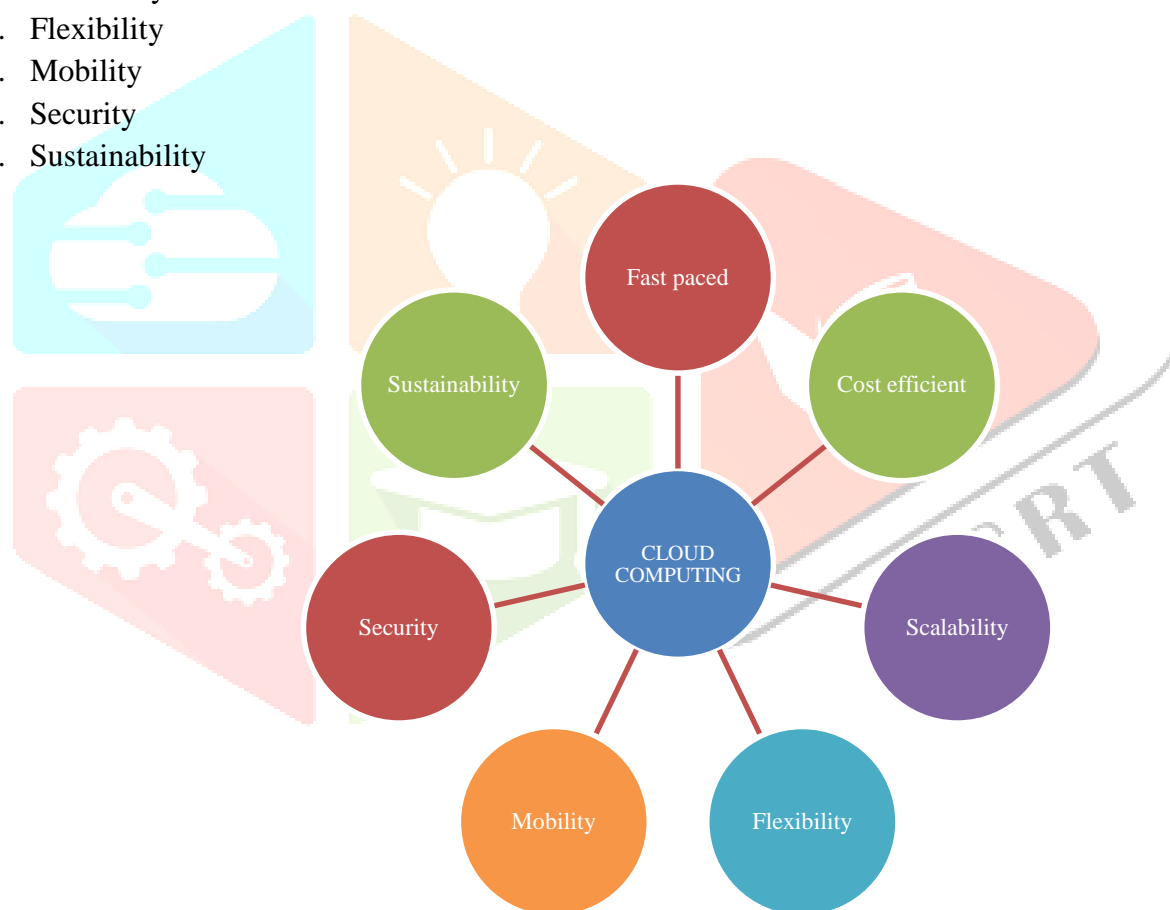5. Mobility
6. Security
7. Sustainability
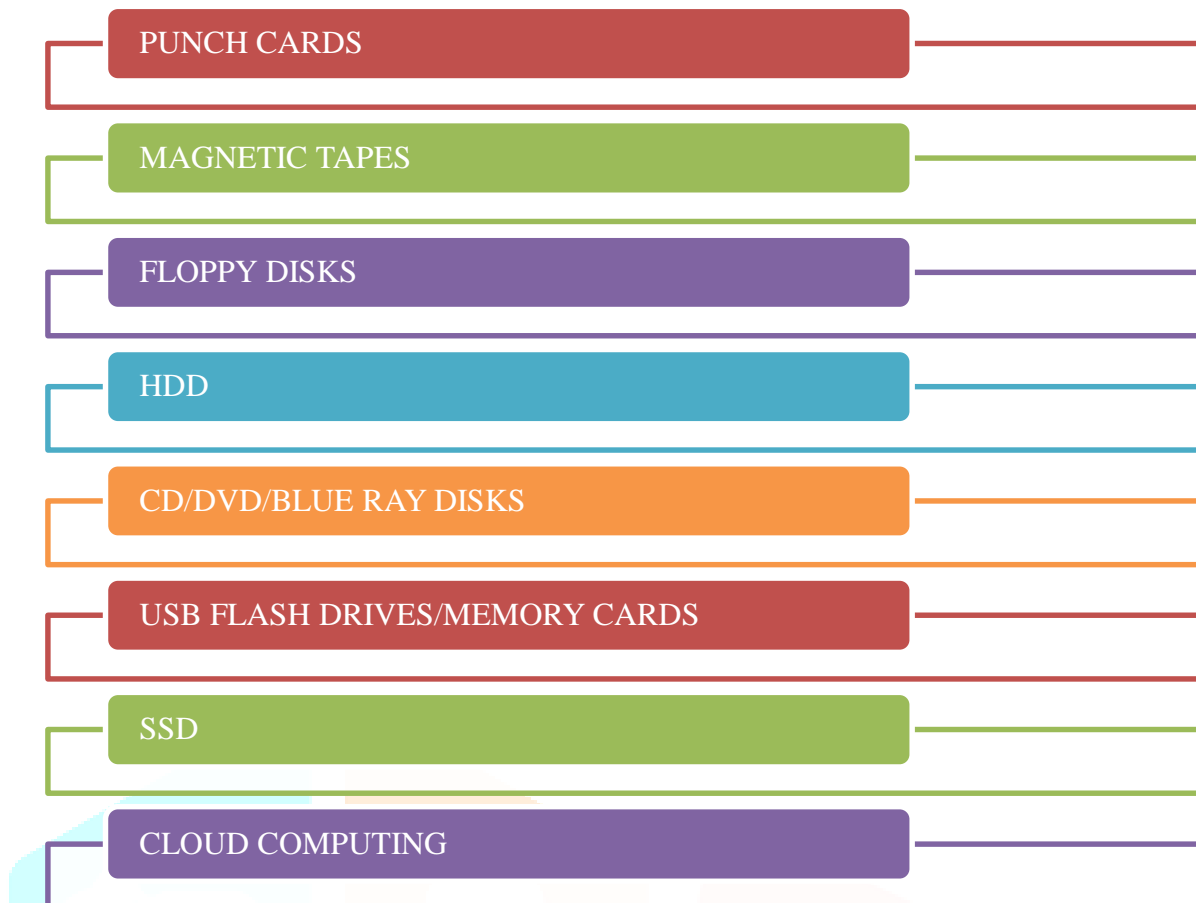


Figure 1: Cloud Computing Benefits

Figure 2: Evolution of Storage

## II. CONCLUSION

With this research paper, we have discussed the evolution of storage technology from the beginning to the present day. In that, we have discussed the two types of computer memory and the three mediums of storage. We have discussed the fourth medium, which is cloud computing. We have discussed the use and advantages of it. We have drawn comparisons between Amazon Web Services and Microsoft Azure.

## III. ACKNOWLEDGMENT

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