

CHAPTER 3

Introduction and Overview of Operating Systems



Week 1 : September 27 – October 1, 2021

Objectives:

1. Discuss the importance of Network Operating Systems.
2. Value the importance of Network Operating Systems.
3. Understand the basic concepts and structures of Network Operating Systems.



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File Systems and Disks

In computing, file system or filesystem (often abbreviated to fs) is a method and data structure that the operating system uses to control how data is stored and retrieved. Without a file system, data placed in a storage medium would be one large body of data with no way to tell where one piece of data stops and the next begins. By separating the data into pieces and giving each piece a name, the data is easily isolated and identified. Taking its name from the way paper-based data management system is named, each group of data is called a "file." The structure and logic rules used to manage the groups of data and their names is called a "file system."



Figure 15. File System Workflow

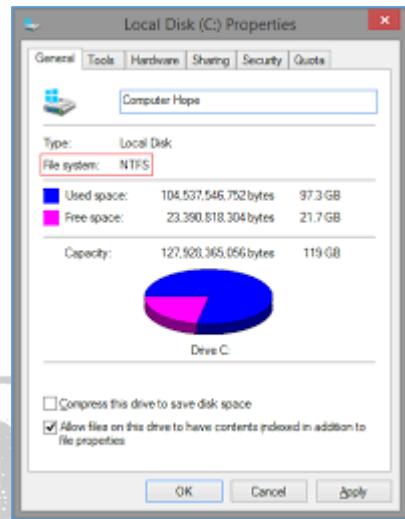


Figure 16. Local Disk C: showing NTFS

File Allocation Table (FAT)

FAT is a file system developed for personal computers. Originally developed in 1977 for use on floppy disks, it was adapted for use on hard disks and other devices. It is often supported for compatibility reasons by current operating systems for personal computers and many mobile devices and embedded systems, allowing interchange of data between disparate systems. The increase in disk drives capacity required three major variants: FAT12, FAT16 and FAT32. The FAT standard has also been expanded in other ways while generally preserving backward compatibility with existing software.

FAT is no longer the default file system for Microsoft Windows computers.

FAT file systems are still commonly found on floppy disks, flash and other solid-state memory cards and modules (including USB flash drives), as well as many portable and embedded devices. FAT is the standard file system for digital cameras per the DCF specification.

The FAT is statically allocated at the time of formatting. The table is a linked list of entries for each cluster, a contiguous area of disk storage. Each entry contains either the number of the next cluster in the file, or else a marker indicating the end of the file, unused disk space, or special reserved areas of the disk. The root directory of the disk contains the number of the first cluster of each file in that directory. The operating system can then traverse the FAT, looking up the cluster number of each successive part of the disk file as a cluster chain until the end of the file is reached. Sub-directories are implemented as special files containing the directory entries of their respective files. Each entry in the FAT linked list is a fixed number of bits: 12, 16 or 32.



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New Technology File System (NTFS)

NTFS is a proprietary journaling file system developed by Microsoft. Starting with Windows NT 3.1, it is the default file system of the Windows NT family.

NTFS has several technical improvements over the file systems that it superseded – File Allocation Table (FAT) and High-Performance File System (HPFS) – such as improved support for metadata and advanced data structures to improve performance, reliability, and disk space use. Additional extensions are a more elaborate security system based on access control lists (ACLs) and file system journaling.

NTFS is supported in other desktop and server operating systems as well. Linux and BSD have a free and open-source NTFS driver, called NTFS-3G, with both read and write functionality. macOS comes with read-only support for NTFS. Windows is additionally capable of directly converting FAT32/16/12 into NTFS without the need to rewrite all files.

NTFS can compress files using LZNT1 algorithm (a variant of LZ77) Files are compressed in 16 cluster chunks. With 4 KB clusters, files are compressed in 64 KB chunks. The compression algorithms in NTFS are designed to support cluster sizes of up to 4 KB. When the cluster size is greater than 4 KB on an NTFS volume, NTFS compression is not available.



ACTIVITY 5

Directions: Refer to Contrast and Compare 105. Write it on any Word Processor and convert it to PDF. Upload your PDF to our Google Classroom by clicking on Activity 5 and follow the steps for uploading or posting. For off-line students, make sure to have your Activity 5 checked by 9am-11am, Friday, October 1, 2021. Same as true with the deadline for on-line students, you can post your Activity 5 on or before the said time and date. For more inquiries, please e-mail me at iansugatan@iscof.edu.ph, or call me at 09462006763. You can also post a comment at our FB Group, or PM Directly.



Contrast and Compare 105

Refer to **FAT and NTFS**. In your own words, Contrast and Compare File Allocation Table from New Technology File System. Provide at least 5 comparisons between the two. You may use any online and offline software, provided it will be copy+pasted to any Word Processor. Convert it to PDF and save it as Activity 5. Upload it in our Google Classroom. Smile while doing the Activity. Godspeed!



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This is a comparison of file hosting services which are currently active. File hosting services are a particular kind of online file storage; however, various products that are designed for online file storage may not have features or characteristics that others designed for sharing files have.

Cloud Storage

Cloud storage is a model of computer data storage in which the digital data is stored in logical pools, said to be on "the cloud". The physical storage spans multiple servers (sometimes in multiple locations), and the physical environment is typically owned and managed by a hosting company. These cloud storage providers are responsible for keeping the data available and accessible, and the physical environment secured, protected, and running. People and organizations buy or lease storage capacity from the providers to store user, organization, or application data.

Cloud storage services may be accessed through a collocated cloud computing service, a web service application programming interface (API) or by applications that utilize the API, such as cloud desktop storage, a cloud storage gateway or Web-based content management systems.

Cloud computing is believed to have been invented by Joseph Carl Robnett Licklider in the 1960s with his work on ARPANET to connect people and data from anywhere at any time.

In 1983, CompuServe offered its consumer users a small amount of disk space that could be used to store any files they chose to upload.

In 1994, AT&T launched PersonaLink Services, an online platform for personal and business communication and entrepreneurship. The storage was one of the first to be all web-based, and referenced in their commercials as, "you can think of our electronic meeting place as the cloud." Amazon Web Services introduced their cloud storage service AWS S3 in 2006, and has gained widespread recognition and adoption as the storage supplier to popular services such as SmugMug, Dropbox, and Pinterest. In 2005, Box announced an online file sharing and personal cloud content management service for businesses.

There are three types of cloud storage:

1. *a hosted object storage service,*
2. *file storage, and*
3. *block storage.*

Each of these cloud storage types offer their own unique advantages.

Examples of file storage services include Amazon Elastic File System (EFS) and Qumulo Core, used for applications that need access to shared files and require a file system.



Figure 17. File Storage in the Cloud



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Solid State Drive (SSD)

A solid-state drive (SSD) is a solid-state storage device that uses integrated circuit assemblies to store data persistently, typically using flash memory, and functioning as secondary storage in the hierarchy of computer storage. It is also sometimes called a solid-state device or a solid-state disk, even though SSDs lack the physical spinning disks and movable read-write heads used in hard disk drives (HDDs) and floppy disks.

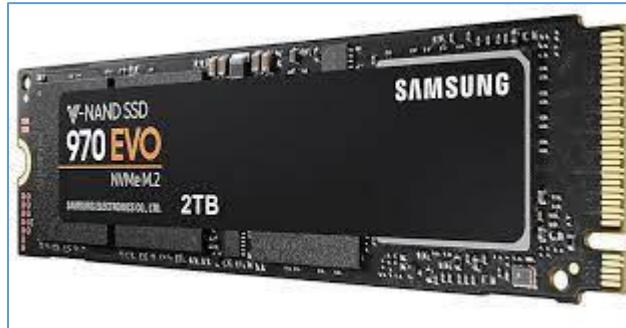


Figure 18. PCI-type SSD



Figure 19. Serial-ATA SSD

Flash Memory

Most SSD manufacturers use non-volatile NAND flash memory in the construction of their SSDs because of the lower cost compared with DRAM and the ability to retain the data without a constant power supply, ensuring data persistence through sudden power outages. Flash memory SSDs were initially slower than DRAM solutions, and some early designs were even slower than HDDs after continued use. This problem was resolved by controllers that came out in 2009 and later.

Flash-based SSDs store data in metal-oxide-semiconductor (MOS) integrated circuit chips which contain non-volatile floating-gate memory cells. Flash memory-based solutions are typically packaged in standard disk drive form factors (1.8-, 2.5-, and 3.5-inch), but also in smaller more compact form factors, such as the M.2 form factor, made possible by the small size of flash memory.

Solid-state drives that rely on V-NAND technology, in which layers of cells are stacked vertically, have been introduced.

The basis for flash-based SSDs, flash memory, was invented by Fujio Masuoka at Toshiba in 1980 and commercialized by Toshiba in 1987. SanDisk Corporation (then SanDisk) founders Eli Harari and Sanjay Mehrotra, along with Robert D. Norman, saw the potential of flash memory as an alternative to existing hard drives, and filed a patent for a flash-based SSD in 1989. The first commercial flash-based SSD was shipped by SanDisk in 1991.

In 2018, both Samsung and Toshiba introduced to market 30.72 TB SSDs using the same 2.5-inch form factor but with 3.5-inch drive thickness using a SAS interface. Nimbus Data announced and reportedly shipped 100 TB drives using a SATA interface, a capacity HDDs are not expected to reach until 2025. Samsung introduced an M.2 NVMe SSD with read speeds of 3.5 GB/s and write speeds of 3.3 GB/s.



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DRAM

SSDs based on volatile memory such as DRAM are characterized by very fast data access, generally less than 10 microseconds, and are used primarily to accelerate applications that would otherwise be held back by the latency of flash SSDs or traditional HDDs.

DRAM-based SSDs usually incorporate either an internal battery or an external AC/DC adapter and backup storage systems to ensure data persistence while no power is being supplied to the drive from external sources. If power is lost, the battery provides power while all information is copied from random access memory (RAM) to back-up storage. When the power is restored, the information is copied back to the RAM from the back-up storage, and the SSD resumes normal operation (similar to the hibernate function used in modern operating systems).

SSDs of this type are usually fitted with DRAM modules of the same type used in regular PCs and servers, which can be swapped out and replaced by larger modules. Such as i-RAM, HyperOs HyperDrive, DDRdrive X1, etc. Some manufacturers of DRAM SSDs solder the DRAM chips directly to the drive, and do not intend the chips to be swapped out—such as ZeusRAM, Aeon Drive, etc.

While the price of DRAM continues to fall, the price of Flash memory falls even faster. The "Flash becomes cheaper than DRAM" crossover point occurred approximately 2004.



ACTIVITY 6

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Contrast and Compare 106

Refer to *Flash Memory and DRAM*. In your own words, Contrast and Compare Flash Memory from DRAM. Provide at least 5 comparisons between the two. You may use any online and offline software, provided it will be copy+pasted to any Word Processor. Convert it to PDF and save it as Activity 6. Upload it in our Google Classroom. Smile while doing the Activity. Godspeed!





File Allocation Table (FAT) is a file system developed for personal computers. FAT file systems are still commonly found on floppy disks, flash and other solid-state memory cards and modules (including USB flash drives), as well as many portable and embedded devices. FAT is the standard file system for digital cameras per the DCF specification.

Internally, NTFS uses B-trees to index file system data. A file system journal is used to guarantee the integrity of the file system metadata but not individual files' content. Systems using NTFS are known to have improved reliability compared to FAT file systems.

Cloud computing is believed to have been invented by Joseph Carl Robnett Licklider in the 1960s with his work on ARPANET to connect people and data from anywhere at any time.

Compared with electromechanical drives, SSDs are typically more resistant to physical shock, run silently, and have quicker access time and lower latency. SSDs store data in semiconductor cells. As of 2019, cells can contain between 1 and 4 bits of data.



https://en.wikipedia.org/wiki/File_Allocation_Table

<https://en.wikipedia.org/wiki/NTFS>

https://en.wikipedia.org/wiki/Cloud_storage

https://en.wikipedia.org/wiki/Solid-state_drive



For tutorials on of C# basics, pls visit this links:

<https://www.youtube.com/watch?v=V2Gxqv3bJCK>

https://www.youtube.com/watch?v=_h30HBYxtws&t=3s

<https://www.youtube.com/watch?v=VDBhvexAj8I>

<https://www.youtube.com/watch?v=kx0ynC8Thlw>



FOR FURTHER STUDY

Steil, Michael (February 26, 2008) [2003]. "Differences between Xbox FATX and MS-DOS FAT". Xbox-Linux project. Archived from the original on June 17, 2010. Retrieved May 25, 2014.

Anderson, Tim (2021-09-06). "GitHub merges 'useless garbage' says Linus Torvalds as new NTFS support added to Linux kernel 5.15". The Register. Retrieved 2021-09-07. "About Tuxera". Retrieved 2020-06-15.

Daniela Hernandez (May 23, 2014). "Tech Time Warp of the Week". Wired. "Box.net lets you store, share, work in the computing cloud". Silicon Valley Business Journal. December 16, 2009. Retrieved October 2, 2016.

Hachman, Mark (2014-01-17). "SSD prices face uncertain future in 2014". pcworld.com. Archived from the original on 2 December 2014. Retrieved 24 November 2014.

