File Systems

2024 Semester 2 COMPSCI 340: Operating Systems
Talia Xu

Lecture 1
1.0.0

I’m Talia, your instructor

I am a lecturer in the Computer Systems Group.

I am about to receive my PhD from TU Delft.

I previously went to University of Toronto for BASc and MASc.

I'm Talia, your instructor

I worked at a few industry places, mostly as an intern

- Canada: IBM, Arista Networks, Amazon
- US: Reach Power (startup)
- UK: Nokia Bell Labs

My research interest is

- Using light for communication and sensing
- Novel sensing systems for health / mental well-beings
- Generally involvesome hardware or embedded systems

I'm Talia, your instructor

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Please provide feedback

Let me know what you like, dislike, or want to see more of

I’m open to suggestions!

These books complement lectures

"Operating Systems: Three Easy Pieces"
by Remzi Arpaci-Dusseau and Andrea Arpaci-Dusseau

"Modern Operating Systems"
by Andrew S. Tanenbaum

Test: You are only responsible for what have been covered in class.

Why should we care about OS?

Distinguished Lecture by Amin Vahdat

- **End of Moore's Law:** The traditional approach of relying on exponential hardware improvement is no longer sustainable.
- **Shifting Demands:** The growing demand for machine learning and data processing requires a different approach to computing infrastructure.
- **System-Level Optimization:** Optimizing the entire system, rather than individual components, can unlock greater gains in capacity and capability.

File System: How to manage a persistent device?

What are the APIs?

What are the important aspects of the implementation?

File system: How to manage a persistent device?

You have a 1 MB file named foo stored in the directory /bar

- What is the full path name of the file?

How are files organized on the disk?

- What data structures are used to store the data of the file?
- The metadata?
- The location?

How do you access data on the disk?

- When you open/write/read the file, what function calls are evoked?
- If we write another 1MB data to /bar/foo, where does this data go?
- Which structures on the disks are read from and written to?

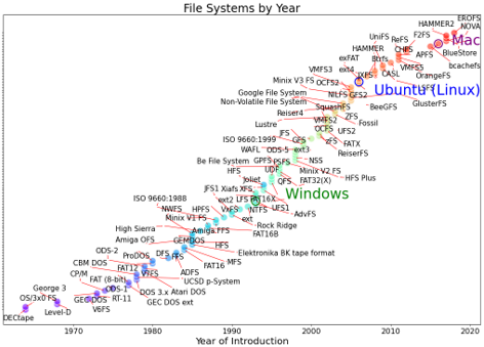
File system is an abstract concept

A File system describes a way of organizing and storing files on a storage device.

What are some requirements of a file system?

- **Availability:** Ensure data can be accessed and used reliably.
- **Permanence:** Store data permanently (or an approximation of it).
- **Concurrent Access:** Make data sharable with other programs or users

File system implementations are design choices



Some popular file system implementations:

- Unix (Linux and Mac)
- Windows
- Specialized system (Mainframe)