

# CMP325

## Operating Systems

### Lecture 30

## ACLs & Device Files

Fall 2021

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#### Note:

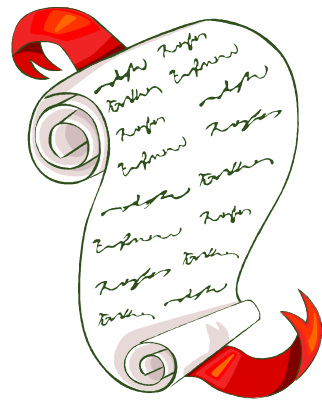
Some slides and/or pictures are adapted from course text book and Lecture slides of

- Dr Syed Mansoor Sarwar
- Dr Kubiatoicz
- Dr P. Bhat
- Dr Hank Levy
- Dr Indranil Gupta

For practical implementation of operating system concepts discussed in these slides, students are advised to watch and practice video lectures on the subject of **OS with Linux** by Arif Butt available on the following link:

<http://www.arifbutt.me/category/os-with-linux/>

# Today's Agenda



- Overview of Hard Disks
  - HDD
  - SSD
- How a Spinning HD works?
- HDD Address
  - CHS
  - LBA
- Partitioning a Hard Disks
  - Introduction
  - Disk Scheduling
- Disk Scheduling Algorithms

# Overview of Hard Disks

# FILE SYSTEM PROTECTION

- FS must implement some kind of protection system
  - To control who (user) can access a file
  - To control how they can access it (e.g. read, write or execute)
- More generally
  - Generalize files to objects (what)
  - Generalize users to principals (who)
  - Generalize read/write to actions (how)
- A protection system dictates whether a given action performed by a given principal on a given object should be allowed.
- For example:
  - You can read or write your files but others cannot
  - You can read /etc/passwd but you cannot write it

# Access Control Matrix / ACLs/Capabilities

- Lampson's Access Control Matrix
  - **Principles/Subjects** (users of a system) index the rows
  - **Objects** (system resource) index the columns

	OS	Accounting program	Accounting data	Insurance data	Payroll data
Bob	rx	rx	r	---	---
Alice	rx	rx	r	rw	rw
Sam	rwx	rwx	r	rw	rw
Accounting program	rx	rx	rw	rw	rw

# Access Control List

- For each object keep a list of principles and principle allowed actions. Store access control matrix by **column**
- List of permissions attached to an object
- Example: ACL for **insurance data** is in **pink**
- ACLs are easier to manage

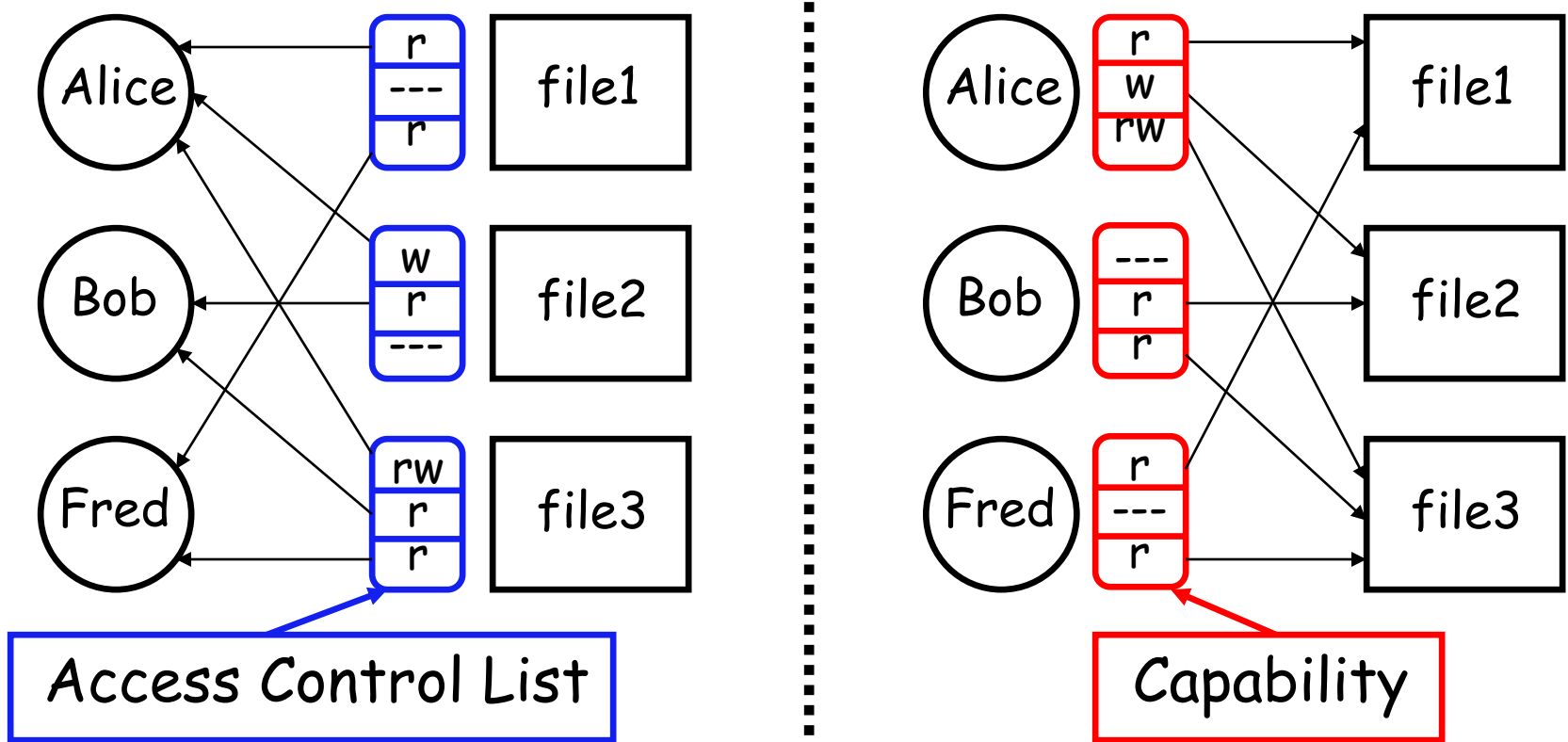
	OS	Accounting program	Accounting data	<b>Insurance data</b>	Payroll data
Bob	rx	rx	r	---	---
Alice	rx	rx	r	<b>rw</b>	rw
Sam	rx	rx	r	<b>rw</b>	rw
Accounting program	rx	rx	rw	<b>rw</b>	rw

# Capabilities

- For each principle keep a list of objects and principle allowed actions.
- Store access control matrix by **row**
- Example: Capability for **Alice** is in **red**
- Capabilities are easy to transfer

	OS	Accounting program	Accounting data	Insurance data	Payroll data
Bob	rx	rx	r	---	---
<b>Alice</b>	<b>rx</b>	<b>rx</b>	<b>r</b>	<b>rw</b>	<b>rw</b>
Sam	rx	rx	r	rw	rw
Accounting program	rx	rx	rw	rw	rw

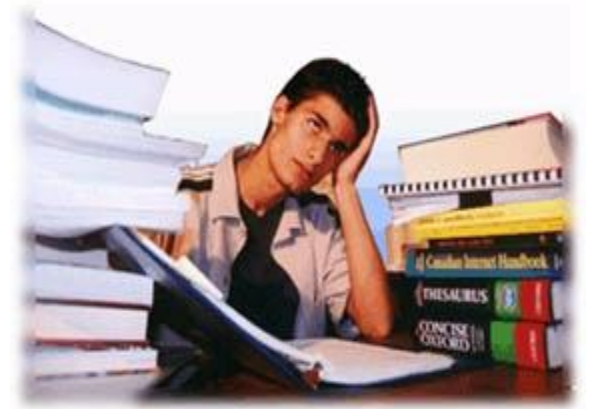
# ACL vs Capabilities



- Note that arrows point in opposite directions!
- With ACLs, separate method needed to associate users to files



# We're done for now, but Todo's for you after this lecture...



- Go through the slides and Book Sections: 9.1 to 9.7, 9.8.1, 9.9
- Solve all the sample problems given in slides to understand the concepts discussed in class