

Operating Systems!

An Overview of Operating Systems (Part 2)

Prof. Travis Peters

Montana State University

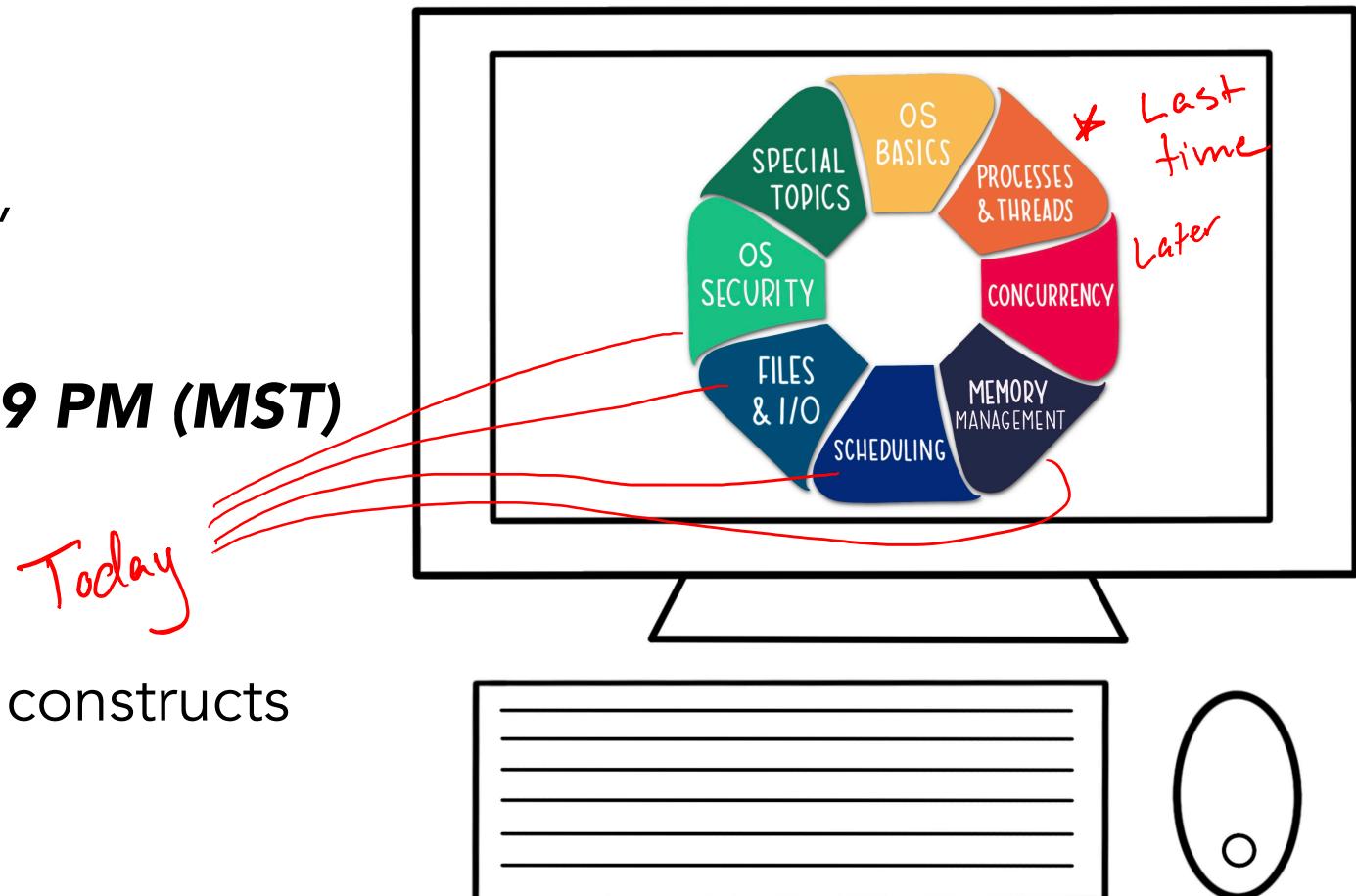
CS 460 - Operating Systems

Fall 2020

<https://www.cs.montana.edu/cs460>

Today

- Announcements
 - Resources for students
(office hours, individual appts.,
help centers, tutoring, etc.)
 - Reminder.... PA0 Due!
Sunday [09/06/2020] @ 11:59 PM (MST)



- Learning Objectives
 - Understand the big ideas and constructs behind operating systems

Recap

What ideas about the role of the OS and processes/threads really stuck out from last time?

Process

- operations (instructions / code)
- data TEXT
- execution context
- pid (ppid)
- state
- "pages" (memory)
- registers (pc, stack ptr, gen. regs.)

an instance of a program running in a computer

Thread
unit of execution

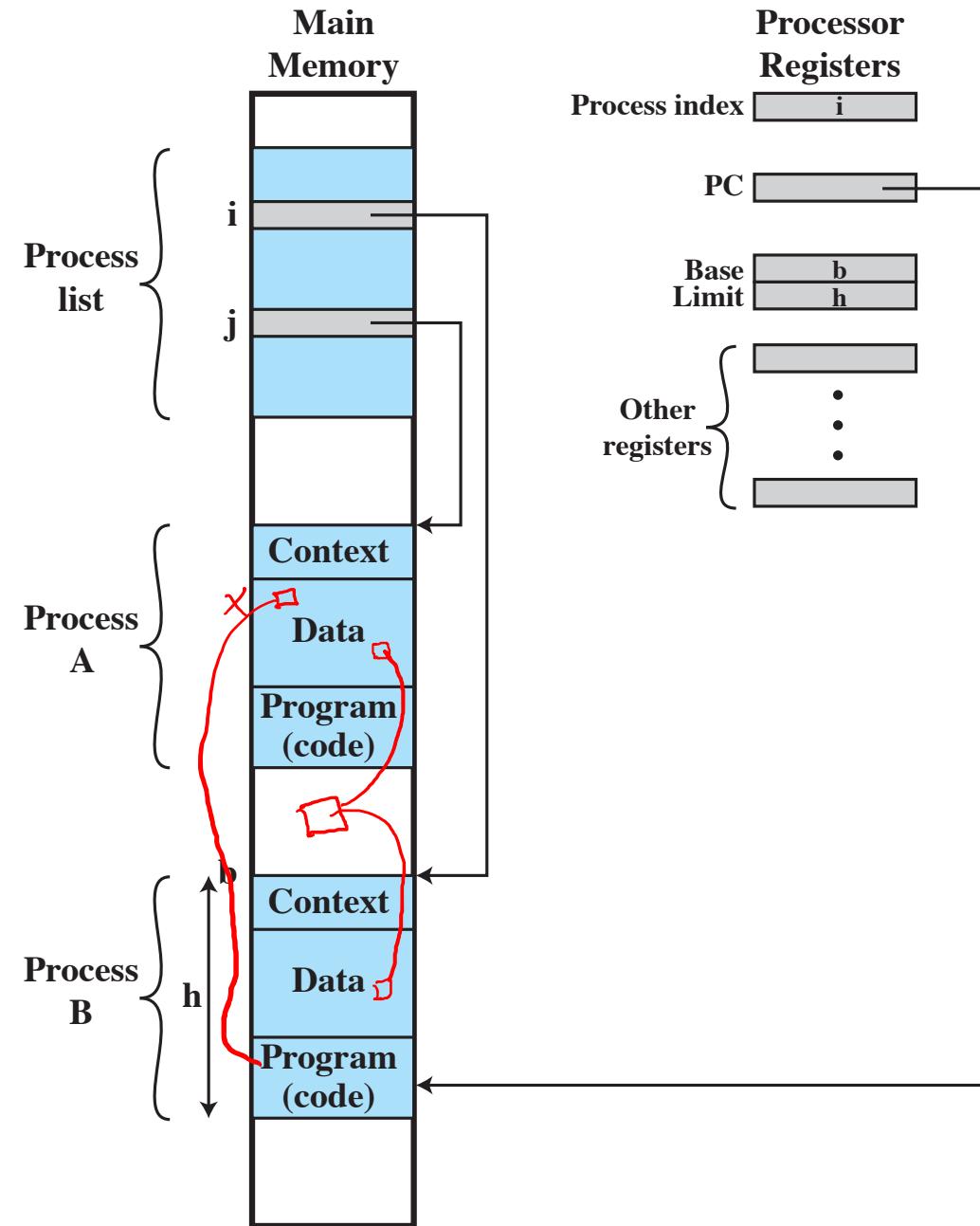
Memory Management

*What follows are the big ideas,
which gives us context for the role and purpose of the OS.*

Memory Management

- OS responsibilities w.r.t. MM
 - Process Isolation
 - Automatic Allocation/Mgmt.
 - Modular
 - Protection & Access Control
 - Long-Term Storage

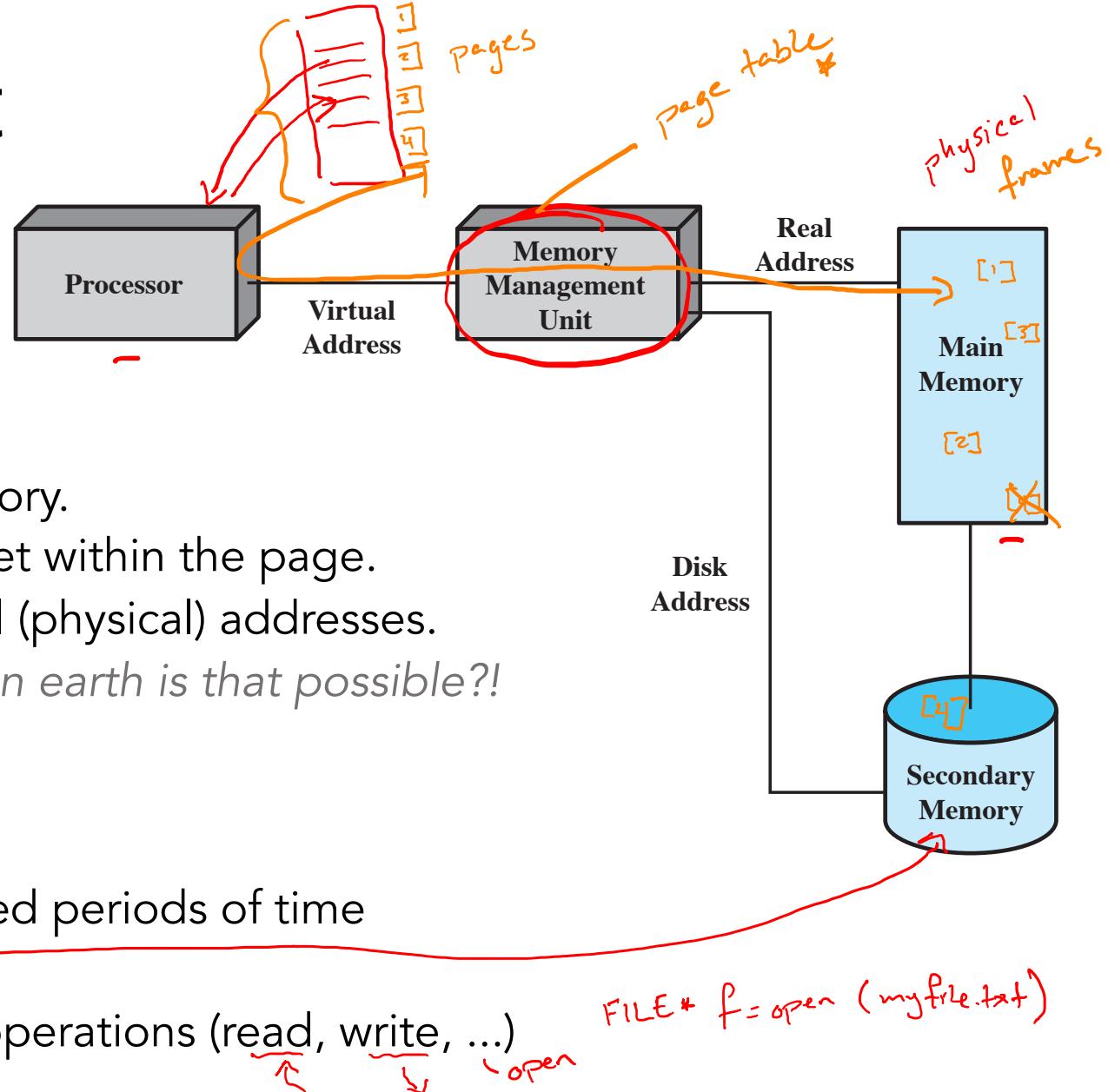
Disk
SSD



Memory Management

- Virtual Memory

- address memory logically, without regard to the actual, physical memory.
- ("paging") **virtual address** = page # + offset within the page.
- MM maps between virtual address and real (physical) addresses.
- pages can be in memory (or not!) — *how on earth is that possible?!*



- File Systems

- good for persisting information for extended periods of time
- files = named objects
- lots of operations phrased in terms of file operations (read, write, ...)

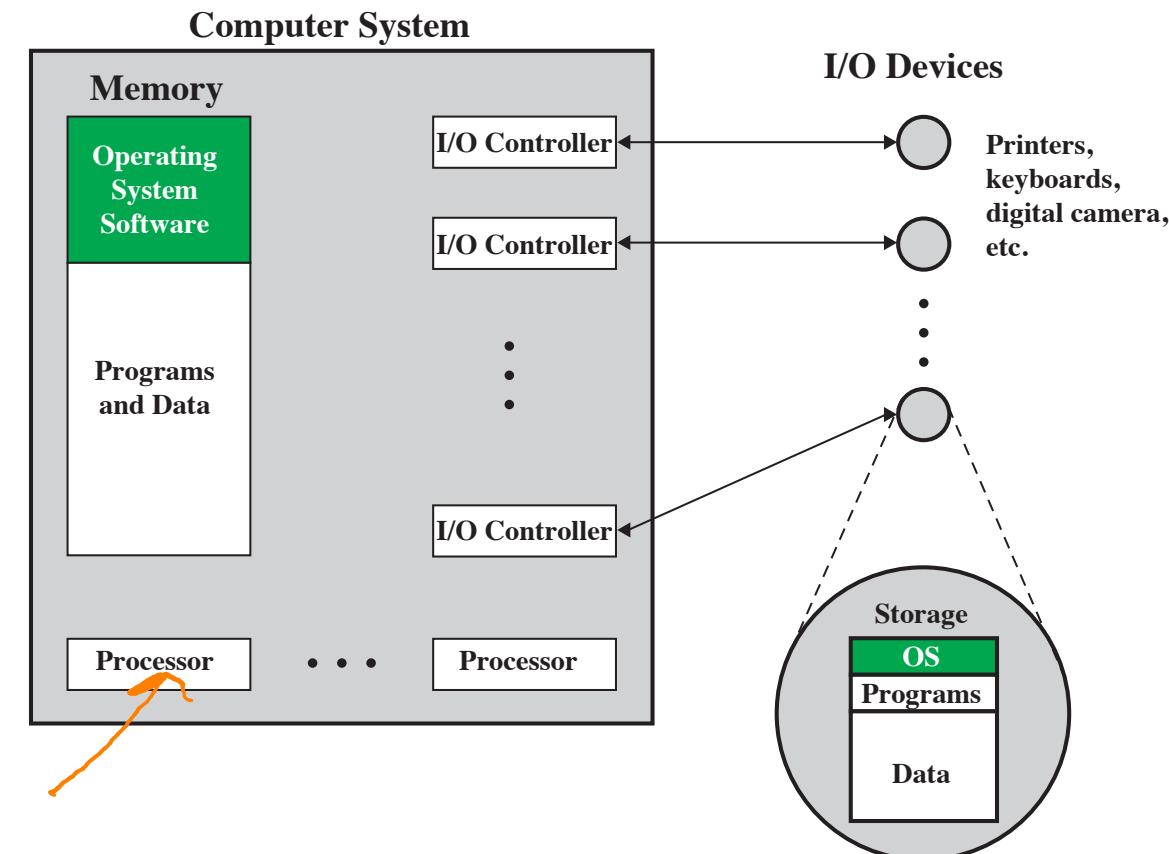
Scheduling & Resource Management

*What follows are the big ideas,
which gives us context for the role and purpose of the OS.*

Scheduling & Resource Management

Manage Resources!

- Manage system resources
(Main Memory, I/O devices, Processors)
- Keep these resources utilized
(i.e., schedule processes to utilize them)
- ...all while being
fair, responsive, and efficient



Scheduling & Resource Management

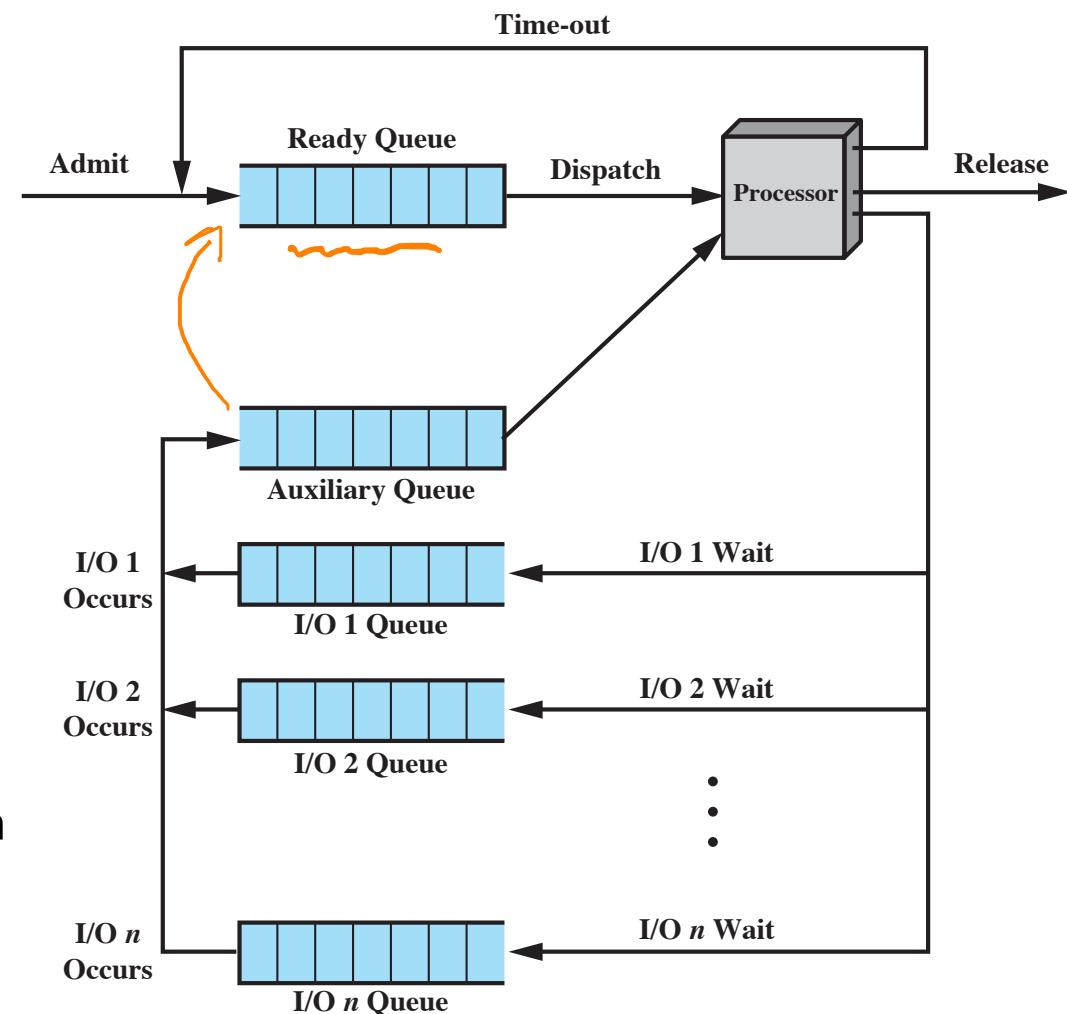
Operations-Research Problems & Lots of Maths

—How do we do things good?

$$\begin{aligned}1 &= 10 \text{ ms} \\2 &= 100 \text{ ms} \\3 &= 1 \text{ ms}\end{aligned}$$

FCFS

- Data Structures: A bunch of queues, and lists, and (mostly) other simple data structures
- Algorithms: A scheduler or dispatcher to pick which process runs next
 - e.g., round-robin = everyone gets some time in turn
 - Other approaches?

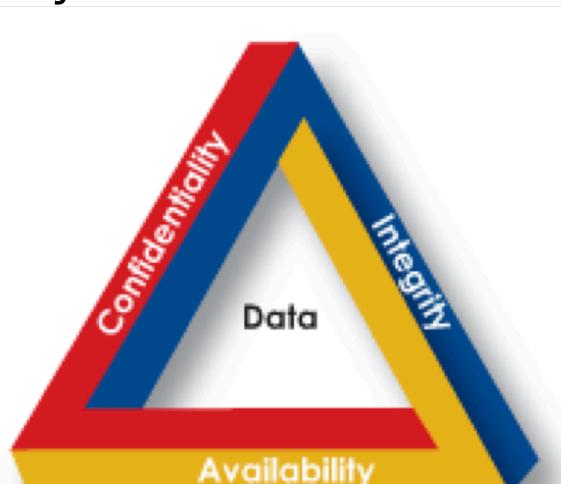


Security

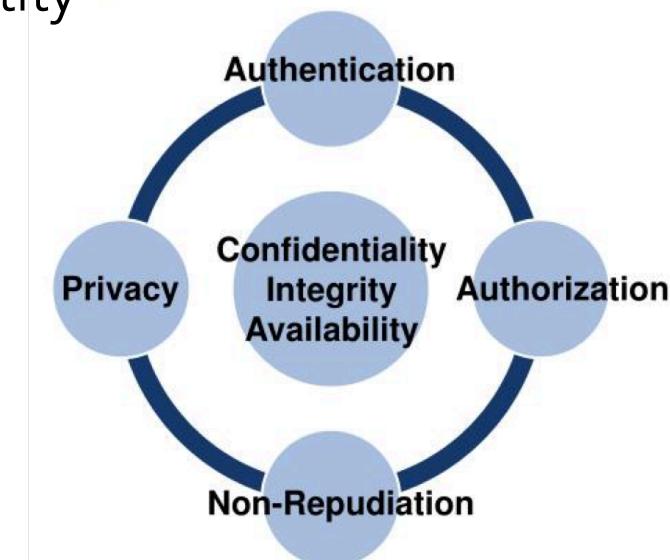
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Information Protection & Security

- CIA
 - Confidentiality — protection from **unauthorized access** (e.g., snooping)
 - Integrity — protection from **unauthorized modification** (e.g., tampering)
 - Availability — protection from **interruption** (e.g., denial of service)
- Also...
 - Authenticity — verification of the origin/identity
 - +...

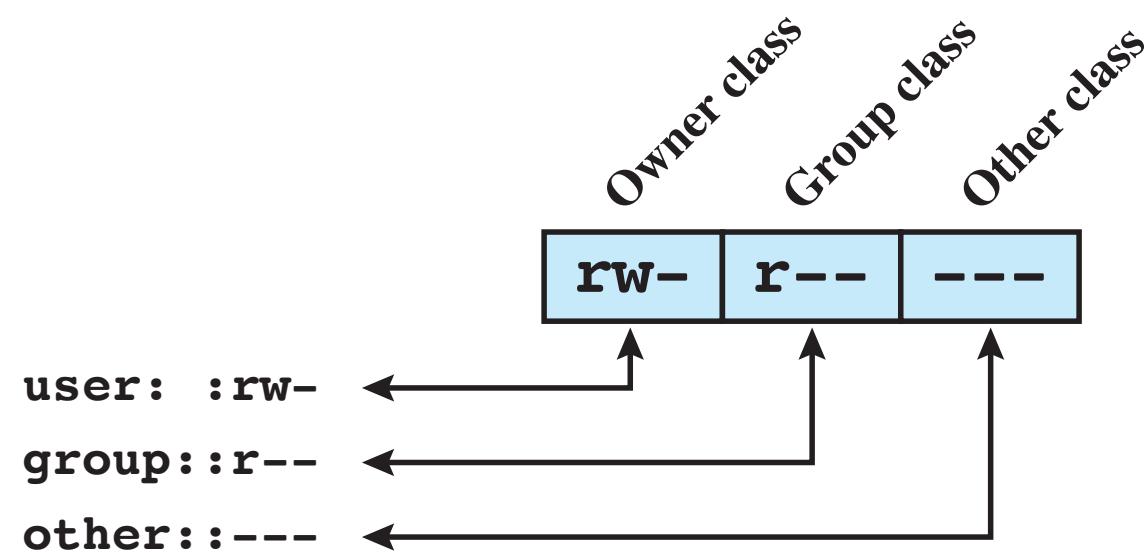


traditional infosec model



...increasingly common to include other goals

Simple Access Control



(a) Traditional UNIX approach (minimal access control list)

Examples of Access Control Structures

SUBJECTS

OBJECTS			
	File 1	File 2	File 3
User A	Own Read Write		Own Read Write
User B	Read	Own Read Write	Write
User C	Read Write	Read	Own Read Write

(a) Access matrix

