# CSE 120: Principles of Operating Systems
# Lecture 1a: Introduction

Prof. J. Pasquale
University of California, San Diego
January 11, 2023

# What is an Operating System?

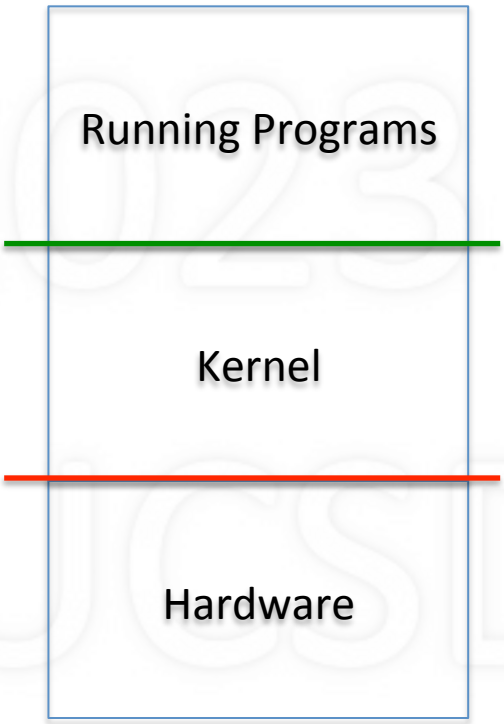
- Software that makes computer easier to use
  - Broadly, for the user to interact with programs
  - For the programmer to use machine's resources
  - Resources: CPU, memory, storage, I/O devices, …
- Improves the computer's capabilities
  - Performance: speed, efficiency
  - Reliability: correctness, fault tolerance
  - Security: privacy, authenticity, integrity

# Operating System vs. the Kernel

- "Operating system" has many interpretations
  - E.g., all software on machine minus applications
- Our focus is much more limited: the *kernel*
  - All programs depend on it, accessed via sys calls
- Works closely with hardware
  - Accesses device registers, responds to interrupts
- Allocates basic resources
  - CPU time, memory space, use of I/O devices

# Two Purposes of the Kernel

- To provide abstract machine
  - Interface for the programmer
  - Functions and resources
  - Goals: simplicity, convenience
- To manage resources
  - All the mechanisms and policies
  - Allocates usage: space and time
  - Goals: performance, reliability, security



# Turn Undesirable into Desirable

- Undesirable inconveniences of reality …
  - Complexity of hardware
  - Single/limited number of processors
  - Small/limited amount of memory
- Desirable conveniences: *illusions*
  - Simple, easy-to-use resources
  - Multiple/unlimited number of processors
  - Large/unlimited amount of memory

# Three Key Ideas

- Abstraction
  - *What* is the desired illusion
- Mechanism
  - *How* to create illusion: basic functionality
  - Fixed: works one way, the only way
- Policy
  - *Which* way to use mechanism, to meet a goal
  - Variable: many possible, select best for situation

# Summary

- What is an operating system?
  - Software that is integral part of computer system
  - Makes it easy for user to use system
  - Keeps system running smoothly
- This course
  - Fundamental aspects of operating systems
  - Managing CPU, memory, storage, I/O devices

# Reading

- OSP: Chapter 1
  - Do the exercises! (suggested, not required)
- OSC: Chapters 1 and 2
  - Lecture-related: 1.1, 1.12, 2.1, 2.3, 2.8, 2.11
  - Hardware background : 1.2, 1.3
  - Recommended: 1.4-1.11, 2.2, 2.4-2.7, 2.9-2.10