Operating Systems

Instructor: Dr. Shachi Sharma

Introduction-1

Bio

- Ph.D in Performance Modelling of Broadband Networks, Jawaharlal Nehru University, Delhi, India
- Total work experience of more than 19 years
  - Center for Development of Telematics (C-DoT) 1999-2005
  - Alcatel Lucent Pvt. Ltd (2006-2007)
  - Bharti Telesoft Ltd (2007-2008)
  - IBM Research Laboratory (2008-2017)
    - More than 10 patented technologies
  - Indraprastha Institute of Information Technology (IIIT), Delhi (2018)

Logistics

- Office Hours:
    - Room No. 314
    - Any working day, drop a mail first (shachi@sau.int)
    - Subject of the mail should include **[OS]**

Evaluation

- Labs:
    - Every lab will be graded
    - All labs will be equally weighted (Advise: Do well in early labs!)
- Mid term and Final exams
    - Mix of objective and subjective type questions

Evaluation

- Quizzes (2): 20%
- Labs: 15%
- Mid term: 25%
- Final Exam: 40%
- Paper Presentation (in teams)- Bonus*

Rules

- No deadline extension
- No re-quiz
- No re-exams
- Cheating in a exam/labs/quizzes: Minimum: zero in the exam, Maximum: Fail
- Cheating/copying/plagiarism in lab: Min: zero, Max: grade reduction

Textbooks and References

- Textbooks
  - Operating Systems Concepts by Abraham Silberschatz, Peter B. Galvin and Greg Gagne, Wiley
  - Operating Systems, Internals and Design Concepts by William Stallings, Pearson
- Reference Books
  - The Design of the Unix Operating System by Maurice J. Bach, Prentice Hall
  - The C Programming Language by Brian Kernighan and Dennis Ritchie, Prentice Hall

Class Objectives

- The basics
- Processes and their siblings
- Process synchronization
    - Threads and thread synchronization
- Issues with processes – deadlocks and deadlock detection
- CPU Scheduling (Real time as well as non-real time)
- Memory Management
- I/O Management
- Storage Management
- Virtual Machines
- Security

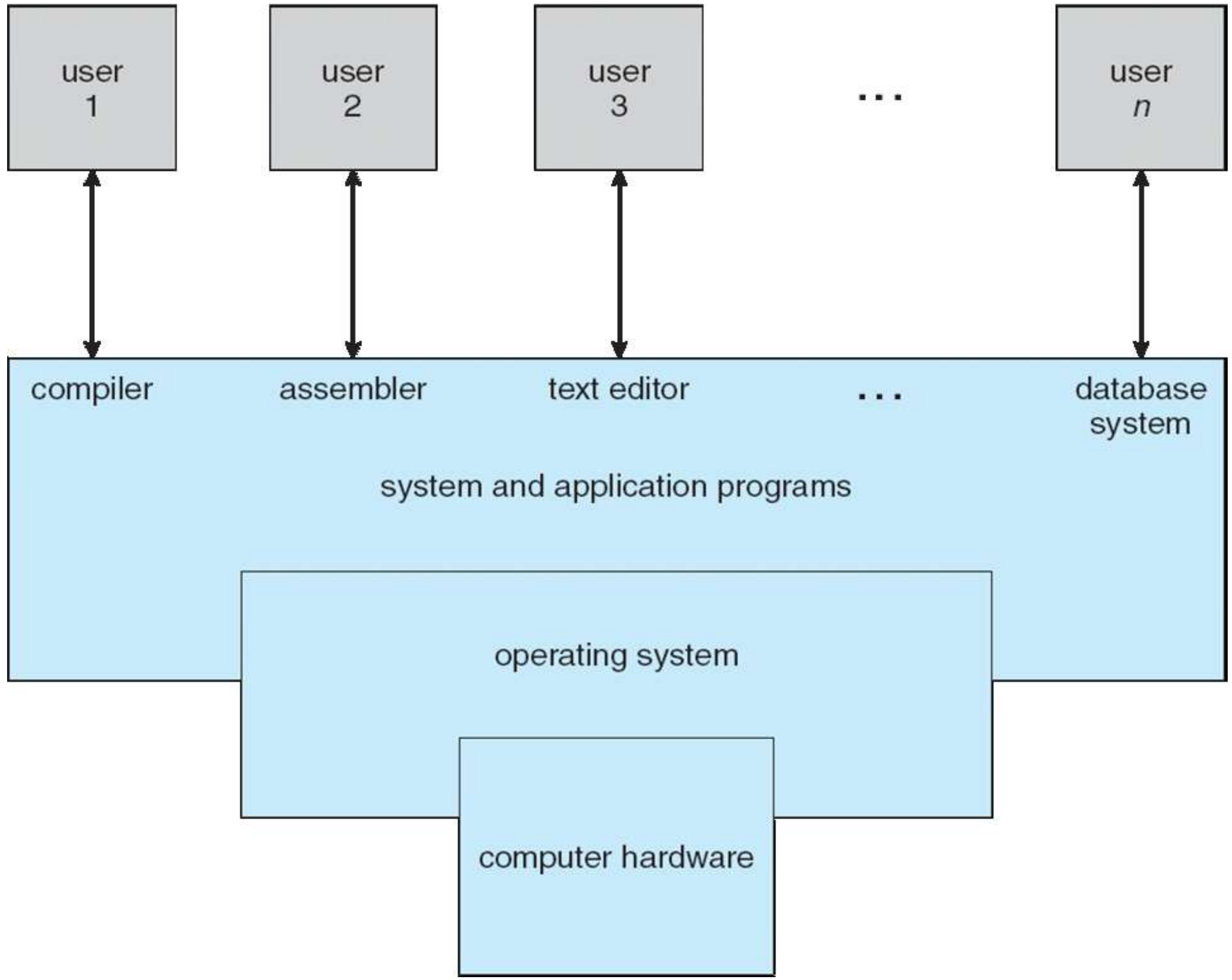
What you should expect at the end of this course

- Pretty conversant in C programming. No fear of pointers, debuggers, assemblers
- Pretty conversant with Linux internals
- Compiling kernel
- Mucking around the kernel
- Strong understanding of processes, threads and the likes
- Good understanding of memory management as it happens inside the OS
- Basics of storage management – aka filesystems and how data is stored on disks.
- How a program (aka binary) runs!
- How a computer boots up!

Introduction

- What is a Computer ?
- What is an Operating System?
- Why does a computer need an Operating System ?

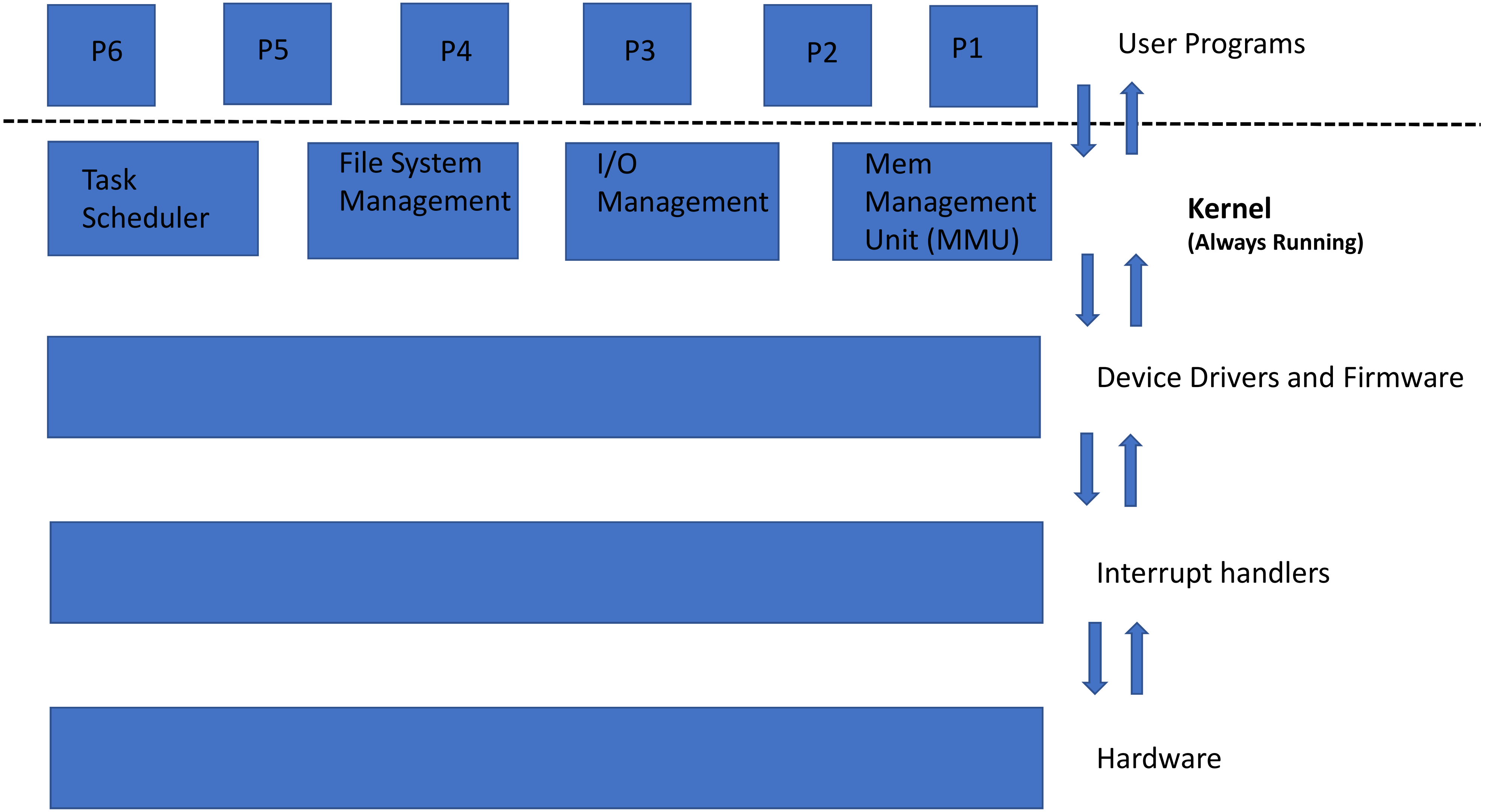
Components of Computer System



Systems and Operating Systems

- Uniprocessor systems
- Multi-processor systems
  - Multi-core is multi-processor
  - Asymmetric multi-processing (ASMP)
    - A master processor controls others
    - Solaris version 4 supports ASMP
  - Symmetric multi-processing (SMP)
    - All processors are peers. OS does all book-keeping
    - Windows, Mac-OS, Linux all supports SMP
- Distributed systems
  - Clustered systems (loosely coupled)
    - Asymmetric clustering (hot standby)
    - Symmetric clustering (active-active)
  - Client-Server systems

Layered Architecture



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P5

P4

P3

P2

P1

User Programs

Task Scheduler

File System Management

I/O Management

Mem Management Unit (MMU)

Kernel
(Always Running)

Device Drivers and Firmware

Interrupt handlers

Hardware