Computer Architecture

Faculty of Computer Science & Engineering - HCMUT

Computer Architecture

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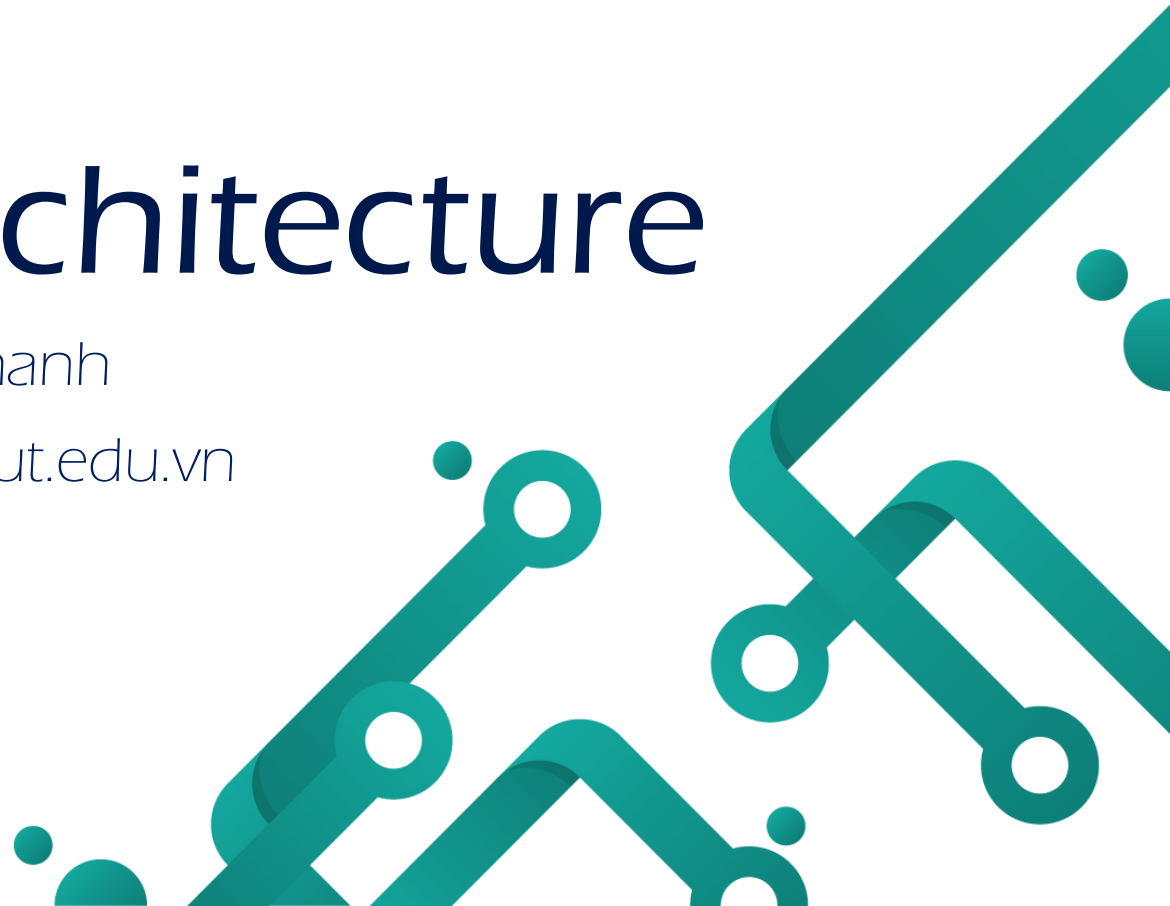


Copyright/Acknowledgments

- The lecture material for this course has been adapted in part from UC Berkeley (US), Penn State, Publisher at UB and The Massachusetts Institute of Technology (M.I.T. US)

What is Computer???

- "A computer is a **data processing** machine which is operated **automatically** under the control of a list of **instructions** (called a program) stored in its main memory."

Classes of Computers

- Personal computers
- Embedded computers
- Server/Supercomputers

Source: internet

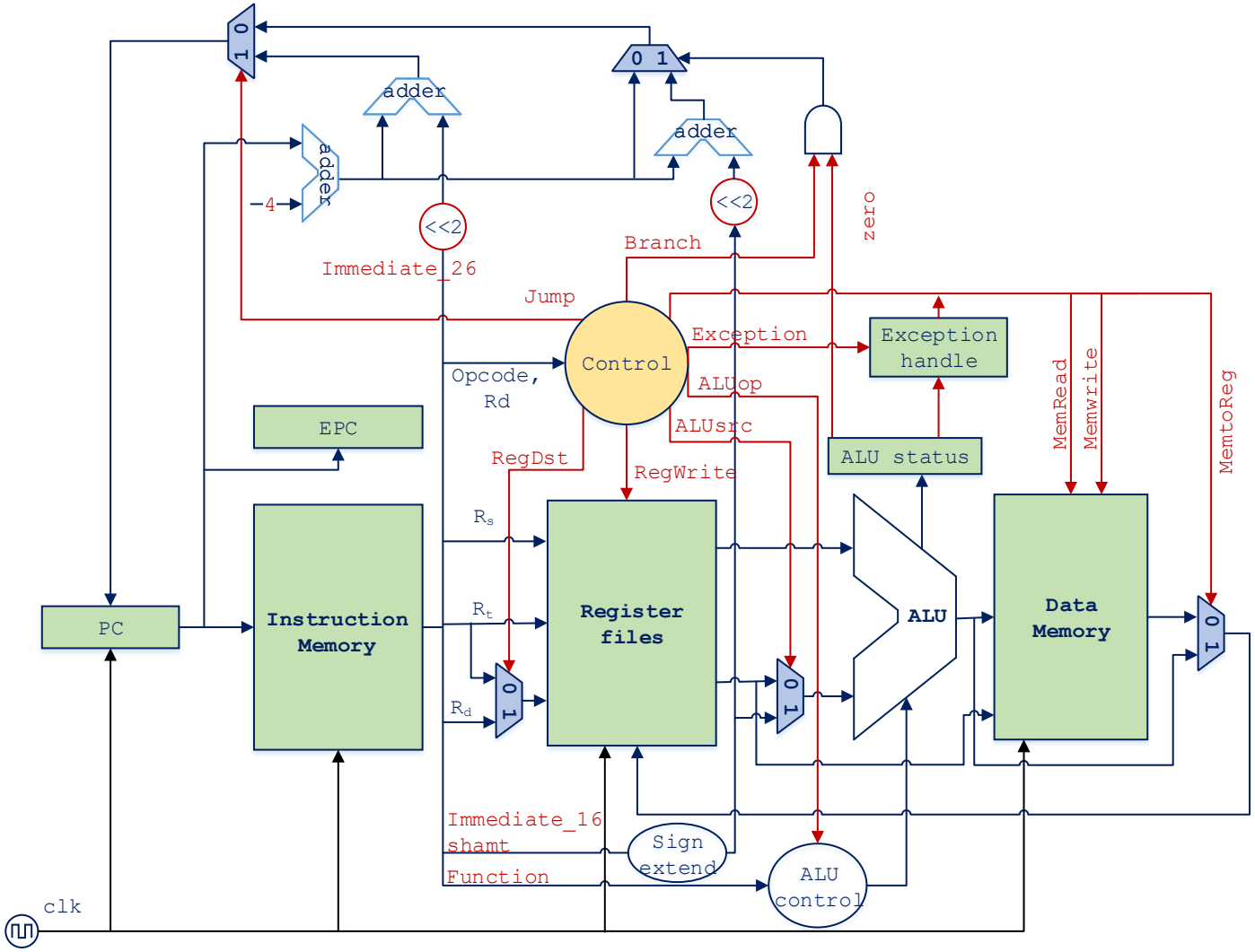
Which class does iPad belong to?

How about smartphone?

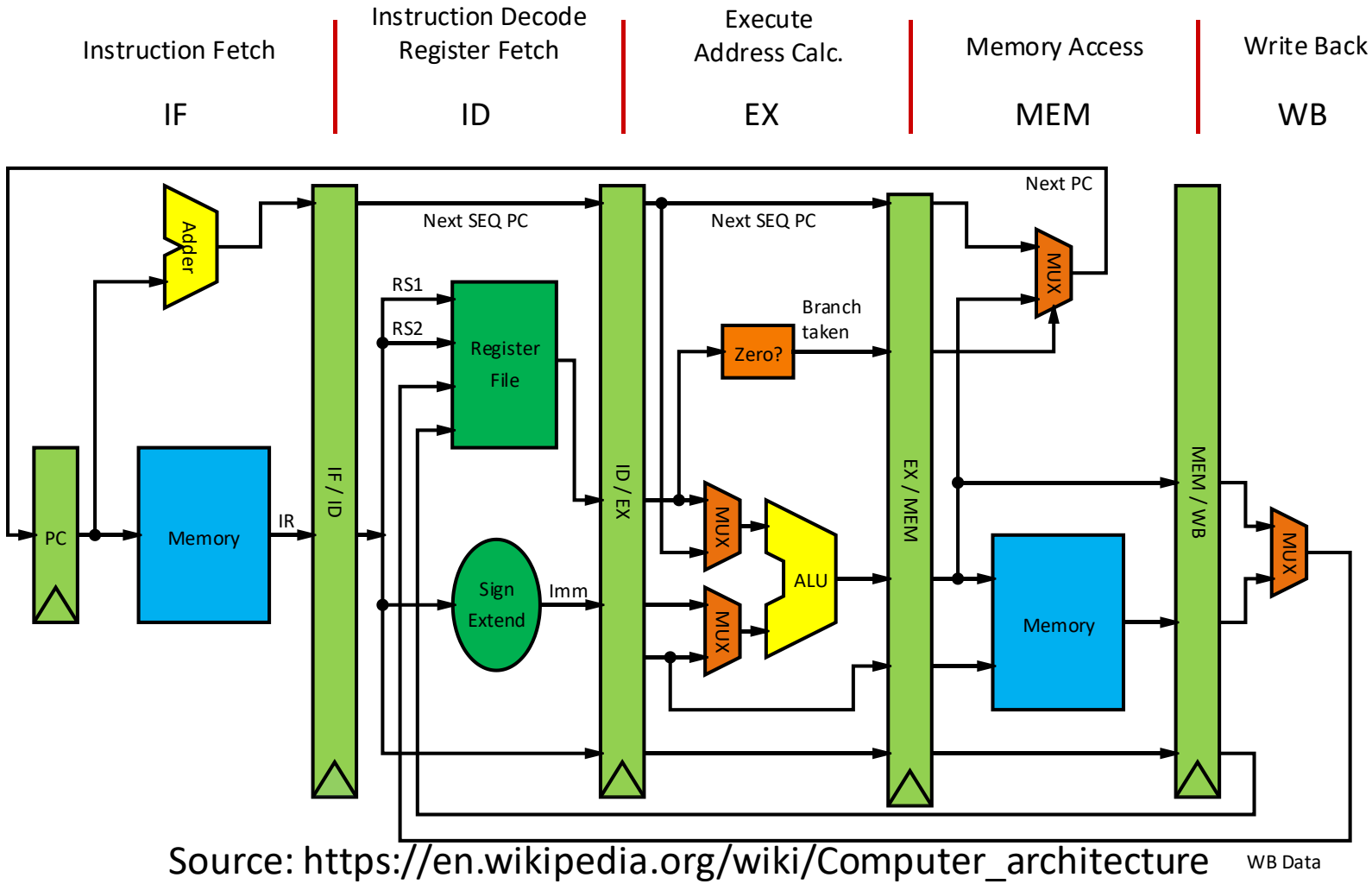
Computer Architecture

- "Computer architecture refers to those **attributes** of a computer system **visible** to programmers, or those attributes that have a **direct impact** on the **logical execution** of programs."

Computer Architecture example



Computer Architecture example



Source: https://en.wikipedia.org/wiki/Computer_architecture

Typical Attributes

- The instruction set (instruction types and operations)
- Basic data representation methods
- I/O mechanisms
- The basic units in the CPU
- Functions of the major components
- Instruction execution
- Memory organization (memory addressing techniques)
- The ways in which the basic components are interconnected

Course Overview

- Principle & organization of digital computers.
- Instruction Set Architecture of a Computer.
- Programming in assembly language (MIPS).
- Performance issues in computer architecture.

Why this Course ???

- To be professional in any field of computing today, not to regard the computer just as a **black box** executing programs by magic.
- To understand functional components that build up a computer system, their characteristics, performance, & interaction between them.
- To understand computer architecture in order to develop a program that runs efficiently on a system.
- To understand the tradeoff among various component features, such as CPU clock speed vs. memory size by design a system

Course Outcomes

- Students who complete this course will be able to
- Explain the structure of a computer system and deeply understand how it works at the hardware level.
- Develop assembly language programs that include complex constructs.
- Design and build basic software components which work efficiently on a known architecture.
- Analyze the performance of computer architecture and organization.

Course Schedule

Introduction to Computer Abstraction and Technology	Week 1-2
Instructions – Language of the Computer with MIPS	Week 3-5
Arithmetic for Computers	Week 6-7
The Processor	Week 8-9
Memory Systems	Week 10-11
Storage and Other IO topics	Week 12-14

Discussion

- Email: thanhbinh@hcmut.edu.vn
- Feel free to talk with me :)).
  - Room: TBD.
  - Time: TBD.
  - Days: TBD.

Course Materials

- Lectures:
  - Bk-elearning (http://e-learning.hcmut.edu.vn/)
- Textbooks:
  - David A. Patterson and John L. Hennessy, Computer Organization and Design: The Hardware/Software Interface, Fifth Edition, Morgan Kaufmann Publishers, 2017.
  - Pham Quoc Cuong, "Kiến trúc Máy tính", Nhà xuất bản Đại học Quốc gia TPHCM, ISBN: 978-604-73-4662-2
- Some well-known online courses
  - Edx, Coursera, Udemy,

Course Evaluation

- Assignments: 30%
- Lab works: **10%**
- Midterm exam: 20%
- Final exam: 40%

Question???