Operating Systems and Platform Wars

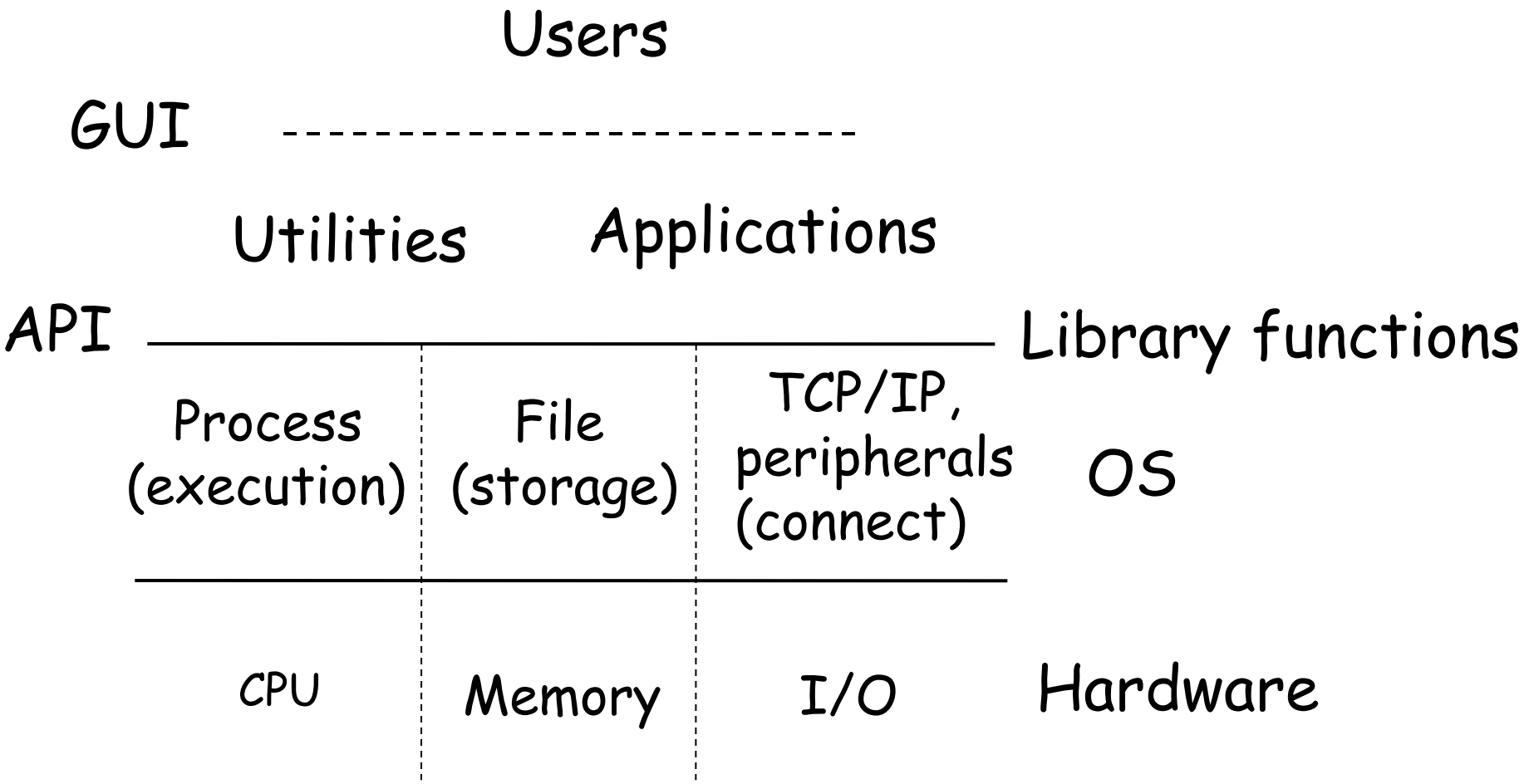
❖ 학습요령

- OS의 정의 및 필요성 이해
- Platform, platform dependency, platform war 이해
- Java technology, smartphone war 이해

Why Buy Computer?

- CPU (program execution)
  - Computation, run applications
- Memory (storage)
  - Data processing (business computing, database)
    - Banking system
    - YouTube, Google database
- I/O (connectivity)
  - Internet, monitor/keyboard, USB, …

What is OS?


Users
GUI
Utilities
Applications
API
Library functions
Process (execution)
File (storage)
TCP/IP, peripherals (connect)
OS
CPU
Memory
I/O
Hardware

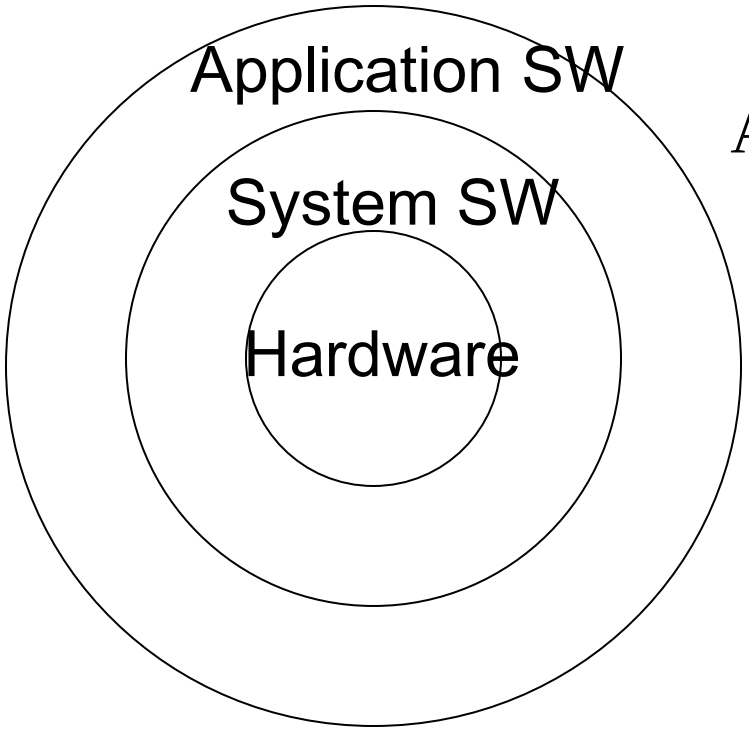
What is OS?

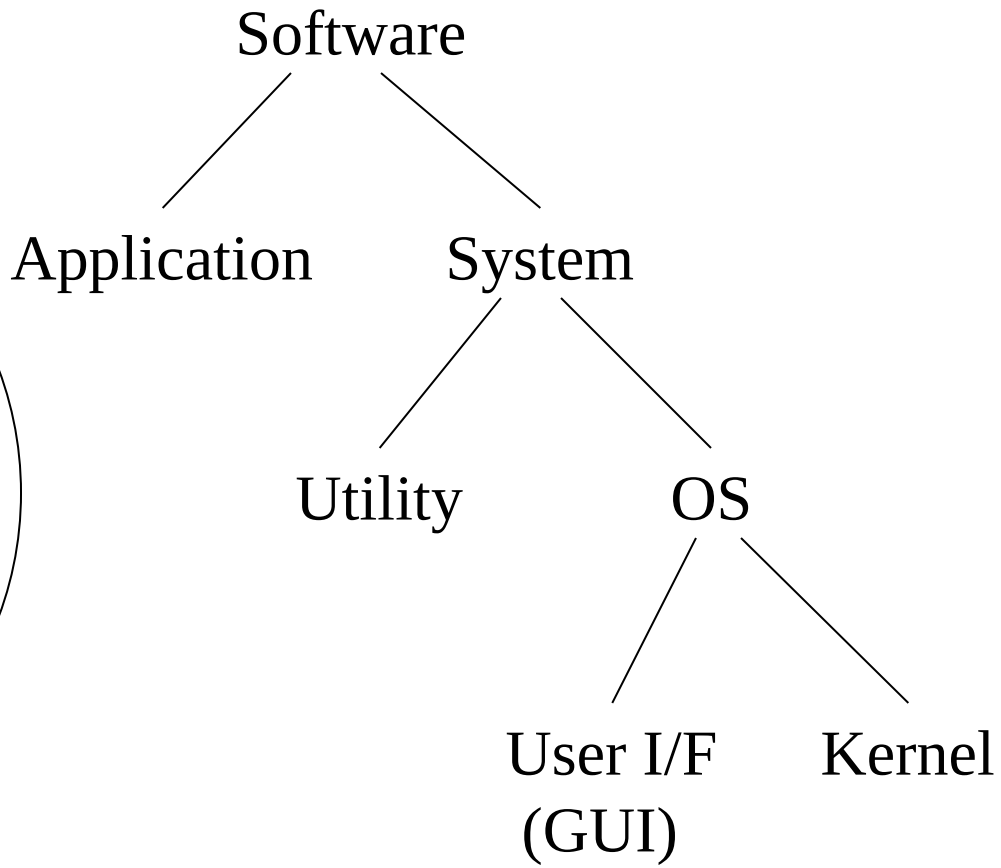
- Make hardware easy to use by providing library
  - CPU (program execution)
    - process_create(), process_kill(), …
  - Memory (storage)
    - file_copy(), delete_folder(), file_rename(), …
  - I/O (connectivity)
    - Socket("naver.com", 80), monitor_write(), …
- GUI, utilities (common applications for all users)
- 공유자원의 사용관리 및 보호 (응용 프로그램간의 조정)

† Programmer: OS API 이용하여 Applications 개발

What is OS?

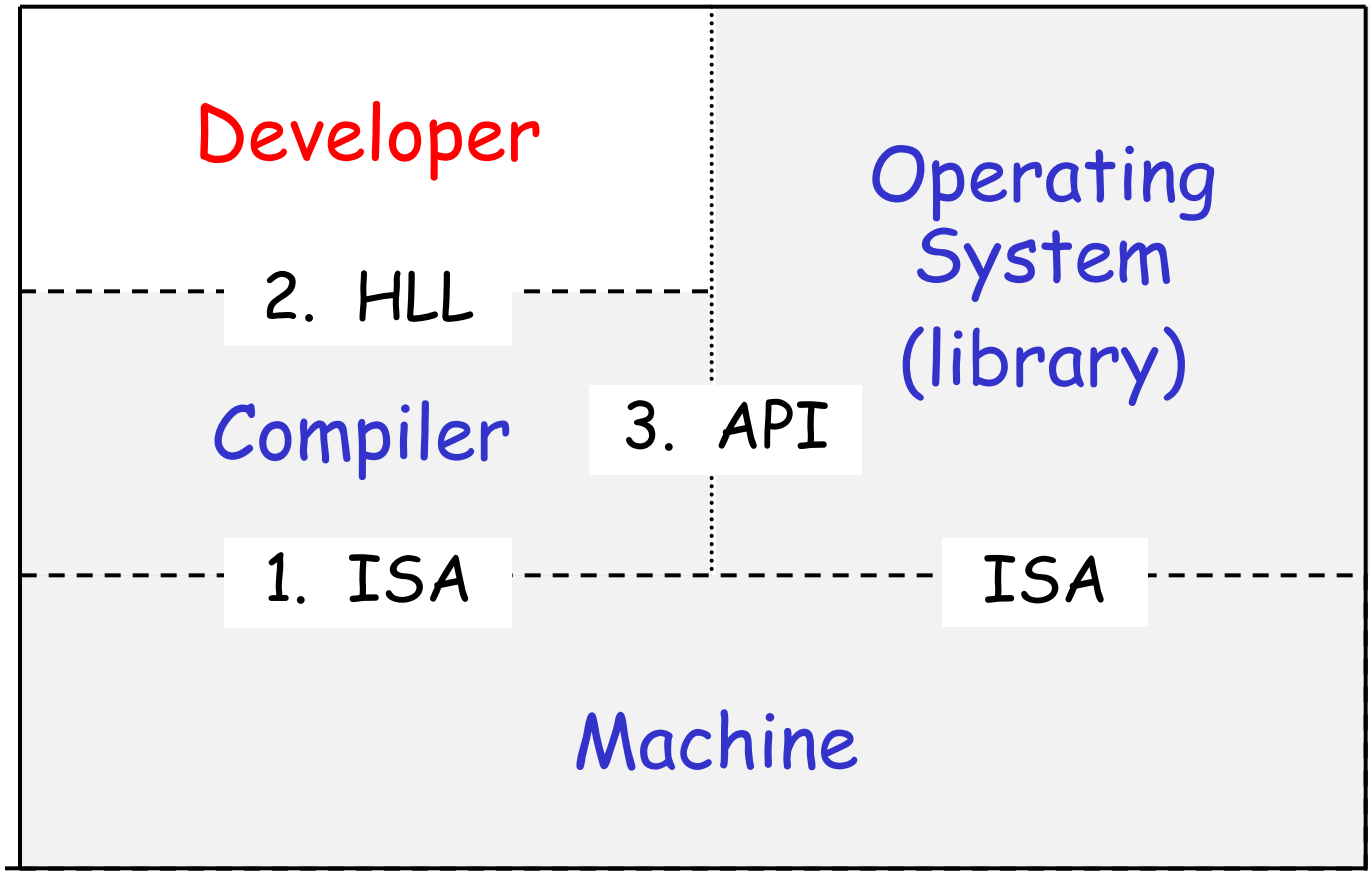
- Map to previous figure



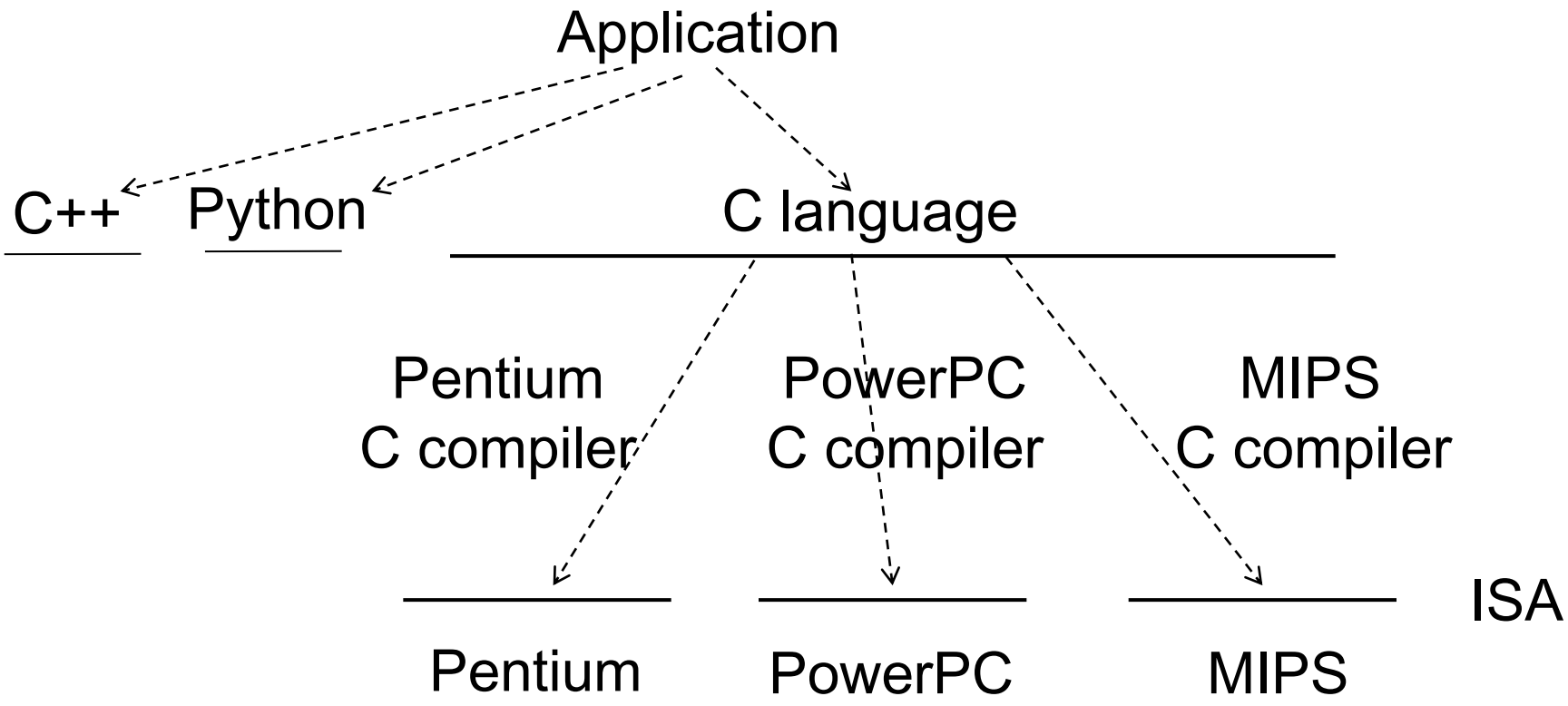


Using OS API: Third Major I/F

- Three interfaces, three key products and their services

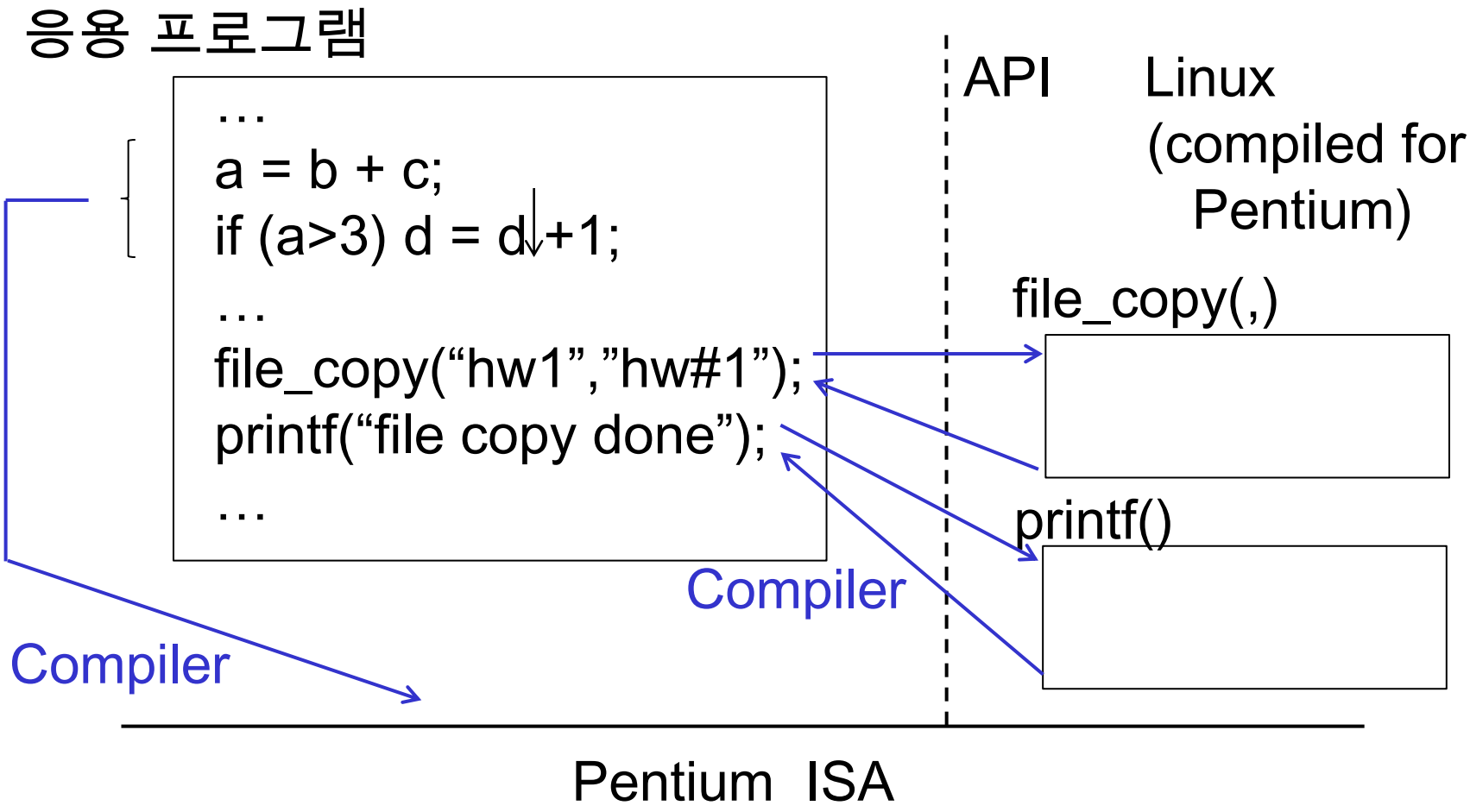


CPU Dependency (skip; 반복)



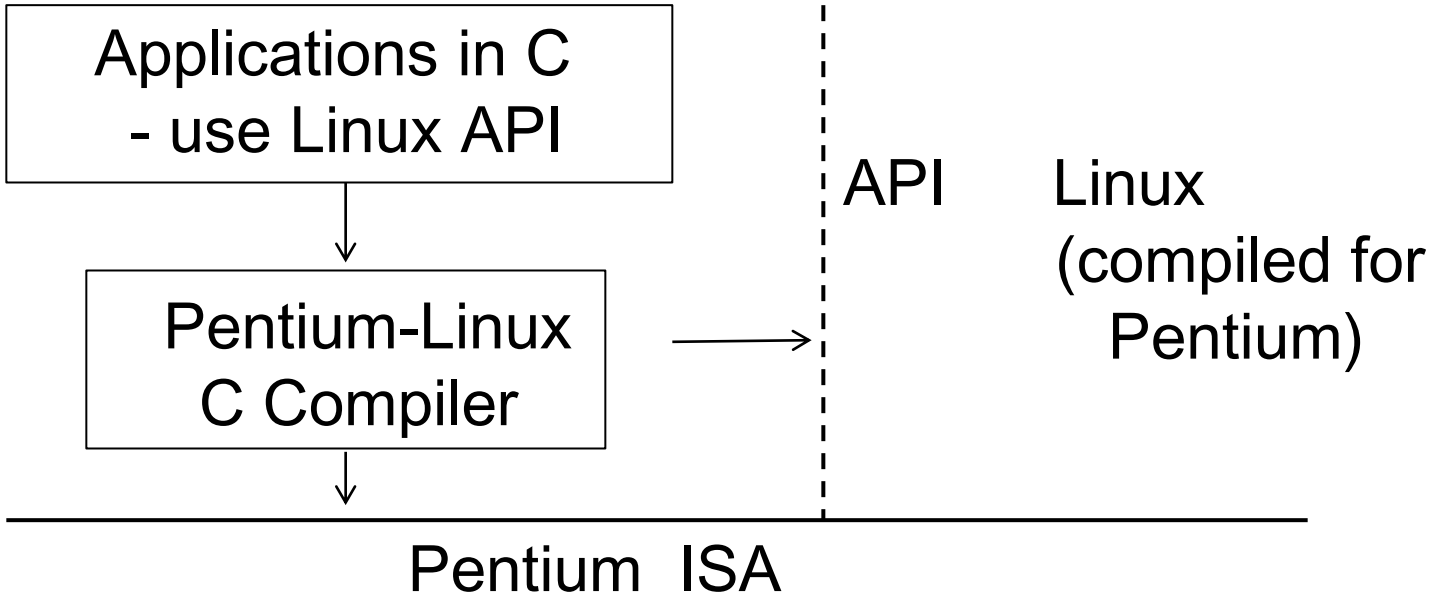
- You buy compiled code (e.g., Word for Pentium)
- When upgrading your PC, you choose Pentium (독점성)
  - Similar dependency exist for OS also

CPU and OS Dependency



- OS change: major change in applications
  - Windows programmer, Linux programmer

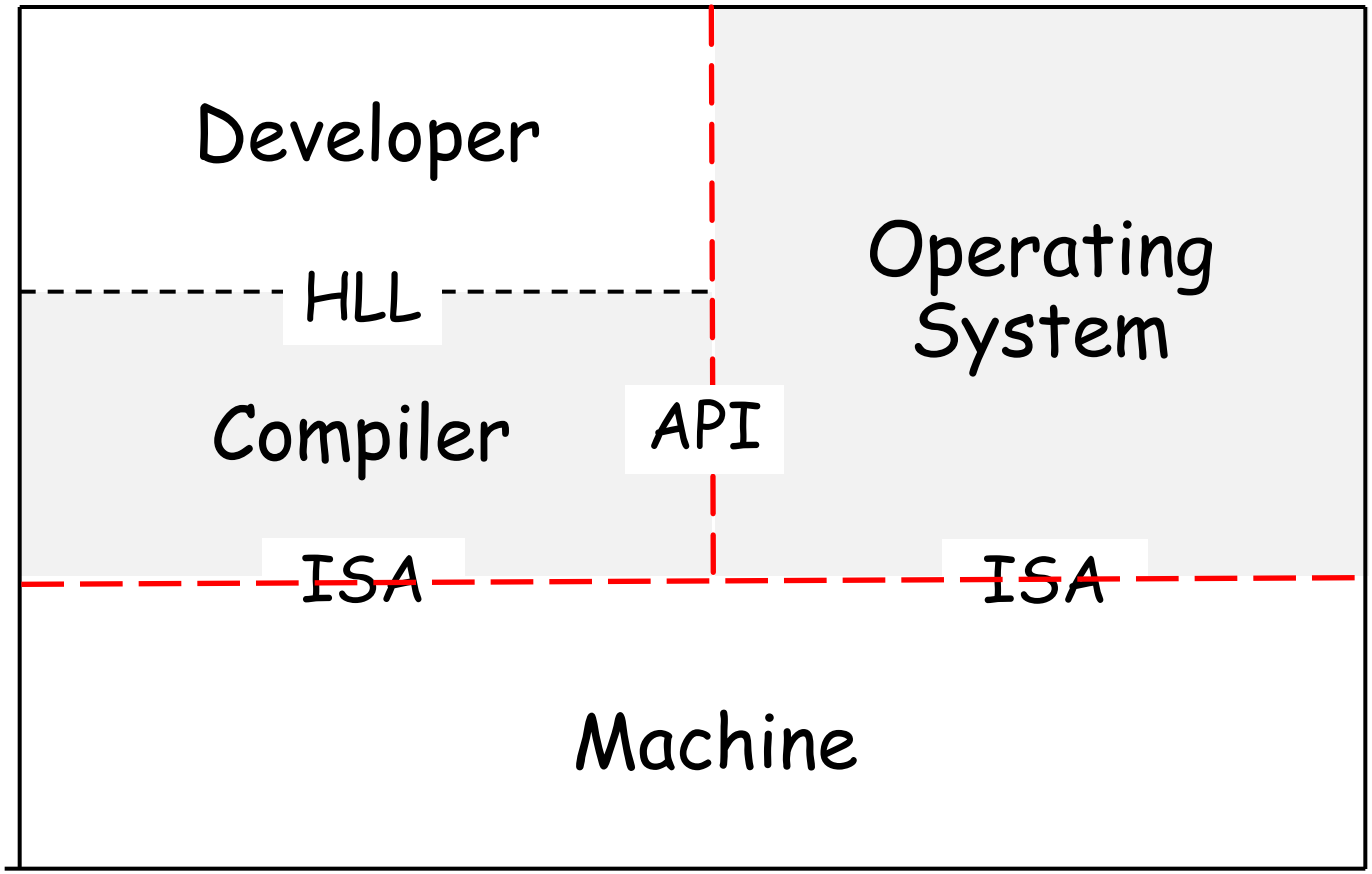
CPU and OS Dependency



- Application programmer
  - Determine OS and CPU (and language) first
- All applications: CPU and OS dependent
  - Once you buy applications for Linux-Pentium, stuck

Platform

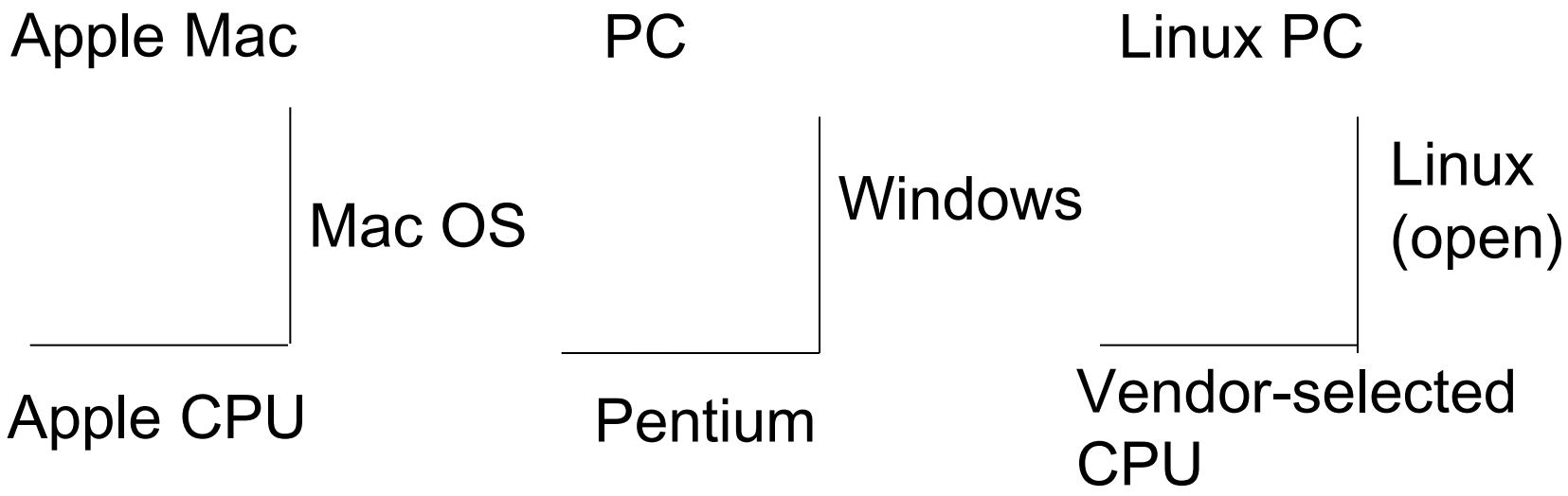
- Program execution environment
  - Commonly CPU plus OS API (e.g., PC Wintel platform)
- Platform dependency (독점성)



Platform Wars

- Will you be happy to own popular platform?
  - Size of user base, exclusive market share
- Big winners
  - IBM mainframe: CPU + OS
  - PDP/VAX minicomputer: CPU + OS
  - Unix: OS (ported on various CPUs)
    - Linux
  - PC: MS Windows + Intel (you keep buying upgrades)
  - Apple Mac: CPU + OS

Personal Computer Platforms



- Compete for user base
  - Apple Mac: Apple own platform (closed)
  - PC: Microsoft and Intel own platform
    - Anyone can build computer systems
  - Linux PC: any supported CPU and Linux (open OS)

From Wikipedia, UNIX Family Tree – Android/IOS?

Image of UNIX history:
http://en.wikipedia.org/wiki/File:Unix_history.svg
Evolution of UNIX and UNIX-like systems:
http://en.wikipedia.org/wiki/File:Unix_history-simple.svg

Java Technology and Smartphones

❖ 학습요령

- Dominant Internet application 의 위력 이해
- Java 기술과 smartphone 플랫폼 이해

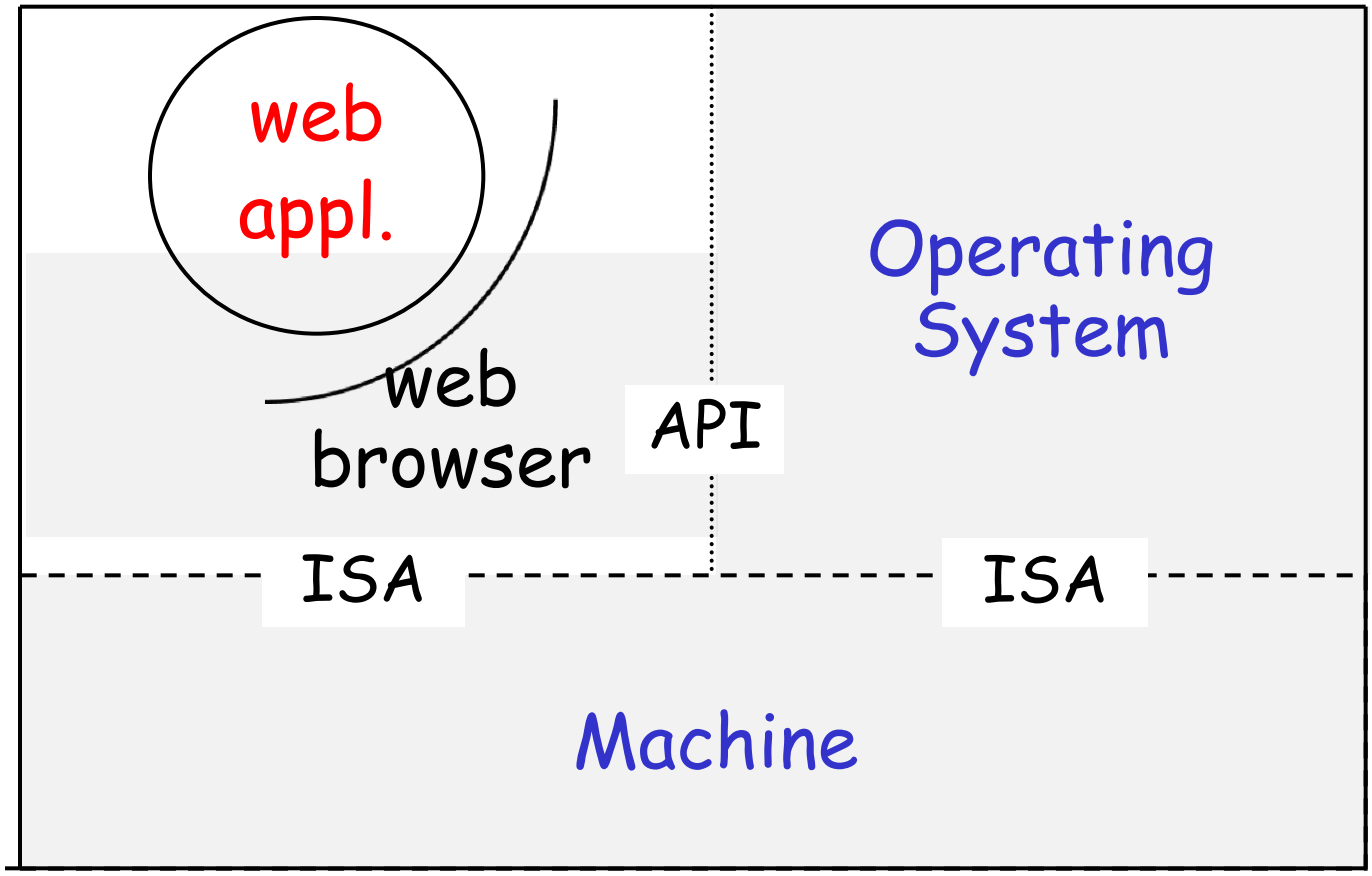
Internet and Web

- Large-scale computer networking since 1970s
  - Internet by USA government is one of them
- Web (Internet application) invented in 1990
- Graphic web browser by Andersen in 1993/1994
  - For PC, Mac, Unix

  † Netscape
- Web surfing: easy, fun, and useful
  - Killer application for Internet
  - Internet become one and only global network (1990s)
- Electronic commerce and Information Revolution

Web Browser Wars

- Microsoft, Netscape, SUN



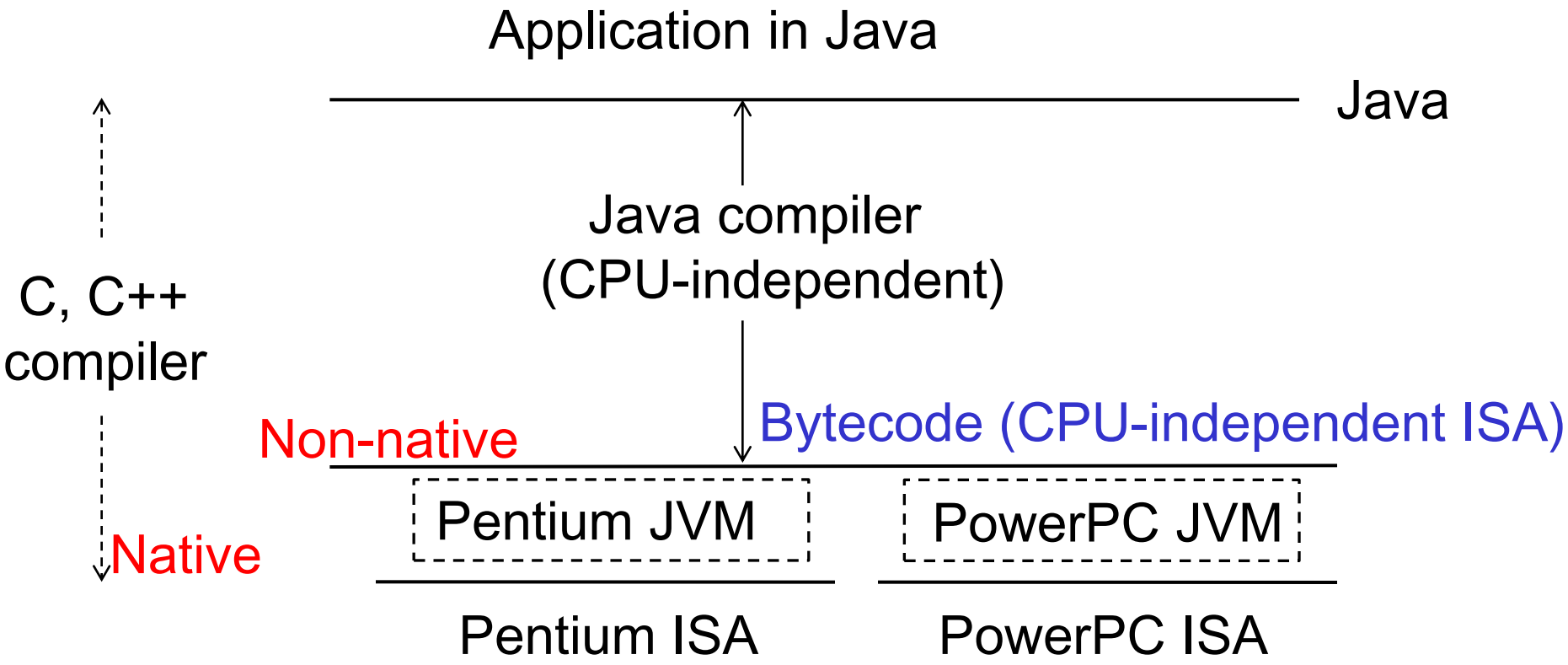
Internet Platform Wars

- Internet application layer
  - Web browser wars
    - Netscape vs. MS Explore
    - SUN Java vs. MS Explore
  - Multiple free browsers with similar capabilities
    - Too big to be owned by one company
    - Still competition continues
  - Google, Facebook, portal
    - Potential of dominant Internet applications (contents)

Smartphone Platform Wars

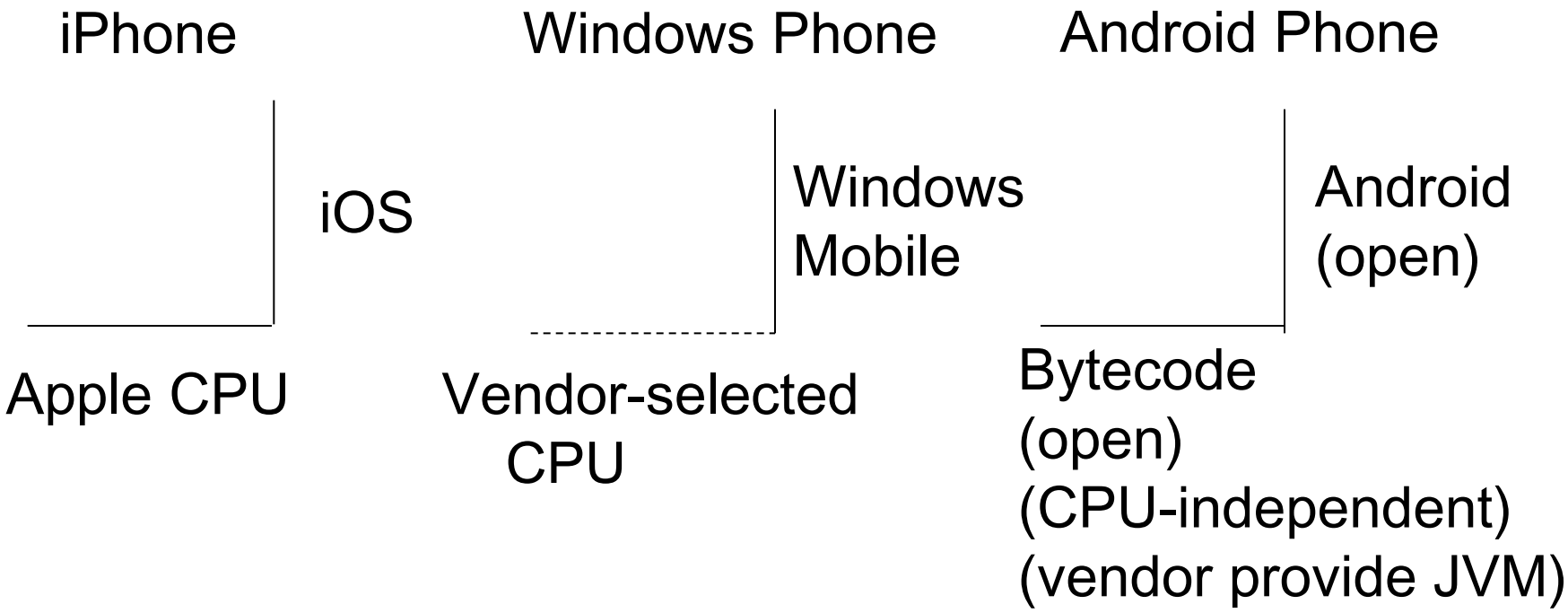
- Smartphone platforms
  - Google Android, iPhone OS, Windows Mobile OS, …
- † Java technology by SUN (Oracle)
  - Mostly under GNU General Public License
  - Billions of mobile phones run Java

Additional Interface with Java



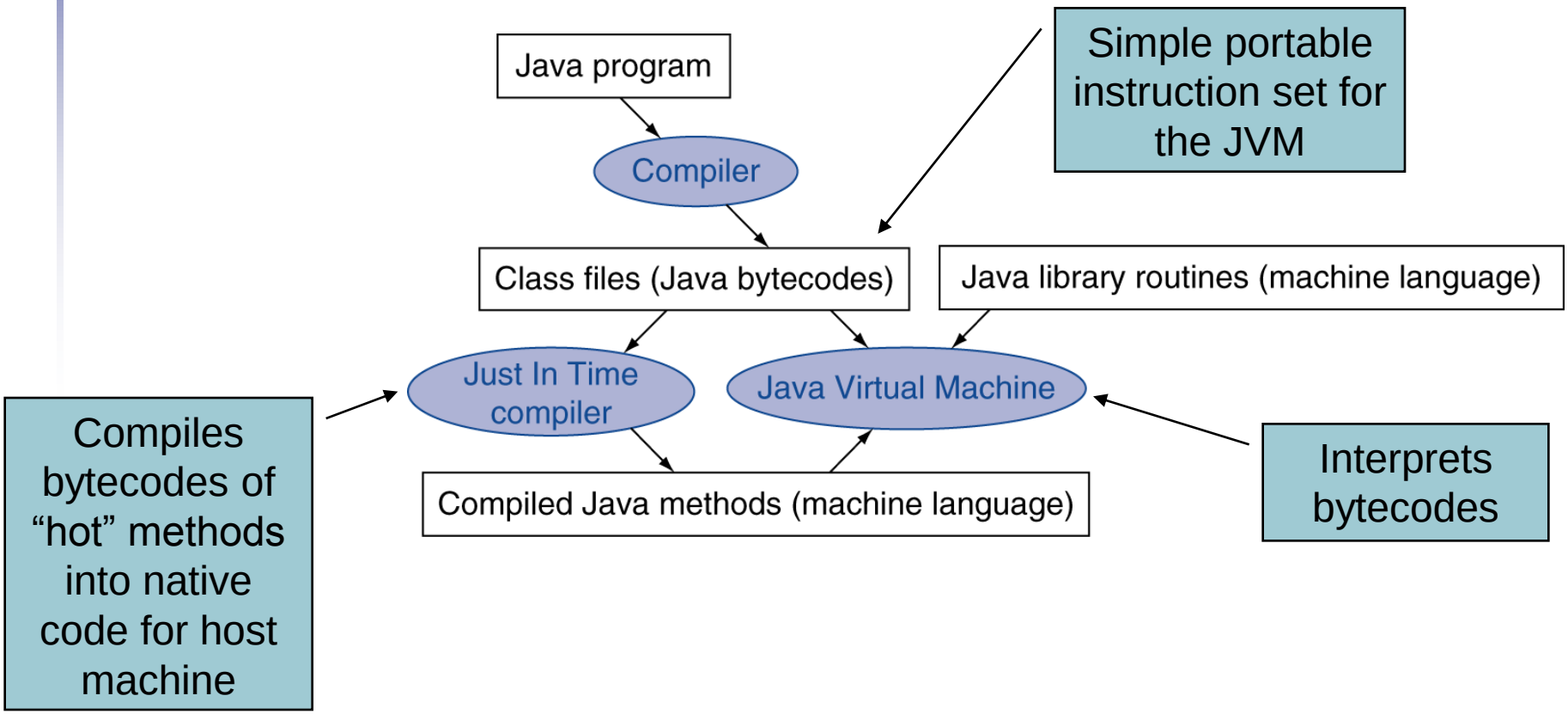
- JVM (Java Virtual Machine) per CPU
  - Read bytecode and translate it into CPU instructions
  - Much simpler than compiler
- Concept of mobile code by SUN (and browser war)

Smartphone Platforms and Java

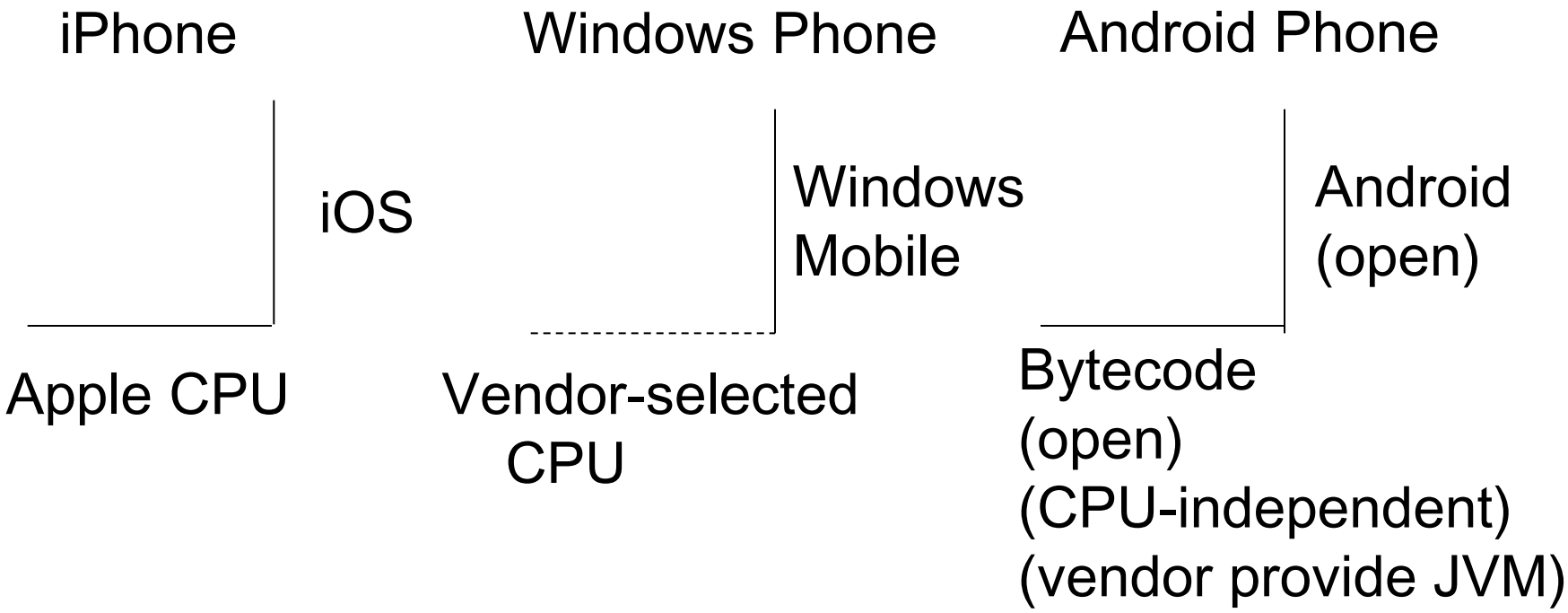


- Apple iPhone platform (closed)
- Windows Phone
  - Smartphone vendor select CPU, port OS
- Android phone
  - Vendor select CPU, port open Android, provide JVM

Starting Java Applications

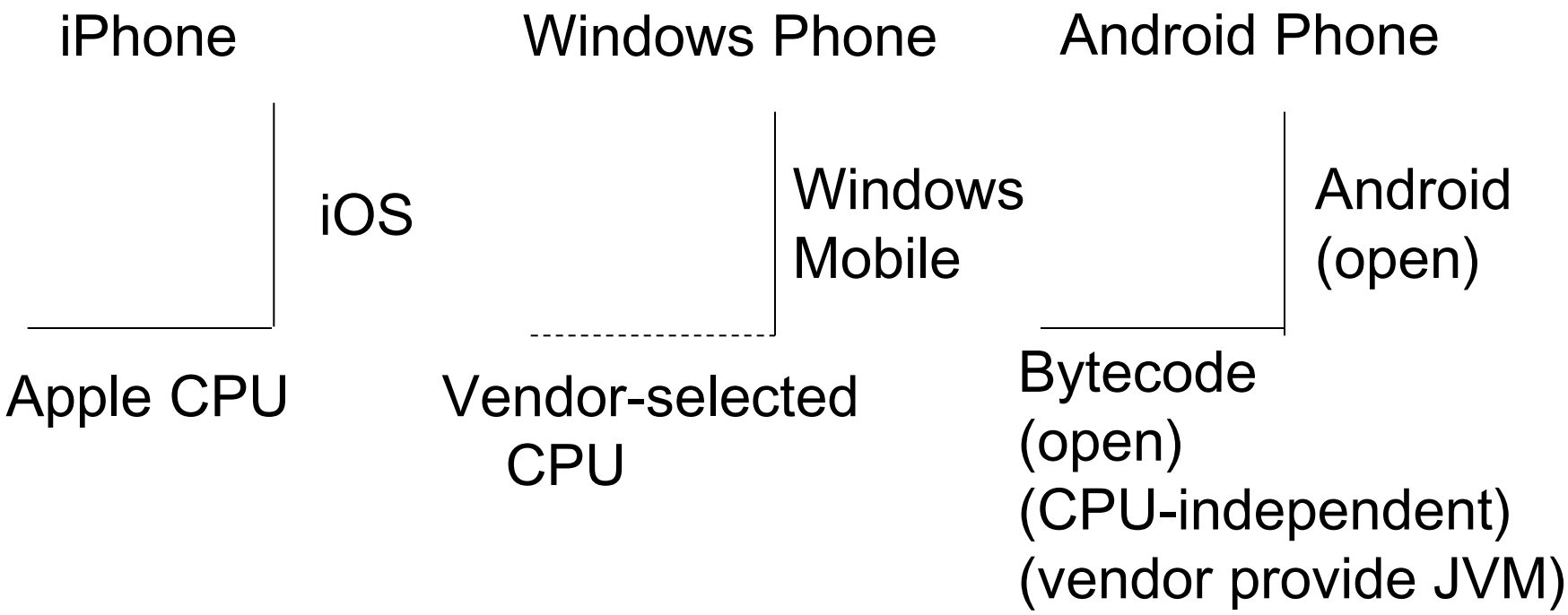


Smartphone Platforms and Java



- Which platform would you choose?
  - Application developer's perspective
  - Smartphone user's perspectives
  - Smartphone vendor's perspectives

Smartphone Platforms and Java



- Apple's business?
- Microsoft's business?
- Samsung's business? (Why pursue Bada and Tizen?)
- Android's business?
  - Is platform important?

Smartphone Korea

- Why Korean companies in Android?
  - Can select or build AP
  - Android OS is open
  - More developers, applications, and users
- Why users in Android?
  - More applications, can move among Android phones?
  - Single company (iPhone) vs. many companies
- Who is smiling?
  - Google control Android applications (e.g., advertisement)
- Android phones vs. Android OS (소모품 vs. 독점성)

† What's next?

Java VM vs. Dalvik VM

- Java technology by Oracle
  - Mostly under GNU public license
  - Want the interface to be preserved
- Google Android
  - Dalvik virtual machine

    .java ----> .class --- (dx tool in DVM) ---> .dex

† JVM: stack machine

  - DVM: register-based machine

    † Dalvik Turbo virtual machine