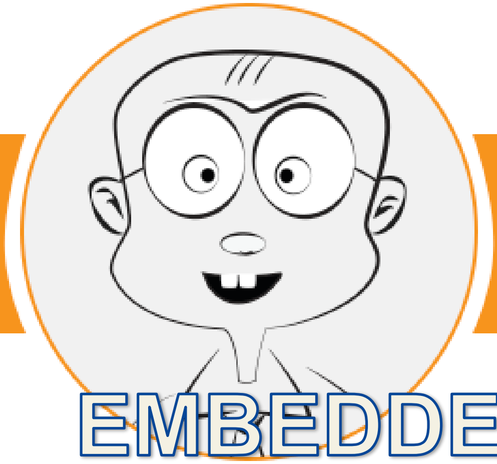

EMBEDDED SYSTEM COURSE

LECTURE 2: EMBEDDED SOFTWARE DEVELOPMENT

Learning Goals

- Understanding how the does the code has been compiled, and generated to an image.
- Understand how does loading/debugging process happen.
- Understand most basis concepts regarding software engineering: pooling & interrupt.
- Having knowledge on how to access peripheral via memory mapped.

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Embedded Software Overview

Definition

Embedded software is ***computer software***, written to control
tiêu biểu
machines or devices that are not typically thought of as
cụ thể
computers. It is typically specialized for the particular hardware
that it runs on and has ***time and memory constraints***. This term
thay thế cho nhau
is sometimes used interchangeably with ***firmware***

(wiki)

Embedded Software Overview

Features:

- Acts directly with and on the hardware

Nguồn lực khá hạn chế

- Quite limited resources.

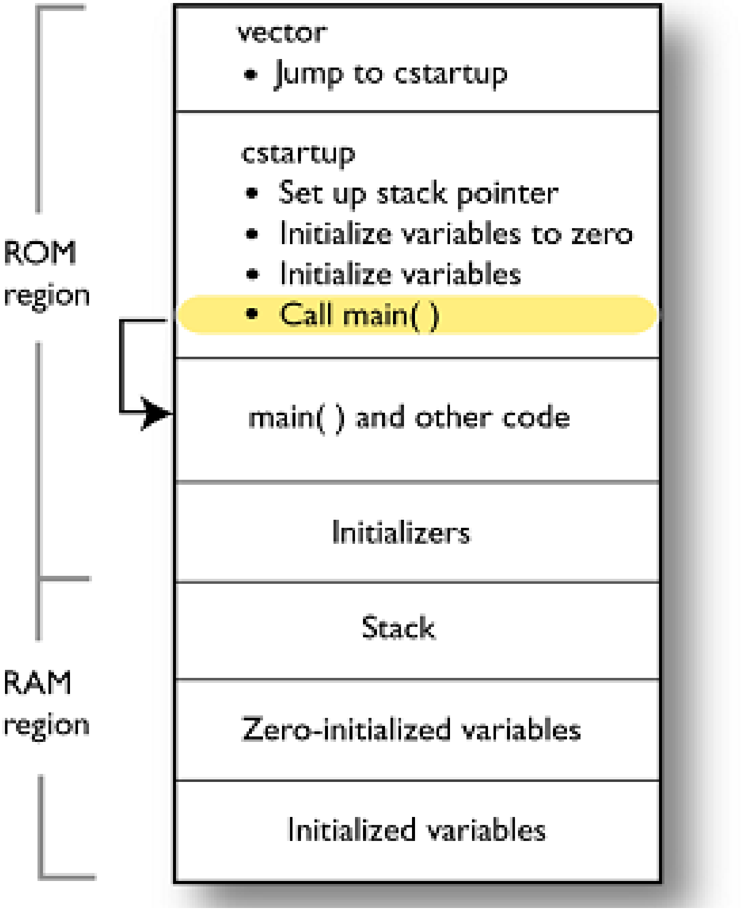
- Using a “Non-hosted environment”

Embedded Software Overview

Các thành phần:

Common Components:

- Reset vector
- Startup code
- Application code
- Libraries
- Interrupt/Exception Handler



Embedded Software Overview

What is needed to start:

- Development suites
- Development board
- Debug Adapter
- Software device driver
- Documents and other resources.

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Embedded Software Development Flow

Software Development Steps in IDE

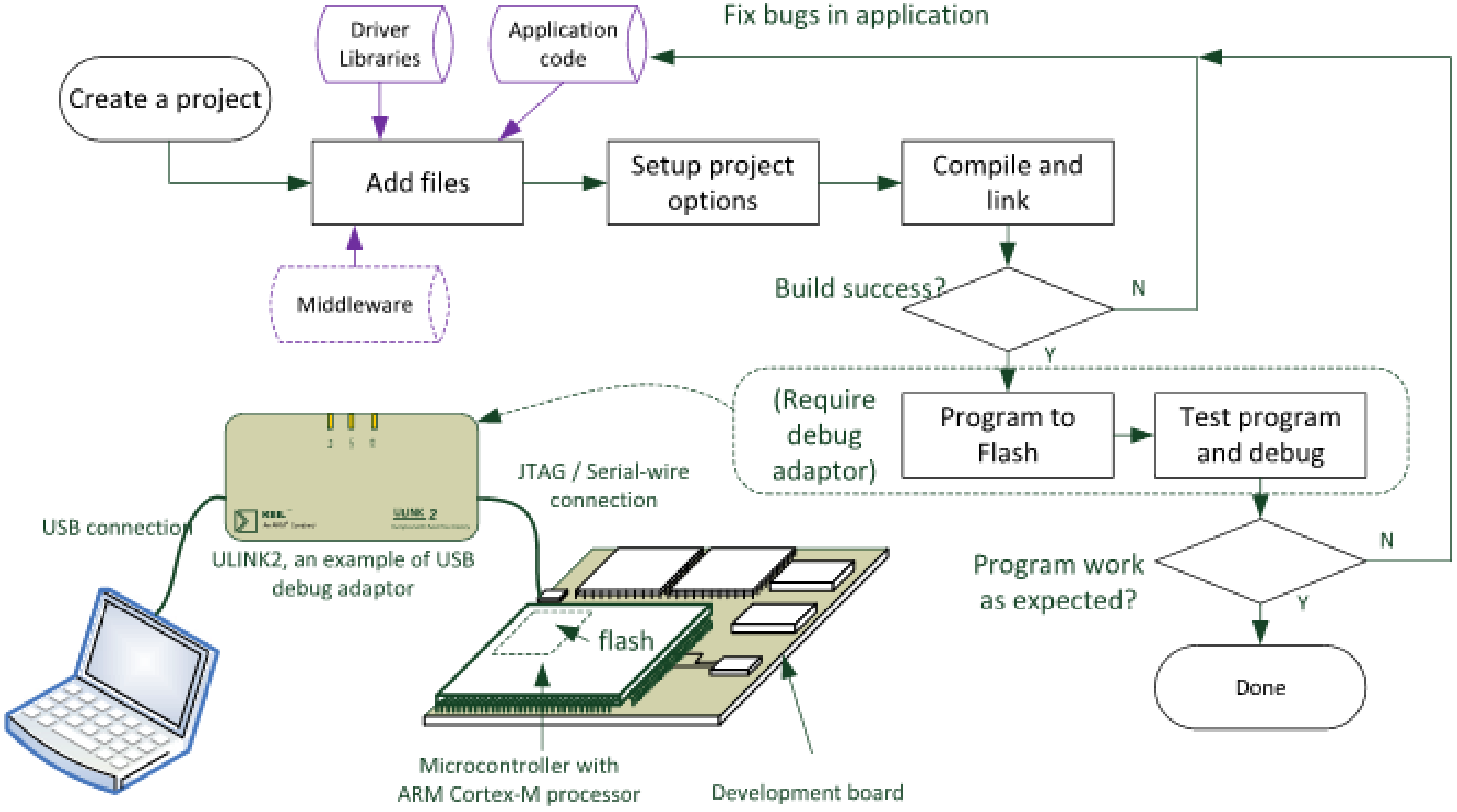
- Create project
- Setup project option
- Compile & Link
- Flash Program

Hành hình

- Execute & Debug

Embedded Software Development Flow

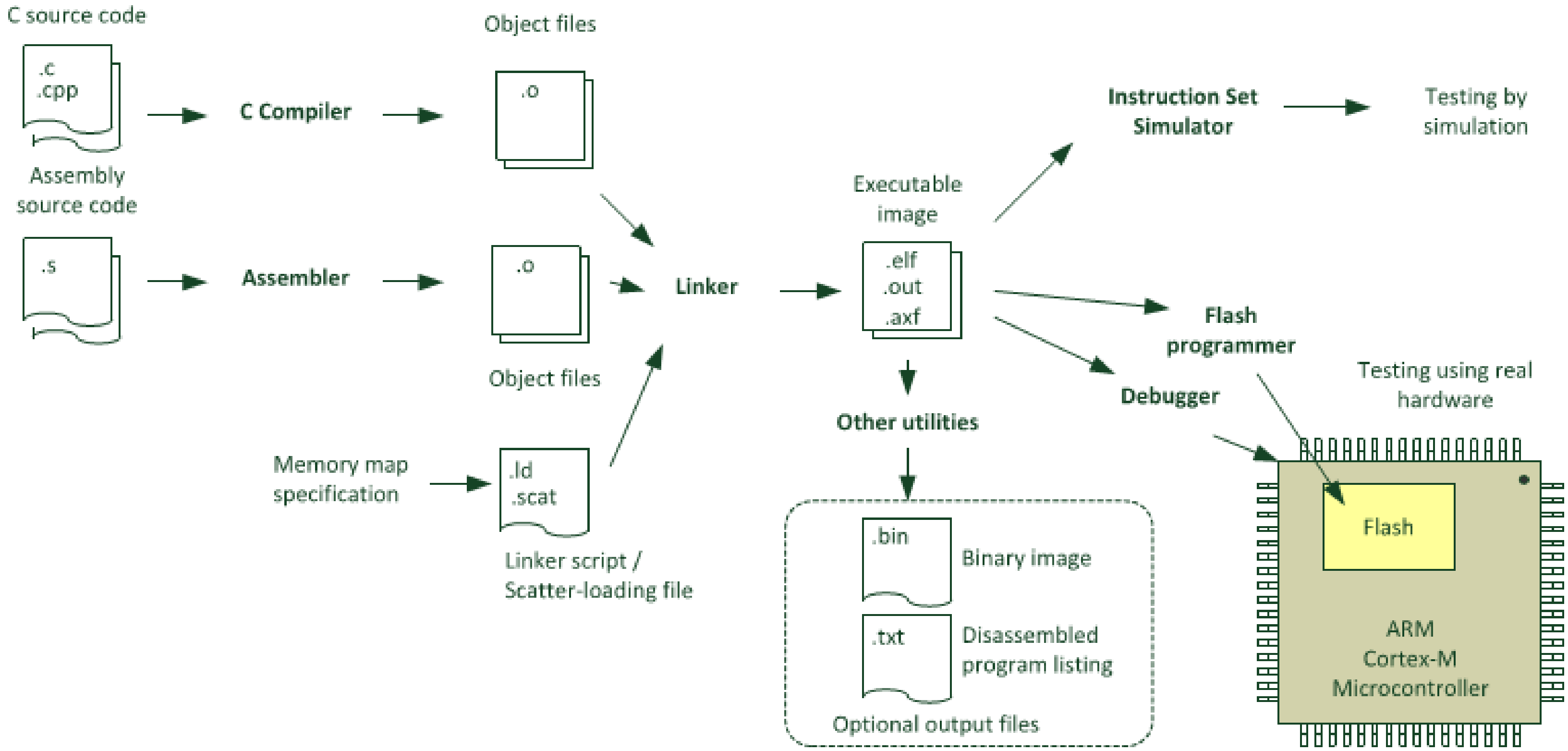
Development Flow



A simplified software development flow

Embedded Software Development Flow

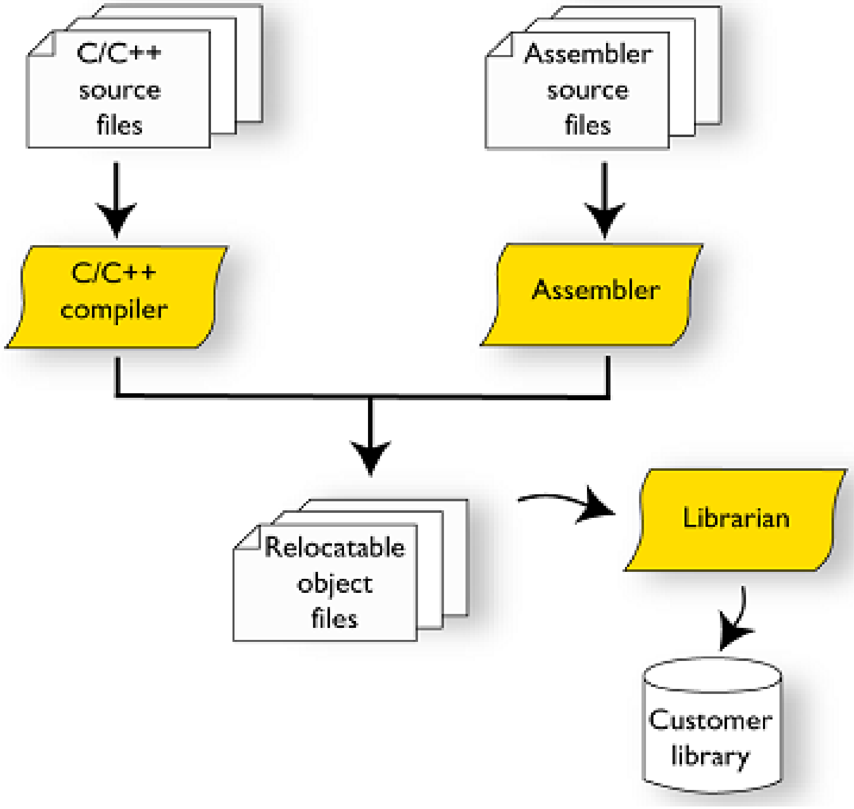
Compilation Flow



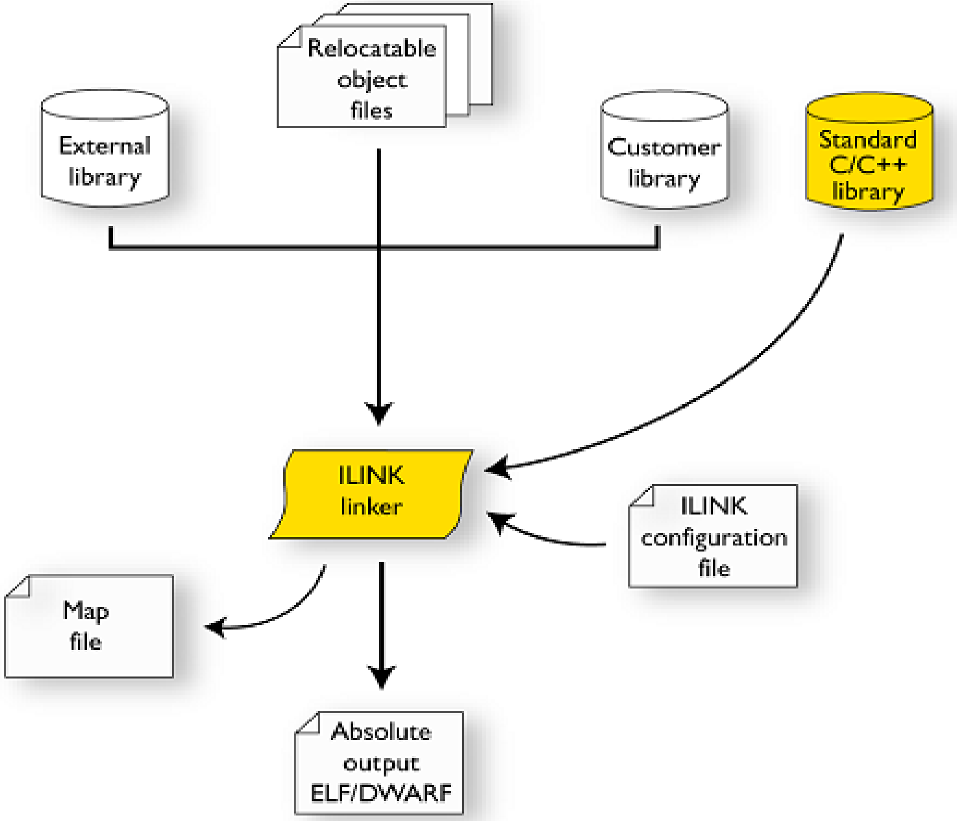
Common software compilation flow

Embedded Software Development Flow

IAR Compilation Flow



IAR Link Flow



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Software Flow

Pooling

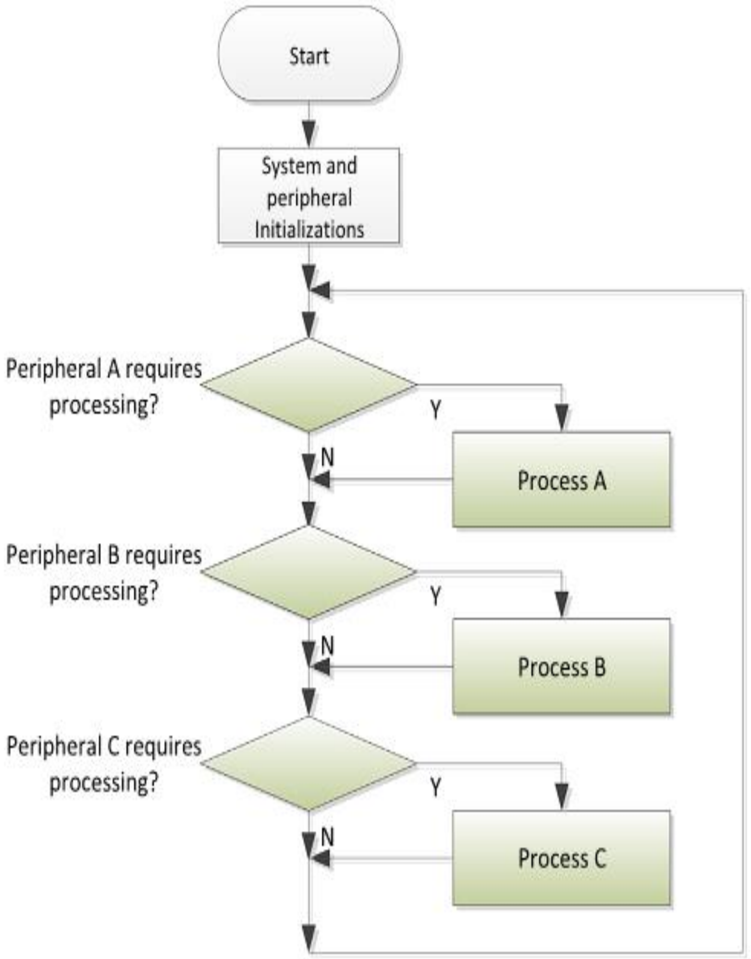
- Continuously checking the status of a peripheral; e.g. read data from an input keyboard.
- Polling is tương đối relatively thẳng thắn straightforward in design and programming with the hy sinh sacrifice of system performance.

Interrupt

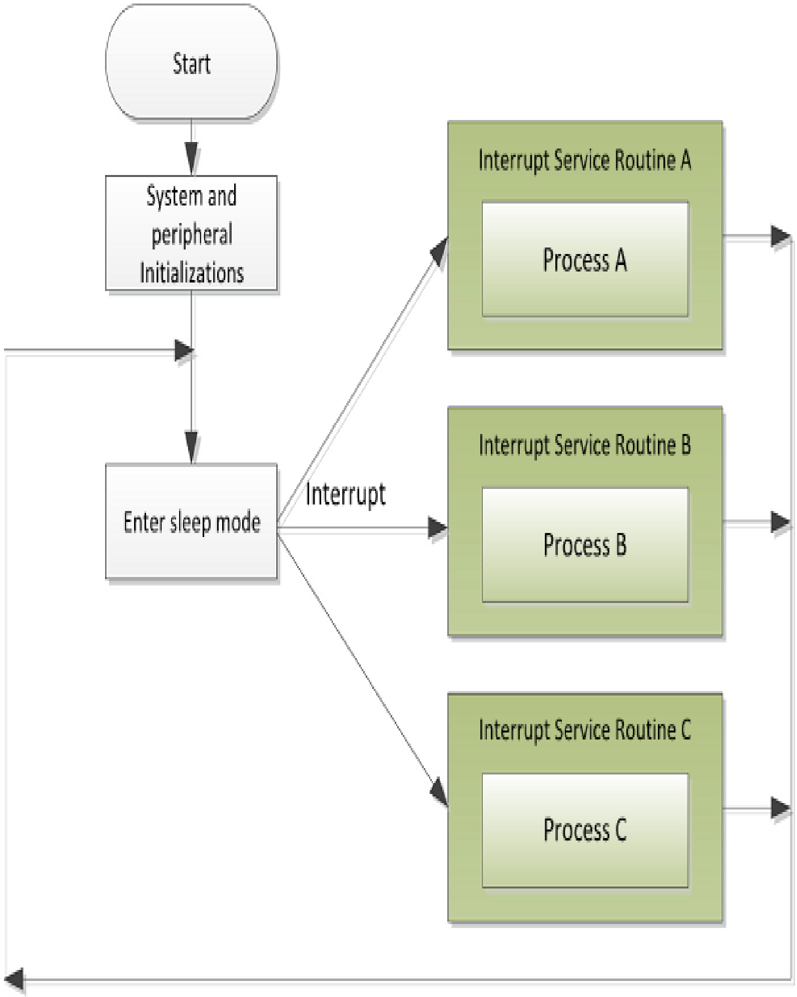
- Device “interrupts” CPU to biểu thi indicate that it needs service.
- These events only biểu thi occur if the interrupt is enabled.
- A handler (software to service the interrupt) is Thực thi executed.
- CPU returns to where it left off in the main program.

Software Flow

Pooling


Start
System and peripheral Initializations
Peripheral A requires processing?
Y
N
Process A
Peripheral B requires processing?
Y
N
Process B
Peripheral C requires processing?
Y
N
Process C

Interrupt


Start
System and peripheral Initializations
Enter sleep mode
Interrupt
Interrupt Service Routine A
Process A
Interrupt Service Routine B
Process B
Interrupt Service Routine C
Process C

Software Flow

Interrupt Process:

cho đến khi

- CPU waits until the current instruction has finished being executed.

nội bộ

- Save the contents of internal registers of the CPU & the state

ở trong

information within Control Unit

- The PC is loaded with address of the Interrupt Service Routine (ISR)
- ISR is executed.
- Return program from interrupt.

Software Flow

Interrupt Handler Features:

- Differs from subroutine because it is executed at any time due to interrupt, not due to Call

Nên thực hiện càng nhỏ càng tốt

- Should be implemented as small as possible

Nên thực hiện trong thời gian ngắn.

- Should be executed in short-time.

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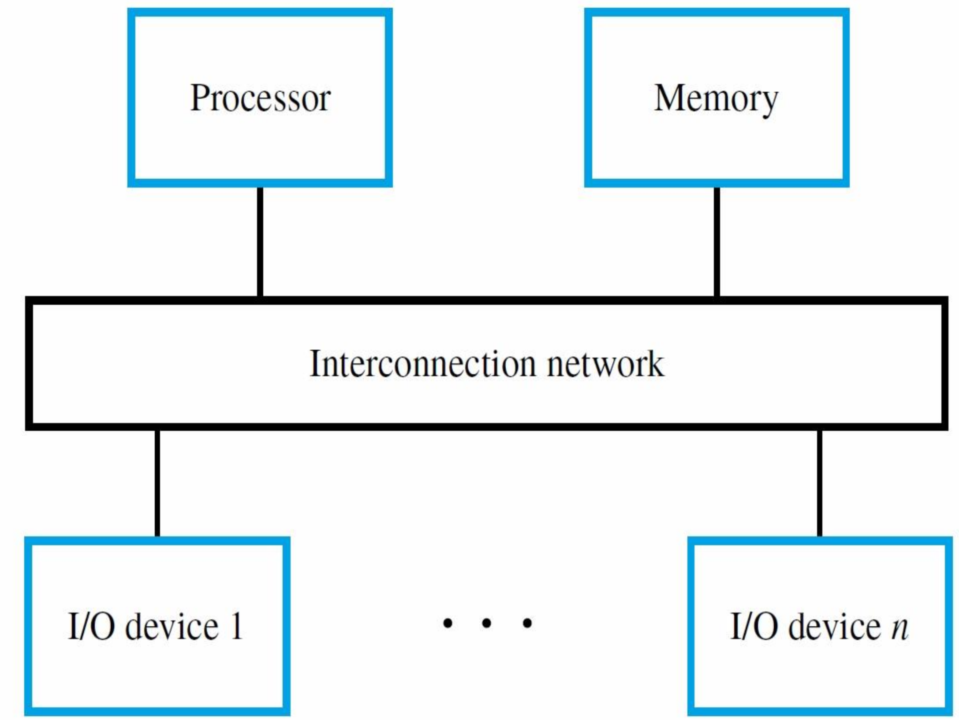
Input Output Basic

Truy cập

Accessing I/O Devices

- Computer system components communicate xuyên qua through an sự kết nối interconnection network

- Memory-mapped I/O allows I/O registers to be accessed as memory locations. As a result, these registers can be accessed using only Load and Store instructions



Input Output Basic

I/O Device Interface

- Provides the means for data transfer and exchange of status and control information
- Includes data, status, and control registers accessible with Load and Store instructions
- Memory-mapped I/O enables software to view these registers as locations in memory

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Summary

- Embedded Software, or firmware, is program that specialized for particular processor

- Embedded software developments including: Create project, compile & link to generate imagine; load & debug in hardware

- There are two kinds of software flow: pooling & interrupt.

- Peripheral (IO) registers are memory-mapped and therefore can be accessed as the memory.

Question and Answer

Thanks for your attention !

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