



VHDL Design and Implementation of an Instruction Set Architecture
Z. Navabi

Course on Details of Hardware of Processors (Processors)

VHDL Design and Implementation of an
Instruction Set Architecture

A

Zain Navabi

Slides prepared by Katayoon Basharkhah



Topic 1

Introduction To Processing Systems

Zain Navabi

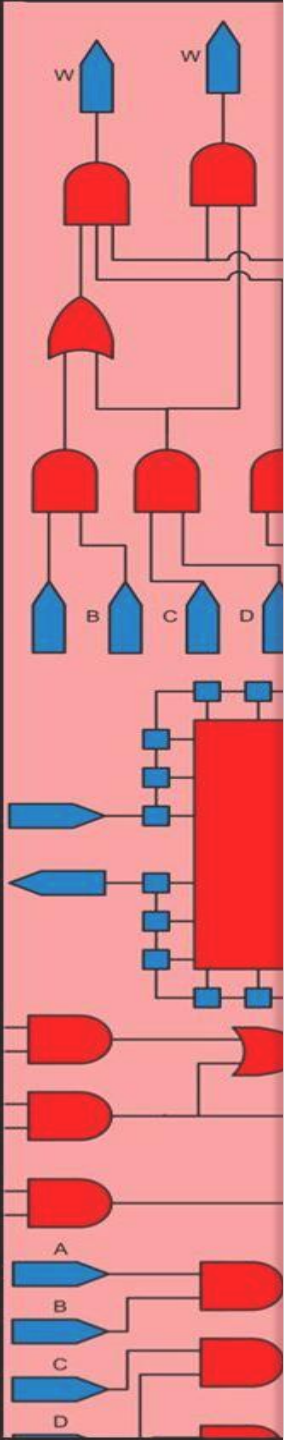
Course Roadmap

	Topic 1	Topic2	Topic 3	Topic 4
Goals	A Processing System <div>Embedded System Introduction</div>	Memory Model <div>Peripheral Hardware</div>	Processor Devices	Processor Architecture <div>A simple ISA</div>
Contents	<div> <ul style="list-style-type: none"> •CPU •Instructions •Memory-Map •Memory •I/O device </div> <div> <p>Introduction to processor-based system, general concepts and different components of the system</p> </div>	<div> <p>Different memory structures Memory mapping in the bussing and devices' communications.</p> </div> <div> <ul style="list-style-type: none"> •SDRAM •ROM •SRAM </div>	<div> <ul style="list-style-type: none"> • Address Logic • Data Registers • Handshaking • Interrupt </div>	<div> <ul style="list-style-type: none"> • SAYAC Instructions • Datapath Design • Controller Design • Simulation and FPGA Synthesis </div> <div> <p>A sample processor named SAYAC. Processor internal architecture starting form the processor instruction set and coming down to the all RTL components of the processor datapath and controller.</p> </div>

Introduction To a Processing System

Learning Outcomes:

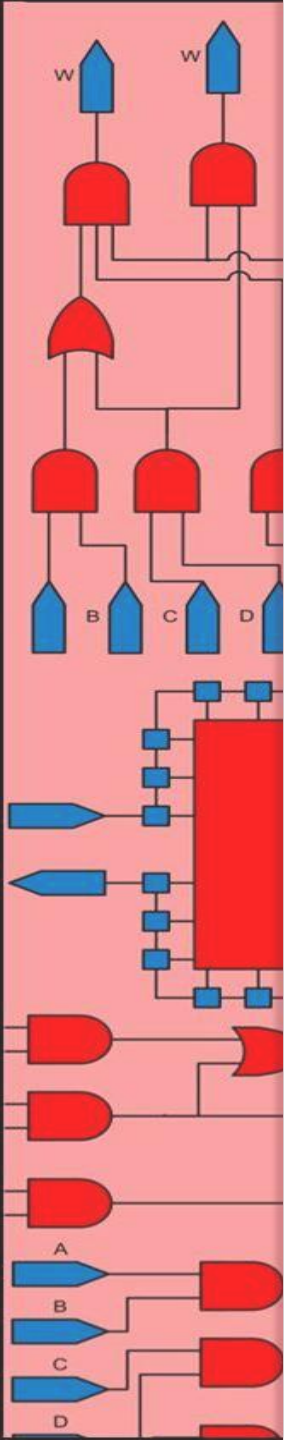
- *Learn* the general concepts of embedded systems
- *Learn* components of an embedded design
- *Learn* communication interfaces



Introduction To a Processing System

Outline:

- Embedded System Layers
- Hardware Components
- Processor Execution Model
- Processor External Communication

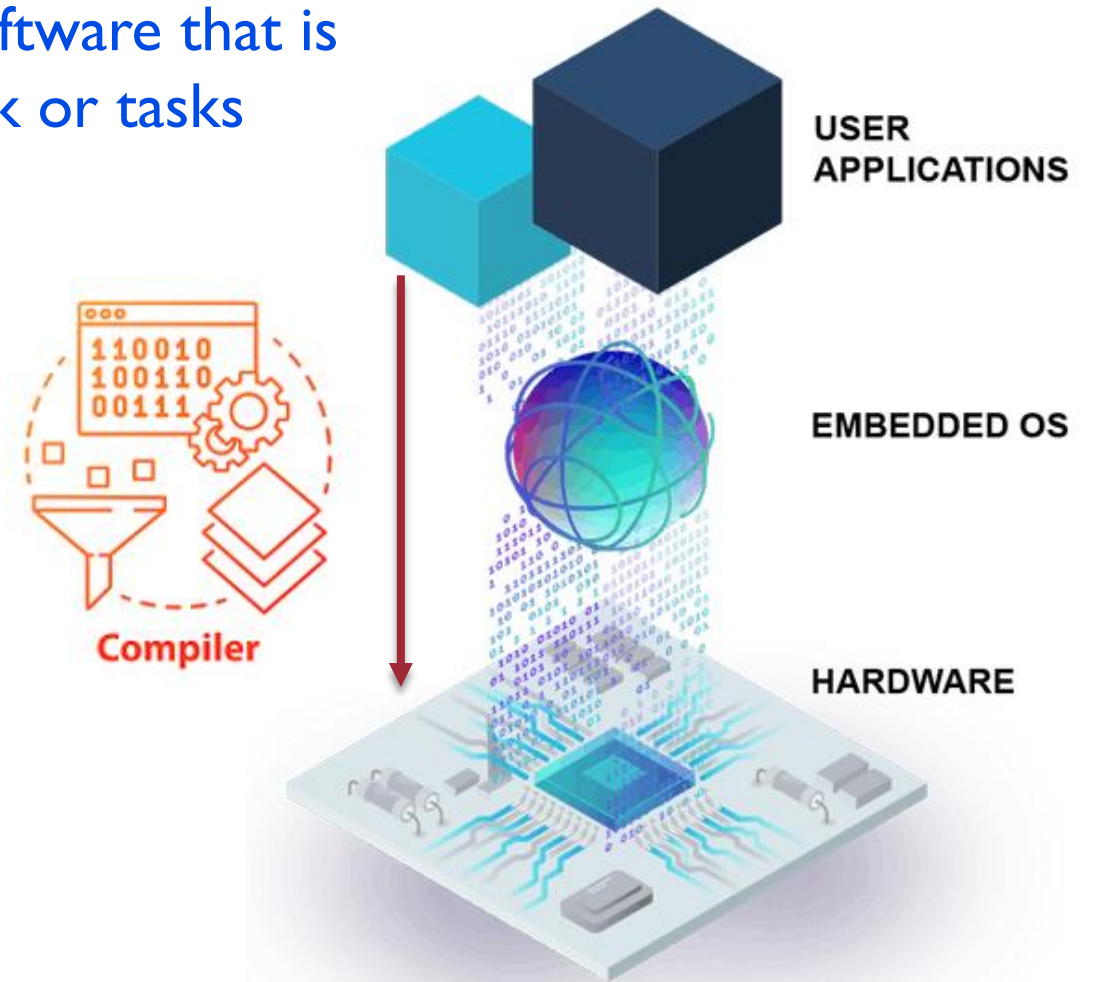


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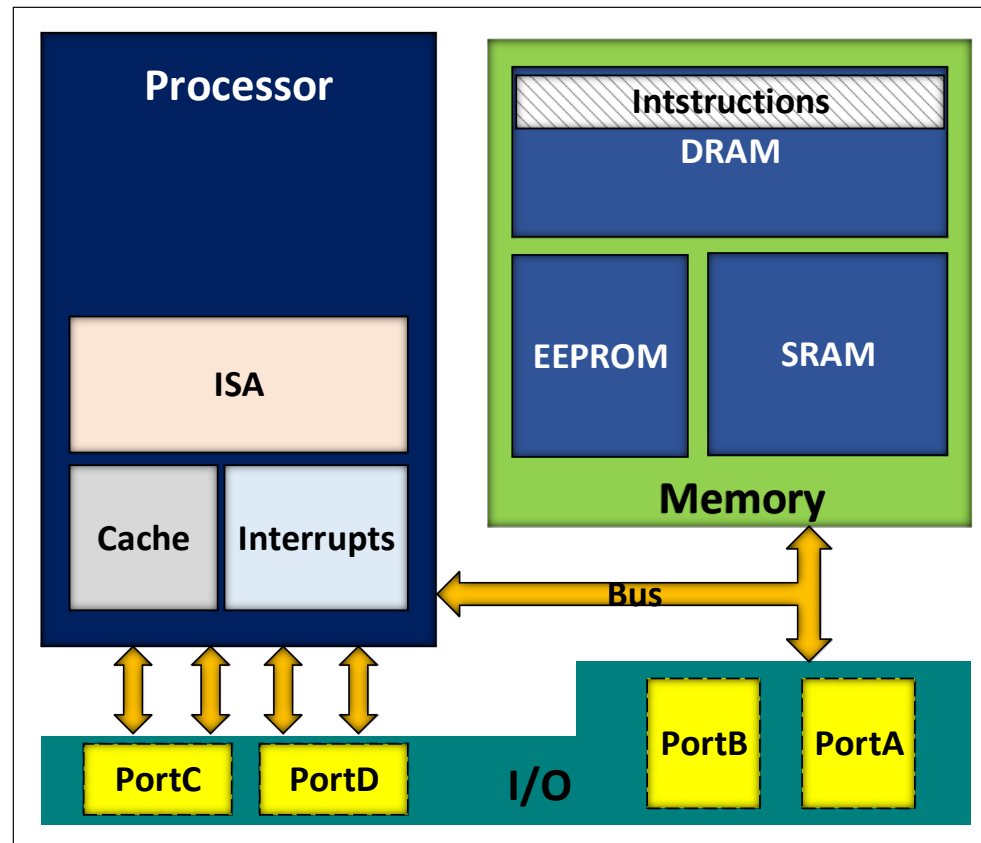
Embedded System Layers

- A combination of hardware and software that is designed to carry out a certain task or tasks

- Software
- Operating System
- Hardware



Introduction To a Processing System



Software

```
min=A(0)
for (i=0; i<=99; i++)
  If (A(i) < min)
    min=A(i);
```

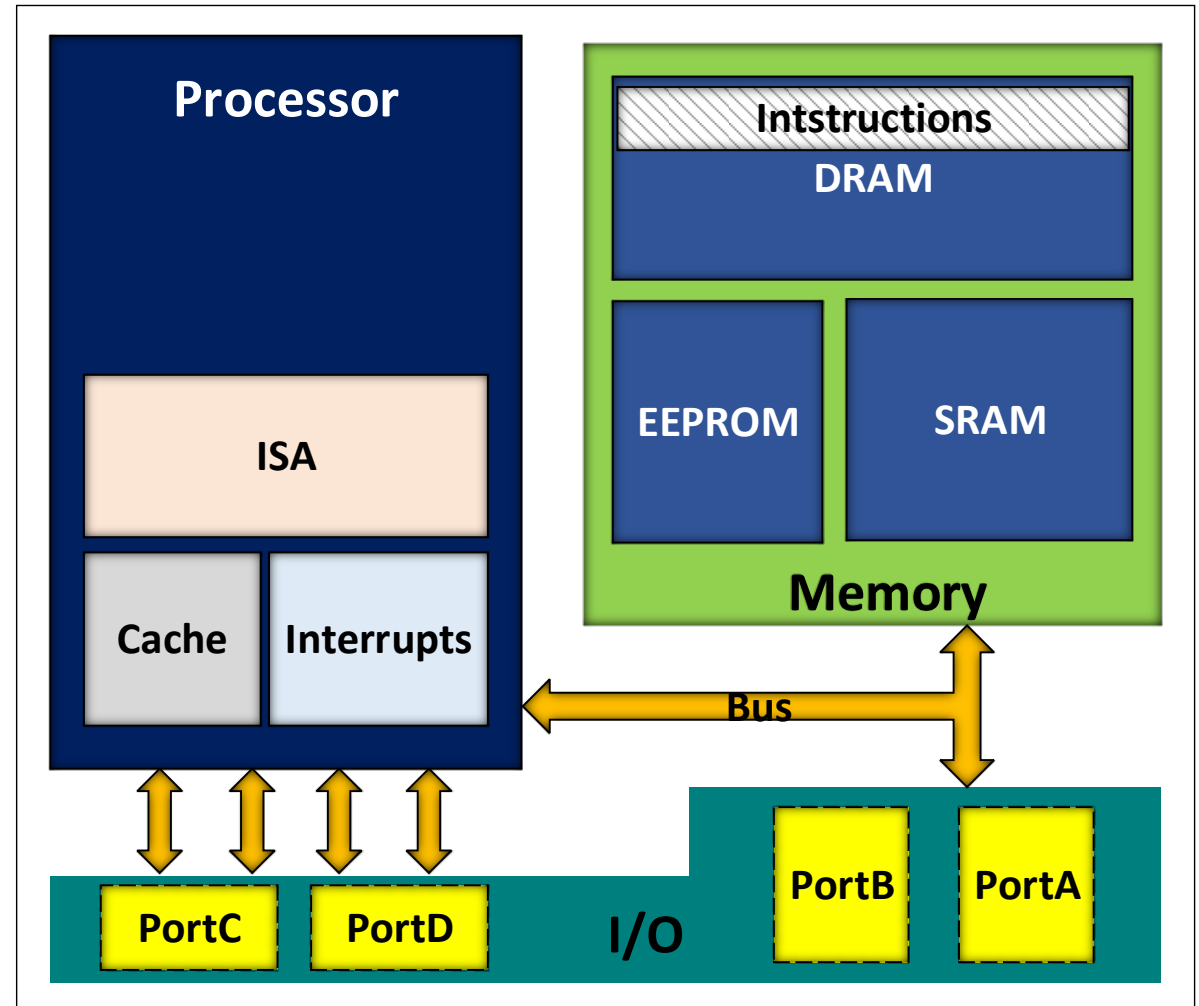


Compiler

Hardware

Introduction To a Processing System

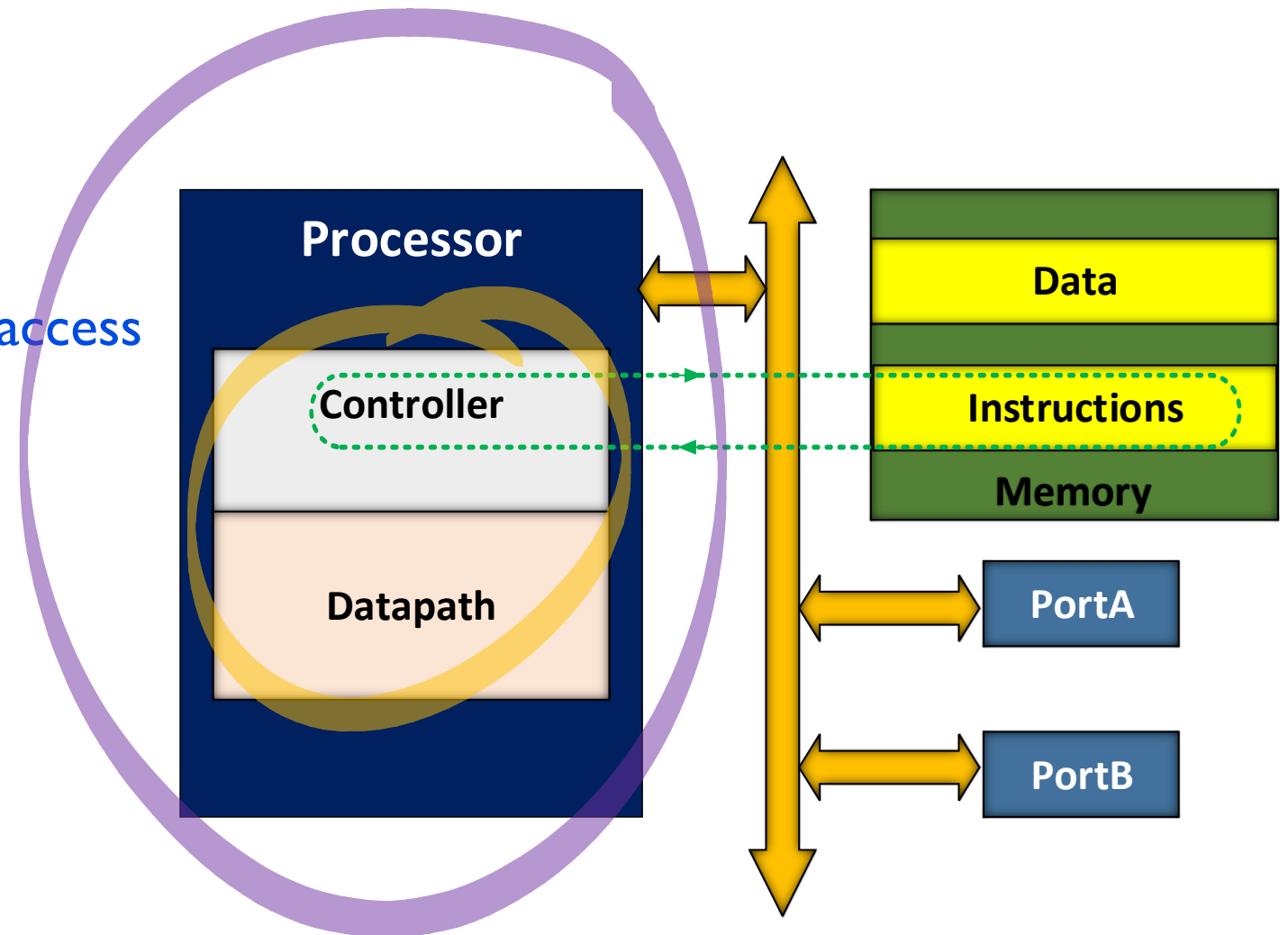
- Memory ✓
- Processor ✓
- I/O Devices ✓
- Bus ✓



Introduction To a Processing System

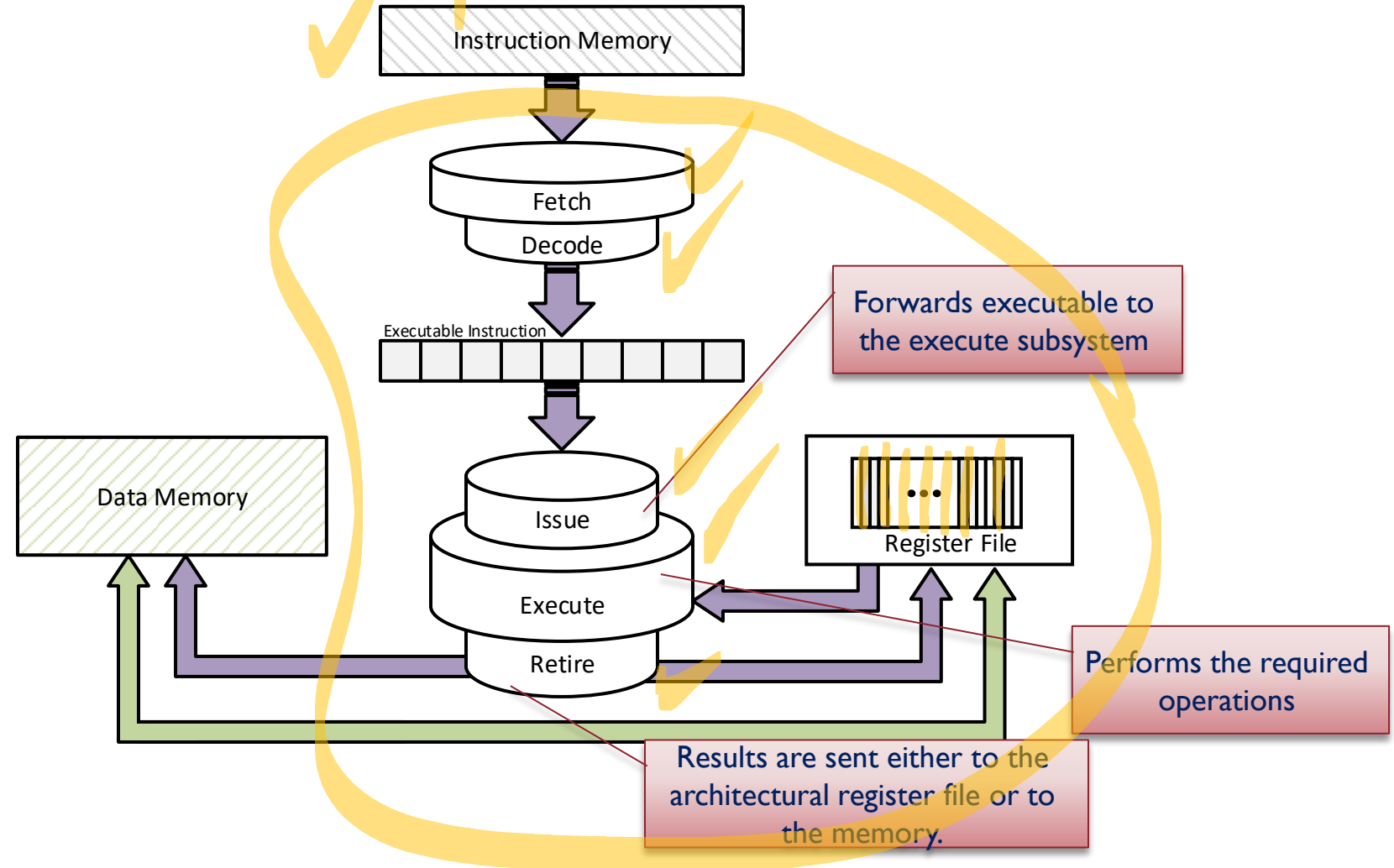
How processor works:

- Fetches instructions
- Executes instructions
 - Internal tasks
 - External memory access



Introduction To a Processing System

Processor Execution Model





Conclusion

In this topic we covered:

- General concepts in embedded systems
- Software-hardware layers
- Hardware components
- Processor execution model

