

# Architecture RISC-V

## CSCI 425 - Operating Systems Design

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# Introduction

## What is RISC-V

- Open-source instruction set architecture (ISA)
- Focused on simplicity and efficiency, unlike complex x86 and ARM
- RISC stands for Reduced Instruction Set Computer
- Opposed to CISC (Complex Instruction Set Computer)

# History

## Early 2010s

- RISC-V project born at UC Berkeley
- Built on decades of RISC research (RISC-I and II in 1981)

## 2011

First RISC-V chip created

## 2014

Publication of a paper on the benefits of open instruction

## 2015

Creation of the RISC-V foundation

### Characteristics

- **Small Instruction Set:** RISC-V uses a limited, well-defined set of instructions
- **Fixed Instruction Length:** Instructions are the same size, making decoding faster and hardware simpler
- **Load/Store Architecture:** Dedicated instructions for memory operations improve efficiency

# Design

## Modularity

### Characteristics

- **Base ISA:** RISC-V defines a core set of essential instructions
- **Standard Extensions:** Provide commonly needed functionality (e.g., floating-point, compressed instructions)
- **Custom Extensions:** Users can design their own extensions for specialized tasks

### Benefits

- Devices only use the instructions they need, reducing chip power and complexity
- Enables innovation and tailoring ISAs for specific application areas
- Promotes a collaborative ecosystem around RISC-V development

# Applications

## Embedded systems

- Microcontrollers for IoT devices, wearables, industrial control
- Meets power consumption requirements of space-constrained and battery-operated designs

## Mobile devices

- Handle the performance needed to power smartphones
- Can act as a co-processor for specialized tasks

## Automotive, High-Performance computing

- Handle complex computational tasks with customized ISAs
- RISC-V extensions: greater energy efficiency

## Aerospace and Government

Meets High reliability, security requirements + resilience to radiation

# Conclusion

## Recap

- Open-source architecture accelerates innovation and collaboration.
- Simplicity and modularity lead to efficiency and tailored solutions.
- Wide range of applications, with potential to disrupt traditional markets.



# The End

Thank you for your attention!  
Do you have any question?