

# Computer Organization and Design: The Hardware/Software Interface (RISC-V Edition)

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First Edition

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# CHAPTER 1

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## COMPUTER ABSTRACTION AND TECHNOLOGY

### 1 Introduction

#### 1.1 Traditional Classes of Computing Applications and Their Characteristics

**Personal computers (PCs)** are possibly the best-known form of computing.

**Servers** are the modern form of what were once much larger computers, and are usually accessed only via a network.

Servers span the widest range in cost and capability. At the low end, a server may be little more than a desktop computer without a screen or keyboard and cost a thousand dollars. At the other extreme are **supercomputers**, which at the present consist of tens of thousands of processors and many **terabytes** of memory, and cost tens to hundreds of millions of dollars.

#### Definition 1.1: terabyte (TB)

To reduce confusion, we now use the term **tebibyte (TiB)** for  $2^{40}$  bytes, defining *terabyte* (TB) to mean  $10^{12}$  bytes.

**Embedded computers** are the largest class of computers and span the widest range of applications and performance.

#### Definition 1.2: Elaboration

Many embedded processors are designed using *processor cores*, a version of a processor written in a hardware description language.

#### Welcome to the Post-PC Era

Replacing the PC is the **personal mobile device (PMD)**.

Taking over from the conventional server is **Cloud Computing**, which relies upon giant datacenters that are now known as *Warehouse Scale Computers* (WSCs). Indeed,

**Software as a Service (SaaS)** deployed via the Cloud is revolutionizing the software industry just as PMDs and WSCs are revolutionizing the hardware industry.

**What You Can Learn in This Book**