



MODULE 01 / 14 • ILLUSTRATED STUDY GUIDE

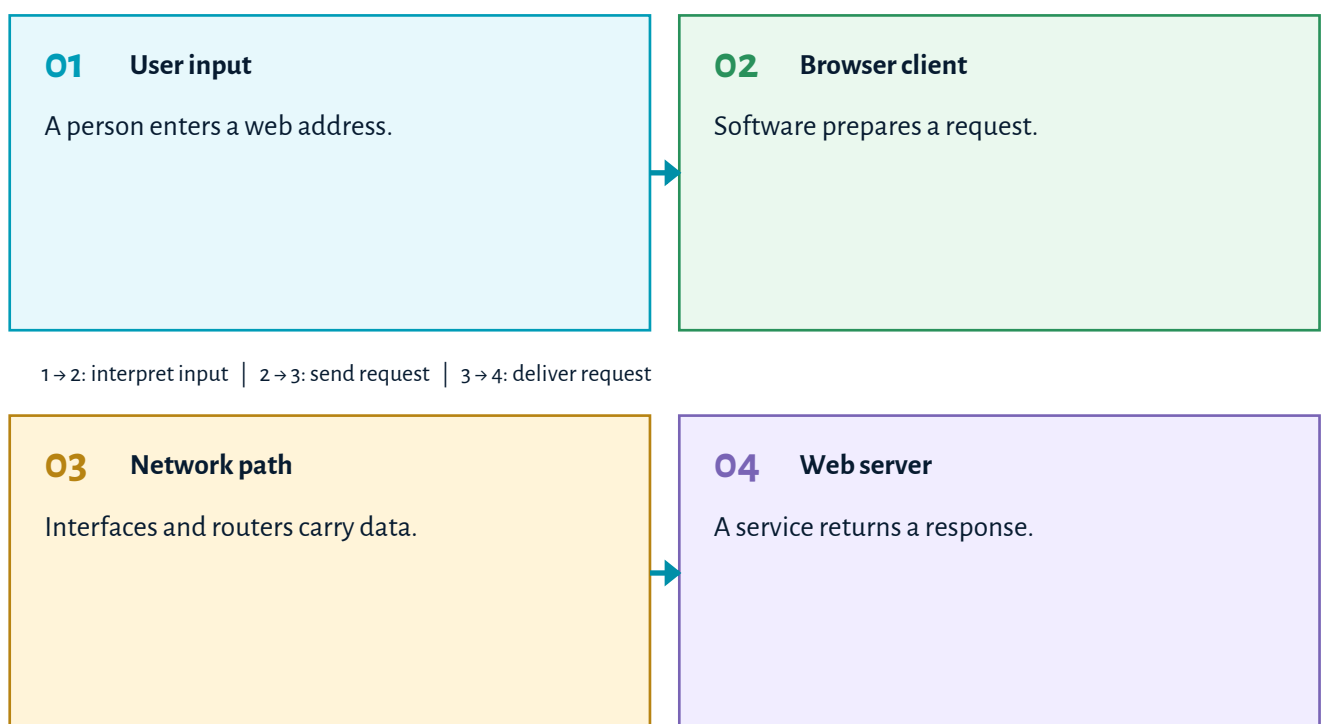
How computer systems work

A computer system is a set of cooperating layers. Physical equipment supplies resources, software decides what work to perform, and networks connect one system to another. Understanding these relationships helps you describe a fault precisely before you choose a security control.

Learning objectives

1. Separate hardware, software and firmware in a real system.
2. Trace a client request and server response.
3. Distinguish a failed service from evidence of an attack.

Following a web request through its dependencies



The response travels back through the network to the browser. Hardware supports every software stage; the boxes describe roles, not necessarily separate physical devices.



CONCEPT 1 / 4 - VISUAL EXPLANATION

Hardware

The physical components of a computer, including its processor, memory, storage and network interface. Hardware supplies the resources software uses.

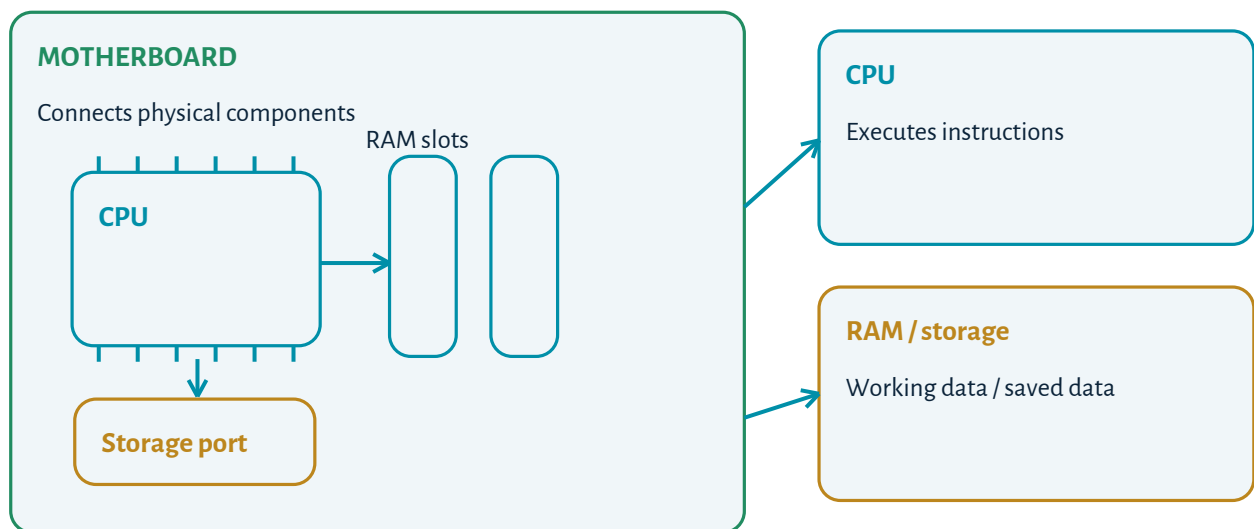


Figure 1.1: Hardware. Simplified teaching illustration; sizes and layouts are not manufacturing specifications.

How it works

Hardware includes the processor, memory, storage, keyboard and network interface. Consider the journey of a typed character: an input device signals the operating system, an application interprets the input, and an output device displays the result. A damaged cable and an incorrect application setting can produce similar symptoms while requiring different repairs. Record the component and its role rather than describing every failure as a computer problem.

Read the illustration alongside the explanation: identify each labelled part or stage, explain its purpose, and trace the relationship to the next part. Arrows show the specific teaching relationship, not necessarily a physical wire or real packet capture.



CONCEPT 2 / 4 - VISUAL EXPLANATION

Software

Programs and instructions that tell hardware what to do. Applications perform user tasks; system software manages their operating environment.

Application - browser or editor

Operating system - manages resources

Driver - device interface

Hardware - physical equipment

Figure 1.2: Software. Simplified teaching illustration; sizes and layouts are not manufacturing specifications.

How it works

Software provides instructions for hardware. The operating system allocates resources and manages access, while applications perform tasks such as browsing or editing a document. An application can depend on a local file, a background service and a remote server at the same time. When diagnosing a problem, identify these dependencies. Reinstalling an application does not fix every failure in its network or server dependencies.

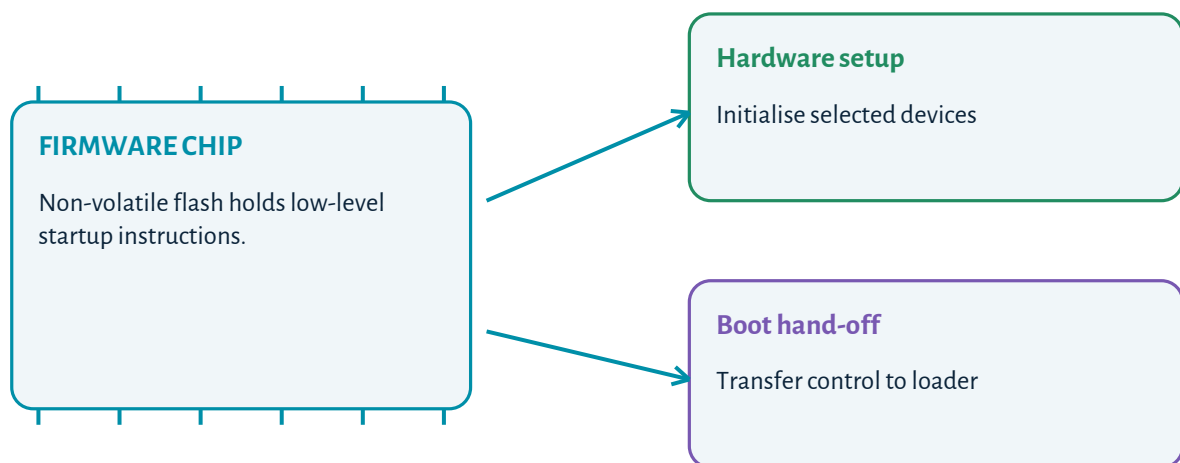
Read the illustration alongside the explanation: identify each labelled part or stage, explain its purpose, and trace the relationship to the next part. Arrows show the specific teaching relationship, not necessarily a physical wire or real packet capture.



CONCEPT 3 / 4 - VISUAL EXPLANATION

Firmware

Software stored on a device that helps initialise or control hardware. UEFI starts a modern computer before its operating system takes over.



Firmware is software stored for device-level control; it can have updates.

Figure 1.3: Firmware. Simplified teaching illustration; sizes and layouts are not manufacturing specifications.

How it works

Firmware helps a device initialise and operate. On a modern computer, UEFI firmware helps prepare hardware and locate the software needed to start the operating system. Other devices also contain firmware. Treat firmware updates as controlled maintenance: use the manufacturer's supported procedure and an appropriate recovery plan. Firmware is software with a particular location and purpose, rather than a separate kind of physical component.

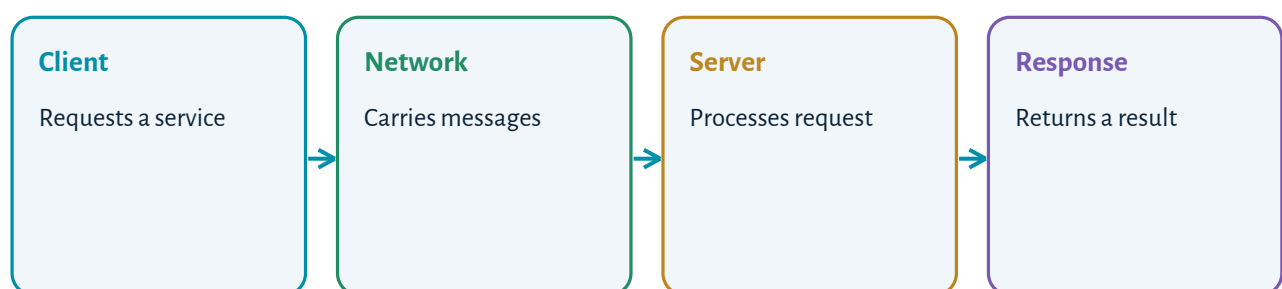
Read the illustration alongside the explanation: identify each labelled part or stage, explain its purpose, and trace the relationship to the next part. Arrows show the specific teaching relationship, not necessarily a physical wire or real packet capture.



CONCEPT 4 / 4 - VISUAL EXPLANATION

Client and server

A client requests a service and a server provides it. These are roles rather than necessarily different types of physical computer. A browser is a web server's client.



Follow the arrows from left to right. Each stage has a different role.

Figure 1.4: Client and server. Simplified teaching illustration; sizes and layouts are not manufacturing specifications.

How it works

Client and server describe roles in an interaction. A browser requests a page; a web server handles that request and returns a response. One machine may act as a client in one exchange and a server in another. A complete page may require several requests for images, scripts and data. Therefore, successful access to one resource does not prove that every part of a service is healthy.

Read the illustration alongside the explanation: identify each labelled part or stage, explain its purpose, and trace the relationship to the next part. Arrows show the specific teaching relationship, not necessarily a physical wire or real packet capture.



From concept to practice

Worked example

A learner can open a local document, but a learning page will not load. This confirms that some local software is working; it does not confirm internet connectivity, DNS resolution or server availability. Another learner opening the page successfully is useful comparative evidence, but differences in their networks or accounts still matter.

Why it matters in cybersecurity

A good asset inventory links devices, applications and services to owners and purposes. Without that context, teams may protect the laptop but overlook the account or service it depends on. An outage is a symptom; an attack is one possible explanation that needs evidence.

Common misconception

A server is not always a large machine in a data centre. Server describes a service-providing role; a small computer can perform it.

Guided practice

1. Record the exact failed action, message and time.
2. Identify the browser, network connection and destination service.
3. Compare another authorised device or resource, changing one condition at a time.



Review and remember

Check your understanding

1. Why can one computer be both a client and a server?
2. Which layers would you examine when only one website fails?
3. What additional evidence would distinguish a service fault from an attack?

Key terms

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Client and server

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Further reading

MDN: How the web works

https://developer.mozilla.org/en-US/docs/Learn_web_development/Getting_started/Web_standards/How_the_web_works

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