

Computer fundamentals · supported focus

Supported focus · HL

Supported scope

- Supported HL focus. First assessment 2027 target; official PDF returns 403; older acquired brief is final assessment 2026. Remaining guide, assessment and practical requirements retain their recorded holds.
- State model conditions and distinguish fictional data from measurements.

Computing Systems · 1.1

Reasoning

A school booking system can calculate correctly and still fail if users lose access or records are disclosed. Success includes the system context. Start with a prediction. State the quantities or features you would compare, then decide what evidence could distinguish two explanations.

Computing Systems · 2.1

Reasoning

A computer system combines hardware, software, data and people. A network enables communication using protocols. Requirements should distinguish function from constraints such as availability, security and accessibility. authentication : Checking an asserted identity; authorization : Determining permitted actions.

Computing Systems · 3.1

Reasoning

Separate authentication from authorization. Authentication checks identity; authorization determines permitted actions. A threat model connects a valuable asset, a possible attack and an appropriate control. Use a fictitious school dataset to define users and permissions. Draw data flows, compare validation and verification, and specify tests for normal, boundary and invalid input. Do not use real credentials or student records in exercises.

Computing Systems · 4.1

Reasoning

State the known values and their units. Choose the relation because its assumptions fit this case, then rearrange before substitution. Known: a file contains 12 megabytes, where this example defines one megabyte as one million bytes. $\text{Bits} = \text{bytes} \times 8 = 12 \times 1,000,000 \times 8 = 96,000,000$ bits. At 8,000,000 bits per second, ideal time = $\text{size}/\text{rate} = 12$ s, excluding overhead.

Computing Systems · 4.2

Reasoning

A 40 million bit file transfers at 5 million bits per second. Find ideal time. Use the same sequence: known quantities $\rightarrow$ model $\rightarrow$ relation $\rightarrow$ substitution $\rightarrow$ unit and interpretation.

Computing Systems · 5.1

Reasoning

Bandwidth is not actual end-to-end throughput. Encryption does not by itself ensure correct authorization or remove every security risk. Return to the original observation. Explain what the result supports, which conditions it assumes, and one way to test a competing explanation.

Computing Systems · 5.2

Reasoning

Encryption guarantees that every user has appropriate access permissions. This claim is false: Bandwidth is not actual end-to-end throughput. Encryption does not by itself ensure correct authorization or remove every security risk.

Computing Systems · 5.3

Reasoning

Computing systems, networks and requirements: Separate authentication from authorization. Authentication checks identity; authorization determines permitted actions. A threat model connects a valuable asset, a possible attack and an appropriate control.

Computing Systems · diagram



- Original teaching diagram: Computing systems, networks and requirements
- Use the labels and the stated model together.

Computing Systems · original transfer

Your turn

A 20 MB file uses decimal MB= 10^6 bytes and a 10 Mb/s link. Find ideal time and explain why observed time can be longer.

Computing Systems · transfer reasoning

Method and interpretation

$\text{Time} = 20 \times 10^6 \times 8 / (10 \times 10^6) = 16 \text{ s}$. Overhead, contention and delays add time.
Distinguish bits from bytes and storage capacity from sustained transfer rate.

Computing Systems · executable trace

- Trace the state changes and boundary guard.
- Run the boundary case and compare the printed output.

```
size_MB, rate_Mbps = 20, 10
bits = size_MB * 1_000_000 * 8
if rate_Mbps <= 0:
    raise ValueError("Rate must be positive")
seconds = bits / (rate_Mbps * 1_000_000)
print(seconds)
print(0 / (rate_Mbps * 1_000_000))
```

Check yourself

- Explain authentication using the stated model.
- Explain authorization using the stated model.
- Change one value in the original transfer; explain which assumption still matters.