

Networks · 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.

Networks · 1.1

Reasoning

A small message can arrive late on a high-bandwidth link. Capacity and delay measure different properties. Start with a prediction. State the quantities or features you would compare, then decide what evidence could distinguish two explanations.

Networks · 2.1

Reasoning

Packets carry addressed data through a network. A layered model separates responsibilities such as application meaning, transport delivery and network routing. Bandwidth describes capacity; throughput is the achieved data rate; latency is delay. throughput: Achieved rate of useful data transfer; latency: Delay experienced in communication.

Networks · 3.1

Reasoning

Transmission time depends on data size and rate. Total delay may also include propagation, processing and queueing. Encryption protects content under its assumptions but does not remove congestion or every metadata exposure. Trace a message route using a documented local model. Record payload size, units and measured time. Use school-approved networks and synthetic messages; do not scan or intercept another user traffic.

Networks · 4.1

Reasoning

State the known values and their units. Choose the relation because its assumptions fit this case, then rearrange before substitution. Known: an 8 megabit file crosses a 2 megabit/s link. Ideal transmission time = $\text{size}/\text{rate} = 8/2 = 4$ s. Protocol overhead, other users and latency can make observed completion slower.

Networks · 4.2

Reasoning

A 12 megabit file crosses a 3 megabit/s link. Calculate ideal transmission time. Use the same sequence: known quantities $\rightarrow$ model $\rightarrow$ relation $\rightarrow$ substitution $\rightarrow$ unit and interpretation.

Networks · 5.1

Reasoning

A megabyte is eight megabits before considering overhead. A faster rated link does not guarantee low latency or secure endpoints. Return to the original observation. Explain what the result supports, which conditions it assumes, and one way to test a competing explanation.

Networks · 5.2

Reasoning

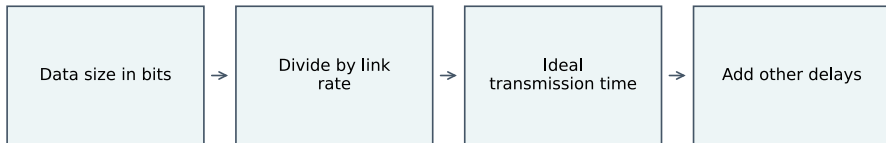
A high-bandwidth connection guarantees zero latency. This claim is false: A megabyte is eight megabits before considering overhead. A faster rated link does not guarantee low latency or secure endpoints.

Networks · 5.3

Reasoning

Networks: latency, throughput and layered delivery: Transmission time depends on data size and rate. Total delay may also include propagation, processing and queueing. Encryption protects content under its assumptions but does not remove congestion or every metadata exposure.

Networks · diagram



- Original teaching diagram: Networks: latency, throughput and layered delivery
- Use the labels and the stated model together.

Networks · original transfer

Your turn

A 12 Mb file crosses a 3 Mb/s link with 0.10 s propagation delay. Give ideal time until the last bit arrives. Can doubling bandwidth remove all delay?

Networks · transfer reasoning

Method and interpretation

Time = $12/3 + 0.10 = 4.10$ s, omitting other delays. Doubling bandwidth gives 2.10 s; propagation remains. Protocol and queueing may add delay.

Networks · executable trace

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

```
size_Mb, rate_Mbps, propagation_s = 12, 3, 0.10
for rate in [rate_Mbps, 2 * rate_Mbps]:
    transmission_s = size_Mb / rate
    print(round(transmission_s + propagation_s, 2))
```

Check yourself

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