02 Data Transmission

SrWL Learning · Complete Classroom Teaching Version · 2026–2028 target

Moving data reliably

55 editable slides / Explanation · Visual · Practice · Teacher Check

By the end of this chapter

- Packets and switching.
- Transmission methods.
- Error detection.
- Encryption.

Learning goals are organised into bite-sized lessons.

Our learning route

10 mini-lessons · each includes one guided check

01 Packets and packet switching: A

02 Packets and packet switching: B

03 Serial and parallel transmission: A

04 Serial and parallel transmission: B

05 Direction and timing: A

06 Direction and timing: B

07 Checking for errors: A

08 Checking for errors: B

09 Encryption and security: A

10 Encryption and security: B

01 Packets and packet switching · Foundations

One clear idea to explain before moving to practice

Long messages can be split into data packets.

TEACHER EXPLANATION

Discuss why this principle matters in real computer systems.

Packets and packet switching — key points

- Long messages can be split into data packets.
- Each packet contains a header, payload and trailer.

Worked context: Packet sequence numbers support reassembly.

Packets and packet switching — connect the ideas

Follow the concept from left to right

01

Long messages can be split into data packets.

→

02

Each packet contains a header, payload and trailer.

Apply the principles to this example: Packet sequence numbers support reassembly.

Try it · Packets and packet switching

Think (30 s) · Pair discussion (1 min) · Share

Explain the meaning of this idea and give a relevant example:

Each packet contains a header, payload and trailer.

YOUR TASK

Use accurate technical vocabulary. Add a second point or a specific example where possible.

Teacher check · Packets and packet switching

Model response · Correct misconceptions

Each packet contains a header, payload and trailer.

EXAM TIP / EXTENSION

Use this worked context to add detail: Packet sequence numbers support reassembly.

02 Packets and packet switching · Applications

One clear idea to explain before moving to practice

Routers may forward packets along different paths.

TEACHER EXPLANATION

Discuss why this principle matters in real computer systems.

Packets and packet switching — key points

- Routers may forward packets along different paths.
- The destination reassembles data in the correct order.

Worked context: Packet sequence numbers support reassembly.

Packets and packet switching — connect the ideas

Follow the concept from left to right

01

Routers may forward packets along different paths.

→

02

The destination reassembles data in the correct order.

Apply the principles to this example: Packet sequence numbers support reassembly.

Try it · Packets and packet switching

Think (30 s) · Pair discussion (1 min) · Share

Describe when this principle applies:

The destination reassembles data in the correct order.

YOUR TASK

Use accurate technical vocabulary. Add a second point or a specific example where possible.

Teacher check · Packets and packet switching

Model response · Correct misconceptions

The destination reassembles data in the correct order.

EXAM TIP / EXTENSION

Use this worked context to add detail: Packet sequence numbers support reassembly.

03 Serial and parallel transmission · Foundations

One clear idea to explain before moving to practice

Serial sends bits one after another along a channel.

TEACHER EXPLANATION

Discuss why this principle matters in real computer systems.

Serial and parallel transmission — key points

- Serial sends bits one after another along a channel.
- Parallel sends multiple bits simultaneously on separate lines.

Worked context: USB is an example of a serial connection.

Serial and parallel transmission — connect the ideas

Follow the concept from left to right

01

Serial sends bits one after another along a channel.

→

02

Parallel sends multiple bits simultaneously on separate lines.

Apply the principles to this example: USB is an example of a serial connection.

Try it · Serial and parallel transmission

Think (30 s) · Pair discussion (1 min) · Share

Identify the key technical terms and describe their roles:

Parallel sends multiple bits simultaneously on separate lines.

YOUR TASK

Use accurate technical vocabulary. Add a second point or a specific example where possible.

Teacher check · Serial and parallel transmission

Model response · Correct misconceptions

Parallel sends multiple bits simultaneously on separate lines.

EXAM TIP / EXTENSION

Use this worked context to add detail: USB is an example of a serial connection.

04 Serial and parallel transmission · Applications

One clear idea to explain before moving to practice

Serial avoids timing skew between parallel lines.

TEACHER EXPLANATION

Discuss why this principle matters in real computer systems.

Serial and parallel transmission — key points

- Serial avoids timing skew between parallel lines.
- Select a method based on distance and hardware.

Worked context: USB is an example of a serial connection.

Serial and parallel transmission — connect the ideas

Follow the concept from left to right

01

Serial avoids timing skew between parallel lines.

→

02

Select a method based on distance and hardware.

Apply the principles to this example: USB is an example of a serial connection.

Try it · Serial and parallel transmission

Think (30 s) · Pair discussion (1 min) · Share

Compare this concept with a related alternative:
Select a method based on distance and hardware.

YOUR TASK

Use accurate technical vocabulary. Add a second point or a specific example where possible.

Teacher check · Serial and parallel transmission

Model response · Correct misconceptions

Select a method based on distance and hardware.

EXAM TIP / EXTENSION

Use this worked context to add detail: USB is an example of a serial connection.

05 Direction and timing · Foundations

One clear idea to explain before moving to practice

Simplex: data travels in only one direction.

TEACHER EXPLANATION

Discuss why this principle matters in real computer systems.

Direction and timing — key points

- Simplex: data travels in only one direction.
- Half-duplex: both directions, but not at the same time.

Worked context: Example: a walkie-talkie is half-duplex.

Direction and timing — connect the ideas

Follow the concept from left to right

01

Simplex: data travels in only one direction.

→

02

Half-duplex: both directions, but not at the same time.

Apply the principles to this example: Example: a walkie-talkie is half-duplex.

Try it · Direction and timing

Think (30 s) · Pair discussion (1 min) · Share

Apply this idea to a new computer science scenario:
Half-duplex: both directions, but not at the same time.

YOUR TASK

Use accurate technical vocabulary. Add a second point or a specific example where possible.

Teacher check · Direction and timing

Model response · Correct misconceptions

Half-duplex: both directions, but not at the same time.

EXAM TIP / EXTENSION

Use this worked context to add detail: Example: a walkie-talkie is half-duplex.

06 Direction and timing · Applications

One clear idea to explain before moving to practice

Full-duplex: both directions simultaneously.

TEACHER EXPLANATION

Discuss why this principle matters in real computer systems.

Direction and timing — key points

- Full-duplex: both directions simultaneously.
- Synchronous and asynchronous describe timing coordination.

Worked context: Example: a walkie-talkie is half-duplex.

Direction and timing — connect the ideas

Follow the concept from left to right

01

Full-duplex: both directions simultaneously.

→

02

Synchronous and asynchronous describe timing coordination.

Apply the principles to this example: Example: a walkie-talkie is half-duplex.

Try it · Direction and timing

Think (30 s) · Pair discussion (1 min) · Share

Explain the meaning of this idea and give a relevant example:

Synchronous and asynchronous describe timing coordination.

YOUR TASK

Use accurate technical vocabulary. Add a second point or a specific example where possible.

Teacher check · Direction and timing

Model response · Correct misconceptions

Synchronous and asynchronous describe timing coordination.

EXAM TIP / EXTENSION

Use this worked context to add detail: Example: a walkie-talkie is half-duplex.

07 Checking for errors · Foundations

One clear idea to explain before moving to practice

Parity adds a bit for an even or odd number of 1s.

TEACHER EXPLANATION

Discuss why this principle matters in real computer systems.

Checking for errors — key points

- Parity adds a bit for an even or odd number of 1s.
- A checksum is calculated from transmitted data.

Worked context: A parity check does not detect every possible error.

Checking for errors — connect the ideas

Follow the concept from left to right

01

Parity adds a bit for an even or odd number of 1s.

→

02

A checksum is calculated from transmitted data.

Apply the principles to this example: A parity check does not detect every possible error.

Try it · Checking for errors

Think (30 s) · Pair discussion (1 min) · Share

Describe when this principle applies:

A checksum is calculated from transmitted data.

YOUR TASK

Use accurate technical vocabulary. Add a second point or a specific example where possible.

Teacher check · Checking for errors

Model response · Correct misconceptions

A checksum is calculated from transmitted data.

EXAM TIP / EXTENSION

Use this worked context to add detail: A parity check does not detect every possible error.

08 Checking for errors · Applications

One clear idea to explain before moving to practice

An echo check returns data to the sender for comparison.

TEACHER EXPLANATION

Discuss why this principle matters in real computer systems.

Checking for errors — key points

- An echo check returns data to the sender for comparison.
- Automatic repeat request can request retransmission.

Worked context: A parity check does not detect every possible error.

Checking for errors — connect the ideas

Follow the concept from left to right

01

An echo check returns data to the sender for comparison.

→

02

Automatic repeat request can request retransmission.

Apply the principles to this example: A parity check does not detect every possible error.

Try it · Checking for errors

Think (30 s) · Pair discussion (1 min) · Share

Identify the key technical terms and describe their roles: Automatic repeat request can request retransmission.

YOUR TASK

Use accurate technical vocabulary. Add a second point or a specific example where possible.

Teacher check · Checking for errors

Model response · Correct misconceptions

Automatic repeat request can request retransmission.

EXAM TIP / EXTENSION

Use this worked context to add detail: A parity check does not detect every possible error.

09 Encryption and security · Foundations

One clear idea to explain before moving to practice

Encryption transforms plaintext into ciphertext.

TEACHER EXPLANATION

Discuss why this principle matters in real computer systems.

Encryption and security — key points

- Encryption transforms plaintext into ciphertext.
- An encryption key controls the transformation.

Worked context: Encryption helps protect intercepted data.

Encryption and security — connect the ideas

Follow the concept from left to right

01

Encryption transforms plaintext into ciphertext.

→

02

An encryption key controls the transformation.

Apply the principles to this example: Encryption helps protect intercepted data.

Try it · Encryption and security

Think (30 s) · Pair discussion (1 min) · Share

Compare this concept with a related alternative:
An encryption key controls the transformation.

YOUR TASK

Use accurate technical vocabulary. Add a second point or a specific example where possible.

Teacher check · Encryption and security

Model response · Correct misconceptions

An encryption key controls the transformation.

EXAM TIP / EXTENSION

Use this worked context to add detail: Encryption helps protect intercepted data.

10 Encryption and security · Applications

One clear idea to explain before moving to practice

Symmetric encryption uses a shared key.

TEACHER EXPLANATION

Discuss why this principle matters in real computer systems.

Encryption and security — key points

- Symmetric encryption uses a shared key.
- Asymmetric encryption uses related public/private keys.

Worked context: Encryption helps protect intercepted data.

Encryption and security — connect the ideas

Follow the concept from left to right

01

Symmetric encryption uses a shared key.

→

02

Asymmetric encryption uses related public/private keys.

Apply the principles to this example: Encryption helps protect intercepted data.

Try it · Encryption and security

Think (30 s) · Pair discussion (1 min) · Share

Apply this idea to a new computer science scenario: Asymmetric encryption uses related public/private keys.

YOUR TASK

Use accurate technical vocabulary. Add a second point or a specific example where possible.

Teacher check · Encryption and security

Model response · Correct misconceptions

Asymmetric encryption uses related public/private keys.

EXAM TIP / EXTENSION

Use this worked context to add detail: Encryption helps protect intercepted data.

Five essential ideas

Recall these without looking at the teaching slides

01 Packets and packet switching

02 Serial and parallel transmission

03 Direction and timing

04 Checking for errors

05 Encryption and security

End-of-chapter challenge

Answer in your notebook, then compare with a partner

Name the three main packet sections and explain packet sequence numbers.

TEACHER MODEL ANSWER

Header, payload, trailer; sequence numbers help restore the original order.