

Nifty Networks

Suitable for Key Stage 2 upwards



What you need

Blank A3 sheets of paper
Pens and pencils
Envelopes (A4 or smaller)

What to do

1. Ask the class to stand at various locations around the room – the locations should be completely random but they should all be stood at arm's length from each other.
2. Select up to four children from the class and set them a challenge separate from the rest.
 - a. Give the group a message written on A3 paper and challenge them to fit the message into an A4 envelope.
 - b. Explain that no folding is allowed but that they can use as many envelopes as they need to.
 - c. This will inevitably result in them tearing up the message and putting each piece into a separate envelope.
3. Select a child positioned at the other side of the classroom and explain to the group that they need to get the message to the designated person.
4. The initial group of four pupils should then send the envelopes out to the pupils, or nodes, around the classroom.

Discussion point: *When distributing the envelopes, pupils will instantly be able to see that not all envelopes follow the same path, yet they all arrive at the same destination. Ask some of the pupils, or nodes, why they passed an envelope to one pupil rather than another. Some pupils will inevitably tell you that they did so because one pupil already had an envelope in their hand so they simply gave it to another child. Explain that the internet, particularly routers, generally work in the same way and make the same decisions. They don't always select the shortest path, just what will possibly be the most effective or fastest route.*

5. When the envelopes reach their destination, the recipient then has to remove the separate pieces of paper, or data, from the envelopes and assemble it to discover the original message. They will find this tricky to do initially as they won't know what they have received, so trying to find the original order won't be easy.
6. While the recipient is trying to decipher the message, ask the group that sent the message how they could make it easier for the recipient to piece the message together.
 - a. Allow the pupils to suggest and try out various solutions
 - b. Repeat the activity using a new message, this time asking the sender to label the envelopes to help the recipient.
7. Repeat the activity but this time, instead of having one targeted recipient, designate two pupils.
 - a. Explain that no instructions are to be called out to the nodes or the recipient, only instructions written on the envelopes can be used.
 - b. How do the nodes know where to send the envelopes?
 - c. Engage the class in discussion and allow them the opportunity to discover that the envelopes need to be addressed with the recipient's name.

Tips for extending the activity



- Encourage the recipients to send replies so that you have multiple messages in transit at any particular point
- Simulate a server 'crash' by asking a particular student to sit down and not send or receive any data. What happens?
- Get senders and receivers to work in teams of four. Each student represents a different layer of the TCP/IP stack. For example, one student generates the request (application layer), the second student splits the request into different envelopes to form packets (transport layer), the third student addresses the envelopes (network layer) and the final one sends it on its way (link layer). Give each student their role. What do they do when they receive information rather than send it?
- If the packets are being addressed with the student's names (i.e. Anita), then what happens if there are several students with the same name? How do you differentiate it then? Ask the students to explore various options, this acts as a nice lead in to bring in IP addressing.

Computational Thinking

The great thing about this activity is that the pupils actually discover a lot of the networking concepts themselves. Your role as a teacher is now more to do with formalising their learning and giving them the more technical vocabulary. Key computational thinking concepts have also been covered during this activity. The pupils will have carried out a lot of logical reasoning when solving the problems, representing a network requires a certain level of abstraction, while being able to extend and adapt what they are doing begins to build in some generalisation. Having discussions surrounding what they've done can also help to build in evaluation skills.

