



PROGRESS OUTCOME 8

# Communicating online successfully

## Context

Ravi's digital technologies class has been learning about the use of data on the internet at home and school. He has developed a real interest in how data is organised, manipulated and used in computers.



### Insight 1: Key concepts

A key aspect of society today is communication. Even the most basic (short distance) and complex (long distance) aspects of communication can be done using technology. People rely on technology for communication and expect it to function well, so they don't tend to think about the mechanisms that enable this.

I started researching the concept of network protocols, as I like using the internet and wanted to find out more. Transferring files around the world is a complex and difficult task, so it's not surprising that data can be corrupted, delayed or lost in transit. To address this problem, transport protocols are created to send intact data from one location to another.

On a conceptual level, a protocol is an established process for accomplishing a task. When applied to networking, a protocol is a formal set of rules that ensures a successful communication between two parties. The presence of protocols across a network enables data to be transferred efficiently and means that users don't have to worry about the reliability of online communication.



### Insight 2: How transport protocols work

I posed the question "Can a protocol ever reach 100 percent efficiency?" To test different transport protocols and their efficiency in transferring data across a network, I conducted an experiment with Skype. Skype uses the protocols TCP (Transmission Control Protocol) and UDP (User Datagram Protocol). By carrying out a long-distance video call and chat (messages) with my family back in Sri Lanka, I could see the application of these two different transport protocols and their results.

Skype's use of two protocols means that data being sent from New Zealand to Sri Lanka can travel through different routers. When data is sent, large amounts of data are broken up into transportable segments called packets, which later combine to form the original set of data. Data packets can be traced by an application called Wireshark. Using this application allowed me to see the packets that I was sending through each router and enabled me to identify one of the causes of the fluctuating quality in our Skype calls.



### Insight 3: Network protocols in today's world

TCP has built-in calculating algorithms so that it can obtain the most suitable window size for efficient transport of a file. This size is chosen once the first couple of packets are received so an efficient data transfer rate is achieved early in the transfer. This mechanism also helps to control congestion by constantly adapting to the fluctuating network. Due to all these safety mechanisms, TCP is known for prioritising accurate data transmission over speed, while UDP prioritises speed over accuracy.

Our school network is large due to our BYOD policy. It uses both TCP and UDP transport protocols for several applications run by the school. The centre of our school's online learning experience is our e-learning website. It contains subject resources, external links and daily updates on school notices. It's accessible in and out of school and is linked to the school database from which it retrieves information.

The website, however, is run by an external company, so the servers for e-learning aren't located in the school. The company uses TCP to manage the website because all the information must be displayed accurately. Because data needs to be received intact and doesn't require simultaneous delivery, TCP is ideal.



### Insight 4: How network protocols affect me and others

My family in Sri Lanka and I often experience poor video reception when talking to one another on Skype. I think this is because bandwidth capacity is much smaller in Sri Lanka than in New Zealand. Using Wireshark, I could see statistics for the data packets sent and received – the amount of data being sent was much greater than the amount I was receiving. I concluded that some of the data was getting lost due to poor bandwidth and not being recovered due to UDP protocols.

The expression “You can't build a strong building on a weak foundation” applies to network protocols. I think Sri Lanka's network layer with its poor bandwidth is a weak foundation. It's almost impossible for a protocol to be 100 percent efficient when built on top of this layer. The most an efficient protocol can do is reduce the impact of the weak foundation.



### Insight 5: Wider impacts and scenarios

UDP has speed but lacks reliability; TCP has reliability but lacks speed. For our school's e-learning website, it's clear that TCP is better; for video calls, UDP is better. Both protocols have their pros and cons. When used together, they can create reliable and speedy data transfers.

Skype uses TCP for instant messaging to establish trustworthy communication and UDP in video and voice calls for speed and synchronisation. As a result, Skype incorporates the advantages of both protocols, maximising their usefulness and helping to make Skype one of the most popular long-distance communication applications.

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