



Raspberry Pi

Year 7 – Networks: from semaphores to the internet

Unit introduction

Imagine a world without computer networks, and how different your life would be. There would be no more YouTube, Google, instant messaging, online video gaming, Netflix, and iTunes. There would be no online shopping, or quickly looking up directions to a location at the click of a button. There would be no more sharing of files or peripherals such as a printer, and no more central backups of information. As networks have evolved, society has become increasingly reliant on the services that they provide. They have changed the way we learn, work, play, and communicate. This unit begins by defining a network and addressing the benefits of networking, before covering how data is transmitted across networks using protocols. The types of hardware required are explained, as is wired and wireless data transmission. Learners will develop an understanding of the terms 'internet' and 'World Wide Web', and of the key services and protocols used. Practical exercises are included throughout to help strengthen understanding.

Overview of lessons

Lesson	Brief overview	Learning objectives
Lesson 1: Computer networks and protocols	This lesson will get the learners thinking about the history of different communication methods. Learners will learn what a computer network is, along with the meaning of the word 'protocol'. Learners will gain an appreciation of the growth of networked devices. Learners will identify different greeting protocols and use a series of protocol commands in a 'climber/belayer' scenario to ensure	<ul style="list-style-type: none">• Define what a computer network is and explain how data is transmitted between computers across networks• Define 'protocol' and provide examples of non-networking protocols

	that the climber ascends safely. Finally, learners will make a connection between non-networking and networking protocols.	
Lesson 2: Networking hardware	This lesson explores the functionality of key hardware components found in a network. The lesson covers network cables, hubs, servers and routers. Each is explained in turn, and learners then use their knowledge of each component to build a series of increasingly complicated network diagrams. This lesson also includes a piece of homework in which a series of terms and statements need to be matched up.	<ul style="list-style-type: none"> List examples of the hardware necessary for connecting devices to networks
Lesson 3: Wired and wireless networks	This lesson explores the different wireless technologies, and how bandwidth varies between these technologies. Learners will discuss the mobile technologies of 3G, 4G, and 5G. Learners will develop an understanding of the term 'bandwidth' and test the performance of their own internet connection. Learners will also develop an appreciation for online activities that are bandwidth-heavy, before moving on to explore the advantages and disadvantages of wired and wireless networks. By the end of the lesson, learners should be able to identify whether a wired or wireless network should be used in a number of given scenarios.	<ul style="list-style-type: none"> Compare wired to wireless connections and list examples of specific technologies currently used to implement such connections Define 'bandwidth', using the appropriate units for measuring the rate at which data is transmitted, and discuss familiar examples where bandwidth is important
Lesson 4: The internet	This lesson explores the internet and its uses. Learners will watch a video from one of the "fathers of the internet", Vinton Gray Cerf, who explains the internet	<ul style="list-style-type: none"> Define what the internet is

	<p>and its history. Learners will gain an appreciation of the vastness of the internet. It is truly global, with 99% of data transmitted through oceanic cables spanning all continents, the longest of which is 39,000 kilometres. Learners will watch a video called <i>A Packet's Tale</i> which will explain how messages can be successfully sent from one device to another across the planet in under a second using packets and IP addresses. Learners will develop an understanding of packet structure and packet switching. The term 'protocol' will be revisited, and two particular protocols, TCP and IP, will be explained. The lesson will finish with a short multiple choice quiz to test learners' understanding of the lesson material.</p>	<ul style="list-style-type: none"> ● Explain how data travels between computers across the internet ● Describe key words such as 'protocols', 'packets', and 'addressing'
Lesson 5: Internet services	<p>This lesson explores the internet, its services, and the World Wide Web. Learners will understand the difference between the internet and the World Wide Web and how each came about. They will understand that the activity on the internet in a single minute is quite staggering. Through an 'Internet minute' exercise, learners will also understand that many different services are provided across the internet. Email and Voice over Internet Protocol (VoIP) will be explained. The term 'Internet of Things (IoT)' will be explored. Learners will understand that the internet can be integrated into anything to make it smarter. Learners will discuss the predicted growth of this area and review smart home IoT devices. Learners will discuss the advantages of IoT, as well as the disadvantages, focussing on privacy and security.</p>	<ul style="list-style-type: none"> ● Explain the difference between the internet, its services, and the World Wide Web ● Describe how services are provided over the internet ● List some of these services and the context in which they are used ● Explain the term 'connectivity' as the capacity for connected devices ('Internet of Things') to collect and share information about me with or without my knowledge (including microphones, cameras, and

		geolocation) <ul style="list-style-type: none"> Describe how internet-connected devices can affect me
Lesson 6: The World Wide Web	This lesson explores the World Wide Web (WWW), the components that are associated with the WWW, and how they work together. First, learners will look at a series of images and identify how they can be grouped into web browsers, web pages, and search engines. Next, the key components of the WWW are explained (browser, server, web pages, and search engines). A link is made to the first lesson of the unit, in which the class learnt about protocols — learners will develop an understanding of the difference between HTTP and HTTPS protocols. Learners will also gain an understanding of URLs and their structures. Next, learners will discuss the domain name system and the relationship between IP address and domain name, then complete an activity in which they have to identify the ‘type’ of organisation from a website URL. Learners will identify which websites should use HTTP and which should use HTTPS based on the type of activity that they support.	<ul style="list-style-type: none"> Describe components (servers, browsers, pages, HTTP and HTTPS protocols, etc.) and how they work together

Progression

This unit progresses students’ knowledge and understanding of networks and associated hardware. The unit will establish a foundation understanding of how data is transmitted across networks, as well as exploring the factors that can affect performance. The unit will spend time focussing on the internet and services provided over the internet.

Please see the learning graph for this unit for more information about progression.

Curriculum links

[National curriculum links](#)

- Understand the hardware and software components that make up computer systems, and how they communicate with one another and with other systems

[Education for a connected world links](#)

- Explain the term ‘connectivity’ as the capacity for connected devices (‘internet of things’) to collect and share information about me with or without my knowledge (including microphones, cameras and geolocation).
- Describe how internet-connected devices can affect me.

Assessment

Summative assessment

The summative assessment for this unit will be in the form of a set of multiple choice questions.

- Please see the assessment question and answer documents for this unit.

Subject knowledge

This unit focusses on networks, the internet, and associated technology (network, hub, server, router, ISP, protocol, mainframe, personal computer, stand-alone, HTTP, wired, wireless, 3G, 4G, 5G, WiFi, bandwidth, bit, megabit, gigabit, broadband, buffering, packet, IP address, packet header, packet payload, Transmission Control Protocol, Internet Protocol, World Wide Web, WWW, internet services, email, Voice over Internet Protocol (VoIP), Internet of Things (IoT), spam, privacy, security, web browser, web server, web page, search engine, HTTP, HTTPS, URL, domain name, domain name system) .

Enhance your subject knowledge to teach this unit through the following training opportunities:

Online training courses

- [An Introduction to Computer Networking for Teachers](#)

Face-to-face courses

- [Networks and cyber-security in GCSE computer science](#)

Resources are updated regularly — the latest version is available at: ncce.io/tcc.

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