

# Unit 10: Communication Technologies

<b>Unit code:</b>	<b>F/601/7264</b>
<b>QCF Level 3:</b>	<b>BTEC in Computing</b>
<b>Credit value:</b>	<b>10</b>
<b>Guided learning hours:</b>	<b>60</b>

## ● Aim and purpose

The aim of this unit is to ensure learners understand the communication principles of computer networks, know the elements of data communications systems and develop the skills to implement network communications.

## ● Unit introduction

New and developing communication technologies are used within the business world to maximise productivity and access information, whether an employee is working in an office or travelling the world.

This unit focuses on communication technologies, examining their use within social and business communities. Learners will explore the devices and communication technologies they use on a daily basis and gain an understanding of systems, including mobile internet. Learners will look at network topologies and services, connection software and access methods, among other areas. They will investigate the OSI and TCP/IP models.

Communications technology includes a large range of devices used in the business and social communities. Devices include many of the next generation wireless devices, games consoles and newer generations of mobile phones with voice and video streaming. This unit explores these devices along with their transmission methods and the underlying protocols that enable connectivity and transmission of data including signal theory and data elements. Learners will appreciate why particular transmission methods are chosen for particular situations and be able to compare the effectiveness of the different methods.

Finally, learners will be able to use their knowledge and understanding to directly connect communication devices between users.

This unit could be delivered as part of a system support and networking focus, including other units with networking content. Although largely theoretical, the emphasis in this unit should be on practical activity for learners to understand how modern IT can be used to enhance the commercial and personal environment. This unit links directly to other network units and the vendor units.

## ● Learning outcomes

**On completion of this unit a learner should:**

- 1 Understand the communication principles of computer networks
- 2 Know the main elements of data communications systems
- 3 Be able to implement different forms of network communications.

# Unit content

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## 1 Understand the communication principles of computer networks

*Computer networks:* types eg LAN, WAN, wireless; network topologies eg star; mesh; bus; tree (or hierarchical); ring; network services eg packet switched, ISDN, multiplexed, ATM, WAP, broadband; network software eg network operating system; network connection software; access methods eg CSMA/CD, CSMA/CA, token passing

*Network components:* servers; workstation; network cards eg Ethernet, wireless, token ring

*Interconnection devices:* eg switches, routers, bridges, wireless access points, mobile base stations

*Models:* eg open system interconnection (OSI) model, TCP/IP model

*Protocols:* eg Bluetooth®, Wifi, IrDa, cellular radio, GSM/UMTS, WAP, WML, 802.11 standards, TCP/IP, wireless security protocols

## 2 Know the main elements of data communications systems

*Main elements:* communication devices; data elements; electronic communication methods; transmission media and methods

*Communication devices:* wired devices eg data terminal equipment (DTE), data circuit-terminating equipment (DCE); wireless devices eg 3G, GPRS, mobile phone, laptop, netbook

*Signal theory:* digital signalling methods; representing data electronically (bits, bytes, packet structures); synchronous transmission; asynchronous transmission; error detection; error correction; bandwidth limitation; bandwidth noise; channel types eg telephone, high frequency (HF) radio, microwave, satellite; other issues eg bandwidth, data compression

*Data elements:* checksum eg cyclic redundancy check (CRC); encapsulation eg frames, packets, datagrams; addresses; sequence numbers

*Electronic communication:* methods eg simplex, duplex, half-duplex communication, parallel, universal serial bus, serial, infra red, Bluetooth, WiFi, 3G

*Transmission:* methods eg coaxial, optical fibre, unshielded twisted pair (UTP), shielded twisted pair (STP), infrared, radio, microwave, satellite

## 3 Be able to implement different forms of network communications

*Internet communication:* terminology eg HTTP, HTTPS, FTP, SMTP; uniform resource locator; worldwide web; other eg blogs, wikis, video conferencing, vlogs, social networking

*System requirements:* wired or mobile systems; communication services eg email, video, internet, software, configuration

*Direct communication:* eg instant messaging, video communication, email, web phone, social networking, web conferencing, desktop sharing

*Interconnection devices:* eg switches, routers, bridges, wireless access points, mobile base stations

## Assessment and grading criteria

In order to pass this unit, the evidence that the learner presents for assessment needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria for a pass grade describe the level of achievement required to pass this unit.

Assessment and grading criteria		
To achieve a pass grade the evidence must show that the learner is able to:	To achieve a merit grade the evidence must show that, in addition to the pass criteria, the learner is able to:	To achieve a distinction grade the evidence must show that, in addition to the pass and merit criteria, the learner is able to:
<b>P1</b> explain how networks communicate		
<b>P2</b> identify communication protocols and models	<b>M1</b> explain why communication protocols are important [IEI]	<b>D1</b> compare the OSI seven layer model and the TCP/IP model
<b>P3</b> identify different types of communication devices		
<b>P4</b> describe what data elements are and why they are important		
<b>P5</b> describe the principles of signal theory		
<b>P6</b> describe different transmission methods used	<b>M2</b> explain why particular transmission methods are chosen in particular situations	<b>D2</b> compare the effectiveness of different transmission methods.
<b>P7</b> create direct network communication between two users [SM3]	<b>M3</b> assess the effectiveness of data transfer over wired and wireless networks.	
<b>P8</b> set up interconnection devices for direct communication.		

**PLTS:** This summary references where applicable, in the square brackets, the elements of the personal, learning and thinking skills applicable in the pass criteria. It identifies opportunities for learners to demonstrate effective application of the referenced elements of the skills.

<b>Key</b>	IE – independent enquirers	RL – reflective learners	SM – self-managers
	CT – creative thinkers	TW – team workers	EP – effective participators

# Essential guidance for tutors

## Delivery

This unit could be delivered as part of a system support and networking focus which includes other units with networking content. The emphasis is on practical activity to enable learners to understand how modern IT can be used to enhance the commercial and personal environment. This unit links directly to other network units and the practical elements in P7 and P8 could link with the vendor units.

Delivery of the theoretical aspects should focus on the most up-to-date technology available, including all the latest developments in mobile communications such as third generation technology.

The practical aspects of the unit should be opportunities to use the main technologies listed in the unit content, such as 3G hardware and mobile computing technology, for example a wireless PDA. Ideally, the tutor should try to secure as many of these technologies as is feasible.

As an addition to the practical element, it may be useful for learners to have some input from an IT communications technology specialist. They can give an insight into career progression within this sector, as well as providing up-to-the-minute technical knowledge that learners can draw on.

## Outline learning plan

The outline learning plan has been included in this unit as guidance and can be used in conjunction with the programme of suggested assignments.

The outline learning plan demonstrates one way in planning the delivery and assessment of this unit.

Topic and suggested assignments/activities and/assessment
<b>Introduction to the unit</b>
The main elements of data communications systems: <ul style="list-style-type: none"><li>• whole-class exercise – tutor presentation on communication devices</li><li>• directed research – using tutor-provided materials on signal theory</li><li>• whole-class exercise – tutor presentation on data elements</li><li>• whole-class exercise – tutor presentation on methods of electronic communication, followed by whole-class practical</li><li>• whole-class exercise – tutor presentation on transmission media and methods, followed by whole-class practical.</li></ul>
Communication principles of computer networks: <ul style="list-style-type: none"><li>• individual exercise – use tutor-provided materials to understand the features of networks</li><li>• whole-class exercise – tutor demonstrates network components to class</li><li>• whole-class exercise – tutor demonstrates interconnection devices to class.</li></ul>
<b>Assignment 1 – From End to End</b>
Transmission protocols and models: <ul style="list-style-type: none"><li>• whole-class exercise – tutor presentation on the open system interconnection (OSI) model and the TCP/IP model, followed by a practical</li><li>• individual exercise – learn about different electronic communication protocols from tutor-provided materials.</li></ul>
<b>Assignment 2 – A Bespoke Solution</b>

## Topic and suggested assignments/activities and/assessment

Implementing different forms of internet communications:

- whole-class exercise – tutor presentation on internet communication terminology, followed by practical tasks
- whole-class exercise – tutor presentation on system requirements, followed by practical tasks
- whole-class exercise – tutor presentation on direct communication methods, followed by practical tasks.

### Assignment 3 – LAN Manager

## Assessment

This unit can be assessed using the three assignments outlined in the *Programme of suggested assignments* table. However, there are other valid ways of assessment and the programme of suggested assignments is a suggestion only.

### Suggested Assignment 1 – From End to End

Evidence for this assignment could be in the form of a series of leaflets, posters or web pages which are suitably illustrated and annotated.

P1 requires learners to explain how networks communicate. This can be evidenced diagrammatically with annotations and notes, or it could be part of a presentation.

For P2, communication protocols and models should be described using graphics where appropriate.

For P3, learners must identify different types of communication devices, addressing the prescriptive elements of the unit content.

For P4, learners must describe what data elements are and why they are important. Learners need to describe the different elements, and their importance, in their own words.

M1 is an extension of P2 going beyond a straightforward description and explaining why protocols are important.

D1 will require additional work to outline the models and then compare their features and uses.

### Suggested Assignment 2 – A Bespoke Solution

A presentation is the suggested evidence format for this assignment.

P5 requires learners to describe the principles of signal theory as outlined in the unit.

P6 is about transmission methods.

M2 expands on P6 with an explanation of why particular transmission methods are chosen for different situations. D2 requires learners to compare the effectiveness of different transmission methods. The comparison is expected to be detailed and show a comprehensive understanding of both OSI and TCP/IP. This comparison must discuss good and bad points and not just be a description of the two subjects.

### Suggested Assignment 3 – LAN Manager

P7 is practical, and each learner must create a direct communication link between two networked devices. This could be a short video, observation evidence, or a written summary.

P8 is also practical. In this case, learners must create interconnection devices for direct communication. As with P7, evidence could be a short video, observation evidence, or a written summary.

M3 follows P7 and learners must assess the effectiveness of data transfer over wired and wireless networks. This could be presented as a comparative assessment considering the pros and cons of each.

## Programme of suggested assignments

The table below shows a programme of suggested assignments that cover the pass, merit and distinction criteria in the assessment and grading grid. This is for guidance and it is recommended that centres either write their own assignments or adapt any Edexcel assignments to meet local needs and resources.

Criteria covered	Assignment title	Scenario	Assessment method
PI-P4, M1, D1	From End to End	An ISP has commissioned you to write publicity materials explaining some of the basics of IT communication.	Leaflets or posters
P5, P6, M2, D2	A Bespoke Solution	A client wishes to know more about transmission signals. Produce a presentation to describe the principles and methods used.	Presentation
P7, P8, M3	LAN Manager	The ISP has asked you to create a system that will enable two users to make direct communication.	Observation records Witness statement Notes

## Links to National Occupational Standards, other BTEC units, other BTEC qualifications and other relevant units and qualifications

This unit forms part of the BTEC in IT sector suite. This unit has particular links with:

Level 2	Level 3	Level 4
Unit 14: Mobile Communications Technology	Unit 9: Computer Networks	Unit 24: Networking Technologies
Unit 24: Telecommunications Technology		Unit 43: Networking Infrastructure

This unit maps to some of the underpinning knowledge from the following areas of competence in the Level 3 National Occupational Standards for IT (ProCom):

- 4.7 Systems Design
- 5.1 Systems Development
- 5.3 IT/Technology Solution Testing.

## Essential resources

Learners will need access to practical resources and suitable technology; they can also use simulators or multimedia tools to gain experience before handling live resources

## Employer engagement and vocational contexts

Visits to a local ISP or using the centre's network would provide a suitable vocational context.

### Indicative reading for learners

#### Textbooks

Dodd AZ – *The Essential Guide to Telecommunications, 4th Edition* (Prentice Hall, 2005)  
ISBN-10 0131487256, ISBN-13 978-0131487253

Hallberg B – *Networking: A Beginner's Guide, 5th Edition* (Osborne/McGraw-Hill US, 2009)  
ISBN-10 0071633553, ISBN-13 978-0071633550

Lowe D – *Networking All-in-One Desk Reference for Dummies, 3rd Edition* (John Wiley & Sons, 2008)  
ISBN-10 0470179155, ISBN-13 978-0470179154

Schiller J – *Mobile communications, 2nd Edition* (Addison Wesley, 2003) ISBN-10 0321123816,  
ISBN-13 978-0321123817

#### Websites

[www.howstuffworks.com](http://www.howstuffworks.com)

[www.webopedia.com](http://www.webopedia.com)

### Delivery of personal, learning and thinking skills

The table below identifies the opportunities for personal, learning and thinking skills (PLTS) that have been included within the pass assessment criteria of this unit.

Skill	When learners are ...
Independent enquirers	planning and carrying out research to explain why communication protocols are important
Self-managers	organising time and resources to connect users.

Although PLTS are identified within this unit as an inherent part of the assessment criteria, there are further opportunities to develop a range of PLTS through various approaches to teaching and learning.

Skill	When learners are ...
Independent enquirers	assessing the effectiveness of data transfer over wireless and wired networks, judging its value.

## ● Functional Skills – Level 2

Skill	When learners are ...
<b>ICT – Use ICT systems</b>	
Select, interact with and use ICT systems independently for a complex task to meet a variety of needs	creating network communications
Use ICT to effectively plan work and evaluate the effectiveness of the ICT system they have used	
Manage information storage to enable efficient retrieval	
Follow and understand the need for safety and security practices	creating network communications
Troubleshoot	
<b>ICT – Develop, present and communicate information</b>	
Present information in ways that are fit for purpose and audience	explaining protocols and transmission methods
Select and use ICT to communicate and exchange information safely, responsibly and effectively, including storage of messages and contact lists	setting up communication devices.