

Unit 42: Computer Networks

Unit code:	R/601/7320
QCF Level 3:	BTEC Specialist
Credit value:	10
Guided learning hours:	60

Aim and purpose

The aim of this unit is to ensure learners understand the key components of networked systems, know about network protocols and the services provided by network systems and develop the skills required to ensure network security.

Unit introduction

Networks are used in one way or another by virtually every organisation, from simple use of internet services through internal file sharing to wide area networks exchanging data across continents. Therefore, it is essential that learners thinking of careers within the IT industry have a good understanding of the underlying principles of networking and how data travels around networks.

This unit starts by exploring the different types of networks and the standards relating to network systems, including local and wide area networks. Networks can be either wired or wireless systems and, although much of the underpinning content is similar, this unit does make reference to both.

The hardware and software components used in networks and their operation are explored and learners will develop an understanding of their functions and how they relate to each other, particularly how connections are made and the purpose of these connection devices.

As users of networks, we work with them mostly through the services that they provide, from simple services such as file sharing and communications to more complex services involving security and account management. Learners will explore and use the different services available.

For networks to be suitable they must be secure and networks distributed across several physical locations, perhaps via a WAN, makes the ensuring of security a complex business. Learners will be exploring the technologies used to create secure systems and putting security procedures and devices in place to secure a networked system. Learners will come to understand the risks to businesses from insecure networks.

Learning outcomes and assessment 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 determine the standard required to achieve the unit.

On completion of this unit a learner should:

Learning outcomes	Assessment criteria
1 Know types of network systems and protocols	1.1 describe the types of networks available and how they relate to particular network standards and protocols 1.2 describe why different network standards and protocols are necessary
2 Understand the key components used in networking	2.1 explain the key components required for client workstations to connect to a network and access network resources 2.2 explain the function of interconnection devices
3 Know the services provided by network system	3.1 describe typical services provided by networks
4 Be able to make networked systems secure	4.1 make a networked system secure

Unit content

1 Know types of network systems and protocols

Types of network: local area network (LAN); wide area network (WAN), internet; WAN technologies eg frame relay, MPLS, ATM; Personal Area Network (PAN); logical and physical topologies eg star, bus, ring, mesh, tree; network access methods eg CSMA, Token passing; network models eg OSI 7 layer, TCP/IP

Network protocols and standards: types eg TCP/IP, AppleTalk, UDP, 802.2, 802.3, FDDI, 802.5; wireless technologies eg 802.11, infrared, Bluetooth, 3G; factors affecting range and speed of wireless technologies

Application layer protocols: types eg DNS, DHCP, HTTP, FTP, SMTP

2 Understand the key components used in networking

Key components: network devices; interconnection devices; connectors and cabling; software

Network devices: workstations; servers eg print, mail, file, web, proxy; others eg network interface cards (NIC); features and functions

Interconnection devices: equipment eg router, switch, wireless access points; purposes, features and functions of each

Connectors and cabling: leased line; dedicated line; media types eg STP, Category 5, coaxial, UTP, fibre optic; wireless; mobile technology; cable/connection standards

Software: network operating system; virus checker; firewall; other eg email client

Commercial systems: software eg Mac OSX, Linux, Windows

3 Know the services provided by network systems

Directory services: used for eg account management, authentication management, active directory, DNS

Telecommunication services: communication eg email, internet relay chat (IRC), discussion boards; remote access eg via mobiles, remote desktop, social networking

File services: file transfer; file sharing

Application services: application software eg database, web, proxy; shared resources eg printing; storage space; Voice over IP (VoIP); mobile working; authentication eg users, hardware

4 Be able to make networked systems secure

Securing a system: passwords, authorisation permissions and access control lists; backing up and restoring; encrypting; others eg biometrics; physical security eg CCTV, locks, firewalls; security risk levels; software protection eg antivirus, intrusion detection systems

Business risks: loss of service; loss of business or income eg through loss of customer records; increased costs; loss of confidentiality; compromised data integrity; security issues eg malware (hostile, intrusive, or annoying software or program code), viruses, Trojans, worms, spyware, adware

Essential guidance for tutors

Delivery

This unit is based on the principles of networking with a theoretical view to much of the content. However, centres should try to ensure that as many varied learning approaches are used as possible. Practical activities on real networks are recommended, examples are offered in Assessment below.

Visits or talks given by outside professionals will be valuable – preparation may be necessary to ensure that the guest speaker understands the level of programme and is prepared to use appropriate language and respond to the learning outcomes where possible.

This unit can be offered in parallel to the many vendor units on offer and is designed to link into the other network related units.

The unit content can be followed chronologically but this may not be the most appropriate sequence. Integrating practical activity to bring the unit alive will be vital. Much internet research can be done on network components and services and learners can work in teams to cover and collect information and pool findings.

A secure and separate network will be needed for learners to practice implementing security features. Much of the content will not be able to be physically carried out but learners should understand where and when the use of these techniques, such as encryption, is suitable.

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
Introduction to the unit
<ul style="list-style-type: none"> • whole-class exercise – tutor presentation on different types of network • whole-class exercise – learning and understanding network protocols and standards • directed research – learn about application layer protocols.
<ul style="list-style-type: none"> • whole-class exercise – tutor demonstrates network devices, interconnection devices, connectors and cabling, software and commercial systems, followed by practical exercises.
Assignment 1 - Networking/not-working
<ul style="list-style-type: none"> • whole-class exercise – practical work on directory, telecommunication, file and application services.

Topic and suggested assignments/activities and/assessment
Assignment 2 - Bespoke Systems
<ul style="list-style-type: none"> individual exercise – use tutor provided materials to research risk-related business issues whole-class exercise – tutor sets a series of practical exercises to teach learners about securing data.
Assignment 3 - Service Provider
Assignment 4 - Securing a Network

Assessment

As this unit has substantial theory it is important that centres make as much use of varied assessment strategies as possible to maintain interest. This could include the use of online or conventional testing, learner presentations, assignments or question and answer sessions.

The suggested assessment is through four assignments as outlined in the PSA below.

Suggested Assignment 1 – Networking/not-working

The suggested scenario is that learners have been employed to explain possible a network solutions to a business client

For 1.1, describing networks, protocols and standards, learners could produce a report/poster using diagrams. Alternatively, a small set of linked web pages could be appropriate or a presentation.

For 1.2, learners should be able to demonstrate they understand why different network standards and protocols are necessary. Examples given should be realistic. This can be linked to 1.1.

Suggested Assignment 2 – Bespoke Systems

For 2.1, learners are explaining the key components for connection to network systems. This along with the evidence for 2.2 (the function of interconnection devices) could be produced as an information 'leaflet', which may be paper based or web based.

Suggested Assignment 3 – Service Provider

The evidence for 3.1 can be in any appropriate format. To make for some variation this could be presented as a blog or simply a standard report format.

The unit content informs the expected coverage.

Suggested Assignment 4 – Securing a Network

The assumption here is that a network has already been set up and the assessment deals with implementing security procedures. Learners will obviously benefit from setting the system up as well and evidence from that activity may be used for other networking units.

4.1 will be evidenced with observation records and/or witness statements, which should be supplemented with any associated paperwork.

Programme of suggested assignments

The table below shows a programme of suggested assignments that cover the assessment 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
1.1, 1.2	Networking/not-working	You have been employed to explain possible network solutions to a business client.	Report. Poster. Presentation.
2.1, 2.2	Bespoke Systems	The client asks you to design a network for the business.	Leaflet. Presentation. Network diagram.
3.1	Service Provider	The client wants you to explain some typical network services.	Presentation. Blog. Report.
4.1	Securing a Network	The client asks you to secure the network.	Observation records. Witness statements. Report.

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 1	Level 2	Level 3
	Systems Architecture	Systems Architecture
	Setting up an IT Network	Networking Principles
	Networking Principles	
	An Introduction to Communication Technologies	

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 prior 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

www.webopedia.com

Functional Skills – Level 2

Skill	When learners are ...
ICT - Using ICT	
Select, interact with and use ICT systems safely and securely for a complex task in non-routine and unfamiliar contexts	making a network secure
ICT - Finding and selecting information	
Use appropriate search techniques to locate and select relevant information	Research network protocols
ICT - Developing, presenting and communicating information	
Combine and present information in ways that are fit for purpose and audience	explaining network solutions and services.