Unit 105: CCNA Fundamentals of Networking (Exploration 1)

Unit code: A/601/7537

QCF Level 3: BTEC in IT

Credit value: 10

Guided learning hours: 80

Aim and purpose

This unit introduces the architecture, structure, functions, components, and models of the internet and other computer networks. It uses the OSI and TCP layered models to examine the nature and roles of protocols and services at the application, network, data link, and physical layers. The principles and structure of IP addressing and the fundamentals of Ethernet concepts, media, and operations are introduced.

Unit introduction

This unit is a comprehensive introduction to the basics of computer networking and telecommunications principles. This is the first of four units in the exploration study pathway, leading to the Cisco Certified Network Associate (CCNA) qualification. This unit focuses on network terminology and protocols, Local Area Networks (LANs), Wide Area Networks (WANs), conceptual models, cabling, cabling tools, routers and introductory router programming.

The unit covers networking sector skills and knowledge that an ICT network technician would need to successfully complete their work. In particular, learners will be taught how to attach a computer to a network system, connect copper cabling, devise a subnet scheme, plan and recommend improvements to a network infrastructure. In addition, learners will be able to troubleshoot simple networking hardware communication problems. Learners will understand and apply commonly used networking technologies in a variety of contexts and appreciate what takes place in the daily operation of a network.

This unit involves hands-on, lab-oriented activities that stress laboratory safety and working effectively in a group environment. Theory aspects are studied and tested online using Cisco's own electronic curriculum which learners may also access from home. The unit is delivered through a blended learning approach where tutor-led teaching is combined with the electronic materials and testing.

This unit is assessed via the Cisco Network Fundamentals (CCNA1) online examination. There are further criteria for merit and distinction grades.

Learning outcomes

On completion of this unit a learner should:

1 Know the diverse types of network systems and devices in common use

2 Know how different network technologies operate and communicate

3 Understand OSI and TCP/IP and their relationship to the operation of network systems

4 Be able to configure a workstation for connection to a network

5 Be able to design a sub-network scheme

6 Be able to recommend improvements to an existing network infrastructure.

Unit content in relation to the Merit and Distinction Criteria

Network infrastructure: eg small (less than 250 devices), medium (less than 65530 devices), large (over 65540 devices)

Devices: eg mobile devices, workstations, printers, routers, switches, wireless access points

Network design: logical topology, eg star, bus, ring, hierarchical, mesh; physical

topology eg cabling infrastructure, wireless, fibre, 3G, 4G

Sub-networking: eg class A, Class B, Class C, private addresses, public addresses

Multiple hosts: more than two workstations or mobile devices

OSI model: International Standards Organisation seven layer Open Systems Interconnection model

TCP/IP model: DARPA (USA Defense Advanced Research Projects Agency) four layer transmission control protocol/internet protocol

Long-term: five or more years

Network: eg small business system, academic system, public system, case study scenario, switched infrastructure, routed infrastructure

Test: eg top down, bottom up, systematic

Troubleshoot: eg show commands, cable tester, protocol analysis, system logs, debug output, use of tools

Plan: eg using packet tracer, viso, diagrams, command selection, cable selection, protocol design

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:**
Pass Cisco Network Fundamentals (CCNA1) examination. The centre will evidence this with a copy of the learner's class grade book from the assessment system on completion of the unit (this must be listed by learner name). A pass grade is a score of 70% or more in the **final examination.**	**M1** review an existing network infrastructure and provide recommendations for improvement [IE]	**D1** justify a network design which will allow for long-term growth [IE, CT, SM]
	M2 recommend a sub-networking scheme for a small-scale network infrastructure, using private addressing [IE]	**D2** justify a private sub-networking scheme, which could be used on medium or large-scale systems, identifying individual sub-networks [CT, RL]
	M3 plan and implement a network system with multiple hosts to access the internet (or another network). [IE, TW, EP, SM]	**D3** compare the OSI and TCP/IP networking models. [IE]

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

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

Essential guidance for tutors

Delivery

Cisco Network Fundamentals CCNA1 is a proprietary unit within the Cisco Networking Academy program. The curriculum, assessment and support materials are available only to institutions participating in the program.

Cisco Systems makes these available at no cost for any non-profit institution; there are some costs for instructor training and support. For detailed information please consult this web link:

www.cisco.com/web/learning/netacad/get_involved/BecomeAnAcademy.html.

If learners are following the Cisco unit in parallel with a BTEC National unit then it is recommended that the two aspects of the assessment are integrated. Tasks being completed as part of the practical preparation for Cisco Skills Based Exams can then be used to support the BTEC assessment for the merit and distinction criteria.

To view general information about the Cisco Network Fundamentals (CCNA1) objectives please visit: www.cisco.com/web/learning/netacad/unit_catalog/CCNA.html. The detailed scope and sequence documents are available to academies on the Cisco internal site.

Outline learning plan

Cisco Systems as part of the their academy programme, provide learning plans and study guidance for their units. Cisco Systems recommend 75 hours of delivery to attain the pass criteria, in line with QCF credit and notional learning hours. The notional hours for managed learning is set at 40 for learners to attempt the merit and distinction.

Assessment

To achieve a pass grade, learners must pass the Network Fundamentals CCNA1 module examination. For merit/distinction the learner may take the assessment recommended in the 'programme of suggested assignments', this is designed to align with the vendor pass criteria and may be delivered as an alternate skills based assessment.

Programme of suggested assignments

The table below shows a programme of suggested assignments that cover the 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
M1, M2, D1, D2	Network Design	Learners are asked to review an existing network structure and propose a subnetworking and infrastructure scheme.	Presentation, poster, oral, report.
M3, D3	How networks work!	Learners are asked to plan and implement a small network and use this to form the basis for their comparison of the OSI and TCP/IP models, this assessment can follow the theme/context of the previous assessment.	Practical, observation, presentation, oral.

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

This unit forms part of the BTEC IT sector suite. This unit has particular links with the other Cisco Exploration units as well as Principles of Networks, Communications Technology and Organisational Systems Security. A learner who starts on the exploration pathway must remain on this pathway (they cannot transfer to the Cisco Discovery pathway).

Essential resources

Students will need access to practical resources and suitable technology; they can also use simulators such as packet tracer or multimedia tools to gain prior experience before handling 'live resources'.

This unit must be taught in a computer lab with internet access in order to assess learners via the Cisco online assessment system. The web is a great source of technical information.

If another room for lab work is available, then the cabling and network configuration part of the class can be taught in this classroom. One lab computer for every two learners is an ideal situation but many classes have up to three to four learners per lab computer. Lab computers do not need to be the latest or newest systems, but it helps if they are all identical. It is recommended that computers used by other classes are not used as learners may tear down the machines. There should be a supply of redundant computers for this task.

Employer engagement and vocational contexts

The Cisco CCNA certification is internationally recognized by a diverse range of employers (from SME's to large corporations) as one of the principal certifications in networking and telecommunications.

Indicative reading for learners

For a list of Cisco resources to assist with this unit, including exam preparation materials, see: www.cisco.com/web/learning/netacad/unit_catalog/CCNA.html.

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	The pass criteria is set by an examination, the PLTS of self management and reflective learning is supported by the learner, taking personal study and revision in advance of the Cisco Examination.
Creative thinkers	
Reflective learners	
Team workers	
Self-managers	
Effective participators	

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	completing research and analysis of current networked system as well as planning and implementing the networked system
Creative thinkers	implementing any networked solution
Reflective learners	evaluating and looking at the impact of network issues
Team workers	planning and implementing the networked solution; this could be accomplished on an array of 'live' resources by a small group of learners. This is an optional element, depending on how the assignment is designed.
Self-managers	justifying the implementation; the learner can reflect on how they managed their own time and analysis of the problem
Effective participators	planning and implementing the networked solution; this could be accomplished on an array of 'live' resources by a small group of learners. This is an optional element, depending on how the assignment is designed.

Functional Skills – Level 2

Skill	When learners are ...
ICT – Use ICT systems	
Select, interact with and use ICT systems independently for a complex task to meet a variety of needs	Configuring devices, installing cables, setting up terminal sessions
Use ICT to effectively plan work and evaluate the effectiveness of the ICT system they have used	Using show based diagnostic commands and analysis tools
Follow and understand the need for safety and security practices	Configuring devices, installing cables, setting up terminal sessions
Troubleshoot	Using show based diagnostic commands and analysis tools
ICT – Find and select information	
Select and use a variety of sources of information independently for a complex task	Reviewing output from show commands and debug tools as well as web/text reference sources
Access, search for, select and use ICT-based information and evaluate its fitness for purpose	Reviewing output from show commands and debug tools as well as web/text reference sources and comparing to expected outcomes
English	
Speaking and listening – make a range of contributions to discussions and make effective presentations in a wide range of contexts	Presentation of network planning
Reading – compare, select, read and understand texts and use them to gather information, ideas, arguments and opinions	Research on network technologies, topologies and presentation of network solution.
Writing – write documents, including extended writing pieces, communicating information, ideas and opinions, effectively and persuasively	Presentation of networked solution and supporting justification.