

Next Generation Higher National Unit Specification

Network Infrastructure (SCQF level 7)

Unit code: J68S 47

SCQF level: 7 (16 SCQF credit points)

Valid from: session 2022–23

**Prototype unit specification for use in pilot delivery
only (version 1.0) May 2022**

This unit specification provides detailed information about the unit to ensure consistent and transparent assessment year on year.

This unit specification is for teachers and lecturers and contains all the mandatory information required to deliver and assess the unit.

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Unit purpose

This is a non-specialist unit, designed for a wide range of learners with an interest in computer networking. It is particularly suitable for those with a vocational interest in STEM-based subjects, or who wish to progress to higher education and/or vendor qualification-based computing subjects. No previous experience of computer networking is required, although learners should have basic computer skills.

This unit introduces learners to the elements that comprise the planning and implementation of a network infrastructure environment. They use appropriate methods to plan logical and physical network topologies, and identify the types of operating systems, network hardware and services likely to be within a network infrastructure. Learners also plan appropriate network addressing schemes and physical aspects, such as cabling and placement of servers. They then consider the management and security of a network infrastructure.

Opportunities exist for learners to use a range of networking-related hardware and software, in combination with networking terminology — this helps to reinforce core understanding.

On completion of this unit, learners can progress to the *Network Infrastructure* unit at SCQF level 8.

Unit outcomes

Learners who complete this unit can:

- 1 design a network infrastructure
- 2 implement a network infrastructure
- 3 secure a network infrastructure
- 4 maintain a network infrastructure

Evidence requirements

Learners must provide both knowledge and product evidence.

Knowledge evidence

Learners should produce evidence in the form of a theoretical assessment that demonstrates their subject-based knowledge across outcomes 1, 2, 3 and 4. They can do this periodically or on an ongoing basis, throughout the life of the unit, or in one final assessment at the end of the unit. If you test learners, it must be under closed-book and controlled conditions.

Product evidence

This evidence demonstrates practical skills. Learners can design and provide the specification, and recommended solution design for a network from a given scenario with specific requirements. This should include:

- ◆ network design
- ◆ network topologies
- ◆ media and/or cabling to be used as part of the network:
 - cables/patch panels/wireless technology
- ◆ installation and configuration of networking devices:
 - basic configuration of routers and/or switches
- ◆ installation and configuration of network hosts/nodes:
 - including operating systems
- ◆ IP addressing schemes
- ◆ configuration of network services (at least two):
 - Dynamic Host Configuration Protocol (DHCP) and file sharing
- ◆ Security features:
 - firewall/antivirus/wireless encryption
- ◆ network testing
- ◆ troubleshooting and maintenance

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Learners can develop evidence over time, throughout the life of the unit and under lightly controlled conditions. They can have access to books and reference materials.

They can record their progress and document their network using digital means, for example an e-portfolio or blog. Any work recorded electronically must collectively satisfy the evidence requirements.

You must ensure that any evidence produced is the learner's own work.

Knowledge and skills

The following table shows the knowledge and skills covered by the unit outcomes:

Knowledge	Skills
<p>Learners should understand:</p> <ul style="list-style-type: none">◆ network topologies:<ul style="list-style-type: none">— physical— logical◆ operating systems<ul style="list-style-type: none">— client— server◆ IP addressing◆ network services◆ network hardware:<ul style="list-style-type: none">— network interface controllers (NICs)— cabling— wireless— switches— routers◆ network security:<ul style="list-style-type: none">— host security◆ network maintenance:<ul style="list-style-type: none">— testing— documentation	<p>Learners can:</p> <ul style="list-style-type: none">◆ identify a network topology◆ design a computer network◆ design a basic IPv4 addressing scheme◆ develop a cabling scheme including cables and patch panels◆ identify network hardware◆ install and configure network hardware◆ implement wireless technology◆ install and configure operating systems◆ implement network services◆ implement a secure network◆ troubleshoot a network◆ develop a testing strategy◆ implement network testing◆ maintain a network◆ develop network documentation

Meta-skills

Throughout the unit, learners develop meta-skills to enhance their employability in the computing sector.

Self-management

These meta-skills include:

- ◆ focusing: sorting, attention, filtering
- ◆ adapting: self-learning
- ◆ initiative: self-motivation

Social intelligence

These meta-skills include:

- ◆ communicating: receiving information, listening
- ◆ collaborating: teamworking and collaboration
- ◆ leading: motivating others

Innovation

These meta-skills include:

- ◆ curiosity: observing, questioning, information sourcing, problem recognition
- ◆ creativity: visualising
- ◆ sense-making: holistic thinking
- ◆ critical thinking: deconstruction, logical thinking, computational thinking

Literacies

Throughout this unit, learners have opportunities for the development of literacies.

Numeracy

Numeracy is developed through several areas of knowledge and skills such as working with number systems, performing decimal, binary and hexadecimal calculations and IP addressing.

Communication

Communication is developed through several areas of knowledge and skills, such as word processing, communication and collaboration, report writing and presentation.

Digital

This unit contributes significantly towards learners' digital skills.

Delivery of unit

This unit can be done on its own or as part of a group award. You can deliver it alongside and assess it holistically with the *Network Fundamentals* unit and the *Practical Computer Networking* unit at SCQF level 7, as these provide learners with the theoretical and practical aspects of developing a computer network. This unit provides a better understanding of the range of components and services found within the wider perspective of a network infrastructure, as well as their practical implementation.

You should deliver this unit sequentially, given the nature of systems development. Take care not to concentrate solely on networking topics, as there is scope for delivery of these topics within other units. Give learners the opportunity to examine additional and overall features of a network infrastructure, such as:

- ◆ client and server technologies
- ◆ operating systems
- ◆ access control
- ◆ protocols and services
- ◆ fundamentals of managing an infrastructure
- ◆ security

We suggest the following distribution of time:

Outcome 1 — Design a network infrastructure
(25 hours)

Outcome 2 — Implement a network infrastructure
(25 hours)

Outcome 3 — Secure a network infrastructure
(20 hours)

Outcome 4 — Maintain a network infrastructure
(10 hours)

During this unit you can introduce learners to a variety of software for drawing network design scenarios. For example, if networking lab facilities are available, you should give demonstrations to reinforce key concepts.

Learners can employ virtualisation methods and/or network simulation to implement network scenarios. Additionally, learners can describe how you would complete any tasks that cannot be completed on physical equipment or within a virtual/simulated environment.

Additional guidance

The guidance in this section is not mandatory.

Design a network infrastructure (outcome 1)

You should start with the principles of planning and designing a network. For example, the examination of types of topologies, and how they can impact on the performance and management of a computer network.

When an appropriate topology has been determined, you can decide what devices to include, such as cabling, wireless, PCs, servers, network devices, and consider more contemporary approaches such as Bring Your Own Device (BYOD) and Internet of Things (IoT). This allows learners to form a logical topology design. When identifying devices and media for the network, learners should consider a basic IP addressing scheme, as well as choice of operating systems.

Implement a network infrastructure (outcome 2)

When learners have produced a logical topology, it should form the basis for a physical network topology. Ideally, they should produce this as part of a floorplan, depending on the requirements of the project or scenario. This should match the logical diagram in terms of nodes, network devices, cabling, addressing schemes and security features.

At this stage, learners should implement it as part of the network infrastructure. They do not need to detail network device configurations at this point, however, configuration should take place to ensure basic operation. Learners can also install client and server operating systems at this stage, including installing and configuring network services.

Secure a network infrastructure (outcome 3)

When learners have installed the network, they should take additional steps to ensure basic security. This can include installing and configuring a firewall and antivirus software onto end-user devices. Learners should configure user accounts on each of the devices on the network to ensure basic authorisation and authentication. They should configure wireless authentication (including appropriate encryption methods) for any wireless networks that they have implemented.

Maintain a network infrastructure (outcome 4)

You should ensure that learners develop an appropriate strategy for maintenance of the network infrastructure. This should include testing various aspects of the network, such as end-to-end communication between nodes on the network and testing of any services that are in use, as well as authentication mechanisms. Learners should log all testing and maintenance fully as part of the network documentation.

Assessment guidance

The knowledge-based assessment could be a multiple-choice assessment, with 30 questions covering all aspects of each outcome. This should have a pass mark of 60 per cent (18 correct answers out of 30 questions) and should be closed-book, under timed exam conditions. You can do this in stages throughout the unit or as one final test at the end of the unit. If you deliver this unit holistically with the *Network Fundamentals* unit and the *Practical Computer Networking* unit at SCQF level 7, you can combine this with the *Network Fundamentals* unit's multiple-choice assessment.

The product-based assessment should demonstrate practical skills and be based on a case study or scenario. The product could be a report of no more than 800 words, covering the development of the practical aspects of the unit (outcomes 2, 3 and 4). The report should consist of network design diagrams, an implementation log or configuration checklist and testing strategy or logs, which learners should present as a network solution document that demonstrates the development of a network.

You can develop this under lightly controlled conditions as learners progress through the unit. They could also authenticate their own work through oral questioning, for example.

Equality and inclusion

This unit is designed to be as fair and as accessible as possible with no unnecessary barriers to learning or assessment.

You should take into account the needs of individual learners when planning learning experiences, selecting assessment methods or considering alternative evidence.

Guidance on assessment arrangements for disabled learners and/or those with additional support needs is available on the assessment arrangements web page:

www.sqa.org.uk/assessmentarrangements.

Information for learners

Network Infrastructure (SCQF level 7)

This section explains:

- ◆ what the unit is about
- ◆ what you should know or be able to do before you start
- ◆ what you need to do during the unit
- ◆ opportunities for further learning and employment

Unit information

This unit introduces you to the elements that comprise the planning and implementation of a network infrastructure environment. You use appropriate methods to plan logical and physical network topologies as well as identify the types of operating systems, network hardware and services likely to be within a network infrastructure. You plan appropriate network addressing schemes and physical aspects, such as cabling and placement of servers, and then consider the management and security of a network infrastructure.

Opportunities exist in this unit for you to use a range of networking-related hardware and software in combination with networking terminology. This can help to reinforce your core understanding of the implementation of a network infrastructure in the context of the wider IT infrastructure.

You can be assessed in two different ways:

- 1 Knowledge-based assessment — through multiple-choice questions.
- 2 Product-based assessment — using a practical assessment, where you have the opportunity to design, develop and maintain a network infrastructure.

You also develop a range of additional meta-skills to prepare you for the workplace. These include:

- ◆ self-management: attention, self-learning, self-motivation
- ◆ social intelligence: listening, teamworking and collaboration, motivating others
- ◆ innovation: visualising, holistic thinking, logical thinking, computational thinking

Once you have completed this unit, you can progress to other networking units at SCQF level 8.

Administrative information

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Superclass: CB

History of changes

Version	Description of change	Date

Note: please check [SQA's website](#) to ensure you are using the most up-to-date version of this document.