

Next Generation Higher National Unit Specification

Cloud Virtualisation Infrastructure (SCQF level 8)

Unit code: J7E3 48
SCQF level: 8 (24 SCQF credit points)
Valid from: session 2023–24

Prototype unit specification for use in pilot delivery only (version 1.0) June 2023

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

The unit helps learners to gain practical skills in:

- ◆ using a public cloud service to provision and use virtual machines
- ◆ managing identity and accessing the cloud
- ◆ implementing containers
- ◆ creating a cloud infrastructure to a given brief
- ◆ automating a deployment solution on a cloud platform

This specialist unit is intended for learners who have an interest in how virtualisation, cloud computing and container technology enable modern computing solutions for businesses. It is particularly suitable for learners with a background in computer networking.

Learners must have a basic understanding of computer networks and their associated hardware and operating systems. They can evidence this by completing units Network Infrastructure at SCQF level 7 or Networking and Infrastructure at SCQF level 8.

On completion of this unit, learners can determine an appropriate cloud infrastructure for a business situation and identify the required size of each of its components.

Learners may progress to other computing units at SCQF levels 8 and 9, but also to specialist cloud training, including vendor certifications in cloud technologies.

Unit outcomes

Learners who complete this unit can:

- 1 explain cloud computing concepts
- 2 create cloud storage solutions
- 3 build a network in a cloud computing service
- 4 perform compute operations in the cloud
- 5 implement cloud security and access control
- 6 automate a cloud infrastructure
- 7 configure containers and microservices

Evidence requirements

Learners must provide knowledge and product evidence.

The knowledge evidence relates to the underpinning theory required for all outcomes. Learners must produce the evidence individually and without assistance. It must demonstrate their understanding of the knowledge in this unit and its application to practice.

You can sample the knowledge evidence when testing is used, but you must include at least one item from each of the following:

- ◆ Cloud concepts
- ◆ Storage solutions
- ◆ Networking in the cloud
- ◆ Compute solutions
- ◆ Cloud security
- ◆ Automating cloud infrastructure
- ◆ Containers and microservices

Testing can be done using extended-response questions. Learners must produce evidence under controlled conditions in terms of supervision, location, timing and access to reference materials.

The product evidence covers outcomes 2 to 7 and can be produced over an extended period in lightly-controlled conditions. The learner must demonstrate that they can successfully perform the following tasks:

- ◆ create a cloud storage solution to a given problem brief
- ◆ build a network in a cloud computing service
- ◆ implement cloud security and access control
- ◆ automate a cloud infrastructure
- ◆ perform compute operations in the cloud
- ◆ configure containers and microservices

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Authentication is required when evidence is produced in lightly-controlled conditions. The [Guide to Assessment](#) provides further advice on methods of authentication.

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"> ◆ cloud concepts: <ul style="list-style-type: none"> — the advantages of the cloud — different types of cloud computing models. — service models, including software as a service (SaaS), platform as a service (PaaS) and infrastructure as a service (IaaS) — deployment models, including private, community, public and hybrid cloud ◆ storage solutions: <ul style="list-style-type: none"> — block main cloud storage types, including block storage, file storage and object storage ◆ networking in the cloud: <ul style="list-style-type: none"> — virtual private cloud (VPC) — public and private subnets — security groups access control lists (ACL) — route tables ◆ compute solutions, such as instance types ◆ cloud security and access control, such as identity and access management, including users, groups and roles ◆ automating cloud infrastructure: <ul style="list-style-type: none"> — reason for automation — yet another markup language (YAML) and JavaScript Object Notation (JSON) — automatic deployment of cloud resources 	<p>Learners can:</p> <ul style="list-style-type: none"> ◆ identify the cloud infrastructure components ◆ use two types of storage solutions ◆ build a network in the cloud by: <ul style="list-style-type: none"> — creating a VPC with subnets — implementing an appropriate cloud storage solution for a given scenario — designing a VPC architecture — designing, managing, and creating security groups (ACL) — connecting a VPC to the internet ◆ perform compute solutions by: <ul style="list-style-type: none"> — creating and configuring a bastion host — creating and launching compute instances ◆ automate a cloud infrastructure by: <ul style="list-style-type: none"> — writing an automated deployment template — working with YAML and JSON formats ◆ configure containers and microservices by deploying containers using cloud services

Knowledge	Skills
<p>Learners should understand:</p> <ul style="list-style-type: none">◆ containers and microservices:<ul style="list-style-type: none">— concepts of container platforms— differences between virtualisation and containerisation— cloud container services	

Meta-skills

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

Self-management

This meta-skill includes:

- ◆ focusing: the ability to sort, filter, have attention to detail, and apply information correctly
- ◆ integrity: to act in an open manner and with resilience to make decisions
- ◆ initiative: to have self-motivation and a strong sense of self-belief

Social intelligence

This meta-skill includes:

- ◆ communicating: to openly and honestly listen and give information
- ◆ feeling: to consider others' feelings, and inspire others to achieve their full potential
- ◆ leading: to influence and motivate others, developing a clear vision

Innovation

This meta-skill includes:

- ◆ creativity: recognising opportunities, generating own ideas
- ◆ sense-making: logical thinking, using own judgement to synthesise issues
- ◆ critical thinking: analysing, deconstructing, exploring available cloud resources

Delivery of unit

You can deliver this unit on its own, or in conjunction with another networking and infrastructure unit at SCQF level 8.

You can use a variety of online cloud providers when delivering the unit. Every cloud provider offers free academic resources, and you should consider these before delivery. You can support learning by using the following courses:

- ◆ Amazon Web Services (AWS) Academy Cloud Foundations
- ◆ AWS Academy Cloud Architecting and Learners Labs or equivalents from other Cloud providers such as Google Cloud Education Programs or Azure for Education

If your centre does not have access to one of the major cloud providers, you can create a local cloud environment by using technology such as OpenStack.

You must take every opportunity to introduce real-world examples, best practices, and opportunities for class and group discussions and practical demonstrations wherever possible. You should present concepts and terminology in context throughout the unit.

Although learners should have a basic understanding of networking and virtualisation, you should include underlying networking, virtualisation and containers concepts in unit lessons to provide important background information.

This is a very practical unit; therefore, you should take a 'learning by doing' approach. Where possible, you should offer learners short challenges in small groups to encourage peer learning.

You should strongly encourage learners to carry out further reading, and opportunities for individual or group research. Most importantly, learning should be current in such a rapidly evolving field.

You should use video presentations to provide an alternative explanation of a difficult topic, or as a focus for class discussion or group work.

We suggest the following distribution of time:

- Outcome 1** — Describe cloud computing concepts
(20 hours)
- Outcome 2** — Create cloud storage solutions
(10 hours)
- Outcome 3** — Build a network in a cloud computing service
(20 hours)
- Outcome 4** — Perform compute operations in the cloud
(15 hours)
- Outcome 5** — Implement cloud security and access control
(15 hours)
- Outcome 6** — Automate a cloud infrastructure
(20 hours)
- Outcome 7** — Configure containers and microservices
(20 hours)

Professional recognition

This unit has no automatic professional recognition. If you deliver the unit using vendor-provided courses such as the AWS Academy, Google Cloud Education Programs, or Azure for Education, then learners are equipped to take the corresponding vendor exams for certification.

Additional guidance

The guidance in this section is not mandatory.

Content and context for this unit

Describe cloud computing concepts (outcome 1)

Teach learners about:

- ◆ different cloud computing models
- ◆ an appropriate model for a business case, and service models and when to use them
- ◆ pricing models used by the cloud providers

Create cloud storage solutions (outcome 2)

Teach learners about:

- ◆ different storage types and their characteristics
- ◆ when a particular storage type should be used, and what problem it can solve
- ◆ the concepts of short and long-term storage

Build a network in a cloud computing service (outcome 3)

Teach learners about:

- ◆ how to provide connectivity to the cloud resources from the internet and in the VPC
- ◆ how to protect access to resources using access control lists
- ◆ how to implement and design a bastion host (jump-box) and why
- ◆ the importance of using different subnets

Perform compute operations in the cloud (outcome 4)

Teach learners about:

- ◆ virtual machines available in the cloud
- ◆ how to identify an appropriate machine for a given scenario

Implement cloud security and access control (outcome 5)

Teach learners:

- ◆ how to control account access by using AWS Identity and Access Management (IAM)
- ◆ how to identify the steps to secure new accounts
- ◆ how to work with user groups and roles

Automate a cloud infrastructure (outcome 6)

Teach learners about:

- ◆ the importance of the 'Infrastructure as Code' (IaC) concept
- ◆ how to create and manage resources using code. You should use YAML and JSON for this purpose

Configure containers and microservices (outcome 7)

Teach learners about:

- ◆ different methods of deploying containers to the cloud, namely serverless, self-managed and fully managed
- ◆ when to choose between a virtual machine or a container for a given scenario

Before you introduce learners to containers in the cloud, you could use local virtual machines with platforms such as Docker (or a suitable alternative) to familiarise them with containers.

Where possible, you should encourage learners to use command-line tools to complete practical activities and to build their skills with a command line environment.

Approaches to assessment

You can create any assessments that satisfy the evidence requirements for this unit and are suitable for your learners.

The knowledge evidence could take the form of a report or presentation showing that the learner has carried out significant research using reliable sources, including an evaluation of the information gathered. You should specify the length of the report or the duration of the presentation. Alternatively, you could generate knowledge evidence by a more traditional form of assessment such as examination questions under controlled conditions.

For the product evidence you should adopt a holistic assessment approach rather than a series of tasks. This could take the form of a capstone project where the learner researches a given brief, selects a cloud solution, automates its deployment and sets up security and access control.

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

Cloud Virtualisation Infrastructure (SCQF level 8)

This information 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

This is a specialist unit, intended for learners with an interest in virtualisation, the cloud, and containers, so that you can build modern solutions for businesses. It is particularly relevant to you if you have a background in computer networking. The unit requires that you have a basic understanding of computer networks and their associated hardware and operating systems.

The unit covers a range of competencies, including: using a public cloud service to provision and use virtual machines, containers, creating a cloud infrastructure to create a scenario, and automating a deployment solution on a cloud platform.

You gain practical skills in using cloud services, managing identity and access to the cloud, automating deployment, and container technologies.

The unit covers a range of competencies including:

- ◆ cloud concepts
- ◆ storage solutions
- ◆ networking in the cloud
- ◆ compute solutions
- ◆ cloud security and access control
- ◆ automation of cloud infrastructure
- ◆ containers and microservices

Throughout the unit, you develop meta-skills covering self-management, social intelligence and innovation.

When you finish the unit, you can determine an appropriate cloud infrastructure for a business situation and identify the required size of each of its components.

You may progress to the study of other units in networking and cloud infrastructure at SCQF level 9.

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.