Next Generation Higher National Unit Specification

Professional Practice in Networking and Cloud Infrastructure (SCQF level 8)

Unit code: J7EA 48

SCQF level: 8 (32 SCQF credit points)

Valid from: session 2023 to 24

Prototype unit specification for use in pilot delivery only (version 1.1) January 2024

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.

This edition: January 2024 (version 1.1)

Unit purpose

This unit provides learners with the opportunity to apply their understanding of concepts, and their skills and experience in computer networking and cloud infrastructure, to real-world problems in infrastructure design, implementation and maintenance.

They demonstrate the professional behaviours and standards expected in this vital area of organisational computing provision. Professional practice refers to a way of carrying out processes and activities to achieve certain standards and criteria in both the process itself and its end-product. Standards and criteria include both technical aspects and non-technical aspects, such as ethics and sustainability.

This specialist unit is project-based and requires learners to:

- collaborate in a team
- analyse a significant network infrastructure problem from a real-world scenario
- design a solution and complete its construction, testing and implementation
- document their processes
- communicate their findings to an audience
- demonstrate the personal meta-skills that professional practice requires, including the ability to assess their own performance and plan for improvement

Entry to the unit is at your centre's discretion. However, we recommend that learners have completed Network Infrastructure at SCQF level 8, which is the sector skills unit for the Higher National Diploma (HND) in Networking and Cloud Infrastructure. This includes knowledge and skills related to:

- network topologies and design
- network devices and cabling
- installation and configuration of networks
- configuration of network services
- network testing and troubleshooting
- network security

The unit is a mandatory component of the HND Networking and Cloud Infrastructure. It integrates the knowledge and understanding in the HND programme with the skills learners need to apply current networking and cloud computing tools and techniques. This unit also contributes to whole qualification grading for HND Networking and Cloud Infrastructure.

Progression opportunities following the unit include awards or degree programmes at SCQF level 9 in networking or cloud computing topics.

Unit outcomes

Learners who complete this unit can:

1 analyse a problem associated with networking and cloud infrastructure
2 work collaboratively in a project team to create a project specification
3 plan a collaborative solution to a problem using appropriate project management methods
4 apply a design methodology to a network infrastructure problem
5 implement a solution to a networking and cloud infrastructure problem
6 devise and implement a suitable test strategy for a large-scale computer network
7 document and present completed findings
8 develop meta-skills in a vocational or academic context
9 develop sustainability knowledge and understanding, and skills, in a vocational context

Evidence requirements

Learners must provide both product and performance evidence. Knowledge is inferred from the product evidence.

Product evidence

Learners' product evidence should be a fully documented and working solution to a sizeable and complex network infrastructure problem.

The project team must produce:

- a project specification for a given network infrastructure problem
- a project management plan containing a project timeline, project diary and evidence of project progress meetings. It must also include the role (or roles) and tasks that were allocated to project team members
- an analysis of the network infrastructure problem and a solution design
- an implemented solution based on the network design
- a proposed test strategy and the recorded outcomes from testing
- a final report containing conclusions and recommendations

Each individual learner must produce:

- a reflection on the conduct of the project, the challenges they met and overcame, and the ethical and sustainability considerations of the team, including:
  - self-reflection on the conduct of the project and their role in the project delivery
  - a self-assessment of meta-skills
- an evidence checklist that clearly identifies:
  - their contributions to teamwork
  - the quality of the solution
  - their demonstration of professional behaviours during the project

Learners' product evidence should include a portfolio of work carried out over a term in an open-book format. They should complete this under lightly controlled conditions.

You should arrange periodic progress meetings to discuss learners' progress. We suggest that team sizes should be between three and five members.

Performance evidence

Learners' performance evidence is comprised of:

- a team presentation. This should be scheduled and last for no more than 30 minutes (15 minutes presentation and 15 minutes question-and-answer session), involve all team members, and be presented to a client audience. It should cover:
  - the conduct of the investigation
  - the outcomes from analysis of the problem
  - the network infrastructure solution adopted
  - conclusions and recommendations
- a team demonstration of the final solution to the network infrastructure requirement

Performance evidence should also demonstrate learners':

- appropriate use of digital platforms for collaboration
- integrity when dealing with network installation and implementation
- respect in collaborating with others
- communication in terms that are understandable by a given audience

The standard of evidence should be consistent with the SCQF level of the unit.

Outcome 8

Learners develop meta-skills in the course of doing all the units as part of this HND. In this unit, you also assess their meta-skills development as an outcome, following the evidence requirements set out below.

This meta-skills outcome is the same for the HNC (SCQF level 7) and the HND (SCQF level 8). Learners who progress from the HNC to the HND should continue to develop their meta-skills. They should gather evidence in line with the outcome requirements as they work through units and projects at HND level.

Evidence

Learners must gather evidence that shows they have:

- self-assessed their meta-skills baseline
- created a plan for their own meta-skills development
- carried out activities to develop and demonstrate their meta-skills
- used reflective practice to monitor and assess the meta-skills they have improved and developed

Skills 4.0, a skills model to drive Scotland's future, outlines three categories of meta-skills:

- self-management
- social intelligence
- innovation

Each of these comprises four meta-skills and a number of sub-skills.

There are many interrelationships and dependencies between these skills and, at SCQF level 7 and 8, learners should focus on holistic development relevant to their vocational or academic context.

See the Educator Guide for more information.

Outcome 9 (Learning for Sustainability)

Learners gather evidence that demonstrates they can:

- identify and describe sustainability in the context of the United Nations Sustainable Development Goals (UN SDGs)
- explain how one product or process relevant to networking and cloud infrastructure could be made more sustainable and help meet the aims of at least two selected UN SDGs

Knowledge and skills

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

Knowledge	Skills
Learners should understand: ♦ project management concepts and principles ♦ requirements acquisition approaches ♦ roles and responsibilities in team working in computing ♦ professional standards in the conduct of network and cloud infrastructure design and implementation ♦ fundamental networking and cloud infrastructure concepts and processes ♦ a range of networking, cloud infrastructure, and security hardware or software and associated technologies and protocols ♦ strategies used in the testing of large-scale networked systems ♦ meta-skills, specifically: — the categories of self-management, social intelligence and innovation, and associated meta-skills, as described in Skills 4.0 — the importance of developing meta-skills, including employability, adaptability, and effectiveness — what meta-skills are most relevant to the learner's vocational context ♦ approaches to developing meta-skills, in particular: — self-awareness: analysing preferences, strengths and weaknesses; meta-skills self-assessment — goal setting and action planning — reflective practice: principles of reflective practice; tools and approaches for effective reflective practice ♦ the UN SDGs	Learners can: ♦ derive a project specification from a given network infrastructure problem ♦ create a project plan ♦ manage and monitor project progress ♦ meet timescales and milestones ♦ maintain an ongoing record of activities and decisions ♦ participate in team and client meetings ♦ apply network analysis to the problem and design a solution ♦ construct a network infrastructure solution to the problem ♦ test, implement and evaluate the problem solution ♦ plan a report template with a client and team ♦ provide technical and user documentation for the problem solution ♦ create a report to a professional standard ♦ document the steps in the process from problem identification to implementation and evaluation ♦ demonstrate the solution to the client ♦ plan a strategy for meta-skills development ♦ implement and review plans for their meta-skills development ♦ assess their meta-skills development ♦ improve sustainability in a product or process

Meta-skills

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

The unit helps learners develop the meta-skills of self-management, social intelligence and innovation. Learners should develop meta-skills naturally throughout the unit. You should encourage learners to develop a minimum of one area in each of the three categories, but they do not need to cover all suggested subsections. The following suggestions may help shape delivery and assessment, and vary depending on the chosen topics and assessment method.

Self-management

This meta-skill includes:

- focusing: managing cognitive load by paying particular attention to relevant information, while focusing on sorting and filtering information in relation to their project
- integrity: acting in an honest and consistent manner; demonstrating self-awareness, ethical behaviours, and self-control
- adapting: maintaining openness and resilience; self-learning and critically evaluating their work
- initiative: displaying readiness and motivation; showing good decision-making skills; demonstrating self-belief; thinking independently; taking a responsible attitude

Social intelligence

This meta-skill includes:

- communicating: being open and honest; sharing information in a way that creates mutual understanding around the thoughts, intentions and ideas of others in the group
- collaborating: working effectively in coordination; displaying relationship-building skills; social perceptiveness
- leading: having a clear vision that enables others to be inspired, influenced and motivated

Innovation

This meta-skill includes:

- curiosity: wanting to know or learn; to inspire new ideas and concepts
- creativity: thinking of new ways of addressing problems, answering questions or expressing meaning
- sense-making: being able to determine the deeper meaning or significance of what is being expressed; pattern recognition; analysis and synthesis of holistic-based problems
- critical thinking: being able to evaluate and draw conclusions from information; deconstructing problems; logical and computational thinking; good judgement

Delivery of unit

This is a mandatory unit in the HND Network and Cloud Infrastructure. It serves as the common core unit. The unit serves two purposes:

1 It serves as a (mandatory) component unit in the qualification, which learners must pass.
2 It contributes to grading.

The unit must be project-based and you should carry it out towards the end of the learning programme, when learners have acquired a sufficiently wide range of vocational knowledge and skills in developing network infrastructure solutions.

The project must involve devising a solution to a real-world problem. The focus of the unit is not learning new technical knowledge and skills, but applying knowledge and skills to a large-scale computer networking infrastructure activity.

You should deliver the unit as an ongoing project management unit, and provide learners with examples of network infrastructure problems, project management practices, and techniques for analysis and problem-solving. Throughout the unit you should arrange progress meetings with the team.

The time required varies depending on the previous experience of individual learners. Based on 160 hours delivery and assessment time, we suggest the following distribution:

Outcome 1 — Analyse a problem associated with networking and cloud infrastructure
(10 hours)

Outcome 2 — Work collaboratively in a project team to create a project specification
(5 hours)

Outcome 3 — Plan a collaborative solution to the problem using appropriate project management methods
(20 hours)

Outcome 4 — Apply a design methodology to a network infrastructure problem
(30 hours)

Outcome 5 — Implement a solution to a networking and cloud infrastructure problem
(40 hours)

Outcome 6 — Devise and implement a suitable test strategy for a large-scale computer network
(20 hours)

Outcome 7 — Document and present completed findings
(20 hours)

Outcome 8 — Develop their meta-skills in a vocational or academic context
(10 hours)

Outcome 9 — Develop sustainability knowledge and understanding, and skills, in a vocational context
(5 hours)

Additional guidance

The guidance in this section is not mandatory.

Content and context for this unit

This is a project-based unit in which learners work in teams to solve a networking and cloud infrastructure problem. The problem should reflect the networking topics in the Networking and Infrastructure mandatory unit and provide scope for the inclusion of other specialist topics, such as cloud computing or digital forensics.

While most learners should have prior experience of project planning and management, it is important that support and resources are available to assist teams in this aspect of the unit.

The organisation of learners into teams will be at your discretion as the tutor, based on the preferences expressed by learners in relation to the projects available to the group and your judgment of an appropriate composition for each group.

You should select projects that are as real-world (authentic) as possible and that align to the level of study required. They should allow learners to draw on the range of outcomes in their Higher National (HN) course and develop their meta-skills while engaging in the project. To standardise the learner experience and level of demand, you should use a standard template to describe the objectives and required outcomes for each project offered to learners. An exemplar template is available on request.

You should deliver the unit as an ongoing project management unit, and provide learners with examples of network infrastructure problems, project management practices, and techniques for analysis and problem solving.

You must perform the role of team leader in each project. This is necessary for the purposes of:

- making judgments about the contribution each learner makes to the team effort in analysing and solving the problem
- observing and recording the professional behaviours of learners in performing the roles allocated to them

This should be with as light a touch as possible, leaving team members to make their own decisions about roles, timelines, resource allocations and meetings.

Approaches to assessment

The unit requires the solution to a complex or extensive network and cloud infrastructure problem, carried out by learners working in a team. Learners can present their product evidence as a single document that contains the sections listed in the 'Evidence requirements' section.

There should be scope for other presentation formats, such as an e-portfolio showing the elements of the project and exemplifying the progress of the project. This e-portfolio might contain other media, such as images, audio and video.

Use observation checklists to confirm the authenticity of learners' work. You should apply checklists against product evidence, performance evidence, and contributions from individual team members to ensure validity of your assessment.

Learners who complete the unit can:

- work in a project team
- contribute to collaborative project planning and implementation
- analyse a real-world problem requiring the application of network infrastructure concepts
- implement a fully developed and tested solution by applying network infrastructure design principles and methods
- communicate the network and cloud infrastructure solution to an audience
- exhibit professional practice and behaviours
- demonstrate meta-skills in a vocational context
- evaluate their own work
- evaluate the solution and its outcomes
- identify and describe sustainability as it relates to computer networking and the UN SDGs

Learners can implement their project scenario using a variety of hardware and software, which they must use appropriately and in an ethical manner to achieve an end-product. For example, learners may wish to use physical equipment, virtual environments, emulation software, embedded low-cost computing devices, or a combination of all of these.

Each learner must write an evaluation and reflection on their own experience with the project, analysing their actions and their team's actions. This develops their understanding of what constitutes good practice in the industry.

To accommodate the project-based learning, the learning experiences should make good use of scheduled class time and combine theoretical and technical knowledge, while allowing for extended periods of team activity and collaboration, which you must monitor and observe.

We recommend that the real-world problems that you provide for the project are changed regularly.

Assessment for grading

You should assess the product and performance evidence produced for the unit on a pass or fail basis, according to the standards set out in the assessment requirements. You can further consider this evidence as a component of grading in the HND Networking and Cloud Infrastructure, and apply the guidance on grading to the available evidence.

For guidance on grading, you should refer to the grading pack for HND Networking and Cloud Infrastructure.

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

Professional Practice in Networking and Cloud 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

Unit information

This unit provides you with the opportunity to apply your knowledge of concepts in computer networking and cloud infrastructure to real-world problems in network and cloud infrastructure design, implementation, and maintenance.

You demonstrate the professional behaviours and standards expected in this area of organisational computing provision. You learn how professional practice affects the way you carry out processes and activities, to achieve certain standards and criteria, in both the process itself and its end-product.

This specialist unit is a mandatory component of the Higher National Diploma (HND) in Networking and Cloud Infrastructure. It integrates the knowledge and understanding you gain throughout the HND programme in relation to network infrastructure concepts, and the skills you need to apply the currently used networking and cloud computing tools and techniques.

Entry to the unit is at your centre's discretion. However, we recommend that you complete Network Infrastructure at SCQF level 8 (mandatory unit for HND Networking and Cloud Infrastructure) before you start.

The unit requires you to:

- collaborate in a team
- engage in analysing a significant network infrastructure problem from a real-world scenario
- design a solution
- perform construction testing and implementation
- document processes
- communicate findings to an audience
- demonstrate the personal meta-skills that professional practice requires, including the ability to assess your own performance and plan for improvement
- develop sustainability knowledge, understanding and skills in a vocational context

On completion of this unit, you can:

- manage projects while working in a project team
- analyse a real-world problem in the context of networking and cloud infrastructure
- apply network design principles, then implement and test a solution using a variety of specialised hardware and software
- communicate findings to an audience
- demonstrate meta-skills in a vocational context, showing professional practice and behaviours
- reflect and evaluate on your work
- evaluate the solution and its outcomes
- identify and describe sustainability as it relates to computer networking and the United Nations' Sustainable Developments Goals (UN SDGs)

Your evidence for assessment includes a documented report of the project, and its analysis and solution. With other team members, you present the project work, and demonstrate the final working solution. You submit a self-evaluation report that includes your reflections on your own work and that of others, and a report on your meta-skills development. This evidence will also contribute to the whole qualification grade for HND Networking and Cloud Infrastructure.

Throughout the unit, you develop meta-skills covering self-management, social intelligence and innovation. You will be able to identify how networking and cloud computing have an impact on sustainability and know how it could be made more sustainable.

On completion of the unit, you may progress to qualification or degree programmes at SCQF level 9 in networking or cloud computing topics. You may complete a vendor-related networking award (for example a Cisco certification award) or enter the workplace in a junior or intermediate network administrator-related role.

Administrative information

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Superclass: AG

History of changes

Version	Description of change	Date
1.1	Minor update to reflect revised grading model.	January 2024

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