Group Award Specification for:

SQA Advanced Diploma in Computing: Networking

Group Award Code: GM8F 48

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Version: 02 (June 2018)

Acknowledgement

SQA acknowledges the valuable contribution that Scotland's colleges have made to the development of SQA Advanced Qualifications.

Further Information

Call SQA's Customer Contact Centre on 44 (0) 141 500 5030 or 0345 279 1000. Alternatively, complete our Centre Feedback Form.

History of changes

It is anticipated that changes will take place during the life of the qualification and this section will record these changes. Centres are advised to check SQA Connect to confirm they are using the up to date qualification structure.

NOTE: Where a Unit is revised by another Unit:

- No new centres may be approved to offer the Unit which has been revised.
- Centres should only enter candidates for the Unit which has been revised where they are expected to complete the Unit before its finish date.

Version Number	Description	Date
02	The unit Computer Forensics Fundamentals (HP28 47) has been revised by unit Digital Forensics (J0L3 47). The unit Ethical Hacking Fundamentals (HR90 47) has been revised by unit Ethical Hacking (J0L2 47). Centres should enter candidates for the revised units from 1st August 2018. Centres may continue to enter candidates to HP28 47 or HR90 47, but candidates must have completed and results submitted by no later than 31/07/2021.	June 2018

Contents

1 Introduction

The purpose of this document is to:

- assist centres to implement, deliver and manage the qualification.
- provide a guide for new staff involved in offering the qualification.
- inform course managers, teaching staff, assessors, learners, employers and HEIs of the aims and purpose of the qualification.
- provide details of the range of learners the qualification is suitable for and progression opportunities.

1.1 Background

The SQA Advanced Diploma in *Computing: Networking* shares a common generic SQA Advanced Certificate with the SQA Advanced Diplomas (*Software Development*, *Technical Support*, and *Computer Science*).

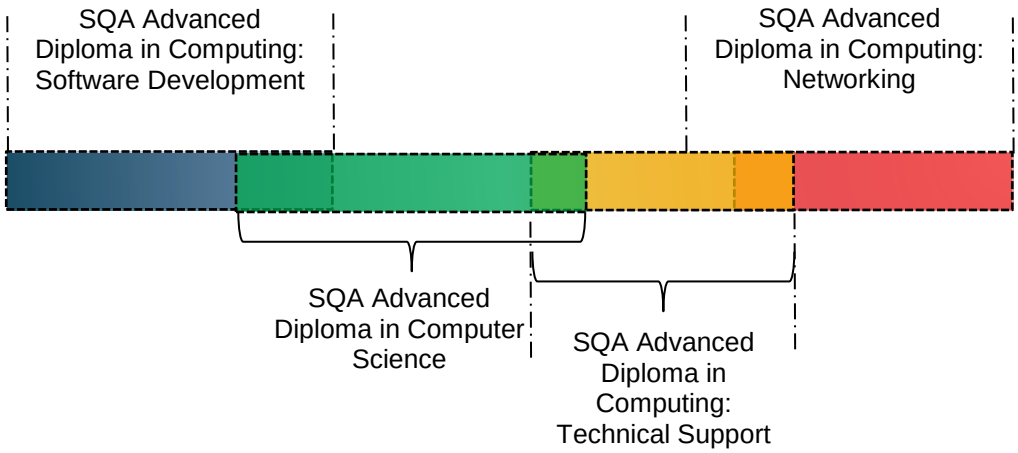
The rationale for this approach is as follows:

- A generic SQA Advanced Certificate serves the purpose of all four pathways.
- Specialisation takes place, in general, at the SQA Advanced Diploma level.
- Given that the majority of successful SQA Advanced Certificate students are expected to progress to an SQA Advanced Diploma, delaying specialisation gives the students more time and a greater selection of SQA Advanced Diplomas to choose from.

This document will concentrate on defining the rationale, content and delivery of the SQA Advanced Diploma in *Computing: Networking*.

1.2 Rationale and Title of the Group Award

The title of the Group Award is SQA Advanced Diploma *Computing: Networking*, which clearly identifies it as one of a range of related SQA Advanced Diplomas in *Computing* progressing from a common generic SQA Advanced Certificate in *Computing*.



Position of awards within the spectrum of SQA portfolio. Diagram illustrates possible overlaps of frameworks

SQA Advanced Diploma

The SQA Advanced Diploma awards have been designed to cover a spectrum of computing provision, from the more specialist streams of Software Development and Networking to the broader streams of Computer Science and Technical Support.

The qualification was developed bearing in mind the rapid and significant developments in ICT that are impacting business so strongly, namely: analytics, mobility, social, cloud and cyber security[1] (see Deloitte Tech Trends report 2012).

The SQA Advanced Diploma in *Computing: Networking* reflects this changing ICT landscape and includes a number of Units such as Cloud Computing, Convergence Technologies and Intrusion Prevention systems, to address some of these technology trends.

A significant number of Units are designed to prepare candidates for vendor certification exams such as Cisco CCNA, CompTIA A+ and Security+ and a variety of Microsoft client and server operating systems. This reflects the importance placed on vendor certifications by employers.

In terms of identifying current skills gaps specific skills shortages in the area of cyber security have been identified by the UK's National Audit Office (NAO) in their report 'The UK cyber security strategy: Landscape Review'. CompTIA also conducted a survey (Jan 2012) of CIOs with regard to IT skills shortages and their impact on their respective business functions, in which 93 per cent reported some gap between the technical skills their IT staffs possessed and the skills their companies needed. Eight-out-of-ten (83 per cent) said that gap was small to moderate. Nine per cent said their IT staff's skills were not close to where they needed to be.

The skills that ranked as the most important were core IT skills. The following IT skills received rankings greater than 70 per cent:

- networking/infrastructure
- servers/data centre management
- storage/back-up
- cybersecurity
- database/information management
- help desk/IT support
- telecom/unified communications
- printers/copiers/faxes
- data analytics/business intelligence

Anecdotal evidence to support the demand for these current skillsets is identified in Section 1.4 Employment Opportunities.

1.3 Target groups for the award

This qualification is suitable for the following range of learners:

- Learners progressing from the generic SQA Advanced Certificate in *Computing* wishing to specialise in networking related technologies in the second year of the award.

[1] Deloitte, Tech Trends 2012

- School leavers or apprentices who possess the necessary entrance requirements and wish to pursue a course which will lead to employment in the ICT sector or further study within a related HE course.
- Further education students who have completed their National Certificate in Technical Support at SCQF level 6.
- Unemployed adults who wish to retrain in this vocational field with a view to finding employment in the ICT sector or further study within a related HE course.
- Any other suitable candidate wishing to achieve this award with a view to further articulation to an appropriate HE award or to pursue employment in the relevant ICT sector.

1.4 Employment Opportunities

Learners who gain this qualification will be equipped with the necessary skillset to pursue employment in the general category of IT&T engineer/ IT&T technician[2].

As has already been indicated, employment opportunities should be enhanced with the range of potential vendor certifications incorporated within the award allowing the candidates to focus on technology clusters such as infrastructure, security and client/server operating systems.

A number of important reports from significant bodies such as e-Skills UK and Gartner have highlighted a growing demand for the aforementioned skillsets and the award will be well placed to address these needs particularly with the inclusion of Units in the area of security.

Given the current preference for graduate entry to the sector[3], it is expected that the majority of students achieving the SQA Advanced Diploma in *Computing: Networking* will articulate to an HE institute to pursue further specialisation within an SCQF level 9 award.

In terms of identifying specific current employment opportunities there is significant anecdotal evidence to show that there is a demand from employers for candidates who possess the skillset contained within the Group Award.

Listed below is a small selection of current job listings taken from online UK jobsites.

All the jobs listed are entry/near entry level for this IT sector, do not explicitly state a minimum academic qualification and, essentially, list key skills which are delivered by the Group Award.

Title: Firewall/Network Security Support Analyst

Skillset:

- CCNA qualified
- Experience of supporting firewalls
- Knowledge of IP networking in a Cisco environment
- Experience of supporting IT customers

[2] HN Review – Employer Survey (Qualitative)

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Title: IT and Network Security Analyst

Skillset:

- Knowledge of securing Windows environments
- Some knowledge of security solutions for infrastructure such as VPN's and firewalls
- A good understanding of best practice security controls

Title: Network Technician

Skillset:

- Experience of supporting, administering and deploying enterprise level routers and switches
- Firewall platforms — Cisco/Checkpoint
- Routing protocols — OSPF/BGP
- LAN and WAN troubleshooting
- Experience/awareness of voice and virtualisation technologies
- Cisco CCNA/CCNP or equivalent.

Title: IT Field Services Technician

Skillset:

- Computer repair
- Network set up & troubleshooting
- Router and data switch configuration

Title: Network Technician

Skillset:

- Configuring cisco nexus
- Network Support Technician
- CCNA, SAN support, PC hardware/software, LAN/WAN and VoIP, Windows

Title: Systems Technician

Skillset:

- LAN
- MS Windows knowledge
- Field Service/Technical Support

Title: Network Technician

Skillset:

- LAN/WAN troubleshooting
- Cisco Firewall platform
- Routing protocols OSPF/BGP
- CCNA qualified

1.5 Articulation Opportunities

The SQA Advanced Diploma in *Computing: Networking* course reflects some of the ongoing technological changes in the ICT sector in relation to support services. This should allow the qualification to align with a wide range of related degrees offered by universities.

In addition to the specialist Units, the qualification framework includes Units specifically identified as essential by most universities, namely a mandatory introduction to programming Unit and a range of optional mathematics Units.

1.6 Relationship with other awards

This award is part of a suite of SQA Advanced Diplomas, as explained in Section 1.2. The SQA Advanced Certificate is embedded within all of the SQA Advanced Diplomas, and (largely) constitutes the first year of each programme. Each SQA Advanced Diploma offers a particular specialism that reflects recognised vocational or academic progression paths (see Sections 1.5 and 6.2 for further information on vocational or academic progression). The awards have similar structures and equivalent demands (in terms of practical or cognitive competencies) but each seeks to provide different skillsets and underpinning knowledge.

2 Qualification structure

This Group Award is made up of 30 SQA Unit credits. It comprises of 240 SCQF credit points of which 64 are at SCQF level 8 in the mandatory section including an SQA Advanced Certificate in *Computing: Graded Unit 1* of 8 SCQF credit points at SCQF level 7 and an SQA Advanced Diploma in *Computing: Networking Graded Unit 2* of 16 SCQF credit points at SCQF level 8. A mapping of Core Skills development opportunities is available in Section 5.3.

2.1 Structure

In order to achieve the SQA Advanced Diploma in *Computing: Networking* Group the candidate must achieve 14 mandatory credits and 16 optional credits from Groups 1, 2 and 3.

Please note: if choosing Units from Group 2 a maximum of 9 credits can be taken. If choosing from Group 3 a maximum of 7 credits can be taken.

The mandatory section of this Group Award incorporates 64 SCQF credit points at SCQF level 8 which satisfies the design principles.

Mandatory Units — Total of 14 credits

Candidates must pass all of the following Units.

Unit title	Code	SCQF credit points	SCQF level	SQA credit value
Developing Software: Introduction	HP1R 47	8	7	1
Professionalism and Ethics in Computing	HP29 47	8	7	1
Computer Systems Fundamentals	HP1T 47	8	7	1
Troubleshooting Computer Problems	HP1V 47	8	7	1
Team Working in Computing	HP1X 47	8	7	1
Computing: Graded Unit 1 (Exam)	HR9J 47	8	7	1
Routing Technology	HP1J 48	16	8	2
Networking Technology	HP1M 48	16	8	2
Server Administration	HP1P 48	16	8	2
Computing: Networking Graded Unit 2 (Project)	HT0A 48	16	8	2

Optional Units — Total of 16 credits

Learners must select at least 16 credits selected from one or more of the following groups of optional Units:

Group 1: Specialist options (up to 16 credits)
Group 2: General options (up to 9 credits)
Group 3: Vendor Units (up to 7 credits)

These rules of combination ensure that the aims and objectives of the award are achieved, irrespective of the route through the award. For example, by limiting the general options to 9 credits, all candidates are required to complete at least 21 credits directly related to the subject area.

Group 1 specialist options should be seen as the non-mandatory credits which are fundamental to giving the Group Award its distinctive emphasis on software development. Group 2 general options give centres a degree of flexibility in course design, eg options to include mathematics, networking and hardware. Group 3 Units are dedicated vendor qualifications. See the following section for further information on vendor provision.

Note that a local option is included in Group 2 (general options). Up to four credits can be selected from any area, subject to the design rules and rules of combination defined above. This is intended to reflect the preferences of centres so that they can customise the awards to their local circumstances.

There are a number of important clusters of Units which develop breadth and depth of technical expertise in specific areas.

Particularly significant in contemporary networks are the four Cisco related Units (Networking Technology, Routing Technology, Switching Technology and Internetworking Technology), the Windows 7 client related Units (Configuring a Desktop Operating System and Troubleshooting a Desktop Operating System) and the network security cluster of Security Concepts and Intrusion Prevention Systems.

Unit title	Code	SCQF credit points	SCQF level	SQA credit value
Group 1 — Specialist Options (Up to 16 credits)				
Big Data	HR9T 47	8	7	1
Data Science	HR9V 48	16	8	2
Private Cloud Virtualisation	HR9R 48	8	8	1
Cloud Computing	HP1Y 47	8	7	1
Computer Networks: Building Local Area Networks	HP2Y 47	16	7	2
Configuring a Desktop Operating System	HR85 47	16	7	2
Convergence Technologies	HP25 48	16	8	2
Internetworking Technology	HP1N 48	16	8	2
Intrusion Prevention Systems	HR8D 47	8	7	1
Mail Server Management	HP30 47	8	7	1
Managing a Web Server	HR8E 47	8	7	1
Managing a Web Server	HP2V 48	16	8	2
Network Concepts	HR8G 47	16	7	2
Client Operating Systems	HP27 47	16	7	2
Computer Networking: Fundamentals	HR87 47	8	7	1
Computer Networking: Practical	HP20 47	8	7	1
Digital Forensics	J0L3 47*	8	7	1
Ethical Hacking	J0L2 47*	8	7	1
Troubleshooting a Desktop Operating System	HR86 47	16	7	2
Network Security Concepts	HX00 47	16	7	2
Switching Technology	HP1L 48	16	8	2
Professional Career Development in the IT Industry	HT06 47	8	7	1

***Refer to History of Changes for information.**

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Unit title	Code	SCQF credit points	SCQF level	SQA credit value
Group 2 — General Options (Up to 9 credits)				
Using Software Applications Packages	HR0A 47	8	7	1
Information Technology: Applications Software 1	HP6L 47	8	7	1
Computing: Planning	HR74 47	8	7	1
Building an e-Business	HR7V 47	8	7	1
Computer Hardware: Hardware Installation and Maintenance	HR91 47	16	7	2
SQL: Introduction	HP2E 47	8	7	1
Computing: Introduction to Project Management	HP21 47	8	7	1
Computing: PC Hardware and Operating System Essentials	HP24 47	8	7	1
Computing: PC Hardware and Operating System Support	HR88 47	8	7	1
Database Design Fundamentals	HP2G 47	8	7	1
Databases: Introduction	HR89 47	8	7	1
Developing Mobile Web Based Applications: An Introduction	HR9X 47	16	7	2
Digital Culture: Online Collaboration	HR83 48	8	8	1
Digital Culture: Online Communications	HR81 47	8	7	1
Digital Culture: Web 2.0 Applications	HR82 46	8	6	1
E-Commerce: Publishing Web Sites	HR1V 47	16	7	2
Entrepreneurship in the Creative Industries	HR7G 48	8	8	1
Preparing to Start a Business	HR3E 47	8	7	1
Handling Information as a Resource	HR8A 47	8	7	1
Human Computer Interaction	HR8C 47	8	7	1
Information Technology: Information Systems and Services	HR92 47	8	7	1
Mathematics for Computing 1	HP1H 47	8	7	1
Mathematics for Computing 2	HR6T 48	8	8	1
Mathematics for Interactive Computing: Essential Techniques	HR7R 47	8	8	1
Mathematics: Calculus and Matrices for Computing	HR7E 47	8	7	1
Mobile Technology	HR8F 48	8	8	1
Multi User Operating Systems	HR77 47	8	7	1
Multimedia: Developing Multimedia Applications	HR72 47	16	7	2
Personal Development Planning	HP6M 47	8	7	1
Project Management for IT	HR7J 47	8	7	1
Providing Support to Users	HR8H 47	8	7	1
Software Development: Developing Small Scale Standalone Applications	HP2N 47	16	7	2
Digital Skills	HR9W 47	8	7	1
Software Development: Programming Foundations	HP2P 47	8	7	1

Software Development: Systems Foundations	HR8K 47	16	7	2
Systems Development: Introduction	HR8M 47	8	7	1
Systems Development: Testing Software	HR8P 47	8	7	1
Systems Development: User Centred Design	HR8T 47	8	7	1
Technical Support: Supporting Users – Hardware	HP31 47	8	7	1
Technical Support: Supporting Users – Software	HP32 47	8	7	1
User Interface Design	HR9Y 47	8	7	1
Work Role Effectiveness	HR0M 47	24	7	3
Work Role Effectiveness	HR0P 48	24	8	3
Working in IT	HR8X 48	16	8	2
Workplace Communication in English	HR1C 46	8	6	1
Bring Your Own Device (BYOD): Introduction	HR9P 47	8	7	1
Communication: Practical Skills	HP4A 47	8	7	1

Unit title	**Code**	**SCQF credit points**	**SCQF level**	**SQA credit value**
Local Option (Up to 4 credits permitted)				
Group 3 — 'Vendor' Options (Up to 7 credits)				
Technical Specialist: Windows 7: Configuring	HT02 48	8	24	3
Technical Specialist: Microsoft SharePoint 2010, Application Development	HR9H 49	9	15	1.5
Technical Specialist: Windows Server 2008: Network Infrastructure, Configuring	HR8Y 47	7	30	3.5
Technical Specialist: Windows Server 2008: Applications Infrastructure, Configuring	HR95 47	7	24	3
Technical Specialist: Windows Server 2008: Active Directory Configuring	HR9A 48	8	35	4
IT Professional: Windows Server 2008: Server Administrator	HR9K 49	9	15	1.5
IT Professional: Windows Server 2008: Enterprise Administrator	HT01 49	9	40	5

SQA Advanced awards adhere to a defined set of design principles[4] which can be summarised as follows:

- SQA Advanced Certificates shall be designed to be at SCQF level 7 and shall comprise 96 SCQF credit points.
- SQA Advanced Diplomas shall be designed to be at SCQF level 8 and shall comprise 240 SCQF credit points.

[4]Design principles for Developing HNC's and HND's (www.sqa.org.uk)

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- SQA Advanced Certificates should incorporate 48 SCQF credit points at SCQF level 7.
- SQA Advanced Diplomas should incorporate 64 SCQF credit points at SCQF level 8.

The Scottish Credit and Qualifications Framework[5] is used when designing qualifications to allocate a level and a number of credits to a qualification, to decide on entry requirements and to map progression routes.

The SCQF level provides an indication of the complexity of the qualification. SCQF Levels are based on a single set of level descriptors that are the common reference points with each having five characteristics determining, for example, the level of a Unit.

The characteristics are as follows:

- Knowledge and understanding — mainly subject-based
- Practice (applied knowledge and understanding)
- Generic cognitive skills — eg evaluation, critical analysis
- Communication, numeracy and IT skills
- Autonomy, accountability and working with others

The generic SQA Advanced Certificate in *Computing* provides the foundation of the first year of the SQA Advanced Diploma in *Computing: Networking* and satisfies the Core Skills requirements for the award.

A number of SCQF level 7 Units have been developed as introductory Units which form the basis on which the more complex SCQF level 8 Units can develop and deepen knowledge and understanding of critical technologies such as security and client/server operating systems. These Units include:

Unit title	Code	SCQF credit points	SCQF level	SQA credit value
Network Security Concepts	HX00 47	16	7	1
Intrusion Prevention Systems	HR8D 47	8	7	1
Configuring a Desktop Operating System	HR85 47	16	7	2
Cloud Computing	HP1Y 47	8	7	1
Ethical Hacking	J0L2 47*	8	7	1
Managing a Web Server	HR8E 47	8	7	1
Mathematics for Computing 1	HP1H 47	8	7	1

[5] An Introduction to the SCQF SQA Publication code AE1243/2

3 Aims of the qualification

The principal aims of this award are to equip candidates with knowledge and skills of contemporary networking technologies to enable them to seek employment in the category of IT&T engineer and to provide an award which will enable candidates to progress to a wide range of degree courses in Scottish, UK and international universities.

In recent years there have been significant technology developments in the field of ICT which are having a major impact on businesses and business processes. Cloud computing is an example of a technology trend emerging from the congruence of developments such as real-time infrastructure (RTI), virtualisation, browsers and Web 2.0[6].

More than half of employers have indicated that issues such as security, cloud computing, convergence of communications & IT and the real world web will have a major impact on business in the coming years[7].

The SQA Advanced Diploma in *Computing: Networking* reflects these changes with the inclusion of a number of Units designed to equip the learner with some of the fundamental knowledge and understanding of these technologies.

Support for the development of an SQA Advanced Diploma in *Computing: Networking* with a focus on networking is evidenced by the Employers Quantitative survey showing 91.7% of employers indicating support for such an award.

3.1 General aims of the qualification

The general aims of this award are:

1 To develop the candidate's knowledge and skills such as planning, analysing and evaluating.
2 To develop employment skills and enhance candidates' employment prospects.
3 To enable progression within the SCQF.
4 To develop study and research skills.
5 To develop transferable skills including Core Skills.
6 To provide academic stimulus and challenge, and foster an enjoyment of the subject.
7 To support learners' continuing professional development.

3.2 Specific aims of the qualification

The specific aims of this award are:

8 To develop a range of specialist knowledge and skills in networking technologies.
9 Where applicable, to provide learners with the underpinning knowledge and skills that may allow them to sit vendor certification examinations.
10 To prepare candidates for progression to further studies in a related discipline at SCQF level 9.

[6] Gartner Report, The top 10 Technology trends for 2012
[7] Technology Insights 2012 e-Skills UK

11 To prepare candidates for employment in the general category of IT&T engineer/ IT&T technician.

3.3 Graded Unit

The QDT opted to remain with the existing arrangements in relation to Graded Units whereby the SQA Advanced Certificate SCQF level 7 Graded Unit will be examination based and the SQA Advanced Diploma SCQF level 8 Graded Unit will be project based for each of the SQA Advanced Diploma awards.

This mix of exam and project based Graded Units continues to be strongly supported by both HE and employers as is evidenced in surveys undertaken by the SQA for this development.

The SCQF level 8 Graded Unit is project based around a network related scenario. It is designed to evidence a candidate's ability to plan, develop, implement and evaluate a project utilising the spectrum of skills acquired throughout their course.

The Graded Units for this award are designed to provide evidence that the candidate has achieved the following aims of the SQA Advanced Diploma in *Computing: Networking:*

- To develop candidates' knowledge and skills in planning, developing and evaluating.
- To develop study and research skills.
- To prepare students for progression to further study in computer networking or a related discipline.
- To provide the learner with the opportunity to develop the identified Core Skills within the context a real project.

4 Recommended entry to the qualification

Entry to this qualification is at the discretion of the centre. The following information on prior knowledge, skills, experience or qualifications that provide suitable preparation for this qualification has been provided by the Qualification Design Team as guidance only.

Learners would benefit from having attained the skills, knowledge and understanding required by one or more of the following qualifications and/or experience:

- Passes in two relevant National Courses at SCQF level 6 (Higher) together with three relevant subjects at National 5.
- A related National Certificate at SCQF level 6.
- A relevant combination of vocational awards at appropriate levels.
- A mix of the above.

For example, a school leaver may be expected to possess two Higher level passes, (such as Computer Science and English) together with three passes at National 5 (such as Mathematics, Business Administration and History).

A college entrant would be expected to have completed a relevant National Certificate programme such as *Digital Media Computing* at SCQF level 6 or *Computer Games Development* at SCQF level 6. A combination of level 6 and level 5 National Units would also be appropriate. For example, a college entrant may possess a National Certificate in Mobile Technology at SCQF level 5 together with individual Unit passes at SCQF level 6.

Given the range of vocational awards available to learners, applicants who possess a range of smaller vocational qualifications should also be considered. For example, possession of relevant National Progression Awards (such as PC Passport and *Computer Games Development* at SCQF level 6) may be considered appropriate for entry to this award.

Applicants with a mixture of the above should also be considered for entry. For example, a candidate who possessed a pass in *Computer Science* at SCQF level 6 (Higher) together with one or more relevant NPA awards at SCQF levels 5 or 6 would, most likely, have the necessary knowledge and skills to benefit from undertaking this award.

Equivalent qualifications from other awarding bodies may also be acceptable as would suitable vendor certifications.

Mature candidates with suitable work experience should also be considered subject to the Core Skill entry profile detailed in Section 4.1.

Entry onto the second year of this award is at the discretion of the centre.

For direct entry into Year 2 of the SQA Advanced Diploma in *Computing: Networking* candidates should have successfully passed the SQA Advanced Certificate in *Computing* (GM8K 47) or qualify for credit transfer using the recognised SQA quality procedures to ensure that the learner is credited with the appropriate SCQF Units. As the SQA Advanced Certificate in *Computing* is a 12 credit award it is recommended

that candidates top up their qualifications with an additional relevant 3 SQA credits prior to progressing to the second year of the award.

4.1 Core Skills entry profile

The Core Skill entry profile provides a summary of the associated assessment activities that exemplify why a particular level has been recommended for this qualification. The information should be used to identify if additional learning support needs to be put in place for learners whose Core Skills profile is below the recommended entry level or whether learners should be encouraged to do an alternative level or learning programme.

Core Skill	Recommended SCQF entry level	Associated assessment activities	SCQF exit level
Communication	SCQF level 5	The Core Skill of 'Communications' at SCQF level 6 can be developed comfortably and naturally within the mandatory Units Team Working in Computing and Professionalism and Ethics in Computing but have been signposted rather than embedded.	SCQF 6
Numeracy	SCQF level 5	The Qualification Design Team have embedded the Core Skill of 'Numeracy' at SCQF level 5 within the mandatory Unit Computer Systems Fundamentals. A selection of 'Mathematics' Units which have Numeracy embedded at SCQF level 6 are also included in the framework as optional Units for centres wishing to offer a higher Core Skill exit level (refer to end of Section 4.1 for more information).	SCQF 5

Core Skill	Recommended SCQF entry level	Associated assessment activities	SCQF exit level
Information and Communication Technology (ICT)	SCQF level 5	The Core Skill of 'ICT' at SCQF level 6 is embedded in the mandatory Unit Team Working in Computing.	SCQF 6
Problem Solving	SCQF level 5	The Core Skill component of 'Critical Thinking' which is part of the Problem Solving Core Skill is embedded within the mandatory Unit of Developing Software: Introduction. The Core Skill of 'Problem Solving' at SCQF level 6 is embedded in the mandatory Unit Troubleshooting Computing Problems.	SCQF 6
Working with Others	SCQF level 5	The Core Skill of 'Working with Others' at SCQF level 6 is embedded in the mandatory Unit Team Working in Computing.	SCQF 6

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The recommended Core Skill profile for entry to this award is the same as for the SQA Advanced Certificate in *Computing* which has already been validated.

It is recognised that some candidates, particularly adult returners, may not possess a specific Core Skills profile on entry, hence entry level is only recommended. In this case, it is recommended that centres carry out an appropriate evaluation of the learner's basic skills to ensure that they have the necessary prerequisites to benefit from undertaking this award.

Core Skills can be embedded or signposted within Units. Embedded skills occur where the development of a Core Skill is incorporated into the Unit and where the Unit assessment also covers the requirements of Core Skill assessment at a particular level. Units that have embedded Core Skill(s) will be automatically certificated upon successful completion of the Unit assessments.

Signposted means identifying opportunities within the Unit for developing Core Skills other than those that can be summatively assessed and certificated. This allows the development of the Core Skills through teaching and learning to be utilised and these opportunities are highlighted within the Unit support notes to those delivering and managing the Units.

Additional opportunities to attain the Core Skill of *Numeracy* at a higher SCQF level exist in the following Units:

HR7E 47 *Mathematics: Calculus and Matrices for Computing* (embedded — SCQF level 6)
HP1H 47 *Mathematics for Computing 1* (Using Number embedded — SCQF level 6, Using Graphical Information embedded — SCQF level 5)
HR7R 47 *Mathematics for Interactive Computing: Essential Techniques* (signposted — SCQF level 6)

5 How the Units meet the aims of the qualification

This qualification is designed to meet a specific purpose and what follows are details on how that purpose has been met through mapping of the Units to the aims of the qualification. Through meeting the aims, additional value has been achieved by linking the Unit standards with those defined in UK National Occupational Standards and/or trade/professional body requirements. In addition, significant opportunities exist for learners to develop the more generic skills, known as Core Skills, through doing this qualification.

A major feature and benefit of the award is the embedding of vendor curricula within the learning and teaching process. This allows candidates to be presented for vendor certification exams if they choose and significantly enhances their employment prospects while assuring employers of their skills profile.

5.1 Mapping of qualification aims to Units

The following table maps the general and specific aims of the qualification, listed below, to the mandatory Units contained within the award:

1 To develop the candidate's knowledge and skills such as planning, analysing and evaluating.
2 To develop employment skills and enhance candidates' employment prospects.
3 To enable progression within the SCQF.
4 To develop study and research skills.
5 To develop transferable skills including Core Skills.
6 To provide academic stimulus and challenge, and foster an enjoyment of the subject.
7 To support learners' continuing professional development.
8 To develop a range of specialist knowledge and skills in networking technologies.
9 Where applicable, to provide learners with the underpinning knowledge and skills that may allow them to sit vendor certification examinations.
10 To prepare candidates for progression to further studies in a related discipline at SCQF level 9.
11 To prepare candidates for employment in the general category of IT&T engineer/IT&T technician.

Unit title and code	**Aims**										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
Developing Software: Introduction (HP1R 47)	✓	✓	✓	✓	✓	✓	✓				
Professionalism and Ethics in Computing (HP29 47)	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
Computer Systems Fundamentals (HP1T 47)	✓	✓	✓	✓	✓	✓	✓		✓		
Troubleshooting Computer Problems (HP1V 47)	✓	✓	✓	✓	✓	✓	✓	✓	✓		
Team Working in Computing (HP1X 47)	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
Computing: Graded Unit 1: Exam (HR9J 47)			✓	✓		✓			✓		
Routing Technology (HP1J 48)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Networking Technology (HP1M 48)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Server Administration (HP1P 48)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Computing: Networking Graded Unit 2: Project (HT0A 48)	✓	✓	✓	✓	✓	✓	✓		✓		✓

5.2 Mapping of National Occupational Standards (NOS) and/or trade body standards

IT and Telecoms Professional National Occupational Standards (NOS) have been developed in parallel with and as part of the IT Professional Competency Model — e-skills Procom. E-skills Procom is being established as the industry recognised, internationally relevant training framework for organising courses and qualifications. It defines knowledge, understanding, and competencies for seven broad disciplines.

The disciplines are:

1 Sales and marketing
2 Business change
3 Programme and project management
4 Solutions architecture
5 Solution development and implementation
6 Information management and security
7 IT service management and delivery

The content of disciplines 1–3, while important to the IT&T sectors, do not fall within the scope of e-skills UK for NOS. Consequently these will not formally be recognised as NOS as is the case for disciplines 4–7. To maintain the relationship these NOS have been numbered to reflect the relationship to e-skills Procom. Within each discipline there exist a number of sub-disciplines. Within each sub-discipline the competences relating to a particular role have been defined.

This is an example of a structure and as there are many more optional Units available then this is not an exhaustive list.

4.1 Systems Architecture
4.2 Data Analysis
4.3 Human Needs Analysis
4.4 Systems Analysis
4.5 Data Design
4.6 Human Computer Interaction/ Interface design
4.7 Systems Design
4.8 IT/Technology Infrastructure Design and Planning

5.1 Systems Development
5.2 Software Development
5.3 IT/Technology Solution testing
5.4 Systems Integration
5.5 IT/Technology systems installation, implementation and handover
6.1 Information management
6.2 IT Security management
6.3 IT Disaster Recovery

SQA Advanced Diploma

The mandatory Units from the SQA Advanced Certificate in *Computing* have already been mapped and are included within the 14 mandatory credits for the SQA Advanced Diploma in *Computing: Networking*.

Unit title and code	National Occupational Standard															
	4.1	**4.2**	**4.3**	**4.4**	**4.5**	**4.6**	**4.7**	**4.8**	**5.1**	**5.2**	**5.3**	**5.4**	**5.5**	**6.1**	**6.2**	**6.3**
Developing Software: Introduction (HP1R 47)		✓		✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	
Professionalism and Ethics in Computing (HP29 47)														✓	✓	
Computer Systems Fundamentals (HP1T 47)	✓					✓			✓		✓		✓			
Troubleshooting Computer Problems (HP1V 47)	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Team Working in Computing (HP1X 47)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Computing: Graded Unit 1 (HR9J 47)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Computing: Networking Graded Unit 2 (HT0A 48)				✓				✓			✓	✓	✓	✓	✓	
Routing Technology (HP1J 48)								✓			✓			✓	✓	
Networking Technology (HP1M 48)								✓			✓			✓	✓	
Server Administration (HP1P 48)								✓			✓	✓	✓	✓	✓	✓

5.3 Mapping of Core Skills development opportunities across the qualification

Unit code	Unit title	Communication		Numeracy		ICT		Problem Solving			Working with Others	
		Written	Oral	Using Number	Using Graphical Information	Accessing Information	Providing/ Creating information	Critical Thinking	Planning and Organising	Reviewing and Evaluating	Working Co-operatively with Others	Reviewing Co-operative Contribution
HP1R 47	Developing Software: Introduction							Embedded (SCQF 6)				
HP1X 47	Team Working in Computing	Signposted (SCQF 6)	Signposted (SCQF 6)			Embedded (SCQF 6)	Embedded (SCQF 6)				Embedded (SCQF 6)	Embedded (SCQF 6)
HP1V 47	Troubleshooting Computing Problems							Embedded (SCQF 6)	Embedded (SCQF 6)	Embedded (SCQF 6)		
HP1T 47	Computer Systems Fundamentals			Embedded (SCQF 5)	Embedded (SCQF 5)							
HP29 47	Professionalism and Ethics in Computing	Signposted (SCQF 6)	Signposted (SCQF 6)			Signposted (SCQF 6)	Signposted (SCQF 6)					
HP1J 48	Routing Technology			Signposted (SCQF 6)								
HP1M 48	Networking Technology							Signposted (SCQF 6)				
HP1P 48	Server Administration	Signposted (SCQF 6)										
HT0A 48	SQA Advanced Diploma in Computing: Networking: Graded Unit 2: Project							Embedded (SCQF 6)	Embedded (SCQF 6)	Embedded (SCQF 6)		

5.4 Assessment strategy for the qualification

The Units listed below are the mandatory Units which when added to the mandatory SQA Advanced Certificate in Computing Units form the 14 mandatory credits for the SQA Advanced Diploma in Computing: Networking.

Unit	**Assessment**				
	Outcome 1	**Outcome 2**	**Outcome 3**	**Outcome 4**	**Outcome 5**
Networking Technology (HP1M 48)	Evidence for the Knowledge and Understanding component of the Unit must be produced using a set of 50 multiple-choice/multiple-response questions to assess candidates' capabilities. This should be administered as a single end-of-Unit test covering all Outcomes. Candidates must answer at least 60% of the questions correctly in order to obtain a pass.				
Routing Technology (HP1J 48)	Evidence for the Knowledge and Understanding component of the Unit must be produced using a set of 50 multiple-choice/multiple-response questions to assess candidates' capabilities. This should be administered as a single end-of-Unit test covering all Outcomes. Candidates must answer at least 60% of the questions correctly in order to obtain a pass				
Server Administration (HP1P 48)	Assessment for all Outcomes must be undertaken at the end of the Unit. Candidate capabilities will be examined by 60 multiple-choice/multiple-response questions with appropriate sampling of the complete Unit content. Candidates must score at least 60% in order to pass the Unit.				
SQA Advanced Diploma Computing: Networking: Graded Unit 2 (HT0A 48)	The candidate will be required to provide documentation which supports evidence of the candidate's ability to plan, develop, implement and evaluate technical skills gained throughout their course.				

6 Guidance on approaches to delivery and assessment

One of the main aims of the SQA Advanced Diploma in *Computing: Networking* has been to reflect in its framework the significant technology developments that are taking place in the field of ICT in areas such as security, cloud computing, convergence of communications & IT and the real world web.

These developments are changing the skill requirements for IT staff[8], even in small organisations, and this is being reflected in the posts being advertised in IT sector employment agencies and in the portfolios of HE institutes offering related degree programmes.

An overarching aim of the SQA Advanced Certificate in *Computing* and the associated SQA Advanced Diploma is to maximise the learning and teaching component of Unit delivery and correspondingly reduce the amount of time spent on assessment.

One possible approach to delivery would be to cluster associated technologies or Units and deliver these within a common teaching block/semester. This would afford the opportunity to sequence or integrate teaching of complementary or related Units creating building blocks of learning. In addition this would also allow for possible cross-assessment and integration of assessment between Units hence reducing overall assessment burden.

Where appropriate and practical this approach is to be encouraged. In addition to impacting significantly on business processes and practices, these same developments in ICT are impacting on pedagogy. Use of social networking tools and delivery of learning resources to personal internet technologies such as tablet computers and smartphones should be employed in addition to traditional classroom based teaching in order to allow for more flexibility and fluidity in learning activities[9].

A feature of the SQA Advanced Diploma in *Computing: Networking* is the significant additional theoretical content introduced within Units such as Cloud Computing, Convergence Technologies, Intrusion Prevention Systems and Mobile Technology. Additionally a significant number of the existing and new Units are assessed by MCSA/MCMA methods. These assessment methods offer significant opportunities for e-assessment in both formative and summative assessment as well as opportunities to expose candidates to assessment methods undertaken in vendor related certification examinations.

Needless to say, delivery of these Units poses challenges to centres in relation to tutor skillsets and potential resources required. Significant planning for CPD and IT resourcing should be undertaken prior to the adoption of this award.

A further aim of the SQA Advanced Certificate in *Computing* and the related SQA Advanced Diploma is to allow centres a high degree of flexibility in the options available to them in order that they could tailor delivery to their own specialisms, HE progression options and potential needs of local employers. This will be expanded upon in the following section.

[8] IDC Cloud Computing's role in job creation

[9] Open University Innovation Report 1 – Innovating Pedagogy 2012

6.1 Sequencing/integration of Units

These awards have been structured to allow a significant degree of flexibility to centres in their choice and sequencing of Units while retaining the core theme of the individual awards.

Given that the SQA Advanced Certificate in *Computing* is a 12 credit award and that a significant percentage of SQA Advanced Certificate students are expected to progress to the second year of an associated SQA Advanced Diploma, it would be advisable to schedule Year 1 delivery to at least offer the option of a relevant additional three credits to accommodate this scenario.

Consequently this raises the potential for a number of possible approaches to delivery, namely:

- Generic SQA Advanced Certificate which progresses to two or more of the SQA Advanced Diplomas in *Computing*
- Networking oriented SQA Advanced Certificate leading to Year 2 of the award

In practice the various permutations of the above will be dictated by numerous factors including the size of the Year 1 cohort and the availability of resources.

Where possible, learners should complete a SCQF level 7 Unit before undertaking an associated SCQF level 8 Unit. It is recommended that where possible assessments should be integrated to reduce the assessment load.

The following table shows a sample SQA Advanced Diploma in *Computing: Networking* schedule of delivery: The schedule suggested below is based upon a 2 Year course with each year comprising of three semesters. Note that centres are free to devise their own alternative course plans:

Note that Year 1 is predominantly populated with SCQF level 7 Units and Year 2 with SCQF level 8 Units.

Year 1			**Year 2**		
Trimester 1	**SCQF level**	**Credit Rating**	**Trimester 1**	**SCQF level**	**Credit Rating**
Developing Software Introduction (HP1R 47)	7	1	Switching Technology (HP1L 48)	8	2
Computer Systems Fundamentals (HP1T 47)	7	1	Server Administration (HP1P 48)	8	2
Configuring a Desktop Operating System (HR85 47)	7	2	Mobile Technology (HR8F 48)	8	1
Networking Technology (HP1M 48)	8	2			
Team Working in Computing (HP1X 47)	7	1			
Trimester 2	**SCQF level**	**Credit Rating**	**Trimester 2**	**SCQF level**	**Credit Rating**
Database Design Fundamentals (HP2G 47)	7	1	Internetworking Technology (HP1N 48)	8	2
Troubleshooting Computer Problems (HP1V 47)	7	1	Network Security Concepts (HX00 47)	8	2
Configuring a Desktop Operating System (HR85 47)	7	2	Intrusion Prevention Systems (HR8D 47)	7	1
Professionalism and Ethics in Computing (HP29 47)	7	1			
Networking Technology (HP1M 48)	8	2			

SQA Advanced Diploma

Trimester 3	SCQF level	Credit Rating	Trimester 3	SCQF level	Credit Rating
Troubleshooting a Desktop Operating System (HR86 47)	7	2	SQA Advanced Diploma Computing: Networking: Graded Unit 2 (HT0A 48)	8	2
SQA Advanced Certificate Computing: Graded Unit 1 (HR9J 47)	7	1	Convergence Technologies (HP25 48)	8	2
Routing Technology (HP1J 48)	8	2	Cloud Computing (HP1Y 47)	7	1

6.2 Recognition of Prior Learning

SQA recognised that learners gain knowledge and skills acquired through formal, non-formal and informal learning contexts.

In some instances, a full Group Award may be achieved through the recognition of prior learning. However, it is unlikely that a learner would have the appropriate prior learning and experience to meet all the requirements of a full Group Award.

The recognition of prior learning may **not** be used as a method of assessing in the following types of Units and assessments:

- SQA Advanced Graded Units
- Course and/or external assessments
- Other integrative assessment Units (which may or not be graded)
- Certain types of assessment instruments where the standard may be compromised by not using the same assessment method outlined in the Unit
- Where there is an existing requirement for a licence to practice
- Where there are specific Health and Safety requirements
- Where there are regulatory, professional or other statutory requirements
- Where otherwise specified in an assessment strategy.

More information and guidance on the *Recognition of Prior Learning* (RPL) may be found on our website **www.sqa.org.uk**

The following sub-sections outline how existing SQA Unit(s) may contribute to this Group Award. Additionally, they also outline how this Group Award may be recognised for professional and progression purposes.

6.2.1 Higher Education

Articulation arrangements exist between a number of Scottish, UK and international universities where SQA Advanced Certificates and Diplomas will be accepted as advanced entry to either the second or third year of a related degree programme. Depending on the specific degree programme, certain units may be required as part of the SQA Advanced Certificate/Diploma. The optional section of the framework is sufficiently broad to ensure that centres are able to comply with reasonable articulation requests. A high proportion of our candidates have articulated to degree programmes and successfully completed them.

6.2.2 Professional Bodies

SQA Advanced Certificates and Diplomas are recognised by many professional bodies. Candidates achieving an SQA Advanced Certificate/Diploma may meet the professional body entry requirements. Candidates may also gain partial and full exemptions to professional body exams.

6.3 Opportunities for e-assessment

The Units in this award offer numerous opportunities for e-assessment ranging from the more obvious objective question based closed-book assessments to the use of e-portfolios and video for some of the open-book assessments. It is also possible to use social media software to record and facilitate group work where appropriate. Each Unit specification includes suggestions of how e-assessments might be used effectively.

As part of an assessment strategy, centres are encouraged to investigate the option of e-assessment to support the programme. E-assessment may take a number of forms, and while it may be feasible in the future to conduct all assessment in an online format, currently some formats are more amenable to e-assessment than others.

The most obvious format is that of objective tests, eg multiple-choice or short-response tests, and some SQA Units already have an Evidence Requirement mandating the use of this type of test.

There is considerable scope for the use of e-assessment within and between the Units in this framework. Many of the Units are mapped to vendor curricula and their assessment methodologies emulate their vendor counterparts.

Consequently there already exist considerable resources and experience in deploying e-assessment methods in assessing Unit Outcomes.

Given the wealth of published research on e-assessment there are undoubtedly further opportunities to broaden the use of e-assessment within this award.

Below is a sample of Units within the Group Award where e-assessment may readily be adopted:

Multiple-choice/Short-response e-assessment opportunities	
Unit title	**Code**
Convergence Technologies	HP25 48
Routing Technology	HP1J 48
Server Administration	HP1P 48
Networking Technology	HP1M 48
Internetworking Technology	HP1N 48
Switching Technology	HP1L 48
Configuring a Desktop Operating System	HR85 47
Troubleshooting a Desktop Operating System	HP1V 47
Network Security Concepts	HX00 47

e-portfolio opportunities	
Unit title	**Type**
SQA Advanced Diploma in Computing: Technical Support: Graded Unit (Project)	Project proposal Project Documentation

6.4 Support materials

A range of Assessment Support Packs (ASPs) have been produced for a number of mandatory and optional Units in this Group Award. These packs are available on the SQA secure website and access can be sought through the SQA coordinator in each centre.

6.5 Resource requirements

There is a requirement for ongoing staff CPD in relation to developments in ICT.

Centres who already deliver the SQA Advanced Diplomas in *Computer Networking* and *Internet Technology* will be investing significantly in staff CPD and hardware/software resources in relation to the Cisco CCNA curriculum and Microsoft Academy programmes.

This award also requires further CPD in relation to some of the Units specific to it. The following table identifies some potential areas for CPD and *suggested* CPD routes:

Technology Area	Related Units	Suggested CPD
Network Infrastructure	Networking Technology, Routing Technology, Switching Technology, Internetworking Technology	Cisco Network Academy Programme
Client Side Operating Systems	Configuring a Desktop Operating System, Troubleshooting a Desktop Operating System	Microsoft Windows 7 Windows 8 vendor courses OR Open Source
Server Side Operating Systems	Server Administration, Administering Network Systems	Microsoft Windows Server 2008, Server 2012 OR Open Source
Convergence Technology, Cloud Computing	Convergence Technologies, Cloud Computing	CompTIA CTP+, CompTIA Cloud Essentials
Security	Security Concepts, Intrusion Prevention Systems	CompTIA Security+ Cisco CCNA Security

7 General information for centres

Equality and inclusion

The Unit Specifications making up this Group Award have been designed to ensure that there are no unnecessary barriers to learning or assessment. The individual needs of learners will be taken into account when planning learning experiences, selecting assessment methods or considering alternative evidence. Further advice can be found on our website **www.sqa.org.uk/assessmentarrangements**

Internal and external verification

All instruments of assessment used within this/these qualification(s) should be internally verified, using the appropriate policy within the centre and the guidelines set by SQA.

External verification will be carried out by SQA to ensure that internal assessment is within the national guidelines for these qualifications.

Further information on internal and external verification can be found in *SQA's Guide to Assessment* (**www.sqa.org.uk/GuideToAssessment**).

8 Glossary of terms

Embedded Core Skills: This is where the assessment evidence for the Unit also includes full evidence for complete Core Skill or Core Skill components. A learner successfully completing the Unit will be automatically certificated for the Core Skill. (This depends on the Unit having been successfully audited and validated for Core Skills certification.)

Graded Unit: Graded Units assess learners' ability to integrate what they have learned while working towards the Units of the Group Award. Their purpose is to add value to the Group Award, making it more than the sum of its parts, and to encourage learners to retain and adapt their skills and knowledge.

SCQF: The Scottish Credit and Qualification Framework (SCQF) provides the national common framework for describing all relevant programmes of learning and qualifications in Scotland. SCQF terminology is used throughout this guide to refer to credits and levels. For further information on the SCQF visit the SCQF website at **www.scqf.org.uk**

SCQF credit points: SCQF credit points provide a means of describing and comparing the amount of learning that is required to complete a qualification at a given level of the Framework. One National Unit credit is equivalent to 6 SCQF credit points. One National Unit credit at Advanced Higher and one SQA Credit (irrespective of level) is equivalent to 8 SCQF credit points.

SCQF levels: The level a qualification is assigned within the framework is an indication of how hard it is to achieve. The SCQF covers 12 levels of learning. SQA Advanced Certificates and SQA Advanced Diplomas are available at SCQF levels 7 and 8 respectively. SQA Advanced Units will normally be at levels 6–9 and Graded Units will be at level 7 and 8.

Signposted Core Skills: refers to opportunities to develop Core Skills which arise in learning and teaching but are not automatically certificated.

SQA Credit Value: The credit value allocated to a Unit gives an indication of the contribution the Unit makes to an SQA Group Award. An SQA credit value of 1 given to an SQA Unit represents approximately 40 hours of programmed learning, teaching and assessment.

9 General information for learners

This section will help you decide whether this is the qualification for you by explaining what the qualification is about, what you should know or be able to do before you start, what you will need to do during the qualification and opportunities for further learning and employment.

The aim of this qualification is to equip you with the necessary skillset to pursue employment in the general category of IT&T engineer/IT&T technician. In addition the award encompasses the necessary training required for a range of commercially recognised certifications such CompTIA, Microsoft and Cisco and allows you to focus on technology clusters such as network infrastructure, security and client/server operating systems.

This qualification is suitable for the following range of learners:

- Learners progressing from the generic SQA Advanced Certificate in *Computing* wishing to specialise in networking related technologies.
- Any other suitable candidate wishing to achieve this award with a view to further articulation to an appropriate HE award or to pursue employment in the relevant ICT sector.

At the discretion of a centre, you may be permitted to enter the award by waiving some of the entry requirements — based on your previous experience.

It is anticipated that the award will allow you to progress to a wide variety of university degree programmes at Year two and Year three respectively.

To achieve the award you will need to pass a minimum of 30 credits from the Group Award framework including all 14 of the mandatory Units.

In the first year of the award you will learn a range of introductory computing topics relating to computer systems and how to troubleshoot faults on them. You will also learn about team working and some of the legislation that governs securing the electronic data that is stored on systems. In addition you will study two Microsoft Windows 7 courses and two semesters of the Cisco Certified Network Associate (CCNA) programme covering local area networks (LAN's) and routers.

In second year you will specialise in server operating systems and complete the remaining two CCNA semesters relating to local area network switches and wide area network (WAN) technology. In addition you will learn about system and network security and voice over IP (VoIP) technology.