Higher National Unit Specification

General information for centres

Unit title: Wireless Local Area Networks

Unit code: DG04 35

Unit purpose: This Unit is designed to enable candidates to understand the concepts of wireless local area networks (WLANs) and enable them to be proficient in the installation, configuration and management of such systems. It is intended for candidates undertaking an HNC or HND in Computing, Computer Networking or a related area who require a detailed knowledge of WLAN systems.

On completion of this unit candidate should be able to:

1   Describe the characteristics of wireless LANs.
2   Describe wireless radio technology concepts.
3   Configure a wireless network.
4   Describe wireless network security basics.
5   Implement security in a wireless network.
6   Describe the characteristics of wireless network design.
7   Carry out a site survey.
8   Manage, monitor and troubleshoot a wireless LAN.

Credit value: 2 HN credits at SCQF level 8: (16 SCQF credit points at SCQF level 8)

SCQF credit points are used to allocate credit to qualifications in the Scottish Credit and Qualifications Framework (SCQF). Each qualification in the Framework is allocated a number of SCQF credit points at an SCQF level. There are 12 SCQF levels, ranging from Access 1 to Doctorates.

Recommended prior knowledge and skills: Access to this Unit will be at the discretion of the Centre. There are no specific requirements but candidates would benefit from knowledge of computer networks. This may be demonstrated by the possession of HN Units such as DF9P 34 Network Concepts and DF9T 34Internetworking Concepts 1.

Core skills: There may be opportunities to gather evidence towards core skills in this Unit, although there is no automatic certification of core skills or core skills components.

Context for delivery: This Unit is included in the framework of a number of HNC and HND group awards. It is recommended that it should be taught and assessed within the context of the particular group award to which it contributes.

Assessment: Evidence for the knowledge and/or skills for the entire Unit must be produced using a set of 50 restricted-response questions to assess candidates' knowledge and understanding. This may be administered as a single end-of unit test, or as several subtests, each covering one or more outcomes.

General information for centres (cont)

Candidates must answer at least 70% of the questions correctly in order to obtain a pass. If subtests are used, they must also score at least 70% in each subtest.

Testing must take place in a closed-book environment where candidates have no access to books, handouts, notes, or other learning material. Testing can be done in either a machine-based or paper-based format and must be invigilated by a tutor or mentor. There must be no communication between candidates and communication with the administrator must be restricted to matters relating to the administration of the test.

If a candidate requires to be reassessed, a different selection of questions must be used. At least half the questions in the reassessment must be different from those used in the original test.

If an outcome has a practical component, this must be assessed by having the candidate use a logbook to record the practical tasks successfully completed. The logbook can be in paper or electronic form and must be authenticated by the tutor or mentor.

For some outcomes only a sample of the practical tasks needs to be completed and recorded for assessment purposes, e.g. three out of five. This is clearly indicated in the logbook instructions for the outcomes involved. Where this occurs, tutors must inform candidates of the tasks to be completed.

Higher National Unit specification: statement of standards

Unit title: Wireless Local Area Networks

Unit code: DG04 35

The sections of the Unit stating the Outcomes, knowledge and/or skills, and evidence requirements are mandatory.

Where evidence for Outcomes is assessed on a sample basis, the whole of the content listed in the knowledge and/or skills section must be taught and available for assessment. Candidates should not know in advance the items on which they will be assessed and different items should be sampled on each assessment occasion.

Outcome 1

Describe the characteristics of wireless LANs.

Knowledge and/or skills

♦ Wireless technologies and components.
♦ Characteristics of the IEEE 802.11 MAC and physical layer.
♦ Common WLAN topologies.
♦ Bridge topologies.

Evidence requirements

Restricted response test

The knowledge and skills component of Outcome 1 must be examined by eight questions, two being derived from each of the four items listed below. Each question must be derived from a single item.

1. Describe wireless technologies and components.

   Wireless and cellular technology, NIC, AP, access bridges, ad hoc, BSS and ESS

2. Describe the characteristics of the IEEE 802.11 MAC and physical layer.

   802.11 (a, b and g), MAC layer, carrier sense mechanism, frequency range, spreading sequences and modulation, HOP sequence, IR specification

3. Describe common WLAN topologies.

   WLAN modularity, repeaters, roaming, scalability, redundancy and load balancing

4. Describe bridge topologies.

   Root modes, point to point, point to multipoint, distance limitations, bandwidth

Higher National Unit specification: statement of standards (cont)

Unit title: Wireless Local Area Networks

The test may be administered on its own as a subtest or be combined with other outcome subtests in the unit.

Alternatively, the 8 questions for this outcome may contribute towards one end-of-unit test of 50 questions.

Logbook

There are no practical tasks relating to Outcome 1.

Assessment guidelines

It is suggested that all the above concepts be presented and explained within the context of current real-world practice and applications.

The suggested time allocation for a restricted response test is 2 minutes for each question plus 5 minutes starting-up time and 5 minutes finishing-off time, thus a total of 110 minutes should be allocated for a 50-question end-of-unit test.

Although individual outcome tests are permissible, it is suggested that if subtests are to be used, outcomes should be combined to produce tests of no fewer than 10 questions. A 10-question test would therefore have a time allocation of 30 minutes.

Outcome 2

Describe wireless radio technology concepts

Knowledge and/or skills

♦ Basic concepts of radio communications.
♦ Media access methods.
♦ Radio wave propagation.

Evidence requirements

Restricted response test

The knowledge and skills component of Outcome 2 must be examined by six questions, two being derived from each of the three items listed below. Each question must be derived from a single item.

1. Describe basic concepts of radio communications

    EM spectrum, radio and microwaves, watts, licensed frequencies, carrier signals, AM/FM/PM), DSSS, FHSS

Higher National Unit specification: statement of standards (cont)

Unit title: Wireless Local Area Networks

2. Describe media access methods

    Alohanet, Ethernet, CSMA/CD, FM Radio, FCC allocation, WLAN, DSSS, CSMA/CA

3. Describe radio wave propagation

    Ray optics, refraction, reflection, diffraction, scattering

The test may be administered on its own as a subtest or be combined with other outcome subtests in the unit.

Alternatively, the 6 questions for this outcome may contribute towards one end-of-unit test of 50 questions.

Logbook

There are no practical tasks relating to Outcome 2.

Assessment guidelines

It is suggested that all the above concepts be presented and explained within the context of current real-world practice and applications.

The suggested time allocation for a restricted response test is 2 minutes for each question plus 5 minutes starting-up time and 5 minutes finishing-off time, thus a total of 110 minutes should be allocated for a 50-question end-of-unit test.

Although individual outcome tests are permissible, it is suggested that if subtests are to be used, outcomes should be combined to produce tests of no fewer than 10 questions. A 10-question test would therefore have a time allocation of 30 minutes.

Outcome 3

Configure a wireless network

Knowledge and/or skills

♦   Install and configure a wireless network interface card.
♦   Install and configure an ad hoc network.
♦   Monitor and use client diagnostic tools.
♦   Install and configure an access point.
♦   Install and configure infrastructure wireless networks.

Higher National Unit specification: statement of standards (cont)

Unit title: Wireless Local Area Networks

Evidence requirements

Restricted response test

The knowledge and skills component of Outcome 3 must be examined by five questions, one being derived from each of the five items listed below. Each question must be derived from a single item.

1. Install and configure a network interface card.

   Carry out efficiently and safely the installation of a wireless NIC in a PC or laptop.

2. Install and configure an ad hoc network.

   Wireless NIC is associated in ad hoc mode with another wireless NIC.

3. Monitor and use client diagnostic tools.

   Install, monitor and use client software and diagnostic tools

4. Install and configure an access point

   Carry out efficiently and safely the installation of a wireless access point.

5. Install and configure infrastructure wireless networks.

   Carry out efficiently and safely the installation of a Basic Service Set wireless network involving one access point and an Extended Service Set involving multiple access points.

The test may be administered on its own as a subtest or be combined with other outcome subtests in the unit.

Alternatively, the 5 questions for this outcome may contribute towards one end-of-unit test of 50 questions.

Logbook

The Logbook for Outcome 4 must record successful completion by the candidate of **each of** the five tasks listed below.

1. Install and configure a network interface card.

   Documentary evidence that the candidate can carry out the installation of a wireless NIC in a PC or laptop efficiently and safely.

Higher National Unit specification: statement of standards (cont)

Unit title: Wireless Local Area Networks

2. Install and configure an ad hoc network

    Documentary evidence that the candidate can install and configure an ad hoc network, ensuring that a wireless NIC is associated in ad hoc mode with another wireless NIC.

3. Monitor and use client diagnostic tools

    Documentary evidence that the candidate can install, monitor and use client software and diagnostic tools

4. Install and configure an access point

    Documentary evidence that the candidate can carry out efficiently and safely the installation of a wireless access point.

5. Install and configure infrastructure wireless networks

    Documentary evidence that the candidate can carry out efficiently and safely the installation of a Basic Service Set wireless network involving one access point and an Extended Service Set involving multiple access points.

Assessment guidelines

It is suggested that all the above concepts be presented and explained within the context of current real-world practice and applications.

The suggested time allocation for a restricted response test is 2 minutes for each question plus 5 minutes starting-up time and 5 minutes finishing-off time, thus a total of 110 minutes should be allocated for a 50-question end-of-unit test.

Although individual outcome tests are permissible, it is suggested that if subtests are to be used, outcomes should be combined to produce tests of no fewer than 10 questions. A 10-question test would therefore have a time allocation of 30 minutes.

Outcome 4

Describe wireless network security basics.

Knowledge and/or skills

♦ Fundamentals of security.
♦ WLAN security technologies.
♦ Enterprise WLAN security considerations.

Higher National Unit specification: statement of standards (cont)

Unit title: Wireless Local Area Networks

Evidence requirements

Restricted response test

The knowledge and skills component of Outcome 4 must be examined by twelve questions, four being derived from each of the three items listed below. Each question must be derived from a single item.

1. Describe fundamentals of security

    Threats, hacking methods, WLAN security threats, security design, security policy

2. Describe WLAN security technologies

    WEP, association, SSID, authentication, MAC filtering, protocol filtering, user lists

3. Describe enterprise WLAN security considerations

    EAP, LEAP, PEAP, AAA, VPN, TACACs+ server, RADIUS server

The test may be administered on its own as a subtest or be combined with other outcome subtests in the unit.

Alternatively, the 12 questions for this outcome may contribute towards one end-of-unit test of 50 questions.

Logbook

There are no practical tasks relating to Outcome 4.

Assessment guidelines

It is suggested that all the above concepts be presented and explained within the context of current real-world practice and applications.

The suggested time allocation for a restricted response test is 2 minutes for each question plus 5 minutes starting-up time and 5 minutes finishing-off time, thus a total of 110 minutes should be allocated for a 50-question end-of-unit test.

Although individual outcome tests are permissible, it is suggested that if subtests are to be used, outcomes should be combined to produce tests of no fewer than 10 questions. A 10-question test would therefore have a time allocation of 30 minutes.

Higher National Unit specification: statement of standards (cont)

Unit title: Wireless Local Area Networks

Outcome 5

Implement security in a wireless network

Knowledge and/or skills

♦ Configure security features.

Evidence requirements

Restricted response test

The knowledge and skills component of Outcome 5 must be examined by five questions, all questions being derived from the item listed below.

1. Configure security features

   Carry out efficiently and safely the installation of a Basic Service Set Wireless Network involving one Access Point and at least one client. Configure WEP security throughout

The test may be administered on its own as a subtest or be combined with other outcome subtests in the unit.

Alternatively, the 5 questions for this outcome may contribute towards one end-of-unit test of 50 questions.

Logbook

The Logbook for Outcome 5 must record successful completion by the candidate of the task listed below.

1. Configure security features

   Documentary evidence that the candidate can carry out efficiently and safely the installation of a Basic Service Set Wireless Network involving one Access Point and at least one client and configure WEP security throughout.

Assessment guidelines

It is suggested that all the above concepts be presented and explained within the context of current real-world practice and applications.

The suggested time allocation for a restricted response test is 2 minutes for each question plus 5 minutes starting-up time and 5 minutes finishing-off time, thus a total of 110 minutes should be allocated for a 50-question end-of-unit test.

Higher National Unit specification: statement of standards (cont)

Unit title: Wireless Local Area Networks

Although individual outcome tests are permissible, it is suggested that if subtests are to be used, outcomes should be combined to produce tests of no fewer than 10 questions. A 10-question test would therefore have a time allocation of 30 minutes.

Outcome 6

Describe the characteristics of wireless network design.

Knowledge and/or skills

♦ WLAN design considerations.
♦ Documenting a WLAN design.

Evidence requirements

Restricted response test

The knowledge and skills component of Outcome 6 must be examined by four questions, two being derived from each of the two items listed below. Each question must be derived from a single item.

1. Describe WLAN design considerations

   Gathering customer data, identifying sources of interference, infrastructure problems, hard to cover areas multi floor survey, interference and RF Propagation

2. Documenting a WLAN design

   Current state of network, design requirements, logical and physical design, testing strategy and results

The test may be administered on its own as a subtest or be combined with other outcome subtests in the unit.

Alternatively, the 4 questions for this outcome may contribute towards one end-of-unit test of 50 questions.

Logbook

There are no practical tasks relating to Outcome 6.

Assessment guidelines

It is suggested that all the above concepts be presented and explained within the context of current real-world practice and applications.

Higher National Unit specification: statement of standards (cont)

Unit title: Wireless Local Area Networks

The suggested time allocation for a restricted response test is 2 minutes for each question plus 5 minutes starting-up time and 5 minutes finishing-off time, thus a total of 110 minutes should be allocated for a 50-question end-of-unit test.

Although individual outcome tests are permissible, it is suggested that if subtests are to be used, outcomes should be combined to produce tests of no fewer than 10 questions. A 10-question test would therefore have a time allocation of 30 minutes.

Outcome 7

Carry out a site survey

Knowledge and/or skills

♦ Carrying out a site survey.

Evidence requirements

Restricted Response Test

The knowledge and skills component of Outcome 7 must be examined by four questions, all questions being derived from the item listed below.

1. Carry out a site survey

   Carry out efficiently and safely a site survey of an indoor environment.

The test may be administered on its own as a subtest or be combined with other outcome subtests in the unit.

Alternatively, the 4 questions for this outcome may contribute towards one end-of-unit test of 50 questions.

Logbook

The Logbook for Outcome 7 must record successful completion by the candidate of the task listed below.

1. Carry out a site survey

   Documentary evidence that the candidate can carry out efficiently and safely a site survey of an indoor environment.

Higher National Unit specification: statement of standards (cont)

Unit title: Wireless Local Area Networks

Assessment guidelines

It is suggested that all the above concepts be presented and explained within the context of current real-world practice and applications.

The suggested time allocation for a restricted response test is 2 minutes for each question plus 5 minutes starting-up time and 5 minutes finishing-off time, thus a total of 110 minutes should be allocated for a 50-question end-of-unit test.

Although individual outcome tests are permissible, it is suggested that if subtests are to be used, outcomes should be combined to produce tests of no fewer than 10 questions. A 10-question test would therefore have a time allocation of 30 minutes.

Outcome 8

Manage, monitor and troubleshoot a wireless LAN.

Knowledge and/or skills

♦ WLAN troubleshooting techniques.
♦ Troubleshooting a WLAN.
♦ Monitoring and managing WLANs.

Evidence requirements

Restricted Response Test

The knowledge and skills component of Outcome 8 must be examined by six questions, two being derived from each of the three items listed below. Each question must be derived from a single item.

1. Use WLAN troubleshooting techniques

    General approach to troubleshooting OSI/TCP/IP troubleshooting, diagnostic tools

2. Troubleshoot a WLAN

    Efficiently and safely troubleshoot a WLAN

3. Monitor and manage WLANs
    Carry out efficiently and safely the monitoring and managing of a WLAN.

The test may be administered on its own as a subtest or be combined with other outcome subtests in the unit.

Higher National Unit specification: statement of standards (cont)

Unit title: Wireless Local Area Networks

Alternatively, the 6 questions for this outcome may contribute towards one end-of-unit test of 50 questions.

Logbook

The Logbook for Outcome 8 must record successful completion by the candidate of **each of** the three tasks listed below.

1. Use WLAN troubleshooting techniques

    Documentary evidence that the candidate can use WLAN troubleshooting techniques and diagnostic tools.

2. Troubleshoot a WLAN

    Documentary evidence that the candidate can efficiently and safely troubleshoot a WLAN.

3. Monitor and manage WLANs

    Documentary evidence that the candidate can carry out efficiently and safely the monitoring and management of a WLAN.

Assessment guidelines

It is suggested that all the above concepts be presented and explained within the context of current real-world practice and applications.

The suggested time allocation for a restricted response test is 2 minutes for each question plus 5 minutes starting-up time and 5 minutes finishing-off time, thus a total of 110 minutes should be allocated for a 50-question end-of-unit test.

Although individual outcome tests are permissible, it is suggested that if subtests are to be used, outcomes should be combined to produce tests of no fewer than 10 questions. A 10-question test would therefore have a time allocation of 30 minutes.

Administrative Information

Unit code: DG04 35

Unit title: Wireless Local Area Networks

Superclass category: CB

Date of publication: May 2004

Version: 01

Source: SQA

Higher National Unit specification: support notes

Unit title: Wireless Local Area Networks

This part of the Unit specification is offered as guidance.

The support notes are not mandatory.

While the exact time allocated to this Unit is at the discretion of the centre, the notional design length is 80 hours.

Outcome 1:   10 hours
Outcome 2:   10 hours
Outcome 3:   10 hours
Outcome 4:   10 hours
Outcome 5:   10 hours
Outcome 6:   10 hours
Outcome 7:   10 hours
Outcome 8:   10 hours

Guidance on the content and context for this Unit

As it is likely that the bulk of the material in this Unit will be delivered through lecturer exposition, it is important that every opportunity is taken to introduce real-world examples, opportunities for whole-class and group discussion and practical demonstrations wherever possible. Concepts and terminology should be presented in context throughout the Unit. Video presentations should be used where appropriate for providing an alternative explanation of a difficult topic, or as a focus for class discussion or groupwork.

Given the theoretical elements of this Unit, it is intended that a significant amount of time will be made available as a central part of the course for revision, tutorials and formative assessment exercises. Candidates should be strongly encouraged to undertake further reading, and opportunities for individual or group research should be provided.

The most important overall emphasis should be on the relevance and currency of content in such a rapidly-evolving field.

This Unit may assist candidates in preparing for the Certified Wireless Networking Administrator (CWNA) examination. Candidates should be encouraged to check the latest information at **www.cwnp.com** to ensure that all objectives have been covered. It may also be used to help prepare candidates for the Cisco Specialist Qualification exams: 9EO-576 WLANSE (Wireless LAN Design Specialist) and 9EO-581 WLANFE (Wireless LAN Support Specialist). Candidates should be encouraged to check the latest information at **www.cisco.com** to ensure that all objectives have been covered.

This unit is designed to provide candidates with sufficient knowledge and skills to design, install, manage and troubleshoot a Wireless LAN. As such the unit comprises eight learning outcomes split equally between underlying theoretical knowledge and practical exercises.

Higher National Unit specification: support notes (cont)

Unit title: Wireless Local Area Networks

Outcome 1

The first outcome introduces candidates to the basic characteristics of Wireless LAN's.

1.   Wireless Technologies and components

The unit begins with an overview of the components of modern WLANs. These include a description of basic wireless and cellular technology, NIC, AP, and access bridges. It also describes the main components of ad hoc, BSS and ESS networks.

2.   IEEE 802.11 MAC and Physical Layer

Following this the IEEE 802.11 standard is presented showing the main flavours (a, b& g), more detailed coverage of the MAC layer, carrier sense mechanism, frequency range, spreading sequences, modulation, HOP sequence and IR specification should be included.

3.   WLAN Topologies

This basic understanding of the operation of WLANs may be related to common network topologies such as scalable or redundant. Indeed the components may allow for roaming users or load balancing amongst AP's.

3.   Bridge topologies

Elements of wireless bridge topologies are presented and should include root modes, point to point, point to multipoint connections, distance limitations and bandwidth restrictions of bridges.

Outcome 2

The second outcome of the unit is conceptually difficult as it is intended to provide a brief overview of wireless radio technology. This should be viewed in the context of an eighty-hour unit and should not dwell heavily upon the physics or mathematics underlying radio communications.

1.   Concepts of radio communications

Basic concepts of radio communications including an introduction to the EM spectrum, radio and microwaves, watts, licensed frequencies, carrier signals (AM/FM/PM), DSSS and FHSS.

2.   Media access methods

Media access methods should provide coverage of Alohanet, Ethernet CSMA/CD, FM Radio FCC allocation and WLAN DSSS CSMA/CA.

Higher National Unit specification: support notes (cont)

Unit title: Wireless Local Area Networks

3. Radio Wave Propagation

Radio Wave Propagation details problems commonly associated with radio networks such as refraction, reflection, diffraction, and scattering.

Outcome 3

The third outcome provides a number of practical exercises for candidates to undertake. This should allow candidates to apply the knowledge gained during the first two outcomes.

1. Install a wireless NIC

Candidates begin by efficiently and safely installing and configuring a wireless NIC in a PC or laptop. Any common OS can be used. Candidates are then required to monitor and use client diagnostic tools to test the operation of the NIC and radio transmitter. Normally such software will be supplied by the card manufacturer.

2. Install and configure an ad hoc network

Following the installation of a single PC candidates are encouraged to work in groups to configuration an ad hoc network comprising of at least two hosts. Candidates are encouraged to research manufacturer web sites or technical support documents to discover the correct settings for a wireless ad hoc peer to peer network. Any common OS may be used to allow candidates to transfer files between peer systems using Wireless NICs.

3. Monitor and use diagnostic tools

In configuring the ad hoc network candidates are expected to utilise client software utilities to monitor and configure the wireless NIC.

4. Install and Configure an Access Point

Candidates are then encouraged to build more complex WLANs by carrying out efficiently and safely the installation of a wireless access point.

5. Install and Configure infrastructure wireless networks

Two complex WLAN topologies may be created by incorporating the AP into a network. Candidates can efficiently and safely install a basic service set wireless network involving one access point and clients. From this they can create an extended service set involving multiple access points and clients. Candidates are encouraged to work in groups, given the limited number of AP available.

Higher National Unit specification: support notes (cont)

Unit title: Wireless Local Area Networks

Outcome 4

The fourth outcome of the unit introduces candidates to WLAN security. This should be viewed in the context of the unit as a whole and is intended as a brief overview.

1.   Fundamentals of security

Thus the fundamentals of security should detail possible network threats, Hacking methods, WLAN security threats, security design, and the contents of security policy documents.

2.   Security technologies

Security technologies present WEP, association, SSID, authentication, MAC filtering, protocol filtering and user lists to candidates.

3.   Enterprise WLAN security

However as security should be viewed within the context of the network as a whole, Enterprise WLAN security considerations is intended to provide a holistic view to the topic of WLAN security in the form of EAP, LEAP, PEAP, AAA, VPN, TACACs+ server, and RADIUS server. This may be related to other units within the HND Internetworking such as Security Concepts.

Outcome 5

Candidates are given the opportunity of configuring some of the security features discussed previously in the fourth outcome.

1.   Configuring security features

Candidates should utilise the networks installed and configured in Outcome three and should apply security features to these. Thus candidates should efficiently and safely install and configure a basic service set wireless network involving one access point and at least one client with WEP security enabled throughout.

Outcome 6

Whilst candidates have built simple LANs, the sixth outcome is intended to offer some guidance on the principle of WLAN design.

1.   WLAN design considerations

Considerations common to most networks can be included such as gathering customer data however concentration should be placed upon areas peculiar to WLAN. Thus identifying sources of interference, infrastructure problems, hard to cover areas, problems of multi-floor survey, radio interference and RF Propagation should be the main focus of this area.

Higher National Unit specification: support notes (cont)

Unit title: Wireless Local Area Networks

2.   Documenting a WLAN

Following this normal LAN documenting standards can be presented for use in a wireless environment and could detail the current state of network, design requirements, logical and physical design, testing strategy and test results.

Outcome 7

Outcome seven allows candidates to design a Wireless LAN based upon the building or classroom they are occupying.

1.   Carry out a site survey

One of the diagnostic and configuration tools supplied will detail signal to noise or signal quality. This may be used throughout a small are to perform a rudimentary site survey of at least the classroom and should be used to identify possible locations for access points. This may be related to the previous outcomes by reviewing hard to cover areas, sources of interference or security threats. Where resources permit a laptop should be provided to candidates to survey the area surrounding the classroom, including access to the WLAN from outside the building.

Outcome 8

The final outcome introduces candidates to the principles of managing, monitoring and troubleshooting a WLAN.

1.   WLAN troubleshooting techniques

Troubleshooting techniques should provide an overview to the use of common approaches and tools in a network.

2.   Troubleshooting a WLAN

Troubleshooting a WLAN provides candidates with the opportunity of identifying and resolving a WLAN with errors. These may include wrong SSID, frequency, transmission method, or OS network settings being wrong.

3.   Monitoring and managing a WLAN

Monitoring and managing WLANs provides candidates with the opportunity of using vendor supplied diagnostic tools to monitor the performance of a WLAN and recommend changes where appropriate. It is recommended this outcome be assessed at the same time as other practicals.

Higher National Unit specification: support notes (cont)

Unit title: Wireless Local Area Networks

Guidance on the delivery and assessment of this Unit

This Unit is likely to form part of a group award which is primarily designed to provide candidates with technical or professional knowledge and skills related to a specific occupational area. It is highly technical in content and should not be adopted by group awards in other areas or delivered as a stand-alone Unit without careful consideration of its appropriateness.

This is a Unit which candidates are likely to find accessible at an intermediate level; it is suggested that it be delivered only as part of a second year HND program in Computing, Computer Networking or a related area. It should be delivered in tandem with other Computing Units and opportunities for teaching and assessment integration explored.

It is recommended the unit is delivered in the second year of the HND program as candidates will already be exposed to some of the terminology and concepts. It is recommended candidates complete Networking Technology and Routing Technology prior to beginning this unit.

The unit should be taught in parallel with the HND Internetworking Graded Unit. Where this occurs centres may deliver underlying theory in this unit and utilize the Graded Unit time to apply these concepts to a real life network design problem. This should enable candidates to progress through both units at a comfortable pace allowing candidates to be guided to produce a workable design.

Although the unit is expressed in generic terms, it could be used as a vehicle to include the Cisco Networking Academy Program Fundamentals of Wireless LANs into a classroom environment. The module is consistent with the latest version of this curriculum. Suggested CCNA modules from the Cisco Networking Academy Program in the table below, indicates possible delivery routes within the framework of this Unit.

It is recommended the Unit should be assessed by two instruments of assessment, a multiple-choice test covering the knowledge and understanding and a checklist or logbook detailing the practical work undertaken. This approach to assessment is reflective of current professional exams in the IT industry and helps prepare candidates for vendor exams should they choose to do so.

The restricted response questions applicable to each Outcome may be used to form a single end-of-unit test comprising a total of fifty questions. A break down of the weighting of questions per Outcome is detailed in the table below. Centres cannot deviate from this where they choose to devise their own instruments of assessment. All Outcomes and Items should be examinable in any single delivery of the end-of-unit test.

Higher National Unit specification: support notes (cont)

Unit title: Wireless Local Area Networks

Wireless Local Area Networks

Outcome	Number Of Items	Number of Questions	Topic	Suggested CWNA Module
1	4	8	WLAN Characteristics	1,2,3
2	3	6	Concepts	4,5,6,7
3	5	5	Configure WLAN	5,6,7
4	3	12	Security Basics	8
5	1	5	Implement Security	8
6	2	4	WLAN Design	9
7	1	4	Site Survey	10
8	3	6	Monitor and Manage	11

Total Questions: 50

In order to complete practical elements of the course centres will need to provide Wireless NICs and Access Points It is recommended as a minimum centres provide at least five AP and ten Wireless NICs per class. This may be supplemented with electronic simulators where available.

Open learning

If this Unit is delivered by open or distance learning methods, additional planning and resources may be required for candidate support, assessment and quality assurance.

A combination of new and traditional authentication tools may have to be devised for assessment and re-assessment purposes.

For further information and advice, please see *Assessment and Quality Assurance for Open and Distance Learning* (SQA, February 2001 — publication code A1030).

Special needs

This Unit specification is intended to ensure that there are no artificial barriers to learning or assessment. Special needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments or considering special alternative Outcomes for Units. For information on these, please refer to the SQA document *Guidance on Special Assessment Arrangements* (SQA, 2001).

General information for candidates

Unit title: Wireless Local Area Networks

This is a 2-credit Unit at Level 8 intended for candidates undertaking a Computing or IT-related qualification who require an understanding of WLANs. It is designed to develop an understanding of the issues involved in designing, installing and administering a WLAN. On completion of the Unit you should be able to:

- Describe the characteristics of wireless LANs
- Describe wireless radio technology concepts
- Configure a wireless network
- Describe wireless network security basics
- Implement security in a wireless network
- Describe the characteristics of wireless network design
- Carry out a site survey
- Manage, monitor and troubleshoot a wireless LAN

In the first part of the course, you will study the characteristics of wireless LANs and common topologies. This includes wireless technologies and components, characteristics of the IEEE 802.11 MAC and physical layer, common WLAN topologies and bridge topologies

The second section covers wireless radio technology concepts and is intended to provide candidates with an understanding of the basic concepts of radio communications, media access methods and radio wave propagation.

The third section covers configuring a wireless network. This allows candidates to apply the knowledge and principles gaining during the first two outcomes in a series of practicals. Candidates install and configure wireless network interface card into a host. This is followed by the Installation and configuration of an ad hoc network. Client diagnostic tools are expected to be used to monitor the network, an access point should be installed and configured. Finally a complex WLAN topology should be implemented by installing and configuring an infrastructure wireless network.

The fourth section covers the theory of wireless network security basics. Coverage is provided of the fundamentals of security, WLAN security technologies and enterprise WLAN security considerations.

The fifth section covers configuring security features and involved efficiently and safely installing a basic service set wireless network involving one access point and at least one client. WEP security should be configured throughout.

The sixth section covers the characteristics of Wireless Network Design including WLAN Design considerations and Documenting the WLAN Design.

The seventh section covers implementing a site survey. Essentially this is the efficient and safe implementation of site survey of an indoor environment. It is a practical activity.

The final section covers managing, monitor and troubleshooting a wireless LAN. This involves basic WLAN troubleshooting techniques and monitoring and managing WLANs.

General information for candidates (cont)

There will be a closed-book multiple-choice assessment covering all outcomes. You will be presented with 50 questions and expected to answer 70% of these correctly. You will also be expected to keep a checklist or logbook recording the practical tasks you have carried out during the Unit. You must satisfy the requirements for these assessments in order to achieve the Unit.

This Unit may assist you in preparing for the Certified Wireless Networking Administrator (CWNA) examination. You should check the latest information at **www.cwnp.com** to ensure that all objectives have been covered. It may also be used to help prepare for the Cisco Specialist Qualification exams: 9EO-576 WLANSE (Wireless LAN Design Specialist) and 9EO-581 WLANFE (Wireless LAN Support Specialist). You should check the latest information at **www.cisco.com** to ensure that all objectives have been covered.