Title	**Demonstrate and apply knowledge of data networking to support electronic security systems and services**		
Level	**4**	**Credits**	**10**

Purpose	This unit standard is intended for the training and assessment of people working in or intending to work in the electronic security industry and covers the knowledge and application of electronic security systems. People credited with this unit standard are able to demonstrate knowledge of: – the telecommunications OSI model; – data cabling used to support data networking applications; – radio transmission principles; – unlicensed wireless networks; – the TCP/IP protocol suite and IP addressing; and – data network topologies, architectures, and hardware components.

Classification	Electronic Engineering > Electronic Security

Available grade	Achieved

Guidance Information

1 This unit standard has been developed for learning and assessment off-job.

2 Persons working or intending to work as a security officer or in related security employment may require a Security Guards Licence or, if an employee of a Security Guard Licence holder, a Certificate of Approval to be the Responsible Employee of a Security Guard. These licences are issued by the Private Security Personnel Licensing Authority available through: www.justice.govt.nz/tribunals/licences-certificates/pspla/.

3 Definitions
ARP – address resolution protocol.
BER – bit error rate.
BOOTP – bootstrap protocol.
Component – any device, module, part, or sub-system of any security system.
DHCP – dynamic host configuration protocol.
DMZ – de-militarized zone.
DNS – domain name system.
EIRP – effective isotropic radiated power.
EMI – electromagnetic interference.
EMR – electronic medical records.

FTP – file transfer protocol.
HTTP – hypertext transfer protocol.
ICMP – internet control message protocol.
Industry practice – practice used and recommended by organisations involved in the electrotechnology industry.
IP – internet protocol.
ONU – optical network unit.
OSI model – Open Systems Interconnection is a reference model for how applications communicate over a network. A reference model is a conceptual framework for understanding relationships.
RFI – radio frequency interference.
Safe working practices – work practices designed to prevent personal injuries and damage to equipment and plant. This includes practices relating to personal attire and use of safety clothing and equipment, use of machinery and tools, and handling of materials and waste.
SMTP – simple mail transfer protocol.
SNMP – simple network management protocol.
TCP – transmission control protocol.
UDP – user datagram protocol.

4 References
Building Act 2004;
Electricity Act 1992;
Electricity (Safety) Regulations 2010;
Health and Safety at Work Act 2015;
Private Security Personnel and Private Investigators Act 2010;
Privacy Act 1993;
Telecommunications Act 2001;
AS 2201.2-2004, *Intruder alarm systems – Monitoring centres;*
AS 2201.4:1990, *Intruder alarm systems – Wire-free systems installed in client's premises*;
AS/NZS 2201.1:2007, *Intruder alarm systems – Client's premises—Design, installation, commissioning and maintenance*;
AS/NZS 2201.5:2008, *Intruder alarm systems – Alarm transmission systems*;
AS/NZS 3000:2007, *Electrical installations (known as the Australian/New Zealand Wiring Rules)*;
IEEE 802.11-2016, *standard for Information Technology —Telecommunications and information exchange between systems Local and metropolitan area networks—Specific requirements - Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications;*
New Zealand Security Association (Inc), Codes of Practice available at https://security.org.nz/;
New Zealand Telecommunications Forum Incorporated cabling requirements;
Local territorial authority requirements;
and all subsequent amendments and replacements.

5 Guidelines for connection of intruder alarm systems to telephone lines are contained in *Access Standards Newsletters* issued periodically by Spark NZ Ltd, available from www.telepermit.co.nz.

6 Range
a Candidates may refer to current legislation and Standards during assessment.

b Demonstration of safe working practices in accordance with *safe and sound practice* are essential components of assessment of this unit standard.
c All activities and evidence presented for all outcomes and performance criteria in this unit standard must be in accordance with:
  i legislation;
  ii policies and procedures;
  iii ethical codes;
  iv Standards;
  v applicable site, enterprise, and industry practice; and,
  vi where appropriate, manufacturer instructions, specifications, and data sheets.

Outcomes and performance criteria

Outcome 1

Demonstrate knowledge of the telecommunications OSI model.

Performance criteria

1.1 Outline the seven layers of the OSI model.

1.2 Summarise examples of applications for the seven layers of the OSI model.

Outcome 2

Demonstrate knowledge of data cabling used to support data networking applications.

Performance criteria

2.1 Describe physical construction, electrical characteristics, and applications of coaxial and twisted pair cables.

Range electrical characteristics may include but are not limited to – loop resistance, insulation resistance, loss at audio and high frequencies, noise, EMI, RFI, bit error rate;
evidence of three is required;
applications may include but are not limited to – structured cabling, video, RS485, RS232.

2.2 Describe physical construction, optical characteristics, and applications of single mode and multi mode optical fibre cables.

Range optical characteristics may include but are not limited to – attenuation, chromatic dispersion, modal dispersion, light reflection, light refraction;
evidence of three is required.

2.3 Describe a typical building and data cabling system for a multi-story building with reference to components, their purposes, requirements, and interconnections.

Range may include but is not limited to – equipment room, earthing facilities, backbone cabling, closets, horizontal cabling, telecommunication outlets, access points, ONU, fire stopping; evidence of five is required.

2.4 Describe the scope of regulations, codes of practice, and standards of relevance to building and data cabling.

2.5 Describe the purpose of and practices associated with data networking bonding and earthing in accordance with industry practice.

Range cables, equipment, frames, backbone and horizontal cabling.

Outcome 3

Demonstrate basic knowledge of radio transmission principles.

Performance criteria

3.1 Explain, in simple terms, the fundamental principles of propagation.

Range spectrum, link budget, cable type losses, impedance matching, frequency versus attenuation, antenna types, Fresnel zones, line of sight versus non-line of sight coverage, fading, multipath, polarisation.

3.2 Describe, in simple terms, requirements of the regulatory standards.

Range standards include but are not limited to – licensed and unlicensed spectrum, EIRP, interference management, EMR health and safety.

Outcome 4

Demonstrate basic knowledge of unlicensed wireless networks.

Performance criteria

4.1 Briefly describe the technical standards with respect to purpose, function, and give examples of their applications.

Range standards include but are not limited to – IEEE 802.11, Bluetooth, Zigbee.

4.2 Explain, in simple terms, typical system performance of unlicensed wireless networks.

Range security, data rates, powers, range, interference, spectrum use, bandwidth sharing, error rates, propagation, quality of service.

4.3 Explain, in simple terms, planning principles for unlicensed wireless networks.

Range coverage, frequency channel utilisation, EIRP, site surveys to position access points, physical security, antenna directional properties.

Outcome 5

Demonstrate knowledge of the TCP/IP protocol suite and IP addressing.

Performance criteria

5.1 Identify the TCP/IP model layers and compare them with the OSI model.

5.2 Explain IP addressing in accordance with industry practice.

Range may include but is not limited to – dotted decimal, IP version 4, reserved addresses, public/private addresses, subnetting, comparison of IPv4 and IPv6.

5.3 Explain methods of obtaining an IP address.

Range may include but is not limited to – static, BOOTP, DHCP, ARP.

5.4 Explain the protocols used in the transport of data in terms of the application.

Range may include but is not limited to – TCP, UDP, DNS, FTP, HTTP, SMTP, SNMP, Telnet, ICMP.

5.5 Explain in simple terms methods of firewall configuration.

Range port forwarding, pin-holing, DMZ.

Outcome 6

Demonstrate knowledge of data network topologies, architectures, and hardware components.

Range hardware components may include but are not limited to – hubs, switches, routers, work stations, servers, access points, terminal equipment, media converter, repeater, patch panels, ethernet over power.

Performance criteria

6.1 Describe common network topologies, architectures, and applications with the aid of a diagram.

Range may include but is not limited to – star, mesh, tree, bus.

6.2 Describe a typical end-user data networking system application for a single-site network with the aid of diagram.

Range hardware – functional elements, interconnection;
software – systems, application.

6.3 Identify control layer elements and describe their functionality with the aid of diagrams.

Range elements may include but are not limited to – gateways, routers, switches, interconnection points, interconnection media (such as copper, fibre, wireless ethernet over power, telecommunication outlets), typical interconnection.

6.4 Explain performance testing of data networking networks with reference to expected results and limitations.

Range BER testing, wire mapping, ping, traceroute, cable analyser.

Planned review date	31 December 2023

Status information and last date for assessment for superseded versions

Process	Version	Date	Last Date for Assessment
Registration	1	24 January 2019	N/A

Consent and Moderation Requirements (CMR) reference	0003

This CMR can be accessed at http://www.nzqa.govt.nz/framework/search/index.do.

Comments on this unit standard

Please contact The Skills Organisation reviewcomments@skills.org.nz if you wish to suggest changes to the content of this unit standard.