Title	Demonstrate basic knowledge of telecommunications concepts		
Level	2	Credits	10

Purpose	This unit standard is intended for technicians who require basic knowledge of telecommunication networks. People credited with this unit standard are able to: – describe the Open Standard Interface (OSI) model and relate the model to telecommunications network components; – demonstrate knowledge of digital network services in terms of their operation and the services provided in terms of the OSI model; – demonstrate knowledge of radio network services in terms of their operation, the services provided, and the key features of each service; – demonstrate knowledge of TCP/IP networks in terms of their operation and the services provided.

Classification	Telecommunications > Telecommunications – Service Delivery

Available grade	Achieved

Guidance Information

1 Evidence presented for assessment against this unit standard must be consistent with safe working practices and be in accordance with relevant industry and legislative requirements.

2 Legislation and references relevant to this unit standard include:
- Electricity Act 1992;
- Health and Safety at Work Act 2015;
- Privacy Act 2020;
- Resource Management Act 1991;
- Telecommunications Act 2001;
- New Zealand Telecommunications Forum Inc., *Customer Complaints Code;* available from https://www.tcf.org.nz/industry/resources/publications/industry-standards-guides/;
- and all subsequent amendments and replacements.

3 Definitions
Basic knowledge refers to fundamental operational and theoretical knowledge of the subject matter to interpret available information.

Industry requirements refer to relevant policies, processes, methodologies, industry codes of practice, site specific health and safety plans, standard operating procedures, quality plans, work plans, traffic management plans, contract work programmes, job safety analysis, safe work method statements, job instructions, manufacturer's requirements, contract specifications, manuals, and procedural documents.

Outcomes and performance criteria

Outcome 1

Describe the OSI model and relate the model to telecommunications network components.

Performance criteria

1.1 Describe typical telecommunications hardware and services in terms of the OSI model and applications network.

1.2 Describe in simple terms with the aid of a diagram the basic concepts of peer to peer communication in terms of the OSI model.

1.3 Describe the transmission media employed in telecommunications with reference to general characteristics and applications.

Range transmission media – unshielded twisted pair, coaxial cable, fibre optic cable, microwave relay systems, cellular radio, microcell networks for Local Area Networks (LANs).

1.4 Compare digital and analogue data transmission.

Range bandwidth requirements, errors, tolerance to noise, crosstalk, and impedance matching.

1.5 Identify networks in terms of services offered.

Range networks may include but are not limited to – Customer Access Network (CAN), Digital Subscriber Line (DSL), Storage Area Network (SAN), Personal Area Network (PAN), Passive Optical Networking (PON), LAN, Metropolitan Area Network (MAN), Wide Area Network (WAN);
evidence of a minimum of three networks is required.

1.6 Identify a range of network topologies from given examples.

Range star, ring, mesh, bus, tree.

Outcome 2

Demonstrate knowledge of digital network services in terms of their operation and the services provided in terms of the OSI model.

Performance criteria

2.1 Describe with the aid of a block diagram the operation of customer premises equipment used with a digital network with reference to the functions of the modules and services offered.

Range equipment – network termination unit, router, analogue telephone adapter, optical network interface, residential gateway;
evidence of four pieces of equipment is required.
modules – modulator, demodulator, packet router, media convertor, optical-electrical convertor;
evidence of three modules and two types of Customer Premises Equipment (CPE) is required.

2.2 Describe types of multiplexing used in a digital network system with reference to process input and output signals, advantages, and applications.

Range types of multiplexing may include but are not limited to – PDH, SDH, TCP/IP, MPLS, Asynchronous Transfer Mode (ATM), Integrated Services Digital Network (ISDN);
evidence of two types of multiplexing is required.

2.3 Describe the functions and features of a digital network in terms of offered services.

Range functions and features may include but are not limited to – low latency, signalling channels, voice circuits, low jitter, Voice Over Internet Protocol (VOIP), high data transfer speed, enhanced services;
evidence of two functions and two features is required.

Outcome 3

Demonstrate knowledge of radio network services in terms of their operation, the services provided, and the key features of each service.

Range radio, cellular.

Performance criteria

3.1 Describe the operation of end user equipment, with reference to the functions of the components.

Range equipment – cellular phone, radio telephone transceiver;
components – microphone, receiver, modulation, display, keypad, antenna.

3.2 Describe the functions of base station hardware used in radio network systems with the aid of a block diagram.

Range may include but is not limited to – antenna, receiver, transmitter, controller, alarm/quality monitoring, call accounting;
evidence of four base station hardware items is required.

3.3 Describe the functions and features of radio network systems.

Range radio network systems may include but are not limited to – 2G networks, 3G networks, 4G networks, trunked radio, mobile radio, Wi-Fi;
evidence of two functions and two features is required.

3.4 Describe interconnection of radio network systems with the public switched telephone network (PSTN) and Data networks in terms of features and services offered by the interconnection.

Range radio network systems may include but are not limited to – 2G networks, 3G networks, 4G networks, trunked radio, mobile radio, Wi-Fi;
evidence of three radio network systems is required.

Outcome 4

Demonstrate knowledge of TCP/IP networks in terms of their operation and the services provided.

Performance criteria

4.1 Describe hardware to permit connection to an existing network in terms of features provided.

Range router, switch, hub, wireless access point.

4.2 Describe configuration of TCP/IP hardware to permit connection to an existing network for a given situation.

Range may include but is not limited to – (IP) v4, IPv6, address, netmask, subnet prefix, gateway, Domain Name System (DNS) server, Dynamic Host Configuration Protocol (DHCP), Media Access Control (MAC) address, Wired Equivalent Privacy (WEP), Wireless Protected Access (WPA), Service Set Identifier (SSID);
evidence of 6 is configurations is required.

4.3 Identify physical data interfaces used for IP connections in terms of connector used, application and transfer speeds.

Range Registered Jack (RJ)11, RJ45, Lucent Connector (LC), Square Connector (SC), Universal Serial Bus (USB), DB9 connector.

4.4 Describe IP addresses in terms of host and network portions for a given netmask (IPv4) or subnet prefix (IPv6).

4.5 Describe Network Address Translation (NAT) in terms of the function of a border router.

Range evidence of a router supporting a minimum of three network interfaces is required.

4.6 Describe methods of establishing communication with equipment behind a firewall.

Range fixed IP, port forwarding, IP forwarding.

Replacement information	This unit standard replaced unit standard 17397.

Planned review date	31 December 2026

Status information and last date for assessment for superseded versions

Process	Version	Date	Last Date for Assessment
Registration	1	18 July 2013	N/A
Rollover and Revision	2	23 November 2017	N/A
Revision	3	28 October 2021	N/A

Consent and Moderation Requirements (CMR) reference	0101

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

Comments on this unit standard

Please contact Connexis – Infrastructure Industry Training Organisation qualifications@connexis.org.nz if you wish to suggest changes to the content of this unit standard.