

<b>Title</b>	<b>Demonstrate knowledge of routing and switching essentials in power engineering</b>		
<b>Level</b>	<b>5</b>	<b>Credits</b>	<b>15</b>

<b>Purpose</b>	<p>People credited with this unit standard are able to: demonstrate and apply knowledge of industrial router technologies; and demonstrate knowledge of the purpose, nature and operation of industrial routers, Dynamic Host Configuration Protocol and Network Address Translation.</p> <p>This standard provides electricity supply industry power technicians with the fundamental knowledge of power protection and control network theory, and hardware.</p>
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<b>Classification</b>	Electricity Supply > Electricity Supply - Power System Maintenance
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<b>Available grade</b>	Achieved
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**Guidance Information**

- 1 Definitions
  - ACL* – access control list.
  - DHCP* – dynamic host configuration protocol.
  - IP* – internet protocol.
  - ISP* – internet service provider.
  - LAN* – local area network.
  - MAC* – media access address.
  - NAT* – network address translation.
  - VLAN* – virtual local area network.
  - WAN* – wide area network.
- 2 It is recommended that Unit 29731 *Demonstrate knowledge of protection and control networks* is assessed prior to assessment with this standard or equivalent knowledge and skills demonstrated.

**Outcomes and performance criteria**

**Outcome 1**

Demonstrate and apply knowledge of industrial router switching technologies.

**Performance criteria**

- 1.1 Data types that can be sent and received by an industrial router are described.

- 1.2 Methods by which the switch can handle frames containing information from the MAC table is explained.
- 1.3 Principles of borderless switched network design are explained.  
Range may include – hierarchical, modularity, resiliency and flexibility.
- 1.4 Configuring of a small industrial LAN using two switches is demonstrated.  
Range may include – IP address parameters on hosts, verify end to end connectivity.
- 1.5 Enhanced switching technologies are described.  
Range may include – VLANs, VLAN trunking Protocol, Rapid Spanning Tree Protocol, Per VLAN Spanning Tree Protocol, 802.1q.
- 1.6 The process of configuring, verifying and testing port security on a network switch is demonstrated.
- 1.7 The process of creating, naming and verifying VLAN on industrial switches is demonstrated.

## **Outcome 2**

Demonstrate knowledge of the purpose, nature and operation of industrial routers.

### **Performance criteria**

- 2.1 The relationship an industrial router can have to local users, industrial networks, multiple LANs and WAN services through ISPs is described.
- 2.2 The process of configuring two interconnected industrial routers so access is secure and passwords applied is explained.
- 2.3 Inter-VLAN and static routing is explained.
- 2.4 Access control using IPv4 and IPv6 is explained and configured on an industrial router.
- 2.5 Building a network topology to design requirements, configuring device settings, verifying connectivity, configuring IPv6 and default routes to meet traffic requirements is demonstrated.
- 2.6 The function of components of routing protocols and ACL to support industrial router and network security risk management is explained.
- 2.7 A named ACL to address a network issue is written, applied and validated.

### Outcome 3

Demonstrate knowledge of Dynamic Host Configuration Protocol and Network Address Translation.

#### Performance criteria

- 3.1 The steps involved in the DHCP are explained.
- 3.2 The roles industrial routers may take in the DHCP are explained.
- 3.3 A network topology is built and configured, a DHCP server and a DHCP relay agent are configured and DHCP services and addresses are verified.
- 3.4 The function of NAT in a network is explained.
- 3.5 A network topology is built, configured and verified for both static and dynamic NAT to meet given network requirements.

**This unit standard is expiring. Assessment against the standard must take place by the last date for assessment set out below.**

#### Status information and last date for assessment for superseded versions

Process	Version	Date	Last Date for Assessment
Registration	1	20 July 2017	31 December 2024
Review	2	2 March 2023	31 December 2024

#### Consent and Moderation Requirements (CMR) reference

0120

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