Unit title:	Networking infrastructure
Unit number:	25
Level:	5
Credit value:	15
Guided learning hours:	60
Unit reference number:	A/601/1964

UNIT AIM AND PURPOSE

This unit will enable learners to understand the directory-based authentication systems used to manage complex networks. Learners will understand the role of a system architect and be able to actively apply the skills learnt in the design and installation of a directory-based system.

LEARNING OUTCOMES AND ASSESSMENT CRITERIA

A pass grade is achieved by meeting **all** the requirements in the assessment criteria.

Learning Outcome (LO) The Learner will:	**Pass** The assessment criteria are the pass requirements for this unit. The Learner can:
LO1 Understand the principles of network infrastructure management	1.1 evaluate current name resolution services 1.2 discuss the technologies that support network infrastructure management 1.3 discuss security resources available in network infrastructure management
LO2 Be able to design complex network infrastructure systems	2.1 design a network infrastructure for a given networked environment 2.2 evaluate addressing and deployment solutions for a given networked environment 2.3 evaluate rights and security requirements for a given networked environment
LO3 Be able to implement complex network infrastructure systems	3.1 implement a network infrastructure based on a prepared design
LO4 Be able to test complex network infrastructure systems	4.1 critically review and test an implemented system 4.2 evaluate system and user assurance of the implemented system

GRADING CRITERIA

A merit grade is achieved by meeting all the requirements in the pass criteria **and** the merit descriptors.

A distinction grade is achieved by meeting **all** the requirements in the pass criteria **and** the merit descriptors **and** the distinction descriptors.

Merit Criteria (M1, M2, M3) (M1, M2, and M3 are mandatory to achieve a merit grade. Each must be achieved at least once per unit to achieve a merit grade.)	**Distinction Criteria (D1, D2, D3)** (D1, D2, and D3 are mandatory to achieve a distinction grade. Each must be achieved at least once per unit to achieve a distinction grade.) (In order to achieve a distinction grade, all merit criteria must also have been achieved.)
MANDATORY TO ACHIEVE A MERIT GRADE	MANDATORY TO ACHIEVE A DISTINCTION GRADE
M1 Analyse concepts, theories or principles to formulate own responses to situations.	D1 Evaluate approaches to develop strategies in response to actual or anticipated situations.
M2 Analyse own knowledge, understanding and skills to define areas for development.	D2 Evaluate and apply strategies to develop own knowledge, understanding and skills.
M3 Exercise autonomy and judgement when implementing established courses of action.	D3 Determine, direct and communicate new courses of action.

TEACHING CONTENT

The Teaching Content describes what has to be taught to cover **all** Learning Outcomes.

Learners must be able to apply relevant examples to their work although these do not have to be the same as the examples specified.

LO1 Understand the principles of network infrastructure management	
Name resolution services	e.g. • Domain Name System (DNS) • Active Directory, OpenLDAP, eDirectory • User, Resource and Service Management • Access Controls
Technologies that support network infrastructure management	• Directory structure • Servers, clients, routers, switches, printers, wireless access • Users, shares, security groups, organisational groups, remote access • User management
Security resources available in network infrastructure management	• User management controls (security groups, timed access, authentication, password policies) • Certificate services (authorities, deployment, revoke, management, encryption) • Logging (audit trails, security logs).
LO2 Be able to design complex network infrastructure systems	
Designing a network infrastructure for a given networked environment	• Select appropriate network infrastructure (e.g. Active Directory, OpenLDAP, eDirectory) • Implement Domain Name System (DNS) • User management • Design directory structure • Identify servers, printers, clients, shares, users • User management (timed access, authentication, password policies) • Certificate services (authorities, deployment, revoke, management, encryption)
Addressing and deployment solutions for a given networked environment	• Naming methodology • Change management • Requirements (scalable, adaptable, commercial)

Rights and security requirements for a given networked environment	• Access Controls (security groups, organisational units, authentication, password policies, time restrictions) • Audit trails (system logs, login, share access, printers).
LO3 Be able to implement complex network infrastructure systems	
Implementing a network infrastructure based on a prepared design	• Domain Name System (DNS) • Active Directory, OpenLDAP, eDirectory • User management • Directory structure • Servers, printers, clients, shares, users • User management (timed access, authentication, password policies) • Certificate services (authorities, deployment, revoke, management, encryption) • Naming methodology • Change management • Requirements (scalable, adaptable, commercial) • Access Controls (security groups, organisational units, authentication, password policies, time restrictions) • Audit trails (system logs, login, share access, printers) • Implementation of designed infrastructure • Interaction with external DNS, other directory services and existing site network infrastructure.
LO4 Be able to test complex network infrastructure systems	
Review and test an implemented system	• Test plan (functional, matches business requirements, analyse results) • Security (penetration tests, availability, visibility, groups, rights, inheritance)
System and user assurance of the implemented system.	• Test plan (functional, matches business requirements, analyse results) • Documentation (plan, user, installation, project) • Security (penetration tests, availability, visibility, groups, rights, inheritance).

GUIDANCE

Delivery guidance
This unit is a mixture of theoretical and practical knowledge and the learners must have experience of designing and installing a directory-based network. It will be beneficial to deliver this unit in a way that uses actual events, industry forecasts or sector specific contexts which offer the learner the opportunity to explore, develop and apply the fundamental principles of the sector or subject area. Learners will benefit from being encouraged to exercise autonomy and judgement to design a complex network infrastructure. Learners will need to adapt their thinking and reach considered conclusions, when testing network systems based on a foundation of relevant knowledge, understanding and/or practical skills. Learners would benefit from being presented with subject/sector-relevant problems from a variety of perspectives and from being given the opportunity to explore them using a variety of approaches and schools of thought. For example, the learner is a System Architect and has to design and implement a directory-based network. It would be beneficial if practicing network managers were available to present talks and discussions to the learners. Learners would benefit from the tutor delivering a theoretical presentation on the subject area with the learners then researching the topic followed by practical project-based exercises.

Assessment evidence guidance
Evidence must be produced to show how a learner has met each of the Learning Outcomes. This evidence could take the form of assignments, project portfolios, presentations or, where appropriate, reflective accounts. Where possible, this should be electronic (OneNote, Website etc) and if possible should provide evidence for other units (if presented in a track or pathway format). It is possible that the criteria of further units can be met in this way (Communicating etc). The portfolio should contain professionally formatted documentation, along with video evidence or screencasts to show practical evidence. Where group work/activities contribute to assessment evidence, the individual contribution of each learner must be clearly identified. All evidence must be available for the visiting moderator to review. Where learners are able to use real situations or observations from work placement, care should be taken to ensure that the record of observation accurately reflects the learner's performance. This should be signed, dated, and included in the evidence. It is best practice to record another individual's perspective of how a practical activity was carried out. Centres may wish to use a witness statement as a record of observation. This should be signed and dated and included in the evidence.

RESOURCES

Books

Butcher, M. *Mastering OpenLDAP: Configuring, Securing and Integrating Directory Services.* Packt Publishing. 2007.

Dreyer, A. *Apple Pro Training Series: OS X Server Essentials: Using and Supporting OS X Server on Mountain Lion.* Peachpit Press. 2012.

Jackiewicz, T. *Deploying OpenLDAP.* Apress. 2004.

Moskowitz, J. *Group Policy: Fundamentals, Security, and the Managed Desktop.* Sybex. 2013.

Stanek, W. R. *Active Directory Administrator's Pocket Consultant.* Microsoft Press. 2009.

Journals

Websites

Microsoft. (2013). *Active Directory*. Retrieved from Microsoft Technet: http://technet.microsoft.com/en-us/library/bb742424.aspx

Ubuntu. (2012). *OpenLDAP server*. Retrieved from Ubuntu Official Documentation: https://help.ubuntu.com/12.04/serverguide/openldap-server.html