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| Unit title: | Local Area Networking technologies |
| Unit number: | 26 |
| Level: | 5 |
| Credit value: | 15 |
| Guided learning hours: | 60 |
| Unit reference number: | L/601/1547 |

## UNIT AIM AND PURPOSE

Learners will gain an understanding of the benefits of a Local Area Network (LAN) in an organisation and the importance of protecting against business disruption. This unit will allow learners to apply skills and knowledge to design, build and manage a LAN.

## LEARNING OUTCOMES AND ASSESSMENT CRITERIA

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

| Learning Outcome (LO)<br><br>The Learner will: | Pass<br><br>The assessment criteria are the pass requirements for this unit.<br><br>The Learner can: |
|---|---|
| LO1  Understand the impact of LAN technologies | 1.1  critically evaluate different LAN technologies<br><br>1.2  critically analyse traffic-intensive services and their performance<br><br>1.3  discuss LAN concerns and make recommendations to sustain network security, reliability and performance |
| LO2  Be able to design LAN infrastructures | 2.1  design a LAN infrastructure to meet a given requirement<br><br>2.2  critically evaluate the suitability of LAN components |
| LO3  Be able to implement LAN infrastructures | 3.1  build and configure a LAN (including services) to meet a given requirement<br><br>3.2  implement network security on a LAN<br><br>3.3  critically review and test a LAN |
| LO4  Be able to manage LAN infrastructures | 4.1  monitor and troubleshoot a LAN<br><br>4.2  resolve LAN issues to improve security, reliability and performance<br><br>4.3  critically evaluate the performance of a LAN |

## 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) | Distinction Criteria (D1, D2, D3) |
|---|---|
| (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.) | (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.)<br><br>(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 impact of LAN technologies | |
| --- | --- |
| Different LAN Technologies | • Hardware: switches, wireless devices, network interfaces, client devices, cabling requirements, wireless network requirements, mobile technologies<br>• Standards: ethernet (IEEE 802), wireless (IEEE802.11), other topologies (token ring, star)<br>• Protocols: STP (spanning tree protocol), DHCP (dynamic host protocol), VTP (VLAN, trunking protocol) |
| Traffic intensive services | • Video or audio streaming, real time communication, voice over IP, Video on Demand (VOD) |
| LAN concerns and recommendations | • Security: identification and authentication policy, addressing policy, firewall, access rules, virus protection<br><br>• Reliability: data loss, data corruption, fault or power failure, trained users, accessibility (to files, printers, etc.), backup copies<br><br>• Performance: bandwidth, throughput, latency (delay). |
| **LO2  Be able to design LAN infrastructures** | |
| Design LAN infrastructure | • Devices: workstation, NIC (network interface card), file server, switch, router, mail server, media server, cables (twisted pair, fibre), peripherals (printers, fax machine etc.)<br>• Topologies: star, ring, bus<br>• OSI model and protocols: SMTP, MIME, HTTP<br>• IP addressing: network address, host address, broadcast address<br>• Expansion: repeater, bridge |
| LAN components | • e.g. cables, workstation/server, interface cards, hubs, switches etc., peripherals, protocols. |

| **LO3  Be able to implement LAN infrastructures** | |
|---|---|
| Implement LAN infrastructure | • IP addressing, network name, host names, hardware connection<br>• services: DNS, DHCP, printing, file sharing, email etc. |
| Network security | • security policies: unauthorised access, passwords, access lists, firewall, anti-virus software |
| Review and test LAN | • review: meets design specification, effective management and operation such as security policies<br>• testing: ping, loopback. |

| **LO4  Be able to manage LAN infrastructures** | |
|---|---|
| Monitor and troubleshoot a LAN | • monitor: security, bandwidth (e.g. average load, peaks), network usage<br>• troubleshoot: check access rules, analyse traffic, check cables, ping, loopback |
| Resolve LAN issues | • security policies to prevent unauthorised access, virus protection, backup copies, disk mirroring, train staff, uninteruptable power supply |
| Performance of LAN | • Simple Network Management Protocol (SNMP), monitor network traffic, bandwidth, throughput, latency (delay), packet loss. |

## GUIDANCE

**Delivery guidance**

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. Typical delivery content could include talks, demonstrations, class presentations and visits to organisations with LAN installations. This will reinforce the theory of LANs.

Learners could interview those involved in the administration of the network in their college or school. Learners could also have the opportunity to practice in labs that use networking equipment.

Learners will benefit from being encouraged to exercise autonomy and judgement to evaluate the suitability of components and technologies for a given requirement, Learners will need to adapt their thinking and reach considered conclusions, when planning a local area network infrastructure to fulfil the given requirement.

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.

**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.

The project could be a real life scenario, to allow learners to research, design, implement and troubleshoot a LAN. Topologies should be discussed and the justification of the one chosen should be included. The needs of the users of the network should be discussed – for example, the type and volume of data. The users could be divided into groups to allow for setting passwords to limit access to parts of the data. Policy recommendations should be included to ensure security, reliability and performance. Learners should apply IP addressing to identify devices on the network. If the network involves more than one room or area, subnetting should also be applied. A justification of the devices used should be included together with the cabling used. The design of the network should be drawn and the devices labelled with a device number and IP address. The network should be built and tested. Once operational, the performance of the network should be evaluated.

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**

Miller, Phillip., *LAN Technologies Explained* (Paperback), Michael Cummins

Stallings, William., *Network Security Essentials: Applications and Standards by Stallings*,

Frye, Douglas, W., *Network Security Policies and Procedures - Advances in Information Security 32* (Paperback)

Lammle, Todd., *CCNA: Cisco Certified Network Associate Study Guide* (640-802)

**Journals**

*Journal of Networking Technology*
Khalil Challita, Laurence Rodrigues do Amaral

**Websites**

http://searchnetworking.techtarget.com/definition/local-area-network-LAN
www.orbit-computer-solutions.com/LAN.php