T Level Technical Qualification in Digital Support Services

Occupational specialism assessment (OSA)

Network Cabling

Assignment 1 - Pass

Guide standard exemplification materials

v2.0: Specimen assessment materials
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T Level Technical Qualification in Digital Support Services
Occupational specialism assessment

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Network Cabling

Assignment 1

Contents

Introduction

The material within this document relates to the Network Cabling occupational specialism sample assessment. These exemplification materials are designed to give providers and students an indication of what would be expected for the lowest level of attainment required to achieve a pass or distinction grade.

The examiner commentary is provided to detail the judgements examiners will undertake when examining the student work. This is not intended to replace the information within the qualification specification and providers must refer to this for the content.

In assignment 1, the student must design a new network for a doctors' surgery and provide a network diagram.

After each live assessment series, authentic student evidence will be published with examiner commentary across the range of achievement.

Assignment 1

Scenario

You are required to provide the network data installation for a doctors' surgery based in a small, single-storey building.

The building will comprise a reception area and 3 surgery rooms.

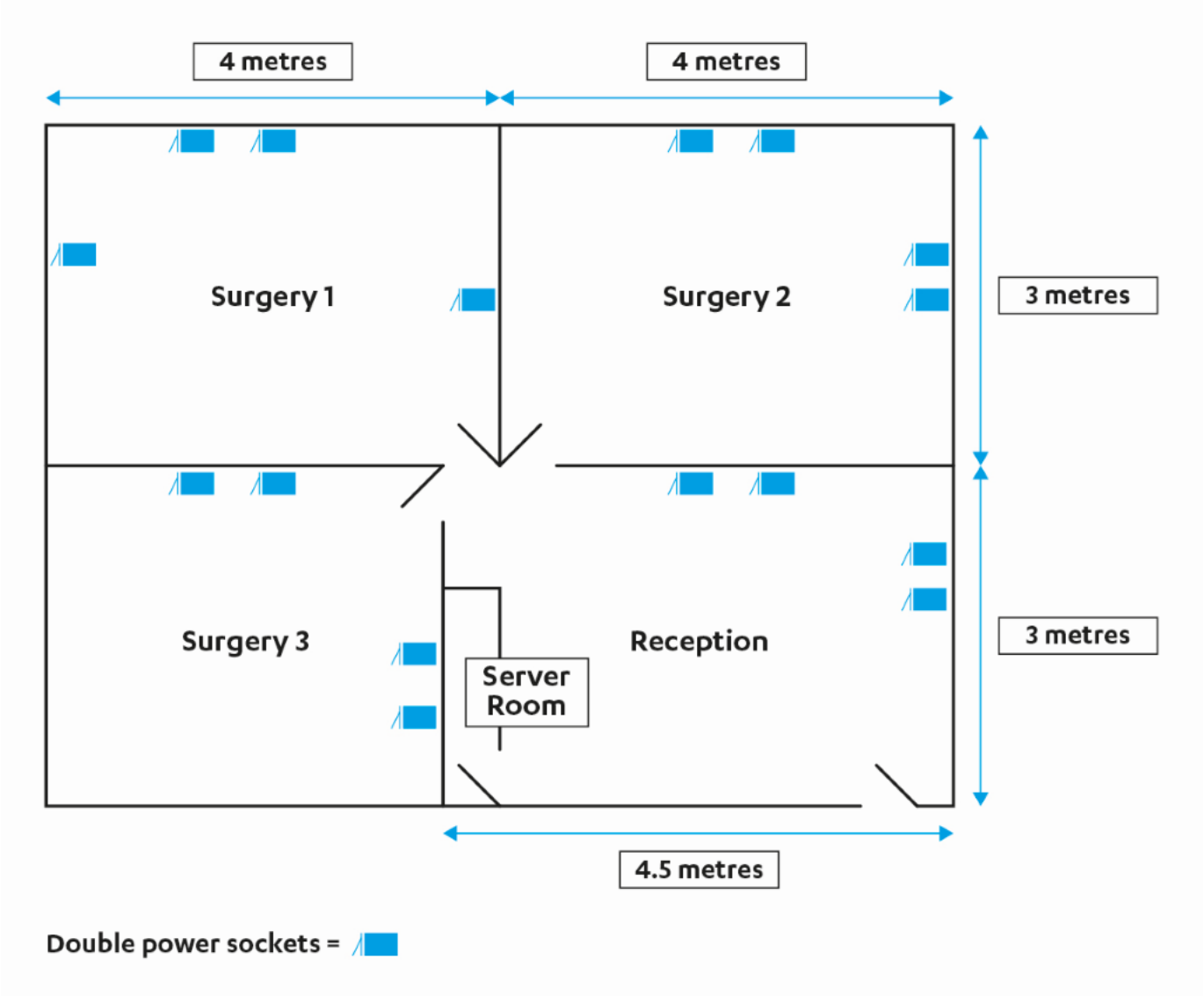
There is an ample supply of power sockets in each surgery room and the reception area.

The needs of the various users are:

- there are 6 doctors working in the practice and all will require access to the network at any time of the day
- doctors will need to be able to access digital medical records which will be stored separately from all other data
- doctors will need to be able to access the digital appointments system
- the 3 reception staff only require access to the booking system and must not have access to digital medical records
- the data server room will be located in the reception area
- all doctors and reception staff need access to a network printer

An outline plan of the surgery (Image A) is provided on the next page.

Image A


4 metres
4 metres
Surgery 1
Surgery 2
3 metres
Surgery 3
Server Room
Reception
3 metres
4.5 metres
Double power sockets =

Task 1: designing the new network

Time limit

8 hours

You can use the time how you want but all parts of the task must be completed within the time limit.

(40 marks)

You are required to produce a network design specification, including a diagram of the physical layout, for the proposed installation of the new network, and supporting rationale.

Your proposal should:

- show the physical layout for the network and proposals for containment/trunking, cable management and separation from power
- clearly state how many users will be able to access the network at any given time
- specify the types of data, for example, VoIP, email and web traffic, which will be transmitted across the network and where the data is stored
- name the required hardware which will allow network access and the specifications of this hardware
- specify how data will be transferred throughout the entirety of the network, either wired or wirelessly, and justify your selection for each choice
- describe the security measures which will be put in place to best ensure the integrity and 24 hour availability of the network and justify your reasons for selecting these measures
- explain the type of cable you have chosen, justifying why it is fit for the required purpose
- provide an estimate for the amount of cable required for the installation, based on the dimensions shown in the outline plan of the surgery:
    - add 10% to the length of cable you have calculated will be required, in anticipation of encountering obstacles to your cable run
    - show how you have arrived at your estimation

You will have access to the following equipment:

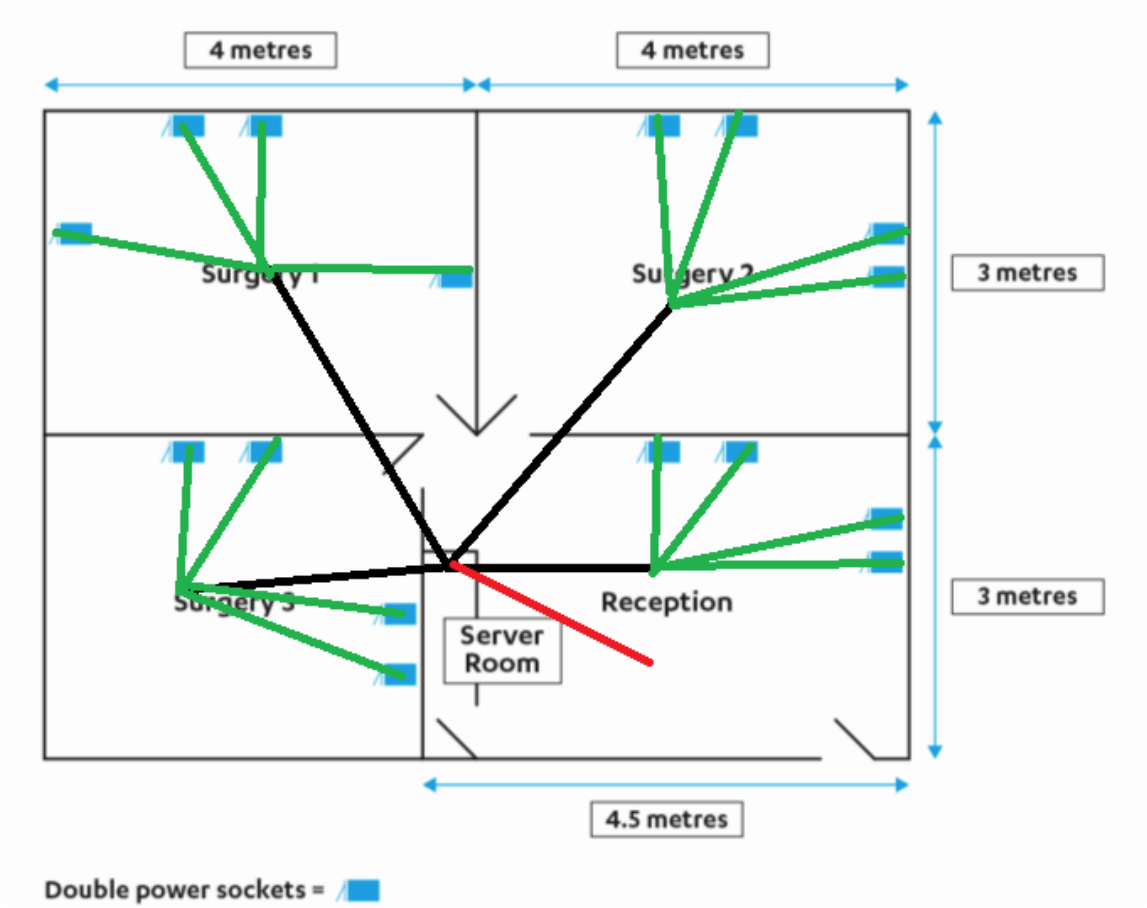
- word processing software
- an appropriate diagramming tool

Evidence required for submission to NCFE

A diagram of the physical network design with headings that clearly show your proposal for each of the points above, in .pdf format.

Written justification for the design decisions you have made, where the task requires this.

Student evidence



Black lines represent 8 cables in a run, green lines represent 2 cables in a run and red lines represent 1 cable.

Black total cable representation = 72m.

Green total cable representation = 96m (64m of ceiling run + an additional 2m per cable for ceiling to trunking runs totalling 32m).

Red is a single cable to an access point taking roughly 2m.

Total cable represented in the diagram – 170m adding 1.5m per cable to reach from the ceiling to the patch panel totals 219.5m of approximate cable.

This is being done in straight runs due to the lowered ceiling above the rooms which will be used to ensure that the cable runs can be kept minimal to save money.

Required equipment

The cable chosen is the Cat5e ethernet cable because it is capable of gigabit speeds and is cost effective per metre. There is a requirement for 219.5 metres of cable. An additional 10% of cable is required to cover for any unforeseen obstacles resulting in a requirement for 241.45 metres of network cable. This cable is capable of gigabit

speeds and has a maximum length of 100 meters which is well within the distance travelled in the network design. By choosing Cat5e rather than Cat6 a cost saving can be made here as the average cost of Cat5e is £70 for 305m whereas similar branded Cat6 can be over £100.

The router used is a BT business router. This is capable of routing traffic around the internal network as well as providing internet connectivity. If required, these routers can also provide DHCP and DNS services. These routers can perform all the required routing and as there are no plans for VLANs or for the router to be performing as a firewall this simplistic router will be very capable for performing well in this design. The BT business router can be supplied by the Internet Service Provider and as it offers all of the required features there is no need to spend additional money upgrading this piece of equipment.

The switch used is a Cisco SG100-24 switch. This is a 24-port gigabit switch. There are enough ports on this switch to ensure all devices can connect to the wired network. As the switch is also gigabit it will not cause any bottlenecking within the network. This enterprise switch can be purchased for £120 and as the surgery is not using any advanced features this basic model will be suitable, despite lacking features it is capable of supplying the full gigabit bandwidth to the devices attached to this switch.

The access point used is a ZyXEL True WiFi 6 as it utilises the latest in wireless technology and can be configured in a standalone configuration so does not require the ZyXEL app or cloud subscription to configure. As the device is WiFi 6 it has the ability to handle many devices at once and still provide high performance.

There will be 2 network ports in each surgery room allowing for one computer and one VoIP phone per room, and the reception will have 4 ports for 2 computers and 2 phones.

This combination of hardware will allow for over 50 users on the network, which is more than enough to cover the current members of staff. The main limitation being users able to be hardwired into this network which is limited by the capacity of the switch which on the chosen model is 24 ports.

Data

There are many different types of data which will be transmitted across the network both to other internal devices and externally.

VoIP data – calls from end user VoIP devices to a phone system. This form of traffic will only be on the wired network as there are no wireless devices. This data would benefit from the use of QoS (Quality of Service) to ensure the voice data gets priority over other data on the network.

HTTP/HTTPS data – all websites visited within the network will be using the HTTP or HTTPS protocol. HTTP using port 80 and HTTPS using port 443. This protocol will ensure that all packets are received to obtain the full set of data for the website to be displayed.

SMTP – all mail sent uses port 25, so this will need to be left open on the firewall.

DNS – DNS requests will be being made on a regular basis, to have domain names resolved to their IP addresses when internal or passed to external DNS servers when the required look up is not available on site.

DHCP – As static addresses are only being utilised for the network hardware and servers, there will be DHCP traffic on the network as devices will require this to have their network devices configured with an appropriate IP address, subnet mask and DNS servers to allow successful communication on the network.

Security measures

There are several security measures which can be put in place both to digitally protect the equipment and physically protect it.

CCTV and door locks can be used to secure equipment. The CCTV can be installed to monitor key areas for the protection of staff and equipment.

A disaster recovery plan can be put in place to ensure that backups are appropriately utilised (including how they should be utilised and when) based on the circumstances of the disaster. This will help ensure downtime is kept to a minimum during an incident.

Malware protection can be installed on all client devices to ensure devices are secured against potentially malicious programs and files. Malware protection can scan files on the devices on a schedule and during real-time usage.

A firewall appliance such as Firewalla Firewall System, which is a cheap but effective firewall appliance, can be used to protect the connections in and out of the network to add a layer of security between devices and the internet.

Task 2: creating the network diagram

Time limit

5 hours

You can use the time how you want but all parts of the task must be completed within the time limit.

(20 marks)

Using Cisco Packet Tracer, you are required to produce a network diagram of the logical network layout for the doctors' surgery. Your network diagram should clearly show all devices and connection points which make up the network.

Your diagram screenshots and accompanying documentation should evidence:

- all resources/components identified to meet requirements in task 1
- identification of each component on the network, demonstrating how they are connected
- the IP addressing structure, evidenced by detailing the IP addressing and subnetting scheme, and how this will be applied to each networked component
- details of the security measures implemented
- how all components on the network work together

You will have access to the following equipment:

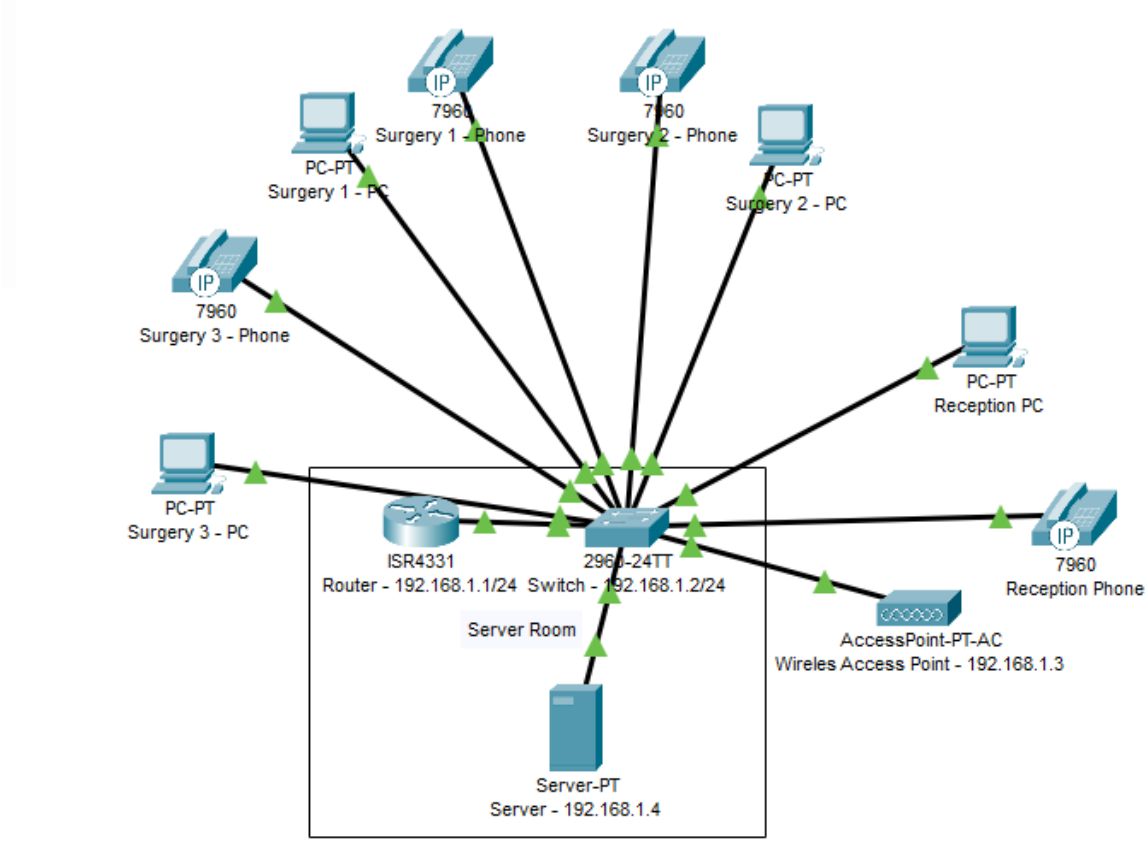
- word processing software
- Cisco Packet Tracer

Evidence required for submission to NCFE

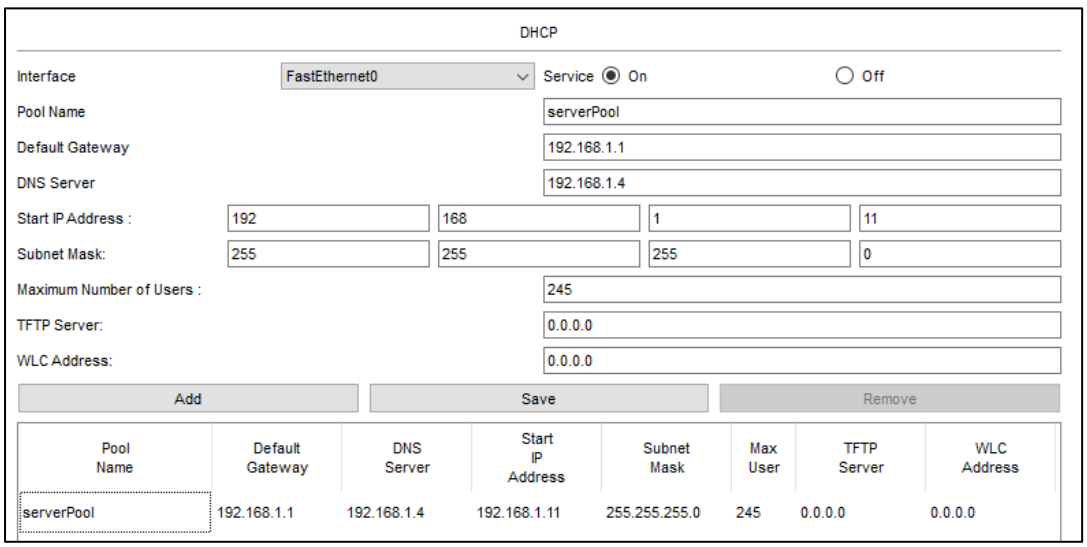
Screenshots of your logical network diagram which demonstrate how the network is configured.

A word-processed description of how all components on the network work together, in .pdf format.

Student evidence

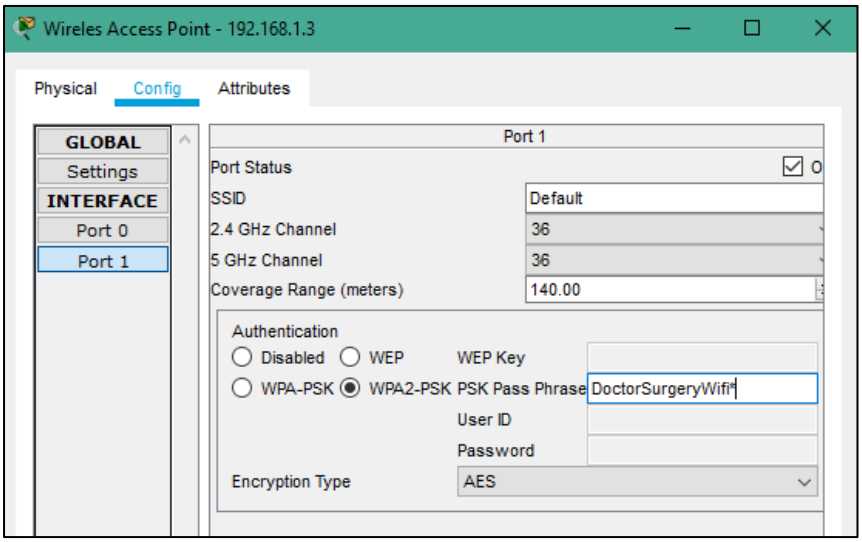


The network will use DHCP for client devices. All hardware with a label stating its IP will be set statically. The server will be configured as the DHCP server.



The DHCP server will allow all devices on the network to communicate with each other without configuring the devices individually, making it quicker, easier and less likely to fail.

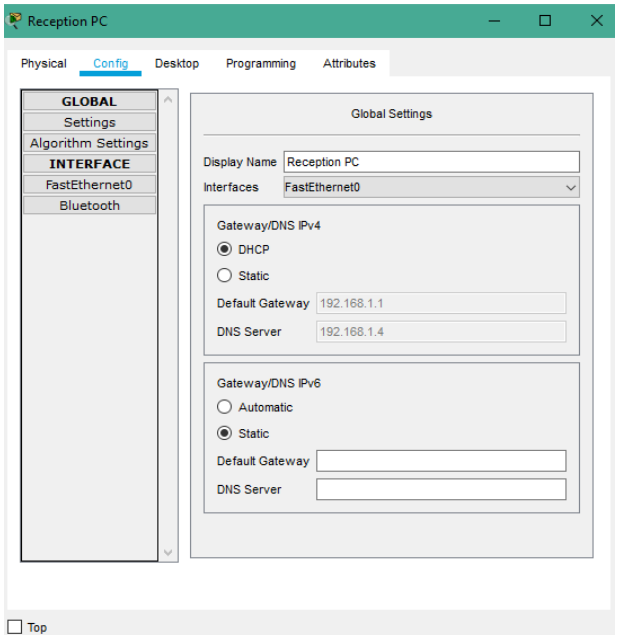
The wireless access point has WPA2-PSK encryption configured to secure wireless communication, it will also have a static IP address of 192.168.1.3



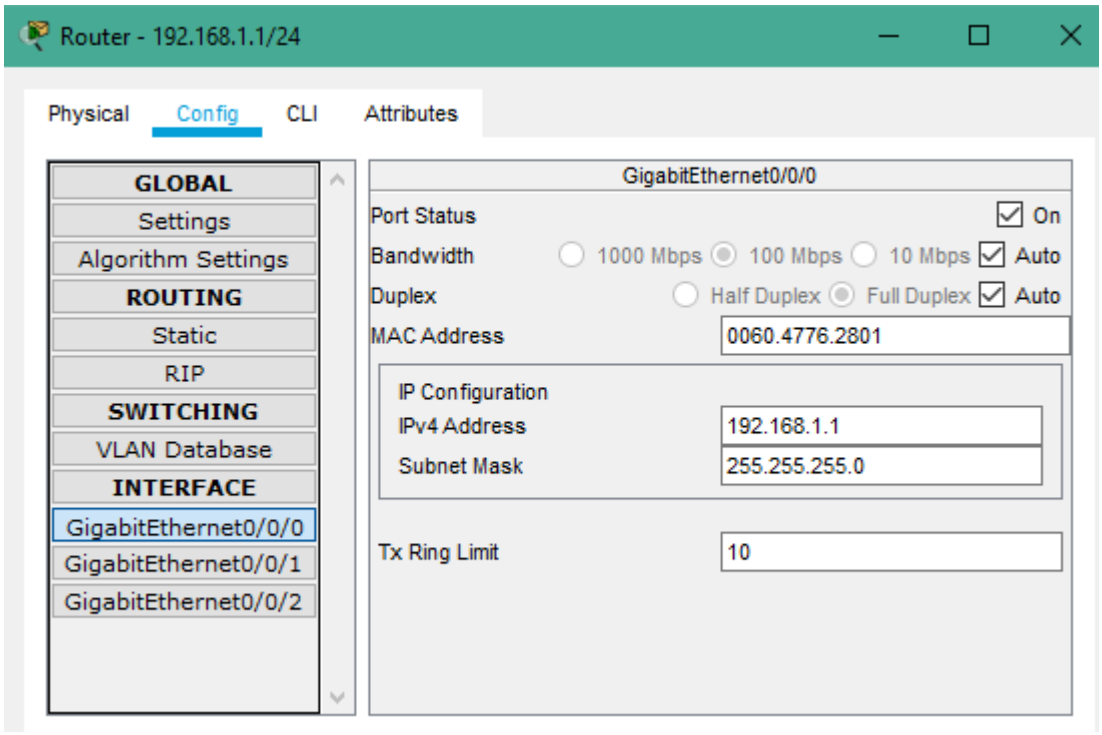
The switch has been password protected and the passwords have been encrypted. This will ensure the device's password is not stored in plain text in its configuration.

```
service password-encryption
!
hostname Switch
!
enable password 7 08071F45031F553D3C253E56783B257578
!
```

All devices will communicate through the switch unless going to the internet, in which case the information will be forwarded to the router. The router is configured with a static IP address of 192.168.1.1. This switch allows the



different devices on the network to communicate seamlessly – the switch acts as a central control hub, sending information to the right devices when it arrives.



All of the computers are set to get their IP address configuration using DHCP.

Examiner commentary

The information is correct and contains the required information to meet a pass; however, there are several areas which require more detail to demonstrate towards a higher grade. There was mention or evidence of pricing, to achieve a higher grade, the student would need to supply more detail on the specific hardware, such as specific models and reasoning behind why that hardware was chosen and what benefits it gives the scenario.

The cable routes are clear enough to be understood but are potentially not very practical when it comes to actually implementing the plan. The student has addressed the cable runs going in straight lines and identified that this is to save money, however has not considered the practicalities of the installation such as runs or walls – to achieve a higher grade the student would need to consider the pre-existing cable runs that may be there, or running along walls to ensure cable safety in the long run.

Some understanding was shown of the different date types; however, there was a lack of detail and some key protocols such as DHCP, which are both vital and relevant to the scenario, are missing. Adding some more relevant protocols and being more specific with what they do would add to this submission, helping raise its quality and potential grade.

The security measures are all appropriate; however, there is not a broad range and there is a lack of any complex solutions. The ones chosen are very obvious and show a lack of additional thinking or research. Giving reasons behind the chosen security measures would help raise the bar on this submission. The diagram is fully functioning; however, it is not clear due to the layout choice. The description of how the network works is very basic and the IP addressing is not clearly documented but it is present on the diagram. To improve this submission, a detailed representation of the IP address scheme as well as implementing and describing more complex security measures, stating why they would be implemented, would need to be provided.

Overall grade descriptors

The performance outcomes form the basis of the overall grading descriptors for pass and distinction grades.

These grading descriptors have been developed to reflect the appropriate level of demand for students of other level 3 qualifications and the threshold competence requirements of the role, and have been validated with employers within the sector to describe achievement appropriate to the role.

Occupational specialism overall grade descriptors:

Grade	Demonstration of attainment
Pass	The network diagrams are logical and display sufficient knowledge in response to the demands of the brief.
	The student makes some use of relevant knowledge and understanding of network cabling theories and practices but demonstrates adequate understanding of perspectives or approaches associated with industry best practice.
	The student makes adequate use of facts/theories/approaches/concepts and attempts to demonstrate breadth and depth of knowledge and understanding in their designs and implementation, as well as in their testing and documentation.
	The student is able to identify some information from appropriate sources and makes use of

	appropriate information/appraise relevancy of information and can combine information to support decision making.
	The student makes sufficient judgements/takes some appropriate action/seeks clarification with guidance and is able to make adequate progress towards solving faults with network cables or resolving faults found in testing.
	The student attempts to demonstrate skills and knowledge of the relevant concepts and techniques reflected in network cabling, design and implementation and generally applies this across different contexts.
	The student shows adequate understanding of unstructured problems that have not been seen before, using sufficient knowledge to find solutions to problems and make some justification for strategies for solving problems.
Distinction	The network designed and developed is precise, logical and provides a detailed and informative resolution to the demands of the brief.
	The student makes extensive use of relevant knowledge and has extensive understanding of the network cabling practices and demonstrates an understanding of the different perspectives/approaches associated with designing, installing and testing networks.
	The student makes decisive use of facts/theories/approaches/concepts in their designs, demonstrating extensive breadth and depth of knowledge and understands and selects highly appropriate skills/techniques/methods to build and test their networks.
	The student is able to comprehensively identify information from a range of suitable sources and makes exceptional use of appropriate information/appraises relevancy of information and can combine information to make coherent decisions.
	The student makes well-founded judgements/takes appropriate action/seeks clarification and guidance and is able to use that to reflect on real life situations in resolving network cabling faults and network configuration.
	The student demonstrates extensive knowledge of relevant concepts and techniques reflected in network cabling, design and implementation and precisely applies this across a variety of contexts and tackles unstructured problems that have not been seen before, using their knowledge to analyse and find suitable solutions to the problems.
	The student can thoroughly examine network requirements in context and apply appropriate analysis in confirming or refuting conclusions and carrying out further work to justify strategies for solving problems, giving concise explanations for their reasoning.

* threshold competence refers to a level of competence that:

- signifies that a student is well placed to develop full occupational competence, with further support and development, once in employment
- is as close to full occupational competence as can be reasonably expected of a student studying the TQ in a classroom-based setting (for example, in the classroom, workshops, simulated working and (where appropriate) supervised working environments)

- signifies that a student has achieved the level for a pass in relation to the relevant occupational specialism component

U grades

If a student is not successful in reaching the minimum threshold for the core and/or occupational specialism component, they will be issued with a U grade.

Document information

The T Level Technical Qualification is a qualification approved and managed by the Institute for Apprenticeships and Technical Education. NCFE is currently authorised by the Institute to develop and deliver the T Level Technical Qualification in Digital Support Services.

Owner: Head of Assessment Design

Change History Record

Version	Description of change	Approval	Date of Issue
v1.0	Published final version.		May 2021
v1.1	NCFE rebrand		September 2021
v2.0	Annual review 2023: Amends to grade descriptors to ensure clarity	June 2023	19 June 2023