Gold - Unit 3 - Managing Computer Hardware, Data and Networks

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Overview

The candidate can show that they understand the main hardware components that make up a computer as well as the associated software drivers that make these pieces work and what their main purpose is. The should be comfortable formatting disks and installing a basic operating system. Computers generally form part of a network, so candidates need to show a good understanding of what this entails in terms of services required and management of users in groups or alone. They should be able to test the basic functions such as network connectivity using browsers. Once operational, they need to show an awareness of basic aspects of managing the system such as security and file and directory management. This will lead to archiving and back-ups.

A work activity will typically be 'non-routine or unfamiliar' because the task or context is likely to require some preparation, clarification or research to separate the components and to identify what factors need to be considered. For example, time available, audience needs, accessibility of source, types of content, message and meaning, before an approach can be planned; and the techniques required will involve a number of steps and at times be non-routine or unfamiliar.

Example of context – configuring a basic desktop with a GUI and also modifying the system using the command line tools.

Assessor's guide to interpreting the criteria

General Information
QCF general description for Level 2 qualifications.

- Achievement at QCF level 2 (EQF Level 3) reflects the ability to select and use relevant knowledge, ideas, skills and procedures to complete well- defined tasks and address straightforward problems. It includes taking responsibility for completing tasks and procedures and exercising autonomy and judgement subject to overall direction or guidance.
- Use understanding of facts, procedures and ideas to complete well-defined tasks and address straightforward problems. Interpret relevant information and ideas. Be aware of the types of information that are relevant to the area of study or work.

Requirements

- Standards must be confirmed by a trained Level 2 assessor or higher
- Assessors must at a minimum record assessment judgements as entries in the online mark book on the INGOTs.org certification site.

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- Routine evidence of work used for judging assessment outcomes in the candidates' records of their day to day work will be available from their e- portfolios and online work. Assessors should ensure that relevant web pages are available to their Account Manager on request by supply of the URL.
- When the candidate provides evidence of matching all the criteria to the specification subject to the guidance below, the assessor can request the award using the link on the certification site. The Account Manager will request a random sample of evidence from candidates' work that verifies the assessor's judgement.
- This unit should take an average level 2 learner 40 guided hours of work to complete.
- Once the candidate has satisfied all the criteria by demonstrating practical competence in realistic contexts they achieve the unit certificate.
- When the Account Manager is satisfied that the evidence is sufficient to safely make an award, the candidate's success will be confirmed and the unit certificate will be printable from the web site. Open Systems IT Management

Assessment Method

Assessors can score each of the criteria N, L, S or H. N indicates no evidence and it is the default setting. L indicates some capability but some help still required to meet the standard. S indicates that the candidate can match the criterion to its required specification in keeping with the overall level descriptor. H indicates performance that goes beyond the expected in at least some aspects. Candidates are required to achieve at least S on all the criteria to achieve the full unit award.

Expansion of the assessment criteria

1. Understand computer hardware

1.1 I can identify the main hardware components in computing devices

Candidates should be able to identify CPU, micro and standard USB ports, audio and video ports, RJ45 network ports, SD Cards, Memory modules, USB memory, hard drive, keyboard, mouse, displays for commonly used computer devices.

Evidence: from assessor observations, internal testing and documentation in portfolios.

Additional information and guidance
Candidates should be familiar with commonly used hardware components through hands on use. Raspberry PI, building a PC or taking apart disused machines will all provide experience. A good little game is to provide a hardware specification for a computer and ask the candidates to use the web to source the parts at the best possible price. The winner is the one who can get the components to build a machine at the best price. If you want to make it more difficult take shipping costs into account and say you need 50 pieces. This will make it less likely that shipping costs will swamp the costs if components are bought from different suppliers. This will help prepare them for sourcing components to service the network.

1.2 I can match discreet components in computing devices to purpose

Candidates should be able to match a component to a description of its purpose

Evidence: from internal testing and portfolios.

Additional information and guidance
Candidates should know the different purposes of common components. CPUs for processing instructions, USB ports for connecting peripherals including different speeds. Note USB 3 compatibility does not necessarily mean the component will operate at the full speed of USB 3. RAM for storing programs and data that is in operation, SDRAM and hard discs for storing programs and data while not being used. A heat-sink is for taking heat away Open Systems IT Management from active components to stop them being damaged by getting too hot. Heat-sinks

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might incorporate a fan. Power supplies to convert mains voltages to the lower levels needed in the devices, Batteries for portable power. Main board to hold and enable connections between the components.

1.3 I can associate software drivers with hardware

Candidates should know that pretty well any hardware will work with any type of computer if the software drivers are available.

Evidence: from internal tests and content of learner portfolios.

Additional information and guidance
Candidates should understand that software drivers are necessary to make hardware operational. Open Source drivers mean that anyone with the technical knowledge could make a driver for any piece of hardware making the hardware usable by different types of computer. The drivers generally operate in layers communicating with the operating system at the top layer and with the hardware itself at the lower layers. This means in principle that only the middle layers need changing if there are standard hooks between it and the layers above and below. Common examples of hardware that needs drivers are printers. The printer will have its own software to control the print heads etc .The CUPs print server [3] is a system that takes a common approach to printing so that it is easier to manage printer drivers from many different manufacturers.

1.4 I can format and partition discs

Candidates should be able to carry out formatting and partitioning of discs under guidance.

Evidence: From internal testing, portfolios, assessor observations.

Additional information and guidance
Candidates should be given opportunities to format a disc and partition it. They should know that a swap partition is used for extending the computer's memory should it run out. This is a lot more important with e.g. 2 GB and less RAM and is probably never going to be used in machines with 8 GB or more. Nevertheless, it is worth reserving about the same size swap partition as there is memory in the computer, just in case unless for some reason the disc space is very precious which is unlikely. Partitioning is very flexible. The main function is to enable you to separate and categorise different types of file e.g. separate system program files from user data files. Candidates should appreciate that organising files logically on large complex systems is important for efficient management.

1.5 I can install an operating system

Candidates should be able to download an iso image and use it to create a USB or similar image to test hardware compatibility and then install the operating system.

Evidence: From assessor observations and learner portfolios

Additional information and guidance
It is relatively straight forward to install Linux but it is best to test all the hardware drivers are appropriately available for the target machine. Popular distros such as Ubuntu come with a wide range of pre-installed drivers so that most hardware will work but there are always exceptions. Sometimes it simply requires some minor adjustments. Discussion forums are a good place to ask questions about installation problems and candidates should get some practice in doing this. It also means they will be communicating directly with industry professionals.

Once an operating system is running satisfactorily from a USB key, it can be installed more permanently on the machine's internal hard drive. Care will need to be taken if there is already an operating system installed. Candidates should be shown how to “dual boot” so that they can choose which operating system they want to use when they start up the machine. This implies they will need to be shown how to set the boot options. The new EUFI boot system can cause more work. There is useful support documentation here [4]. Candidates are not expected to remember all the details but

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they should be able to use the supporting information to get a working operating system running on the machine.

2. Understand the computer on a network

2.1 I can explain the purpose of a domain name service

Candidates should be able to explain the broad principles of DNS and how IP addresses are mapped to names.

Evidence: local testing, portfolios

Additional information and guidance
Candidates should be able to explain that DNS is a way of relating meaningful and memorable (to humans) names such as www. MyWebsite.com to an IP address in the form of numbers. In the case of IPv4 something like 93.184.216.119 and in IPv6 2606:2800:220:6d:26bf:1447:1097:aa7. IPv6 is necessary because there are not enough addresses for every device in the world using the IPv4 system. DNS is explained in more detail here [5] but at this stage a basic understanding of what DNS does is sufficient.

2.2 I can identify a range of network services

Candidates should know that a server provides a range of services including running programs and presenting results to clients, storing client data and information, enabling communication between clients.

Evidence: From local testing and portfolios

Additional information and guidance
In the early days of microcomputers, servers were often called file servers because that was their main function. They stored files and shared them between clients subject to permissions to access them. They would provide shared printing services and perhaps email but they did not run general applications programs. Increasingly servers do both jobs. They run programs and the results are displayed on the client computer and they store files and handle e-mail. It is very expensive to have software applications stored and run individually on every network client, not only in the cost of multiple software licenses but in having to manage the software on every machine. Even though to an extent this management can be made more efficient using the server to update machines, in practice constantly upgrading hardware with different specifications that can not all cope with exactly the same software results in expensive complexity. Running everything from servers is potentially much more efficient and much less expensive but two things made this difficult. One is that the servers needed to be very powerful (expensive) to cope with running very large applications often designed at the limit of hardware capacity and the other is that the network connections have to be fast too.

The internet has changed the way we think of servers and the key is the web browser. Web browsers can run client side applications in the client e.g. in Javascript and also support transactions on the server side e.g. executing PHP code to process database information and then present it on the client through the browser. It is very much easier to manage a large server farm with consistent software than to manage many distributed client computers, scattered all over the world each running an unpredictable range of applications. The browser has effectively standardised the operating platform removing licensing fees and enabling competition based on service. At the time of writing we are in a transition to mobile clients where power consumption is just as important as performance and perhaps more so when servers can provide almost unlimited storage and raw processing power. Clients can still run their own apps but the main productivity tools can be provided and managed centrally.

For this criterion, candidates need to be able to identify the services that servers provide to the network, from processing data, storing and making information available and enabling

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communications.

The most obvious case of programs running locally is the client operating system such as GNU/Linux installed on the local machine. An example of a server running the program on behalf of the client is a search engine like Google. You make the query in the web browser and the search engine somewhere on the web then runs a program to find things linked to the query and returns the results in the local browser. An obvious data server is a file sharing application such as Dropbox. Dropbox enables the sharing of data files over the internet. The distinctions between running programs locally and running them on the server is now much less clear-cut than at any time in the past. Web pages use HTML files to tell the browser what to display but there is generally no interaction for the user. To provide that Javascript is built into the browser. Programs that run in the browser are running locally but these are usually small and could be downloaded into the browser from the server or they could be a plug-in on the local machine. The cooperation between server and client in running programs has become much more closely linked with the internet. Peer to peer systems are effectively making any machine on the network a potential server. The trend is to racks of many low cost machines, often just the main boards and components, sharing the tasks and so what is represented as a server by a box on a diagram might in fact be very many servers not just one machine.

2.3 I can use common services to diagnose problems

Candidates should be starting to adopt systematic strategies to diagnose problems on individual computers and networks.

Evidence: From assessor observations and portfolios

Additional information and guidance
At this stage it is enough to be able to match common problems to system settings and similar facilities in order to look for possible remedies. They should be aware of applications such as SysMon that can be used to view how much memory is being used and which services are active. They should know that the system keeps logs and that these can be examined to look for possible problems.

2.4 I can create new user and group accounts

Candidates should be familiar with the way accounts can be set up and relate this to work on permissions and security.

Evidence: Assessor observations and portfolios.

Additional information and guidance
Linux systems are multi user on networks but also on individual machines. Several people can be logged onto the same machine at the same time. You can manage this quite simply using something like a Thin Terminal system such as this [6].

2.5 I can use a browser with appropriate attention to privacy

The candidates should use more than one browser to to learn the common and different features and any differences in privacy settings.

Evidence: Assessor observations and portfolios.

Additional information and guidance
This [7] is a useful resource on web browsers and general aspects of the web.

2.6 I can connect a computer to a network

The candidate should gain practical experience of setting up a computer in different network scenarios.

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Evidence: Assessor observations and portfolios.

Additional information and guidance
Candidates should understand that connecting to a network requires a means of connecting either using a cable or wireless. Ether net cable using RJ45 connectors and UTP cable is by far the most common cable method. Wireless is usually via a Wifi access point or it could be through a mobile telephone. Smartphones can be configured to become wireless access points for laptops. The laptop connects to the phone using Wifi and the phone uses the phone network (3G or 4G) to connect to the internet. USB 3 is faster than UTP networking but is limited to 3m cables. This means that on laptops without an RJ45 connector (Many ultrabooks and super slim machines), a cable connection can still be made buying a USB to RJ45 connector although they will usually use a wifi connection. To connect to the internet via a router, DHCP is used to allocate IP addresses to devices that connect automatically. All that is usually needed is the pass code required by the router.

3. Be able to manage systems effectively

3.1 I can review security for users and groups

The candidate should be able to make routine checks of user accounts to ensure that the security settings are set appropriately.

Evidence: Portfolios, personal log, assessor observations.

Additional information and guidance
Candidates should appreciate the need for security including strong passwords, careful practice and advice to users e.g. not leaving themselves logged in and leaving the machine unattended, checking firewall settings and appropriate permissions.

3.2 I can identify important systems files and directories

The candidate should be familiar with where to find important files.

Evidence: From assessor observations, internal assignments.

Additional information and guidance
Typical examples are the system log, grub, bin for program files, boot for files related to booting, dev for device drivers. There is a good and straightforward description here [8].

3.3 I can archive and de-archive files using compression

The candidate should be able use archiving tools to reduce the size of files and package them for easy transfer..

Evidence: From portfolios and assessor observations.

Additional information and guidance
Candidates should be familiar with Linux tar gzip system and zip files. The main benefit from using tar gzip is it will preserve permissions on files. This might or might not be important. Candidates should appreciate that this is lossless compression [9] unlike compressing video, audio and jpg images which is lossy compression trading some quality to get a smaller file.

They should appreciate why this is not possible in program files, for example, where losing any data will stop the program from working. They should also appreciate that archiving a video or similarly compressed file is very unlikely to make any further saving in size because the files are already compressed about as far as is possible.

3.4 I can describe the purpose of file directory types (public, private, hidden)

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The candidate should be able to describe the ways different types of directory can be used.

Evidence: From local testing, portfolios, assessor observations.

Additional information and guidance
This is simply a matter of understanding the properties of directories. It is not so obvious on a standalone computers but very obvious why shared and public directories are of value on the internet. Systems like Dropbox are examples of using a directory and permissions to make information shareable. Hidden files prevent rarely used files adding to the number seen in a directory.

3.5 I can manage files within a directory structure

The candidate should demonstrate that they can organise their files in a logical way within a directory structure.

Evidence: From images of their directories

Additional information and guidance
Directories and files should have meaningful names with files in places that help their management.

3.6 I can explain the difference between an absolute and relative path

The candidate should be able to explain absolute and relative paths and why they are used.

Evidence: From portfolios, internal assessments.

Additional information and guidance
There is a description here [10].

3.7 I can make and restore a simple backup

The candidate should demonstrate a sound personal backup strategy.

Evidence: From portfolios, internal assessments, assessor observations.

Additional information and guidance
There are very many different backup strategies depending on the circumstances. Any sound system is acceptable but it would be a good learning process to consider strengths and weaknesses in several options. One clear benefit of cloud computing is that entire data systems can be backed up without the user having to do anything. It can be argued that if you store everything on line with a reputable service provider there is no need for a separate backup system. On the other hand loss of the internet then prevents access to your files. One way round this is to synchronise the on-line store with a backup on a local hard drive so that if you lose the internet connection you can work on the files on the local drive and when the connection is restore the files will be automatically be updated.

Moderation/verification

The assessor should keep a record of assessment judgements made for each candidate and make notes of any significant issues for any candidate. They must be prepared to enter into dialog with their Account Manager and provide their assessment records to the Account Manager through the on-line mark book. They should be prepared to provide evidence as a basis for their judgements through reference to candidate e-portfolios and through signed witness statements associated with the criteria matching marks in the on-line markbook. Before authorizing certification, the Account Manager must be satisfied that the assessors judgements are sound.

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Source URL: https://theingots.org/community/sysml2u3x

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