L3 Computing - Unit 5 - Computer Systems Management

Relevant LINKS

BACK TO COMPUTING UNITS **[1]**

Handbook home page **[2]**

Overview

Computer Science at Platinum Level requires the candidate to completely understand how to set up and maintain a modern computer, including installation, configuration, initialisation of systems such as web services and trouble-shooting. As a result of reviewing their work, they will be able to identify and use automated methods or alternative ways of working to improve programming and using computers. Unfamiliar aspects will require support and advice from other people.

A work activity will typically be 'straightforward or routine' because:

The task or context will be familiar and involve few variable aspects. The techniques used will be familiar or commonly undertaken.

Example of context – designing, planing, implementing and testing a program for controlling a physical system or solving a complex problem.

Support for the assessment of this award

Example of typical Computing work at this level (Coming Soon)

Assessor's guide to interpreting the criteria

General Information

QCF general description for Level 3 qualifications

- Achievement at Level 3 (EQF Level 4) reflects the ability to identify and use relevant understanding, methods and skills to complete tasks and address problems that, while well defined, have a measure of complexity. It includes taking responsibility for initiating and completing tasks and procedures as well as exercising autonomy and judgment within limited parameters. It also reflects awareness of different perspectives or approaches within an area of study or work.
- Use factual, procedural and theoretical understanding to complete tasks and address problems that, while well defined, may be complex and non-routine.
- Identify, select and use appropriate skills, methods and procedures.
- Use appropriate investigation to inform actions.
- Review how effective methods and actions have been.
- Take responsibility for initiating and completing tasks and procedures, including, where relevant, responsibility for supervising or guiding others.
- Exercise autonomy and judgement within limited parameters information and ideas.

Requirements

- Standards must be confirmed by a trained Level 3 Assessor or higher.

- Assessors must at a minimum record assessment judgements as entries in the online mark book on the INGOTs.org certification site.
- 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.
- 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.
- Each unit at Level 3 has recommended guided learning hours based on time required to complete by an average learner.

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. The candidate will set up systems

1.1 I can install and set up an operating system

Candidates should be able to install a new operating system on a computer device and deal with common issues.

Evidence: Assessor observations and documentation in portfolios.

Additional information and guidance

A good practical way to do this is to use more than one Linux distribution on more than one device. This will show candidates that there are common principles and give them confidence in any unfamiliar new situations. Candidates should be confident to install an operating system and know that they need to be sure that the hardware drivers are available to make it operational. Using a live CD or USB installation is a good way to check this because it means the proposed software can easily be removed in a situation where eg the screen drivers fail so you can’t see any display output.

1.2 I can set and customise boot sequence and options.

Candidates should be able to set bios boot options and any further options that can be adjusted as the machine starts up.

Evidence: assessor observations, documentation in portfolios.

Additional information and guidance

Candidates should have practical experience of accessing the BIOS at start up and know what the main options are. This varies a bit from machine to machine but it will normally include the boot sequence for devices so for example the machine can be set to boot from a USB key, the network or a DVD. Date and time are other possible settings and the BIOS will provide information about hardware. It is also possible to set a password for accessing the bios but for personal use this is probably a risk not worth taking. If you for get the bios password it will be necessary to reset it and

that is usually using a pin on the motherboard that might not be obvious. In the case of Linux systems, the boot loader e.g. Grub or Lilo is started by the BIOS and parameters can be changed to fix boot problems. Internet searches will often result in finding any fixes for particular hardware. It would be well worth candidates examining some bootloader files to see what they are doing. These files can be edited in a text editor but of course it will be difficult to get to them if the machine won't boot.

If there are RaspberryPIs available for practice, the link [3] at provides instructions about how to set up a SD card to boot the machine.

1.3 I can customise the display to personal preference.

Candidates should be confident to make display adjustments and be aware of display issues with different display hardware.

Evidence: from assessor observation and documentation in portfolios.

Additional information and guidance

Candidates should understand the background principles of display technologies and relate this to the work on computation in unit 1. Spacial resolution, colour resolution and refresh rate.

Typically, modern displays use 8 bits for each of the 3 primary colours, Red, Green and Blue. The graphics cards driving the displays can use 10 bits per colour and can use an extra field for transparency but in most cases 8 bit is sufficient . So it would be possible to have 256 levels of transparency for each of 16 million (256 x 256 x 256) colours. That would take 4 bytes per pixel. 1 byte for each of RBG and 1 for transparency. If a screen is 1000 pixels by 1000 pixels that is 1 million and 4 Mbytes of storage is needed. Screens are constantly refreshed to show moving pictures. If this happens 100 times a second it will not be noticeable to humans because our eyes take time to refresh too. So 100 Hz refresh rate means 400Mbytes of data every second. The higher the resolution and refresh rates, the faster the hardware has to be to get the data onto the screen. Another property of the display is the aspect ratio. This governs the height and width of the screen. Usually the width dimension is greater than the height dimension. In High definition TV the vertical height is 1080 pixels and the horizontal spatial resolution 1920 pixels. This is referred to as 1080p. With the convergence of computer TV and mobile technologies, these numbers are becoming more common in all technologies. When choosing a display for a computer, the computer graphics hardware has to be able to cope with the demands of the display. If the refresh rate of the display is too high for the graphics hardware there will be no picture.

If the display has a lower resolution that the computer hardware (not uncommon with data projectors) the computer has to reduce its output to meet the needs of the projector. In some cases it is possible to connect two displays with different resolutions to the same computer.

Candidates should experiment with display options to be confident about situations where they can and can not make appropriate adjustments. Other aspects they will be able to customise include background image, screensaver, positions and visibility of toolbars and possibly the entire window theme.

1.4 I can set up network connections.

Candidates should be able to set up straightforward computer networks understanding the issues with network connections.

Evidence: assessor observations and documentation in portfolios.

Additional information and guidance

In most cases the connection will be automatic and so candidates need to understand more in case anything does not happen as anticipated. They should have the opportunity to set up client

machines on a network . They should be familiar with network connection types including wireless, UTP cable and fibre and the advantages and disadvantages of each. They should understand that on the internet, a network connection requires an IP address, and that IPv4 and IPv6 are the descriptions. They should relate these to the work on binary numbers in unit 1.

They should know about the DHCP protocol for assigning IP addresses, and the DNS for assigning IP addresses to meaningful names. Candidates should be able to use a background knowledge of how networking works to troubleshoot network problems.

1.5 solve problems in systems setup and configuration.

Candidates should use the knowledge they have gained and internet searches to help solve problems in systems set up and configuration.

Evidence: Assessor observations and portfolio documentation.

Additional information and guidance

Candidates should have the opportunity to solve typical problems such as a machine that refuses to boot, a faulty cable connection, a failed hardware component or similar. These can be set up on old computers as challenges to be resolved. Candidates should be encouraged to be systematic in their approach to fault finding.

2. The candidate will support system storage and security

2.1 I can format and partition storage devices

The candidate should be able to format and partition storage devices understanding the risks of losing data in doing so.

Evidence: Assessor observations and documents in portfolios.

Additional information and guidance

Candidates should understand why discs need to be formatted and partitioned and relate this to concepts of computing such as binary numbers and data patterns. Practical experience can be gained with old computers and operating systems such as Linux distributions.

2.2 I can devise and implement a backup strategy.

Candidates should be able to match a backup strategy to risk, convenience and cost.

Evidence: documentation in portfolios.

Additional information and guidance

Candidates should carry out a research study of backup strategies and summarise this in a 1000 word portfolio document with an emphasis on cost, risk and security.

2.3 I can set up and understand how to customise a firewall for network connection.

Candidates should understand the principles of firewalls and understand how these work.

Evidence: assessor observations and portfolios

Additional information and guidance

Most PC operating systems include software-based firewalls to protect against threats from the

public Internet. Routers that pass data between networks contain firewall components and firewalls can perform basic routing functions.

Candidates should be familiar with the basic ports that can be opened or blocked by a firewall and three key firewall methods.

1. Packet filtering - Packets of incoming data compared to a set of filters. Packets that make it through the filters are sent to the requesting system and all others are discarded.
2. Proxy service - Information from the Internet is retrieved by the firewall and then sent to the requesting system and vice versa after checking.
3. Stateful inspection - Compares certain key parts of the packet to a database of trusted information. Information traveling from inside the firewall to the outside is checked for specific attributes, then incoming information is compared to these and if there is a reasonable match, the information is allowed through. Otherwise it is discarded.

2.4 I can write a risk assessment for system security including passwords and malware.

Candidates should write a risk assessment for a familiar computer installation identifying and prioritising risks.

Evidence: Documentation in portfolios.

Additional information and guidance

The candidates risk assessment should include the major risks to a computer system connected to a network. This could be a mobile phone network, the internet or LAN. The important thing is for the candidate to research the nature of the use of the network and where the security vulnerabilities are greatest including the possibilities of human error. They should test drafts of their risk assessment with peer review and make amendments accordingly before finalising it. Assessors should provide feedback on the strengths and weaknesses of their final work.

2.5 I can describe a range of storage devices and their strengths and weaknesses.

Candidates should carry out a survey of storage devices and provide comparative descriptions of them in terms of their properties and cost.

Evidence: Documentation in portfolios.

Additional information and guidance

As a minimum candidates should produce a table of devices covering electromechanical, solid state and optical media. They should understand at least some of the reasons why there is such a diversity and consider whether some are devices are destined for obsolescence and if so why.

3. The candidate will maintain systems

3.1 I can install software updates and dependencies

Candidates should understand why it is important to keep software up to date and be practically capable of taking responsibility for doing so.

Evidence: Assessor observations and documentation in portfolios.

Additional information and guidance

Regular updates and patches help reduce security risks and ensure bugs get eliminated. Different systems have different methods of providing updates but most are automated.

3.2 I can set up cron jobs to automate regular procedures.

Candidates should understand the concept of cron jobs to automate regular actions and how to practically implement them.

Evidence: from assessor observations and portfolios.

Additional information and guidance

On Windows a cron job is a scheduled task. Candidates should ideally see how to setup cron jobs on more that one system and both on graphical and command line systems. One obvious candidate for a regular automated process is backup.

3.3 I can set up a secure virtual connection to manage a system from a remote location.

Candidates should be able to manage a computer remotely using a secure remote connection.

Evidence: Assessor observations and portfolios of evidence.

Additional information and guidance

There are a number of different ways of achieving this. A good starting point is here [4].

3.4 I can install and remove applications.

Candidates should be confident to install and remove applications.

Evidence: Assessor observations and portfolio of evidence.

Additional information and guidance

Candidates should understand the need for trusted sources for applications that they install. It is highly inadvisable to install any executable file if it is not from a secure and trusted source. Great care especially needs to be exercised on the internet to make sure that web sites are genuine. They should also know the importance of using the correct tools to remove software since simply deleting files is dangerous owing to possible dependencies. They should also understand that there are potential IPR issues when installing software.

3.5 I can provide effective support for system users.

Candidates should be provided with opportunities to support other less experienced users.

Evidence: Assessor observations and portfolio documents.

Additional information and guidance

Candidates could spend time in a junior school, local business or similar environment providing support. This activity would be most appropriate in the second half of the course
when they have had more time to learn.

4. The candidate will understand key Internet systems

4.1 I can describe the terms HTML, W3C and HTTP

Candidates should understand these terms well enough to provide general explanations illustrated by examples.

Evidence: Internal tests and portfolios of evidence

Additional information and guidance:

This link [5] will provide all the information anyone needs about HTML. The depth for a particular student will depend on the nature of their interests e.g. in their main project. All candidates should have an idea about how HTML works including very common tags such as <h1> and </h1>, links to pages and other resources such as images and structure through elements. They should understand the principle of styles and CSS but a detailed knowledge of key words and syntax is not required. The W3C mission is to lead the World Wide Web to its full potential by developing protocols and guidelines that ensure the long-term growth of the Web. Candidates should be familiar with how W3C came about, its aims, values and role in maintaining the web. HTTP is a key protocol familiar from its role in browser URLs. It is a good example of a widely used protocol that is open and royalty free. There is a comprehensive description here [6].

Candidates should understand the principles but will not be expected to memorise the details.

4.2 I can explain the function of a web server.

Candidates should be familiar with the basic functions of a web server.

Evidence: From internal tests and portfolios of evidence.

Additional information and guidance

There is a reasonable overview here [7]. Apache has by far the biggest market share and is open source. It would be a good example on which to gain some practical experience.

4.3 I can explain the importance of TCP/IP.

Candidates should explain how TCP/IP is a fundamental protocol for the internet and use it as an example for computational thinking.

Evidence: Internal tests and portfolios of evidence.

Additional information and guidance:

While the details are complex [8] and not expected, candidates should have some basic concepts such as layers and this is a good opportunity to reinforce the concept of abstraction. It should be increasingly obvious that these very complex systems are fundamentally made up from binary patterns. Concepts such as layers and objects enable us to reduce the amount of detail anyone has to consider at any time.

Someone has to know all the details of specific parts but no-one needs to know all the details of all the parts.

4.4 I can explain the effects of proprietary standards and lock-in.

Candidates should understand the relationship between control over particular standards and the capacity to establish a monopoly.

Evidence: Internal tests and portfolios of evidence.

Additional information and guidance

Candidates should understand that the greater the dependency on a standard the easier it is for the owner of the standard to determine the price paid for using the standard. If one company owned the patent for ASCII numbers it would mean that all text stored on every computer would be locked into that company unless everyone made an effort to translate all those

characters to a different system and modified all the software that operates on text. How likely would that be to happen? Probably if a royalty of £1 a character was charged change would occur because without it, it would probably bankrupt much of the world. On the but not be damaging other hand £1 for 10,000 characters might make the company a fortune but not be damaging enough to precipitate change.

The barrier to any competition would be high simply because of the dependencies of so many systems on the ASCII standard. Companies and governments have taken a long time to realise that there is a solution to these issues by demanding open systems, from protocols to data formats and even computer application code. HTML is an excellent example. If this had been patented and royalties charged, the power given to the owner over everyone else would have been enormous. The owner of HTML could also have become the owner of web browsers, web servers and a whole range of other technologies. With no competition development and innovation would have suffered. Look at the rate of growth and innovation in the mobile computing space where there is far more competition than in the desktop space.

4.5 I can explain the role of an internet service provider.

Candidates should be able to explain how ISPs operate, and the range of services that they provide.

Evidence: Assessor observations and portfolio documents.

Additional information and guidance:

Internet service providers [9] can provide a range of different services on a range of business models. Candidates should understand the boundary between traditional service provision providing access to the internet has now evolved to web hosting and consequently applications hosting. The gradual shift to Cloud Computing makes internet service provision and software as a service, increasingly likely to dominate. Candidates should consider this in the context of lock-in to proprietary standards. Perhaps a bigger danger is having all your data locked into a particular provider.

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 dialogue with their Account Manager and provide their assessment records to the Account Manager through the online 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 mark book. Before authorizing certification, the Account Manager must be satisfied that the assessors judgements are sound.

Source URL: https://theingots.org/community/cpl3u5csmx

Links
[1] http://theingots.org/community/Computing_qualification_info_units
[2] https://theingots.org/community/sites/default/files/uploads/common/Handbooks/Computing/L3_OpenSystems_Computing_v2%20.pdf
[3] http://http://elinux.org/RPi_Easy_SD_Card_Setup#SD_card_setup
[4] http://en.wikipedia.org/wiki/Virtual_private_network
[5] http://www.w3schools.com/html/
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