Level 3 - Unit 28 - Optimise IT System Performance (5 credits)

Platinum - Unit 28 - Optimise IT System Performance

Relevant LINKS

BACK TO ITQ UNITS **[1]**

Handbook home page **[2]**

Overview

The candidate can greatly improve the overall performance of a personal computer by using the appropriate hardware and software, as well as drivers, to make sure the system operates efficiently and to its full potential. The performance improvements will be based on adjustments to the operation of the system and general house-keeping duties related to file and resource management. Candidates will keep detailed logs and reflective journals on the process so that it can be replicated by anyone else.

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 – an example might be to maintain a number of PCs for a local school or charity.

Example of work at this level **[3] (to follow)**

Assessor's guide to interpreting the criteria

General Information

QCF general description for Level 3 qualifications

- Achievement at QCF 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.

- 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 Platinum Level Assessor or higher
- Assessors must at a minimum record assessment judgements as entries in the on-line 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 on-line work. Assessors should ensure that relevant web pages and files 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.
- This unit should take an average level 3 learner 50 hours of work to complete.

Assessment Method

Assessors can score each of the criteria N, L, S or H. N indicates no evidence. L indicates some capability but some help still required. S indicates that the candidate can match the criterion to its required specification. H indicates performance that goes beyond the expected in at least some aspects. Candidates are required to achieve at least a S on all the criteria to achieve the full award.

Expansion of the assessment criteria

1. Candidates will keep computer hardware and software operating efficiently

1.1 I can explain the factors that should be taken into account when choosing an operating system

Candidates should be able to explain in detail the most salient choices that need to be considered with an operating system.

Evidence: will be provided by short guides and assessor feedback.

Additional information and guidance

The number of operating systems and devices available will determine how this criterion is

addressed by candidates, but in most instances it will relate to a desktop PC system. The most common desktop OS is still Windows and it is likely that most candidate swill have this in mind. There are alternatives that can be researched and tried and it will depend on the situation the system will be used in and for. Many media based companies tend to favour the Apple OS as it has more tools suited to the creation and development of media. Whe choosing this type of OS, the main consideration might be long term suitability. The OS itself can be updated without issue, but it will require extra resources and most Apple hardware is not unreadable which means the entire system will need to be upgraded. Since the cost remains quite fixed on these, it will need consideration. Most OS development takes place on the latest hardware which means that it does not always work that well on older hardware. The exception to this is open standards systems such as Linux which are designed and maintained to support as mch hardware as possible and distributions such as Puppy Linux are designed to run on the least amount of available hardware. Windows itself might have developed at the same rate at Apple if they had the same control over their hardware that Apple does.
The key factors are:

- the performance, how well does it work on basic hardware
- the features, what features are built in and what additional features might need to be purchased which will add to cost. Windows and Apple come with some basic system software, but no advanced applications such as office software so these need to be purchased. Linux comes with all the open source versions of most applications and all of them are readily available for free or to purchase if required
- the compatibility, what will it work with and what extras are required to make it functional in the environment it will be used in
- the future-proofing, how long will it work before it has to be completely replaced
- the ease of use, how good is it to use and how much training will be required to make it work efficiently and effectively
- the reliability, will it crash all the time or can it be relied on to work always
- the cost, how affordable is it. If it is for an organisation, this will potentially mean millions, which is why the NHS and other big public bodies still use Windows XP which is no longer supported even by Microsoft. The cost of licenses to upgrade to 7 or 10 is too much.

1.2 I can take appropriate steps to protect computer hardware from loss or damage
Candidates should be able to use acceptable techniques when working on computers to minimise hardware damage.

Evidence: will be provided by portfolio work assessor feedback.

Additional information and guidance
Candidates should understand some of the associated dangers when working with computer hardware. The most obvious one is in relation to static as this high voltage discharge will ruin a computer's sensitive circuitry. There are other ways to minimise this, such as wearing anti-static wrist straps when working on hardware. It could also be something as simple as using the correct size of screwdriver head to limit damage to the screws that hold the equipment together. other practices need to be understood in relation to un-connecting and re-connecting devices such as hard drives or CPUs. As technology continues to minimise, the equipment gets more and more fragile. Each year a small but significant number of devices get left on trains and planes so candidates need to address how this type of equipment loss can be avoided. They also need to investigate and describe tools such as physical locks and security measures that are in place for hardware.

1.3 I can explain why routine fault-finding procedures are important
Candidates should be able to show a clear understanding of the importance of some forward planning.

Evidence: will be provided by portfolios and assessor feedback.

Additional information and guidance
Candidates should be able to articulate why it is important to be proactive on computers and to

deploy and use regular check-ups to make sure no problems are likley to occur. In some cases there will be little or no indication, but knowing a system well and keeping details logs should help to understand where problems are likely to occur. One obvious problem that occurs with PCs in dusty offices is the accumulation of dust in the fans. These and the computer case vents need to be clear in order to dissipate the huge amount of heat that is generated. if the computer overheats, it may not recover. Settings for this can be activated in the bios to make sure that if the core gets to X^{o}C, the computer will shut down to be investigated. The bios also has a page which shows the system's health and will show some potential problems such as heat or mechanical problems. A noisy fan or hard drive is a good indication of something working. Not so easy with SSD drives, but some diagnostics can be carried out to test their health periodically. if candidates maintain these reports over time, they can compare and contrast their findings and look for potential failure.

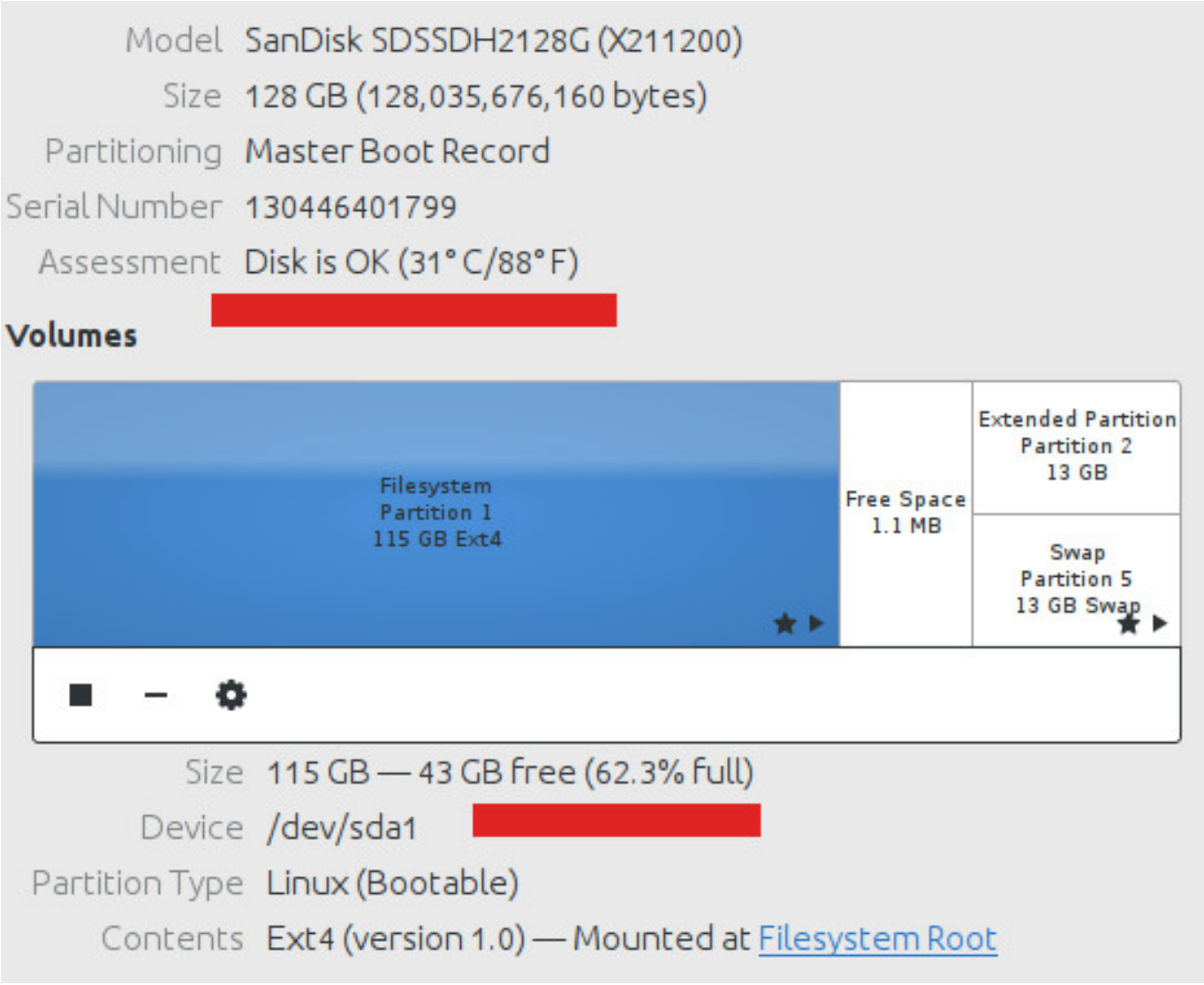
1.4 I can use an appropriate fault-finding procedure to routinely monitor hardware performance

Candidates should be able to show evidence of their planning for looking for errors.

Evidence: will be provided by short guides and assessor feedback.

Additional information and guidance
Candidates should be competent and comfortable using a range of tools and techniques to look for faults.

The following shots show some diagnostic tools for hard drive maintenance.



As snapshots they are useful to see the drive's health, but if recorded on a regular basis, they could see radical changes in temperature or throughput which could indicate impending failure.

Some systems have built in monitoring systems such as gkrellm (image at the right above) on Linux systems that can be used to remotely check system health.

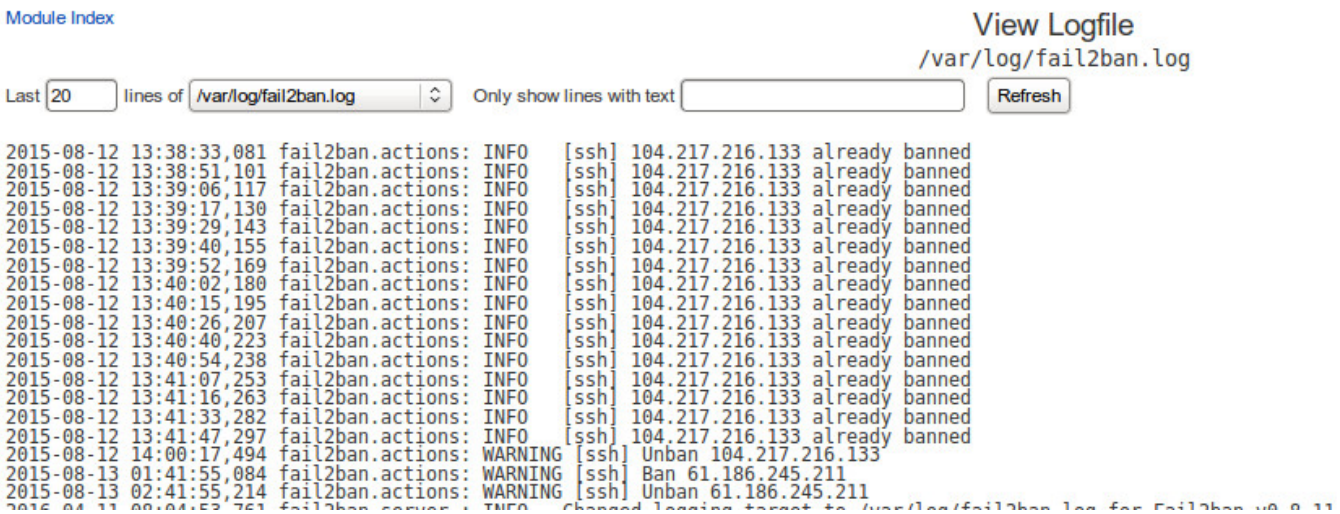
1.5 I can configure anti-virus and other security software

Candidates should be able to set up basic security software.

Evidence: will be provided by short guides and assessor feedback.

Additional information and guidance

Candidates should be competent in using different security tools to protect systems. In most cases this will be anti-virus software, but could also include more complex elements such as root kits or similar preventative software. Root kit software will make sure that no core files have been tampered with as many of these softwares are hard to detect. These days, with high speed Internet connections and vulnerable systems, there are countless people and systems trying to break into computers to take control of them or steal information. Some utility like fail2ban [4] for Linux and Mac helps to deter them.



As the above log shows, these computers are trying to get in every few seconds and will exploit any weakness found in a computer they come across on the Internet.

1.6 I can install and configure printers and other peripheral devices

Candidates should be able to demonstrate the ability to extend the use of a PC.

Evidence: will be provided by short guides and assessor feedback.

Additional information and guidance

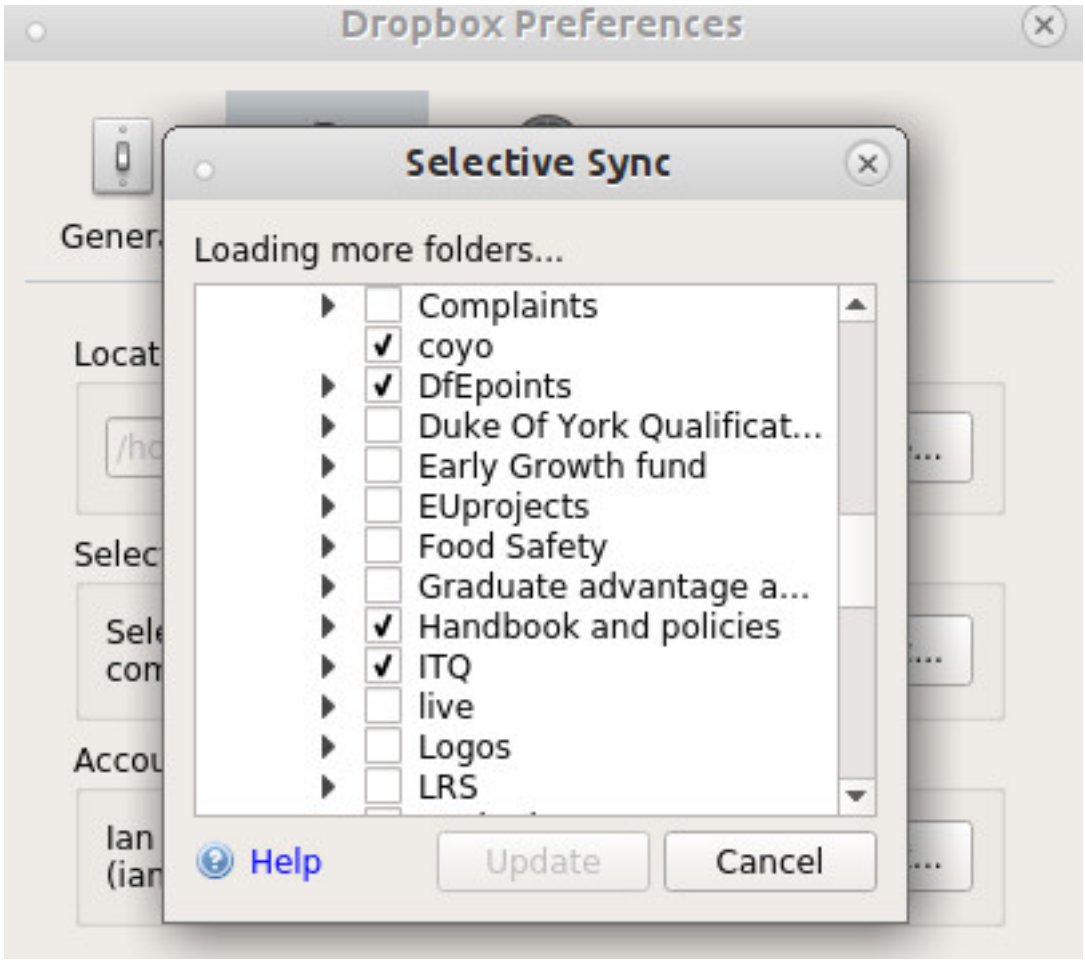
Computers on their own are obviously very useful, but without some important input and out devices, they may well be lacking for some people. The most obvious output device would be something like a printer and candidates need to document and explain how they install such a device as well as any tools required and diagnostic elements. Most modern printers come with a CD which contains driver software to work with various operating systems or at least a link in the manual about where to get the latest drivers. Some peripheral devices outlive their operating systems and are no longer supported. A scanner which works fine on Windows XP and is still functional, may nt have drivers and will therefore not work on Windows 7 or 10. Other devices will be headphones (for VoIP etc), joy sticks for games, loudspeakers etc. Candidates need to show that they are aware of some of the issues involved such as the need for specific drivers and possible

changes in the OS required due to resource conflicts.

1.7 I can configure synchronisation and maintain security on remote access sessions
Candidates should be able to maintain machines both locally and remotely.

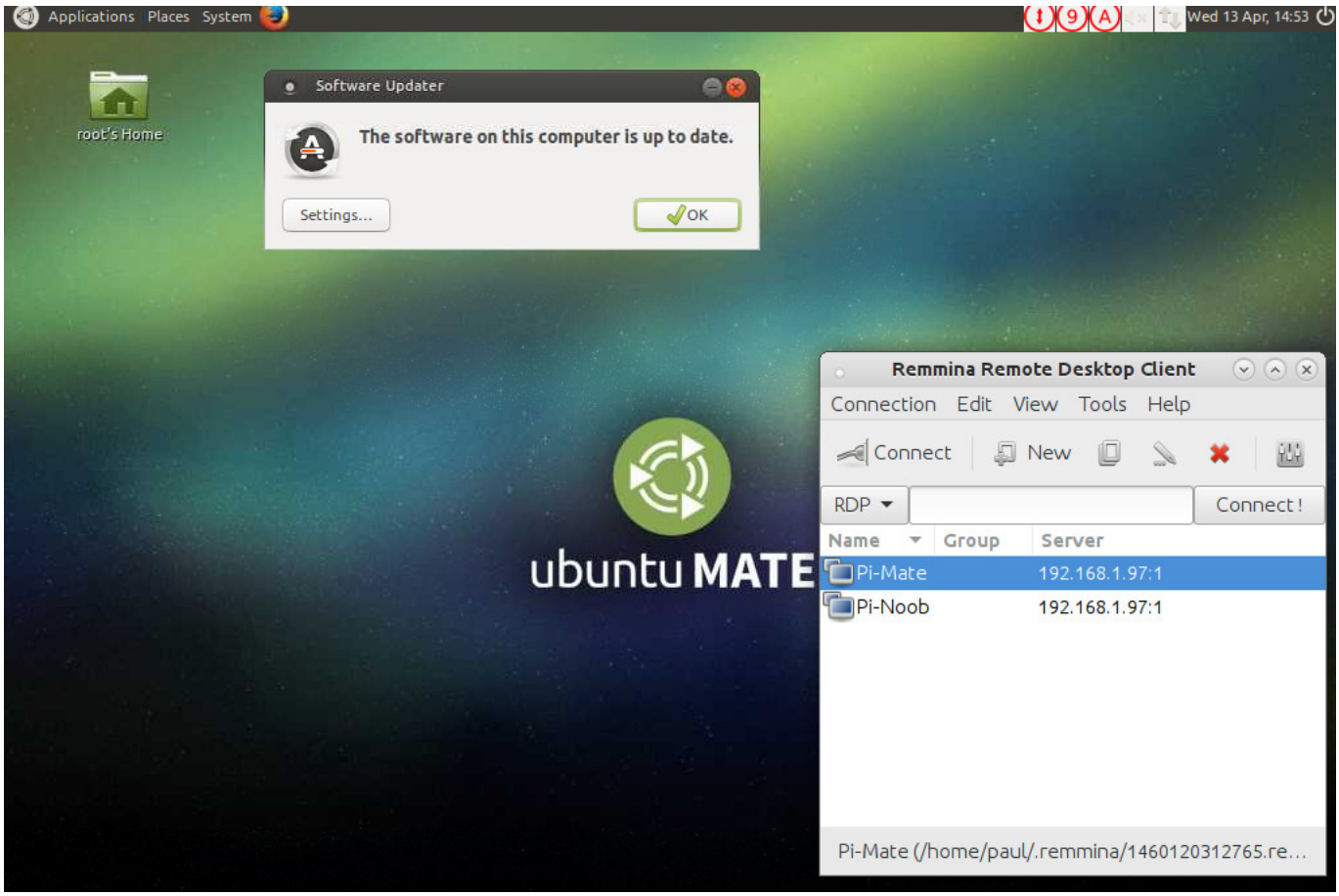
Evidence: will be provided by portfolio work and assessor feedback.

Additional information and guidance
These days, computers tend to be used a great deal with collaboration technologies. People can access their machines as long as they have internet connections and therefore there is a need to make sure that all the data is the same on all devices. Some software has tools built in to assist with this process such as Dropbox.



In this case, only certain folders and files can be synchronised for efficiency. Each device that connects to the service can have this choice with all devices perhaps synched to the core files for the organisation. candidates should be able to demonstrate understanidng of this range of tools and make recommendations about how best to use them.

Equally, it may not be physically possible to work on machines as they may be miles away or even in different countries. These need to be synchronised and maintained and other tools need to be mastered to achieve this. The following example shows the use of the software VNC to connect to a remote machine to work on it.



The above show shows a VNC client connecting to a remote computer and running the software updater to make sure it is secure.

1.8 I can configure a computer to present or display information to an audience
Candidates should be able to set up a computer for a presentation.

Evidence: will be provided by short guides or videos and assessor feedback.

Additional information and guidance
Candidates should be able to present information to an audience as in many cases PC support will involve telling employees in an organisation about new features or changes in the IT systems. Most localised systems will be different, but it will generally involve a PC or laptop and some form of projector. Candidates should be able to demonstrate comfortably that they can deal with this combination and present their material without issue.

2. Candidates will manage files to maintain and improve performance

2.1 I can explain why it is important to undertake file housekeeping of the information stored on computer systems and how it affects performance
Candidates should be able to explain the theory behind system performance in relation to maintaining files.

Evidence: will be provided by portfolios or videologs and assessor feedback.

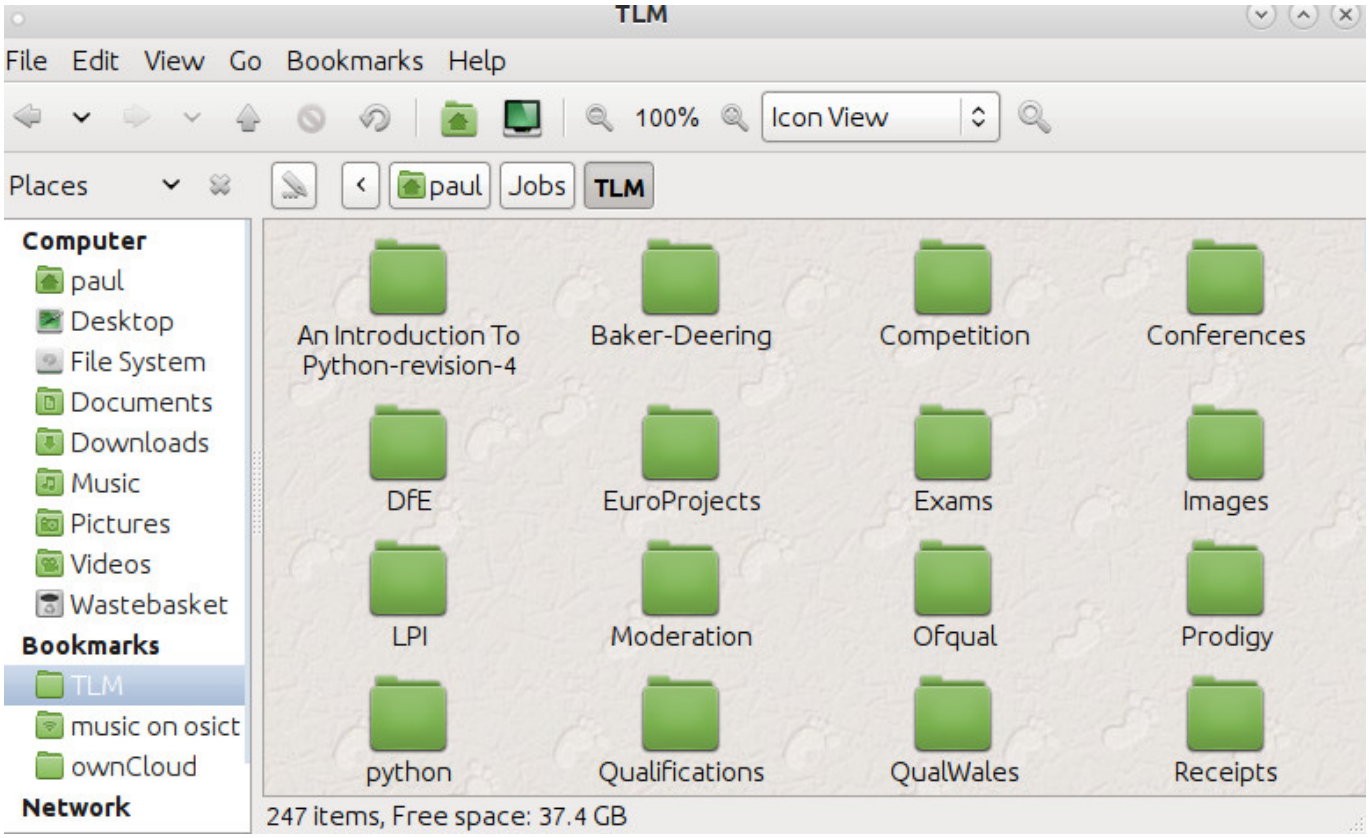
Additional information and guidance
Every file that is added to a computer system needs to be cataloged and checked by the operating

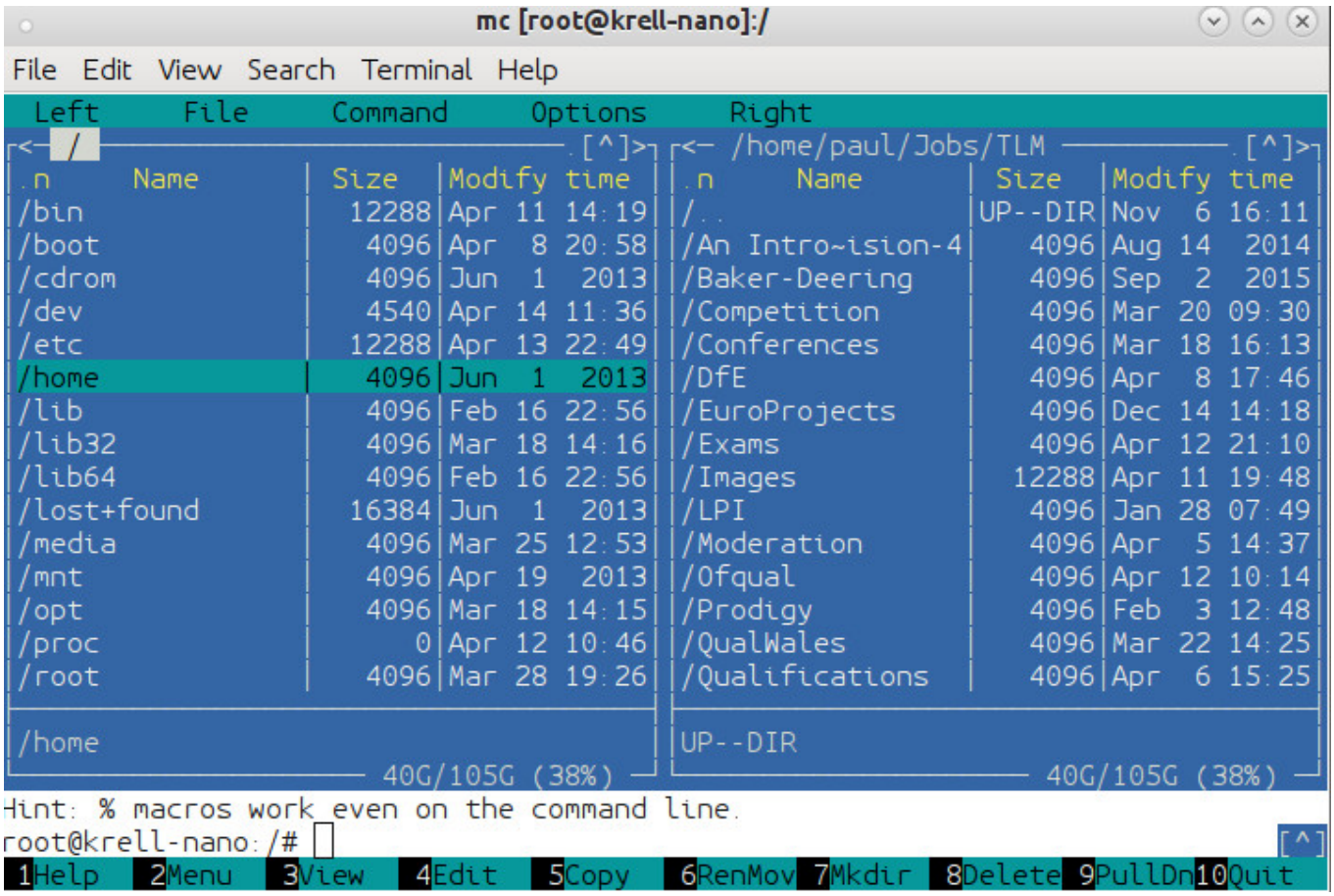
system. In some cases it may need to be shuffled around when being opened and saved. All of this creates some load on the operating system and any means that can be used to make this more efficient will improve system performance. Some systems carry this out automatically by using journaling file systems [5]. These systems can help with the order and efficiency of stored files for retrieval and operation. Other systems may need some intervention. A common example here would be the use of the Disk Defragmentation tool on systems running NTFS or FAT file systems. If this is not done, the computer has to work far harder to locate file material. If the data is scattered in multiple locations on a hard drive, even with a fast seek time it will still take a long time to locate and load. Also, while this is happening, the operating system is still trying to do other tasks and these will be slowed as it is working on finding files. he whole thing has a knock on effect.
 Candidates should write a short piece on why this is important and what impact it can have on a system's performance if it is not undertaken regularly.

2.2 I can use file navigation software to organise files into an appropriate folder structure
Candidates should be able to organise a system for the best performance.

Evidence: will be provided by short guides and assessor feedback.

Additional information and guidance
All operating systems have a built in file manager to be able to move and rename files and place them into folders for greater ease of navigation and storage. The following are two of the many Linux ones. The graphical one is called Nautilus, and the command line program is called Midnight Commander. Both are showing the same information.





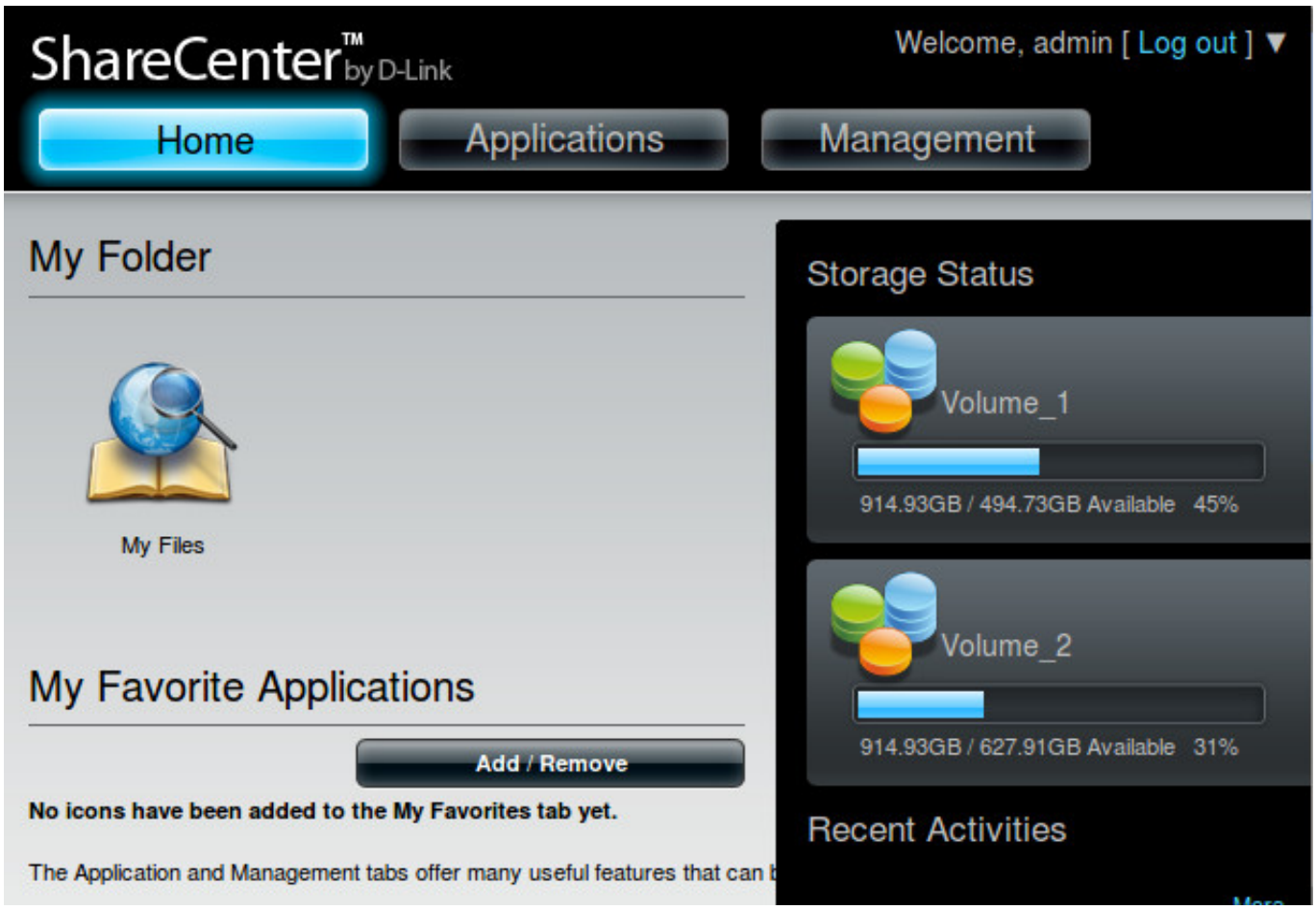
2.3 I can archive, backup and restore files and folders
Candidates should be able to use disaster recovery tools and techniques.

Evidence: will be provided by short guides and assessor feedback.

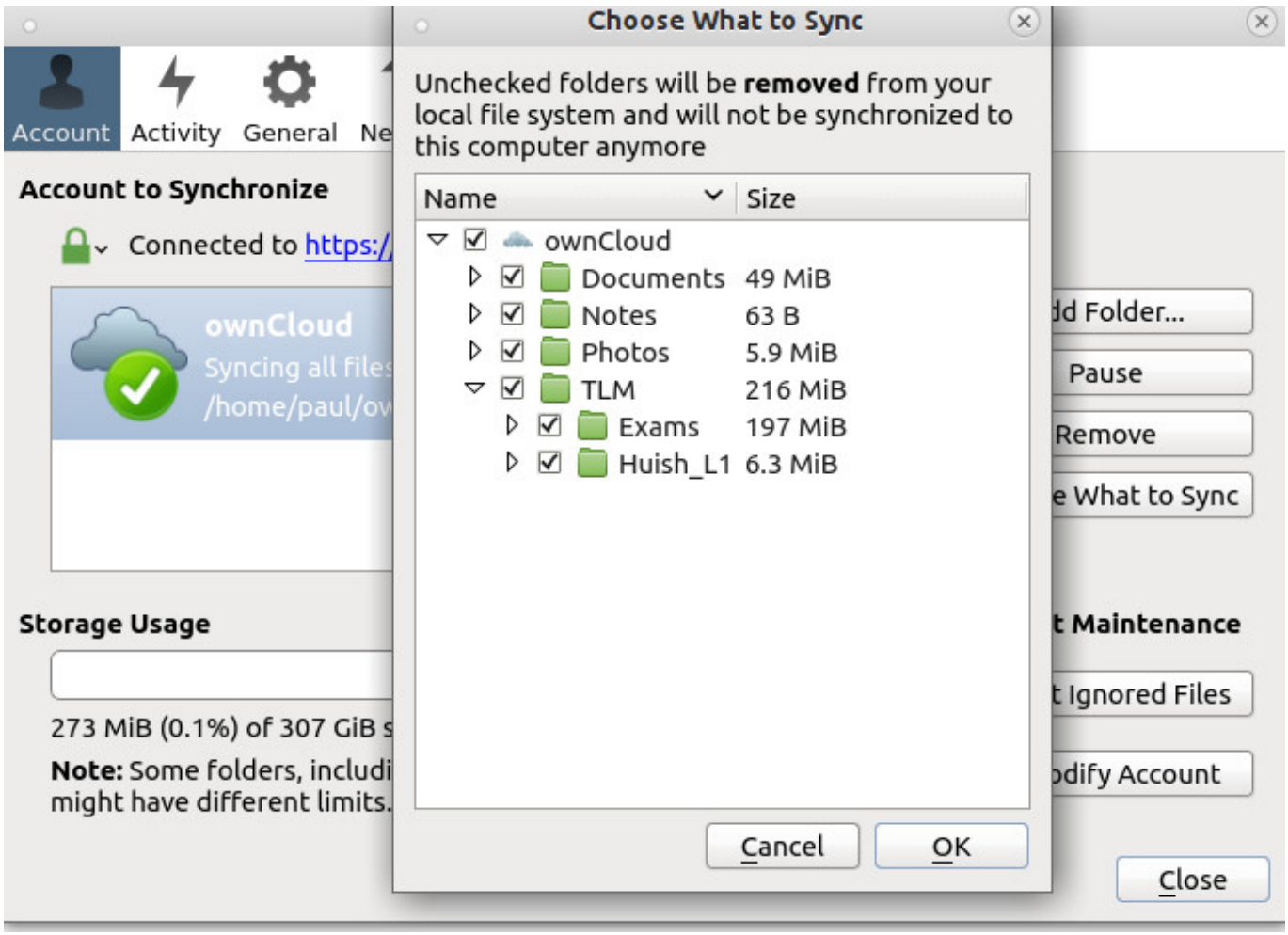
Additional information and guidance
A computer system is ultimately only as good as the backup and restore tools as if a disaster happens and you can't get the material back it is incredibly destructive. Few organisation can recover from a disaster in their computers if they don't have a good backup and restore system. Candidates need to be able to setup systems to make sure they are prepared for these. Most operating systems have built in tools and external ones can also be sued. The systems can be localised, though they need to think carefully about security. If the backup is on the same system, then recovery will be impossible. If the system is off-site, how can it be protected and how easy will it be to get back. Even with the fastest computers, a terabyte of data will take a large number of hours to re-build and if it is rebuilt via the Internet, there could be interrupts which cause it to fail.

Most companies have a policy to do a test restore at intervals of a month or three months etc to make sure the systems work when they are really required.

Tools such as a NAS (Network Addressed Storage) device can be deployed easily and in a cost effective way. many have very easy to use web based interfaces for management of data and backups.



There are some other excellent tools such as the open source cloud storage system OwnCloud.



other systems and techniques should be explored and described.

2.4 I can manage file and disk housekeeping so that information is secure and easy to find
Candidates should be able to manage their systems effectively and be aware of and implement good security.

Evidence: will be provided by short guides and assessor feedback.

Additional information and guidance
Related to the above criteria, candidates should show an awareness of file management and security. This could be securing computer systems in safe rooms and locked server rooms, or having locks on computers and setting the bios to notify if it has been opened. There are also software tools which can be set up to make sure that there are no unauthorised entries to the computers the candidate manages. One useful piece of software, for example, can check your system for intrusion of people trying to put in rootkits. The following is the final output from Root Kit Hunter.

```
System checks summary
=====================

File properties checks...
    Files checked: 149
    Suspect files: 15

Rootkit checks...
    Rootkits checked : 365
    Possible rootkits: 0

Applications checks...
    All checks skipped

The system checks took: 1 minute and 21 seconds

All results have been written to the log file: /var/log/rkhunter.log

One or more warnings have been found while checking the system.
Please check the log file (/var/log/rkhunter.log)
```

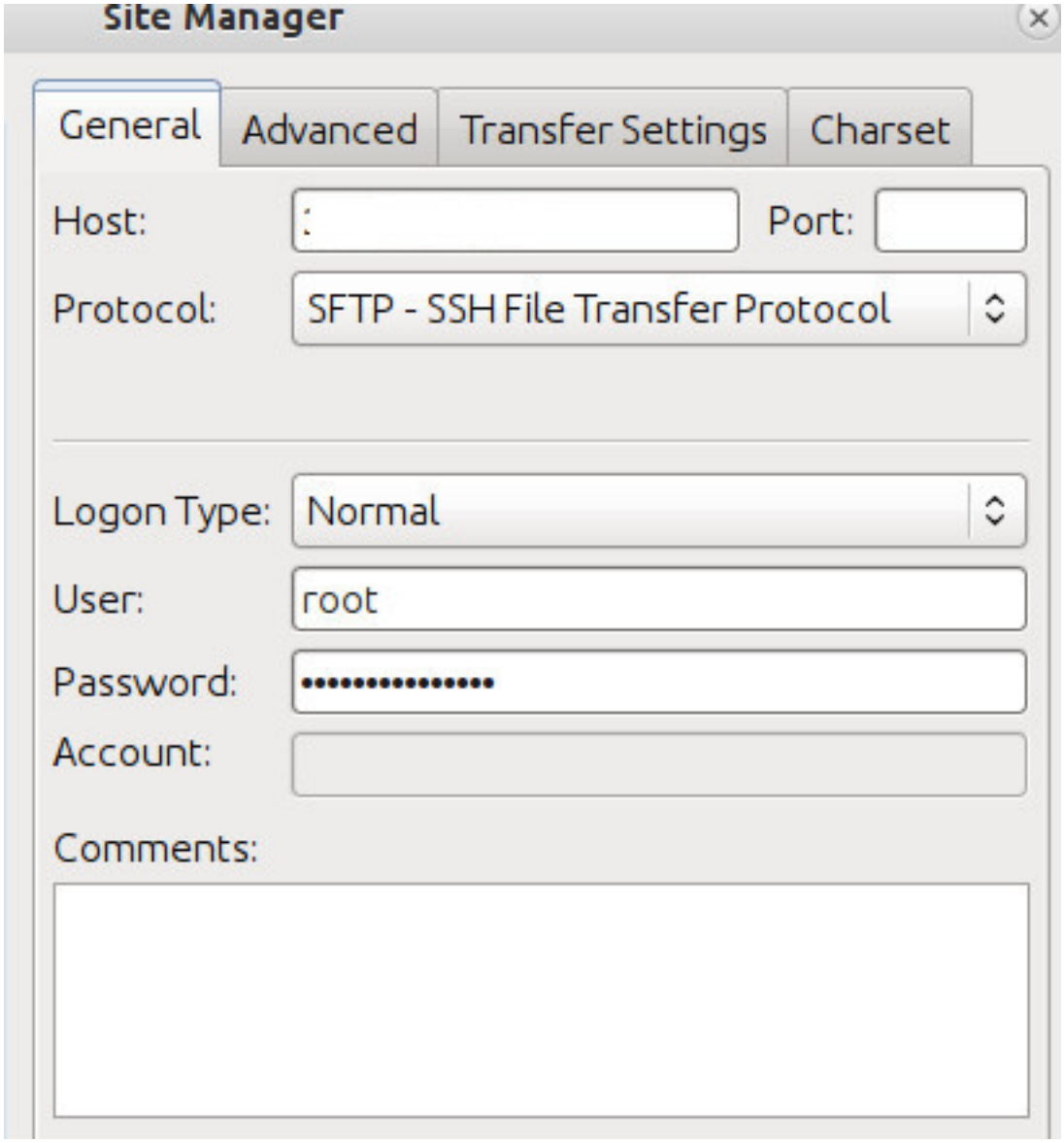
On most server based system there will be different file permissions that can be set for different files, such as shared ones and private ones. Most system files will need to be protected from damage or hacking. The three key determinants and read, write and execute. Most people should be able to read files, but very few should be able to write to a system or execute files as this could lead to damage.

2.5 I can configure access to remote file systems
Candidates should be able to access a remote system to work on it by various means as required.

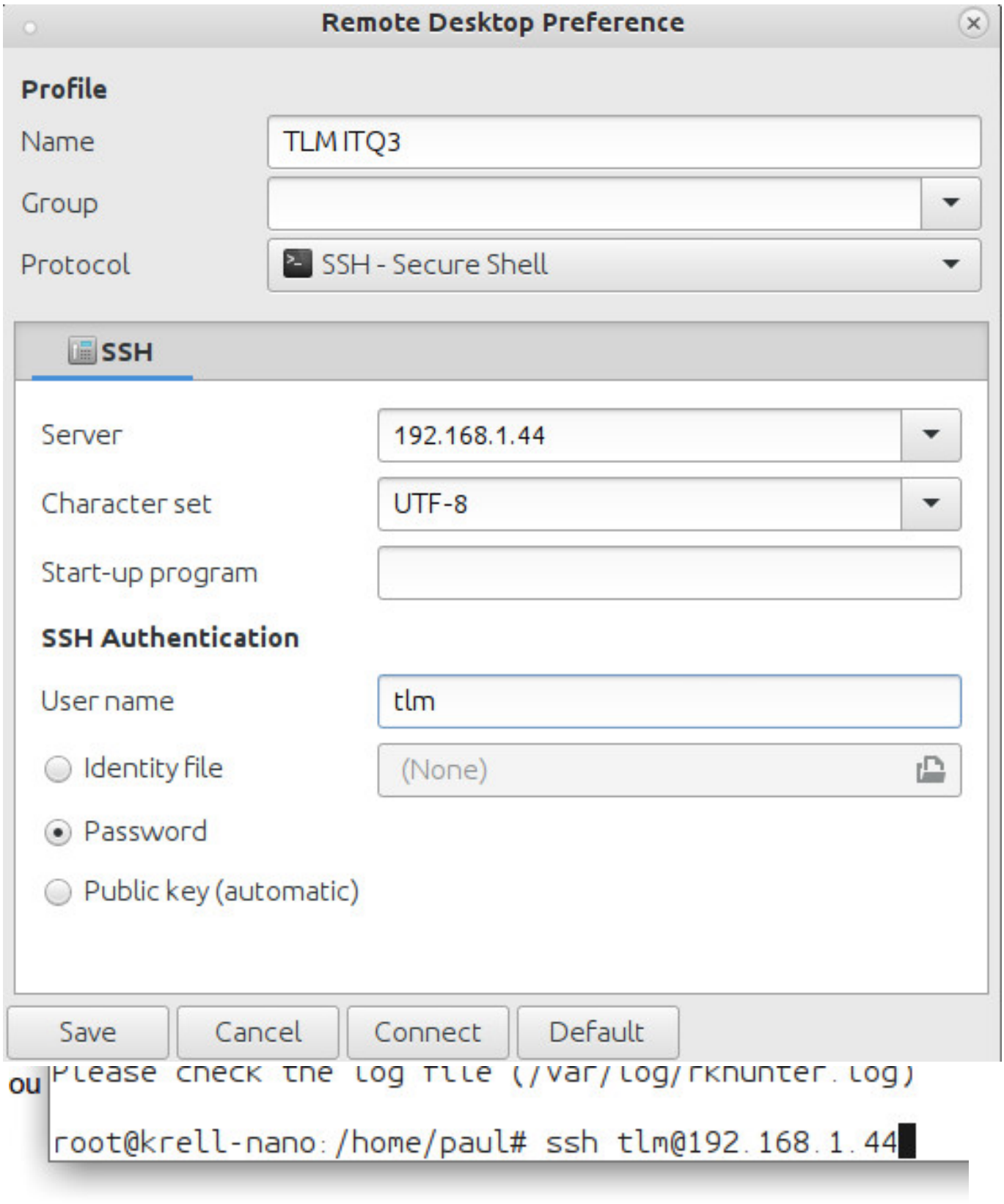
Evidence: will be provided by short guides and assessor feedback.

Additional information and guidance
Depending on the system and the maintenance required, candidates should be able to explore ways of managing a system remotely. In most cases they will probably use a web based interface provided by the computer. For a desktop machine this could be some type of RDP (Remote Desktop Protocol). This needs to be running on the local machine and the settings used on the remote machine to match. There are some web based tools set up to use these protocols and these can be investigated. One popular system is VNC [6] (Virtual Network Computing) which allows control of various operating systems.

Another popular means is via FTP (File Transfer Protocol) or preferably SFTP (Secure File Transfer Protocol) as you don't want man in the middle attacks on your connections. The following is from FileZilla [7].



Candidates should also explore command line access using SSH (Secure Shell Access).



2.6 I can distinguish between data and system file types
Candidates should be able to understand the way an operating system works.

Evidence: will be provided by short guides and assessor feedback.

Additional information and guidance
A computer system has system files which make it work and the individual files that are stored by users and each of these has their own functions, permissions and access. Candidates need to show

that they understand this at a working level. Giving access to a server system file via the web would be a disaster as would locking down a user's file so they can't use it.

```
dr-xr-xr-x 287 root root        0 Apr 12 10:46 proc
drwx------  38 root root     4096 Mar 28 19:26 root
drwxr-xr-x  35 root root     1160 Apr 14 08:22 run
drwxr-xr-x   2 root root    12288 Mar 18 17:47 sbin
drwxr-xr-x   2 root root     4096 Apr 24  2013 srv
dr-xr-xr-x  13 root root        0 Apr 12 10:46 sys
drwxrwxrwt  21 root root    12288 Apr 14 13:44 tmp
drwxr-xr-x  13 root root     4096 Oct 22 11:09 usr
drwxr-xr-x  15 root root     4096 Apr 28  2015 var
lrwxrwxrwx   1 root root       29 Apr  5 14:23 vmlinuz -> boot/vmlinuz-4.2.0-3
-generic
lrwxrwxrwx   1 root root       29 Mar 14 14:35 vmlinuz.old -> boot/vmlinuz-4.2
0-34-generic
-rw-r--r--   1 root root     8741 Apr 28  2015 webmin-setup.out
root@krell-nano:/# cd home
root@krell-nano:/home# ls -l
total 12
drwxrwxr-x 92 paul paul 12288 Apr 14 13:20 paul
```

Each of the above directories has a series of owners and permissions and the important directory folders, such as the root folder, has very little access to anyone other than the owner, root.

3. Candidates will troubleshoot and respond to IT system problems quickly and effectively

3.1 I can assess IT system problems, explain what causes them and how to respond to them to avoid similar problems

Candidates should be able to plan evidence basic skills in trouble-shooting PC systems.

Evidence: will be provided by short guides and assessor feedback.

Additional information and guidance

There are a number of problems which occur regularly in computer systems, such as failing hardware, incorrect drivers following up-grades and other issues. Candidates need to show that they are comfortable fixing most issues and doing various checks to make sure everything is working correctly. They will show the skill in reading the bios for settings, checking some utilities on the operating system to make sure the right drivers are loaded and doing physical checks of hardware t make sure it is seated and installed correctly or using the correct interfaces. It might be useful to draft a table to show some of the common issues and have the correct resolutions. The table might also have suggestions about the most effective time scales for some of these interventions and corrective actions.

3.2 I can carry out contingency planning to recover from system failure and data loss

Candidates should be able to draft and explain a contingency plan.

Evidence: will be provided by short guides and assessor feedback.

Additional information and guidance

Candidates should demonstrate that they have carefully thought through all eventualities surrounding a PC system so that if failure occurs, they should be able to get it back in a reasonable amount of time. This plan may have some caveats, such as they can only guarantee getting 80%

back or that it will take X hours because of Y factors etc. They should explore the different potential disasters and show how they would be dealt with in each case. This needs to be run through, such as restoring a partial or full system to make sure it works in practice as well as theory. The plan might also highlight some of the other facilities and tools that might be required, or if additional resources might be required. Do they have spare hard drives to swap out if one starts to fail on a system for example. It is not expected that they have the skills to recover lost date, but they might be shown how to use recovery tools such as bootable CD drives. There are Linux based distros [8] which are designed only for data recovery.

3.3 I can monitor and record IT system problems to enable an effective response
Candidates should be able to accurately record and respond to problems.

Evidence: will be provided by short guides and assessor feedback.

Additional information and guidance
If candidates are looking after PC systems, the more information about them they record, the better it will be for them and anyone else who works on the system. They should keep a detailed log of what they did, what the information is on the PC, such as serial numbers, driver and OS versions etc. All this will make everyone's job far easier if a problem occurs. It also will be useful when problems occur as you may be able to trace back why it happened as there could be some clues in the detailed logs that are maintained. If, for example, there are a suit of PCs and the logs show a pattern of hard disk failure over a number of years, they can make the decisions to replace all of the hard drives with a different model as it may be a very poorly manufactured batch.

3.4 I can monitor system settings and adjust when necessary
Candidates should be able to use logs and documentation effectively.

Evidence: will be provided by short guides and assessor feedback.

Additional information and guidance
Candidates should be able to keep and use their detailed logs to keep their systems working at their peek. Small tweaks can be made to improve things. For example, some forums will report on small changes to settings that will improve existing systems. Other users may post that a bios update or software revision improves a bug that everyone else experiences. Little changes like this will make the system far easier to maintain and also create a better user experience for their users.

3.5 I can explain when and where to get expert advice
Candidates should be able to plan get help where appropriate.

Evidence: will be provided by short guides and assessor feedback.

Additional information and guidance
Candidates should not be expected to be complete masters of all things PC. In many cases they will come across issues that are beyond their skill set or understanding. In these instances they will need to seek the help of professionals who are more skilled in these areas. The identification of this is an important skill. Part of their log keeping should be a list of contacts or web addresses that are most useful for specific issues.

3.6 I can help others to select and use appropriate resources to respond to IT system problems
Candidates should be able to demonstrate good leadership and team working skills.

Evidence: will be provided by assessor feedback.

Additional information and guidance
Candidates should be comfortable assisting end-users or others in their technical team with issues that they understand. They should be able to demonstrate to others how to fix or improve problems and perhaps have some short guides to allow people to understand if they are not able to physically show them. This can be carried out remotely by some sort of video based technology such as Dead

Simple Screen Share [9] or Big Blue Button [10].

3.7 I can check that errors and problems have been resolved satisfactorily
Candidates should be able to complete tasks satisfactorily.

Evidence: will be provided by assessor feedback.

Additional information and guidance
Candidates should maintain their logs and make sure that they have a good and clear resolution, either by dealing with it themselves or through passing it on to someone else. If they have timelines and objectives they set themselves, they can use these as measures against their performance if required.

4. Candidates will plan and monitor the routine and non-routine maintenance of hardware and software

4.1 I can clarify the resources that will be needed to carry out maintenance
Candidates should be clear about what resources they need to carry out there job effectively.

Evidence: will be provided by short guides and assessor feedback.

Additional information and guidance
Candidates should have some form of log to identify what tools they use and for what purposes. The tools they have will be both physical tools, for taking equipment apart, and software based tools such as diagnostic software and boot disks etc. In most cases, companies will have mixed systems comprised of different operating systems and both fixed and portable devices. Each of these requires a different set of maintenance tools to be dealt with. One of the most effective tools for hardware, for example, is a can of forced air propellant for blowing away the dust that clogs up fans and heat dispensers. Candidates should identify and describe these different tools and resources.

4.2 I can develop a plan for the maintenance of IT hardware and software
Candidates should be able to plan effectively.

Evidence: will be provided by short guides and assessor feedback.

Additional information and guidance
Candidates should have a detailed planning system, whether this is paper based or computer based, in order to track their work. The plan will include, but not be limited too:

- dates and timelines for tasks
- resources required (from 4.1 above)
- actions taken or to be taken
- software upgrades and activities to improve systems
- replacement plans, based on the expected lifetime of devices
- security patches and fixes to code

These plans and preparatory details will greatly help in the ongoing maintenance of systems.

4.3 I can monitor the implementation of maintenance plans, updating them where necessary
Candidates should be able to adjust plans as required.

Evidence: will be provided by short guides and assessor feedback.

Additional information and guidance
There is no such thing as a perfect plan, especially when related to technology, so candidates need to constantly work on and improve their plans so that they can react to issues that arise that are not on their plans. Each time they work through elements of their maintenance plan, they should keep detailed notes and make changes as required. The plan should not be static, but should be a living document. It may be useful sometimes to get some feedback from other professionals as they may be able to guide candidates in better techniques and share some of their insights that have helped. Candidates can also set up or use forums to share ideas and best practices.

5. Candidates will review and modify hardware and software to maintain performance

5.1 I can use appropriate techniques to maintain software for optimum performance
Candidates should be able to plan apply upgrades and patches to keep software performing at the optimum.

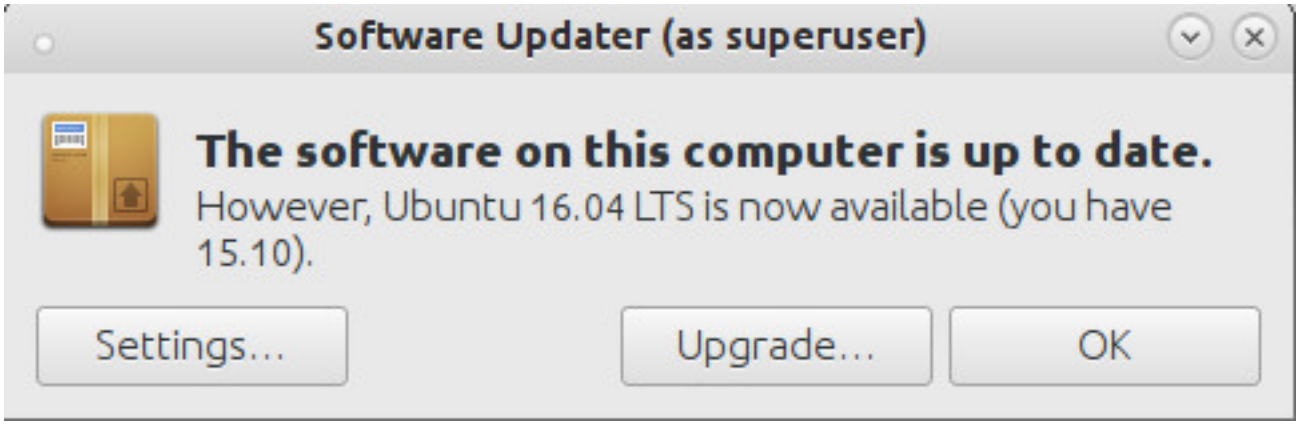
Evidence: will be provided by portfolio work and assessor feedback.

Additional information and guidance
Candidates should use regular update procedures to make sure that software is working as well as possible. The operating system itself generally has patches and updates to key software, particularly for security problems, but also in response to other problems. Operating systems that are slightly older need to be updated to make sure they can work with newer devices such as SSD drives or newer transmission devices, for example using USB 3.0. In most system, they can be set to check for updates on a regular basis and in most cases this an be automated, but some systems will require a re-boot to apply some of there changes so manual intervention may be required and it might have to be built in to their maintenance plans. Application software will need to be updated, but in some cases it will depend on the local situation. When Microsoft Office was radically changed to include the ribbon toolbar, many existing users found it difficult to adjust. This needs to be taken into consideration when deciding to upgrade applications. Candidates should probably have a test machine to try out new updates and check that their effects are not too drastic.

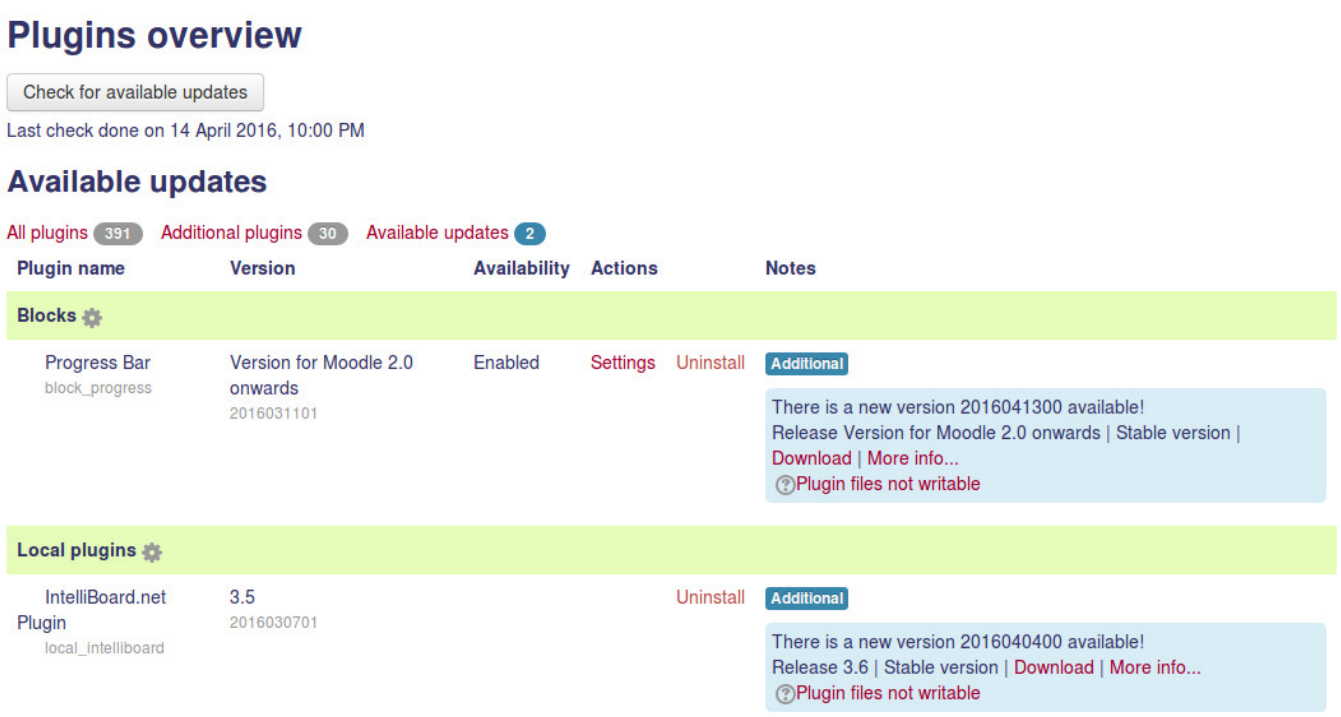
5.2 I can clarify when and how to upgrade software
Candidates should be able to show an appreciation for the process of upgrades.

Evidence: will be provided by portfolio work and assessor feedback.

Additional information and guidance
Candidates should know whn and how to upgrade systems.



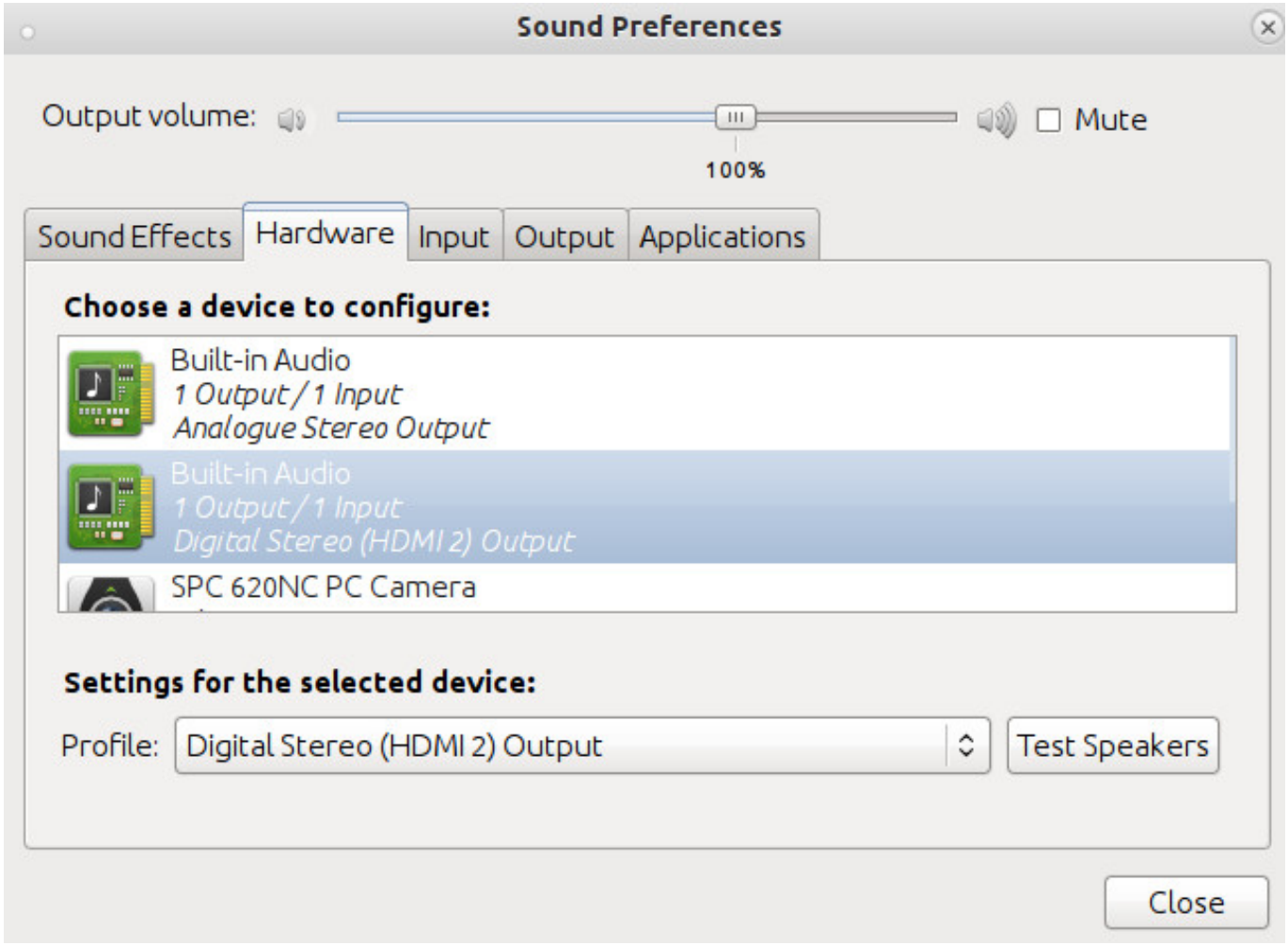
In some cases, they may need to justify why it is not good to upgrade a system. If they have tested it and it introduces some other problems that are too difficult to manage, it may be better to minimise the problems and stick with a smaller risk.



5.3 I can review and modify hardware settings to maintain performance
Candidates should be able to optimise hardware with different methods and tools.

Evidence: will be provided by portfolio work and assessor feedback.

Additional information and guidance
Candidates should be able to understand hardware components well enough to make sure they are working effectively. An obvious one here might be to clean printer heads and checking them to amke sure they work well. Other hardware settings might be changing the colour depth of graphics card or the resolution of monitors to make them work better. Other hardware includes the input devices such as mice or scanners and the output, such as setting the sound driver hardware effectively.



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.

Source URL: https://theingots.org/community/sil3u28x

Links
[1] http://theingots.org/community/ITQ_unit_development
[2] http://theingots.org/community/handbook2
[3] https://theingots.org/community/sites/default/files/uploads/user4/PupilFNC7.pdf
[4] http://www.fail2ban.org/wiki/index.php/Main_Page
[5] https://en.wikipedia.org/wiki/JFS_%28file_system%29

[6] https://www.realvnc.com/
[7] https://filezilla-project.org/
[8] http://redobackup.org/
[9] http://deadsimplescreensharing.com/
[10] http://bigbluebutton.org/