UNIVERSITY OF HULL

Computer Systems Infrastructure and Management (600099)

ACW (100% of Module)

Virtual Machine Configuration and Networking Infrastructure

Deliverables:

Virtual Machine Practical Report: (PDF)	Wednesday 7th May by 2pm	30%
Networking Infrastructure Report: (PDF)	Wednesday 7th May by 2pm	70%

Assignment

The assignment is split into two deliverables, the Virtual Machine Configuration practical, and the Networking Infrastructure theoretical exercise. Both of these submissions are reports, with their own set limits and restrictions. Please read the below sub-sections carefully. Both items are to be submitted to their separate and appropriate sections under Canvas by the deadline provided.

Virtual Machine Configuration

The University has recently acquired some computing resources to facilitate departmental research, as well as PhD research. You have been given to a freshly created Virtual Machine from the IT department which will need configuring appropriately.

Task:

1. Secure, with justification, the root user account
2. Setup administrative users for yourself and one of the academic members of staff (ashley).
3. Set-up and correctly configure the SSH server, taking into account all user account requirements.
4. Create accounts where needed for the following persons:
    a. John Murray - Head of Department
    b. Steve Smith - Is a third year undergraduate student who is supervised by John Murray. John would like a place in /srv/ where he can put files for Steve related to his project.
    c. Laura Lance - Is a marketing department employee, and requires access to /srv/http to see, and put any promotional material. Laura is not familiar with CLI, and only requires SFTP access.
    d. Annika & Albert - PhD students on a Machine Learning research project, requiring access to sensitive data.
5. Store, and secure access to, a research project data directory (under /srv/) for PhD students to have access to. These students should not be allowed to change the data, as this could alter results! Only the academic in-charge of the project, John Murray, should be able to modify things within that folder. Such as uploading new research data, or archiving old data.
6. Critical reflection section, reflecting on the process of learning these tools, and of configuring the VM to this specification. This can include challenges faced (such as error messages) and how you solved them, as well as personal reflections on the process as a whole.

Some “research project data”, alongside a list of public keys for appropriate users is available on Canvas. For the time being John has no data for Steve.

Albert normally uses private keys; however, he asks if he can login with password only from the following host: albert-machine.net.dcs.hull.ac.uk; Everywhere else he has private keys made.

First Steps

Follow the vSphere access instructions, including VPN access. You must rename your VM hostname. This must be done prior to obtaining an IP address via DHCP. Modify /etc/hostname to be Student-XXXXXX where XXXXXX is your ADIR numbers. E.g Student-588664. Then you may use DHCP to obtain an IP address.

Each VM has internet connection for downloading any packages you may need. Each of your VMs is also in a subnetwork, therefore enabling communication between your colleagues for testing purposes. Note: Any abuse of this will be dealt with severely.

Deliverable

A PDF report (Minimum 4 pages; Maximum 8 pages) detailing the steps from the initial machine given to you, towards the goal of configuring to the above specification. You should provide clear and justified rationale for decisions made.
You should include steps taken to verify that changes implemented are working as intended. You may utilise additional software which is required to be installed via pacman; however, these must be justified and fit-for-purpose.

Cover page, table of contents page, appendices, and references sections do not count towards the page limit.

Note: You may request your Virtual Machine be reset back to template. This will remove anything you have configured / installed. Your VM will be fresh again.

Networking Infrastructure

A University is undergoing a new building project as part of their expansion plans. This expansion brings together Engineering and Computer Science departments, by expanding upon their existing Engineering building. Architectural plans have been made available to you so that you may begin the process of designing the Network Infrastructure.

You have been tasked with helping to design the network for the existing portion of the building as well as the new expansion. These include dedicated spaces for each department, teaching spaces, office spaces, and shared spaces.

You must:

1. Design, cost, and justify a suitable network infrastructure to support activities within the building. This will involve taking into account the number of computing labs, office spaces, collaborative shared spaces, and any server rooms. You should consider any networking equipment required as part of your proposed topology, including cabling.
    a. Support both Computer Science and Engineering networks as separate networks.
    b. Shared spaces require access to both Computer Science and Engineering.
2. Provide a full wireless coverage solution, taking into consideration expected client numbers for such a space. You should assume all lab spaces, office spaces, can be fully utilised at once, and that people may be roaming the corridors to get between lectures.

You are free to utilise networking tools/utilities of your choice for modelling the network should you wish.
For the sake of costing, assume consumer prices inclusive of VAT. You may use popular vendors such as Amazon, EBuyer, Overclockers, Novatech, etc. Or directly from the supplier themselves.

Deliverable

Provide a full report (A 10 page maximum PDF), specifying:

1. Problem breakdown (Minimum 1 page, maximum 2 pages)
   This should include your analysis of the task, alongside the requirements generated from the floor plans provided.
2. Solution proposal (Minimum 3 pages; maximum 8 pages)
   a. Based on the requirements you have identified, propose network topologies that will meet the requirements including networking equipment, cabling, etc.
   b. Include locations where cabling, and networking equipment will reside, as well as how they are configured and connected.
   c. A cost breakdown of the proposed solution

Remember, this report must be backed up by justification for design decisions.

Cover page, table of contents page, appendices, and references sections do not count towards the page limit.