COMP1609 (24/25)	Network and Internet Technology and Design	Faculty Header ID: 32017	Contribution: 100% of the course
Course Leader: Jason Parke	Tetcos NetSim Coursework		Deadline Date: Monday 06/12/2024

This coursework should take an average student who is up to date with tutorial work approximately 50 hours Feedback and grades are normally made available within 15 working days of the coursework deadline.

Learning Outcomes:
A. Demonstrate knowledge of network communication, OSI and TCP/IP model.
B. Demonstrate a critical understanding of the top network model with related key protocols, services, and applications.
C. Evaluate common network problems (malfunction, poor performance), and adopt a systematic approach to troubleshooting and resolving the problem.
D. Be competent in the use of tools designed to analyse and simulate network functionality.

Plagiarism is presenting somebody else's work as your own. It includes copying information directly from the Web or books without referencing the material; submitting joint coursework as an individual effort; copying another student's coursework; stealing coursework from another student and submitting it as your work. Suspected plagiarism will be investigated and, if found to have occurred, will be dealt with according to the university's procedures. Please see your student handbook for further details of what is/isn't plagiarism.

All material copied or amended from any source (e.g., internet, books) must be referenced correctly according to the reference style you are using.

Your work will be submitted for plagiarism checking. Any attempt to bypass our plagiarism detection systems will be treated as a severe Assessment Offence.

Coursework Submission Requirements

An electronic copy of your work for this coursework must be fully uploaded by the **Deadline Date of Monday 06/12/2024** using the link on the coursework Moodle page for COMP1609.

For this coursework, you must submit a single PDF document. In general, any text in the document must not be an image (i.e., must not be scanned) and would normally be generated from other documents (e.g., MS Office using "Save As. PDF"). An exception to this is the handwritten mathematical notation (e.g., subnetting), but when scanning does ensure the file size is not excessive.

There are limits on the file size (see the relevant course Moodle page).

Make sure that any files you upload are virus-free and not protected by a password or corrupted otherwise they will be treated as null submissions.

Your work will not be printed in colour. Please ensure that any pages with colour are acceptable when printed in Black and White.

You must NOT submit a paper copy of this coursework.

All coursework must be submitted as above. Under no circumstances can they be accepted by academic staff.

The University website has details of the current Coursework Regulations, including details of penalties for late submission, procedures for Extenuating Circumstances, and penalties for Assessment Offences. See https://docs.gre.ac.uk/rep/sas/academic-misconduct-policy-and-procedure-taught-awards

The coursework detailed specification:

This is an individual assessment. Your investigation should not be shared among other students.

The objective of the coursework is to simulate a client-server model communication over an IP network and to investigate an application and network performance in multiple provided scenarios.

This assessment requires to use Tetcos NetSim simulator.

The network architecture overview:

The company's headquarters are in Johannesburg (South Africa). They have recently opened regional offices in Tokyo (Japan) and Sao Paulo (Brazil). The main service provided by the Tokyo and Sao Paulo offices will be gathered and distributed monthly and annual reports describing sales managed by the headquarters in Johannesburg (South Africa). The company has decided to perform a simulation to investigate the feasibility of expanding to an additional call centre.

Johannesburg (South Africa) LAN: The network is undefined and needs to be designed by the student with justifications, this implies justification of several nodes, users, and applications.

Tokyo (Japan) LAN: This site consists of 5 users connected to a core switch, Local printer, and email. They are connected to the Internet via a backbone link. Some applications, run by users including printers and databases, are local and others like web browsing and MS OneDrive are supported including remote desktops, in Johannesburg. Additionally, 10 users work from home using MS Teams and Zoom with all supported services.

Sao Paulo (Brazil) Office LAN: This site consists of 5 users connected to a core switch, Local printer, and email. They are connected to the Internet via a backbone link. Some applications, run by users including printers and databases, are local and others like web browsing and MS OneDrive are supported remotely, in Johannesburg. Additionally, 5 users work from home using MS Teams and Zoom for voice and video calls.

Network Operations Centre (NOC): This site consists of 5 users connected to a core switch, Local printer, and email. They are connected to the Internet via a backbone link. Some applications run by users including printers and databases are local and others like web browsing and MS OneDrive are supported remotely, in Johannesburg. All users run MS Teams and Zoom conferencing applications with Sao Paulo Office.

The tasks:

The objective is to perform group literature research, individually build a Tetcos NetSim simulation model based on the network architecture given and evaluate the behaviour of network parameters gained by simulating the use cases. The design, implementation and simulation discussion imply the inclusion of graphs and justification of made decisions or the results achieved through the simulation.

The tasks:

1. The objective is to perform ***group*** literature research.
   Perform literature research on the technologies that are used in a modern network.
   CHOOSE 3 from the following list of network technologies: -
   i. 5G and WiFi 6 technology
   ii. Artificial Intelligence (AI) and Machine Learning (ML)
   iii. Augmented reality and virtual reality
   iv. Cloud computing
   v. DevOps
   vi. Digital transformation
   vii. Intent-based networking (IBN)
   viii. Internet of Things (IoT)
   ix. Data Security
   x. SD-WAN
   There are multiple providers of such services, some examples, are Amazon AWS, CrowdStrike and CISCO (BUT NOT LIMITED TO). Critically discuss these technologies concerning the scalability and transparency of communication, providing examples. Identify two or more commercial risks arising due to the failure of such cloud services. The discussion should be documented and should be approximately 700 words. The group should consist of two roles:
   Risk assessor: The risk assessor evaluates the potential threats.
   Upgrade engineer: The upgrade engineer must review the technologies from a benefit point of view. **[GROUP TASK] 10%**

2. Design, implement and simulate your model in the Tetcos NETSIM simulator guided by the given network architecture overview. The design requires detailed documentation on the application and performance settings in the Tetcos NETSIM simulator for each user and these settings justifications. Following the implementation, you are required to simulate your scenario. **[INDIVIDUAL TASK] 15%**

3. The documentation must contain a table of your subnetting schemes for each LAN/WAN/MAN. **Note: You should configure Tetcos NetSim to use these subnets and show evidence of this.** You must provide the following: Network Address, Broadcast Address, Usable Addresses, and IP Address assignments to hosts. You must use at least two classes from the Private Address Space. **[INDIVIDUAL TASK] 15%**

4. Conduct an analysis of the behaviour of the network performance in a variety of cases. The analysis must be done regarding your expectations. Discuss the scenario and hypothesize on the possible outcomes of provided use cases followed by the **analysis of the results** that were received from the simulation.
   [INDIVIDUAL TASK] 20%

5. For additional marks include analysis on each of the following
   [INDIVIDUAL TASK] 20%:

   i. Utilization of the backbone link.
   ii. Cloud Storage (OneDrive) average file download time
   iii. Web Server page response time.
   iv. The behaviour of MS Teams/Zoom applications.
   v. Ethernet delay on the network (bottlenecks)

6. Simulate the following expansion use case: The new NOC will communicate with the Tokyo and Sao Paulo offices. It is planned that 4 new users will communicate with the Sao Paulo office and 3 new users will communicate with the Tokyo office. All offices will communicate via MS Teams or Zoom. Investigate the behaviour of the MS Teams vs Zoom in the given scenario. **[INDIVIDUAL TASK] 5%**

7. Evaluate the network performance, where you introduce improvements based on what you have identified.
   [INDIVIDUAL TASK] 5%

8. Provide a critical reflection on the tasks you carried out.
   [INDIVIDUAL TASK] 5%

9. The document must include your concluding comments.
   [INDIVIDUAL TASK] 5%

Note:

Perform the analysis of the results starting from the first minute. This should be done, to reduce the noise from the data caused by the initialization of network devices such as routers and switches which may have an impact on your investigation.

The group assessment should be completed in pairs and must include the following: -

1. You must provide the names of all participants who contributed to the group work.
2. Your submission must include exact copies of the group work.

Deliverables (No more than 2000 words):

A good structure report must include the following:

- A literature review on the technologies used in a provided network architecture and the benefits of using cloud services. Refer to Task 1.
- Description of the designed and implemented scenarios, including the justifications for the design and choice of performance parameters. Refer to Task 2.
- Documentation on the investigation of required features and use cases, including graphs and analysis of the results of the simulation. Refer to Tasks 3, 4, and 5 and the subcategories.
- Based on the results; recommend your choice of consideration to improve the network model. Refer to Task 7
- A critical reflection that is both evaluative and reflective. Refer to Task 8.
- Concluding comments. Refer to Task 9.

Assessment Criteria:

A. Review of technologies and cloud services discussion. (Task 1)	10%
B. Justified design and simulation of the network architecture and application models. (Task 2)	15%
C. A neatly presented subnetwork scheme (Task 3)	15%
D. Investigation and analysis of the results. (Task 4 + Task 5)	40%
E. Expansion use case investigation (Task 6)	5%
F. Recommendation(s) of your choice for improvement of network architecture. (Task 7)	5%
G. Critical reflection (Task 8)	5%
H. Conclusion (Task 9)	5%

>80% Excellent

Evidence of in-depth understanding, detailed investigation and analytical explanation of the results, critical and evaluative conclusion. The analysis must include a graphical representation of the results and any relevant network diagrams and identification of trends in the data. All sections were completed to an excellent standard.

70-79% Very Good

Evidence of clear understanding, good analysis of the results and some critical and justified evaluation in the conclusion. The analysis must include a graphical representation of the results and any relevant network diagrams and identification of trends in the data. All sections are completed to a consistently good standard.

60-69% Good

Evidence of an understanding of the networking fundamentals, some results attained and presented. Correct but not incredibly detailed analysis, limited evaluation (but there must be some), all sections attempted and provided.

50-59% Satisfactory

Limited data samples and results, shallow analysis, or evaluation. Some essential elements may be missing. The provided documentation must be correct. Conclusions must be included and must be justifiable.

<49% Fail

A poorly written report without structure. The essential elements are missing, insufficient data samples. Little or no evidence of having devised or conducted research and experiments. Little evidence of understanding, poor or incorrect analysis or the conclusion.

Criteria for Assessment	90-100 Exceptional	80-89 Excellent	70-79 Very Good	60-69 Good	50-59 Satisfactory	30-49 Fail	0-29 Fail
Assessment Domain 1 (Knowledge) Demonstrate a critical understanding of the technical challenges posed by current mobile systems and wireless communications.	Demonstrates an exceptional systematic understanding of Network and Internet Technology and Design and their technical challenges. The motivation and rationale of a chosen area is underpinned by an exceptional understanding of relevant theory and best practices and engagement with the literature.	Demonstrates an excellent systematic understanding of Network and Internet Technology and Design and their technical challenges. The motivation and rationale of a chosen area are underpinned by an excellent understanding of relevant theory and best practices and engagement with the literature.	Demonstrates a very good understanding of Network and Internet Technology and Design and their technical challenges. There is evidence that relevant theory and best practices have been applied effectively in the choice of area, and there is engagement with the literature.	Demonstrates overall a good understanding of Network and Internet Technology and Design and their technical challenges. There is some evidence that relevant theory and best practices have been applied effectively in the choice of area, and there is some engagement with the literature.	There is satisfactory evidence that at least some Network and Internet Technology and Design practices have been applied and supported by the literature.	There is a lack of understanding of Network and Internet Technology and Design and their technical challenges. The choice of the research problem lacks justifications and is not supported by the literature.	There is hardly any engagement with relevant technologies, technical challenges, and best practices. The choice of the research problem is not based on engagement with the literature.
Assessment Domain 2 (Research) Be able to understand and evaluate the key security threats that relate to different.	The assignment provides exceptionally strong and consistent evidence of critical evaluation when considering the security	The assignment provides excellent evidence of critical evaluation when considering the security vulnerability or vulnerabilities of	The assignment provides very good evidence of critical evaluation when considering the security vulnerability or vulnerabilities of the chosen	The assignment provides some good evidence of critical evaluation when considering the security vulnerability or vulnerabilities of the chosen	There is some evidence that at least some of the security aspects of the chosen configuration have been considered.	There is a lack of understanding of the security aspects of the chosen configuration. No evidence	There is hardly any engagement with understanding the security aspects of the chosen configuration. No evidence of

Network and Internet Technology and Design, as well as appropriate countermeasures .	vulnerability or vulnerabilities of the chosen configuration and the appropriate countermeasures . The understanding is supported by extensive literature.	the chosen configuration and the appropriate countermeasures . The understanding is supported by extensive literature.	configuration and the appropriate countermeasures . The understanding is supported by the appropriate literature.	configuration and the appropriate countermeasures . The understanding is supported by some literature.	The understanding is supported by some literature.	of supporting literature.	supporting literature.
Assessment Domain 3 (Evaluation) Understand and communicate the performance, costs, overheads and trade-offs of different wireless and mobile communication technologies.	The assignment provides exceptionally strong and consistent evidence of critical evaluation when considering the adequately chosen performance metrics, cost, overhead and trade-offs of the used technologies. The results of the analysis have been clearly presented in accordance with	The assignment provides excellent evidence of critical evaluation when considering the adequately chosen performance metrics, cost, overhead and trade-offs of the used technologies. The results of the analysis have been clearly presented in accordance with the provided guideline.	The assignment provides very good evidence of critical evaluation when considering the chosen performance metrics, cost, overhead and trade-offs of the used technologies. The results of the analysis have been presented in accordance with the provided guideline.	The assignment provides some good evidence of critical evaluation when considering the chosen performance metrics, cost, overhead and trade-offs of the used technologies. The results of the analysis have been presented mostly in accordance with the provided guideline.	There is some evidence of evaluation with respect to performance metrics, cost, overhead and trade-offs of the used technologies. The analysis is not very conclusive. Satisfactory presentation of the results.	The assignment provides little evidence of evaluation with respect to performance metrics, cost, overhead and trade-offs of the used technologies. Not satisfactory presentation of the results.	The assignment lacks evidence of evaluation with respect to performance metrics, cost, overhead and trade-offs of the used technologies. No results have been provided.

	the provided guidelines.						
Assessment Domain 4 (Communication) Be able to communicate available technologies for the design and implementation of mobile and wireless networks according to user requirements.	Communicates an exceptional systematic understanding of Network and Internet Technology and Design processes based on user requirements. The understanding is supported by extensive literature.	Communicates an excellent and systematic understanding of Network and Internet Technology and Design processes based on user requirements. The understanding is supported by extensive literature.	Communicates a very good understanding of Network and Internet Technology and Design processes based on user requirements. The understanding is supported by the appropriate literature.	Communicates overall a good understanding of Network and Internet Technology and Design processes based on user requirements. The understanding is supported by some literature.	There is satisfactory evidence that at least some user requirements have been. Communicated in Network and Internet Technology and Design processes and is supported by some literature.	There is a lack of understanding of Network and Internet Technology and Design processes based on user requirements. No evidence of supporting literature.	There is hardly any engagement with an understanding of Network and Internet Technology and Design processes based on user requirements. No evidence of supporting literature.
Assessment Domain 5 (Referencing) Determining appropriate resources. Sources used are acknowledged in the text and reference list using correct academic citation	Evidence of determining an extensive list of outstanding resources. All sources used are acknowledged.	Evidence of determining excellent resources. All sources used are acknowledged.	Evidence of determining very good resources. All sources used are acknowledged.	Good evidence of determining appropriate resources. All sources used are acknowledged.	Some evidence of determining appropriate resources. Most sources used are acknowledged	Poor evidence of determining appropriate resources. Most sources used are not acknowledged	No evidence of determining appropriate resources. Sources used are not acknowledged

Assessment domain 6 (Employability) Developing transferable skills such as interpersonal skills and human relations within teamwork, organisation, and communication. Also, time management and commitment to meeting goals, both short-term and long-term. Ability to reflect on these skills.	Outstanding and effective group dynamics. Outstanding effort to communicate, motivate and inspire members of the CW group. Outstanding evidence of ability to reflect on group work. Outstanding time management and meeting goals ahead of the planned time.	Excellent participation in group work. Excellent effort to communicate, motivate and collaborate with members of the CW group. Excellent evidence of ability to reflect on group work. Excellent group dynamics. Excellent time management.	Very good participation in group work. Very good effort to communicate and collaborate with members of the CW group. Very good evidence of ability to reflect on group work. Very good group dynamics. Very good time management with no issues in committing to meeting goals.	Good participation in group work. Good effort to communicate and collaborate with members of the CW group. Good evidence of ability to reflect on group work. Good group dynamics with minor issues. Good time management with minor issues in committing to meeting goals.	Some participation within group work. Limited effort to communicate and collaborate with members of the CW group. Some evidence of ability to reflect on group work. Group dynamics have areas of concern. Okay, time management with some issues in committing to meeting goals.	Poor participation in group work. Little effort to communicate and collaborate with members of the CW group. Poor evidence of ability to reflect on group work. Poor group dynamics with a range of issues. Poor time management.	Nonparticipation or very poor participation within group work. No evidence of effort to communicate and collaborate with members of the CW group. Very poor time management. No evidence of the ability to reflect on group work.