CSYM029: Computer Networks
Mobile Signalling – Spring semester

Assignment

Part-1 (70%): Software Defined Network
Part-2 (30%) :LTE signalling

Part-1 (70%): Software Defined Network

MSc Computing (Computer Network Engineering)

Aspect (& weighting)	Excellent	Very Good	Satisfactory	Needs some more work	Needs much more work
Assessment Feedback					
Content					
Critical Analysis					
Structure					
Referencing					
Presentation + Discussion					
Specific aspects of the assignment that the marker likes:		Specific aspects of the assignment that need more work:			
Tutor's Signature:		Date:		Grade	

NB.   By entering your **name**(s) and **student ID**(s) you are asserting that this submission is entirely your own individual (or group) work
You must hand in this Front Sheet (fully filled-in) along with the deliverables.

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Section 1   SDN Assignment Brief

You are required to prepare lab activities paper (see appendix 1 for details) to present one of the following SDN topics:

1. Understand the architecture of OpenDaylight controller and using it to control random topology (Mininet and HP SDN switches). Measuring its performance parameters (delay and throughput).

2. Understand the architecture of Floodlight controller and using it to control random topology (Mininet and HP SDN switches). Measuring its performance parameters (delay and throughput).

3. Understanding the code and the operating of the FlowVisor controller and using it to control network with multiple controllers.

4. Understanding how to build a cluster of controllers (most popular methods)? Explain and implement the code examples in the Giti-Hub.

5- Find a well-known SDN project topology and mimic it to Mininet. Building two VLAN policies (Day & Night polices) with following conditions:

   a) Network usage policy1(Day policy): (VLAN1 100%, VLAN2 70%, VLAN3 50%, and VLAN4 30% of number of the network switches).
   b) Network usage policy2(Night policy): (VLAN1 80%, VLAN2 30%, VLAN3 80%, and VLAN4 50% of number of the network switches).
   c) All VLANs equally cpu usage and equally share the bandwidth of shared links.
   d) VLAN switches must be connected (to be able to communicate with controller through its own network).
   e) The network change form policy 1 to policy 2 after a specific period of time or a keyboard interrupt.

Notes:
   - The mimics network must has the exact topology(links, BW, and distances "delay") of the original network.
   - The original topology reference should be provided.
   - The test depend on the network connectivity in the two cases.
   - VLAN 100% usage means, that VLAN has at least used one port in all switches.

Section 2   SDN Deliverables

1. The lab activities should be limited to 4000 words and the lab activities paper should be submitted as cisco Lab activities paper, and the format are available in the assignment folder.
2. 20 minutes Demo and Presentation in class and then 10 minutes question and answers which is equivalent to (3500 words).

Section 3 SDN Assessment Criteria

(A- to A+): An exceptional paper, demonstrating strong evidence of original thinking around a clearly articulated work; the paper should have a good structure and be well organized; the paper demonstrates a capacity to analyze and synthesize; superior grasp of the subject matter with sound critical evaluations; evidence of extensive knowledge base is expected; clear and effective writing style and appropriate referencing format

(B- to B+): The paper shows strong evidence of a very good grasp of subject matter; coherent structure; strong evidence of critical capacity and analytic ability as well as strong understanding of relevant issues; although a substantial research effort may not have been made, there should be strong evidence of familiarity with the most relevant literature.

(C+): The paper shows satisfactory evidence of grasp of subject matter; critical capacity and analytic ability as well as a reasonable understanding of relevant issues; although a substantial research effort may not have been made, there is an evidence of familiarity with the most relevant literature.

(C- to C): Such a paper lacks or does not develop a coherent or clear thesis statement, but some effort is made to structure the paper around an argument; nevertheless, there is little attempt to develop or sustain a coherent argument throughout the paper; the paper demonstrates an understanding of the subject matter; Paper reflects acceptable but uninspired work; it lacks style and vigour (especially in argumentation).

(F- to F+) This grade is reserved for papers with little or no evidence of understanding of the subject matter; no thesis statement is made; there are weaknesses in critical and analytic stills; major errors are made in discussions of the subject matter; the literature used is limited or irrelevant; or the subject is not on list of paper topics or has not received prior approval by the instructor.

Section 4   Appendix 1 (structure of the Lab activities paper)

An Example of Lab Activities paper is uploaded in the assignment Folder in Nile called (Lab Activities paper as an example.pdf). Please follow the same structure in presenting your SDN Lab activities.

Part-2 (30%): LTE signalling

Section 5 Background information

LTE have been designed by a collaboration between global and regional standardization bodies known as the 3GPP Long-Term Evolution. LTE is the direct descendant of the Universal Mobile Telecommunications Service (UMTS) standard, known as the 3G cellular telephony. Although LTE architecture and spectrum design has changed a lot since the UMTS era, similarities between the two cellular communications standards are still very obvious.

The enormous growth of cellular communications in the past decade, even before the introduction of LTE, has significantly increased the needs for channel capacity resulting to an enormous increase in the number of communication cells in a network. As a consequence, signalling between nodes in a cellular communications network has been consuming lots of the wired and wireless resources, hence reducing the throughput performance of the cellular network. This effect is often referred to as the "signalling tsunami".

To address the signalling tsunami problem, an important change in the design of the LTE architecture combined with some new signalling methods have drastically facilitated the smooth operation of 4G networks. The main improvement in the network architecture is the introduction of a special network node that will only handle signalling and will manage its own resources, saving the user channel resources intact.

Section 6 Statement of requirements

This assignment is designed to help students comprehend the signalling operation at the background of typical LTE communication systems. You will be asked to investigate LTE signalling procedures, messages and message contents and create video of the procedures, demonstrating the flow of the messages in an LTE network.

You will be expected to demonstrate exceptional understanding of the LTE network architecture and topology. The assignment will be aligned with the module contents between weeks 23 – 29 of the spring semester. It is strongly advised that students will use a simulation tool of their choice to demonstrate real life signalling scenarios.

Signalling scenarios will be given to the students in the class by the instructor.

Section 7 Additional requirements

7.1 Interfaces
- However, the increased need for interconnections between various communication nodes have made interfaces and functions a lot more complex. You will need to investigate all functions and parameters of the interfaces involved in your given signalling scenario.

7.2 Architecture / Nodes
- Given the LTE flat architecture, some functions have been simplified when compared to the UMTS or GSM. You will need to investigate all functions of the LTE network communication nodes involved in your given signalling scenario.

7.3 Functionality
- Given the various communication nodes and interfaces of the LTE network, some procedures could be completed via different network nodes or over various interfaces. You are expected to investigate as many scenarios as you can for your given procedure.

Section 8 Deliverables

8.1   Assignment / Report

a.   You are expected to write a full report describing all the functions of your scenario satisfying the requirements in Section 2 and Section 3. The report should not exceed 4000 words.

b.   In your report you should clearly present:

    i.   A drawing of your scenario's network design using some professional drawing tool (MS Visio, e-draw, MS Powerpointetc).

    ii.   The functionality of each and every one interface in your network.

    iii.   The functionality of each and every one communication node in your network.

    iv.   The alternative options to perform the exact same function over various network devices or interfaces.

8.2   Demonstration

a.   You are expected to create a video that does not exceed 10 minutes in duration where you will fully demonstrate the proceduresof your given LTE signalling scenario.

b.   The video should clearly show

- the flow of the messages between network nodes
- the contents of the message at each stop

c.   Your video should be uploaded on a video sharing website (youtube, vimeo, dailymotionetc) and it should be kept private (non searchable).

d.   The link to your video should be provided in the cover page of your report.

e.   If you fail to provide a video with your given scenario, your grade will be capped to F-.

Section 9 Personal Development & Key Skills

This assignment provides an opportunity to add to your personal development portfolio as indicated below:

Key Skill	Y/N
1 **Managing the Learning Process:** Ability to evaluate learning styles, identify strategies for approaching study tasks, manage and organise oneself taking responsibility for decision-making, target-setting and delivery of action.	**Y**
2 **Communication Skills:** The ability to express, discuss and present knowledge, ideas and viewpoints to a variety of audiences with confidence and clarity.	**Y**
3 **Groupwork:** The ability to work harmoniously and productively as a member of a group in a variety of roles, demonstrating an awareness of group dynamics, appropriate inter personal and interactional skills.	**N**
4 **Information Skills:** The ability to identify information needs, access and evaluate a range of relevant sources, organise and use information efficiently and effectively for both academic and professional purposes.	**Y**
5 **Problem Solving:** The ability to identify problems and to apply concepts, principles and techniques in order to generate solutions, choose between alternatives and take appropriate action.	**Y**
6 **Use of IT:** The ability to effectively use key information technology and appropriate software to assist in the learning process through research and retrieval, communication and manipulation of information in various forms.	**Y**
7 **Application of number:** The ability to understand, interpret and use numerical and graphical information accurately and effectively.	**N**

Remember to consult and completing your **Key Skills Checklist** or **Skills Development Plan** as appropriate, to help you to identify current strengths and how you can build on these, as well as highlight areas that need improving. At the end of each year you can complete a new skills checklist/plan, based on your learning experiences.
Year 1:
http://pdp.northampton.ac.uk/Year1_Files/docs/Key%20Skills%20Checklist.doc
Year 2:
http://pdp.northampton.ac.uk/Year2_Files/Docs/Stage2SkillsDevelopmentPlan.doc
Year 3
http://pdp.northampton.ac.uk/Year3_Files/Docs/Skill%20Development%20Plan%20year%203%20generic.doc