Coursework commentary 2018–2019

CO2222 Data communications and enterprise networking

Coursework assignment 1

General remarks

This was the first of two coursework assignments for CO2222. It required students to perform five tasks, using different features of the ping and traceroute utilities, and an open source network analysis tool (Wireshark) in order to provide an understanding of the main factors that contribute to delay in communication networks (namely, propagation, transmission and queuing delays). Reasonably detailed instructions were provided, together with some advice and details of what was required from the write-up, both in terms of content and the marks available for the various tasks.

This was a straightforward assignment and students who followed the instructions and advice generally scored good marks, as is evident from the mark distribution below, with 91 per cent of students achieving *Very good* or *Excellent* grades.

However, a small number either didn't do what was asked and/or appeared to pay little or no attention to the marking scheme. Common mistakes were to just report results with little detail of the method and little or no analysis. The majority of marks (60 per cent of the total) were available for the method and analysis sections, so this was a serious error.

See cohort mark distribution for 2018–2019 below:

CO2222 CW1 Cohort mark distribution 2018-19

Legend:
- Excellent
- Very good
- Good
- Acceptable
- Fail
- Suspected Plagiarism
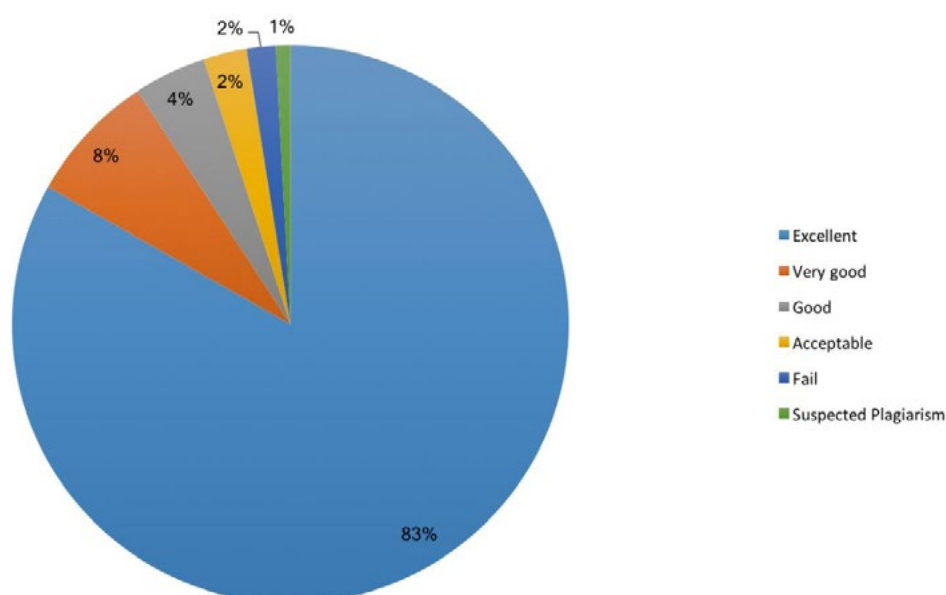
Comments on specific questions

Task 1

This task asked for a short report on the main features and operation of the ping and traceroute utilities, by way of an introduction to the coursework and an aid to understanding these tools. Only 5 marks were available for this section, so a brief and concise report on each is all that was expected. A number of students produced quite lengthy reports, far more than required, and often simply copied and pasted from websites. While this might simplify the writing of the report, it rather defeats the object of this introductory task which is, as previously stated, to aid with understanding in order to assist with the interpretation and analysis of the results obtained in the subsequent tasks.

Task 2

This task asked students to find a nearby host that responded to the ping command and then to determine the maximum packet size (MTU) that could be transmitted, using this command. Details were given on how to perform a binary search in order to find this value, which the majority of students followed, though not all used the required method. A few also lost marks for simply stating the MTU they had 'found' with no results from their trials. Without results, it is impossible to know if any ping commands were actually sent or if the 'answer' was simply obtained from a website. A good solution provided a summary for each MTU tried, with one or two screenshotsin an appendix. The final part of this task asked for an explanation of the MTU size reported. Performance here was variable. The best solutions provided a clear discussion of the TCP/IP and Ethernet frame formats, and thereby a clear rationale as to why the standard had been set to this value. The least satisfactory solutions either showed little understanding of the network constraints and/or just appeared to have pasted sections from the web, suitably referenced but with minimal or no comment.

Task 3

This involved the identification of three host sites, each one on a different continent, that responded to ICMP echo, and then to perform some measurements to investigate the correlation between Round Trip Time (that is, the time it takes for a packet to be transmitted and for an acknowledgement to be returned) and the size of the packet being sent. This task required a little more by way of processing the results, with a scatter diagram and trend line being presented and the calculation of the correlation. Most students produced a scatter diagram, but many omitted the trend line and a significant number ignored the correlation calculation – the main purpose of this section of the assignment. Of those who did produce a correlation value, a number did not comment on how they had obtained it. A good solution explained how the correlation had been calculated with an explanation of the meaning and significance of the value.

The final part of the task asked students to explain their results in respect of the various delays that might impact Round Trip Time. This was arguably the least well attempted part of this task, with many submissions simply providing a textbook summary of the three main factors with little or no attempt to relate it to the results obtained.

Task 4

This task asked students to carry out traceroute investigations of the three host sites identified in Task 3. Candidates were asked to comment on the routes taken by their packets and to explain why these may not have been as expected, and how that may have affected results in earlier tasks. A good solution here explained how geographical distance is not a good predictor of the route taken and hence round trip delays, using data from Task 3 to illustrate the answer. Performance on the last element was variable with a significant number making no reference back to the preceding task.

Task 5

This was fairly open-ended and potentially the most difficult but most rewarding part of the coursework assignment. It involved downloading and installing Wireshark, an open source network analysis tool, and then using this to analyse a complete TCP transaction with one of the hosts used in Tasks 3 or 4. Wireshark is a technically advanced piece of software and requires some skill to install and operate. Likewise, large and complex output traces are produced, and some experimentation and skill is required in order to set up filters to extract only the information that is relevant for a particular test. Most students performed well on this part of the assignment, demonstrating good mastery of the package but comment/analysis of the data obtained was more variable. As with the previous Tasks, a good answer used the findings to suggest or explain earlier observations, especially where there were apparent anomalies (for example, round trip delays were longer to some sites that were physically closer to the user).

The **Conclusions** section was intended for candidates to comment on their overall findings and what had been learned from the tasks. Solutions here were somewhat variable with some being just a few lines while others were more comprehensive. A good conclusion provided a very brief summary of the main findings, comments and possible explanations for any unexpected results, and how this affects modern network architectures and operation.

Finally, although the need for a **Reference section** was not mentioned explicitly, references should be included for any piece of work where use is made of other published material.