Coursework commentaries 2016–17

CO2222 Data communications and enterprise networking – Coursework assignment 1

General remarks

This was the first of two coursework assignments for this subject. 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 demonstrate an understanding of the main factors that contribute to delay in communication networks (i.e. propagation, transmission and queuing delays). 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 coursework assignment and students who followed the instructions and advice generally scored good marks. However, a number did not do what was asked of them, and/or appeared to pay little or no attention to the marking scheme. Common mistakes were to just simply report results with scant detail on the method used and little or no analysis. This was a serious error as the majority of marks (60 per cent of the total) were available for the **method** and **analysis** sections.

Comments on specific questions

Task 1 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 five marks were available for this section, so a concise report on each is all that was expected. Many students produced quite lengthy reports, far more than required.

Task 2 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 the ping command. Details were given on how to perform a binary search in order to find this value, which most students followed, but not all used the required method. A few also lost marks for just 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 screen dumps in an appendix. The final part of this task asked for an explanation of the MTU size reported. Performance here was very 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 showed little understanding of the network constraints and/or appeared to have simply cut and paste sections from the web, usually cited and referenced, but with minimal or no comment.

Task 3 involved the identification of three host sites, each on a different continent, which responded to Internet Control Message Protocol (ICMP) echo, and required students to perform some measurements to investigate

the correlation between Round Trip Time (i.e. 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 more effort in terms of processing the results, including the presentation of a scatter diagram and trend line, and 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, many 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.

Task 4 asked students to carry out traceroute investigations of the three host sites identified in Task 3. Students 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 results in round-trip delays.

Task 5 was fairly open-ended and potentially the most difficult but most rewarding part of the assignment. It involved downloading and installing Wireshark, an open source network analysis tool, and then using this to analyse complete TCP transactions. 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 to a particular test. Most students performed well on this part of the assignment in spite of a problem with the brief which advised that a traceroute transaction should be monitored. This was not possible, and most students quickly realised this and switched to monitoring access to a website.

The concluding section was intended for students to comment on their overall findings and what had been learned from the tasks. Solutions here were somewhat variable. A good conclusion provided a concise summary of the main findings, comments and possible explanations for any unexpected results, and outlined what had been learned.

Finally, references should have been included where published material was used, with in-text citation, following the Harvard system.

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CO2222 Data communications and enterprise networking – Coursework assignment 2

General remarks

This was the second of two assignments for this course. The aim of the assignment was to provide the opportunity for students to develop their skills by applying knowledge gained in the taught element of the course to solve a real-world problem, namely road pricing or congestion charging.

This assignment provided an opportunity to research and propose a design for a metropolitan area network to meet a given specification, using existing network links as far as possible. The scenario given involved a government contract to outline the infrastructure needed to support a road pricing system that was both cost effective and simple to install. A report providing an overview of a number of existing systems was suggested by way of background reading.

A reasonably detailed set of design considerations, (a) to (e), and a marking scheme were provided to guide and advise students on the format and relative weightings of the various required elements of the report.

Comments on specific questions

There was no single 'best' solution to this task, a good answer would have justified whether a client- or server-based architecture was preferred and developed a possible design around this. There are good arguments in favour of both client-server and centralised systems (see also London and Singapore). It was important that a clear recommendation was made for one of these two options, based on a clear justification. Some modelling of anticipated loading (e.g. number of vehicles per hour/day) would have been useful in order to estimate network data rates, storage requirements and so on.

Common mistakes were to spend too much time on the design and functionality of the consumer units; the question asked for this in terms of their communications needs. Many designs ignored the brief that existing infrastructures should be used wherever possible (the existing mobile telephone network was expected here) and recommended a completely new network. Likewise, many either neglected the security and authentication issue completely, with little or no mention of data security issues in relation to drivers' personal details. This is a significant concern as names and addresses, bank and other payment details would need to be held in a database.

Another area of weakness in a number of reports was little or no consideration of enforcement.

In order to obtain high marks, it was important to provide a solution that addressed the task and contained all of the elements specified in the marking scheme. While this sounds obvious, a number of students failed to do this. With approximately 30 hours allocated for each coursework, there was sufficient time available for the research required to construct a thorough report.