Coursework commentary 2017–18

CO2222 Data communications and enterprise networking

Coursework assignment 1

General remarks

This was the first of two coursework assignments for this module. 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 *(i.e.* 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 coursework assignment, and students who followed the instructions and advice generally scored good marks. However, a number of students either did not 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 were available for the method and analysis sections, so this was a serious error.

Comments on specific tasks

Task 1

The first 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 assignment and an aid to understanding these tools. Only five marks were available for this section, so a brief and concise report on each is all that was expected. Many students produced quite lengthy reports, far more than required.

Task 2

Here students were asked 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 most students followed, but not all used the required method. A number of students 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 screenshots 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 either showed little understanding of the network constraints and/or just appeared to have cut-and-pasted sections from the web, suitably referenced but with minimal or no comment.

Task 3

Task 3 asked students to identify three host sites, each on a different continent, that responded to ICMP echo, and then 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 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.

Task 4

For Task 4 students were asked 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 hence round trip delays.

Task 5

This task 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 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 for a particular test. Most students performed well on this part of the coursework assignment, demonstrating good mastery of the package.

Conclusions

The final conclusion 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 very brief summary of the main findings, comments and possible explanations for any unexpected results, and how this affects modern network architectures and operation.

References

Finally, you should always include references for any piece of work where use is made of other published material.

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Coursework assignment 2

General remarks

This was the second of two coursework assignments for this module. The aim of this coursework assignment was to provide the opportunity for students to develop their skills through the application of knowledge gained from the subject guide to the solution of real world problems. It comprised four tasks, set out in the format of examination questions, a secondary aim being to provide an opportunity to gain experience of answering such questions prior to the final examination.

Comments on specific questions

Question 1

The first question focussed on the lower three layers of the OSI model (Physical, Data Link and Network layers) with topics ranging from data transmission, error detection and correction, data compression and routing. This required students to apply material from the subject guide (and/or taught classes if you attend a teaching centre) to a number of numerical and operational problems. These types of calculation and operational issues appear quite frequently in the examination papers, so part of the aim here was to provide some practice with this type of question. The calculations are straightforward and presented no problems, but performance was more variable on the Hamming code problem. Hamming code problems are not inherently difficult but do require close attention to detail, and considerable benefit can be obtained in working through a few examples.

Question 2

Question 2 focussed on network design. Part (a) involved a reasonably straightforward calculation to find the effective data rate of a channel, taking propagation delay (the time taken to travel between two nodes in a network) and transmission delay (how long it takes to clock a data frame onto the medium) into account. A value of 3.65Mbps should have been obtained.

Part (b) asked for three possible designs for a backbone network to link a number of LANs. Comparison between Bus, Ring and Star architectures was expected, with the Star (switched Ethernet) being identified as the preferred solution for this application.

The problem posed in Part (c) involved the design of a distributed, client server architecture connected over a WAN. The relatively small number of locations, some of them in rural locations, suggested that the WAN should be implemented using telecom provider lines rather than a satellite or private lines. This in turn required reasonable server power to be located at each of the sites to reduce the amount of traffic and hence delays inherent in a centralised design.

Question 3

The third question began with a review of ATM technology and how it relates to other standards. The material needed to answer this part is all in the subject guide, but a good solution was not just a description of the various standards. Students were asked to 'comment' and some comparison and evaluation was required. A good way to set out solutions to this type of question is in the form of a table.

Part (b) involved a WAN network design problem but not in terms of the actual design, rather to identify four important criteria on which to evaluate competing solutions and companies that may bid for the work. Students were also asked to identify two likely contenders for the contract in their area and to select a preferred supplier based on their offerings. A good solution identified two companies by name, and included a brief description of the type of solution that each would be likely to offer, together with some discussion on which was preferred when judged against the four criteria specified. The four standard criteria from the subject guide were expected, namely Functionality, Performance, Reliability and Cost, but others were acceptable. Likewise, local telecom providers were expected to be the companies identified as the best placed to provide the required network.

Part (c) of this question involved an aspect of network design, specifically how address space is allocated. Performance on this part of the question was quite varied. Like Hamming codes in question 1, these problems are not difficult but do require care with the details and become easier with practice. Several worked examples are provided in the subject guide.

Question 4

This question required the application of knowledge gained from the subject guide to the solution of a number of practical, real world problems ranging from the choice of the most appropriate media for a given scenario, through to location technology and security issues. The latter parts of the question required some research and a good solution included evidence of this, together with suitable references. Performance was very variable on these latter aspects, particularly in terms of references. This was an important part of the question and good practice and experience here should be carried through to the final project.