
Coursework commentaries 2015–2016

C02222 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 six tasks using different features of the ping and traceroute utilities in order to demonstrate 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 useful 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 simply report results; Reports for both zones summarise the most frequent mistakes made by candidates taking those examinations. with little detail as to the method; and little or no analysis. This was a serious error as the majority of the 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 5 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 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 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 or from discussion with other students! A good solution was to provide 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 extremely 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 appeared to have simply cut-and-paste sections from the internet (which were not always properly cited and referenced). You should use your sources judiciously – we are interested in your own understanding of the issues. This requires writing, with both analysis and commentary.

Task 3 involved the identification of five host sites, one on each continent, that responded to ICMP echo and then required students to perform some measurements to investigate the correlation between Round Trip Time (namely, the time it takes for a packet to be transmitted and for an acknowledgement to be returned); and the distance the packet was being sent. This task required a little more in terms of processing the results: the presentation of a scatter diagram and trend line; 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 coursework assignment. Of those who did produce a correlation value, many did not comment on how they had obtained it, and an even smaller number provided any discussion on the value. A good solution explained how the correlation had been calculated and then explained the meaning and significance of the value.

Task 4 asked students to identify five hosts within their own country, repeat the procedure used for Task 3 and provide commentary on the results. See the comments for Task 3, which also applied here. Furthermore, only a small number of students offered any analytical comparison of the Task 3 and Task 4 results. Anomalous results were expected, with what appeared to be local hosts actually being based elsewhere in the world.

Task 5 asked students to select one of the five sites identified for Task 3 and repeatedly send ICMP echo requests, while incrementing a value known as the Time To Live (TTL) field in the frame header. Students then had to report a list of the IP addresses and hostnames of each of the hosts that responded up to the required site. This is equivalent to a manual version of the traceroute utility, which most students realised. No analysis was required for this task.

Task 6 was the final experiment and asked students to carry out traceroute investigations of the five 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 correct solution here explained how geographical distance is not a good predictor of the route taken and, hence, round trip delays. Performance here was generally of a very high standard, with some good results and explanation of earlier anomalies.

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 very brief summary of the main findings, comments, possible explanations for any unexpected results and what had been learned from the tasks.