Department of Computer Science

CS2CA17 Computer Architecture & Networking

Coursework Instructions

Autumn Term 2022

Professor Shuang-Hua Yang
24 Oct 2022

Module Title: **Computer Architecture and Networking**

Module Code: **CS2CA17**

Lecturer responsible: **Professor Shuang-Hua Yang**

Type of Assignment: **Coursework**

Individual / Group Assignment: **Individual**

Weighting of the Assignment: **15%**

Page limit/Word count: **min. 2 pages** (A4 sheets) (excluding appendices) at 12pt Times Roman font

Expected hours spent on this assignment: **6 hours**

Items to be submitted: **1 PDF file and Network Implementation .pkt file**

Work to be submitted on-line via Blackboard Learn by: **12:00 on 2 Dec 2022**

NOTES:

By submitting this work, you are certifying that it is all your sentences, figures, tables, equations, code snippets, artworks, and illustrations in this report are original and have not been taken from any other person's work except where explicitly the works of others have been acknowledged, quoted, and referenced. You understand that failing to do so will be considered a case of plagiarism. Plagiarism is a form of academic misconduct and will be penalised accordingly. The University's Statement of Academic Misconduct is available on the University web pages.

If your work is submitted after the deadline, *10%* of the maximum possible mark will be deducted for *each* working day (or part of) it is late. A mark of zero will be awarded if your work is submitted more than 5 working days late. You are strongly recommended to hand work in by the deadline as a late submission on one piece of work can impact on other work. If you believe that you have a valid reason for failing to meet a deadline then you should complete an Extenuating Circumstances form and submit it to the Student Support Centre *before* the deadline, or as soon as is practicable afterwards, explaining why.

Resources Required:

You should make use of these specific tools and resources:

• Wireshark

• Packet Tracer

• Lecture/Lab Materials.

• Textbook: Computer Networking: a top down approach

1. Assessment classifications

First Class (>= 70%)	A proper use of Wireshark for packet sniffing and analysis. An excellent implementation of Small Office Network. Impeccable configurations of DNS and HTTP servers. The report is well structured and narrated, including the implementation details of the ICMP protocol, results, and appraisal.
Upper Second (60-69%)	A reasonable use of Wireshark for packet sniffing and analysis. A good implementation of Small Office Network. DNS and HTTP servers are functional. The report is well structured and narrated, including the implementation details of the ICMP protocol, results, and appraisal.
Lower Second (50-59%)	A reasonable implementation of Small Office Network. The report is well structured and narrated, including the implementation details of the ICMP protocol, results, and appraisal.
Third (40-49%)	A good attempt at implementation of the Small Office Network. The report is well structured and narrated, including the implementation details of the ICMP protocol, results, and appraisal.
Pass (35-39%)	The report is readable, includes the implementation preparations of the ICMP protocol, issues, and appraisal.
Fail (0-34%)	No attempts or the provided implementation/report are not readable.

2. Assignment description

1. The objectives of this part of the course work are to capture and analyse remote ICMP Data in Wireshark. Wireshark is a software protocol analyser, or "packet sniffer" application, used for network troubleshooting, analysis, software and protocol development, and education. As data streams travel back and forth over the network, the sniffer "captures" each protocol data unit (PDU) and can decode and analyse its content according to the appropriate RFC or other specifications. You are to ping a remote host (host not on the LAN) and examine the generated data from this ping. Explain what would be different about this data from the usual data in LAN. Ping the following website www.reading.ac.uk (set the number of ping requests to 4). You then examine IP and MAC addresses, analyse the data from the remote host. What is significant about this information, does Wireshark show the actual MAC address for the remote host? Write your reflection about MAC address in terms of local host.

2. Packet tracer is a simulation tool which helps to configure and visualise a network in logical and physical mode. The objective is to configure a small office Local Area Network (LAN) where 5 PCs and 1 printer are connected to a wireless router through wires. 1 mobile, 1 tablet PC are connected to the same wireless router which is acting as a DHCP server and default gateway provided by Internet Service Provider (ISP) to connect all those devices to the internet.

   Configure those devices with the IP addresses
   Default gateway- 192.168.1.1/24

   Reserve IP addresses for those devices through DHCP
   PC1- 192.168.1.10/24
   PC2- 192.168.1.11/24
   PC3- 192.168.1.12/24
   PC4- 192.168.1.13/24
   PC5- 192.168.1.14/24
   Printer – 192.168.1.253/24

   Wireless Router configuration would be – SSID- pollyvacherwireless, with WPA2 Enterprise AES with shared key - P0llyVch3r. (Hint: you may need to set up a Radius AAA server). You then test at least two pairs of device-to-device connections using proper networking command(s) and check that different devices can communicate with each other.

3. Install 1 DNS Server (192.168.1.2/24) and 1 HTTP server (192.168.1.3/24) into the previous office network. Update DHCP configuration to reserve IP addresses for the new servers. On the DNS Server, add an A record to create a mapping between www.pollyvacher.ac.uk and the HTTP server. Test the DNS resolution for www.pollyvacher.ac.uk using proper networking command(s)

on at least 1 PC and 1 mobile device. Finally, use the web browser to open www.pollyvacher.ac.uk on at least 1 PC and 1 mobile device.

3. Assignment submission requirements

The two files which should be submitted to Blackboard are:

1. An electronic report in **PDF format** describing your work. The report should be a minimum of 2 pages (A4 sheets) at 12pt Times Roman font (including diagrams, code fragments, figures, and references). The report must include:

   a. Front page of the submission should include:
      Module Code: **CS2CA17**
      Assignment report Title: **Internet Control Message Protocol (ICMP) and Small Network configuration**
      Student Number (e.g., 25098635):
      Date (when the work completed):
      Actual hrs spent for the assignment:
      Assignment evaluation (3 key points):

   b. Introduction.

   c. Use of Wireshark for packets sniffing. It's essential to include evidence (e.g., screenshots) of the testing carried out after the implementation of ICMP protocol.

   d. A small office network implementation .pkt file, network overview, and screenshots should be provided along with discussions. You should include as minimum screenshots of network diagram, DHCP configuration (router), Wireless Security (router), AAA configuration (Radius server), DNS configuration (DNS Server), HTTP configuration (HTTP server).

   e. A discussion, a short conclusion, and your personal reflection on this project.

   f. Fill and include the self-assessment form (attached below).

Marking Scheme

You must fill and submit the self-assessment form below with your submission.

Section (# marks)	Students own assessment	Marks
1. (30 marks)	**Wireshark** [ ] Definition of ICMP [ ] Examine IP and MAC address from LAN and Remote Host [ ] Significant about this information [ ] Reflection about MAC address	(total 30) 5 10 5 10
2. (25 marks)	**Small Office Network** [ ] All devices connection [ ] All devices IP configuration [ ] DHCP server configuration [ ] Wireless router and AAA server setup [ ] Connectivity tests (x2)	(total 25) 5 5 5 5 5
3. (25 marks)	**DNS and HTTP Servers** [ ] All devices connection and IP configuration [ ] DNS Server configuration [ ] HTTP Server configuration [ ] DNS resolution tests (x2) [ ] HTTP service tests (x2)	(total 25) 5 5 5 5 5
4. (20 marks)	**Quality of the submitted report** [ ] Introduction [ ] Detailed WireShark testing with screenshots [ ] Small Office Network Setup with tests [ ] DNS and HTTP Servers Setup with tests [ ] Discussion, conclusion, and personal reflection	(total 20) 2 5 5 5 3
5. (5 marks)	Bonus marks for: [ ] Use of custom domain names (say, pc1.pollyvacher.ac.uk) for PCs in connectivity tests.	(total 5) 5