Department of Computer Science
University College London

Cover Sheet for Examination Paper to be sat in March 2001

COMPZ05: Internet Architecture

Answer TWO questions from Section A and TWO questions from Section B

Calculators are permitted

Checked by First Examiner: Date:

Approved by External Examiner: Date:

4. IPv4 uses a "*class-based*" addressing scheme.

    a) Explain the operation of the class-based scheme. What were the motivations for this scheme?

    [3 marks]

    i) Much of the Internet now operates with so-called "*classless*" addressing. What was the motivation for this change? Illustrate the way in which classless addresses may be allocated to IP subnets and supernets.

    [6 marks]

    b) IPv6 supports the concept of "*autoconfiguration*". Explain the motivation behind the introduction of autoconfiguration and illustrate the operation of "*stateless*" autoconfiguration when an IPv6 host is switched on for the first time.

    [11 marks]

    c) IPv6 modifies the rules concerning *fragmentation* compared with IPv4. What are these changes and why have they been made?

    [5 marks]

5. a) A company occupies four floors of a building plus the basement. Each floor is occupied by one department and includes the offices of the senior managers responsible for the department. About 30 PCs in total are expected to be deployed on each floor. The basement accommodates several server machines. A high proportion of traffic remains within a single department. Much of the rest is access to the servers, though there is some inter-departmental traffic. All traffic is IP based. For security reasons the senior managers should be accessible from the other machines only via a firewall router. The basic wiring configuration on a floor consists of CAT-5 UTP wiring from wall sockets to a wiring closet. The closets are linked vertically by trunking through which further wiring may be installed.

        Discuss how the requirements above might be met indicating clearly what components (hubs, switches, routers etc.) are needed and how these are interconnected.

        [12 marks]
        [Question 5 continued on next page]

[Question 5 continued]

    b) The company in a) uses addresses from the *private* Internet network 192.68.1.0. The company now obtains a connection to the global Internet via an ADSL link to an ISP. As part of this arrangement the ISP issues the company with a single real Internet address. Describe the operation of a scheme which allows the company's PCs to share this address.

[4 marks]

    c) The *Routing Information Protocol* (RIP) is an example of a "*distance vector*" (DV) routing protocol.

        i) Briefly explain the principle of operation of DV routing protocol as used in RIP.

[4 marks]

        ii) RIP is said not to be suitable for large networks. Give reasons to support this view.

[5 marks]

6. a) Two "*Logical IP Subnets*" (LIS) are established on an ATM network using "*Classical IP and ARP over ATM*" (CIPA) in "switched virtual circuit" (SVC) mode.

        i) Explain why a router is needed if full IP connectivity is to be obtained between all the hosts in such a configuration.

[2 marks]

        ii) Illustrate the important features of CIPA operation by means of a step-by-step account of the passage of an IP datagram from a host on one LIS to a host on another.

[9 marks]

        iii) Describe the operation of a mechanism which may be used to avoid sending traffic via the router and so improve the efficiency of the configuration.

[7 marks]

    b) A TCP connection is operating across a 10Mbps link with a round-trip delay of 60ms and a segment size of 576 octets. Assuming error-free operation, estimate the minimum window size (in segments) needed to keep the pipeline full and the time the protocol will take to reach that window size after a timeout using Jacobson's approach.

[7 marks]