

1997 Paper 8 Question 2

Digital Communication II

In the Internet, error-detecting check fields are usually included at the data-link, network and transport layers of the protocol stack. Why is this the case? [6 marks]

What is the standard Internet checksum? [3 marks]

Explain in detail how the Internet checksum can be efficiently implemented, commenting on how the word size and machine endianness affect your implementation. [5 marks]

A certain engineer constructs an Ethernet interface which includes processing at the IP layer in hardware. The engineer “tests” the new interface by sending many 1 kbyte UDP datagrams filled with different random contents from a conventional workstation to a host with the new interface, and observes that the UDP checksum software on the host detects no errors. In fact, the engineer has incorrectly used inverting pads on those pins of the ASIC used to transfer the UDP data and UDP header from the interface to the host memory. The IP header is transferred over other (non-inverting) pins.

How can it be that no errors were detected? What can be deduced about the two hosts being used? [6 marks]

[Hint: you may wish to consider the rôle of the UDP pseudo-header.]