COMPUTER SCIENCE TRIPOS Part II – 2021 – Paper 8

13 Principles of Communications (jac22)

(a) Multipath routing allows flows of packets in the Internet to be split over more than just one source-destination path. As a consequence, the fair allocation of network capacity amongst different flows may need to be re-considered. Inelastic (real time) flows are usually allocated capacity according to max-min fairness. Elastic (non real-time) flows employ end-to-end congestion control to adapt to available capacity, typically targeting proportional fairness over the long run.

Discuss how these two fairness policies operate in the presence of multipath routing. [10 marks]

(b) Multicast routing provides the delivery of flows of packets in the Internet from a source or set of sources, to a group or set of receivers. Routing protocols construct delivery trees rather than point-to-point paths, and routers have to replicate multicast addressed packets out each interface towards where there are recipients.

Multicast has seen little deployment outside single Internet Service Providers. Barriers include security concerns, but also the lack of a clear business model for inter-domain multicast, even if one were to extend the Border Gateway Protocol to support IP multicast routing and forwarding.

Discuss the security and inter-domain concerns, considering what information is not made visible by IP Multicast, and what information is hidden by the Border Gateway Protocol, paying particular attention to the different cases of customer-provider, and peering relationships.

[10 marks]