

Representation of Internetworks as Graphs

There are two ways of doing this:

- (i) Identify routers as nodes and individual networks which are part of the internetwork as edges – in this method routers are connected by networks. Cost of an edge is the cost of traversing the network represented by the edge measured by dollar cost, error rate, propagation delay etc or some combination of these
- (ii) Identify individual networks which are part of the internetwork as nodes and routers as edges- in this method individual networks are connected by routers. Cost of an edge is the cost of passing through that router measured by dollar cost, queueing delays, processing delays etc or some combination of these

Generally the first method is preferred and will be invariably used in this course

An example of an internetwork where 4 networks N1-N4 are interconnected by 3 routers R1-R3 is shown below as Fig 1. N1 and N2 are multiple access networks in a LAN like Ethernet or Wifi. N3 is a ring network like FDDI. Finally N4 is a point-to-point network like HDLC in a WAN. H1,H2,H3 are hosts which are part of N2. H7 and H8 are hosts which are parts of N1. H4,H5,H6 are hosts which are part of N3. Only the networks and routers figure in the graph and not the individual hosts.

Fig 2 is the graphical representation with 3 nodes and 2 edges using method (i). R1 and R2 are connected by N3. R2 and R3 are connected by N4. R1 and R3 are not directly connected.

Fig 3 is the graphical representation with 4 nodes and 3 edges using method (ii). N2 and N3 are connected by R1. N3 and N4 are connected by R2. N4 and N1 are connected by R3.

It may be noted that the 2 graphs are not isomorphic which means there is no one-to-one correspondence between the nodes and edges of the two graphs.

4.1 Simple Internetworking (IP)

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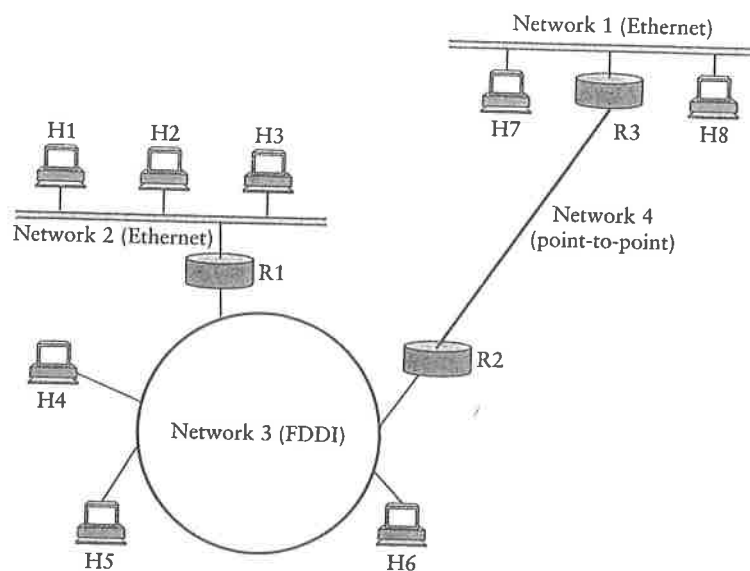


Fig 1

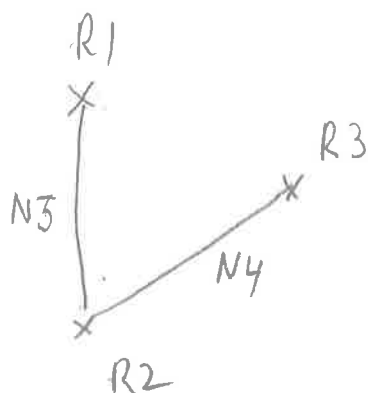


Fig 2

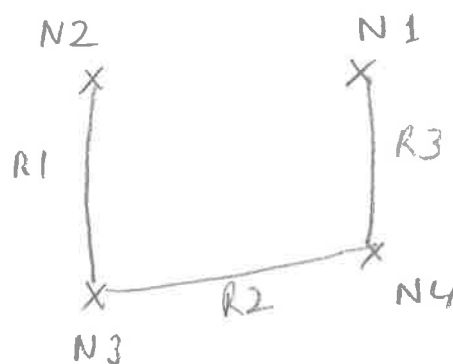


Fig 3