

Lecture 20: Network Layer & Internet Protocol Continued

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1 Routing

Routing is needed for forwarding packets in a datagram (connectionless) network, or for establishing virtual circuits in a VC (connection oriented) network. Routing algorithms or protocols create routing tables from which one may derive the necessary forwarding tables. These in turn, define the output port through which a packet will be forwarded.

Most routing protocols work only for 10s or 100s of nodes and hence they are referred to as **interior gateway protocols (IGPs)** or (**intra-domain routing protocols**). To make them scale, internetworks employ a hierarchical routing structure based on **domains**.

- A **domain** is an internetwork where all routers are under a single administrative entity (e.g. university campus).
- Each domain uses IGPs to route packages within its boundaries and uses gateway routes to forward packets to other domains (inter-domain routing).

1.1 Graph Representation of Routing

Routing is a graph-theoretic problem and requires one to calculate the lowest-cost path between two nodes.

- Nodes are hosts, switches, routers or networks
- Edges are network links, each associated with a cost.
- Cost of a path is the sum of the costs of all traversed edges.

There are two main types of algorithms for solving the problem:

- Global routing: all routers have complete topology and link cost info — "link state" algorithms.
- Decentralised routing: router knows link costs to neighbours — "distance vector" algorithms.