ETSF10: Internet Protocols

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Fall 2015, Lund University

Notes written from Jens Andersson's lectures

Contents

1 Internet Routing

1.1 Routing

Routing select route across network between nodes, requiring:

- correctness
- simplicity
- robustness
- ...

1.1.1 Flooding

Flooding: packets are sent by node to every neighbour and eventually at least one copy arrives at the destination

- no network information required
- uniquely number packets, so we can discard duplicates
- limit infinite transmission with time-to-live

1.1.2 Packet-Switching

Packet-switching: choose optimal path according to a cost metric, make it decentralized

1.2 Router Architechture

Router: internetwork device that passes data between networks, by checking network layer addresses

- routing
- forwarding

Input port: getting input from line termination to the switch fabric

- physical layer: bit-level reception
- data link layer
- switching: look up output port using routing table in input port memory
- queuing: for fabric slower than input
  - delay and loss from overflow
  - Head-of-the-line blocking

Output port: outputting packets to physical layer

- priority scheduling: schedule most important packets to leave first

1.3 Best Path

Performance criteria: used for selection of route

- minimum hop
- least cost (more flexible)

Decision time:

- packet or virtual circuit basis
- fixed or dynamically changing

Decision place:

- distributed: made by each node
- centralized: made by a designated node
- source: made by source station

Network information:

- distributed routing: using only local knowledge, information from adjacent nodes, maybe information from all nodes on a potential route
- central routing: information from all nodes

Update timing:

- fixed: never updated
- adaptive: regular updates

1.4 Routing Strategies

1.4.1 Basic Types

Fixed routing: single permanent route for each source-dest pair (uses least-cost)

- fixed until a change in network topology
- simple but inflexible

Adaptive routing: routing decisions change as congestion and failure happen, classified based on information source

- local: route to outgoing link with shortest queue
- adjacent: use delay and outage info
- all nodes: like adjacent

1.4.2 Network Types

Autonomous System a set of connected routers managed by single org under same protocol

IRP Interior Router Protocol, routing inside AS

ERP Exterior Router Protocol, routing between AS