INF3190 Group lecture
Lecture #7

Jan Anders Bremer

UiO - IFI

07.03.2013

Contact information

Phone: 91125994
Mail: janabr@ifi.uio.no
IRC: janabr at irc.ifi.uio.no (currently in #ping.uio.no and #cyb, but you can always /msg me)
Feel free to send questions, suggestions and feedback.

Contents

- Network layer - routing

From last time...

- Polarization
- Glasses

Routing techniques

- Datagram/IP routing
  - Decisions are made on the fly with data available there and then
- Virtual circuit
  - Virtual line switching (in-order, lossless)
  - Still prone to delays
  - Transparent end-to-end
- Source routing
  - Sender specifies parts or entire path

Routing techniques

- Static - set weights, done.
- Dynamic - let the network figure out where to route on the fly, adapts based on observations
- Distance vector - maintains a table of each node's neighbours' distances to all other nodes.
- Link state - each node knows the complete network
- Hierarchical - routing based on pre-set rules - may also be adaptive

Properties of a good routing algorithm

- Robustness
- Efficiency
- Fairness
- Simplicity
- Optimization

Problems related to good routing algorithms

- Robustness vs. security - making a distributed algorithm offers more stability, but makes the algorithm less safe and more complex
- Fairness vs. optimization - sometimes the least optimal choice is the fairest one
- Robustness vs. simplicity - simple algorithms may not be as stable as more complex ones.

Optimization principle and related terminology

- Given a subnode in a path to between two nodes being the optimal choice one way, it is also a part of the optimal path the other way.
- A sink-tree is the optimal path structure fom a given node to all other nodes.

Non-constant sink-trees

- Two advices: 1. Don't optimize. 2. Experts only: don't optimize (yet!)
- Laying out a complete network structure with path costs is time-consuming
- Path costs change (new connections, varying load), static weights don't - more work
- Better to run the network with dynamic routing and then tweak certain constants to make routing more efficient

LSR (link-state routing) vs DVR (distance-vector)

- LSR considers disconnects, DVR gives an infinite loop counting to infinity when this happens
- LSR knows the state of every link
- DVR only knows the distance each neighbour has to each node
- Demonstration

DVR fixes

- Split horizon - no advertisements of a destination back to the node which advertised it
- Poison reverse - set to infinite distance, all nodes informed
- Hold time - slower convergence

LSR behaviour

- It takes some time before all the information in the network is updated - non-optimal paths possile
- When link-state information has been propagated, no packets will be sent incorrectly
- With long delays on the links, paths are more optimal close to a desination

Multicast in LSR and DVR

- LSR: Multicast Open Shortest Path First - create sink-tree, remove node which are not a part of the group
- DVR: Distance Vector Multicast Routing Protocol - flooding, very inefficient