Lecture 19

CS625: Advanced Computer Networks
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http://www.cse.iitk.ac.in/users/braman/courses/cs625-fall2004/outline.html

Topic for Today

- Scalable Multicast
  - Core-Based Trees (CBT) [BFC93]
- *Scribe for today?*

Multicast Routing Issues

- Protocols considered so far:
  - Distance Vector Multicast Routing Protocol (DVMRP)
  - Link-State based Protocol
- Issues:
  - Per (group X source) information in routers
  - Dependent on underlying unicast routing protocol

Algorithm Specific Issues

- DVMRP:
  - Routers charged for *not* being in multicast tree
  - Should determine child and leaf links
    - Each time next-hop to source changes
    - Each time distance to source changes for a router on a link
- Link-State:
  - All routers learn about all groups!
  - Flooding after any group membership change
  - Re-computation after any topology change or group membership change

Core-Based Trees (CBT) [BFC93]

- Key idea:
  - Have a single tree for all sources
  - One tree per group
  - Tree is rooted at *core* node
  - Simplicity and scalability will compensate for additional data latency (hopefully)
- Advantages:
  - Scalability: only O(num. groups) state at routers
  - Routers exchange control messages using *any* underlying unicast protocol
  - Tree creation is receiver-based (only relevant routers involved)

CBT Protocol Details

- Core and group identification:
  - Each core router has an id (its unicast address)
  - Group-id's are per core-id
- Issues to be resolved:
  - How is core router identified?
  - How is the tree formed?
  - How is data forwarding done?

Data Forwarding

- Assume that core has been identified and tree has been created
- Source sends with *core-id* as destination
  - Group id is given in IP option
  - Data packet travels towards core
  - On arriving at an on-tree router, change destination address to group-id
- Important advantage: can have CBT unaware routers in-between

Tree Formation

- Receiver sends JOIN-REQ towards core
  - Forward using unicast
  - Until we hit an already on-tree router
  - On-tree router sends JOIN-ACK
  - This effectively extends the tree
- Similarly, QUIT-REQ to leave a group
- On path failure, rejoin the tree

Choice of the Core

- Can choose at or near source, if there is only one source
- Otherwise, choice is unclear
- In any case, we need multiple core nodes
  - For fault-tolerance
  - Two choices:
    - Determine backup dynamically
    - Or, have a routing protocol constantly running between the set of core routers