Fault Isolation in a Multicast Tree using DYSWIS

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Phil Sphicas
Goal

• Correlate faults between multicast receivers of the same stream, and pinpoint where in the network the loss occurred
How do we detect faults?

• RTP has sequence numbers
• When a packet is received with an unexpected sequence number, we know that a fault occurred
• This could be a loss or a packet reordering - for the purposes of this project, we don’t distinguish
How can we isolate faults?

- Nodes can determine their own path to the multicast source
- If an end node experienced a fault, all the hops between it and the source are suspect
- If an end node was joined to the stream but did not experience the fault, all the hops between it and the source are good
- By combining the sets of known good and possibly bad hops, we can come up with a smaller set of suspect hops
Multicast Topology
Fault Isolation Algorithm

- Let $H(n)$ be the set of hops between node $n$ and the source
- Choose a node $a$ that experienced a fault
- Let $B$ represent the set of possible bad hops
- Initialize $B = H(a)$
- For all other nodes $b$ that experienced the fault, $B = B \cap H(b)$
- For all nodes $c$ that did not experience the fault, $B = B \setminus H(c)$
Shifting gears … DYSWIS

- DYSWIS is a distributed automatic fault detection and diagnosis system
- Provides a framework for detecting faults, querying other nodes for information about faults, and analyzing the results
Monitoring multicast RTP streams
Detecting multicast RTP faults
DYSWIS Probes

- Probes are used to query remote DYSWIS nodes for information
- We use a MultiProbe to query multiple nodes at once
- We ask each remote node:
  - Was it joined to the same stream at the same time?
  - Did it experience the same fault?
  - What is its path back to the source?
Diagnosing multicast RTP faults

- Initialize `badhops` to all hops in local node’s traceroute
- Update `badhops` to only include hops shared with remote node’s traceroute
- Update `badhops` to exclude hops in remote node’s traceroute
- Same fault?
- Same session?
- Remote probe results available?
- `badhops` are suspect
- Retrieve next remote probe result