ssmping

<draft-venaas-mboned-ssmping-00.txt>

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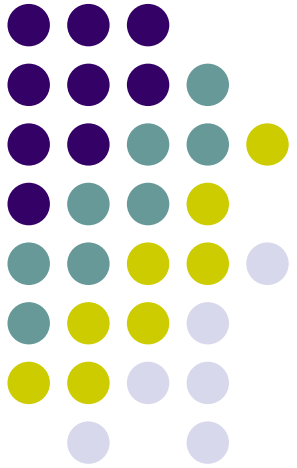
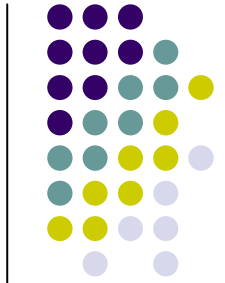
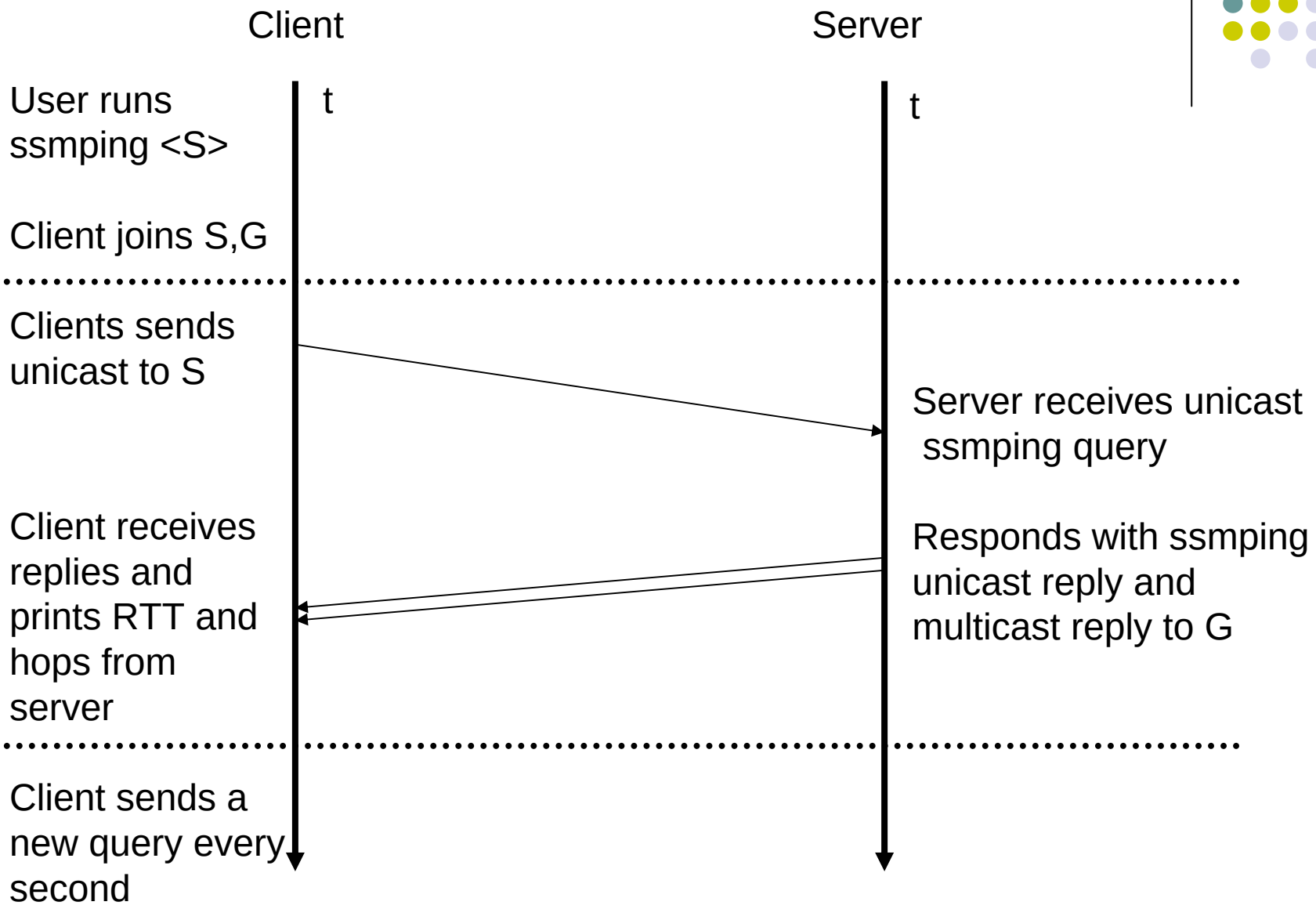


ssmping

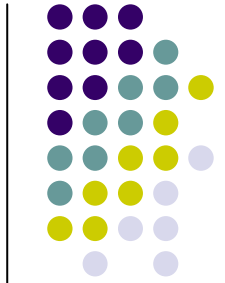


- A tool for testing multicast connectivity and more
- Behaviour is a bit like normal icmp ping
- Implemented at application layer using UDP
  - No additional requirements on the operating system
  - The operating system and network must support SSM
- A server must run ssmpingd
- A client pings server by sending unicast ssmping query
- The server replies with both unicast and multicast ssmping replies
- In this way a client can check that it receives SSM from the server
  - You can run your own server, also several public IPv4 and IPv6 servers on the Internet
  - And also parameters like delay, number of router hops etc.

How it works

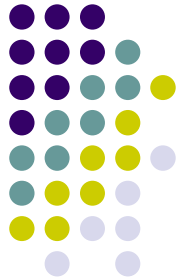

Client
Server
User runs ssmping <S>
t
t
Client joins S,G
Clients sends unicast to S
Server receives unicast ssmping query
Client receives replies and prints RTT and hops from server
Responds with ssmping unicast reply and multicast reply to G
Client sends a new query every second

Example output



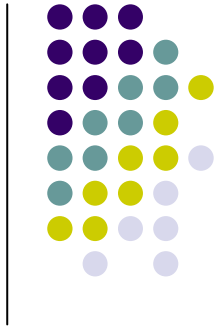
```
$ ssmping -c 5 -4 flo.nrc.ca
ssmping joined (S,G) = (132.246.2.20,232.43.211.234)
pinging S from 158.38.63.20
  unicast from 132.246.2.20, seq=1 dist=13 time=122.098 ms
  unicast from 132.246.2.20, seq=2 dist=13 time=122.314 ms
multicast from 132.246.2.20, seq=2 dist=13 time=125.061 ms
  unicast from 132.246.2.20, seq=3 dist=13 time=122.327 ms
multicast from 132.246.2.20, seq=3 dist=13 time=122.345 ms
  unicast from 132.246.2.20, seq=4 dist=13 time=122.334 ms
multicast from 132.246.2.20, seq=4 dist=13 time=122.371 ms
  unicast from 132.246.2.20, seq=5 dist=13 time=122.360 ms
multicast from 132.246.2.20, seq=5 dist=13 time=122.384 ms

--- 132.246.2.20 ssmping statistics ---
5 packets transmitted, time 5003 ms
unicast:
   5 packets received, 0% packet loss
   rtt min/avg/max/std-dev = 122.098/122.286/122.360/0.394 ms
multicast:
   4 packets received, 0% packet loss since first mc packet (seq 2)
   recvd
   rtt min/avg/max/std-dev = 122.345/123.040/125.061/1.192 ms
```

What does the output tell us?



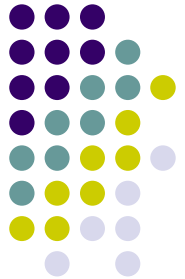
- 13 unicast hops from source, also 13 for multicast
- Multicast RTTs are slightly larger and vary more
  - The difference in unicast and multicast RTT shows one way difference for unicast and multicast replies, since they are replies to the same request packet
- The multicast tree is not ready for first multicast reply, ok for 2nd
- No unicast loss, no multicast loss after tree established

Is it useful?



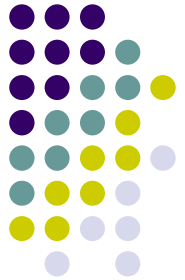
- Complements multicast beacons
- Useful for “end users” or others that want to perform a “one-shot” test rather than continuously running a beacon
- Beacons don’t show how long it takes to establish the multicast tree, they only show the “steady state”
  - We’ve seen cases where it takes much longer than expected
- Neither do they compare unicast and multicast
- Are there other data than RTT and hops that should be measured?
  - Hops are measured by always using a ttl/hop count of 64 when sending replies

Also asmping. Example output:



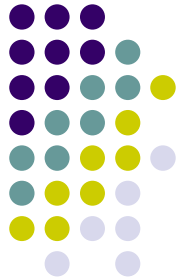
```
sv@xiang /tmp $ asmping 224.3.4.234 ssmping.uninett.no
ssmping joined (S,G) = (158.38.63.22,224.3.4.234)
pinging S from 152.78.64.13
  unicast from 158.38.63.22, seq=1 dist=23 time=57.261 ms
  unicast from 158.38.63.22, seq=2 dist=23 time=56.032 ms
multicast from 158.38.63.22, seq=2 dist=7 time=207.876 ms
multicast from 158.38.63.22, seq=2 dist=7 time=208.567 ms (DUP!)
  unicast from 158.38.63.22, seq=3 dist=23 time=56.852 ms
multicast from 158.38.63.22, seq=3 dist=21 time=70.352 ms
multicast from 158.38.63.22, seq=4 dist=21 time=57.208 ms
  unicast from 158.38.63.22, seq=4 dist=23 time=57.910 ms
  unicast from 158.38.63.22, seq=5 dist=23 time=56.206 ms
multicast from 158.38.63.22, seq=5 dist=21 time=57.375 ms
```

Protocol overview



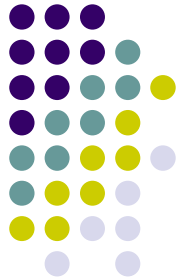
- All messages have following format
- Message type, one octet (Q or A)
- Options in TLV format
- Client sends Q message with some options
- Server sends two identical replies, one unicast and one multicast
- Changes Q into A, echoes back all options, may add some
  - Server should only add options when requested?
- Responses have ttl/hop count of 64

Client options



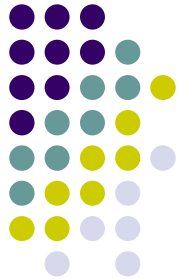
- Client identifier
  - IP address, PID, hashed?, some random number?
  - Used by client to know it is not a reply for someone else
- Sequence number
  - 1 for first request, increased by 1 for each request
- Timestamp in microseconds (also for servers)
- Multicast group
  - Only for ASM (or?), see later slide
- Option request option
  - Client might ask server to include certain options
- Reply size
  - Client asks server to send response of a given size
  - Can it be used for DoS attacks? Should client instead pad its queries? May be hard to know response size if server is asked to add options

Server options



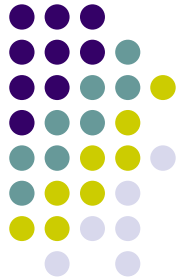
- Server may append options (only by request?)
- Timestamp in microseconds (also for clients)
- Version
  - Free text vendor/implementation version etc (UTF-8?)
- Pad
  - If client asks for given reply size

Server behaviour



- What should server do if it is overloaded?
  - It's been suggested that server can multicast generic/common replies to clients. Is that useful?
  - Should it simply not respond?
  - Should it respond with some "leave me alone" message
    - Might also be useful if server restricts which clients to serve

asmping



- Even more useful to have tool for ASM (IMO)
  - Registers/MSDP, multiple forwarding paths…
- Want to allow client to pick multicast group (or prefix)
  - For IPv6 we should use fixed group id and allow /96 prefix to be specified
  - Useful to choose group to choose different RPs or scopes
- Can client pick address that is used by some multicast session in order to attack it?
- How to reduce the security issue?
  - Server rate limit?
  - Fixed destination port?

Next steps

- Want to reserve port number and/or SRV name
  - Open question whether client should use a fixed port and whether it can be the same as the server port
- Reserve IPv4 SSM address?
  - The source might be running other multicast applications
- Reserve IPv6 Group IDs
  - Used for both SSM and ASM
- Don’t think reserving anything for IPv4 ASM is doable
- Need input to improve protocol