Mode Independent Session Directory Service Architecture

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Why Multicast!

- Multicast has benefits for almost every party involved – end users, content providers and the network ISPs as well.
  - Benefits for the content providers
    - Lower bandwidth requirements regardless of the number of subscribers
    - Low cost of operation as huge server farms are no longer needed to be maintained
Why Multicast!

• Benefits for the ISPs
  – Lesser congestion in the CORE network
    • Especially suited for live multimedia streams
    • Schemes for stored, on demand multimedia streams have also been proposed recently
Why Multicast!

• Benefits for end users
  – Better QoS over congested links
  – Even if the end user is capable in receiving a larger bandwidth stream, if the bottleneck link throughput is low his overall experience will be low as well.
  – Multicast helps an end user by reducing congestion in the bottleneck links.
Why this lack of popularity!

• Low user demand because of lack of usability compared to unicast
  – DNS URL resolution has been a great help
  – URLs for hosted contents are generally long-lived and can be bookmarked

• Lower deployment by ISPs
  – Network complexity cited most common reason for no deployment by the ISPs
  – This leads to even lower end user demand for IP multicast.
mDNS – brief summary

• An mDNS domain has these components
  – One or more MSD servers
  – A DNS service running
  – An URS server running

• Depending on the URS configuration an mDNS domain joins in the global hierarchy!

• The global hierarchy takes care of the global configuration changes.
Making mDNS SSM capable

• Earlier mDNS implementation only supported ASM mode of IP multicast
• We incorporated changes to enable uplink (child -> parent) communication using unicast.
• We incorporated a concept of hybrid domains that could act as gel between ASM only and SSM only mDNS domains.
Making mDNS SSM capable

ASM only scenario

Mixed mode operation
Using caches to improve search

Earlier Version

Current Scheme
Earlier Version - Search

- User made search request to local MSD server!
- The search request got routed using hash based keyword routing schemes.
- The target servers responded back directly to the requesting clients

DRAWBACKS

1. Network firewalls could block incoming replies to local clients
2. Poses a security threat as the end user does not know what remote servers to expect response from a-priori!
Current Approach - Search

- We make use of keyword caches in MSD servers.
- The user makes request for keywords to local MSD server
- If the remote MSD connection information is in local cache, the MSD responds with the connection information.
  - The user requests the remote MSD
  - The remote MSD responds with the search results to the client.
  - If remote MSD rejects the request, the client invalidates the cache entry!
- If no cache entry located or if the entry has been invalidated, the MSD routes keywords using hash routing scheme.
  - The target MSD responds to the originating MSD with connection details
  - This is cached and the info. Relayed to the requesting client.
Current Approach - Search

Changes from earlier approach –
- The user initiates search with remote MSD directly and the remote MSD responds back!
- The nature of connection now becomes outgoing instead of incoming in the earlier approach and hence is more firewall friendly!

BENEFITS –
1. More secure approach
2. Network firewall friendly

Caching Strategy Used –
- A combination of LRU & LFU is used in our current approach
- The score for each cache entry is computed using –

\[
\alpha \times \text{freq} + (1 - \alpha) \left[ \frac{\text{timeout} - (t_{\text{curr}} - t_{\text{last-access}})}{60000} \right] \leq \alpha \leq 1
\]

- The cache entry with the lowest score is selected for replacement
Conclusion

• We were able to implement the architecture to operate under ASM as well as SSM environment!

• We changed the way search results were sent back to the clients to address some of the security & firewall issues.

• We simulated our implementation; the results and interpretations are provided in the paper (not given in this presentation).
More details on mDNS

• mDNS research website:
  
  http://www.cons.cise.ufl.edu/mdns/

• mDNS RFC – current status IETF BCP Track


• Contact the authors –

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