# 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
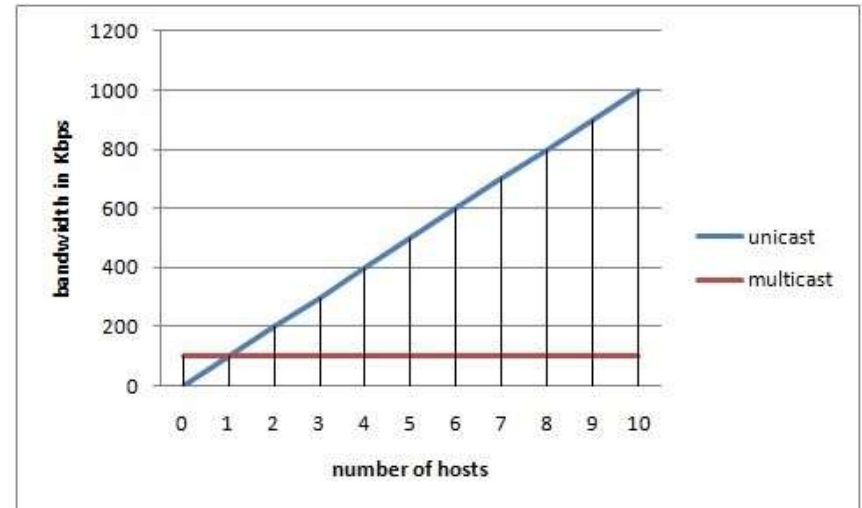
# Why Multicast!

- 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
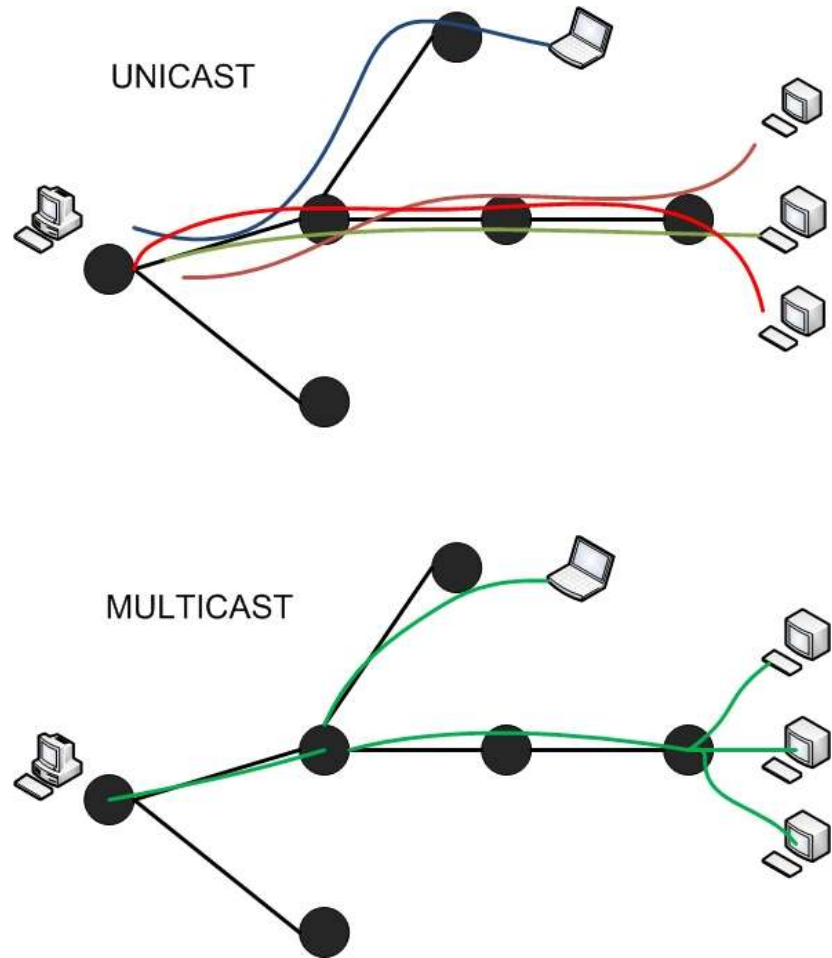
# Why Multicast!

- 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.
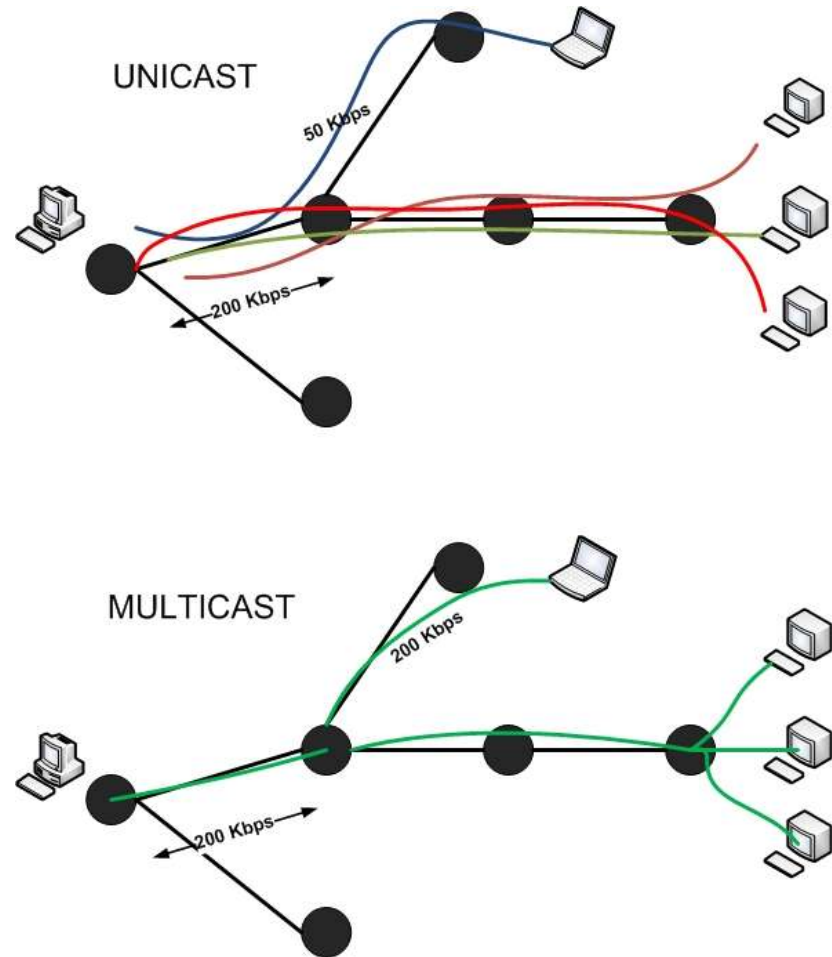
# Why this lack of popularity!

- 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
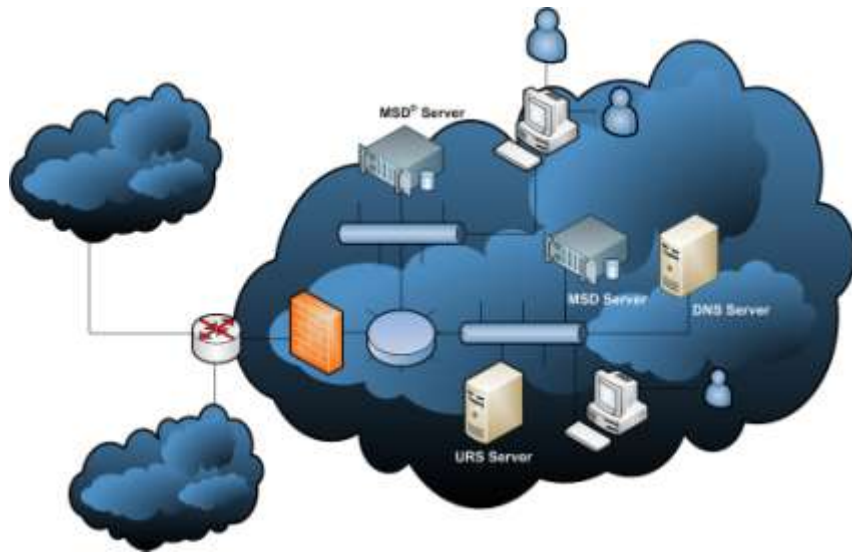


- An mDNS domain has these components
  - One or more MSD servers
  - A DNS service running
  - An URS server running
- Depending on the URS configuration an mDNS domain joins in the global hierarchy!
- The global hierarchy takes care of the global configuration changes.
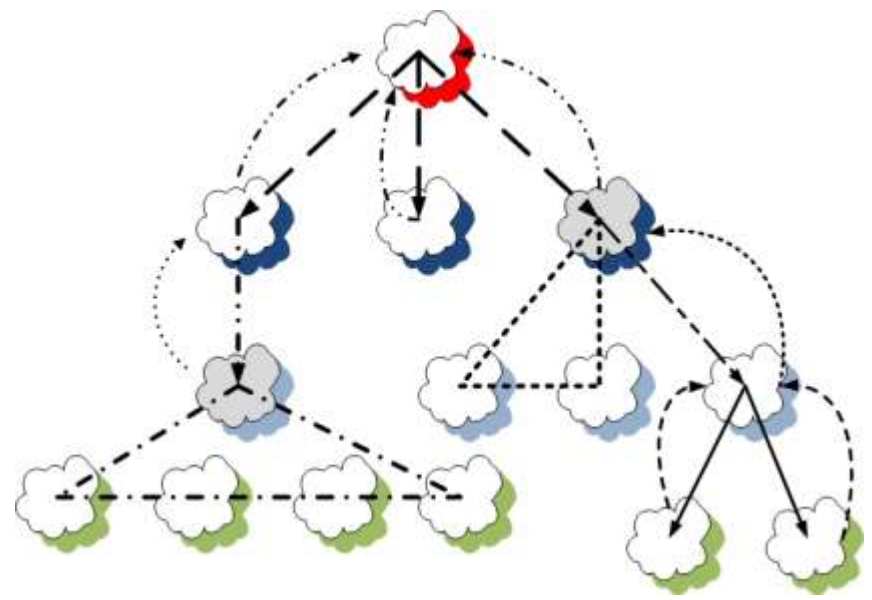
# Making mDNS SSM capable

- 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.
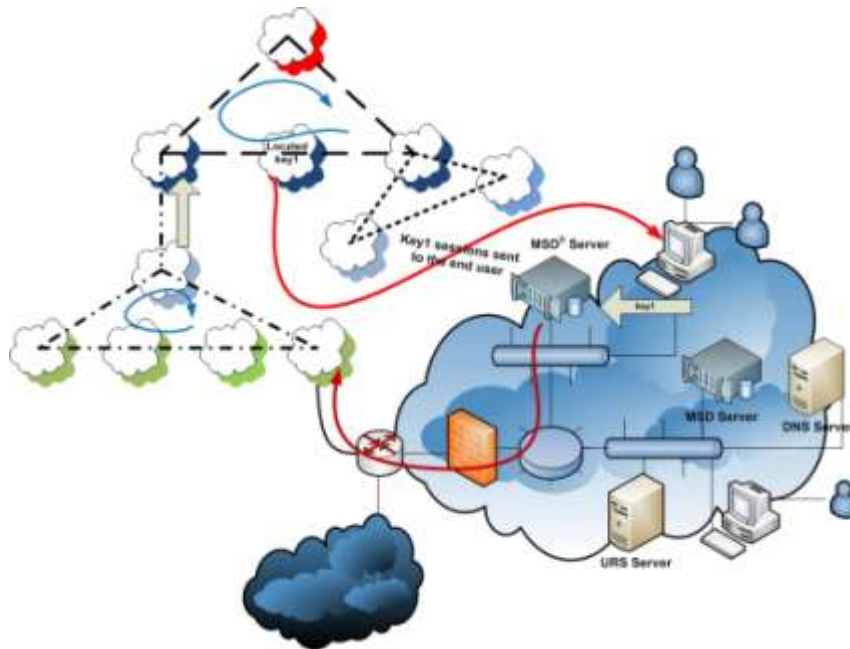
# Making mDNS SSM capable

**ASM only scenario**
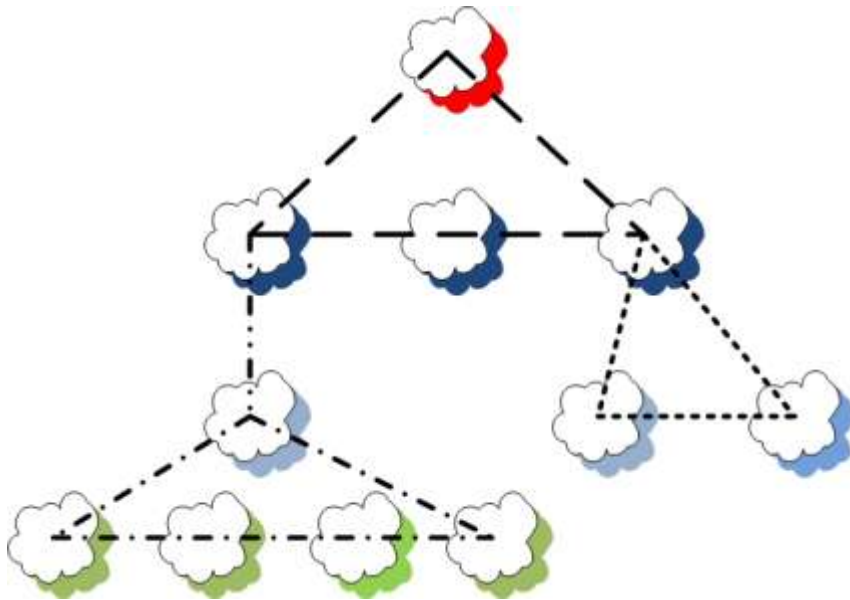
**Mixed mode operation**

# 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.
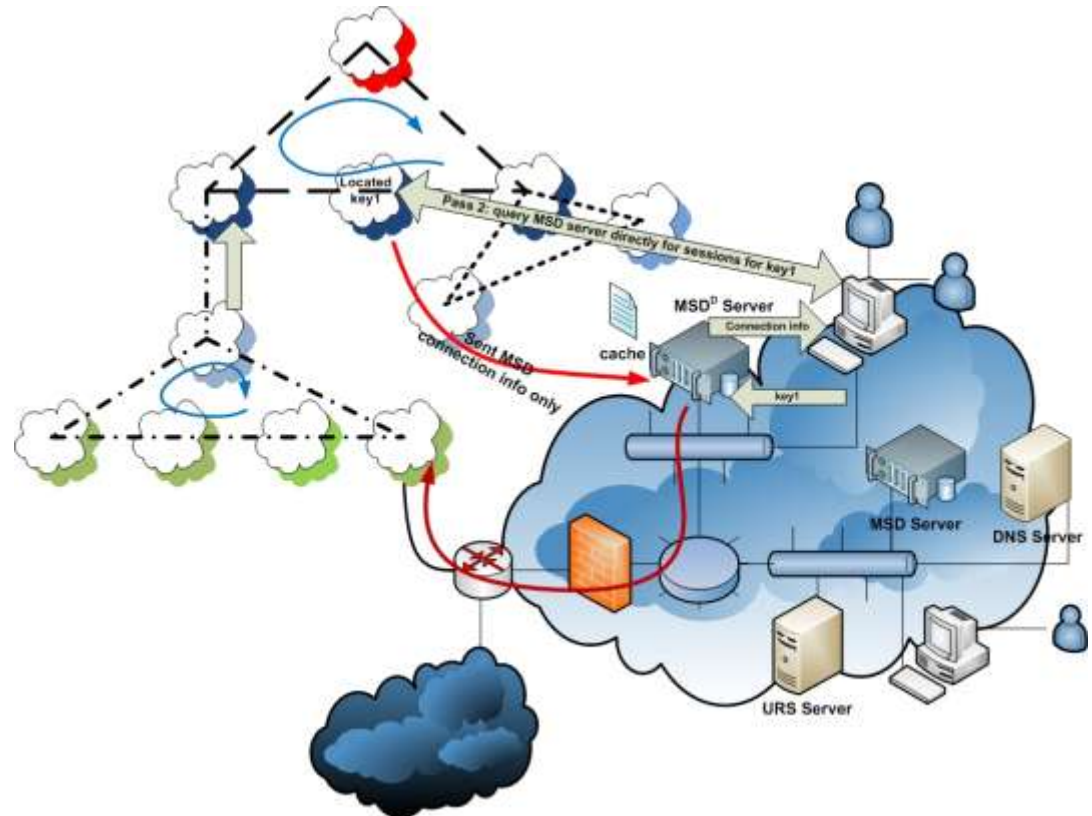
# Current Approach - Search

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 –

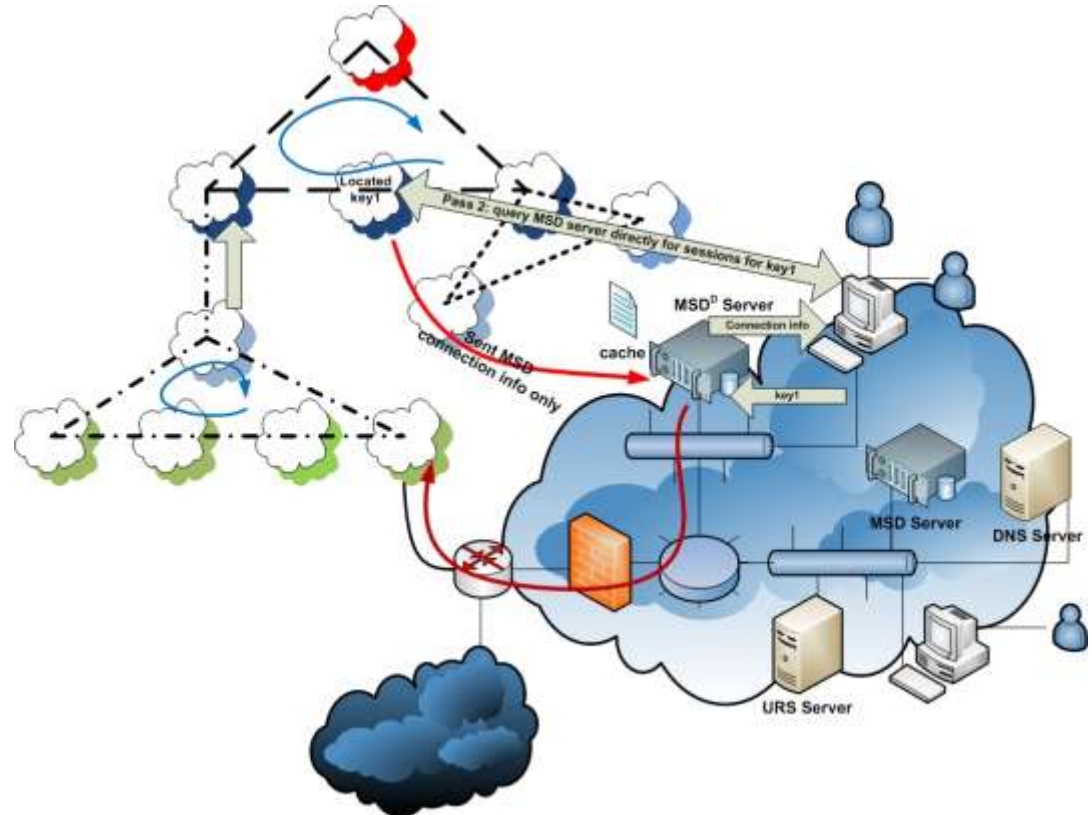1. More secure approach
2. Network firewall friendly

Caching Strategy Used –

❑ A combination of LRU & LFU is used in our current approach

❑ The score for each cache entry is computed using –

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

$$0 \le \alpha \le 1$$

❑ 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

  *A Hierarchical Multicast Session Directory Service Architecture, Nov 2009, Internet Engineering Task Force, ID 19409.*

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