Application Layer Multicast
Extensions to RELOAD
draft-kolberg-sam-baseline-protocol-00

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Overview

• New baseline document
  – Extension to RELOAD, uses P2PSIP RELOAD as the overlay layer
  – Uses AMT (Automatic IP Multicasting Tunneling) for tunneling between ALM and Native Multicast regions

• Based on previous framework and protocol IDs
  – draft-irtf-sam-hybrid-overlay-framework-02
  – draft-irtf-sam-overlay-protocol-00.txt
  – draft-waehlisch-sam-common-api-01
  – draft-irtf-sam-problem-statement-02.txt

• Request that the RG adopt this as an RG deliverable for future RFC submission
RELOAD Extensions

- Experimental
- New overlay protocol messages to support ALM tree lifecycle
- New overlay protocol messages to support formation of ALM-NM trees
- New RELOAD usages to support storing tree root, tree attribute, statistics, and diagnostics in the DHT
- API for group management
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Sec. 2 and 3 were adopted from draft-irtf-sam-hybrid-overlay-framework-02
Sec 4. was adopted from draft-irtf-sam-hybrid-overlay-framework-02
Sec 5. was adopted from draft-waehlisch-sam-common-api-01
Sec 6. was adopted from draft-irtf-sam-hybrid-overlay-protocol-00 and modified to be consistent with RELOAD baseline v07
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Sec 7 is new
Sec 8 is a placeholder
Example ALM-NM Topology
from: draft-irtf-sam-hybrid-overlay-framework-02

- Select between OM subtree and NM subtree opportunistically
- Expect improved network efficiency, increase throughput and reduce latency
- Design based on AMT tunnelling mechanism
- Protocol uses structured P2P overlay to connect peers in different types of multicast regions
Sec. 4.1 Algorithm: ALM only

- **groupId=create();**
  - Allocation of unique groupId
  - Out of band advertisement/publishing in DHT

- **joinTree(groupId)**
  - Out of band discovery of groupId (lookup in DHT)
  - Send join message to peer with the nearest NodeID to the groupId (tree root)
  - Peers on the path to the root join tree as forwarding nodes

- **leaveTree(groupId)**
  - Sends leave message to each child node and the parent node
  - If parent is a forwarding node and this is its last child, forward to its parent
  - Child node receiving a leave message from parent sends join message to tree root

- **multicastMsg(groupId)**
  - SSM tree: creator of tree is source; it sends data message to tree root from where it will be forwarded down the tree
  - ASM: peer sending message will send it to its parent and children; each node receiving message will forward it to remaining tree edges it is connected to
Sec. 4.2 Algorithm: ALM with peer at AMT site

- Joining peer
  - use ALM algorithm
  - If tree includes peer in NM, joining peer can use AMT-GW to connect to NM
  - Joining peer can chose delivery path based on latency etc

- If peer is not a joining peer, but on the overlay path of a join request
  - If next hop is peer in NM with AMT-R, peer can select overlay routed multicast or AMT delivered multicast
  - If next peer is a peer outside of NM, then peer can use ALM only or use AMT delivery as an alternative
Sec. 4.4 ALM with NM peer using AMT-R

• There is no peer in the tree which has AMT-GW. NM peer uses ALM.
• There is one peer which can operate as P-AMT-GW. NM peer can use ALM or P-AMT-GW.
• There is one peer in the tree which is in AMT-GW region. The NM peer can use ALM or connect to the AMT-GW

• If we have an ALM tree with NM peer with P-AMT-R functionality, then the 3 rules above apply similarly
Sec 5. Group Management API

• API between Application and Group stack

• init(out Handle s)
  – This call creates a multicast socket that is bound to some virtual multicast interface and provides a corresponding handle to the application programmer, which will be used for subsequent communication.

• join(in Handle s, in URL g)
  – This operation initiates a group subscription for the name g, including the corresponding tree access.

• leave(in Handle s, in URI g)
  – This operation results in an unsubscription for the given name g, including the corresponding disconnect of the tree.

• send(in Handle s, in URI g, in Message m)
  – This call sends data m to the multicast group name g. It simultaneously initiates creation of the group state, if not already present.

• receive(in Handle s, out URI g, out Message m)
  – This call delivers data m to the application along with an indicator of the group membership.
Sec. 6 Protocol definition

- Messages between RELOAD nodes
- Supports different tree formation algorithms described earlier
- Control messages are propagated using overlay routing
- Message categories
  - ALM Usage:
    - Tree life-cycle (create, join, leave, re-form, heartbeat)
  - Hybrid ALM Usage:
    - Tree life-cycle
    - AMT gateway advertisement and discovery
    - Peer region and multicast properties
New RELOAD Usages

• Applications of RELOAD are restricted in terms of the data types they can store in the overlay → usage
• RELOAD is extendible in that new usages can be defined
• ALM applications need additional data types to the base RELOAD types → define new usage
• Define 2 new usages
  – ALM Usage
  – Hybrid ALM Usage
ALM Usage

• ALM applications use the RELOAD data storage functionality to store a groupID when a new ALM tree is created, and to retrieve groupIDs for existing ALM trees.
• ALM applications use the RELOAD data storage functionality to store a set of attributes for an ALM tree,
  – E.g. owner, tree size, tree height, tree formation algorithm, and join criteria.
• ALM applications and management tools use the RELOAD data storage functionality to store diagnostic information about the operation of tree,
  – average number of trees, delay from source to leaf nodes, bandwidth use, lost packet rate.
  – In addition, diagnostic information may include statistics specific to the tree root, or to any node in the tree.
Hybrid ALM Usage

- HALM applications use the RELOAD data storage functionality to store a set of attributes for a AMT Gateway that can connect to at least one node in the overlay.
- HALM applications use the RELOAD data storage functionality to store a set of attributes about a native multicast region associated with an AMT Gateway.
- HALM applications and management tools use the RELOAD data storage functionality to store diagnostic information about the operation of AMT and ALM interconnections.
V01 Changes Being Discussed

• Provide a more detailed, illustrative sample use case in section 4 that explains what actually can be achieved and how.

• Move section 7 up just behind section 4 and reflect the achievable operations directly in reload usages.
Experimental Plan

• We are looking for a RELOAD implementation that is consistent with the current RELOAD spec
  – draft-ietf-p2psip-base-07
RG Action Requested

- Request that the RG adopt this as an RG deliverable for future RFC submission