Cross-over Mobility Anchor Point based Hierarchical Mobility Management Protocol for Mobile IPv6 Network

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Mobile IPv6 Overview

• Mobile IPv6 means a node’s IP can be mobile

• “IP routing” characteristics forces each node to change its IP address whenever it moves from one subnet to another

• Mobile IPv6 requires that there will be one unique IP address (Home Address) by which the node will be identified
Mobile IPv6 Working

- Whenever the MN’s POA changes, it informs its HA & CNs about its new IP address (CoA)

- As a result, the HA refreshes its Binding Cache Entry for the MN,
  - Home Address
  - Care-of Address

- After that, the MN finishes the “return routability procedure” with all the CNs
Mobile IPv6 Working

• Now, the MN starts the “return routability procedure” with all the CNs

• After that key-exchange protocol, the MN updates its binding at all the CNs

| Home Address | Care-of Address |
Handover Problem for MIPv6

• For every movement (i.e. IP changes for MN), the MN has to update its binding with HA and all the CNs which comprises of the time-consuming “return routability” procedure also. As a result, Handover delay is quite high

• Signaling load generated for every movement (i.e. control messages required for Mobile IPv6) is also large

• All these will result in
  – Loss of in-transit packets destined to the old POA for the MN
  – Additional delay for the packets
  – Wastage of bandwidth
Remedy

- **Goal**: To reduce the handover delay & also the signaling load

- Many extensions have been proposed. One of them is Hierarchical Mobile IPv6 (HMIPv6)

- Separates movement inside a domain from movement across domains

- In each domain, MAP (mobility anchor point) will serve as a local Home Agent
Hierarchical MIPv6

• Separates movement inside a domain from movement across domains

• In each domain, MAP (mobility anchor point) will serve as a local Home Agent

• MN will have two addresses – one is on Link CoA and the other one is RCoA at the MAP’s link

• Nodes outside the domain will identify the MN with its RCoA
Hierarchical MIPv6

- Nodes outside the domain will identify the MN with its RCoA
- So, the movement inside a domain is transparent to the outside world
- **Result**: smaller handover delay and signaling load for movements inside a domain than MIPv6
Problems of HMIPv6

- No definite MAP selection criteria
- Sometimes results in greater handover delay because of the selection of the MAPs
- Sometimes packets suffer additional delay and also causes bandwidth wastage
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Our strategy will select all the MAPs in a domain along the path from MN to HA when the MN first moves into a domain.

- MN will be identified by a different RCoA in each of the MAP’s link along the path.

- HA and all the CNs will only see the top-level RCoA of the MN.
XMAP-HMIPv6

- Then for each movement inside, the binding procedure ends at the cross-over MAP.

- All the higher level binding cache entries above the cross-over MAP remains intact.

- **Result:** Similar reduced signaling load like HMIPv6 but lower handover latency than it.
XMAP-HMIPv6

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- **Result:** Similar reduced signaling load like HMIPv6 but lower handover latency than it.
XMAP-HMIPv6

- Smaller circle is the MAP\textsubscript{2} domain and big circle is the MAP\textsubscript{3} domain
- The binding cache entry at HA and all the CNs for the MN,
  \[
  \begin{array}{|c|c|}
  \hline
  \text{HoA} & \text{RCoA\textsubscript{3}} \\
  \hline
  \end{array}
  \]
- The binding cache entry at MAP\textsubscript{3} for the MN,
  \[
  \begin{array}{|c|c|}
  \hline
  \text{RCoA\textsubscript{3}} & \text{RCoA\textsubscript{2}} \\
  \hline
  \end{array}
  \]
- The binding cache entry at MAP\textsubscript{2} for the MN,
  \[
  \begin{array}{|c|c|}
  \hline
  \text{RCoA\textsubscript{2}} & \text{LCoA} \\
  \hline
  \end{array}
  \]
Analytical Results
Future Work & Conclusion

- We are currently doing in-depth analysis to come up with the complete protocol specification.

- Signaling load analysis for our proposal.

- Analyze our proposal with other protocols based on an analytical mobility model (i.e., Random Walk).

- NS-2 simulation to test higher-level protocol’s performance (e.g., TCP, UDP) with our proposal.
Thank You for your patience. Any Questions??