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MobilityFirst: An Integration Approach

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What's the problem? Why is it important? 1

What has been done? Why are they not sufficient? including any of your previous, other and ongoing projects too 1

What's your approach? Why can it do better or differently? 2

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What's the problem? Why is it important?

Current internet technologies, specifically the IP protocol, act as both an identifier and routing information. This causes issues when trying to maintain connection where one or both of the peers change network locations (IP addresses). This is important because modern workloads often have one peer changing network locations.

What has been done? Why are they not sufficient?

This area has been studied quite extensively, both the set of MobilityFirst papers as well as the QUIC protocol drafts tackle this problem in different ways. Please see Appendix A for a list of papers.

I believe the MobilityFirst papers are not sufficient because they assume a clean slate. This means current technologies must be thrown away for them to work or, as the papers mention, they implement them as an overlay network. It is unlikely the MobilityFirst network will ever become used for anything but academia due to this.

The QUIC protocol draft specifies a unique connection ID which is verified by the peer whenever a packet is received from a new IP address. This allows for peers to change IP addresses without setting up a new connection. Unfortunately this was specified in such a way it cannot be generalized and is tied in with the QUIC protocol.

What's your approach? Why can it do better or differently?

I want to provide the same socket interface to users however if both sockets on either end can upgrade they do by using self signing GUIDs. Effectively a wrapper around TCP which works with a GNS. This method is a mix between QUICs connection oriented protocol and MobilityFirst GNS. Whenever a peer changes they can “reconnect” using a QUIC like protocol and if both peers change they may call back to the GNS service to see if the peer has changed.

This idea can be thought of as a lower in the stack connection upgrade protocol and would provide a way of migrating to the MobilityFirst technologies. This protocol sits between IP and TCP/UDP.

Appendix A: Relevant Papers

Arun Venkataramani, James F. Kurose, Dipankar Raychaudhuri, Kiran Nagaraja, Morley Mao, and Suman Banerjee. 2014. MobilityFirst: a mobility-centric and trustworthy internet architecture. SIGCOMM Comput. Commun. Rev. 44, 3 (July 2014), 74–80. DOI:https://doi-org.ezproxy.library.uvic.ca/10.1145/2656877.2656888

Dipankar Raychaudhuri, Kiran Nagaraja, and Arun Venkataramani. 2012. MobilityFirst: a robust and trustworthy mobility-centric architecture for the future internet. SIGMOBILE Mob. Comput. Commun. Rev. 16, 3 (July 2012), 2–13. DOI:https://doi-org.ezproxy.library.uvic.ca/10.1145/2412096.2412098

Ivan Seskar, Kiran Nagaraja, Sam Nelson, and Dipankar Raychaudhuri. 2011. MobilityFirst future internet architecture project. In Proceedings of the 7th Asian Internet Engineering Conference (AINTEC '11). Association for Computing Machinery, New York, NY, USA, 1–3. DOI:https://doi-org.ezproxy.library.uvic.ca/10.1145/2089016.2089017

F. Zhang et al., "EdgeBuffer: Caching and prefetching content at the edge in the MobilityFirst future Internet architecture," 2015 IEEE 16th International Symposium on A World of Wireless, Mobile and Multimedia Networks (WoWMoM), Boston, MA, 2015, pp. 1-9, doi: 10.1109/WoWMoM.2015.7158137.

B. Yang, X. Chen, J. Xie, S. Li, Y. Zhang and J. Yang, "Multicast Design for the MobilityFirst Future Internet Architecture," 2019 International Conference on Computing, Networking and Communications (ICNC), Honolulu, HI, USA, 2019, pp. 88-93, doi: 10.1109/ICCNC.2019.8685485.

QUIC Protocol - https://datatracker.ietf.org/doc/draft-ietf-quic-transport/

Appendix B: Schedule

Feb 8 - Feb 21:

Review relevant papers and post reading notes on them in aggregate or individually on the website.

Feb 22 - Feb 28:

Re-evaluate the initial proposal given the new information. Involving a meeting with the teaching staff for feedback.

Mar 1 - Mar 14:

Start formally defining the connection upgrade protocol with reference to current protocols.

Mar 15 - Mar 21:

Finalize the protocol and start writing up the findings

Mar 22 - Apr 4:

Finalize the paper and include a section about how to go about implementing the protocol.

Appendix C: Website

https://mcraealex.github.io/research/csc466/

Appendix D: Expected Deliverables

Given the amount of time and workload this semester I will not be able to complete an implementation of the protocol I define in the paper. However, I will be able to provide a recommendation for how to go about the protocol with detail, including the linux interfaces required and pitfalls.

I will also be able to provide a paper outlining the protocol as well as why the protocol is needed. I aim to make it similar in format to the QUIC protocol drafts.