Part III Personal Project Brief

Real-time One to Many Synchronized Wireless Multimedia Entertainment System

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This project will investigate techniques to achieve real-time high quality audio delivery over WiFi. While TCP has clear advantage on delivering high quality audio, this project will instead try to preserve the same audio quality under UDP. This allows us to implement routing schemes such as Reliable Multicast(RM). RM provides much better scalability and utilizes the bandwidth more efficiently compared to Broadcast or Unicast. An experiment will be conducted to understand the human emotional reaction to poor audio quality. This will determine how the audio system should handle badly connected speakers under undesirable network conditions.

Synchronized audio system challenges all speakers to minimize their apparent latency to a level less than humans ability to discern interaural time difference. Such would require an efficient clock synchronization algorithm. This is a well researched area, with various different methods of synchronizing across different scales of network. Global synchronization technique such as Network Time Protocol(NTP)[1] is an extremely robust synchronization algorithm, however performance is sacrificed due to its complexity. Alternatively Simple Network Time protocol(SNTP)[2] is lightweight but far too inaccurate. While high performance algorithm for local network synchronization do exist (eg. Precision Time Protocol), most implementations are done with a mixture of hardware and software components. This project will aim to implement high performance algorithm, such as the PTP, while keeping it completely software based for maximum flexibility during deployment at the later stage.

References

[1] Mills, David *Network Time Protocol (Version 3) Specification, Implementation and Analysis.* University of Delaware, March 1992. RFC-1305

[2] Mills, David *Simple Network Time Protocol (Version 4)* University of Delaware, October 1996. RFC-2030