
EE/CprE/SE 492 WEEKLY REPORT 3

Jan 2023 – Dec 2023

Group number: 12

Project title:

Application Exploration of 5G-and-Beyond Wireless Systems and Rural Broadband

Client &/Advisor:

ARA Wireless/ Dr. Hongwei

Team Members/Role:

Vibhu Dhavala, Software Engineer
Cristofer Espinoza, Hardware Engineer
Andrew French, Hardware Engineer
Caleb Kitzelman, Hardware Engineer
Samuel Rettig, Software Engineer
Jake Roskopf, Hardware Engineer

Weekly Summary

On Sept 28th, we had our biweekly meeting with Dr. Hongwei. In this meeting we discussed our tentative road map and deliverables that we had derived from our meeting with the graduate students. During this meeting Dr. Hongwei advised that we should create tasks to specifically define what would be done short term and long term.

Over the weekend we met as a team and assigned ourselves to one of two roles: data acquisition research and Unity development. On the research side of things, we are looking for data that may affect QoS/QoE and how this data would be acquired. In terms of Unity development, we started the project during this period and hope to have a working prototype soon. We are unsure of whether we can test yet as this would require the actual stream to do so; but this will come with time, especially as we have a meeting with Dr. Hongwei soon. We also still waiting on the graduate students who are creating streaming setup in one of their labs in Coover that we would be able to test 360 viewing via XR.

Past week accomplishments

Vibhu Dhavala – I continued research into Unity development, specifically how to include an RTSP stream into unity. I found a module called VLC for unity and started working with that. It uses a c# library known as VLCSharp so I began looking into how to write scripts using that library.

Cristofer Espinoza – Continued research into data acquisition, specifically articles on different data collection frameworks and network quality monitoring. Relevant data collection when analyzing effects on QoS and QoE

include but are not limited to downlink radio quality, occupied bandwidth, uplink radio quality, transport level QoS parameters (packet loss, jitter, round-trip time RRT), transport related metrics (bitrate, throughput), and network packets. As far as tools within or related to Unity, unity has a “Unity Profiler” and there are third party tools such as Firebase (Google) and Wireshark that are compatible with Unity and can perform network/performance monitoring. I will have to investigate these more in the upcoming weeks.

Andrew French – I conducted research into how we could monitor our stream’s quality while we are sending the RTSP stream over the network to the headset. I specifically spent time looking through real time streaming protocol and the gstreamer RTP library to find information relevant to data acquisition.

Caleb Kitzelman – I spent time researching network data acquisition techniques using Unity and outside of Unity. Looked into standard network profiler and analysis tools from Unity. Third party SDKs are also available for unity, although the process for using them and installing them are currently being looked into still.

Samuel Rettig - The prior two weeks I have delved primarily into Unity development and making sure that knowledge/utilization of Git is a core part of Unity development. Since we decided on our team roles in an internal meeting last week and split the Unity and research tasks, I have been doing my best to fulfill the role of the one (currently) primary Unity developers.

Jake Roskopf - The last two weeks I worked on setting up my account of the remote desktop with unity, git, and other needed applications. I also spent time trying out some different SDKs and getting used to working in the Unity environment. I found many useful links for us to reference while working on the unity development.

Pending issues

Vibhu Dhavala - None

Cristofer Espinoza – None

Andrew French – None

Caleb Kitzelman – None

Samuel Rettig – None

Jake Roskopf - None

Individual contributions

<u>NAME</u>	<u>Individual Contributions</u> <i>(Quick list of contributions. This should be short.)</i>	<u>Hours this week</u>	<u>HOURS cumulative</u>
Vibhu Dhavala		6	56
Cristofer Espinoza	Data Acquisition Research	6	45
Andrew French	Data Acquisition Research	5	66
Caleb Kitzelman	Data Acquisition Research	4	56
Samuel Rettig	Unity Development + Git	9	61
Jake Roskopf	Unity set up and research	8	66

Plans for the upcoming week

Vibhu Dhavala: I plan to continue working on RTSP integration with unity and VLC for unity library. I may also see if there are any other viable alternatives to that are easier to use.

Cristofer Espinoza: I would like to investigate more frameworks for data acquisition on end-to-end radio transmissions and studies on the different parameters monitored for improved and efficient systems. There may be parameters that cater better or are more relevant to XR and video streaming. It will also be a challenge to see what frameworks work best with the set up and limitations that we have. One article I had read use a physical extra piece of hardware but maybe there are frameworks that just require software. I also came across Firebase, Wireshark, and Unity Profiler. All are tools for network monitoring with/in Unity. This may be more ideal compared to external software.

Andrew French: With the information that we've obtained regarding our stream's quality, I would like to start experimenting with what would be compatible with our setup.

Caleb Kitzelman: I plan to try to implement some SDKs into Unity and begin experimenting with them. I also want to look more into what is available from the ARA team regarding possible network testing and analysis using video streaming.

Samuel Rettig: I would like to finish one version of the possible avenues for Unity development. While we have a current idea of what it looks like, another process may be the correct way to structure the project. For example, we can take ideas from the VR Unity development template and make a better final demonstration. As part of my week has been learning more about Unity, I look forward to figuring out the best practices to develop the application.

Jake Roskopf: I want to continue understanding our current unity setup and investigate how we can use the XR interactions toolkit along with the RTSP plugin to further our application. I also want to sync up with the other members of the Unity development team to combine our efforts and get their input on how we want to structure our application.