

## EE/CprE/SE 492 GROUP PROGRESS REPORT

**Group number:**sdmay22-30

**Project title:** 5G and beyond

**Client:** Hongwei

**Advisor:** Hongwei

**Team Members:** Josh Guyer, Joshua Naber, Johnathan Leisinger, Connor Kesterson, Raffael Neuser, Nick Garrelts, Ruofeng Gao

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- **Project Summary:** *(Short summary about the project. What are the design goals? Have the direction or scope of the project changed? This should be about a paragraph in length.)*

The goal of our project is to design and create a User Equipment enclosure that will be deployed locally around Iowa to be used by the ARA Wireless network. This enclosure will hold a couple radios including the B210, B205, and skyLark mMIMO radio. All of these radios will be controlled by a main computer inside of the enclosure in which we will be using the Intel NUC. There will also be a secondary Dell Precision used within the enclosure to provide a research environment to outside researchers. The software team is also working on getting several algorithms implemented into the srsRan protocol suite. Some of these algorithms include a device-to-device (D2D) communication algorithm as well as a local-deadline partition algorithm.

- **Accomplishments** *(Please describe/summarize as to what was done, by whom, when and, collectively as a group since the last report. This should be about a paragraph or two in length. Bulleted points are acceptable as well. Please keep only your technical details related to your project. Figures, schematics, flow diagrams, pseudocode, and project related results are acceptable, but please ensure that they are legible (clear enough to read) and to provide an explanation. If researching a topic, please add a few details about what was learned and how it is relevant to the project. If two or more people worked on a single task, be sure to distinguish how each member contributed to the task. Specific details relating to the assistance provided to other members may be included here.)*

- ☐ Joshua Naber - This past month has been spent on working with Josh G to get our components in our enclosure efficiently arranged. We also went to Sukup lab and have been working with the advisor there to get several acrylic panels cut for the enclosure. We are just about finished with getting everything put into the enclosure, just need new panels cut then we will connect everything together. The UE enclosure should be done very soon.
- ☐ Josh Guyer- Have a 3D model of the location of the components in the enclosure and working with the ABE lab in Sukup to get panels cut out of acrylic. This has been a difficult task and a learning experience as we have never had to do this kind of work before so we are running into problems as we go. We are splicing ethernet cables to length this week and getting everything inside the enclosure wired together.
- ☐ Nicholas Garrelts - I have been working on implementing a local-deadline partition (LDP) algorithm, including pseudocode for an implementation into srsRAN. Next will be setting

up in the test environment and running speed tests to check the validity of this implementation.

- ☐ Johnathan Leisinger - I have been working on translating a D2D algorithm into C for use in srsRAN. Once done, I will be confirming that the algorithm is working by measuring SNR and power loss in a test environment of B210 SDRs.
- ☐ Connor Kesterson- Working on implementing a UCS (Unified Cellular Scheduling) into srsRAN. After software team implements their respective algorithms, we will be setting up different test environments (different number of UE's and different distance from UE to base station)
- ☐ Ruofeng Gao- Study on the WFQ (Weighted Fair Queueing) working and adapting in srsRAN. WFQ can be utilized for controlling the quality of service. When I have done the work, I will test with the team.
- ☐ Raffael Neuser - Set up local srsRAN env on WSL for testing and compiling directly from source

- **Pending issues** *(If applicable: Were there any unexpected complications? Please elaborate.)*

The hardware team did have some complications in our design of the UE enclosure. Some of the holes in our panels were not cut in the right place. We used this opportunity to re-arrange some of the components inside of the enclosure to better efficiently utilize the space. Another complication we had was that some of the screws that we ordered were not the right size. Fortunately we have been able to make due with what we have but will need to get different screws for the next iteration.

The software team had initially expected to implement algorithms that were focused on interference from environmental conditions, which only requires a base station and user equipment radio. However, many of the software team's chosen algorithms are focused on mitigating interference due to other signals, which will require one more user equipment radio. We are using B210 SDRs for both the base station and the user equipment, so we will need to request at least one more B210 from our research assistant in order to implement our chosen algorithms.

- **Advisor Input:** It is very important that you meet regularly with your advisor. Please have your advisor select one of the options below.

\_\_\_\_\_ I am pleased with the progress the team is making.

\_\_\_\_\_ The teams progress could use some minor improvements.

\_\_\_\_\_ The team's progress has some major concerns.

**Your advisor's selection must be confirmed by either an email attached to this report (merge files into a single pdf) or a physical signature obtained from an in person meeting. Please provide this report to your advisor at least 1 week before the due date so that they have time to respond.**

**Signature:** \_\_\_\_\_



**Zhang, Hongwei [E CPE]**

to me, Timothy ▾

Mar 25, 2022, 5:56 PM (3 days ago)



Hi Josh,

Per the instruction, please use this email as confirmation of my selection of "I am pleased with the progress the team is making."

Please replay this feedback to the software subteam:

Please have a strategy of integrating the trials different scheduling algorithms. If the team decides to focus on a specific algorithm, it may be best to collaborate on the implementation and testing of that chosen algorithm.

Hi Tim,

Thanks a lot for your effort in leading the senior design project.

I did approve the team's last report, and sorry if I should not just put my name in the file as my signature. If possible, your consideration of giving the points back to the team will be much appreciated.

Thanks,

Hongwei