
EE/CprE/SE 491 WEEKLY REPORT 01

8/23/2019 – 10/4/2019

Group number: sdmay20-36

Project title: Open-Source Prototyping of 5G Wireless Systems for Unmanned Ground and Aerial Vehicles

Client &/Advisor: Hongwei Zhang

Team Members/Role:

Andrew Eschweiler – Algorithm Dev.

William Byers – Algorithm Dev.

Nathan Whitcome – OAI Integration Dev.

Samuel Stanek – OAI Integration Dev.

Ibrica Tutic – Project Manager

Nicholas Lorenz – Quality/Performance Analyst

○ **Weekly Summary**

Since the start of the quarter the bulk of the work completed has been forming a team, choosing a project, planning the project alongside our faculty advisor, setting roles, and setting up the team work environment. The closest to technical work done so far is doing research on topics pertaining to the tools and algorithms that will be used for our project. Technical tasks are not expected to begin until the middle of October.

○ **Summary of Weekly Advisor Meetings**

- **Week 1:** Introductions and project overview, Roadmap draft
- **Week 2:** Open Air Interface and 5G algorithm resources for research
- **Week 3:** Reviewed updated roadmap, clarified project goals
- **Week 4:** Reviewed specific, weekly goals in roadmap and team member roles

○ **Past week accomplishments**

- **Ibro:** Read two papers about algorithms for 5G scheduling for primarily UGV vehicles. Began more research on the key differences between LTE and 5G, along with what types of algorithms are used in current 5G scheduling. Most of the current work on 5G involves algorithms for large throughput and simultaneous connections, not necessarily low latency and ultra reliability. Also began look at the scheduling algorithm in Open Air Interface and how we could potentially design ours to fit in nicely with their current model.
- **Will:** Read all provided papers for 5G scheduling algorithms. Also started to look into Open Air Interface. Learned the design philosophies behind the current 5G algorithms. Made notes on general ideas regarding how to integrate the new algorithm based on topics discussed in the papers for the other algorithms.
- **Nathan:** Started reading into OpenAirInterface and the EURECOM standards. Studied how to get OpenAirInterface working based on tutorials on their website. Researched how to dual boot Ubuntu alongside Windows on a PC.
- **Sam:** Read both papers on PRKS and CPS. Looked more into CPS and SUMO and installed SUMO on personal computer. Started watching tutorials on how to make networks in SUMO. Installed OAI on personal computer and looking into code.
- **Drew:** Looked into the general requirements of 5-G systems and how companies are going about implementing it. Did a brief look-over of Open Air, but nothing in depth.
- **Nick:** Looked into the current performance of 5G tech and possible ways to improve it or at least which parts need to be improved. Read up more on Open Air interface and the difficulties of 5G tech on moving vehicles.

○ **Pending issues**

- All: Understanding algorithms and tools the project will use
 - Team goal is to have a solid understanding by the end of October

○ **Individual contributions**

<u>Name</u>	<u>Individual Contributions</u>	<u>Hours this period</u>	<u>Hours cumulative</u>
Andrew Eschweiler	Existing Algorithm Implementation Research	30	30
William Byers	Algorithm Design Research	30	30
Nathan Whitcome	OAI, IEEE, and EURECOM Standards Research	30	30
Samuel Stanek	SUMO Simulation Research	30	30
Ibrica Tutic	Algorithm Function Research	30	30
Nicholas Lorenz	5G Performance Research	30	30

○ **Comments and Extended Discussion**

The individual hours are all the same for right now. This is because a large amount of the time was spent collaborating with everyone, and there wasn't a good way to track the individual time yet. Each member also spent around the same amount of time on their research portion as well. Once technical tasks start to be worked on, it is expected these numbers will begin to vary. The hours in this report are also for the first four weeks since our team formed.

Another issue we've been facing is there seems to be a lack of concrete goals for the project deliverable coming from the faculty advisor. This makes planning harder because the team has to decide what the goal should be, which means figuring out what each member expects and how hard they want to work.

The reason technical tasks haven't begun yet is the tools and algorithms are not commonplace, so each member needs to gain an understanding of those things before working on them. The team is also waiting on a write up of the new algorithm that will be implemented from the faculty advisor. This also means our individual plans will look fairly similar as we familiarize with the contents.

○ **Plans for the Upcoming Period**

- **All:** Read up on Open Air Interface, SUMO, and wireless networking algorithms provided by faculty advisor
- **Ibro:** Read the third paper on pktRT scheduling algorithms. Dual boot linux on my PC so I can run simulations/emulations as close to hardware as possible. Begin simulating/emulating networks using OpenAirInterface and potentially NSB sim for flight network simulation.
- **Will:** Dig deeper into OAI architecture and set up a dual boot for Linux on my PC. Try and identify where specifically in OAI the algorithm will be implemented, both from a stack perspective and a code perspective.
- **Sam:** Set up dual boot to setup and run OAI simulator. Look into SUMO and NSB sim to learn how to simulate networks with OAI. Keep reading book on LTE and 5G and the paper on CPS.
- **Nathan:** Read more into wireless networking standards and install OpenAirInterface on my computer. Read the rest of the information given to us by our faculty advisor.
- **Andrew:** Look further into Open Air and read the documents and links provided by our professor. Should definitely take notes.
- **Nick:** Study the algorithm for current 5G systems and familiarize myself with it. When we receive the new algorithm study it as well.