

5G Documentation Project - sdmay23-31



Danny Cao



Adam Kruger



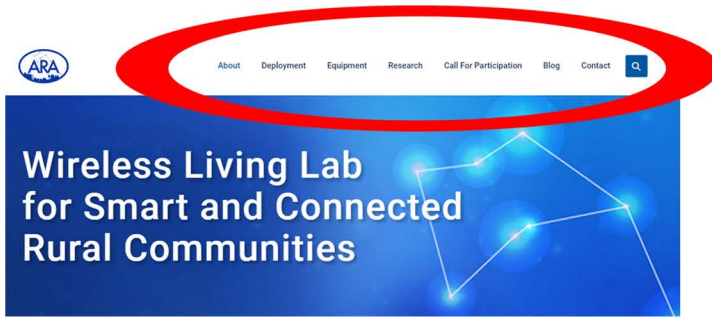
Ethan Gabriel



Zachary Miller

Introduction:

This project serves as a means of addressing the issue of lack of documentation on the subject of 5G as a whole as well as a tool of supplementing supporting information for the 5G ARA network architecture. Our advisor, who is also the receiving client of the team's project, wants to have a means of providing learning material or supporting documentation on both general 5G networking technical details as well as the operation of the ARA wireless living lab, which is being led by the advisor/client. The team then sought to address this issue through our project and product by targeting mainly undergraduate students as the focus of the content of the project website.



ARA Wireless Website

Problem Statement:

While the ARAWireless website does a very good job at detailing what the ARA project is, there is a lack of resources available that can actually inform a user about 5G technologies and how they work. Our product and project is seeking to solve that problem, by creating learning modules with highly detailed information about these technologies, and by constructing experiments that users can actually do on their own

Overview

Our project seeks to provide useful and relevant information to the public regarding 5G technologies. Experiments that are hosted on the website should be engaging and capable of being performed with little setup time.

Unique Features

- Documentation contains integrated quizzes with realtime results
- Experiments with step-by-step comprehensive guides
- Overview of ARA Infrastructure, specific to ARA Wireless project

Example quiz shown on right

Resources Required

- Website hosted on Readthedocs
- GitLab for shared codebase
- GENI software login and appropriate terminal
- Virtual Machines

Example Quiz

What does 5G stand for?

- 5-Gigabytes
- 5th Generation
- 5-Gigabits

What is an example of a UE with regards to 5G architecture?

- Mobile Phones
- Personal Computers
- iPad
- All of the above

The functions that Radio Access Networks perform are

(i) radio transmission and reception
(ii) routing data between different networks
(iii) signal processing

- i, iii
- i, ii, iii
- ii, iii
- None of the above

Core Networks transfer data between different Radio Access Network nodes.

- True
- False

Results

Though we are still receiving feedback as the website is being used, comments that we have already heard have praised the cleanliness of our website, as well as the thorough experiment guides.

We have incorporated some of the more critical reception into our website and helped develop it into what it is today. We are also waiting to beta test software for our advisor, but have not heard back on next stages for that as of yet.

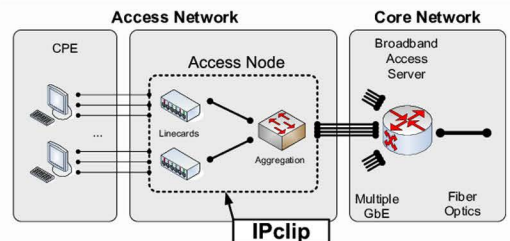
Target Audience:

- Future senior design teams
- Undergraduate students
- Future ARA collaborators
- Interested Users

Methodology

This project has been through many iterations, from developing hardware for 5G testing, to developing software for hardware acceleration, and finally to a documentation website. Through bi-weekly meetings with our advisor/client, we have been able to develop a website which meets all requirements set forth by our advisor.

We used documentation and resources provided by our advisor to develop our site, and conducted research of 5G technologies in order to establish our learning modules and quizzes.



This picture depicts core network architecture

Conclusion

In conclusion, our team feels we have accomplished what we sought out to do, even if our end result was not what we had originally expected. Working around the departure of a teammate as well as work done for other classes during the semester we feel that we have a product that we can be proud of.

We feel our site is an effective learning tool for 5G technologies on a highly detailed yet accessible level, and our experiments are comprehensive and effective at teaching about the aforementioned subject material.

Special Thanks

Thank you to Benjamin Riemersma for his contributions to this project during the Fall 2022 semester



IOWA STATE UNIVERSITY