

Documentation and Educational Website Weekly Report

EE/CprE/SE 492 WEEKLY REPORT 04

3/24/2023 - 4/07/2023

Group number: 31

Client &/Advisor: Dr. Hongwei Zhang

<i>Team Members</i>	<i>Majors</i>
Adam Kruger	Software Engineering
Danny Cao	Electrical Engineering
Ethan Gabriel	Electrical Engineering
Zachary Miller	Software Engineering

Sphinx Development

- Adam Kruger
- Zachary Miller

Website Design

- Zachary Miller
- Ethan Gabriel

Willingness to learn about

5th Gen Wireless Networks

- All team members

Tech Writer Skills

- Danny Cao
- Ethan Gabriel

Experiment Design

- Danny Cao

Git

- Zachary Miller

Surveying Experience

- All team members

Weekly Summary:

For this week's progress report, the team had mainly focused on generating the content and discussing with each other possible testbench applications with ARA. In terms of content for the learning module and the overall objective, the team has finally laid out the overall learning modules that will be present within the documentation site. The learning modules will cover:

- Overall Basic 5G Network Structure
 - User Equipment (UE)
 - Radio Access Network (RAN)
 - Mobile Core (NG-Core)
- User Equipment and Other Equipment
 - Devices - Phones, Drones, and Cars
 - Applications such as agricultural advancement
 - Antenna
 - Routers and Switches
 - Small Cells: Used to provide wireless coverage in areas with poor coverage and can be deployed indoors or outdoors.
- RAN Overview
 - RAN Basics
 - Radio Spectrum
 - Base Stations
 - Millimeter-wave frequencies
- NG-Core Overview:
 - Mobile Core Basics
 - Authentication, IP Connectivity, Bill Tracking
 - Network Function Virtualization (NFV) - network functions that can be ran on on virtual machines, i.e. virtual firewall, routers, and switches
- 5G Networking in Rural Locations
 - Coverage
 - Infrastructure
 - Economic Impact
 - Policies and Regulations
- ARA Related Topics
 - Network infrastructure of ARA
 - Deployed equipment for ARA
- NOTE: Any mention of items that may not be familiar to users such as "User Equipment" will have to be discussed and explained regarding purpose.

It should also be mentioned that with the release of ARA within the following weeks, the team believed it may be the best decision to associate testbeds utilizing only ARA and to cut back on other applications such as Powder. With that said, some testbeds and experiment currently being discussed includes:

- "Hello World!" in ARA
- Utilizing UEs to interact with the ARA network
- Determining which base station is online and active within the ARA network
- Transmitting, Receiving, and Visualizing Waveforms using UHD and GNURadio

In terms of website layout, the following layout has been updated to learning modules and testbeds to reflect these changes and have been set to working on getting it implemented into current website.

Introduction

- Now must add experiments and documentation from the official ARA website

Module Links

- We are now going to be adding more stuff from the ARA official site onto the modules, testbeds, and experiments sections of the documentation website
- Overall Basic 5G Network Structure
 - User Equipment (UE)
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- 5G Networking in Rural Locations
 - Coverage
 - Infrastructure
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 - Policies and Regulations
- Must decide on how to incorporate detailed information regarding basic networking information such as IP address, user equipment, etc.

Test Bed

- More relevant ARA features will be implemented within Test Bed as an ISU associated 5G application. We can implement this using some resources from the ARA site.
- Implement:
 - “Hello World!” in ARA
 - Utilizing UEs to interact with the ARA network

- Determining which base station is online and active within the ARA network
- Transmitting, Receiving, and Visualizing Waveforms using UHD and GNURadio

How to Get Started

- Inclusion of O-RAN application, inclusion of ARA-RAN, PowderWireless
- ARA will be active within the following weeks, software and application guide will be provided to support this.
- “Hello World” - ARA

ReadTheDocs.org Implementation

- ReadTheDocs implementation has been added to git repo and also has begun to be implemented into the codebase

Past Week Accomplishments:

- Zach Miller: Added ReadtheDocs to git, started embedding the ReadTheDocs implementation into the code base to get it to be hosted on ReadTheDocs.org
- Danny Cao: Established outline of what will all be included in the learning module.
- Adam Kruger: Worked on website layout and configured navigation.
- Ethan Gabriel: Established methods for constructing effective learning methods. Research on SRS and OAI completed, organized to easily fit into learning modules.

Pending Issues:

- Zach Miller: Need to further read the ReadTheDocs documentation and figure out how to exactly embed its functionality correctly into the codebase and .rst files. I also need to get some CSS to make the website look more professional like our advisor told us to do.
- Danny Cao: Need to work with Ethan on being provided feedback on learning modules. Will also have to work closer with our client to discuss other possible avenues for testbeds.
- Adam Kruger: Get the website set up to host on ReadTheDocs
- Ethan Gabriel: Need to establish learning modules and get feedback soon so that we can incorporate real feedback into our learning modules.

Individual Contributions:

NAME	Individual Contributions <i>(Quick list of contributions.</i>	Hours this week:Hours cumulative

	<i>This should be short.)</i>	
Zach Miller	Continued working on website and layout/content Added ReadTheDocs.org to git Embedded ReadtheDocs in code base	5 24
Adam Kruger	Coded the framework for the navigation Wrote into the learning modules Configured the links	2 24
Danny Cao	Created outline of all content that will be within learning modules Worked on populating information for the topics that will be discussed.	4 24
Ethan Gabriel	Continued documentation of 5G technologies and established methods for teaching in our learning modules	4 23

Plans for Upcoming Week:

- Finish populating website content including learning modules
 - Adam Kruger and Zach Miller
- Riff off of some of the ARA experiments and select which ones to put (since they are new this is late stage addition)
 - Danny Cao, Zach Miller
- Continue to discuss and populate learning modules with advisor/client present
 - Danny Cao and Adam Kruger and Zach Miller Ethan Gabriel
- Further implement the readthedocs.org and embed it into the codebase
 - Zach Miller
- Beta test for ARA's testbeds and experiments on the site
 - Danny Cao and Adam Kruger and Zach Miller Ethan Gabriel
- Restyle website due to advisor request to make it look more like ARA website
 - Zach Miller

Summary of Weekly Advisor Meeting:

This week's meeting with our advisor was one of the final checkpoints that we have with him before preparing for final meetings. We first discussed the status of our learning modules. Danny clarified with Hongwei that we do want to go in-depth with the content in our modules, as the site will likely be used for a while, so the more information the better. We were also asked by an advisor if we would be willing to do some beta testing for the ARA wireless project and we accepted. We also learned that we are going to get another small sample of undergraduate students from another group working under our advisor.

We also conversed about the progress of the website, including our update that the ReadtheDocs implementation is partially complete. Since we know now that this project is likely going to be picked up by another senior design group in the future, we also talked about things we can do now to help better prepare that group, such as establishing our advisor as a maintainer on our github so that the code for our site can be accessed and edited/improved in the future. Dr. Zhang also reminded us that the deadline for this project is just about 4 weeks away, and he requested that we have a much more functional website with some modules ready to go in 2 weeks. He advised us on where to find some CSS templates for our website to make it look more like the ARA website that was just released.