

CprE/SE 492 STATUS REPORT 3

2/14/2025 – 2/27/2025

Group Number: 27

Project title: Open-Sourced Radio Microcontroller

Client &/Advisor: Dr. Henry Duwe

Team Members/Role:

Noah: Team Organization

Will: Project Management

Ibram: Analog Design Lead

Nathan: Digital Peripheral Lead

Nolan: CPU/Memory Architecture Lead

Ethan: Software Lead

○ **Weekly Summary**

This week we continued to work on different parts of our project. Each team member has a different part of the system they are working on, which is developed asynchronously from each other. This enables us to produce designs, prototypes and tests without having to wait on other team members until it is time to integrate the components together.

○ **Past week accomplishments**

- **Noah:** I created and tested each individual part of the divider in xschem. Currently debugging the testbench of the complete component. Learned how to use magic for layout.
- **Nolan:** I worked on instantiating some Efabless DFF RAM macros we found online. The instantiation of the modules was straightforward, but they did not come with a wishbone interface, so I created one. After debugging the interface and learning more about the RTL simulation tools, I was able to achieve a working wishbone slave interface for the DFF RAM. I also started to develop some RTL testbenches to verify the functionality of the DFF RAM modules.
- **Nathan:** After some continued work on trying to genericize the Wishbone crossbar, I have moved to a Python script to easily generate a crossbar due to difficulties with the previous approach. The code can be generated but has issues in simulation. I'm currently working to resolve them.

- **Will:** Continued AES research and worked on documentation for encryption in the design document.
- **Ibram:** I made the schematic for the VCO and testbenches. I simulated the VCO with an ideal current source and calculated frequencies up to 4GHz. I made progress in calculating the phase noise of the closed loop system.
- **Ethan:** Worked on AES documentation for design document, and testing for the provided Efabless AES encryption/decryption
- **All Team Members:**

○ **Pending issues**

- **Noah:** Issues when integrating divider components into the whole
- **Nolan:** Luckily, I was able to figure out all my issues with the DFF RAM work this week!
- **Nathan:** Currently have some simulation errors with the autogenerated Wishbone crossbar.
- **Will:**
- **Ibram:** none
- **Ethan:** 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>
Noah	Created divider in xschem, testing, learning magic	28(2 weeks)	91
Will	AES research and documentation	5	60
Ethan	Worked on AES documentation and testing	6	59
Ibram	VCO schematic and testing. Phase noise calculations (In-progress)	20	82
Nathan	Switched to different crossbar generation method and working on verifying it.	12	76.5
Nolan	Instantiated DFF RAM, wrote a wishbone slave interface for the RAM, created some basic tests.	8	68

○ **Plans for the upcoming week**

- **Will:** Continue AES documentation and testing
- **Nathan:**
- **Ibram:** complete VCO schematic and simulations.

- **Nolan:** I will be continuing to develop my testbench for the DFF RAM. Once the testbench is complete and fully passes, I will hook up the DFF RAM modules to the RISCv core I generated. Then, I will create some testbenches to test out the RISCv processor to verify that it works correctly.
- **Ethan:** Continue testing AES provided by Efabless, potentially have it hardened, test other AES as well. Continue working on proper documentation for design document.
- **Noah:** Debug and identify issues with the divider TB try to layout some components.

○ **Summary of weekly advisor meeting**

Our advisor meeting this week primarily consisted of reporting our progress on the individual components we were working on. Noah presented some testbenches he created for the dividers he is working on. Ibram presented progress on the VCO component. Nathan gave a progress report on the wishbone crossbar arbiter he is genericizing. Nolan reported his progress on incorporating DFF RAM into the design and presented a few issues he was running into. Finally, Will and Ethan presented their findings after testing out an AES encryption macro they found online.