CyWi: Open-Source Wireless Innovation Lab for Smart Ag, AR/VR, and Beyond

Team Number: sddec19-02   **Client**: Dr. Hongwei Zhang   **Faculty Advisor**: Dr. Hongwei Zhang

Team Members

Chenye Lim   Ryan Cullinan

Jian Chew   Shay Willems

Pawel Darowski   Tyler Beder

Dates

February 16 to March 1, 2019

Weekly Summary

The team spent one week creating the first draft of the Project Plan which included a problem statement, use cases, proposed approach, diagrams, functional requirements, timeline, and much more. Unfortunately, our weekly meeting with the client/advisor on February 25th was cancelled due to weather safety concerns. We continued researching similar testbeds such as POWDER and ORBIT to understand the lifecycle of a testbed experiment. Most of us now have the ability to run experiments on the POWDER testbed.

Hardware for the Software Defined Radios (SDR) devices are all but decided: Ettus X310 and B210 should work great for 5G development with the OpenAirInterface environment. Hardware for the Cyber-Physical Systems (CPS) and Internet of Things (IoT) experiments are looking like Texas Instruments CC26X2R1 development kits since they support Wi-Fi, Bluetooth Low Energy, Zigbee, Thread, and Sub-1 GHz protocols; however, there are still some software/platform concerns we need to work out with the client/advisor. We're not yet clear if TI's SimpleLink SDK is what the client has in mind.

Accomplishments

- Everyone - Created the first draft of the Project Plan
  - This took a whole week to complete and we all spend many hours working on each of the sections.
- Pawel - Researched ORBIT testbed and Software Development Kits (SDK)
  - ORBIT is a mature wireless testbed with good documentation explaining what is needed to setup an experiment. This will help us plan our testbed, especially the server side.
  - Texas Instruments SimpleLink is a SDK that comes with low-level software such as HAL, drivers, TI RTOS (also supports the FreeRTOS kernel), and a POSIX layer for OS portability. Middleware stacks are also provided for each of the wireless protocols needed.
  - IoTivity is an open-source software framework which can be implemented with Qualcomm's QCA4020 development kit.

- Ryan - Began looking into Open Air Interface and its uses
  - Reviewed the layers of a software defined network (SDN)
  - Learned that SDN's are broken down into three layers: application, control, and infrastructure
  - For our project the application layer will be our web based service, the control will be handled by our server and scheduler, and our infrastructure will be our hardware and software one our NUC's

Pending Issues
- Jian - Having trouble to instantiate an OAI experiment on Powder.
  - Something to do with mapping devices.

Individual Contributions

Team Member	Contribution	Weekly Hours	Total Hours
Chenye Lim	Gain deeper understanding of the needs by CyWi testbed Contact TI agents to get information about supported SDK Follow up with the advisor and deliver necessary messages to the team	5	9
Jian Chew	Ran experiment on Powder	6	16
Pawel Darowski	High-level block diagram, intended users and uses, functional requirements, constraints, technical approach, technology considerations, and testing requirements. Investigated TI CC26X2R1 development kits for CPS & IoT hardware and what platforms they are compatible with. Also viewed alternative CPS & IoT solutions such as Qualcomm's QCA4020. Read about ORBIT hardware and their experiment lifecycle.	16	28
Ryan Cullinan	Worked on Part 2 of the project plan with Shay. Filled in a couple of missing sections in the project plan. Read into AOI, specifically Software Defined Networks (SDN). Began thinking about how the different layers of an SDN apply to our project	5	14
Shay Willems	Gantt chart, Part 2 of Project Plan	8	17
Tyler Beder	Use Case diagram and Statement of work.	4	13

Plan for Coming Week
- Everyone - Meet with the client to finalize the hardware and software.
  - SDR choice seems to be settled on Ettus X310 and B210 with OpenAirInterface software.
  - CPS/IoT need some more discussion to determine if TI's SimpleLink SDK is acceptable software.
  - Node controllers must be discussed: Intel NUC8 vs MintBox Mini 2
- Everyone - Begin looking closely at the server components needed to manage our nodes and user experiments.
- Jian - Run experiment on Powder successfully.
  - Need to read documents on how to configure the OAI profile to run SDR-based experiment.