EE / CprE / SE 491 – sddec20-05

An Advanced Networking Outreach Activity for Kids

Bi-Weekly Report #4
3/1/2020 – 3/15/2020
Client & Faculty Advisor: Dr. Tom Daniels

Team Members

Grayson Cox | UI Developer | Agile Project Manager
Austin Dvorak | Network Systems Manager
Ryan Newell | System Admin
Spencer Parry | UI Developer
Ross Thedens | Hardware Systems Manager | Meeting Secretary

Reporting Period Summary

In this reporting period, our main accomplishments were finalizing our bill of materials and continuing experimentation with OpenWrt and Python socket programming. In the first week, we completed our second lightning talk. This helped us clarify some points of our design and revise the first two sections of our design document. We were able to wrap up our work on the bill of materials after meeting with Dr. Daniels, who suggested we buy full Raspberry Pi 4 kits instead of trying to get by with the bare minimum for our prototypes (i.e. just buying the boards and scrounging up cables and microSD cards of our own). We have continued to experiment with OpenWrt and Python socket programming, which has generally been successful. However, we still face a potential roadblock if OpenWrt does not work nicely with the camera module. Presently, we are getting sections 3 and 4 of the design document underway and preparing for the arrival of our ordered materials.

Reporting Period Accomplishments

- Bill of Materials (BOM) (Austin, Ryan, & Ross)
    - Finalized and sent in Bill of Materials for a four Raspberry Pi kits (including cases, microSD cards, heatsinks, etc.), a camera module, and a camera mount
- Routing Node Prototyping (Ross)
    - Modified previous Python code to allow forwarding of video packets in UDP
        - Tested a scenario where a video is streamed from VLC from a desktop computer to a Raspberry Pi and back to the desktop

        - Packets are streamed from one instance of VLC on the desktop to the Pi's IP address and received by the Python program on the Pi
        - Packets received by the Pi are sent back to the desktop computer's IP, where a second instance of VLC player on the desktop plays the received video
        - This will be used on top of B.A.T.M.A.N/OpenWrt, which will route the packets between the nodes as necessary to transfer video streams from sensor nodes to the network master node
    - Prototyped a header system for packets sent through network
        - This is a way to distinguish video data packets from sensor data packets and control packets
        - Tested using similar technique to previous, but with two Python programs on the Pi
            - One appends a basic header to the data, then sends it to the other
            - The other removes the header and transmits the packet back to the desktop
    - Design Document V2 (All)
        - Some revisions to sections 1 and 2 (especially renaming the types of nodes) (Ross)
        - Located previous literature for section 3.1 (Ross)

Pending Issues

- Determine video/sensor feasibility in routing distributions considering incompatibility of Raspberry Pi camera module (Ross)
    - Our BOM includes the V2 Raspberry Pi camera module. We will need to test this in OpenWrt to make sure it is supported and assess what needs to be done to make it work

Individual Contributions

Team Member	Contribution	Reporting Period Hours	Total Hours
Grayson Cox	Experimented with methods of hosting web-based applications on a Raspberry Pi, coordinated group meetings, monitored creation of Issues in GitLab.	12	48
Austin Dvorak	Assisted in selecting parts of the BOM along with more OpeWRT mesh experimentation	12	48

Ryan Newell	Cleaned up the BOM and reached out to ETG to get parts ordered	12	48
Spencer Parry	Did some research on how to host the web app part of the project, created information for lightning talk	12	48
Ross Thedens	Assisted in selecting parts for the BOM, Conducted additional Python experiments with video streaming, started on Design Document v2, Contributed to lightning talk and compiled recordings	12	48

Plans for Next Period

- Raspberry Pi Web-App Hosting (Grayson & Spencer)
    - Make final decision on method of hosting
        - NodeJS
        - Apache
- Python Experimentation (Ross)
    - Once the camera module and new Raspberry Pi boards are in, experiment with camera streaming from Pi to VLC player on desktop (in lieu of the UI/Control program)
    - Test camera module in OpenWrt
    - Determine video/sensor feasibility in routing distributions considering incompatibility of Raspberry Pi camera module
- Design Document V2 (All)
    - Write all subsections in sections 3 and 4
    - Review sections 1 and 2 as a team to see if things have changed (terminology, methodology)
- Adapt to Online Instruction (All)
    - Re-coordinate meetings to use Zoom instead of meeting physically
    - Send someone to campus to pick up hardware from ETG once it is available
    - Choose where to store hardware since senior design lab is closed
- Start mesh networking configuration and testing
    - Set up openwrt for mesh networking and get 3 nodes connected to a network