EE / CprE / SE 492 – sddec20-05

An Advanced Networking Outreach Activity for Kids

Bi-Weekly Report #5
10/12/2020 – 10/26/2020
Client & Faculty Advisor: Dr. Tom Daniels

Team Members

Grayson Cox | UI Developer | Agile Project Manager
Austin Dvorak | Network Systems Manager
Malcolm Johnson
Ryan Newell | Hardware Systems Admin
Spencer Parry | UI Developer
Ross Thedens | Communication Systems Manager

Reporting Period Summary

In this period, we began our main integration efforts for the project. With most of the main software and network setup components completed, we held two meetings (on 10/22 and 10/26) to integrate the user application, backend application, and video streaming functionality in a mesh network on our Pis. In the first meeting, we had difficulties with connecting to the Pis via Ethernet; we ultimately decided that all connections to the Pis while in mesh network mode will be wireless. In the second meeting, we installed our user application and backend application on the mesh network-configured Pis. Apart from these meetings, we made refinements to some of the individual components, completing Docker work on the user and backend applications and finalizing the options for the video streaming command. We also procured additional hardware for our final network demonstration.

Reporting Period Accomplishments

- Initial integration attempts (All)
  - Abandoned Ethernet and added wireless support to all nodes (Austin)
  - Installed user application, backend application, video streaming components on nodes
- Streaming video to user application (Grayson & Ross)
  - Fully implemented the UI code for video streaming.
  - We tested streaming video from a Pi to the User Application running on a laptop and got acceptable performance.

- ■ "Packet Loss" issue was caused by a high resolution setting. Video originally did not play because autoplay was not enabled
    - ○ Verified that streams up to 30 frames per second and 2 mbps bit rates work well over a 10 mbps connection
    - ○ Disabled extraneous options for video streaming to potentially reduce CPU intensiveness of streaming
- ● Network Master Node software containerization (Grayson & Spencer)
    - ○ Fully implemented the Docker configuration files required to containerize the User Application and Backend Application.
    - ○ Now all the software required for the Network Master Node can be compiled and deployed with one command.
    - ○ Tested the configuration on a one of the Raspberry Pi 4's and got exceptional performance
- ● Ordered three more Raspberry Pis and cases. Holding off on ordering more batteries/hats until we've confirmed that they work properly. (Ryan & Malcolm)
- ● Selected temperature sensors to use for some relay nodes (Ryan)

Pending Issues

- ● Camera that was ordered last semester has still not arrived. Contacting ETG about this. (Ryan)
    - ○ We are working with Ross's Pi Camera 2.1 module as an interim
- ● Package availability when building the video streaming Docker image is somewhat unpredictable (Ross)
    - ○ Document how mirrors can be changed when Docker container is built

Individual Contributions

Team Member	Contribution	Reporting Period Hours	Total Hours
Grayson Cox	● Help Ross to test video streaming UI code. ● Help Spencer to debug and implement the Docker configuration files/scripts for containerizing the Network Master Node software. ● Fix some URL issues in the User Application.	18	74

	● Review Ross's merge request for optimizing some network configuration scripts. ● Assist with our first attempt at integration testing. ● Look into what requirements we have remaining for the final sprint.		
Austin Dvorak	● Added wireless support to each node ● Assist with first attempt at integration testing	12	66
Malcolm Johnson	● Selected and ordered Raspberry Pi Cases. ● Began review of poster and final report process	12	36
Ryan Newell	● Ordered more Raspberry Pis and cases ● Determined a temperature sensor that fits our needs	12	60
Spencer Parry	● Worked on the issues we were seeing with the Docker Compose File ● Started work on a fullscreen button for the live video	12	64
Ross Thedens	● Test updated video streaming UI code ● Test higher frame rates and bit rates for video streaming ● Review and edit FFmpeg options to improve video streaming ● Install video streaming component on project Raspberry Pi	14	66

Plans for Next Period

- Poster (Malcolm)
  - Construct a draft of the poster for senior design
  - Consult with other group members to ensure information is accurate
- PIRM Presentation (All)
  - Prepare for PIRM presentation in upcoming period

- ○ Discuss technical challenges with mesh network setup
- Assemble battery hats and cases and test that they work properly (Ryan)
  - ○ If they work and do what we need, order more batteries and hats for Pis that were just ordered.
- Continue integration work (Ross, Austin, Grayson, Spencer)
  - ○ Meeting on 10/28 to get all components of project running on Pis, test video stream to user application in mesh network
  - ○ Work with getting network statistics/information from Pis in mesh network
  - ○ Determine what improvements are needed to user application interface
  - ○ Work on creating a full screen video function
- Lesson plans
  - ○ Decide what activities would be best, what activities can be completed based on existing features
  - ○ Begin drafting the lesson plans to accompany the wireless nodes
- Begin final report draft