

CPR E / SE 492 BIWEEKLY STATUS REPORT 6

March 29 - April 12

Senior Design Team 15

Debugger and Visualizer for a Shared Sense of Time
on Batteryless Sensor Networks

Client/Advisor

Dr. Henry Duwe

Team Members

Adam Ford - Report Manager

Allan Juarez - Scribe

Maksym Nakonechnyy - Design Lead

Anthony Rosenhamer - Facilitator

Quentin Urbanowicz - Test Engineer

Riley Thoma - Project Manager

Biweekly Summary

Over the past two weeks, we have continued to integrate the full system and have also incorporated feedback from our clients. For the simulator, we have updated the simulation to better reflect the simulations that our clients will be running. We have also modified the node communication handling within the simulator. The backend has made good steps towards the consumption of the events and serving them in proper ways to the frontend. We also completed other endpoints that serve important base functionality. For the frontend application, we have moved the file importing functionality to a separate page that verifies if the upload was successful. We also refactored our code to be more modular and tried integrating the endpoints that the backend team implemented.

Accomplishments from the Past Two Weeks

- Backend Team (Adam and Allan)
 - Script to run the database and backend works on multiple systems
 - Event Data is consumed into the processed type as requested by frontend
 - Endpoints completed:
 - /gettimeobjects - Serves time object for a given time
 - /getconfig - Serves the config info for the simulation
 - /file - Allows input of trace file
- Frontend Team (Maksym and Riley)
 - Test backend refactored into the visualizer folder to prepare to merge frontenddev branch with master
 - New Trace File Input page created to input simulation trace files and send it to the backend before opening the main visualizer page. (The file input has been removed from the main page)
 - The error graph now displays the mean and median error lines for the whole simulation.
 - Refactored all components to only have access to information they need.
 - Successfully integrated the new backend endpoints.
 - Updated the frontend application to handle multiple simulations open at the same time.

Trace File Input Page

Select Trace File:

No file chosen



- Simulator Team (Anthony and Quentin)
 - The simulation is updated to run with nodes that have realistic characteristics (e.g. 1-2 second off time, 20 ms boot time, and 100-200 ms off time).
 - The simulator also has been modified to use the times given by the energy models when determining the off, boot, and on times. The energy model also provides a node's local expectation of time.
 - We added a node communication failure event.
 - We also began looking at real energy trace files provided by our client that we will be using to generate off and on times for the nodes in the system.

```
node1 = {
  "node_id": 1,
  "x_pos": 1,
  "y_pos": 1,
  "off_time": 1500,
  "boot_time": 20,
  "on_time": 100,
  "neighbors": [2],
  "energy_model": "random"
}
```

Node with Realistic Characteristics

Individual Contributions

Name	Individual Contributions	New Hours	Total Hours
Adam Ford	Consumed simulator events into a meaningful data structure that can be served to the frontend and the endpoint that serves it. Wrote and tested the “Start Backend” script that launches the database and backend.	17	75
Allan Juarez	Created two endpoints for the frontend to use. One serves the configuration of the current simulator to the frontend and the other endpoint allows the user to upload files for parsing.	12	69.5
Maksym Nakonechnyy	Rewrote some of the network communication logic to fix some errors with integration. Refactored how the code is structured, and what information each component handles. Implemented a possibility to handle multiple simulation pages.	16	76
Anthony Rosenhamer	Modified nodes to use realistic timing characteristics Updated nodes to use energy model times to update local times rather than the true time Implemented share time failure event Added basic file for energy trace file reading	14	72
Quentin Urbanowicz	Added method to energy model base class for getting node’s estimated off time (based on its persistent clock) Reformatted simulator files to conform with PEP 8 standard	6*	60
Riley Thoma	Worked on implementing the mean and median error graph lines into the error graph. Tested backend integration with new backend start script Created separate pages for main visualizer and input of trace file, got backend requests working for the trace file Updated visualizer UI with borders and new styling once trace input was removed	16	64

*Family Emergency

Plans for the Next Two Weeks

- Adam Ford - backend development
 - Build the error graph functionality and endpoint
 - Work on re-working current functionality to allow multiple tracefile
 - Allan Juarez - backend development
 - Work on error trees
 - Maksym Nakonechnyy - frontend development
 - Figure out how to graph the error tree more nicely (node coordinates).
 - Integrate more backend endpoints as the backend team develops them.
 - Create instructions for Dr. Duwe on how to run the application.
 - Update the GUI to show the direction of communications.
 - Anthony Rosenhamer - simulator development
 - Develop simulator documentation for clients
 - Test different configurations for simulations
 - Quentin Urbanowicz - simulator development
 - Finish adding time delay for node operations
 - Implement configurable random variation based on gaussian distribution
 - Work on documentation for clients
 - Riley Thoma - frontend development
 - Add a vertical reference line to the error graph that is synced with the slider and real time value.
 - Get all error graph requests working with backend
 - Help with backend integration of requests and application instructions
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Summary of Advisor Meetings

4/2/21 - Team Meeting with Dr. Duwe and Vishal

The main progress we agreed on was that the system only needs to allow the user to view the “important” points of the simulation. This is when you change state or attempt to communicate. This means the frontend will have a next and back button, and a jump to an interesting point, but no pure scrubbing. Some other definitions were settled on as a team, such as boot time minimum and maximums. Vishal also provided a new dataset for the simulator to leverage regarding timing based on distance from the power transmitter.

4/9/21 - Team Meeting with Dr. Duwe and Vishal

In this meeting, we discussed the error graph that will be displayed in the visualizer and some timing questions for the simulator. We decided with our clients that the error graph would display errors for interesting events in the simulation (i.e. when the nodes change state or communicate) rather than at every time step. We also agreed to connect each of the interesting events linearly. For the simulation characteristics, we agreed to make the starting charges (which affect timing) configurable. Finally, we discussed the simulation duration, concluding that it should run from 2 hours to 1 day of simulated time.