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Title: A Modern User Interface for the LANL Neutron Pulse Simulator (NPS)

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Neutron Pulse Simulator (NPS)

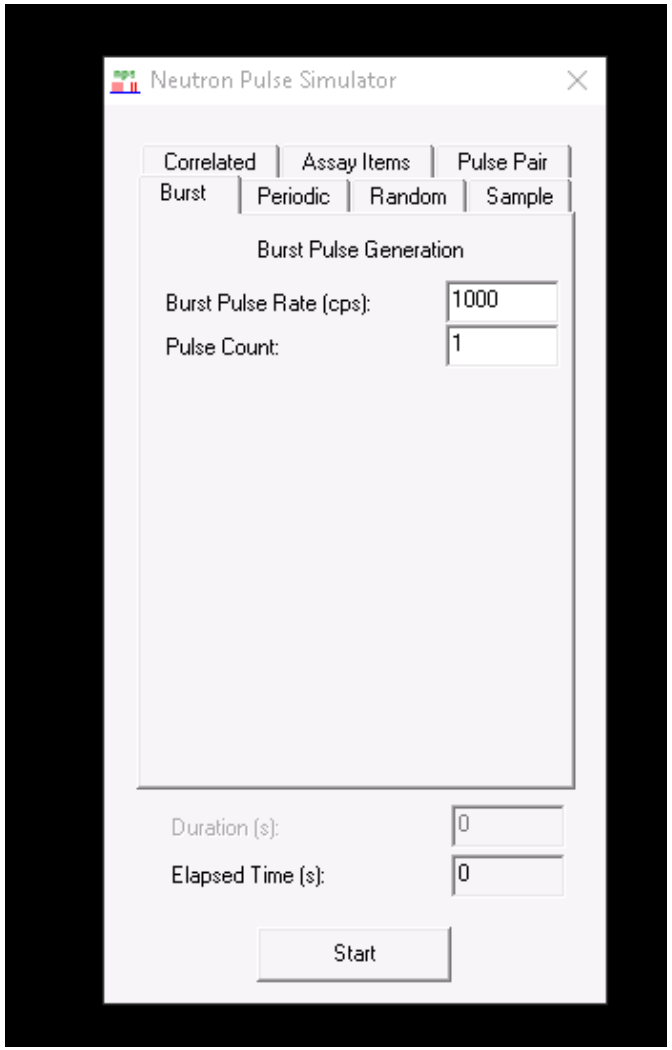
- Neutron Coincidence is a technique used to measure how neutrons are emitted from a radioactive material. This technique is able to capture the unique signature of nuclear material.
- The NPS is an instrument designed “for use as a training and testing tool for neutron coincidence and multiplicity counting systems” (LA-UR-06-4208).

Importance of NPS

- The NPS aids development and testing of software and/or devices without actually using nuclear sources.
- The NPS is used for “measurement control, quality control, diagnostics, and training for neutron coincidence counting systems” (LA-UR-06-4208). In addition, it increases safety for nuclear material testing as it allows personnel to avoid contact with radioactive material.

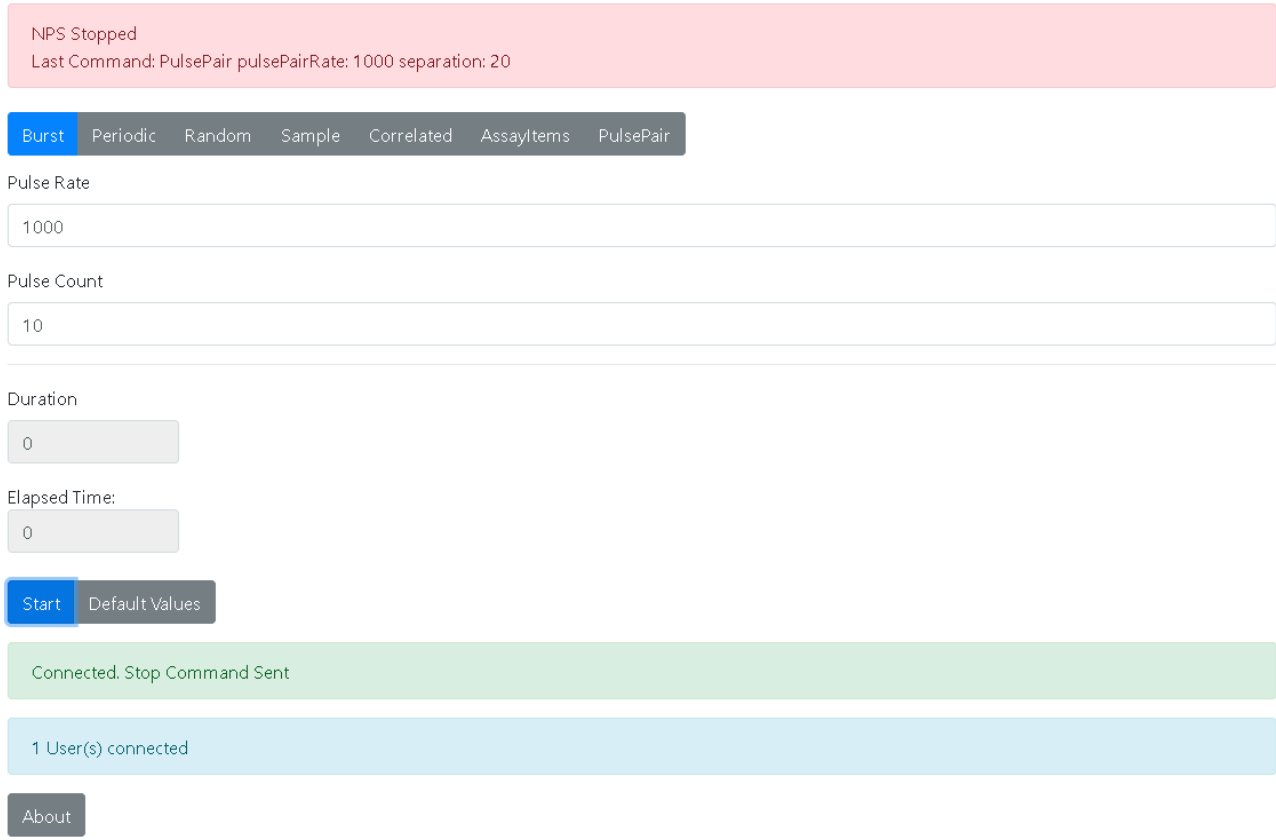
Windows application

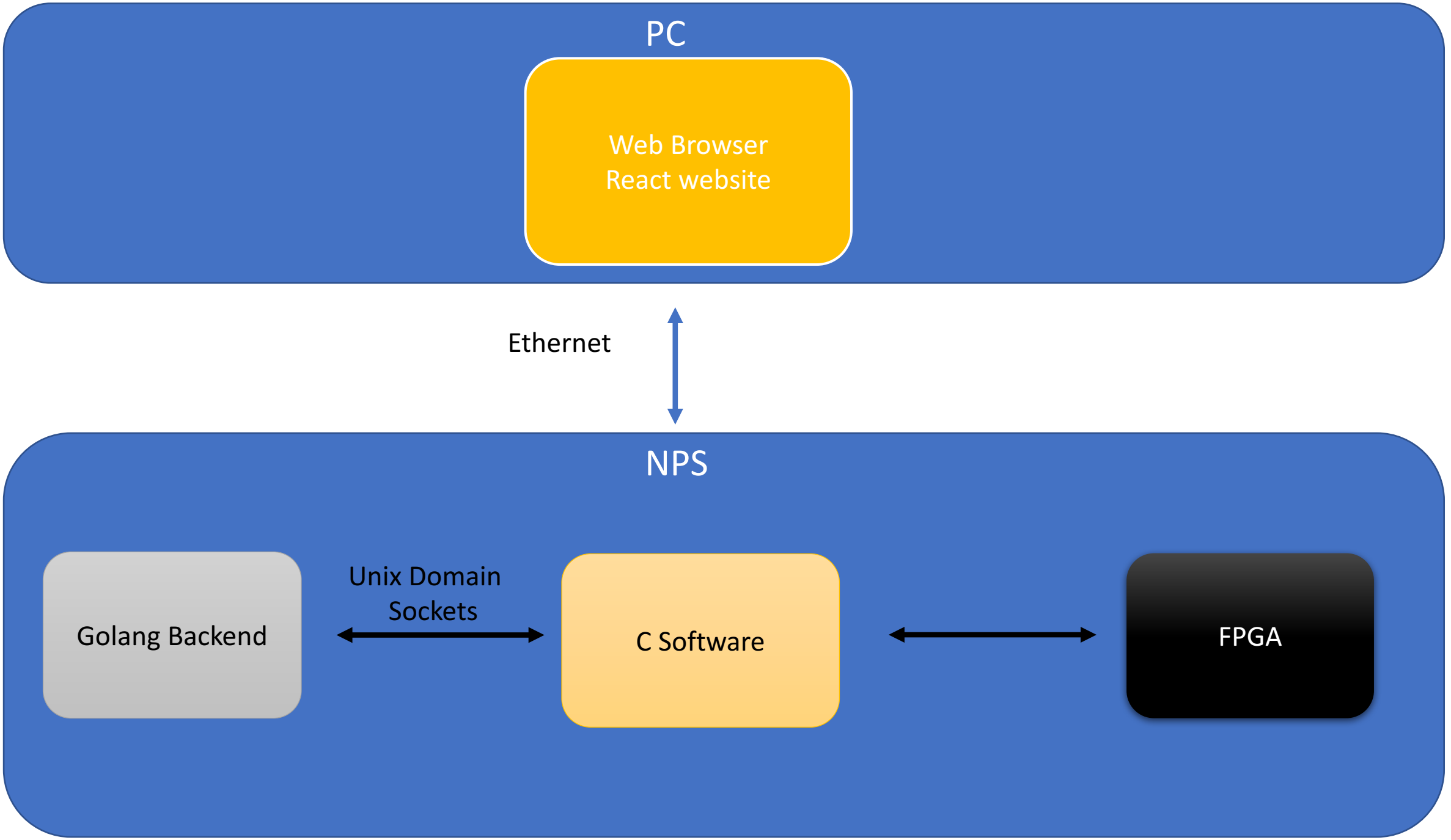
- Windows application was made to control the NPS' pulses.
- It gives the user 7 different modes to choose from to configure the pulses sent.
- Can be inconvenient to setup as it requires drivers to be installed.
- It also only works on a Windows operating system.



Modern Web Interface

- The issues with the Windows application inspired a newer more modern web user interface to be designed.
- The new application is much more robust, portable, and convenient.
- Because it is web based *any* device (including mobile) can control the NPS.
- Additionally there are no downloads or drivers required, simply a browser and the URL to the web application.




PC
Web Browser
React website
Ethernet
NPS
Golang Backend
Unix Domain
Sockets
C Software
FPGA

Challenges

- Having to learn modern JS and React, and starting with no knowledge of Go.
- Learning how to structure the programs, as well as how to use the communication protocols proved to be a bit more difficult than expected.
- In order to have smooth and efficient web socket communication, I had to rewrite the entire Go websocket handler to be concurrent. This allowed communication with the web interface, while simultaneously communicating with the NPS.
- Although there were many more challenges, the last I will mention was rewriting thousands of lines of code from the older Windows Application (written in C++) into Go.