PAWR Program

Developing Advanced Hands-On Labs

Lightning Talk (Testing)

SDMAY24-20

IOWA STATE UNIVERSITY

Project Goal

The Challenge:

On August 1, 2023, GENI (Global Environment for Network Innovation), a virtual lab environment used for simulation of networking and systems for research and education, shut down its servers and effectively went defunct.

Iowa State has used GENI for networking classes in the past (CPR E 431, for example). As a result of GENI's shutdown, our goal is to find alternative platforms to research, develop, and test networking and cybersecurity labs using their resources and environments.

The Solution:

The goal of this project is to research and analyze a variety of platforms that educators can use to replace GENI within their curriculum. In the end this will take the form of a publishable research paper comparing and contrasting the various platforms we discover and their potential use cases.

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Project Deliverables

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Project Goal #1

Our main focus and priority revolves around developing and publishing a IEEE Standard Research Paper focusing on "Exploring Educational Opportunities with PAWR Platforms: ARA, AERPAW, COSMOS, POWDER".

This research paper will compare and contrast different platforms like GENI to supplement the hole GENI had left on our Network and Security courses.

Project Goal #2

Our attention has now been split to focus on designing and implementing our first introductory lab to deploy on PAWR Platforms.

We'll be designing a lab document, a lab justification, and the specifications to allow students to take at their own pace and get an introductory Network and Security experience.

General Testing

What does Testing look like for us?

As mentioned, our project doesn't necessarily require the traditional testing elements other projects may need.

We'll more or less be focusing on the creation and the quality of our work while meeting the standards and needs of our Advisor.

We'll have to take more of an abstract look and approach to testing and redefine the word for our project.

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Unit Testing

Unit Testing

Since the creation of our labs ARE the unit tests, we can focus on breaking them down and looking at the different units of the lab modules, and any of the network protocols and security algorithms used in our labs.

One idea for how we can evaluate these is looking at the internal logic and functionality of these components and monitor their expected behavior.

We can also use tools like JUnit or PyTest for certain components to test the metrics of each component and determine if they're best suited for our introductory labs.

The Big Idea

The introductory Network and Security labs we create **ARE** the unit tests for the different PAWR Platforms we push to.

We'll take our labs (the unit tests) and deploy them on PAWR Platforms to see how they behave and determine if that platform is a good fit or not.

Testing

Software Approach (Interface)

With the creation of our introductory labs, we'll be able to test the connection strength and adaptability of the different PAWR Platforms and determine if their servers are capable and compatible for our needs and the needs of other Network and Security courses.

We won't have access or the responsibility to interact or configure the hardware for each platform as that is out of the scope of our mission.

Software Approach (Integration)

We'll have to look at how we can connect and integrate our lab designs and concepts and see how they behave and react with the specific PAWR Platform.

We'll have to connect to their servers & APIs as well as their sandbox servers.

We won't have access or the responsibility to interact or configure the hardware for each platform as that is out of the scope of our mission.

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System/Reg. Testing

System Settings, the Software Avenue

In general, our creation of the introductory labs are limited to the complexity we make them, but our duty first is the lab document and justification.

We are bound by the PAWR Platform system and sandbox.

While we create our Unit Tests (our introductory labs), we'll be testing the strength and system statistics of the platform.

Regression Settings, the Software Avenue

With the loss of GENI, we are building from scratch and using pre-existing labs to mold and shift into the pre-existing platforms.

We'll abide by their policies and guidelines to ensure our labs do not cause harm or conflict with their current system.

Thus limiting our negative impact on the systems themselves.

Final Testing

Acceptance Testing
Measuring Success

Our acceptance testing won't be focused on acceptability, but rather usability from students and professors as well as applicality.

We'll look at students success and their ease of access with our introductory labs on different PAWR Platforms.

Results
Looking at the Results and what they mean

Our results are going to look abnormal and not your standard project, we'll first have a complete Research Paper in conjunction with several introductory labs on various PAWR Platforms that focus on Network and Security.

Our results and acceptance will be measured in the quality and quantity of our labs and the success they have with students and professors.

Positive results will show that these various PAWR Platforms will be able to accommodate Iowa State's needs, as well as other universities.

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