

A white spiderweb graphic is positioned in the upper left corner, extending across the top of the slide. The background is split into red and yellow sections by a vertical black line.

PAWR Program

Developing Advanced Hands-On Labs

Lightning Talk (Engineering Designs)

SDMAY24-20

IOWA STATE UNIVERSITY

Project Goal

SDMAY24-20

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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Design Content

SDMAY24-20

End of Fall Semester, 2023

Our design content for the end of the first semester is aimed at having the rough draft of an IEEE Research Paper completed.

Compile individual research, collect data, evidence, and information and compile into a comprehensive and cohesive research paper describing the alternatives to *GENI*.



End of Spring Semester, 2024

This semester will hold a different design look. Here, we will strive to create and simulate Network & Security related introductory labs.

- Lab Documentation >>
- Lab Simulation >>
- Lab Explanation/Justification.

Will depend on hardware specifications and user statistics for each specific platform.

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Design Complexity

SDMAY24-20

End of Fall Semester, 2023

With the goal of First Semester being the Rough Draft of our IEEE Research Paper, the complexity of this can be described as:

- » Formulating a Cohesive and Comprehensive Paper
- » Adhering to IEEE Research Paper Standards and Principles



*Advancing Technology
for Humanity*

End of Spring Semester, 2024

A singular Lab will consist of the following submodules:

- Lab Document (For students to follow)
- The Step-by-Step Lab Simulation
- Lab Justification/Explanation
 - I.e. Why this? Why that? The purpose.

While taking into consideration the hardware and software constraints of each of the 8+ specific platforms being analyzed.

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Modern Engineering Tools

SDMAY24-20

Modern Engineering Tools

Computer/Internet:

- LaTeX (Overleaf)
- Research Databases (IEEE, etc)
- IEEE Research Document Template

Platform (Storage, IDE, VCS, Analysis Tools)

- Will be accompanied by the specific platform

* Our project is heavily focused and driven to create a comprehensive Research Paper that describes the alternatives to **GENI** and how each new platform stacks up against each other.

This results in our project requiring no physical tools, equipment, or programs



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Design Context

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Areas	Description
Public Health, Safety, and Welfare	Our solution poses no risk to the general public or wellbeing of people. Claiming anything of the sort is beyond far-fetched. Our solution is meant to help willing educational systems in providing resourceful research and useful lab designs.
Global, Cultural, and Social	Our solution is meant to be an educational jump in providing thorough research and evidence to suggest a preferred platform for introductory Network and Security Labs. Our solution will help mitigate the fall of GENI and encourage Iowa State University, and others, to make a better, smarter change in their lab approach.
Environmental	Our solution poses no risk to the environment. Most of the platform infrastructure is already built, and future plans are not at the expense or benefit of our goal. This Senior Design project cannot be held accountable or liable for any future environmental impacts.
Economic	Our solution poses no risk to the economy. While our solution could cost Universities who choose to participate and enact our research and labs, it is their prerogative and decision to spend their money. Other than that, our research and solution have no impact on the economy - none directly and none in an abstract stance.

Prior Work / Solutions

SDMAY24-20

What's Next?

Since this project is focused on “What’s Next?” since the shutdown of *GENI*, it’s important to note the parallel platforms and programs that focused on the same mission.



The screenshot shows the GENI website header with navigation links: ABOUT GENI, GET INVOLVED, DOCUMENTATION, TESTBED STATUS, PARTNERS, WIKI, CONTACT US. Below the header is a prominent red and blue notice: **Notice: GENI has transitioned to FABRIC**. The notice text states: "Having served the NSF research community for more than a decade, the GENI research network shut down its operations on August 1, 2023." It includes two bullet points: "Researchers wanting to use GENI for their research should [apply for an account on FABRIC](#) instead." and "Instructors planning to teach a course on GENI should use FABRIC instead. Please see [FABRIC Information for Instructors](#)".

Platforms like **FABRIC** have risen to the challenge and mission to fill the void GENI has left.

Alternate Platforms:

COSMOS, ARA, SAGE, Colosseum, EduceLab, Chameleon, POWDER, Cloudlab, etc.

Parallel Missions:

The platforms we were tasked to research all circle around Network Infrastructures and Security, yet each seem to have a specific focus and goal in mind.

Each platform has their own strengths and weaknesses and that hinder **our** goal of using an alternative to GENI.

Due to the recent closure of GENI, there is no prior solution or paper that answers our goal and question. However, we will cite papers regarding the new platforms so that we can share the proper information within our paper.



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Design Decisions

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Design Decisions

1) Criteria

a) *How we separate and divide the platforms*

- Important for how we proceed with the research paper and the labs we create for Universities

2) Suitable Platforms

a) *If we allow them into the research paper*

- Important for ensuring we get the most relevant and useful information into our Research Paper

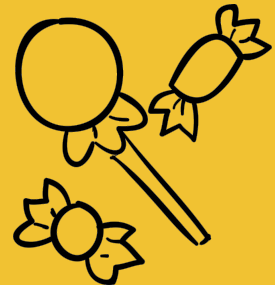
Design Decisions

3) Research Methodology & Research Paper Format

a) *How we choose to go forward with research and writing*

- Important for meeting industry standards and expectations

i.e. Choosing IEEE Research Format



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Proposed Design

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First Semester

Goal: Rough Draft of our Research Paper Completed

Proposed Design of our Research Paper:

- Introduction
- Explain Research Methodology
- Outline all System Architecture/Platforms
- Technical Details (Hardware/Software/Costs/Capabilities)
- Competing Platforms / Other Solutions
- Timeline/Implementation
- Conclusion

Second Semester

Goal(s): Publish our Research Paper + Create Introductory Labs for Network/Security Labs

Proposed Design of our Network/Security Labs:

- 1) Initial Lab Document
 - *What the students would be given*
- 2) Step-By-Step Document that outlines the lab
 - *TA's+ would see to fully understand the lab and be able to replicate*
- 3) Analysis & Explanation of the Lab
 - *The why's, the how's, and the purpose of the lab*



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Initial Design

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Paper Title* (use style: *paper title*)

*Note: Sub-titles are not captured in Xplore and should not be used

line 1: 1st Given Name Surname
line 2: dept. name of organization
(of Affiliation)
line 3: name of organization
(of Affiliation)
line 4: City, Country
line 5: email address or ORCID

line 1: 4th Given Name Surname
line 2: dept. name of organization
(of Affiliation)
line 3: name of organization
(of Affiliation)
line 4: City, Country
line 5: email address or ORCID

line 1: 2nd Given Name Surname
line 2: dept. name of organization
(of Affiliation)
line 3: name of organization
(of Affiliation)
line 4: City, Country
line 5: email address or ORCID

line 1: 5th Given Name Surname
line 2: dept. name of organization
(of Affiliation)
line 3: name of organization
(of Affiliation)
line 4: City, Country
line 5: email address or ORCID

line 1: 3rd Given Name Surname
line 2: dept. name of organization
(of Affiliation)
line 3: name of organization
(of Affiliation)
line 4: City, Country
line 5: email address or ORCID

line 1: 6th Given Name Surname
line 2: dept. name of organization
(of Affiliation)
line 3: name of organization
(of Affiliation)
line 4: City, Country
line 5: email address or ORCID

Abstract—This electronic document is a “live” template and already defines the components of your paper (title, text, heads, etc.) in its style sheet. **VERTICAL DO NOT CAR SYMBOLS, SPECIAL CHARACTERS, FOOTNOTES, OR MARK IN PAPER TITLE OR ABSTRACT (Abstract)**

Keywords—component, formatting, style, styling, insert (key words)

I. INTRODUCTION (HEADING 1)

This template, modified in MS Word 2007 and saved as a “Word 2003 Document” for the PC, provides authors with most of the formatting specifications needed for preparing electronic versions of their papers. All standard paper components have been specified for three reasons: (1) ease of use when formatting individual papers, (2) automatic compliance to electronic requirements that facilitate the concurrent or later production of electronic products, and (3) conformity of style throughout a conference proceedings. Margins, column widths, line spacing, and type styles are built-in; examples of the type styles are provided throughout this document and are identified in italic type, within parentheses, following the example. Some components, such as multi-level equations, graphics, and tables are not prescribed, although the various table text styles are provided. The formatter will need to create these components, incorporating the applicable criteria that follow.

II. EAST OR USE

A. Selecting a Template (Heading 2)

First, confirm that you have the correct template for your paper size. This template has been tailored for output on the A4 paper size. If you are using US letter-sized paper, please close this file and download the Microsoft Word Letter file.

B. Maintaining the Integrity of the Specifications

The template is used to format your paper and style the text. All margins, column widths, line spaces, and text fonts are prescribed; please do not alter them. You may note peculiarities. For example, the head margin in this template measures proportionately more than is customary. This measurement and others are deliberate, using specifications

Merely applicable finding agency here. If none, delete this text box.

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Design o: (Initial)

Based on our current timeline, we plan on having a more exact and better grouping of platforms for our Research Paper by the end of October.

This living Gantt chart will allow us to better improve and exact our design in later stages.

IEEE Research Paper Format

We plan on matching the industry standard of IEEE Research Paper Format

Basic Page Format

The standard IEEE template contains the following sections in the same order:

1. Title Page (including the article’s title, byline, membership, and first footnote)
2. Abstract – should be one paragraph long (preferably between 150 to 250 words)
3. Index Terms
4. Nomenclature (optional)
5. Introduction
6. Body of Article
7. Conclusion
8. Appendix(es)
9. Acknowledgment(s)
10. References
11. Photos and Biographies

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PAWR Program

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Camron Corcoran, Bryan Pope, Corey Lieu, Brendon Droege, Susanna Noble, Leha Dutta



SDMAY24-20 - Mohamed Selim



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