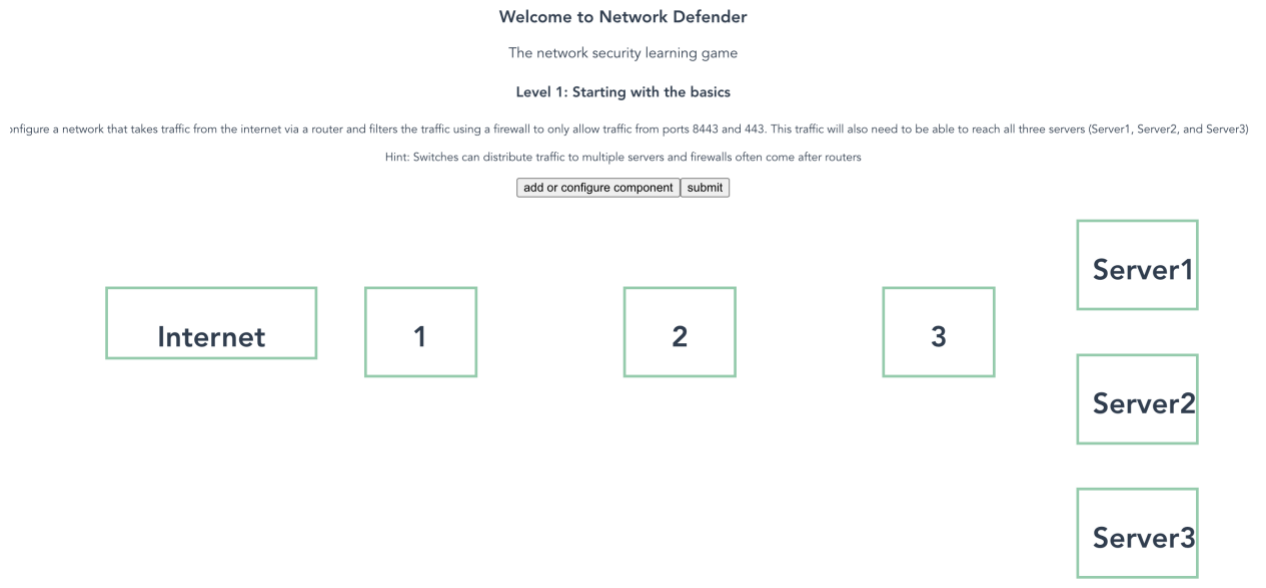


CPRE 530 Final Report  
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**Research & Analysis:**

**Purpose & Significance of Project:** The purpose of this project is to create a network configuration game that gives the user the ability to add and configure network components to accomplish a predefined network goal (such as getting traffic to servers on a specific port). The goal of this project is not to be complex or incredibly in-depth, but rather, to provide an approachable, easy-to-learn game to facilitate interest in network security for novices as well as to provide an educational experience.

**Overview of Gameplay:** The purpose of the game is for those new to networking to have an approachable way to learn basic network architecture and configuration. The player will configure preplaced and numbered nodes to determine their type and function. To better illustrate this, the first level is shown below:



The player would add and configure network components to get traffic from the internet to the 3 backend servers. As we know from the textbook, Routers must be connected to the edge of the network to connect to the internet (Jacobson 2009). So, the position directly bordering the 'Internet' node should always be a router. From that point on, the player must decide where to place firewalls and switches in order to successfully and securely get traffic to the servers via a specified port. Typically, that port is a secure port such as 443 or 8443 (*Difference between HTTPS port 443 and port 8443*). I chose port 8443 as the other secure port since it commonly used in Tomcat, which is widely used in industry.

Even though the levels and game play are fairly simple, they follow basic networking principles. I did significant research regarding common network configurations for edge

devices and firewall placement to ensure that the levels were as realistic as they could be in such a simple game (*Where are Firewalls Located*).

### **Reflection:**

**General Reflection:** This project was challenging and was potentially more than I had originally bargained for when I first started. I very much underestimated the amount of work that would go into the front-end components. However, once I was able to start getting the gameboard built out for the first level, I was able to quickly iterate and complete the graphics for the next two levels.

The backend logic was fairly easy to complete with the most complex part being the evaluation of the level. The rule sets that determine whether the level was completed successfully are often complex. However, much like the front end, once the rulesets were defined, I was able to easily translate them between levels.

In my opinion, the easiest part of the project was the initial concept and design. The original concept regarding how the network components would function and to what level they would be abstracted has remained the same. However, there were significant changes to the UI to make it more feasible to complete with my current level of front-end skill. For example, the original concept was to allow the user to drag and drop network components on the board to create a network from scratch. This approach was modified to the current implementation in order to both make the game more approachable for new players as well as to make it easier to build within the time frame given.

**Strengths, Weaknesses & Possible Improvements:** Although I am very proud of the game I have constructed, I do concede that there is a significant weakness. That being that the game is incredibly high-level. If I had more time, I would like to add different difficulty levels that allow for more complex network scenarios as well as integrate actual commands for device configuration rather than just the basic configuration currently present in the game.

Although the simplicity of the game can be a weakness, I also think that it can be defined as a strength. It makes the game easy and approachable for those new to networking (such as novices or those in school). This means that it can be used as an interactive and low cost way to further advance these subjects and get a wider portion of the population interested and involved.

If given more time to research and develop the game, I would spend a significant amount of time building out more levels and researching more complex network configurations. This would include adding different components (such as load balancers and mail servers). It would also include adding the more detailed configuration commands noted in the paragraphs above. This would allow for the game to be playable

by those at many different levels of networking knowledge rather than just novices and beginners.

## References

*Where are Firewalls Located.* Cisco Learning Network. (n.d.). Retrieved May 7, 2023, from <https://learningnetwork.cisco.com/s/question/0D53i00000Kt6SuCAJ/where-are-firewalls-located>

Jacobson, D. (2009). *Introduction to Network Security*. CRC Press.

*Difference between HTTPS port 443 and port 8443 - router-switch.com.* router-switch.com. (n.d.). Retrieved May 7, 2023, from <https://www.router-switch.com/faq/difference-between-https-port-443-and-8443.html>