PROJECT REPORT ON

Blocking a Domain using pfSense

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ACKNOWLEDGEMENT

We would like to express our sincere gratitude to everyone who supported us in the completion of this project.

We extend our heartfelt thanks to our supervisor, Alan Sheri for his guidance and invaluable feedback throughout this project.

We would also like to thank Red Team Hackers Academy for providing the necessary resources and a supportive environment that enabled us to complete this project successfully.

Thank you to everyone involved for your support and contributions. This project would not have been possible without the contributions of everyone mentioned, and I am truly appreciative of their efforts and dedication.

ABSTRACT

Network security and traffic control are critical aspects of maintaining a secure and efficient organizational environment. pfSense, an open-source firewall and router solution, provides advanced capabilities for managing network traffic, enforcing policies, and protecting against unauthorized access. This project focuses on setting up and configuring pfSense to block access to a specific domain from within a virtual LAN network.

The project involves deploying pfSense in a virtualized environment, creating and configuring a virtual LAN, and implementing firewall rules to restrict access to unwanted domains. Through careful configuration of pfSense DNS Resolver/Forwarder and firewall policies, the project demonstrates how domain-based blocking can be effectively applied to control user activity and safeguard network resources.

The primary goal is to illustrate how pfSense can be used to enforce domain restrictions at the firewall level, thereby preventing access to potentially harmful or distracting websites from connected client systems. By implementing domain blocking, the project enhances security, improves productivity, and reduces the risks associated with malicious or suspicious domains.

This practical implementation highlights pfSense as a reliable, customizable, and cost-effective firewall solution for administrators aiming to strengthen network controls within virtualized test environments as well as real-world enterprise networks.

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INTRODUCTION

Network security plays a pivotal role in protecting organizational resources and ensuring operational efficiency. Firewalls serve as the first line of defense by controlling incoming and outgoing network traffic based on defined security policies. pfSense, an open-source firewall platform, offers robust routing and firewall capabilities suitable for enterprise and virtual environments. This project focuses on deploying pfSense as a firewall solution to block access to a specific domain within a virtual LAN (VLAN) setup, illustrating how network administrators can enforce domain-level restrictions to enhance security and productivity.

OBJECTIVES

1. To set up pfSense firewall in a virtualized environment supporting VLANs.
2. To configure the virtual LAN network for client devices.
3. To implement firewall and DNS rules in pfSense that block access to a specified domain.
4. To validate and test the domain blocking functionality ensuring clients cannot reach the targeted domain.

By the end of this project, administrators will be able to configure pfSense to reliably block access to chosen domains from within a VLAN, establishing improved control over user web activity and safeguarding the network against risky or non-compliant resources.

PREREQUISITE

HARDWARE

A system with the following minimum configurations:

- **Processor**: 64-bit amd64 (x86-64) compatible CPU, 600 MHz or faster (modern Intel Core i5 processors or equivalent recommended for smooth performance).
- **RAM**: 1 GB or more (2 GB or more recommended for better virtualized pfSense performance).
- **Storage**: 8 GB or larger disk space (SSD recommended) allocated for pfSense virtual machine.
- **Network**: At least two network interfaces required; VirtualBox adapters configured as NAT for WAN and Host-only/Internal Network for LAN simulation. Stable internet connectivity on the host system.

SOFTWARE

The following software are used for this project. Exact versions are not mandatory to complete the objective:

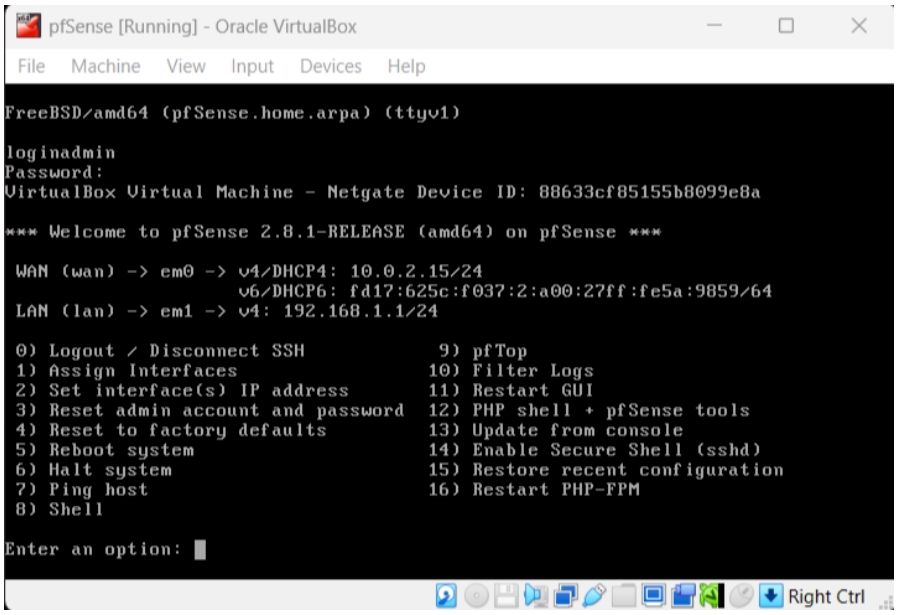
- **Windows 10**: Operating system running on the virtual machine that manages the virtualized lab environment.
- **Oracle VirtualBox**: Virtualization software used to create and manage a virtual machine hosting pfSense firewall/router.
- **pfSense**: Open-source firewall and routing platform installed as a virtual machine in VirtualBox, providing network security and routing functions within the lab setup.

PROCEDURES

SETTING UP pfSense

Step 1:

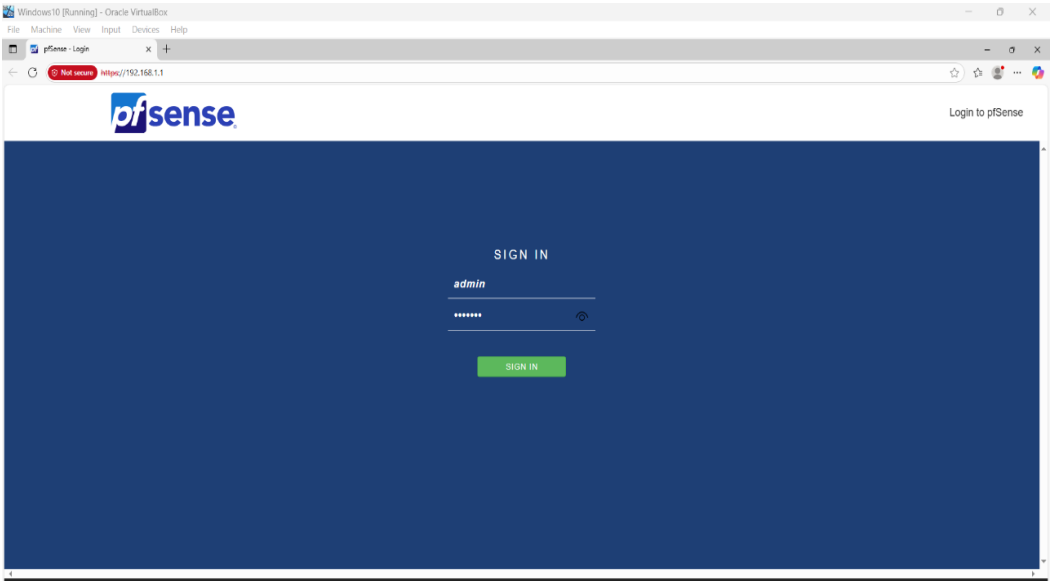
Start pfSense machine on virtual Box:



Step 2:

Access pfSense web interface on the test machine:

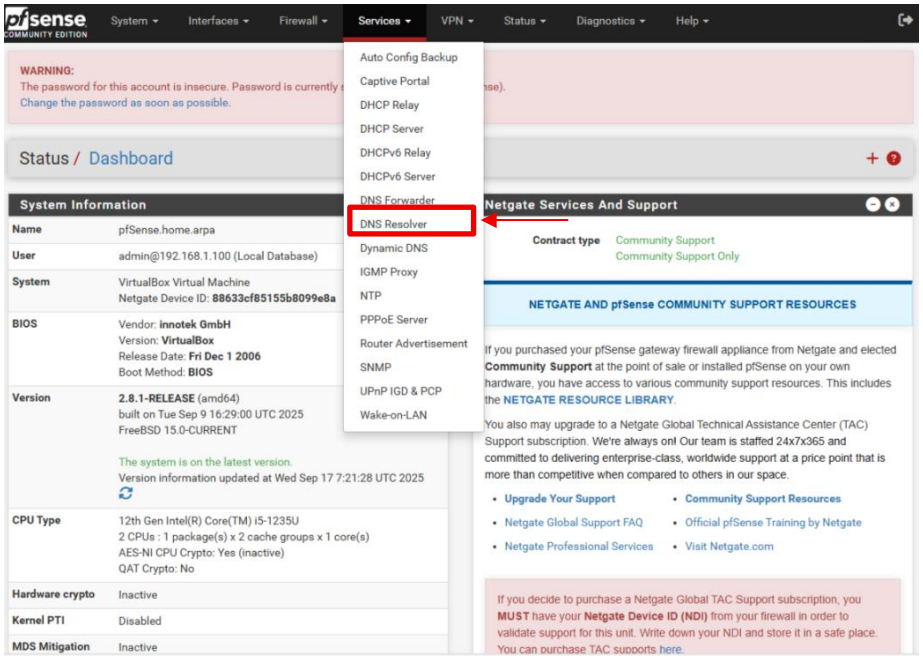
- Login with the credentials.



Step 3:

Access and configure DNS Resolver:

- Go to DNS Resolver from services dropdown list.

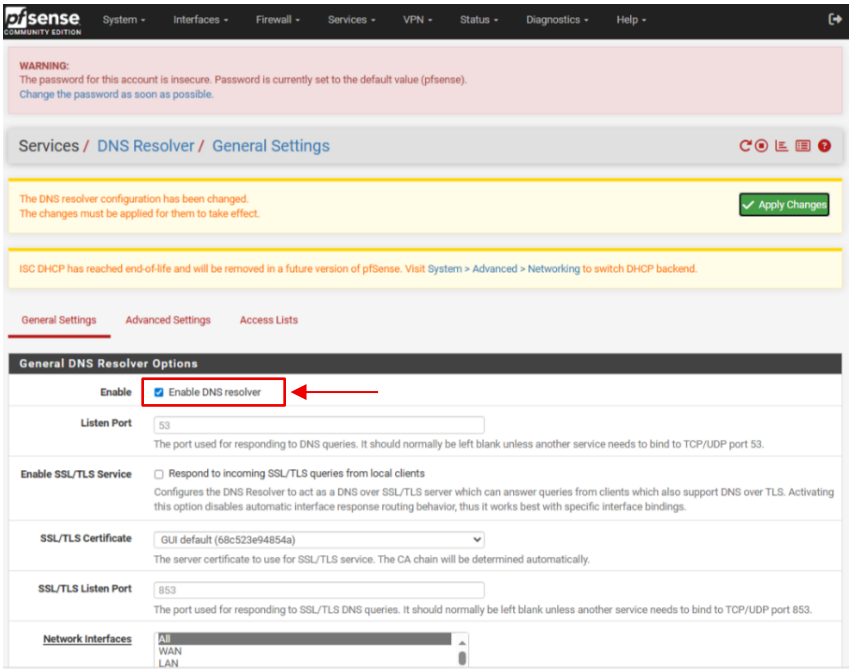


Step 4:

Configure General DNS Resolver Settings

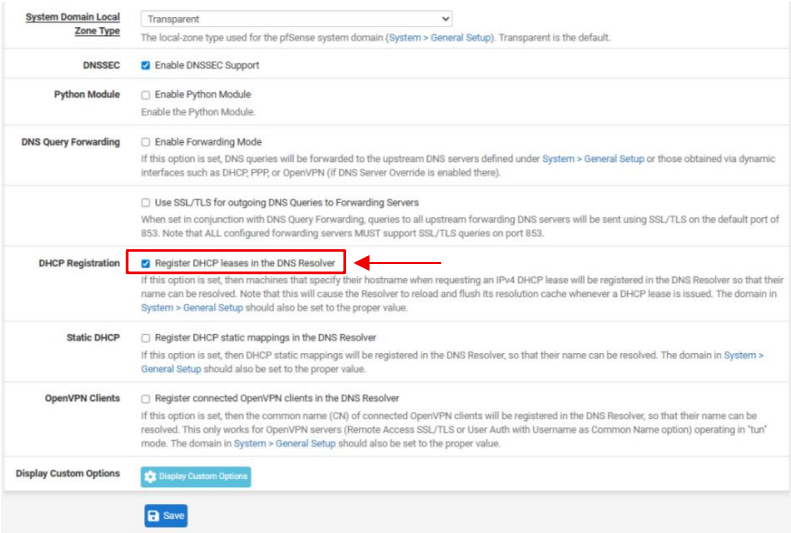
Step 1:

- Enable DNS Resolver.



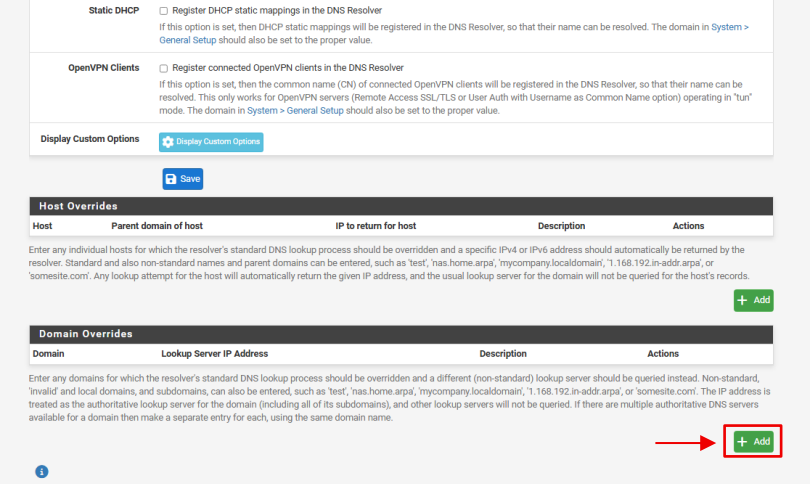
Step 2:

- Scroll down and enable DHCP registration in DNS Resolver.
- Leave other options as of default.

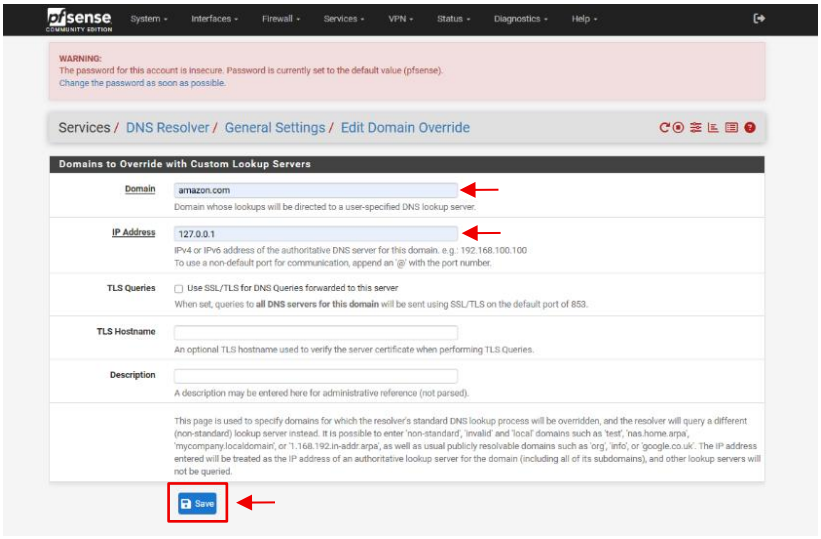


Step 3:

- Scroll down to the bottom of the DNS Resolver page until you see the **Domain Overrides** section.
- Click the green **+ Add** button in the **Domain Overrides** section.

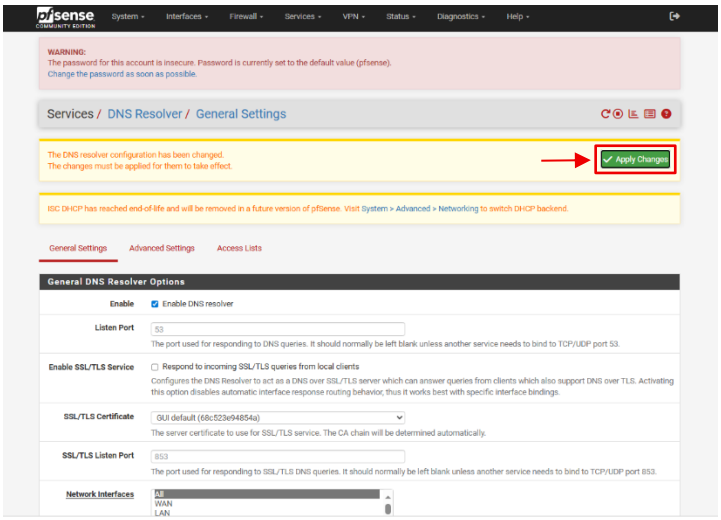


- Fill in the required fields for **Domain** and **Lookup Server IP Address** as necessary.
    - Enter amazon.com in the Domain field to specify that DNS lookups for this domain will use a custom server.
    - Fill in **127.0.0.1** as the **IP Address** for the authoritative DNS server for amazon.com lookups.
    - Optionally, tick the box for the **Use SSL/TLS for DNS Queries forwarded to this server** if you want DNS queries to be encrypted (leave unchecked in this example).
    - Leave the **TLS Hostname** field empty unless you need to specify a custom hostname for certificate verification (not required in this example).
    - Optionally, add any details in the **Description** field for reference.
    - Click **Save** at the bottom to apply your domain override settings.



Step 4:

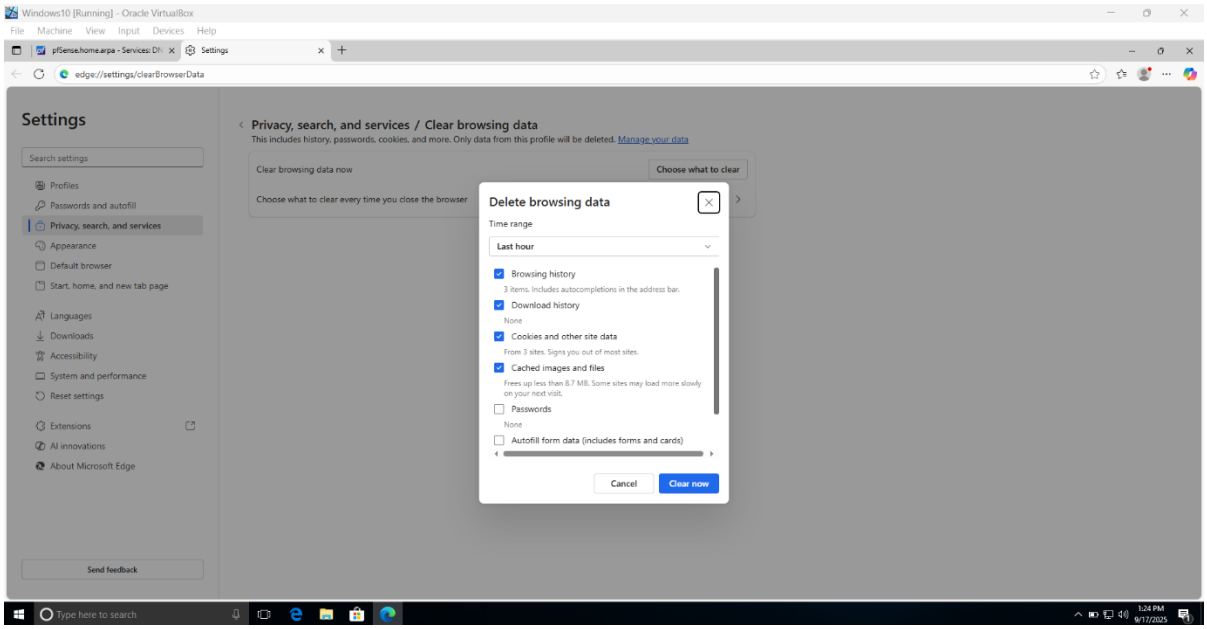
- After saving your changes, look for the yellow banner stating "The DNS resolver configuration has been changed."
- Click the green **Apply Changes** button to activate your updated DNS resolver configuration.
- Wait for the confirmation that the settings have been successfully applied before proceeding with further configuration.



Step 5:

- Navigate to browser settings and select the '**Privacy, search, and services**' section. Alternatively, use the shortcut **Ctrl + H** to directly access the browsing history.
- Click on Choose what to clear under "**Clear browsing data**" to open the data selection window.
- Select key items to delete:
    - **Browsing history** removes records of visited pages and autocompletions.
    - **Cookies and other site data** signs out of most sites and clears session info.
    - **Cached images and files** force the browser to reload all resources from the web, ensuring new DNS settings are respected.
- Optionally clear additional items like **Passwords** and **Autofill** form **data** if required.
- Set the desired **Time range** for deletion, such as "Last hour" or "All time" to ensure thorough cache refresh.
- Click **Clear now** to apply changes and confirm that the cache is deleted.

Clearing the cache ensures that recent DNS configuration changes are not masked by old browser data, helping troubleshoot and verify if domains resolve properly using the new DNS settings.



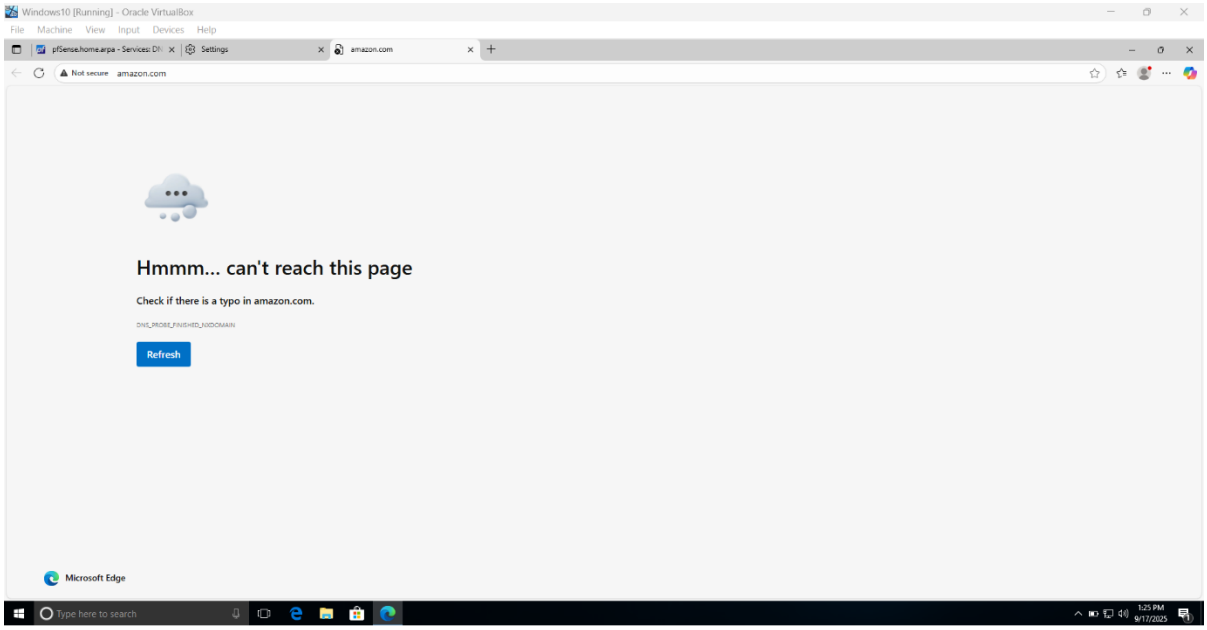
Step 6:

Verify Site Accessibility After DNS Changes

- Attempt to access the target website (e.g., amazon.com) using your browser to confirm the effect of your DNS override configuration.

- Observe the result; if the site does not load and displays an error (such as "can't reach this page"), it indicates that pfSense DNS Resolver has successfully blocked or redirected traffic for this domain as intended.

- Use this outcome to confirm that DNS overrides are functioning correctly and the configured settings are being enforced by pfSense.



CONCLUSION

This project successfully demonstrated the use of pfSense as a powerful and flexible firewall solution to block access to a specific domain within a virtual LAN environment. By deploying pfSense in a virtualized setup, configuring the DNS Resolver with domain overrides, and applying appropriate firewall rules, we effectively restricted client access to the targeted domain. The practical approach highlights pfSense's strong capabilities in managing network security and controlling user activity at the DNS level. This domain blocking solution enhances organizational productivity and security by preventing access to unauthorized or potentially harmful websites. Overall, pfSense proves to be a reliable, customizable, and cost-effective tool for network administrators seeking to enforce domain restrictions within both test and real-world environments.

REFERENCES

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2. pfSense DNS Resolver Guide: https://docs.netgate.com/pfsense/en/latest/services/dns/resolver.html
3. Netgate Forum - discussion on DNS Resolver domain overrides (see Netgate community for details).
4. Oracle VirtualBox Documentation: https://www.virtualbox.org/manual/UserManual.html
5. Microsoft Edge Browser Settings Help: https://support.microsoft.com/en-us/microsoft-edge

CONTRIBUTIONS

Vishnu P V:

pfSense setup, VLAN configuration, DNS resolver and firewall rule implementation, documentation, project reporting, configuration guides, and validation testing.