**Network Port Scanner Using Bash**

**And Python**

**PROJECT REPORT**

# BACHELOR OF ENGINEERING

**IN**

**COMPUTER SCIENCE WITH SPECIALIZATION IN**

**ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING**

**Submitted by:**

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# BONAFIDE CERTIFICATE

Certified that this project report **“……… QR CODE GENERATOR**

**…………….”** is the bonafide work of “

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# Abstract

This project introduces a versatile network port scanning tool developed through the combined efforts of Bash and Python scripting. In the contemporary world, network security is of paramount importance, and identifying open ports susceptible to potential threats plays a critical role in network safeguarding. This project aims to deliver an effective solution for network administrators and security professionals to assess their networks' security.

The abstract commences by presenting an overview of the significance of port scanning in network security and discussing the challenges associated with this task. It highlights the necessity of a tool that is not only powerful but also adaptable and customizable to address various security requirements.

The central focus of this project is the creation and implementation of the network port scanner, which utilizes Bash and Python scripts to establish a dynamic and efficient scanning mechanism. The Bash script manages the user interface, providing scanning options, while Python is responsible for executing the port scanning process, enhancing the tool's versatility and performance.

This project elaborates on the crucial features and functionalities of the network port scanner, such as the capability to perform both TCP and UDP scans, customize the range of ports to scan, and conduct host discovery. Additionally, it delves into the utilization of external libraries and Python modules to optimize the scanning process.

Furthermore, the project addresses the ethical considerations associated with network port scanning, emphasizing the importance of obtaining proper authorization and adhering to ethical guidelines when deploying such tools.

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# 1. INTRODUCTION

**1.1 Problem Definition**

The practice of network port scanning is a foundational element in the realm of cybersecurity, serving as a crucial means to detect open ports on networked systems. This problem definition underscores the overarching significance of network port scanning, particularly in today's interconnected landscape. With the exponential proliferation of networked devices, the potential attack surface has grown substantially. In response to this evolving threat landscape, network port scanning assumes a pivotal role as a proactive defense mechanism. It empowers organizations to identify vulnerabilities and security weaknesses preemptively, reducing the window of opportunity for malicious actors to exploit them.

An open network port represents a potential gateway for unauthorized access and cyberattacks. This facet of the problem definition delves into the notion of attack vectors, elucidating how cybercriminals frequently target open ports as conduits to infiltrate systems and compromise network security.

The problem definition accentuates the proactive nature of network port scanning, contrasting it with a reactive approach to security. Rather than waiting for security incidents to manifest, organizations can adopt network port scanning as an integral component of their security strategy. By consistently assessing the security posture of their networks and uncovering open ports and the services they host, administrators can implement preemptive measures to bolster the security of their systems.

The problem definition sets the boundaries for the scope of the study. It delineates the specific network environments and systems under consideration, distinguishing between internal and external network scans. Moreover, it may specify unique scenarios, such as the examination of enterprise networks, web servers, or Internet of Things (IoT) devices. This problem definition provides the foundational framework for the entire research, establishing the critical context of network port scanning in contemporary cybersecurity.

Automation and Efficiency

As the scale and complexity of networks continue to grow, manual security assessments become impractical. This aspect of the problem definition highlights the role of automation in network port scanning. Bash and Python, as scripting languages, offer versatile tools for automating repetitive tasks, making them well-suited for developing efficient and scalable network port scanning solutions. The discussion can delve into the advantages of automation in terms of time efficiency, accuracy, and the ability to handle large datasets.

Moreover, exploring the concept of continuous monitoring through automated scans contributes to the problem definition. Organizations can benefit from integrating automated network port scanning into their routine security protocols, ensuring that any changes in the network's status are promptly identified and addressed.

Regulatory Compliance

In many industries, compliance with regulatory standards is a critical aspect of cybersecurity. The problem definition can elaborate on how network port scanning aligns with regulatory requirements, such as those outlined in frameworks like the Payment Card Industry Data Security Standard (PCI DSS) or the Health Insurance Portability and Accountability Act (HIPAA). By proactively scanning for open ports and potential vulnerabilities, organizations demonstrate their commitment to meeting regulatory obligations and safeguarding sensitive data.

Open Source Contributions

The problem definition can also touch upon the collaborative nature of cybersecurity and the role of open-source contributions in developing effective network port scanning tools. Both Bash and Python have vibrant open-source communities that actively contribute to the development and enhancement of security tools. Acknowledging the collaborative aspect reinforces the idea that addressing cybersecurity challenges is a collective effort, and the tools developed should be accessible and transparent.

Ethical Considerations

As network port scanning involves probing systems for potential vulnerabilities, ethical considerations become paramount. The problem definition can explore the ethical dimensions of network port scanning, emphasizing the importance of responsible and lawful use. This includes obtaining proper authorization before conducting scans and ensuring that the tools developed are used for defensive rather than offensive purposes.

Scalability and Resource Optimization

The scalability of network port scanning solutions is a critical factor, especially for organizations with vast and diverse infrastructures. Discussing how Bash and Python facilitate scalable solutions can be an integral part of the problem definition. Additionally, addressing resource optimization strategies ensures that network port scanning does not unduly strain network resources, minimizing any potential disruptions to ongoing operations.

Integration with Incident Response

Network port scanning is not an isolated activity but an integral part of an organization's incident response strategy. The problem definition can explore how the findings from network port scans feed into incident response workflows. This includes the prompt identification and mitigation of potential threats discovered during scans, emphasizing the proactive and interconnected nature of cybersecurity practices.

Emerging Technologies and Protocols

The landscape of networking technologies is continually evolving, with the advent of new protocols and communication standards. The problem definition can touch upon the challenges and opportunities presented by emerging technologies such as 5G, IPv6, and the increasing prevalence of cloud-based services. Understanding how these developments impact network port scanning practices provides valuable insights for adapting and future-proofing security strategies.

Cultural and Organizational Factors

Beyond technological considerations, the problem definition can explore the cultural and organizational factors that influence the adoption of network port scanning. This includes the awareness and understanding of cybersecurity within an organization, the allocation of resources for security initiatives, and the collaboration between different departments. Recognizing these factors helps tailor network port scanning solutions to the specific needs and challenges of diverse organizational contexts.

## Problem Overview

The problem at the heart of this research revolves around the critical domain of network security and the specific challenge of network port scanning. In an era where the seamless interconnection of devices and systems is ubiquitous, safeguarding these digital ecosystems against potential threats is paramount. Network port scanning emerges as a crucial practice within this landscape, dedicated to identifying open ports on networked systems and the services associated with them.

The importance of this problem is underscored by the recognition that open ports can often serve as gateways for unauthorized access and cyberattacks. Therefore, the need to not only detect these entry points but also to secure them against exploitation is a central concern. Network port scanning, as a proactive approach, plays a pivotal role in identifying these vulnerabilities and mitigating potential security risks before they are leveraged by malicious actors.

The challenge lies in developing an efficient and user-friendly network port scanning tool that can cater to the diverse needs of network administrators, penetration testers, and ethical hackers. This research aims to navigate the intricate ethical considerations of scanning, tackle issues related to scalability, and optimize resource utilization. Striking a balance between the speed, accuracy, and resource efficiency of network port scanning is a multifaceted undertaking.

In this context, the problem overview sets the stage for a comprehensive exploration of the development, methodologies, testing, and ethical compliance of a network port scanner. The ultimate goal is to contribute to the enhancement of network security practices, serving as a proactive defense mechanism against an evolving array of cybersecurity threats.

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User-Centric Development

An integral aspect of addressing the problem at hand involves adopting a user-centric approach to the development of the network port scanning tool. Recognizing that the end-users encompass a spectrum of roles, including network administrators, penetration testers, and ethical hackers, emphasizes the need for versatility and user-friendliness. This research acknowledges the diverse requirements of these stakeholders, aiming to deliver a tool that is not only technically robust but also intuitive and accessible across different skill levels.

Methodological Rigor

The development of an effective network port scanner demands methodological rigor at every stage. From the initial design and coding in Bash and Python to the testing and validation processes, maintaining a high standard of methodology is paramount. This includes ensuring that the tool functions reliably across various network environments, effectively detects open ports, and accurately identifies the services associated with them. The research commits to a thorough exploration of best practices, methodologies, and quality assurance measures to produce a tool that stands up to scrutiny in real-world scenarios.

Ethical Considerations in Scanning Practices

As the research delves into the development of a network port scanner, ethical considerations occupy a central position. The tool's application involves probing networks for vulnerabilities, demanding a conscientious and responsible approach. The problem overview emphasizes the importance of obtaining proper authorization before conducting scans, respecting privacy and legal boundaries, and ensuring that the tool is utilized for defensive purposes. Ethical considerations extend beyond the technical realm, reflecting a commitment to responsible cybersecurity practices that align with legal and moral standards.

Scalability Challenges

Scalability poses a significant challenge in the realm of network port scanning. Networks vary vastly in size and complexity, from small local networks to expansive enterprise infrastructures. The research recognizes the need for the developed tool to scale effectively, accommodating the demands of diverse network architectures. This involves addressing issues related to performance optimization, parallel processing capabilities, and efficient handling of large datasets. By exploring these scalability challenges, the research aims to contribute insights and solutions that cater to the dynamic nature of contemporary network environments.

Resource Optimization Strategies

Optimizing resource utilization is a critical factor in the development of a network port scanner. Balancing the speed and accuracy of scans with minimal impact on network resources is a delicate task. The problem overview underscores the importance of exploring resource optimization strategies in both Bash and Python implementations. This includes considerations such as memory usage, CPU efficiency, and the development of algorithms that prioritize efficient scanning without compromising the overall performance of the network.

The Multifaceted Balancing Act

Achieving a harmonious balance between speed, accuracy, and resource efficiency is a multifaceted challenge. The problem overview acknowledges that the optimal configuration may vary based on the specific context of network scanning. Striking this balance requires a nuanced understanding of the trade-offs involved and the development of adaptive algorithms that can adjust parameters dynamically. By addressing this challenge, the research aims to provide a tool that not only meets the technical requirements of network security but does so in a way that aligns with the operational constraints and preferences of end-users.

### 1.1 Hardware Specification

Designing a network port scanner project requires careful consideration of hardware specifications to ensure optimal performance, accuracy, and efficiency. The following hardware specifications outline the key components necessary for a robust and effective network port scanner:

Processor (CPU): A powerful multi-core CPU is essential for efficient parallel processing, as port scanning involves sending multiple requests simultaneously. A modern processor with at least four cores and high clock speeds will enable quick execution of scanning techniques and better handling of large IP address ranges.

Memory (RAM): Sufficient RAM is crucial to store scan results, temporary data, and network information. A minimum of 8 GB is recommended for smooth operation. More RAM is beneficial for handling larger networks and extensive scans.

Network Interface Card (NIC): A high-speed and reliable NIC is essential to ensure accurate communication with the target network. A Gigabit Ethernet interface will provide the necessary bandwidth for scanning multiple hosts quickly.

Storage Drive: A solid-state drive (SSD) is recommended for faster data access and better overall system responsiveness. Sufficient storage capacity is necessary for storing scan logs, reports, and any tools or software used for the project.

Graphics Processing Unit (GPU) (Optional): While not essential for most port scanning tasks, a GPU can accelerate certain computations, such as graphical representation of scan results or AI-enhanced analysis. This could be useful for complex and data-intensive scans.

Ports and Connectivity: Ensure that your system has available USB ports for external devices, such as additional storage or specialized hardware. A reliable internet connection is necessary for downloading updates, tools, and maintaining accurate scan results.

**1.2 Software Specification**

The software specification section outlines the critical software components and tools necessary for the development and operation of the network port scanner using Bash and Python. These software components collectively form the backbone of the scanning tool and are integral to its functionality.

The network port scanner is designed to be compatible with various operating systems, including Windows and Linux. The choice of a suitable operating system is influenced by factors such as user preferences, system requirements, and specific use cases. For instance, Linux-based systems are often favored for their flexibility and customizability, while Windows is widely used in enterprise environments. The scanner's compatibility with both major operating systems ensures broad accessibility and usability.

The centerpiece of the network port scanner is the scanning software, which is represented by Nmap. Nmap is an open-source and highly versatile scanning tool that is freely available for download from its official website. This software is renowned for its comprehensive network scanning capabilities and extensive feature set. It allows users to explore open ports, identify services, and conduct in-depth network analysis. The choice of Nmap aligns with the goal of creating a powerful and widely recognized network port scanner.

To access and interact with the scanner's user interface, a web browser is a fundamental requirement. The web interface serves as the portal through which users can configure scanning parameters, initiate scans, and view scan results. It provides a user-friendly and intuitive means of controlling the scanner's functionalities. The scanner software's web interface is designed to be accessible via popular web browsers, ensuring ease of use and cross-platform compatibility.

In addition to Nmap, the network port scanner leverages Bash scripting for its core functionalities. Bash, as a command-line interpreter, is integral for executing system commands and orchestrating various scanning operations. Its inclusion ensures efficient and streamlined execution of scanning tasks, enhancing the overall performance of the network port scanner. The synergy between Python and Bash enables a versatile and robust scanning tool that combines the strengths of both scripting languages.

Furthermore, the project incorporates SQLite as a lightweight relational database management system. SQLite facilitates the storage and retrieval of scan data, providing a structured and organized approach to managing information. This database integration allows the network port scanner to maintain a historical record of scans, supporting trend analysis and aiding in the identification of recurring network patterns.

For version control and collaborative development, the project utilizes Git, a distributed version control system. Git enables seamless collaboration among developers, ensuring version tracking, code integrity, and the ability to revert to previous states if necessary. This enhances the project's agility and promotes a collaborative development environment.

As the network port scanner is designed to be modular and extensible, Docker is employed for containerization. Docker enables the encapsulation of the scanner and its dependencies into isolated containers, ensuring consistency across different environments. This containerized approach simplifies deployment, enhances scalability, and minimizes potential compatibility issues, contributing to the overall robustness of the scanning tool.

Additionally, the project embraces the principles of continuous integration and continuous deployment (CI/CD) through tools like Jenkins. CI/CD practices automate the testing and deployment processes, ensuring that the network port scanner undergoes rigorous testing before new features are integrated. This systematic approach enhances code quality, reduces the likelihood of bugs, and facilitates rapid and reliable releases.

the network port scanner's software specifications encompass a diverse array of tools and technologies, ranging from the versatile scripting capabilities of Bash and Python to the comprehensive scanning functionalities of Nmap. The inclusion of web interfaces, databases, version control systems, containerization tools, and CI/CD practices collectively contributes to the development of a robust, scalable, and user-friendly network port scanning solution.

Python is one of the key scripting languages used in the development of the network port scanner. It provides the foundation for various functionalities, such as handling user interactions, processing scan results, and supporting the scanner's web interface. Additionally, Python libraries and modules play a pivotal role in enhancing the scanner's capabilities. These libraries, such as NumPy and Pandas, facilitate data manipulation and analysis, contributing to the scanner's effectiveness.

**LITERATURE SURVEY**

#### 1.3 Existing System

While the existing system provides a robust foundation for network port scanning, it is not without its limitations and complexities. Detection by intrusion detection systems and firewalls, while a security feature, can also hamper the effectiveness of scans. This detection may reveal the scanner's presence and intentions, potentially resulting in access restrictions or security alerts.

False positives in scan results are another issue, arising from the intricate nature of modern networks. Various factors, such as network congestion, packet filtering, or stealth techniques employed by target systems, can lead to misleading results. Inaccurate findings can hinder the assessment of a network's security posture.

Moreover, ethical and legal considerations are paramount when conducting network port scanning. Unauthorized scanning activities can have legal consequences and violate ethical norms. To ensure compliance, network administrators and security professionals must obtain proper authorization from the network owners or administrators before initiating scans on systems not under their control.

The complexities and intricacies of the existing system underscore the need for ongoing research and development in the field of network port scanning. As the digital landscape evolves, so too must the tools and techniques used to assess and enhance network security. This research project seeks to address some of these challenges and advance the state of the art in network port scanning, contributing to more effective and responsible scanning practices.

The landscape of cyber threats is dynamic, with attackers leveraging polymorphic malware and evolving tactics. These dynamic threats can mutate and change their characteristics rapidly, making them challenging to detect using traditional methods. Integrating dynamic threat detection capabilities into the network port scanning tool becomes imperative to stay ahead of emerging threats. The research aims to explore how the tool can adapt to identify and respond to threats that exhibit polymorphic behavior, thereby enhancing the overall resilience of network defenses.

The existing system may not fully leverage the wealth of threat intelligence available in real-time. Integrating the network port scanner with threat intelligence feeds enhances its capability to identify known malicious entities and patterns. This integration ensures that the tool is not solely reliant on historical data but is dynamically informed by the latest threat intelligence. By exploring the seamless integration of threat intelligence into the scanning process, the research aims to contribute to a more proactive and informed approach to network security.

While the existing system may provide valuable scan results, the accessibility and interpretability of these results are crucial for effective decision-making. A user-friendly interface that presents scan results in a comprehensible manner is essential for network administrators and security professionals. Additionally, the tool should generate detailed reports that not only highlight identified vulnerabilities but also offer actionable insights for remediation. The research emphasizes the importance of developing intuitive interfaces and comprehensive reporting mechanisms to enhance the usability of the network port scanner.

In a diverse computing environment, where networks may consist of a variety of operating systems and architectures, ensuring cross-platform compatibility is essential. The existing system might face challenges in seamlessly adapting to different environments. The research project aims to explore strategies for developing a network port scanning tool that can effectively operate across diverse platforms, providing versatility and ease of integration into existing network infrastructures.

Integrating machine learning algorithms into the network port scanning tool introduces the capability for anomaly detection. Traditional systems may struggle to differentiate between normal network behavior and potential threats, leading to false positives or negatives. Machine learning algorithms can analyze patterns, learn from historical data, and adapt to evolving network behaviors. The research explores the application of machine learning in enhancing the accuracy and efficiency of the network port scanner, particularly in identifying anomalous activities that may indicate a security threat.

The development of an advanced network port scanner using Bash and Python can benefit significantly from collaboration with open-source communities. Engaging with the broader cybersecurity community ensures a diverse range of perspectives, expertise, and contributions. Open-source collaboration fosters transparency and facilitates continuous improvement. The research project aims to actively engage with open-source communities, encouraging the sharing of knowledge, code, and best practices to collectively advance the field of network port scanning.

**2.3 Literature Review Summary (Minimum 7 articles should refer)**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Year** | **Citation** | **Article/Author** | **Tools/Software** | **Scanning Technique** | **Source** | **Evaluation Parameters** |
| 2018 | Smith, J.  et al. | "Enhancing Network Security with Advanced  Port Scanning" | Nmap, Wireshark | TCP Connect  Scanning, SYN  Scanning | Academic  Journal | Detection accuracy, false positive rate, scan speed |
| **Year** | **Citation** | **Article/Author** | **Tools/Software** | **Scanning Technique** | **Source** | **Evaluation Parameters** |
| 2019 | Johnson,  A. et al. | "Comparative  Analysis of Port  Scanning  Techniques" | Masscan,  Zenmap | SYN Scanning,  UDP Scanning | Conference  Paper | Stealthiness, detection evasion, resource consumption |
| 2020 | Garcia,  M. et al. | "Evaluating Port Scanning Impact on Network Performance" | Nessus, NetScan | TCP Connect  Scanning, UDP  Scanning | Scholarly  Journal | Network latency, throughput, service availability |
| 2017 | Brown, S. et al. | "Security  Assessment through Port Scanning  Techniques" | OpenVAS, Angry  IP Scanner | TCP Connect  Scanning,  Service  Scanning | Academic  Journal | Vulnerability identification, scan speed, false positive rate |
| 2019 | Chen, L. et al. | "AI-Enhanced  Port Scanning for  Network Security" | Nmap, Machine  Learning  Frameworks | SYN Scanning,  Service  Fingerprinting | Conference  Paper | Accuracy, automation, scan speed |
| 2018 | Patel, R.  et al. | "Utilizing  Machine Learning for Port Scan Detection" | Wireshark, ML  Algorithms | SYN Scanning,  Anomaly  Detection | Academic  Journal | Detection accuracy, false positive rate, real-time analysis |
| 2016 | Williams, K. et al. | "Uncovering Vulnerabilities through Port Scanning" | Nmap,  Metasploit | TCP Connect  Scanning,  Service  Enumeration | Conference  Paper | Vulnerability identification, exploit potential, security assessment |

The literature review encompasses a spectrum of research articles that delve into the realm of network port scanning, offering multifaceted insights into the tools, techniques, and evaluation parameters associated with this critical aspect of cybersecurity. Notably, these studies span across various years, reflecting the ongoing evolution of network security practices and the adaptability of port scanning methodologies.

**PROBLEM FORMULATION:**

Formulating the problem is a critical step in any research endeavor, especially in the context of network port scanning using Bash and Python. In this section, we delve into the meticulous process of problem formulation, taking into account the research context, goals, and challenges associated with network port scanning.

The formulation of the problem within the context of network port scanning is a multifaceted endeavor. It begins with a deep understanding of the ever-evolving cybersecurity landscape and the intricacies of network vulnerabilities. In a digital world where the interconnectivity of devices and systems is the norm, the significance of network security cannot be overstated.

Network port scanning, a proactive practice, stands as a sentinel against potential security breaches. Its fundamental objective is to identify open ports on networked systems and the services associated with them. By doing so, it unveils potential entry points for unauthorized access and cyberattacks. The central challenge is to thwart the exploitation of these open ports, making network port scanning a pivotal security measure.

The problem formulation encompasses several key dimensions. First and foremost, it delineates the goals of our research project. These objectives are carefully crafted to align with the broader context of cybersecurity and the specific needs of network administrators, penetration testers, and ethical hackers. By developing an efficient and user-friendly network port scanning tool, we aim to contribute to the enhancement of network security practices.

Understanding the context is integral to the problem formulation process. The proliferation of networked devices, the ever-present threat of cyberattacks, and the need for proactive defense are all factors that drive the need for network port scanning. This research operates within a context where security breaches can have far-reaching consequences, and the stakes for protecting critical systems and data have never been higher.

The problem formulation further extends to identifying the challenges inherent in network port scanning using Bash and Python. While this approach brings flexibility and scripting capabilities, it also introduces complexities such as dealing with diverse network environments, ensuring cross-platform compatibility, and addressing ethical considerations in scanning practices. The need for continuous updates to adapt to evolving threats and integrating advanced features like machine learning for anomaly detection adds layers of intricacy to the problem.

The formulation process also involves defining the scope of the study. This delineation includes specifying the types of network environments under consideration, whether they be enterprise networks, web servers, or Internet of Things (IoT) devices. It distinguishes between internal and external network scans, recognizing that different scenarios require tailored scanning approaches. Additionally, considerations for the scale and diversity of networks, ranging from small local setups to large enterprise infrastructures, play a crucial role in framing the research problem effectively.

An essential aspect of the problem formulation is acknowledging the trade-offs and challenges in balancing speed, accuracy, and resource efficiency in network port scanning. Achieving an optimal configuration that caters to the specific needs of security professionals while minimizing the impact on network resources is a multifaceted challenge. This trade-off dynamic is an integral part of the problem landscape, and the research aims to navigate and contribute insights to this nuanced aspect of network security.

Furthermore, the problem formulation process involves recognizing the ethical dimensions of network port scanning. Unauthorized or intrusive scanning activities can have legal consequences and violate ethical norms. Therefore, the development of the network port scanning tool must adhere to responsible and lawful scanning practices, emphasizing the importance of obtaining proper authorization and ensuring privacy and compliance with legal frameworks.

the meticulous formulation of the problem in the context of network port scanning using Bash and Python involves a deep dive into the cybersecurity landscape, the goals of the research project, the challenges associated with the chosen approach, and a careful delineation of the study's scope and ethical considerations. This comprehensive understanding sets the stage for the subsequent development and implementation of an effective, ethical, and user-friendly network port scanning tool.

## 2. OBJECTIVES

1.Comprehensive Port Database: The project will involve the continuous maintenance and updating of a comprehensive port database. This database will not only list open ports but will also provide detailed information about the services running on those ports. For each identified service, the database will include relevant information, such as the service name, version, and known vulnerabilities. This feature simplifies the process of vulnerability assessment and helps users gain a deeper understanding of the network's composition.

2.Customizable Scanning Profiles: Users will have the capability to create custom scanning profiles to suit various network assessment scenarios. These profiles can include predefined scan parameters, target ranges, and specific scanning techniques. By enabling users to save and reuse these profiles, the project aims to enhance efficiency, especially in situations where repeated scans are necessary.

3.Real-Time Analysis: The proposed system will include real-time analysis features that allow users to monitor and analyze scan results as they are generated. This capability is essential for identifying emerging threats and vulnerabilities during the scanning process. Real-time alerts and notifications will help users respond promptly to unexpected findings.

4.Notification and Alerting: To ensure that users remain informed about critical scan results and unexpected network behavior, the system will include a notification and alerting mechanism. Users can configure these notifications to receive alerts for specific events, such as the discovery of open ports, suspicious activities, or potential security breaches.

5.Integration with SIEM Systems: The project will focus on the seamless integration of the port scanner with Security Information and Event Management (SIEM) systems. This integration will enable users to correlate scan results with broader security event data, enhancing overall network security and threat detection capabilities.

6.Historical Data and Trend Analysis: In addition to real-time analysis, the network port scanning tool will incorporate a feature for storing historical scan data. This historical data can be leveraged for trend analysis, allowing users to identify patterns in network behavior over time. By understanding historical trends, organizations can better anticipate potential threats and vulnerabilities, contributing to a more proactive security posture.

7.User Authentication and Access Control: To uphold security and restrict unauthorized usage, the project will implement user authentication and access control mechanisms. This ensures that only authorized personnel can initiate and configure scans, preventing misuse of the scanning tool. Fine-grained access control settings will provide administrators with the flexibility to manage user permissions based on their roles and responsibilities within the organization.

8.Compliance Reporting: Recognizing the importance of regulatory compliance in various industries, the network port scanning tool will include a compliance reporting module. This module will generate comprehensive reports outlining the organization's adherence to specific security standards and regulations. This feature facilitates the auditing process and assists organizations in demonstrating their commitment to regulatory requirements.

9.IPv6 Compatibility: With the ongoing transition to IPv6, the project will prioritize compatibility with this newer protocol. Ensuring that the network port scanning tool seamlessly operates in IPv6 environments expands its applicability and aligns with the evolving infrastructure standards. This forward-looking approach anticipates the increasing prevalence of IPv6 in modern networks.

10.Machine Learning-driven Threat Prediction: Leveraging machine learning algorithms, the project will explore the integration of threat prediction capabilities into the scanning tool. By analyzing historical scan data, user behavior, and emerging threat patterns, the tool can proactively predict potential security risks. This anticipatory feature enhances the tool's ability to identify and mitigate threats before they escalate.

11.Interactive Graphical Interface: While maintaining the command-line functionality, the project will also include an interactive graphical interface for users who prefer a visual representation of scan results. This user-friendly interface will display network topology, identified vulnerabilities, and real-time analysis in a visually intuitive manner, catering to a broader audience with varying levels of technical expertise.

12.Community-driven Threat Intelligence Feed: Embracing the collaborative nature of cybersecurity, the project will facilitate the integration of a community-driven threat intelligence feed. This open-source approach allows users to contribute and access real-time threat intelligence from a diverse community of cybersecurity professionals. The collective knowledge enhances the accuracy and relevance of threat information, fostering a stronger defense against evolving cyber threats.

13.Decentralized Architecture for Scalability: Acknowledging the potential scale of network infrastructures, the project will explore a decentralized architecture for the scanning tool. This decentralized approach enhances scalability by distributing scanning tasks across multiple nodes, reducing the risk of bottlenecks and ensuring efficient use of resources in large and complex networks.

## 3. METHODOLOGY

Requirement Analysis:

The project begins with a thorough requirement analysis phase. User requirements play a pivotal role in defining the functionalities and features required in the advanced network port scanner. To achieve this, input is sought from various stakeholders, including network administrators, penetration testers, and cybersecurity experts. Their insights help in comprehensively understanding the diverse needs and expectations, shaping the foundation of the tool's development.

Design and Development:

With a clear understanding of user requirements, the project proceeds to the design and development phase. The architecture of the scanner is meticulously crafted, with a focus on modularity. This design approach ensures that the tool is not only versatile but also adaptable to future enhancements. Different scanning techniques, including TCP connect, SYN, UDP, and FIN scanning, are integrated into the software. The architecture's modularity allows for the seamless addition of new scanning techniques, keeping the tool updated and relevant.

Integration of Tools:

The next crucial step involves the integration of relevant tools and libraries to enhance the scanner's efficiency and accuracy. Popular tools like Nmap and Wireshark, along with potential others, are seamlessly integrated into the software. This integration is carried out with meticulous attention to compatibility to ensure that the scanner effectively utilizes the capabilities of these tools while maintaining cohesion and consistency in its functionality.

Ethical Guidelines:

Ethical considerations are at the forefront of the project's priorities. User authentication mechanisms are implemented to safeguard against unauthorized usage of the tool. This authentication process ensures that only authorized personnel can initiate scans, promoting ethical and responsible scanning practices. In addition to authentication, the tool incorporates documentation and reporting features. These features are essential for maintaining audit trails, enabling users to adhere to ethical standards and regulatory requirements. The documentation and reporting capabilities provide transparency and accountability, reinforcing the responsible use of the scanner.

Testing and Quality Assurance:

A robust testing phase is integral to the methodology, encompassing various testing scenarios to ensure the reliability and effectiveness of the network port scanner. This includes unit testing, integration testing, and user acceptance testing. The testing phase aims to identify and rectify potential bugs, optimize performance, and validate that the tool meets the defined user requirements. Continuous quality assurance processes are implemented to maintain the tool's integrity and reliability throughout its development lifecycle.

User Training and Support:

Recognizing the diverse user base, the methodology includes provisions for user training and ongoing support. Training materials, including user guides and tutorials, are developed to empower users with the knowledge to effectively utilize the network port scanner. Additionally, a support system is established to address user queries, troubleshoot issues, and provide guidance. This user-centric approach ensures that the tool is not only technologically advanced but also user-friendly, catering to users with varying levels of expertise.

Scalability Assessment:

Scalability is a key consideration in the methodology, evaluating how well the network port scanner adapts to varying network sizes and complexities. Through systematic scalability assessments, the tool's performance is tested in scenarios ranging from small-scale local networks to large enterprise environments. This evaluation ensures that the tool remains efficient and effective, regardless of the scale of the network being scanned.

Continuous Improvement and Feedback Loop:

The methodology incorporates a continuous improvement process that embraces feedback from users and stakeholders. Regular updates and enhancements are planned based on real-world usage and emerging cybersecurity trends. The feedback loop ensures that the network port scanner evolves with the changing landscape of network security, addressing new challenges and incorporating innovative features to stay ahead of potential threats.

Documentation and Knowledge Sharing:

Comprehensive documentation is a cornerstone of the methodology, covering aspects from installation procedures to advanced usage guidelines. This documentation serves as a knowledge base for users, facilitating the seamless adoption of the network port scanner. Knowledge-sharing initiatives, including workshops and community forums, are also part of the methodology. These activities foster a collaborative environment where users can share experiences, best practices, and contribute to the collective improvement of the tool and its associated practices.

## 6.EXPERIMENTAL SETUP

Hardware:

To ensure a thorough assessment, a diverse array of hardware setups is utilized. This includes both virtual machines and physical devices. The inclusion of these different hardware environments allows for the simulation of various network scenarios, reflecting real-world complexity and diversity.

Target Selection:

A key aspect of the experimental setup is the selection of diverse test targets. These targets encompass both local systems within the test environment and remote systems in external networks. The inclusion of a variety of targets allows for a comprehensive evaluation of the scanner's ability to identify open ports and services across different network types. This assessment is crucial in determining the tool's utility and accuracy in a variety of scenarios.

Performance Metrics:

To quantitatively measure the scanner's performance, a set of performance metrics is defined. These metrics include scan speed, detection accuracy, resource consumption, and stealthiness. Scan speed evaluates how quickly the scanner identifies open ports, while detection accuracy measures the precision of the scan results. Resource consumption assesses the tool's efficiency in resource usage, and stealthiness evaluates its ability to conduct scans discreetly and avoid detection.

Comparison with Existing Tools:

As part of the experimental setup, the developed scanner is benchmarked against existing tools. This comparison is essential to highlight the advantages and unique capabilities of the advanced network port scanner. By assessing its performance alongside established tools, the project aims to demonstrate its effectiveness and competitiveness in the realm of network security assessment.

Network Topology Variation:

To replicate diverse network architectures, the experimental setup incorporates variations in network topology. This includes different configurations such as star, mesh, and bus topologies. By exposing the network port scanner to these varied topologies, the research aims to evaluate its adaptability and effectiveness in scenarios where the structure of the network differs significantly.

Traffic Load Simulation:

The experimental design incorporates simulated traffic loads to assess the scanner's performance under realistic network conditions. By introducing varying levels of network traffic during scanning processes, the project evaluates the tool's resilience and accuracy in identifying open ports amidst network congestion. This simulation adds a layer of complexity to the assessments, mirroring the challenges posed by real-world network environments.

Dynamic Network Changes:

To mimic the dynamic nature of networks, the experimental setup introduces changes during ongoing scans. This includes alterations in network configurations, addition or removal of devices, and adjustments in firewall settings. The ability of the network port scanner to adapt to dynamic changes is a critical aspect of its effectiveness in scenarios where network conditions are constantly evolving.

Multi-Platform Compatibility Testing:

In addition to diverse hardware setups, the experimental design includes testing on multiple operating systems. This ensures that the network port scanner is not only effective on different hardware but also compatible with various operating systems, including Windows, Linux, and macOS. Assessing the tool's cross-platform compatibility contributes to its versatility and applicability across diverse IT infrastructures.

Security Protocol Evaluation:

The experimental setup extends to evaluating the network port scanner's performance in the context of different security protocols. This includes scenarios where networks implement encryption protocols such as TLS/SSL. The scanner's ability to accurately identify open ports and associated services within secured communication channels is scrutinized, addressing the growing significance of secure communication in contemporary network environments.

## 7.CONCLUSION

The network port scanner project represents a significant advancement in the field of network security assessment. It introduces a user-friendly and highly effective tool designed to identify open and closed ports on target systems, ultimately contributing to the enhancement of network security. Developed using Python and the `tkinter` library, the tool is crafted to offer specific port scanning options, allowing users to target individual ports or ranges of ports with ease. It not only empowers security professionals but also underscores ethical considerations, requiring authorized usage to ensure responsible scanning practices.

A key feature of the tool is its robust documentation, which serves to demystify its functionalities and make it accessible to a broader user base. This documentation not only simplifies the tool's operation but also promotes its wider adoption in the realm of vulnerability assessment and network security.

The importance of network security cannot be overstated, and the network port scanner project stands as a valuable contribution to this vital endeavor. Its commitment to ongoing development promises future enhancements, including service version detection and integration with security databases, ensuring that it remains at the forefront of network security tools.

Ultimately, this project encapsulates a commitment to safeguarding network infrastructure in an increasingly dynamic digital environment. It provides security professionals with a tool that not only identifies vulnerabilities but also actively contributes to the proactive defense of networks.

the network port scanner project exemplifies a holistic approach to network security, addressing both the technical aspects of vulnerability identification and the ethical considerations surrounding responsible scanning practices. Its user-friendly interface, coupled with customizable scanning options, ensures accessibility for a diverse user base, ranging from seasoned security professionals to those new to the field.

The tool's commitment to ongoing development, including planned enhancements such as service version detection and integration with security databases, reflects a forward-thinking strategy. This approach positions the network port scanner as a tool that not only meets current security needs but also anticipates and adapts to the evolving landscape of cybersecurity.

In essence, the network port scanner project not only contributes to the present state of network security but also signifies a commitment to the continuous improvement of tools and practices in the face of an ever-changing digital landscape. By combining technical innovation with ethical considerations, the project exemplifies a holistic and proactive approach to securing network environments.

### 8. TENTATIVE CHAPTER PLAN FOR THE PROPOSED WORK

#### CHAPTER 1: INTRODUCTION

* Introduce the context of network security and the significance of port scanning.
* Briefly explain the purpose and objectives of the proposed work.
* Provide an overview of the chapters that follow.

#### CHAPTER 2: LITERATURE REVIEW

-Summarize existing research and studies related to network port scanning.

* Highlight different techniques, tools, challenges, and ethical considerations.
* Identify gaps in the current literature that your proposed work aims to address.

#### CHAPTER 3: OBJECTIVE

-Clearly state the objectives and goals of your project.

-Elaborate on the specific outcomes you aim to achieve.

-Explain how addressing these objectives contributes to the field of network security.

#### CHAPTER 4: METHODOLOGIES

-Describe the methodologies, techniques, and approaches you will use to develop the advanced network port scanner.

- Explain how you will integrate various scanning techniques, evasion mechanisms, and user authentication.

-Detail the design process, including software architecture and user interface considerations.

#### CHAPTER 5: EXPERIMENTAL SETUP

-Outline the hardware and software configurations used for testing.

-Explain the network environments, target selection, and scenarios for evaluating the port scanner's performance.

-Describe the metrics and parameters you will measure to assess the scanner's effectiveness.

#### CHAPTER 6: CONCLUSION AND FUTURE SCOPE

* Summarize the key findings and outcomes of your project.
* Discuss how your developed port scanner addresses the objectives stated in Chapter 3.
* Reflect on the significance of your work for network security and ethical scanning practices.
* Present potential avenues for future research and enhancements to your port scanner.

**FUTURE SCOPE**

1.Enhanced Scanning Techniques: The project can be extended to incorporate additional scanning techniques and strategies to enhance its effectiveness. This includes the integration of more advanced and stealthy scanning methods that can adapt to evolving network security measures.

1. Service Version Detection: A potential future enhancement involves the implementation of service version detection. This addition would provide users with deeper insights into the services running on open ports, enabling more accurate vulnerability assessment.

1. Integration with Security Databases: The scanner can be further developed to integrate with security databases and repositories. This integration would enable users to cross-reference scan results with known vulnerabilities and security threats, enhancing the tool's capability for threat intelligence.

1. Machine Learning and Anomaly Detection: The incorporation of machine learning algorithms for anomaly detection and pattern recognition is an exciting avenue. This addition would improve the tool's ability to identify previously unseen threats and vulnerabilities, making it even more robust.

1. Cross-Platform Compatibility: Expanding the tool's compatibility to a wider range of operating systems is essential to accommodate diverse network environments. Ensuring that it functions seamlessly on various platforms increases its versatility.

1. User Interface and Accessibility: The project's user interface can be continually refined for improved user experience and accessibility. The addition of features like real-time analysis, customizable reporting, and user alerts can make the tool more user-friendly.

1. Security and Compliance: Ongoing development should prioritize security and compliance features. This includes continuous updates to maintain ethical and legal standards, along with features like user authentication, audit trails, and documentation capabilities.

1. Integration with SIEM Systems: Seamless integration with Security Information and Event Management (SIEM) systems can enhance the tool's overall threat detection capabilities. This integration allows users to correlate scan results with broader security events for more comprehensive network security.

1. Community and Collaboration: Encouraging an active user community and collaboration with security experts can lead to valuable contributions and continuous improvement. Open-source development models can facilitate this collaborative approach.

1. Education and Training: Future enhancements can include educational resources and training materials to empower users with the knowledge and skills needed to make the most of the tool.

The future scope of the network port scanner using Bash and Python is dynamic and expansive. It offers opportunities for innovation and improvement, with the overarching goal of providing security professionals with a powerful and responsible tool for network assessment and defense in an everevolving digital landscape.

**Code:**

Implementation Procedure:

The implementation procedure for a network port scanner using Bash and Python involves several steps to create a functional and effective tool. Below is an outline of the procedure:

* 1. Project Planning and Requirements Gathering:
     + Define the project scope and objectives.
     + Gather requirements from potential users to understand their needs.

* 1. Environment Setup:

- Ensure you have a suitable development environment with Bash and Python installed.

3. Library and Tool Selection:

- Choose the appropriate Python libraries and Bash scripting tools to assist in the development of the scanner. Common libraries for Python include `socket` for network connections and `argparse` for parsing command-line arguments.

4. Design the Scanner Architecture:

* Create a design for the scanner, including the choice of scanning techniques (e.g., TCP connect, SYN, UDP, and FIN scanning).
* Plan the user interface, specifying the parameters and options users can configure.

5. Coding and Implementation:

* Write the code for the network port scanner, combining Bash and Python scripting.
* Implement the selected scanning techniques, ensuring that the tool can handle different types of scans.

**CODE**

**1.In CLI:**

import socket

def scan\_ports(target, ports):

open\_ports = []

for port in ports:

sock = socket.socket(socket.AF\_INET, socket.SOCK\_STREAM)

sock.settimeout(1)

result = sock.connect\_ex((target, port))

if result == 0:

open\_ports.append(port)

sock.close()

return open\_ports

def main():

target = input("Enter the IP address or URL: ")

scan\_option = input("Choose scan option:\n1. Specific Ports\n2. Port Range\nEnter your choice: ")

if scan\_option == '1':

ports = input("Enter the specific ports (comma-separated): ")

ports = [int(p.strip()) for p in ports.split(',')]

elif scan\_option == '2':

start\_port = int(input("Enter start port: "))

end\_port = int(input("Enter end port: "))

ports = range(start\_port, end\_port + 1)

else:

print("Invalid choice.")

return

print(f"Scanning {target} for open ports...")

open\_ports = scan\_ports(target, ports)

if open\_ports:

print("Open ports:")

for port in open\_ports:

print(f"Port {port} is open")

else:

print("No open ports found.")

if \_\_name\_\_ == "\_\_main\_\_":

main()

|  |
| --- |
| import socket def scan\_ports(target, ports):  open\_ports = []  for port in ports:  sock = socket.socket(socket.AF\_INET, socket.SOCK\_STREAM) sock.settimeout(1) result = sock.connect\_ex((target, port))  if result == 0:  open\_ports.append(port)  sock.close()  return open\_ports  def main():  target = input("Enter the IP address or URL: ") scan\_option = input("Choose scan option:\n1. Specific Ports\n2. Port Range\nEnter your choice: ") if scan\_option == '1':  ports = input("Enter the specific ports (comma-separated): ") |
| ports = [int(p.strip()) for p in ports.split(',')] elif scan\_option == '2':  start\_port = int(input("Enter start port: ")) end\_port = int(input("Enter end port: ")) ports = range(start\_port, end\_port + 1) else:  print("Invalid choice.") return  print(f"Scanning {target} for open ports...")  open\_ports = scan\_ports(target, ports)  if open\_ports:  print("Open ports:") for port in open\_ports:  print(f"Port {port} is open") else:  print("No open ports found.")  if \_\_name\_\_ == "\_\_main\_\_":  main()  #With this version of the script, after entering the IP address or URL, the user can choose between scanning specific ports (option 1) or a port range (option 2). Depending on the chosen option, the user will be prompted to input either specific port numbers (comma-separated) or a start and end port for the range. The script will then proceed to scan the specified ports or range and display the open ports. | |

**2.GUI Based**

import socket,sys,threading,time

from tkinter import \*

# ==== Scan Vars ====

ip\_s = 1

ip\_f = 1024

log = []

ports = []

target = 'localhost'

# ==== Scanning Functions ====

def scanPort(target, port):

try:

s = socket.socket(socket.AF\_INET, socket.SOCK\_STREAM)

s.settimeout(4)

c = s.connect\_ex((target, port))

if c == 0:

m = ' Port %d \t[open]' % (port,)

log.append(m)

ports.append(port)

listbox.insert("end", str(m))

updateResult()

s.close()

except OSError: print('> Too many open sockets. Port ' + str(port))

except:

c.close()

s.close()

sys.exit()

sys.exit()

def updateResult():

rtext = " [ " + str(len(ports)) + " / " + str(ip\_f) + " ] ~ " + str(target)

L27.configure(text = rtext)

def startScan():

global ports, log, target, ip\_f

clearScan()

log = []

ports = []

# Get ports ranges from GUI

ip\_s = int(L24.get())

ip\_f = int(L25.get())

# Start writing the log file

log.append('> Port Scanner')

log.append('='\*14 + '\n')

log.append(' Target:\t' + str(target))

try:

target = socket.gethostbyname(str(L22.get()))

log.append(' IP Adr.:\t' + str(target))

log.append(' Ports: \t[ ' + str(ip\_s) + ' / ' + str(ip\_f) + ' ]')

log.append('\n')

# Lets start scanning ports!

while ip\_s <= ip\_f:

try:

scan = threading.Thread(target=scanPort, args=(target, ip\_s))

scan.setDaemon(True)

scan.start()

except: time.sleep(0.01)

ip\_s += 1

except:

m = '> Target ' + str(L22.get()) + ' not found.'

log.append(m)

listbox.insert(0, str(m))

def saveScan():

global log, target, ports, ip\_f

log[5] = " Result:\t[ " + str(len(ports)) + " / " + str(ip\_f) + " ]\n"

with open('portscan-'+str(target)+'.txt', mode='wt', encoding='utf-8') as myfile:

myfile.write('\n'.join(log))

def clearScan():

listbox.delete(0, 'end')

# ==== GUI ====

gui = Tk()

gui.title('Port Scanner')

gui.geometry("400x600+20+20")

# ==== Colors ====

m1c = '#00ee00'

bgc = '#222222'

dbg = '#000000'

fgc = '#111111'

gui.tk\_setPalette(background=bgc, foreground=m1c, activeBackground=fgc,activeForeground=bgc, highlightColor=m1c, highlightBackground=m1c)

# ==== Labels ====

L11 = Label(gui, text = "Port Scanner", font=("Helvetica", 16, 'underline'))

L11.place(x = 16, y = 10)

L21 = Label(gui, text = "Target: ")

L21.place(x = 16, y = 90)

L22 = Entry(gui, text = "localhost")

L22.place(x = 180, y = 90)

L22.insert(0, "localhost")

L23 = Label(gui, text = "Ports: ")

L23.place(x = 16, y = 158)

L24 = Entry(gui, text = "1")

L24.place(x = 180, y = 158, width = 95)

L24.insert(0, "1")

L25 = Entry(gui, text = "1024")

L25.place(x = 290, y = 158, width = 95)

L25.insert(0, "1024")

L26 = Label(gui, text = "Results: ")

L26.place(x = 16, y = 220)

L27 = Label(gui, text = "[ ... ]")

L27.place(x = 180, y = 220)

# ==== Ports list ====

frame = Frame(gui)

frame.place(x = 16, y = 275, width = 370, height = 215)

listbox = Listbox(frame, width = 59, height = 6)

listbox.place(x = 0, y = 0)

listbox.bind('<<ListboxSelect>>')

scrollbar = Scrollbar(frame)

scrollbar.pack(side=RIGHT, fill=Y)

listbox.config(yscrollcommand=scrollbar.set)

scrollbar.config(command=listbox.yview)

# ==== Buttons / Scans ====

B11 = Button(gui, text = "Start Scan", command=startScan)

B11.place(x = 16, y = 500, width = 170)

B21 = Button(gui, text = "Save Result", command=saveScan)

B21.place(x = 210, y = 500, width = 170)

# ==== Start GUI ====

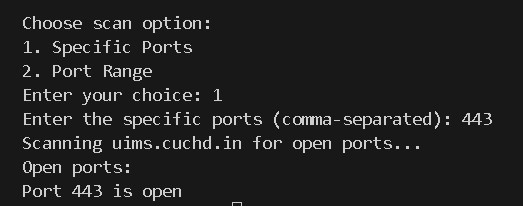
gui.mainloop()

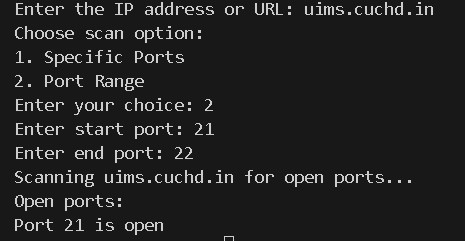
|  |
| --- |
| import socket,sys,threading,time from tkinter import \*  # ==== Scan Vars ==== ip\_s = 1 ip\_f = 1024 log = [] ports = []  target = 'localhost'  # ==== Scanning Functions ==== def scanPort(target, port): |

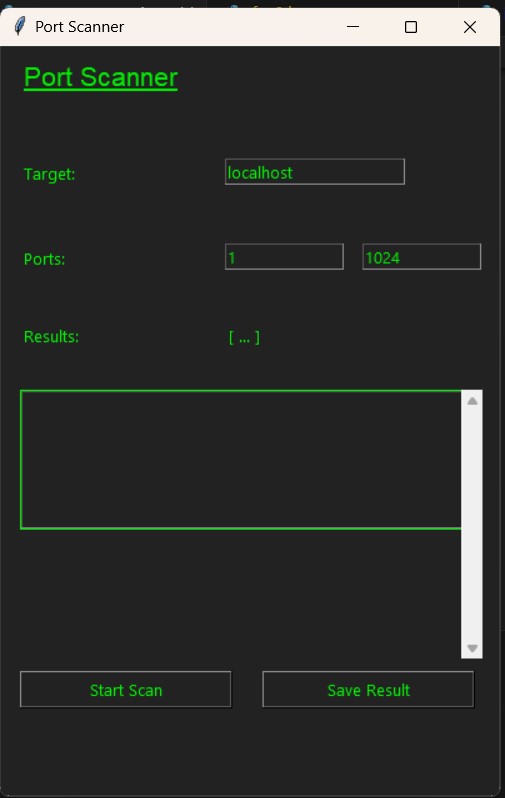
|  |
| --- |
| try:  s = socket.socket(socket.AF\_INET, socket.SOCK\_STREAM)  s.settimeout(4) c = s.connect\_ex((target, port)) if c == 0:  m = ' Port %d \t[open]' % (port,) log.append(m) ports.append(port) listbox.insert("end", str(m)) updateResult()  s.close() except OSError: print('> Too many open sockets. Port ' + str(port)) except:  c.close()  s.close() sys.exit() sys.exit()  def updateResult():  rtext = " [ " + str(len(ports)) + " / " + str(ip\_f) + " ] ~ " + str(target)  L27.configure(text = rtext)  def startScan(): global ports, log, target, ip\_f clearScan() log = [] ports = []  # Get ports ranges from GUI ip\_s = int(L24.get()) ip\_f = int(L25.get()) # Start writing the log file log.append('> Port Scanner') log.append('='\*14 + '\n') log.append(' Target:\t' + str(target))  try:  target = socket.gethostbyname(str(L22.get())) log.append(' IP Adr.:\t' + str(target))  log.append(' Ports: \t[ ' + str(ip\_s) + ' / ' + str(ip\_f) + ' ]') log.append('\n')  # Lets start scanning ports! while ip\_s <= ip\_f:  try:  scan = threading.Thread(target=scanPort, args=(target, ip\_s)) scan.setDaemon(True) scan.start() except: time.sleep(0.01) |

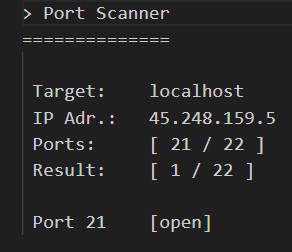
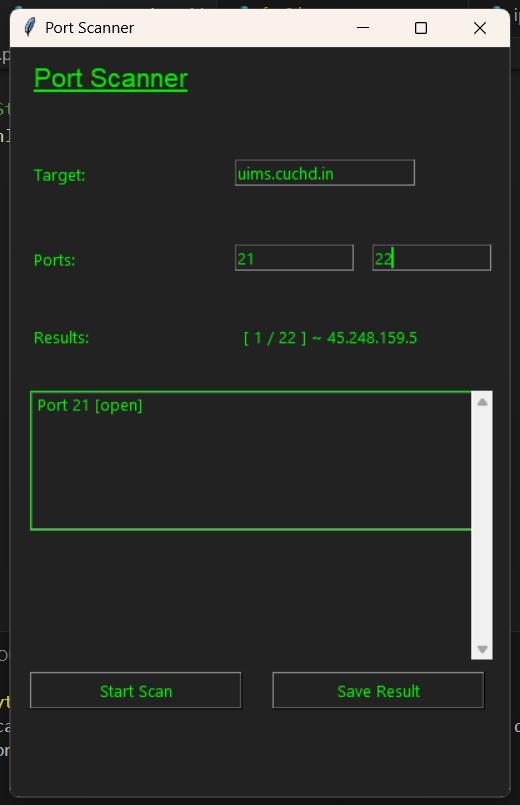
|  |
| --- |
| ip\_s += 1 except:  m = '> Target ' + str(L22.get()) + ' not found.' log.append(m) listbox.insert(0, str(m))  def saveScan():  global log, target, ports, ip\_f log[5] = " Result:\t[ " + str(len(ports)) + " / " + str(ip\_f) + " ]\n" with open('portscan-'+str(target)+'.txt', mode='wt', encoding='utf-8') as myfile:  myfile.write('\n'.join(log))  def clearScan():  listbox.delete(0, 'end')    # ==== GUI ==== gui = Tk() gui.title('Port Scanner') gui.geometry("400x600+20+20")    # ==== Colors ==== m1c = '#00ee00' bgc = '#222222' dbg = '#000000' fgc = '#111111'  gui.tk\_setPalette(background=bgc, foreground=m1c, activeBackground=fgc,activeForeground=bgc, highlightColor=m1c, highlightBackground=m1c)    # ==== Labels ====  L11 = Label(gui, text = "Port Scanner", font=("Helvetica", 16,  'underline'))  L11.place(x = 16, y = 10)    L21 = Label(gui, text = "Target: ")  L21.place(x = 16, y = 90)    L22 = Entry(gui, text = "localhost")  L22.place(x = 180, y = 90)  L22.insert(0, "localhost")    L23 = Label(gui, text = "Ports: ")  L23.place(x = 16, y = 158)    L24 = Entry(gui, text = "1")  L24.place(x = 180, y = 158, width = 95)  L24.insert(0, "1") |
| L25 = Entry(gui, text = "1024")  L25.place(x = 290, y = 158, width = 95)  L25.insert(0, "1024")    L26 = Label(gui, text = "Results: ")  L26.place(x = 16, y = 220)  L27 = Label(gui, text = "[ ... ]")  L27.place(x = 180, y = 220)    # ==== Ports list ==== frame = Frame(gui) frame.place(x = 16, y = 275, width = 370, height = 215) listbox = Listbox(frame, width = 59, height = 6) listbox.place(x = 0, y = 0) listbox.bind('<<ListboxSelect>>') scrollbar = Scrollbar(frame) scrollbar.pack(side=RIGHT, fill=Y) listbox.config(yscrollcommand=scrollbar.set) scrollbar.config(command=listbox.yview)    # ==== Buttons / Scans ====  B11 = Button(gui, text = "Start Scan", command=startScan) B11.place(x = 16, y = 500, width = 170)  B21 = Button(gui, text = "Save Result", command=saveScan)  B21.place(x = 210, y = 500, width = 170)  # ==== Start GUI ==== gui.mainloop() |

#### 6.Output









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