Jyothi Engineering College
NAAC accredited college with NBA Accredited Programmes*
Approved by AICTE & affiliated to APJ Abdul kalam Technological University
A CENTRE OF EXCELLENCE IN SCIENCE & TECHNOLOGY BY THE CATHOLIC ARCHDIOCESE OF TRICHUR
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NBA accredited B. Tech Programmes in Computer Science & Engineering, Electronics & Communication Engineering, Electrical & Electronics Engineering and Mechanical Engineering valid for the academic years 2016 to 2022
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CREATING TECHNOLOGY LEADERS OF TOMORROW
ESTD 2002

Project Title: Python-Based Network Scanner

Guide:

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Vision of the Department

Creating eminent and ethical leaders in the domain of Computational Sciences through quality professional education with a focus on holistic learning and excellence.

Mission of the Department

- To create technically competent and ethically conscious graduates in the field of Computer Science and Engineering by encouraging holistic learning and excellence.
- To prepare students for careers in Industry, Academia and the Government.
- To instill Entrepreneurial Orientation and research motivation among the students of the department.
- To emerge as a leader in education in the region by encouraging teaching, learning, industry and societal connect.

Programme Educational Objectives (PEOs)

1. The graduates shall have sound knowledge of Mathematics, Science, Engineering and Management to be able to offer practical software and hardware solutions for the problems of industry and society at large.

2. The graduates shall be able to establish themselves as practicing professionals, researchers or Entrepreneurs in computer science or allied areas and shall also be able to pursue higher education in reputed institutes.

3. The graduates shall be able to communicate effectively and work in multidisciplinary teams with team spirit demonstrating value driven and ethical leadership.

Programme Outcomes

Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Programme Specific Outcomes (PSOs)

On the completion of Computer Science & Engineering program, the students will possess:

1. An ability to apply knowledge of data structures and algorithms appropriate to computational problems.
2. An ability to apply knowledge of operating systems, programming languages, data management, or networking principles to computational assignments.
3. An ability to apply design, development, maintenance or evaluation of software engineering principles in the construction of computer and software systems of varying complexity and quality.
4. An ability to understand concepts involved in modeling and design of computer science applications in a way that demonstrates comprehension of the fundamentals and trade-offs involved in design choices.

Contents

- Introduction ½ slides
- Objectives
- Literature Review (3 Papers)
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- Architecture of Proposed System /DFD
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Introduction

Network Scanner: A Python-based tool designed to explore networks, identify active devices, detect open ports, and analyze network configurations to enhance security assessment.

Enhanced Network Visibility: Provides a seamless interface for scanning networks, discovering connected devices, and identifying potential vulnerabilities for better network management.

Key Features: Includes device discovery using ARP scanning, multi-threaded port scanning for efficiency, customizable network and port range selection, and result saving for detailed analysis.

Technology Stack: Developed using Python with Scapy for network probing, threading for parallel scanning, and socket programming for port detection, ensuring accurate and efficient network exploration.

Objectives

- To develop a Python-based network scanner capable of discovering active devices, identifying open ports, and analyzing network topology for security assessments.
  To implement efficient scanning techniques using ARP requests and multi-threaded port scanning to enhance speed and accuracy.
  To create a system that retrieves and displays device manufacturers using MAC address lookup from an OUI database.
  To enable result logging by saving scan outputs to a file for easier analysis and reporting.
  To enhance future capabilities by integrating AI/ML for anomaly detection and advanced network threat analysis.

literature survey

Sl No	Author, Year, Publisher	Title	Methodology / Dataset / Software / Algorithm etc….	Inferences
1	G. Murali M.Pranavi Y.Navateja K.Bhargavi, 2011, IJCTA	NETWORK SECURITY SCANNER	Constructed using a variety of tools and subsequently deployed.	The functionalities done in Network Security Scanner were well implemented successfully.

literature survey

Sl No	Author, Year, Publisher	Title	Methodology / Dataset / Software / Algorithm etc….	Inferences
2	Nikita Jhala, 2014, ResearchGate	Network Scanning & Vulnerability Assessment with Report Generation	Self supervised scanning and result analysis	Scanning Tool Developed and Tested Successfully

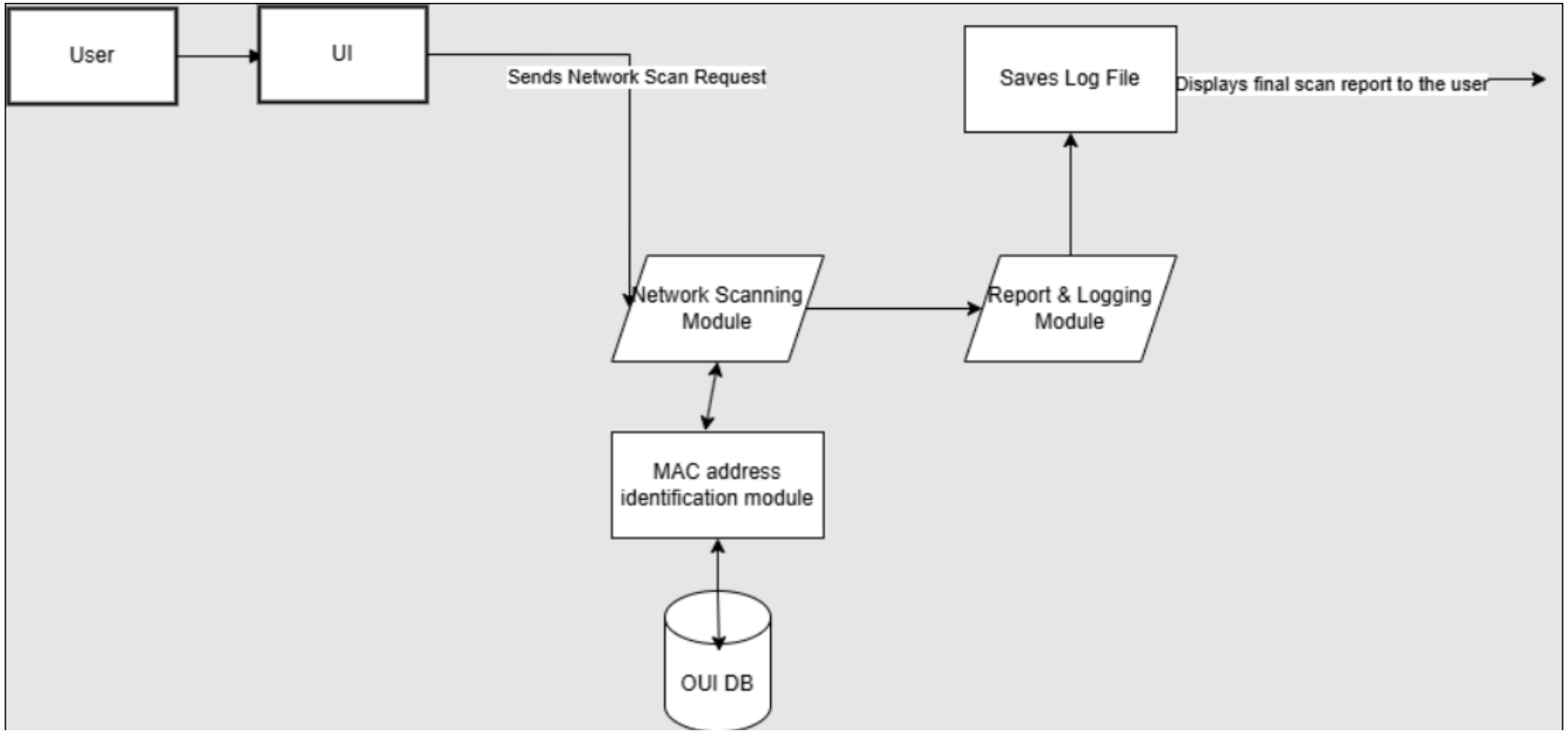
Problem statement

This project aims to develop a user-friendly and efficient Python-based network scanner that simplifies network monitoring, ensures accurate device identification, integrates real-time scanning capabilities, and enhances cybersecurity analysis for improved network management and security assessment.

Proposed System – Discuss module

- **User Interface:** Provides a GUI for users to scan and monitor network devices.
- **Network Scanning:** Detects active devices, retrieves IP/MAC addresses, and scans open ports.
- **Device Identification:** Uses an OUI database to recognize device manufacturers.
- **Logging & Reporting:** Stores scan results for network monitoring and security analysis.
- **Security Analysis:** Identifies unknown devices and potential vulnerabilities

Architecture / DFD of Proposed System



Hardware Software Requirements

Frontend: Python/ CustomTkinter Module

Backend: Python / Socket/ Scapy Modules

Database: Locally Saved DB from IEEE.org(OUI DB)

Conclusion

Efficient & User-Friendly Network Scanning

The developed Python-based network scanner provides a seamless interface for users to scan their network, identify active devices, and analyze security vulnerabilities in real time.

Enhanced Network Monitoring & Security

With automated device detection, port scanning, and MAC address identification, users can efficiently monitor their network, ensuring better visibility and proactive security measures.

Scalability & Future Enhancements

The system is designed to be scalable, allowing for future integrations such as real-time alerts, AI-driven threat analysis, and advanced vulnerability assessments for improved cybersecurity.

References

1 M Pranavi et al, Int. J. Comp. Tech. Appl., Vol 2 (6), 1800-1805 IJCTA | NOV-DEC 2011 Available online@www.ijcta.com 1800 ISSN:2229-6093

2 https://www.researchgate.net/publication/263779662_Network_Scanning_Vulnerability_Assessment_with_Report_Generation

[3] DFD creation: https://www.drawio.com/

[4] Python Scapy Modules : https://scapy.net/