Automated Port Scanner Using Python for Network Reconnaissance

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Abstract

This project involves developing a simple automated port scanner using Python to perform active network reconnaissance. The tool scans a target IP address or domain to identify open ports and their associated services. This mimics the first phase of penetration testing — information gathering — which is essential in any offensive cybersecurity engagement.

Port Scanner

A **port scanner** is a cybersecurity tool used to identify open ports and services running on a target machine. In the context of **offensive security**, port scanning is a critical step during the **reconnaissance phase** of penetration testing, as it helps attackers or ethical hackers map the network and detect potential entry points.

This project involves creating a **Python-based automated port scanner** that connects to specified ports on a target IP address or domain to check their status (open/closed). The scanner also attempts to retrieve service banners from open ports, providing further insight into the system's exposed services.

By automating this process using Python and multithreading, the tool allows fast and efficient scanning of port ranges, mimicking real-world penetration testing techniques.

Objectives:

- Scan target IP for open ports
- Identify services from banners
- Log or display results clearly
- Understand ethical usage in penetration testing

Tools Used:

- Python 3
- Libraries: socket, argparse, concurrent.futures

Methodology:

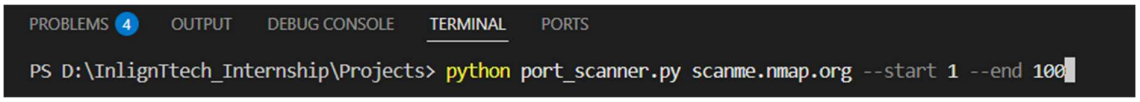
1. Target IP is resolved.
2. Ports scanned in parallel threads.
3. Open ports are logged with banners.
4. Results displayed in console.

Source Code

port_scanner.py > run_scanner

```python
import socket
import argparse
from concurrent.futures import ThreadPoolExecutor

# Port scan function
def scan_port(ip, port):
    try:
        sock = socket.socket()
        sock.settimeout(1)
        sock.connect((ip, port))
        try:
            banner = sock.recv(1024).decode().strip()
        except:
            banner = "No banner"
        return (port, "OPEN", banner)
    except:
        return None

def run_scanner(ip, ports):
    open_ports = []
    with ThreadPoolExecutor(max_workers=100) as executor:
        results = executor.map(lambda p: scan_port(ip, p), ports)
        for result in results:
            if result:
                open_ports.append(result)
    return open_ports

if __name__ == "__main__":
    parser = argparse.ArgumentParser(description="Simple Python Port Scanner")
    parser.add_argument("target", help="Target IP or domain to scan")
    parser.add_argument("--start", type=int, default=1, help="Start port")
    parser.add_argument("--end", type=int, default=1024, help="End port")
    args = parser.parse_args()

    print(f"Scanning {args.target} from port {args.start} to {args.end}...\n")
    ports = list(range(args.start, args.end + 1))
    results = run_scanner(args.target, ports)

    for port, status, banner in results:
        print(f"[+] Port {port} is {status} - Banner: {banner}")
```

Sample Run



Output

Extensions (Optional):

- Save results to a text/CSV file
- Add UI with Tkinter or web version with Flask
- Scan for vulnerabilities based on banner info

Conclusion

The Python-based port scanner developed in this project demonstrates the core concepts of network reconnaissance in offensive cybersecurity. By scanning and identifying open ports and service banners on a target system, the tool aids in detecting potential vulnerabilities that could be exploited in further stages of penetration testing.

This project not only reinforces the practical use of Python in cybersecurity but also emphasizes the importance of ethical hacking practices. The port scanner provides a solid foundation for understanding how attackers gather information and how defenders can proactively secure exposed services.

References

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- Port Scanning Techniques – SANS Institute Whitepapers

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  https://www.youtube.com/watch?v=rfscVS0vtbw