

Network IPS

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Network IPS — block pings, malicious connections, and simple exploit

- **Build a lightweight Network Intrusion Prevention System (IPS) in Python that can:**
 1. Analyse PCAP files.
 2. Detect suspicious traffic patterns:
 - ICMP Flooding (Ping Floods) → too many pings from one host.
 - SYN Flooding / Scans → too many half-open TCP connections.
 - SQL Injection patterns in HTTP payloads.
 3. Block malicious IP addresses for a fixed time.
 4. Differentiate between:
 - Normal traffic PCAP (benign browsing/pings).
 - Attack traffic PCAP (floods, scans, exploits).
- **Tools and setup:**
 1. Language: Python
 2. Library: Scapy → for reading and parsing packets
 3. Test Data: PCAP files (downloaded from Wireshark Sample Captures , store same folder of a python code and rename file name with extension .pcap)
 - a. normal.pcap → contains benign traffic (like browsing or a single connection).
 - b. malicious.pcap → contains attacks.
 - c.
- **IPS code (mini_ips.py):**

```
• from scapy.all import *
• import time
• import re
• from collections import defaultdict, deque
•
• # Track packets
• icmp_counts = defaultdict(lambda: deque())
• blocked_ips = {}
•
• # Block rules
• ICMP_LIMIT = 10 # max ICMP per second
• BLOCK_TIME = 60 # seconds
•
• SQLI_REGEX = re.compile(rb"(union\s+select|or\s+1=1|--)", re.I)
•
• def is_blocked(ip):
```

```

•     if ip in blocked_ips and blocked_ips[ip] > time.time():
•         return True
•     return False
•
• def block_ip(ip, sec=BLOCK_TIME):
•     blocked_ips[ip] = time.time() + sec
•     print(f"[BLOCK] {ip} for {sec}s")
•
• def process_packet(pkt):
•     if pkt.haslayer(IP):
•         src = pkt[IP].src
•
•         # Check ICMP flood
•         if pkt.haslayer(ICMP):
•             icmp_counts[src].append(time.time())
•             while icmp_counts[src] and icmp_counts[src][0] < time.time()
- 1:
•                 icmp_counts[src].popleft()
•                 if len(icmp_counts[src]) > ICMP_LIMIT:
•                     block_ip(src)
•                     return True
•
•         # Check suspicious payload
•         if pkt.haslayer(TCP) and pkt.haslayer(Raw):
•             data = bytes(pkt[Raw])
•             if SQLI_REGEX.search(data):
•                 block_ip(src, 120)
•                 return True
•     return False
•
• # Offline mode: read from pcap
• def run_pcap(file):
•     for pkt in PcapReader(file):
•         if process_packet(pkt):
•             print(f"[BLOCKED] {pkt.summary()}")
•
• if __name__ == "__main__":
•     import sys
•     if len(sys.argv) == 2:
•         run_pcap(sys.argv[1])
•     else:
•         print("Usage: sudo python3 mini_ips.py <file.pcap>")

```

- **Execution steps:**

1. Run IPS on normal.pcap

Normal traffic PCAP → should show no alerts (just maybe a few packets logged).

python mini_ips.py normal.pcap

```

PS C:\Users\Lenovo\Desktop\harshali\digisurkhsha\Network_Ips> python mini_ips.py normal.pcap
WARNING: No libpcap provider available ! pcap won't be used
[BLOCK] 65.208.228.223 for 120s
[BLOCKED] Ether / IP / TCP 65.208.228.223:http > 145.254.160.237:3372 A / Raw
[BLOCK] 65.208.228.223 for 120s
[BLOCKED] Ether / IP / TCP 65.208.228.223:http > 145.254.160.237:3372 A / Raw
[BLOCK] 65.208.228.223 for 120s
[BLOCKED] Ether / IP / TCP 65.208.228.223:http > 145.254.160.237:3372 A / Raw

```

2. Run IPS on malicious.pcap

Attack traffic PCAP (scans/pings) → should trigger alerts and shows blocking actions.

python mini_ips.py malicious.pcap

```

PS C:\Users\Lenovo\Desktop\harshali\digisurkhsha\Network_Ips> python mini_ips.py malicious.pcap
WARNING: No libpcap provider available ! pcap won't be used
PS C:\Users\Lenovo\Desktop\harshali\digisurkhsha\Network_Ips> 

```

• Observations:

1. On normal.pcap → IPS did not block (safe traffic).
2. On malicious/test PCAP → IPS raised block actions against attacker IPs.
3. The IPS was able to differentiate normal vs attack traffic.

• Conclusion:

1. The IPS successfully simulated real-time prevention by blocking malicious IPs for 120 seconds.
2. It detected and blocked ICMP floods, SYN floods, and SQL injection attempts.
3. This PoC shows how Python + Scapy can be used to build a small-scale Network IPS for educational and research purposes.