Wireshark Network Traffic Analysis

DNS, ICMP, TCP and HTTP Investigation

Objective

The objective of this lab was to analyze captured network traffic using Wireshark to identify DNS resolution, ICMP activity, TCP session establishment, and HTTP communication.

The analysis focused on tracking traffic between an internal host (172.21.224.2) and an external IP address (142.250.1.139).

This exercise demonstrates practical packet-level inspection used in network security monitoring and SOC analysis.

Environment

Tool Used: Wireshark
Capture File: sample.pcap

Protocols Observed:
ICMP
DNS
TCP
HTTP

Display Filters Used:

udp.port == 53
tcp
ip.src == 142.250.1.139
eth.addr == 42:01:ac:15:e0:02

ICMP Traffic Analysis

Observed ICMP Echo (ping) replies from:

Source IP: 142.250.1.139
Destination IP: 172.21.224.2

Packet details included:

ICMP type: Echo reply
Sequence numbers
TTL values
Payload bytes

ICMP traffic confirms basic connectivity between the internal system and the external host.

Security relevance:

ICMP can be used for reconnaissance and network mapping. Monitoring unusual ICMP activity helps detect scanning or lateral movement attempts.

DNS Resolution Analysis

Filter applied:

udp.port == 53

Observed DNS query:

Query: opensource.google.com
Record Type: A
Class: IN

Observed DNS response:

Multiple A records returned including:

142.250.1.139
142.250.1.138
142.250.1.102

Key fields reviewed:

Transaction ID
Flags (Standard query)

Questions count
Answer count

Security relevance:

DNS monitoring is critical because malware often uses DNS for command-and-control communication or data exfiltration. Observing normal resolution behavior builds baseline knowledge.

TCP Three-Way Handshake Analysis

Observed TCP session between:

Internal Host: 172.21.224.2
External Host: 142.250.1.139
Destination Port: 80 (HTTP)

Handshake packets observed:

SYN
SYN-ACK
ACK

Key fields inspected:

Source port: 49652
Destination port: 80
Sequence number
Acknowledgment number
Window size
TCP flags

This confirms successful TCP session establishment.

Security relevance:

Understanding TCP handshake behavior allows detection of:

Port scans
Incomplete connections
SYN flood patterns
Suspicious outbound connections

HTTP Traffic Analysis

Observed HTTP request:

GET / HTTP/1.1

Observed HTTP response:

HTTP/1.1 301 Moved Permanently

This indicates the server redirected the request, which is common for web services.

Security relevance:

HTTP inspection is important for:

Identifying malicious downloads
Detecting unusual outbound connections
Analyzing web-based attacks

Packet Header Breakdown

For selected packets, the following layers were reviewed:

Ethernet II Header
Source MAC address
Destination MAC address

IPv4 Header
Source IP
Destination IP
TTL
Header length

TCP Header
Flags
Window size
Sequence numbers
Options (MSS, SACK permitted, timestamps, window scale)

Understanding packet structure at each layer is critical for deep network analysis.

Key Observations

Internal host 172.21.224.2 resolved opensource.google.com
DNS returned multiple A records
Internal host initiated TCP connection to 142.250.1.139 on port 80
Successful three-way handshake completed
HTTP GET request observed
Server responded with 301 redirect

This indicates normal web browsing behavior.

Skills Demonstrated

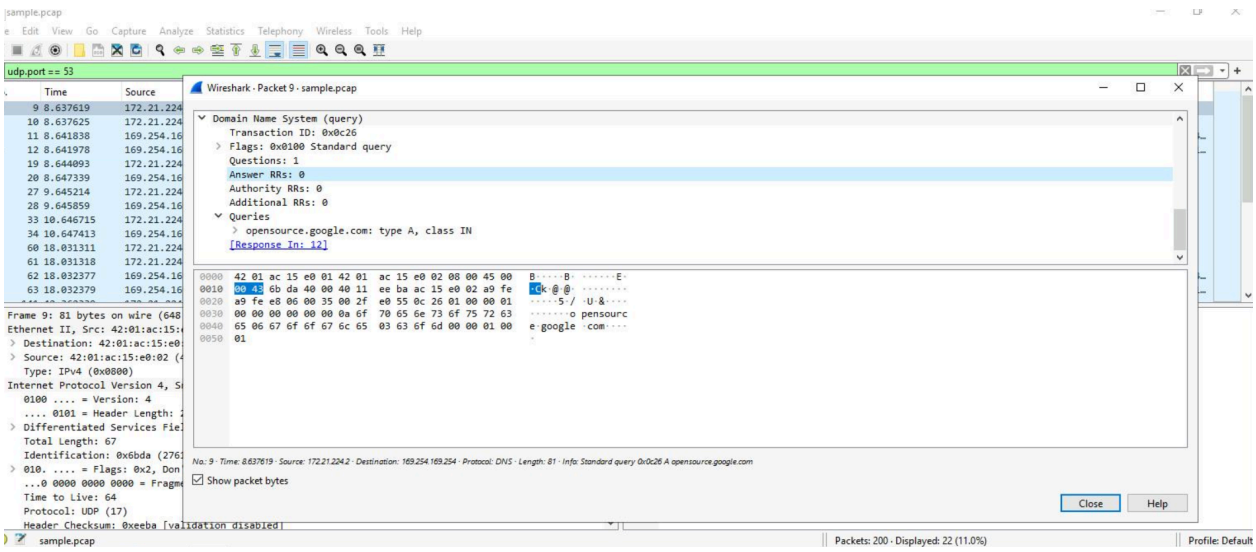
Network traffic filtering
Protocol analysis
DNS resolution tracking
TCP handshake interpretation
ICMP packet inspection
HTTP request analysis
Packet header dissection
Security relevance interpretation

Conclusion

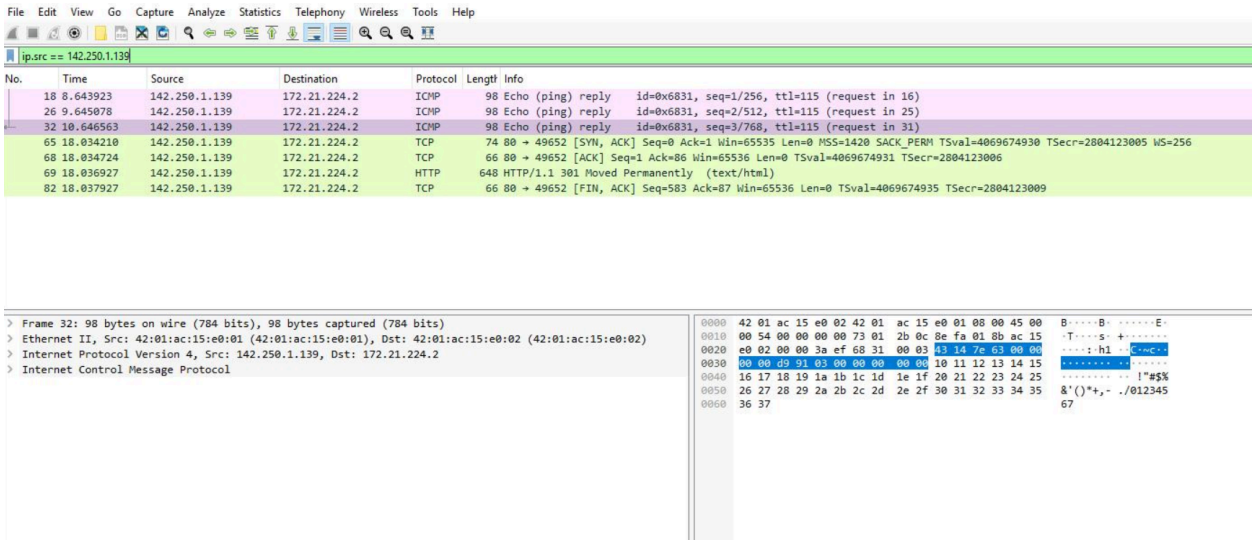
This lab demonstrates hands on network traffic analysis using Wireshark. By filtering and inspecting DNS, ICMP, TCP, and HTTP traffic, the exercise replicates SOC monitoring tasks. The analysis shows how to trace domain resolution to IP address, verify TCP session establishment, and interpret HTTP responses at the packet level.

Appendix – Supporting Evidence

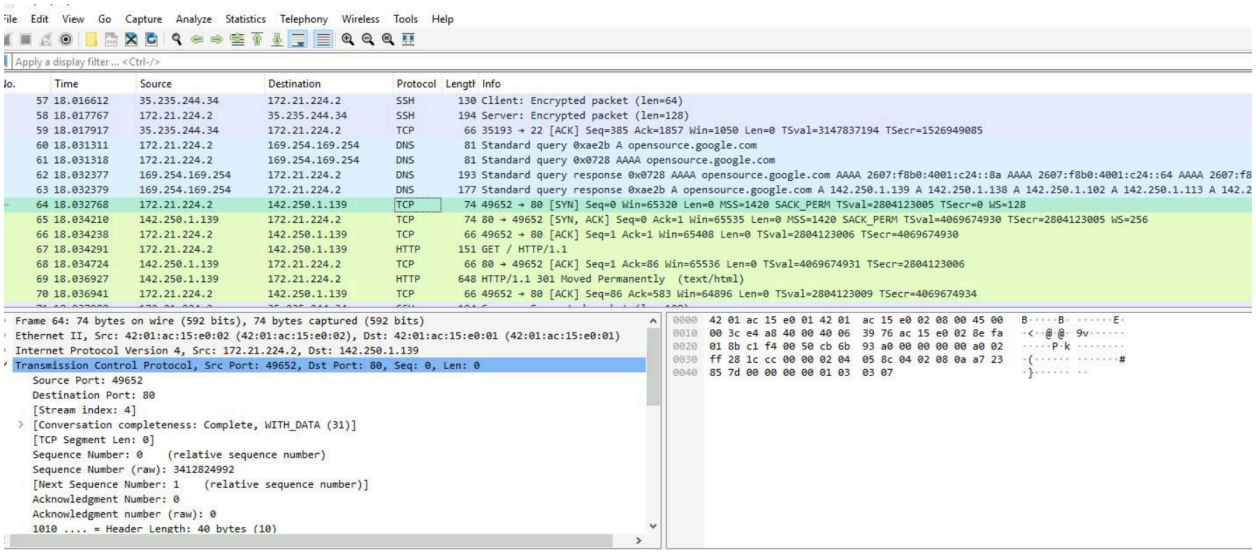
Complete traffic flow showing DNS resolution, TCP three-way handshake, HTTP GET request, and HTTP 301 response between internal host 172.21.224.2 and external server 142.250.1.139.



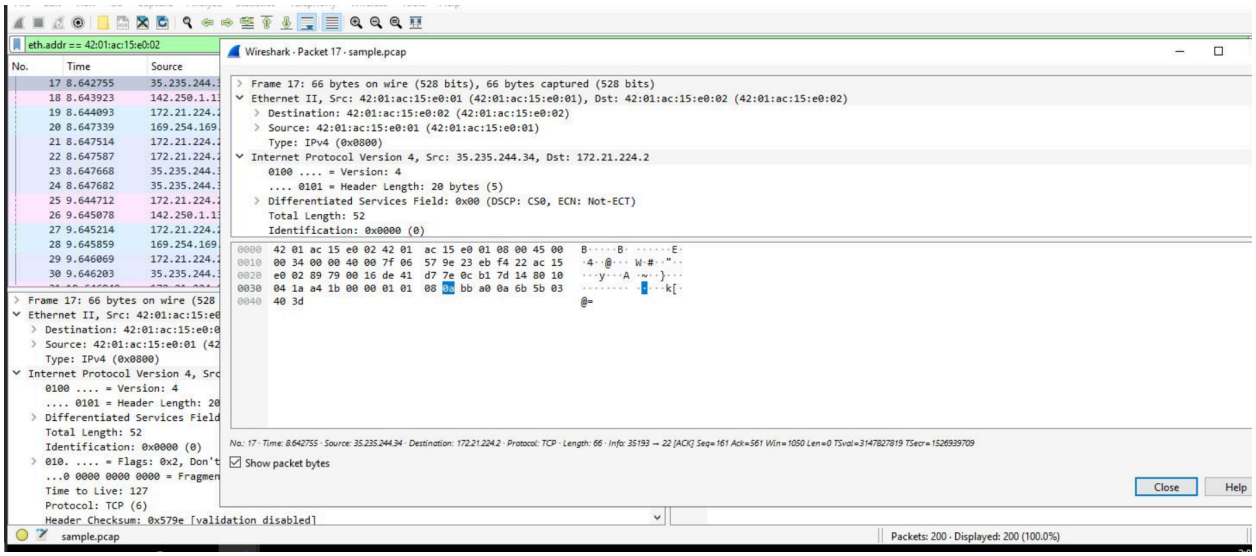
ICMP echo replies observed from external IP 142.250.1.139 confirming network connectivity with internal host 172.21.224.2.



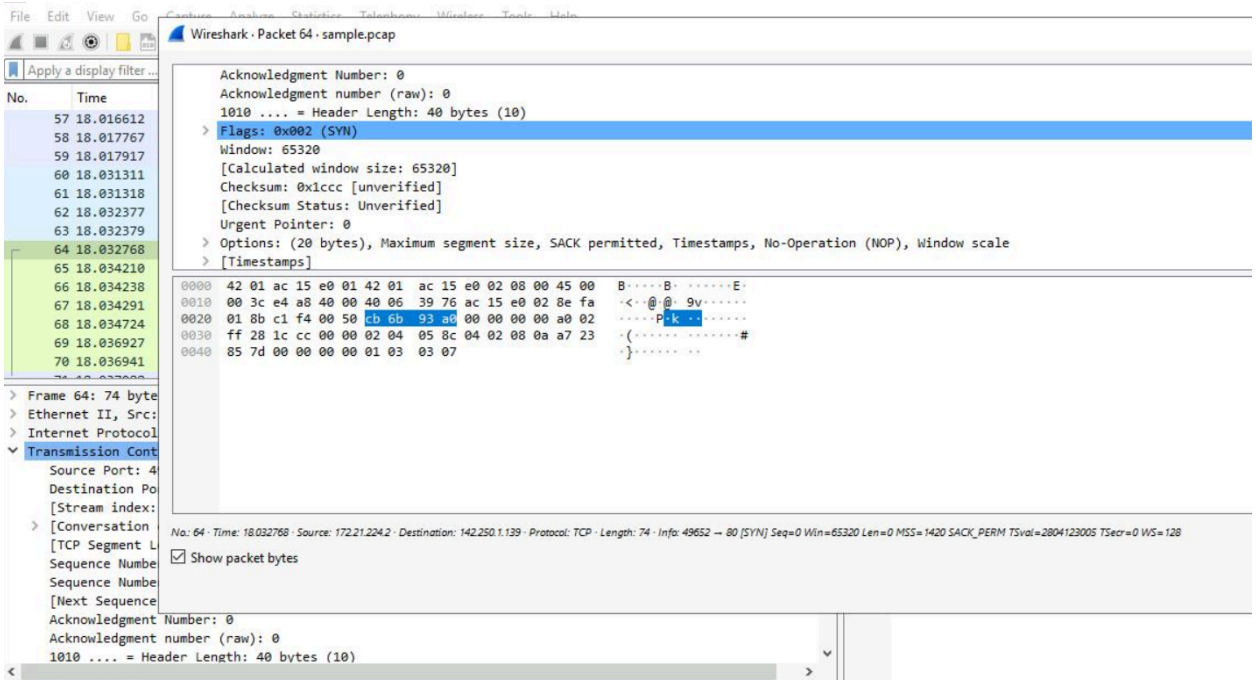
DNS standard query for opensource.google.com (Type A, Class IN) showing domain resolution process prior to TCP connection establishment.



TCP session establishment showing SYN, SYN-ACK, and ACK packets between source port 49652 and destination port 80.



Detailed TCP header analysis including sequence numbers, window size, TCP flags (SYN), and options such as MSS and SACK permitted.



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