FOR572

GNFA Certification
Network Forensic Analyst

www.giac.org/gnfa

Advanced Network Forensics and Analysis

Six-Day Program
36 CPEs
Laptop Required

Who Should Attend

- Incident response team members and forensicators
- Hunt team members
- Law enforcement officers, federal agents, and detectives
- Information security managers
- Network defenders
- IT professionals
- Network engineers
- Anyone interested in computer network intrusions and investigations
- Security Operations Center personnel and information security practitioners

You Will Be Able To

- Extract files from network packet captures and proxy cache files, allowing follow-on malware analysis or definitive data loss determination
- Use historical NetFlow data to identify relevant past network occurrences, allowing accurate incident scoping
- Reverse-engineer custom network protocols to identify an attacker's command-and-control abilities and actions
- Decrypt captured SSL traffic to identify attackers' actions and what data they extracted from the victim
- Use data from typical network protocols to increase the fidelity of the investigation's findings
- Identify opportunities to collect additional evidence based on the existing systems and platforms within a network architecture
- Examine traffic using common network protocols to identify patterns of activity or specific actions that warrant further investigation
- Incorporate log data into a comprehensive analytic process, filling knowledge gaps that may be far in the past
- Learn how attackers leverage man-in-the-middle tools to intercept seemingly secure communications
- Examine proprietary network protocols to determine what actions occurred on the endpoint systems
- Analyze wireless network traffic to find evidence of malicious activity
- Learn how to modify configuration on typical network devices such as firewalls and intrusion detection systems to increase the intelligence value of their logs and alerts during an investigation
- Apply the knowledge you acquire during the week in a full-day capstone exercise, modeled after real-world nation-state intrusions

Take your system-based forensic knowledge onto the wire. Incorporate network evidence into your investigations, provide better findings, and get the job done faster.

It is exceedingly rare to work any forensic investigation that doesn't have a network component. Endpoint forensics will always be a critical and foundational skill for this career, but overlooking network communications is akin to ignoring security camera footage of a crime as it was committed. Whether you handle an intrusion incident, data theft case, employee misuse scenario, or are engaged in proactive adversary discovery, the network often provides an unparalleled view of the incident. Its evidence can provide the proof necessary to show intent, uncover attackers that have been active for months or longer, or even prove useful in definitively proving a crime actually occurred.

FOR572: Advanced Network Forensics and Analysis was built from the ground up to cover the most critical skills needed to mount efficient and effective post-incident response investigations. We focus on the knowledge necessary to expand the forensic mindset from residual data on the storage media from a system or device to the transient communications that occurred in the past or continue to occur. Even if the most skilled remote attacker compromised a system with an undetectable exploit, the system still has to communicate over the network. Without command-and-control and data extraction channels, the value of a compromised computer system drops to almost zero. Put another way: Bad guys are talking – we'll teach you to listen.

This course covers the tools, technology, and processes required to integrate network evidence sources into your investigations, with a focus on efficiency and effectiveness. You will leave this week with a well-stocked toolbox and the knowledge to use it on your first day back on the job. We will cover the full spectrum of network evidence, including high-level NetFlow analysis, low-level pcap exploration, ancillary network log examination, and more. We cover how to leverage existing infrastructure devices that may contain months or years of valuable evidence as well as how to place new collection platforms while an incident is already under way.

Whether you are a consultant responding to a client's site, a law enforcement professional assisting victims of cybercrime and seeking prosecution of those responsible, an on-staff forensic practitioner, or a member of the growing ranks of "threat hunters", this course offers hands-on experience with real-world scenarios that will help take your work to the next level. Previous SANS SEC curriculum students and other network defenders will benefit from the FOR572 perspective on security operations as they take on more incident response and investigative responsibilities. SANS Forensics alumni from FOR500 (formerly FOR408) and FOR508 can take their existing knowledge and apply it directly to the network-based attacks that occur daily. In FOR572, we solve the same caliber of real-world problems without the use of disk or memory images.

The hands-on labs in this class cover a wide range of tools and platforms, including the venerable tcpdump and Wireshark for packet capture and analysis; NetworkMiner for artifact extraction; and open-source tools including nfdump, tcpxtract, tcpflow, and more. Newly added tools in the course include the SOF-ELK platform – a VMware appliance pre-configured with the ELK stack. This "big data" platform includes the Elasticsearch storage and search database, the Logstash ingest and parse utility, and the Kibana graphical dashboard interface. Together with the custom SOF-ELK configuration files, the platform gives forensicators a ready-to-use platform for log and NetFlow analysis. For full-packet analysis and hunting at scale, the Moloch platform is also used. Through all of the in-class labs, your shell scripting abilities will also be used to make easy work of ripping through hundreds and thousands of data records.

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Course Day Descriptions

572.1 HANDS ON: Off the Disk and Onto the Wire

Network data can be preserved, but only if captured directly from the wire. Whether tactical or strategic, packet capture methods are quite basic. You will re-acquaint yourself with tcpdump and Wireshark, the most common tools used to capture and analyze network packets, respectively. However, since long-term full-packet capture is still uncommon in most environments, many artifacts that can tell us about what happened on the wire in the past come from devices that manage network functions. You will learn about what kinds of devices can provide valuable evidence and at what level of granularity. We will walk through collecting evidence from one of the most common sources of network evidence, a web proxy server, then you'll go hands-on to find and extract stolen data from the proxy yourself. The Linux SIFT virtual machine, which has been specifically loaded with a set of network forensic tools, will be your primary toolkit for the week.

Topics: **Web Proxy Server Examination; Foundational Network Forensics Tools: tcpdump and Wireshark; Network Evidence Acquisition; Network Architectural Challenges and Opportunities**

572.2 HANDS ON: Core Protocols & Log Aggregation/Analysis

Understanding log data and how it can guide the investigative process is an important network forensicator skill. Examining network-centric logs can also fill gaps left by an incomplete or nonexistent network capture. In this section, you will learn various logging mechanisms available to both endpoint and network transport devices. You will also learn how to consolidate log data from multiple sources, providing a broad corpus of evidence in one location. As the volume of log data increases, so does the need to consider automated analytic tools. You'll use the SOF-ELK platform for post-incident log aggregation and analysis, bringing quick and decisive insight to a compromise investigation.

Topics: **Hypertext Transfer Protocol (HTTP): Protocol and Logs; Domain Name Service (DNS): Protocol and Logs; Firewall, Intrusion Detection System, and Network Security Monitoring Logs; Logging Protocol and Aggregation; ELK Stack and the SOF-ELK Platform**

572.3 HANDS ON: NetFlow and File Access Protocols

In this section, you will learn the contents of typical NetFlow protocols, as well as common collection architectures and analysis methods. You'll also learn how to distill full-packet collections to NetFlow records for quick initial analysis before diving into more cumbersome pcap files. In addition, you'll examine the File Transfer Protocol, including how to reconstruct specific files from an FTP session. While FTP is commonly used for data exfiltration, it is also an opportunity to refine protocol analysis techniques, due to its multiple-stream nature. Lastly, you'll explore a variety of the network protocols unique to a Microsoft Windows or Windows-compatible environment. Attackers frequently use these protocols to "live off the land" within the victim's environment. By using existing and expected protocols, adversaries can hide in plain sight and avoid deploying malware that could tip off the investigators to their presence and actions.

Topics: **NetFlow Collection and Analysis; Open-Source Flow Tools; File Transfer Protocol (FTP); Microsoft Protocols**

SANS

FOR572 Training Formats

(subject to change)

Live Training
www.sans.org/security-training/by-location/all

Summit Events
www.sans.org/summit

Mentor Training
www.sans.org/mentor

Private Training
www.sans.org/onsite

vLive
www.sans.org/vlive

Simulcast
www.sans.org/simulcast

OnDemand
www.sans.org/ondemand

SelfStudy
www.sans.org/selfstudy

572.4 HANDS ON: Commercial Tools, Wireless, and Full-Packet Hunting

Commercial tools hold clear advantages in some situations a forensicator may typically encounter. Most commonly, this centers on scalability. Many open-source tools are designed for tactical or small-scale use. Whether they are used for large-scale deployments or for specific niche functionalities, these tools can immediately address many investigative needs. You'll look at the typical areas where commercial tools in the network forensic realm tend to focus, and discuss the value each may provide for your organizational requirements or those of your clients. Additionally, we will address the forensic aspects of wireless networking.

Topics: **Simple Mail Transfer Protocol (SMTP); Commercial Network Forensics; Wireless Network Forensics; Automated Tools and Libraries; Full-Packet Hunting with Moloch**

572.5 HANDS ON: Encryption, Protocol Reversing, OPSEC, and Intel

Encryption is frequently cited as the most significant hurdle to effective network forensics, and for good reason. When properly implemented, encryption can be a brick wall in between an investigator and critical answers. However, technical and implementation weaknesses can be used to our advantage. Even in the absence of these weaknesses, the right analytic approach to encrypted network traffic can still yield valuable information about the content. We will discuss the basics of encryption and how to approach it during an investigation. The section will also cover flow analysis to characterize encrypted conversations.

Topics: **Encoding, Encryption, and SSL; Man in the Middle; Network Protocol Reverse Engineering; Investigation OPSEC and Threat Intel**

572.6 HANDS ON: Network Forensics Capstone Challenge

Students will test their understanding of network evidence and their ability to articulate and support hypotheses through presentations made to the instructor and class. The audience will include senior-level decision-makers, so all presentations must include executive summaries as well as technical details. Time permitting, students should also include recommended steps that could help to prevent, detect, or mitigate a repeat compromise.

Topics: **Network Forensic Case**