جرم یابی دیجیتال
و راهکارهای جمع آوری و حفظ ادله دیجیتال

حسین مومنی
رییس مرکز آپا دانشگاه گلستان

Outline

- Computer Crime
- Digital Forensic
- Digital Evidence
- Preservation of Digital Evidence
- Computer Forensic Steps
- SysAdmin and Network Admin roles as First Responder

Type of Computer Crimes

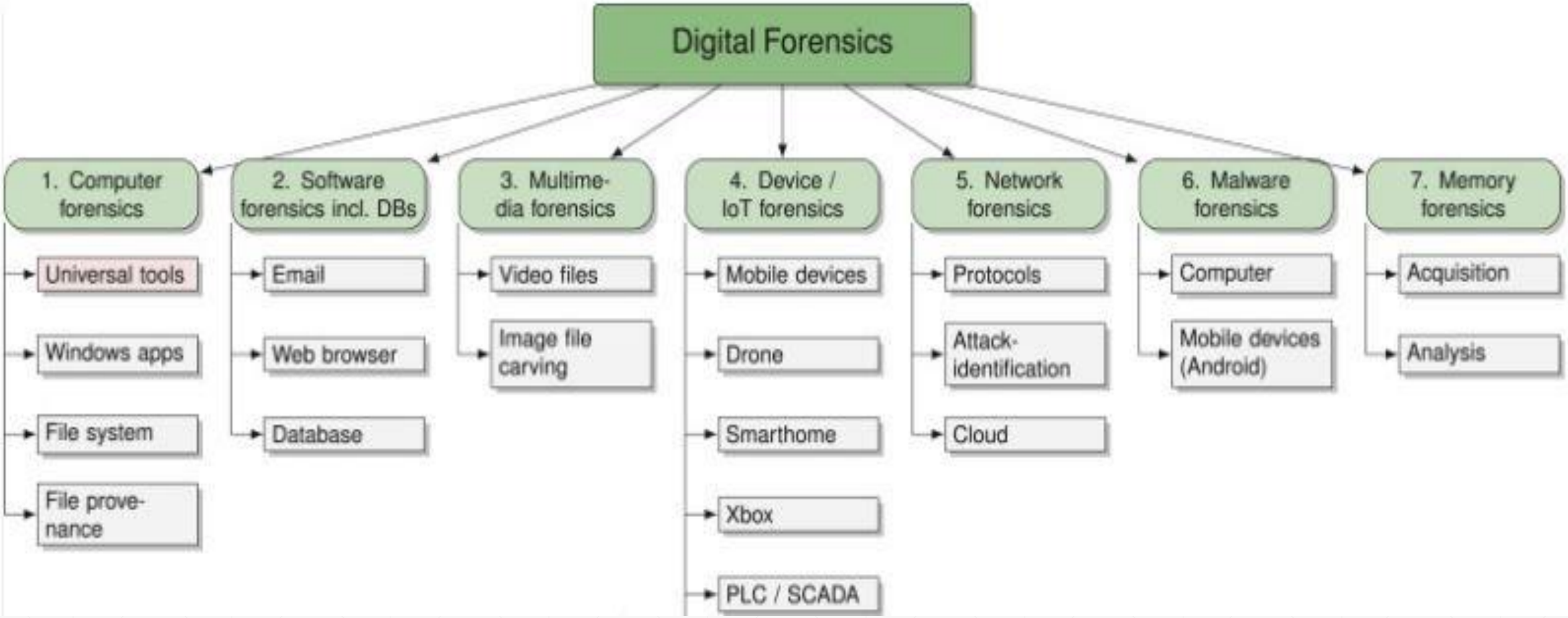
Computer Forensics in Today's World

- Forensic Computing: the science of capturing, processing, and investigating data from computers using a methodology whereby any evidence discovered is acceptable in the court of law.

- Cyber Crime: cybercrime is a term used to describe criminal activity in which a computer or network is a tool, a target, or a place of criminal activity.

Computer as tools Vs. Computer as target

Digital Forensic Types



Digital Evidence

- Digital evidence is any information of probative value that is either stored or transmitted in a digital form.
- Digital evidence is found in:
  - **Network traffic**
  - **OS system files (event, task, process …)**
  - **Server logs**
  - **Emails**
  - **Internet browser histories (Caches, Cookies)**
  - **DB files**
  - **Memory and Storage**
  - **Graphic, Audio and video files**

Characteristics of Digital Evidence

- **Characteristics of Digital Evidence**
  - **Believable**
  - **Admissible**
  - **Authentic**
  - **Reliable**
  - **Complete**
  - **Innocence**

Digital Evidence

- **Type of digital Evidence**
  - **Volatile (running processes)**
  - **Transient (open network connection)**
  - **Fragile (last file access)**
  - **Archival**
  - **Backup**

INCIDENT RESPONSE STEPS

NIST Framework	SANS Framework
1. Preparation	1. Preparation
2. Detection and Analysis	2. Identification
3. Containment, Eradication and Recovery	3. Containment
	4. Eradication
	5. Recovery
4. Post-Incident Activity	6. Lessons Learned

First Responder

- First responder is a person who arrives first at the crime scene and accesses the victim's computer system after the incident

- System or network administrator
- Responsible for protecting, integrating, and preserving the evidence obtained from the crime scene

First Responder

- **Roles of First Responder**
  - ❑ **Identifying the crime scene**
  - ❑ **Protecting the crime scene**
  - ❑ **Preserving <u>temporary evidence</u>**
  - ❑ **Collecting the complete information**
  - ❑ **Documenting all finding**

Pre-Incident Preparation

- **Incident response is reactive in nature.**
- **The pre-incident preparation phase is the proactive and is establishing policies, and procedures to manage and respond to security incidents BEFORE you need them.**
- **Administrator of an organization consider the following strategies:**
  - ❑ **Organizing the networks and assets**
  - ❑ **Deploying sensors to data gathering**
  - ❑ **Training end users**
  - ❑ **Employing an IDS**
  - ❑ **Creating strong access control**
  - ❑ **Ensuring backups are performed on a regular basis**

Policy vs. Mechanism

Common indicators of a computer security incident

- IDS Detection of Remote Attacks
- Numerous Failed Logon Attempts
- Login into Dormant or Default Accounts
- System Crash
- New Accounts not Created by SysAdmin
- Gaps in Log files
- Alter Pages on Webservers
- Slower System Performance
- Receipt of emails extorting your Organizations
- Unfamiliar files or executable programs
- Activity during non-working Hours

First Responder Common Mistakes

- **Shutting down or rebooting the victim's computer:** In this case, the system loses the complete volatile data, such as MAC time and log files, shuts down processes running when shutting down and rebooting.
- **Assuming that some components of the victim's computer may be reliable and usable:** In this case, using some commands on the victim's computer may activate Trojans, malware, and time bombs to delete vital volatile data.

Volatile Information

- The system date and time
- The applications currently running on the system
- The currently established network connections
- The currently open sockets (ports)
- The applications listening on the open sockets
- The state of the network interface (promiscuous or not)

This information can be collected when a computer system is still powered on and running

First Step-Preparation

Initial response checklist

- **Initial response checklist to make sure you record the pertinent facts.**
  - Current time and date
  - Who/what reported the incident
  - The nature of the incident
  - When the incident occurred
  - Hardware/software involved
  - Points of contact for involved personnel

Incident #: _____ Date: _____

Initial Response Checklist

Contact Information

Your Contact Information	
Name:	
Department:	
Telephone	
Other Telephone:	
Email:	

Individual Reporting Incident*	
Name:	
Department:	
Telephone:	
Other Telephone:	
Email:	

* If the Contact Information is the same as the individual above, please leave blank.

Incident Detection

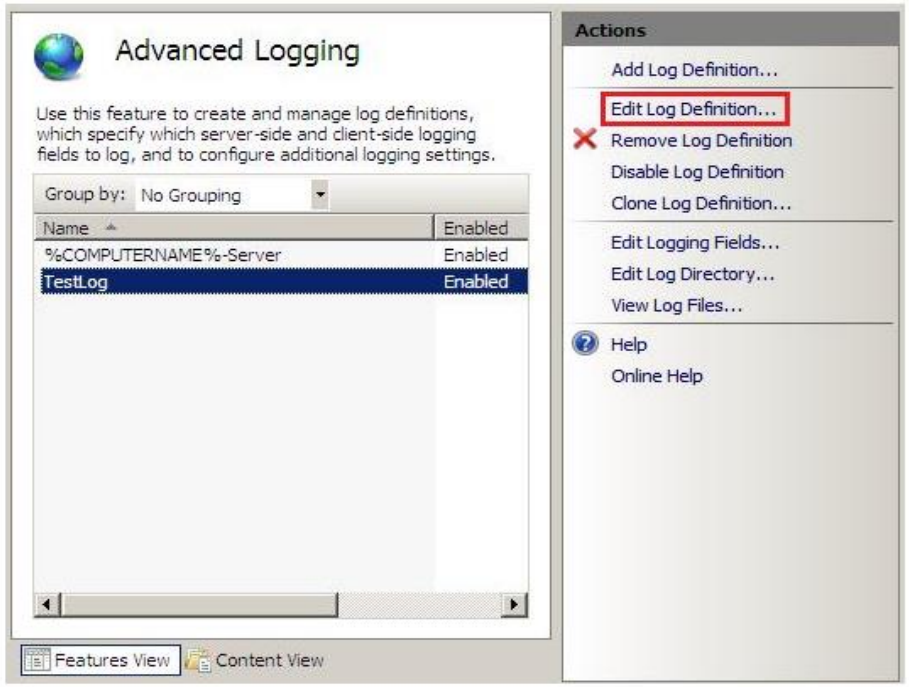
Type of Incident:	☐ Denial of Service ☐ Virus ☐ Hoax ☐ Unauthorized Access ☐ Unauthorized Use of Computer Resources ☐ Theft of Intellectual Property ☐ Other:
Location of Incident:	Address: Building: Room Number:
Describe the Physical Security At the Site: Are there locks? Alarm systems? Who is in charge of the physical security at the site?	
How the Incident was Detected:	
Is the information concerning the incident stored in a protected, tamper-proof manner?	

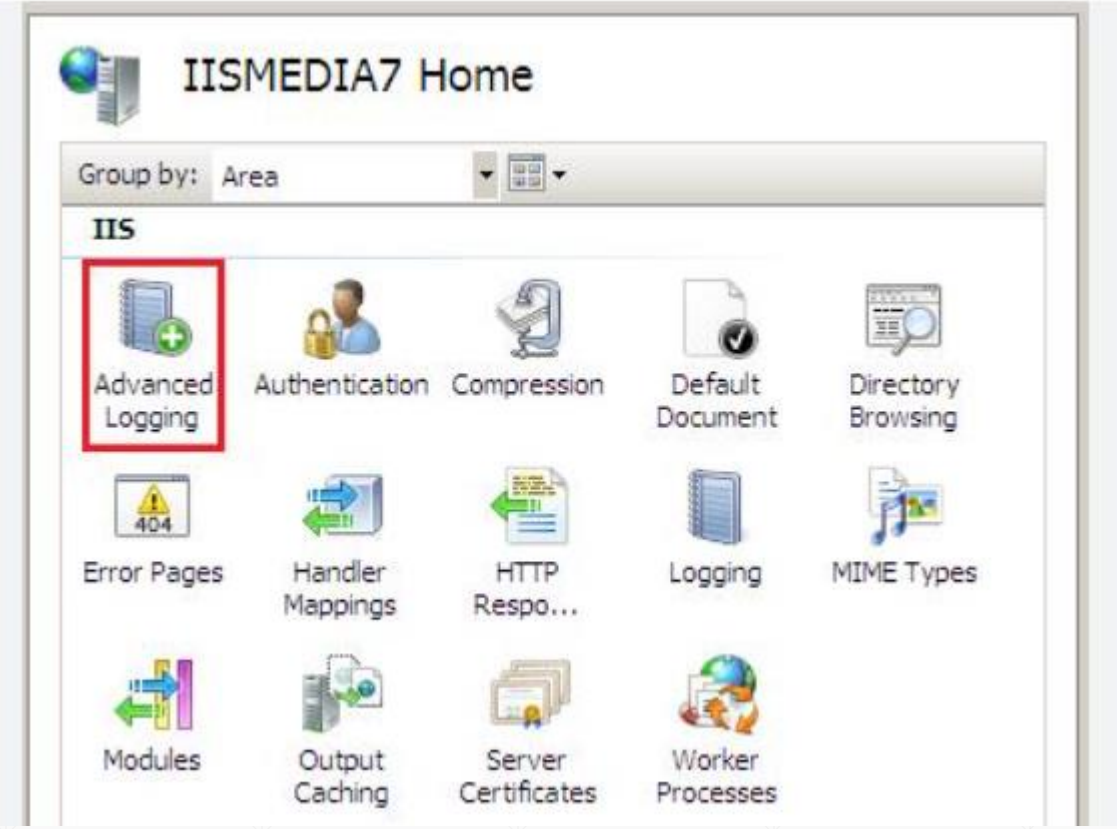
First Step-Preparation

- **Increasing or Enabling Secure Audit Logging**
- **Expand the default logging capabilities so that you'll have plenty of data to review in the event of an incident.**
- **Unix-like OS:**
  - **Syslog: auth.info /var/log/syslog or *.* /var/log/syslog**
- **Window OS: C:\WINDOWS\system32\config**
  - **Enabling Security Auditing**
  - **Auditing File and Directory Actions**
  - **Setting Up Remote Logging**

First Step-Preparation

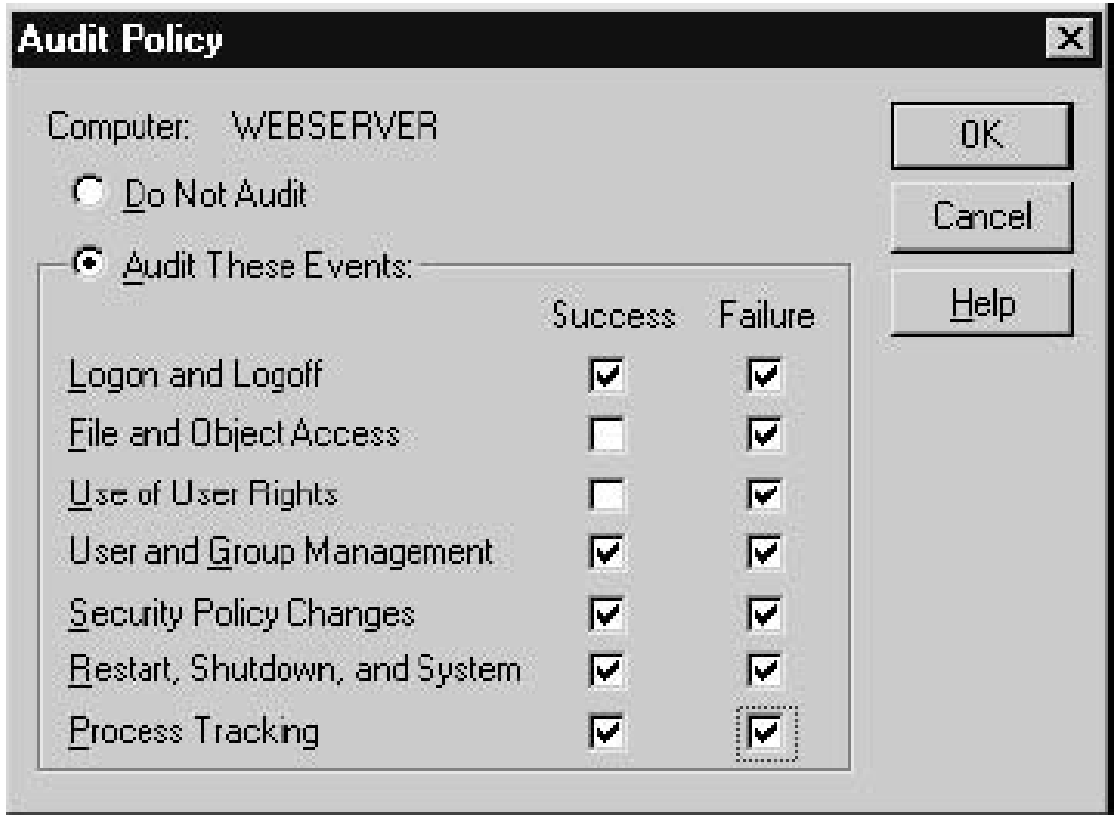
- **Configuring Application Logging**
  - ❑ **Advanced Logging IIS**
  - ❑ **Advanced Logging Apache**
    - **var/log/httpd/**

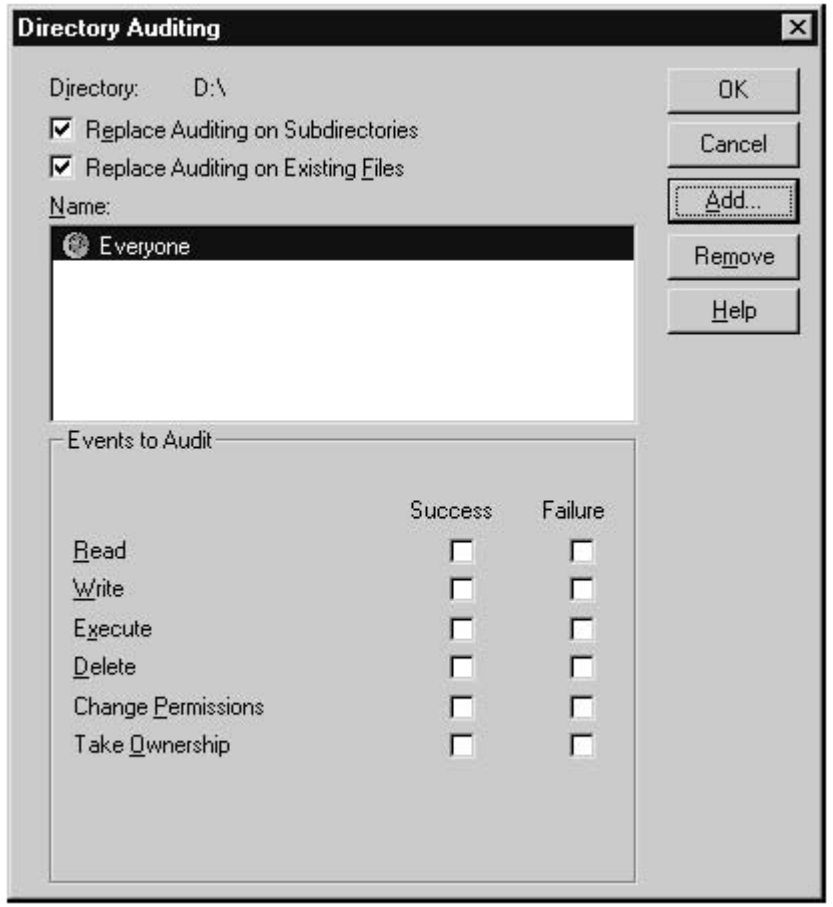




First Step-Preparation

- **Audit Policy Setting**





Second Step-Data Collection

What Data to Collect?

- System time
- Logged-on user(s)
- Open files, Ports
- Detect Backdoors
- Network information
- Network connections
- Running Process information
- Process-to-port mapping
- Running program information
- Network status
- Service/driver information
- Command history
- Script
- Autoruns
- Modification, creation and access time of all files

Second Step-Data Collection

~/.local/share/recently-used.xbel

Data Collection

Network-Based Evidence
- Obtain IDS Logs
- Obtain Existing Router Logs
- Obtain Relevant Firewall Logs
- Obtain Remote Logs from a Centralized Host (SYSLOG)
- Perform Network Monitoring
- Obtain Backups

Host-Based Evidence
- Obtain the Volatile Data during a Live Response
- Obtain the System Time
- Obtain the Time/Date Stamps for Every File on the Victim System
- Obtain all Relevant Files that Confirm or Dispel Allegation
- Obtain Backups

Other Evidence
- Obtain Oral Testimony from Witnesses

Analysis

1. Review the Volatile Data.
   - Review the Network Connections.
   - Identify Any Rogue Processes (Backdoors, Sniffers).

2. Analyze the Relevant Time/Date Stamps.
   - Identify Files Uploaded to the System by an Attacker.
   - Identify Files Downloaded or Taken from the System.

3. Review the Log Files.

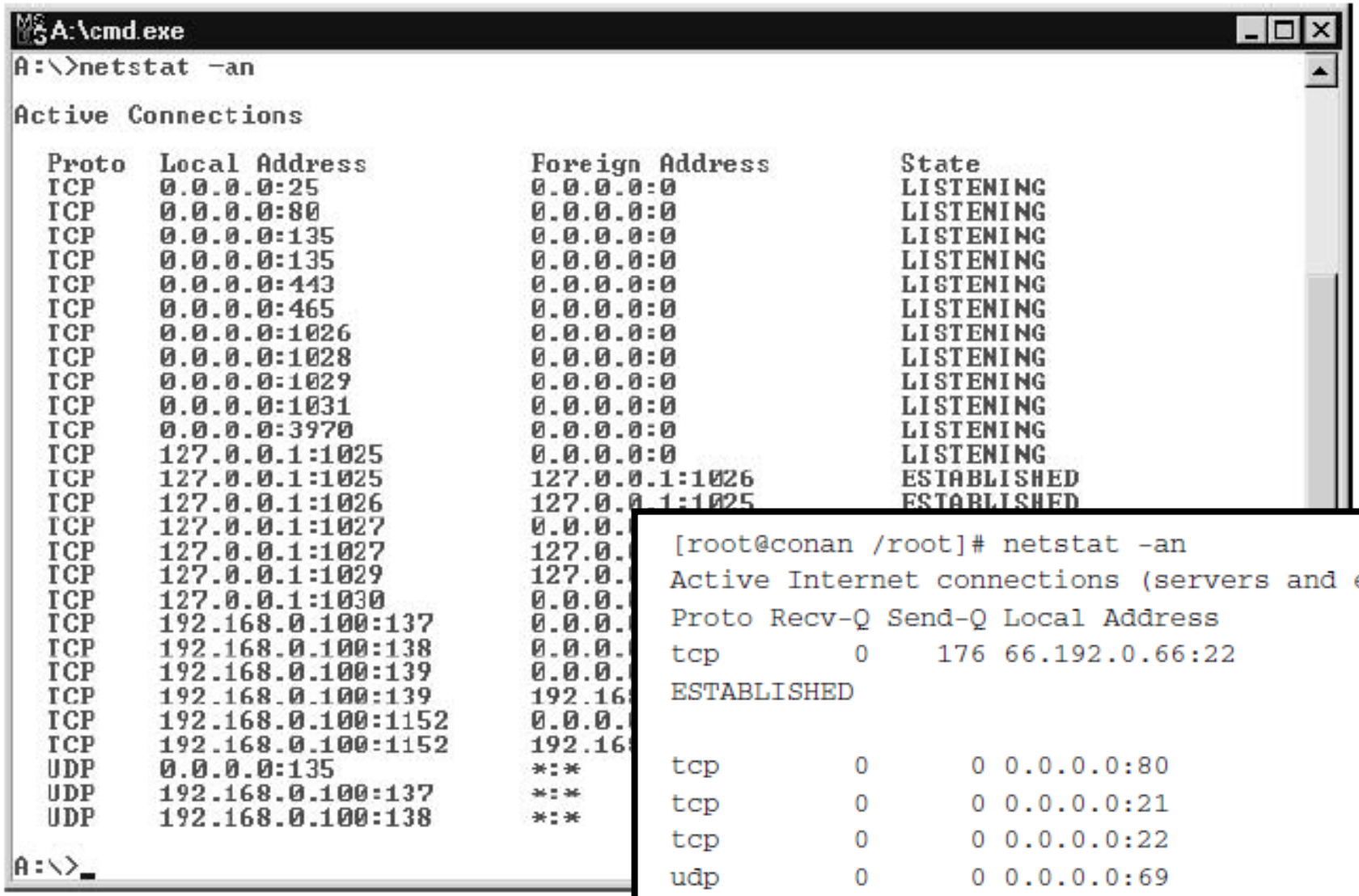
4. Identify Unauthorized User Accounts.

5. Look for Unusual or Hidden Files.

6. Examine Jobs Run by the Scheduler Service.

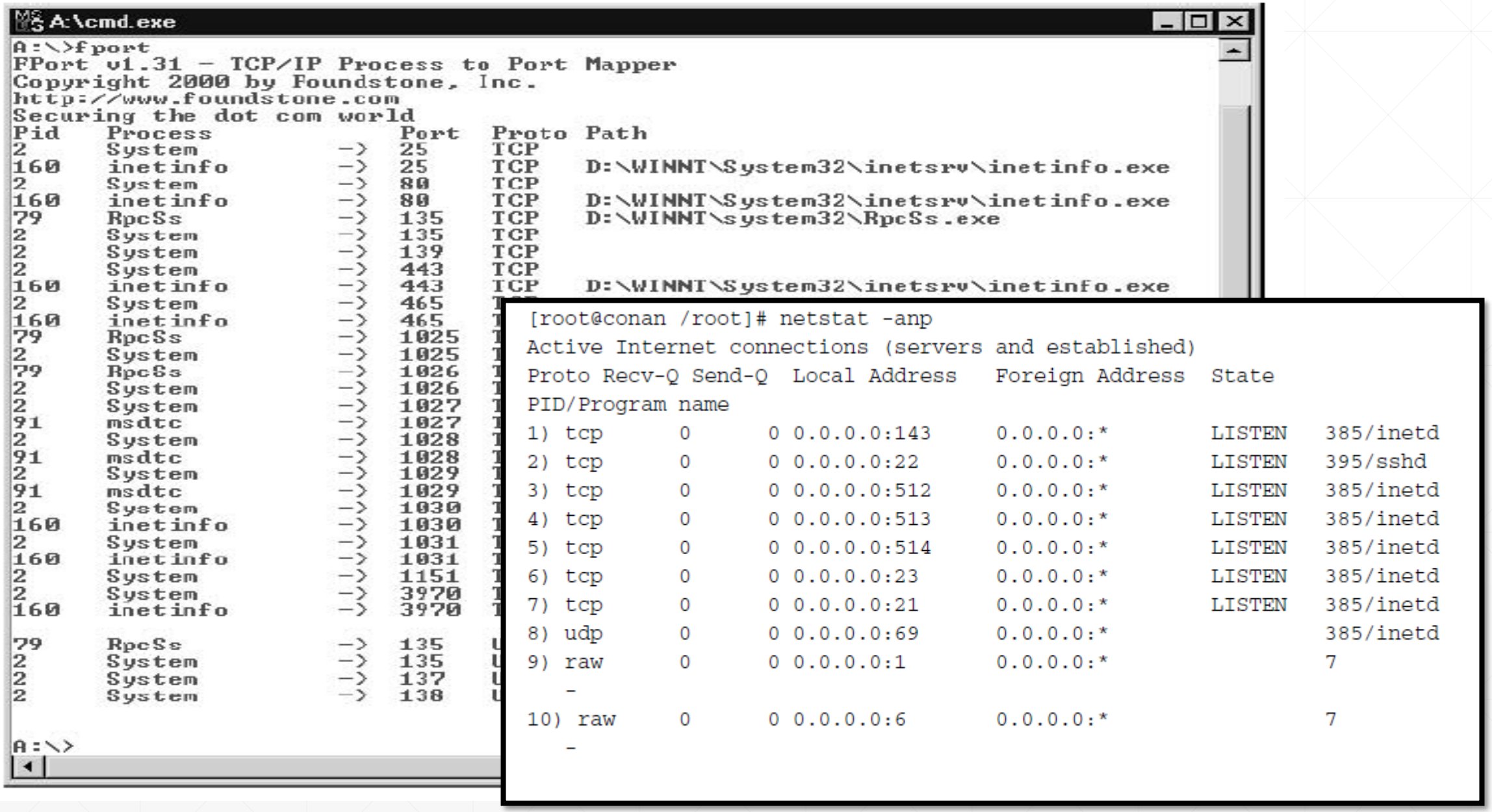
7. Review the Registry.

8. Perform Keyword Searches.

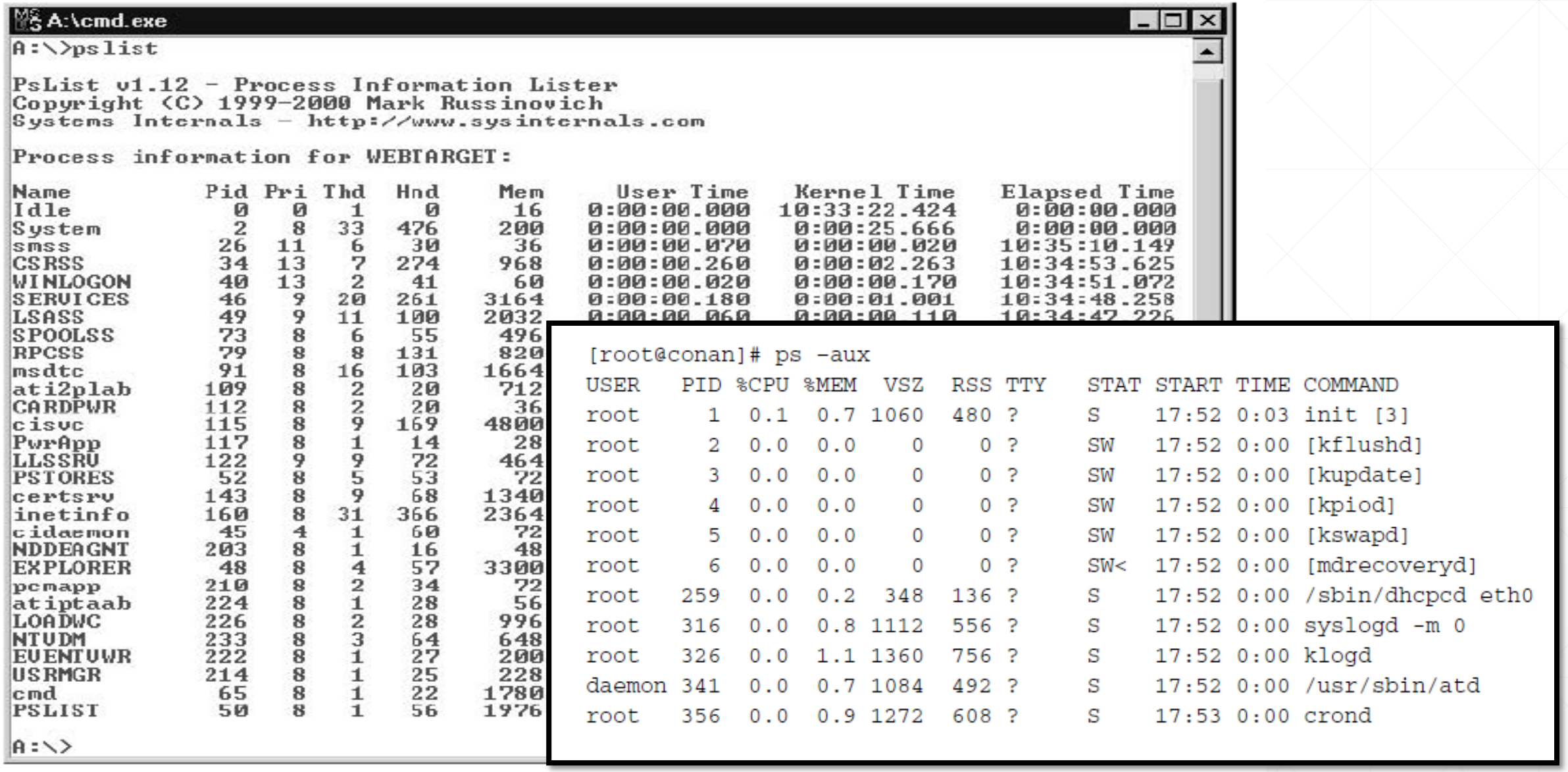



```
[root@conan /root]# netstat -an
Active Internet connections (servers and established)
Proto Recv-Q Send-Q Local Address           Foreign Address         State
tcp        0    176 66.192.0.66:22          66.192.0.26:20819
ESTABLISHED

tcp        0      0 0.0.0.0:80              0.0.0.0:*               LISTEN
tcp        0      0 0.0.0.0:21              0.0.0.0:*               LISTEN
tcp        0      0 0.0.0.0:22              0.0.0.0:*               LISTEN
udp        0      0 0.0.0.0:69              0.0.0.0:*
```




```
[root@conan /root]# netstat -anp
Active Internet connections (servers and established)
Proto Recv-Q Send-Q  Local Address   Foreign Address  State
PID/Program name
1) tcp      0      0 0.0.0.0:143     0.0.0.0:*        LISTEN   385/inetd
2) tcp      0      0 0.0.0.0:22      0.0.0.0:*        LISTEN   395/sshd
3) tcp      0      0 0.0.0.0:512     0.0.0.0:*        LISTEN   385/inetd
4) tcp      0      0 0.0.0.0:513     0.0.0.0:*        LISTEN   385/inetd
5) tcp      0      0 0.0.0.0:514     0.0.0.0:*        LISTEN   385/inetd
6) tcp      0      0 0.0.0.0:23      0.0.0.0:*        LISTEN   385/inetd
7) tcp      0      0 0.0.0.0:21      0.0.0.0:*        LISTEN   385/inetd
8) udp      0      0 0.0.0.0:69      0.0.0.0:*                 385/inetd
9) raw      0      0 0.0.0.0:1       0.0.0.0:*                 7
   -
10) raw     0      0 0.0.0.0:6       0.0.0.0:*                 7
   -
```




```
[root@conan]# ps -aux
USER    PID %CPU %MEM  VSZ  RSS TTY   STAT START TIME COMMAND
root      1  0.1  0.7 1060  480 ?     S    17:52 0:03 init [3]
root      2  0.0  0.0    0    0 ?     SW   17:52 0:00 [kflushd]
root      3  0.0  0.0    0    0 ?     SW   17:52 0:00 [kupdate]
root      4  0.0  0.0    0    0 ?     SW   17:52 0:00 [kpiod]
root      5  0.0  0.0    0    0 ?     SW   17:52 0:00 [kswapd]
root      6  0.0  0.0    0    0 ?     SW<  17:52 0:00 [mdrecoveryd]
root    259  0.0  0.2  348  136 ?     S    17:52 0:00 /sbin/dhcpcd eth0
root    316  0.0  0.8 1112  556 ?     S    17:52 0:00 syslogd -m 0
root    326  0.0  1.1 1360  756 ?     S    17:52 0:00 klogd
daemon  341  0.0  0.7 1084  492 ?     S    17:52 0:00 /usr/sbin/atd
root    356  0.0  0.9 1272  608 ?     S    17:53 0:00 crond
```

Logs in Windows

- Event viewer *C:\WINDOWS\system32\config*
  - **Security -** Logs related to various authentication requests, failed and successful logins.
  - **Application** - System components logs and other logs related to drivers.
  - **System -** Logs created by the operating system, status change of the various services, and uptime.
  - **Setup -** Logs regarding updates and installs on your Windows system.
- Useful commands: cmd.exe, Netstat, Arp, ipconfig

Logs in Linux

- **/var/log/auth.log** or **/var/log/secure**: Keep authentication logs for both successful or failed logins, and authentication processes.
- **/var/log/boot.log**: start-up messages and boot info.
- **/var/log/maillog or var/log/mail.log:** is for mail server logs.
- **/var/log/kern**: keeps in Kernel logs and warning info.
- **/var/log/dmesg**: a repository for device driver messages.
- **/var/log/faillog:** records info on failed logins.

Logs in Networks

- Network-based logs includes information obtained from the following sources:
  - IDS/IPS logs
  - Monitoring logs
  - Web Servers Logs(IIS, Apache, NginX)
  - Router&Switch logs
  - Firewall logs(Network Firewall, WAF, OS Firewall)
  - Authentication servers

Other Important Logs

- Application Logs
- DB Log
- USB Log
- Email Log

Common Tools to Digital Forensic

- Wireshark and NetworkMiner to Network Forensic
- Network Mapper (NMAP) is one of the digital forensics services for network scanning and auditing
- The Sleuth Kit extracts data from hard disk drives and other types of storage media.
- Volatility is a memory forensics framework that allows you to extract information directly from the processes that are running on the computer
- Free Hex Editor Neo is one of the top database forensic tools for handling large files

Questions ?

Thanks for your Attention