Scanning Networks

Module 3

Engineered by Hackers. Presented by Professionals.

SECURITY NEWS

November 26, 2010

the news tribune.com

Your identity is for sale on Internet black markets

The online black markets, called carding sites, deal in big batches of folks' Visa-card numbers, PIN numbers and more, Kerry Tomlinson, an investigative reporter with KATU TV News, told an audience on Nov. 4 during Scam Jam 2010, organized by the Better Business Bureau and held at Jantzen Beach Center.

About a dozen experts from agencies and groups including the FBI, U.S. Postal Inspection Service, Federal Trade Commission and Portland Crime Prevention spoke about scams.

One report you'll find describes http://www.shadowcrew.com, a global website with thousands of members who conducted their business anonymously, using nicknames and passwords, and running their online business through "proxy servers," separate computers that cover their trails by not revealing the true IP addresses on the crooks' computers. Shadowcrew operated for two years before being taken down after a yearlong undercover operation by the U.S. Secret Service.

"**Shadowcrew members collectively trafficked in at least 1.5 million stolen credit card numbers that resulted in over $4 million in actual losses to credit card companies and financial institutions**," says the report. It was written by Kimberly Kiefer Peretti, a senior counsel with the U.S. Department of Justice's Computer Crime & Intellectual Property Section.

http://www.thenewstribune.com

Module Objectives

- Definition and Types of Scanning
- Understanding CEH Scanning Methodology
- Checking Live Systems and Open Ports
- Understanding Scanning Techniques
- Different Tools Present to Perform Scanning

- Understanding Banner Grabbing and OS Fingerprinting
- Drawing Network Diagrams of Vulnerable Hosts
- Preparing Proxies
- Understanding Anonymizers
- Scanning Countermeasures
- Scanning Pen Testing



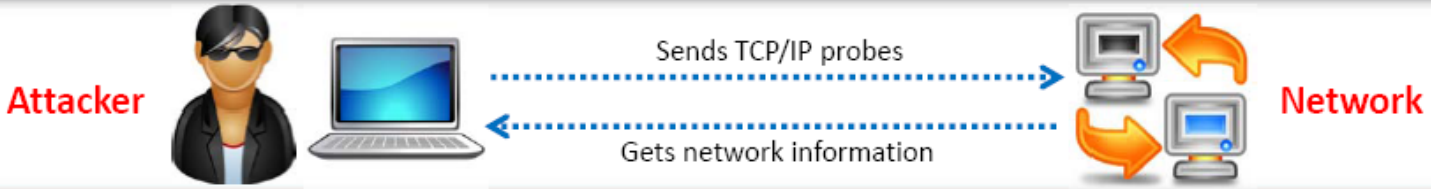
Network Scanning

IP address and open ports of Live Hosts

Operating Systems and System Architecture

Services Running on Hosts

- Scanning refers to a set of procedures for **identifying hosts**, **ports**, **and services in a network**
- Scanning is one of the **components of intelligence gathering** for an attacker to create a profile of the target organization



Types of Scanning

Port Scanning

A series of messages sent by someone attempting to break into a computer to learn about the computer's network services

Each message is associated with a "well-known" port number

1

Vulnerability Scanning

The automated process of proactively identifying vulnerabilities of the computing systems present in a network

2

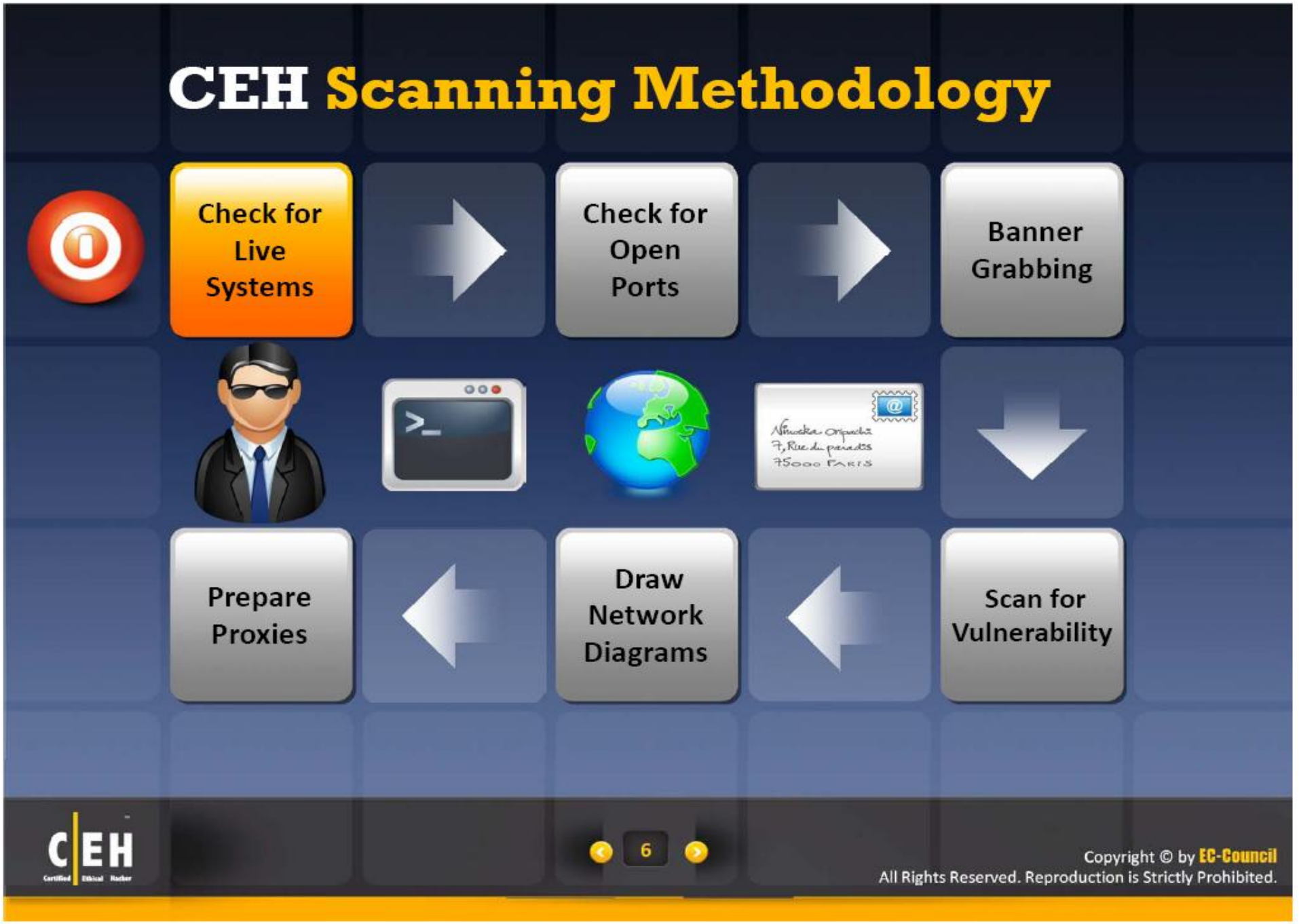
Network Scanning

A procedure for identifying the active hosts on a network

Either for the purpose of attacking them or for network security assessment

3

CEH Scanning Methodology



Checking for Live Systems - ICMP Scanning

- Ping scan involves sending ICMP ECHO requests to a host. If the host is live, it will return an ICMP ECHO reply
- This scan is useful for locating active devices or determining if ICMP is passing through a firewall

Source	Destination	Summary
192.168.168.3	192.168.168.5	ICMP: Echo
192.168.168.5	192.168.168.3	ICMP: Echo Reply

The ping scan output using Nmap:

```
# nmap -sP -v 192.168.168.5

Starting nmap 5.21 (http://nmap.org) at 2010-07-11 16:30 EDT
Host 192.168.168.5 appears to be up.
MAC Address: 00:E8:48:12:CD:8A (Hewlett Packard)
Nmap finished: 1 IP address (1 host up) scanned in 0.889 seconds
Raw packets sent: 5 (30B) | Rcvd: 2 (25B)
```

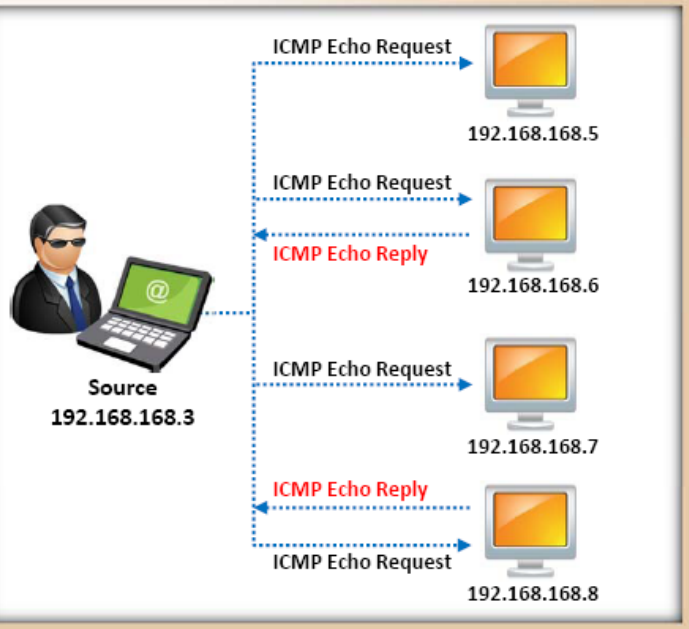
Ping Sweep

- Ping sweep is used to determine the live hosts from a range of IP addresses by sending ICMP ECHO requests to multiple hosts. If a host is live, it will return an ICMP ECHO reply
- Attackers use ping sweep to create inventory of live systems in a network

The ping sweep output using Nmap:

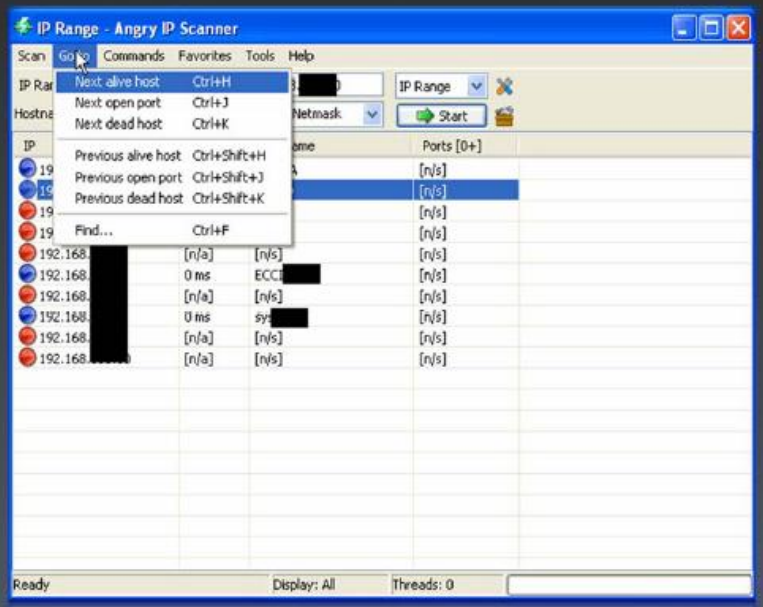
```
nmap -sP -PE -PA21,23,80,3389 192.168.168.1-
50

Starting Nmap 5.21 ( http://nmap.org ) at
2010-07-13 14:16 EDT
Nmap scan report for 192.168.168.1
Host is up (0.00s latency).
MAC Address: 00:A8:5A:E0:83:05 (Hewlett
Packard)
Nmap scan report for 192.168.168.2
Host is up (0.016s latency).
MAC Address: 00:01:6B:0A:8E:15 (Foxconn)
Nmap scan report for 192.168.168.4
Host is up (0.00s latency).
MAC Address: 00:2A:B9:03:DD:80 (Dell)
Nmap scan report for 192.168.168.6
Host is up (0.00s latency).
```



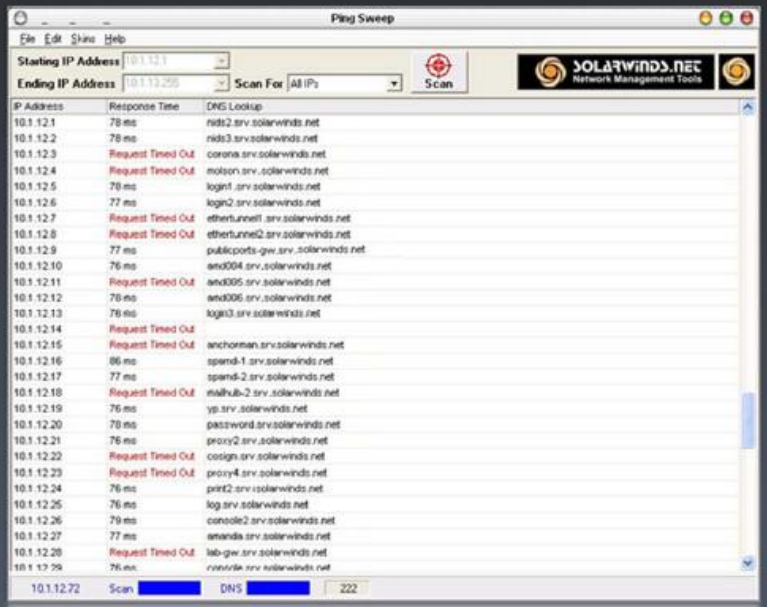
Ping Sweep Tools

Angry IP Scanner



http://www.angryip.org

SolarWinds Engineer's Toolset



http://www.solarwinds.com

Ping Sweep Tools

Colasoft Ping Tool
http://www.colasoft.com

Ping Scanner Pro
http://www.digilextechnologies.com

SolarWinds Standard Edition
http://www.solarwinds.com

Ultra Ping Pro
http://ultraping.netfirms.com

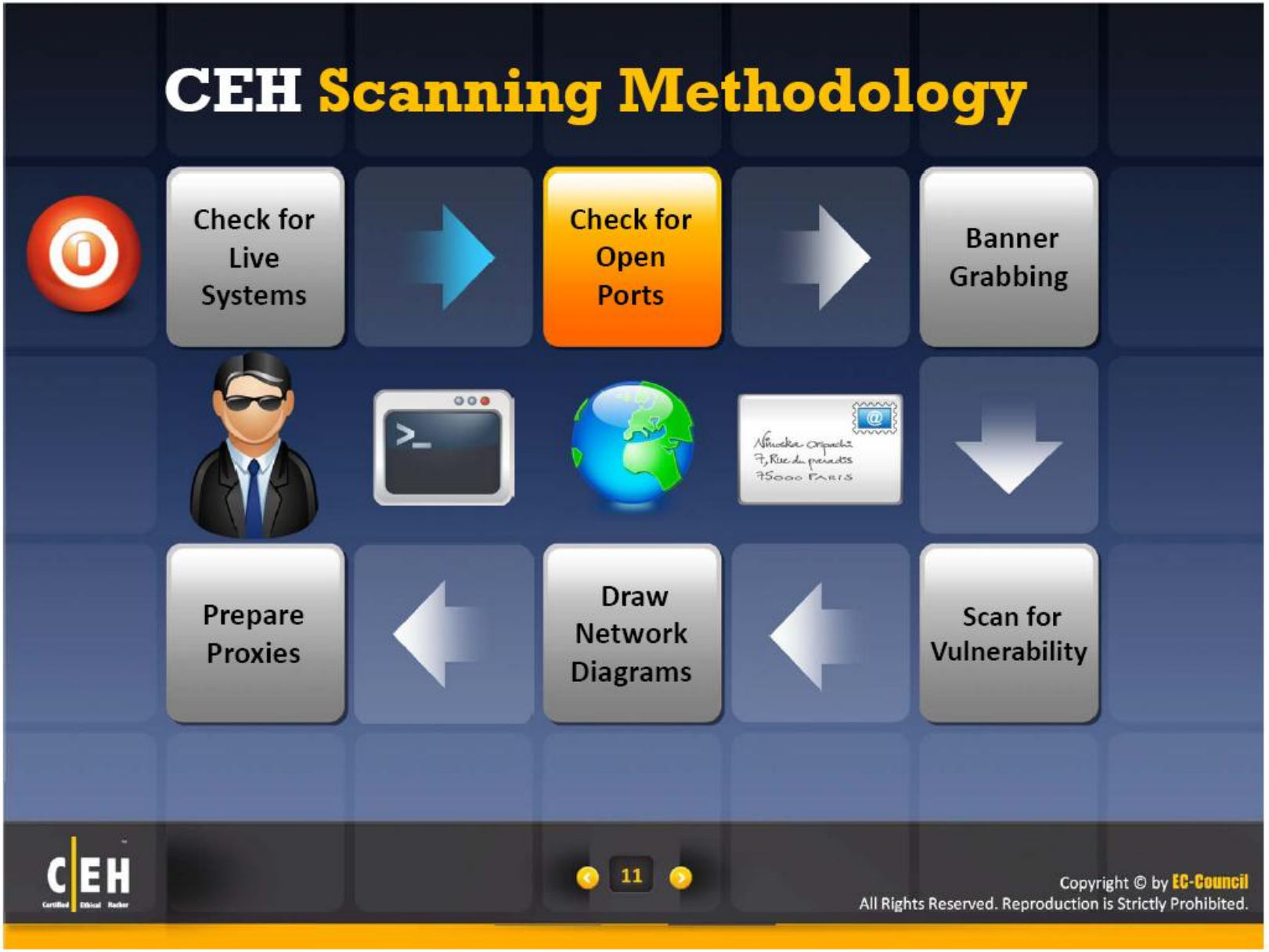
Utility Ping
http://www.wavget.com

PingInfoView
http://www.nirsoft.net

Visual Ping Tester
http://www.pingtester.net

PacketTrap pt360
http://www.packettrap.com

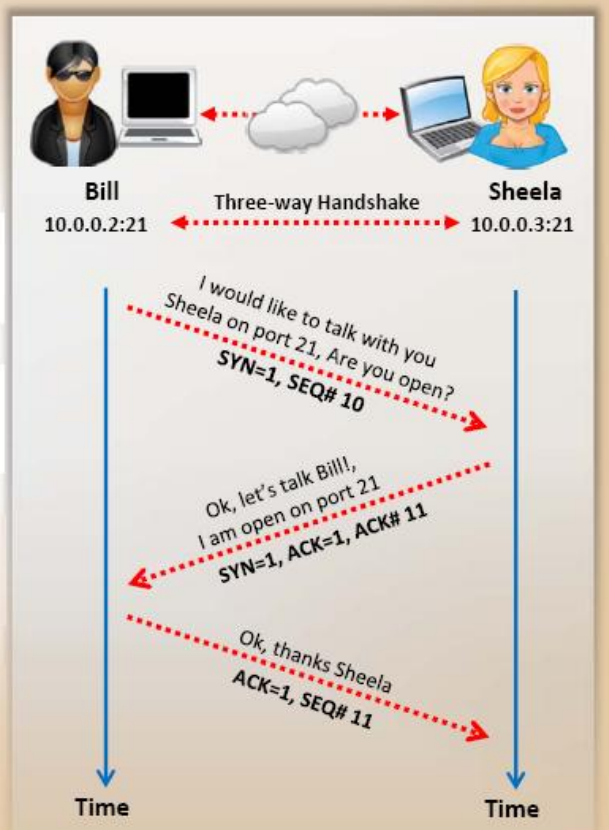
CEH Scanning Methodology



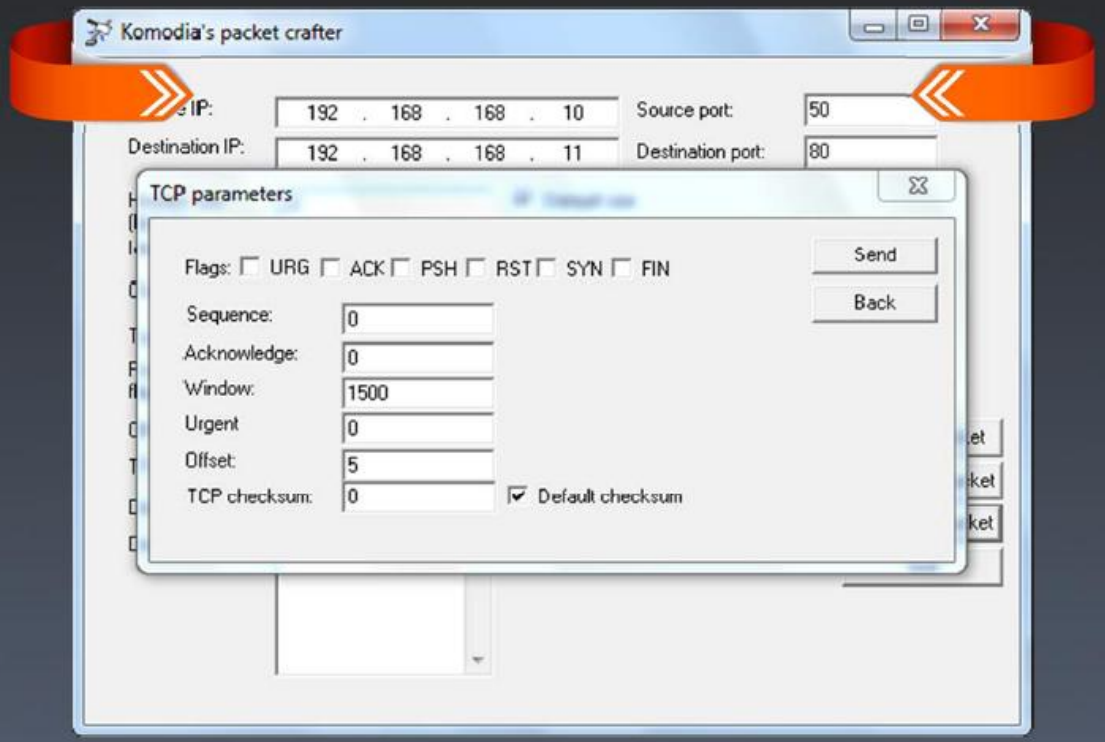
Three-Way Handshake

TCP uses a **three-way handshake** to establish a connection between server and client

1. The Computer A (10.0.0.2) initiates a connection to the server (10.0.0.3) via a packet with only the **SYN** flag set
2. The server replies with a packet with both the **SYN** and the **ACK** flag set
3. For the final step, the client responds back to the server with a single **ACK** packet
4. If these three steps are completed without complication, then a TCP connection is established between the client and the server



Create Custom Packet using TCP Flags



Hping2 / Hping3

It is a command line packet crafter for the TCP/IP protocol

Tool for security auditing and testing firewall and networks

It runs on both Windows and Linux operating systems

hping3 is a scriptable TCL language command line tool compatible with hping2

CEH Certified Ethical Hacker

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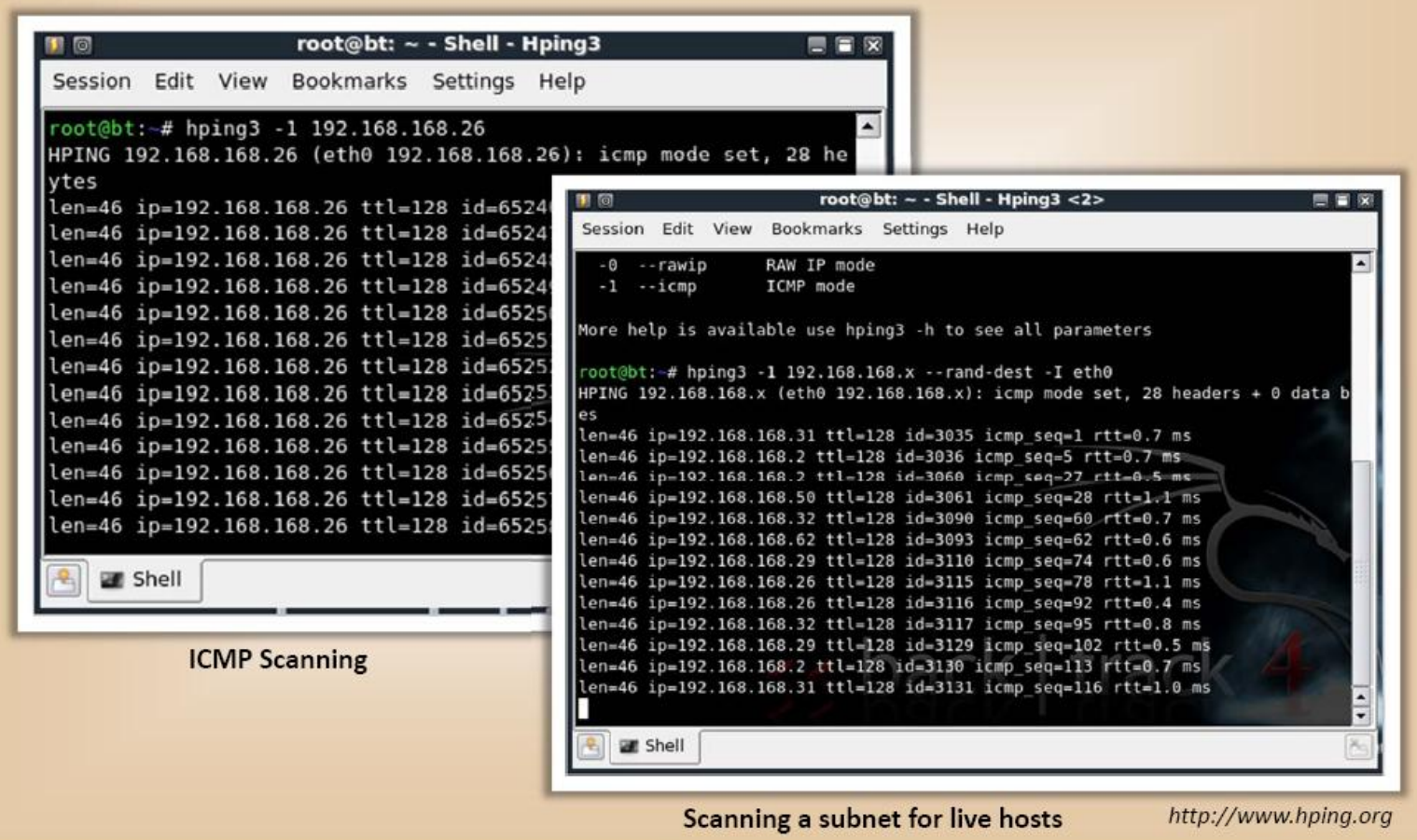
Hping3 Screenshot



ICMP Scanning

Scanning a subnet for live hosts

http://www.hping.org

Hping Commands

ICMP Ping

```
hping3 -1 10.0.0.25
```

SYN scan on port 50-60

```
hping3 -8 50-56 -S 10.0.0.25 -V
```

ACK scan on port 80

```
hping3 -A 10.0.0.25 -p 80
```

FIN, PUSH and URG scan on port 80

```
hping3 -F -p -U 10.0.0.25 -p 80
```

UDP scan on port 80

```
hping3 -2 10.0.0.25 -p 80
```

Scan entire subnet for live host

```
hping3 -1 10.0.1.x --rand-dest -I eth0
```

Collecting Initial Sequence Number

```
hping3 192.168.1.103 -Q -p 139 -s
```

Intercept all traffic containing HTTP signature

```
hping3 -9 HTTP -I eth0
```


Scanning Techniques
SYN/ACK/ FIN Scan
XMAS Scan
Stealth Scan
Inverse Mapping Scan
NULL Scan
IDLE Scan
TCP Connect Scan
CEH
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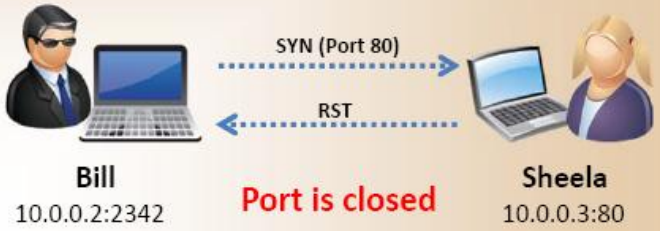
TCP Connect / Full Open Scan

- TCP Connect scan detects when a port is open by completing the three-way handshake
- TCP Connect scan establishes a full connection and tears it down by sending a RST packet

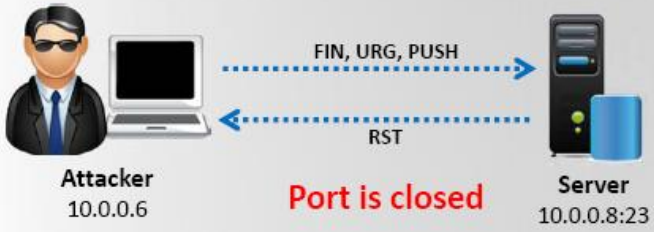
Stealth Scan (Half-open Scan)

Attackers use **stealth scanning techniques** to bypass firewall rules, logging mechanism, and hide themselves as usual network traffic



1. The client sends a single **SYN** packet to the server on the appropriate port
2. If the port is open then the server responds with a **SYN/ACK** packet
3. If the server responds with an **RST** packet, then the remote port is in the "closed" state
4. The client sends the **RST** packet to close the initiation before a connection can ever be established

Xmas Scan



- Xmas scan sends a TCP frame to a remote device with URG, ACK, RST, SYN, and FIN flags set
- FIN scan only with OS TCP/IP developed according to RFC 793
- It will not work against any current version of Microsoft Windows

The Xmas scan output using Nmap:

```
# nmap -sX -v 10.0.0.8

Starting nmap 5.21 (http://nmap/.org at 2010-07-11
16:30 EDT
Initiating XMAS Scan against 10.0.0.8 [1663 ports]
at 21:18
The XMAS Scan took 1.55s to scan 1663 total ports
Host 10.0.0.8 appears to be up ... good.
Interesting ports on 10.0.0.8:
(The 1654 ports scanned but not shown below are in
state: closed)
PORT     STATE            SERVICE
21/tcp   open|filtered    ftp
22/tcp   open|filtered    ssh
79/tcp   open|filtered    finger
110/tcp  open|filtered    POP3
514/tcp  open|filtered    Shell
#
```

FIN Scan

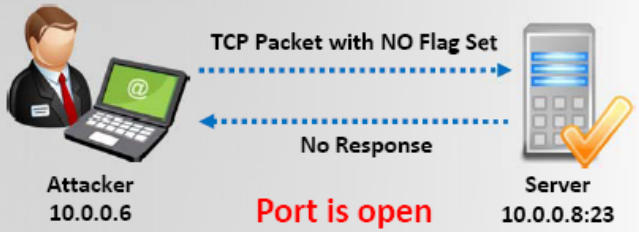
- FIN scan sends a TCP frame to a remote device with **FIN** flag set
- FIN scan only with OS TCP/IP developed according to **RFC 793**
- It will not work against any current version of **Microsoft Windows**

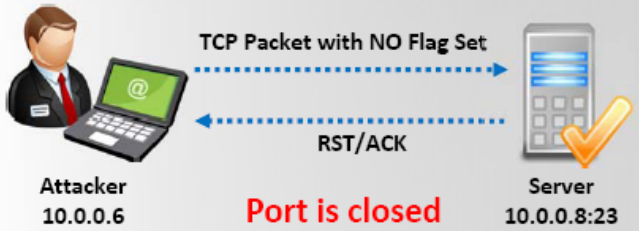
```
nmap -sF 192.168.168.13

Starting Nmap 5.21 ( http://nmap.org ) at 2010-07-
15 20:51 EST
Nmap scan report for 192.168.168.13Host is up
(0.000052s latency).
All 1000 scanned ports on 192.168.168.13 are closed
MAC Address: 00:15:58:A1:07:B2 (Foxconn)
Nmap done: 1 IP address (1 host up) scanned in 5.55
seconds
```

In FIN scan, attackers send a TCP frame to a remote host with **only FIN flags set**

NULL Scan





- NULL scan only works if OS' TCP/IP implementation is developed according to RFC 793
- It will not work against any current version of Microsoft Windows

```
nmap -sN 192.168.168.13

Starting Nmap 5.21 ( http://nmap.org ) at 2010-07-15
21:10 EST
Nmap scan report for 192.168.168.13 Host is up (0.00s
latency).
All 1000 scanned ports on 192.168.168.13 are
open|filtered
MAC Address: 00:15:58:A1:07:B2 (Foxconn)
Nmap done: 1 IP address (1 host up) scanned in 29.03
seconds
```

In NULL scan, attackers send a TCP frame to a remote host with NO Flags

IDLE Scan

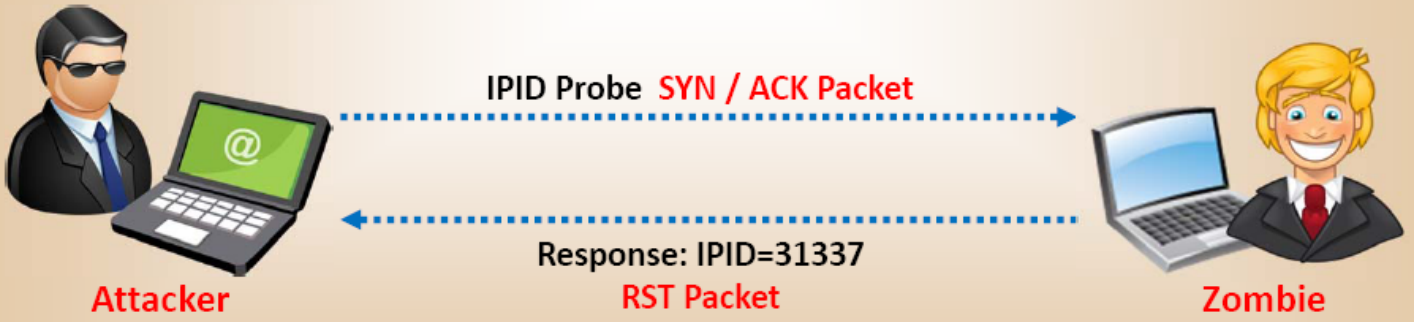
- Most network servers listen on TCP ports, such as **web servers on port 80** and **mail servers on port 25**. Port is considered "open" if an application is listening on the port
- One way to determine whether a port is open is to **send a "SYN"** (session establishment) packet to the port
- The target machine will send back a **"SYN|ACK"** (session request acknowledgment) packet if the port is open, and **an "RST" (Reset) packet** if the port is closed

- A machine which receives an **unsolicited SYN|ACK packet** will respond with an RST. An unsolicited RST will be ignored
- Every IP packet on the Internet has a **"fragment identification" number**
- It is a TCP port scan method that allows sending spoofed packets to a computer through software tools such as **Nmap** and **Hping**



IDLE Scan: Step 1

1. Send SYN/ACK packet to the zombie machine to probe its IPID number
2. Every IP packet on the Internet has a fragment identification number (IP ID), which is a 4 digit number that increases every time a host sends IP packet
3. Zombie not expecting a SYN/ACK packet will send RST packet, disclosing the IP ID
4. Analyze the RST packet from zombie machine to extract IPID



IDLE Scan: Step 2.1 (Open Port)

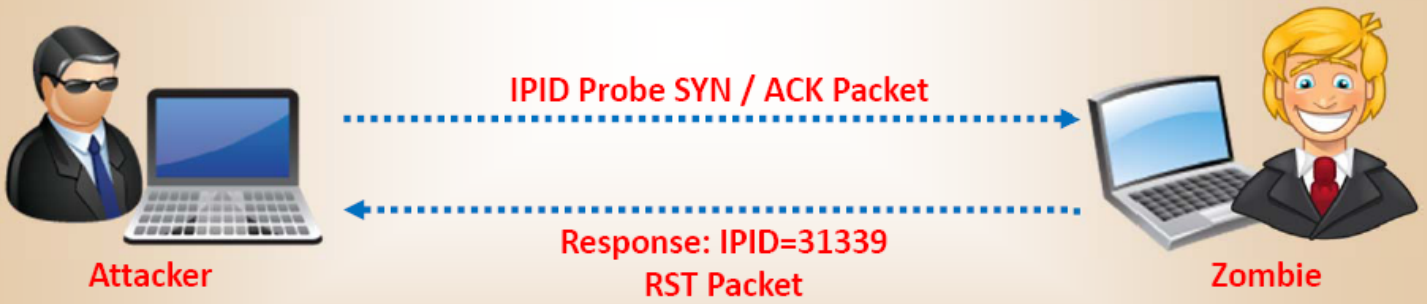
- Send SYN packet to the target machine (port 80) spoofing the IP address of the "zombie"

IDLE Scan: Step 2.2 (Closed Port)

- The target will send RST to the "zombie" if the port is closed but zombie will not send anything back

IDLE Scan: Step 3

- Probe "zombie" IPID again



IPID incremented by 2 since Step 1, so port 80 must be open

ICMP Echo Scanning/List Scan

ICMP Echo Scanning

- This is not really port scanning, since ICMP does not have a port abstraction
- But it is sometimes useful to determine which hosts in a network are up by pinging them all
- `nmap -P cert.org/24 152.148.0.0/16`

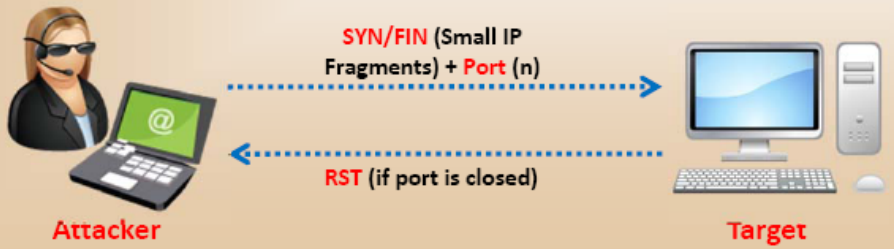
List Scan

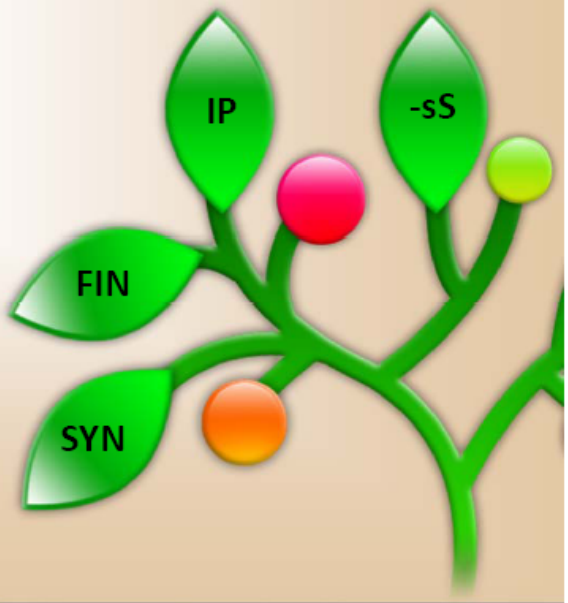
- This type of scan simply generates and prints a list of IPs/Names without actually pinging or port scanning them
- A DNS name resolution will also be carried out

SYN/FIN Scanning Using IP Fragments

- It is not a new scanning method but a modification of the earlier methods
- The TCP header is split up into several packets so that the packet filters are not able to detect what the packets intend to do

```
Command Prompt
C:\>nmap -sS -T4 -A -f -v 192.168.168.26
Starting Nmap 5.21 ( http://nmap.org ) at 2010-11-29
13:05 India Standard Time
Initiating SYN Stealth Scan at 13:05
Scanning 192.168.168.26 [1000 ports]
Discovered open port 139/tcp on 192.168.168.26
Discovered open port 135/tcp on 192.168.168.26
Completed SYN Stealth Scan at 13:05, 1.16s elapsed
(1000 total ports)
```





UDP Scanning

UDP Port Open

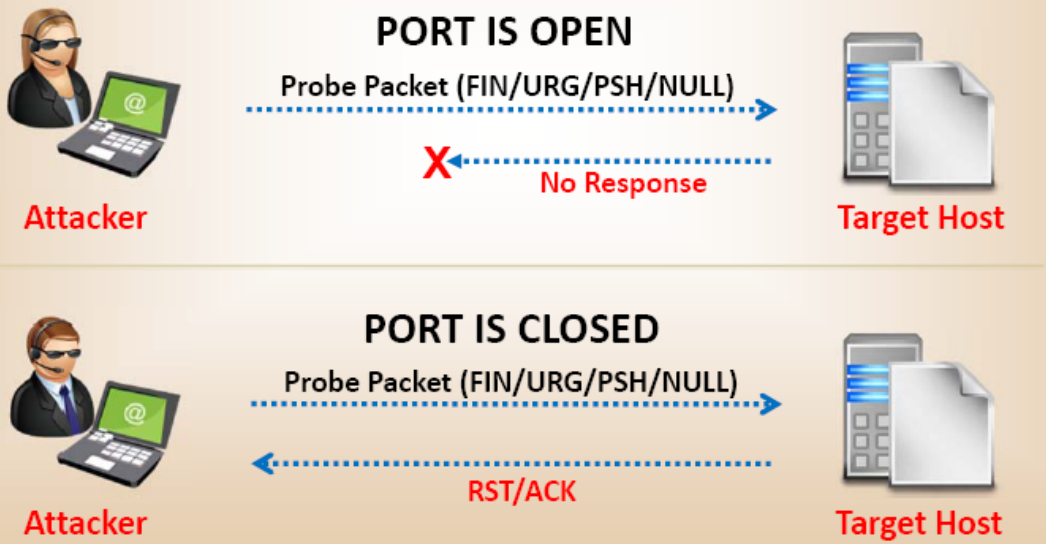
- There is no three-way TCP handshake for UDP scan
- The system does not respond with a message when the port is open

UDP Port Closed

- If a UDP packet is sent to open port, the system responds with ICMP port unreachable message
- Spywares, Trojan horses, and other malicious applications use UDP ports

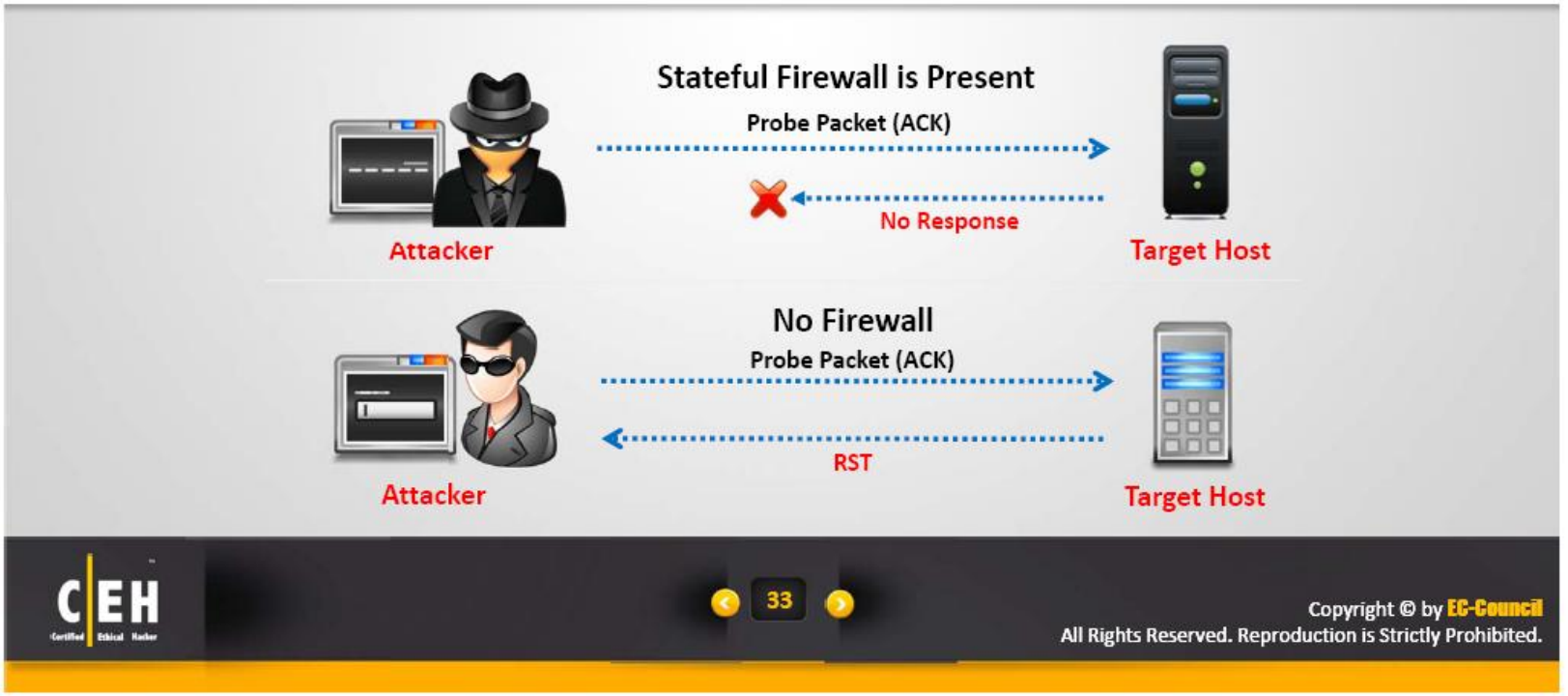
Inverse TCP Flag Scanning

- Attackers send TCP probe packets with various TCP flags (FIN,URG,PSH) set or with no flags, no response means port is open and RST/ACK means the port is closed



ACK Flag Scanning

- Attackers send an ACK probe packet with random sequence number, no response means port is filtered (stateful firewall is present) and RST response means the port is not filtered
- ```
  nmap -sA -P0 10.10.0.25
  Starting nmap 5.21 (http://nmap.org) at 2010-05-16 12:15 EST
  All 529 scanned ports on 10.10.0.25 are: filtered
  ```


  ```

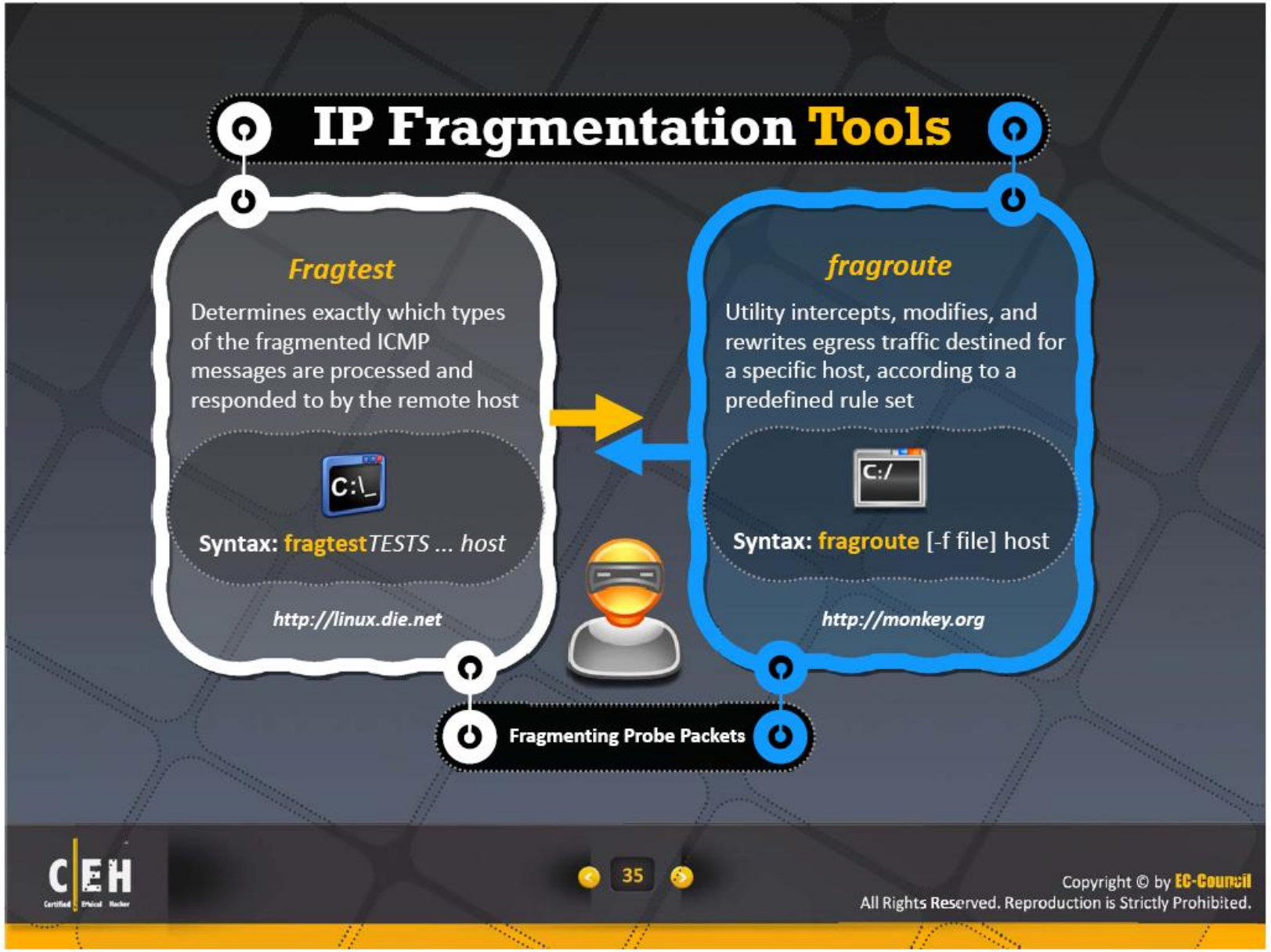
Scanning: IDS Evasion Techniques

1. Use fragmented IP packets

2. Spoof your IP address when launching attacks and sniff responses from server

3. Use source routing (if possible)

4. Connect to proxy servers or compromised trojaned machines to launch attacks


IP Fragmentation Tools
Fragtest
Determines exactly which types of the fragmented ICMP messages are processed and responded to by the remote host
C:_
Syntax: fragtest TESTS ... host
http://linux.die.net
fragroute
Utility intercepts, modifies, and rewrites egress traffic destined for a specific host, according to a predefined rule set
C:/
Syntax: fragroute [-f file] host
http://monkey.org
Fragmenting Probe Packets
CEH
Certified Ethical Hacker
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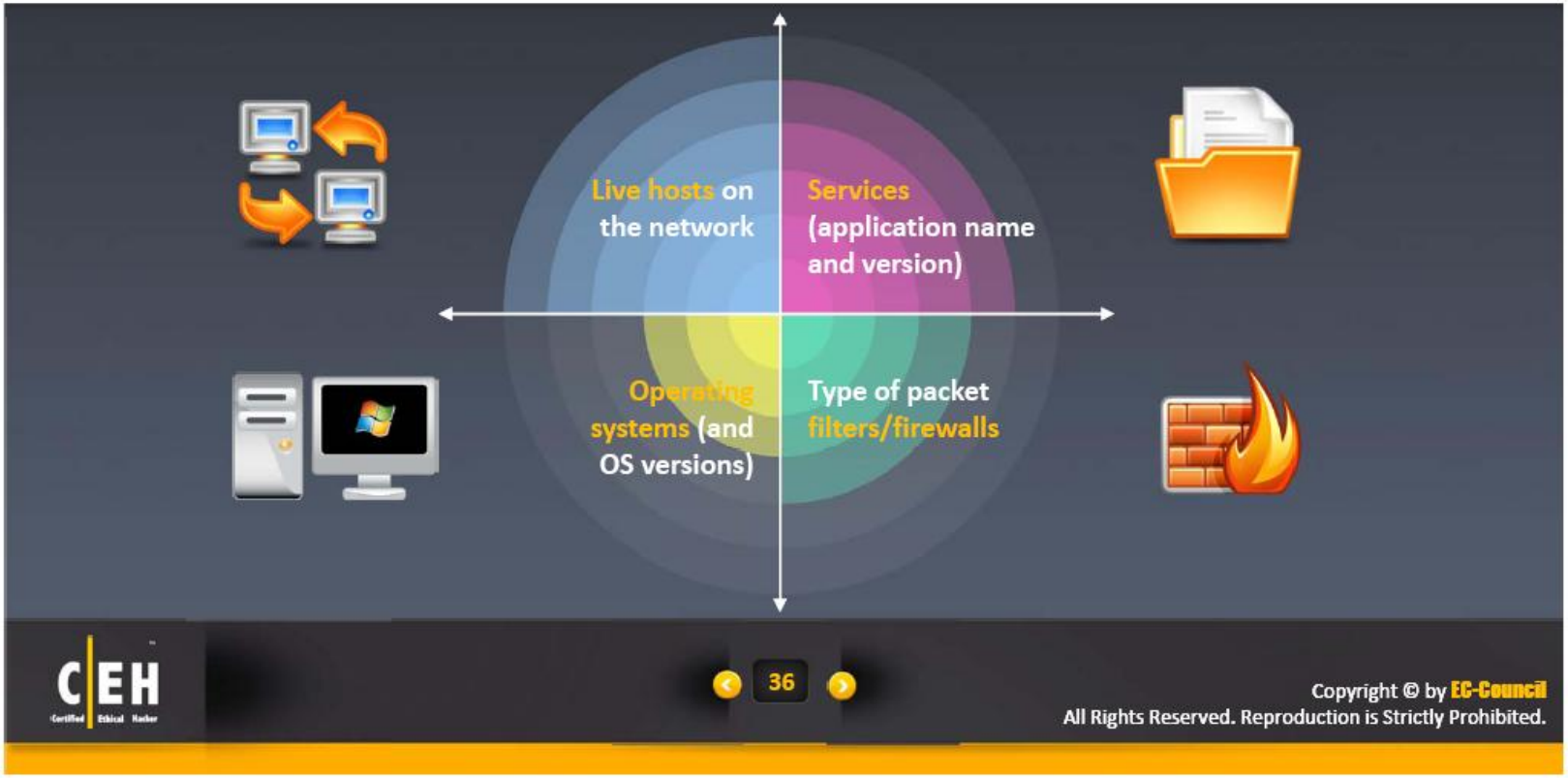
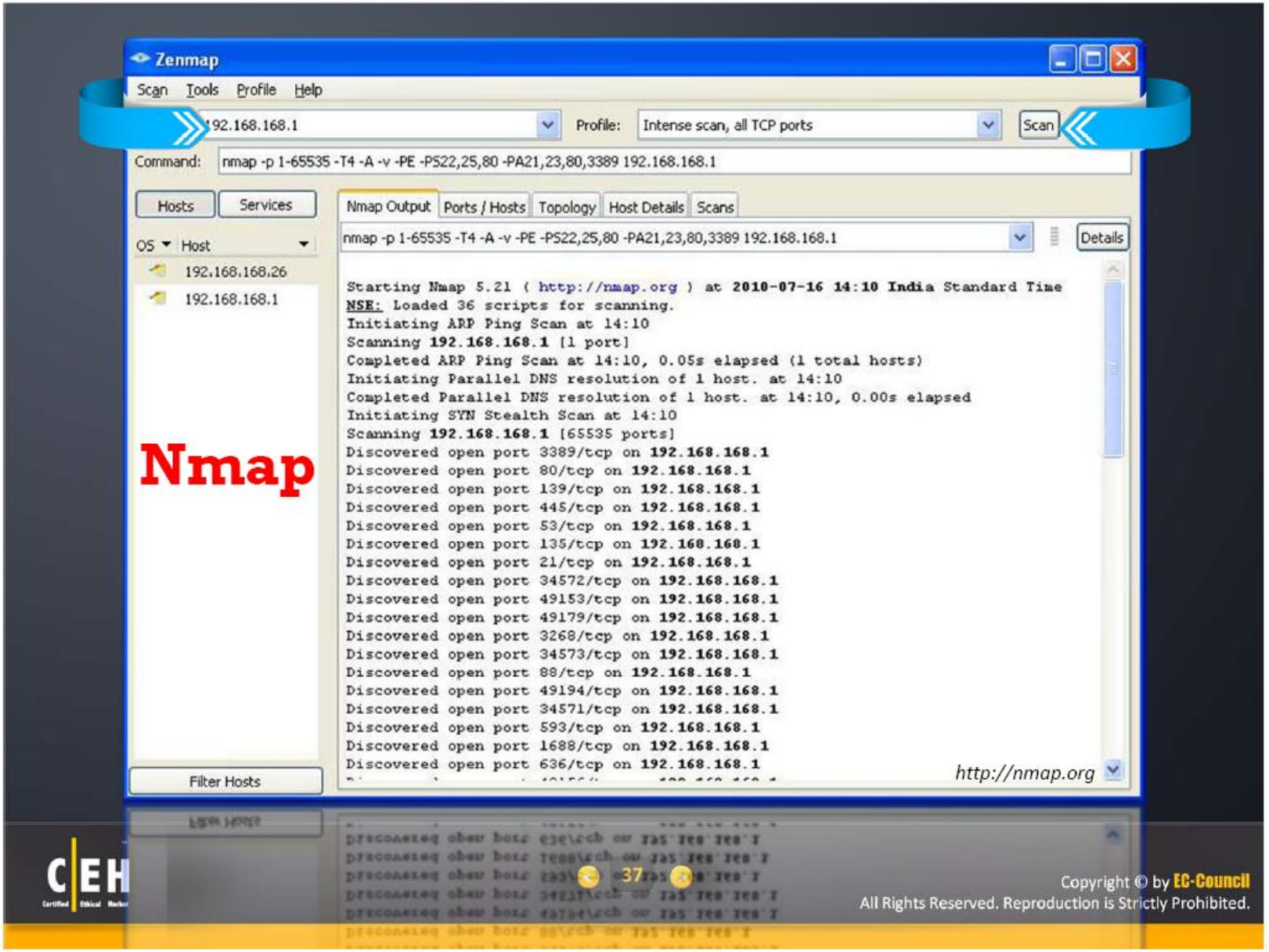
Scanning Tool: Nmap

- Nmap is a free open source utility for network exploration
- Network administrators can use Nmap for network inventory, managing service upgrade schedules, and monitoring host or service uptime
- Attacker can use Nmap to extract information such as:




Zenmap
Scan Tools Profile Help
192.168.168.1
Profile: Intense scan, all TCP ports
Scan
Command: nmap -p 1-65535 -T4 -A -v -PE -PS22,25,80 -PA21,23,80,3389 192.168.168.1
Hosts Services
OS Host
192.168.168.26
192.168.168.1
Nmap Output Ports / Hosts Topology Host Details Scans
nmap -p 1-65535 -T4 -A -v -PE -PS22,25,80 -PA21,23,80,3389 192.168.168.1
Details
Starting Nmap 5.21 (http://nmap.org) at 2010-07-16 14:10 India Standard Time
NSE: Loaded 36 scripts for scanning.
Initiating ARP Ping Scan at 14:10
Scanning 192.168.168.1 [1 port]
Completed ARP Ping Scan at 14:10, 0.05s elapsed (1 total hosts)
Initiating Parallel DNS resolution of 1 host. at 14:10
Completed Parallel DNS resolution of 1 host. at 14:10, 0.00s elapsed
Initiating SYN Stealth Scan at 14:10
Scanning 192.168.168.1 [65535 ports]
Discovered open port 3389/tcp on 192.168.168.1
Discovered open port 80/tcp on 192.168.168.1
Discovered open port 139/tcp on 192.168.168.1
Discovered open port 445/tcp on 192.168.168.1
Discovered open port 53/tcp on 192.168.168.1
Discovered open port 135/tcp on 192.168.168.1
Discovered open port 21/tcp on 192.168.168.1
Discovered open port 34572/tcp on 192.168.168.1
Discovered open port 49153/tcp on 192.168.168.1
Discovered open port 49179/tcp on 192.168.168.1
Discovered open port 3268/tcp on 192.168.168.1
Discovered open port 34573/tcp on 192.168.168.1
Discovered open port 88/tcp on 192.168.168.1
Discovered open port 49194/tcp on 192.168.168.1
Discovered open port 34571/tcp on 192.168.168.1
Discovered open port 593/tcp on 192.168.168.1
Discovered open port 1688/tcp on 192.168.168.1
Discovered open port 636/tcp on 192.168.168.1
Filter Hosts
Nmap
http://nmap.org
CEH
37
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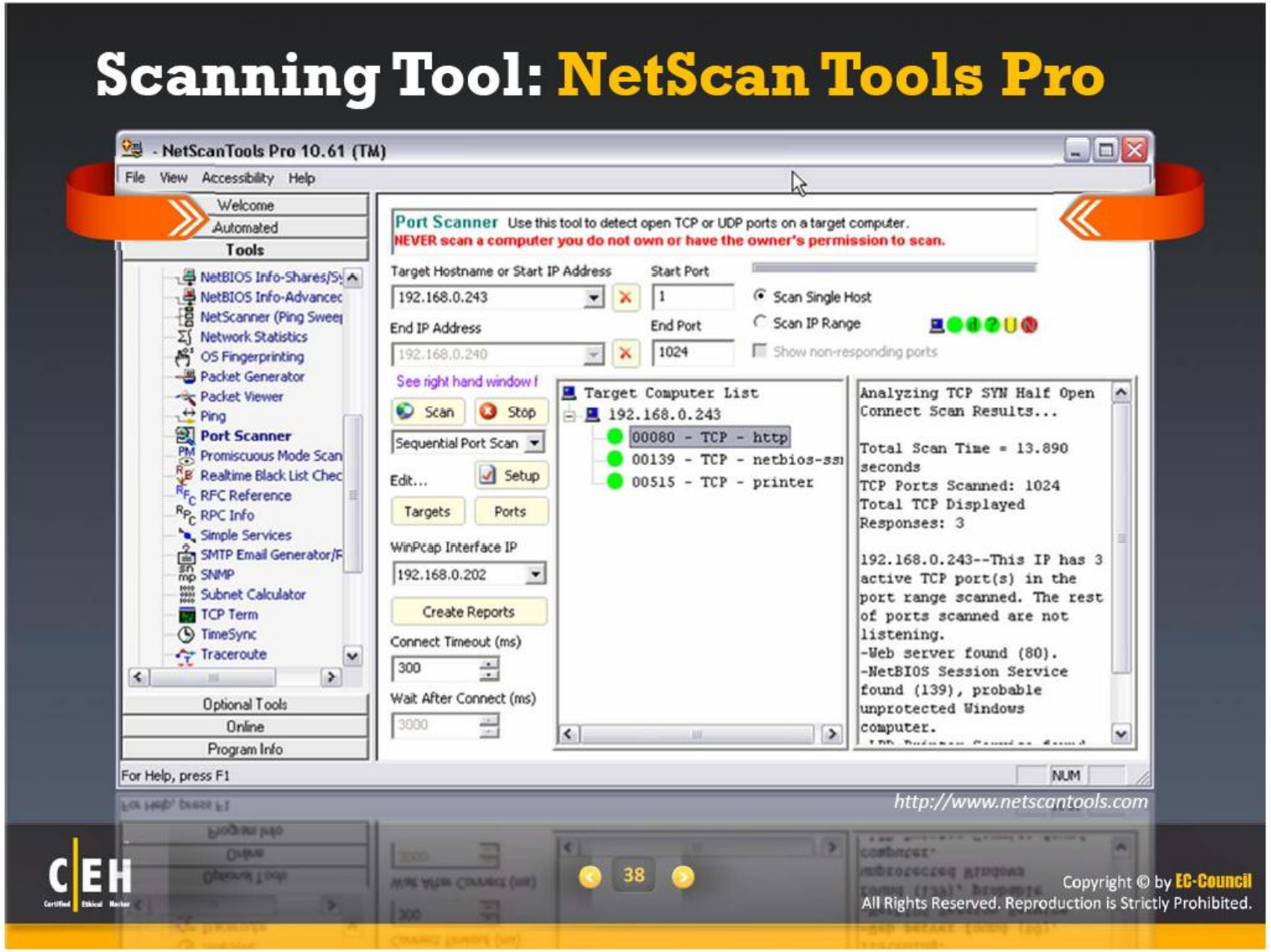
Scanning Tool: NetScan Tools Pro



Scanning Tools

Global Network Inventory Scanner
http://www.magnetosoft.com

Advanced Port Scanner
http://www.radmin.com

AWSPS: UDP Scanner
http://www.atelierweb.com

MegaPing
http://www.magnetosoft.com

Net Tools Suite Pack
http://users.telenet.be

Netifera
http://netifera.com

AWPTA
http://www.atelierweb.com

Network Inventory Explorer
http://www.10-strike.com

Scanning Tools

Free Port Scanner
http://www.nsauditor.com

Infiltrator network security scanner
http://www.infiltration-systems.com

SuperScan
http://www.foundstone.com

Nscan
http://www.nscan.org

Komodia's PacketCrafter
http://www.komodia.com

xCAT Portscan
http://www.xcat-industries.nl

IP Tools
http://www.ks-soft.net

PhatScan
http://phatlinks.com

Do Not Scan These IP Addresses

(Unless you want to get into trouble)

RANGE 128
128.37.0.0 Army Yuma Proving Ground
128.38.0.0 Naval Surface Warfare Center
128.43.0.0 Defence Research Establishment-Ottawa
128.47.0.0 Army Communications Electronics Command
128.49.0.0 Naval Ocean Systems Center
128.50.0.0 Department of Defense
128.51.0.0 Department of Defense
128.56.0.0 U.S. Naval Academy
128.60.0.0 Naval Research Laboratory
128.63.0.0 Army Ballistics Research Laboratory
128.80.0.0 Army Communications Electronics Command
128.102.0.0 NASA Ames Research Center
128.149.0.0 NASA Headquarters
128.154.0.0 NASA Wallops Flight Facility
128.155.0.0 NASA Langley Research Center
128.156.0.0 NASA Lewis Network Control Center
128.157.0.0 NASA Johnson Space Center
128.158.0.0 NASA Ames Research Center
128.159.0.0 NASA Ames Research Center
128.160.0.0 Naval Research Laboratory
128.161.0.0 NASA Ames Research Center
128.183.0.0 NASA Goddard Space Flight Center
128.202.0.0 50th Space Wing
128.216.0.0 MacDill Air Force Base
128.217.0.0 NASA Kennedy Space Center
128.236.0.0 U.S. Air Force Academy

RANGE 129
129.23.0.0 Strategic Defense Initiative Organization
129.29.0.0 United States Military Academy
129.50.0.0 NASA Marshall Space Flight Center
129.51.0.0 Patrick Air Force Base
129.52.0.0 Wright-Patterson Air Force Base
129.53.0.0 - 129.53.255.255 66SPTG-SCB
129.54.0.0 Vandenberg Air Force Base, CA
129.92.0.0 Air Force Institute of Technology
129.99.0.0 NASA Ames Research Center
129.131.0.0 Naval Weapons Center
129.163.0.0 NASA/Johnson Space Center
129.164.0.0 NASA IVV
129.165.0.0 NASA Goddard Space Flight Center
129.167.0.0 NASA Marshall Space Flight Center
129.168.0.0 NASA Lewis Research Center
129.190.0.0 Naval Underwater Systems Center
129.198.0.0 Air Force Flight Test Center
129.209.0.0 Army Ballistics Research Laboratory
129.229.0.0 U.S. Army Corps of Engineers
129.251.0.0 United States Air Force Academy

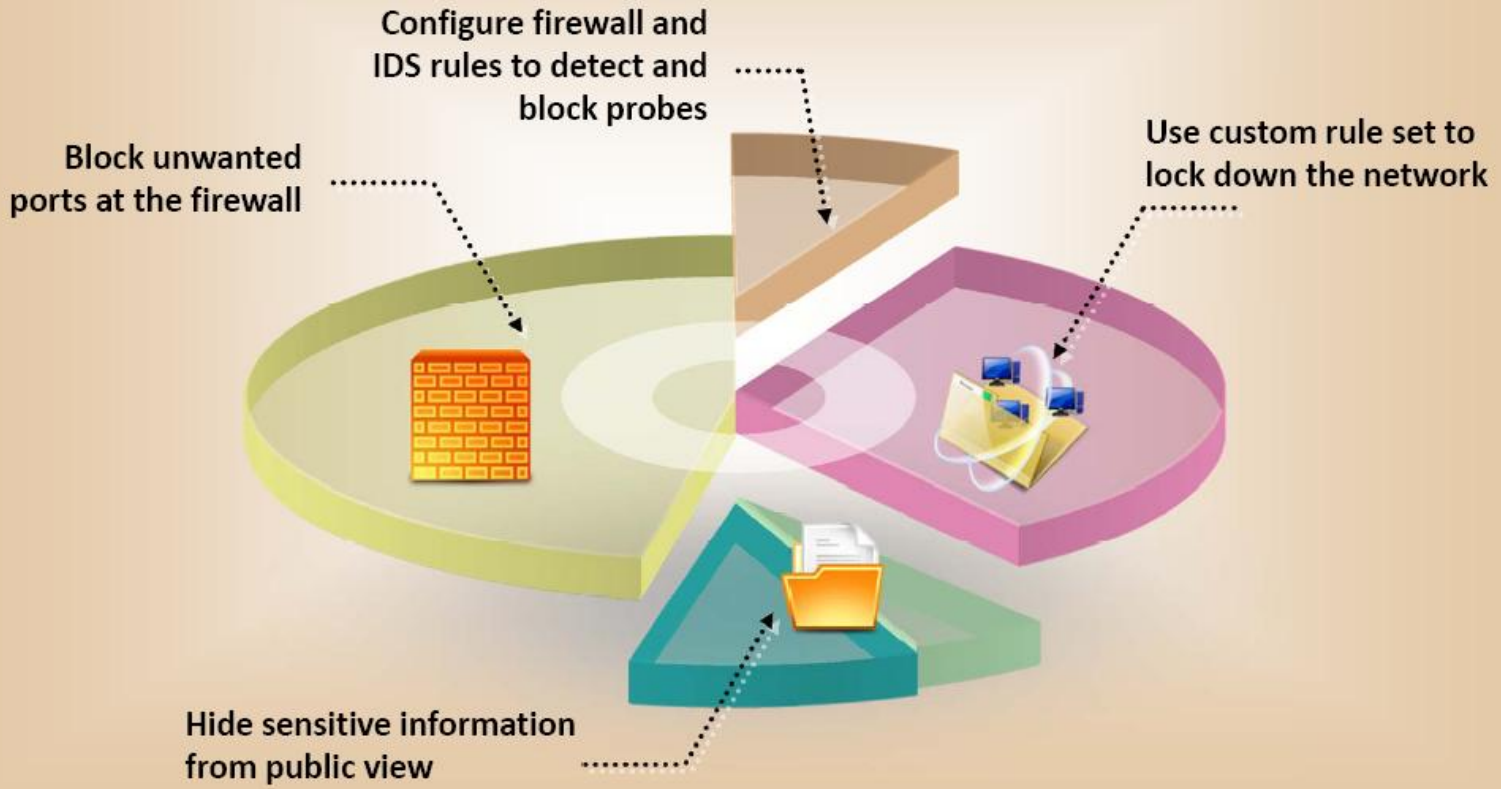
RANGE 130
130.40.0.0 NASA Johnson Space Center
130.90.0.0 Mather Air Force Base
130.109.0.0 Naval Coastal Systems Center
130.124.0.0 Honeywell Defense Systems Group
130.165.0.0 U.S.Army Corps of Engineers
130.167.0.0 NASA Headquarters

RANGE 131
131.6.0.0 Langley Air Force Base
131.10.0.0 Barksdale Air Force Base
131.17.0.0 Sheppard Air Force Base
131.21.0.0 Hahn Air Base
31.32.0.0 37 Communications Squadron
131.35.0.0 Fairchild Air Force Base
131.36.0.0 Yokota Air Base
131.37.0.0 Elmendorf Air Force Base
131.38.0.0 Hickam Air Force Base
131.39.0.0 354CS/SCSN

RANGE 132
132.3.0.0 Williams Air Force Base
132.5.0.0 - 132.5.255.255 49th Fighter Wing
132.6.0.0 Ankara Air Station
132.7.0.0 - 132.7.255.255 SSG/SINO
132.9.0.0 28th Bomb Wing
132.10.0.0 319 Comm Sq
132.11.0.0 Hellenikon Air Base
132.12.0.0 Myrtle Beach Air Force Base
132.13.0.0 Bentwaters Royal Air Force Base
132.14.0.0 Air Force Concentrator Network
132.15.0.0 Kadena Air Base
132.16.0.0 Kunsan Air Base
132.17.0.0 Lindsey Air Station
132.18.0.0 McGuire Air Force Base
132.19.0.0 100CS (NET-MILDENHALL)
132.20.0.0 35th Communications Squadron
132.21.0.0 Plattsburgh Air Force Base
132.22.0.0 23Communications Sq
132.24.0.0 Dover Air Force Base
132.25.0.0 786 CS/SCBM
132.27.0.0 - 132.27.255.255 39CS/SCBBN
132.28.0.0 14TH COMMUNICATION SQUADRON
132.30.0.0 Lajes Air Force Base
132.31.0.0 Loring Air Force Base
132.33.0.0 60CS/SCSNM
132.34.0.0 Cannon Air Force Base
132.35.0.0 Altus Air Force Base
132.37.0.0 75 ABW
132.38.0.0 Goodfellow AFB
132.39.0.0 K.I. Sawyer Air Force Base

For a complete list, see the file in DVD
IP ADDRESSES YOU SHOULD NOT SCAN.txt

Scanning Countermeasures



Scanning Countermeasures

Filter inbound ICMP message types and all outbound ICMP type 3 unreachable messages at **boarder routers and firewalls**

If a commercial firewall is in use, ensure that:

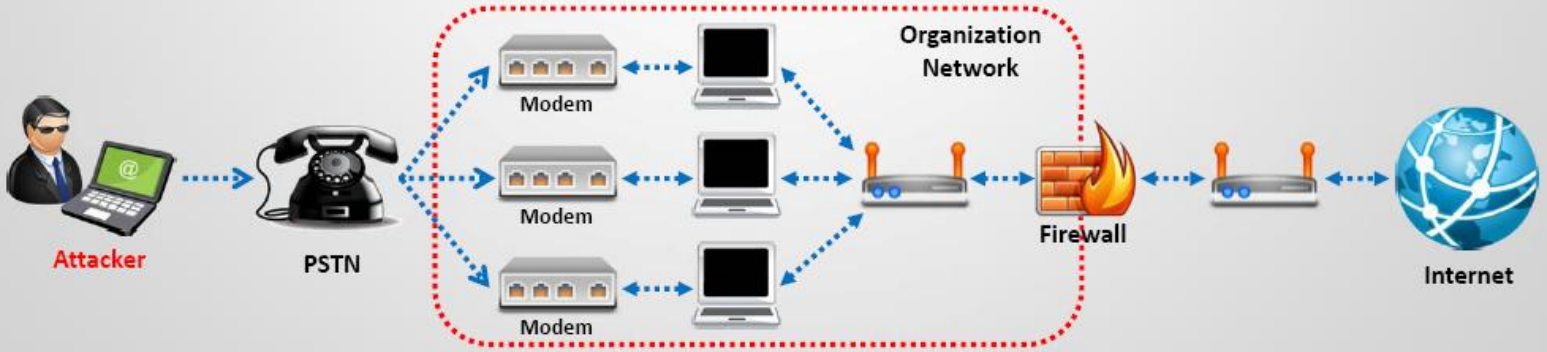
1. The **latest service pack** is installed
2. The **Antispoofing rules** have been correctly defined
3. Fastmode services are not used in **Check Point Firewall-1** environments

Ensure that routing and filtering mechanisms cannot be bypassed using **specific source ports** or source-routing techniques

Understand the network configuration and its accessible ports by launching **TCP and UDP port scans** along with ICMP probes against your own IP address space

War Dialing

1	2	3	4
War dialing involves the use of a program in conjunction with a modem to penetrate the modem-based systems	Companies do not control the dial-in ports as strictly as the firewall and machines with attached modems	A tool that identifies the phone numbers that can successfully make a connection with a computer modem	It generally works by using a predetermined list of common user names and passwords in an attempt to gain access to the system



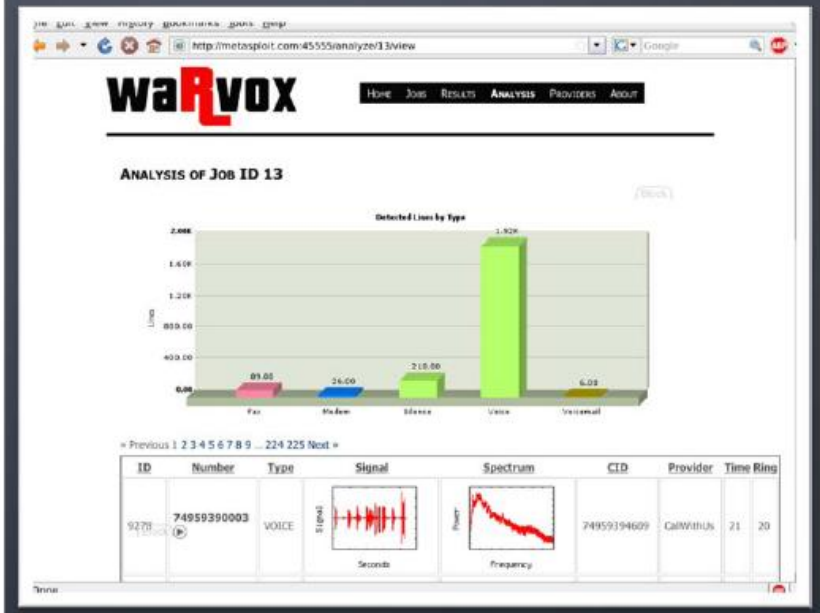
Why War Dialing?

- It does not matter how strongly you have locked the front door to your network if you have left the back door wide open

CEH Certified Ethical Hacker

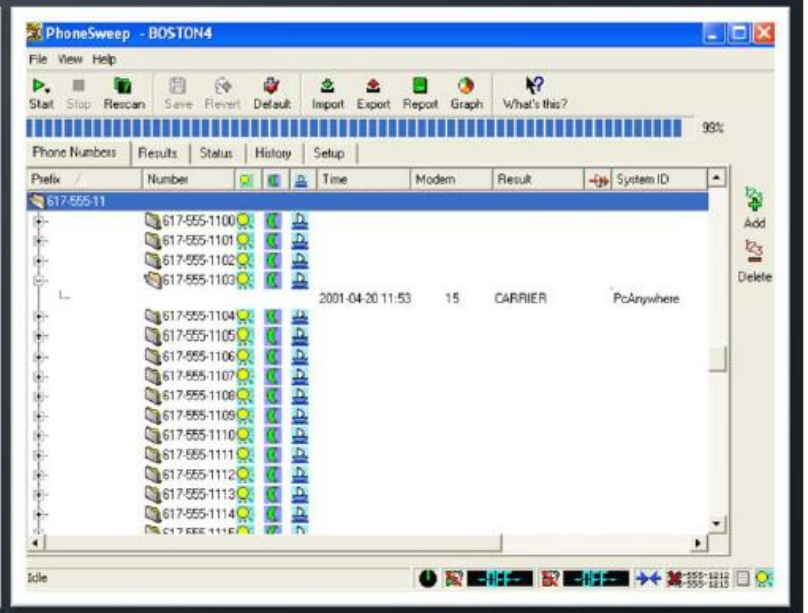
War Dialing Tools

WarVOX



http://warvox.org

PhoneSweep – War Dialing Tool



http://www.sandstorm.net

War Dialing Tools

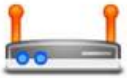
THC Scan
http://freeworld.thc.org

TeleSweep Secure®
http://www.securelogix.com

PAW / PAWS
http://www.wyae.de

ToneLoc
http://www.oldskoolphreak.com

iWar
https://www.softwink.com



Plax Network Suite
http://www.bestsecuritytips.com

ShokDial
http://www.w00w00.org

Visual NetTools
http://www.airgrab.com

War Dialing Countermeasures

Develop and implement **security policies**

Conduct a **manual reconnaissance** of your network

Use phone numbers in a range completely different from your **internal PBX numbers**

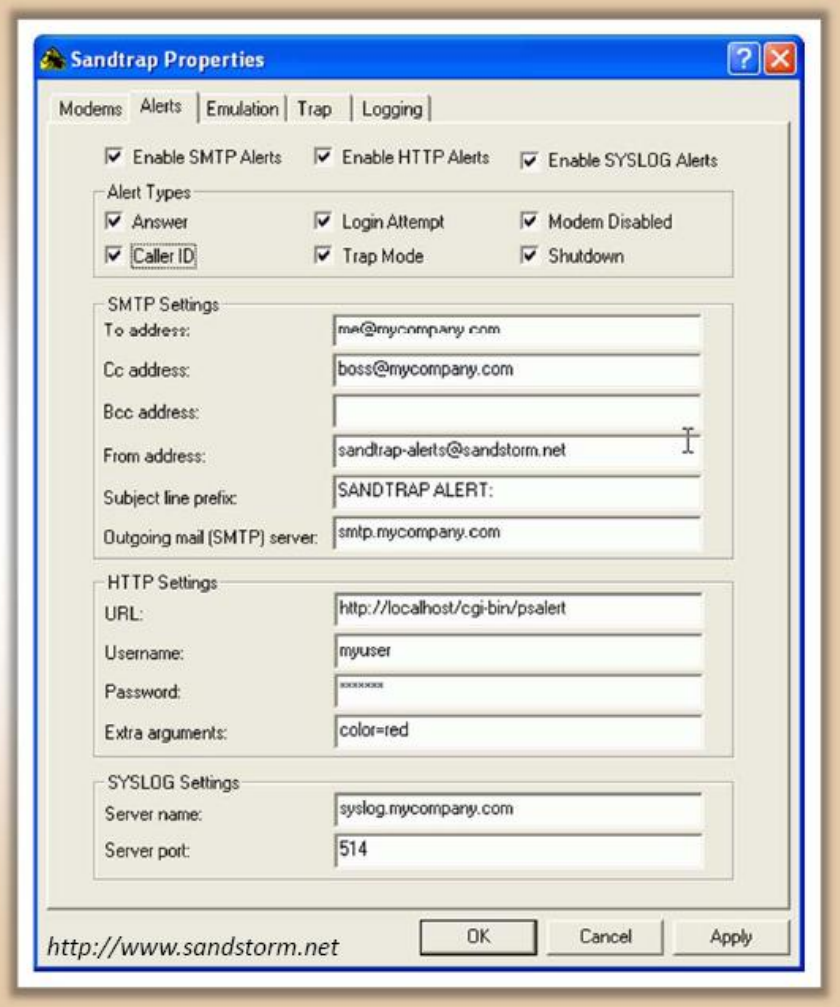
Document floor plans and all your equipment

Check your **auto answer configurations** on your modem

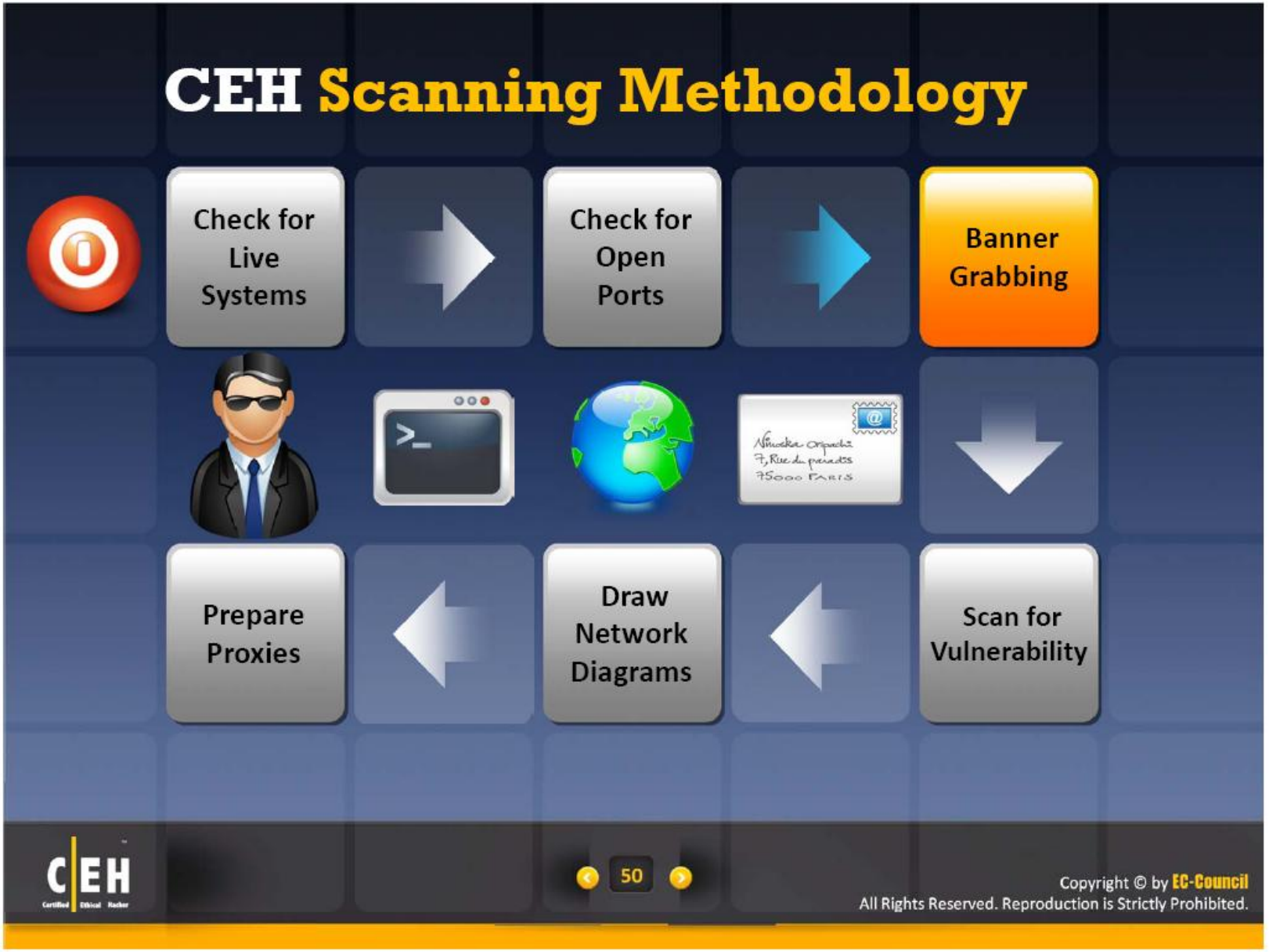
Log all **successful and failed login attempts**

War Dialing Countermeasures: SandTrap Tool

Sandtrap can **detect war dialing attempts** and notify the administrator immediately being called, connected, via HTTP POST to a web server



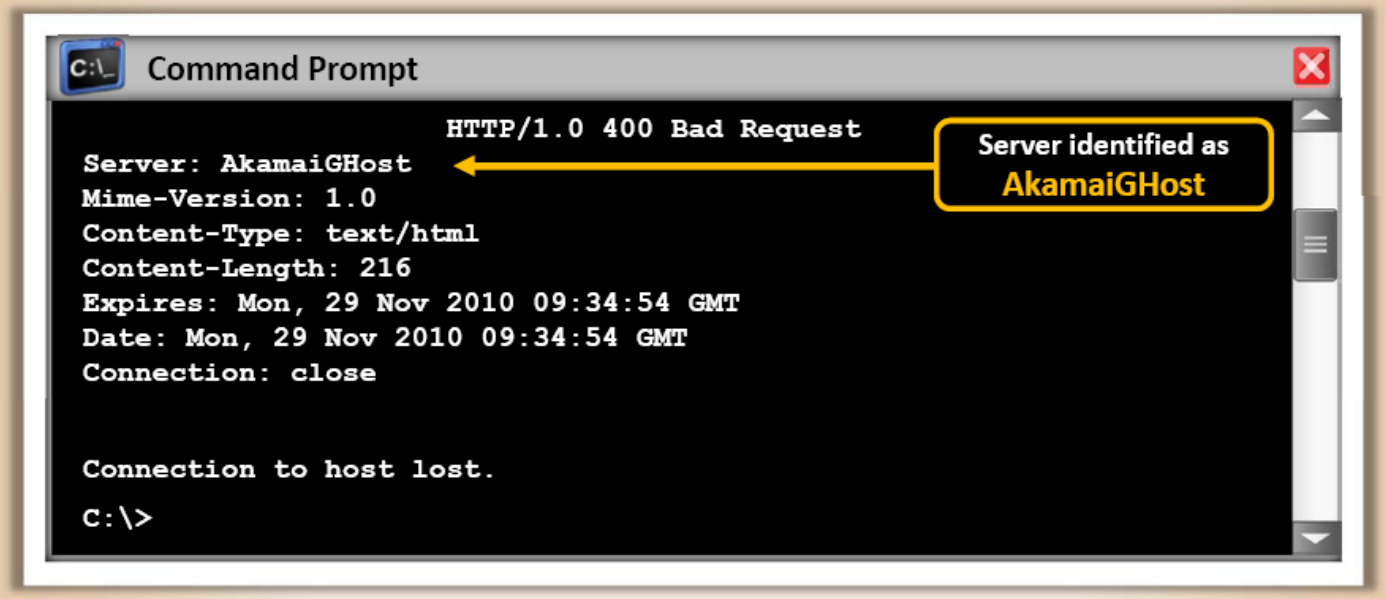
CEH Scanning Methodology



OS Fingerprinting

- OS fingerprinting is the method to determine the **operating system running on a remote target system**. There are two types of OS fingerprinting: Active and Passive.

Active Banner Grabbing Using Telnet




```
C:\telnet www.juggyboy.com 80 HEAD / HTTP/1.0
```

This technique probes HTTP servers to determine the Server field in the HTTP response header

Banner Grabbing Tool: ID Serve

- ID Serve is used to identify the **make, model, and version of** any web site's server software
- It is also used to **identify non-HTTP** (non-web) **Internet servers** such as FTP, SMTP, POP, NEWS, etc.

GET REQUESTS

- You might want to try these additional get requests for banner grabbing
- Take a look at: GET REQUESTS KNOWN_TESTS.htm file

```
xample code:
      'GET',
      'GET /',
      'GET / HTTP/999.99',
      'GET / HHTP/1.0',
      'GET / HTP/1.0',
      'GET / HHTP/999.99',
      'GET / hhtp/999.99',
      'GET / http/999.99',
      'GET / HTTP/Q.9',
      'GET / HTTP/9.Q',
      'GET / HTTP/Q.Q',
      'GET / HTTP/1.X',
      'GET / HTTP/1.10',
      'GET / HTTP/1.1.0',
      'GET / HTTP/1.2',
      'GET / HTTP/2.1',
      'GET / HTTP/1,0',
      'GET / HTTP/1.0X',
      'GET / HTTP/',
      'GET/HTTP/1.0' ,
      'GET/ HTTP/1.0' ,
      'GET /HTTP/1.0' ,
      'GET/HTTP /1.0' ,
      'GET/HTTP/1 .0' ,
      'GET/HTTP/1. 0' ,
      'GET/HTTP/1.0 ' ,
      'GET / HTTP /1.0',
      'HEAD /.\\ HTTP/1.0',
      'HEAD /asdfasdfasdfasdfasdf/../
HTTP/1.0',
      'HEAD /asdfasdfasdfasdfasdf/..
HTTP/1.0',
      'HEAD
/./../../../../../../../../../../ HTTP/1.0',
      'HEAD
/../../../../../qwerty/../../../../../../
HTTP/1.0',
      'HEAD /.. HTTP/1.0',
```

```
'HEAD /../ HTTP/1.0',
      'HEAD /../../../../../ HTTP/1.0',
      'HEAD .. HTTP/1.0',
      'HEAD\t/\tHTTP/1.0',
      'HEAD /////////////// HTTP/1.0',
      'Head / HTTP/1.0',
      '\nHEAD / HTTP/1.0',
      ' \nHEAD / HTTP/1.0',
      ' HEAD / HTTP/1.0',
      'HEAD / HQWERTY/1.0',
      'HEAD %s HTTP/1.0' % url,
      'HEAD %s' % url,
      'HEAD http:// HTTP/1.0',
      'HEAD http:/ HTTP/1.0',
      'HEAD http: HTTP/1.0',
      'HEAD http HTTP/1.0',
      'HEAD h HTTP/1.0',
      'HELLO',
      'GET \0 / HTTP/1.0',
      'GET / \0 HTTP/1.0',
      'GET / HTTP/1.0\0',
      'GET / H',
      ' GET / HTTP/1.0',
      ' '*1000 + 'GET / HTTP/1.0',
      'GET'+' '*1000+'/ HTTP/1.0',
      'GET '+'/'*1000+' HTTP/1.0',
      'GET /'+' '*1000+'HTTP/1.0',
      'GET / '+'H'*1000+'TTP/1.0',
      'GET / '+'HTTP'+'/'*1000+'1.0',
      'GET / '+'HTTP/'+'1'*1000+'.0',
      'GET / '+'HTTP/1'+'.'*1000+'0',
      'GET / '+'HTTP/1.'+'0'*1000,
      'GET / HTTP/1.0' + ' ' * 1000,
      '12345 GET / HTTP/1.0',
      '12345 / HTTP/1.0',
      '\0',#70
      '\0'*1000,
      '\0'+'GET / HTTP/1.0',
```

Banner Grabbing Tool: Netcraft

Netcraft reports a site's operating system, web server, and netblock owner together with, if available, a **graphical view of the time** since last reboot for each of the computers serving the site

Results for microsoft.com

Found 170 sites

	Site	Site Report	First seen	Netblock	OS
1.	www.microsoft.com		august 1995	microsoft corp	windows server 2003
2.	support.microsoft.com		october 1997	microsoft corp	unknown
3.	technet.microsoft.com		august 1999	microsoft corp	windows server 2008
4.	msdn.microsoft.com		september 1998	microsoft corp	windows server 2008
5.	office.microsoft.com		november 1998	microsoft corp	unknown
6.	update.microsoft.com		febuary 2005	microsoft corp	windows server 2008
7.	www.update.microsoft.com		may 2007	microsoft corp	windows server 2008
8.	go.microsoft.com		november 2001	microsoft corp	windows server 2003
9.	windows.microsoft.com		june 1998	microsoft corp	unknown
10.	social.technet.microsoft.com		august 2008	microsoft corp	windows server 2008

http://www.netcraft.com

Banner Grabbing Tools

Serversiders.com
http://serversiders.com

PRADS
http://download.github.com

P0f Banner Grabbing Tool
http://lcamtuf.coredump.cx

SINFP
http://www.gomor.org

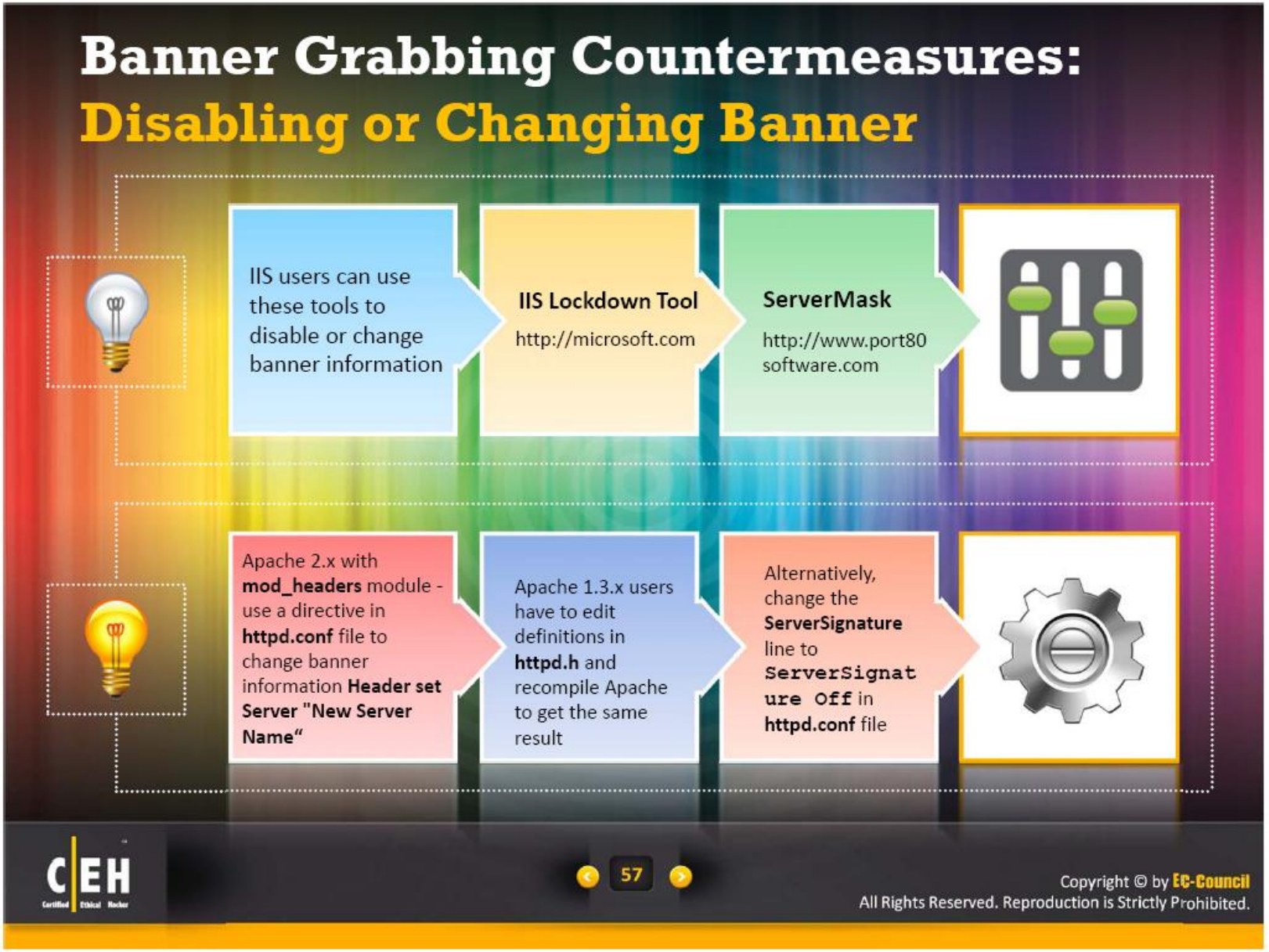
NetworkMiner
http://networkminer.sourceforge.net

Xprobe
http://space.dl.sourceforge.net

Satori
http://myweb.cableone.net

THC-AMAP
http://freeworld.thc.org

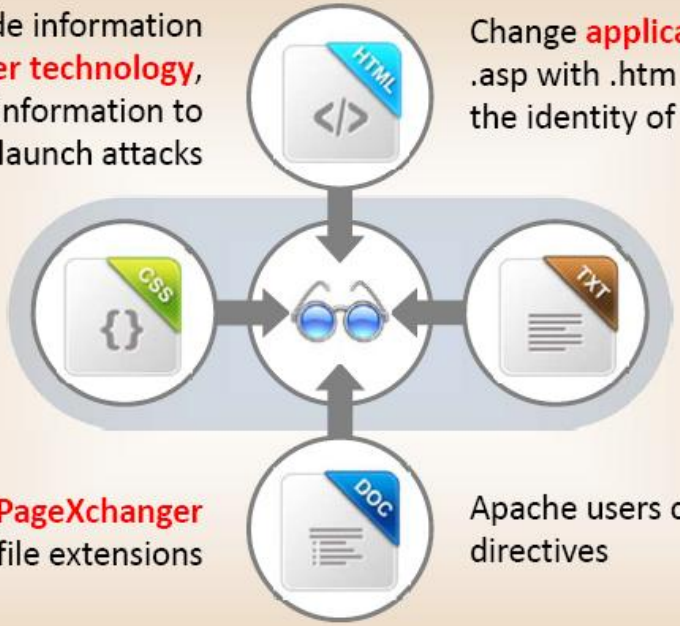
Banner Grabbing Countermeasures:
Disabling or Changing Banner



Hiding File Extensions

Hiding File Extensions from Webpages

File extensions provide information about the underlying server technology, attackers can use this information to search vulnerabilities and launch attacks



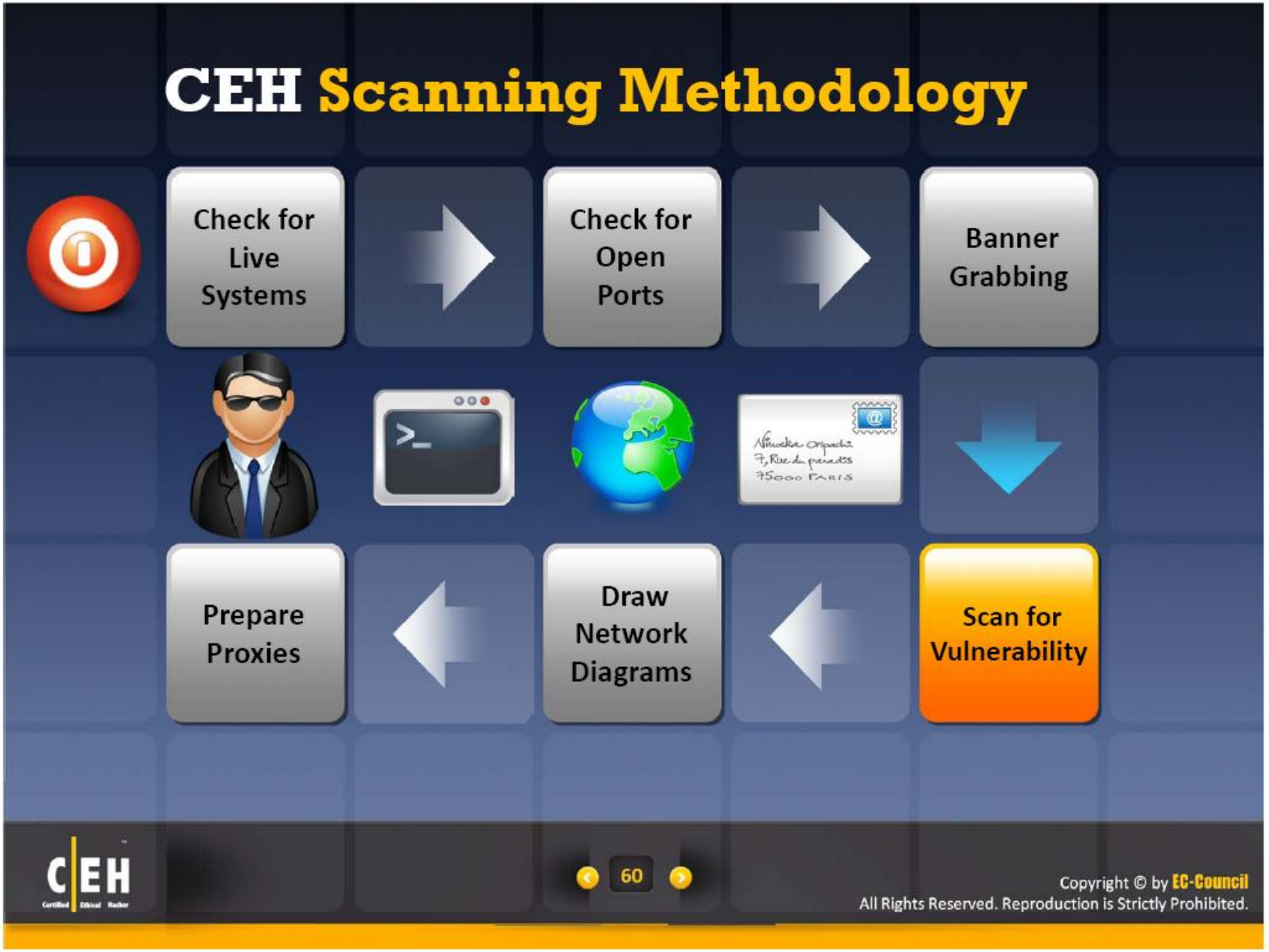
Change application mappings such as .asp with .htm or .foo, etc. to disguise the identity of the servers

IIS users use tools such as PageXchanger to manage the file extensions

Apache users can use mod_negotiation directives

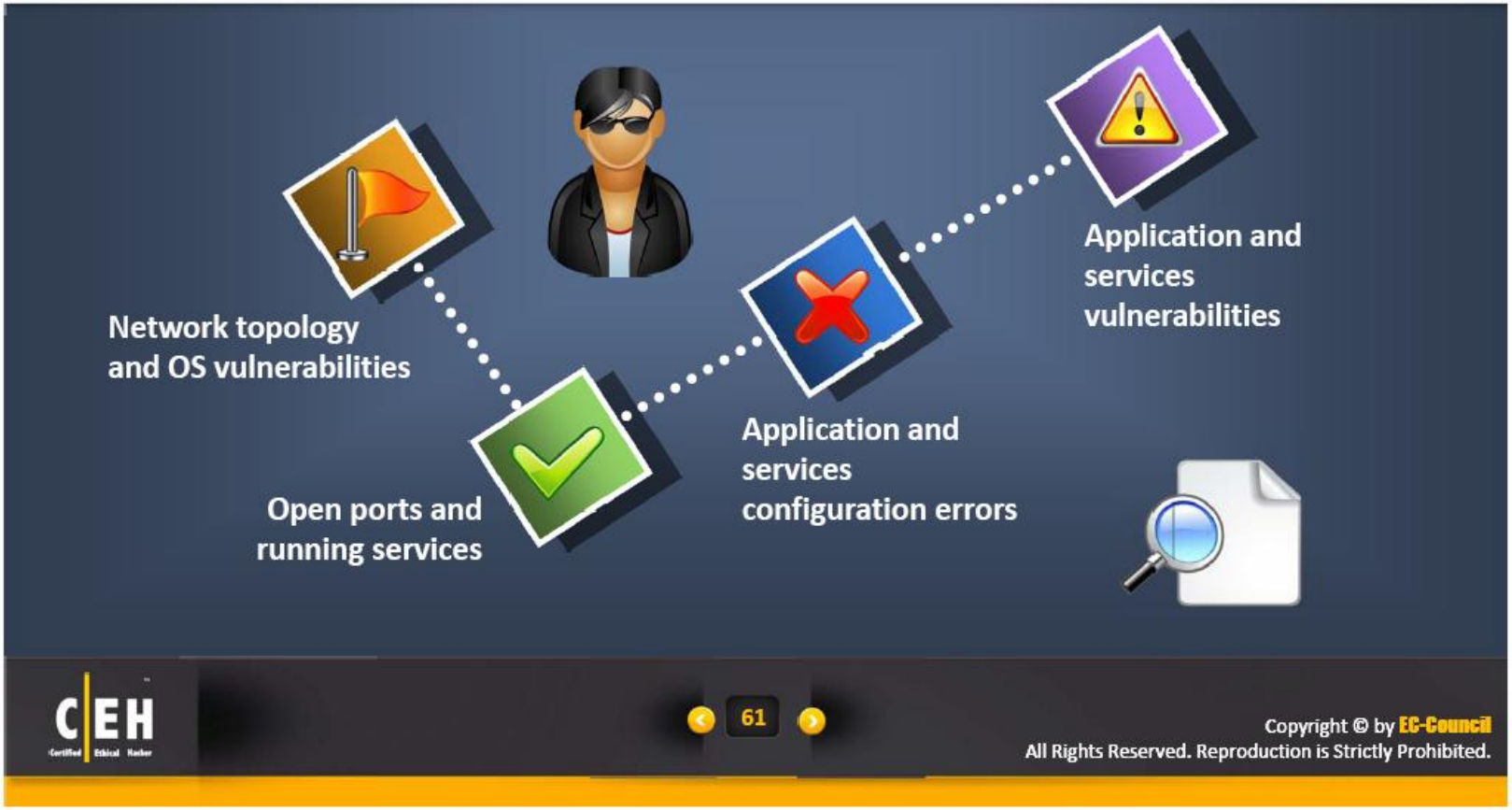
Doing without file extensions altogether is an even better idea

CEH Scanning Methodology

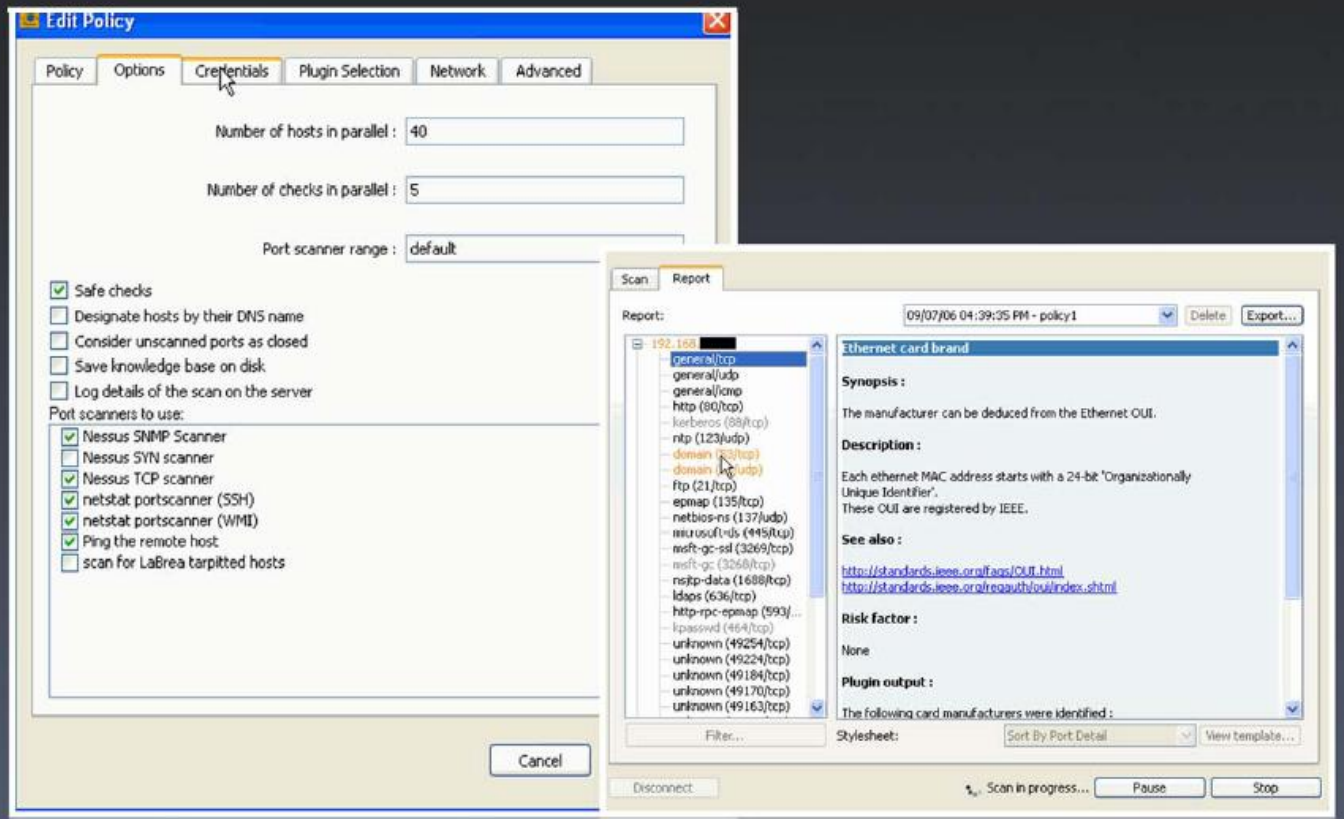


Vulnerability Scanning

Vulnerability scanning identifies vulnerabilities and weaknesses of a system and network in order to determine how a system can be exploited



Nessus: Screenshot

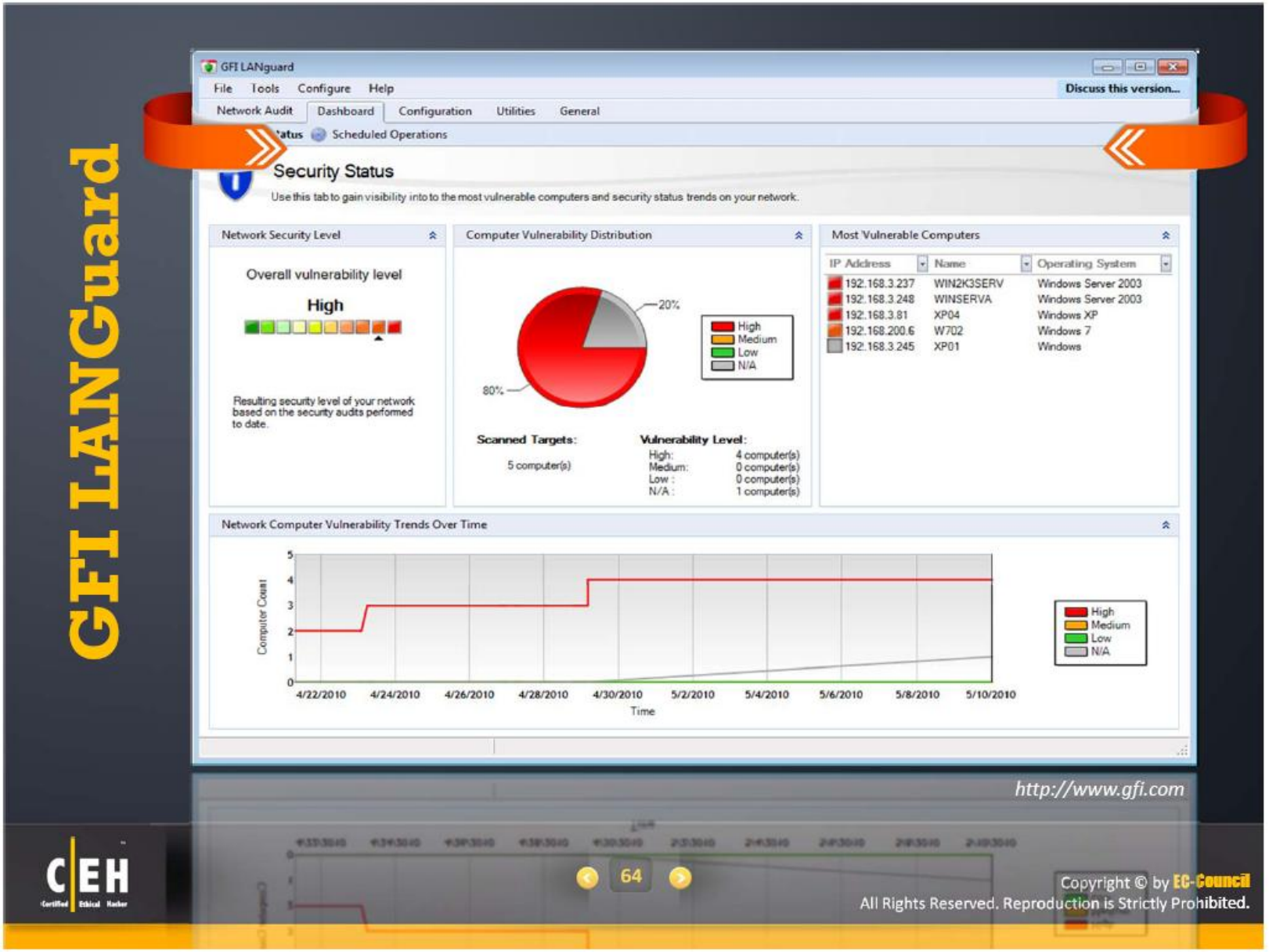


Vulnerability Scanning Tool: SAINT

SAINT is also known as Security Administrator's Integrated Network Tool

Attackers can detect the network vulnerabilities on any remote target in a non-intrusive manner

It gathers information regarding what type of OS is running and which ports are open


GFI LANguard
GFI LANguard
File Tools Configure Help
Discuss this version...
Network Audit Dashboard Configuration Utilities General
Scheduled Operations
Security Status
Use this tab to gain visibility into to the most vulnerable computers and security status trends on your network.
Network Security Level
Overall vulnerability level
High
Resulting security level of your network based on the security audits performed to date.
Computer Vulnerability Distribution
20%
80%
High
Medium
Low
N/A
Scanned Targets:
5 computer(s)
Vulnerability Level:
High: 4 computer(s)
Medium: 0 computer(s)
Low : 0 computer(s)
N/A : 1 computer(s)
Most Vulnerable Computers
IP Address Name Operating System
192.168.3.237 WIN2K3SERV Windows Server 2003
192.168.3.248 WINSERVA Windows Server 2003
192.168.3.81 XP04 Windows XP
192.168.200.6 W702 Windows 7
192.168.3.245 XP01 Windows
Network Computer Vulnerability Trends Over Time
Computer Count
0
1
2
3
4
5
4/22/2010
4/24/2010
4/26/2010
4/28/2010
4/30/2010
5/2/2010
5/4/2010
5/6/2010
5/8/2010
5/10/2010
Time
High
Medium
Low
N/A
http://www.gfi.com
CEH
64
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Network Vulnerability Scanners

Retina
http://www.eeye.com

Nsauditor
http://www.nsauditor.com

Core Impact
http://www.coresecurity.com

Network Security Inspector
http://www.sunbeltsoftware.com

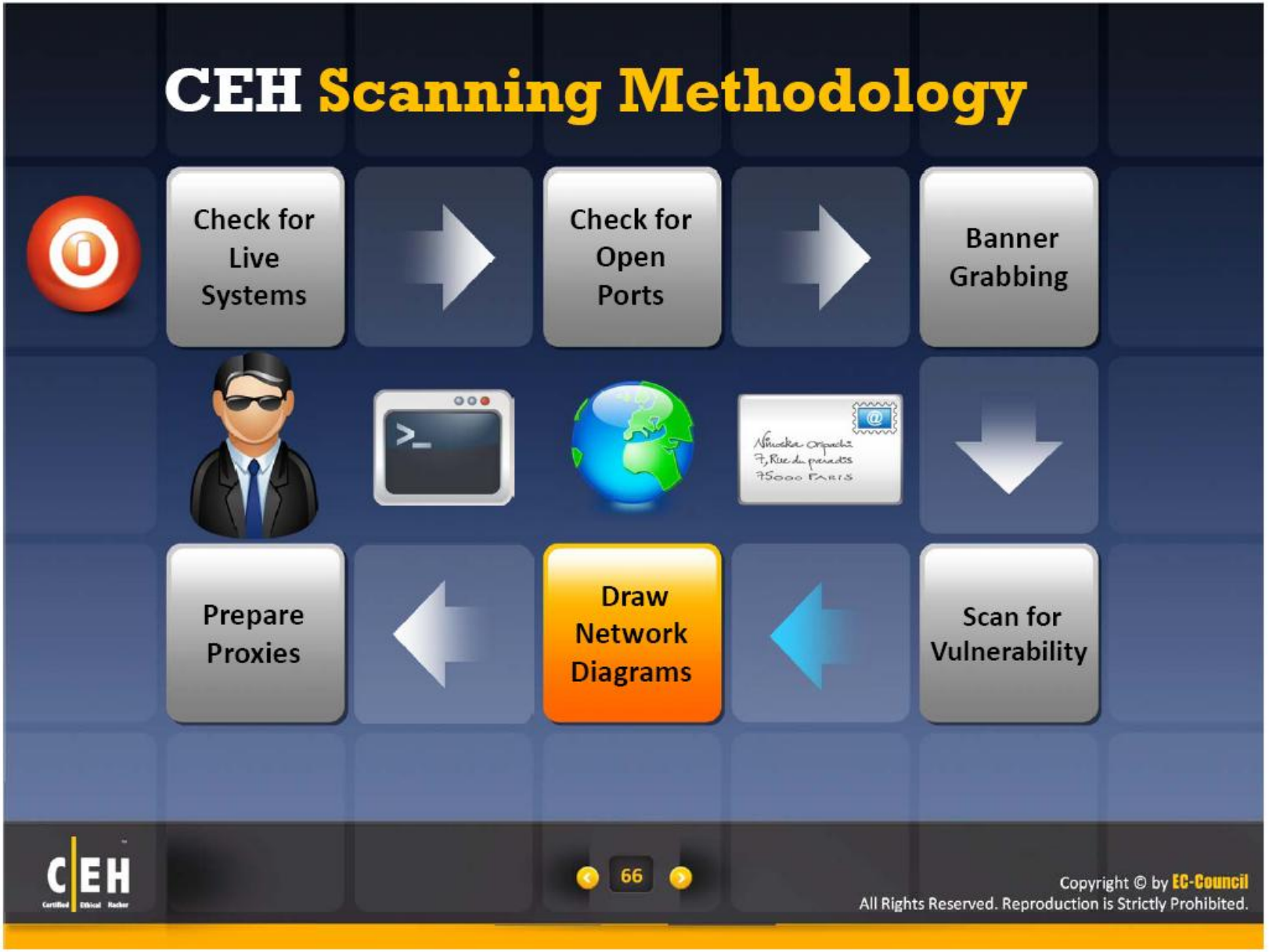
MBSA
http://technet.microsoft.com

OpenVAS
http://www.openvas.org

Shadow Security Scanner
http://www.safety-lab.com

Security Manager Plus
http://www.manageengine.com

CEH Scanning Methodology



LANsurveyor

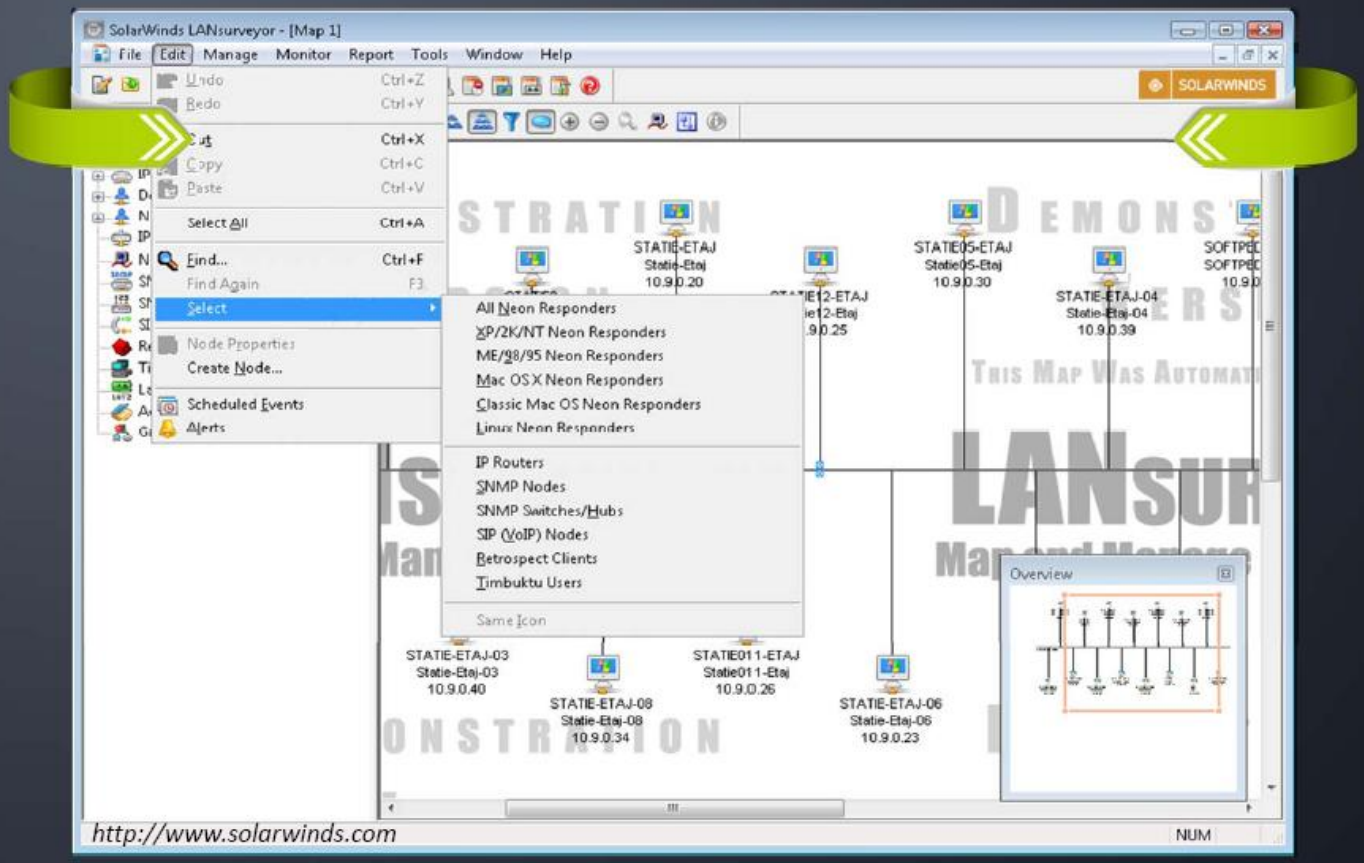
VisioLANsurveyor automatically discovers your network and **produces comprehensive and easy-to-view network maps** that can be exported into Microsoft Office

Features

- Automatically discovers and diagrams network topology
- Generates network maps in Microsoft Office® Visio®
- Detects new devices and modifications in network topology
- Performs inventory management for hardware and software assets
- Directly addresses PCI compliance and other regulatory requirements

Attackers use mapping tools for drawing network diagrams of vulnerable host to launch attack

LANsurveyor: Screenshot



Network Mappers

LANState
http://www.10-strike.com

CartoReso
http://cartoreso.campus.ecp.fr

Insightix Visibility
http://www.insightix.com

Lan-Secure Switch Center
http://www.lan-secure.com

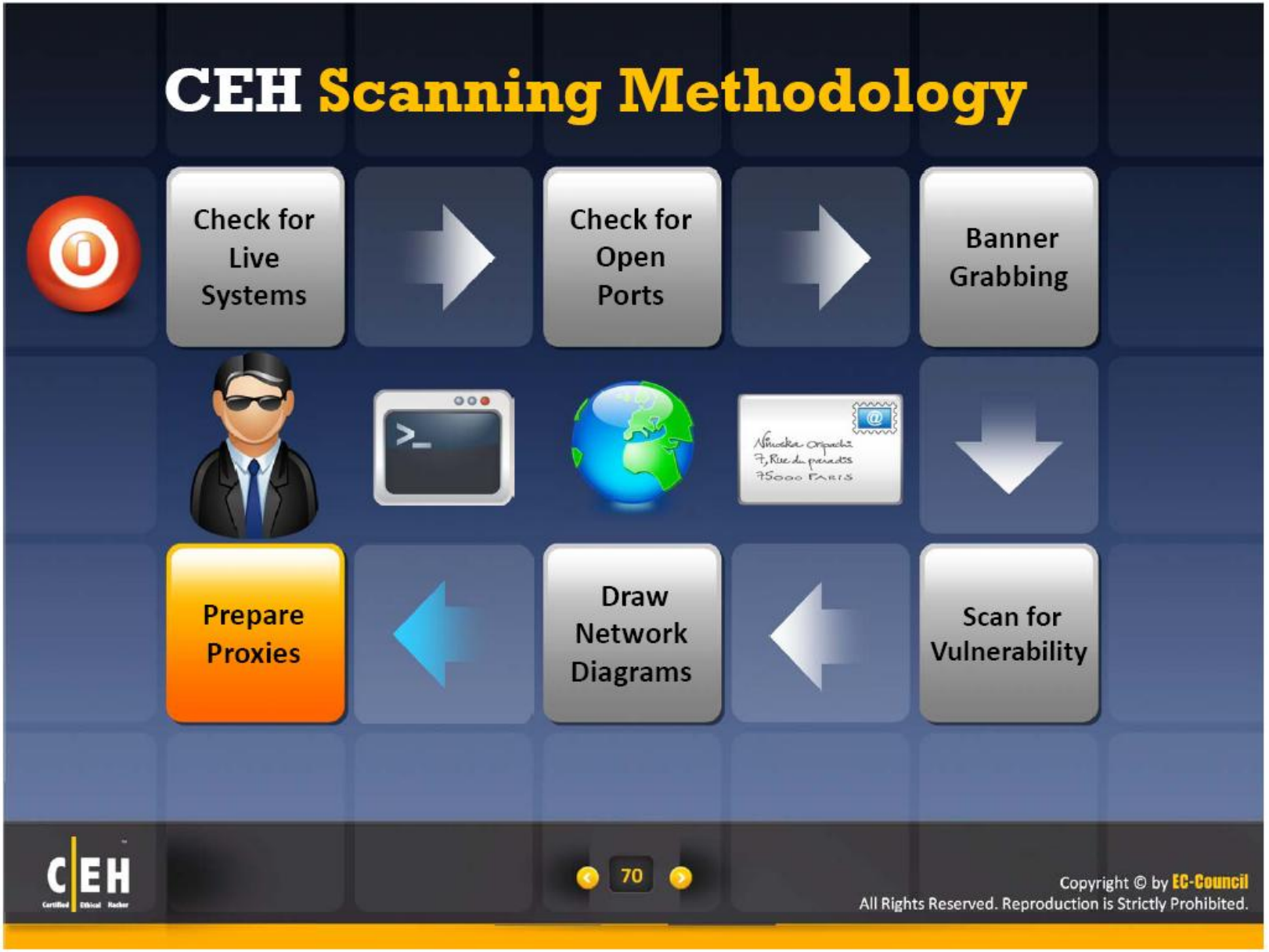
FriendlyPinger
http://www.kilievich.com

HP OpenView Network Node Manager
https://h10078.www1.hp.com

Ipsonar
http://www.lumeta.com

NetMapper
http://www.opnet.com

CEH Scanning Methodology



Proxy Servers

- Proxy is a network computer that can **serve as an intermediary** for connecting with other computers

As a firewall, a proxy **protects the local network** from **outside access**

Proxy servers can afford some protection against **hacking attacks**

As an **IP addresses multiplexer**, a proxy allows the connection of a number of computers to the Internet when having only one IP address

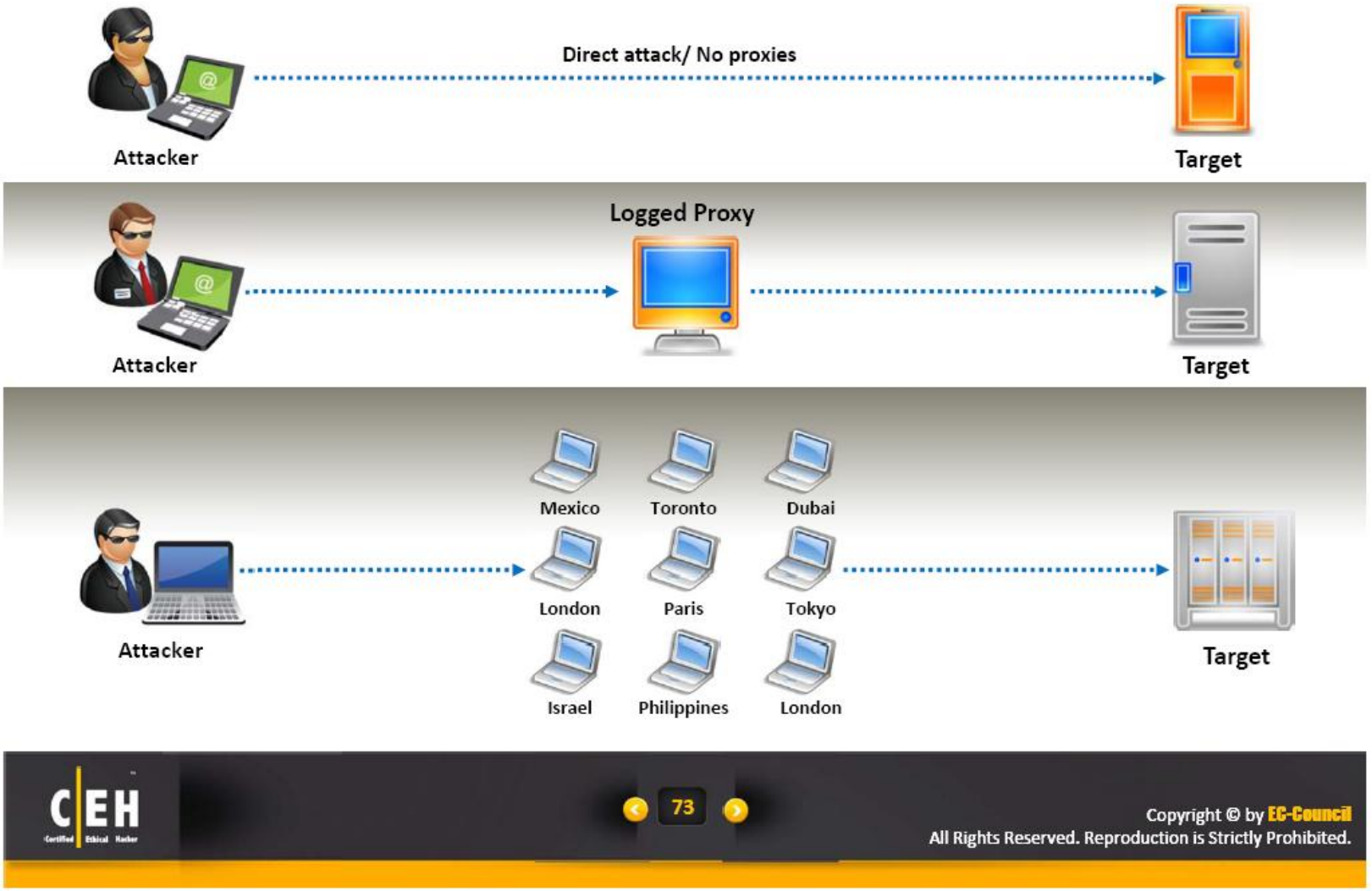
Specialized proxy servers **can filter out the unwanted content**, such as ads or 'unsuitable' material

Proxy servers can be used (to some extent) to **anonymize web surfing**

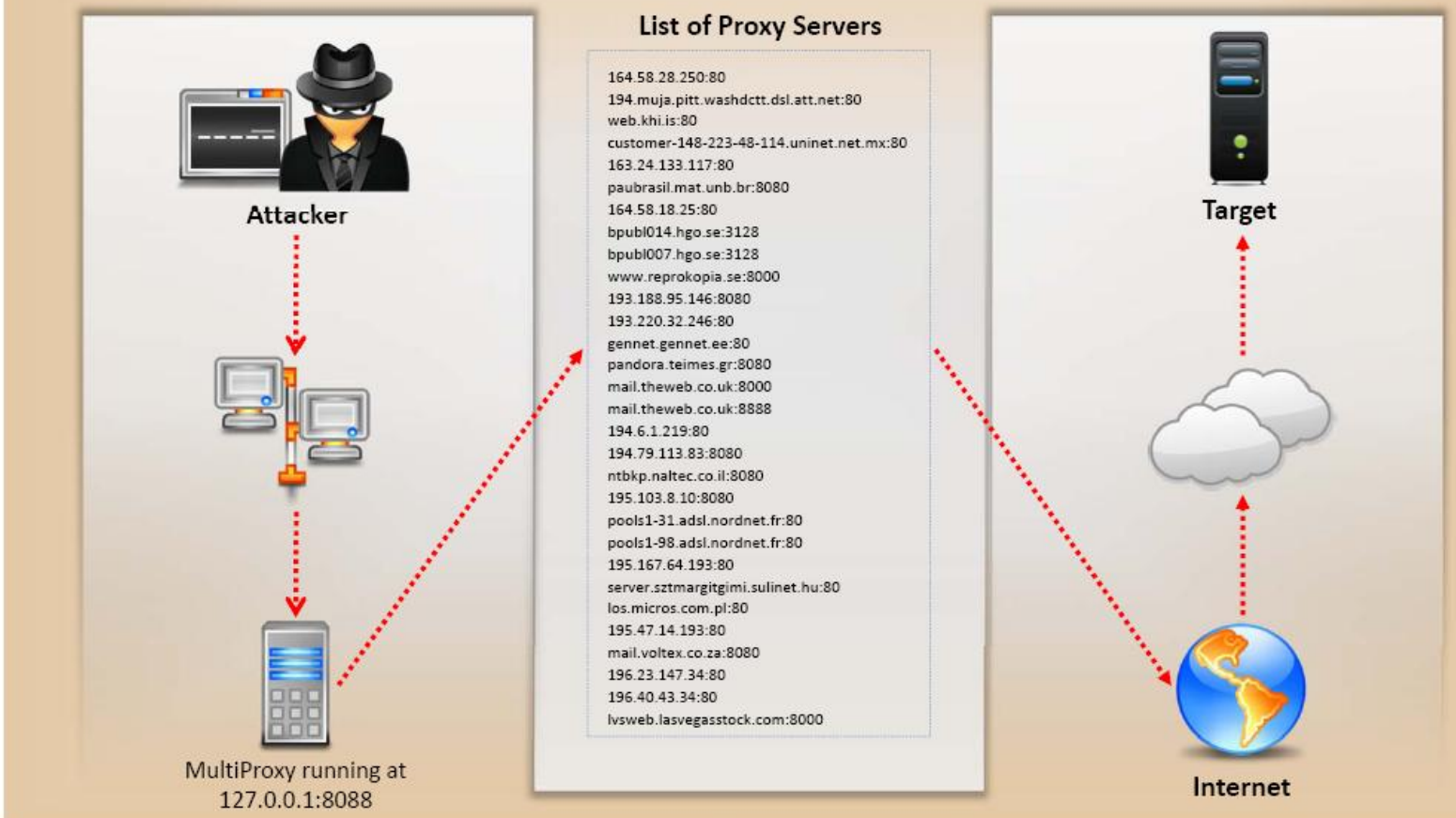
Why Attackers Use Proxy Servers?

- To hide the source IP address so that an attacker can hack without any legal corollary
- Attacker appears in a victim server's log files with a fake source address of the proxy rather than with the attacker's actual address
- To remotely access intranets and other website resources that are normally off limits
- To interrupt all the requests sent by an attacker and transmit them to a third destination, hence victims will only be able to identify the proxy server address
- To use multiple proxy servers for scanning and attacking, making it difficult for administrators to trace the real source of attack

Use of Proxies for Attack



How Does MultiProxy Work?



Free Proxy Servers

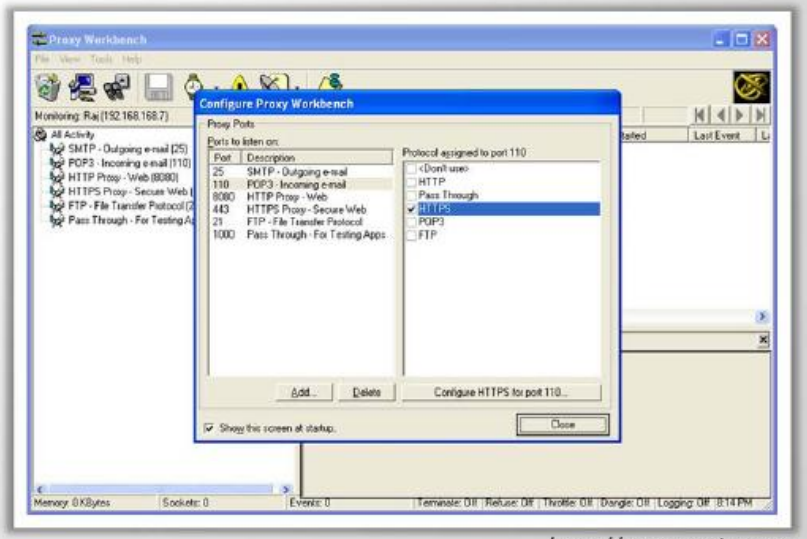
A search in Google lists thousands of free proxy servers

Proxy Workbench

- Proxy workbench is a proxy server that resides inside the network and **monitors the connection**, supports proxy chaining

How to run:

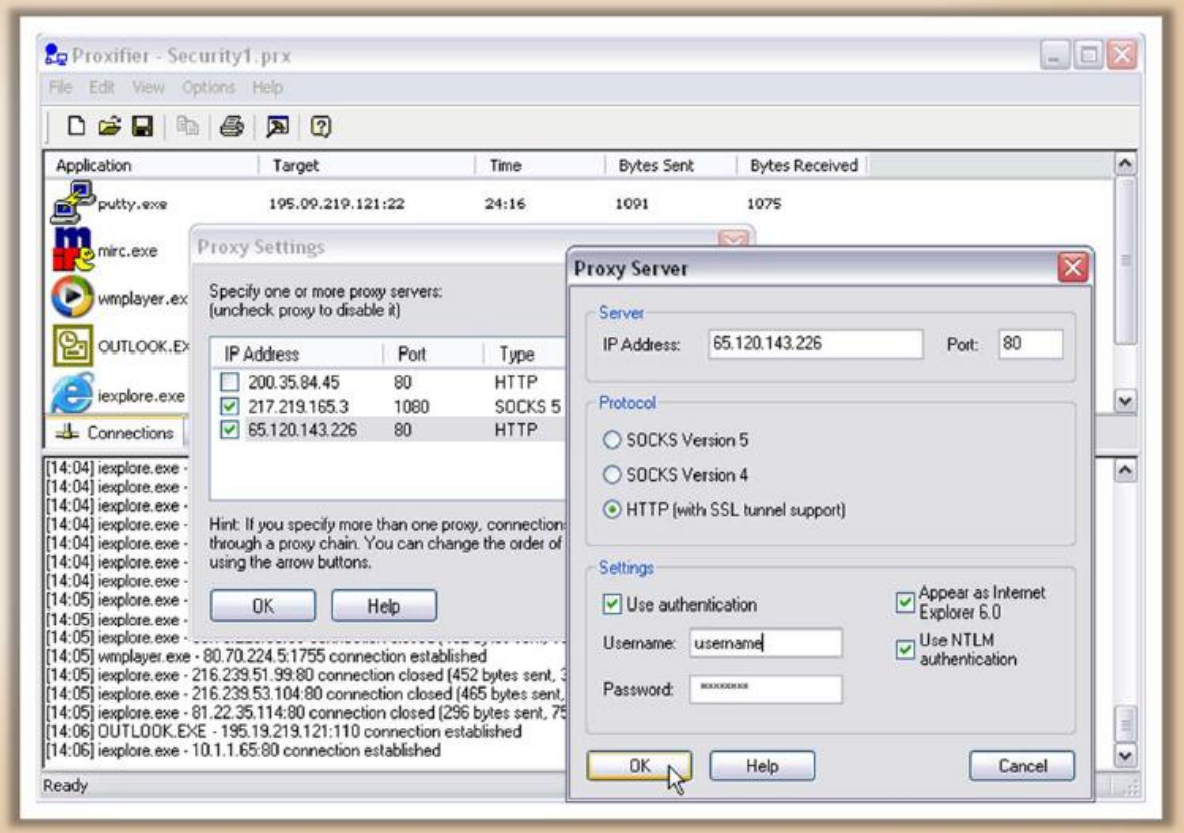
- Install proxy workbench
- Configure the client to use this proxy IP to connect to port 8080



http://www.tcpiq.com

Proxifier Tool: Create Chain of Proxy Servers

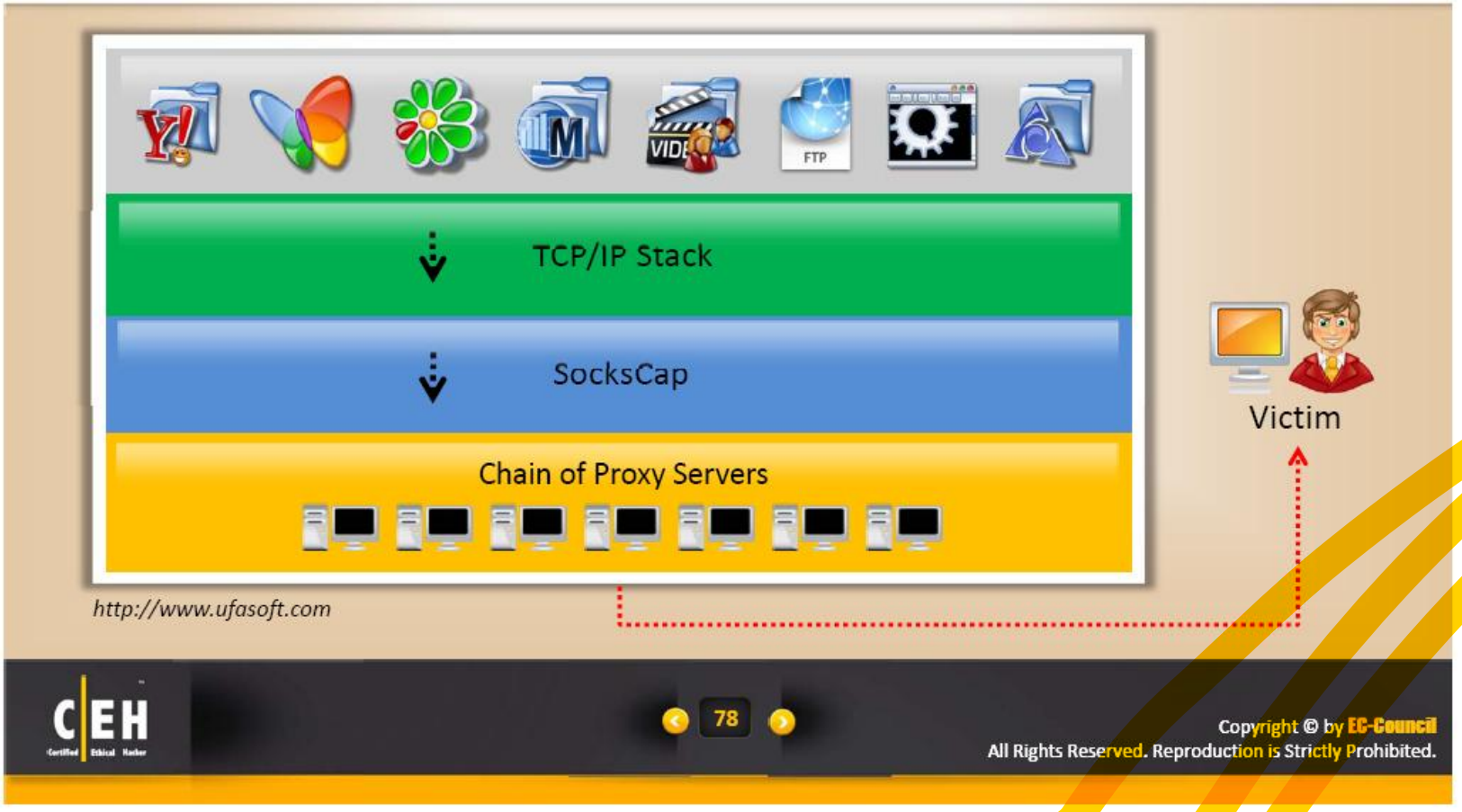
Proxifier is a program that allows network applications that do not support working through proxy servers to operate through an HTTPS or SOCKS proxy or a **chain of proxy servers**



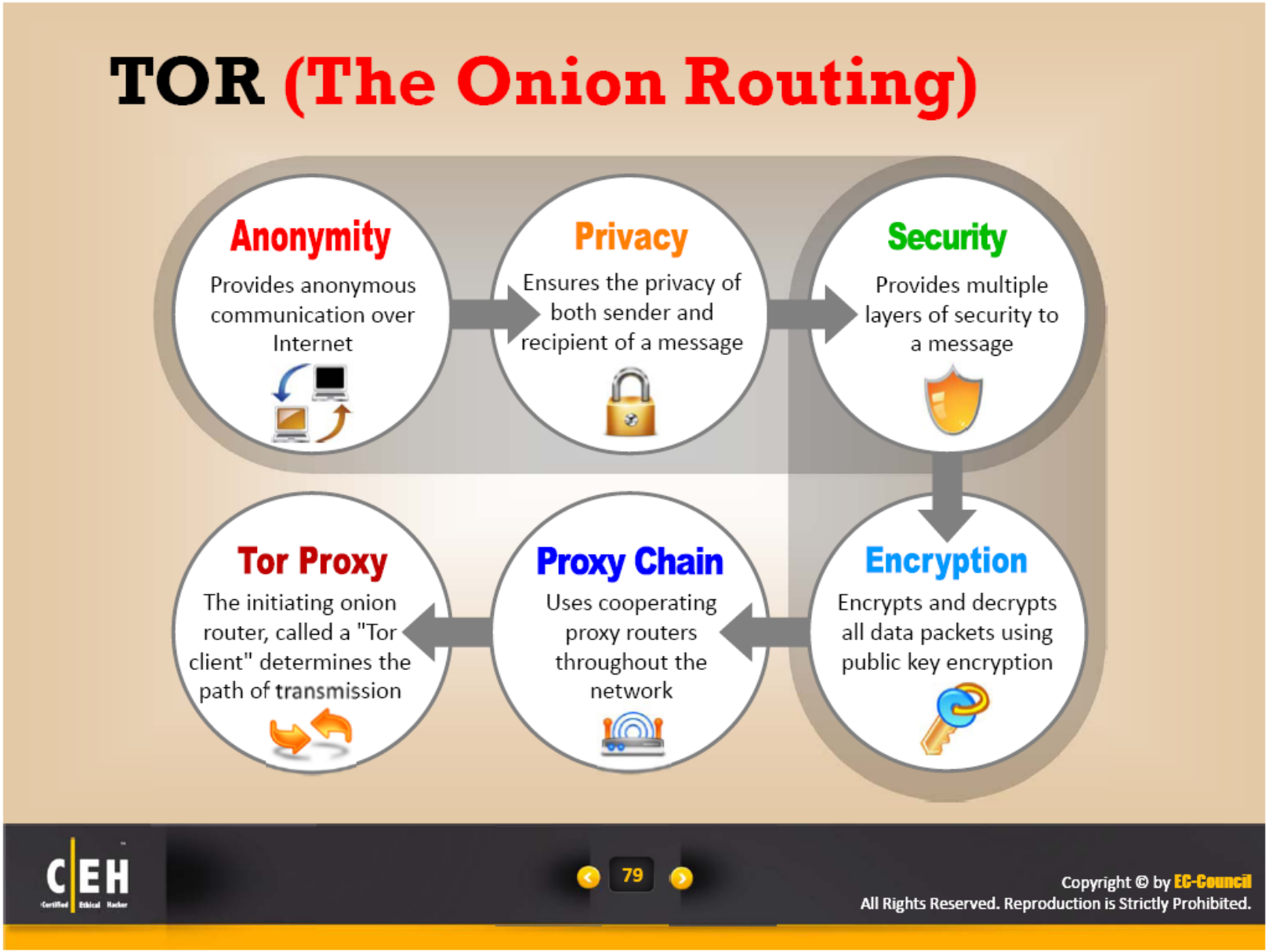
http://www.proxifier.com

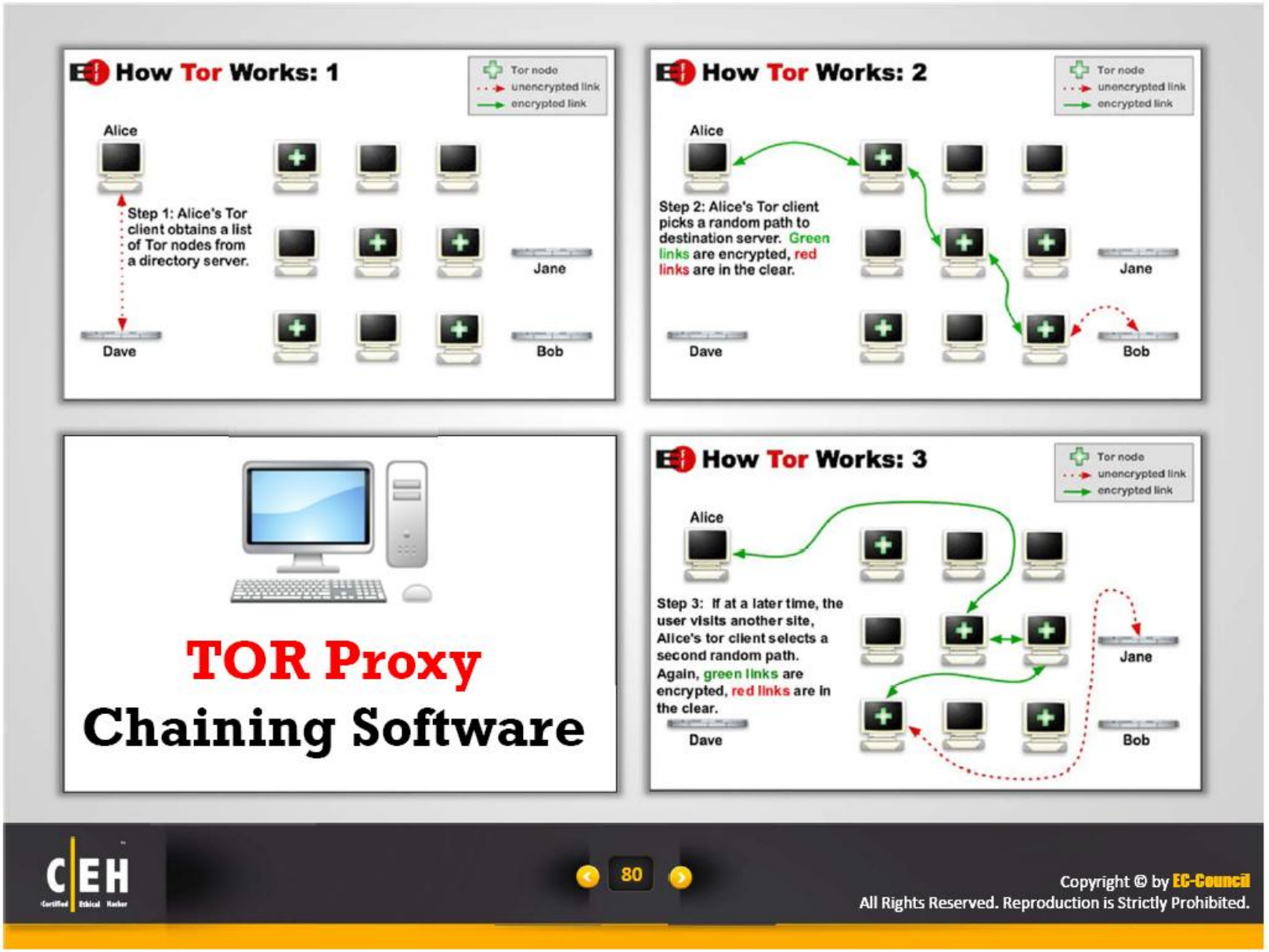
SocksChain

- SocksChain **transmits the TCP/IP applications** through a chain of proxy servers



TOR (The Onion Routing)




How Tor Works: 1
Tor node
unencrypted link
encrypted link
Alice
Step 1: Alice's Tor client obtains a list of Tor nodes from a directory server.
Jane
Dave
Bob
How Tor Works: 2
Tor node
unencrypted link
encrypted link
Alice
Step 2: Alice's Tor client picks a random path to destination server. Green links are encrypted, red links are in the clear.
Jane
Dave
Bob
TOR Proxy
Chaining Software
How Tor Works: 3
Tor node
unencrypted link
encrypted link
Alice
Step 3: If at a later time, the user visits another site, Alice's tor client selects a second random path. Again, green links are encrypted, red links are in the clear.
Jane
Dave
Bob
CEH
80
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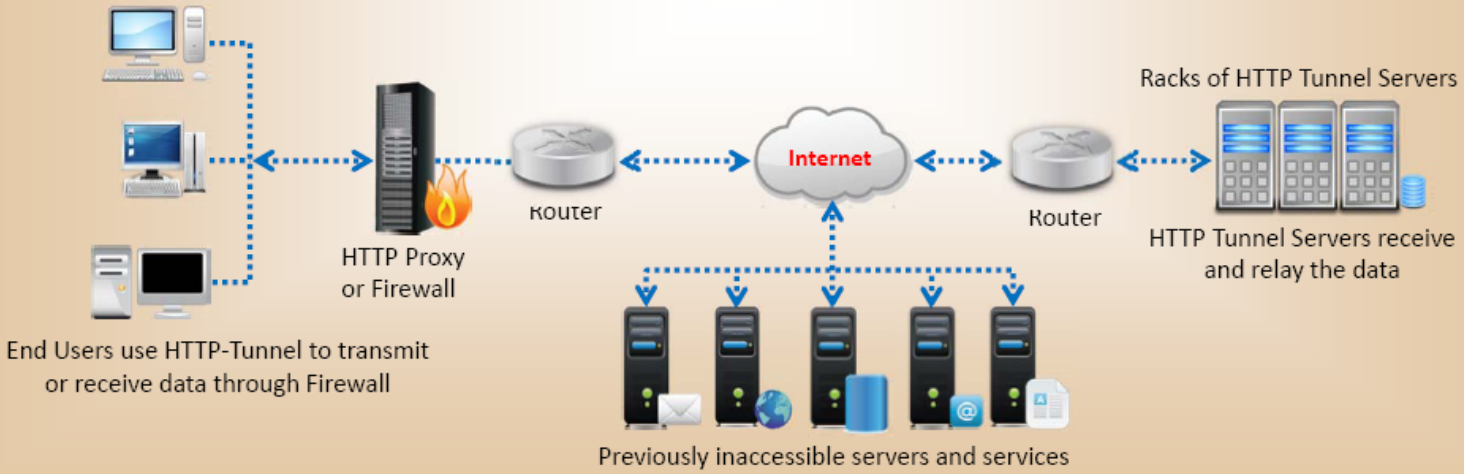
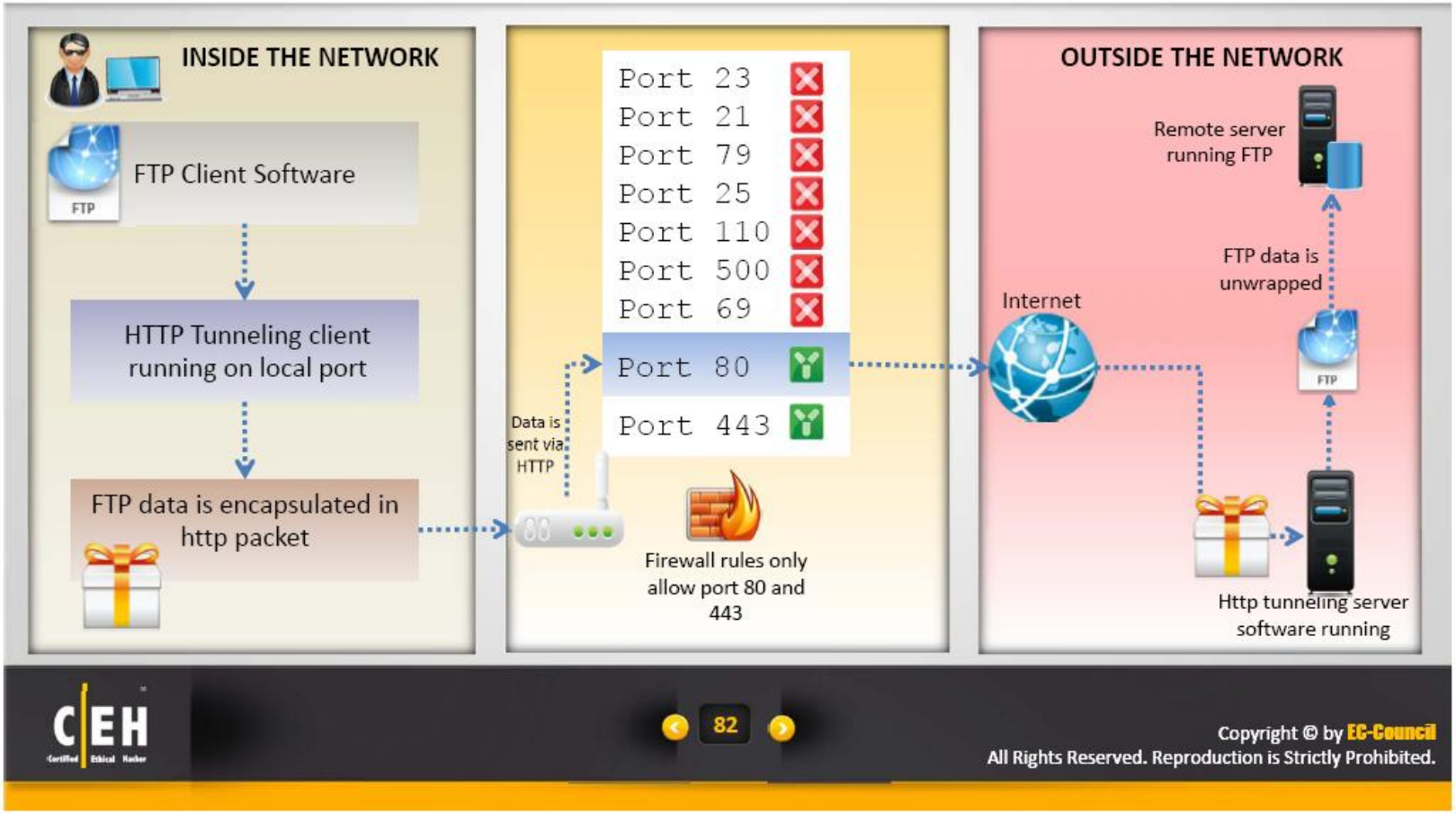
HTTP Tunneling Techniques

- HTTP Tunneling technology allows users to perform various Internet tasks despite the restrictions imposed by firewalls
- This is made possible by sending data through HTTP (port 80)



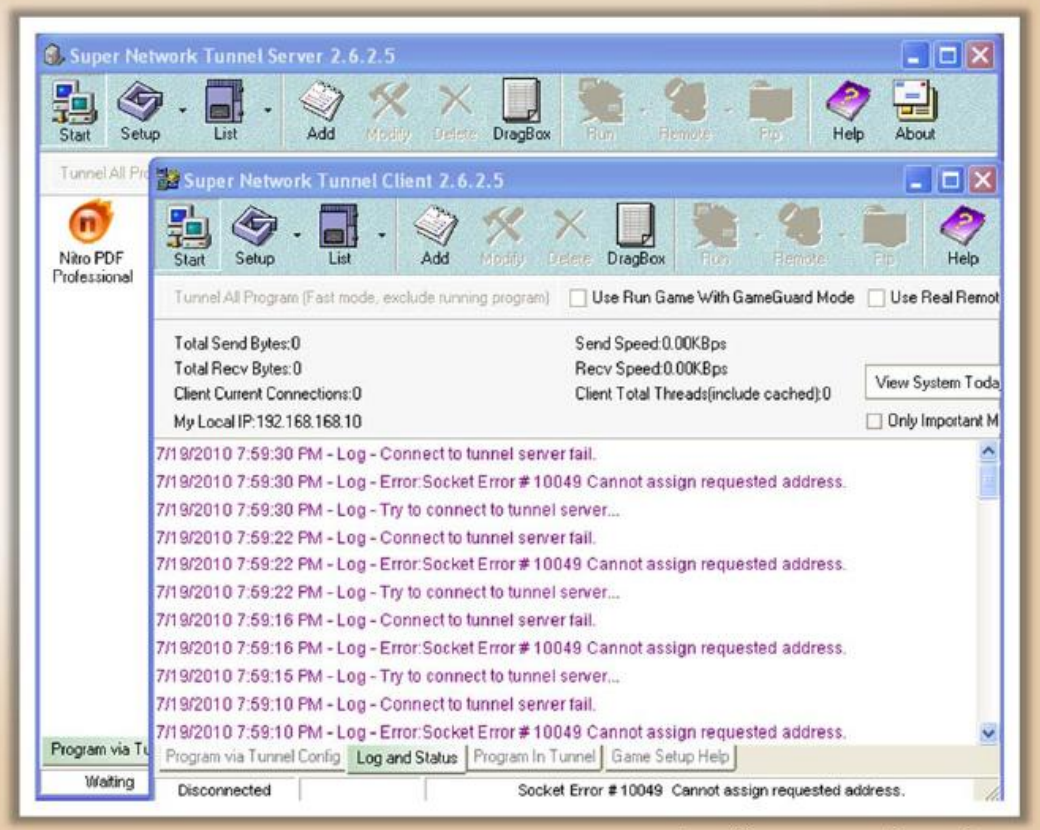
Why do I Need HTTP Tunneling?

- If the organization has blocked all the ports in your firewall and only allows **port 80/443** and you want to use FTP to connect to some remote server on the Internet
- In this case, you can send your packets **via http protocol**



Super Network Tunnel Tool

It is a **two-way http tunnel** software connecting two computers. It works like **VPN tunneling** but uses http protocol to establish a connection



http://www.networktunnel.net

Httptunnel for Windows

- httptunnel creates a **bidirectional virtual data connection** tunnelled in HTTP requests. The HTTP requests can be sent via an HTTP proxy if so desired
- This can be **useful for users behind the restrictive firewalls**
- If WWW access is allowed through an HTTP proxy, it is possible to use httptunnel and, say, **telnet or PPP to connect to a computer outside the firewall**

On the server, you must run hts. If you want to redirect all port 80 (http) traffic to port 23 (telnet), it would go something like:

```
hts -F server.test.com:23 80
```

On the client you would run htc. If you are going through a proxy, the -P option is needed otherwise omit it.

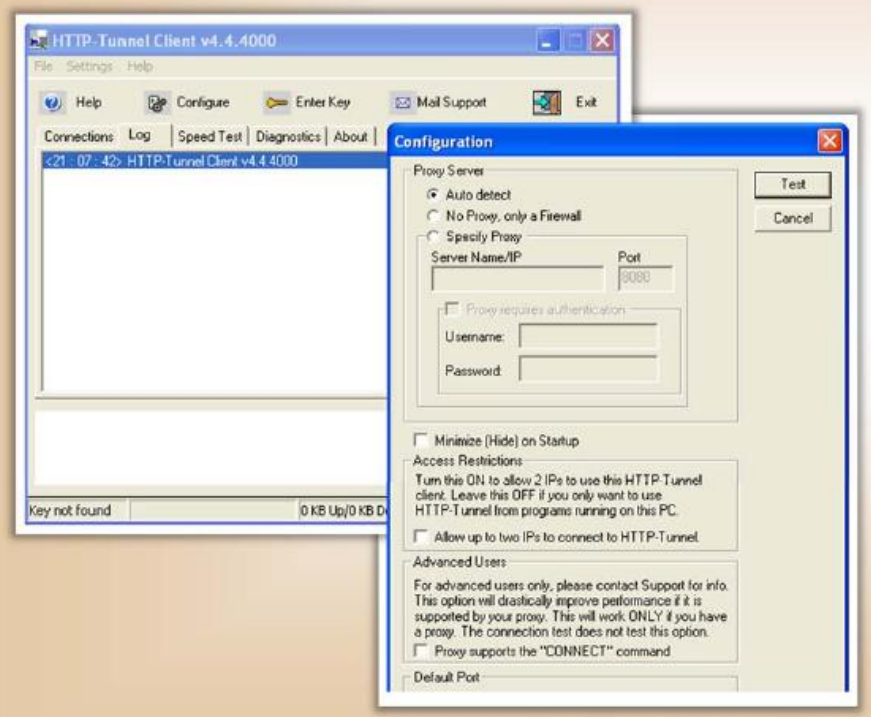
```
htc -P proxy.corp.com:80 -F 22 server.test.com:80
```

Then telnet localhost and it will redirect the traffic out to port 80 on the proxy server and on to port 80 of the server, then to port 23

http://www.neophob.com

Additional HTTP Tunneling Tools

HTTP-Tunnel



http://www.http-tunnel.com

HTTPort

website unavailable

SSH Tunneling

- Using OpenSSH you can **tunnel all of the traffic from your local box to a remote box** that you have an account on

```
ssh -f user@juggyboy.com -L
2000:juggyboy.com:25 -N
```

`-f` = backgroung mode

`user@juggyboy.com` = user name and server you are logging into

`-L 2000:juggyboy.com:25` = local-port:host:remote-port

`-N` = Do not execute the command on the remote system

*This essentially forwards the **local port 2000 to port 25** on juggyboy.com encrypted*

Simply point your E-mail client to use localhost:2000 as the SMTP server

SSL Proxy Tool

SSLproxy is a **transparent proxy** that can translate between encrypted and unencrypted data transport **on socket connections**

It also has a **non-transparent mode** for automatic encryption-detection on netbios

http://www.obdev.at

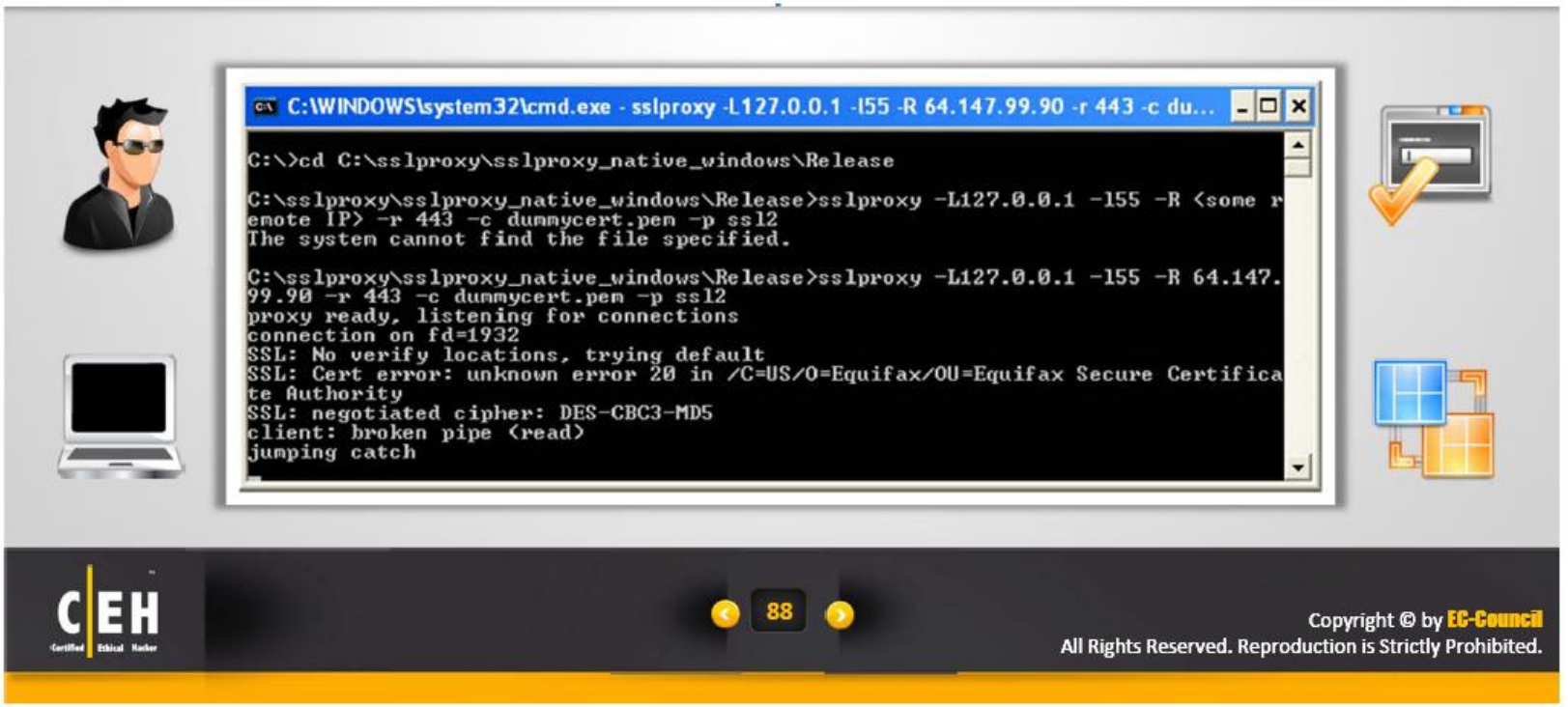
How to Run SSL Proxy?

Window 1: Client – Hacker Machine Run:

```
sslproxy -L127.0.0.1 -155 -R <some
remote IP> -r 443 -c dummycert.pem
-p ssl2
```

Window 2: Client - Connect to 12.0.0.1 port 55 and send your exploits

- Example: `telnet 127.0.0.1 55`
- Then type `GET /`



Proxy Tools

Proxy Commander
http://www.dlao.com

FastProxySwitch
http://affinity-tools.com

GProxy
http://gpass1.com

ProxyFinder
http://www.proxy-tool.com

Protoport Proxy Chain
http://www.protoport.com

ProxyFinder Enterprise
http://www.proxy-tool.com

Proxy+
http://www.proxyplus.cz

Proxy-Pro Professional GateKeeper
http://www.sysgenic.com

Proxy Tools

ezProxy
http://psw.oclc.org

ProxyBag
http://www.alcenia.com

SurfStream
http://software-files-l.cnet.com

CC Proxy Server
http://www.yzsoft.net

Proxy Switcher
http://www.proxyswitcher.com

Proxyswitcher Lite
http://www.proxyswitcher.com

JAP Anonymity and Privacy
http://anon.inf.tu-dresden.de

Free Proxy
http://www.sysgenic.com

Anonymizers

- An anonymizer **removes all the identifying information** from the user's computers while the user surfs the Internet
- Anonymizers make **activity on the Internet untraceable**
- Anonymizer tools allow you to **bypass Internet censored websites**

Why use Anonymizer?

Types of Anonymizers

Networked Anonymizers

They transfer communications through a network of Internet computers between you and the destination

Advantage: Complication of the communications makes traffic analysis complex

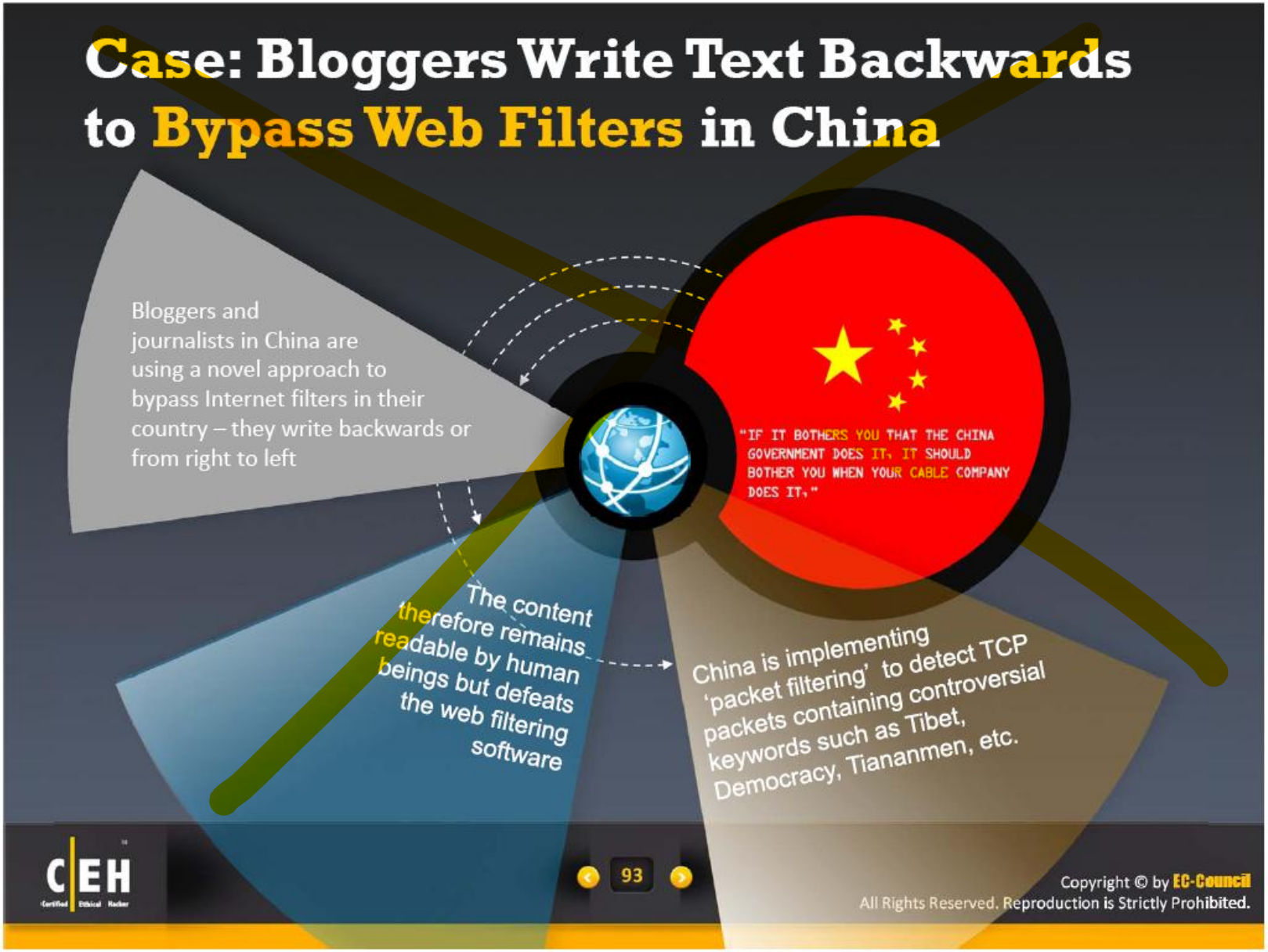
Disadvantage: Any multi-node network communications have some degree of risk at each node for compromise of confidentiality

Single-point Anonymizers

They passes your surfing through a single web site to protect your identify

Advantage: User's IP address and related identifying information are protected by the arms-length communications

Disadvantage: It offers less resistance to the sophisticated traffic analysis


Case: Bloggers Write Text Backwards to Bypass Web Filters in China
Bloggers and journalists in China are using a novel approach to bypass Internet filters in their country – they write backwards or from right to left
"IF IT BOTHERS YOU THAT THE CHINA GOVERNMENT DOES IT, IT SHOULD BOTHER YOU WHEN YOUR CABLE COMPANY DOES IT."
The content therefore remains readable by human beings but defeats the web filtering software
China is implementing 'packet filtering' to detect TCP packets containing controversial keywords such as Tibet, Democracy, Tiananmen, etc.
CEH
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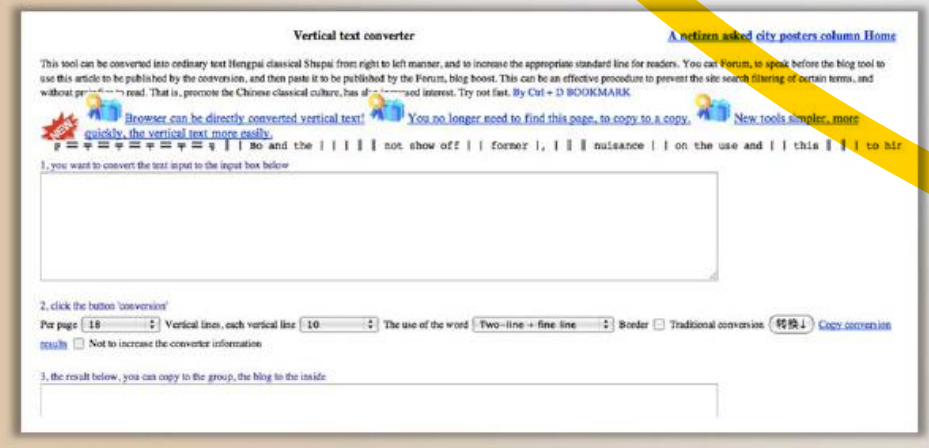
Text Conversion to Avoid Filters

Manual Conversion

- Manual text conversion is a type of **classical steganography**, where text in natural language is jumbled according to a predefined pattern known to both sender and receiver
- It can be used to **bypass keyword based Internet filtering** but is not effective against URL or DNS filtering techniques

Dismissing privacy concerns, a judge ordered YouTube to disclose who watches which video clips and when.

w h e n	c l i p s a n d	i c h v i d e o	w a t c h e s w h	c l o s e w h o	u b e t d i s	d e r e d Y o u T	A j u d g e o r



This tool can convert an ordinary Chinese classical text from **horizontal to vertical patterns** to avoid firewall rules

Tool: Vertical Text Converter
(http://www.cshbl.com)

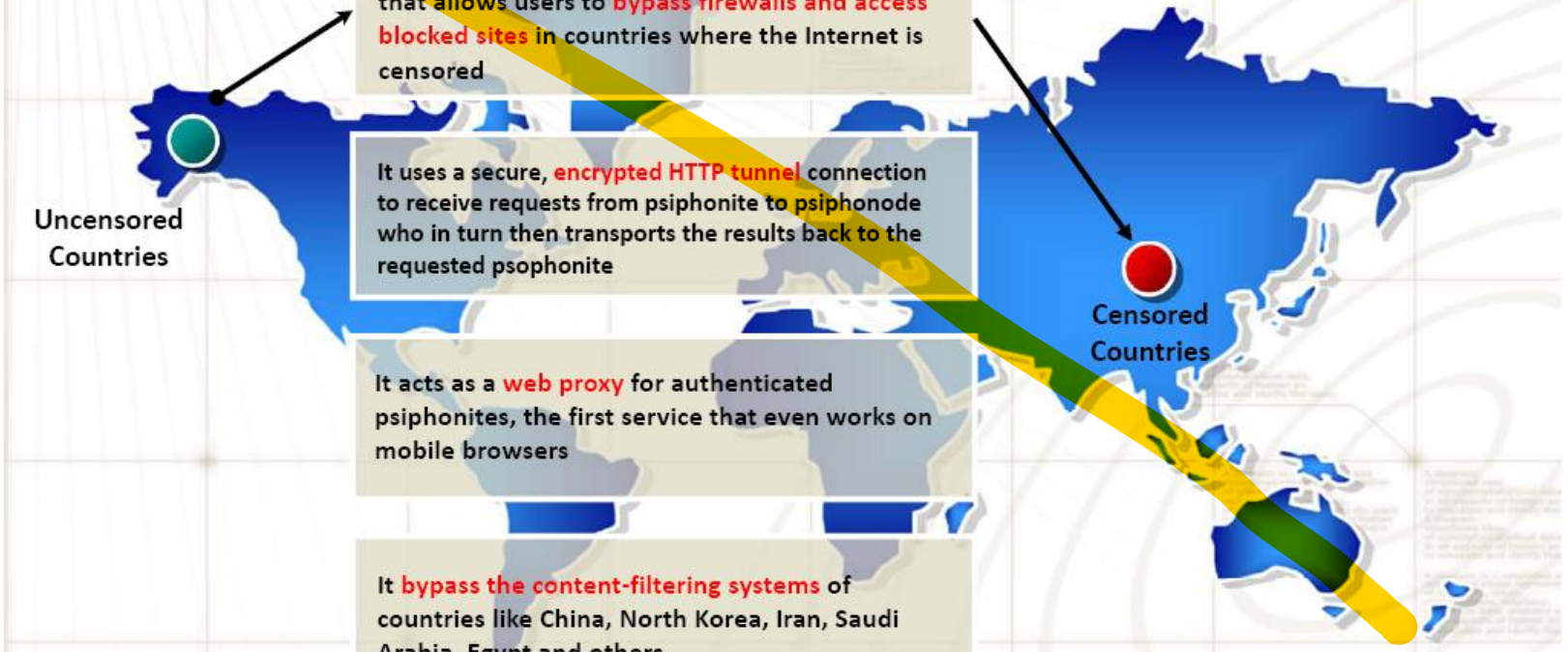
Censorship Circumvention Tool: Psiphon

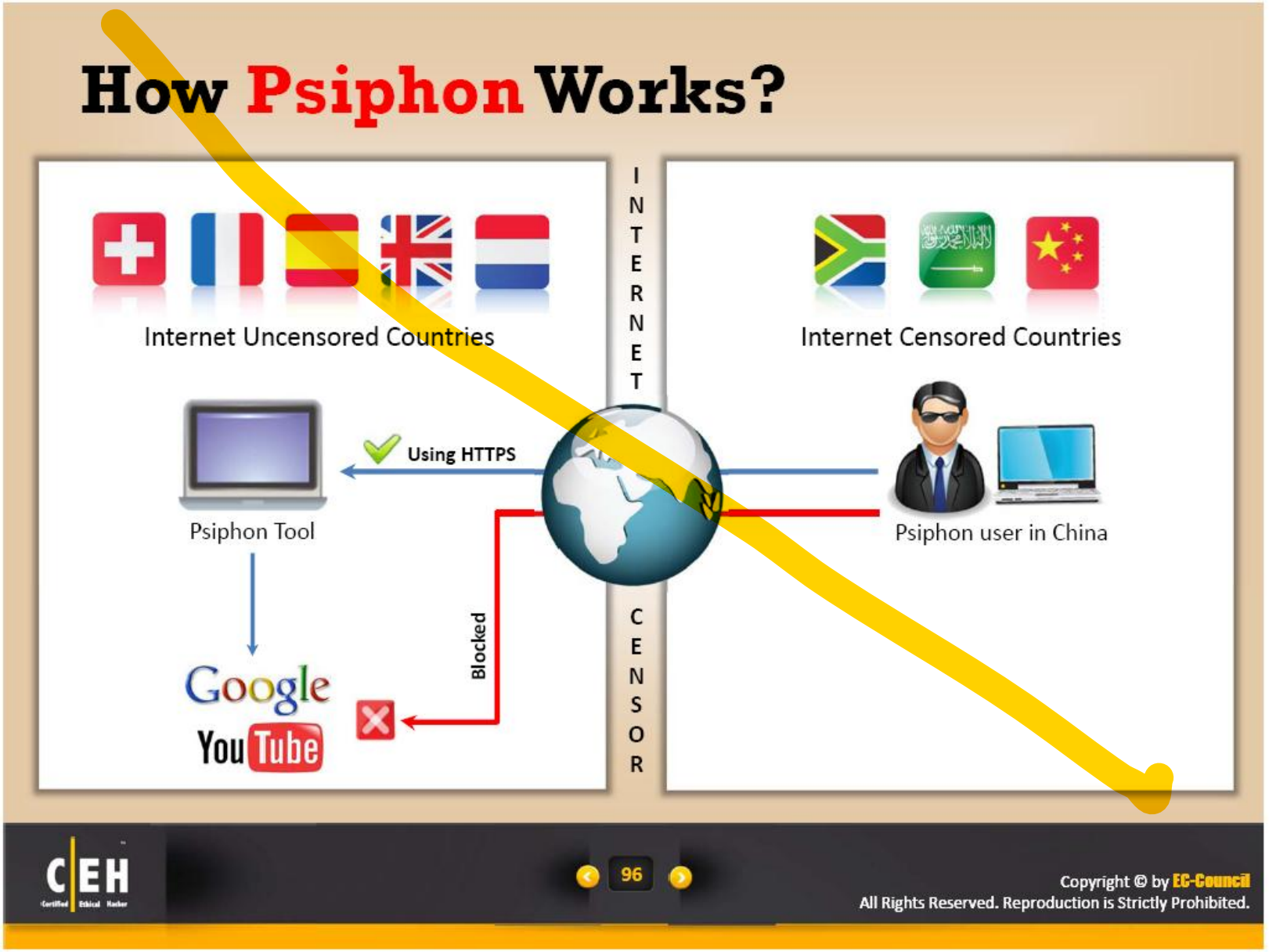
Psiphon is a censorship circumvention system that allows users to bypass firewalls and access blocked sites in countries where the Internet is censored

It uses a secure, encrypted HTTP tunnel connection to receive requests from psiphonite to psiphonode who in turn then transports the results back to the requested psophonite

It acts as a web proxy for authenticated psiphonites, the first service that even works on mobile browsers

It bypass the content-filtering systems of countries like China, North Korea, Iran, Saudi Arabia, Egypt and others




How Psiphon Works?
Internet Uncensored Countries
Internet Censored Countries
INTERNET CENSOR
Using HTTPS
Blocked
Psiphon Tool
Psiphon user in China
Google
YouTube
CEH
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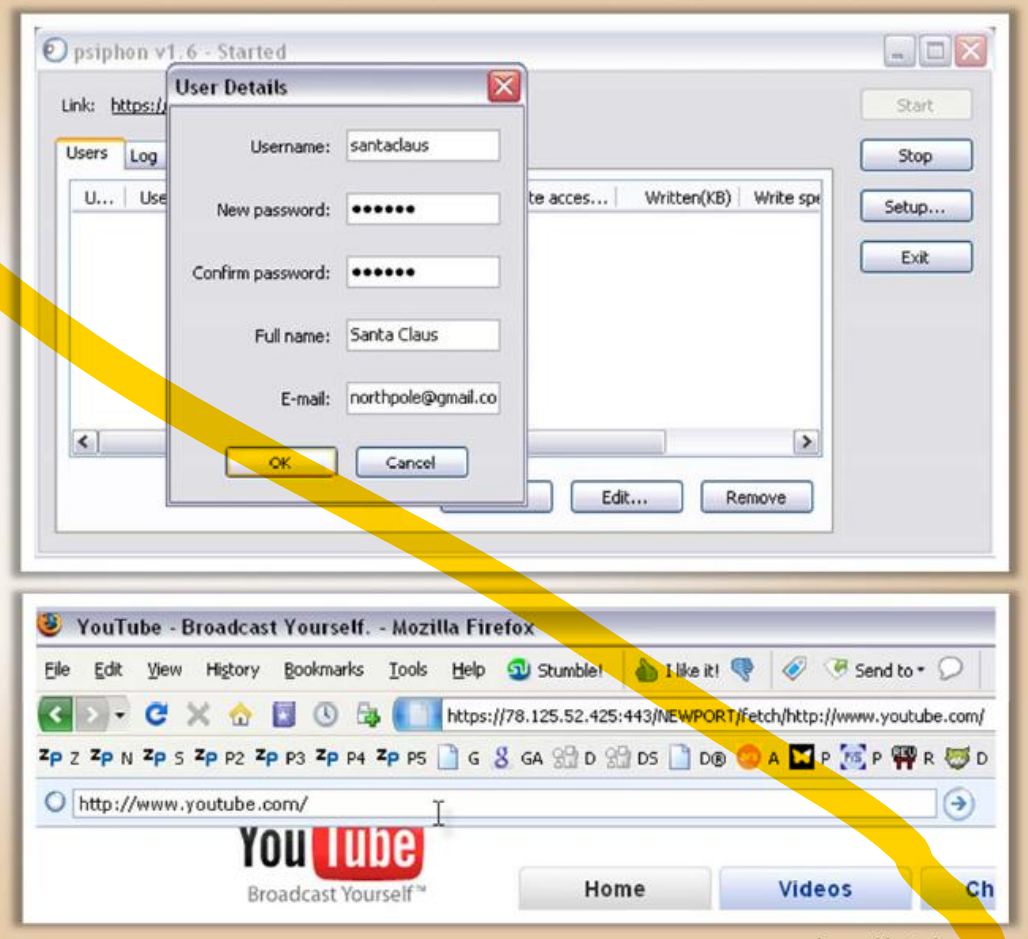
Psiphon: Screenshot

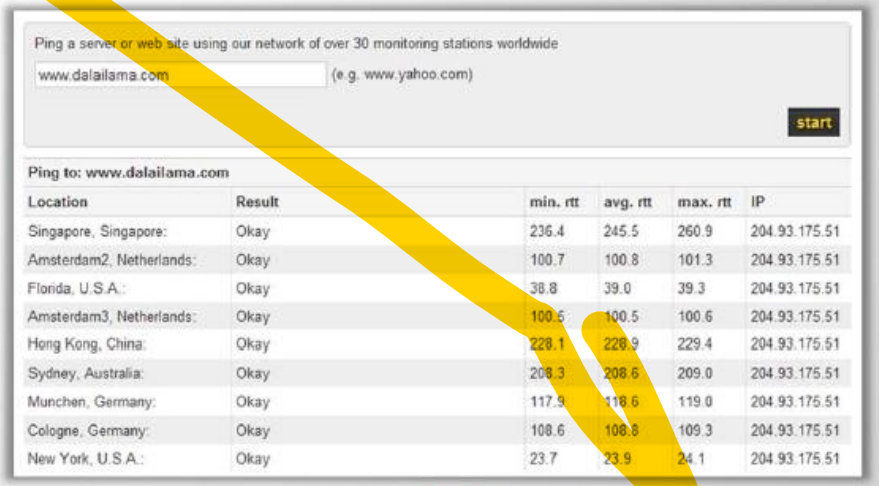


http://psiphon.ca

How to Check if Your Website is Blocked in China or Not?

- "How do I find out if web users in China can access my website at xyz.com?"
- If you get a "Packets lost" error or there is a time-out while connecting to your site, chances are that the site is restricted

Just Ping
(http://www.just-ping.com)

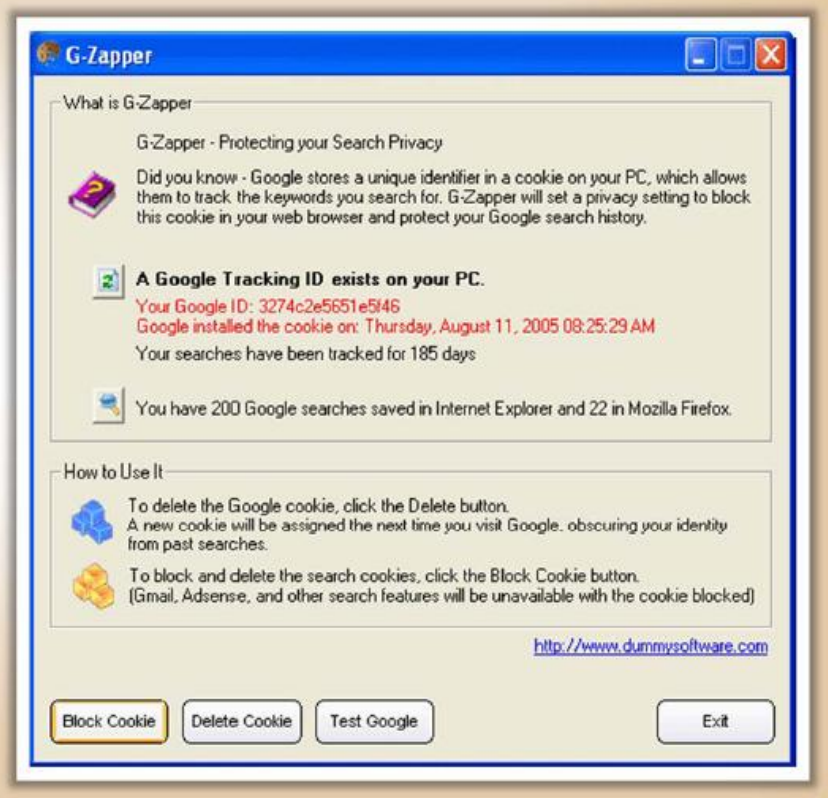


Watch Mouse
(http://www.watchmouse.com)

G-Zapper

- Google sets a cookie on users' system with a unique identifier that enables them to track users' web activities such as:
  1. Search Keywords and habits
  2. Search results
  3. Websites visited
- Google cookies expire in two years
- Information from Google cookies can be used as evidence in a court of law
- This is what Google's log might look like when you search for "PORSCHE"

```
inktomi1-lng.server.ntl.com -
28/Jan/2010 11:16:32
http://www.google.com/search?q=PORSCH
E" - MSIE 8.0; Windows NT 7.0 -
```



http://www.dummysoftware.com

Anonymizers

Mowser
http://www.mowser.com

Anonymizer
http://anonymizer.com

Anonymous Web Surfing Tool
http://www.anonymous-surfing.com

The Cloak
http://www.the-cloak.com

Hide Your IP Address
http://www.hideyouripaddress.net

IDsecure
http://www.idzap.com

JAP Anonymity and Privacy
http://anon.inf.tu-dresden.de

Guardster
http://www.guardster.com

Spoofing IP Address

IP spoofing refers to the procedure of an attacker changing his or her IP address so that he or she appears to be someone else

When the victim replies to the address, it goes back to the spoofed address and not to the attacker's real address

Attacker sending a packet with a spoofed address 7.7.7.7

Reply goes to the real IP address

Victim IP address
5.5.5.5

Real address
7.7.7.7

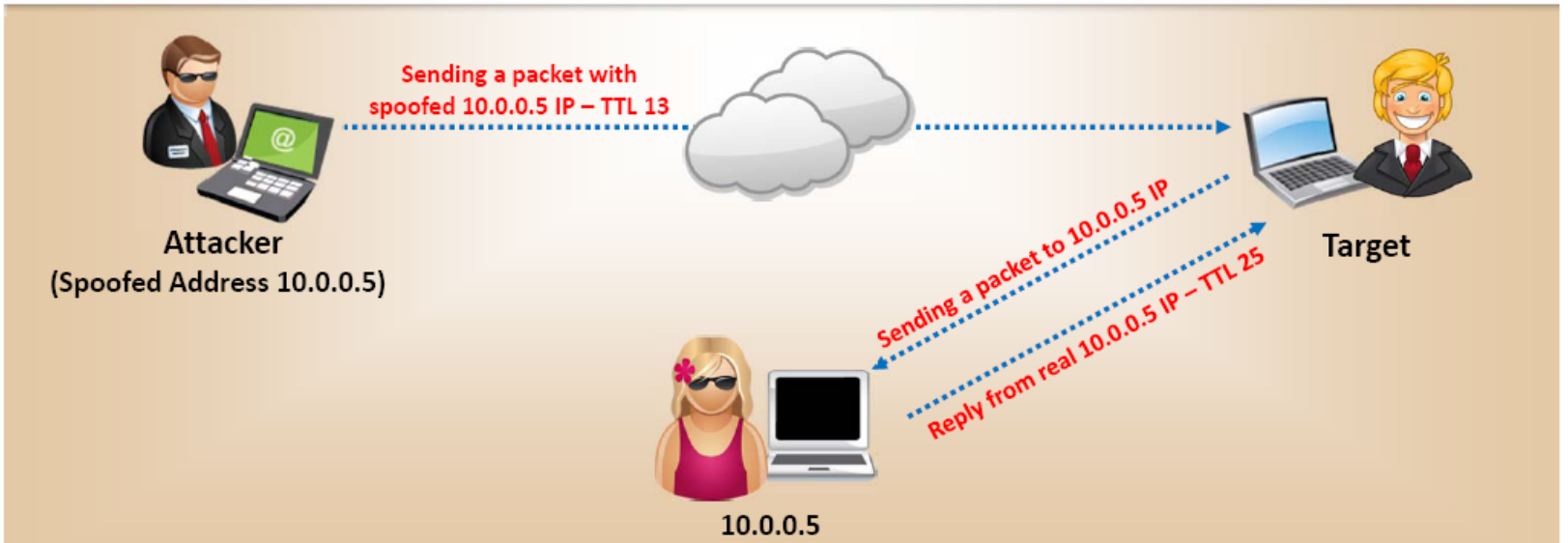
IP spoofing using Hping2:

```
Hping2 www.juggyboy.com -a 7.7.7.7
```

You will not be able to complete the three-way handshake and open a successful TCP connection by spoofing an IP address

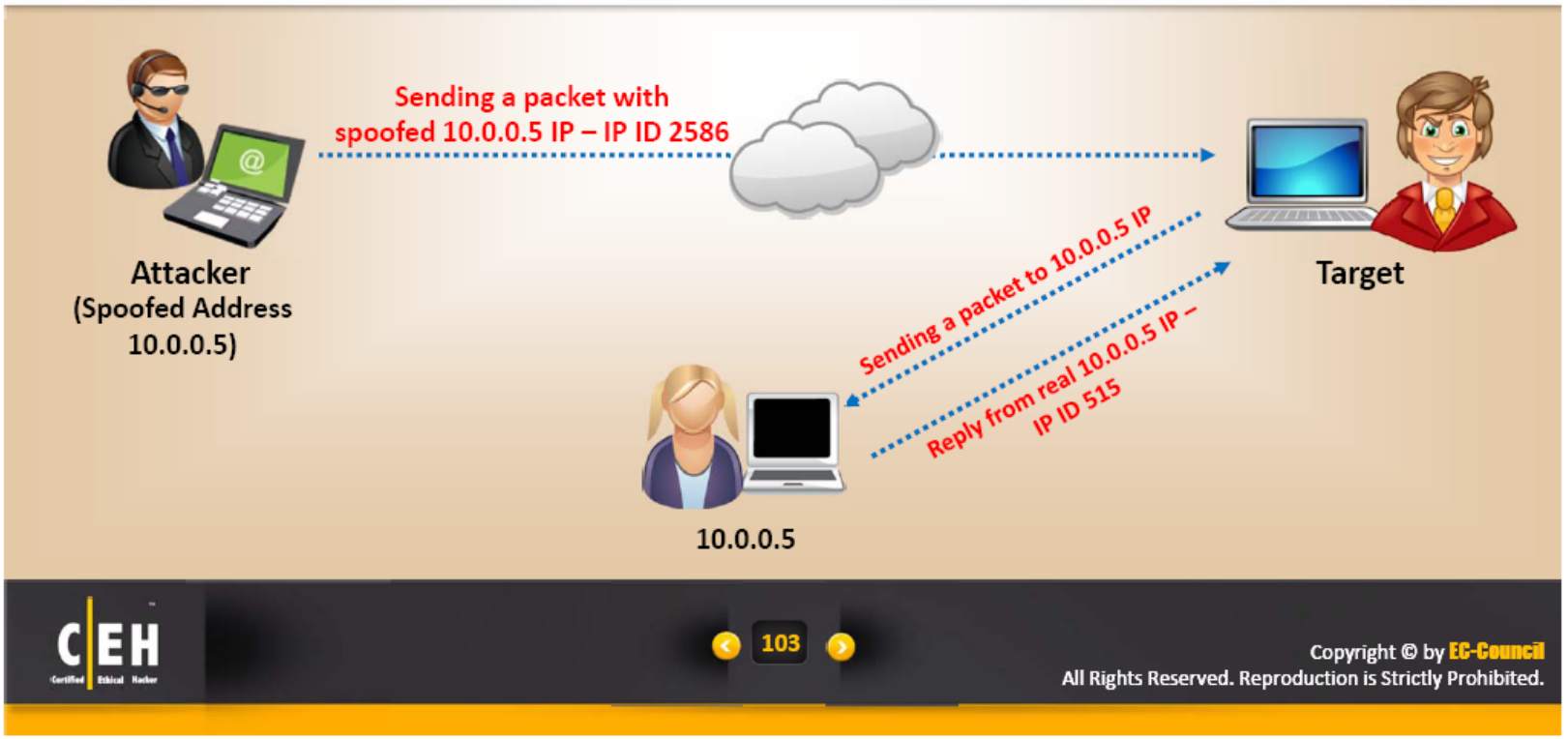
IP Spoofing Detection Techniques: Direct TTL Probes

- Sending a packet to the claimed host will result in a reply, if the TTL in the reply is not the same as the packet being checked, it is a spoofed packet
- This technique is successful when attacker is in a different subnet



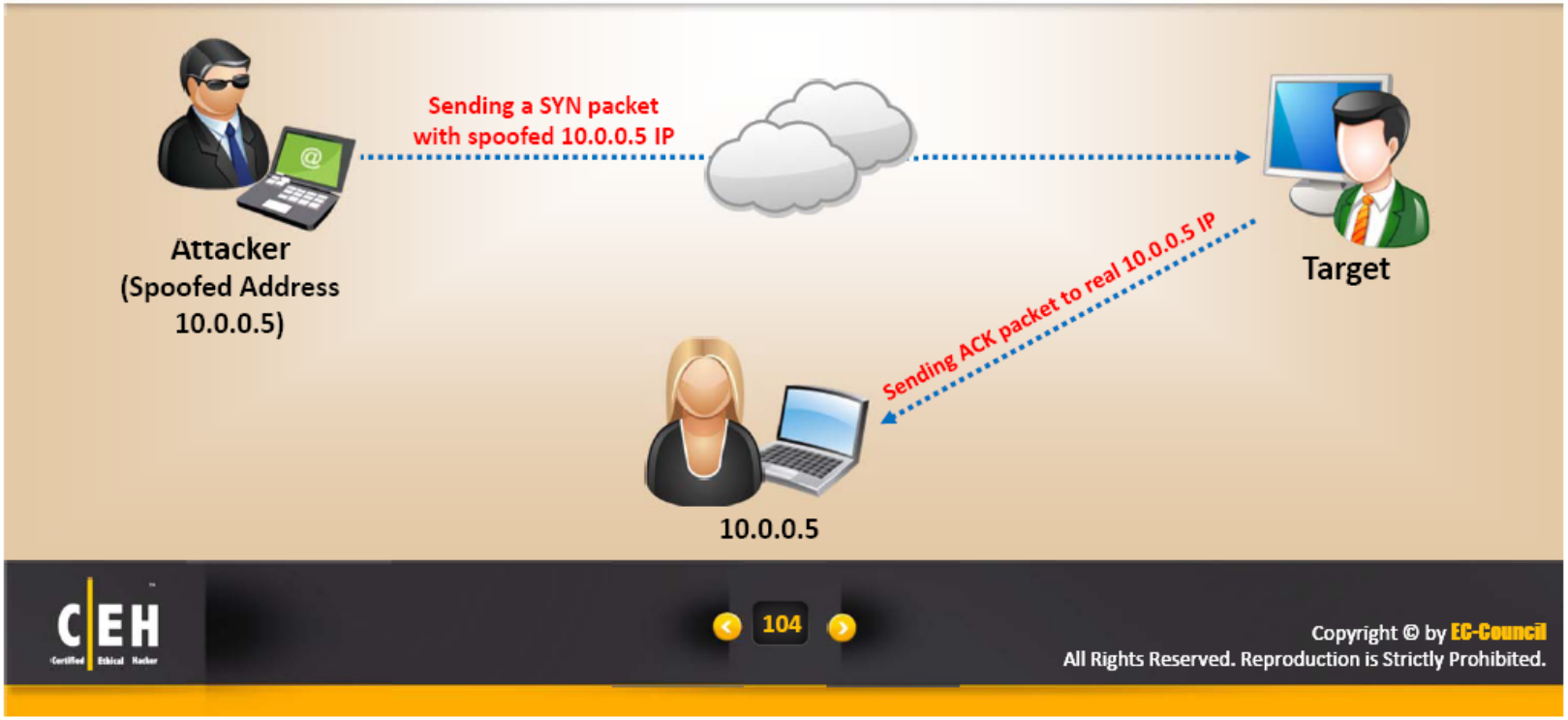
IP Spoofing Detection Techniques: IP Identification Number

- Sending a probe packet to the claimed host will result in a reply, if the IP ID number in the reply is not in the near value as the packet being checked, it is a spoofed packet
- This technique is successful even if the attacker is in the same subnet



IP Spoofing Detection Techniques: TCP Flow Control Method

- If attacker is sending spoofed packets, he will not receive the target's ACK-packets and will not respond with SYN+ACK packet
- If the attacker does not stop sending packets after the initial window size is exhausted, most probably the packets are spoofed



IP Spoofing Countermeasures

Encryption

Encrypt all network traffic

Limit Access

Limit access to configuration information on a machine

Egress Filtering

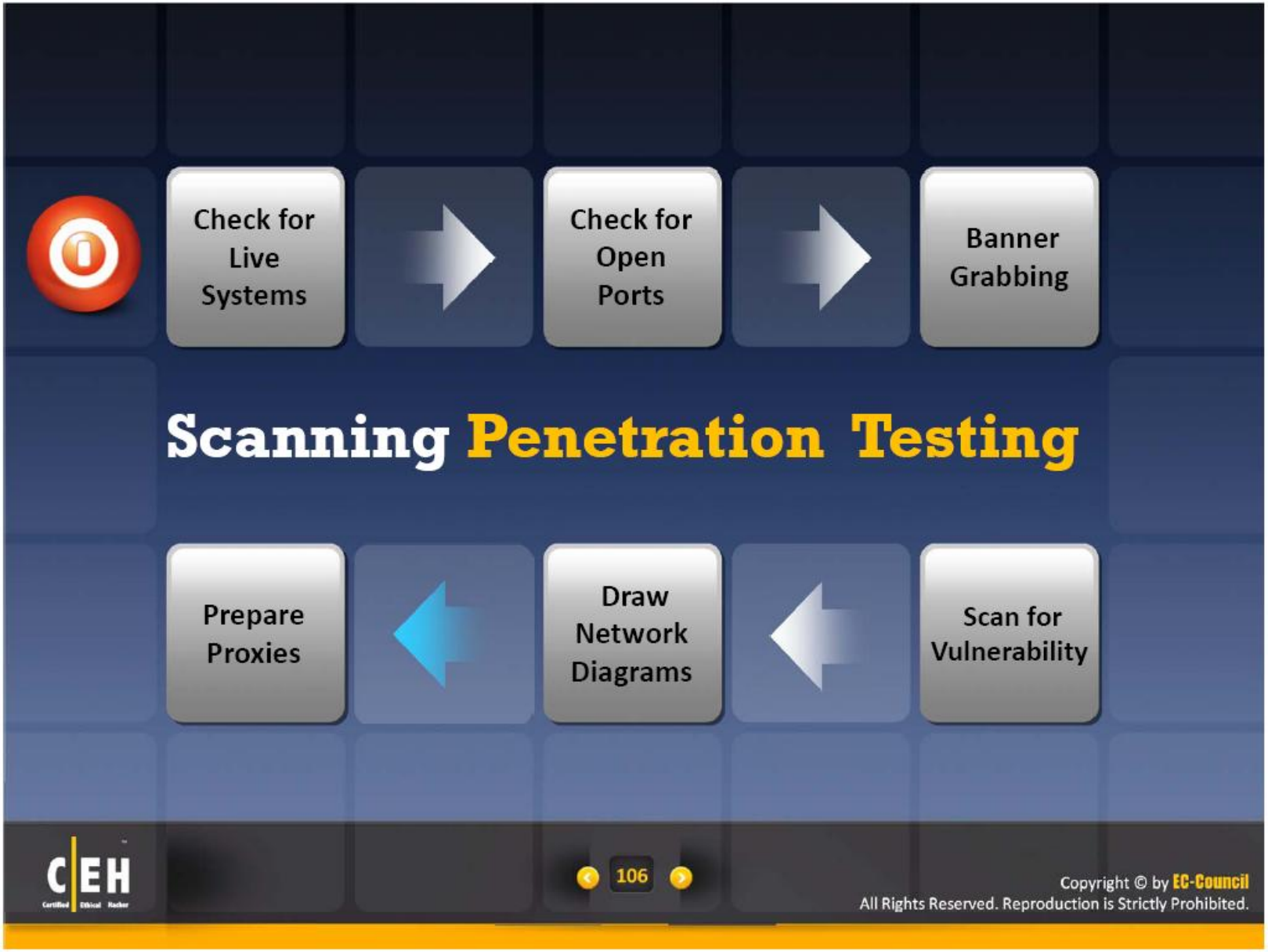
Use filters to prevent packets from leaving your network

Ingress Filtering

Use router filters to prevent packets from entering your network

Sequence Number

Use random initial sequence numbers


Check for Live Systems
Check for Open Ports
Banner Grabbing
Scanning Penetration Testing
Prepare Proxies
Draw Network Diagrams
Scan for Vulnerability
CEH
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Scanning Pen Testing

- The objective of penetration testing a network for scanning attempts is to determine the network security posture by identifying live systems, discovering open ports, associated services and grabbing system banners from a remote location simulating a network hacking attempt
- The penetration testing report will help system administrators to:

Scanning Pen Testing

START

Perform Host discovery ← Use tools such as Angry IP Scanner, Nmap, Netscan, etc.

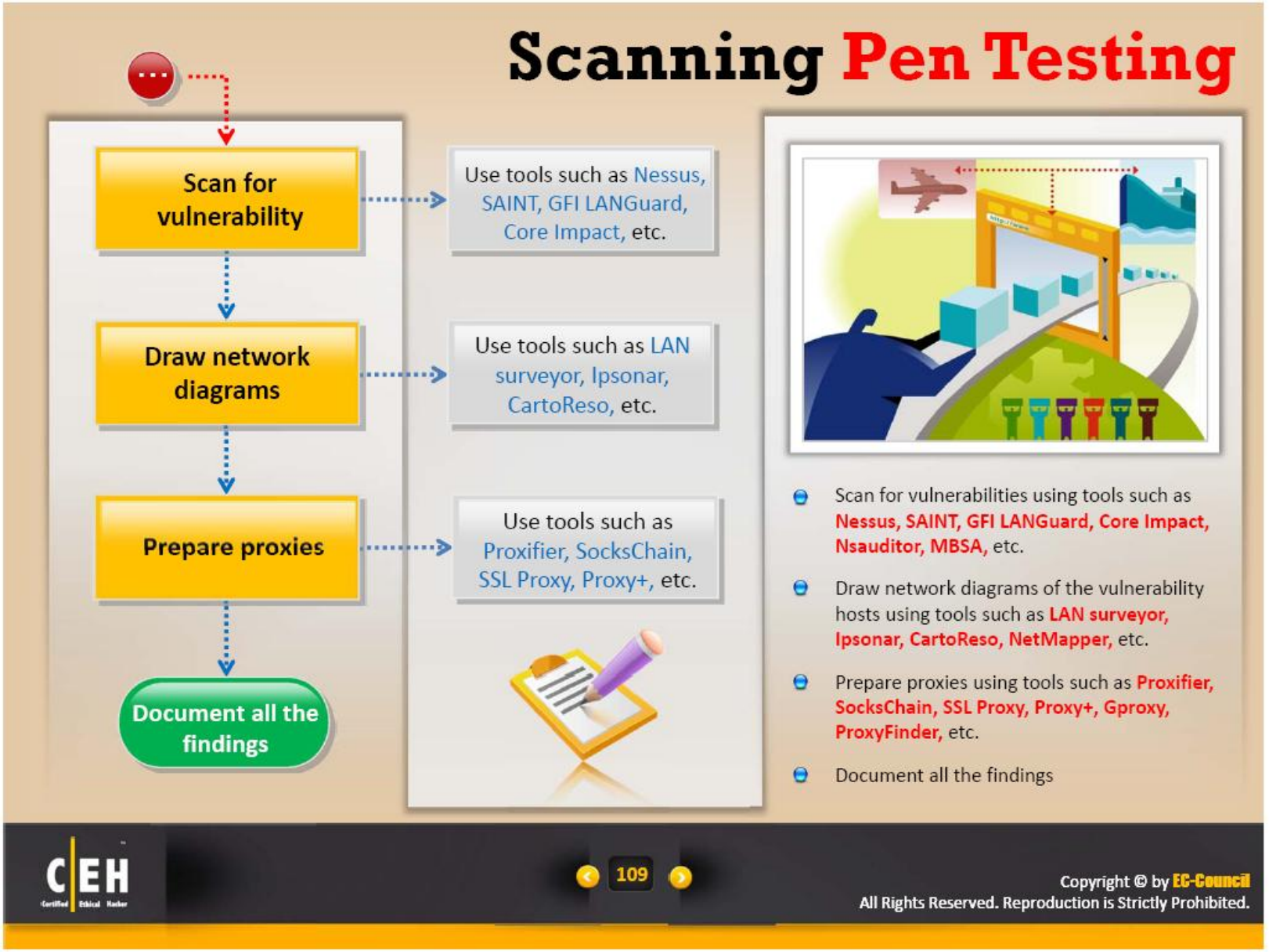
Perform Port scanning ← Use tools such as Nmap, Netscan Tools Pro, UDP Scanner, etc.

Perform Banner Grabbing/OS Fingerprinting ← Use tools such as Telnet, Netcraft, Xprobe, Satori, etc.

...

- Check for the live hosts using tools such as **Angry IP Scanner, SolarWinds Engineer's toolset, Colasoft Ping, Utility Ping, Nmap, Netscan,** etc.
- Check for open ports using tools such as **Nmap, Netscan Tools Pro, Net Tools Suite Pack, UDP Scanner,** etc.
- Perform banner grabbing/OS fingerprinting using tools such as **Telnet, Netcraft, Xprobe, Satori,** etc.

Scanning Pen Testing



Module Summary

- Scanning is one of the three components of intelligence gathering for an attacker
- The objective of scanning is to discover live systems, active/running ports, the operating systems, and the services running on the network
- FTP bounce scanning is a type of port scanning which makes use of the Bounce attack vulnerability in FTP servers
- War dialing involves the use of a program in conjunction with a modem to penetrate the modem-based systems of an organization by continually dialing in
- OS fingerprinting is the method to determine the operating system that is running on the target system
- Proxy is a network computer that can serve as an intermediary for connecting with other computers
- A chain of proxies can be created to evade the traceback of the attacker

Quotes

"The only problem with Microsoft is that they have no taste. They have absolutely no taste. And what that means is, I don't mean it in a small way I mean't it in a big way."

- Steve Jobs,
CEO, Apple Inc.