Certified Ethical Hacker (CEH) Exam Cheat Sheet

STATIONX
THE CYBER SECURITY COMPANY

Basics

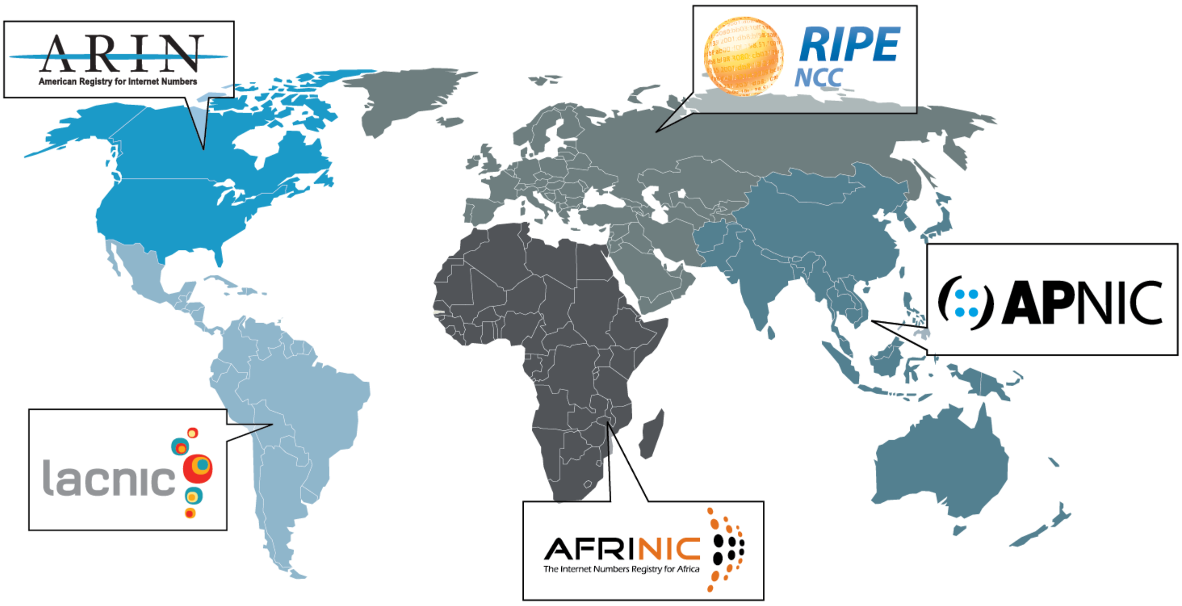
ATTACK TYPES
OS: Attacks targeting default OS settings
App level: Application code attacks
Shrink Wrap: off-the-shelf scripts and code
Misconfiguration: not configured well

5 phases to a penetration
Reconnaissance
Scanning & Enumeration
Gaining Access
Maintaining Access
Covering Tracks

Legal

18 U.S.C 1029 & 1030	
RFC 1918 – Private IP Standard	SOX – Corporate Finance Processes
RFC 3227 – Collecting and storing data	GLBA – Personal Finance Data
ISO 27002 – InfoSec Guideline	**FERPA –** Education Records
CAN-SPAM – email marketing	**FISMA –** Gov Networks Security Std
SPY-Act – License Enforcement	**CVSS –** Common Vuln Scoring System
DMCA – Intellectual Property	**CVE –** Common Vulns and Exposure

Regional Registry Coverage Map


ARIN
American Registry for Internet Numbers
RIPE NCC
APNIC
lacnic
AFRINIC
The Internet Numbers Registry for Africa

Cryptography

SYMMETRIC ENCRYPTION
Only one key used to encrypt and decrypt

ASYMMETRIC ENCRYPTION
Public key = Encrypt, Private Key = Decrypt

SYMMETRIC ALGORITHMS
DES: 56bit key (8bit parity); fixed block
3DES: 168bit key; keys ≤ 3
AES: 128, 192, or 256; replaced DES
IDEA: 128bit key
Twofish: Block cipher key size ≤ 256bit
Blowfish: Rep. by AES; 64bit block
RC: incl. RC2 —> RC6. 2,040key, RC6 (128bit block)

ASYMMETRIC ALGORITHMS
Diffie-Hellman: key Exchange, used in SSL/IPSec
ECC: Elliptical Curve. Low process power/Mobile
EI Gamal: !=Primes, log problem to encrypt/sign
RSA: 2 x Prime 4,096bit. Modern std.

HASH ALGORITHMS
MD5: 128bit hash, expres as 32bit hex
SHA1: 160bit hash,rq 4 use in US apps
SHA2: 4 sep hash 224,256,384,512

TRUST MODELS
Web of trust: Entities sign certs for each other
Single Authority: CA at top. Trust based on CA itself
Hierarchical: CA at top. RA's Under to manage certs
XMKS – XML PKI System

CRYPTOGRAPHY ATTACKS
Known Plain-text: Search plaintext for repeatable sequences. Compare to t versions.
Ciphertext-only: Obtain several messages with same algorithm. Analyze to reveal repeating code.
Replay: Performed in MITM. Repeat exchange to fool system in setting up a comms channel.

DIGITAL CERTIFICATE	
Used to verify user identity = nonrepudiation	**Valid from/to:** Certificate good through dates
Version: Identifies format. Common = V1	**Key usage:** Shows for what purpose cert was made
Serial: Uniquely identify the certificate	**Subject's public key:** self-explanatory
Subject: Whoever/whatever being identified by cert	**Optional fields:** e.g., Issuer ID, Subject Alt Name…
Algorithm ID: Algorithm used	
Issuer: Entity that verifies authenticity of certificate	

Reconnaissance

DEFINITION
Gathering information on targets, whereas foot-printing is mapping out at a high level. These are interchangeable in C|EH.

GOOGLE HACKING
Operator: keyword additional search items
site: Search only within domain
ext: File Extension
loc: Maps Location
intitle: keywords in title tag of page

DNS RECORD TYPES
Service (SRV): hostname & port # of servers
Start of Authority (SOA): Primary name server
Pointer (PTR): IP to Hostname; for reverse DNS

allintitle: any keywords can be in title
inurl: keywords anywhere in url
allinurl: any of the keywords can be in url
incache: search Google cache only

Name Server (NS): NameServers with namespace
Mail Exchange (MX): E-mail servers
CNAME: Aliases in zone. list multi services in DNS
Address (A): IP to Hostname; for DNS lookup
DNS footprinting: whois, nslookup, dig

TCP HEADER FLAGS
URG: Indicates data being sent out of band
ACK: Ack to, and after SYN
PSH: Forces delivery without concern for buffering
RST: Forces comms termination in both directions
SYN: Initial comms. Parameters and sequence #'s
FIN: ordered close to communications

DNS
port 53 nslokup (UDP), Zone xfer (TCP)

DHCP
Client – Discover-> Server
Client<–Offers–- Server
Client –Request–> Server
Client<–-ACK–- Server
IP is removed from pool

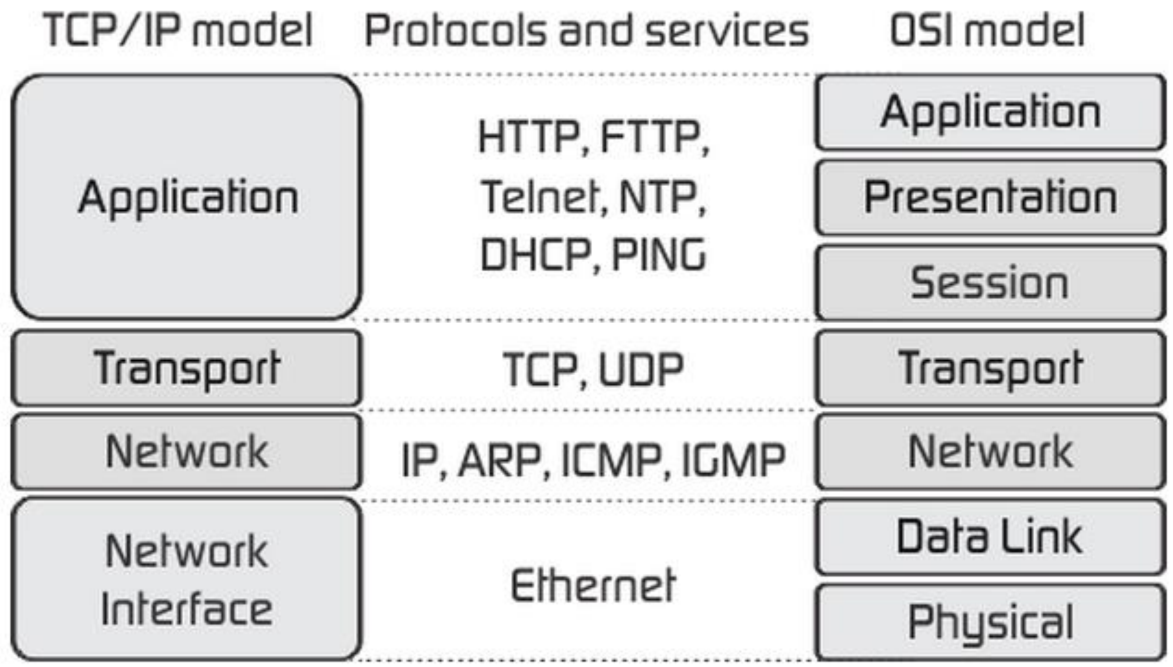
Scanning & Enumeration

ICMP MESSAGE TYPES	
0: Echo Reply: Answer to type 8 Echo Request	
3: Destination Unreachable: No host/ network Codes	**4:** Source Quench: Congestion control message
0 – Destination network unreachable	**5:** Redirect: 2+ gateways for sender to use or the best route not the configured default gateway Codes
1 – Destination host unreachable	0 – redirect datagram for the network
6 – Network unknown	1 – redirect datagram for the host
7 – Host unknown	**8:** Echo Request: Ping message requesting echo
9 – Network administratively prohibited	**11:** Time Exceeded: Packet too long be routed
10 – Host administratively prohibited	
13 – Communication administratively prohibited	

CIDR

Method of the representing IP Addresses.

IPV4 NOTATION	
/30=4	.255.252
/28=16	.255.240
/26=64	.255.192
/24=256	. 255.0
/22=1024	.248.0
/20=4096	.240.0



TCP/IP model	Protocols and services	OSI model
Application	HTTP, FTTP, Telnet, NTP, DHCP, PING	Application Presentation Session
Transport	TCP, UDP	Transport
Network	IP, ARP, ICMP, IGMP	Network
Network Interface	Ethernet	Data Link Physical

PORT NUMBERS
0 — 1023: Well-known
1024 — 49151: Registered
49152 — 65535: Dynamic

HTTP Error Codes
200 Series – OK
400 Series – Could not provide req
500 Series – Could not process req

IMPORTANT PORT NUMBERS			
FTP:	20/21	**NetBIOS/SMB:**	137-139
SSH:	22	**IMAP:**	143
Telnet:	23	**SNMP:**	161/162
SMTP:	25	**LDAP:**	389
WINS:	42	**HTTPS:**	443
TACACS:	49	**CIFS:**	445
DNS:	53	**RADIUS:**	1812
HTTP:	80 / 8080	**RDP:**	3389
Kerbers:	88	**IRC:**	6667
POP3:	110	**Printer:**	515,631,9100
Portmapper (Linux):	111	**Tini:**	7777
NNTP:	119	**NetBus:**	12345
NTP:	123	**Back Orifice:**	27374
RPC-DCOM:	135	**Sub7:**	31337

NMAP
Nmap is the de-facto tool for this pen-test phase

NMAP <SCAN OPTIONS> <TARGET>
-sA: ACK scan -sF: FIN scan
-sS:SYN -sT: TCP scan
-sI: IDLS scan -sn: PING sweep
-sN: NULL -sS: Stealth Scan
-sR: RPC scan -Po: No ping
-sW: Window -sX: XMAS tree scan
-PI: ICMP ping – PS: SYN ping
-PT: TCP ping -oN: Normal output
-oX: XML output -A OS/Vers/Script
-T<0-4>: Slow – Fast

NMAP SCAN TYPES
TCP: 3 way handshake on all ports.
Open = SYN/ACK, Closed = RST/ACK
SYN: SYN packets to ports (incomplete handshake).
Open = SYN/ ACK, Closed = RST/ ACK
FIN: Packet with FIN flag set
Open = no response, Closed = RST
XMAS: Multiple flags set (fin, URG, and PSH) **Binary Header: 00101001**
Open = no response, Closed = RST
ACK: Used for Linux/Unix systems
Open = RST, Closed = no response
IDLE: Spoofed IP, SYN flag, designed for stealth.
Open = SYN/ACK, Closed= RST/ACK
NULL: No flags set. Responses vary by OS. NULL scans are designed for Linux/ Unix machines.

SNMP
Uses a community string for PW
SNMPv3 encrypts the community strings

NETBIOS	
nbstat	
nbtstat -a COMPUTER 190	nbtstat -S 10 -display ses stats every 10 sec
nbtstat -A 192.168.10.12 remote table	**1B** ==master browser for the subnet
nbtstat -n local name table	**1C** == domain controller
nbtstat -c local name cache	**1D** == domain master browser
nbtstat -r -purge name cache	

Sniffing and Evasion

IPV4 AND IPV6
IPv4 == unicast, multicast, and broadcast
IPv6 == unicast, multicast, and anycast.
IPv6 unicast and multicast scope includes link local, site local and global.

MAC ADDRESS
First half = 3 bytes (24bits) = Org UID
Second half = unique number

NAT (NETWORK ADDRESS TRANSLATION)
Basic NAT is a one-to-one mapping where each internal IP== a unique public IP.
Nat overload (PAT) == port address translation. Typically used as is the cheaper option.

Stateful Inspection
Concerned with the connections. Doesn't sniff ever packet, it just verifies if it's a known connection, then passes along.

HTTP Tunnelling
Crafting of wrapped segments through a port rarely filtered by the Firewall (e.g., 80) to carry payloads that may otherwise be blocked.

IDS EVASION TACTICS
Slow down OR flood the network (and sneak through in the mix) OR fragmentation

TCPDUMP SYNTAX
#~tcpdump flag(s) interface

SNORT IDS	
It has 3 modes:	Sniffer/Packet logger/ Network IDS.
Config file: /etc/snort, or c:snortetc #~alert tcp!HOME_NET any ->$HOME_NET 31337 (msg : "BACKDOOR ATTEMPT-Back-orifice.")	Any packet from any address !=home network. Using any source port, intended for an address in home network on port 31337, send msg.
Span port: port mirroring	**False Negative:** IDS incorrectly reports stream clean

LM HASHING
7 spaces hashed: AAD3B435B51404EE

SAM FILE
C:Windowssystem32config

Attacking a System

C|EH RULES FOR PASSWORDS
Must not contain user’s name. Min 8 chars. 3 of 4 complexity components. E.g., Special, Number, Uppercase, Lowercase

ATTACK TYPES
Passive Online: Sniffing wire, intercept clean text password / replay / MITM
Active Online: Password guessing.
Offline: Steal copy of password i.e., SAM file. Cracking efforts on a separate system
Non-electronic: Social Engineering

SIDEJACKING
Steal cookies exchanged between systems and use tp perform a replay-style attack.

AUTHENTICATION TYPES
Type 1: Something you know
Type 2: Something you have
Type 3: Something you are

SESSION HIJACKING
Refers to the active attempt to steal an entire established session from a target
1. Sniff traffic between client and server
2. Monitor traffic and predict sequence
3. Desynchronise session with client
4. Predict session token and take over session
5. Inject packets to the target server

KERBEROS
Kerberos makes use of symmetric and asymmetric encryption technologies and involves:
KDC: Key Distribution Centre
AS: Authentication Service
TGS: Ticket Granting Service
TGT: Ticket Granting Ticket
Process
1. Client asks KDC (who has AS and TGS) for ticket to authenticate throughout the network. this request is in clear text.
2. Server responds with secret key. hashed by the password copy kept on AD server (TGT).
3. TGT sent back to server requesting TGS if user decrypts.
4. Server responds with ticket, and client can log on and access network resources.

REGISTRY
2 elements make a registry setting: a key (location pointer), and value (define the key setting).
Rot level keys are as follows:
HKEY_LOCAL_MACHINE_Info on Hard/software
HKEY_CLASSES_ROOT – Info on file associations and Object Linking and Embedding (OLE) classes
HKEY_CURRENT_USER – Profile info on current user
HKEY_USERS – User config info for all active users
HEKY_CURRENT-CONFIG–pointer tohardware Profiles.
HEKY_LOCAL-MACHINESoftwareMicrosoftWindowsCurrentVersion
RunServicesOnce
RunServices
Run Once
Run

Social Engineering

HUMAN BASED ATTACKS	COMPUTER BASED ATTACKS
Dumpster diving	Phishing - Email SCAM
Impersonation	Whaling - Targeting CEO’s
Technical Support	Pharming - Evil Twin Website
Should Surfing	
Tailgating/ Piggybacking	

TYPES OF SOCIAL ENGINEERS
Insider Associates: Limited Authorized Access
Insider Affiliates: Insiders by virtue of Affiliation that spoof the identity of the Insider
Outsider Affiliates: Non-trusted outsider that use an access point that was left open

Physical Security

3 MAJOR CATEGORIES OF PHYSICAL SECURITY MEASURES
Physical measures: Things you taste, touch, smell
Technical measures: smart cards, biometrics
Operational measures: policies and procedures

Web-Based Hacking

CSRF - CROSS SITE REQUEST FORGERY

CSRF – CROSS SITE REQUEST FORGERY
Variant of Unicode or un-validated input attack

SQL INJECTION ATTACK TYPES

Union Query: Use the UNION command to return the union of target Db with a crafted Db

Tautology: Term used to describe behavior of a Db when deciding if a statement is true.

Blind SQL Injection: Trial and Error with no responses or prompts.

Error based SQL Injection: Enumeration technique. Inject poorly constructed commands to have Db respond with table names and other information

BUFFER OVERFLOW

A condition that occurs when more data is written to a buffer than it has space to store and results in data corruption. Caused by insufficient bounds checking, a bug, or poor configuration in the program code.

Stack: Premise is all program calls are kept in a stack and performed in order. Try to change a function pointer or variable to allow code exe

Heap: Takes advantage of memory “on top of” the application (dynamically allocated). Use program to overwrite function pointers

NOP Sled: Takes advantage of instruction called “no-op”. Sends a large # of NOP instructions into buffer. Most IDS protect from this attack.

Dangerous SQL functions

The following do not check size of destination buffers: gets() strcpy() stract() printf()

Wireless Network Hacking

WIRELESS SNIFFING

Compatible wireless adapter with promiscuous mode is required, but otherwise pretty much the same as sniffing wired.

802.11 SPECIFICATIONS			
WEP: RC4 with 24bit vector. Kers are 40 or 104bit			
WAP: RC4 supports longer keys; 48bit IV			
WPA/TKIP: Changes IV each frame and key mixing			
WPA2: AES + TKIP features; 48bit IV			
Spec	**Dist**	**Speed**	**Freq**
802.11a	30m	54 Mbps	5GHz
802.11b	100m	11 Mbps	2.4 GHz
802.11g	100m	54 Mbps	2.4 GHz
802.11n	125m	100 Mbps+	2.4/5GHz

BLUETOOTH ATTACKS
Bluesmacking: DoS against a device
Bluejacking: Sending messages to/from devices
Bluesniffing: Sniffs for Bluetooth
Bluesnarfing: actual theft of data from a device

Trojans and Other Attacks

VIRUS TYPES
Boot: Moves boot sector to another location. Almost impossible to remove.
Camo: Disguise as legit files.
Cavity: Hides in empty areas in exe.
Marco: Written in MS Office Macro Language
Multipartite: Attempts to infect files and boot sector at same time.
Metamorphic virus: Rewrites itself when it infects a new file.
Network: Spreads via network shares.
Polymorphic virus: Constantly changing signature makes it hard to detect.
Shell virus: Like boot sector but wrapped around application code, and run on application start.
Stealth: Hides in files, copies itself to deliver payload.

DOS TYPES	
SYN Attack:	Send thousands of SYN packets with a false IP address. Target will attempt SYN/ACK response. All machine resources will be engaged.
SYN Flood:	Send thousands of SYN Packets but never respond to any of the returned SYN/ACK packets. Target will run out of available connections.
ICMP Flood:	Send ICMP Echo packets with a fake source address. Target attempts to respond but reaches a limit of packets sent per second.
Application level:	Send "legitimate" traffic to a web application than it can handle.
Smurf:	Send large number of pings to the broadcast address of the subnet with source IP spoofed to target. Subnet will send ping responses to target.
Fraggle Attack:	Similar to Smurf but uses UDP.
Ping of Death:	Attacker fragments ICMP message to send to target. When the fragments are reassembled, the resultant ICMP packet is larger than max size and crashes the system

Linux Commands

LINUX FILE SYSTEM	
/	-Root
/var	-Variable Data / Log Files
/bin	-Biniaries / User Commands
/sbin	-Sys Binaries / Admin Commands
/root	-Home dir for root user
/boot	-Store kernel
/proc	-Direct access to kernel
/dev	-Hardware storage devices
/mnt	-Mount devices

IDENTIFYING USERS AND PROCESSES
INIT process ID 1
Root UID, GID 0
Accounts of Services 1-999
All other users Above 1000

PERMISSIONS
4 – Read
2 – Write
1 – Execute
User/Group/Others
764 – User>RWX, Grp>RW, Other>R

SNORT
action protocol address port -> address port (option:value;option:value)
alert tcp 10.0.0.1 25 -> 10.0.0.2 25
(msg:"Sample Alert"; sid:1000;)

Command Line Tools

NMAP	NMAP -ST -T5 -N -P 1-100 10.0.0.1
Netcat	nc -v -z -w 2 10.0.0.1
TCPdump	tcpdump -i eth0 -v -X ip proto 1
Snort	snort -vde -c my.rules 1
hping	hping3 -I -eth0 -c 10 -a 2.2.2.2 -t 100 10.0.0.1
iptables	iptables -A FORWARD -j ACCEPT -p tcp –dport 80

CEH Tools

VULNERABILITY RESEARCH
National Vuln Db
Eccouncil.org
Exploit Database

FOOT-PRINTING
Website Research Tools
Netcraft
Webmaster
Archive
DNS and Whois Tools
Nslookup

SCANNING AND ENUMERATION
Ping Sweep
Angry IP Scanner
MegaPing
Scanning Tools
SuperScan
NMap (Zenmap)
NetScan Tools Pro
Hping
Netcat
War Dialing
THC-Scan
TeleSweep

Sam Spacde
ARIN
WhereisIP
DNSstuff
DNS-Digger

Website Mirroring

Wget
Archive
GoogleCache

SYSTEM HACKING TOOLS

Password Hacking

Cain
John the Ripper
LCP
THC-Hydra
ElcomSoft
Aircrack
Rainbow Crack
Brutus
KerbCrack

Sniffing

Wireshark
Ace
KerbSniff
Ettercap

Keyloggers and Screen Capture

KeyProwler
Ultimate Keylogger
All in one Keylogger
Actual Spy
Ghost
Hiddern Recorder
Desktop Spy
USB Grabber

Privilege Escalation

Password Recovery Boot Disk
Password Reset
Password Recovery
System Recovery

Executing Applications

PDQ Deploy
RemoteExec
Dameware

Spyware

Remote Desktop Spy
Activity Monitor
OSMomitor
SSPro
Spector Pro

Covering Tracks

ToneLoc
WarVox

Banner Grabbing

Telnet
ID Serve
Netcraft
Xprobe

Vulnerability Scanning

Nessus
SAINT
Retina
Core Impact
Nikto

Network Mapping

NetMapper
LANState
IPSonar

Proxy, Anonymizer, and Tunneling

Tor
ProxySwitcher
ProxyChains
SoftCab
HTTP Tunnel
Anonymouse

Enumeration

SuperScan
User2Sid/Sid2User
LDAP Admin
Xprobe
Hyena

SNMP Enumeration

SolarWinds
SNMPUtil
SNMPScanner

CRYPTOGRAPHY AND ENCRYPTION

Encryption
TureCrypt
BitLocker
DriveCrpyt
Hash Tools
MD5 Hash
Hash Calc
Steganography
XPTools
ImageHide
Merge Streams
StegParty
gifShuffle
QuickStego
InvisibleSecrets

ELsave
Cleaner
EraserPro
Evidence Eliminator

Packet Craftin/Spoofing

Komodia
Hping2
PackEth
Packet Generator
Netscan
Scapy
Nemesis

Session Hijacking

Paros Proxy
Burp Suite
Firesheep
Hamster/Ferret
Ettecap
Hunt

SNIFFING

Packet Capture

Wireshark
CACE
tcpdump
Capsa
OmniPeek
Windump
dnsstuff
EtherApe
Wireless
Kismet
Netstumbler

MAC Flooding/Spoofing

Macof
SMAC

ARP Poisoning

Cain
UfaSoft
WinARP Attacker

WEB ATTACKS

Wfetch
Httprecon
ID Serve
WebSleuth
Black Widow
CookieDigger
Nstalker
NetBrute

SQL Injection

EZStego
OmniHidePro
Cryptanalysis
Cryptobench

WIRELESS

Discovery
Kismet
NetStumbler
insider
NetSurveyor
Packet Sniffing
Cascade Pilot
Omnipeek
Comm View
Capsa
WEP/WPA Cracking
Aircrack
KisMac
Wireless Security Auditor
WepAttack
WepCrack
coWPatty
Bluetooth
BTBrowser
BH Bluejack
BTScanner
Bluesnarfer
Mobile Device Tracking
Wheres My Droid
Find My Phone
GadgetTrack
iHound

TROJANS AND MALWARE

Wrappers
Elite Wrap
Monitoring Tools
HiJackThis
CurrPorts
Fport
Attack Tools
Netcat
Nemesis
IDS
Snort
Evasion Tools

BSQL Hacker
Marathon
SQL Injection Brute
SQL Brute
SQLNinja
SQLGET

ADMutate
NIDSBench
IDSInformer
Inundator

The information in this cheat sheet is not only useful for passing the Certified Ethical Hacker Exam, but can act as a useful reference for penetration testers and those pursuing other security certifications.

However you choose to use it, we hope you’ve found it a helpful resource to keep around.