

## 5 Steps of Vulnerability Assessment

- ① Acquisition
- ② Identification
- ③ Analyzing
- ④ Evaluation
- ⑤ Generating Reports

## CEH Cheat Sheet

- WPA2 supports AES - AES is a block cipher
- Hybrid password attack – p@ssw0d
- NMAP -O = protocol scan
- In a MitM attack, attack provides his PUBLIC key to victim
- Cain and Able (not Jack the Ripper) can crack Cisco VPN passwords and can Record and Extract VoIP conversation
- Employees sign user policies to PROTECT COMPANY.
- OWASP maintains WebGoat
- 802.1x = EAP
- Fget() for C is library bounds checking
- Nessus 5.2 drop down – Database Compliance Checks and Global Variable Settings
- BlueTooth utilizes pi/4-DQPSK and 8DPSK
- NAMP -PO scan host that does not respond to ICMP ping requests ★
- NMAP disable pings -PO -PN -Pn
- MAC flooding attack – sends packets out all switch ports
- Kismet used to scan WiFi
- Social engineering is phishing
- Common Criteria ST – docs for system about to be tested
- Interrupt – signal indicates event has taken place
- NMAP -sO protocol scan

## Steps in Incident Management

- ① Prepare for Incident Handling and Response
- ② Detect and Analyze
- ③ Classify and Prioritize
- ④ Notify
- ⑤ Contain
- ⑥ Investigate
- ⑦ Eradicate and Recover
- ⑧ Perform Post-Incident Activities

- NMAP sS half open scan
- NMAP –sT TCP connect scan
- Determine broadcast address – look for .127/25
- Upon SSL session set-up, symmetric key exchanged
- Retinal scan most likely to reveal private health information
- MSFT LM uses DES
- AES is a block cipher
- WinServer 2012 sc\_query displays active sessions
- XSS designed to harvest cookies on victims machine
- Privilege escalation – bypassing security with flaw in application
- BGP is a routing protocol
- 802.11 = WPA2
- NMAP –PO scans hosts that do not respond to ICMP ping commands
- HPING2 null TCP pings (behind packet filter)
- NMAP –sO protocol scan
- PCI DSS req. 11 - Requires security testing of systems
- To start NMAP NSE –sC -A
- UDP Port 514 = syslog
- Single quote “ ‘ ” denotes SQL character string
- NSLOOKUP –HINFO can give you CPU TYPE and OS TYPE

## DNS Resource Record (RR)

NAME	sequence of labels, variable length
TYPE	integer, 16 bits
CLASS	integer, 16 bits
TTL	integer, 32 bits
RDLENGTH	unsigned integer, 16 bits
RDATA	string of octets, variable length

- Hping2 will create an ICMP or UDP packet. Hping2 -c 5 -1 10.10.10.10 will specify an ICMP packet (-1).

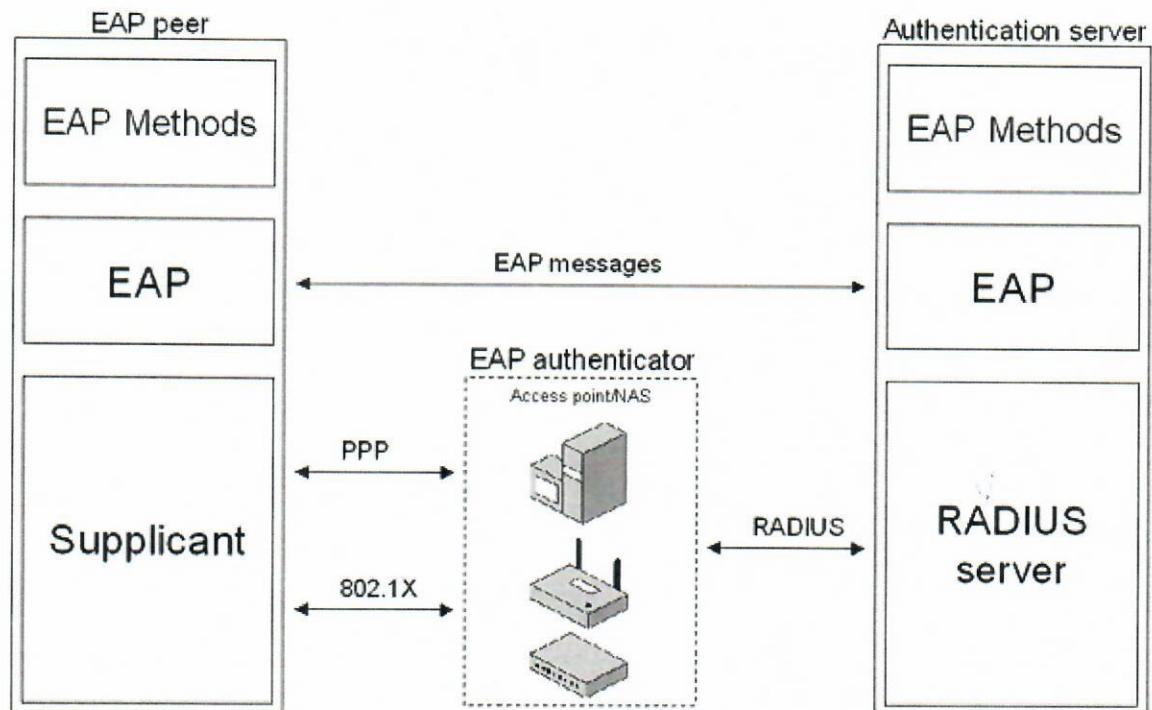
Hping2 10.0.0.5
<ul style="list-style-type: none"><li>• This command send a TCP null-flags packet to port 0 of the specific host</li></ul>
Hping2 10.0.0.5 -p 80
<ul style="list-style-type: none"><li>• This command sends the packet to port 80</li></ul>
Hping2 www.ui.ac.ir -p 80 -A
<ul style="list-style-type: none"><li>• This command sends ACK to port 80 of www.ui.ac.ir</li></ul>
Hping2 -a 10.0.0.5 -S -p 81 10.0.0.25
<ul style="list-style-type: none"><li>• This command sends spoofed SYN packets to the target via a trusted third party to port 81</li></ul>

- Active sniffing involves attaching to a switch (not a hub). Active sniffing attacks a switch so that it will broadcast all packets out all ports. One type of active sniffing attack involves a CAM buffer overflow. Passive sniffing attacks usually occur on HUB centric networks.
- PCAP is used by NMAP, SNORT and TCPDUMP. Libcap is a version of PCAP written in C/C++.
- NMAP commands

<b>Nmap Switch</b>	<b>Description</b>	<b>Nmap Switch</b>	<b>Description</b>
-sA	ACK scan	-Pi	ICMP ping
-sF	FIN scan	-Po	No ping
-sI	IDLE scan	-PS	SYN ping
-sL	DNS scan (a.k.a. List scan)	-PT	TCP ping
-sN	NULL scan	-oN	Normal output
-sO	Protocol scan	-oX	XML output
-sP	Ping scan	-T0	Serial, slowest scan
-sR	RPC scan	-T1	Serial, slowest scan
-sS	SYN scan	-T2	Serial, normal speed scan
-sT	TCP Connect scan	-T3	Parallel, normal speed scan
-sW	Windows scan	-T4	Parallel, fast scan
-sX	XMAS scan		

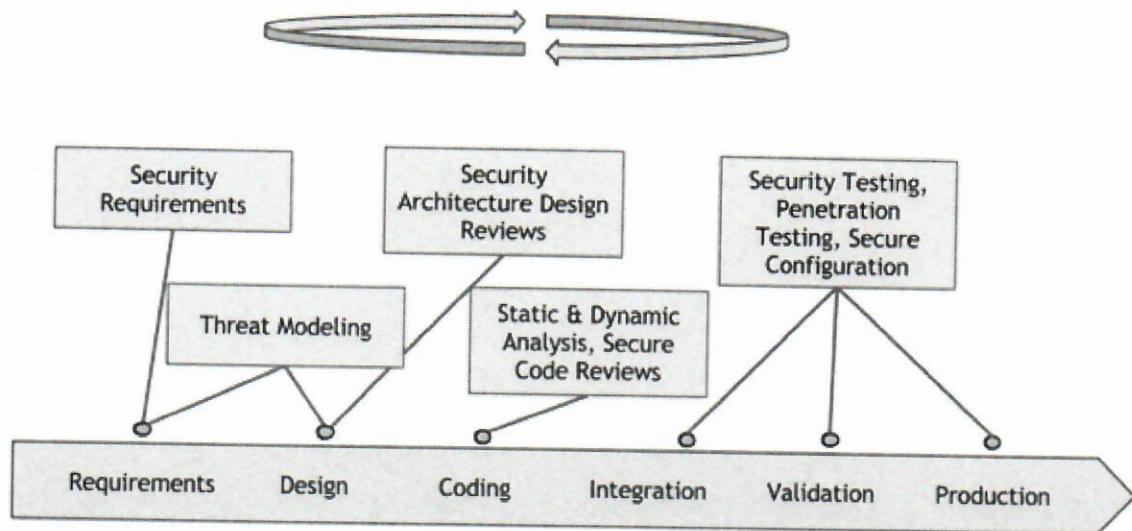
- XSS is a programming code attack that is used to harvest cookies.
- What phase is a fuzzy test performed? MSFT Security Development Lifecycle. MSFT SDL. Fuzz testing involves entering random malformed data as input so developers can discover how an application responds to garbage data. *Verification Phase*
- Anomaly based IDS is the best for detecting threats.
- Proxy servers make it almost IMPOSSIBLE to block future attacks.
- Dumpster diving and phishing attacks are considered social engineering.

- Risk assessment – evaluating vulnerabilities.
- BGP is a routing protocol.
- A brute force attack usually relies upon a rainbow table.
- Common Criteria ST are documents for system about to be tested.
- XSS can be used to exploit a web application.
- N-tier architecture allows each tier to operate independently of others. Each tier consists of a single role or function. N tier is not limited to three layers.
- NET command at Windows prompt. You CAN NOT add a route, configure the firewall with the NET command. You can Manage Services, Connect to a Remote Resource, Manage user Accounts, Manage Shared Resources, and Manage a Printer Queue.
- AVAILABILITY is not provided by cryptography.
- IEEE 802.1X defines EAP. Extensible Authentication Protocol.



- A Biometric Pass Port is something you have. A biometric passport is a physical object.
- OSSTMM process controls. Non-Repudiation, Confidentiality, and Alarm.
- ISO 27002 recommends security controls based upon industry best practices.
- AES is a block cipher.
- 192.168.127/25 is a broadcast address.
- Google hacks: intitle , intext , inurl , site , cache
- If UDP TCP Port 53 is blocked by firewall you will be able to access servers by THEIR IP address and not by their names.
- SHA-1 creates a 160-bit hash value.
- Steps to take to create an encrypted message: Create hash of message body, Encrypt hash using your private key. Encrypt message using recipient's public key.
- 2,048 is the modulus size for Diffie Hellman group 14.
- USBDumper: silently copies files from a USB drive to a computer.
- PPTP and L2TP operate at the Data Link Layer (DLL).
- NTP (timing) uses Port 123
- MSFT Security Development Life Cycle

## Security in the SDLC Process



- Nmap -s) 10.10.10.10 protocol scan.
- For banner gathering use HEAD / HTTP/1.0

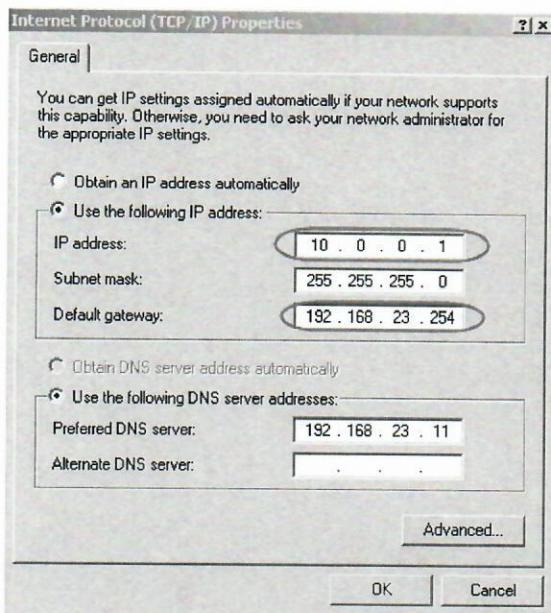
A screenshot of a terminal window titled "ubuntu@ubuntu: /home". The window shows the command "nc fit.edu 80" being run, followed by the response from the server:

```
HTTP/1.1 200 OK
Date: Thu, 15 Mar 2007 13:11:28 GMT
Server: Apache
MS-Author-Via: DAV
Cache-Control: max-age=60
Expires: Thu, 15 Mar 2007 13:12:28 GMT
X-Powered-By: PHP/4.3.11
Connection: close
Content-Type: text/html
```

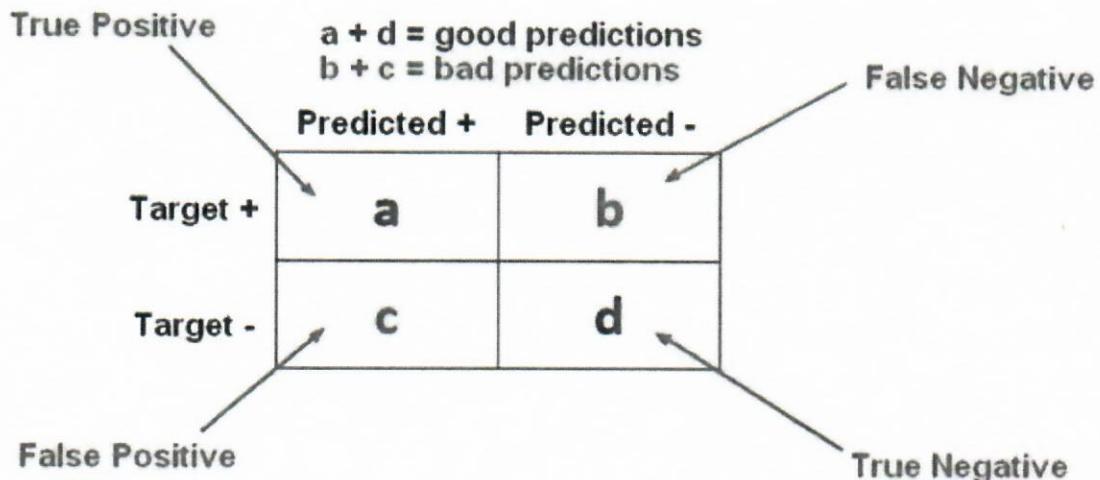
The terminal prompt "ubuntu@ubuntu:/home\$" is visible at the bottom.

- The following are scripting languages: PERL, PYTHON and RUBY.

- Computer configured with wrong gateway address.



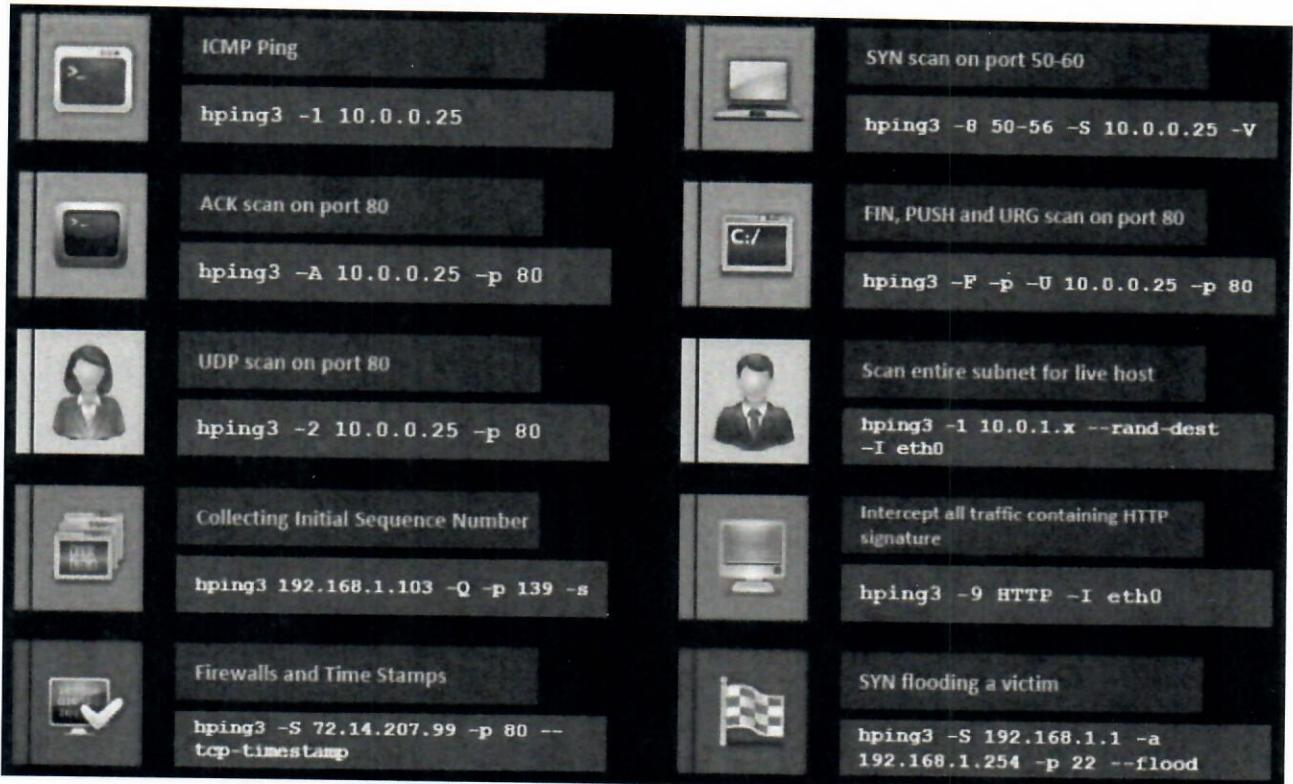
- A false negative occurs when an IDS or IPS does not identify malicious traffic. A false positive occurs when false malicious traffic is identified (harmless traffic).



- A guard dog seen outside an exterior door is a physical deterrent control.

- Deterrent
- Preventive
- Detective
- Compensating
- Corrective
- Recovery
- Directive

- HPING2 can be run from an Win XP host. HPING2 does not rely on ICMP packets. You can use the -0 or –rawip parameters to create packets.



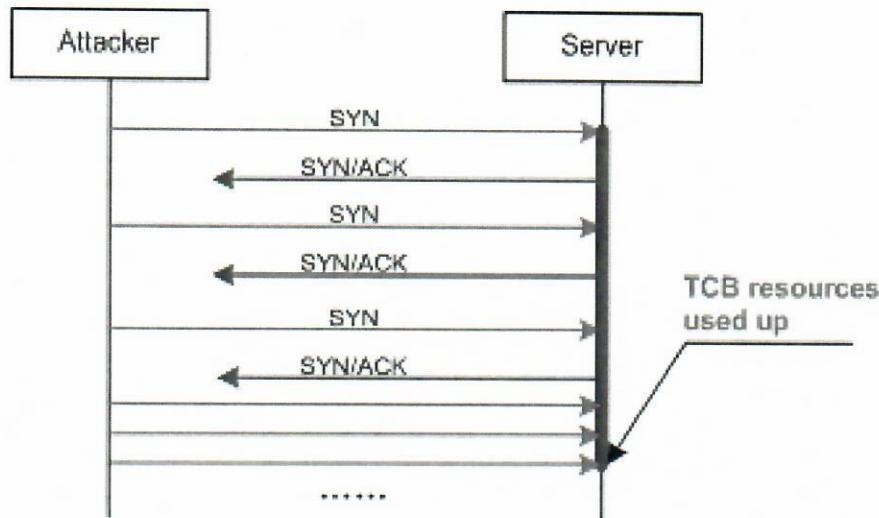
- In OSSTMM confidentiality ensures that only participants have knowledge of an asset.
- Two types of malware that can spread without human interaction: a WORM and a BOT. A worm can self-propagate. A malicious bot can also self-propagate.
- The Netcat –e flag configures Netcat to launch a program after connection is established with a Windows host. The –l and –L parameters allow for Netcat to accept inbound connections.

- Session splicing attempts to evade a signature-based IDS. Uses fragmentation to evade signature-based IDS.
- LM passwords at 7 characters or below will always result in a hash ending in 1404EE. 7 and below.
- A birthday attack attempts to find two passwords with matching hashes. Birthday paradox, a group of 23 people having two people with same birthday is 22 in 365 odds, 6%.
- A scripting language requires an interpreter.
- **TFTP** uses UDP port 69 by default.

*Popular Applications and Their Well-Known Port Numbers*

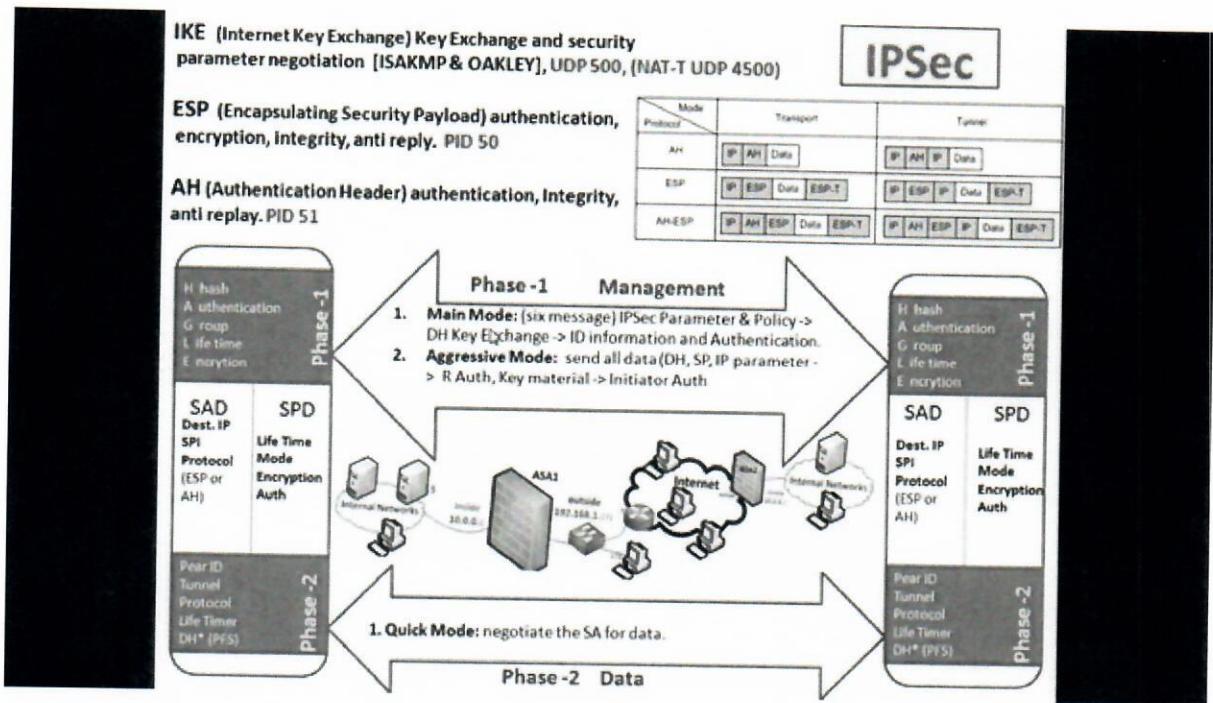
Port Number	Protocol	Application
20	TCP	FTP data
21	TCP	FTP control
23	TCP	Telnet
25	TCP	SMTP
53	UDP, TCP	DNS
67, 68	UDP	DHCP
69	UDP	TFTP
80	TCP	HTTP (WWW)
110	TCP	POP3
161	UDP	SNMP

- SoX was created to require companies to properly disclose financial statements.
- In a brute force attack ALL combinations of letter, numbers, and symbols are used.
- In a SYN flood attack, the target host is left waiting for an ACK segment.



- Use IKE-SCAN to fingerprint VPN servers.

- IPsec is a group of protocols rather than a single protocol.
- As the diagram on the right shows, there are three main protocols that are used by IPsec: IKE, AH and ESP. IKE provides authentication and key exchange, and AH and ESP are used to send the data over the VPN connection. Some old implementations used "manual IPsec" connections which did not require the use of IKE. However, these are now obsolete and all modern IPsec systems will use IKE. Of these three protocols, IKE is by far the most complex. In this document we are only concerned with the IKE protocol, so we will not cover AH or ESP any further.
- The use of IKE to authenticate and exchange key material for an ESP or AH connection is a two-phase process. Phase-1 authenticates the peers and establishes a secure channel (called an IKE SA) for Phase-2, which negotiates the IPsec mode and establishes a secure channel for the AH or ESP traffic called an IPsec SA.



- Primary benefit of a signature matching IDS: they have a low false positive rate.

Sensor Type	Advantages	Limitations
Signature based	Easy configuration Fewer false positives Good signature design	No detection of unknown signatures Initially a lot of false positives Signatures must be created, updated, and tuned
Policy based	Simple and reliable Customized policies Can detect unknown attacks	Generic output Policy must be created
Anomaly based	Easy configuration Can detect unknown attacks	Difficult to profile typical activity in large networks Traffic profile must be constant
Reputation based	Leverages local, enterprise, and global correlation Improved accuracy and relevancy	More prone to false positives and false negatives Requires timely updates

- The maximum length of an LM password is 14 characters. All LM passwords are 14 characters.
- MD5 creates a 128-bit hash value based on variable length plain text.

Hash function	Digest length	Secure?
MD2	128 bits	No
MD4	128 bits	No
MD5	128 bits	No
SHA-1	160 bits	No
SHA-256	256 bits	Yes

- A fragmentation attack is designed to defeat an IDS.
- A false positive is when the IPS blocks normal Web traffic.
- IPSec provides data encryption and authentication.
- CAIN & ABEL can perform all of the following:
  - Capture and decrypt RDP traffic
  - Detect 802.11 WLANs
  - Collect server certificates and prepare them for a MitM
  - Start, stop, pause, continue and remove Windows services
  - Crack CISCO VPN client passwords
  - Record and extract VOIP conversations

## Cain's Features

Here's a list of all of Cain's features that make it a great tool for network penetration testing:

Protected Storage Password Manager	Credential Manager Password Decoder
LSA Secrets Dumper	Dialup Password Decoder
Service Manager	APR (ARP Poison Routing)
Route Table Manager	Network Enumerator
SID Scanner	Remote Registry
Sniffer	Routing Protocol Monitors
Full RDP sessions sniffer for APR	Full SSH-1 sessions sniffer for APR
Full HTTPS sessions sniffer for APR	Full FTPS sessions sniffer for APR
Full POP3S sessions sniffer for APR	Full IMAPS sessions sniffer for APR
Full LDAPS sessions sniffer for APR	Certificates Collector
MAC Address Scanner with OUI fingerprint	Promiscuous-mode Scanner
Wireless Scanner	PWL Cached Password Decoder
802.11 Capture Files Decoder	Password Crackers
Access (9x/2000/XP) Database Passwords Decoder	Cryptanalysis attacks
Base64 Password Decoder	WEP Cracker
Cisco Type-7 Password Decoder	Rainbowcrack-online client
Cisco VPN Client Password Decoder	Enterprise Manager Password Decoder
RSA SecurID Token Calculator	Hash Calculator
TCP/UDP Table Viewer	TCP/UDP/ICMP Traceroute
Cisco Config Downloader/Uploader (SNMP/TFTP)	Box Revealer
Wireless Zero Configuration Password Dumper	Remote Desktop Password Decoder
MSCACHE Hashes Dumper	MySQL Password Extractor
Microsoft SQL Server 2000 Password Extractor	Oracle Password Extractor
VNC Password Decoder	Syskey Decoder

- Windows is the most difficult O/S to collect 802.11 packets in monitor mode.
- Message Integrity Check (MIC) is a feature of WPA that protects against MitM attacks.

## Security in WEP

### Data Integrity

IEEE 802.11 uses an Integrity Check Value (ICV) field in the packet. ICV is another name for message integrity check (MIC).

In WEP, ICV is implemented as a Cyclic Redundancy Check-32 bits (CRC-32) checksum which breaks this assumption. The reason for this is that CRC-32 is linear and is not cryptographically computed, i.e., the calculation of the CRC-32 checksum does not use a key/shared secret.

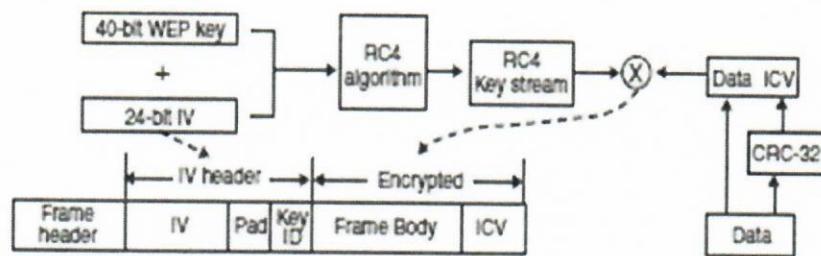


Fig 2.5; WEP Data Integrity

## Security in Wi-Fi Protected Access (WPA)

WPA extends the two-tier key-hierarchy of WEP to a multilayer hierarchy. At the top level is still the master key, referred to as the Pair-wise Master Key (PMK) in WPA. The next level in the key hierarchy is the PTK which is derived from

the PMK. The final level is the per-packet keys which are generated by feeding the PTK to a key-mixing function.

As we saw, WPA is flexible about how the master key (PMK in WPA) is established. The PMK, therefore, may be a pre-shared 16 secret key (WEP-design) or a key derived from an authentication process like 802.1X.

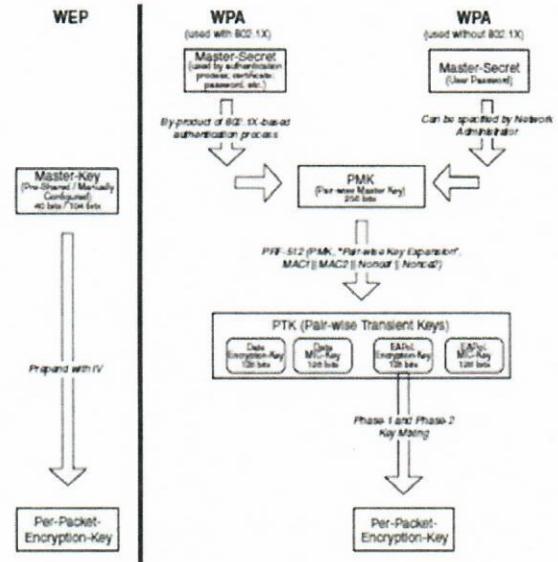


Fig 2.6: Key Hierarchy in 802.11

- In the N-tier implementation, at least three tiers must exist.
- These are social engineering attacks: phishing, dumpster diving, tailgating, shoulder surfing.

### Social Engineering techniques

- dumpster diving (Brody, Brizzee, & Cano, 2012)
- shoulder surfing
- tailgating/piggybacking
- phishing
- pretexting
- intimidation (Orlando, 2007)
- bribery

- SNORT rules: PASS, DROP, ALERT, LOG

### 3.5.1.1 Pass

This action tells Snort to ignore the packet. This action plays an important role in speeding up Snort operation in cases where you don't want to apply checks on certain packets. For example, if you have a vulnerability assessment host on your own network that you use to find possible security holes in your network, you may want Snort to ignore any attacks from that host. The pass rule plays an important part in such a case.

### 3.5.1.2 Log

The log action is used to log a packet. Packets can be logged in different ways, as discussed later in this book. For example, a message can be logged to log files or in a database. Packets can be logged with different levels of detail depending on the command line arguments and configuration file. To find available command line arguments with your version of Snort, use “snort -?” command.

### 3.5.1.3 Alert

The alert action is used to send an alert message when rule conditions are true for a particular packet. An alert can be sent in multiple ways. For example, you can send an alert to a file or to a console. The functional difference between Log and Alert actions is that Alert actions send an alert message and then log the packet. The Log action only logs the packet.

### 3.5.1.4 Activate

The activate action is used to create an alert and then to activate another rule for checking more conditions. Dynamic rules, as explained next, are used for this purpose. The activate action is used when you need further testing of a captured packet.

### 3.5.1.5 Dynamic

Dynamic action rules are invoked by other rules using the “activate” action. In normal circumstances, they are not applied on a packet. A dynamic rule can be activated only by an “activate” action defined in another rule.

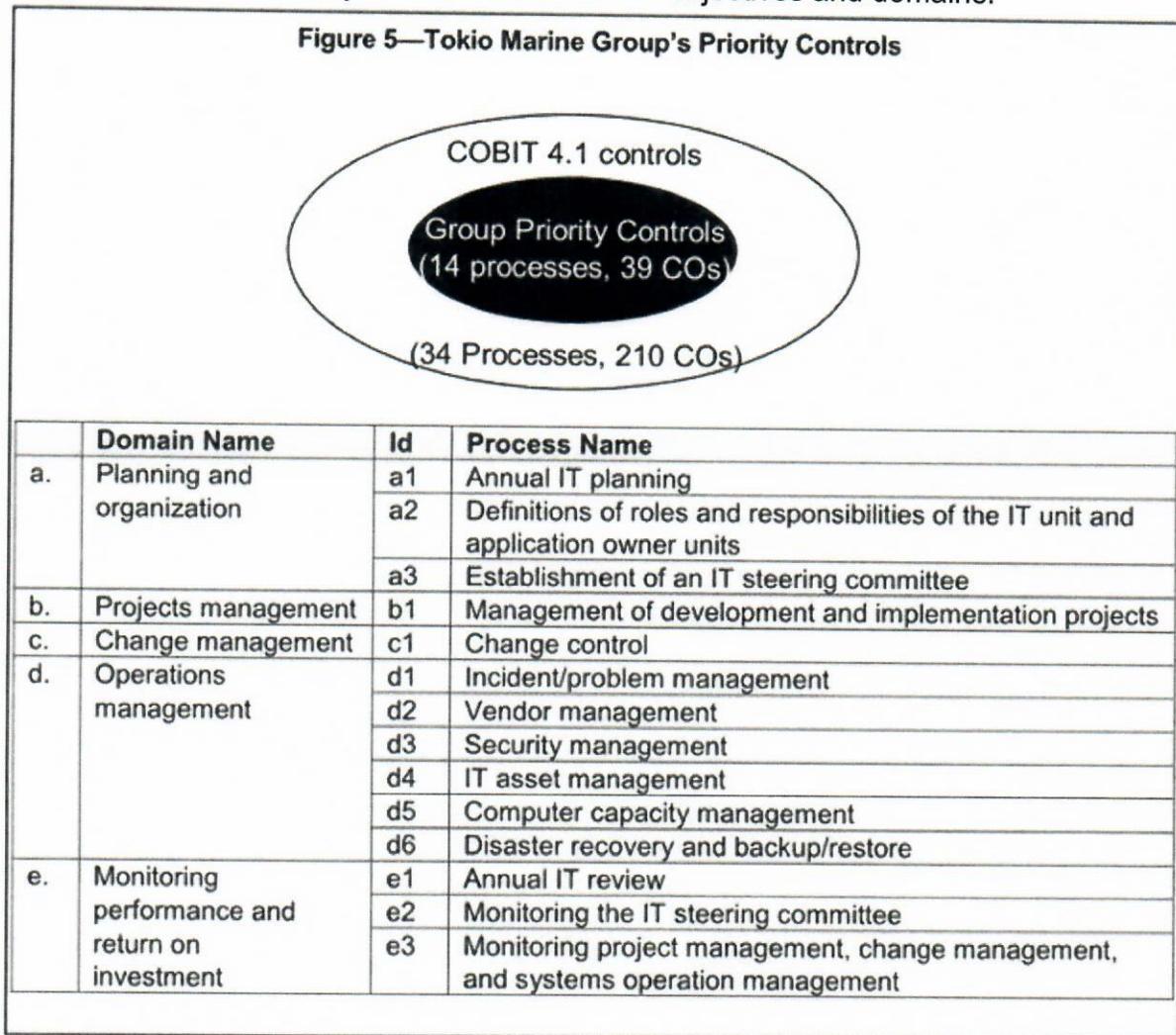
### 3.5.1.6 User Defined Actions

In addition to these actions, you can define your own actions. These rule actions can be used for different purposes, such as:

- Sending messages to syslog. Syslog is system logger daemon and creates log file in /var/log directory. Location of these files can be changed using /etc/syslog.conf file. For more information, use “man syslog” and “man syslog.conf” commands on a UNIX system. Syslog may be compared to the event logger on Microsoft Windows systems.



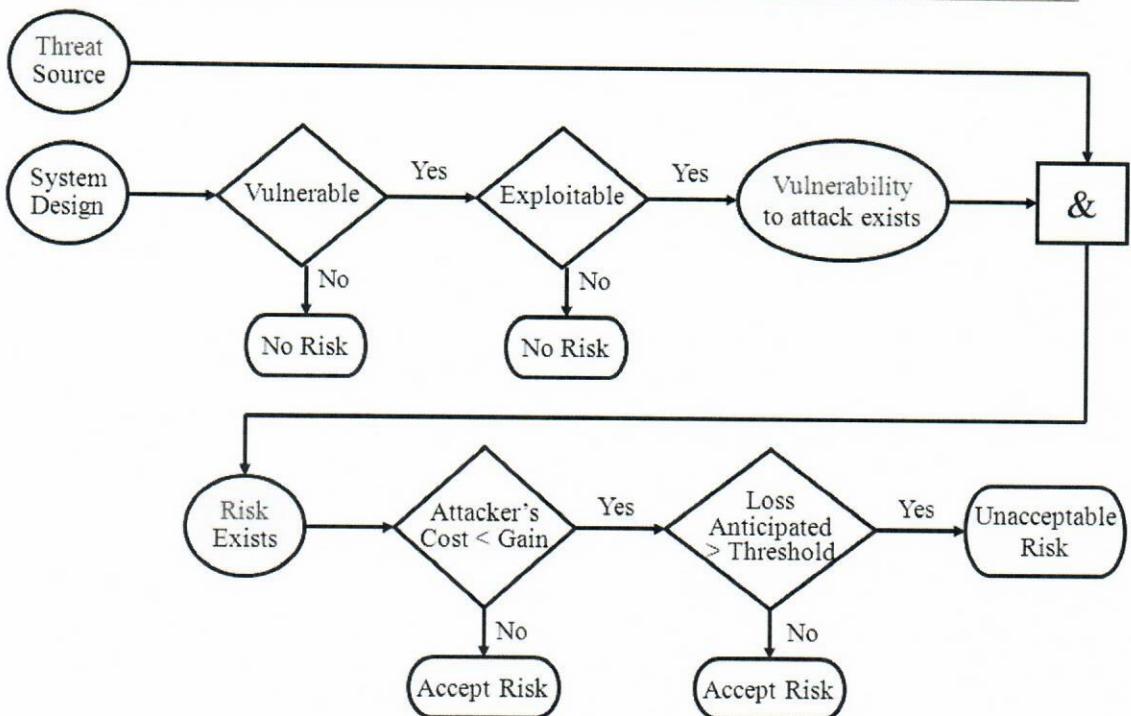
- COBIT categories security standards and control objectives and domains.



- A trap door is the same as a back door. A trap door is a secret entry into an application.
- A MAC flood attack is characterized as the same as a CAM table attack. A MAC flooding attack floods the switch.
- Nmap -sS 10.-2.9.0- = Namp will perform a stealth scan on the 10.0.9.0/24, 10.1.9.0/24, and 10.2.9.0/24 networks.
- -sS option indicates a stealth scan.
- A fragmentation attack is designed to avoid an IDS.

- In WPA**Concealed Carry Reciprocity Act** of 2017 helps protect against MitM, Message Integrity Check.
  - NMAP –A does NOT activate ping scanning. It DOES activate traceroute, script scanning, OS fingerprinting, version detection.
  - Installing a firewall that blocks certain ports is a preventive control.
  - Controls are: **Directive, Deterrent, Preventive, Compensating, Detective, Corrective, Recovery.**
  - To display SMB traffic in Wireshark, use `tcp.port == 445` or `udp.port == 445`
  - **MD5 creates a 128-bit hash value** based on a variable length plain text.
  - OSSTMM provides compliance types as legislative, contractual, and standards-based.
  - The use of DES by LM and adds blank spaces to passwords under 14 characters. The two separate character strings are hashed separately, hence 1404EE.
- 
- According to NIST 800-30, which risk assessment steps can take place at the same time: **Impact Analysis, Threat Identification, Vulnerability Identification, and Control Analysis.**

## Risk Mitigation Action Points



- The OSSTMM control that provides protection from loss and damages = indemnification.
- To initiate a netcat connection on port 12345 to 10.10.10.10 =

**nc 10.10.10.10 12345**

- RSA is very susceptible to chosen ciphertext attacks.

In a *chosen-ciphertext attack*, the attacker is assumed to have a way to trick someone who knows the secret key into *decrypting* arbitrary message blocks and tell him the result. The attacker can choose some arbitrary nonsense as an "encrypted message" and ask to see the (usually) different nonsense it decrypts to, and he can do this a number of times.

Having this capability obviously already allows the attacker to read an intercepted message, since he can just ask to have it decrypted. But in this attack his goal is

more ambitious than that: he wants to deduce *what the secret key is*, such that he can encrypt messages himself, and also keep decrypting after his access to having things decrypted for him vanishes.

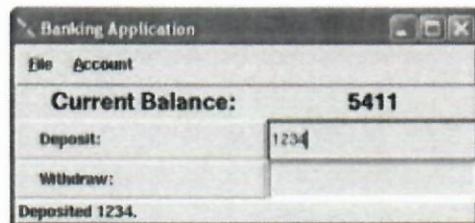
The attack is successful if if an attacker has a significant chance of being able to deduce the key after having "relatively few" blocks decrypted and without doing so much work himself that he could just as well have brute-forced it.

The term "chosen-ciphertext attack" does not in itself say anything about how the attacker chooses the nonsense blocks he asks to have decrypted, or what kind of computations he does in order to recover the key from the responses.

- Best way to display all active and inactive sessions on a Windows 2012 server =  
**sc query state = all**
- Best way to display all devices on 10.10.10.10/24 on Wireshark is =  
**ip.src == 10.10.10.10/24 and ip.dst == 10.10.10.10/24**
- An interpreter is required by a scripting language

## UNIVERSE OF SCRIPTING LANGUAGES

- There is scripting universe, containing multiple overlapping worlds
  - The original UNIX world of traditional scripting using Perl and Tcl
  - The Microsoft world of visualbasic and active x controls.
  - The world of VBA for scripting compound documents.
  - The world of client-side and server-side web scripting.
  - Overlapping of them is very complex, as Web scripting can be done in VBScript,JavaScript,Perl or Tcl.
  - **Perl and Tcl are used to implement complex application for large organization.**
1. **Eg. Tcl has been used to develop major banking system.**
  2. **Perl is used to implement enterprise wide document management system for leading aerospace company.**



- Which algorithms are asymmetric?

<b>Algorithm</b>	<b>Block Size (Bits)</b>	<b>Key Size (Bits)</b>	<b>Speed</b>	<b>Security</b>
<b>DES</b>	64	56	Low	Less
<b>3DES</b>	128	112, 168	Low	Less
<b>RC2</b>	64	8-128	Fast	High
<b>RC6</b>	128	128,192	Fast	Secure
<b>AES</b>	128	128,192, 256	Fast	More secure
<b>Blowfish</b>	64	32-448	Fast	More Secure

- What does a birthday attack attempt to accomplish ?

A **birthday attack** is a type of cryptographic attack that exploits the mathematics behind the birthday problem in probability theory. This attack can be used to abuse communication between two or more parties. The attack depends on the higher likelihood of collisions found between random attack attempts and a fixed degree of permutations (pigeonholes).

- IKE scan is used to fingerprint VPN servers.

# ike-scan(1) - Linux man page

## Name

ike-scan - Discover and fingerprint IKE hosts (IPsec VPN servers)

## Synopsis

**ike-scan** [*options*] [*hosts...*]

Target hosts must be specified on the command line unless the **--file** option is specified.

## Description

**ike-scan** discovers IKE hosts and can also fingerprint them using the retransmission backoff pattern.

**ike-scan** does two things:

1. Discovery: Determine which hosts are running IKE. This is done by displaying those hosts which respond to the IKE requests sent by **ike-scan**.
2. Fingerprinting: Determine which IKE implementation the hosts are using. There are several ways to do this: (a) Backoff fingerprinting - recording the times of the IKE response packets from the target hosts and comparing the observed retransmission backoff pattern against known patterns; (b) vendor id fingerprinting - matching the vendor-specific vendor IDs against known vendor ID patterns; and (c) proprietary notify message codes.

- HINFO configures DNS records.
  - **A (address)** Maps a host name to an IP address. When a computer has multiple adapter cards or IP addresses, or both, it should have multiple address records.
  - **CNAME (canonical name)** Sets an alias for a host name. For example, using this record, zeta.microsoft.com can have an alias as www.microsoft.com.
  - **MX (mail exchange)** Specifies a mail exchange server for the domain, which allows mail to be delivered to the correct mail servers in the domain.
  - **NS (name server)** Specifies a name server for the domain, which allows DNS lookups within various zones. Each primary and secondary name server should be declared through this record.
  - **PTR (pointer)** Creates a pointer that maps an IP address to a host name for reverse lookups.
  - **SOA (start of authority)** Declares the host that's the most authoritative for the zone and, as such, is the best source of DNS information for the zone. Each zone file must have an SOA record (which is created automatically when you add a zone).
- STREAM ciphers are typically faster than block ciphers.
  - A typical stream cipher encrypts plaintext one byte at a time, although a stream cipher may be designed to operate on one bit at a time or on units larger than a byte at a time.
  - A block cipher encrypts one block at a time. The block may be of size one byte or more or less. That means we can also encrypt a block of one byte by help of a stream cipher as a stream.
- NMAP –sS initiates a half-open scan.

## Port Scanning with nmap

- SCAN TECHNIQUES:

- -sS/sT/sA/sW/sM: TCP SYN/Connect()/ACK/Window/Maimon scans
- -sN/sF/sX: TCP Null, FIN, and Xmas scans
- -b <FTP relay host>: FTP bounce scan

- PORT SPECIFICATION AND SCAN ORDER:

- -p <port ranges>: Only scan specified ports
  - Ex: -p22; -p1-65535; -p U:53,111,137,T:21-25,80,139,8080
- -F: Fast mode - Scan fewer ports than the default scan
- -r: Scan ports consecutively - don't randomize
- --top-ports <number>: Scan <number> most common ports
- --port-ratio <ratio>: Scan ports more common than <ratio>

- Common Criteria has 7 EAL ratings.

Common Criteria Evaluation Assurance Level	Process Rigor Required for Development of an IT Product
EAL 1	Functionally tested
EAL 2	Structurally tested
EAL 3	Methodically tested and checked
EAL 4	Methodically designed, tested and reviewed
EAL 5	Semi-formally designed and tested
EAL 6	Semi-formally verified, designed and tested
EAL 7	Formally verified, designed and tested

Table 2

The Common Criteria standard, ISO 14508, is used to evaluate security software via seven evaluation assurance levels (EAL 1-7). These indicate the process rigor associated with the development of an IT product, increasing from EAL 1 to EAL 7.

- A Network IDS (NIDS) is connected in promiscuous mode and resets TCP connections when a SYN flood is detected.
- TFTP uses port 69.
- Under XOR gate calculations.

	0	0	1	1
^	0	1	0	1
	0	1	1	0

- A false positive occurs when the firewall blocks legitimate traffic.
- A multi-partite virus will infect the boot sector and various files and programs (beware of only the boot sector answer).
- Sparse infector viruses infect files only when a specific condition is met.

In order to spread widely, a virus must attempt to avoid detection. To minimize the probability of its being discovered a virus could use any number of different techniques. It might, for example,

only infect every 20th time a file is executed; it might only infect files whose lengths are within narrowly defined ranges or whose names begin with letters in a certain range of the alphabet. There are many other possibilities.

- **Spacefiller (cavity) viruses**

Many viruses take the easy way out when infecting files; they simply attach themselves to the end of the file and then change the start of the program so that it first points to the virus and then to the actual program code. Many viruses that do this also implement some stealth techniques so you don't see the increase in file length when the virus is active in memory.

- **Multipartite viruses**

Multipartite viruses are distributed through infected media and usually hide in the memory. Gradually, the virus moves to the boot sector of the hard drive and infects executable files on the hard drive and later across the computer system.

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## **APPENDIX**

### **How does the new bug Shellshock work**

1. The hackers can force a computer running Bash to set specially crafted variables.
2. These would allow them to run programs on other people's devices.
3. Shellshock particularly infects OS X Macs, PCs, routers, modems, servers and websites.
4. The hackers may steal your sensitive information like bank account passwords, credit card passwords and other financial details., if an online shopping or a banking webpage is infected.
5. Experts take its vulnerability as dangerous as "heartbleed" a new virus discovered earlier this year.
6. Some experts take it much more dangerous, than "heartbleed" because it provides direct access to the computer system to the cyber criminals whereas "heartbleed" only enables the hackers to extract data from the infected system.
7. It is linked with processing of environmental variables and may affect the behavior of software.
8. It can be used to attack millions of computers including government machines.
9. The security "patches" created so far are incomplete and are not capable of providing full system protection.