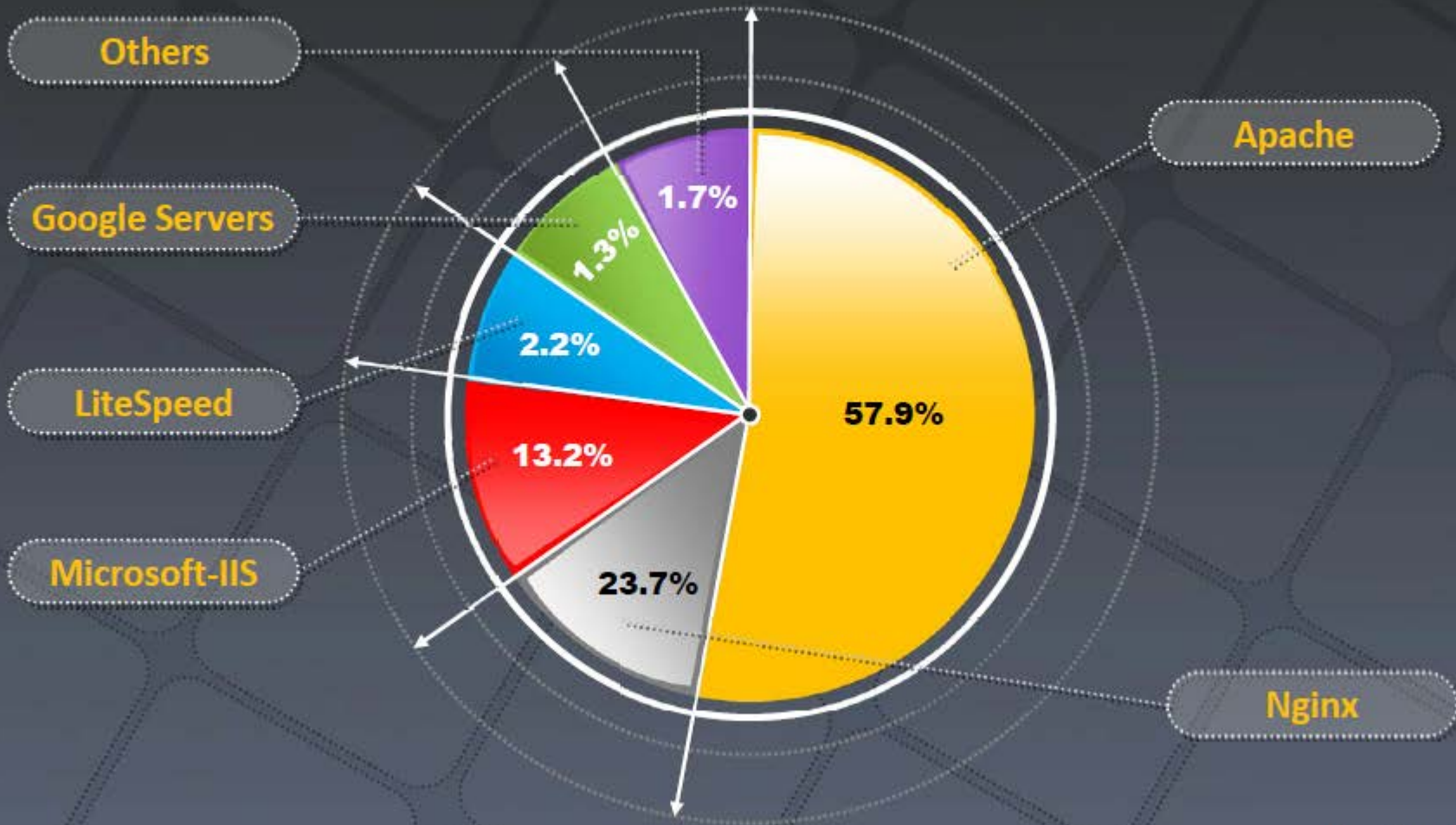
Hacking Webservers

Module 11

Unmask the Invisible Hacker.

Webserver Market Shares



http://w3techs.com

Module Objectives

- Understanding Webserver Concepts
- Understanding Webserver attacks
- Understanding Webserver Attack Methodology
- Webserver Attack Tools

- Countermeasures against Webserver Attacks
- Overview of Patch Management
- Webserver Security Tools
- Overview of Webserver Penetration Testing



Module Flow

1 Webserver Concepts

2 Webserver Attacks

3 Attack Methodology

4 Webserver Attack Tools

5 Counter-measures

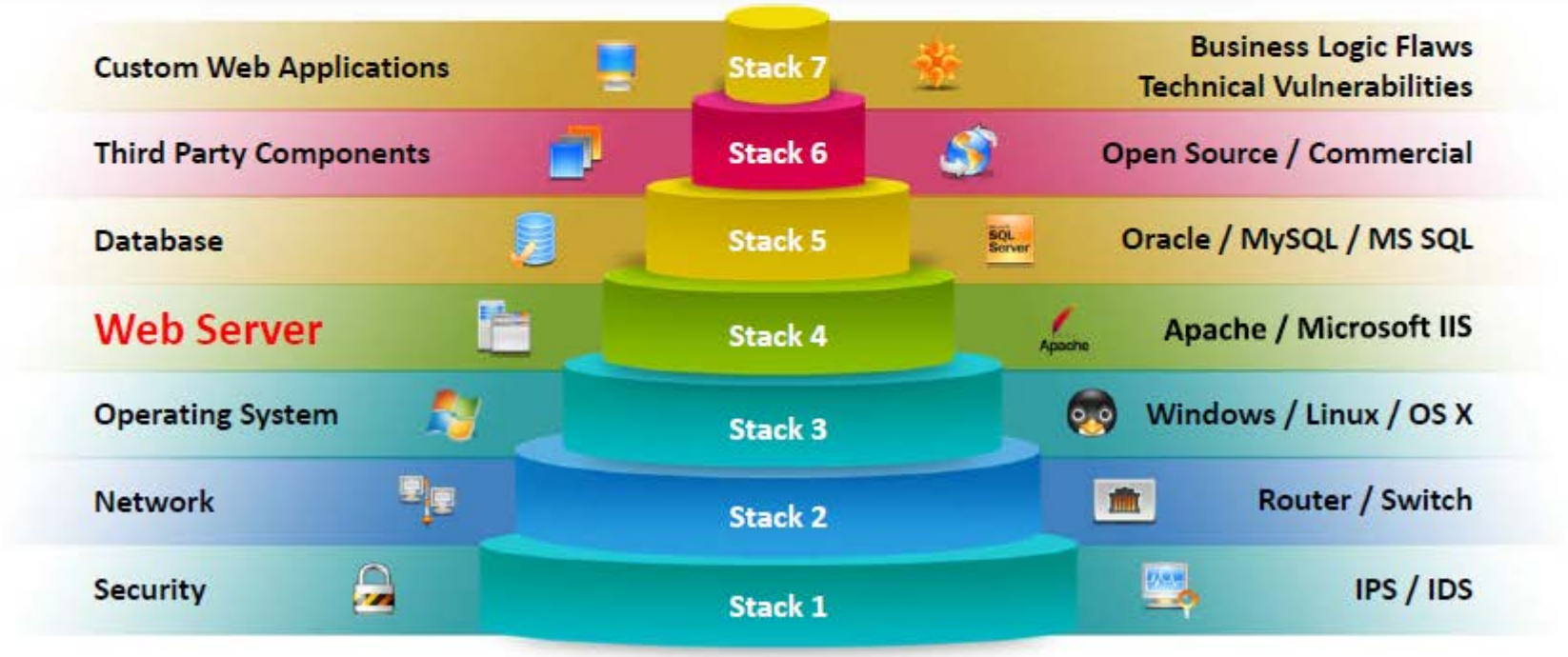
6 Patch Management

7 Webserver Security Tools

8 Webserver Pen Testing

Web Server Security Issue

- Web server is a program (both hardware and software) that hosts websites; attackers usually target **software vulnerabilities** and configuration errors to compromise web servers
- Nowadays, **network** and **OS level attacks** can be well defended using proper network security measures such as firewalls, IDS, etc., however, web servers are accessible from anywhere on the web, which makes them **less secured** and **more vulnerable** to attacks



Why Web Servers Are Compromised

- Improper file and directory permissions
- Installing the server with default settings
- Unnecessary services enabled, including content management and remote administration
- Security conflicts with business ease-of-use case
- Lack of proper security policy, procedures, and maintenance
- Improper authentication with external systems
- Default accounts with their default or no passwords
- Unnecessary default, backup, or sample files
- Misconfigurations in web server, operating systems, and networks
- Bugs in server software, OS, and web applications
- Misconfigured SSL certificates and encryption settings
- Administrative or debugging functions that are enabled or accessible on web servers
- Use of self-signed certificates and default certificates

Impact of Webserver Attacks

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01 Compromise of user accounts

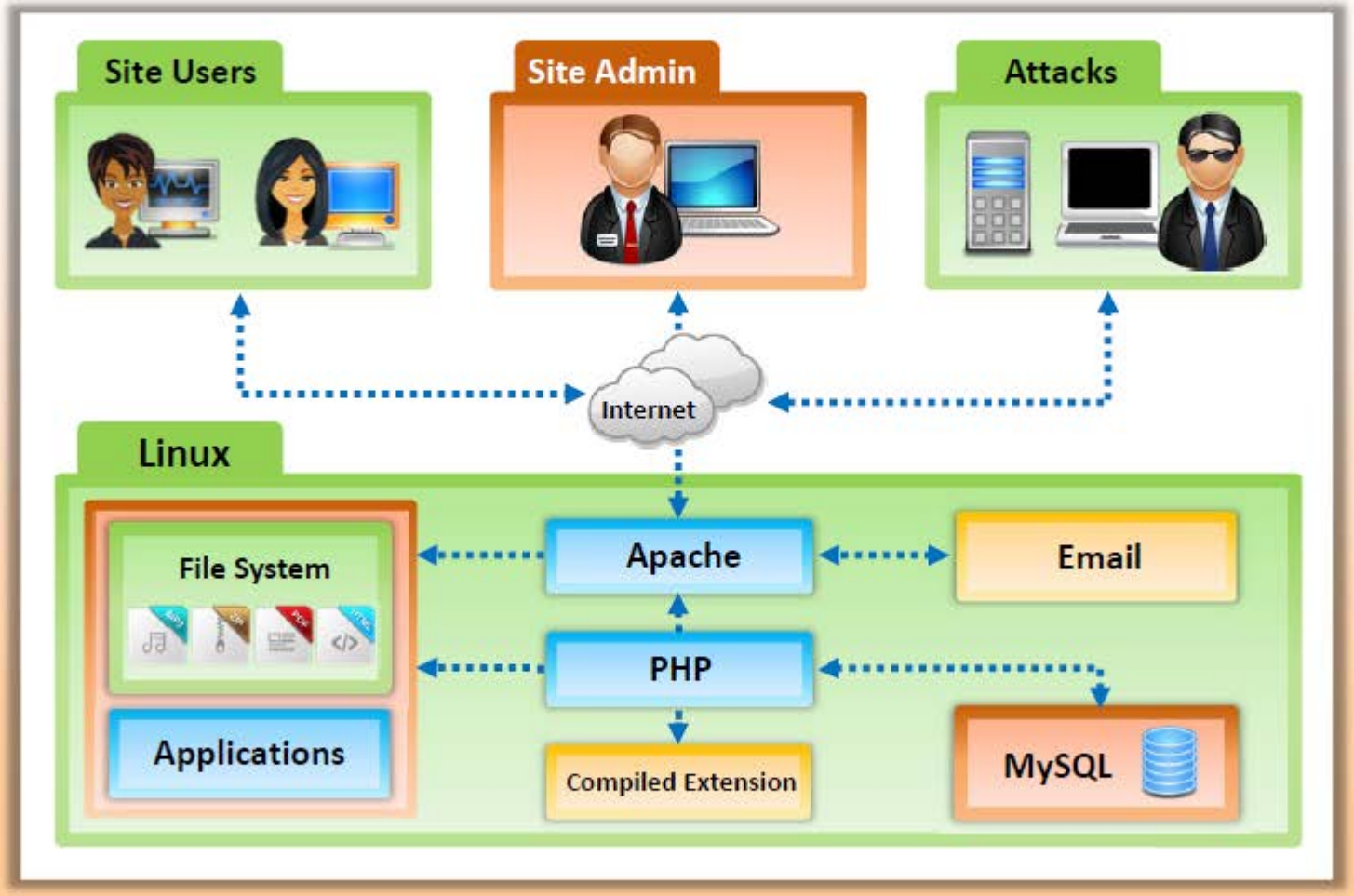
02 Website defacement

03 Secondary attacks from the Website

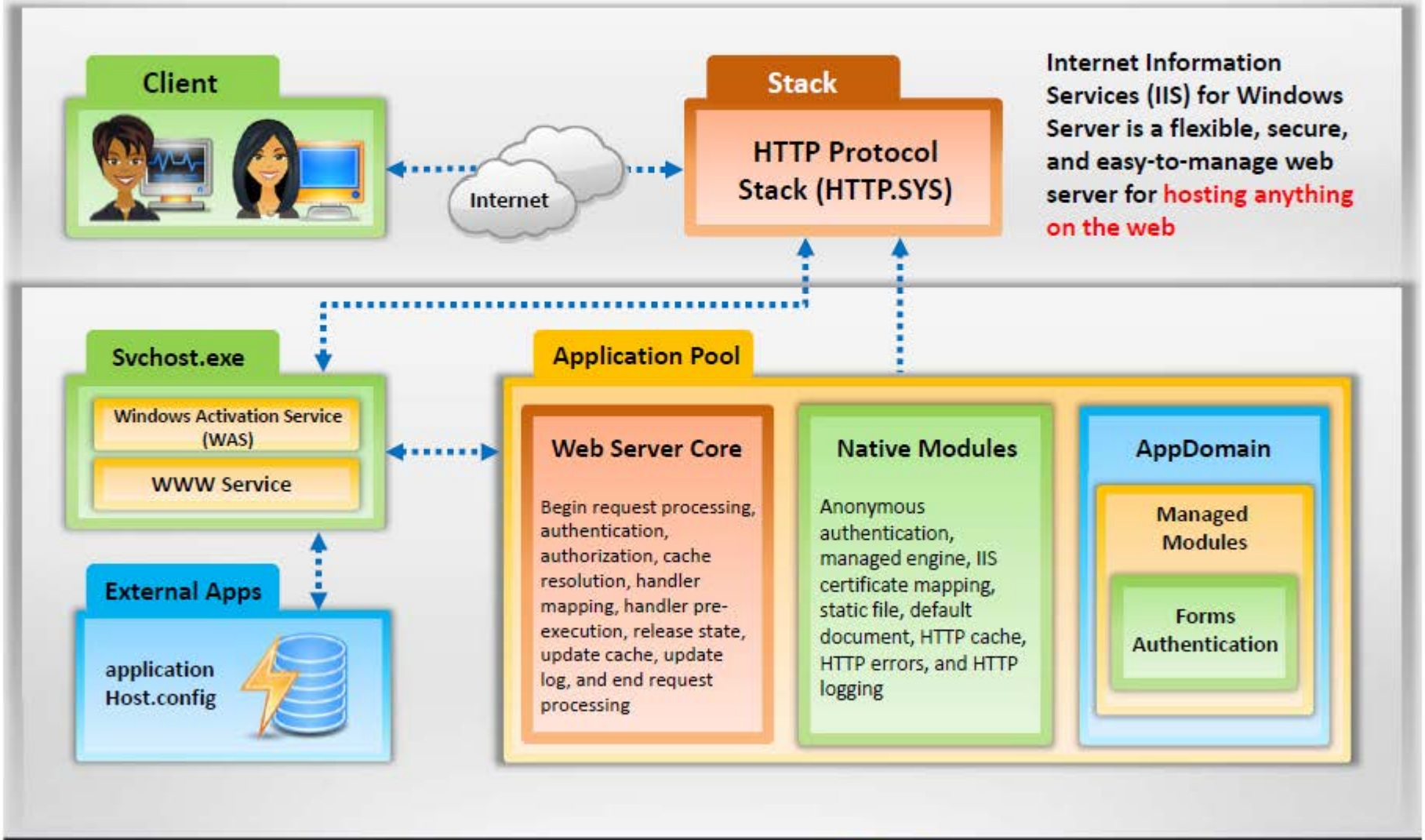
04 Root access to other applications or servers

05 Data tampering and data theft

Open Source Webserver Architecture



IIS Web Server Architecture



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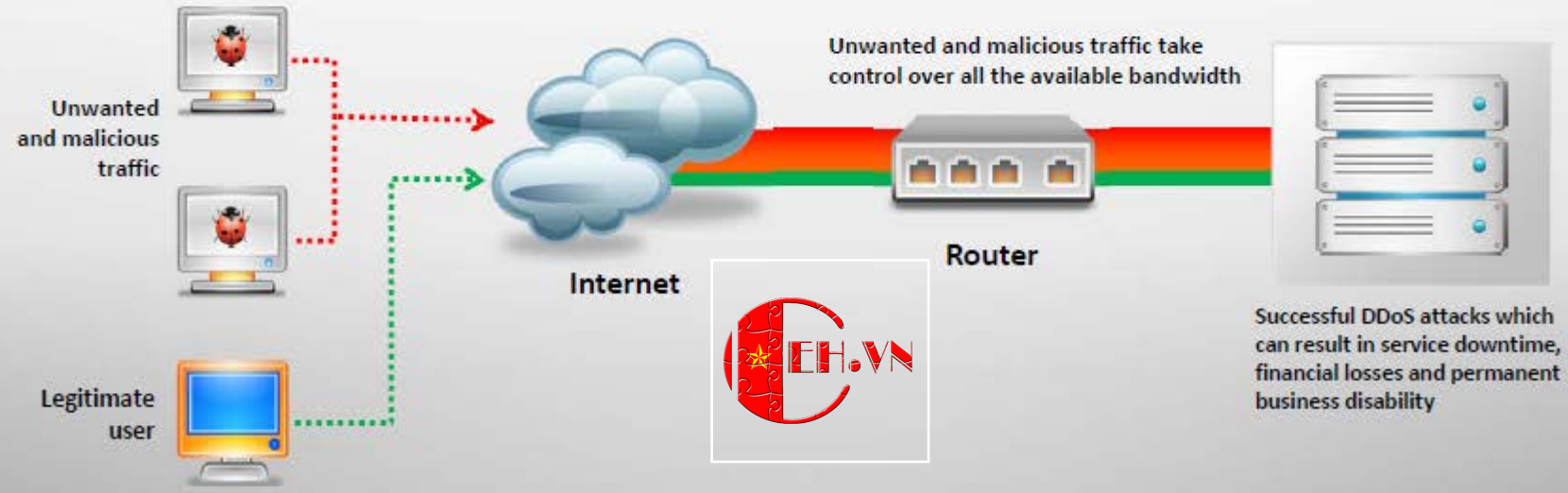
DoS/DDoS Attacks

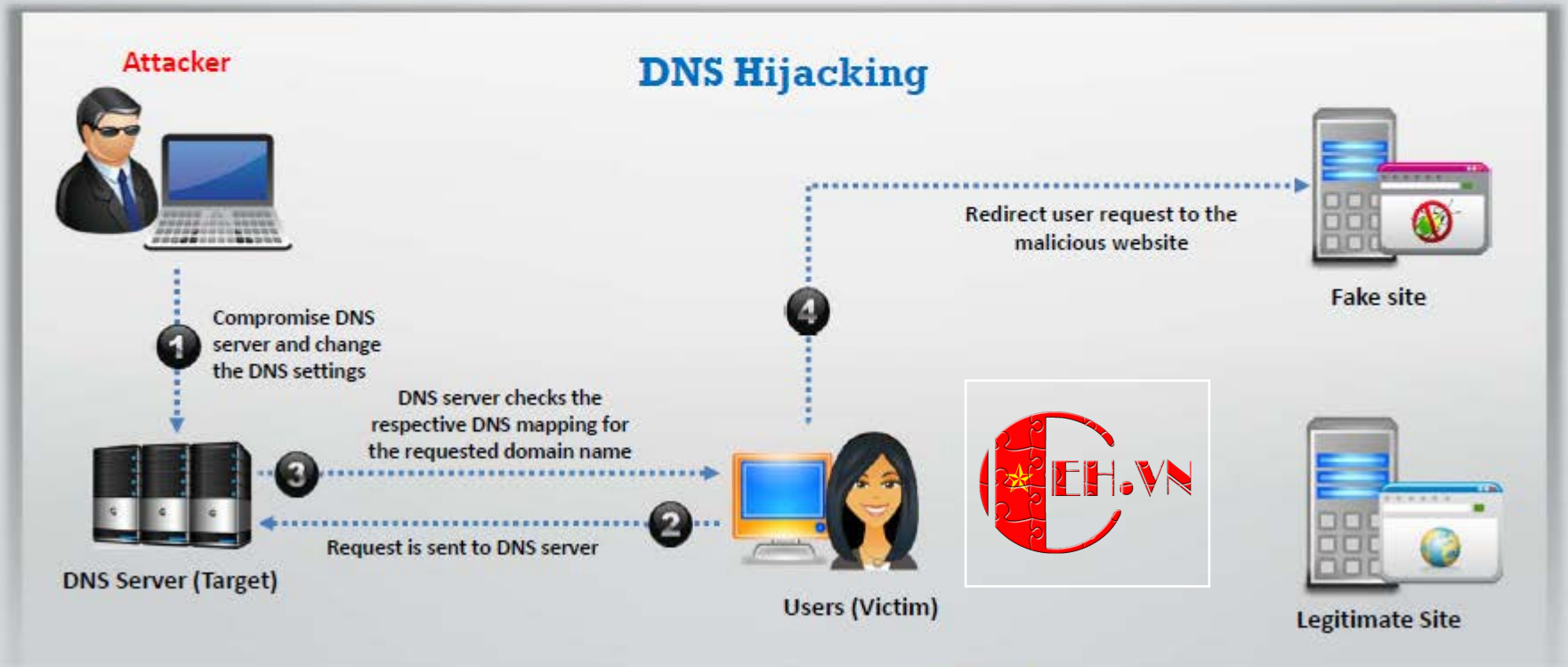
Attackers may send numerous **fake requests** to the web server which results in the **web server crash** or become unavailable to the legitimate users

Attackers may target **high profile web servers** such as banks, credit card payment gateways, government owned services, etc. to **steam user credentials**



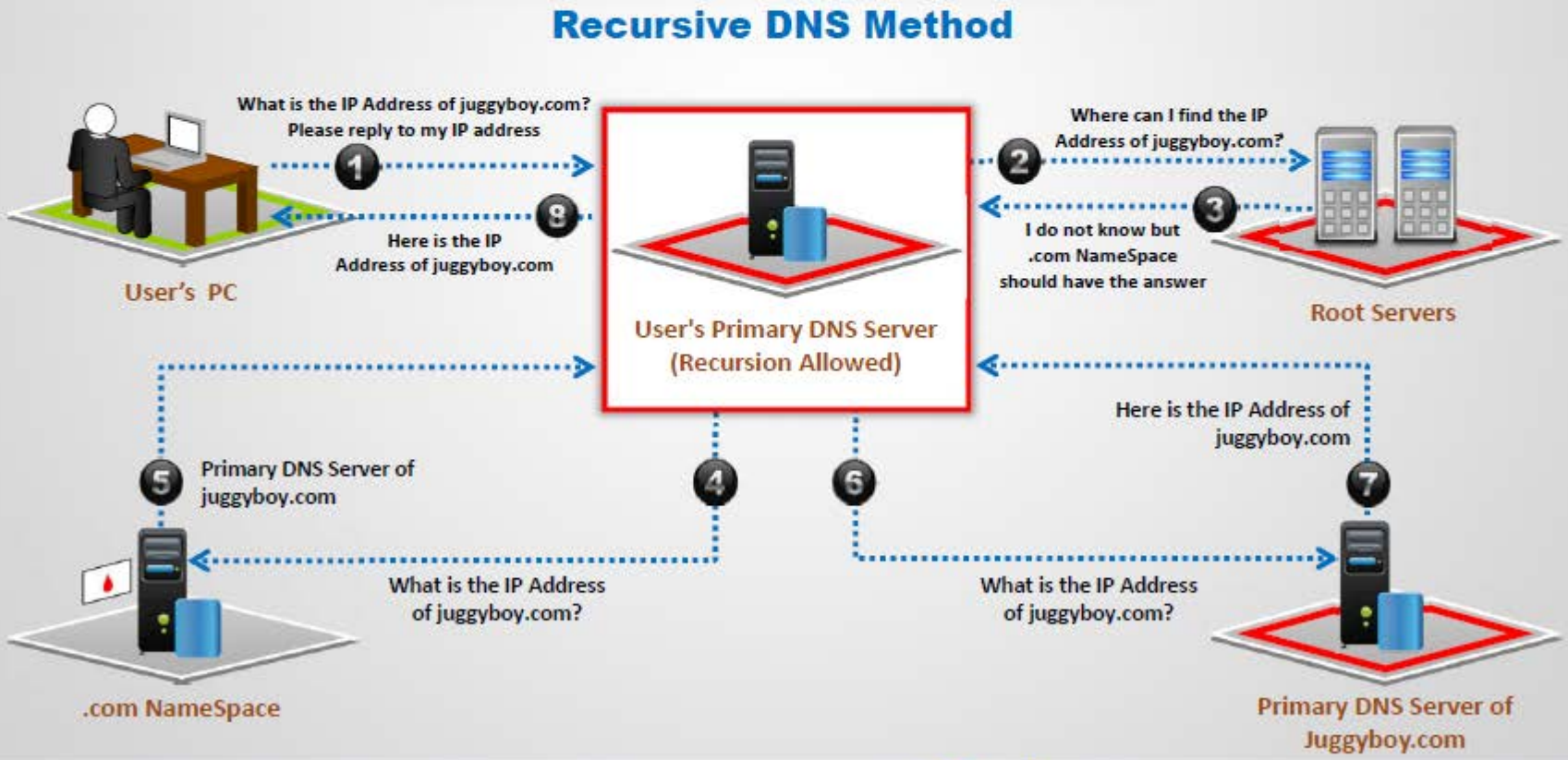
DNS Server Hijacking

Attacker compromises DNS server and **changes the DNS settings** so that all the request coming toward the target web server should be redirected to his/her own malicious server



DNS Amplification Attack

Attacker takes the advantage of **DNS recursive method** of DNS redirection to perform DNS amplification attack



Directory Traversal Attacks

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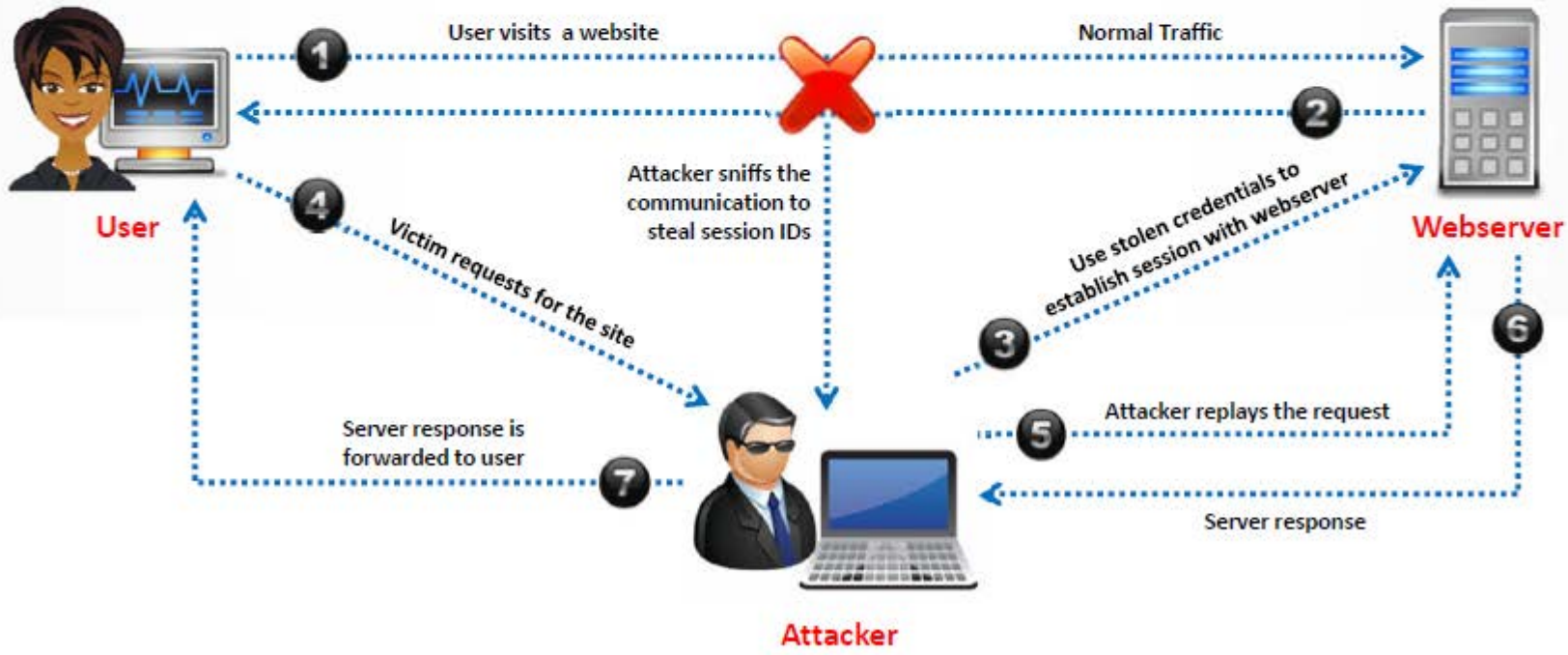
In directory traversal attacks, attackers use ../ (dot-dot-slash) sequence to access restricted directories outside of the web server root directory

Attackers can use trial and error method to navigate the outside of root directory and access sensitive information in the system

Man-in-the-Middle/Sniffing Attack

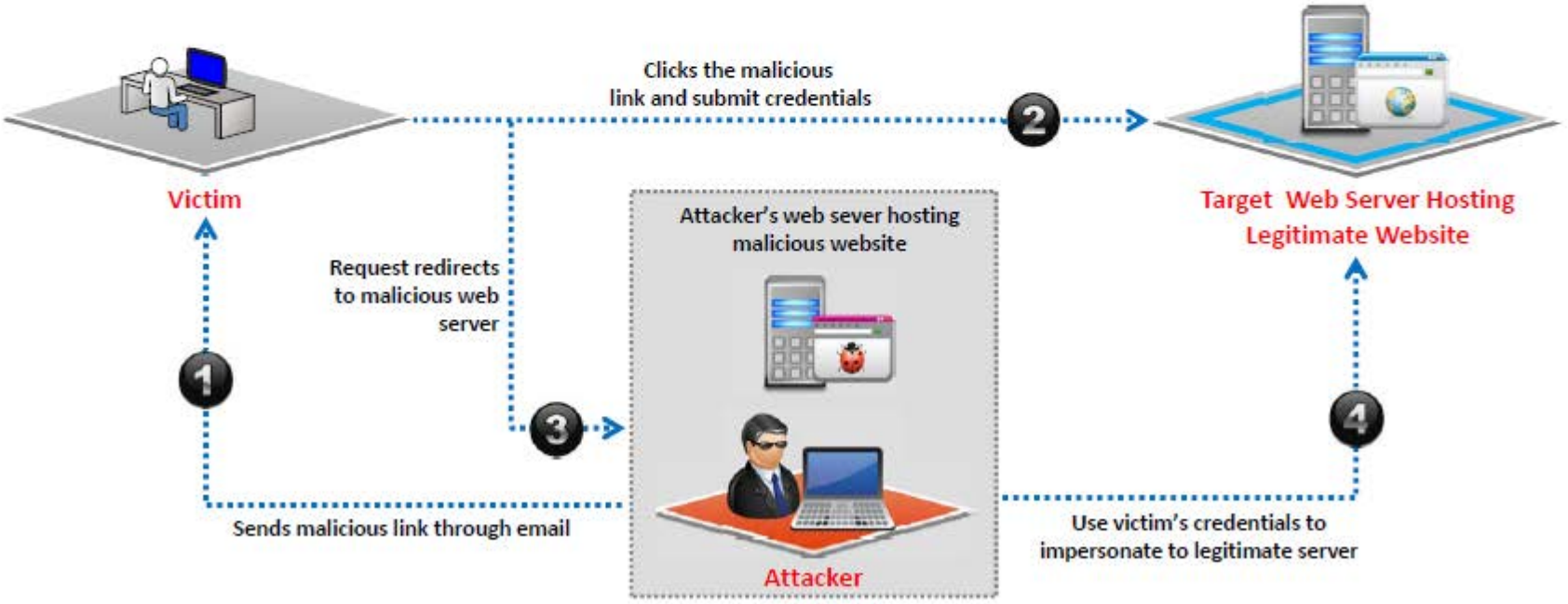
01 Man-in-the-Middle (MITM) attacks allow an attacker to access sensitive information by **intercepting and altering communications** between an end-user and webservers

02 Attacker **acts as a proxy** such that all the communication between the user and webserver passes through him



Phishing Attacks

- Attacker tricks user to submit **login details** for website that looks legitimate, but it redirect to the malicious website hosted on attacker web server
- Attacker **steals the credentials** entered and use it to impersonate with the website hosted on the legitimate target server
- Attacker then can perform **unauthorized** or **malicious operation** with the website target server



Website Defacement

- Web defacement occurs when an intruder **maliciously alters visual appearance of a web page** by inserting or substituting provocative and frequently offending data
- **Defaced pages exposes visitors to some propaganda** or misleading information until the unauthorized change is discovered and corrected
- Attackers uses variety of methods such as **MYSQL injection** to access a site in order to deface it

Web Server Misconfiguration

Server misconfiguration refers to **configuration weaknesses** in web infrastructure that can be exploited to launch various attacks on web servers such as directory traversal, server intrusion, and data theft

- Verbose Debug/Error Messages
- Anonymous or Default Users/Passwords
- Sample Configuration, and Script Files
- Remote Administration Functions
- Unnecessary Services Enabled
- Misconfigured/Default SSL Certificates

Web Server Misconfiguration Example

This configuration allows anyone to view the **server status** page, which contains detailed information about the current use of the web server, including information about the **current hosts** and requests being processed

httpd.conf file on an **Apache** server

```
<Location /server-status>
SetHandler server-status
</Location>
```

This configuration gives **verbose error messages**

php.ini file

```
display_error = On
log_errors = On
error_log = syslog
ignore_repeated_errors = Off
```

HTTP Response Splitting Attack

HTTP response splitting attack involves **adding header response data into the input field** so that the server split the response into two responses

The attacker can **control the second response to redirect user to a malicious website** whereas the other responses will be discarded by web browser

Server Code

```
String author =
request.getParameter(AUTHOR_PA
RAM);
...
Cookie cookie = new
Cookie("author", author);
cookie.setMaxAge(cookieExpirat
ion);
response.addCookie(cookie);
```

Input = Jason

HTTP/1.1 200 OK
...
Set-Cookie: author=Jason
...

Input = JasonTheHacker\r\nHTTP/1.1 200 OK\r\n

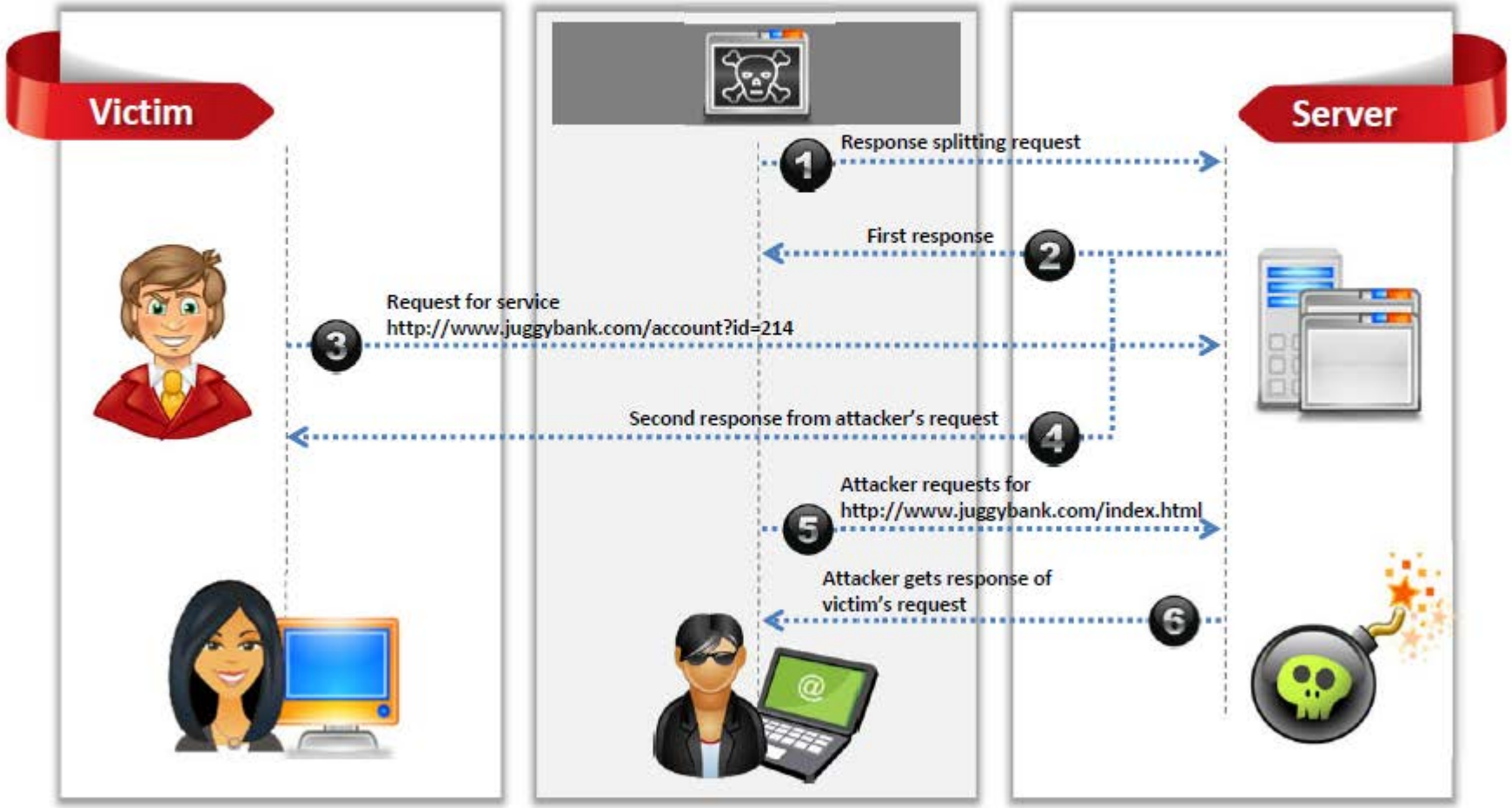
First Response (Controlled by Attacker)

Set-Cookie: author=JasonTheHacker
HTTP/1.1 200 OK
...

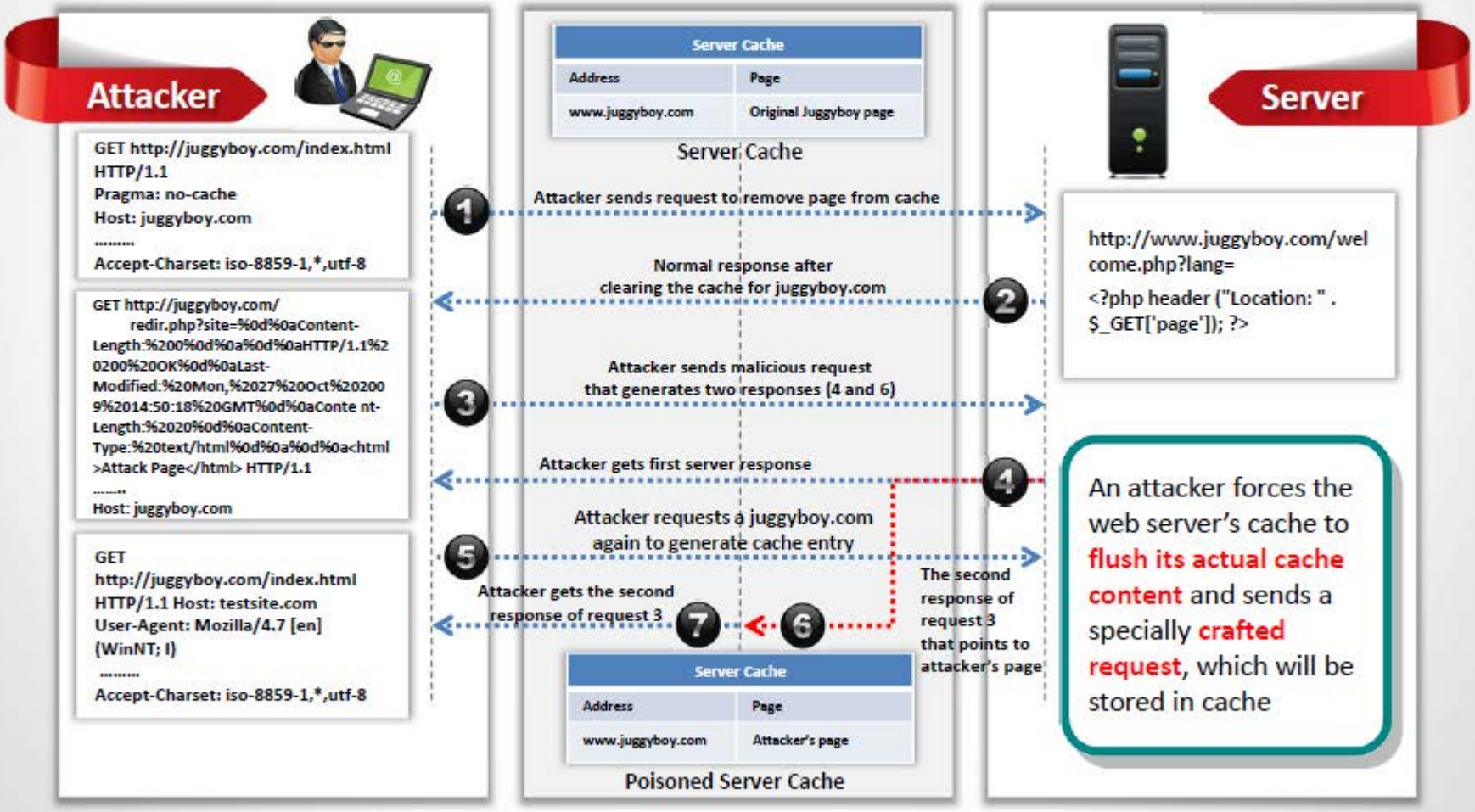
Second Response

HTTP/1.1 200 OK
...

HTTP Response Splitting Attack (Cont'd)

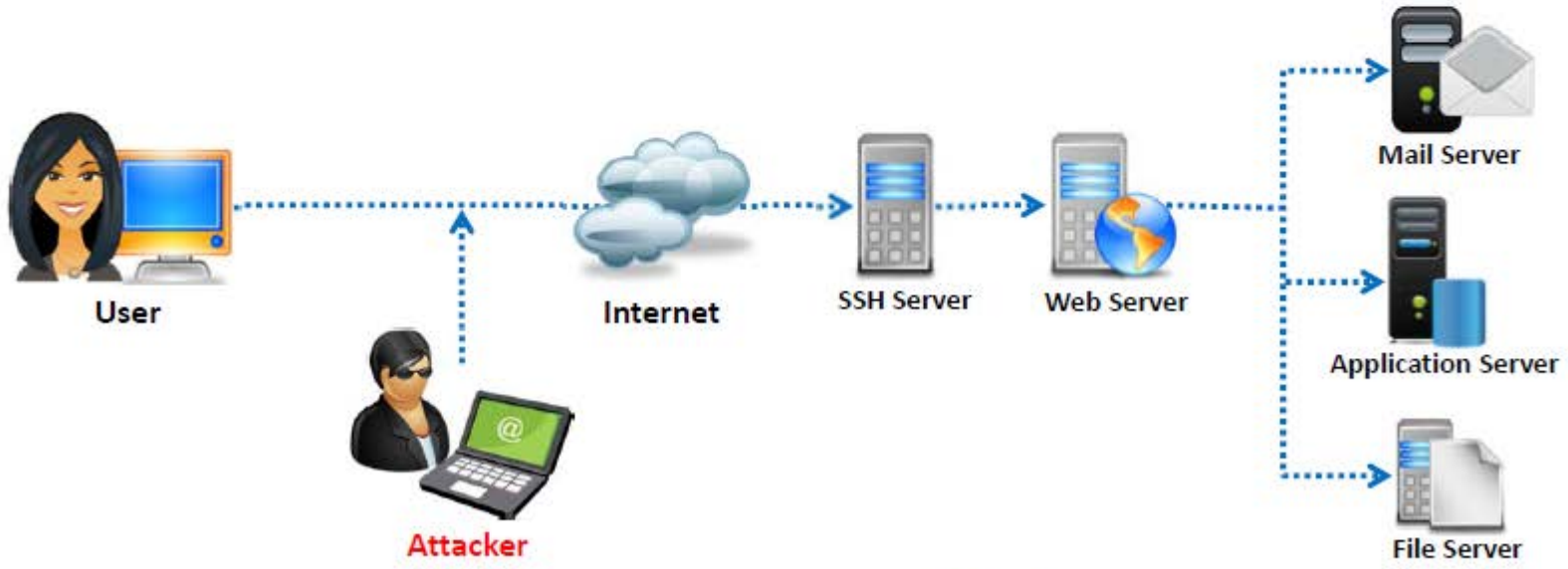


Web Cache Poisoning Attack



SSH Bruteforce Attack

1. SSH protocols are used to create an encrypted SSH tunnel between two hosts in order to transfer unencrypted data over an insecure network
2. Attackers can brute force SSH login credentials to gain unauthorized access to a SSH tunnel
3. SSH tunnels can be used to transmit malwares and other exploits to victims without being detected



Webserver Password Cracking

An attacker tries to exploit weaknesses to hack **well-chosen passwords**

The most **common passwords** found are password, root, administrator, admin, demo, test, guest, qwerty, pet names, etc.

Attacker target mainly for:

- SMTP servers
- Web shares
- SSH Tunnels
- Web form authentication cracking
- FTP servers

Attackers use different methods such as **social engineering**, **spoofing**, **phishing**, using a Trojan Horse or virus, wiretapping, keystroke logging, etc.

Many hacking attempts start with **cracking passwords** and proves to the webserver that they are a **valid user**

Webserver Password Cracking Techniques

- Passwords may be cracked **manually** or with **automated tools** such as Cain & Abel, Brutus, THC Hydra, etc.
- Passwords can be cracked by using following techniques:

Guessing	A common cracking method used by attackers to guess passwords either by **humans** or by **automated tools** provided with dictionaries
Dictionary Attacks	A **file of words is run against user accounts**, and if the password is a simple word, it can be found pretty quickly
Brute Force Attack	The most time-consuming, but comprehensive way to crack a password. Every **combination of character is tried** until the password is broken.
Hybrid Attack	A hybrid attack works similar to dictionary attack, but it adds **numbers** or **symbols** to the password attempt

Web Application Attacks

Vulnerabilities in **web applications** running on a webserver provide a broad attack path for webserver compromise

- Parameter/Form Tampering
- Cookie Tampering
- Unvalidated Input and File Injection Attacks
- SQL Injection Attacks
- Session Hijacking
- Directory Traversal
- Denial-of-Service (DoS) Attack
- Cross-Site Scripting (XSS) Attacks
- Buffer Overflow Attacks
- Cross-Site Request Forgery (CSRF) Attack

Note: For complete coverage of web application attacks refer to Module 12: Hacking Web Applications

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1 Webserver Concepts

2 Webserver Attacks

3 Attack Methodology

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6 Patch Management

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8 Webserver Pen Testing

Webserver Attack Methodology

Information Gathering 01

02 Webserver Footprinting

Mirroring Website 03

04 Vulnerability Scanning

Session Hijacking 05

06 Hacking Webserver Passwords

Webserver Attack Methodology: Information Gathering

1. Information gathering involves collecting information about the **targeted company**

2. Attackers search the **Internet**, **newsgroups**, **bulletin boards**, etc. for information about the company

3. Attackers use **Whois**, **Traceroute**, **Active Whois**, etc. tools and query the Whois databases to get the details such as a domain name, an IP address, or an autonomous system number

http://www.whois.net

Note: For complete coverage of information gathering techniques refer to Module 02: Footprinting and Reconnaissance

Webserver Attack Methodology: Information Gathering from Robots.txt File

- The robots.txt file contains the **list of the web server directories and files** that the web site owner wants to hide from web crawlers
- Attacker can simply request Robots.txt file from the URL and retrieve the sensitive information such as **root directory structure**, **content management system information**, etc., about the target website

robots - Notepad

File Edit Format View Help

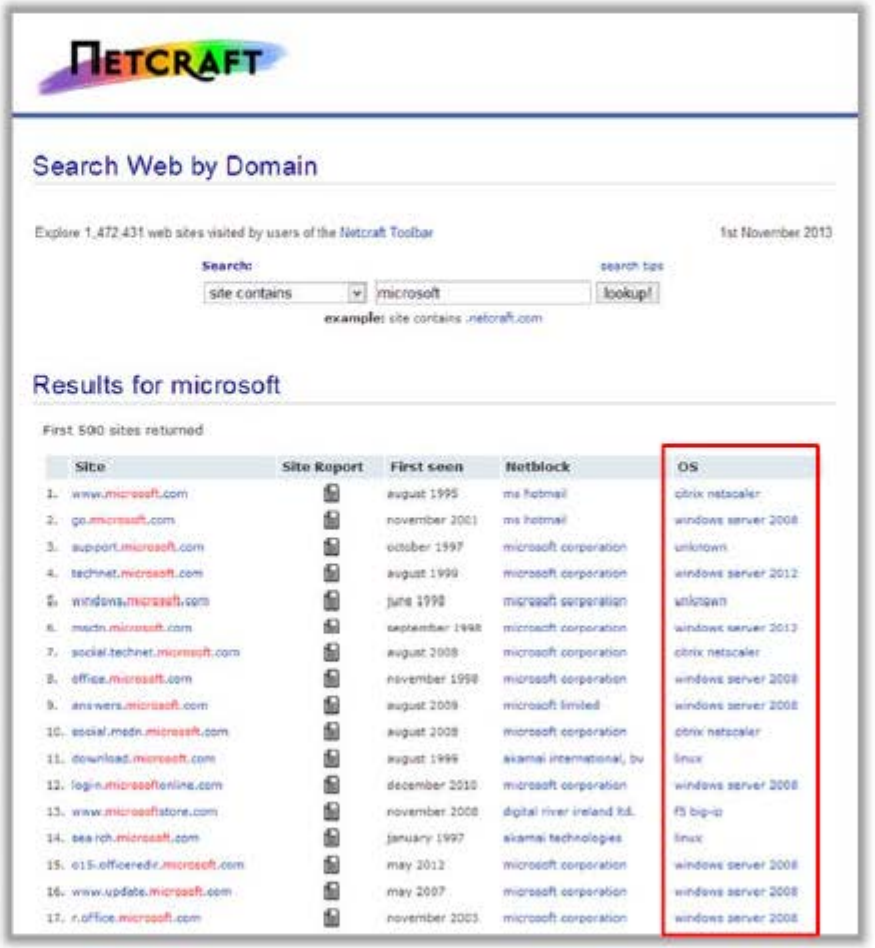
```
User-agent: *
Disallow: /wp-admin/
Disallow: /wp-includes/
Disallow: /*/download/confirmation.aspx?
Disallow: /ctl/
Disallow: /admin/
Disallow: /App_Browsers/
Disallow: /genuine/ajax/
Disallow: /App_Code/
Disallow: /App_Data/
Disallow: /App_GlobalResources/
Disallow: /bin/
Disallow: /Components/
Disallow: /Config/
Disallow: /contest/
Disallow: /genuine/survey/
Disallow: /controls/
Disallow: /DesktopModules/
Disallow: /HttpModules/
Disallow: /Install/
Disallow: /js/
Disallow: /software
Disallow: /software.aspx
Disallow: /windows/404.aspx?*
Disallow: /Userlogin
Disallow: /testgallery
Sitemap: http://www.juggyboy.com/sitemap.xml
```

Webserver Attack Methodology: Webserver Footprinting

01 Gather **valuable system-level data** such as account details, operating system, software versions, server names, and database schema details

02 **Telnet** a webserver to footprint a webserver and gather information such as server name, server type, operating systems, applications running, etc.

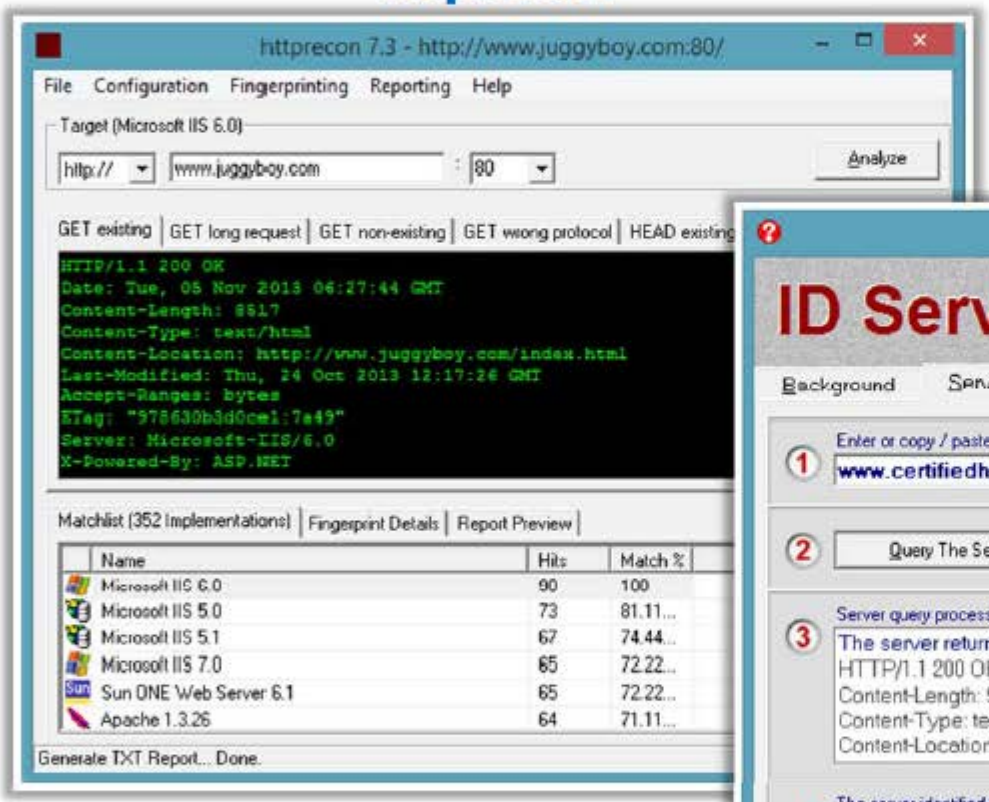
03 Use tool such as **ID Serve**, **httprecon**, and **Netcraft** to perform footprinting



http://toolbar.netcraft.com

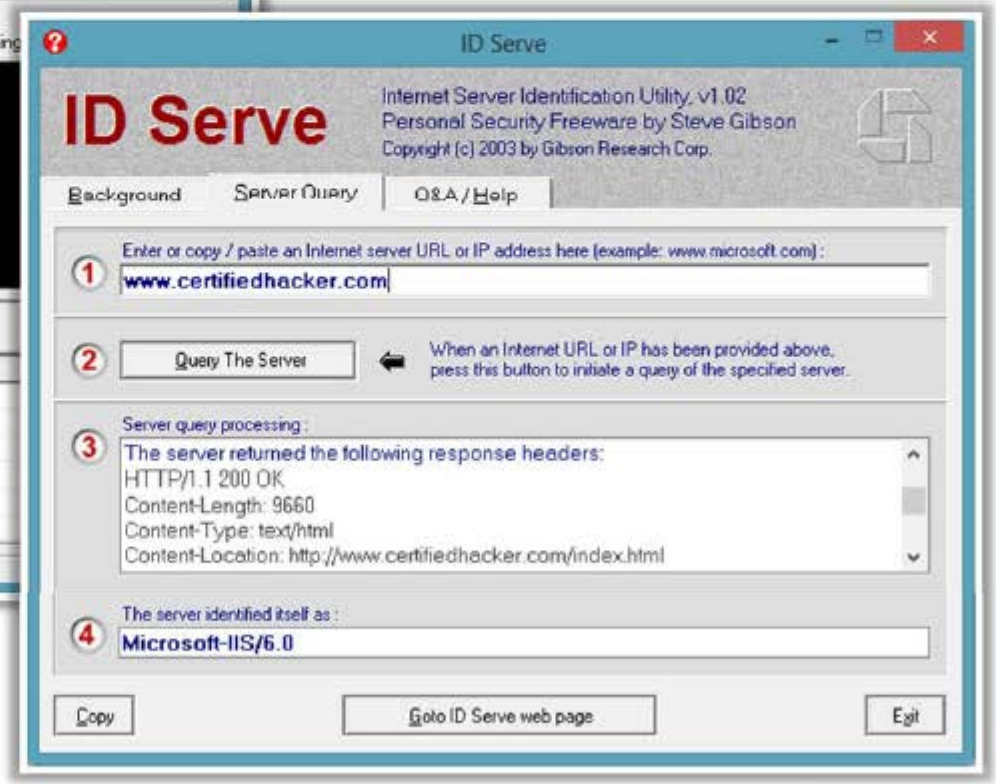
Webserver Footprinting Tools

httprecon



http://www.computec.ch

ID Serve



http://www.grc.com

Enumerating Webserver Information Using Nmap

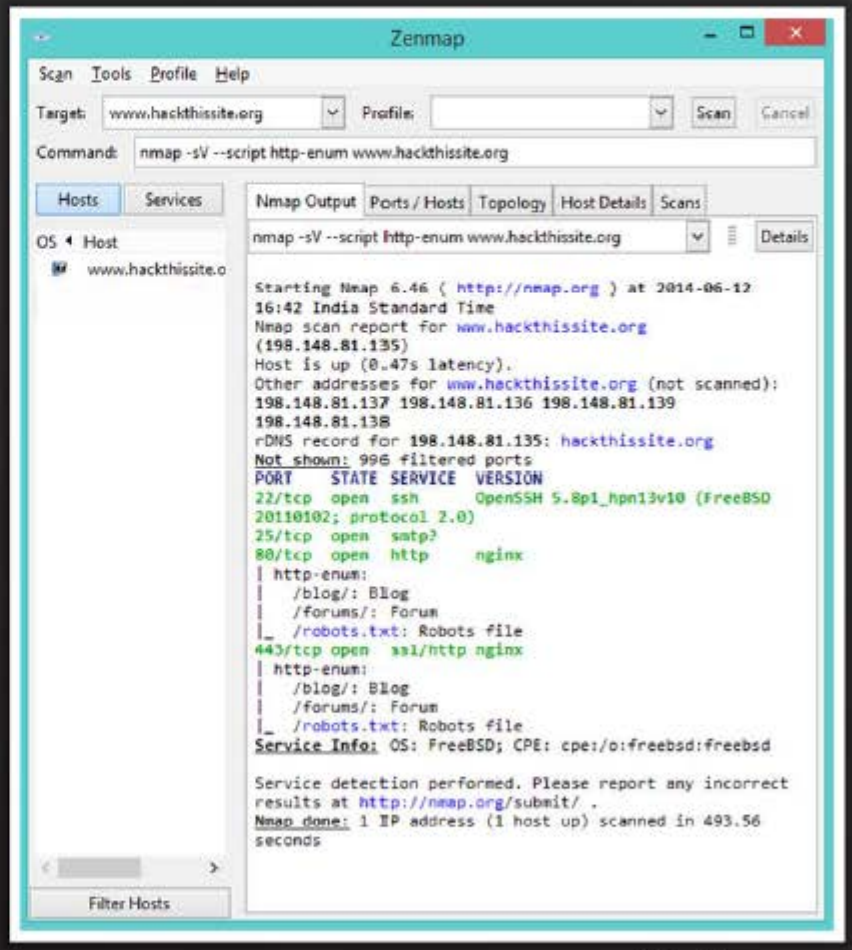
1. Attackers can use advanced **Nmap commands** and **Nmap Scripting Engine (NSE) scripts** to enumerate information about the target website

2. `nmap sV -O -p target IP address`

3. `nmap -sV --script=http-enum target IP address`

4. `nmap target IP address -p 80 --script = http-frontpage-login`

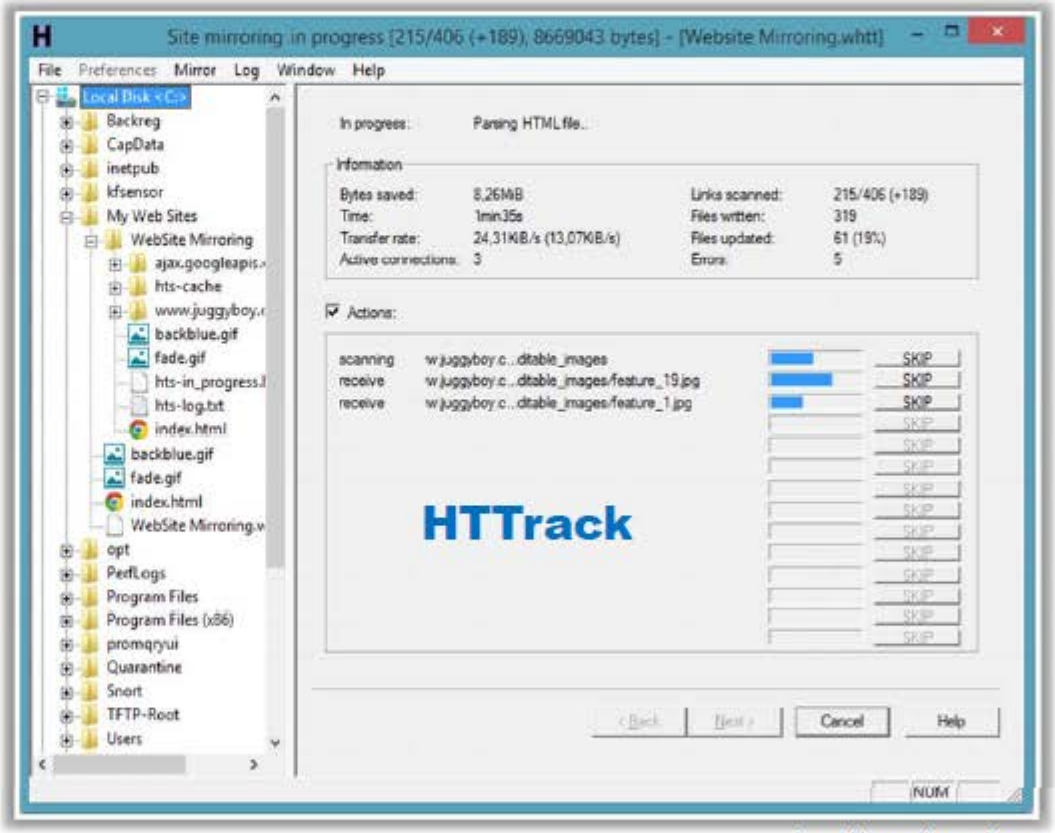
5. `nmap --script http-passwd --script-args http-passwd.root =/ target IP address`



http://nmap.org

Webserver Attack Methodology: Mirroring a Website

- Mirror a website to create a complete profile of the site's **directory structure**, **files structure**, **external links**, etc.
- Search for comments and other items in the **HTML source code** to make footprinting activities more efficient
- Use tools **HTTrack**, **WebCopier Pro**, **BlackWidow**, etc. to mirror a website



http://www.httrack.com

Webserver Attack Methodology: Vulnerability Scanning

01 Implement vulnerability scan to identify weaknesses in a network and determine if the system can be exploited

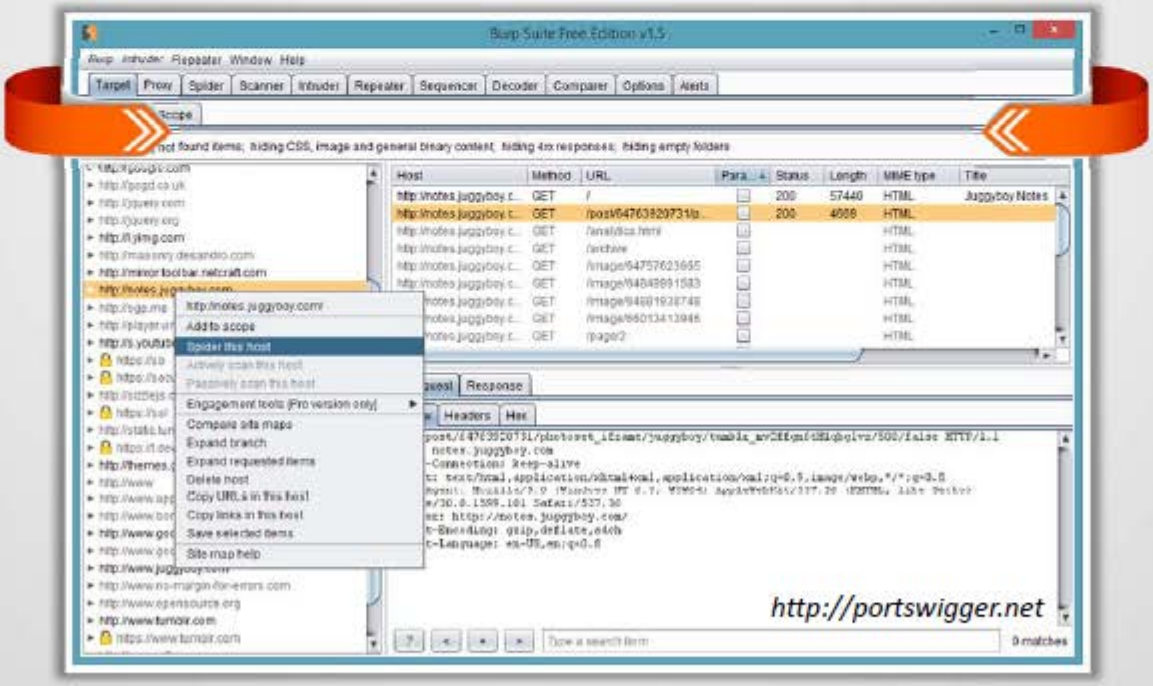
02 Use vulnerability scanners such as HP WebInspect, Acunetix Web Vulnerability Scanner, etc. to find hosts, services, and vulnerabilities

03 Sniff the network traffic to find out active systems, network services, applications, and vulnerabilities present

04 Test the web server infrastructure for any misconfigurations, outdated content, and vulnerabilities

Webserver Attack Methodology: Session Hijacking

1. Sniff valid session IDs to **gain unauthorized access** to the Web Server and snoop the data
2. Use session hijacking techniques such as session fixation, session sidejacking, Cross-site scripting, etc. to **capture valid session cookies and IDs**
3. Use tools such as **Burp Suite**, **Firesheep**, **JHijack**, etc. to automate session hijacking

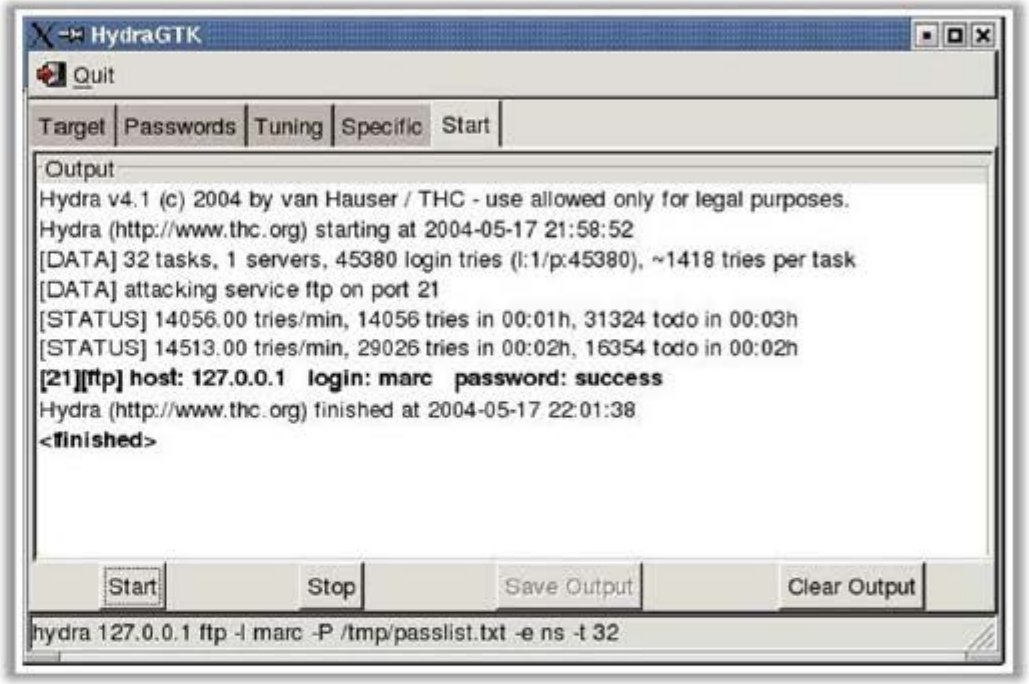


Note: For complete coverage of Session Hijacking concepts and techniques refer to Module 10: Session Hijacking

Webserver Attack Methodology: Hacking Web Passwords

Use password cracking techniques such as **brute force attack**, **dictionary attack**, password guessing to crack webserver passwords

Use tools such as **THC-Hydra**, **Brutus**, etc.



https://www.thc.org

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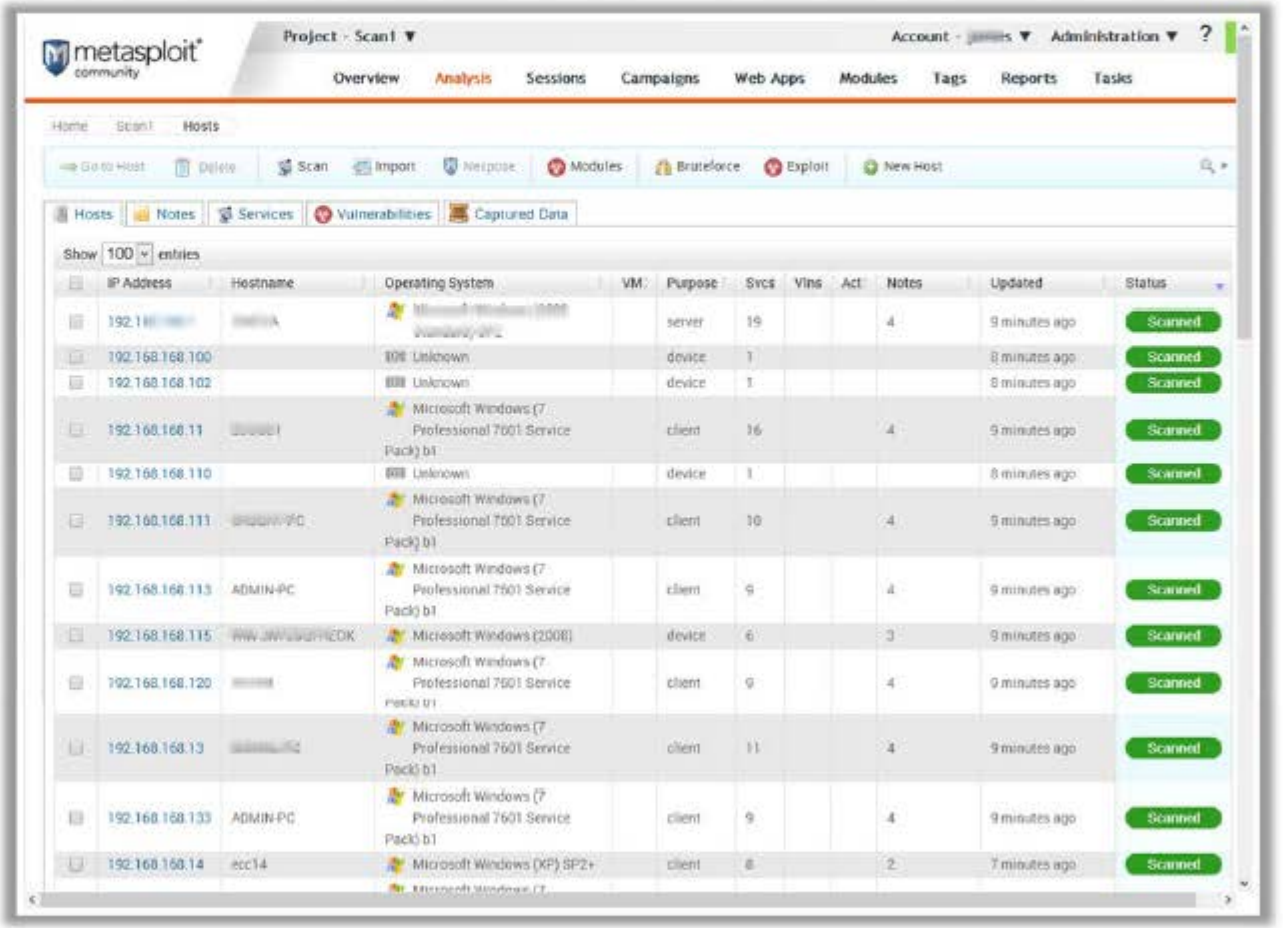
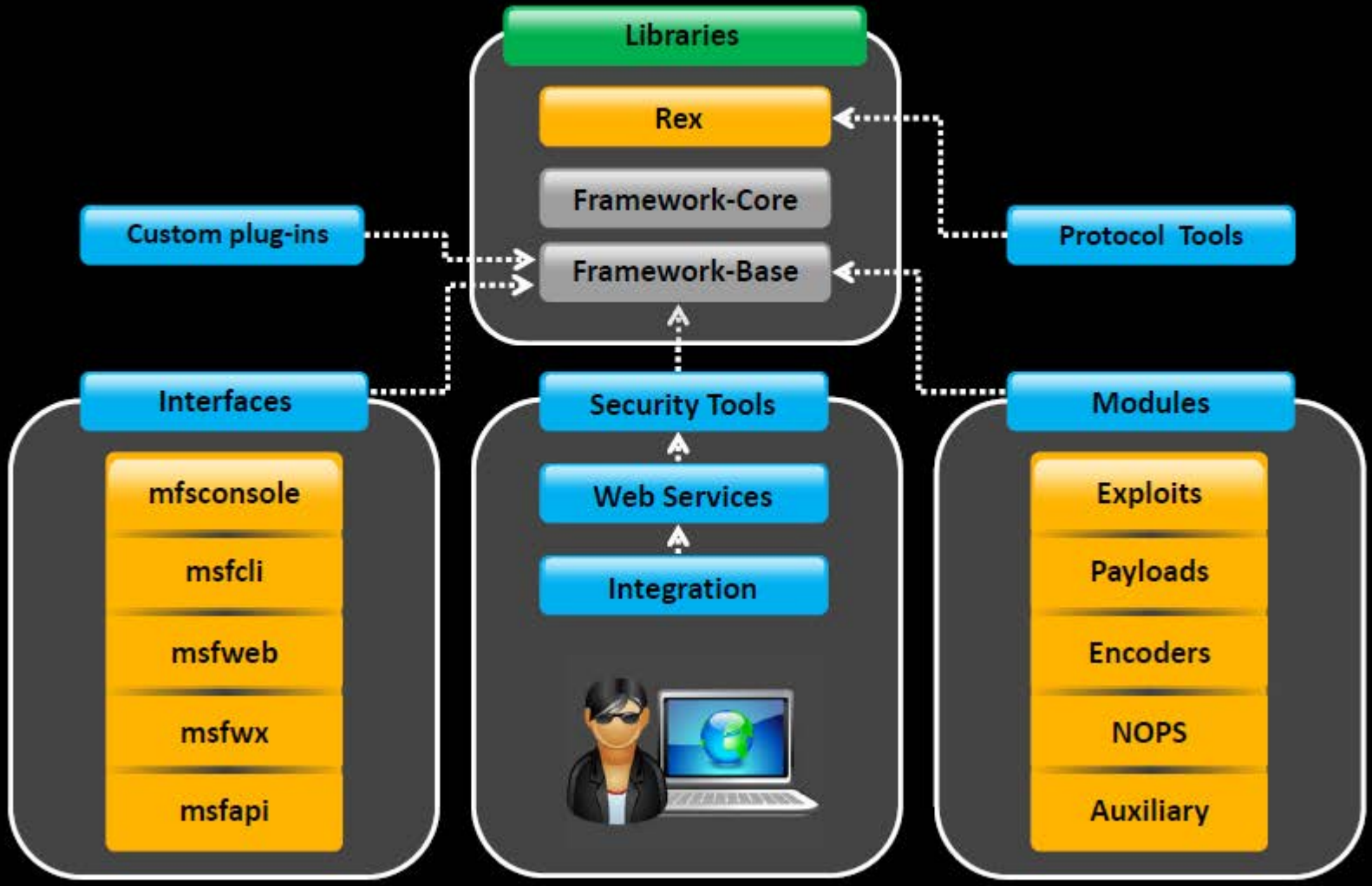
Webserver Attack Tool: Metasploit

- The Metasploit Framework is a **penetration testing toolkit**, exploit development platform, and **research tool** that includes hundreds of working remote exploits for a variety of platforms
- It supports fully automated **exploitation of web servers**, by abusing known vulnerabilities and leveraging weak passwords via Telnet, SSH, HTTP, and SNM



http://www.metasploit.com

Metasploit Architecture



Metasploit Exploit Module

- It is the basic module in Metasploit used to **encapsulate an exploit** using which users target many platforms with a single exploit
- This module comes with **simplified meta-information fields**
- Using a Mixins feature, users can also **modify exploit behavior dynamically**, brute force attacks, and attempt passive exploits

Steps to exploit a system follow the Metasploit Framework

1. Configuring Active Exploit
2. Verifying the Exploit Options
3. Selecting a Target
4. Selecting the Payload
5. Launching the Exploit

Metasploit Payload Module

- Payload module establishes a **communication channel** between the Metasploit framework and the victim host
- It combines the **arbitrary code** that is executed as the result of an exploit succeeding
- To generate **payloads**, first select a payload using the command:

Command Prompt

```
msf > use windows/shell_reverse_tcp
msf payload(shell_reverse_tcp) > generate -h
Usage: generate [options]
Generates a payload.
OPTIONS:
-b <opt> The list of characters to avoid:
'\x00\xff'
-e <opt> The name of the encoder module to use.
-h Help banner.
-o <opt> A comma separated list of options in
         VAR=VAL format.
-s <opt> NOP sled length.
-t <opt> The output type: ruby, perl, c, or raw.
msf payload(shell_reverse_tcp) >
```

Metasploit Auxiliary Module

- Metasploit's auxiliary modules can be **used to perform arbitrary**, one-off actions such as port scanning, denial of service, and even fuzzing
- To run auxiliary module, either use the **`run`** command, or use the **`exploit`** command

Command Prompt

```
msf > use dos/windows/smb/ms06_035_mailslot
msf auxiliary(ms06_035_mailslot) > set RHOST 1.2.3.4
RHOST => 1.2.3.4
msf auxiliary(ms06_035_mailslot) > run
[*] Mangling the kernel, two bytes at a time...
```

Metasploit NOPS Module

- NOP modules generate a no-operation instructions used for blocking out buffers
- Use **generate** command to generate a NOP sled of an arbitrary size and display it in a given format

OPTIONS:

-b <opt>: The list of characters to avoid: '\x00\xff'

-h: Help banner

-s <opt>: The comma separated list of registers to save

-t <opt>: The output type: ruby, perl, c, or raw

```
msf nop(opty2)>
```

Generates a NOP sled of a given length

```
msf > use x86/opty2
msf nop(opty2) > generate -h
Usage: generate [options] length
```

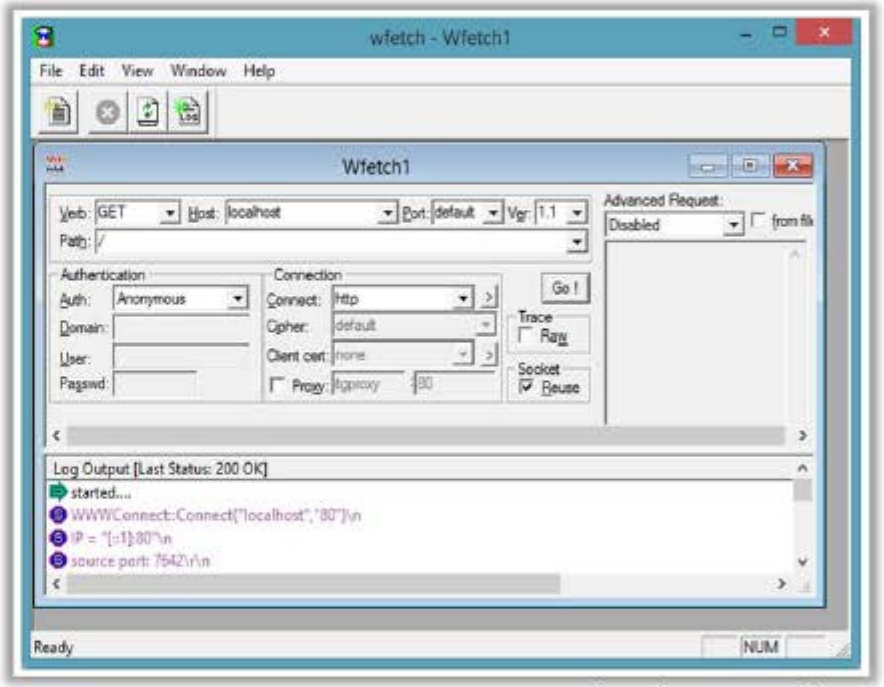
Command to generate a 50 byte NOP sled

```
msf nop(opty2) > generate -t c 50
unsigned char buf[] =
"\xf5\x3d\x05\x15\xf8\x67\xba\x7d\x08\xd6\x
66\x9f\xb8\x2d\xb6"
"\x24\xbe\xb1\x3f\x43\x1d\x93\xb2\x37\x35\x
84\xd5\x14\x40\xb4"
"\xb3\x41\xb9\x48\x04\x99\x46\xa9\xb0\xb7\x
2f\xfd\x96\x4a\x98"
"\x92\xb5\xd4\x4f\x91";
msf nop(opty2) >
```

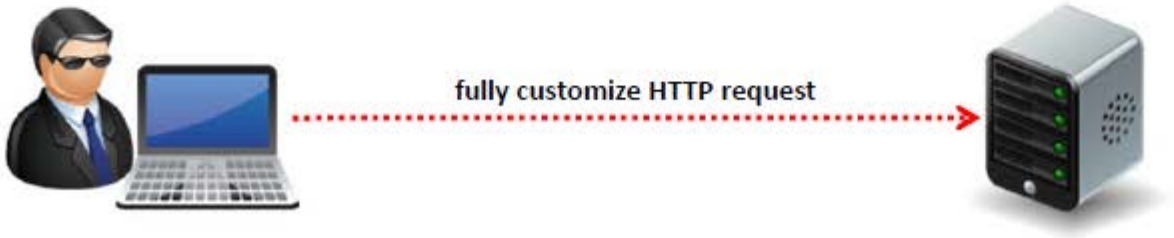
Webserver Attack Tool: Wfetch

WFetch allows attacker to fully customize an **HTTP request** and send it to a Web server to see the raw HTTP request and response data

It allows attacker to test the performance of Web sites that contain new elements such as **Active Server Pages** (ASP) or wireless protocols



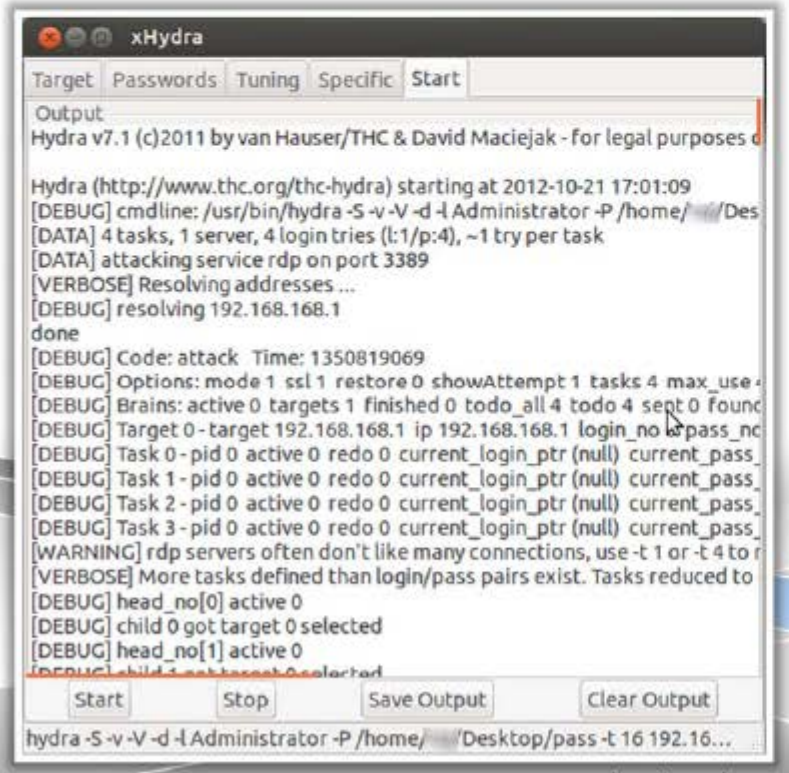
http://www.microsoft.com



Web Password Cracking Tools: THC-Hydra and Brutus

THC-Hydra

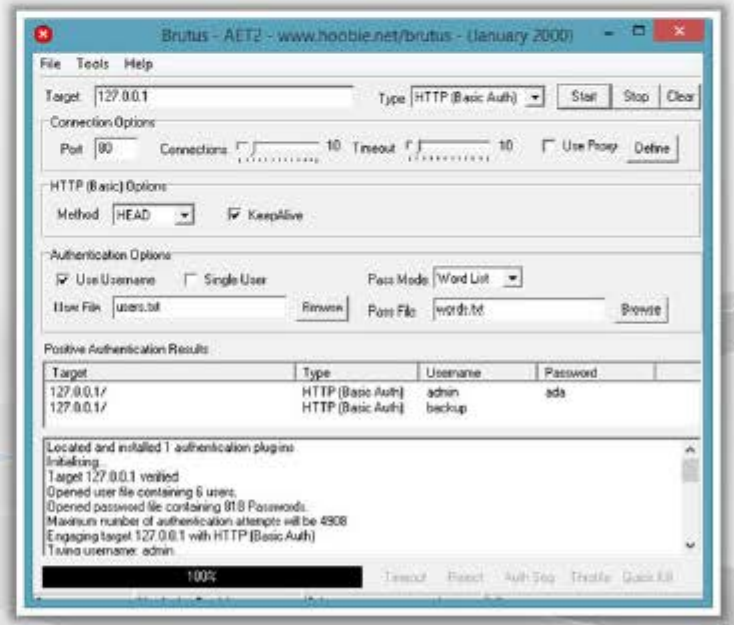
- Hydra is a parallized **login cracker** which supports numerous protocols to attack



http://www.thc.org

Brutus

- It includes a multi-stage authentication engine and can **make 60 simultaneous target connections**
- It supports no user name, single user name, **multiple user name**, password list, combo (user/password) list and configurable brute force modes



http://www.hoobie.net

Module Flow

1 Webserver Concepts

2 Webserver Attacks

3 Attack Methodology

4 Webserver Attack Tools

5 Counter-measures

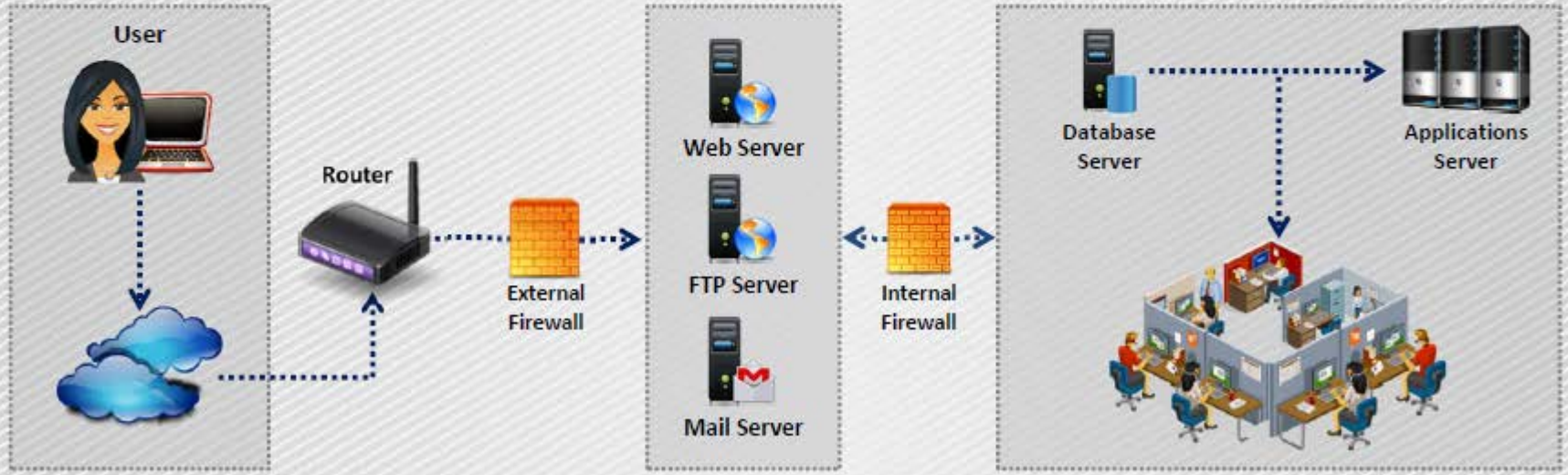
6 Patch Management

7 Webserver Security Tools

8 Webserver Pen Testing

Place Web Servers in Separate Secure Server Security Segment on Network

- An ideal **web hosting network** should be designed with at least **three segments** namely Internet segment, secure server security segment often called demilitarized zone (DMZ), internal network
- Place the web server in **Server Security Segment** (DMZ) of the network isolated from public network as well as internal network
- The firewalls should be place for **internal network** as well as **Internet traffic** going towards DMZ



Countermeasures: Patches and Updates

C|EH Certified Ethical Hacker

01 Scan for existing vulnerabilities, patch, and update the server software regularly

02 Before applying any service pack, hotfix, or security patch, read and peer review all relevant documentation

03 Apply all updates, regardless of their type on an "as-needed" basis

04 Test the service packs and hotfixes on a representative non-production environment prior to being deployed to production

05 Ensure that service packs, hotfixes, and security patch levels are consistent on all Domain Controllers (DCs)

06 Ensure that server outages are scheduled and a complete set of backup tapes and emergency repair disks are available

07 Have a back-out plan that allows the system and enterprise to return to their original state, prior to the failed implementation

08 Schedule periodic service pack upgrades as part of operations maintenance and never try to have more than two service packs behind

Countermeasures: Protocols

C|EH Certified Ethical Hacker

01 Block all unnecessary ports, Internet Control Message Protocol (ICMP) traffic, and unnecessary protocols such as NetBIOS and SMB

02 Harden the TCP/IP stack and consistently apply the latest software patches and updates to system software

03 If using insecure protocols such as Telnet, POP3, SMTP, FTP, take appropriate measures to provide secure authentication and communication, for example, by using IPSec policies

04 If remote access is needed, make sure that the remote connection is secured properly, by using tunneling and encryption protocols

05 Disable WebDAV if not used by the application or keep secure if it is required

Countermeasures: Accounts

Remove all unused modules and application extensions

Disable unused default user accounts created during installation of an operating system

When creating a new web root directory, grant the appropriate (least possible) NTFS permissions to the anonymous user being used from the IIS web server to access the web content

Eliminate unnecessary database users and stored procedures and follow the principle of least privilege for the database application to defend against SQL query poisoning

Use secure web permissions, NTFS permissions, and .NET Framework access control mechanisms including URL authorization

Slow down brute force and dictionary attacks with strong password policies, and then audit and alert for logon failures

Run processes using least privileged accounts as well as least privileged service and user accounts

Countermeasures: Files and Directories

Eliminate unnecessary files within the **.jar files**

Disable serving of **directory listings**

Eliminate **sensitive configuration** information within the **byte code**

Eliminate the **presence of non web files** such as archive files, backup files, text files, and header/include files

Avoid mapping **virtual directories** between two different servers, or over a network

Disable serving certain **file types** by creating a resource mapping

Monitor and check all **network services logs**, **website access logs**, **database server logs** (e.g., Microsoft SQL Server, MySQL, Oracle) and OS logs frequently

Ensure the presence of **web application** or **website files** and **scripts** on a separate partition or drive other than that of the operating system, logs, and any other system files

Detecting Web Server Hacking Attempts

Use **Website Change Detection System** to detect hacking attempts on the web server

Website Change Detection System involves:

Running specific script on the server that detects any changes made in the existing executable file or new file included on the server

Periodically comparing the **hash values** of the files on the server with their respective master hash value to detect the changes made in codebase

Alerting the user upon any change detection on the server

For example: WebsiteCDS is a script that goes through your entire web folder and detects any changes made to the your code base and alert you using email

How to Defend Against Web Server Attacks

01 Ports

- Audit the ports on server regularly to ensure that an **insecure** or unnecessary service is not active on your web server
- Limit inbound traffic to **port 80 for HTTP** and **port 443 for HTTPS** (SSL)
- Encrypt or restrict **intranet traffic**

02 Server Certificates

- Ensure that **certificate data ranges** are valid and that certificates are used for their intended purpose
- Ensure that the certificate has not been revoked and **certificate's public key** is valid all the way to a trusted root authority

03 Machine.config

- Ensure that protected resources are mapped to **HttpForbiddenHandler** and unused **HttpModules** are removed
- Ensure that **tracing is disabled** <trace enable="false"/> and **debug compiles** are turned off

04 Code Access Security

- Implement **secure coding** practices
- Restrict **code access security policy** settings
- **Configure IIS** to reject URLs with "../" and install new patches and updates

How to Defend Against Web Server Attacks (Cont'd)

UrlScan

- UrlScan is a security tool that **restricts** the types of HTTP requests that IIS will process
- By blocking specific HTTP requests, the UrlScan security tool helps to **prevent potentially harmful requests** from reaching applications on the server
- UrlScan screens all incoming requests to the server by filtering the requests based on **rules** that are set by the administrator

Services

- UrlScan can be configured to filter HTTP query string values and other HTTP headers to **mitigate SQL injection** attacks while the root cause is being fixed in the application.
- It provides **W3C formatted logs** for easier log file analysis through log parsing solutions like Microsoft Log Parser 2.2

How to Defend Against Web Server Attacks (Cont'd)

CEH Certified Ethical Hacker

01
- Apply **restricted ACLs** and block remote registry administration
- Secure the **SAM** (Stand-alone Servers Only)

02 Ensure that security related settings are **configured appropriately** and access to the metabase file is restricted with hardened **NTFS permissions**

03 **Remove** unnecessary ISAPI filters from the webserver

04
- Remove all unnecessary file shares including the **default administration shares** if not required
- Secure the shares with restricted **NTFS permissions**

05 Relocate sites and virtual directories to **non-system partitions** and use IIS Web permissions to restrict access

06 Remove all unnecessary **IIS script mappings** for optional file extensions to avoid exploiting any bugs in the ISAPI extensions that handle these types of files

07 Enable a **minimum level of auditing** on your web server and use NTFS permissions to protect the log files

How to Defend Against Web Server Attacks (Cont'd)

- Do use a **dedicated machine** as a web server
- Do physically protect the **webserver machine** in a secure machine room
- Create **URL mappings** to internal servers cautiously
- Do not connect an IIS Server to the **Internet** until it is fully hardened
- Do not install the **IIS server** on a domain controller
- Do not allow anyone to **locally log on** to the machine except for the administrator
- Use server side **session ID tracking** and match connections with time stamps, IP addresses, etc.
- Do configure a **separate anonymous user account** for each application, if you host multiple web applications
- If a database server, such as **Microsoft SQL Server**, is to be used as a backend database, install it on a **separate server**
- Limit the **server functionality** in order to support the web technologies that are going to be used
- Use **security tools** provided with web server software and **scanners** that automate and make the process of securing a web server easy
- Screen and filter the **incoming traffic request**

How to Defend against HTTP Response Splitting and Web Cache Poisoning

Server Admin

- Use latest **web server software**
- Regularly **update/patch OS** and webserver
- Run **web Vulnerability Scanner**

Application Developers

- Restrict web application access to **unique IPs**
- Disallow **carriage return** (%0d or \r) and line feed (%0a or \n) characters
- Comply to **RFC 2616** specifications for HTTP/1.1

Proxy Servers

- Avoid sharing **incoming TCP connections** among different clients
- Use different TCP connections with the proxy for different **virtual hosts**
- Implement "**maintain request host header**" correctly

How to Defend against DNS Hijacking

Choose an ICANN accredited registrar and encourage them to set Registrar-Lock on the domain name

Safeguard the registrant account information

Include DNS hijacking into incident response and business continuity planning

Use DNS monitoring tools/services to monitor DNS server IP address and alert

Avoid downloading audio and video codecs and other downloaders from untrusted websites

Install antivirus program and update it regularly

Change the default router password that comes with the factory settings

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Patches and Hotfixes

Hotfixes are an **update to fix a specific customer issue** and not always distributed outside the customer organization

A patch is a **small piece of software designed to fix problems**, security vulnerabilities, and bugs and improve the performance of a computer program or its supporting data

Users may be notified through **emails** or through the **vendor's website**

A patch can be considered as a **repair job to a programming problem**

Hotfixes are sometimes packaged as a set of fixes called a **combined hotfix** or **service pack**

What is Patch Management?

"Patch management is a process used to ensure that the appropriate patches are installed on a system and help fix known vulnerabilities"

An automated patch management process

Detect	Use tools to detect missing security patches
Assess	Asses the issue(s) and its associated severity by mitigating the factors that may influence the decision
Acquire	Download the patch for testing
Test	Install the patch first on a testing machine to verify the consequences of the update
Deploy	Deploy the patch to the computers and make sure the applications are not affected
Maintain	Subscribe to get notifications about vulnerabilities as they are reported

Identifying Appropriate Sources for Updates and Patches

1. First make a **patch management plan** that fits the operational environment and business objectives

2. Find appropriate **updates** and **patches** on the home sites of the applications or operating systems' vendors

3. The recommended way of tracking issues relevant to **proactive patching** is to register to the home sites to **receive alerts**

Installation of a Patch

01 Users can access and install security patches via the World Wide Web

Patches can be installed in two ways

Manual Installation

In this method, the user has to **download the patch** from the vendor and fix it

Automatic Installation

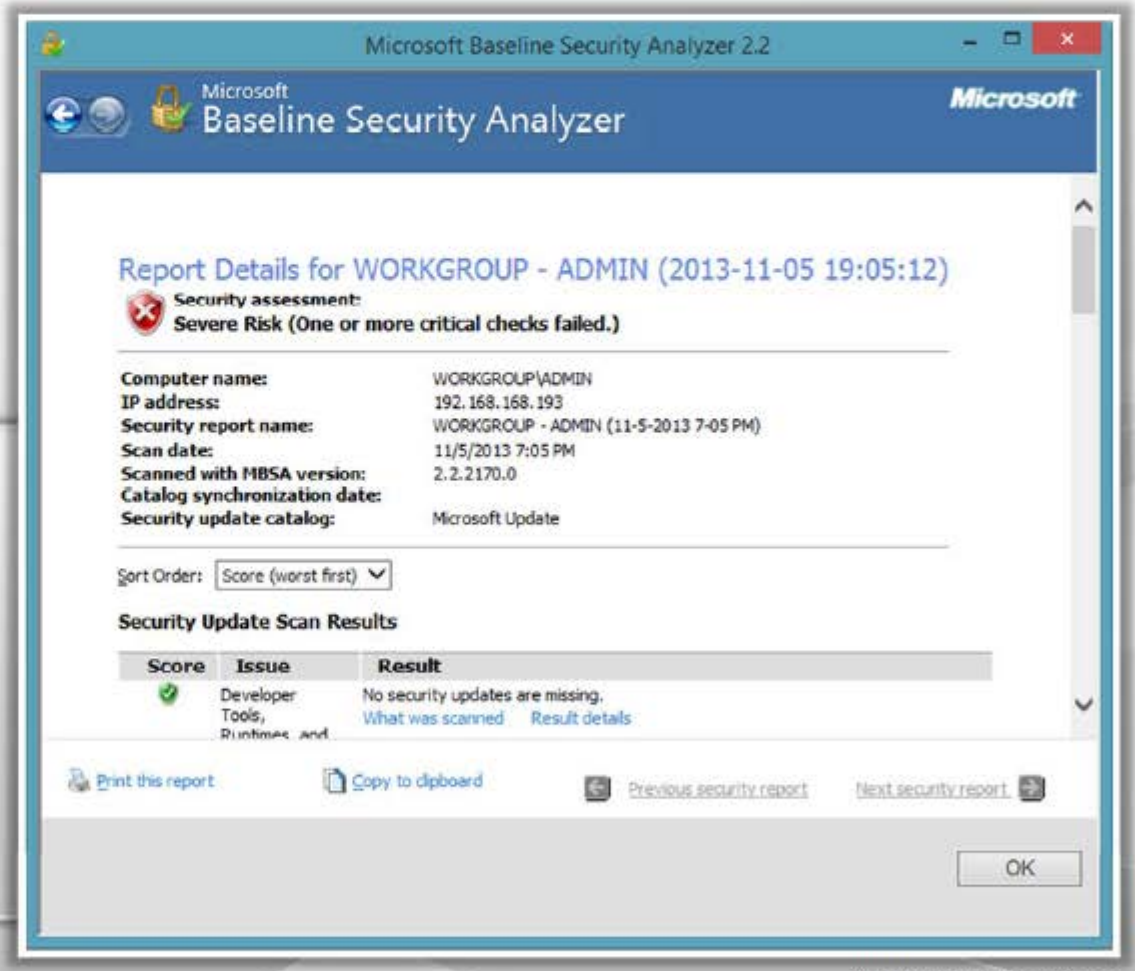
In this method, the applications use the **Auto Update** feature to update themselves

Implementation and Verification of a Security Patch or Upgrade

1.  Before installing any patch **verify the source**
2.  Use proper **patch management program** to validate files versions and checksums before deploying security patches
3.  The patch management tool must be **able to monitor the patched systems**
4.  The **patch management team** should check for updates and patches regularly

Patch Management Tool: Microsoft Baseline Security Analyzer (MBSA)

- MBSA checks for **available updates** to the operating system, Microsoft Data Access Components (MDAC), MSXML (Microsoft XML Parser), .NET Framework, and SQL Server
- It also scans a computer for insecure **configuration settings**



http://www.microsoft.com

Patch Management Tools

Altiris Client Management Suite
http://www.symantec.com

GFI LanGuard
http://www.gfi.com

Kaseya Security Patch Management
http://www.kaseya.com

ZENworks® Patch Management
http://www.novell.com

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

Prism Suite
http://www.newboundary.com

MaaS360® Patch Analyzer Tool
http://www.maas360.com

Secunia CSI
http://secunia.com

Lumension® Patch and Remediation
http://www.lumension.com

VMware vCenter Protect
http://www.vmware.com

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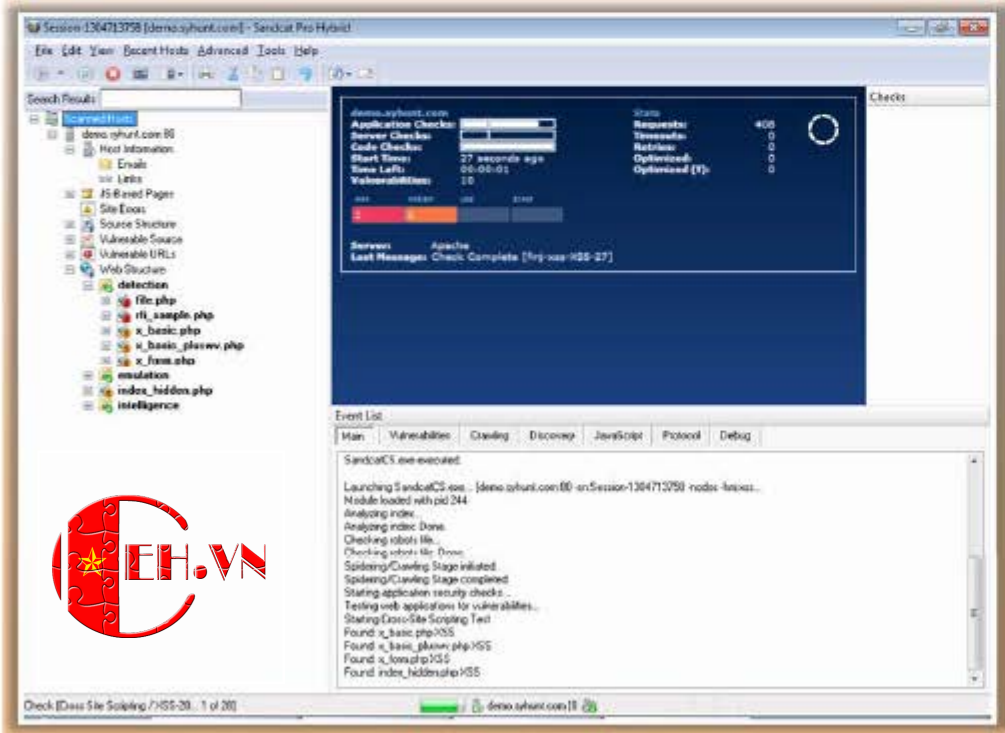
Web Application Security Scanners: Syhunt Dynamic and N-Stalker Web Application Security Scanner

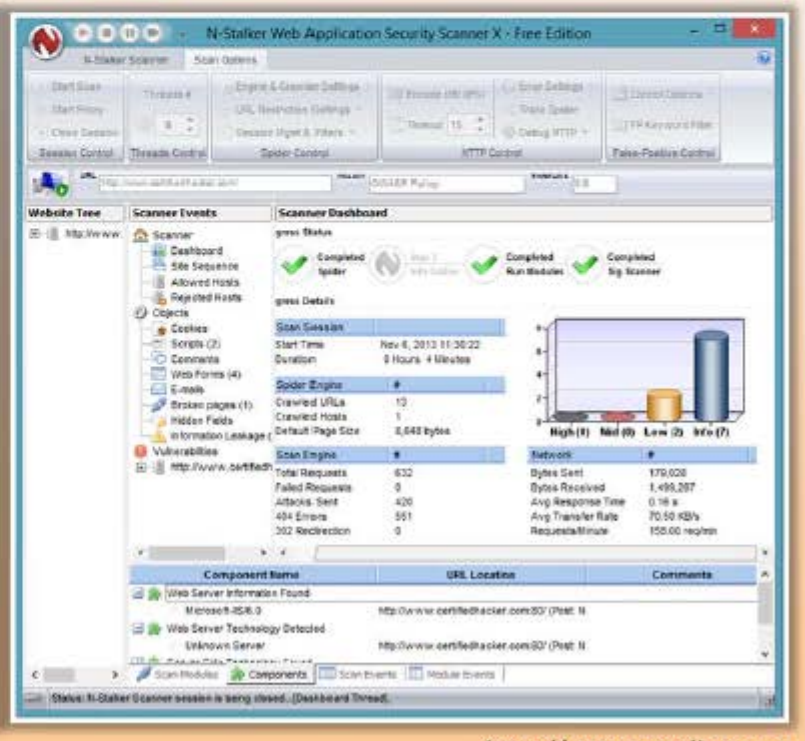
Syhunt Dynamic

Syhunt Dynamic helps to automate **web application security** testing and guard organization's **web infrastructure** against various web application security threats

N-Stalker Web Application Security Scanner

N-Stalker is a **WebApp Security Scanner** to search for vulnerabilities such as SQL injection, XSS, and known attacks





http://www.syhunt.com

http://www.nstalker.com

Web Server Security Scanners: Wikto and Acunetix Web Vulnerability Scanner

Wikto

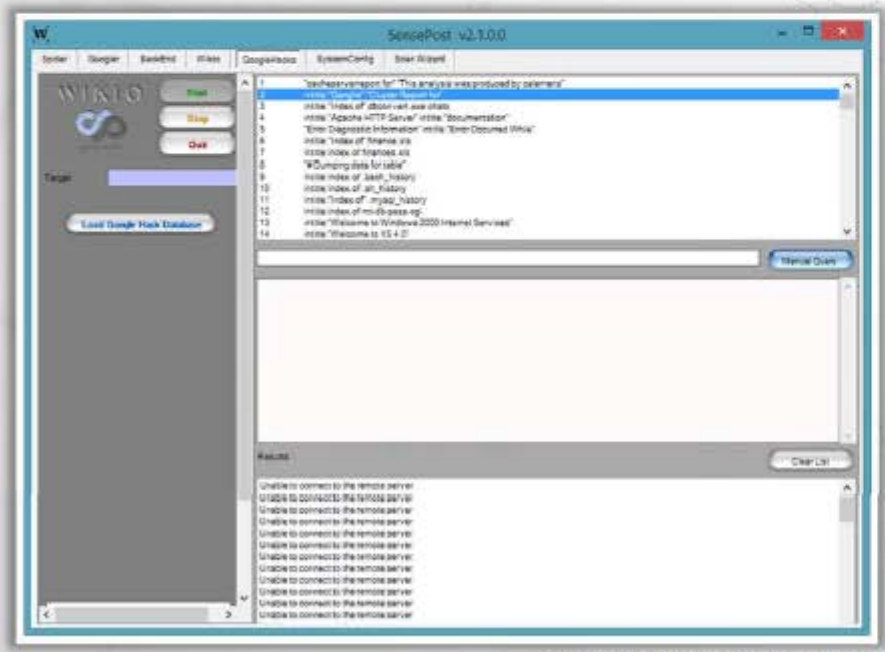
Microsoft

Witko is a **web server security scanner** for windows

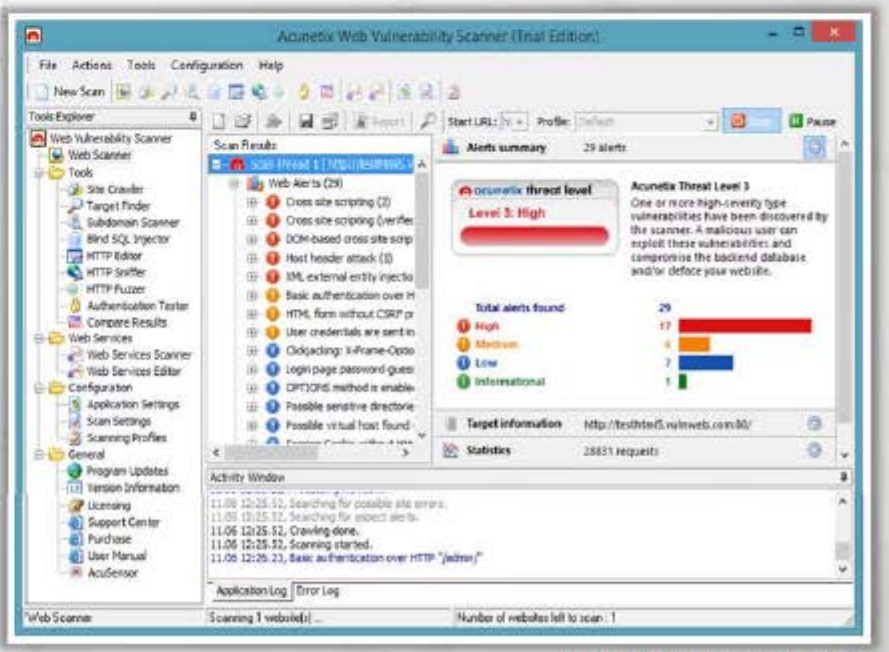
- Fuzzy logic error code checking
- Google assisted directory mining
- Back-end miner
- Real time HTTP request/response monitoring

Acunetix Web Vulnerability Scanner

- Acunetix WVS **checks web applications** for SQL injections, cross-site scripting, etc.
- It includes advanced penetration testing tools to ease **manual security audit processes**, and also creates professional security audit and regulatory compliance reports



http://www.sensepost.com



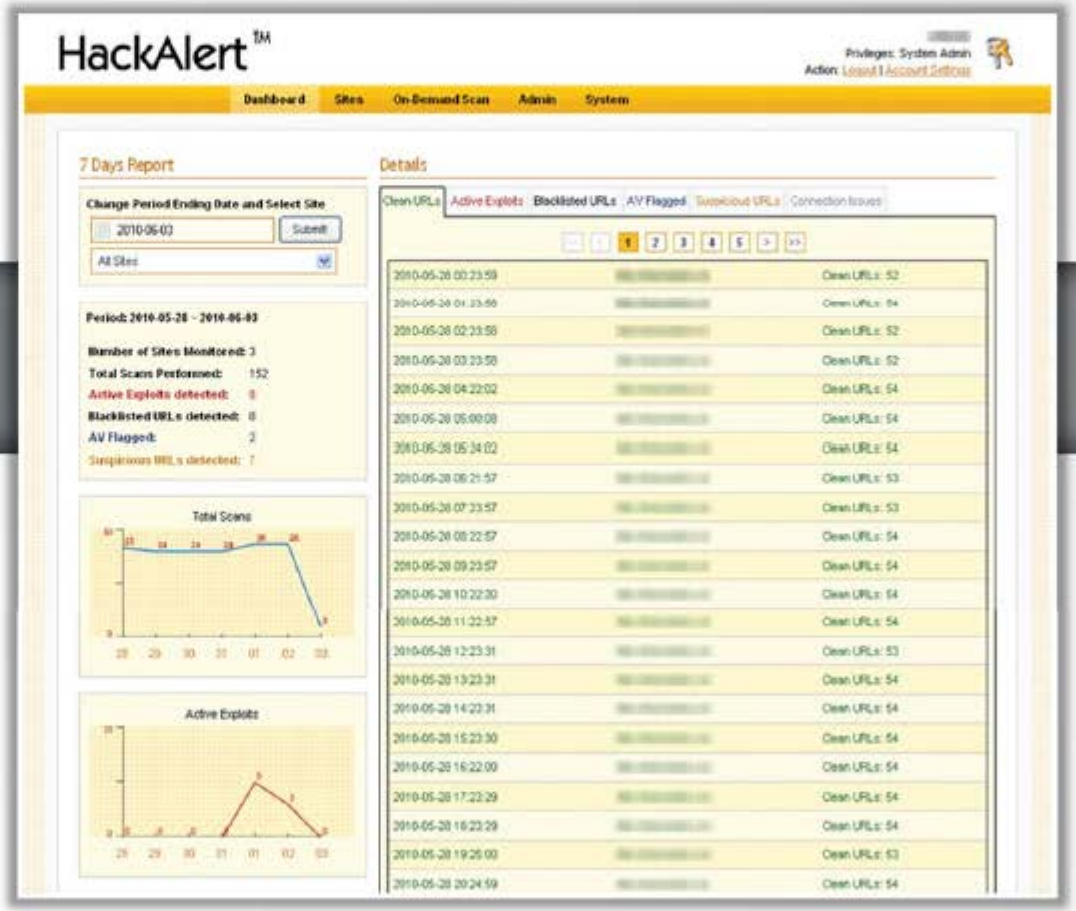
http://www.acunetix.com

Web Server Malware Infection Monitoring Tool: HackAlert

HackAlert is a **cloud-based service** that identifies hidden zero-day malware and drive-by downloads in websites and online advertisements

Features

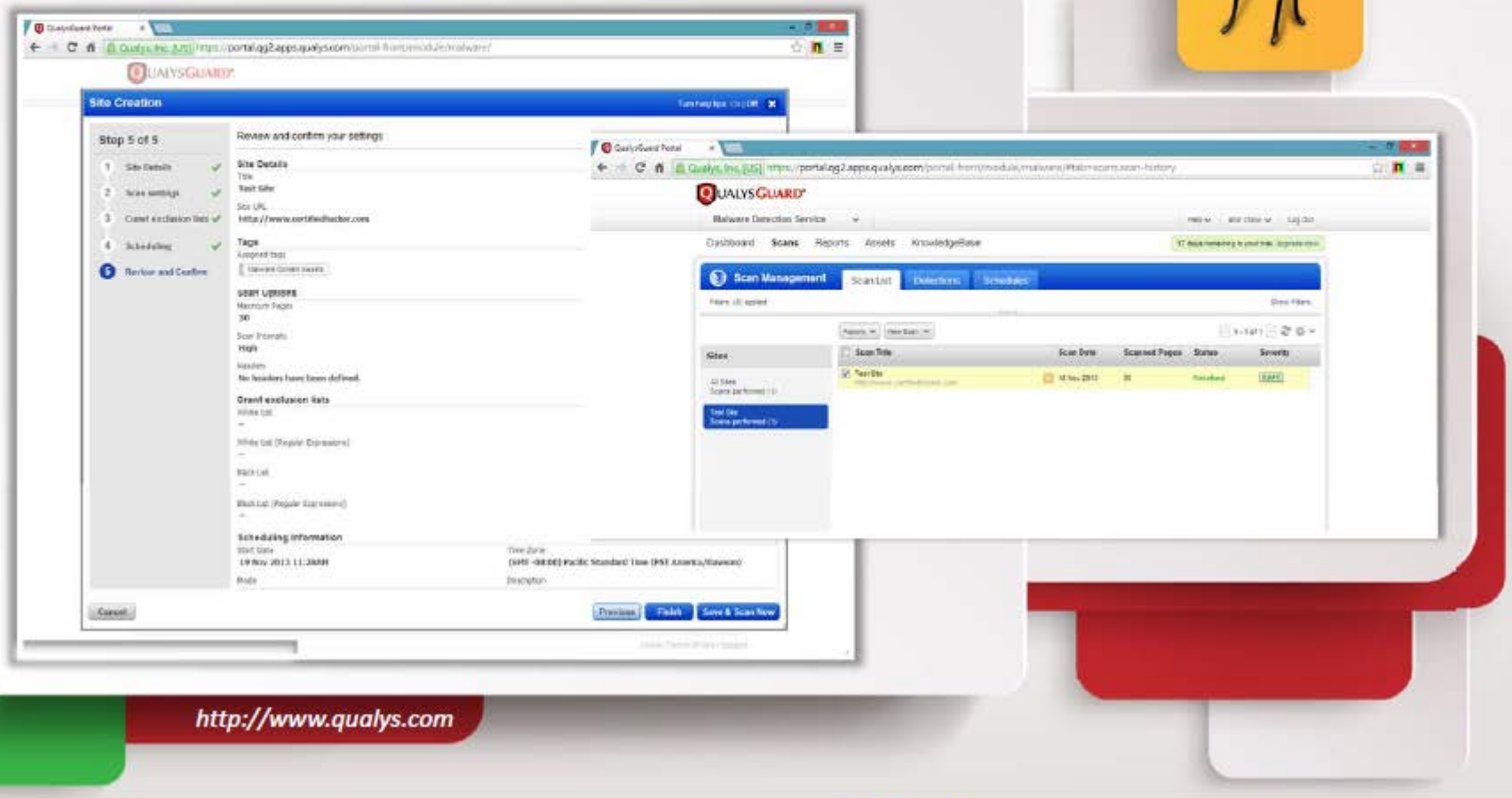
- Protects clients and customers from malware injected websites
- Identifies malware
- Displays injected code snippets
- Deploys as cloud-based SaaS
- Integrates with WAF or web server modules for instant mitigation



http://www.armorize.com

Web Server Malware Infection Monitoring Tool: QualysGuard Malware Detection

- QualysGuard® Malware Detection Service scans websites for **malware infections** and **threats**



http://www.qualys.com

Webserver Security Tools

Retina CS
http://www.beyondtrust.com

Nscan
http://nscan.hypermart.net

NetIQ Secure Configuration Manager
http://www.netiq.com

SAINTscanner
http://www.saintcorporation.com

HP WebInspect
https://download.hpsmartupdate.com

Arirang
http://monkey.org

N-Stalker Web Application Security Scanner
http://www.nstalker.com

Infiltrator
http://www.infiltration-systems.com

WebCruiser
http://sec4app.com

dotDefender
http://www.applicure.com

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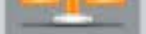


7 Webserver Security Tools

8 Webserver Pen Testing

Web Server Penetration Testing

- Web server pen testing is used to **identify**, **analyze**, and **report vulnerabilities** such as authentication weaknesses, configuration errors, protocol related vulnerabilities, etc. in a web server
- The best way to perform penetration testing is to **conduct a series of methodical and repeatable tests**, and to work through all of the different application vulnerabilities

Why Webserver Pen Testing?

Verification of Vulnerabilities

To exploit the vulnerability in order to test and fix the issue

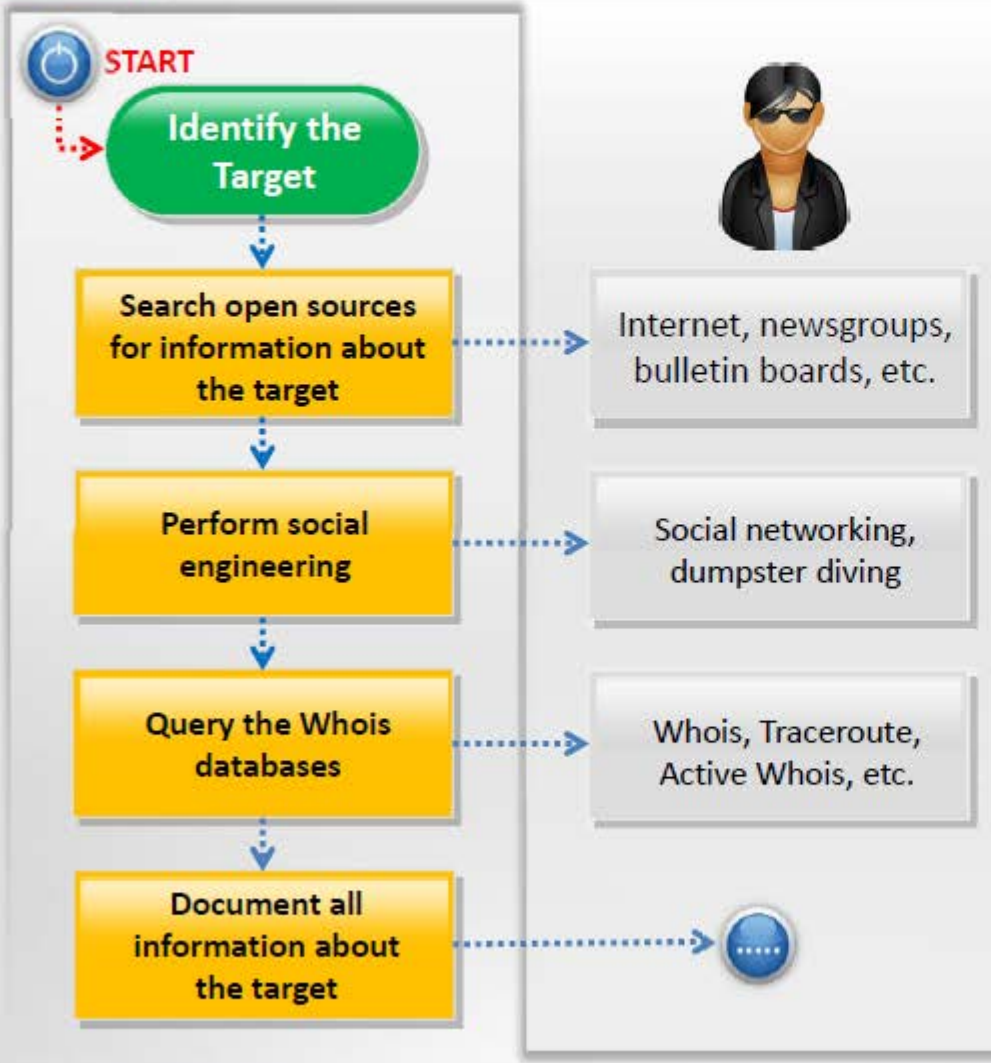
Remediation of Vulnerabilities

To retest the solution against vulnerability to ensure that it is completely secure

Identification of Web Infrastructure

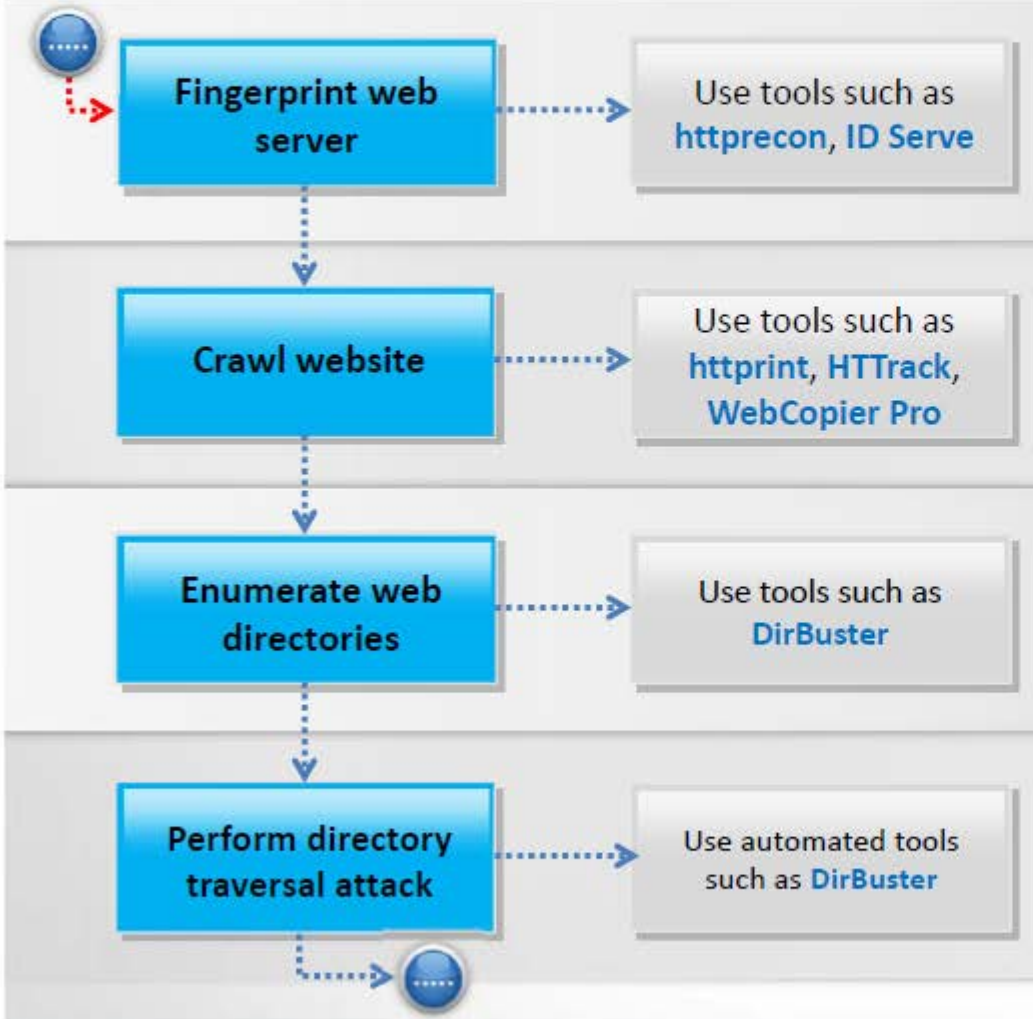
To identify make, version, and update levels of web servers; this helps in selecting exploits to test for associated published vulnerabilities

Web Server Penetration Testing (Cont'd)



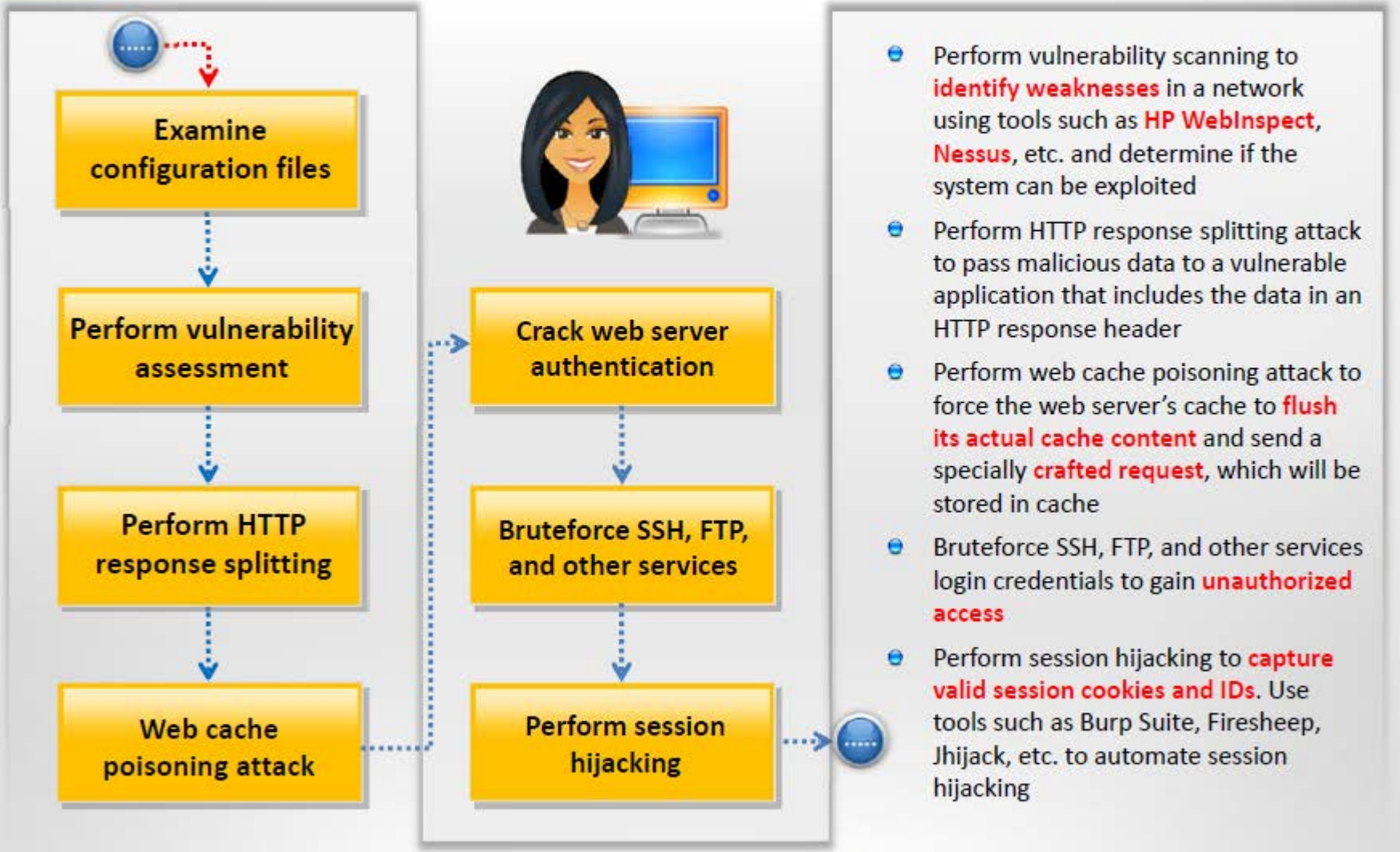
- Webserver penetration testing starts with **collecting as much information** as possible about an organization ranging from its physical location to operating environment
- Use **social engineering techniques** to collect information such as human resources, contact details, etc. that may help in **webserver authentication testing**
- Use **Whois database query tools** to get the details about the target such as domain name, IP address, administrative contacts, Autonomous System Number, DNS, etc.
- **Note:** Refer Module 02: Footprinting and Reconnaissance for more information gathering techniques

Web Server Penetration Testing (Cont'd)



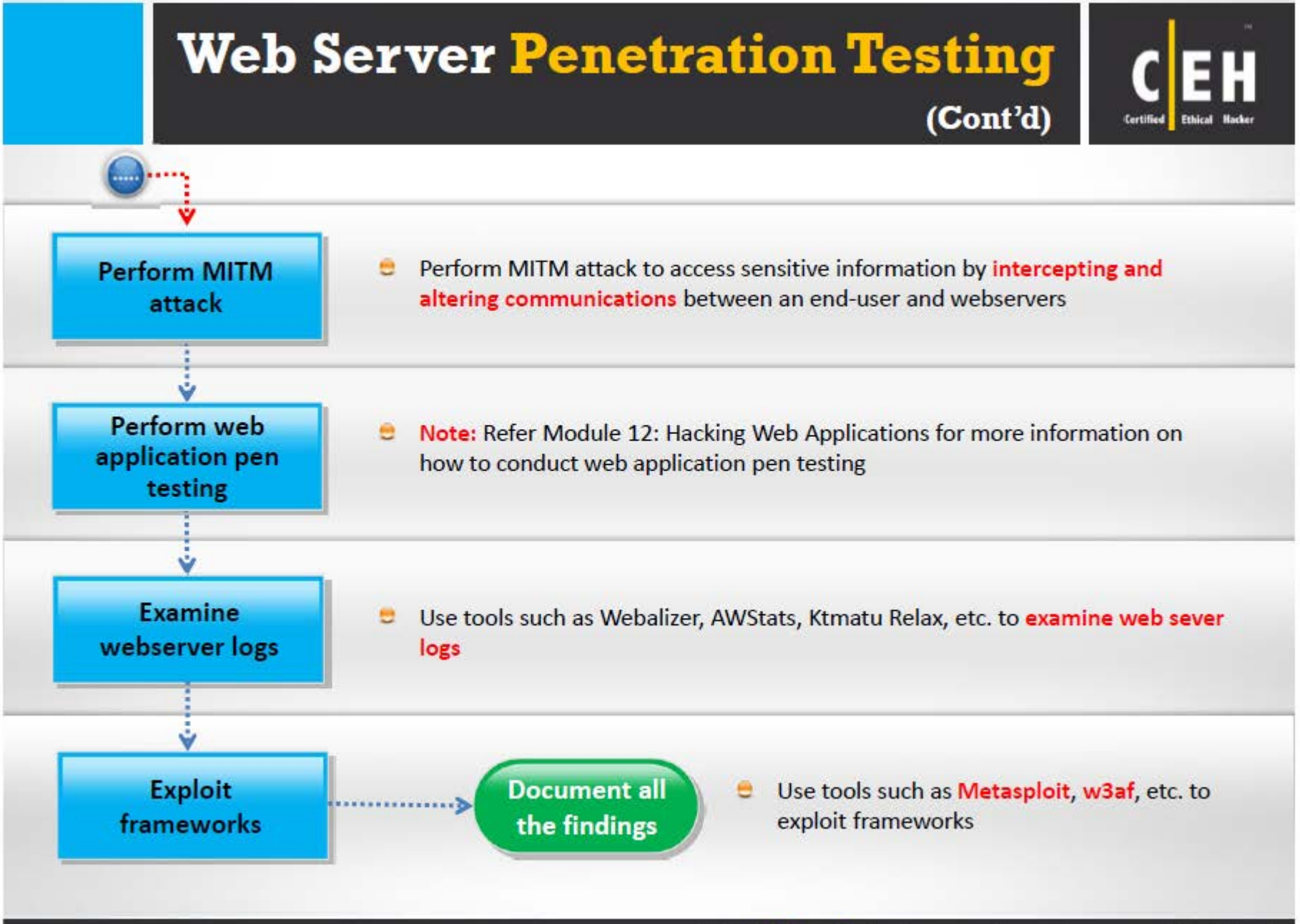
- Fingerprint web server to gather information such as server name, server type, operating systems, applications running, etc. using tools such as ID Serve, httprecon, and Netcraft
- Crawl website to gather specific types of information from web pages, such as email addresses
- Enumerate webserver directories to extract important information such as web functionalities, login forms etc.
- Perform directory traversal attack to access restricted directories and execute commands outside of the web server's root directory

Web Server Penetration Testing (Cont'd)



- Perform vulnerability scanning to **identify weaknesses** in a network using tools such as **HP WebInspect**, **Nessus**, etc. and determine if the system can be exploited
- Perform HTTP response splitting attack to pass malicious data to a vulnerable application that includes the data in an HTTP response header
- Perform web cache poisoning attack to force the web server's cache to **flush its actual cache content** and send a specially **crafted request**, which will be stored in cache
- Bruteforce SSH, FTP, and other services login credentials to gain **unauthorized access**
- Perform session hijacking to **capture valid session cookies and IDs**. Use tools such as Burp Suite, Firesheep, Jhijack, etc. to automate session hijacking

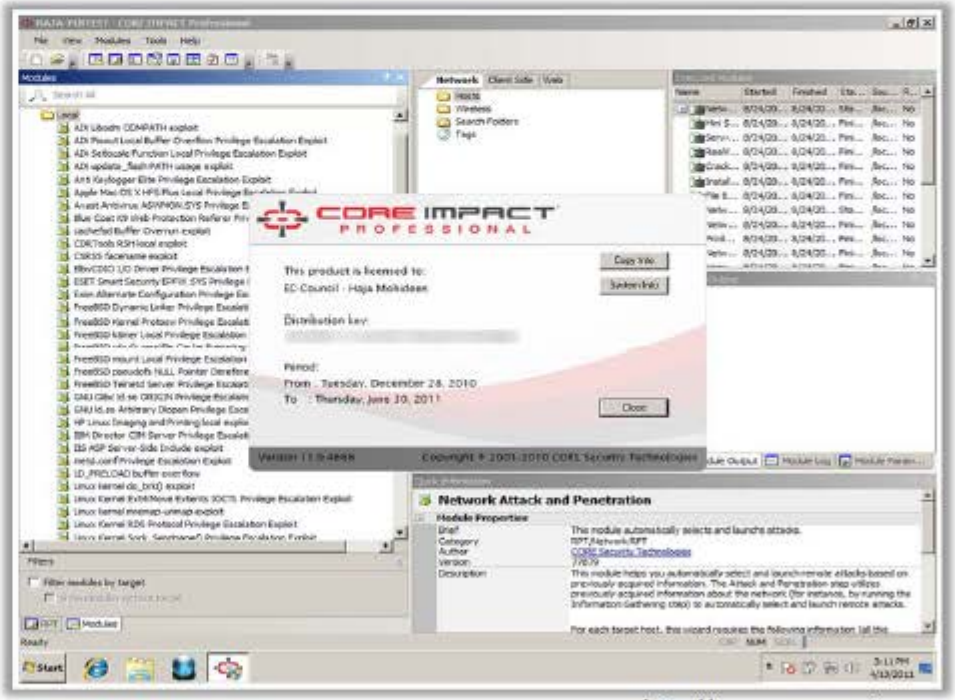
Web Server Penetration Testing (Cont'd)



Web Server Pen Testing Tool: CORE Impact® Pro

CORE Impact® Pro is the software solution for assessing and testing **security vulnerabilities** in the organization:

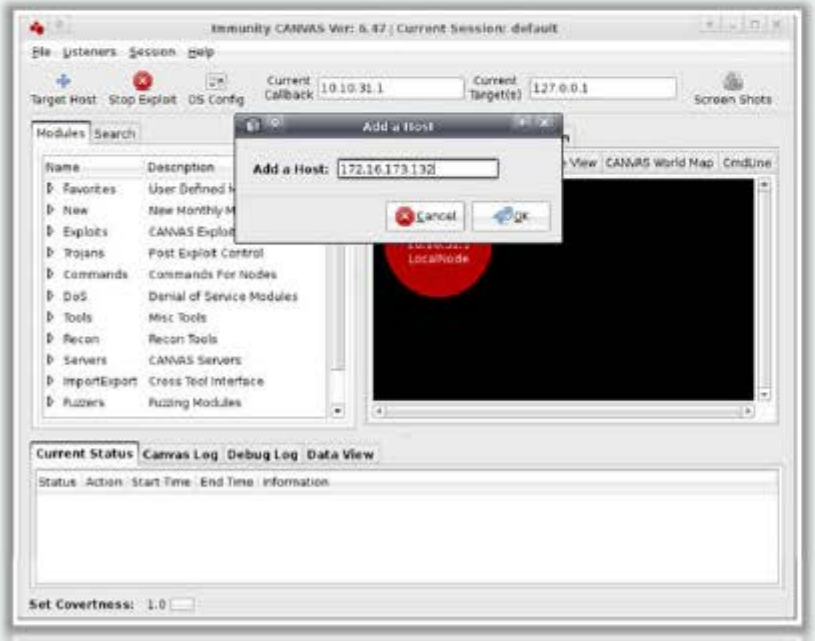
- Web Applications
- Network Systems
- Endpoint systems
- Wireless Networks
- Network Devices
- Mobile Devices
- IPS/IDS and other defenses

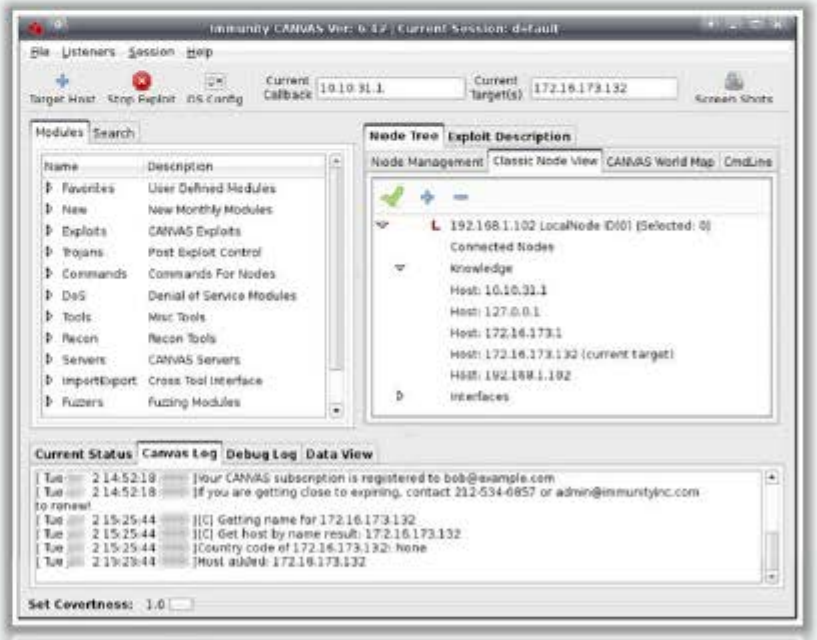


http://www.coresecurity.com

Web Server Pen Testing Tool: Immunity CANVAS

CANVAS is an automated exploitation system, and a comprehensive, reliable **exploit development framework** to security professionals and penetration testers

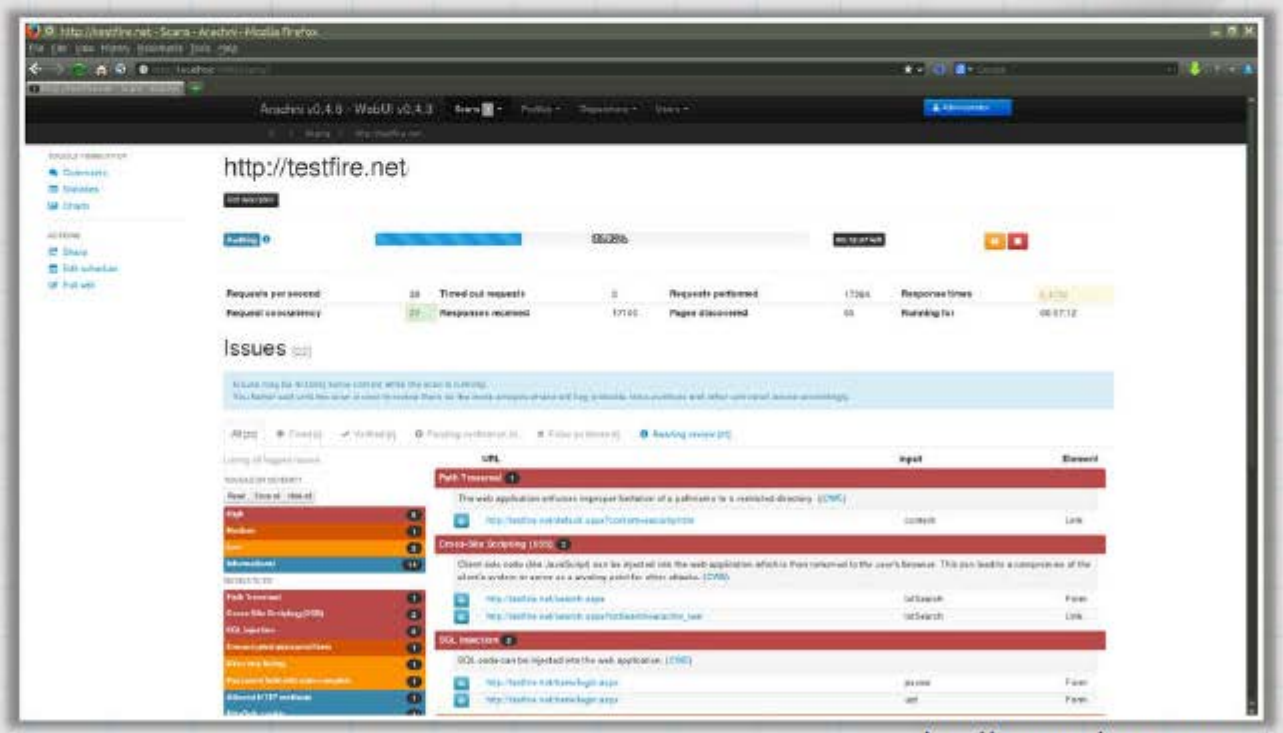




http://www.immunitysec.com

Web Server Pen Testing Tool: Arachni

Arachni is an open source, feature-full, modular, high-performance Ruby framework aimed towards helping penetration testers and administrators evaluate the **security of web applications**



http://www.arachni-scanner.com

Module Summary

- Web servers assume critical importance in the realm of Internet security
- Vulnerabilities exist in different releases of popular webservers and respective vendors patch these often
- The inherent security risks owing to the compromised webservers have impact on the local area networks that host these websites, even on the normal users of web browsers
- Looking through the long list of vulnerabilities that had been discovered and patched over the past few years, it provides an attacker ample scope to plan attacks to unpatched servers
- Different tools/exploit codes aid an attacker in perpetrating web server's hacking
- Countermeasures include scanning for the existing vulnerabilities and patching them immediately, anonymous access restriction, incoming traffic request screening, and filtering