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**(PHD IN INFORMATION TECHNOLOGY)**

**THESIS ON**

**MAC ADDRESS IN COMPUTER NETWORKING UPDATES & ROUTER FAULT**

**DATE:20/11/2018**

I do hereby attest that I am the sole author of this project/thesis and that its contents are only the result of the readings and research I have done.



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## ABSTRACT

MAC FILTERING IS NOT AN EFFECTIVE CONTROL IN WIRELESS NETWORKING AS ATTACKERS CAN EAVESDROP ON WIRELESS TRANSMISSIONS. HOWEVER MAC FILTERING IS MORE EFFECTIVE IN WIRED NETWORKS, SINCE IT IS MORE DIFFICULT FOR ATTACKERS TO IDENTIFY AUTHORIZED MACS. MAC ADDRESSES ARE UNIQUELY ASSIGNED TO EACH CARD, SO USING MAC FILTERING ON A NETWORK PERMITS AND DENIES NETWORK ACCESS TO SPECIFIC DEVICES THROUGH THE USE OF BLACKLISTS AND WHITELISTS. CHANGING MAC ADDRESSES IS NECESSARY IN NETWORK VIRTUALIZATION. IT CAN ALSO BE USED IN THE PROCESS OF EXPLOITING SECURITY VULNERABILITIES. THIS IS CALLED MAC SPOOFING. IN IP NETWORKS, THE MAC ADDRESS OF AN INTERFACE CAN BE QUERIED GIVEN THE IP ADDRESS USING THE ADDRESS RESOLUTION PROTOCOL (ARP) FOR INTERNET PROTOCOL VERSION 4 (IPV4) OR THE NEIGHBOR DISCOVERY PROTOCOL (NDP) FOR IPV6. IN THIS WAY, ARP OR NDP IS USED TO RELATE IP ADDRESSES (OSI LAYER 3) TO ETHERNET MAC ADDRESSES (OSI LAYER 2). A MAC ADDRESS IS LIKE A SOCIAL SECURITY NUMBER WHICH REMAINS UNCHANGED FOR A PERSON'S LIFE TIME (THE DEVICE), WHILE AN IP ADDRESS IS LIKE A POSTAL CODE WHICH CAN BE CHANGED. THE SOLE OF THIS THESIS IS ABOUT THE MAC ADDRESS DESCRIPTIONS IN IPV4 AND IPV6.THIS ALSO INTRODUCE HOW TO FIND DIFFERENT OPERATING SYSTEM'S & ROUTER'S MAC & IP ADDRESS,HOW THEY ARE RELATED,HOW DATA ROUTE FROM PC TO SWITCH(ROUTING SCHEME).IT INCLUDES MAC ADDRESS CREATION,IP ADDRESS CREATION TECHNOLOGY BY CHANGING PC'S SETUP MANUALLY & WITH THE HELP OF THIRD PARTY SOFTWARE,OSI LAYER DESCRIOTIONS,THE IMPOTANCE OF MAC ADDRESS CHANGING & SO ON IN STEP BY STEP METHOD& CASE STUDY ALSO.....

# CHAPTER:1

## SECTION1:

### INTRODUCTION:

In computer networking, Media Access Control MAC Filtering (**layer 2** address filtering) refers to a security access control method whereby the 48-bit address assigned to each network card is used to determine access to the network.

#### OSI Model

Layer	Protocol data unit (PDU)	Function	FUNCTIONS
7. Application			High-level APIs, including resource sharing, remote file access
6. Presentation		Data	Translation of data between a networking service and an application; including character encoding, data compression and encryption/decryption
5. Session			Managing communication sessions, i.e. continuous exchange of information in the form of multiple back-and-forth transmissions between two nodes
4. Transport		Segment, Datagram	Reliable transmission of data segments between points on a network, including segmentation, acknowledgement and multiplexing
3. Network		Packet	Structuring and managing a multi-node network, including addressing, routing and traffic control
2. Data link		Frame	Reliable transmission of data frames between two nodes connected by a physical layer
1. Physical		Symbol	Transmission and reception of raw bit streams over a physical medium

## SECTION2:

### WHAT IS A MAC ADDRESS?

Just like an IP address identifies connected device and allows it to communicate with other devices while connected to the internet, the MAC address is similar in that it is used as an identifier. However, there are some very distinct differences.

MAC stands for Media Access Control. It is a set of numbers that identifies network devices. This number is set by the manufacturer and is embedded within the hardware so it cannot be altered. It is also known as a fixed address for this reason. While it was once known as an Ethernet address, other types of hardware have been introduced making this term more obsolete. Wi-Fi and Bluetooth are among the technologies that also use MAC addresses.

MAC address can be access through your operating system by using commands. Like IP addresses, MAC addresses are all unique. However, they all follow the same set of rules when it comes to format.

## SECTION3:

### HOW MANY BITS ARE IN A MAC ADDRESS?

MAC addresses are made up of 12-digit numbers and are made up of 48 bits, or 8 bytes. However, some types of hardware require a 64-bit MAC address. Certain wireless home automation systems, for example, may require a 64-bit MAC address.

When using an IPv6 network, the settings change a bit more. These networks translate 48-bit networks to 64-bit networks by inserting an **FFFE** value **in the middle**. These identifiers are used to differentiate between 48-bit addresses and 64-bit addresses.

## SECTION4:

### WHAT ARE TYPICAL FORMATS FOR MAC ADDRESSES?

There are a few different formats that are used for MAC addresses, depending upon the network and specific hardware. Traditionally, these addresses are written in the format of MM:MM:MM:SS:SS:SS. However, this can vary. Two additional formats for 48-bit addresses are MM-MM-MM-SS-SS-SS or MMM.MMM.SSS.SSS.

A 48-bit address that is converted to a 64-bit address would be formatted as MM:MM:MM:FF:FE:SS:SS:SS.

## CHAPTER:2

### SECTION1:

#### WHAT DOESBITS NUMBER OF MAC ADDRESS MEAN?

The first six digits, which makes up 24 bits in a 48-bit network, is a prefix that is used to identify the manufacturer of the device. It's not unusual to find that several devices created by the same manufacturer have different prefixes. This is because some of the biggest manufacturers utilize multiple prefixes across their lines of products.

The next set of numbers, which makes up the remaining 24 bits, is essentially a serial number. This identifies the particular device. All products from the same manufacturer that have the same prefix (or first set of digits) will have a distinct second set of numbers. Each will be unique. However, if the prefix is different, the product identifier may be the same, even when the products are from the same manufacturer. You may also find that the identifier is the same between two products from different manufacturers. However, as already explained, each manufacturer has its own prefix, so this number will vary. In short, every device will in some way have a completely unique MAC address, whether they were made by the same manufacturer or not.

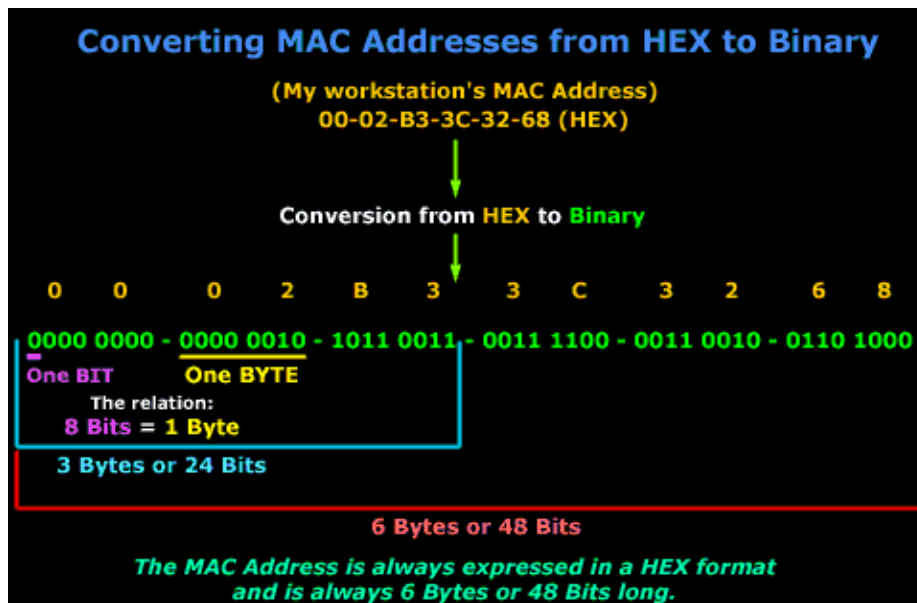
**MAC** addresses are uniquely assigned to each card, so using MAC filtering on a network permits and denies network access to specific devices through the use of blacklists and whitelists. While the restriction of network access through the use of lists is straightforward, an individual person is not identified by a MAC address, rather a device only, so an authorized person will need to have a whitelist entry for each device that he or she would use to access the network.

## SECTION2:

### FORMAT OF A MAC ADDRESS

MAC addresses are 12-digit (6 bytes or 48 bits) hexadecimal numbers. By convention, they are usually written in one of the following three formats:

- MM:MM:MM:SS:SS:SS
- MM-MM-MM-SS-SS-SS
- MMM.MMM.SSS.SSS



The leftmost 6 digits (24 bits) called a "prefix" is associated with the adapter manufacturer. Each vendor registers and obtains MAC prefixes as assigned by the IEEE. Vendors often possess many prefix numbers associated with their different products. For example, the prefixes 00:13:10, 00:25:9C and 68:7F:74 (plus many others) all belong to Linksys (Cisco Systems).

The rightmost digits of a MAC address represent an identification number for the specific device. Among all devices manufactured with the same vendor prefix, each is given their own unique 24-bit number. Note that hardware from different vendors may happen to share the same device portion of the address.

### SECTION3:

#### 64-BIT MAC ADDRESSES

While traditional MAC addresses are all 48 bits in length, a few types of networks require 64-bit addresses instead. ZigBee wireless home automation and other similar networks based on IEEE 802.15.4, for example, require 64-bit MAC addresses be configured on their hardware devices.

TCP/IP networks based on IPv6 also implement a different approach to communicating MAC addresses compared to mainstream IPv4. Instead of 64-bit hardware addresses, though, IPv6 automatically translates 48-bit MAC address to a 64-bit address by inserting a fixed (hardcoded) 16-bit value FFFE in between the vendor prefix and the device identifier. IPv6 calls these numbers "identifiers" to distinguish them from true 64-bit hardware addresses.

For example, a 48-bit MAC address 00:25:96:12:34:56 appears on an IPv6 network as (commonly written in either of these two forms):

- 00:25:96:FF:FE:12:34:56
- 0025:96FF:FE12:3456

### SECTION4:

#### MAC ADDRESS AND DIFFERSNT FUNCTIONS

**MAC filtering is not an effective control in wireless networking as attackers can eavesdrop on wireless transmissions. However MAC filtering is more effective in wired networks, since it is more difficult for attackers to identify authorized MACs.**

A **media access control address**(MAC address) of a device is a unique identifier assigned to a **network interface controller**(NIC) for communications at the **data link layer** of a network segment. MAC addresses are used as a network address for most IEEE 802 network technologies, including Ethernet and Wi-Fi. MAC addresses are used in the medium access control protocol sublayer.

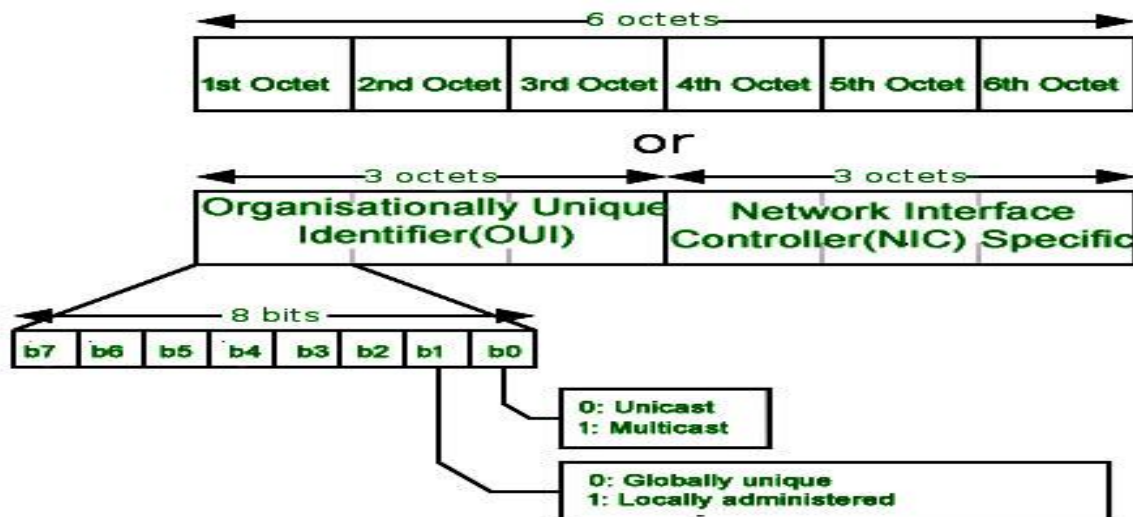
A MAC may be referred to as the **burned-in address**(BIA). It may also be known as an **Ethernet hardware address**(EHA), hardware address or physical address (not to be confused with a memory physical address).

A network node may have multiple NICs and each NIC must have a unique MAC address. Sophisticated network equipment such as a multilayer switch or router may require one or more permanently assigned MAC addresses.

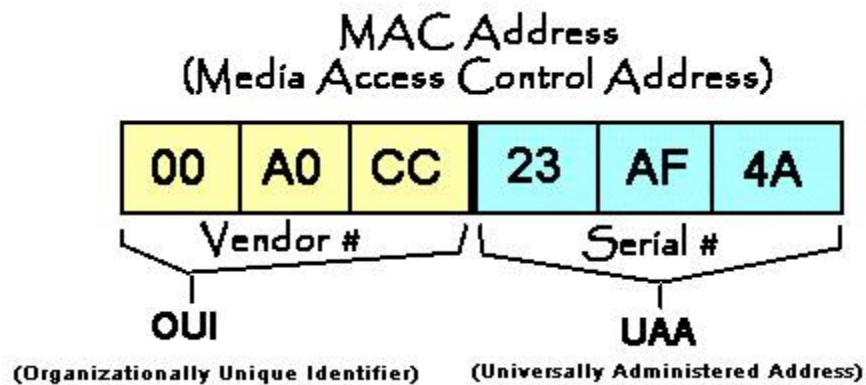


Addresses can either be **universally administered addresses(UAA)** or **locally administered addresses(LAA)**. A universally administered address is uniquely assigned to a device by its manufacturer. The first three octets (in transmission order) identify the organization that issued the identifier and are known as the organizationally unique identifier (OUI). The remainder of the address (three octets for EUI-48 or five for EUI-64) are assigned by that organization in nearly any manner they please, subject to the constraint of uniqueness. A locally administered address is assigned to a device by a network administrator, overriding the burned-in address.

**Universally administered and locally administered addresses are distinguished by setting the second-least-significant bit of the first octet of the address.** This bit is also referred to as the **U/Lbit**, short for Universal/Local, which identifies how the address is administered. **If the bit is 0, the address is universally administered. If it is 1, the address is locally administered.** In the example address 06-00-00-00-00-00 the first octet is 06 (hex), the binary form of which is 00000110, where the second-least-significant bit is 1. Therefore, it is a locally administered address. Another example that uses locally administered addresses is the **DECnet**(DECnet is a suite of network protocols created by Digital Equipment Corporation. Originally released in 1975 in order to connect two PDP-11minicomputers, it evolved into one of the first peer-to-peer network architectures, thus transforming DEC into a networking powerhouse in the 1980s. Initially built with three layers, it later (1982) evolved into a seven-layer OSI-compliant networking protocol) protocol. The MAC address of the Ethernet interface is changed by the DECnet software to be AA-00-04-00-XX-YY where XX-YY reflects the DECnet network address xx.yy of the host. This eliminates the need for an address resolution protocol since the **MAC address for any DECnet host can be simply determined.**



When the least significant bit of an address's first octet is 0 (zero), the frame is meant to reach only one receiving NIC. This type of transmission is called **unicast**. A unicast frame is transmitted to all nodes within the collision domain. In a modern wired setting the **collision domain** (usually is the length of the Ethernet cable between two network cards). In a wireless setting, the collision domain is all receivers that can detect a given wireless signal. If a switch does not know which port leads to a given MAC address, the switch will forward a unicast frame to all of its ports (except the originating port), an action known as **unicast flood**. Only the node with the matching hardware MAC address will accept the frame; network frames with non-matching MAC-addresses are ignored, unless the device is in promiscuous mode.



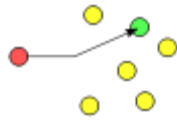
If the least significant bit of the first octet is set to 1, the frame will still be sent only **once**, however, NICs will choose to accept it based on criteria other than the matching of a MAC address: for example, based on a configurable list of accepted multicast MAC addresses. This is called **multicast addressing**. In computer networking, multicast is group communication, where data transmission is addressed to a group of destination computers simultaneously. **Multicast can be one-to-many or many-to-many distribution**. Multicast should not be confused with physical layer point-to-multipoint communication.

Group communication may either be application layer multicast or network assisted multicast, where the latter makes it possible for the source to efficiently send to the group in a single transmission. Copies are automatically created in other network elements, such as routers, switches and cellular network base stations, but only to network segments that currently contain members of the group. **Network assisted multicast may be implemented at the data link layer using one-to-many addressing and switching such as Ethernet multicast addressing, Asynchronous Transfer Mode (ATM), point-to-multipoint virtual circuits (P2MP) or InfiniBand multicast**. Network assisted multicast may also be implemented at the **Internet layer using IP multicast**. In IP multicast the implementation of the multicast concept occurs at the IP routing level, where routers create optimal distribution paths for datagrams sent to a multicast destination address.

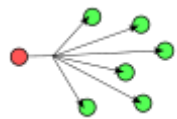
SECTION5:

ROUTING SCHEMES:

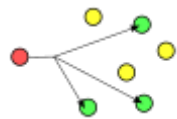
Unicast



Broadcast



Multicast



Anycast



Geocast



## CHAPTER:3

### SECTION1:

#### ROUTING SCHEMES DESCRIPTIONS:

##### UNICAST:

The frame is meant to reach only one receiving NIC. This type of transmission is called unicast.

##### BROADCAST:

Packets sent to the broadcast address, all one bits, are received by all stations on a local area network. In hexadecimal the broadcast address would be FF:FF:FF:FF:FF:FF. A broadcast frame is flooded and is forwarded to and accepted by all other nodes. Packets sent to a multicast address are received by all stations on a LAN that have been configured to receive packets sent to that address.

##### MULTICAST:

Multicast is often employed in Internet Protocol (IP) applications of streaming media, such as IPTV and multipoint video conferencing. Multicast delivers a message to a group of nodes that **have expressed interest in receiving the message**.

##### ANYCAST:

Anycast is a network addressing and routing methodology in which a single destination address has multiple routing paths to two or more endpoint destinations. Routers will select the desired path on the basis of number of hops, distance, lowest cost, latency measurements or based on the least congested route. Anycast networks are widely used for content delivery network (CDN) products to bring their content closer to the end user.

## GEOCAST:

Geocast refers to the delivery of information to a group of destinations in a network identified by their geographical locations. It is a **specialized form of multicast** addressing used by some routing protocols for mobile ad hoc networks.

## FUNCTIONAL ADDRESS:

Functional addresses identify one or more Token Ring NICs that provide a **particular service**, defined in IEEE 802.5.

## CHAPTER:4

### SECTION1:

#### MAC SPOOFING:

On broadcast networks, such as Ethernet, the MAC address is expected to uniquely identify each node on that segment and allows frames to be marked for specific hosts. It thus forms the basis of most of the link layer (OSI Layer 2) networking upon which upper layer protocols rely to produce complex, functioning networks. Although intended to be a permanent and globally unique identification, **it is possible to change the MAC address on most modern hardware**. Changing MAC addresses is necessary in network virtualization. **It can also be used in the process of exploiting security vulnerabilities. This is called MAC spoofing.** In IP networks, the MAC address of an interface can be queried given the IP address using the **Address Resolution Protocol(ARP)** for **Internet Protocol Version 4 (IPv4)** or the **Neighbor Discovery Protocol (NDP)** for IPv6. **In this way, ARP or NDP is used to relate IP addresses (OSI layer 3) to Ethernet MAC addresses (OSI layer 2).** A MAC address is like a social security number which remains unchanged for a person's life time (the device), while an IP address is like a postal code which can be changed.

### SECTION2:

#### NATIONAL SECURITY & MAC ADDRESS:

According to Edward Snowden, the US National Security Agency has a system that tracks the movements of everyone in a city by monitoring the MAC addresses of their electronic devices. As a result of users being trackable by their devices' MAC addresses, Apple has started using random MAC addresses in their iOS line of devices while scanning for networks. Other vendors quickly followed: MAC address randomization during scanning was added in Android starting from version 6.0, Windows 10, and Linux kernel 3.18. The actual implementations of the **MAC address randomization technique** vary largely in different devices. Moreover, **various flaws and shortcomings** in these implementations may allow an attacker to track a device even if its MAC address is changed, for instance its probe requests' other elements, or their timing.

The standard notation, also called canonical format, for MAC addresses is written in transmission order with the least significant bit of each byte transmitted first, and is used in the output of **the ifconfig, iproute2, and ipconfig commands, for example.**

## **CHAPTER:5**

### **SECTION1:**

#### **HOW TO GET MAC ADDRESS OF MAC COMPUTERS:**

#### **WHAT IS MAC COMPUTER:**

The Mac is just a PC with Mac OS installed on it. As much as Apple sometimes prefers the Mac to be thought of as something different than a PC, it's never been more similar. We can even install both Windows and Mac OS on your MacBook or iMac, switch between them, or even run them side-by-side (or, more accurately, run Windows on top of Mac OS) using software such as Parallels or Fusion.

Let's look at some of those similarities:

- They both use the same basic hardware components.
- They are both compatible with third-party keyboards and mice, including wireless keyboards and wireless mice.
- They both have a similar interface that allows you to save apps to your desktop, click on apps to run them, browse files in folders, etc.
- They both have a virtual assistant. The Mac has Siri and Windows-based PCs have Cortana.
- They both allow you to use cloud services such as Dropbox, Box.net and Google Drive.
- Popular browsers like Chrome, Safari and Firefox are available for both with Microsoft's Edge browser one of the few popular browsers to remain only Windows only.
- The documents you create in Microsoft Office and other popular office suites can be viewed on both Mac and Windows PCs.

---

BUT A MAC IS STILL VERY DIFFERENT, THE MOUSE ONLY HAS ONE BUTTON:

Mac OS supports both a left-click and a right-click for the mouse. More than that, Anyone can hook up the mouse you use on your Windows PC and use it on a Mac. And while Apple's Magic Mouse may seem like it is a single button, clicking it from the right side produces a right click.

In fact, one of the biggest stumbling blocks people coming from the Windows world comes down to keyboard shortcuts. The first time we try to use control-c to copy something to the clipboard, we realize that control-c doesn't copy anything to the clipboard. On the Mac Command-c does. And as simple as that sounds, it can take some getting used to before it feels natural.

So what's different?

- Microsoft Windows has more software written for it, including proprietary software some people need for work.
- Microsoft Windows supports both touchscreens and the familiar keyboard and mouse setup, so it is available on desktops, laptops, and tablets. macOS doesn't support touch screens, so it is only available as a laptop or desktop.
- The Mac has a connected relationship with the iPhone and the iPad. Not only can the Mac share files with the iPhone or iPad wirelessly using AirDrop, it can also open documents that are open on the iPhone or iPad and even receive phone calls routed through the iPhone.
- Because Windows is more popular than macOS, there are more viruses and malware that target Windows-based PCs. However, there is malware written specifically for the Mac.
- Windows-based PCs are built by many different manufacturers such as HP, Dell, and Lenovo. This helps drive prices down on PCs, which are generally cheaper than Macs.
- Macs are built and sold by Apple. This tighter control of the hardware leads to fewer problems, which can mean better stability, but it also means fewer options.
- Microsoft Windows has better support for gaming, especially "hardcore" gaming. This includes support for Virtual Reality (VR) hardware such as the Oculus Rift or HTC Vive.
- It is easier to upgrade a Windows-based PC part-by-part. While most people find it easier to simply buy a new PC, techies can boost the longevity of their PC by upgrading the RAM memory used by applications, the graphics used by games or the storage used by music, movies and other media.

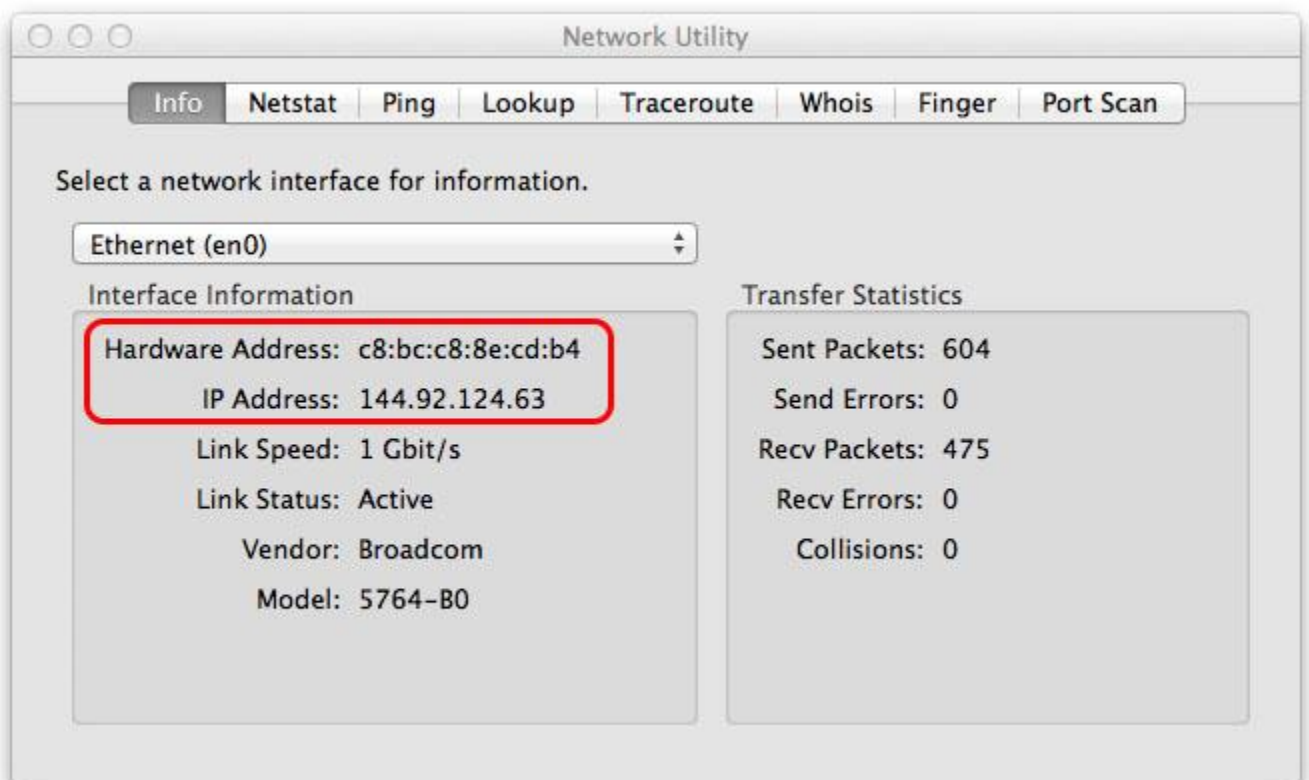


Open Network Utility by searching for it using Spotlight  in the upper right corner

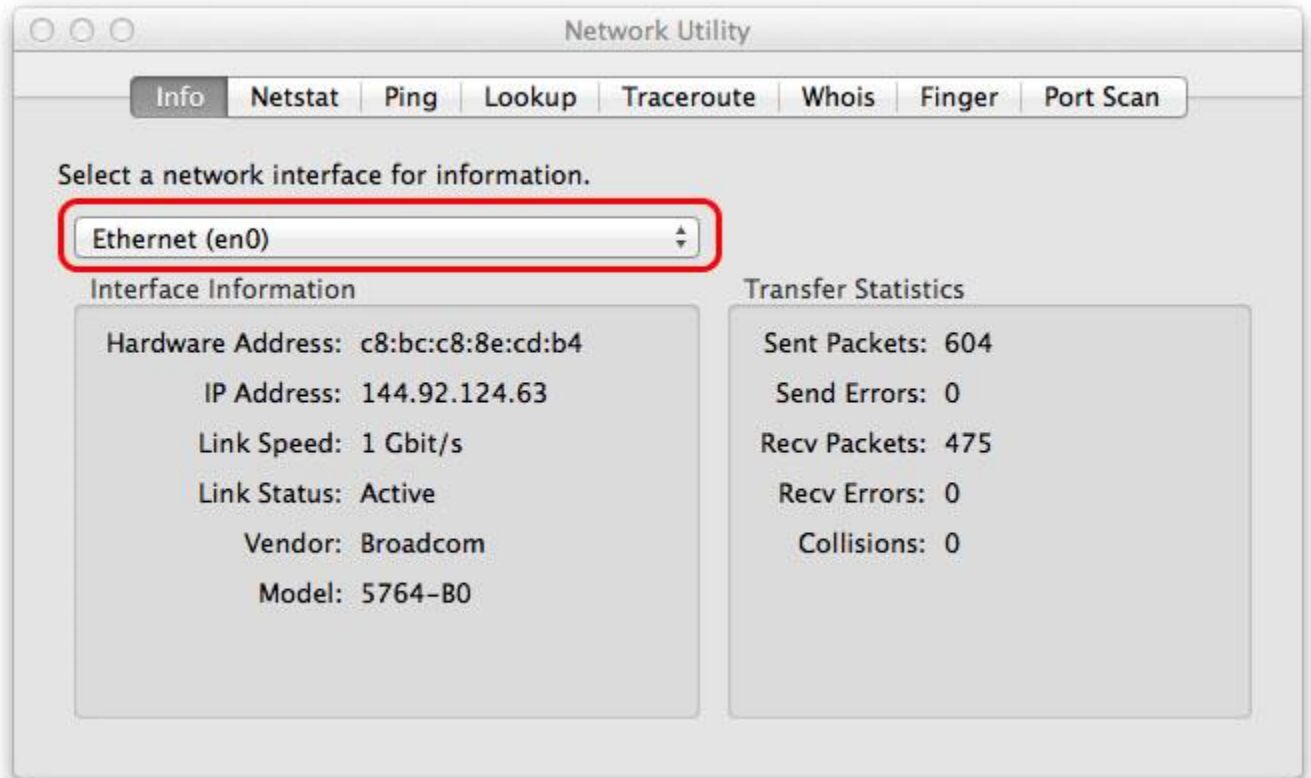


In Network Utility, under the Info tab, you will be able to see the Hardware Address (a.k.a. MAC address) and the IP Address under Interface Information

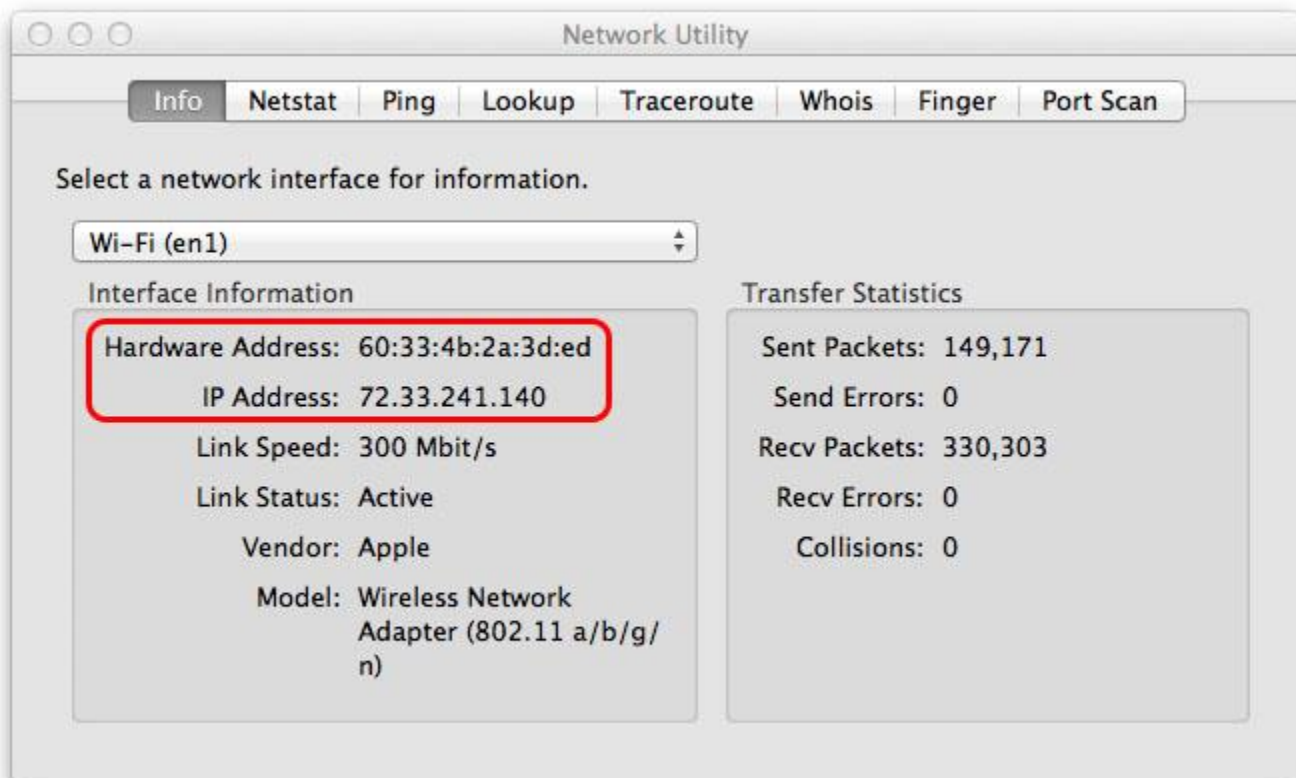
Note: By default will be shown this information for your Ethernet connection



To check the MAC and IP address for your Wi-Fi (a.k.a. AirPort), click on the drop down arrow for Select a network interface for information and select Wi-Fi.



Under Interface information you will be able to view the Hardware Address (MAC Address) and IP address for your Wi-Fi connection



## SECTION2:

### HOW TO GET WIFI/WIRELESS MAC ADDRESS UNDER WINDOWS:

1. Click on the Start Menu, then select the Run item.
2. Type cmd in the text field.
3. A terminal window will appear on the screen. Type ipconfig /all and return.
4. There will be a block of information for each adapter on your computer. Look in the description field for wireless. The Physical Address for that block is your wireless MAC address.

## SECTION3:

### HOW TO GET WIFI/WIRELESS MAC ADDRESS OF ANROID MOBILE PHONE:

1. Just install mac address finder apps.

or

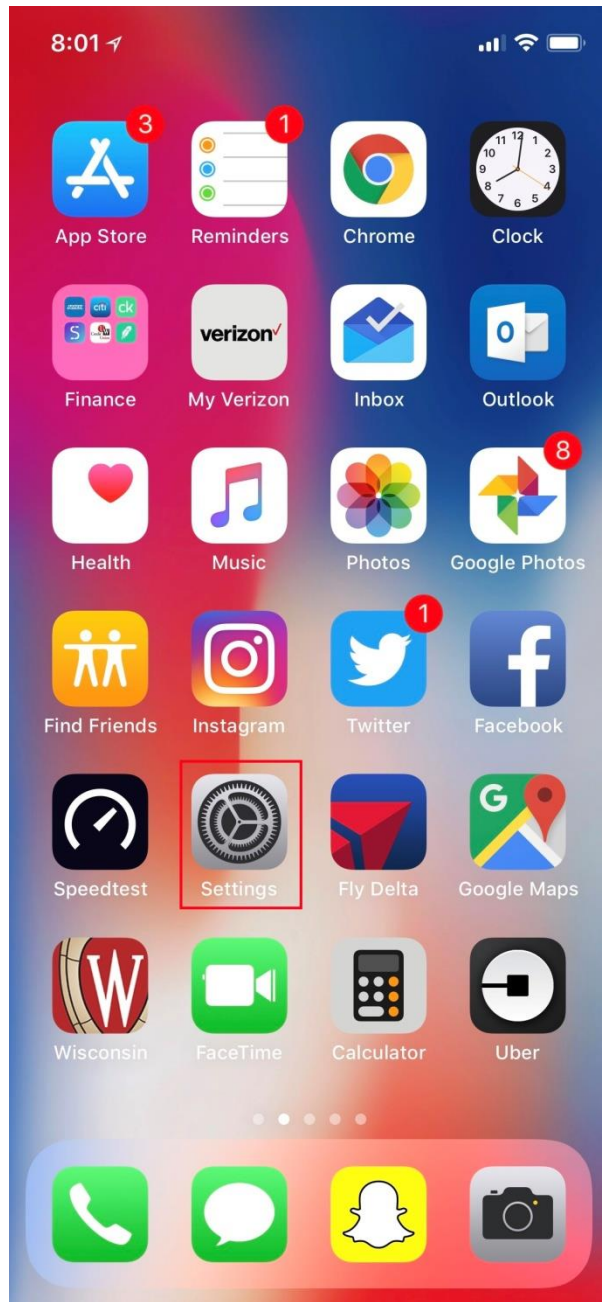
## SECTION4:

### HOW TO GET WIFI/WIRELESS MAC ADDRESS UNDER IPAD:

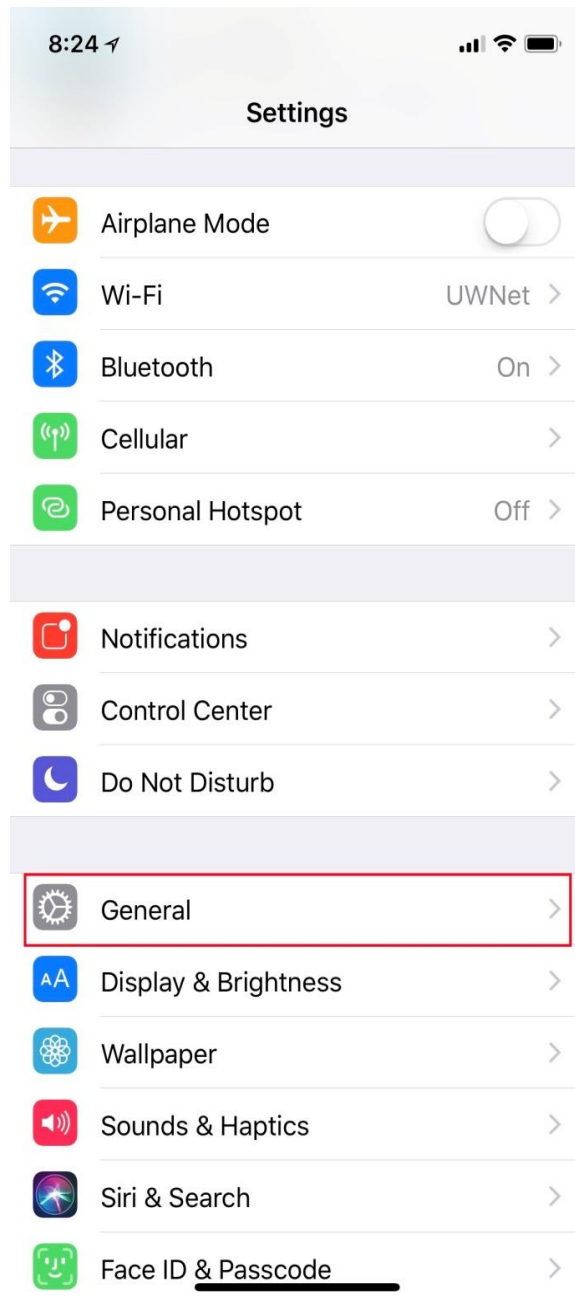
OS Devices (iPhone/iPad)

Mac Address

1. Locate and open the Settings app.



2. Tap General.



3. Tap About.



4. Note the current WiFi MAC address is listed by WiFi Address

8:25		Signal, Wi-Fi, Battery	
<a href="#">General</a>		<b>About</b>	
Name	John's iPhone X >		
Network	Verizon Wireless		
Songs	2		
Videos	1,504		
Photos	16,454		
Applications	88		
Capacity	256 GB		
Available	231.23 GB		
Version	11.2.2 (15C202)		
Carrier	Verizon 31.1		
Model	MQCN2LL/A		
Serial Number			
Wi-Fi Address	B0:19:C6:B0:19:C6		
Bluetooth	B0:19:C6:B0:19:C6		
IMEI	25 477708 025022 2		



## IP ADDRESS

1. Locate and open the Settings app.

2. Tap Wifi



3. Tap the info icon. It is the I inside the circle.



4. Note the current IP address is listed by IP Address.

IPV4 ADDRESS

Configure IP Automatic >

IP Address [REDACTED]

Subnet Mask [REDACTED]

Router [REDACTED]

[Renew Lease](#)

DNS

Configure DNS Automatic >

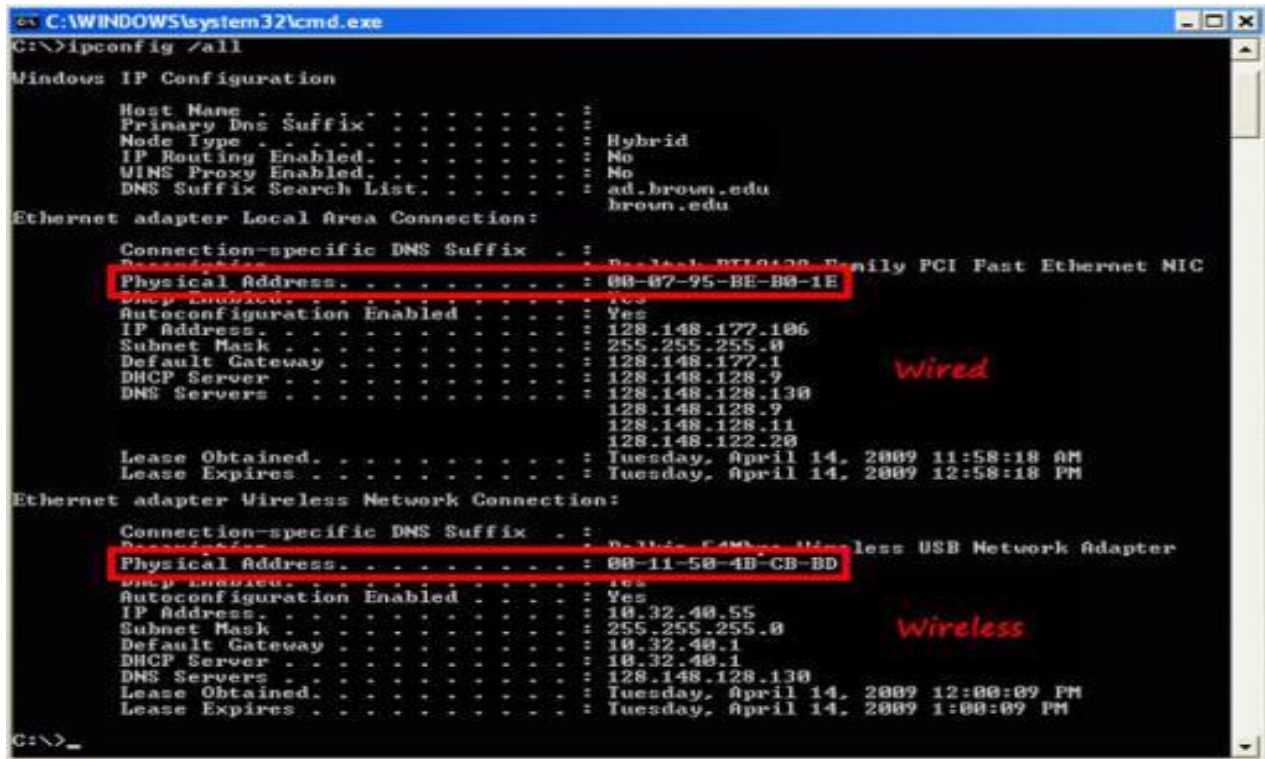
HTTP PROXY

Configure Proxy Off >

## SECTION 5:

### HOW TO GET MAC ADDRESS OF WINDOWS VISTA, WINDOWS 7:

1. Click the Start button.
2. In the Run text box, type cmd. This will open the command window.
3. At the command prompt, type ipconfig /all.
4. Copy down the "Physical Address" (the MAC address) from the "Ethernet adapter Wireless Network Connection" section.



```
C:\WINDOWS\system32\cmd.exe
C:\>ipconfig /all

Windows IP Configuration

Host Name . . . . . : 
Primary Dns Suffix . . . . . : 
Node Type . . . . . : Hybrid
IP Routing Enabled. . . . . : No
WINS Proxy Enabled. . . . . : No
DNS Suffix Search List. . . . . : ad.brown.edu
      brown.edu

Ethernet adapter Local Area Connection:

   Connection-specific DNS Suffix  . : 
   Physical Address. . . . . : 00-07-95-BE-B0-1E
   DHCP Enabled. . . . . : Yes
   Autoconfiguration Enabled . . . . : Yes
   IP Address. . . . . : 128.148.177.106
   Subnet Mask . . . . . : 255.255.255.0
   Default Gateway . . . . . : 128.148.177.1
   DHCP Server . . . . . : 128.148.128.9
   DNS Servers . . . . . : 128.148.128.130
                           128.148.128.9
                           128.148.128.11
                           128.148.122.20
   Lease Obtained. . . . . : Tuesday, April 14, 2009 11:58:18 AM
   Lease Expires . . . . . : Tuesday, April 14, 2009 12:58:18 PM

Ethernet adapter Wireless Network Connection:

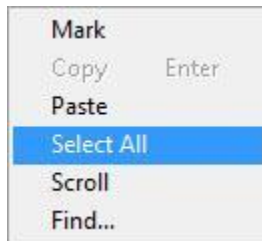
   Connection-specific DNS Suffix  . : 
   Physical Address. . . . . : 00-11-50-4B-CB-BD
   DHCP Enabled. . . . . : Yes
   Autoconfiguration Enabled . . . . : Yes
   IP Address. . . . . : 10.32.40.55
   Subnet Mask . . . . . : 255.255.255.0
   Default Gateway . . . . . : 10.32.40.1
   DHCP Server . . . . . : 10.32.40.1
   DNS Servers . . . . . : 128.148.128.130
                           128.148.128.9
                           128.148.128.11
                           128.148.122.20
   Lease Obtained. . . . . : Tuesday, April 14, 2009 12:00:09 PM
   Lease Expires . . . . . : Tuesday, April 14, 2009 1:00:09 PM

C:\>
```

## SECTION6:

### **COPY THIS INFORMATION FROM THE COMMAND PROMPT SCREEN INTO A NOTEPAD DOCUMENT:**

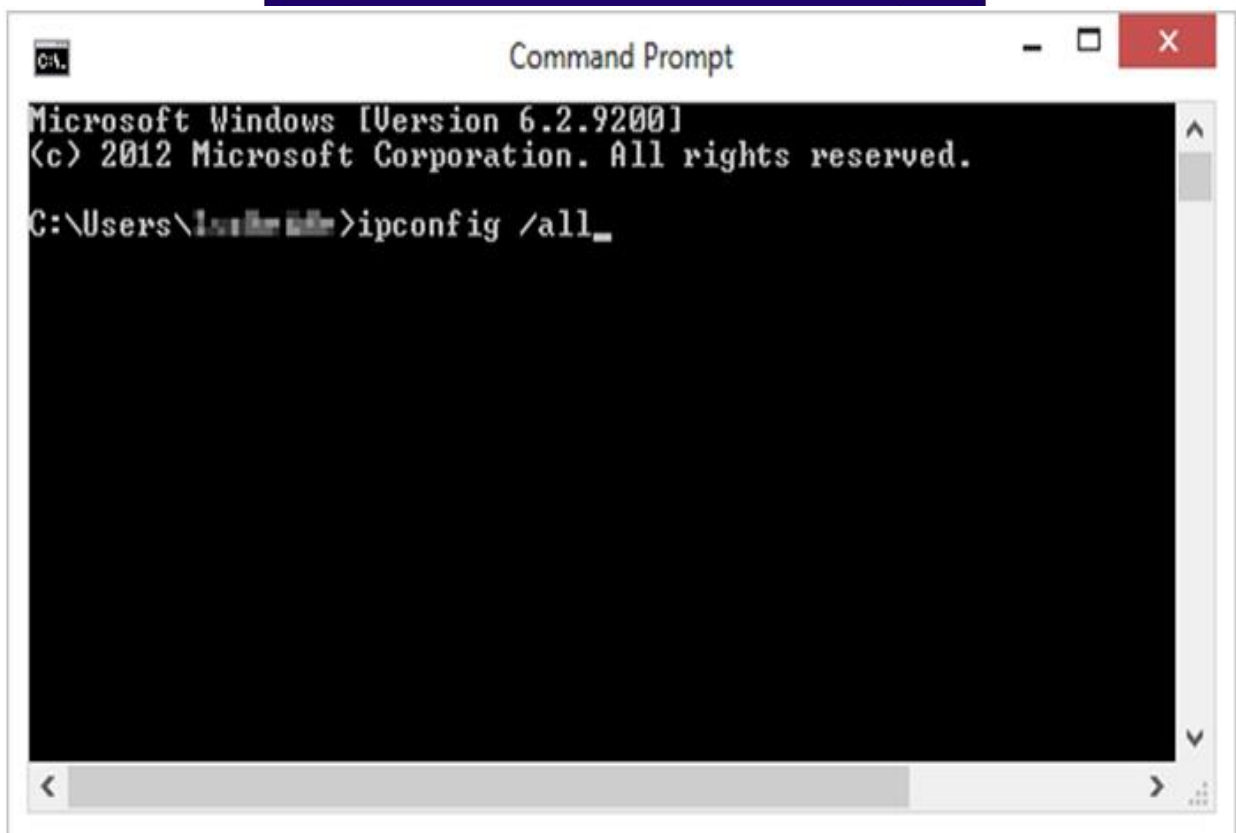
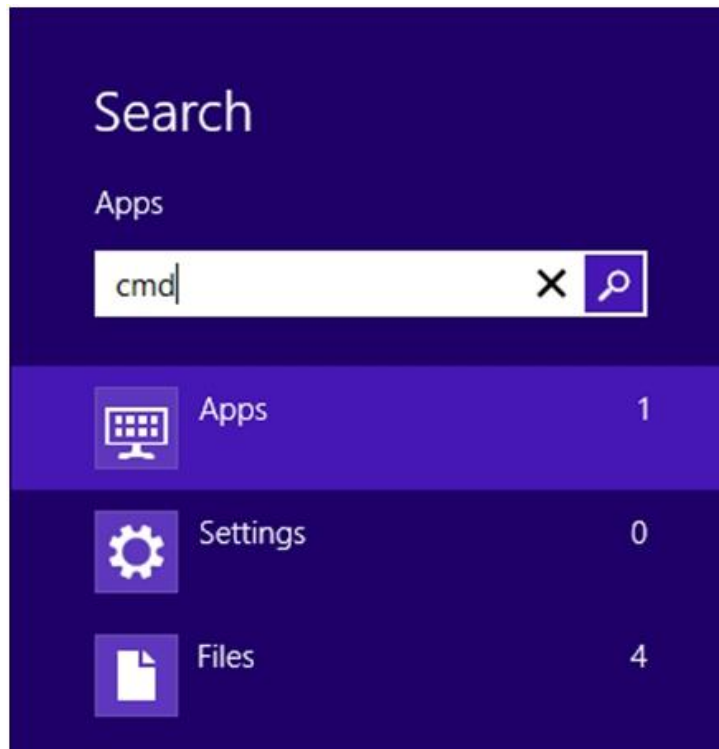
1. Right-click anywhere in the command prompt window and choose Select All.
2. Press Enter to copy the text from the Command Prompt screen.
3. Open up Notepad (Start->All Programs->Accessories->Notepad).
4. Right-click and choose Paste to put the information into the document.
5. Save and Print the document and keep it with your important papers.



## SECTION7:

### **HOW TO GET MAC ADDRESS OF A NETWORK CARD OF WINDOWS 8:**

1. Press the Windows Start key to open the Start screen.
2. Type cmd and press Enter to launch the command prompt.
3. Note:Do not need to click on anything on the Start screen—typing will automatically initiate a program search.
4. Type ipconfig /all at the command prompt to check the network card settings.
5. The IP address and MAC address are listed under the appropriate adapter as Physical Address and IPv4 Address.
6. Can copy the Physical Address and IPv4 Address from the command prompt by right clicking in the command prompt and clicking Mark.
7. Select the text want to copy with the mouse and hit the Enter key to copy it. Should now be able to paste the text elsewhere using the standard clipboard "paste" function.



```
Command Prompt
Microsoft Windows [Version 6.2.9200]
(c) 2012 Microsoft Corporation. All rights reserved.

C:\Users\lscheide>ipconfig /all

Windows IP Configuration

Host Name . . . . . : HD-FL-DHGPGD1
Primary Dns Suffix . . . . . : ad.wisc.edu
Node Type . . . . . : Hybrid
IP Routing Enabled. . . . . : No
WINS Proxy Enabled. . . . . : No
DNS Suffix Search List. . . . . : ad.wisc.edu
                                doit.wisc.edu

Ethernet adapter Ethernet:

    Connection-specific DNS Suffix . : doit.wisc.edu
    Description . . . . . : Broadcom NetXtreme 57xx Gigabit Controller
    Physical Address. . . . . : 00-1A-A0-AC-E3-BC
    DHCP Enabled. . . . . : Yes
    Autoconfiguration Enabled . . . . . : Yes
    Link-local IPv6 Address . . . . . : fe80::359b:5a6a:a3a7:6efb%12(Preferred)
    IPv4 Address. . . . . : 144.92.124.118(Preferred)
    Subnet Mask . . . . . : 255.255.255.128
    Lease Obtained. . . . . : Wednesday, November 07, 2012 3:12:39 PM
    Lease Expires . . . . . : Wednesday, November 14, 2012 3:28:17 PM
    Default Gateway . . . . . : 144.92.124.1
    DHCP Server . . . . . : 144.92.254.20
    DHCPv6 IAID . . . . . : 251665056
    DHCPv6 Client DUID. . . . . : 00-01-00-01-18-0E-64-24-00-1A-A0-AC-E3-BC
```

```
Command Prompt

Ethernet adapter Ethernet:

    Connection-specific DNS Suffix . : doit.wisc.edu
    Description . . . . . : Broadcom NetXtreme 57xx Gigabit Controller
    Physical Address. . . . . : 00-1A-A0-AC-E3-BC
    DHCP Enabled. . . . . : Yes
    Autoconfiguration Enabled . . . . . : Yes
    Link-local IPv6 Address . . . . . : fe80::359b:5a6a:a3a7:6efb%12(Preferred)
    IPv4 Address. . . . . : 144.92.124.118(Preferred)
    Subnet Mask . . . . . : 255.255.255.128
    Lease Obtained. . . . . : Wednesday, November 07, 2012 3:12:39 PM
    Lease Expires . . . . . : Wednesday, November 14, 2012 3:28:17 PM
    Default Gateway . . . . . : 144.92.124.1
    DHCP Server . . . . . : 144.92.254.20
    DHCPv6 IAID . . . . . : 251665056
    DHCPv6 Client DUID. . . . . : 00-01-00-01-18-0E-64-24-00-1A-A0-AC-E3-BC

    DNS Servers . . . . . : 128.104.254.254
                            144.92.254.254
    Primary WINS Server . . . . . : 128.104.22.23
```

```

C:\>

Ethernet adapter Ethernet:

    Connection-specific DNS Suffix . . . : doit.wisc.edu
    Description . . . . . : Broadcom NetXtreme 57xx Gigab
    Physical Address . . . . . : 00-1A-A0-AC-E3-BC
    DHCP Enabled. . . . . : Yes
    Autoconfiguration Enabled . . . . . : Yes
    Link-local IPv6 Address . . . . . : fe80::359b:5a6a:a3a7:6efb%12<
    IPv4 Address. . . . . : 144.92.124.118<Preferred>
    Subnet Mask . . . . . : 255.255.255.128
    Lease Obtained. . . . . : Wednesday, November 07, 2012
    Lease Expires . . . . . : Wednesday, November 14, 2012
    Default Gateway . . . . . : 144.92.124.1
    DHCP Server . . . . . : 144.92.254.20
    DHCPv6 IAID . . . . . : 251665056
    DHCPv6 Client DUID. . . . . : 00-01-00-01-18-0E-64-24-00-1A

    DNS Servers . . . . . : 128.104.254.254
                           144.92.254.254
    Primary WINS Server . . . . . : 128.104.22.23

```

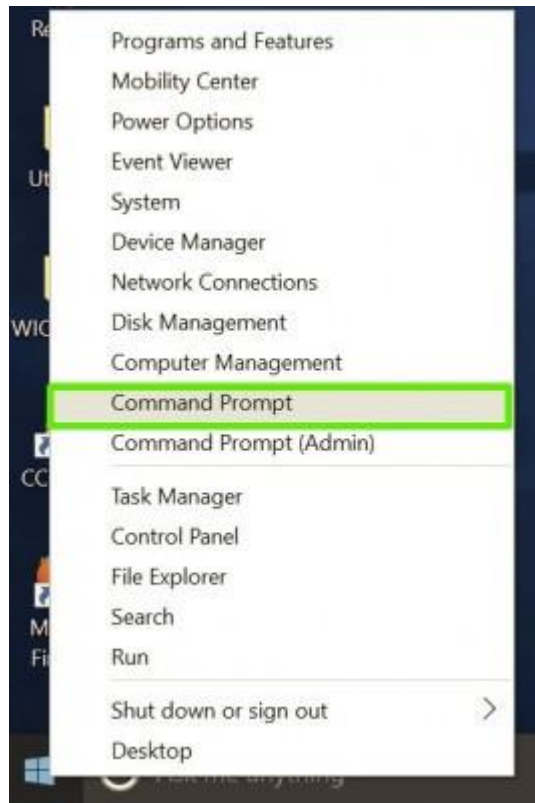
SECTION8:

**HOW TO GET MAC ADDRESS WITH THE COMMAND PROMPT IN WIN 10:**

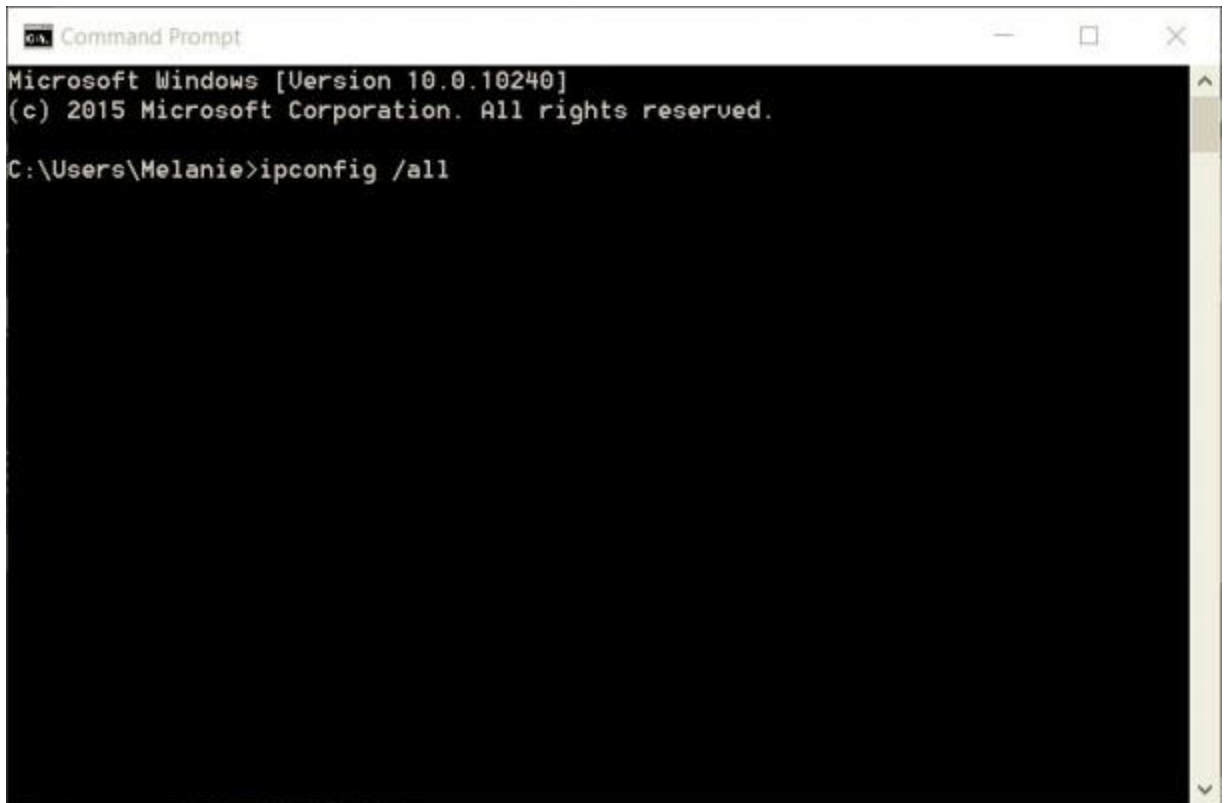
The quickest way to find the MAC address is through the command prompt.

1. Open the command prompt. Right-click on the Start button and select Command Prompt from the menu.





2. Type in `ipconfig /all` and press Enter. This will display your network configuration.



```
Command Prompt
Microsoft Windows [Version 10.0.10240]
(c) 2015 Microsoft Corporation. All rights reserved.

C:\Users\Melanie>ipconfig /all
```

3. Find your adapter's physical address. Scroll down to your network adapter and look for the values next to "Physical Address," which is your MAC address.

```
Command Prompt
NetBIOS over Tcpip. . . . . : Enabled

Wireless LAN adapter Wi-Fi:

Connection-specific DNS Suffix . :
Description . . . . . : Intel(R) Centrino(R) Advanced-N 6205
Physical Address. . . . . : 84-3A-4B-C8-E9-00
DHCP Enabled. . . . . : Yes
Autoconfiguration Enabled . . . . : Yes
Link-local IPv6 Address . . . . . : fe80::8466:77b0:5ae1:4871%6(Preferred)
IPv4 Address. . . . . : 192.168.2.108(Preferred)
Subnet Mask . . . . . : 255.255.255.0
Lease Obtained. . . . . : Sunday, August 23, 2015 6:14:17 PM
Lease Expires . . . . . : Tuesday, August 25, 2015 9:21:05 AM
Default Gateway . . . . . : 192.168.2.1
DHCP Server . . . . . : 192.168.2.1
DHCPv6 IAID . . . . . : 260323915
DHCPv6 Client DUID. . . . . : 00-01-00-01-19-92-AB-E2-84-3A-4B-C8-E9-00

DNS Servers . . . . . : 192.168.2.1
NetBIOS over Tcpip. . . . . : Enabled

Ethernet adapter Ethernet 2:

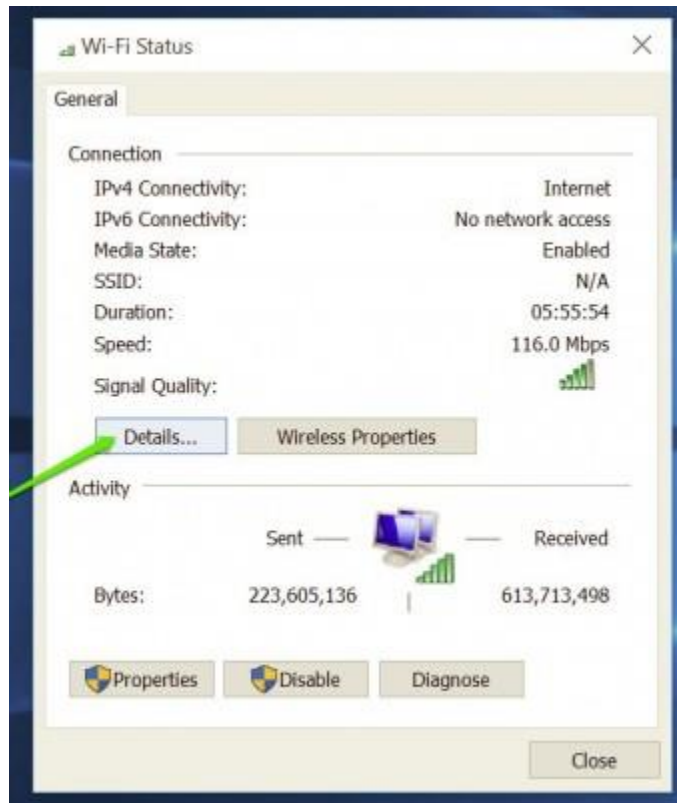
Media State . . . . . : Media disconnected
```

SECTION9:

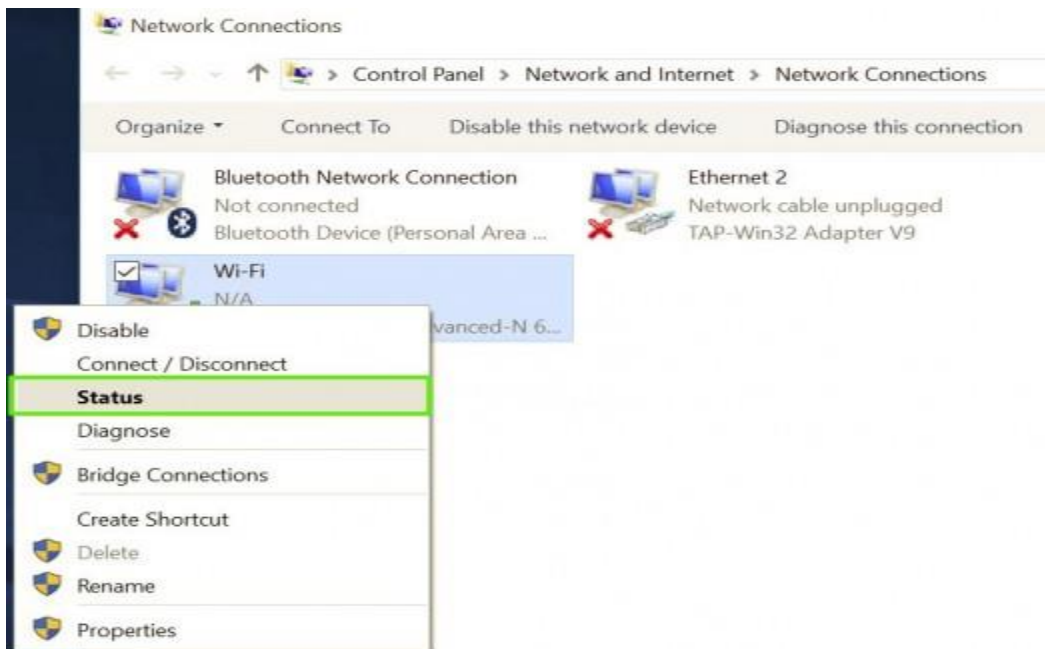
HOW TO GET MAC ADDRESS IN THE NETWORK CONNECTION SETTINGS IN WIN 10:

You can also find the MAC address by looking at the details of your network adapter in Windows.

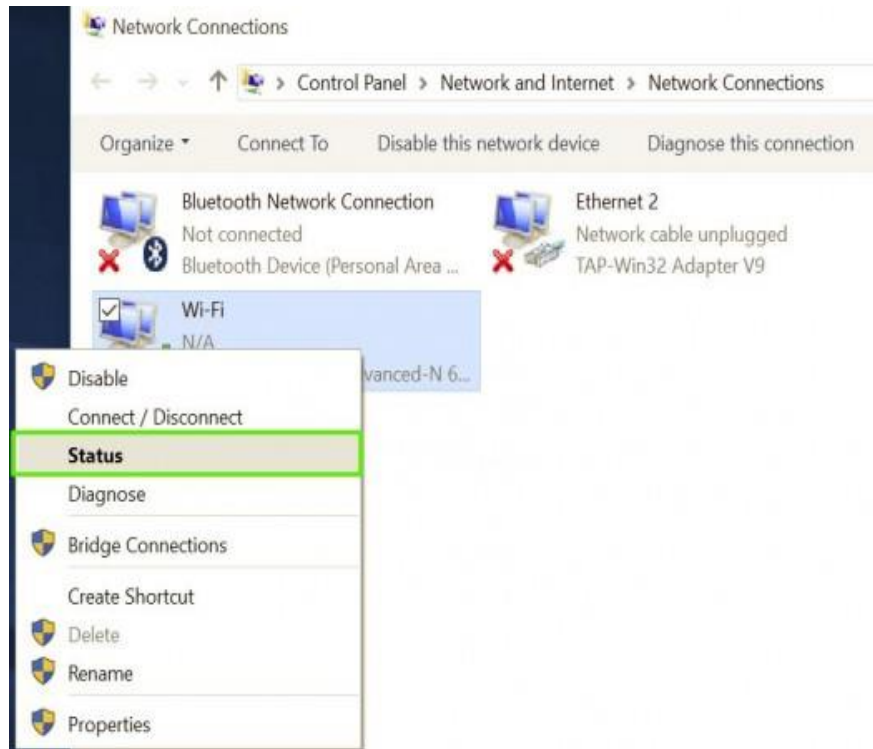
1. Search "network connections" in the taskbar and select "View network connections." (Or navigate to Control Panel > Network and Internet > Network Connections)



2. Right-click on your network connection and select "Status."



3. Click the "Details" button.



4. Locate the Physical Address. The value for the physical address in the Network Connection Details window is your MAC address.



## SECTION10:

### HOW TO GET MAC ADDRESS OF WINDOWS 2000, 2003, XP, NT:

Click Start > Run. A Run text box appears.

1. In the Run text box, type cmd.
2. Press Enter.  
A command prompt displays.
3. In the command prompt, type ipconfig /all.
4. Press Enter.  
Under Ethernet adapter Wireless Network Connection, a Physical Address displays. This is your computer's Ethernet MAC address.

## SECTION11:

### HOW TO GET MAC ADDRESS OF IOS:

Select Settings > General > About.  
A Wi-Fi Address displays. This is your device's MAC address.

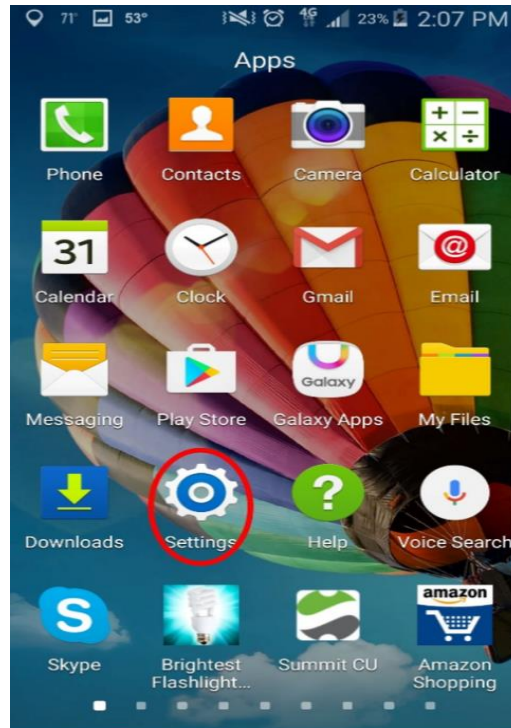
## SECTION12:

### HOW TO GET MAC ADDRESS OF ANDROID:

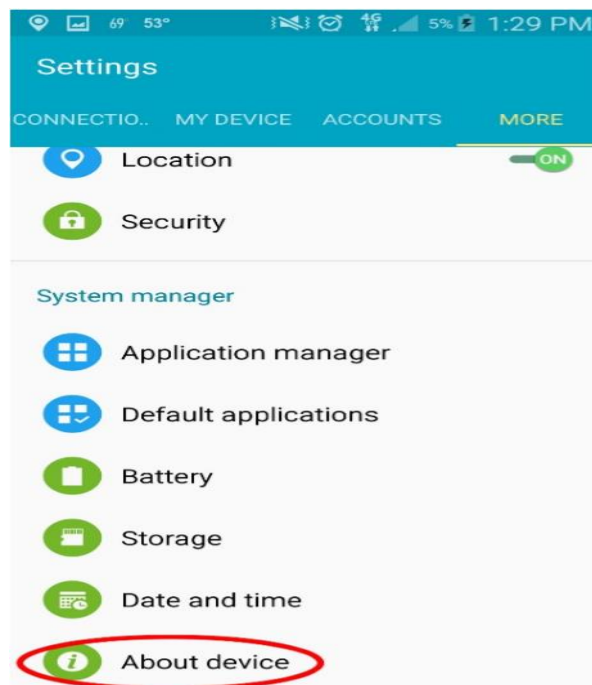
#### ANDROID PHONES/TABLETS

**Note:** DUE TO THE LARGE VARIETY OF ANDROID DEVICES AVAILABLE AND VARIANCE BETWEEN SOFTWARE VERSIONS AND INTERFACES, THERE MAY BE SLIGHT DIFFERENCES BETWEEN THE INSTRUCTIONS BELOW AND THE PROCEDURE FOR DEVICE.

Locate and tap the Settings app.



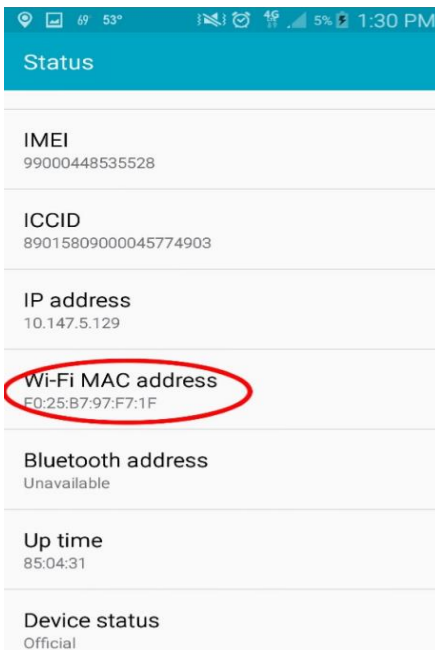
1. Scroll to find, then tap About Device (on some phones it will say About Phone).



2. Tap Status.



3. The MAC address is listed under WiFi Address





## SECTION13:

### HOW TO GET MAC ADDRESS OF GAMING CONSOLES (XBOX, PLAYSTATION, WII, ETC.):

#### XBOX ONE:

If you are signed into a profile, go to My Games & Apps and Settings. If you are not signed into a profile, just go to Settings.

Select Network then Advanced Settings.

Scroll down and select Network Settings. Then choose either Wired (Ethernet) or Wireless, depending on how you want to connect.

#### XBOX 360:

Go to the Xbox 360 Dashboard and navigate all the way to the right most tab labeled My Xbox and select the System Settings option.

Select Network Settings then Configure Network

Go to the Additional Settings Tab and select the Advanced Settings. In the next window you should see the MAC Address listed.

#### PLAYSTATION 4:

Go to Settings in the main menu (looks like a toolbox).

Scroll down and select System. Then select System Information.

Here you will see the MAC addresses for LAN (Ethernet) and Wi-Fi.

#### PLAYSTATION 3:

Go to Settings in the main menu (looks like a toolbox).

In settings, go to System, then scroll down to System Information. Your MAC Address will be listed here.

## PLAYSTATION VITA:

On the Home Screen, go to Settings.

In settings, go to System, then select System Information. Your MAC address will be listed here.

## NINTENDO SWITCH:

On the Home Menu, go to System Settings.

In the menu on the left side, select Internet. The MAC Address will be under System MAC Address.

## WII U:

**NOTE:** This will also be the wireless MAC address.

On the Wii U menu screen, select to the System Settings Icon

Go to the Internet menu and select it. Then select the View MAC Address icon. The MAC address will be listed here

## WII:

**NOTE:** This mac address will be for the Wireless internet, so if you are connecting using an Ethernet to USB adaptor, you will have to use the MAC address of that adaptor.

From the Wii Channel Menu, select the Wii Settings button the in the bottom left hand corner

Navigate the settings menu to Internet, and the Console Settings. The MAC Address will be listed there.

## NINTENDO 3DS:

On the 3DS Home Screen, select System Settings. Then select Internet Settings.

In the Internet Settings, select Other Information and then Confirm MAC Address. The MAC Address will be listed here.

## SECTION14:

### HOW TO GET MAC ADDRESS OF APPLE WATCH:

Note: Only select Apple Watch products have WiFi available. These instructions will only work for Apple Watch/WatchOS devices with WiFi built in.

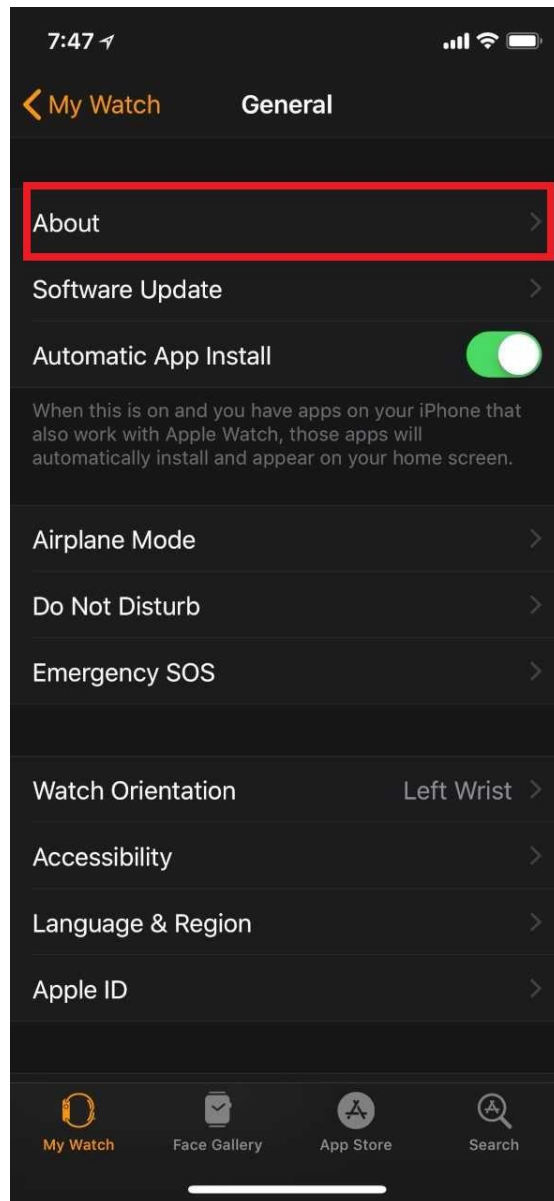
1. Locate and tap the Watch app



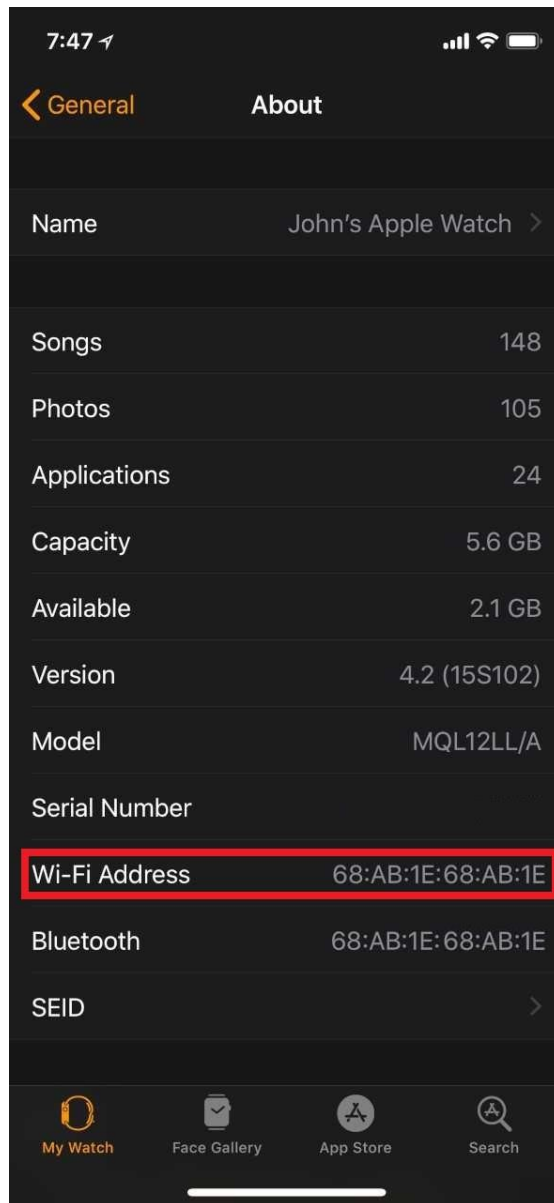
2. Tap General.



3. Tap About.



The WiFi/MAC address is listed by the Wi-Fi Address section.




If looking to register the Apple Watch on UWNet, follow the instructions for registering a device without a browser once located the MAC address.

## SECTION15:

### HOW TO GET MAC ADDRESS OF LINUX/UNIX:

Each Linux or Unix operating system is unique. For most systems, the following command returns the MAC address: **ifconfig -a**



```
Terminal — bash — 92x42
Last login: Tue Apr 14 11:25:03 on ttys000
AisMac:~$ ifconfig
lo0: flags=8049<UP,LOOPBACK,RUNNING,MULTICAST> mtu 16384
    inet6 fe80::1::1%lo0 prefixlen 64 scopeid 0x1
    inet 127.0.0.1 netmask 0xff000000
    inet6 ::1 prefixlen 128
gif0: flags=8010<POINTOPOINT,MULTICAST> mtu 1280
stf0: flags=8<> mtu 1280
en0: flags=8063<UP,BROADCAST,SMART,RUNNING,SIMPLEX,MULTICAST> mtu 1500
    ether 08:16:cb:89:3d:52 ← Wired
    media: autoselect status: inactive
    supported media: autoselect 10baseT/UTP <half-duplex> 10baseT/UTP <full-duplex> 10ba
seT/UTP <full-duplex,hw-loopback> 10baseT/UTP <full-duplex,flow-control> 100baseTX <half-dup
lex> 100baseTX <full-duplex> 100baseTX <full-duplex,hw-loopback> 100baseTX <full-duplex,flow
-control> 1000baseT <full-duplex> 1000baseT <full-duplex,hw-loopback> 1000baseT <full-duplex
,flow-control> none
fx0: flags=8063<UP,BROADCAST,SMART,RUNNING,SIMPLEX,MULTICAST> mtu 2038
    lladdr 08:16:cb:ff:fe:54:ca:46
    media: autoselect <full-duplex> status: inactive
    supported media: autoselect <full-duplex>
en1: flags=8063<UP,BROADCAST,SMART,RUNNING,SIMPLEX,MULTICAST> mtu 1500
    inet6 fe80::216:cbff:fe98:54cb%en1 prefixlen 64 scopeid 0x6
    inet6 2002:8a10:3ae4:9:216:cbff:fe98:54cb prefixlen 64 deprecated autoconf
    inet6 fec0::9:216:cbff:fe98:54cb prefixlen 64 deprecated autoconf
    inet 128.148.179.244 netmask 0xfffffe00 broadcast 128.148.179.255
    ether 08:16:cb:98:54:cb ← Wireless
    media: autoselect status: active
    supported media: autoselect
enf: flags=8963<UP,BROADCAST,SMART,RUNNING,PROMISC,SIMPLEX,MULTICAST> mtu 1500
    inet6 fe80::21c:42ff:fe98:90en4 prefixlen 64 scopeid 0x7
    inet 10.211.55.2 netmask 0xfffff800 broadcast 10.211.55.255
    ether 08:1c:42:80:80:86
    media: autoselect status: active
    supported media: autoselect
en5: flags=8963<UP,BROADCAST,SMART,RUNNING,PROMISC,SIMPLEX,MULTICAST> mtu 1500
    inet6 fe80::21c:42ff:fe98:90en5 prefixlen 64 scopeid 0x8
    inet 10.37.129.2 netmask 0xfffff800 broadcast 10.37.129.255
    ether 08:1c:42:80:80:89
    media: autoselect status: active
    supported media: autoselect
AisMac:~$
```

If computer has multiple network interfaces – say both a wired Ethernet port and a wireless network adapter – each interface will have its own MAC address. In theory, it's unique. In theory, every network card or network interface should have its own unique MAC address that is different from every other network card on the planet.

## CHAPTER:6

### SECTION1:

#### THERE ARE TWO PROBLEMS IN GENERAL MAC ADDRESSING:

1.Occasionally, manufacturers don't ensure they're unique, so multiple network interfaces can in fact have the same MAC address.2.In many network interfaces, the MAC address can be set in software – meaning whatever the original MAC address, it can be overridden and changed.So the uniqueness on which we might want to rely is not completely reliable. But that isn't really the biggest problem.

### SECTION2:

#### CAVEATS TO CHANGING MAC ADDRESS:

In Linux, Windows, Mac OS X, or a different operating system, changing MAC address is only temporary. Once you reboot your machine, the operating system reflects the physical MAC address burnt in your network card and not the MAC address you set.

### SECTION3:

#### MAC VS. IP ADDRESS RELATIONSHIP:

TCP/IP networks use both MAC addresses and IP addresses but for separate purposes. A MAC address remains fixed to the device's hardware while the IP address for that same device can be changed depending on its TCP/IP network configuration. Media Access Control operates at Layer 2 of the OSI model while Internet Protocol operates at Layer 3. This allows MAC addressing to support other kinds of networks besides TCP/IP.

IP networks manage the conversion between IP and MAC addresses using Address Resolution Protocol (ARP). The Dynamic Host Configuration Protocol (DHCP) relies on ARP to manage the unique assignment of IP addresses to devices.

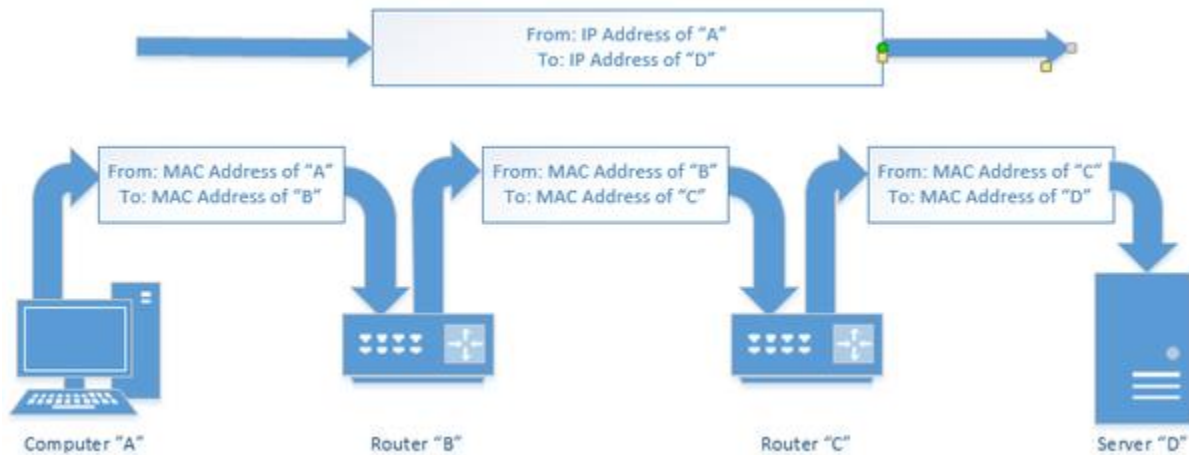
While the IP addresses involved indicate the original source and ultimate destination, a MAC address is used only on connections from one piece of networking equipment to the next.



## CHAPTER:7

### SECTION1:

#### MAC ADDRESS ROUTING PROTOCOL:



That means when information leaves your computer, it has a computer's network adapter's MAC address. But when it arrives at any router, that MAC address is removed. When the router sends the information further upstream to your ISP's router, it contains the MAC address of your router. When it moves from the ISP's router to another router on the internet, it contains the MAC address of the ISP's router. And so on.

### SECTION2:

#### CAN A WEBSITE SEE/KNOW MY MAC ADDRESS EVEN IF ANYONE USE [DUPLICATE] VPN?:

### DECISION:1

#### Case Studies

**MAC address is meaningless outside of any local network. It gets stripped out of the network packet by router**

### SECTION3:

#### WHY ANY ONE USE VPN?:

What we should be worried about is our public IP address (not the IP address of our local machine but our router's external IP address, not the 127.0.0.1 address). That address is assigned by our ISP and we can't set it to something else without breaking our internet connection.

The real worry is that for billing purposes our ISP keep track of what address is assigned to who at what time. This is what people who use VPN want to circumvent. The worry is mostly about preventing the government from looking at what you do but there have also been cases where criminals have hacked ISP's databases so they can use that information to unmask our home address from our public IP address.

### SECTION4:

#### OTHER USE OF MAC:

MAC addresses, however, have been used for other things. For example, since MAC addresses are theoretically unique, a MAC address could be used as a unique identifier for tracking the actions being taken by or on a specific computer. The MAC addresses of the network adapters on any computer are easily readable by software running on your machine, and could be used for just about anything... except tracking your stolen laptop via its network connection.

MAC addresses are often used for other purposes:

- **Static IP Assignment:** Routers allow you to assign static IP addresses to your computers. When a device connects, it always receives a specific IP address if it has a matching MAC address
- **MAC Address Filtering:** Networks can use MAC address filtering, only allowing devices with specific MAC addresses to connect to a network. This isn't a great security tool because people can spoof their MAC addresses.
- **MAC Authentication:** Some Internet service providers may require authentication with a MAC address and only allow a device with that MAC address to connect to the Internet. You may need to change your router or computer's MAC address to connect.
- **Device Identification:** Many airport Wi-Fi networks and other public Wi-Fi networks use a device's MAC address to identify it. For example, an airport Wi-Fi network might offer a

free 30 minutes and then ban your MAC address from receiving more Wi-Fi. Change your MAC address and you **COULD** get more Wi-Fi. (Free, limited Wi-Fi may also be tracked using browser cookies or an account system.)

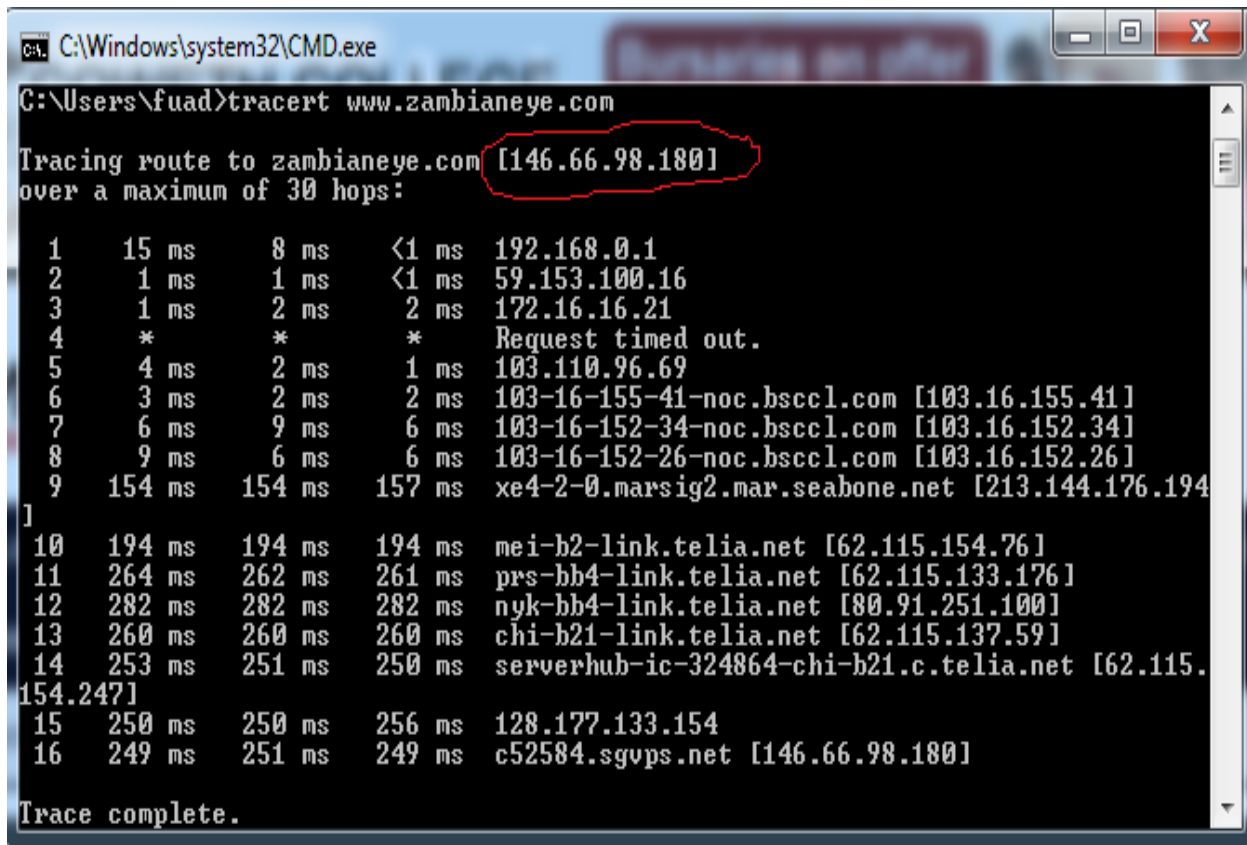
- **Device Tracking:** Because they're unique, MAC addresses can be used to track you. When you walk around, your smartphone scans for nearby Wi-Fi networks and broadcasts its MAC address. A company named Renew London used trash bins in the city of London to track people's movements around the city based on their MAC addresses. Apple's iOS 8 will use a random MAC address each time it scans for nearby Wi-Fi networks to prevent this sort of tracking.

## CHAPTER:8

### SECTION1:

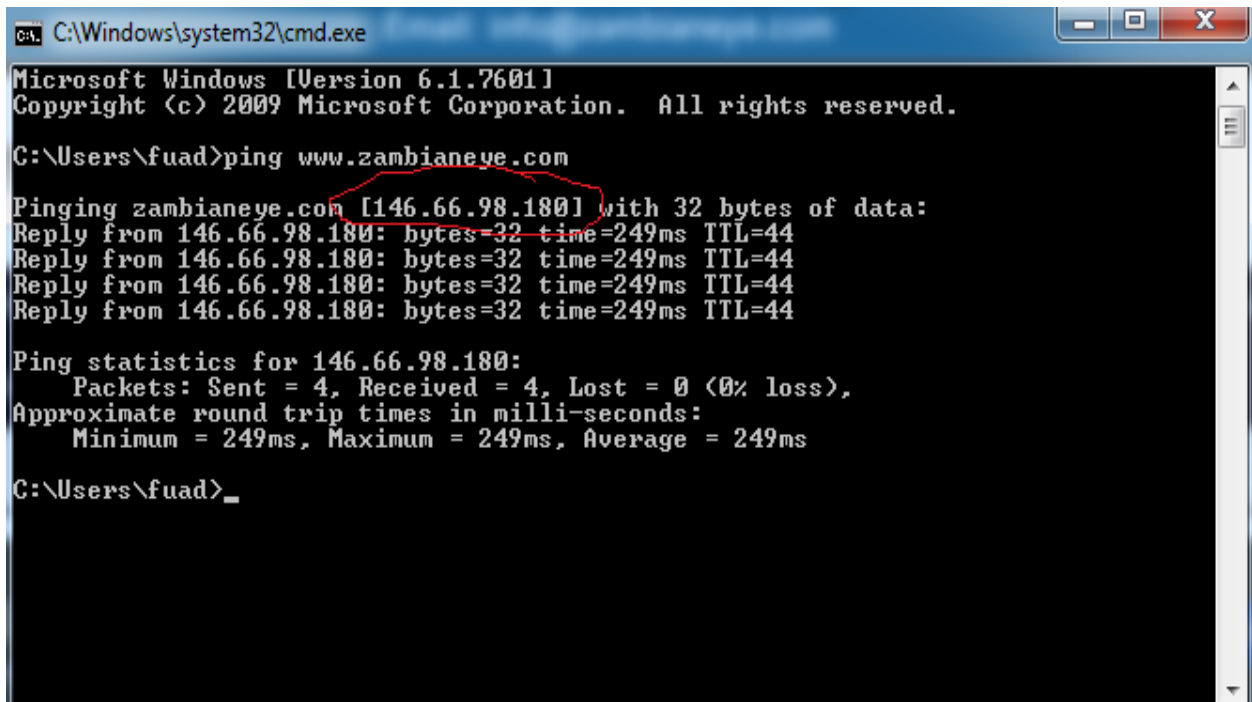
#### FIND IP ADDRESS OF A WEBSITE:

**FIND THE IP ADDRESS:METHOD:1.**Open command prompt and type in "tracert" then type in the **website** for example "tracert www.instructables.com" without these things". The **IP** address is what comes up next to where it says "tracing route to (the **website** you inserted)(the **IP** address).



```
C:\Windows\system32\CMD.exe
C:\Users\fuad>tracert www.zambianeye.com
Tracing route to zambianeye.com [146.66.98.180]
over a maximum of 30 hops:
  0  15 ms  8 ms  <1 ms  192.168.0.1
  1  1 ms  1 ms  <1 ms  59.153.100.16
  2  1 ms  2 ms  2 ms  172.16.16.21
  3  *      *      *      Request timed out.
  4  4 ms  2 ms  1 ms  103.110.96.69
  5  3 ms  2 ms  2 ms  103-16-155-41-noc.bscc1.com [103.16.155.41]
  6  6 ms  9 ms  6 ms  103-16-152-34-noc.bscc1.com [103.16.152.34]
  7  9 ms  6 ms  6 ms  103-16-152-26-noc.bscc1.com [103.16.152.26]
  8  154 ms  154 ms  157 ms  xe4-2-0.marsig2.mar.seabone.net [213.144.176.194]
  9
 10 194 ms  194 ms  194 ms  mei-b2-link.telia.net [62.115.154.76]
 11 264 ms  262 ms  261 ms  prs-bb4-link.telia.net [62.115.133.176]
 12 282 ms  282 ms  282 ms  nyk-bb4-link.telia.net [80.91.251.100]
 13 260 ms  260 ms  260 ms  chi-b21-link.telia.net [62.115.137.59]
 14 253 ms  251 ms  250 ms  serverhub-ic-324864-chi-b21.c.telia.net [62.115.
154.247]
 15 250 ms  250 ms  256 ms  128.177.133.154
 16 249 ms  251 ms  249 ms  c52584.sgvps.net [146.66.98.180]
Trace complete.
```

**METHOD:2.** Open command prompt and type in "ping" then type in the **website** for example "ping www.instructables.com" without these things"".



```
C:\Windows\system32\cmd.exe
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation. All rights reserved.

C:\Users\fuad>ping www.zambianeye.com

Pinging zambianeye.com [146.66.98.180] with 32 bytes of data:
Reply from 146.66.98.180: bytes=32 time=249ms TTL=44
Reply from 146.66.98.180: bytes=32 time=249ms TTL=44
Reply from 146.66.98.180: bytes=32 time=249ms TTL=44
Reply from 146.66.98.180: bytes=32 time=249ms TTL=44

Ping statistics for 146.66.98.180:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 249ms, Maximum = 249ms, Average = 249ms

C:\Users\fuad>_
```

## CHAPTER:9

### SECTION1:

#### FIND MAC ADDRESS OF A NETWORK PC'S& ROUTER'S:

Type in the following command

**arp -a**

WHERE **ARP** STANDS FOR: **Address Resolution Protocol**

Will now get a list of all the connected devices on your network along with their physical addresses.

Ip of router will be 192.168.0.1 by default.

```
C:\Documents and Settings\Aseem Kishore>arp -a
Interface: 192.168.1.71 --- 0x2
Internet Address      Physical Address      Type
192.168.1.72         00-20-00-3c-01-cf     dynamic
192.168.1.100        f8-1e-df-d8-9d-8a     dynamic
192.168.1.254        b0-e7-54-1d-6e-01     dynamic
```

### SECTION2:

#### SETTING THE IP ADDRESS BY USING ARP/PING COMMAND:

Start Command Prompt installed in Windows as standard, and set the IPv4 address of the machine.Start [Command Prompt].

Open the [Start] menu and select [All Programs] or [Programs] ► [Accessories] ► [Command Prompt].

**Enter "arp -s <IP address><MAC address>" and press the [ENTER] key.**

<IP address> Enter the IP address to assign to the machine.

Enter the MAC address of the machine with separation at every two digits by a hyphen "-." MAC Address

<MAC  
address>

Example: arp -s 192.168.1.45 00-1E-8F-46-80-2e

Enter "ping <IP address>-l 479" \* and press the [ENTER] key.

\* Enter a lowercase "l" for "-l."

<IP address>    Enter the same address as the one that you typed in step 2.

Example: ping 192.168.1.45 -l 479

Restart the machine, and the specified IP address is configured in the machine.



The subnet mask and gateway address are set to "0.0.0.0."

Enter "exit" and press the [ENTER] key.

### SECTION3:

#### **WILL I EVER NEED TO CHANGE MY MAC ADDRESS?:**

In general, Anyone will not find any cause for changing your MAC address. This is simply a number that identifies the network device that you are using, and there shouldn't be any reason to change it. However, some internet users may encounter issues with their ISPs when they change equipment, such as upgrading their router or obtaining a new residential gateway. The ISP has essentially linked the MAC address of the old equipment to the network. When this equipment changes, so does the MAC address, leaving a customer unable to access the internet.

This is when MAC address cloning comes into play. When his happens, the ISP links the new hardware to the old MAC address so that connectivity is maintained. If the equipment is being sent over directly by the ISP, the cloning process has most likely already been performed so anyone will experience no interruptions. If, however, anyone is choosing to update his own equipment, a quick call to your ISP can help clear up any service issues caused by MAC addresses that do not match. This may include providing with troubleshooting steps to change router or equipment settings. However, other than these instances, your MAC address is fixed and will not need to be changed.

#### SECTION4:

### WHY SHOULD CHANGE MAC ADDRESS OF YOUR LINUX MACHINE:

These are the reasons to change the MAC address of machine.....

For privacy - For instance when connecting to a Wi-Fi hotspot.

To ensure interoperability. Some internet service providers bind their service to a specific MAC address; if the user then changes their network card or intends to install a router, the service won't work anymore. Changing the MAC address of the new interface will solve the problem.

#### SECTION5:

### WHAT IS MAC ADDRESS CLONING?:

MAC cloning can only be done at your router providing it has those capabilities. Most ISPs assign their IPs based on the MAC address in your equipment. If the MAC address of your router is 00-11-22-33-44-55 and you connect to your ISP, the DHCP server records your MAC and assigns an IP. If you disconnect from the ISP, you lose your IP address. The next time you connect, the DHCP server sees your MAC, looks to see if it has assigned an IP address to you before. If it has and the lease time has not expired, it will most likely give you the same IP address you had before disconnecting.

#### SECTION6:

### NEW MAC ADDRESS GENERATION TO CHANGE MAC ADDRESS:

There are actually 4 sets of Locally Administered Address Ranges that can be used on network without fear of conflict, assuming no one else has assigned these on any network:

x2-xx-xx-xx-xx-xx

x6-xx-xx-xx-xx-xx

xA-xx-xx-xx-xx-xx

xE-xx-xx-xx-xx-xx

Replacing x with any hex value.



## CHAPTER:10

### SECTION1:

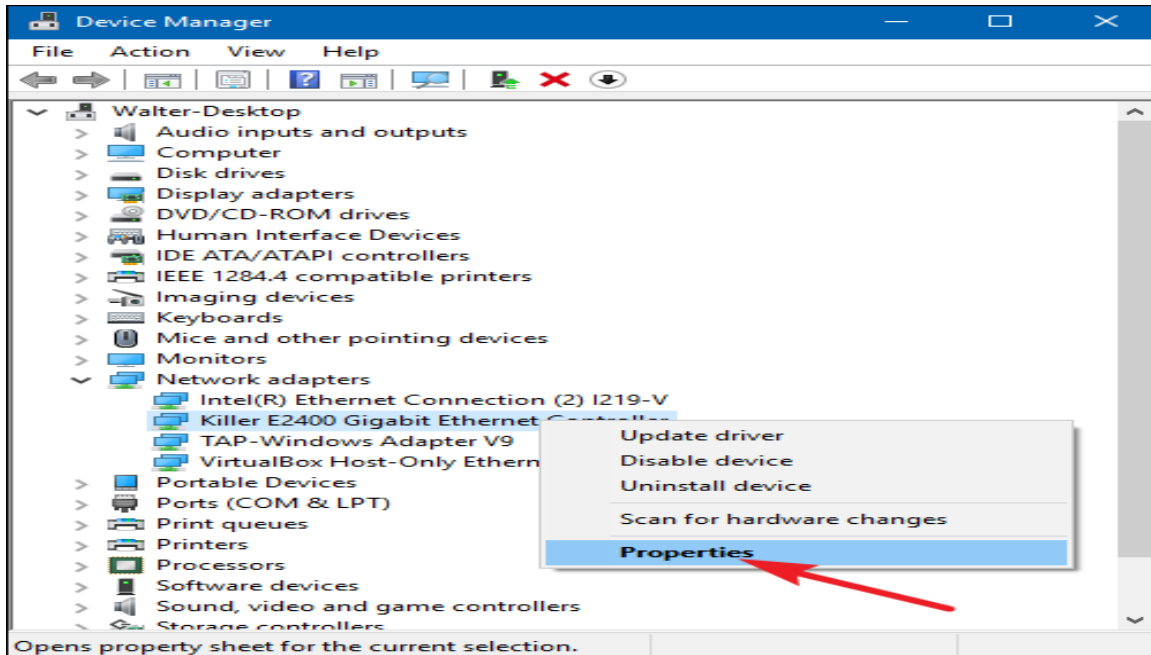
**WAY TO CHANGE WIRELESS NIC'S MAC/PC'S MAC IN WINDOWS XP,VISTA,7,8 CAN BE EDITED IN THE ADAPTER SETTINGS:**

**MAC ADDRESS CAN BE CHANGEABLE WITHOUT ANY SOFTWARE**

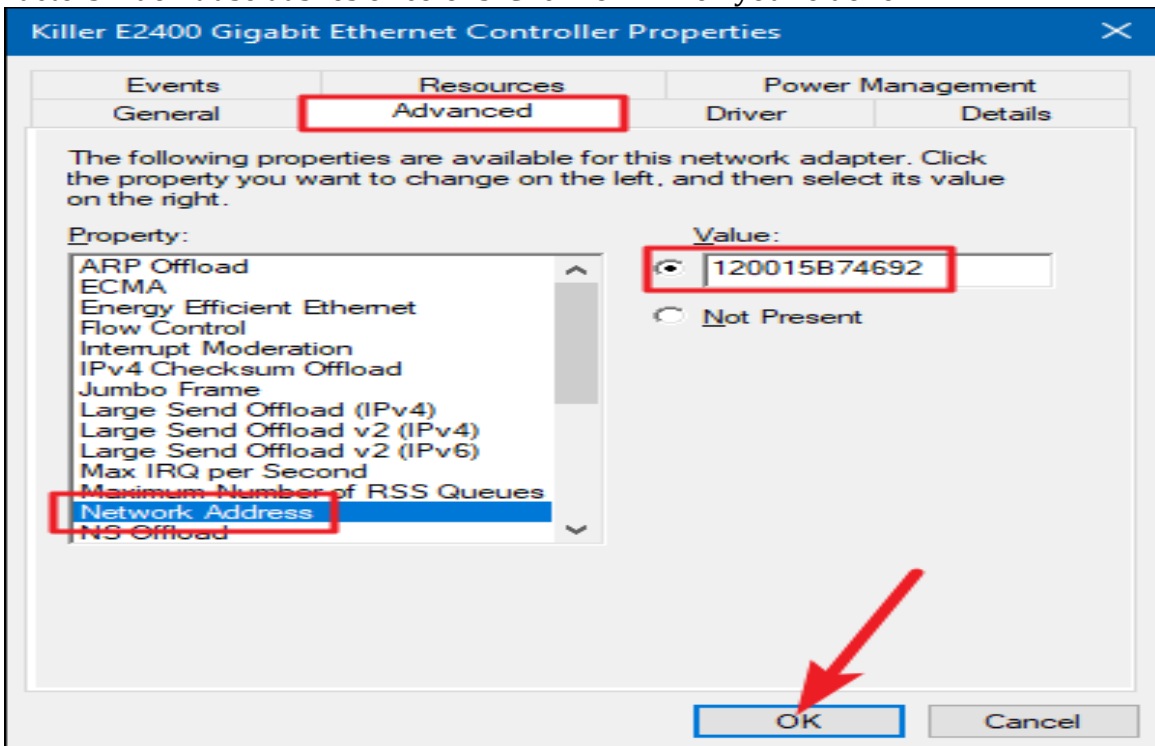
1. Open Network and Sharing Center, choose Change Adapter Settings on the left.
2. Right click on your wireless adapter and choose properties.
3. Make sure the Networking tab is selected (should be by default) and choose Configure.
4. Click the Advanced tab.
5. In the Property window, choose Network Address and select value &insert your desired mac without "-".
6. Press ok.
7. To width draw given network address: Select not present.

Or

8. First, open the Device Manager. On Windows 8 and 10, press Windows+X, and then click "Device Manager" on the Power User menu. On Windows 7, press the Windows key, type "Device Manager" to search for it, and then click the "Device Manager" entry. The Device Manager app will look the same no matter which version of Windows you're using.
9. In Device Manager, under the "Network adapters" section, right-click the network interface you want to modify, and then select "Properties" from the context menu.



10. In the properties window, on the "Advanced" tab and select the "Network Address" entry in the "Property" list. If you don't see this option, then your network driver doesn't support this feature.
11. Enable the Value option and type your desired MAC address without any separating characters—don't use dashes or colons. Click "OK" when you're done.

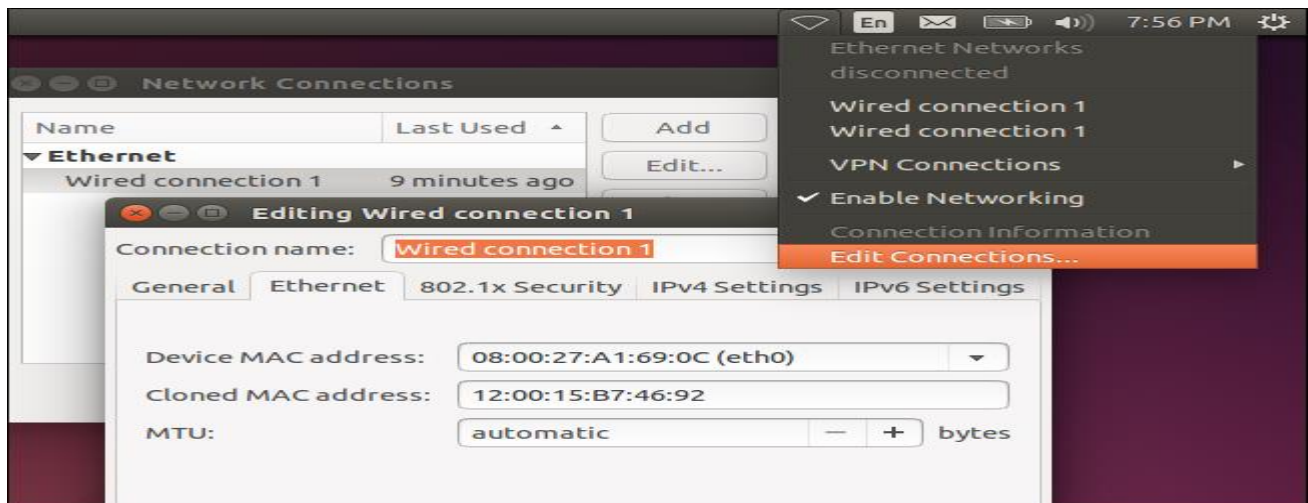


## SECTION2:

### CHANGE A MAC ADDRESS IN LINUX:

Modern Linux distributions like Ubuntu typically use Network Manager, which provides a graphical way to spoof a MAC address.

For example, in Ubuntu you'd click the network icon on the top panel, click "Edit Connections," select the network connection you want to modify, and then click "Edit." On the Ethernet tab, you'd enter a new MAC address in the "Cloned MAC address" field, and then save your changes.



You can also do this the old-fashioned way. This involves taking the network interface down, running a command to change its MAC address, and then bringing it back up. Be sure to replace "eth0" with the name of the network interface you want to modify and enter the MAC address of your choice:

```
sudoifconfig eth0 down
```

```
sudoifconfig eth0 hw ether xx:xx:xx:xx:xx:xx
```

```
sudoifconfig eth0 up
```

```
chris@ubuntu1404vbox: ~
chris@ubuntu1404vbox:~$ sudo ifconfig eth0 down
chris@ubuntu1404vbox:~$ sudo ifconfig eth0 hw ether 12:00:15:b7:36:92
chris@ubuntu1404vbox:~$ sudo ifconfig eth0 up
chris@ubuntu1404vbox:~$
```

You'll have to modify the appropriate configuration file under `/etc/network/interfaces.d/` or the `/etc/network/interfaces` file itself if you want this change to always take effect at boot time. If you don't, your MAC address will be reset when you restart.

### SECTION 3:

## CHANGE A MAC ADDRESS IN MAC OS X:

Mac OS X's System Preferences pane displays each network interface's MAC address, but doesn't allow you to change it. For that, you need the Terminal. Open a Terminal window (press Command + Space, type "Terminal," and then press Enter.) Run the following command, replacing `en0` with your network interface's name and filling in your own MAC address:

```
sudo ifconfig en0 xx:xx:xx:xx:xx:xx
```

The network interface will generally be either `en0` or `en1`, depending on whether you want to configure a Mac's Wi-Fi or Ethernet interface. Run the `ifconfig` command to see a list of interfaces if you're not sure of the appropriate network interface's name.

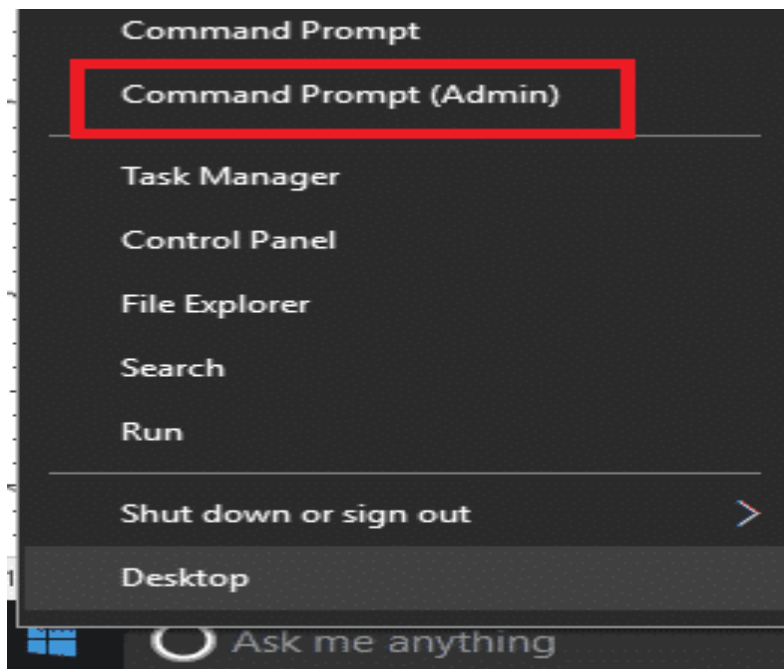
```
Chris — bash — 80x24
Christophers-MacBook-Air:~ chris$ sudo ifconfig en0 ether 12:00:15:b7:36:92
Password:
Christophers-MacBook-Air:~ chris$
```

As on Linux, this change is temporary and will be reset when you next reboot. You'll need to use a script that automatically runs this command on boot if you'd like to permanently change your Mac address.

#### SECTION4:

### CHANGE A MAC ADDRESS OF WINDOWS 10 PC:

- Right click on start button and open **Command-Prompt (Admin)**



Now in Command Prompt windows, Type **ipconfig/all**. You can now see MAC address of all the network cards in front of **Physical Address**.

```
C:\WINDOWS\system32>ipconfig/all

Windows IP Configuration

    Host Name . . . . . : DESKTOP-1IM64A4
    Primary Dns Suffix . . . . . :
    Node Type . . . . . : Hybrid
    IP Routing Enabled. . . . . : No
    WINS Proxy Enabled. . . . . : No

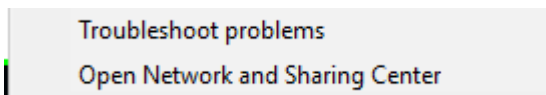
Ethernet adapter Ethernet:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix . :
    Description . . . . . : Intel(R) Ethernet Connection (3) I218-V
    Physical Address. . . . . : 50-7B-9D-4C-D9-3D
    DHCP Enabled. . . . . : Yes
    Autoconfiguration Enabled . . . . : Yes

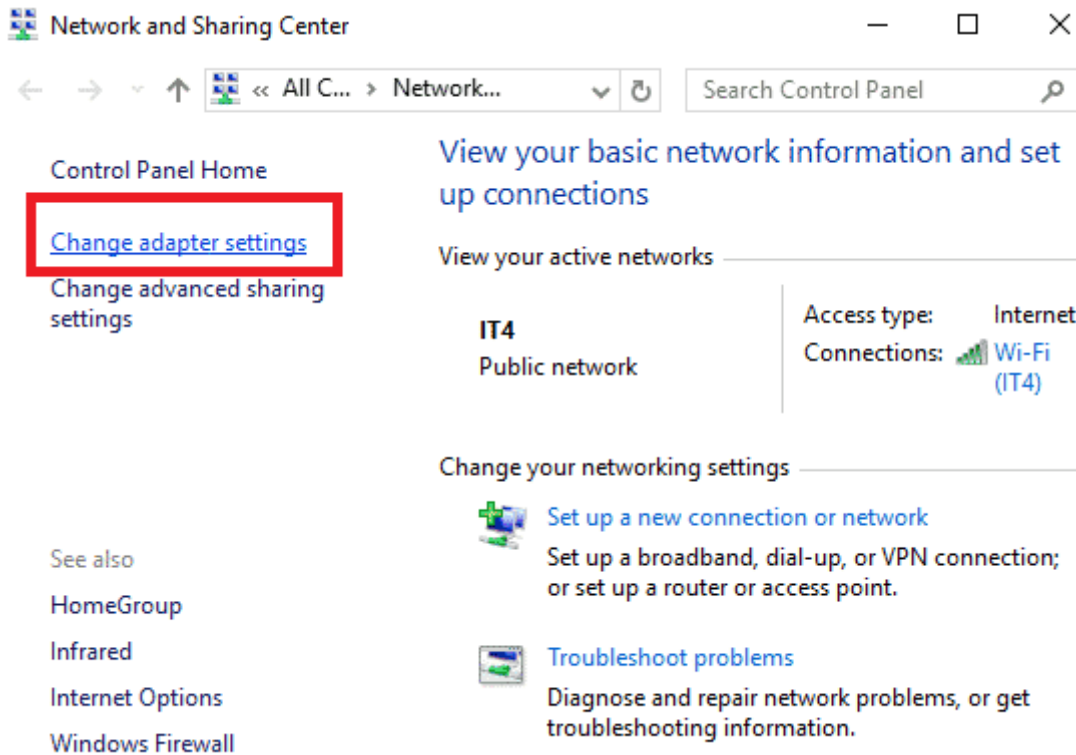
Wireless LAN adapter Local Area Connection* 2:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix . :
    Description . . . . . : Microsoft Wi-Fi Direct Virtual Adapter
    Physical Address. . . . . : 78-0C-B8-00-FB-DC
    DHCP Enabled. . . . . : Yes
    Autoconfiguration Enabled . . . . : Yes
```

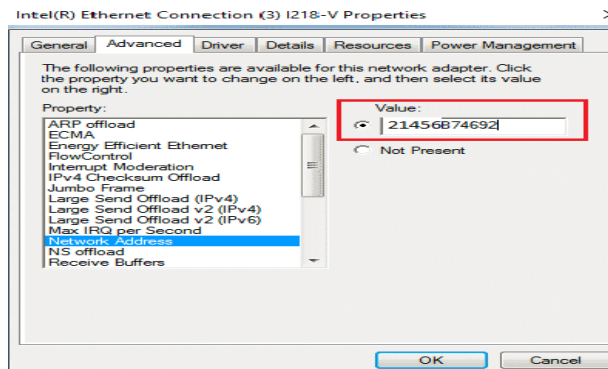
- Now in order to change the MAC address, you need to right click on network icon in the taskbar.



- Open **Change Adaptor settings** and right click on the network adapter you wish to change the MAC



- Click on configure and under the Advanced tab search for Network Address and change the value.



**Note:** The above method is the easiest method to change MAC address in Windows 10 but in most cases, it may not work if the device driver does not support it or some other software is controlling the network resource. In such a caseneed to follow the following option.

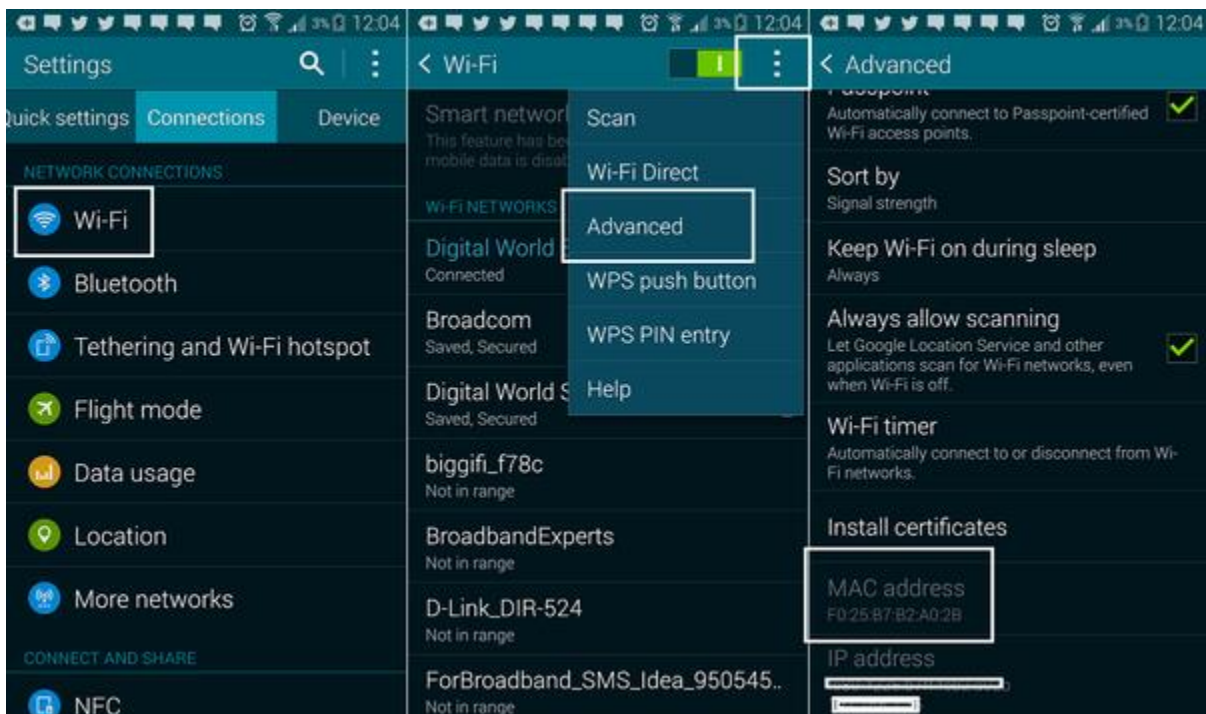
## SECTION5:

### CHANGE A MAC ADDRESS OF ANDROID:

#### TRICK TO CHANGE THE MAC ADDRESS WITHOUT ROOTING ANDROID DEVICE.

For changing the MAC address permanently, root the device. However, if just want to have it temporary changed, don't need to root device. But before moving on with changing the MAC, let us see how can look up MAC address. I strongly recommend to just note down your MAC address before starting to experiment on it. Also need to know the connection name, to get it all follow the steps below:

- Open up settings and then go to WiFi.
- Now, you will see a gear on the top of this screen, click it. But if you don't see it, look for "Configure WiFi" option and click it. Some Android system have Advanced option in WiFi, MAC address can be found there also.
- Voila ! You can find the MAC address on the bottom of this screen. Keep a note of it.
- In order to get the interface name, you will have to install Terminal Emulator for Android. Go to Google Play Store and download it or click the link to get it.



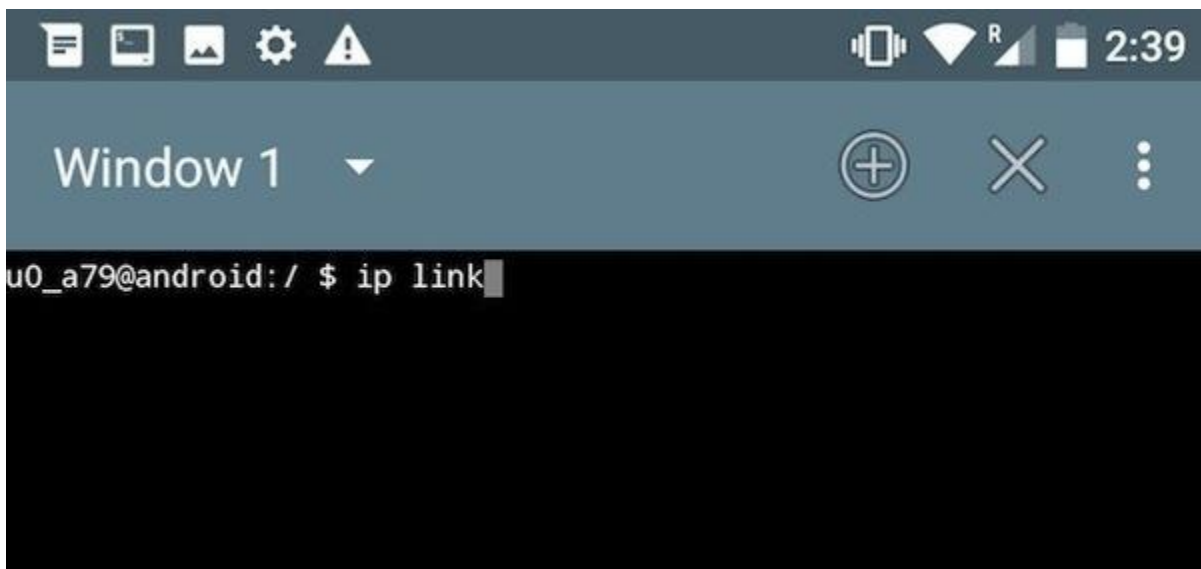
- Once you download it, install it and open up.



- Type the following command : **ip link**. Screen will be filled with lot of information, useful and useless. Just look for this MAC address under “link/ether” for all the cases. The one that matches our MAC address, is the connection name. For most of the devices it is either “wlan0” or “eth0”.

Now, that we know our MAC address and the connection name, we can go on to change the MAC address with this terminal emulator only. Before that should have a valid MAC address in mind or generate one from this link. Once, have a new MAC address, just get on with the below steps:

- Launch the Terminal Emulator
- Just type the following command: `ip link set wlan0 address XX:XX:XX:YY:YY:YY`, where wlan0 is the name of the interface and XX:XX:XX:YY:YY:YY is the MAC address want to set.
- Important thing to keep in mind that the manufacturer name should be kept unchanged while changing the MAC address i.e. XX:XX:XX (first 6 digits) should be same as before, otherwise you might face a lot of authentication issue.
- This is only a temporary change and when restart your device, previous MAC address will be retrieved back.

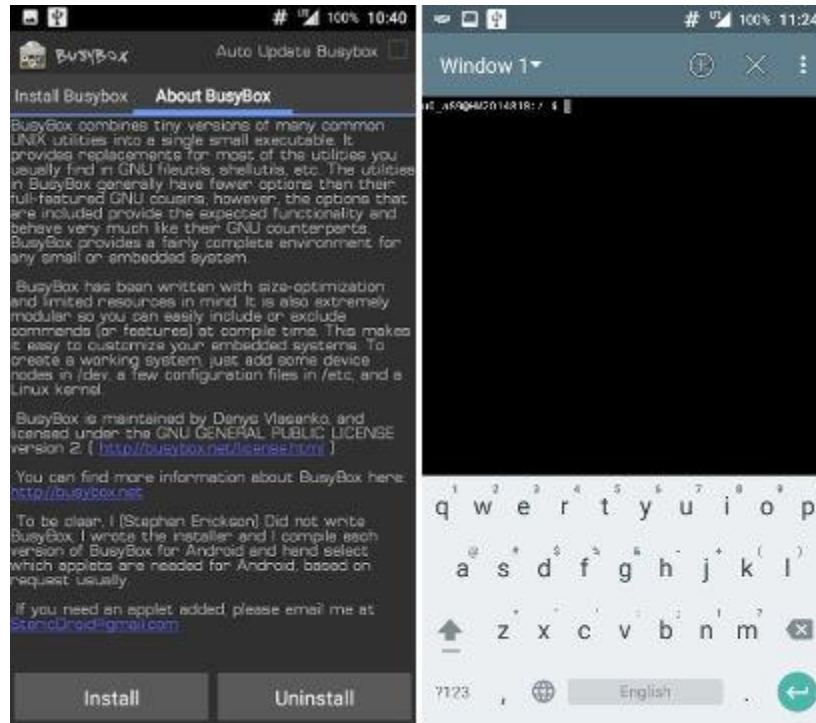


This was all about changing the MAC in non-rooted mobile phone, for rooted devices have a bunch of options to select from. Here are a few techniques can use:

- Using BusyBox App
- Using ChameleMAC App

## 1. Using BusyBox App

We still need a Terminal Emulator for this method. Open the Terminal and then type the following commands:



- `su ->` This will get you into super user mode
- `busybox ip link show wlan0 ->` this will pop up the current MAC address
- `busybox ifconfig wlan0 hw ether XX:XX:XX:XX:XX:XX ->` configure the new MAC address
- `busybox ip link show eth0 ->` this is to check whether the MAC address has been changed or not.

### SECTION 6:

#### CHANGE MAC ADDRESS IN LINUX:

##### METHOD 1: USING MACCHANGER

Macchanger is simple utility to view, modify, and manipulate MAC addresses for Network interface cards. It is available in almost all GNU/Linux operating systems.

On Arch Linux:

To install Macchanger in Arch Linux and its derivatives, run:

```
#sudo pacman -S macchanger
```

ON FEDORA, CENTOS, RHEL:

```
#sudo yum install macchanger
```

Or

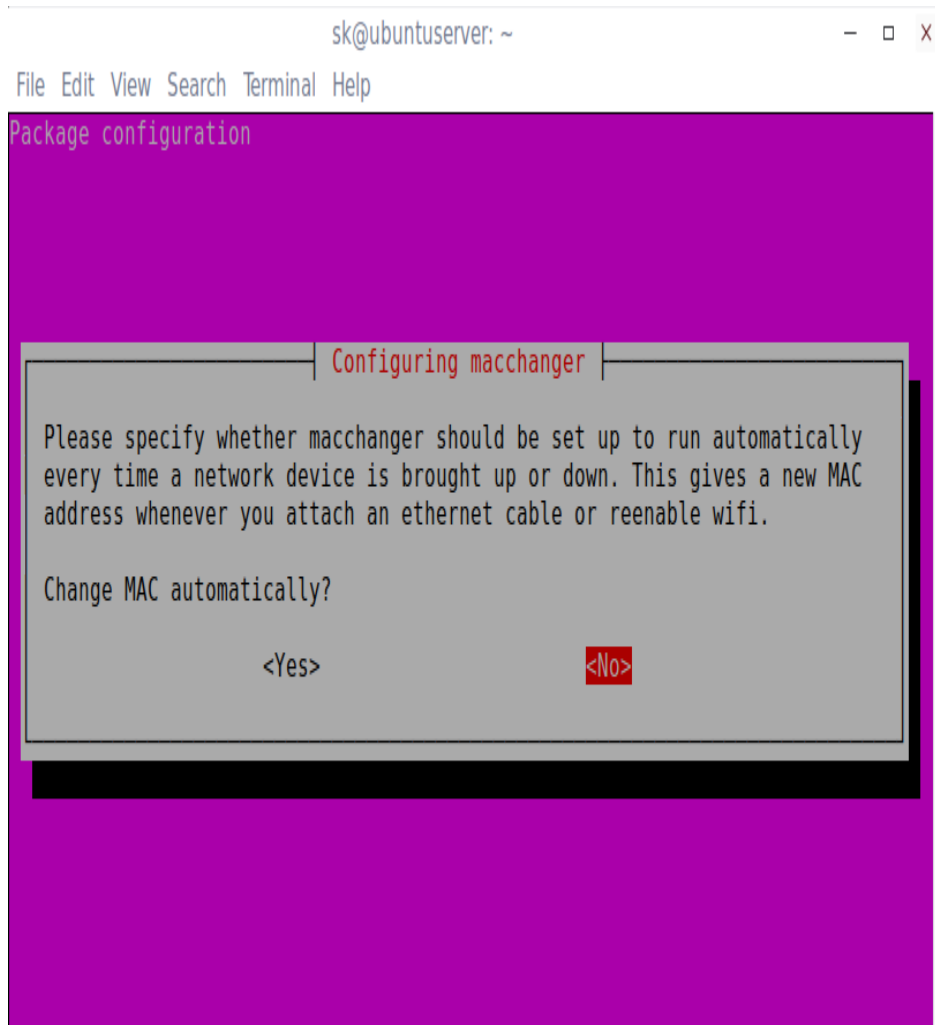
```
#sudo dnf install macchanger
```

ON DEBIAN / UBUNTU:

To macchanger in Debian, Ubuntu and its derivatives, run:

```
sudo apt-get install macchanger
```

Specify whether macchanger should be set up to run automatically every time a network device is brought up or down. This gives a new MAC address whenever you attach an ethernet cable or reenable wifi. Recommend way not to run automatically, unless really need to change the MAC id every time.



Macchanger has been installed.

---

#### USAGE

To assign any random MAC address, run:

```
macchanger -r <interface-name>
```

To find out the network interface name, run:

```
ip addr
```

## SAMPLE OUTPUT:

1: lo: <LOOPBACK,UP,LOWER\_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1

link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00

inet 127.0.0.1/8 scope host lo

valid\_lft forever preferred\_lft forever

inet6 ::1/128 scope host

valid\_lft forever preferred\_lft forever

2: **enp0s3**: <BROADCAST,MULTICAST,UP,LOWER\_UP> mtu 1500 qdisc pfifo\_fast state UP group default qlen 1000

link/ether **08:xx:xx:xx:xx:x1** brd ff:ff:ff:ff:ff:ff

inet 192.168.1.105/24 brd 192.168.1.255 scope global enp0s3

valid\_lft forever preferred\_lft forever

inet6 fe80::a00:27ff:fe12:f8c1/64 scope link

valid\_lft forever preferred\_lft forever

```
sk@ubuntuuser: ~
File Edit View Search Terminal Tabs Help

sk@ubuntuuser: ~
sk@sk:~

sk@ubuntuuser:~$ ip addr
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
        valid_lft forever preferred_lft forever
2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 08:00:27:ff:fe12:f8c1 brd ff:ff:ff:ff:ff:ff
    inet 192.168.1.105/24 brd 192.168.1.255 scope global enp0s3
        valid_lft forever preferred_lft forever
    inet6 fe80::a00:27ff:fe12:f8c1/64 scope link
        valid_lft forever preferred_lft forever
sk@ubuntuuser:~$
```

**enp0s3** is network interface card's name.

To change the MAC address of enp0s3 network card, run:

```
sudo macchanger -r enp0s3
```

After changing the MAC id, verify it using command:

```
ip addr
```

## SAMPLE OUTPUT:

```
sk@ubuntuuserver:~$ ip addr
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
        valid_lft forever preferred_lft forever
2: emp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1
    link/ether 6a:2a:c9:61:a2:6c brd ff:ff:ff:ff:ff:ff
    inet 192.168.1.103/24 brd 192.168.1.255 scope global emp0s3
        valid_lft forever preferred_lft forever
    inet6 fe80::a00:27ff:fe12:f8c1/64 scope link
        valid_lft forever preferred_lft forever
sk@ubuntuuserver:~$ _
```

Now see that MAC has been spoofed.

To change the MAC address to a specific value, specify any custom MAC address using command:

```
macchanger --mac=XX:XX:XX:XX:XX:XX
```

Where **XX:XX:XX:XX:XX:XX** is the new MAC id that wish to change to.

Finally, to return the MAC address to its original, permanent hardware value, run the following command:

```
macchanger -p enp0s3
```

```
sk@ubuntu:~$ sudo macchanger -p enp0s3
[sudo] password for sk:
Current MAC: 6a:2a:c9:61:a2:6c (unknown)
Permanent MAC: 08:00:27:00:00:01 (CADMUS COMPUTER SYSTEMS)
New MAC: 08:00:27:00:00:01 (CADMUS COMPUTER SYSTEMS)
sk@ubuntu:~$
```

Once reboot the system, the changes will be automatically lost, and the actual MAC address will be restored again.



## METHOD 2: USING IPROUTE2

First, turn off the Network card using command:

```
ip link set dev enp0s3 down
```

Next, set the new MAC is using command:

```
ip link set dev enp0s3 address XX:XX:XX:XX:XX:XX
```

Finally, turn it on back with command:

```
ip link set dev enp0s3 up
```

Now, verify new MAC id using command:

```
ip link show enp0s3
```

### **Sample output:**

```
link/ether xx:xx:xx:xx:xx:xx brd ff:ff:ff:ff:ff:ff
```

Alternatively, you can do this using **'ifconfig' command** as described below.

```
ifconfig eth0 down
```

```
ifconfig eth0 hw ether 00:80:48:BA:d1:30
```

```
ifconfig eth0 up
```

```
ifconfig eth0 | grep HWaddr
```

## MAC ADDRESS CHANGING SOFTWARE:

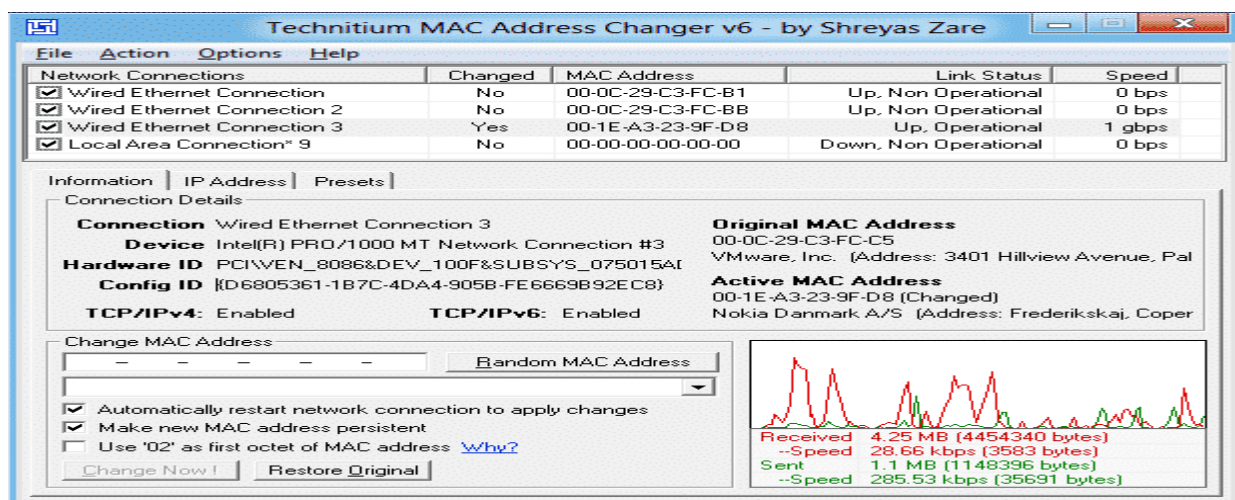
### SECTION 7:

#### USE THIRD-PARTY TOOLS TO CHANGE YOUR MAC ADDRESS:

Technitium MAC address changer is a free 3<sup>rd</sup> party software which works well with all versions of windows OS right from windows XP to Windows 10. After running it, the software will automatically detect all the network adapters installed in the system and provide plenty of options to change the MAC address of active or selected network adapter.

If you want to use a MAC address changer to change your MAC address on Windows 10, there are few tools that you can use. One of these tools is Technitium MAC Address Changer. To use this tool to change your MAC address, follow these steps:

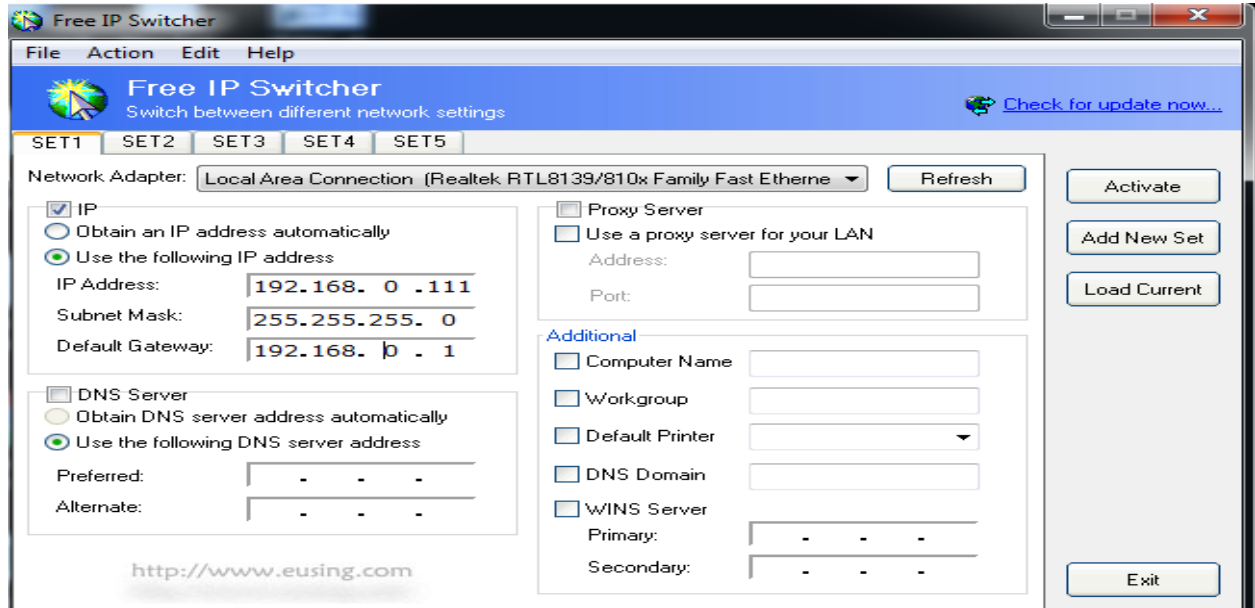
1. Download Technitium MAC Address Changer.
2. Once you've downloaded and installed this tool, run it.
3. When Technitium MAC Address Changer starts, you should see the list of all network adapters available.
4. Select the network adapter you want to change and in the **CHANGE MAC** address section enter a new MAC address. Remember to use a hexadecimal value. If you wish to make this step faster, you can just click Random MAC Address button that will generate a random MAC address for you.
5. Click **Change Now!** button and your MAC address should be changed.
6. **OPTIONAL:** If you wish to restore your default MAC address just click the **Restore Original** button.



SECTION8:

**IP ADDRESS CHANGER:**

DOWNLOAD IT FROM [WWW.FILEHIPPO.COM](http://WWW.FILEHIPPO.COM)



## CHAPTER:11

### SECTION1:

#### **ROUTER FAULT:**

**WHAT WILL TAKE PLACE IF THE MAC ADDRESS & IP OF ONE PC AND ROUTER ARE THE SAME OF A BIG OFFICE NETWORK?:**

#### **DECISION:2**

##### **Case Studies**

**The Lan network will be down instantly. No internet service will be available then.**

### SECTION2:

**WHAT WILL TAKE PLACE IF THERE TWO MAC ADDRESSES ARE CONNECTED TO A SINGLE NETWORK SWITCH FROM ONE PC OF A BIG NETWORK?OR A PC HAS TWO LAN CARDS?:**

#### **DECISION:3**

##### **Case Studies**

**If one pc has two lan cards and two cables are through to a single switch of a lan network with internet connections at a same time from that pc, the switch is going down slowly and after a short time the network is going down & no internet service will be available later.**