

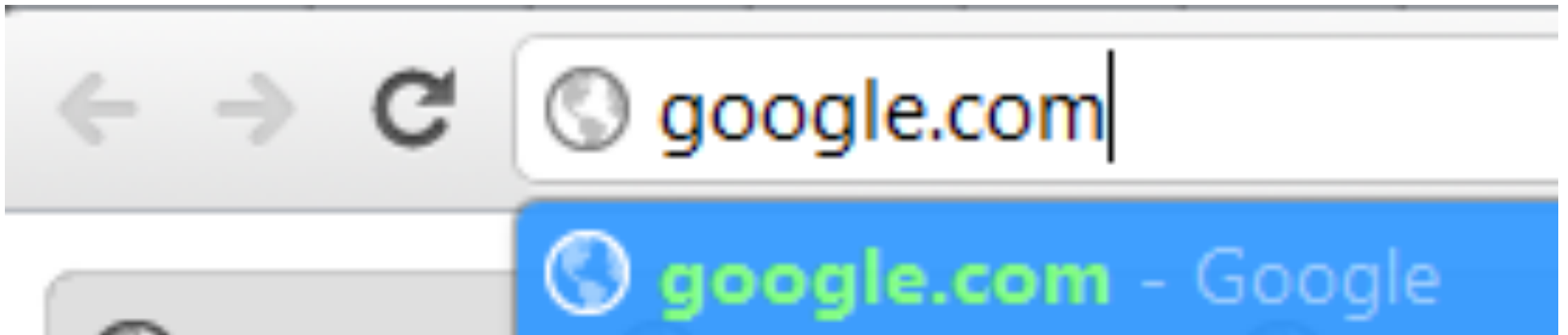
# Even more Internet

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CS-E1- Fall 2011

# Homework 2

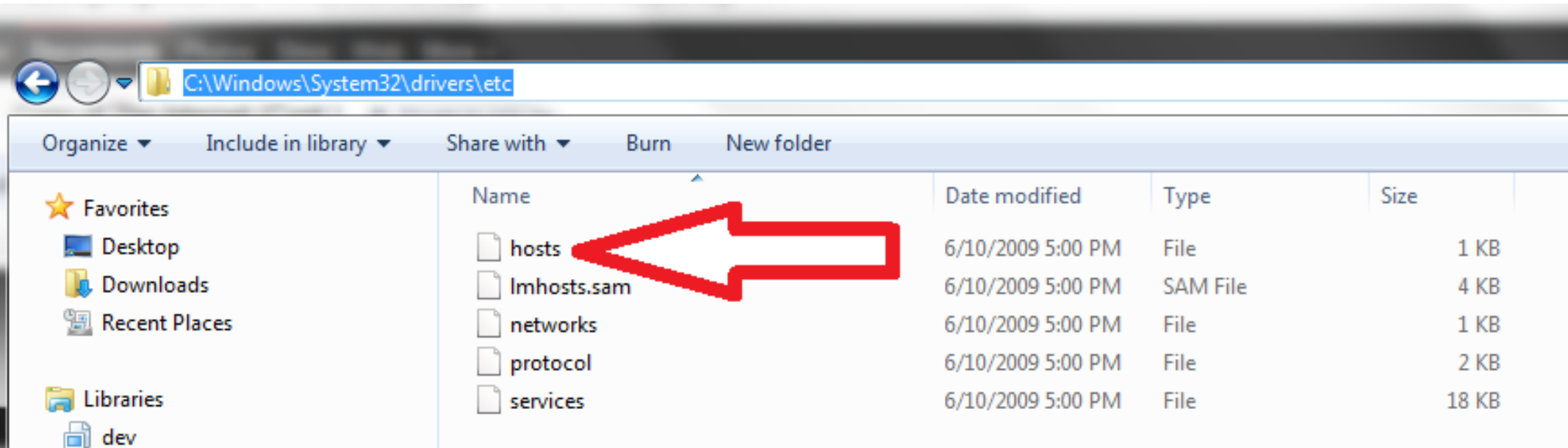
Leave a reply on two separate posts on the blog

So you type in google.com - what happens?



First, your browser opens up a file on your computer to see if you've manually specified any rules for this domain name.

While you probably shouldn't edit  
this file, here's where it is:  
C:\Windows\System32\drivers\etc

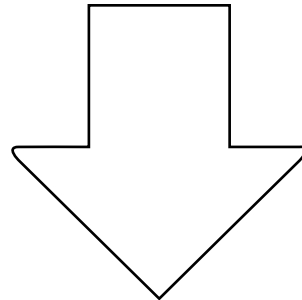


In mac, the file is at  
/private/etc/hosts

If you do want to edit it, you want to make sure to make a backup first, and to run the text editor as an "administrator." It looks like this:

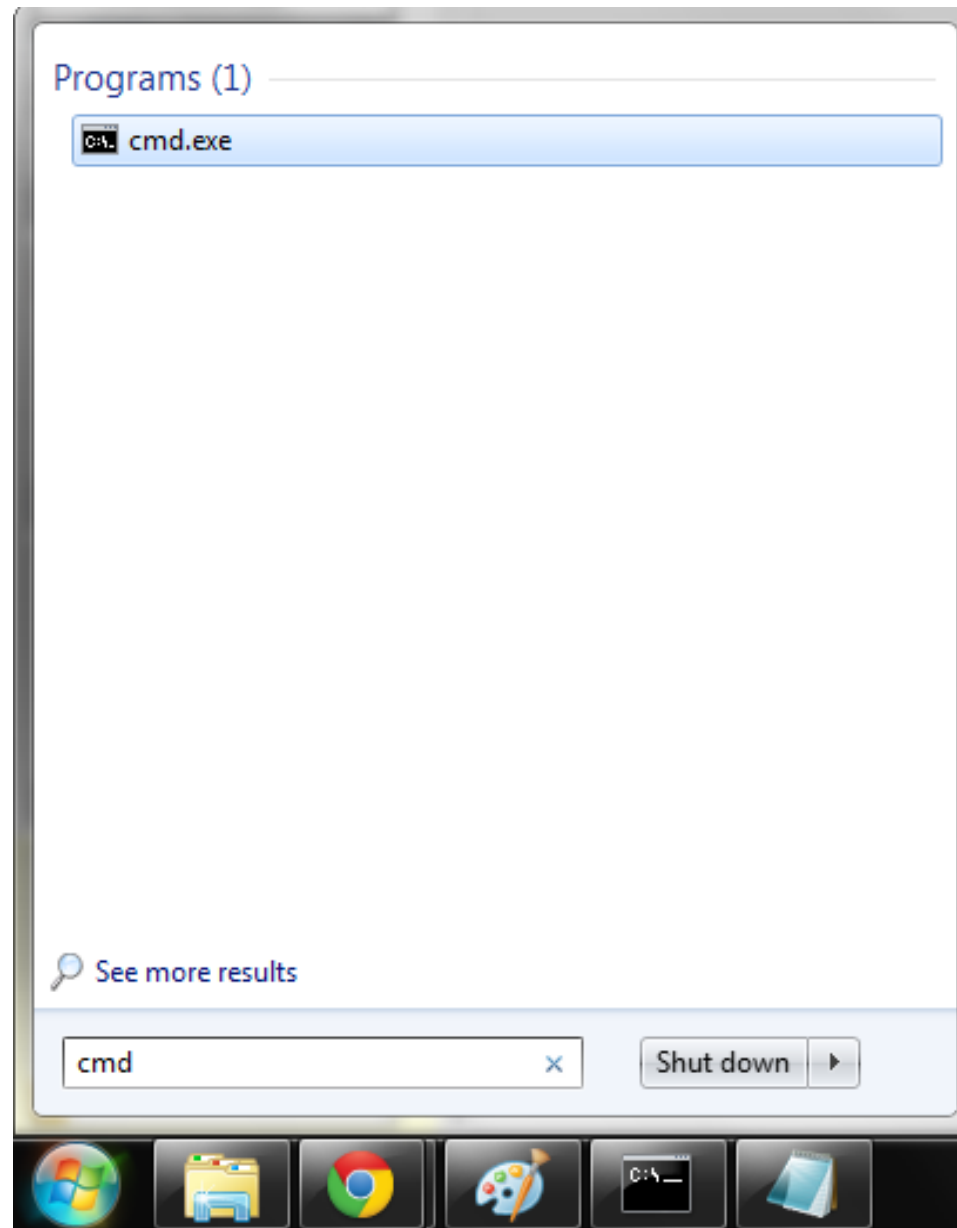
```
# Copyright (c) 1993-2009 Microsoft Corp.
#
# This is a sample HOSTS file used by Microsoft TCP/IP for Windows.
#
# This file contains the mappings of IP addresses to host names. Each
# entry should be kept on an individual line. The IP address should
# be placed in the first column followed by the corresponding host name.
# The IP address and the host name should be separated by at least one
# space.
#
# Additionally, comments (such as these) may be inserted on individual
# lines or following the machine name denoted by a '#' symbol.
#
# For example:
#
# 102.54.94.97    rhino.acme.com    # source server
# 38.25.63.10    x.acme.com        # x client host
#
# localhost name resolution is handled within DNS itself.
# 127.0.0.1      localhost
# ::1            localhost
```

Let's make it so nytimes.com goes to  
google.com.



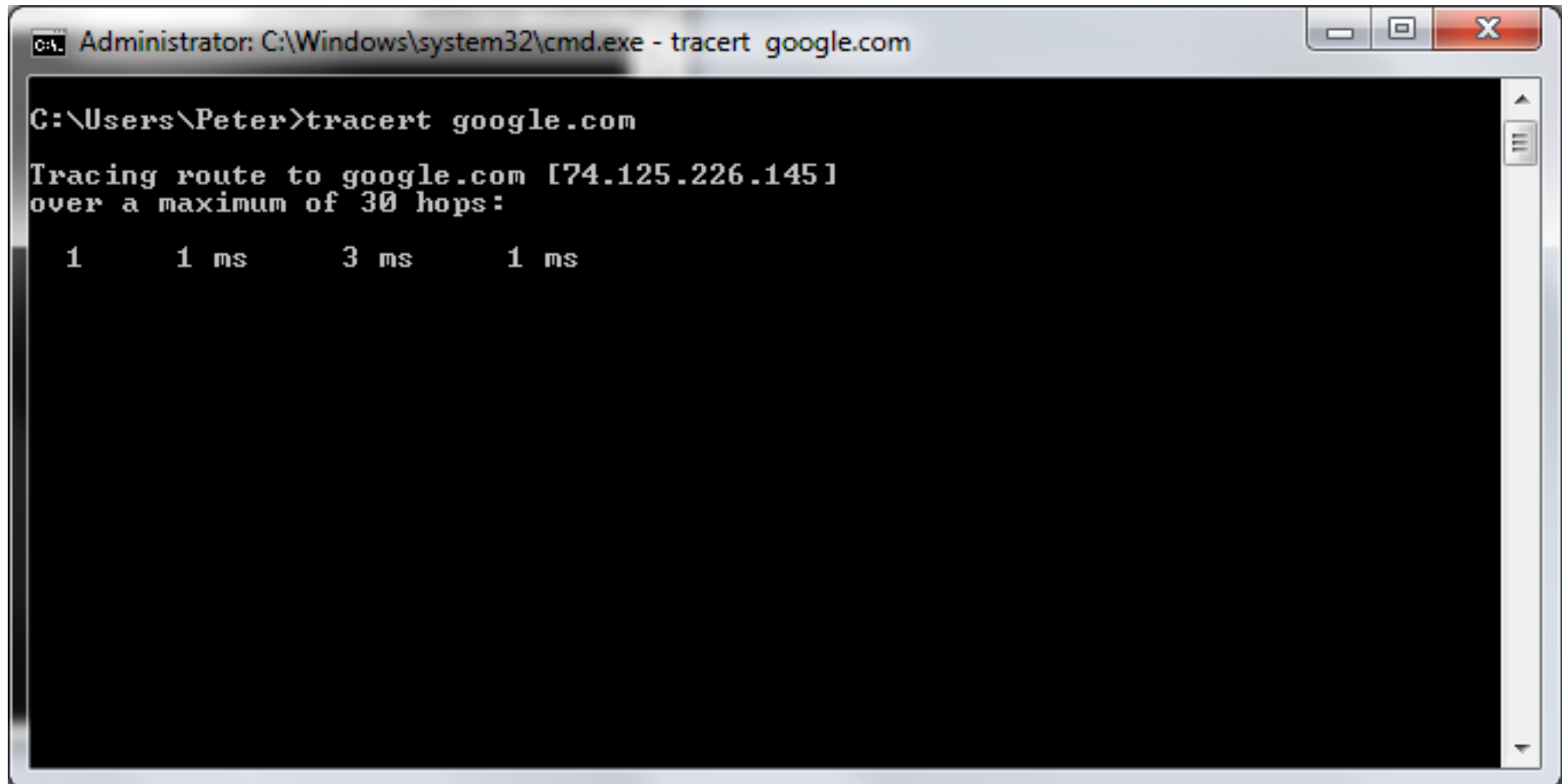
[google will appear here]

Open the command prompt.





Open the command prompt.



The screenshot shows a Windows command prompt window titled "Administrator: C:\Windows\system32\cmd.exe - tracert google.com". The user has entered the command `tracert google.com`. The output shows the tracing route to google.com [74.125.226.145] over a maximum of 30 hops. The first hop is shown with a delay of 1 ms, 3 ms, and 1 ms.

```
C:\Users\Peter>tracert google.com

Tracing route to google.com [74.125.226.145]
over a maximum of 30 hops:

  1      1 ms      3 ms      1 ms
```

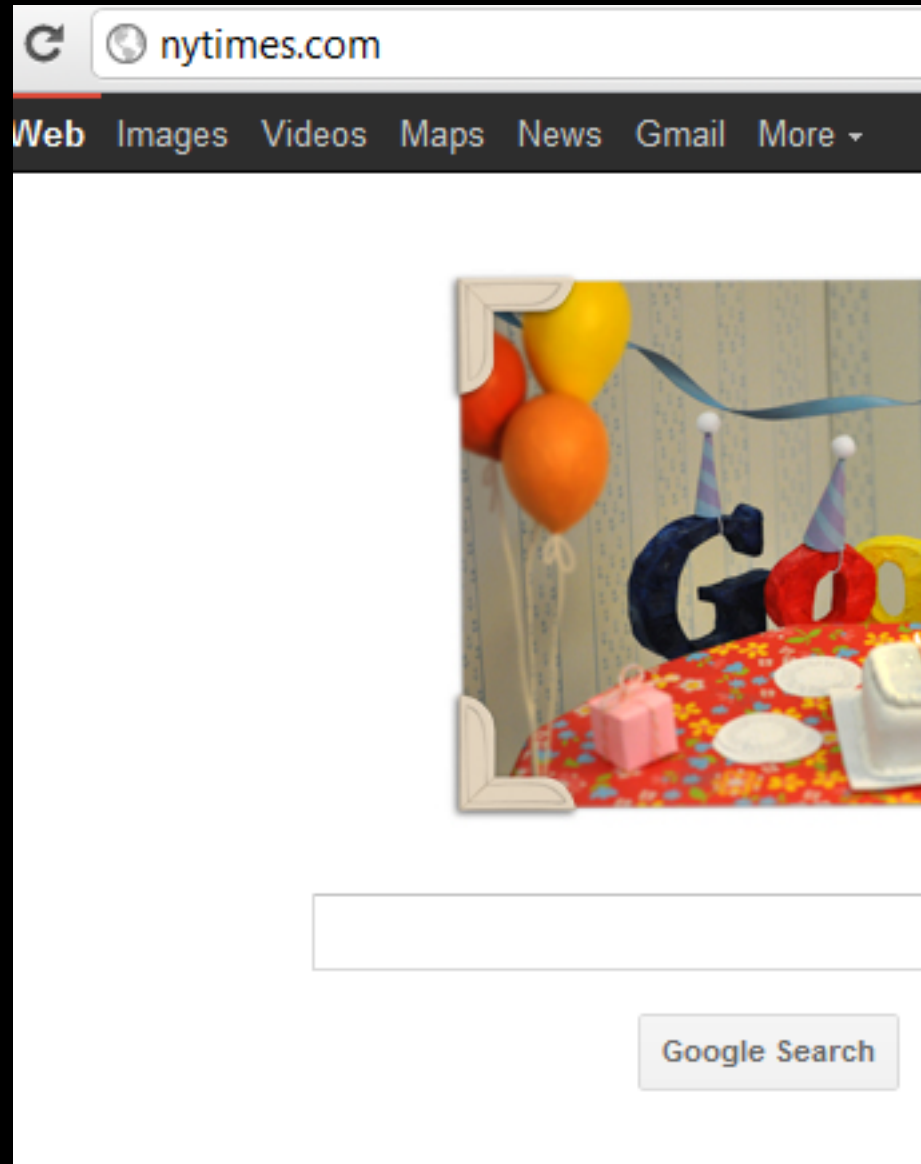
the "trace route" command - *tracert* above - gives us the IP address of google.com, 74.125.226.145.

Now, in the hosts file, make nytimes.com point to google's ip address.

```
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# The IP address and the host name should be separated by at least one  
# space.  
#  
# Additionally, comments (such as these) may be inserted on individual  
# lines or following the machine name denoted by a '#' symbol.  
#  
# For example:  
#
```

```
74.125.226.145 nytimes.com
```

Now when you go to nytimes.com, you get google.



This is basically how the first step in resolving google works - your browser asks your network connection what the ip address of google.com is.

# DNS

Domain Name System

In this case, your computer's network connection senses the changes in **C:\windows\system32\drivers\hosts** and acts as your own private domain name server for the domains in hosts only.

In Windows XP, a common malware program would often edit the hosts file to reroute google.com to some other server that provided a malicious download or advertising.

In later versions of Windows, you must be an administrator to edit the file to avoid this kind of abuse.

Most of the time, though, your browser knows what IP address to request because of a remote domain name server.

This is a special type of server that only sends out IP addresses, not web pages.

But how does your computer know the address of the nearest domain name server?

... how does your computer know the address of the nearest domain name server?

On the phone, you can always (well, you used to always be able to) dial zero and get an operator that will help connect you to "directory service."

What's the internet equivalent?

# DHCP

Dynamic  
Host  
Configuration  
Protocol



# How does DHCP work?

## 1. server discovery

- Client broadcasts DHCPDISCOVER packet asking **"Who can give me DHCP information?"**

source: <https://nets.ucar.edu/nets/presentations/DHCP-in-SCD/>

# How does DHCP work?

## 2. servers make an offer

- All servers on the subnet unicast a DHCP OFFER packet saying “**I can supply you with DHCP information, if you like.**”

source: <https://nets.ucar.edu/nets/presentations/DHCP-in-SCD/>

# How does DHCP work?

## 3. client requests

- The client selects one of the responses, and broadcasts a DHCPREQUEST packet saying “**I choose server XYZ. Server XYZ, here’s my MAC address, what’s my IP address?**”
- The unchosen servers treat this as a rejection.
- The request can specify a preferred IP address, if the client has a preference.
- The request can ask for additional information.

source: <https://nets.ucar.edu/nets/presentations/DHCP-in-SCD/>

pop quiz ... what's a mac address?

A **Media Access Control address (MAC address)** is a unique identifier assigned to network interfaces for communications on the physical network segment.

MAC addresses are used for numerous network technologies and most IEEE 802 network technologies including \_\_\_\_\_

While **IP addresses** are associated with **software**, **MAC addresses** are linked to the **hardware** of network adapters. For this reason, the MAC address is sometimes called the **hardware address**

# How does DHCP work?

## 4. server responds

- The server responds with a DHCPACK packet saying **“Here is your IP address. It’s good for 24 hours.”**
- The response can contain additional information, if the client asked for it.
- The server records that the IP address is in use.

source: <https://nets.ucar.edu/nets/presentations/DHCP-in-SCD/>

# How does DHCP work?

## 5. client releases

- The client finishes it's work, and send a DHCPRELEASE packet saying "**I'm done with the IP address.**"
- The server records that the IP address is not in use.

source: <https://nets.ucar.edu/nets/presentations/DHCP-in-SCD/>

# How does DHCP work?

## clients preserve addresses

- A client can remember its last-used IP address in non-volatile memory. When it boots, it can request the address from the server. This improves the chances that a client will retain the same IP address over long periods of time.

## What does DHCP provide?

- IP address
- subnet mask
- default route
- dns server
- more

source: <https://nets.ucar.edu/nets/presentations/DHCP-in-SCD/>



how do you know what your dns server is?

```
C:\WINDOWS\system32\cmd.exe

C:\Documents and Settings>ipconfig /all

Windows IP Configuration

    Host Name . . . . . : xpbox
    Primary Dns Suffix . . . . . :
    Node Type . . . . . : Unknown
    IP Routing Enabled. . . . . : No
    WINS Proxy Enabled. . . . . : No

Ethernet adapter Local Area Connection:

    Connection-specific DNS Suffix  :
    Description . . . . . : VMware Accelerated AMD PCNet Adapter
    Physical Address. . . . . : 00-0C-29-3D-5E-41
    Dhcp Enabled. . . . . : No
    IP Address. . . . . : 192.168.1.17
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . : 192.168.1.254
    DNS Servers . . . . . : 192.168.1.2

C:\Documents and Settings>
```

ipconfig /all tells you everything\*  
\* in windows

# What is a default gateway?

A gateway is a device that routes between different networks

Every computer knows a few routes to other computers, but not all of them of course!

... so the "default gateway" is the router you ask to figure out the route to a server that your computer doesn't know

# What is a subnet mask?

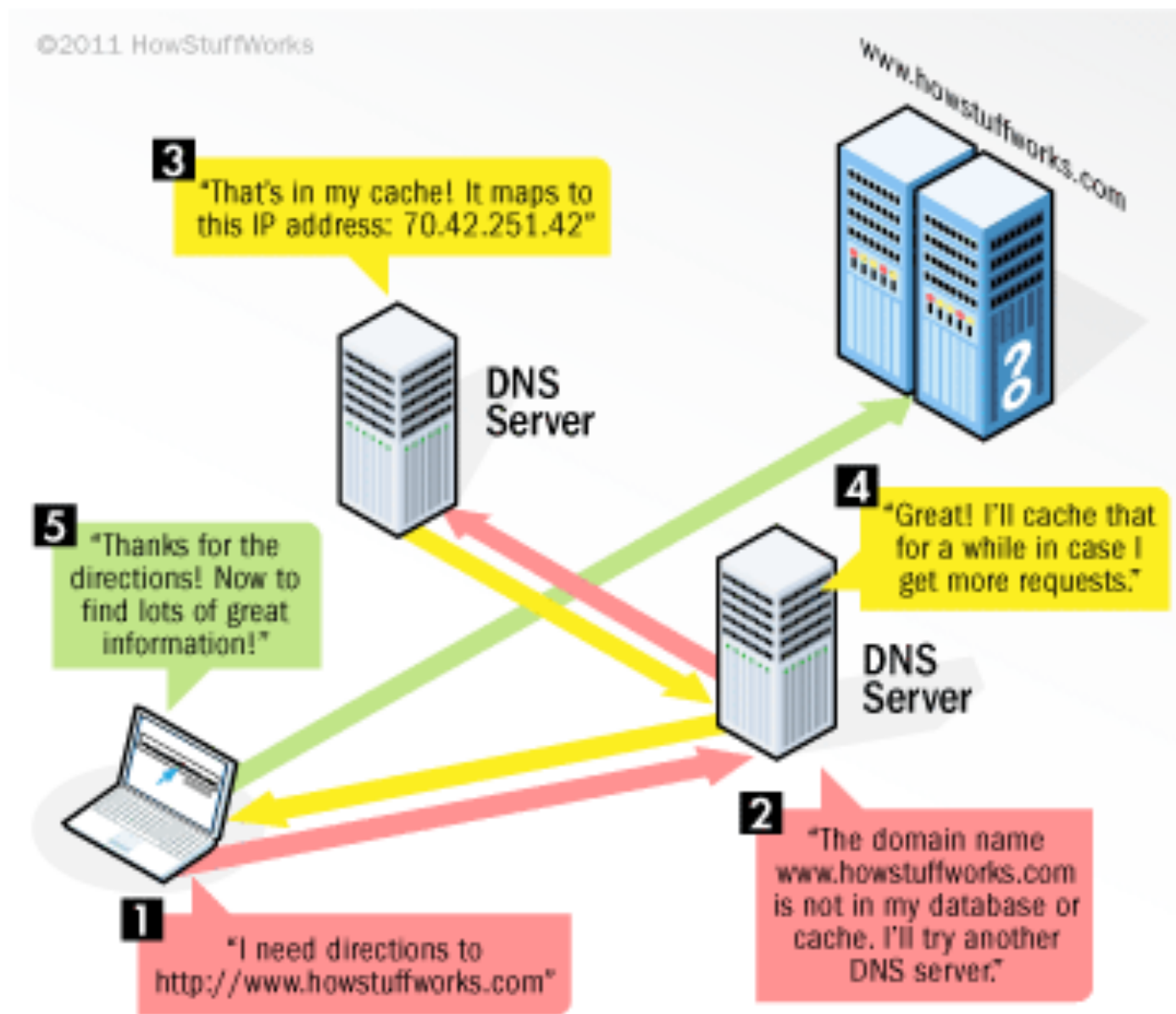
Every IP address consists of two parts, the network address, and the host address.

If you just have the IP address, you can't tell what part of the number does what!

... so the subnet mask is a "mask" you put onto the IP address to figure out.

(the actual process by which you figure out the network address by applying the subnet mask isn't something we'll go into today)

So once you know where your dns server is, then what?



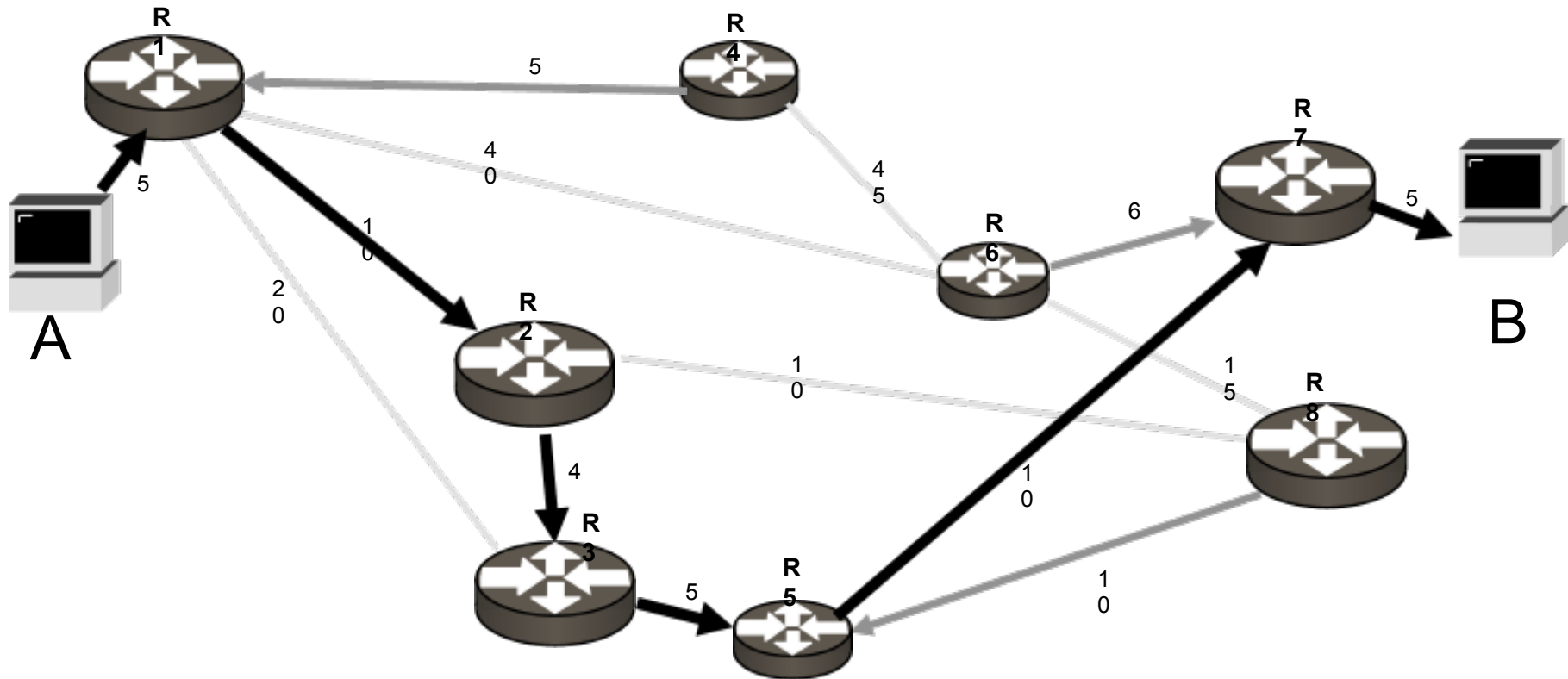
source: <http://www.howstuffworks.com/dns.htm>

Wait ... how does it send a message  
with the IP address of the DNS  
server?

Wait ... how does it send a message  
with the IP address of the DNS  
server?

... how does IP routing work?

# Path Selection



Minimum cost from A to B is 39 units

Wait, how does any one router know  
which router to send the message  
on to?



# Routing



- "You tell me all the address prefixes you can reach, but don't tell me the path you use to get there"
  - "I'll tell you the same"
- "If anything changes, please let me know"
- "If you tell me an address I'll send you traffic destined to that address."
  - If I tell you an address I will accept traffic destined to that address

# Routing



- Border Gateway Protocol version 4 (BGP4)
- Each interior route collection is described by an Autonomous System (AS) number
- Internal topology is hidden
- Routes are announced with associated AS value
  - 139.130.0.0/16 + AS 1221

credit: [www.potaroo.net/t4/ppt/introrte.ppt](http://www.potaroo.net/t4/ppt/introrte.ppt)