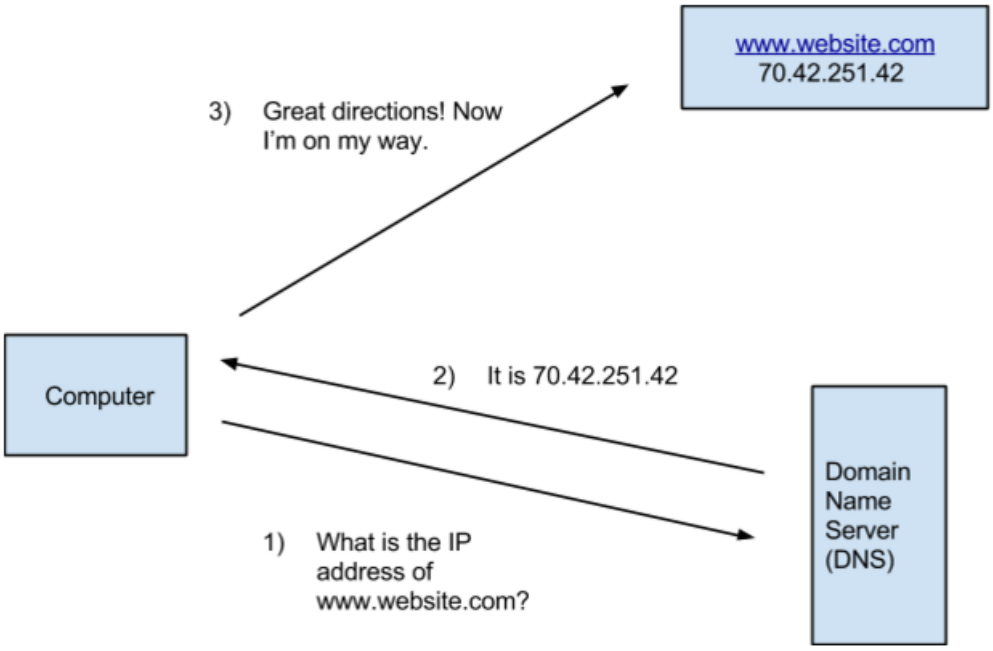
Activity 5: The Internet

The Internet is the underlying global network that supports Email, the World Wide Web, and other applications. It consists of many different local networks that are connected together.

Model 1 How the Internet Works

All devices connected to the Internet are assigned an ***IP address*** made up of four 8-bit numbers separated by dots (e.g., 173.194.208.139). Some are assigned a ***static*** (permanent) IP address, whereas others are assigned a ***dynamic*** (temporary) IP address. Since it's difficult for people to remember numbers, we typically use ***domain names*** when referring to websites.



Questions (15 min) **Start time:** _____

1. Based on the paragraph above:

a) How many bits does an IP address have? 32 bits

b) What is the largest possible IP address? 255.255.255.255

2. Based on the diagram above:

a) What is the domain name of the requested server? www.website.com

b) What is the IP address of the requested server? 70.42.251.42

3. In your own words, what is the function of a DNS server?

It translates domain names into IP addresses upon request. DNS maintains a database of all registered domain names.

4. Give examples of domain names that you use frequently. Name at least two .com, two .org, two .edu, and two of something else.

Examples may include: google.com, facebook.com, youtube.com; wikipedia.org, craigslist.org, wordpress.org; mit.edu, stanford.edu, harvard.edu; sourceforge.net, irs.gov, bit.ly

5. How are domain names an example of an abstraction?

They represent an IP address; it's much easier to remember a name than four specific numbers. Also the suffix (.com, .org. edu) indicates what type of domain it is (e.g., commercial, organization, educational).

6. List the IP addresses for two of your lab computers and two of your phones. (You can search Google for "IP address" to find them.)

Answers will vary depending on the student's location.

7. Go to TCPIPutils.com and search for your school's domain name. Scroll down half-way to "Network information".

a) Identify the range of IP addresses used by your school. 134.126.0.0 – 134.126.255.255

b) Does the university have enough IP addresses for all students, faculty, and staff (and their multiple devices)? Explain your answer.

JMU has about 21,000 students plus 1,500 faculty and staff. With a 16-bit range, there are $2^{16} = 65,536$ possible IP addresses. That means we have about 2.9 IP addresses per person. But some of the addresses are for computer labs, campus servers, etc. And it's not uncommon for people to have both a computer and a phone. At some point, we're going to run out of IP addresses.

Model 2 Measuring Your Network

Your network performance can be measured in two ways:

- **bandwidth** – the rate at which data is downloaded or uploaded to a network, measured in bits per second (bps), kilobits per second (kbps), or megabits per second (Mbps)
- **latency** – how much time it takes (in milliseconds) for a request to reach its destination

Questions (10 min) Start time: _____

8. Consider how performance should be measured:

a) For bandwidth, would good performance be a large number or a small number? large

b) For latency, would good performance be a large number or a small number? small

9. Use an Internet speed test (https://www.google.com/search?q=speed+test) to measure bandwidth here on campus and later at home.

a) On campus: 6.63 Mbps

b) At home: 9.32 Mbps

10. Use Pingdom's speed test (https://tools.pingdom.com/) to measure the average latency between San Francisco and:

a) http://google.com Performance grade: B 85, Load time: 1.55 s

b) http://whitehouse.gov Performance grade: B 80, Load time: 1.54 s

c) Any website you use http://facebook.com takes 1.60 s

11. Search for "Internet speed by state" and "Internet speed by country" to find the interactive maps on fastmetrics.com.

a) Which state in the US has the fastest **average peak speed**? Which state has the slowest?
Delaware was the fastest, Kentucky was the slowest (when the map was created)

b) What is the difference between the fastest and slowest states?
75 Mbps − 34 Mbps = 41 Mbps
(DE is more than twice as fast as KY)

c) Which country has the fastest **average speed**? How does the US compare?

South Korea has 26.7 Mbps; the US only has 14.2 Mbps