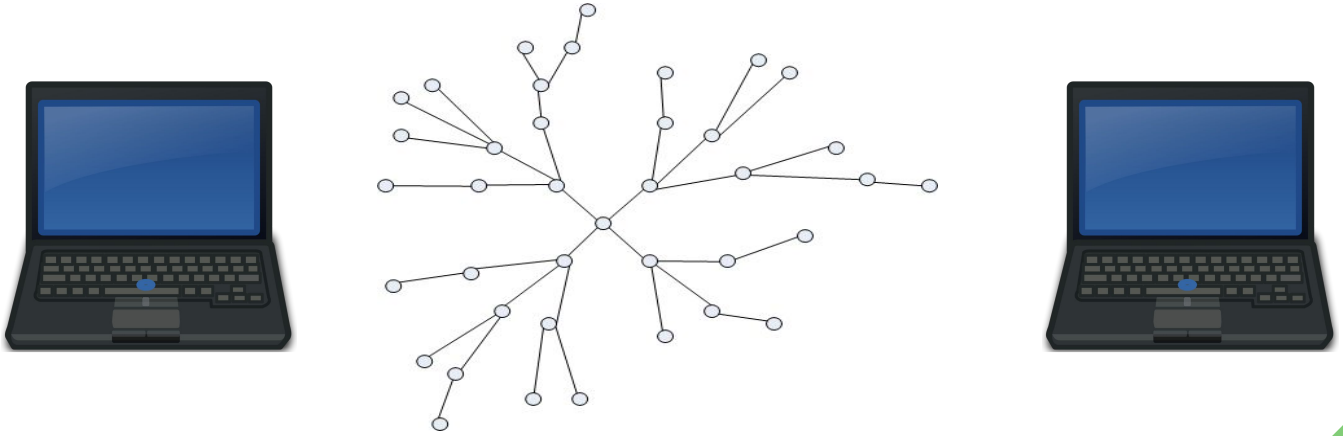
Internet Addresses

Sending Information

Sending information is the core functionality of the Internet - that's what it's truly designed to do.



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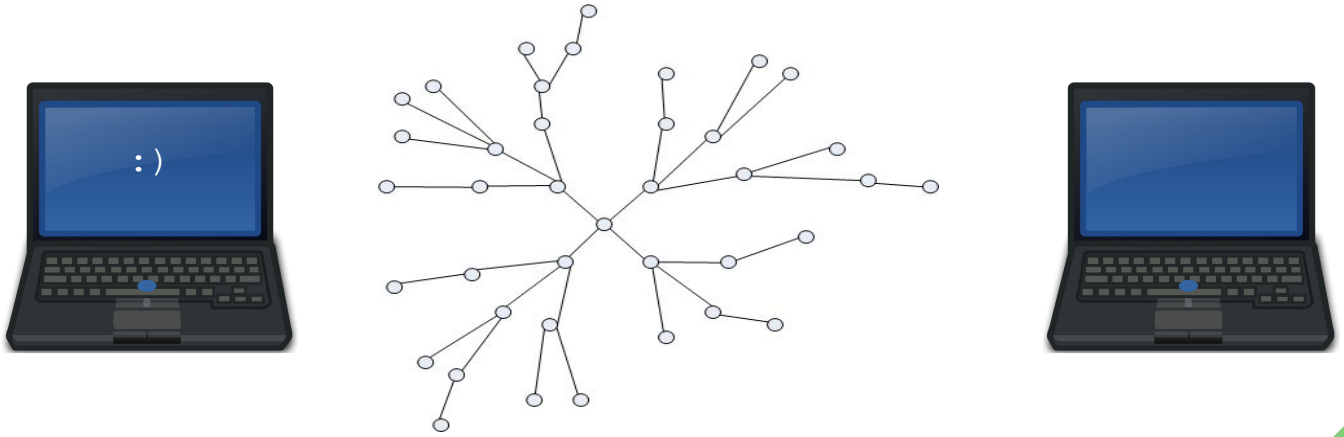

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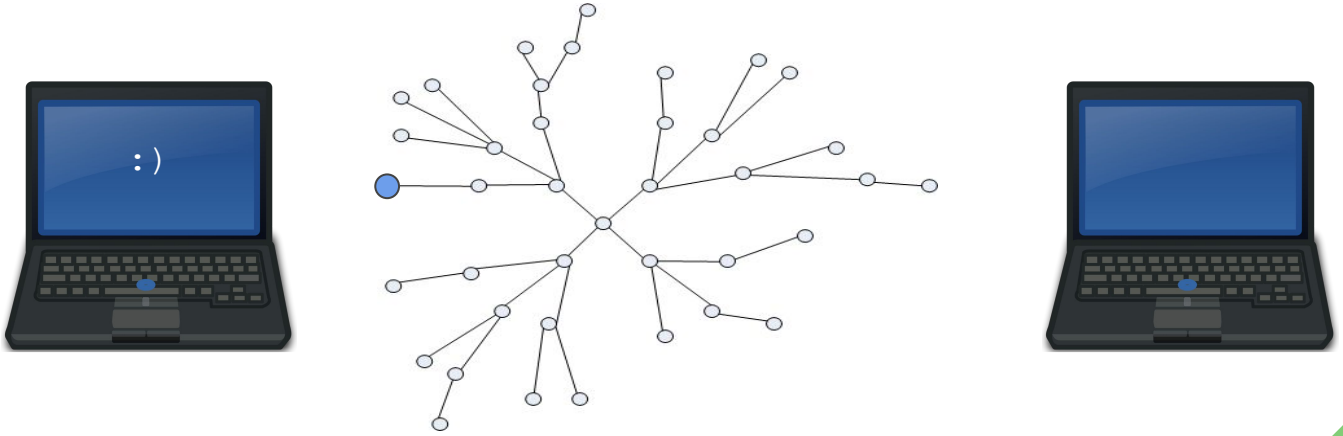

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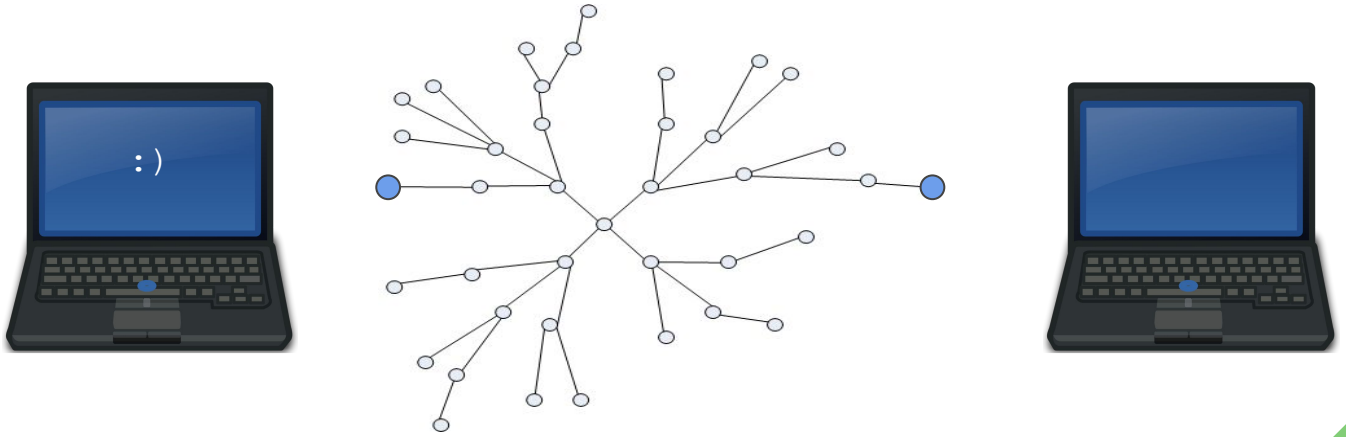

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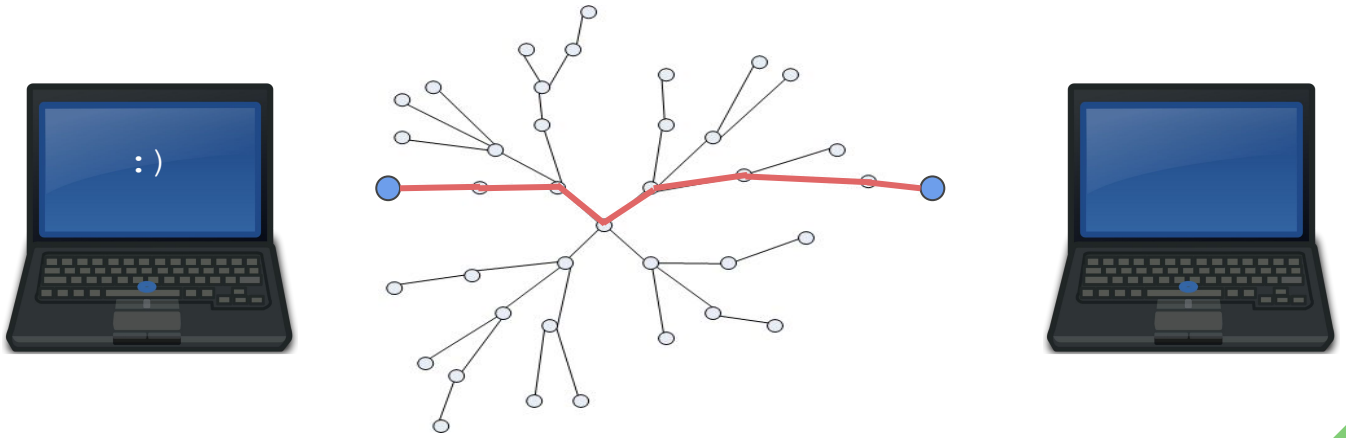

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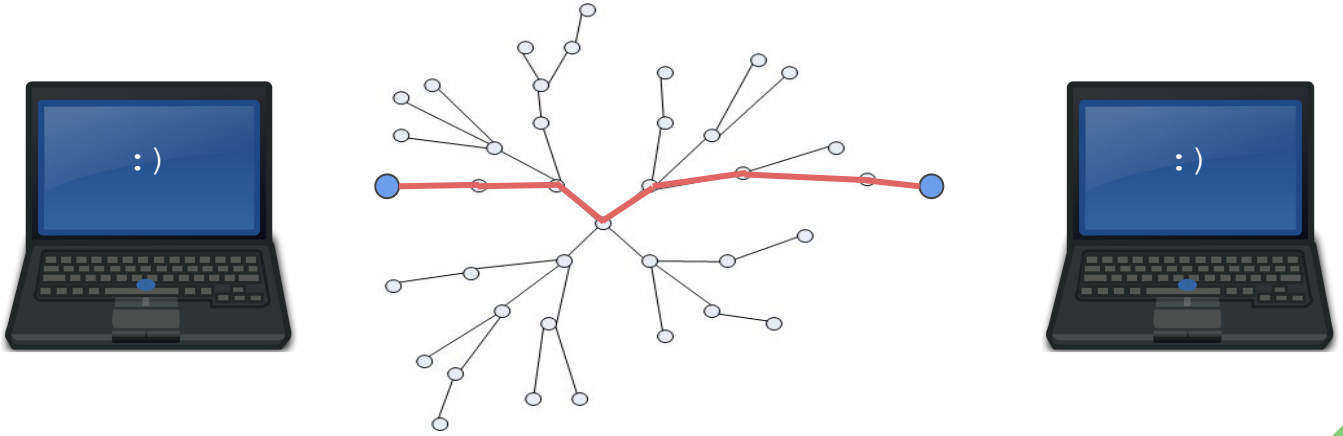
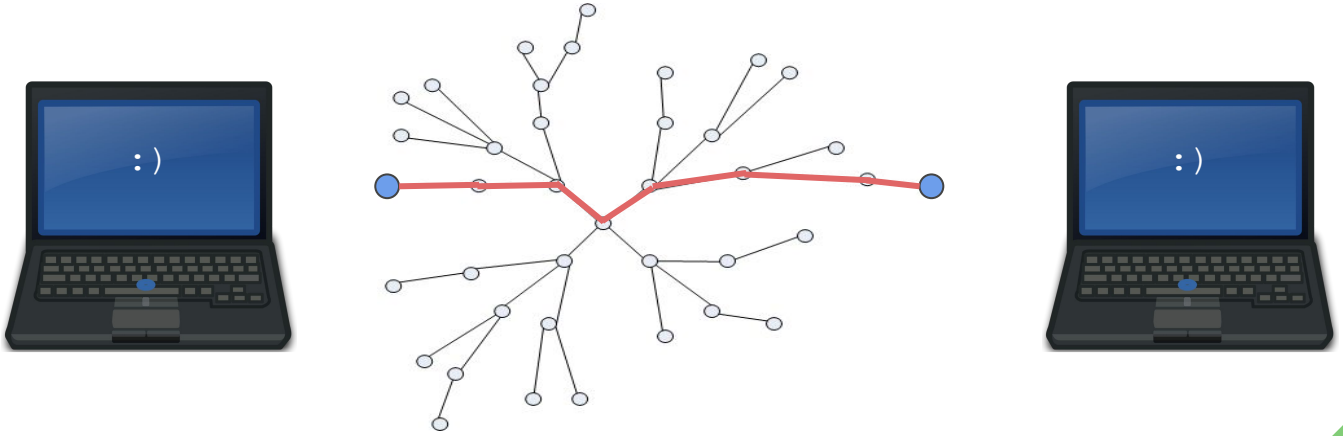


Sending *Digital* Information

How are those two computers able to locate one another through the huge tangle of networks that is the Internet?



Addressing

Every single device on the Internet must have a unique address that refers to only that device, so that it can be found by any other device looking for it!

This is very similar to how we have an address for our mail - everyone has a unique address at which they can receive their mail from the mailman!

Mailing Addresses

100 Skyway Dr.

San Jose, CA 95111

USA

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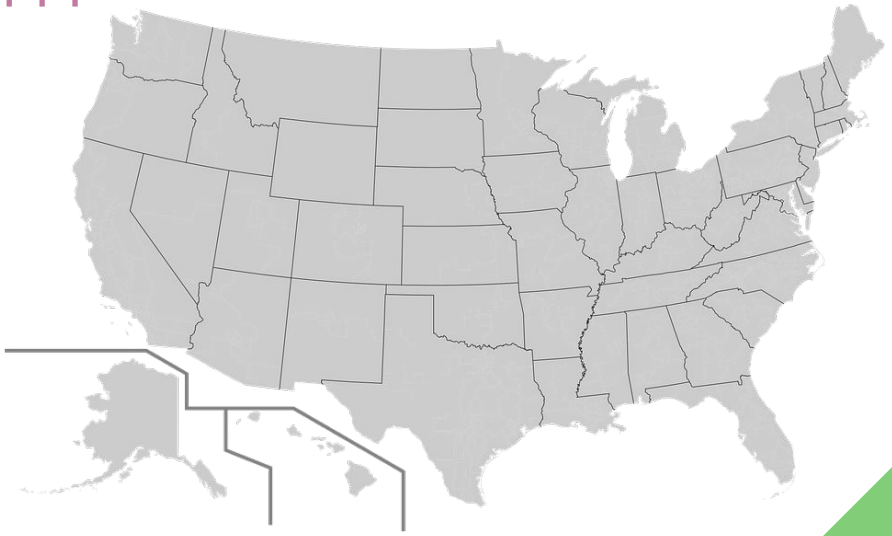

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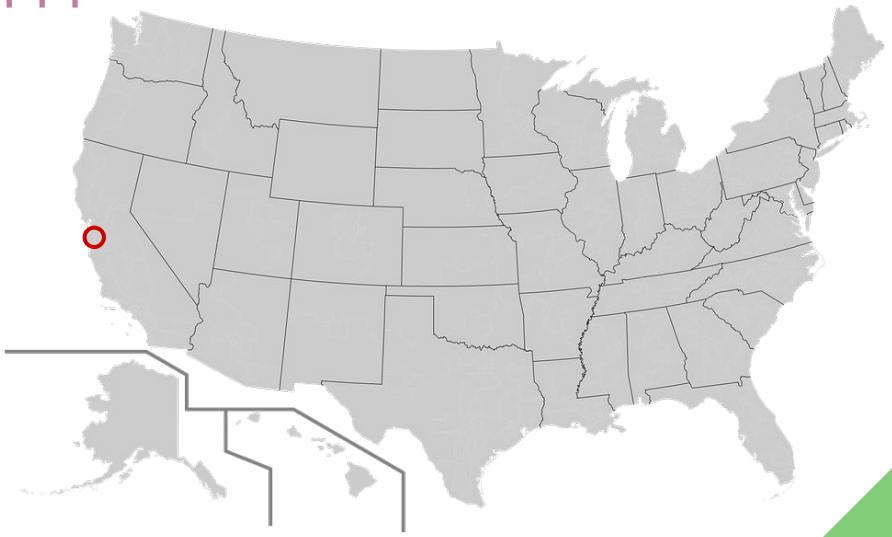

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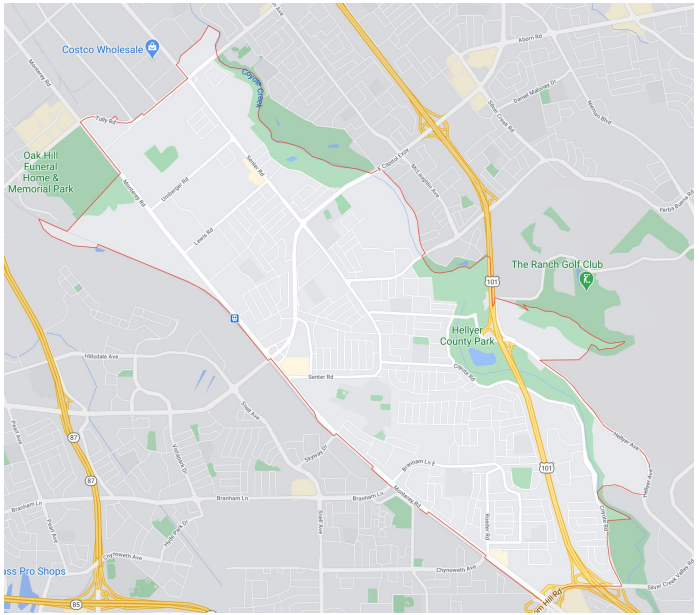

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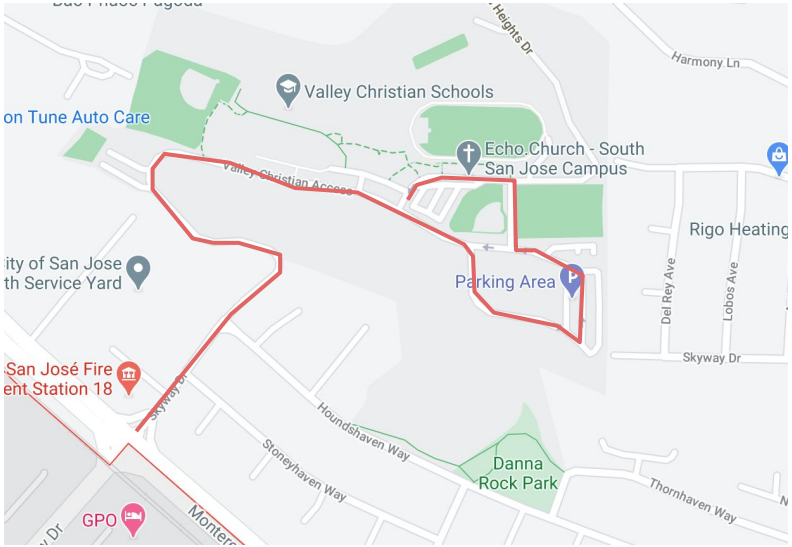

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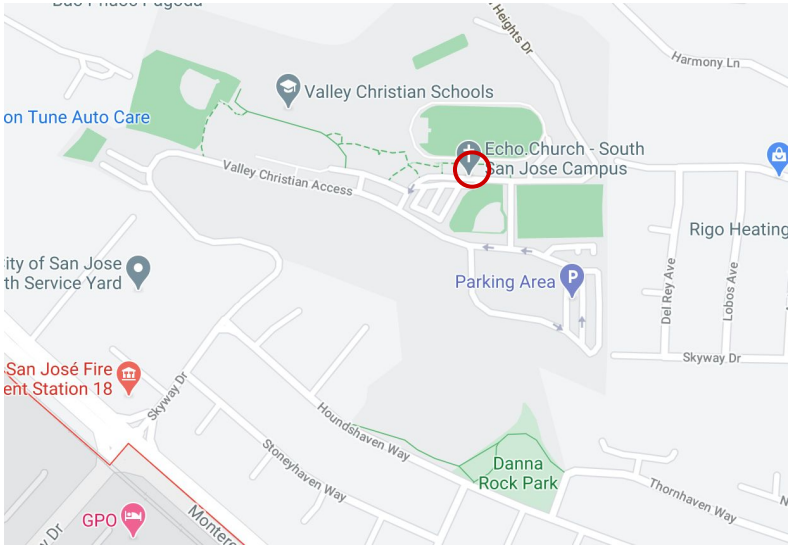


Internet Addresses

Like I said earlier, every single device on the Internet has a unique Internet Address!

Anytime information is sent over the Internet, it has both a **to** and a **from** Address (just like postal addresses again!)

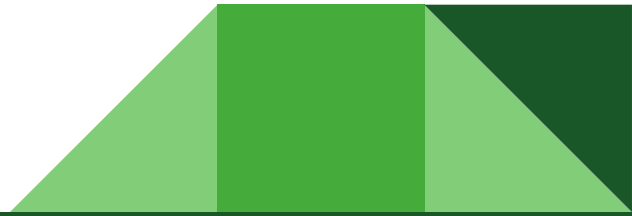
Internet Addresses follow a standard, agreed-upon format, call the Internet Protocol (often shortened to IP). This protocol defines the layout of Internet Addresses, which are commonly referred to as IP Addresses.

IP Address

Let's say we have the IP Address:

93.184.216.34

What does each of those numbers represent?



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Network

IP Address

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Sub-Network

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Device

IP Address

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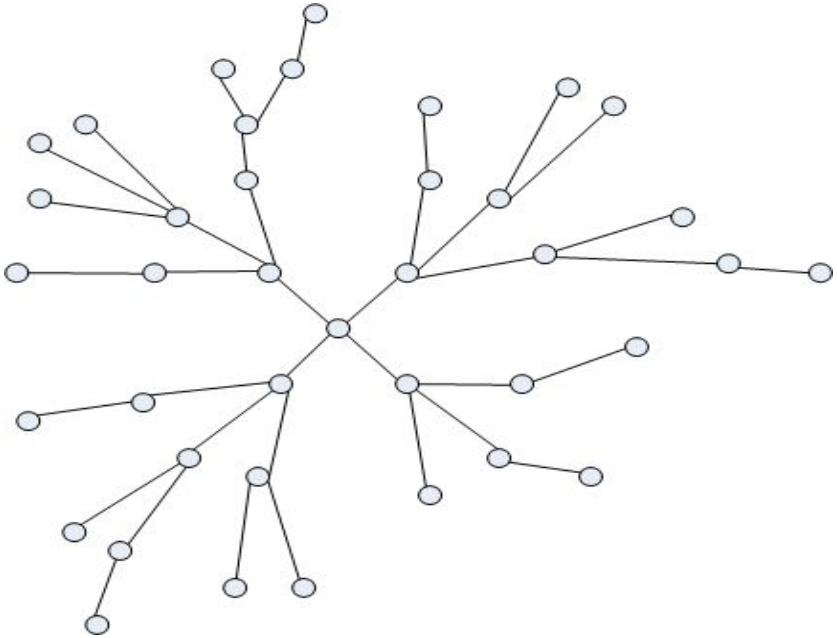

IP Address

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93.184.216.34

93 . X . X . X

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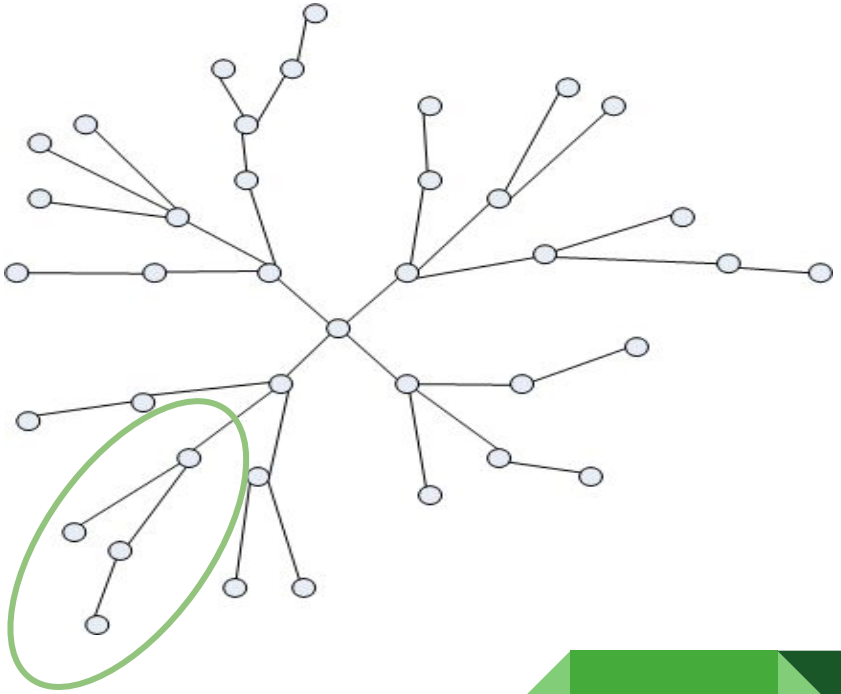
93 . 184 . X . X



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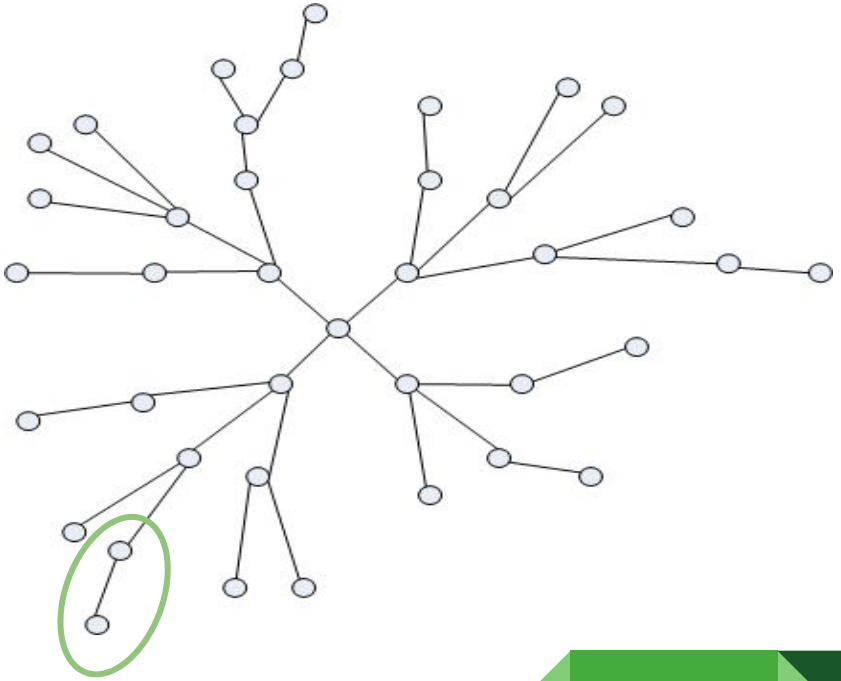
93 . 184 . 216 . X



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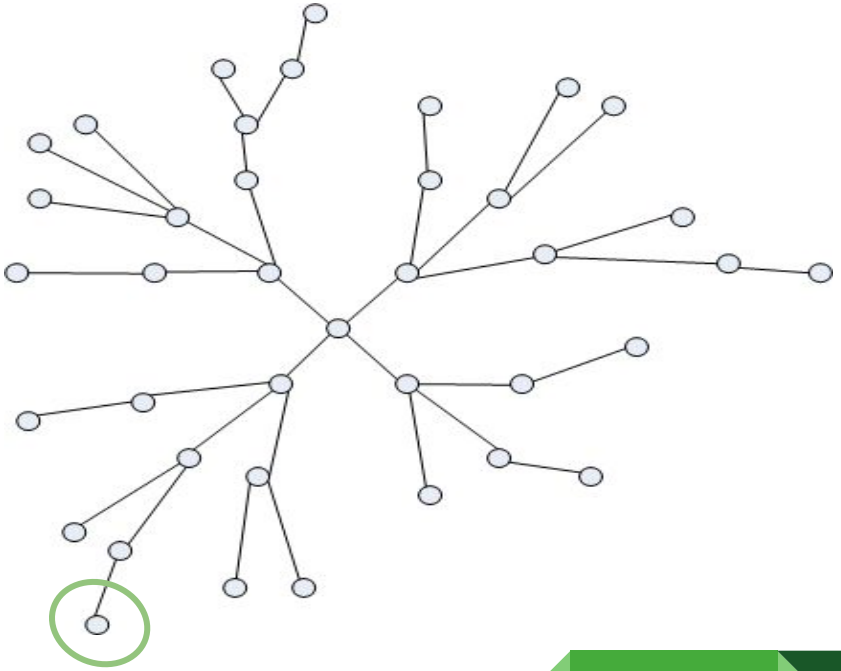

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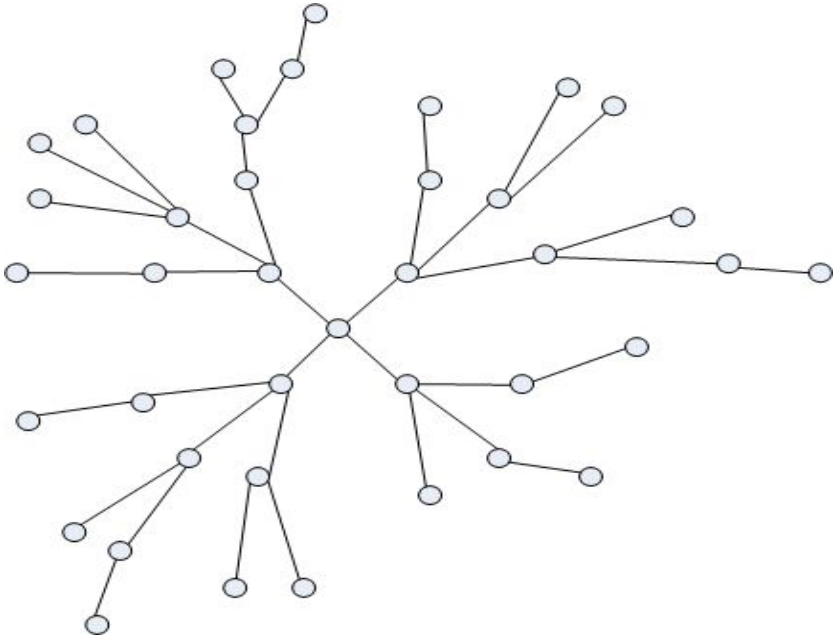
One really good thing about the IP Address system is that it's very scalable. It's super easy to add more networks and devices!

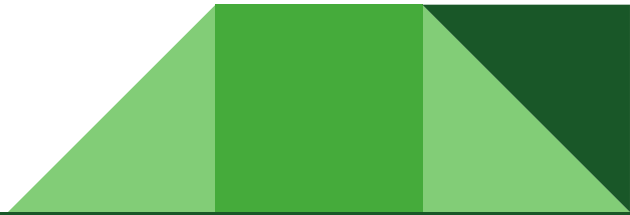


IP Address in Binary

93.184.216.34

01011101 . 10111000 . 11011000 . 00100010

Each number within an IP Address can be represented by 8 bits - the largest number for any given spot is 255.



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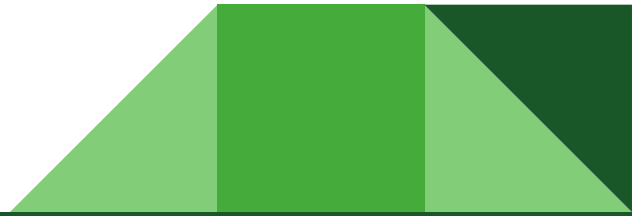
Given a 32-bit number, we can have a maximum of 2^{32} total different IP Addresses - that's over 4 billion!



IPv4

This 32-bit version of IP Addresses, which is known as IPv4, has been around since the 80's.

As the internet grew and grew (it ended up being more popular than expected!), it became apparent that 2^{32} unique addresses wasn't going to be enough. Because of this, a new protocol is being put in place to accommodate for this!

IPv6

IPv6 is the new standard for Internet Addresses, and it's actively being swapped in for IPv4.

In the IPv6 protocol, each device has an address that consists of **eight** four-digit Hexadecimal numbers. For example:

2001:0DB8:AC10:FE01:34F7:6789:9876:DCB1

If we remember how many bits we can use to represent each Hexadecimal digit, we can calculate the total number of bits in one IPv6 address!

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$8_{\text{clusters}} * 4_{\text{digits per cluster}} * 4_{\text{bits per digit}}$ = **128** bits total!

2^{128} = 340,282,366,920,938,463,463,374,607,431,768,211,456

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IPv6 uses the same sort of hierarchical structure as IPv4, it simply has more possible combinations!

Who decides this stuff?

A group of people known as the Internet Engineering Task Force, or IETF, is responsible for making decisions like this.

IETF is an open community of engineers, designers, vendors, and researchers concerned with the evolution and smooth functioning of the Internet. They're also all volunteers for the positions that they hold!