

# Limitations of the Internet

We've mentioned IP addresses a lot in this course, but we haven't actually gone into detail about them. There are actually different versions of IP addresses. The current protocol, Internet protocol version four, or IPV4, is an address that consists of 32 bits separated into four groups. IPV4 addresses can be something like 73.55.242.3. Even though it might seem like a lot of possible IPV4 addresses, there are less than 4.3 billion IPV4 addresses. There are way more than 4.3 billion websites out on the web today. Some IPV4 addresses are even reserved for special purposes. The number of usable IP addresses is even less. A device that wants to connect to the Internet needs to have an IP address. But devices around the world have already exceeded those numbers. Where have we been getting IP addresses? IP addresses have been able to keep up with the amount of devices in the world thanks to IPV6 or Internet Protocol version 6 addresses, IPV6 addresses consists of 128 bits, four times the amount that IPV4 uses, which means way more devices can have IP addresses. The adoption of IPV6 addresses has been slow but steady. Eventually, you'll start seeing more and more IPV6 addresses in the wild. An example of IPV4 address can be something like 172.14.24.1. But an IPV6 address can be something like what you see here. Quite a bit of a difference, don't you think? Here's an analogy for how big this difference is between IPV4 and IPV6. With IPV6, there are two to the 128th power possible IP addresses. Two to the 128th power is an insanely huge number, so huge that scientists had trouble describing with words just how big this number is. Here's an analogy. Think of a grain of sand. If you scoop up a handful, do you know how many grains you have in your hand? Probably a lot, but that's not even close to the number we're talking about. Now, take all the grains of sand in the entire world. Assuming there are roughly seven and a half times ten to the 18th power grains of sand in the world that still wouldn't be enough IPV6 addresses. Now, let's take all the sand from multiple Earths. Now you're close to what that number would be. It's a crazy large number. Just know that we won't be running out of IPV6 addresses anytime soon. Another mitigation tool that we've been able to use is NAT or Network Address Translation. This lets organizations use one public IP address and many private IP addresses within the network. Think of that like a receptionist at a company. You what number to dial to get to the company. Once you reach the receptionist, he can transfer your call to one of the private numbers inside the company. Now, instead of companies using hundreds of public IP addresses, they can just use one IP address. Remember the routers we talked about earlier? One task you might need to perform when you're an IT support specialist is to configure NAT on a router to facilitate communication between your company's network and the outside world.

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