Disadvantages of IPv4

- Not enough IPv4 addresses
  - Approximately 4.3 billion public IP addresses
  - 7.8 billion world population
  - Multiple devices per user (computers, tablets, smart phones, smart TVs, home automation, etc.)
- Less Efficient Routing (compared to IPv6)
- Security is Optional
  - Encrypted data is optional

IPv6 Solutions

- Plethora of Addresses
  - 128-bit binary address space compared to 32-bit for IPv4
  - 340 trillion trillion trillion addresses
  - 5×10^{28} addresses for each person on the planet
- Simplified Internet Routing Tables
  - IPv6 packet header enables more efficient routing:
    - Fixed at 40 Bytes versus IPv4 “Variable Length” Packet Header for Optional Fields
- Easier & Automated Configuration Compared to IPv4
  - Stateless Auto-Configuration
  - No need for a DHCP server
- Security is Required
  - Internet Protocol Security (IPSec) is required
    - Source IP can be authenticated
    - Data in transit is encrypted

IPv4 versus IPv6

	IPv4	IPv6
Deployed	1981	1999
Address Size	32-Bit	128-Bit
Number of Addresses	2^{32} = 4,294,967,296	2^{128} = 340,282,366,920,938,463,463,374,607,431,768,211,456
Addressing	Class-Based	Classless

Why is IPv4 Still Around?

- Subnetting / CIDR
- Use of Private IP Addresses
- Network Address Translation (NAT)