IPv6

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IP overview

- ▶ IP (Internet Protocol) an L3 protocol in the ISO/OSI model
- An intermediate protocol, however very important
- Relays data across network boundaries
- Negotiates different physical layer technologies
- Establishes the Internet

IP address

- ► Each host (a network participant, except L2/L1 devices) has an unique IP address
- Usually you don't use it directly (and there's a reason for that!)
- Nonetheless it's a neccesary part of a communication process
- For example, you can't call the phone if you don't know it's number

IP address

- ▶ IPv4 still 96% of the traffic
- Addresses are 32 bit sized
- ▶ $2^{32} \approx 4$ billion addresses
- ▶ It's a lot?

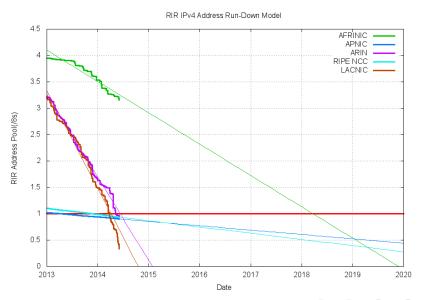
- ► Feature phones
- ▶ POS terminals
- Sensors
- ▶ It's a lot? Nope.





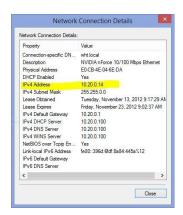


IPv4 address exhaustion



Popular solutions

- ► Two popular solutions: Proxy and NAT
- ▶ Like a call center: one number, many phones.



Class	Private Address Range
А	10.0.0.0 to 10.255.255.255
В	172.16.0.0 to 172.31.255.255
С	192.168.0.0 to 192.168.255

What's the problem?

- Relies on higher-level protocols
- Slower than a simple routing
- ▶ The main drawback: an address is not unique anymore.
- Cannot accept incoming connections
- Often called a "grey" IP address
- Conclusion: an IPv4 address is just a bunch of numbers nowadays, that's the reason why you don't use it directly.

DON'T SLEEP!



IPv6

- ► Since 1996
- \triangleright 2¹²⁸ addresses, or approx. 3.4 · 10³⁸

An IPv4 address (dotted-decimal notation)

10101100.00010000.111111110.00000001

One byte = Eight bits

Thirty-two bits (4×8) , or 4 bytes

An IPv6 address (in hexadecimal)

2001:0DB8:AC10:FE01:0000:0000:0000:0000

2001:0DB8:AC10:FE01:: Zeroes can be omitted

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Minor changes

- $ightharpoonup ARP \Rightarrow NDP$
- Broadcast via multicast
- ightharpoonup DHCP \Rightarrow SLAAC
- ▶ IPv6 routers do not perform fragmentation
- ▶ TTL \Rightarrow Hop limit

IPv6 adoption rate

