

ouees-202006 topic 05:

IP addresses

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On the internet

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Lecture notes and reporting

- <https://github.com/jj1bdx/oueees-202006-public/>
- Check out the README.md file and the issues!
- Keyword at the end of the talk
- URL for submitting the report at the end of the talk

Topic of this video:

Internet Protocol (IP) addresses

Role of IP addresses

- Network numbers
- Interfaces: connected to the networks
- Host IDs in the numbered networks
- Global uniqueness
- Special addresses (private, broadcast, multicast, loopback, etc.)

IPv4 addresses: 32 bits

192.168.100.20

In hexadecimal notation: 0xC0A86414

- 4 x 0~255 numbers split with dots
- Relatively easy to remember, but already being used up

IPv4 address with netmask 192.168.100.20/24

- Network: 192.168.100.0/24
- Host: number 20 (0~255) ($32-24=8$)
- Host 0 = network itself
- Host 255 = broadcast

Address in another netmask

192.168.100.20/28

- Network: 192.168.100.16/28
- Host: number 4 (0~15) ($32-28=4$)
- Host 0 = network itself
- Host 15 = broadcast
- Different netmask = different address interpretation

Private addresses (RFC1918)

No global routing for these address blocks

- 10.0.0.0/8
- 172.16.0.0/12 (172.{16~31}.*.*)
- 192.168.0.0/16 (192.168.*.*)

Other special addresses (RFC6890)

- 0.0.0.0/8: "This" network
- 100.64.0.0/10: Shared address
- 127.0.0.0/8: Loopback
- 169.254.0.0/16: Link local
- 192.0.0.0/24: IANA specific
- 192.0.2.0/24, 198.51.100.0/24, 203.0.113.0/24: Documentation
- 192.88.99.0/24: 6to4 Relay Anycast
- 198.18.0.0/15: Benchmarking
- 240.0.0.0/4: Reserved
- 255.255.255.255/32: Limited broadcast

IPv6 addresses: 128 bits

2404:6800:400a:813::2004

= 2404:6800:400a:0813:0000:0000:0000:2004

- a www.google.com address, as of 7-JUN-2020 0315UTC
- :xxx: = up to 4 hex digits
- :: = arbitrary number of 0, appearing only once in an address

IPv6 addresses with netmask

2404:6800:400a:813::2004/64

- Network: 2404:6800:400a:813::/64
- Host number: 0x00000000000002004
- Host number: 64 bits (0: network)
- Broadcast -> multicast addresses
- ff02::1 = all hosts, ff02::2 = all routers, etc.

Why IPv4 to IPv6?

- Because we've used up the 32-bit IPv4 addresses already
- No more new address block for IPv4
- You need to buy unused blocks from other users
- Took ~20 years (1996-2016) for the transition from IPv4 to IPv6

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