a brief history of the internet

oh and some stuff on TCP/IP/UDP

by @cb

special thanks to @forrest for pontificating
about computers at happy hour that one time
which basically inspired this talk

🍻

in my job as an SRE, I'm often working on low-level networking things that most people don't care about

Is this a internet?

Senator Ted Stevens

In Charge of the Senate committee
overseeing net neutrality regulations
in like 2006 or something, idk

Had this to say about the internet…

he's not totally wrong

how can I build an internet dump truck?

🤔

Amazon, circa 2006

S3

89% of the internet's memes*

* this is not a true fact

there's an electrical impulse, originating at my computer, that gets relayed through a series of copper wires to another computer on the other side of the country
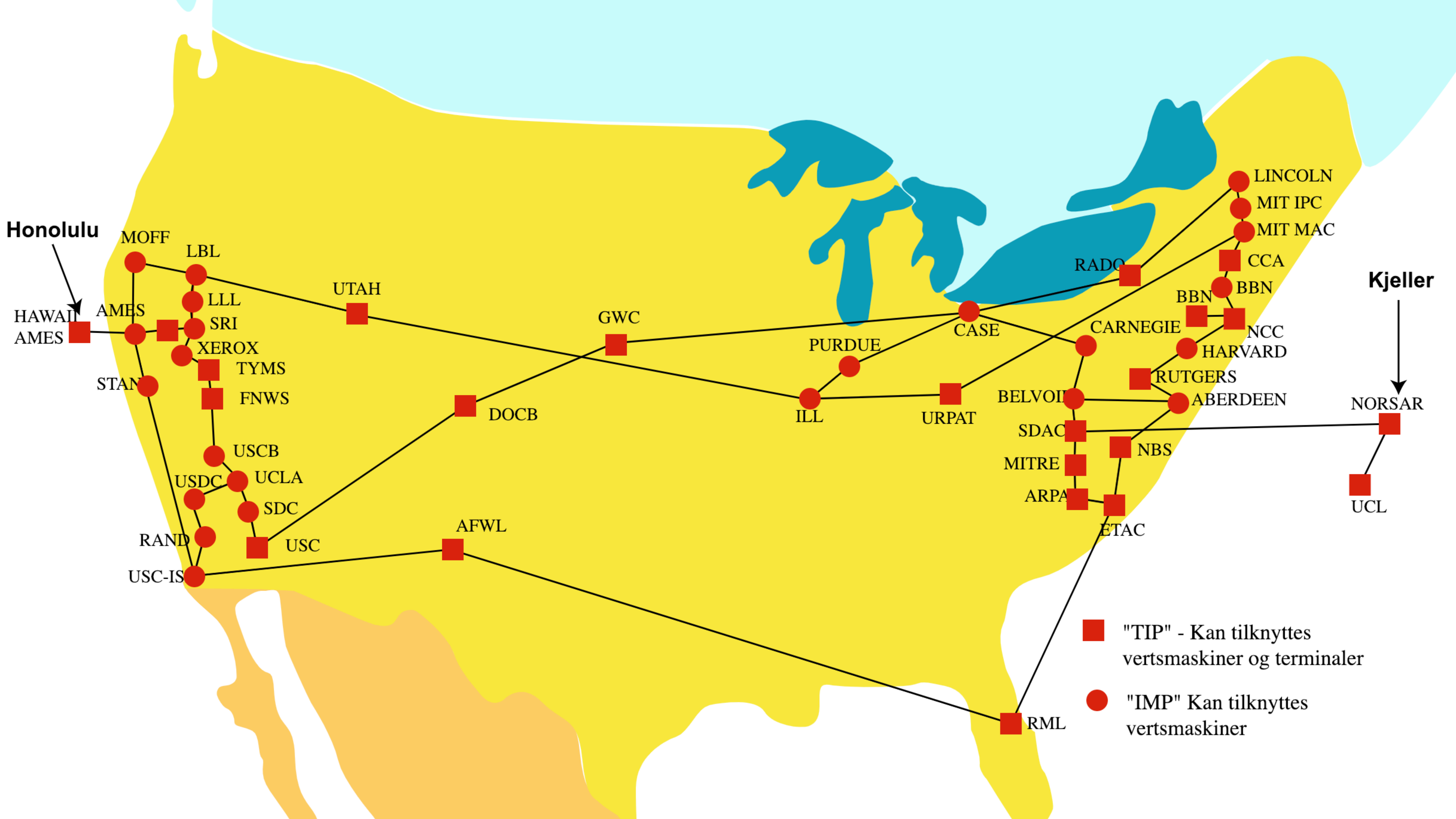
"well actually there's wifi"

ARPANET

Advanced Research Projects Agency Network

Honolulu

Kjeller

MOFF LBL
HAWAII AMES UTAH
AMES LLL
SRI GWC
XEROX PURDUE
STAN TYMS CASE
FNWS DOCB ILL URPAT

RADO
LINCOLN
MIT IPC
MIT MAC
CCA
BBN BBN
CARNEGIE NCC
HARVARD
RUTGERS
BELVOIR ABERDEEN
NORSAR
SDAC NBS
USCB MITRE
USDC UCLA ARPA UCL
SDC ETAC
RAND
USC-IS USC AFWL

RML

■ "TIP" - Kan tilknyttes
    vertsmaskiner og terminaler

● "IMP" Kan tilknyttes
   vertsmaskiner

packet switching

a network could share a single communication link for talking between multiple pairs of receivers and transmitters

modern packet switching was invented in the late 60s

the US Air Force wanted a fault tolerant communications method for radar data, in case a nuclear disaster took out specific lines

ARPANET project led to the development of protocols for internetworking, multiple separate networks joining into a network of networks.

The original message is Green, Blue, Red.
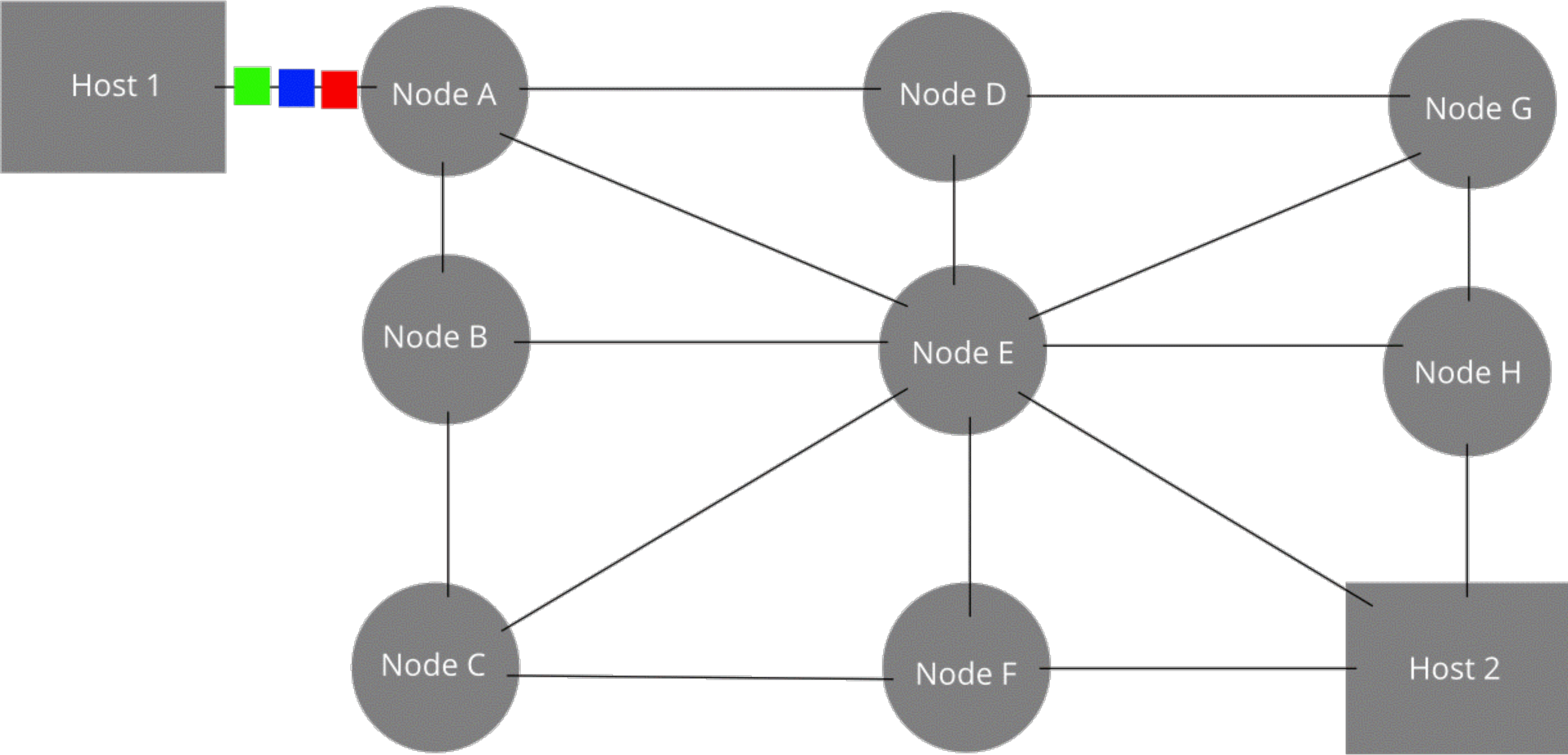
TCP/IP

transmission control protocol

Internet protocol

the internet protocol suite provides end-to-end data communication specifying how data should be packetized, addressed, transmitted, routed, and received

IP is connectionless, meaning that all of the data needed by a packet to get to the destination is encapsulated within that packet

the link layer contains communication methods for
data that remains within a single network segment (link)

ARP

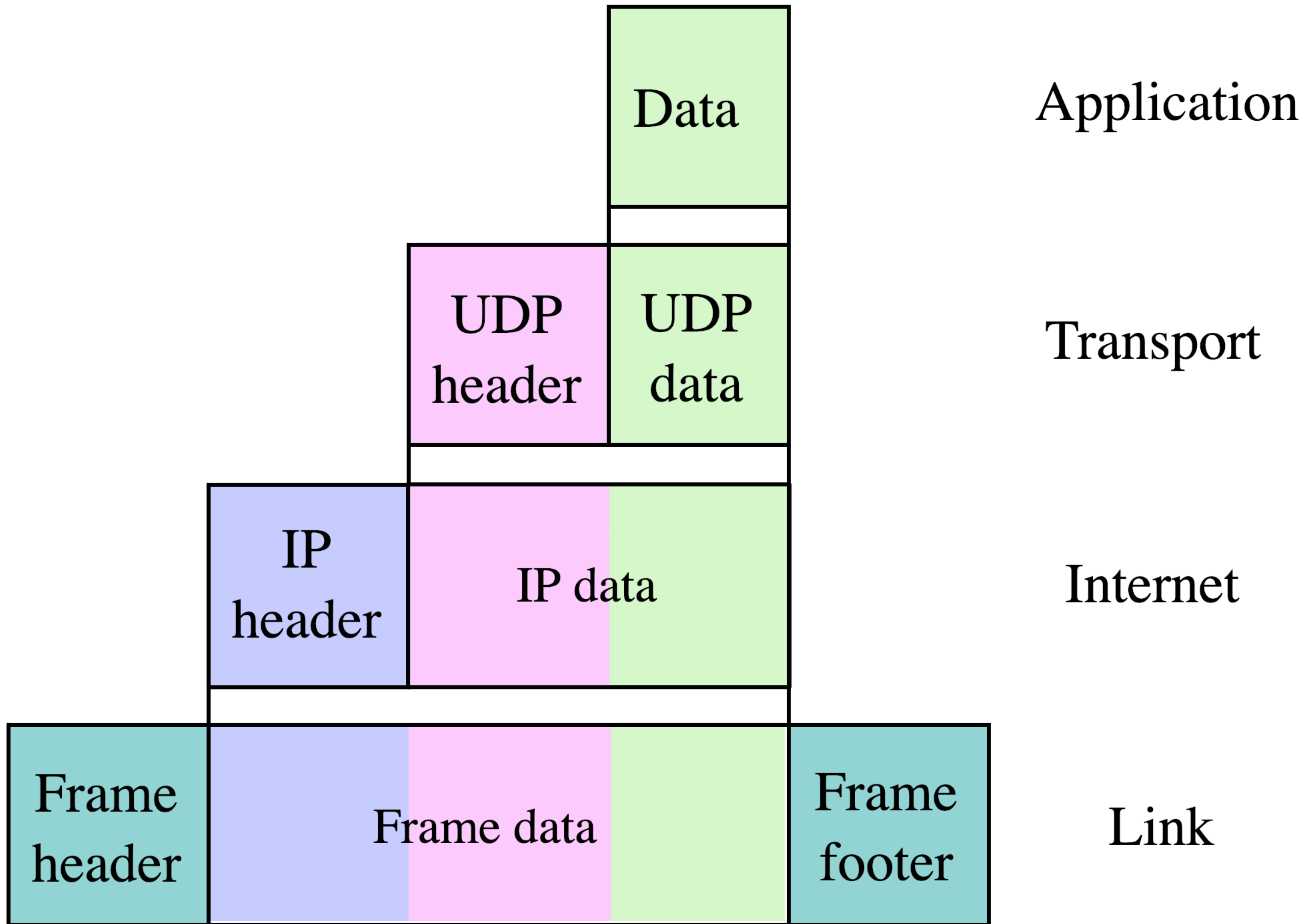the internet layer provides internetworking between
independent networks

IP

the transport layer handles host-to-host
communication

TCP/UDP

and the application layer provides process-to-process
data exchange for applications.

HTTP

		Application
Data		
UDP header	UDP data	Transport
IP header	IP data	Internet
Frame header	Frame data	Frame footer	Link

Internet protocol suite

Application layer

BGP · DHCP · DNS · FTP · HTTP · HTTPS ·
IMAP · LDAP · MGCP · MQTT · NNTP · NTP ·
POP · ONC/RPC · RTP · RTSP · RIP · SIP ·
SMTP · SNMP · SSH · Telnet · TLS/SSL ·
XMPP · *more...*

Transport layer

TCP · QUIC · UDP · DCCP · SCTP · RSVP ·
more...

Internet layer

IP (IPv4 · IPv6) · ICMP · ICMPv6 · ECN ·
IGMP · IPsec · *more...*

Link layer

ARP · NDP · OSPF · Tunnels (L2TP) · PPP ·
MAC (Ethernet · DSL · ISDN · FDDI) · *more...*

V · T · E

IP

primary protocol in the internet protocol suite

responsible for delivering packets from source to the destination, regardless of network boundaries

routing function is essentially the backbone off the internet

Status: **Connected**

USB 10/100/1000 LAN is currently active and has the IP address 10.1.4.213.

Configure IPv4: Using DHCP

IP Address: 10.1.4.213

Subnet Mask: 255.255.248.0
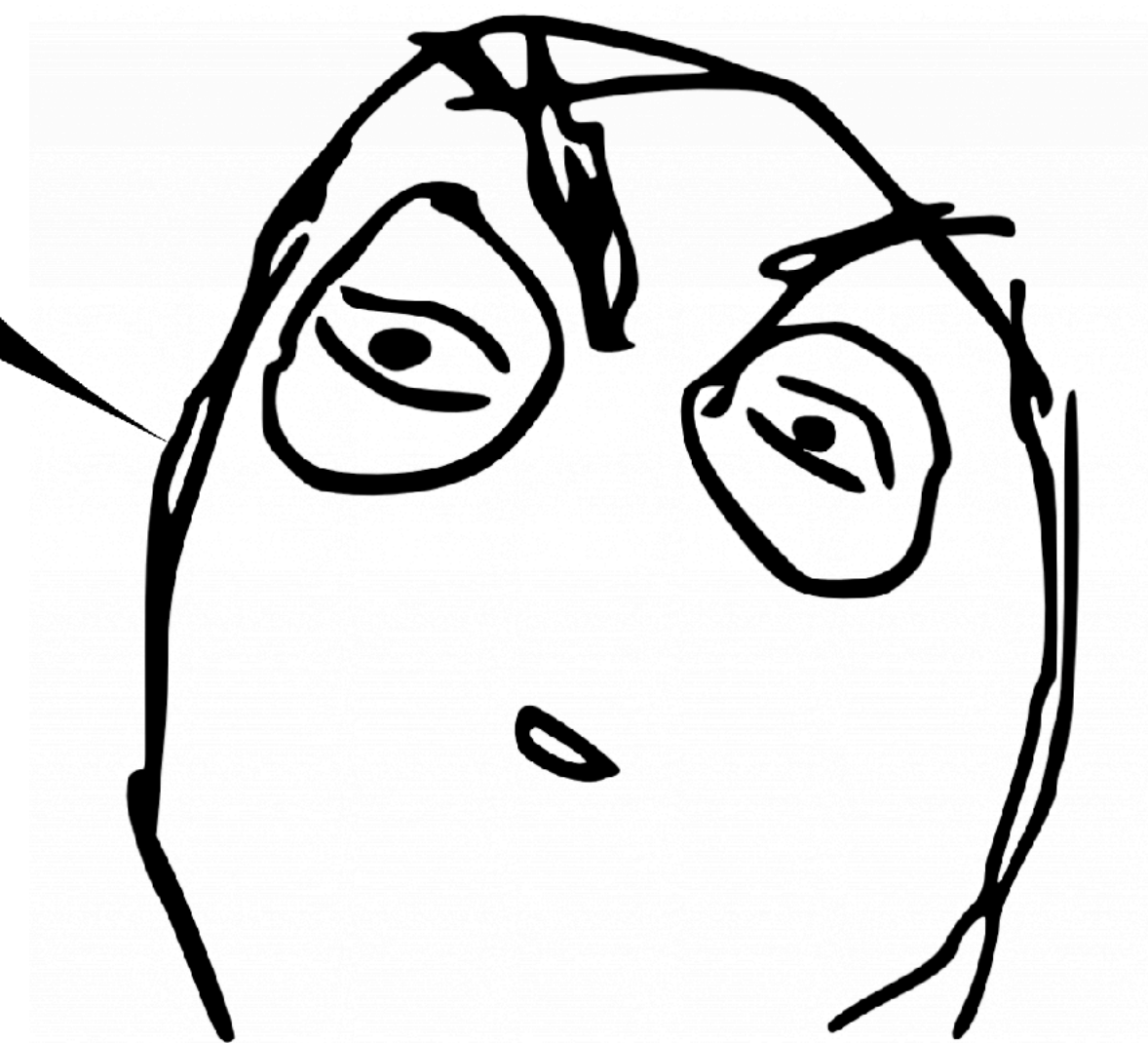
Router: 10.1.0.1

```
$ traceroute google.com
traceroute to google.com (172.217.12.142), 64 hops max, 52 byte packets
 1  10.1.0.1 (10.1.0.1)  0.640 ms  0.306 ms  0.303 ms
 2  rrcs-184-75-107-193.nyc.biz.rr.com (184.75.107.193)  0.719 ms  0.618 ms  0.663 ms
 3  nycmnytg01h.ny.twcbiz.com (69.193.245.129)  1.273 ms  1.217 ms  1.191 ms
 4  agg112.nyclnyrg01r.nyc.rr.com (68.173.198.16)  4.147 ms  3.420 ms  3.786 ms
 5  bu-ether19.nwrknjmd67w-bcr00.tbone.rr.com (66.109.6.78)  3.820 ms
    bu-ether29.nwrknjmd67w-bcr00.tbone.rr.com (107.14.19.24)  8.530 ms
    bu-ether19.nwrknjmd67w-bcr00.tbone.rr.com (66.109.6.78)  3.481 ms
 6  66.109.5.138 (66.109.5.138)  2.875 ms  9.396 ms  6.204 ms
```
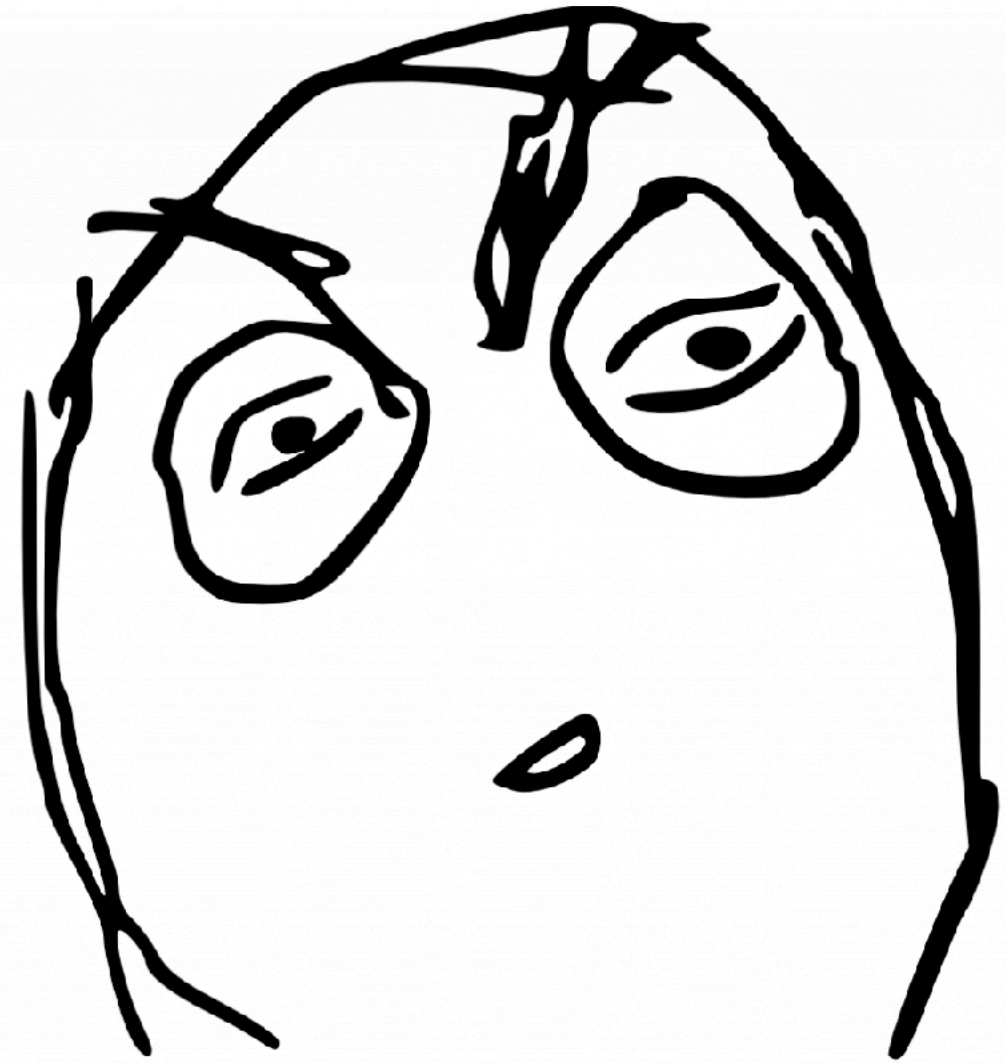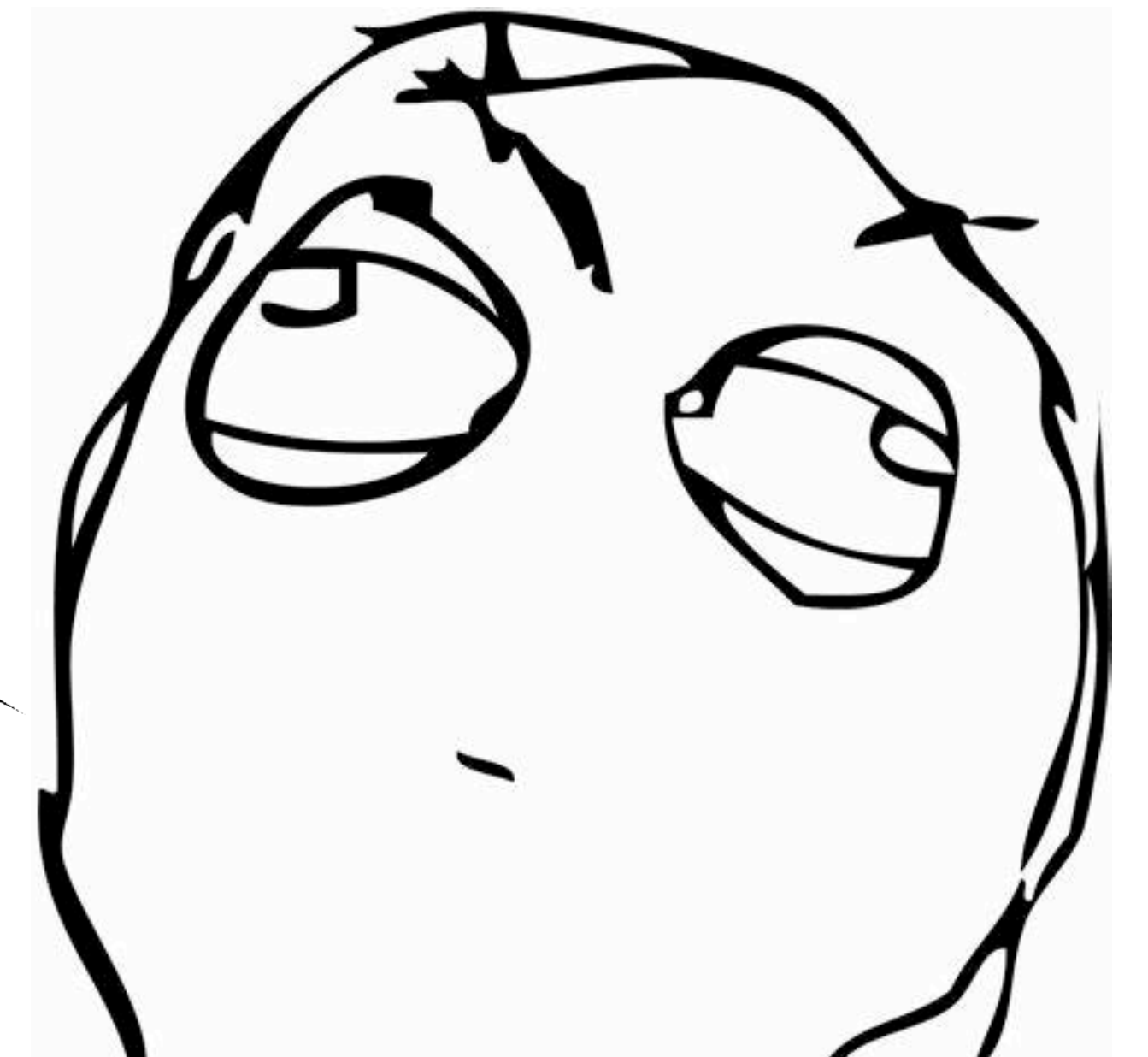
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```

IP is kinda like the delivery truck of the internet
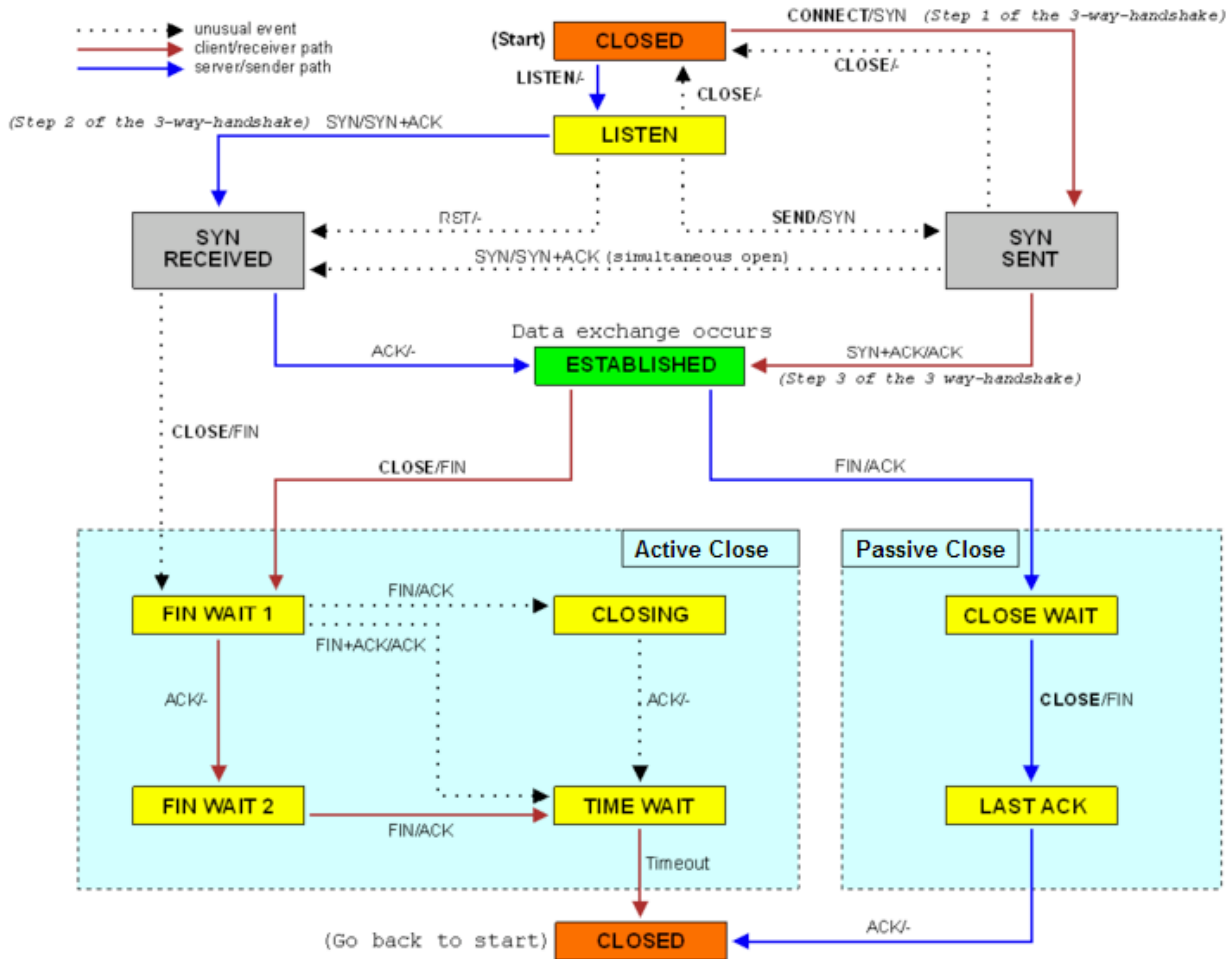
it doesn't care about the payload

it has the delivery and return address on each box
(packet)

TCP

TCP is a transport layer protocol that sits on top of IP
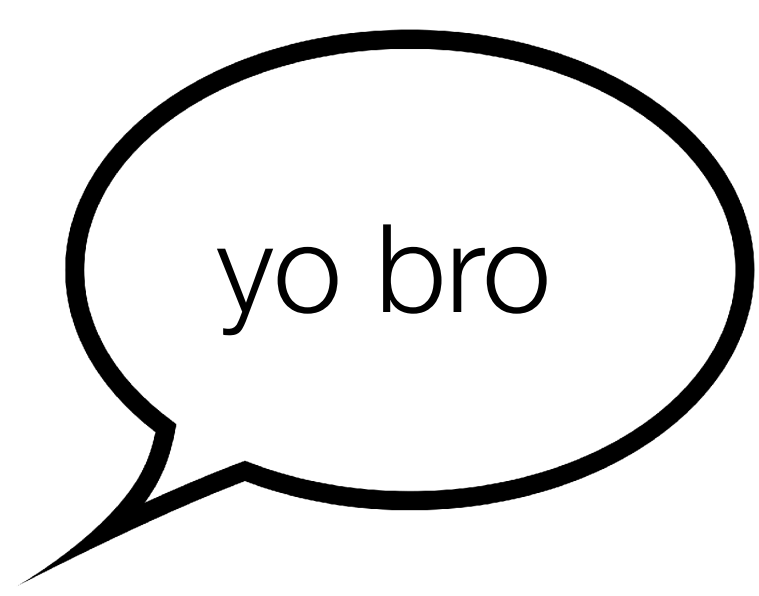
It is connection-oriented, meaning a session must be established before data can be sent

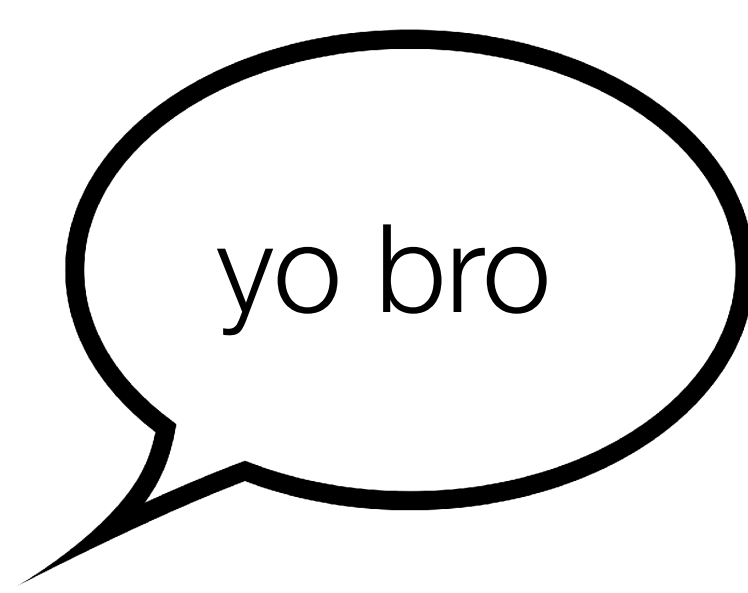reliable, ordered, and error corrected

tcp example with stupid bros™

A
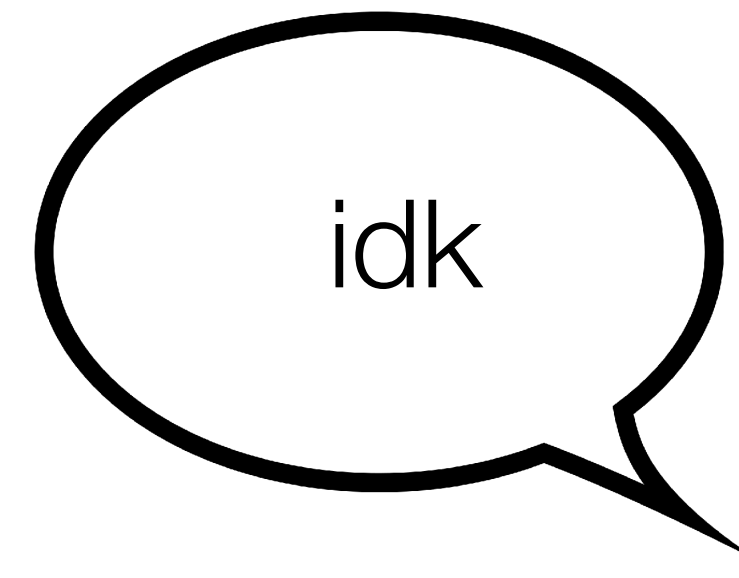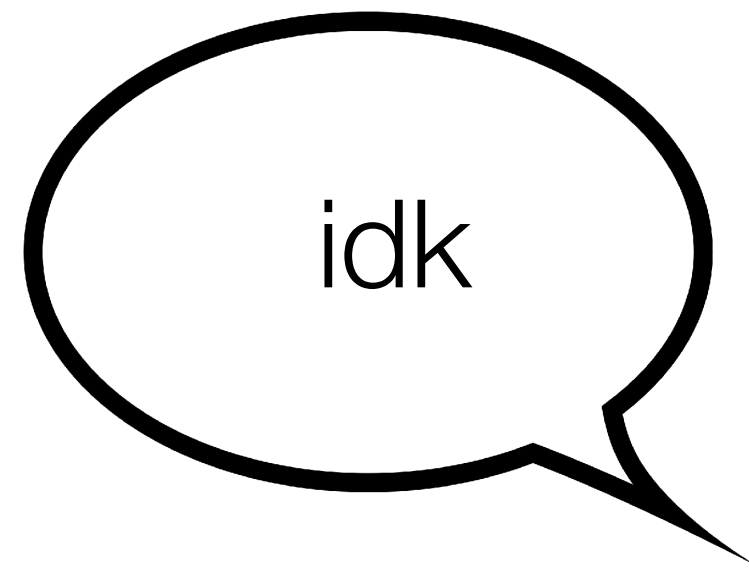
UDP

UDP also sits on top of IP

It is connectionless, meaning packets are delivered (or not) without the source host knowing

unreliable, unordered, and not error corrected

fast

UDP is used for things like streaming video and online gaming

udp example IRL

"Can you take out the trash?"

you pretend not to hear that request

parent doesn't care if you heard or not

if you care about the geeky details

                        TRANSMISSION CONTROL PROTOCOL

                          DARPA INTERNET PROGRAM

                         PROTOCOL SPECIFICATION

                            September 1981

                              prepared for

                  Defense Advanced Research Projects Agency
                  Information Processing Techniques Office
                          1400 Wilson Boulevard
                        Arlington, Virginia 22209

Updated by: 1349, 2474, 6864   INTERNET STANDARD
                                            Errata Exist
RFC: 791

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User Datagram Protocol

Introduction

This User Datagram Protocol (UDP) is defined to make available a
datagram   mode of packet-switched   computer   communication in the
environment of an interconnected set of computer networks.   This
protocol assumes that the Internet Protocol (IP) [1] is used as the
underlying protocol.

This protocol provides a procedure for application programs to send
messages to other programs with a minimum of protocol mechanism. The
protocol is transaction oriented, and delivery and duplicate protection
are not guaranteed. Applications requiring ordered reliable delivery of
streams of data should use the Transmission Control Protocol (TCP) [2].

Format

```
                 0      7 8     15 16    23 24    31
                +--------+--------+--------+--------+
                |     Source      |   Destination   |
                |      Port       |      Port       |
                +--------+--------+--------+--------+
                |                 |                 |
                |     Length      |    Checksum     |
                +--------+--------+--------+--------+
                |
                |          data octets ...
                +-------------------------------
```

(modem dials)

thanks