CLIENT-SERVER ARCHITECTURE & HTTP

CLIENTS & SERVERS

- Client requests a resource
- Server responds with resource
- These are *roles* — not technical specs or computer types

CLIENTS & SERVERS

When you hear "server" you probably think of a big special computer connected to the internet that hosts websites…

CLIENTS & SERVERS

- These are *roles* — not technical specs or computer types

CLIENTS & SERVERS

A bank teller is a server. Clients ask the teller for stuff and the teller responds. The teller doesn't go looking out on the street for clients, he/she just waits for requests.

CLIENTS & SERVERS


DEAR ABBY:

My Dad Objects To a Pet Monkey

Dear Abby: clients write in for advice, Abby responds with advice. Abby doesn't send prospective letters to newspaper readers…

CLIENTS & SERVERS

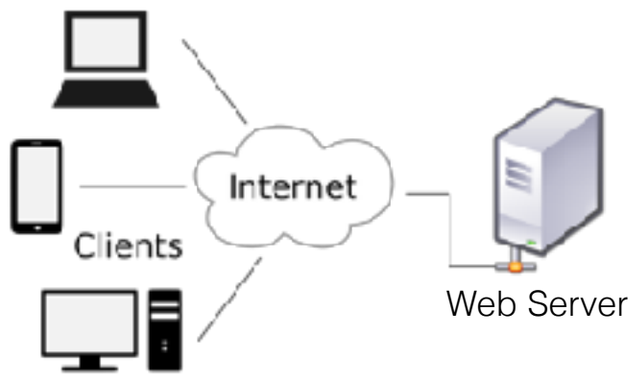
…however, a *web server* is really any PROGRAM connected to the internet, which can receive requests and send responses. That means your laptop can be a server. Heck, it can be many servers!

CLIENTS & SERVERS

Heck, it can be many servers (if each is on a different port) — and also a client (for other servers).

WEB SERVERS

- **Processes (running programs) not physical machines**
  - Might be running on a laptop,
  - or a Raspberry Pi,
  - or an enterprise-grade workstation…
- **Listening on a port for incoming requests**
- **Send back responses**



...but we are getting ahead of ourselves.

INTERNET COMMUNICATION PROTOCOLS

TCP
BitTorrent
AFP
HTTPS
POP
9P
IMAP
BGP
SSL
UDP
HTTP
SCP
ICMP
FTP
SSH
IP
PPP
NFS
SMTP

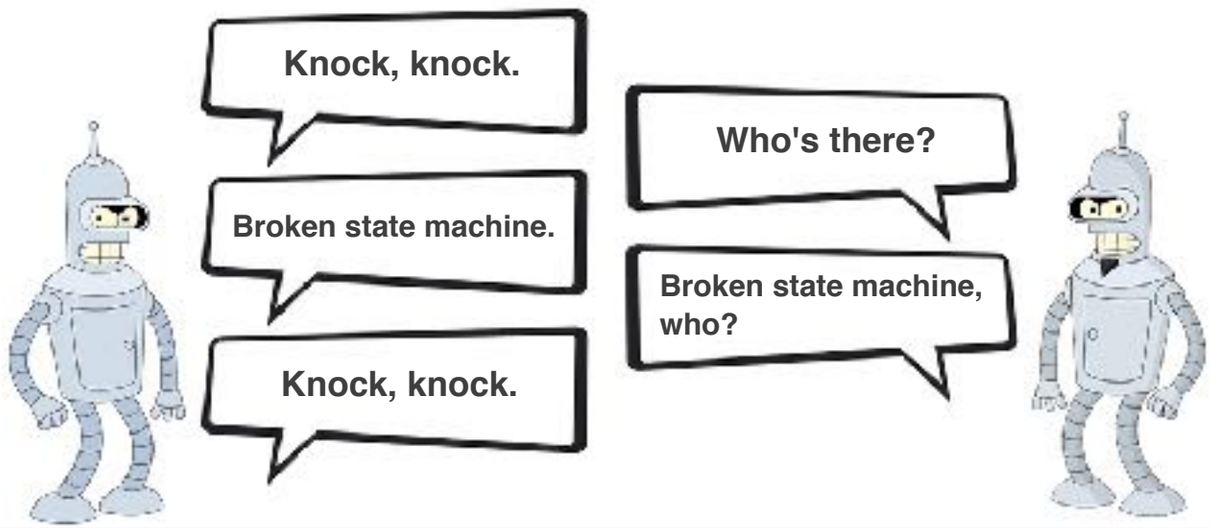
PROTOCOL

- Rules for interaction / communication
- Specification, not implementation

PROTOCOL

PROTOCOL

PROTOCOL


Knock, knock.
Who's there?
Broken state machine.
Broken state machine, who?
Knock, knock.

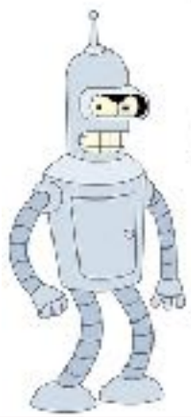
THE KNOCK-KNOCK MESSAGE PROTOCOL

- Joker opens connection with "knock, knock."
- Victim completes handshake with "who's there?"
- Joker transmits identity label: "<IDENTITY>"
- Victim requests clarification: "<IDENTITY> who?"
- Joker delivers payload: "<PUNCHLINE>"
- Joke is now delivered, close connection. Participants may optionally laugh and/or dodge fists.

MESSAGING / APP VS. TRANSMISSION

- KnockKnock is an *application level* protocol
- It specifies the sequence and content of messages
- It does NOT specify how those messages are transmitted

KNOCK KNOCK OVER VOX



Knock, knock.

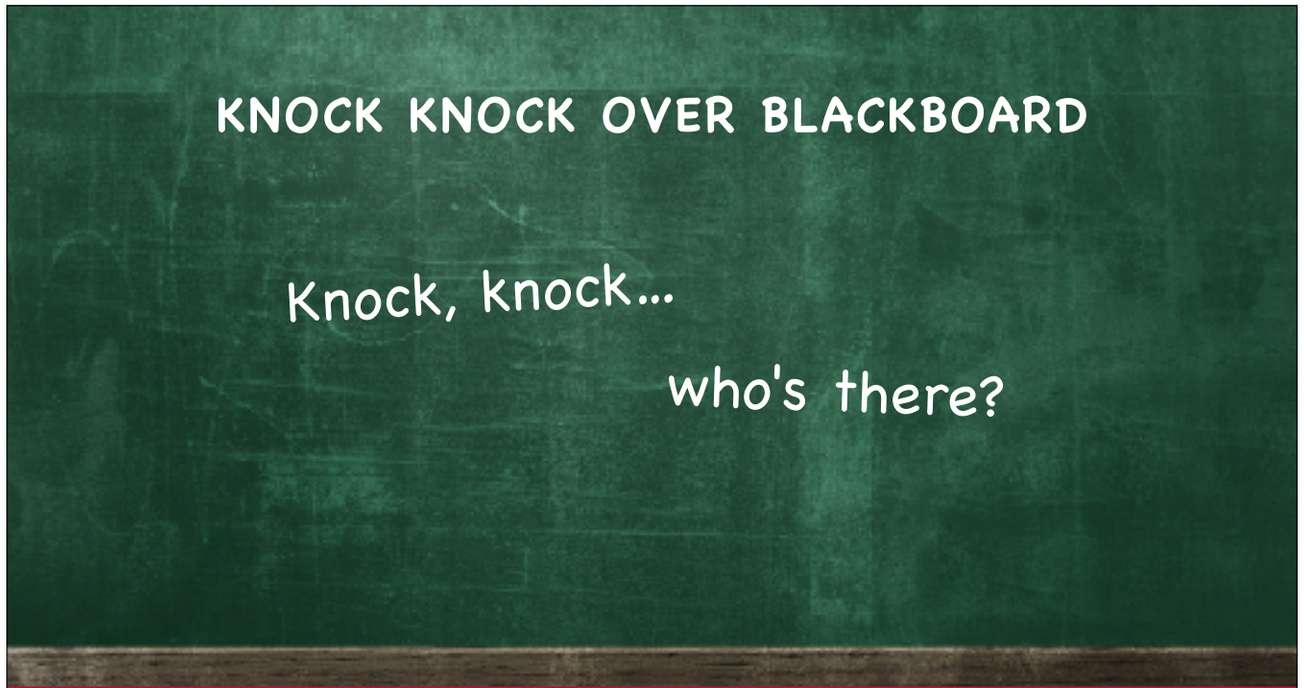
Broken state machine.

Knock, knock.

Who's there?

Broken state machine, who?

KNOCK KNOCK OVER TEXT


KNOCK KNOCK OVER BLACKBOARD
Knock, knock...
who's there?

HTTP

HTTP

- An *application-level* communications protocol. You might call it a *messaging* protocol.
- Specifies allowable *metadata* and *content* of messages.
- Does *NOT* specify *how* messages are transmitted!
- STATELESS: does *not* need to remember previous req-res!

HTTP PROTOCOL

- **RFC (Request For Comments) 7230 (link)**
- **By the IETF (Internet Engineering Task Force)**
- **But a *generic* messaging protocol**
  - *"HTTP is a generic interface protocol for information systems. It is designed to hide the details of how a service is implemented... independent of the types of resources provided."*

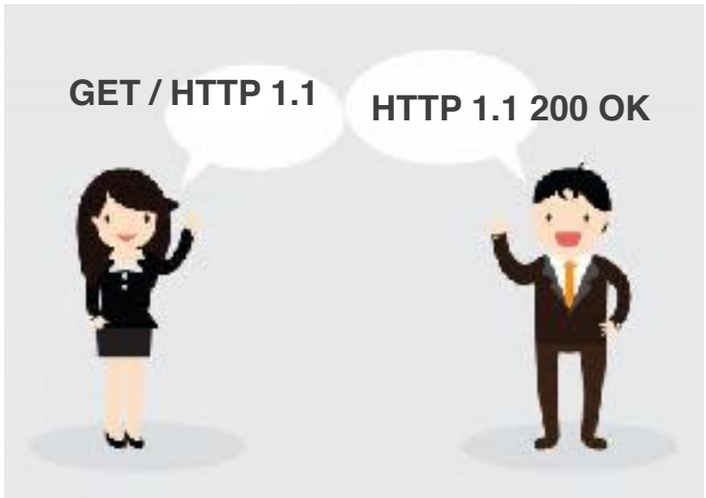
HTTP CLIENTS & SERVERS

- **Example Clients**
  - web browsers
  - household appliances
  - stereos
  - firmware update scripts
  - command-line programs
  - mobile apps
  - communication devices
- **Example Servers**
  - web servers
  - home automation units
  - networking components
  - office machines
  - autonomous robots
  - news feeds
  - traffic cameras

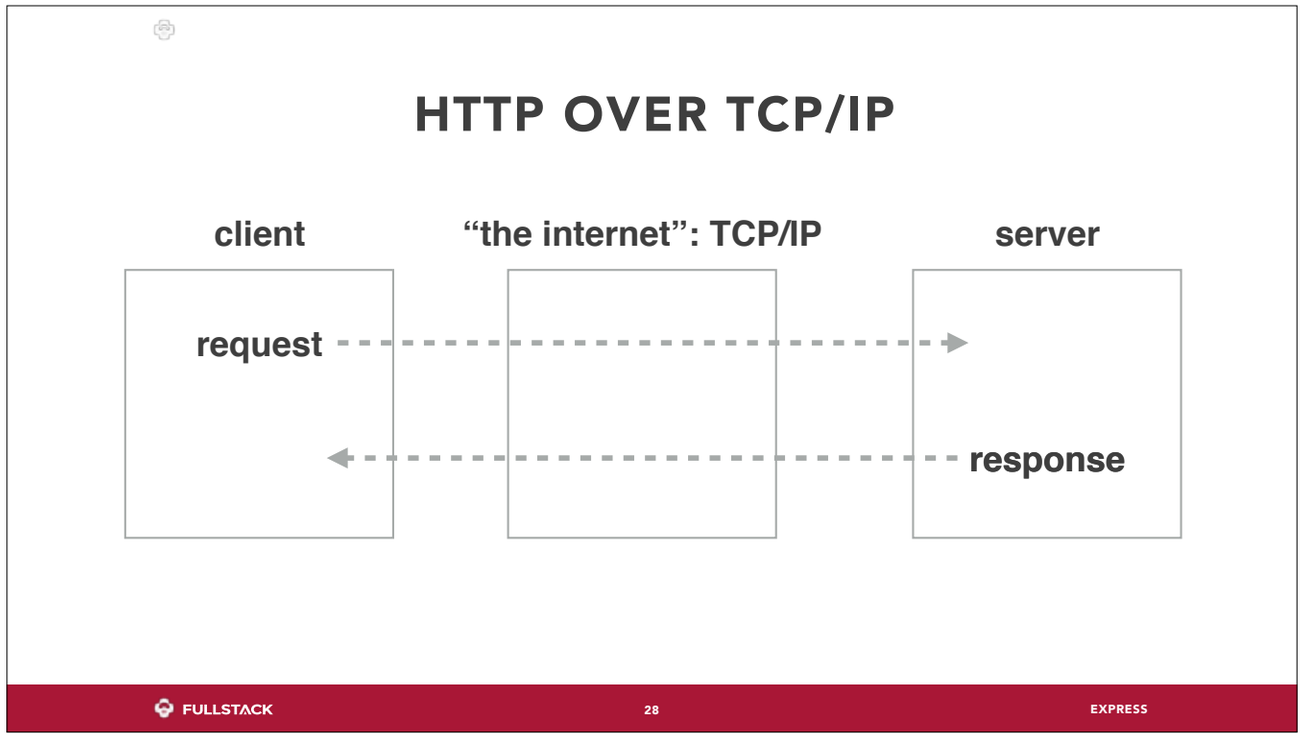
NOT A TRANSMISSION PROTOCOL!

It is an application-level communications protocol

HTTP OVER VOX



HTTP OVER TEXT



TCP = Transmission Control Protocol
IP = Internet Protocol
Together, they are a set of networking protocols that allow computers to communicate over the internet.

TCP/IP is a little bit like the mail system. Addressing, sorting, routing packets, etc. Not a perfect metaphor — the mail system doesn't split your letter into a thousand packets and then glue them back together on the other end, for example.

HTTP

Every request gets exactly one (total) response
(sometimes a response is broken up into chunks)

HTTP REQUEST

just a message with a certain format

verb URI

headers

```
POST /docs/1/related HTTP/1.1
Host: www.test101.com
Accept: image/gif, image/jpeg, */*
Accept-Language: en-us
Accept-Encoding: gzip, deflate
User-Agent: Mozilla/4.0 (compatible; MSIE 6.0; Windows NT 5.1)

bookId=12345&author=Nimit
```

body

(from http://www.ntu.edu.sg/home/ehchua/programming/webprogramming/HTTP_Basics.html)

COMMON VERBS

GET	“read”
POST	“create”
PUT	“update”
DELETE	“delete”

HTTP RESPONSE

status

```
HTTP/1.1 200 OK
Date: Sun, 18 Oct 2009 08:56:53 GMT
Server: Apache/2.2.14 (Win32)
Last-Modified: Sat, 20 Nov 2004 07:16:26 GMT
ETag: "10000000565a5-2c-3e94b66c2e680"
Accept-Ranges: bytes
Content-Length: 44
Connection: close
Content-Type: text/html
X-Pad: avoid browser bug

<html><body><h1>It works!</h1></body></html>
```

headers

(from http://www.ntu.edu.sg/home/ehchua/programming/webprogramming/HTTP_Basics.html)

payload/body

COMMON STATUSES

200	“OK”
201	“created”
304	“cached”
400	“bad request”
401	“unauthorized”
404	“not found”
500	“server error”

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