

A wide-angle photograph of a sunset over a calm body of water. The sky transitions from a deep blue at the top to a bright orange near the horizon. The water reflects the colors of the sky. On the right side, there are dark silhouettes of trees and a small structure. Overlaid on the image is a large, stylized logo in a light blue/grey color. The logo consists of the letters 'CUR' followed by a vertical bar, two small circles, and two parallel diagonal lines. The entire logo is reflected in the water below it.

CUR1://

May 22, 2025

Daniel Stenberg

Daniel Stenberg

@bagder
@mastodon.social



<https://daniel.haxx.se>

A close-up photograph of a lemur, likely a Red-tailed Lemur, peeking its face and one paw from behind a dark, textured tree trunk. The lemur has a distinctive orange-brown crown and nape, with a white face and chest. Its large, round, yellow-green eyes are wide open, looking directly at the camera. The background is a soft, out-of-focus green, suggesting a forest environment. The text "Just ask!" is overlaid in white on the right side of the image.

Just ask!



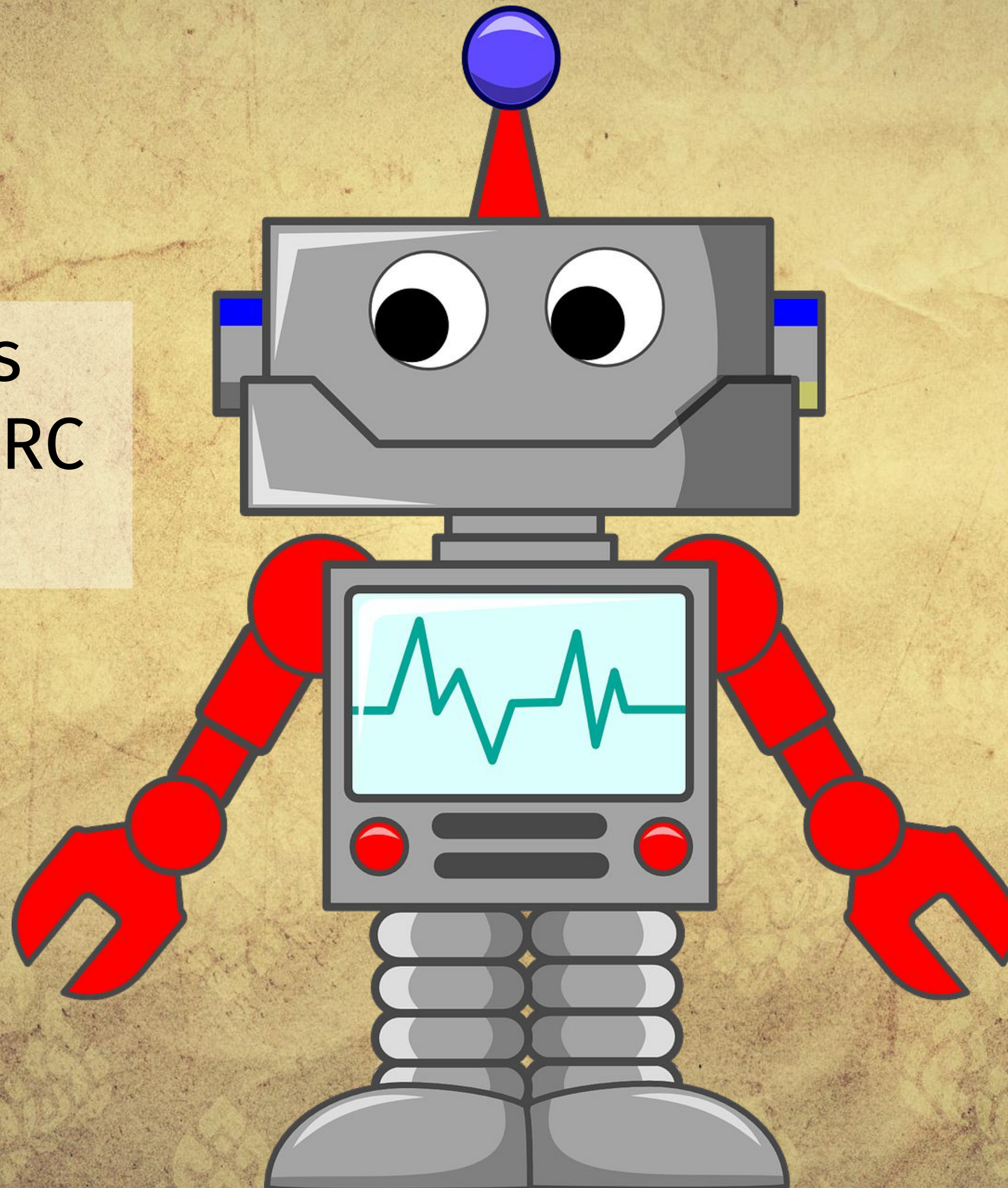
An *open source project* that
makes a *command line tool*
and a *library* for transferring
data using Internet protocols

curl.se

Once upon the time...



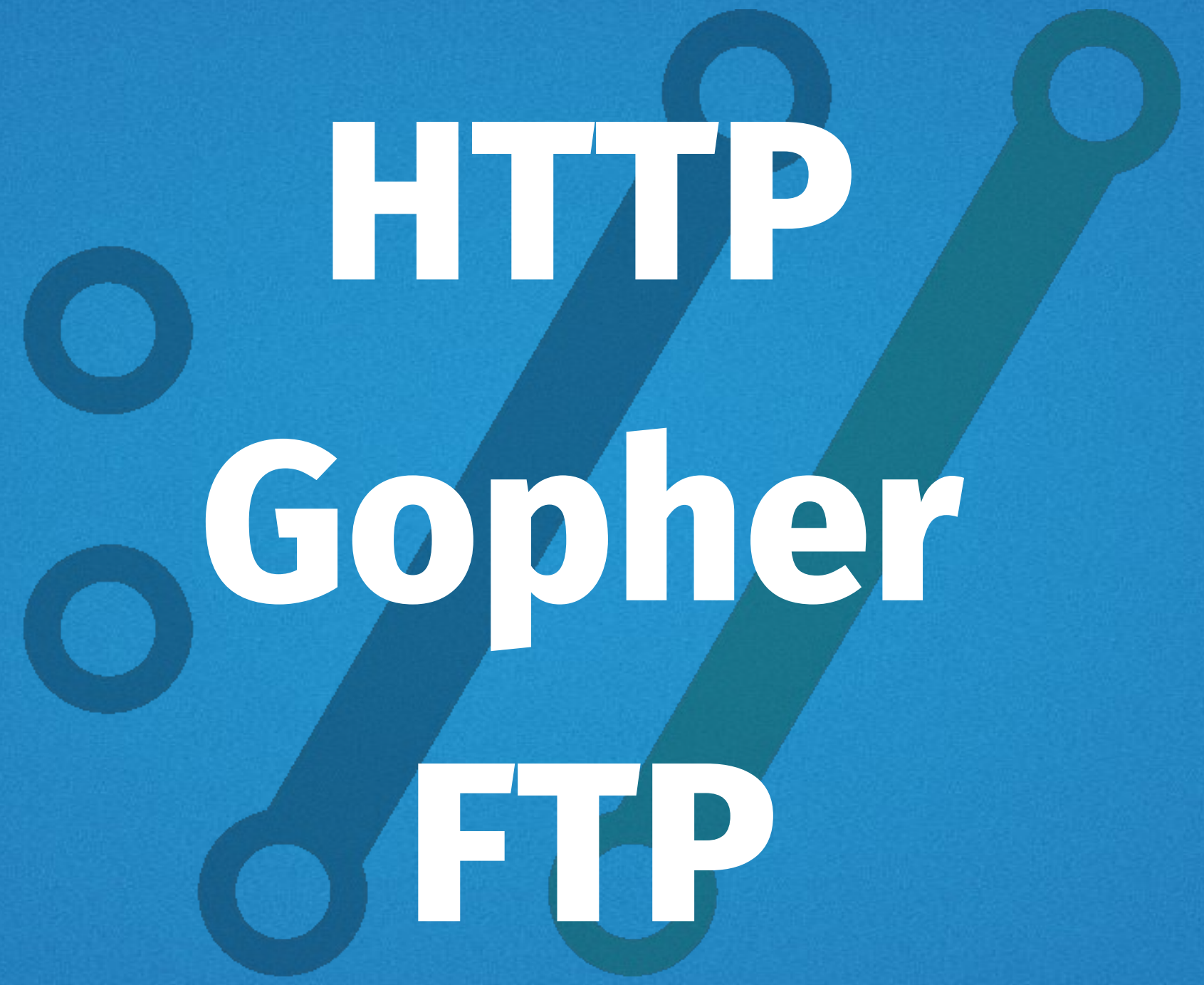
... while I was
writing this IRC
bot...



httpget

urlget

... became curl 1998

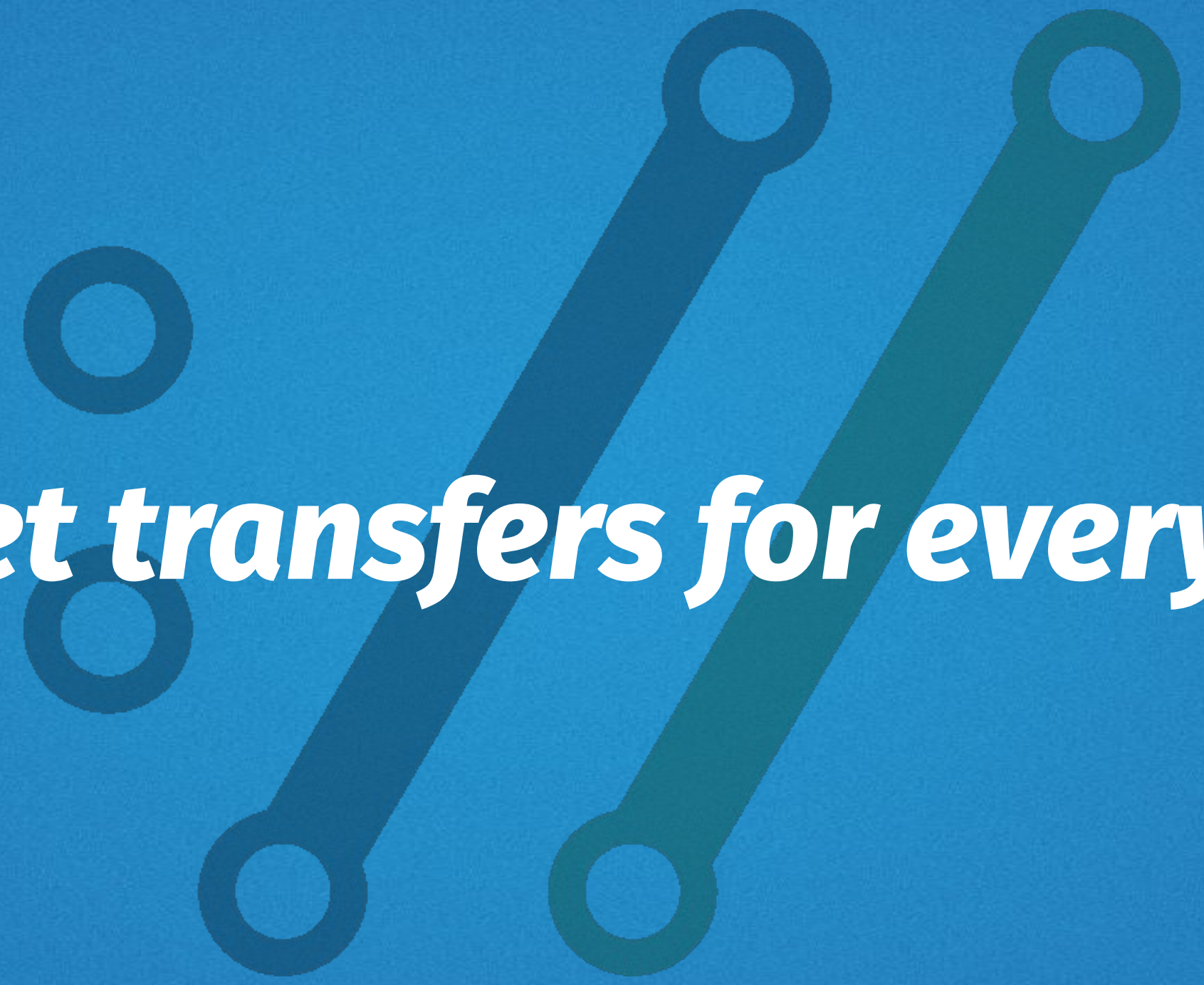


HTTP

Gopher

FTP

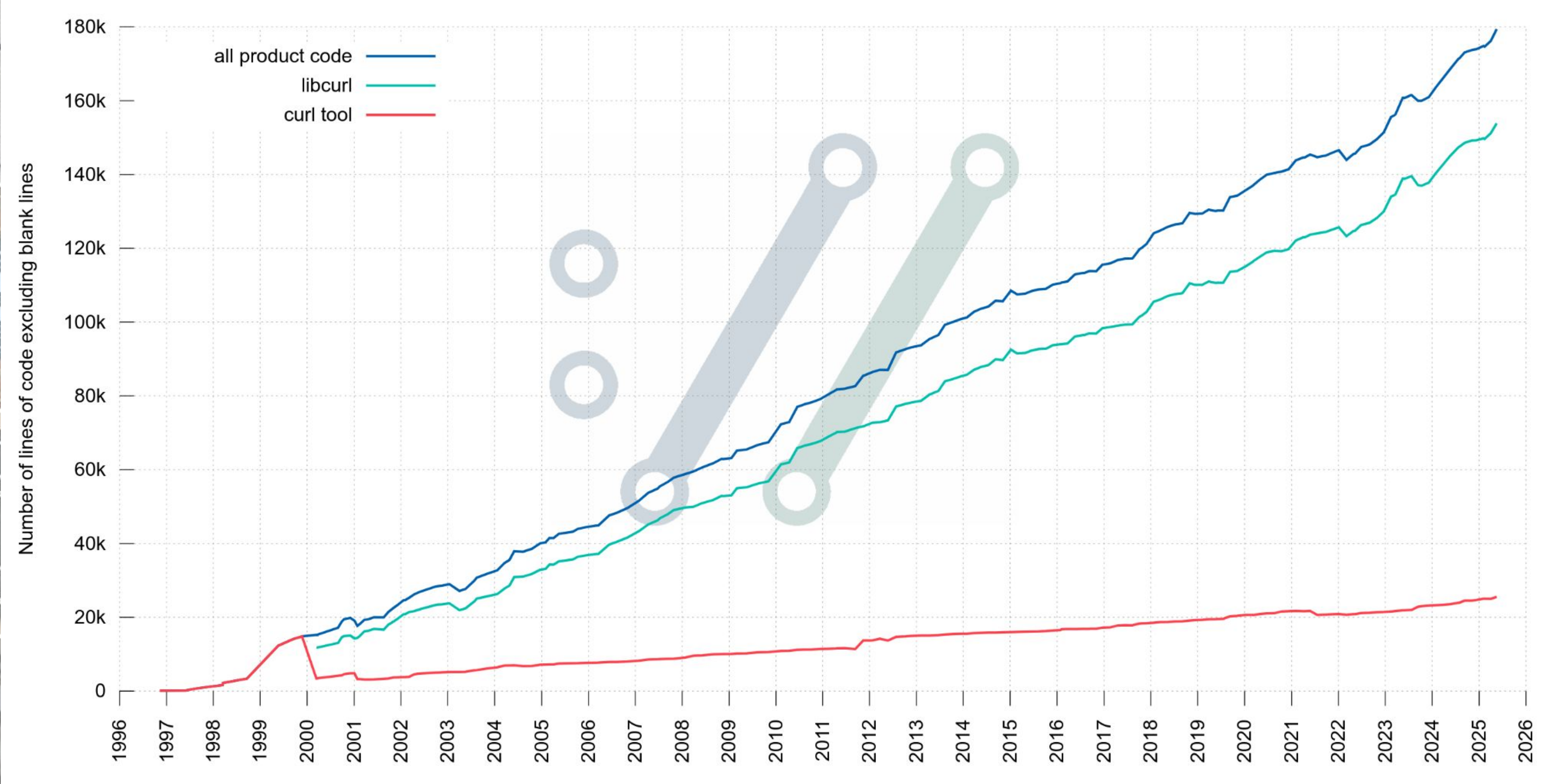
libcurl was created in 2000

An abstract graphic consisting of several circles and lines. Two thick, dark teal lines cross each other diagonally in the center of the slide. There are also several thinner, lighter blue circles scattered around, some of which are connected to the lines by thin segments.

Internet transfers for everyone!

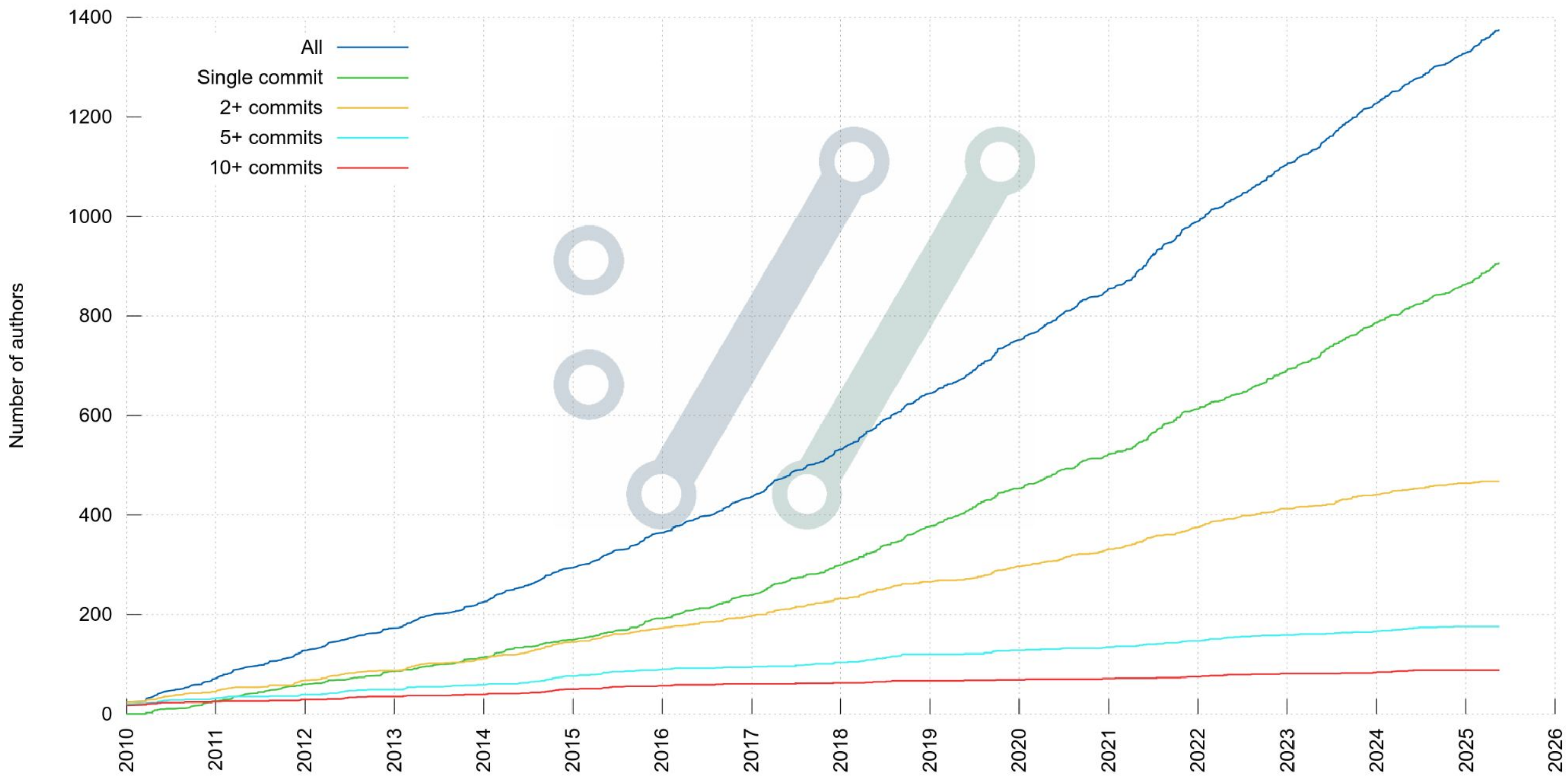
... and time passed...

Lines of code (incl comments)



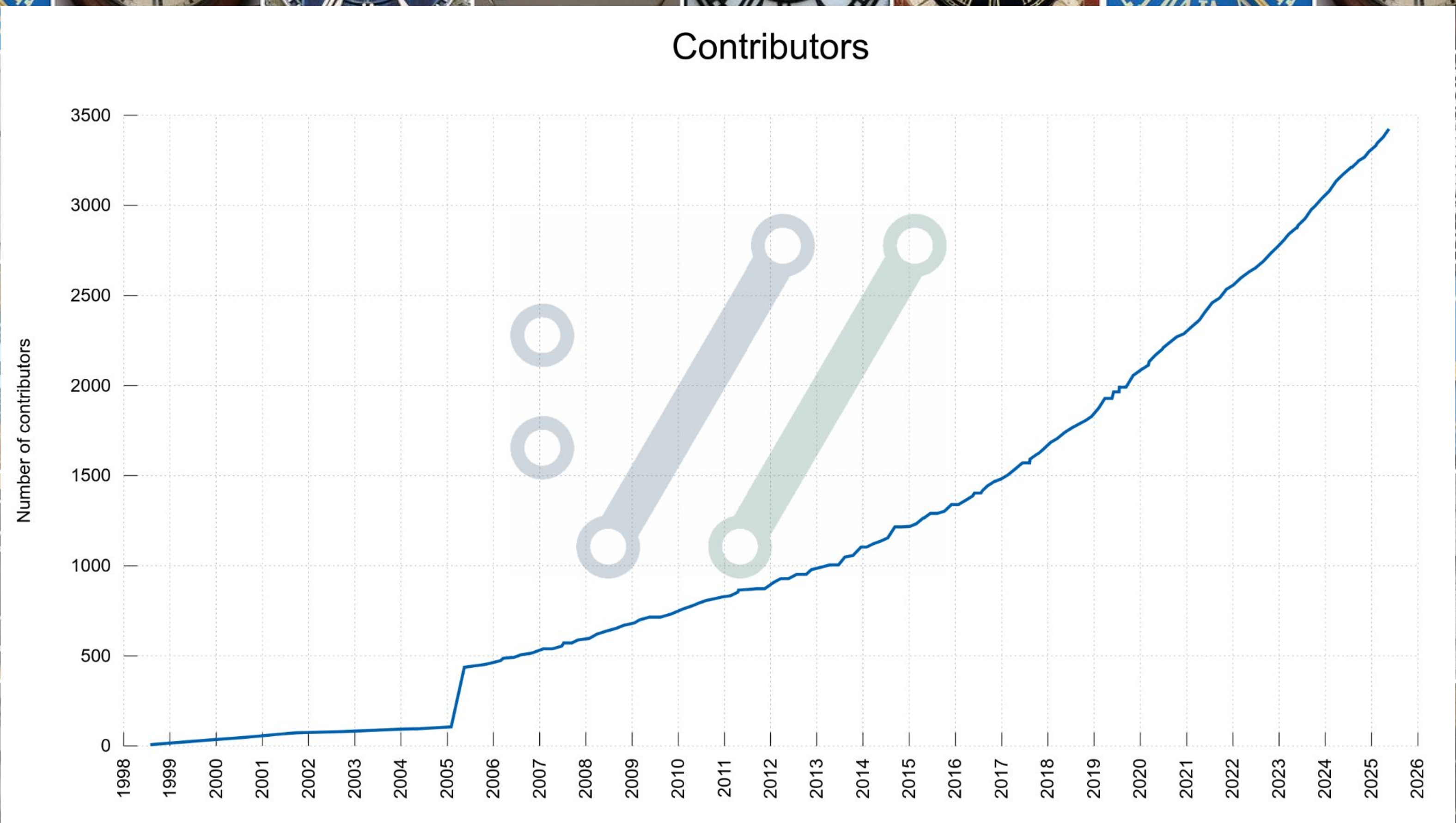
... and time passed...

Commit authors



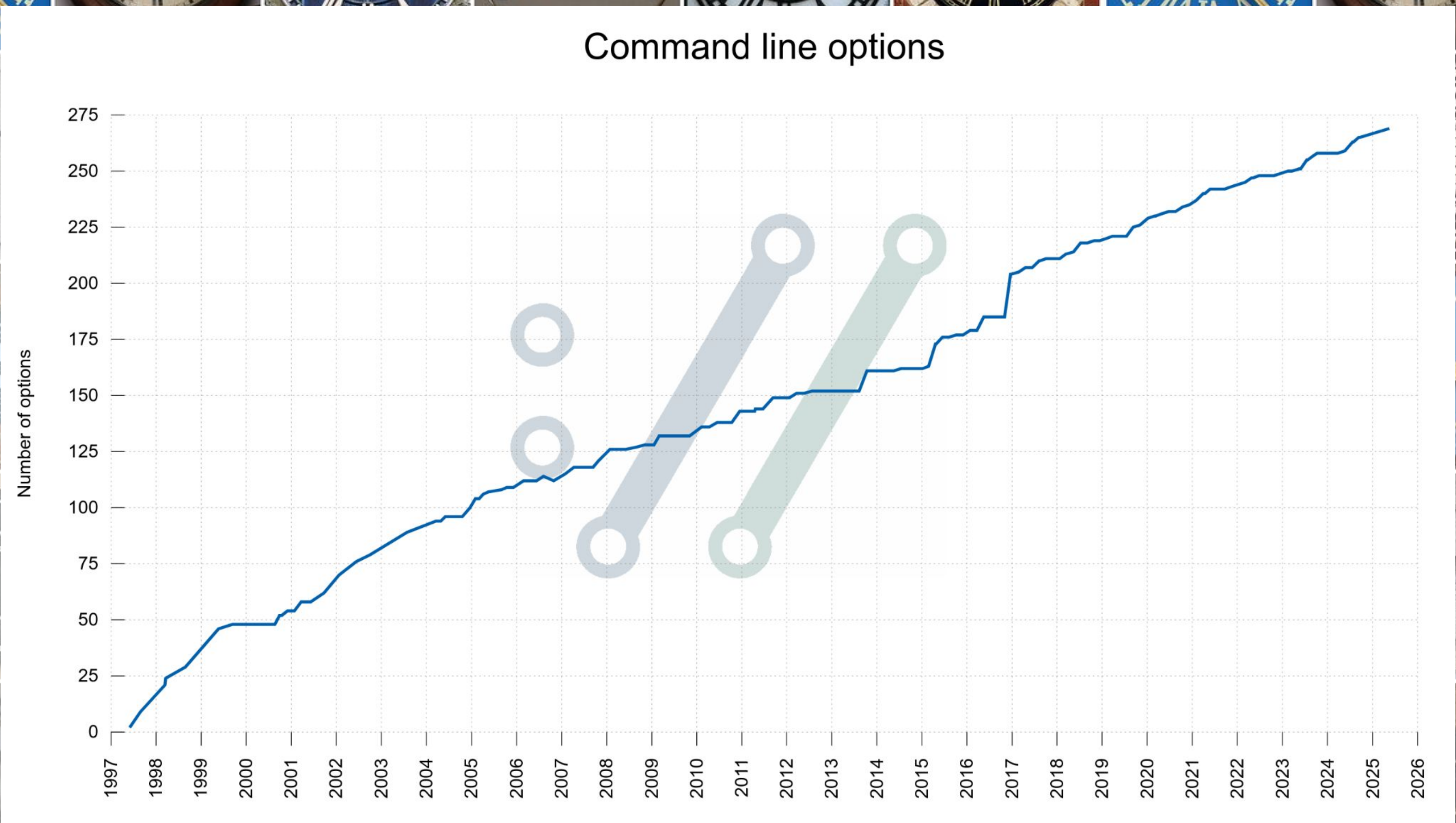
... and time passed...

Contributors



... and time passed...

Command line options



DICT, FILE, FTP, FTPS, GOPHER, GOPHERS, HTTP, HTTPS, IMAP, IMAPS, LDAP, LDAPS, POP3, POP3S, RTMP, RTMPS, RTSP, SCP, SFTP, SMB, SMBS, SMTP, SMTPS, TELNET, TFTP, WS and WSS

TLS certificates, HTTP POST, HTTP PUT, FTP upload, HTTP form based upload, proxies (SOCKS4, SOCKS5, HTTP and HTTPS), HTTP/2, HTTP/3, cookies, user+password authentication (Basic, Plain, Digest, CRAM-MD5, SCRAM-SHA, NTLM, Negotiate, Kerberos, Bearer tokens and AWS Sigv4), file transfer resume, proxy tunneling, HSTS, Alt-Svc, unix domain sockets, HTTP compression (gzip, brotli and zstd), etags, parallel transfers, DNS-over-HTTPS and much more



Suitable for curl?

URL?



Download || Upload?



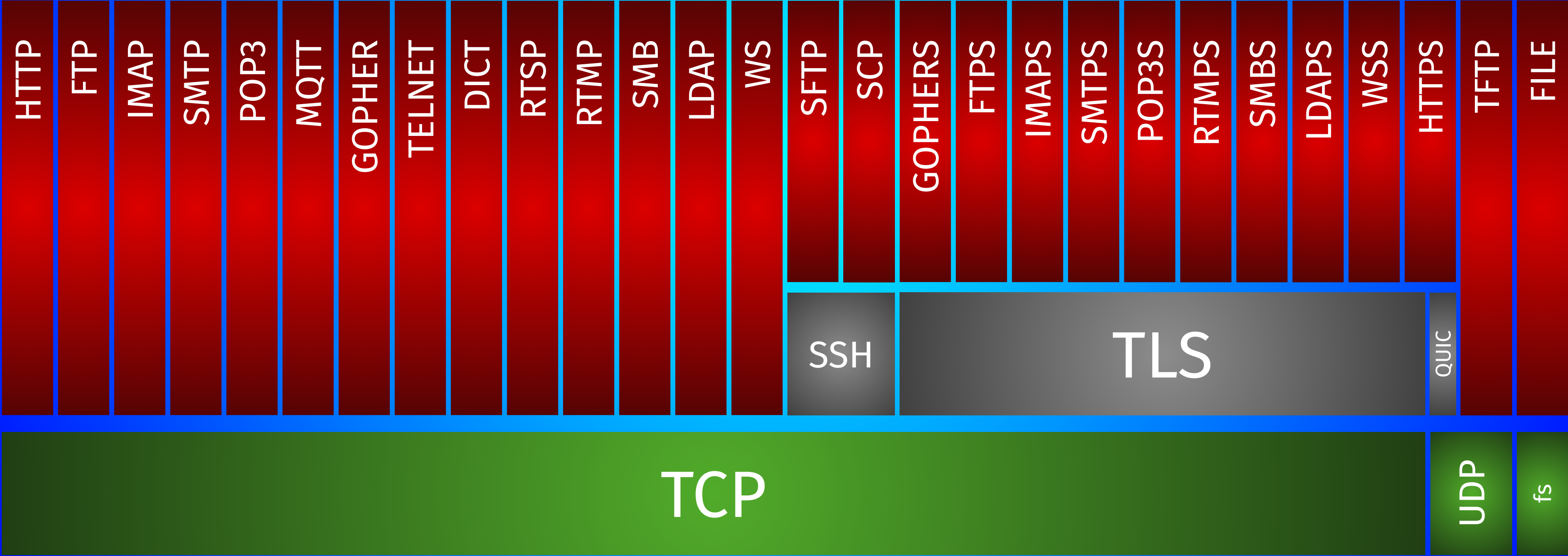
Content agnostic?



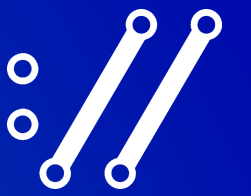
Otherwise:



28 transfer protocols



106 operating systems

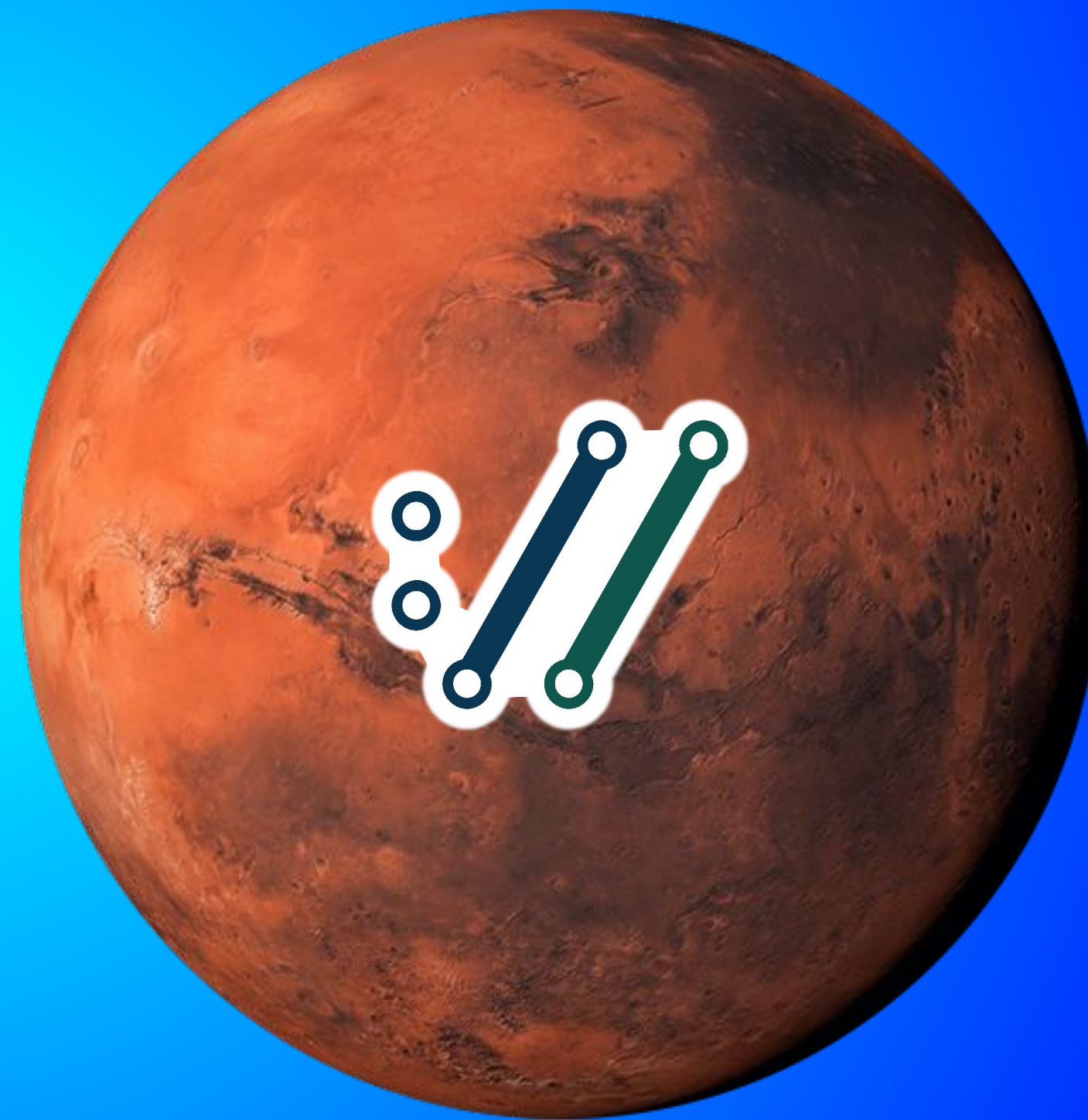


AIX	AmigaOS	Android	ArcaOS	Aros	Atari FreeMiNT	BeOS	Blackberry 10	Blackberry Tablet OS
Cell OS	CheriBSD	Chrome OS	Cisco IOS	DG/UX	DragonFly BSD	DR DOS	eCOS	FreeBSD
FreeDOS	FreeRTOS	Fuchsia	Garmin OS	Genode	Haiku	HardenedBSD	HP-UX	Hurd
IBM I	Illumos	Integrity	iOS	ipadOS	IRIX	KasperskyOS	Linux	Lua RTOS
Mac OS 9	macOS	Maemo	Mbed	Meego	Minoca	Micrium	MINIX	Moblin
MorphOS	MPE/iX	MS-DOS	NCR MP-RAS	NetBSD	NetWare	NextStep	Nintendo Switch	Nintendo 3DS
NonStop OS	NuttX	OpenBSD	OpenStep	Orbis OS	OS/2	OS21	PikeOS	Plan 9
PlayStation Portable	QNX	Qubes OS	ReactOS	Redox	RISC OS	ROS	RTEMS	Sailfish OS
SCO Unix	Serenity	SINIX-Z	SkyOS	Solaris	Sortix	SunOS	Syllable OS	Symbian
Tizen	TPF	Tru64	tvOS	ucLinux	Ultrix	UNICOS	UnixWare	visionOS
VMS	vxWorks	watchOS	Wear OS	WebOS	Wii System Software	Wii U	Windows	Windows CE
Xbox System	Xenix	Zephyr	z/OS	z/TPF	z/VM	z/VSE	Operating systems known to have run curl	

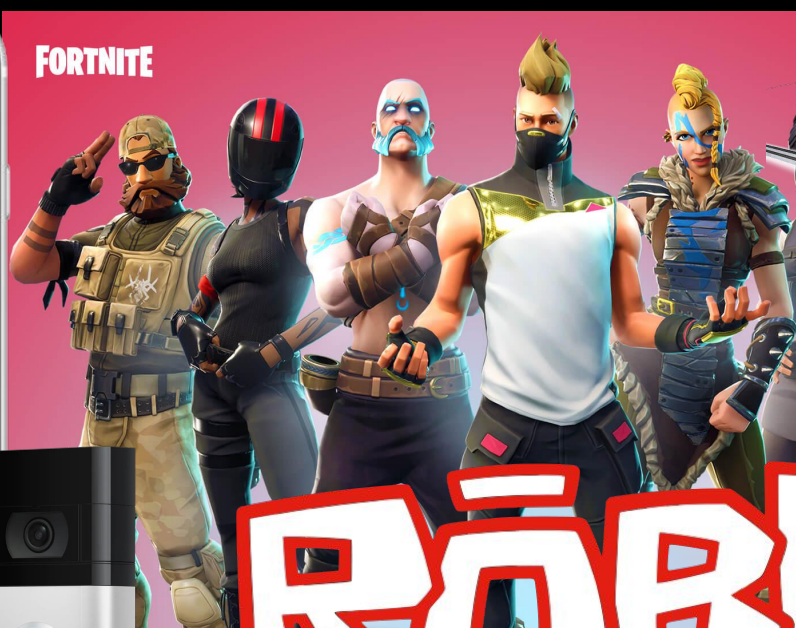
28 CPU architectures

Alpha	ARC	ARM	AVR32	C-SKY	CompactRISC
Elbrus	ETRAX	HP-PA	Itanium	LoongArch	m68k
m88k	MicroBlaze	MIPS	Nios	OpenRISC	POWER
PowerPC	RISC-V	s390	SH4	SPARC	Tilera
	VAX	x86	Xtensa	z/arch	

2 planets



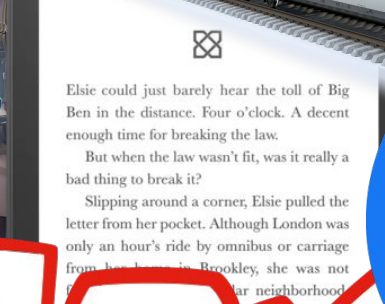
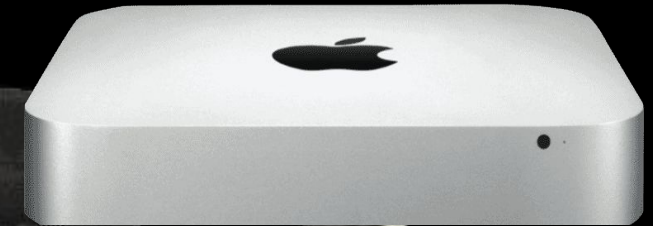
Planets known to have run curl

The Roblox logo is prominently displayed in the center of the page. It features the word "ROBLOX" in a bold, white, sans-serif font with a thick red outline. The letters are slightly shadowed, giving them a 3D appearance as if they are floating above the background. The background is a collage of various images related to the Roblox platform, including a Roblox character, a Roblox logo, and a Roblox game interface.

chromeOS



curl runs in all your devices



>20,000,000,000
0

installations

**The world
changed**

Internet users worldwide

1996

36 million

2025

6,000 million

166 x



Websites

1996

250,000

2025

1,100,000,000

4400 x



Household connection speeds in Sweden

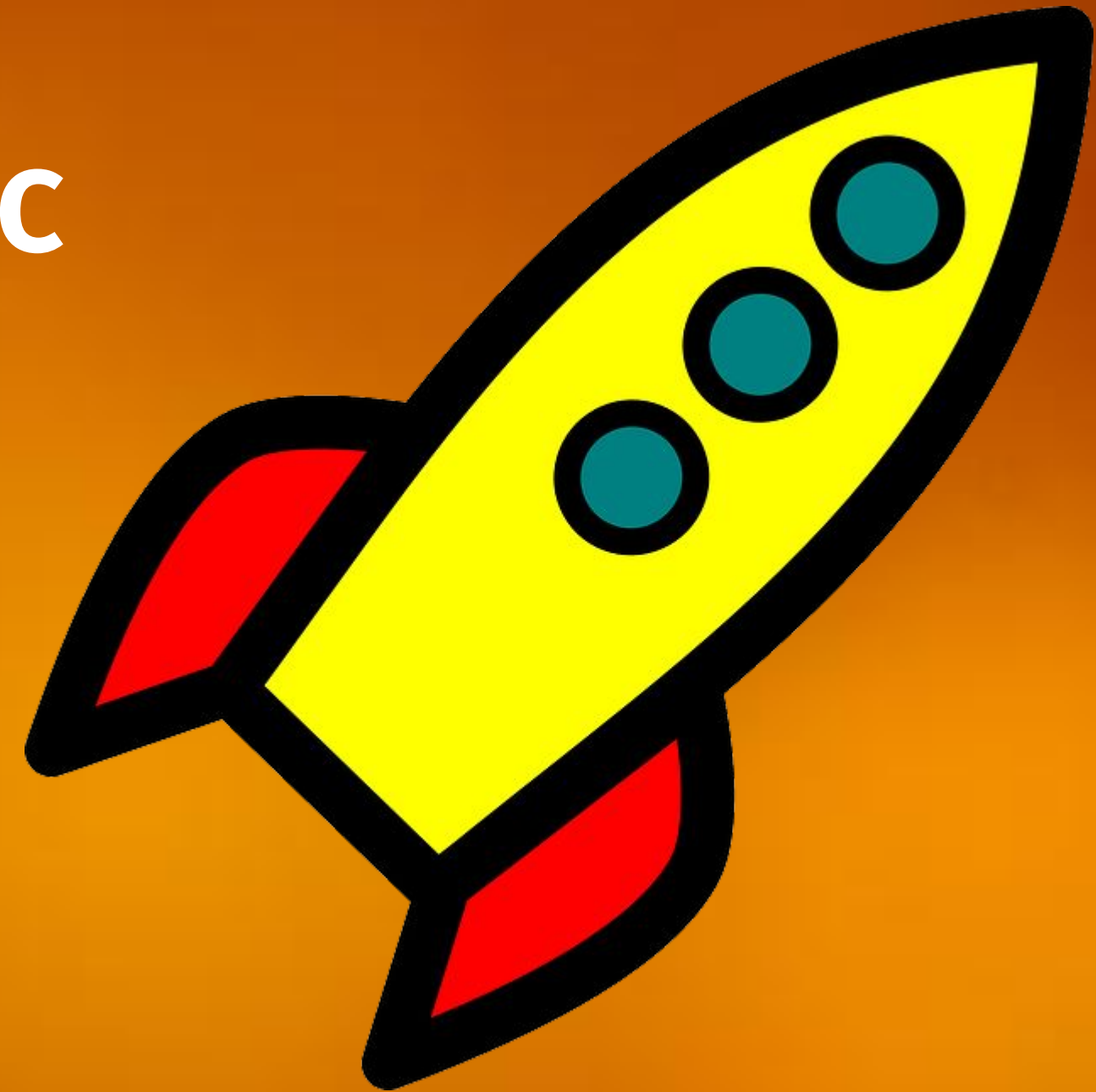
1996

30 kbit/sec

2025

170,000 kbit/sec

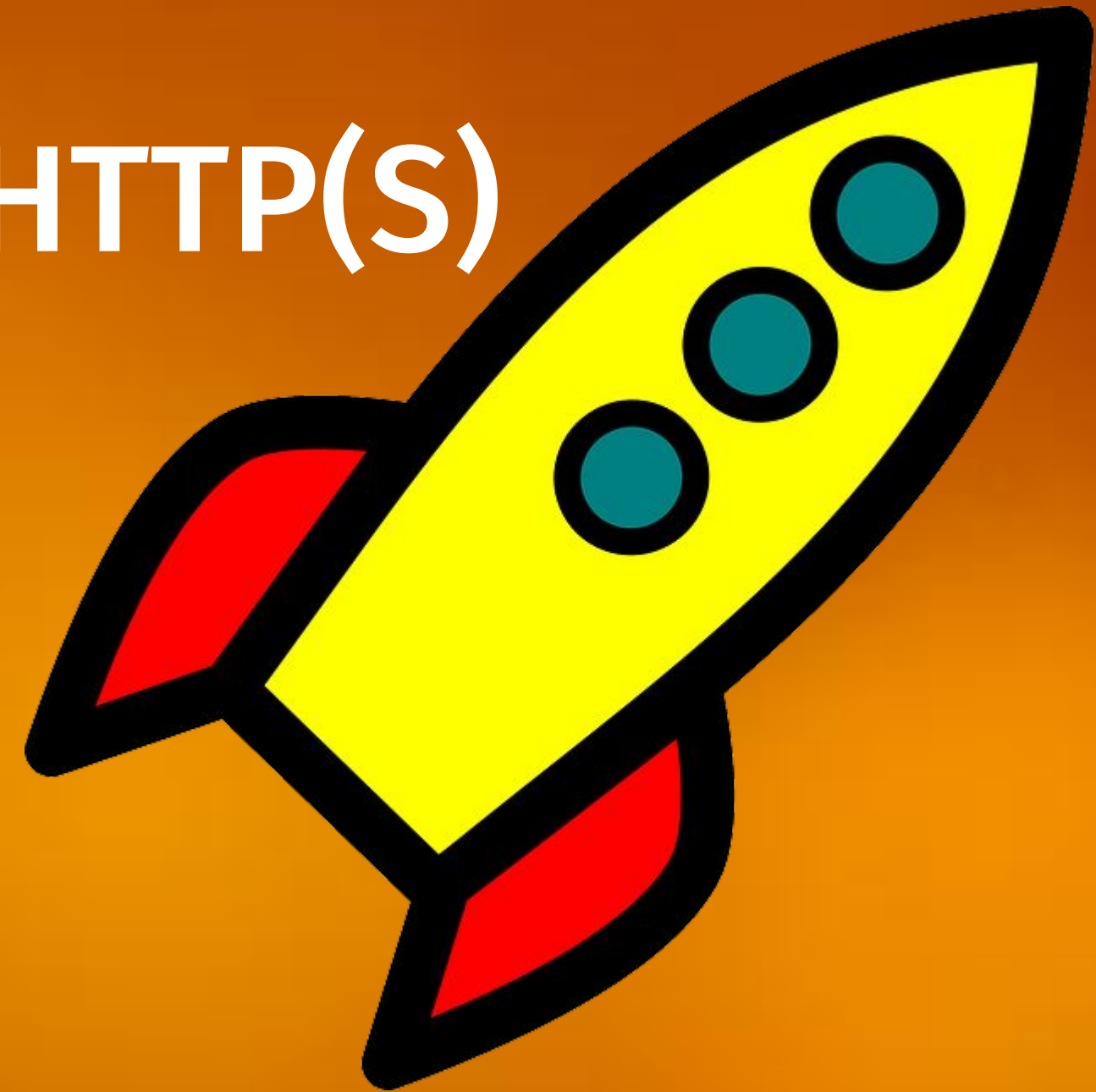
5666 x



HTTP

1996 - different protocols

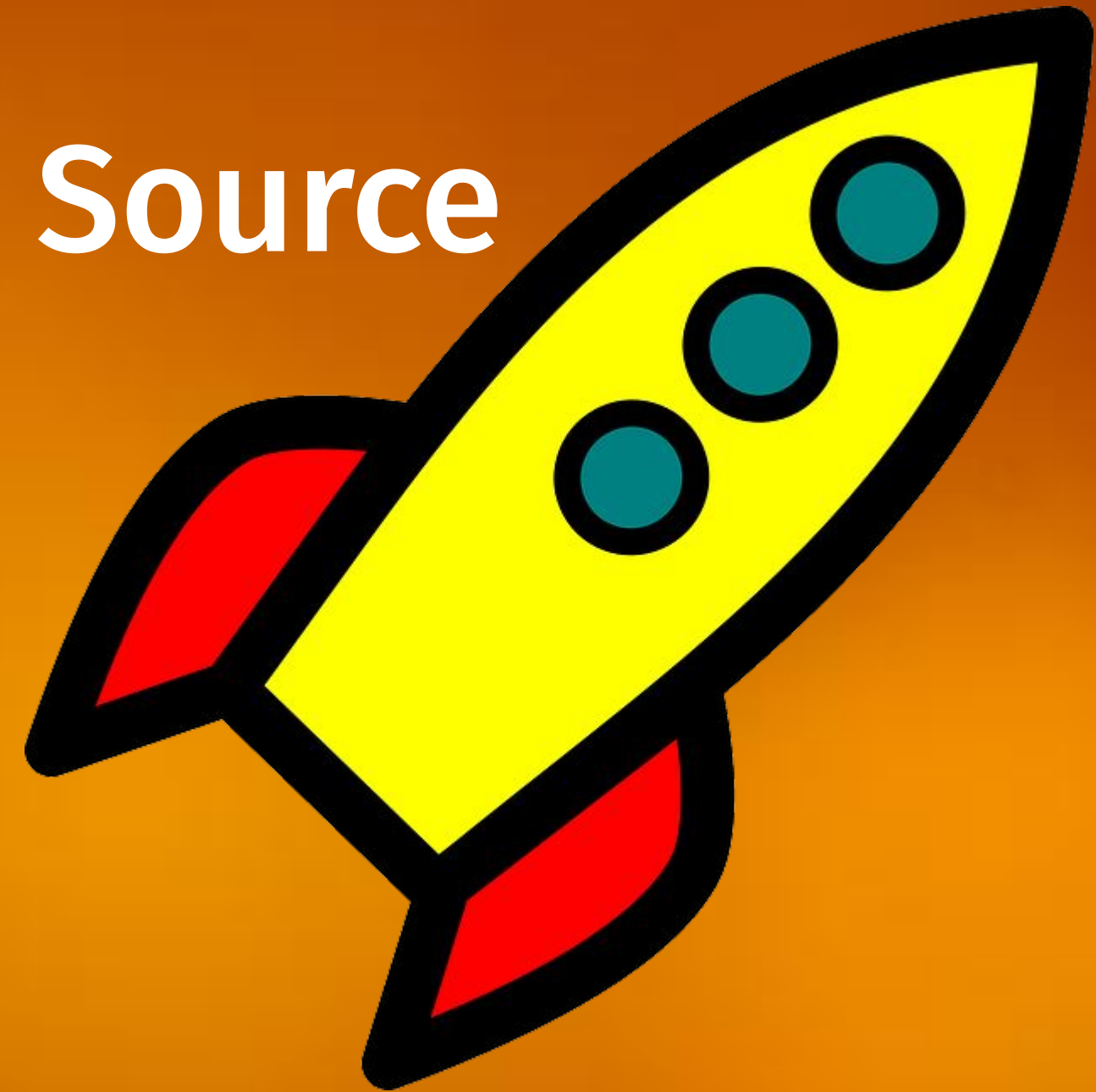
2025 - everything runs over HTTP(S)



Open Source

1996 - a fringe concept

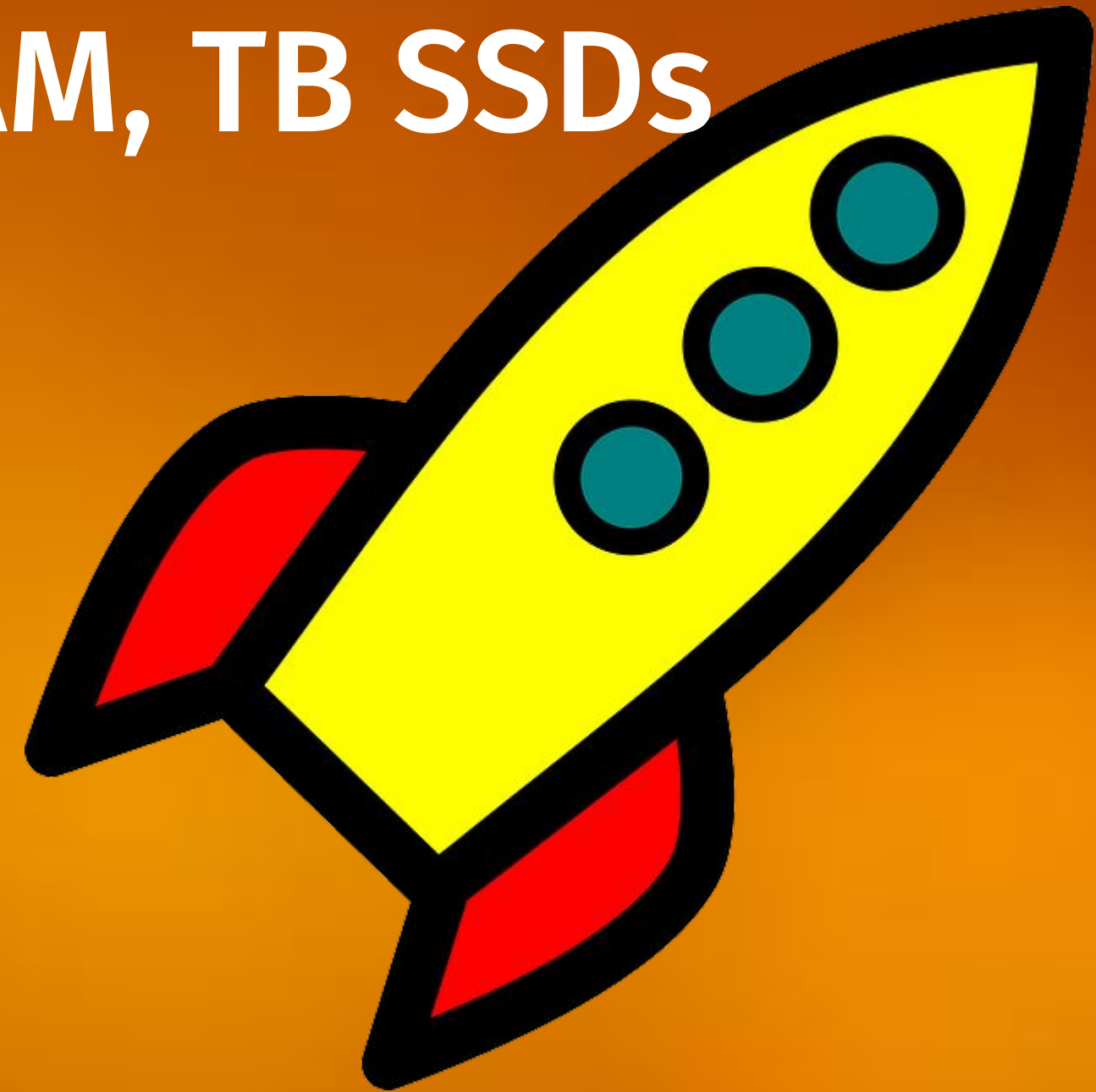
2025 - everything uses Open Source



Computing

1996 - Pentium 100 Mhz, 8 MB RAM, 2GB HDD

2025 - multi-core GHz, GBs RAM, TB SSDs




```
> curl -X POST http://api.allthethings.com  
-d {email:freetshirt@apigee.com}  
{  
> link: api.allthethings.com/redirect
```

 Nasdaq

\$ curl 'techJobs' SanFran
//don't tell my boss

H&M
CONSCIOUS
EXCLUSIVE

Hi Daniel,

I'm the marketing director for Dice.com and I wanted to reach out to you to thank you for spotting our billboard error on the 101. We are deeply embarrassed by this mistake

San Francisco 2024

MFA.
JUST A PUT
REQUEST AWAY.

```
curl --request PUT \
  --url https://api.stytch.com/v1/b2b/organizations/{ID} \
  -d '{
    "mfa_policy": "REQUIRED_FOR_ALL",
    "mfa_methods": "RESTRICTED",
    "allowed_mfa_methods": ["totp", "sms_otp"]
  }'
```

Switch to
STYTCH

```
curl --request PUT \
  --url https://api.stytch.com/v1/b2b/organizations/{ID} \
  -d '{
    "mfa_policy": "REQUIRED_FOR_ALL",
    "mfa_methods": "RESTRICTED",
    "allowed_mfa_methods": ["totp", "sms_otp"]
  }'
```

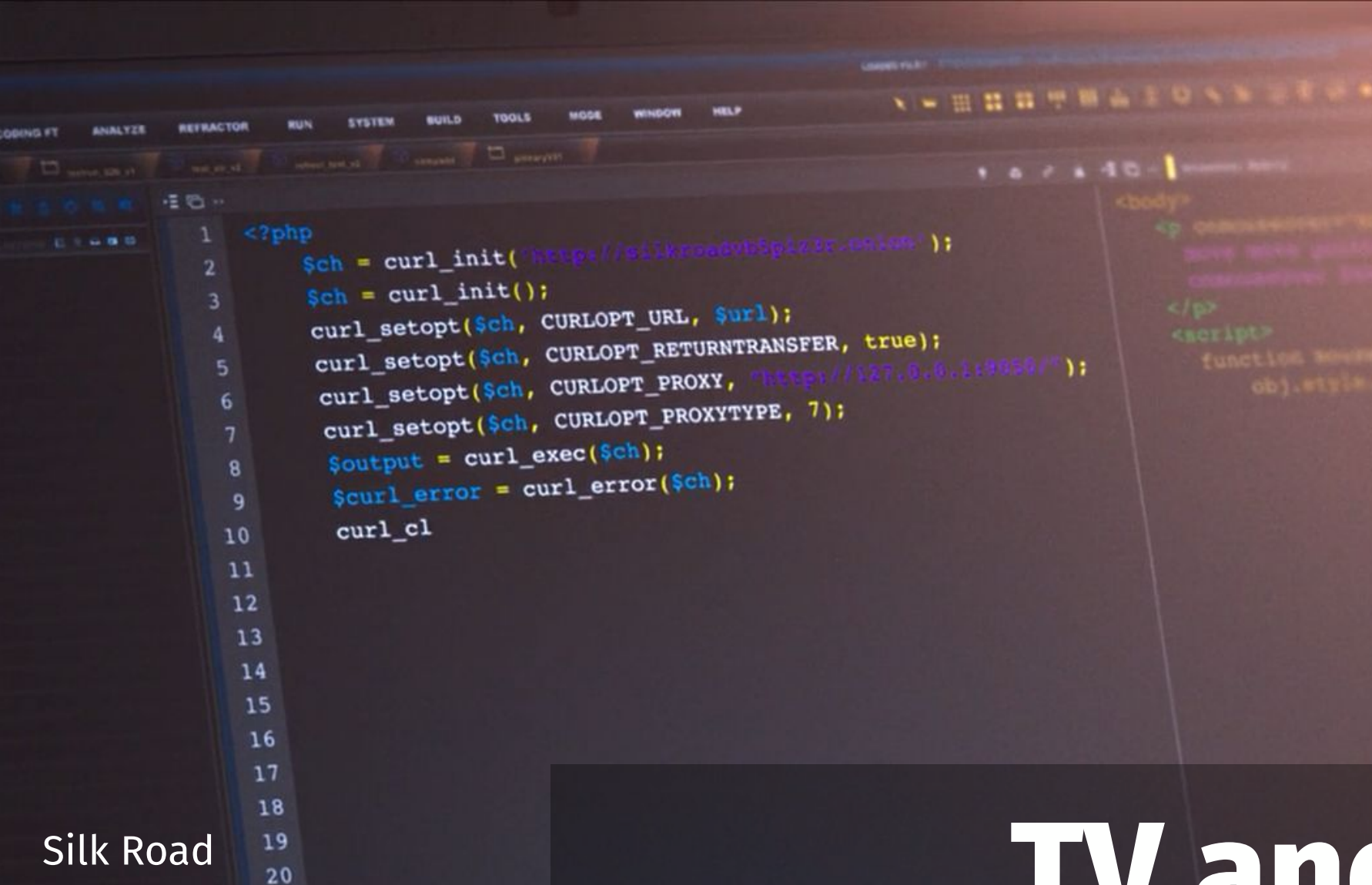

Master of many things

Subject: Multimedya isc-v:85

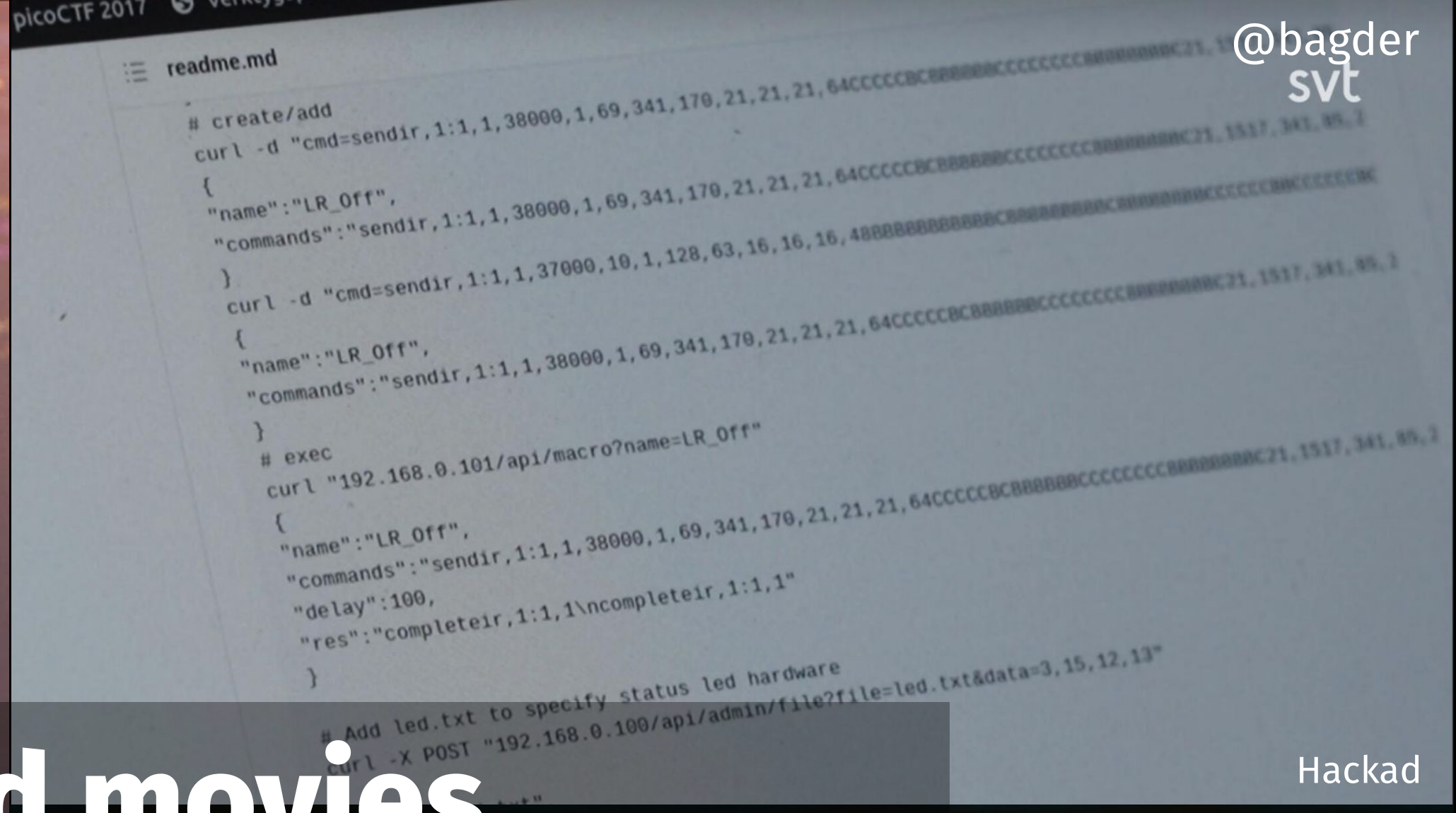
I have toyota corola with multimedya system that you have its copyright. I need a advice to know how to use the gps.

<https://daniel.haxx.se/email/>


```
location / {  
    root    html;  
    index  index.html index.htm;  
  
    if ($http_user_agent ~* "curl") {  
        return 403;  
    }  
  
    proxy_set_header X-Real-IP $remote_addr;  
    proxy_set_header Host $http_host;  
    proxy_set_header X-Forwarded-For $proxy_add_x_forwarded_for;  
  
    rewrite ^/(.*) https://$host/$1 permanent;  
  
    proxy_pass 'http://$server_addr:8000';  
}
```

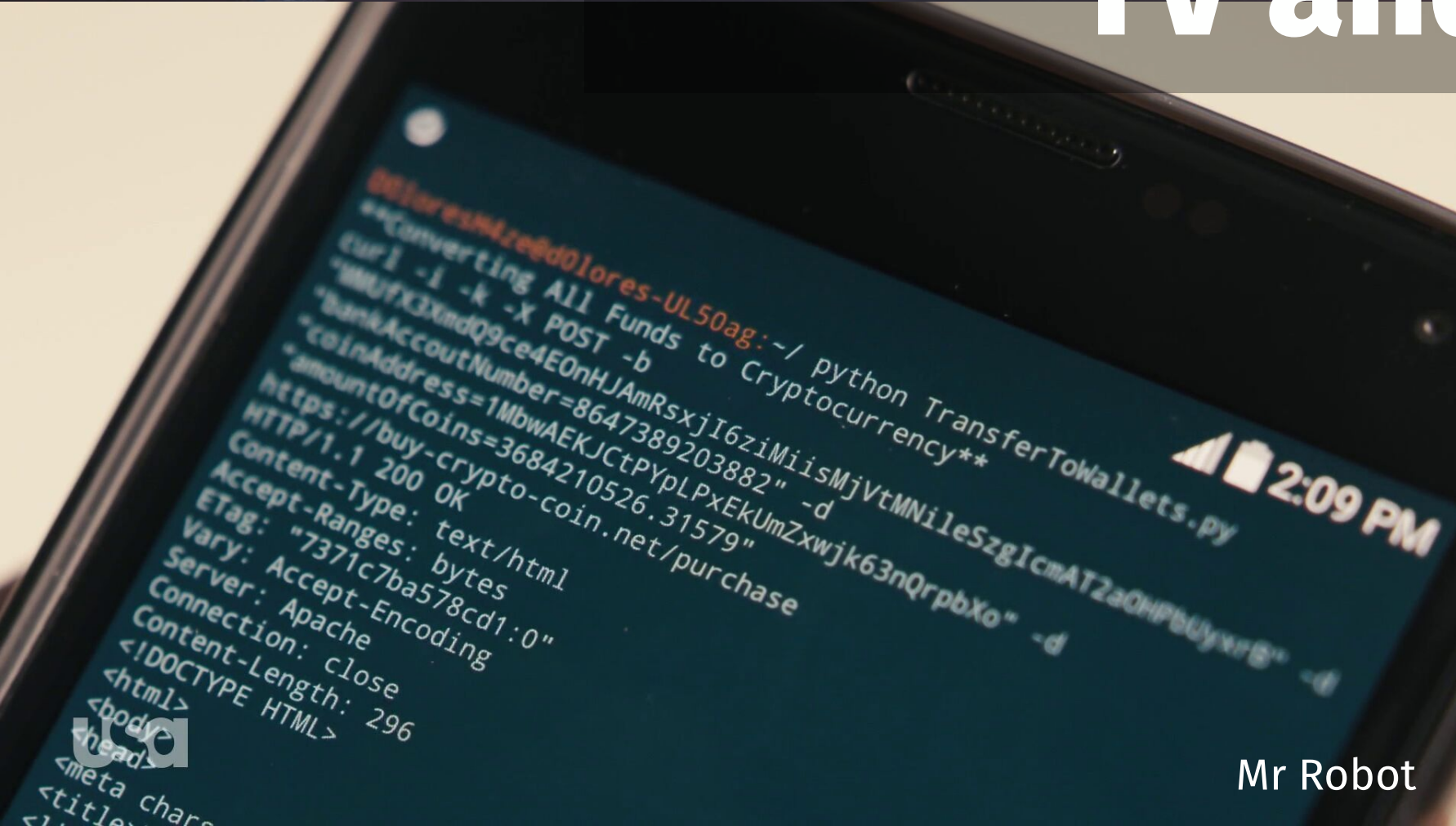
Silk Road



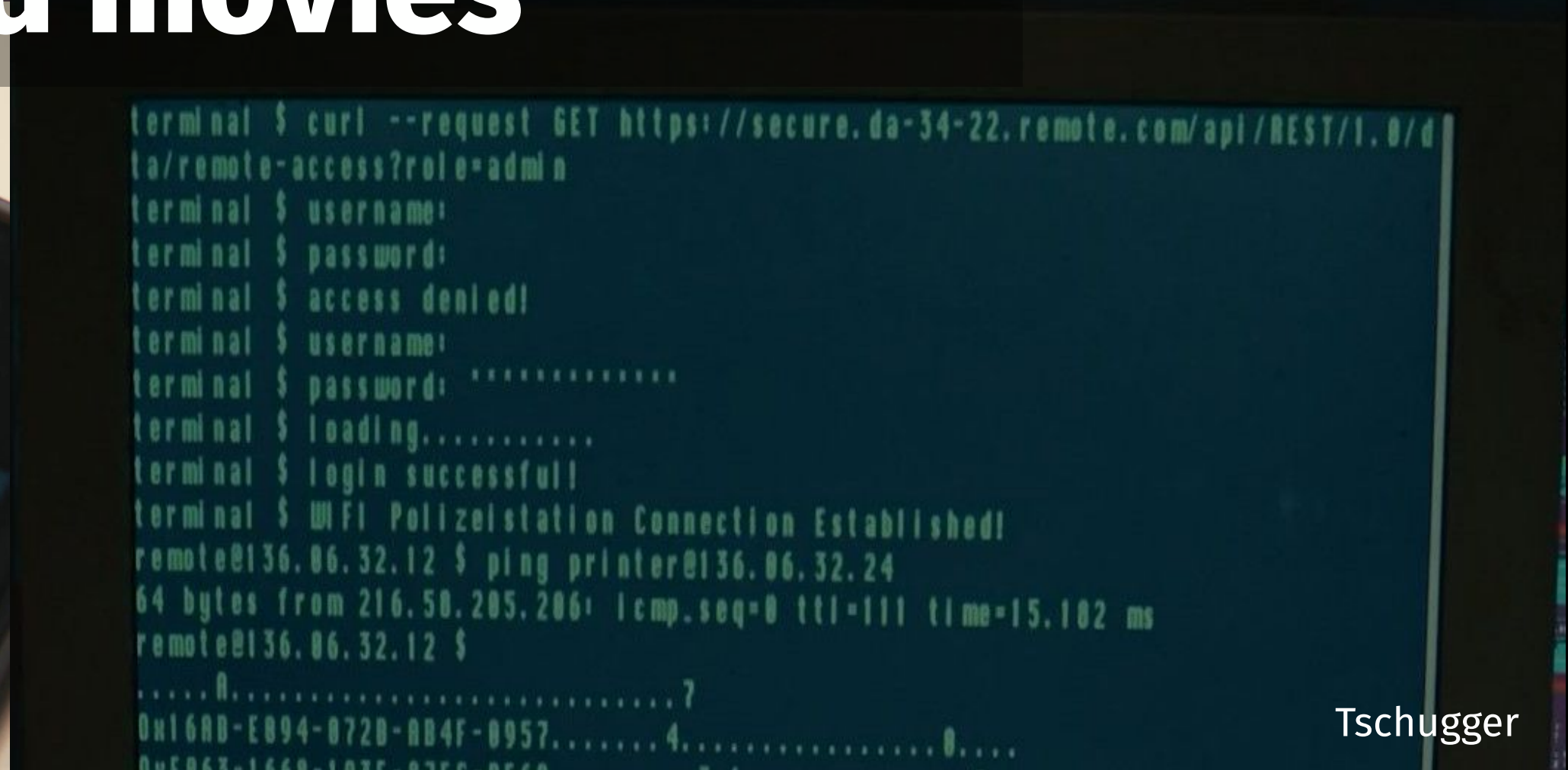
@bagder
svt

Hackad

TV and movies



Mr Robot

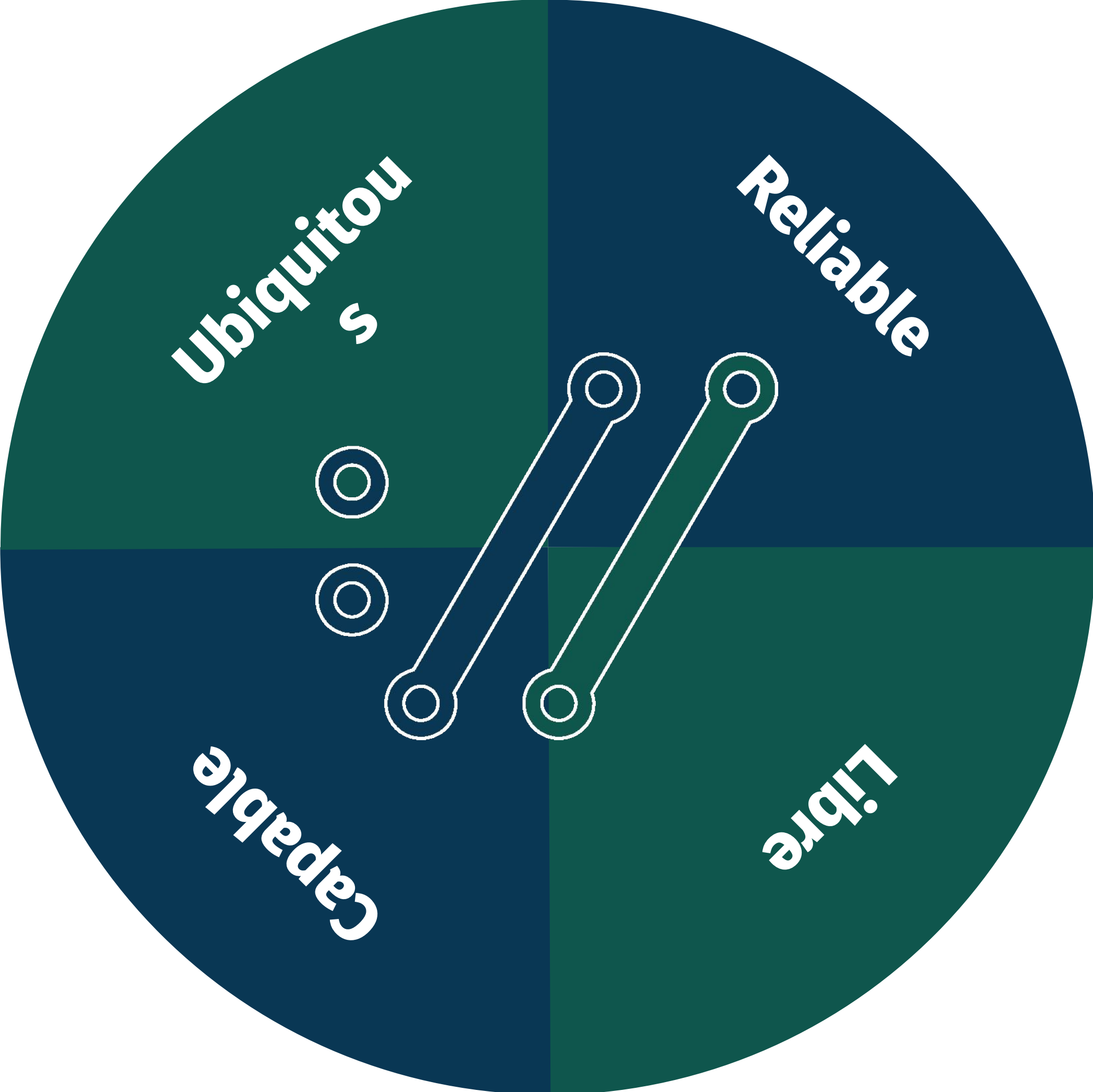


Tschugger

Why?

Why everyone uses
curl

@bagder



Why Open Source?

There was never any alternative to me

Wanted to contribute back

Would never even come close unless

No, I would not be rich otherwise

How?

149 Relevant RFCs (305,437 lines)



0821 0822 0850 0854 0959 0974 1035 1081 1123 1225 1350 1425 1427 1436
1460 1510 1635 1639 1651 1653 1725 1730 1734 1738 1777 1808 1867 1869 1870
1884 1928 1939 1945 1950 1951 1952 1959 1964 2045 2046 2047 2048 2049
2060 2061 2068 2095 2104 2109 2133 2145 2183 2184 2192 2195 2222 2228
2229 2231 2246 2255 2326 2373 2384 2388 2389 2396 2428 2449 2459 2478
2487 2518 2553 2554 2577 2595 2616 2617 2640 2718 2732 2817 2818 2821 2831
2854 2936 2964 2965 3207 3280 3490 3493 3501 3513 3617 3659 3961 3986
4120 4121 4178 4217 4248 4346 4366 4422 4511 4516 4559 4616 4954 4959
5034 5092 5321 5322 5335 5336 5849 5890 6531 6532 6749 7230 7231 7232
7233 7234 7235 7238 7540 7541 7628 7838 8314 8446 8484 8999 9000 9001
9002 9110 9111 9112 9113 9114 9204

1,606,599 RFC words

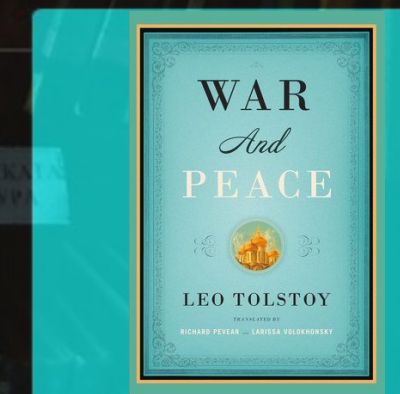
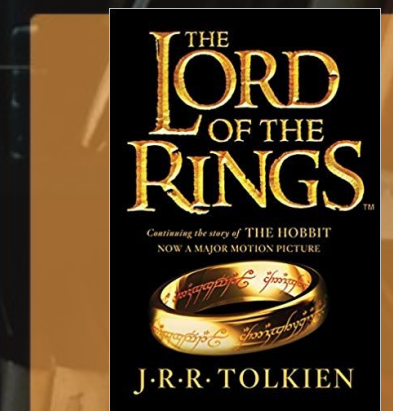
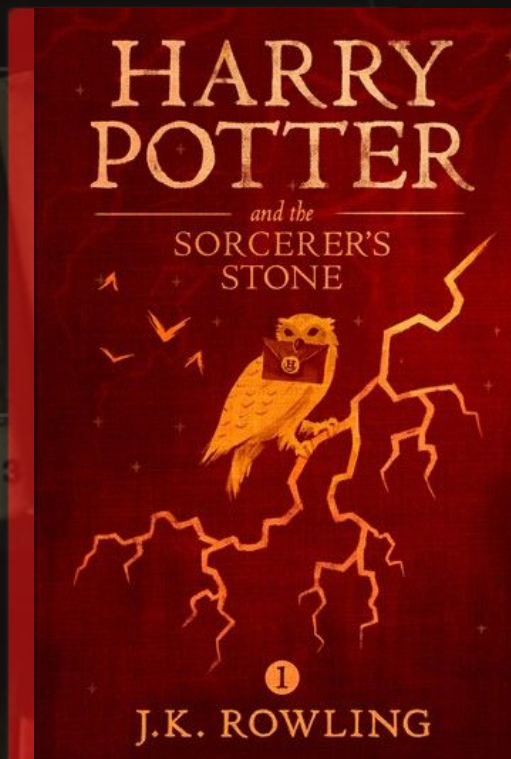
2000000

1500000

1000000

500000

0

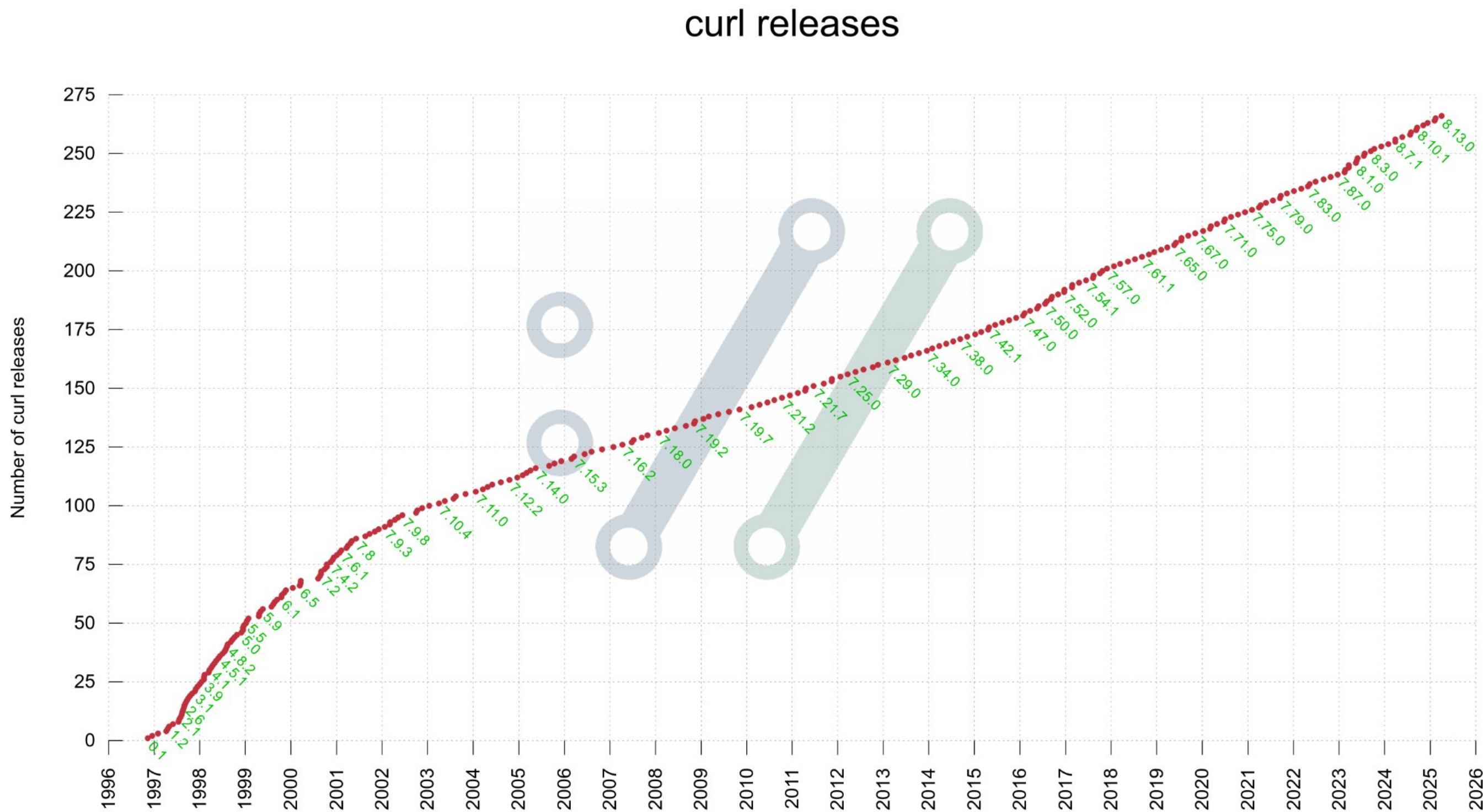


Contributors

A group of children are participating in a tug-of-war competition. They are all pulling on a thick rope with effort. The children are wearing various colored shirts, including orange, red, and grey. The background is a grassy field.

3,424 in total
60-80 per release
Small core team
Volunteers

Reliable and predictable



Independent

A tropical island with palm trees and a rainbow in the background, with the word 'Independent' overlaid in large white text. The island is small and sandy, surrounded by clear blue water. The sky is bright blue with some light clouds. The word 'Independent' is written in a large, bold, white sans-serif font, centered horizontally across the middle of the image. A faint, semi-transparent reflection of the word is visible in the water below it.



Everything is
public

mailing lists



<https://github.com/curl>

a selected few
have push
rights

C89

```
chunk.memory = malloc(1);
chunk.size = 0; /* no data */

curl_global_init(CURL_GLOBAL_ALL);
curl = curl_easy_init();
if(curl) {
    curl_easy_setopt(curl, CURLOPT_URL, "https://www.");

    /* send all data to this function */
    curl_easy_setopt(curl, CURLOPT_WRITEFUNCTION, WriteMemoryCallback);

    /* we pass our 'chunk' struct to the callback function */
    curl_easy_setopt(curl, CURLOPT_WRITEDATA, (void *)&chunk);

    /* some servers don't like requests that are made without a user-agent
    field, so we provide one */
    curl_easy_setopt(curl, CURLOPT_USERAGENT, "libcurl-agent/1.0");

    /* if we don't provide POSTFIELDS, it will strlen() by
    itself */
    curl_easy_setopt(curl, CURLOPT_POSTFIELDSIZE, (long)strlen(postthis));

    /* Perform the request, res will get the return code */
    res = curl_easy_perform(curl);

    /* Check for errors */
    if(res != CURLE_OK) {
        fprintf(stderr, "curl_easy_perform() failed: %s\n",
            curl_easy_strerror(res));
    }

    /* memory points to a memory block that is chunk.size
    the remote file.

```


Top sponsors May 2025



wolfSSL

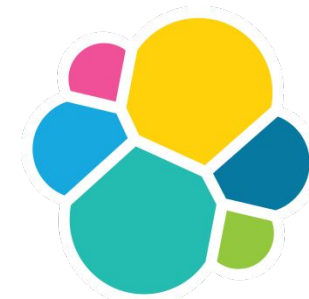
Haxx

fastly®



TeamViewer

kirei



elastic

Secure enough for the billions?

Static code
analyzers

CI like crazy

Code audits

Many tests

Docs

Fuzzing

Valgrind and
sanitizers

Reviews

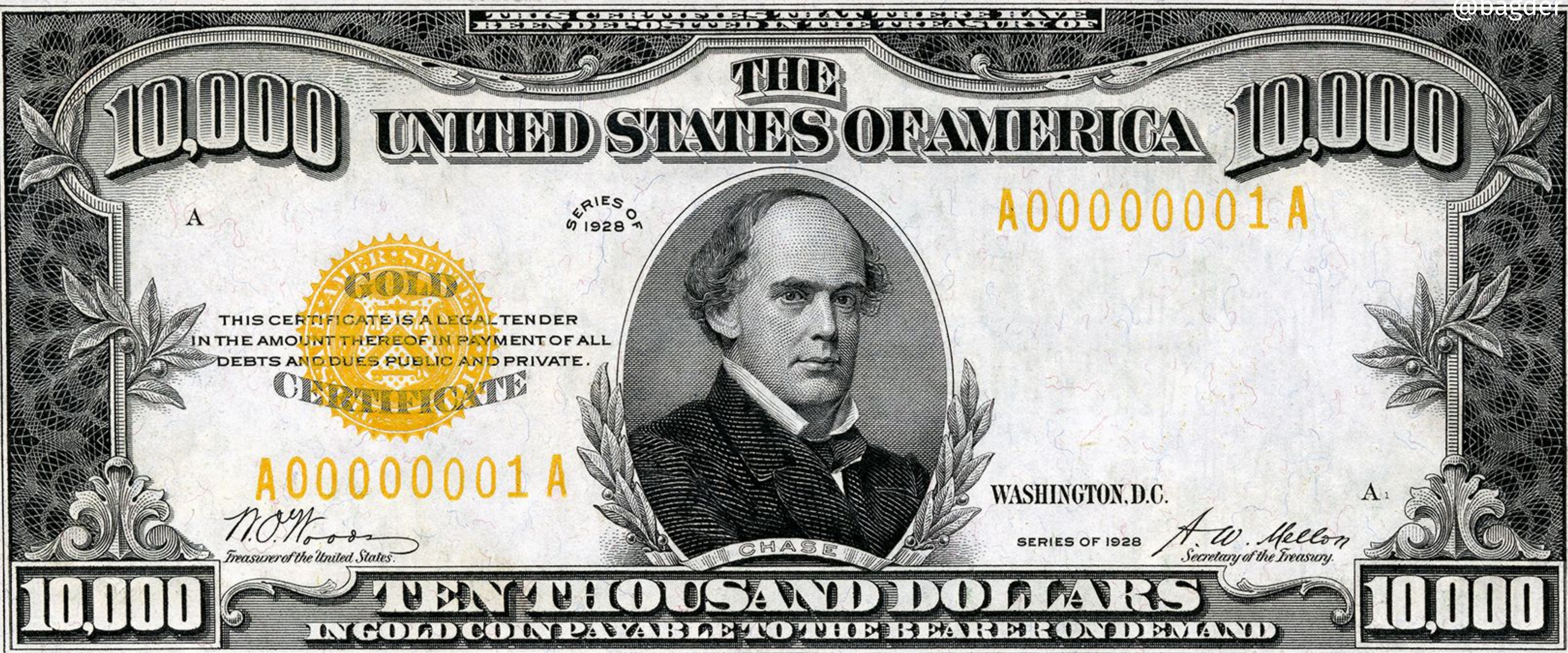
Code style

2017 TESLA MODEL S
INSURANCE INSTITUTE
FOR HIGHWAY SAFETY
CEN1708

curl CI

220 jobs per commit and PR
Tests code style, indenting etc
Thousands of tests per build
Builds and tests on tens of platforms
Verifies many build combinations





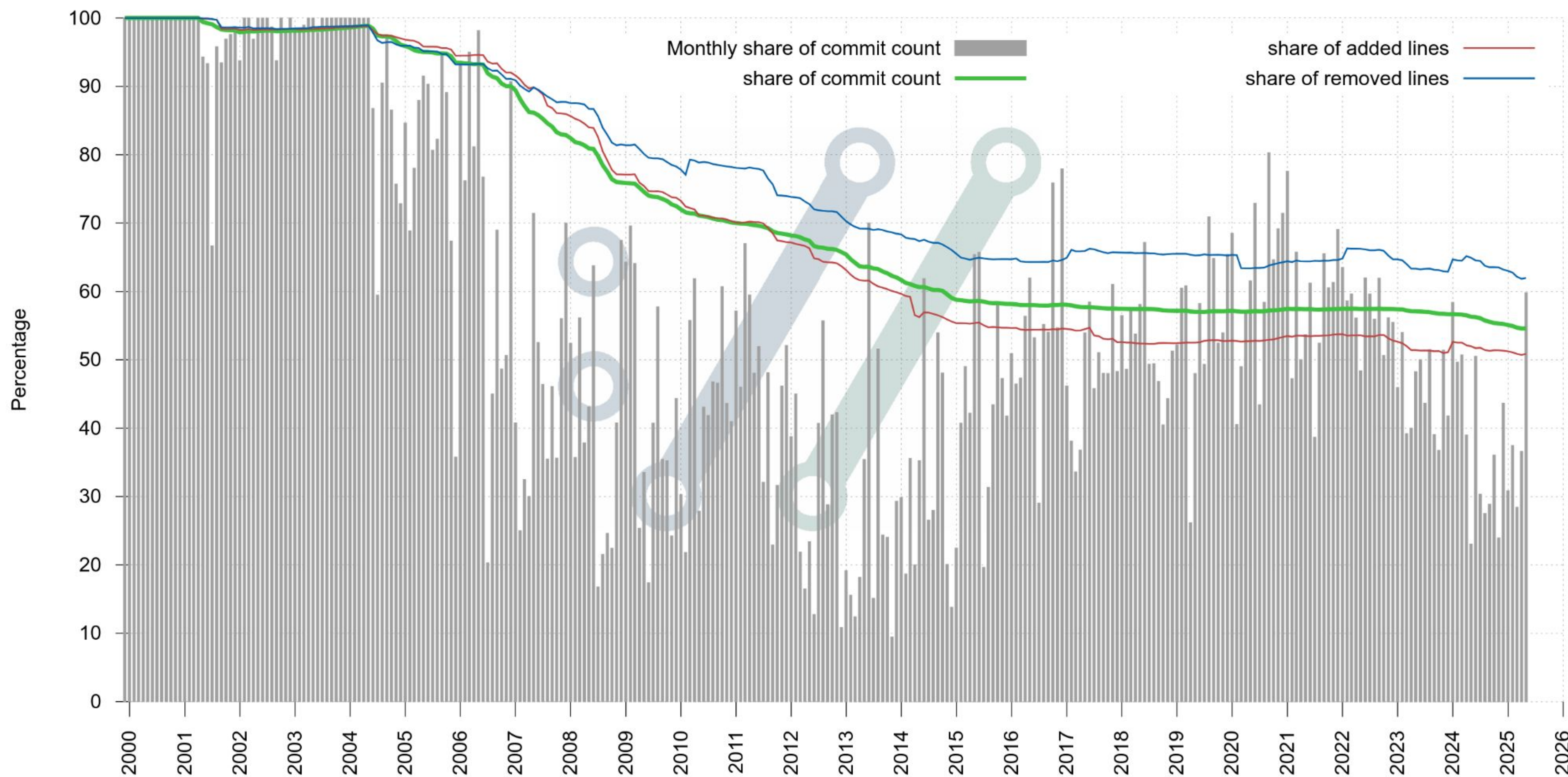
curl bug bounty

86,000 USD

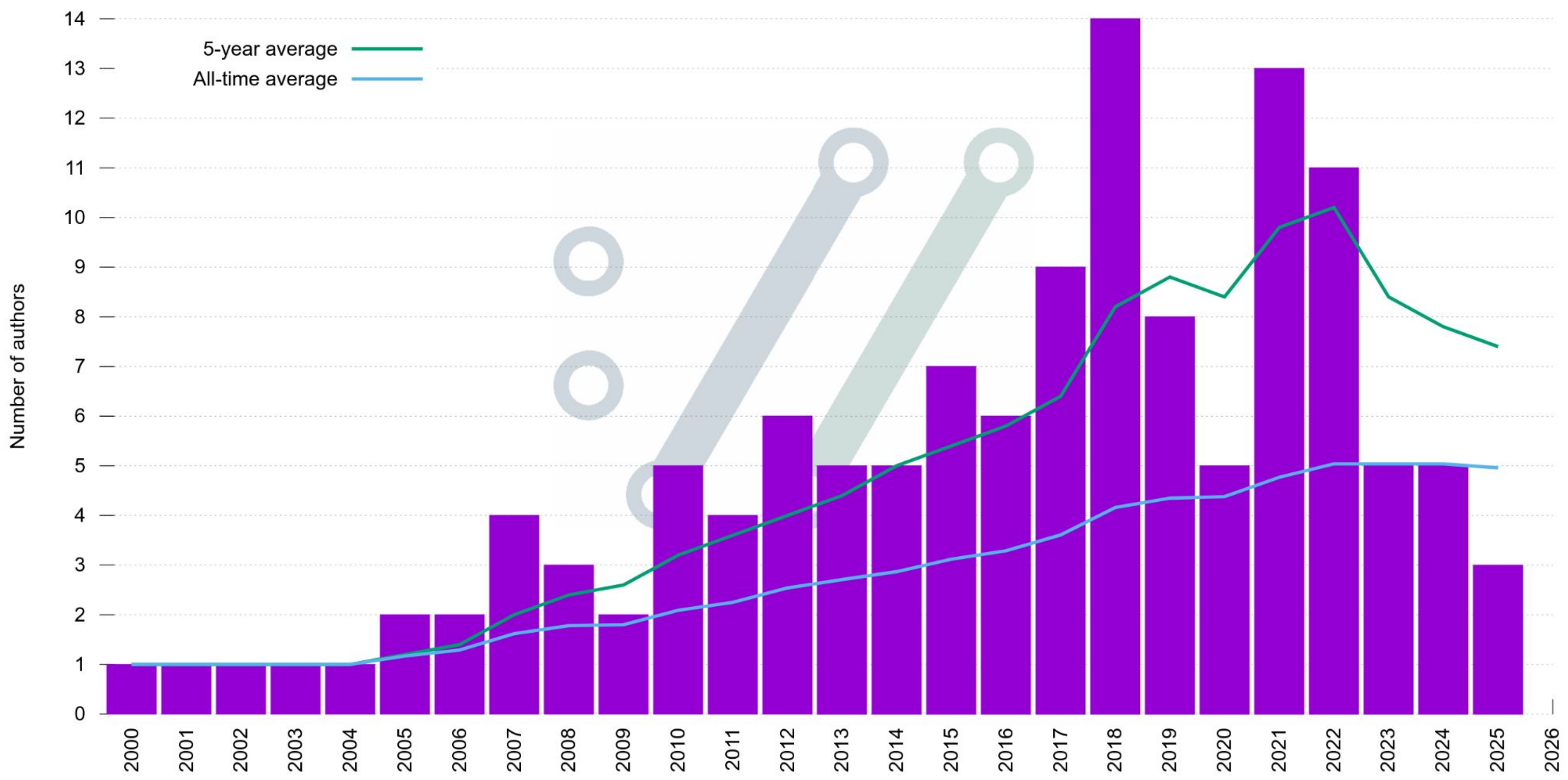
Let's make it personal

This is the lead
developer of this project

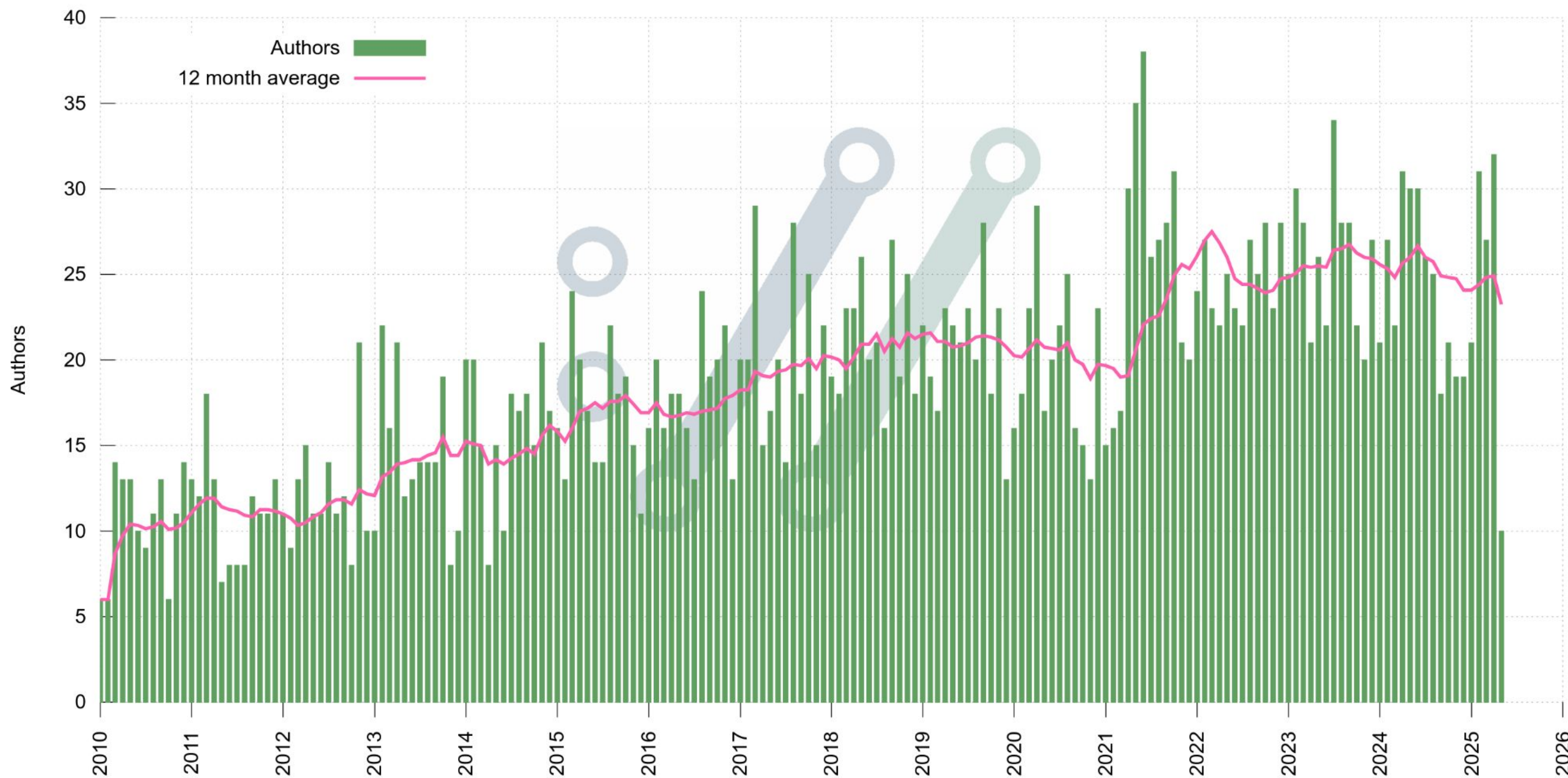
Daniel Stenberg's share of authored commits



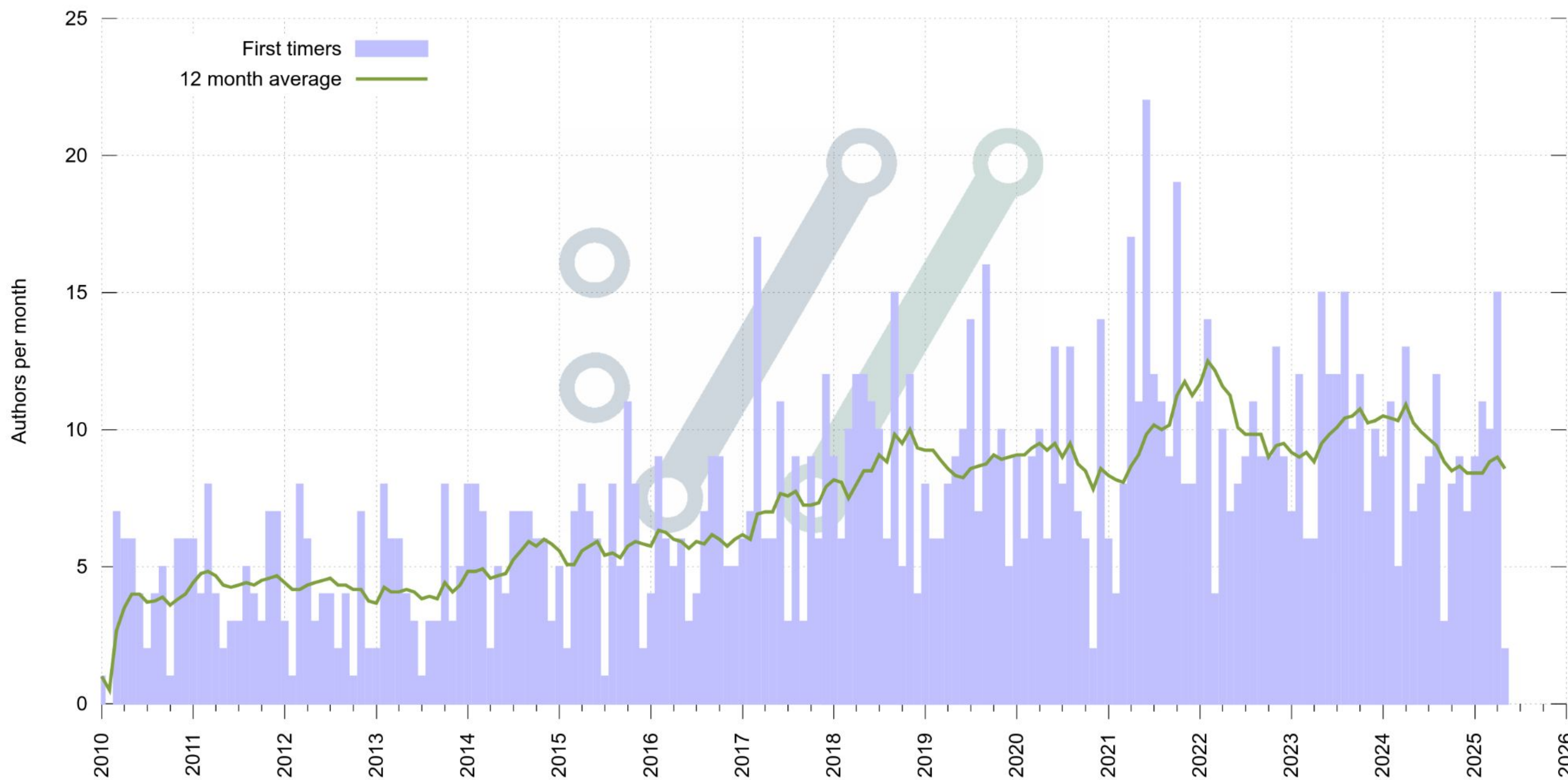
Number of persons authoring 80% of the commits



Authors per month



First time commit authors



I still lead the development

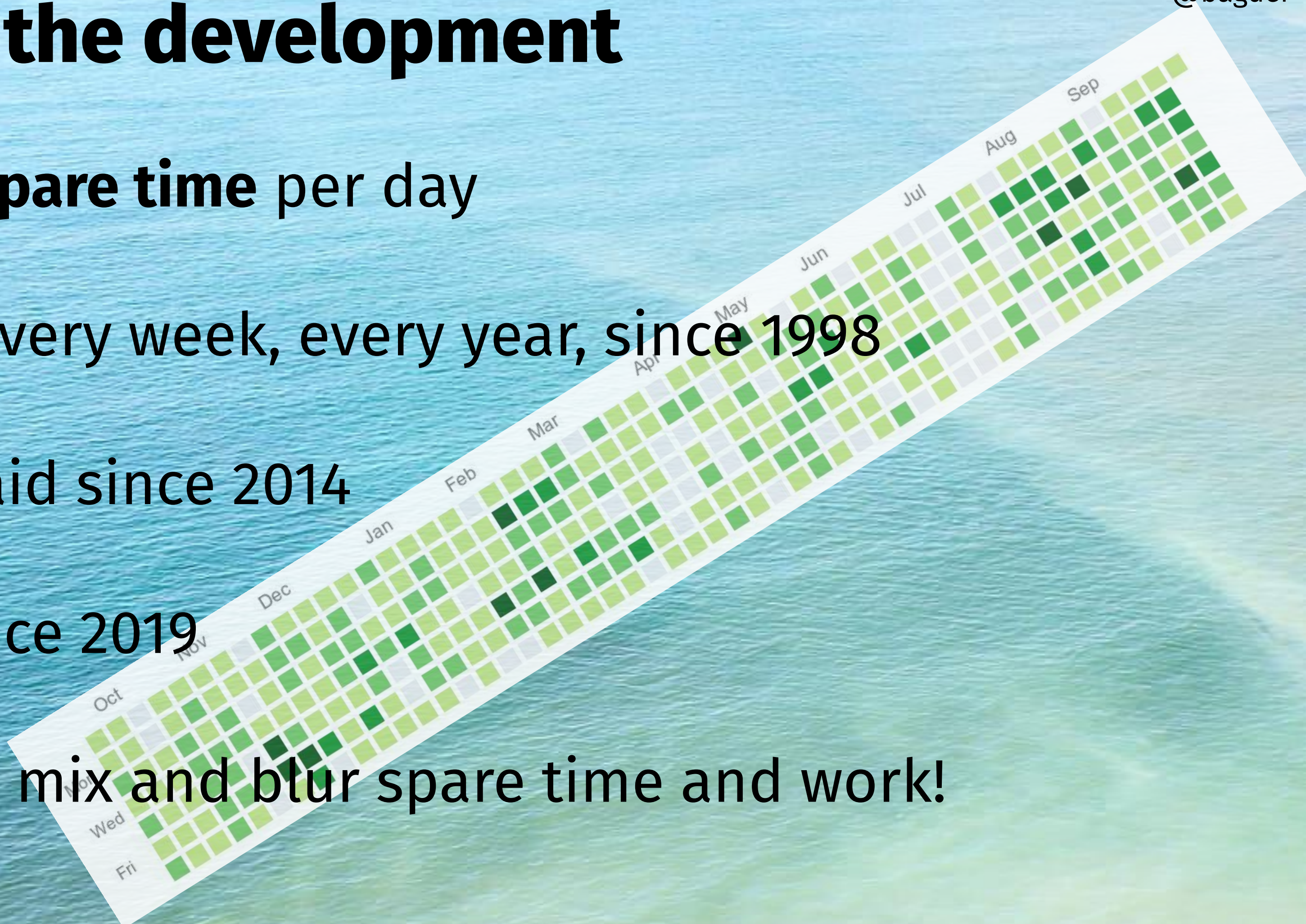
Two hours **spare time** per day

Every day, every week, every year, since 1998

Part time paid since 2014

Full time since 2019

Yes, I totally mix and blur spare time and work!



What's maintaining?

Security issues

Release management

Web site admin

Mailing list admin

PR reviewing

User support

Blogging about it

People management

Debugging

PR merging

CI/test maintenance

Find sponsors/money

Feature development

Write documentation

Event planning

Getting stickers

Doing talks



How to keep up motivation?

Knowing it is widely used is a boost

Accept that motivation comes and goes

Allow yourself silly detours

Set my own priorities

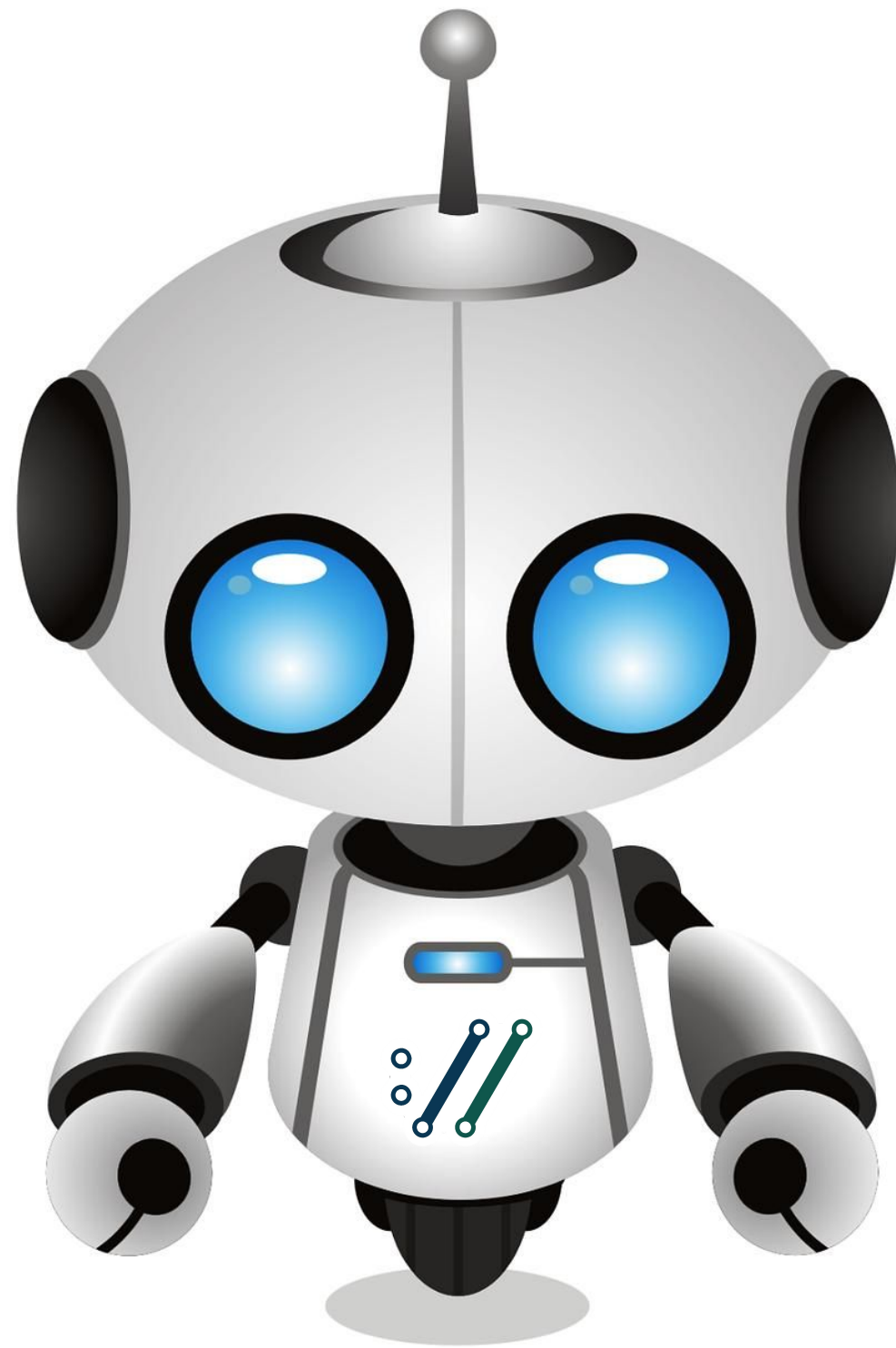
Community and positive feedback

“The created economic value
cannot be overstated.”



Where does the road lead from here?

Future



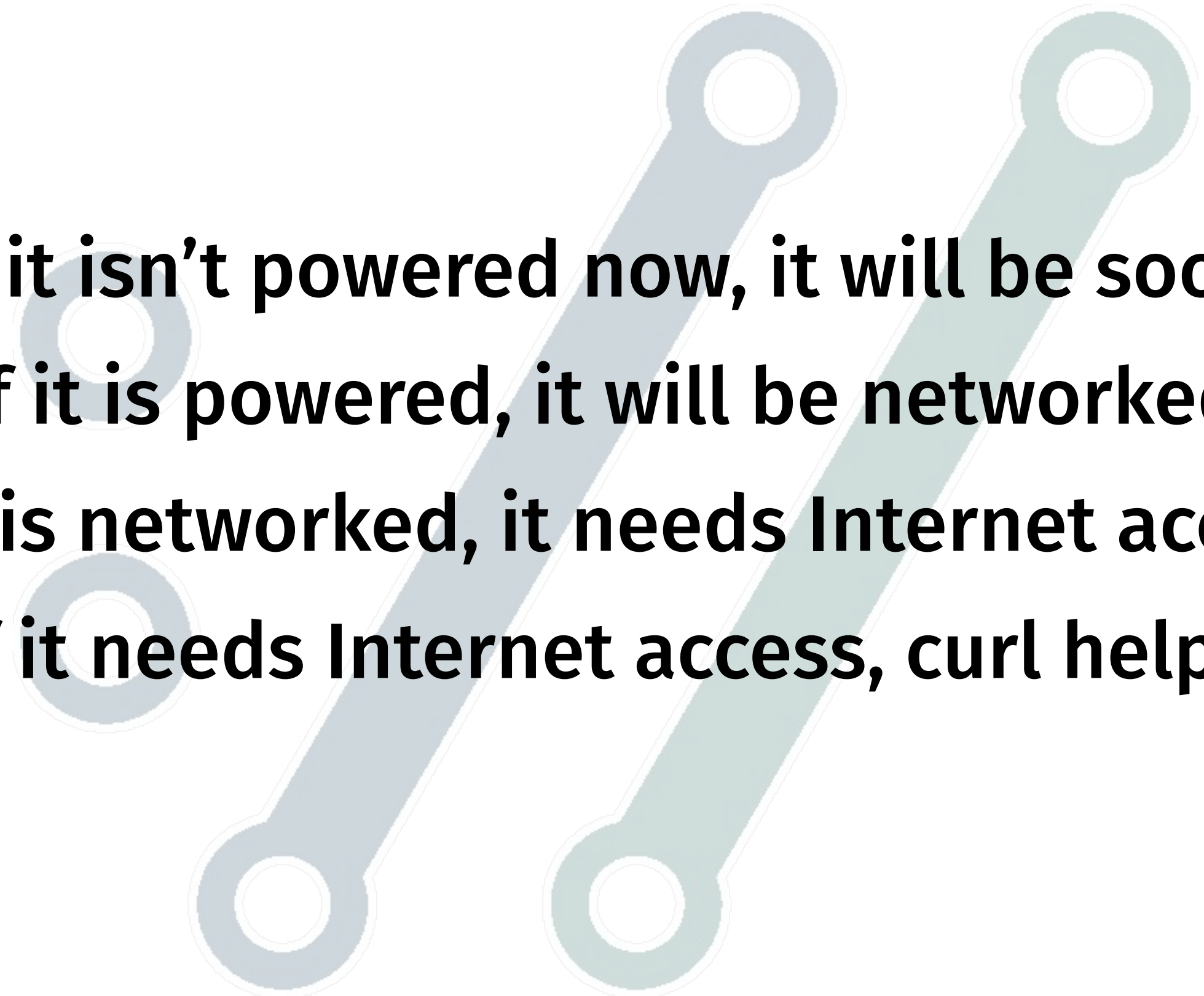
Everything eventually runs curl

If it isn't powered now, it will be soon

If it is powered, it will be networked

If it is networked, it needs Internet access

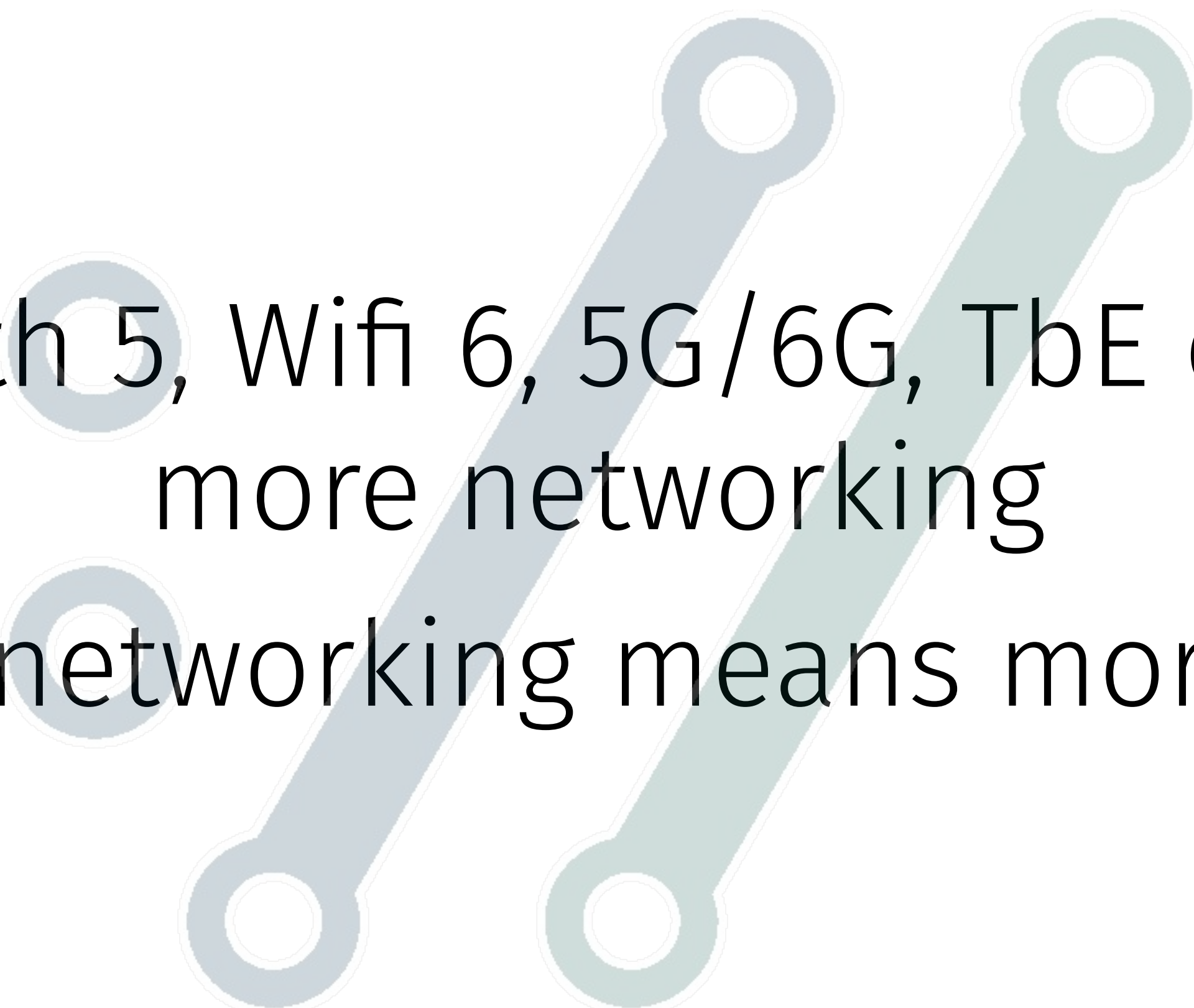
If it needs Internet access, curl helps



Everything will be networked

sewing machine, microwave, advertisement sign, kitchen scale, electric razor, kitchen oven, fan, dog collar, bicycle computer, power plug, piano, child monitor, radiator, vacuum cleaner, escooter, lawn mower, air conditioner, printer, projector, kettle, bluray player, set top box, computer monitor, alarm clock, clothes iron, powertool, exercise equipment, mouse, wifi router, car, headphones, electric toothbrush, bluetooth speaker, air purifier, doorbell, watch, game console, keychain fob, flashlight, ebook-tablet, washing machine, stereo equipment, ebikes, tv, toaster, thermostat, door lock, drilling machine, fridge and freezer, lamp switch, clothing, bathroom scale, camera, smart phone, garage door opener, medical device, bus-stop sign, stove, blender, light bulb, tablet

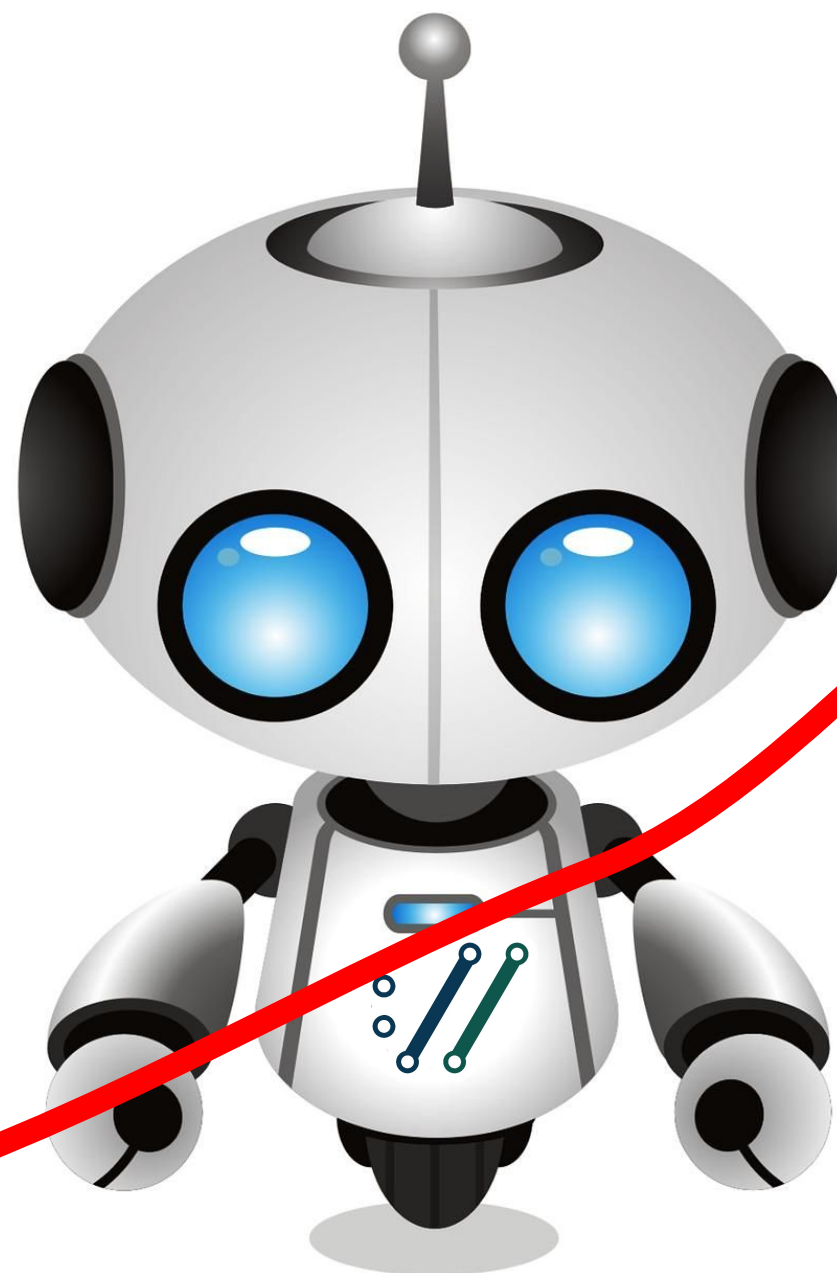
All network technologies



Bluetooth 5, Wifi 6, 5G/6G, TbE etc drive
more networking

More networking means more curl

MORE curl:// EVERYWHERE



STUFF

TIME

Future

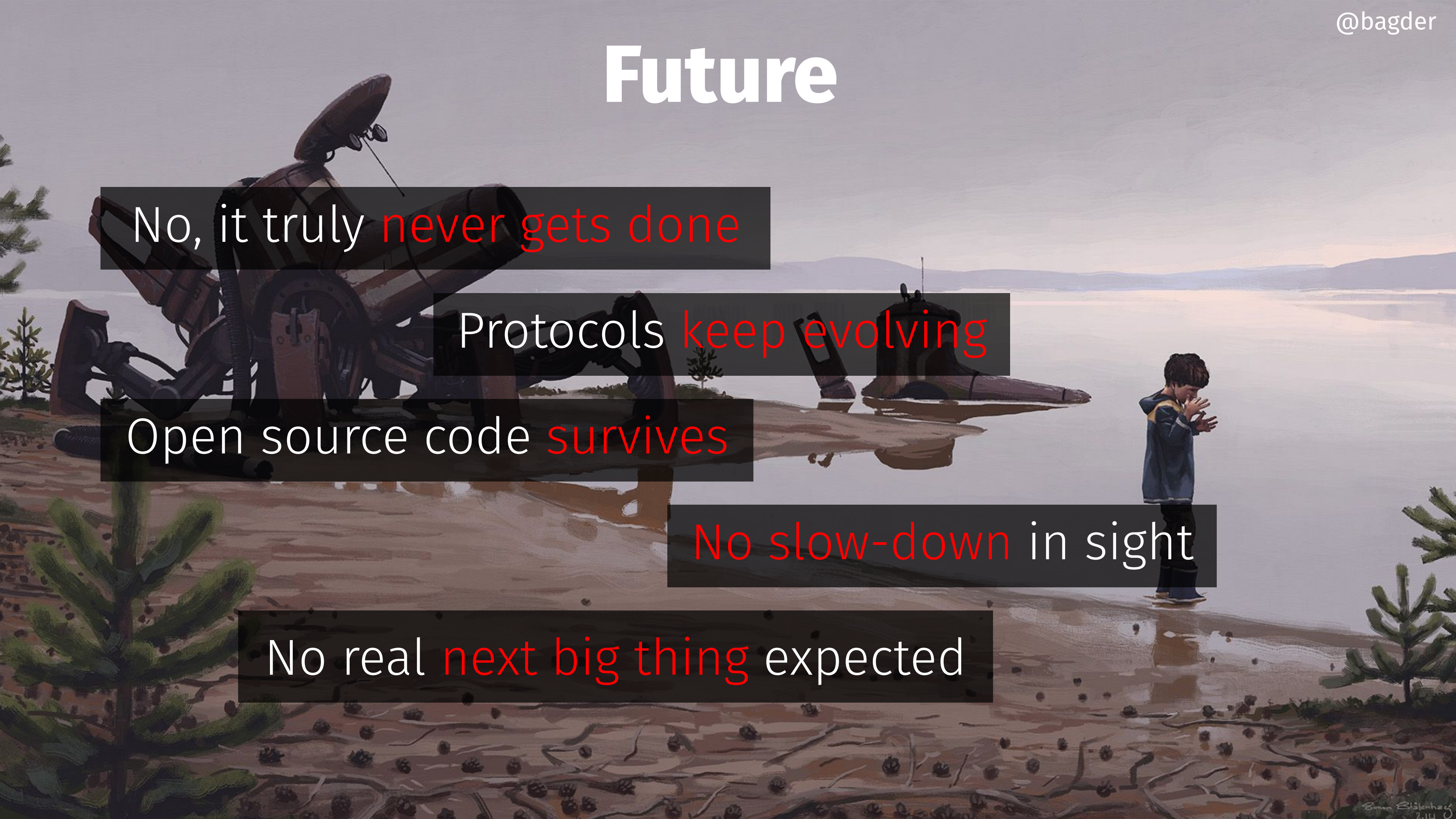
No, it truly **never** gets done

Protocols **keep** evolving

Open source code **survives**

No **slow-down** in sight

No real **next big thing** expected



Everything

curl!!!

<https://everything.curl.dev/>

The complete guide to all there is
to know about the curl project

Daniel Stenberg

You can help!



Thank you!

Questions?

Daniel Stenberg

@bagder

<https://daniel.haxx.se/>



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