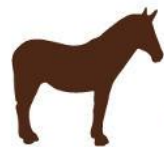


# curl: // up



**sticker**mule



FACULTY  
OF MATHEMATICS  
AND PHYSICS  
Charles University



**wolf**SSL





**The state of curl 2019**

# **The curl project 2019**



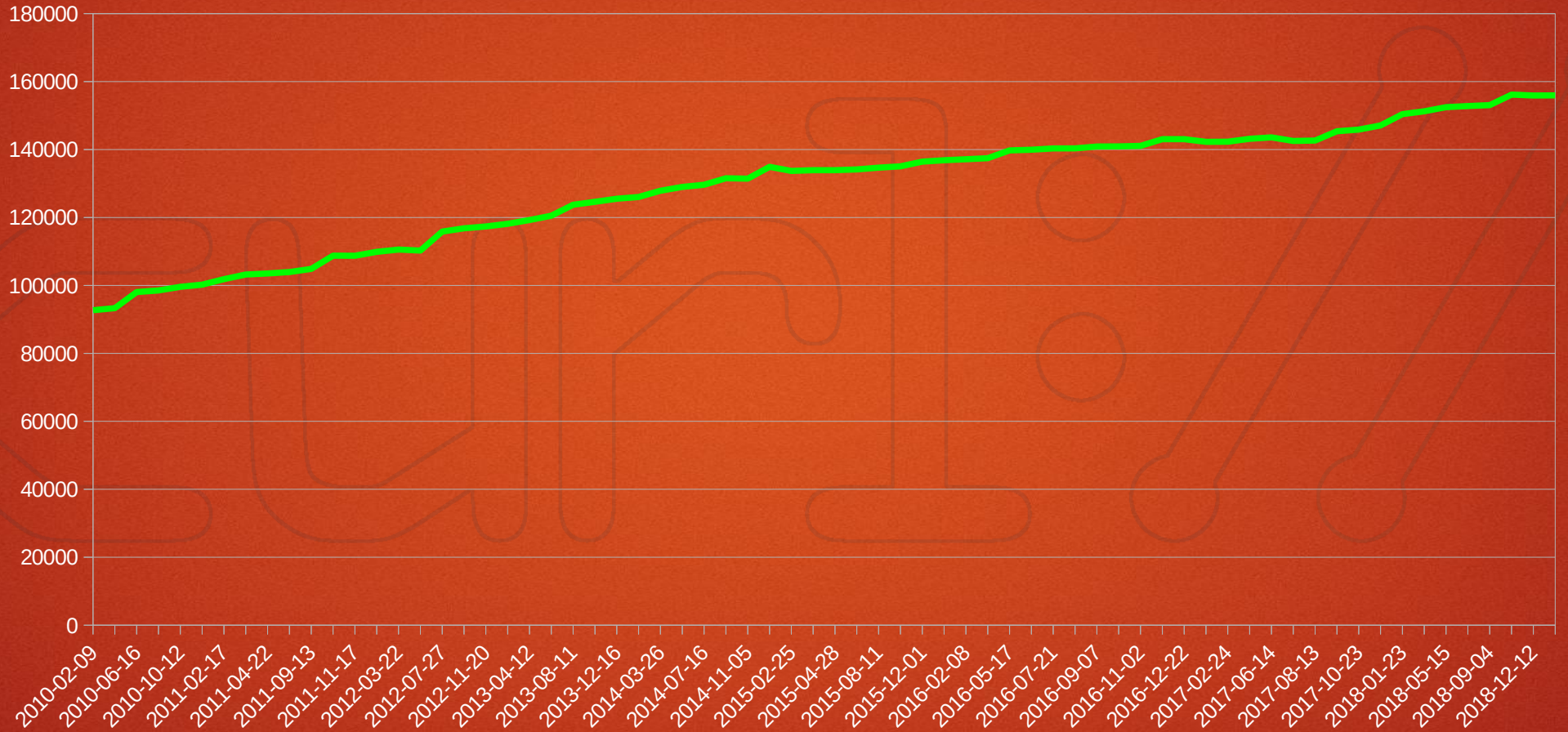
# Stats

Mostly from 2010 or later

Due to data availability

Represents “the modern curl project”

# Number of lines of “product code”





# Is a 160K a lot or a little?

A dozen TLS backends

Two SSH backends

Three name resolver backends

Feature packed; 221 command line options and 267 setopt() options

More portable than most

More compliant than most

More feature-packed than most

25% comments

# C!

Efficient and *portable*!

Some security problems could be avoided using something else

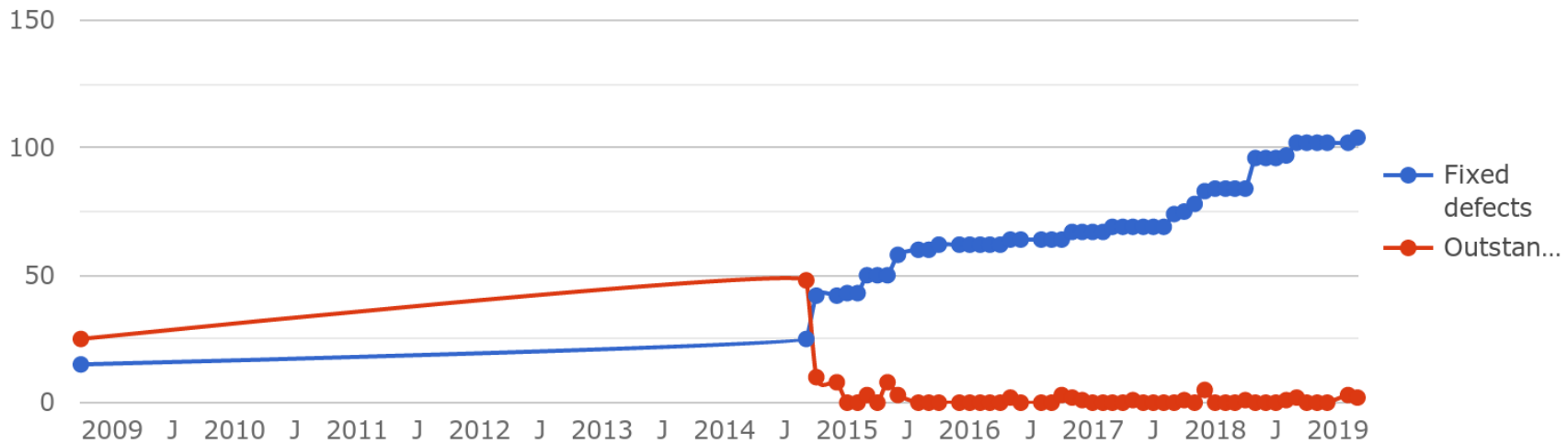
Lots of “reach” would then also be avoided

Mitigation: readable code, reviews, tests, fuzzing, static code analyzing



# Coverity on curl – fixed defects

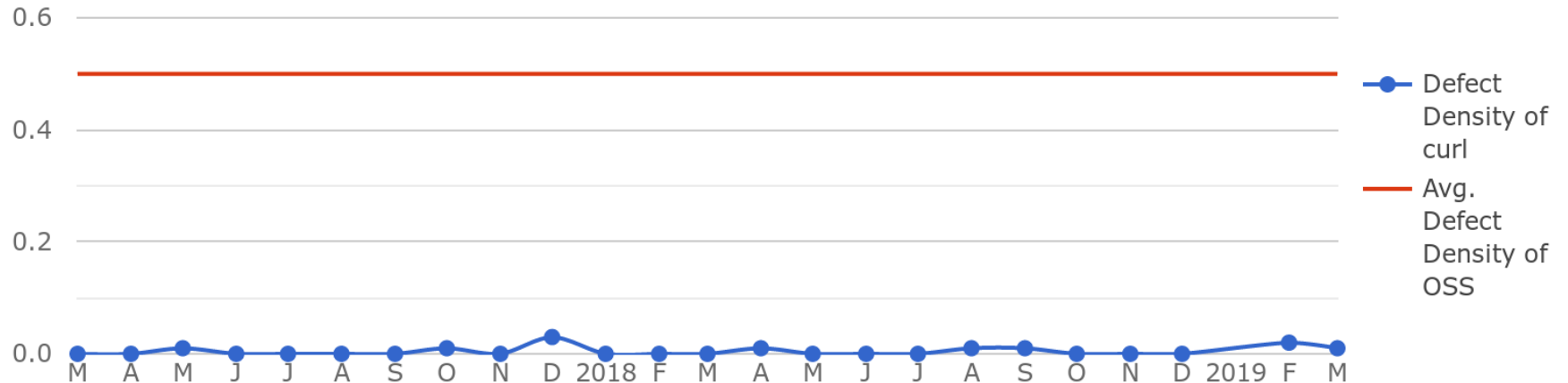
Outstanding vs Fixed defects over period of time





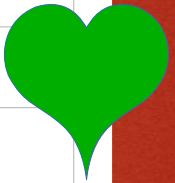
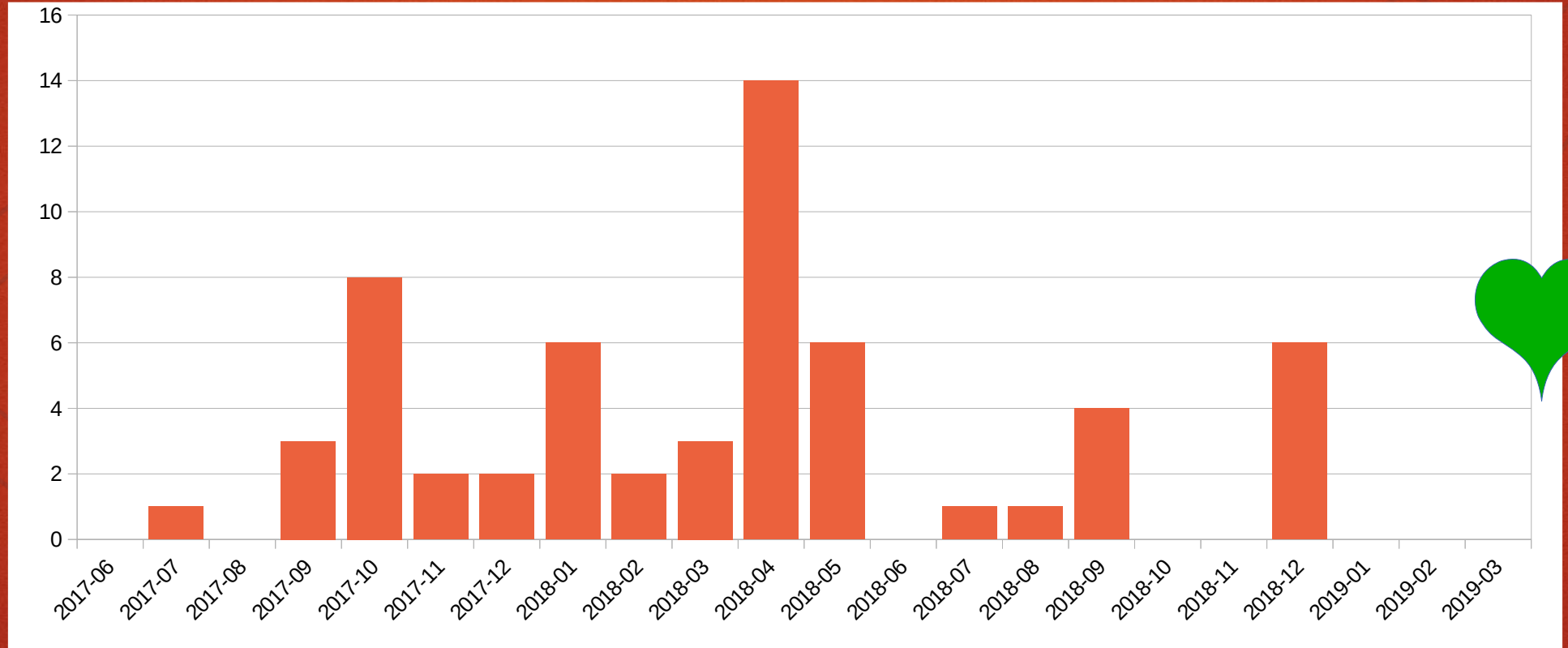
# Coverity on curl – defects over time

**Defect Density over period of time**

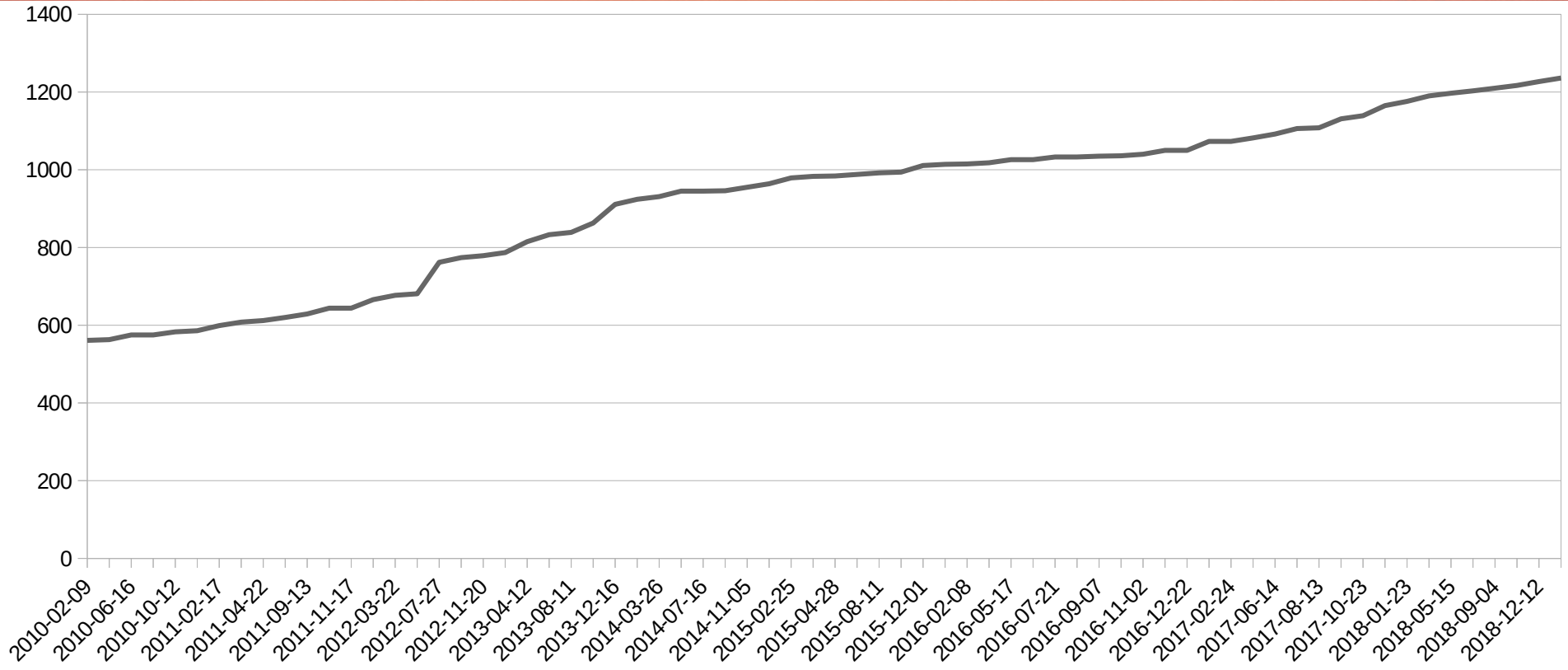


*The graph compares the defect density of the project with the average defect density of open source projects that are similar in size (i.e. 100,000 to 499,999 lines of code)*

# OSS-Fuzz reports over time

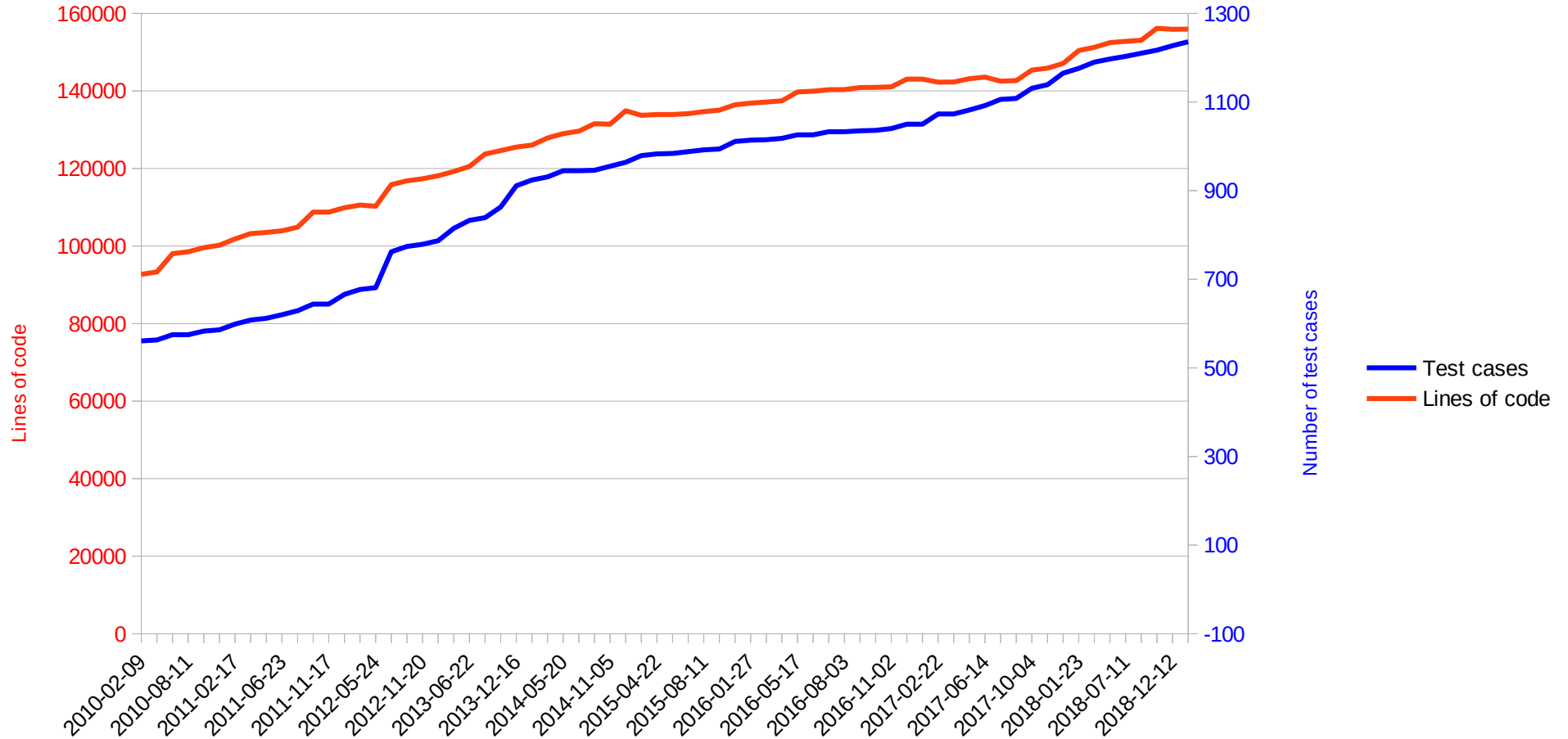


# Test cases over time

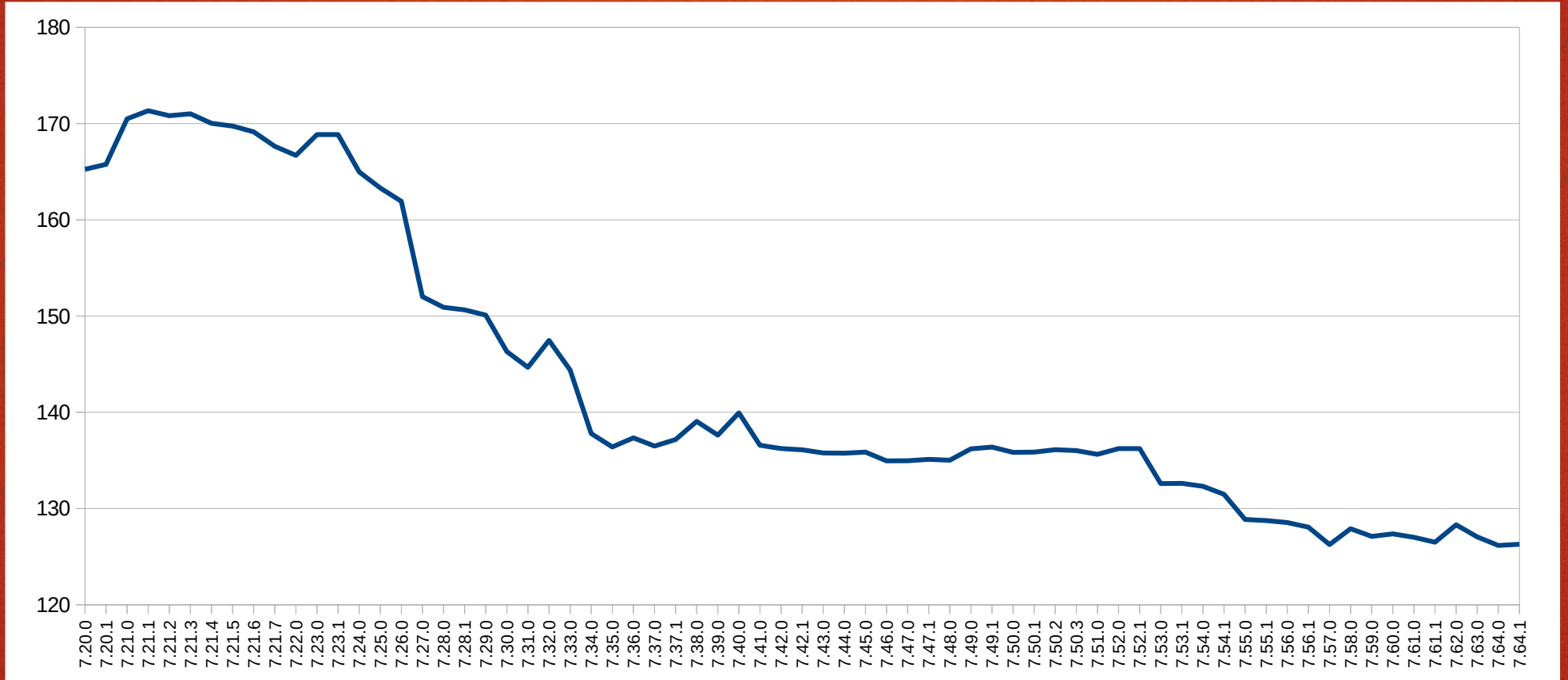




# Source vs tests over time



# Source lines per test file since 2010



The y-axis is not zero-based!

# Test coverage

Good to know, hard to measure

72 - 78% on coveralls.io

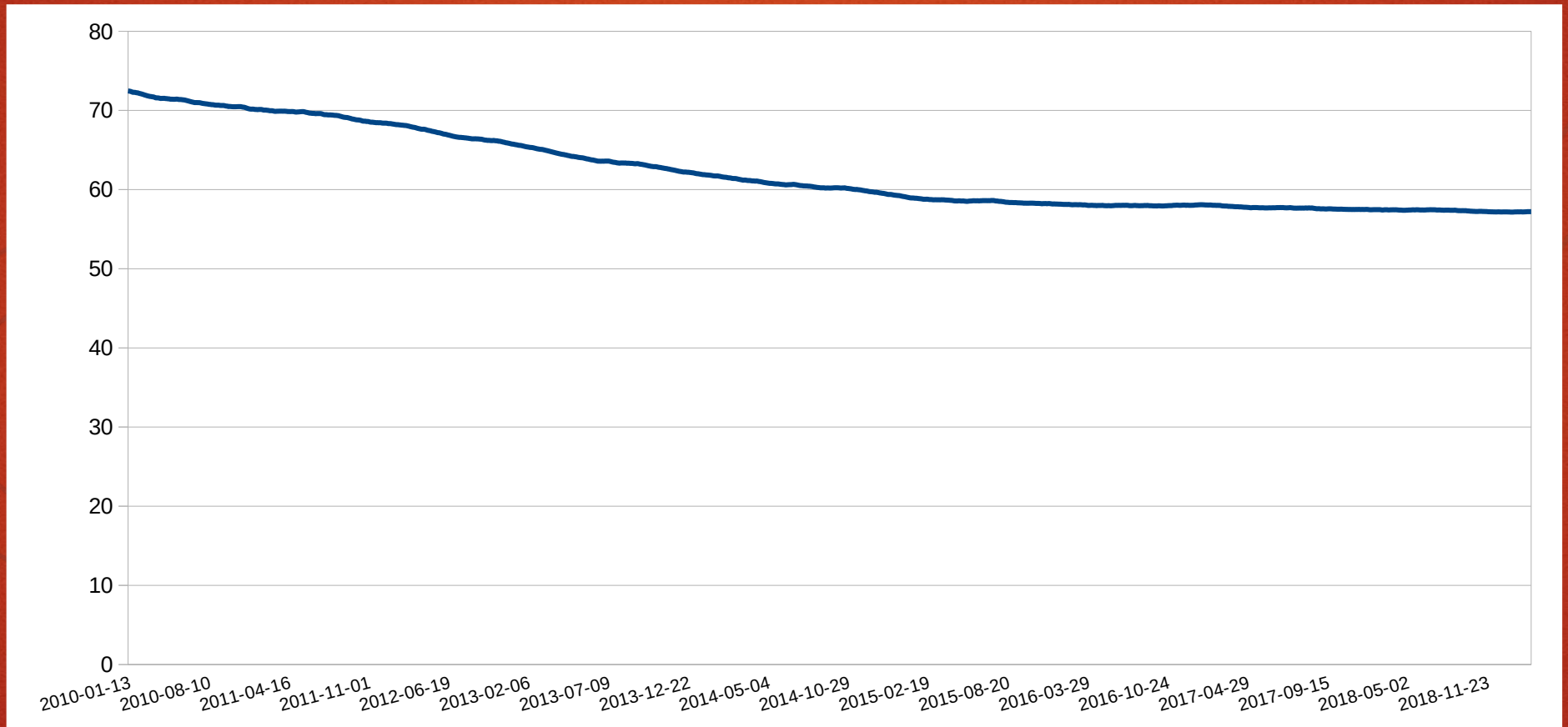
For a single TLS – SSH – resolver – config setup!

Some tests too slow for coverage runs in the cloud (torture)

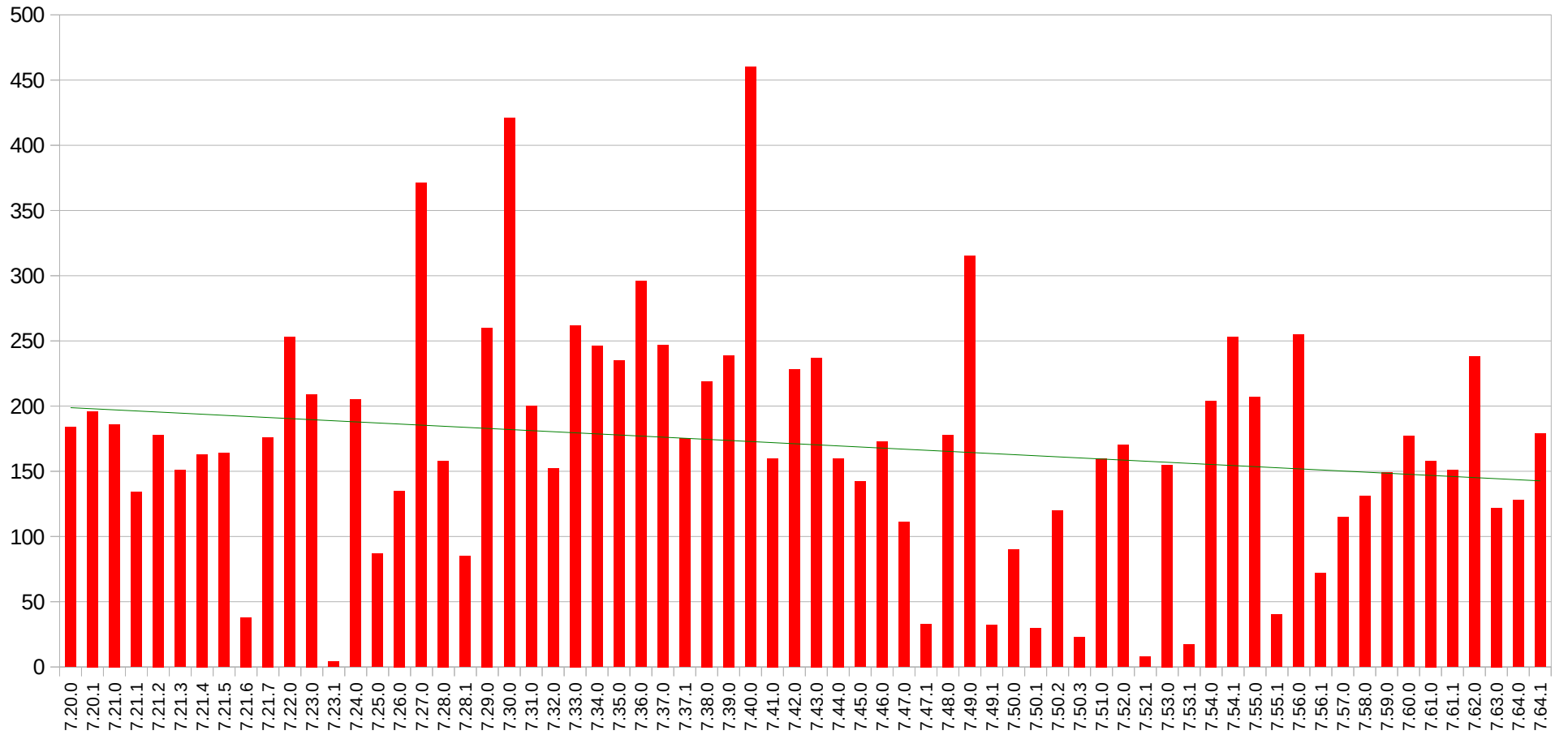
Some code paths still hard to test with existing test suite



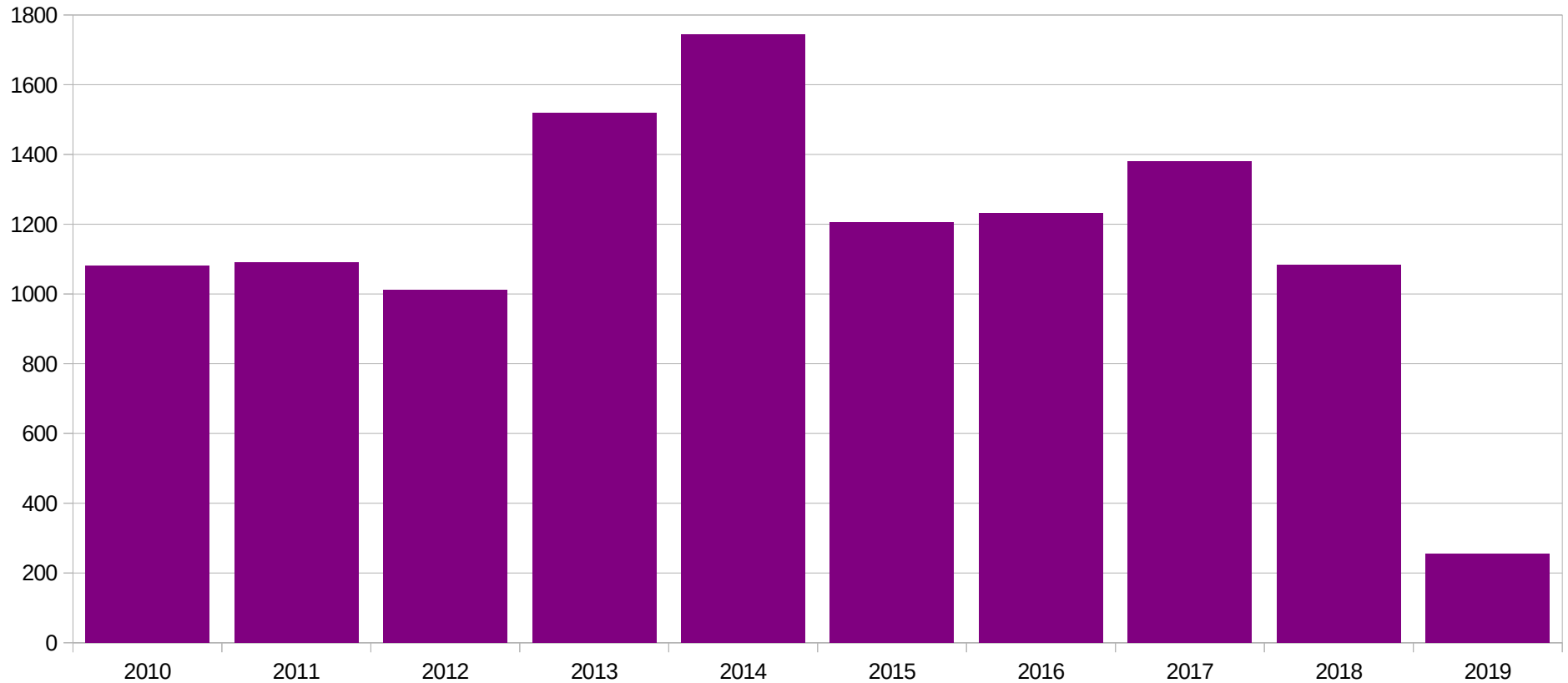
# Daniel's share of curl commits



# Commits per release since 2010

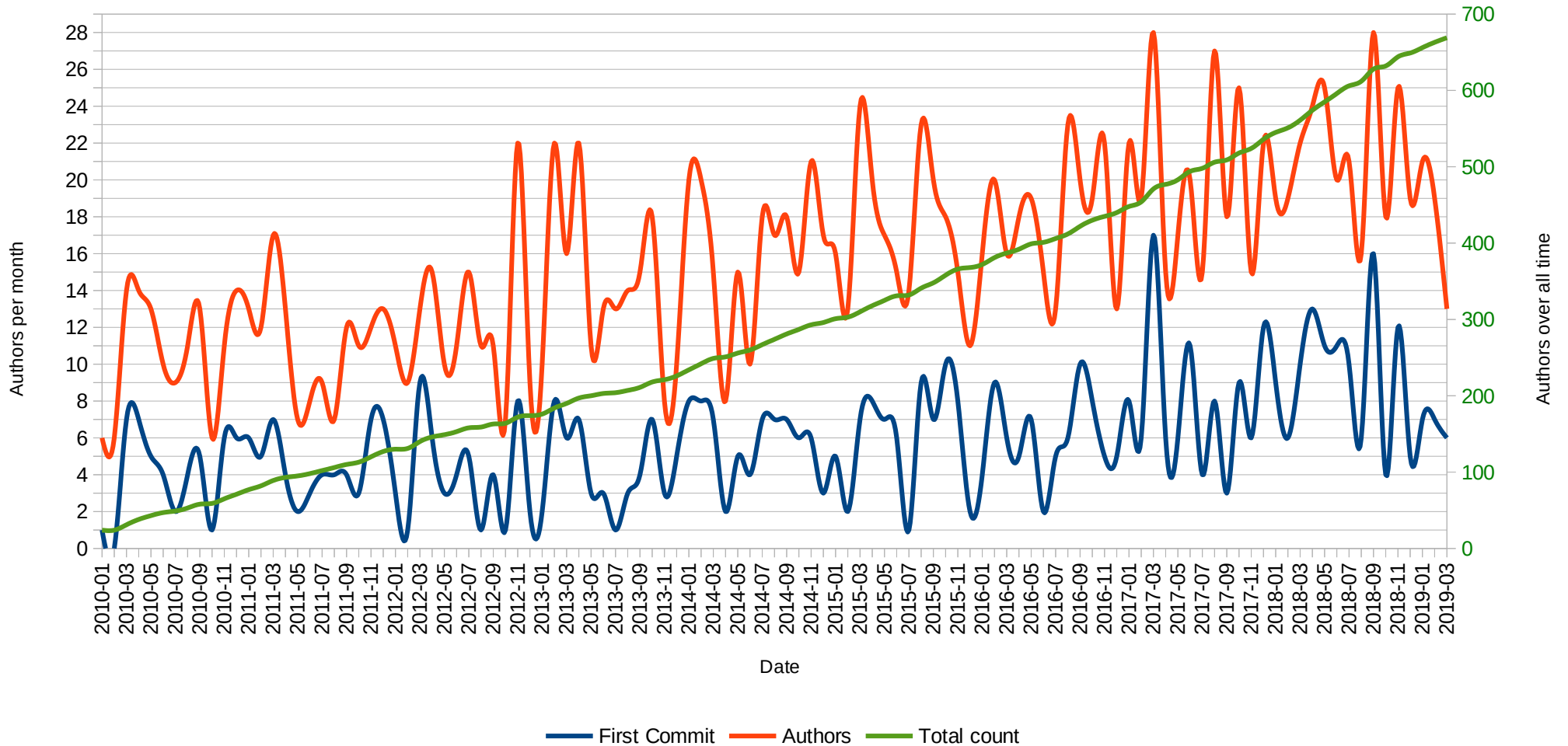


# Commits per year

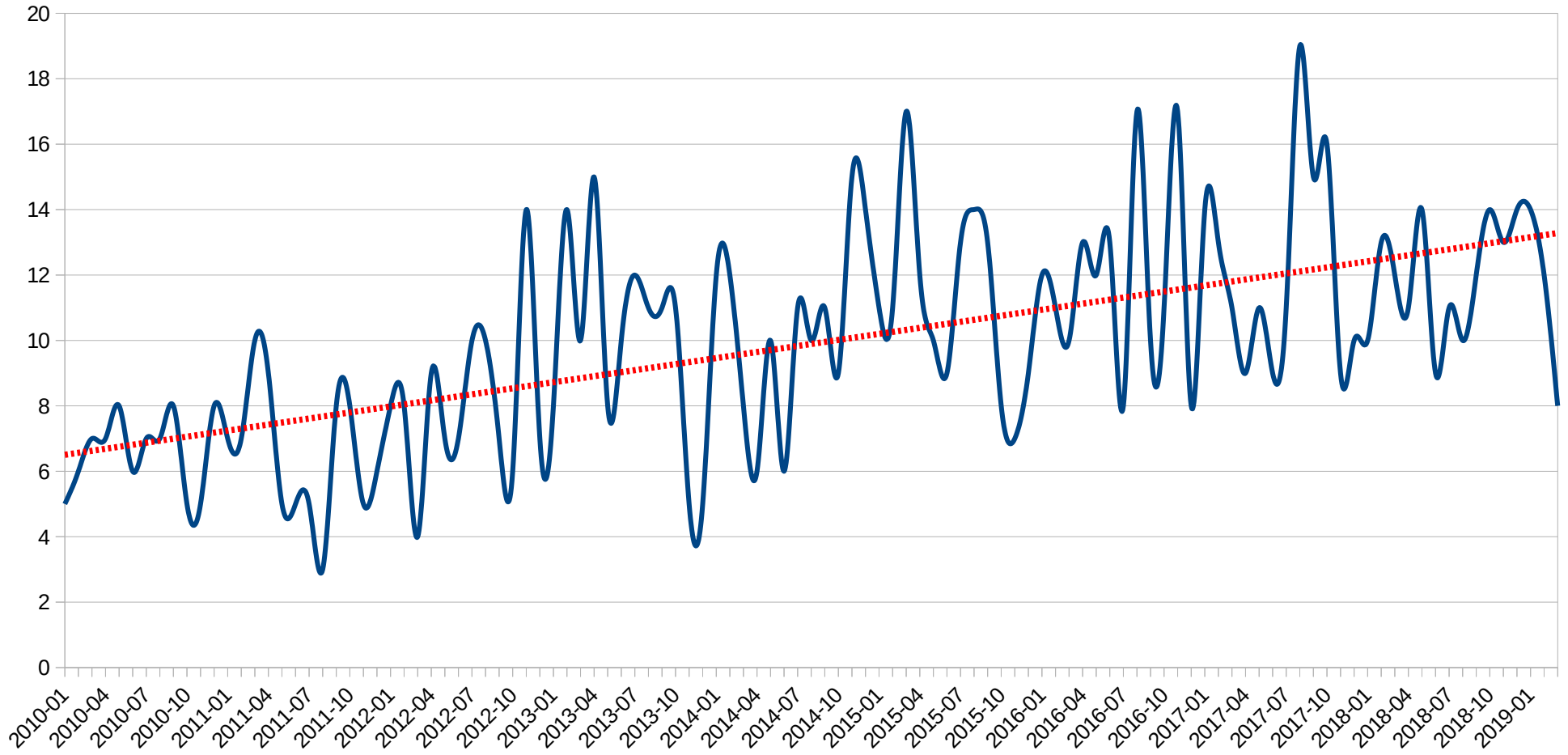




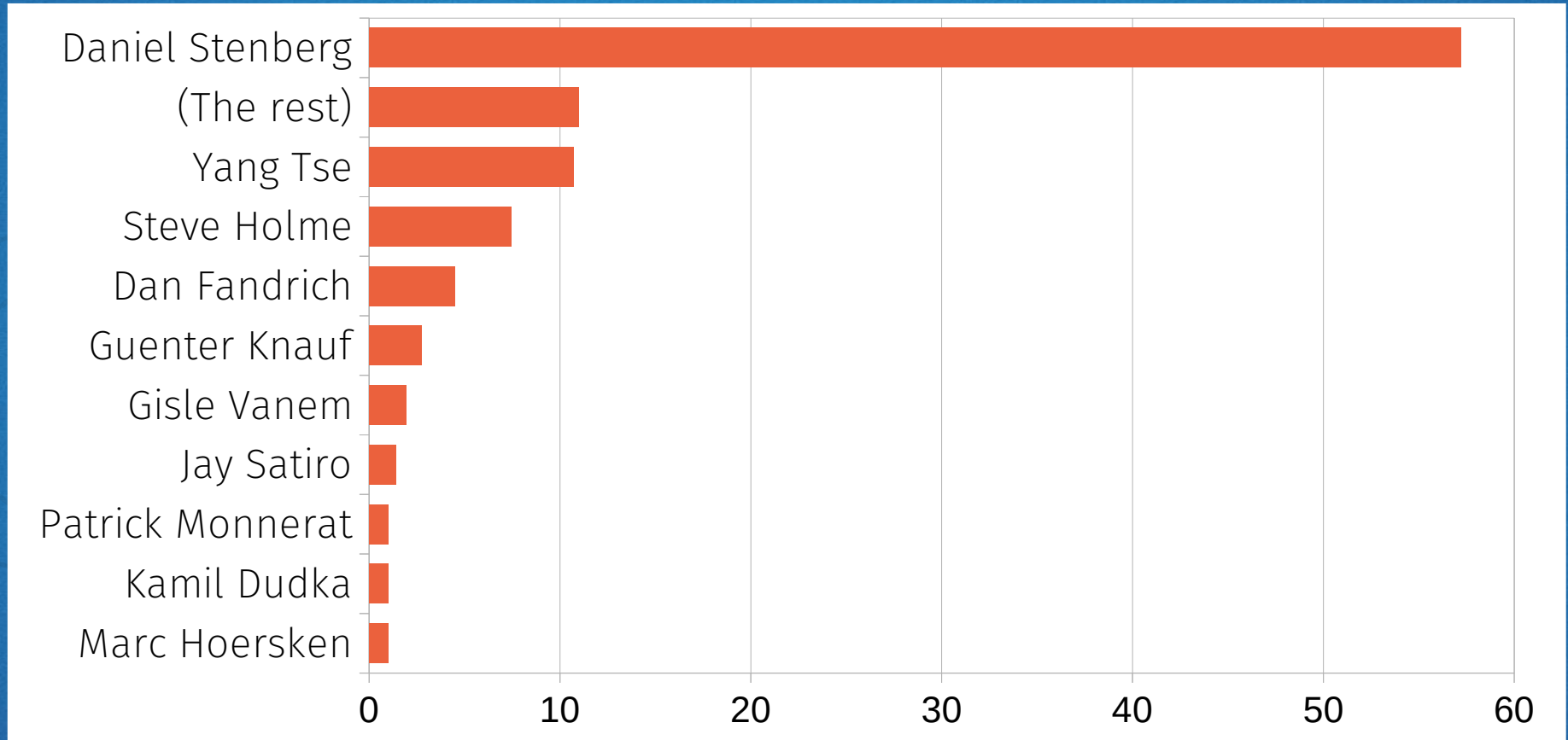
# Commit authors in curl since 2010



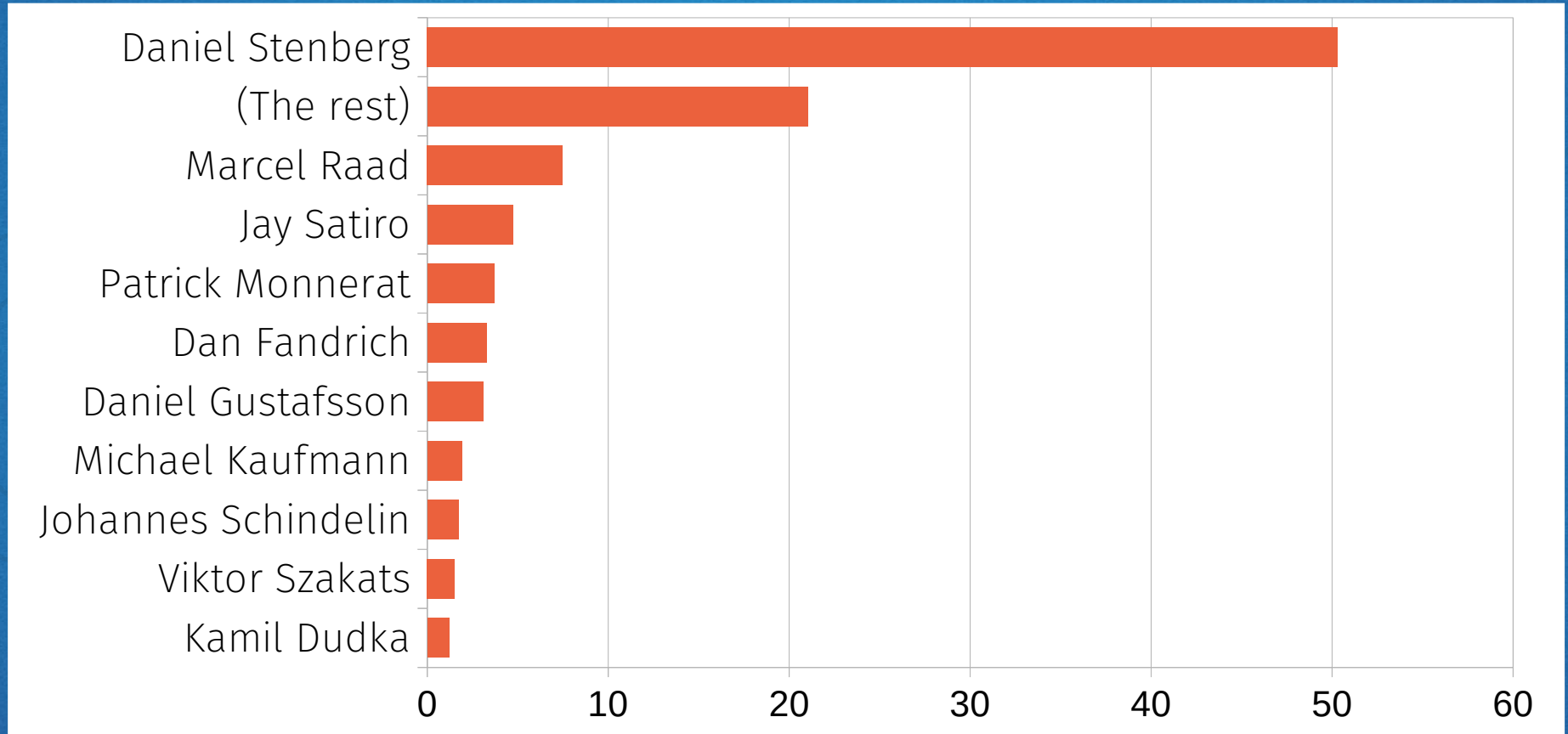
# Authors per month, excluding first-timers



# Top-10 commit author share since forever

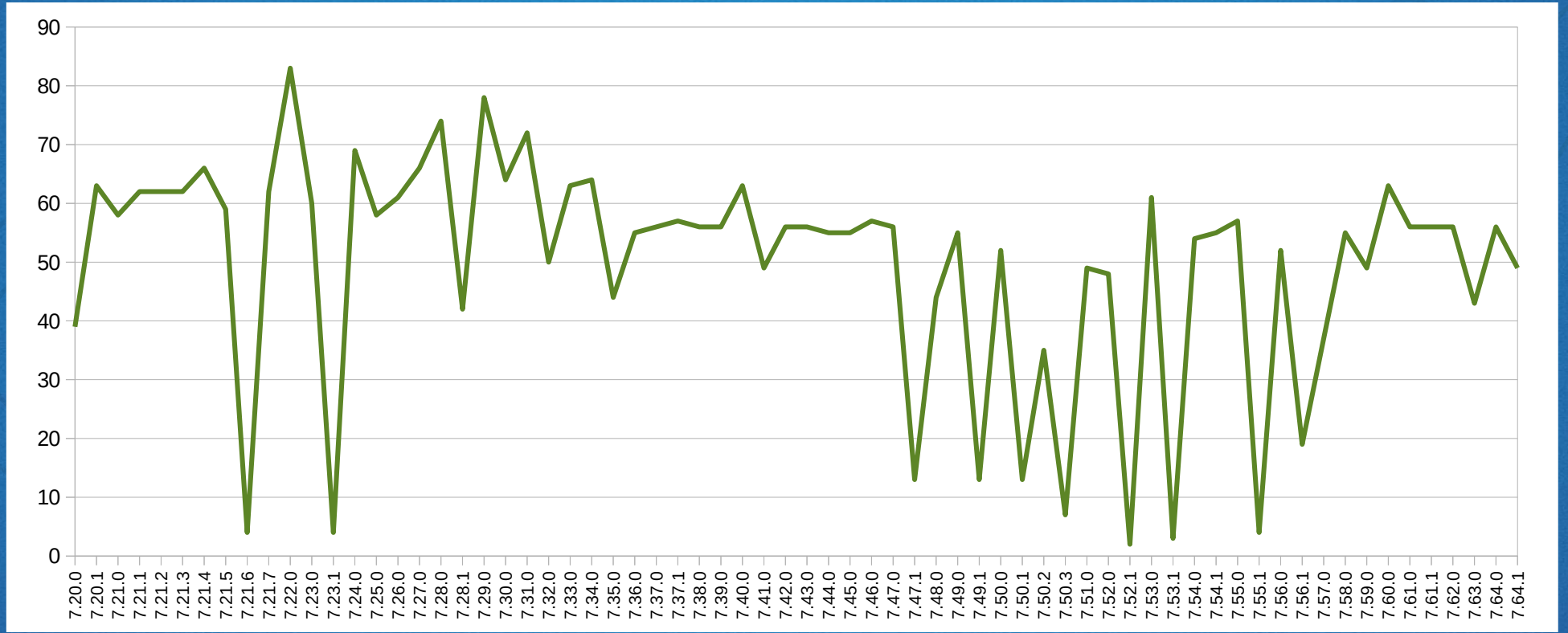


# Top-10 commit author share since 2017





# Days between curl releases since 2010



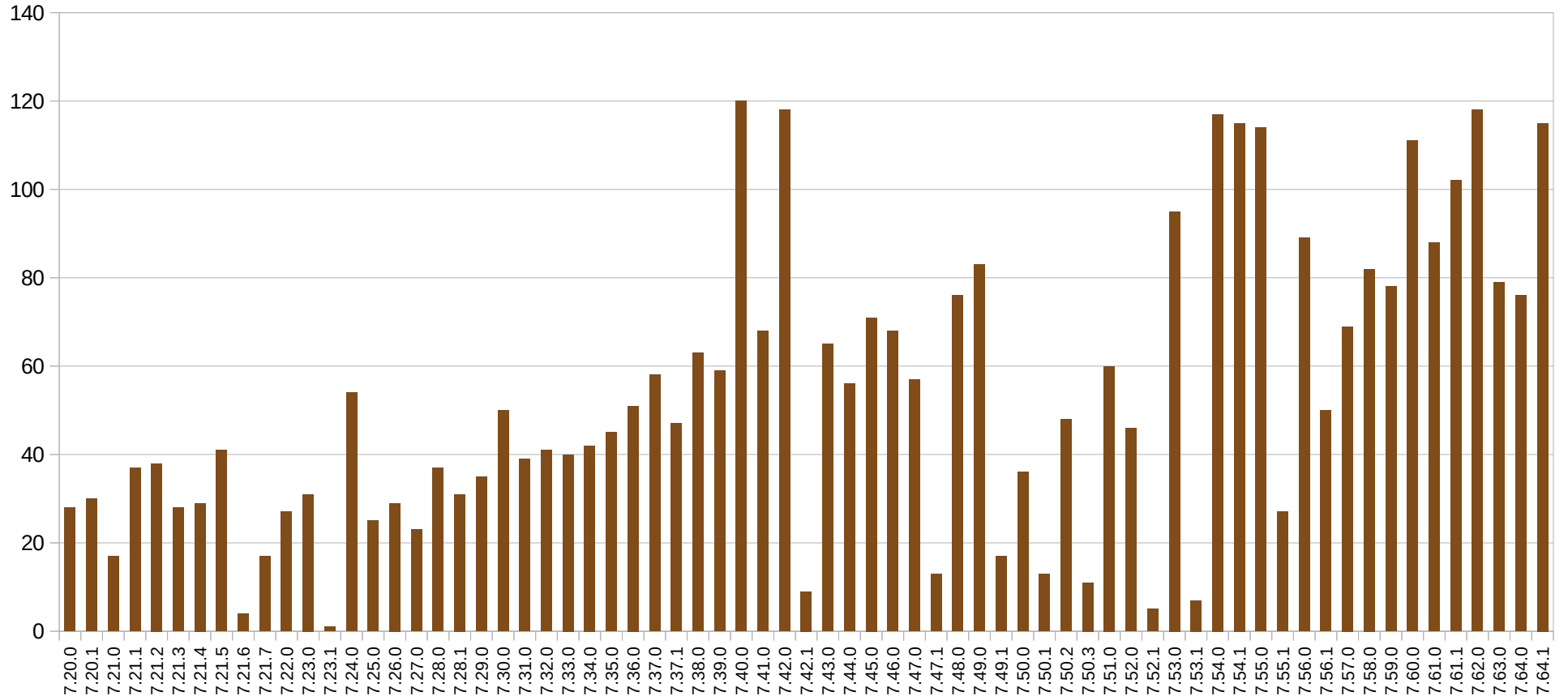
Average: 50

Median: 56

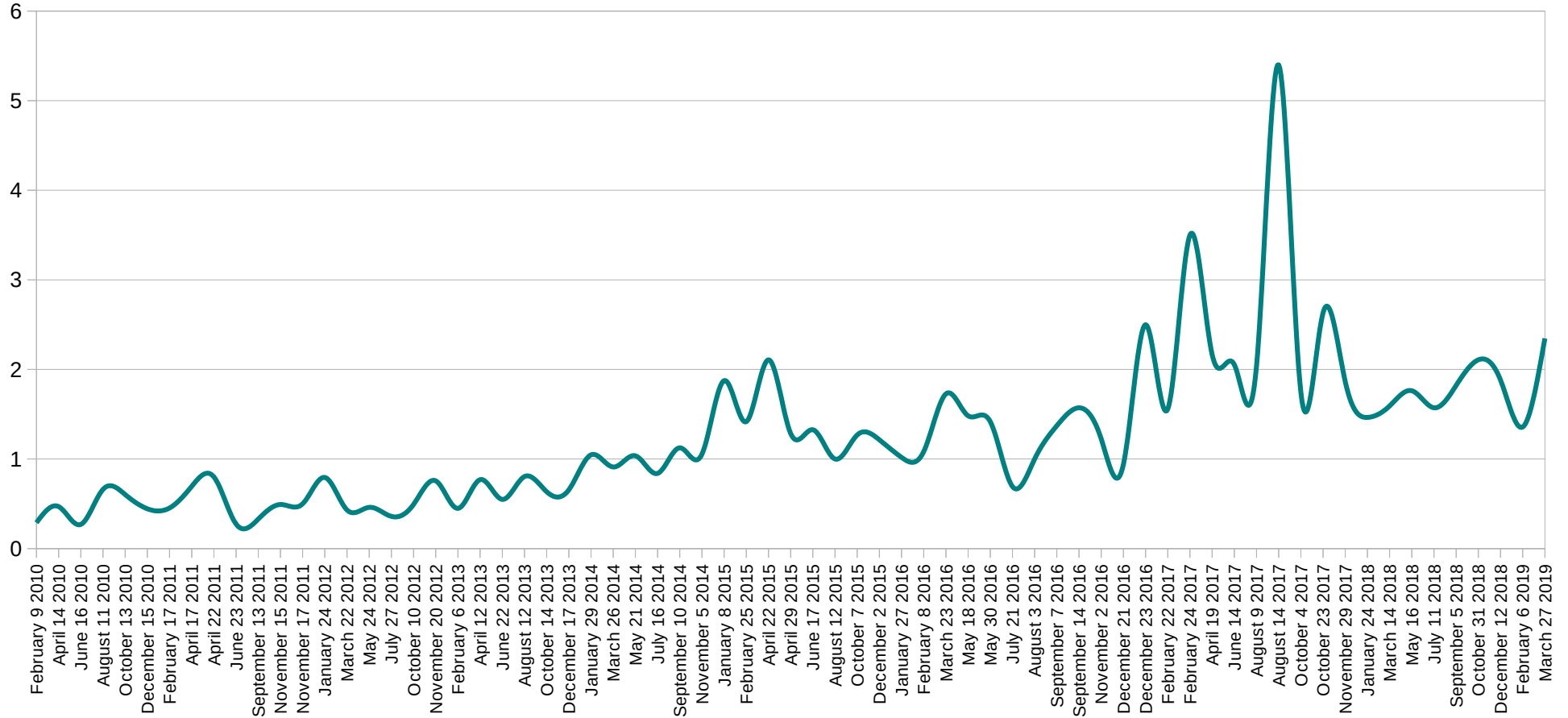
Max: 83

Min: 2

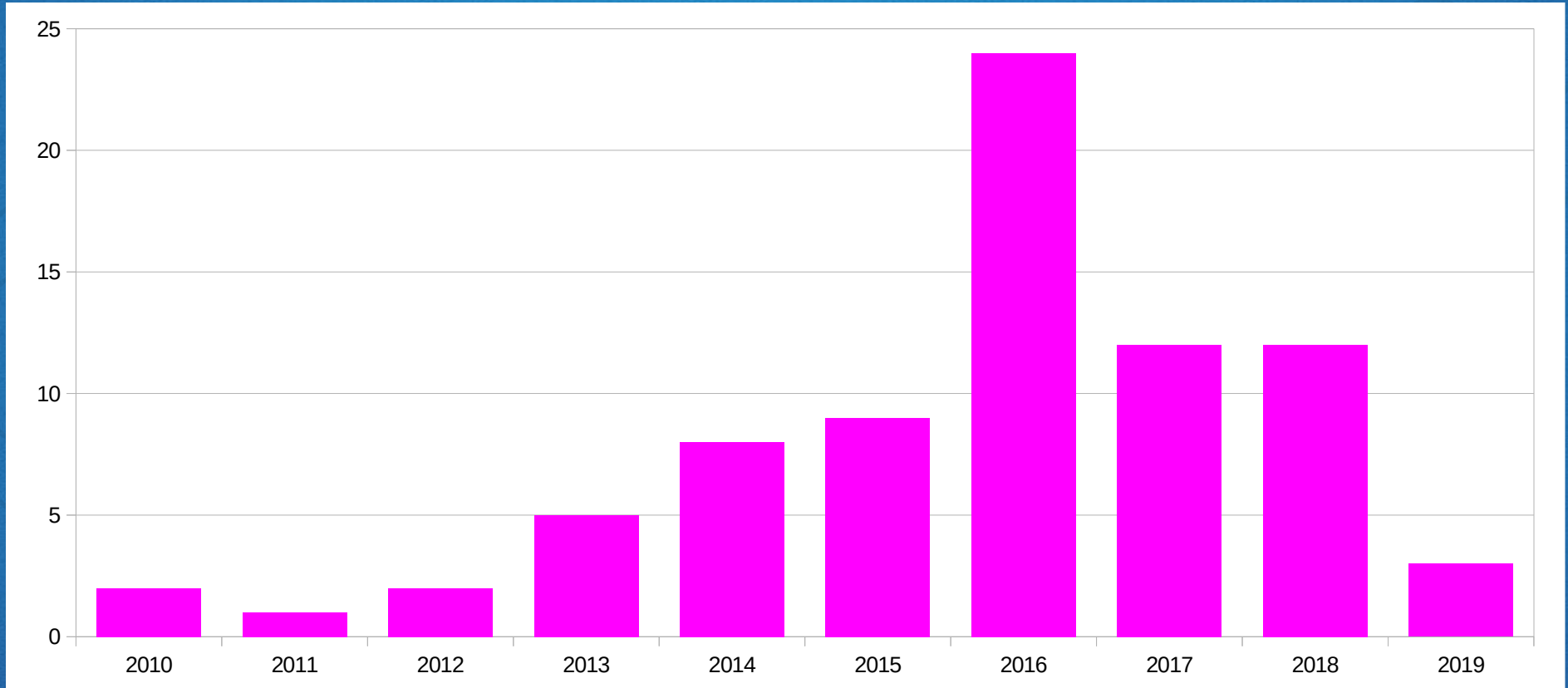
# Bug-fixes per release since 2010



# Bug-fixes per day since 2010



# Vulnerability reports since 2010





# Lessons from past vulnerabilities?

Integer overflows are tricky things – different architectures make them more so

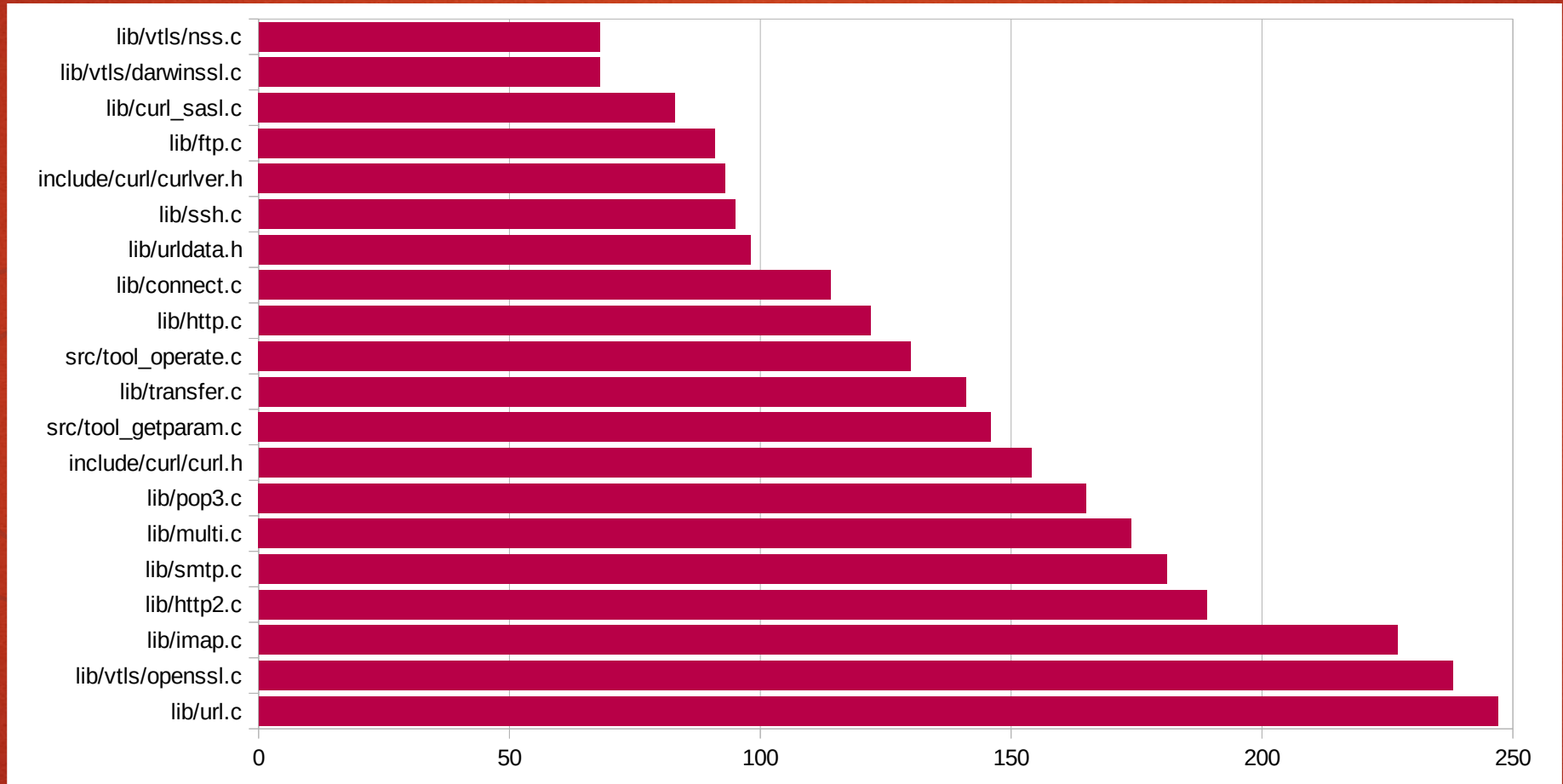
Most flaws linger in the code a long time until detected

Fuzzing is king

Fixing the flaws is usually straight-forward

Bug bounties can help

# Top-20 changed source files since 2010



# Annual user survey

What is used, what is ignored

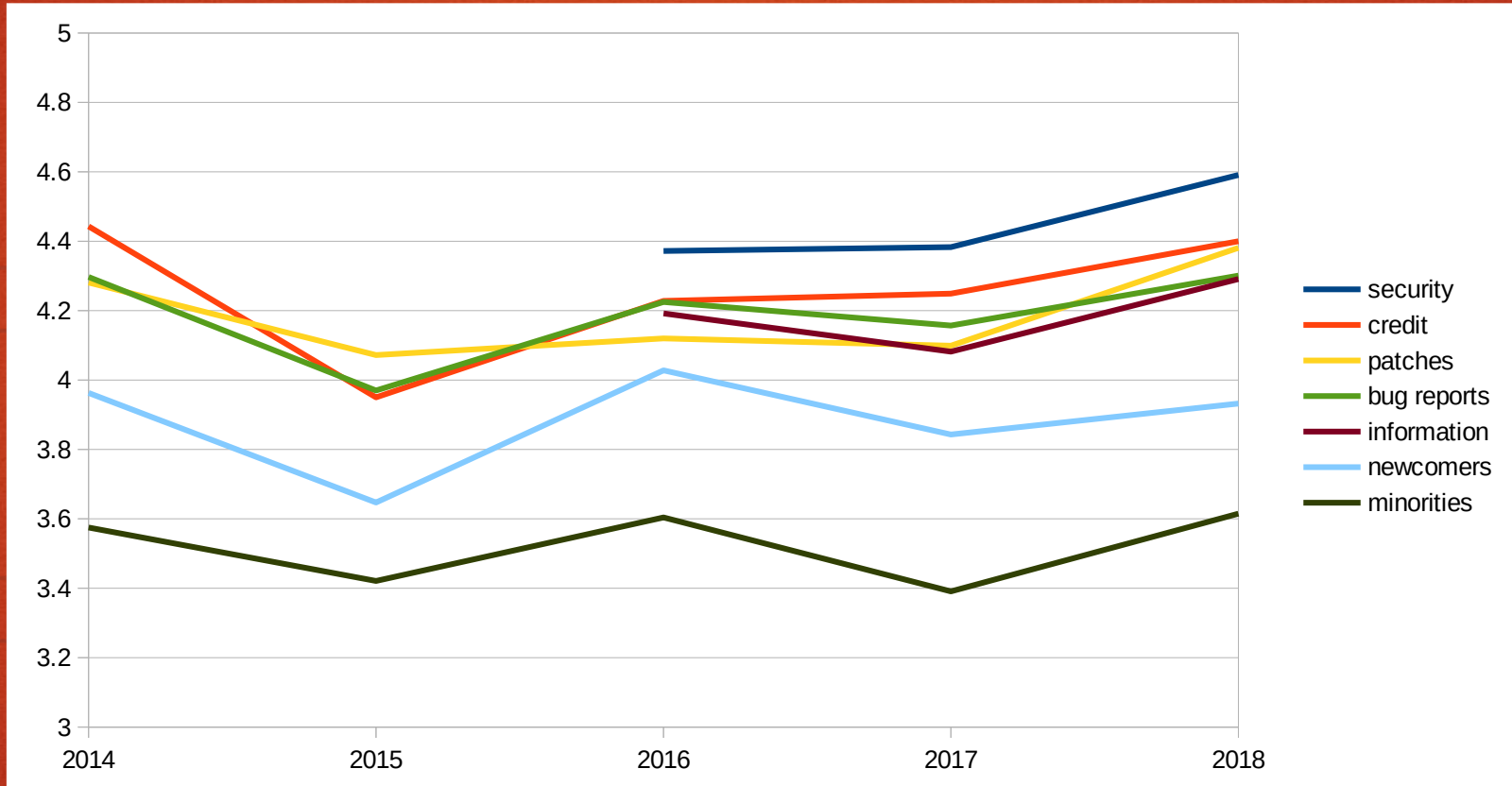
What is good, what is bad

What should be added, what should be removed

How are we doing



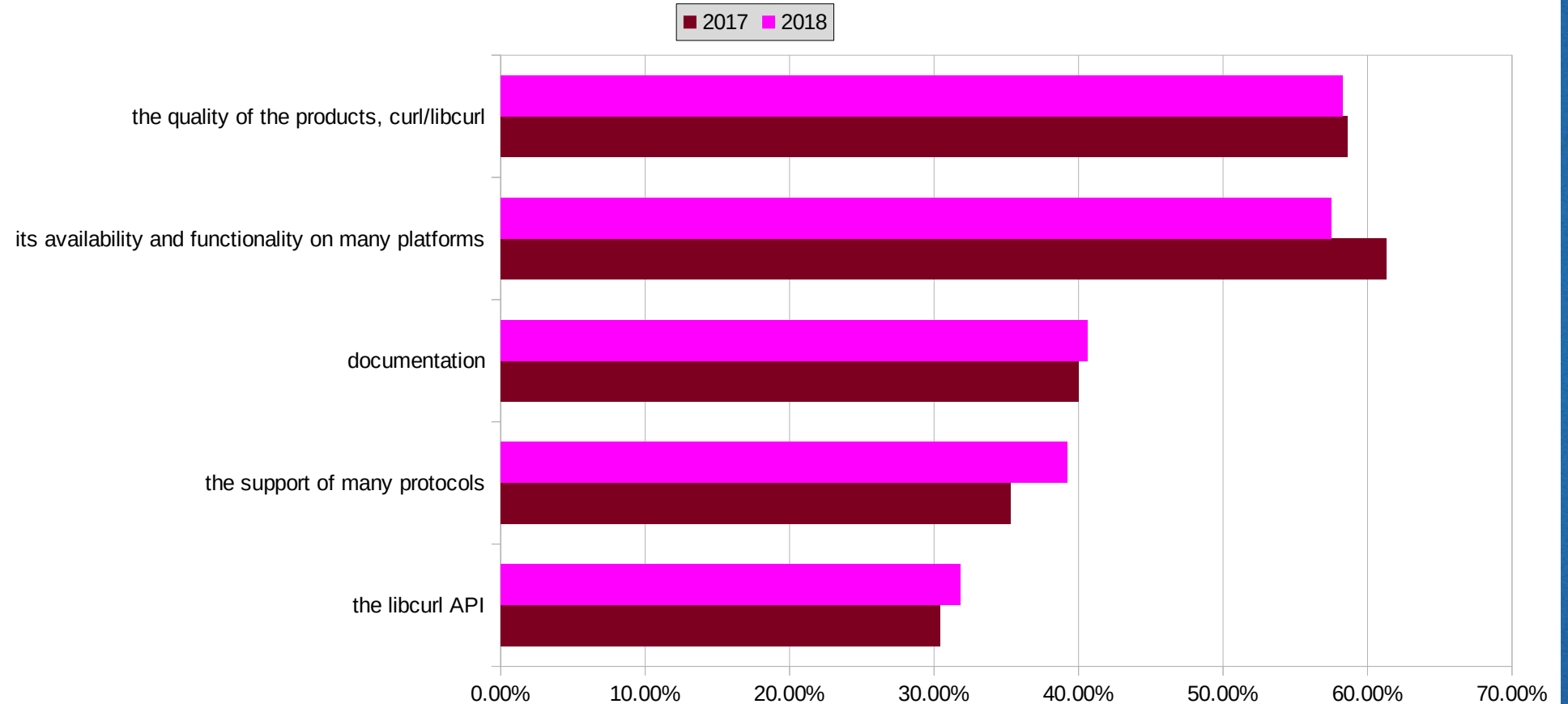
# How good is the project to handle



(According to the annual user survey)

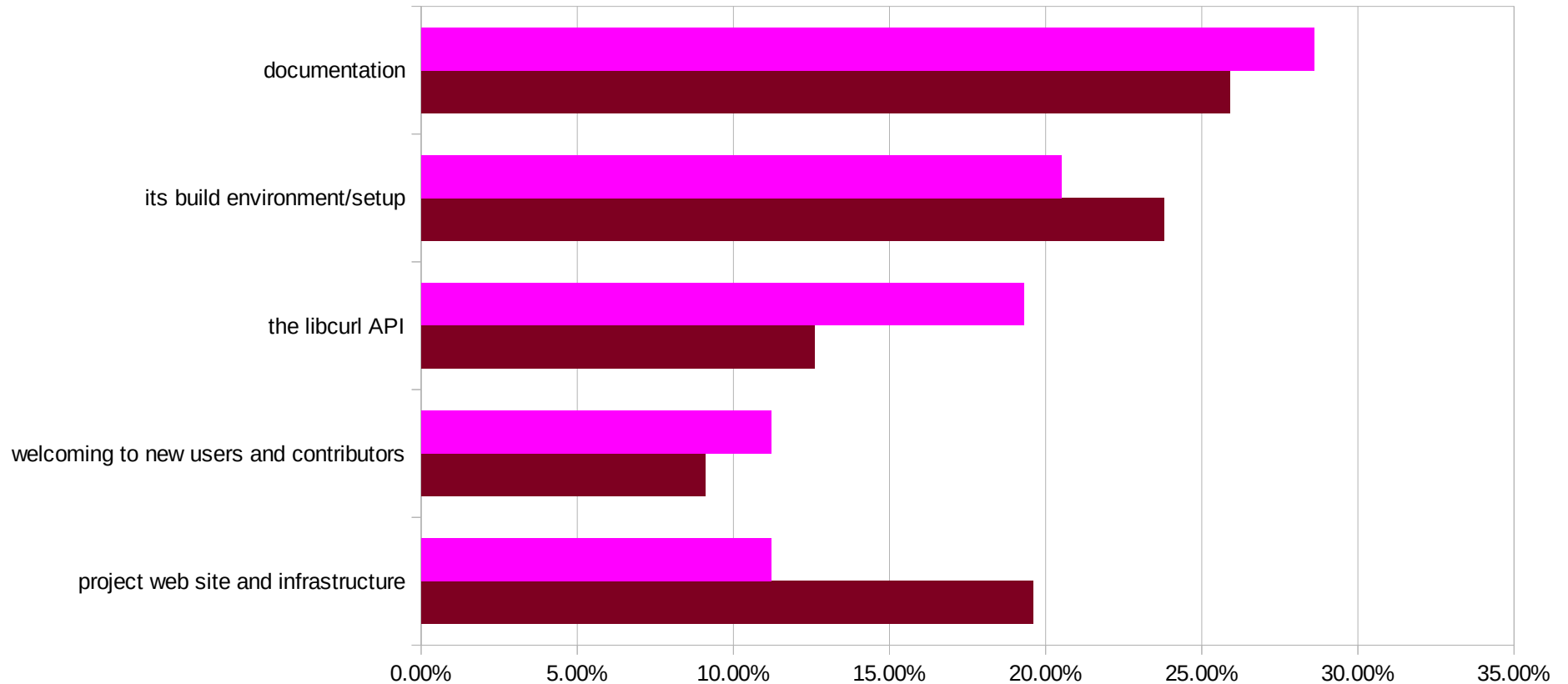


# curl's top-5 areas according to users



# curl's worst-5 areas according to users

■ 2017 ■ 2018



# User survey 2019

Around May time frame

Very much interested in feedback on where to take it and what to ask for

Received 670 responses 2018

<https://daniel.haxx.se/blog/2018/06/12/curl-survey-2018-analysis/>



# Web site traffic 2019

Fastly makes our lives easier

1.5 million requests/day (from 1.8)

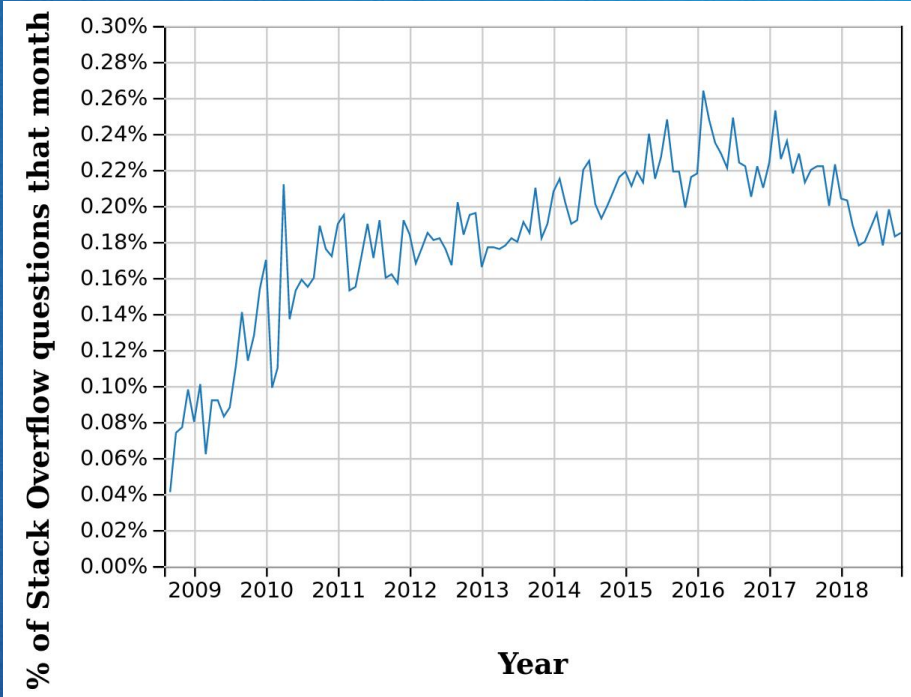
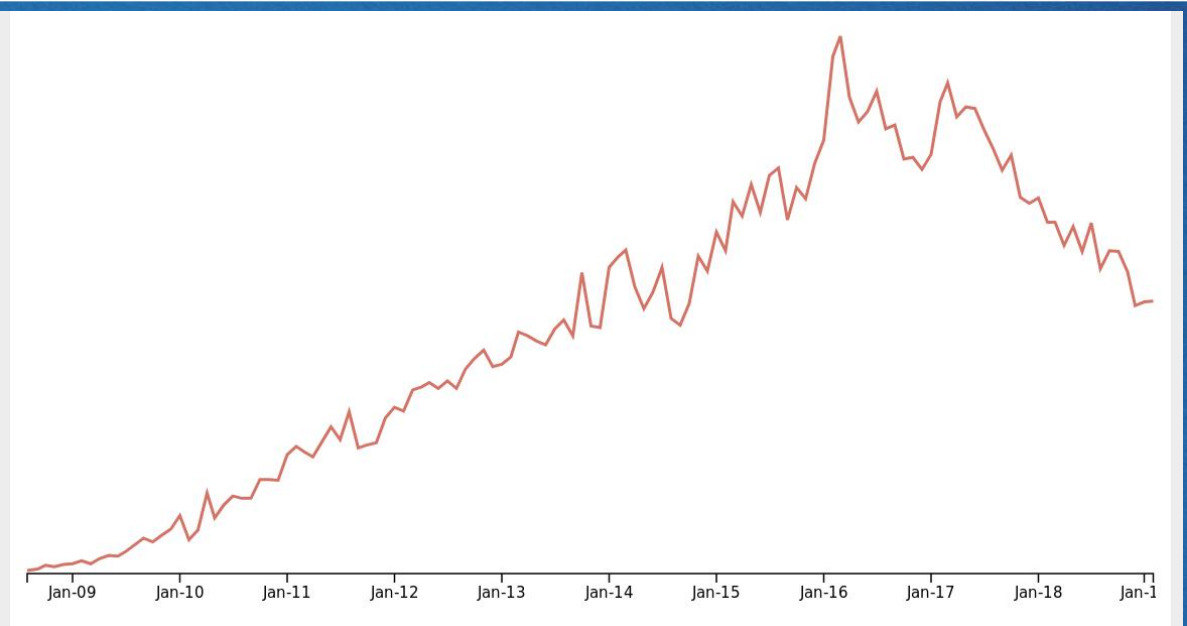
41.6 TB the last 12 months

Fast web site, close to most users

No logs, no tracking, very little stats

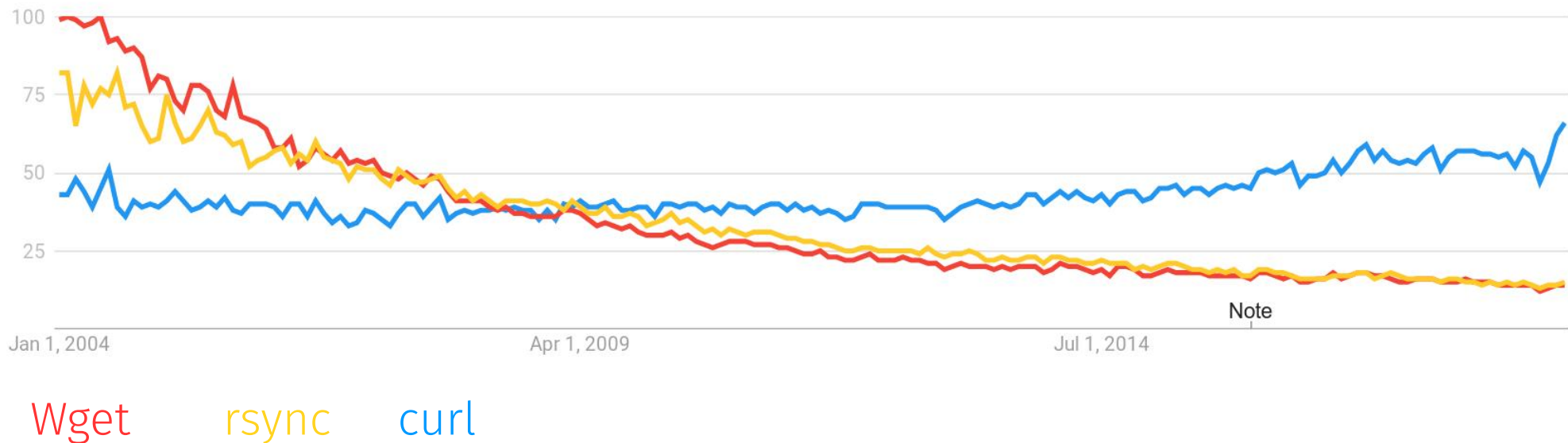
The logo for Fastly, featuring the word "fastly" in a bold, red, lowercase sans-serif font. The letter 'a' is stylized to include a clock face with a red hand. A registered trademark symbol (®) is located at the end of the word. The logo is set against a dark blue background with faint, light blue outlines of server racks and network cables.





[curl] 34,550 times  
[libcurl] 2,510 times

# Google trends, worldwide search



Includes wget and rsync only to provide references with similar projects

# CII Best Practices

<https://bestpractices.coreinfrastructure.org/en/projects/63>

100% passing



cii best practices passing

96% Silver



26% Gold

*“SHOULD have a legal mechanism where all developers of non-trivial amounts of project software assert that they are legally authorized to make these contributions”*





# Everyone uses curl 2019

Apps: Youtube, Instagram, Skype, Spotify, ...

OS: iOS, macOS, Windows, Linux, ChromeOS, AOSP, ...

Cars: Mercedes, BMW, Toyota, Nissan, Volkswagen, ...

Game consoles: PS4, Nintendo Switch, ...

Games: Fortnite, Red Dead Redemption 2, Spider Man, ...

**Estimate: 6 billion installations**



**Done the last 12 months**

# Defaults (1/4)

multiplexing enabled by default

defaults to "2TLS"

leave secure cookies alone

high resolution timestamps on Windows

headers output in bold



# New features (2/4)

DNS-over-HTTPS support

URL parsing API

`curl_easy_upkeep()`

`--resolve` supports wildcard hosts

trailing headers support for chunked transfer uploads

`alt-svc`

# Improvements (3/4)

`%{stderr}` and `%{stdout}` for `--write-out`

support for HTTP Bearer tokens

IMAP changed from "FETCH" to "UID FETCH"

MesaLink is a new TLS backend

microsecond resolution timers for seven `getinfo` intervals



# New setopts (4/4)

CURLOPT\_CURLU

CURLOPT\_UPLOAD\_BUFFERSIZE

CURLOPT\_TLS13\_CIPHERS and CURLOPT\_PROXY\_TLS13\_CIPHERS

CURLOPT\_DISALLOW\_USERNAME\_IN\_URL

CURLOPT\_HAPROXYPROTOCOL

CURLOPT\_DNS\_SHUFFLE\_ADDRESSES

(the alt-svc pair)

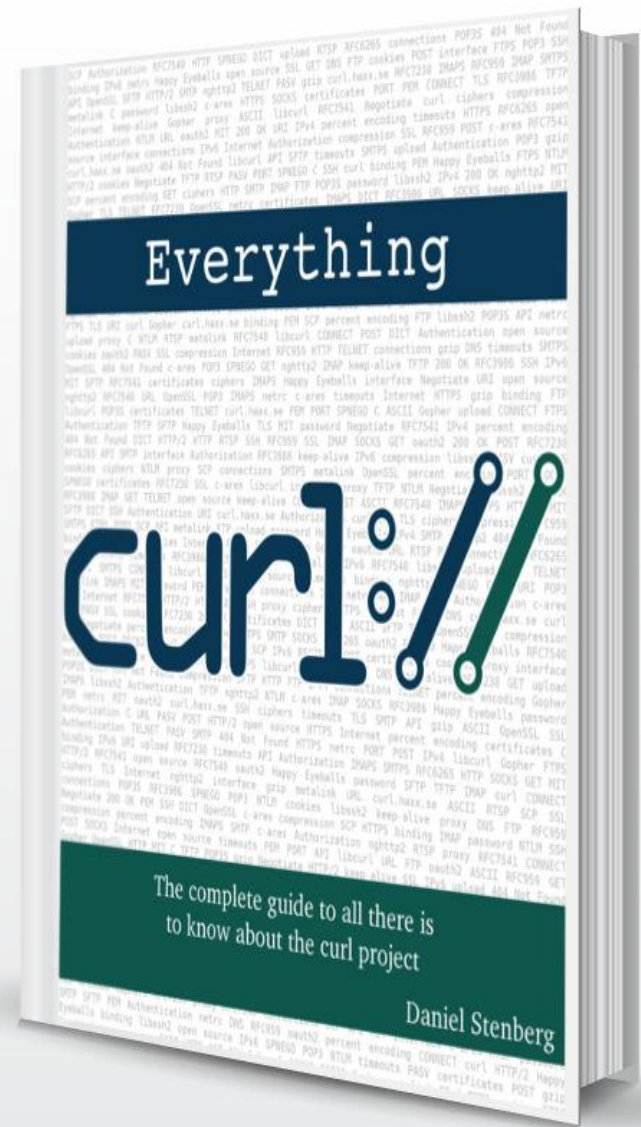
# Everything curl

70K words, 10K lines

332 pages (PDF version)

“95.1% complete”

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





# Everything curl – printed

<https://curl.haxx.se/book.html>


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## Everything curl

by Stenberg, Daniel



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| ISBN-13            | 9789163965012   |
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| Published          | 2018            |
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New 200 p. Includes: illustrations, diagrams, index. Everything curl is an extensive guide to everything there is to know about curl, the project, the command-line tool, the library, how everything started and how it came to be what it is today. It covers how we work on developing it further, what it takes to use it, how you can contribute with code and bug reports and why all those millions of existing users use it. curl is a project and its primary purpose and focus is to make two products: curl, the command-line tool and libcurl the transfer library with a C API. Both the tool and the library do internet transfers for resources specified as URLs using internet protocols. Both products are frequently used not only to drive thousands or millions of scripts and applications for an internet connected world, but they are also widely used for server testing, protocol fiddling and trying out new things. The library is used in every imaginable sort of embedded device where internet transfers are needed: car infotainment, televisions, video players, set-top boxes, printers, routers, game systems, etc. by some of the biggest names in technology.

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# Less good

A dark Audi car is parked on a road, with a large fire and thick smoke rising from it. The car's license plate reads 'EH-3538'. The background shows a road with trees and a white fence.

Flaky tests/CI

Slow CI tests

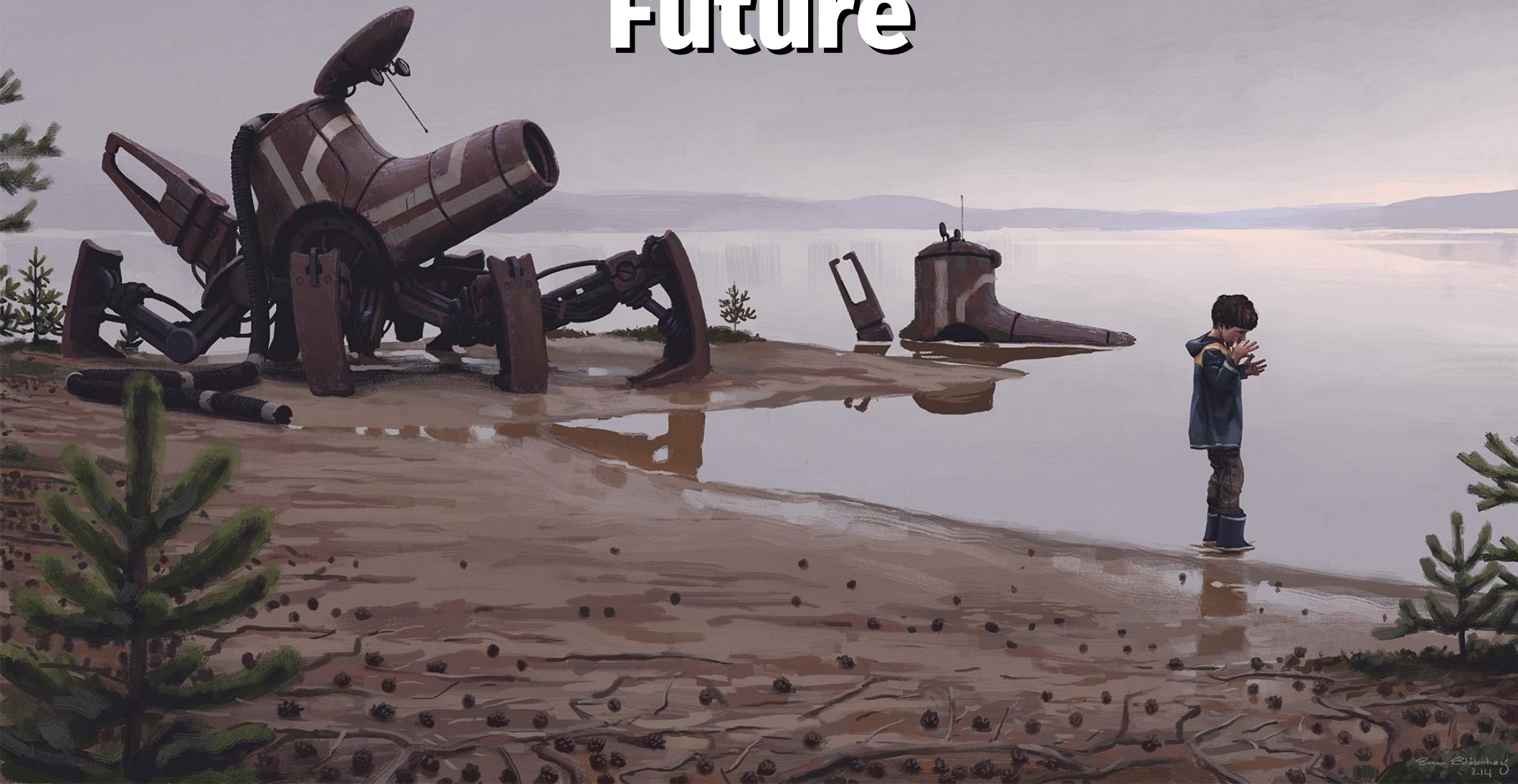
Vulnerabilities are still reported

Still regressions, but less frequently?

Could use more people who stick around



# Future



# Planning

I can't tell what "we" will do

I have some ideas about what to do next

Things change all time time

Tell us what *you* want!



# Version 8

Release every 56 days

7.65.0 is next

A bump in every release gives us  $35 * 56 = 1960$  days until version 7.100

I want to avoid reaching 7.100 due to confusions it'll create

1960 days == 5 years and 4.5 months == September 2024

Evolutionary, not revolutionary?

# libcurl work to consider

Keep up with browsers

HTTP/3 and QUIC

ESNI

Hardcode localhost

Refuse HTTP => HTTPS redirects

Option to let

CURLOPT\_CUSTOMREQUEST be  
overridden on redirect

HSTS

"menu config"-style build  
feature selection



# New APIs?

Config file reader



# curl tool work to consider

Parallel transfers

Support for HTTP/2 Push

Master/slave mode

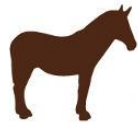
Make --retry resume

*This list is identical to last  
year's curl tool list!*



# Finally

# curl://up



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Charles University



**wolf**SSL

