

Surveying the Community

What Could Possibly Go Wrong

Anastasia Kazakova

Alternative title

```
ide1: BM-DMA at 0xc008-0xc00f, BIOS settings: hdc:pio, hdd:pio
ne2k-pci.c:v1.03 9/22/2003 D. Becker/P. Gortmaker
    http://www.scyld.com/network/ne2k-pci.html
hda: QEMU HARDDISK, ATA DISK drive
ide0 at 0x1f0-0x1f7,0x3f6 on irq 14
hdc: QEMU CD-ROM, ATAPI CD/DVD-ROM drive
ide1 at 0x170-0x177,0x376 on irq 15
ACPI: PCI Interrupt Link [LNKC] enabled at IRQ 10
ACPI: PCI Interrupt 0000:00:03.0[A] -> Link [LNKC] -> GSI 10 (level, low) -> IRQ
    10
eth0: RealTek RTL-8029 found at 0xc100, IRQ 10, 52:54:00:12:34:56.
hda: max request size: 512KiB
hda: 180224 sectors (92 MB) w/256KiB Cache, CHS=178/255/63, (U)DMA
hda: set_multmode: status=0x41 { DriveReady Error }
hda: set_multmode: error=0x04 { DriveStatusError }
ide: failed opcode was: 0xef
hda: cache flushes supported
    hda1
hdc: ATAPI 4X CD-ROM drive, 512kB Cache, (U)DMA
Uniform CD-ROM driver Revision: 3.20
Done.
Begin: Mounting root file system... .
/init: /init: 151: Syntax error: 0xforce=panic
Kernel panic - not syncing: Attempted to kill init!
```

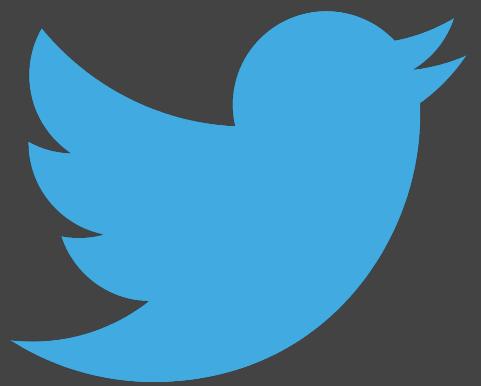
About me



C++: Embedded,
Telecom, 4G/LTE



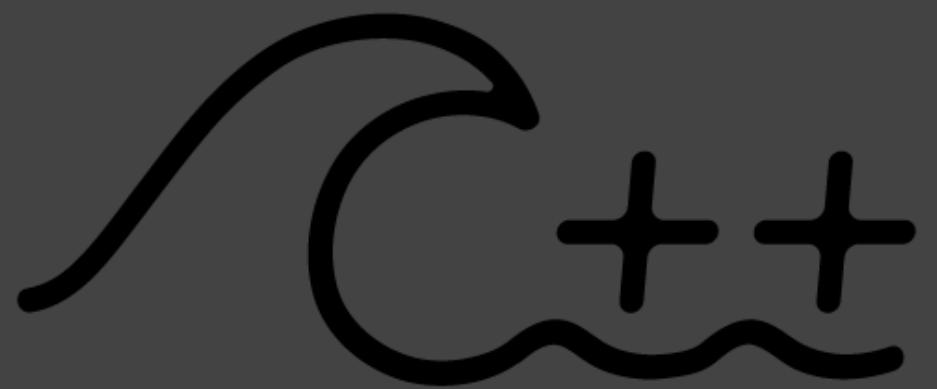
Head of Marketing
& BizDev



@anastasiak2512



The Dutch C++ Group



Program Committee Chair
C++ Under the Sea
cppunderthesea.nl

Why do we need data

-

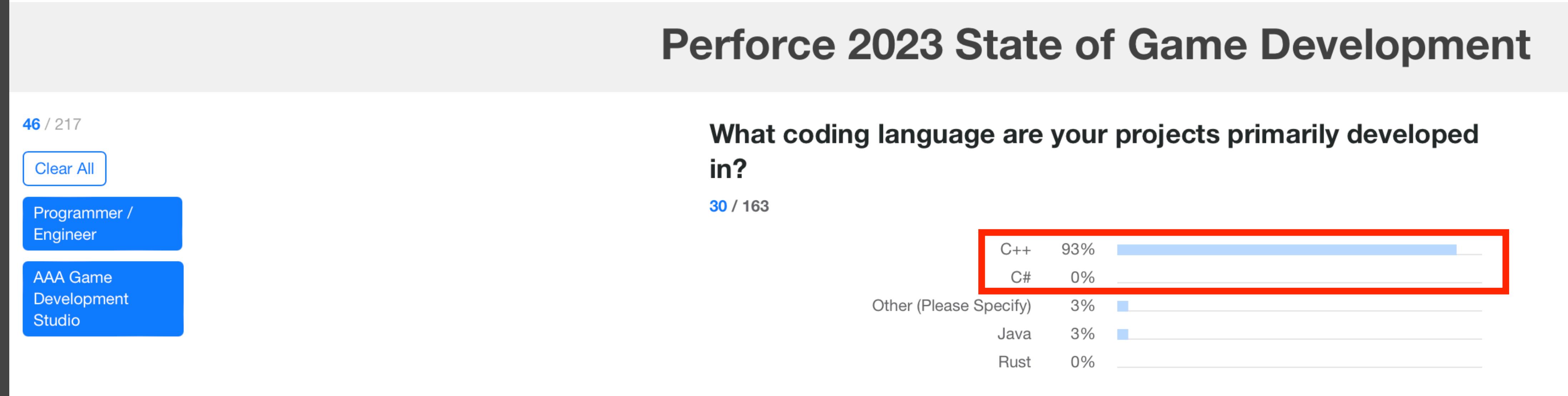
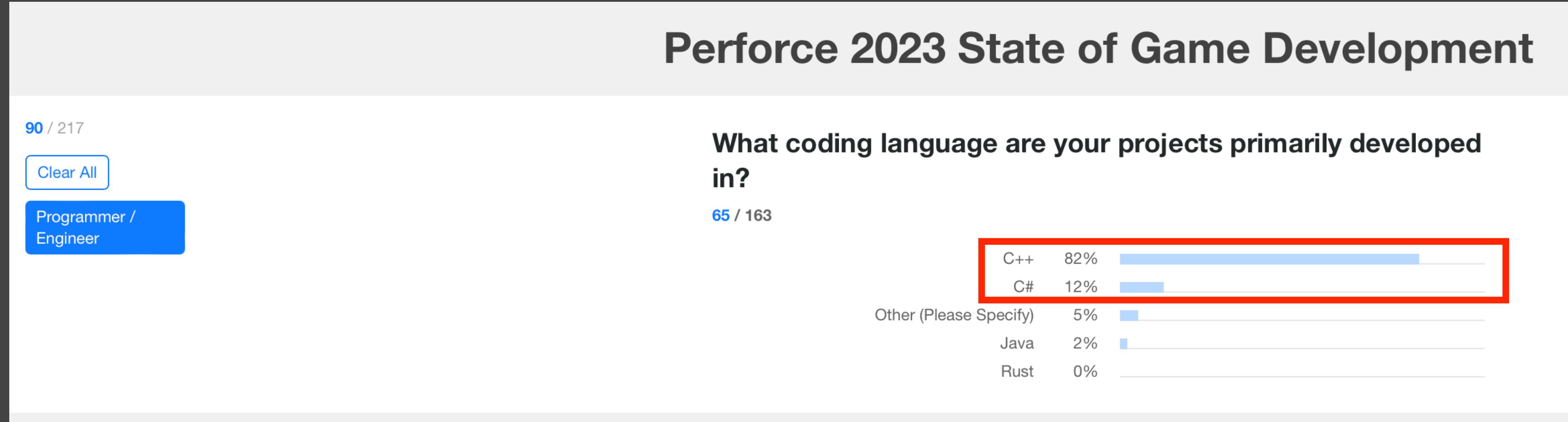
Data-driven development in the era of
uncertainty

How to use the data

The screenshot shows the Survey Visualizer interface. At the top, there is a search bar with the word "game" typed into it, enclosed in a red box. To the right of the search bar is a magnifying glass icon and a button labeled "Pick a date". Below the search bar, the text "4 of 518 Surveys" is displayed. To the right of this, there are three columns: "Category", "Total Costs", and "Respondents: Started / Finished / Total". The table below lists four survey entries:

	Category	Total Costs	Respondents: Started / Finished / Total
Perforce 2023 State of Game Development	NA	NA	0 / 217 / 217
survey for debugger in Game Dev	NA	NA	13 / 70 / 83
Native profilers in GameDev	NA	NA	238 / 606 / 844
Additional GameDev Survey to DevEco20 participants	NA	NA	216 / 903 / 1119

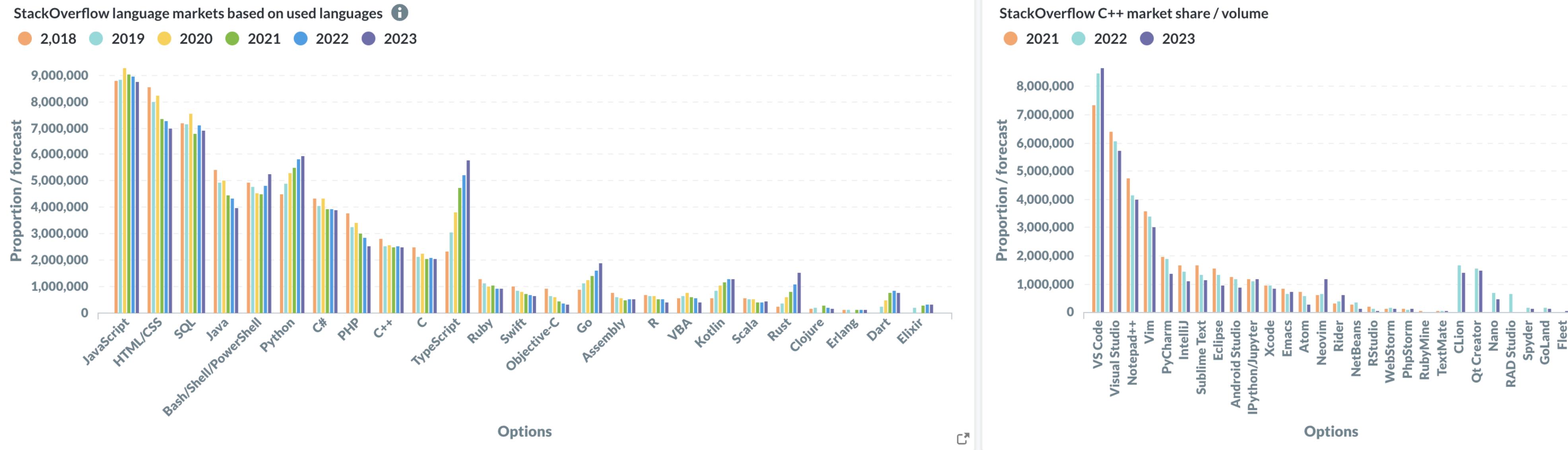
How to use the data



How to use the data

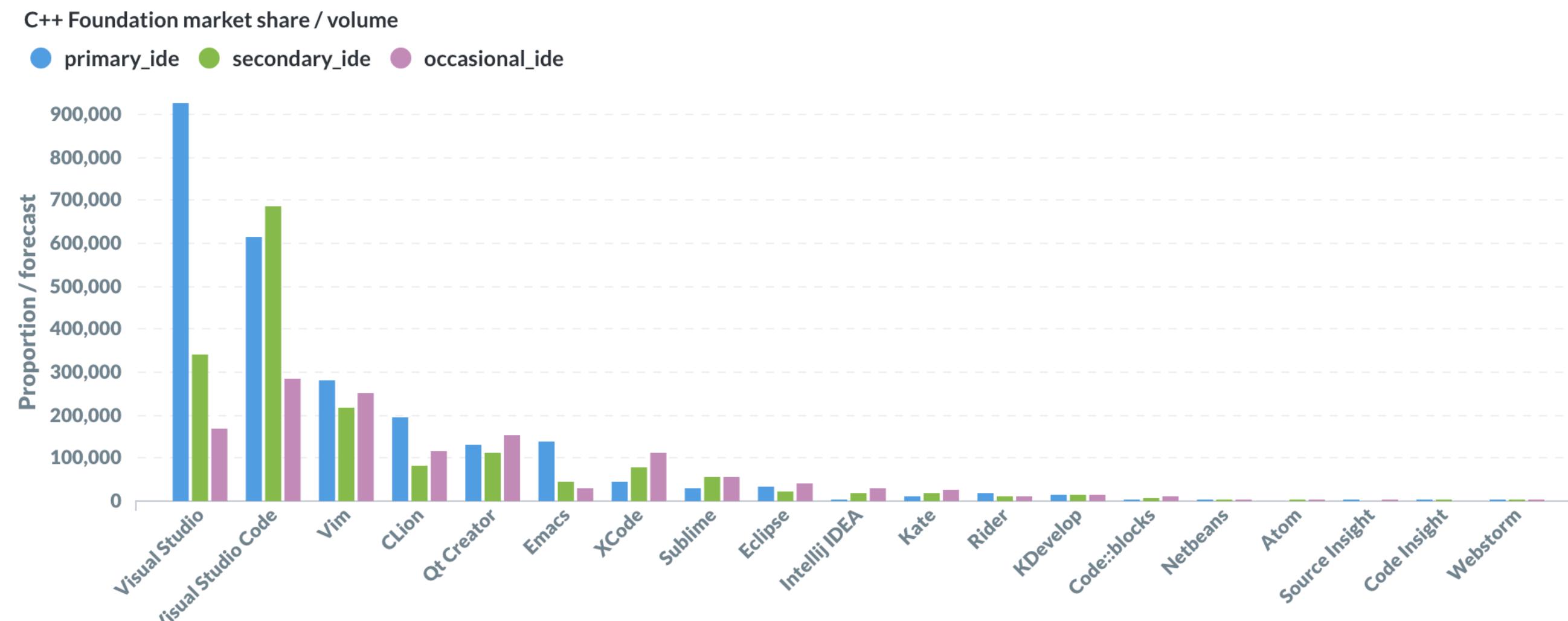


StackOverflow



C++ Foundation

The general trend of the languages is not available for C++ Foundation Survey because this survey is not global and all the sample of C++ Foundation use C-related programming languages.



How to use the data

Developer Ecosystem: Data Playground

Discover the latest software development trends and insights



Navigate the main trends in the IT community.



Compare yourself to the community portrait.



Find out the size of a specific market for your products.



View average salaries across multiple countries and major programming languages.



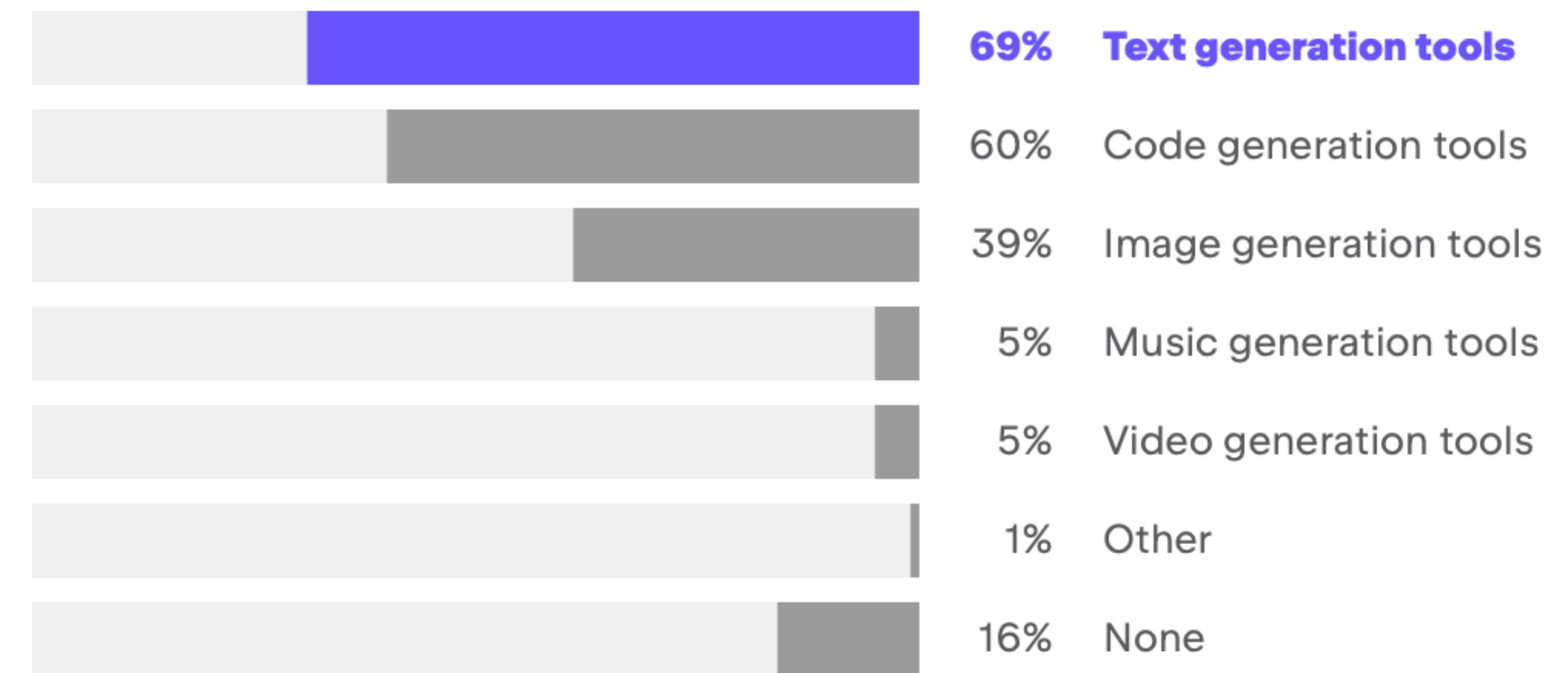
How many developers are there in the world?

What's the most popular programming language by number of developers?

What are the average salaries for popular IT job roles?

Why do we need data: AI evolution

What types of generative AI tools are you familiar with?

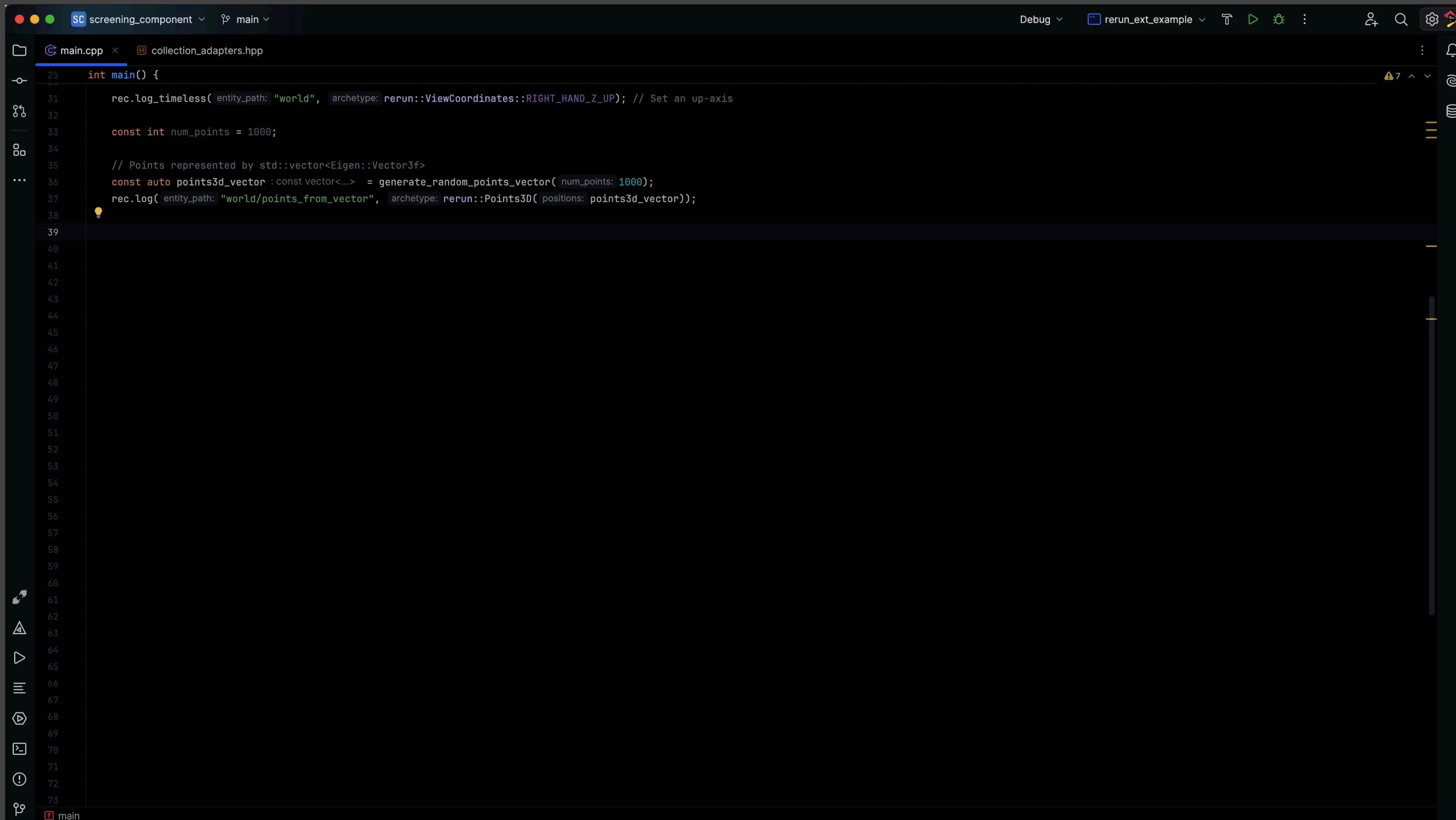


84%

of developers are familiar with generative AI tools in one way or another.

Interestingly, AI text generative tools are more familiar to developers than code generative tools, which might be attributable to the popularity and accessibility of ChatGPT.

Why do we need data: AI evolution



A screenshot of a dark-themed code editor, likely Visual Studio Code, showing a file named `main.cpp`. The code is part of a project named `screening_component`, specifically under the `main` folder. The code itself is as follows:

```
int main() {
    rec.log_timeless(entity_path: "world", archetype: rerun::ViewCoordinates::RIGHT_HAND_Z_UP); // Set an up-axis
    const int num_points = 1000;
    // Points represented by std::vector<Eigen::Vector3f>
    const auto points3d_vector : const vector<...> = generate_random_points_vector( num_points: 1000 );
    rec.log( entity_path: "world/points_from_vector", archetype: rerun::Points3D( positions: points3d_vector));
}
```

The editor interface includes a top bar with tabs for `main.cpp` and `collection_adapters.hpp`, and various status indicators like `Debug` and `rerun_ext_example`. On the left is a sidebar with icons for file operations like new, open, save, and delete. The right side features a vertical toolbar with icons for search, refresh, and other development tools. A status bar at the bottom shows the current file is `main`.

Why do we need data: AI evolution

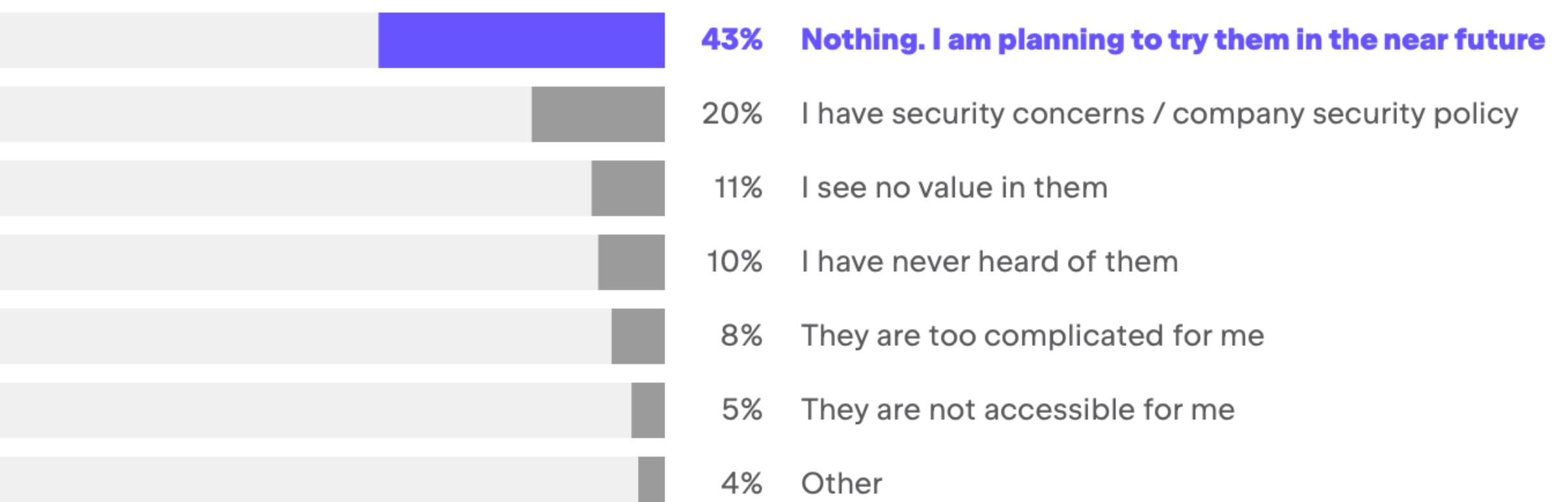
GDC: Are generative AI tools being used at your company or department?

- 49% Generative AI tools are currently being used in their company
- 31% personally use Generative AI tools

21% of AAA developers said their companies have banned the use of such tools. Compared to 9% indie.

In JetBrains DevEco 20% have security concerns or company policies banning AI.

What stops you from learning about generative AI tools?



*This question was shown only to the developers who chose "None" in the previous question.

How many developers?

How many **developers** are there in the world?

How many **professional developers** are there in the world?

How many **C++ developers** are there in the world?

How many **professional C++ developers** are there in the world?

Professional developers

Full-, self- or part-time employed devs and freelancers whose one of job roles is QA, Dev, Team Lead, DBA, Architect, DevOps or Technical support.

Quiz time! Ready?

How many **professional** developers are there in the world?

-

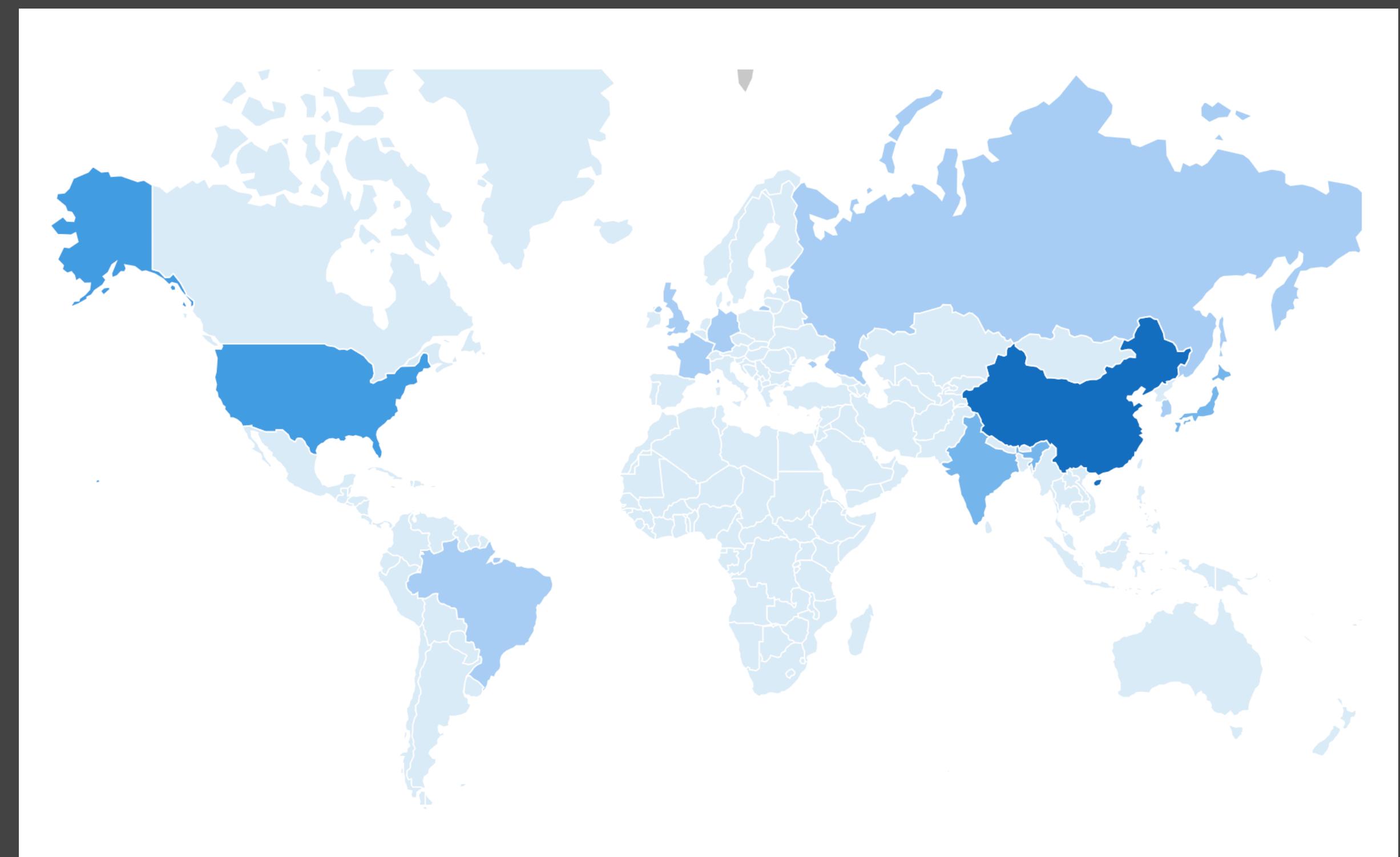
13,400,000

professional developers worldwide in 2023

And top country?

How many **professional** developers are there in the world?

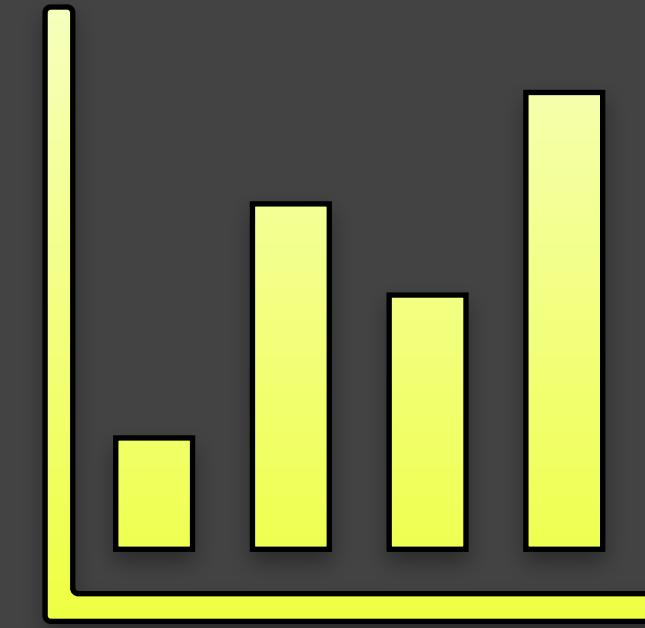
1. China 2,650K
2. US 1,851K
3. Japan 1,336K
4. India 1,212K
5. Germany 495K
6. UK 402K
7. Brazil 392K



C++ shares

- Developer Ecosystem Survey
- StackOverflow Survey

C++ shares



13,400,000
professional developers
worldwide in 2023

~ 8% - 9% of them use C++ as a
primary programming language



~ 1,072,000 - 1,206,000
professional developers who use C++ as a
primary programming language in 2022

C++ shares in 2023

1, 157, 000

professional developers with C++ as primary language in 2023

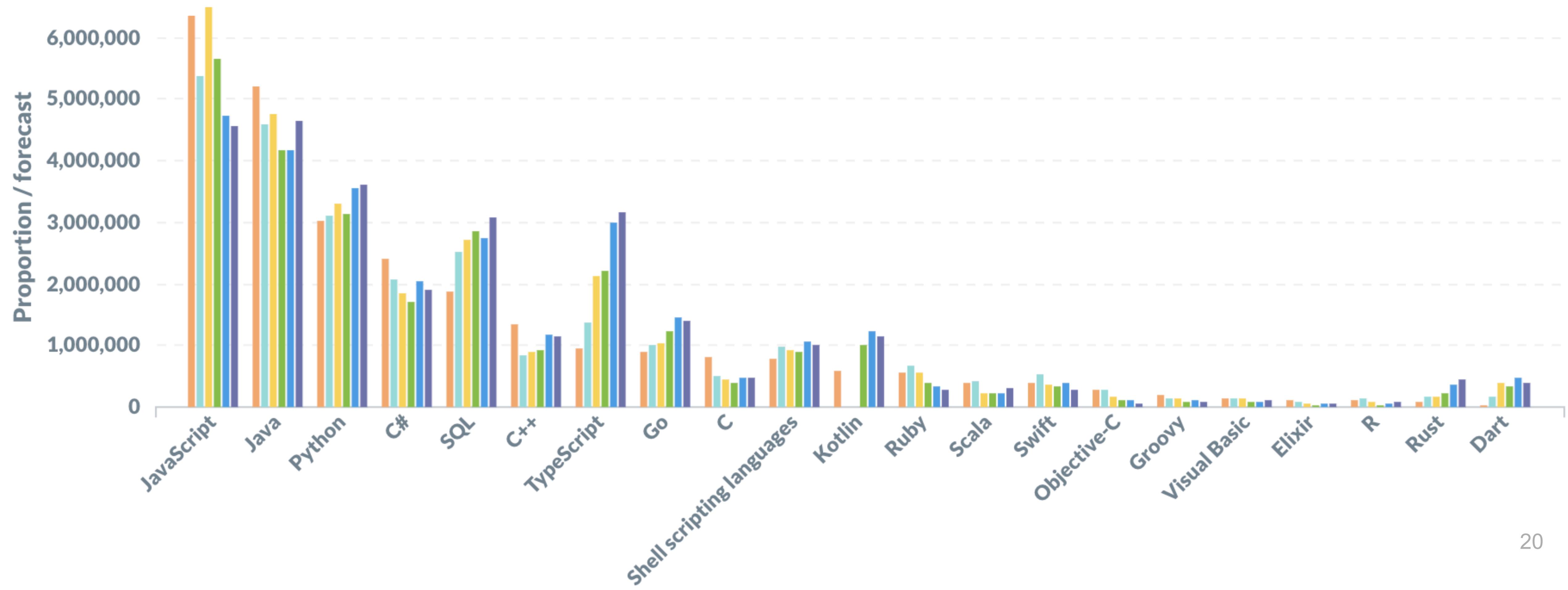
2, 492, 000

professional developers who regularly use C++ in 2023

C++ shares

Developer Ecosystem language markets based on primary languages

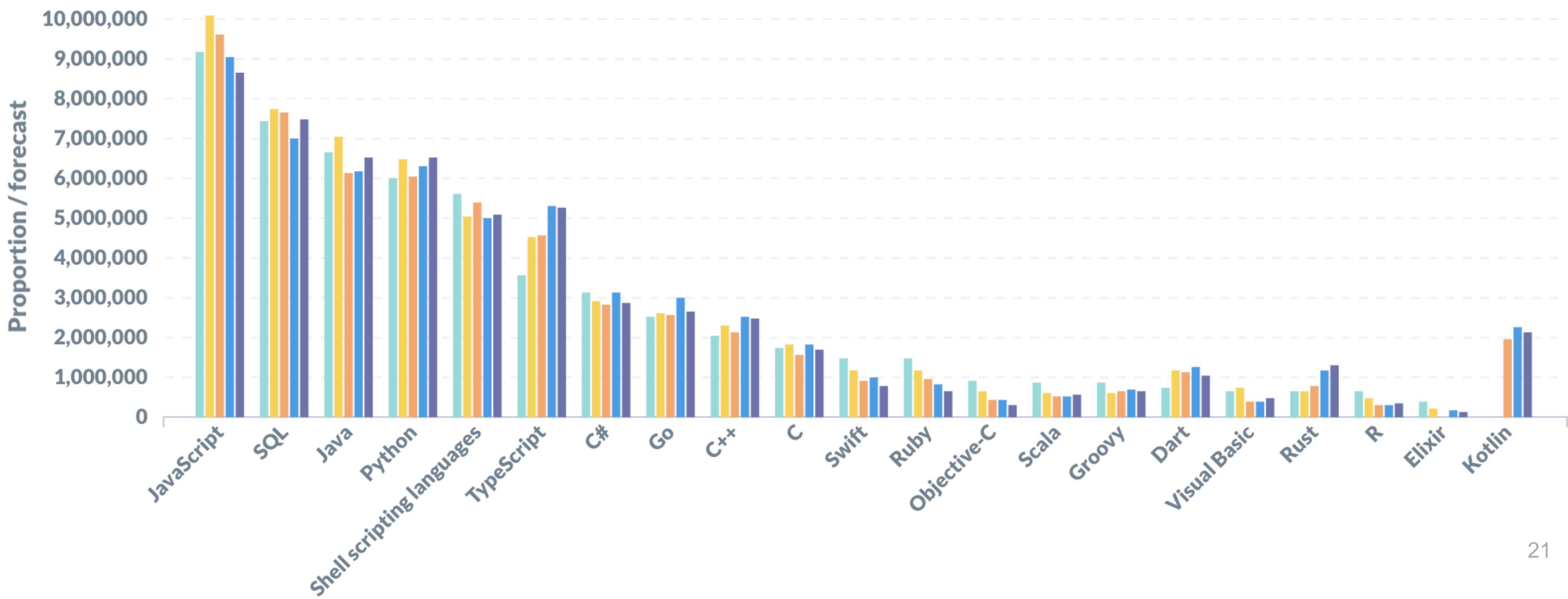
● 2018 ● 2019 ● 2020 ● 2021 ● 2022 ● 2023



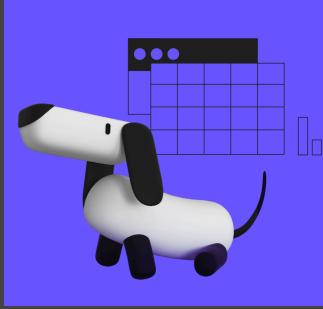
C++ shares

Developer Ecosystem language markets based on used languages

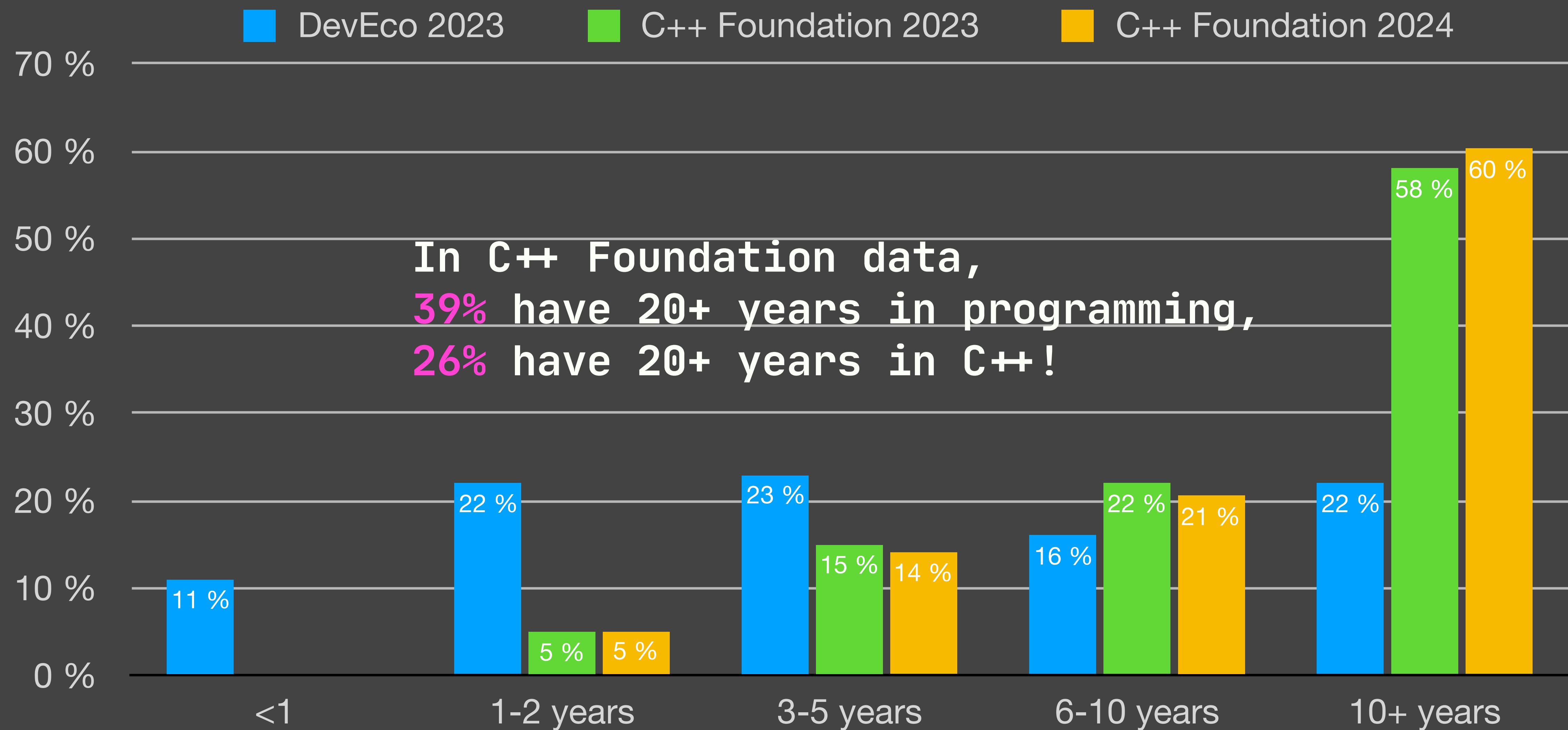
● 2019 ● 2020 ● 2021 ● 2022 ● 2023



Community Surveys in C++

		Meeting C++
Running since 2017	Running since 2018	Running since 2020 as a continuous survey
Global for all languages	Focused on C++	Focused on C++
Partially-random set from 527 questions	22 questions	88 questions
In 2023: 2,647 responses	In 2024: 1,262 responses	~ 1,000-1,500 in 2020/21, ~ 3,000 through years

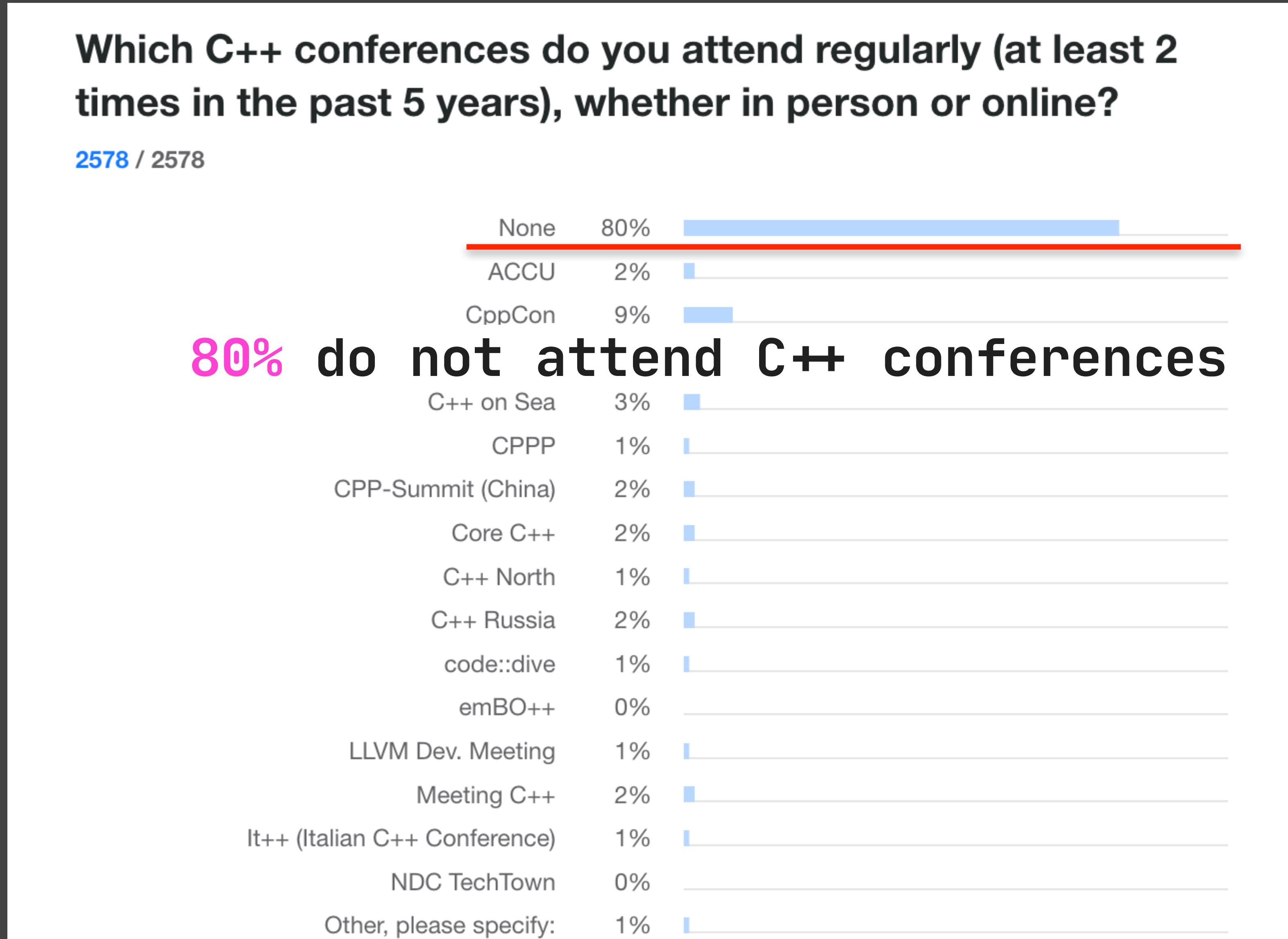
Audience



Audience

Quiz time:
**What's the % of respondents
who don't attend C++ conferences regularly?**

Audience



Reducing the error

Every survey is lying
How? What? When? Where?

Reducing the error

1. Sampling bias (data cleaning)
2. Response burden bias
3. Brand bias
4. Regional bias
5. Language (EN) bias
6. Statement bias

Reducing the error: Sampling bias

1. No primary programming language

2. Filled-out too fast

3. Identical:

- 75% identical answer from identical IPs
- or same email address

4. Conflicting answers



18-20yo and 16+ years of experience
18yo CEO with 10 years of experience

Reducing the error: Responses burden

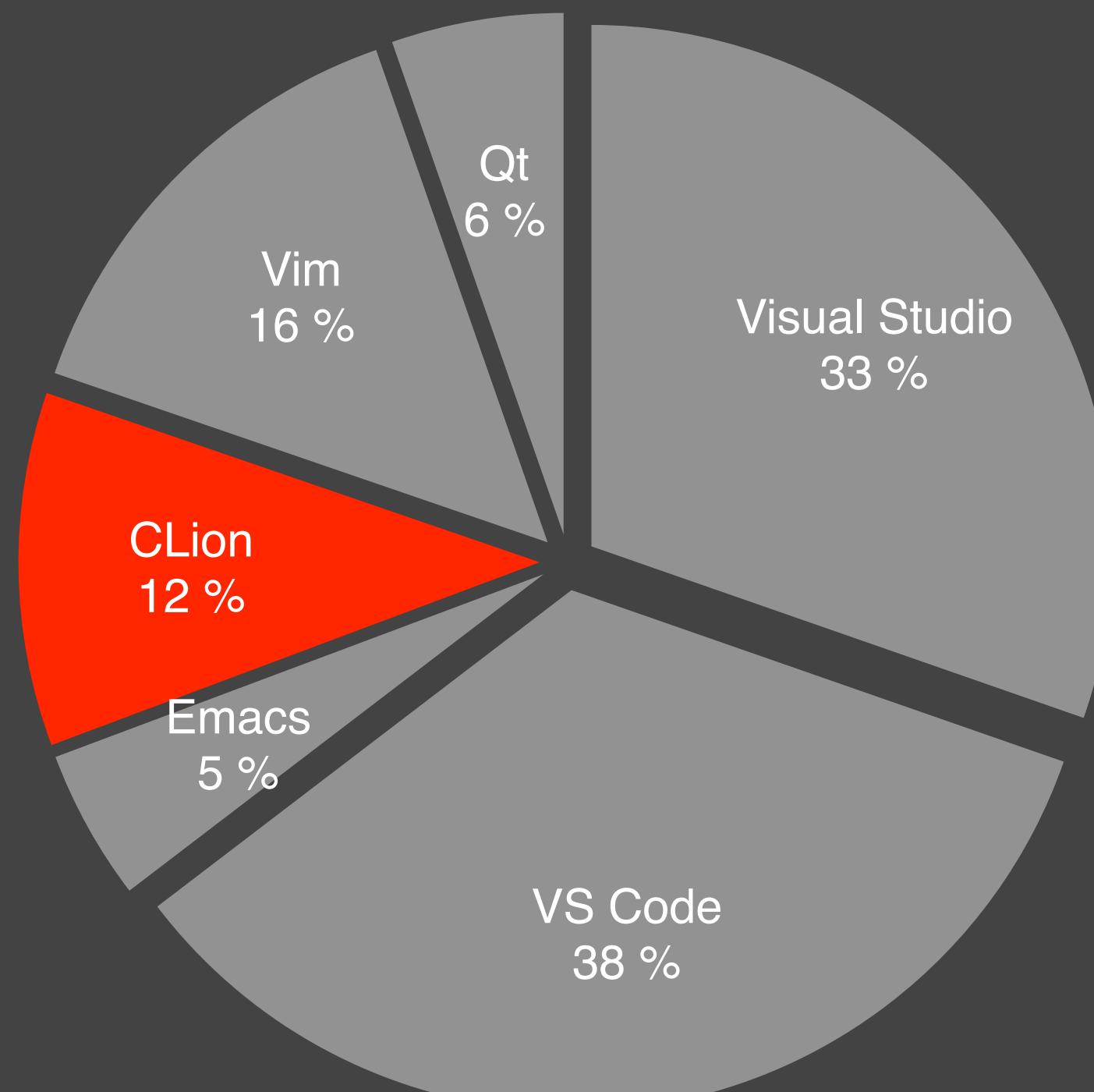
1. Total 527 questions
2. Primary languages in priority
3. Regularly used → randomly show to 50% of qualified respondents
4. Randomize 8 extra sections → show 2
5. 30-40 minutes



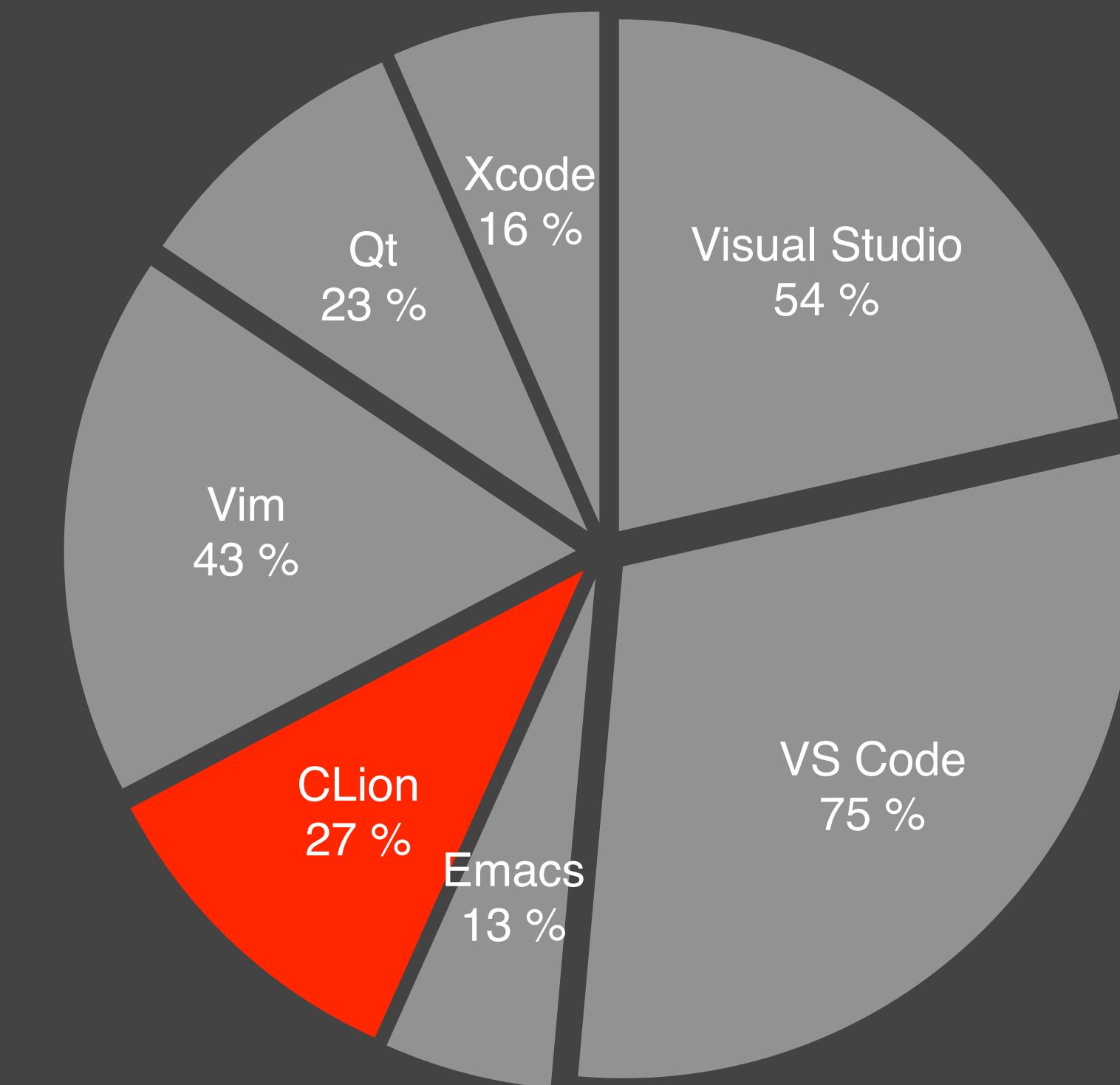
The C++ Stories Weekly Newsletter
11,000 readers
243 full C++ answers in 2023!

Reducing the error: Brand bias

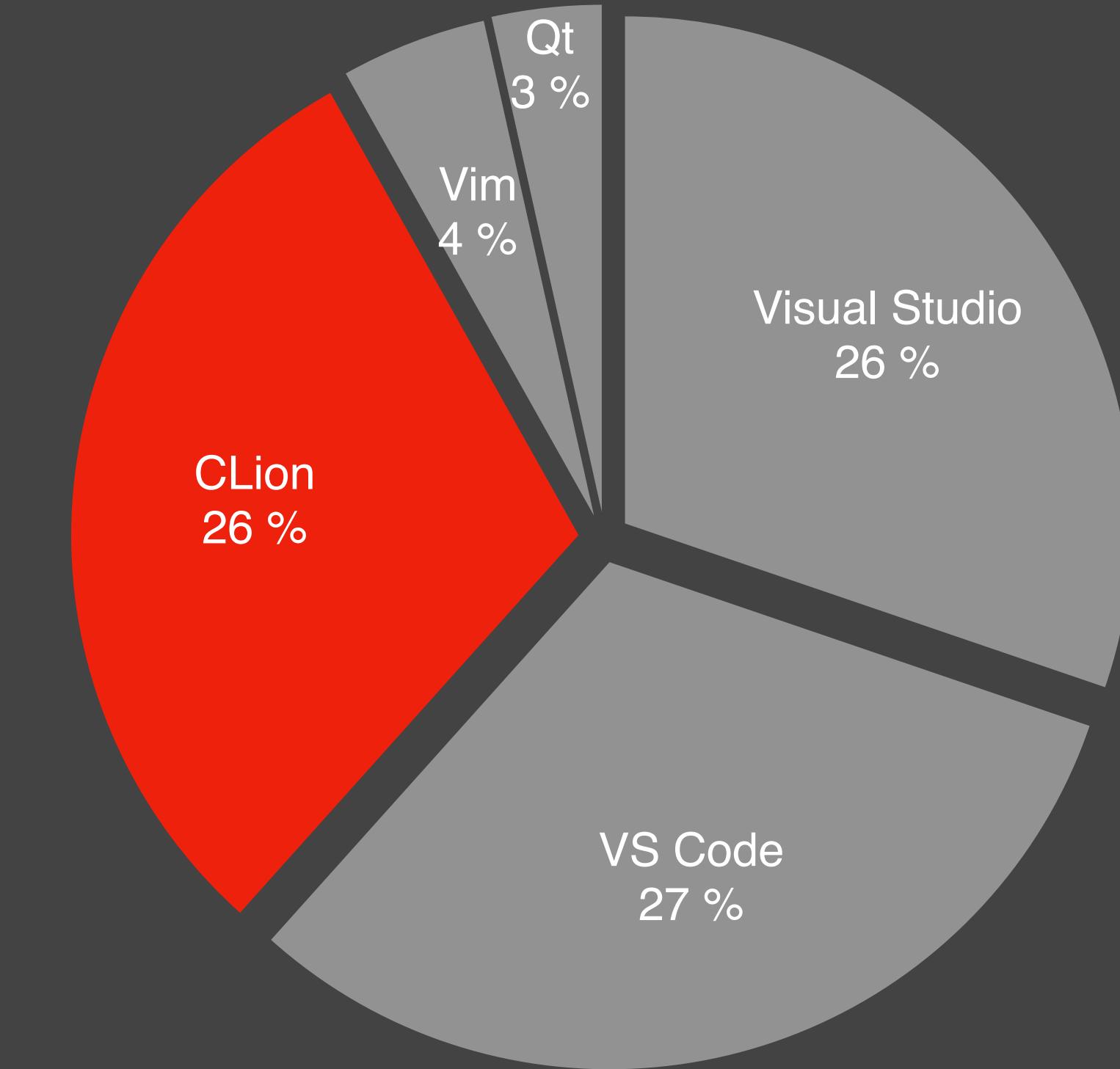
C++ Foundation Primary IDE 2024



C++ Foundation Total 2024



DevEco 2023 C++ IDE



C++ IDE: WebStorm 1, IntelliJ IDEA 12

Reducing the error: Regional bias

17 countries contains the majority of developers

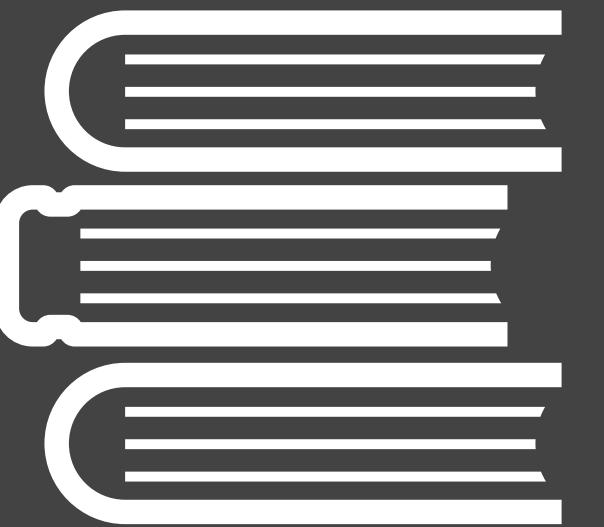
In 14 countries, at least 300 responses from external sources, such as ads



Reducing the error: Language bias

EN-speaking bias is real!

8 additional languages

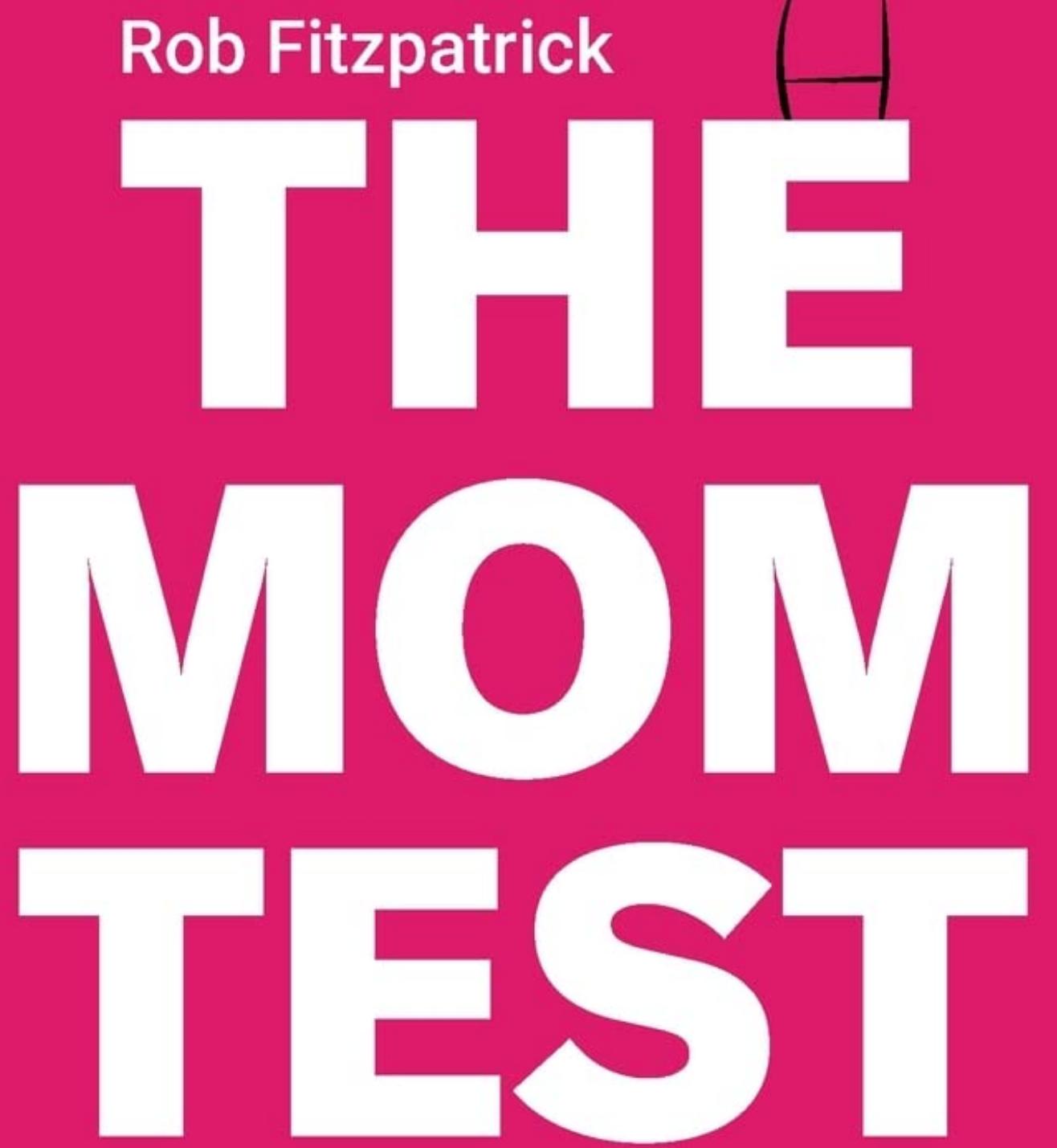


Reducing the error: Statement bias

-
- Specific to C++
- What and How
- Which options

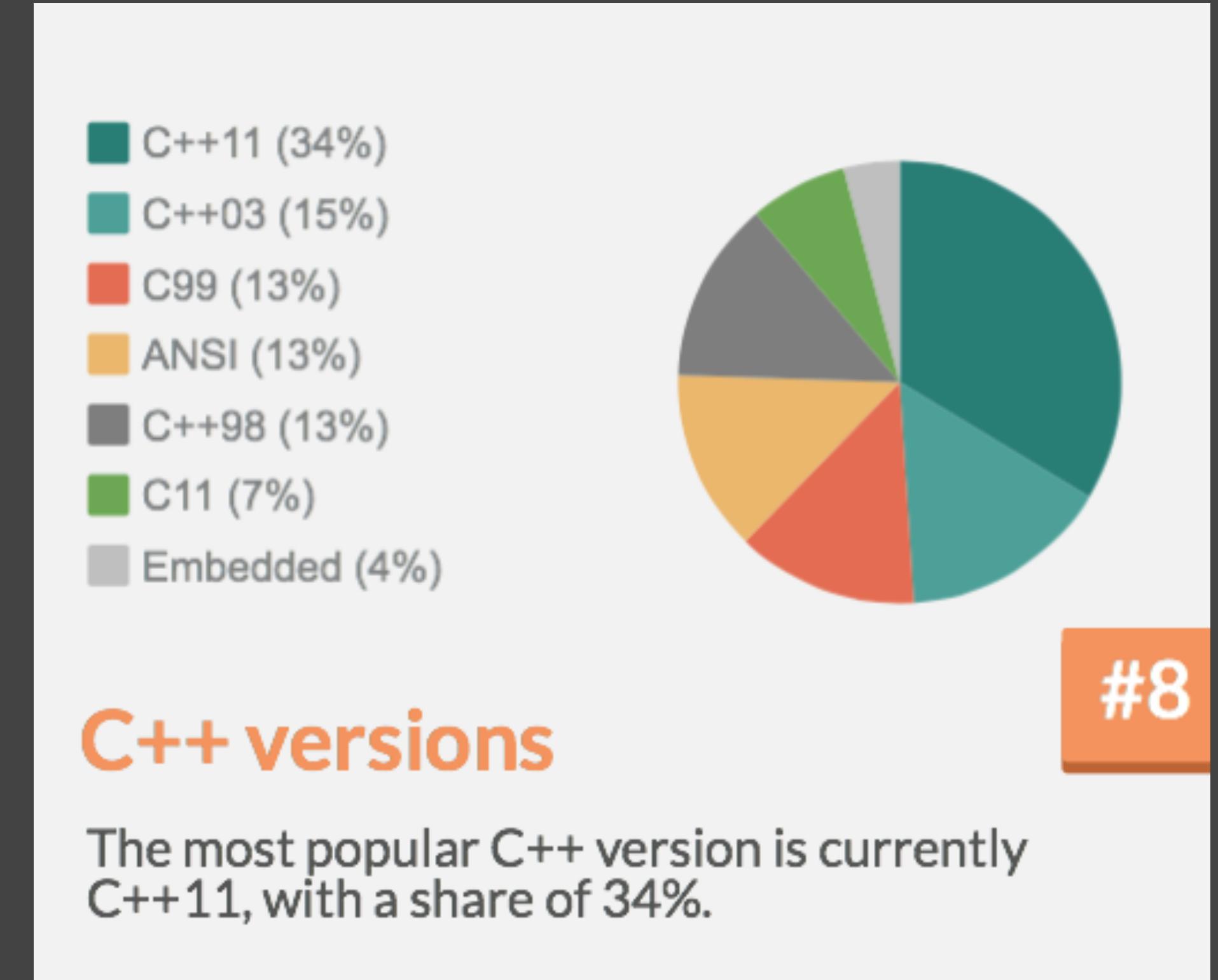
"Ounce for ounce, there's no better way to learn what customers want and will buy than this wonderful little book. If you want your new product or new business to succeed, start here."

— John Mullins
Author of *The New Business Road Test*



How to talk to customers and learn if your business is a good idea when everyone *is lying to you*

Asking questions is hard!

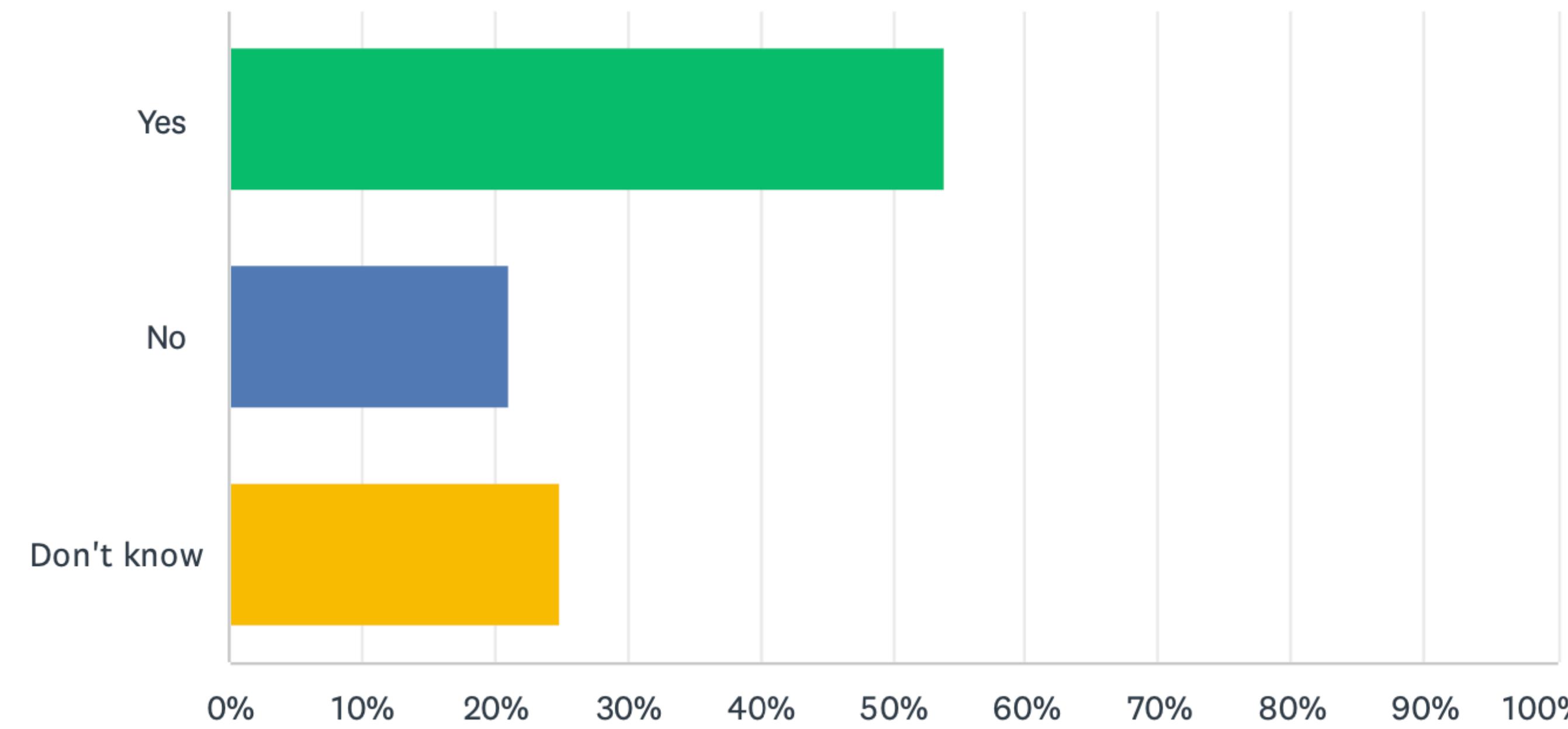


- 4.4m^{ln} C++ devs
- inconsistent list of industries
- C and C++ versions mixed

Asking questions is hard!

Q14 In the next 12 months, does your current project plan to start allowing additional use of newer C++ standard features (i.e., more than in the previous answer)?

Answered: 1,250 Skipped: 15

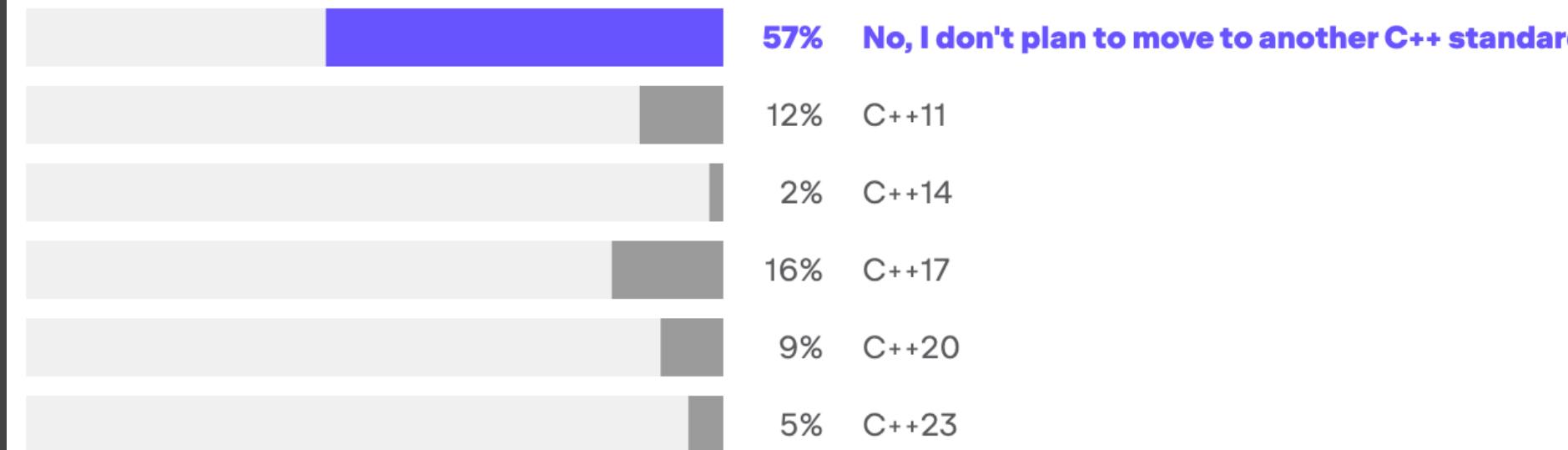


Asking questions is hard!

Upgrade paths are important

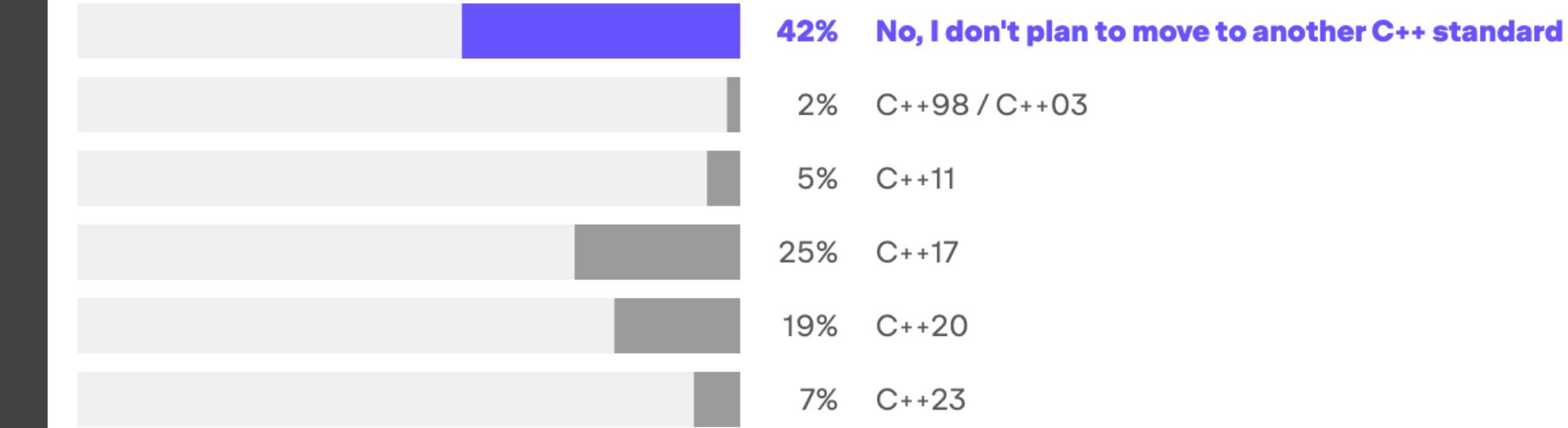
C++ standards migration

from C++98/03 from C++11 from C++14 from C++17



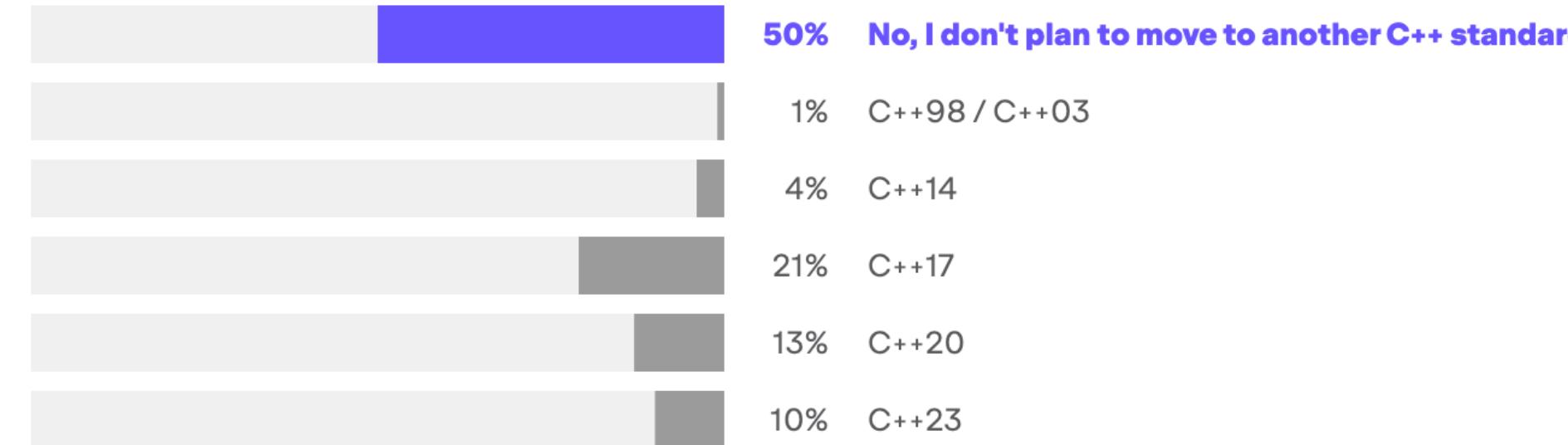
C++ standards migration

from C++98/03 from C++11 from C++14 from C++17



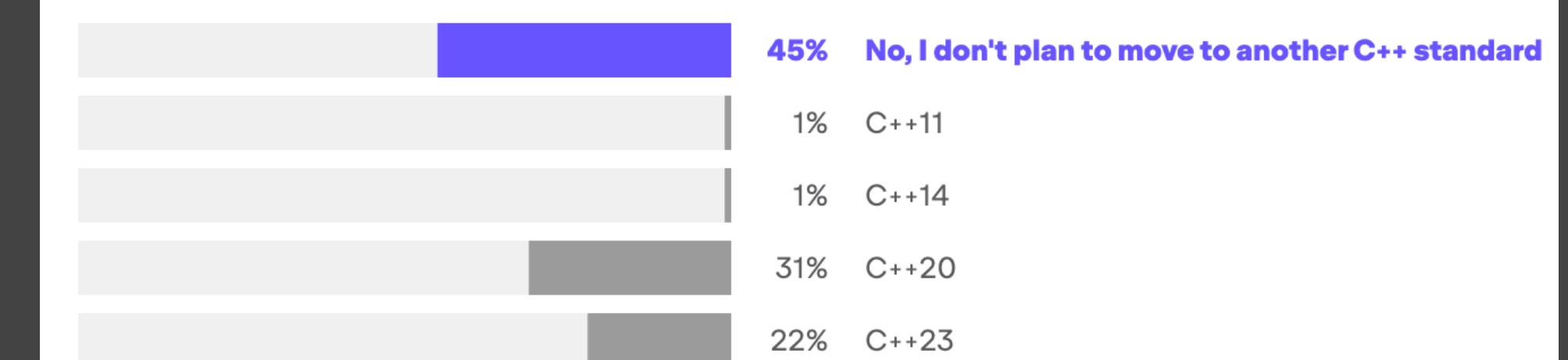
C++ standards migration

from C++98/03 from C++11 from C++14 from C++17



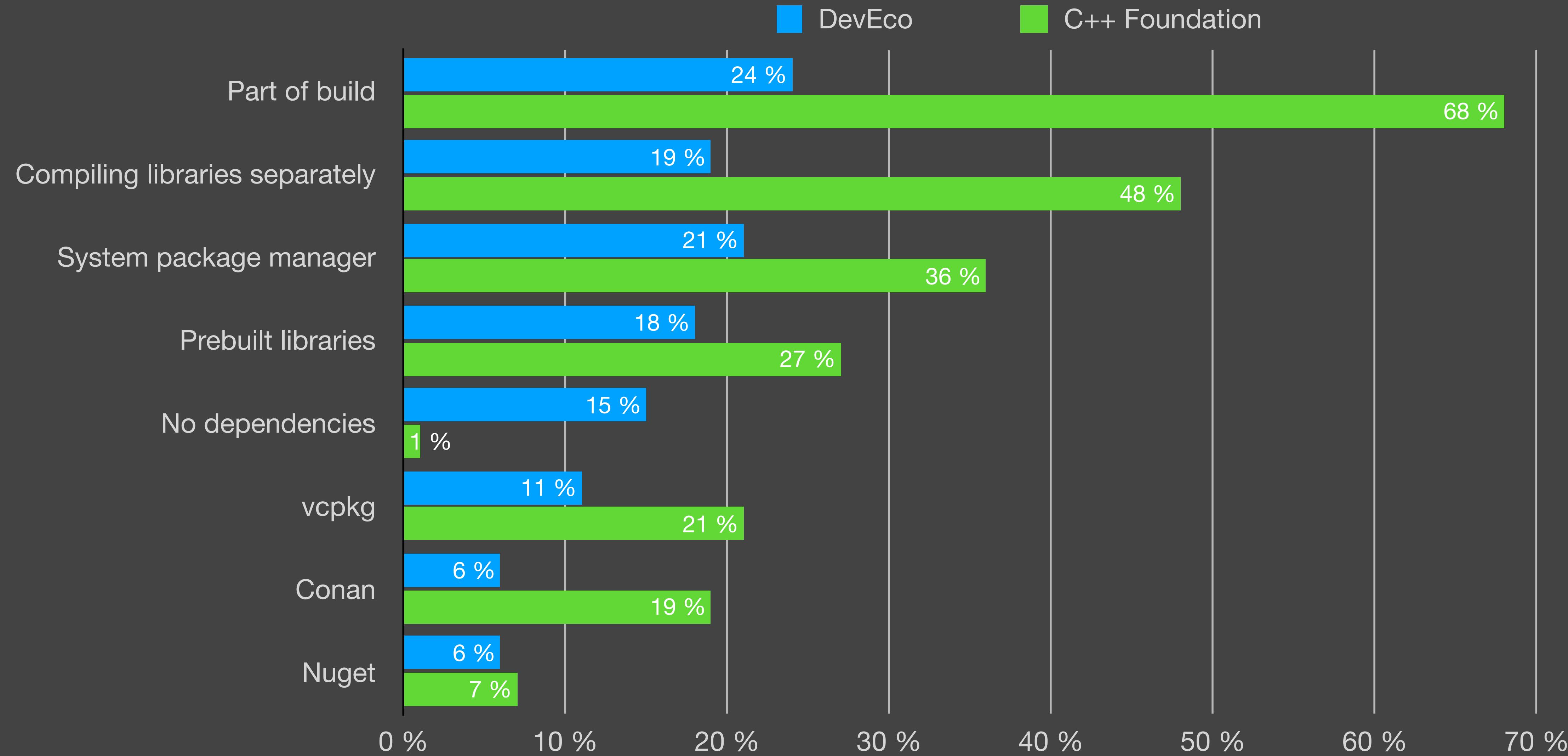
C++ standards migration

from C++98/03 from C++11 from C++14 from C++17



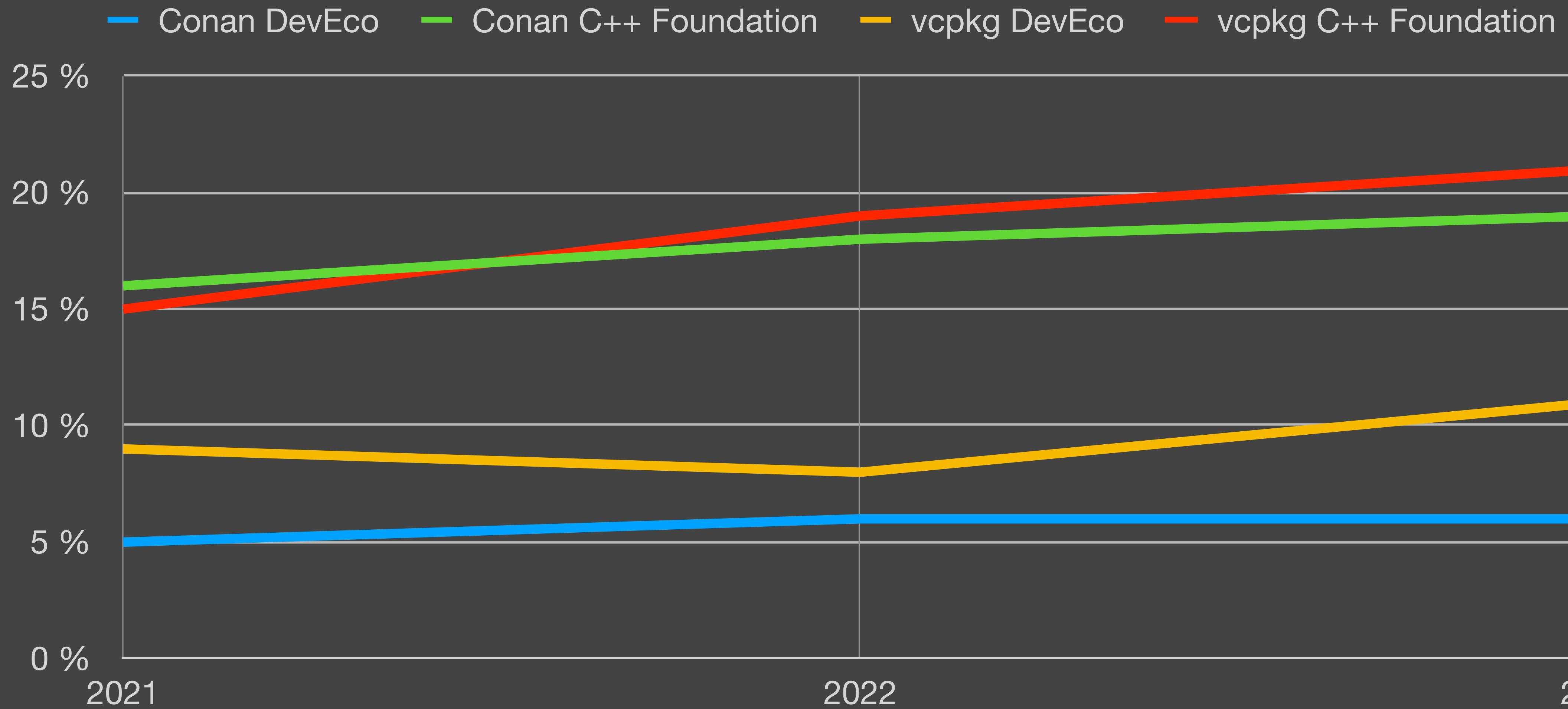
Asking questions is hard!

-



Check all that apply effect + 1st and 3rd party libraries

Asking questions is hard!

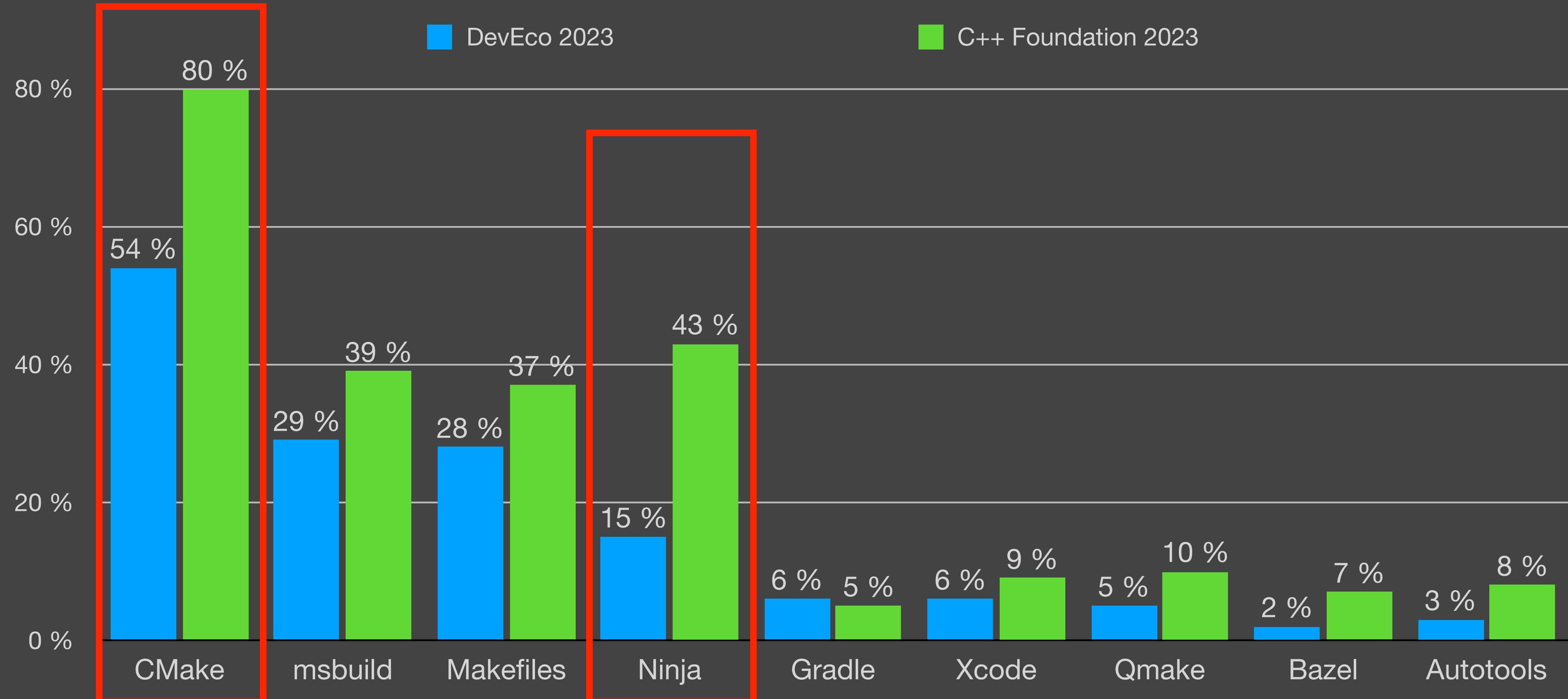


Asking questions is hard!

“We have very solid internal indicators (including telemetry, not only vanity metrics) that prove that Conan **keeps growing** solidly like more **20% YoY**, and this year we have also seen a lot of new **very large enterprises** onboarding Conan too, so not only free users, but also many new **paying JFrog customers** grow every year.”

Diego Rodriguez-Losada Gonzalez

Asking questions is hard!

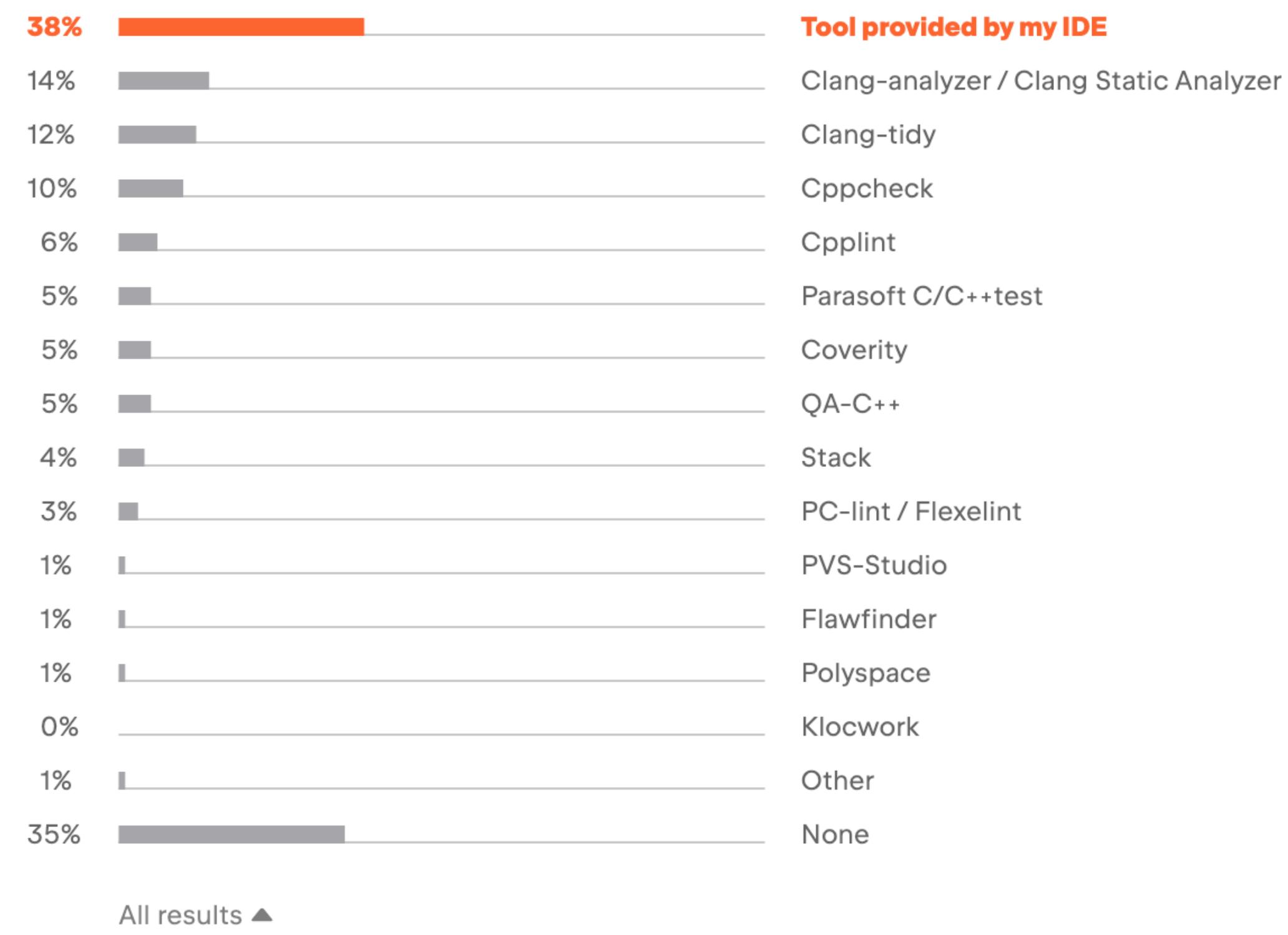


Check all that apply effect

Build tool vs Project model⁴⁰

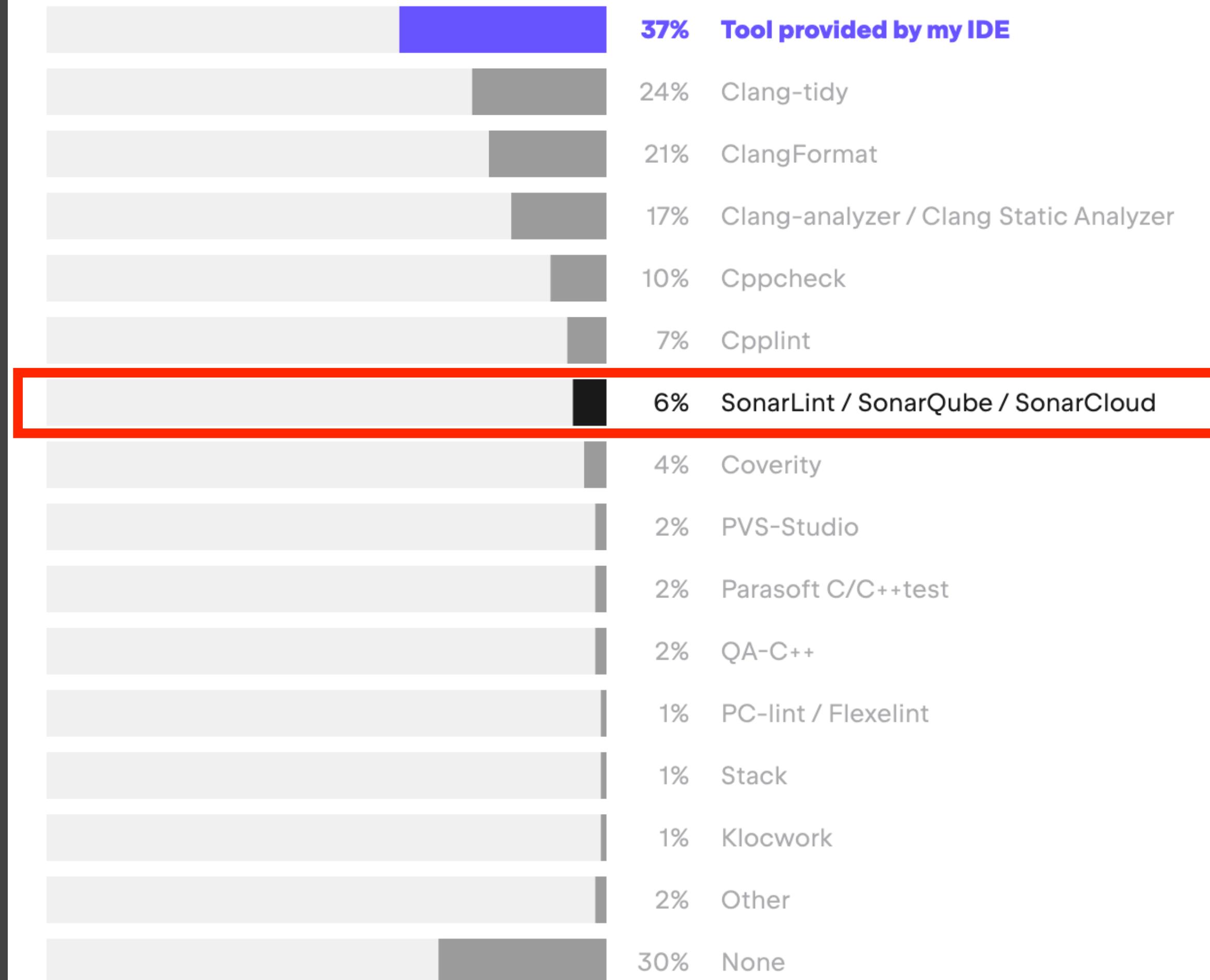
Asking questions is hard!

Which of the following tools do you or your team use for guideline enforcement or other code quality/analysis?



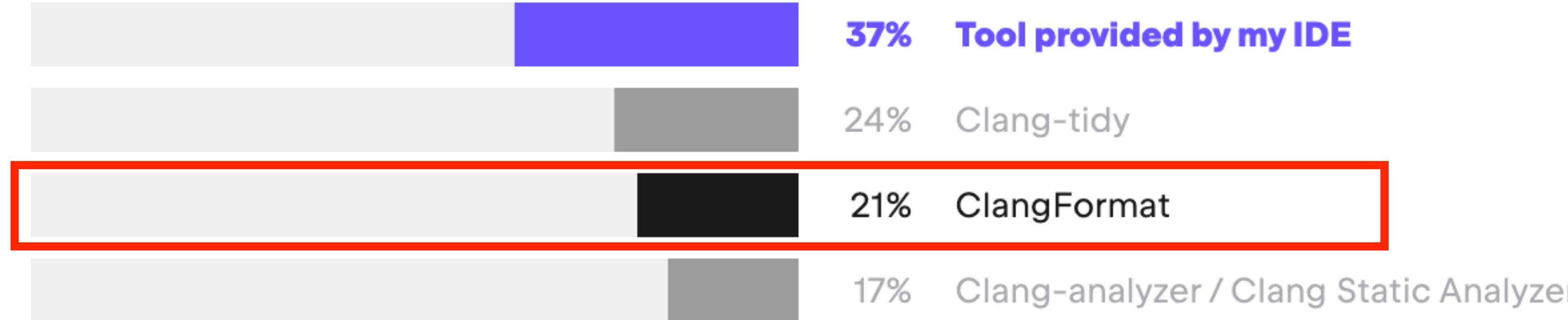
CI tools matter!

Which of the following tools do you or your team use for guideline enforcement or other code quality / analysis?



Asking questions is hard!

Which of the following tools do you or your team use for guideline enforcement or other code quality / analysis?



ClangFormat is not ...

Scan GitHub for:

primary language C or C++ &

10+ stars &

latest version is scanned

⇒ 163,420 such repositories

14,131 (8.65%) with .clang-format at any level (*)

ClangFormat and its fuzzy parser

ClangFormat doesn't parse...

...it generates annotated tokens
based on simple lexer.

StatementMacros: array

A vector of macros that should be interpreted as complete statements.

(since clang-format 8)

Typical macros are expressions, and require a semi-colon to be added; sometimes this is not the case, and this allows to make clang-format aware of such cases.

For example: Q_UNUSED

:

ClangFormat and its fuzzy parser

```
#define START_COMPLEX_MACRO do {  
#define END_COMPLEX_MACRO \  
} \  
while (0);  
#define MIDDLE_MACRO std::cout << "wow\n";  
#define IF_STATEMENT_MACRO if (argc % 3)  
#define ELSE_STATEMENT_MACRO else  
  
int main(int argc, char *argv[]) {  
    START_COMPLEX_MACRO  
        MIDDLE_MACRO  
    END_COMPLEX_MACRO  
  
    IF_STATEMENT_MACRO  
    {  
        std::cout << "one\n";  
        MIDDLE_MACRO  
    }  
    ELSE_STATEMENT_MACRO {  
        std::cout << "two\n";  
        MIDDLE_MACRO  
    }  
    return 0;  
}
```

.clang-format:

MacroBlockBegin: '(START_COMPLEX_MACRO)'

MacroBlockEnd: '(END_COMPLEX_MACRO)'

StatementMacros:

- MIDDLE_MACRO

- IF_STATEMENT_MACRO

Asking questions is hard!

—

Which unit-testing frameworks do you regularly use, if any?

Google Test
35%

CppUnit
15%

Boost.Test
10%

Catch
5%

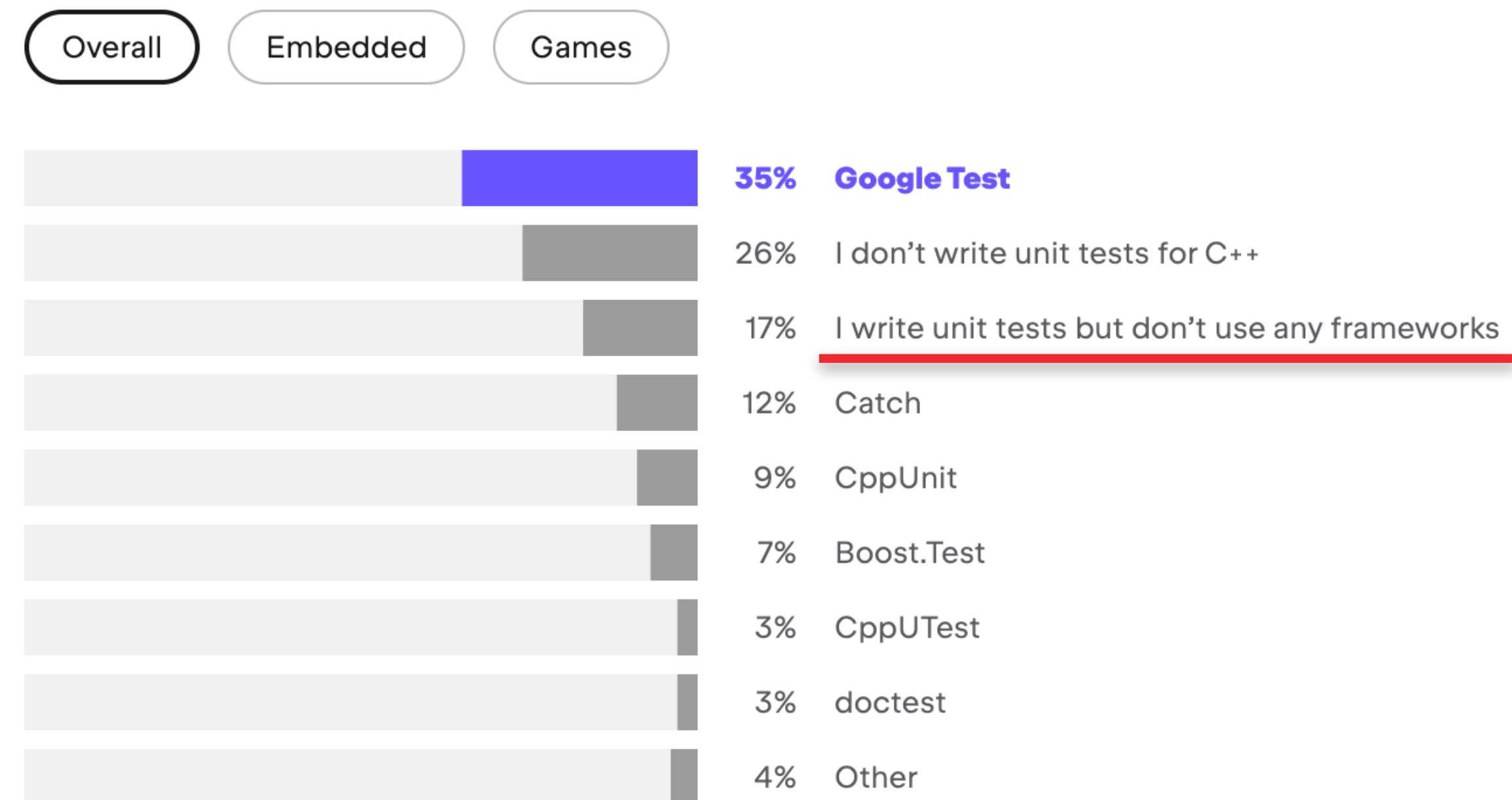
CppUTest
5%

Other
6%

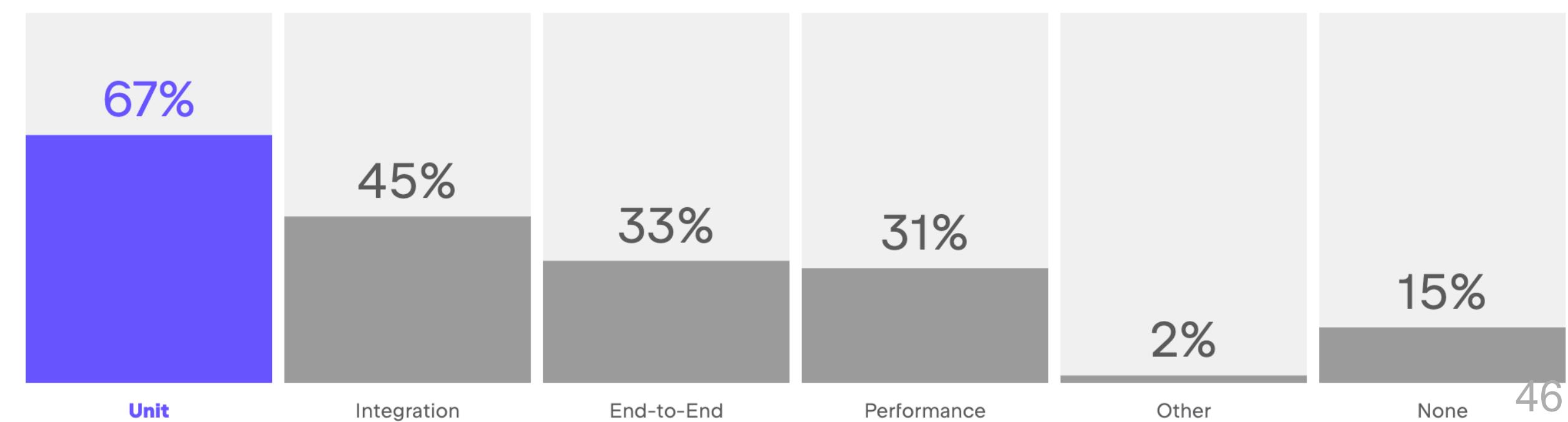
None
41%

No Unit Tests ≠ No Tests

Which unit-testing frameworks do you regularly use?



What types of tests do you have in your projects?



Asking questions is hard! Summary

1. C is not C++
2. C++ versions paths
3. Check all that apply effect
4. Package management
5. Project model vs Build tool
6. Code Analysis on CI matters
7. ClangFormat is not <...> but we use it so
8. No Unit Tests No Tests

Validation

How to validate data?

Validation = probative comparison

1. Compare on the same audience slices
2. Compare on the same questions (1-1 msg match)
3. Explain the difference



Example: validating game dev data

-

1. JetBrains DevEco
2. Perforce: State of Game Development and Design
3. Unity Gaming Report
4. State of the Game Industry by GDC
5. UK Games Industry Census
6. IGDA Diversity in the Game Industry Report
7. ...

Example: compare audiences

JetBrains includes 25% professionally and
66% developing games as a hobby.

Perforce represents 38% of AAA Studio and
37% Indie or Midsized studio.

GDC report contains 18% AAA Studio respondents and
32% Indie Studio.

Example: Which game engines are you primarily using?

Perforce	GDC	DevEco (prof)
Unity 18%	Unity 33%	Unity 60%
UE5 40%, UE4 17%	Unreal Engine 33%	Unreal Engine 30%
Custom 15%	Custom 14%	Custom 11%
Godot 1%	Godot 3%	Godot 8%

Example: validating game dev data



PERFORCE
**2024 State
of Game
Technology
Survey**

In partnership with



Thank you to

-

1. JetBrains Market Research & Analytics Team for all their work
2. Herb Sutter for collaboration around our two surveys
3. Diego Rodriguez-Losada Gonzalez, Inbal Levi, and Bryce Adelstein Lelbach for reviewing and commenting on 2023 data
4. Inbal Levi for inspiring me to do this talk

Surveys

1. JetBrains DevEco 2023 (and all since 2017), <https://www.jetbrains.com/lp/devcosystem-2023/cpp/>
2. Developer Ecosystem: Data Playground <https://www.jetbrains.com/lp/devcosystem-data-playground/>
3. C++ Foundation annual C++ Developer Survey "Lite", <https://isocpp.org/files/papers/CppDevSurvey-2024-summary.pdf>
4. Meeting C++ Survey, <https://meetingcpp.com/mcpp/survey/>
5. The Mom Test, https://www.amazon.com/Mom-Test-customers-business-everyone/dp/1492180742/ref=tmm_pap_swatch_0
6. C++ facts we learned before doing CLion, <https://blog.jetbrains.com/clion/2015/07/infographics-cpp-facts-before-clion/>