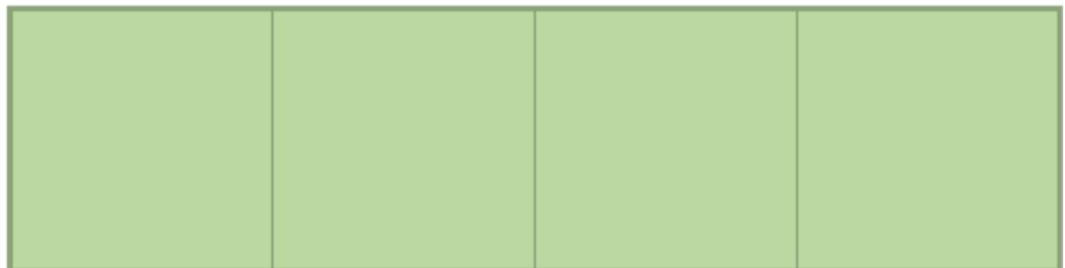


# **EASYBUILD**



# State of the union

Kenneth Hoste (HPC-UGent)

*kenneth.hoste@ugent.be*

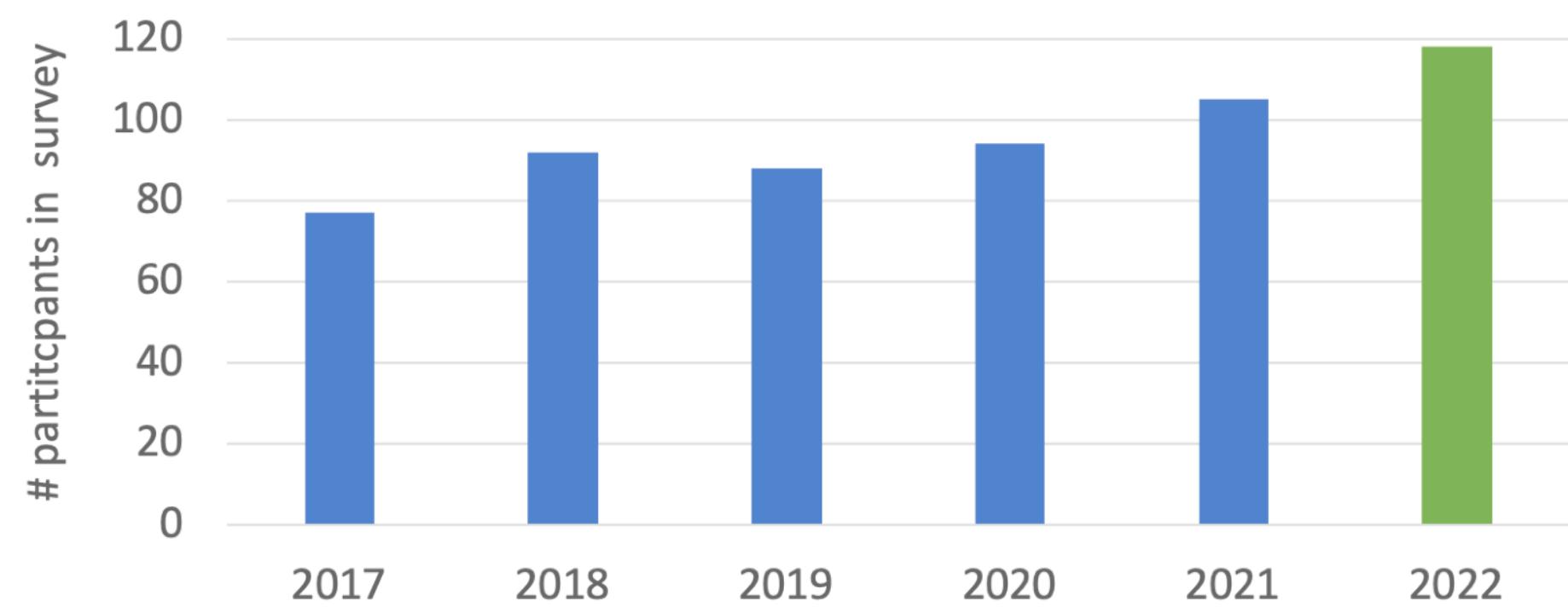
8th EasyBuild User Meeting

*24-26 April 2023 - London (UK)*

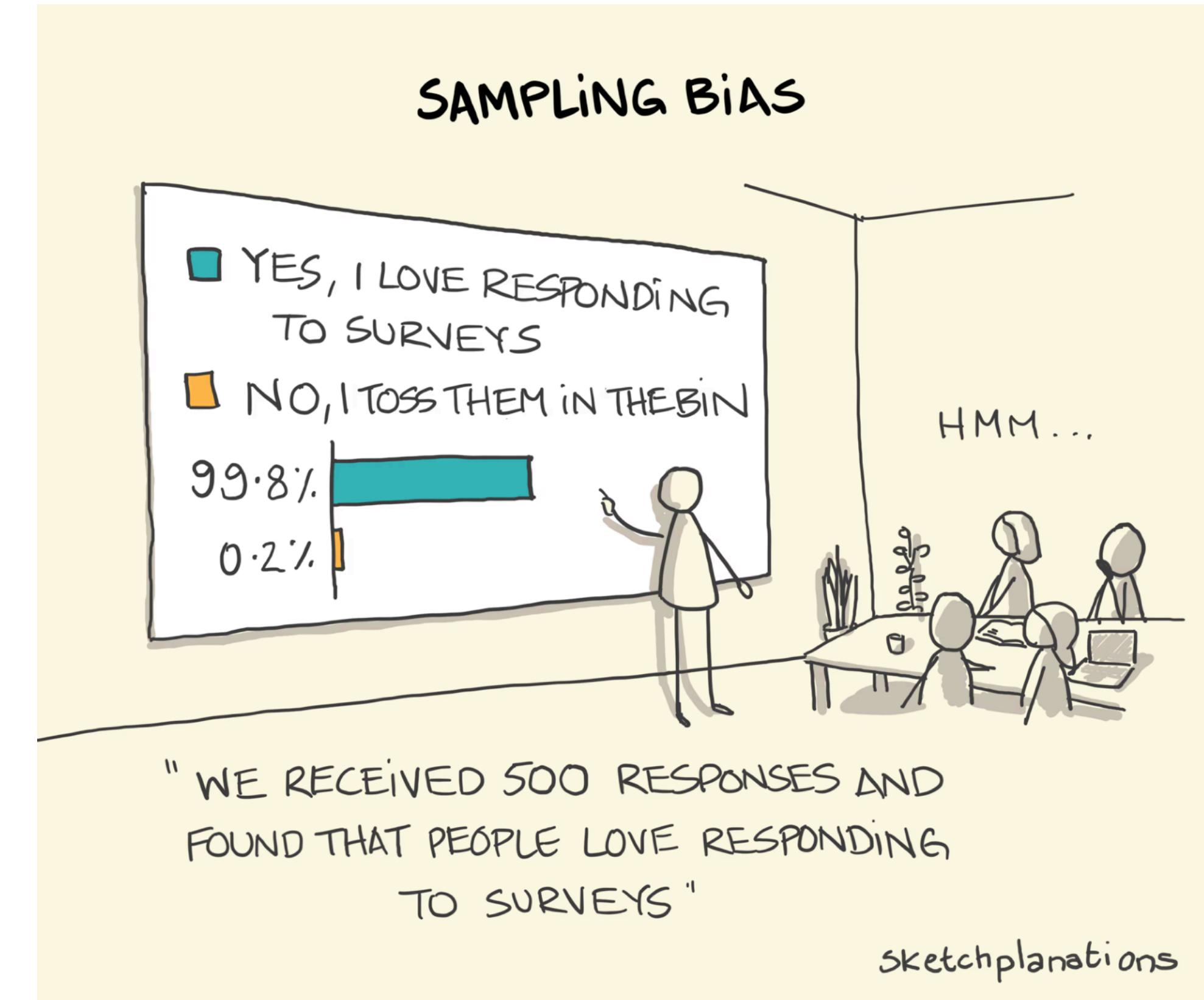
<https://easybuild.io/eum23>

# EasyBuild User Survey

- Anonymous survey via  SurveyMonkey®, 6th edition (for 2022, was held in March 2023)
- Get feedback from / gain insight into EasyBuild community
- 51 questions (incl. 5 new), covers wide variety of aspects
- 118 people participated in last survey (new record \o/)
- **Full survey results (raw) are available at <https://docs.easybuild.io/user-survey>**
- Highlights are covered in this talk - questions with “boring” results are skipped
- 6 years of survey results allows for observing evolution and trends

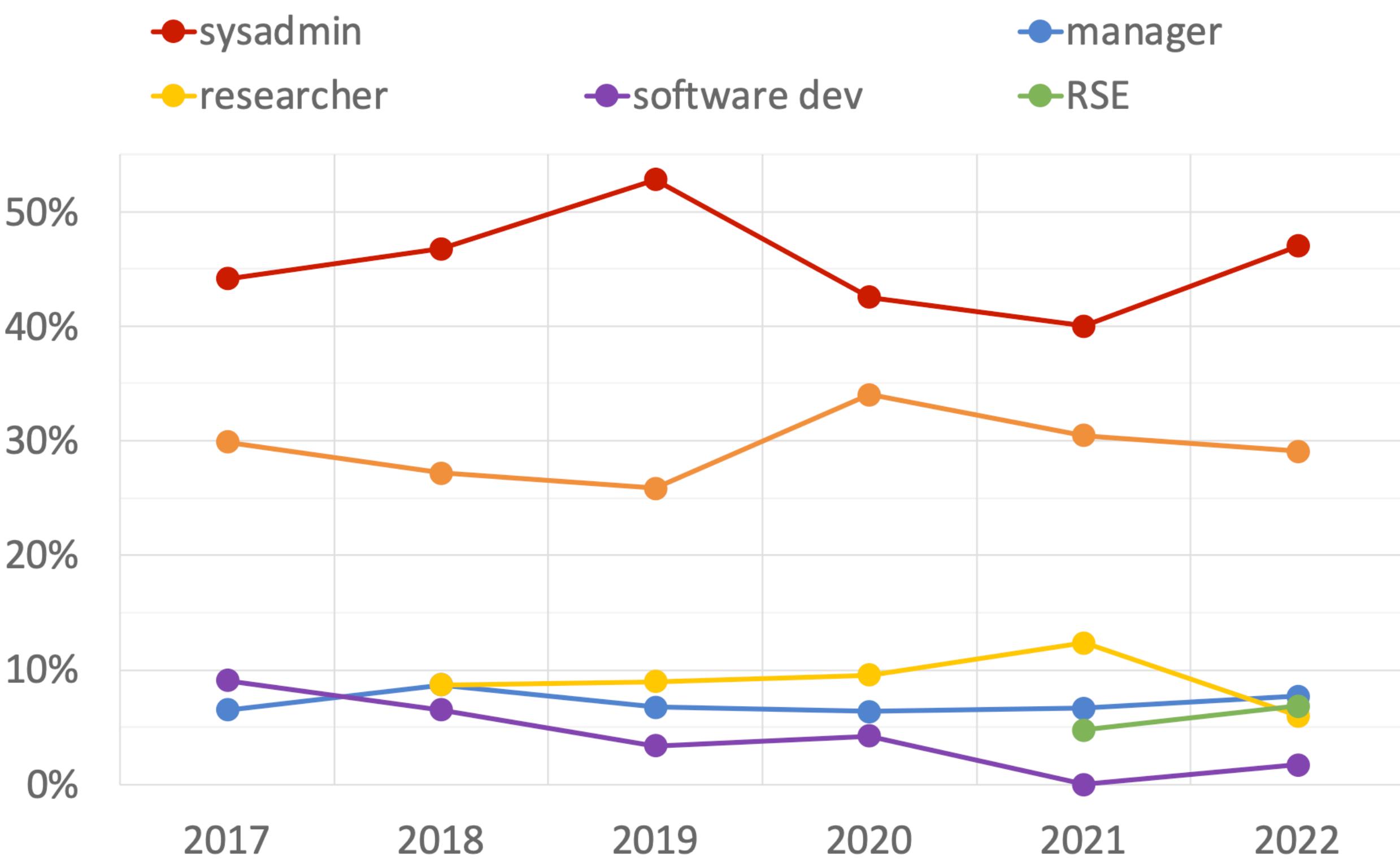
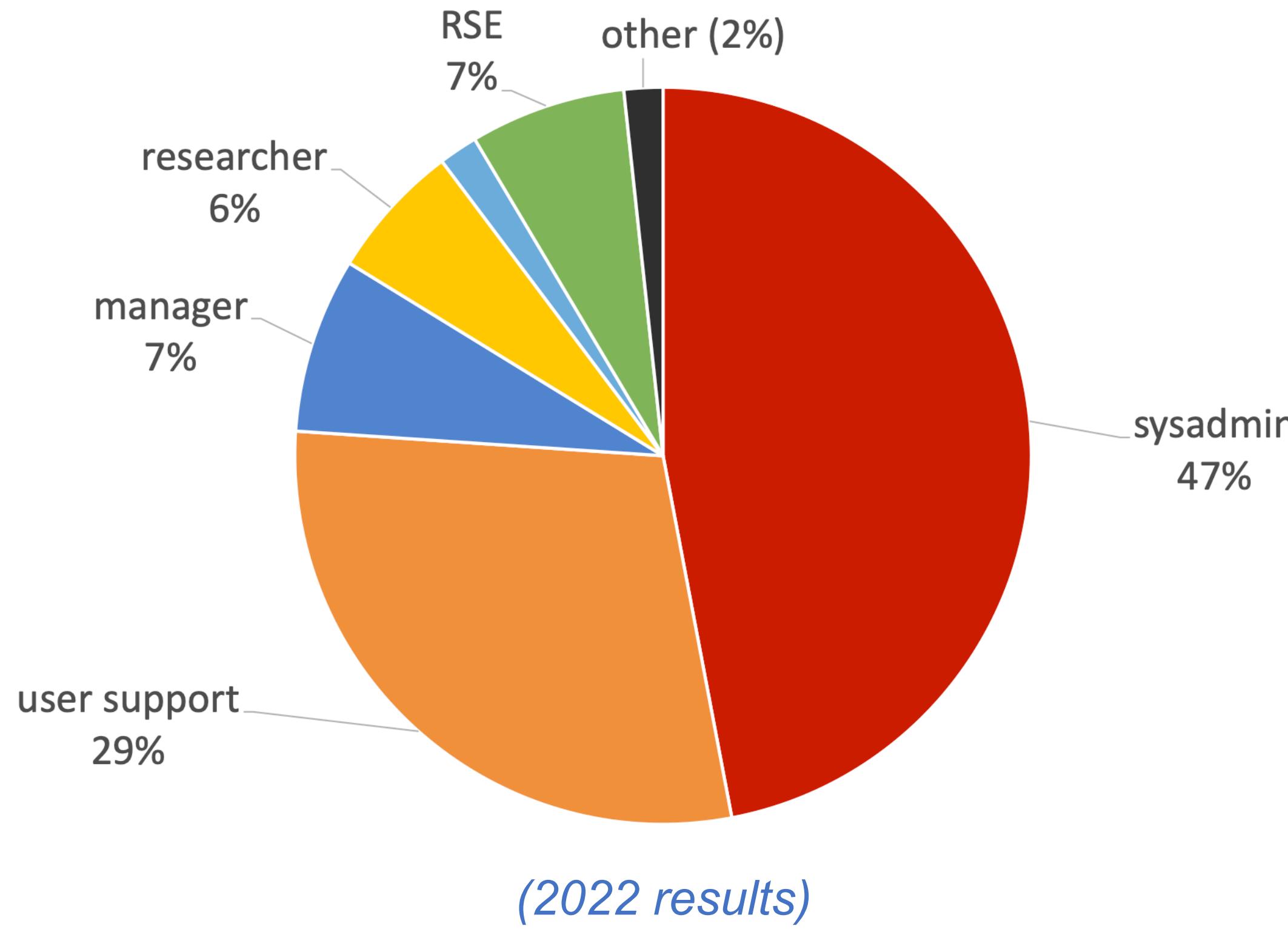
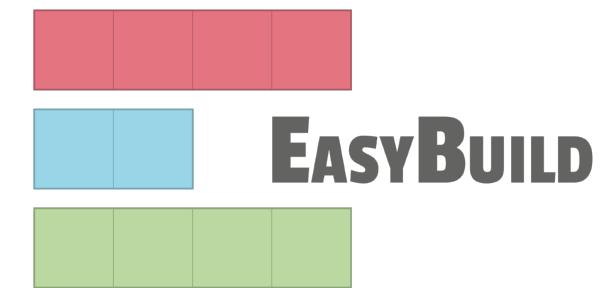


# EasyBuild User Survey

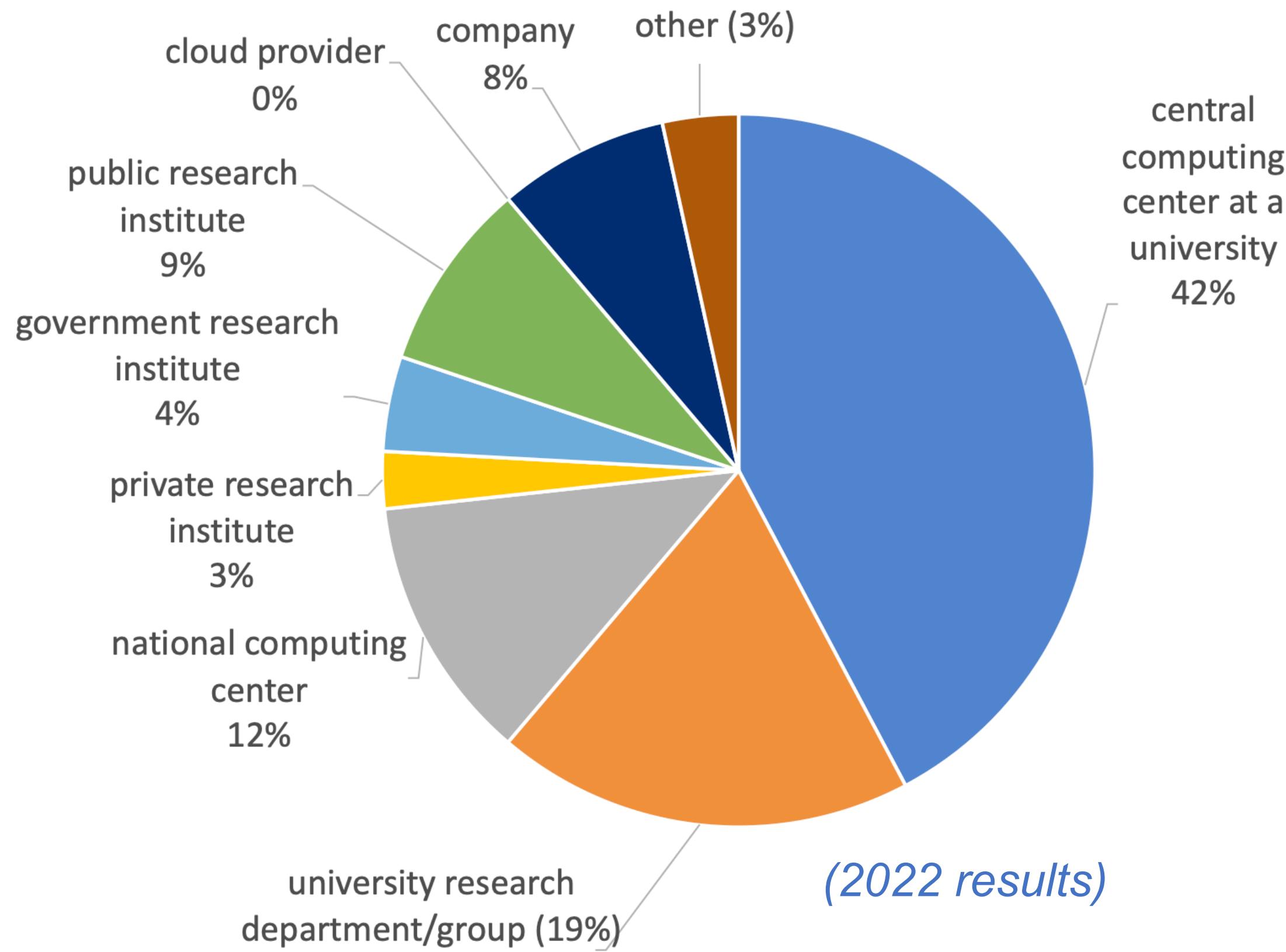
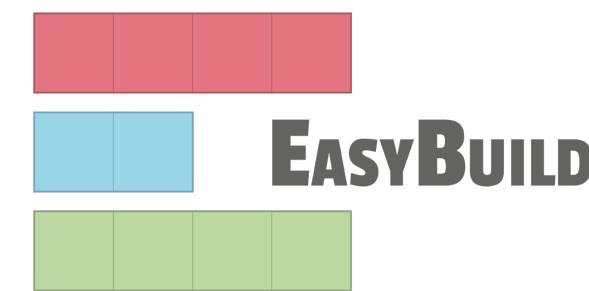


Assumption is that survey results give relevant view on EasyBuild community  
 (but results are interpreted with a grain of salt)

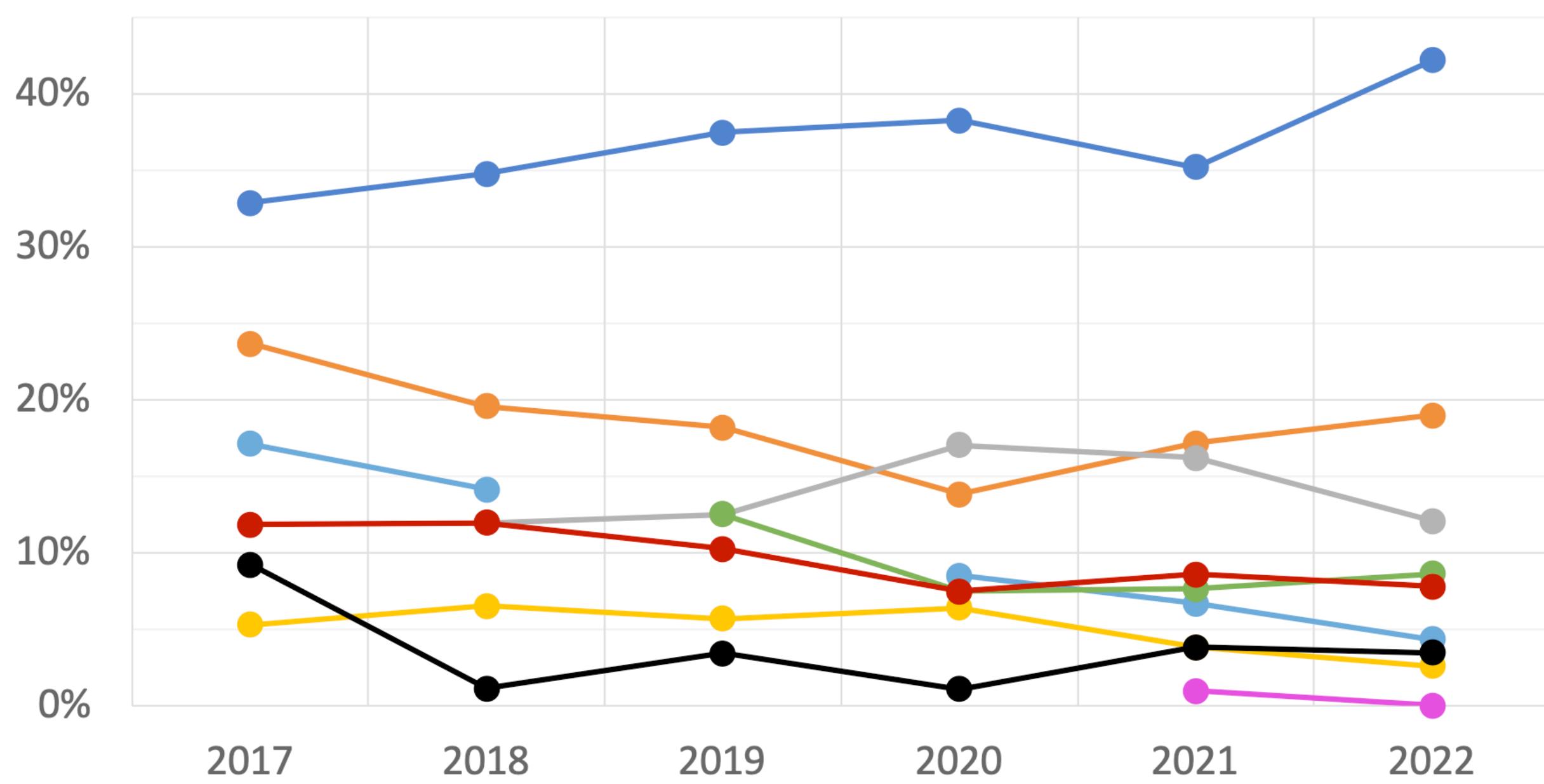
# EasyBuild demographics - primary profile



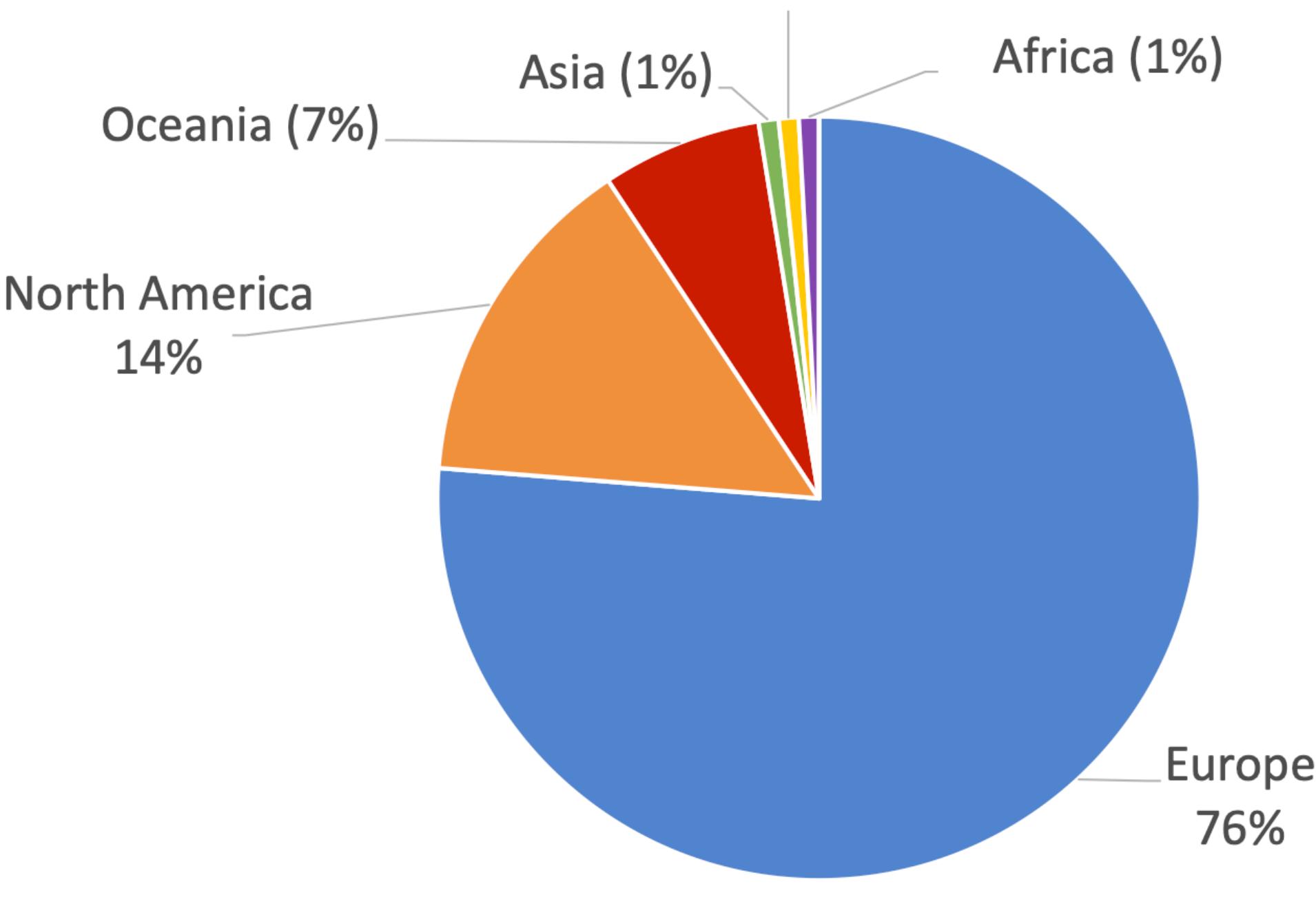
# EasyBuild demographics - type of organization



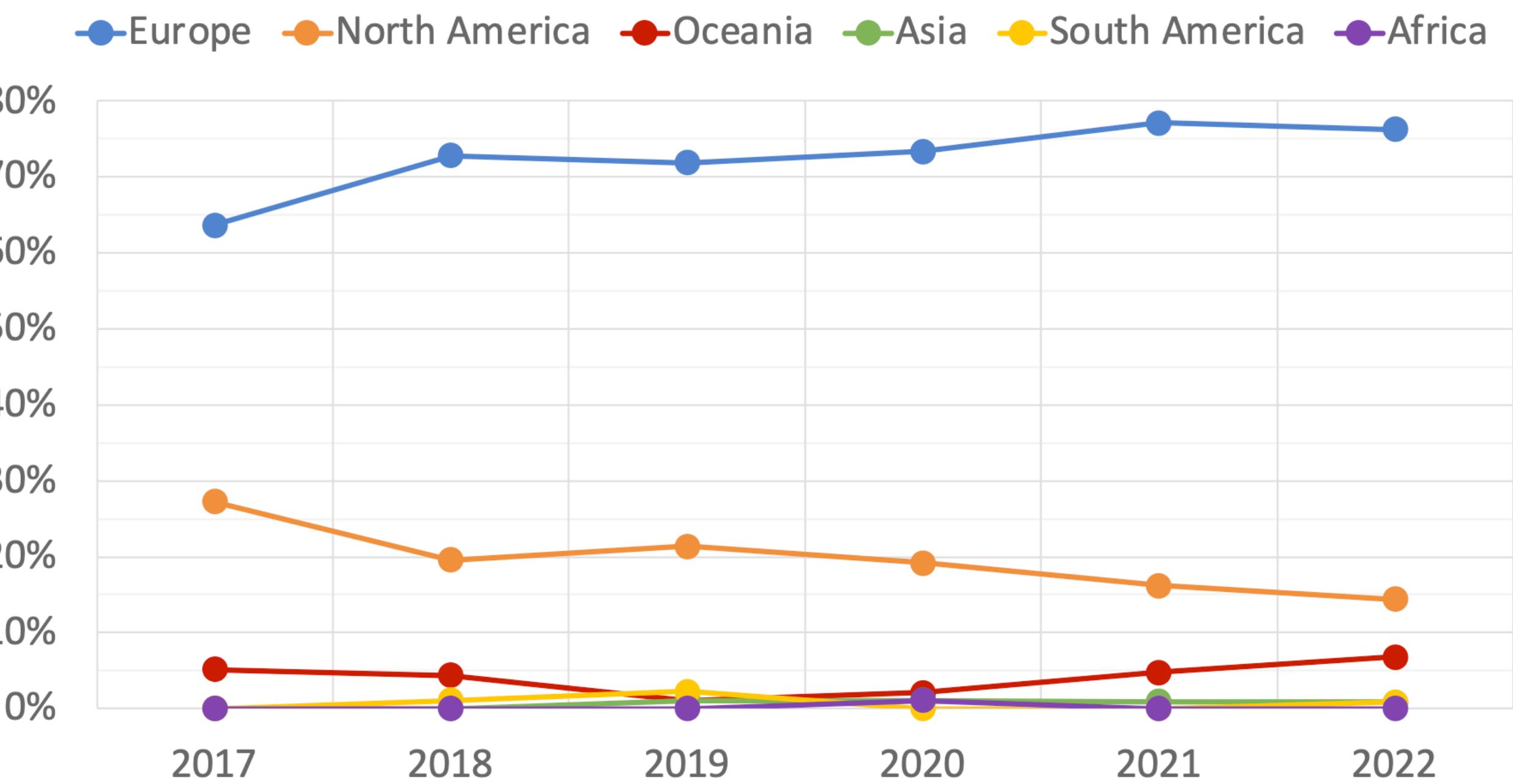
- central computing center at a university
- national computing center
- government research institute
- cloud provider
- company
- other



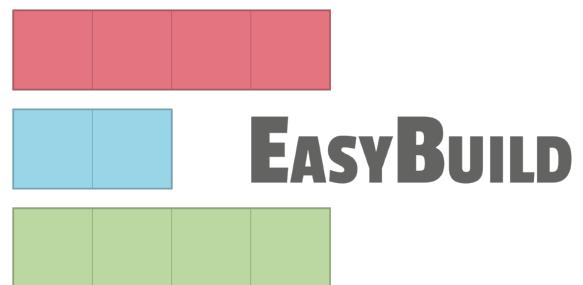
# EasyBuild demographics - geographical



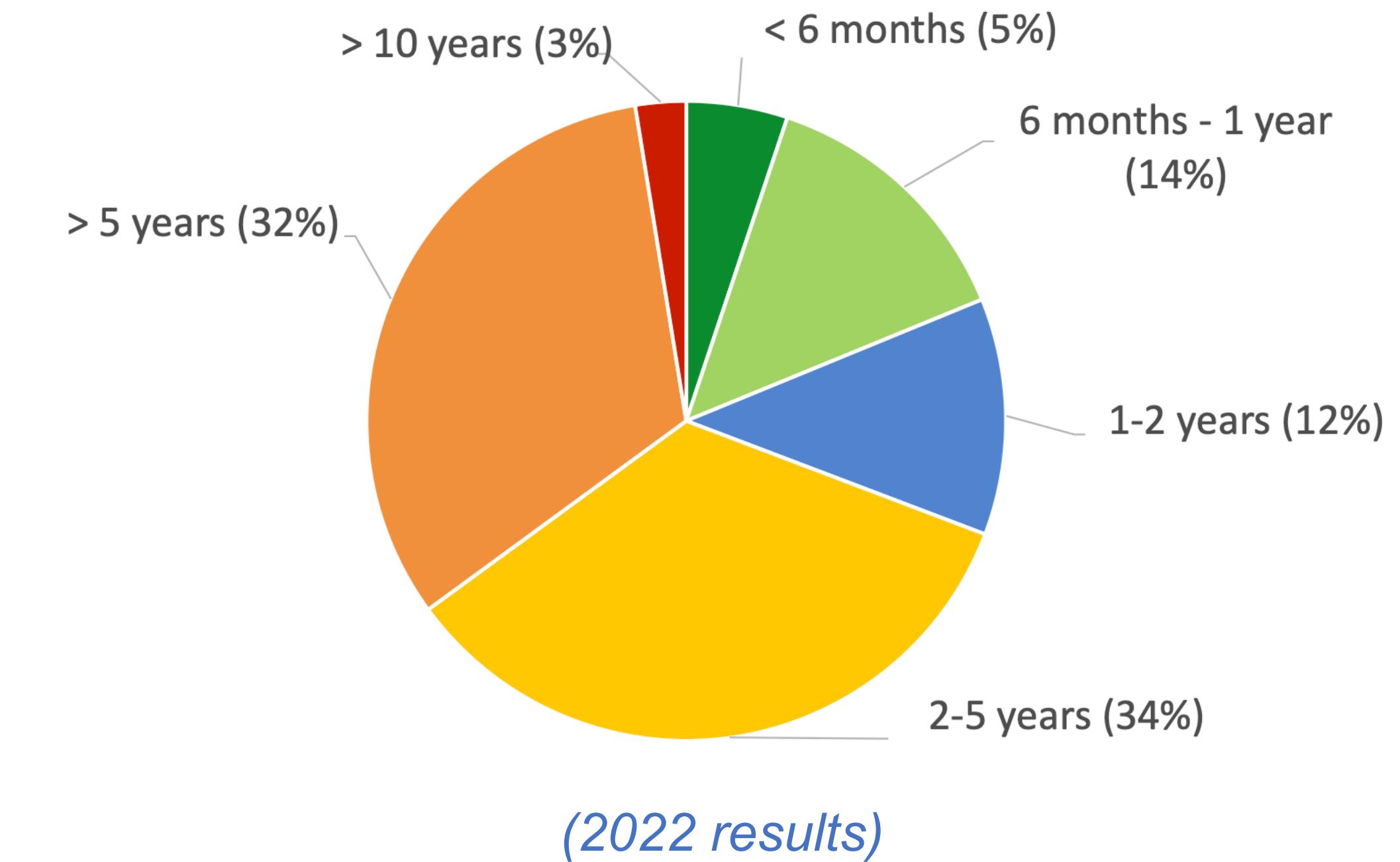
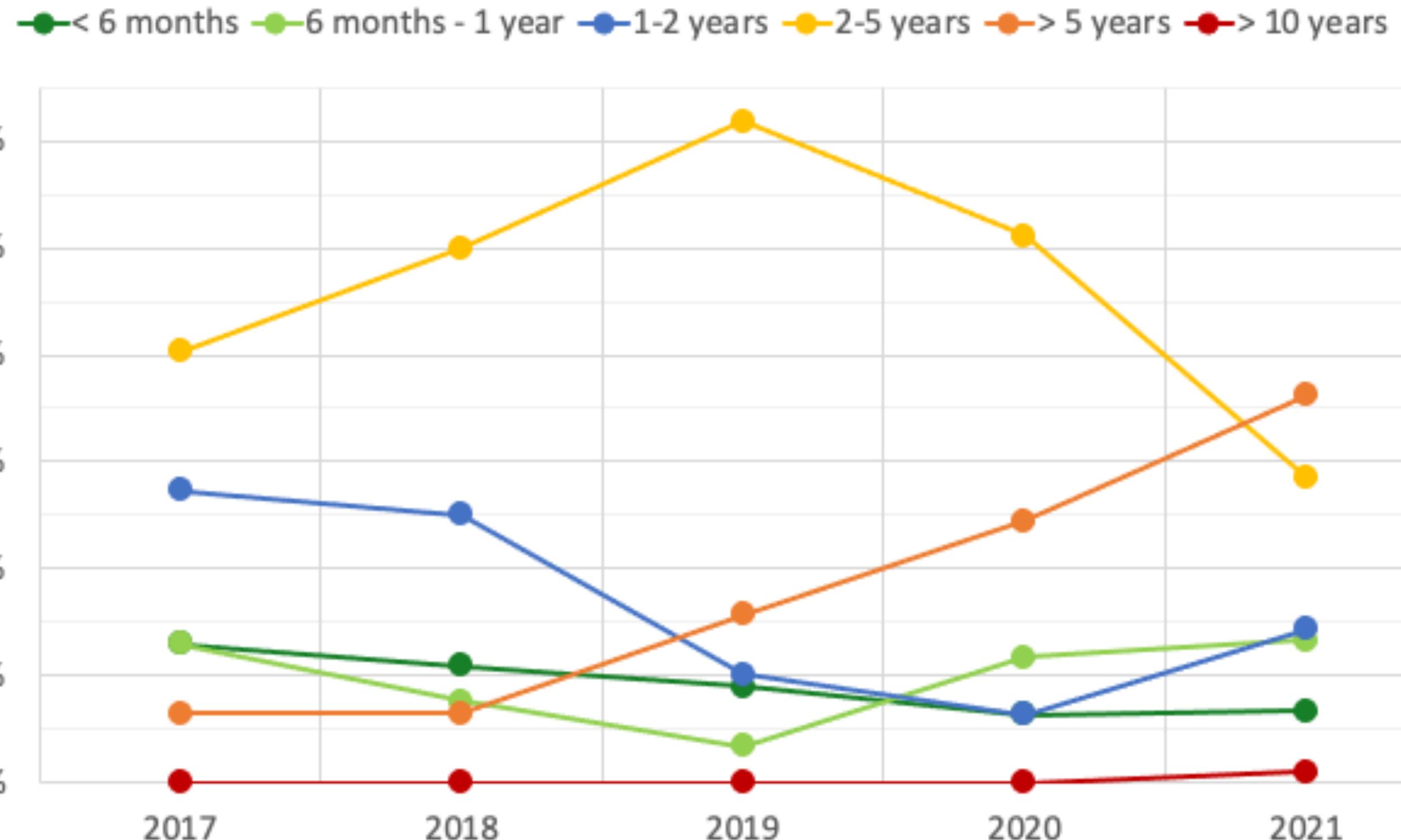
*(2022 results)*



# EasyBuild demographics

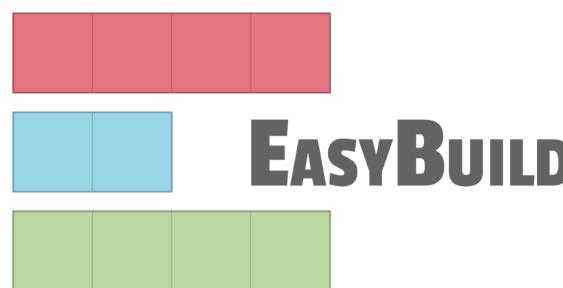


*How long have you been using EasyBuild?*



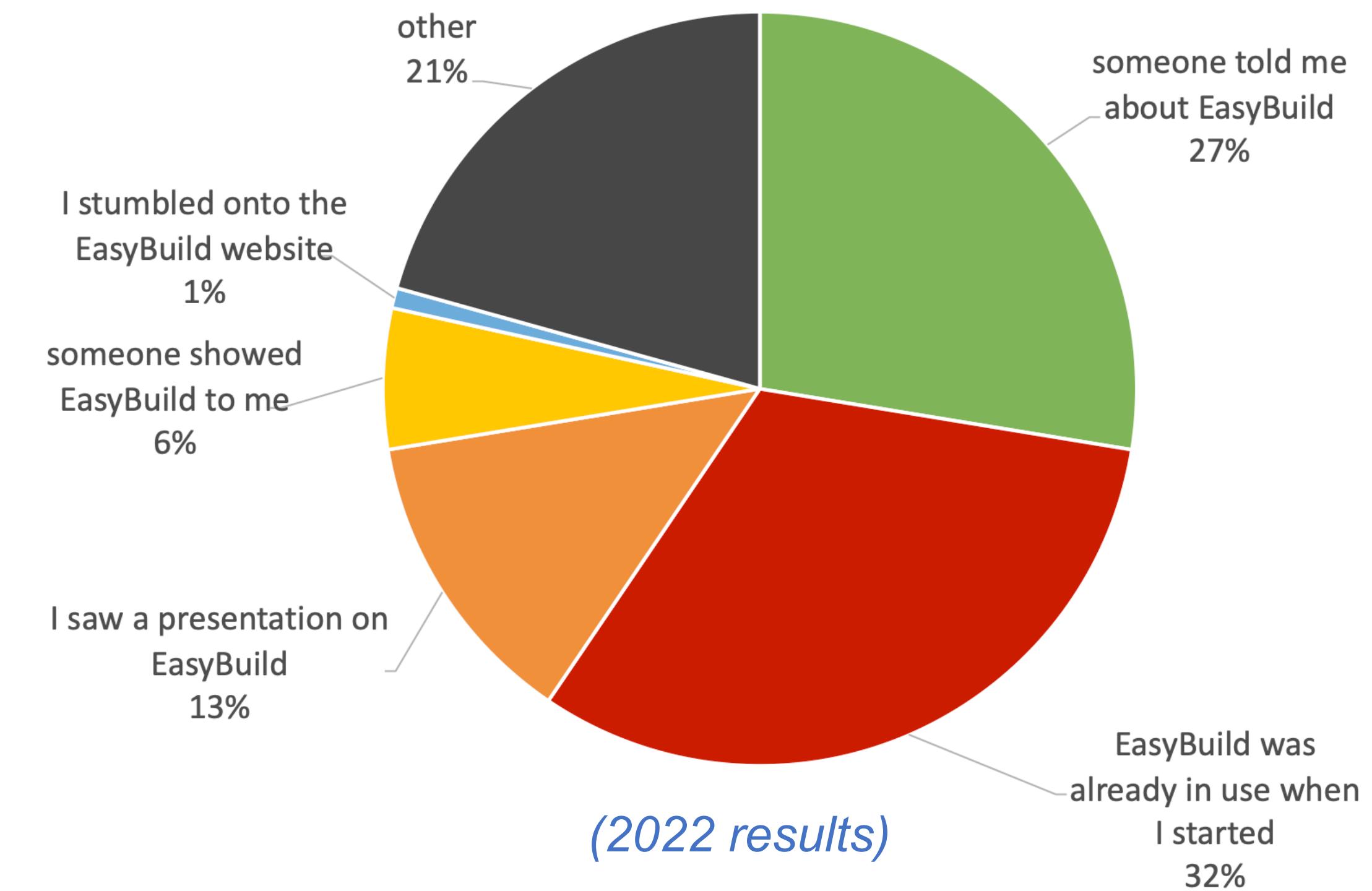
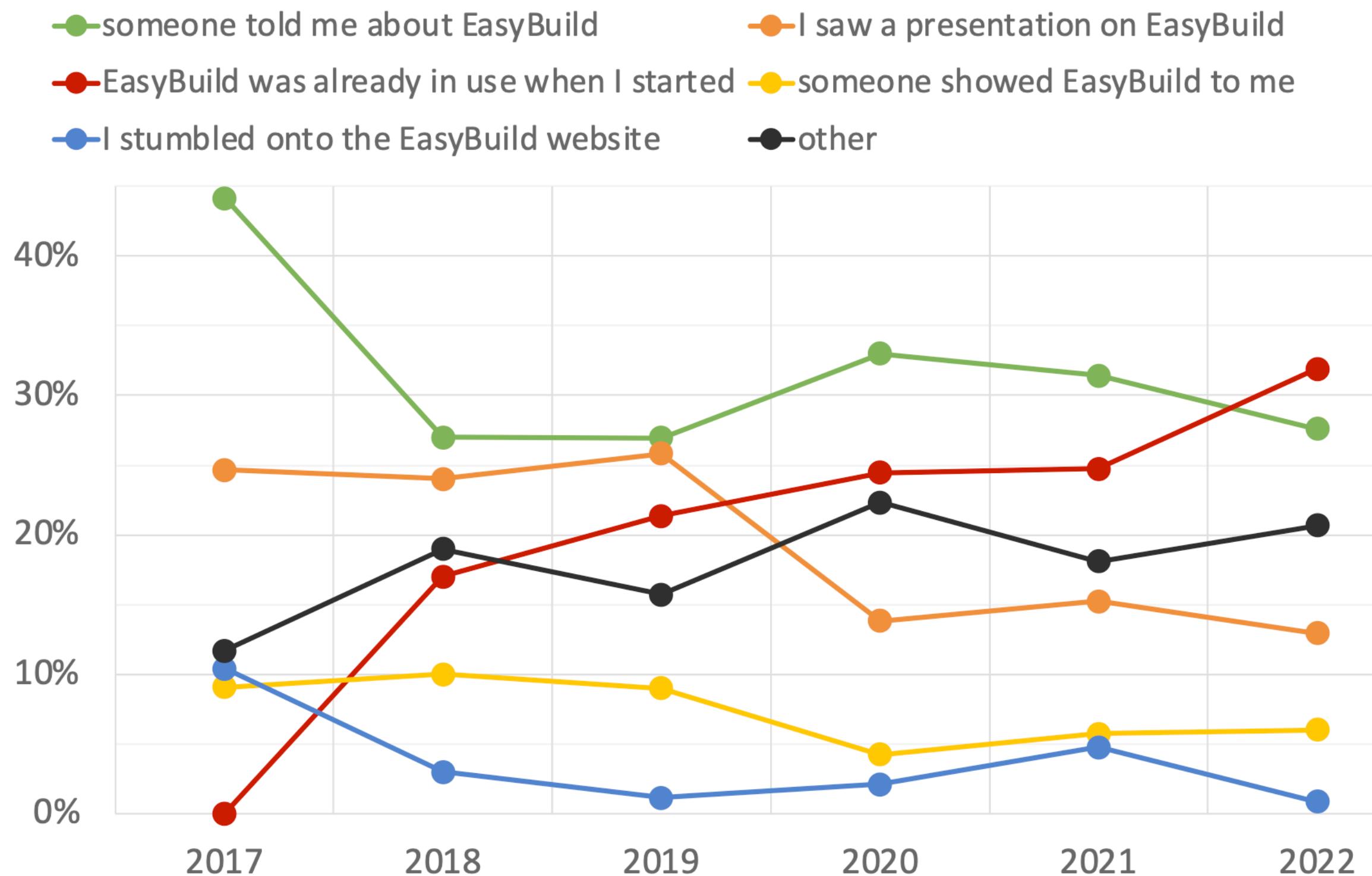
Steady and significant influx of new people: ~20% of current community!

Group with > 10 years of experience with EasyBuild is starting to form...



# EasyBuild demographics

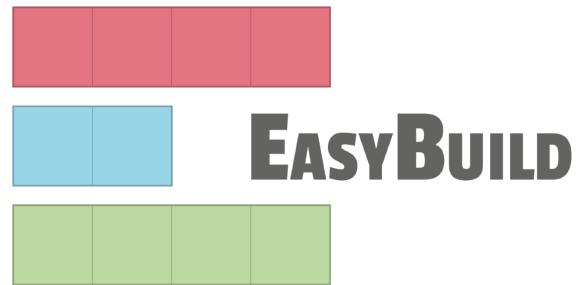
*How did you first learn about EasyBuild?*



Word-of-mouth (peers, talks, demos, social media) remains dominant (~51%)

People who learned about EasyBuild on the job is now largest group

# 2022 was a special year for EasyBuild

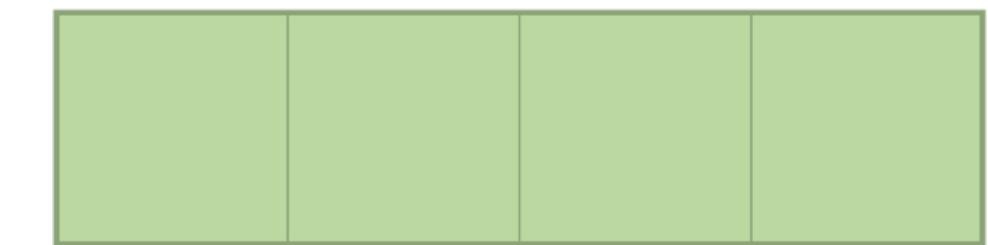
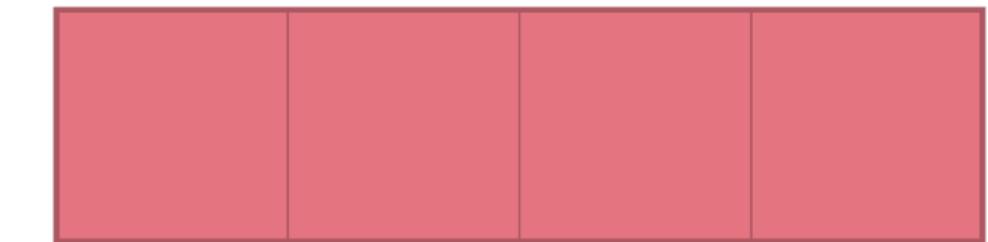


- EasyBuild was first publicly released in 2012, so **10 years of (publicly available) EasyBuild!**
  - After several years of internal development at HPC-UGent
  - EasyBuild v0.5 released in April 2012 to "feel the water", and get feedback from HPC community
  - EasyBuild v1.0 released in Nov. 2012 (literally during SC12) after lots of feedback by early adopters
- EasyBuild community has been growing ever since!
  - 11 EasyBuild hackathons (2012-2016), all across Europe + at TACC
  - 7 EasyBuild User Meetings (2016-2022), 5 physical/hybrid + 2 virtual
  - "Getting Scientific Software Installed" Birds-of-a-Feather sessions at ISC and SC
  - Lots of presentations, tutorials, etc.
- As promised, we didn't let 10 years of EasyBuild pass by unnoticed...





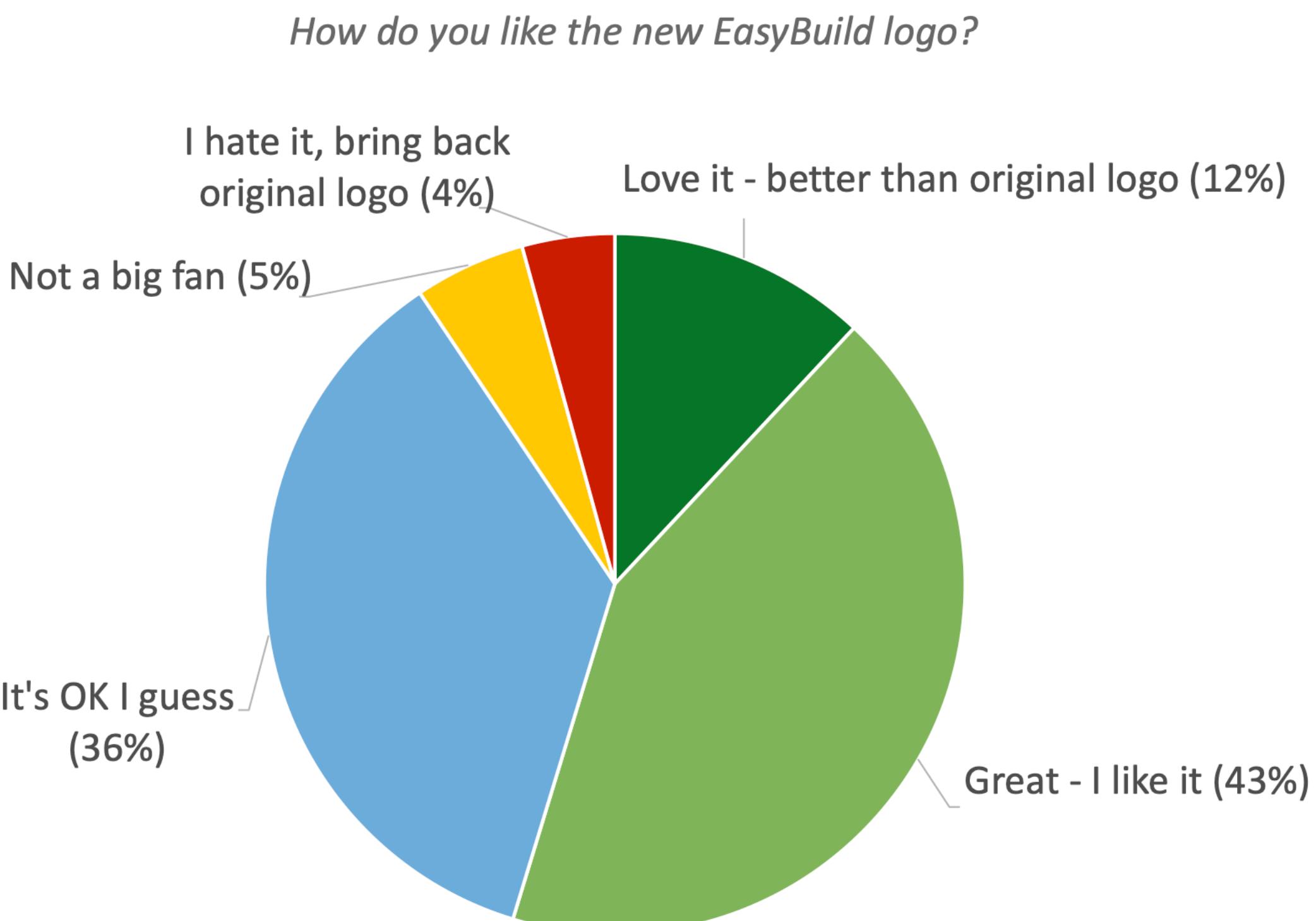
# New EasyBuild logo



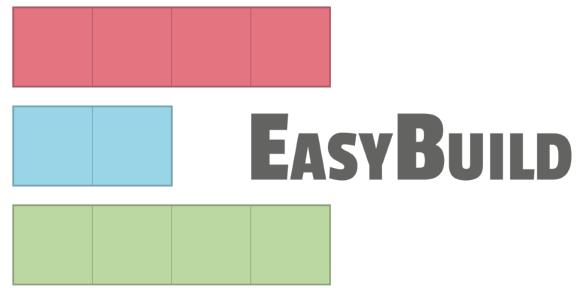
**EASYBUILD.io**  
building software with ease

A new logo for EasyBuild was introduced on 14 Nov 2022,  
exactly 10 years after the release of EasyBuild v1.0 .

More information on (the motivation for) new logo:  
<https://easybuild.io/new-logo-2022.html>

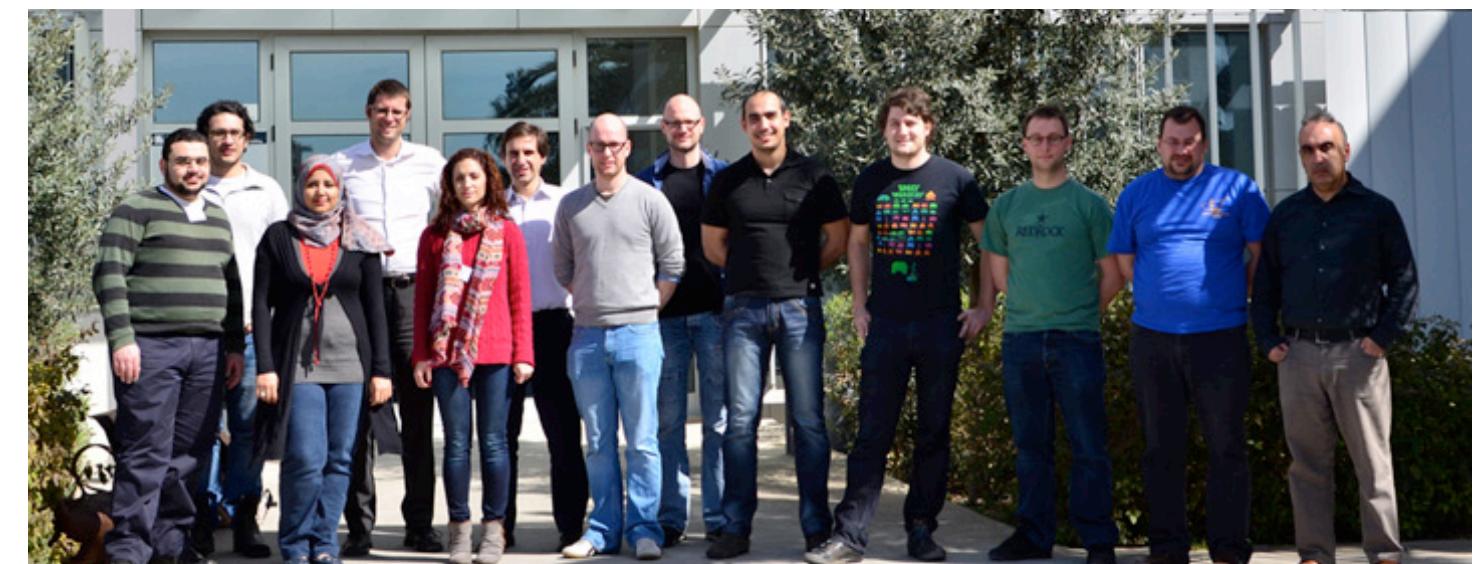


# EasyBuild: Into a New Decade



*“EasyBuild: Into a New Decade” talk was presented on 14 Nov 2022*

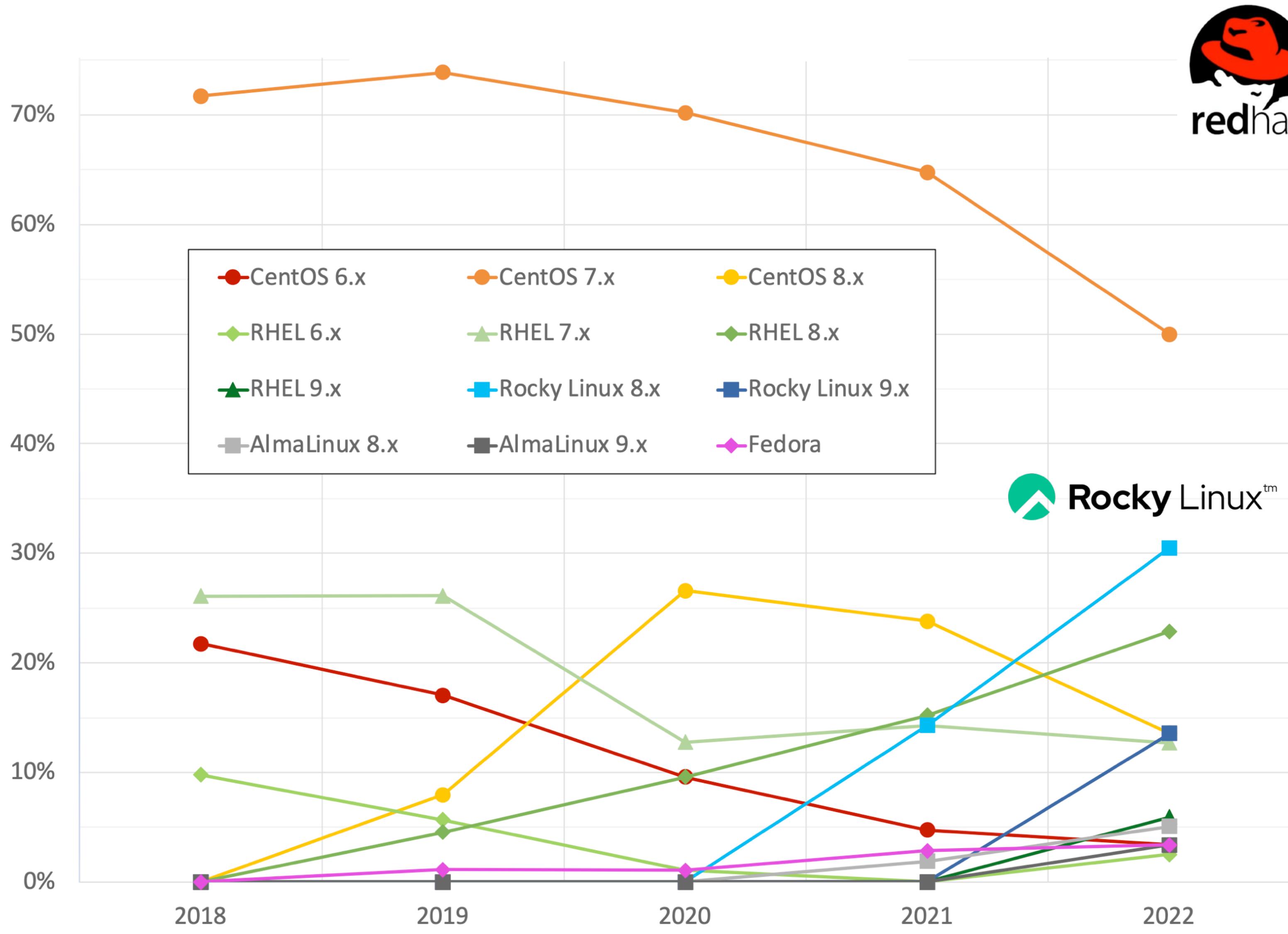
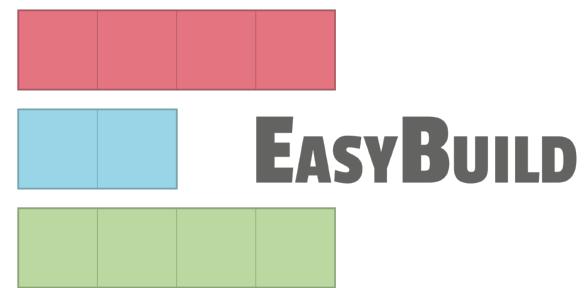
- History of EasyBuild: from in-house development to public release, and beyond
- Overview of EasyBuild features that were developed over the years
- Rise of the EasyBuild community
- Lessons learned
- Current efforts
- Outlook to the future, incl. EasyBuild v5.0 + EESSI
- Introduction of new EasyBuild logo



Slides: <https://easybuild.io/files/EasyBuild-into-a-new-decade-2022-11-14.pdf>

Recording: <https://www.youtube.com/watch?v=crXchK5SRys>

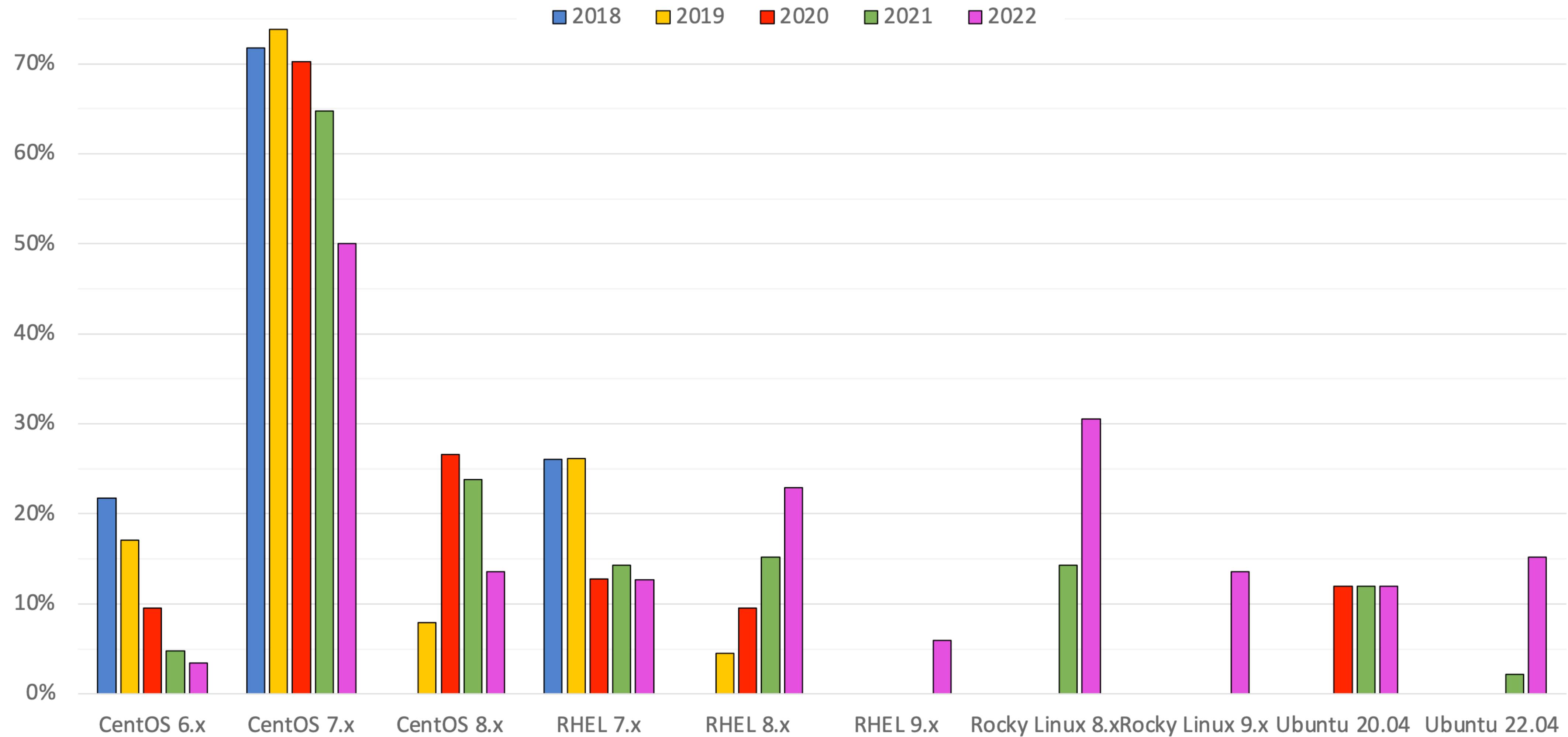
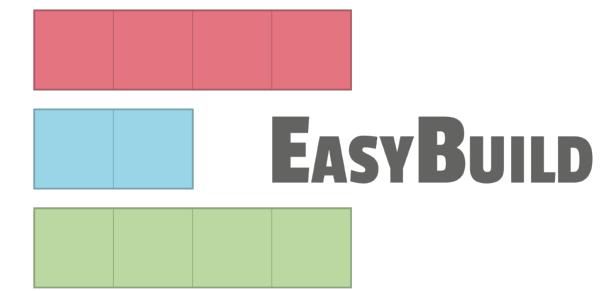
# Operating systems in EasyBuild community



- Vast majority of EasyBuild community is using a RHEL-based OS
- **CentOS 7 is still most prominent**, but it is losing ground since it's EOL mid next year
- Rocky Linux is replacing CentOS, along with RHEL
- CentOS 6 + RHEL 6 are still not fully gone...

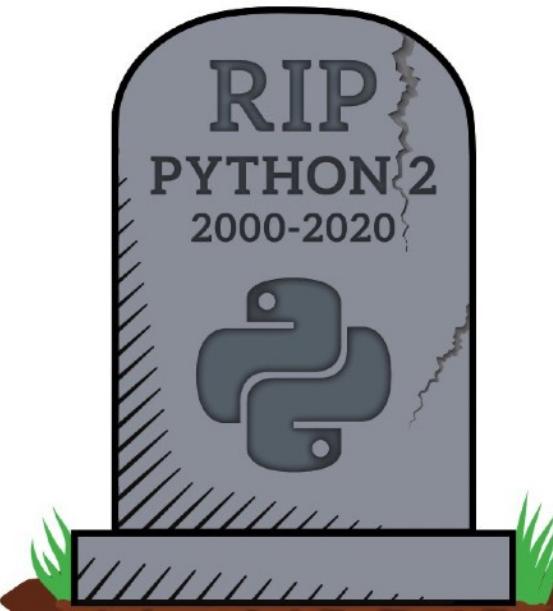
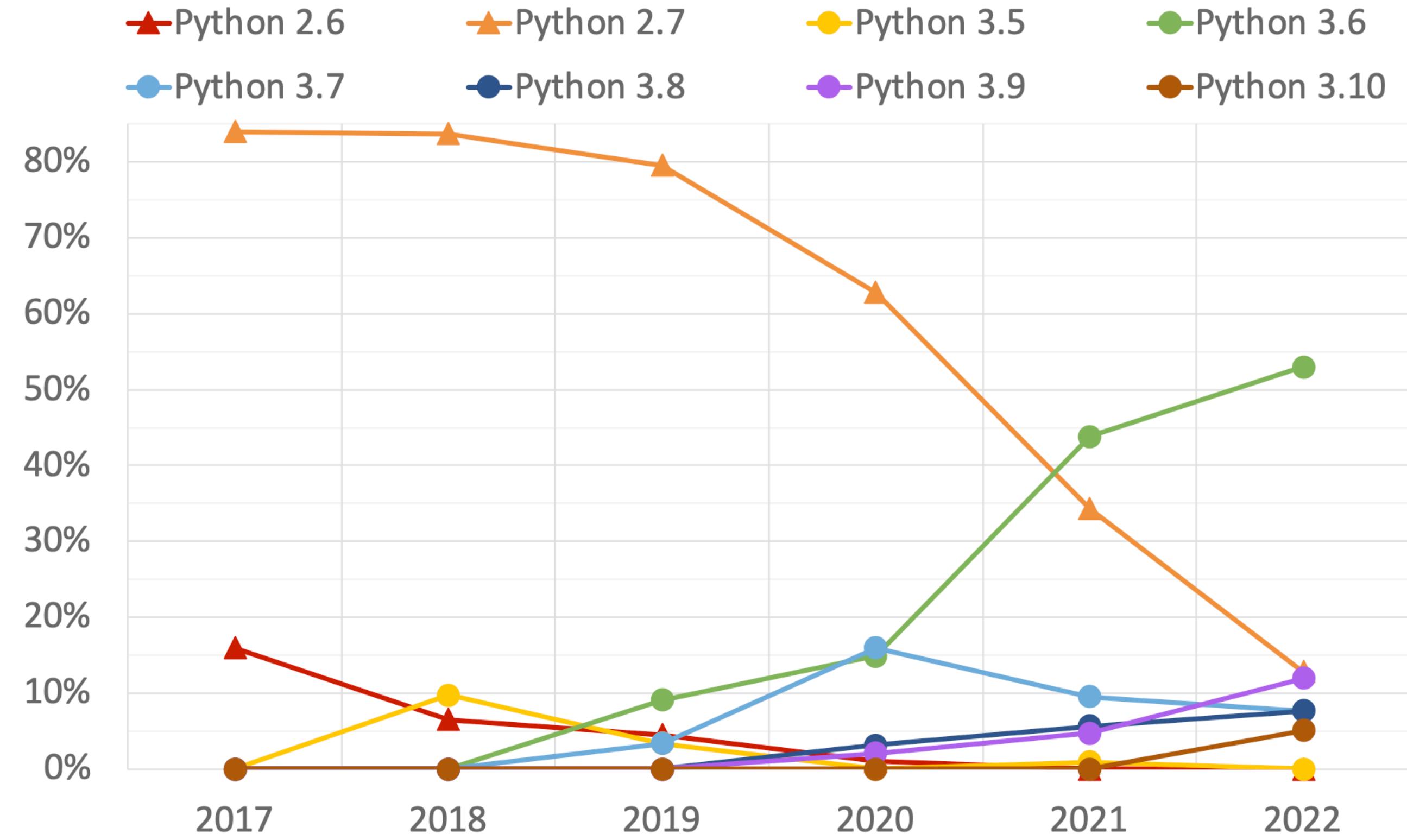
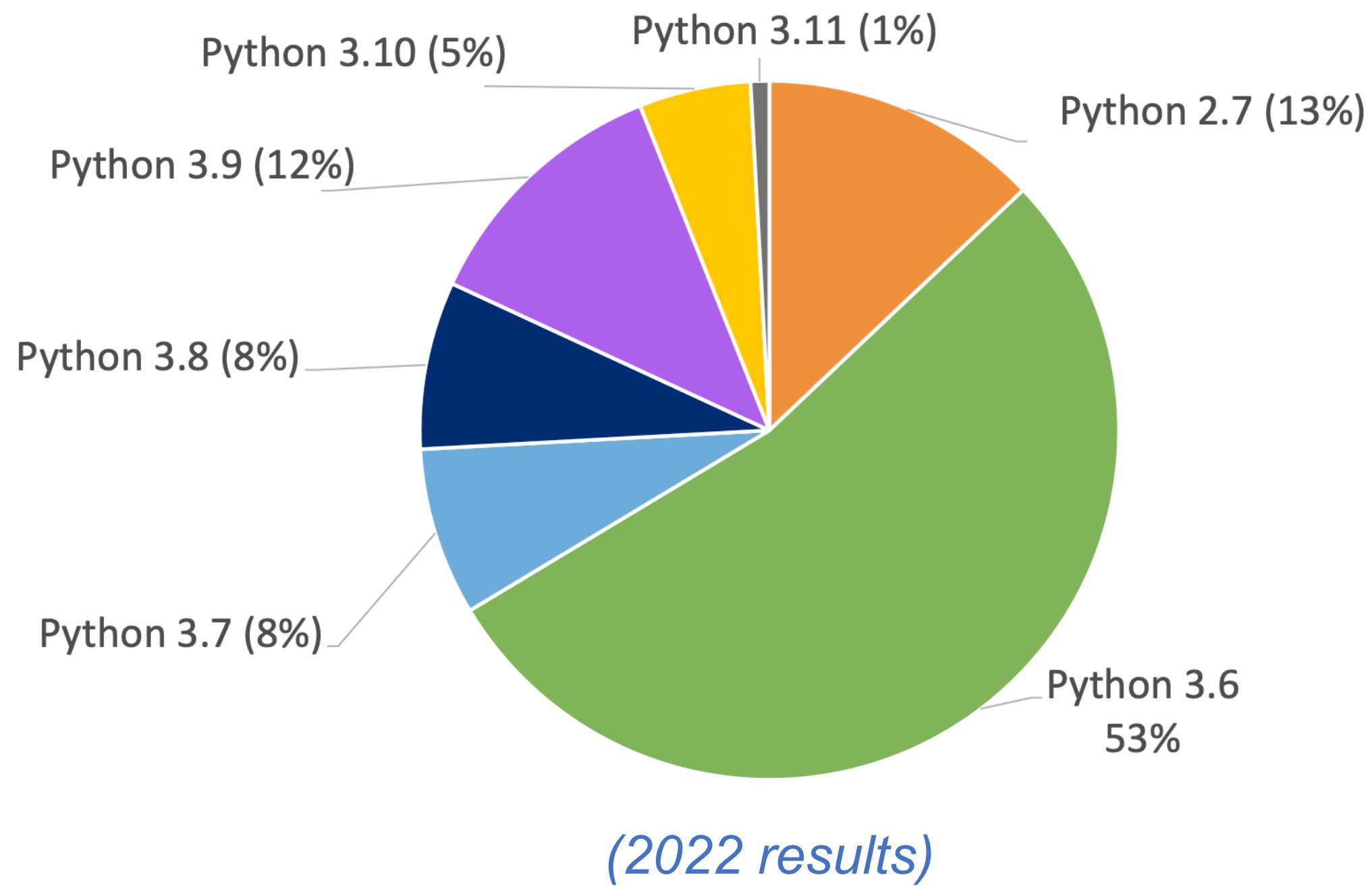
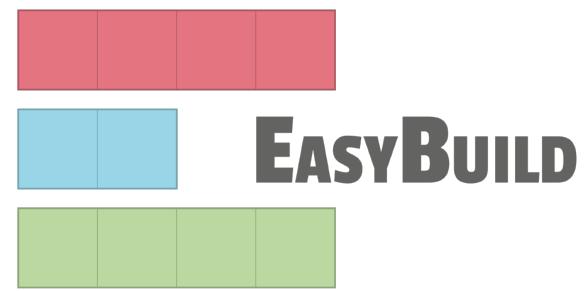
CentOS 6 EOL: Nov 2020  
CentOS 7 EOL: June 2024  
CentOS 8 EOL: Dec 2021  
RHEL 6 EOL: Nov 2020  
RHEL 7 EOL: June 2024  
RHEL 8 EOL: May 2029

# Operating systems in EasyBuild community



Non-RHEL based OSs are a minority in the EasyBuild community

# Python versions used to run EasyBuild

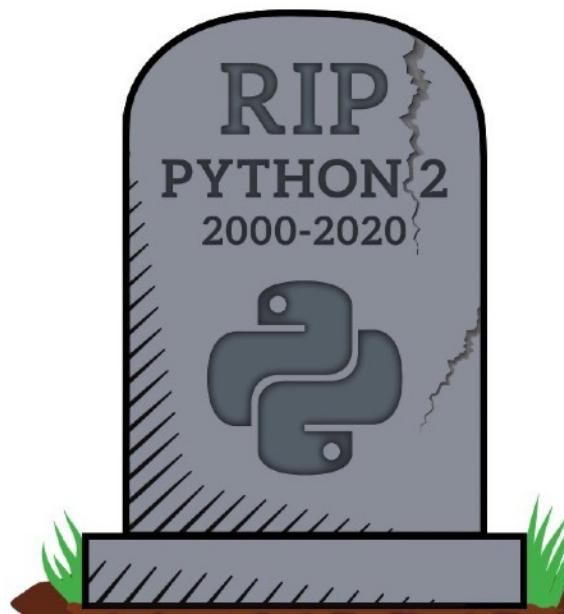
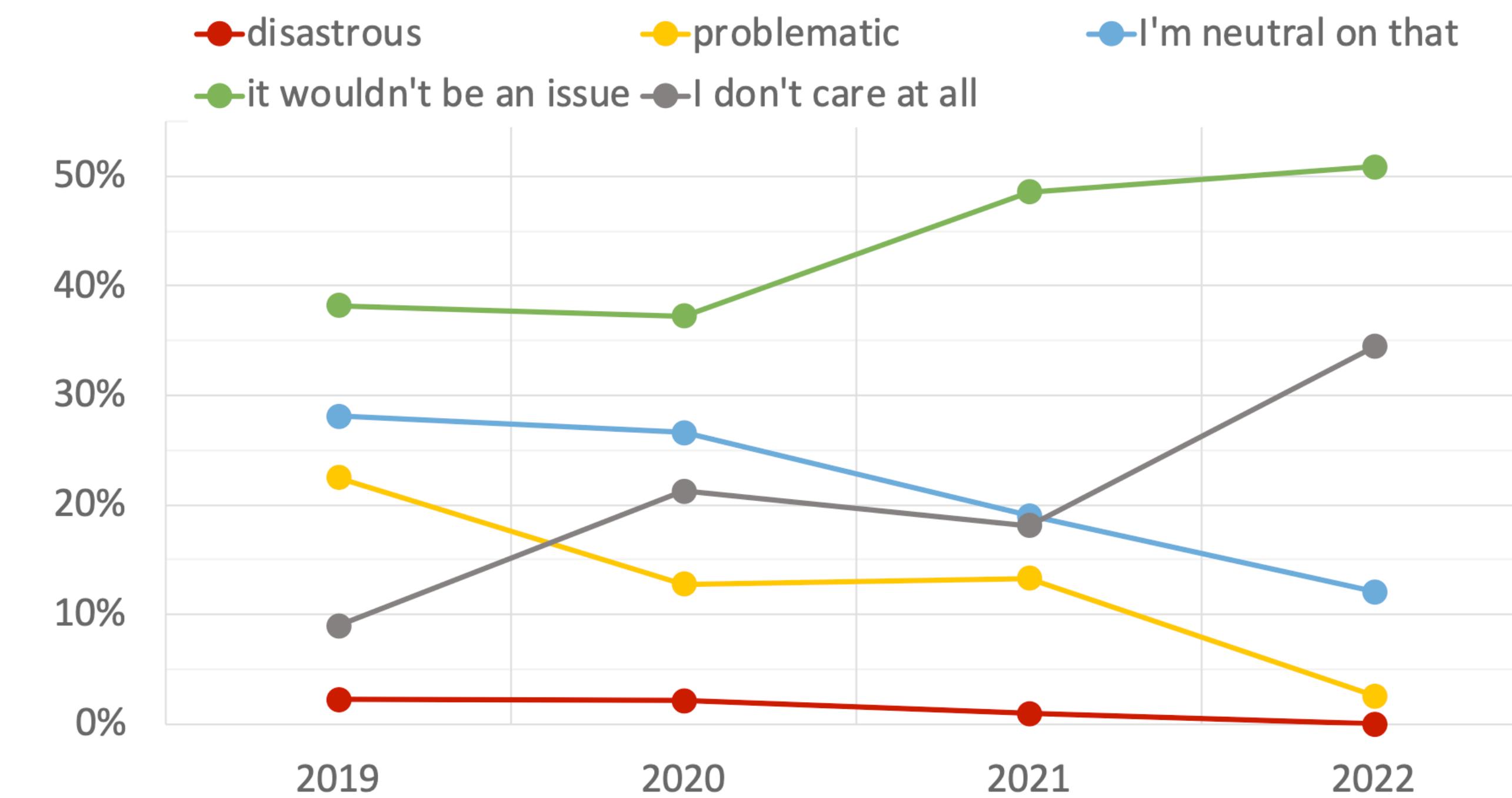
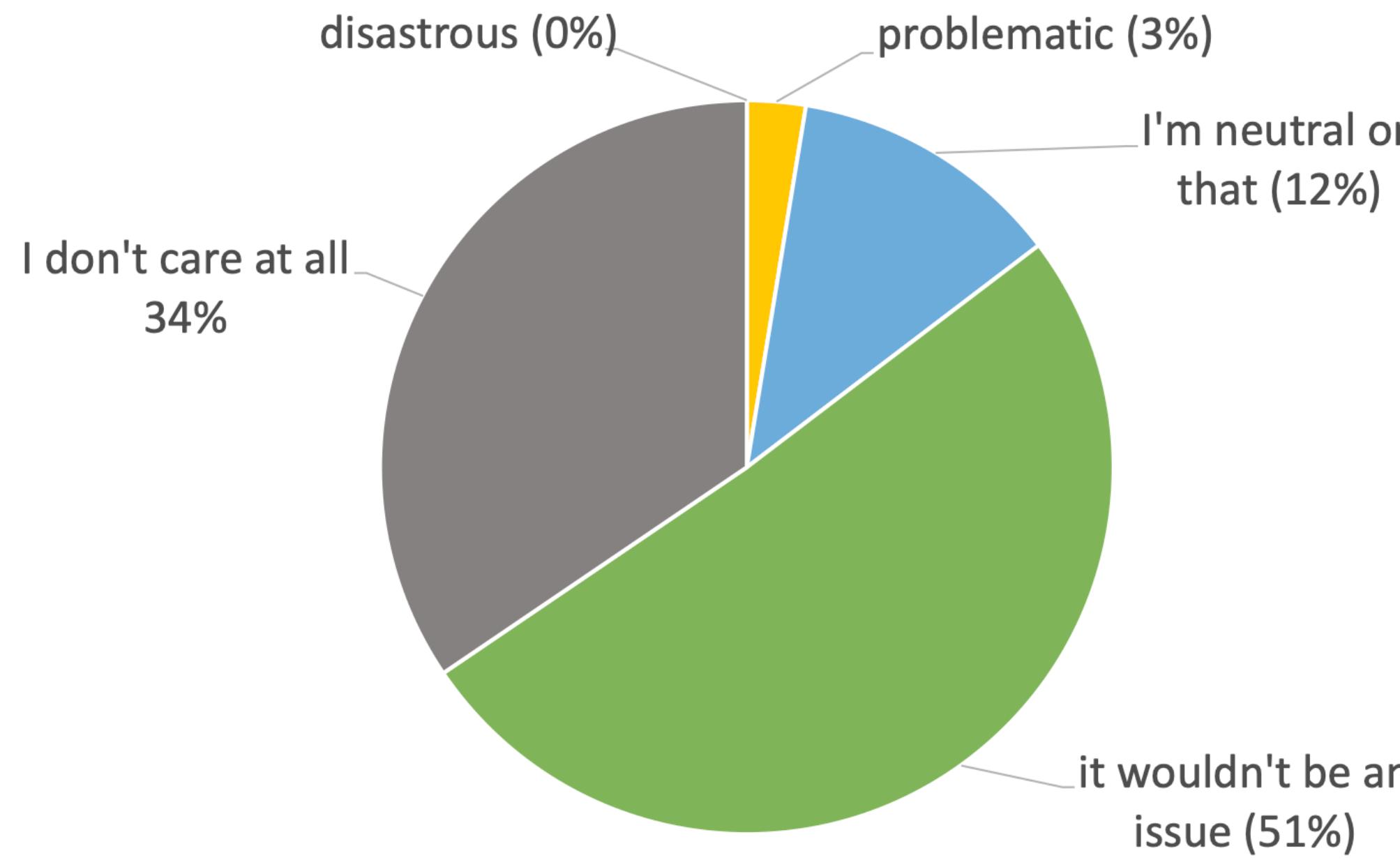


The time is right now to stop supporting running EasyBuild on top of Python 2.7...

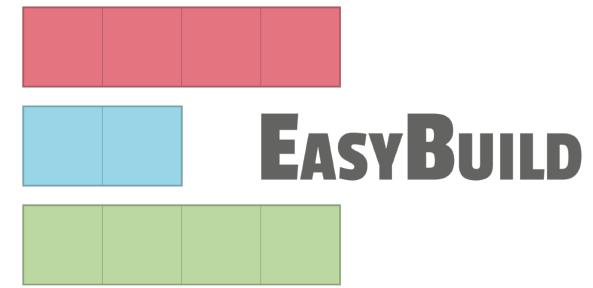
Keeping support for using Python 3.6 (default Python in RHEL8-based OSs) is important!

# Community is fine with getting rid of Python 2.7

*How troublesome would it be for you if EasyBuild becomes incompatible with Python 2.7?*



Support for running on top of Python 2.7 is deprecated since EasyBuild v4.7.0 (Jan'23),  
 and will be removed in EasyBuild v5.0 (ETA end of 2023)



# Using Python 3 to run EasyBuild

<https://docs.easybuild.io/python-2-3-compatibility>

- eb script determines which python command will be used to run EasyBuild
- By default considers python, python3, python2 (in that order)
- You can specify which command should be used via \$EB PYTHON:

```
export EB PYTHON=python3.6
```

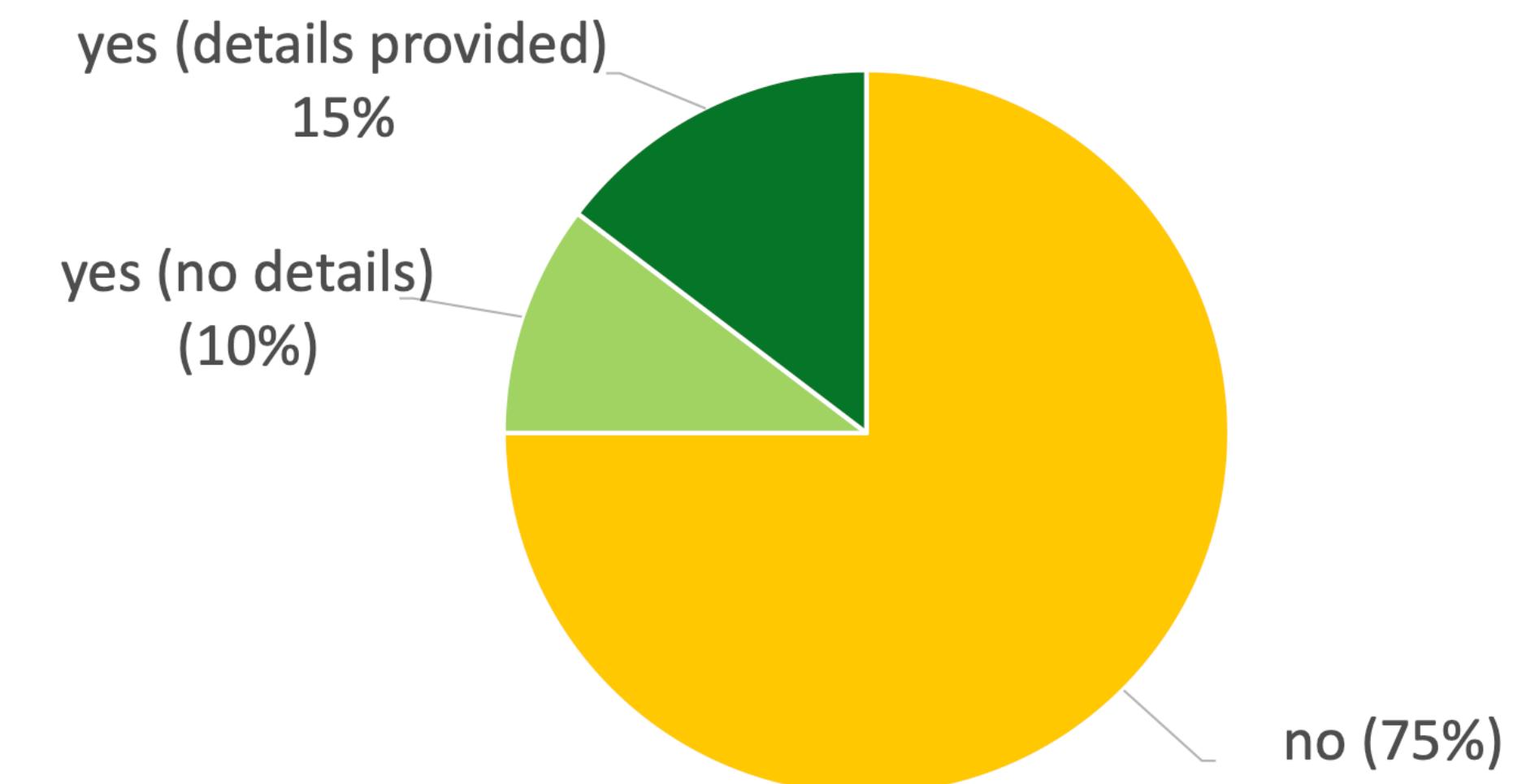
```
eb --show-system-info
```

- Use this to opt-in to using Python 3 to run EasyBuild if python is Python 2 !
- Use "EB VERBOSE=1 eb ..." to get report on what was considered...

# EasyBuild on Top 500 systems

*Are you using EasyBuild on a system that's in the current Top500 list (Nov'22)?*

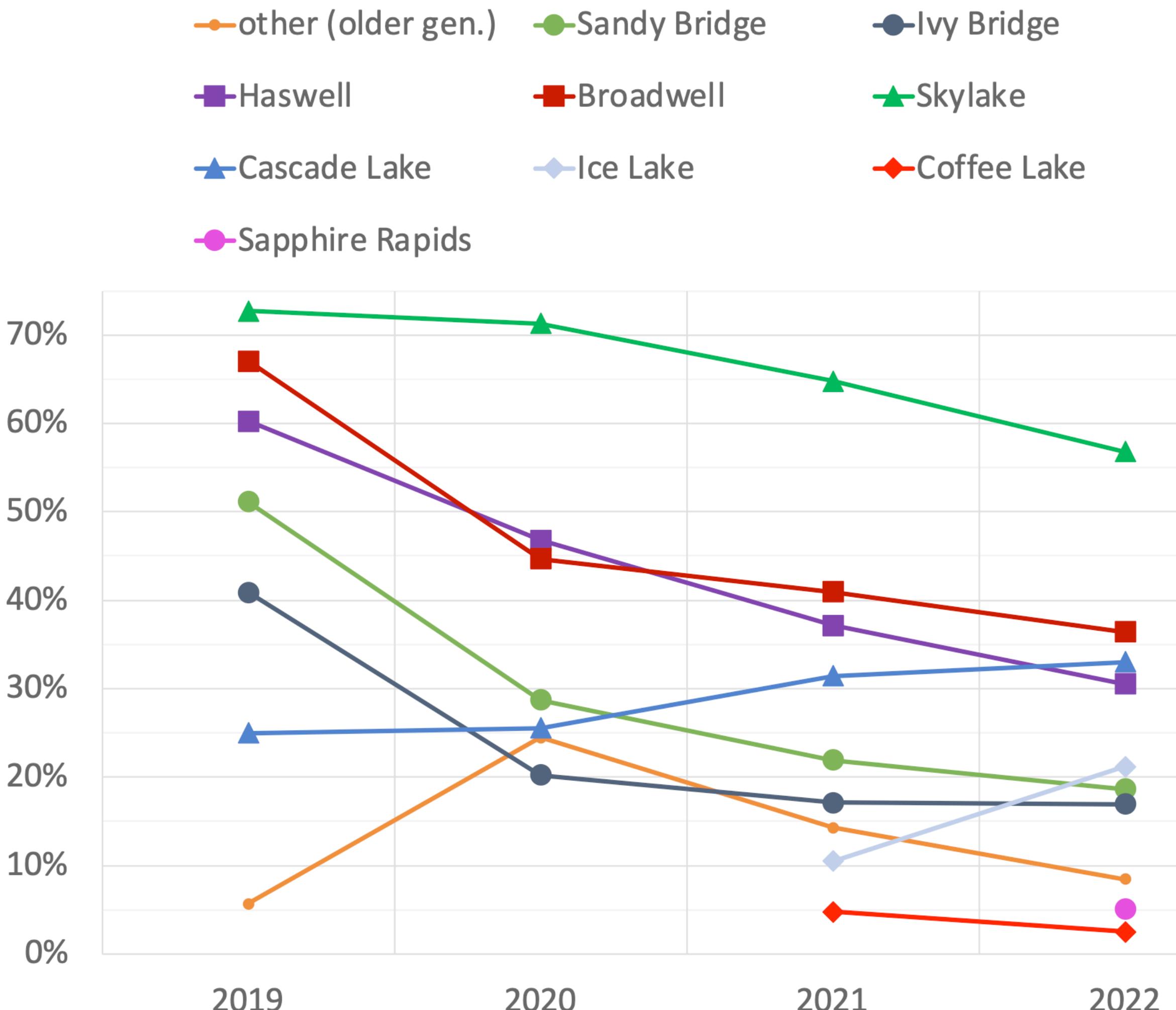
- LUMI (#3)
- Perlmutter (#8)
- JUWELS (#12)
- Piz Daint (#26)
- JURECA (#61)
- Karolina - GPU (#85)
- Narval (#99)
- Noctua 2 (#131)
- Niagara (#150)
- Cedar - GPU (#166)
- Karolina - CPU (#226)
- Lucia (#245)
- Snellius (#254)
- Cedar - CPU (#268)
- CLAIX (#286)
- Béluga (#346)
- Alvis (#440)



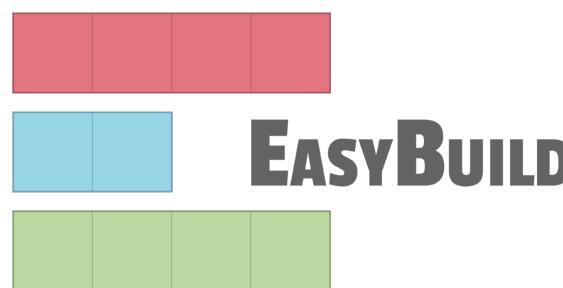
Only ~25% of survey participants is using EasyBuild on a Top 500 system  
 (mix of end users and user support teams/sysadmins for named systems)

# Processor families (Intel)

*For which processor families are you installing software using EasyBuild?*



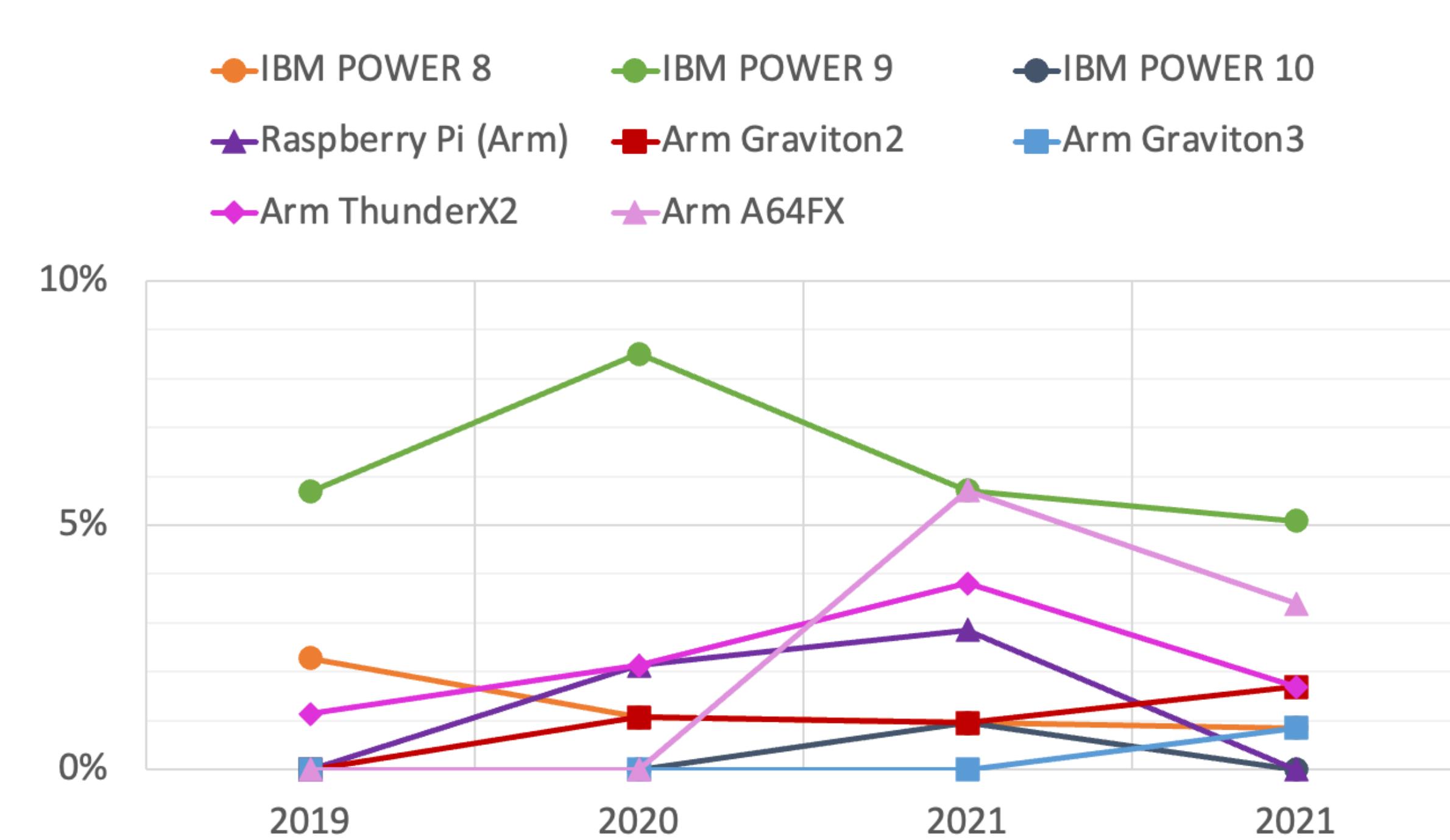
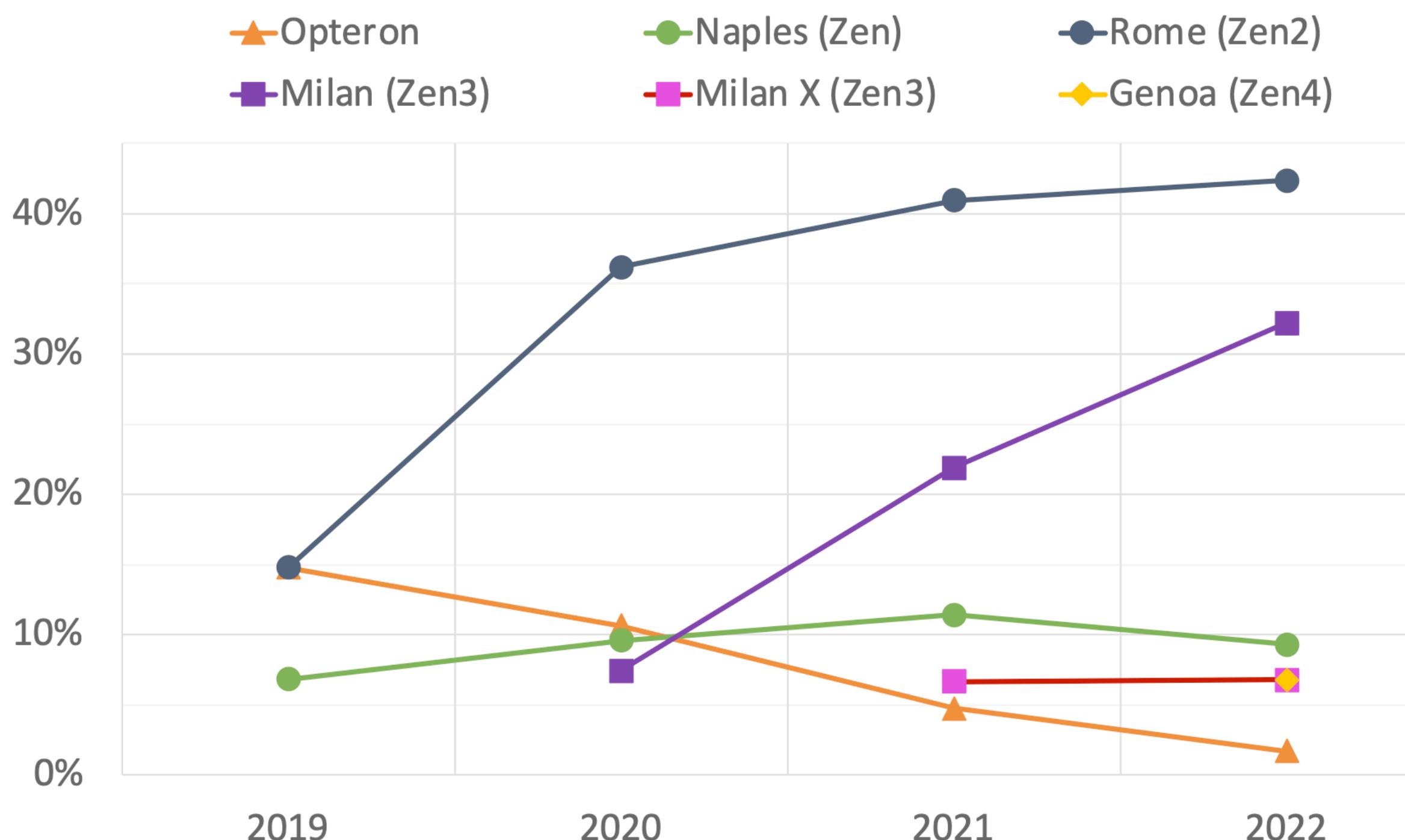
- Skylake still most popular at 57%, declining...
- Also (slowly) declining: Haswell / Broadwell (30-35%)
- Ivy Bridge, Sandy Bridge (**still** at 17-18%)
- On the rise (slowly): Cascade Lake (33%), Ice Lake (21%)
- Still a small portion *older than Sandy Bridge* (8%)...



# Processor families (non-Intel)

*For which processor families are you installing software using EasyBuild?*

- AMD Rome (Zen2) quickly becoming popular at 42%, only beaten by Intel Skylake (57%)
- AMD Milan (Zen3) is ramping up quickly to 32%
- IBM POWER 9 is still around (sort of, ~5%)
- No strong adoption of Arm CPUs (yet)
- No RISC-V (yet)

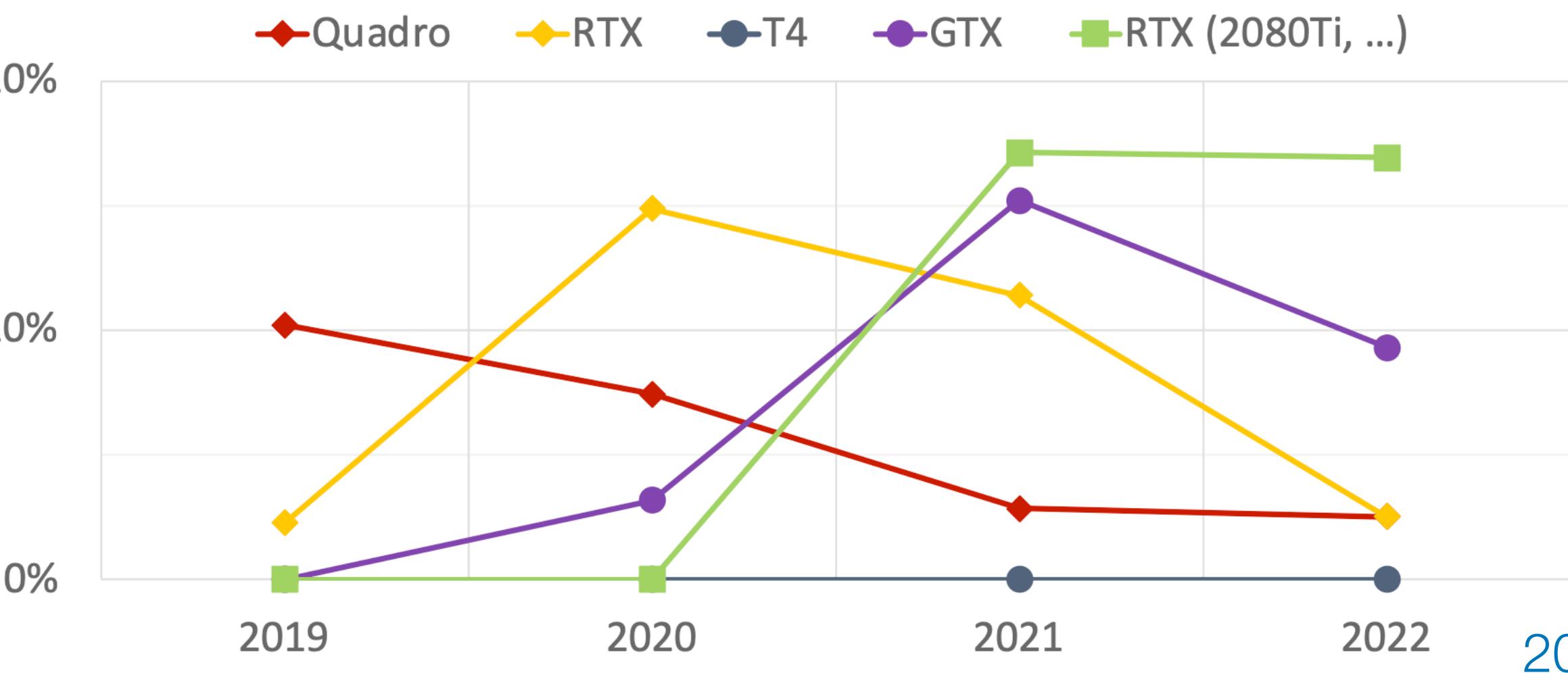


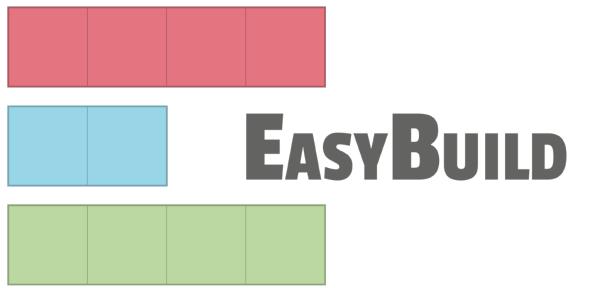
# Accelerators (NVIDIA GPUs)

*For which accelerators are you installing software using EasyBuild?*



- V100 stagnated at 50%
- Ampere (A100, A30) now most popular GPU family at 64%
- Kepler almost fully retired, P100 hanging on at 28%
- Relatively small interest in RTX family and other Ampere GPUs
- AMD and Intel GPUs still (well) below 5% (not shown here)

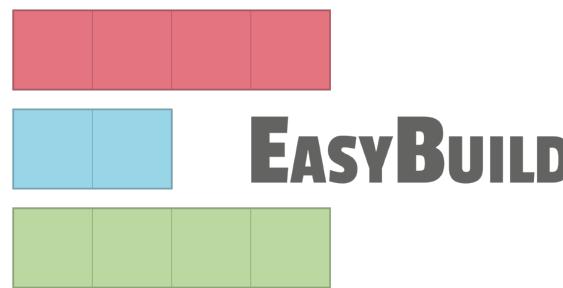




# Revamped EasyBuild documentation

<https://docs.easybuild.io>

- There was a desire to migrate EasyBuild docs to MarkDown format + using Material for MkDocs...
- Should make contributing to documentation significantly easier
- MkDocs provides some interesting features - very nice search being a major one
- **Effort was finally started in October 2022**
  - Dedicated GitHub repository for EasyBuild docs was set up: **easybuilders/easybuild-docs**
  - Hosting was moved from ReadTheDocs to GitHub Pages
  - Porting was mainly done by Simon Branford and James Carpenter (Univ. of Birmingham)
  - **Effort was completed end of January 2023**
- Existing URLs ([easybuild.readthedocs.io/...](https://easybuild.readthedocs.io/), [docs.easybuild.io/en/latest/...](https://docs.easybuild.io/en/latest/)) were not broken!
- Redirects have been put in place to new URLs powered by MkDocs



# Revamped EasyBuild documentation

<https://docs.easybuild.io>

Improved, more modern look - easier to navigate

EasyBuild v4.7.0 documentation (release 20230109.0) »

EasyBuild documentation

Welcome to the documentation of [EasyBuild](#), a software build and installation framework that allows you to manage (scientific) software on High Performance Computing (HPC) systems in an efficient way.

This documentation is intended for EasyBuild version 4.7.0, and was last rebuilt on Tue, 28 Feb 2023 13:34:28.

Note: Please consult the [overview of major changes in EasyBuild v4.0 before upgrading!](#)

## Introductory topics

- What is EasyBuild?
- Concepts and terminology
  - [EasyBuild framework](#)
  - Easyblocks
  - Toolchains
  - Easyconfig files
  - Extensions
- Typical workflow example: building and installing WRF
  - Searching for available easyconfigs files
  - Getting an overview of planned installations
  - Installing a software stack

## Getting started

- Installing EasyBuild
  - Requirements
  - Using pip to Install EasyBuild
  - Installing EasyBuild with EasyBuild
  - Dependencies

EasyBuild - building software with ease

EasyBuild Documentation

EasyBuild - building software with ease

- Home
- Basic info >
- Getting started with EasyBuild >
- Using EasyBuild >
- Advanced topics >
- For developers/contributors >
- Experimental features >
- Version-specific info >
- EasyBuild release notes
- EasyBuild maintainers
- API >
- List of supported software
- Getting help
- Other topics >

Welcome to the documentation of **EasyBuild (version 4.7.1)**.

Use the menu to navigate, or use the search feature (top right).

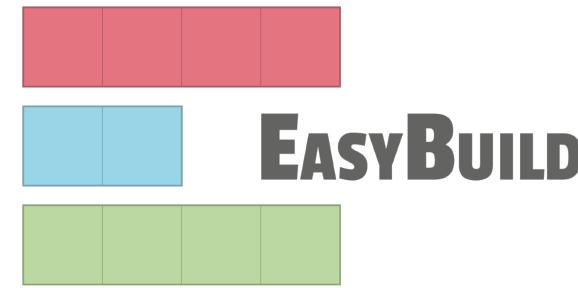
See also the [EasyBuild tutorial](#) (separate website).

To contribute to this documentation, open a pull request.

## Quick links

- What is EasyBuild? - terminology
- Installing, configuring, and using EasyBuild
- Writing easyconfig files - available easyconfig parameters
- Generic easyblocks
- List of common toolchains and supported software
- Contributing to EasyBuild - GitHub integration features
- EasyBuild release notes
- Getting help: mailing list - Slack - conference calls - GitHub

**EASYBUILD.io**  
building software with ease



# Revamped EasyBuild documentation

<https://docs.easybuild.io>

Search feature works really well - lightning fast, better search results

The screenshot shows a dark-themed web page for the EasyBuild documentation. On the left is a sidebar with a navigation menu:

- EasyBuild - building software with ease
  - Home
  - Basic info
  - Getting started with EasyBuild
  - Using EasyBuild
  - Advanced topics
  - For developers/contributors
  - Experimental features
  - Version-specific info
  - EasyBuild release notes
  - EasyBuild maintainers
  - API
  - List of supported software
  - Getting help
  - Other topics

In the center, a search bar at the top contains the query "easystack". Below it, a list of "10 matching documents" is shown:

- Easystack files**

This documentation covers aspects of specifying a software stack to install with EasyBuild with [easystack](#) files.

Some breaking changes were made to the experimental [easystack](#) support in EasyBuild v4.7.0.

[5 more on this page](#)
- easystack**

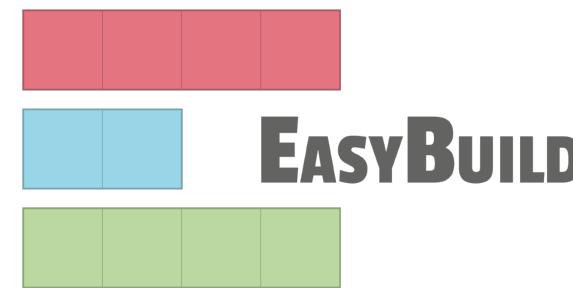
Support for easybuild-ing from multiple easyconfigs based on information obtained from provided file (easystack) with build specifications.

Authors:

  - Denis Kristak (Inuits)
  - Pavel Grochal (Inuits)
  - Kenneth Hoste (HPC-UGent)
  - Casper van Leeuwen (SURF)

[5 more on this page](#)
- Experimental features**
  - support for easyconfig files in YAML syntax (see [Writing easyconfig files in YAML syntax](#))
  - support for generating container recipes & images (see [Generating container recipes & images](#))

On the right side of the search results, there are several small, partially visible snippets of text related to the search term.



# Revamped EasyBuild documentation

<https://docs.easybuild.io>

Light and dark themes - pick your favourite!

EasyBuild Documentation

Welcome to the documentation of **EasyBuild** (version 4.7.1). Use the menu to navigate, or use the search feature (top right). See also the [EasyBuild tutorial](#) (separate website). To contribute to this documentation, open a pull request.

**Quick links**

- [What is EasyBuild? - terminology](#)
- [Installing, configuring, and using EasyBuild](#)
- [Writing easyconfig files - available easyconfig parameters](#)
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**EASYBUILD.io**  
building software with ease

EasyBuild Documentation

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**Quick links**

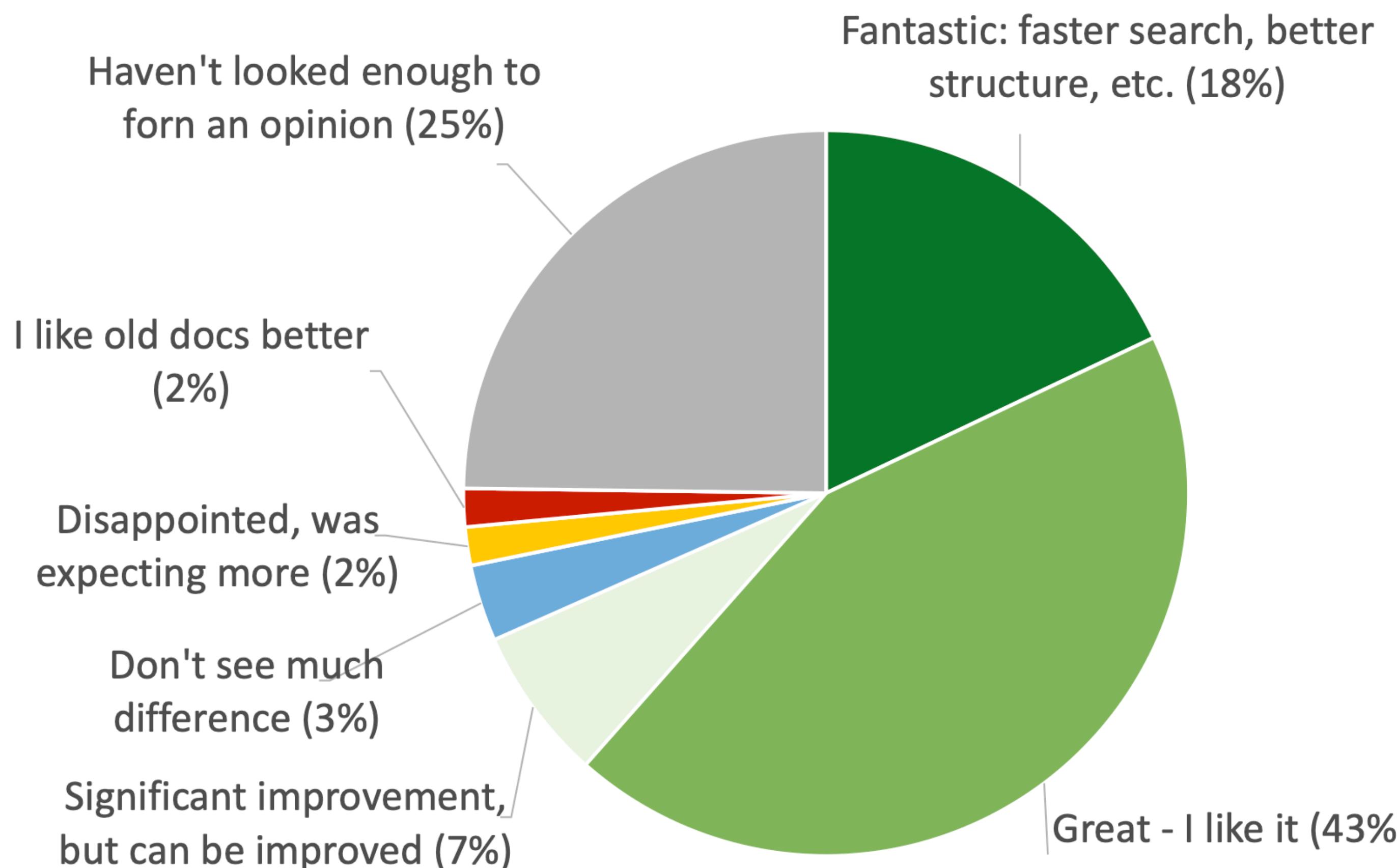
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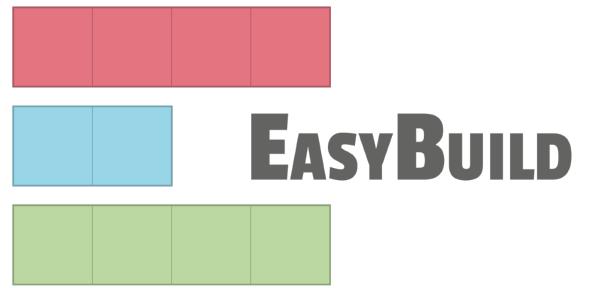
**EASYBUILD.io**  
building software with ease

# Revamped EasyBuild documentation

<https://docs.easybuild.io>

*How do you like the revamp of the EasyBuild documentation?*

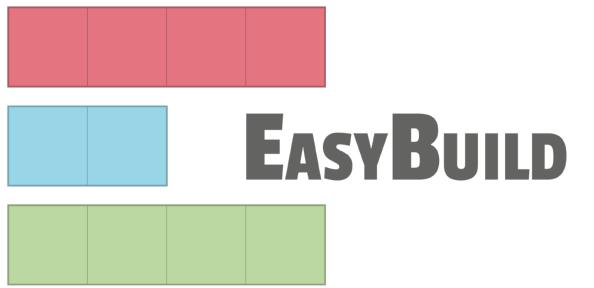




# Revamped EasyBuild documentation

<https://docs.easybuild.io>

- **This is not the end of this effort, it is actually a starting point...**
- We want to:
  - Fill up the gaps in the existing documentation
  - Re-organise existing documentation where needed
  - Actually update the documentation when new features are implemented
  - Kickstart a yearly review cycle for the documentation
  - Try to engage additional contributors + maintainers for the documentation
  - Collapse EasyBuild tutorial into documentation?
- **If you would like to be involved, join the #docs channel in the EasyBuild Slack!**



# EasyBuild tutorial

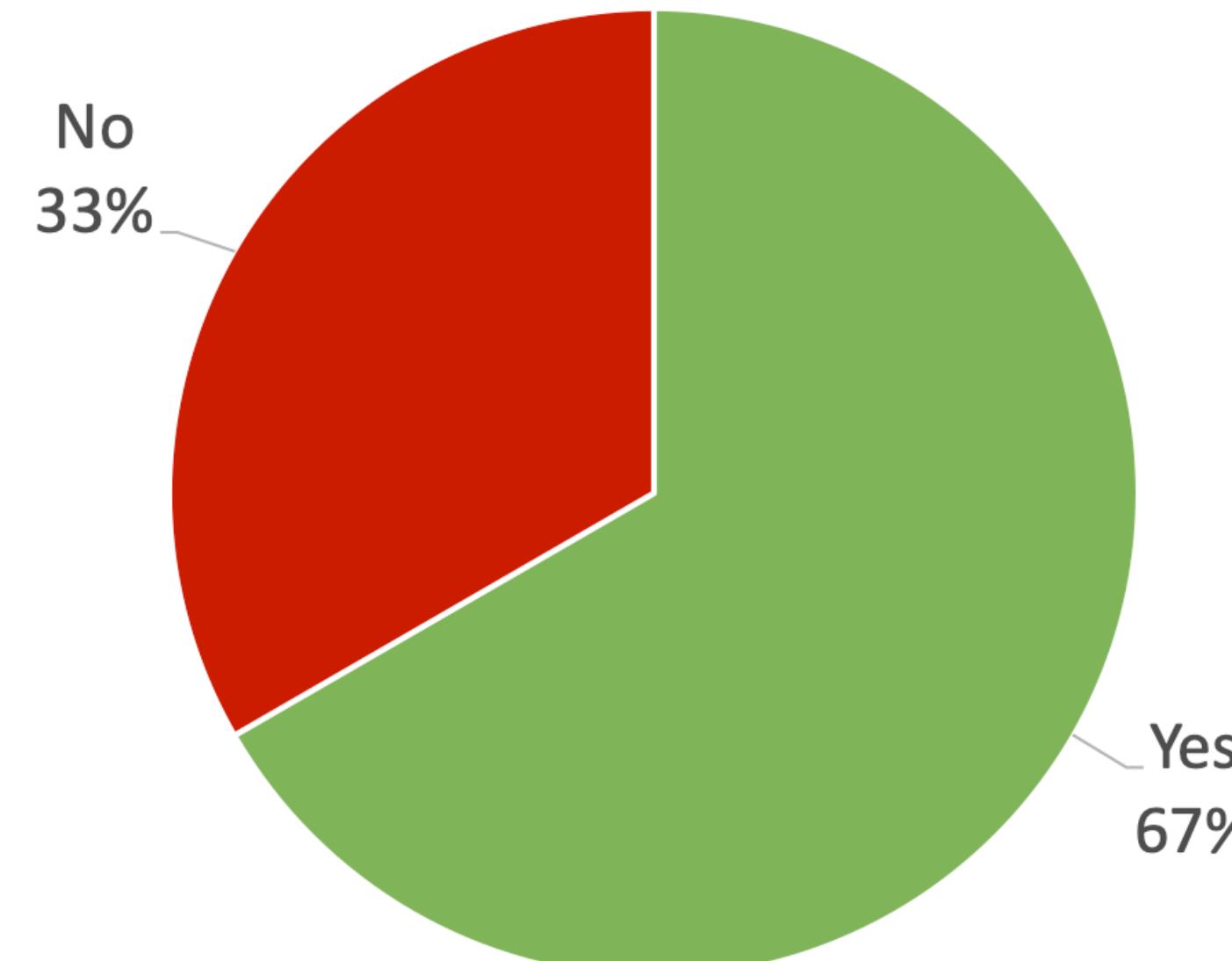
<https://tutorial.easybuild.io>

- Official EasyBuild tutorial at ISC'22 (half-day), like we had at ISC'21
- EasyBuild tutorial submission for ISC'23 was not accepted :( - but it seems we were close...
- **EasyBuild + EESSI UK workshop:** 27+28 April 2023, on-site only (we may try to record)
  - <https://easybuild.io/eb-eessi-uk-workshop-2023-04>
  - Introduction to EasyBuild (incl. hands-on)
  - Advanced EasyBuild topics
  - Introduction to EESSI (incl. hands-on)
- Maybe a free online EasyBuild (+ EESSI?) tutorial again in June 2023, or later in 2023?
  - Like we had in 2020, where we had over 100 registrations

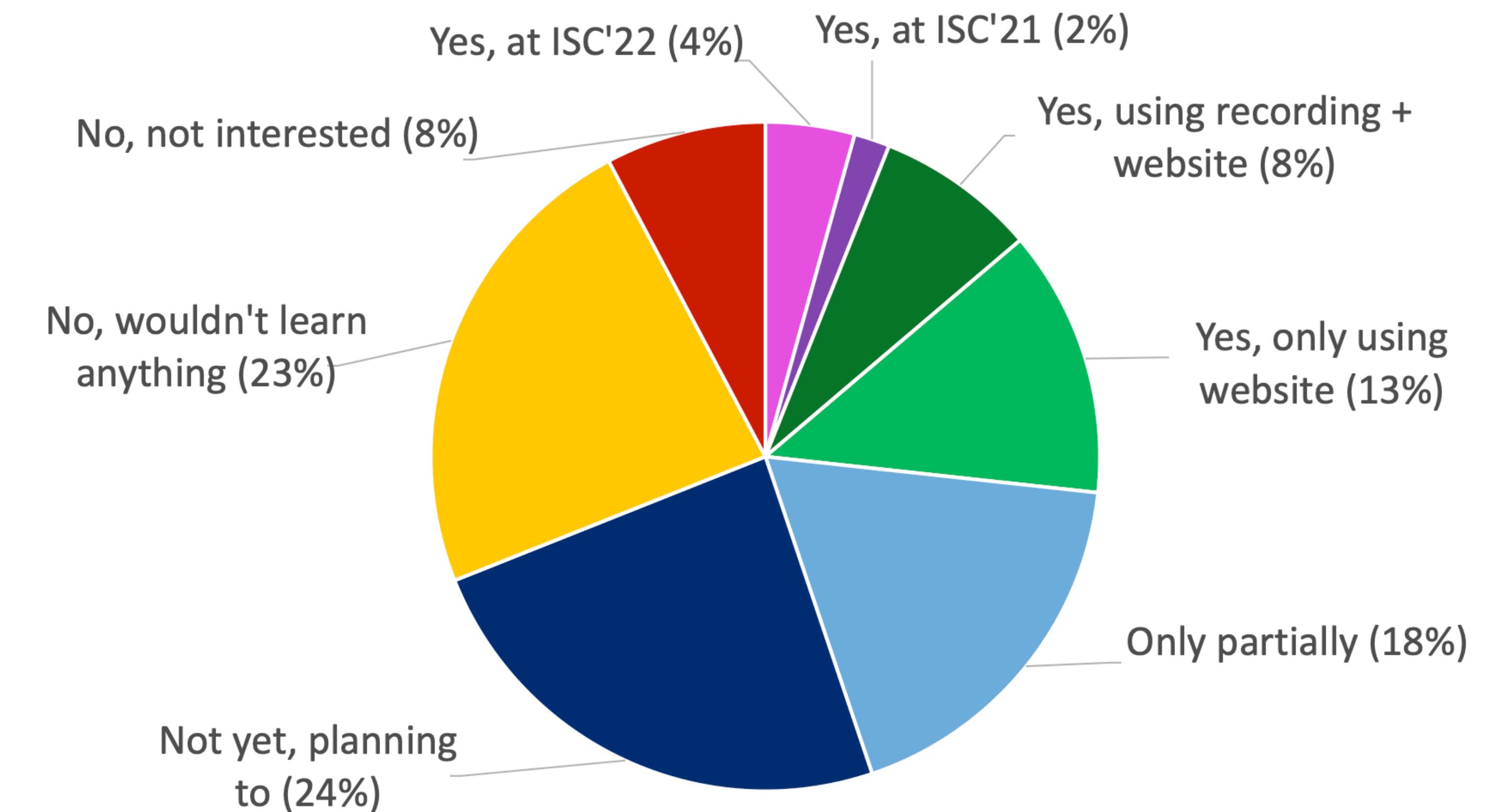
# EasyBuild tutorial

<https://tutorial.easybuild.io>

*Are you aware of the EasyBuild tutorial?*



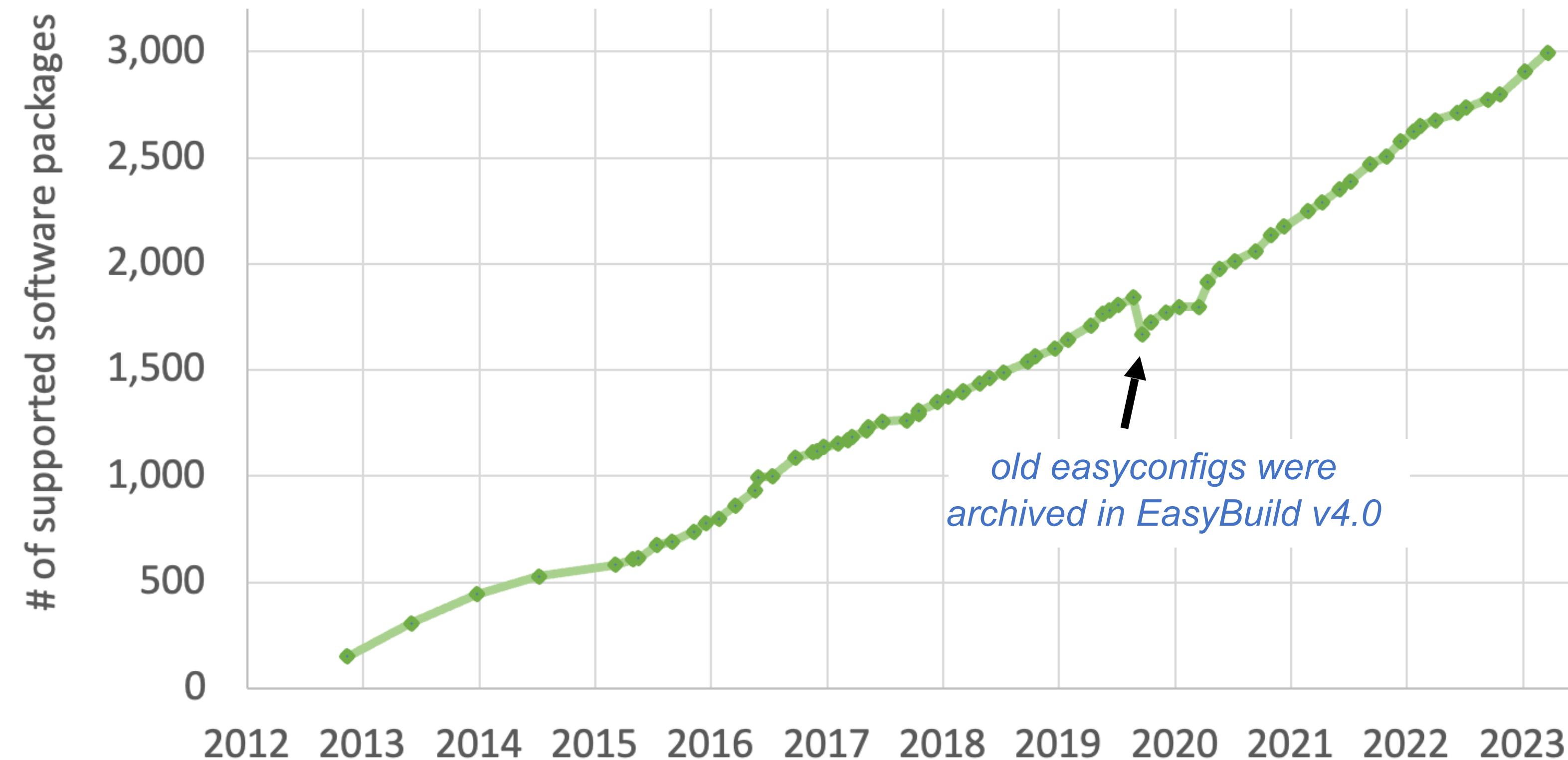
*Have you worked through the EasyBuild tutorial?*



More awareness needed for EasyBuild tutorial, and which topics it covers...

# Supported software

*Evolution of number of supported software packages in EasyBuild (without extensions)*

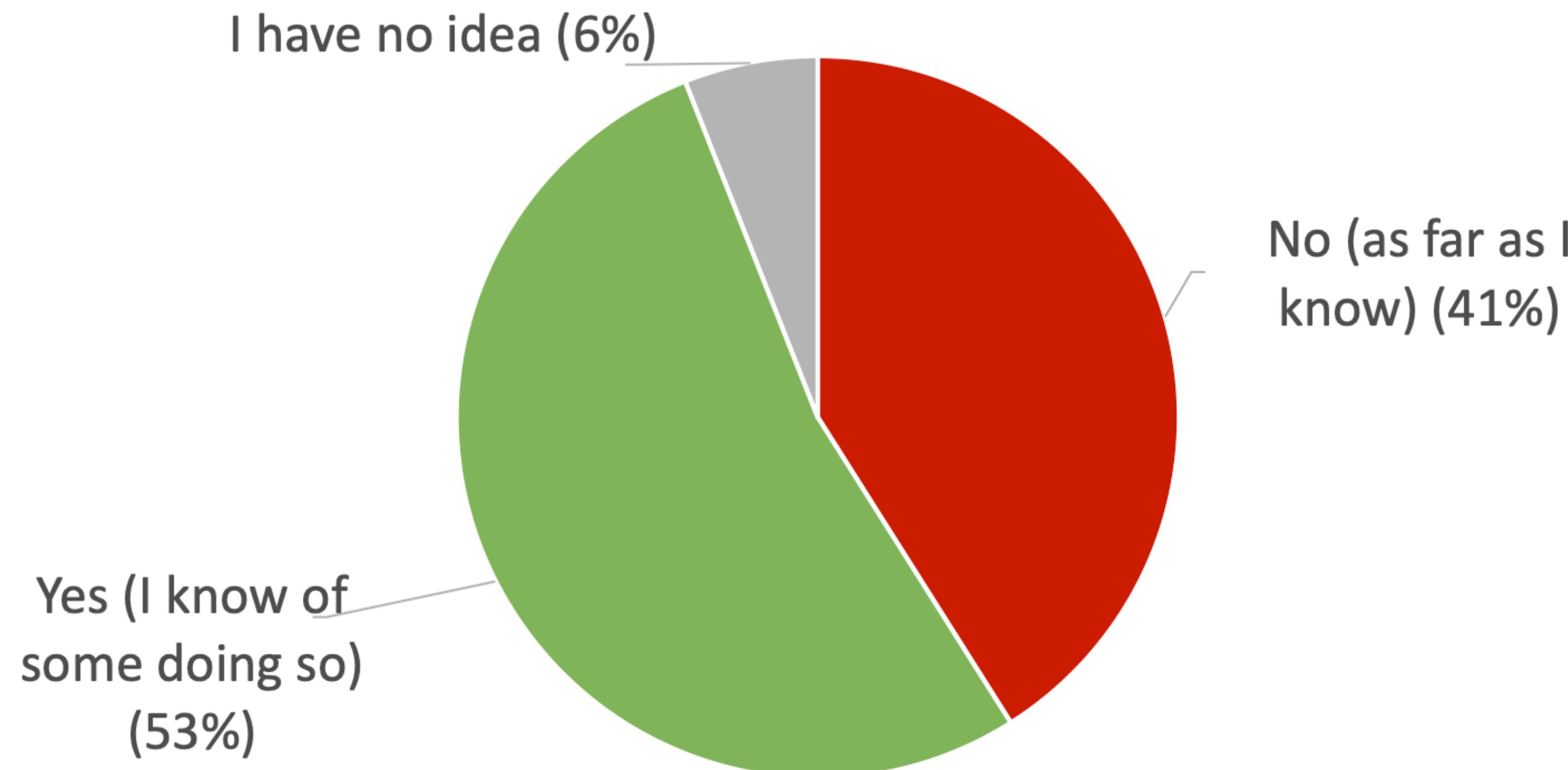


**Close to 3,000** different software supported by EasyBuild v4.7.1 (plus ~2,000 extensions)

Stable upward trend, no sign of slowing down, *it is actually picking up pace...*

# EasyBuild for end users

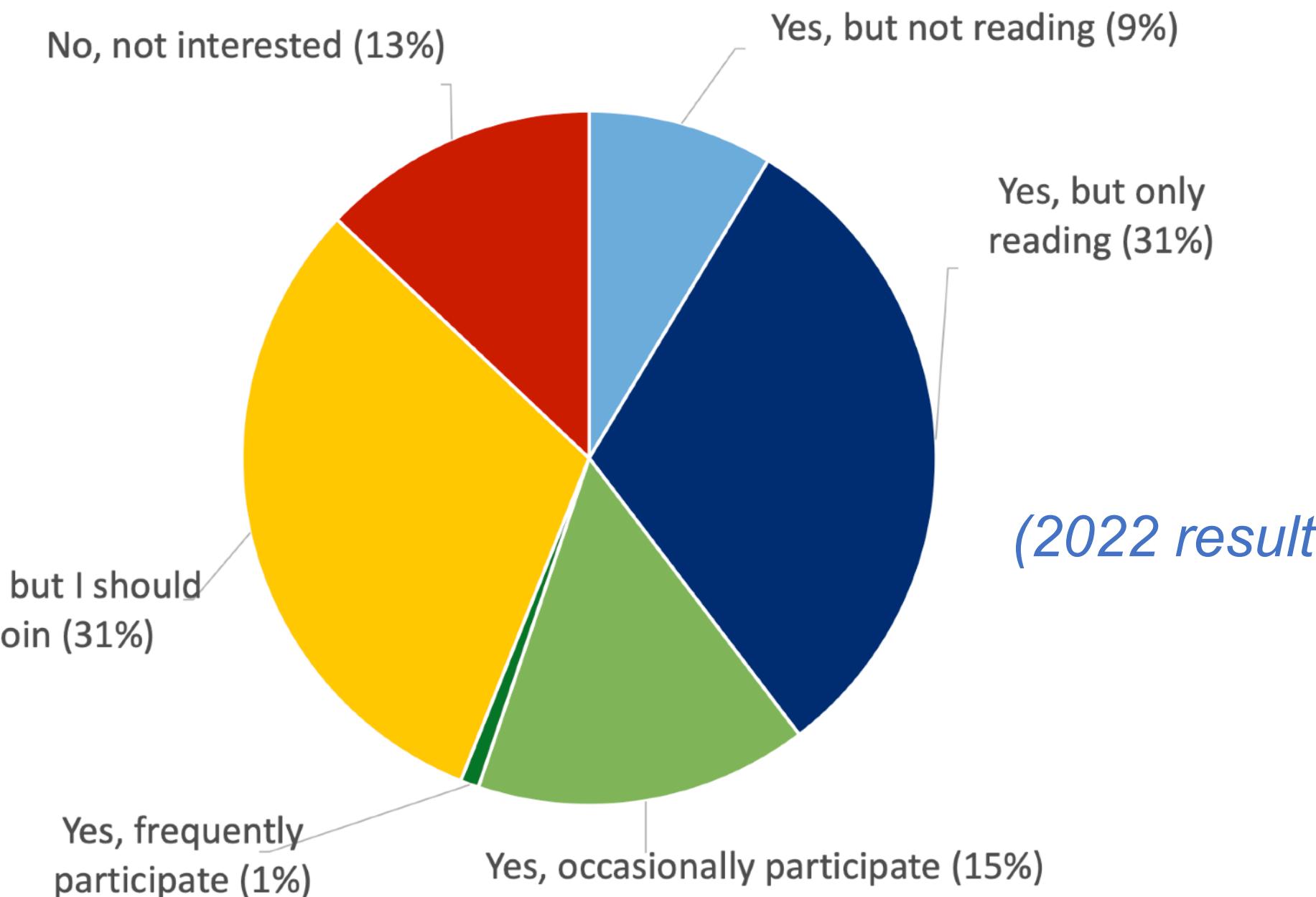
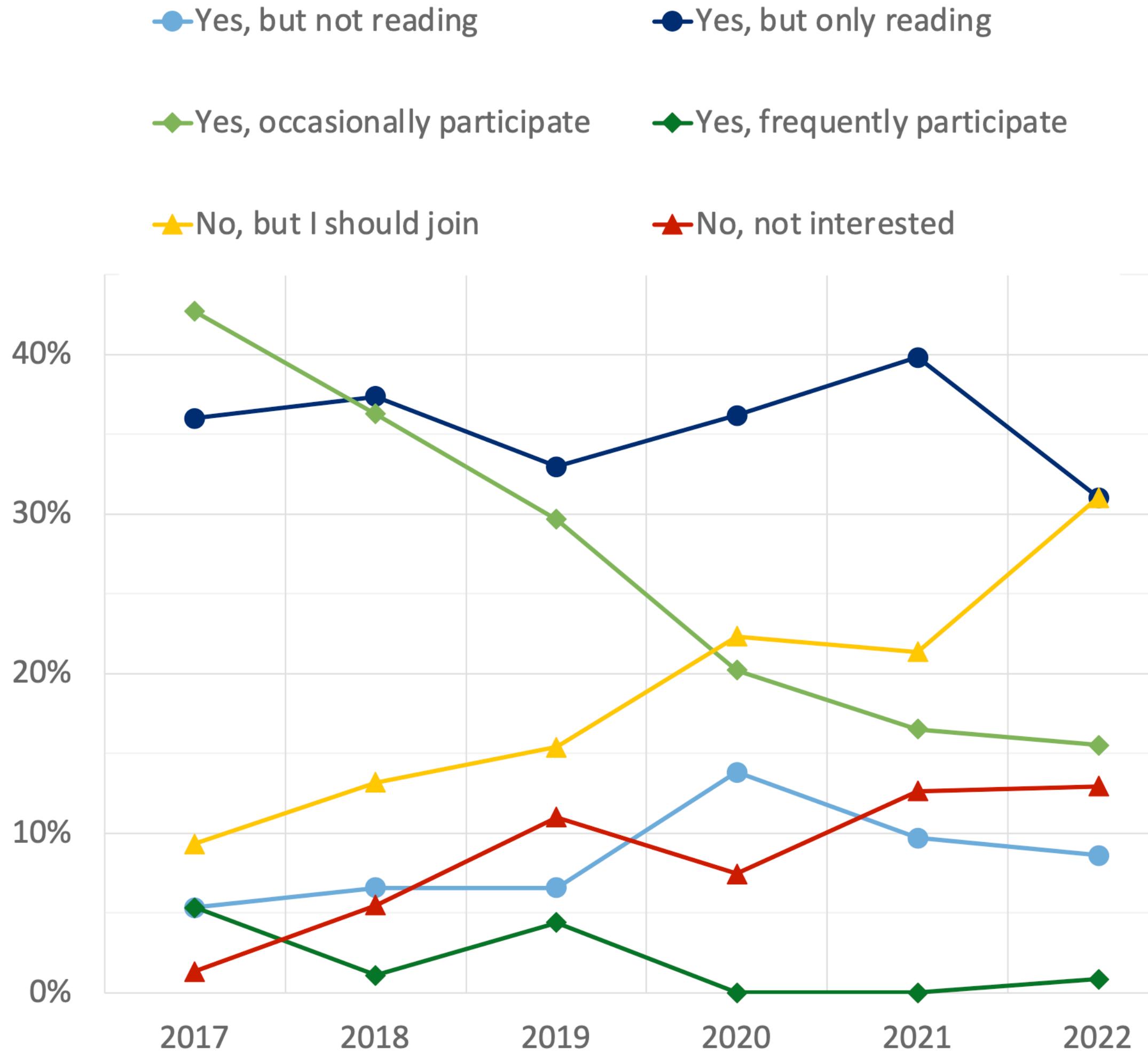
*Are end users using EasyBuild to install software in their own accounts, or are you doing so yourself?*



Significant increase in end users also using EasyBuild (from 35% to 53%)

# EasyBuild mailing list

*Are you subscribed to the EasyBuild mailing list?*

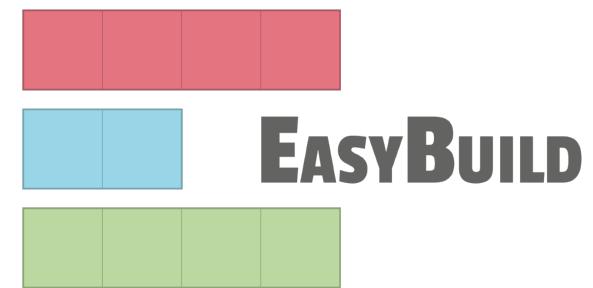


- Active participation declines further to just ~15%
- Yet there's an increased interest in joining the mailing list...

Mailing list remains an important communication channel!

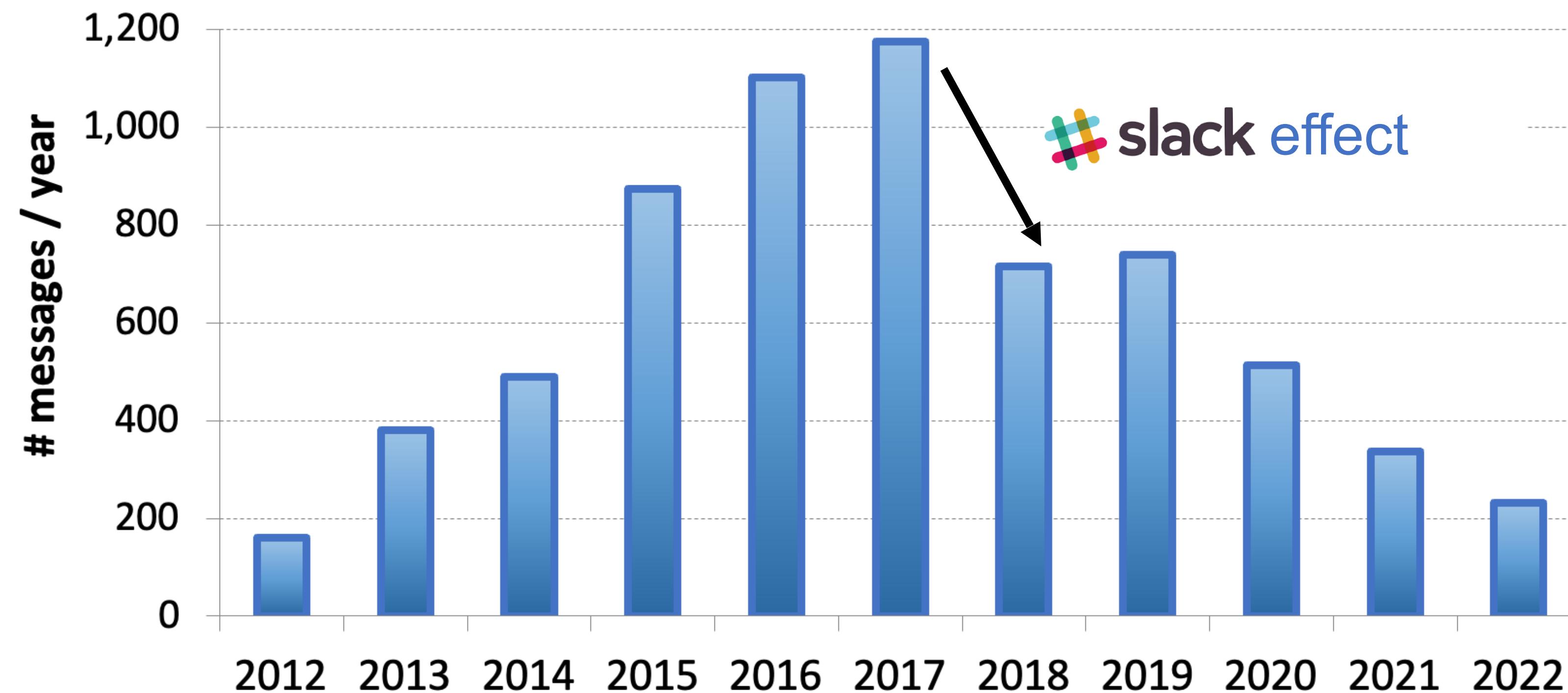
Subscribe to EasyBuild mailing list via

<https://lists.ugent.be/wws/subscribe/easybuild>



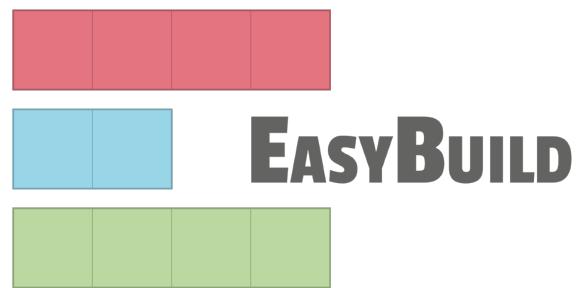
## EasyBuild mailing list (traffic)

Traffic on EasyBuild mailing list peaked in 2017,  
due to start of EasyBuild Slack channel, but remains active.

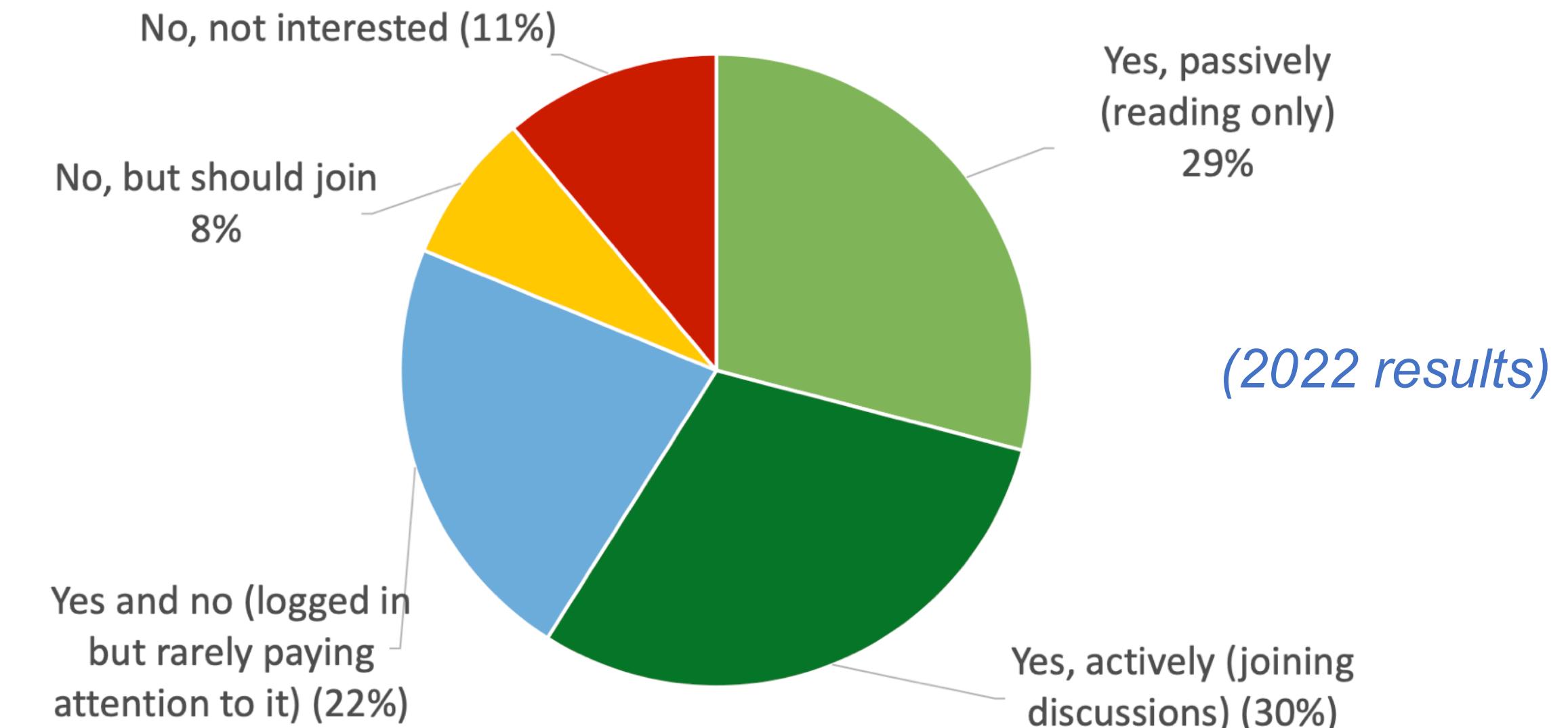
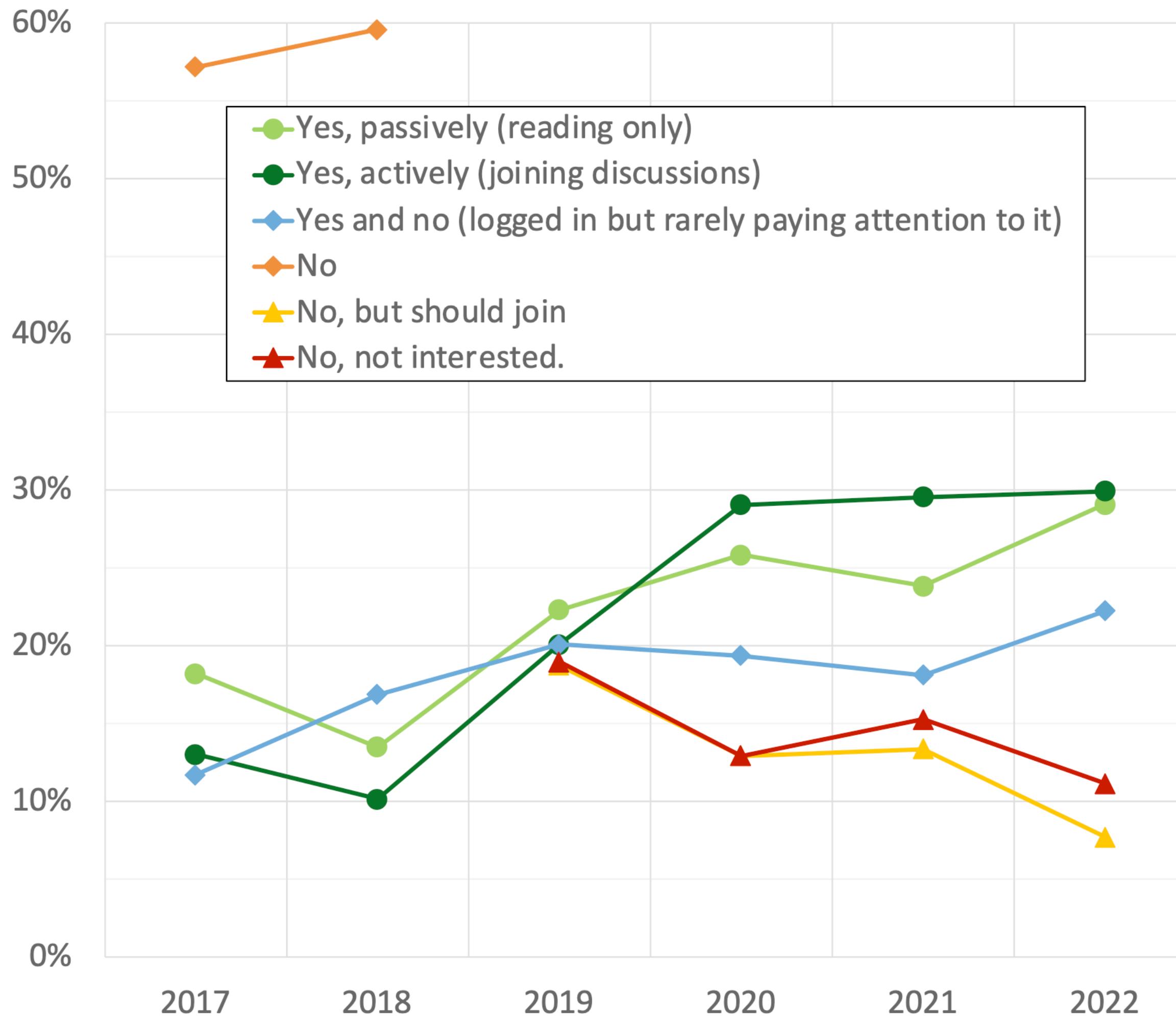


314 subscribers to EasyBuild mailing list currently

# EasyBuild Slack



*Do you use the EasyBuild Slack channel?*

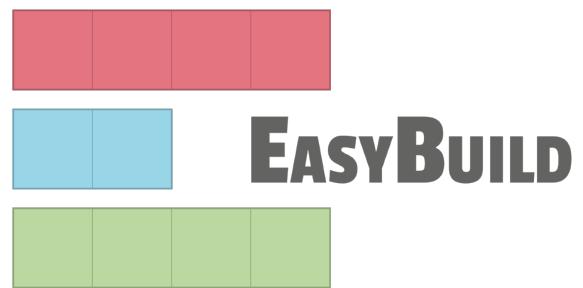


Only ~30% of community *actively* participates in Slack.

Significant part of community (~20%) is not on Slack (or ML)!

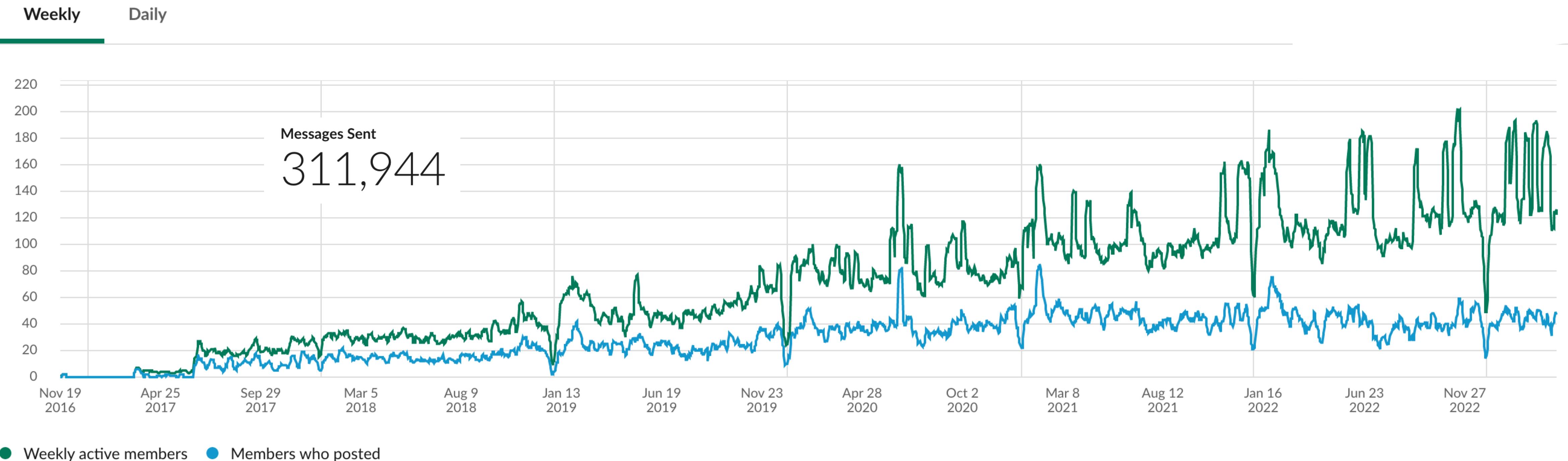
Join EasyBuild Slack via  
<https://easybuild.io/join-slack>

# EasyBuild Slack



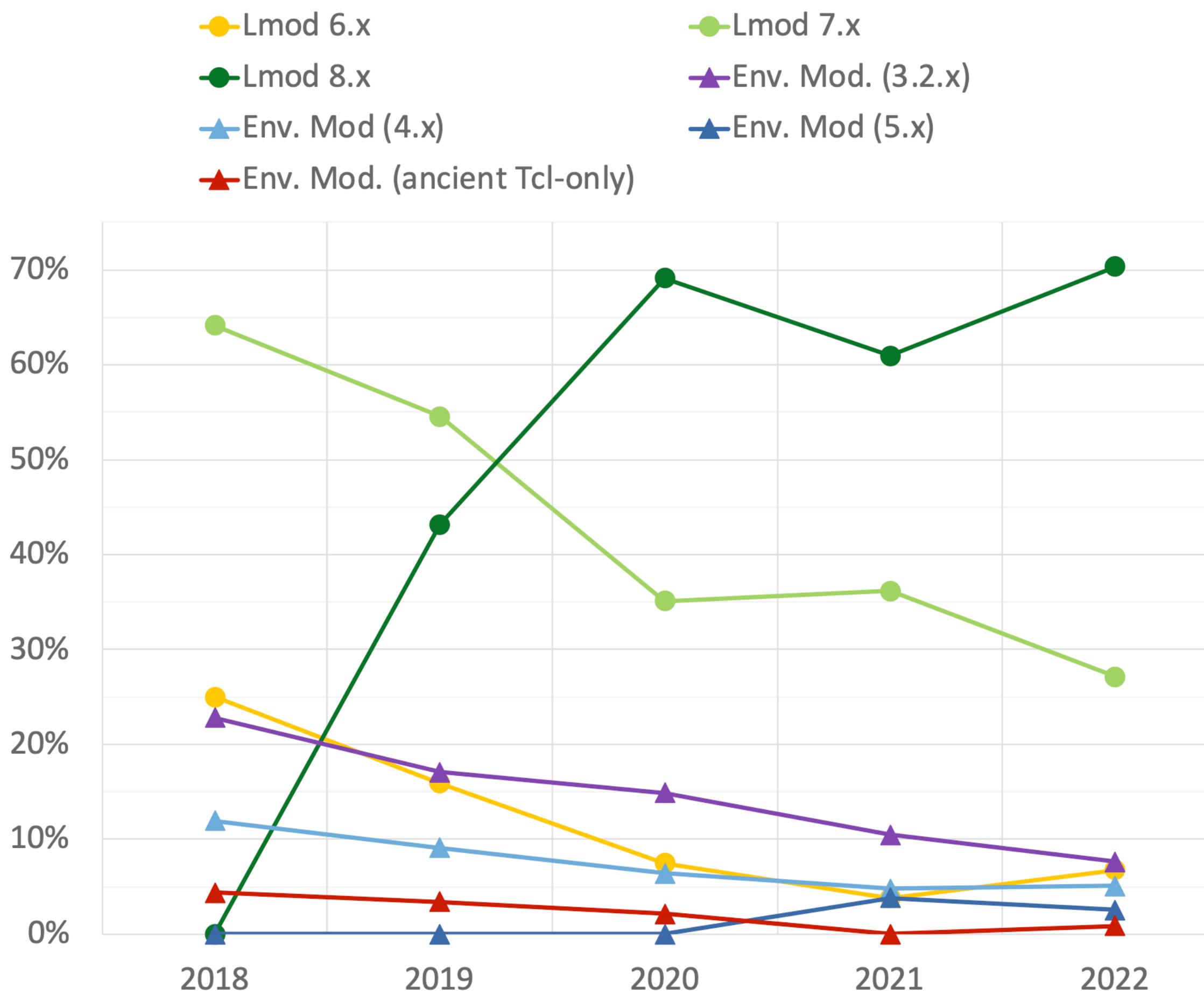
- Steady growth in activity since start of EasyBuild Slack in 2017
- 726 members on Slack channel, increase of ~160 per year since 2020
- Total messages sent increases quickly (since 2019: 105k → 192k → 260k → 311k)

**Join EasyBuild Slack via <https://easybuild.io/join-slack> !**



# Environment modules

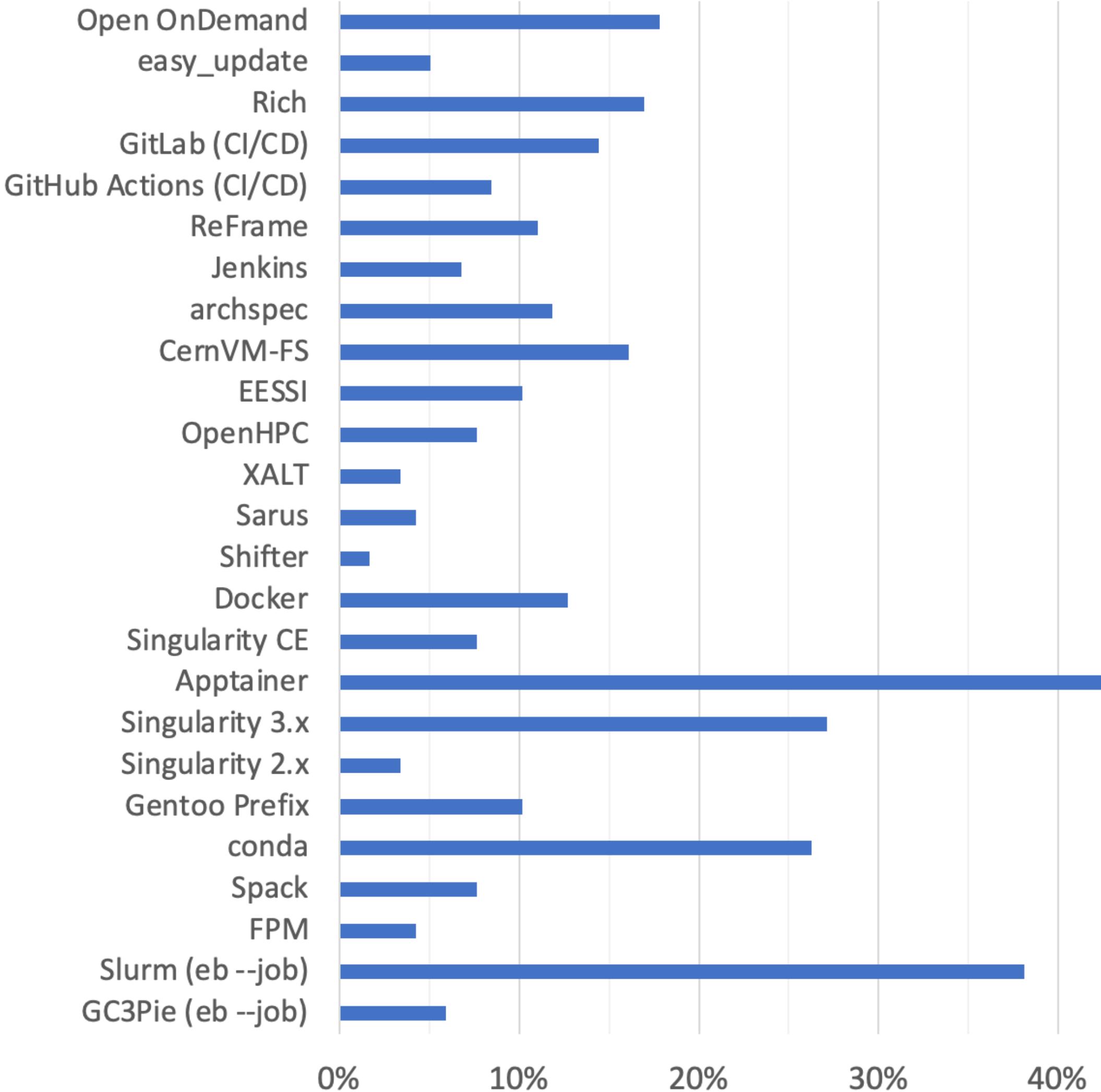
*Do you use any other tools/projects in combination with EasyBuild?*



- Lmod remains most popular modules tool (by far)
- ~70% is using Lmod 8.x, ~27% is still using Lmod 7.x
- ~7% still using Lmod 6.x (deprecated in EasyBuild!)
  - Partially due to outdated Lmod package in Debian/Ubuntu
  - New maintainer for Lmod package in Debian/Ubuntu: Alexandre Strube (JSC)
- Tcl-based Environment Modules remains small minority
- Most popular Tcl-based variant is *still* version 3.2.x (Tcl/C)

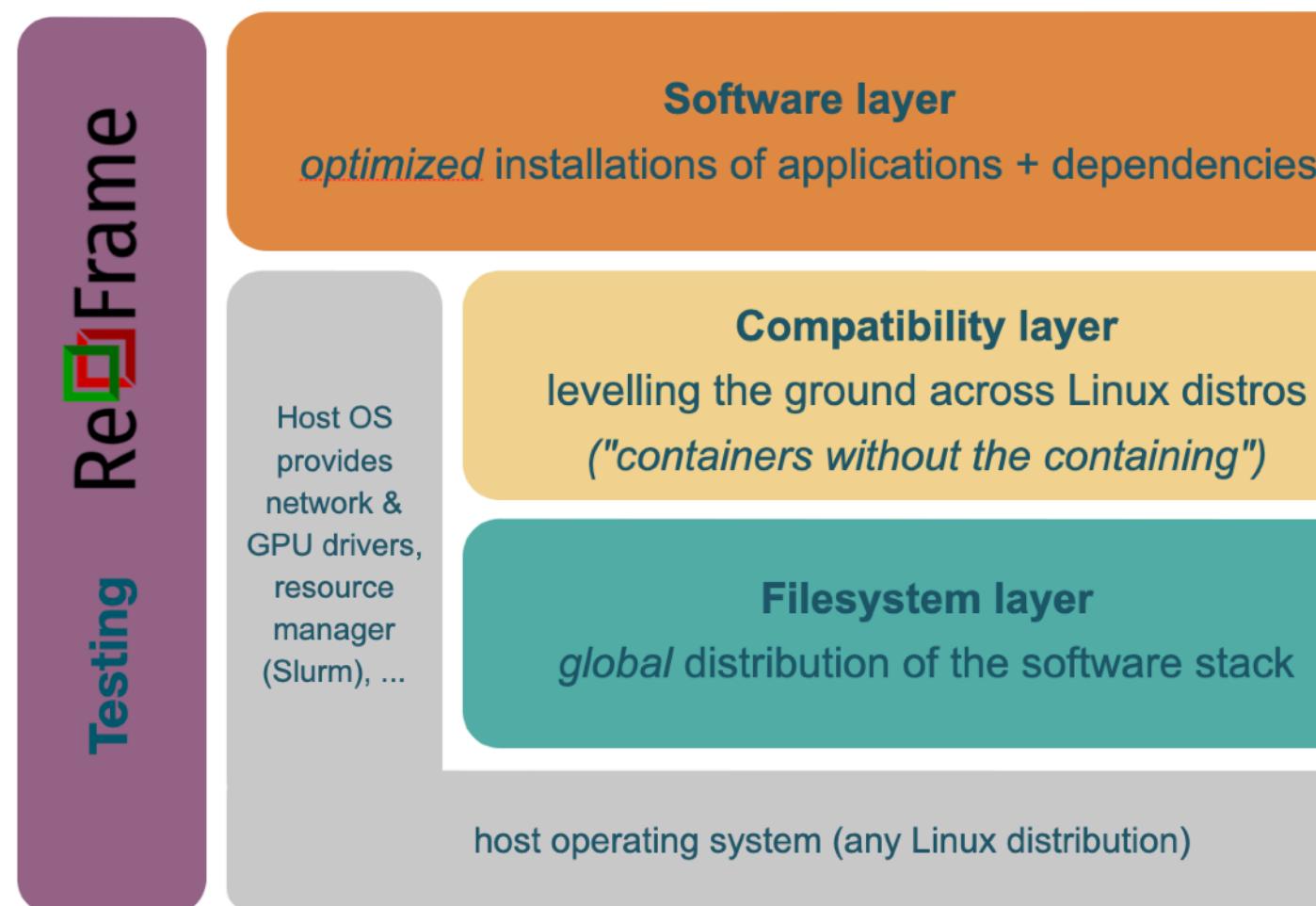
# Other tools & projects

*Do you use any other tools/projects in combination with EasyBuild?*



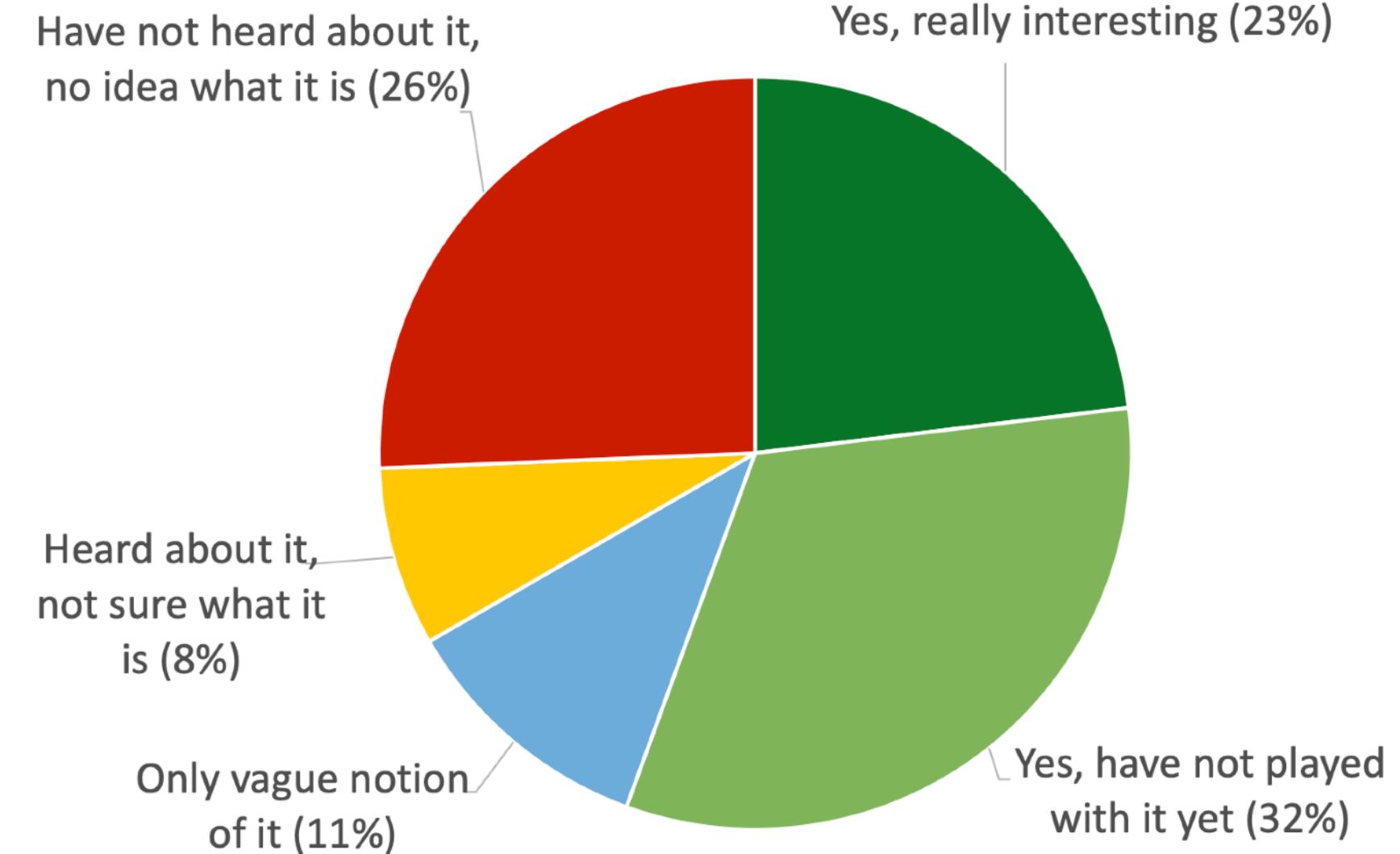
- Slurm way more popular than GC3Pie as job backend
- Apptainer is most popular 3rd party tool used with EasyBuild, but Singularity 3.x is also still used a lot
- Conda is used by over 25% (combined with EasyBuild?!)
- Steady increase for CernVM-FS, now at 16%
- Small stable minority (~8%) uses both EasyBuild and Spack
- New entries: Open OnDemand (18%), EESI (10%)

# European Environment for Scientific Software Installations



**intel.** **AMD** **ARM** **POWER** **RISC-V**

*Have you heard about the EESSI project?*

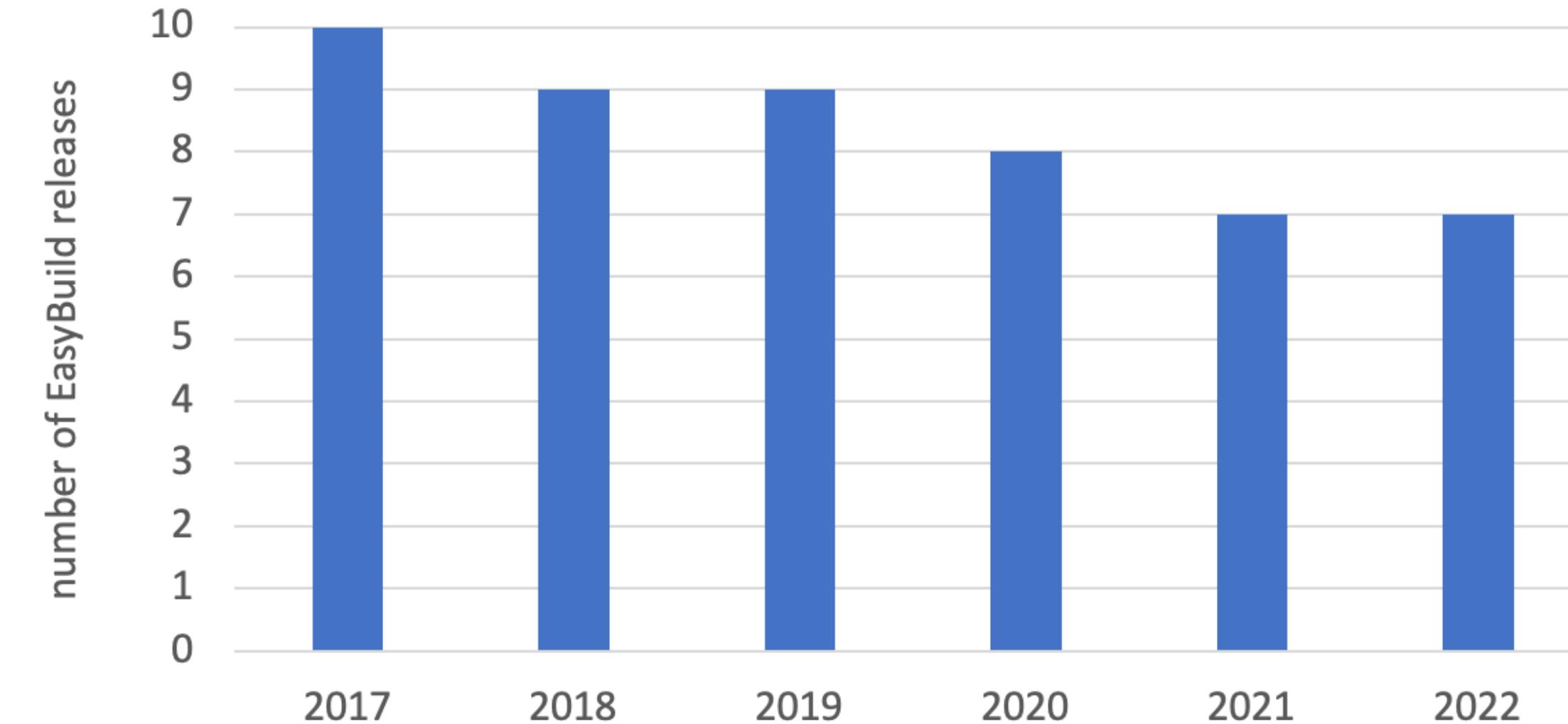
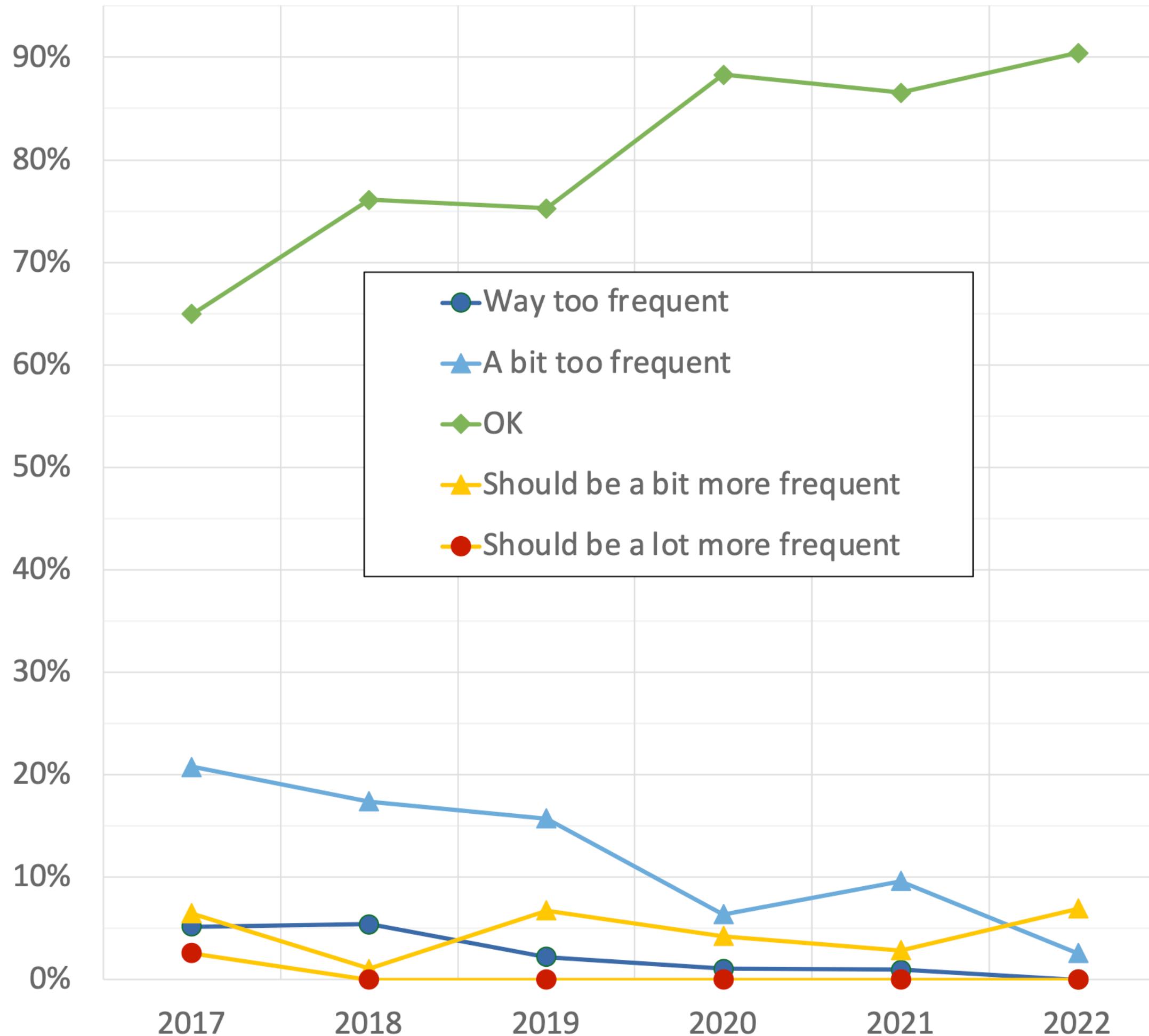


- Only 23% of EasyBuild community has hands-on experience with EESSI
- It is now a funded project, via the MultiXscale EuroHPC Centre-of-Excellence
- Significant involvement of EasyBuild community, but does not replace EasyBuild!
- More on EESSI in Caspar's EUM'23 talk on Tuesday!



# EasyBuild releases

*How do you like the frequency of EasyBuild releases?*



Number of EasyBuild releases has been steady in recent years

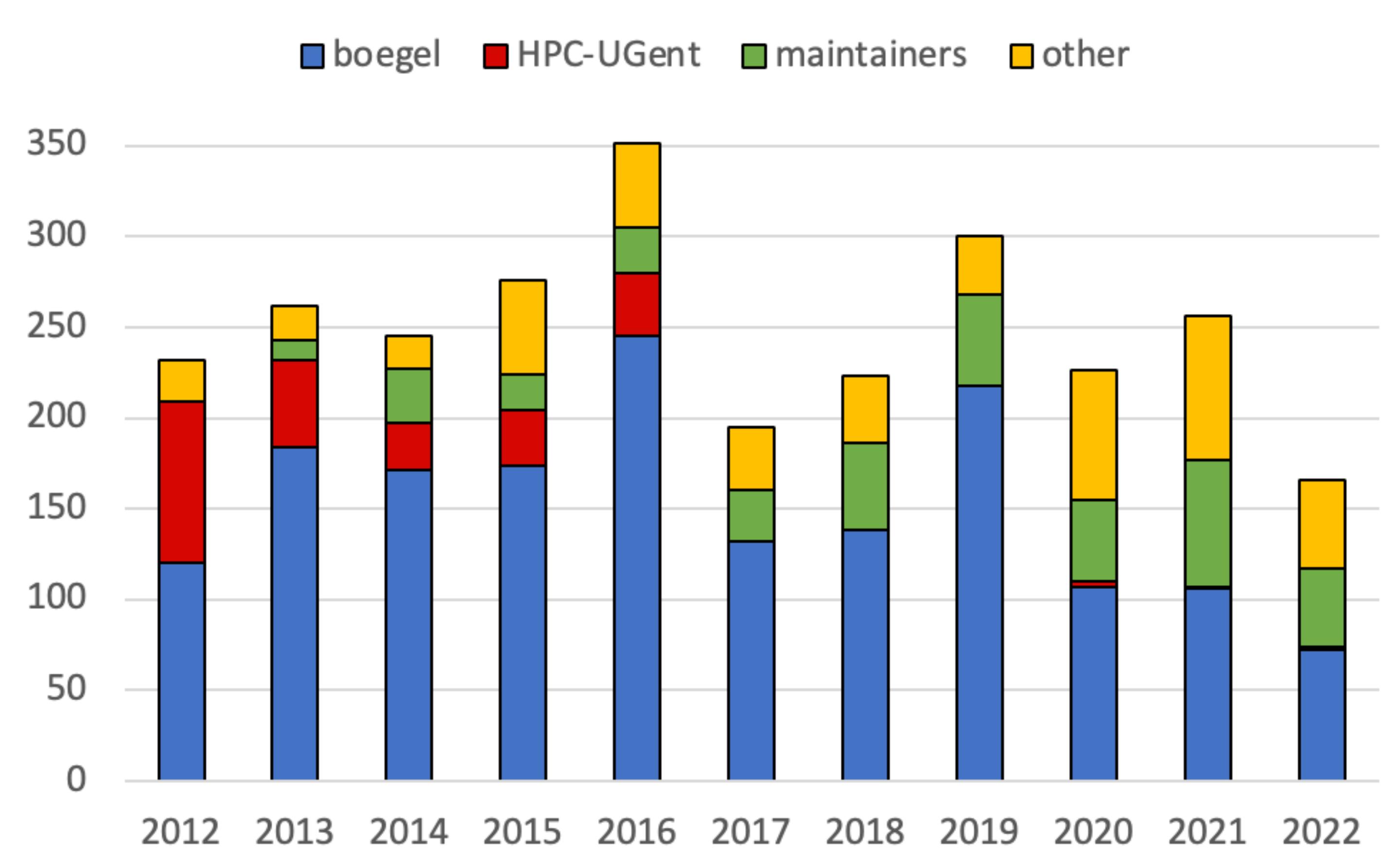
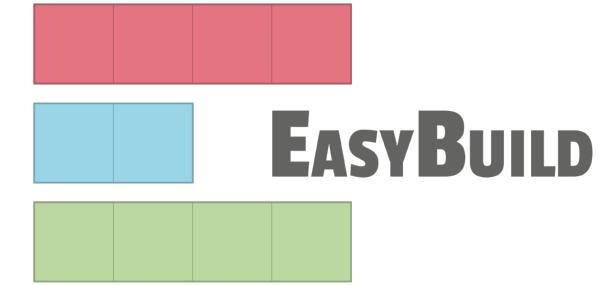
Currently: new EasyBuild release every 7-8 weeks

Frequency is better appreciated now than before 

# Contributors, contributors, contributors, ...

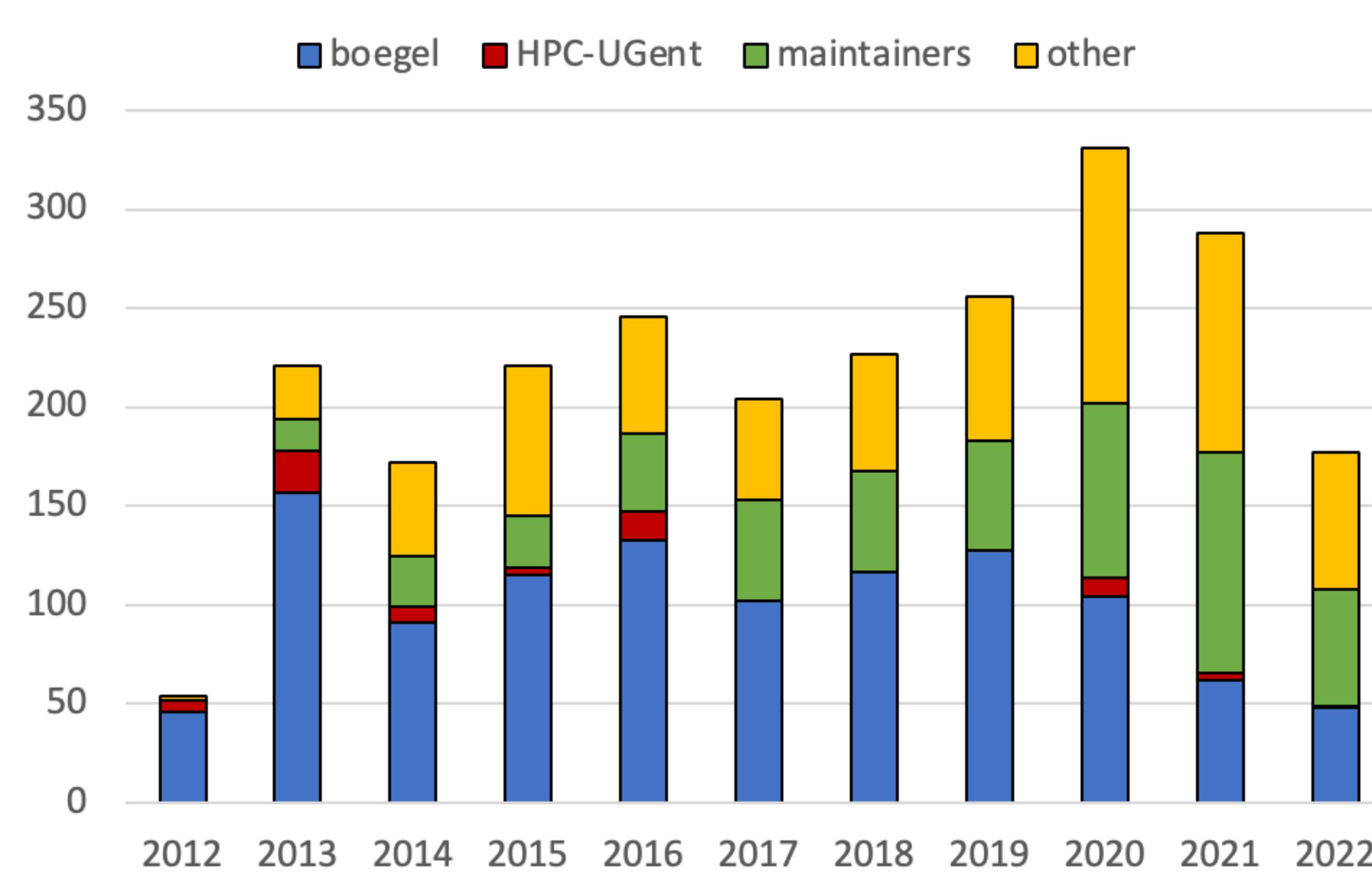
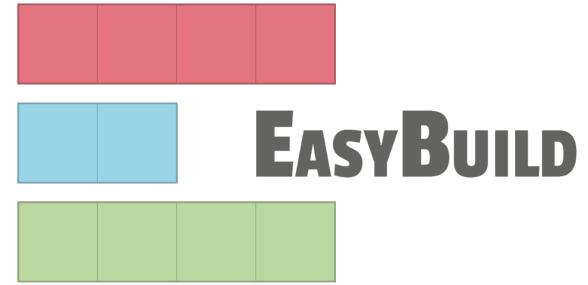


# Overview of contributions (framework)



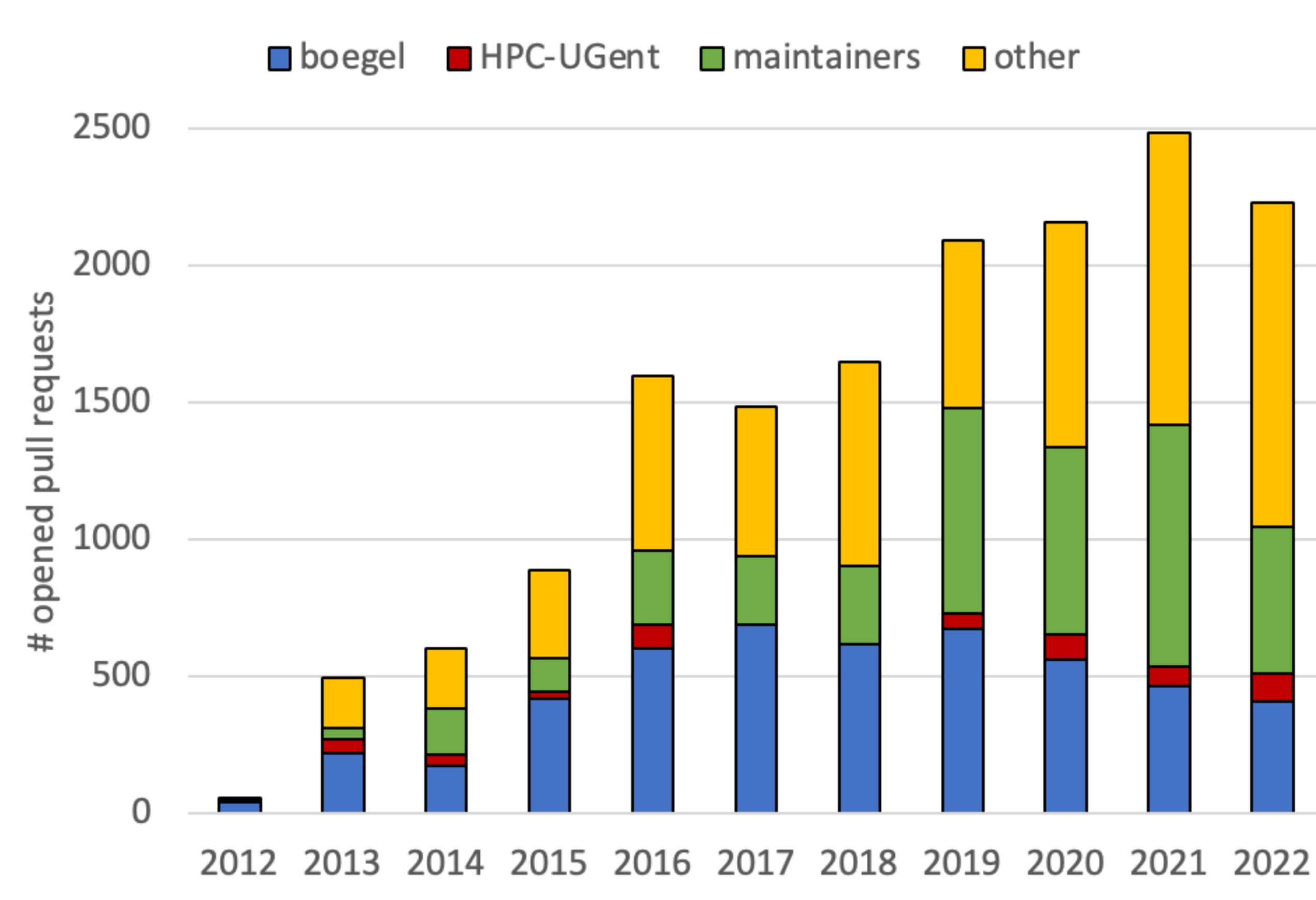
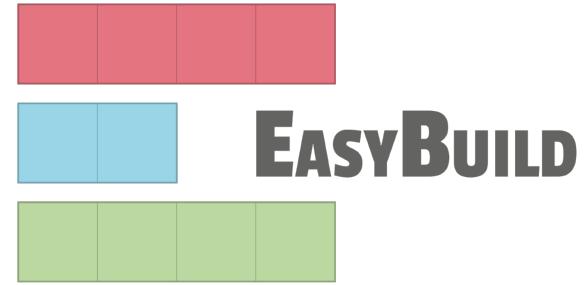
- ~56% of framework PRs in 2022 by contributors outside HPC-UGent
- Peak in PRs in 2019 is due to effort for porting EasyBuild to Python 3

# Overview of contributions (easyblocks)



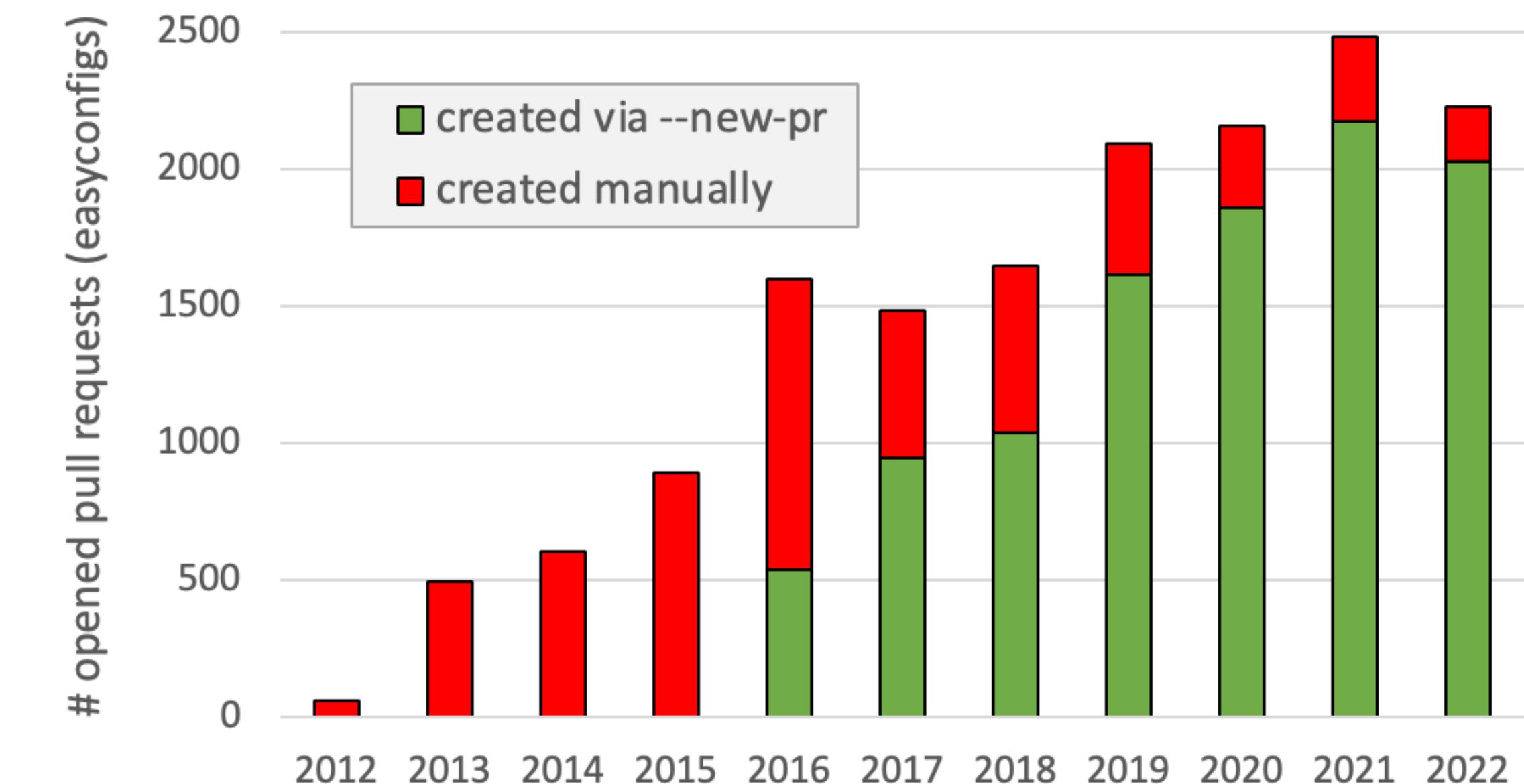
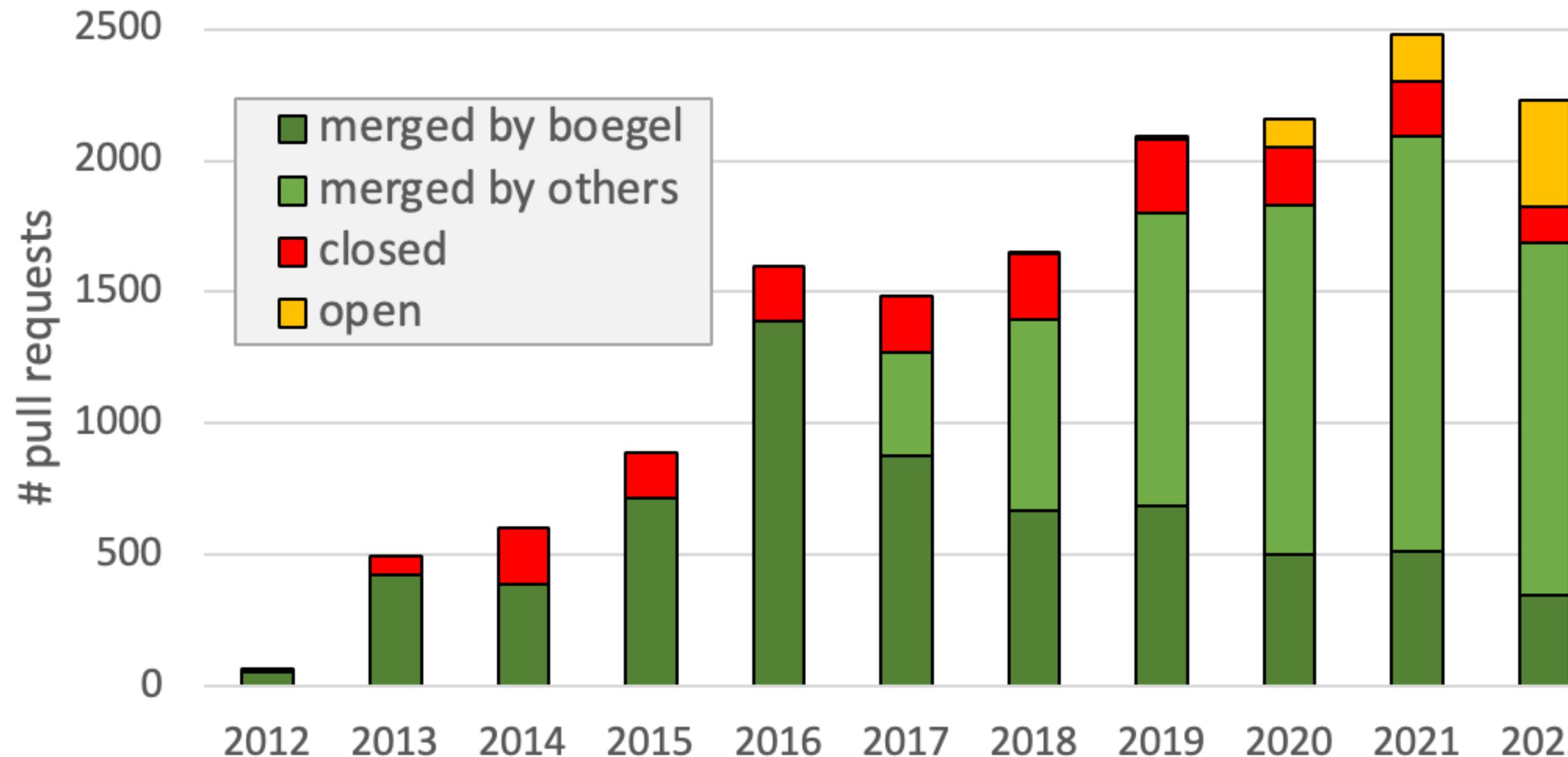
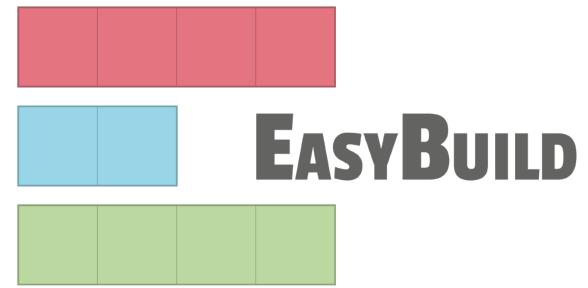
- Significantly less activity in easyblocks in 2022, but still over 30 unique contributors
- > 70% of PRs by outside contributors, ~38% by people who are not an EasyBuild maintainer

# Overview of contributions (easyconfigs)



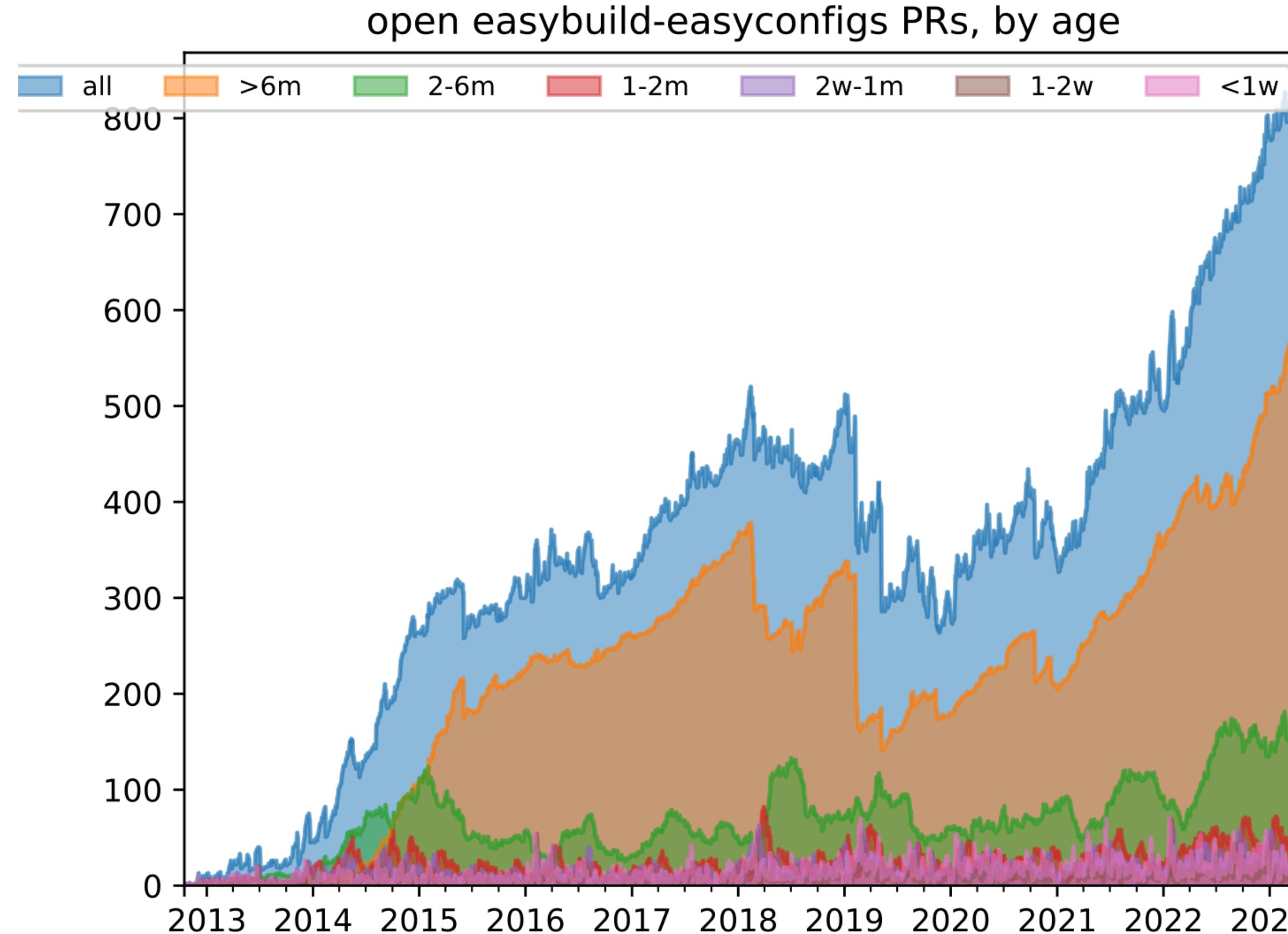
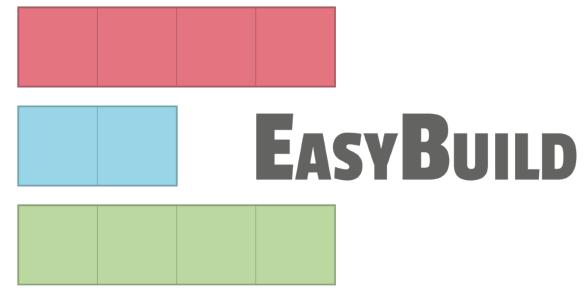
- 10% less easyconfigs PRs than in 2021
- Probably combination of causes: backlog of open PRs, late 2022b common toolchain, EESSI, ...
- Over 80% of PRs from contributors outside of HPC-UGent

# Overview of contributions (easyconfigs)



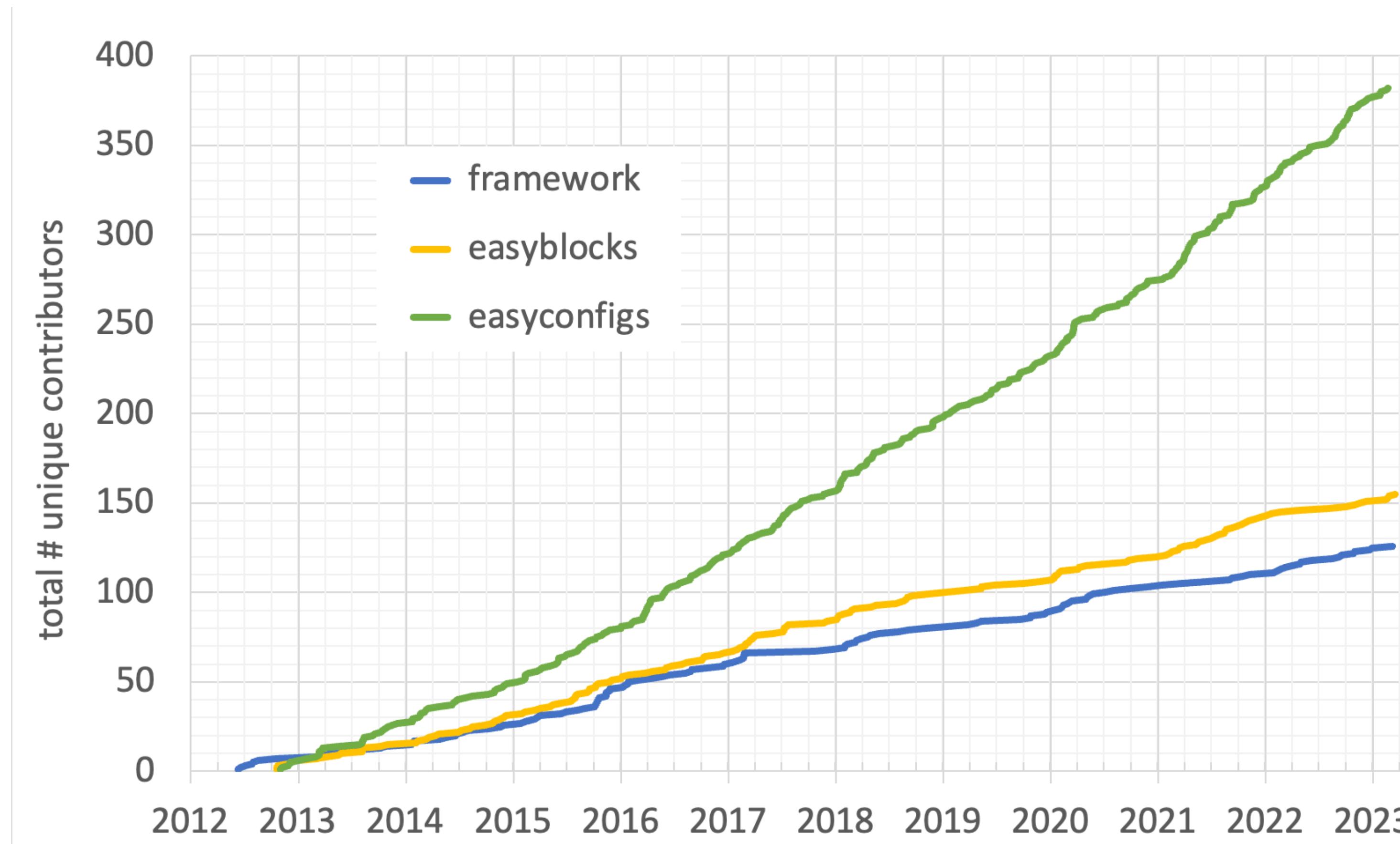
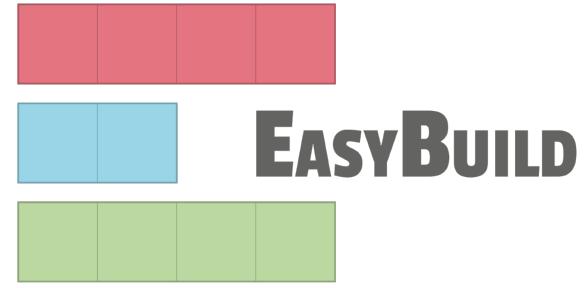
- Growing number of easyconfig PRs merged by other maintainers (~80% in 2022)
- Significant number of easyconfigs PRs from 2022 (and 2021) are still unmerged...
- Ratio of PRs opened with "eb --new-pr" is stable at 88%

# Overview of contributions (easyconfigs)



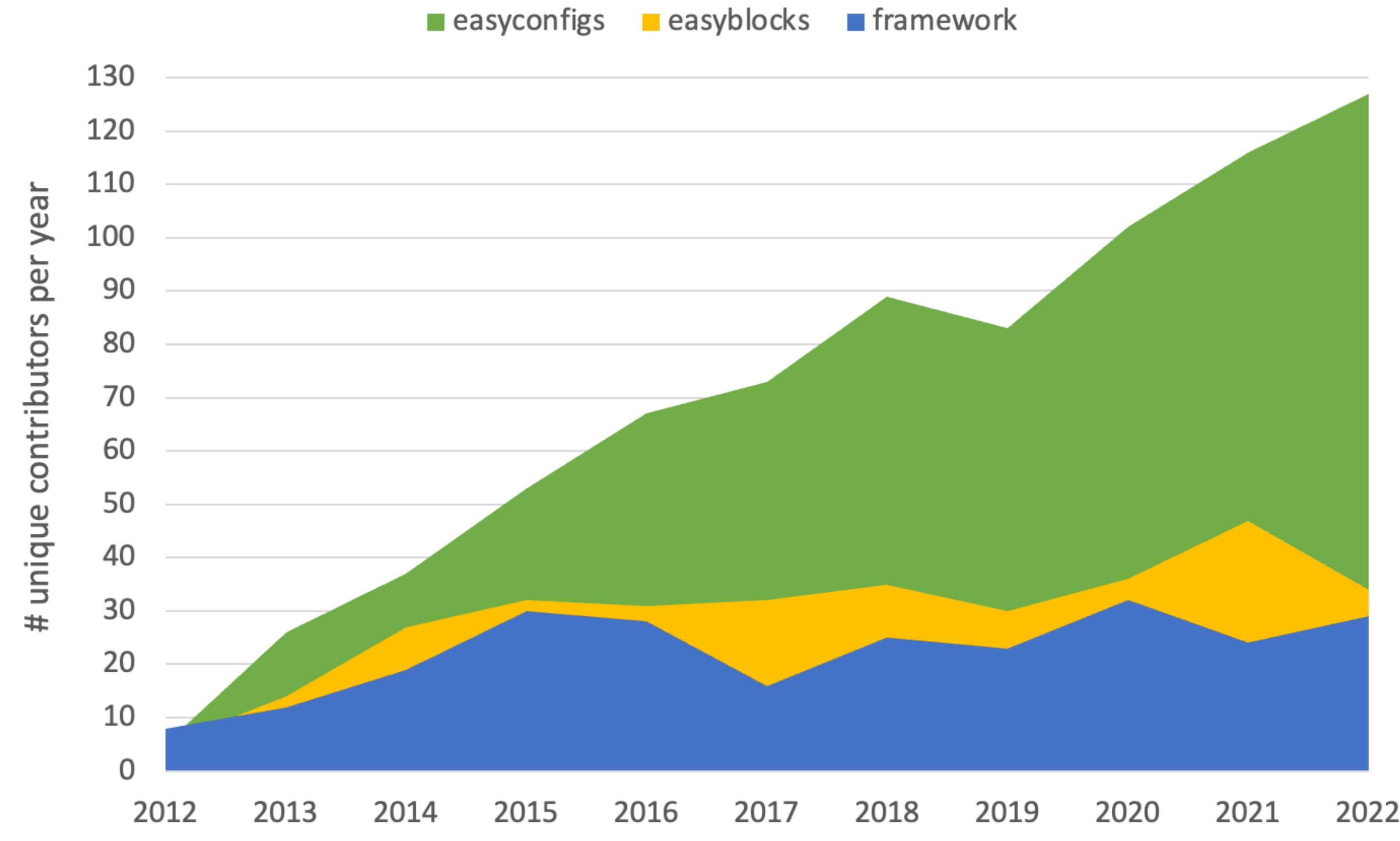
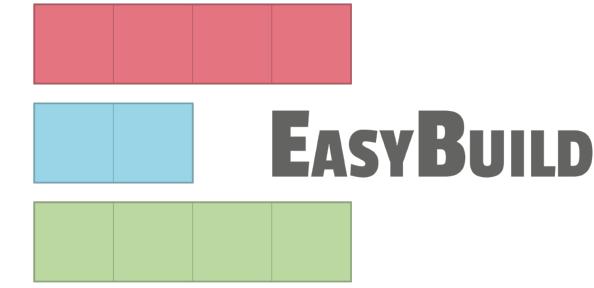
- Backlog of open easyconfigs PRs, has been growing quick, is “stuck” at ~800 for a while now
- Lack of sufficient time from active EasyBuild maintainers to process contributions *and* tackle backlog
- To some extent also negative effect of our involvement in the EESSI project

# Overview of contributors



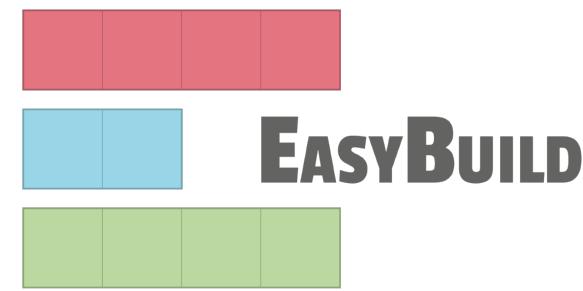
- Over 50 new contributors to easyconfigs repo in 2022, now over 380 in total
- Continued growth in unique contributors for all 3 major EasyBuild GitHub repos

# Overview of contributors (per year)



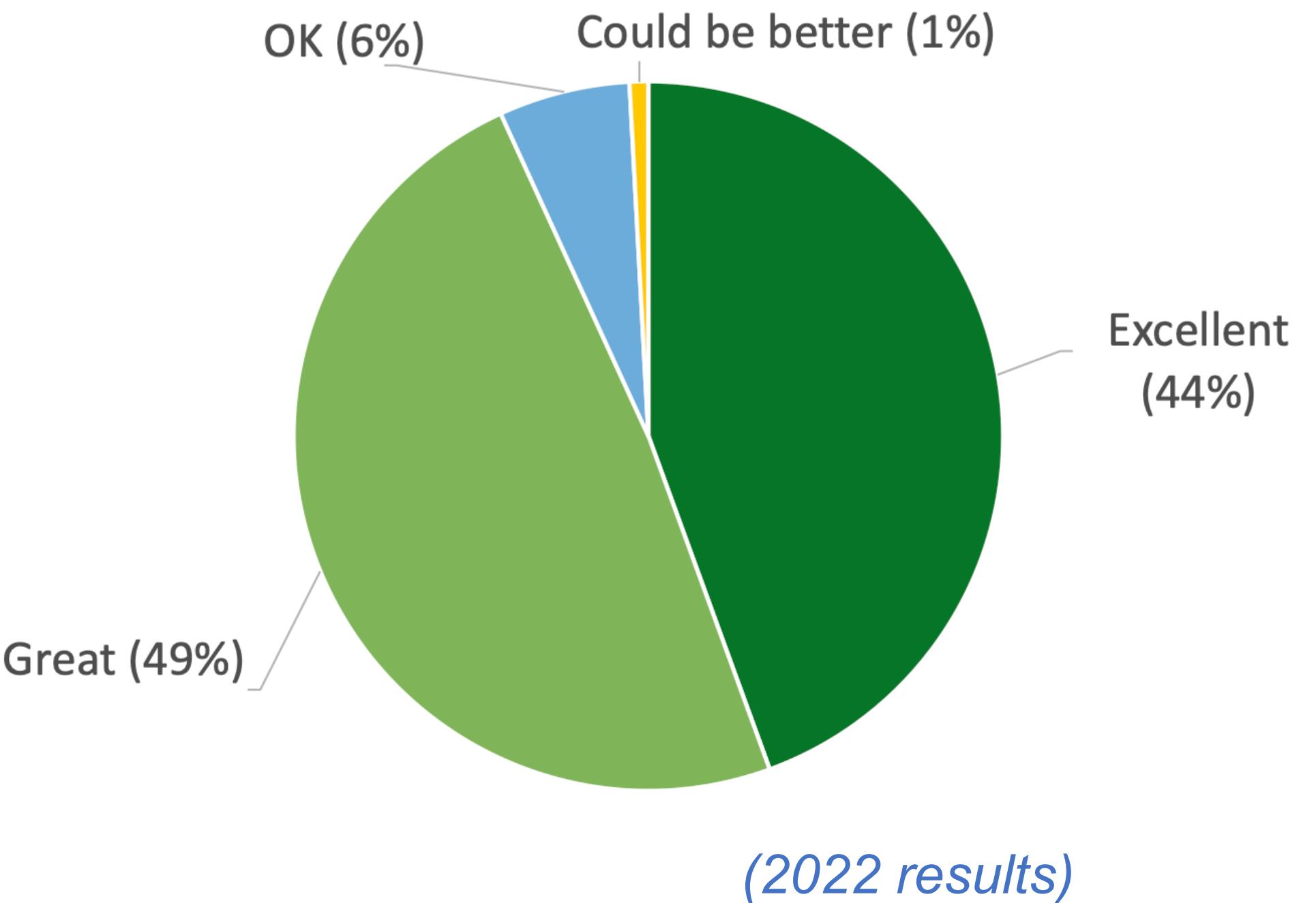
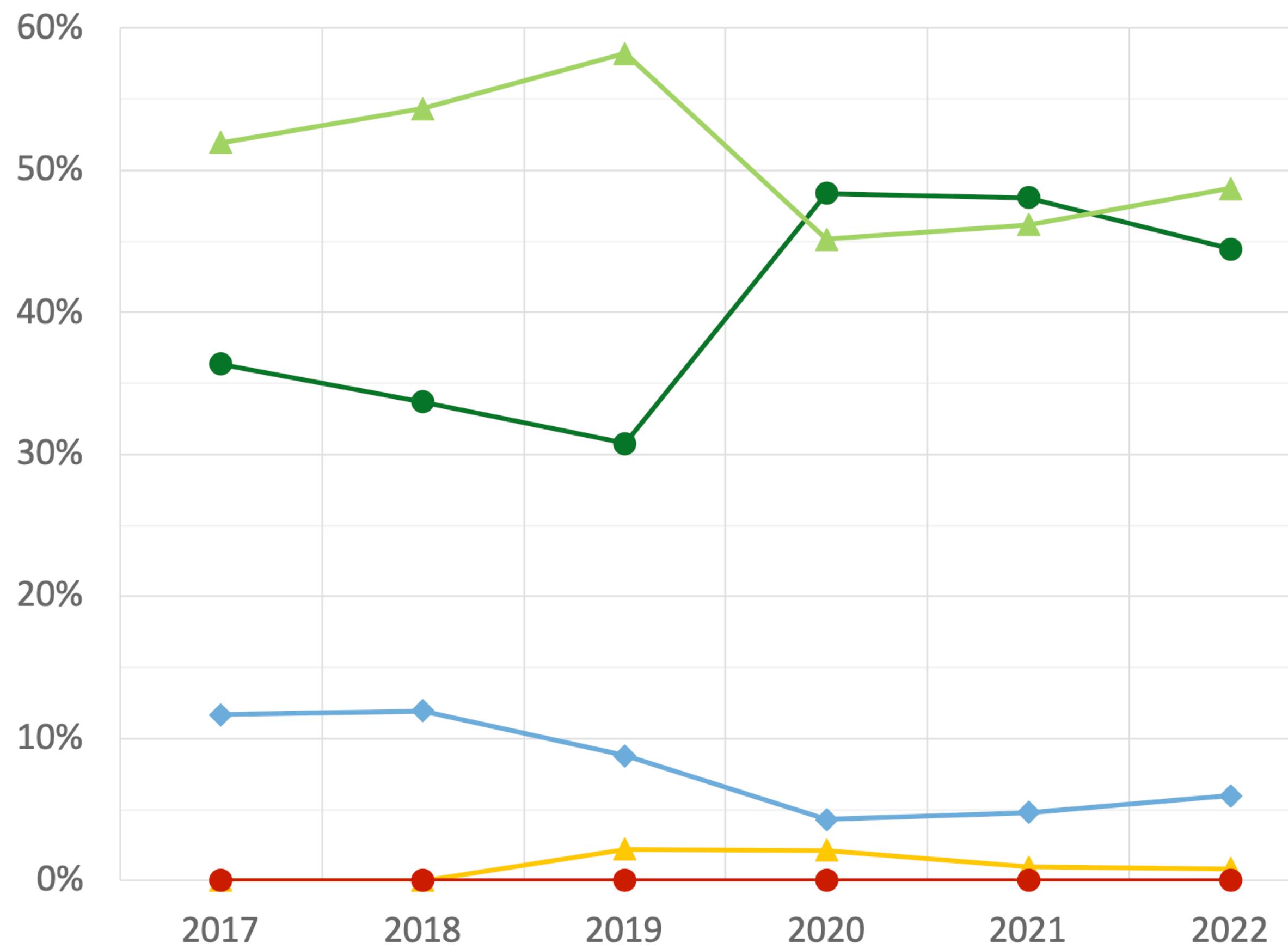
- 25-30 unique contributors per year to EasyBuild framework
- Over 30 unique contributors per year to easyblocks
- Now close to 130 unique contributors per year for easyconfigs

# Overall quality of EasyBuild



*How would you rate the overall quality of EasyBuild?*

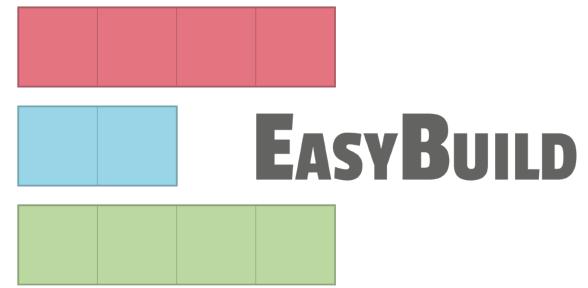
- Excellent
- ▲ Great
- ◆ OK
- ★ Could be better
- Pretty bad



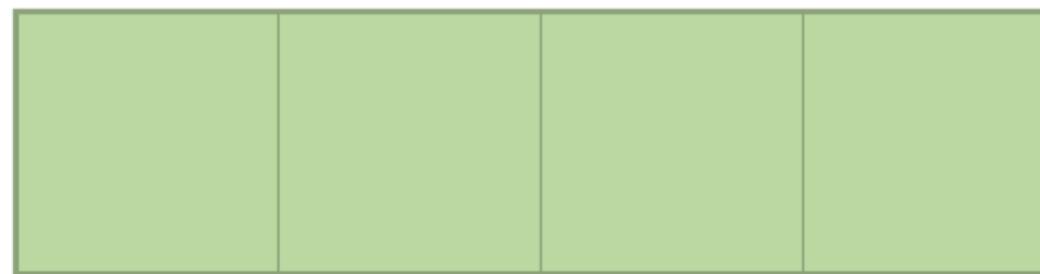
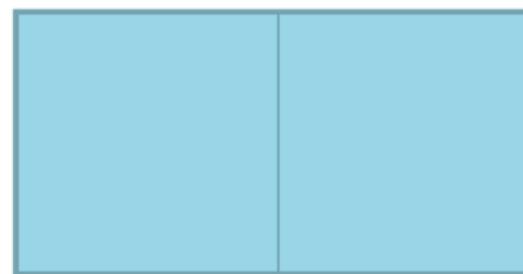
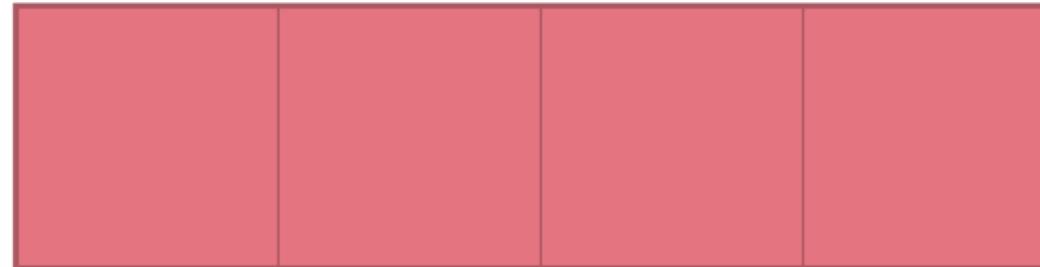
Positive evaluation of overall quality is stable

(nobody ever answered "pretty bad")

# Goals & challenges for 2023



- Catching up on backlog in easyconfigs PRs
- Keeping up with incoming questions and contributions (also beyond easyconfigs)
- **Releasing EasyBuild v5.0 by end of the year** (see also Simon's EUM'23 talk!)
- Stabilising currently experimental support for easystack files
- Integration of EasyBuild in EESSI (RPATH, alternate sysroot, filtered deps, ...)
- Testing of easyconfigs in different environments (OS, CPUs, EasyBuild config, ...)



# EasyBUILD

# Questions?

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[@kehoste \(Twitter\)](#)

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[easybuild@lists.ugent.be](mailto:easybuild@lists.ugent.be)

<https://easybuild.io>

<https://docs.easybuild.io>

<https://tutorial.easybuild.io>