Coq Community Survey 2022: Summary of Results

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Coq Workshop
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1 Introduction

2 How People Use Coq

3 Popular Features, Tools, and Libraries

4 Who is Using Coq and in What Context

5 Renaming of Coq

6 Conclusion
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Coq Community Survey 2022 Introduction

- Online public survey conducted during February 2022
- Main goals:
  - updated picture of the Coq community
  - decision support for developers and ecosystem members
- Inspired by the Coq survey from 2014 and other programmer surveys
- Available in English and Chinese
- Received 466 submitted responses
Survey Design, Deployment, and Analysis

- Survey questions created and edited collaboratively by the WG
- Effort to adhere to survey best practices
  - Demographic questions late to not affect other answers
- Deployed on the Inria LimeSurvey instance
- Announced on Coq Discourse, Twitter, Zulip, Coq-Club
  - Lean and Agda Zulip chats
  - Types-announce, other mailing lists
- Data analyzed primarily using Jupyter
Scope of the Survey

• 109 questions, some with conditional visibility
  • use of Coq features, IDEs, libraries, plugins
  • views on renaming Coq, on Coq improvements, inclusion
  • demographic data, including professional experience
  • survey static HTML linked in abstract and at the end of the slides

• Every question was optional to answer

• Most questions had a free text option
Example Question

If you have projects that are not compatible with recent versions of Coq (8.13 or more recent), why is that?

Please choose all that apply:

☐ It would take too much effort to port them.

☐ I don’t care that they aren’t on the latest version.

☐ A dependency of the project is not compatible with recent versions of Coq.

☐ Other: ___________

[Question hidden unless the respondent had used Coq within the last 6 months]
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Which operating system(s) have you last used Coq on (or would like to use Coq on)?

- **Linux**: 74% (339) of all users and 75% (131) of long-time users chose Linux. 69% (95) of new users chose Linux.
- **macOS**: 37% (168) of all users and 39% (67) of long-time users chose macOS. 34% (47) of new users chose macOS.
- **Windows**: 18% (83) of all users chose Windows. 12% (21) of long-time users chose Windows. 24% (33) of new users chose Windows.
- **Other**: 1% (5) of all users chose other operating systems. 1% (2) of long-time users chose other operating systems. 1% (1) of new users chose other operating systems.

**Long-time users**: used Coq for more than 5 years

**Newcomers**: used Coq for less than 2 years and in the last year
How have you installed Coq?

- **opam**: 70% (307) of all users, 55% (75) of long-time users, 80% (140) of newcomers.
- **Linux distribution**: 28% (122) of all users, 28% (48) of long-time users, 26% (35) of newcomers.
- **Source**: 16% (69) of all users.
- **Brew**: 15% (65) of all users, 16% (27) of long-time users, 15% (21) of newcomers.
- **Windows installer**: 14% (62) of all users, 17% (19) of long-time users, 18% (24) of newcomers.
- **Platform scripts**: 11% (50) of all users, 14% (24) of long-time users.
- **macOS dmg**: 9% (39) of all users, 9% (15) of long-time users, 8% (11) of newcomers.
- **Nix**: 9% (38) of all users, 9% (14) of long-time users, 9% (13) of newcomers.
- **Snap**: 2% (7) of all users, 2% (3) of long-time users, 1% (2) of newcomers.
- **Chocolatey**: 1% (4) of all users, 1% (1) of long-time users, 1% (1) of newcomers.
- **Conda**: 1% (3) of all users, 0% (0) of long-time users, 1% (2) of newcomers.
- **Other**: 3% (11) of all users, 3% (5) of long-time users, 2% (3) of newcomers.
Installation of dependencies

How have you installed the Coq libraries and plugins your work depends on? (396 answers)

- **Opam**: 78% (310) respondents
- **Manually**: 33% (132) respondents
- **Submodule**: 16% (64) respondents
- **Vendoring**: 10% (38) respondents
- **Nix**: 8% (31) respondents
- **Other**: 5% (18) respondents
Which versions of Coq do you use? (345 answers)

- **Recent versions (8.13+)**: 81% (281)
- **Older versions (8.12-)**: 8% (27)
- **Both**: 11% (37)
If you have projects that are not compatible with recent versions, why? (147 answers)

- **Do not care**: 59% (86)
- **Too much effort**: 26% (38)
- **Dependency**: 24% (36)
- **Other**: 7% (11)
Continuous integration

Have you used CI for your projects? (392 answers)

- Yes: 34% (134)
- No: 50% (195)
- Don't know what CI is: 16% (63)
Continuous integration platforms

Which CI platforms have you last used for your Coq projects? (128 answers)

- GitHub Actions: 59% (75)
- GitLab CI: 38% (48)
- Travis CI: 29% (37)
- Circle CI: 11% (14)
- Other: 5% (6)
Continuous integration tools

Which of these tools have you last used? (72 answers)

- docker-action template: 43% (31)
- Custom opam-based: 29% (21)
- Docker-Coq-Action no template: 21% (15)
- Other Docker-Coq-based: 19% (14)
- Coq Nix Toolbox (standalone): 10% (7)
- Custom Nix-based: 7% (5)
- nix-action template: 6% (4)
- Other: 10% (7)
Integrated Development Environments

Which editors or IDEs have you used for Coq?

- Emacs: 60% (263) for all users, 72% (126) for long-time users, 49% (67) for newcomers.
- CoqIDE: 52% (229) for all users, 57% (99) for long-time users, 39% (54) for newcomers.
- VsCode: 34% (150) for all users, 31% (54) for long-time users, 40% (55) for newcomers.
- jsCoq: 9% (40) for all users, 9% (13) for long-time users, 9% (13) for newcomers.
- Vim: 9% (40) for all users, 8% (14) for long-time users, 10% (14) for newcomers.
- Jupyter: 1% (6) for all users, 2% (3) for long-time users, 1% (1) for newcomers.
- Other: 1% (5) for all users, 2% (3) for long-time users, 0% (0) for newcomers.
What factors influence your choice of one IDE over another? (436 answers)

- Editor preference: 71% (308)
- Ease of installation: 40% (175)
- Features: 36% (156)
- Awareness: 25% (109)
- Community help: 11% (46)
- Other: 7% (31)
IDE satisfaction

How satisfied are you with...?

- Proof General (253)
- CoqIDE (222)
- VsCoq (149)
- jsCoq (34)
- Coqtail (27)
- coq_jupyter (8)

Legend:
- Very unsatisfied
- Neutral
- Unsatisfied
- Satisfied
- Very satisfied
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Features

Language features usage

- Inductive types
- Modules
- Typeclasses
- Universe polymorphism
- Coinductive types
- Module types
- Canonical structures
- Primitive integers
- Cumulative inductive types
- SProp
- -type-in-type
- Primitive arrays
- Primitive floats
- -indices-matter

Legend:
- Advanced user
- Casual user
- Plan to use

Number of respondents
Ecosystem general libraries

General libraries usage

- Mathematical Components
- Coq-std++
- Coq-ExtLib
- Math Classes
- TLC

Legend:
- Advanced user
- Casual user
- Plan to use

Number of respondents
Ecosystem plugins and tools

Ecosystem plugins and tools usage

- Dune: 80 respondents
- CompCert: 50 respondents
- QuickChick: 60 respondents
- Alectryon: 70 respondents
- Ott: 40 respondents
- Paco: 30 respondents
- CoqHammer: 85 respondents
- coq-dpdgraph: 45 respondents
- SerAPI: 60 respondents
- Hierarchy Builder: 50 respondents
- Interval: 35 respondents
- Paramcoq: 25 respondents
- SMTCoq: 70 respondents
- AAC Tactics: 30 respondents
- Unicoq: 20 respondents
- PyCoq: 10 respondents

Legend:
- Green: Advanced user
- Cyan: Casual user
- Yellow: Plan to use

Number of respondents
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Location (top 7)

Top seven respondent locations by experience

- **France**: 27% (118) All user, 17% (22) Long-time users, 38% (61) Newcomers
- **United States**: 23% (99) All user, 23% (37) Long-time users, 17% (22) Newcomers
- **United Kingdom**: 4% (6) All user, 7% (30) Long-time users, 9% (11) Newcomers
- **China mainland**: 1% (2) All user, 7% (30) Long-time users, 15% (19) Newcomers
- **Germany**: 6% (24) All user, 5% (6) Long-time users, 9% (14) Newcomers
- **Canada**: 3% (15) All user, 2% (4) Long-time users, 5% (6) Newcomers
- **Russia**: 1% (2) All user, 3% (12) Long-time users, 6% (8) Newcomers

Legend:
- **Blue**: All user (430)
- **Orange**: Long-time users (161)
- **Green**: Newcomers (128)
What is your age? (443 answers)

- 20-29: 39% (172)
- 30-39: 33% (145)
- 40-49: 15% (66)
- 50-59: 7% (33)
- 60-69: 3% (15)
- ≥ 70: 0% (0)

% of respondents
What is your gender? (433 answers)

- **Man**: 91% (394)
- **Woman**: 7% (31)
- **Non-binary**: 2% (8)
- **Other**: 1% (4)
What is your highest level of education? (451 answers)

- No diploma: 1% (4)
- High school: 5% (23)
- Bachelor: 18% (79)
- Master: 31% (139)
- PhD: 46% (206)
Students and academics

Students and academics (300 answers)

- Undergraduate students: 6% (18)
- Graduate students: 39% (117)
- PhD academics: 55% (165)
Research topics

What are your research topics? (412 answers)

- Programming languages: 70% (288)
- Formal methods: 63% (260)
- Logic: 38% (155)
- Software engineering: 25% (101)
- Other computer science: 18% (73)
- Other math: 11% (47)
- Algebra: 11% (47)
- Algorithms and complexity: 11% (46)
- Analysis: 7% (27)
- Topology: 5% (22)
- Engineering: 5% (22)
- Physics: 2% (10)
- Philosophy: 2% (9)
- Social science: 1% (6)
- Economics: 1% (6)
- Linguistics: 1% (5)
- Law: 0% (2)
- Other: 3% (13)
**Application domains**

What are your Coq application domains? (437 answers)

- **Software verification**: 66% (288)
- **Formal theoretical systems**: 59% (259)
- **Formal existing math**: 45% (196)
- **Formal novel math**: 22% (94)
- **Hardware verification**: 9% (38)
- **Other**: 2% (7)
Duration of Coq use

How long have you used Coq? (464 answers)

<table>
<thead>
<tr>
<th>Duration</th>
<th>% of respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never used</td>
<td>5% (23)</td>
</tr>
<tr>
<td>&lt; 1 year</td>
<td>16% (74)</td>
</tr>
<tr>
<td>1-2 years</td>
<td>19% (87)</td>
</tr>
<tr>
<td>2-5 years</td>
<td>23% (106)</td>
</tr>
<tr>
<td>5-10 years</td>
<td>21% (98)</td>
</tr>
<tr>
<td>&gt; 10 years</td>
<td>16% (76)</td>
</tr>
</tbody>
</table>
Last use of Coq

When was the last time you wrote Coq code? (440 answers)

- 49% (215) < 1 week ago
- 19% (85) < 1 month ago
- 13% (57) < 6 months ago
- 8% (33) < 1 year ago
- 5% (22) < 2 years ago
- 4% (16) < 5 years ago
- 2% (9) < 10 years ago
- 1% (3) ≥ 10 years ago
Functional programming experience

Which functional programming language(s) did you have prior experience with? (370 answers)

- Haskell: 64% (237) respondents
- OCaml: 60% (221) respondents
- Scheme: 29% (107) respondents
- Scala: 21% (77) respondents
- Standard ML: 21% (76) respondents
- Racket: 18% (65) respondents
- Erlang: 10% (37) respondents
- F#: 10% (36) respondents
- Clojure: 9% (32) respondents
- Elm: 6% (23) respondents
- PureScript: 4% (13) respondents
- Elixir: 3% (11) respondents
- ReasonML: 1% (5) respondents
- Other: 7% (26) respondents
Which other proof assistant(s) do you have experience with? (256 answers)

- **Agda**: 54% (139) users
- **Isabelle**: 38% (97) users
- **Lean**: 36% (93) users
- **Idris**: 24% (62) users
- **F***: 16% (41) users
- **HOL light**: 9% (24) users
- **PVS**: 8% (21) users
- **Twelf**: 7% (18) users
- **HOL4**: 7% (17) users
- **Nuprl**: 4% (10) users
- **Acl2**: 4% (10) users
- **Matita**: 4% (9) users
- **Mizar**: 2% (4) users
- **Lego**: 1% (2) users
- **Other**: 12% (31) users
General renaming views

Should Coq be renamed?

- All respondents (450) -
- Coq users (428) -
- Men (381) -
- Women (31) -
- Respondents in anglophone locations (154) -
- Respondents in other locations (264) -
- Newcomers (133) -
- Long-time Coq users (170) -

100 80 60 40 20 0 20 40 60 80 100

- Absolutely not
- I don't know
- Absolutely
- Probably not
- Probably
Strategy when favorable to renaming

- Radical change (150)
- Make the name longer (140)
- Make the name sound more French (146)
- Change pronunciation (175)
Strategy when against renaming

- Change pronunciation (127)
  - Hate: 20
  - Find acceptable: 60
  - Like: 20
  - Love: 10

- Make the name sound more French (107)
  - Hate: 20
  - Find acceptable: 60
  - Like: 20
  - Love: 10

- Make the name longer (98)
  - Hate: 30
  - Find acceptable: 50
  - Like: 20
  - Love: 10

- Radical change (97)
  - Hate: 80
  - Find acceptable: 20
  - Like: 0
  - Love: 0
Renaming options

- Rocq (344)
- Copa (355)
- Gallo (338)
- C.O.Q. (384)
- LPC (Le Prouver Coq) (342)
- CoqPiT (344)
- Coqgorico (346)
- Coqio (347)
- Coquatrix (347)
- Le Coq (351)
- Le Coq Formel (343)
- Chook (333)
- UP (Universal Prover) (340)

Legend:
- Blue: Hate
- Light Blue: Do not like
- Grey: Find acceptable
- Orange: Like
- Red: Love
Renaming options when favorable to renaming

![Graph showing renaming options]

Legend:
- **Hate**
- **Find acceptable**
- **Love**
- **Do not like**
- **Like**

- Rocq (165)
- Gallo (161)
- Copa (168)
- LPC (Le Prouver Coq) (161)
- CoqP!T (164)
- Coqorico (164)
- Coquatrix (165)
- Coqqio (162)
- C.O.Q. (175)
- Chook (156)
- UP (Universal Prover) (159)
- Le Coq Formel (162)
- Le Coq (163)
Renaming options when against renaming

- C.O.Q. (127)
- Le Coq (113)
- CoqPIT (111)
- LPC (Le Prouver Coq) (112)
- Coqrico (111)
- Copa (110)
- Le Coq Formel (110)
- Coqqio (112)
- Coquatrix (111)
- Rocq (108)
- Gallo (108)
- Chook (109)
- UP (Universal Prover) (110)

Legend:
- Blue: Hate
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Conclusion

• Additional plots in the blog posts on Coq Discourse Forum
• Plan to publish formal research papers
• We thank all members of the WG for their efforts
References and Blog Posts

These slides in PDF

Survey (HTML)
References and Blog Posts

\{ Blog Post I \\
Who is using Coq & in what context \}

\{ Blog Post II \\
How people are using Coq \}