



The OSS-ential Understanding of Open Source Community Health and Metrics

Moving Beyond Surface Signals to Real Project Health

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About Me



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The State of Open Source Today

80%+

of software in any
technology product
is open source

60%

of maintainers
work completely
unpaid

60%

have quit or
considered quitting
their projects

Activity ≠ Health

Looks Active, But...

- High commit velocity may signal chaos, not growth
- Spike in issues may mean confusion or unclear docs
- Many PRs may indicate poor review practices
- Frequent releases may mask instability

Looks Quiet, But...

- Fewer commits may mean the project reached maturity
- Low issue count may mean docs are clear, users are happy
- Slow releases may reflect a thoughtful, stable cycle
- Small team may mean dedicated, experienced maintainers



Case Study: The XZ Utils Backdoor

CVE-2024-3094 | CVSS Score: 10.0 (Maximum)

- 2021** Attacker ("Jia Tan") begins contributing legitimate patches
- 2022** Sock puppet accounts pressure the burned-out solo maintainer
- 2023** Attacker gains co-maintainer status and release control
- Feb 2024** Backdoor injected into XZ Utils versions 5.6.0 and 5.6.1
- Mar 2024** Caught by accident — a Microsoft engineer noticed a 500ms SSH delay

2.6 years of patient social engineering. Only 8 malicious commits. Everything else was legitimate.

What Metrics Would Have Told Us

What Surface Metrics Showed

- Active commits
- New contributor joined
- Regular releases
- Issues being addressed

Verdict: "Healthy"

What Health Metrics Would Show

- Bus factor: 1 (critical risk)
- Organizational diversity: 0
- No governance documentation
- No succession planning
- Maintainer showing burnout signals

Verdict: "At Risk"

So how do we bridge the gap between

visible activity

and

**real community
health?**

Two foundational ideas. One framework.



Pillar 1: Sustainability

Can the project keep going without burning people out?

Contributor Experience

How newcomers and regulars experience contributing — friction, support, clarity

Documentation Quality

Is documentation current, comprehensive, and accessible to diverse audiences?

Onboarding

How quickly can a new contributor go from zero to first meaningful contribution?

Communication

Response time to issues, PRs, and questions. Are people being heard?

Workload Distribution

Is work spread across contributors, or concentrated in a few?

Release Cadence

Is the release rhythm consistent and sustainable for the team?



Pillar 2: Survivability

Can the project survive a crisis or sudden change?

Bus Factor

How many people need to leave before the project can't continue? If it's 1, that's critical.

Organizational Diversity

How many different organizations contribute? Single-org projects have single-org risk.

Governance Strength

Are there written governance docs? Clear decision-making processes? Defined roles?

Succession Planning

Is there a plan for leadership transition? Or does everything depend on one person?

Dependency Health

Are upstream dependencies also healthy? Supply chain risk cascades.

Security Response

How quickly does the project respond to vulnerability reports?



The CHAOSS Project

Community Health Analytics in Open Source Software | Linux Foundation | Est. 2017

How It Works

Researchers, maintainers, and industry partners collaborate in open working groups to define what health means — not as a single number, but as shared standards everyone can use.

Each metric answers one question about community health. Metrics models combine them for deeper insight. Practitioner guides translate them into real-world action.

The result: a common language for comparing projects, reading patterns, and making fair, context-aware decisions.

Shared Metrics

Dozens of defined, implementation-agnostic metrics

Practitioner Guides

Guides for community managers, OSPOs, and maintainers

10+ Working Groups

DEI, OSPO, Science, Funding, AI, Accessibility, and more

chaoss.community | github.com/chaoss | podcast.chaoss.community



CHAOSS Software Tools

GrimoireLab

- 30+ data sources (Git, GitHub, Jira, Slack, mailing lists...)
- 150+ pre-built metrics and visualizations
- Aggregated view across all development channels
- Onion analysis: core, regular, and casual contributors
- Used by major foundations (LF, Eclipse, CNCF...)
- Best for: Community managers, project leads, OSPOs

Augur

- Python library + web service
- GitHub and GitLab focused, scales to 10,000s of repos
- Relational database for custom SQL queries
- Compliance, security, and dependency analysis
- Funded by Alfred P. Sloan Foundation
- Best for: Data scientists, researchers, analysts



Numbers Need Narratives

Commits dropped 40%

Common Assumption:

Project is dying

Possible Reality:

Reached stability — fewer features needed

Issues spiked 3x

Common Assumption:

Growing fast

Possible Reality:

New release introduced confusion; docs need work

1 person does 80%

Common Assumption:

Dedicated lead

Possible Reality:

Critical bus factor risk — one departure kills it

Context transforms data into understanding.



Health Is Lived Experience

When Health Fails

A maintainer works nights and weekends. Users file issues demanding fixes. No one reviews PRs. Contributors leave after their first attempt is ignored for weeks.

The maintainer stops responding. People ask "is this project dead?" on social media. A year later, the project is archived.

The dashboard said: 200 open issues, steady commits.
The reality was: one exhausted person, alone.

When Health Works

A project mentors three new contributors through their first PRs. One becomes a regular. The founder writes a governance doc and shares release access.

Two years later, the founder steps back. The project keeps going. No drama. No crisis.

The dashboard said: fewer commits than last year.
The reality was: a mature, resilient community.

Health shows up in conversations, mentorship, leadership transitions, and confidence — not just graphs.

Health Is Lived Experience

Community health isn't just charts — it shows up in how people feel.



Conversations & Culture

How are decisions made? Who gets heard? Is dissent welcome?



Mentorship & Onboarding

Are new contributors guided, or left to figure it out alone?



Leadership Transitions

Can the project survive a change in leadership gracefully?



Contributor Confidence

Do people feel safe, valued, and motivated to keep contributing?

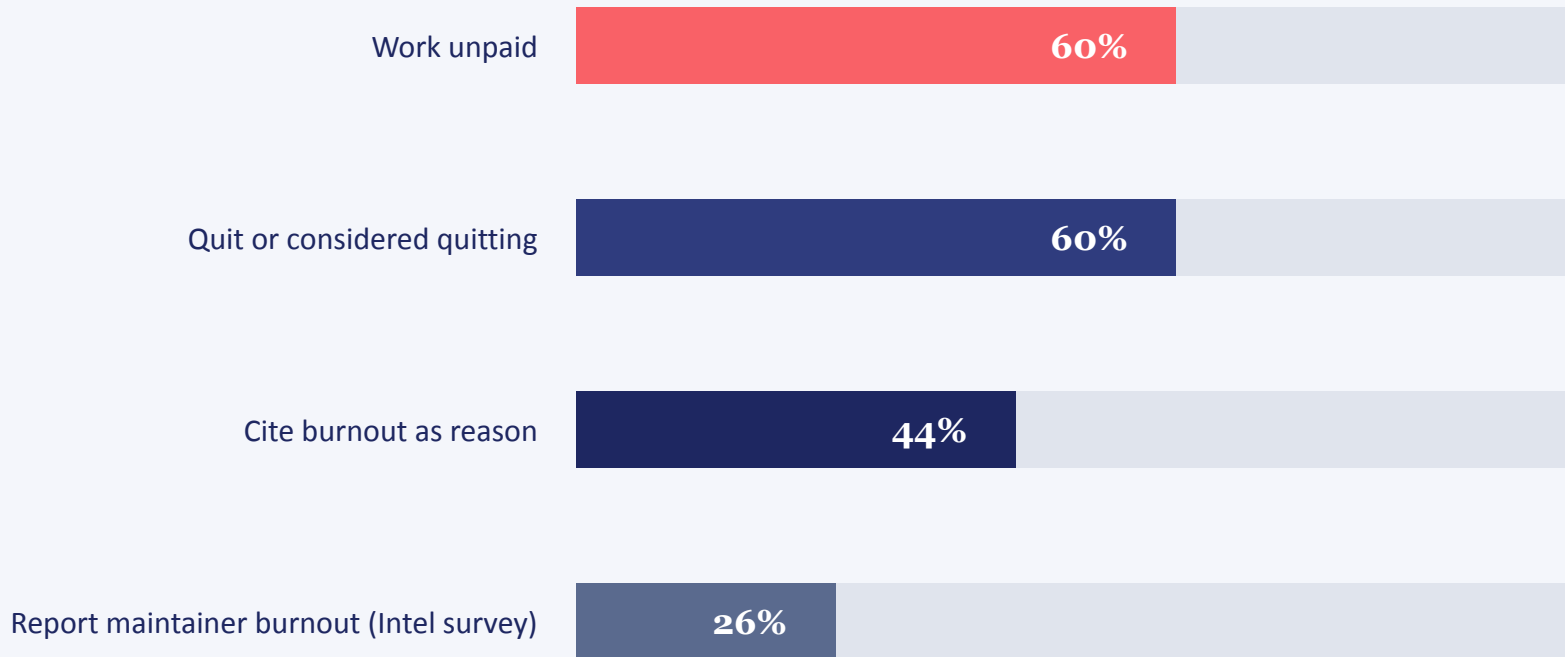


Psychological Safety

Can people raise concerns without fear of retaliation or dismissal?



The Burnout Crisis in Numbers



"Money doesn't write code, review pull requests, or manage releases." — Kubernetes Ingress NGINX maintainers



Reading the Signs

Warning Signs

- Rising response time to issues/PRs
- Single contributor doing most work
- Stale documentation & broken links
- No governance docs or succession plan
- Declining contributor diversity
- Increasing unanswered questions

Positive Signals

- New contributors staying past first PR
- Multiple organizations contributing
- Active mentorship & onboarding
- Clear governance & decision-making
- Regular, predictable release cadence
- Healthy leadership transitions



Ask Better Questions

Instead of:

How many commits this month?

Ask:

Is commit activity consistent with the project's maturity stage?

Instead of:

How many contributors?

Ask:

How distributed is knowledge? What's the bus factor?

Instead of:

Are issues being closed?

Ask:

Are contributors' questions being answered? How responsive is the community?



Ask Better Questions (continued)

Instead of:

Is the project active?

Ask:

Does the project have clear governance and a plan for leadership transition?

Instead of:

How many stars?

Ask:

How many organizations depend on and contribute back to this project?

Instead of:

When was the last release?

Ask:

Is the release cadence intentional, or has the project gone silent?



If Your Project Is Struggling

Practical first steps for projects that want to grow but don't know where to start

Start with governance

Write a GOVERNANCE.md. Document how decisions are made, who has access, and how new maintainers are added. It doesn't have to be perfect — it has to exist.

Fix onboarding before recruiting

Before asking for contributors, make sure a newcomer can go from clone to contribution. Add a CONTRIBUTING guide, label good-first-issues, and respond to first PRs within a week.

Distribute knowledge deliberately

Pair contributors on reviews. Rotate who handles releases. Write architecture docs. Every task only one person knows is a risk.

Use CHAOSS Practitioner Guides

Start with the 'Introduction' and 'Contributor Sustainability' guides. They translate metrics into actions you can take this month.

You don't need to be healthy to start. You need to start to become healthy.



What Does Healthy Actually Look Like?

A quick health check you can do on any project today

Area	Key Question	Healthy Signal	Warning Signal
Bus Factor	Do 2+ people understand the core codebase?	Multiple active reviewers	One person approves all PRs
Org Diversity	Are contributors from multiple organizations?	3+ companies contributing	Single-company project
Governance	Are decision-making processes documented?	Written governance, clear roles	No docs, informal decisions
Responsiveness	How long do issues/PRs wait for a response?	Median < 7 days	Weeks or months of silence
Onboarding	Can a newcomer make a contribution?	Good-first-issue labels, guides	No onboarding path exists
Succession	Is there a plan if the lead steps down?	Documented transition process	No plan, no backup

Start here. Six questions. No special tools required.



What You Can Do Today

- 01** Evaluate differently. Ask about sustainability and survivability, not just stars and commits.
 - 02** Use CHAOSS Practitioner Guides to assess the projects you depend on — start with Assessing Viability.
 - 03** Check the bus factor of your critical dependencies. If it's 1, contribute — or plan for failure.
 - 04** If you maintain a project: write governance docs, fix onboarding, distribute knowledge. Start small.
 - 05** Join CHAOSS. Help define what health means. The standards are open and the community needs your context.
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Thank You

Health is not a set of charts.

It is lived experience.
