Gephi *towards v1.0*

The codebase, and the rest.

Mathieu Bastian
Mathieu Jacomy

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The future version 1.0

Gephi has always been **unfinished**. The day it stops being unfinished, we will number the version **1.0**. It will hopefully happen in late 2023 or 2024.

The version 1.0 will be:

- Basically **current** Gephi,
- with a **consolidated** set of features,
- meeting better **reliability** goals,
- and better **performance** goals.

It is about finishing the *product** before discussing new directions to explore.

* don't worry, we are not becoming a company. The Gephi team wants to keep being an open source project, and Gephi will remain free, forever.

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Rationale of the road map

PREMISE

There is a demand for Gephi

GOALS

The Gephi project is sustainable

Gephi's tech side is sustainable

Gephi is a popular tool. From there, how to make the project sustainable?

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Contributors and users are clashing

The Gephi project is sustainable

PREMISE

There is a demand for Gephi

No one *wants* to maintain the codebase (breaks)

Gephi's tech side is sustainable

No one *knows* how to do it

One can identify the main threats against the project.

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PREMISE

STEPS FORWARD

Contributors and users are clashing

A thriving Gephi community

The Gephi project is sustainable

There is a demand for Gephi

No one *wants* to maintain the codebase (breaks)

Paying developers for maintenance (& improvement)

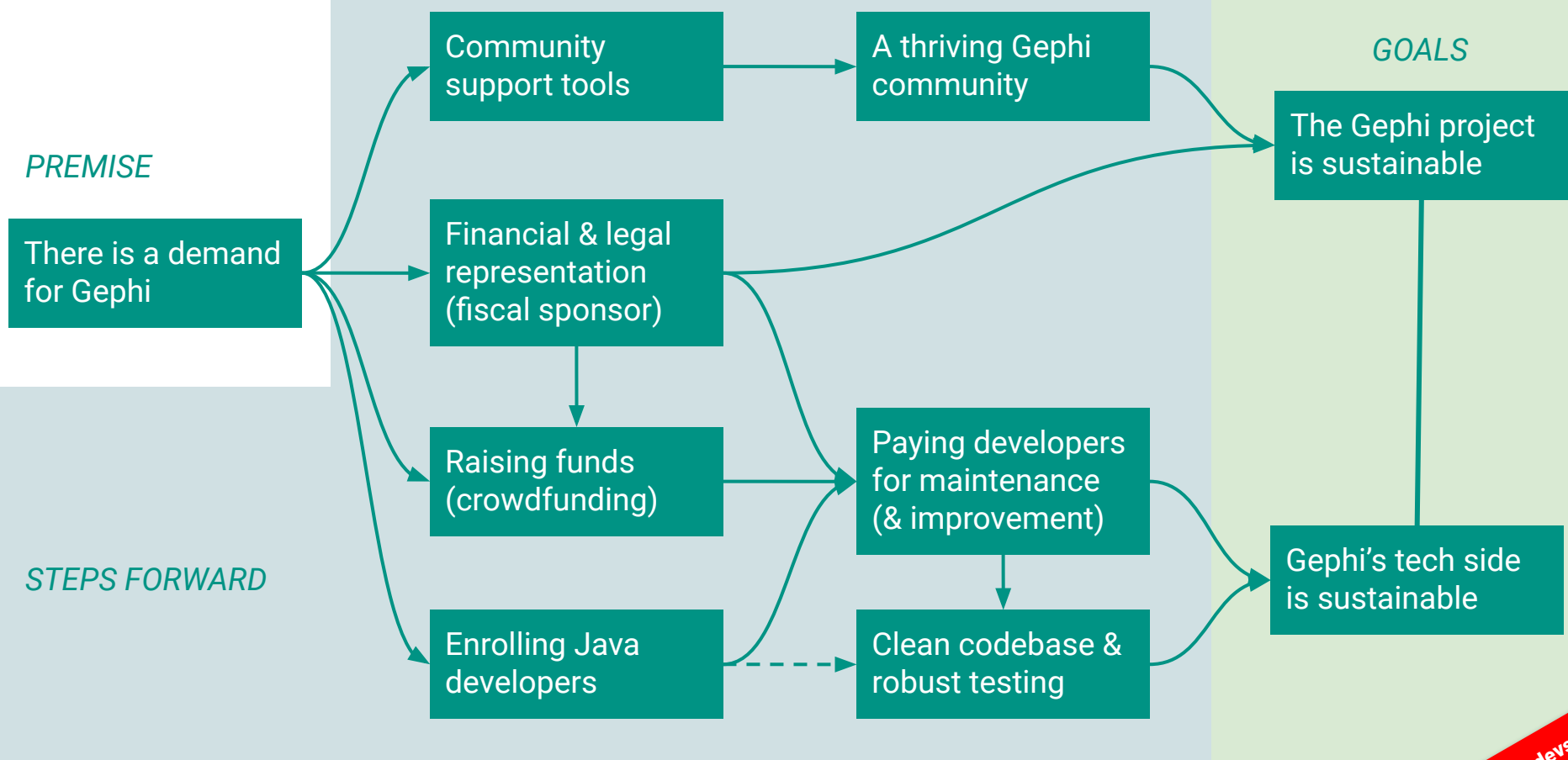No one *knows* how to do it

Clean codebase & robust testing

Gephi's tech side is sustainable

Our priority is to prevent the main threats.

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PREMISE

GOALS

STEPS FORWARD

- Community support tools
- A thriving Gephi community
- The Gephi project is sustainable
- There is a demand for Gephi
- Financial & legal representation (fiscal sponsor)
- Raising funds (crowdfunding)
- Paying developers for maintenance (& improvement)
- Enrolling Java developers
- Clean codebase & robust testing
- Gephi's tech side is sustainable

Those steps forward underlie our road map.

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PREMISE

GOALS

STEPS FORWARD

Community support tools → A thriving Gephi community

There is a demand for Gephi

Financial & legal representation (fiscal sponsor) — 1

Raising funds (crowdfunding) — 2

Enrolling Java developers — 3

Paying developers for maintenance (& improvement) — 4

Clean codebase & robust testing — 5

The Gephi project is sustainable

Gephi's tech side is sustainable
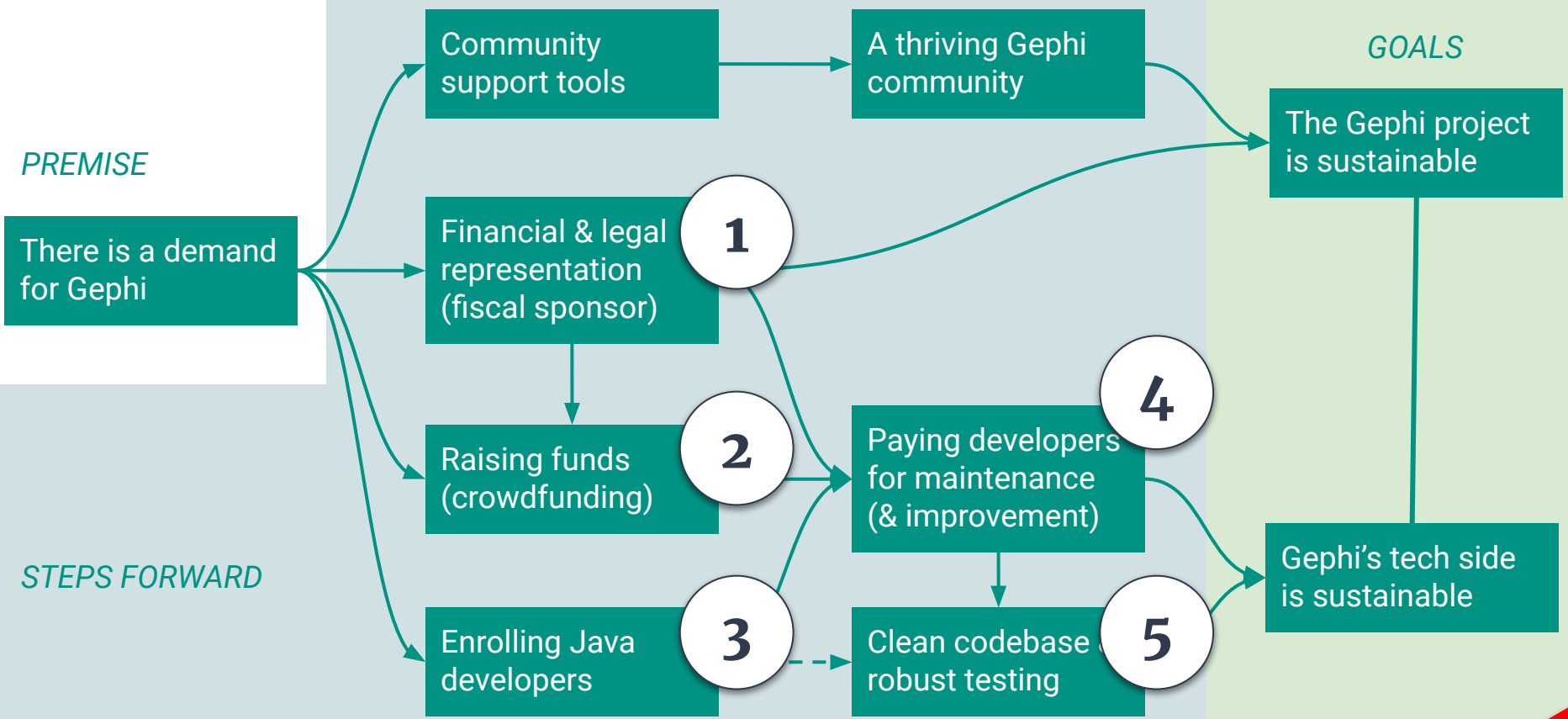
The dependencies tell in which order we have to structure the project.

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The priorities of the Gephi project

- **Sustainability.** Maintenance. Gephi needs to work before anything else. That is:
  - Easy to install (including Java) on all platforms
  - UI and OpenGL acceleration working on all screen resolutions and (most) hardware
  - Testing! (not all modules currently covered)
  - Stability (fix major bugs)
  - Sufficiently clear and documented codebase
- **Getting to version 1.0.** We want to finalize today's Gephi before discussing new directions to explore.
- **Stabilizing core contributors.** This entails institutional support, fundraising, and discussing governance.

- **Other things.** There are many sides to the project.
  - Community tools and online presence (GitHub, website…).
  - Plugins.
  - Web integration (Gephi JS).
  - Evolution of Gephi.
  - Documentation, tutorials and teaching material.
  - Dev community (code examples).
  - Keeping Gephi state-of-the-art over the long term.

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Technical road map to v1.0

DONE Embed **Java**

DONE Update to the **latest Netbeans Platform**

DONE **GDPR** compliance for bug reports

⚠️ **New OpenGL engine.** Improvement + solves maintenance issues.

⚠️ **Quick search** in nodes/edges and metadata.

⚠️ **New icons.**

⚠️ **Unit and UI testing** (for instance end2end).

- **UNDO/REDO** feature, with **Activity log**
- **Autosave and crash recovery.** Better recover data from crashes.
- **Parallel edges.**
- **Cleaner data laboratory.**
- **Revamp appearance** (label color & size, sliders).
- **Logging** (much more logs to facilitate debugging)
- **Instrumentation** (opt-in statistics on feature usage)
- Some **modules to rewrite** from scratch (timeline…)
- A lot of other small things…

Gephi's code sustainability retreats
(also called "Gephi Week")

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2021, 2022, and hopefully every year to come

2021: Restarting the machine

One week in Copenhagen, 6 participants.

- We made the **codebase healthy enough** to welcome new developers.
- **New features** developed (as prototypes).
- A long **bug bash** was started (finished later).
- Building a **common vision** for the project!

It paved the way forward and kickstarted a new dynamic in the team.

https://gephi.wordpress.com/2021/12/06/gephi-code-sustainability-retreat-2021-debriefing/

2022: Thinking the way to v1.0 and beyond

One week in Paris, 22 participants.

- **Improved dev tools** and documentation
- **Refreshing the UX** (icons, dark mode…)
- **New features** (Neo4J plugin, web export…)
- **Issues fixing** session
- **Gephi Lite** (more on this later)
- Experiments about **community detection**

https://gephi.wordpress.com/2022/10/16/gephi-week-2022-debriefing/

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Gephi Week 2021

Tiago Peixoto, prominent network scientist and developer of GraphTools, helps us implement inference-based community detection.

Antonin Delpeuch, maintainer of OpenRefine, provides advice on Java, structuring an open source project, and the "undo" feature.
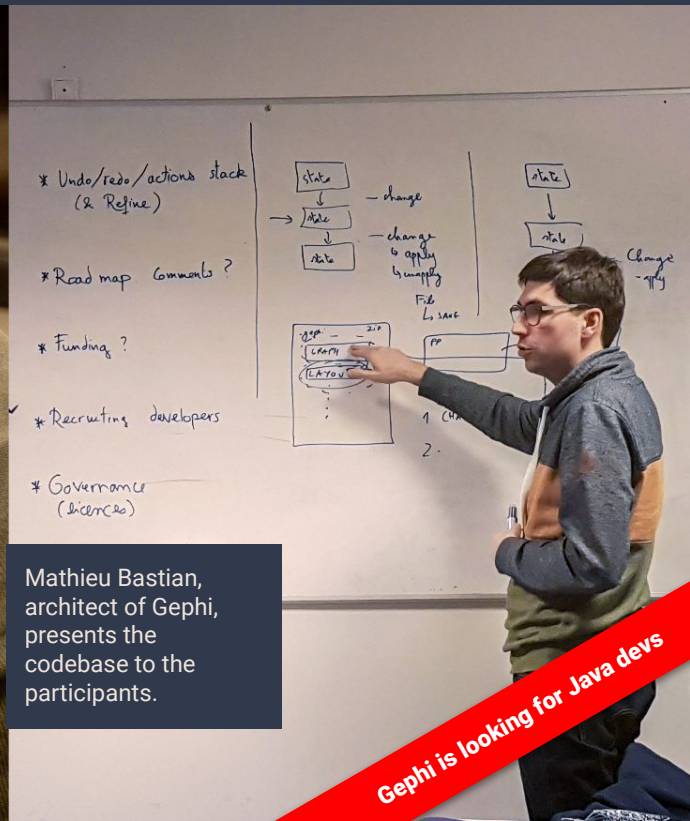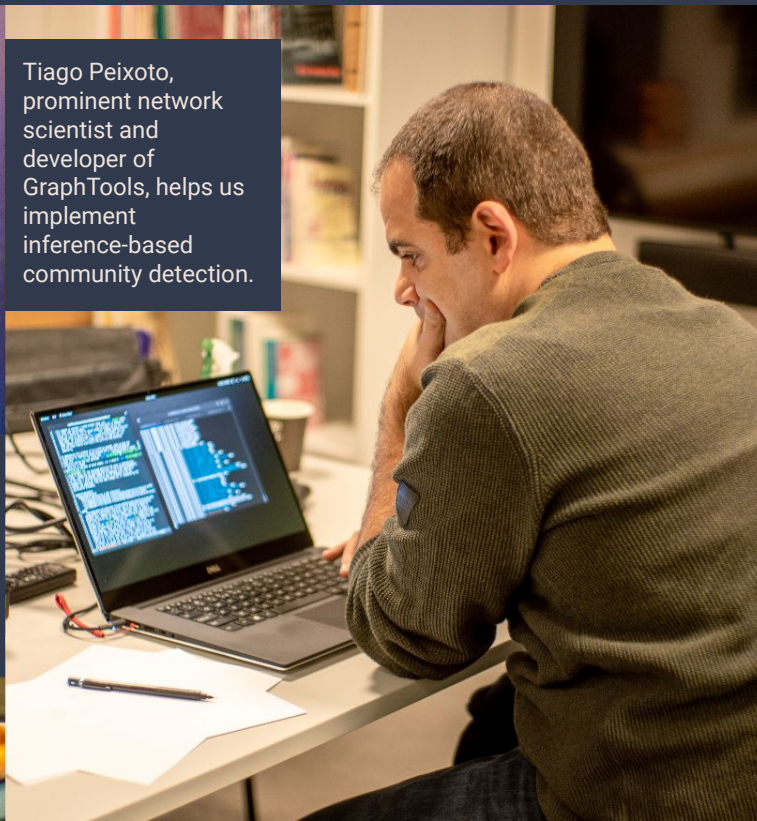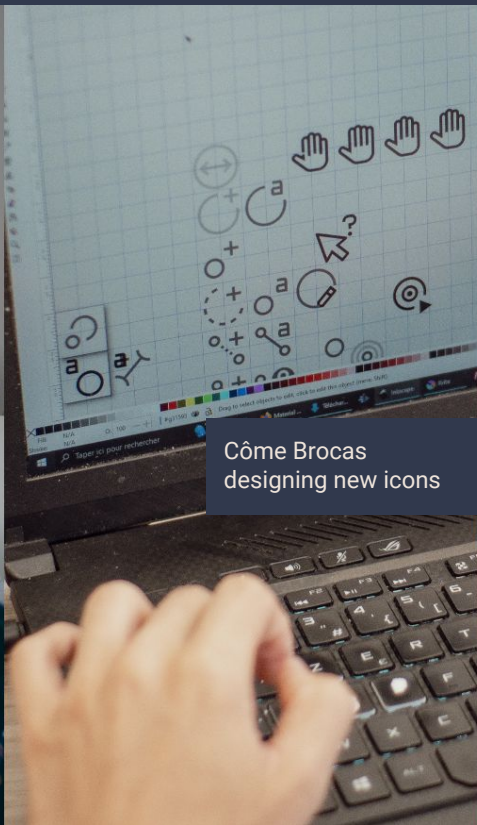
Mathieu Bastian, architect of Gephi, presents the codebase to the participants.

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Gephi Week 2022

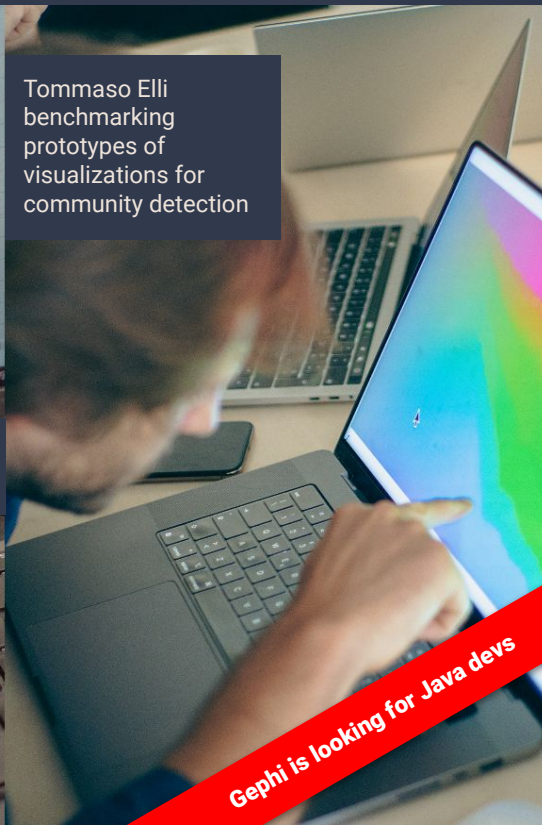Our collective included developers, users, designers, researchers…

Tommaso Elli benchmarking prototypes of visualizations for community detection

Côme Brocas designing new icons

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Takeaways about these initiatives

These retreats are **beneficial** to the project: they provide the room we need to tackle the most important issues.

It works in **unexpected ways**. We met surprising people and brand new ideas emerged. The event creates a powerful, attractive dynamic.

The "Gephi Week" becomes a **mini-festival**, but it seeks a **balance** between development and other parts of the project: community life, experimentation, research…

We still **fail to attract Java devs organically**. How to convert this good will? Even though we pay for travel and accommodation, few developers applied (although many contribute through plugins).
→ What is the path to Gephi for a developer?

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What is the path to Gephi for a dev?

Path #1: you co-founded the project
Ex: Mathieu Bastian, architect of Gephi.

Path #2: from plug-in developer to core dev
Ex: Eduardo Ramos Ibáñez, current lead dev;
Matthieu Totet (Twitter plug-in)...

Path #3: from user to developer via a Gephi Week!
Ex: Schuh (coordinate export features in 2022)

Open question: are there Java developers working
with Gephi in the industry, who would like to contribute
to maintaining the project?
→ Path #4: from industry to open source project?

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Our efforts to engage Java devs

The Gephi team is a **welcoming** crowd who wants to make the new dev's life **easier**.

The codebase is **commented** and **documented**, but we are working at improving both aspects.

It is not just about the code, but also the **infrastructure**. We aim at improving the coverage of testing: more unit tests, end2end…

We rely heavily on **GitHub**: we accept pull-requests, we use issues and projects to organize maintenance, our build process uses GitHub actions, even our website is hosted on GH.

We actively worked on reducing the number of GH issues from ~600 to ~400. Cleaning up helps bring clarity.

We **teach the codebase** during the Gephi Weeks, also available on our YouTube channel. We will share knowledge via other means in the future: conferences, meetups, live streaming…

To improve: the online resources for the dev community are not all up to date (ex: plugin boot camp).

Open question: is it a problem for the attractivity of the project that Gephi is coded in Java?

Open question 2: how important is the Gephi Toolkit to Java developers? Is it a significant entry point into the codebase?

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Why developing Gephi is so challenging?

It's a **full product,** with lots of UI code but also deep **performance** challenges.

There are deep, **open technology questions**
- Java as a UI framework
- Multi-platform 3d acceleration (OpenGL)

We put the bar high on **multi-threading.** Practically, it means longer development time.

We're committed to being **multi-platform.** Each platform having their own unique challenges.

We have big gaps in **testing**, and no proper **quality assurance** processes yet.

Managing the **plugin lifecycle** is a challenge by itself.

The ecosystem is very wide and being **interoperable** is also a challenge.

The group of contributors is small, making **specialisation** difficult.

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Why we still believe in it?!

First, **desktop tools** still matter.

We have built strong foundations

- Scalable **modular architecture**
- **Fast, memory-efficient and robust** GraphStore
- **Automated** build and release

We have been able to **rewrite modules one-by-one**, with good outcomes.

We have become much better at **testing** and its paying off.

Java keeps improving and there is a lot of potential still untapped in **better performance**.

There is some exciting **work in progress** (viz-engine, …)

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Gephi Lite

Gephi Lite: Branching out to the web in 2023

Gephi Lite is a **spin-off**: a different team, with web developers (OuestWare).

It is called **Lite** because it does not target the same graph scales, and it will not try to include every features that Gephi offers.
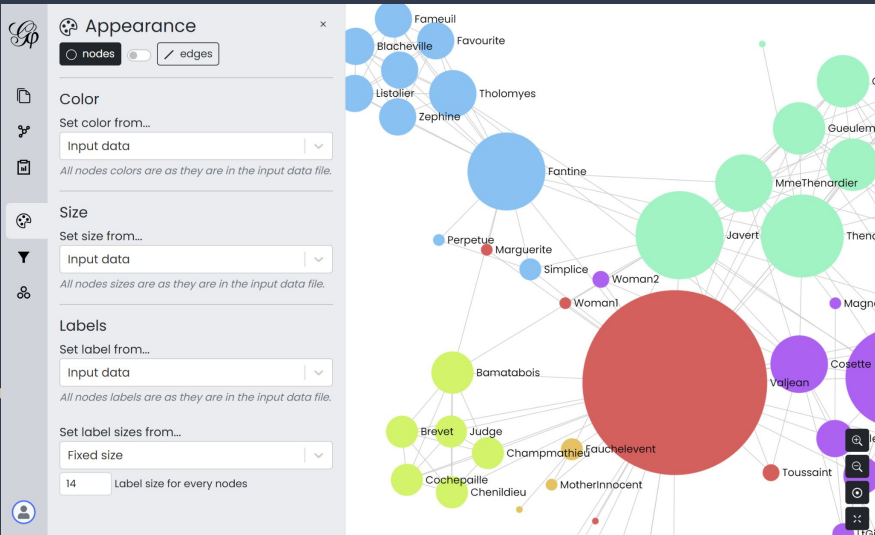
Because it is web based, it will offer a few **unique features**, such as JavaScript inputs alternatives to some forms (mimicking Graph Recipes), or GitHub synchronization (i.e., Gist as a database).

It might also be used as a **playground** for the Gephi project, to test new features.

Repo: https://github.com/gephi/gephi-lite
Proto: https://gephi.org/gephi-lite

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Conclusion

Forthcoming

In the next few years you can expect:

- A new OpenGL engine
- An *undo* button
- A progressive refreshing of the UX (icons…)
- A consolidation of statistics plug-ins (with a systematic benchmarks)
- New documentation portal
- Gephi Lite
- More Gephi Weeks
- A fiscal sponsorship
- A crowdfunding campaign
- Gephi 1.0

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Open questions
Thank you for your attention!

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Do you have feedback on **fiscal sponsors** adapted to the Gephi project? *Bonus points if it is in Europe!*

Should we launch a crowdsourcing campaign **before or after** the version 1.0? What is the best strategy for the project?

Ideas about where to start a discussion with the **Java dev community**, both to engage developers and to get advices when we need it?

We're looking for **sponsors** to the next Gephi Week!

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Remark: the FOSDEM is an awesome place to make new connections with interesting people. Example: we met Antonin Delpeuch, maintainer of OpenRefine, who helped us specify the upcoming *undo* feature.
KUDOS TO THE OPEN SOURCE COMMUNITY!