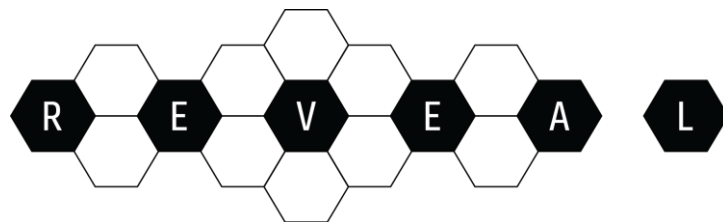


Visualizing GitHub Repositories with Nautilus

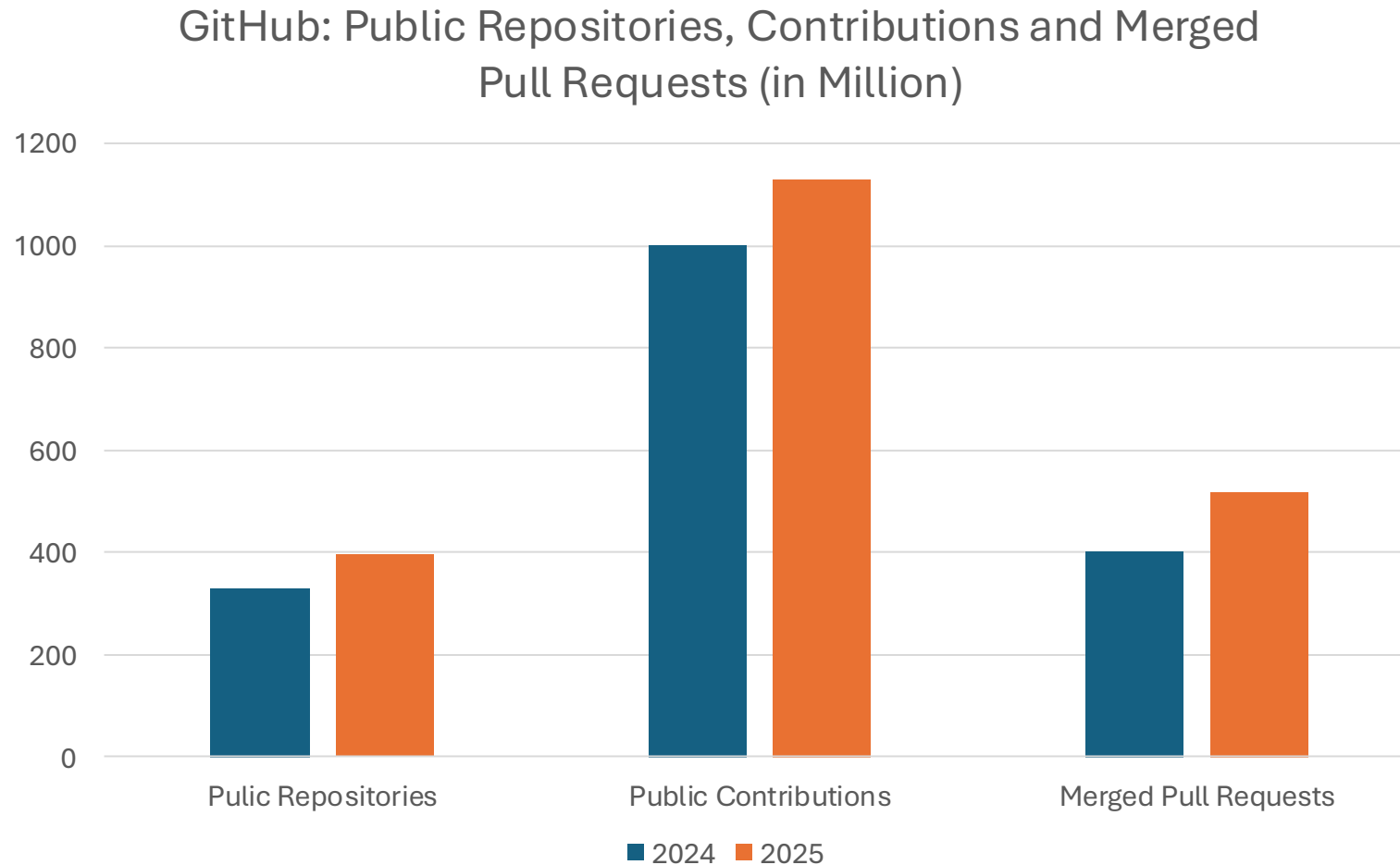
Phillip Entin – Marco Raglianti – Michele Lanza



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GitHub is a Huge Data Pool



GitHub Repositories Vary in Commit Count



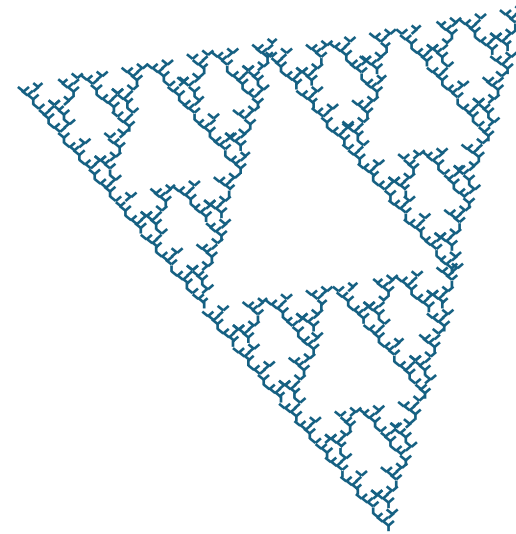
**Linux: 1,446,950
commits**

**Pharo: 36,211
commits**

GitHub Repositories Vary in Branch Count



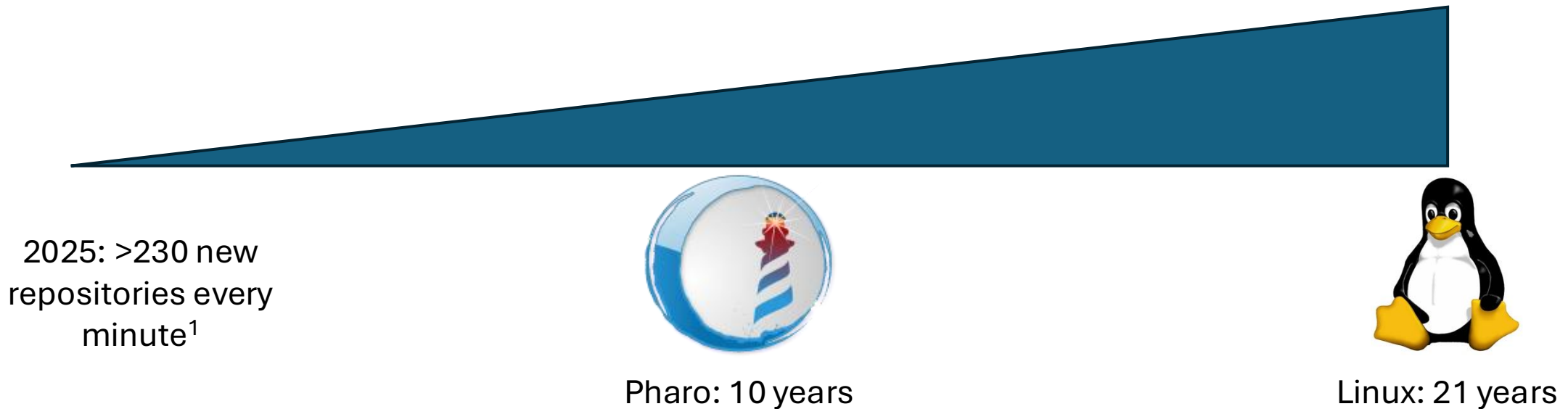
9 branches



 PyTorch

7,635 branches

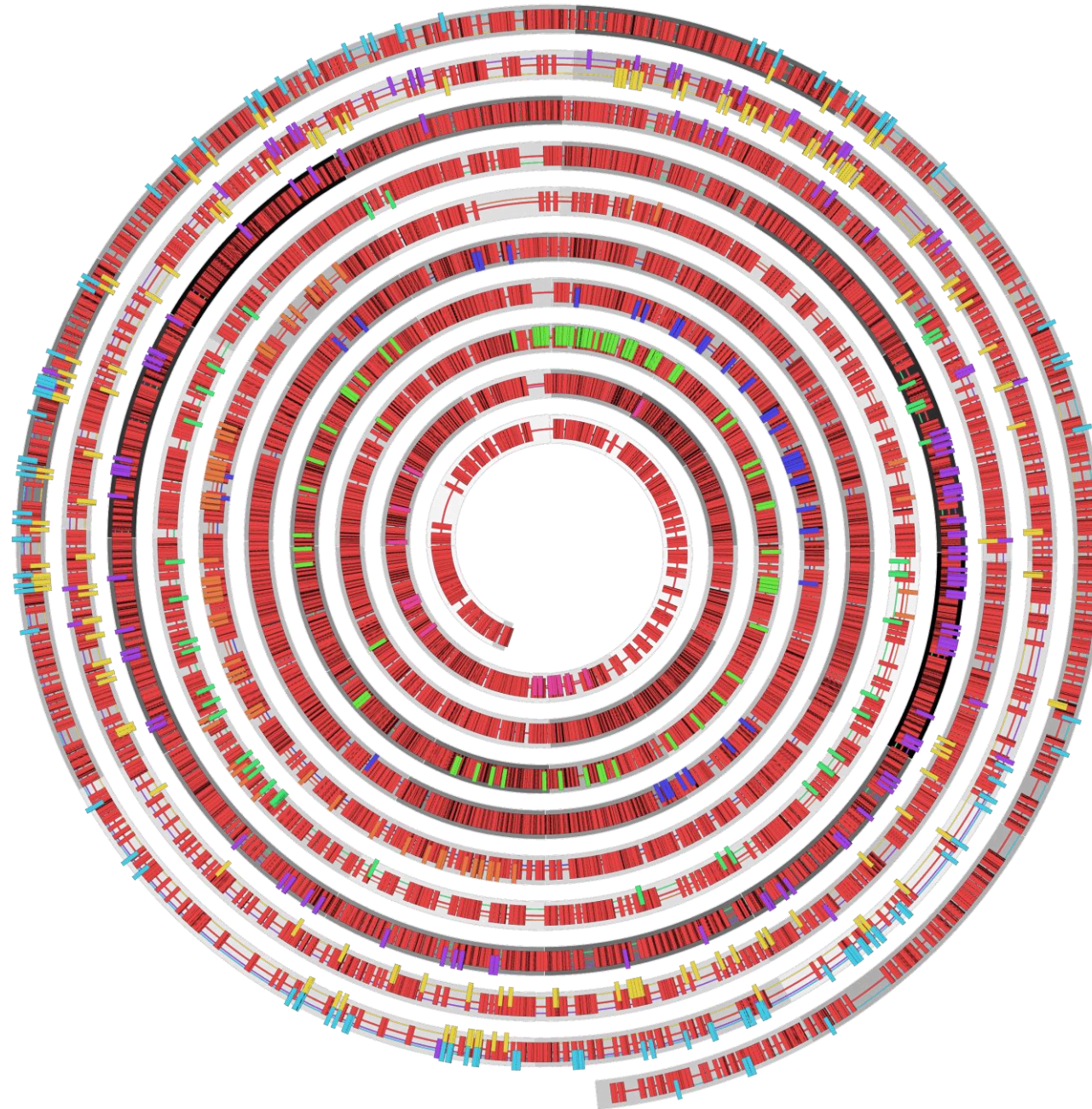
GitHub Repositories Vary in Age



[1] <https://github.blog/news-insights/octoverse/octoverse-a-new-developer-joins-github-every-second-as-ai-leads-typescript-to-1/>

GitHub's Network Graph is not Adaptive



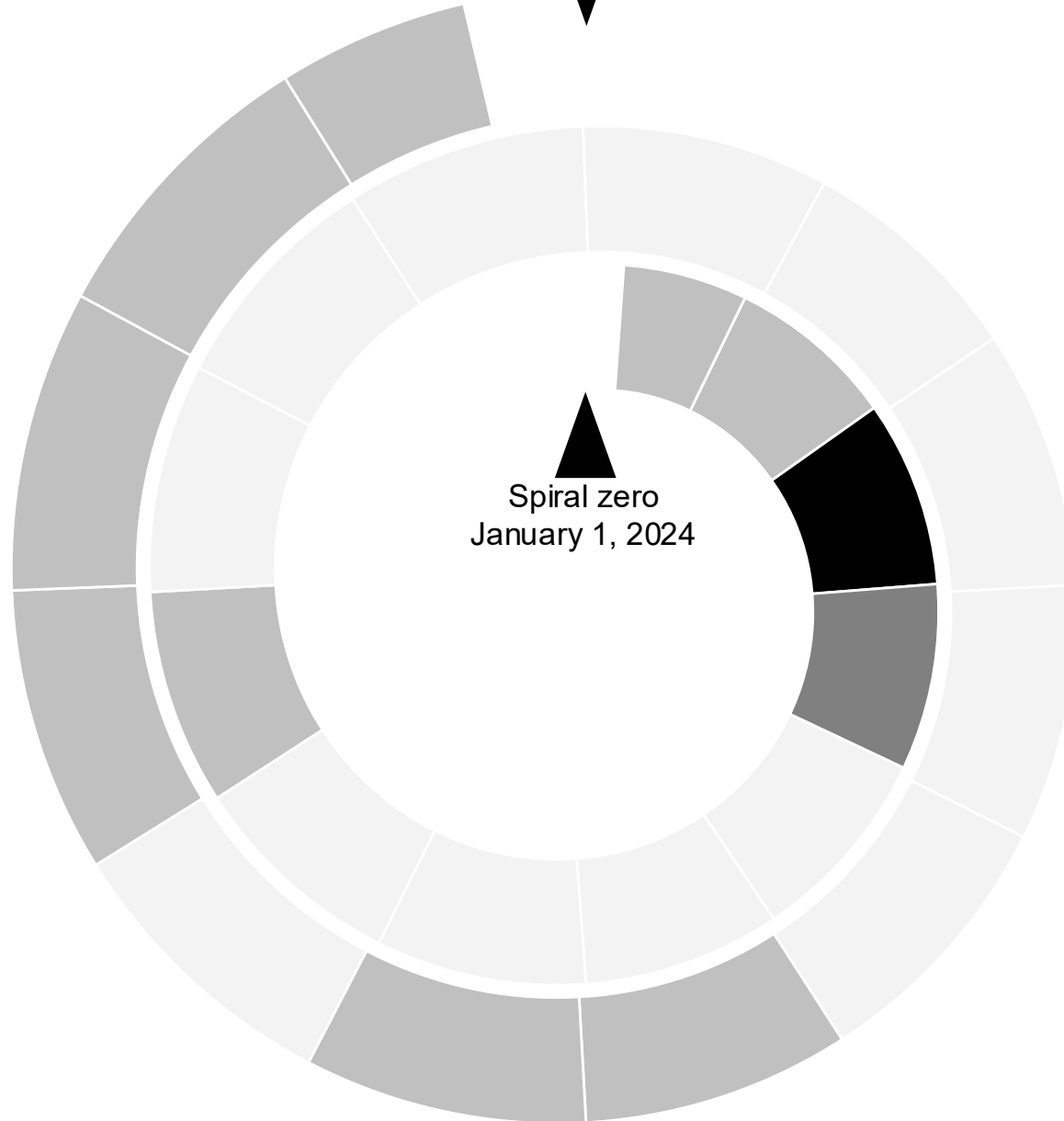


How Does it Work?

Spiral end
January 1, 2026



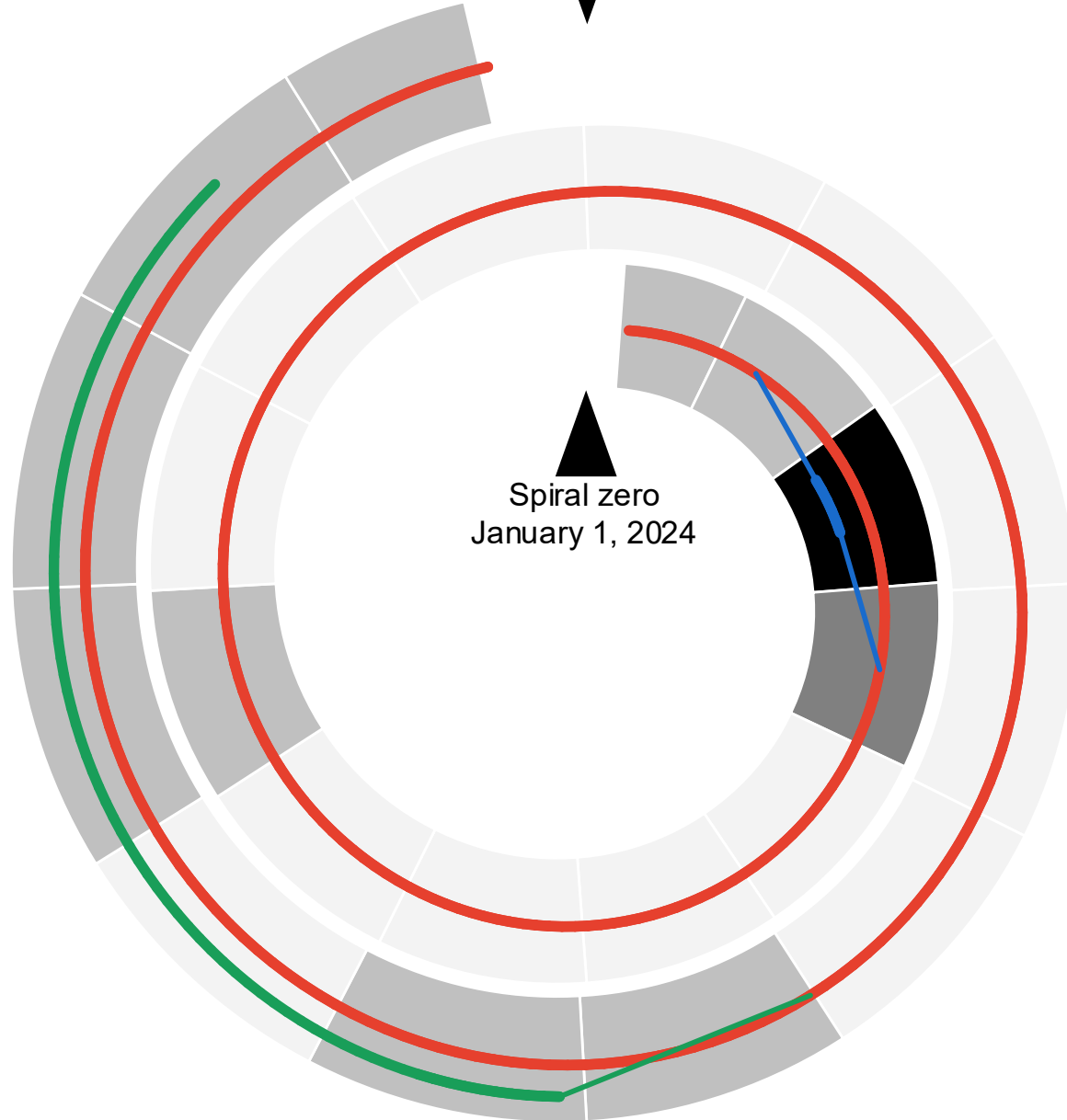
Spiral zero
January 1, 2024



Spiral end
January 1, 2026

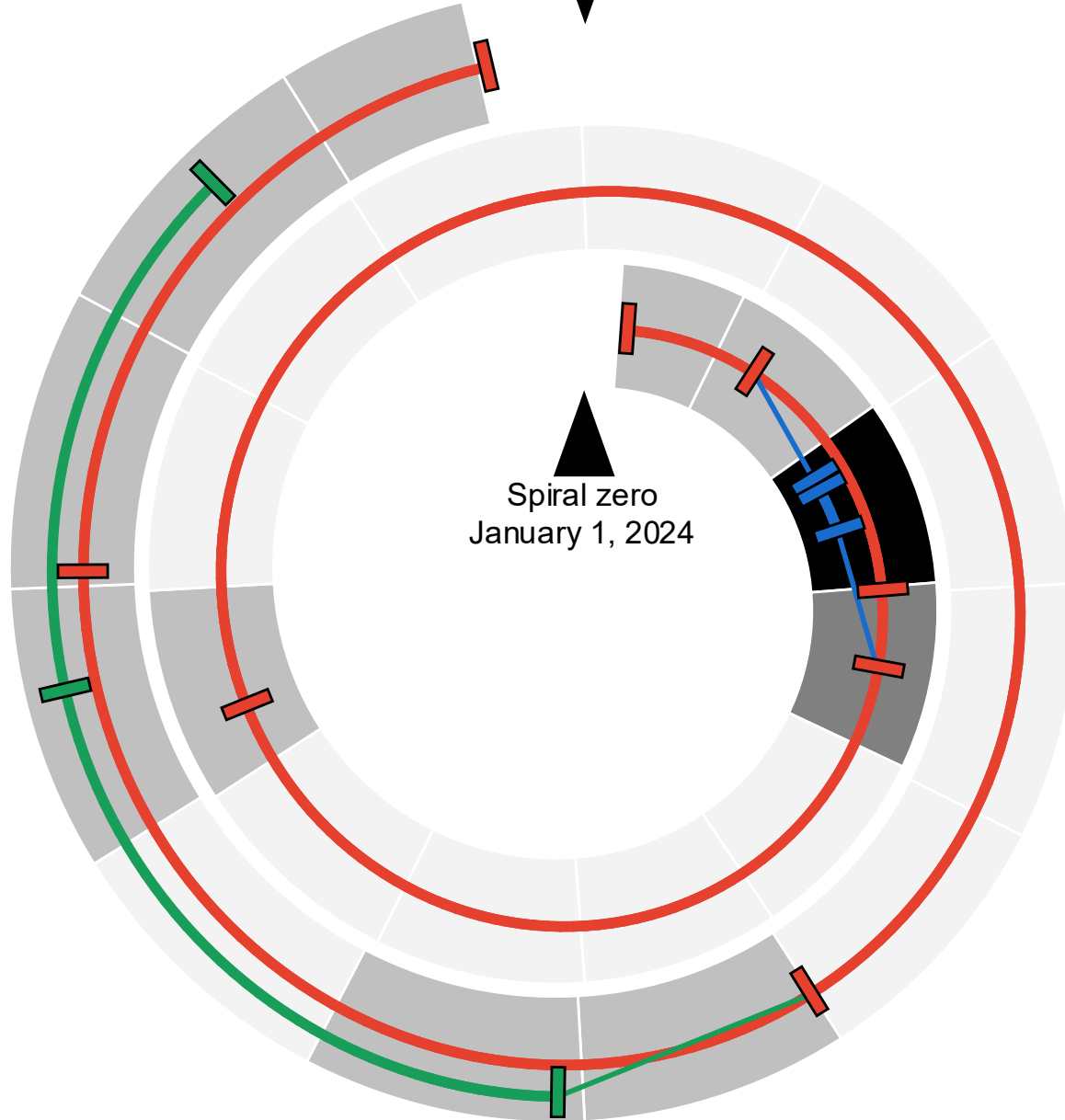


Spiral zero
January 1, 2024



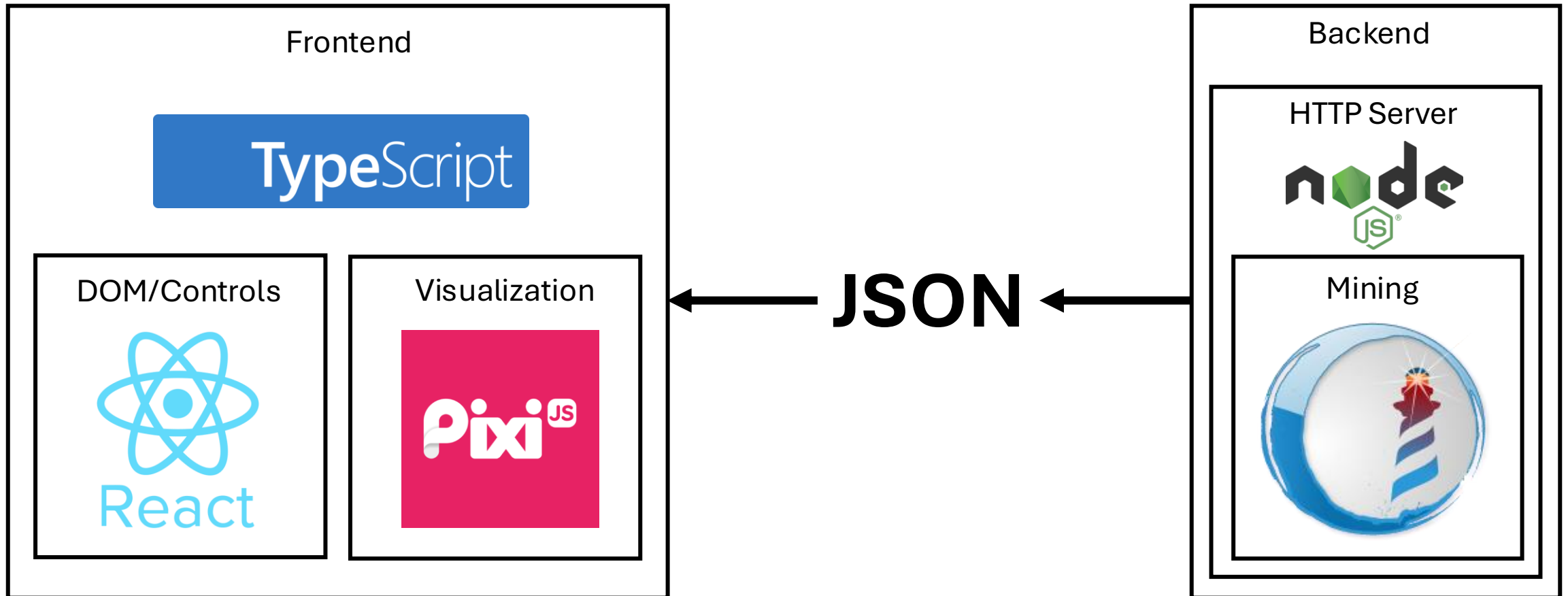
Spiral end
January 1, 2026

Spiral zero
January 1, 2024



Let's Look at Nautilus Live

Techstack



Let's Look at the Pharo Code

Wrap-Up

Wrap-Up

- Current visualization approaches fall short on providing a quick overview on long software evolution histories
- We leverage spiral layouts to fit long time series onto one viewport
- We mine GitHub repositories using Pharo in an efficient way
- Pharo allowed a direct focus on the domain and rapid prototyping
- We can observe interesting patterns and get a glimpse of how AI is influencing software development

Nautilus

Try it yourself on:

<https://nautilus.si.usi.ch/>

Demo video link:

<https://figshare.com/s/9ef5a94ced86c9311fdf>

phillip.entin@usi.ch



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Image Credits

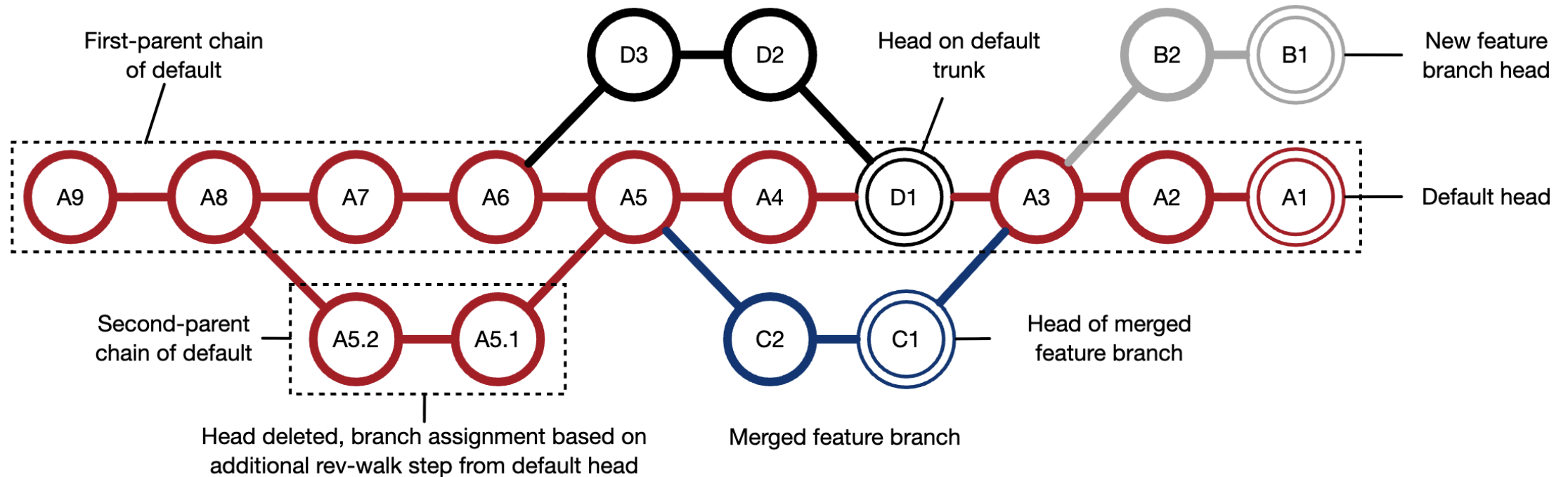
- Linux Logo: **Larry Ewing** <lewing@isc.tamu.edu>

Backup

Glossary

- Contributions according to the aforementioned GitHub blog:
"Commenting on a commit, issue, pull request, pull request diff, or team discussion; creating a gist, issue, pull request, or team discussion; pushing commits to a project; and reviewing a pull request"

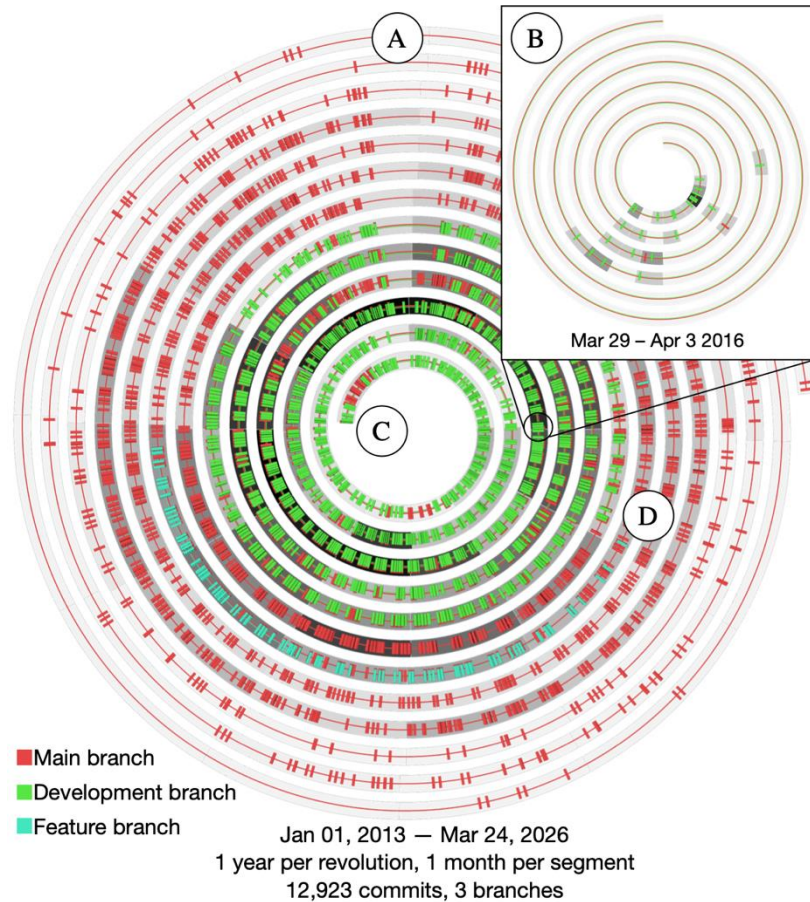
Our Branch Reconstruction Approach



Assumptions we Have to Make

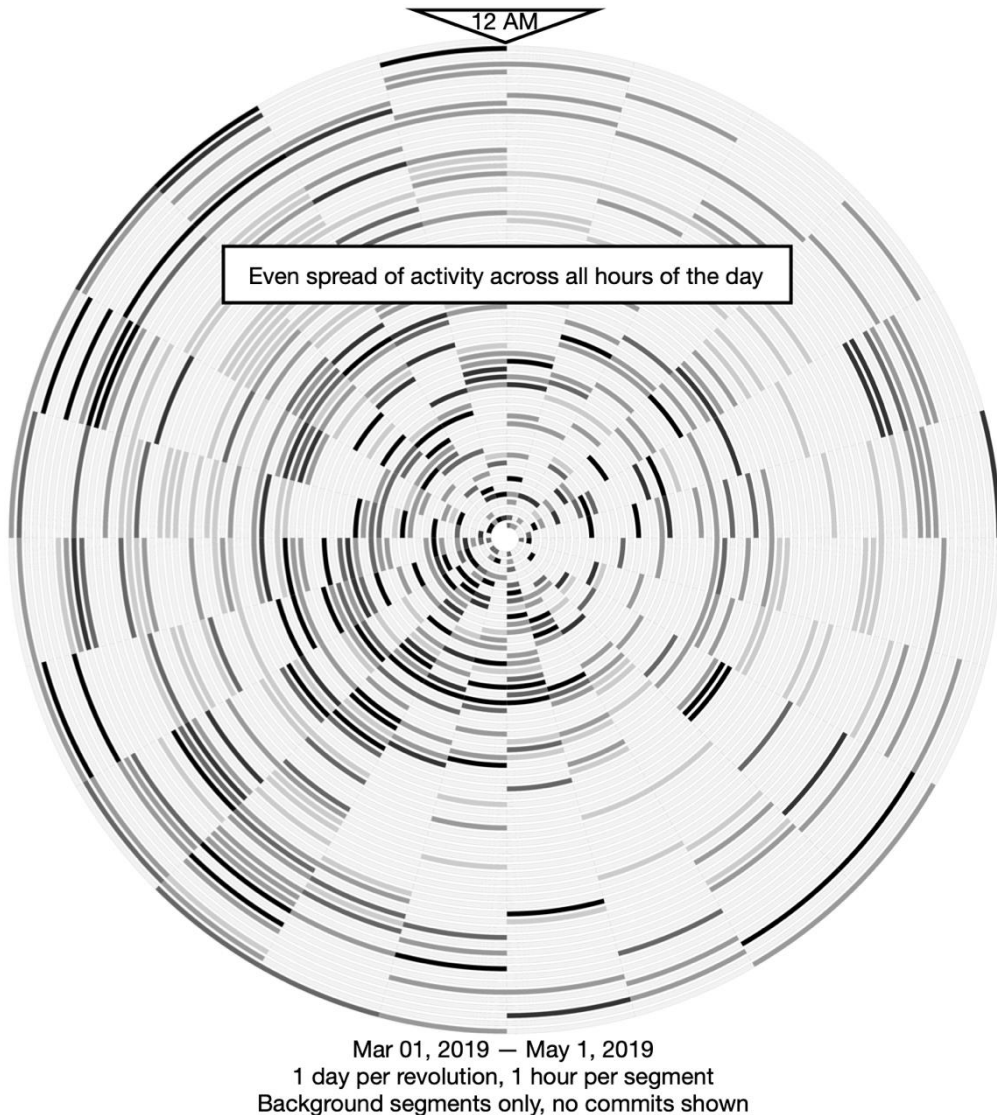
- A branch contains at least all commits that are reachable from its head's first-parent chain
- The current default branch is the only default branch during the entire repository lifetime
- Branch lifetime is defined by the first commit's timestamp to the head's timestamp.

The Corporate Worker



- *joynr*, a web-based communication framework for distributed services
- Developed by BMW Car IT
- 1 year per revolution, 1 month per segment
- Activity span:
 - Oct 08, 2013 – Mar 24, 2026
 - Shown completely
- Commits: 12,923/13,188
- Branches: 3/54
- Typical corporate patterns: Gaps in weekends and during Christmas time

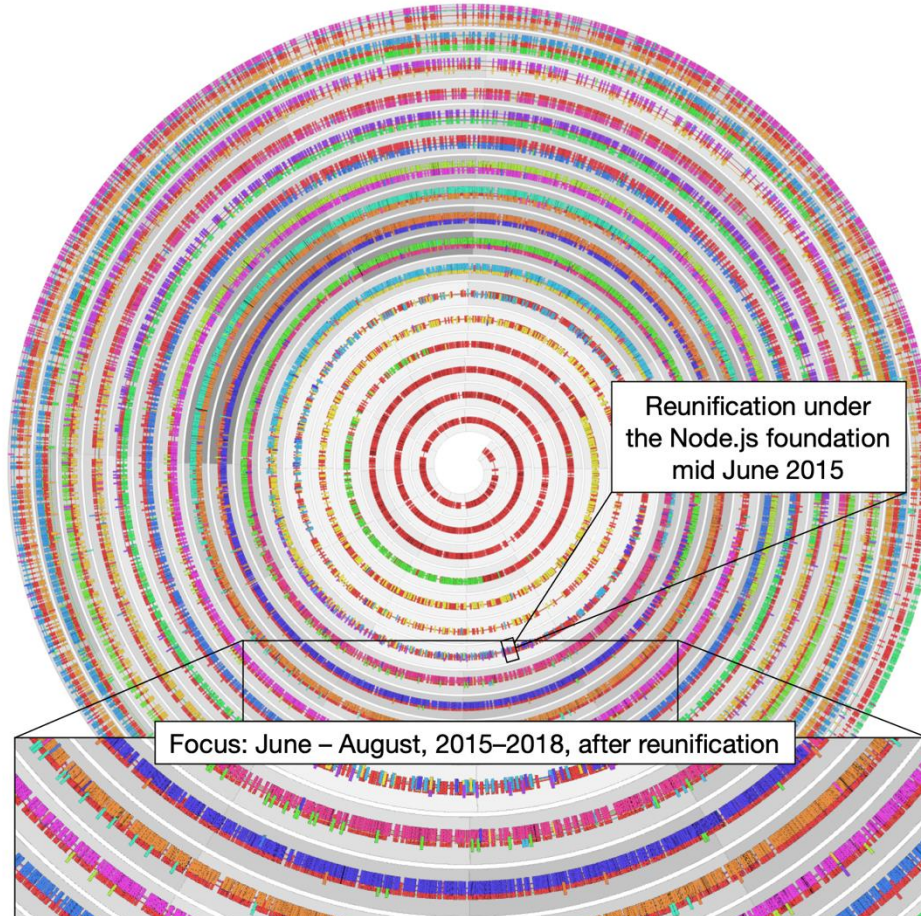
The Globetrotter



- Excerpt of *Node.js*, here in a daily resolution
- Activity span:
 - Feb 16, 2009 – May 06, 2026
- Shown timespan:
 - Mar 01, 2019 – May 01, 2019
- Commits: 0/102,003
- Branches: 0/64
- Global spread of workforce: Activity at all times of the day

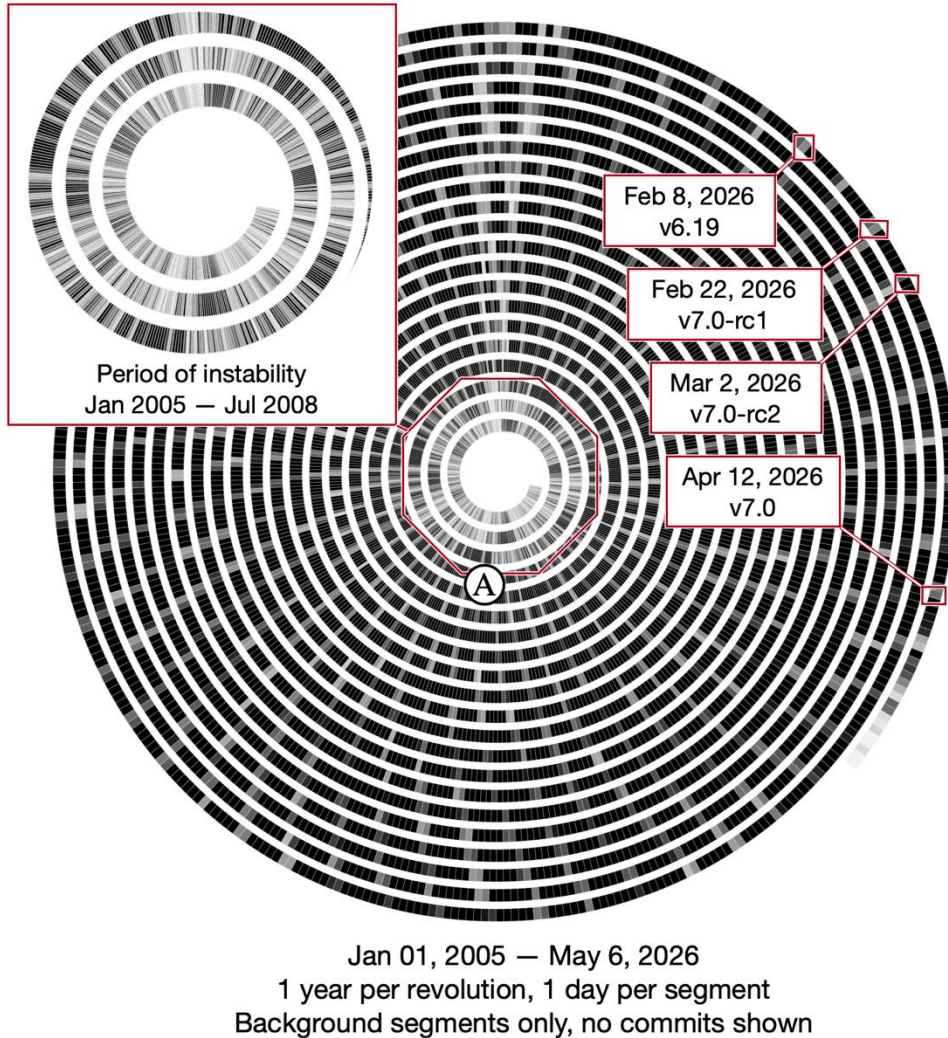
The Globetrotter

Jan 1, 2009 – May 6, 2026
1 year per revolution, 1 month per segment
102,003 commits, 64 branches



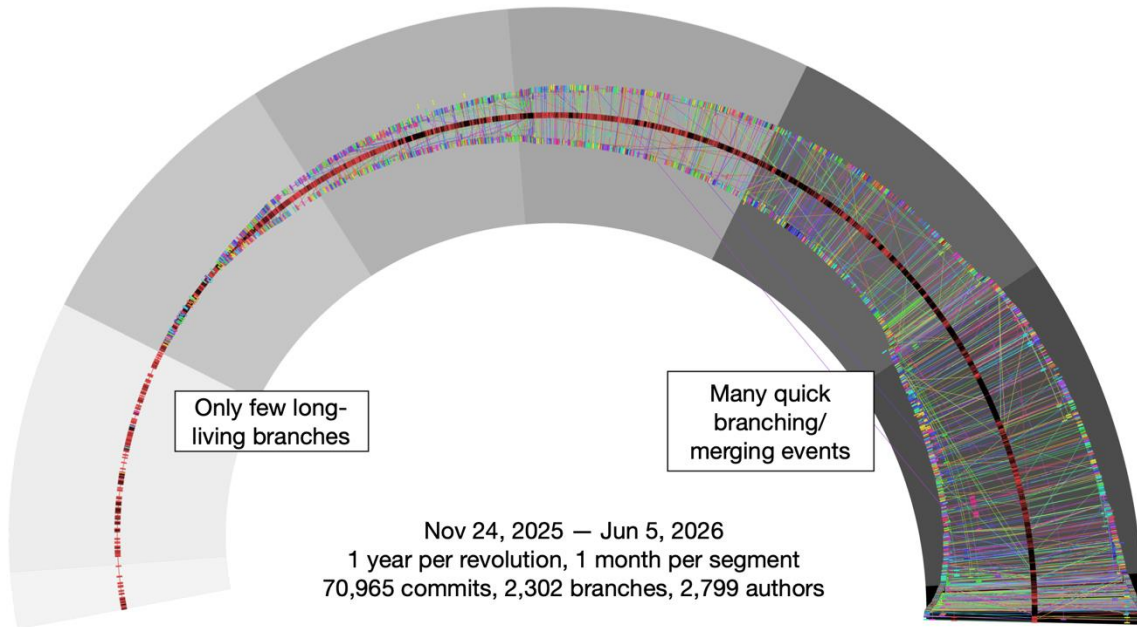
- *Node.js* fully shown
- 1 year per revolution, 1 month per segment
- Activity span:
 - Feb 16, 2009 – May 06, 2026
- Shown timespan:
 - Feb 16, 2009 – May 06, 2026
- Commits: 102,003/102,003
- Branches: 64/64
- At a large scale, major events are showing up

The Pioneer



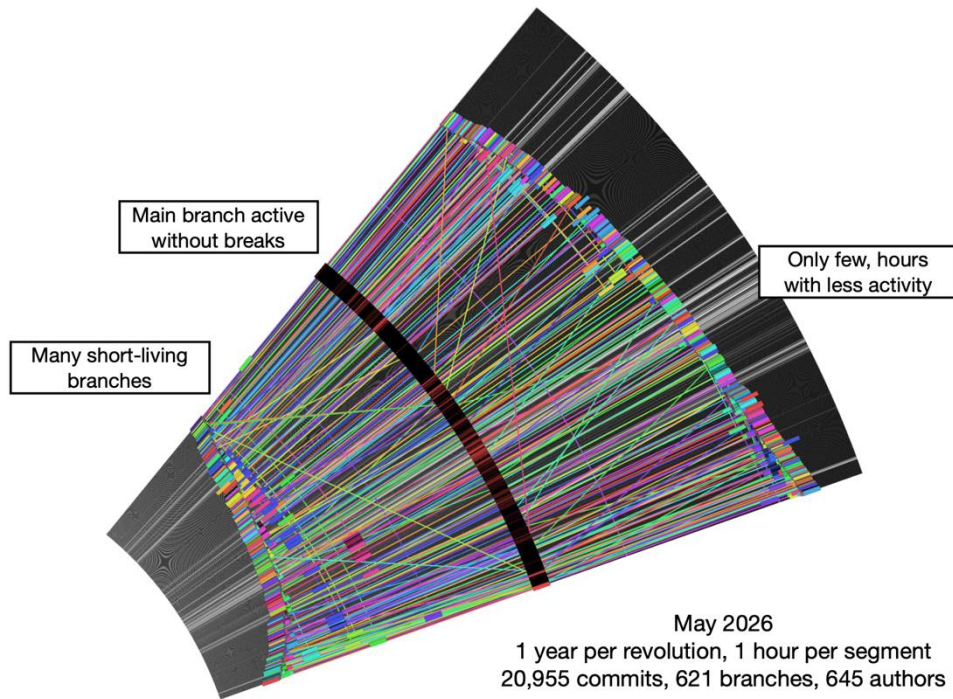
- *Linux Kernel*
- 1 year per revolution, 1 day per segment
- Activity span:
 - Jan 06, 2005 – May 06, 2026
- Shown timespan:
 - Jan 06, 2005 – May 06, 2026
- Commits: 0/1,444,589
- Branches: 0/1
- At a large scale, major events are showing up

AI is Driving Software Development



- *OpenClaw*
- 1 year per revolution, 1 month per segment
- Activity span:
 - Nov 24, 2025 – Jun 05, 2026
- Shown timespan:
 - Nov 24, 2025 – Jun 05, 2026
- Commits: 70,965/70,965
- Branches: 2,306/2,306
- AI-driven development has an unreal speed, looking at the default branch:
 - Roassal: 1.44 commits per day
 - Node.js: 7.2 commits per day
 - Linux: 34.32 commits per day
 - OpenClaw: **293.52** commits per day

The Velocity is Staggering



- *OpenClaw*
- 1 year per revolution, 1 month per segment
- Only May 2026 is shown
- Commits: 20,955/70,965
- Branches: 621/2,306
- No activity breaks on the main branch
- Other branches are created and merged extremely fast