2021 China Open Source Annual Report

前 言 / Preface

2022 年来了，网上有一个段子，说这不过是“2020 too”，2022 年 1 月，也不过是 2020 年第 25 月。看起来一切都没有变化，我们依然在 COVID 之中。但是，从另一个角度来看，世界正在发生巨变，我们所处的世界，正在高速朝着某个未知的方向前进。

There is an internet joke saying that 2022 is just 2020 ... too. The January of 2022 is only the 25th month of 2020. Nothing has changed, and we are still in COVID Time. However, from another perspective, the world we live in is undergoing tremendous changes and moving in an unknown direction at high speed.

对于中国开源而言，2021 年的关键词，应该是“助跑”。迹象已经非常明显，工信部信息技术发展司发布了《“十四五”软件和信息技术服务业发展规划》，就是一个典型的信号，开源领域即将起飞了。从地面行走，到天空飞行，这是两个完全不同的阶段。而 2021 年，则是起飞之前的助跑阶段。从地面到天空，意味着整个行为的模式都会发生深刻的变化。我们原来只需要在一个二维平面思考路径与方向，而到了天空，在三维空间里，我们多了无数选择。

For China's open source, the keyword for 2021 should be "run-up." The signs are undeniable. The Ministry of Industry and Information Technology of the People's Republic of China (MIIT) has released the "14th Five-Year Plan for the Development of Software and Information Technology Services", a typical signal that the open source sector will take off. Walking on the ground to flying in the sky are two completely different stages. The year 2021 is the run-up phase before the take-off. From the ground to the sky, the whole pattern of behavior will change profoundly. We used to think about paths and directions in a two-dimensional plane, but when we get to the sky, we have countless more options in three-dimensional space.

虽然对于未来，对于在空中的状态，我们还无法预测和把握，但是 ：所有人都在奋力奔跑，奋勇向前。

Although we cannot predict and grasp the future and the state in the air, we are running hard and moving forward courageously.

去年的中国开源年度报告，我们总结了三个趋势，今年的报告，我们索性新增了《开源大事

记》栏目，整整总结了十个趋势。所以在这个前言里，我们就聊聊感想吧。

In last year's China Open Source Annual Report, we summarized three trends, and this year, we added a new section called "Open Source Milestones," which revealed ten trends. So in this preface, let us talk about our feelings.

出圈 / Out of the Circle

开源不仅越来越热，而且已经在圈外的朋友中引发了各种讨论。首先是嗅觉灵敏的投资人开始关注开源这个“赛道”，然后是基于中美对抗的背景，很多人开始从国际政治、国家实力、国家安全的角度，来探讨开源（这个原本是纯技术的范畴）。直到最近几起开源软件安全事件，更是令大家议论纷纷。这样一个令人喜忧参半的现象，也许还会继续持续下去。

Open source is getting hotter and hotter and has sparked various discussions among friends outside the circle. First, investors with a keen sense began to pay attention to the open source field. Then, against the Sino-US confrontation background, many people began to discuss open source (which was initially a purely technical category) from the perspective of international politics, national strength, and national security. The recent open source software security incidents made everyone talk in succession. Such a mixed phenomenon may be likely to continue.

生态责任 / Ecological responsibility

在开源还只是一个小众群体的业余爱好时，几乎做任何事情，都是自由的。但是，在软件吞噬世界、开源吞噬软件的今天，开源技术，已经成为整个世界的基础设施之一。能力越大，责任越大。应用越广，风险越高。我们应该如何思考与保障开源供应链安全呢？应该如何建设更加健康的开源生态呢？在这样一种生态中，各方的责任又该如何界定呢？

When the open source was just a niche hobby, it was free to do almost anything. Nevertheless, today, as software devours the world and open source eats software, open source technology has become one of the infrastructures of the entire world. With great powers comes great responsibility. The wider the application, the higher the risk. How should we think about and secure the open source supply chain? How should we build a healthier open source ecology? In such an ecology, how should the responsibilities of all parties be defined?

历史感 / Sense of History

开源社已经连续第四年发布中国开源年度报告了，也举办了第六届中国开源年会了。不断的，在与朋友的交流中，我们常常会谈到 ：如果开源的事情，我们再做 10 年、再做 20 年将会怎样？如果再过 10 年、20 年，我们再回来看我们这些开源人，所做的这些事情，哪些做对了？哪些做错了？哪些应该更早去做？这样的感受，就是一种“历史感”。当我们更多具备这样的历史感，更多以将来会被人回看的心态，来做这些事情时，我们又该如何抉择？又该如何行动呢？

For the fourth consecutive year, KaiYuanShe has published the China Open Source Annual Report and held the sixth China Open Source Conference. In the exchange with friends, we often talk about: what

will happen if we contribute open source for another 10 or 20 years? If, after another 10 to 20 years, how we open sourcers reflect on the past? What have we done right, what have we done wrong, or what should we have done earlier? Such a feeling is a "sense of history." How should we choose when we have more such a sense of history and more of a mindset that we will be looked back at in the future? Furthermore, how should we act?

当然，千里之行，始于足下。那个我们无限向往的未来，也只能由我们的点滴努力来塑造。与诸位共勉吧！

Of course, the journey of a thousand miles begins with the first step. The future we yearn for infinitely can only be shaped by our puny efforts. Let us share it with you all!

Zhuang Biaowei, 2021 Chairman of the Board, KaiYuanShe

January 14, 2022

问卷篇 / Questionnaire

1、报告背景 / 1 Report Background

2016 年初，开源社发布了《2015 年中国开源社区参会调查报告》，随后的几年中，持续发布了开发者调查报告，旨在从多种维度呈现国内的开源发展情况。今年我们再次启程，结合数据分析手段和调查报告等多种形式，绘制一份 2021 年中国开源世界的地图。

In early 2016, KaiYuanShe released the 2015 China Open Source Community Attendance Survey Report. In the following years, it continued to release developer survey reports, aiming to present open source development in China from various dimensions. This year we set off again, combining data analysis tools and survey reports in various forms to draw a map of the Chinese open source scenarios in 2021.

这份问卷是每年中国开源年报的重要一环，不基于调研的分析报告不过是纸上谈兵。问卷从两个角度展开，其中包括个人信息（包括工作信息和开发者技术信息）和开源社区参与情况，与往年不同的是，今年我们加入了开源社区度量和开源商业化相关的话题，欢迎大家参与问卷并发表自己的想法。

This questionnaire is an essential part of the annual China Open Source Report, and an analysis report without research is just an empty talk. We conduct the questionnaire from two perspectives: personal information (including work information and developer technical information) and open source community participation.

通过 44 项左右问题的统计调查与分析，我们希望能够还原出当前中国开源社区的真实现状，从而为开源的后来人提供权威的参考。

Through the statistical survey and analysis of 44 or so questions, we hope to restore the real status of the current Chinese open source community, so as to provide an authoritative reference for the later

generations of open source.

调查对象 ：覆盖开发者、社区成员、贡献者、学生、政府企业管理人员

Target: Covering developers, community members, contributors, students, government and corporate executives

调查内容 ：主要涵盖个人信息、工作状况、开源社区以及开发者技术

Survey content: mainly covers personal information, work status, open source community, and developer technology

调查方法 ：以在线问卷方式搜集样本和数据，交叉对比法分析数据

Survey method: Online questionnaire to collect samples and data, cross-comparison method to analyze data

推广方法 ：线上社交媒体、博客、开源社、开源中国网站

Promotion method: Online social media, blogs, open source community, open source China website

问题数量 ：44

Number of questions: 44

问题类型 ：单选、多选、开放性

Question type: single choice, multiple choices, open

样本量 ：537

Sample size: 537

2、重要发现 / 2 Important Findings

通过分析 2021 年的统计数据，并对比往年数据和其它一些公开发布的统计报告，我们有如下一些重要发现：

By analyzing the statistics for 2021 and comparing previous years' data with some other publicly released statistical reports, we have some significant findings as follows:

- 参与者的年龄集中在 20-39 岁，受教育程度普遍在本科及以上，其中男性占比约为 82%，女性为 18%，与去年持平。
- The age of the participants is 20-39 years old, and their education level is generally at the undergraduate level and above, of which 82% are men and 18% are women, which is the same as last year.
- 相较于 2020 年，今年的问卷参与者中，还未工作的人群占了绝大部分，从参与者从事领域和职位分布也可以看出，这些“还未工作”人群多数指向学生群体，这和当前社会普遍追

求更高学历深造有关。

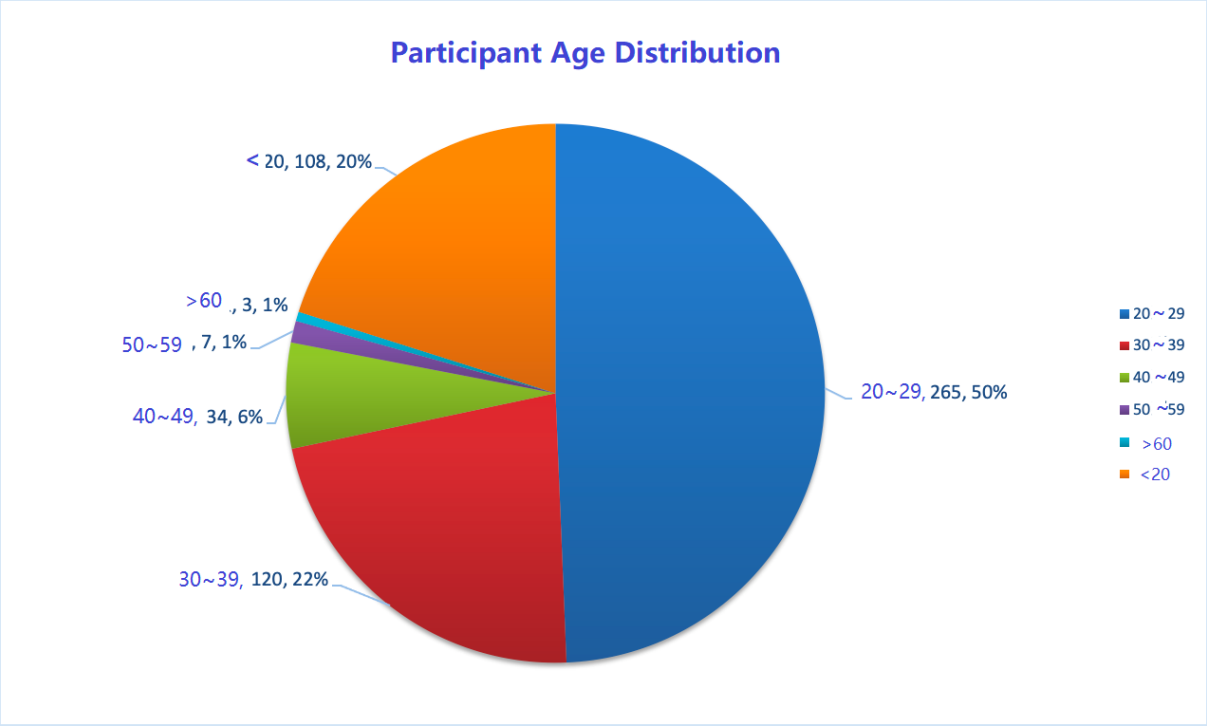
- Compared with 2020, the majority of participants in this year's questionnaire are not yet working, and the distribution of participants in the field and position also shows that most of these "not yet working" people point to students, which is related to the current society's general pursuit of higher education.
- 公司在购买开源产品时，多由工程团队负责人（技术总监 / 架构师 /TL）来进行产品的选择，而且在同类型软件的购买中，半数的人会考虑软件供应商对开源社区的贡献，但不是主要的考虑因素，只有在产品性能差别不大时，才会选择对开源社区贡献大的供应商。
- When companies buy open source products, the engineering team leader (technical director/architect / TL) selects most of them. In the same type of software purchase, half of them will consider the contribution of the software vendor to the open source community. However, it is not the primary consideration, and only when the product performance is not much different will they choose the vendor who contributes to the open source community.
- 参与者首次参与 / 转而参与开源项目的原因多为主观原因，例如更好的技能施展空间、更和谐的社区氛围、更多的朋友，而应公司所在组织的要求来参与开源社区的占比很小。
- Participants who first joined/switched to open source projects are primarily subjective, such as better skills, a more harmonious community atmosphere, and more friends. In contrast, participation in the open source community at the request of the company's organization is minimal.
- 与去年类似，参与开源的形式仍然为以代码和文档为主，社区和项目正在意识到文档的重要性，更多开源贡献者投入到了文档撰写中。
- Similar to last year, participation in open source continues to be primarily in the form of code and documentation, with communities and projects realizing the importance of documentation and more open source contributors getting involved in writing documentation.
- 85% 的开发者认为开源活动对促进和推动开源社区至关重要，相较于去年的 81% 有所提升。而对于更倾向于线上还是线下的会议，结果竟惊人地持平。
- 85% of developers believe that open source activities are critical to promoting and advancing the open source community, up from 81% last year. The results are surprisingly even for whether meetings are preferred online or offline.
- 对于开发者来说，一个项目的开发者活跃度、所加入社区信息的完整度、Readme 简介、开源许可证以及核心开发者的及时回复都能够影响其是否会留下成为项目的贡献者。
- For developers, a project's developer activity, completeness of information about the community they are a part of, Readme profiles, Open Source Licenses, and timely responses from core developers can all influence whether they will stay as a contributor to a project.
- 超过 9 成以上的参与者们开源社区的度量是非常有必要的，并且比较认可度量项目活跃度、健康度、影响力以及开发者活跃度和贡献度的意义。
- More than 90% of participants agree that open source community metrics are necessary and agree on the significance of measuring project activity, health, influence, and developer activity and contributions.

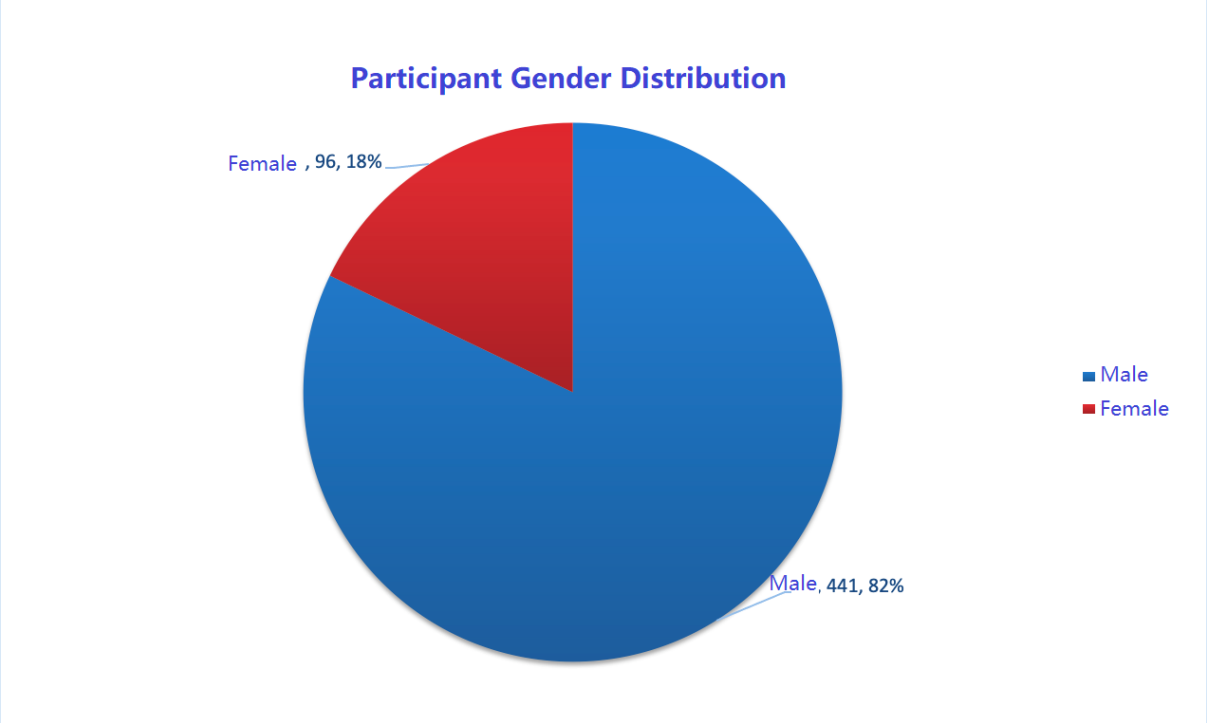
3、受访者群体特征 / 3 Respondent group characteristics

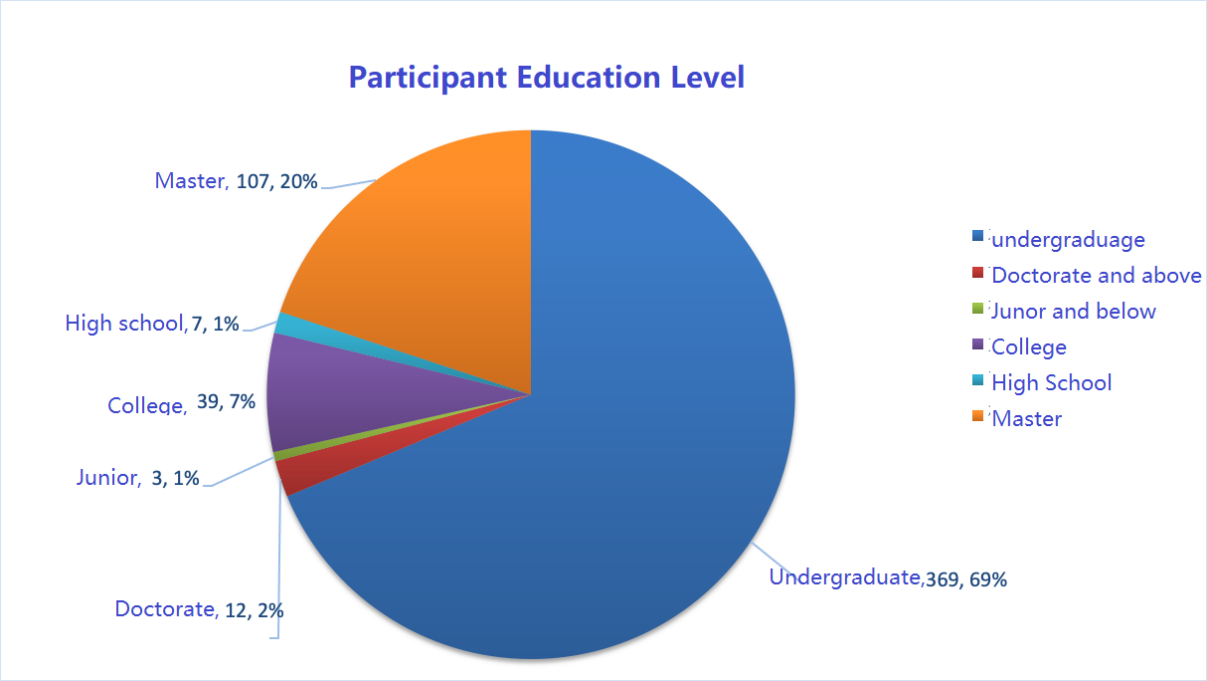
3.1 受访者年龄 & 性别 / 3.1 Respondents' age & gender

受访者的年龄集中在 20-39 岁，受教育程度普遍在本科及以上，其中男性占比约为 82%，女性为 18%，与去年持平。

Most of the respondents belong to the 20-39 age group. Their education level is generally at the undergraduate level and above, with men accounting for about 82% and women 18%, the same as last year.







注：问卷篇中饼图的数据标签，例如“硕士,107,20%”，其中硕士表示选项，107 是选择该选项的人数，20%是选择该选项人数所占的比例。

Note: The data labels of the pie chart in the questionnaire, such as "Master,107,20%", where Master indicates the option, 107 is the number of people who chose that option, and 20% is the proportion of people who chose that option.

【专家点评】/ [Expert Comment]

堵俊平：整体而言，在开源领域，男性在参与人数上仍然占据绝对优势，这一点和 IT 行

业整体参与者性别比例失调的趋势是一致的。尽管越来越多的开源项目都在争取吸引更多的女性开发者大力来参与开源，但整体的状况从调查来看并没有太多改善。可能我们首先要做的是吸引女性在 IT 技术领域就业，类似“Women In Tech”这样的项目，鼓励女性在高科技领域发光发热。

Du Junping: Overall, men still have an absolute advantage in the number of participants in open source, which is consistent with the trend of gender imbalance in the IT industry as a whole. Although more and more open source projects are striving to attract more female developers to participate in open source, the survey's overall situation does not improve much. Perhaps the first thing we need to do is attract women to work in IT technology, with programs like Women In Tech to encourage women to shine in tech.

单致豪：毫无疑问，开发者和开源爱好者重要的来源是学生，提高高校的开源教育将是非常重要的一环，腾讯之前启动了“犀牛鸟开源人才计划”，打造面向高校学生的开源课程。2022 年，腾源会将联合 Techo Youth 开展开源实战高校巡回。

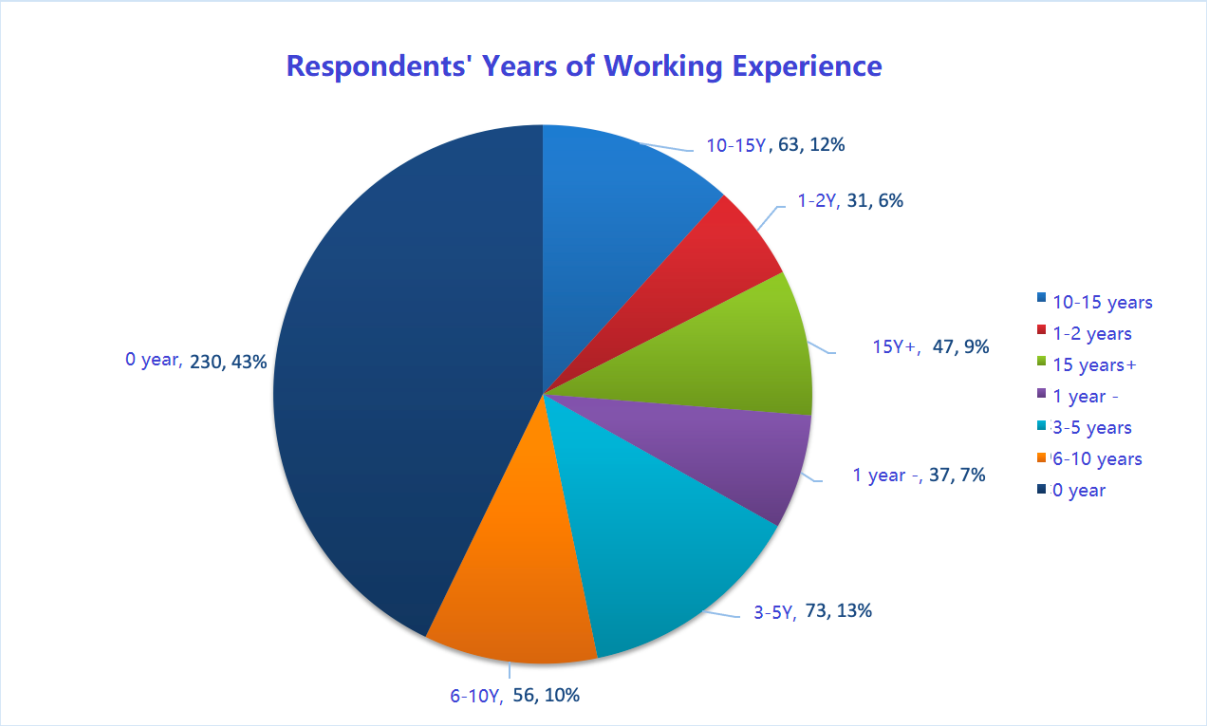
Shan Zhihao: There is no doubt that the most crucial source of developers and open source enthusiasts is students. Improving open source education in universities will be a vital part. Tencent launched the "Rhinoceros Bird Open Source Talent Program" to create open source courses for college students. In 2022, TengYuananHui will cooperate with Techo Youth to carry out series of open source college tour.

3.2 受访者从业时间 / 3.2 Respondents' years of working experience

受访者中还未参加工作的人数最多，占比约 43%，其次则是从业时间为 3-5 年、10-15 年的参与者占比分别为 13%、12%，从业时间在 10 年以上的约 3 成。

About 43% of respondents have not yet joined the workforce. 13% of respondents have 3~5 years of working experience, 12% with 10-15 years of experience. About

30% have been working for more than ten years.



【专家点评】/ [Expert Comment]

郭悦：开源参与中 43%还未参与工作的学生群体占比最大，这证实了近两年我国开源文化推广成果，能反映出开源项目的推广已下沉影响到学生群体。不论是 gitee 开源暑期活动、中科院开源软件点亮计划以及 Google summer of code 等这些来自各个组织公司的项目都培养了下一代参与开源贡献习惯，了解了开源文化精神和开源协作的共创模式，为我们更好的推进开源发展能做出巨大贡献，未来可期。

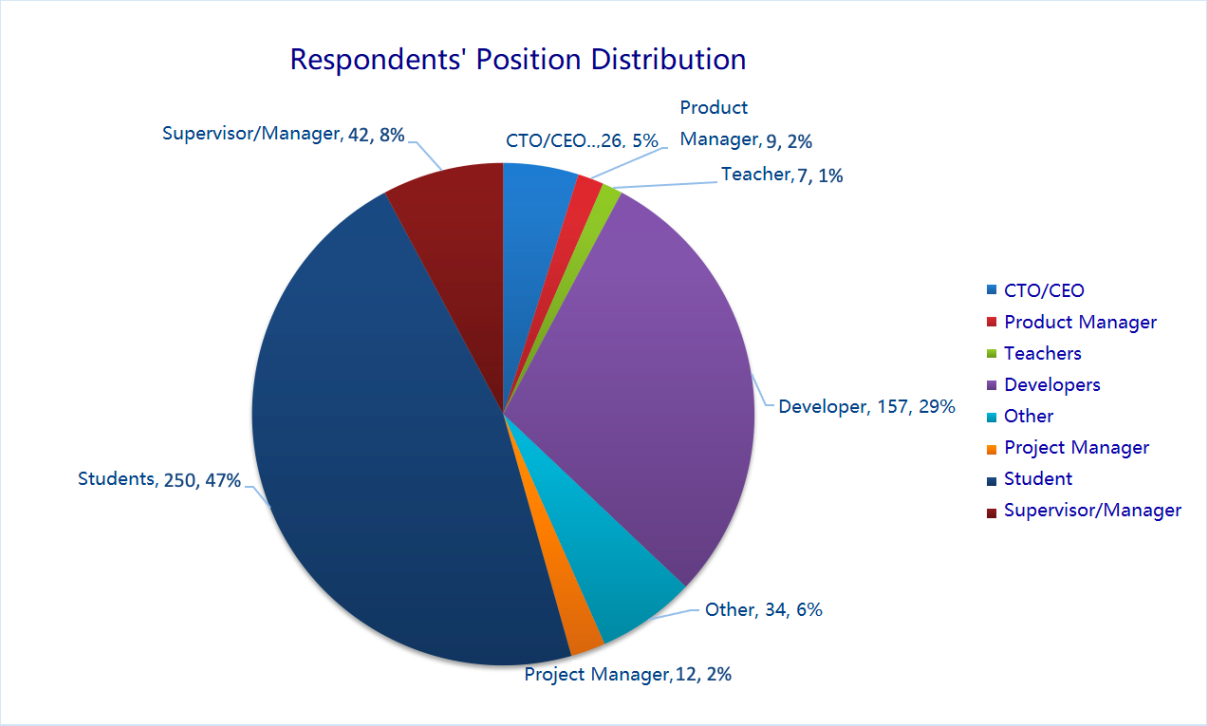
Guo Yue: The most significant proportion of 43% of open source participants who are not yet involved in the work is students. It confirms the results of the promotion of open source culture in China over the past two years and reflects that the promotion of open source projects has sunk to affect the student community. Projects from various organizations and companies, including Open Source summer (Gitee), Open Source Software Lighting Program (Chinese Academy of Sciences), and Summer of Code (Google), have cultivated the habit of contributing to open source participation of the next generation. Understanding the open source culture and the

open source collaboration, we could better promote the development of open source and make an outstanding contribution; the future is predictable.

3.3 受访者职位分布 / 3.3 Respondents' position distribution

受访者中学生和开发者占绝大多数，学生占比约 47%，开发者占比约 29%。

The majority of respondents are students and developers, with about 47% of students and 29% developers.



【专家点评】/ [Expert Comment]

堵俊平：参加开源项目的开发者有超过四成是学生。这一方面说明高校学生参与开源的热情高涨，学校里老师们也鼓励和重视开源；另一方面，也说明现有的 IT 从业人员在开源领域投入的比例偏小。开源领域资深专家的比例偏低，技术人员梯度不够合理，也是国内各大开源社区在吸引贡献者方面，可以优化的地方。

Du Junping: More than 40% of the developers participating in open source projects are students. On the one hand, this shows that university students are enthusiastic about participating in open source, and teachers in schools encourage and attach importance to open source. On the other hand, it also

shows that the proportion of existing IT practitioners invested in open source is negligible. The proportion of senior experts in the field of open source is low, and the gradient of technical personnel is not reasonable enough, which is also a place where the major domestic open source communities can be optimized to attract contributors.

段夕华：近些年来，学生在开源人群中占比持续增多到今天接近一半，可能也是因为用人单位越来越认可学生在开源中所展现出的编程技能、沟通能力及合作精神，因此这其中应该也不乏各种刷榜行为，需要开源项目所有者更多关注学生贡献者增多所带来的质量、合规等问题。

Duan Xihua: In recent years, the proportion of students in the open source population has continued to increase to nearly half today, probably because employers increasingly recognize the programming skills, communication skills, and cooperation spirit shown by students in open source, so there should be no shortage of various brush-up behavior, open source project owners need to pay more attention to the quality, compliance and other issues brought about by the increase in student contributors.

杨丽蕴：我国开源人才后备力量足、基数大。 我国高校越来越重视开源人才的培养,越来越多的学生参与到开源开发中，开源人才培养周期前置，越来越多的学校开设开源课程，希望后续可以实现在学习计算机、编译原理、软件工程等理论知识的同时，让学生学习掌握开源开发模式、理解认同开源文化。

Yang Liyun: China's open source talent reserve is sufficient; the base is large. China's universities are paying more and more attention to the training of open source talent. More and more students are involved in open source development, open source talent training cycles, and more and more schools to open source courses. We hope the follow-up can be achieved in the learning of computers, compiling principles, software engineering, and other theoretical knowledge at the same time so that students learn to master the open source development model, understanding, and open source culture.

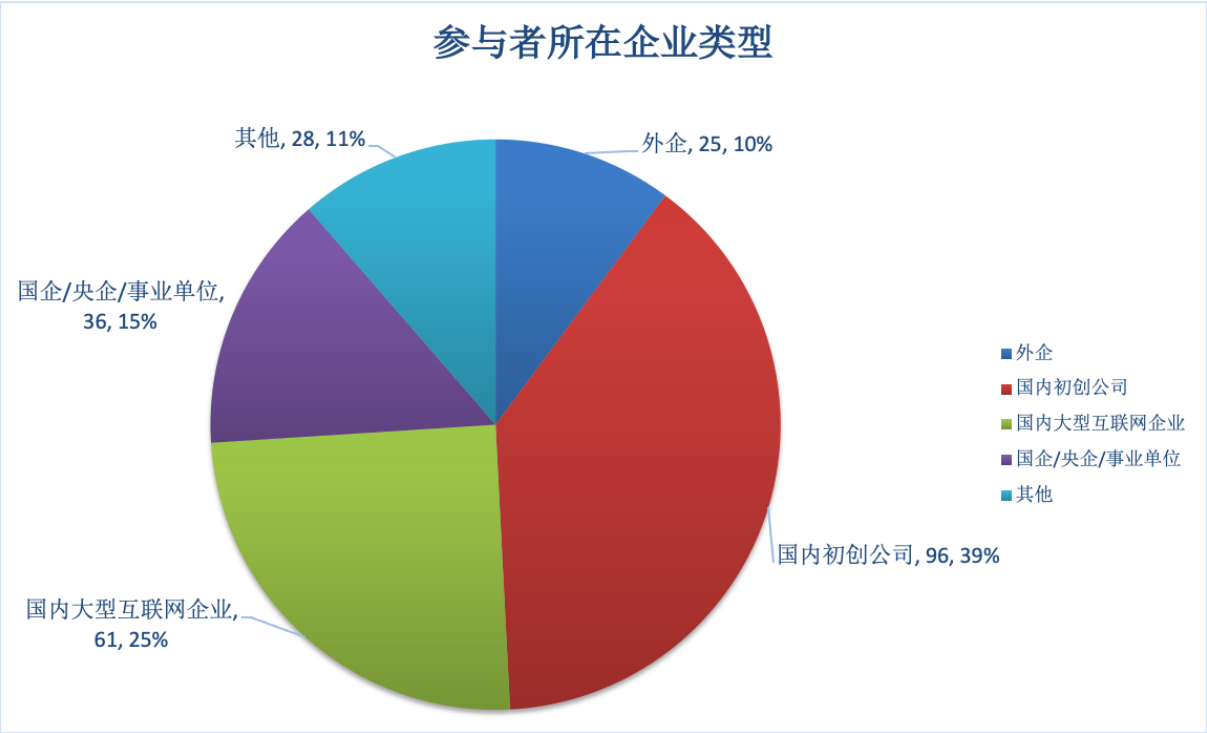
江波：我觉得这个数字分布只能体现出我们问卷覆盖的人群中，学生占比相对比较大（毕竟样本数量只有 500 多），不能提现行业现状。所以我个人对于各位专家对于开源教育的乐观分析有所保留，我认为目前学生群体参与开源的现状应该有在逐年上升，但远未到占比 47% 的程度。

Jiang Bo: I think the distribution of this number only reflects the relatively large proportion of students among the people covered by our questionnaire (after all, the sample size is only 500+) but cannot reflect the industry's current situation. I think the current situation of student participation in open source should be increasing year by year, but it is far from 47%. So I have reservations about the experts' optimistic analysis of open source education.

3.4 受访者所在的企业类型 / 3.4 Type of business where the respondent works

受访者所在的企业类型多为国内初创公司和国内大型互联网企业，占比分别是 39%和 25%。

The types of companies the respondents work for are mostly domestic startups and large domestic Internet companies, accounting for 39% and 25%, respectively.



【专家点评】/ [Expert Comment]

段夕华： 科技型初创公司用开源来实现技术能力展现，吸引潜在合作伙伴，这个趋势不容忽视。这其中国内最为抢眼的就是 PingCAP/TiDB，其开源策略、战术均值得大家学习借鉴。

Duan Xihua: Technology startups use open source to show their technical capabilities and attract potential partners, a trend that cannot be ignored. The most eye-catching one in China is PingCAP/TiDB, whose open source strategy and tactics are worth learning.

堵俊平：这两年，一个很明显的趋势是越来越多的初创企业参与开源。这一方面得益于 ToB 赛道成为市场和政策导向的热点，另一方面开源所代表的开放式创新也被投资界所认可。尤其是开源与数据（数据库&大数据）以及 AI 等热点技术相结合，更是为市场带来了极大的想象空间。

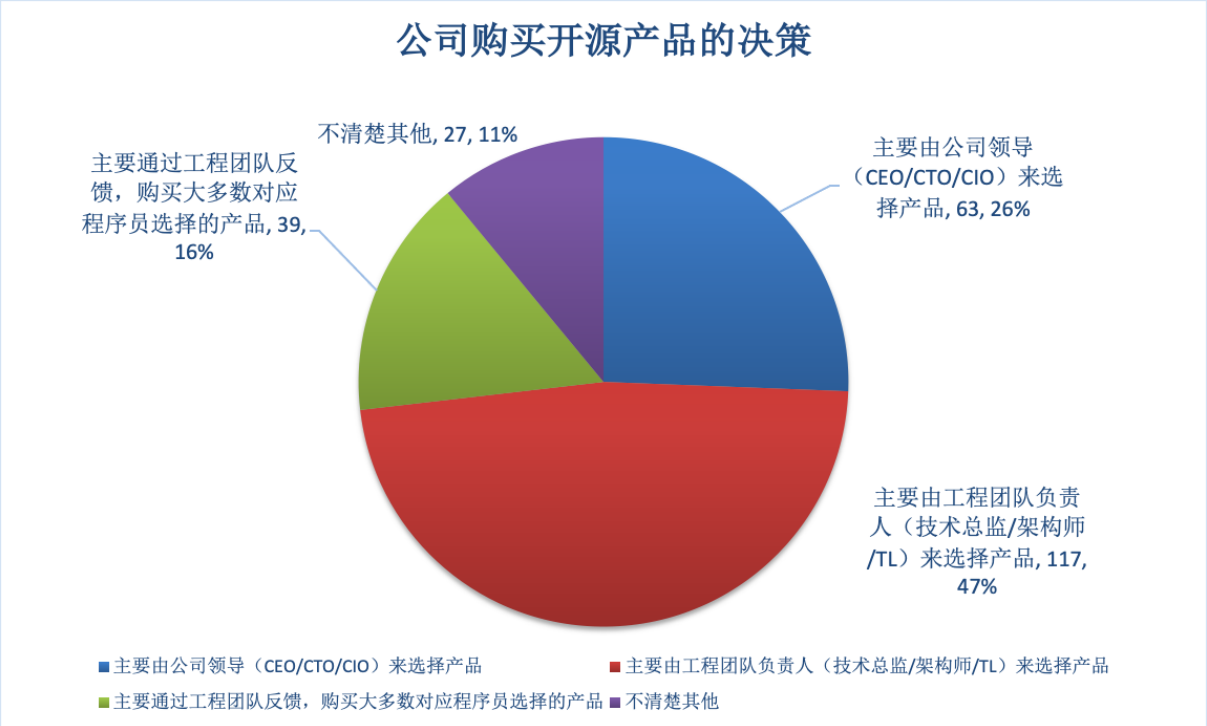
Du Junping: In the past two years, a clear trend has been that more and more startups are participating in open source. On the one hand, it is due to the ToB track has become a market and policy-oriented hotspot; on the other, the investment community recognizes open innovation represented by open source.

In particular, the combination of open source with data (database & big data) and hot technologies such as AI has brought great imagination to the market.

3.5 公司购买开源产品的决策 / 3.5 Company's decision to purchase open source products

公司在购买开源产品*（基于开源项目的商业化产品）*时，多由工程团队负责人（技术总监/架构师/TL）来进行产品的选择，而且在同类型软件的购买中，半数的人会考虑软件供应商对开源社区的贡献，但不是主要的考虑因素，只有在产品性能差别不大时，才会选择对开源社区贡献大的供应商。

When companies buy open source products (commercial products based on open source projects), most engineering team leaders (technical directors/architects/TLs) will select the product. Half of them will consider the software vendor's contribution to the open source community in the same type of software purchase, but not the primary consideration. They will only choose the vendor that contributes a lot to the open source community when there is little difference in product performance.



【专家点评】/ [Expert Comment]

姜宁：这里的开源产品是指基于开源项目的商业化产品吧！大部分的情况下，开源项目的选型是由在一线的开发人员决定的，但是由于公司决策链的关系，商业产品的购买还是要通过公司领导，工程团队负责人进行决策。

Jiang Ning: Are the open source products herein referred to as commercial products based on open source projects? In most cases, The developers on the front line decide the selection of open source projects; however, due to the company's decision-making chain, the purchase of commercial products should be decided by the company's leadership and the head of the engineering team.

王蕴博：这个确实是，一般调研都是一线员工，老板就是审批个流程

Wang Yunbo: This is true. The general research is usually done by front-line staff, and the boss is to approve the process

堵俊平：由于技术领域的发展日新月异，技术采购决策权下沉至工程团队技术负责人的趋势是不可避免的。这同时也要求技术产品的采购在决策流程上透明化，更看重产品在技术指标上的优势。客观来看，这对开源的发展有利有弊。利的一面在于，技术产品的提供方，在相关的开源领域的贡献可以被视为技术竞争力；弊的一面在于让部分厂商为了取得差异化的竞争优势，把本应开源出来的特性或者优化，来闭源处理，从而不利于开放式创新，也降低了可维护性。更为健康的针对开源产品的采购模式，应该平衡产品指标，技术竞争力以及产品本身的可维护性。

Du Junping: Due to the rapid development of the technology field, the decision-making power of technology procurement will inevitably be relegated to the technical leader of the engineering team, which requires the procurement of technical products in the decision-making process to be transparent, more critical to the product's advantages in terms of technical indicators. From an objective point of view, this has both advantages and disadvantages for developing open source. On the positive side, the contribution of the technical product providers in the relevant open source field can be regarded as technical competitiveness; The

disadvantage lies in that some vendors take the features or optimization that should be open sourced out to closed-source processing, which is not conducive to open innovation and reduces the maintainability, in order to achieve differentiated competitive advantage. A healthier procurement model for open source products should balance product metrics, technical competitiveness, and maintainability of the product itself.

段夕华：不知道 21 年底所爆发的 log4j 漏洞，是否会让公司购买开源产品更加保守谨慎？开源安全任重而道远。

Duan Xihua: I wonder if the log4j vulnerability in late 2021 will make companies more conservative and cautious in buying open source products? Open source security has a long way to go.

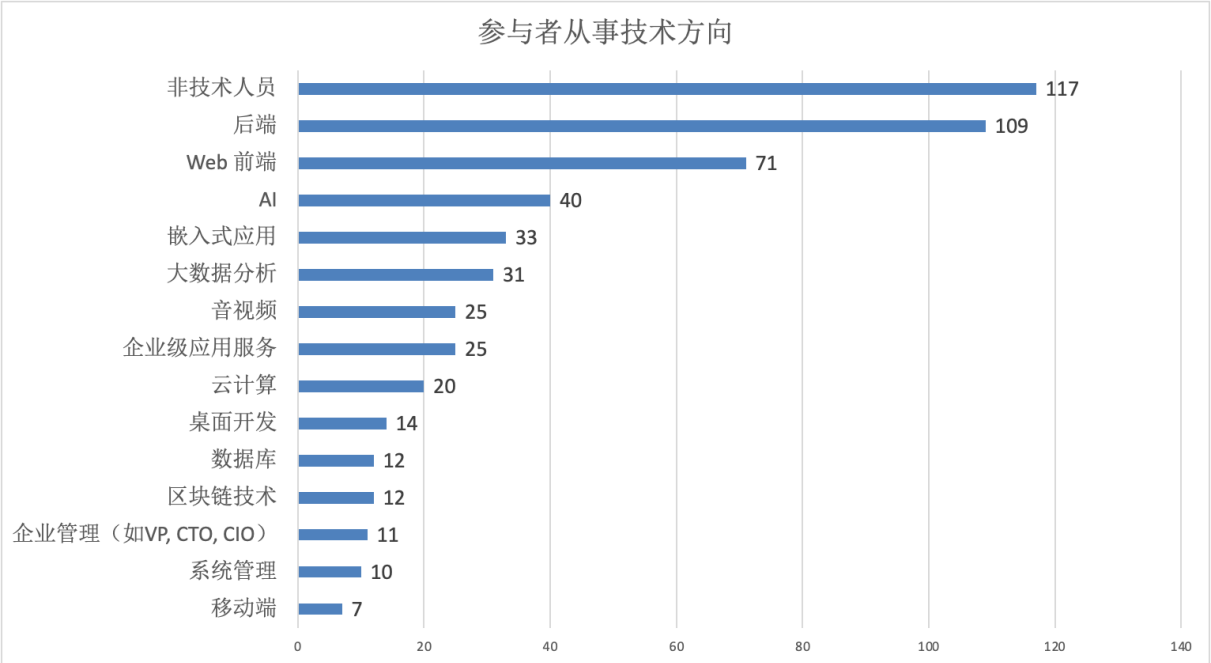
3.6 受访者所从事的技术方向 / 3.6 The technical direction of the respondents

受访者中非技术人员占比最高，后端开发次之，与去年相比，非技术人员的比例大幅提升，说明开源已经越来越受到各行各业的关注。

The highest percentage of respondents are non-technical, followed by back-end developers. Compared with last year, the proportion of non-technical people has increased significantly, indicating that open source has become more and more popular in all walks of life.

注：非技术人员和学生是对受访者的不同维度的刻画，不太能确定非技术人员中所包含学生的比例，有些学生可能会选择自己未来从事的职业方向。

Note: Non-technical staff and students are different dimensions of the respondents' portrayal, and it is not quite possible to determine the proportion of students included in non-technical staff, and some students may choose their future career direction.



【专家点评】/ [Expert Comment]

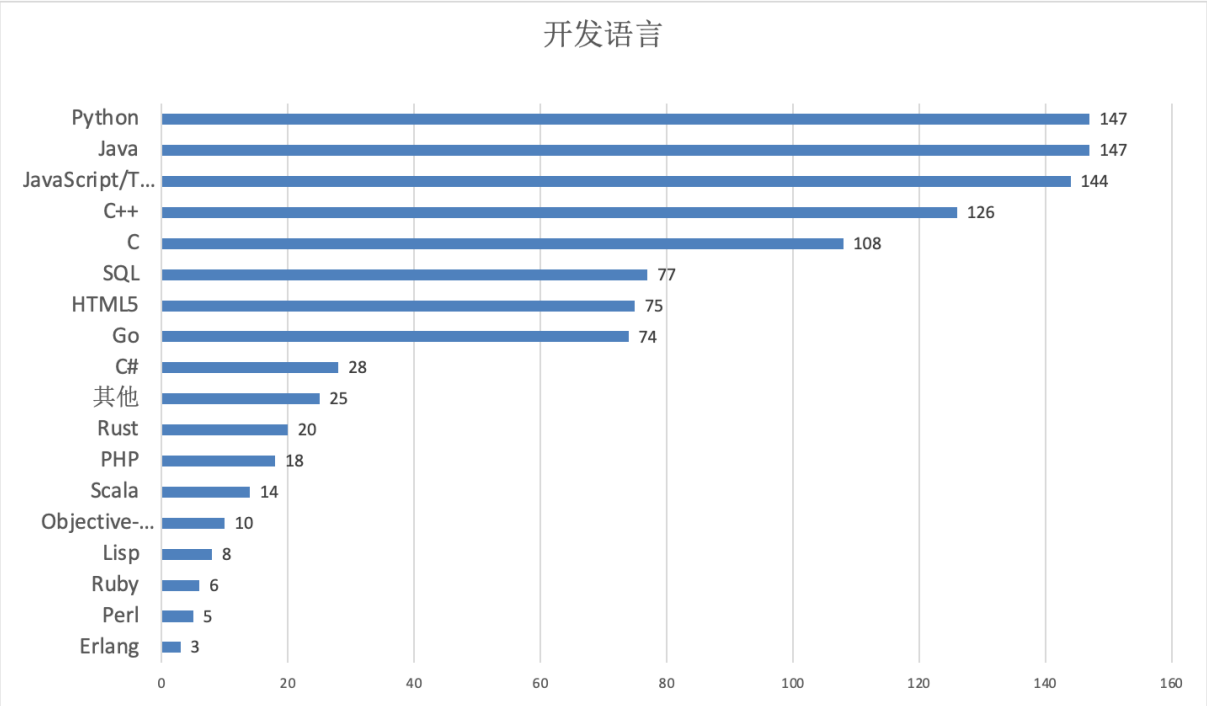
堵俊平：开源的参与者中非技术人员比例提高说明开源在向各行各业渗透，同时开源自身也需要法务，公共政策等领域的支撑才能更好的发展。

Du Junping: The increase in non-technical personnel among open source participants shows that open source is penetrating all walks of life, while open source itself also needs the support of legal affairs, public policy and other areas to achieve better development.

3.7 开发语言 / 3.7 Development Languages

开发语言呈现多超多强的状态，Python 后来居上，超过 Java 成为榜首，JavaScript/TypeScript 位居第三。

The development language shows the state of many super powers and multi-great power; Python later overtakes Java to become the top of the list, JavaScript/TypeScript in the third place.



【专家点评】/ [Expert Comment]

堵俊平：Python 和 Java 并驾齐驱，某种程度反映了当下的技术热点趋势。开源的大数据项目，Java (以及基于 JVM 的 Scala)是绝对主力，比如大家耳熟能详的 Hadoop, HBase, Spark 等，而开源的 AI 框架类项目，如：TensorFlow, PyTorch, MindSpore 等，则主要由 Python 语言所构成。未来，这两大语言还将持续在各自擅长的领域发光发热。

Du Junping: Python and Java go hand in hand, which to some extent reflects the current technology hot trend. Java (and JVM-based Scala) is the absolute mainstay of open source big data projects, such as the familiar Hadoop, HBase, Spark, etc., while open source AI framework projects, such as TensorFlow, PyTorch, MindSpore, etc., are mainly composed of the Python language. These two languages will continue to shine in their respective areas of expertise in the future.

段夕华：随着世界全面进入大数据和 AI 时代，Python 相比较 Java 的优势应该会持续扩大。

Duan Xihua: As the world enters the era of big data and AI, Python's advantages over Java should continue to expand.

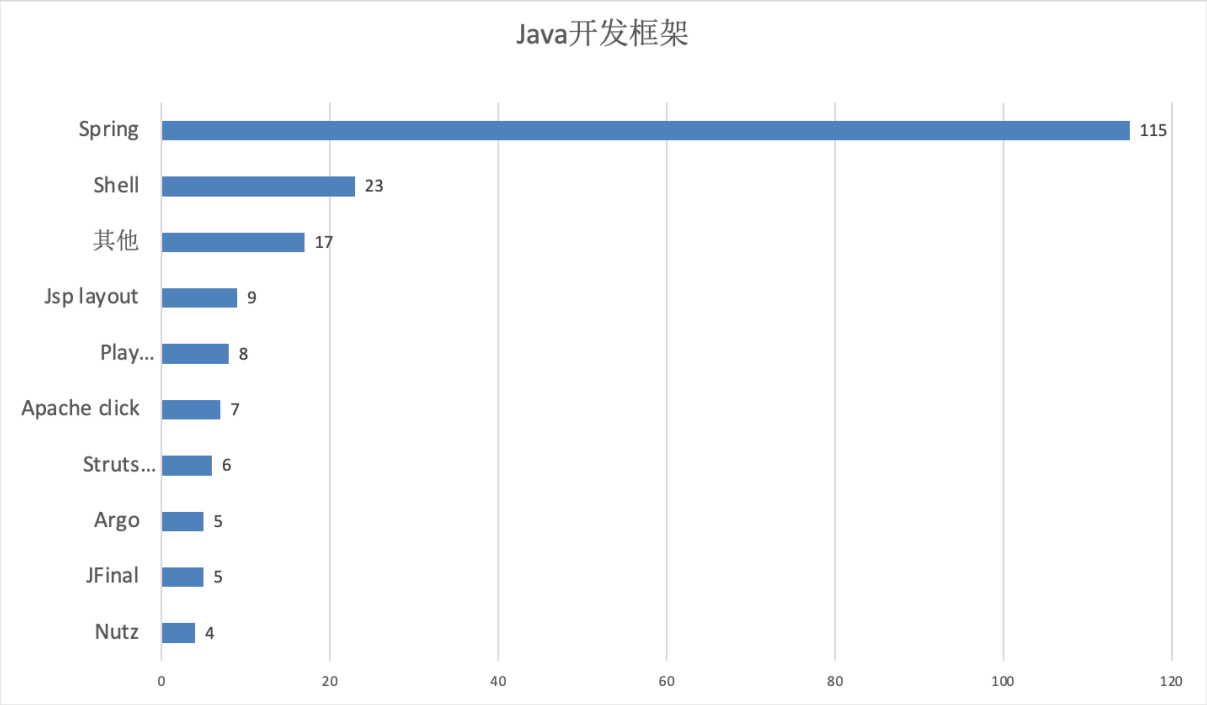
3.8 Java 开发框架 / 3.8 Java Development Framework

Java 开发框架的使用中，Spring 以绝对优势遥遥领先。

Spring is far and away from the leader in using Java development frameworks.

注：此处 Java 数据暂未考虑前端的 Android 开发群体

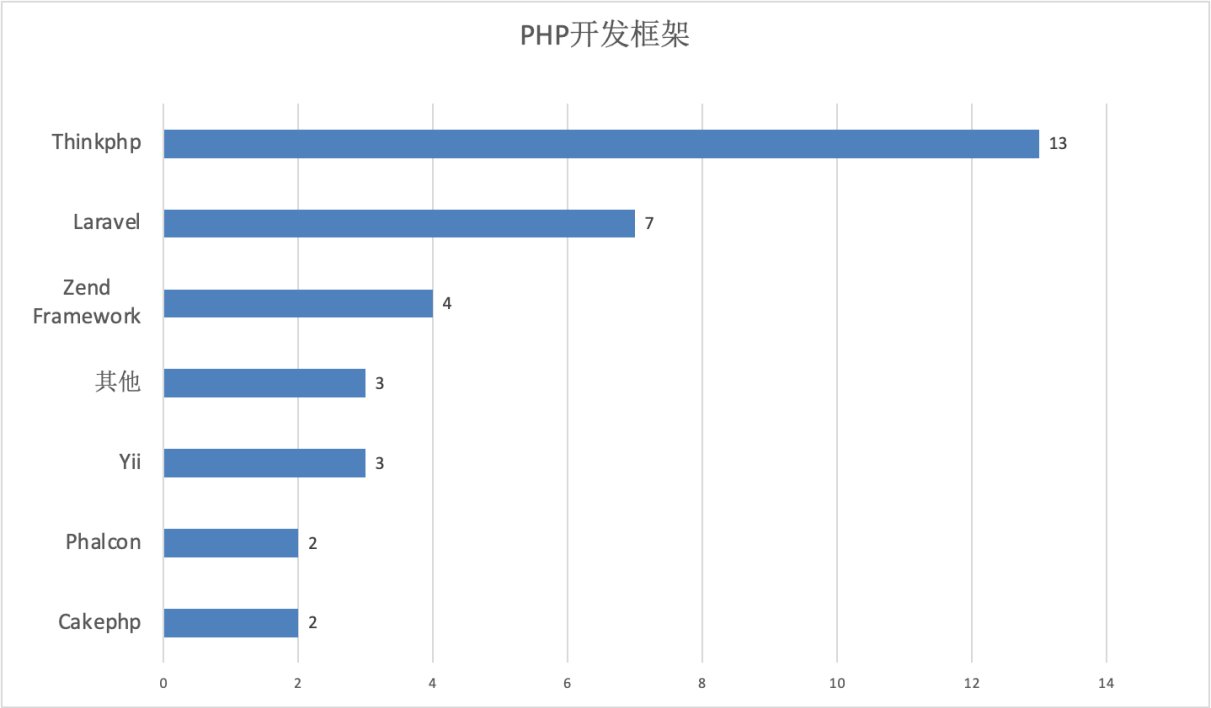
Note: The Java data here does not consider the front-end Android development group for the time being



3.9 PHP 开发框架 / 3.9 PHP Development Framework

PHP 开发框架以 Thinkphp 的使用居多。

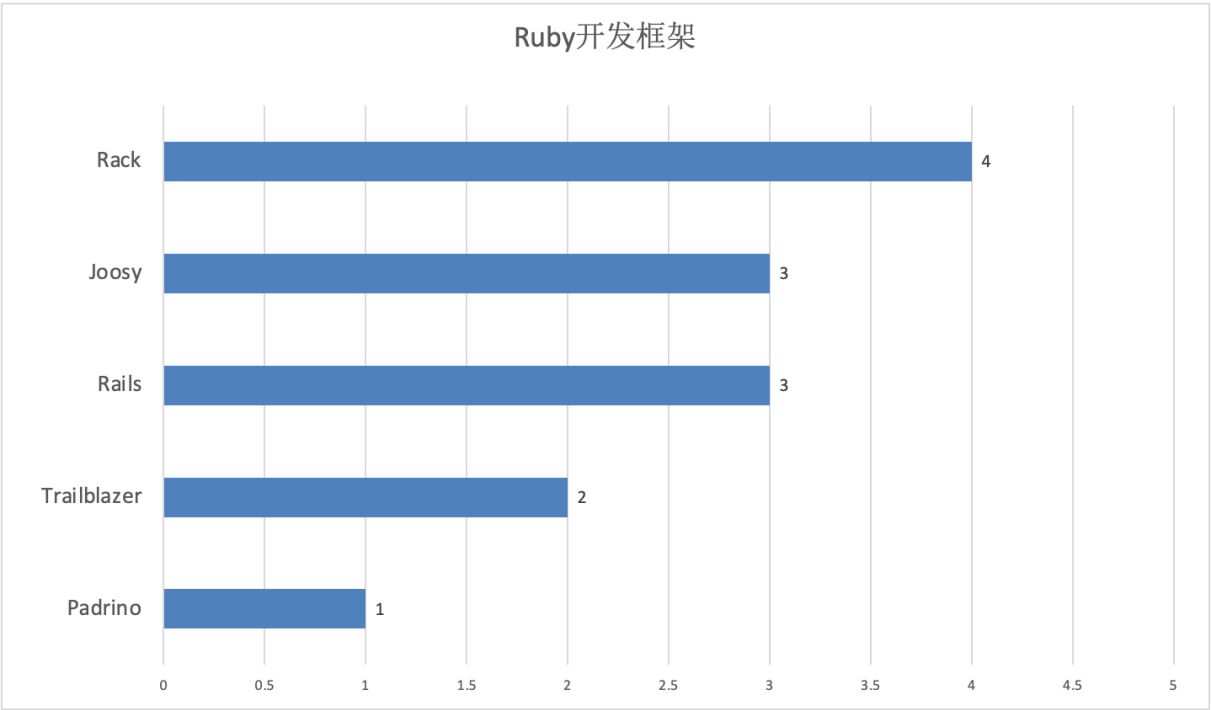
PHP development frameworks are predominantly used with Thinkphp.



3.10 Ruby 开发框架 / 3.10 Ruby Development Framework

Ruby 开发框架的使用中，使用 Rack 的开发者居多。

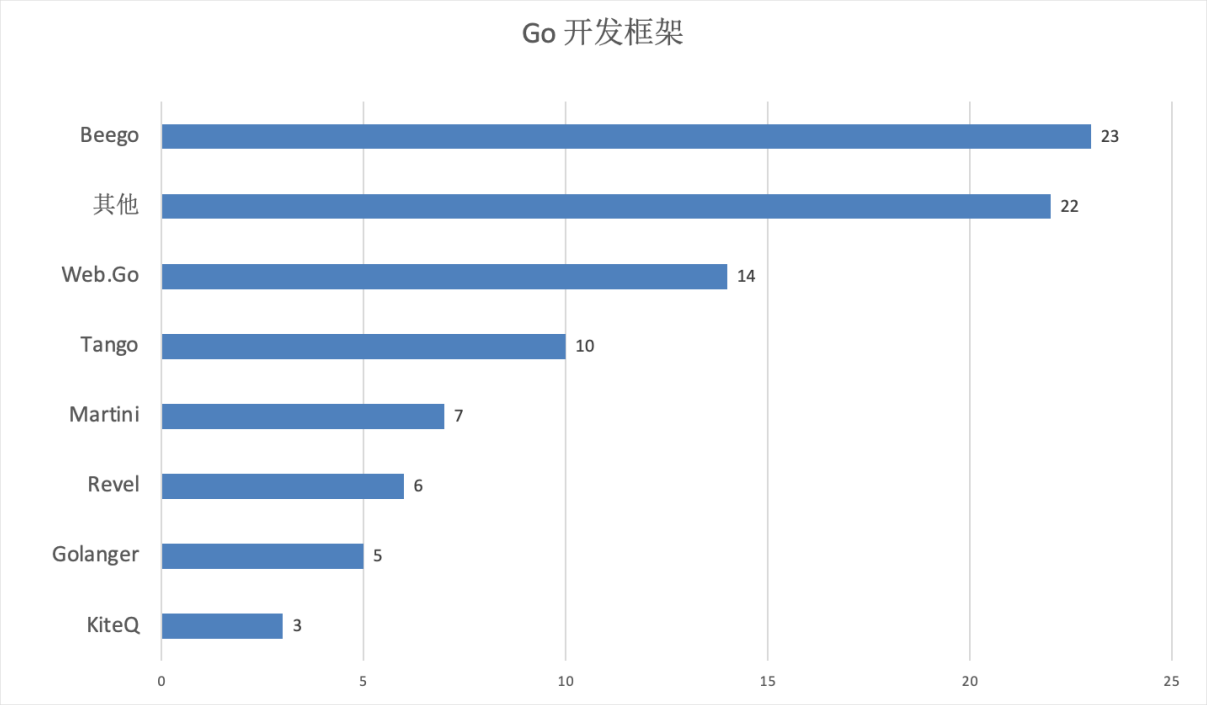
The use of Ruby development frameworks is dominated by developers who use Rack.



3.11 Go 开发框架 / 3.11 Go Development Framework

Go 的开发框架中，使用 Beego 的开发者占比最大。

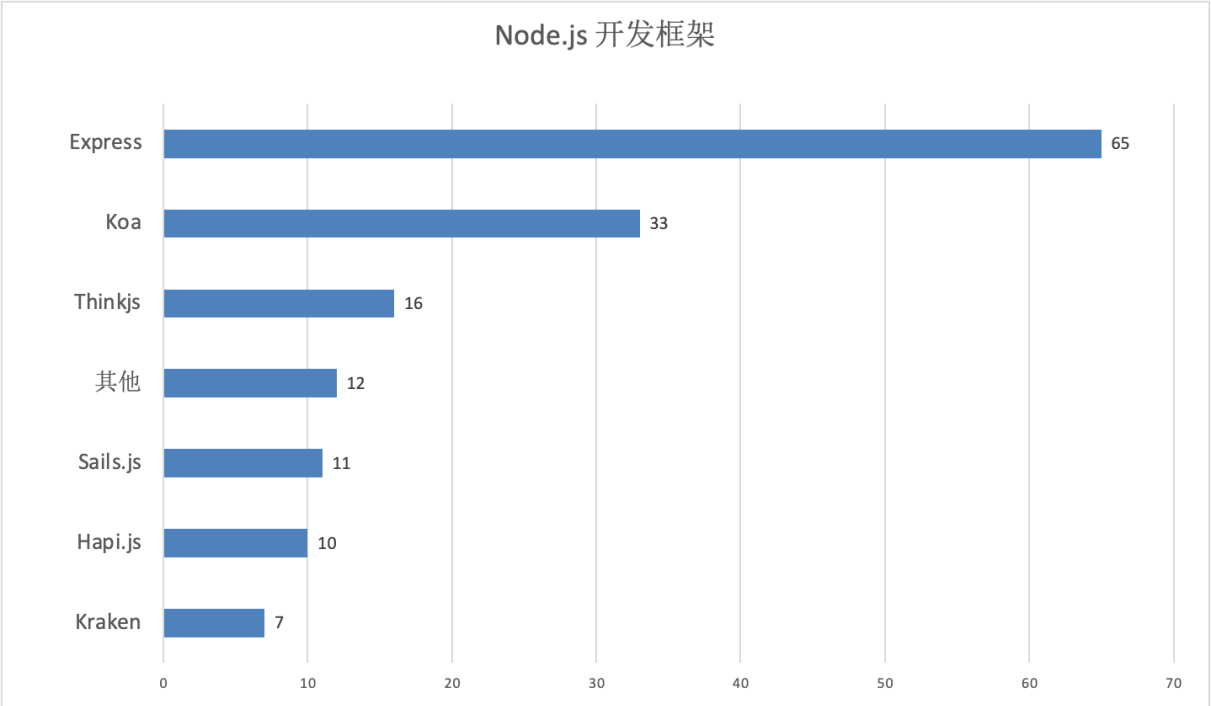
Go has the largest percentage of developers using Beego as a development framework.



3.12 Node.js 开发框架 / 3.12 Node.js development framework

Node.js 开发框架中，Express 使用最多，其次是 Koa。

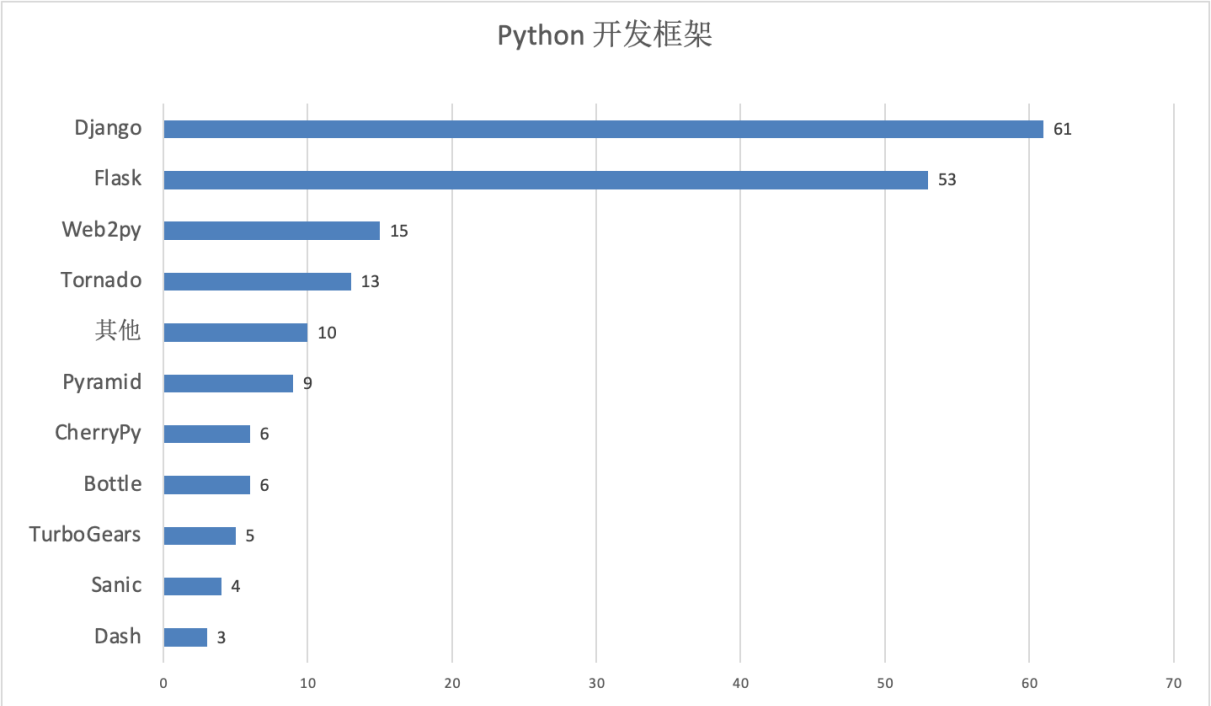
Of the Node.js development frameworks, Express is the most used, followed by Koa.



3.13 Python 开发框架 / 3.13 Python Development Framework

Python 开发框架使用情况中，Django 和 Flask 遥遥领先。

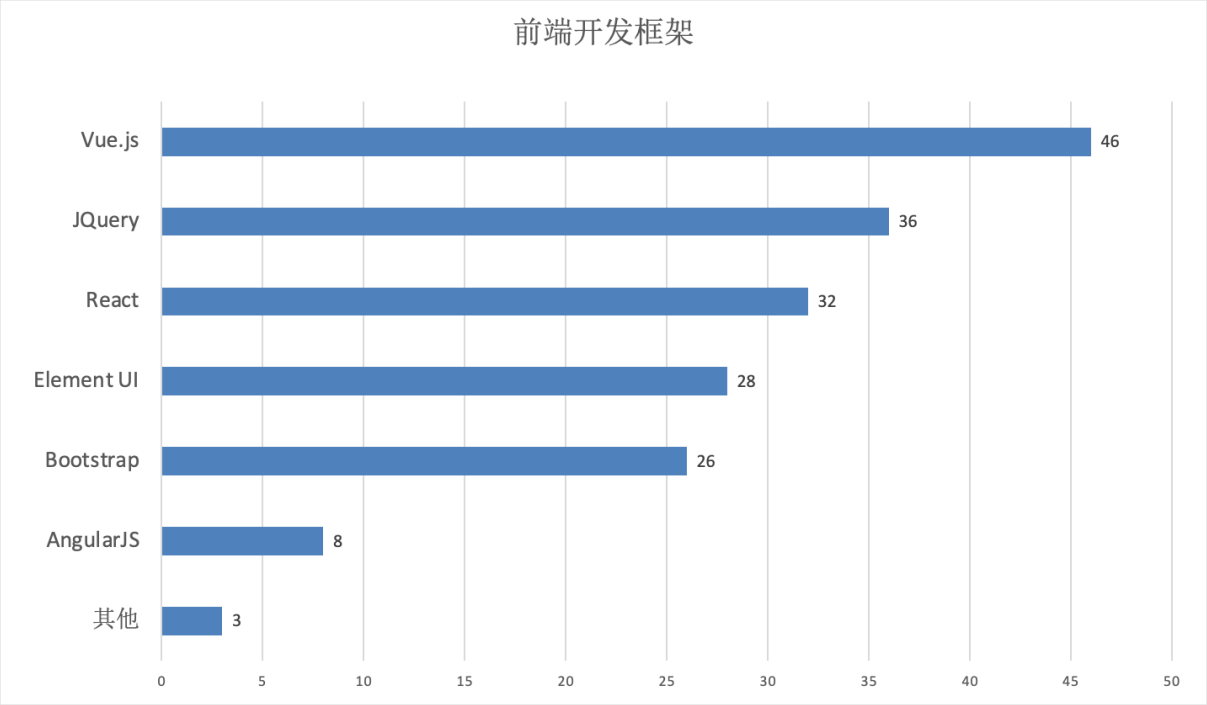
Django and Flask lead the pack in terms of Python development framework usage.



3.14 前端开发框架 / 3.14 Front-end development framework

前端开发框架的使用中，Top5 分别是 Vue.js，JQuery，React，Element UI 和 Bootstrap。

The Top5 front-end development frameworks in use are Vue.js, JQuery, React, Element UI and Bootstrap.



【专家点评】/ [Expert Comment]

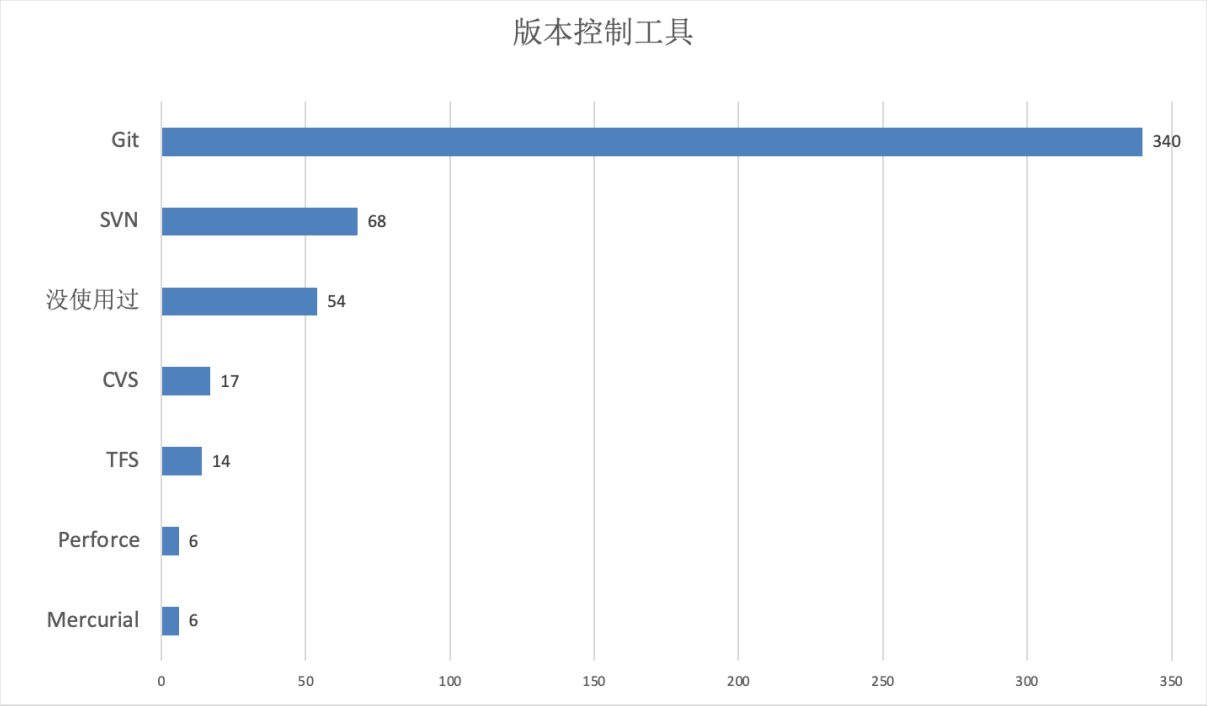
> **段夕华：**这个数据有点意思，React 居然屈居 Vue 之后，好像跟国外的统计数据不太一致。不知道是样本容量问题，还是因为国内开源项目对华人发起的 Vue 情有独钟。
>
> **Duan Xihua**: This data is somewhat interesting. React ranked second to Vue, which seems inconsistent with foreign statistics. I do not know whether it is a sample size problem or because domestic open source projects have a particular preference for Vue initiated by the Chinese.

3.15 版本控制工具 / 3.15 Version Control Tools

毫无疑问的是，Git 一枝独秀，具有绝对性优势。SVN、TFS、CVS 目前仍有不少参与者在使

用。

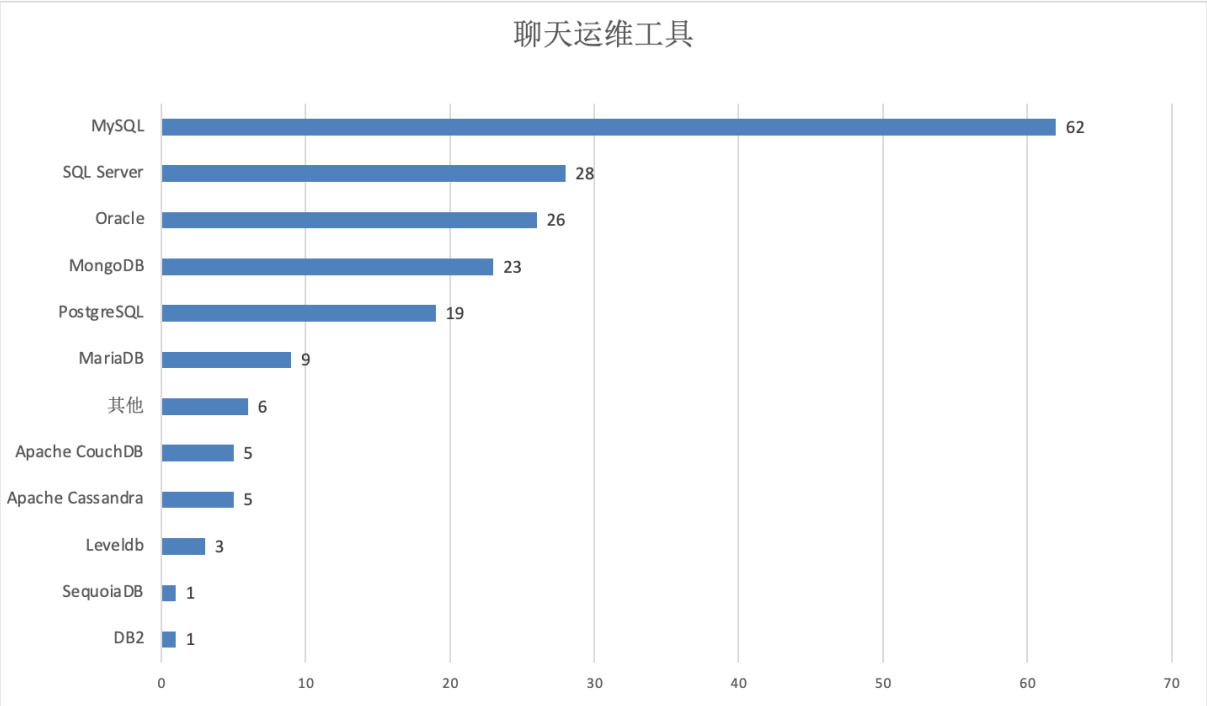
There is no doubt that Git stands alone as having an overwhelming advantage. SVN, TFS, and CVS are still in use by many participants.



3.16 数据库 / 3.16 Database

数据库使用情况中，不出意外地，MySQL 以绝对优势遥遥领先，SQL Server 与 Oracle 跟随其后。

Not surprisingly, MySQL leads the pack in terms of database usage, with SQL Server and Oracle trailing behind.



【专家点评】/ [Expert Comment]

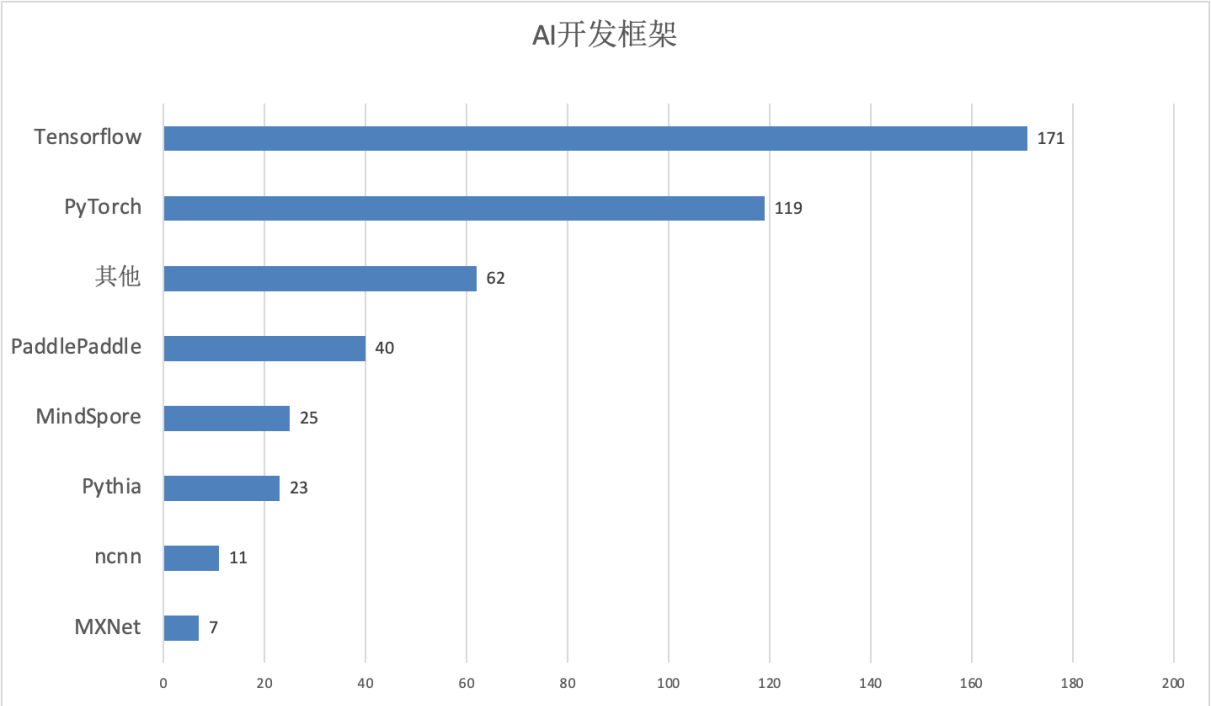
段夕华：Mysql 和 Postgres 的对比关系也有国内外差异，估计还是惯性使然

Duan Xihua: The comparison between Mysql and Postgres is also different at home and abroad. It is probably due to inertia.

3.17 AI 开发框架 / 3.17 AI Development Framework

AI 开发框架使用情况中，意料之中地，Tensorflow 和 PyTorch。

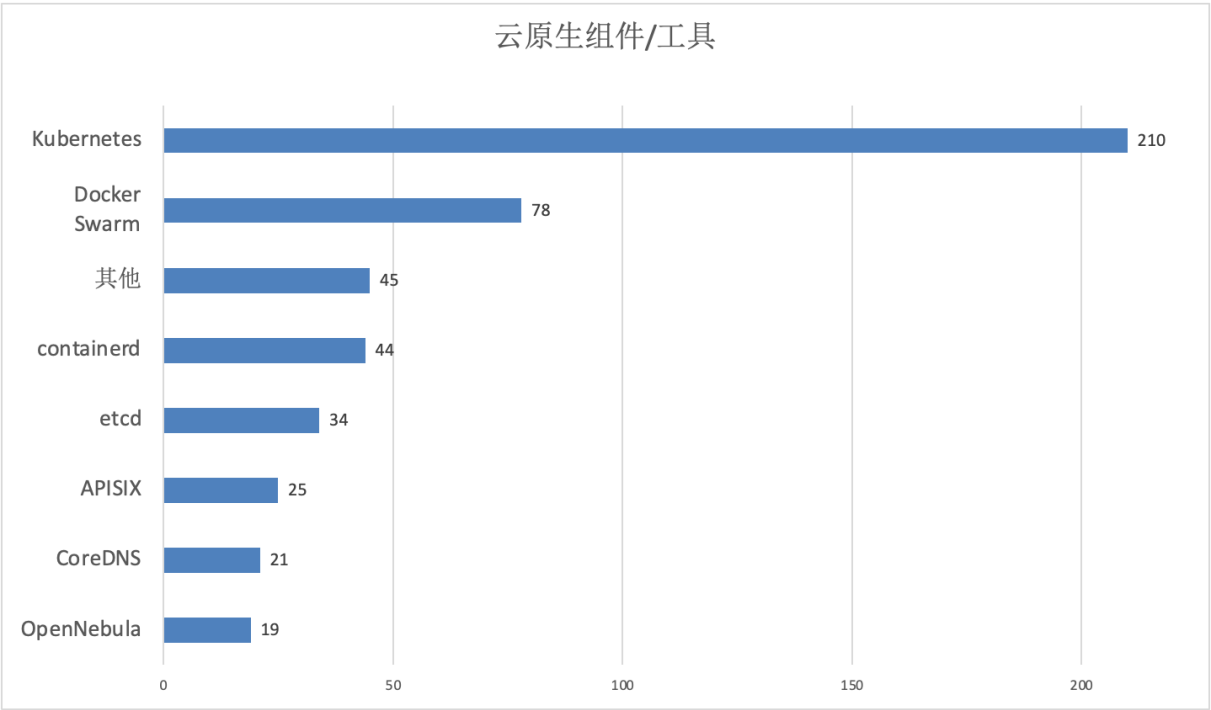
Among the AI development frameworks used, unsurprisingly, are Tensorflow and PyTorch.



3.18 云原生组件/工具 / 3.18 Cloud-native components/tools

云原生组件/工具的使用中，Kubernetes 一枝独秀。

Kubernetes stands alone in the use of cloud-native components/tools.



【专家点评】/ [Expert Comment]

4、开源社区参与现状 / 4 Open Source community participation status

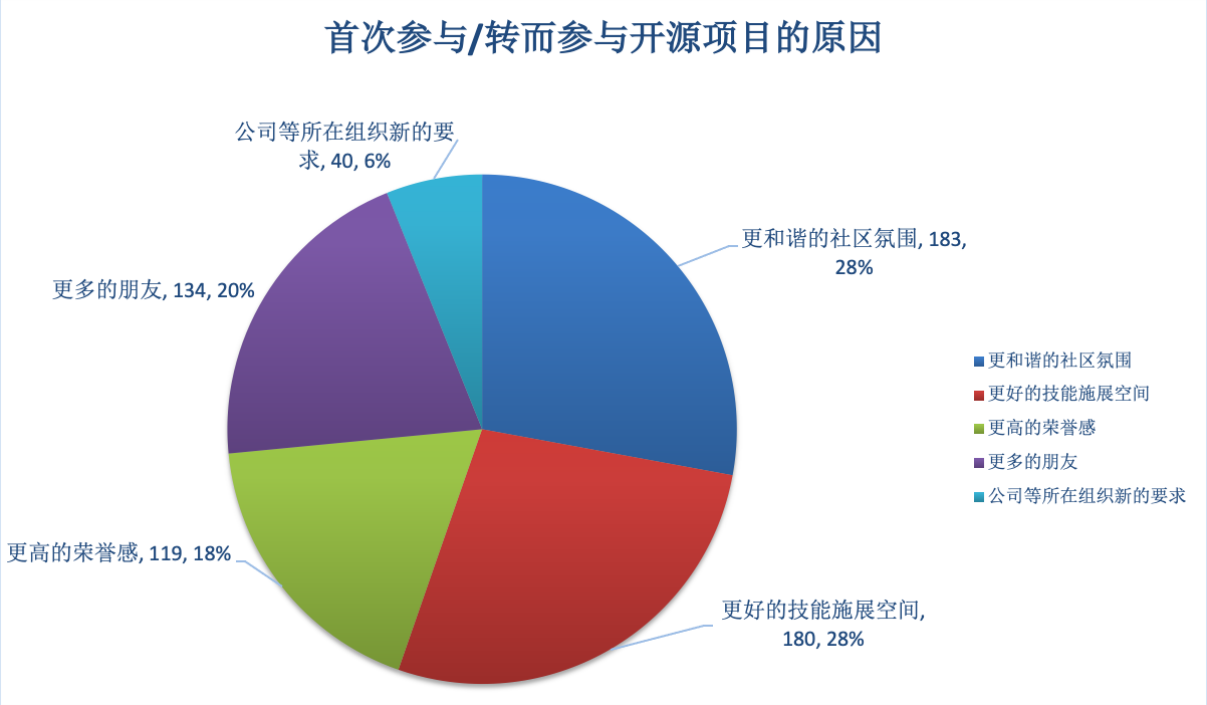
在填写问卷的 537 人中，约有 52%的受访者有过参与开源社区的经历。

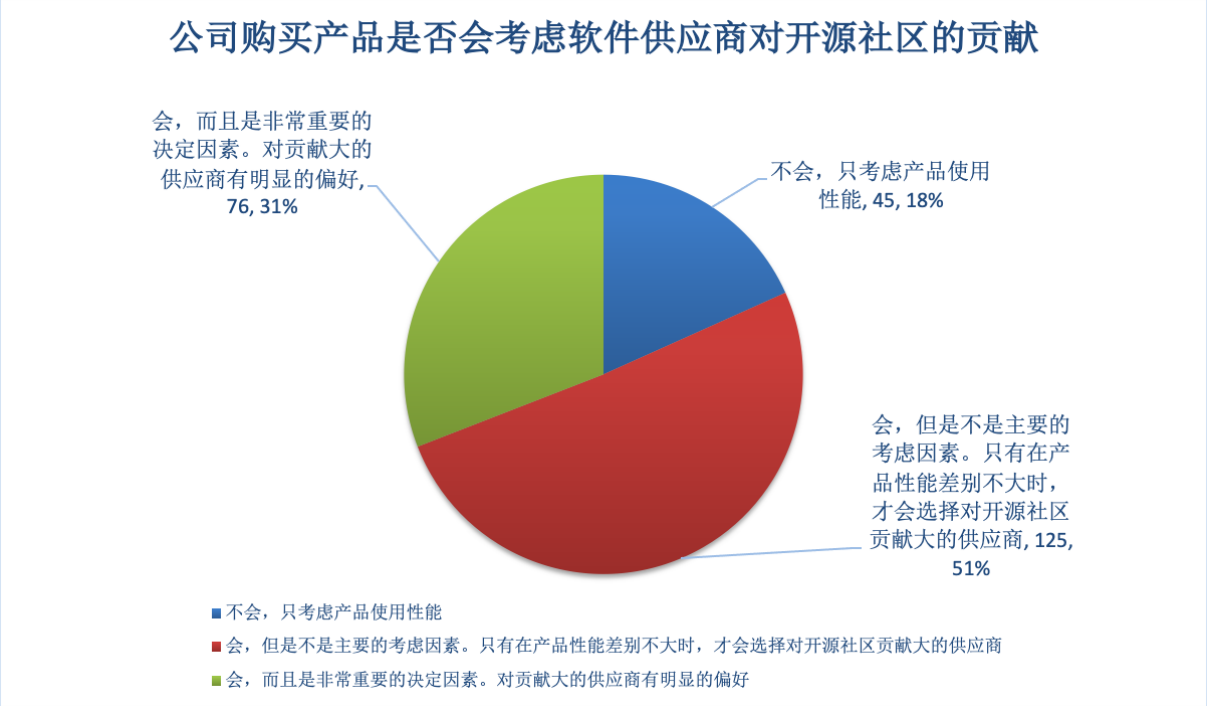
Of the 537 people who completed the questionnaire, about 52% of respondents had experience participating in open source communities.

4.1 首次参与/转而参与开源项目的原因 / 4.1 Reasons for first-time participation/switching to open source projects

受访者首次参与/转而参与开源项目的原因多为主观原因，例如更好的技能施展空间、更和谐的社区氛围、更多的朋友，而应公司所在组织的要求来参与开源社区的占比很小。

The reasons for respondents to participate for the first time/switch to open source projects were subjective primarily, such as better space for skill application, a more harmonious community atmosphere, and more friends. In contrast, a small percentage of respondents participated in the open source community at the request of their organizations.





【专家点评】/ [Expert Comment]

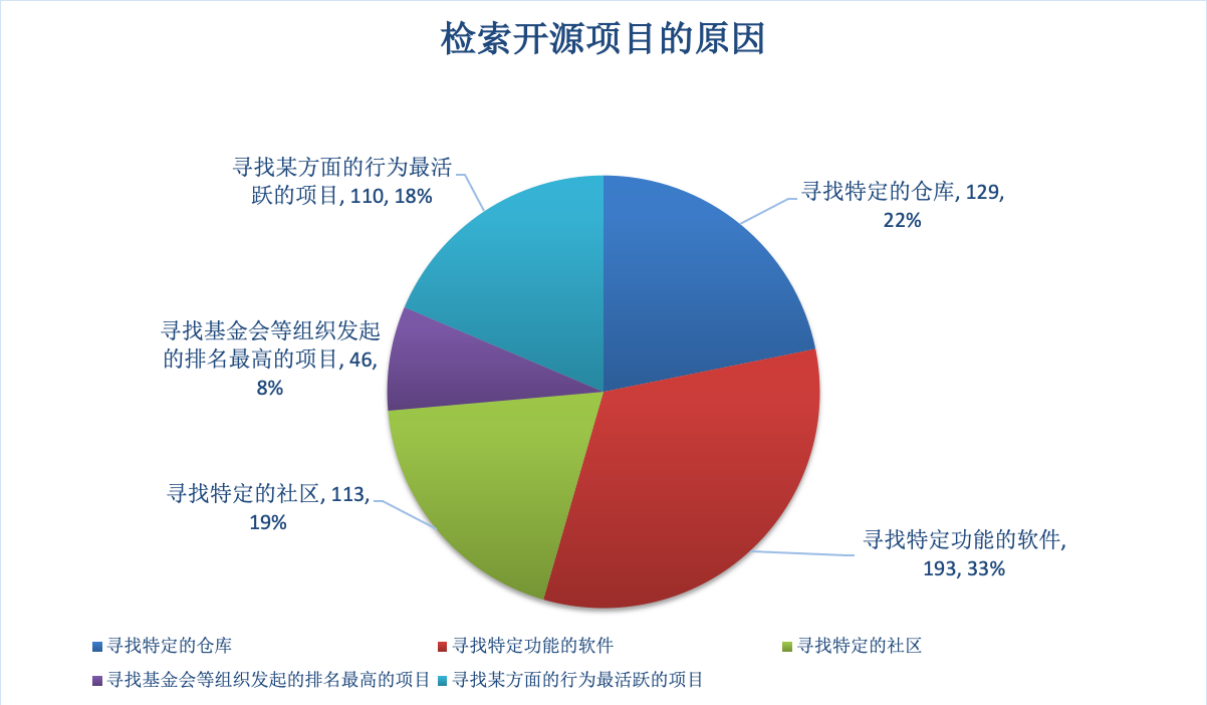
堵俊平：大部分投身开源的人不能简单视为仅仅是工作需要，更多的则是源于内在需要。例如希望发挥自身更大的价值、喜欢社区的工作氛围或者拓展人脉，等等。把工作需要与人的需求结合起来，让每个开发者在社区里找到归属感，开源项目才能不断吸引优秀的人才加入。

Du Junping: Most people who engage in open source are motivated not simply by work but by internal needs. For example, they want to give full play to their value, like the working atmosphere of the community or expanding the network. By combining the needs of the work with the needs of the people and giving every developer a sense of belonging in the community, open source projects will continue to attract talented people to join.

4.2 检索开源项目的原因 / 4.2 Reasons for retrieving open source projects

受访者们检索开源项目的原因多种多样，占比较大的原因是寻找特定功能的软件。

Respondents searched open source projects for various reasons, with the majority of the reasons being to look for software with specific functions.



【专家点评】/ [Expert Comment]

姜宁：大家使用开源项目还是从解决自己的问题角度出发。

Jiang Ning: people use open source projects from the perspective of solving their

problems.

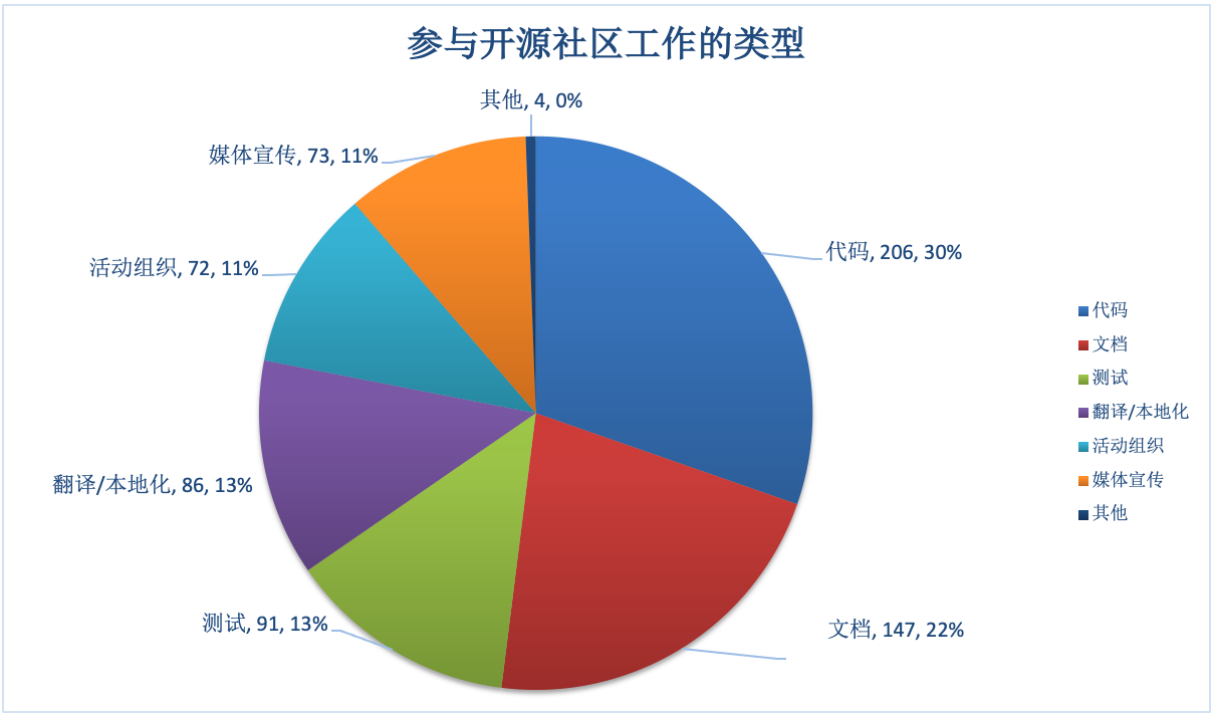
堵俊平：用户是大部分人接触开源的首要角色，也是最重要的角色。对开源项目而言，有独创性的特色功能是引发大众关注和使用的关键。

Du Junping: Users are the first and most crucial role for most people to approach open source. Innovative features are the key to gaining public attention and adoption for open source projects.

4.3 参与开源社区的工作 / 4.3 Participation in the open source community

绝大多数受访者在社区都参与代码或文档撰写的工作，测试、本地化、活动组织以及媒体宣传也是很多人在社区会参与的工作。

The vast majority of respondents are involved in writing code or documentation in the community. Testing, localization, event organization, and media outreach are also tasks that many are involved in.



【专家点评】/ [Expert Comment]

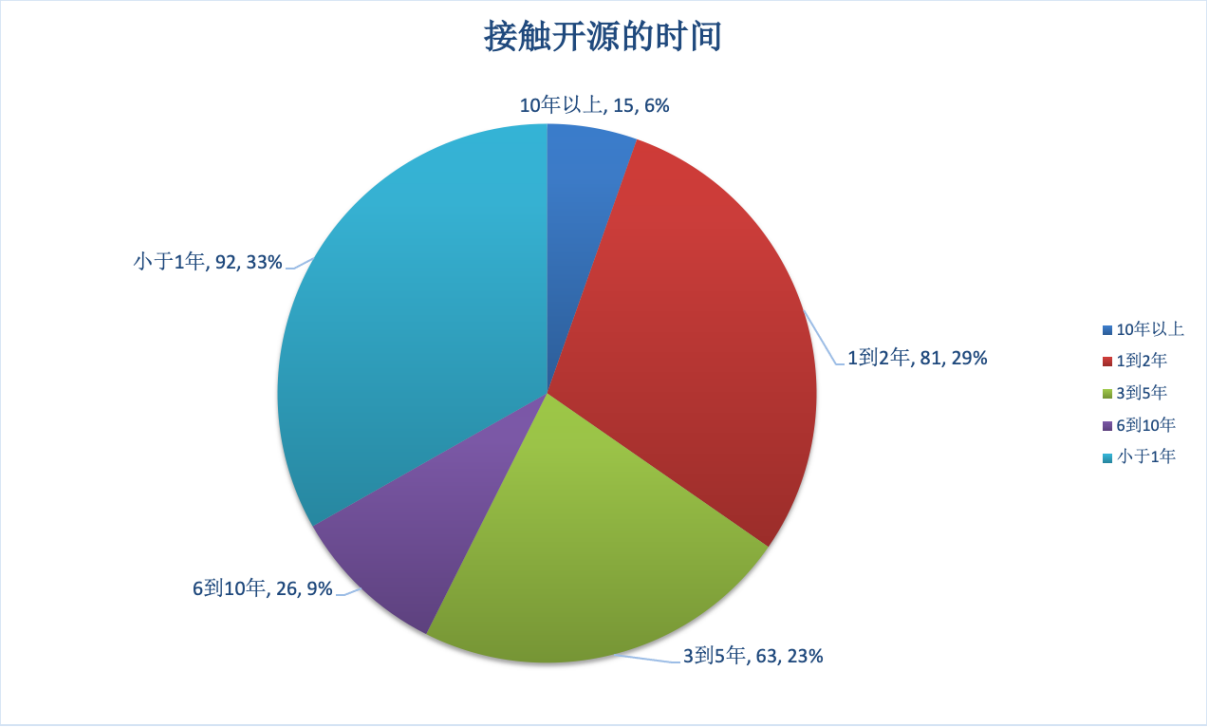
堵俊平： “Community over Code”，开源社区的工作不只是代码，代码以外的工作占的比例更高。另外，开源项目非常注重文档建设，这一点从本调查也可以反映出来。

Du Junping: "Community over Code", the work of the open source community, is not just code but also non-code work. In addition, open source projects attach great importance to documentation, which is also reflected in this survey.

4.4 接触开源的时间 / 4.4 Time of engaging in open source

有近三成受访者接触开源的时间在 1-2 年，近七成受访者接触开源时间在一年以上。

Nearly 30% of respondents have engaged in open source for 1-2 years, and nearly 70% have contacted with open source for more than a year.



【专家点评】/ [Expert Comment]

杨丽蕴：如果是想表达近两年参与开源的人越来越多，那么：在 1-2 年内接触开源的参与者越来越多，与我国近两年开源政策引导、开源社区快速发展并受到越来越多的关注等等

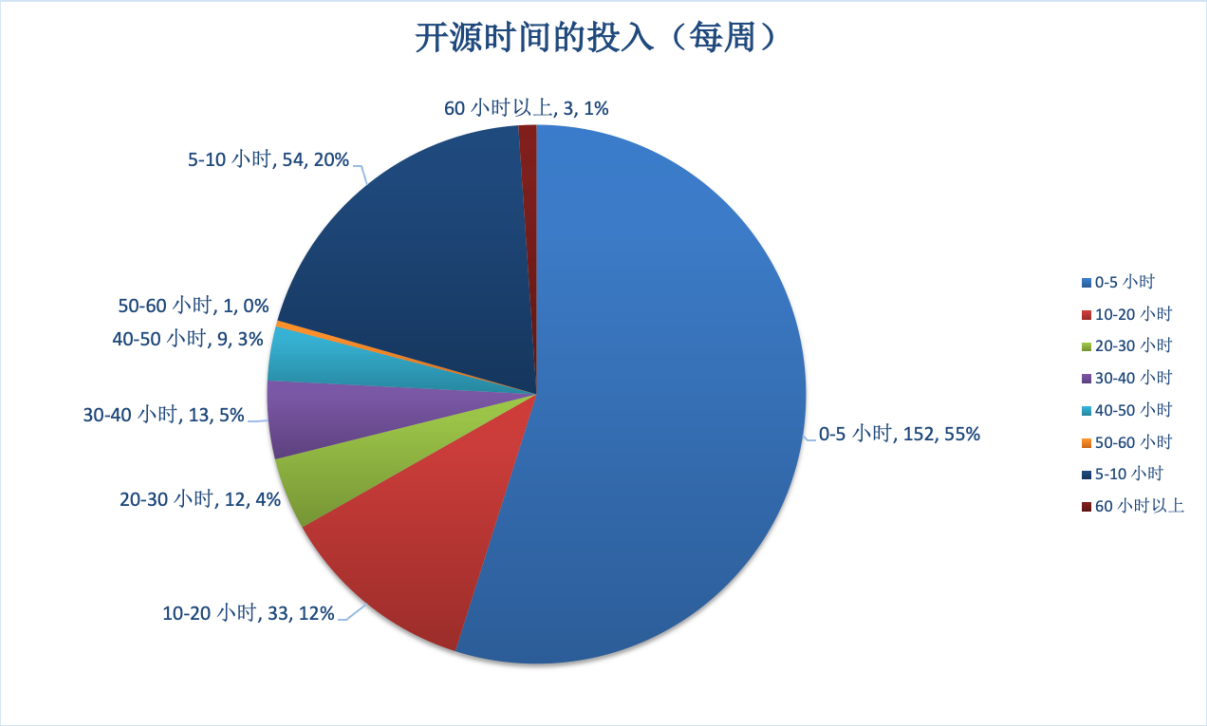
外部因素有密切关系。

Yang Liyun: If it is to express the increasing number of people involved in open source in the past two years, then: the increasing number of participants engaged in open source in 1-2 years is closely related to the external factors such as open source policy guidance, rapid development of open source communities and increasing attention in China in the past two years.

4.5 在开源中的时间投入 / 4.5 Time investment in open source

约有 55% 的受访者每周在开源上的时间投入不足 5 小时，每周对开源投入时间在 5-20 个小时的受访者约有 30%，与去年相比，每周在开源上的时间投入不足 5 小时的比例有所增加。

About 55% of respondents spend less than 5 hours per week on open source, and about 30% of respondents spend 5-20 hours per week on open source, an increase compared to last year.



【专家点评】/ [Expert Comment]

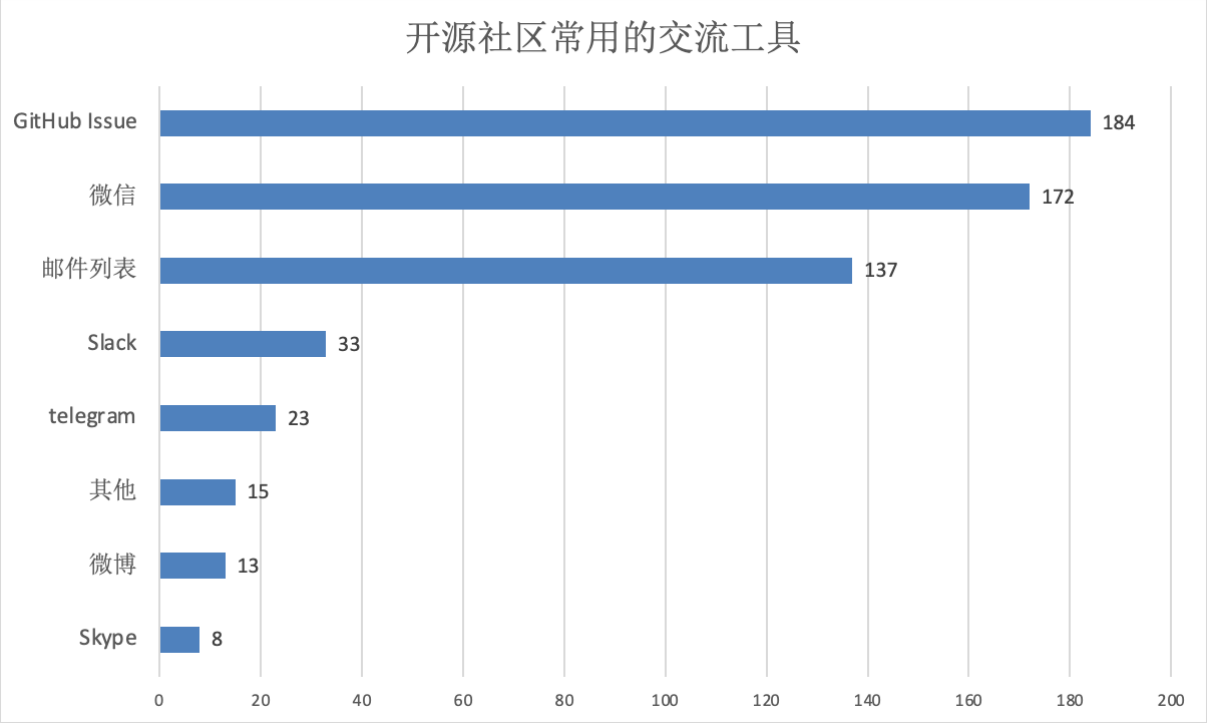
堵俊平：一般而言，每周投入法定工作时间的 50% 以上（即 20 个小时）即可视为全职开源开发者，这个比例大概是 13%，相对偏低。可以看到，现阶段，在中国，大多数的开源贡献者更多是出于爱好，而非全职投入。换句话说，开源开发还没有成为广大开发者可以赖以谋生的职业手段，这距离开源生态的真正繁荣还有差距。

Du Junping: Generally speaking, a full-time open source developer is considered to devote more than 50% (i.e., 20 hours) of his or her legal working hours per week, which is about 13%, relatively low. As we can see, most open source contributors in China at this stage are more of a hobby than a full-time commitment. In other words, open source development has not yet become a viable career for most developers, and there is still far from the true prosperity of the open source ecosystem.

4.6 开源社区的交流方式 / 4.6 Communication tools in the open source community

在社区的交流方式中，Github Issue、微信和邮件列表目前最为普遍。

Among the community communication tools, Github Issues, WeChat and mailing lists are currently the most common.



【专家点评】/ [Expert Comment]

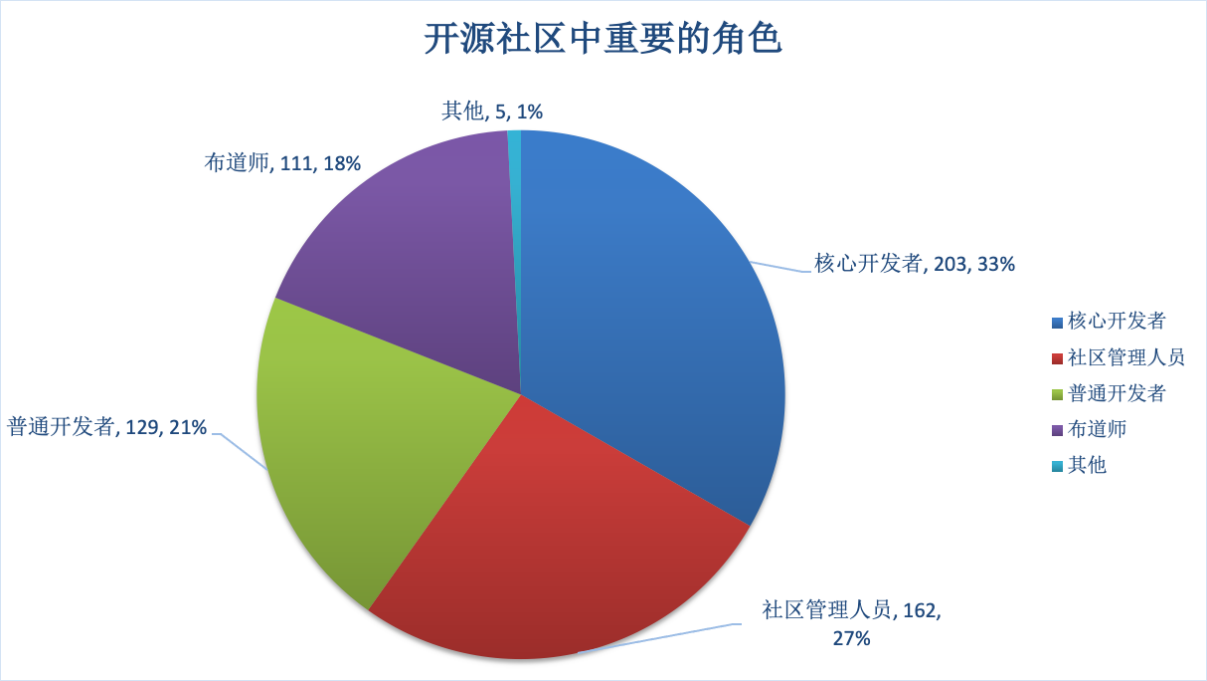
堵俊平：在欧美，邮件列表和 Issue 是开源开发者交流的主要方式，这样既可以公开、透明，又可以把讨论的过程沉淀下来，降低后加入者的学习成本。国内开发者当前习惯在微信群中讨论问题，但受限于微信群的规模以及非公开的讨论问题的方式，需要聊天机器人等辅助工具才能达成开源社区的沟通需要。

Du Junping: In Europe and the United States, mailing lists and Issues are the main ways for open source developers to communicate, which can be open and transparent, and settle down the discussion process and reduce the learning cost of new entrants. Domestic developers are currently used to discussing issues in WeChat groups, but due to the size of WeChat groups and the non-public discussions, they need auxiliary tools such as chatbots to reach the communication needs of open source communities.

4.7 开源社区中重要的角色 / 4.7 Important players in the open source community

受访者们认为开源社区中核心开发者、社区管理人员、普通开发者、布道师都是很重要的角色，他们共同支持着社区的良好运转。

Respondents identified core developers, community managers, general developers, and evangelists as important players in the open source community who work together to support a well-functioning community.



【专家点评】/ [Expert Comment]

堵俊平：大家对开源社区中各种角色的认知还有局限性，这里列出的除了代码开发就是布道，其实还有运营、法务、营销等角色，共同构成了社区的贡献者。

Du Junping: There are limitations to the perception of various roles in the open source community. In addition to code development and evangelism, there are also operations, legal, marketing, and other roles that constitute the community's contributors.

王蓉：社区里的角色不仅只有代码贡献者，非代码贡献者的重要性在开源社区里愈发重

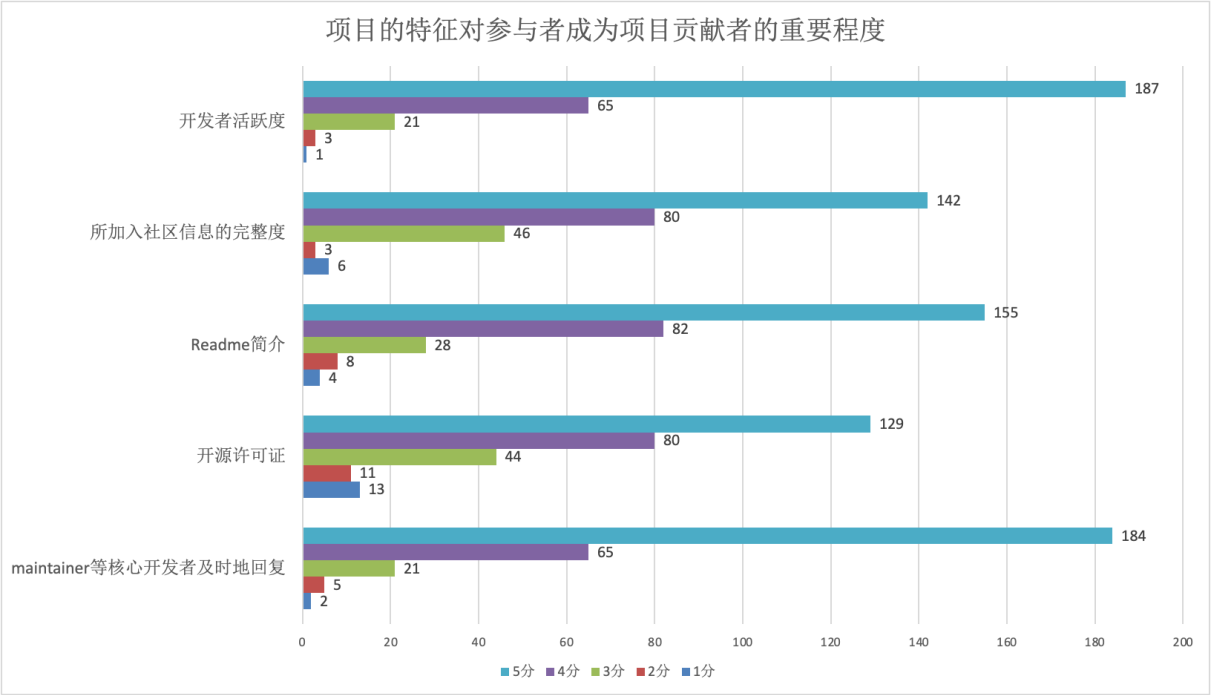
要，相信会有越来越多的贡献者以文档建设、活动组织等形式参与到开源社区里来。

Wang Rong: The roles in the community are not only code contributors. The importance of non-code contributors is becoming more and more important in the open source community, I believe more and more contributors will participate in the open source community in the form of document construction and event organization.

4.8 一个项目的哪些特征对于您留下成为项目贡献者的重要度评级 / 4.8 What features of a project are vital for you to stay as a contributor to the project rating

对于受访者来说，一个项目的开发者活跃度、所加入社区信息的完整度、Readme 简介、开源许可证以及核心开发者的及时回复都能够影响其是否会留下成为项目的贡献者。

For respondents, a project's developer activity, completeness of information about the community they join, Readme profiles, Open Source Licenses, and timely responses from core developers can influence whether they will stay as a contributor to the project.



【专家点评】/ [Expert Comment]

堵俊平：谁说工程师不善于沟通？对开源项目而言，社区的氛围以及交流和沟通是开发者留存的关键因素。

Du Junping: Who says engineers are not good at communicating? For open source projects, the atmosphere of the community as well as communication and exchange is a key factor for developer retention.

段夕华：最后这个指标跟前面调查中的社区和谐诉求本质是相通的，那就是马斯洛需求层次中的「尊重和被认可的需求」

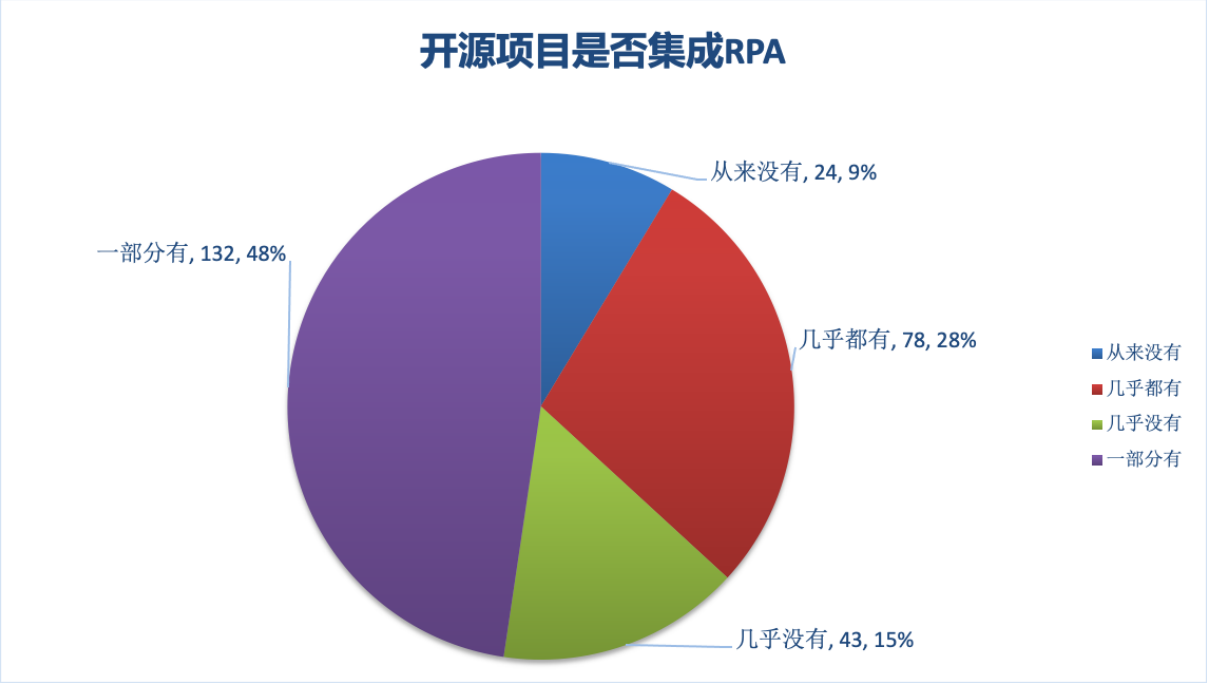
Duan Xihua: The last indicator is essentially the same as the community harmony appeal in the previous survey: the "need for respect and recognition" in Maslow's hierarchy of needs.

4.9 开源项目是否集成 RPA（机器人流程自动化）/ 4.9 Whether open source projects integrate RPA (Robotic Process Automation)

对于开源项目是否集成了 RPA，即机器人流程自动化工具，有 5 成受访者表示一部分项目集

成了 RPA，较去年有所提升，仅有 1 成的受访者表示从来没有在开源项目中集成过 RPA，比去年下降了 15%，说明开源项目越来越重视流程的自动化。

Whether for open source projects integrated RPA, namely Robotic Process Automation tools, 50% of respondents said a portion of their projects had integrated RPA, an increase from last year. Only 10% of respondents said they had never integrated RPA in an open source project, down 15% from last year, indicating that open source projects are increasingly focusing on process automation.



【专家点评】/ [Expert Comment]

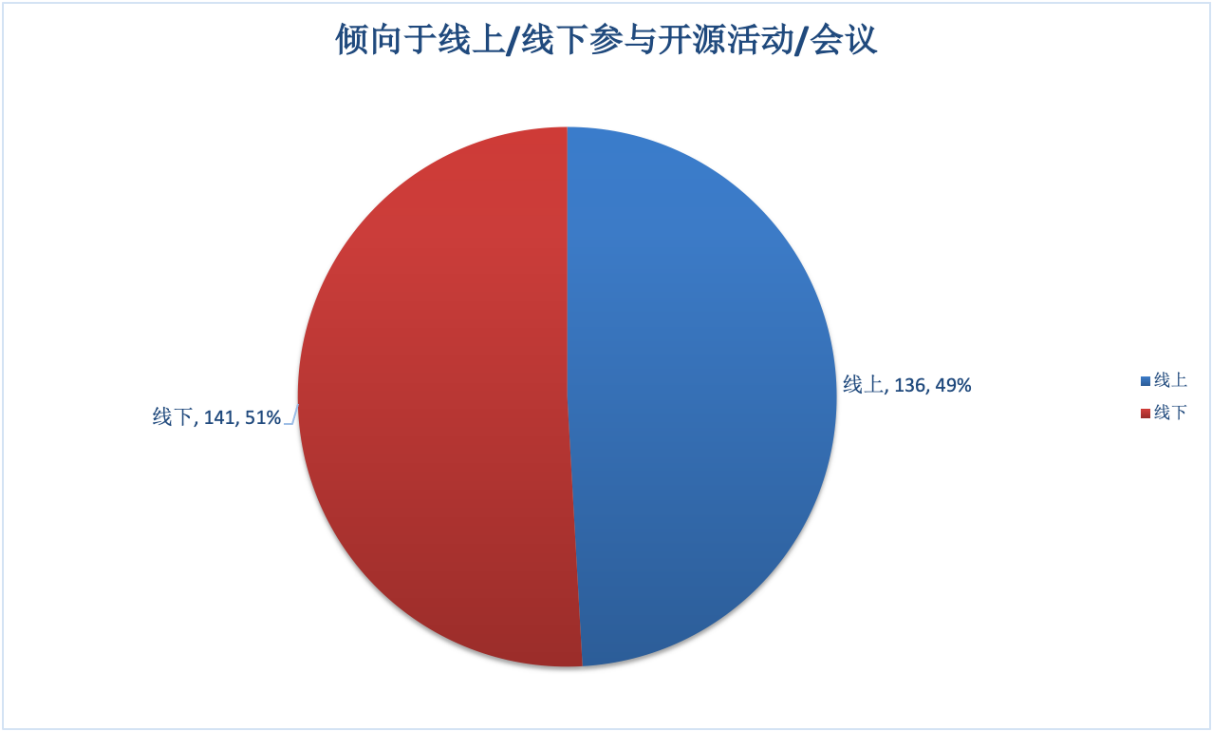
堵俊平：以机器人来代替一部分人为的工作是必然趋势，也是社区提高效率的关键。开源社区应当加大基础设施领域的创新，持续降低沟通成本，提升开发者体验。

Du Junping: Replacing some human work with robots is an inevitable trend and the key to efficiency in the community. The open source community should increase innovation in the area of infrastructure, continuously reduce communication costs, and improve the developer experience.

4.10 开源活动 / 4.10 Open Source Activities

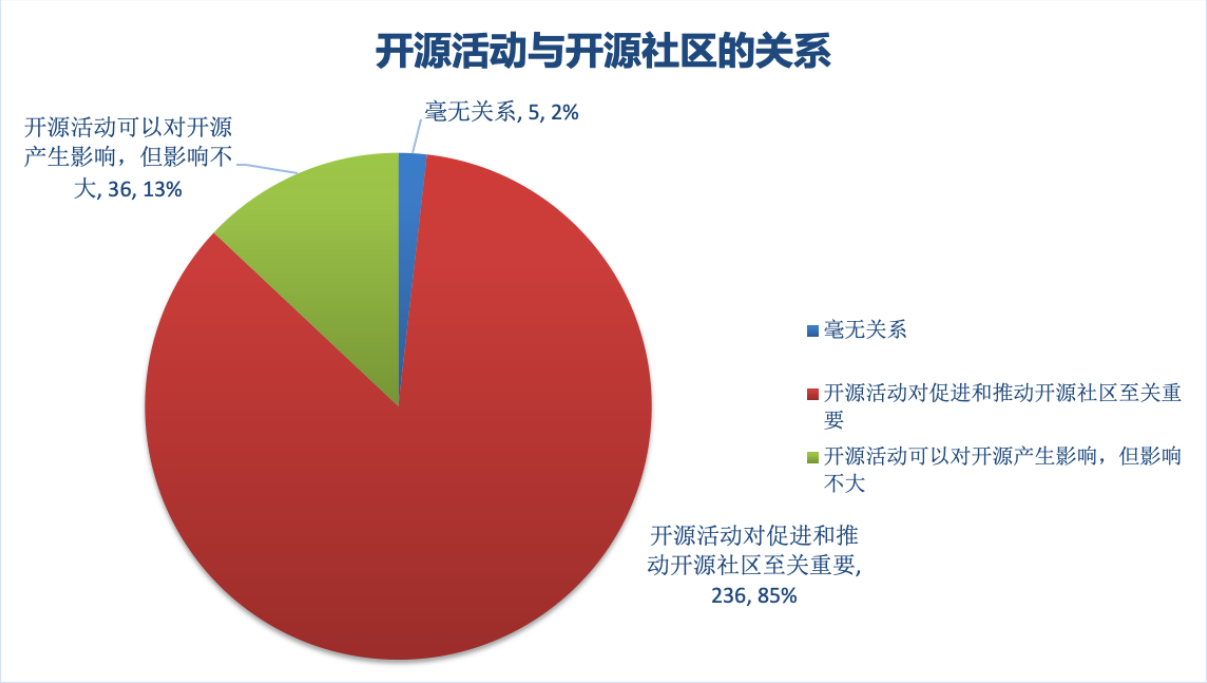
倾向于线上和线下参与开源活动/会议的受访者分别占比约 50%。

The percentage of respondents who prefer to participate in open source events/conferences online and offline account for about 50%, respectively.



85% 的受访者认为开源活动对促进和推动开源社区至关重要，与去年相比，有更多的受访者认可开源活动的价值。

85% of respondents believe that open source activities are critical to promoting and advancing the open source community, with more respondents recognizing the value of open source activities than last year.



【专家点评】/ [Expert Comment]

段夕华：线下占比接近一半是跟新冠疫情持续有关系，还是真进入了 Cyber 生存时代？

Duan Xihua: Is nearly half of the offline share related to the ongoing COVID-19 pandemic, or is it really into the Cyber survival era?

堵俊平：与二三十年前开源项目凤毛麟角的情况不同，当前各种开源项目层出不穷，只有通过有效的运营活动才能快速吸引开发者的眼球。“酒好不怕巷子深”的思路已经不再适用于开源项目推广。当然，要避免另一个极端，即过度包装和营销，开源最后还是要回归代码 - “talk is cheap, show me the code”.

Du Junping: Unlike the situation 20 to 30 years ago when open source projects were rare, various open source projects are emerging, and only through effective operational activities can quickly attract the attention of developers. The idea of "good wine needs no bush" is no longer applicable to open source project promotion. Of course, to avoid the other extreme, i.e., over-packaging and marketing, open source should finally return to the code - "talk is cheap, show me the code".

王蓉：后疫情时代，线下+线上的 hybrid event 将长期持续，但线下面对面的交流对开

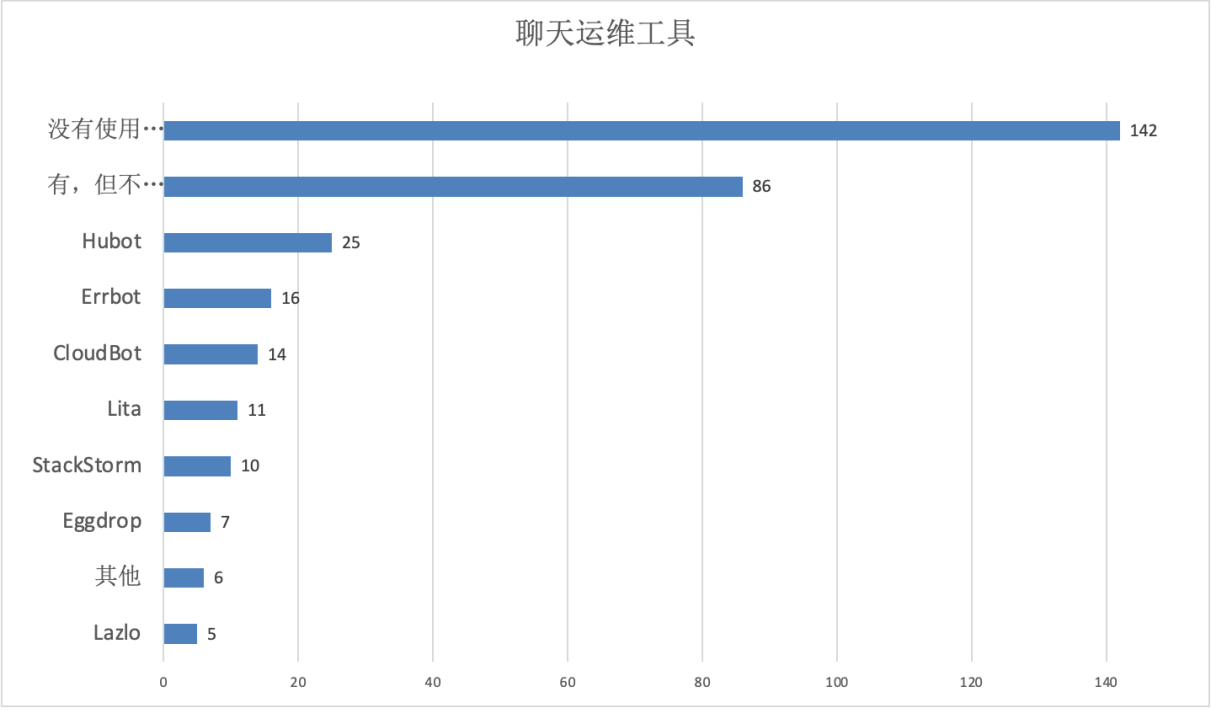
发者来说几乎是无法替代的体验，相信后续我们通过工具和形式创新，探索出合适合中国开发者的混合活动最佳实践。

Wang Rong: In the post-epidemic era, offline + online hybrid events will continue for a long time, but offline, face-to-face communication is almost an irreplaceable experience for developers, and we believe that we will explore the best practice of hybrid events suitable for Chinese developers through tools and format innovation.

4.11 聊天运维工具 / 4.11 ChatOps Tools

目前，绝大多数的受访者都没有使用过聊天运维工具来进行项目的自动化管理，而对于使用过该类工具的受访者来说，Hubot 是使用最多的聊天运维工具，而且多数人不清楚具体的技术细节。

Currently, the vast majority of respondents have not used a ChatOps tool to automate project management, and for those who have used such a tool, Hubot is the most used chat ops tool, and most are unsure of the specific technical details.

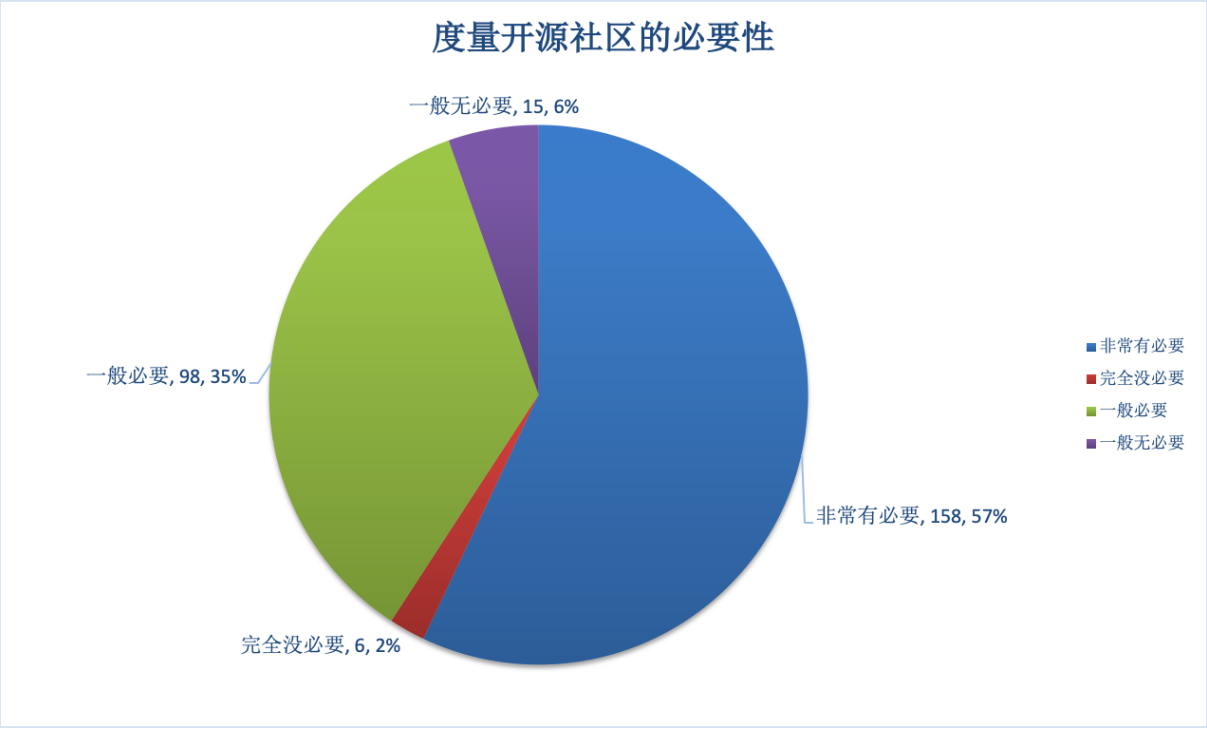


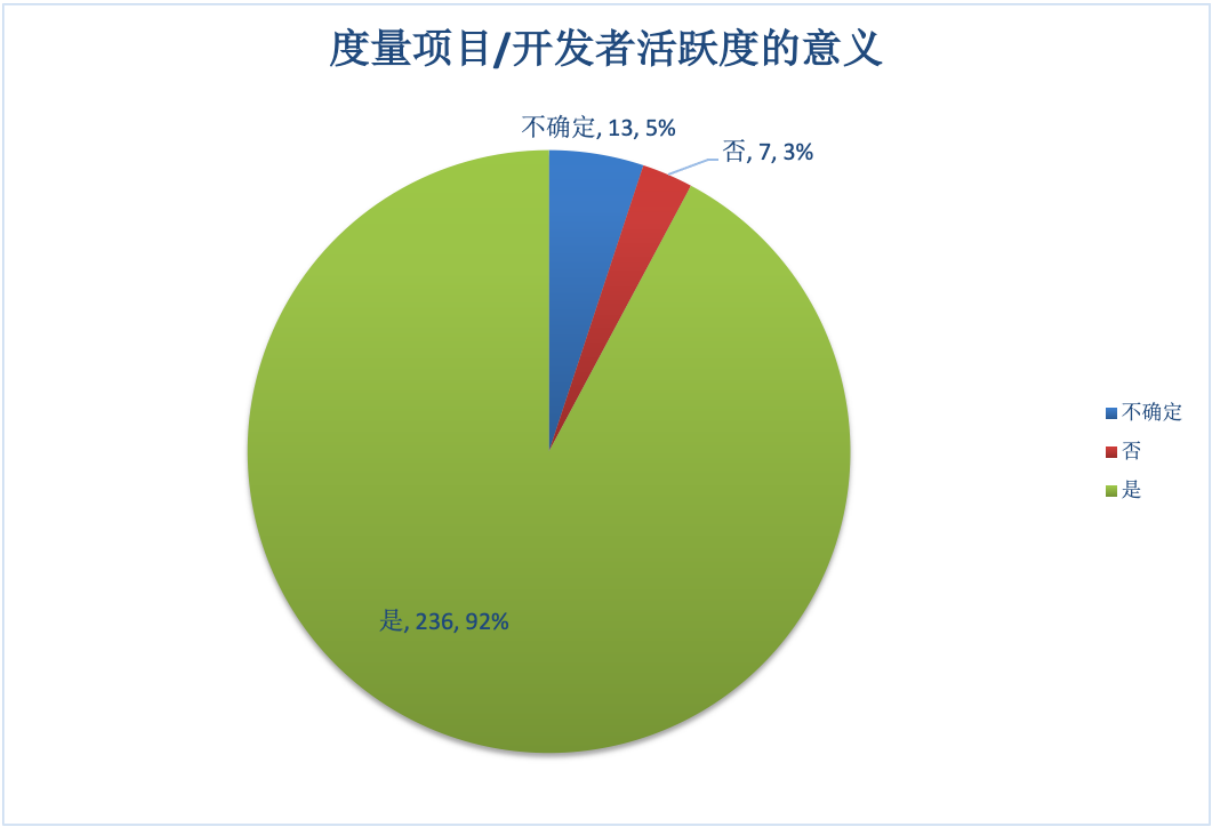
【专家点评】/ [Expert Comment]

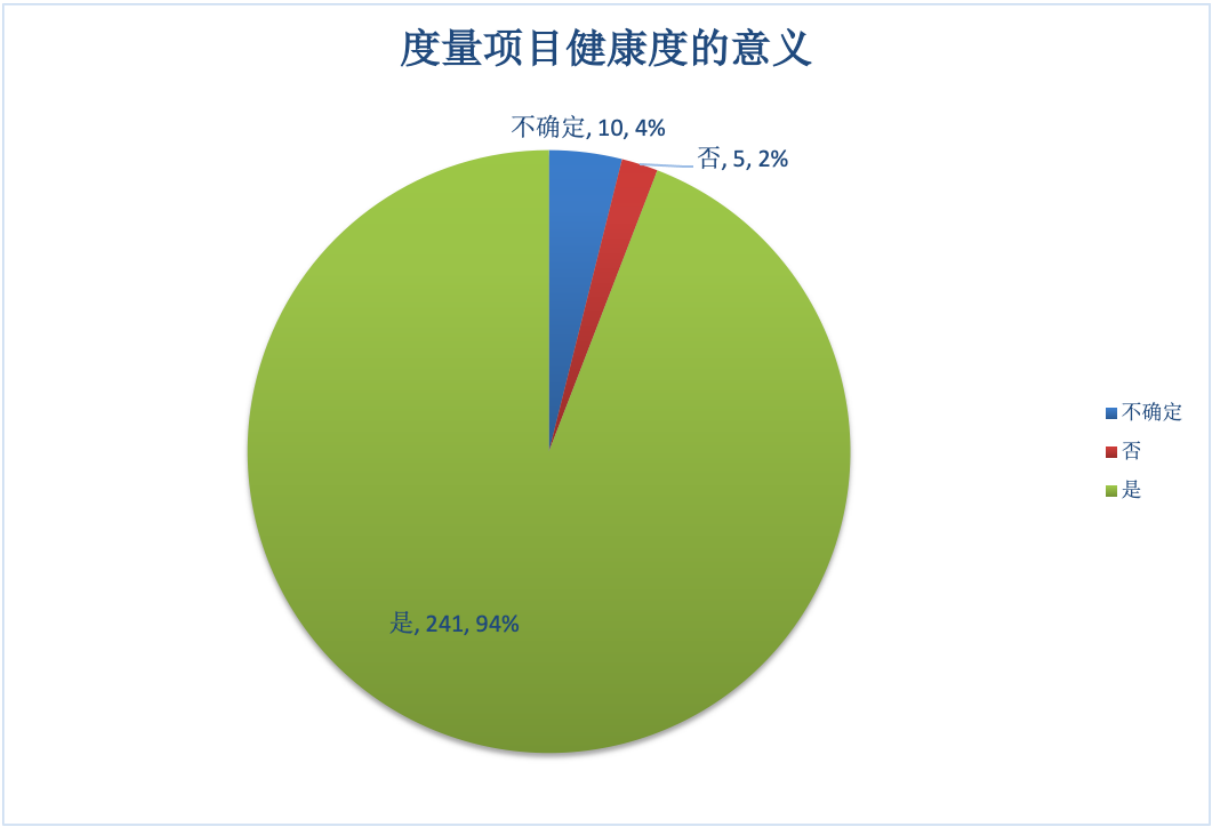
4.12 度量开源社区的必要性 / 4.12 The need to measure the open source community

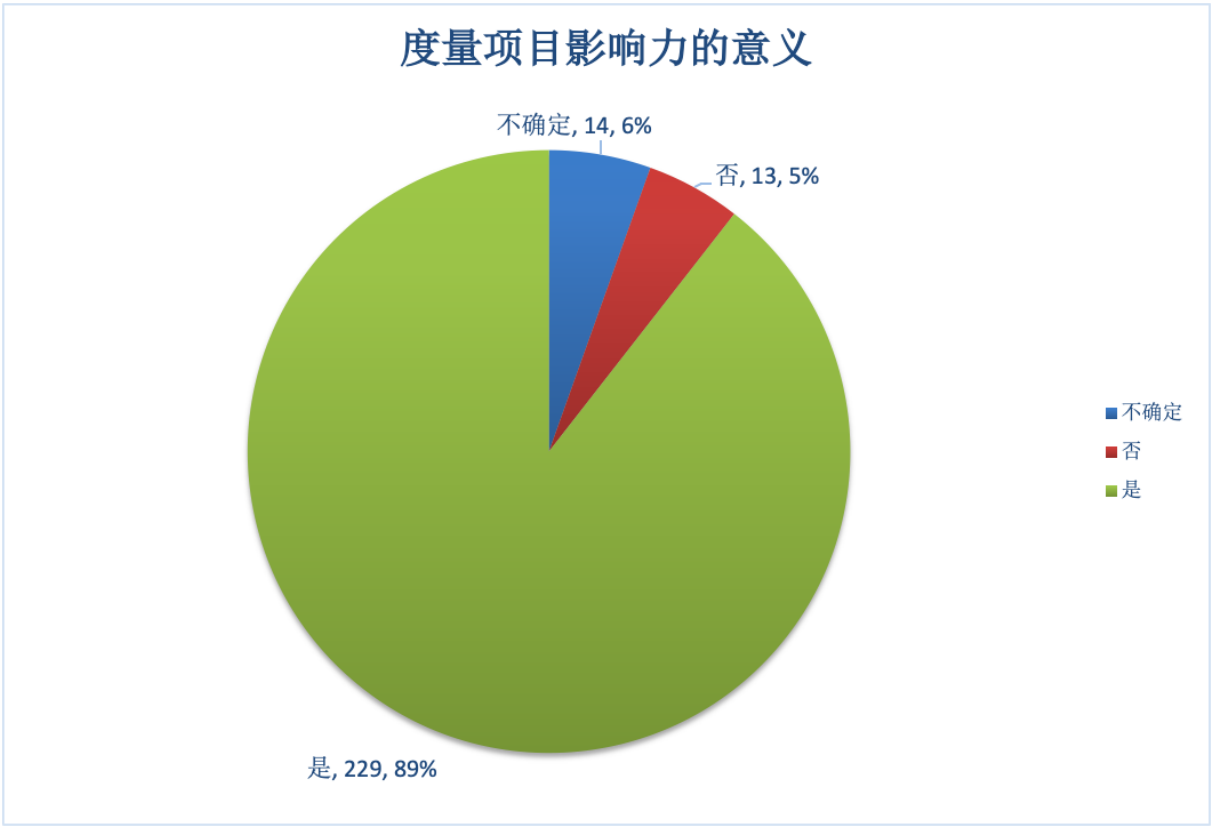
超过 9 成以上的受访者认为度量开源社区是有必要的，并且认可度量项目/开发者活跃度，项目健康度，项目影响力和开发者贡献度的意义。

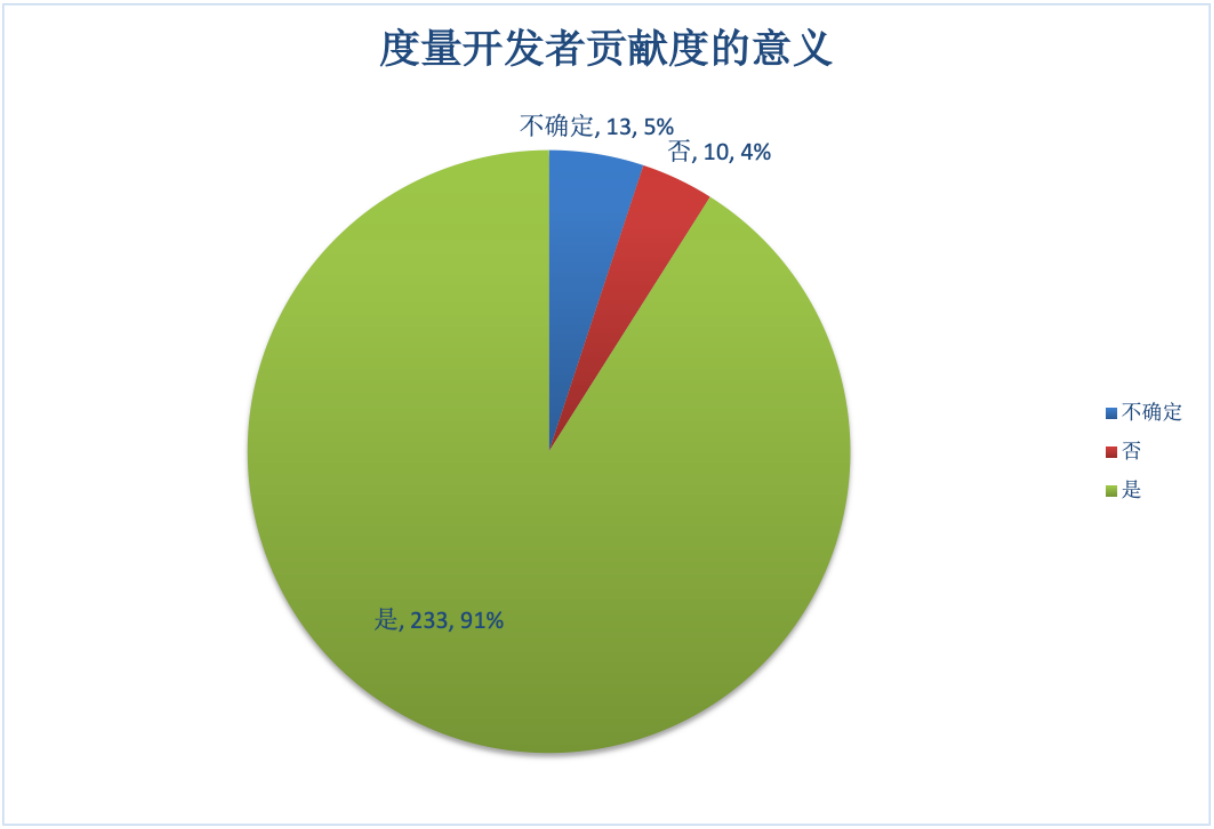
More than 90% of respondents believe it is necessary to measure the open source community and recognize the significance of measuring project/developer activity, project health, project impact and developer contributions.

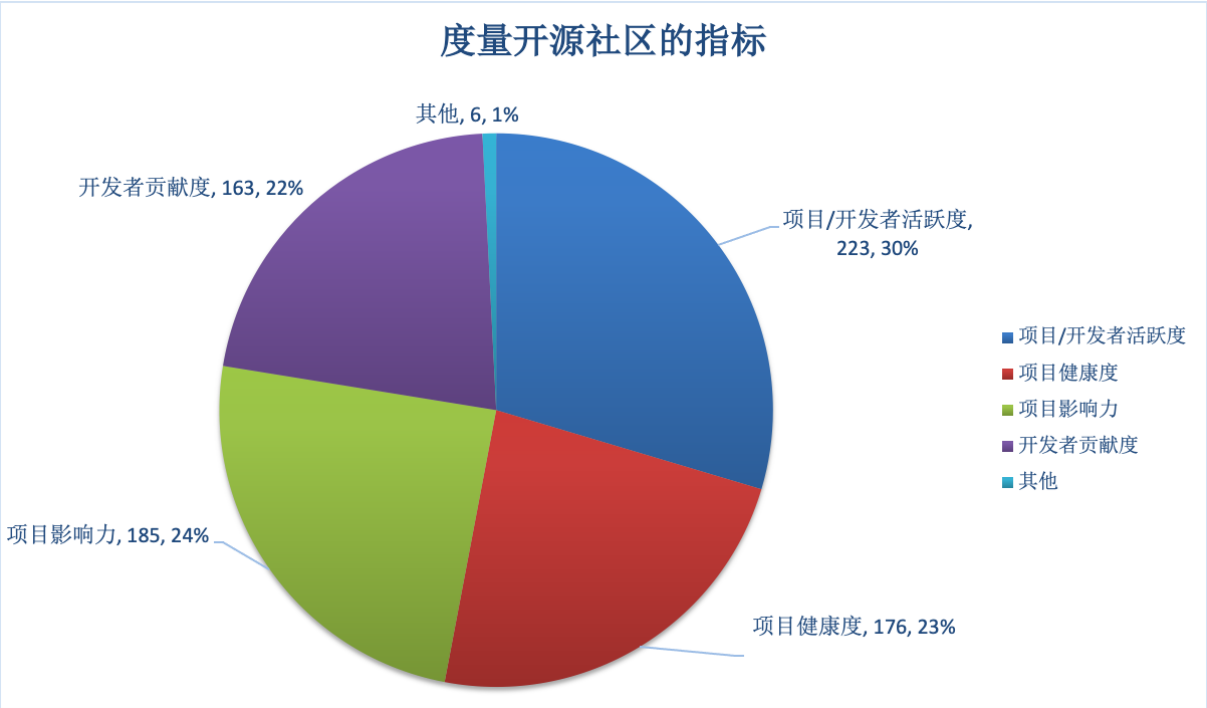



度量项目/开发者活跃度的意义
不确定, 13, 5%
否, 7, 3%
是, 236, 92%
不确定
否
是


度量项目健康度的意义
不确定, 10, 4%
否, 5, 2%
是, 241, 94%
不确定
否
是


度量项目影响力的意义
不确定, 14, 6%
否, 13, 5%
是, 229, 89%
不确定
否
是


度量开发者贡献度的意义
不确定, 13, 5%
否, 10, 4%
是, 233, 91%
不确定
否
是



【专家点评】/ [Expert Comment]

江波：可能是因为会花时间填问卷的人都是关注开源社区度量的群体。

Jiang Bo: Probably because the people who take the time to fill out the questionnaire are the ones who are concerned about the open source community metrics.

堵俊平：这客观上反映了成立 CHAOSS 项目的必要性。

Du Junping: This objectively reflects the need for the CHAOSS project.

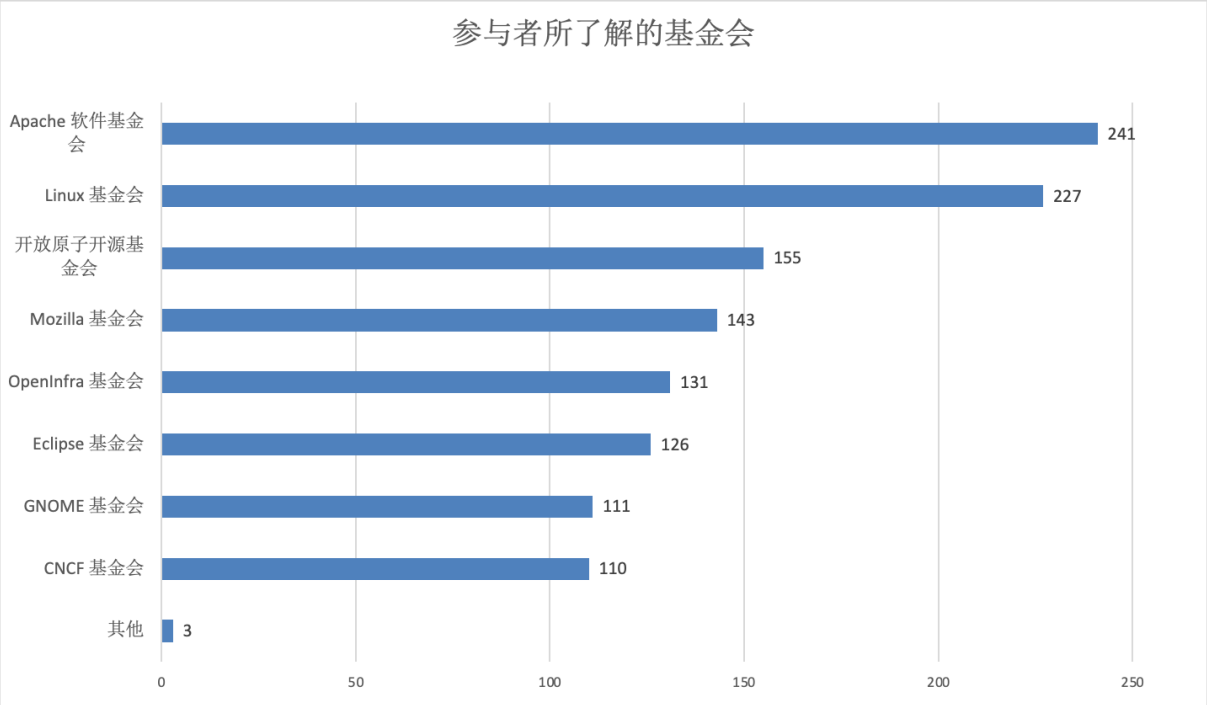
王蓉：虽然开发者对于开源度量的重要性表示任何，但目前业界对开源社区的度量指标有一些探索，但缺乏一个受社区普遍认可的、可自动化执行的一个工具或者说 index。希望 OpenDigger 项目后续在国际标准和自动化平台落地过程中能有关键进展。

Wang Rong: Although the developers expressed nothing about the importance for open source metrics, there are some explorations on open source community metrics in the industry, but there is a lack of a tool or index that is generally recognized by the community and can be implemented automatically. It is hoped that the OpenDigger project can make key progress in the subsequent implementation of international standards and automation platforms.

4.13 参与者所了解的基金会 / 4.13 What the participants know about the Foundation

受访者们了解 Apache 软件基金会和 Linux 基金会较多。

Respondents knew more about the Apache Software Foundation and the Linux Foundation.



【专家点评】/ [Expert Comment]

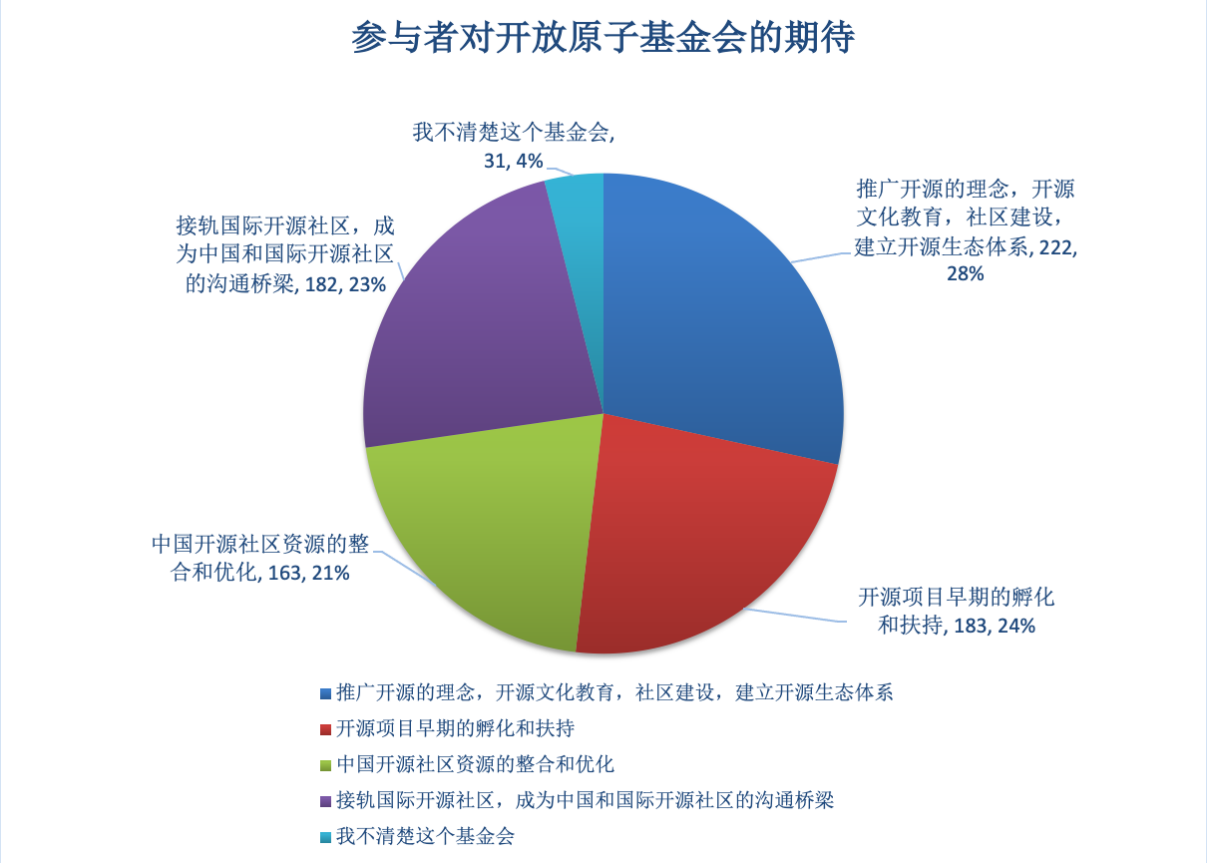
段夕华：排名前二的两个基金会一个得益于强大的社区治理能力，一个得益于灵魂人物的影响力。

Duan Xihua: The top two Foundations benefit from solid community governance and the influence of soul figures.

4.14 受访者对开放原子开源基金会的期待 / 4.14 What Respondents Expect from the OpenAtom Open Source Foundation

绝大多数受访者们对开放原子开源基金会持积极肯定的态度，可以推广开源的理念，开源文化教育，社区建设，建立开源生态体系，也可以接轨国际开源社区，成为中国和国际开源社区的沟通桥梁，同时还能够支持开源项目早期的孵化以及整合中国开源社区的资源。

The vast majority of respondents have a positive attitude towards the OpenAtom Open Source Foundation, which can promote the concept of open source, open source culture education, community building, and the establishment of an open source ecosystem, as well as serve as a bridge between the Chinese and international open source communities, and support the early incubation of open source projects and the integration of resources from the Chinese open source community.

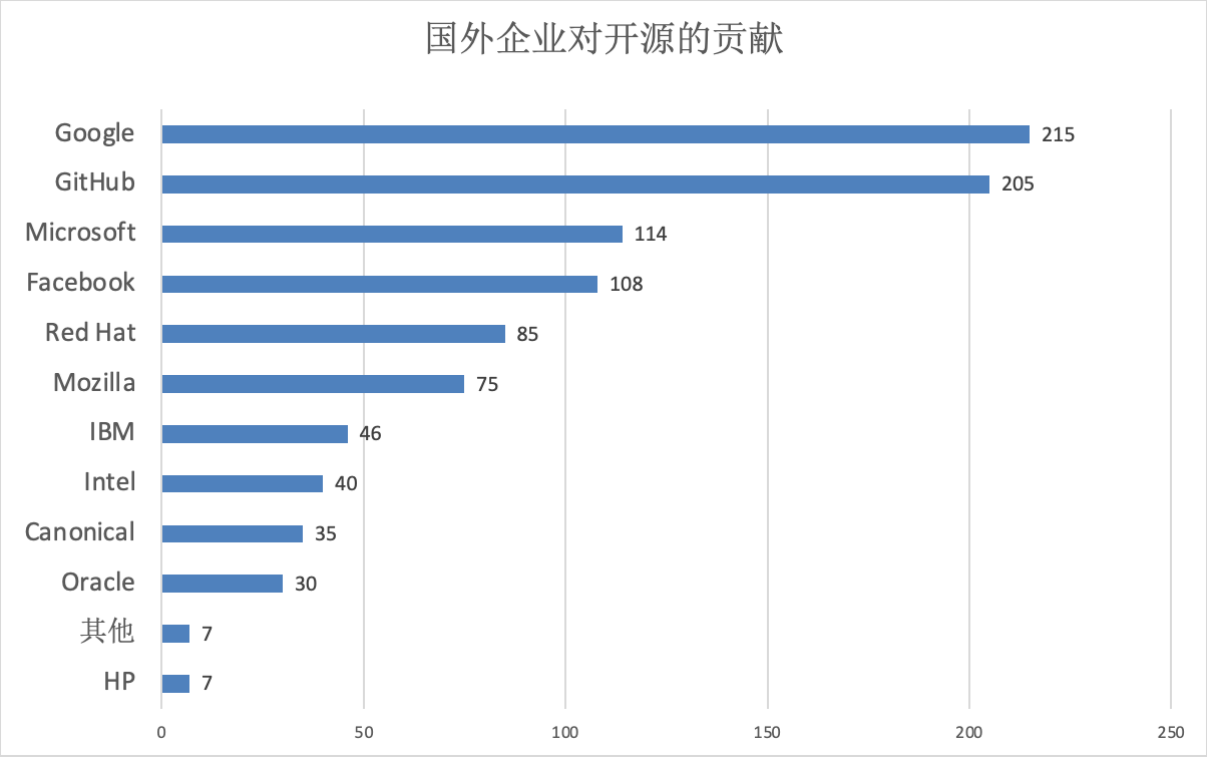


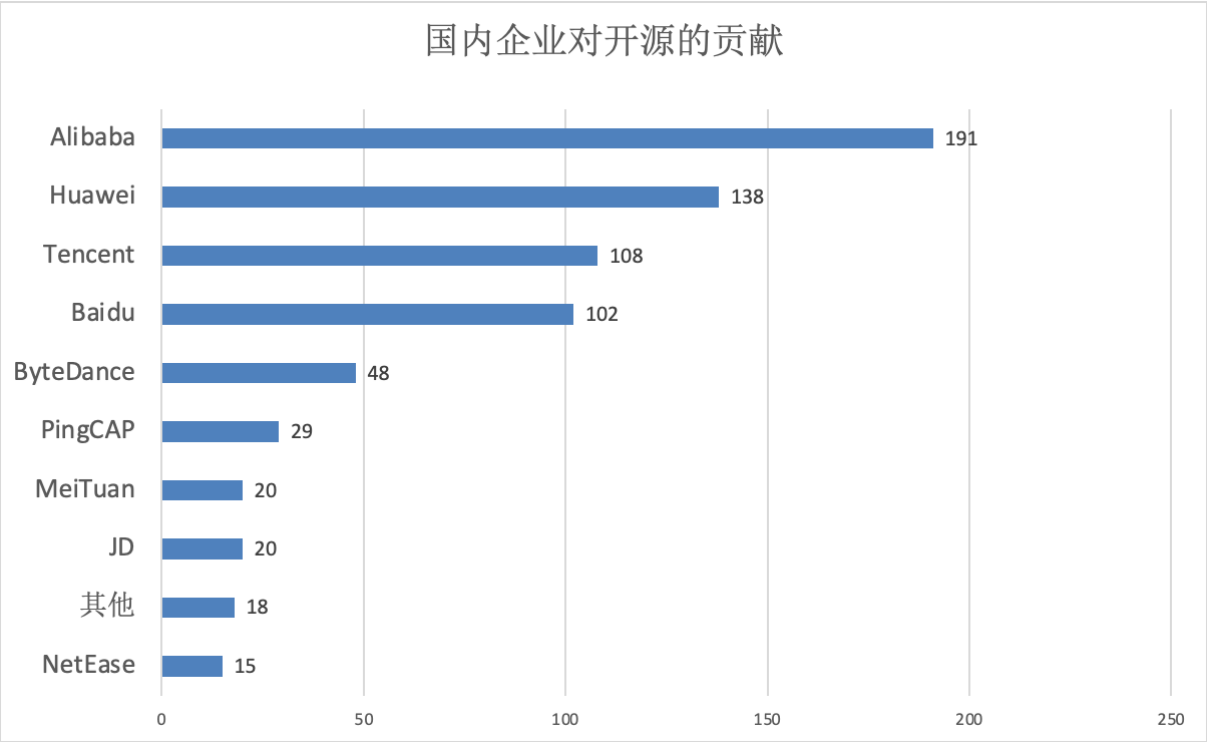
【专家点评】/ [Expert Comment]

4.15 企业对开源的贡献 / 4.15 Corporate Contribution to Open Source

受访者认为，在国内企业中，对开源贡献最大的 Top3 公司分别是 Alibaba、Huawei 和 Tencent；在国外企业中，Google 对于开源软件的贡献最大，其次是 Github。

Respondents believe that among domestic companies, the Top 3 companies that contribute the most to open source are Alibaba, Huawei, and Tencent; among foreign companies, Google contributes the most to open source software, followed by Github.





【专家点评】/ [Expert Comment]

段夕华：从 Ballmer 时代一个靠卖软件赚大钱的 ISV，华丽转身为如此有影响力的开源企业（Microsoft + 被收购的 GitHub），Satya 的战略眼光及非凡领导力令人侧目。

Duan Xihua: Satya's strategic vision and leadership is remarkable, going from an ISV that made a lot of money selling software in the Ballmer era to such an influential open source company (Microsoft + acquired GitHub).

5、总结 & 致谢 / 5 Summary & Acknowledgement

本次问卷在传播和收集过程中多有坎坷，最终呈现的不过是开源世界的小小一隅，但意义重大。见微知著，不难察觉到中国的开源结构已经在发生变化，开源的星星之火正在燎原，势不可当。希望这份报告能够抛砖引玉，吸引更多的社区和开发者加入。

This questionnaire had many bumps in the dissemination and collection process, and what we ended up with is just a tiny part of the open source world, but it is of great

significance. It is easy to see that the open source structure in China is already changing, and the flame of open source is starting a prairie. We hope this report will attract more communities and developers to join us.

该报告的问卷问题， 报告文档均发布在代码托管平台，开源社官方网站和合作伙伴网站平台，基于 Creative Commons Attribution-ShareAlike 4.0 International (CC BY-SA 4.0) 许可证协议分享。对于问卷的问题设计和报告内容有任何建议和想法，欢迎您在代码托管平台上提交 Patch，对报告进行补充和贡献。 您的一小步，整个中国开源社区的一大步。

The questionnaire questions and report documents are published on the code hosting platform, the official website of the Open Source Society, and partner websites and are shared under the Creative Commons Attribution-ShareAlike 4.0 International (CC BY-SA 4.0) license. If you have any suggestions and ideas about the questionnaire design and report content, you are welcome to submit a patch on the code hosting platform to add and contribute to the report—one small step for you, one giant step for the whole Chinese open source community.

2021 中国开源年度报告•数据篇

2021 China Open Source Annual Report ·Data

GitHub 数据 GitHub Data

说明 Description

为了方便后续处理，每个表格后都附上了 csv 文件。Each table has a csv file attached to it for ease of follow-up.

活跃度公式 Activity formula：

$$A_{actor} = issueComment * 1 + openIssue * 2 + openPull * 3 + pullReview * 4 + mergePull * 2$$

$$A_{repo} = \sum \sqrt{A_{actor}}$$

注：项目的活跃度只考虑开发者在当前项目中的行为数据。
Note: The project's activity only considers the developer's behavior data in the current project.

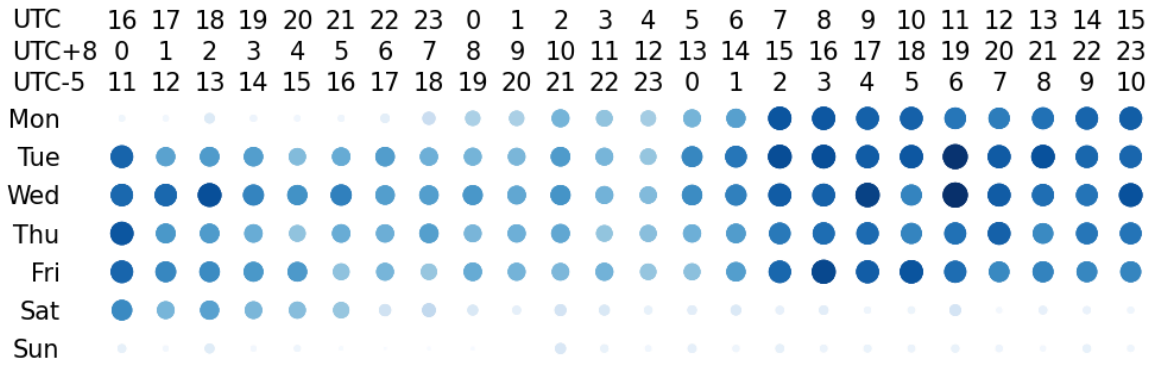
一、 世界活跃度排名 Top10

World Activity Ranking Top 10

	repo_name	activity_score	actor_num	IssueComment	Ope
0	microsoft/vscode	31588.348534629700	40824	84383	2105
1	flutter/flutter	28688.557094674100	45907	133616	1368
2	MicrosoftDocs/azure-docs	24185.28887550640	14883	55594	1099
3	home-assistant/core	23395.095389176700	23412	72387	6229
4	NixOS/nixpkgs	19705.13323096400	6591	96142	4002
5	education/GitHubGraduation-2021	15899.306207139600	10112	2970	210
6	kubernetes/kubernetes	15374.946781275100	19451	169451	2584
7	firstcontributions/first-contributions	15056.680154689000	20255	7828	106
8	pytorch/pytorch	15021.932022448100	15618	80426	5336
9	dotnet/runtime	13663.644119775200	7816	82210	7011

VSCode 工作时间分布打孔图

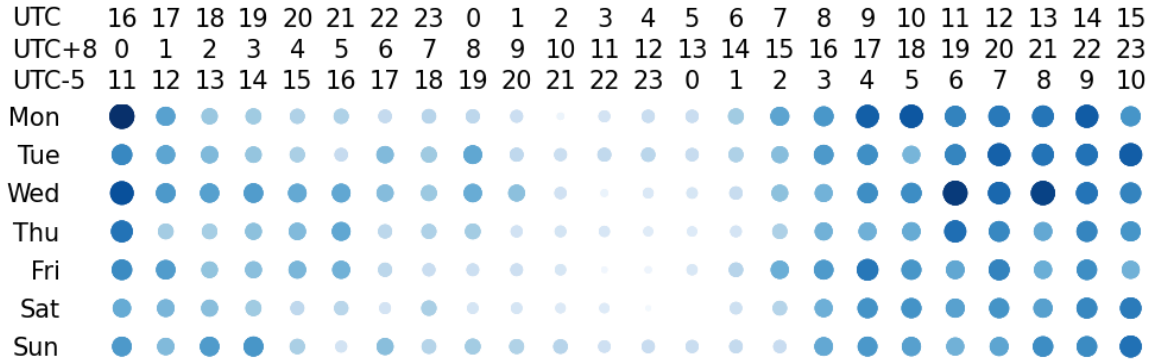
VSCode Punch Chart for Work Time Distribution



VSCode is a deserved international open source project, with many participants and a wide range of regions, whether from the activity and specific data or the visual punch chart.

NixOS/nixpkgs 工作时间分布打孔图

NixOS/nixpkgs Punch Chart for Work Time Distribution



每一位开发者在使用 Linux 的过程中想必都遭受过软件包版本冲突的痛苦折磨。NixOS 系统以非常出色的包管理工具获取了一大批粉丝。一年过去了，NixOS/nixpkgs 仍然以非常高的活跃度位居榜单前列，期待未来有更出色的表现。

Every developer who has used Linux has suffered from package version conflicts.

The NixOS system has gained a vast fan base with its excellent package management tools. One year later, NixOS/nixpkgs is still at the top of the list with a very high level of activity, and we expect even better performance in the future.

【专家点评】

二、 中国活跃度排名 Top30

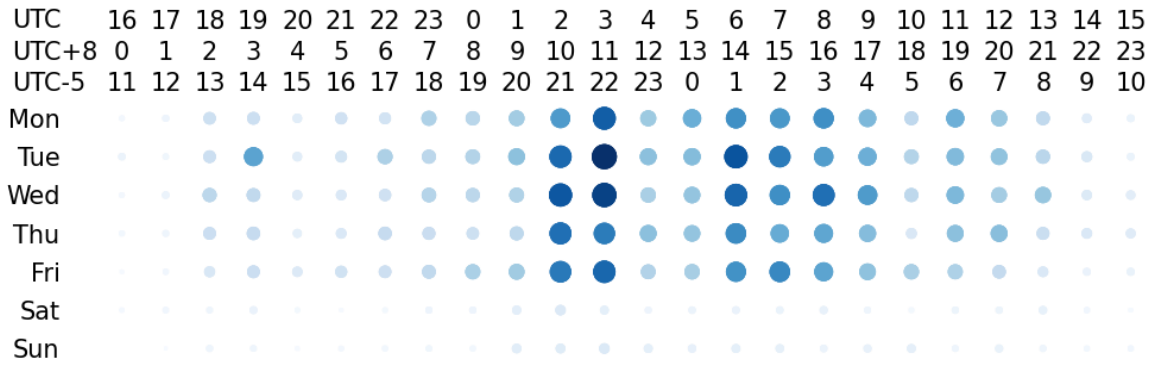
China Activity Ranking Top30

	repo_name	activity_score	actor_num	IssueCom
0	PaddlePaddle/Paddle	6490.893754947870	5756	18979
1	ant-design/ant-design	6429.396422527120	86368	13139
2	pingcap/tidb	4504.277250498670	4807	60968
3	apache/flink	3812.1036709421400	4724	13676
4	PaddlePaddle/PaddleOCR	3461.304851224500	12519	8103
5	alibaba/nacos	3340.324913238220	9188	6504
6	apache/echarts	3239.266718113420	9054	7644
7	NervJS/taro	3004.098359530620	4507	5132
8	ant-design/pro-components	2927.8060839373400	2661	7240
9	apache/tvm	2795.6354982857400	2232	7060
10	apache/shardingsphere	2726.6591767756100	3334	8224
11	ant-design/ant-design-pro	2386.770151344300	5650	4363
12	PaddlePaddle/PaddleDetection	2336.730078084980	4787	5619
13	apache/apisix	2294.935367133850	4382	6520
14	apache/dolphinscheduler	2102.7012870620900	3092	9141

15	apache/dubbo	1907.2779679868600	5044	4904
16	tikv/tikv	1900.5971171139700	2408	18928
17	ElemeFE/element	1889.4662450783600	6456	2601
18	apache/skywalking	1886.7815310808000	3880	5747
19	youzan/vant	1816.3786862426800	5068	2880
20	pingcap/docs-cn	1731.7751205852300	550	13593
21	tencentyun/qcloud-documents	1458.6199483344500	1736	232
22	apache/incubator-doris	1360.2758552459300	2037	2530
23	alibaba/canal	1318.7773231110300	5667	1408
24	PaddlePaddle/Paddle-Lite	1310.0607139415400	900	3148
25	seata/seata	1300.1371157709100	5354	2290
26	apache/rocketmq	1289.296138641670	4935	2508
27	pingcap/docs	1284.511159382570	292	12602
28	PaddlePaddle/PaddleNLP	1263.2950848178900	2751	1682
29	dcloudio/uni-app	1221.6597928046800	8034	1887

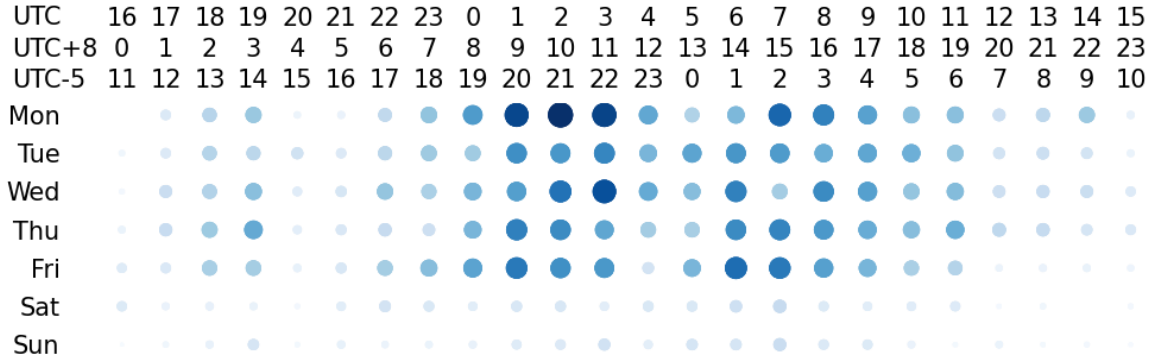
PaddlePaddle/Paddle 工作时间分布打孔图分析

PaddlePaddle/Paddle Punch Chart Analysis for Work Time Distribution



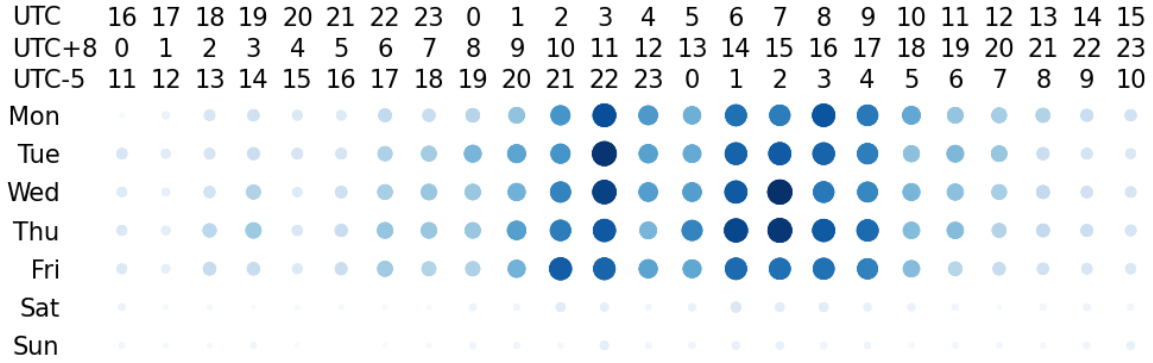
ant-design/ant-design 工作时间分布打孔图分析

ant-design/ant-design Punch Chart Analysis for Work Time Distribution



pingcap/tidb 工作时间分布打孔图分析

Pingcap/tidb Punch Chart Analysis for Work Time Distribution



【专家点评】[Expert Comment]

王蓉：期待后续榜单能以项目为单位聚合同一个大项目的 repository，这样我们&开发者能看到更多的 top 中国开源项目。

Expect the subsequent list to aggregate the repository of the same big project as a unit, so developers & we can see more top Chinese open source projects.

段夕华：我觉得以 actor 和 comment 来衡量项目的活跃度也似乎也有失偏颇，小体量的工具类开源项目如 node.js 的 co、java 的 fastjson 一般这两个数字也不会很大，但被四处应用，star 数也不少。为保证公平起见，我觉得可以考虑以上数字除以代码行数，另外，挤掉水分后的 star 和 fork 还是蛮有说服力的。

In my opinion, it seems biased to measure the activity of projects by actor and comment. Small open source tool projects, such as Node. js CO and Java Fastjson are generally not very large, but they have applied around, and the number of stars is quite large. To ensure fairness, I think we can divide the number by the number of lines of code, and the star and fork numbers are pretty convincing when trimmed down.

三、 中国企业开源数据分析（按活跃度排序）

Open Source Data aAnalysis of Chinese Enterprises (ranked by Activity)

	company	activity_score	repo_count	IssueComment
0	Alibaba	67313.50639564990	1618	114414
1	Baidu	35131.39188072020	457	65409
2	PingCAP	20840.195083348700	161	164912
3	Tencent	16685.444738129700	467	19846
4	Huawei	7215.673369556140	115	22811
5	QingCloud	4672.3901126582900	92	24127

6	JD	4503.940913137800	76	6382
7	Vesoft	4047.862723685400	44	4183
8	Bytedance	3368.500559151240	130	3200
9	Youzan	3162.898633104100	57	4139
10	DiDi	2385.4796437905700	76	2128
11	WeBank	1987.3315787514700	65	1510
12	Deepin	1825.5841496085300	159	4354
13	DCloud	1729.8888508276500	45	2331
14	Netease	1546.7604242230700	144	3350
15	Juejin	1372.4099310206000	25	3819
16	Xiaomi	1177.3574228246100	74	893
17	CTrip	964.1939061432820	39	2039
18	Bilibili	955.5404317482340	56	854
19	360	762.400266076533	158	544
20	Meituan	746.7820566082150	94	611
21	Linux China	638.14974023683	15	168
22	Qunar	134.68800391188700	31	115
23	Vipshop	104.16067908342300	13	46

24	Douban	80.63226391691720	40	43

【专家点评】[Expert Comment]

四、 Apache 基金会中国项目活跃度分析 Top20

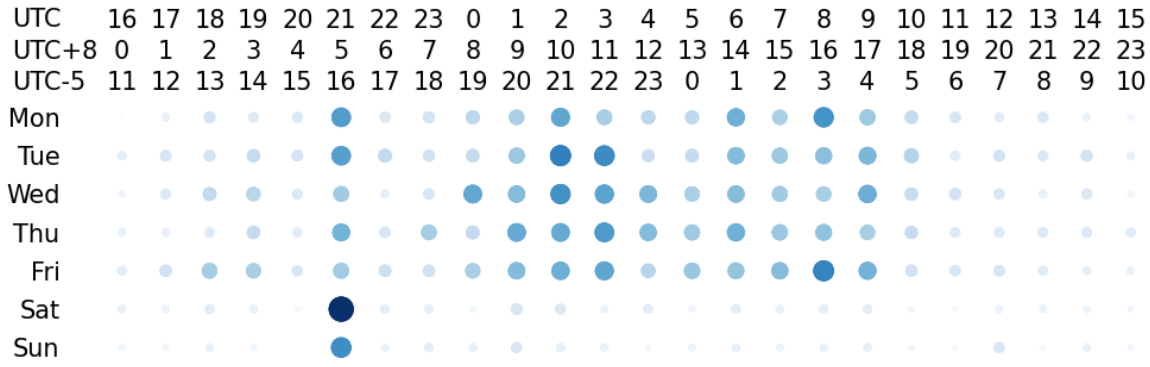
Apache Foundation: China Project Activity Analysis Top20

	repo_name	activity_score	actor_num	Is
0	apache/echarts	3239.2667181134200	9054	7
1	apache/shardingsphere	2726.659176775610	3334	8
2	apache/apisix	2294.9353671338500	4382	6
3	apache/dolphinscheduler	2102.7012870620900	3092	9
4	apache/dubbo	1907.2779679868600	5044	4
5	apache/skywalking	1886.7815310808000	3880	5
6	apache/incubator-doris	1360.2758552459300	2037	2
7	apache/incubator-shenyu	1323.5012404827600	3209	3
8	apache/rocketmq	1289.296138641670	4935	2
9	apache/iotdb	1255.1558471370900	900	3
10	apache/ozone	1097.2327026122800	298	2

11	apache/incubator-kyuubi	622.060165093585	675	2
12	apache/incubator-brpc	484.79766944803200	2162	6
13	WeBankFinTech/Linkis	446.81373349117800	753	2
14	apache/servicecomb-java-chassis	436.85745475127800	311	1
15	apache/carbondata	435.6278595553300	227	3
16	apache/incubator-eventmesh	326.881269064158	454	8
17	apache/incubator-inlong	323.4432153113160	249	5
18	apache/kylin	242.6255538056750	495	4
19	apache/incubator-pegasus	142.54539298975000	208	1

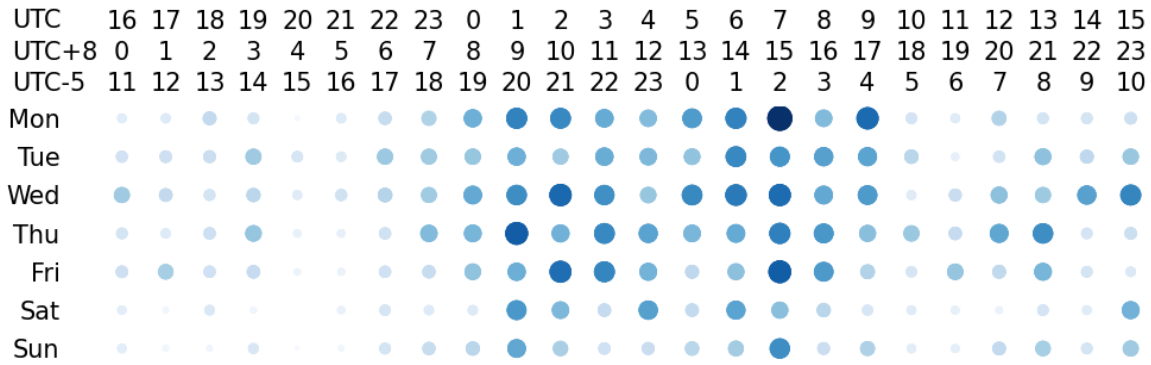
apache/echarts 工作时间分布打孔图

apache/echarts Punch Chart for Work Time Distribution



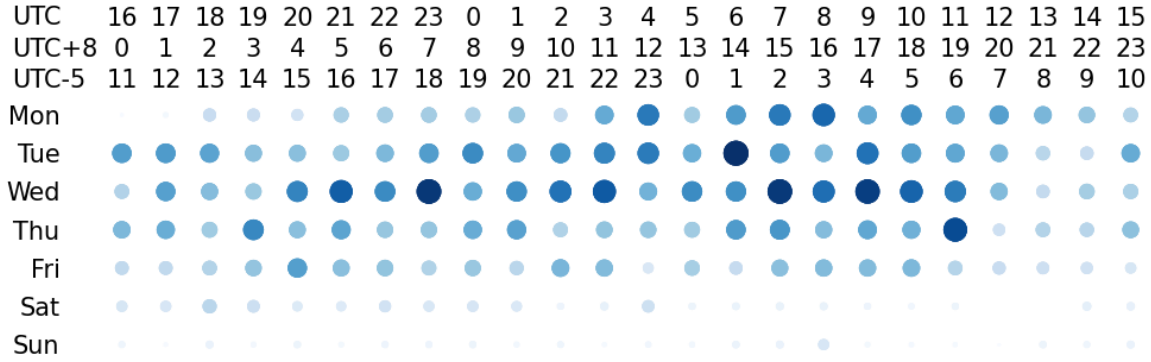
apache/skywalking 工作时间分布打孔图

apache/skywalking Punch Chart for Work Time Distribution



apache/ozone 工作时间分布打孔图

apache/ozone Punch Chart for Work Time Distribution



【专家点评】[Expert Comment]

五、 CNCF 中国项目活跃度分析 Top20

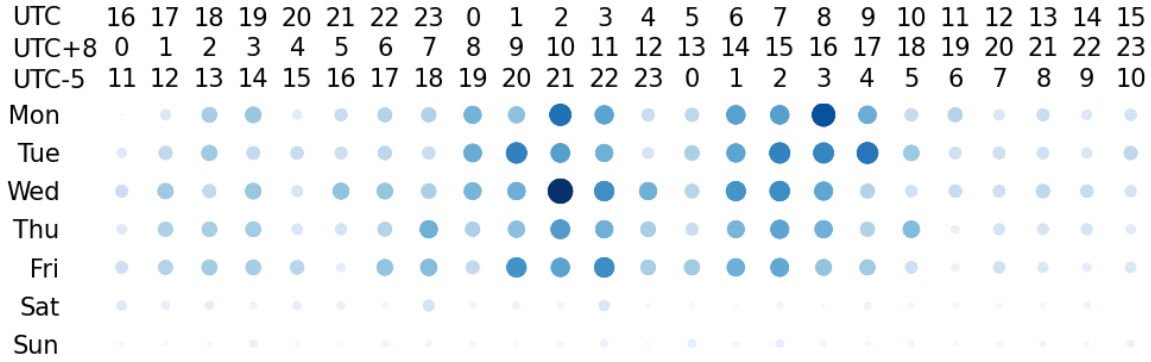
CNCF: China Project Activity Analysis Top20

	repo_name	activity_score	actor_num
0	goharbor/harbor	2261.3601682391200	4120
1	k3s-io/k3s	2017.4619445235600	4565

2	tikv/tikv	1900.5971171139700	2408
3	kubeedge/kubeedge	1132.2193445010600	1653
4	oam-dev/kubevela	1006.0651186399000	2135
5	chaos-mesh/chaos-mesh	958.7506461130560	1459
6	volcano-sh/volcano	692.3775535617090	921
7	karmada-io/karmada	671.0238190222060	1882
8	openyurtio/openyurt	503.44490330210500	550
9	openkruise/kruise	465.3581786368680	938
10	fluid-cloudnative/fluid	434.48305156680300	697
11	WasmEdge/WasmEdge	350.6752188723470	1805
12	alibaba/inclavare-containers	315.1785460390370	293
13	nocalhost/nocalhost	257.4690236714800	910
14	kubeovn/kube-ovn	249.00750121389600	478
15	dragonflyoss/Dragonfly2	235.42638688717200	239
16	superedge/superedge	224.54387840392600	567
17	chaosblade-io/chaosblade	195.34852104934100	1183
18	alibaba/libvineyard	173.6986117449970	545
19	bfenetworks/bfe	173.2188444336170	1048

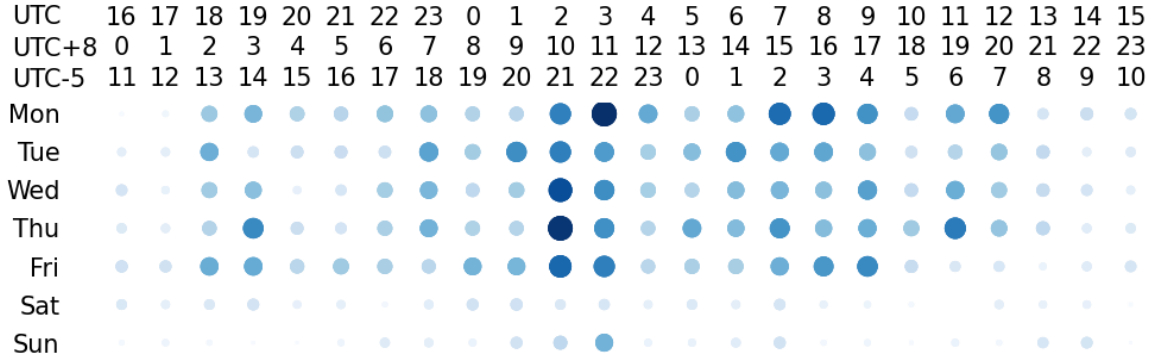
goharbor/harbor 工作时间分布打孔图

goharbor/harbor Punch Chart for Work Time Distribution



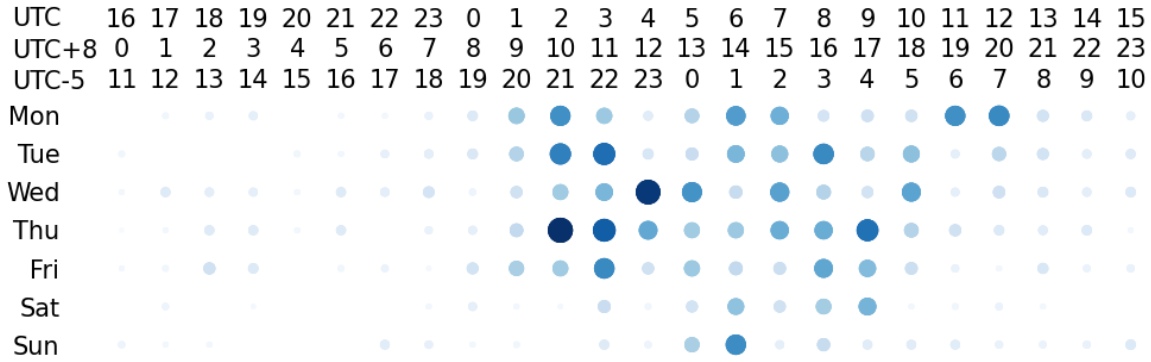
oam-dev/kubevela 工作时间分布打孔图

oam-dev/kubevela Punch Chart for Work Time Distribution



kubeovn/kube-ovn 工作时间分布打孔图

kubeovn/kube-ovn Punch Chart for Work Time Distribution



【专家点评】[Expert Comment]

六、 Linux Foundation 中国项目活跃度排名 Top20

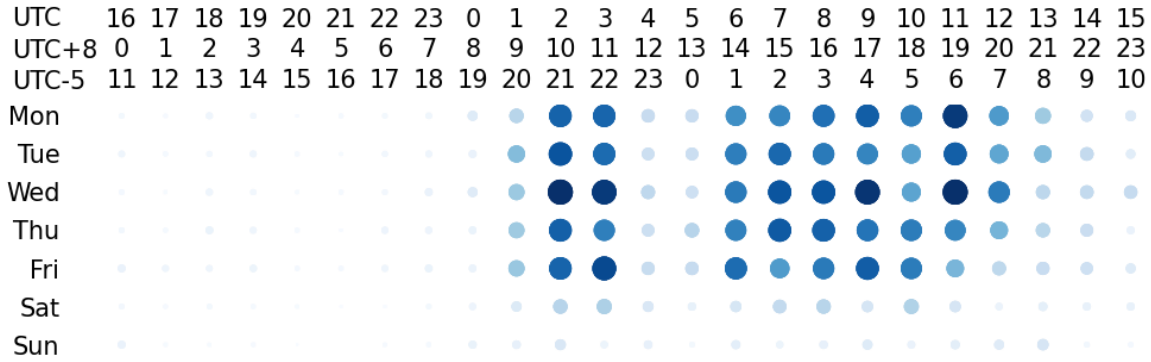
Linux Foundation: China Project Activity Analysis Top20

	repo_name	activity_score	actor_num
0	milvus-io/milvus	2172.3983776531900	4756
1	onnx/onnx	1065.554415393090	3294
2	kubeflow/kfserving	909.2438621878980	934
3	horovod/horovod	830.6332018793580	1908
4	feast-dev/feast	820.4038654049590	1541
5	amundsen-io/amundsen	816.8099402310110	1749
6	projectacrn/acrn-hypervisor	790.6254099991450	272

7	flyteorg/flyte	599.7098834735150	830
8	quantumblacklabs/kedro	548.7625383934240	1726
9	cloud-hypervisor/cloud-hypervisor	499.94850252068700	638
10	Trusted-AI/adversarial-robustness-toolbox	495.1682899579140	1046
11	JanusGraph/janusgraph	452.257302447994	788
12	odpi/egeria	442.3088745250530	262
13	nnstreamer/nnstreamer	401.14770486033800	172
14	ludwig-ai/ludwig	368.3889881473260	857
15	MarquezProject/marquez	354.3991906502730	515
16	sodafoundation/delfin	323.6957702838480	47
17	occlum/occlum	287.9466009897750	407
18	pyro-ppl/pyro	284.0450624621440	807
19	lf-edge/ekuiper	260.533337267565	372

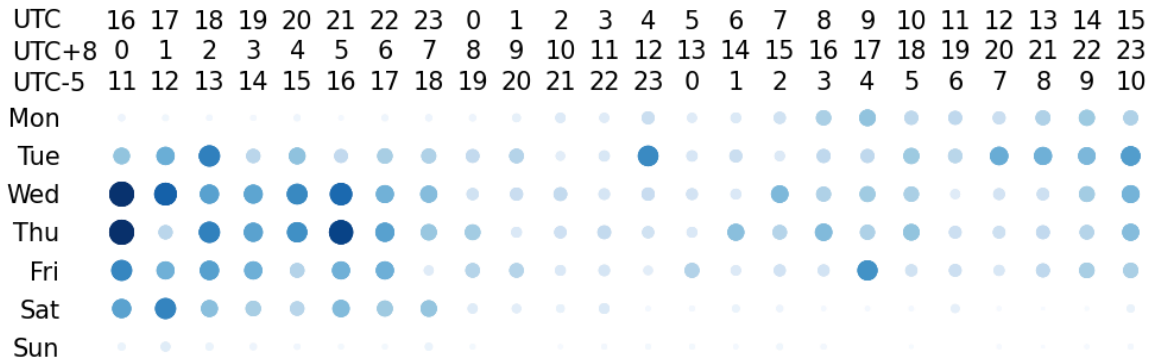
milvus-io/milvus 工作时间分布打孔图

milvus-io/milvus Punch Chart for Work Time Distribution



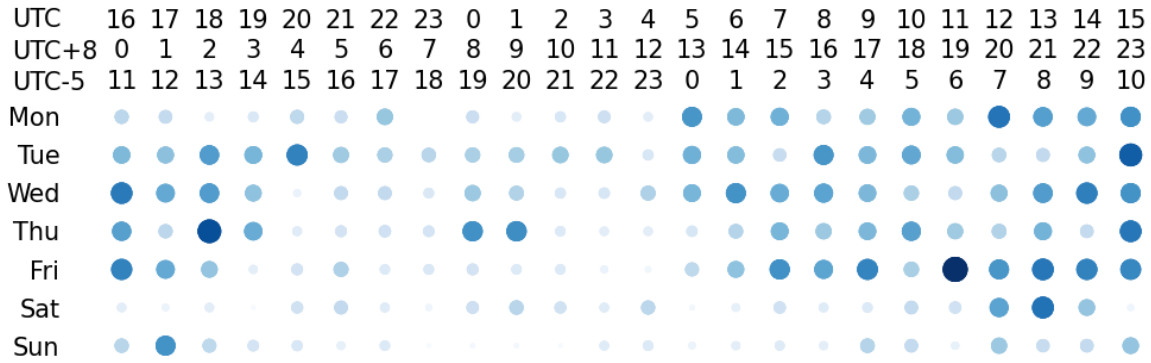
onnx/onnx 工作时间分布打孔图

onnx/onnx Punch Chart for Work Time Distribution



kubeflow/kfserving 工作时间分布打孔图

kubeflow/kfserving Punch Chart for Work Time Distribution



【专家点评】[Expert Comment]

Gitee 数据

Gitee Data

1. 概述

Gitee 是开源中国旗下的代码托管平台，至今已有超过 800 万开发者用户。我们对托管在 Gitee 的开源项目进行了统计分析，梳理和解读编程语言、功能分布的变化趋势，分析开发者在 Gitee 参与开源的情况，以期为观察国内开源的演进提供一个 “本土平台” 视角。

Gitee is the code hosting platform of Open Source China which has over 8 million users. We have conducted a statistical analysis of the open source projects hosted on Gitee to understand the changing trends in programming languages and feature distribution and analyzed how developers participate in open source on Gitee to provide a "local platform" to observe the evolution of open source in China.

2.主要内容与发现 Key Findings

2.1 总体趋势 General Trends

- 2021 年 Gitee 上托管的代码仓库超过了 2000 万。

  Over 20 million code repositories hosted on Gitee in 2021

- 2021 年 Gitee 用户总量超过 800 万。

  Over 8 million total Gitee users in 2021

2.2 总体语言趋势 General Language Trends

排名 Ranking	语言 Language	占比 Percentage	排名变化

			Ranking change
1	Java	49.28%	●
2	JavaSript	12.07%	●
3	Python	6.92%	↑1
4	PHP	5.22%	↓ 1
5	Golang	4.29%	↑3
6	C#	3.81%	↓ 1
7	C++	3.24%	↑2
8	C	2.60%	↑3
9	HTML	2.53%	↑1
10	Android 开发语言 Android development languages	1.89%	↓4

注：Android 开发语言为 Java 和 Kotlin，这里为了跟后端的 Java 做区分所以用 Android 概括。

Java 作为国内目前应用最广泛的语言，在 2021 年仍保持着强大的竞争力，仓库数量在极高存量的情况下仍有不错的增长态势，使用 Java 的仓库数量占比超越了 2020 年的 37%，回到了 2019 年的 50%左右。

移动端语言（Android/Objective-C/Swift）在 2021 年仍难以重现往日的辉煌，仅剩下 Android 以 1.89% 的占比留在第十名，这与跨平台开发框架和各类小程序越来越流行不无关系，移动端原生 App 在未来的发展路线会是怎样？这个问题值得持续关注。

Note: The Android development languages are Java and Kotlin, summarised here in Android to differentiate them from Java on the back end.

Java, currently the most widely used language in China, remains strong in 2021, with good growth in the number of repositories despite the very high stock, with the number of repositories using Java surpassing 37% in 2020 and returning to around 50% in 2019.

The mobile languages (Android/Objective-C/Swift) are still struggling to regain their former glory in 2021, with only Android remaining in 10th place with 1.89%. It is worth keeping an eye on this question.

2.3 增速最快语言 Fastest Growing Language

排名 Ranking	语言 Language	2021 增幅 rate of increase
1	Erlang	226.85%
2	Pascal	153.16%
3	Rust	115.01%
4	Verilog	84.54%
5	TypeScript	81.12%
6	Tex / LaTex	80.68%
7	R	69.64%
8	汇编语言 Assembly Language	60.9%

9	PowerShell	60.65%
10	Kotlin	59.96%

- Rust 连续三年保持高速增长，增长率均超过 110%。
- 2021 年基础软件在国内热度持续走高，Verilog 也连续两年出现在了增速最快语言榜单中。
- TypeScript 连续三年入选增速最快语言，其在 Gitee 所有仓库中采用语言的占比也在逐年上升，2021 年已经来到了第 13 位。

● Rust has maintained rapid growth for three consecutive years, with a growth rate of over 110%

● Verilog is also on the list of fastest-growing languages for the second year in a row, as the base software grew in popularity in China in 2021.

- TypeScript has been ranked as the fastest-growing language for the third year in a row, and its share of adopted languages in all Gitee repositories has been increasing every year, coming in at number 13 in 2021.

【专家点评】[Expert Comment]

> **段夕华：**Erlang 和 Pascal 的增速如此之高应该跟之前的 base 较低应该有很大关系。
>
> Duan Xihua: The high growth rate of Erlang and Pascal should have a lot to do with the previous low base.

2.4 新增开源项目领域分布 Distribution of New Open Source Project Areas

排名 Ranking	分类 Category	占比 Ratio
1	程序开发 program development	21.19%
2	Web 应用开发	15.42%

	Web application development	
3	手机/移动开发 Mobile Development	6.89%
4	建站系统 Station System	6.74%
5	应用工具 Application tool	5.6%
6	鸿蒙开源项目 OpenHarmony project	4.68%

新增开源项目领域分布的前五名与 2020 年相同，值得关注的是鸿蒙相关开源项目在 2021 年飞速增长，新增项目数量占比在所有领域中排在了第六位，OpenHarmony 生态在开源两年后已经初具雏形并保持了高速增长，后续的发展值得开发者们关注。

The top five new open source project areas are the same as in 2020, and it is worth noting that OpenHarmony-related open source projects are proliferating in 2021, ranking sixth among all areas in terms of the number of new projects. The OpenHarmony ecology has taken shape and maintained a high growth rate after two years of open source, and the subsequent development is worthy of developers' attention.

2.5 年度最受开发者关注的用户　Most Developer-Focused User of the Year

排名 Ranking	用户 User	用户主页	用户介绍
1	狂神说	https://gitee.com/kuangstudy	知识博主
2	若依	https://gitee.com/y_project	GVP 作者

3	peng-zhihui	https://gitee.com/peng_zhihui	优质智能硬件作者
4	贤心	https://gitee.com/sentsin	GVP 作者
5	小柒 2012	https://gitee.com/52itstyle	GVP 作者
6	百小僧	https://gitee.com/monksoul	GVP 作者
7	飞扬青云	https://gitee.com/feiyangqingyun	优质 Qt 项目作者
8	技术胖	https://gitee.com/jishupang	知识博主
9	JEECG 开源社区	https://gitee.com/jeecg	优质低代码项目作者
10	花裤衩	https://gitee.com/panjiachen	优质 JavaScript 项目作者

2021 年，除了知名开源项目作者外，也涌现出了一批受到广大开发者欢迎的新用户，如 BiliBili 知名科技博主稚晖君，在 2021 年下半年入驻 Gitee 后粉丝数量暴涨，跃居为全年最受关注用户第三名。

In 2021, in addition to authors of well-known open source projects, many new users emerged who were welcomed by the majority of developers, such as BiliBili's well-known tech blogger ZhiHuiJun, whose fan base skyrocketed after he joined Gitee in the second half of 2021, jumping to the third most followed user of the year.

此外，从排名中我们可以看出，除了优质项目的作者外，知识博主也受到了诸多关注。很多知识博主选择将代码仓库作为公开的学习资料储存库使用，让读者和观众们自由获取，代码仓库的用途不再仅限于存储代码，这种新型的知识分享形式也越来越受到开发者们的欢迎。

In addition, we can see from the rankings that knowledge bloggers are also receiving much attention in addition to authors of quality projects. Many knowledge bloggers have chosen to use code repositories as public learning materials, making them freely available to readers and viewers. Code repositories are no longer limited to storing code, and this new form of knowledge sharing is becoming increasingly popular among developers.

注：用户介绍以其被推荐仓库的技术栈为依据。

User profiles are based on the technology stack of the repository they are recommended.

2.6 年度最受开发者关注的组织 Most Developer-Focused Organization of the Year

排名 Ranking	组织名称 Org Name	组织主页 Org Homepage
1	OpenHarmony	https://gitee.com/openharmony
2	dotNET China	https://gitee.com/dotnetchina
3	人人开源	https://gitee.com/renrenio
4	dromara	https://gitee.com/dromara
5	Pear Admin	https://gitee.com/pear-admin

2021 年 Gitee 上的开源组织数量已超过了 25 万个，OpenHarmony 作为国内话题性最高的国产开源项目，在 2021 年也获得了广泛关注，随着 OpenHarmony 2.0 的发布，其受关注再创新高，OpenHarmony 组织的关注总数也超过了 3 万。

In 2021, the number of open source organizations on Gitee exceeded 250,000. OpenHarmony, the most talked-about domestic open source project in China, also received wide attention in 2021. With the release of OpenHarmony 2.0, it received a record amount of attention, and the total number of OpenHarmony followers exceeded 30,000 in total.

令人欣喜的是，2021 年国内开发者自发创建的开源组织也收获了诸多关注，这些开源组织从简单的项目集合开始，近两年的发展愈发成熟，已经逐渐形成了一个个较为完善的开源社区，正是一个个这样的开源组织，构成了国内开源生态发展的重要基础。

It is encouraging to note that 2021 also saw much interest in open source

organizations created by Chinese developers themselves, which started as simple collections of projects and have matured over the last two years to form a complete open source community. These open source organizations constitute an essential foundation for the development of domestic open source ecosystem.

2.7 Gitee 指数 Gitee Index

在 Gitee 上衡量一个开源项目优质与否，除了 Star 的数量以外，还有一个很重要的指标——Gitee 指数。如果该项目 Star 数量很多但 Gitee 指数较低，那么该项目可能“年久失修”或已无人维护，如果该项目 Star 数量并不多但 Gitee 指数较高，那么说明这个项目是个“潜力股”，值得持续关注。

The Gitee index is an essential indicator of the quality of an open source project on Gitee in addition to the number of Stars. If the project has a large number of Stars but a low Gitee index, then the project is probably "in disrepair" or unmaintained, while if the project does not have a large number of Stars but a high Gitee index, then the project is a "potential sotck" that deserves constant attention.

在 Gitee 上有超过 2 万个优秀开源项目获得了官方推荐，我们对这 2 万多个项目进行了 Gitee 指数的分析。

Over 20,000 officially recommended open source projects on Gitee, and we have analyzed the Gitee Index for 20,000+ projects.

注：Gitee 指数的评估结果为全站范围的相对值。

Note: The Gitee Index is evaluated on a site-wide relative basis.

2.7.1 Gitee 指数评估维度 Gitee Index Evaluation Dimensions

1.影响力 Impact

用来判断开发者是否真正关注过该项目，低 Star 数可能是由种种原因被埋没，而长时间无

Star，可能这个项目并没有辐射到其他开发者。

It is used to determine if developers are following the project. A low Star count may be due to various reasons, while a long time without a Star may mean that the project is not reaching other developers.

2.代码活跃度 Code activity

项目代码“年久失修”，维护人员可能已经抛弃了该项目，只是忘了清除仓库，这样的项目在全球范围内不在少数，但也有可能是已经较为完善的项目，不需要过多地维护。

If the code is "in disrepair", the maintainer may have abandoned the project and forgotten to clear the repository.

3.社区活跃度 Community activity

你对一个项目提了一个 Issue，在短时间内就得到回应，这样的感觉是极好的，反映其项目作者与社区普通用户的互动频率。

It is a great feeling when you raise an Issue on a project and get a response within a short time, reflecting the frequency of interaction between the author of the project and the general users of the community.

4.团队健康 Team health

这一点也相当的重要，如果项目实际的贡献者只有那么几位，关键贡献者从团队退出是经常导致一个软件的停更的原因，该指数与贡献者人数和稳定度相关。

This is also quite important; if there are only a few actual contributors to a project, the withdrawal of key contributors from the team is often the reason for a software hiatus, this index correlates with the number and stability of contributors.

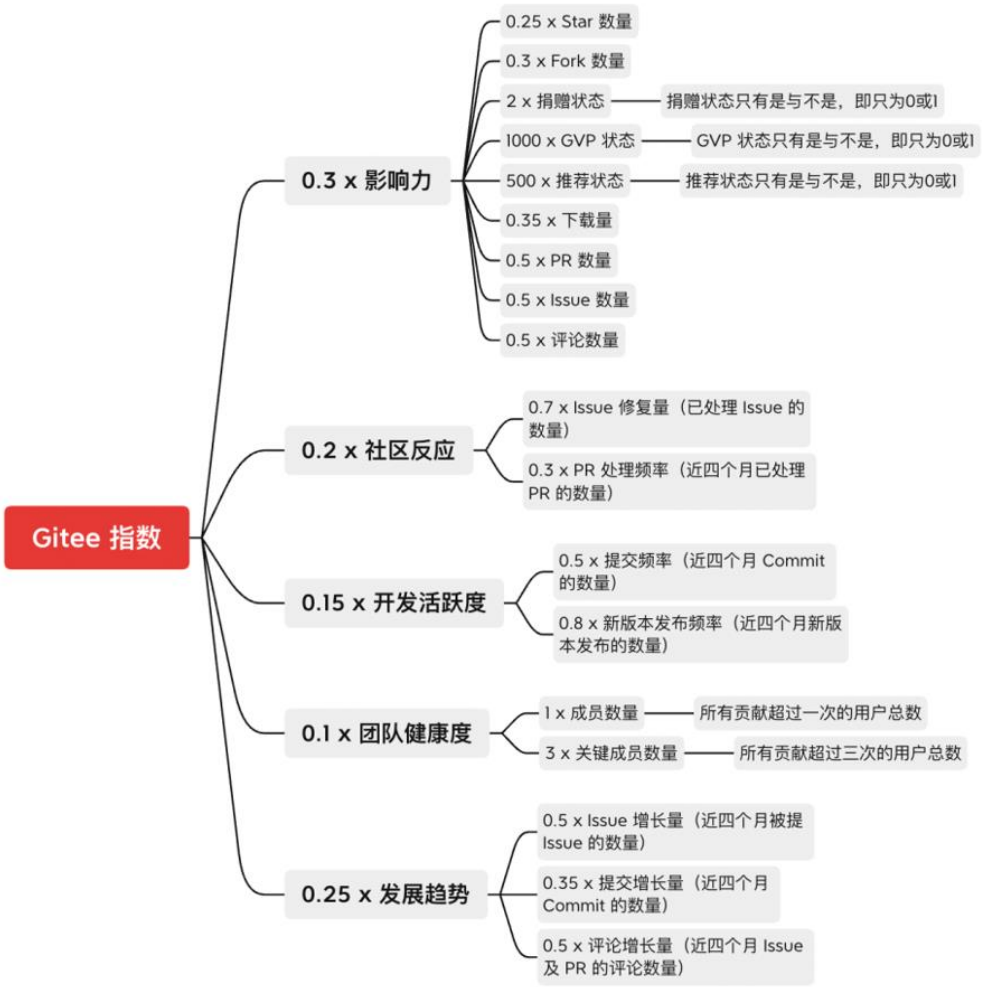
5.流行趋势 Trends

与项目近期收到用户的关注程度相关。

This relates to how much attention the project has received from users recently.

有了评估维度后，就需要对各个维度进行权重划分，各维度具体的权重如下图所示：

Once the evaluation dimensions are available, the individual dimensions need to be weighted, with the specific weighting of each dimension shown in the figure below:



*

2.7.2 年度 Gitee 指数 Top 10

Gitee Index Top10 of the Year

排名 Ranking	项目名 Project Name	项目地址 Project address
1	OpenHarmony	https://gitee.com/openharmony
2	MindSpore	https://gitee.com/mindspore

3	Ascend	https://gitee.com/ascend
4	RuoYi	https://gitee.com/y_project/RuoYi
5	pig	https://gitee.com/log4j/pig
6	Paddle	https://gitee.com/paddlepaddle
7	hutool	https://gitee.com/dromara/hutool
8	openGauss	https://gitee.com/opengauss
9	BootstrapBlazor	https://gitee.com/LongbowEnterprise/BootstrapBlazor
10	mybatis-plus	https://gitee.com/baomidou/mybatis-plus

在 Gitee 指数上，来自华为的 OpenHarmony、MindSpore 和 Ascend 占据了前三甲，Gitee 上优质的开源项目作者与大厂相比也不遑多让，仍然保持着极高的活跃度，在 Top 10 中也占据了五个席位。

In the Gitee index, OpenHarmony, MindSpore, and Ascend from Huawei occupy the top three seats, and the authors of quality open source projects on Gitee are not far behind the tech giants, remaining extremely active and occupying five of the top 10 seats.

2.8 开源安全与合规 Open Source Security and Compliance

2.8.1 CVE 漏洞风险 CVE Vulnerability Risks

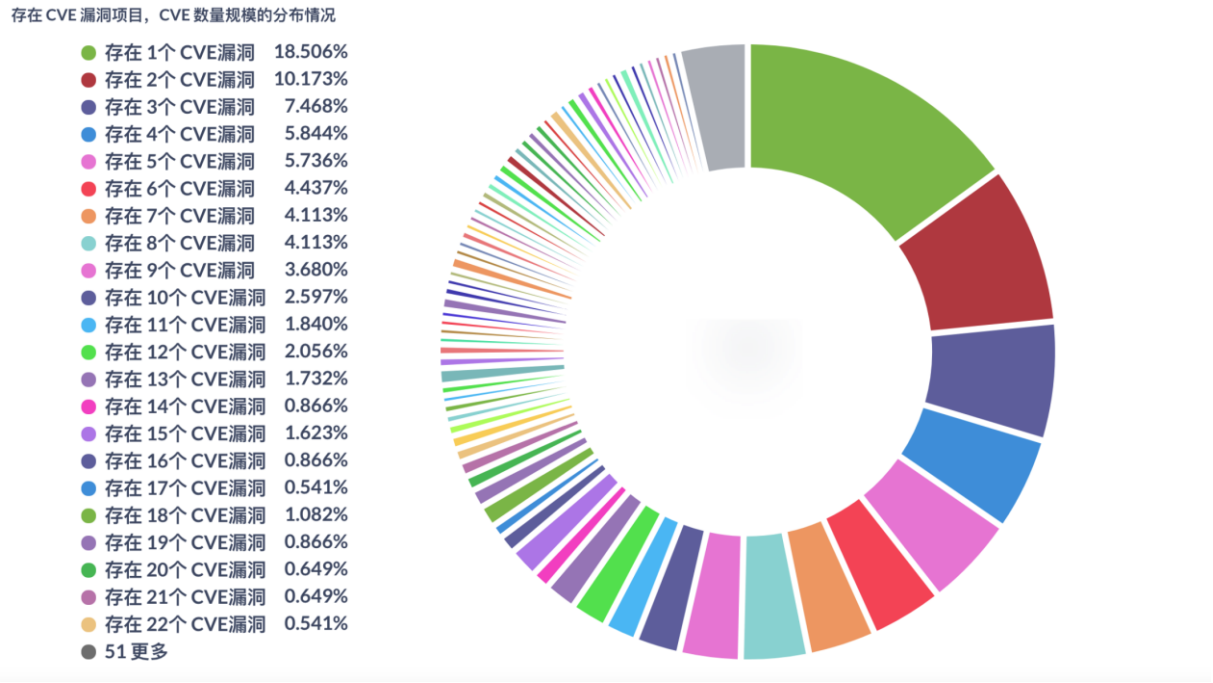
Gitee 采用棱镜七彩 FossEye 静态扫描了 1.5 万 个 Gitee 平台上具有代表性的优质推荐开源项目仓库，结果显示有超过 93% 不存在 CVE 漏洞风险。

Gitee used Prism Seven FossEye to statically scan a representative sample of 15,000 recommended open source repositories on the Gitee platform, and the results showed that over 93% were not at risk for CVE vulnerabilities.

其中，在所有存在 CVE 漏洞风险的项目中，存在一个 CVE 漏洞的占比为 18.51%，存在超

过 10 个 CVE 漏洞的占比 2.58%。

Of the projects with CVE vulnerabilities, 18.51% have one CVE vulnerability, and 2.58% have more than 10 CVE vulnerabilities.



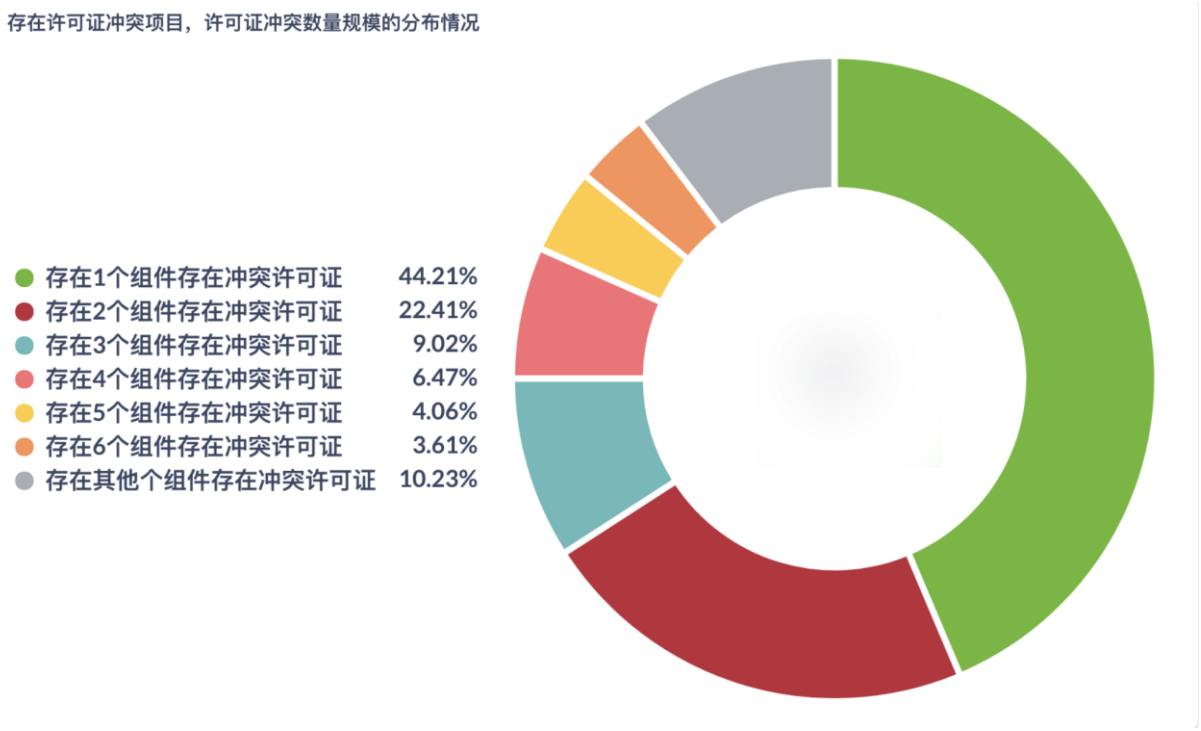
2.8.3 开源合规情况 Open Source Compliance

Gitee 采用棱镜七彩 FossEye 扫描了 1.5 万 个 Gitee 平台上具有代表性的优质推荐开源项目仓库，结果显示有超过 95% 不存在直接 License 冲突风险。

Gitee used Prismatic Seven FossEye to scan a representative sample of 15,000 recommended open source repositories on the Gitee platform, and over 95% of them were free of direct license conflicts.

其中，在所有存在直接 License 冲突风险的项目中，仅存在 1 个 License 冲突风险的占比为 44.21%。

Of the projects with direct license conflicts, 44.21% had only one Lincense conflict risk.



3.总结 Summary

2021 年，国内开源生态发展稳中向好，参与开源的人数随着开发者基数越来越多，优质开源项目的数量与种类越来越丰富，大厂开源项目与普通开发者的开源项目齐头并进，在高速发展的过程中，越来越多的开发者开始重视开源的安全和合规问题。

In 2021, domestic open source ecology development is stable and positive. The number of people involved in open source is growing with increasing developers. The number and variety of quality open source projects are becoming more prosperous, and open source projects from tech giants and ordinary developers are growing hand in hand. Amid rapid development, more and more developers are becoming aware of open source security and compliance issues.

Gitee 作为本土的代码托管平台，见证在 2021 年大厂投入开源的决心和开发者加入开源事业的热情。随着国家「十四五」规划开始重视开源生态发展，开源获得了国家层面的支持，通过 Gitee 这样基础平台的建设，为个人开发者和企业提供了展示的舞台和良好的发展土壤，让 Gitee 成为汇聚我国开发者智慧、促进技术创新的共享平台。

As the country's 14th Five-Year Plan begins to focus on open source ecological development, open source is gaining support at the national level. Gitee, as a local code hosting platform, is a testament to the commitment of the tech giants to open source and the enthusiasm of developers to join the cause in 2021. The construction of a primary platform like Gitee provides a stage for individual developers and enterprises to showcase and a good ground for development, making Gitee a shared platform that brings together the wisdom of China's developers and promotes technological innovation.

2021 年，是国内开源建设夯实基础的一年，只有根扎的越深，长出的枝叶才能更加繁茂，Gitee 将与国内开发者一起努力，聚沙成塔，让国内开源生态的枝叶更加茂盛！

2021 is a year of building a solid foundation for open source in China. The more profound the roots are, the more branches and leaves will grow. Gitee will work together with domestic developers to gather sand into a tower and make the branches of the domestic open source ecosystem flourish!

> 本部分数据为 Gitee 平台提供，内容撰写方面做出贡献的小组成员包括：李泽辰。

The Gitee platform provides the data in this section, and the panelists who contributed to the content include Li Zechen.

2021 中国开源年度报告•商业化篇

2021 China Open Source Annual Report - Commercialisation

1. 概述 Overview

1998 年开源（Open Source）一词诞生，这种新提法的出现很大程度上是为了消除人们对于自由软件（Free Software）中 “Free” 的模糊理解，使其更加商业友好。可以说开源软件从诞生之初，就和商业化之间并无矛盾，开源不等于免费。近年来，随着一些开源公司在资本市场

获得亮眼的表现，开源商业化在国内开发者社区和投资人群体中的认知也在逐步提升。开源这种独特的开发模式创造了巨大潜力的商业价值吸引着开发者、科技企业、投资机构等等各方力量投入到开源行业中。

It is fair to say that there has been no contradiction between open source software and commercialization from its inception and that open source is not the same as free. The term Open Source was coined in 1998 to remove the ambiguity of "Free" in Free Software and make it more commercial friendly. In recent years, as some open source companies have made a splash in the capital market, the perception of open source commercialization has gradually increased in the domestic developer community and among investors. The unique development model of open source has created substantial potential business value, attracting developers, technology companies, investment institutions, and other parties to invest in the open source industry.

虽然开源企业可以实现变现是不争的事实，但是选择哪种模式可以最高效的进行商业化发展还是困扰每个开源企业的难题。开源商业化模式共有五种支持、托管、限制性许可、开放核心、混合许可。当前开源市场下托管、开放核心、混合许可是最为主流科技公司所采用的，但是企业应根据自身社区以及产品情况进行商业道路的选择。

While it is undisputed that open source companies can realize cash, choosing which model is the most efficient for commercialization is still a problem for every open source company. There are five open source commercialization models: support, hosting, restricted licensing, open core, and hybrid licensing. Under the current open source market, hosting, open core, and hybrid licensing are the most mainstream technology companies to adopt, but companies should choose their business path based on their community and product situation.

资本方是促进开源市场发展的重要参与方。对于投资机构来讲，在对一个开源项目进行判断时往往会综合考虑以下几点：在产品开发阶段重点要看企业是否拥有代码所有权和控制权以及是

否具备国际竞争力；社区运营阶段主要看企业是否具备足够强的运营能力；而在商业化探索阶段，市场匹配能力与商业模式的成熟度将成为主要关注点。

Capital is an essential participant in the development of the open source market. For investment institutions, when judging an open source project, they usually consider the following points comprehensively: In the product development phase, the focus is on whether the company has ownership and control of the code and whether it is internationally competitive; in the community operation phase, the focus is on whether the company has solid operational capabilities; and in the commercialization phase, the ability to match the market and the maturity of the business model will be the primary concerns.

本章内容由云启资本投资团队撰写，主要内容包括：

- **开源软件商业化成功的底层驱动因素**
- **开源软件公司的可能商业化路径**
- **开源项目投资人判断标准以及案例分享**

This chapter is written by the investment team of Yunqi Partners Investment team and covers the following topics

- Underlying drivers of successful open source software commercialization
- Possible commercialization paths for open source software companies
- Judgment criteria for open source project investors and case studies

2. 开源软件商业化成功的底层驱动因素

Underlying Drivers of Successful Commercialization of Open Source Software

近年来，开源软件商业化的成功已经成为共识。不论是相关公司在二级市场上持续走高的市值，又或是一级市场上资本的不断涌入，都显示着开源软件商业化模式正得到越来越广泛的认可。

In recent years, the success of the commercialization of open source software has become a consensus. The continued high market value of companies in the secondary market and the influx of capital in the primary market show that the open source software commercialization model is gaining wider recognition.

开源软件商业化的成功不是空穴来风。我们认为，开源软件之所以可以成功进行商业化发展，是由于**开源模式在软件开发、销售等阶段带来的杠杆效应优势**。尤其是，**协作开发、自下向上销售模式、刺激创新**等特点，成为了驱动开源产生商业价值的底层因素。

The success of open source software commercialization is not an empty story. We believe that the successful commercial development of open source software is due to the leverage effect that the open source model brings in the software development and sales stages. In particular, features such as collaborative development, bottom-up sales models, and stimulating innovation have been the underlying factors driving the commercial value of the open source.

2.1 开源商业模式验证 Open source business model validation

开源软件公司迎来上市潮，多家公司估值已突破 100 亿美元。1999 年，Red Hat 在纳斯达克上市为开源软件公司进行商业化点燃信心。据不完全统计，自此已有近 20 家开源软件公司

纷纷走上了上市的道路。我们看到，开源软件公司在上市之初的估值，也从最开始 Red Hat 的 36 亿美元，提升到 GitLab 的 110 亿美元。同时，公司上市后市值也在不断上升。例如 MongoDB 的市值，从 2017 年上市的 16 亿美元增长到现今的 353 亿美元。

Open source software companies are seeing a wave of IPOs, with several companies already valued at over $10 billion. In 1999, Red Hat went public on the NASDAQ to give open source companies the confidence to commercialize. Since then, according to incomplete statistics, nearly 20 open source software companies have gone public. We have seen the valuation of open source software companies at the start of their IPOs rise from $3.6 billion at Red Hat to $11 billion at GitLab. At the same time, the market capitalization of companies has been rising since they went public. MongoDB's market cap, for example, had grown from US$1.6 billion in 2017 when it went public to US$35.3 billion today.

板块估值快速提升主要来自于开源软件公司持续兑现高增长业绩。近年来，二级市场上开源软件公司的 P/S 倍数快速攀升 ,例如 MongoDB 的 P/S 倍数从 2019 年的 30 倍上涨到 2021 年的 42 倍之高。我们认为，二级市场开源软件公司 P/S 估值的上升，离不开相关公司业绩的支撑。MongoDB、Confluent、Elastic、GitLab 等优秀开源企业 2017 至 2020 的收入年复合增长率都达到 55%左右，且 2020 年毛利率超过 70%，除此之外，2020 年 NDR 全部超过 120%，其中 GitLab 的表现尤其亮眼，NDR 达到 152%。

The rapid rise in the plate valuation comes primarily from open source software companies continuing to cash in high growth performance. In recent years, the P/S multiple of open source software companies in the secondary market has climbed rapidly. For example, MongoDB's P/S multiple has risen from 30 times in 2019 to 42 times in 2021. We believe that the rise in P/S valuation of open source software companies in the secondary market cannot be separated from the support of the performance of the relevant companies. MongoDB, Confluent, Elastic, GitLab, and other excellent open source companies have all achieved a revenue CAGR of around 55% from 2017 to 2020, with gross margins exceeding 70% in 2020, in addition to

NDR exceeded 120%, with GitLab performing exceptionally well, with an NDR of 152%.

图表 1：部分开源企业的上市表现

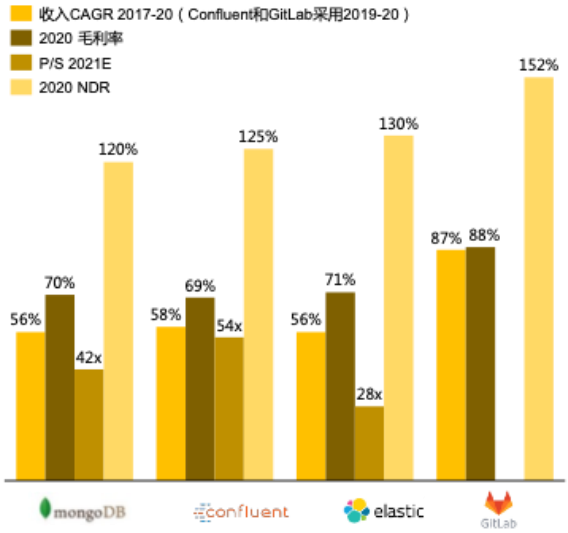
Figure 1: IPO performance of selected open source companies

资料来源：Crunchbase，Pitchbook，云启资本

Source: Crunchbase, Pitchbook, Yunqi Partners

图表 2：开源企业的业绩表现

Figure 2: Performance of open source companies



资料来源：Crunchbase，Pitchbook，云启资本

Source: Crunchbase, Pitchbook, YunqiCapital

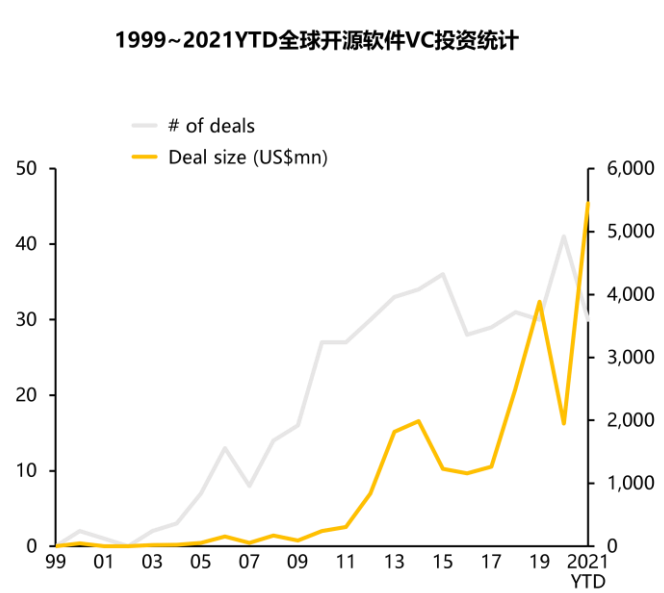
全球开源软件公司获风险投资数量与总金额不断攀升，资本市场退出周期加快。可以看到，在近二十年间，一级市场的投资布局在投资规模和融资事件都在持续上升。据不完全统计，全球开源软件 2021 年在资本市场融资金额为 50 多亿美元，融资交易事件为 30 起。资本市场上对开源行业的大力热捧主要源于二级市场上开源软件公司的良好表现，已上市企业较高的估值倍数给予一级市场投资者信心。同时，开源软件公司的从成立到上市的周期也在缩短，从早期的 10 到 15 年，缩短到现在的 3 到 8 年。我们甚至看到 2-3 年就通过并购的方式进行资本退出的案例，例如 Streamlio 被 Splunk 公司收购和 Flink 被阿里收购。

The number and total value of venture capital investments in open source software companies worldwide continue to climb, and the withdrawal cycle in the capital markets

is accelerating. In the past two decades, the primary market investment layout in the investment scale and financing events are continuing to rise. According to incomplete statistics, the global open source software in 2021 has amounted to more than 5 billion U.S. dollars with 30 financing transactions events. The vigorous enthusiasm for the capital market on the open source industry, mainly from the secondary market on the excellent performance of open source software companies. The high valuation multiple of listed companies gives confidence to primary market investors. At the same time, the cycle time of open source software companies from inception to IPO is also shortening, from 10 to 15 years in the early days to 3 to 8 years today. We are even seeing cases of capital exits through M&A in 2-3 years, such as Streamlio's acquisition by Splunk and Flink's acquisition by Alibaba.

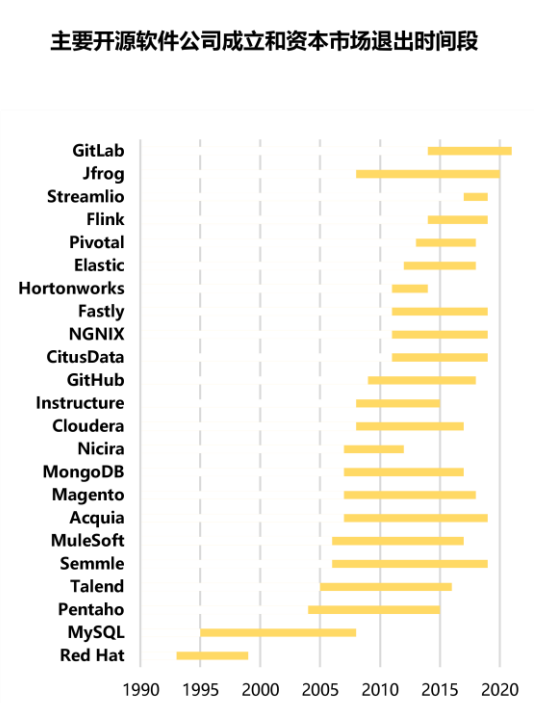
图表 3：全球开源软件 VC 投资统计

Figure 3: Global Open Source Software VC Investment Statistics



图表 4：主要开源软件公司资本退出周期

Figure 4: Capital Exit Cycle of Major Open Source Software Companies



资料来源：Crunchbase，Pitchbook，云启资本

Source: Crunchbase, Pitchbook, Yunqi Partners

资料来源：Crunchbase，Pitchbook，云启资本

Source: Crunchbase, Pitchbook, Yunqi Partners

2.2 开源模式商业优势 Business Advantages of Open Source Model

2.2.1 开源项目可以为软件的开发提供杠杆 Open source projects can provide leverage for software development

开源带来了产品的快速迭代与用户场景的拓宽。开源模式下的协同开发平台使产品迭代速度加快。开源模式下，社区成员能够协同编写软件，软件用户可以提交及时使用反馈，在反馈的基础上开发人员可以进行更高效地修改、迭代。此外，开源使用户可以直接参与到产品开发中来，这比闭源软件开发更能了解客户的需求，并且发掘出用户需要的使用场景。因此，相对于单一的闭源软件供应商，开源社区有着更清晰的研发方向，能致力于开发出更多的功能，并创造出对用户更有价值的产品，避免不必要的开发成本支出。除此之外，企业可以聘用贡献者来保证开发的活跃性，向开发者提供灵活的工作地点与模式，提高自身的人才储备来加速产品开发。

Open source brings about rapid product iteration and broadening of user scenarios. The collaborative development platform in the open source model enables faster product iteration. The open source model allows community members to write software collaboratively and software users to submit timely usage feedback, based on which developers can make more efficient changes and iterations. In addition, open source allows users to be directly involved in product development, which provides a better understanding of customer needs and uncovers the usage scenarios that users require than closed source software development. As a result, the open source community has a more precise R&D direction than a single closed source software provider, able to focus on developing more features and creating products that are more valuable to users and avoid unnecessary development costs. Beyond that,

companies can hire contributors to keep development active, offer flexible work locations and models to developers, and increase their talent pool to accelerate product development.

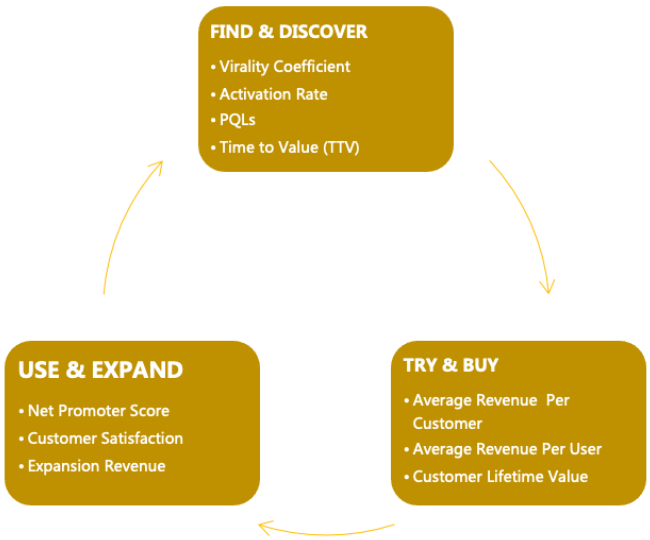
2.2.2 开源软件具有的 Product-Led Growth（PLG）模型特征可以促进付费转化

The Product-Led Growth (PLG) model features of open source software could facilitate paid conversions.

PLG 模式主要通过自下而上的销售模式进行获客，产品是整个销售过程的核心。PLG 模式的增长飞轮有三个主要阶段：获客、转化、留存。在这三个阶段中，开源都有着区别于传统商业模式的优势。

The PLG model mainly obtains customers through a bottom-up sales model where the product is the core of the whole sales process. The PLG growth flywheel has three main stages: acquisition, conversion, and retention. In each of these three stages, open source has advantages that distinguish it from traditional business models.

图表 6：开源软件增长飞轮



资料来源：云启资本

Figure 6: Open Source Software Growth Flywheel

Source: Yunqi Partners

首先在获客阶段，开源运营模式降低了获客成本，并且使获客流程更具针对性。开发人员的相互交流、GitHub 等平台带来的社区型协作，加速了传播获客。开源产品的初始客户定位通常为开源社区的参与者，他们往往是企业里的开发者或者 IT 人员。培育了这些优质潜在客户，也就具备了“群众基础”。社区帮助打开企业的边界，让好的开源项目和产品的口碑传播得以可能。使用者为了解决自身问题和痛点自发的进行下载使用，此时开源软件产品不仅仅是作为通过功能解决用户问题的一个方式，也可以成为帮助企业去传播和增长的一个载体。长期来看，就可以降低企业的获客成本，让自动化的获客越来越多，降低销售方面的费用支出。

Firstly, the open source operating model reduces customer acquisition costs in the customer acquisition stage and makes the process more targeted. The interaction between developers and the community collaboration that comes with platforms such as GitHub accelerates the spread of customer acquisition. Initial customers for open source products are usually participants in the open source community, often developers or IT staff in the enterprise. A "mass base" comes into being by nurturing these quality prospects. The community helps open up the boundaries of the business and makes it possible for word-of-mouth to spread about good open source projects and products. Users spontaneously download and use open source software products to solve their problems and pain points, so open source software products are not just a way to solve users' problems through functionality but can also become a vehicle to help companies spread and grow. In the long run, it can reduce the cost of customer acquisition to automate the process and reduce the sales expenditure.

其次，在转化阶段，相比较传统商业软件，开源软件往往拥有更高的付费转化率。一方面，当用户使用过免费版的软件后，只要软件的功能可以很好的满足用户需求，就可以以较短周期的速度进行付费转化，并使其成为长期用户。另一方面，企业可以通过观察用户对免费版软件的使用行为，进行有针对性的转换跟进和追加销售，例如，向销售团队提供超出其使用限制并准备付款的客户列表。除了传统的销售转化，还可以通过自助购买路径进行转化(Self-

service selling)，这种转换路径很大程度上降低了销售成本。

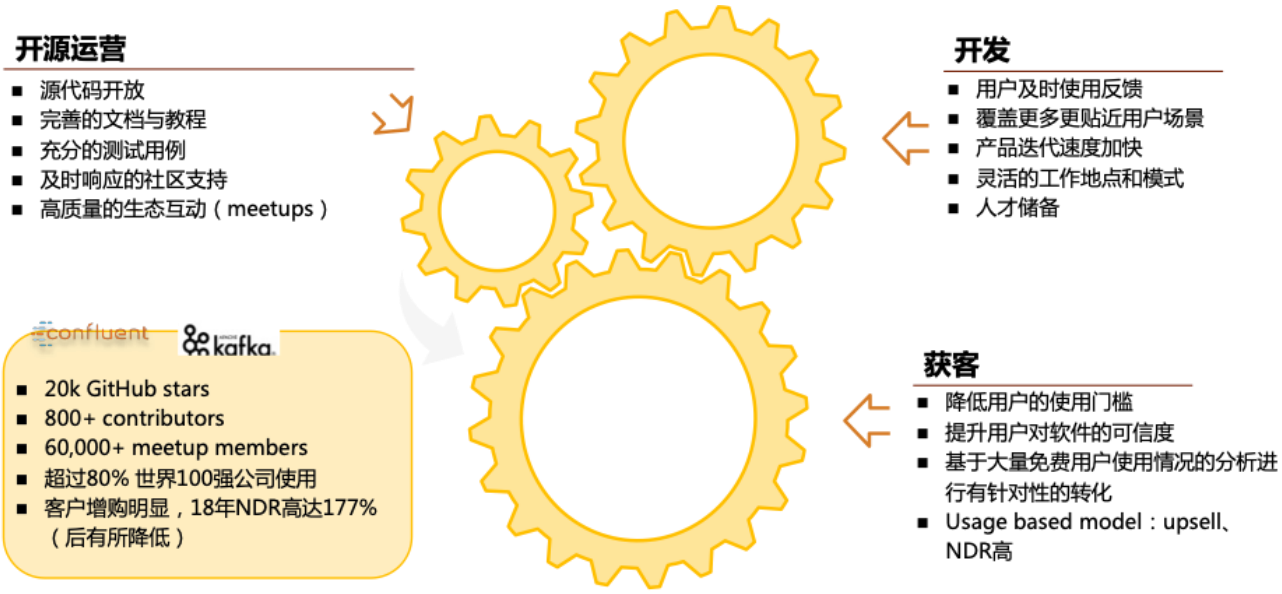
Secondly, open source software tends to have a higher paid conversion rate than traditional commercial software in the conversion stage. On the one hand, when users have used the free version of the software, as long as the functions of the software can meet the user's needs well, they can be converted into paid users in a short period and make them long-term users. On the other hand, companies can carry out targeted conversion follow-up and up-selling by observing users' behavior with the free version of the software, for example, by providing the sales team with a list of customers who have exceeded their usage limits and are ready to pay. In addition to traditional sales conversions, a self-service selling route can also be used, which reduces sales costs to a large extent.

最后在留存阶段，开源软件可以使用户规避供应商锁定风险，使其愿意进行长期使用。基于同一个开源项目，其下游可能会出现多个提供相似功能软件的供应商，并且可以以比较小的成本来改变供应商的选择，因此用户可以放心地选择长期使用软件。相反地，当顾客使用闭源产品时，如果在使用一段时间后想要转换使用另一个软件，需要重新进行硬件、数据等的部署，造成不小的转移成本，因此当用户选择使用闭源软件时，可能会由于软件后期开发情况不满足需求或者转移成本过高而放弃对软件的继续使用。

Finally, in the retention phase, open source software protects users from the risk of vendor lock-in and makes them willing to use it for the long term. For the same open source project, there may be multiple suppliers downstream offering similar functional software, allowing supplier changes at a relatively small cost to assure users that the software could be available long-term. Conversely, suppose customers who use a closed source product want to switch to another software after a period of use. In that case, they need to redeploy such as hardware and data, resulting in a high transfer cost, so when users select the use of closed source software, they may abandon continued use of the software because the later development of the software does not meet their needs or the transfer cost is too high.

图表 7：开源项目可以为软件的开发和产品获客提供杠杆

Figure 7: Open source projects can provide leverage for software development and acquiring customers with products



资料来源：云启资本

2.2.3 开源可以带来技术和业务创新的良性循环

只有当技术创新与商业创新相结合时，开源的全部潜力才能实现。Andreessen Horowitz（a16z）分析指出，开源是一种技术驱动的模式，它可以加速产品反馈和创新、提高软件可靠性、扩展支持、推动采用并汇集技术人才。然而正是有支持付费、Open Core 和 SaaS 模式等商业模式的出现，才有了现在的开源发展。经济利益创造了一个良性循环。开源的业务创新越多，开发者社区就越大，这会刺激更多的技术创新，从而增加对开源的经济激励，形成一个良性循环。

The full potential of open source can only be realized when technological innovation is combined with commercial innovation. Andreessen Horowitz's (a16z) analysis points out that open source is a technology-driven model that accelerates product feedback and innovation, improves software reliability, extends support, drives adoption, and brings together technical talent. However, the emergence of business models such as paid support, Open Core, and SaaS models has led to the current development of open source. The economic benefits have created a virtuous circle. The more business

innovation that comes from open source, the larger the developer community becomes, which stimulates more technological innovation, thus increasing the economic incentives for open source and creating a virtuous circle.

开源 3.0 时代下的技术创新与商业创新正在齐头并进。技术层面上，人工智能、开源数据和区块链是新兴创新的一些例子。而得益于时刻保持创新的开发者社区，开源已成为云计算，SaaS 服务，下一代数据库，移动设备，互联网甚至区块链的基础。下一代商业模式可能包括广告支持的 OSS，类似于大型专有企业支持的开源项目、数据驱动的收入以及通过区块链货币化的加密代币。

Technology innovation and business innovation are going hand in hand in the Open Source 3.0 era. Artificial intelligence, open source data, and blockchain are some examples of emerging innovations on a technical level. Moreover, thanks to a community of developers who are constantly innovating, open source has become the foundation for cloud computing, SaaS services, next-generation databases, mobile devices, the Internet, and even blockchain. Next-generation business models may include ad-supported OSS, open source projects like those supported by large proprietary enterprises, data-driven revenue, and crypto tokens monetized via blockchain.

图表 8：开源的良性循环

Figure 8: The virtuous circle of open source

资料来源：a16z

source: a16z

Figure 9: Innovations in Open Source 3.0 technologies and business models

资料来源：a16z

source: a16z

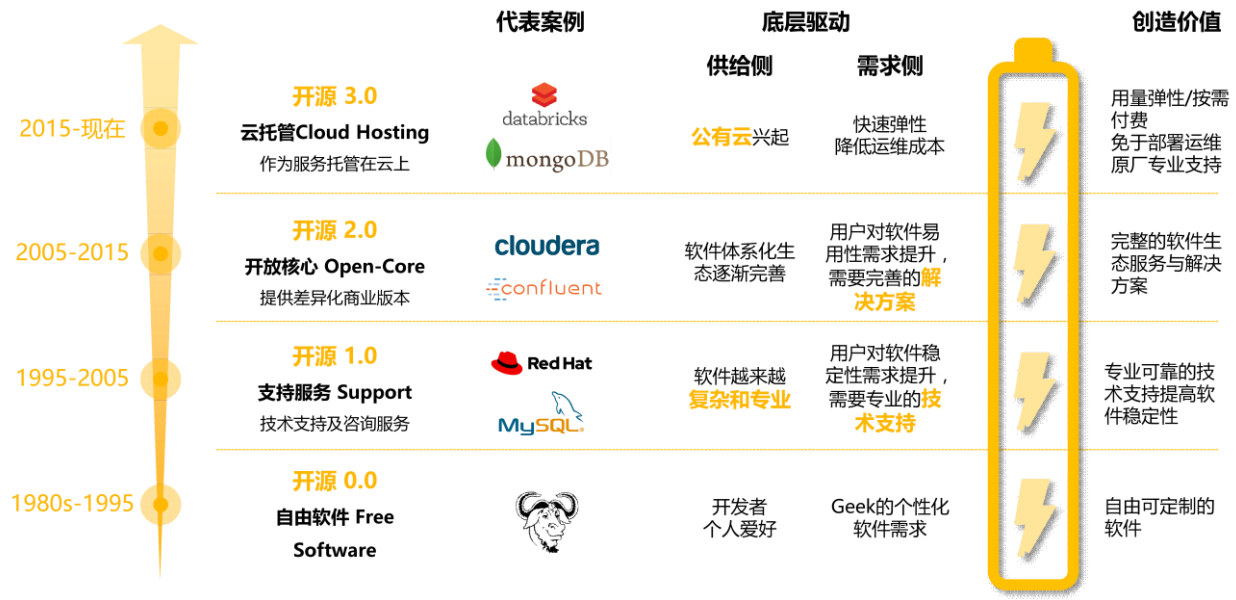
2.3 开源软件商业化模式发展历程 History of open source software commercialization models

开源软件商业化发展经过多次变革，从最初始的自由软件，逐渐发展出不同的商业化模式---从以 RedHat 为例的支持服务时代演变到当前的云托管时代。商业模式的发展演变离不开每个时代下供给侧与需求侧的驱动，在技术与经济大环境下的不断推动，开源行业才得以如今的蓬勃发展。

The commercialization of open source software has evolved through many changes, from the initial free software to different commercialization models - from the era of RedHat as a support service to the current era of cloud hosting. The evolution of the business model has been driven by both the supply and demand sides of each era, with the technology and economic environment driving the open source industry to thrive today.

图表 10：开源商业化发展历程

Figure 10: History of open source commercialization



资料来源：云启资本

source: Yunqi Partners

开源 0.0 时代 The Open Source 0.0 era

开源起源于“自由软件”时代。最初是为了对抗大型闭源互联网公司对技术的垄断，开发者自发地开发了可以自由使用的“自由软件”。自由软件运动的发起人，也是 GNU 操作系统开发人及自由软件基金会创始人的 Richard Stallman 将自由软件定义为“用户可以自由地运行、复制、分发、研究、更改和改进的软件”。在这个时期出现了首批开源许可证 GNU（通用许可证，现在通常称为“GPL”）和 BSD 许可证。

Open source originated in the era of "free software." Originally developed to counter the technological monopoly of large closed-source Internet companies, developers spontaneously developed "free software" available for free use. Richard Stallman, the founder of the free software movement, the developer of the GNU operating system, and the founder of the Free Software Foundation, defined free software as "software that users are free to run, copy, distribute, study, change and improve." For the time, the first open source licenses, the GNU (General Purpose License, now commonly known as the "GPL") and BSD licenses, emerged.

开源 1.0 时代 The Open Source 1.0 era

“Support 支持服务”模式面向开源软件客户。随着越来越多基础开源技术的出现，软件的复杂性和专业性都大幅度提高，用户对软件稳定性的需求也同步提升，需要专业的技术支持。这个时期出现了一些企业开始尝试基于开源软件实现商业化运营，主要的商业模式为“Support 支持服务”模式，为使用开源软件的客户提供付费的技术支持与咨询服务。

The "Support Services" model is for open source software customers. With the advent of more and more basic open source technologies, the complexity and expertise of software increased significantly, as did the demand for stability and the need for professional support. During this period, some enterprises began to try to realize commercial operations based on open source software. The primary business model is "Support Services," which provides paid technical support and consulting services for customers using open source software.

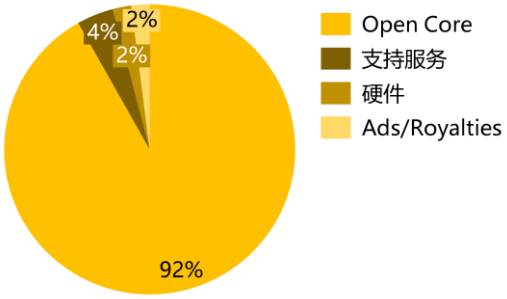
开源 2.0 时代 Open Source 2.0 Era

“Open Core 开放核心”模式成为主要的开源商业模式。随着越来越多的企业开发者加入到开源生态中，软件体系化生态逐渐完善，用户对软件易用性需求提升，此时用户更需要完善的解决方案。因此出现了新的收入模式，供应商将专有部分打包成与开源基础部分连接的单独模块或服务，或者在专门的商业版本中发布。用户可以通过付费的有更多功能模块组成的商业版本软件来获得更完整的软件生态服务与解决方案。Open Core 开放核心模式是当前成功的商业开源软件公司使用的主要商业模式，在年收入超过 100 万美元的公司中，有 92%的公司都选择了 Open Core 的商业模式。

The "Open Core" model is the primary open source business model. As more and more enterprise developers join the open source ecosystem, the systematic ecosystem of software is gradually improved, users' demand for software ease of use increases, and users need more complete solutions at this time. As a result, new revenue models have emerged, with vendors packaging proprietary parts into separate modules or services linked to the open source base part or releasing them in a dedicated commercial version. Open Core is the primary business model used by successful commercial open source software companies today, with 92% of companies with annual revenues of over $1 million choosing the Open Core model.

图表 11:年收入$100M+的开源软件商业公司商业模式统计

Figure 11: Business model statistics of open source software commercial companies with annual revenue of $100M+



资料来源：Crunchbase，公开资料，云启资本

Source: Crunchbase, public sources, Yunqi Partners

开源 3.0 时代 Open Source 3.0 Era

云计算打开了 SaaS 服务模式的大门，开源软件目前更多的作为服务托管在云上。自云计算技术发展以来，云增长持续超出预期。不断增长的对灵活和可扩展基础设施的需求推动了 IT 企业的云计算支出与全球范围内云渗透率的不断提高。在这样的技术背景下，用户对降低软件运维成本的需求不断增加。一些开源软件公司例如 Databricks、HashiCorp 等提出了新的解决方案，通过 SaaS 使客户跳过内部部署，直接将软件作为服务托管在云平台上。客户通过订阅 SaaS 服务，将前期高额的资本性支出转为小额的经常性支出，并在很大程度上缓解了运维压力。

Cloud computing has opened the door to the SaaS service model, and open source software is now more often hosted as a service on the cloud. Since the development of cloud computing technology, cloud growth has continued to exceed expectations. The growing demand for flexible and scalable infrastructure drives IT organizations' cloud spending with increasing cloud penetration worldwide. Against this technological backdrop, there is a growing demand to reduce the cost of software operations and maintenance. Some open source software companies such as Databricks and HashiCorp have developed new solutions that enable customers to skip on-premise deployments and host software as a service directly on cloud platforms through SaaS. By subscribing to SaaS services, customers can turn their high upfront capital expenditure into a small recurring one and relieve the pressure on operations and

maintenance to a large extent.

图表 12:云计算支出增长以及全球云渗透率的提高持续受到推动

Growth in cloud spending and increased global cloud penetration continue to be propelled

	2015	→	2020	→	2025E
云计算支出	$105B	3.0x	$320B	2.7x	$848B
渗透率 (占全球 IT 支出的百分比)	3%	2.7x	8%	2.0x	16%
Cloud Titan 收入 (Microsoft, AWS, Google)	$11B	7.7x	$83B	3.6x	$303B

资料来源：Battery Ventures，云启资本

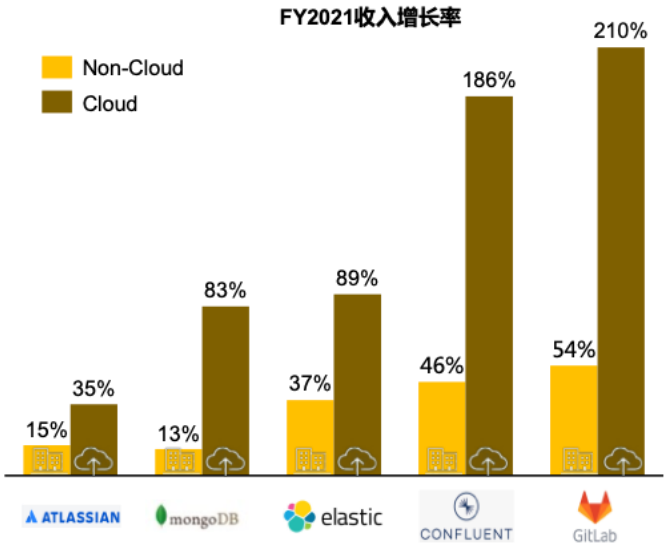
Source: Battery Ventures, Yunqi Partners

开源软件企业着重加强云战略布局，以加速和推动持续性增长。开源软件企业的 SaaS 服务模块的营收正在成指数倍增长。例如，GitLab 在其最近提交的 S-1 文件中指出，类似于 SaaS 的全托管云产品在 2020 财年至 2021 财年间的 ARR 占比从 9% 增长至 16%，SaaS 业务收入同比增长 210%。Confluent 云收入年增长率为 186%，MongoDB 的云收入现在占其总收入一半以上，2021 年 SaaS 收入增长达到 83%。

open source software enterprices focus on strengthening cloud strategies to accelerate and drive sustainable growth. open source software companies are seeing exponential growth in revenue from their SaaS service modules. For example, in its recent S-1 filing, GitLab noted that the ARR share of fully hosted cloud offerings like SaaS grew from 9% to 16% between FY2020 and FY2021, with SaaS business revenue growing by 210% year-over-year. More than half of MongoDB's cloud revenues account for more than half of its total revenues, with SaaS revenue growth reaching 83% in 2021.

图表 13： 2021 财年部分开源软件企业云服务和非云服务的收入增长率

Figure 13: Revenue growth rates of selected open source software companies for cloud and non-cloud services in FY 2021



资料来源：各公司公告，云启资本

Source: Company announcements, Yunqi Partners

未来开源 4.0 时代 Future Open Source 4.0

Serverless 将成为开源与云计算结合的新模式。无服务器（Serverless）是一种云原生开发模型，可使开发者在无需管理服务器的情况下专注构建和运行应用。无服务器方案将服务器从应用开发中抽离，由云供应商负责置备、维护和扩展服务器基本架构，而开发者则可仅将代码打包到容器中进行部署。Serverless 的全球规模保持着比较高的增速。据沙利文报告统计，2020 年营收统计口径下，Serverless 全球市场规模高达 446.1 亿元，相对于 2019 年 348 亿的市场规模，增速达到 28%。

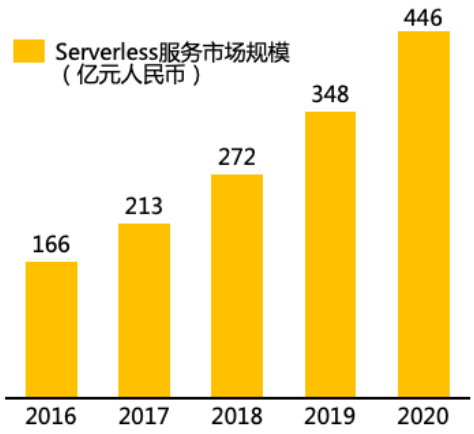
Serverless will be the new paradigm for combining open source and cloud computing. Serverless is a cloud-native development model that allows developers to focus on building and running applications without managing servers. Serverless solutions take the server out of application development, leaving the cloud provider to build, maintain and scale the server infrastructure, while developers can package code into containers for deployment. The global size of Serverless has maintained a relatively high growth rate. According to the Sullivan report, the global market for Serverless will reach 44.61 billion yuan in 2020, a 28% growth rate compared to the 34.8 billion yuan in 2019.

通过在自有云和 Serverless 基础上运行开源，开源方案成本降低。Serverless 平台会根据请求的数量来创建对应的函数实例来执行，无需人工干预，瞬间弹性扩容，应对流量爆发。更大程度上降低了云基础设施成本以及维护扩张成本。除此之外，基于 Serverless 开源解决方案能够以零支出在世界各地部署，并且在运营成本和管理复杂度方面上不会有任何增长。同时，还能够提供更优异的终端用户性能。

By running open source on private cloud and Serverless, the cost of open source solutions achieves cost reduction. the Serverless platform creates instances of corresponding functions to execute based on the number of requests, without manual intervention, and instantly scales elastically to cope with traffic bursts, lowering the cloud infrastructure cost and maintenance expansion cost to a greater extent. In addition, the Serverless-based open source solution can be deployed worldwide at zero cost, with no increase in operational costs or administrative complexity. It also provides superior end-user performance.

图表 14：2016-2020 年全球 Serverless 服务市场规模（按营收计）

Figure 14: Global Serverless Services Market Size (by revenue), 2016-2020



资料来源：沙利文，云启资本

Source: Sullivan, Yunqi Partners

3. 开源软件公司商业化路径选择

Commercialisation Path Options for Open Source software Companies

开源项目的开发者应该意识到开源不是免费的，开源可以进行商业化。从开源这一术语的出现至今，众多的个人开发者以及企业在开源商业化的道路上不断探索，而历史的开源商业化演变道路也向我们展示着开源项目可以成功的进行商业化。这是由于开源这一独特的产品开发模式产生了自己的商业价值，开发者可以选择不同的商业模式将产生的商业价值实现货币化。

Developers of open source projects should be aware that open source is not free and that open source can be commercialized. Since the advent of the term open source, many individual developers and companies have explored the path of open source commercialization, and the historical evolution of open source commercialization has shown us that open source projects can be successfully commercialized. This is because open source is a unique product development model that generates business value. Developers can choose different business models to monetize the business value generated.

3.1 开源软件商业化可以选择的路径和案例

Alternative Paths and Cases for Commercialization of Open Source Software

Support 支持服务——为免费的开源软件提供付费的技术支持和咨询服务，例如集成、使用培训、商业部署等。支持服务的优势在于可以与客户深度融合。但是这种模式从长远来看会受到限制，主要原因为：(1) 支持通常需要大量的人工工作，因此降低了业务利润；(2) 工作缺乏可复制性，部署/集成不可扩展，无法规模性发展；(3) 客户转化率低，通常只能将不到 1% 的用户转化为付费客户，主要是因为只有那些依赖关键任务系统项目的客户才愿意为支持付费。 然而，那些严重依赖项目的人自然会随着时间的推移投入自己的工程努力来了解项目，从而减少对外部支持的需求。选择 Support 支持服务商业路径的主要公司案例是 Red Hat。

Support services - provide paid technical support and consulting services for free

open sources software, such as integration, usage training, and commercial deployment. The advantage of support services is deep integration with the customer. However, this model is limited in the long term because

1. support is often labor-intensive and therefore less profitable for the business;
2. the work is not replicable, deployments/integrations are not scalable, inability to grow at scale;
3. Customer conversion rates are low, typically converting less than 1% of users into paying customers, mainly because only those who rely on mission-critical systems projects are willing to pay for support.

However, those who rely heavily on the project will naturally invest their engineering efforts over time to understand the project, thereby reducing the need for external support. Red Hat is the leading company example of choosing the commercial path for Support services.

Hosting 托管——供应商将其开源软件作为服务托管在云上，通过收取每月/每年的托管和服务费获利。托管意味着提供一个完全托管的项目版本，当用户想要在生产中部署时，可以使用该软件启动远程服务器，而不必担心它不用担心备份、停机、升级等问题。Databricks、Acquia 等公司已经成功证明了托管模式商业化路径的可行性。但是这也引起了公有云提供商（例如 AWS）与开源社区的矛盾。

Hosting: Vendors host their open source software on the cloud and profit by charging a monthly/annual hosting and service fee. Hosting means providing a fully hosted version of the project that users can use to launch remote servers when they want to deploy in production without worrying about backups, downtime, or upgrades. Companies such as Databricks, Acquia, and others have successfully demonstrated the viability of the commercial path of the hosting model. Nevertheless, this has also caused conflict between public cloud providers (like AWS) and the open source community.

Restrictive Licensing 限制性许可——通过提供一个带有稍带限制的开源许可证来激励使用者进行付费。GPL 和 AGPL 许可，以及新创建的 Commons Clause（被某些 Redis 模块采用）都是这种模型的例子。特别是 AGPL 和 Commons Clause（以及 MongoDB 推出的新 SSPL）也是旨在防御公共云提供商的许可证。这种方法的最大缺点是这些许可证会影响软件采

用，通常会流失潜在用户。尤其是部分大公司禁止使用该模式下的开源软件。

Restrictive Licensing - Incentivizing users to pay by providing an open source license with limited restrictions. The GPL and AGPL licenses and the newly created Commons Clause (adopted by some Redis modules) are examples of this model. In particular, the AGPL and Commons Clause (and the new SSPL introduced by MongoDB) are also licenses designed to defend against public cloud providers. The most significant disadvantage of this approach is that these licenses affect software adoption and often turn off potential users. Especially some large companies prohibit open source software under this model.

Open-core 开放核心——供应商将专有部分打包成与开源基础部分连接的单独模块或服务，或者在专门的商业版本中发布。开放核心模式是指公司的大部分代码库是开源的，而一小部分（针对生产或企业用户）是专有的。通常，专有功能是生产部署或大规模生产所需的功能。（例如，对于开源数据库，监控、管理、备份/恢复和集群等功能通常是专有的）。开放核心模式通过允许开源公司在专有代码库中保留某些功能以此来抵御公共云厂商的竞争。但是，这种模式存在两个挑战。首先，开源范围的尺度难以拿捏。如果开源部分太多，专有功能的盈利就会变少；但如果开源提供的功能太少，那么开源项目可能无法得到广泛采用。另一个挑战是，将开源与代码中的专有功能彻底分开有时比较困难。

Open-core: Vendors package proprietary parts into separate modules or services connected to the open source base part or released in a dedicated commercial version. The open-core model means that most of a company's codebase is open source, while a small portion (for production or enterprise users) is proprietary. Typically, the proprietary features are those required for deployment or mass production. (For example, with open source databases, features such as monitoring, administration, backup/restore, and clustering are usually proprietary). The open core model fends off competition from public cloud vendors by allowing open source companies to keep certain features in a proprietary codebase. However, there are two challenges with this model. First, the scale of open source scope is difficult to pin down. If there is too much

open source, proprietary functionality becomes less profitable; but open source projects may not be widely adopted if open source offers too little functionality. Another challenge is that it is sometimes challenging to thoroughly separate open source from proprietary features in the code.

Hybrid Licensing 开放核心+混合许可——混合许可在同一个代码库中混合了开源代码和专有代码。用户可以选择只使用开源代码，或者同时使用开源代码和专有软件代码。这种模式是基于开放核心模式的改进，因此优势包括 open-core 的所有优势，以及更多：(1) 将所有内容都放在同一个代码库中，可以更轻松地管理工程流程和开发；(2) 允许用户方便从免费升级到付费；(3) 允许外部社区成员（例如，通过 GitHub 评论、提交问题）为专有功能做出贡献。

Open Core + Hybrid Licensing - Hybrid licensing mixes open source and proprietary code in the same codebase. Users can use only open source code or use both open source and proprietary software code. This model improves the open-core model, so the benefits include all the advantages of open-core and more.

1. Having everything in the same codebase makes it easier to manage the engineering process and development;
2. Allow users to upgrade from free to paid quickly; and
3. Allow external community members (e.g., via GitHub comments, submitting issues) to contribute to proprietary functionality.

图表 15：开源的五种商业模式 Figure 15: The five business models of open source

商业模式	简介	特点	代表企业
Support 支持服务	• 用户只需为技术支持及咨询服务买单	• 人工外包作，利润率偏低 • 工作可复制性低，scale较难 • 客户转换率低，通常<1%	Hortonworks redhat
Hosting 托管	• 供应商将其开源软件作为服务托管在云上，通过收取每月/每年的托管和服务费获利	• 该模式成为了部分云厂商打包开源项目赚取利润的途径	databricks ACQUIA
Restrictive Licensing 限制性许可	• 通过提供一个带有稍带限制的开源许可证来激励使用者进行付费	• 许可证定义模糊，需要法院判决 • 部分公司禁止使用该商业模式下的开源软件	redis neo4j
Open-core 开放核心	• 该模式下的大部分代码是开源的，而少数代码（针对企业用户）是专有的，需要收费 • 专有部分可以打包成与开源基础部分连接的单独模块或服务，或者在分叉版本中分发	• 该模式可以避免云厂商打包开源项目赚取利润 • 难以拿捏开源范围的尺度 • 很难将代码中的开源与专有特性完全分离	confluent cloudera
Hybrid Licensing 开放核心+混合许可	• 最新的模式，在开放核心基础上进行了改进 • 混合许可在同一个代码库中混合了开源代码和专有代码 • 用户可以选择只使用开源代码，或者同时使用开源代码和专有软件代码	• 代码在同一个代码库中，使管理和开发变得更容易 • 允许用户方便升级到付费模式 • 允许外部社区（比如GitHub）成员对专有软件功能模块进行改进	elastic Cockroach LABS

资料来源：云启资本

Source: Yunqi Partners

3.2 开源项目的 life cycle 以及软件供应商在对应阶段的重点工作

The life cycle of an open source project and the priorities of software vendors in the corresponding stage

3.2.1 早期阶段：软件项目代码公开化及社区构建—开发者社区管理

Early stages: code disclosure and community building for software projects - developer community management

在项目的早期阶段，供应商创建和管理开发者社区，在欢迎开发者加入成为社区成员的同时保持项目主导地位。个人、团体或企业为解决问题创建软件，并将软件项目代码公开化，这代表着一个开源项目的开始。供应商通过构建沟通渠道、技术平台和治理模型等基础设施来创建开发者社区。在社区创建时，供应商应该向开发者解释清楚项目的管理方式、项目主管、外界可作出哪些贡献、以及项目是否由第三方基金会（如云原生计算基金会-CNCF 和 Apache 软件基金会）监督。除此之外，在这个阶段企业应该进行概念验证（PoC）证实开源项目的行业价值与机会，主要可以通过注册用户以及下载量来作为衡量指标。

In the early stages of a project, the vendor creates and manages a developer community, welcoming developers as community members while maintaining ownership of the project. Creating software by an individual, group, or company to solve a problem and make the software project code publicly available represents the beginning of an open source project. Vendors create developer communities by building infrastructures such as communication channels, technology platforms, and governance models. At the time of community creation, the vendor should explain clearly to the developers how the project will be managed, who will be in charge of the project, what external contributions can be made, and whether the project will be overseen by third-party foundations such as the Cloud Native Computing Foundation - CNCF and the Apache

Software Foundation. In addition, at this stage, the company should conduct a proof of concept (PoC) to confirm the industry value and opportunity of the open source project, which can be measured primarily by the number of registered users and downloads.

3.2.2 成长阶段：Roadmap 策略制定及扩大社区建设—产品管理

Growth stage: Roadmap strategy development and community construction - product management

在开发者社区进行有效构建后，下一个阶段是指定产品路线并加速扩大社区。企业应明确软件产品的专有和开源路线图，分析产品特点及使用信息反馈以预测销售机会。目前大多数开源软件企业采用 Open Core 开放核心模式以及 SaaS 托管模式，旗下产品或服务通常分为免费版以及付费版，因此开源企业通常需要管理开源产品路线图和专有产品路线图这两个路线图，如何确定哪些功能开源，哪些功能专有是产品管理中非常重要的部分。

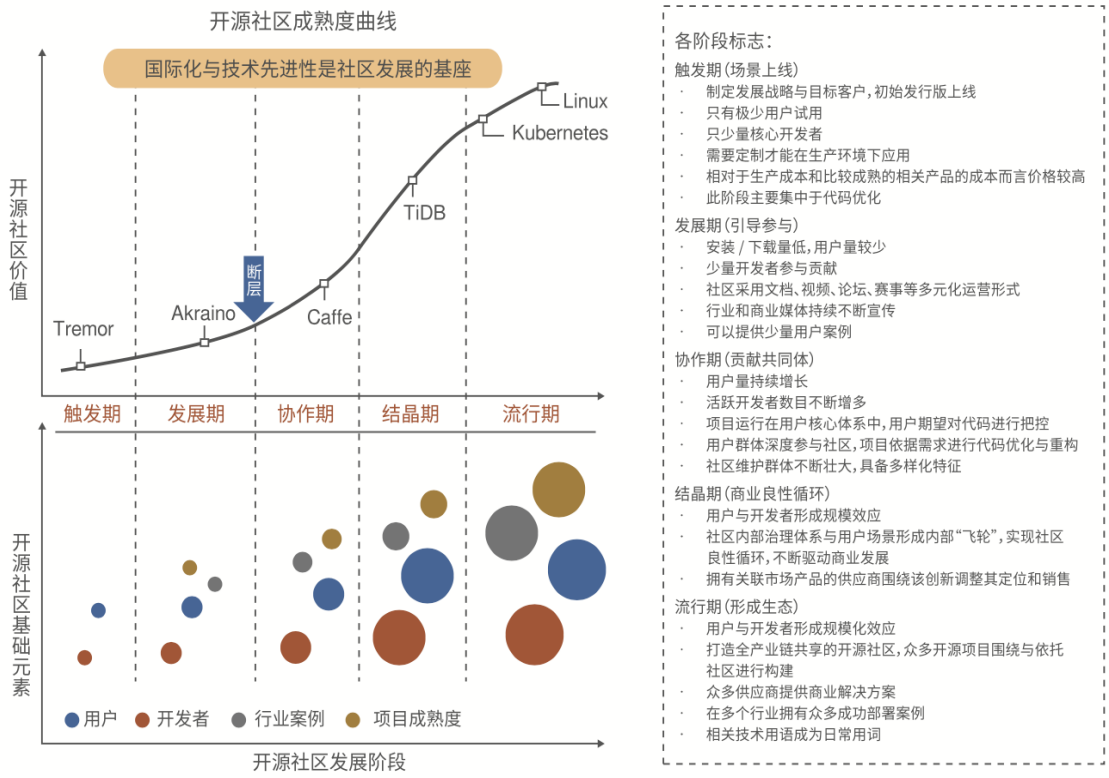
After building the developer community effectively, the next stage is defining the product path and accelerating the community's expansion. Companies should define a roadmap for proprietary and open source software products and analyze product features and user feedback to predict sales opportunities. Most Open source software enterprises adopt the Open Core model and SaaS hosting model, and their products or services are usually divided into free versions and paid versions. Therefore, Open source enterprises usually need to manage both an open source product roadmap and a proprietary product roadmap, and determining which features are open source and which are proprietary is an integral part of product management.

当一个开源项目刚刚开始的时候，需要重点吸引新开发者用户，建立项目“品牌”。企业应该持续投入反馈社区，打造高质量产品及内容的产出，以此维护社区信任，吸引更多的开发者加入社区来加速社区扩张。在社区运营方面，项目创始人往往是社区的灵魂人物。创始人可通过参加面向开发者的会议与在线讨论会，并撰写有关该项目的技术文章、参与论坛等等方式进行项目的宣传。要注意的是，在此阶段可能会发生社区成熟度落后于宣传热度而导致的断层，开源项目发展路径和用户需求出现偏差，或者优化迭代速度无法满足用户要求，造成用户流失，社区死亡。因此，在这个阶段对项目和社区的大量投入是非常必要的，如果可以跨越这一阶段，会迎来快速增长时期。

When an open source project is just starting, the focus needs to attract new developer users and build the project 'brand.' Companies should continue to invest in feedback to the community and build a high-quality product and content output to maintain community trust and attract more developers to join the community to accelerate its expansion. In terms of community operations, the founder of a project is often the community's soul. Founders can promote their projects by attending conferences and webinars for developers, writing technical articles about the project, and participating in forums. It is important to note that at this stage, there may be a fault caused by the community maturity falling behind the publicity heat, a deviation in the development path of the open source project and the needs of the users, or a failure to optimize the iteration rate to meet user requirements, resulting in the loss of users and the death of the community. Therefore, it is necessary to invest heavily in the project and community during this stage. If we can overcome this stage, we will usher in a period of rapid growth.

图表 16：开源社区成熟度曲线

Figure 16: Open source community maturity curve



资料来源：PingCAP，中国信通院

Source: PingCAP, China Academy of Information and Communications Technology

3.2.3 加速扩张阶段：加速软件采用及付费转换—销售管理

Accelerated expansion stage: accelerating software adoption and paid conversion - sales management

加速扩张阶段的主要任务是增强开发者和用户对软件的喜爱、采用和价值，发掘潜在客户并将免费用户向付费用户转换。定位潜在用户应该优先考虑针对特定细分市场的活动，基于产品使用信息进行用户分析，了解哪些角色和部门正在使用该产品以及他们的兴趣所在，同时预测免费用户向付费用户转换的百分比。

The main task of the accelerated expansion stage is to increase the popularity, adoption, and value of the software to developers and users, identify potential customers and convert free users to paid users. Targeting potential users should prioritize segment-specific activities, conduct user analysis based on product usage information to understand which roles and departments are using the product and their interests, and forecast the percentage of free users that will convert to paid users.

开源软件企业在进行付费转换时要遵循 PLG 增长飞轮的获客、转化、留存三个阶段，分别采取不同的行动来增大转换率。获客阶段，企业应着重关注产品合格线索(Product Qualified Leads - PQL)，PQL 是根据产品的使用行为，去把用户确定为一个潜在的销售线索。获客阶段可以参考的量化指标有 PQLs、TTV (新用户到达他们的“aha moment”或激活事件并实现价值所需的时间) 等。在转化阶段，企业应该根据免费版软件的使用行为反馈，进行有针对性的转换跟进和追加销售。最后在留存阶段，产品质量是能否留住客户的最根本因素。只有持续地为客户提供价值，才能提高客户留存率。开源软件的销售也可以兼容传统 SLG 模式和 PLG 模式。一方面，PLG 模式免费版产品面向个人，或中小企业，或者大企业员工用户，扩大用户基数；另一方面，通过 SLG 销售模式去面向中大型企业进行大单交易。

open source software enterprises should follow the three stages of the PLG growth flywheel to acquire customers, convert, retain, and take separate actions to increase the

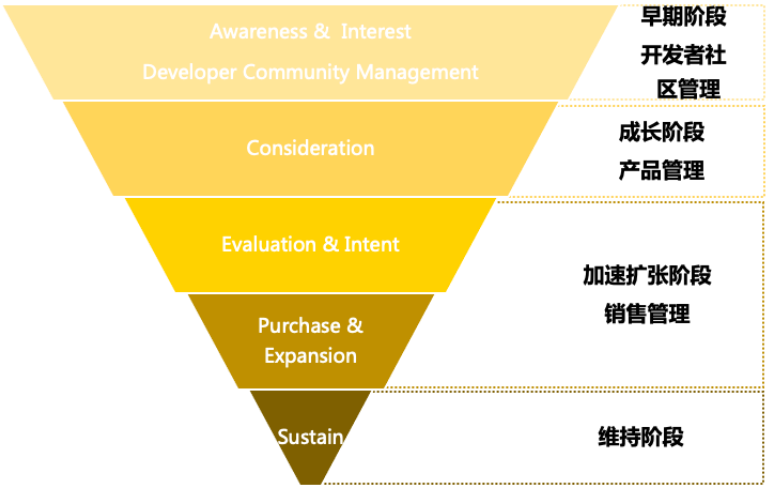
conversion rate. In the acquisition stage, companies should focus on Product Qualified Leads (PQL), which identifies users as potential Sales Leads according to the usage behavior of the product. Quantitative metrics used in the acquisition phase include PQLs, and TTV (the time it takes for a new user to reach their "aha moment" or activation event and realize value). In the conversion stage, companies should follow up with targeted conversions and up-sells based on feedback on the usage behavior of the free version of the software. Finally, product quality is the most fundamental factor in retaining customers in the retention phase. Only by consistently providing value to customers can customer retention rates be increased. The sales of open source software can also be compatible with the traditional SLG and PLG models. On the one hand, the PLG free version of products for individuals, small and medium-sized enterprises, or employees of large enterprises expands the user base; On the other hand, the SLG sales model is used to carry out the large deals for medium and large enterprises.

3.2.4 成熟阶段：维持开源社区运行 Maturity stage: keeping the open source community running

在项目成熟阶段，供应商主要任务是发布新版本、提供漏洞修复、维护社区的运行。开源社区是开源项目的根基。自由包容、积极活跃的开源社区支持项目持续稳定的发展与迭代。

In the maturity phase, the vendor's main tasks are releasing new versions, providing bug fixes, and maintaining the community's operation. The open source community is the foundation of an open source project. A free, inclusive, and active open source community supports the project's continued and stable development and iteration.

图表 17：开源项目生命周期 Figure 17: Life cycle of an open source project



资料来源：云启资本

Source: Yunqi Partners

3.3 商业化过程中的风险点 Risk points in the commercialization process

3.3.1 开源项目技术归属风险 Technical attribution risk of open source projects

开源项目代码公开透明，可能会存在多个下游供应商基于上游社区技术进行各自的商业化开发，这会导致开源项目技术归属出现争议。Apache Doris 和 StarRocks（原 DorisDB）就存在由于开源技术归属引发的矛盾：

Open source projects are open and transparent, and there may be multiple downstream vendors that commercialize their technologies based on upstream community technologies, which may lead to disputes over the ownership of open source projects. Apache Doris and StarRocks (formerly DorisDB) have conflicts caused by the ownership of open source technology:

【专家点评】 [Expert Comment]

姜宁：这个问题还是集中在商标权的问题， 不是技术归属的问题。 开源许可协议允许在满足一定条件下的二次分发，由于 DorisDB 和 Apache Doris 有很强的关联性，存在误导大

家的嫌疑，需要及时纠正。

Jiang Ning: The issue still focuses on trademark rights, not technology ownership. The open source license agreement allows for secondary distribution under certain conditions, and since DorisDB and Apache Doris are firmly related, there is a suspicion of misleading people, which needs prompt corrective action.

- Apache Doris 2018 年由百度贡献给 Apache 软件基金会。2020 年 2 月，百度 Doris 团队的个别成员离职创业，基于 Apache Doris 之前的版本做了自己的商业化闭源产品 DorisDB ，也就是 StarRocks 的前身。DorisDB 在 2021 年 9 月宣布采用 Elastic 2.0 许可证下全面开源。这件事引起了很大争议。

Apache Doris was contributed to the Apache Software Foundation by Baidu in 2018. in February 2020, individual members of the Baidu Doris team left to start their own commercial closed-source product DorisDB, the predecessor to StarRocks, based on a previous version of Apache Doris. DorisDB announced full open source under the Elastic 2.0 license in September 2021. It caused a great deal of controversy.

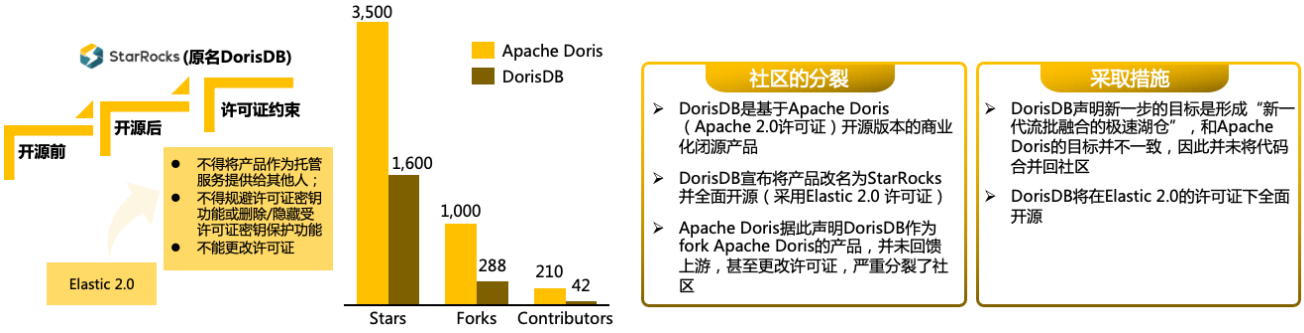
- Apache Doris 认 为 DorisDB 作为 Fork 自 Apache Doris 的项目，不仅未回馈上游社区，选择变更为 OSI 不认可的 Elastic 2.0 许可证，增加了“不得将产品作为托管服务提供给其他人”、“不得规避许可证密钥功能或删除/隐藏受许可证密钥保护的功能”、“不能更改许可证”等条件，是一种“伪开源”的行为。但是由于 Apache Doris 使用的许可证为 Apache License 2.0，允许分发完全自由、允许项目代码被修改、允许作为开源或商业化软件再次发布，法律层面上 Apache License 约束不了这样的行为。在这件事上，双方各执一词，引起了人们对开源项目技术归属问题的重视与思考。

Apache Doris argues that DorisDB, a Fork from Apache Doris, has not only failed to give back to the upstream community but has changed to the OSI-unrecognised Elastic 2.0 license, adding conditions such as "products shall not be provided to others as hosted services," "shall not circumvent the functionality of the license key or remove/hide functionality protected by the license key," and "shall not change the license.", which is a kind of "pseudo-open source" behavior. However, since Apache Doris is licensed under the Apache License 2.0, which allows

complete freedom of distribution, modification of the project code, and redistribution as open source or commercial software, the Apache License does not legally restrict such behavior. In this matter, both sides hold different opinions, causing people to pay attention to and think about the technical ownership of open source projects.

图表 18：Apache Doris 与 Doris DB 的分裂

Figure 18: The split between Apache Doris and Doris DB



资料来源：公开资料，云启资本

Source: Public sources, Yunqi Partners

3.3.2 代码安全风险

开源组件漏洞引起的安全风险也是开源风险中不可忽视的重要因素。开源代码具有公开易获取的特点，这为开发者提供便利的同时，也隐含着漏洞反馈和修复滞后的潜在风险。开源项目一旦被广泛使用，一方面漏洞信息散落在各类开发者手中，能否及时被官方收录是一个挑战；同时另一方面，如果软件使用者跟踪漏洞修复不及时，则其被攻击的风险将大大提升。

Security risks arising from vulnerabilities in open source components are also an essential element of open source risk that cannot be ignored. Open source code is open and easily accessible, which provides developers convenience and implies the potential risk of vulnerability feedback and lagging fixes. Once open source projects are widely used, on the one hand, vulnerability information is scattered among developers, and whether it can be included officially in time is a challenge; on the other hand, if software users do not track vulnerability fixes on time, the risk of being attacked will be significantly increased.

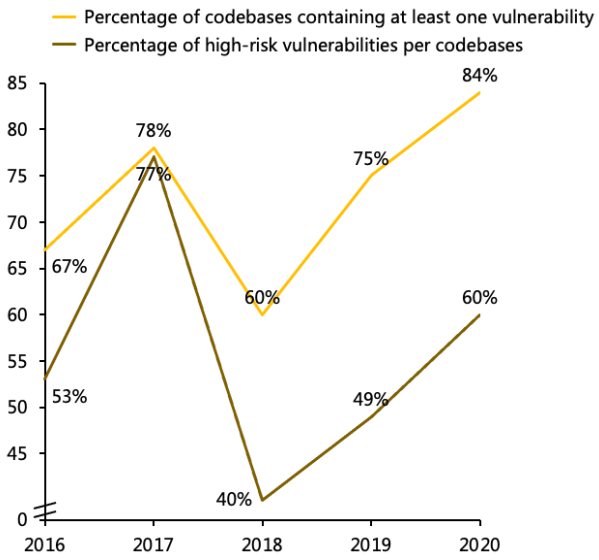
【专家点评】[Expert Comment]

> **姜宁：**开源组件的使用并不是没有成本的。 一般来说开源软件许可中都包含了一个不提供质保的声明。 如果想要比较好解决开源项目代码安全风险的问题 ，公司要么投入人力参与上游项目的开发， 要么购买商业公司基于开源项目制作的发行版。
>
> **Jiang Ning:** The use of open source components is not without cost. Generally speaking, open source software licenses include a statement that no warranty is provided. To better settle the code security risks associated with open source projects, companies either have to invest in developing upstream projects or buy distributions made by commercial companies based on open source projects.

大量开源项目、开源组件存在安全漏洞，且漏洞数量近年来逐年递增。据 Synopsys 统计，在 2020 年审计的 1,500 多个代码库中，其中 84%至少包含一个公共开源漏洞——比 2019 年的 75% 增加了 9%。而包含高风险开源漏洞的代码库在 2020 年增加到 60%，比 2019 年审计的 49% 增加了 11%。

A large number of open source projects and components have security vulnerabilities, and the number of vulnerabilities has been increasing every year. According to Synopsys, 84% of the more than 1,500 codebases audited in 2020 contained at least one public open source vulnerability - up 9% from 75% in 2019. Furthermore, the number of codebases containing high-risk open source vulnerabilities increases to 60% in 2020, an 11% increase from the 49% audited in 2019.

图表 19：开源代码漏洞统计 Figure 19: Open source vulnerability statistics



资料来源：Synopsys，云启资本

Source: Synopsys, Cloud Qi Capital

全球知名开源日志组件 Apache Log4j 于 2021 年 12 月被曝存在严重高危险级别远程代码执行漏洞，引发人们对开源安全性问题的探讨。12 月 9 日，Apache Log4j2 被曝出第一个高危漏洞 Log4Shell，并在此之后持续爆雷，至 12 月 22 日已经发现了第三个高危漏洞 CVE-2021-45105。而由于 Log4j 在国际上的流行度，漏洞带来的安全问题是巨大的。根据谷歌安全团队的统计，截至 2021 年 12 月 16 日，来自 Maven Central 的 35,863 个可用 Java 组件依赖于 Log4j。这意味着 Maven Central 上超过 8% 的软件包里至少有一个版本会受此漏洞影响。除此之外，根据 Cloudflare 研究人员的观测，每秒有超过 1,000 次利用 Log4j 漏洞的尝试。有不法分子利用远程代码执行漏洞窃取云基础设施，部署加密货币矿工和勒索软件。据 Check Point 的统计表示，全球近一半企业因为该漏洞受到了黑客的试图攻击。

Apache Log4j, a world-renowned open source logging component, was exposed to a severe high-risk remote code execution vulnerability in December 2021, sparking a discussion of open source security issues. On December 9, Apache Log4j2 was exposed to its first high-risk vulnerability, Log4Shell, and has continued to explode since then, with a third high-risk vulnerability, CVE-2021-45105, discovered by December 22. Due to Log4j's international popularity, the security implications of the vulnerability are enormous. According to Google's security team, as of December 16, 2021, 35,863 available Java components from Maven Central rely on Log4j, which means that more than 8% of packages on Maven Central have at least one

version affected by this vulnerability. In addition, according to Cloudflare researchers, there are over 1,000 attempts per second to exploit the Log4j vulnerability. Criminals use remote code execution vulnerabilities to steal cloud infrastructure and deploy cryptocurrency miners and ransomware. According to Check Point, nearly half of the world's enterprises have been exposed to hacking attempts due to this vulnerability.

图表 20：受 Log4j 漏洞影响的企业网络的区域统计 Figure 20: Regional statistics of enterprise networks affected by the Log4j vulnerability

资料来源：Check Point Research，云启资本

Source: Check Point Research, Yunqi Partners

3.3.3 云厂商竞争风险 Risks of competition from cloud vendors

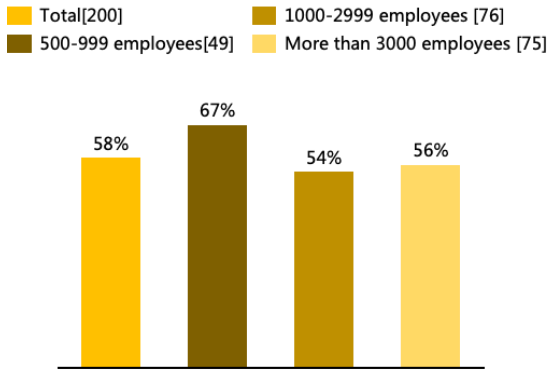
与使用开源项目但不回馈的公共云公司的竞争是多数软件供应商面临的挑战。云厂商通过 Fork 流行项目的源代码，将其作为付费托管服务面向客户，用基于原供应商代码的项目与其竞争客户，造成了云厂商与开源项目现在的摩擦现状。在 VansonBourne 的 2021 年开源调研报告中显示，对于 200 家开源公司进行问卷调查，58% 的公司表明其正在面临着与使用开源项目但不回馈的公共云公司的竞争。作为主要开源项目维护者的公司对于云厂商非常抵触，因为他们投入大量资源为开源项目做出巨大贡献，这些项目作为他们自己的专有付费产品的基础。但是使用开源项目但不回馈社区的云厂商，削弱他们的产品并冲击他们的市场。

Competition with public cloud companies that use open source projects without giving back is challenging for most software vendors. Cloud vendors Fork the source code of popular projects and sell it to customers as a paid hosting service, competing for customers with projects based on the original vendor's code, creating the current state

of friction between cloud vendors and open source projects. In VansonBourne's 2021 Open Source Research Report, a survey of 200 open source companies, 58% indicated that they face competition with public cloud companies that use open source projects but do not give back. Companies that are the primary maintainers of open source projects are very resistant to cloud vendors because they invest significant resources in contributing to open source projects that serve as the basis for their proprietary paid-for products. Nevertheless, cloud vendors that use open source projects without giving back to the community weaken their offerings and undercut their markets.

图表 21：开源公司是否正在面临着与使用开源项目但不回馈社区的云厂商间竞争

Figure 21: Are open source companies facing competition with cloud vendors that use open source projects without giving back to the community?



资料来源：VansonBourne，云启资本

Source: VansonBourne, Yunqi Partners

- 围绕这个问题以亚马逊网络服务（AWS）与 Elastic 的争论为例。Elasticsearch 是 Elastic 公司旗下的一款搜索和数据分析引擎，采用 OpenCore 的商业模式。AWS 在它的下游开了一个发行版叫 OpenDistro for Elasticsearch。2021 年 1 月，Elastic 公司宣布即将变更 Elasticsearch 的 Apache License 2.0 为双授权许可，即 Server Side Public License (SSPL) + Elastic License，主要是针对 AWS 基于 Elasticsearch 的托管服务。作为应对措施，AWS 宣布创建“真正”开源的 Elasticsearch 分支，将 Elastic search 修

改协议之前的最后一个版本 7.10 直接 fork 出来变成 OpenSearch，开源许可证也会继续使用 Apache License 2.0。业界对于 Elastic 改变许可证的做法褒贬不一，有些人认为是在合理的保护自己对于软件的贡献成果，有些人认为 Elastic 已经违背了开源的原则，实际上已经走向了闭源。

- An example of the debate around this issue is the one between Amazon Web Services (AWS) and Elastic.

  Elasticsearch is a search and data analytics engine owned by Elastic, using the OpenCore business model. AWS has a distribution downstream called OpenDistro for Elasticsearch. In January 2021, Elastic announced that it was changing the Apache License 2.0 for Elasticsearch to a dual License, the Server Side Public License (SSPL) + Elastic License, primarily for AWS Elasticsearch-based hosted service. In response, AWS announced the creation of a "true" open source branch of Elasticsearch, forking out the last Elastic Search release, 7.10, as OpenSearch, and the open source license continuing to use the Apache License 2.0. The change in Elastic's license has been met with mixed reviews, with some believing it is a reasonable way to protect their contributions to the software and others arguing that Elastic has gone against the principles of open source and is effectively closed source.

图表 22：Elastic 和 AWS 之争 Figure 22: The Elastic and AWS debate

资料来源：公开资料，云启资本

Source: public sources, Yunqi Partners

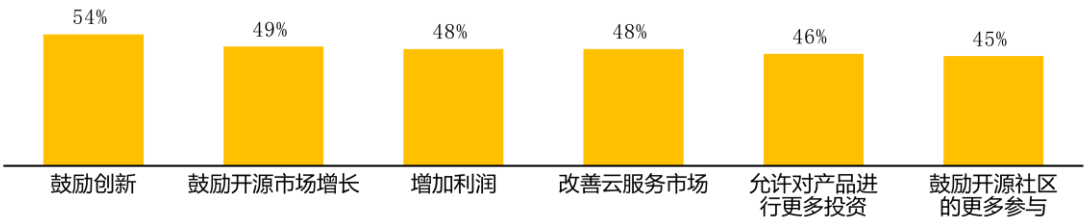
软件供应商通过改变许可证限制程度作为抵抗云服务商的做法存在两面性。为了防止云供应商产生的威胁，大多数开源公司选择了改变许可证限制条件的方法。例如 Redis 创造了新的许可证 Redis Source Available License (RSAL)。大型开源公司 MongoDB、Confluent 和 Elastic 也转向了自己的定制许可证。然而，这些变化对开源社区以及供应商来说仍然存在争议。

There are two sides to software vendors' attempts to resist cloud providers by changing the degree of licensing restrictions. To protect against the threat posed by cloud providers, most open source companies have chosen to change their licensing restrictions. For example, Redis has created a new license, the Redis Source Available License (RSAL). Large open source companies MongoDB, Confluent, and Elastic, have also moved to their bespoke licenses. However, these changes remain controversial for the open source community as well as for vendors.

对开源软件企业进行访问时，一些企业表达了更改许可证限制对于企业可能存在的好处。例如当开源公司可以将成果保护起来时，可以激励其在开发时投入更多的资源。还有其他的一些优点，如鼓励创鼓励开源市场增长、增加利润等等。

During interviews with open source software companies, some expressed the possible benefits of changing licensing restrictions for companies. For example, when open source companies can keep their results protected, they can be incentivized to invest more resources in development. There are other advantages, such as encouraging the growth of the open source market and increasing profits.

图表 23：更改许可证对开源软件公司的优势 Figure 23: The advantages of changing licenses for open source software companies



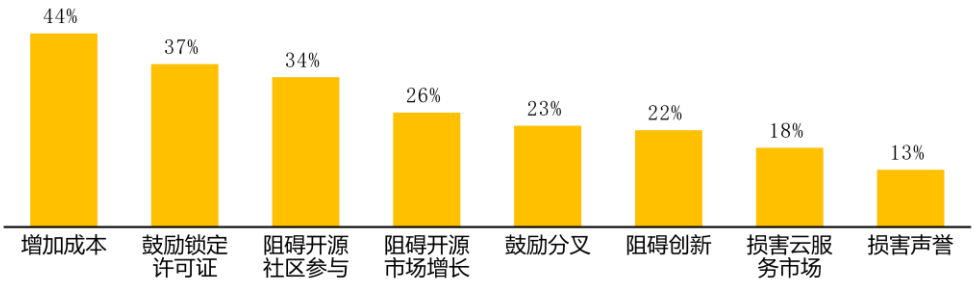
资料来源：VansonBourne，云启资本

Source: VansonBourne, Yunqi Partners

尽管更改代码许可有助于抵制公共云公司，但这种做法将会给那些确实想要贡献并按预期使用开源的人带来不好的影响。不可避免地，开源公司转向可用的源许可证会增加成本并鼓励锁定许可证，这违背了开源的本意—开放。除此之外，更改许可证也可能带来鼓励分叉、阻碍创新、损害云服务市场等弊端。

While changing the code license could help counteract public cloud companies, this practice will negatively impact those who do want to contribute and use open source as intended. Inevitably, the move by open source companies to available source licenses will increase costs and encourage license lock-in, defeating the very purpose of open source - to be open. In addition, changing licenses can have the disadvantage of encouraging forking, discouraging innovation, and harming the market for cloud services.

图表 24 :更改许可证对开源软件公司的劣势 Figure 24: Disadvantages of changing licenses for open source software companies



资料来源：VansonBourne，云启资本

Source: VansonBourne, Yunqi Partners

开源软件商应该加强自身产品差异化的能力，主动拥抱云服务商进行合作。在开源软件公司与云厂商的竞争中代码不是竞争护城河，而是社区以及开发。独立开源软件公司具有三大竞争优势：企业客户不希望供应商锁定；用户更想从编写代码的人那里购买软件及服务；云厂商没有开源公司的专长。首先企业客户不希望供应商锁定。应用云厂商的托管服务，要将其所有对应数据托管到其平台上，可能存在比较大的转移成本，造成供应商锁定。在这一方面开源可以避

免供应商锁定，更受企业用户的喜爱。其次，软件用户更倾向于向编写代码的公司去购买产品。作为开源社区的创建者与主导者，软件用户对开源软件公司的信任度更高，更愿意从开源软件公司购买软件而非云厂商。再次，开源软件公司有着自己的专长。开源软件公司可以吸引大量的开发者来完善软件和服务，这些开发者往往具有云厂商团队所不具有的许多技能。

Open source software vendors should strengthen their ability to differentiate their products and proactively embrace cloud providers for collaboration. Code is not a moat in the competition between open source software companies and cloud vendors, but the community and development are. ISOs have three significant competitive advantages: Enterprise customers do not want vendor lock-in; Users prefer to buy software and services from the people who write the code; Cloud vendors do not have the expertise of open source companies.Firstly, enterprise customers do not want vendor lock-in. Applying a cloud vendor's hosted services to host all their corresponding data on their platform can have relatively high transfer costs, resulting in vendor lock-in. In this respect, open source can avoid vendor lock-in and is preferred by enterprise users. Secondly, software users are more likely to buy products from the company that wrote the code. As the creators and leaders of the open source community, software users trust open source software companies and are more likely to buy software from them than from cloud vendors. Again, open source software companies have their expertise. Open source software companies can attract a large number of developers to refine software and services, and these developers often have many skills that cloud vendor teams do not have.

在实际情况中，云和开源并不是“零和博弈”，而可以是相互促进的合作关系。云是开源软件新的发展机遇。开源产品本身的特点使其十分适合在云上运行，云帮助这些开源软件构建起了新的商业模式。云计算可以解决基础软件之间、企业之间存在太多差异化的问题，开源软件的优质功能与云计算相结合可以高效的实现商业价值。 PingCAP 创始人黄东旭也曾表达了自己的观点—云是开源可规模化变现的唯一出路。他指出一个好的生意应该是可以规模化的，但是传统开源商业模式需要人的介入（销售/售前/售后交付等等），而基于人的生意是没法规模化的。云的本质是一个资源租赁（Hosting），用户按需购买，让开源的规模化成为可能。

In practice, cloud and open source are not a 'zero-sum game' but can be mutually reinforcing partnerships. The cloud is a new opportunity for open source software.

The characteristics of open source products make them well suited to the cloud, and the cloud helps build new business models for these open source software. Cloud computing can solve the problem of too much differentiation between essential software and between enterprises, and the quality features of open source software combined with cloud computing can efficiently realize business value. PingCAP founder Huang Dongxu has also expressed his view that the cloud is the only way to realize open source at scale. He pointed out that a good business should be scalable, but the traditional open source business model requires human intervention (sales/pre-sales/post-sales delivery,etc.), and a human-based business cannot scale. The essence of the cloud is a resource rental (Hosting), where users buy on-demand, making open source scalability possible.

开源软件商应该加强自身产品差异化的能力，若开源产品做的足够复杂，云服务商就不能进行简单的打包销售，必须要同开源软件商进行合作。云厂商可以进行底层整套生态的培育。云、开源、社区之间能够形成生态，从而产生正面影响。

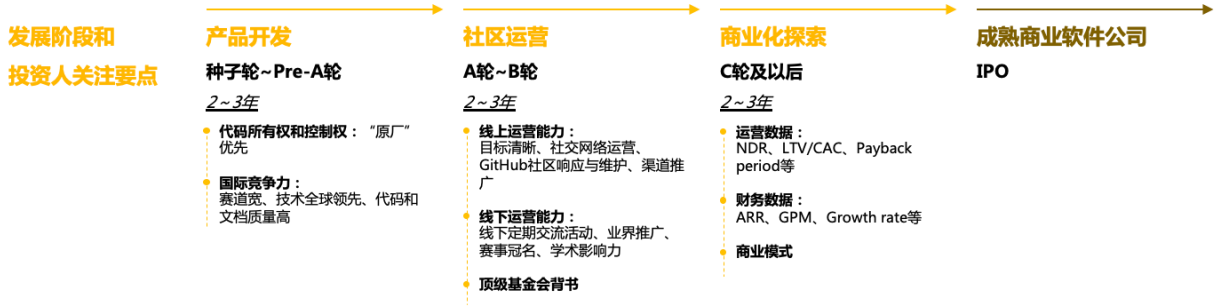
Open source software vendors should strengthen their ability to differentiate their products. If open source products are complex enough, cloud providers cannot simply package and sell them but must work with open source software vendors. Cloud vendors can carry out the cultivation of the entire underlying ecology. Ecology can be formed between cloud, open source, and community, which can positively impact.

4. 投资——如何找到下一个开源独角兽 Investment - how to find the next open source unicorn

4.1 成功商业开源项目判断标准 Judgment criteria for successful commercial open source projects

图表 25：不同阶段投资人对开源项目的判断要点

Figure 25: Key points of the judgment of open source projects by investors at different stages



资料来源：云启资本

Source: Yunqi Partners

4.1.1 拥有代码所有权和控制权——产品开发阶段

Ownership and control of the code - the product development stage

拥有代码所有权和控制权意味着拥有项目主导权、开发自主权、知识产权和商业模式选择权。一个开源软件如果要成功地商业化，最好背后只有一家商业化公司。这也是一个历史教训，Cloudera 和 Hortonworks 都是基于 Hadoop 的上市公司，但是因为基于同一个开源项目，中间有很多斗争内耗，而且由于产品没有明显的差异化，最后价格战的结果就是两败俱伤。相反的，正面例子既有 2021 年上市的基于 Kafka 项目的 Confluent，还有基于 Spark 的商业化公司 Databricks，他们的特点是只有一个商业化公司在主导项目的产品和商业化进程，不会有内耗、价格战的问题。

Having ownership and control of the code means having project ownership, development autonomy, intellectual property rights, and the choice of business model. For open source software to be successfully commercialized, it is best to have only one commercialization company behind it. This is a lesson from history, as Cloudera and Hortonworks are both publicly traded companies based on Hadoop, but because they stem from the same open source project, there was much internal struggle in between, and because the products were not differentiated, the price war ended up being a lose-lose situation. In contrast, positive examples include Confluent, a Kafka-based project that will go public in 2021, and Databricks, a Spark-based commercialization company, which features a single commercialization company leading the product and commercialization process of the project without the problems of internal conflict and price wars.

图表 26：原厂开源项目 VS 非原厂开源项目

Figure 26: Original open source projects vs. non-original open source projects

资料来源：云启资本

Source: Yunqi Partners

4.1.2 具备国际竞争力——产品开发阶段 Being internationally competitive - the product development stage

开源项目的国际竞争力主要通过赛道选择、技术水平、获客能力、社区运营能力来体现。开源本身作为基础软件来说是没有国界的，全世界的诉求一致。要脱颖而出的话必须做到同领域的世界领先地位，而不仅仅在中国内领先。由于研发人员可以采用开源软件时可以选用美国的也

可以用中国的，不会牵扯到代码安全或者自主可控的问题。因此如果开源项目没有全球竞争力，那它的市场就会特别局限。以 PingCAP 为例，它的数据库产品 TiDB 对标的是美国的 CockroachDB，但是无论从社区活跃度、GitHub 的星标或者一些评论文章，PingCAP 的指标已经全面超过了它的美国对标。

As essential software, open source has no national boundaries; the world's appeal is consistent. To stand out, we must be a world leader in our field, not just within China. The international competitiveness of open source projects is mainly reflected through track selection, technical level, customer acquisition ability, and community operation ability. Since developers can use open source software from the US or China, code security or autonomy is no question. So if an open source project is not globally competitive, its market will be minimal. For example, PingCAP's database product TiDB is benchmarked against CockroachDB in the US, but in terms of community activity, GitHub stars, or some commentary, PingCAP's metrics have surpassed its US counterpart across the board.

图表 27：如何提高开源项目国际竞争力

Figure 27: How to improve the international competitiveness of open source projects

资料来源：云启资本

Source: Yunqi Partners

4.1.3 社区运营能力——社区运营阶段 Community operation capability - the community operation stage

开放、协作的社区是开源项目的第一支柱。一个成功的开源项目一定有一个活跃的开源社区，不论是参与开发的开发人员还是参与使用的用户。评价指标可以用包括 GitHub Star、Fork、Pull Request 、Contributor 等来衡量。从 GitHub Star、Fork 等可以看项目参与的广泛程度，从 Contributor、Commits 可以看出项目的迭代情况，这些都是比较量化的指标。而从问答则可以看出社区的活跃度和了解真实用户反馈。尽管 OSS 社区的规模各不相同，但日益增长的人气是 OSS 项目激发开发人员群体浓厚兴趣的关键指标。

An open, collaborative community is the first pillar of an open source project. A successful open source project must have an active open source community, both the developers involved in the development and the users involved in using it. Evaluation metrics can be measured using GitHub Star, Fork, Pull Request, Contributor, etc. Quantitative metrics such as GitHub Star and Fork can show the extent of project participation, while Contributor and Commits are quantitative indicators of iteration. Questions and Answers are an excellent way to see how active the community is and get honest user feedback. Although OSS communities vary in size, growing popularity is a crucial indicator of the strong interest generated by the developer community.

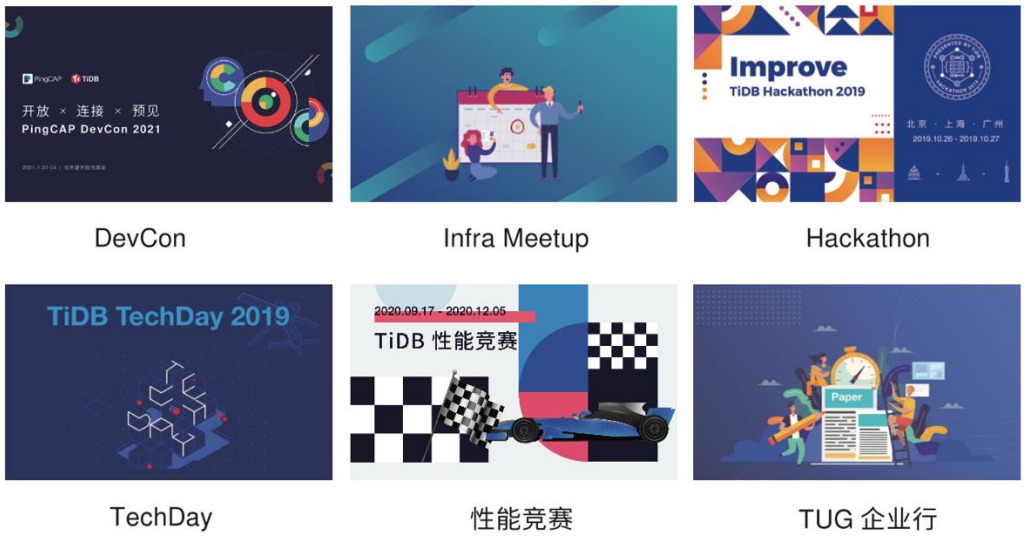
企业应具有强大的线上和线下宣传运营能够吸引更多的开发者参与到开源项目中，以此增加项目的影响力。线上运营方面，官网要有清晰的目标、蓝图和路线，让开发者理解项目本质，从而吸引开发者参与。并且要积极进行社交网络的运营，例如维护公众号等社交媒体，发表高质量的技术文章 ,以解决问题的心态帮助开发者等等。对 GitHub 社区应该进行及时的响应与维护，对开发者需求及时响应，定期维护代码，及时更新说明文档。除此之外还应拓宽渠道推广，不断加强 SEO ,增加项目线上曝光度和易得度。线下的运营方式包括 :通过定期举行社区 meetup 等线下交流活动，增加开发者之间的交流，扩大社区的影响力；参加各种业界会议，并与媒体保持良好的合作关系，增加媒体曝光度；举办开源比赛，让全球的公司和学校参与进来，增加项目知名度；与学术界合作，发表顶级论文，增加业界影响力等。

Companies should have solid online and offline publicity operations to attract more

developers to open source projects, thereby increasing the project's impact. For online publicity, the website should have a clear goal, blueprint, and roadmap that allows developers to understand the nature of the project and attract developers to participate. In addition, we should also be active in social networking, such as maintaining social media such as public accounts, publishing quality technical articles, and helping developers with a problem-solving mindset. Be responsive to and maintain the GitHub community, respond to developer needs, maintain code regularly, and update documentation timely. It is also essential to promote through various channels and enhance SEO to increase exposure and accessibility online. Offline operations include: increasing communication between developers and expanding the influence of the community by holding regular offline events such as community meetups; attending industry conferences and maintaining good relationships with the media to increase media exposure; holding open source competitions to engage companies and schools around the world to increase project visibility, and collaborating with academics to publish top-tier papers to increase industry influence, etc.

图表 28：TiDB 社区运营模式

Figure 28: TiDB community operation model



资料来源：PingCAP 官网

Source: PingCAP official website

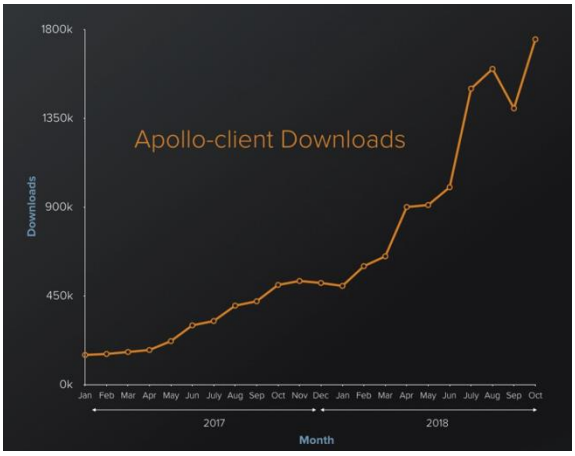
4.1.4 市场匹配能力——商业化探索阶段 Market matching capability - Commercial exploration stage

首先，开源项目应该具有产品-市场契合。产品与市场的契合体现在用户对软件的初始采用率，可以用下载量这一指标进行衡量。产品市场契合度主要是用来衡量免费产品的用户基数，因为在开源的商业模式下社区用户（含开发者）有一定几率在未来转化为付费客户，所以在初期可以吸引到多少用户进行产品的使用时后期付费转化的先决条件。

Firstly, open source projects should have a product-market fit embodied in users' initial adoption rate of the software, which the metric of downloads can measure. Product-market fit is primarily a measure of the user base of a free product because, in an open source business model, there is a certain chance that community users (including developers) will convert to paid customers in the future. Hence, the number of users attracted to the product in the early stages is a prerequisite for later payment conversion.

图表 29：Apollo 客户下载情况

Figure 29: Apollo customer downloads



资料来源：a16z

Source: a16z

其次，开源项目应具有价值-市场契合。价值与市场的契合度就是要找到企业要进行商业化的内容来创造收入。价值与市场契合度是开源软件公司能否成功进行商业化最重要的因素。产品市

场契合度引入了用户，价值市场契合度就是找到客户关心并愿意支付的费用，进而使企业可以自然延伸来推动收入。开源软件公司已经找到了一些围绕功能的价值市场契合，包括 RAS（可靠性、可用性、安全性）、工具附加组件、性能、审计、服务等。

Secondly, open source projects should have a value-market fit. Value-market fit is about finding the content that the companies need to commercialize to generate revenue and is the most crucial factor for an open source software company to successfully commercialize. Product market fit introduces users, and value market fit is finding what customers care about and are willing to pay for, allowing companies to extend to drive revenue naturally. Open source software companies have found some value market fit around functionality, including RAS (reliability, availability, security), tool add-ons, performance, auditing, services, etc.

图表 30：开源软件公司价值市场契合点

Figure 30: Value market fit for open source software companies

资料来源：a16z

Source: a16z

4.1.5 成熟的商业模式——商业化探索阶段

Mature business model - Commercial exploration stage

成功的开源公司必须有成熟的商业模式，选择哪种商业模式取决于可以为客户提供什么价值以及如何最好地提供这些价值。支持服务模式是开源 1.0 时代的基础模式，但是 RedHat 已经在这方面垄断了市场并实现了规模化。选择支持服务模式有可能要与 RedHat 在这方面竞争。Open Core 模型在开源软件之上分层增值专有代码，是内部部署软件的一个很好的模型。如果可以在不损害开源软件采用的情况下保持专有的高价值的组件，那么 Open Core 将是一个很好的模型。但是 Open Core 模式存在的风险是---如果不能很好地决定哪些功能属于专有，哪

些属于开源码时，社区疏远可能会成为一个问题，会出现项目的分叉版本，或者围绕相同的代码库启动一个新项目。如果企业的价值和竞争优势在于软件的运维，那么可以选择 SaaS 作为商业模式。但是要面对公共云厂商竞争的潜在风险。

Successful open source companies must have a mature business model, and the choice of business model depends on what value can be offered to customers and how best to deliver that value. The support services model was the foundation of the open source 1.0 era, but RedHat has already cornered the market and achieved scale in this area. The Open Core model, which layers value-added proprietary code on open source software, is a good model for on-premise software. If proprietary, high-value components can be maintained without compromising open source adoption, Open Core would be a good model. However, there is a risk with the Open Core model - community alienation can become an issue when there is no good decision about what proprietary features are and what is open source, resulting in forked versions of a project, or starting a new project around the same codebase. If the value and competitive advantage of the business lies in operation and maintenance of the software, then SaaS may be the business model of choice. However, it faces the potential risk of competition from public cloud vendors.

不是所有开源软件都适合做商业化。根据对美国开源独角兽公司的相应研究，发现大数据、AI、企业搜索、中间件和操作系统这几个领域相对是容易商业化的。相反一些前端的控件，关注度很高，但是很难设置收费点，商业化会有难度。因此成功的开源公司有成熟的商业模式，并且通常在美国有对标的项目。

Not all open source software is commercially viable. A corresponding study of open source unicorn companies in the US found that big data, AI, enterprise search, middleware, and operating systems are relatively easy to commercialize. Conversely, some front-end controls, which get much attention but are challenging to set charges, can be difficult to commercialize. Therefore successful open source companies usually have proven business models and have benchbenchmarking projects in the US.

4.2 中国开源市场 China's open source market

随着越来越多的中国优秀开发者参与到开源社区中，涌现了很多达到国际水平的优秀开源项目。在开源领域表现最为亮眼的是 PingCAP， TOP 20 项目中上榜的项目有 6 个， 包括位于榜首的由其自主设计、研发的开源分布式关系型数据库 TiDB，分布式事务型的键值数据库 TiKV，文档型项目 docs-cn、docs 等。其次是阿里，TOP 10 项目中上榜的项目有 2 个，分别是蚂蚁金服采用 React 封装的一套组件库 Ant Design (位于第 2 名)，以及致力于配置和管理微服务的特性集 Nacos。百度也上榜了 2 个项目，主要集中在人工智能领域，是百度深度学习平台 PaddlePaddle 的 2 个项目，分别是核心框架 Paddle 以及相关工具库。

As more and more talented Chinese developers participate in the open source community, many outstanding open source projects have emerged that have reached international standards. The most prominent performer in the open source field is PingCAP, with six projects in the Top 20, including TiDB (an open source distributed relational database designed and developed by PingCAP), TiKV (a distributed transactional key-value database), docs-cn, and docs. The second is Ali, with two projects in the Top 10, Ant Design (at #2), a set of component libraries wrapped in React by Ant Financial Services, and Nacos, a feature set dedicated to configuring and managing microservices. Baidu is also on the list with two projects, mainly artificial intelligence. The two projects are the core framework, Paddle, and the associated tool libraries on the deep learning platform PaddlePaddle.

图表 31：GitHub2020 中国项目活跃度 TOP20

GitHub 2020 Top 20 Active Projects in China

排名	项目名	活跃度	参与开发者数量	issue comment	open issue	open pull	pull review comment	merge pull	star	fork
1	pingcap/tidb	210.1	5,831	53,022	2,801	4,969	10,928	3,459.2	4,862	1,052
2	ant-design/ant-design	193.3	23,620	32,026	4,836	3,131	3,320	2,130.7	12,709	8,052
3	PaddlePaddle/Paddle	127.4	4,842	15,329	2,256	5,656	9,625	3,478.2	3,574	786
4	tikv/tikv	81.7	2,593	17,817	997	2,019	5,547	1,279.9	2,129	434
5	apache/shardingsphere	75.3	5,267	9,055	1,713	3,235	1,858	2,539.5	3,834	1,443
6	apache/incubator-tvm	70.4	2,148	7,961	437	2,112	8,506	1,540.1	1,454	662
7	pingcap/docs-cn	65.1	532	8,202	96	2,965	6,959	2,315.9	140	320
8	apache/incubator-echarts	64.2	11,638	7,650	1,620	324	346	194.5	6,664	4,463
9	pingcap/pd	60.9	437	13,325	667	1,667	4,972	1,297.7	214	224
10	alibaba/nacos	59.9	9,956	7,042	1,640	706	827	410.0	6,347	3,450
11	NervJS/taro	54.7	7,469	9,339	2,231	917	135	551.5	5,250	1,012
12	youzan/vant	54.2	9,806	4,897	1,661	715	201	554.4	4,672	4,502
13	pingcap/docs	53.9	314	7,014	64	2,736	5,226	2,257.8	90	164
14	ElemeFE/element	52.7	11,749	4,993	1,762	297	10	33.3	6,853	3,411
15	apache/skywalking	51.9	5,556	6,783	1,084	860	3,455	583.4	4,201	1,471
16	PaddlePaddle/PaddleOCR	47.9	9,394	4,039	1,033	573	622	420.0	8,430	1,664
17	apache/incubator-dolphinscheduler	47.1	2,588	9,364	1,269	1,407	730	902.7	1,835	909
18	apache/apisix	45.4	2,923	5,855	1,109	1,029	3,383	715.0	2,496	579
19	seata/seata	45.1	7,339	3,754	785	517	1,805	313.5	5,261	2,296
20	pingcap/tidb-operator	45.1	425	8,627	703	1,498	3,683	1,172.1	240	140

资料来源：中国开源软件推进联盟，GitHub

Source: China Open Source Software Promotion Alliance, GitHub

4.3 资本市场上投资人对开源领域布局力度加大

Investors in the capital market are placing more emphasis on the open source sector

在中国由于越来越多的开源企业正在积极地进行商业化，大量资本投资方也看准了投资机会，进入开源市场。目前国内比较代表性的开源项目投融资情况表现出具有发展潜力的开源项目往往呈现出实力资本多轮注资，从早期开始长期陪伴企业发展的现象，如 PingCAP(TiDB)、巨杉数据库（SequoiaDB）等。表明企业在融资后利用资金进行了有效发展和扩张，融资后路径满足资本预期。2020 年和 2021 年是开源市场迎来资本热潮的时期，大部分公司在 2020 年至 2021 年初都迎来了最新融资，例如 PingCAP 在 2020 年完成 D 轮 2.7 亿美元融资创造了全球数据库历史新的里程碑，以及 Zilliz 创下了全球开源基础软件领域迄今为止最大单笔 B 轮融资的记录。

In China, as more and more open source companies are actively commercializing, a large number of capital investors also see the investment opportunity and enter the open source market. At present, the investment and financing situation of more representative open source project in China shows that open source projects with development potential often attract strong capital injection in multiple rounds and would accompany the development of the enterprise from the early stage for a long time, such as PingCAP (TiDB), and SequoiaDB. 2020 and 2021 are the period of capital boom in the open source market, with most companies receiving their latest funding between 2020 and early 2021; for example, PingCAP completed a

$270 million Series D round in 2020, which set a new milestone in the global database; Zilliz set a record for the largest single Series B round to date in the global open source infrastructure software sector.

图表 32：国内开源软件企业融资状况 Figure 32: Financing status of domestic open source software companies

公司	开源核心	最新一轮融资金额	最新一轮融资时间	GitHub Star	GitHub Fork	Github Contributor
支流科技	Apache APISIX	数百万美元	2021/6	6.5k	1.3k	228
偶数科技	Apache HAWQ	近 2 亿人民币	2021/8	619	304	69
跬智信息技术	Apache Kylin	7000 万美元	2021/4	3.2k	1.4k	184
StreamNative	Apache Pulsar	2300 万美元	2021/10	9.7k	2.4k	452
映云科技	EMQ	1.5 亿人民币	2018/4	8.6k	1.6k	75
泛化智能	GAAS	千万级	2018/10	1.5k	382	11
Gitee	git	未披露	2020/8	40k	22k	408
极纳科技	Jina	3000 万美元	2021/11	11.5k	1.3k	117
Juicedata	JuiceFS	数百万元	2018/10	3.8k	292	34
才云科技	Kubernetes	数千万元	2019/12	82k	30k	373
Zilliz	milvus	4300 万美元	2020/11	8.1k	1.1k	141
欧若数网	Nebula	近千万美元	2020/11	6.6k	668	61
一流科技	oneflow	5000 万元	2021/2	2.7k	307	92
EasyStack	OpenStack	未披露	2021/1	4.1k	1.5k	357
好雨科技	Rainbond	未披露	2016/11	2.8k	565	18
睿赛德科技	RT-Thread	未披露	2020/1	6.3k	3.6k	309
巨杉数据库	SequoiaDB	数亿元人民币	2020/10	251	103	0
涛思科技	TDengine	4700 万美元	2021/5	16k	4k	123
顶想信息	ThinkPHP	100 万人民币	2015/3	7.7k	1.7k	37
PingCAP	TiDB	未披露	2021/7	29k	4.7k	398
数字天堂	uni-app	未披露	2018/9	34k	3.1k	170
云轴信息	ZStack	未披露	2021/3	1.1k	364	43
易软天创	禅道	未披露	2021/10	777	239	35
Chatopera	春松客服	数百万元	2018/8	1,9k	623	3
泽拓科技	昆仑数据库	数千万元人民币	2021/8	87	13	6
云联壹云	云联壹云	未披露	2021/1	661	187	18

资料来源：公司公告，Crunchbase，云启资本

Source: Company Announcements, Crunchbase, Yunqi Partners

5. 案例分析 Case study

5.1 PingCAP

PingCAP 国内领先的企业级开源分布式数据库厂商。公司成立于 2015 年，致力于为全球行业用户提供稳定高效、安全可靠、开放兼容的新型数据基础设施。核心产品为分布式关系型数据库 TiDB。TiDB 是 PingCAP 公司自主设计、研发的开源分布式关系型数据库，是一款同时支持在线事务处理与在线分析处理（Hybrid Transactional and Analytical Processing, HTAP）的融合型分布式数据库产品。

PingCAP, an enterprise-level open source distributed database vendor in China, was founded in 2015. The company is committed to providing stable, efficient, safe, reliable, open, and compatible new data infrastructure for global industry users. Its core product is TiDB, an open-source, distributed, NewSQL database that supports Hybrid Transactional and Analytical Processing (HTAP) workloads.

图表 33：PingCAP 发展历史

Figure 33: History of PingCAP

资料来源：公司公告，GitHub，云启资本

Source: Company announcement, GitHub, Yunqi Partners

图表 34：PingCAP 核心产品 TiDB

Figure 34: TiDB, the core product of PingCAP

资料来源：公司公告，云启资本

Source: Company announcement, Yunqi Partners

PingCAP 的发展潜力受到资本追捧。PingCAP 在 2020 年底完成了 2.7 亿美元的 D 轮融

资，成功迈入独角兽行列也成为中国开源新势力的领军人物。2021 年 7 月，公司完成完成估值 30 亿美元的新一轮融资。在 PingCAP 的融资历程中，出现了资本连续加持的情况。经纬中国从 2015 年的天使轮投起，连投了 5 轮；云启资本从 2016 年的 A 轮进入，也跟进到最新一轮。

PingCAP's growth potential has been sought after by capital. PingCAP secured $270 million in a Series D funding round held in late 2020, successfully entering the unicorn category and becoming a leading player in China's new open source force. In July 2021, the company closed a new funding round valued at approximately $3 billion. Successive capital additions have marked PingCAP's funding history. Matrix Partners China has invested in PngCap for five consecutive rounds, starting with an angel round in 2015, and Yunqi Partners has followed through to the latest round from a Series A round in 2016.

图表 35：PingCAP 融资历程　Figure 35: PingCAP's funding history

日期	融资轮次	融资金额	投资机构
2021-07-20	战略融资	未披露	红杉基金，GIC，贝塔斯曼亚洲投资基金，纪源资本，五源资本
2020-11-17	D 轮	2.7 亿美元	Coatue，云启资本，FutureX 天际资本，贝塔斯曼亚洲投资基金，时代资本，经纬中国，挚信资本，纪源资本，昆仑资本，五源资本，Access Technology Ventures，晨曦投资
2018-09-12	C 轮	5000 万美元	云启资本，复星创富，经纬中国，华创资本，五源资本
2017-06-13	B 轮	1500 万美元	峰瑞资本，云启资本，经纬中国，险峰长青，华创资本
2016-09-21	A 轮	700 万美元	峰瑞资本，云启资本，初心资本，经纬中国
2015-12-09	天使轮	数百万元人民币	经纬中国

资料来源：公司公告，Crunchbase，云启资本

Source: Company announcement, Crunchbase, Yunqi Partners

PingCAP 产品-社区-商业化生态处于全国领先。PingCAP 产品具备一键水平扩容或者缩容、金融级高可用、 实时 HTAP、云原生的分布式数据库、高度兼容 MySQL 生态等重要特性。截止到 2021 年 11 月，TiDB 项目在 GitHub 上已总计获得超过 29,000 颗星，近 1,500 位开源代码贡献者，达到全球知名的开源软件厂商水平。公司定位全球数据库科技公司，目前已

经向包括中国、美国、欧洲、日本、东南亚等国家和地区，超过 2000 家企业提供服务，涉及金融、运营商、制造、零售、互联网、政府等多个行业。

Conceived and built to be a global technology company with global impact, the company currently provides services to over 2,000 enterprises in a wide range of industries, including finance, operators, manufacturing, retail, internet, and government in countries and regions including China, the US, Europe, Japan, and Southeast Asia.

图表 36：PingCAP 产品-社区-商业化

Figure 36: PingCAP Product - Community - Commercialization

资料来源：公司公告，GitHub，云启资本

Source: Company Announcement, GitHub, Yunqi Partners

5.2 GitLab

GitLab 提供开源的 DevOps 平台，帮助编码者实现线上合作开发以及版本控制。GitLab 成立于 2014 年，总部位于特拉华州。最初起源于一个个人项目，是由 GitLab 前 CTO Dmitriy

2001 年创建的。根据 GitLab 2021 年的上市招股说明书所示，GitLab 截至 2021 年 7 月 31 日，公司年化营收超过 2.3 亿，最近的 QRR 达到 5,800 万美元，同比增长 69%。GitLab 拥有 ARR 大于 5,000 美元的客户 3,632 个，ARR 大于 10 万美元的客户 383 个，包括高盛、西门子、英伟达等，开源社区中的代码贡献者超过 2,600 位。

GitLab provides an open source DevOps platform to help coders with online collaborative development and version control. GitLab was founded in 2014 and is located in Delaware. Originally started as a personal project, it was founded in 2001 by Dmitriy, the former CTO of GitLab. According to GitLab's 2021 IPO prospectus, GitLab had annualized revenue of over $230 million as of July 31, 2021, with a recent QRR of $58 million, up 69% year-over-year. GitLab has 3,632 customers with ARRs greater than $5,000 and 383 customers with ARRs greater than $100,000, including Goldman Sachs, Siemens, and Nvidia, and over 2,600 code contributors in the open source community.

图表 37：GitLab 发展历史

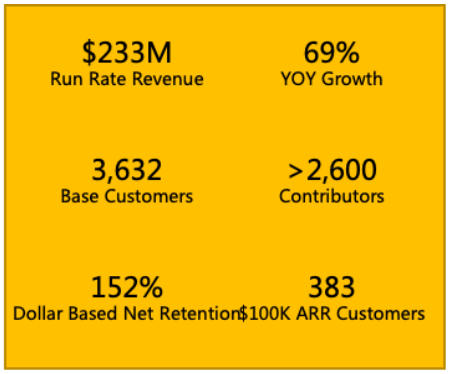
Figure 37: GitLab development history

资料来源：公司公告，云启资本

Source: Company Announcements, Yunqi Partners

图表 38：GitLab 经营状况

Figure 38: GitLab Business Status



资料来源：Pitchbook，云启资本

Source: Pitchbook, Yunqi Partners

GitLab 采用的是 OpenCore 开放核心的开源商业模式。服务共分为三级，包括一个免费套餐与两个收费套餐，分别针对社区开源用户、中小企业与大型企业。免费套餐主推面向大众用户

的 Create 和 Verify 模块，两个收费套餐分别增加了版本控制、运营分析、项目管理与进阶安全测试、产品组合管理、合规规划等内容。订阅模式分为建立在公有云上的 SaaS 服务与企业本地管理，在企业本地管理的情况下，企业可以根据情况 将 GitLab DevOps 平台建立在私有云或者混合云上,同时 GitLab 也会将本地管理的控制权完全交予企业。

GitLab adopts the open source business model of OpenCore. The service contains three levels: one free package and two paid packages for community open source users, SMBs, and large enterprises, respectively. The free package features the Create and Verify modules for the general public, while the two paid packages add version control, operational analysis, project management and advanced security testing, portfolio management, compliance planning, and other contents, respectively. The subscription model falls into SaaS services built on the public cloud and enterprise local management. In the case of enterprise local management, companies can build the GitLab DevOps platform on a private or hybrid cloud as appropriate, and GitLab will hand over complete control of local management to the company.

图表 39：GitLab 的 Open Core 商业模式

Figure 39: GitLab's Open Core Business Model

Open Core模式，三条产品线

标准版GitLab（针对个人用户）	DevOps全生命周期所有阶段； 自带GitLab CI运行器；支持任意生产环境部署；免费静态网站；获取每月400分钟的CI/CD流水线时间
专业版GitLab（提高团队协作）	更好的代码评审；运维可视化；项目管理 发布控制；SaaS用户每月10,000分钟CI/CD流水线时间
旗舰版GitLab（企业级安全&合规&规划）	高级安全测试；合规性；项目组合管理；价值流分析 访客不计入计费用户；SaaS用户每月50,000分钟CI/CD流水线时间

资料来源：公司公告，云启资本

Source: Company announcement, Yunqi Partners

5.3 Jina AI

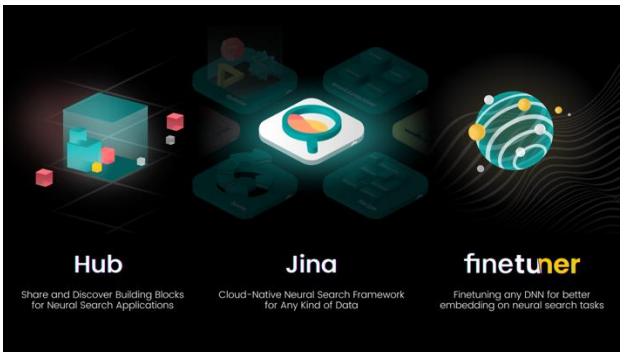
Jina 首创的“神经搜索”，可以让企业利用可操作的非结构化数据构建搜索解决方案，做出更

有效的业务决策。Jina AI 的核心项目在 Github 上被称为 Jina ，允许用户在短短几分钟内创建一个由深度学习驱动的云原生搜索解决方案。Jina 将构建一个生产就绪的神经搜索系统的工作量从几个月减少到几分钟，非常适合需要快速、轻量级开发周期的商业环境。除了主产品 Jina，公司最近推出了 Finetuner，它可以让用户根据企业的独特需求对神经搜索系统进行调整。

Jina pioneered "neural search," allowing companies to build search solutions using actionable unstructured data to make more effective business decisions. Jina AI's core project, known as Jina on Github, allows users to create a cloud-native search solution powered by deep learning in just a few minutes. Jina reduces the effort of building a production-ready neural search system from months to minutes, making it ideal for business environments requiring a fast, lightweight development cycle. Ideal for business environments that require a fast, lightweight development cycle. In addition to the main product, Jina, the company recently launched Finetuner, which allows users to tailor a neural search system to the unique needs of their organization.

图表 40：Jina 产品矩阵

Figure 40: Jina product matrix



资料来源：Jina 官网

Source: Jina official website

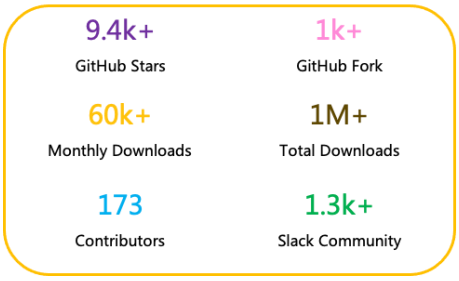
Jina AI 已经受到社区的积极认可，并且受到资本不断注入。自 2020 年 2 月成立至今，公司已经创建了超过 1,000 个用户的大规模开发者社区。Jina 仅用了 18 个月的时间在 GitHub 上吸引了大量用户，GitHub stars 达到 9.4k+，fork 数达到 1k+，总下载量超过 100 万次。Jina 用户场景多样，可以满足不同行业对神经搜索的需求，比如游戏制作公司的 3D 模型，电商网站上的图像和能够理解混合语义的问答聊天机器人。Jina 在资本市场上也受到多个知名投

资机构认可，目前公司总融资金额已达到 3,900 万美元，最新 A 轮融资 3,000 万美元,该轮融资由新投资方美国投资机构 Canaan Partners 领投，Mango Capital 以及原投资方 GGV 纪源资本、SAP.iO 和云启资本跟投。

Jina AI has received positive recognition from the community and a steady capital infusion. Since its inception in February 2020, the company has created a large developer community of over 1,000 users. Jina has attracted massive users on GitHub in 18 months only, with 9.4k+ GitHub stars, 1k+ forks, and over 1 million total downloads. Jina has a diverse user base that can meet the needs of different industries for neural searches, such as 3D models for game production companies, graphics for e-commerce sites, and Q&A chatbots that understand mixed semantics. Jina has also been recognized by several leading investors in the capital markets, with a total funding round of US$39 million, including a US$30 million Series A round led by new investors Canaan Partners and follow-up investments from Mango Capital, GGV Capital, SAP.iO, and Yunqi Partners.

图表 41：Jina GitHub 运营情况

Figure 41: Jina performance on GitHub



资料来源：GitHub，云启资本

Source: GitHub, Yunqi Partners

图表 42：Jina AI 融资历史

Figure 42: Jina AI financing history

披露日期	交易金额	融资轮次	投资方
2021-11-22	3000万美元	A轮	Canaan Partners，Mango Capital，GGV纪源资本，SAP，iO Fund，云启资本
2020-09-22	600万美元	Pre-A轮	GGV纪源资本，SAP，iO Fund，云启资本
2020-05-13	500万美元	种子轮	云启资本

资料来源：Crunchbase，云启资本

Source: Crunchbase, Yunqi Partners

5.4 Zilliz

Zilliz 是研发面向人工智能的新一代数据处理和分析平台 ，其主要是为应用型企业提供底层技术。Zilliz 研发的 GPU 加速的 AI 数据中台解决方案 Mega，其中包括数据 ETL 系统 MegaETL、数据库系统 MegaWise、面向 Hadoop 生态的模型训练系 MegaLearning 和特

征向量检索系统 Milvus，可满足传统的加速数据 ETL、加速数据仓库和加速数据分析的场景和需求，面向各类新兴的 AI 应用场景，已被全球 1,000 多个企业使用，涵盖金融、电信、安防、智慧城市和电子商务等行业。

Zilliz is a next-generation data processing and analytics platform for artificial intelligence that provides the underlying technology for application-oriented enterprises. Mega, Zilliz's GPU-accelerated AI data medium solution, Including data ETL system MegaETL, database system MegaWise, Model training system MegaLearning for Hadoop ecology, and feature vector retrieval system Milvus, meet the traditional scenarios and requirements for accelerated data ETL, accelerated data warehousing and accelerated data analytics for a variety of emerging AI application scenarios and are used by more than 1,000 enterprises worldwide, covering industries such as finance, telecommunications, security, smart cities, and e-commerce.

图表 43：Zilliz 全球用户

Figure 43: Zilliz global users

资料来源：公司公告，云启资本

Source: Company announcement, Yunqi Partners

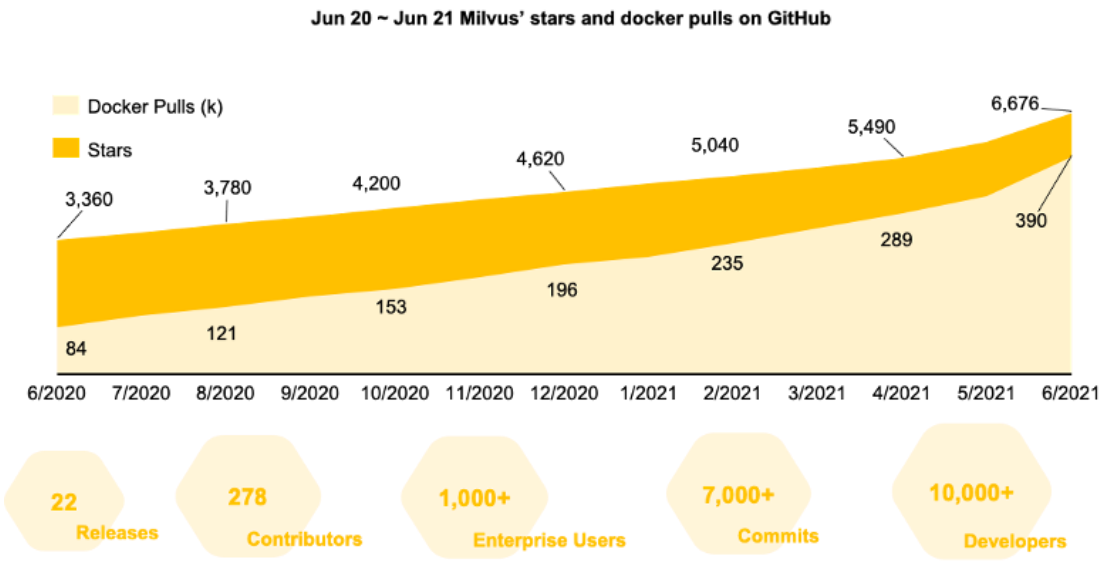
Zilliz 的成功代表着基于 GPU 的大数据加速器为企业日益增长的数据分析需求提供了有效解决方案。Zilliz 的核心项目向量相似度搜索引擎 Milvus 是全球首款 GPU 加速海量特征向量匹配和检索引擎。Milvus 依托 GPU 加速 提供极速特征向量匹配以及多维度数据联合查询(特征、标签、图片、视频、文本和语音等联合查询) 功能，并且支持自动分库分表和多副本，能对接 TensorFlow、PyTorch 和 MxNet 等 AI 模型，可实现百亿特征向量的秒级查询。Milvus

于 2019 年 10 月在 GitHub 上开源，Stars 和 Docker Pulls 数量持续高速增长，2021 年 6 月达到 6,000+，拥有近 300 位贡献者和 10,000+ 用户的开发者社区。资本市场上，Zilliz 在 B 轮获 4,300 万美金，成为全球开源基础软件最大单笔 B 轮融资，表明了投资机构对 Zilliz 未来发展潜力的看好。

The success of Zilliz represents a GPU-based Big Data accelerator that offers an effective solution to the growing data analysis needs of enterprises. Milvus, the vector similarity search engine of Zilliz, is the world's first GPU-accelerated mass feature vector matching and retrieval engine. Milvus relies on GPU acceleration to provide high-speed feature vector matching and multi-dimensional data fusion queries (feature, tag, image, video, text, and voice...). It also supports automatic library and table splitting and multi-copy support and can connect with AI models such as TensorFlow, PyTorch, and MxNet to achieve ten billion feature vectors in seconds. Milvus opened source on GitHub in October 2019, and the number of Stars and Docker effects continues to proliferate, reaching 6,000+ in June 2021, with a developer community of nearly 300 contributors and 10,000+ users. In the capital market, Zilliz raised $43 million in Series B, making it the largest single Series B round of funding for open source infrastructure software globally, indicating that investment institutions are bullish on Zilliz's future growth potential.

图表 44：Zilliz GitHub 社区运营情况

Figure 44: Zilliz community operations on GitHub



资料来源：GitHub，云启资本

Source: GitHub, Yunqi Partners

5.5 EMQ 映云科技

EMQ 公司是一家开源物联网数据基础设施软件供应商。EMQ 开源项目发起于 2013 年，2017 年在杭州正式成立公司，致力于提供覆盖云边端的开源物联网消息中间件及流数据库产品，一站式满足企业在 5G 时代物联网实时数据移动分发、流处理及分析的需求。有超过 10 个开发团队，分布在世界各地。目前，EMQ 国内在北京、上海、深圳、南京、昆明设有分支机构；海外研发总部设在斯德哥尔摩，在瑞典、德国、北美和日本设有分支机构或服务团队。

EMQ is an open source IoT data infrastructure software provider. EMQ open source project launched in 2013 and the company was formally established in Hangzhou in 2017. EMQ is committed to delivering the world's leading cloud-native MQTT-based IoT messaging platform and streaming database, providing a one-stop cloud-native solution for real-time IoT data connection, movement, processing and analytics, from edge to cloud to multicloud. EMQ currently has domestic offices in Beijing, Shanghai, Shenzhen, Nanjing, and Kunming, and overseas R&D headquarters in Stockholm, with branches or service teams in Sweden, Germany, North America, and Japan. There are over ten development teams located around the world.

图表 45：EMQ 公司情况概览

Figure 45: EMQ company overview

资料来源：EMQ 官网

Source: EMQ official website

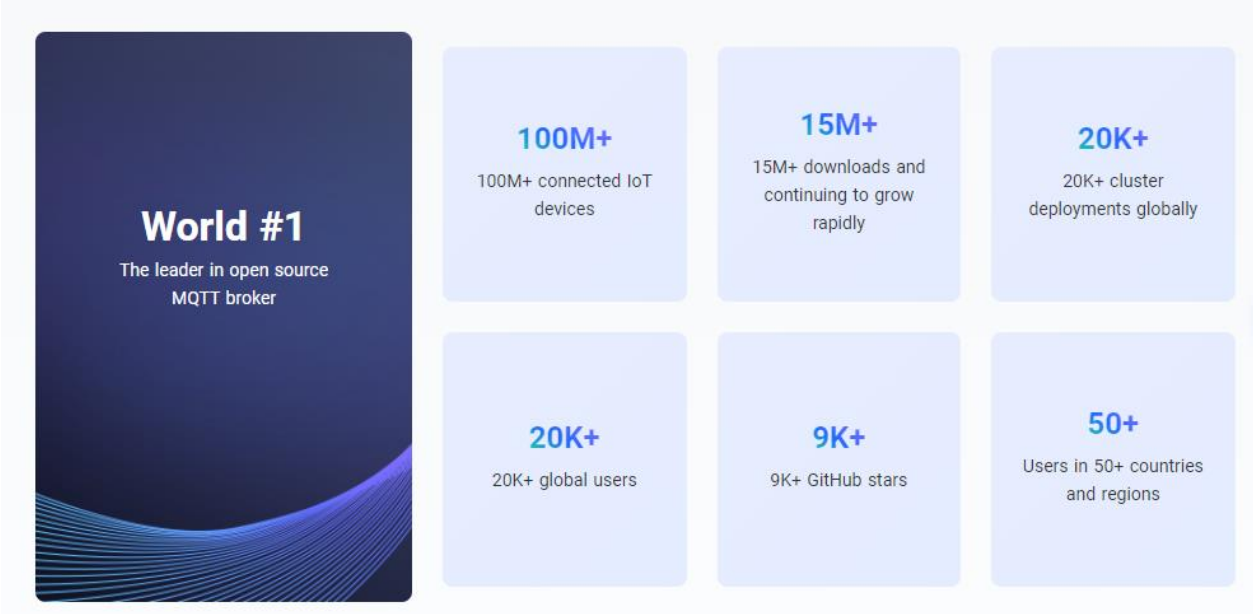
EMQ 是全球开源 MQTT 消息服务器领导者。EMQ 目前在全球拥有近 1 万家开源用户、近 400 家企业客户和 20 多家世界五百强合作伙伴。公司商业客户与合作伙伴来自多个国家和地区，包括 HPE、Vmware、Ericsson、Verifone、Telstra、Nokia、华为、中国电信、中国移动、上汽大众、中国银联、国家电网、台积电等海内外大型企业，从车联网到工业互联网，从运营商到金融支付，从能源电力到智慧城市构建了一站式物联网平台与应用。

EMQ is the global leader in open source MQTT brokers, with nearly 10,000 open source users, 400 enterprise customers, and over 20 Fortune 500 partners worldwide. The company's commercial customers and partners come from many countries and regions, including HPE, Vmware, Ericsson, Verifone, Telstra, Nokia, Huawei, China Telecom, China Mobile, SAIC Volkswagen, China UnionPay, State Grid, TSMC, and other

large enterprises at home and abroad, from Telematics to Industrial Internet, from carriers to financial payments, from energy from car networking to industrial Internet, from operators to financial payments, from energy to smart cities, EMQ has built one-stop IoT platforms and applications.

图表 46：EMQ 业务情况

Figure 46: EMQ Business



资料来源：EMQ 官网

Source: EMQ official website

5.6 AppFlowy

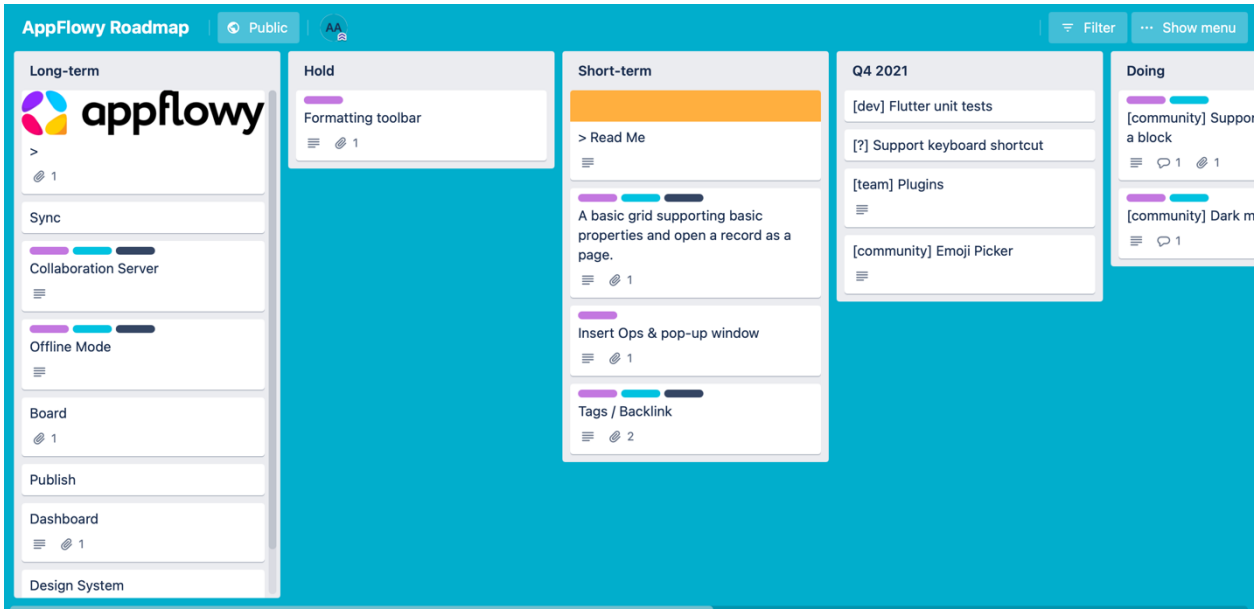
针对 Notion 数据安全、移动端适配等局限性，AppFlowy 意在成为 Notion 的开源替代。

AppFlowy 的开源模式使其具备一定的优势：首先，用户可以实现 100% 数据控制。尤其是对于团队用户来说，可以随时随地托管 AppFlowy，没有供应商锁定的问题。其次，向用户提供了定制与扩展功能。企业或者团队用户可以使用开放的核心代码库以定制的方式设计和修改 AppFlowy；无编码经验的个人用户可以使用社区驱动的工具箱，包括模板、插件、主题等。再次，由于 AppFlowy 是基于 Flutter 和 Rust 构建的，因此可以很好的支持多在个平台和设备上的使用。

AppFlowy is intended to be an open-source alternative to Notion, which has limitations, including weak data security and poor compatibility with mobile devices. AppFlowy's open-source model has certain advantages: firstly, users have 100% data control. For team users, in particular, AppFlowy can be hosted anywhere, anytime, without vendor lock-in issues. Secondly, customization and extension functions are available to users. Enterprise or team users can use the open core codebase to design and modify AppFlowy in a customized way; individual users with no coding experience can use the community-driven toolkit, including templates, plugins, and themes. Again, because AppFlowy is built on Flutter and Rust, it is well supported across multiple platforms and devices.

图表 47：AppFlowy Roadmap

Figure 47: AppFlowy Roadmap



资料来源：AppFlowy 官网

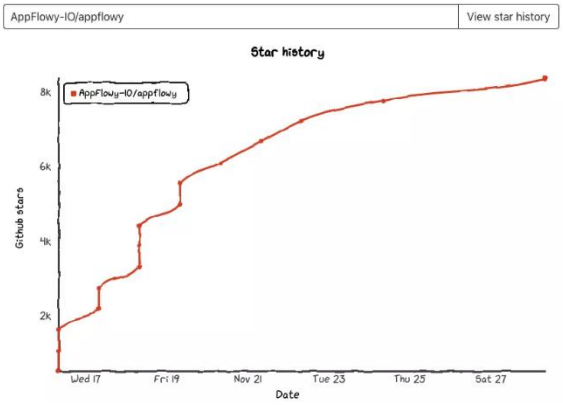
Source: AppFlowy official website

AppFlowy 一经发布就受到广泛的关注。在 GitHub 上线的短短一周就获得了近 8k Star。而截至 2021 年 12 月 25 号的最新数据，AppFlowy 的 GitHub stars 达到了 13.8k+，Fork 数达到 619，贡献者人数达到 29 人。

AppFlowy has received much attention since its release. In just one week on GitHub, AppFlowy received nearly 8k Stars, and as of December 25, 2021, AppFlowy has 13.8k+ GitHub stars, 619 Forks, and 29 contributors.

图表 48：AppFlowy 上线一周内 Github 运营情况

Figure 48: Github performance within one week of AppFlowy's launch

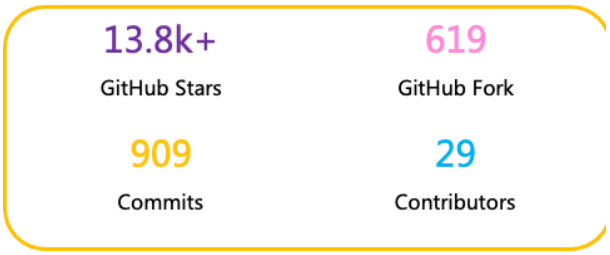


资料来源：AppFlowy，GitHub

Source: AppFlowy, GitHub

图表 49：AppFlowy 最新 GitHub 运营情况

49: AppFlowy's latest GitHub operations



资料来源：GitHub，云启资本

Source: GitHub, Yunqi Partners

5.7 Confluent

2021 年 6 月 Confluent 在纳斯达克 IPO 上市，估值高达 114 亿美元。Confluent 的核心产品是 Apache Kafka。Kafka 是由 Jay Kreps、Jun Rao 和 Neha Narkhede 于 2011 年在 LinkedIn 内部创建，2014 年，三位创始人将公司独立拆分出来。Confluent 的 Apache

Kafka 是一个高吞吐量的分布式发布订阅消息系统，用于在技术系统之间传输信息，已经拥有超过 6 万名来自全球的社区成员，大约超过 70% 的财富 500 强企业使用过 Kafka，包括花旗集团、Humana、英特尔和沃尔玛等。

Confluent went public on the NASDAQ IPO in June 2021 at a valuation of $11.4 billion. Confluent is built on Apache Kafka, an open source technology that was created inside LinkedIn in 2011 by Jay Kreps, Jun Rao, and Neha Narkhede. After using the technology internally for data streams, the trio spun out Confluent as a separate company in 2014. Confluent's Apache Kafka is a high-throughput distributed publish-subscribe messaging system with over 60,000 community members worldwide and used by over 70% of the Fortune 500, including Citigroup, Humana, Intel, and Walmart, among others.

图表 50：Confluent 不同行业的企业用户

Figure 50: Corporate users of Confluent across industry

资料来源：Confluent 官网

Source: Confluent official website

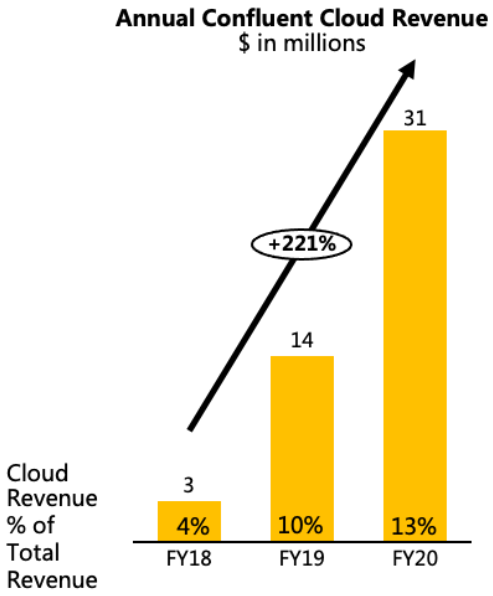
Confluent 提供的云服务是营业收益的一项主要来源。过去三年，Confluent 的销售额年均增长率为 90%，而其中云服务的收入占比从 2018 财年的 4% 升至 2020 财年的 13%，复合

增长率高达 221%，超过其总收入的增长率，可以看出 Confluent 很看重云市场，下一步将重点发展 Confluent Cloud。Confluent 通过三个公共云提供 Confluent Cloud：Microsoft、AWS 和 Google。

Confluent’ s cloud-native offering is a significant source of operating revenue. Over the past three years, Confluent's sales have grown at an average annual rate of 90%, with cloud services accounting for 13% of revenues by 2020, up from 4% in fiscal 2018, a CAGR of 221%, outpacing its total revenue growth, showing Confluent's focus on the cloud market and its next steps in developing the Confluent Cloud. Confluent offers Confluent Cloud through three public clouds: Microsoft, AWS, and Google.

图表 51：Confluent FY18 至 FY20 云服务年收益

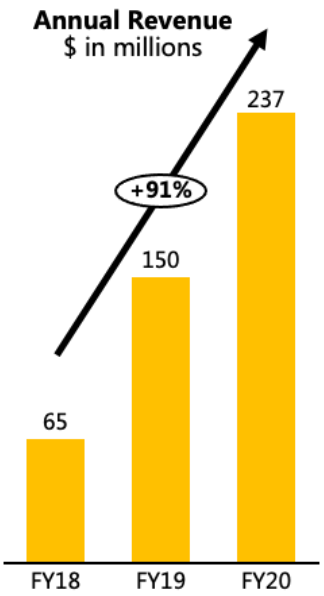
Figure 51: Confluent annual cloud revenue，FY18 to FY20



资料来源：Pitchbook，云启资本

图表 52：Confluent FY18 至 FY20 总年收入

Figure 52: Confluent total annual revenue ,FY18 to FY20



资料来源：Pitchbook，云启资本

5.8 MongoDB

MongoDB 是全球领先的 NoSQL 数据库平台。当前产品主要包括企业级数据库 产品 MongoDB Enterprise Advanced、云数据库产品 MongoDB Atlas、开源数据库产品 Community Server 和移动数据库及同步平台 MongoDB Realm。公司对于不同产品采用不同的定价方式，企业版按服务器节点订阅，云产品按需付费。以云数据库产品 MongoDB Atlas 为例，公司面向小型团队提供共享集群，共享内存和算力，并根据不同的存储空间按使用时长计费;面向专业开发团队提供专属集群，根据不同的 RAM、算力和存储空间按使用时长计费。

MongoDB is the world's leading NoSQL database platform. Its current products include MongoDB Enterprise Advanced, a cloud database product - MongoDB Atlas, an open source database product -Community Server, and MongoDB Realm - a mobile database and synchronization platform. The company has different pricing methods for different products, with enterprise edition subscribing by server node and cloud product pay-as-you-go. Take MongoDB Atlas, a cloud database product, as an example. The company provides a shared cluster, shared memory, and computing power for small teams and charges according to storage space usage time; Dedicated clusters for professional development teams, charging by hours based on different RAM, computing power, and storage space.

图表 53：Atlas Dedicated Cluster 版本定价规则

Figure 53: Atlas Dedicated Cluster pricing rules

Cluster	Storage	RAM	vCPUs	Base Price
M10	10 GB	2 GB	2 vCPUs	$0.08/hr
M20	20 GB	4 GB	2 vCPUs	$0.20/hr
M30	40 GB	8 GB	2 vCPUs	$0.54/hr
M40*	80 GB	16 GB	4 vCPUs	$1.04/hr
M50*	160 GB	32 GB	8 vCPUs	$2.00/hr
M60*	320 GB	64 GB	16 vCPUs	$3.95/hr
M80*	750 GB	128 GB	32 vCPUs	$7.30/hr
M140	1000 GB	192 GB	48 vCPUs	$10.99/hr
M200*	1500 GB	256 GB	64 vCPUs	$14.59/hr
M300*	2000 GB	384 GB	96 vCPUs	$21.85/hr
M400*	3000 GB	488 GB	64 vCPUs	$22.40/hr
M700	4000 GB	768 GB	96 vCPUs	$33.26/hr

资料来源：MongoDB 官网

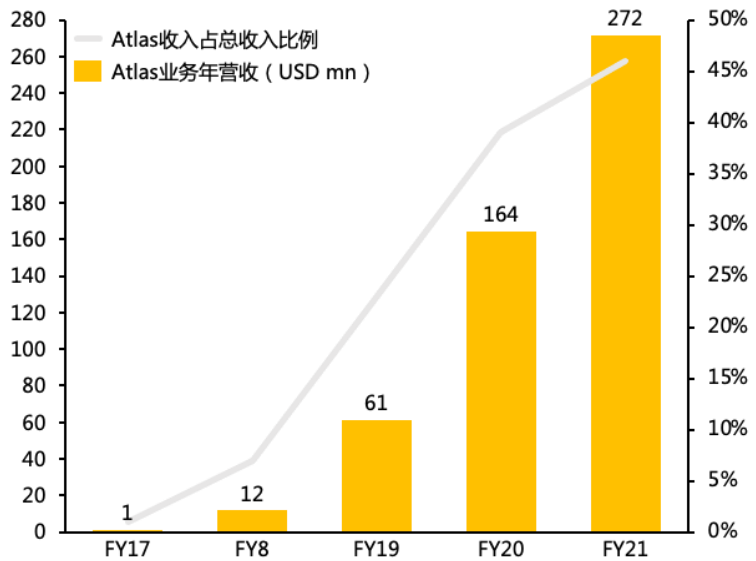
Source: MongoDB official website

MongoDB 云业务快速发展。Atlas 是 MongoDB 托管的多云产品，MongoDB Atlas Free Tier 产品现已在北美、欧洲和亚太地区的所有三大云提供商（亚马逊网络服务（“AWS”）、谷歌云平台（“GCP”）和微软（Azure））上提供，受益于全球数据量（尤其是非结构数据）的爆发式增长、本地数据库向云端的不断迁移，MongoDB 营收持续高速增长。自 2017 财年 MongoDB Atlas 发布以来，Atlas 贡献的收入占比由当年的 1% 迅速上升至 2021 财年前三季度的 44%。2021 财年，Atlas 产品实现收入 2.72 亿美元，同比增加 46%。

M**ongoDB cloud services develop rapidly.** Atlas is a MongoDB-hosted multi-cloud product, and the MongoDB Atlas Free Tier products are now available on all three major cloud providers (Amazon Web Services ("AWS"), Google Cloud Platform ("GCP"), and Microsoft (Azure)) in North America, Europe, and Asia Pacific. MongoDB revenue continues to multiply, benefiting from the explosive growth in global data volumes, particularly unstructured data, and the continued migration of local databases to the cloud. Since the release of MongoDB Atlas in the fiscal year 2017, the percentage of revenue contributed by Atlas has increased rapidly from 1% in that year to 44% in the first three quarters of fiscal 2021, with Atlas products generating $272 million in revenue in fiscal 2021, an increase of 46% year-over-year.

图表 54：MongoDB Atlas 业务情况

Figure 54: MongoDB Atlas business



资料来源：Pitchbook，云启资本

Source: Pitchbook, Yunqi Partners

附录 1 开源硬件 v.s. 开源软件 Appendix 1 Open Source Hardware v.s. Open Source Software

开源硬件，即 Open Source Hardware，是可以通过公开渠道获得的硬件设计，如电路图、材料清单和开发板布局数据。并且硬件设计的源代码的特定的格式可以为其他人获得，以方便对其进行修改。以 CPU 处理器为例，开源芯片的开源通常包括三个层次，首先是指令集（ISA）开源，例如 RISC-V 指令集规范是开源的；其次是微架构的设计开源；第三层是开源 RTL 源码乃至 GDSII，例如 Berkeley 的 Rocket Chip、剑桥大学的 lowRISC、芯来蜂鸟 E203 等都开源了 RTL 级源码。

Open Source Hardware is hardware designs such as circuit diagrams, BOMs, and development board layout data available through public channels. Furthermore, the source code of a hardware design is available in a specific format for others to easily modify. Taking CPU processors as an example, the open source of chips usually consists of three levels. First, open source the instruction set (ISA), for example, the RISC-V instruction set specification is open sourced; secondly, open source the design of the microarchitecture; the third level is to open source RTL source code or even GDSII, for example, Berkeley's Rocket Chip, Cambridge University's lowRISC, Core Come Hummingbird have all open-sourced RTL-level source code.

【专家点评】[Expert Comment]

段夕华：开源硬件尤其是 RISC-V 前途不可限量

Duan Xihua: The future of open source hardware, especially RISC-V, is unlimited

就开源硬件而言，与开源软件概念真正可比的是第三层的硬件开源，即开放 RTL 级源码。但硬件代码和软件代码有较大的差异，从硬件 RTL 代码到 GDSII 仍有较长的开发流程，而没有经过流片验证的 GDSII 也并不具备实际的参考价值。因此考虑到软件和硬件开发周期的不同、迭代成本的差异，**硬件 RTL 级源码开源后，能撬动的开发杠杆较为有限**，目前来看市面上只有少数学术或社区推广性质的产品。2021 年 12 月首届滴水湖中国 RISC-V 产业论坛上，与会的专业嘉宾投票结果显示，超 60% 的嘉宾认为 RISC-V 芯片还不应该被开源。

In terms of open source hardware, what is comparable to the concept of open source software is the third layer of hardware open source, i.e., open RTL level source code. However, there are significant differences between hardware code and software code, there is still a long development process from hardware RTL code to GDSII, and GDSII without physical verification is not a practical reference. Given the different development cycles and iterative costs of software and hardware, **the development lever that can be leveraged after the open source of hardware RTL level is relatively limited**. At present, there are only a few academic or community promotion products on the market. At the first Dripping Lake China RISC-V Industry Forum in December 2021, over 60% of the professional attendees voted that RISC-V chips should not yet be open-sourced.

附录 2 美国开源资本市场情况

Appendix 2 Open source capital market in the United States

COSS Company	FOSS Core	VC Raised(M)	VC Date	GitHub Star	GitHub Fork	Github Contributor
Alfresco	Alfresco	$70	2014/8			
Segment	Analytics.js	$284	2020/1	4.7k	766	59

SphereEx	Apache ShardingSphere	Millions of dollars	2021/5	14.6k	5.1k	292
Jfrog	Artifactory	$227	2018/10	828	1.9k	57
Instructure	Canvas	$90	2015/2	4.1k	1.7k	248
Datastax	Cassandra	$228	2021/5	1.8k	868	95
Pivotal(Now Vmware Tanzu)	CloudFoundry	$1,700	2016/5	2k	648	303
Couchbase	Couchbase	$251	2020/5	1.5k	291	48
Acquia	Drupal	$174	2018/8			
Elastic	ElasticSearch	$162	2018/5	56.7k	20.7k	1668
Mozilla Corporation	Firefox	$22		10.5k	2.4k	209
Treasure Data	Fluentd	$54	2016/11	10.6k	1.2k	220
GitLab	Git	$415	2020/11	40k	22k	408
GitHub	Git	$350	2015/12	39.7k	22.3k	1493
Cloudera	Hadoop	$1,040	2018/4	12k	7.4k	395
JetBrains	IntelliJ	-		12.7k	4.2k	717
Cloudbees	Jenkins	$111	2018/6	17.9k	7k	673

Confluent	Kafka	$455	2020/4	2.5k	675	85
Kaltura	Kaltura	$166	2016/8	1.5k	349	21
Liferay	Liferay Portal	-		1.8k	3k	700
VA Linux(Geeknet)	Linux	$30				
Red Hat	Linux	$5		120k	39.3k	5000+
SUSE	Linux Kernel	-		16	5	5000+
Magento Commerce	Magento	$273	2017/1	9.7k	8.6k	1475
HashiCorp	Many	$349	2020/3			
Mapbox	Mapbox GL JS	$334	2020/5	7.9k	1.8k	311
Rapid7	Metasploit	$89	2014/12	25.3k	11.6k	901
Docker	Moby	$330	2021/5	61.3k	17.7k	2132
MongoDB(fka 10gen)	MongoDB	$311	2018/3	20.5k	5k	541
MuleSoft	Mule ESB	$259	2016/3	245	625	116
MySQL AB	MySQL	$40	2006/2	7k	2.7k	86
Neo4j	Neo4j	$516	2021/6	9.4k	2k	213

Odoo	Odoo	$319	2021/7	22.9k	15.1k	1275
Nicira	Open vSwitch	$42	2011/2	2.7k	1.6k	410
ForgeRock	OpenAM/IDM/DJ/IG	$234	2020/4	105	54	15
Mirantis	OpenStack	$227	2015/8	4.1k	1.5k	357
Rackspace	OpenStack	$227	2017/9	4.1k	1.5k	357
Pentaho	Pentaho	$75	2012/10	5.3k	2.7k	185
Enterprise DB	Postgres	$68	2011/2	9k	3k	48
Postman	Postman Runtime	$433	2021/8	133	75	32
Puppet Labs	Puppet	$190	2020/7	6.3k	2.2k	561
Redis Labs	Redis	$356	2021/4	51.4k	20.1k	524
Linden Lab	Second Life Viewer	$19	2006/3			
Sourcefire	Snort	$40	2006/10	1.2k	353	18
Databricks	Spark	$3,500	2021/8	31.1k	24.6k	1728
SugarCRM	SugarCRM	$123	2018/8			
Talend	Talend Data Integration	$102	2013/12			

Canonical	Ubuntu	$13	2013/8			
Fastly	Varnish	$220	2018/7	2.7k	336	79
WP Engine	Wordpress	$291	2018/1			
Automattic	Wordpress	$986	2021/2			

附录 3 YC 开源项目一览

Appendix 3 Overview of YC open Source projects

COSS Company	FOSS Core	Space	YC Batch	Funding (M)
Activeloop	Activeloop	Data Pipelines	S18	$2
Data Mechanics	Apache Spark	Data Science	W19	-
BackType	Apache Storm	Data Analytics	S08	$1
Athens	Athens	Note-Taking App	W21	-
280 North	Cappuccino	Web Application Development	W08	-
Chatwoot	Chatwoot	Helpdesk / "Modern ITSM"	W21	-
Dataform	Dataform	Data Engineering	W18	-
DevicePlane	Deviceplane	Embedded Systems	W20	-
Docker / fka DotCloud	Docker	DevOps	S10	$308

AppJet	Etherpad	Document Editing	S07	$1
kSense (Jitsu)	EventNative	Data Collection / Analytics	S20	-
Fig	Fig	DevTools	S20	-
Flynn	Flynn	DevOps	S14	-
GitDuck	GitDuck	DevTools	S20	-
GitLab	GitLab/Git	DevOps	W15	$436
Manycore	GraalVM	Developer Tool	S20	
Apollo fka Meteor	GraphQL	DevOps	S11	$53
Influx Data	InfluxDB	Database	W13	$120
Insoshi	Insoshi	Social Network	W08	-
Protocol Labs	IPFS	Storage	S14	$260
EQ Alpha Tech	KeyDB	Database	S20	
CoreOS	Kubernetes	DevOps	S13	$48
KubeSail	Kubernetes	DevOps	S19	-
Lunatic	Lunatic	W21	-	
Mattermost	Mattermost	Messaging Application	S12	$70
MindsDB	MindsDB	Machine Learning	W20	-

FathomDB	MySQL	Database Hosting	W08	-
Heroic Labs	Nakama	Game Engine	S15	-
Flotype (Bridge)	NowJS	DevOps	W11	$2
Okteto	Okteto	DevOps	W19	-
OneGraph	OneGraph	Developer Platform	W18	-
Ukama	OpenCellular	Cellular Networks	S20	-
Clickpass	OpenID	Authentication / Identity	S07	-
Opentrons	Opentrons	Robotics	W16	$40
Optic	Optic	API Platform	W18	-
Our World In Data	OWID	Data Portal	W19	-
Pachyderm	Pachyderm	Data Science	W15	$12
Papercups	Papercups	Customer Service Application	S20	-
PipelineDB	PipelineDB	Database	W14	-
Parakey	Planned but no OSS	Operating System	W07	-
Batch.sh	Plumber	Middleware Messaging	S20	-
CitusData	Postgres/CDB	Database	S11	$13
PostHog	PostHog	Analytics	W20	-

Pyroscope	Pyroscope	Contuinuous Profiling	W21	-
QuestDB	QuestDB	Database	S20	-
Quirk - now RoomService.dev	Quirk	Consumer Application	W19	-
Convox	Rack	DevOps	S11	-
Realm	Realm	Mobile Database	S11	$12
Replicate	Replicate	Machine Learning	W20	$40
RethinkDB	RethinkDB	Database	S09	$1
Heroku	Ruby	PaaS	S07	$13
Sails	Sails	Node.js Framework	W15	-
SigNoz	SigNoz	COSS Datadog	W21	-
Armory	Spinnaker	DevOps	W17	$42
Supabase	Supabase	Database	S20	-
SuperTokens	SuperTokens	Secure Networking	S20	-
Synth	Synth	Synthetic Data	S20	-
NestyBox	SysBox	DevOps	S20	-
Open Motors fka	TABBY EVO	Electric Vehicle Platform	W16	-

OSVehicle				
Dataline	TBA	Data Integration	W20	-
Gravitational	Teleport/Kubernetes	DevOps	S15	$29
Tipe	Tipe	CMS	W18	-
Virtualmin	Virtualmin	Web Hosting	W07	-
vueStorefront	vueStorefront	eCommerce	W21	-
Wasmer	Wasm/Wasmer	Developer Platform	S19	-
Wasp	Wasp	Wasm	W21	-
Webiny	Webiny	App Dev	W21	-
Zencoder	Zencoder	Video Encoding	W10	$2

2021 开源大事记

2021 Open Source Chronology

摘要

整理：蔡芳芳

Abstract

Collated by Cai Fangfang

一、 各国开源政策将对开源世界的未来产生重大影响 National open source policies will have a significant impact on the future of the open source world

2021 年，多国发布政策将开源提升至国家级别的战略高度，肯定了开源模式对信息技术创新和软件产业发展的重要性，并将繁荣开源生态作为一项重要任务，国内工信部信息技术发展司发布的《“十四五”软件和信息技术服务业发展规划》就是其中典型的一例。
In 2021, many countries released policies that elevate open source to a strategic height at the national level, affirming the importance of the open source model to IT innovation and software industry development and making it an important task to prosper the open source ecology. A typical example is the "Fourteenth Five-Year Plan for the Development of Software and Information Technology Services Industry" issued by the Department of Information Technology Development of the Ministry of Industry and Information Technology.

二、 开源法务合规趋势：意识增强，道阻且长

Trends in open source legal compliance: Awareness grows, but the road is long

随着各行各业越来越多地使用开源代码，一些开源项目已成为“大生意”，围绕开源法务和合规话题的讨论成为焦点。中国首个明确 GPL 3.0 协议法律效力的判决案例、甲骨文诉谷歌版权侵权案尘埃落定等事件表明，软件行业对于开源法务和合规的意识正在增强。
With the increasing use of open source code in various industries, some open source projects have become "big business," and discussions around open source legal and compliance issues have come into focus. Events such as China's first ruling on the legal effect of the GPL 3.0 agreement and the settlement of oracle's copyright infringement case against Google show that the software industry is becoming more aware of open source legal and compliance issues.

三、 开源治理成为显学

Open Source Governance Becomes Epiphany

开源软件安全事件频发，开源软件供应链治理日趋重要。Linux 基金会积极推动 OpenChain 国内外社区接轨与交流，中国信通院与诸多国内企业密切关注或加入。此外，企业如何开源、项目开源流程、开源项目度量等问题也是产业界关注的焦点。基于量化模型的方式对社区治理效果进行各项评估，成为越来越多成熟开源组织的“标配”。Linux 基金会推动成立的度量开源项目与社区健康度的开源项目 CHAOSS，值得关注。

Open source software security incidents occur frequently, and supply chain governance of open source software becomes increasingly essential. The Linux Foundation is actively promoting OpenChain to connect and exchange with domestic and international communities, and the China Academy of Information and Communications Technology and many domestic enterprises are paying close attention or joining. In addition, how enterprises open source, the project open source process, open source project metrics, and other issues are also the industry's focus. The Linux Foundation's open source project CHAOSS, which measures the health of open source projects and communities, is worthy of attention.

四、 国际基金会的左右博弈：RMS 重回自由软件基金会与 Rust 社区争议 The International Foundation's game of "Left and Right Inter-fighting": the return of RMS to the Free Software Foundation and the Rust community controversy

开源软件项目需要不同主体通力协作，社区内部的冲突无疑会对软件项目的开发和维护产生负面影响。2021 年，自由软件之父 Richard M. Stallman 重返自由软件基金会引发激烈争议、Rust 社区 Moderation Team 因不满核心团队而集体辞职等风波，都暴露出了自由和开源软件社区面临的复杂态势和治理难题。

Open source software projects require the collaboration of different stakeholders, and conflicts within the community can undoubtedly have a negative impact on the development and maintenance of software projects. In 2021, the controversial return

of Richard M. Stallman, the father of free software, to the Free Software Foundation and the collective resignation of the Rust Community Moderation Team due to dissatisfaction with the Core Team had exposed the complex dynamics and governance challenges facing the FREE and Open Source software community.

五、 中国开源走向世界，塑造新时代影响力 China's open source approach to the world, shaping the influence of the new era

中国开发者在开源世界的影响力正在不断提升。据最新的 GitHub 年度开发者报告，2021 年中国在 GitHub 上的开发者新增了近 103 万，累计约 755 万。在 ASF、LF、CNCF 等国际开源基金会中，源自中国的开源项目越来越多，同时，开始有更多中国开源人当选国际基金会重要职位。

The influence of Chinese developers in the open source world is growing. According to the latest GitHub Annual Developer Report, the number of Chinese developers on GitHub increased by nearly 1.03 million in 2021, to about 7.55 million. More and more open source projects from China in international open source foundations such as ASF, LF, and CNCF, and more Chinese open source people are being elected to key positions in international foundations.

六、 开源新创投资持续发光发热 Open source start-up investment continues to shine

2020 年底到 2021 底，国内外基于开源项目的初创企业空前活跃，基于开源项目的商业公司获得融资、上市等现象屡见不鲜，且融资金额和估值/市值不断刷新上限，开源社区和开源软件的商业价值得到资本认可。

From the end of 2020 to the end of 2021, domestic and foreign startups based on open source projects are more active than ever, and it is common to see commercial companies based on open source projects getting financing and going listed. The amount of financing and valuation/market value continue to set new ceilings, and the commercial value of open source communities and open source software is recognized by capital.

七、 开源操作系统迎来新一轮繁荣期 Open source operating systems usher in a new boom

2020 年底，RedHat 宣布将在 2021 年底结束对 CentOS 8 的支持，全球用户开始尝试寻找合适的操作系统进行替换，而及时解决用户在 CentOS 退出后可能面临的风险成为了操作系统厂商和研发人员努力的方向，这使得开源操作系统在 2021 年迎来新的蓬勃发展期。
At the end of 2020, RedHat announced that it would end support for CentOS 8 by 2021. Users around the world began to try to find a suitable operating system to replace it, and the timely resolution of the risks that users might face after CentOS was withdrawn became the direction that operating system vendors and R&D personnel worked on, which made open source operating systems usher in a new booming period in 2021.

八、 Rust 迈上新征程 Rust on a new journey

2021 年，Rust 基金会由 Mozilla、Amazon、华为、谷歌、微软联合成立，Rust 终于告别“动荡”。此外，Linux 社区也对 Rust 表现出了积极的接纳态度，2021 年下半年 Rust for Linux 项目进展顺利，开发者有望在 2022 年看到 Linux 内核正式支持 Rust。
In 2021, the Rust Foundation was founded by Mozilla, Amazon, Huawei, Google, and Microsoft, and Rust finally left the "turmoil" behind. The Linux community has also shown a positive attitude towards Rust, and with the Rust for Linux project well underway in the second half of 2021, developers can expect to see official support for Rust in the Linux kernel in 2022.

九、 AI & 低代码将会如何改变开源，值得关注

How AI&low code will change open source is worth watching

人工智能时代的开源工作，正面临着全新的挑战。今年发布的 GitHub Copilot 工具，使用了机器学习技术来提供代码建议/自动补全，并因此引发了不小的争议。许多开发者认为，GitHub Copilot 宣称的基于公开代码训练其实是在未遵循开源许可证的情况下，肆意“抄袭”开源代码。

Open source work in the age of artificial intelligence faces a whole new set of challenges. The GitHub Copilot tool, released this year, uses machine learning techniques to provide code suggestions/auto-completion and has generated quite a bit of controversy. Many developers have argued that GitHub Copilot's claim to train on public code is in fact an indiscriminate "plagiarism" of open source code without following the open source license.

十、 开源硬件持续升温，RISC-V 成果涌现

Open source hardware continues to heat up and RISC-V achievements emerge

随着市场对定制硬件需求的增多，以及越来越多初创企业开始寻求用于构建高度合适 AI/ML 算法的加速器和解决方案，开源硬件的热度持续升温。而随着 RISC-V 处理器 ISA 的出现，开源硬件已成为现实。同时，RISC-V 在中国得到了越来越多的关注和投入，也有越来越多出色成果涌现出来。

Open source hardware continues to heat up as the demand for custom hardware increases, and more startups seek accelerators and solutions for building highly suitable AI/ML algorithms. Moreover, with the advent of the RISC-V processor ISA, open source hardware has become a reality. At the same time, RISC-V is receiving more and more attention and investment in China, and more outstanding results are coming out.

全文 Full Report

审校（蔡芳芳、庄表伟）

Reviewer (Cai Fangfang and Zhuang Biaowei)

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一、 各国开源政策将对开源世界的未来产生重大影响

National open source policies will have a significant impact on the future of the open source world

国内 Domestic

- 2021 年 11 月 30 日，工信部信息技术发展司发布了《“十四五”软件和信息技术服务业发展规划》，规划是按照《中华人民共和国国民经济和社会发展第十四个五年规划和 2035 年远景目标纲要》编写。

  On 30 November 2021, the Department of Information Technology Development of the Ministry of Industry and Information Technology (MIIT) released the 14th Five-Year Plan for the Development of Software and Information Technology Services, which was prepared in accordance with the 14th Five-Year Plan for National Economic and Social Development of the People's Republic of China and the Outline of Vision 2035.

  其中提到了，开放、平等、协作、共享的开源模式，加速软件迭代升级，促进产用协同创新，推动产业生态完善，成为全球软件技术和产业创新的主导模式。当前，开源已覆盖软件开发的全域场景，正在构建新的软件技术创新体系，引领新一代信息技术创新发展，全球 97%的软件开发者和 99%的企业使用开源软件，基础软件、工业软件、新兴平台软件大多基于开源，开源软件已经成为软件产业创新源泉和“标准件库”。

It is mentioned that the open source model of openness, equality, collaboration, and sharing has accelerated software iteration and upgrading, promoted collaborative innovation between industry and consumption, and facilitated the improvement of industrial ecology, becoming the leading model of global software technology and industrial innovation. At present, open source has covered the full range of software development scenarios, is building a new software technology innovation system, leading the development of a new generation of information technology innovation. 97% of global software developers and 99% of enterprises use open source software, and most of the infrastructure software, industrial software, emerging platform

software is based on open source which has become a source of innovation in the software industry and "standard parts library. "

在发展目标上，通知指出，生态培育获得新发展。培育一批具有生态主导力和核心竞争力的骨干企业，到 2025 年，主营业务收入达百亿级企业过百家，千亿级企业超过 15 家。建设 2-3 个有国际影响力的开源社区，培育超过 10 个优质开源项目。高水平建成 20 家中国软件名园。软件市场化定价机制进一步完善。建成一批国家特色化示范性软件学院。国际交流合作全面深化。

On development goals, the Plan points out that ecological cultivation has gained new development. Cultivate a number of backbone enterprises with ecological dominance and core competitiveness; there will be more than 100 primary enterprises with revenue of 10 billion yuan, and more than 15 enterprises with revenue of 100 billion yuan by 2025. Build 2-3 open source communities with international influence and cultivate more than 10 high-quality open source projects. Build 20 famous Chinese software parks at a high level. Further improve the software market-based pricing mechanism. Build a batch of national specialized and exemplary software institutes. Deepen international exchanges and cooperation.

在主要任务上，努力繁荣国内开源生态。大力发展国内开源基金会等开源组织，完善开源软件治理规则，普及开源软件文化。加快建设开源代码托管平台等基础设施。面向重点领域布局开源项目，建设开源社区，汇聚优秀开源人才，构建开源软件生态。加强与国际开源组织交流合作，提升国内企业在全球开源体系中的影响力。

On the main tasks, we will strive to prosper the domestic open source ecology. Vigorously develop domestic open source organizations such as open source foundations, improve open source software governance rules, and popularize open source software culture. Accelerate the construction of open source code hosting platforms and other infrastructure. Layout open source projects for critical areas, build open source communities, gather outstanding open source talents and

build an open source software ecology. Strengthen exchanges and cooperation with international open source organizations and enhance the influence of domestic enterprises in the global open source system.

欧洲 Europe

2021 年 9 月，欧盟委员会（European Commission）发布名为《欧盟经济中开源软硬件对技术独立、竞争力和创新的影响研究》报告，旨在从多角度研究开源软件（OSS）及开源硬件（OSH）对欧盟经济的影响，报告还提供了当前开源软硬件的商业用途、成本、效益等方面的数据，评估了欧盟通过使用开源软硬件在经济增长、竞争力、增加就业等方面能够达到的潜力。

In September 2021, the European Commission (EC) released a report entitled "Study on the Impact of Open Source Software and Hardware on Technological Independence, Competitiveness and Innovation in the EU Economy," which aims to study the impact of open source software (OSS) and open source hardware (OSH) on the EU economy from multiple perspectives. The report also provides data on the current commercial use, costs, and benefits of open source software and hardware and assesses the potential that the EU can achieve through the use of open source software and hardware in terms of economic growth, competitiveness, and increased employment.

2021 年 12 月 8 日，欧盟委员会（European Commission）宣布，其正在采纳有关开源软件的新规则，以使之能够在开源许可下发布软件。该规则中指出，只要对民众、公司或其他社会公共服务有潜在益处，就可以公开访问其软件解决方案。据悉，根据新规则，委员会将通过开源其软件解决方案为公司、初创企业、创新者、公共行政部门等带来重大价值，这一决定也将刺激创新。

On 8 December 2021, the European Commission announced that it is adopting new rules on open source software to enable it to distribute software under open source licenses. The rules state that software solutions can be publicly accessible as long as they are potentially beneficial to people, companies, or other social

public services. According to the new rules, the Commission will bring significant value to companies, startups, innovators, and public administrations by open-sourcing its software solutions, a decision that will also stimulate innovation.

二、 开源法务合规趋势：意识增强，道阻且长 Trends in open source legal compliance: increasing awareness, but a long way to go

国内 Domestic

- “完善开源知识产权和法律体系”相继被写入《“十四五”规划和二〇三五年远景目标纲要》、《知识产权强国建设纲要（2021 - 2035 年)》、《“十四五”国家知识产权保护和运用规划》等国家政策文件。
- Improving open source intellectual property and legal systems" has been included in the 14th Five-Year Plan and the Outline of the 2035 Vision, the Outline for Building a Strong Intellectual Property State (2021-2035), and the National Intellectual Property Rights (NIPR) Plan for the 14th Five-Year Plan. "National Intellectual Property Protection and Application Plan for the 14th Five-Year Plan" and other national policy documents.
- 浙江省发布全国首个《开源社区知识产权管理规则指引(试行)》，共十二条，包括管理原则、管理平台、社区组成、约束机制、协同研发、软件管理、专利管理、商标管理、风险管理等方面，提出了合法正当、创新引领、应用先导、发展优先以及数据安全的管理原则。
- Zhejiang Province issued the country's first "Guidelines on Intellectual Property Management Rules for Open Source Communities (for Trial Implementation)," which contains 12 articles, including management principles, management platform, community composition, constraint mechanism, collaborative R&D,

software management, patent management, trademark management, and risk management, putting forward the management principles of legal and legitimate, innovation-led, application-led, development-first and data security.

- 深圳中院判决国内首个明确 GPL-3.0 协议法律性质的案例，判定 GPL3.0 协议是一种民事法律行为，具有合同性质，可认定为授权人与用户间订立的著作权协议，属于我国《合同法》调整的范围。
- The Shenzhen Intermediate Court decided the first case in China to clarify the legal nature of the GPL-3.0 agreement, ruling that the GPL3.0 agreement is a civil legal act with a contractual nature and can be considered as a copyright agreement between the licensor and the user, which falls under the scope of China's Contract Law.
- Elastic License 2.0 (ELv2) 虽然满足源码可见，但并不符合 OSI 的开源定义，采用 ELv2 的 StarRocks 因自称开源，而引起业界非议。
- Elastic License 2.0 (ELv2), although satisfying the source code visibility, does not meet the OSI definition of open source, and StarRocks, which adopts ELv2, has attracted criticism from the industry for claiming to be open source.
- 国外一开发者在网上抱怨深圳手机公司 UMIDIGI 未公开其采用了 GPL-2.0 协议的手机操作系统内核源代码，位于深圳的知名博主机械妖姬（Naomi Wu）帮助开发者前往手机公司登门索要源代码，并将整个过程的自拍视频发布在了网上，造成热议。事后，该公司在官网的论坛和 GitHub 上相继提供了源代码，国外开发者表达了谢意，纠纷顺利解决。
- A foreign developer complained online that UMIDIGI, a Shenzhen-based mobile phone company, did not disclose the kernel source code of its mobile phone operating system using GPL-2.0 protocol. Naomi Wu, a well-known blogger, living in Shenzhen, helped the developer visit the mobile phone company to ask for the source code and posted a selfie video of the whole process on the Internet, raising a hot debate. Later, the company provided the source code on its official website forum and GitHub. The foreign developer expressed his gratitude, and the dispute was successfully resolved.

国外 Abroad

- 近年来，云厂商纷纷将开源软件集成到自己的云产品中，以整体的云服务解决方案推向客户，利益平衡模式面临新的考验。Elastic 公司宣布将 Elasticsearch 和 Kibana 的部分源代码所遵循的协议，由 Apache 2.0 变更为 Server Side Public License (SSPL) 与 Elastic License 双许可，并表示意在抵制云服务提供商，在社区引发巨大争议。 SSPL 是由 MongoDB 制定的许可证，含有条款“如果将程序的功能或修改后的版本作为服务提供给第三方，那么必须免费公开提供服务源代码”Elastic License 要求”如果将产品作为 SaaS 使用则需要获得商业授权”；两者均未获得 OSI 认证。
- In recent years, cloud vendors have been integrating open source software into their cloud offerings, pushing customers with holistic cloud service solutions. The balance of interests model is facing a new test.Elastic announced a change in the protocol under which some of the source code for Elasticsearch and Kibana is licensed from the Apache 2.0 to a dual Server Side Public License (SSPL) and the Elastic License, with the stated intention of boycotting cloud service providers, sparking massive controversy in the community. The SSPL is a license developed by MongoDB and contains the clause "if the functionality or modified version of the program is provided as a service to third parties, the source code of the service must be made available free of charge," and the Elastic License requires "a commercial license if the product is used as a SaaS"; neither is OSI certified.
- 历经十余年诉讼，美国最高法院在甲骨文诉谷歌版权侵权一案中推翻了联邦巡回法院的判决，裁定谷歌的安卓移动操作系统使用甲骨文 Java API 源代码，属于“合理使用”，不构成版权侵权。
- After more than a decade of litigation, the US Supreme Court overturned the Federal Circuit's decision in Oracle v. Google, ruling that Google's Android mobile operating system's use of Oracle's Java API source code was "fair use" and did not constitute copyright infringement.

三、 开源治理成为显学

Open Source Governance Becomes Epiphenomenal

- **开源软件供应链治理日趋重要　Open source software supply chain governance is becoming increasingly important**
  - 国内企业开始重视并纷纷成立开源计划办公室（OSPO）　Domestic companies are beginning to pay attention to and set up open source program offices (OSPO)
  - 安全事件频发，最新爆出的 Apache Log4j2 漏洞，威胁大半个互联网圈（详见下表）Security incidents are frequent, with the latest Apache Log4j2 vulnerability threatening half of the Internet community (see table below for details)

2021 年开源软件供应链安全重大事件表（引用自奇安信集团公众号，原文链接）

2021 Open Source Software Supply Chain Significant Security Incidents Table (quoted from Qi'anxin Group official account, original link)

序号 No.	时间 Time	安全事件 Security Incidents	成因类型 Genetic Types	危害 Hazards
1	2020 年 12 月	全球著名的网络安全管理软件公司 SolarWinds 遭遇国家级 APT 组织高度复杂的供应链攻击	软件更新包后门	导致包括美国关键基础设施、军队、政府等在内的超过 18000 家客户全部收到影响，可任由攻击者操控
2	2021 年 2 月	安全研究任由通过利用开源生态安全机制上的漏洞，实施依赖混淆攻击	开源生态机制漏洞	成功侵入了微软、苹果、PayPal、特斯拉、优步等 35 家国际大型科技公司的内网

3	2021 年 3 月	攻击者向 git.php.net 服务器上的 php-src 存储库推送了两次恶意提交，在 PHP 代码中植入了一个后面	开源库漏洞	可通过后面获得运行 PHP 的网站系统的远程代码执行权限
4	2021 年 4 月	知名代码测试公司 Codecov 宣布其产品的 bash uploader 脚本被攻击者修改	软件产品构建问题	用户在使用 Codecov 产品时，会向攻击者的服务器发送敏感信息，可造成软件源代码等机密信息泄露
5	2021 年 5 月	在流行的 Visual Studio Code 扩展中发现严重安全缺陷	开发环境漏洞	可使攻击者危急本地机器，或通过开发人员 IDE 构建和部署系统，这些扩展的下载量超过 200 万
6	2021 年 6 月	研究人员披露了影响 Linux 平台基于 Pling 的自由和开源软件（FOSS）市场的漏洞	软件发布源漏洞	攻击者可利用该漏洞进行供应链攻击 XSS 蠕虫并实现远程代码执行（RCE）
7	2021 年 7 月	攻击者获得 Kaseya 公司后端设施访问权限，在运行于客户现场的安全事件响应工具 VSA 服务器上部署 REvil 勒索软件	软件产品自身漏洞	通过 VSA 服务器将勒索软件安装到联网工作站，从而感染其它第三方企业网络。攻击发生前，互联网上处于联网状态的 VSA 服务器超过 2200 台
8	2021 年 8 月	台湾芯片设计厂商	开发环境漏洞	攻击者可利用这些漏洞攻陷

		Realtek 称，其 WiFi 模块的三款开发包（SDK）中存在 4 个严重漏洞		目标设备并以最高权限执行任意代码。SDK 用于至少 65 家厂商制造的近 200 款物联网设备中
9	2021 年 9 月	因使用五年前发布的 RunC v1.0.0-rc2，微软 Azure 容器服务器爆出跨账户接管漏洞	开源软件漏洞	攻击者可攻陷托管 ACI 的多租户 K8S 集群，接管平台上的其他客户的容器，在其中执行代码并访问部署在平台上的数据
10	2021 年 12 月	Apache 开源项目 Log4j2 的远程代码执行漏洞细节被公开	开源软件漏洞	可能的受影响应用包括但不限于：Spring-Boot-strater-log4j2、Apache Struts2、Apache Solr、Apache Flink、Apache Druid、Elasticsearch、Flume、Redis、Logstash、Kafka 等

- **国际标准协作**
  - Linux 基金会推动开源社区衡量指标 [CHAOSS]
  - Linux 基金会积极推动 OpenChain & SPDX [软件供应链治理] 国内外社区接轨与交流
  - 2021 年 8 月 17 日，华为加入 OpenChain 项目，并成为董事会成员。
  - 中国信通院成为 OpenChain 项目首家国内第三方机构，开展基于《ISO/IEC 5230:2020 OpenChain Specifications》检验，协助企业开展开源合规治理

- **国内标准进展**
  - 中国信通院建立可信开源标准体系，推动 8 个行标立项
  - 中国电子技术标准化研究院推动国家开源标准体系顶层设计，推动相关开源标准立项，分别涵盖术语、元数据、许可证框架、开源项目、开源贡献者、开源治理等方面，首个开源领域国家标准《信息技术 开源 开源许可证框架》获批立项
- **木兰开源社区动向**
  - 木兰开源社区的木兰宽松许可证已有多达 10 万个国内项目采用
  - 木兰开源社区吸纳 OpenDigger 项目进入孵化，推动和完善开源项目、社区衡量指标建设

- International Standards Collaboration
  - The Linux Foundation promotes the open source community metrics [CHAOSS]
  - Linux Foundation actively promotes OpenChain & SPDX [Software Supply Chain Governance] for domestic and international communities to connect and exchange
  - On August 17, 2021, Huawei joined the OpenChain project and became a board member.
  - China Academy of Information and Communications Technology (CAICT) became the first domestic third-party organization of the OpenChain project to conduct inspections based on ISO/IEC 5230:2020 OpenChain Specifications to assist enterprises in open source compliance governance
- Progress on domestic standards
  - CICT established a trusted open source standard system and promoted the establishment of 8 industry standards

  The first national standard in the field of open source, "Information Technology Open Source Open Source Licensing Framework", has been approved for establishment
- Mulan Open Source Community Trends

○ Mulan Open Source Community's Mulan Loose License has been adopted by as many as 100,000 domestic projects

○ ○ The Mulan Open Source Community has accepted the OpenDigger project into the incubation, promoting and improving the construction of open source projects and community measurement indicators

四、 国际基金会的左右博弈：RMS 重 回自由软件基金会与 Rust 社 区争议

The International Foundation's game of "Left and Right Inter-fighting": the return of RMS to the Free Software Foundation and the Rust community controversy

2021 年 3 月 21 日，自由软件之父理查德·斯托曼（Richard M. Stallman）在 LibrePlanet 2021 年度会议上公开宣布，他重返自由软件基金会（Free Software Foundation），并再次成为基金会的董事会成员。该消息引发自由及开源软件领域的激烈争论，许多人对斯托曼的回归表示欢迎，但也有众多个人和组织表示反对：开放源代码促进会（Open Source Initiative）呼吁将斯托曼逐出自由软件基金会的董事会，否则将停止与自由软件基金会的合作；红帽（Red Hat）也发表声明称，将暂停对自由软件基金会的所有资助；数千名个人和组织联名发布抵制信，要求罢免斯托曼。据悉，斯托曼在 2019 年因发表不当言论而辞去自由软件基金会的领导职务；反对者声称斯托曼“长期以来一直是自由软件社区的一股危险力量”，斯托曼被指控“歧视女性、残疾人和跨性别者”。

n March 21, 2021, Richard M. Stallman, the father of free software, publicly announced at the LibrePlanet 2021 conference that he was returning to the Free Software Foundation and would again be a member of its board directors. The announcement sparked a heated debate in the free and open source software community, with many welcoming Stallman's returning but many individuals and organizations opposing it: the Open Source Initiative called for Stallman to be expelled from the Free Software Foundation's board of directors or to stop working

with the Foundation. Red Hat has also issued a statement saying it will suspend all funding to the Free Software Foundation, and thousands of individuals and organizations have issued a boycott letter calling for Stallman's removal. Stallman resigned from his leadership position at the FWF in 2019 after reportedly making inappropriate comments; opponents claim Stallman has "long been a dangerous force in the free software community" and that Stallman has been accused of "discriminating against women, people with disabilities, and transgender people. ".

作为自由软件运动的标志性人物，理查德·斯托曼发起 GNU 项目并成立了自由软件基金会。自上世纪八十年代以来，斯托曼一直是重要的自由软件活动家。斯托曼回归引发的系列争议反映出自由和开源软件社区目前存在的理念分歧。自由软件运动和相关的开放源代码运动经历数十年的发展，早已成为一股不容忽视的潮流。然而伴随自由和开源软件社区的壮大，不同群体的理念差异也显现端倪，斯托曼的争议言论使其备受女权主义者等群体的批评。

An iconic figure in the free software movement, Richard Stallman started the GNU Project and founded the Free Software Foundation. Stallman has been an influential free software activist since the 1980s. The controversies surrounding Stallman's return reflect the current philosophical differences between the free and open source software communities. The free software movement and the related open source movement have evolved over the decades and have become a trend that cannot be ignored. However, as the free and open source software community has grown, so too have the differences between the philosophies of different groups, with Stallman's controversial comments attracting criticism from groups such as feminists.

2021 年的另一场风波同样暴露出自由和开源软件社区面临的复杂态势。Rust 编程语言项目的审核团队 Rust Moderation Team 于 11 月 23 日在 GitHub 上发表辞职公告，抗议 Rust 核心团队“除了自己，不受任何人的约束”。虽然辞呈未透露过多细节，但原审核团队部分成员的后续言论表明，此次集体辞职事件与 Rust 软件项目长期不断恶化的矛盾有关。另外根据长期参与 Rust 社区的 Dragdu，撰文透露，社区内部的分歧还与 “Abolish ICE” 运动有

所关联。尽管 Rust 社区在诞生之初便倡导和推广 “Rustacean Principles” 原则以凝聚共识，2018 年还成立了专门的“治理工作组”，但社区矛盾未得到有效缓和。虽然 Rust 编程语言项目近年大获成功，但此次集体辞职事件却也反映了 Rust 社区的治理难题。

Another controversy in 2021 also revealed the complexities facing the FOSS community. The Rust Moderation Team, the review team for the Rust programming language project, posted a resignation announcement on GitHub on November 23, protesting that the core Rust team was "not beholden to anyone but themselves. The announcement was made on GitHub on November 23, protesting that the core Rust team was "not beholden to anyone but themselves. Although the resignation did not reveal many details, subsequent comments from some members of the original moderation team suggest that the mass resignation was related to the long-standing and worsening conflict in the Rust software project. Despite the success of the Rust programming language project in recent years, this resignation reflects the governance challenges of the Rust community. Although the Rust community has advocated and promoted the "Rustacean Principles" since its inception to build consensus, and a dedicated "Governance Working Group" was established in 2018, the community's conflicts have not been effectively mitigated. Another article by Dragdu, a long-time participant in the Rust community, reveals that the divisions within the community are also linked to the 'Abolish ICE' movement.

开源软件项目需要不同主体的通力协作，社区内部的冲突无疑会对软件项目的开发和维护产生负面影响。在社会价值观念差异愈发加剧的背景下，自由及开源软件社区必须面对如何平衡各方诉求的难题。

Open source software projects require the collaboration of different stakeholders, and conflict within the community can have a negative impact on the development and maintenance of software projects. Against the background of increasing differences in social values, the free and open source software community must face the challenge of balancing the demands of all parties.

五、 中国开源走向世界，塑造新时代影响力 Chinese open source goes global, shaping a new era of influence

中国开发者在开源世界的影响力正在不断提升。据最新的 GitHub 年度开发者报告，2021 年中国在 GitHub 上的开发者新增了近 103 万，累计约 755 万。在 ASF、LF、CNCF 等国际开源基金会中，源自中国的开源项目越来越多，同时，开始有更多中国开源人当选国际基金会重要职位。

The influence of Chinese developers in the open source world is growing. According to the latest GitHub Annual Developer Report, China added nearly 1.03 million developers to GitHub in 2021, for about 7.55 million. More and more open source projects of Chinese origin in international open source foundations such as ASF, LF, and CNCF, and more Chinese open source people are starting to be elected to key positions in international foundations.

- **Linux 基金会项目列表 List of Linux Foundation projects**
    - CNCF 基金会：目前有 26 个源自中国的开源项目，毕业项目有 2 个，孵化中项目 2 个，沙盒项目 22 个。其中 2021 年捐赠给 CNCF 基金会的开源项目就达到了 14 个。其中除了来自阿里、华为、腾讯等大厂捐赠的项目，也能看到工业届和学术界的合作以及 Seconed State 和灵雀云等创业公司的项目。
    - CNCF Foundation: there are currently 26 open source projects from China, two graduated projects, two incubating projects, and 22 sandbox projects. The number of open source projects donated to the CNCF Foundation in 2021 is 14. In addition to projects donated by major companies such as Ali, Huawei, and Tencent, we can also see collaborations between industry and academia and projects from startups such as Seconed State and LingQueYun.
    - AI & Data 基金会：目前有 6 个项目。AI & Data Foundation: currently, there are six projects.

项目名称 Project name	**基金会 Foundation**	**子基金会 Sub-foundation**	**项目捐赠单位/方 project donor/party**	**沙箱 Sandbox**	**孵化 incubation**	**毕业时间** Graduation Time
Occlum LibOS	Linux 基金会	Confidential Computing Consortium	蚂蚁集团			
harbor	Linux 基金会	CNCF	VMWare 中国研发中心	2018 年 8 月	2018 年 11 月	2020 年 6 月
TiKV	Linux 基金会	CNCF	PingCAP	2018 年 8 月	2019 年 5 月	2020 年 9 月
Dragonfly	Linux 基金会	CNCF	阿里	2018 年 10 月	2020 年 4 月	
KubeEdge	Linux 基金会	CNCF	华为	2019 年 3 月	2020 年 9 月	
ChubaoFS	Linux 基金会	CNCF	京东	2020 年 1 月		
Volcano	Linux 基金会	CNCF	华为	2020 年 4 月		
BFE	Linux 基金会	CNCF	百度	2020 年 6 月		
CNI-Genie	Linux 基金会	CNCF	华为	2020 年 6 月		
Chaos Mesh	Linux 基金会	CNCF	PingCAP	2020 年 7 月		
K3s	Linux 基金会	CNCF	Rancher	2020 年 8 月		
OpenYurt	Linux 基金会	CNCF	阿里	2020 年 9 月		
OpenKruise	Linux 基金会	CNCF	阿里	2020 年 11 月		
Kube-OVN	Linux 基金会	CNCF	灵雀云	2021 年 1 月		
Fluid	Linux 基金会	CNCF	南京大学、	2021 年 4 月		

			阿里云、Alluxio 开源社区			
Vineyard	Linux 基金会	CNCF	阿里	2021 年 4 月		
ChaosBlade	Linux 基金会	CNCF	阿里	2021 年 5 月		
KubeDL	Linux 基金会	CNCF	阿里	2021 年 6 月		
KubeVela	Linux 基金会	CNCF	阿里	2021 年 6 月		
WasmEdge	Linux 基金会	CNCF	Second State	2021 年 6 月		
Karmada	Linux 基金会	CNCF	华为	2021 年 6 月		
Inclavare Containers	Linux 基金会	CNCF	阿里	2021 年 9 月		
SuperEdge	Linux 基金会	CNCF	腾讯	2021 年 9 月		
Nocalhost	Linux 基金会	CNCF	腾讯	2021 年 11 月		
Open Cluster Management	Linux 基金会	CNCF	阿里、红帽、蚂蚁	2021 年 11 月		
OpenELB	Linux 基金会	CNCF	青云	2021 年 11 月		
Piraeus-Datastore	Linux 基金会	CNCF	LINBIT、DaoCloud、上海浦东发展银行	2021 年 11 月		
EdgeGallery	Linux 基金会	Edge	华为	2021 年 10 月		
Baetyl	Linux 基金会	Edge	百度	2019 年		

EMQ X Kuiper	Linux 基金会	Edge	EMQ	2021 年 7 月		
FATE	Linux 基金会		微众银行	2019 年 6 月		
Caliper	Linux 基金会	Hyperledger	华为	2018 年 3 月		
cello	Linux 基金会	Hyperledger	Baohua Yang (Oracle)、Haitao Yue (IBM)、Tong Li (IBM)、Jiahao Chen (VMware)	2017 年 1 月		
Adlik	Linux 基金会	AI & Data	中兴通讯	2019 年 10 月		
Angel	Linux 基金会	AI & Data	腾讯	2021 年 5 月		
DELTA	Linux 基金会	AI & Data	滴滴	2019 年 10 月		
Elastic Deep Learning	Linux 基金会	AI & Data	百度	2020 年 7 月		
Milvus	Linux 基金会	AI & Data	Zilliz	2019 年 12 月		
OpenBytes	Linux 基金会	AI & Data	Graviti	2021 年 11 月		
ONAP	Linux 基金会	Networking	华为、中兴	2018 年 1 月		
XGVela	Linux 基金会	Networking	中国移动	2020 年 5 月		
Feilong	Linux 基金会	Open				

		Mainframe Project				

- **Linux 子基金会列表 List of Linux sub-foundations**

子基金会 sub-foundation	**发起单位 Initiator**	**发起时间 Launch Time**
OpenMessaging	阿里	2017 年 10 月
NextArch Foundation	40 家企业联合发起	2021 年 11 月
SODA Foundation	华为	2020 年 6 月
TARS Foundation	10 家企业联合发起	2020 年 3 月

- **Apache 软件金会项目列表 Apache Software Foundation Project List**
  - Apache 软件基金会：目前有 24 个源自中国的开源项目，其中顶级项目达到了 14 个，孵化项目 10 个。而 2021 年 ASF 孵化器新增的 5 个项目全部来自中国。
  - Apache Software Foundation: there are now 24 open source projects from China, including 14 top projects and ten incubators. The five new projects added to the ASF incubator in 2021 are all from China. https://projects.apache.org/projects.html

项目名称 Project Name	**基金会 Foundation**	**项目捐赠单位/方 Project donor/party**	**孵化 Incubation**	**毕业时间 Graduation Time**
Apache DolphinScheduler	Apache 软件基金会	易观	2021/4/8	2021/4/8
Apache ECharts	Apache 软件基金会	百度	2018/1/18	2020/12/16
Apache Ozone	Apache 软件基金会	原 Hadoop 子项目	2018/11/22	2020/10/21

Apache IoTDB	Apache 软件基金会	清华大学	2018/11/18	2020/9/17
Apache APISIX	Apache 软件基金会	深圳支流科技	2019/10/17	2020/7/15
Apache ShardingSphere	Apache 软件基金会	京东科技	2018/11/10	2020/4/16
Apache Dubbo	Apache 软件基金会	阿里巴巴	2018/2/16	2019/5/15
Apache SkyWalking	Apache 软件基金会	吴晟	2017/12/8	2019/4/17
Apache Griffin	Apache 软件基金会	eBay	2016/12/5	2018/11/21
Apache ServiceComb	Apache 软件基金会	华为	2017/11/22	2018/10/17
Apache HAWQ	Apache 软件基金会	Pivotal	2015/9/4	2018/8/15
Apache RocketMQ	Apache 软件基金会	阿里巴巴	2016/11/21	2017/9/20
Apache CarbonData	Apache 软件基金会	华为	2016/6/3	2017/4/19
Apache Kylin	Apache 软件基金会	eBay	2014/11/25	2015/11/18
Apache SeaTunnel	Apache 软件基金会	乐视	2021/12/9	
Apache Linkis	Apache 软件基金会	微众银行	2021/8/2	
Apache Kyuubi	Apache 软	网易	2021/6/21	

	件基金会			
Apache ShenYu	Apache 软件基金会	Dromara 开源社区	2021/5/3	
Apache EventMesh	Apache 软件基金会	微众银行	2021/2/18	
Apache Pegasus	Apache 软件基金会	小米	2020/6/22	
Apache InLong	Apache 软件基金会	腾讯	2019/11/3	
Apache Teaclave	Apache 软件基金会	百度	2019/8/19	
Apache brpc	Apache 软件基金会	百度	2018/11/13	
Apache Doris	Apache 软件基金会	百度	2018/7/18	

- **中国开源人当选国际基金会重要职位 Chinese open sourcer elected to a critical position at the international foundation**

  - 吴晟：当选 Apache 软件基金会董事
  - 堵俊平：当选 LF AI & Data 基金会董事会主席
  - 王晔晖：当选 Linux 基金会 CHAOSS 项目的董事会的董事
  - 单致豪：当选 TARS 基金会董事主席，FinOps 基金会董事，LF Research 董事

○ Wu Sheng: Elected to the Board of Directors of the Apache Software Foundation

o Du Junping: Elected to Chairman of the Board of Directors of LF AI & Data Foundation

o Wang Ye-Hui: Elected to the Board of Directors of the Linux Foundation's CHAOSS project

- Shan Zhihao: Elected as Chairman of the Board of Directors of TARS Foundation, Director of FinOps Foundation, Director of LF Research

六、 开源新创投资持续发光发热 Open source start-up investments continue to shine

2020 年底到 2021 底，国内外基于开源项目的初创企业空前活跃，基于开源项目的商业公司获得融资、上市等现象屡见不鲜，且融资金额和估值/市值不断刷新上限，开源社区和开源软件的商业价值得到资本认可。以下为部分开源新创公司的融资和上市情况：

From the end of 2020 to the end of 2021, there will be an unprecedented number of startups based on open source projects at home and abroad, and it is not uncommon to see commercial companies based on open source projects raise funds and go public, with the amount of funding and valuation/market value constantly breaking new limits. The following are some open source startups that have raised funding and gone public.

国外 Abroad

- 6 月，开源产品分析工具 PostHog 融资 1,500 万美元
- GitLab 在纳斯达克股票交易所上市 （2021-10-15）
- 红帽峰会发布数据分析类产品套件
- Eclipse 经历大裁员，无力运营将项目捐献给 Linux 基金会
- Databricks 估值 380 亿美金，计划 2022 年 IPO
- SUSE 在法兰克福证券交易所上市
- Docker 融资 2,300 万美元，与微软合作转型开发工具公司
- 11 月 11 日，开源工具 CloudQuery 获得 350 万美元种子轮融资
- 11 月 30 日，Upbound 投资 6,000 万美元发展开源 Crossplane 多云管理项目

- 12 月 9 日，聚焦云基础设施的软件企业 Hashicorp 在美国纳斯达克上市，市值超过 150 亿美元
- 12 月 16 日，Cockroach Labs 再获 2.73 亿美元 F 轮融资，估值已经达到 50 亿美元，而今年 1 月 Cockroach Labs 才刚获得了 1.6 亿美元融资

● In June, PostHog, an open source product analysis tool, raised $15 million in funding

● GitLab goes public on the Nasdaq stock exchange (2021-10-15)

● Red Hat Summit launches suite of data analytics products

● Eclipse undergoes major layoffs, cannot afford to run, donates project to Linux Foundation

● Databricks, valued at $38 billion, plans IPO in 2022

● SUSE goes public on the Frankfurt Stock Exchange

● Docker raises $23 million, partners with Microsoft to transform development tools company

● CloudQuery, an open source tool, raised $3.5 million in a seed round on November 11

● Upbound invests $60 million in open source Crossplane multi-cloud management project, November 30

● On December 9, Hashicorp, a cloud infrastructure-focused software company, went public on NASDAQ with a market cap of over $15 billion

- ● On December 16, Cockroach Labs raised another $273 million in Series F funding, already valuing the company at $5 billion, compared to the $160 million funding Cockroach Labs received in January this year

国内 Domestic

- 白鲸开源（基于 Apache DolphinScheduler）获得数百万美元天使轮融资
- 北京思斐软件 SphereEx (基于 Apache ShardingSphere 项目）完成数百万美元天使轮

融资

- Engula 天使轮融资
- Authing 完成 500 万美金 Pre-A 轮融资以及 A 轮融资 2,300 万美元
- 深圳支流科技 API7 (基于 Apache APISIX 项目) 完成数百万美金 Pre-A 轮以及 A 轮融资
- StreamNative (基于 Apache Pulsar 项目) 完成 2,300 万美元 A 轮融资
- 极纳科技 Jina AI 完成 3,000 万美元 A 轮融资
- 一流科技 OneFlow 完成 5,000 万人民币 A 轮融资
- 上海瞩睿信息科技 Zilliz 完成 4,300 万美元 B 轮融资
- 涛思数据 TaosData 完成 4,700 万美元 B 轮融资
- 上海硅智信息技术 Kyligence (基于 Apache Kylin 项目) 完成 7,000 万美金 C 轮融资
- PingCAP 已完成 5 轮融资，最新一轮是去年 11 月 2.7 亿美金 D 轮融资，融资额已达到 3.4 亿美元，而估值约 30 亿美元，为国内开源新创公司的现象级里程碑
- 鲸鲮科技获创新工场领投 1000 万美元天使轮融资

● White Whale Open Source (based on Apache DolphinScheduler) received a multi-million dollar angel round of funding

● Beijing SphereEx (based on the Apache ShardingSphere project) closed a multi-million dollar angel round of funding

● Engula raised an angel round of funding

● Authing closed a $5 million Pre-A round and a $23 million Series A round

Shenzhen Tributary API7 (based on the Apache APISIX project) closed a multi-million dollar Pre-A round and Series A round

StreamNative (based on Apache Pulsar project) closed a $23M Series A funding round

Jina AI (based on the Apache Pulsar project) closes a $30 million Series A round

● OneFlow (based on Apache Pulsar project) closed RMB 50 million Series A funding round

● Shanghai Zeerui Zilliz completed a $43 million Series B financing

● TaosData closed $47 million Series B financing

● Shanghai Silicon Intelligence Kyligence (based on Apache Kylin project) closed a $70 million Series C funding round

● PingCAP has completed five rounds of funding, the latest being a $270 million Series D round in November last year, reaching $340 million in funding and a valuation of about $3 billion, a phenomenal milestone for domestic open source startups

- Whale Technology received US$10 million in angel round funding led by Innovation Works

七、 开源操作系统迎来新一轮繁荣期 Open source operating systems usher in a new boom

2020 年底，Red Hat 宣布将在 2021 年底结束对 CentOS 8 的支持，这对全球操作系统的发展都带来了巨大的影响，全球用户开始尝试寻找合适的系统进行切换。解决用户在 CentOS 退出后可能面临的风险，成为了操作系统厂商和研发人员努力的方向。

At the end of 2020, Red Hat announced that it would end support for CentOS 8 by the end of 2021, which had a considerable impact on the development of operating systems around the world, and users worldwide began to try to find a suitable system to switch. This had a significant impact on the global operating system community, and users worldwide began to try to find a suitable system to switch. Addressing the risks users might face after CentOS was withdrawn became a priority for operating system vendors and developers.

也是在这样的背景下，2020 年 9 月，阿里云联合统信、龙芯、中科方德等 16 家操作系统、芯片、云计算公司共同发起 OpenAnolis 龙蜥操作系统开源社区。龙蜥操作系统源于 2011

年前阿里为替换自身的 CentOS 而打造的 Alibaba Cloud Linux，经历了 “双 11” 百万虚机、千万部署的实际考验。2021 年 11 月 4 日，龙蜥操作系统宣布将捐赠到开放原子开源基金会进行孵化。目前，龙蜥操作系统已在阿里云全面上线，总装机量达百万量级。龙蜥社区（OpenAnolis）已拥有 50 多家生态企业。其中统信软件、中国移动云等已基于龙蜥操作系统发布商业版本。龙蜥也是国内首个从操作系统层面提供全软件栈国密算法的 OS 解决方案，并且对内核 SM4 算法做了深度优化，性能提升近 800%，让中国国密算法从合规走向生产应用。

It is also against this background that in September 2020, AliCloud, together with 16 operating system, chip, and cloud computing companies such as Unisys, Longxin, and Zhongke Fangde, launched the OpenAnolis Dragon Lizard OS open source community. On November 4, 2021, the Dragon Lizard OS was announced to be donated to the Open Atom Open Source Foundation for incubation. Currently, Dragon Lizard OS has been fully launched on AliCloud, with a total installed base of millions of machines. The OpenAnolis community already has more than 50 eco-enterprises. Unisys and China Mobile Cloud have released commercial versions based on Dragon Lizard OS. Dragon Lizard is also the first OS solution in China to provide a complete software stack of national security algorithms from the operating system level. It has deeply optimized the kernel SM4 algorithm, improving performance by nearly 800%, and allowing Chinese national security algorithms to move from compliance to production applications.

在更早之前的 2019 年 12 月 31 日，华为将内部自研且已经过十年打磨的操作系统 EulerOS 重新命名为 openEuler 正式开源 ，源代码、镜像及开发测试环境全部向社区开放。开源近两年，openEuler 共发布了四个版本，分别是 20.03 LTS 版本、20.09 创新版本、21.03 创新版本和 21.09 创新版本。2021 年 3 月，openEuler 在内核热升级和内存分级管理上做了创新，21.03 创新版本推出；9 月，21.09 创新版本发布，该版本不仅增强了服务器和云计算场景能力，还实现了对于边缘计算和嵌入式场景的支持。

On December 31, 2019, Huawei rebranded its self-developed and decade-old operating system EulerOS as openEuler, and opened the source code, images, and development test environment to the community. In the past two years of open

source, openEuler has released four versions: version 20.03 LTS, 20.09 Innovation, 21.03 Innovation, and 21.09 Innovation. openEuler innovated in kernel hot upgrade and memory hierarchy management in March 2021 with the release of 21.03 Innovation, and in September, 21.09 Innovation was released. This version enhances the capabilities of server and cloud computing scenarios and enables support for edge computing and embedded scenarios.

2021 年 11 月，华为 openEuler 正式捐赠给开放原子开源基金会。随后，英特尔也正式签署贡献者许可协议加入 openEuler 开源社区。如今 openEuler 社区已经有 300 多家企业、近万名社区开发者加入。

In November 2021, Huawei openEuler was officially donated to the Open Atom Open Source Foundation. Subsequently, Intel also officially signed a contributor license agreement to join the openEuler open source community. Today the openEuler community has more than 300 companies and nearly 10,000 community developers onboard.

2020 年 9 月，腾讯也将 TencentOS Tiny 捐献给了开放原子开源基金会。目前开放原子开源基金会已在孵化 5 个国产开源操作系统项目，分别是龙蜥操作系统（Anolis OS）、openEuler、OpenHarmony、TecentOS Tiny、AliOS Things，此外还有类 Redis 存储系统 PIKA、云原生分布式数据库 ZNBase 等，隐有成为中国开源基础软件大本营之势。

The Open Atom Open Source Foundation is currently incubating five Chinese open source operating system projects, namely Anolis OS, openEuler, OpenHarmony, TecentOS Tiny, and AliOS Things, in addition to the Redis-like storage system PIKA and the cloud-native distributed database ZNBase, etc. In September 2020, Tencent also donated TencentOS Tiny to the Open Atomic Open Source Foundation. The company has become the home of Chinese open source infrastructure software.

2021 年 10 月 28 日，开放原子开源基金会技术监督委员会投票通过开源项目 OpenCloudOS 进入开放原子开源基金会孵化。 12 月 22 日，国产开源操作系统

OpenCloudOS 的开源社区正式成立。腾讯、宝德、北京初心、北京红旗、飞腾、浪潮、龙芯中科、OPPO、先进开源、中电科申泰、中科方德、兆芯等 20 余家操作系统生态厂商及用户成为首批创始单位。据悉，作为国产开源操作系统社区，OpenCloudOS 沉淀了多家参与单位在软件和开源生态的优势，在云原生、稳定性、性能、硬件支持等方面均有坚实支撑，可以平等全面地支持所有硬件平台。

On October 28, 2021, the Technical Oversight Committee of the Open Atomic Open Source Foundation voted for the open source project OpenCloudOS to be incubated by the Open Atomic Open Source Foundation. On December 22, the open source community for OpenCloudOS, a home-grown open source operating system, was officially established. More than 20 operating system eco-vendors and users, including Tencent, Baode, Beijing First Heart, Beijing Red Flag, Feiteng, Longchao, Longxin Zhongke, OPPO, Advanced Open Source, CEC Shentai, Zhongke Fangde, and Zhaoxin, became the first founding units. It is reported that, as a domestic open source operating system community, OpenCloudOS has precipitated the advantages of many participating units in software and open source ecology, with solid support in cloud-native, stability, performance, and hardware support, and can support all hardware platforms equally and comprehensively.

在移动开源操作系统方面，2021 年 1 月 31 日，JingOS 开放下载，鲸鲮科技的 JingOS 基于 Linux 内核，是一款主要适用于平板电脑，同时也可支持笔记本、手机等多种终端的新一代通用型移动操作系统，开源代码贡献量超 115 万行，三次登陆 YC 的 Hacker News 头条，是 2021 年上半年全球开源社区关注度最高的移动 Linux 操作系统。

In terms of mobile open source operating systems, JingOS was made available for download on January 31, 2021. JingOS, based on the Linux kernel, is a new generation of the general-purpose mobile operating system mainly for tablets and laptops, mobile phones, and other terminals, with over 1.15 million lines of open source code contributed. It was the most popular mobile Linux operating system in the global open source community in the first half of 2021.

八、 Rust 迈上新征程 Rust embarked on a new journey

作为一门开源的通用系统级编程语言，Rust 由于其出色的内存安全机制、不亚于 C 语言的性能优势等特点，吸引了大量开发人员关注。2021 年，Rust 告别“动荡” ，在多个维度上都迈出了一大步。

Rust is an open source general-purpose system-level programming language that has attracted much attention from developers due to its excellent memory safety mechanisms and performance advantages over C. In 2021, Rust left behind its "turbulence" and took a big step forward in several dimensions.

【专家点评】[Expert Comments]

> **段夕华：**在基础软件及隐私计算领域领域，Rust 必将大有所为。
>
> Duan Xihua: Rust is set to make a big difference in the field of basic software and privacy computing.

2021 年 2 月 9 日，Rust 基金会由 Mozilla、Amazon、华为、谷歌、微软联合成立。作为创始白金成员，五家企业承诺在两年时间里，每年投入不少于 100 万美元的预算，用于 Rust 项目的开发、维护和推广。Rust 基金会的成立，一方面让 Rust 技术的研发和推广免去资金之忧，另一方面，多方参与的基金会管理模式也可以避免单一企业对社区的垄断，确保 Rust 开源社区的开放性与多元化。

On February 9, 2021, the Rust Foundation was established by Mozilla, Amazon, Huawei, Google, and Microsoft. As founding platinum members, the five companies have committed a budget of at least $1 million over two years to develop, maintain and promote the Rust projects. The establishment of the Rust Foundation, on the one hand, eliminates financial worries for the development and promotion of Rust technology. On the other hand, the multi-stakeholder foundation management model

can avoid the monopoly of a single enterprise over the community and ensure the openness and diversification of the Rust open source community.

Rust 基金会成立前后，硅谷同步掀起了一场 Rust 人才争夺大战。不少原 Rust 团队的活跃开发人员纷纷转而加入谷歌、微软、Amazon、Facebook 等科技巨头，这也成为 Rust 语言未来看涨的明确信号。首先，Rust 开发者被商业公司招聘并继续在社区专职投入，会是对社区与技术可持续发展非常好的保证；而这些开发者在解决商业公司遇到的技术问题的同时，反过来将改进方案贡献回社区，更能增加 Rust 在大规模商用场景下的效率与技术韧性，结果将是双赢的。

Around the establishment of the Rust Foundation, a competition for Rust talents started simultaneously in Silicon Valley. Many of the active developers on Rust's team are joining tech giants like Google, Microsoft, Amazon, and Facebook, a clear sign of the language's future. First, Rust developers are recruited by commercial companies and continue to invest full-time in the community, which is a perfect guarantee for the community's sustainable development and technology. In addition to solving the technical problems commercial companies encounter, these developers contribute their improvement solutions to the community, which can increase Rust's efficiency and technical resilience in large-scale commercial scenarios. The result will be a win-win situation.

2021 年 11 月，ARM、Sentry、Knóldus、Spectral、Automata、Activision 和 Toyota Connected 、Clever Cloud、Ferrous Systems、Futurewei、KDAB、Open Source Security、ParaState、Tag1、Zama 共 15 家企业也相继加入 Rust 基金会。

In November 2021, A total of 15 companies, including ARM, Sentry, Knoldus, Spectral, Automata, Activision and Toyota Connected, Clever Cloud, Ferrous Systems, Futurewei, KDAB, Open Source Security, ParaState, Tag1 and Zama, have also joined the Rust Foundation.

除了商业公司大力支持，Linux 社区也对 Rust 表现出了积极的接纳态度：

- 2021 年 6 月，谷歌强推 Rust 进驻 Linux 内核，与 Rust for Linux 项目的主要开发者兼 Linux 内核开发者 Miguel Ojeda 签订合同；
- 2021 年 7 月 4 日，Linux 内核团队发布添加 Rust 支持的 “v1” 补丁；
- 2021 年 12 月 6 日，Linux 内核团队发布支持 Rust 的“v2” 补丁。

In addition to strong support from commercial companies, the Linux community has also shown a joyous embrace of Rust:

- In June 2021, Google pushed Rust into the Linux kernel, signing a contract with Miguel Ojeda, the lead developer of the Rust for Linux project and a Linux kernel developer;
- On July 4, 2021, the Linux Kernel team released a "V1" patch adding Rust support;
- ● On December 6, 2021, the Linux Kernel team released a "V2" patch supporting Rust.

Miguel Ojeda 在邮件中指出，新的“v2” 补丁将为 Linux 内核增加对 Rust 作为第二语言的支持，并且对 Rust 的整体支持进行了多项改进。目前 Rust for Linux 项目进展顺利，开发者有望在 2022 年看到 Linux 内核正式支持 Rust。

Miguel Ojeda points out in an email that the new "V2" patch will add support for Rust as a second language to the Linux kernel and make a number of improvements to Rust's overall support. The Rust for Linux project is progressing well, and developers expect to see Rust officially supported by the Linux kernel in 2022.

九、 AI & 低代码将会如何改变开源，值得关注 How AI & low code will change open source is worth watching

- 2021 年 3 月，腾讯云微搭 WeDa 低代码平台正式发布

- 2021 年 3 月，微软宣布推出新的开源编程语言 Power Fx，一种基于 Microsoft Excel 的低代码公式语言；将可以在整个 Microsoft Power Platform 中进行使用。
- 2021 年 6 月，GitHub 推出 Copliot，一款由 GitHub 和 OpenAI 开发的人工智能工具，通过自动完成代码来帮助 Visual Studio Code、Neovim 和 JetBrains 的用户。GitHub Copilot 发布不足一周时间，却引发了前所未有的争议。有开发者表示：「我不同意 GitHub 在未经授权和未经许可的情况下，使用受版权保护的源代码作为其 Copilot 产品的训练数据。该产品将受版权保护的源代码放入使用者的软件中，而不告知他们源代码的许可，这导致了对版权所有者作品的未经授权和未经许可的不当使用。」

In March 2021, Tencent Cloud Micro-build WeDa low-code platform was officially released

● In March 2021, Microsoft announced the launch of a new open source programming language, Power Fx, a low-code formula language based on Microsoft Excel, which will be available throughout the Microsoft Power Platform.

- ● In June 2021, GitHub launched Copliot, an ARTIFICIAL intelligence tool developed by GitHub and OpenAI to help users of Visual Studio Code, Neovim, and JetBrains by auto-completing Code. Less than a week after its release, the GitHub Copilot has generated unprecedented controversy. One developer said: "I do not agree with GitHub's unauthorized and unlicensed use of copyrighted source code as training data for its Copilot product. The product puts copyrighted source code into users' software without informing them of the license of the source code, which leads to unauthorized and unlicensed improper use of copyright owners' work."

【专家点评】[Expert Comment]

> **段夕华：**除了合规挑战之外，目下基于 ML 的自动代码生成及补足，因为其学习样本存在着质量差异且未做深入甄别，其质量也会是个很大的问题，但定位为辅助代码工具或将有所作为。
>
> Duan Xihua: In addition to compliance challenges, the following automatic code

generation and complement based on ML will also be a big problem due to the quality difference of its learning samples and the lack of in-depth identification. However, it is positioned as an auxiliary code tool and may make a difference.

- 2021 年 7 月，OpenAI 宣布推出一种类似于 Python 的开源编程语言 Triton，并发布了 Triton 1.0 版本。目标是替代 Nvidia CUDA，可使没有 CUDA 经验的研究人员能够编写高效的 GPU 代码，且大多数情况下可以与专家所能编写的代码质量媲美。
- ● In July 2021, OpenAI announced the release of Triton, an open source programming language similar to Python, and released version 1.0 of Triton. The goal is to replace Nvidia CUDA, enabling researchers without CUDA experience to write efficient GPU code that, for the most part, is as good as what experts can write.
- 2021 年 11 月，已经有文章报道《20 个开源低代码平台》，并总结了低代码平台的六大好处。
- In November 2021, the article "20 Open Source Low-Code Platforms" summarised the six benefits of low-code platforms.
- 2021 年 12 月，微软专家推出新型 AI 工具，能自动发现代码中的 Bug。据 mspoweruser 报道，微软公司的研究人员开发了一种新的人工智能（AI）工具，利用深度学习算法可以发现代码中的错误，帮助开发者更准确、更高效地对程序进行调试。这种工具能够识别一些常见的错误，比如不正确的符号 “<=” 和 “<” ，不正确的布尔运算符 “and” 和 “or” ，变量滥用等等。为了测试该系统，微软使用了 Python 代码。与其它方法相比，经过训练后的模型发现 Bug 的概率最多可以提高 30%。【来源】

  In December 2021, Microsoft experts launched a new AI tool that automatically finds bugs in code. Researchers at Microsoft have developed a new artificial intelligence (AI) tool that uses deep learning algorithms to find errors in code and help developers debug programs more accurately and efficiently, mspoweruser reported. This tool can identify common errors such as incorrect symbols "<=" and "<", incorrect Boolean operators "and" or ", variable abuse, and so on. To test the system, Microsoft used Python code. Compared with other methods, the trained

model can detect bugs up to 30% more often. [source]

一个值得思考的问题是：当开源不断的推动各种各样的技术飞速向前发展时，这些技术将会如何反过来促进开源技术、开源开发方式的发展？

It is worth thinking about: as open source continues to push all kinds of technologies forward rapidly, how will these technologies promote open source technologies and open source development methods?

十、 开源硬件持续升温，RISC-V 成果涌现 Open source hardware continues to heat up, RISC-V achievements emerge

- 2021 年 1 月，欧洲核子研究组织推出的 CERN 开放硬件许可证 2.0 版（CERN Open Hardware Licence Version 2）获得 OSI 认证，包括 Permissive、Weakly Reciprocal、Strongly Reciprocal 三个版本。
- 2021 年 6 月 21-26 日，首届 RISC-V 中国峰会（RISC-V World Conference China）在上海科技大学举办，峰会由上海科技大学和中国科学院软件研究所联合主办。
- 2021 年 6 月 22 日，中科院计算所牵头开发的香山开源高性能 RISC-V 处理器在首届 RISC-V 中国峰会发布；7 月，香山处理器完成第一版（代号雁栖湖）的 28nm 流片；10 月 30 日，香山处理器团队负责人包云岗研究员在第六届中国开源年会发表演讲《开源芯片的挑战与机遇》；12 月 6 日，香山通过 RISC-V Summit 第一次在国际 RISC-V 社区正式亮相。
- 2021 年 9 月，RISC-V 国际协会、 CHIPS 联盟、OpenPOWER 基金会和西部数据公司联合筹建开放硬件多样性联盟（Open Hardware Diversity Alliance），努力推动为开放硬件社区中的女性和未被充分代表的个体提供支持。
- 2021 年 10 月 19 日，阿里平头哥于 2021 云栖大会宣布开源四款玄铁 RISC-V 系列

处理器，成为系列处理器与基础软件的全球首次全栈开源。

- 2021 年 10 月 28 日，OpenPOWER Summit NA 2021 在线上举办，OpenPOWER 基金会执行董事 James Kulina 在开场演讲中提到，采用开源硬件是大势所趋。
- 2021 年 12 月 6 日，Linux 基金会 2021 年度报告发布，报告体现出对开源硬件的重点关注：Linux 基金会社区关注的方向包括开源硬件、开放标准、开放数据、开放硬件，分别占比 75%、20%、3%、2%；Linux 基金会将会在下一阶段创建新的开放硬件社区，例如和 Open19 创建开放硬件生态。
- 2021 年 12 月 9 日，由赛昉科技支持的 RISC-V 开源社区平台 RVspace 正式上线。

● In January 2021, CERN Open Hardware Licence Version 2 was granted OSI certification. It can be Permissive, Weakly Reciprocal, and Strongly Reciprocal.

● June 21-26, 2021, the first RISC-V World Conference China will be held at the Shanghai University of Science and Technology. The summit is co-hosted by the Shanghai University of Science and Technology and Institute of Software, Chinese Academy of Sciences.

● On June 22, 2021, Xiangshan open source high-performance RISC-V processor led by the Institute of Computing Technology of the Chinese Academy of Sciences was released at the first RISC-V China Summit. In July, Xiangshan processor completed the first version (code name yanqi Lake) of 28nm streaming chip; On October 30, Researcher Yungang Bao, head of Xiangshan Processor team, delivered a speech "Challenges and Opportunities of Open Source Chips" at the 6th China Open Source Annual Conference. On December 6, Xiangshan made its first official debut in the international RISC-V community through the RISC-V Summit.

● In September 2021, RISC-V International Association, CHIPS Alliance, OpenPOWER Foundation, and Western Digital established the Open Hardware Diversity Alliance.

Promote support for women and underrepresented individuals in the open hardware community.

● On October 19, 2021, Ali Pingtou announced the open source of four Basalts RISC-V series processors at the 2021 Cloud Computing Conference, becoming the world's first full-stack open source of series processors and essential software.

● In his opening remarks at the OpenPOWER Summit NA 2021 on October 28, 2021, James Kulina, Executive Director of the OpenPOWER Foundation, mentioned that the adoption of open source hardware is the trend.

● On December 6, 2021, the Linux Foundation 2021 annual Report was released. The report reflects the focus on open source hardware: the focus of the Linux Foundation community includes open hardware, open standards, open data, open hardware, accounting for 75%, 20%, 3%, 2%, respectively; The Linux Foundation will create new open hardware communities in the next phase, such as the Open Hardware Ecosystem with Open19.

- ● On December 9, 2021, RVspace, the RISC-V open source community platform supported by Saifang Technology, was officially launched.

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