intel®

Zephyr® Turns 10

A Decade of Adoption, Maturity, and Ecosystem Evolution

Bianca Trinkenreich, Ph.D., *Colorado State University*
Adrienn Lawson, *The Linux Foundation*
Hilary Carter, *The Linux Foundation*

Foreword by Kate Stewart, Zephyr Project Director

March 2026

THE LINUX FOUNDATION | Research

Zephyr® Turns 10

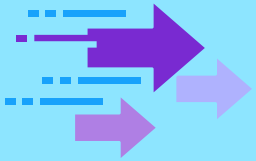
70% of surveyed organizations in the U.S. and Canada and **62%** in Europe **already use Zephyr in commercial products.**

69% of organizations plan to increase or significantly increase their use of Zephyr, while only 1% expect to decrease usage.

52% of organizations support embedded products running Zephyr for 5–10 years or longer, reflecting long-term production commitments.

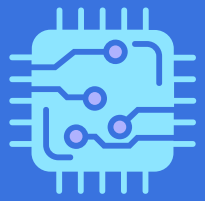
64% of respondents report that security has either improved or remained stable, reflecting Zephyr's security-by-design principles.

49% of organizations cite easier hardware portability as the biggest impact of adopting Zephyr.



36% of organizations value Zephyr's community and ecosystem support, and 35% highlight freedom from vendor lock-in.

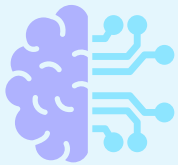
79% of respondents report improved hardware and board support, and 60% report improved connectivity since adopting Zephyr.



Only 20% of respondents report improvements in Zephyr's learning curve, making onboarding the most persistent challenge.

49% of organizations envision long-term maintenance and support as Zephyr's biggest challenge over the next five years.

While 54% of respondents report reduced cognitive effort, only 18% believe GenAI helps them write code with fewer errors, and just 22% feel more confident when coding with it.



Practitioners highlight that Zephyr enables easier hiring and faster onboarding compared to proprietary RTOS environments where engineers start with zero system-specific knowledge.

Experts confirm Zephyr's maturity: now production-ready with stable stacks, and suitability for long-lifecycle industrial devices requiring decades of operation.

Contents

Foreword

Ten years ago, Zephyr set out to solve a problem that many embedded teams quietly struggled with: how to build dependable real-time systems without being locked into a single vendor, toolchain, or proprietary stack. Before beginning the project, open source developers were surveyed to identify the key problems they wanted to see a new open source real-time operating system (RTOS) to solve, such as security and safety certifications. The decision to place Zephyr under open governance at the Linux Foundation was the starting point. It established neutrality, invited broad industry participation, and created the long-term trust that open ecosystems require to thrive.

What followed over the next decade was more than steady adoption. Zephyr introduced a new model for embedded development, one built around portability, adoption of security best practices, modern tooling, and a shared ecosystem of drivers and middleware. Organizations could move across hardware platforms while preserving their software investments. Contributors from across the industry collaborated in the open to improve performance, connectivity, and reliability. Most importantly, Zephyr crossed the hardest threshold any open source project faces: it became production infrastructure, embedded in products designed to last and be supported for years, and in many cases, decades.

Today, Zephyr stands as a mature and trusted RTOS, used across industries and deployment scales. But maturity brings new responsibilities. The challenge of the next decade is no longer simply adoption. It is demonstrating that an open source project with high contribution velocity can dependably be adopted in safety critical systems.

Zephyr now serves an expanding spectrum of use cases, from highly constrained microcontrollers to increasingly complex systems that once relied on embedded Linux, but have power considerations that need a more efficient solution. Balancing performance, memory footprint, safety, security, and long-term maintenance across that spectrum requires technical discipline, clear project boundaries, and continued investment in community health. Growth alone is not enough. The platform must remain neutral, dependable, and focused on solving the core problems of embedded development.

This report captures both how far Zephyr has come and the work ahead. It reflects a project that has succeeded in building a global ecosystem and now faces the equally important task of sustaining critical digital infrastructure for the long term. The next decade will be defined not just by new features, but by how well we preserve the principles that made Zephyr successful: openness, collaboration, portability, and trust.

I am deeply proud of what this community has built together over the past ten years. And I am equally excited about what we can achieve as we strengthen Zephyr for the decade ahead.

Kate Stewart
Zephyr Project Director,
VP Dependable Embedded Systems

Executive summary

Over the past decade, Zephyr® has evolved from an emerging real-time operating system into a foundational platform for modern embedded development. Zephyr is being used across a wide range of industries and deployment contexts, from small-scale embedded systems to large fleets of production devices. As embedded software becomes increasingly central to connected products, industrial systems, and safety-critical infrastructure, the role of an open, vendor-neutral RTOS has grown in both technical and strategic importance.

This report marks Zephyr's 10-year milestone by examining how the project is used today, how it is perceived by organizations and contributors, and what challenges and opportunities lie ahead. Drawing on survey data and qualitative interviews from organizations that use, evaluate, or contribute to Zephyr, the report provides an empirical view of Zephyr's adoption, technical footprint, and ecosystem dynamics. Rather than focusing solely on usage metrics, we emphasize how Zephyr fits into long-term product strategies and organizational decision-making.

The findings show a project that has reached a stage of operational maturity. Zephyr is widely deployed in production environments characterized by constrained hardware and long product lifecycles. There is also a need for portability across heterogeneous platforms. At the same time, adoption patterns reveal variation in how deeply Zephyr is integrated into products and how critical it is perceived to be to organizational success. This shows different stages of maturity among adopters.

Looking forward, the report also surfaces key tensions shaping Zephyr's next decade. Respondents consistently point to sustainability challenges that include long-term maintenance, onboarding, and the need to focus on security and certifications. Emerging technologies, including Generative AI-based development tools, are viewed as promising productivity aids but are met with caution in contexts where correctness and verification remain crucial.

The results position Zephyr as a stable and trusted platform. But they also show that long-term success depends as much on people, processes, and ecosystem health as on technical capabilities. By grounding these insights in empirical data, this report aims to inform practitioners, contributors, and stakeholders seeking to understand where Zephyr stands today and what it will take to sustain and strengthen the project in the decade ahead.

Introduction

This report marks the 10th anniversary of the Zephyr real-time operating system (RTOS) by presenting a global, survey-based analysis of its adoption, use, and ecosystem evolution as well as qualitative interviews with experts. Zephyr was launched a decade ago to provide an open, vendor-neutral RTOS for resource-constrained and heterogeneous hardware environments. Since then, it has grown into a widely used platform supporting products with long lifecycles, diverse deployment contexts, and increasing organizational and regulatory complexity.

> "One of the reasons Zephyr gained attention so quickly was that connectivity was built in from the beginning. Bluetooth and networking were core parts of the RTOS, not add-ons. At a time when IoT was taking off, having open source real-time software with modern connectivity support was a major breakthrough."
>
> — ANAS NASHIF, SENIOR PRINCIPAL ENGINEER, INTEL; ZEPHYR MAINTAINER, TSC CHAIR, AND BOARD MEMBER

The findings in this report are based on a web-based survey conducted by Linux Foundation Research between October and December 2025. The survey targeted professionals with experience selecting, using, or contributing to real-time operating systems, including Zephyr and those not using Zephyr. Responses were collected from practitioners across regions, organization sizes, and industry sectors. In total, the study includes 413 valid responses, spanning organizations that currently use Zephyr in production, are actively evaluating it, have used it in the past, or have chosen alternative RTOS solutions. The report also includes expert quotes from industry practitioners with a strong background in RTOS and the use of Zephyr.

The survey instrument comprised 53 questions organized into sections covering respondent background and organizational context, RTOS selection and deployment practices, Zephyr usage and technical characteristics, perceived impacts and challenges, community participation, and contributor experiences. Targeted question paths were used to capture perspectives from non-adopters, users, and contributors. This enabled analysis across different levels of engagement with the project. The survey design emphasizes descriptive and comparative analysis rather than causal inference. Detailed information about sampling, screening, data quality checks, and question structure is provided in the Methodology section.

This report is organized to reflect the lifecycle of RTOS adoption and engagement with Zephyr. It begins by examining how organizations choose and deploy RTOSs, providing context for Zephyr's position within the broader decision landscape. Subsequent sections analyze Zephyr's current adoption footprint, technical characteristics, and perceived value, followed by an exploration of future expectations and challenges. The report also addresses non-adoption and non-contribution as structural phenomena before turning to community dynamics, contribution practices, and contributor experiences.

How organizations choose and deploy RTOS

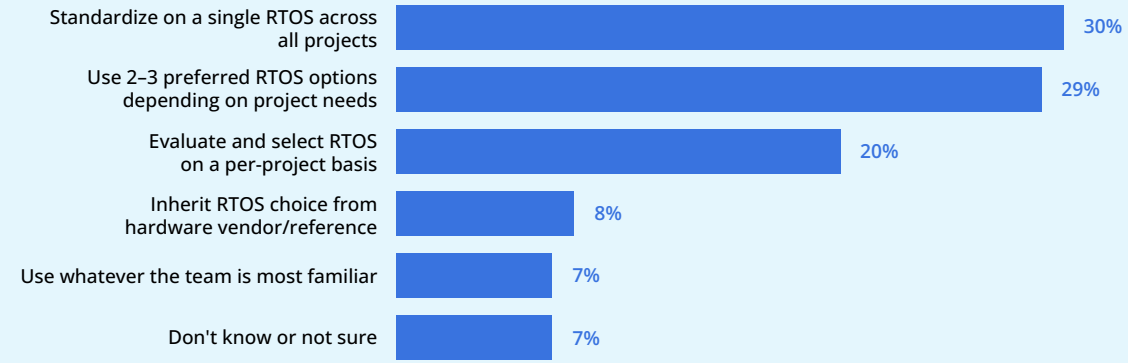
The RTOS decision landscape

This survey data reveals that organizations take diverse approaches to RTOS selection, with no single dominant strategy as shown in Figure 1. The most common approach is standardizing on a single RTOS across all projects, adopted by 30% of organizations. Close behind, 29% maintain flexibility by using 2-3 preferred RTOS options and selecting based on specific project requirements. Another 20% evaluate RTOS choices on a per-project basis without predetermined preferences, prioritizing project-specific optimization. The remaining organizations use less strategic approaches: 8% inherit their RTOS from hardware vendors or reference designs, 7% simply use whatever their team already knows, and 7% are uncertain about their approach.

FIGURE 1

What is your organization's typical approach to RTOS selection?

Zephyr Turns 10 Survey, Q9, Sample Size = 413



RTOS selection practices vary by region. The United States and Canada show a more balanced and diverse approach, having 21% standardize on a single RTOS, 35% use 2-3 preferred RTOS and 21% evaluate RTOS per project (see Appendix A1). Europe also leans toward standardized RTOS practices, 38% standardize on one RTOS. Asia-Pacific is more exploratory, where 28% evaluate RTOS on a per-project basis.

RTOS strategy also diverges by company size. As Appendix A2 shows, very large organizations (10,000+ employees) favor controlled flexibility: 40% rely on 2-3 preferred RTOS options, allowing teams to match RTOS choices to project needs while maintaining governance and support at scale. Smaller organizations prioritize simplicity and efficiency: among companies with fewer than 250 employees, 35% standardize on a single RTOS. Large organizations sit between standardization and flexibility. Companies with 250-9,999 employees show a more even split between per-project evaluation and limited RTOS portfolios.

> "Zephyr feels immediately familiar to developers with open source experience. Using Devicetree, CMake, Python, and GitHub creates a recognizable workflow that lowers friction and accelerates development, even though the tools are tailored for embedded systems."
>
> — HENRIK BRIX ANDERSEN, LEAD EMBEDDED SOFTWARE ENGINEER, VESTAS WIND SYSTEMS A/S

RTOS selection practices also vary substantially between organizations that use Zephyr and those that do not (Figure 2). Organizations using Zephyr tend to adopt more structured and standardized selection approaches. Nearly two-thirds of Zephyr users report either standardizing on a single RTOS across all projects (31%) or maintaining a small set of two to three preferred RTOS options selected based on project needs (31%). In contrast, organizations

that do not use Zephyr are more likely to rely on ad hoc or team-driven decision making. One quarter of non-users (25%) report selecting an RTOS primarily based on what the team is already familiar with, compared to only 5% among Zephyr users. Non-users are also more likely to evaluate and select an RTOS on a per-project basis (29% vs. 21%).

Top priorities when selecting an RTOS: Ecosystem, hardware support, and performance

The most important factors when selecting an RTOS are ecosystem maturity (46%), closely followed by hardware support (41%) and technical performance (41%) (see Figure 3). The relatively low selection rate for safety certifications (11%) should not be interpreted as a lack of importance. Safety certification is often considered a prerequisite for adoption.

"When choosing an RTOS for products, the most important factors are stability, extensibility, and understandability. Zephyr requires more upfront learning than something like FreeRTOS, but that investment pays off as systems become more complex. FreeRTOS is easier at the beginning; Zephyr pays off in the long run."

— DOMINIK TACKE, PRINCIPAL KEY EXPERT, SIEMENS

RTOS selection priorities vary across regions (Appendix A3). Respondents from North America

FIGURE 2

RTOS Selection Approaches: Zephyr Users vs. Non-Users

Zephyr Turns 10 Survey, Q15/Q16, Sample Size = 375, Using = Current Zephyr users or planning to use Zephyr, Not using = Past Zephyr users or not planning to use Zephyr

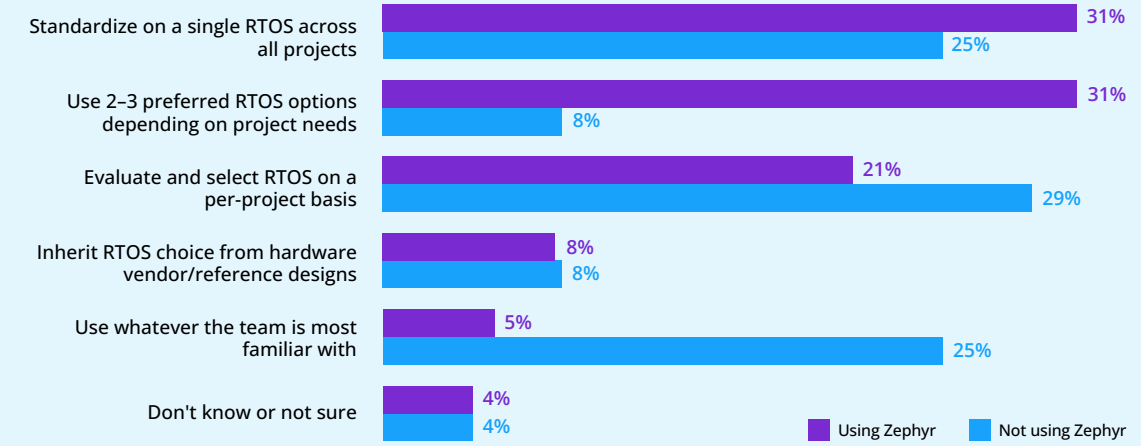


FIGURE 3

What are the most important factors when selecting an RTOS?

Zephyr Turns 10 Survey, Q15, Sample Size = 413, Total Mentions = 1,122

place the greatest emphasis on technical performance, with 47% identifying it as a top priority when selecting an RTOS. In contrast, respondents in the Asia-Pacific region prioritize ecosystem maturity (54%), while European respondents emphasize both ecosystem maturity (47%) and hardware platform support (44%).

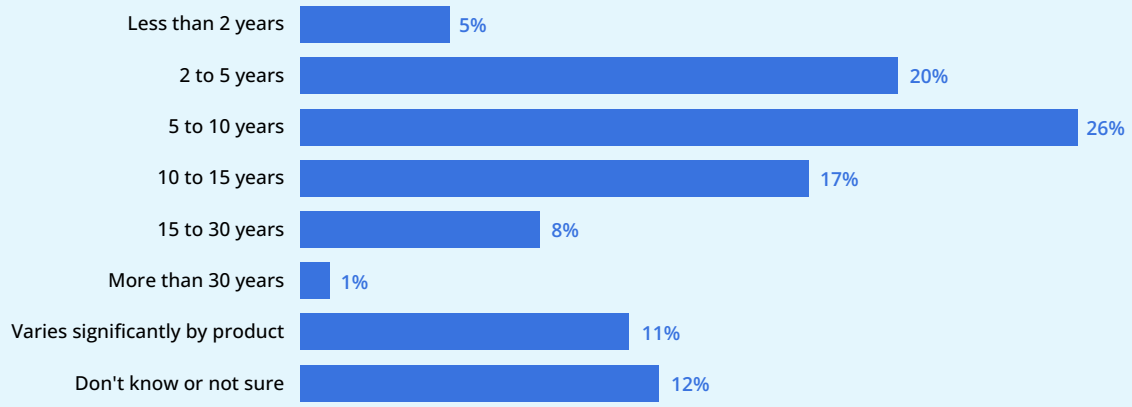
"The tooling around Zephyr is incredibly strong. West, Twister, and the project's CI make it possible to manage complex, multi-repo development at scale. The documentation is extensive, and even after years of use I still discover useful details. It's impressive that a community project can maintain this level of quality."

— YASUSHI SHOJI, CO-FOUNDER AND CEO, SPACE CUBICS

FIGURE 4

What is the typical lifecycle/support duration for your embedded products?

Zephyr Turns 10 Survey, Q12, Sample Size = 400



Embedded product lifecycles are long, which strongly shapes RTOS selection decisions. The most common lifecycle duration reported is 5 to 10 years (26%), with a substantial share of products supported for a decade or longer (see Figure 4, product lifecycle duration).

Among organizations that do not use Zephyr, selection priorities are more strongly oriented toward ease of adoption and long-term reliability (Figure 5). Documentation and learning resources are the most critical factor, with 87% of non-Zephyr users rating them as very important, followed by maturity and stability of the codebase (80%). Ecosystem and community support also rank highly. In contrast, a substantial proportion of non-Zephyr users report that commercial support options (37%) and legacy codebase compatibility (37%) are not important when selecting an RTOS.

"If I had to name one thing that makes Zephyr feel like an ecosystem, it would be West. It removes a lot of the friction around bootstrapping projects, managing repositories, and integrating third-party components. Once you get used to it, you start wishing you had something like West in other projects too."[1]

— PHILIPP MIEDL, SENIOR SOFTWARE DEVELOPER, BANG & OLUFSEN

1 Interview with Philipp Miedl, whose views expressed are personal and not attributable to his organization. January 20, 2026.

FIGURE 5

Which factors are most important when selecting an RTOS for your products? (Non-Zephyr users)

Zephyr Turns 10 Survey, Q18, Sample Size = 115, Non-Zephyr users

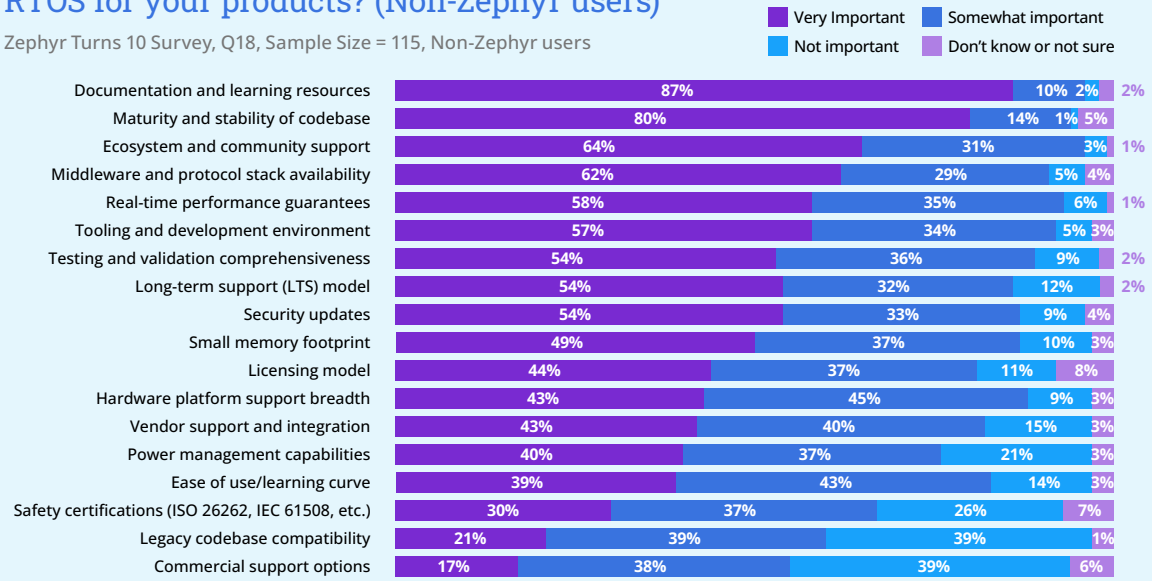
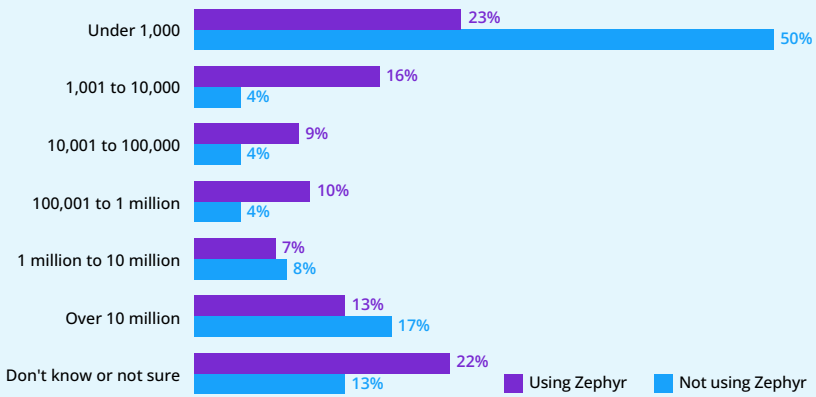


FIGURE 6

Approximately how many hardware devices has your organization deployed using RTOS(es)?

Zephyr Turns 10 Survey, Q10/Q16, Sample Size = 365, Using = Current Zephyr users or planning to use Zephyr, Not using = Past Zephyr users or not planning to use Zephyr



RTOS deployment: Scale, constraints, and cost

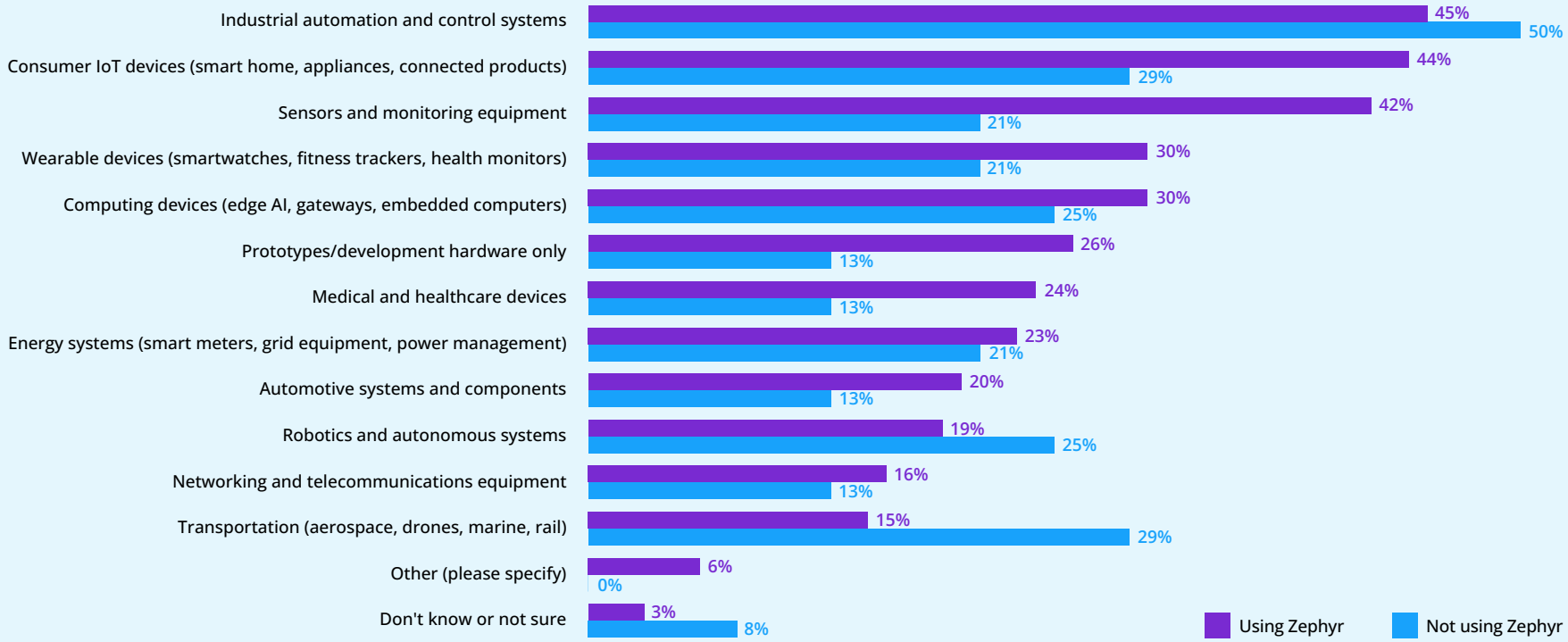
RTOS deployment scale further differentiates organizations that use Zephyr from those that do not, and helps contextualize the selection priorities discussed above (Figure 6). Organizations not using Zephyr (and with no plans to adopt it) tend to operate at smaller deployment scales: half (50%) report deploying RTOS-based products on fewer than 1,000 devices. These smaller-scale deployments are consistent with an emphasis on ease of adoption, strong documentation, and codebase maturity, as teams prioritize minimizing onboarding costs and development risk over scalability concerns. In contrast, Zephyr users and organizations actively evaluating Zephyr are consistently represented across medium to very large deployment tiers, including fleets comprising hundreds of thousands to millions of devices. At these scales, RTOS decisions are shaped by additional constraints related to long-term maintenance, operational cost, and ecosystem sustainability.

RTOS deployment contexts also differ by application domain, further distinguishing Zephyr users from non-users (Figure 7). Organizations using (or planning to use) Zephyr are more strongly represented in sensing- and data collection-oriented domains. Zephyr users are approximately twice as likely to report using an RTOS for sensors and monitoring equipment (42%) compared to organizations not using Zephyr (21%). This pattern aligns with Zephyr's adoption in environments characterized by constrained devices, heterogeneous hardware, and

FIGURE 7

In which types of hardware does your organization use RTOS?

Zephyr Turns 10 Survey, Sample Size = 375, Total Mentions = 1,267, Using = Current Zephyr users or planning to use Zephyr, Not using = Past Zephyr users or not planning to use Zephyr



large-scale deployments where portability and ecosystem support are critical. In contrast, organizations not using Zephyr report higher RTOS usage in transportation-related systems. Nearly one-third of non-Zephyr users (29%) report RTOS use in transportation contexts, compared to 15% among Zephyr users. Non-Zephyr users are also more represented in robotics and autonomous systems.

Responses categorized as "Other" (6%) indicate that RTOS use by Zephyr users extends beyond traditional embedded or IoT-focused deployments into a diverse set of consumer and specialized systems. Participants reported using RTOSs in consumer electronics and non-IoT consumer devices, including USB controllers connected to computers and even laptops, public and industrial lighting systems, as well as in VR/AR hardware.

RTOS deployment is strongly shaped by both hardware constraints and financial limitations. Figures 8 and 9 illustrate that RTOS adoption commonly occurs under conditions that demand low overhead, predictable costs, and long-term sustainability within constrained technical and financial environments.

As shown in Figure 8, the most common target environment falls within the 128KB-512KB RAM range (32%). This shows the prevalence of resource-constrained devices and the importance of lightweight kernels, modular system design, and careful feature trade-offs. Only a small share of respondents report operating in environments with no significant memory constraints. This suggests that efficiency and footprint are central considerations in RTOS adoption.

Budget constraints further influence these deployment decisions. Figure 9 shows that one-third of organizations report annual RTOS-related costs under $10,000, while relatively few report budgets exceeding $100,000. At the same time, nearly half of respondents are unable to specify their RTOS-related budget.

FIGURE 8

What are your typical memory constraints for RTOS-based devices?

Zephyr Turns 10 Survey, Q13, Sample Size = 413

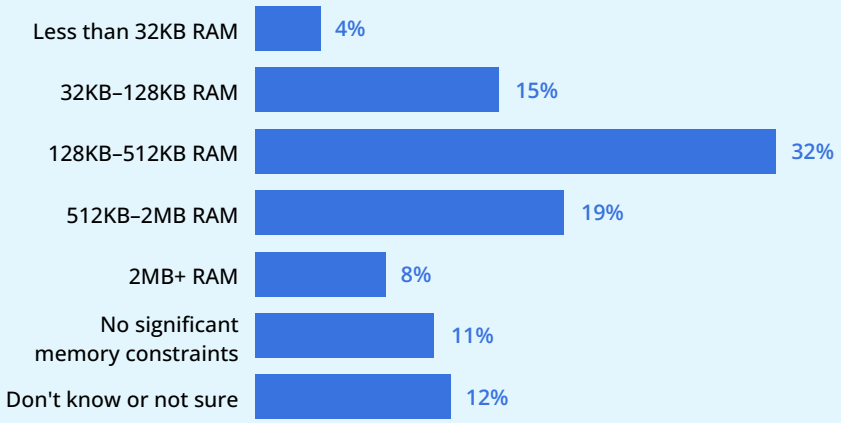
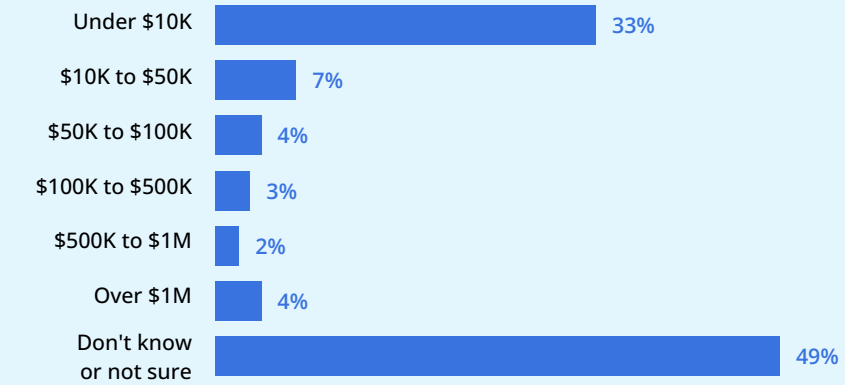


FIGURE 9

What is your organization's annual budget for RTOS-related costs (licensing, support, training)?

Zephyr Turns 10 Survey, Q14, Sample Size = 400



The state of Zephyr after 10 years

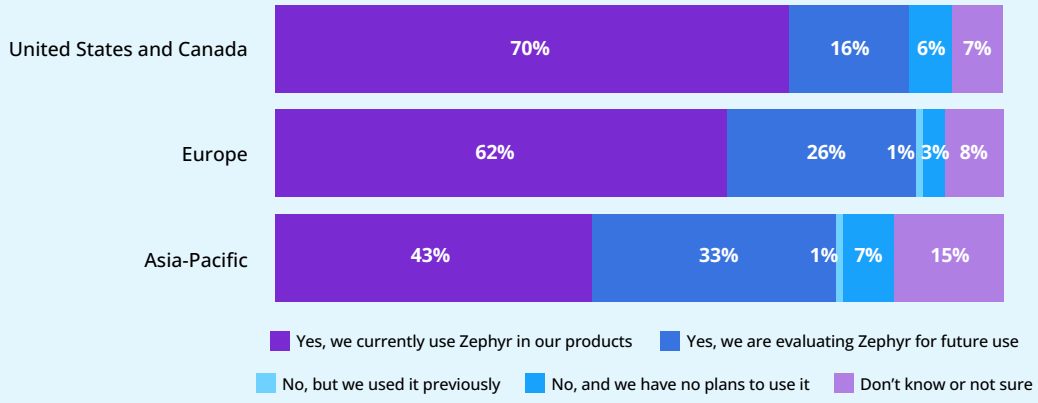
Where Zephyr is today

Ten years after its launch, Zephyr shows a strategically significant adoption footprint, combining strong established usage with active evaluation pipelines across regions. As shown in Figure 10, current Zephyr usage is highest in the United States and Canada, where 70% of respondents report that their organization is already using Zephyr in products. Europe follows closely, with 62% reporting active use.

FIGURE 10

Does your organization currently use or plan to use Zephyr?

Zephyr Turns 10 Survey, Q16, Sample Size = 390



At the same time, Figure 10 shows substantial evaluation activity outside North America. Europe and Asia-Pacific (including India) show the strongest evaluation pipelines, with 26% of European respondents and 33% of Asia-Pacific respondents actively evaluating Zephyr for future use.

Beyond the regions shown in Figure 10, respondents from Mexico, Central America, the Caribbean, and South America, as well as Africa, also report growing interest in Zephyr. These regions are not displayed in the figure due to the smaller number of survey responses, but qualitative signals and reported usage indicate emerging adoption patterns that suggest Zephyr's reach continues to expand beyond the markets observed in the survey.

Zephyr is widely regarded as important to organizational operations across all regions surveyed (Figure 11). In the United States and Canada, 59% of respondents rate Zephyr as extremely important or very important, with a further 21% considering it important. Europe's reporting is slightly lower, with 47% rating Zephyr as extremely or very important and 32% as important. Asia-Pacific also shows a strong signal of business criticality, with 71% of respondents rating Zephyr as important, very important, or extremely important.

"With Zephyr, a lot of work that used to take weeks has essentially disappeared. We can move an application from a discovery board to custom hardware in days instead of weeks, which lets teams focus on solving the customer problem rather than rebuilding board support, security, and connectivity from scratch."

— DOMINIK TACKE, PRINCIPAL KEY EXPERT, SIEMENS

FIGURE 11

How important is Zephyr to your organization's business?

Zephyr Turns 10 Survey, Q24, Sample Size = 215

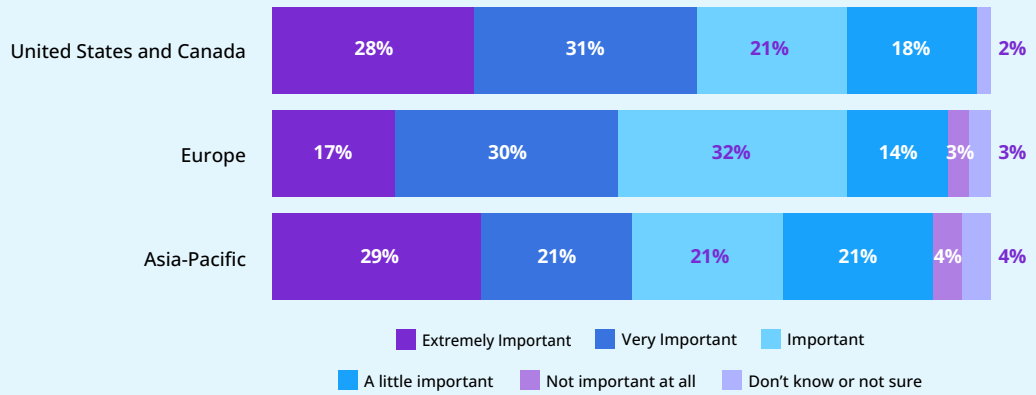
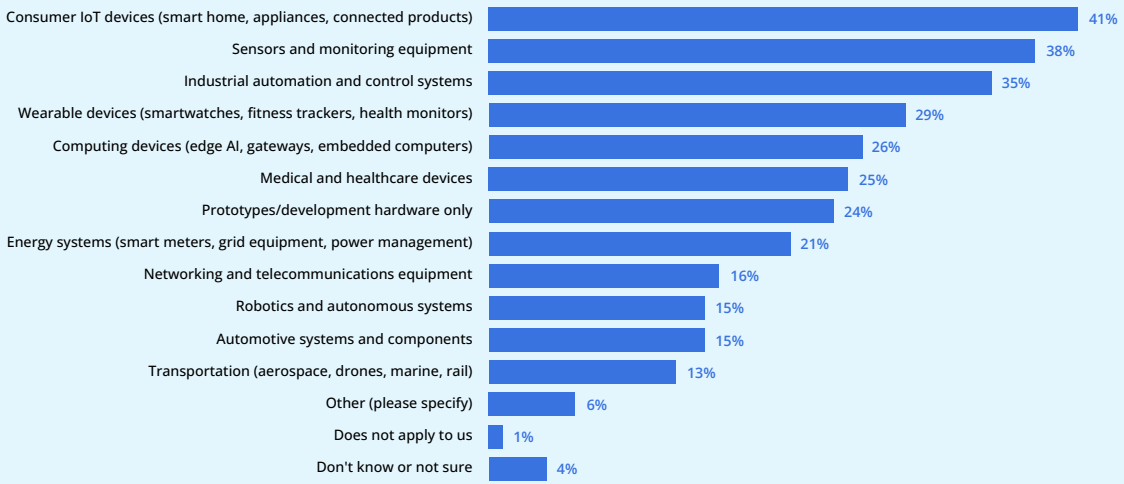


FIGURE 12

On which types of hardware does your organization run or embed Zephyr?

Zephyr Turns 10 Survey, Q25, Sample size = 230, Total mentions = 712



Zephyr is embedded across a wide range of hardware platforms, reflecting its use in diverse application contexts rather than a single dominant deployment category. As shown in Figure 12, respondents report embedding Zephyr in consumer IoT devices, sensors and monitoring equipment, industrial automation and control systems, wearables, computing devices, and healthcare systems, among others. Because this question allowed respondents to select multiple hardware types, the percentages shown in Figure 12 are not mutually exclusive and do not sum to 100%; instead, they indicate the breadth of domains in which Zephyr is actively deployed.

> "High polling rates normally come with high power consumption, which forces users to charge devices frequently. Zephyr allows us to keep polling rates high while dramatically extending battery life, so users can charge a wireless keyboard every few months instead of every few days. That completely changes the wireless experience."
>
> — PAUL TAN, COO, KEYCHRON

Organizations reported using Zephyr on custom ARM-based hardware designs, across customer projects with widely varying hardware, and on general-purpose microcontrollers. Additional mentions include computing devices such as PCIe cards, PCIe hardware accelerators, RISC-V application processors, and consumer peripherals such as a gaming mouse.

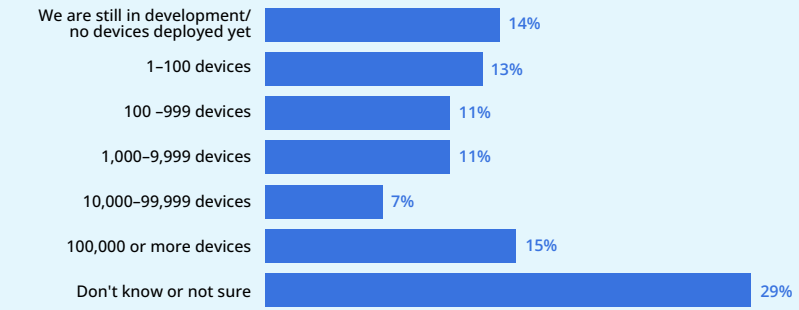
Regional differences further shape how Zephyr is embedded across hardware domains (Appendix A4). In Europe, Zephyr adoption is most strongly associated with sensors and monitoring equipment, where 46% of respondents report using Zephyr, alongside substantial use in consumer IoT devices (44%). This pattern reflects Zephyr's role in data-driven and infrastructure-oriented deployments that emphasize reliability and long-term operation. In the Asia-Pacific region, adoption is most pronounced in consumer IoT devices, with 46% of respondents reporting Zephyr use in this category. This shows the region's strong focus on connected consumer products and high-volume device ecosystems. In contrast, organizations in the United States and Canada most commonly report embedding Zephyr in computing devices such as edge AI platforms, gateways, and embedded computing systems (51%).

Ten years after its launch, Zephyr spans the full adoption spectrum, from early experimentation to large-scale production deployments (Figure 13). Early-stage use is strong, with 14% of respondents reporting that they have not yet deployed devices in production, indicating a continued inflow of new adopters entering the ecosystem. At the same time, production use is widespread: the majority of respondents report running Zephyr in active deployments ranging from tens to thousands of devices.

FIGURE 13

How many Zephyr-run devices or products have your customers currently deployed or are actively using?

Zephyr Turns 10 Survey, Q26, Sample Size = 230



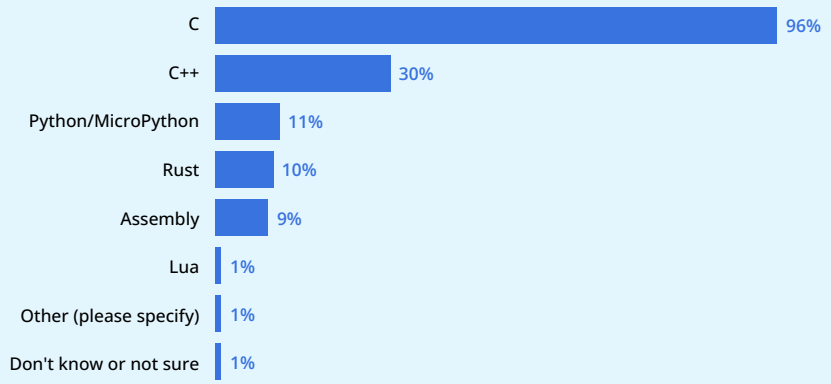
Zephyr's technical footprint

Ten years on, Zephyr's technical footprint reflects both continuity and evolution in embedded software development practices (Figure 14). C is the backbone of Zephyr-based development, with 96% of organizations reporting its use. At the same time, the prevalence of C++ is notable in an RTOS context: 30% of respondents report using C++ in their Zephyr-based application development. The fact that Zephyr supports other application languages beyond C, such as Python/Micropython, Rust and Lua, means it enables migration of existing applications on top of Zephyr, which is another beneficial feature of the project.

FIGURE 14

Which programming languages does your organization primarily use for Zephyr-based development?

Zephyr Turns 10 Survey, Q27, Sample Size = 230, Total Mentions = 364



Zephyr's hardware footprint is shown as firmly microcontroller-centric, while also demonstrating an expanding architectural reach (Figure 15). ARM Cortex-M platforms dominate Zephyr deployments, with 88% of respondents reporting usage, reaffirming Zephyr's core strength in resource-constrained, real-time embedded systems. At the same time, Zephyr's support has broadened beyond its original MCU focus. Nearly one-third of respondents report using

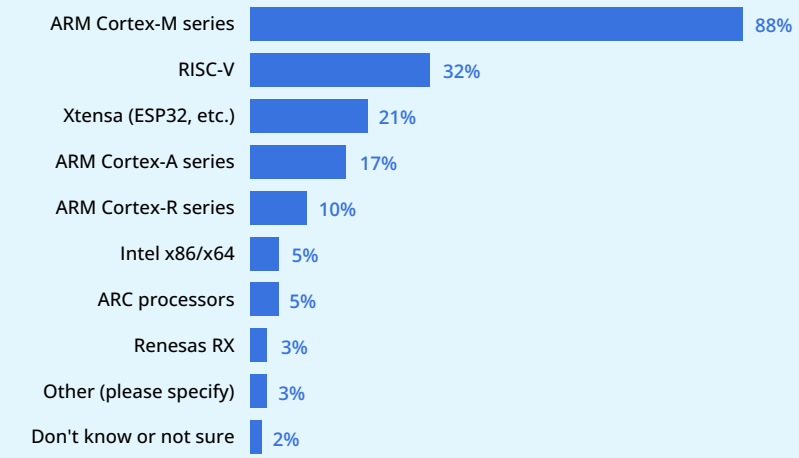
Zephyr on RISC-V platforms (32%), and meaningful adoption is also observed on Xtensa-based systems (21%) and ARM Cortex-A processors (17%). A regional breakdown of hardware platform usage shows that across all regions, ARM Cortex-M platforms dominate Zephyr deployment (Appendix A5).

Beyond this common baseline, secondary platform usage varies by region. Organizations in Asia-Pacific report higher use of RISC-V platforms compared to other regions, while respondents in the United States and Canada show relatively higher adoption of ARC processors and x86/x64 systems. European respondents show a narrower distribution, with most deployments concentrated on Cortex-M platforms and lower reported use of alternative architectures. These differences suggest that, while Zephyr deployments converge on similar core hardware platforms globally, regional ecosystems influence the adoption of additional processor architectures.

FIGURE 15

What types of hardware platforms does your organization use with Zephyr?

Zephyr Turns 10 Survey, Q28, Sample Size = 230, Total Mentions = 433

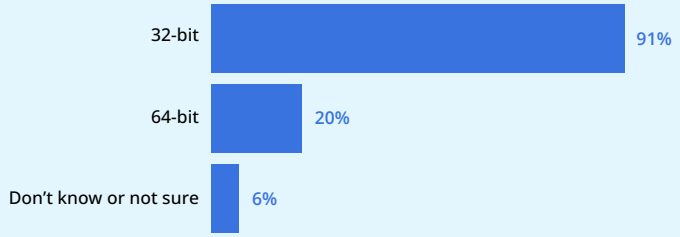


The bit-widths used in Zephyr-based deployments indicate a strong concentration on 32-bit architectures (Figure 16). A large majority of respondents (91%) report using Zephyr on 32-bit platforms, while a smaller subset (20%) indicate use on 64-bit systems.

FIGURE 16

For the platforms you selected, which bit-widths does your organization use?

Zephyr Turns 10 Survey, Q29, Sample Size = 230, Total Mentions = 271



Zephyr's momentum and value

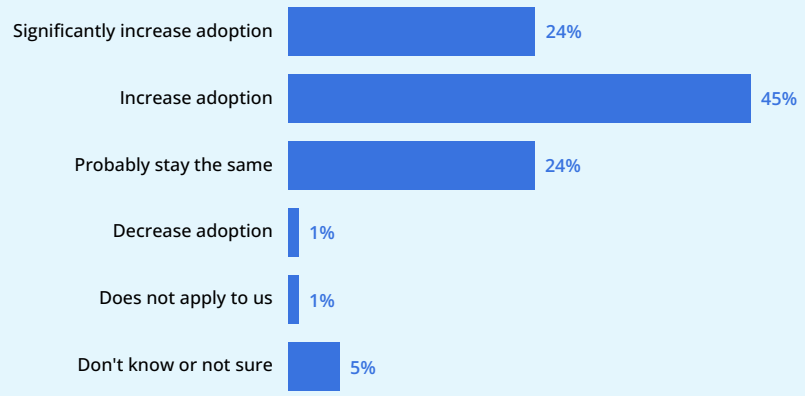
Trajectory: Growth, confidence, and stability

Looking ahead, survey responses indicate that Zephyr is positioned on a broadly positive adoption trajectory (Figure 17). Most organizations anticipate expanding their use of Zephyr: 45% report plans to increase adoption and an additional 24% expect to significantly increase their use. At the same time, a substantial share of respondents (24%) expect their level of Zephyr usage to remain unchanged. This stability is consistent with earlier findings showing mature deployments and may reflect organizations that have already integrated Zephyr into established product lines at a steady scale. In contrast, signals of contraction are minimal: only 1% of respondents anticipate decreasing their use of Zephyr, and a small fraction report uncertainty.

FIGURE 17

What are your organization's future plans for Zephyr?

Zephyr Turns 10 Survey, Q30, Sample Size = 230



"What immediately stood out with Zephyr was the engineering quality. The codebase felt clean, familiar, and practical for real-time control, especially coming from a Linux background. It takes best practices from other open source projects and applies them in a way that makes the system predictable, extensible, and developer-friendly."

— YASUSHI SHOJI, CO-FOUNDER AND CEO, SPACE CUBICS

A regional breakdown of future plans further clarifies how adoption momentum varies geographically (Figure 18). Organizations headquartered in the United States and Canada report the strongest growth intent, with 75% indicating plans to increase or significantly increase their use of Zephyr. Europe and Asia-Pacific also show substantial forward momentum, with 66% and 65% of respondents, respectively, planning to grow adoption. Across all regions, only a small minority anticipate reducing usage, while a notable share expect adoption levels to remain stable. As noted earlier, respondents from Mexico, Central America, the Caribbean, and South America, as well as Africa, also report growing interest in Zephyr; these regions are not shown due to smaller sample sizes.

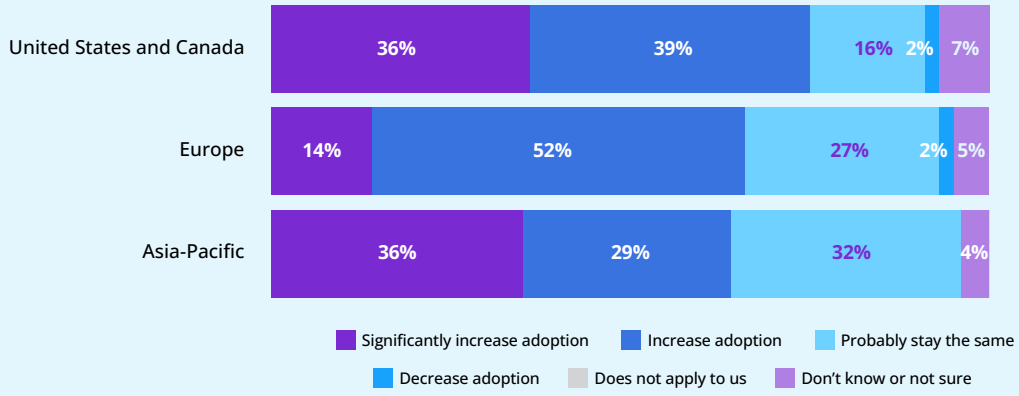
"Ten years in, Zephyr has passed the hardest test for any open source project: survival and sustained adoption. Many projects appear, gain attention, and disappear. Zephyr is now an established platform with real production impact across industries."

— ANAS NASHIF, SENIOR PRINCIPAL ENGINEER, INTEL; ZEPHYR MAINTAINER, TSC CHAIR, AND BOARD MEMBER

FIGURE 18

Future adoption plans for Zephyr by region

Zephyr Turns 10 Survey, Q30/Q6, Sample Size = 215



Why Zephyr matters to organizations

Organizations report a range of concrete benefits from adopting Zephyr, with technical flexibility and ecosystem-related advantages most frequently cited (Figure 19). Easier hardware portability is the most reported impact, selected by 49% of respondents, indicating that Zephyr enables organizations to target multiple hardware platforms with less development effort.

"Using Zephyr gives us long-term flexibility. Instead of paying per-unit fees for proprietary firmware or being locked into a single vendor, we can select different chips and MCUs while keeping the same software foundation. That freedom reduces dependency risks and lowers long-term costs, even if the upfront development effort is higher."

— PAUL TAN, COO, KEYCHRON

"When we had to redesign control modules due to processor obsolescence, Zephyr gave us a scalable foundation for an entire family of products. Its cross-vendor and cross-MCU design allowed us to port to new SoCs quickly while keeping a layered, reusable firmware architecture."

— HENRIK BRIX ANDERSEN, LEAD EMBEDDED SOFTWARE ENGINEER, VESTAS WIND SYSTEMS A/S

Community and ecosystem support (36%) and the absence of vendor lock-in (35%) are also prominent. This shows the importance of Zephyr's open, collaborative development model and freedom from proprietary constraints. In addition, 35% of respondents cite faster product development cycles, suggesting that Zephyr supports shorter paths from development to deployment, though this benefit is reported less frequently than platform and ecosystem-related considerations.

"Zephyr saves a significant amount of development time by eliminating boilerplate. Device driver frameworks, sensor models, networking stacks, and even basic console tooling are already there. Instead of maintaining our own libraries, we can switch features on and off with Kconfig and focus on the actual application."

— GLENN ANDREWS, FIRMWARE ENGINEER (AUGMENTED REALITY), META

Regional segmentation shows both shared and region-specific perceptions of Zephyr's value (Appendix 6). Overall, portability emerges as a common theme across all regions. In the United States and Canada, as well as in Europe, easier hardware portability is the most frequently reported impact, cited by just over

FIGURE 19

In your opinion, what are the biggest impacts of using Zephyr?

Zephyr Turns 10 Survey, Q32, Sample Size = 227, Total Mentions = 623

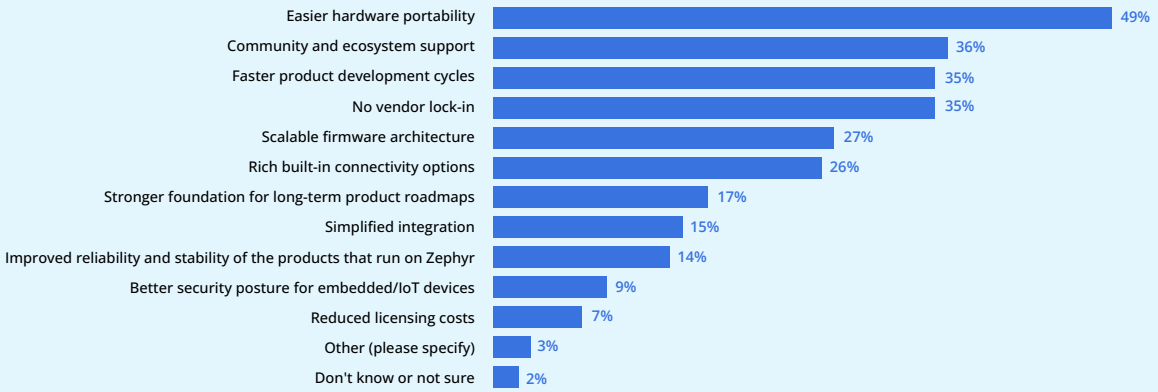
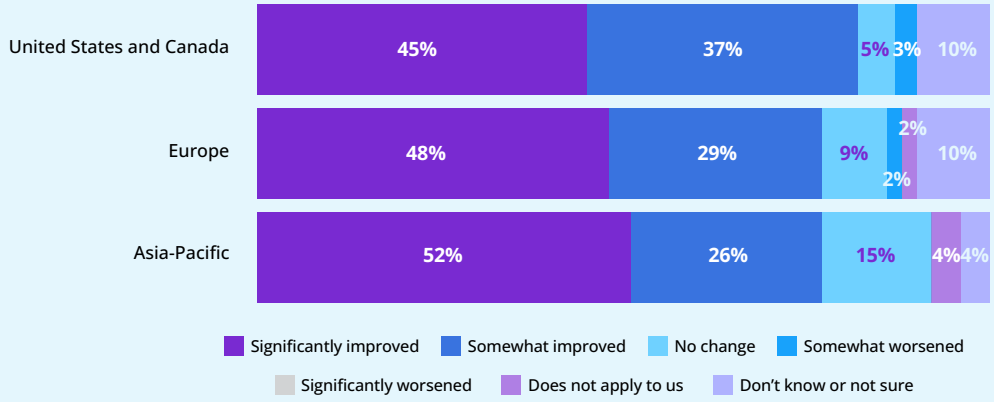


FIGURE 20

How has Zephyr impacted product/firmware development in your organization?

Zephyr Turns 10 Survey, Q33/Q6, Sample Size = 212



half of respondents in both regions. In Asia-Pacific, perceived benefits are more distributed: hardware portability, community and ecosystem support, and faster product development cycles are jointly cited as the top impacts.

Across regions, respondents consistently report positive impacts of Zephyr on product and firmware development (Figure 20). In the United States and Canada, Europe, and Asia-Pacific, at least three quarters of organizations indicate that Zephyr has either significantly or somewhat improved their development processes. Reports of no change or negative impact are comparatively rare, and only a small fraction of respondents indicate any worsening outcomes.

"Before moving to Zephyr, our wireless keyboards delivered around 200 hours of battery life at a 1k polling rate. With Zephyr-based firmware, using the same battery size, we now achieve more than 600 hours at an 8k polling rate. That is a fundamental improvement in power efficiency and performance at the same time."

— PAUL TAN, COO, KEYCHRON

Zephyr's road ahead: Readiness and challenges

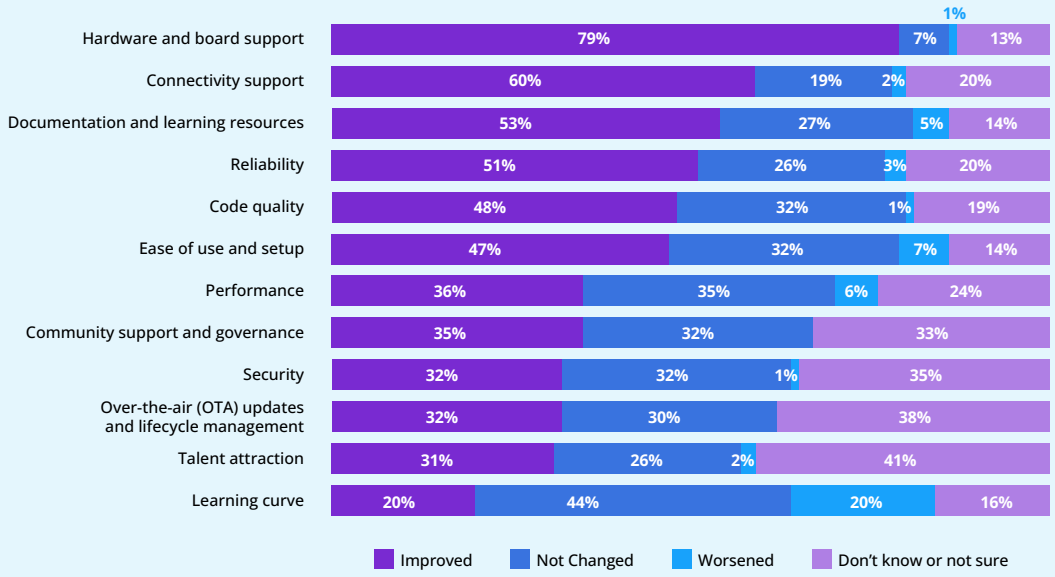
Figure 21 summarizes how respondents perceive changes in key characteristics of Zephyr since they began evaluating or using it. Overall, respondents reported improvement across a wide range of dimensions, particularly in core platform fundamentals such as hardware and board support (79%) and connectivity support (60%). Quality-related aspects, including documentation and learning resources (53%), reliability (51%), and code quality (48%), are also widely perceived as having improved, suggesting sustained maturation of the platform and its supporting ecosystem.

> "In 2018, Zephyr was not mature enough for industrial products that must run unsupervised for decades—documentation was limited and key drivers, like Bluetooth, were unstable. Today, the documentation is excellent, the stacks have matured, and I'm confident that Zephyr can meet the stability expectations of long-lifecycle industrial devices."
>
> — DOMINIK TACKE, PRINCIPAL KEY EXPERT, SIEMENS

FIGURE 21

How have the following characteristics of Zephyr changed since you started evaluating/using it?

Zephyr Turns 10 Survey, Q36, Sample Size = 215



At the same time, the results indicate areas where progress has been uneven. Notably, the learning curve stands out as an exception: a substantial share of respondents report that it has worsened, or has not improved, relative to other dimensions.

The perceived changes in Zephyr's characteristics shown in Figure 21 frame respondents' assessments of whether the project is evolving to meet future technology needs, shown in Figure 22. Across all regions, most respondents indicate positive expectations, selecting either "definitely yes" or "probably yes." This pattern is consistent in the United States and Canada and in Europe, where positive assessments account for more than four-fifths of responses. In Asia-Pacific, responses are more polarized, with a higher share selecting "definitely yes," alongside a larger neutral group.

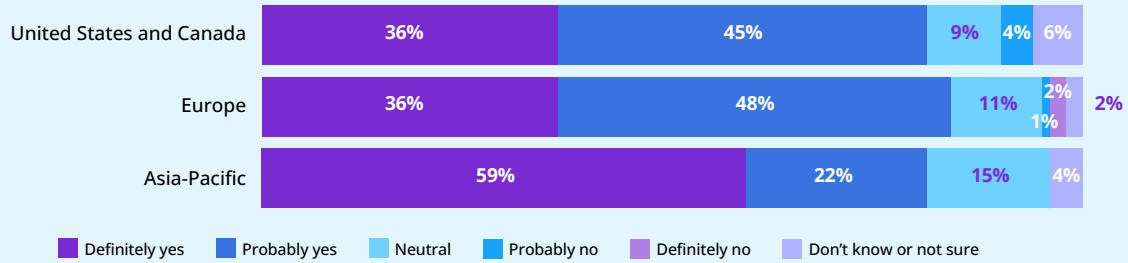
"I remembered Zephyr from its original announcement, but I only started using it seriously once it reached a clear maturity point. The growth in contributors, broader microcontroller support, and improvements in code quality made it competitive with long-standing RTOS options, while still offering a more modern software stack."

— JACOB BENINGO, CEO, BENINGO EMBEDDED GROUP

FIGURE 22

Do you think Zephyr is evolving to meet the future needs of the technology industry?

Zephyr Turns 10 Survey, Q38/Q6, Sample Size = 201



"Zephyr already offers most of what teams need, but there are still areas that would benefit from improvement, particularly around debugging support and the maturity of some specific areas, e.g., board support packages."[2]

— PHILIPP MIEDL, SENIOR SOFTWARE DEVELOPER, BANG & OLUFSEN

Challenges ahead

Organizations identify Zephyr's main risks over the next five years as challenges related to sustainability and adoption rather than core technical capability. As shown in Figure 23, maintenance and long-term support are the most frequently cited concern (49%), showing the importance of stable governance, predictable evolution, and sustained contributor capacity as Zephyr is used in products with long operational lifecycles. Safety certifications (40%) and onboarding and documentation (38%) follow closely. This suggests ongoing challenges around regulatory readiness and lowering barriers to entry for new adopters. In contrast, fewer respondents identify competition from other RTOSs (16%) or scaling to large device fleets (13%) as significant risks.

"For us, two improvements would be game-changers: the ability to target multiple similar devices with a single binary, and clearer device-tree error messages. When things go wrong today, they can produce thousands of lines of output, and only the first error actually matters."

— GLENN ANDREWS, FIRMWARE ENGINEER (AUGMENTED REALITY), META

"As Zephyr adoption grows, the ecosystem is becoming harder to scale. Supporting large numbers of SoCs and board-specific overlays increases complexity, even for basic testing. Improving scalability will be critical to maintaining long-term sustainability."

— HENRIK BRIX ANDERSEN, LEAD EMBEDDED SOFTWARE ENGINEER, VESTAS WIND SYSTEMS A/S

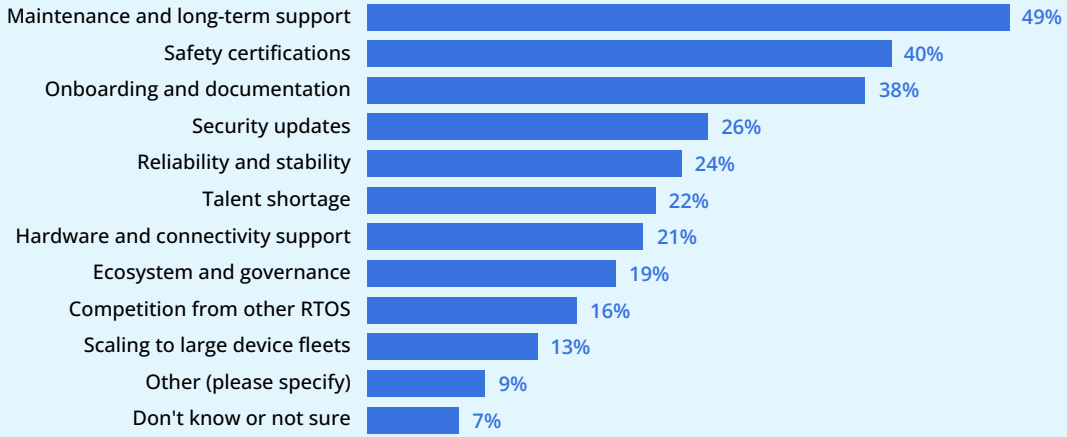
2 Interview with Philipp Miedl, whose views expressed are personal and not attributable to his organization. January 20, 2026.

Participants who marked Other (9%) mentioned regulatory pressures, build system integration and flexibility, and scalability concerns, including maintaining quality as contributions grow and the risk of future maintainer burnout. Other responses mentioned the risk of Zephyr becoming too bloated for small devices, ongoing concerns about code size, and broader external factors such as trade wars, sanctions, and de-globalization.

FIGURE 23

What are the biggest challenges facing Zephyr in the next five years?

Zephyr Turns 10 Survey, Q39, Sample Size = 215, Total Mentions = 610



A segmented analysis of perceived challenges by region (Appendix A7) shows broad alignment across regions on the most salient risks facing Zephyr, with maintenance and long-term support, onboarding and documentation, and safety certifications consistently ranking among the top concerns. Some regional variation is evident in emphasis: respondents in Asia-Pacific place comparatively greater weight on onboarding and documentation, while respondents in the United States and Canada more frequently identify competition from other RTOSs as a challenge. European respondents show a stronger focus on security updates relative to other regions.

Looking ahead, respondents articulate a clear set of priorities for Zephyr's continued evolution over the next decade. As shown in Figure 24, the most frequently expressed expectation is a richer ecosystem of libraries, middleware, and integrations (42%), closely followed by stronger long-term maintenance and LTS guarantees (40%) and improved onboarding, training, and documentation (39%).

> "There are still areas where Zephyr needs to improve for industrial use. Continuous sensor data acquisition, faster build times, and more accurate automatic SBOM generation would be real game changers. These capabilities are on the right path, but improving them would significantly strengthen Zephyr for industrial compliance and safety-critical environments."
>
> — DOMINIK TACKE, PRINCIPAL KEY EXPERT, SIEMENS

Alignment with industry standards and certifications (33%) and expanded safety certification support (31%) further shows the importance of regulatory readiness as adoption broadens. Zephyr's systematic focus on security best practices positions it well for emerging regulatory requirements, including the EU Cyber Resilience Act (CRA). The Linux Foundation's research on CRA compliance best practices highlights how open source projects such a Zephyr can effectively meet these evolving regulatory expectations through transparent development processes, security-by-design principles, and comprehensive documentation.

In contrast, relatively fewer respondents call for clearer governance or roadmap transparency (12%). Participants who marked Other (7%) expressed a desire for simpler and easier device tree access in code, better Rust support, improved performance (for example, in GPIO operations), better tooling to help maintainers keep a coherent code base, and smaller code size.

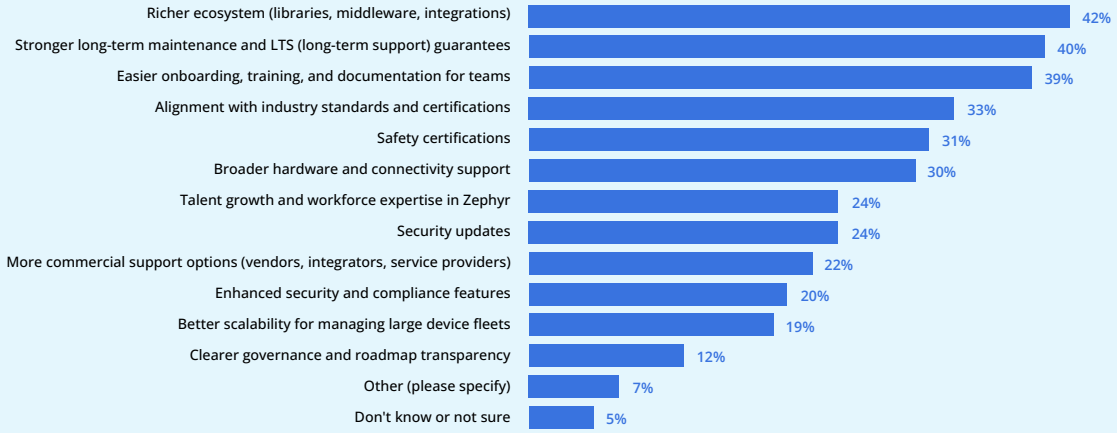
"As Zephyr grows, it's important not to lose sight of its real-time roots. Performance and memory footprint still matter deeply for microcontrollers. Expanding simulation and off-target development, along with continued focus on safety, security, and space-grade use cases, would make Zephyr even more compelling for high-reliability systems."

— JACOB BENINGO, CEO, BENINGO EMBEDDED GROUP

FIGURE 24

What do you hope to see from the Zephyr project in the next 10 years?

Zephyr Turns 10 Survey, Q40, Sample Size = 153, Total Mentions = 560



"Zephyr now has to serve both extremely constrained devices and increasingly complex systems that once ran Linux. Balancing performance, safety, security, and code size across that spectrum is the project's biggest challenge going forward."

— ANAS NASHIF, SENIOR PRINCIPAL ENGINEER, INTEL; ZEPHYR MAINTAINER, TSC CHAIR, AND BOARD MEMBER

Non-adopters and noncontributors: Barriers, not rejection

The primary reasons organizations are not using Zephyr are largely organizational and transitional rather than technical (Figure 25). The most common barrier is existing commitment to another RTOS or in-house solution (30%), followed by lack of awareness or familiarity with Zephyr (28%) and organizations still evaluating options (26%).

"Zephyr makes it easy for us to move from one chip maker to another because many vendors already support the project. When a new chip vendor approaches us, the first question we ask is whether they support Zephyr—if they do not, we are unlikely to use their chips."

— LOKHER GAN, FIRMWARE DEVELOPER, KEYCHRON

Workforce readiness also plays a role, with one in five respondents citing talent or expertise shortages (20%). In contrast, concerns typically associated with technical capability, such as security, scalability, safety certification, or reliability, are among the least cited reasons. Participants who marked Other (6%) reported preferring embedded Linux over Zephyr, noted that Zephyr did not exist when their project started, and cited build and development complexity, including reliance on non-standard tools. Other responses described Zephyr as overly complex for small systems, reflecting a perception that it was designed "from large systems going small," and pointed to complexity and self-compatibility issues, such as those related to device tree (DTS).

FIGURE 25

Why does your organization not use Zephyr?

Zephyr Turns 10 Survey, Q19, Sample Size = 112, Total Mentions = 194

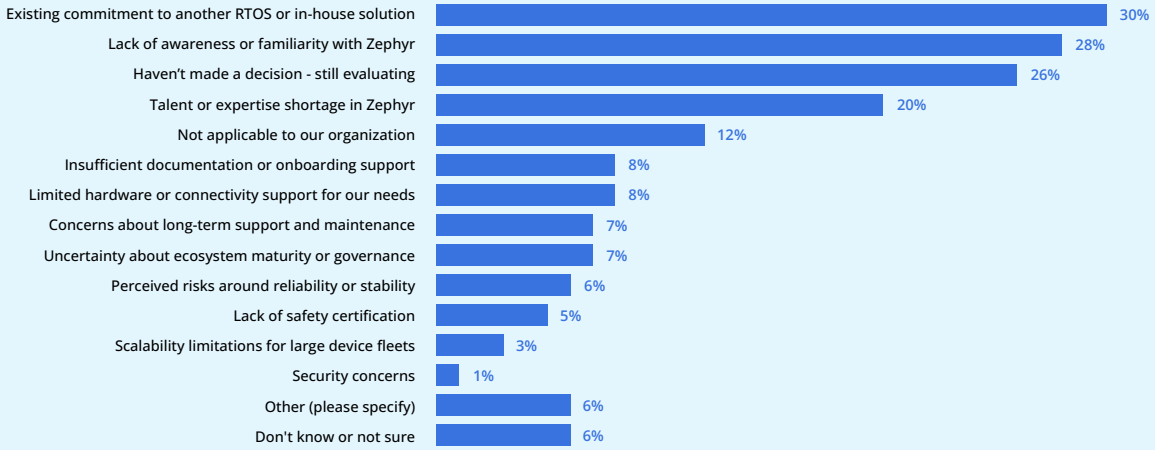
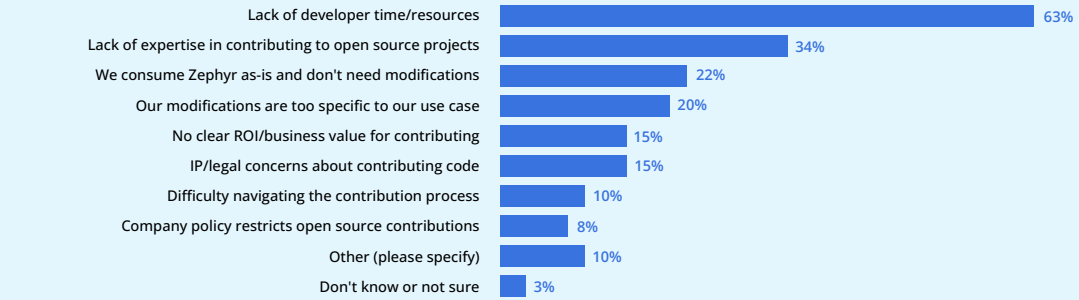


FIGURE 26

What are the main reasons why your organization does not contribute to Zephyr?

Zephyr Turns 10 Survey, Q31, Sample Size = 59, Total Mentions = 119



While Figure 25 shows that non-adoption is largely driven by switching costs, awareness, and readiness, Figure 26 indicates that similar structural factors also explain why some organizations use Zephyr without contributing back. The dominant barrier is capacity: nearly two-thirds of respondents (63%) cite lack of developer time or resources as the primary reason for not contributing. Skills and process also matter, as 34% reported insufficient expertise in open source contribution, and 10% point to difficulty navigating the contribution process. Importantly, non-contribution does not signal disengagement: 22% consume Zephyr largely as-is, and 20% report that their changes are too use-case-specific to upstream. Participants who selected Other (10%) indicated lack of management support or priority, including not wanting to allocate time and the need to convince managers. Others reported that contribution has not been necessary so far, either because they have not needed to modify Zephyr or have not yet encountered a need to contribute, though it may happen in the future. Additional responses noted that organizations are still at an early stage of using Zephyr, or that contributing feels technically intimidating or difficult.

Community, contribution, and sustainability

How the human side of Zephyr works today

Many organizations are actively building products on top of Zephyr. As shown in Figure 27, nearly one-third of respondents (31%) primarily use Zephyr as end users or developers without modifying the core, and a substantial share of the community contributes back: 20% report contributing occasionally, and 12% identify as core developers or maintainers. Smaller groups engage through evaluation, research, or non-code community participation.

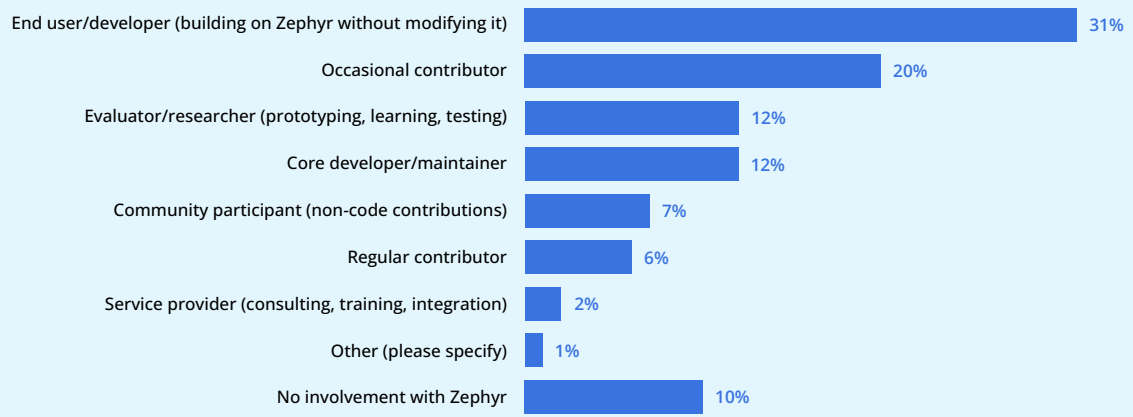
Contribution rates are highest among organizations headquartered in the United States and Canada, where 62% report actively contributing to the Zephyr project (see Appendix A8). Europe follows with a more balanced profile, with 45% contributing, indicating substantial engagement alongside a sizable user-only base. In contrast, organizations in the Asia-Pacific region are more likely to be consumers rather than contributors: only 32% report contributing, while half (50%) indicate they do not contribute and 18% of respondents do not know if their organizations are contributing back to the project.

Contribution to Zephyr is largely embedded in professional work rather than relying solely on unpaid effort. As shown in Figure 28, 70% of contributors receive some form of compensation for their Zephyr involvement: 25% contribute as a small part of their paid role, 22% do so during paid work time with explicit employer support, and another 23% are paid either full-time (16%) or part-time (7%) to work on Zephyr. At the same time, volunteer participation remains meaningful, with one in five contributors (20%) contributing on their own time.

FIGURE 27

What is your primary role in relation to Zephyr, if any?

Zephyr Turns 10 Survey, Q20, Sample Size = 397



> "Using Zephyr sends a strong signal to developers. As more engineers become familiar with it, organizations benefit from easier hiring and faster onboarding, especially compared to proprietary RTOS environments where newly hired engineers often have to start with zero system-specific knowledge. Over time, that reduces friction in building and sustaining embedded teams."[3]
>
> — PHILIPP MIEDL, SENIOR SOFTWARE DEVELOPER, BANG & OLUFSEN

3 Interview with Philipp Miedl, whose views expressed are personal and not attributable to his organization. January 20, 2026.

Building on how contributors engage with Zephyr, as shown in Figure 29, nearly half of contributors (46%) spend less than four hours per month on Zephyr, indicating that many contributions are made alongside other responsibilities rather than as a primary role. At the same time, a meaningful core of highly engaged contributors remains: 46% report contributing at least one hour per week, including 28% who dedicate five or more hours per week, from those 28%, 12% spend over 20 hours weekly on Zephyr.

"With Zephyr, the community actually responds. You can post a bug report at the end of your day, and when you wake up, someone in another time zone has already reviewed it or suggested a fix. That level of responsiveness and communication is rare, and it makes a real difference in day-to-day development."

— YASUSHI SHOJI, CO-FOUNDER AND CEO, SPACE CUBICS

Community interaction around Zephyr is concentrated in a small number of highly effective channels. As shown in Figure 30, GitHub is the primary hub for engagement, with 60% of respondents interacting through issues, pull requests, and discussions. Real-time communication also plays a major role, with nearly half of respondents (47%) using Zephyr's Discord channels to connect with other stakeholders. In-person events and conferences, such as project meetups (20%), ZDS (19%), and Embedded World (18%), also play a role. Importantly, when analyzing the satisfaction with Zephyr communication channel in a separate question that ranged from 1 to 10, respondents report strong satisfaction with

FIGURE 28

In what capacity do you contribute to Zephyr?

Zephyr Turns 10 Survey, Q44, Sample Size = 125

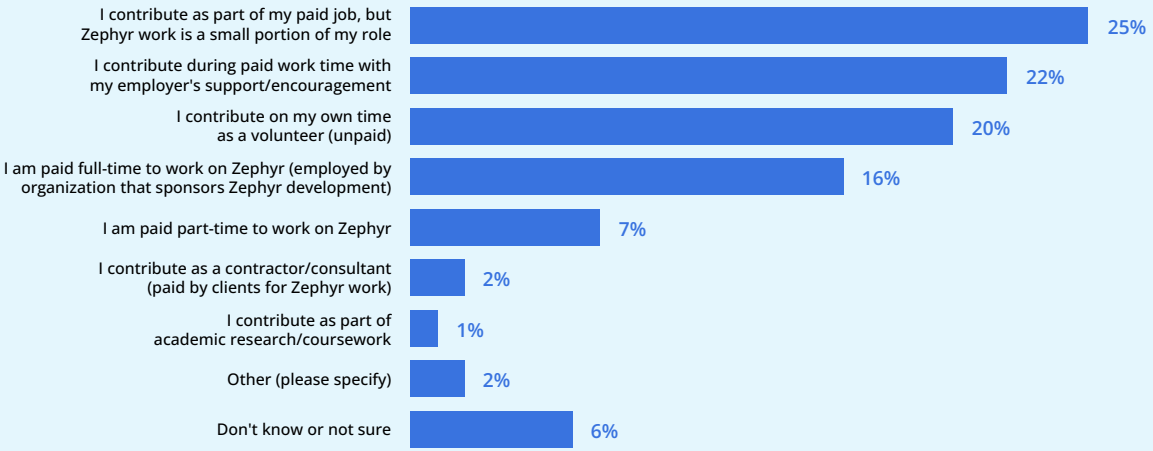


FIGURE 29

On average, how much time do you dedicate to contributing to Zephyr?

Zephyr Turns 10 Survey, Q45, Sample Size = 125

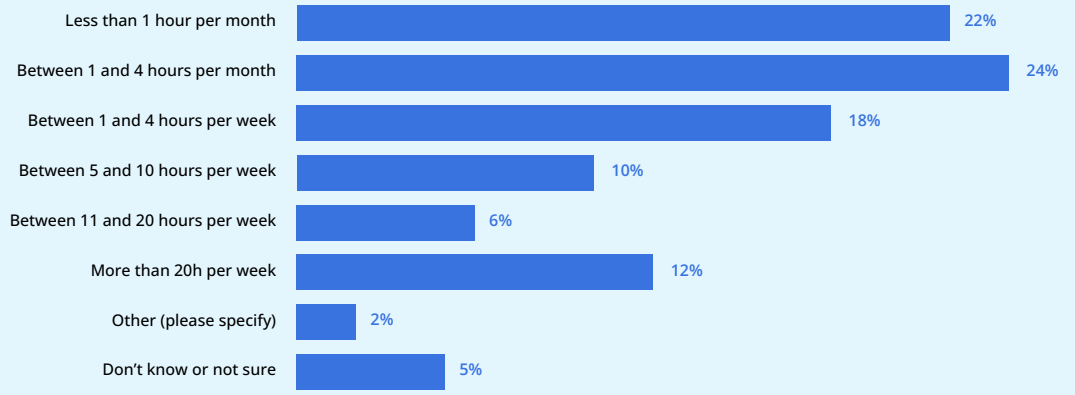


FIGURE 30

Which of the following is your main channel for interacting with other Zephyr stakeholders?

Zephyr Turns 10 Survey, Q41, Sample Size = 215, Total Mentions = 497

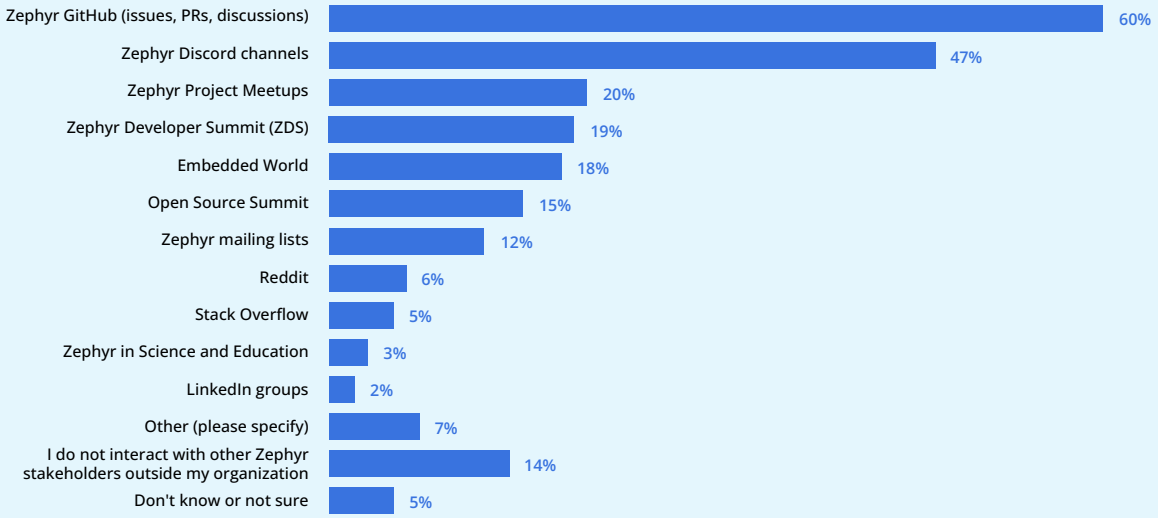
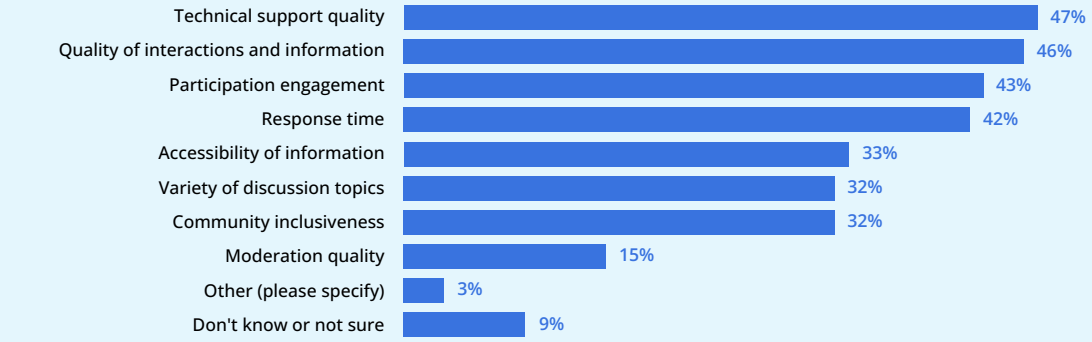


FIGURE 31

Preferred qualities of Zephyr's communication channels

Zephyr Turns 10 Survey, Q43, Sample Size = 126, Total Mentions = 399



their chosen interaction channels, reflected in a high average recommendation score of 8.24, suggesting that Zephyr's core communication spaces are not only widely used but also working well for the community. Participants who answered Other (7%) reported engaging through community conferences such as FOSDEM, working group meetings, and other webinars and industry events (for example, Elektor and Elektronikpraxis). Additional channels mentioned include vendor-specific communities such as Nordic Semiconductor DevZone, regional or language-specific messaging groups (e.g., WeChat groups).

Building on the strong use and high satisfaction of Zephyr's communication channels, Figure 31 shows that users primarily value the quality and effectiveness of community interactions. Nearly half of respondents selected technical support quality (47%) and the quality of interactions and information (46%) as key factors shaping their experience, closely followed by participation and engagement (43%) and response time (42%). Accessibility of information (33%), diversity of discussion topics (32%), and inclusiveness (32%) further reinforce the importance of an open, responsive, and welcoming community. In contrast, moderation quality ranks lower (15%).

Contributors also perceive clear progress in several contributor-facing aspects of the Zephyr project over time (Figure 32). A majority report improvements in overall community progress (54%), documentation on how to contribute (47%), and levels of active contribution and engagement (43%). Contributors' experience itself is also viewed as

FIGURE 32

How have the following characteristics of the Zephyr project changed over time?

Zephyr Turns 10 Survey, Q46, Sample Size = 125

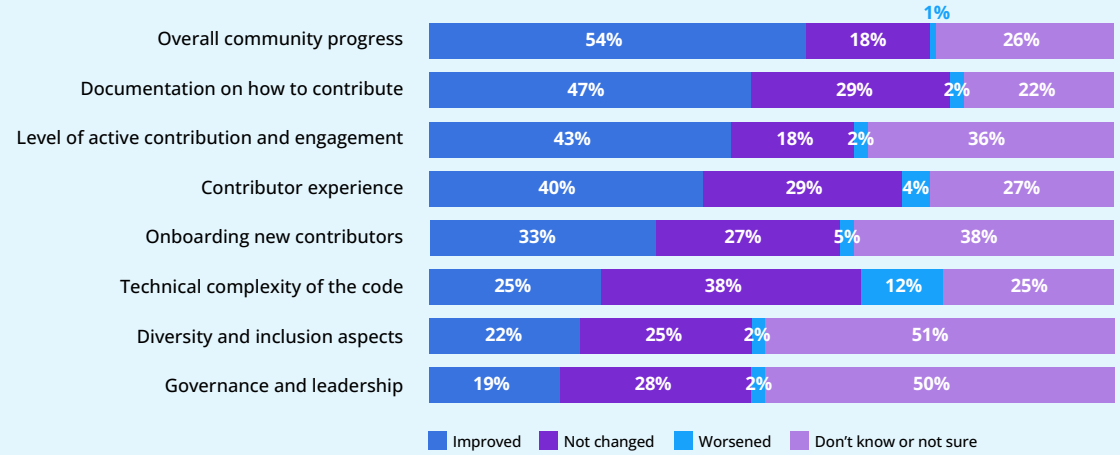
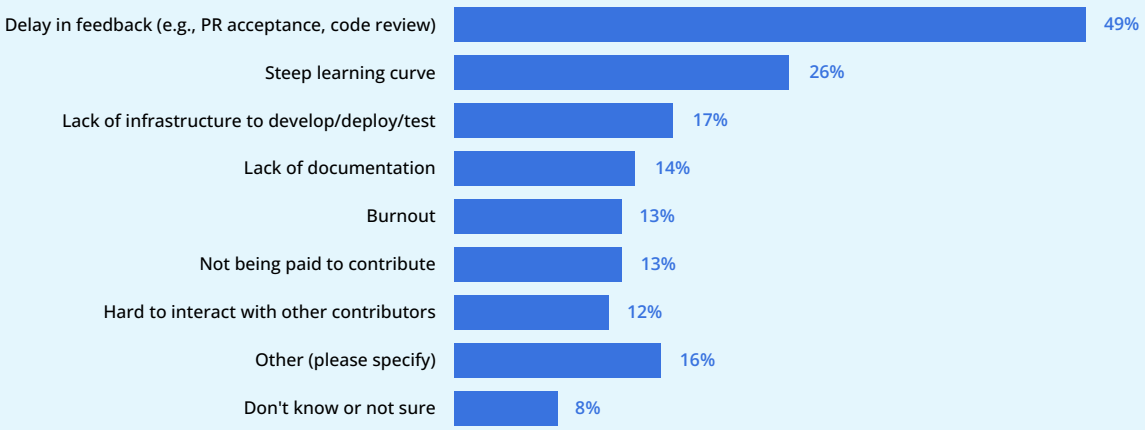


FIGURE 33

What are the most impactful challenges you face as a contributor?

Zephyr Turns 10 Survey, Q47, Sample Size = 125, Total Mentions = 209



improving by 40% of respondents, reinforcing the perception that participation has become smoother as the project has matured. At the same time, signals around onboarding new contributors and governance are more mixed, with sizable shares reporting no change or uncertainty, indicating that progress has been uneven across dimensions. Notably, technical complexity stands out as a growing concern: while many see stability, 12% report worsening complexity, pointing to maintainability challenges as the project grows.

While contributors generally perceive progress in how the project has evolved, Figure 33 shows where day-to-day contribution still feels most constrained. The most frequently cited challenge is delay in feedback, such as during PR reviews or acceptance, which affects nearly half of contributors (49%), making it a more prominent issue than burnout or motivation. A steep learning curve (26%) and limited infrastructure for development, testing, or deployment (17%) further shape the contribution experience, reinforcing earlier signals about growing technical complexity. In contrast, burnout is reported by a smaller share of respondents (13%), suggesting that contributors are more constrained by process and responsiveness than by personal exhaustion. Participants who answered Other (16%) pointed to time constraints, including limited time availability during or outside work hours. Others emphasized a steep learning curve in some areas of Zephyr, requiring months of effort to understand the system, and noted that while CI is strong, it is also perceived as complex and difficult to navigate.

The expectations contributors express for the coming years focus less on governance or status and more on making participation easier and more rewarding (Figure 34). Easier onboarding and better documentation are cited by 34% of respondents, matched by an equal share calling for stronger collaboration with companies that use Zephyr in production. Career-related signals are also clear: 31% selected career development pathways and employment opportunities linked to Zephyr involvement, while 30% point to mentorship and learning within the community.

Expectations from the Zephyr project vary meaningfully across regions, reflecting different stages of maturity and integration into local ecosystems (Appendix A9). Respondents in Asia-Pacific articulate the strongest demand for foundational support: 67% prioritize easier onboarding and better documentation, more than double the share reported in North America (31%) and Europe (29%). Requests for recognition and visibility also stand out in Asia-Pacific (40%), compared to 19% in North America and 12% in Europe.

The responses from Zephyr contributors reflect a measured, human-in-the-loop approach to GenAI use (see Figure 35). Contributors primarily use GenAI to improve efficiency and reduce cognitive load, rather than as a tool they rely on for correctness, assurance, or autonomous code generation. While 54% report that GenAI helps them write code faster and reduces cognitive effort, this efficiency gain is paired with sustained caution. A large majority (78%) indicate that they do not trust GenAI-generated code without heavy review,

FIGURE 34

To improve your contribution experience, what do you hope to see from the Zephyr project in the next 10 years?

Zephyr Turns 10 Survey, Q48, Sample Size = 125, Total Mentions = 260

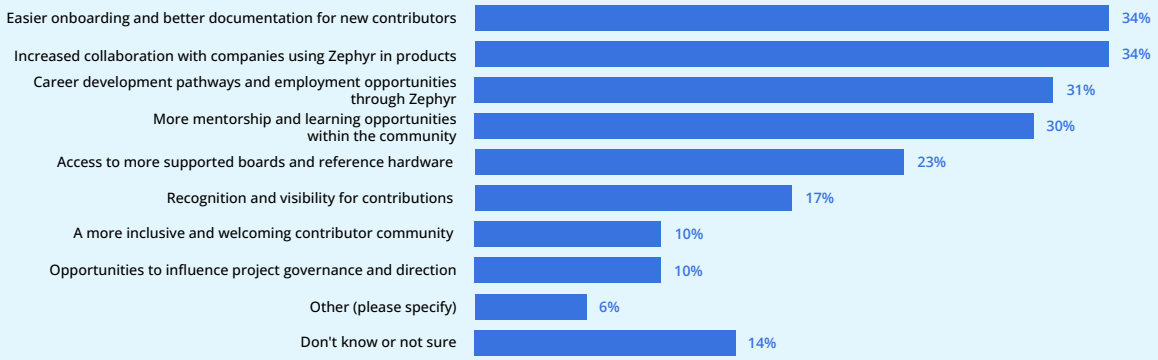


FIGURE 35

How do you perceive the use of Generative AI tools (e.g., GitHub Copilot, ChatGPT) for writing code?

Zephyr Turns 10 Survey, Q49, Sample Size = 125

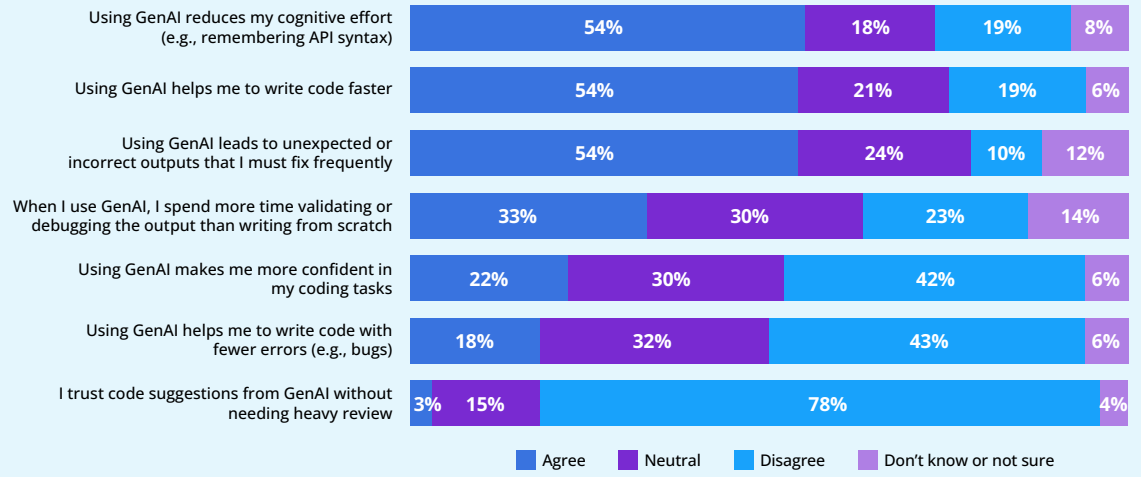
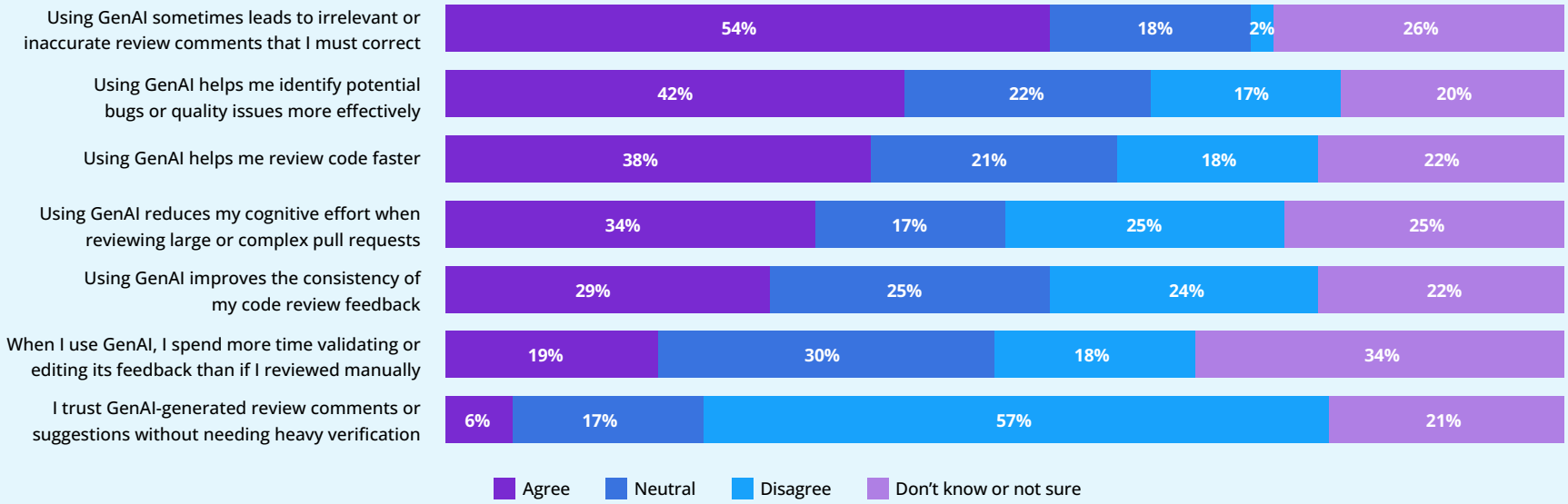


FIGURE 36

How do you perceive the use of Generative AI tools (e.g., GitHub Copilot, ChatGPT) for code review?

Zephyr Turns 10 Survey, Q50, Sample Size = 125



and 54% report frequently encountering unexpected or incorrect outputs that require manual correction. Confidence-related responses remain comparatively low: only 22% report feeling more confident when coding with GenAI, and just 18% believe it helps them write code with fewer errors.

Perceptions of GenAI in code review further reinforce a pattern of cautious adoption (Figure 36). Respondents acknowledge clear efficiency benefits: 38% report that GenAI helps them review code faster, 42% say it improves their ability to identify potential bugs or quality issues, and 34% report reduced cognitive effort when reviewing large or complex pull requests. At the same time, these gains are consistently offset by concerns about review quality and trust. A majority (54%) report that GenAI sometimes produces irrelevant or inaccurate review comments that require correction, and only 6% trust GenAI-generated review feedback without heavy verification. Perceptions of consistency and effort remain mixed, with respondents evenly split on whether GenAI improves review consistency or increases validation time.

Conclusion

The Zephyr Turns 10 survey results describe Zephyr as a project that grows into sustained, production-grade maturity. Zephyr is currently embedded in mature products, large-scale device fleets, and heterogeneous hardware environments. Adoption momentum remains strong, with nearly seven in ten organizations planning to increase their use of Zephyr and very few anticipating any contraction. This stability reflects confidence in Zephyr's technical capabilities and its role as a strategic foundation for embedded systems development.

> "Zephyr is one of the best examples I use to show what modern firmware development should look like. It enables faster prototyping, reduces duplicated effort, and provides an integrated set of building blocks that let teams focus on architecture and application logic instead of recreating infrastructure."
>
> — JACOB BENINGO, CEO, BENINGO EMBEDDED GROUP

At the same time, the findings make clear that long-term success cannot be taken for granted. As Zephyr enters its second decade, the most pressing challenges are found in sustainability, maintainability, onboarding, and contributor capacity.

Key recommendations include the following:

Treat long-term maintenance as a first-order concern.
Nearly half of respondents identified maintenance and long-term support as the biggest challenge facing Zephyr over the next five years. Sustaining adoption requires long-term support strategies, and sufficient maintainer capacity to manage growing code complexity without sacrificing stability.

Strengthen certification and regulatory readiness.
As Zephyr adoption expands into safety-critical and regulated domains, expectations around certification and compliance exist. Safety certifications are ranked among the top challenges and future priorities. Providing a transparent certification pathway and information about how Zephyr aligns with industry standards will be essential for enabling Zephyr's use in increasingly regulated environments.

Lower onboarding barriers to support ecosystem growth.
Despite broad improvements across many dimensions, the learning curve remains the most persistent weakness in Zephyr's evolution. Documentation, onboarding resources, and contributor guidance were cited as areas needing further investment to reduce the steep learning curve of newcomers.

Sustain community health by supporting contributors.
Zephyr's ecosystem benefits from a committed core of contributors, many of whom balance contribution alongside other professional responsibilities. Delays in feedback, process friction, and growing technical complexity are concerns among contributors. Investments in tooling, review capacity, and clearer contribution pathways can improve contributor experience and help retain critical expertise as the project scales further.

Methodology

About the survey

Linux Foundation Research and its partners conducted a web survey from October to December 2025 that provided the basis for this study. The survey's goal was to understand the Zephyr impact over the past decade, hear from RTOS users who have chosen Zephyr or other solutions, and hear from Zephyr users and contributors about how the project has made a difference in their products and work, and how they've seen the community evolve. In this section, we present the study methodology and context regarding how we analyzed the data, followed by the demographics of the respondents.

We sourced our usable sample from Linux Foundation subscribers, members, partner communities, and social media. We addressed data quality through extensive prescreening, survey screening questions, and data quality checks to ensure that respondents had sufficient professional experience to answer questions accurately on behalf of the organization they worked for.

We collected survey data from industry-specific companies; IT vendors and service providers; and nonprofit, academic, and government organizations. Respondents spanned many vertical industries and companies of all sizes, and we collected data from several geographies, including the Americas, Europe and Asia-Pacific.

The Zephyr Turns 10 survey comprised 53 questions organized into sections covering respondent demographics and organizational context, RTOS usage practices, and varying levels of engagement with the Zephyr project. The survey included questions for all respondents on their background, organizational characteristics, and RTOS use, as well as targeted sections for organizations not using Zephyr, respondents with experience or involvement in the Zephyr project, and organizations actively using Zephyr in products. Additional sections examined the impact of Zephyr on individuals, organizations, and the broader industry; perceptions of how Zephyr is evolving; community events and communication channels; and contributor-specific experiences within the Zephyr project. Optional closing questions captured broader reflections from remaining respondents. Information about access to the 2025 Zephyr Survey, its dataset, and survey frequencies is provided in the data access section below.

Survey screening involved being familiar with RTOS.

FIGURE 37

Survey Design

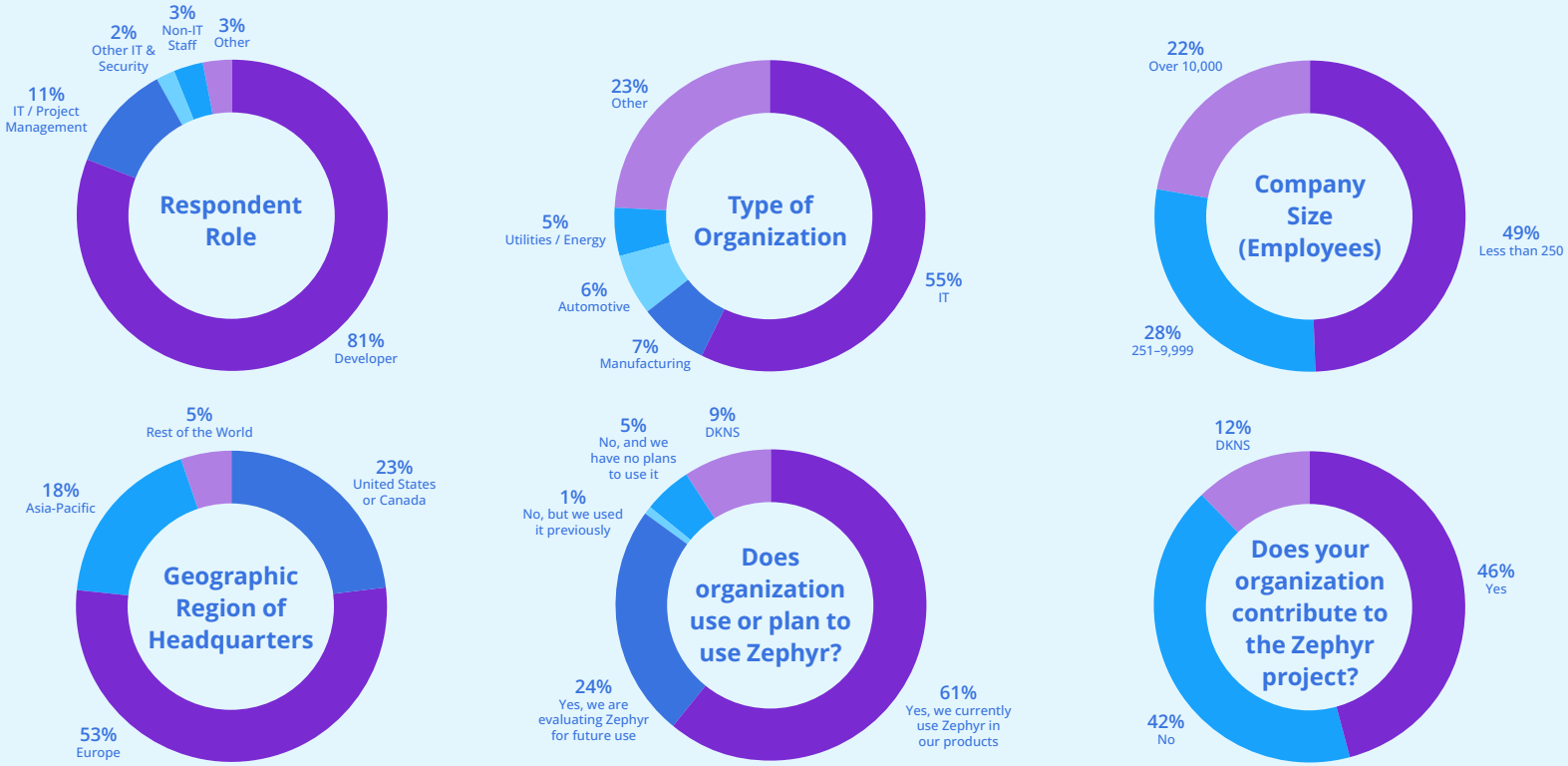
PAGES	QUESTION	QUESTION CATEGORIES	WHO ANSWERS THE QUESTIONS
P1		Introduction	All respondents
P2 – P3	Q1 – Q5	Tell us about yourself	All respondents (N=313)
P4	Q6 – Q8	Tell us about your organization	All respondents (N=313)
P5	Q9 – Q17	Tell us about the RTOS use in your organization	All respondents (N=313)
P6	Q18 – Q19	Organizations not using Zephyr	Respondents whose organization is not using Zephyr (N=98)
P7	Q20	Tell us about your relation to Zephyr	All respondents (N=313)
P8	Q21 – Q23	Tell us about your experience with Zephyr	Respondents with some involvement with Zephyr (N=268)
P9	Q24 – Q31	Tell us about your organization's experience with Zephyr	Respondents whose organization is using Zephyr (N=185)
P10	Q32 – Q35	The impact Zephyr had on you, your organization, and the industry	Respondents whose organization is using Zephyr (N=185)
P11	Q36 – Q41	The perceptions about how Zephyr is evolving	Respondents whose organization is using Zephyr (N=185)
P12	Q42 – Q43	Tell us about the community events and communication channels	Respondents who interact with Zephyr stakeholders (N=127)
P13	Q44 – Q50	Tell us about the Zephyr project as a contributor	Respondents who are Zephyr contributors (N=115)
P14	Q51 – Q53	Optional closing questions	All remaining respondents

Demographics

Figure 38 presents the demographic profile of survey respondents. Most respondents are developers (81%), representing a range of organization types, with a majority working in IT organizations (55%), alongside manufacturing (7%), automotive (6%), utilities and energy (5%), and other sectors (23%). Organizations of all sizes are represented: 49% of respondents work at organizations with fewer than 250 employees, 28% at mid-sized organizations (251-9,999 employees), and 22% at large enterprises with more than 10,000 employees. Geographically, most respondents are based in Europe (53%) and the United States or Canada (23%), followed by Asia-Pacific (18%) and the rest of the world (5%). Regarding adoption, 61% report that their organization currently uses Zephyr in products, 24% are evaluating Zephyr for future use, 1% previously used Zephyr, and 5% report no current or planned use. Finally, 46% indicate that their organization contributes to the Zephyr project, 42% do not contribute, and 12% report that they are unsure.

FIGURE 38

Respondent demographics



Some demographics have been regrouped to facilitate a more insightful analysis. For the original source data and study frequencies, please see the data.world dataset and access as described above.

Survey data access

Linux Foundation Research makes each of its empirical project datasets available on Data.World. Included in this dataset are the survey instrument, raw survey data, screening and filtering criteria, and frequency charts for each question in the survey. Linux Foundation Research datasets, including this project, are available at data.world/thelinuxfoundation. Access to Linux Foundation datasets is free but does require you to create a Data.World account.

Interviews

To complement the quantitative findings, we conducted nine semi-structured interviews with experts from diverse sectors and countries globally. The interview sample comprised volunteer respondents from media, consumer electronics, industrial, space, and technology sectors with headquarters in Asia, Europe, and North America. The interviews were conducted digitally via videoconference between December 2025 and February 2026.

About the authors

BIANCA TRINKENREICH is an assistant professor of Computer Science at Colorado State University and a research analyst at LF Research. Her research on software engineering and open source software has resulted in several awards in top-tier venues. She serves on the program committees of renowned conferences and as both a reviewer and editor for several journals. Dr. Trinkenreich has a Ph.D., a master's in informatics, and a BS in computer science. She also has more than 20 years of IT industry experience. For more information, visit http://biancatrink.github.io.

ADRIENN LAWSON serves as Director of Quantitative Research at The Linux Foundation, where she leads data-driven initiatives to understand open source ecosystems. With expertise in social data science from the University of Oxford and a background spanning academic and governmental research, she brings methodological rigor to analyzing distributed collaboration networks. At the Linux Foundation, Adrienn leads a team conducting cross-sectional research across industry verticals and geographic regions to provide comprehensive insights into open source dynamics. Her work encompasses empirical investigations into regulatory compliance, the implications of AI, and sustainable funding models. She produces evidence-based recommendations that inform strategic decision-making within the open source community.

HILARY CARTER joined the Linux Foundation in 2021 to launch and lead LF Research, established to deliver empirical insights into open source trends, opportunities, and challenges. Prior to joining the Linux Foundation, Hilary was the managing director of the Toronto-based Blockchain Research Institute, a global, syndicated think tank focused on blockchain technology. She has contributed to nearly 200 research projects focused on open source innovation and its adoption across industries. Hilary received a Master of Science in Management from the London School of Economics, and holds dual Canadian and Irish citizenship.

Acknowledgments

The authors wish to thank all the people who participated in the survey. Special thanks to people who played a significant role in the research project's development: Benjamin Cabé, Yan Li Dufour, Anna Hermansen, Zhaoxiang Jin, Jessica Marz, Anas Nashif, Kate Stewart.

We extend our gratitude to all participants who generously shared their insights and experiences through qualitative interviews. Their perspectives were invaluable to this research.

Special thanks to sponsors Intel and the Zephyr Project, and to the following project communities for helping to distribute this study's survey:

Dronecode LF EDGE LF ENERGY

Appendix

Appendix A1

What is your organization's typical approach to RTOS selection? (select one) by In what country or region does your organization have its headquarters? (select one)

Zephyr Turns 10 Survey, Q9/Q6, Sample Size = 390, Mexico, Central America, the Caribbean, and South America, and Africa excluded from analysis due to low number of responses

	UNITED STATES & CANADA	EUROPE	ASIA-PACIFIC
Standardize on a single RTOS across all projects	21%	38%	15%
Use 2–3 preferred RTOS options depending on project needs	35%	27%	29%
Evaluate and select RTOS on a per-project basis	21%	18%	28%
Inherit RTOS choice from hardware vendor/ reference designs	6%	6%	14%
Use whatever the team is most familiar with	7%	4%	14%
Don't know or not sure	10%	6%	0%

Appendix A2

What is your organization's typical approach to RTOS selection? (select one) by In what country or region does your organization have its headquarters? (select one)

Zephyr Turns 10 Survey, Q9/Q7, Sample Size = 405

	LESS THAN 250 EMPLOYEES	250-9,999 EMPLOYEES	OVER 10,000 EMPLOYEES
Standardize on a single RTOS across all projects	35%	30%	16%
Use 2–3 preferred RTOS options depending on project needs	25%	28%	40%
Evaluate and select RTOS on a per-project basis	18%	25%	22%
Inherit RTOS choice from hardware vendor/ reference designs	12%	5%	3%
Use whatever the team is most familiar with	6%	7%	6%
Don't know or not sure	4%	6%	13%

Appendix A3

What are the most important factors when selecting an RTOS? (select up to three responses) by In what country or region does your organization have its headquarters? (select one)

Zephyr Turns 10 Survey, Q15/Q6, Sample Size = 390, Total Mentions = 1,060, Mexico, Central America, the Caribbean, and South America, and Africa excluded from analysis due to low number of responses

	UNITED STATES & CANADA	EUROPE	ASIA-PACIFIC
Ecosystem maturity (libraries, tools, community)	42%	47%	54%
Technical performance (real-time capabilities, footprint)	47%	35%	50%
Hardware platform support	38%	44%	35%
Open source vs. proprietary	30%	25%	24%
Cost (licensing, support fees)	25%	21%	38%
Long-term viability and roadmap	23%	17%	8%
Communication/connectivity protocol support	12%	20%	7%
Safety certifications	9%	12%	10%
Security updates	8%	14%	4%
Documentation quality	8%	12%	4%
Vendor support and services	14%	6%	8%
Team expertise and familiarity	3%	10%	13%
Ease of migration from existing system	5%	3%	6%
Other (please specify)	1%	1%	3%
Don't know or not sure	6%	6%	1%

Appendix A4

In which types of hardware does your organization run or embed Zephyr on? (select all that apply) by In what country or region does your organization have its headquarters? (select one)

Zephyr Turns 10 Survey, Q25/Q6, Sample Size = 215, Total Mentions = 673, Mexico, Central America, the Caribbean, and South America, and Africa excluded from analysis due to low number of responses

	UNITED STATES & CANADA	EUROPE	ASIA-PACIFIC
Consumer IoT devices (smart home, appliances, connected products)	31%	44%	46%
Sensors and monitoring equipment	28%	46%	25%
Industrial automation and control systems	34%	39%	21%
Wearable devices (smartwatches, fitness trackers, health monitors)	25%	30%	39%
Computing devices (edge AI, gateways, embedded computers)	51%	13%	32%
Medical and healthcare devices	18%	32%	14%
Prototypes/development hardware only	23%	25%	21%
Energy systems (smart meters, grid equipment, power management)	18%	25%	18%
Robotics and autonomous systems	18%	14%	18%
Automotive systems and components	16%	15%	7%
Networking and telecommunications equipment	8%	19%	7%
Transportation (aerospace, drones, marine, rail)	11%	15%	14%
Other (please specify)	13%	4%	4%
Does not apply to us	2%	2%	0%
Don't know or not sure	5%	5%	0%

Appendix A5

What types of hardware platforms does your organization use with Zephyr? (select all that apply) by In what country or region does your organization have its headquarters? (select one)

Zephyr Turns 10 Survey, Q28/Q6, Sample Size = 215, Total Mentions = 400, Mexico, Central America, the Caribbean, and South America, and Africa excluded from analysis due to low number of responses

	UNITED STATES & CANADA	EUROPE	ASIA-PACIFIC
ARM Cortex-M series	77%	94%	86%
RISC-V	43%	24%	50%
Xtensa (ESP32, etc.)	26%	14%	25%
ARM Cortex-A series	20%	17%	18%
ARM Cortex-R series	13%	9%	11%
Intel x86/x64	13%	2%	4%
ARC processors	18%	0%	0%
Renesas RX	3%	2%	0%
Other (please specify)	0%	6%	4%
Don't know or not sure	3%	2%	0%

Appendix A6

In your opinion, what are the biggest impacts of using Zephyr? (select up to three responses) by In what country or region does your organization have its headquarters? (select one)

Zephyr Turns 10 Survey, Q32/Q6, Sample Size = 212, Total Mentions = 585, Mexico, Central America, the Caribbean, and South America, and Africa excluded from analysis due to low number of responses

	UNITED STATES & CANADA	EUROPE	ASIA-PACIFIC
Easier hardware portability	52%	52%	37%
Community and ecosystem support	42%	34%	37%
Faster product development cycles	38%	32%	37%
No vendor lock-in	30%	39%	19%
Scalable firmware architecture	30%	23%	33%
Rich built-in connectivity options	18%	33%	11%
Stronger foundation for long-term product roadmaps	22%	17%	15%
Simplified integration	12%	17%	15%
Improved reliability and stability of the products that run on Zephyr	17%	12%	19%
Better security posture for embedded/IoT devices	8%	8%	1%
Reduced licensing costs	10%	4%	19%
Other (please specify)	3%	3%	0%
Don't know or not sure	0%	3%	4%

Appendix A7

What are the biggest challenges facing Zephyr in the next five years? (select all that apply) by In what country or region does your organization have its headquarters? (select one)

Zephyr Turns 10 Survey, Q39/Q6, Sample Size = 201, Total Mentions = 566

	UNITED STATES & CANADA	EUROPE	ASIA-PACIFIC
Maintenance and long-term support	45%	50%	44%
Onboarding and documentation	36%	38%	52%
Safety certifications	34%	41%	41%
Reliability and stability	21%	26%	26%
Security updates	15%	32%	4%
Talent shortage	25%	21%	22%
Hardware and connectivity support	25%	19%	19%
Ecosystem and governance	17%	21%	19%
Competition from other RTOS	36%	7%	19%
Scaling to large device fleets	8%	13%	11%
Other (please specify)	13%	8%	7%
Don't know or not sure	8%	9%	4%

Appendix A8

Does your organization contribute to the Zephyr project? (select one) by In what country or region does your organization have its headquarters? (select one

Zephyr Turns 10 Survey, Q17/Q6, Sample Size = 390

	UNITED STATES & CANADA	EUROPE	ASIA-PACIFIC
Yes	62%	45%	32%
No	27%	47%	50%
Don't know or not sure	11%	9%	18%

Appendix A9

To improve your contribution experience, what do you hope to see from the Zephyr project in the next 10 years? (select all that apply) by In what country or region does your organization have its headquarters? (select one)

Zephyr Turns 10 Survey, Q48/Q6, Sample Size = 116, Total Mentions = 240

	UNITED STATES & CANADA	EUROPE	ASIA-PACIFIC
Easier onboarding and better documentation for new contributors	31%	29%	67%
Increased collaboration with companies using Zephyr in products	34%	33%	33%
Career development pathways and employment opportunities through Zephyr involvement	38%	28%	33%
More mentorship and learning opportunities within the community	34%	26%	33%
Access to more supported boards and reference hardware	28%	19%	20%
Recognition and visibility for contributions	19%	12%	40%
A more inclusive and welcoming contributor community	19%	9%	7%
Opportunities to influence project governance and direction	6%	13%	0%
Other (please specify)	6%	6%	0%
Don't know or not sure	13%	16%	7%

github.com/zephyrproject-rtos/zephyr

linkedin.com/company/the-zephyr-project

youtube.com/c/ZephyrProject

facebook.com/ZephyrIoT

https://x.com/ZephyrIoT

March 2026

To reference this work, please cite as follows: Bianca Trinkenreich, Adrienn Lawson, and Hilary Carter, "Zephyr Turns 10: A Decade of Adoption, Maturity, and Ecosystem Evolution" foreword by Kate Stewart and Jessica Marz, The Linux Foundation, March 2026.

Zephyr®

The Zephyr® Project is an open source, scalable real-time operating system (RTOS) supporting multiple hardware architectures, including more than 900 boards running embedded microcontrollers from Arm and RISC-V to Tensilica, Renesas RX, ARC and x86 as single and multicore systems. Zephyr RTOS delivers a growing set of software libraries that can be used across various applications and industry sectors such as Industrial IoT, wearables, machine learning and more. It is built with an emphasis on broad chipset support, security, dependability, long-term support releases and an extensive open source ecosystem. To learn more, visit www.zephyrproject.org.

intel.

Intel (Nasdaq: INTC) is an industry leader, creating world-changing technology that enables global progress and enriches lives. Inspired by Moore's Law, we continuously work to advance the design and manufacturing of semiconductors to help address our customers' greatest challenges. By embedding intelligence in the cloud, network, edge and every kind of computing device, we unleash the potential of data to transform business and society for the better. To learn more about Intel's innovations, go to newsroom.intel.com and intel.com.

THE LINUX FOUNDATION | Research

Founded in 2021, Linux Foundation Research explores the growing scale of open source collaboration, providing insight into emerging technology trends, best practices, and the global impact of open source projects. By leveraging project databases and networks and committing to best practices in quantitative and qualitative methodologies, Linux Foundation Research is creating the go-to library for open source insights for the benefit of organizations worldwide.