cilium

hubble

tetragon

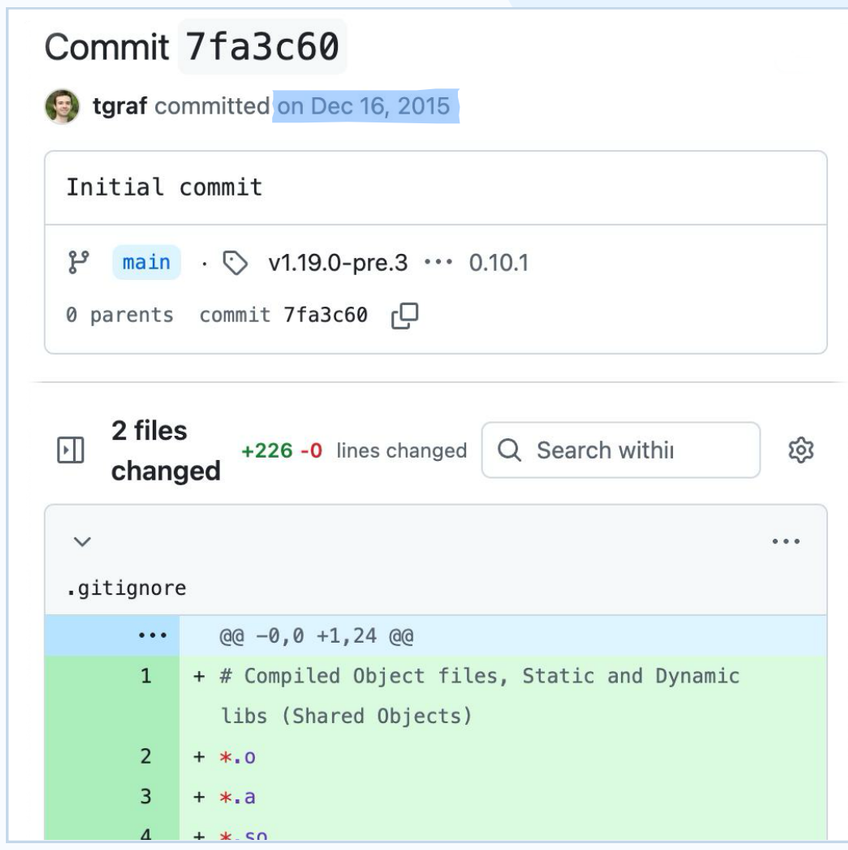
2025

# Annual Report

## A Decade of Cloud Native Networking

# ABOUT THIS REPORT

On December 16, 2015, Thomas Graf pushed the first commit for Cilium. Ten years later, what began as a bold idea is now the industry standard.




Reflecting on the last decade, Cilium has evolved from an experimental, IPv6-only container networking project into the de facto CNI for the cloud native world. It is still one of the fastest moving projects in the Cloud Native Computing Foundation, and is now the second largest CNCF project in terms of contributions, behind only Kubernetes.

According to the recent State of Kubernetes Networking report, Cilium represents over 60% of CNI deployments, more than double the next alternative. It has been adopted by all of the major cloud providers, and many other clouds and Kubernetes distributions, driven by customer demand,  are investing heavily in Cilium as their CNI of choice.

And even after a decade, the project isn't showing any signs of slowing down.  Annual development activity has grown 55x since year one, with nearly 10,000 PRs contributed in 2025 alone.

Looking ahead to the next decade, Cilium is already established as the networking data plane for AI. Tech giants, like Microsoft and Google, are currently using Cilium to run some of the largest AI training clusters in the world. Simultaneously, Tetragon is positioned to redefine the runtime security landscape.

A decade in, we are also seeing widespread adoption of Cilium's original vision, IPv6-only workloads, at major organizations like ESnet and TikTok. Finally, Cilium is unifying the infrastructure stack by extending networking support to Virtual Machines (VMs) enabling organizations to run consistent networking across these environments.

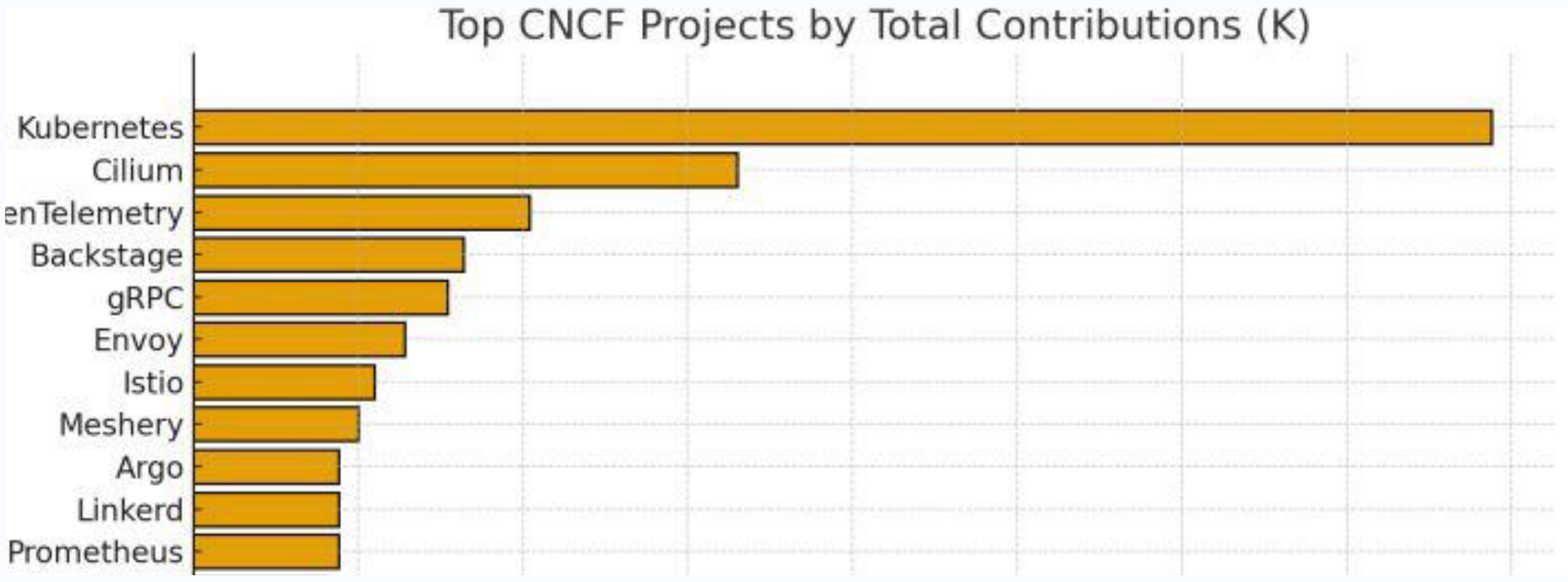
The purpose of this report is to celebrate the Cilium project's achievements of 2025, share key milestones, events, and feedback from our incredible community, and celebrate a decade of solving cloud native networking while looking forward to the next. The data included in this report is taken from the Cilium User Survey, the project's public dashboard, GitHub organization, Slack, blog, and social media. If you have any comments or feedback about this report, please reach out to the project at contribute@cilium.io.

# PROJECT SNAPSHOT

## Contributors

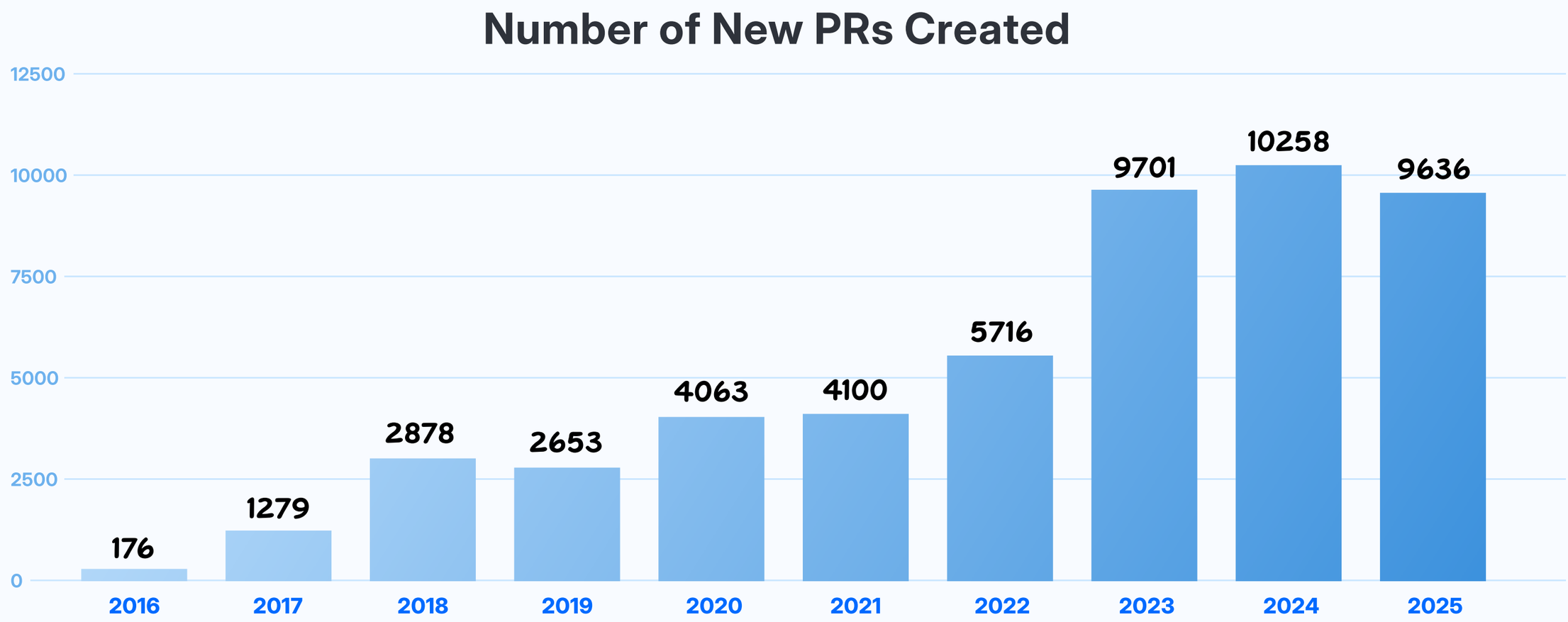
Despite becoming a mature and stable standard for cloud native networking, Cilium is still showing impressive growth. The project has evolved into a global ecosystem, now ranking as the **second largest CNCF project** in terms of contributions, trailing only Kubernetes itself.

- **Total Contributions**: 546,000+ (up 142% since joining CNCF)
- **Total Contributors**: 5,800+ individuals (up 359% since joining CNCF)
- **Global Reach**: Contributors span 82 countries
- **Total PRs Opened**: 50,000+ across all repositories



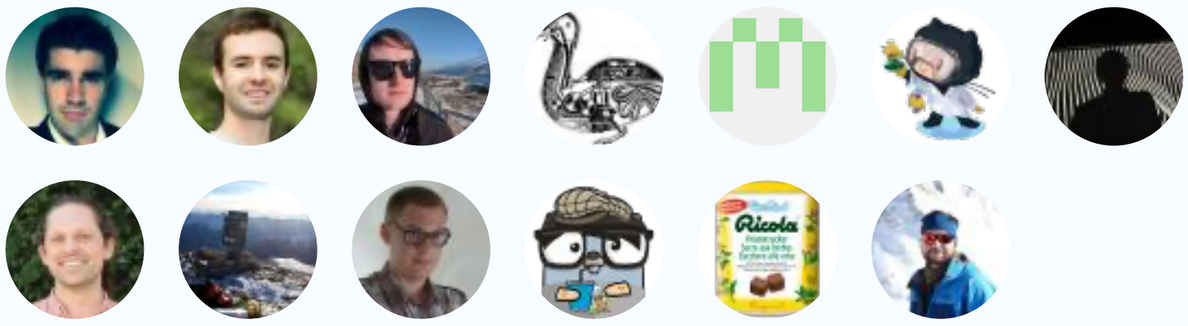

From Torsten Volk on LinkedIn ↗

Since the project was created, the number of new PRs created in all repositories has increased by 284x, surpassing 50,000 total. For the past three years, Cilium's contribution patterns have remained relatively stable at around 10,000 PRs created annually, reflecting its status as a mature open source project with sustained high-volume development and predictable release cadences.



**Milestone**: In October 2025, the project surpassed **1,000** individual contributors to the main Cilium repository.

## Contributors 1,012



+ 1001 contributors

### cilium

Top **10 contributors** to **Cilium** in 2025:

1. Julian Wiedmann
2. Jussi Mäki
3. Marco Iorio
4. André Martins
5. Marco Hofstetter
6. Tobias Klauser
7. Simone Magnani
8. Joe Stringer
9. Tam Mach
10. Paul Chaignon

### tetragon

Top **10 contributors** to Tetragon:

1. Jiri Olsa
2. Mahé Tardy
3. Kornilios Kourtis
4. Anadi Sharma
5. Federico Di Pierro
6. Kevin Sheldrake
7. Anastasios Papagiannis
8. Michi Mutsuzaki
9. Tam Mach
10. T0x01

*A special thanks to these individuals for all the hard work and innovation they have put into the project.*

## Committers

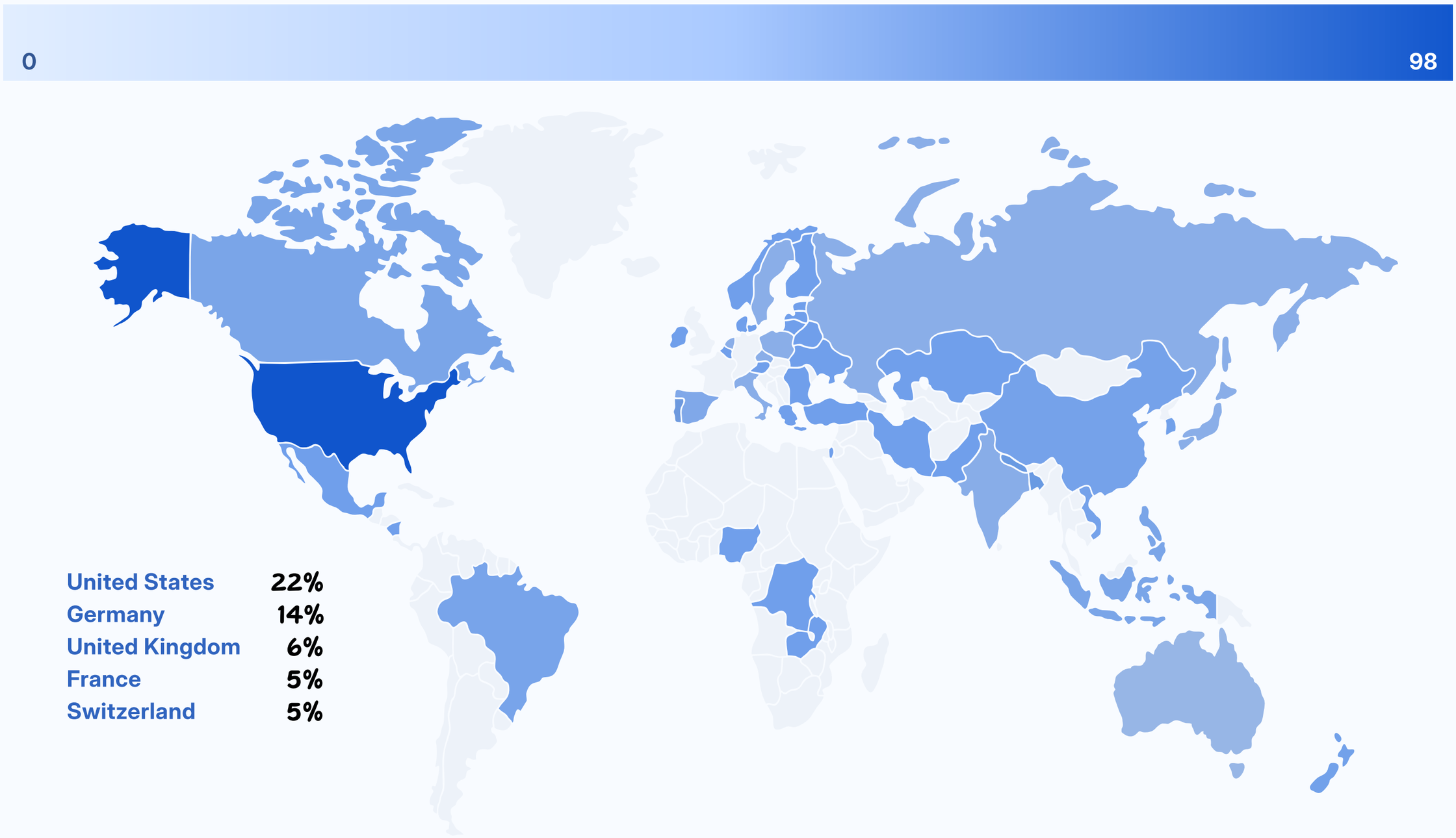
We would also like to thank all of the hard working committers for the time and effort they consistently put into the project. Cilium committers represent a diverse range of industry leaders:

- AMD
- Datadog
- Google
- Hedgehog
- Isovalent at Cisco
- Ledger
- Microsoft
- Palantir

## Users

The number of public users has increased from 153 to 172! Additionally, Cilium public case studies have seen growth, rising from 82 to 90 this year.

# GEOGRAPHIC LOCATION OF CONTRIBUTORS

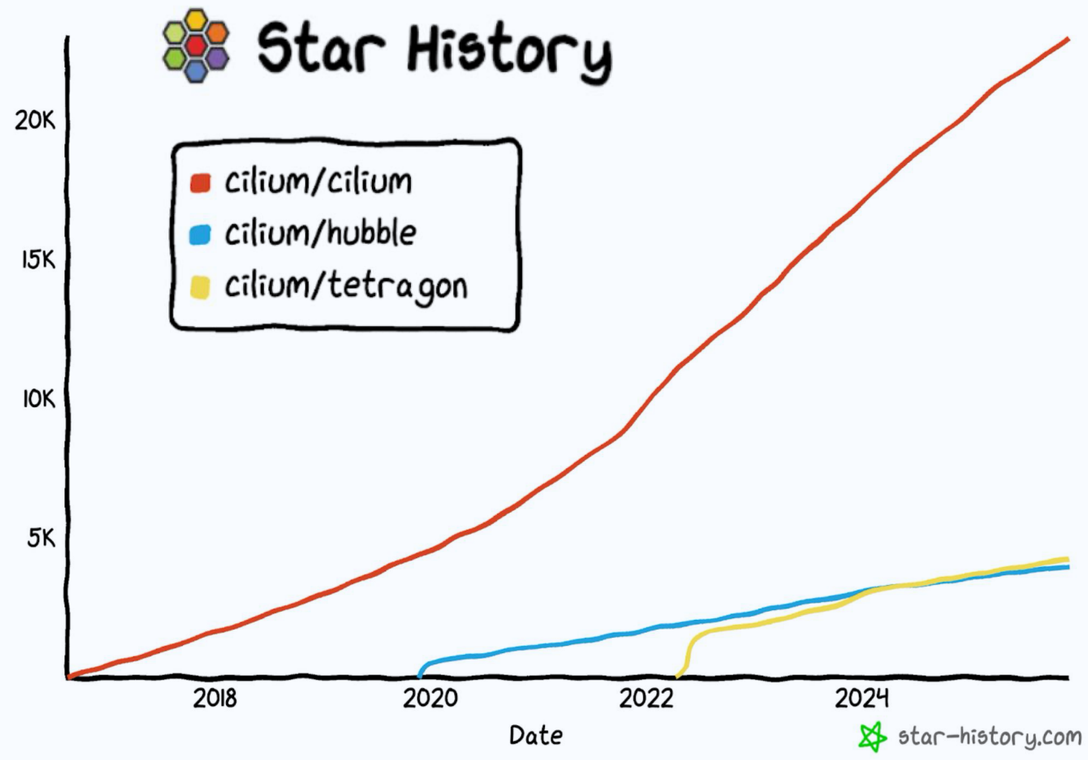


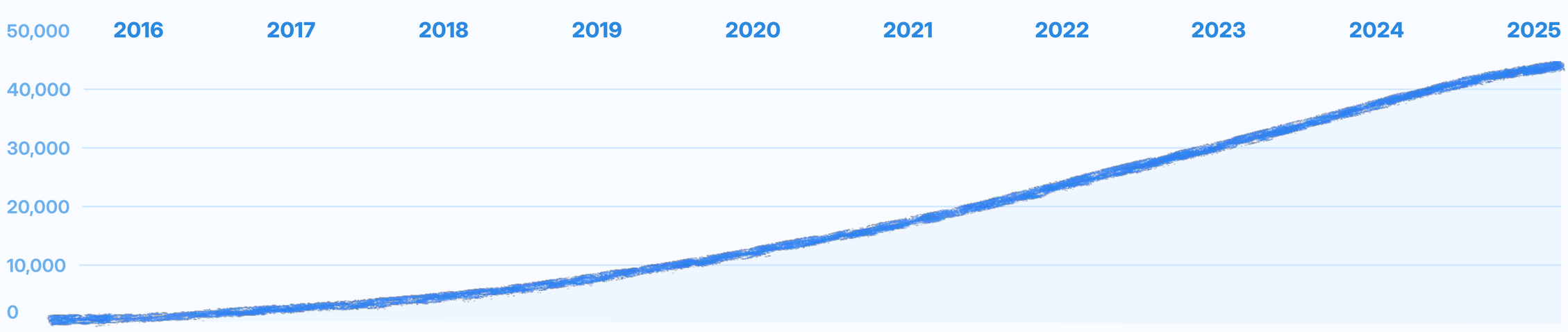

## Github Stars...50k stars here we come

cilium From 19,539 to 22,964

hubble From 3,435 to 4,006

tetragon From 3,499 to 4,290




YEARLY STARS GROWTH

Stars: **45,348**

# RELEASE HIGHLIGHTS

Cilium 1.17 and 1.18 were both released in 2025 and mirrored the intense focus of a hive in summer for building, refining, and maintaining for the future. These releases reflect a decade of Cilium in production, with IPv6, seamless "Day 2" operations, performance, and security top priorities all shaped by real-world feedback from adopters using Cilium at scale.

## First Class IPv6 Support: Future-Proofing Networking

Cilium continues to lead the charge in modernizing Kubernetes networking by treating IPv6 as a first-class citizen.

- **IPv6 Underlay Support**: Platform teams can now run Cilium encapsulation modes (VXLAN/Geneve) entirely over an IPv6 underlay. Additionally, Cilium's eBPF-based kube-proxy replacement can now perform service translation on IPv6 underlays, enabling fully IPv6-first networks.
- **IPv6 Egress Control**: Egress Gateway policies have been extended to support matching IPv6 destination CIDRs, ensuring consistent control regardless of IP version.

## Performance and Scalability

As Kubernetes clusters grow, Cilium has been optimized to handle intense churn and high node counts that come with running some of the largest production clusters in the world.

- **1,000-Node Scale Testing:** Extensive testing on 1,000-node clusters resulted in a 40% reduction in policy latency and a 43% reduction in agent CPU usage during high service churn.
- **Policy Engine Optimization:** Internal optimizations in 1.17 delivered massive gains, such as making CIDR deny rule regeneration up to 10,000x faster, reducing memory usage by up to 99.5%, and heap allocations reduced by over 99%.
- **Load Balancing Redesign:** A complete internal rework of the service load balancing engine in 1.18 reduces memory usage and simplifies long-term maintenance.

## Advanced L7 Networking and BGP Maturity

To support complex hybrid environments, Cilium has deepened its BGP and L7 traffic control capabilities.

- **BGP Route Aggregation:** To prevent routing table exhaustion in large environments, Cilium can now collapse large numbers of /32 or /128 service IPs into summarized prefixes. This reduces route churn and conserves TCAM space in upstream network gear.
- **BGP Unnumbered**: 1.17 introduced support for BGP Unnumbered, allowing peers to discover each other dynamically over link-local IPv6 addresses without manual IP configuration.
- **Gateway API v1.3 Support**: Cilium keeps pace with upstream standards, adding support for request mirroring, retry budgets, and enhanced CORS.
- **GAMMA Support**: Users can now attach multiple HTTPRoutes to a single Kubernetes Service, simplifying east-west traffic segmentation.
- **QoS and Traffic Prioritization**: Cilium honors Kubernetes QoS class when queuing egress traffic, allowing operators to prioritize traffic for critical workloads.

## Security with Tetragon

- **Tetragon for Windows**: Significant efforts are ongoing to bring the security observability and runtime enforcement capabilities of Tetragon to the Windows ecosystem. The current preview version already supports process_exec and process_exit events on Windows.
- **Persistent Enforcement**: With persistent enforcement, enforcement policies continue running even when the tetragon agent is down. This plugs the security lapse should in case the Tetragon agent becomes unavailable.
- **Enforcement Modes**: Tetragon now supports two different enforcement modes. A monitoring mode where enforcement policies are ignored or an enforcement mode where enforcement policies are enforced.
- **Attribute Resolution**: Attribute resolution allows to dynamically extract specific attributes from kernel structures passed as parameters to Kprobes and LSM hooks. This ultimately gives a better experience when writing tracing policies.
- **Userspace Hooks (uprobes/USDTs) Support**: Tetragon now supports Uprobes and User Statically-Defined Tracing(USDTs) as userspace hook points extending the same visibility and enforcement to userspace programs.

## Improved Day-2 operations

- **Dynamic Hubble metrics:** Operators can now configure Hubble metrics at runtime, with expanded metric coverage for BGP, network events, and policies.
- **Improved decoding of encapsulated traffic:** Hubble understands more encapsulation formats, improving debugging of overlay networks.
- **Improved status and error messages:** With more granular readiness checks, improved error messages, and additional context provided by agent and operator components, it's easier than ever to troubleshoot connectivity issues.

## Enhancements to ebpf-go

- The ebpf-go library continues to expand its capabilities and developer experience, positioning itself as the go-to library for eBPF tooling. Major additions include support for ebpf-for-windows and struct_ops, unlocking new cross-platform and kernel integration possibilities. CO-RE relocations have been significantly enhanced to work automatically against all kernel modules, not just vmlinux, removing previous limitations without requiring extra effort from the caller.

# STATE OF CILIUM AND KUBERNETES NETWORKING

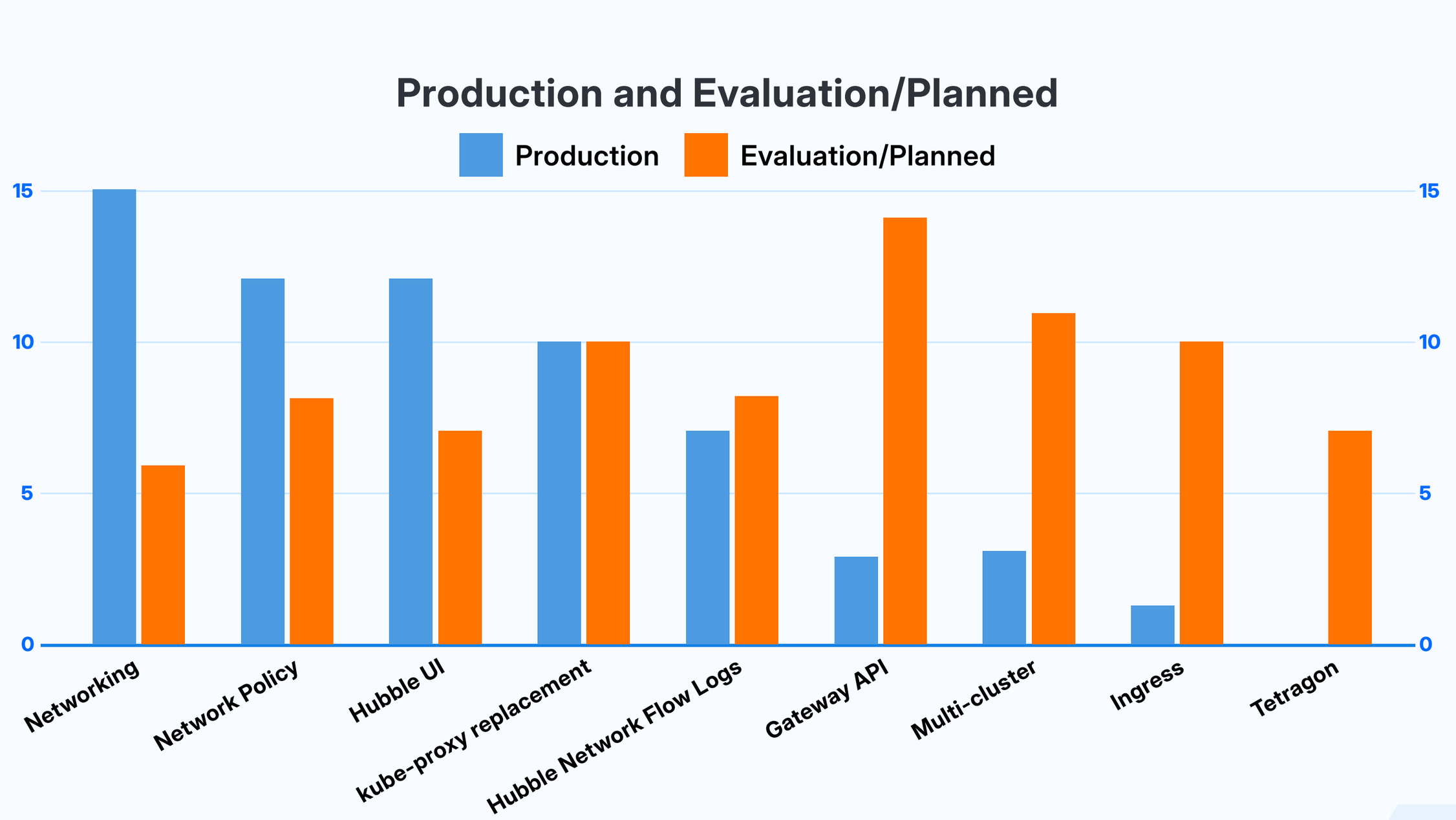
As we celebrate a decade of Cilium, two surveys, our annual User Survey and the broader State of Kubernetes Networking Report, confirm that Cilium has become the operational foundation of the cloud native world.

## The Cilium User Survey 2025: A Decade of Production Maturity

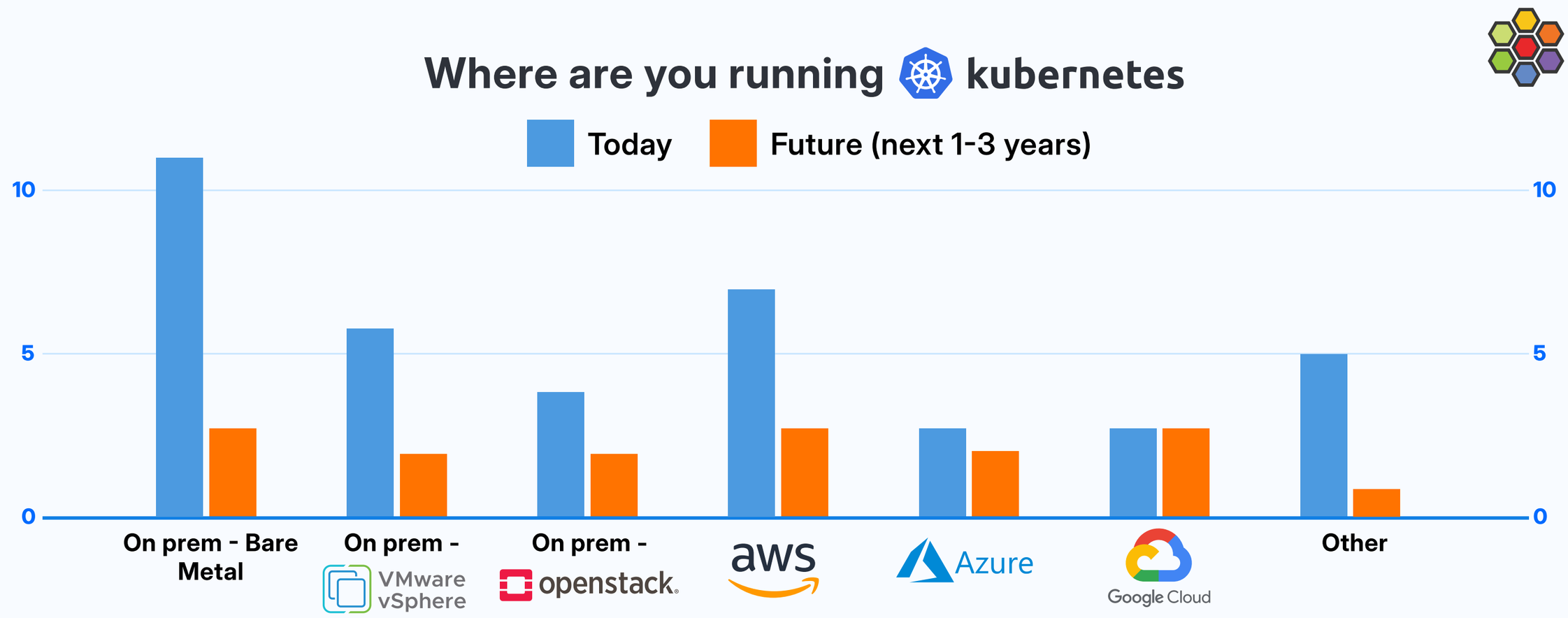
The 2025 Cilium User Survey, conducted over four weeks in September and October, revealed a technology that has matured significantly over its 10-year history and is trusted, versatile, and deployed at massive scale.

*Production-Ready at Scale*
Approximately 80% of surveyed users run Cilium in production, consistent with 2024 results and demonstrating sustained confidence. Users predominantly deploy Cilium 1.18 while also keeping pace with the latest Kubernetes and Linux kernel releases, indicating users looking for the latest developments in the project.

Cilium's core capabilities dominate adoption with networking and network policy leading usage, followed by kube-proxy replacement and Hubble observability. Looking ahead, users are actively evaluating Gateway API, multi-cluster networking, and ingress capabilities. Feature requests center on continuing to improve ingress controller functionality, BGP support, and Gateway API.



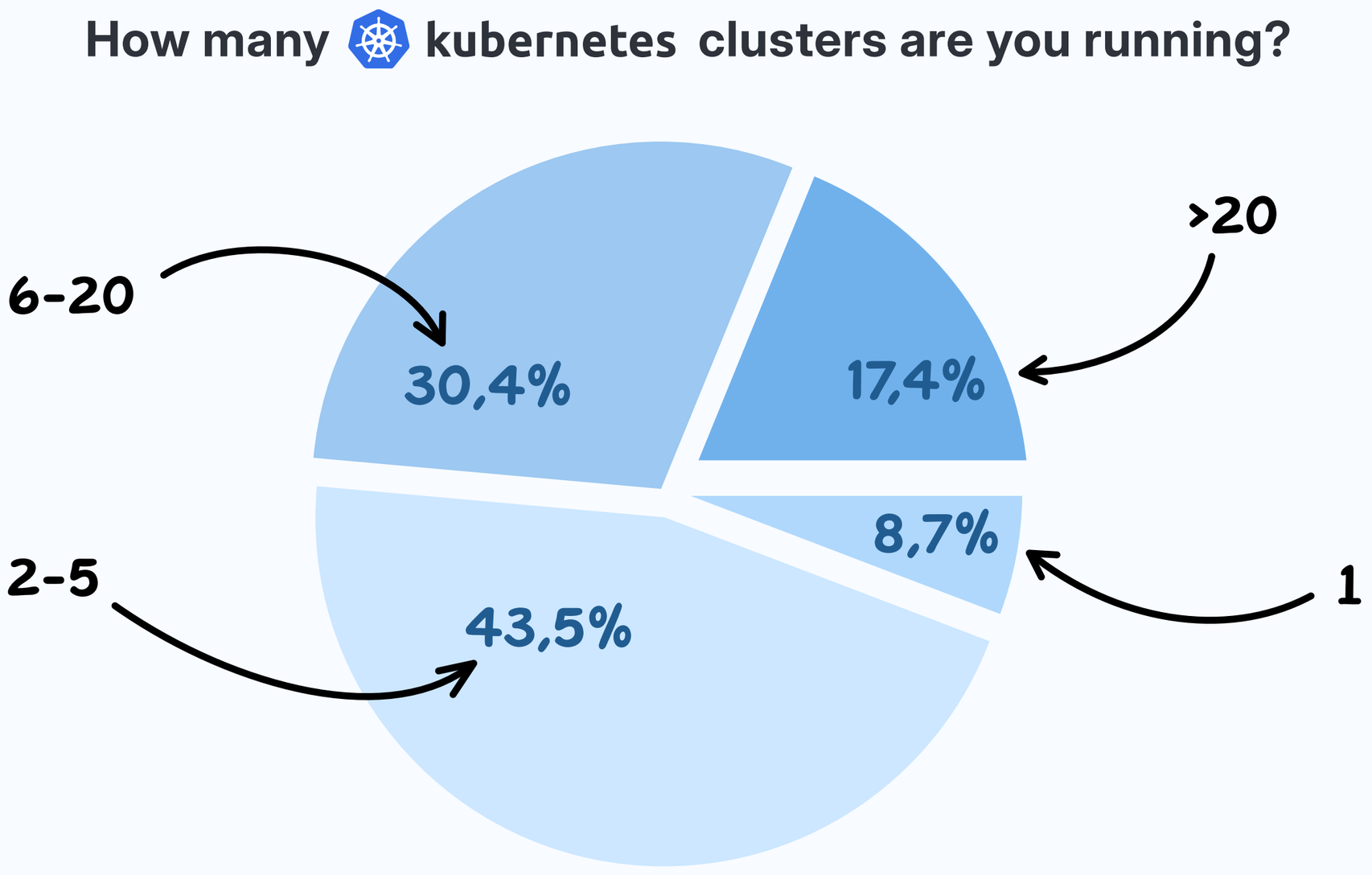

*Infrastructure Evolution*
The most significant trend is on-premises bare metal emerging as the most common deployment environment, surpassing AWS and marking growth over cloud providers from 2024. This shift correlates with increased upstream Kubernetes adoption, suggesting organizations are building sophisticated self-managed platforms.




## Multi-Cluster & Multi-Tenant *are* the **New Normal**

*Complex architectures are becoming the new standard for Kubernetes.*

- ***Multi-Cluster***: *Deployments spanning 2–5 clusters are now the most common configuration.*
- ***Multi-Tenancy***: *Only 25% of users still run single-tenant clusters.*
- ***Scale***: *While many operate under 50 nodes, 13% of users manage massive environments exceeding 5,000 nodes.*
- ***Beyond Kubernetes***: *25% of respondents now deploy Cilium in Virtual Machine (VM) environments, proving its versatility as a unified networking layer.*



## The State of Kubernetes Networking

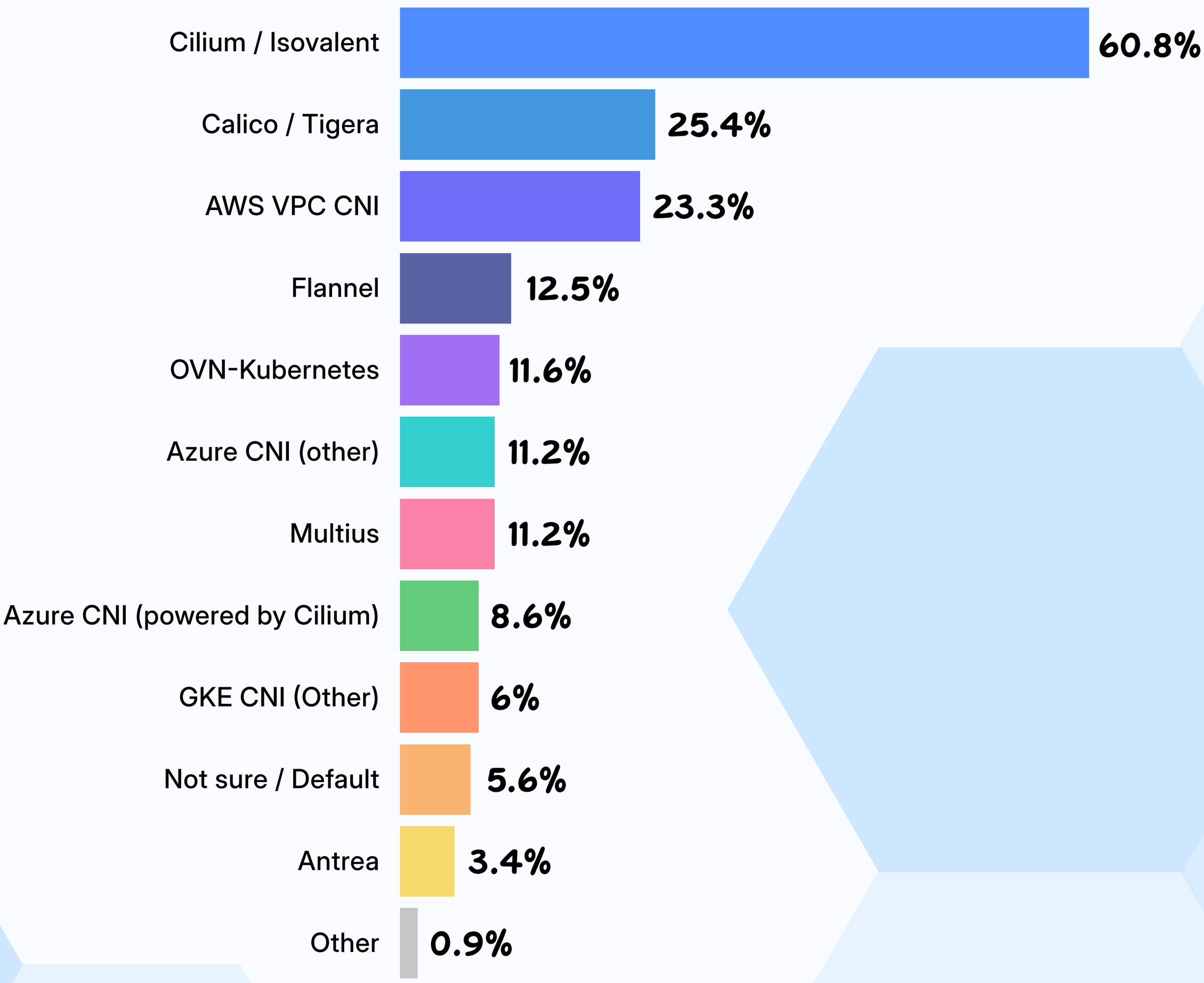
The 2025 State of Kubernetes Networking Report, which surveyed Kubernetes practitioners across industries and deployment environments, provides validation of Cilium's position as the clear choice for cloud native networking.

*"This report shows Cilium is now the clear choice for Kubernetes networking and security, trusted in organizations of all sizes around the world. Powered by eBPF, Cilium delivers levels of performance and deep visibility that modern cloud native environments demand, but that weren't possible with traditional approaches. CNCF graduation in 2023 underscored its maturity and production-readiness, and since then the community has continued to push the boundaries of what's possible."*

Liz Rice, Chief Open Source Officer at Isovalent

According to the report, Cilium represents over 60% of CNI deployments, more than double the next alternative. When including Cilium-powered managed services like Azure CNI powered by Cilium (8.6%) and GKE Datapath V2 (6%), Cilium underpins over 75% of the surveyed Kubernetes environments.

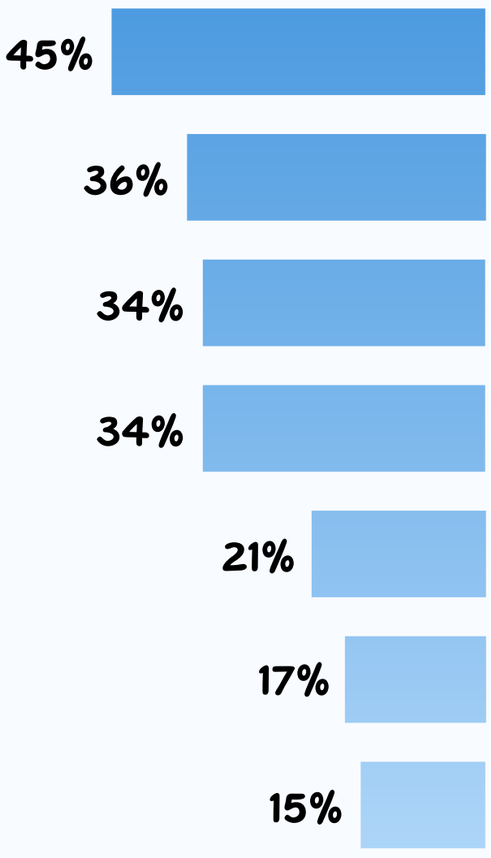
### Which CNI(s) are in use in your environment?



*Cilium Chosen for Technical Merit*

The report reveals that organizations are choosing Cilium through deliberate technical evaluation rather than simply accepting platform defaults. Respondents consistently cited performance, eBPF capabilities, integrated observability through Hubble, and advanced network policy features as reasons for adoption.

Looking forward, the report identifies the capabilities organizations plan to add in the next 12 months —and they well aligned with Cilium's roadmap:




**Gateway API**
Cilium's conformant implementation continues to mature and usage is growing

**Multi-cluster connectivity**
Users are planning for multi-cluster networking with Cilium Cluster Mesh

**eBPF-based capabilities**
The foundation of Cilium's architecture

**Advanced traffic management** - Recent and upcoming releases build on capabilities like per-service load balancing and ingress bandwidth controls

**BGP for connectivity**
Enhancements across 1.17 and 1.18

**Bandwidth management**
Introduced in 1.17

**IPv6/Dual Stack support**
Production-proven in deployments at organizations like ESnet and TikTok

# CILIUM IN PRODUCTION

Companies use Cilium to solve a wide range of challenges and 18 of them have shared their story with us this year. We are thankful to our users for speaking to us about how they use Cilium in their organizations. You can read the CNCF case studies on the website or see all of the Cilium case studies here. If you'd like to talk about how your organization is using Cilium, please reach out.

## Orgs that shared case study with Cilium in 2025

- ByteDance
- Canopus Networks
- Cloudera
- Corner Banca
- Cybozu
- DB Schenker
- eBay
- ECCO
- ESnet
- G-Research
- Imagine Learning
- Michelin
- Nutanix
- OpenAI
- Preferred Networks
- Social Network Company
- TikTok
- University of Wisconsin

# COMMUNITY QUOTES

## Quotes from Organization using Cilium

### Cybozu

*"Cilium's largest value was higher service availability and increased security through network policy. Node failures and service disruptions happen, but we have been able to keep our service online through Maglev hashing. Network policy is also very easy to use, not just for our infrastructure team, but also for engineers across other teams looking to secure their own applications."*

*– Tomoya Terashima, software engineer at Cybozu*

### DB Schenker

*"Our service mesh's discontinuation of open source support was a trigger for us to explore alternatives. We replaced a fragmented set of tools with Cilium, streamlining our operations significantly. Cilium's built-in encryption capabilities were a perfect fit for what we needed from a service mesh."*

*- Amir Kheirkhahan, platform engineer at DB Schenker*

### ECCO

*"When we benchmarked the performance, latency dropped by 33% and tasks that previously took minutes to process were completed in seconds, which directly impacted our decision-making capabilities and operational speed...Speed is everything in our business. If we can move goods efficiently and forecast demand accurately, we win. Cilium has become a cornerstone of our strategy. It's not just a tool; it's a game-changer."*

*- George Zubrienko, Data & AI lead platform engineer, ECCO*

### ESnet

*"We were looking for a tool that would make cluster networking simple, but also has advanced capabilities available. Cilium provides an on-ramp for getting started and securing clusters, but also offers deep networking related features like BGP and Cluster Mesh."*

*- Luke Baker, Group Lead of ESnet's Platform Engineering Team*

### Nutanix

*"There are still workloads that run best on VMs. We want customers to have control between deploying on VMs or Kubernetes and be able to seamlessly cross that boundary. Cilium makes it easy for users to see traffic flows and define network policies between VMs and Kubernetes clusters running in the same environment. Operations are much simpler since implementing Cilium. Features like observability through Hubble are designed sensibly. They're easy to deploy, easy to use, and essential to our roadmap."*

*- Daniel Lipovetsky, Senior Software Engineer at Nutanix.*

## Social Networking Company

*“Tetragon’s overhead compared to any other tool has been very minimal. We did in-depth performance testing in terms of process monitoring, file access monitoring, and network monitoring. We tested the baseline behavior without any security tool. Then we compared it with all the security tools we were testing against, and it turned out that Tetragon had the best performance among all the tools we tested out and for all the criteria we were testing for.”*

*- Security engineer, social networking company*

## University of Wisconsin–Madison

*“Managing 25+ Kubernetes clusters in support of research workloads is complex. Researchers want to maximize compute for science, not infrastructure overhead. Cilium lets us deliver deep network visibility across all clusters while keeping our per-cluster footprint minimal.” “Managing 25+ Kubernetes clusters in support of research workloads is complex,” Sherman reflects. “Researchers want to maximize compute for science, not infrastructure overhead. Cilium lets us deliver deep network visibility across all clusters while keeping our per-cluster footprint minimal.”*

*- Cory Sherman, DevOps engineer at UW–Madison.*

# COMMUNITY EVENTS

This year, the community gathered in London and Atlanta for our flagship CiliumCon and KubeCon + CloudNativeCon. From celebrating our 10-year anniversary to deep-diving into bare metal ML workloads, the energy at the events confirmed that the Cilium ecosystem is more vibrant than ever.


## KubeCon + CloudNativeCon and CiliumCon Europe - London

### CiliumCon Europe

CiliumCon drew a packed house for talks spanning performance optimization, production deployments, and advanced networking patterns. Highlights included Isovalent's Liz Rice and Microsoft's Neha Aggarwal presenting strategies for configuring Cilium for performance and scale, G-Research's Luigi Zhou detailing how the organization leverages Cilium as the core networking layer for on-premise bare metal clusters supporting machine learning workloads, and sessions on simplifying multi-cluster networking with the Multi-Cluster Services API.

### Cilium at KubeCon Europe

Cilium's presence extended throughout the main KubeCon conference. The Maintainers Track featured project updates, DB Schenker demonstrating how Cilium replaced their service mesh, and Google engineers providing insights into why Cilium serves as the foundation for core networking features in the GKE dataplane, highlighting the project's integration into major cloud platforms.


## KubeCon + CloudNativeCon and CiliumCon North America - Atlanta

### CiliumCon North America

CiliumCon featured a special Q&A with project co-creator Thomas Graf, who reflected on Cilium's decade-long journey from its first commit to CNCF graduation and beyond. Additional sessions covered upcoming features like  CiliumEndpointSlice or Cilium's scalability in large deployments, and ESnet’s implementation of Kubernetes in an IPv6-only network environment.

### Cilium at KubeCon North America

The main KubeCon conference celebrated Cilium's 10-year milestone with a special Maintainers Track session featuring Thomas Graf who provided a retrospective on the project's evolution and vision for the future.

Technical sessions showcased cutting-edge production deployments and innovations. TikTok engineers presented their large-scale IPv6-only datacenter implementation powered by Cilium. While Daniel Borkmann dove into using netkit to make VMs running on Kubernetes as fast as the host by using  KubeVirt Pods to launch QEMU/KVM instances backed by AF_XDP interfaces.

# Cilium Developer Summits

Contributors gathered at two Developer Summits to discuss the future of the Cilium project and align on technical strategy.

## London Developer Summit

Representatives from Google, Isovalent, Microsoft, Seznam, and more discussed the status of existing and new features like Cluster Mesh and StateDB-based load balancing, and the project roadmap.


## Atlanta Developer Summit

Representatives from Google, Isovalent, Microsoft, Confluent, and Coreweave discussed updates to Multi-Network support, netkit queue binding, eBPF inline mode for FQDN network policies, and more.


# LOOKING FORWARD INTO THE SECOND DECADE OF CLOUD NATIVE NETWORKING

As Cilium enters its second decade, it's clear the project has evolved from an experimental tool using a then little known technology called eBPF to becoming the comprehensive platform for cloud native networking, observability, and security. The use cases and themes emerging in 2025 point to several trends that will only accelerate the adoption of Cilium in the decade ahead.

### Ubiquitous Adoption and Future Proof Roadmap

Nearly 80% of surveyed users are running Cilium in production. Cloud, managed services providers, and Kubernetes distributions are investing in Cilium as the CNI of choice. Additionally, user roadmaps are perfectly aligned with features the project already has with Gateway API, multi-cluster connectivity, eBPF-based capabilities the top planned for adoption in the next few years.

### The IPv6 Future is Here

ESnet and TikTok's IPv6-only deployments come as Cilium continued to enhance IPv6 and dual-stack capabilities in the 1.18 release. We expect to see more organizations following their lead, particularly in research, telecommunications, and large-scale cloud environments where IPv6 adoption is accelerating. Cilium is ready for the next wave of networking demands.

### Convergence of VMs and Kubernetes

Modernization is rarely a "rip and replace" process, the need to integrate existing VM workloads with new Kubernetes deployments is becoming critical. Tools like Cluster Mesh and KubeVirt, combined with low-level technologies like netkit, enable organizations to run both VMs and containers on a consistent networking plane. This will accelerate in 2026 as more enterprises recognize they don't need to choose between VMs and containers and will need a platform that can handle both.

### Runtime Security Becomes Infrastructure

Tetragon's continued evolution throughout 2025, including October's v1.6.0 release with performance and security enhancements, positions runtime security as foundational infrastructure rather than specialized tooling. The combination of Cilium's network policy enforcement with Tetragon's process and file monitoring creates comprehensive security when built in from the ground up. We expect widespread adoption in 2026 as security teams realize they can achieve deep observability without sacrificing application performance.

### Get Involved

If all of this has gotten you excited about Cilium, there are many ways to get involved. The best way to start is by checking out the Cilium project on GitHub. There, you can find information about the project, as well as ways to get involved, such as reporting bugs, suggesting new features, or contributing code. To discuss specific features or talk with developers, consider joining the weekly Cilium developer meeting. The community is also active on GitHub Discussions, Slack, Bluesky, Reddit, and LinkedIn. If you want to just follow along for now, be sure to sign up for the newsletter. If you have any questions or comments please reach out to contribute@cilium.io.