Optimizing Kubernetes Networking with Cilium and BGP

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Agenda

- What is Cilium?
- What is BGP?
- BGP Integration with Cilium
- Use-Cases
- Key Takeaways

What is Cilium?

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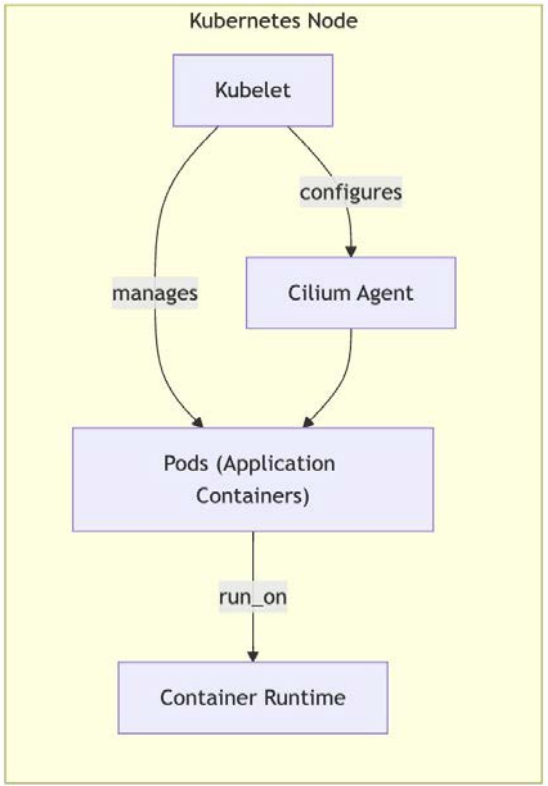
Open-source and eBPF based networking, security and observability layer for cloud-native environments like kubernetes



What is Cilium?

Key Benefits

- **Performance**: eBPF enables kernel-level efficiency without relying on iptables for every packet.
- **Network Security** - Visibility and control at the application level
- **Scalability**: Works across large cluster environments, facilitating multi-tenant and multi-cloud scenarios.
- **Observability**: Built-in monitoring and troubleshooting tools like Hubble.

What is BGP?

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BGP (Border Gateway Protocol) is a routing protocol used to exchange routing information between different networks on the Internet or within large private networks.

BGP integration with Cilium

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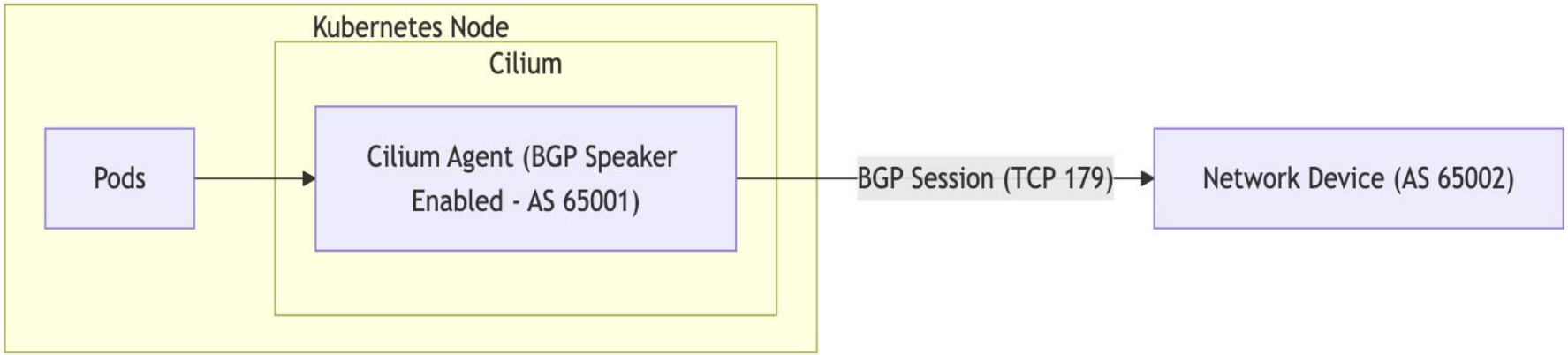
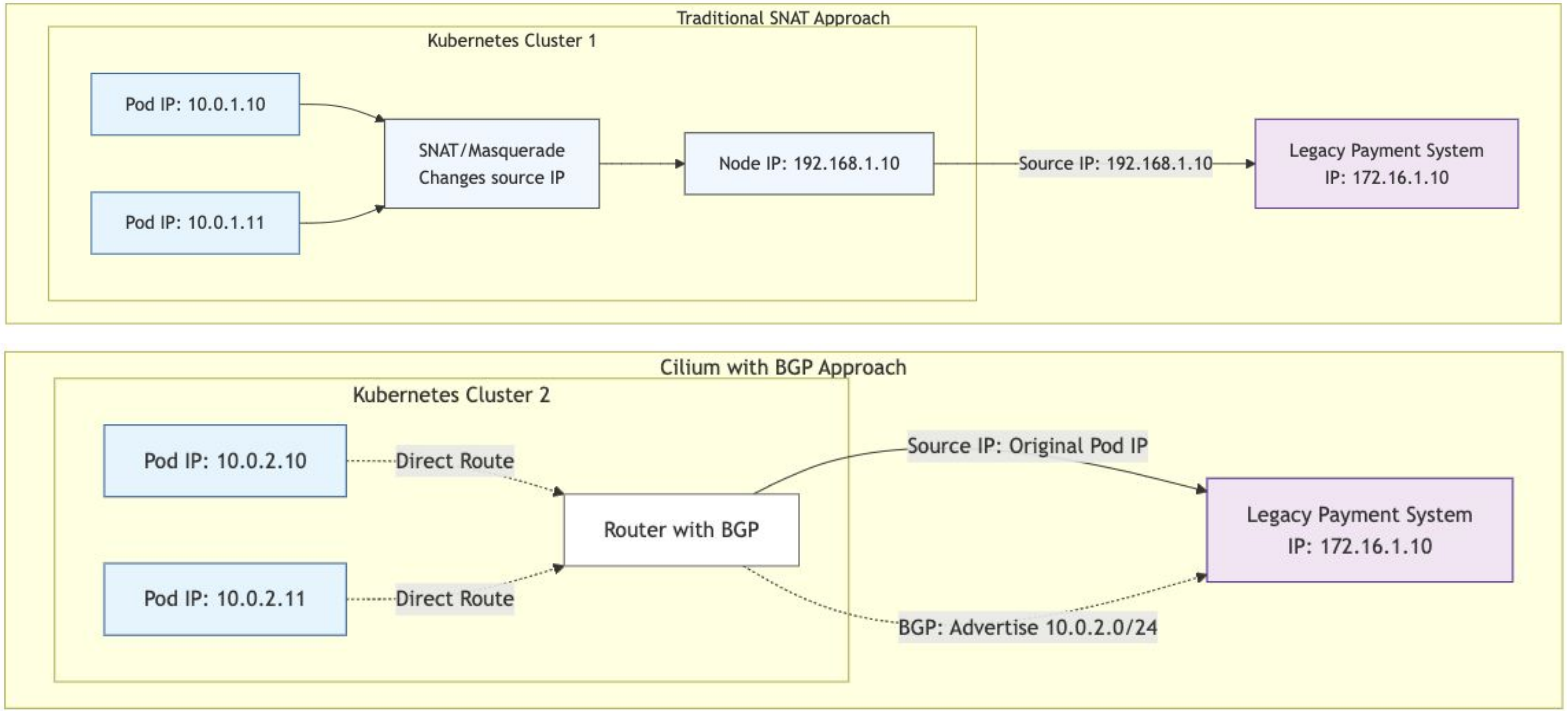


BGP integration with Cilium

- **Enhanced Redundancy:** Improves network availability and fault tolerance
- **Direct Service Exposure:** Enables external access to services without additional components
- **Reduced Latency**: Regional affinity for lower latency
- **Scalability**: Handles large-scale deployments with thousands of routes efficiently

Use-Cases of Cilium with BGP

Direct Pod-to-External Communication

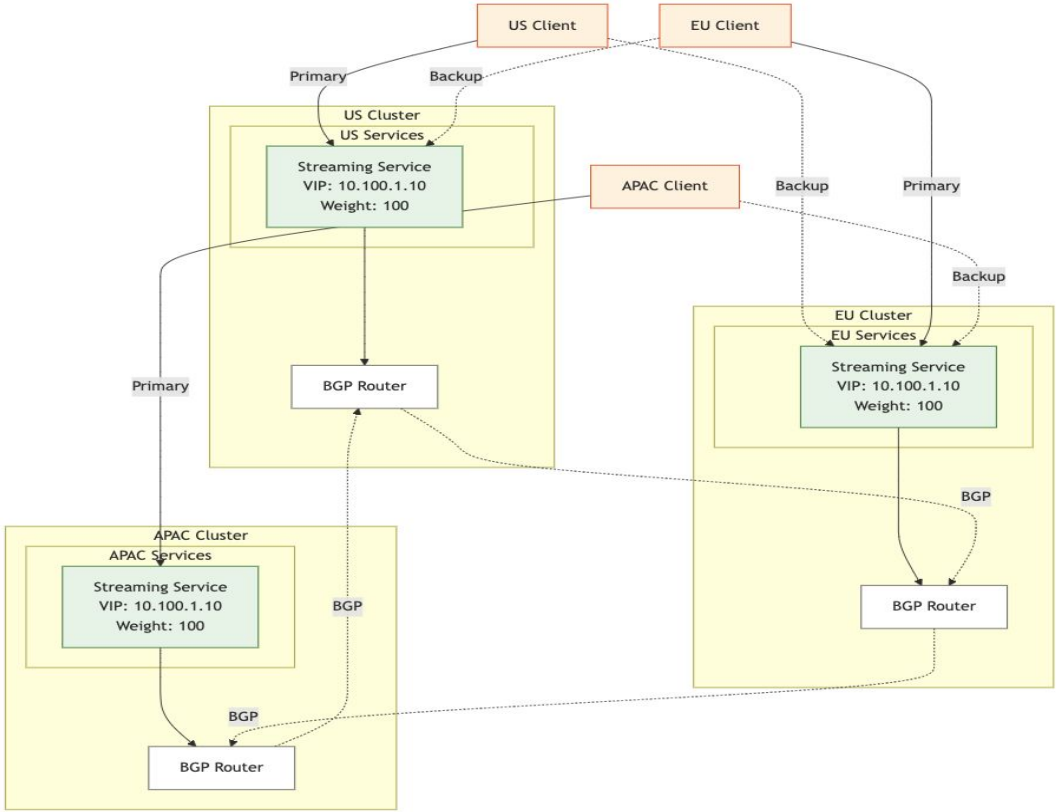


Direct Pod-to-External Communication

Benefits of using BGP with Cilium

- Original Pod IPs preserved throughout communication simplifies network troubleshooting
- Better security auditing (exact Pod source tracking)
- Reduced latency (no NAT overhead)

Multi-cluster Load Balancing



Multi-cluster Load Balancing

Benefits of using BGP with Cilium

- Native load balancing without external LBs
- Automatic failover between clusters
- Reduced Latency due to regional affinity
- Path optimization based on BGP metrics

Concerns

- Imbalance load balancing due to imbalance of traffic between regions can lead to one cluster getting overloaded

Key Takeaways

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- **Plan IP Addressing Early:** Overlapping pod/service ranges across multiple clusters can complicate route advertisement
- **Start Simple, Then Expand:** Begin with a single cluster BGP advertisement to an external router to confirm the route correctness and failover behavior before extending to multi-cluster topologies
- **Security Posture**: Implement BGP session security and use route filters to avoid advertising unnecessary networks externally.

Thank You!