LoxiLB: AI-Native Networking for Next-Generation Cloud Services

NETLOX

LoxiLB

CLOUD NATIVE SANDBOX

LoxiLB: The Next-Gen AI-Native Load Balancer

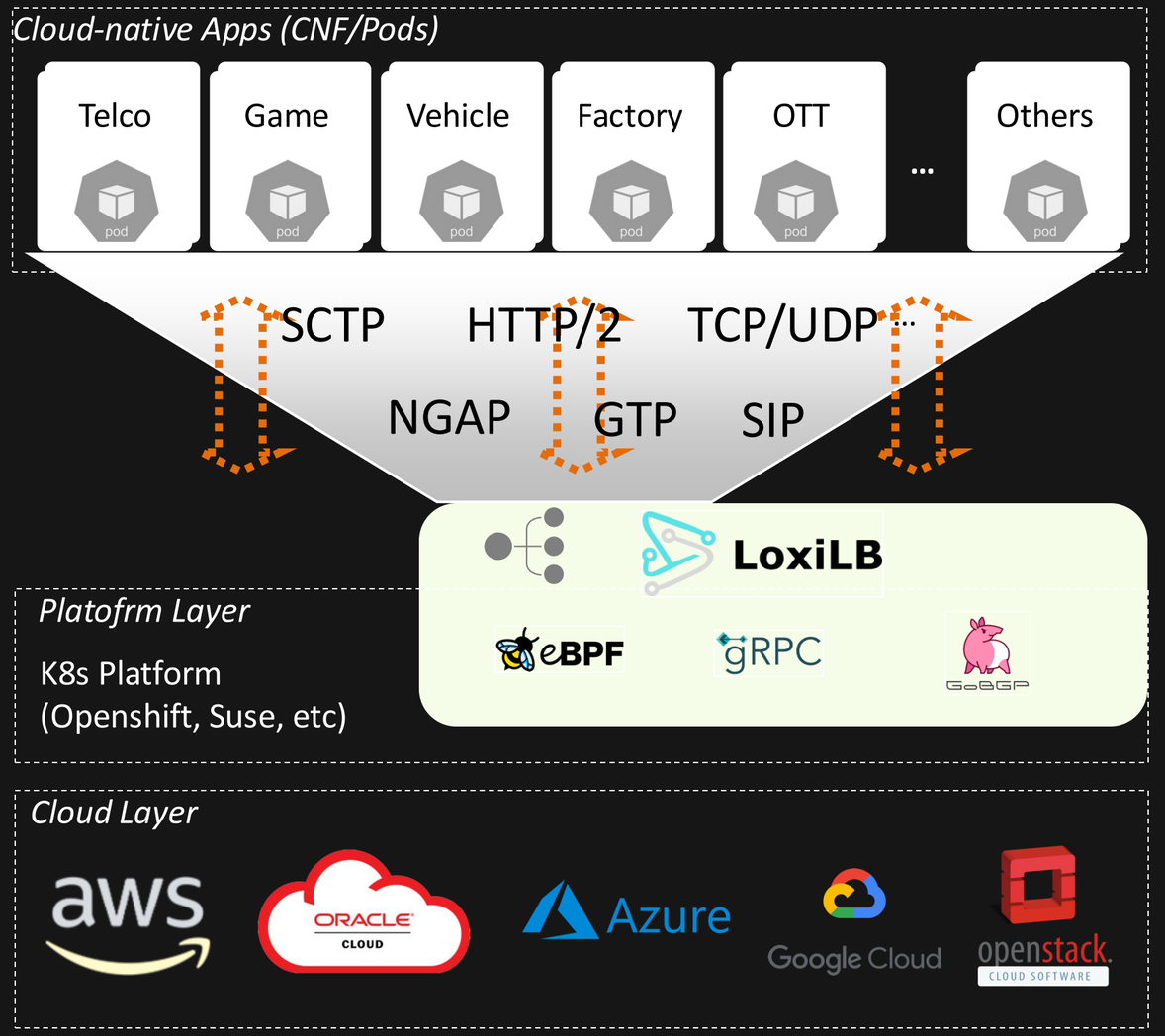
- **Key Features :**

1. Traffic Optimization with eBPF & AI

2. Cloud/AI-Native Advanced Scalability

3. Comprehensive Protocol Compatibility (TCP, UDP, SCTP, HTTP2, QUIC, etc.)

https://github.com/loxilb-io/loxilb



Demo 1 : Telco Use Case

Intelligent Load Balancing (N2, N4, PFCP)

Key Highlights

- **LoxiLB** supports advanced **load balancing** for the **NGAP** protocol over the N2 / N4 interface.
- Traditional **load balancing** can struggle with inefficiencies in scenarios like handovers or skewed gNB-to-UE distributions.
- LoxiLB distributes UEs across multiple **AMF instances** using **telco protocol aware load balancing**, ensuring:

  ✓ **Optimal performance**
  ✓ **Seamless handovers**
  ✓ **Balanced traffic** even during spikes

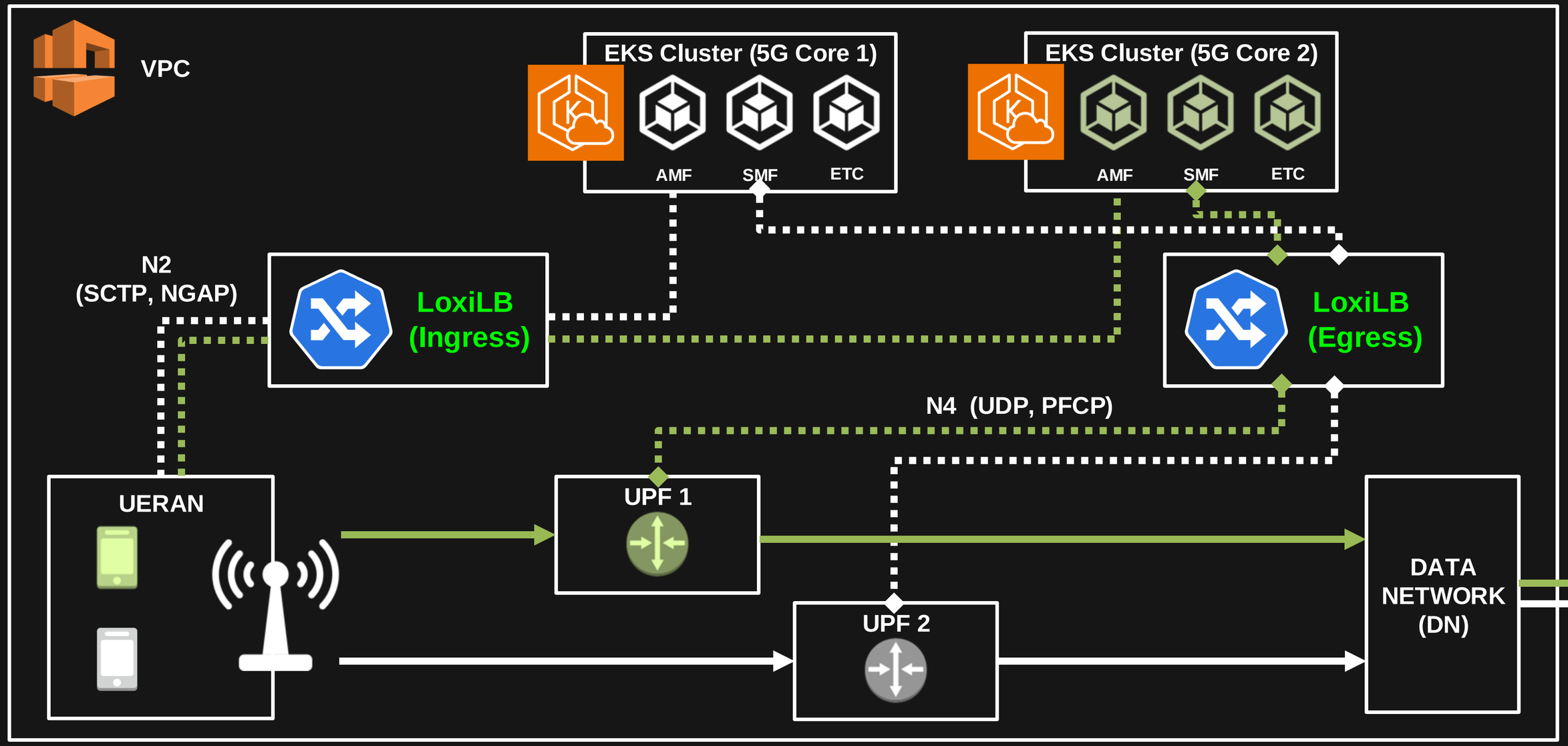
Why intelligent Load Balancing ?

- Challenges of Telco Signaling Load Balancing:
  - ✓ **AMF overload**: Assigning all UEs from a gNB to one AMF overloading, leading to slower response
  - ✓ **Handover issues**: When UEs move between gNBs connected to different AMFs, re-establishing connections can disrupt service.
- Intelligent Load Balancing with LoxiLB:
  - ✓ **Application-layer awareness**: Handles NGAP and PFCP messages intelligently, ensuring balanced distribution.
  - ✓ **No re-initiations during handovers**: UEs remain connected to the same AMF instance, avoiding service disruptions.
  - ✓ **Optimized resource use**: Prevents bottlenecks, improving performance and resource efficiency.

Technical Benefits and Impact

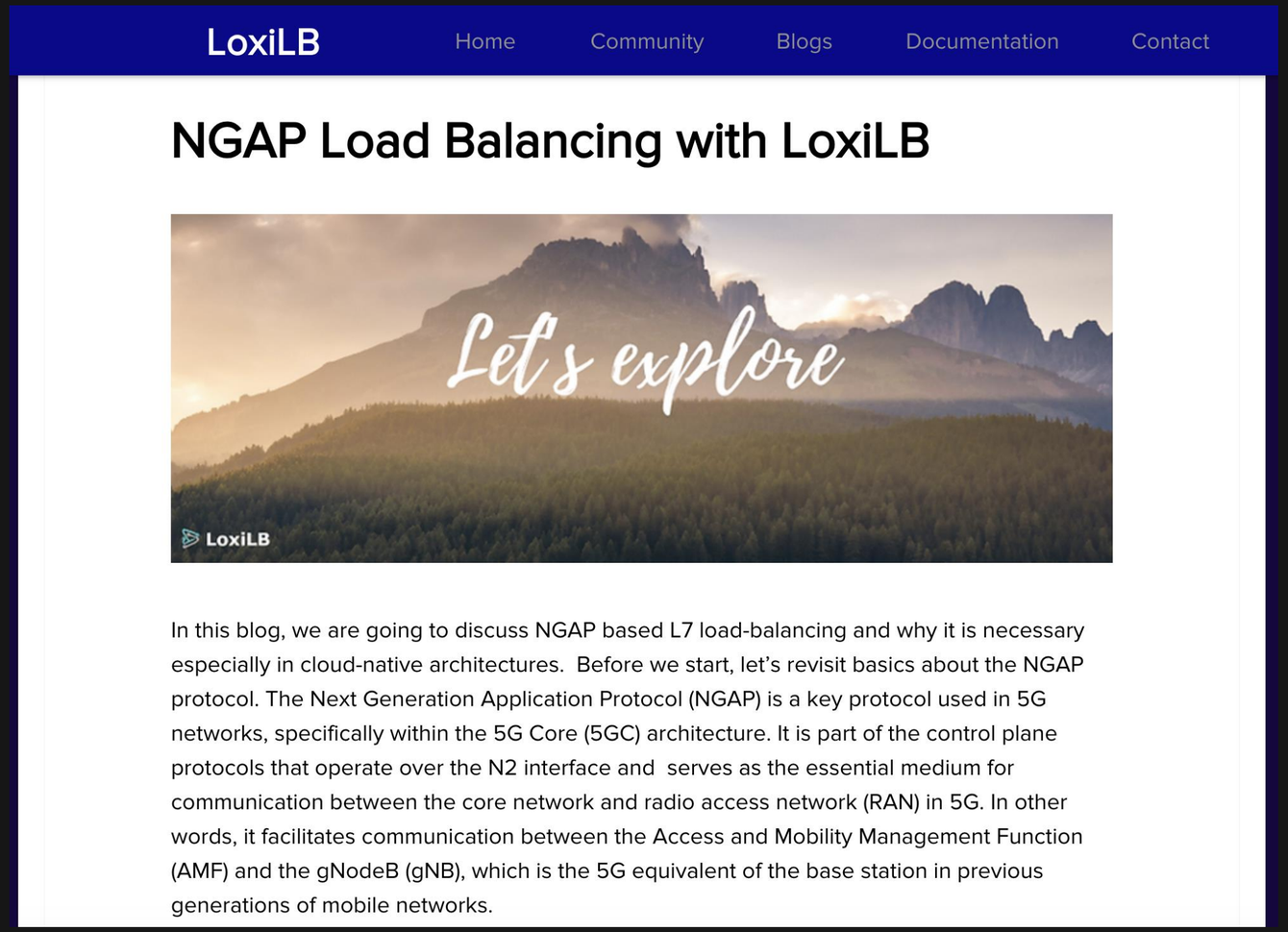
- **Load balancing comprehends** both **NGAP protocol** and **PFCP** messages, ensuring smarter, application-level traffic distribution.
- **Multi-cluster support for Kubernetes-native** deployments, ensuring high availability and efficient failovers.
- **Real-world impact**: Optimized for critical 5G traffic, providing **seamless user experience**, especially during handovers, while handling high volumes of UEs efficiently.
- **Future-ready**: Scalable solution prepared for expanding demands in 5G and 6G core deployments based on AI-native networking.

Demo Scenario



Hands On

- https://www.loxilb.io/post/ngap-load-balancing-with-loxilb



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Demo 2 : Enterprise Use Case

Fast HA(High Availability) in Multi-AZ Cloud

Key Highlights

- **Fast High Availability (HA)** across **multiple Availability Zones (AZs)** using **LoxiLB** for seamless failover.
- Ensures **minimal & deterministic downtime** for critical enterprise applications by dynamically managing traffic between AZs.
- **Auto-detection of AZ failure**: LoxiLB automatically detects failures in an AZ and reroutes traffic in real-time.
- **Load redistribution**: Automatically redistributes load across healthy AZs, preventing bottlenecks and maintaining performance.

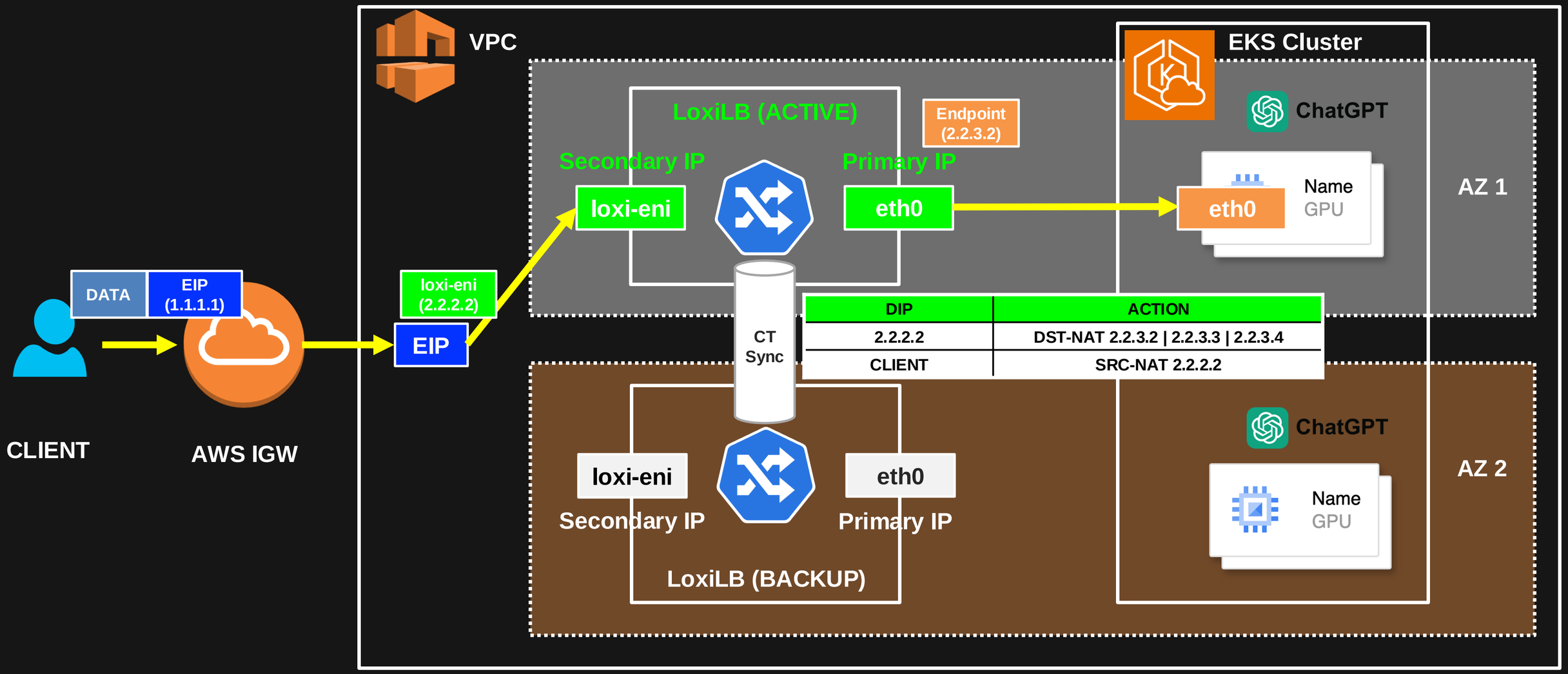
Challenges of Traditional HA Approaches

- **Slow failover times**: Traditional approaches often suffer from **long recovery times and Non-deterministic down time**.
- **Inconsistent state handling**: Managing service state across multiple AZs can lead to data and state inconsistencies, especially with larger workloads.
- **LoxiLB's Fast HA Solution**:
  - ✓ **Intelligent traffic distribution** across AZs ensures **real-time failover**.
  - ✓ Handles **traffic rerouting** instantly when an AZ becomes unavailable, maintaining service availability.
  - ✓ Optimized for **multi-AZ deployments**, reducing failover times significantly.

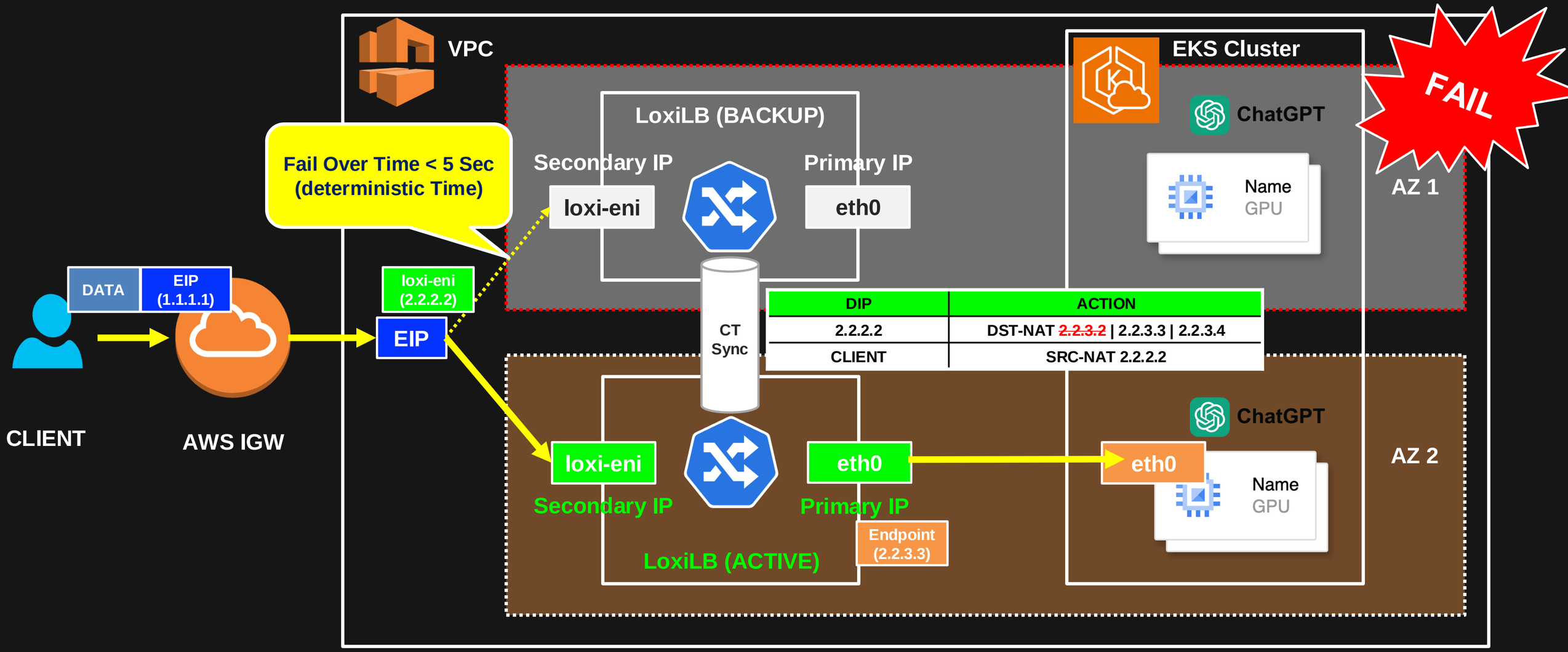
Technical Benefits and Impact

- **Multi-AZ architecture**: Enables resilience and high availability in cloud-native environments.
- **Real-world impact**: In the event of an AZ failure, LoxiLB ensures **continuous operation** with no noticeable downtime for end users.
- **Future-ready**: Scalable to handle **multi-cloud deployments** and prepared for growing enterprise demands.
- **Fast HA with LoxiLB** ensures:
  - ✓ Instant failover across multiple AZs.
  - ✓ Efficient resource utilization and **load balancing** for enterprise-grade applications.

Demo Scenario



Demo Scenario (Fail Over)



Hands On

- https://github.com/loxilb-io/loxilbdocs/blob/main/docs/aws-multi-az.md

Deploy LoxiLB with multi-AZ HA support in AWS

LoxiLB supports stateful HA configuration in various cloud environments such as AWS. Especially for AWS, one can configure HA using the Floating IP pattern, together with LoxiLB.

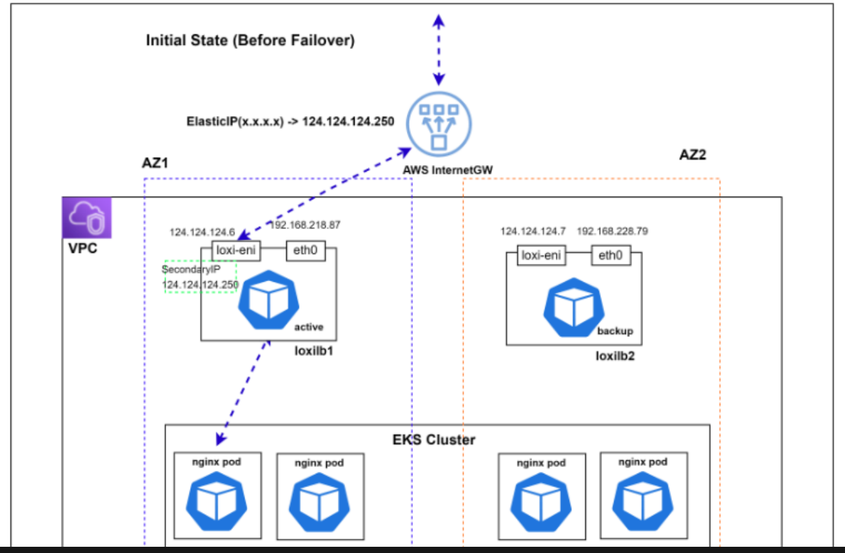
The HA configuration described in the above document has certain limitations. It could only be configured within a single Availability-Zone(AZ). The HA instances need to share the VIP of the same subnet in order to provide a single access point to users, but this configuration was so far not possible in a multi-AZ environment. This blog explains how to deploy LoxiLB in a multi-AZ environment and configure HA.

Overall Scenario

Two LoxiLB instances - loxilb1 and loxilb2 will be deployed in different AZs. These two loxilbs form a HA pair and operate in active-backup roles.

The active loxilb1 instance is additionally assigned a secondary network interface called loxi-eni. The loxi-eni network interface has a private IP (124.124.124.250 in this setup) which is used as a secondary IP.

loxilb1 associates this *124.124.124.250* secondary IP with an user-specified public ElasticIP address. When a user accesses the EKS service externally using an ElasticIP address, this traffic is NATed to the 124.124.124.250 IP and delivered to the active loxilb instance. The active loxilb instance can then load balance the traffic to the appropriate endpoint in EKS.



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Join the LoxiLB Open-Source Community

Contribute to LoxiLB:

- Explore our GitHub repository.
- Participate in ongoing development and future innovations.

LoxiLB

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LoxiLB github QR Code

https://github.com/loxilb-io/loxilb

Invest in the Future: LoxiLB is Your Next Opportunity

- **Why Invest in LoxiLB?**
  - ✓ **Pioneering AI-Native Networking**: LoxiLB stands at the forefront of AI-driven networking, setting new standards for telco clouds and beyond.
  - ✓ **Unmatched Growth Potential**: Positioned to scale with the rapid evolution of **5G, 6G**, and **multi-cloud environments**, ensuring relevance in next-gen network infrastructure.
  - ✓ **Future-Proof Innovation**: Our cutting-edge solutions are already optimizing high-demand networks, making LoxiLB a key player in the future of intelligent networking.
- **Interested in learning more?**
  Come visit our booth for **exclusive insights** into our fundraising efforts and discuss how you can be part of our journey towards **shaping the future of networking.**

THANKS!

https://github.com/loxilb-io/loxilb

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