

eBPF / LoxiLB

엔지니어의 오픈소스 소프트웨어 'LoxiLB' 프로젝트 참여
(eBPF based Cloud Native external Load Balancer)

2023년 3월 12일

안종석

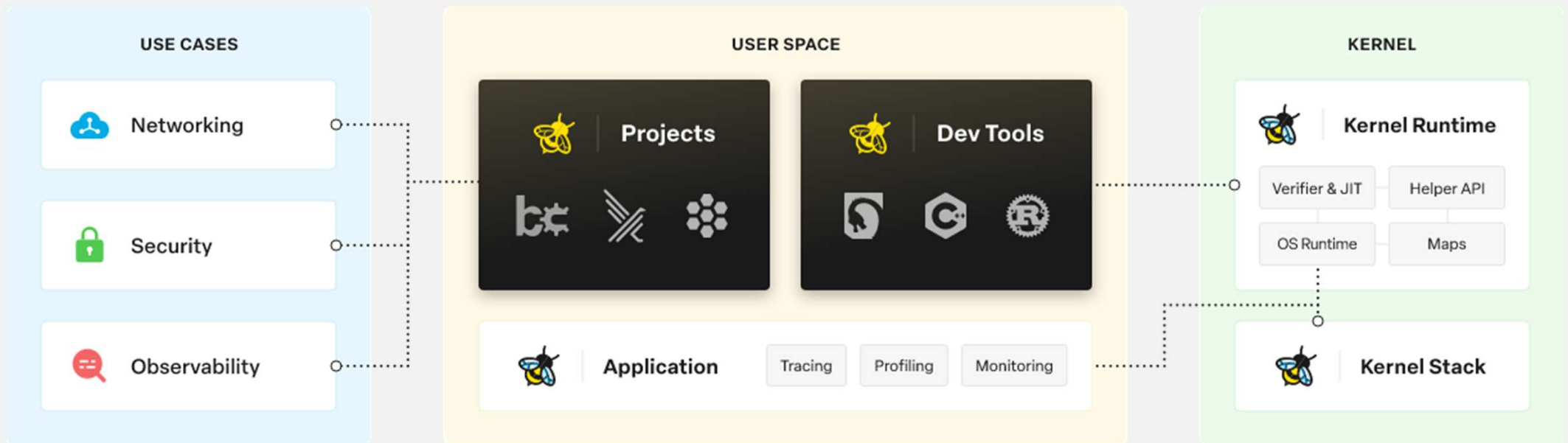
james@jslab.kr

EBPF

❖ **eBPF(Extended Berkeley Packet Filter):** eBPF는 운영 체제 커널과 같은 권한 있는 컨텍스트에서 샌드박스가 적용된 프로그램을 실행할 수 있는 기술이다. 커널 소스 코드를 변경하거나 커널 모듈을 로드할 필요 없이 런타임에 커널의 기능을 안전하고 효율적으로 확장하는 데 사용한다.



THE **LINUX** FOUNDATION PROJECTS



<https://ebpf.foundation/what-is-ebpf/>
Source: <https://ebpf.io/>



CILIUM



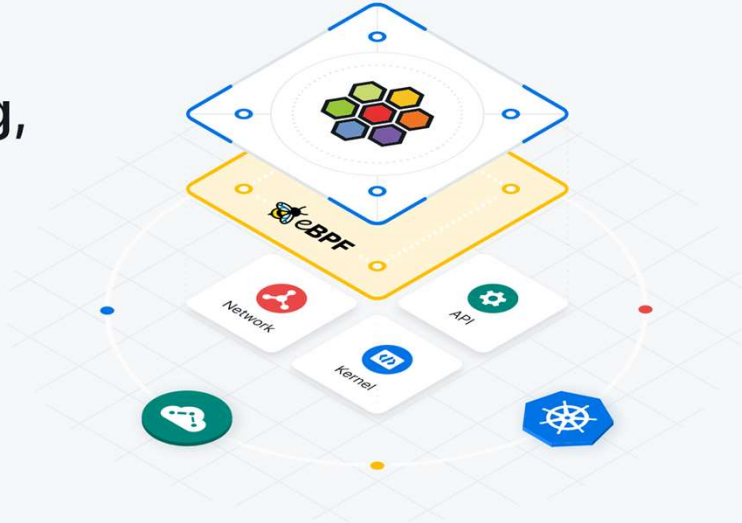
 cilium [GitHub Stars 14.6k](#) [Join Slack](#)

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eBPF-based Networking, Observability, Security

Cilium is an open source software for providing, securing and observing network connectivity between container workloads - cloud native, and fueled by the revolutionary Kernel technology eBPF.

[Discover Cilium](#)




Google chooses Cilium for Google Kubernetes Engine (GKE) networking


Bell uses Cilium and eBPF for telco networking

 Adobe
What Makes a Good Multi-tenant Kubernetes Solution


AWS picks Cilium for Networking & Security on EKS Anywhere

Source: <https://cilium.io/>



EBPF @ CALICO

❖ eBPF @ Calico

Factor	Standard Linux Dataplane	eBPF dataplane
Throughput	Designed for 10GBit+	Designed for 40GBit+
First packet latency	Low (kube-proxy service latency is bigger factor)	Lower
Subsequent packet latency	Low	Lower
Preserves source IP within cluster	Yes	Yes
Preserves external source IP	Only with externalTrafficPolicy: Local	Yes
Direct Server Return	Not supported	Supported (requires compatible underlying network)
Connection tracking	Linux kernel's conntrack table (size can be adjusted)	BPF map (fixed size)
Policy rules	Mapped to iptables rules	Mapped to BPF instructions
Policy selectors	Mapped to IP sets	Mapped to BPF maps
Kubernetes services	kube-proxy iptables or IPVS mode	BPF program and maps
IPIP	Supported	Supported (no performance advantage due to kernel limitations)
VXLAN	Supported	Supported
Wireguard	Supported (IPv4 and IPv6)	Supported (IPv4)
Other routing	Supported	Supported
Supports third party CNI plugins	Yes (compatible plugins only)	Yes (compatible plugins only)
Compatible with other iptables rules	Yes (can write rules above or below other rules)	Partial; iptables bypassed for workload traffic
Host endpoint policy	Supported	Supported
Enterprise version	Available	Available
XDP DoS Protection	Supported	Supported
IPv6	Supported	Not supported (yet)

Source: <https://docs.tigera.io/calico/3.25/about/about-ebpf>



LOXILB

❖ LoxiLB: eBPF based cloud-native load-balancer for 5G Edge

- LoxiLB는 클라우드 네이티브 5G/엣지 워크로드를 위한 오픈 소스 클라우드 네이티브 "외부" 서비스 로드 밸런서로, eBPF를 핵심 엔진으로 사용하고 Go 언어에 기반하여 작성되었습니다. LoxiLB는 5G/엣지 서비스를 위한 K8s 네트워크 로드 밸런싱을 고속의 유연하고 프로그래밍 가능한 LB 서비스를 제공



•그러나 온프레미스 및 엣지 배포의 경우 기본적으로 외부 로드 밸런서 제공업체라는 서비스 유형이 없습니다. 오랫동안 Google에서 제공하는 MetalLB가 유일한 선택이었습니다. 그러나 엣지 서비스는 GTP, SCTP, SRv6 등과 같은 이색적인 프로토콜이 너무 많고 모든 것을 원활하게 작동하는 솔루션에 통합하는 것이 매우 어려웠기 때문에 완전히 다른 차원의 문제입니다.

Source: <https://ebpf.io/applications/>

The screenshot shows a web browser displaying the 'eBPF Project Landscape' page. The page features a yellow header with 'eBPF summit 2022 (28-29 September)' and a 'Register Now!' button. Below the header is the eBPF logo and a navigation menu. The main content area is titled 'Applications (Emerging)' and lists 'LoxiLB' as an 'eBPF based cloud-native load-balancer for 5G Edge'. It includes links for 'Website' and 'GitHub' and a detailed description of the project.



HTTPS://WWW.LOXILB.IO/

❖ <https://www.loxilb.io/>

○ github

LoxiLB

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English

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Flexible & Extensible
Cloud-Native
Service Load-Balancer

eBPF based cloud-native load-balancer

Visit our github

LOAD BALANCE HIGH AVAILABLE

What is LoxiLB ?



LoxiLB is a fully open-source "external" service load-balancer for cloud-native workloads written from scratch using eBPF as its core-engine and based on Go Language.

Source: <https://ebpf.io/applications/>



USER MANUAL

I. LoxiLB 개요	3
<ul style="list-style-type: none">• loxilb 도커 이미지 pull/run 실행하기• loxilb 로드밸런서 구성하기• loxilb 로드밸런서 모드	
II. LoxiLB 명령어	15
<ul style="list-style-type: none">• 로브밸런서 정보 확인 / 실행 / 구성• Loxilb 명령어별 실행• Session Recorder	
Appendix	33
<ul style="list-style-type: none">• endpoint / fdb / firewall / ip / lb• mirror / neighbor / policy / route• session / sessionulcl / vlan / vlanmember• vxlan / vxlanpeer	

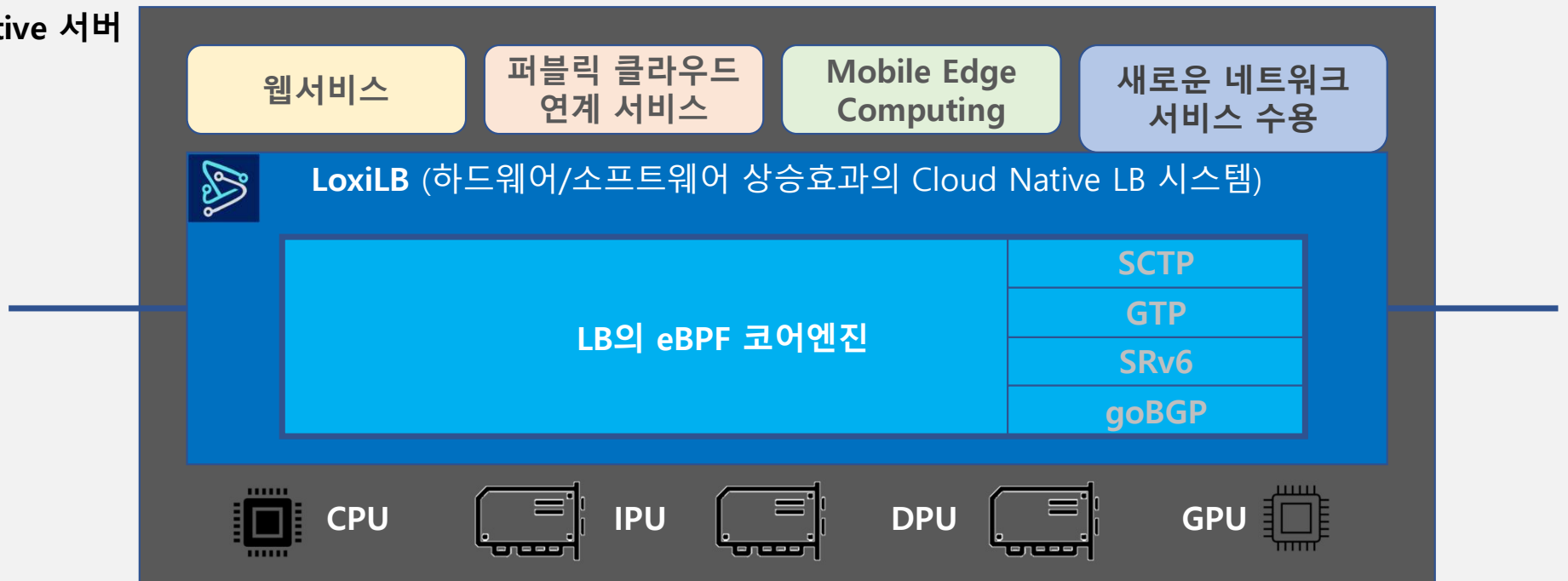


JSAHN99 (ENGINEER)

❖ Jsahn99 (Engineer in Korea)

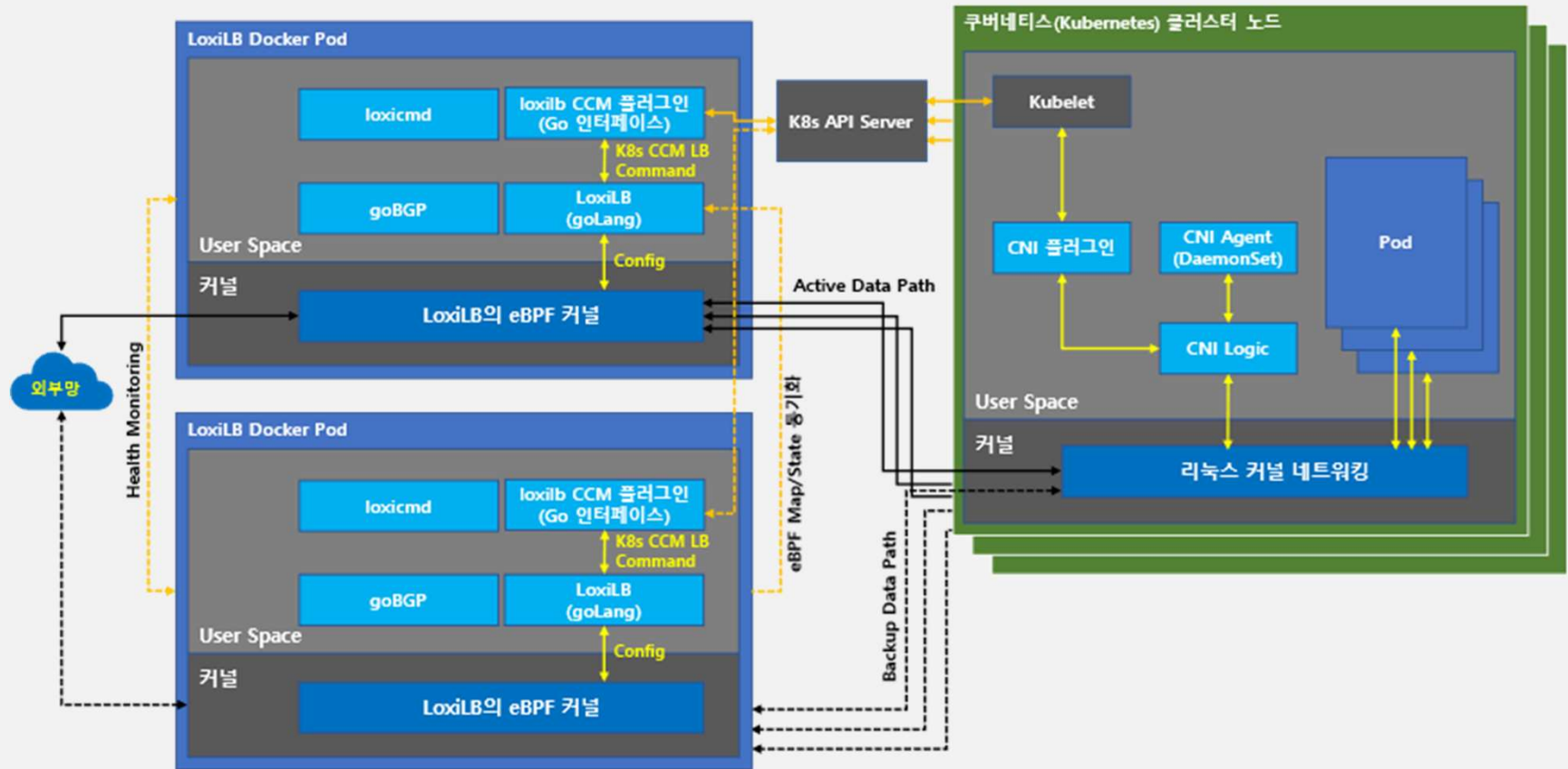
- 한글 문서 작업
- Engineer View Support: Versioning, Training, AWS Marketplace (0.8.3)

Cloud Native 서버



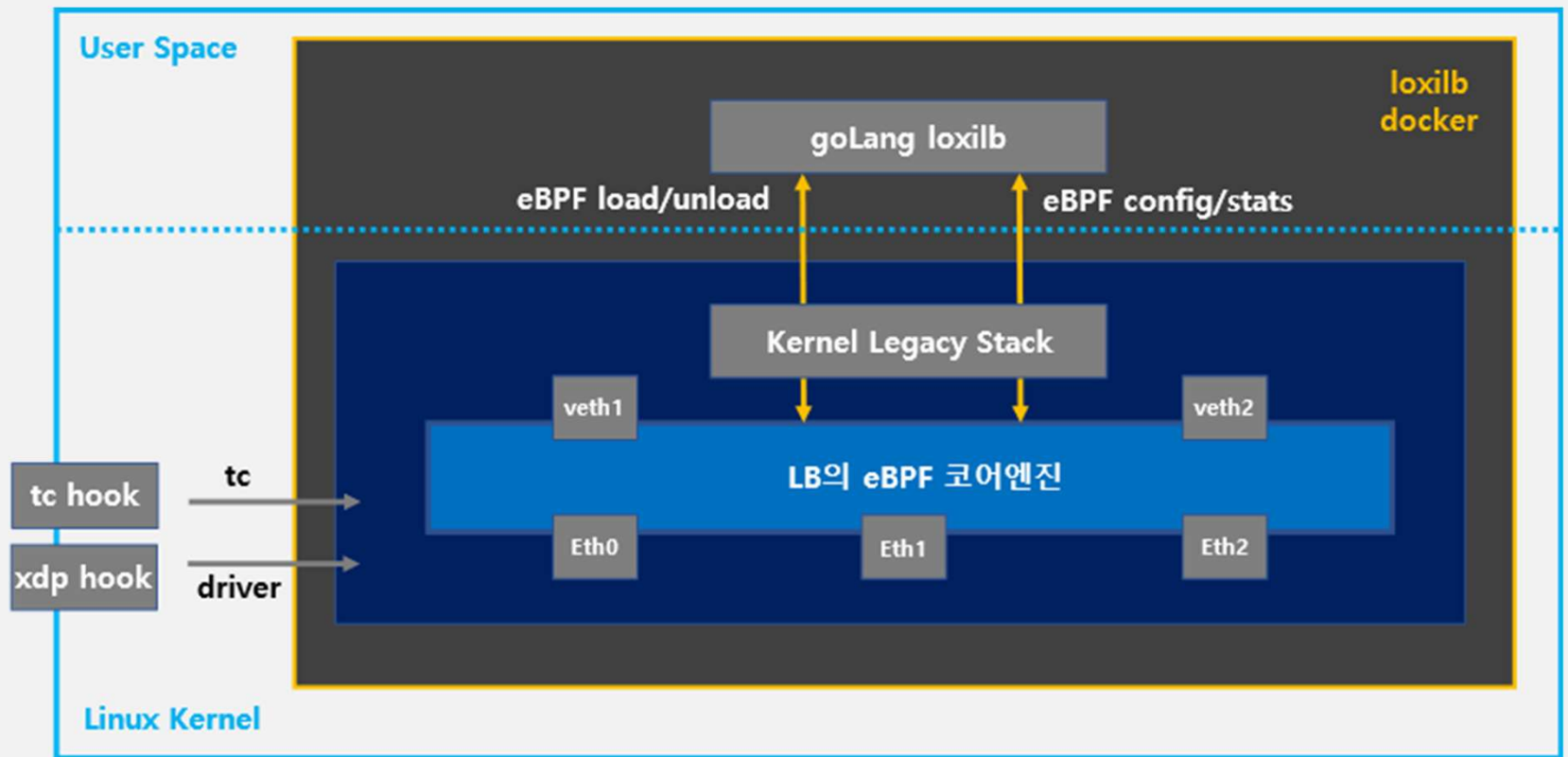
'LOXILB'의 CLOUD NATIVE 인프라 구성

❖ 'LoxiLB'의 Cloud Native 인프라 구성



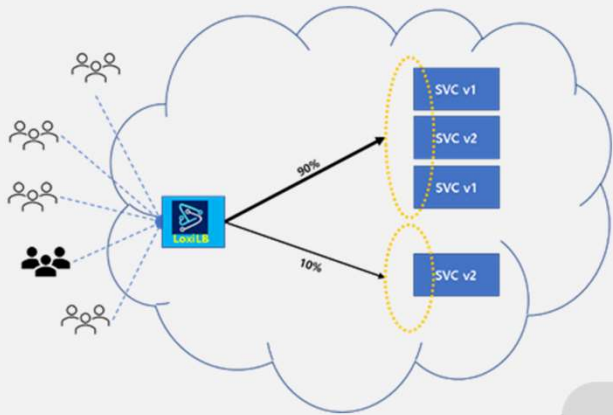
LOXILB의 EBPF 구성

❖ LoxiLB의 eBPF 구성

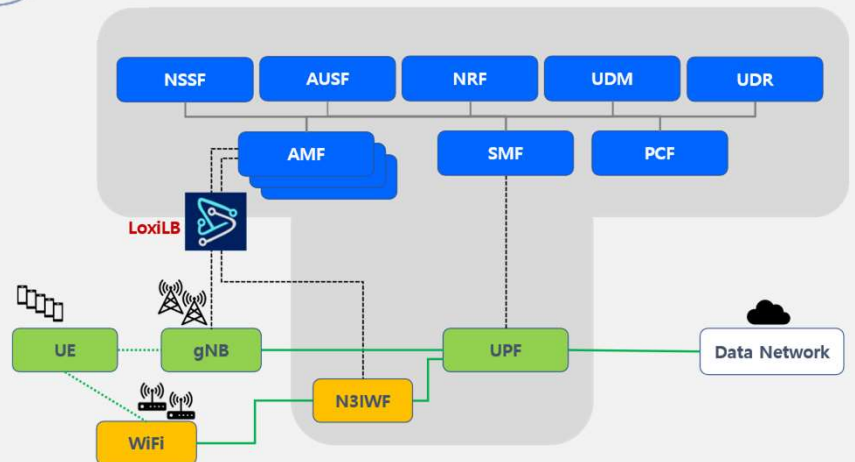


USE CASE

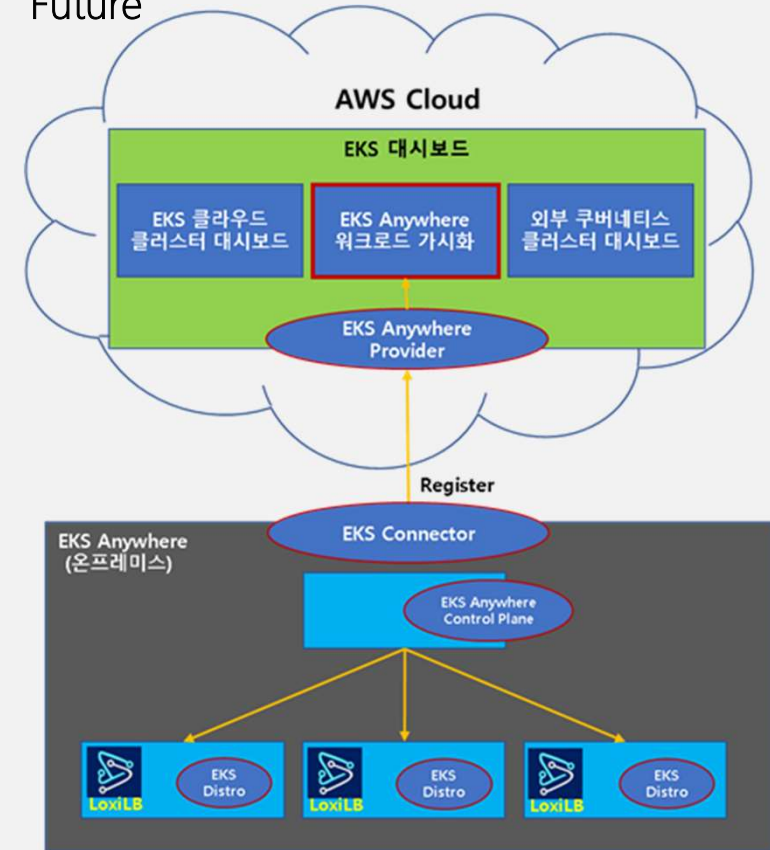
❖ Use Cases



Weighted Round-Robin (Canary Deployment)



Future





**THANK
YOU**