Navigating the World of API Gateways

A Comparative Analysis of Open Source Solutions

Outline

Why API Gateway

Why API Gateway

Challenges

1. Uncontrolled API Traffic
2. Security Risks
3. Performance Bottlenecks
4. Lack of Observability

API Gateway and its role

An API Gateway is a **reverse proxy** that sits between clients and backend services, acting as a centralized traffic manager.

Traffic Management & Request Routing

1. Route incoming API requests to the correct backend services based on request params.
2. Support for different protocols: **REST**, **gRPC**, **GraphQL**, **WebSockets**, and even **TCP/UDP** traffic
3. Traffic splitting

Performance Optimization

1. Load Balancing
2. Caching
3. Compression
4. Request/response transformation

Security & Authentication

Acts as a central security layer for all API calls

1. OAuth2, JWT, OpenID Connect
2. API Keys
3. mTLS

Observability & Monitoring

1. Metrics collection
2. Logging and tracing
3. Real time dashboards

Extensibility & Customization

1. Built-in plugins
2. Custom plugins

Introduction to Open-Source API Gateways

Why open-source

➔ Cost-Effective: No Licensing Fees

➔ Transparency & Security: No Black Box

➔ Community-Driven Innovation & Rapid Updates

Open-source API Gateways

1. Apache APISIX
2. Kong
3. Tyk
4. KrakenD
5. Gloo Edge

Apache APISIX

Written in	OpenResty (Nginx + LuaJIT)
License	Apache 2.0
Deployment model	Standalone, Kubernetes-native
Storage options	Files, etcd
Configuration options	Files, Admin API, Kubernetes CRDs
Plugin system	Lua, Go, Python, Node.js, WASM
Authentication	JWT, OAuth2, mTLS, OpenID, API Keys
Observability	Prometheus, Datadog, OpenTelemetry, SkyWalking
Hot reload	Yes
Commercial support	Yes (by api7.ai)

Kong

| Written in	Lua (OpenResty)
License	Apache 2.0
Deployment model	VM, bare metal, Kubernetes-native
Storage options	DB-less, Konnect, traditional (db), Hybrid
Configuration options	Files (via decK), Kubernetes CRDs, Admin API
Plugin system	Lua, Go, Python, JavaScript
Authentication	JWT, OAuth2, LDAP, API Keys
Observability	Prometheus, OpenTelemetry, Datadog, Zipkin
Hot reload	Yes
Commercial support	Yes (Kong Enterprise and Kong Connect)

Tyk

Written in	Go
License	MPL
Deployment model	Standalone, Docker, Kubernetes, Hybrid Cloud
Storage options	Redis (for GW), MongoDB/Postgres (for dashboard)
Configuration options	JSON, Admin API
Plugin system	Go, JavaScript, Python, Lua, WASM
Authentication	JWT, OAuth2, mTLS, Auth tokens
Observability	Prometheus, OpenTelemetry, Datadog
Hot reload	Yes
Commercial support	Yes (Tyk Enterprise)
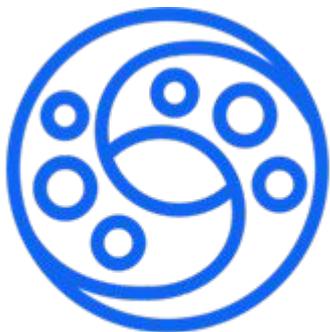
KrakenD

Written in	Go
License	Apache 2.0
Deployment model	Docker, Kubernetes, bare-metal
Storage options	**Stateless**, no DB required
Configuration options	Files
Plugin system	Go
Authentication	JWT, OAuth2, Keycloak, mTLS, Auth0
Observability	Prometheus, OpenTelemetry, Datadog, and many others
Hot reload	Not recommended in prod
Commercial support	Yes (Enterprise)

Gloo Edge

Written in	Go (Envoy-based)
License	Apache 2.0
Deployment model	Docker (for development), Consul, Kubernetes-native
Storage options	Files, Consul
Configuration options	Files, Kubernetes CRD
Plugin system	Go
Authentication	JWT, OAuth2, LDAP
Observability	Prometheus, Grafana, Datadog
Hot reload	Yes
Commercial support	Yes (solo.io)

Comparative Analysis

Performance

API Gateway	Concurrency model	Plugin execution	Links
APISIX	Multi-threaded (Nginx + LuaJIT)	LuaJIT (Fast, Native Nginx)	Benchmarks, APISIX vs Kong
KrakenD	Multi-threaded (Go, Goroutines)	Go (Lightweight, Fast)	KrakenD vs Kong vs Tyk
Tyk	Multi-threaded (Go)	Go-based Plugins	Benchmarks, Tyk vs Kong
Gloo Edge	Envoy-based (Go)	Go-based Plugins	Benchmarks
Kong	Single-threaded (Lua + OpenResty)	Lua (Slower than APISIX)	Benchmarks

Websocket support

APISIX	Yes
Kong	Yes
Tyk	Yes
KrakenD	Yes (but only in Enterprise version)
Gloo Edge	Yes

gRPC support

APISIX	Yes
Kong	Yes
Tyk	Yes
KrakenD	No
Gloo Edge	Yes

License

APISIX	Apache 2.0
Kong	Apache 2.0
Tyk	MPL
KrakenD	Apache 2.0
Gloo Edge	Apache 2.0

Customers

APISIX	NASA, Vivo, Oppo, XPeng, Tencent, Airwallex, Lotus
Kong	PayPal, Nasdaq, Verifone, Volvo, Wayfair, AppDynamics
Tyk	NatWest, Bell, Soundcloud, T Mobile, Global Blue
KrakenD	America's Navi, Oracle, Universal, Letgo, AMC Networks
Gloo Edge	Tomtom, Domino's, Xero, FitchRating, Grainger

Future trends

Future trends

➔   AI plugins simplifying access to LLM providers

➔   Kubernetes Gateway API replacing ingress

➔   GraphQL and gRPC-native support

➔   API Monetization & Marketplaces

Questions?

Linkedin: @rastiehaiev

References

How to choose the right API Gateway for your platform

11 Open-Source API Gateways

A Guide for Choosing the Best API Gateway

10 Best API Gateways and Management Tools in 2024

Top 10 Open-Source API Gateways to Add to Your Tech Stack

6 Best Open-Source API Gateways

16 Best API Gateway for Modern Applications