Security in Applications

API Management and Service Mesh (ISTIO)

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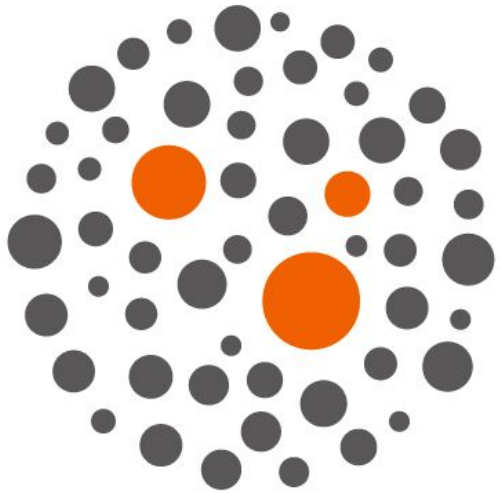
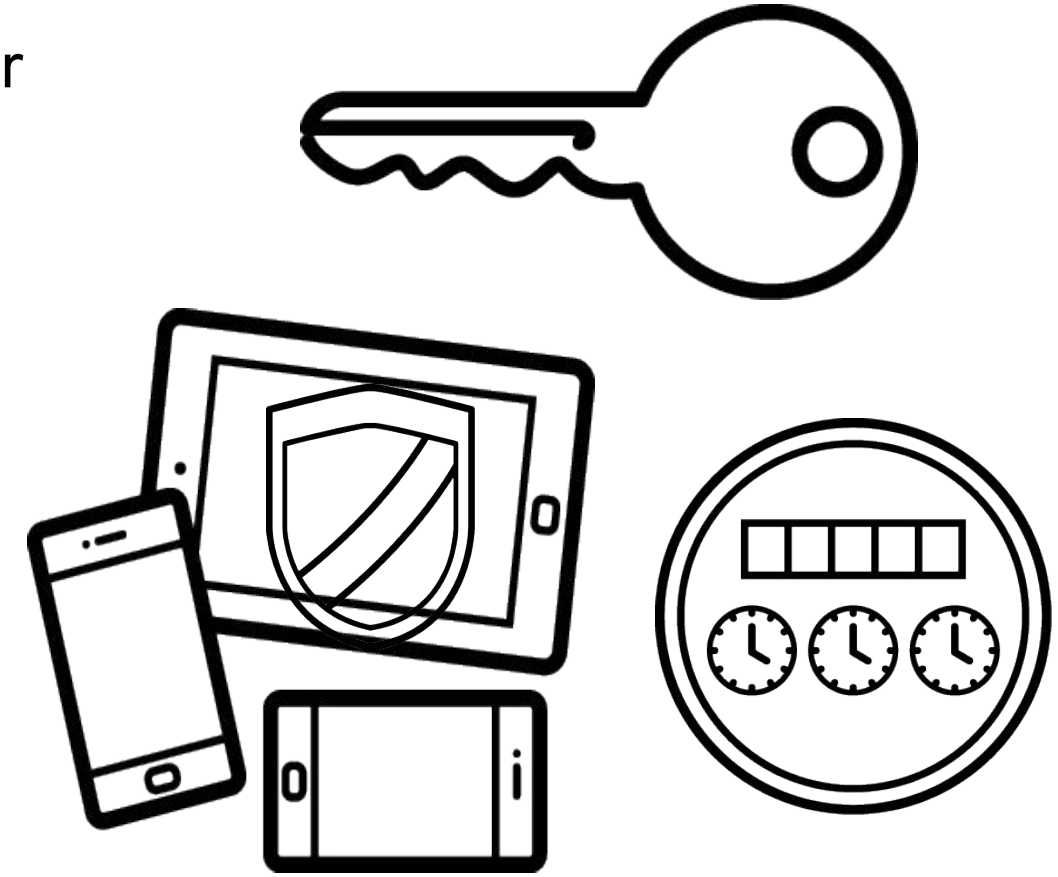
API Management (3 Scale)



APPLICATION API MANAGEMENT

Consider configuring an API gateway for container platform & application APIs

- Authentication and authorization
- LDAP integration
- End-point access controls
- Rate limiting



RED HAT 3SCALE API MANAGEMENT

Key capabilities

Control

- Security
- Key management
- Rate limiting
- Policy enforcement
- App and user management
- Provisioning

Visibility

- Analytics
- App tracking
- User tracking
- Traffic alerts
- Engagement
- Developer support

Flexibility

- Distributed
- Multi-department
- Multi-environment
- Highly scalable
- Powerful APIs
- Webhooks

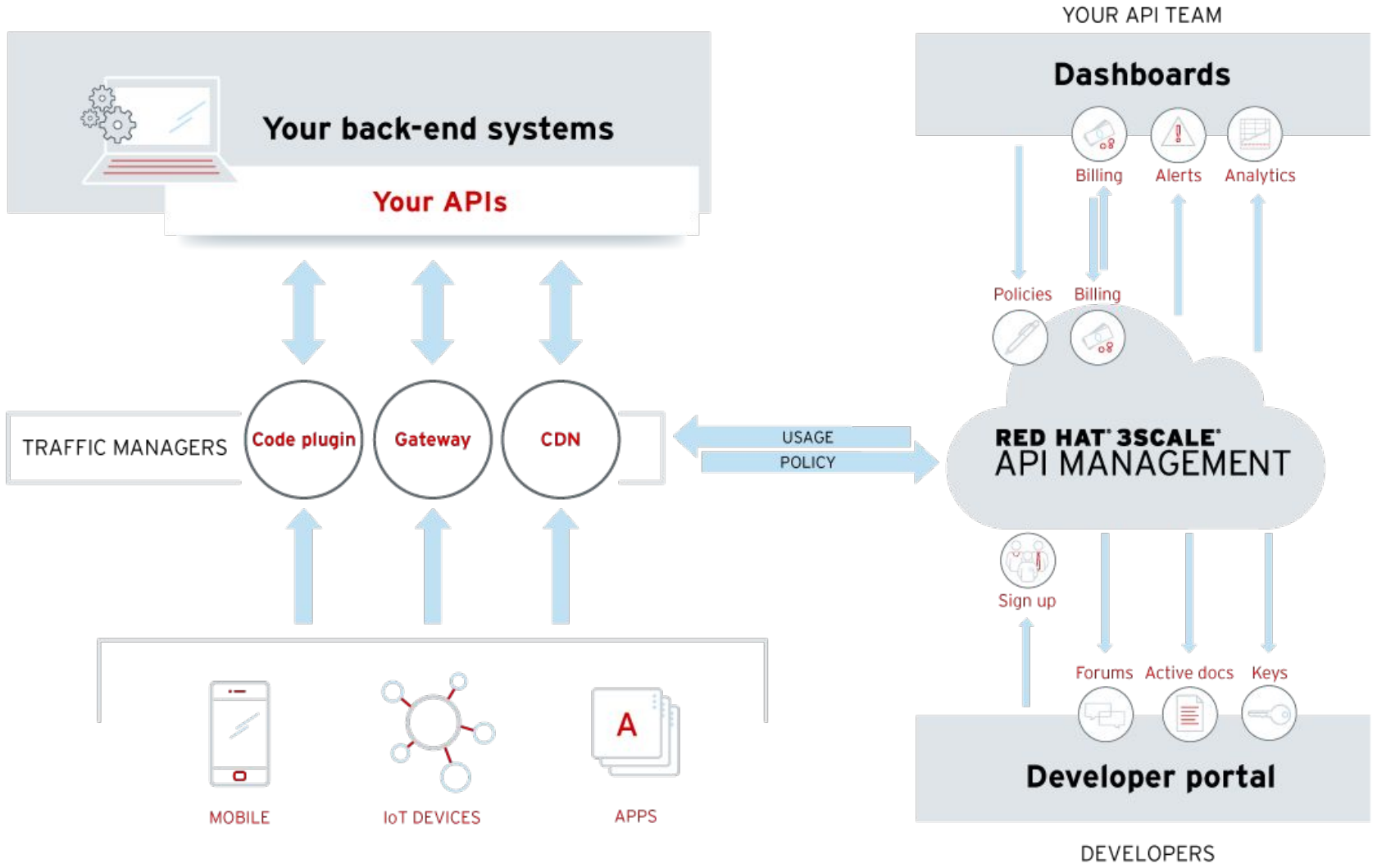
Flexible distributed control

Modular

No single point of failure

Hybrid cloud access

Highly scalable



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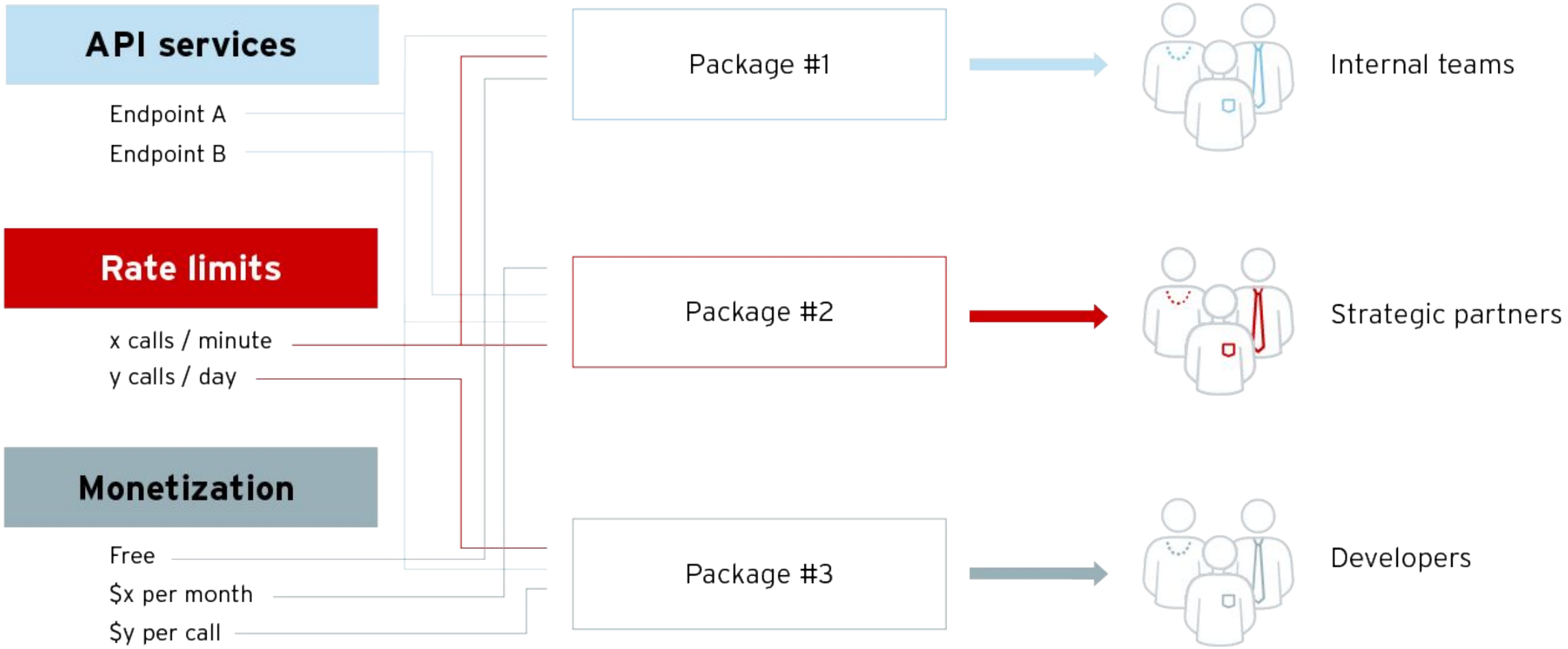
API contracts and rate limits

Package your APIs. Create access tiers. Set rate limits.

Allow/restrict access to your API endpoints along with rate limits.



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API SECURITY

Top Schemes

Most API Management platforms supports the following security schemes:

- **API Key** single token string
- **APP ID/APP Key (Basic Auth)** two token strings i.e. username, password
- **OAuth** authentication framework to delegate access
- **OpenID Connect (OIDC)** simple identity layer on top of OAuth framework

OAUTH 2.0

From 20,000 FT

OAuth (Open Authorization) is an open standard for access delegation:

- One service can request access to resources on another service on the behalf of the user.

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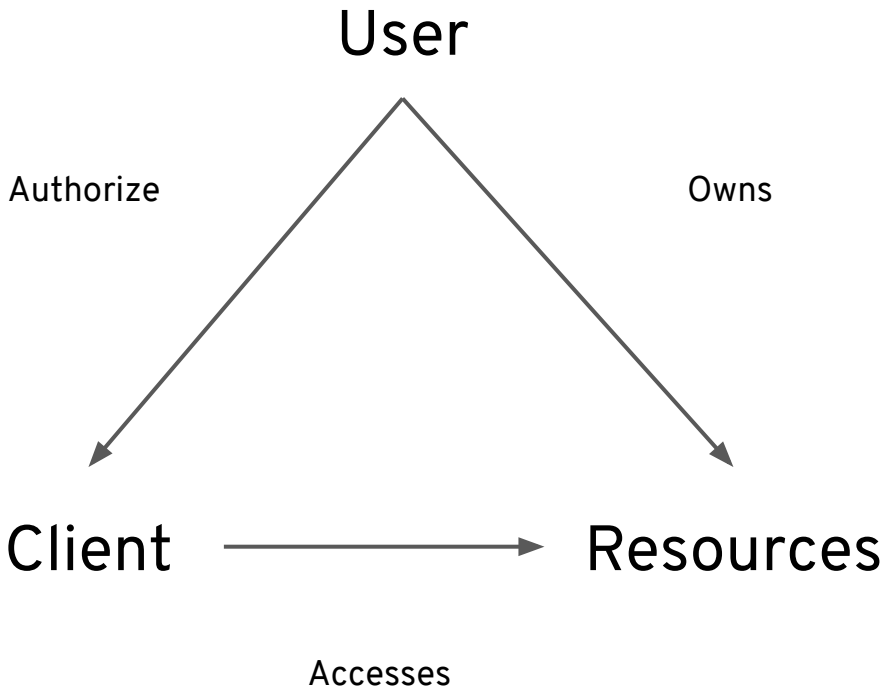


OAUTH 2.0

Terminology

- **Resource Owner:** generally yourself.
- **Resource Server:** server hosting protected data (for example Google hosting your profile).
- **Client:** application requesting access to a resource server (i.e. a mobile application).
- **Authorization Server:** server issuing token to the client. This token will be used for the client to request the resource server.

OAUTH 2.0

Grant / Flow Types

Authorization Code Flow

The most secure and used where a user logs into Identity server and grants access to Application to retrieve their data

Client Credentials Flow

Only Application data is passed in a single request for an Access Token

Implicit Flow

User logs in but secret is not passed

Resource Owner Password Flow

Application, username and password data is passed in a single request for an Access Token

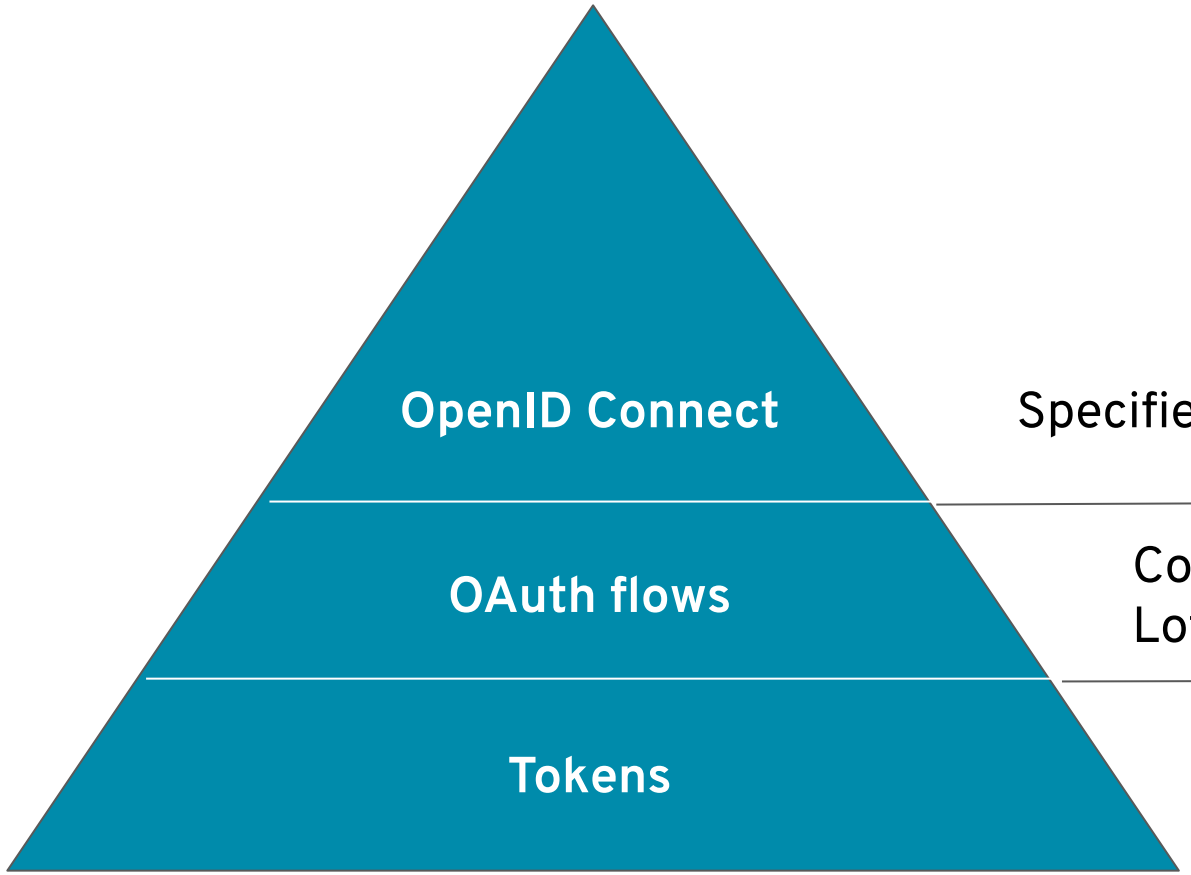
OPENID CONNECT

Overview

- Built on top of the OAuth 2.0 protocol
- Allows clients to verify the identity of an end user and obtains basic profile information
- RESTful HTTP API, using JSON as a data format
- Like SAML - but not just webpage centric, easier to implement.

OPENID CONNECT

Layered Security Standards



Specifies JWT for token, and some extensions

Core delegation flows.
Lots of flexibility (perhaps too much?)

Wide variety of token and encryption standards

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OPENID CONNECT

Vs OAuth 2.0

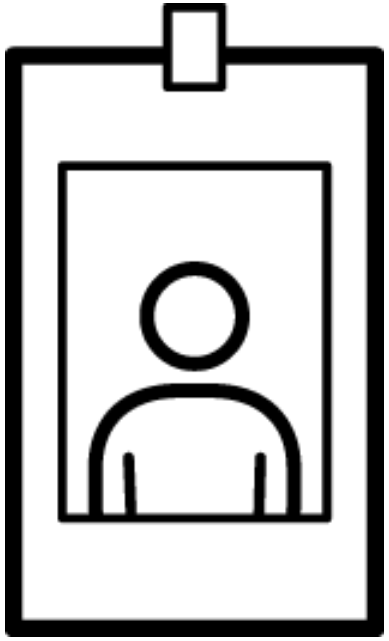
OpenID is an open standard for authentication. A user must obtain an OpenID account through an OpenID identity provider (for example, Google). The user will then use that account to sign into any website (the relying party) that accepts OpenID authentication.

OAuth 2.0 is an open standard for authorization. Confusingly, OAuth 2.0 is also the basis for OpenID Connect. OAuth 2.0 provides secure delegated access, meaning that an application, called a client, can take actions or access resources on a resource server on the behalf of a user, without the user sharing their credentials with the application.

OPENID CONNECT

ID Token

- Provides identity information to the application from the Authority Server
- Base64 encoded - easy to work with.



Name: John Doe

Type: Employee

Issued by: Company

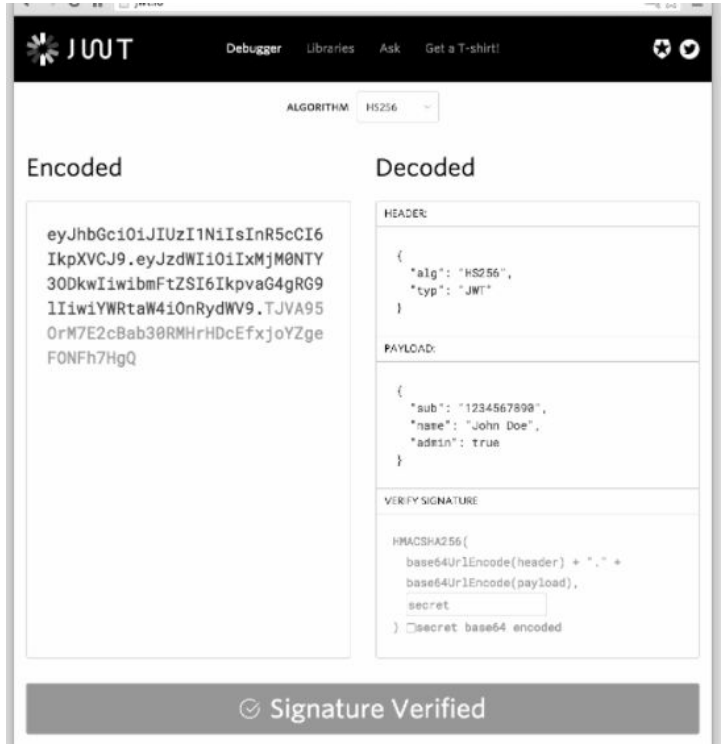
Expiration Date:

02-06-2019

JWT (“JOT”)

To The Rescue

- Signed by algo and verified by only correct key
- Contains user identity in form of claims (Private, public, reserved)
- For OIDC purpose, SSO is widely adopted in consumer/enterprise apps
- Eliminates the need to look up against a central access control list



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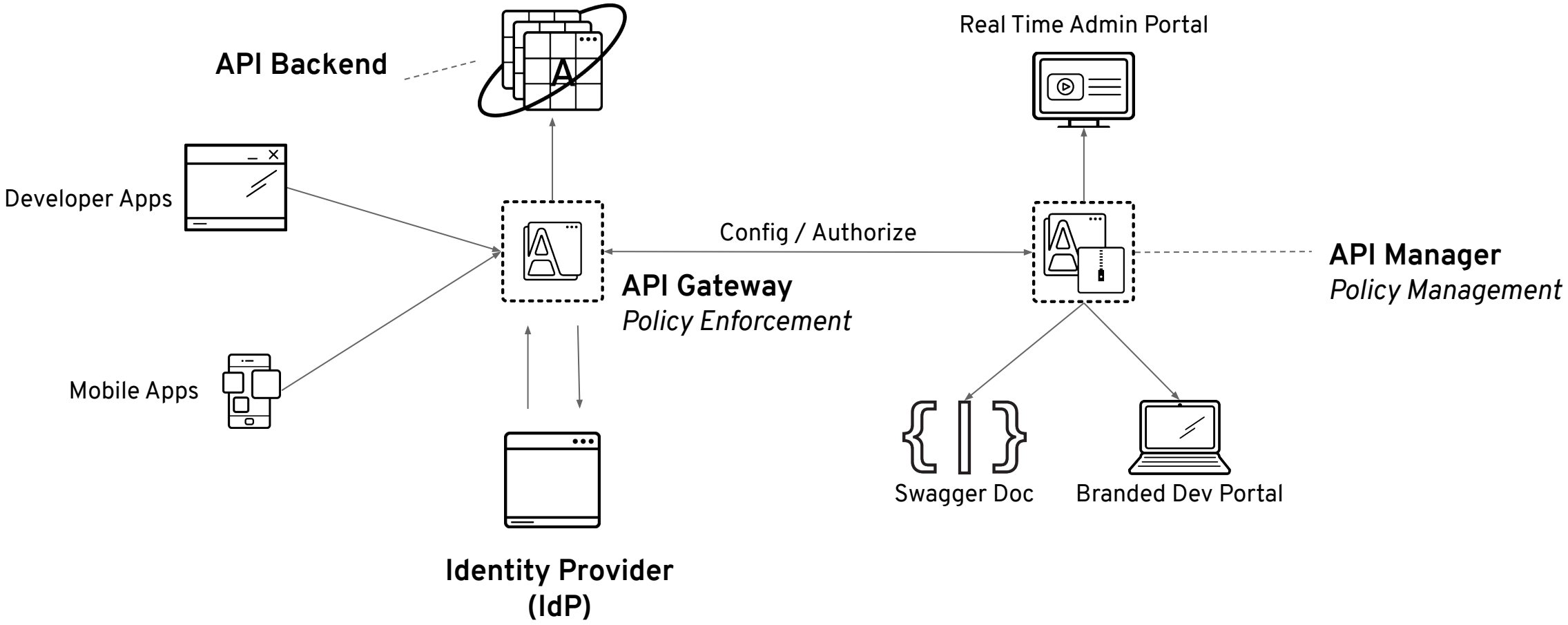
RED HAT 3SCALE API MANAGEMENT

System Architecture



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RED HAT 3SCALE API MANAGEMENT

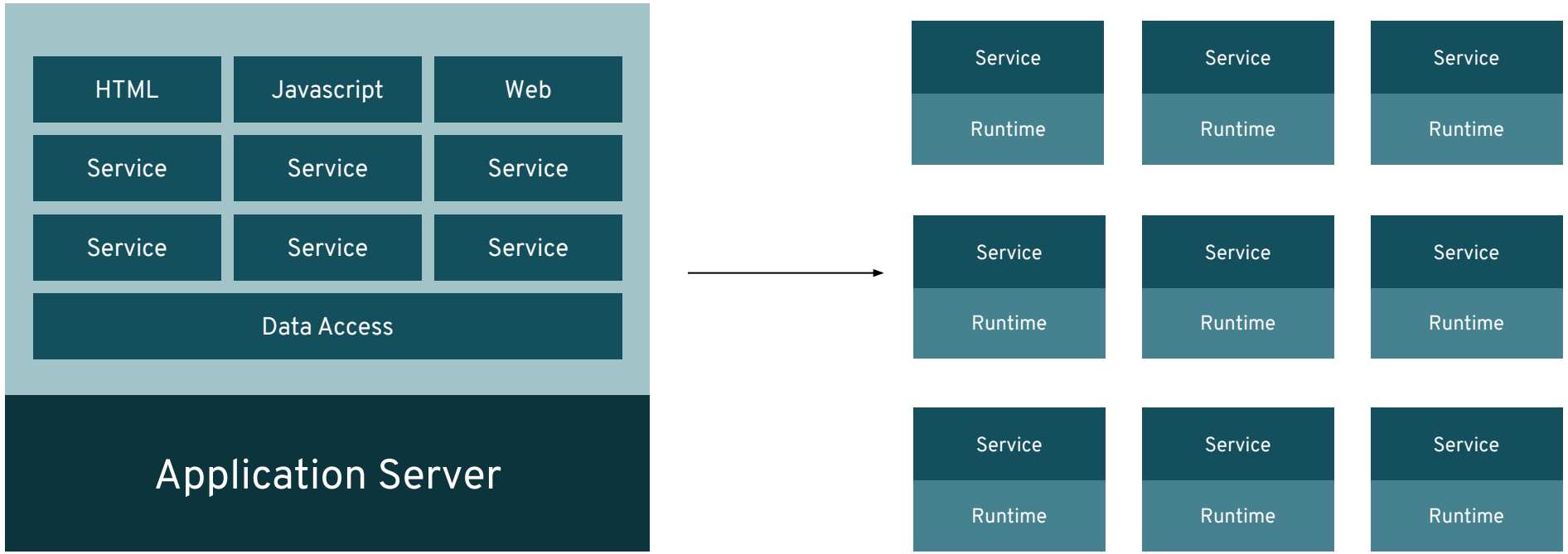
Gateway Operations

- Checks the timestamp for ‘expired’ token.
- Checks the client_id is still valid
- Performs a check on the signature of the JWT using RH SSO public key

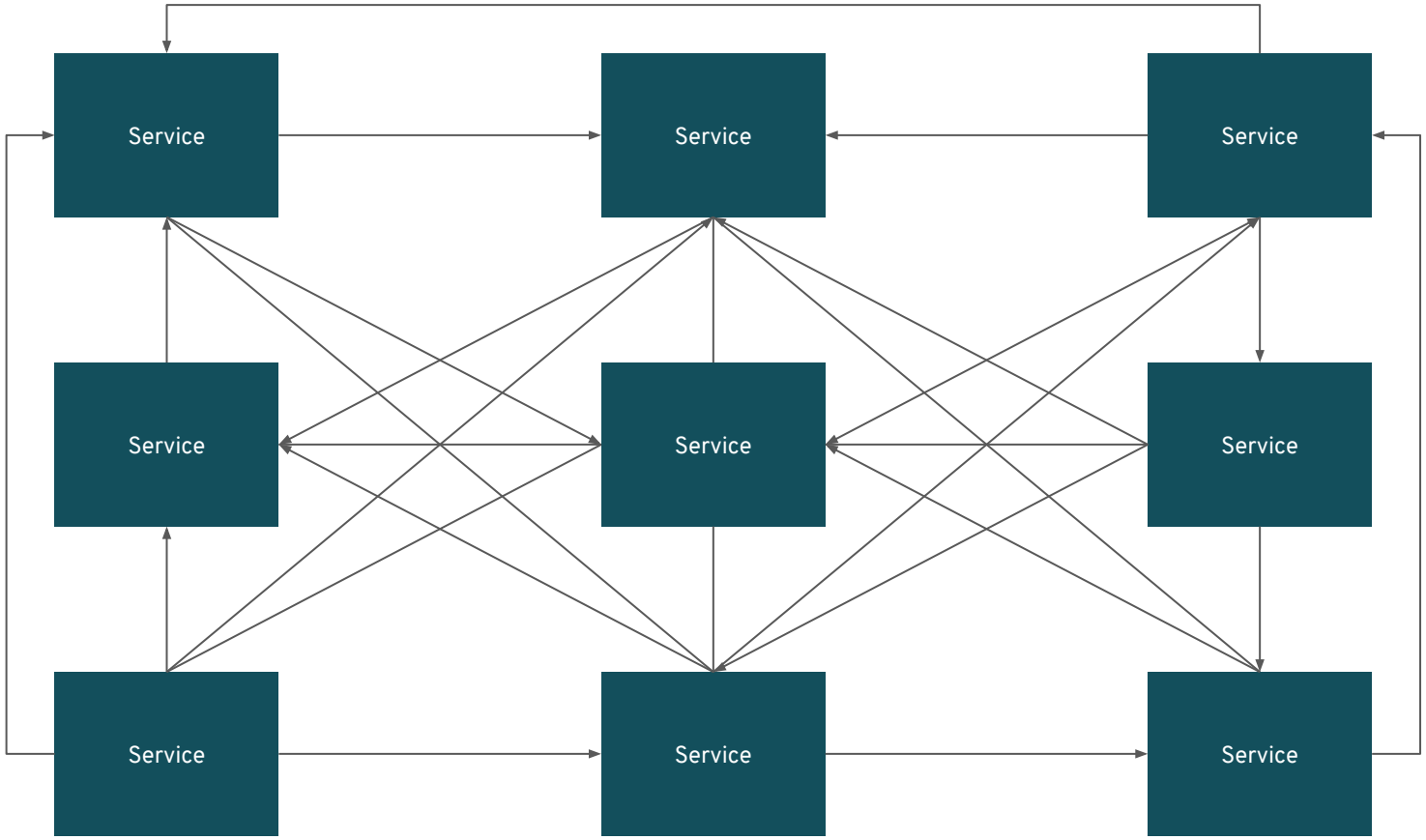
Red Hat Service Mesh (Istio)

~~MICROSERVICES~~ ARCHITECTURE

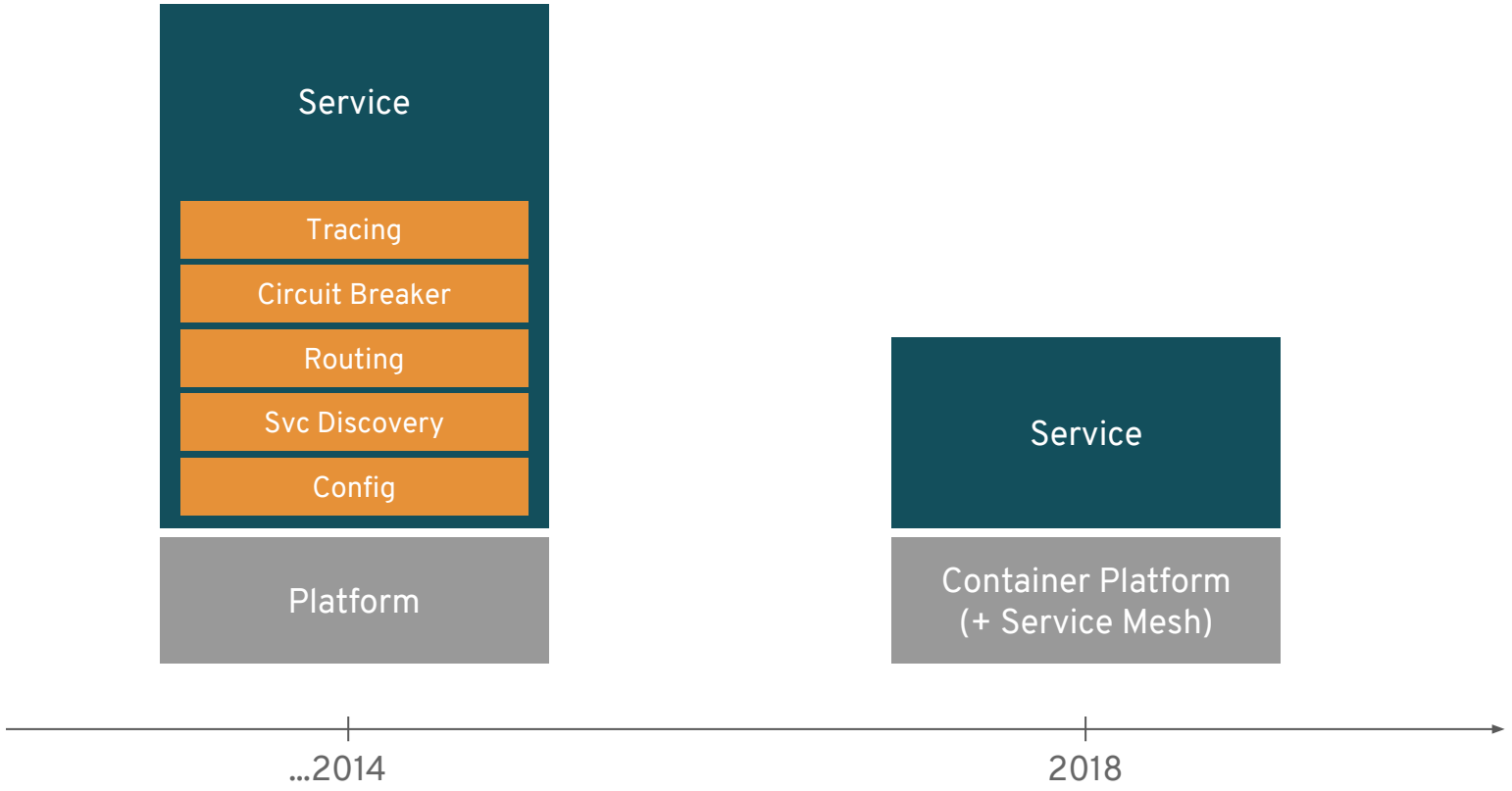
DISTRIBUTED



DISTRIBUTED ARCHITECTURE



A better way with a service mesh



A service mesh provides a **transparent** and **language-independent** network for connecting, observing, securing and controlling the connectivity between services.

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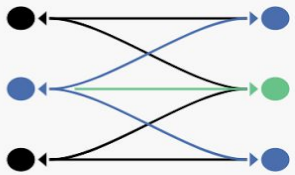
Istio

Connect, secure, control, and observe services.

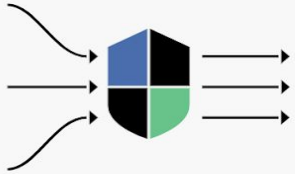


Connect

Intelligently control the flow of traffic and API calls between services, conduct a range of tests, and upgrade gradually with red/black deployments.

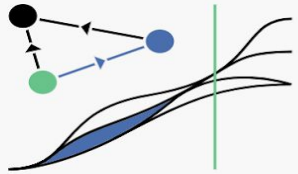
Secure

Automatically secure your services through managed authentication, authorization, and encryption of communication between services.



Control

Apply policies and ensure that they're enforced, and that resources are fairly distributed among consumers.

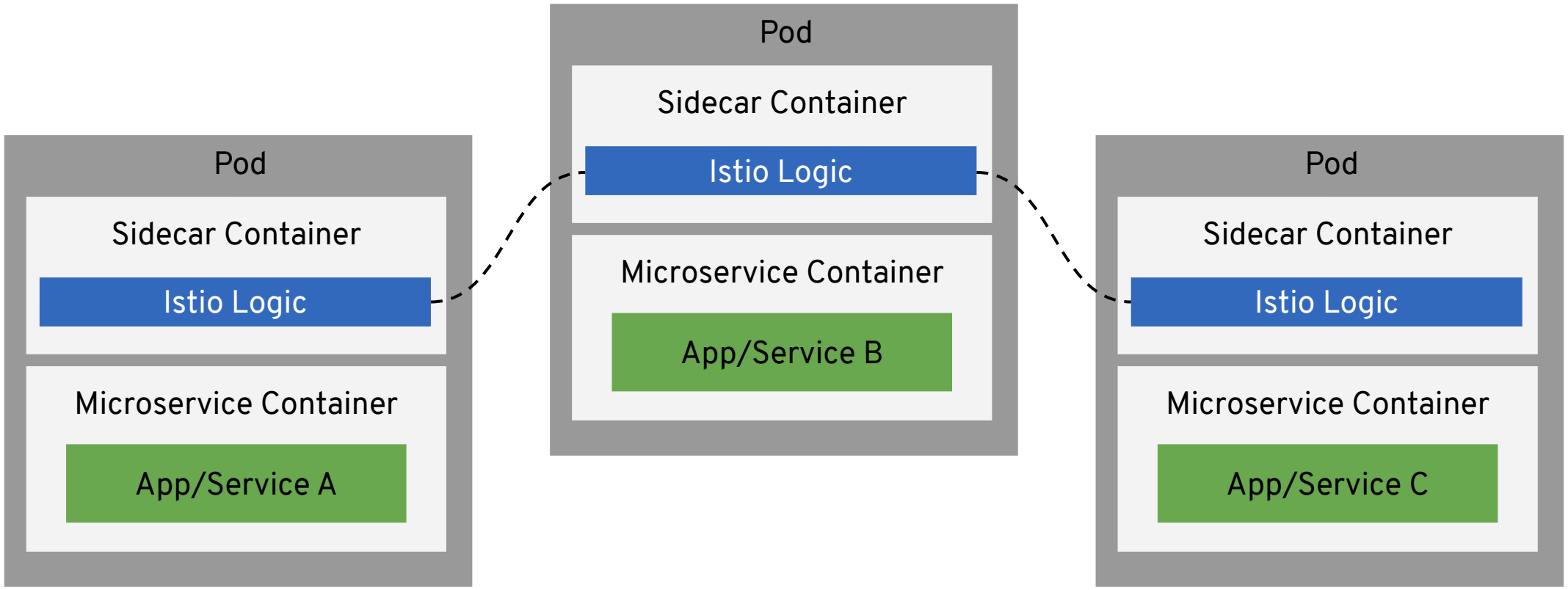


Observe

See what's happening with rich automatic tracing, monitoring, and logging of all your services.

MICROSERVICES WITH ISTIO

connect, manage, and secure microservices *transparently*



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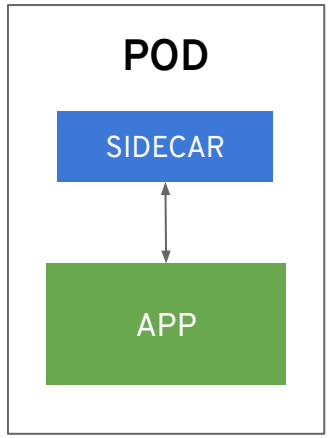
WHAT IS A SIDECAR?

A proxy instance that abstracts common logic away from individual services

SIDECAR PATTERN

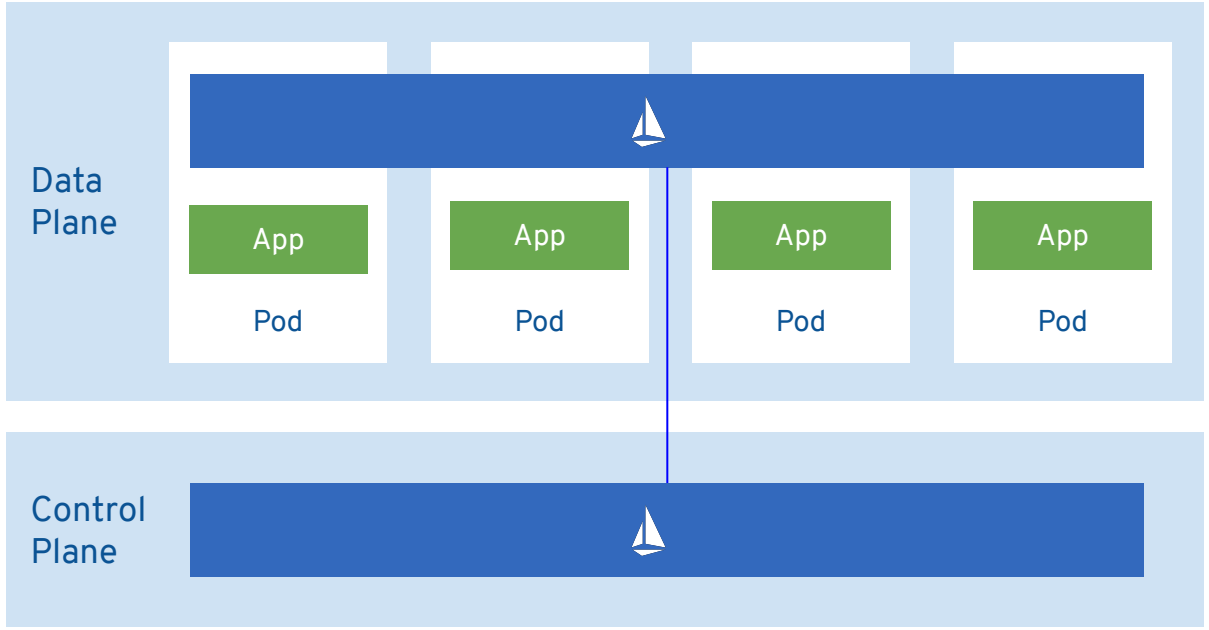
- A utility container in the same pod to enhance the main container's functionality
- Share the same network and lifecycle
- Istio uses an Istio Proxy (L7 Proxy) sidecar to proxy all network traffic between apps



ISTIO PROVIDES BOTH CONTROL AND DATA PLANES

The **data plane** is composed of a set of intelligent proxies (Envoy) deployed as sidecars that mediate and control all network communication between microservices.

The **control plane** is responsible for managing and configuring proxies to route traffic, as well as enforcing policies at runtime.



RED HAT OPENSHIFT

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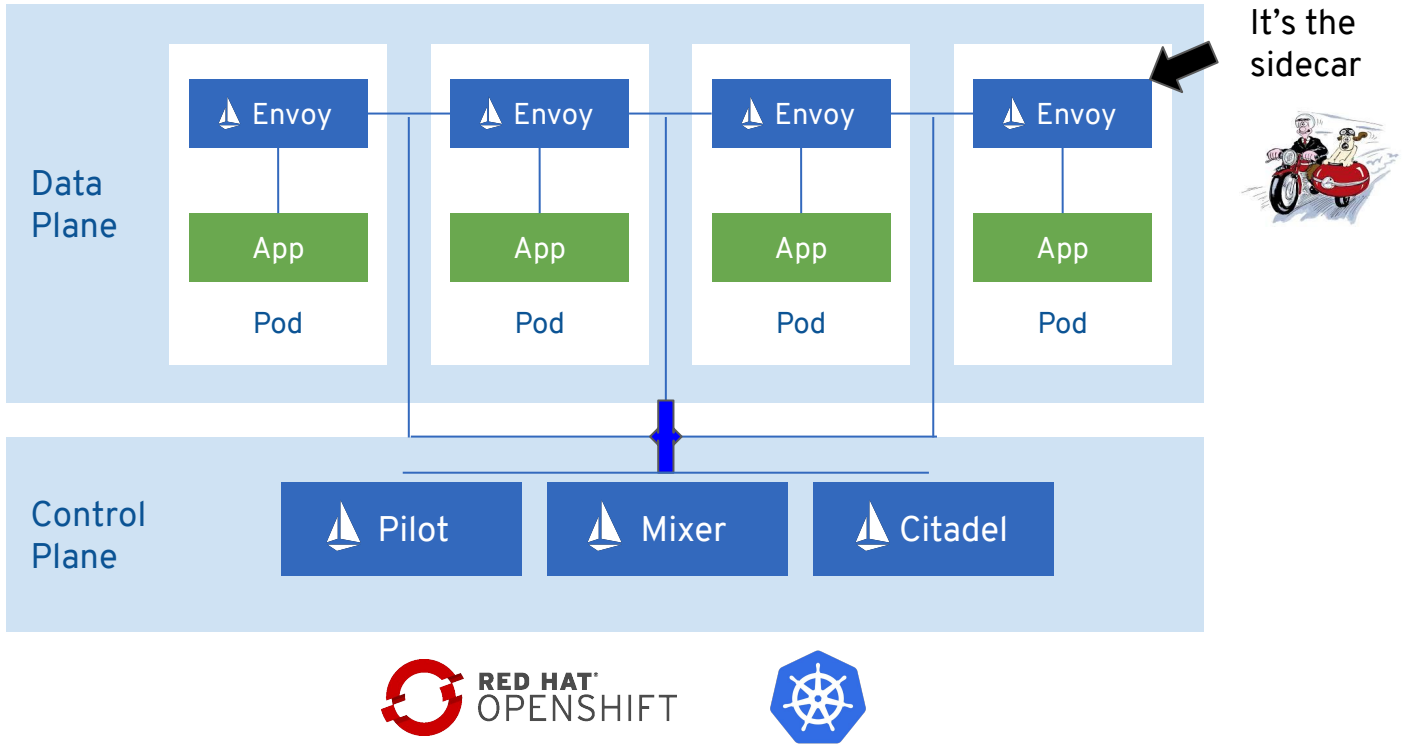
COMPONENTS OF ISTIO

Envoy, originally from Lyft - it's an intelligent proxy. Highly parallel non-blocking, network filtering, service discovery, health checking, dynamically configurable.

Pilot, the component responsible for managing a distributed deployment of Envoy proxies in the service mesh. Intelligent routing, traffic mgmt, resiliency

Mixer, which provides the policy and access control mechanisms within the service mesh. Monitoring, reporting, quotas - plugin-based.

Citadel, control service-service traffic based on origin and user. Key mgmt certificate authority.



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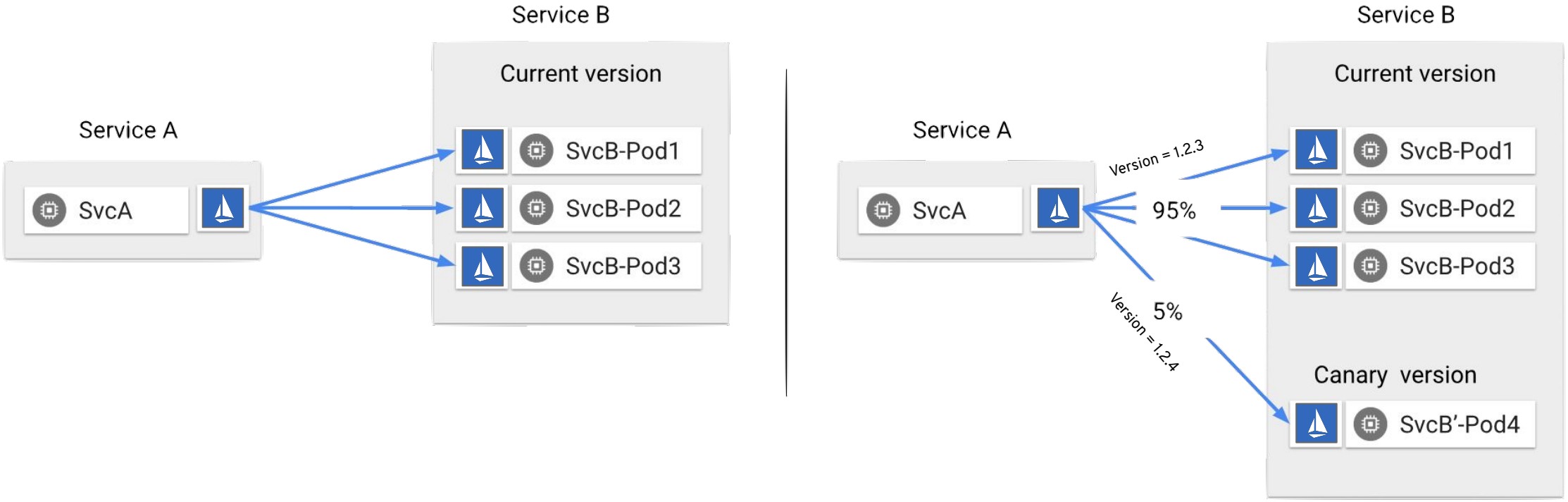
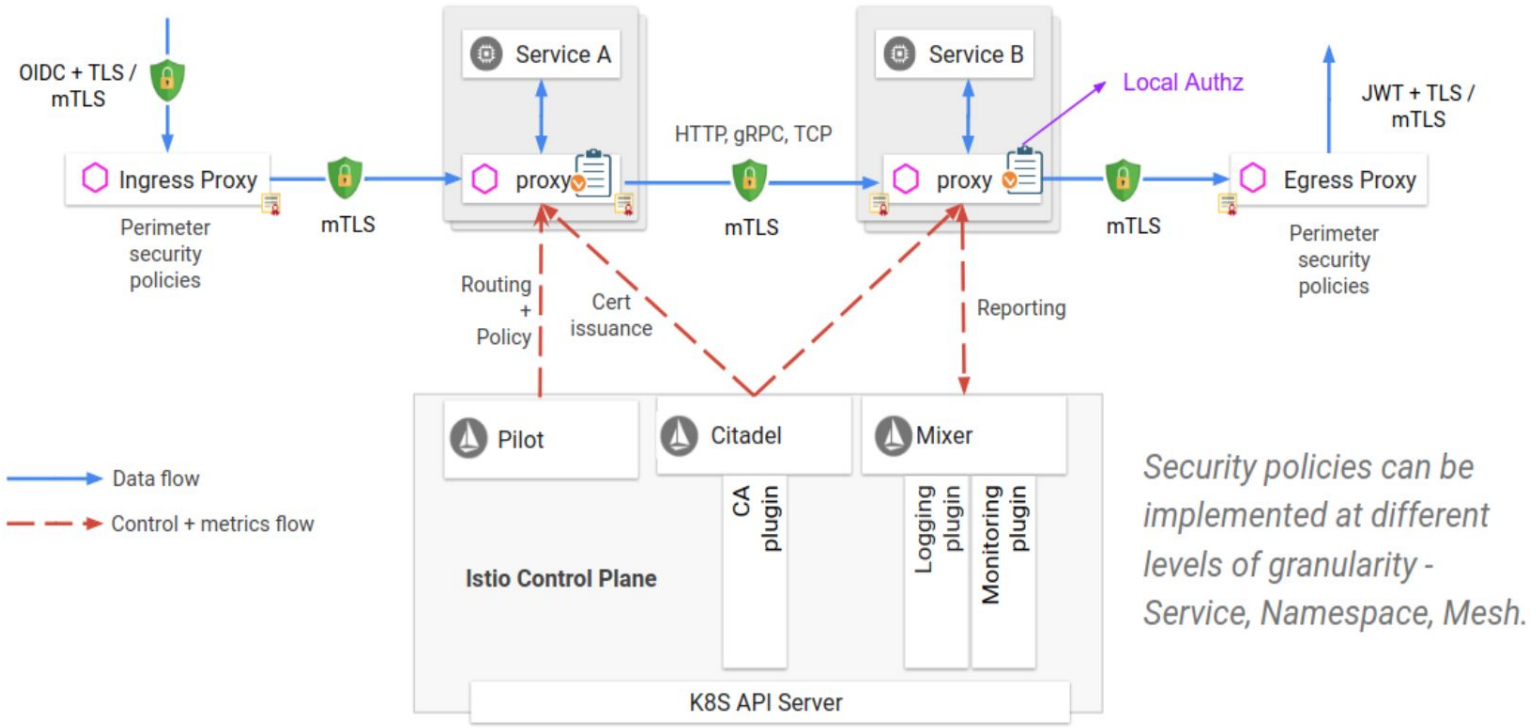
WHAT DOES CONNECT MEAN?



Discovery and Routing: Decoupled from infrastructure, load balancing modes, dynamic routing...
Advanced Deployments: A/B testing, gradual rollouts, canary releases, mirroring...
Failure, Health, and Testing: timeouts, retries, circuit breakers, fault injection, active health checks...

HOW DO YOU SECURE SERVICES?

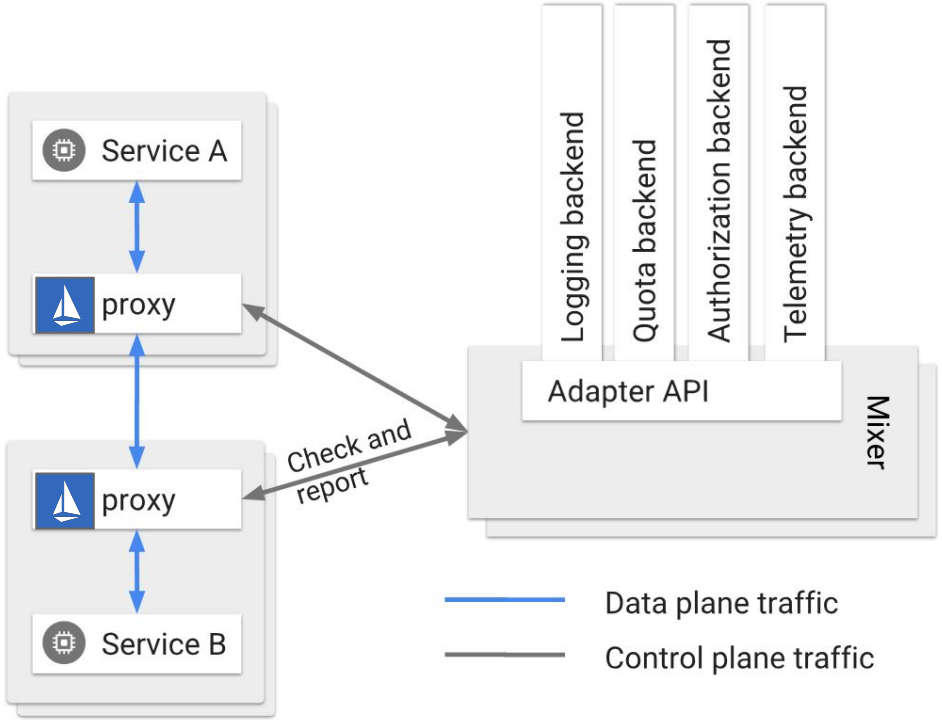


Security by default
no changes needed for application code and infrastructure

Defense in depth
integrate with existing security systems to provide multiple layers of defense

Zero-trust network
build security solutions on untrusted networks

WHAT CAN YOU CONTROL?



Restrict to 2 requests per second per IP :

```
quotas:
  - name: requestcount.quota.istio-system
      overrides:
      - dimensions:
              destination: someservice
                maxAmount: 2
```

Exempt if:

```
match(request.headers["cookie"], "user=*") == false
```

Set and Check Policy: Open-ended, connection limits, rate limits, simple denials, lists

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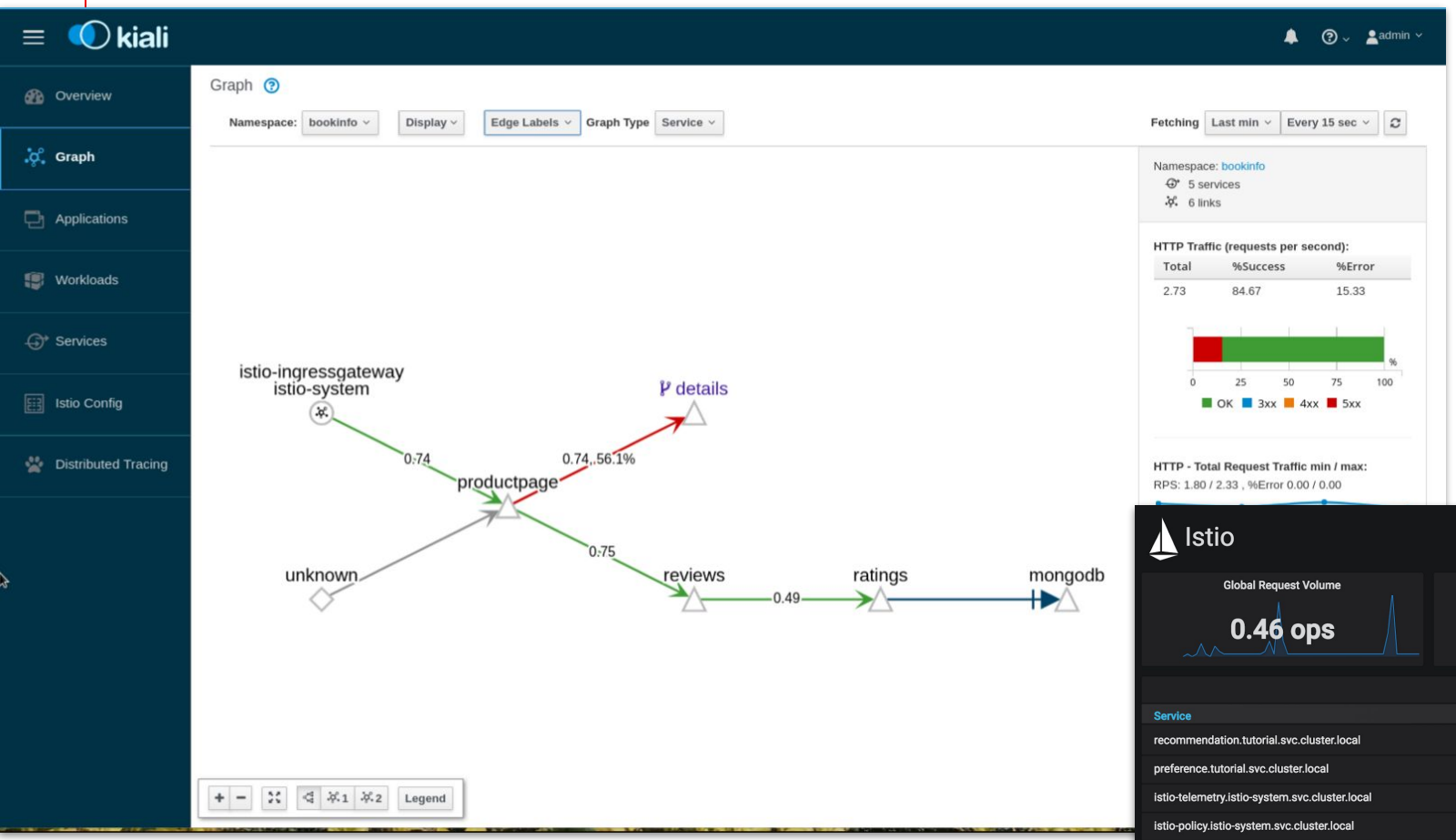
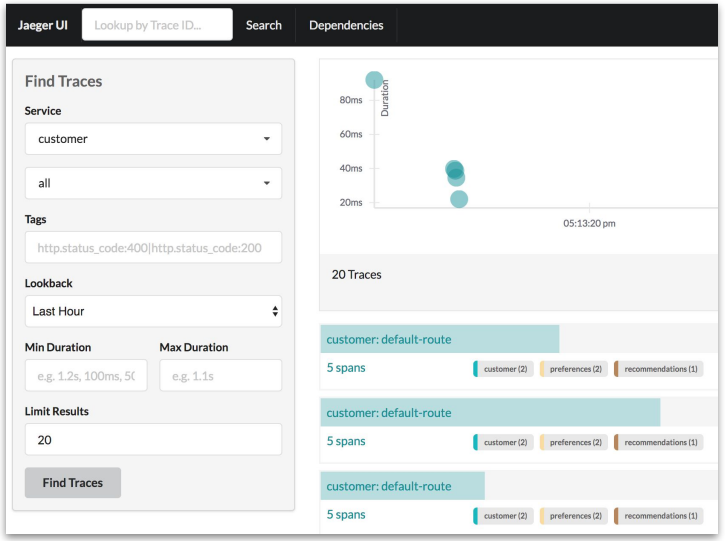
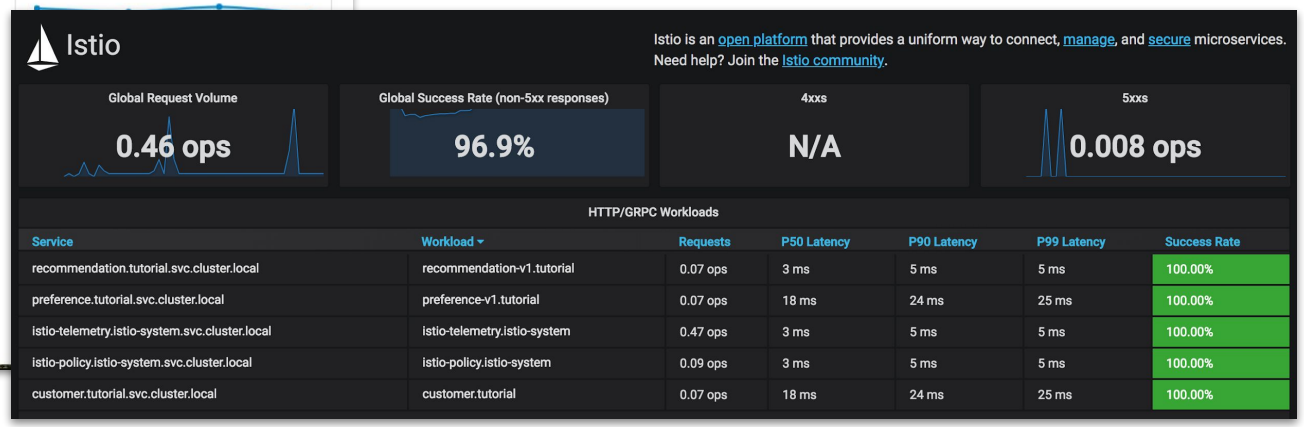
HOW CAN YOU OBSERVE?







Understand how your services are operating: Metrics, tracing, network visibility

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Thank you

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