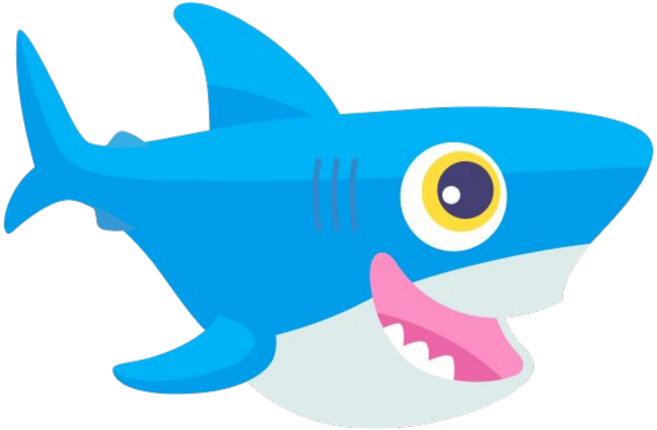
Enhancing delivery using Kubernetes Gateway API and Istio

About me



- Sachin Singh (@sachinkumarsingh092)
- Software Engineer at DigitalOcean

Continuous Deployment is a hard problem.

Normal rollouts provides no protection against a newer version of a deployment being rolled out, which may contain a faulty configuration or a bug.

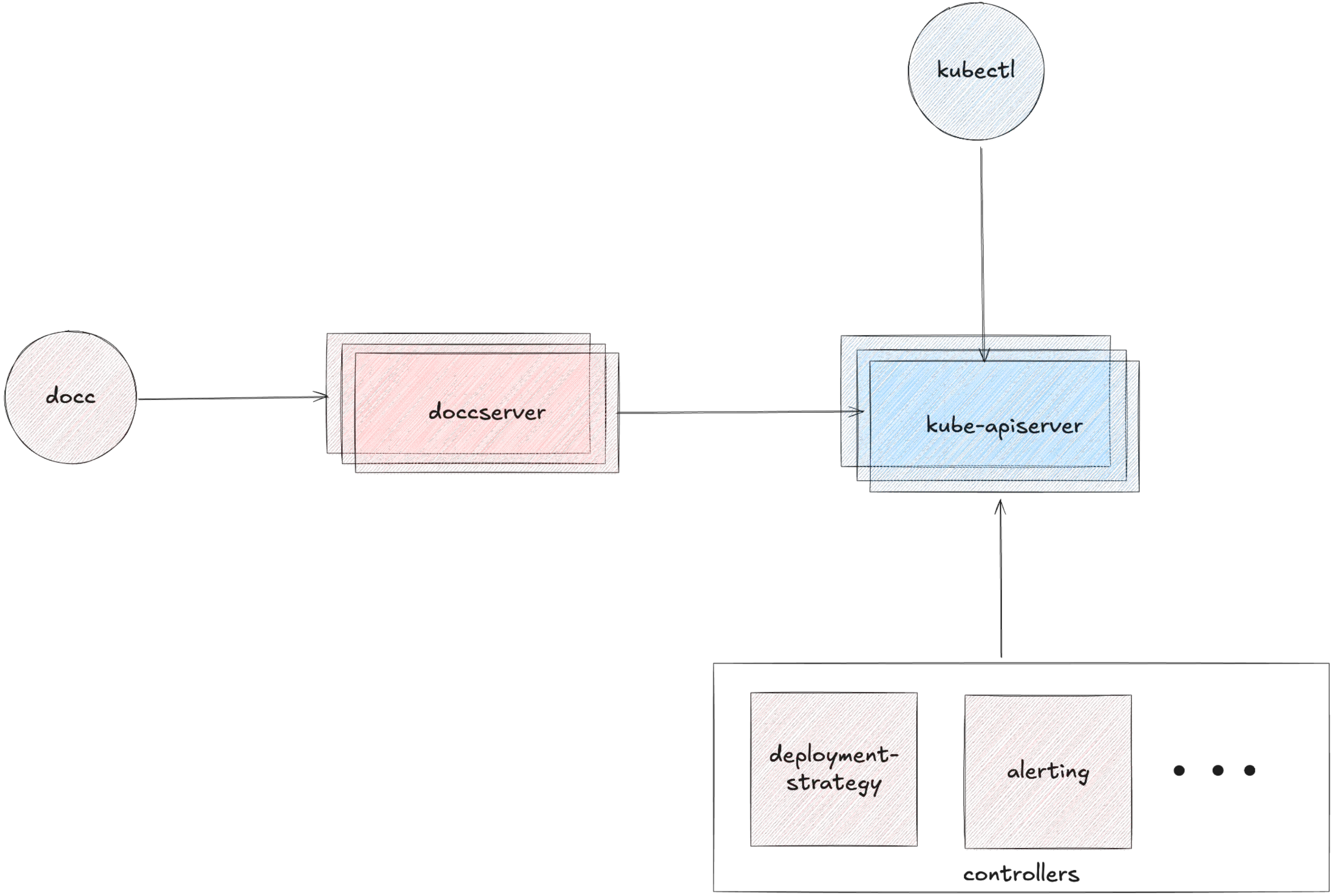
Interlude

How we do internal deployments at DigitalOcean:
docc

docc is a tool for deploying containerized applications.

It provides an abstraction on top of the Kubernetes project with our chosen sane defaults.

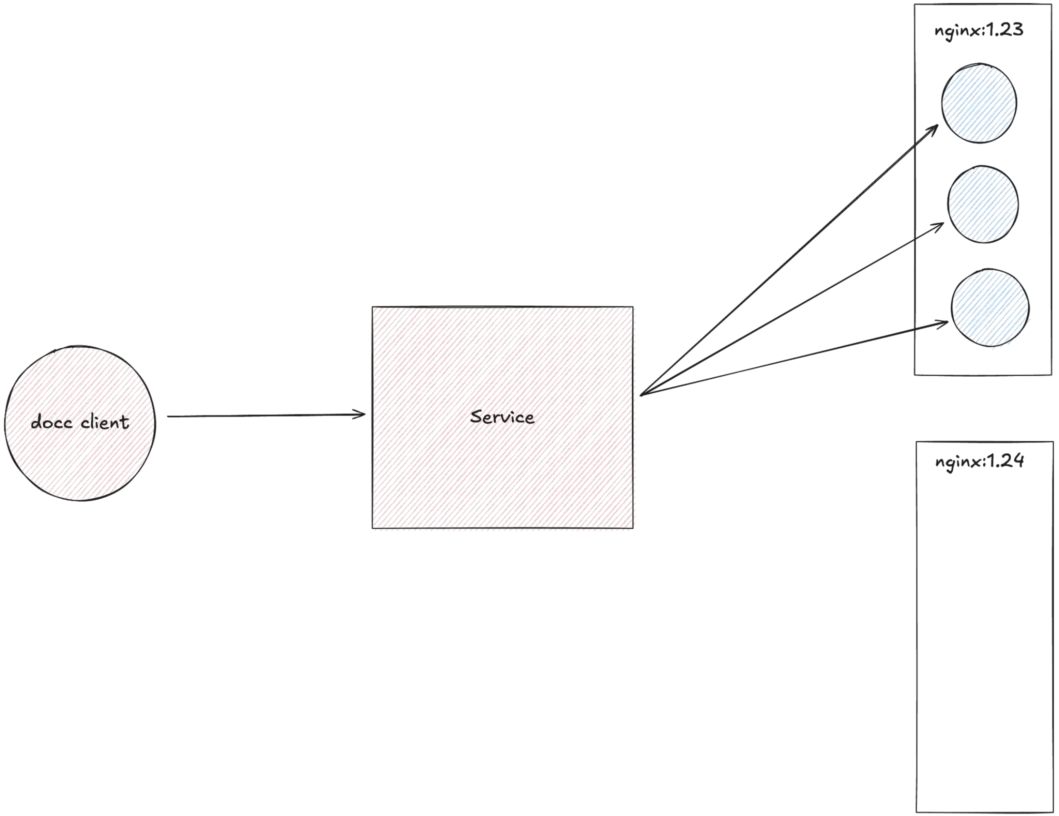
A scalpel not a swiss army knife for declarative deployments.


kubectl
docc
doccserver
kube-apiserver
deployment-strategy
alerting
• • •
controllers

Sample docc manifest

```
{
  "application": {
    "name": "uber-cool-app",
    "namespace": "default",
    "scale": 3,
    "containers": {
      "dev": {
        "image": "nginx:1.23",
        "ports": [
          {
            "port": 80,
            "protocol": "TCP"
          }
        ]
      }
    },
  },
  "maintainer": "appdev@digitalocean.com"
}
```

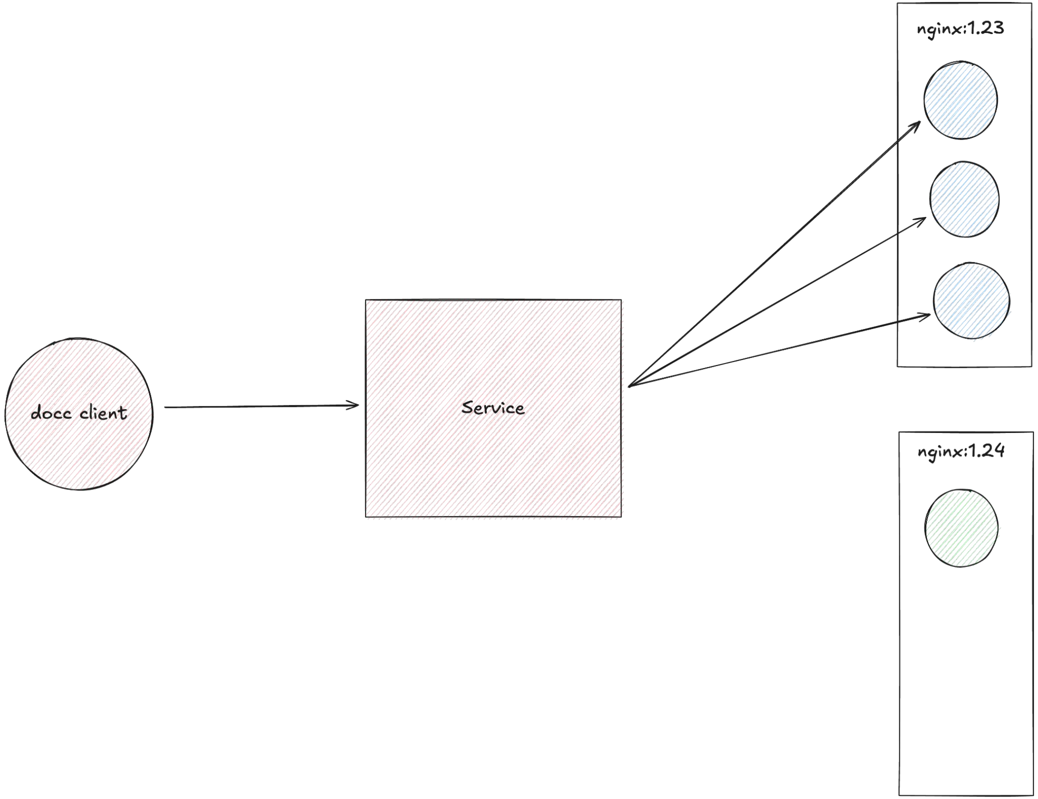
Normal rollouts



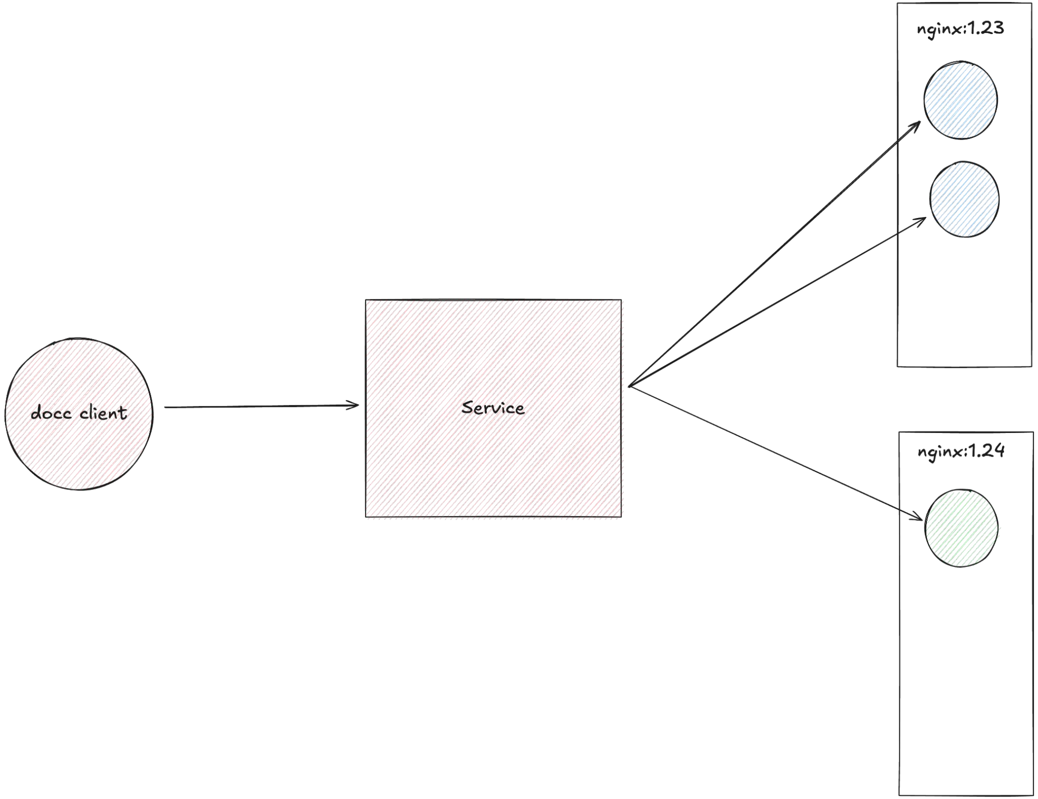
Normal rollouts

```
-       "image": "nginx:1.23"",
+       "image": "nginx:1.24"",
```

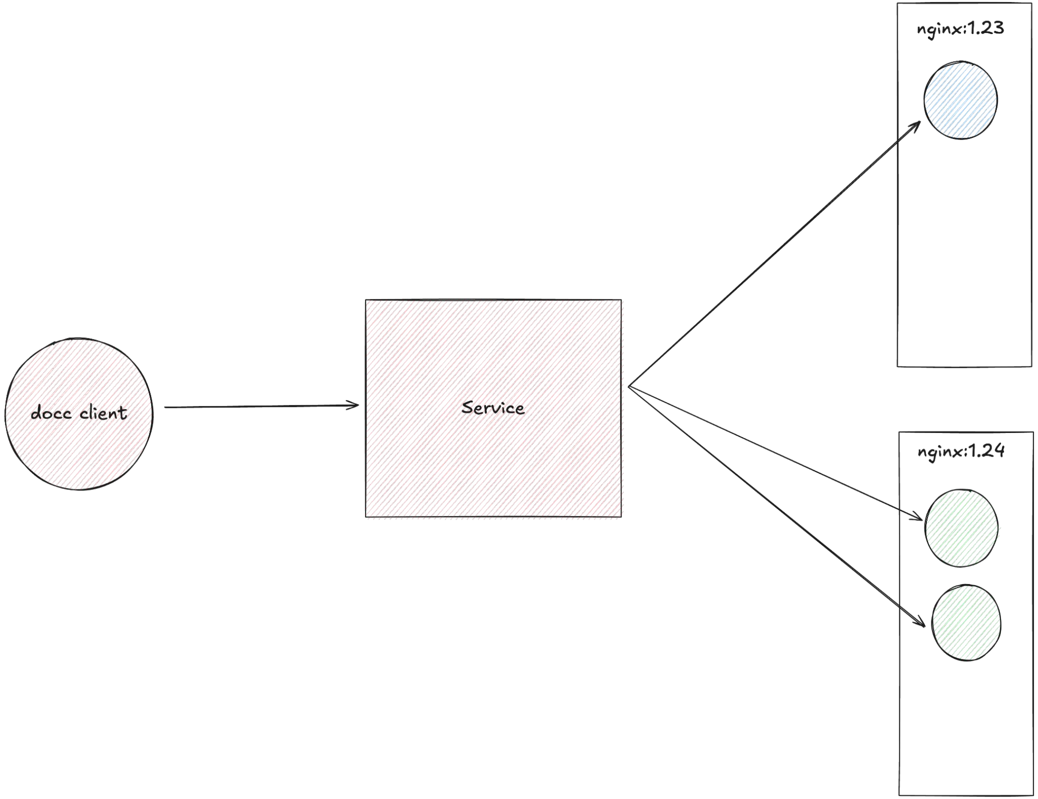
Normal rollouts



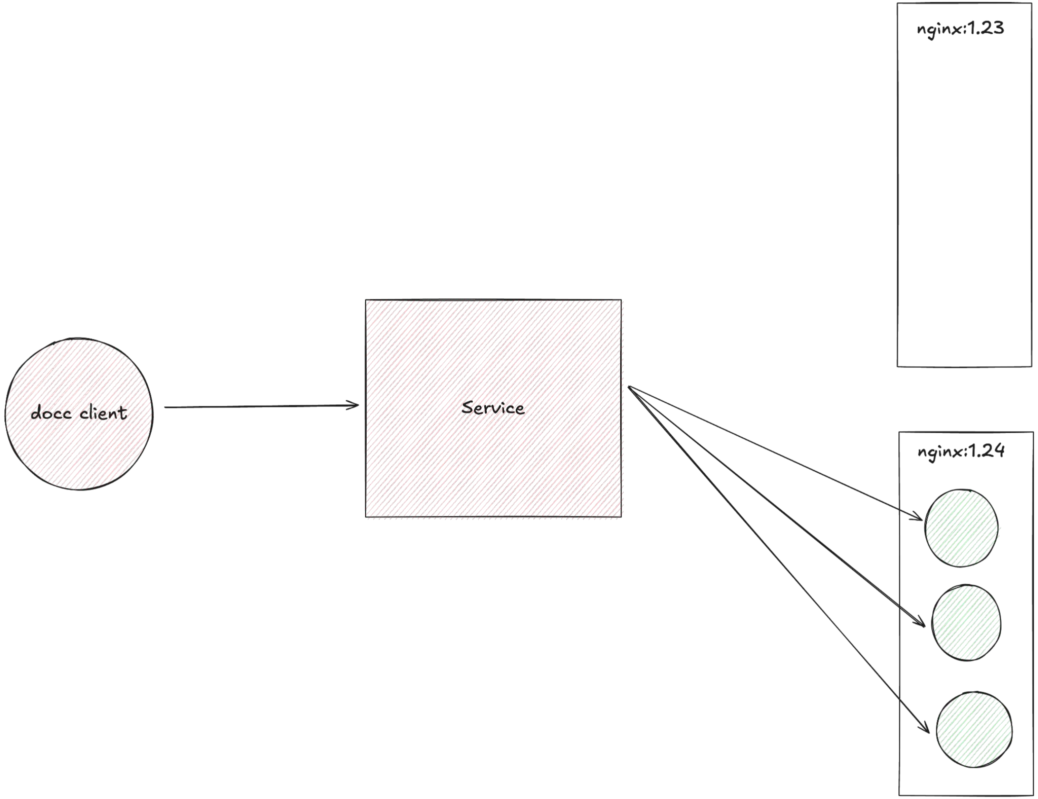
Normal rollouts



Normal rollouts



Normal rollouts



Problems

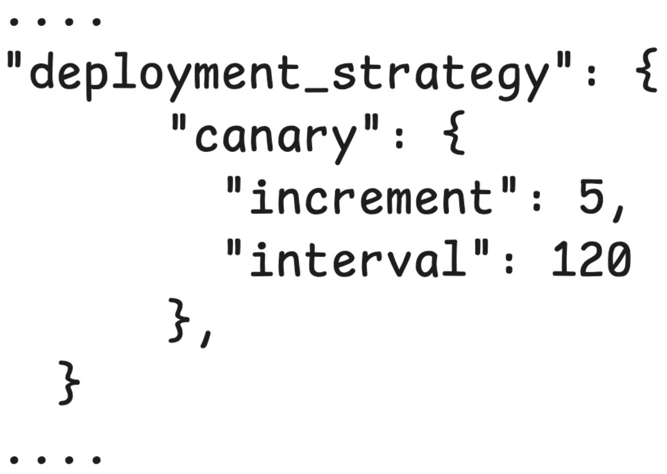
- We don’t have control over time and the percentage of traffic that will be split.
- If there is a bug, we’re out of luck cause there is no older version to revert back to.

Enter progressive rollouts.

Progressive deployments aims to help with this by gradually releasing new updates to a subset of users before rolling it out to the entire user base.

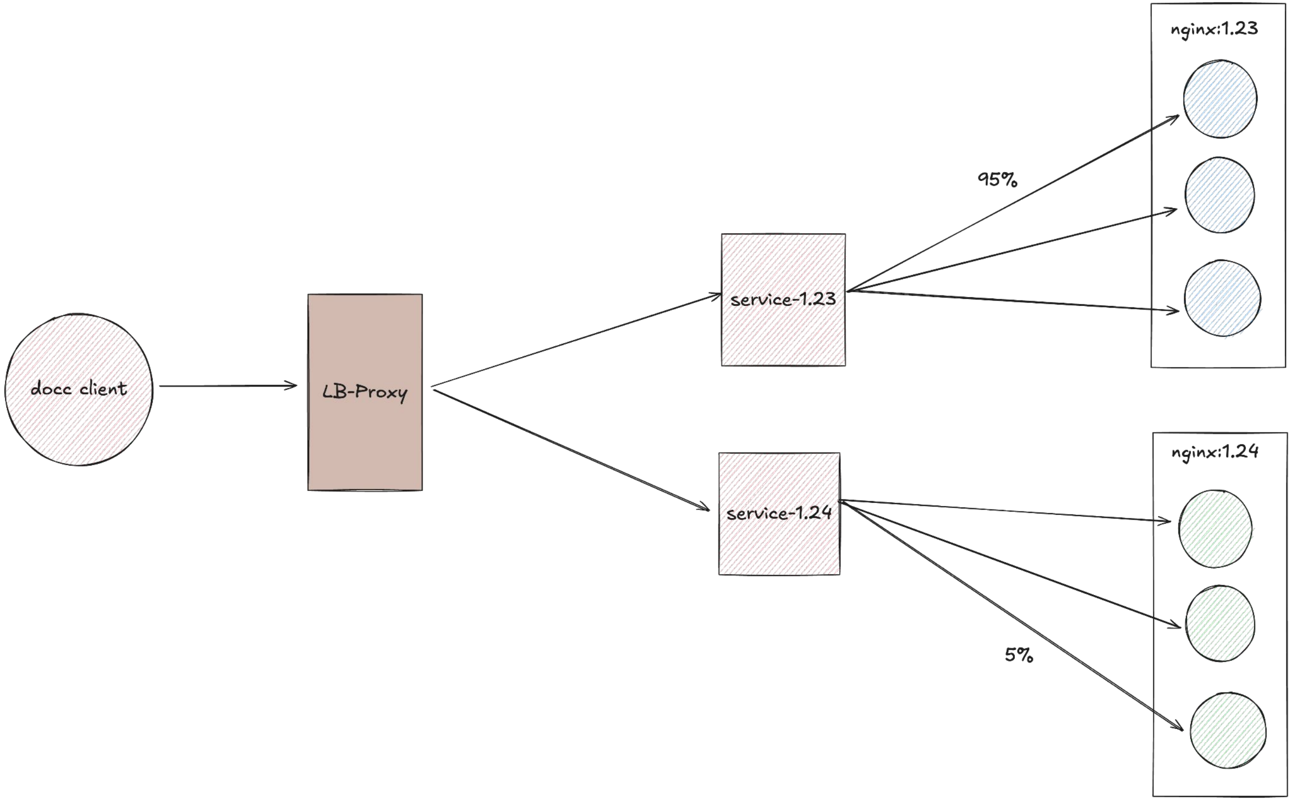
Canary in a coal mine

Canary rollout



```
....
"deployment_strategy": {
      "canary": {
        "increment": 5,
        "interval": 120
      },
  }
....
```

Canary rollout



Canary rollout

- We get more time to detect any issues.
- We can easily rollback if we encounter any fault in the newer instances.

Canary rollout

To achieve this, use a combination of
Istio + Envoy proxy + Gateway API.

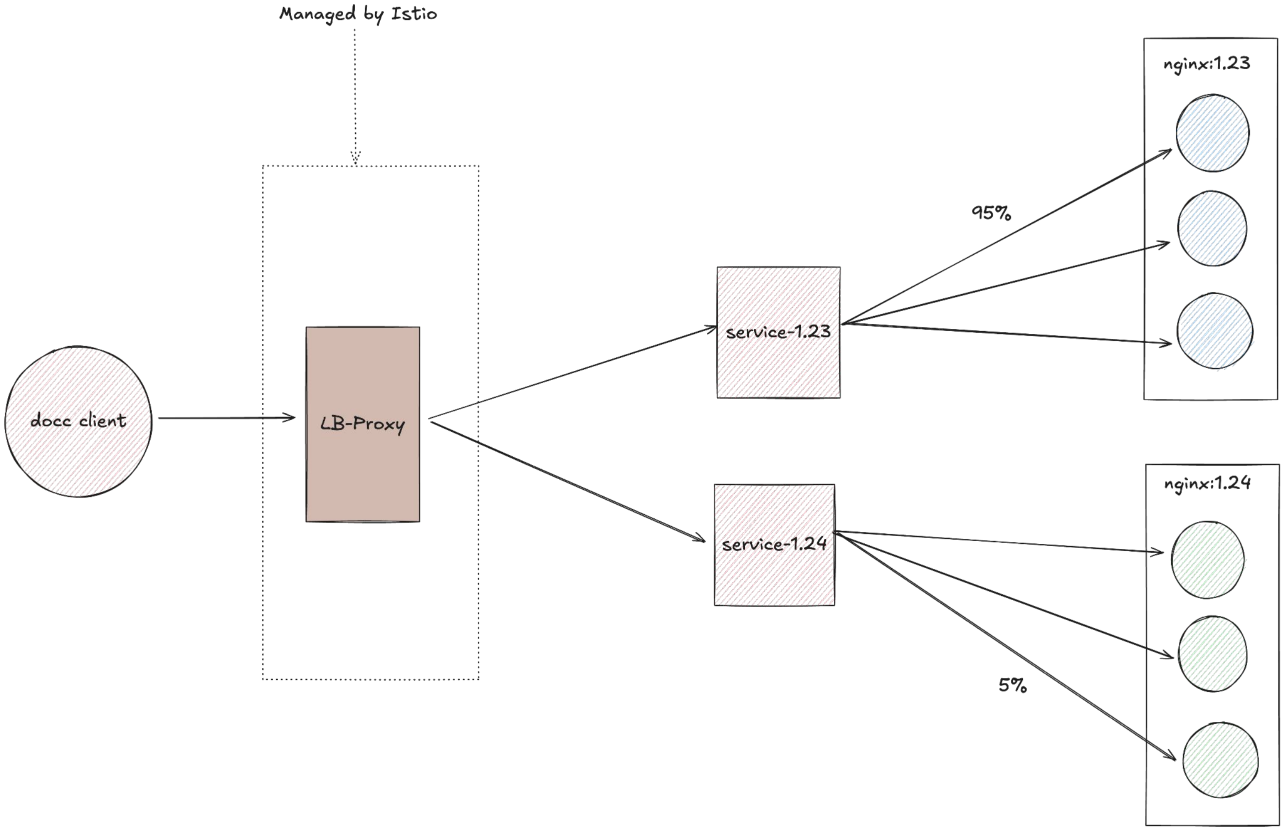
Let’s zoom in a bit and see how these work in synergy to achieve this.

Istio

An open-source service mesh* for kubernetes that creates and manages individual load-balancing proxies.

*A service mesh is a software layer that manages communication between services in an application.

Istio



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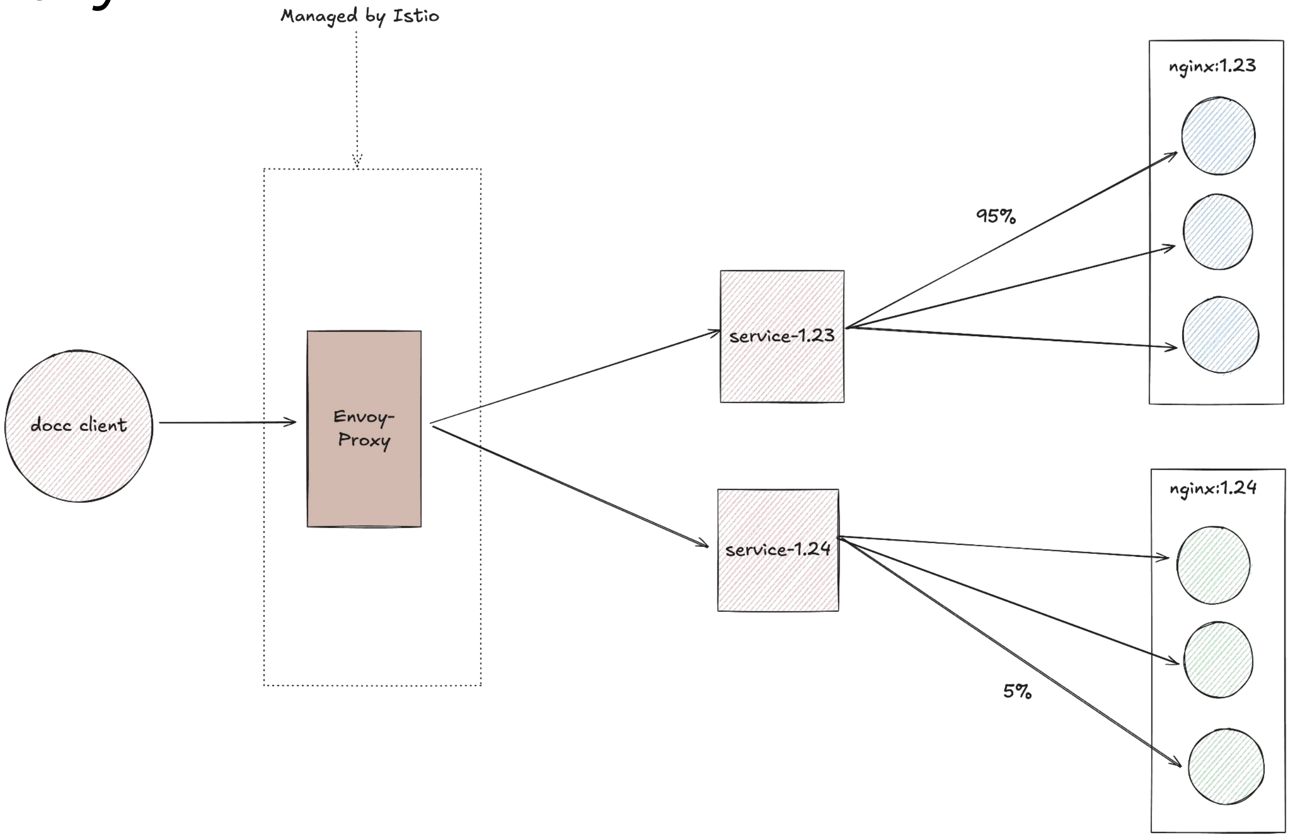
Envoy proxy

An open-source, high-performance edge and service proxy designed to facilitate communication between services.

Acts as data plane in the service mesh.

Envoy proxy



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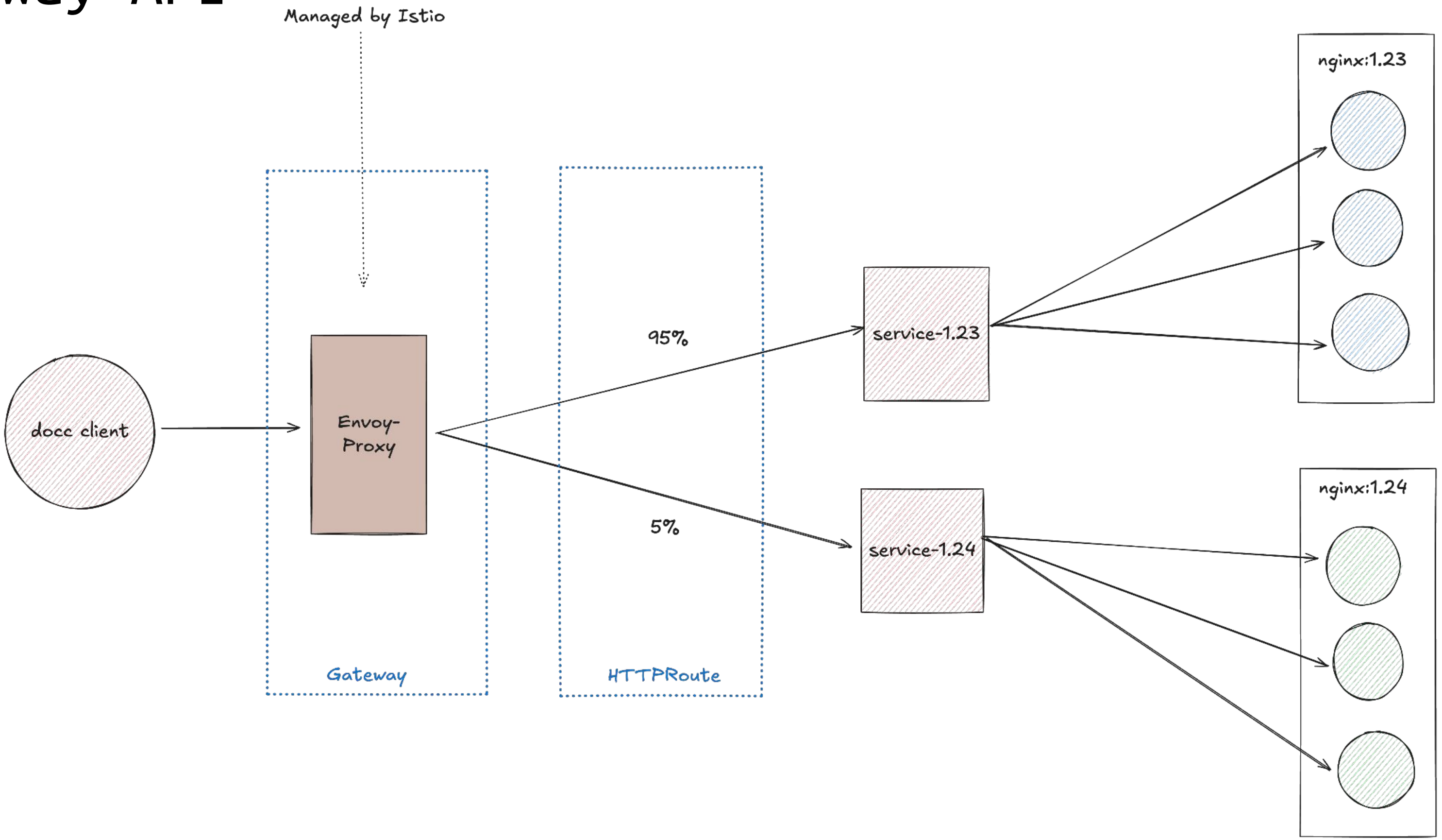
Gateway API

A set of open-source, Kubernetes-native APIs designed to standardise networking traffic management within Kubernetes clusters.

Gateway API

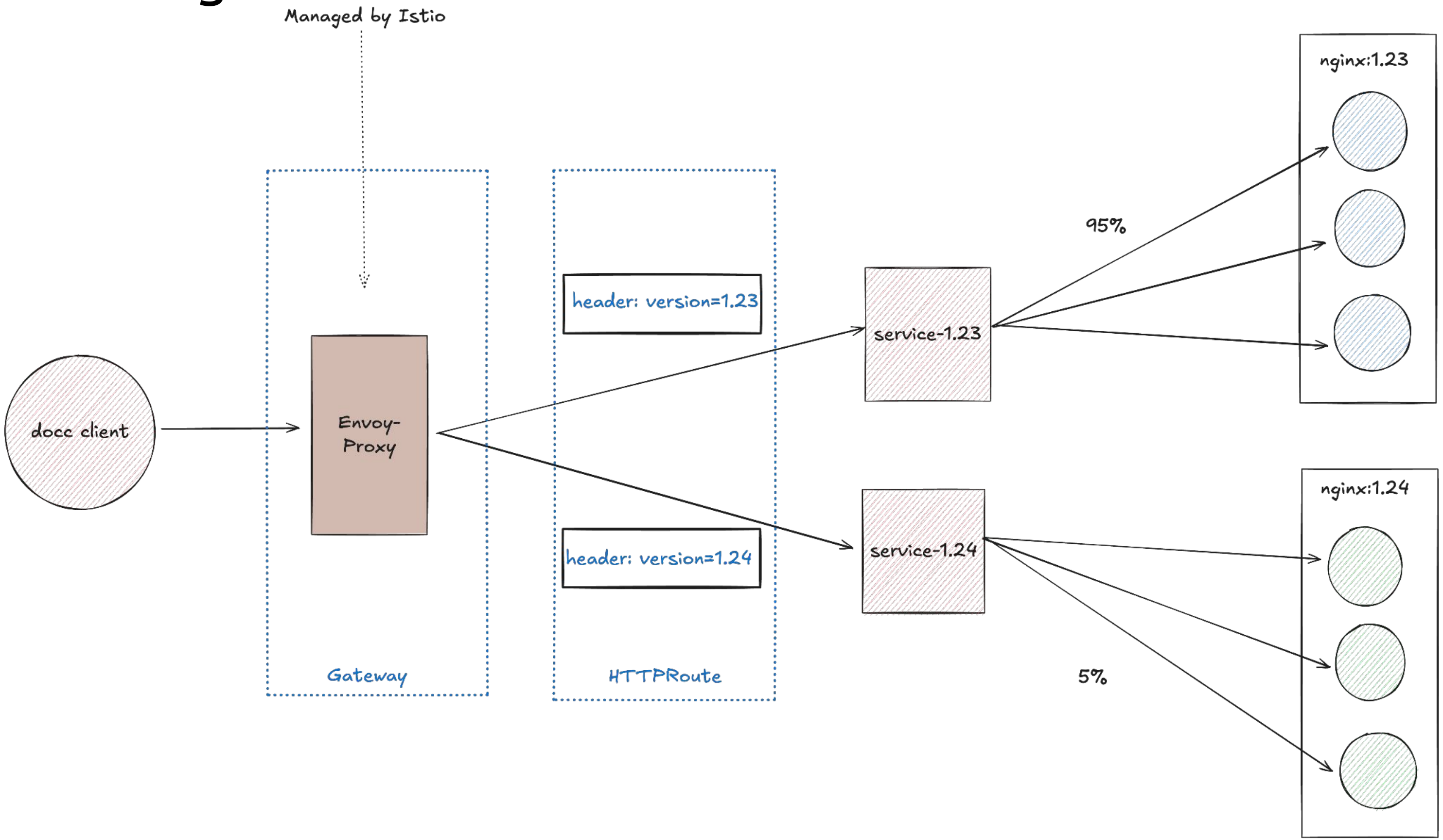

Managed by Istio
docc client
Envoy-Proxy
Gateway
HTTPRoute
95%
5%
service-1.23
service-1.24
nginx:1.23
nginx:1.24

To B, or not to B: A/B testing

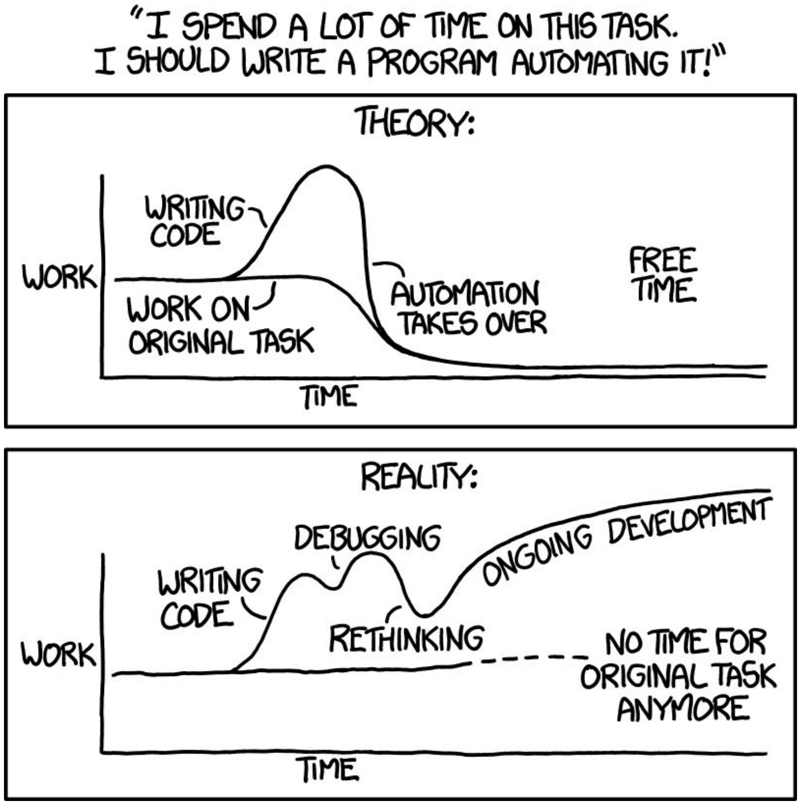
A/B testing

```
....
"deployment_strategy": {
        "ab_testing": {
         "enable_headers": true,
         "pause_before_rollout": true
       },
  }
....
```

A/B testing

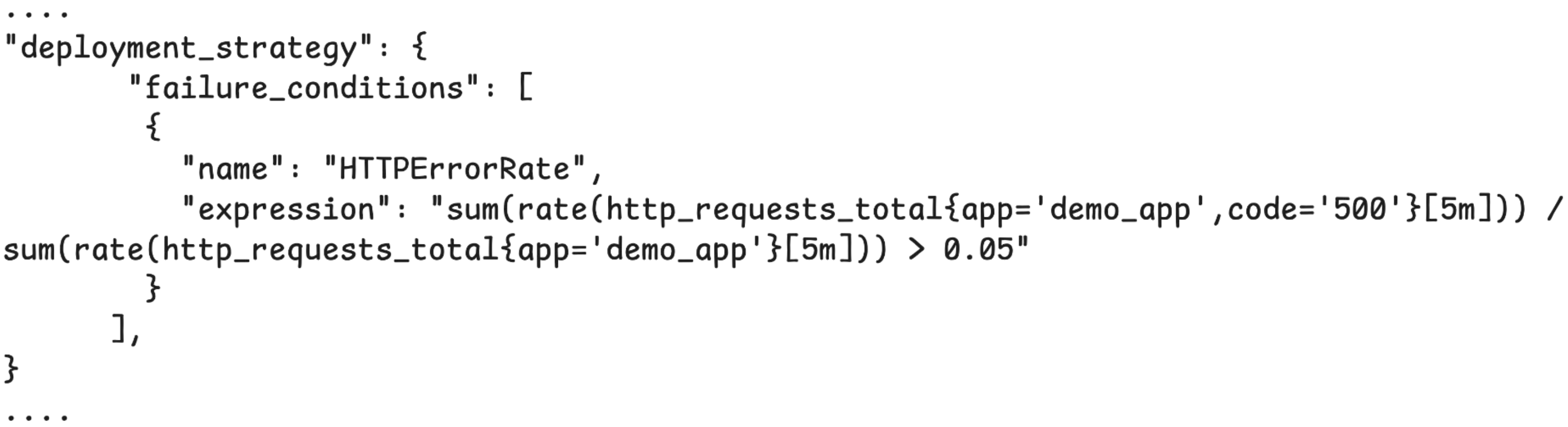

Managed by Istio
docc client
Envoy-Proxy
Gateway
header: version=1.23
header: version=1.24
HTTPRoute
service-1.23
service-1.24
95%
5%
nginx:1.23
nginx:1.24

Monitoring is the new testing: automatic rollbacks



HTTPS://XKCD.COM/1319/

Automatic Rollbacks



```
....
"deployment_strategy": {
       "failure_conditions": [
        {
          "name": "HTTPErrorRate",
          "expression": "sum(rate(http_requests_total{app='demo_app',code='500'}[5m])) /
sum(rate(http_requests_total{app='demo_app'}[5m])) > 0.05"
        }
      ],
}
....
```

Improvements

We have a lot of deployments that rolled back before we encountered any issues, each could have been a potential incident.

References

- https://istio.io/
- https://gateway-api.sigs.k8s.io/
- https://gateway-api.sigs.k8s.io/guides/traffic-splitting/
- https://www.envoyproxy.io/
- Diagrams drawn using https://excalidraw.com/

Thank you

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