The Future of Ingress in Kubernetes

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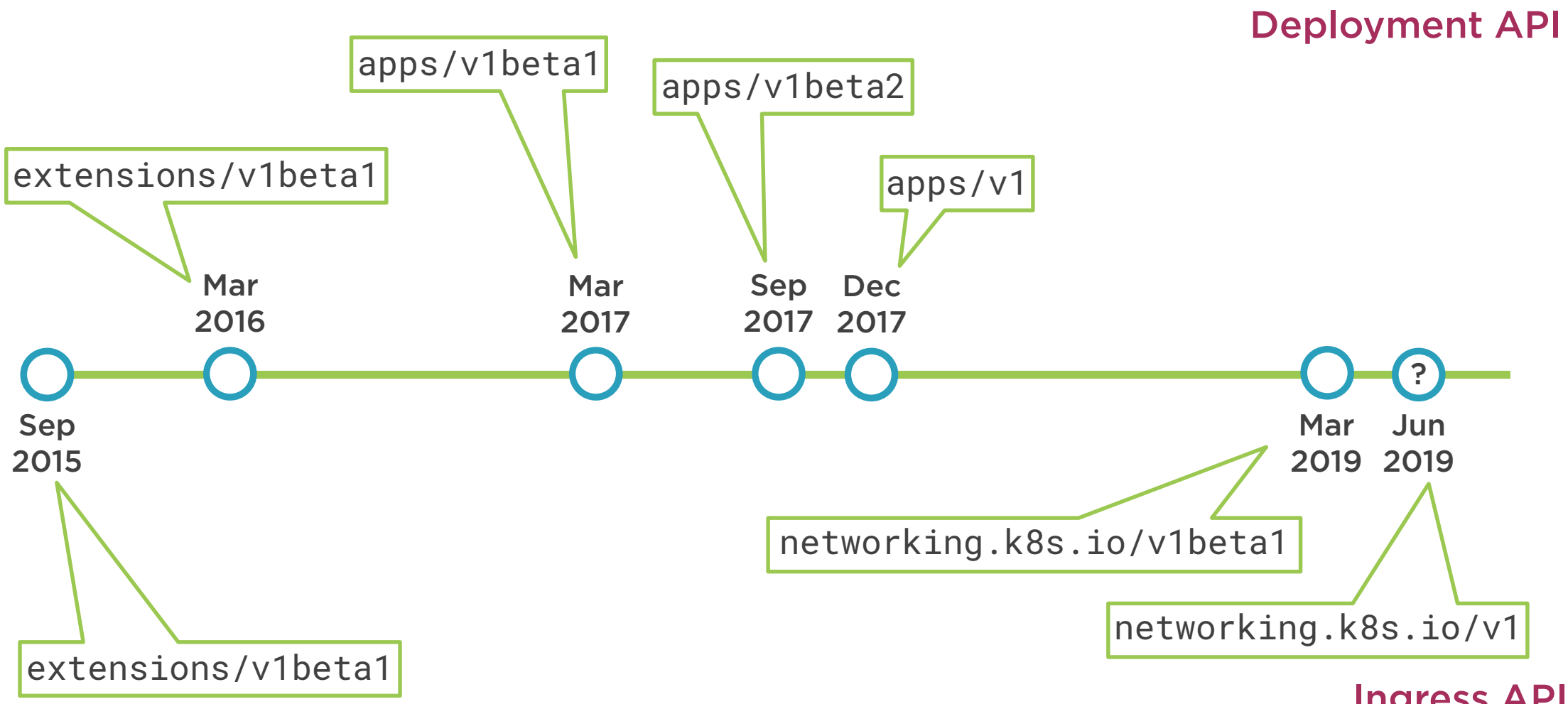
Module Outline

- Explore the limitations of the Ingress API
- Look at an enhanced ingress-related API called IngressRoute
- Explain how to avoid the Ingress API altogether using an API gateway
- Discuss ingress in the context of a service mesh

Slow Evolution of the Ingress API



Compromise Solution with Side Effects

Limited by Design

Ingress API is deliberately terse

Annotation Stopgap

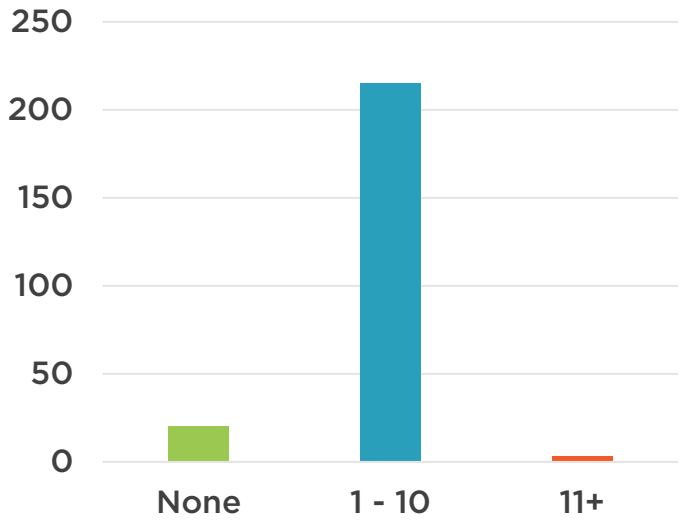
Provided as method to overcome deficiency

Impractical Solution

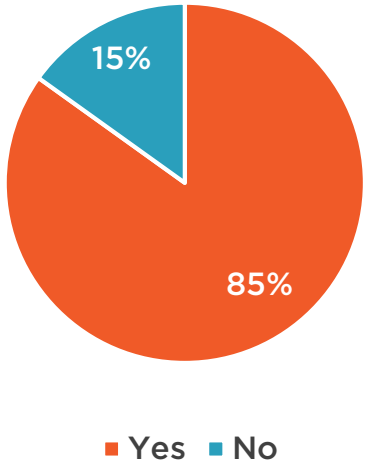
Explosion of disparate annotation patterns

Kubernetes Ingress Survey 2018

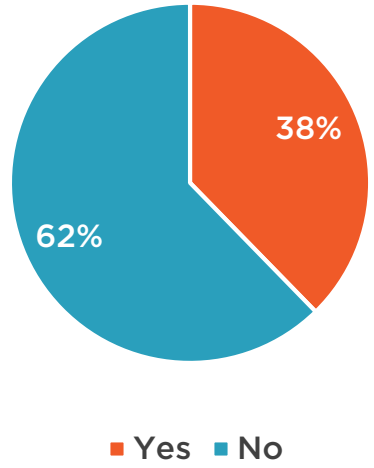
Annotations per ingress definition?



Ingress definitions should be portable?

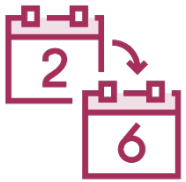


Is Ingress API expressive enough?



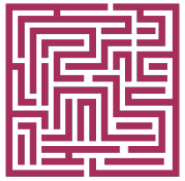
https://git.io/fjT7c

Future Direction of Ingress



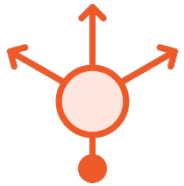
Network SIG is likely to facilitate a consensus for a future v2 Ingress API or equivalent

Some ingress controllers types are starting to use custom resource definitions (CRD)

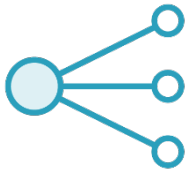


Ingress controller users need to select the tool that best suits the intended purpose

Contour Ingress Controller



Contour ingress controller provides a richer experience for ingress traffic configuration, without annotations



The basic Kubernetes Ingress API is still supported by Contour, along with a number of annotations

Contour comes with a Custom Resource Definition (CRD) called IngressRoute for enhanced ingress use

```
apiVersion: contour.heptio.com/v1beta1
kind: IngressRoute
metadata:
  name: nginxhello-ingress
```

Defining an IngressRoute Object

Contour's CRD has an API kind called IngressRoute

```
spec:
  virtualhost:
    fqdn: dibble.sh
  routes:
    - match: /
      services:
      - name: nginxhello
        port: 80
```

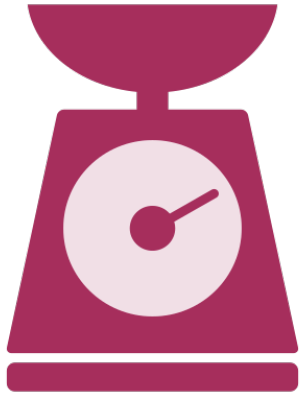
IngressRoute Spec Basics

A separate IngressRoute definition is required per virtual host

Fully qualified domain name is matched against request's Host header

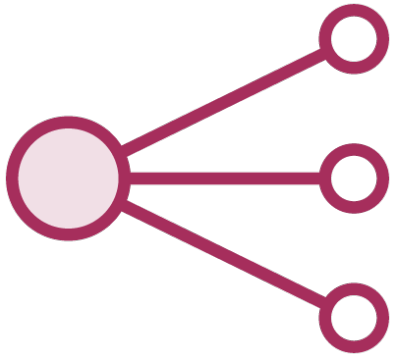
Routes comprise matched paths and one or more service backends

IngressRoute CRD Capabilities



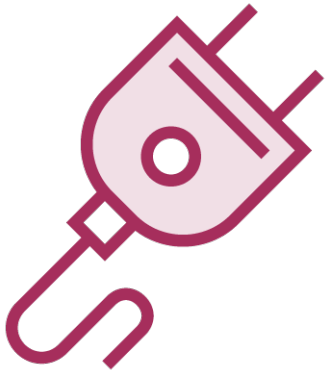
Service Weights

Traffic routed by service weights



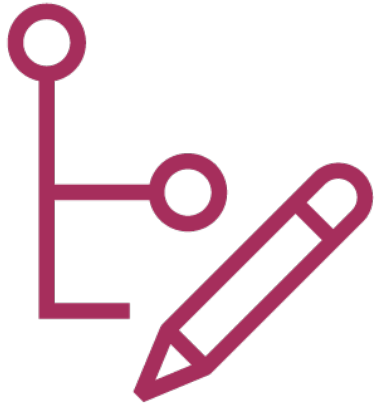
Load Balancing

Different service LB algorithms



WebSockets

Connections can be upgraded



Path Rewrite

URL paths can be prefixed

IngressRoute Delegation

```yaml
apiVersion: contour.heptio.com/v1beta1
kind: IngressRoute
metadata:
  name: dibble-sh
  namespace: admin
spec:
  virtualhost:
    fqdn: dibble.sh
  routes:
    - match: /
      services:
      - name: nginxhello
        port: 80
    - match: /blue
      delegate:
        name: blue-dibble-sh
        namespace: blue
```

```yaml
apiVersion: contour.heptio.com/v1beta1
kind: IngressRoute
metadata:
  name: blue-dibble-sh
  namespace: blue
spec:
  routes:
    - match: /blue
      services:
      - name: nginxhello-blue
        port: 80
        strategy: RoundRobin
```

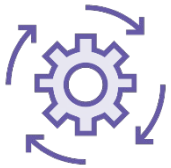
TLS delegation, TCP Proxying ...
https://git.io/fjkiW

Ingress and IngressRoute

In the future, IngressRoute may well form the basis of a revised Ingress API

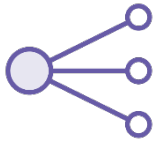
Ambassador Microservices API Gateway

Ambassador is an open source API gateway designed for use in Kubernetes clusters



Uses Envoy under the covers to provide microservices API gateway and ingress functions

Bypasses the Kubernetes Ingress API, and configures Envoy using annotations on Service objects



Ambassador will ordinarily be fronted by a Service object of type LoadBalancer

Ambassador Capabilities

- Routing by Header
- URL Path Prefix Rewrites
- Canary Release Deployments
- Traffic Shadowing Deployments
- Addition of Headers
- TCP Traffic Proxying

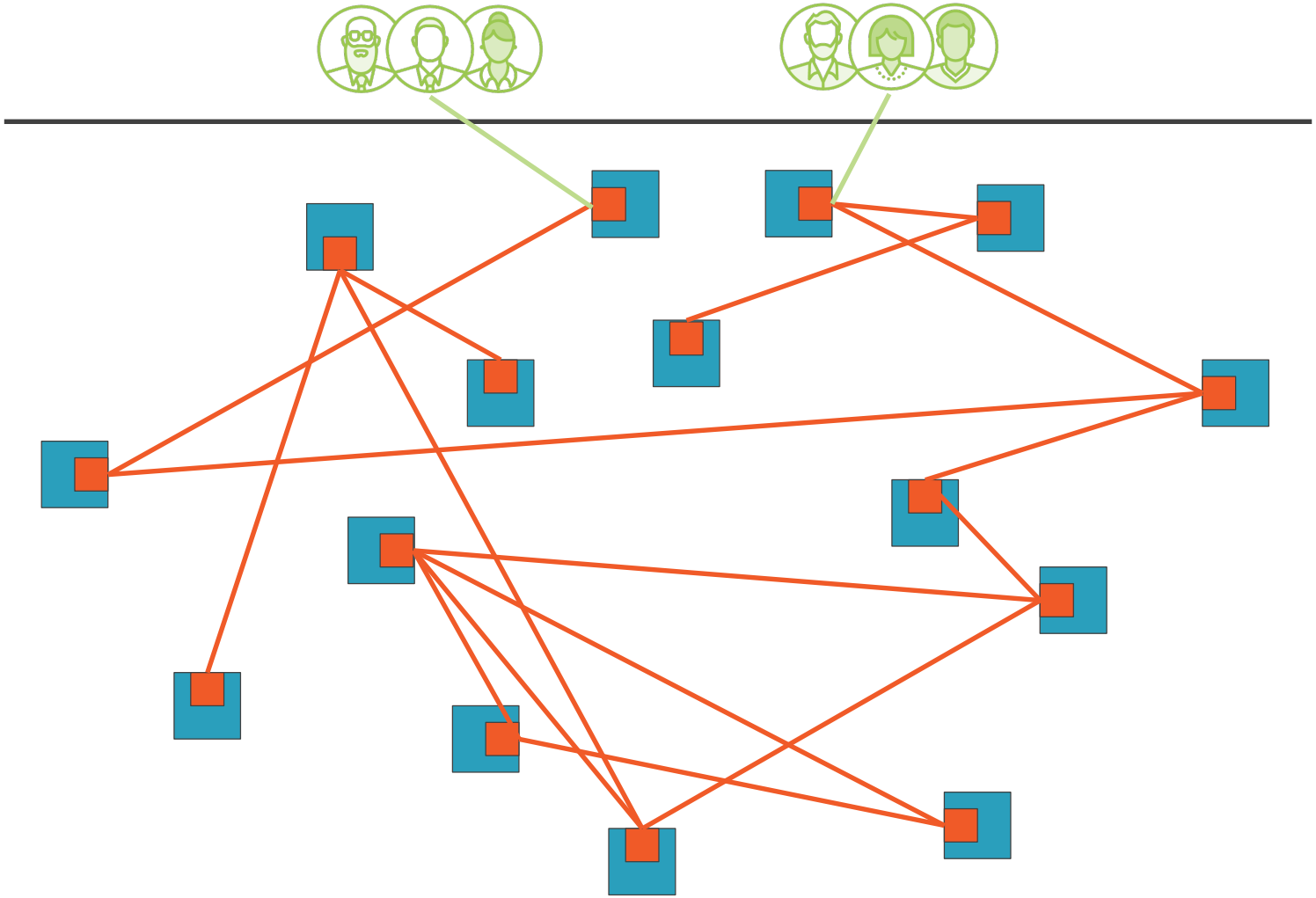
```
apiVersion: v1
kind: Service
metadata:
  name: nginxhello
  labels:
    app: nginxhello
  annotations:
    getambassador.io/config: |
      ---
      apiVersion: ambassador/v1
      kind: Mapping
      name: nginxhello-mapping
      host: dibble.sh
      prefix: /
      service: nginxhello 80
spec:
.
.
```

- Standard k8s service definition
- Ambassador-specific annotation
- Version of the Ambassador API, resource kind and name
- Host header and path
- Target service

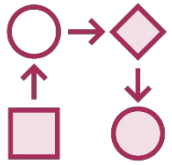
Istio

Istio is a platform for managing the complexity of microservices deployments, using a service mesh abstraction.

Service Mesh



Istio Ingress Gateway



Ingress is performed by a suitably configured deployment of the Envoy proxy

Gateway objects define the types of ingress traffic allowed to enter the mesh

Rules for routing traffic to services in the mesh, are defined using VirtualService objects

Traffic policy is defined and applied to routes using DestinationRule objects

Ingress Options

Ingress API

Contour IngressRoute

Ambassador API Gateway

Istio Ingress Gateway

Course Summary

Thank you!

Kubernetes Service objects provide a simple ingress option

The Ingress API is the purpose built feature for handling ingress

Cert-manager builds on the Ingress API for TLS certificate management

Ingress controllers provide advanced features accessible through annotations

Other community-led initiatives provide a richer ingress experience

Where to Go Next

Kubernetes Ingress	https://k8s.io/docs/concepts/services-networking/ingress/
Nginx Ingress Controller	https://git.io/fjLR4
Traefik Ingress Controller	https://docs.traefik.io/user-guide/kubernetes/
Contour Ingress Controller	https://git.io/fh4Ua
cert-manager	https://docs.cert-manager.io/en/latest/
Ambassador API Gateway	https://www.getambassador.io/docs
Istio Service Mesh	https://istio.io/