Building Platforms with Istio

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About Me

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In this talk …

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Platform Intro

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What we set out to build

On-Premises, **Multitenant** and **fully managed Serverless platform** with…

#1 Simple UX

#2 Low barrier of entry

#3 Handle cross cutting concerns like Authz/Authn

#4 Resilient

#5 End to End Observability

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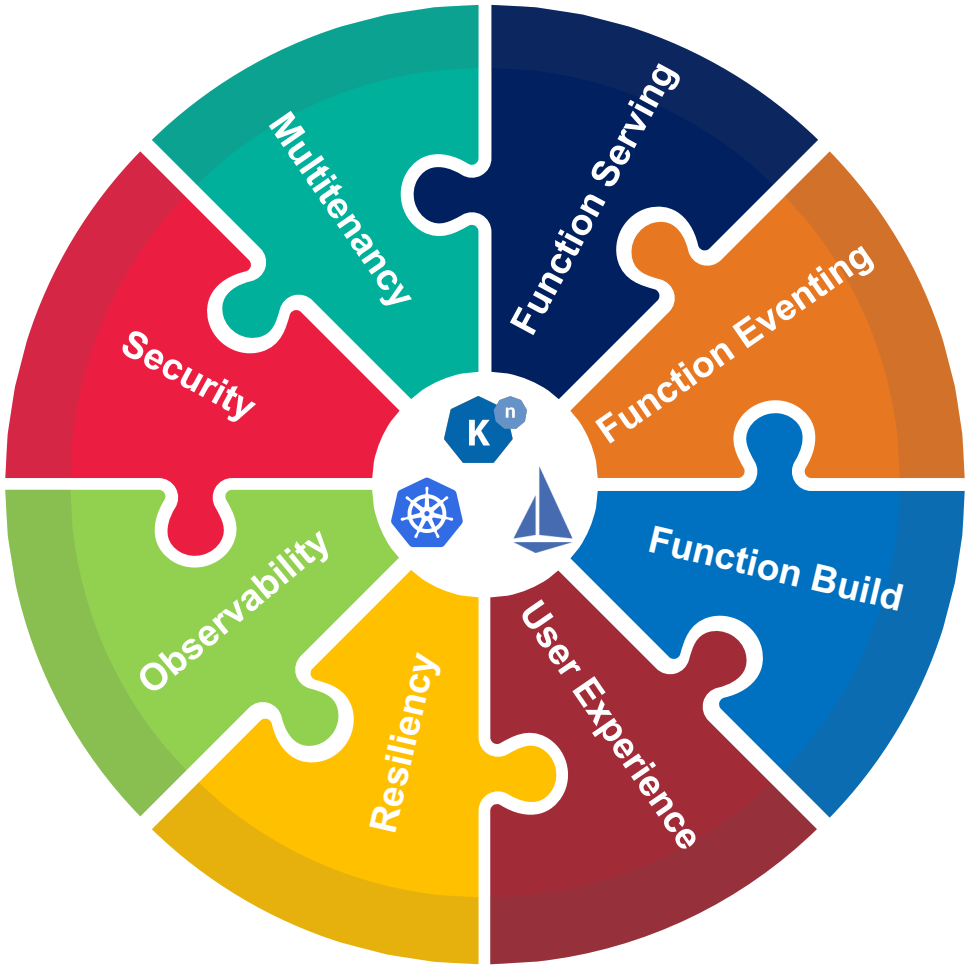
Platform Capabilities



Technology picks

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Technology – Capability Matrix

	Function - Serving	Function - Build	Function - Eventing	Multitenancy
Kubernetes				✓
Istio				✓
Knative	✓		✓	✓
Tekton		✓		✓
Prometheus				✓
Grafana				✓
Banzai Cloud Logging Operator				✓
In-house Tools and UX		✓		✓

Technology – Capability Matrix

	Security	Observability	Resiliency	UX
Kubernetes	✓	✓	✓	
Istio	✓	✓	✓	
Knative		✓	✓	
Tekton		✓		
Prometheus		✓		
Grafana		✓		
Banzai Cloud Logging Operator		✓		
In-house Tools and UX		✓	✓	✓

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How they stack up ?

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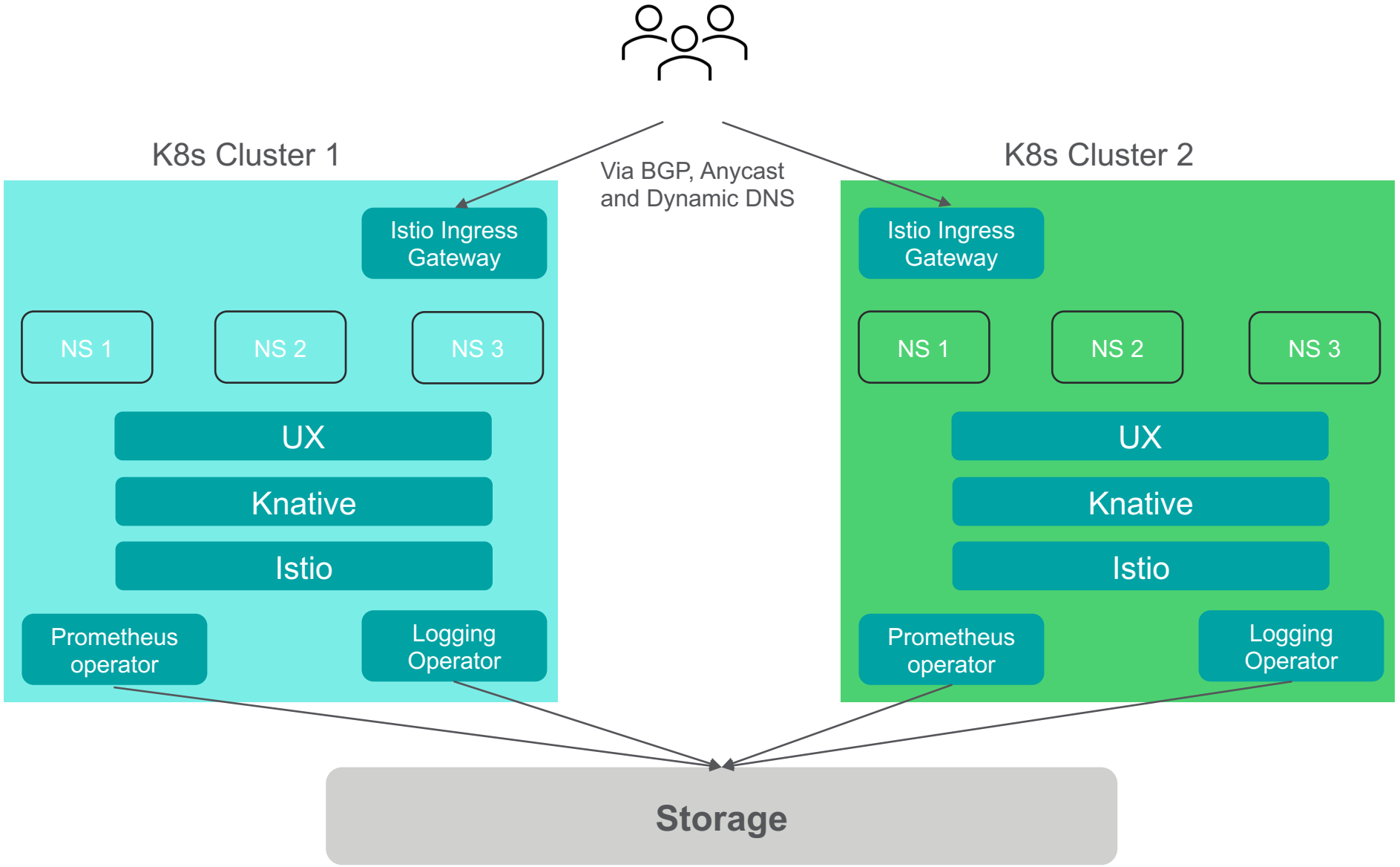
Platform Architecture



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Istio in Action

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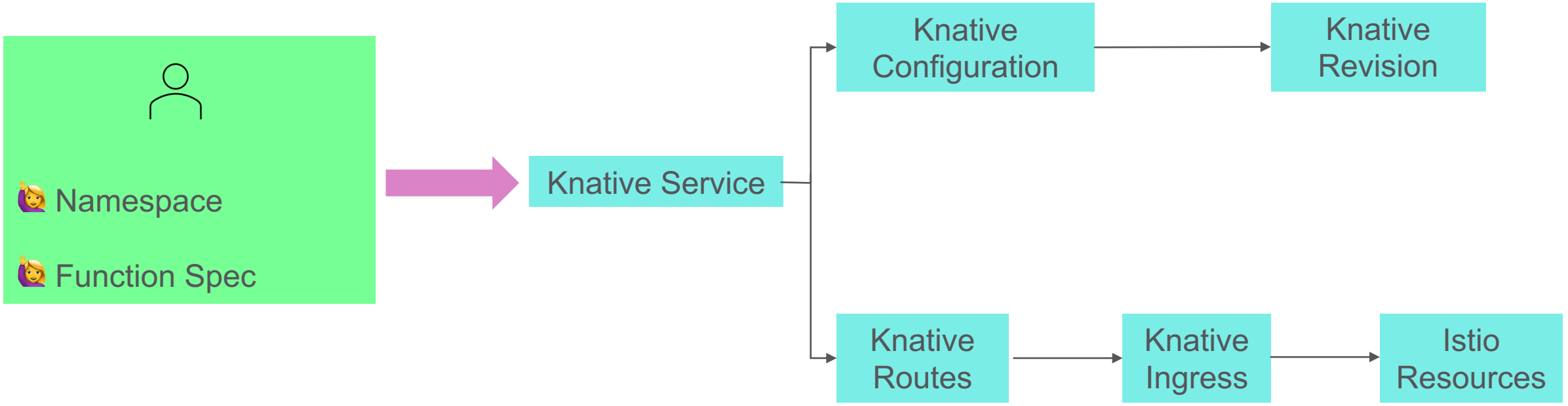
Knative and Istio

Knative requires a L7 load balancer for

- Routing the traffic to the correct Knative service
- Split traffic
- per-request load balancing between Pods



Knative Routes

```
apiVersion: networking.istio.io/v1beta1
kind: VirtualService
metadata:
  name: java-knative-svc-test-ingress
  namespace: test-alpha
  ownerReferences:
  - apiVersion: networking.internal.knative.dev/v1alpha1
    blockOwnerDeletion: true
    controller: true
    kind: Ingress
    name: java-knative-svc-test
spec:
  gateways:
  - knative-serving/knative-ingress-gateway
  - knative-serving/knative-local-gateway
  hosts:
  - java-knative-svc-test.test-alpha
  - java-knative-svc-test.test-alpha.svc
  - java-knative-svc-test.test-alpha.svc.cluster.local
```

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Knative Traffic Splitting

```
apiVersion: serving.knative.dev/v1
kind: Service
metadata:
  name: hello
  namespace: test-alpha
spec:
  template:
     name: hello-v2
    spec:
     containers:
     - image: docker.repo1.uhc.com/seset/java-knative
  traffic:
  - latestRevision: true
    percent: 50
  - latestRevision: false
    percent: 50
    revisionName: hello-skblr-1
    tag: staging
```

```
apiVersion: networking.istio.io/v1beta1
kind: VirtualService
metadata:
  name: hello-ingress
  namespace: test-alpha
hosts:
  - hello.test-alpha
  - hello.test-alpha.svc
  - hello.test-alpha.svc.cluster.local
  - staging-hello.test-alpha
  - staging-hello.test-alpha.svc
  - staging-hello.test-alpha.svc.cluster.local
  http:
    route:
    - destination:
        host: hello-v2.test-alpha.svc.cluster.local
        port:
          number: 80
      headers:
        request:
          set:
            Knative-Serving-Namespace: test-alpha
            Knative-Serving-Revision: hello-v2
      weight: 50
    - destination:
        host: hello-skblr-1.test-alpha.svc.cluster.local
        port:
          number: 80
      headers:
        request:
          set:
            Knative-Serving-Namespace: test-alpha
            Knative-Serving-Revision: hello-skblr-1
      weight: 50
```

Knative TLS

```
apiVersion: networking.istio.io/v1beta1
kind: Gateway
metadata:
  name: hello-3797421420
  namespace: test-alpha
  ownerReferences:
  - apiVersion: networking.internal.knative.dev/v1alpha1
    blockOwnerDeletion: true
    controller: true
    kind: Ingress
    name: hello
spec:
  selector:
    app: istio-ingressgateway
    istio: ingressgateway
  servers:
  - hosts:
    - hello-test-alpha.domain.com
    port:
      name: test-alpha/hello:0
      number: 443
      protocol: HTTPS
    tls:
      credentialName: hello-3c74709c-0a4f-4aba-a346-3e555a3ce0ee
      mode: SIMPLE
      privateKey: tls.key
      serverCertificate: tls.crt
```

```
apiVersion: cert-manager.io/v1
kind: Certificate
metadata:
  name: route-5b6d939d-a52d-47d4-9912-bc9267dca0ef-199426798
  namespace: test-alpha
  ownerReferences:
  - apiVersion: networking.internal.knative.dev/v1alpha1
    blockOwnerDeletion: true
    controller: true
    kind: Certificate
    name: route-5b6d939d-a52d-47d4-9912-bc9267dca0ef-199426798
spec:
  commonName: hello-test-alpha
  dnsNames:
  - hello-test-alpha.domain.com
  issuerRef:
    kind: ClusterIssuer
    name: tpp-venafi-issuer
  secretName: route-5b6d939d-a52d-47d4-9912-bc9267dca0ef-199426798
```

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Authz & Authn

💁‍♀️ Namespace

💁‍♀️ Function Name

💁‍♀️ JWT Claim

```
apiVersion: security.istio.io/v1beta1
kind: RequestAuthentication
metadata:
  name: java-knative-svc-policy
spec:
  jwtRules:
  - issuer: https://issuer-url
    jwksUri: http://issuer-certs-url
  selector:
    matchLabels:
      serving.knative.dev/service: java-knative-svc
```

```
apiVersion: security.istio.io/v1beta1
kind: AuthorizationPolicy
metadata:
  name: java-knative-svc-authz-policy
spec:
  rules:
  - when:
    - key: request.auth.claims[groups]
      values:
      - secure-group
  selector:
    matchLabels:
      serving.knative.dev/service: java-knative-svc
```

```
apiVersion: security.istio.io/v1beta1
kind: AuthorizationPolicy
metadata:
  name: java-knative-svc-def-authz-policy
spec:
  rules:
  - to:
    - operation:
        paths:
        - /_internal/knative/activator/probe
        - /metrics
        - /healthz
        - /_/health
  selector:
    matchLabels:
      serving.knative.dev/service: java-knative-svc
```

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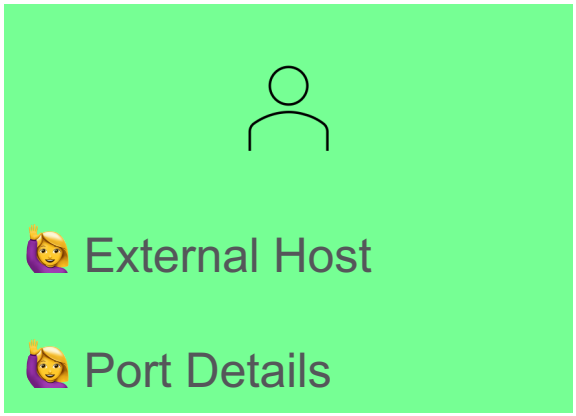
External Service Registration




```
apiVersion: networking.istio.io/v1beta1
kind: ServiceEntry
metadata:
  name: service-entry-request
spec:
  hosts:
  - mesh-external.host.com
  location: MESH_EXTERNAL
  ports:
  - name: http
    number: 80
    protocol: HTTP
  resolution: DNS
```

Custom Domains

Configure Knative to create Knative service url with custom domain

Update Knative ingress gateway to accept this host

```
apiVersion: v1
kind: Service
metadata:
  annotations:
    external-dns.alpha.kubernetes.io/hostname: gateway.custom.domain.com
  labels:
    app: istio-custom-gateway
    istio: istio-custom-gateway
    release: istio
  name: istio-custom-gateway-svc
  namespace: istio-system
spec:
  ports:
  - name: http2
    port: 80
    targetPort: 8080
  - name: https
    port: 443
    targetPort: 8443
  selector:
    app: istio-ingressgateway
    istio: ingressgateway
  type: LoadBalancer
```

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And..

End to End Tracing

Metering

Kiali

Istio CNI

- In House – UX – Only point of interaction for users
  - Opinionated
  - Low barrier for entry
  - Eliminate bad actors
  - Handle deprecations and version upgrades
    - Service role/bindings to request auth/auth policy

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Managing Istio

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Istioctl

- **Installation**

  $ istioctl manifest generate -f istio-template.yaml > istio.yaml

- **Proxy status**

  $ istioctl proxy-status

- **Dashboard**

  $ istioctl dashboard envoy

Closing thoughts

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Summary

- Right set of tools for building and managing platform
  - Istioctl
  - Istio Go Client
- Active community
- Start small


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