Introducing Envoy-based service mesh at Booking.com

Ivan Kruglov

KubeCon Europe 2018
02.05.2018

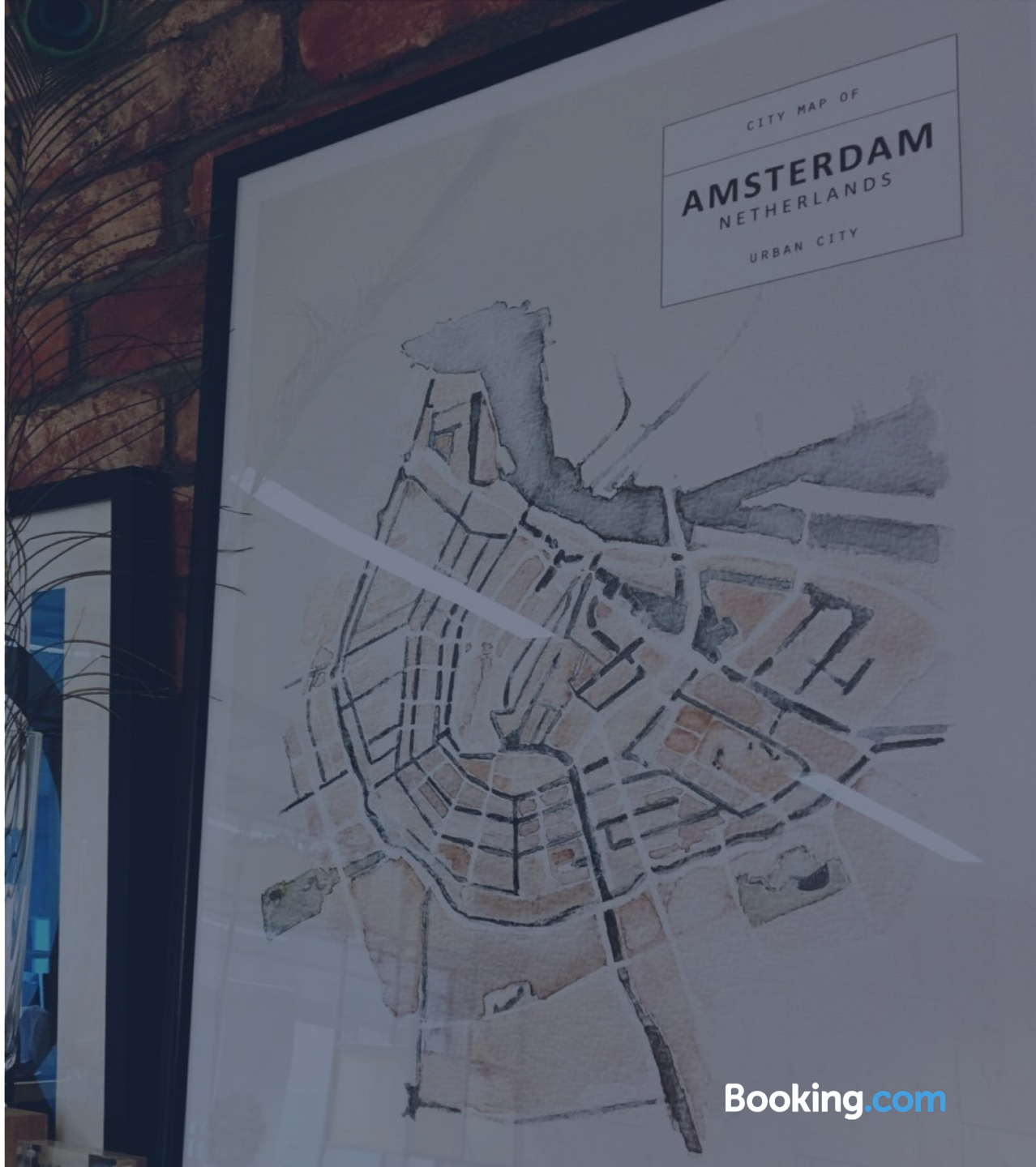
Booking.com

based in Amsterdam

28M listings

1,5M room nights per day

1700 IT staff



Agenda

- what is service mesh?
- why did we start the project?
- our setup
- learnings
- conclusion

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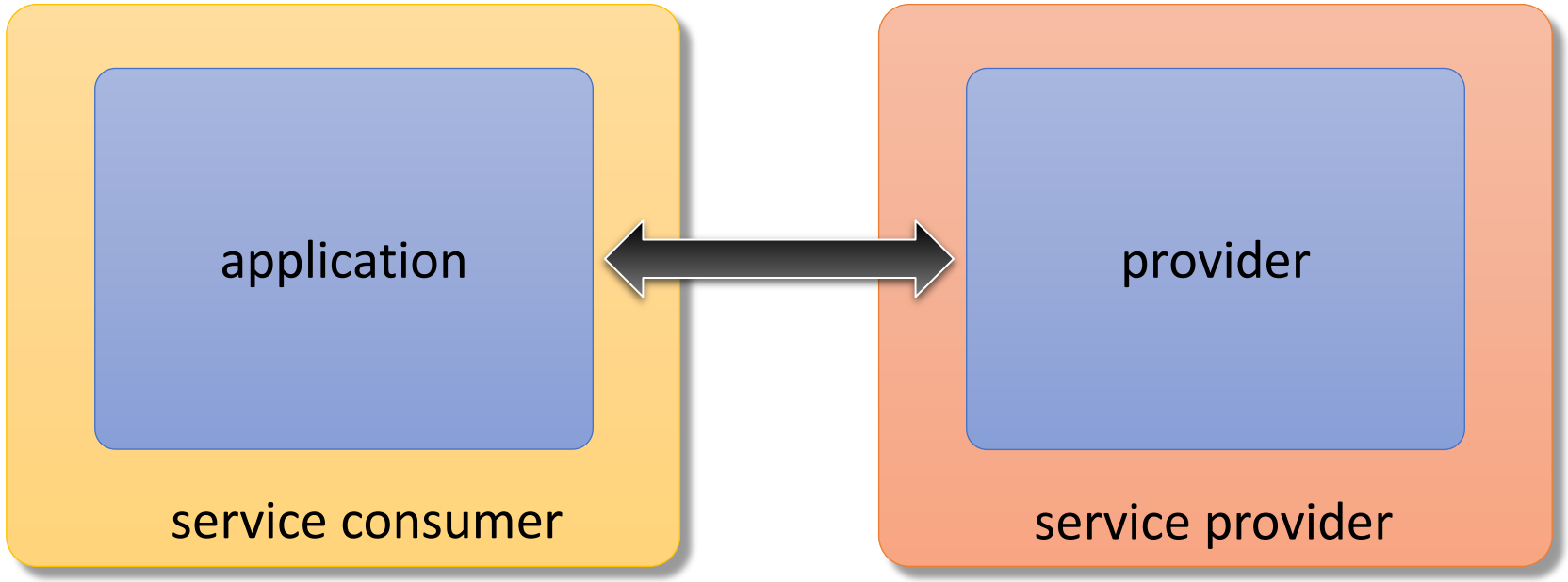
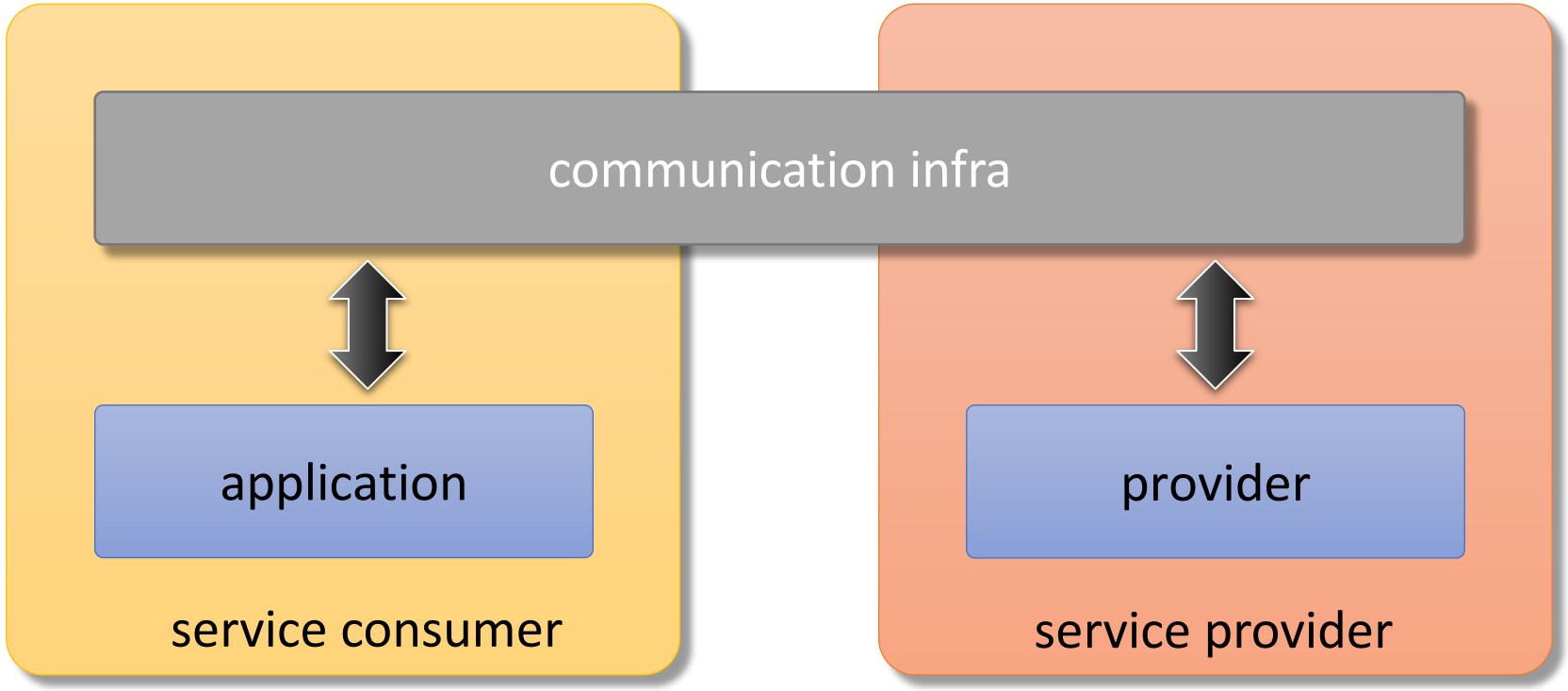
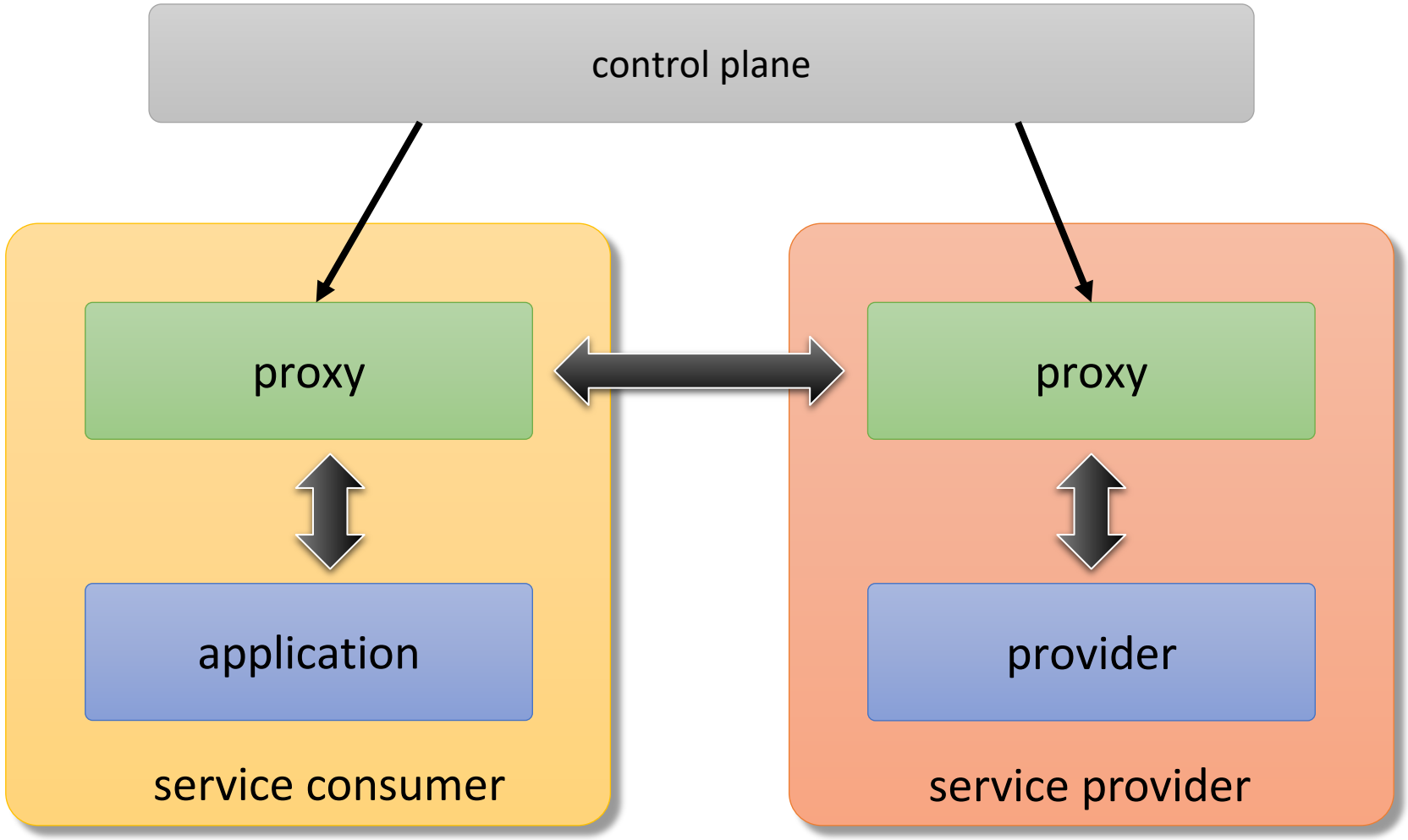
What is service mesh*?

* the way I understand it




communication infra
application
provider
service consumer
service provider


control plane
proxy
application
service consumer
proxy
provider
service provider

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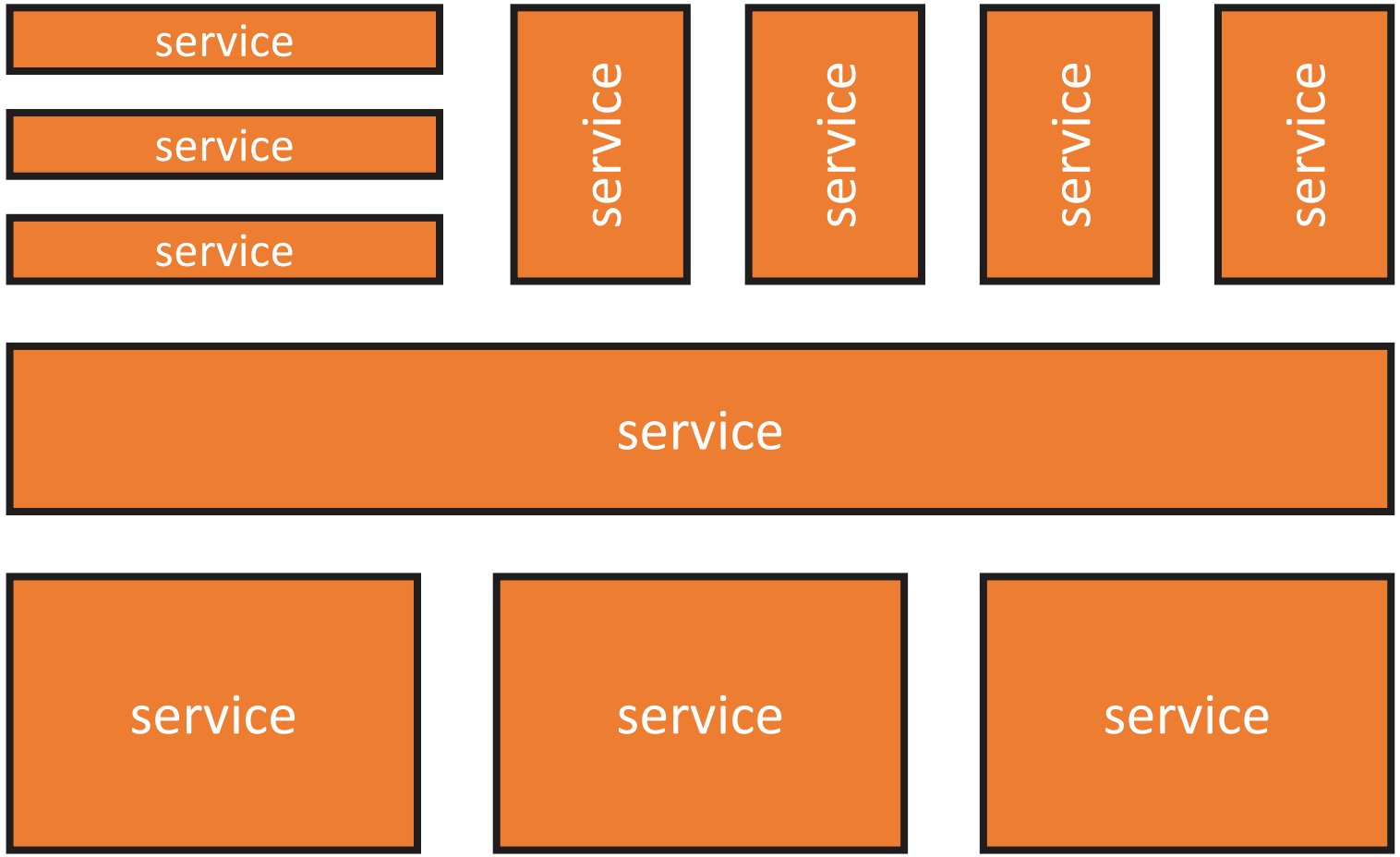
Why did we start service mesh project?


monolith


service
service
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service

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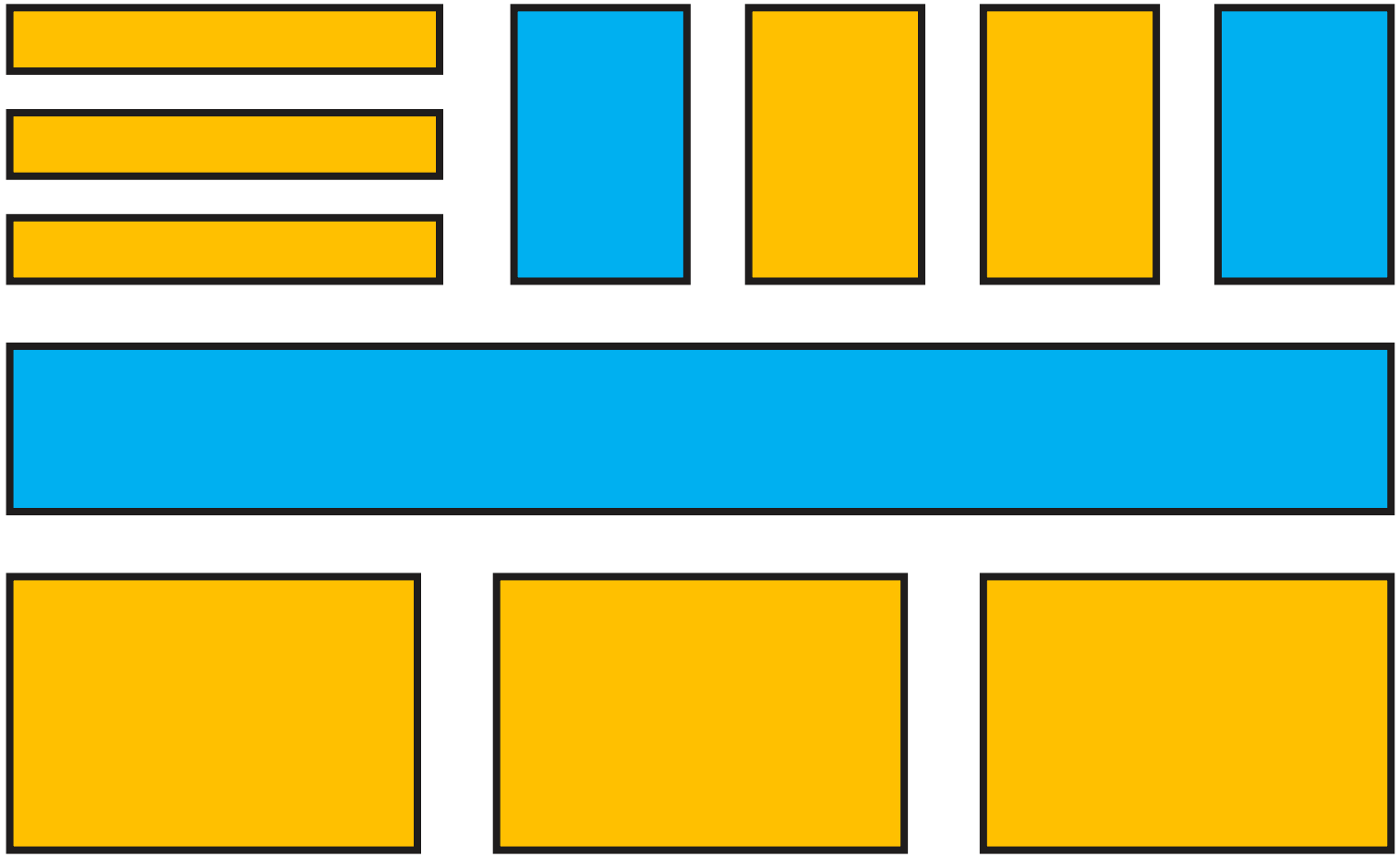

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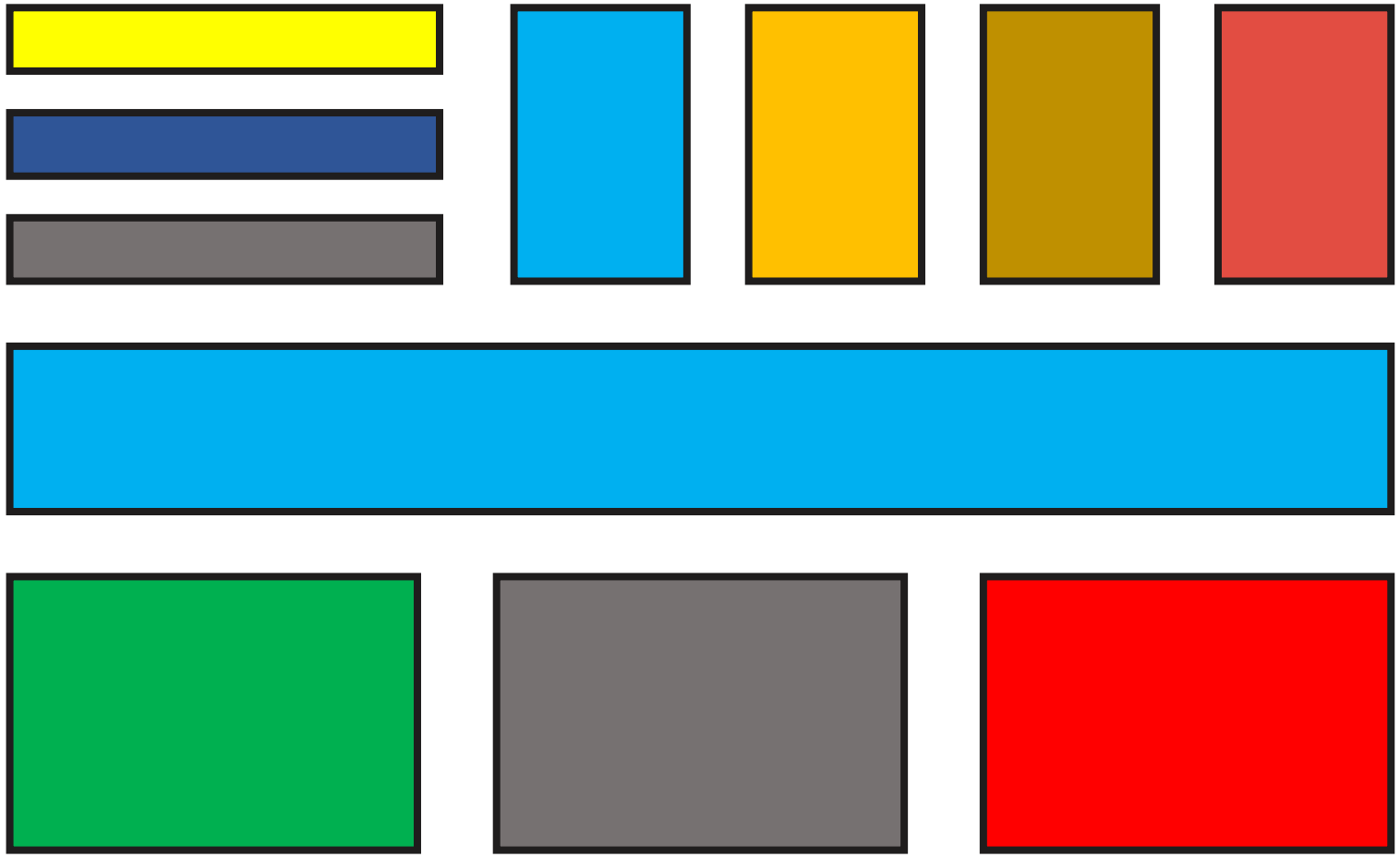

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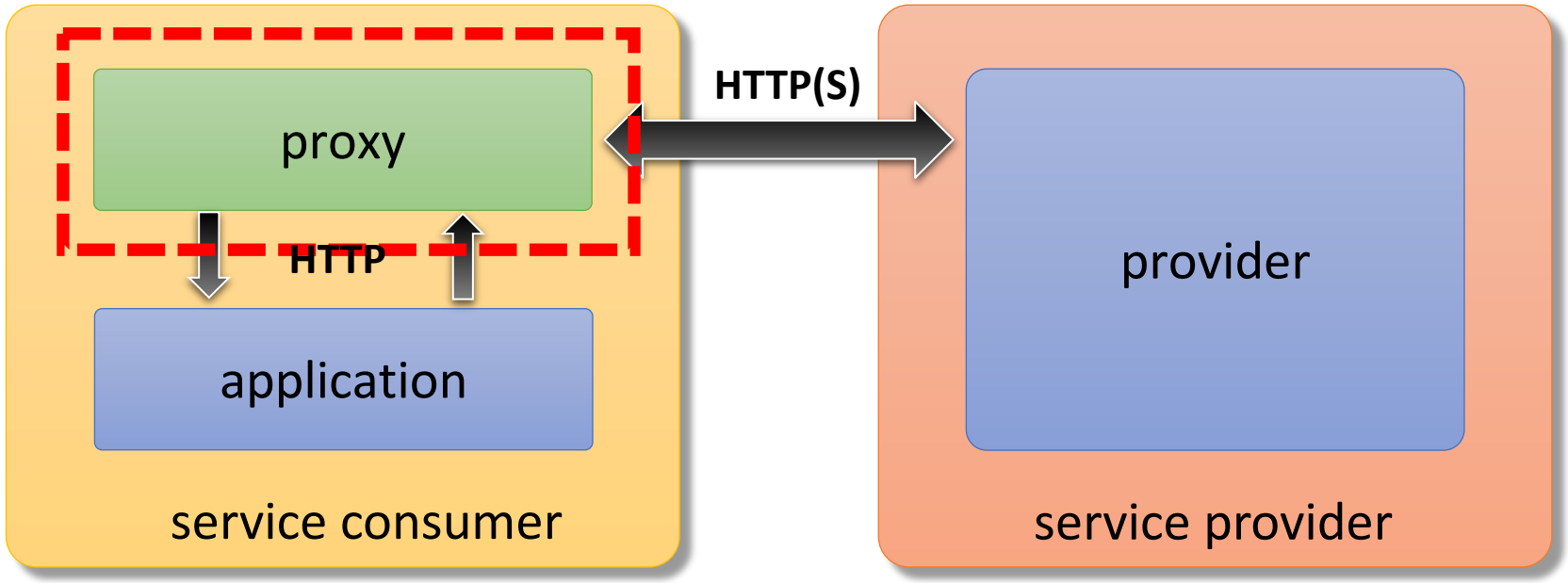
Consistency & Visibility

in communications

Our setup

data plane



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linkerd

envoy

- graceful restart
- TCP proxy

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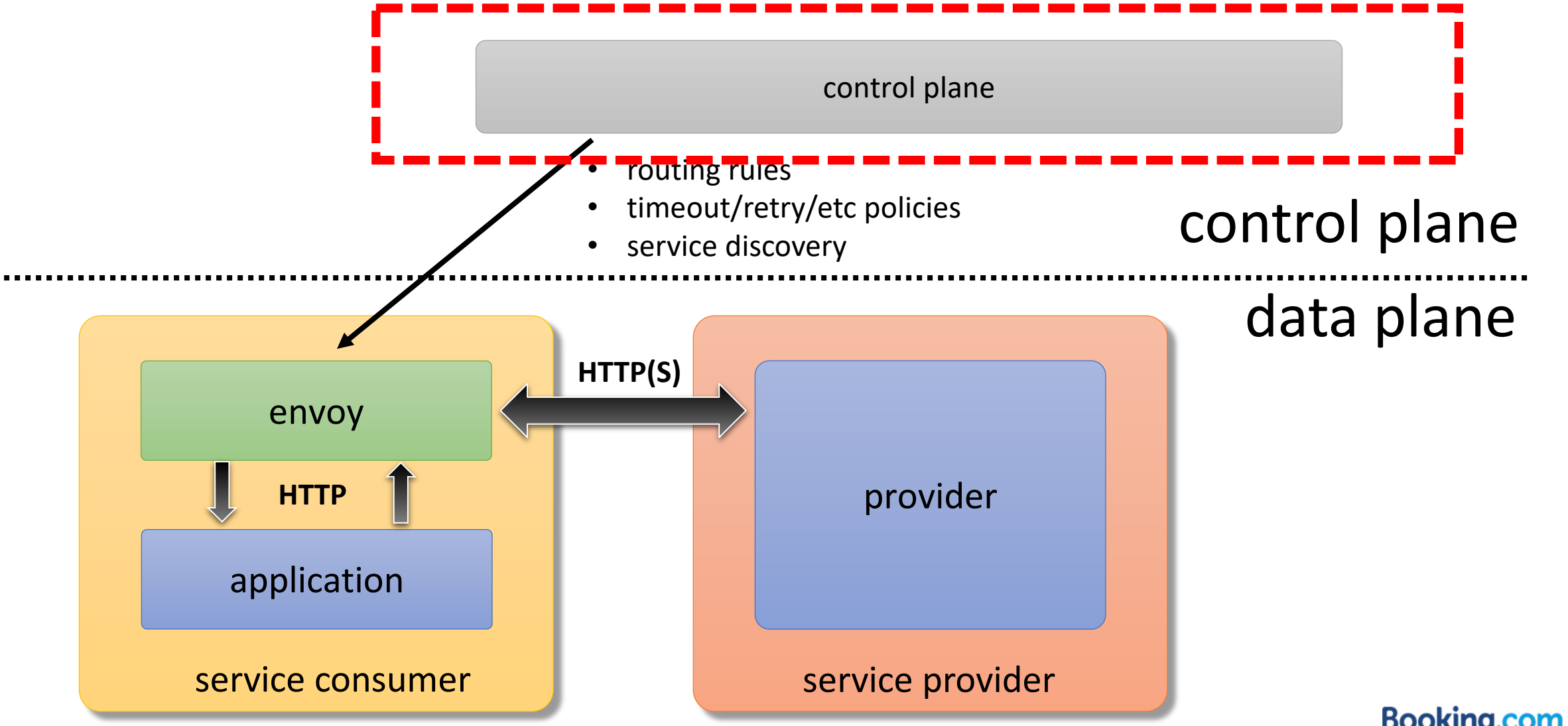
control plane
routing rules
timeout/retry/etc policies
service discovery
control plane
data plane
envoy
HTTP(S)
HTTP
application
provider
service consumer
service provider

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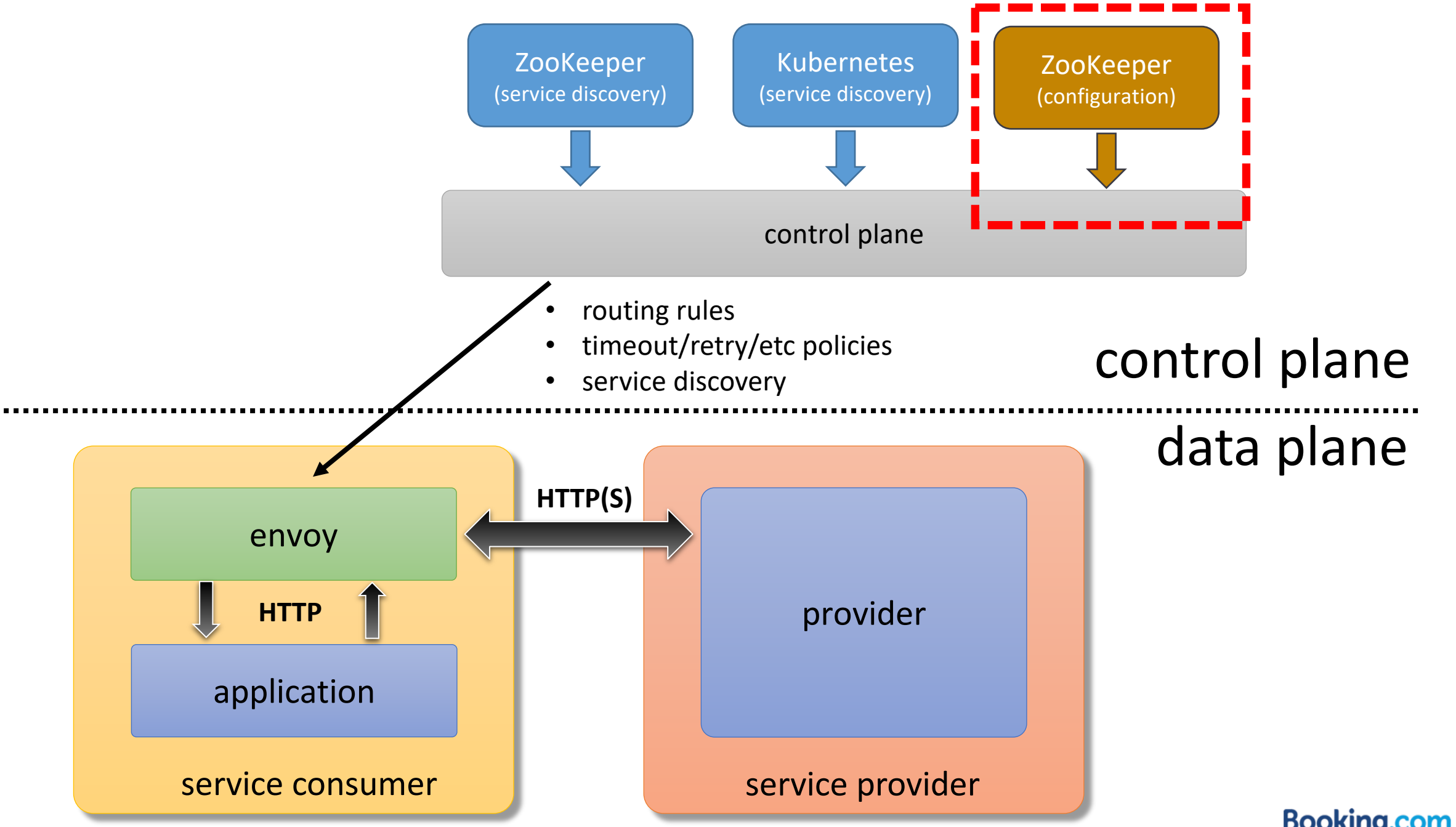
control plane

- in-house (v1/v2 API)
  - started in August 2017; Istio is around 0.2
  - one complex system at a time
- start with bare-metal support
- minimal abstraction
  - yup, just write Envoy config (partially)
  - fine with Envoy's set of features
- self-service for service owners


ZooKeeper
(service discovery)
Kubernetes
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ZooKeeper
(configuration)
control plane
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configuration

- Envoy configuration is quite rich
- power vs. usability:
  - cluster specification
  - virtual host specification

```
kind: ClusterSpec
metadata:
  annotations:
    watcher_name: zookeeper.watcher
    paths: ["/pools/api/dc"]
spec:
  name: api.prod.cluster
  lb_policy: LEAST_REQUEST
  connect_timeout: 1s
  lb_subset_config:
    subset_selectors:
    - keys: ["DC"]
    - keys: ["IsLocal"]
    fallback_policy: DEFAULT_SUBSET
    default_subset:
      IsLocal: true
```

```
kind: VirtualHostSpec
spec:
  name: api.vhost
  domains: ["api.service"]
  routes:
  - match:
      prefix: /
    route:
      cluster: api.prod.cluster
      timeout: 10s
      retry_policy:
        retry_on: 5xx
        num_retries: 3
        per_try_timeout: 3s
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envoy cluster spec

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envoy virtual host spec

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  connect_time
  lb_subset_co
    subset_sel
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envoy cluster spec

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                                x
                                  3
                  eout: 3s
```
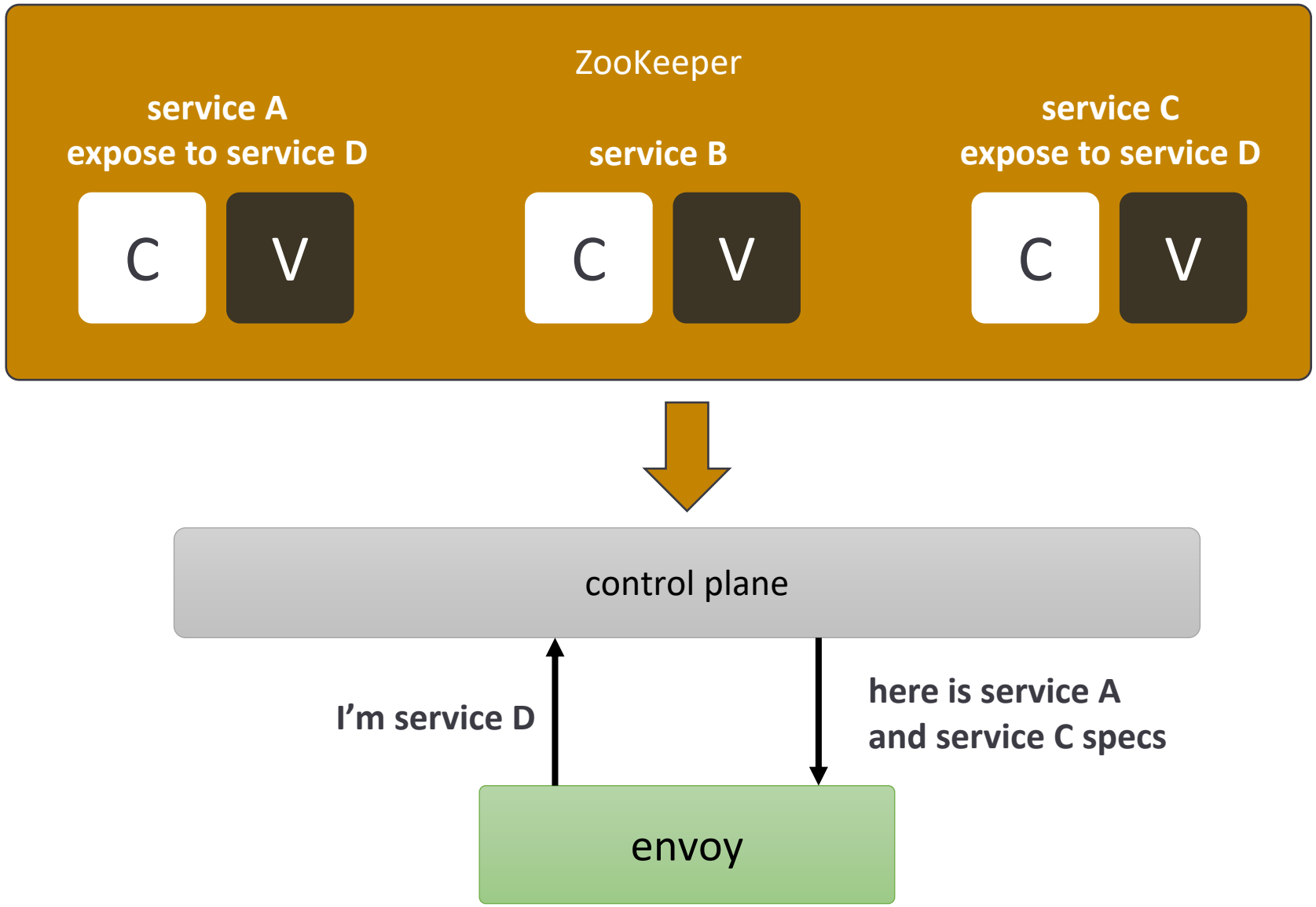

envoy virtual host spec

bootstrap wizard


ZooKeeper
service A
expose to service D
C
V
service B
C
V
service C
expose to service D
C
V
control plane
I'm service D
here is service A
and service C specs
envoy

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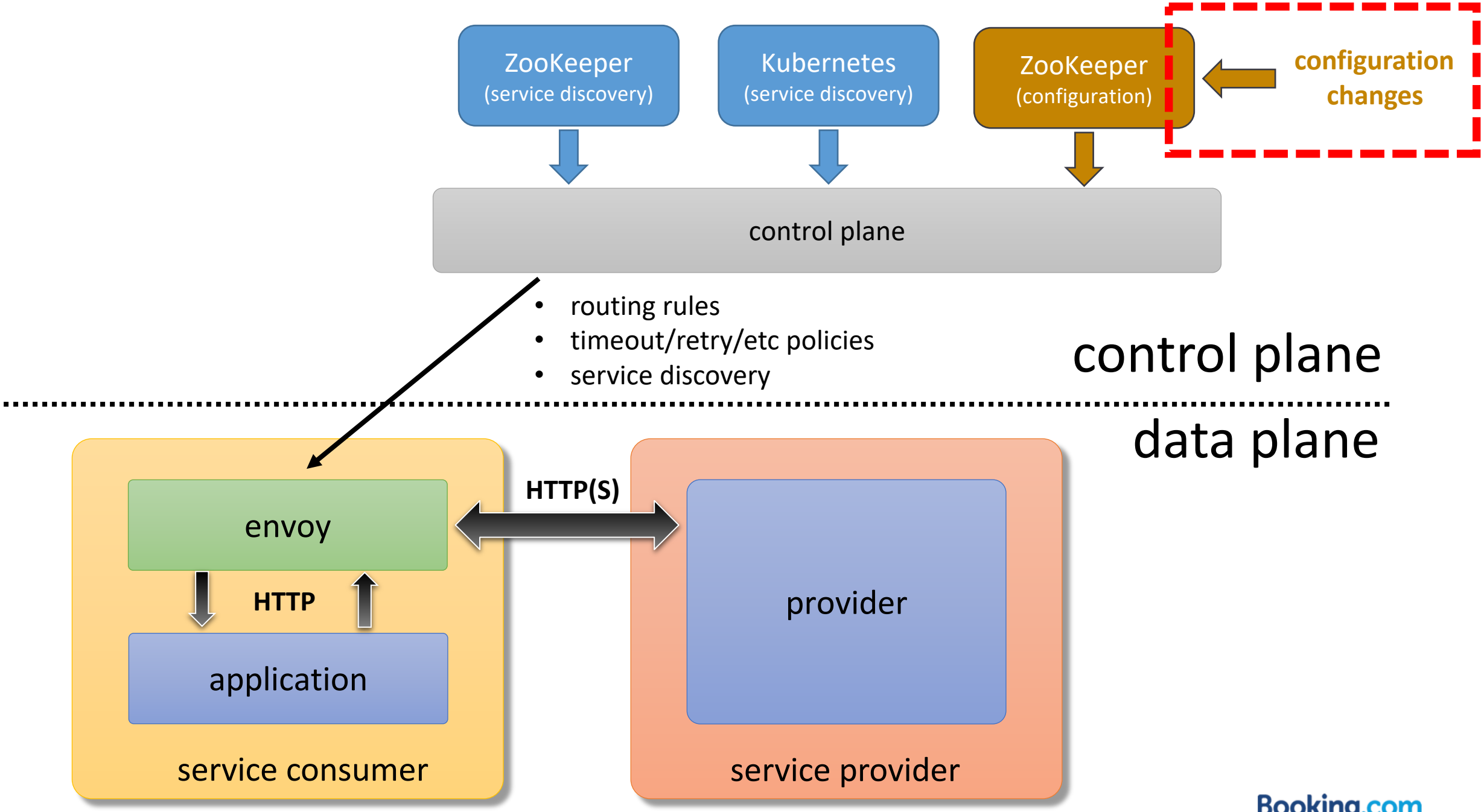
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routing rules
timeout/retry/etc policies
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control plane
data plane
envoy
HTTP
application
HTTP(S)
provider
service consumer
service provider

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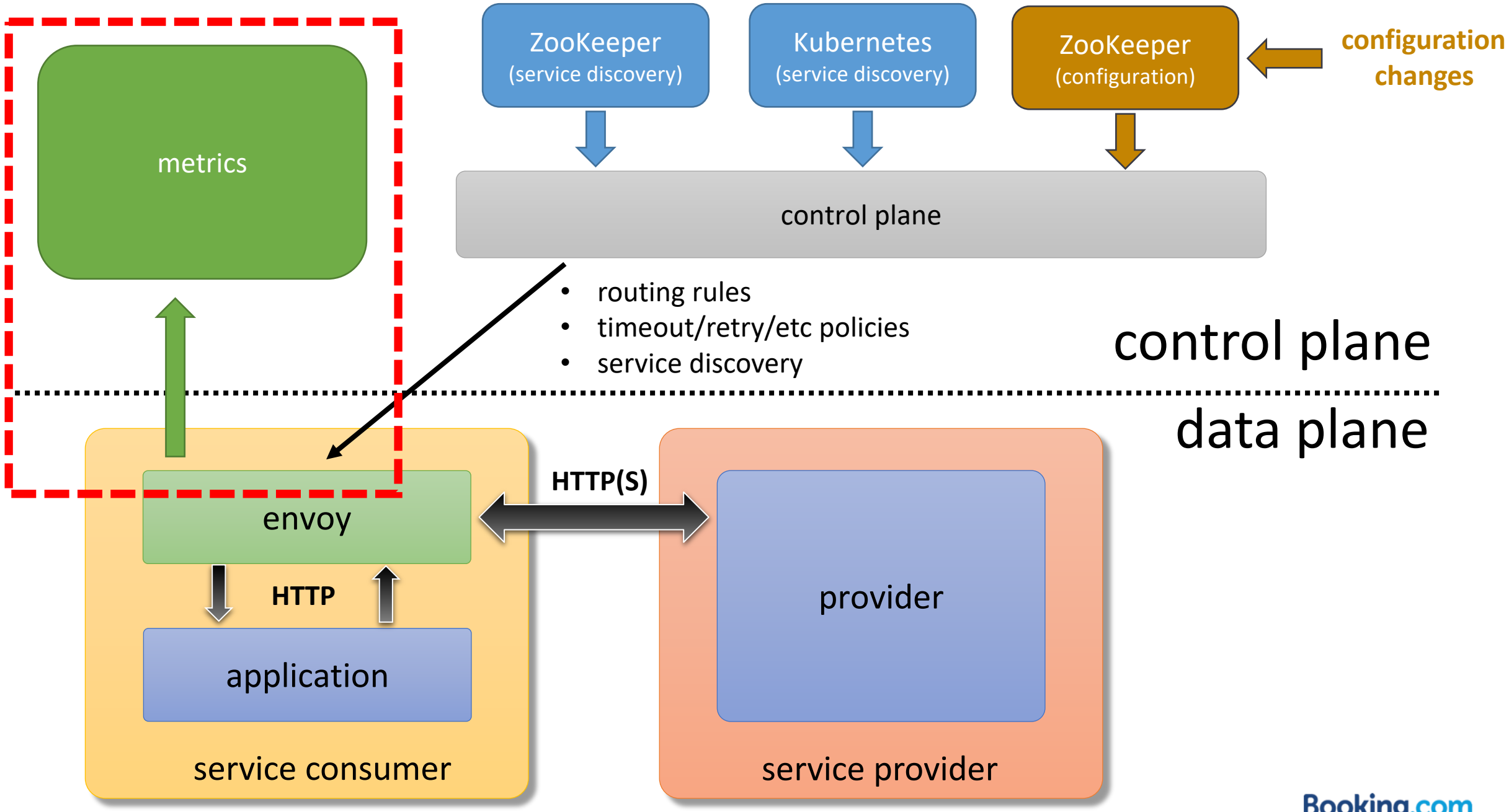
Deploying changes

- integration with existent infrastructure
  - git-deploy
- vanguard (canary) deployment
- syntax and semantic validation
- fast rollback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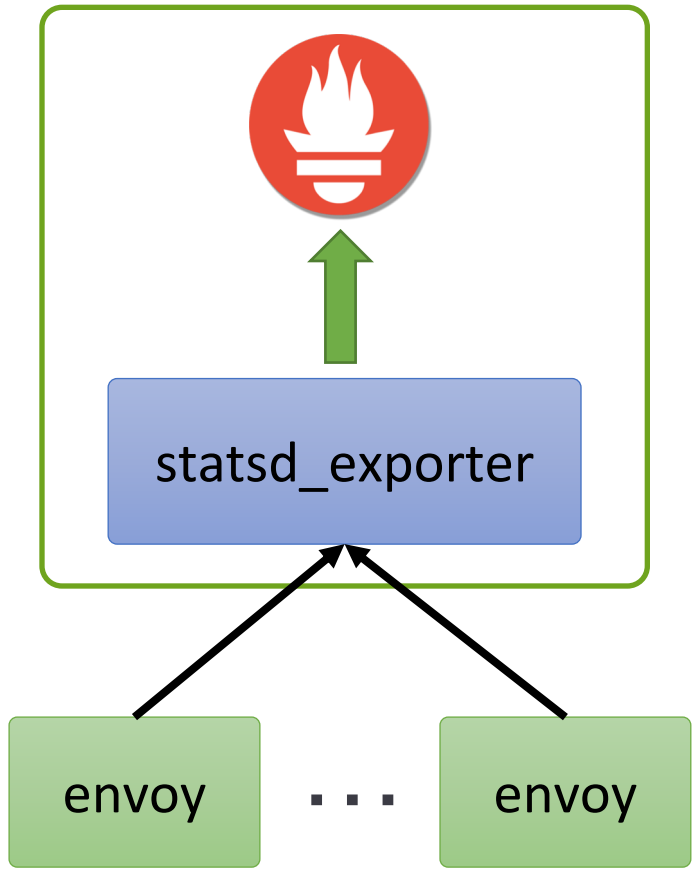
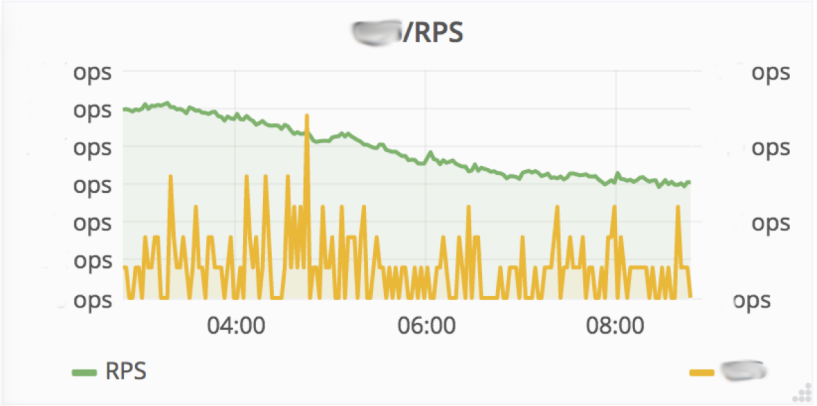
Monitoring

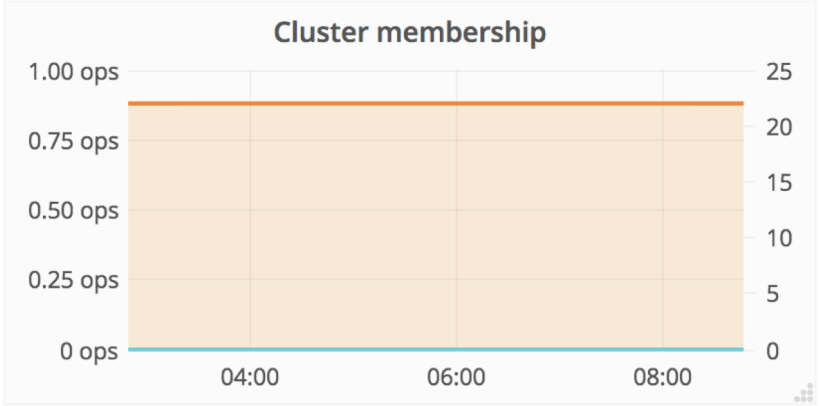
- approach #1 – graphite
  - excellent in-house facilities
  - aggregations is too heavy at scale
- approach #2 – prometheus
  - statsd support
  - statsd_exporter
  - still iterating
- standard dashboard

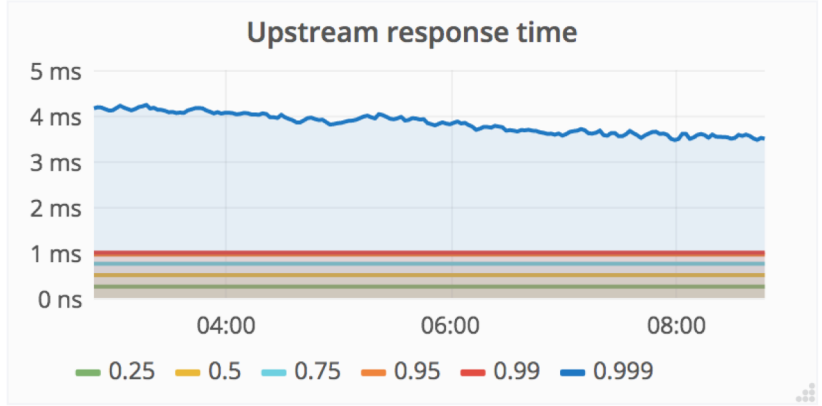


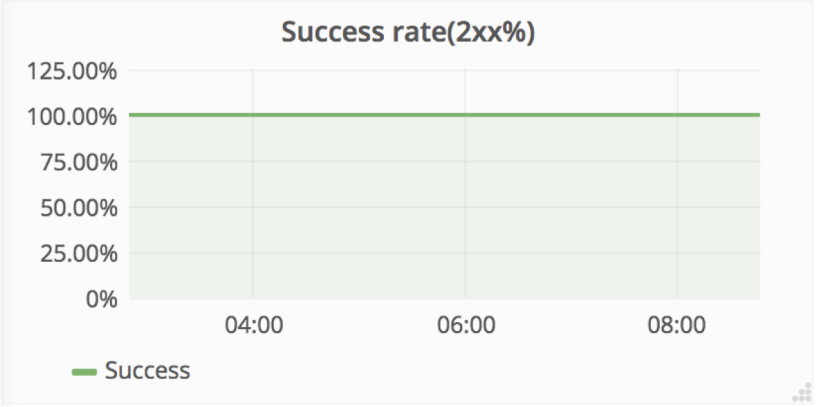
DataSource [redacted] To Service [redacted].prod.cluster

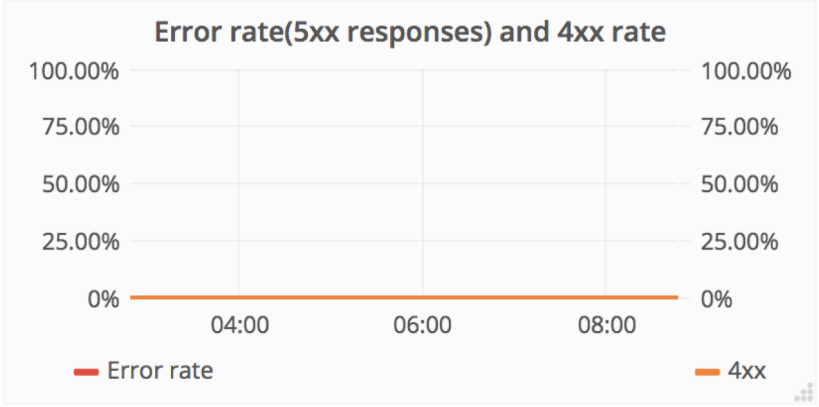
Egress to [redacted]prod.cluster

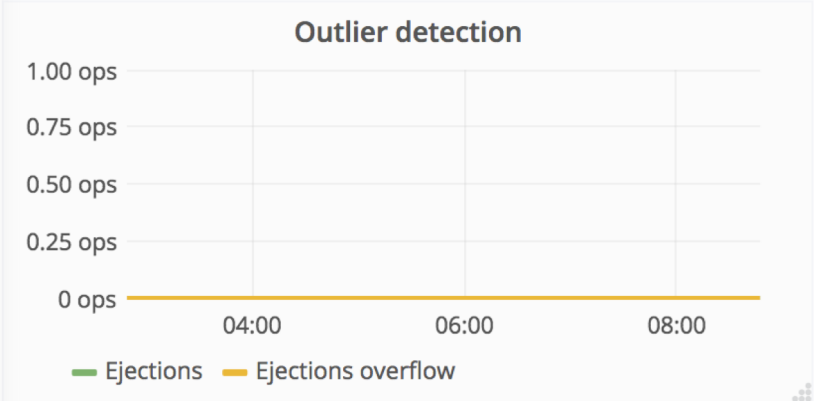


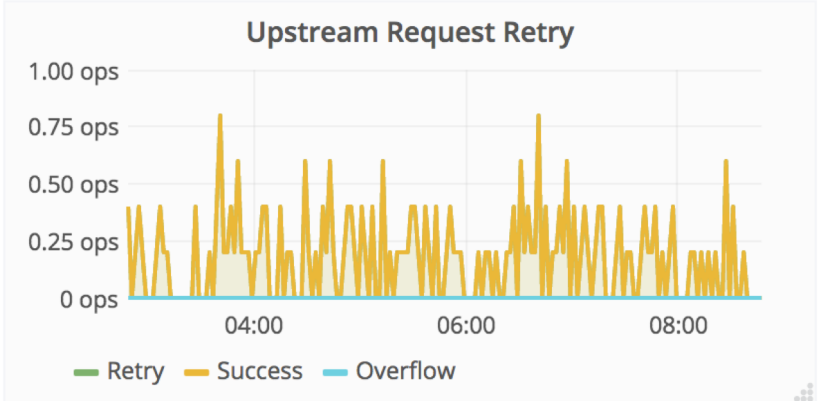


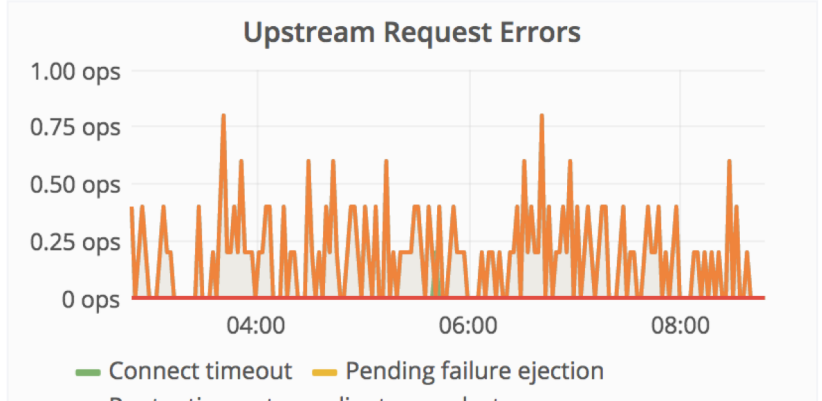


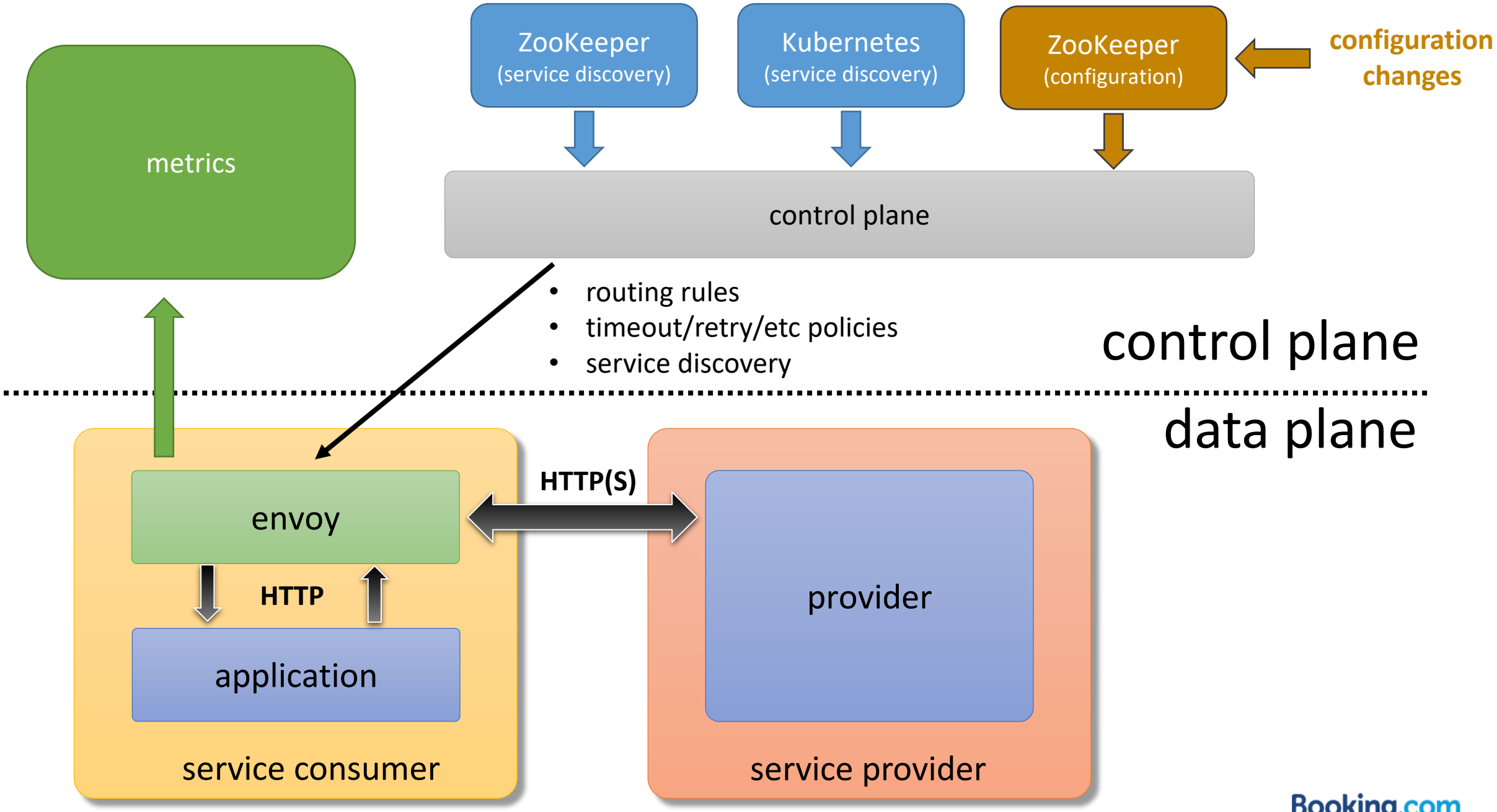








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Production

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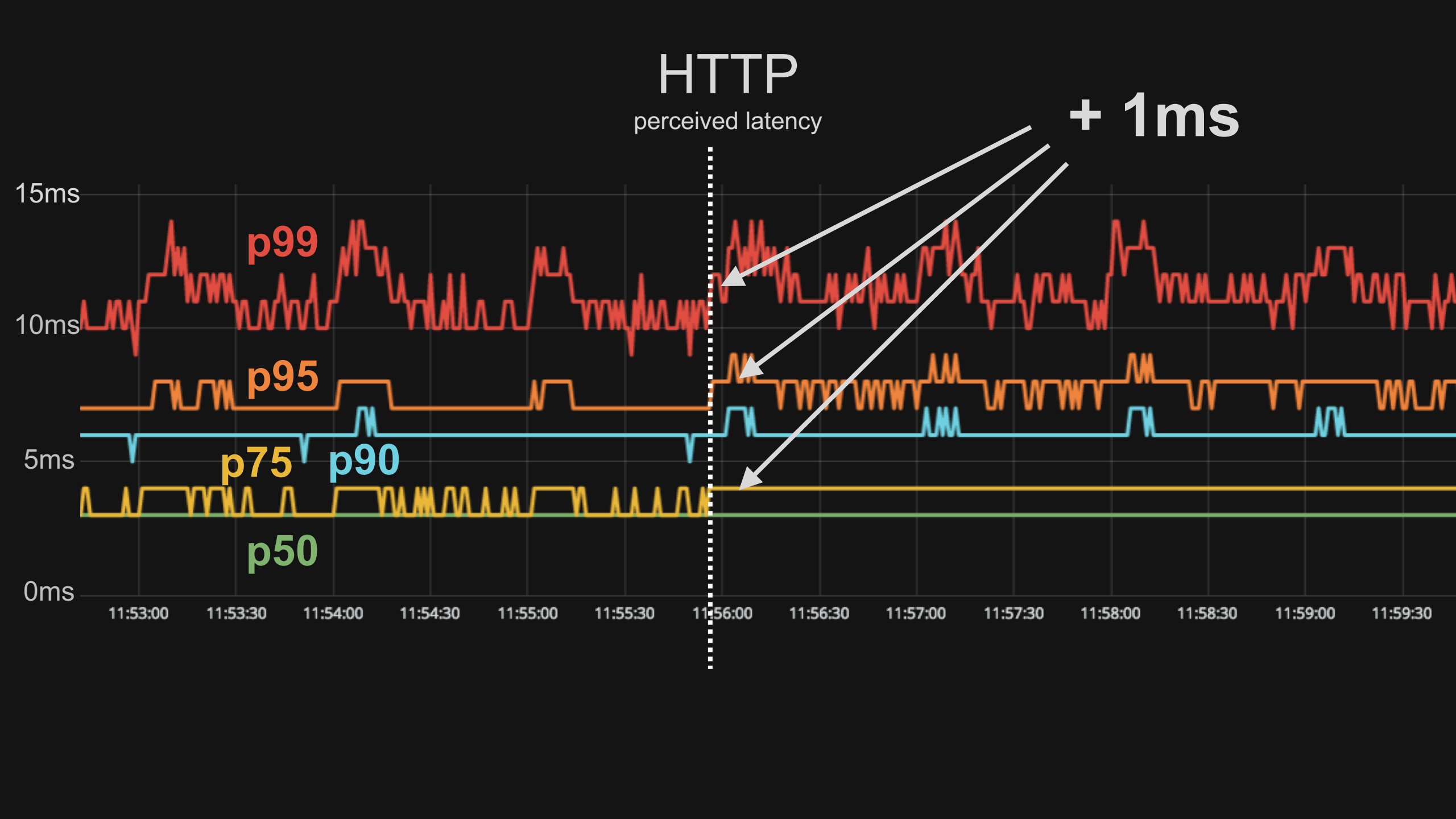
Some numbers

- ~ 6 months in production
- ~ 30 projects
- ~ 10K servers
- hundreds of thousands RPS
- overheads…


HTTP
perceived latency
+ 1ms
15ms
10ms
5ms
0ms
p99
p95
p75
p90
p50
11:53:00
11:53:30
11:54:00
11:54:30
11:55:00
11:55:30
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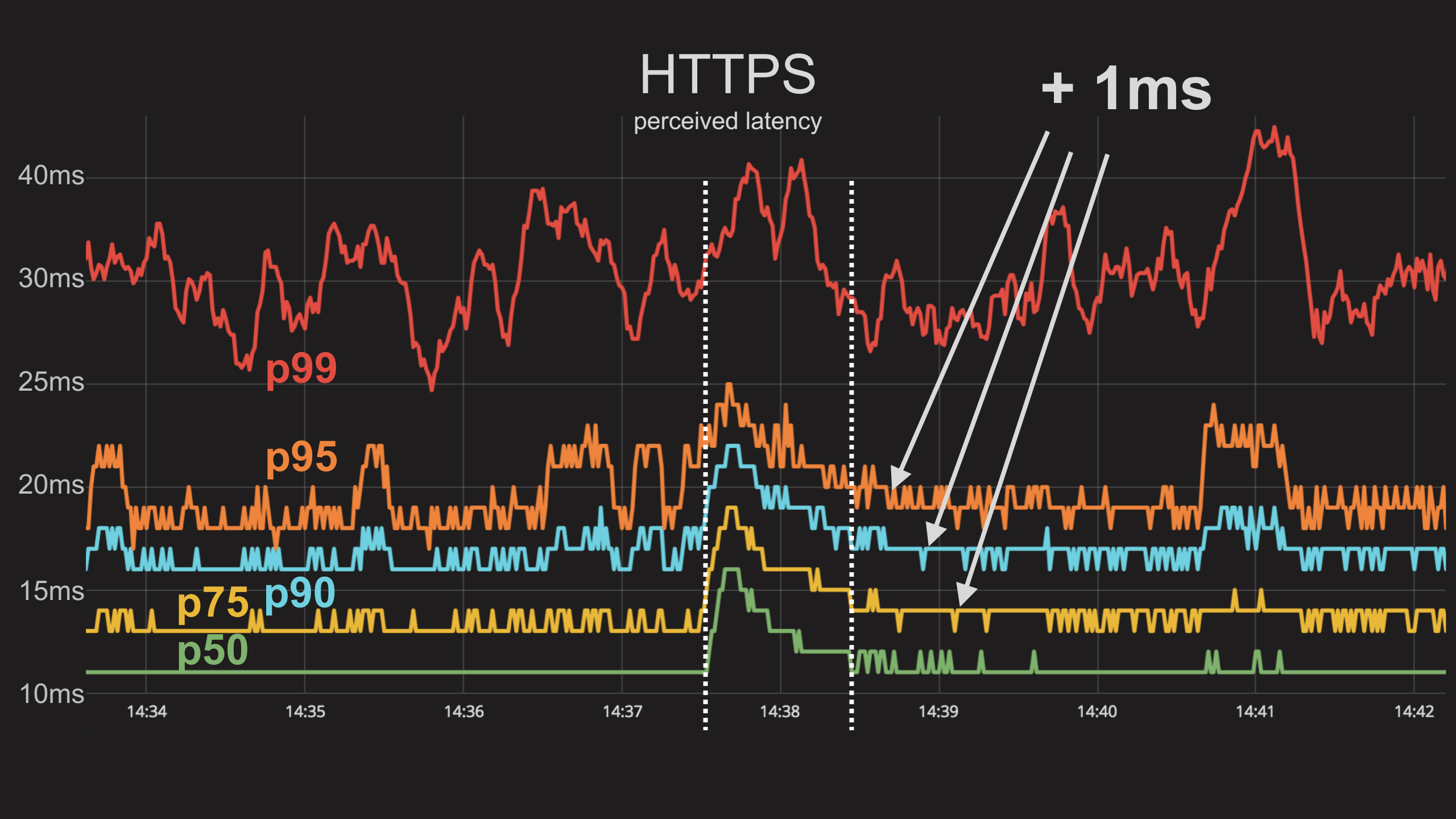
11:59:30


HTTPS
perceived latency
+ 1ms
40ms
30ms
25ms
20ms
15ms
10ms
p99
p95
p90
p75
p50
14:34
14:35
14:36
14:37
14:38
14:39
14:40
14:41
14:42

Some findings

- graceful restart works, but not always!
  - (major) Envoy upgrades may not be graceful
- ”x-envoy-retry-on = connect-failure” – too few
  “x-envoy-retry-on = 5xx” – too much
  - gateway-error – HTTP 502, 503, 504
- absence of TCP keepalive => stale connections
  - coming in 1.7
  - idle_timeout in TCP proxy in 1.6
- cluster_name (1.5) -> cluster_names (1.6)

Conclusion

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service mesh* is
a building block on the path to SOA
technically & organizationally

* the way I understand it

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Andrei Vereha
Envoy production stories
Friday, May 4th 14:00
Envoy Deep Dive

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Thank you!
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ivan.kruglov@booking.com
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