云智慧
Cloudwise

Kubernetes自动伸缩实现

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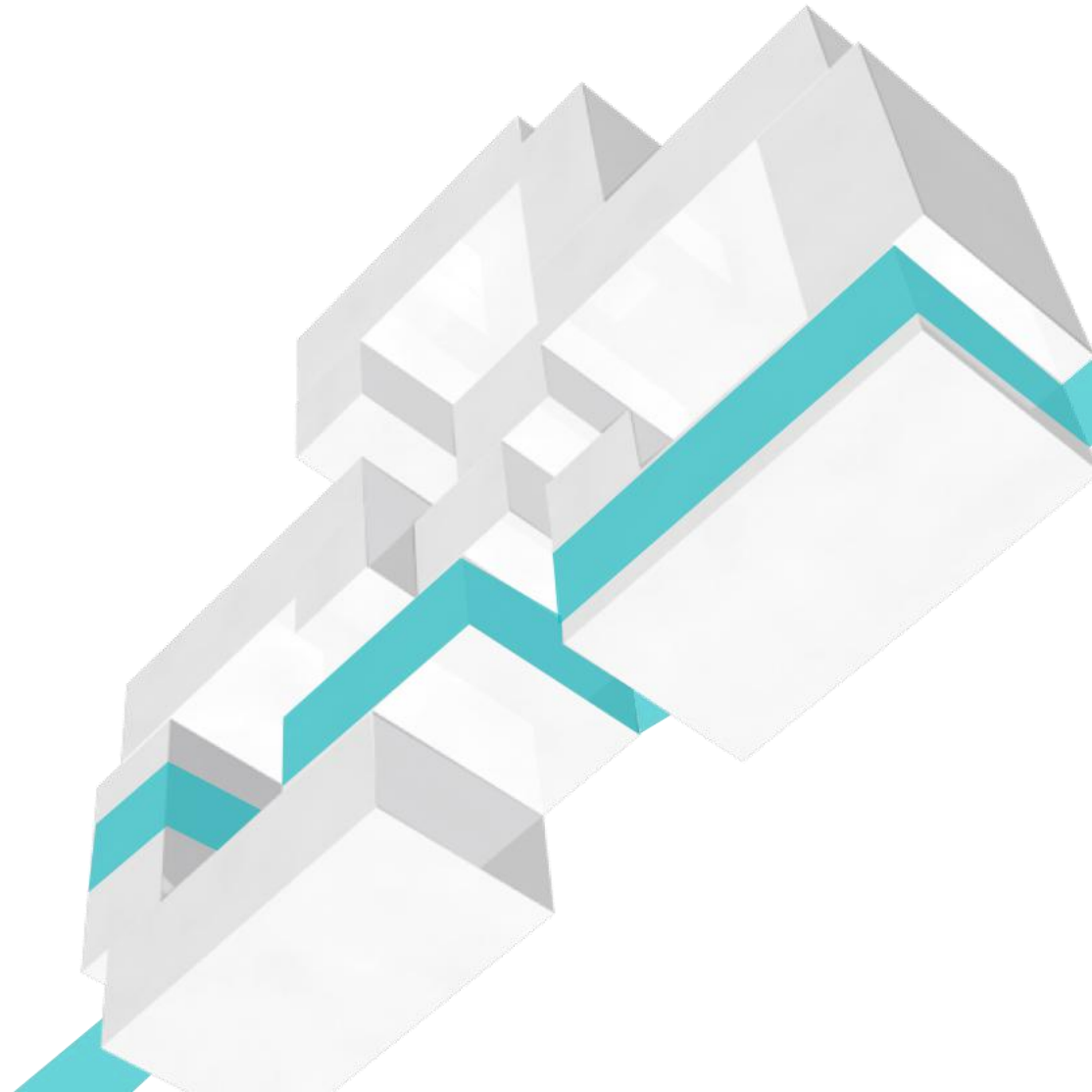
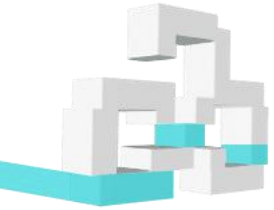


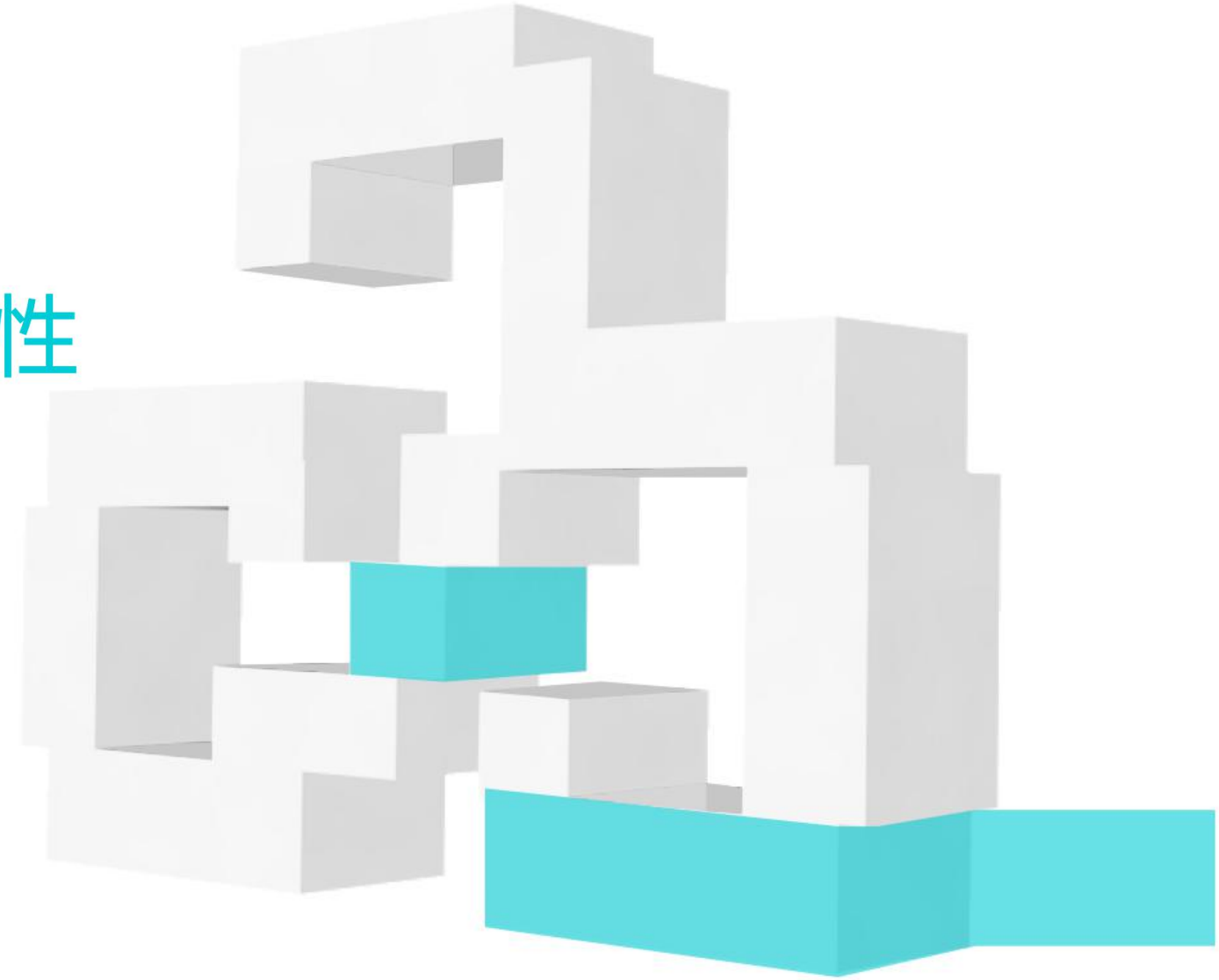


自我介绍

- 某跨国互联网公司架构师，从事云原生应用落地工作
- 技术图书《云原生架构》、《Istio实战指南》作者
- 极客时间&InfoQ专栏作者
- 云原生社区管委会成员
- AWS Container Hero

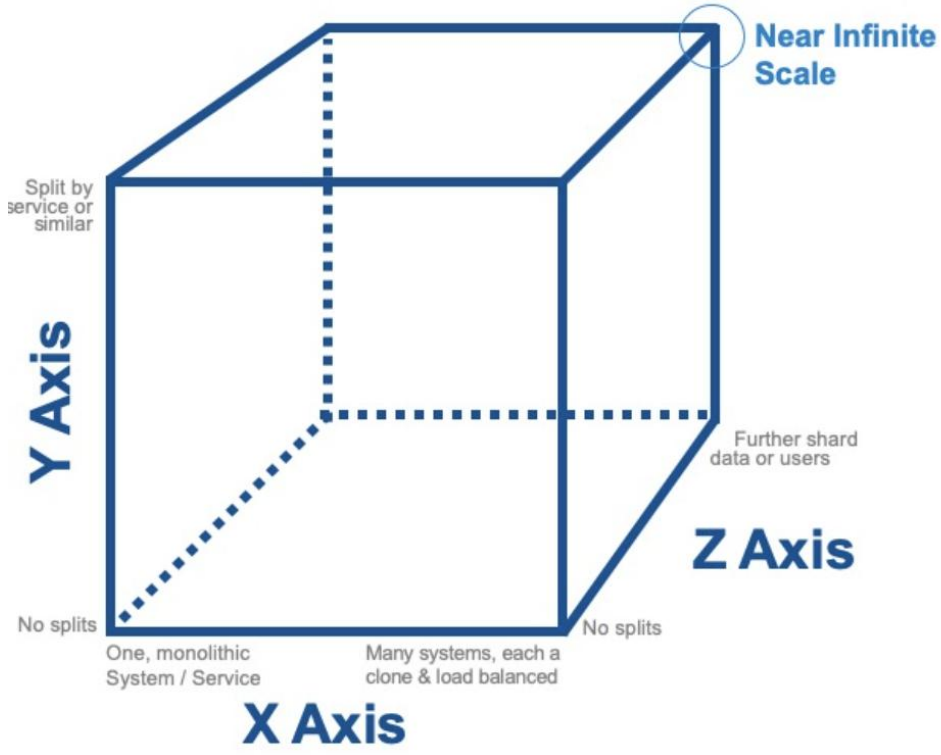
目 录

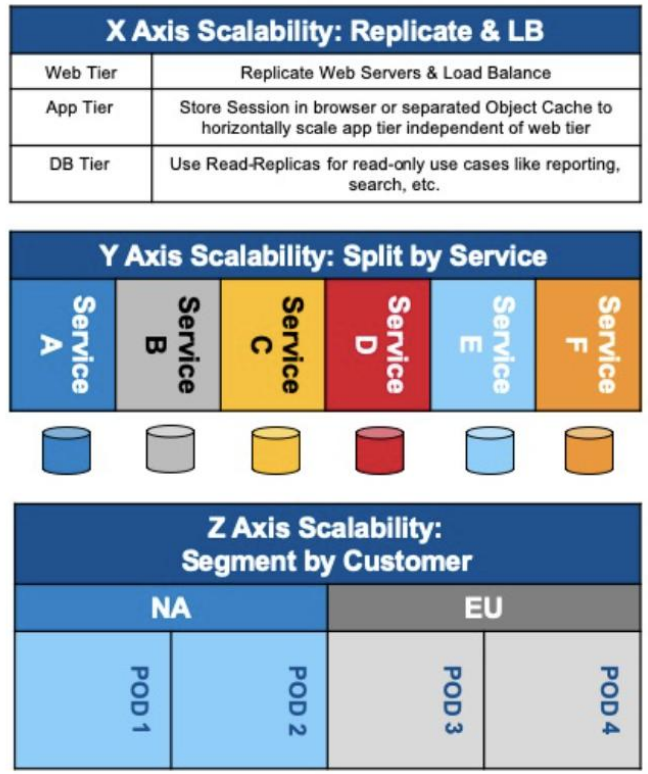
自动伸缩能力的重要性



从可扩展性说起

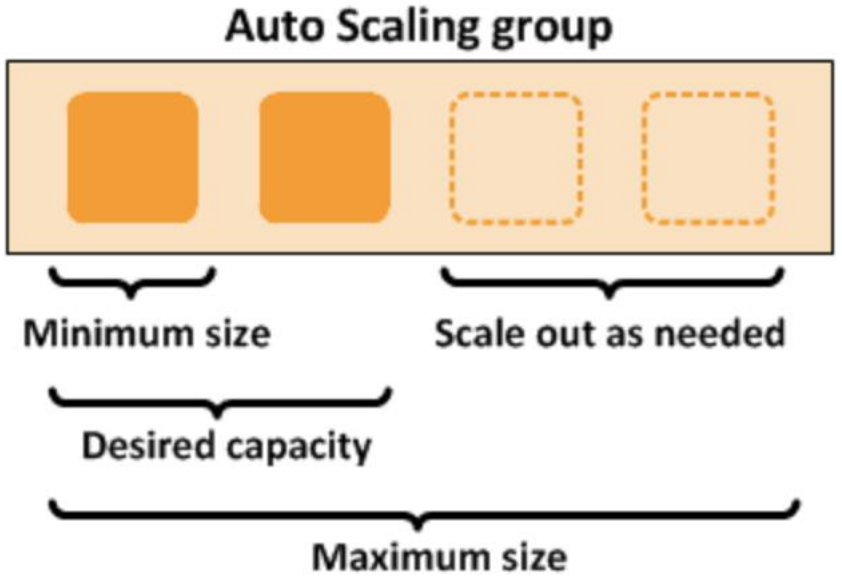
X轴：水平复制
Y轴：功能扩展
Z轴：数据分区

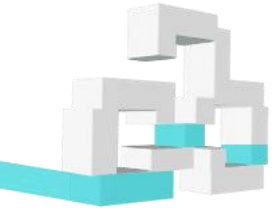




什么是自动伸缩（Auto-scaling）

- 一种自动扩展计算资源的云计算技术，资源实例数量会基于用户需要动态变化。



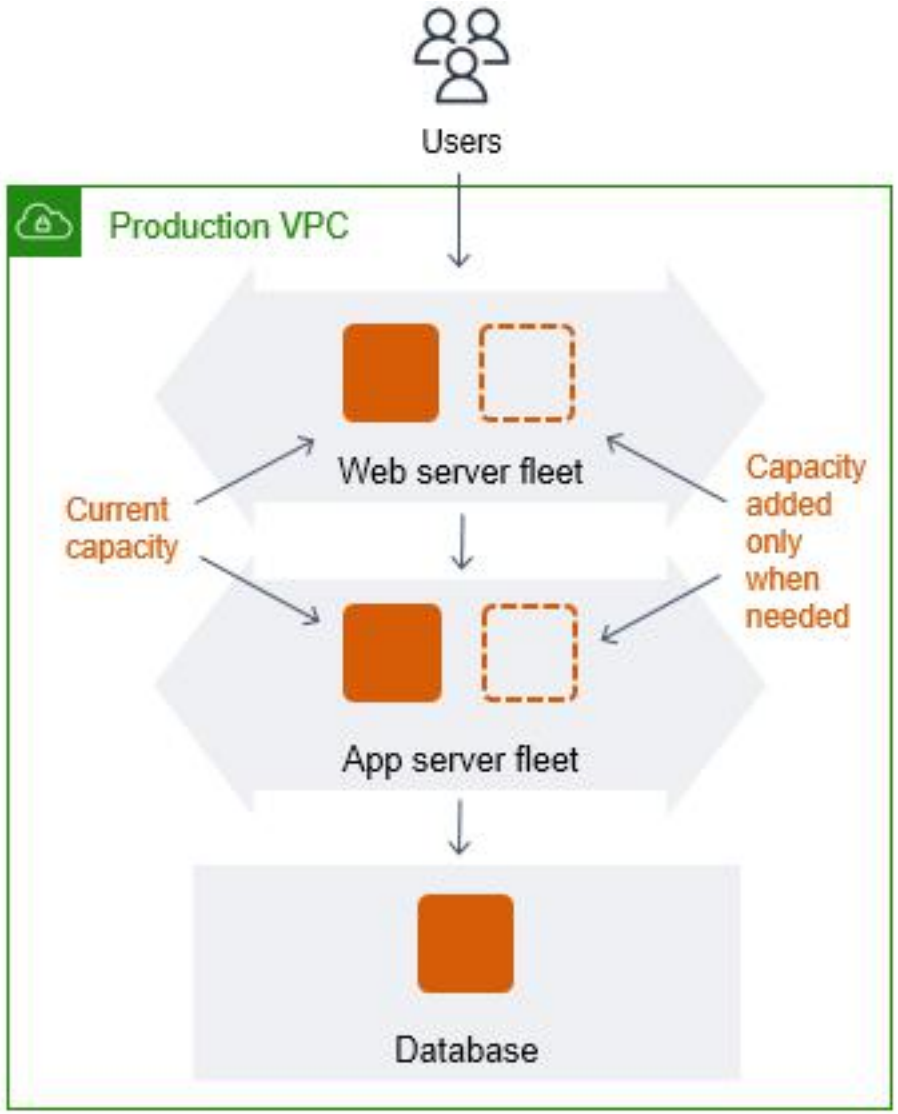


自动伸缩的重要性

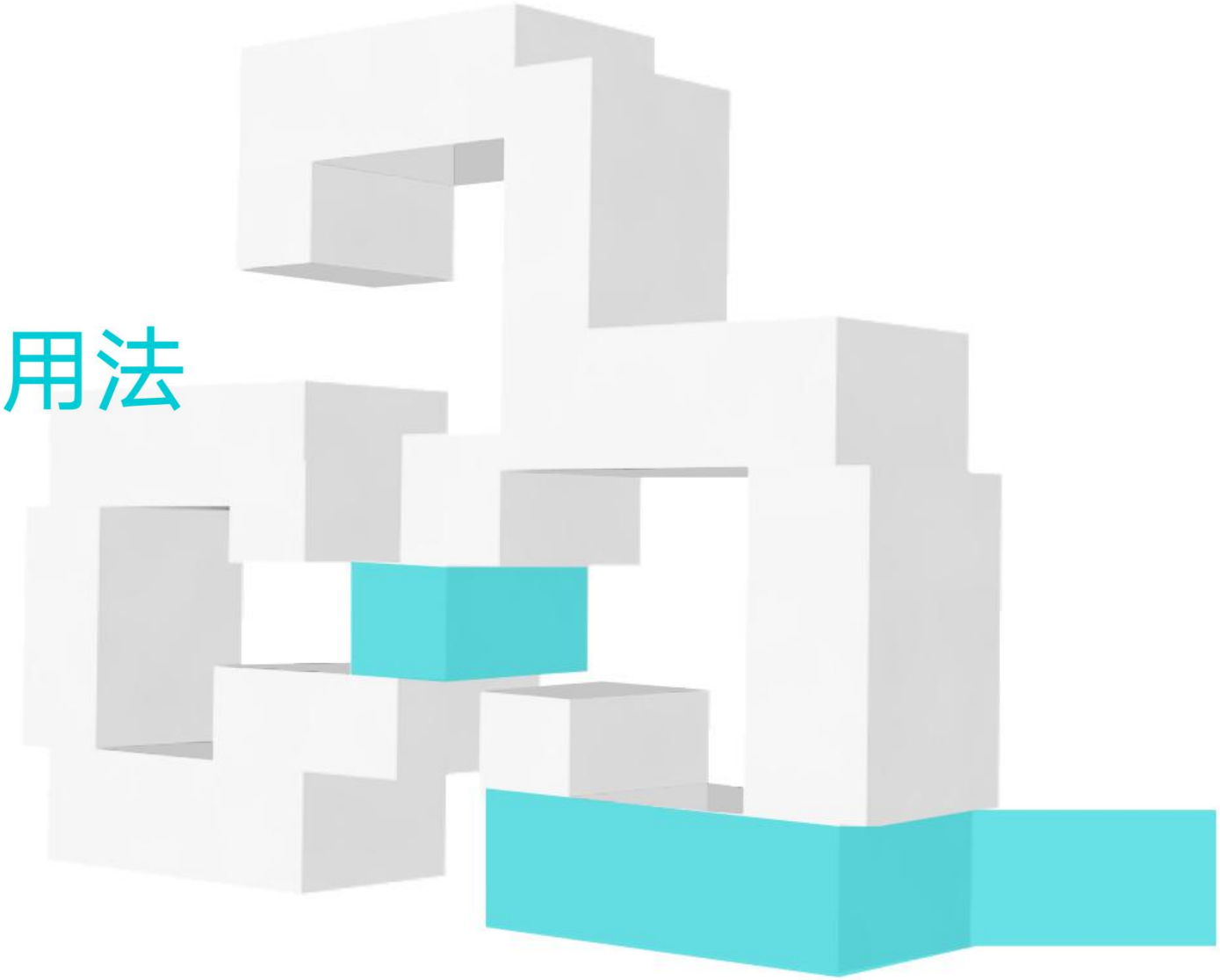
- 更好的容错性（Fault-tolerance）
  - 及时、快速应对负载压力
- 更好的可用性（High Availability）
  - 高可用的本质：冗余
- 更好的成本管理（Cost saving）
  - 按需付费
- 云原生应用的必备能力
- 缺点：难以识别非正常流量（Ddos攻击）

常见的自动伸缩的实现

- 云提供商的基本服务
- Serverless
- Kubernetes HPA

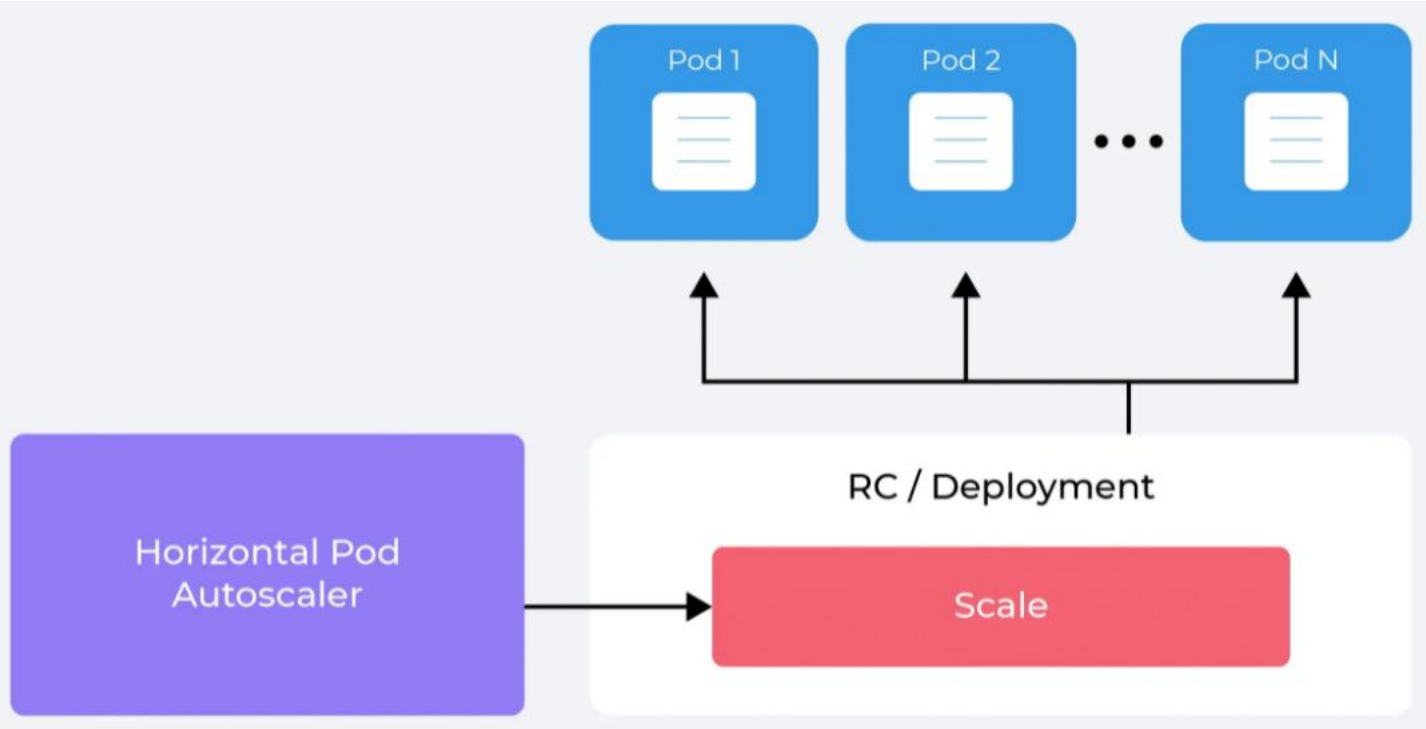


HPA工作原理及基本用法

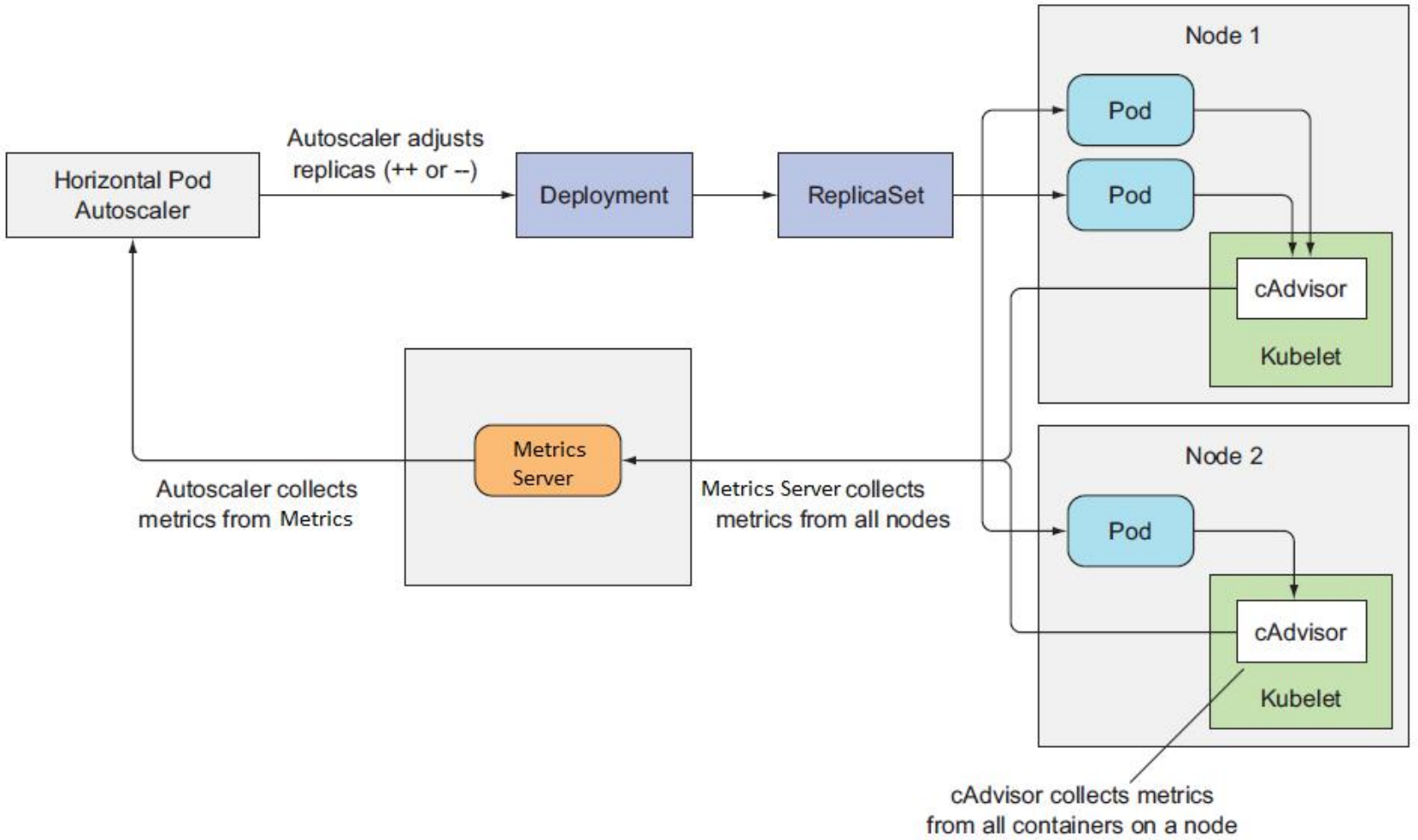


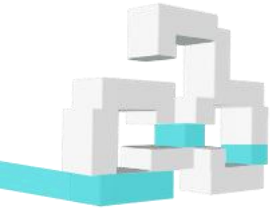
Kubernetes里的自动伸缩实现 - HPA

Kubernetes Horizontal Pod Autoscaler (HPA)



HPA工作原理


Horizontal Pod Autoscaler
Autoscaler adjusts replicas (++ or --)
Deployment
ReplicaSet
Node 1
Pod
Pod
cAdvisor
Kubelet
Metrics Server
Autoscaler collects metrics from Metrics
Metrics Server collects metrics from all nodes
Node 2
Pod
cAdvisor
Kubelet
cAdvisor collects metrics from all containers on a node



基于默认资源指标实现的HPA

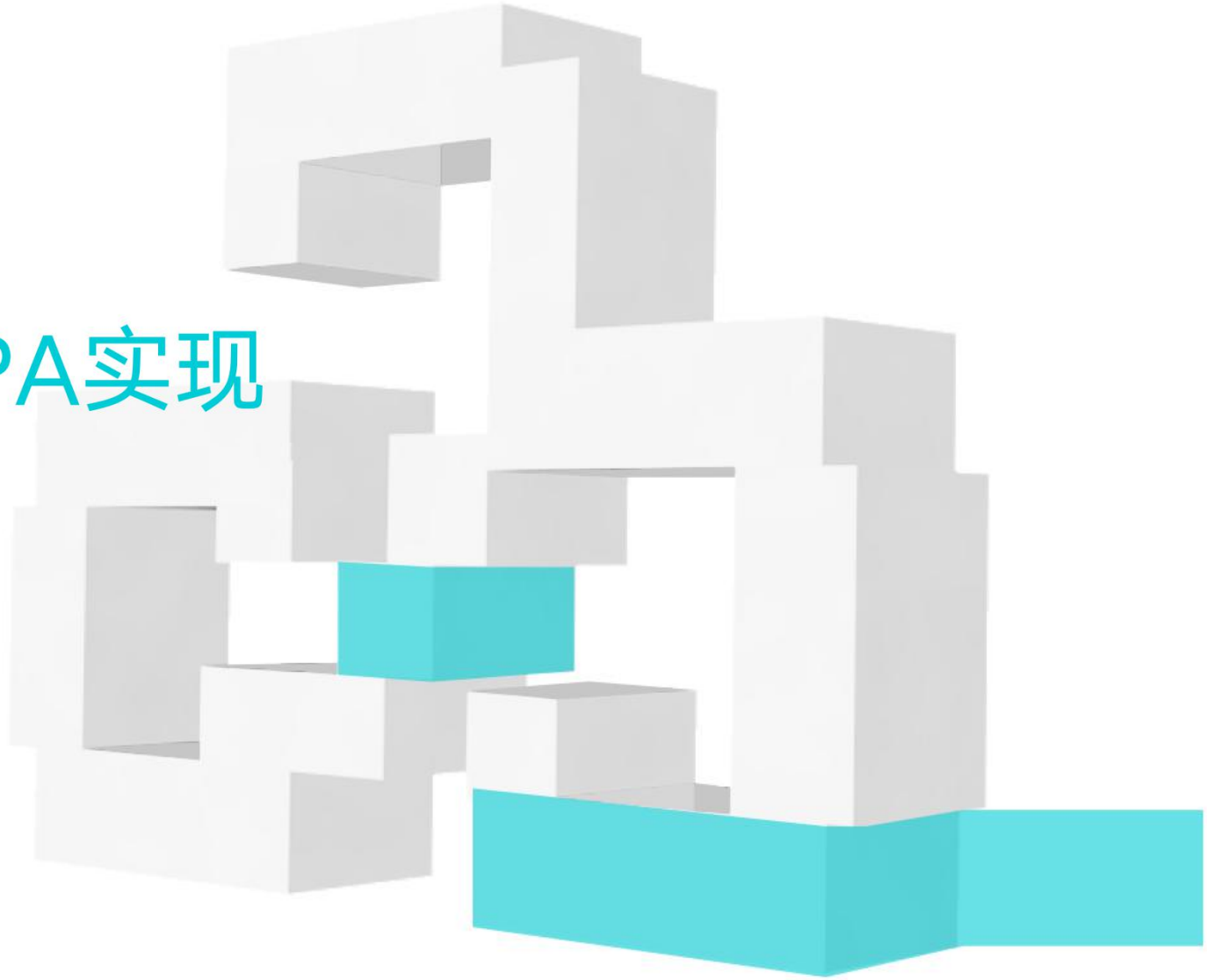
默认指标：CPU、内存

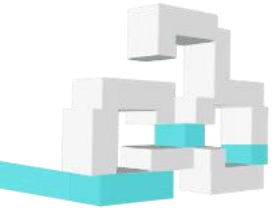
检查间隔：默认15s

公式：ceil[当前副本数 * (当前指标 / 期望指标)]

```yaml
apiVersion: autoscaling/v2beta2
kind: HorizontalPodAutoscaler
metadata:
  name: php-apache
spec:
  scaleTargetRef:
    apiVersion: apps/v1
    kind: Deployment
    name: php-apache
  minReplicas: 1
  maxReplicas: 10
  metrics:
  - type: Resource
    resource:
      name: cpu
      target:
        type: Utilization
        averageUtilization: 50
```

基于自定义指标的HPA实现

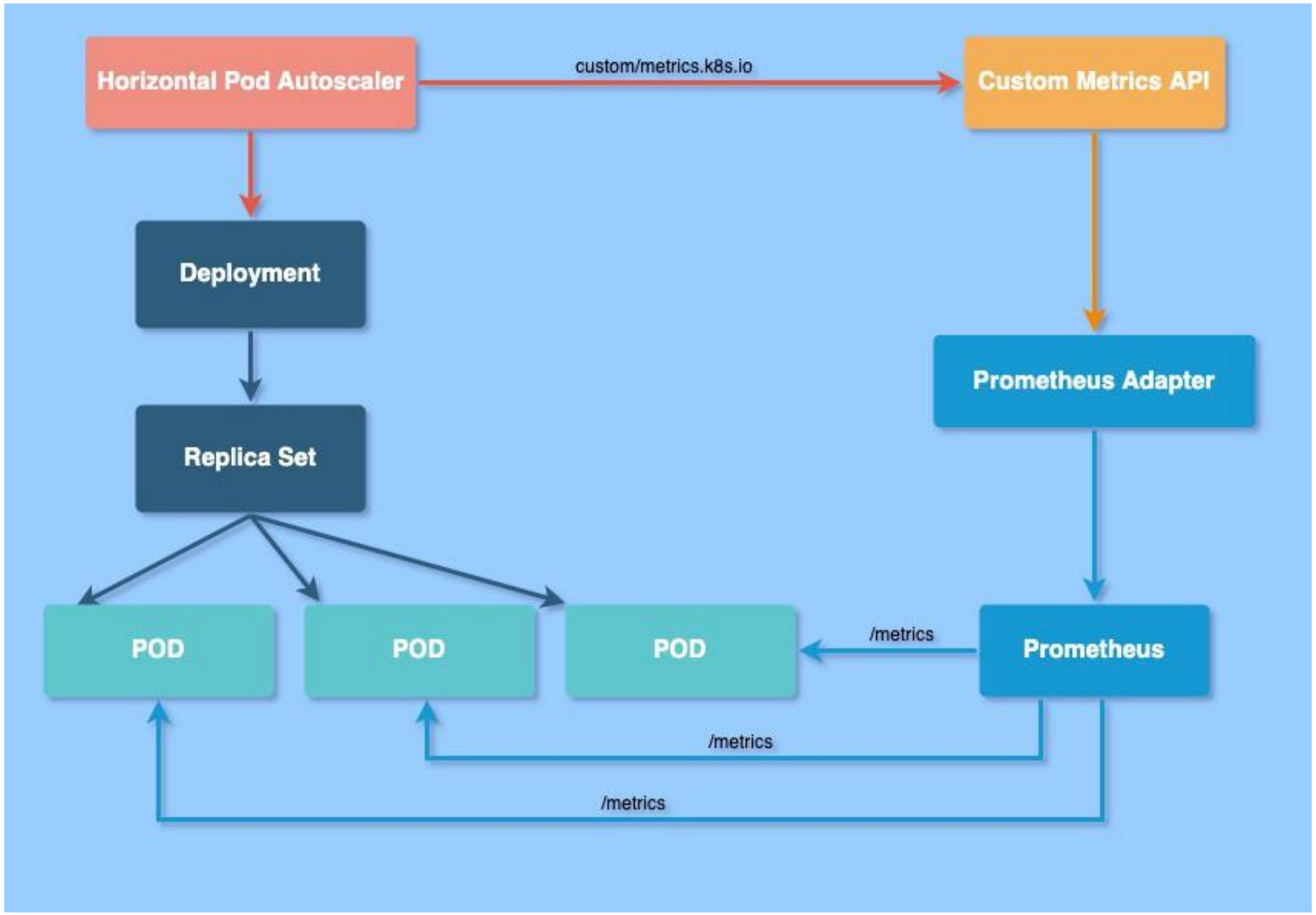




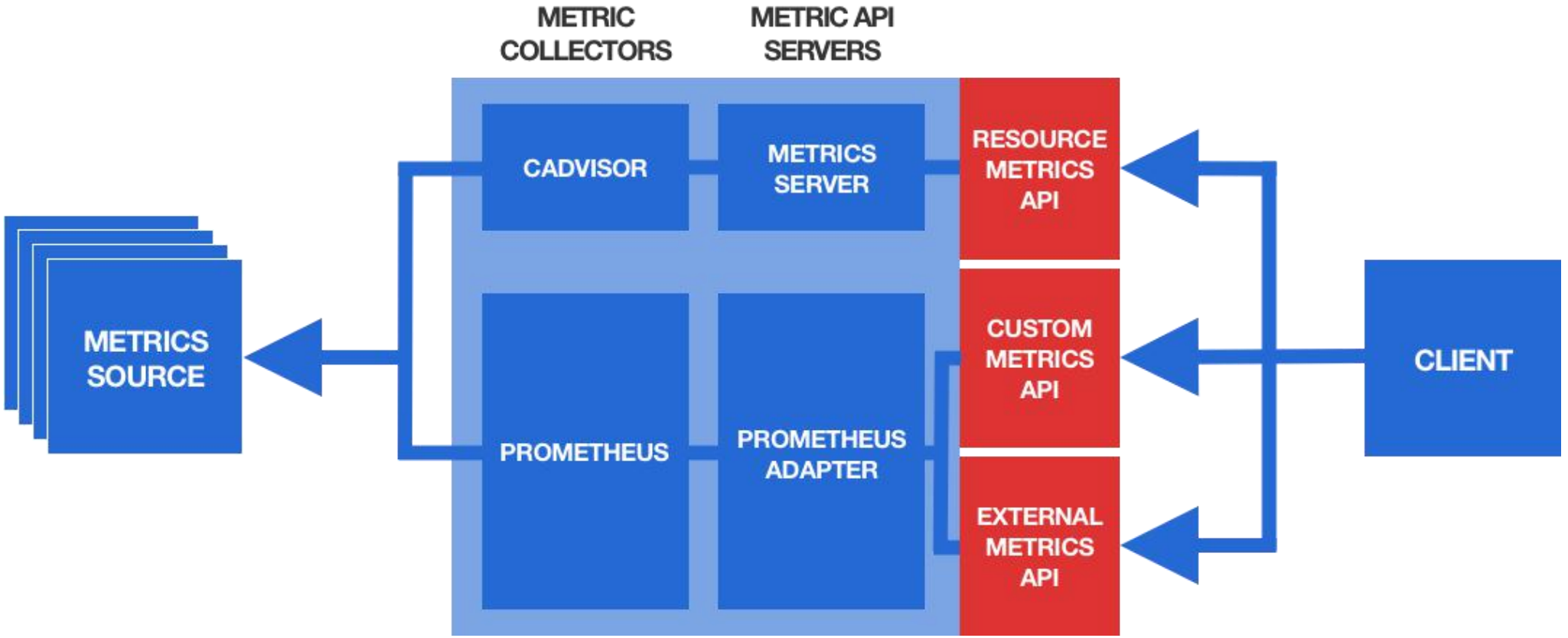
为什么需要自定义指标实现自动伸缩？

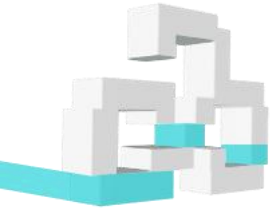
- 默认指标单一，不能反映真实的负载
- 无法满足定制需要
- 基于多指标扩容

自定义指标实现及原理



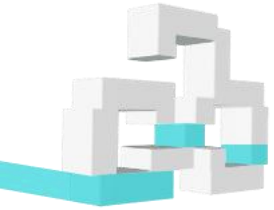
自定义指标实现及原理





基于QPS的HPA实现 – 定义指标

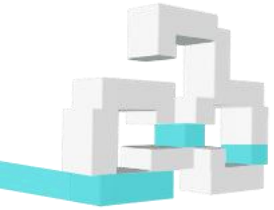
```
import (
    //1. 引入依赖包
    "github.com/prometheus/client_golang/prometheus"
    "github.com/prometheus/client_golang/prometheus/promhttp"
)

var (
    //2. 定义指标
    HTTPRequests = prometheus.NewCounterVec(
        prometheus.CounterOpts{
            Name: "http_requests_total",
            Help: "Number of the http requests received since the server
        },
        []string{"status"},
    )
)

func init() {
    //3. 注册指标
    prometheus.MustRegister(HTTPRequests)
}

func main() {
    http.HandleFunc("/", func(w http.ResponseWriter, r *http.Request) {
        //...
        switch path {
        //4. 暴露接口
        case "/metrics":
            promhttp.Handler().ServeHTTP(w, r)
        //...
    })
    //5.调用指标
    HTTPRequests.WithLabelValues(strconv.Itoa(code)).Inc()
```



基于QPS的HPA实现 – 为adapter定义规则

```
rules:
  custom:
  - seriesQuery: 'http_requests_total'
    resources:
      template: <<.Resource>>
    name:
      matches: "http_requests_total"
      as: "qps"
    metricsQuery: sum(rate(<<.Series>>{<<.LabelMatchers>>}[1m])) by (<<.GroupBy>>)
prometheus:
  url: http://prometheus.monitoring.svc.cluster.local
  port: 9090
```

可通过kubectl get --raw /apis/custom.metrics.k8s.io/v1beta1测试



基于QPS的HPA实现 – 定义HPA

```yaml
apiVersion: autoscaling/v2beta2
kind: HorizontalPodAutoscaler
metadata:
  name: httpserver
spec:
  minReplicas: 1
  maxReplicas: 10
  scaleTargetRef:
    apiVersion: apps/v1
    kind: Deployment
    name: httpserver
  metrics:
  - type: Pods
    pods:
      metric:
        name: qps
      target:
        averageValue: 1000
        type: AverageValue
```

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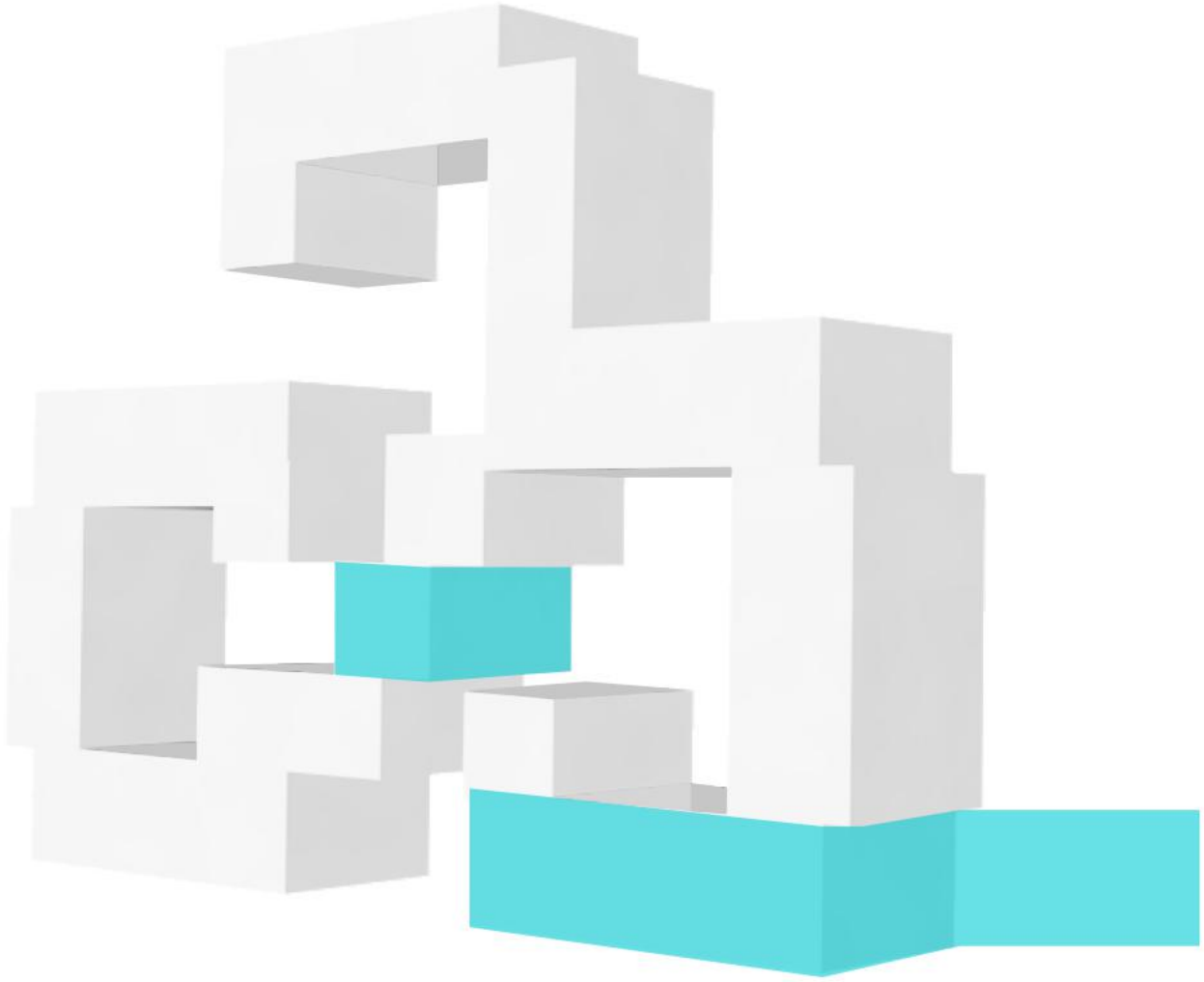
感谢观看

Q&A



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数据展示

APM Server | APM APP RUM | APM Browser | APM Host

数据分析

应用拓扑	请求分析	页面分析	用户追踪	磁盘读写分析	JS分析	渲染性能分析
堆栈详情	流量监控	链式追踪	端到端分析	内存资源跟踪	Ajax分析	响应阶段分解
错误异常	CPU监控	CDN分析	中间件分析	进程占用分析	资源加载时序	.....

事件通知

告警

接口

API接口

数据存储

ClickHouse | HBase | Elasticsearch | PostgreSQL | GreenPlum

数据采集

Java | PHP | Python | .NET | Andriod | IOS | NodeJs | Javascript | Go