About the Presenter

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- SaaS Pioneer
- Helps drive Platform as a Service strategy at WSO2
- F500/G2000 Advisor
- Open Source Aficionado

Learn more about me

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Blog: http://blog.cobia.net/cobiacomm

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On Google+ too

Agenda

Presentation

- Motivation
- Cloud Scale Architecture
- Moving Parts
- Real world Application Composition Scenarios
- Running at Scale

Container as a Service Platform Demo

- Launch kubernetes cluster + CoreOS nodes
- Launch event backplane and load balancer
- Launch Platform as a Service components
- Deploy Application Model Policies
- Launch dockerized application
- Test and Scale <- Iterate


Average values of the dynamics of sales
Retail sales levels
CHANGE IN THE BASIC EARNINGS BY REGION
Distribution of the securities market key players
Daily income per employee per hour by department
Regional segments sales
Rental for storage
Central Europe
Birmingham
Share of the income of participants by quarter
London
Sheffield
East Europe

First Order Dev Concerns

? Can I forklift my existing app into the Cloud?

? Can I find room for my app in the Cloud?

? How easily can I deploy my complex app in the Cloud?

? What about a micro-service design approach?

Ops-centric Concerns

Do you hit Gates and Roadblocks?

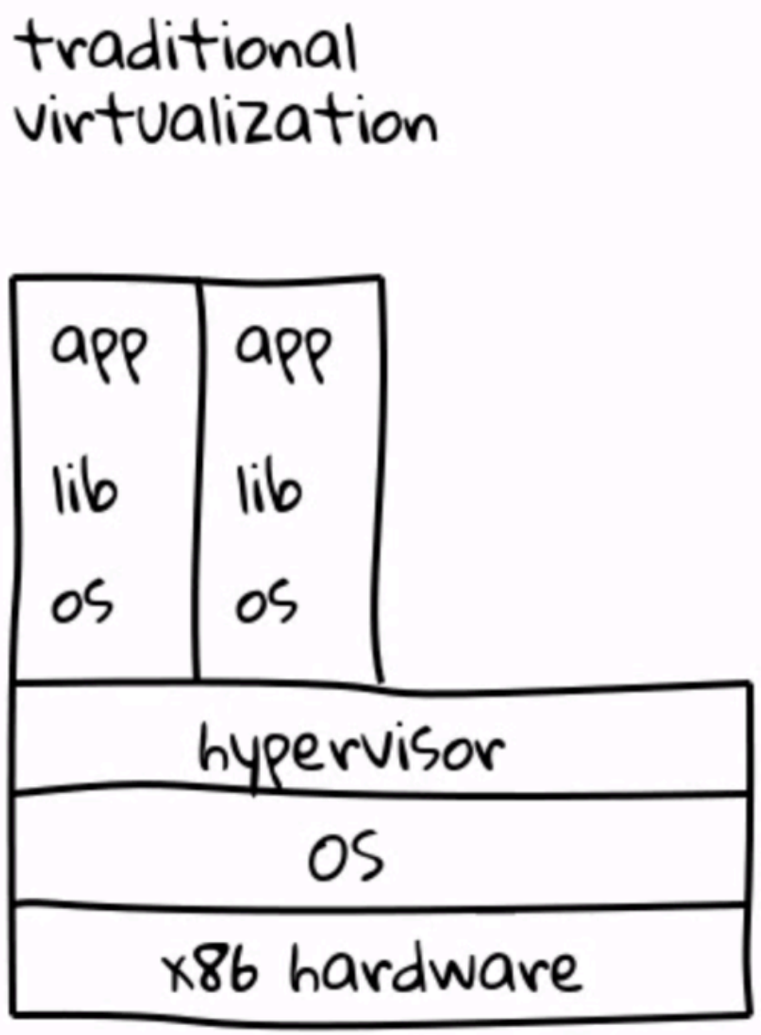
- Solution Fragility
- Operational Burdens
- Developer Productivity

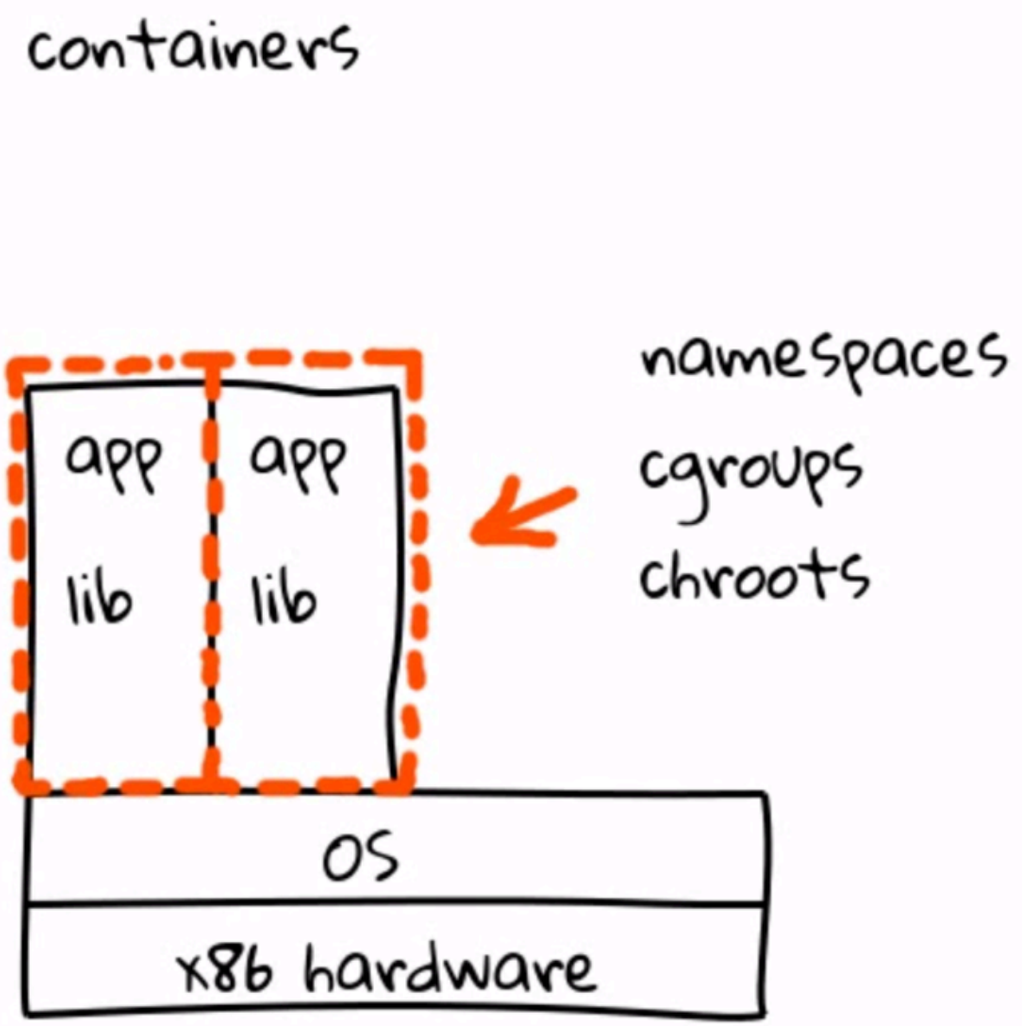
Image Source: http://blog.industryweapon.com/2010/01/beware-of-the-business-blocker/

Solution: Cloud-Native Platform

- ✓ Automate Deployment
- ✓ Dynamically Deliver Service Management
- ✓ Facilitate Root Cause Analysis

Changing the Deployment Paradigm

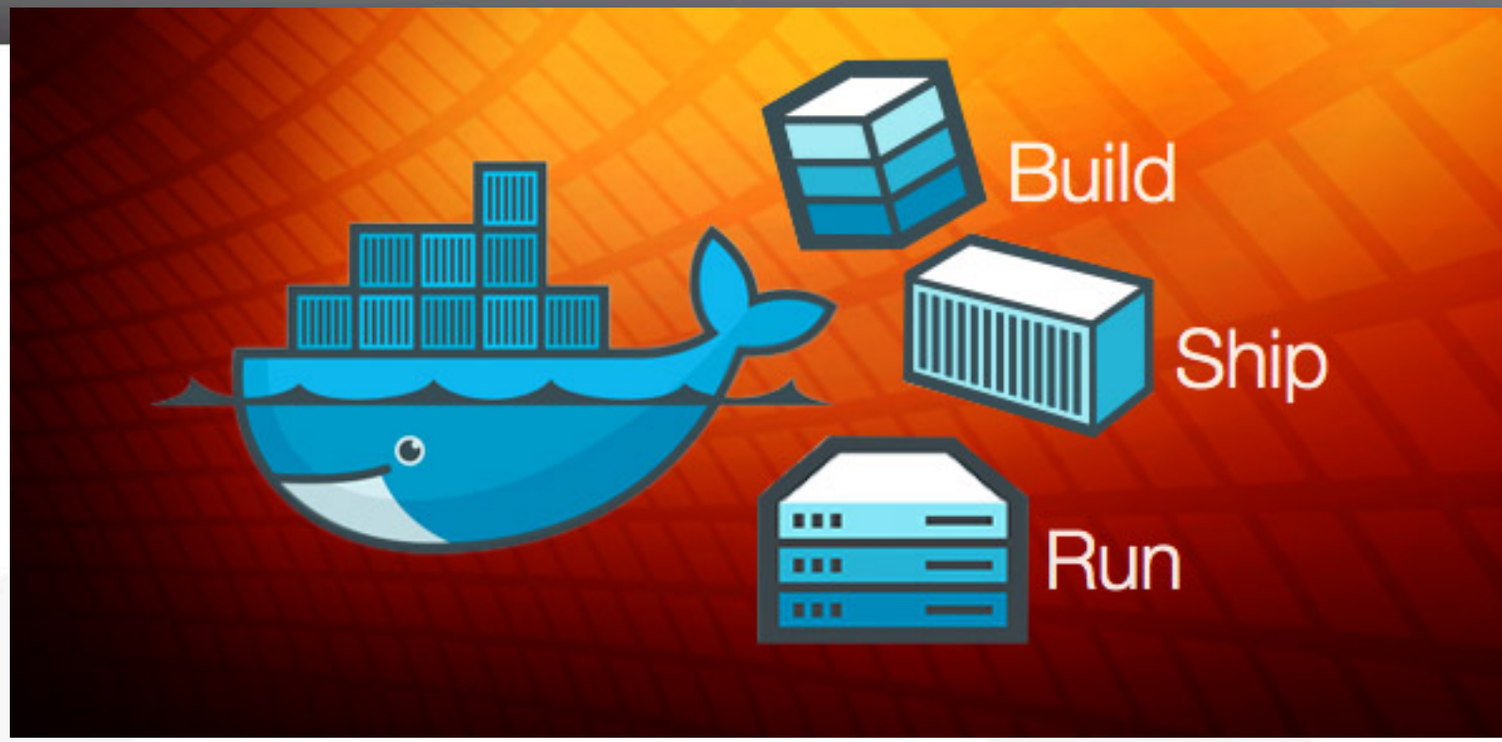




Container Design Goals

- ✓ Composable
- ✓ Security
- ✓ Image distribution
- ✓ Open

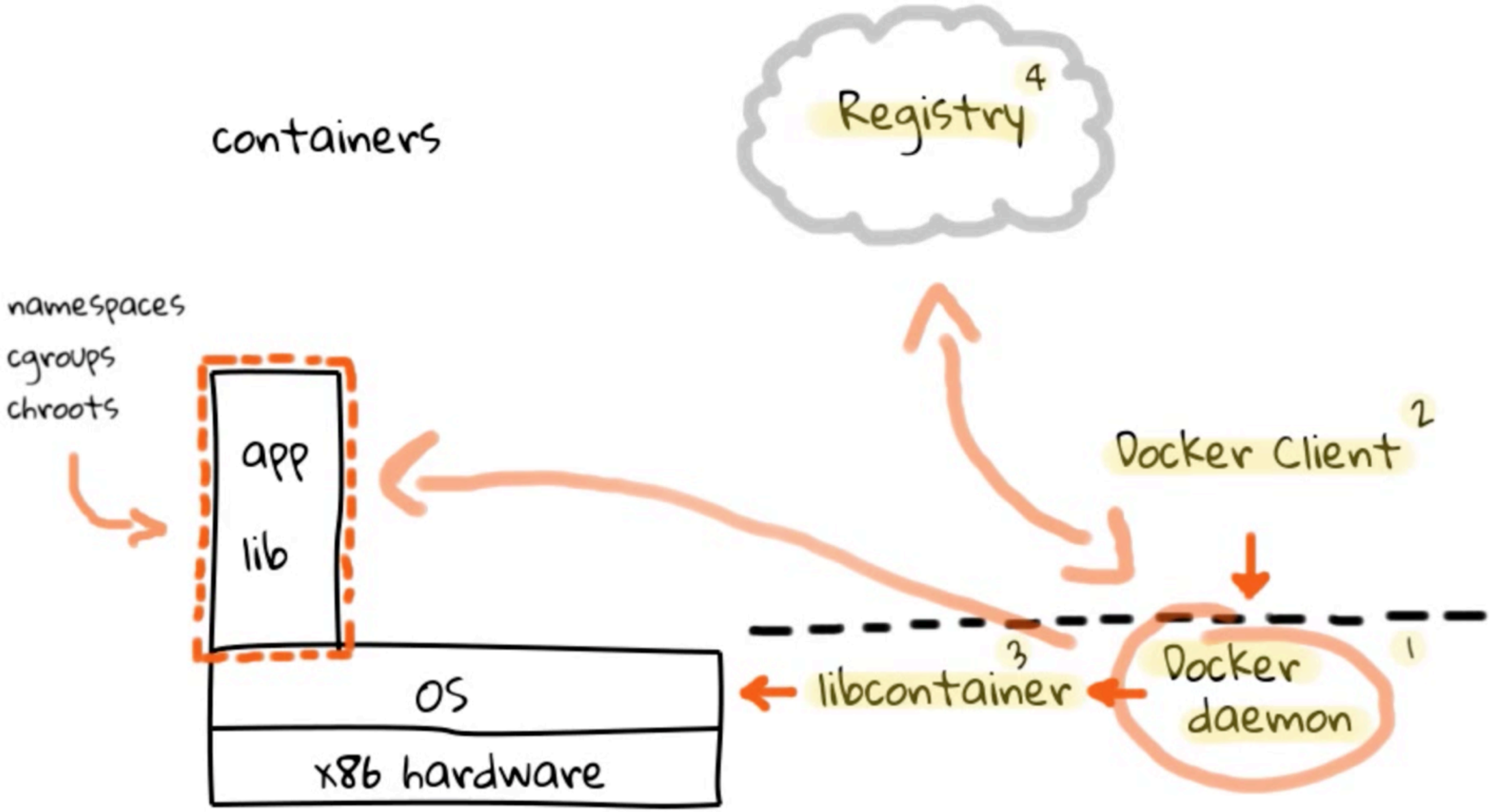
What is Docker?



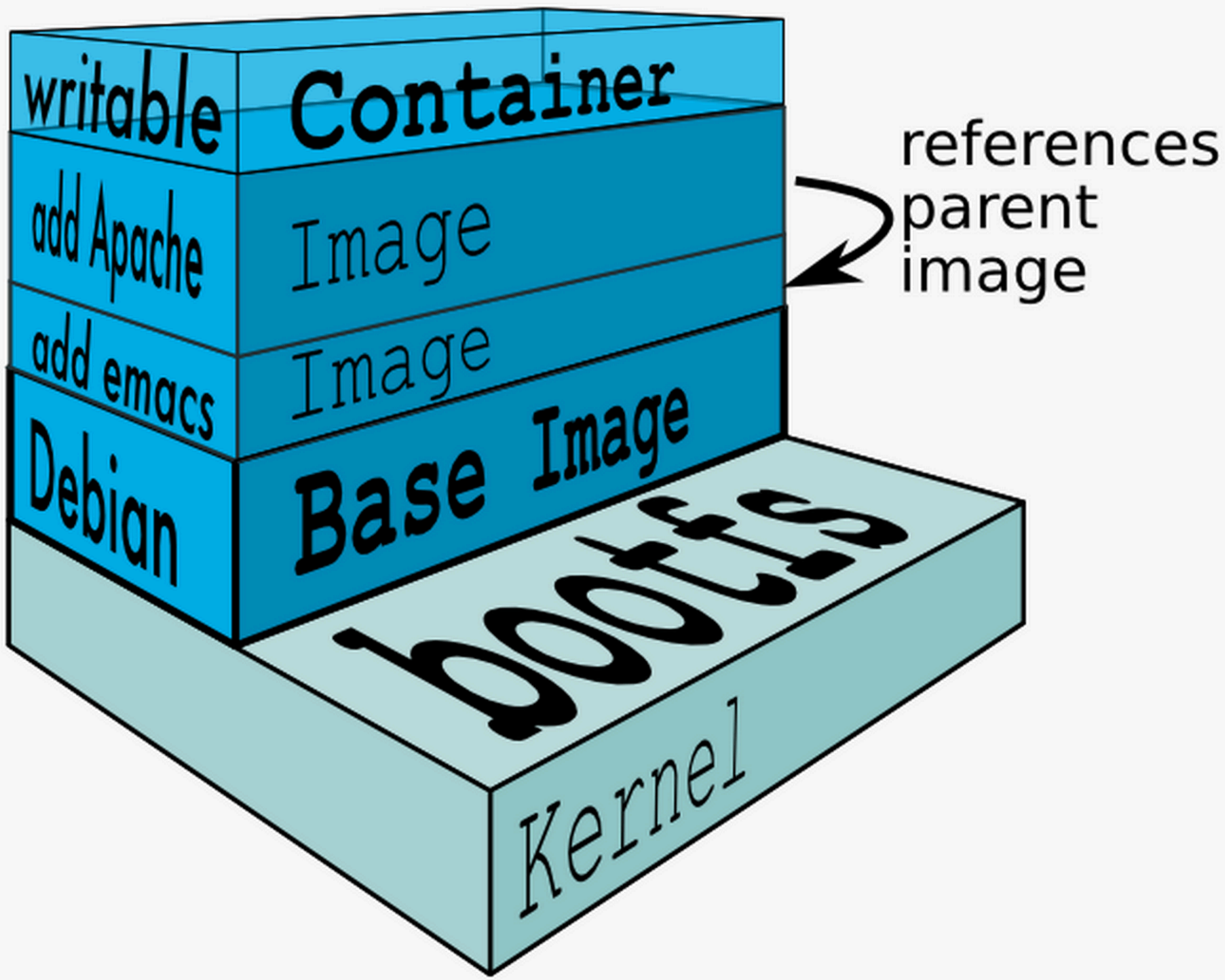
A platform create, run, and manage portable containers

- Container image
  - Only the bits necessary to run application within container space
- Container run-time
  - Environment parameters, software defined networking, provisioning scripts
- Container discovery
  - Find and download a container image

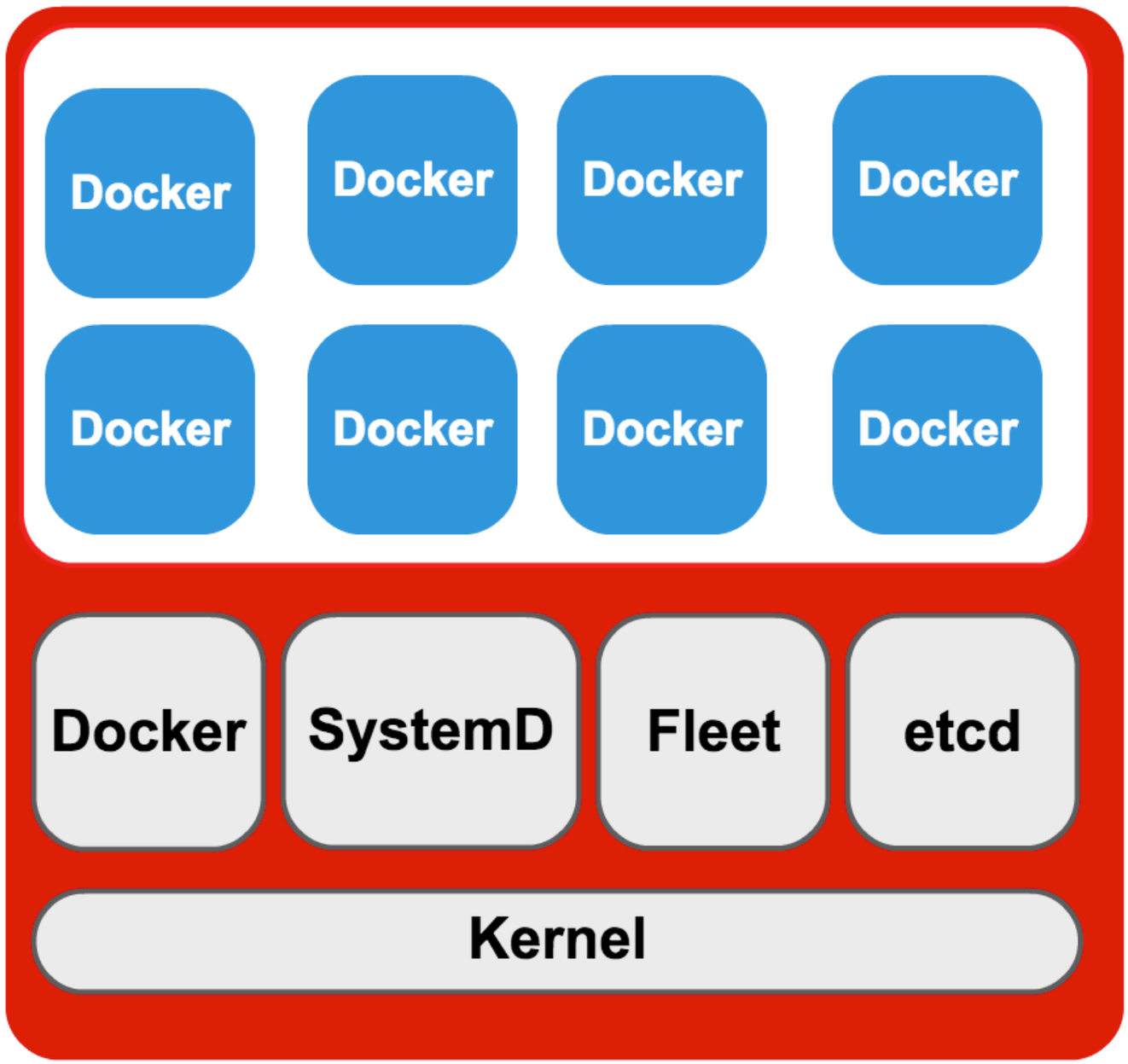
Visualizing Docker @ runtime



Docker Streamlines Image Management

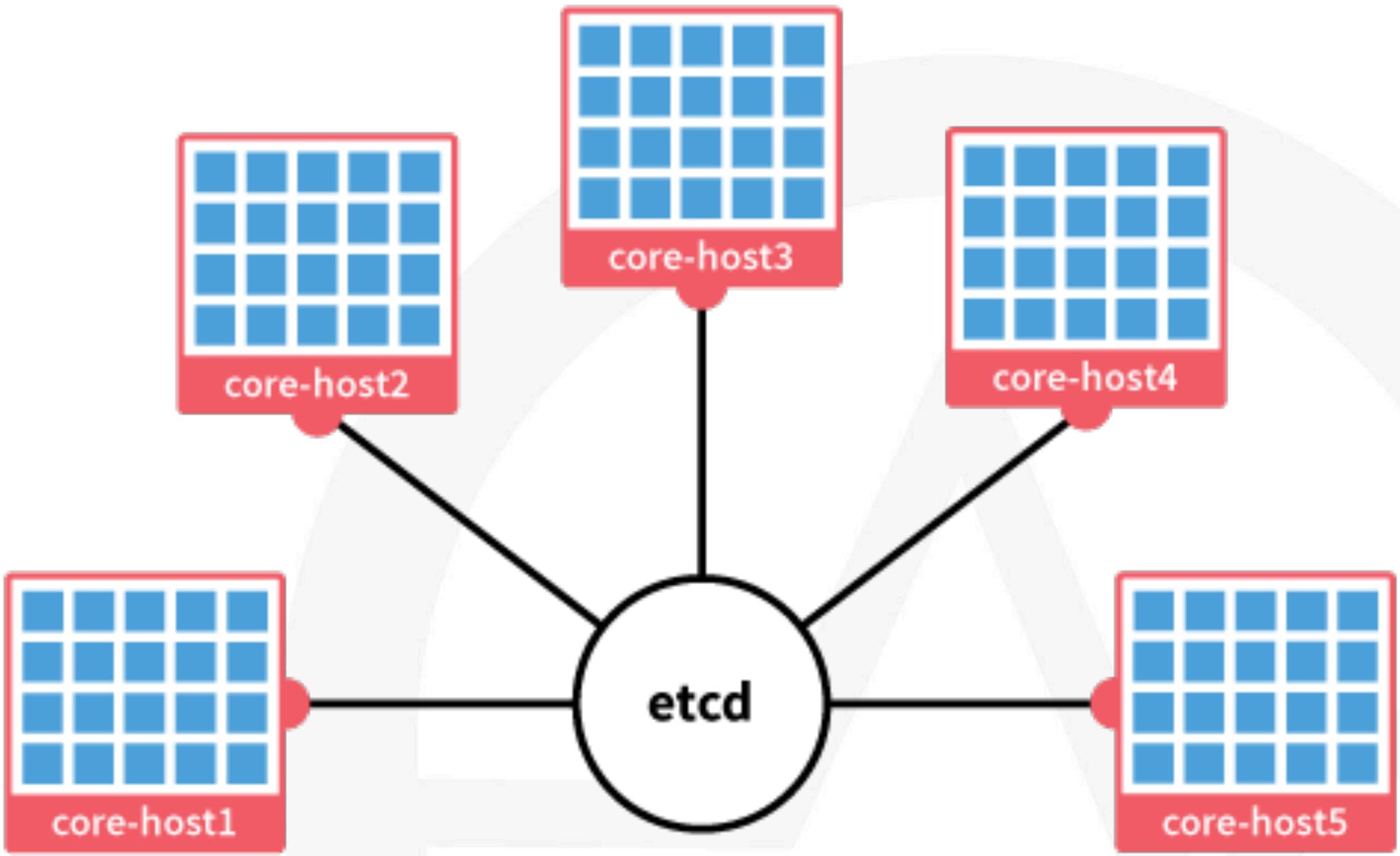


What is CoreOS?

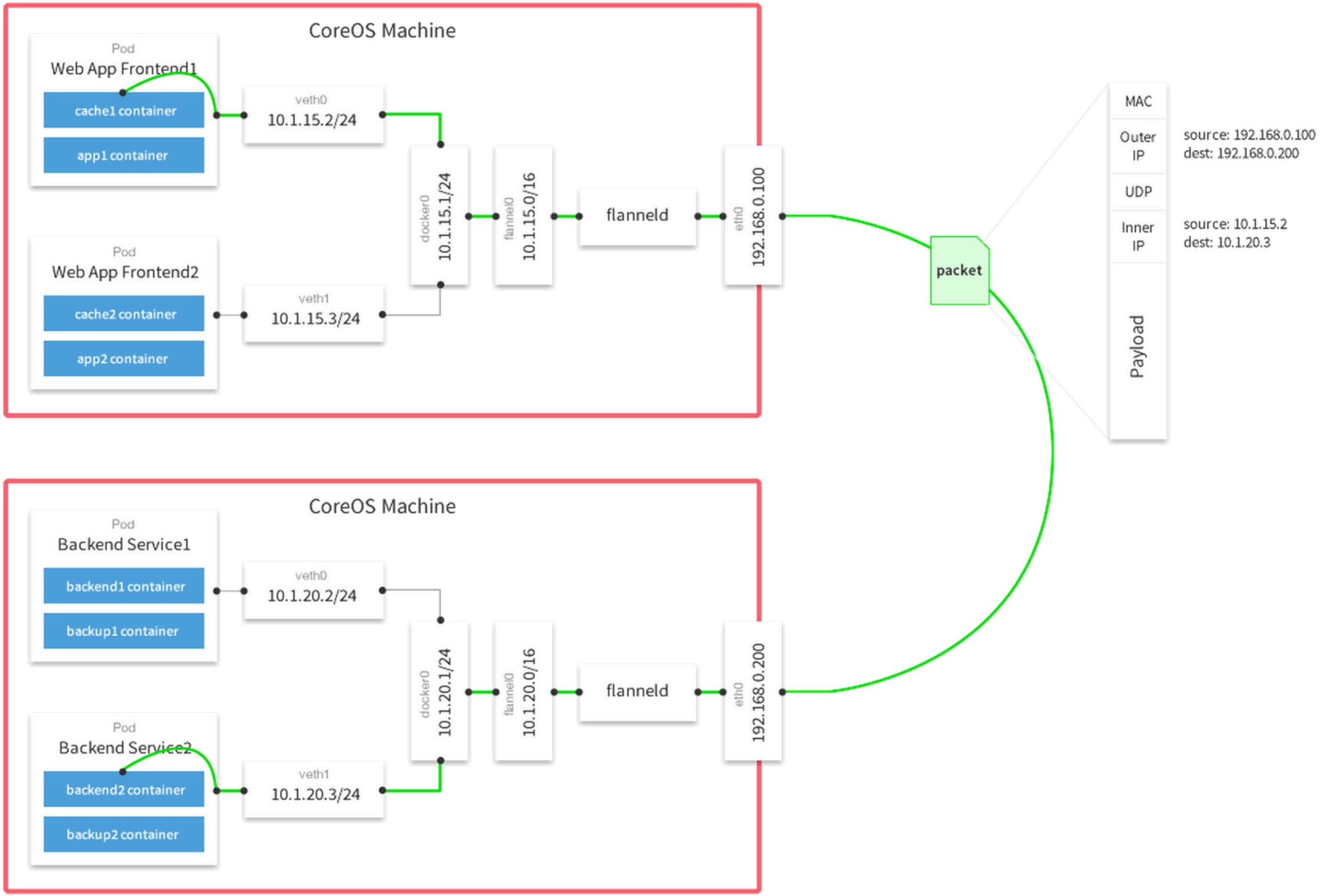


- Systemd – container bootstrapping
- Fleet – container scheduling
- Etcd – discovering configuration values
- Flannel – overlay a software defined network fabric

Scale Out with CoreOS Clustering and etcd



Flannel in Action



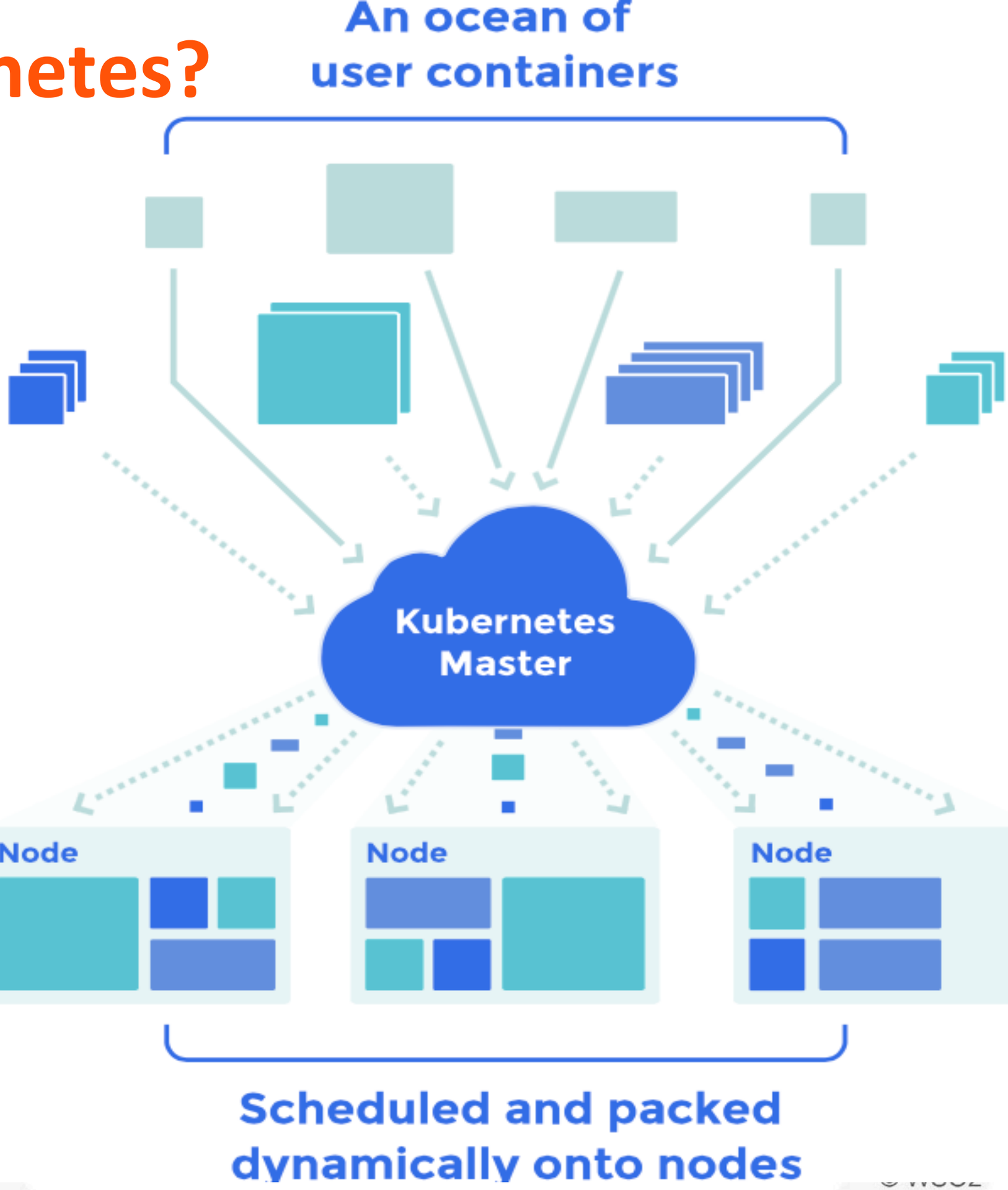
Why add Kubernetes?

Manage clusters and containers

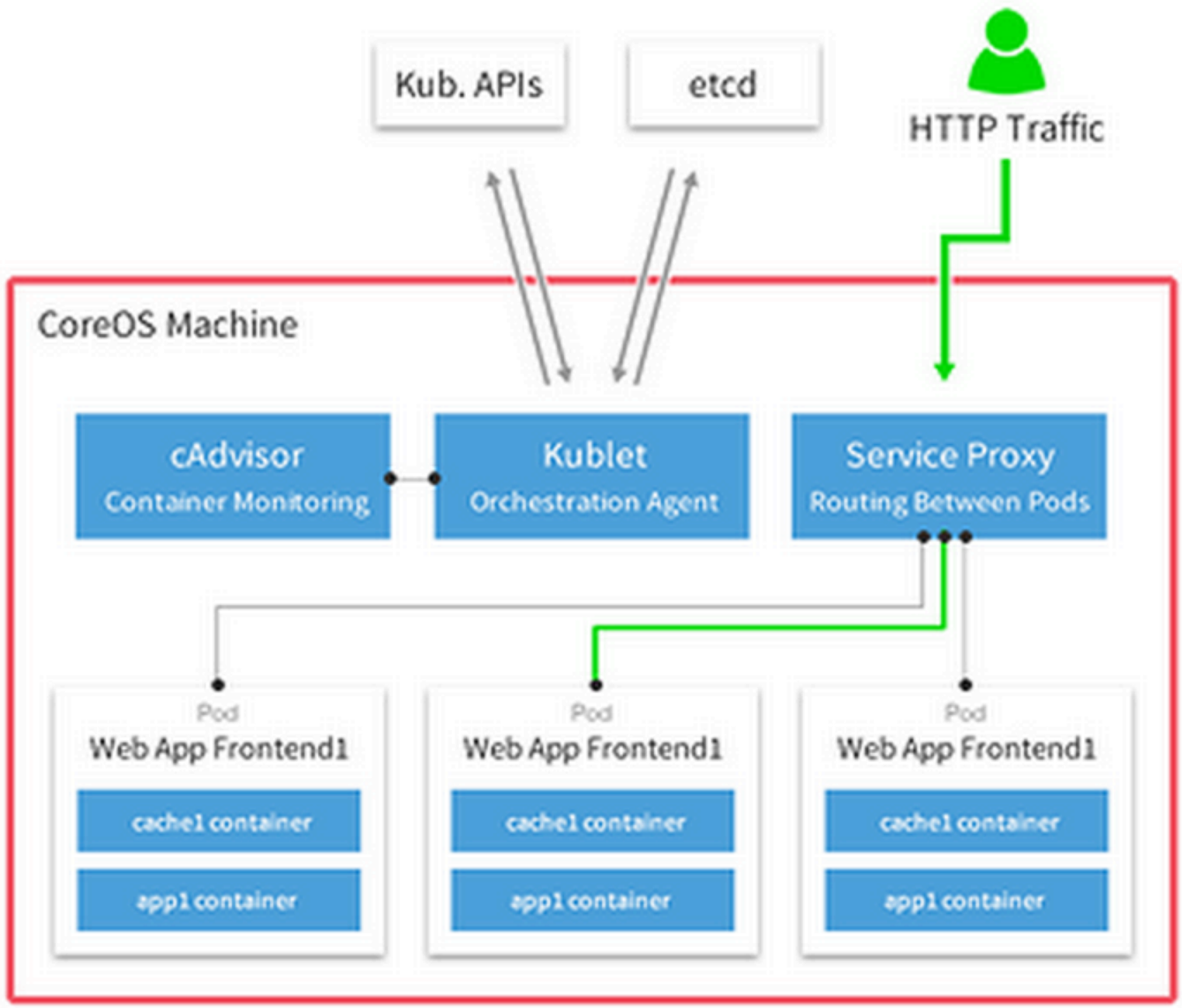
- Schedule
- Control

Concepts

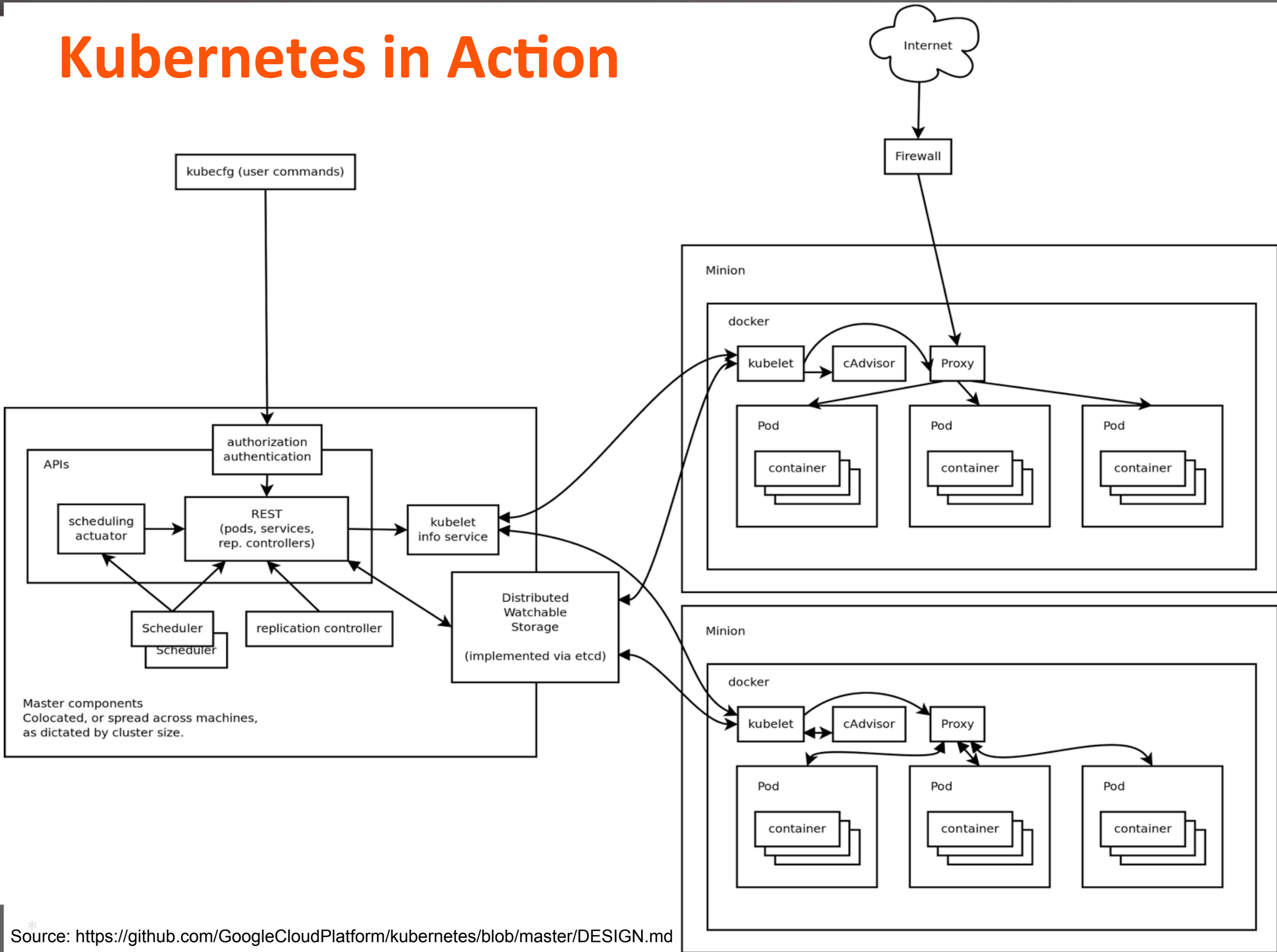
- Pods
- Labels
- Nodes



Kubernetes with CoreOS



Kubernetes in Action



Source: https://github.com/GoogleCloudPlatform/kubernetes/blob/master/DESIGN.md

Kubernetes – Opportunity Zone

“we want Kubernetes to be built as a collection of pluggable components and layers, with the ability to use alternative schedulers, storage systems, and distribution mechanisms, and we're evolving its current code in that direction.”

“A single Kubernetes cluster is not intended to span multiple availability zones. Instead, we recommend building a higher-level layer to replicate complete deployments of highly available applications across multiple zones.”

Source: https://github.com/GoogleCloudPlatform/kubernetes/blob/master/DESIGN.md

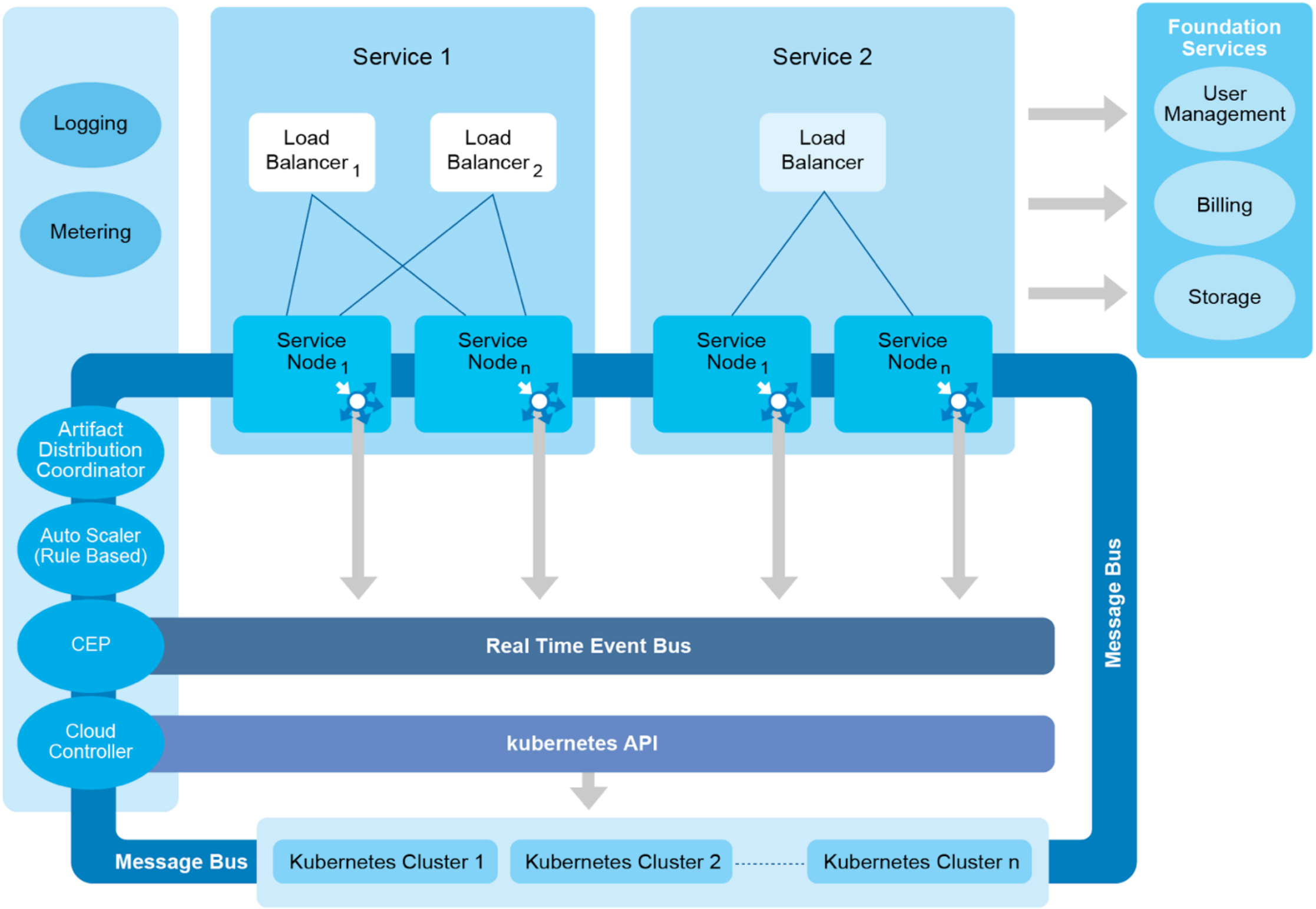
The Role of

- Package Manager
- Define Security and Network Policies
- Manage Micro-service Definition
- Define Composite Application
- Container Auto-Scaler Logic
- Manage Service Subscriptions

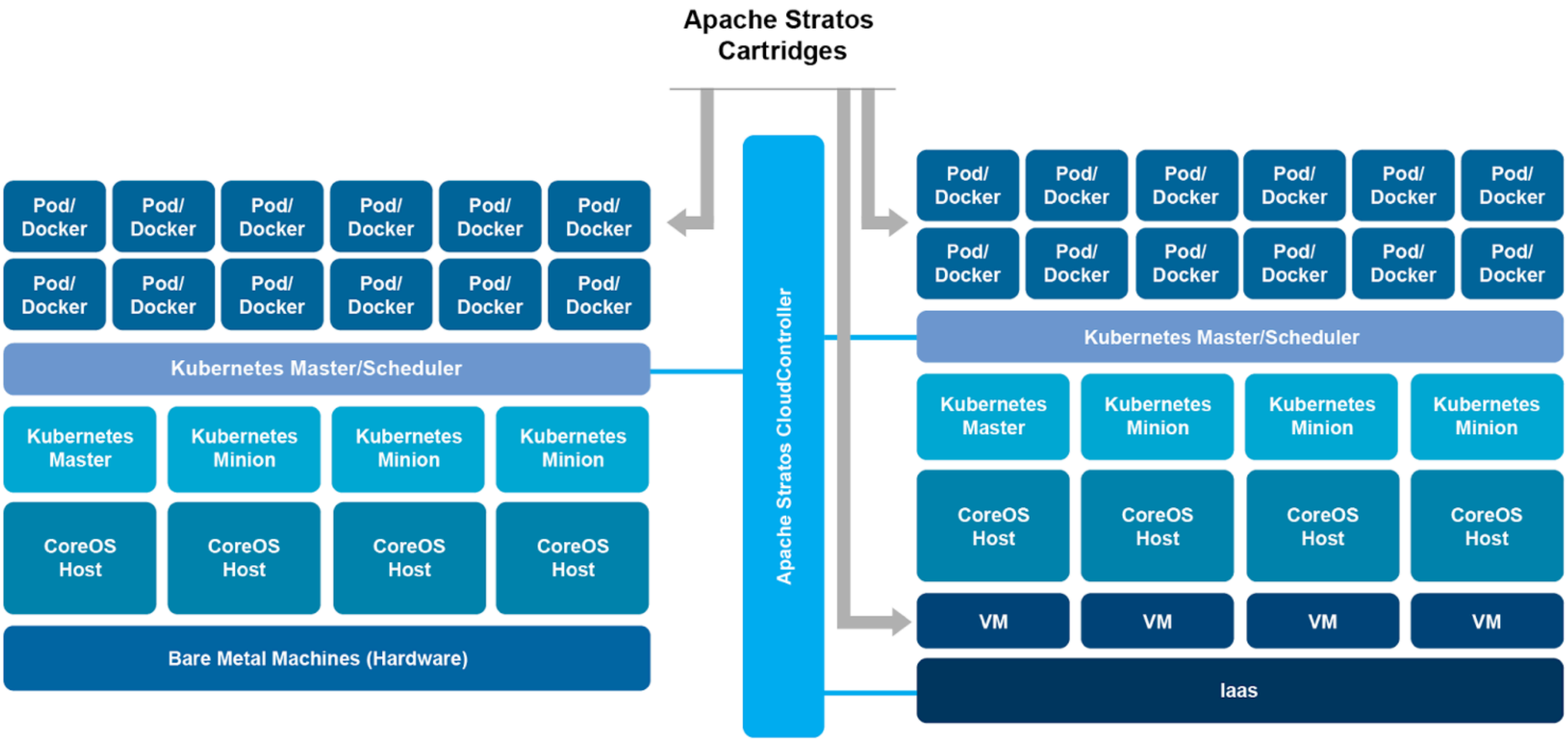
Apache Stratos 4.1 – Containerization and Composition Release

- Application Composition
- Containerization
  - Docker based cartridge support
  - integration with CoreOS
  - integration with Kubernetes
  - integration with flannel
  - integration with discovery service and build in docker registry support
- Support docker top of VM
  - provide two level of scalability
  - support for integrated with any existing IaaS
  - any public, private cloud support which can run docker host VM

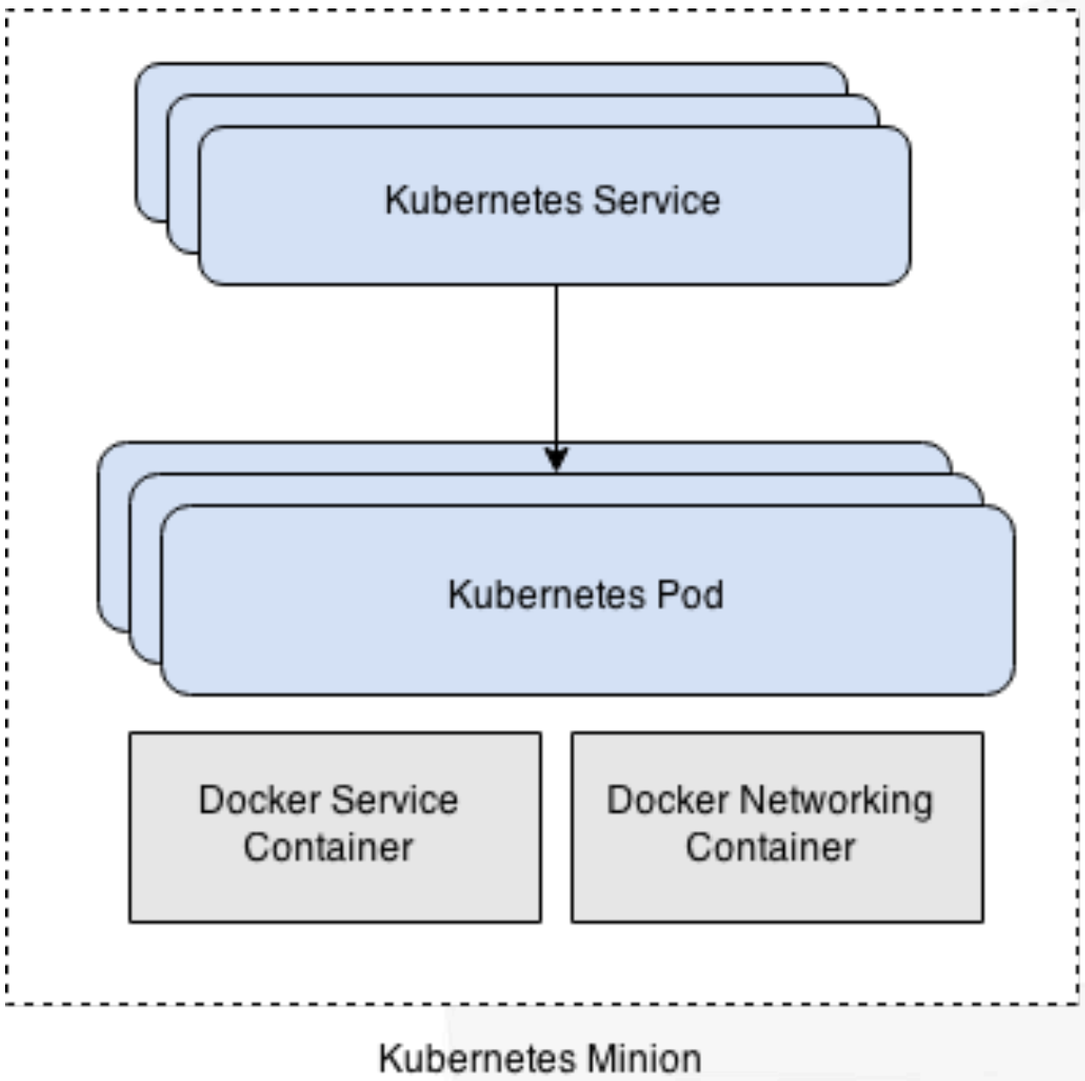
Apache Stratos L1 Deployment Architecture for Docker based Cartridges



Stratos Architecture with Docker Support

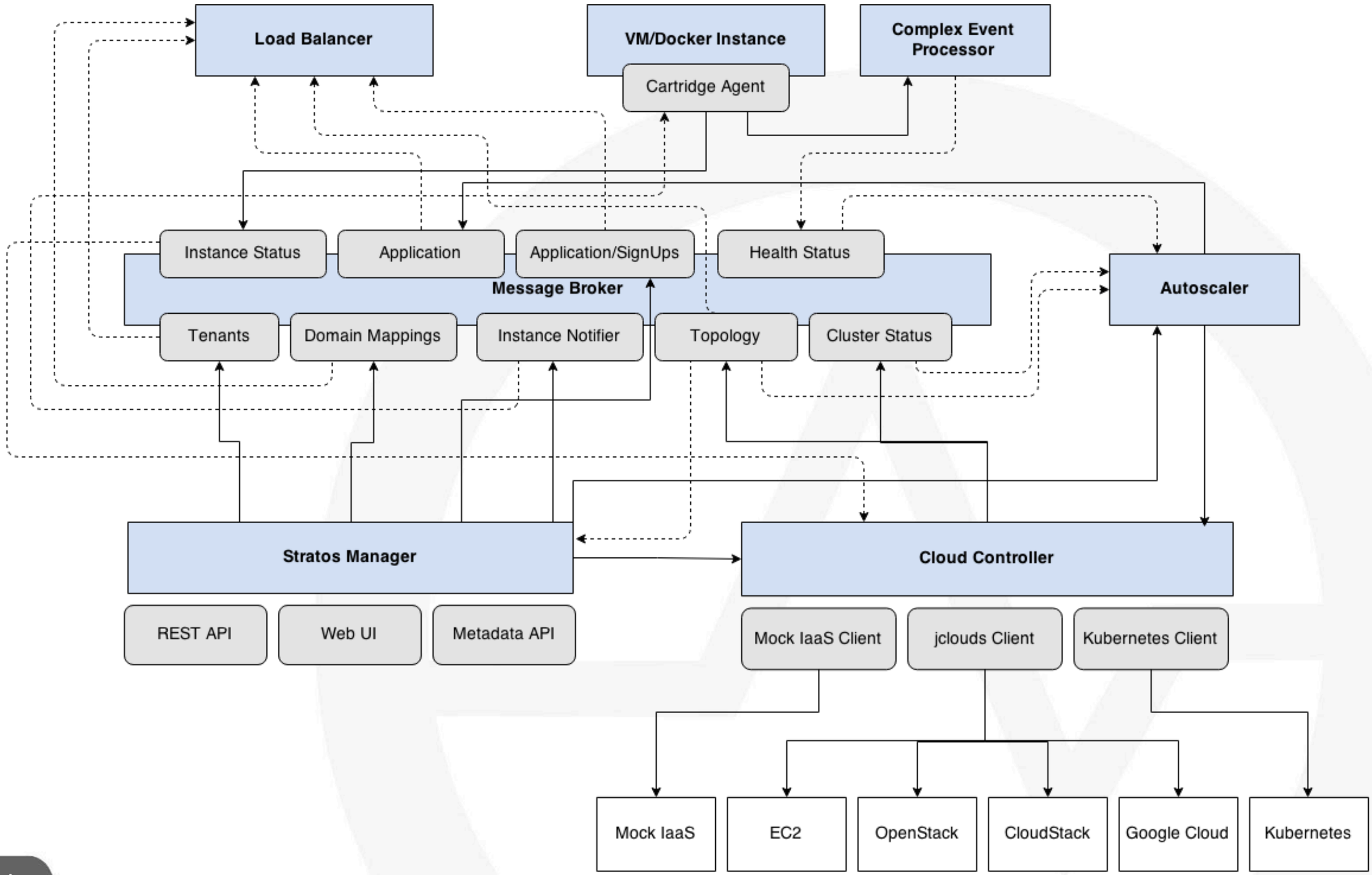


Kubernetes Resources Used by Stratos

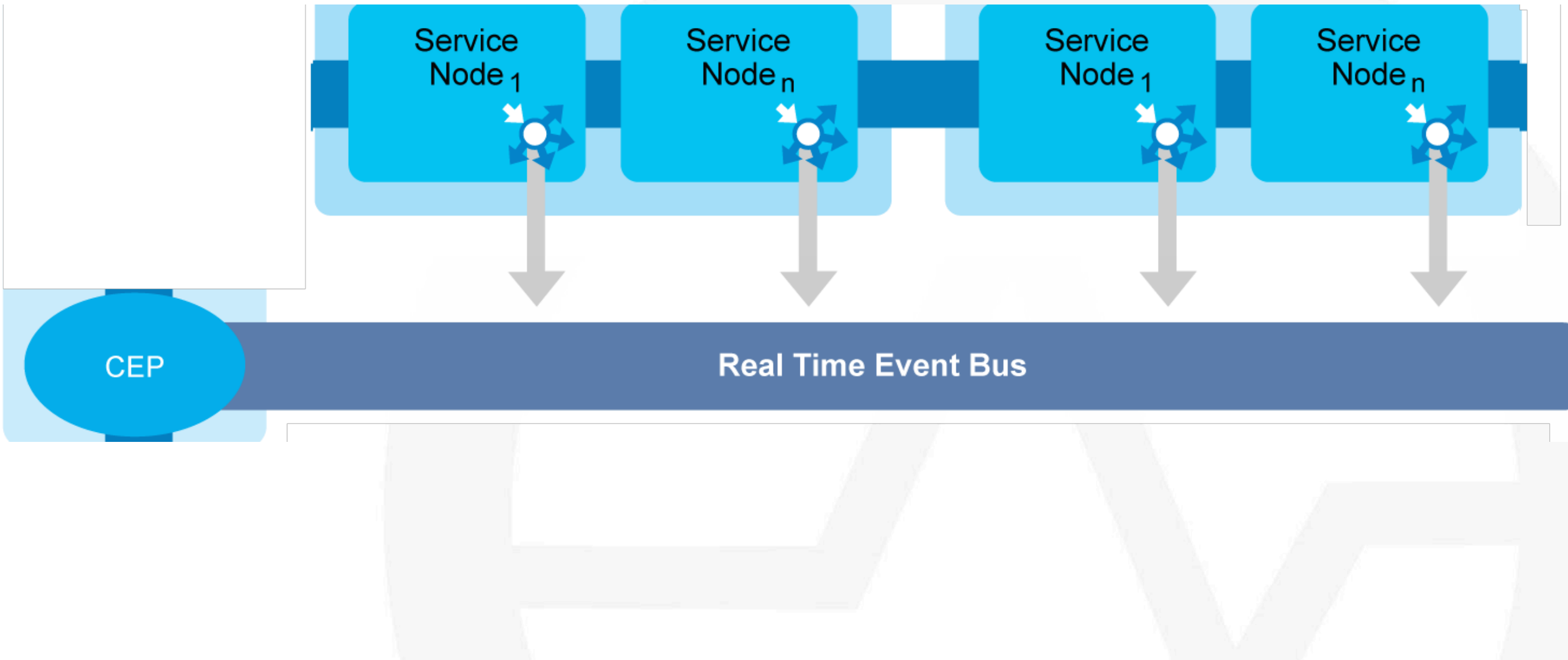


- A Kubernetes Service is created for each transport/port mapping defined in the cartridge.
- Kubernetes Service is a load balancing service for Pods.
- A Kubernetes Pod is created for each member in a cluster.
- A Kubernetes Pod is a group of Docker containers.
- Kubernetes creates a separate Docker container for networking.

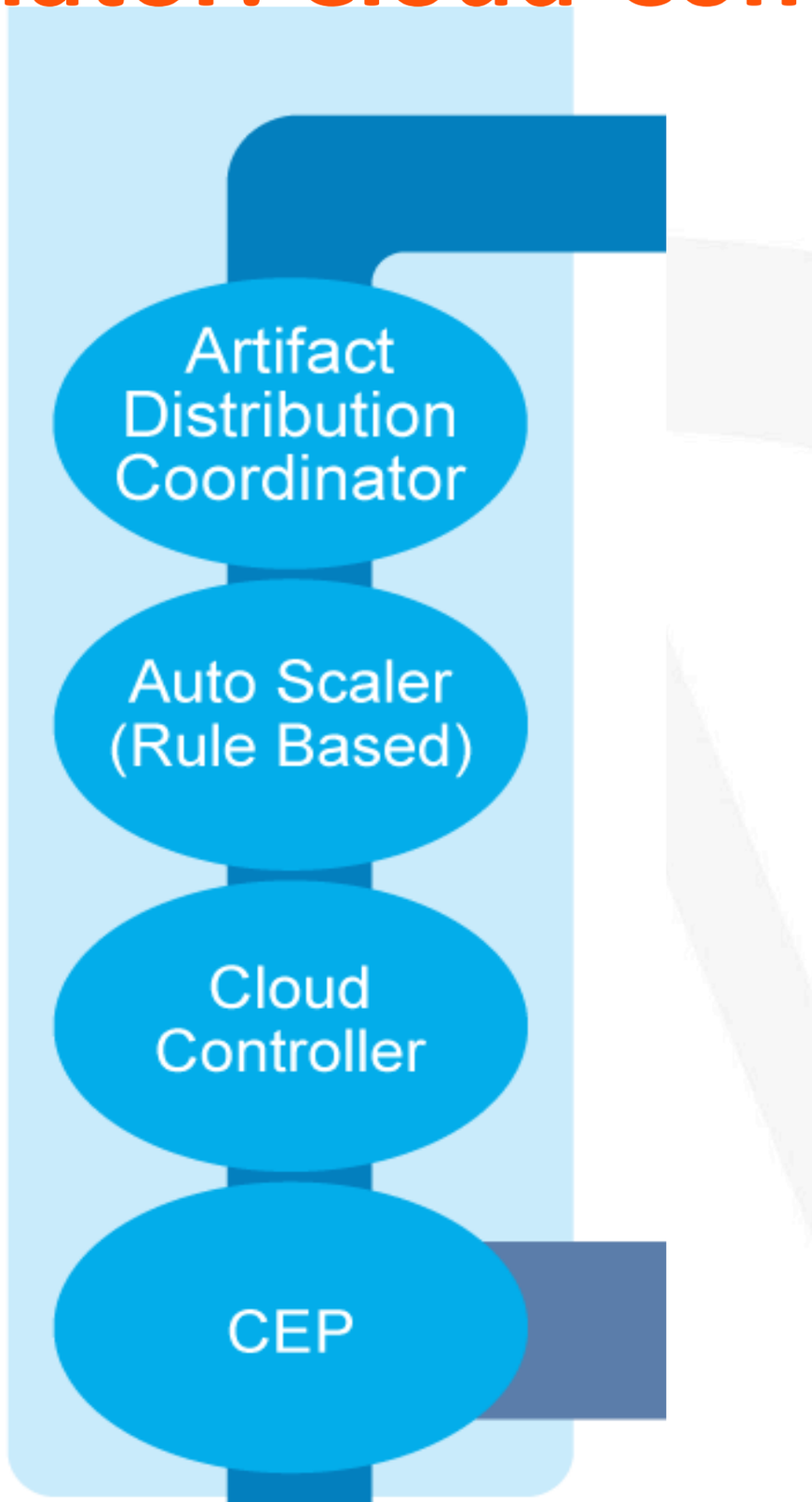
Stratos Architecture



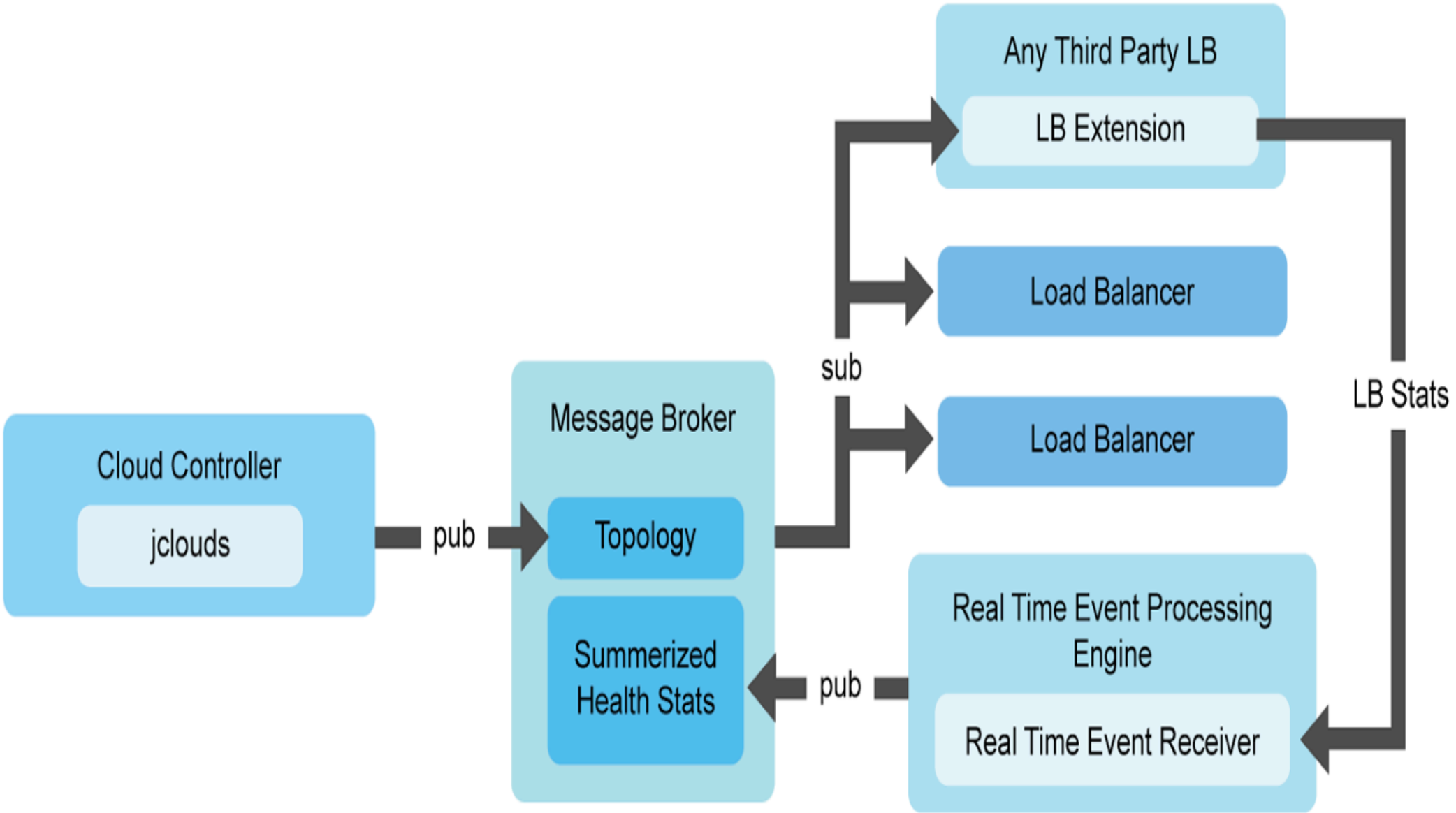
Stratos Differentiator: Real Time Event Bus



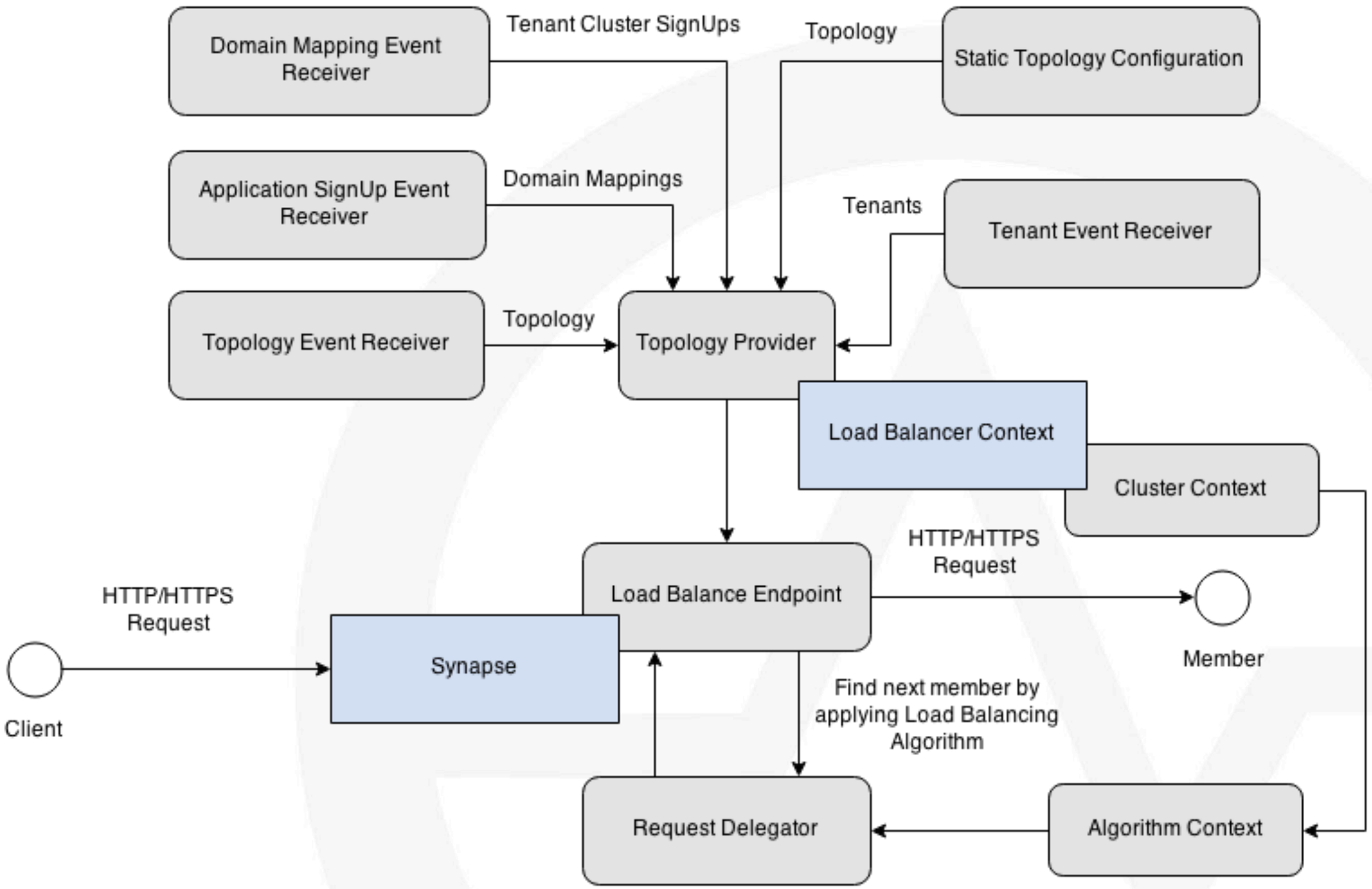
Stratos Differentiator: Cloud Controller



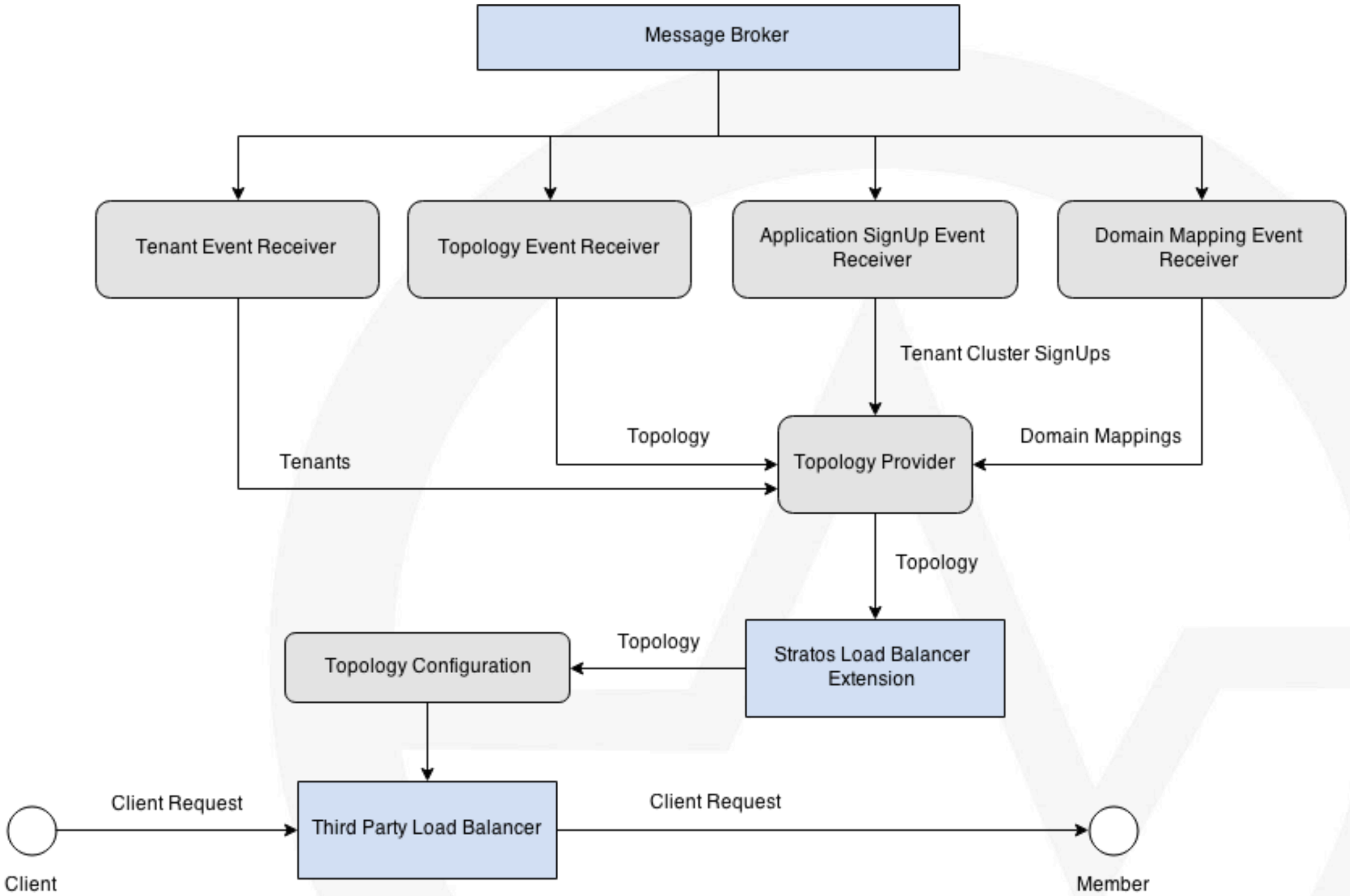
Scalable and Dynamic Load Balancing..



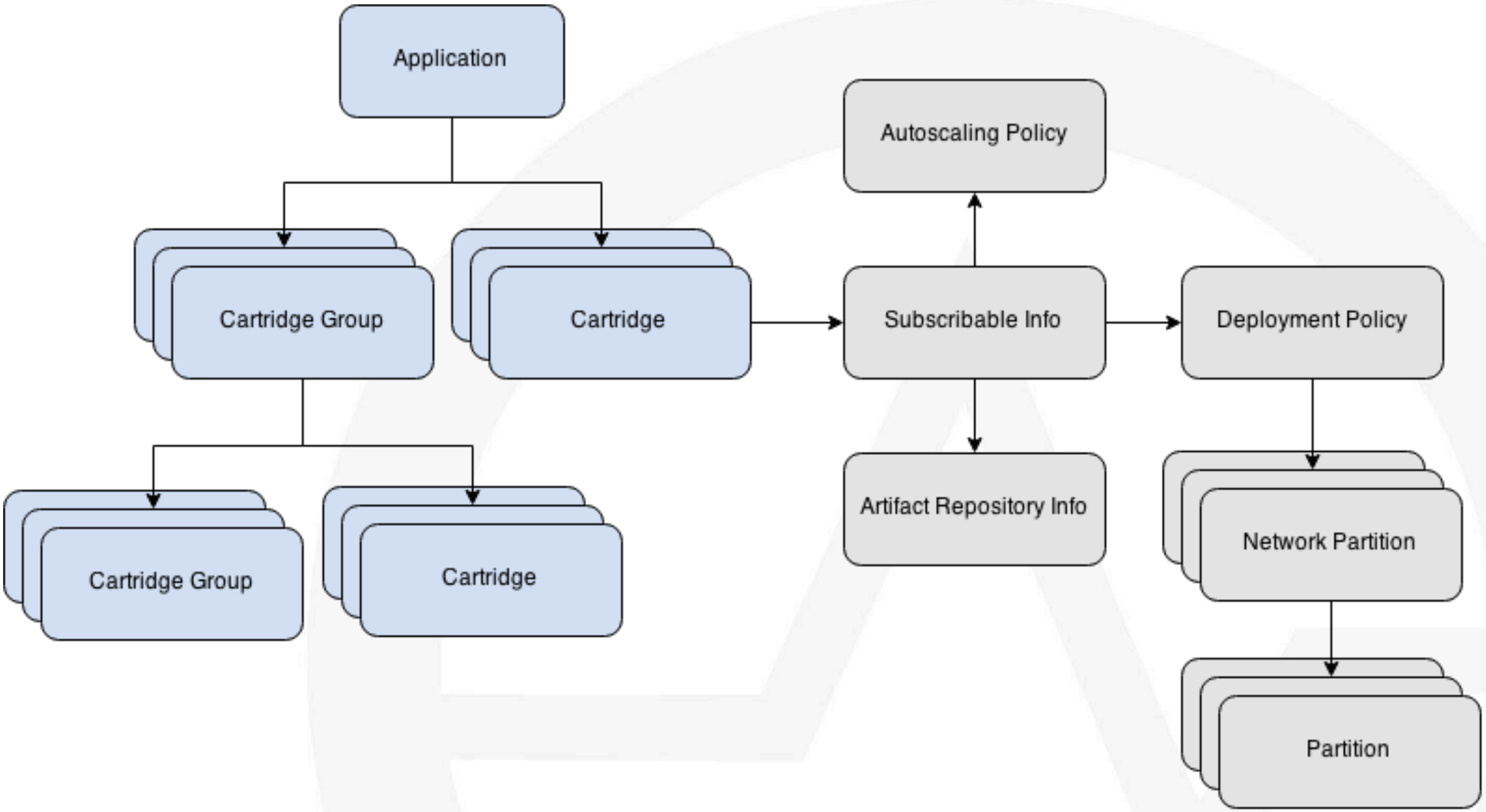
Stratos Load Balancer Architecture



Stratos Load Balancer Extension Architecture



Composite Application Model and Policy Model



Groups = Composite Cloud Instances

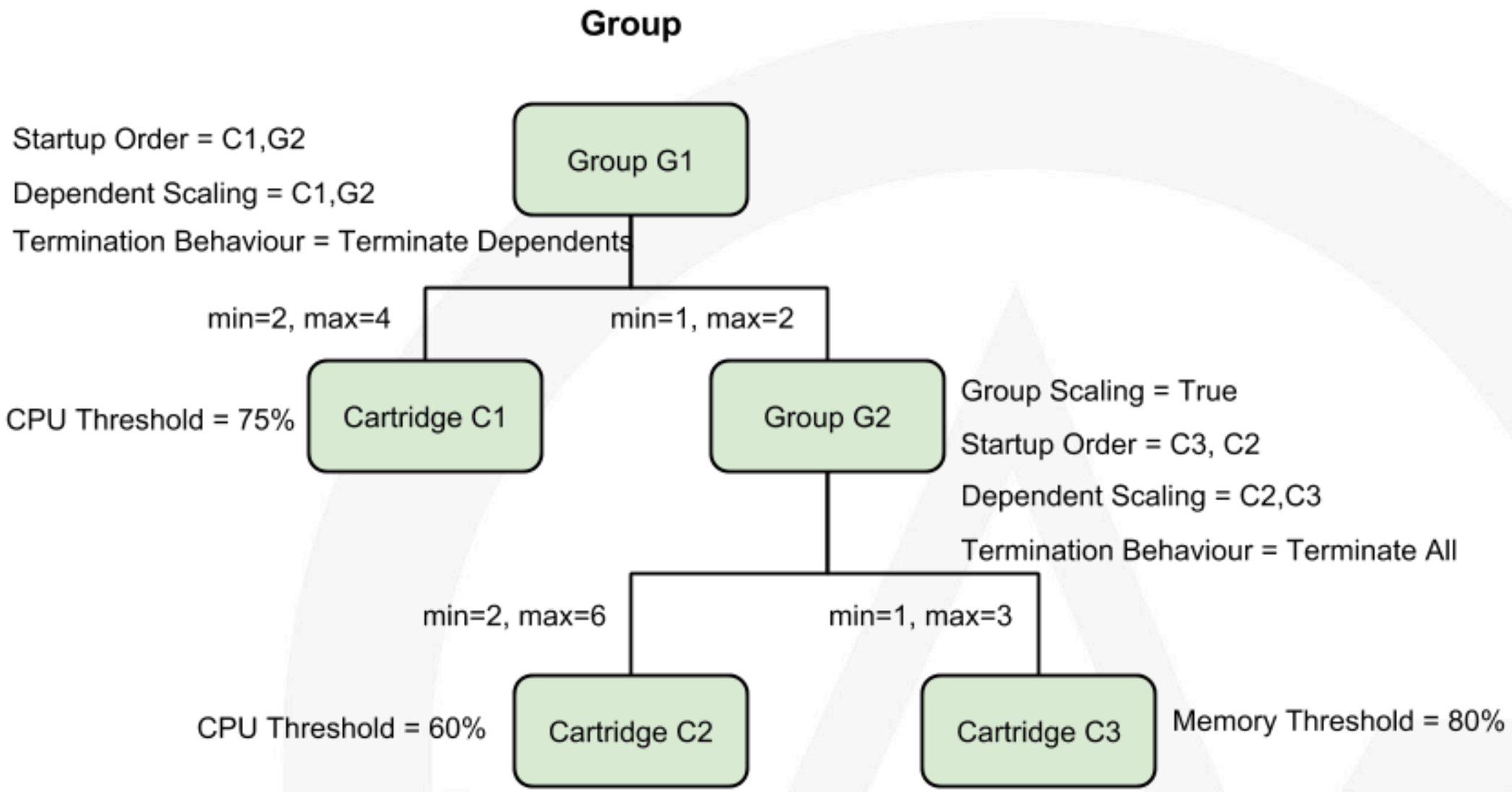


diagram - 01

Smart Policies

What are the smart policies?

- Auto scaling
- Deployment

Auto scaling policy

- Define thresholds values pertaining scale up/down decision
- Auto Scaler refer this policy
- Defined by DevOps

Deployment policy

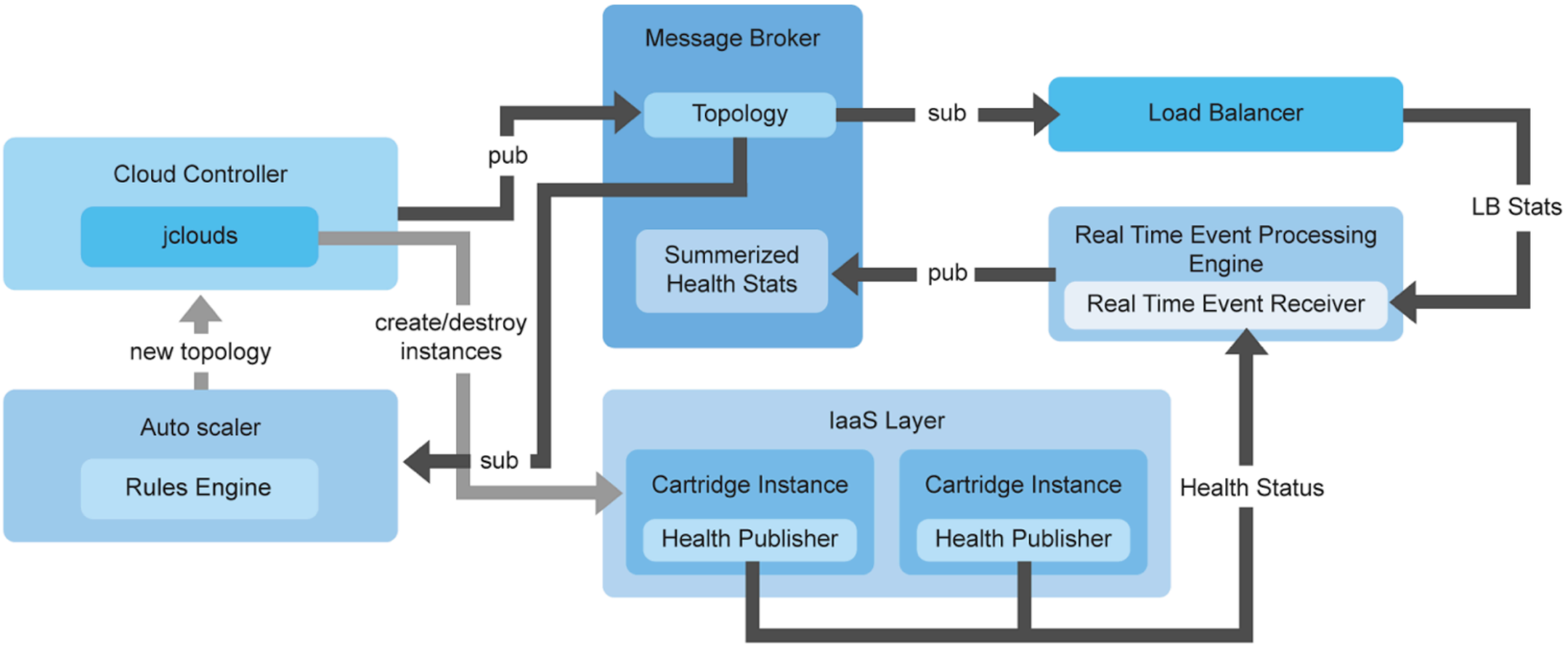
- Defined how and where to spawn cartridge instances
- Defined min and max instances in a selected service cluster
- Defined by DevOps based on deployment patterns

How do you specify elastic scale?

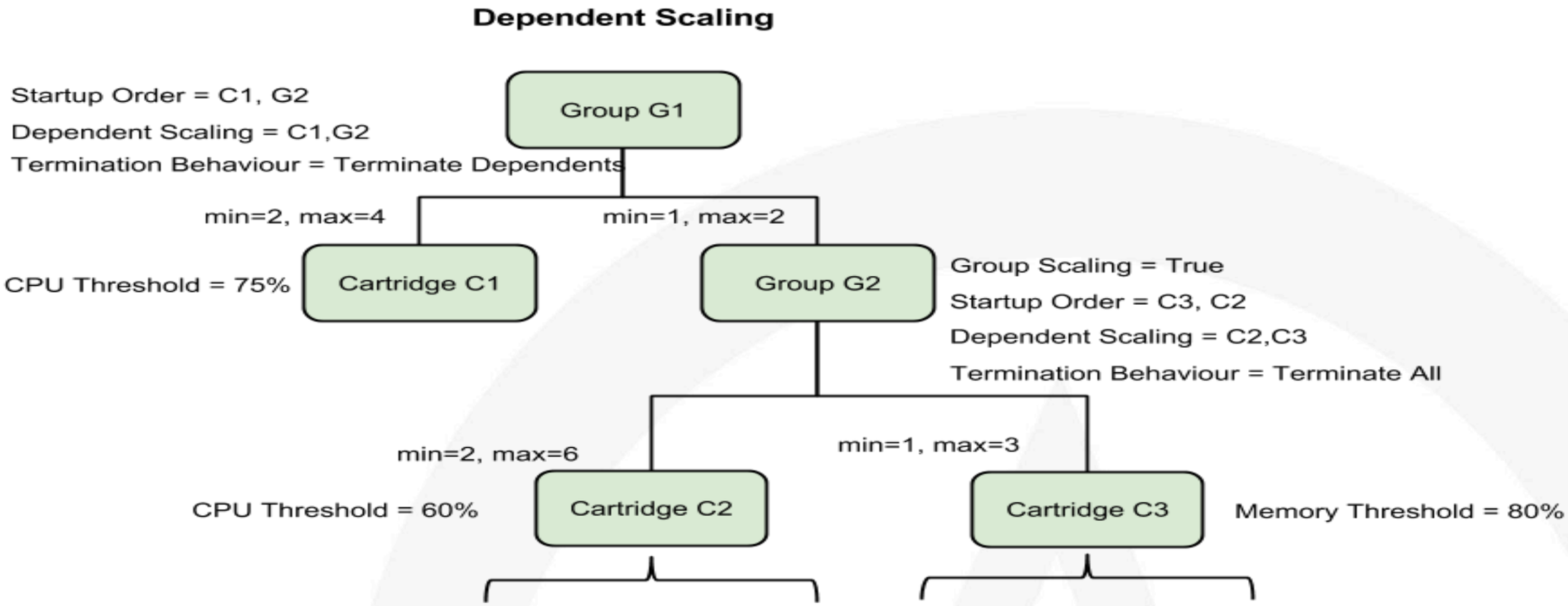
Scaling algorithm can use multiple factors. such as

- Load average of the instance
- Memory consumption of the instance
- In-flight request count in LB

$$\text{required Instances} = \frac{\text{predicted value}}{\text{threshold value}} \times \text{number of current Instances}$$



Dependent Scaling Scenario



Auto Scaling Iteration	Predicted CPU	Total No of Instances	Predicted Memory	Total No of Instances
1	40%	2	40%	1
2	40%	4	85%	2
3	75%	5	50%	3
4	36%	3	40%	2
5	40%	6	160%	3

Group Scaling

Cluster Monitor C2 | Cluster Monitor C3

diagram - 02

Group Scaling Scenario

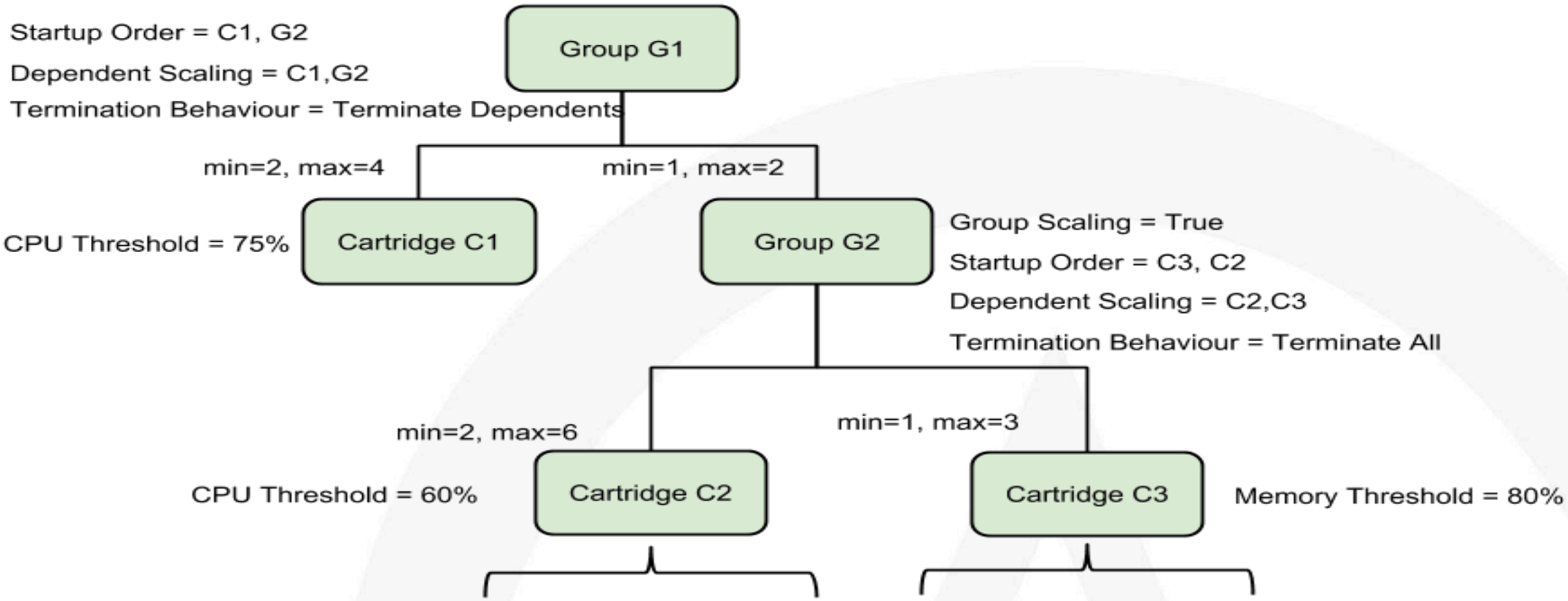
Group Scaling

Cartridge C2 | Cartridge C3

Auto Scaling Iteration	Group Instance	No of Instances	No of Instances
5	G1-1	6	3
	G1-2	2	1
		Cluster Monitor C2	Cluster Monitor C3

diagram - 03

Predictive Scaling

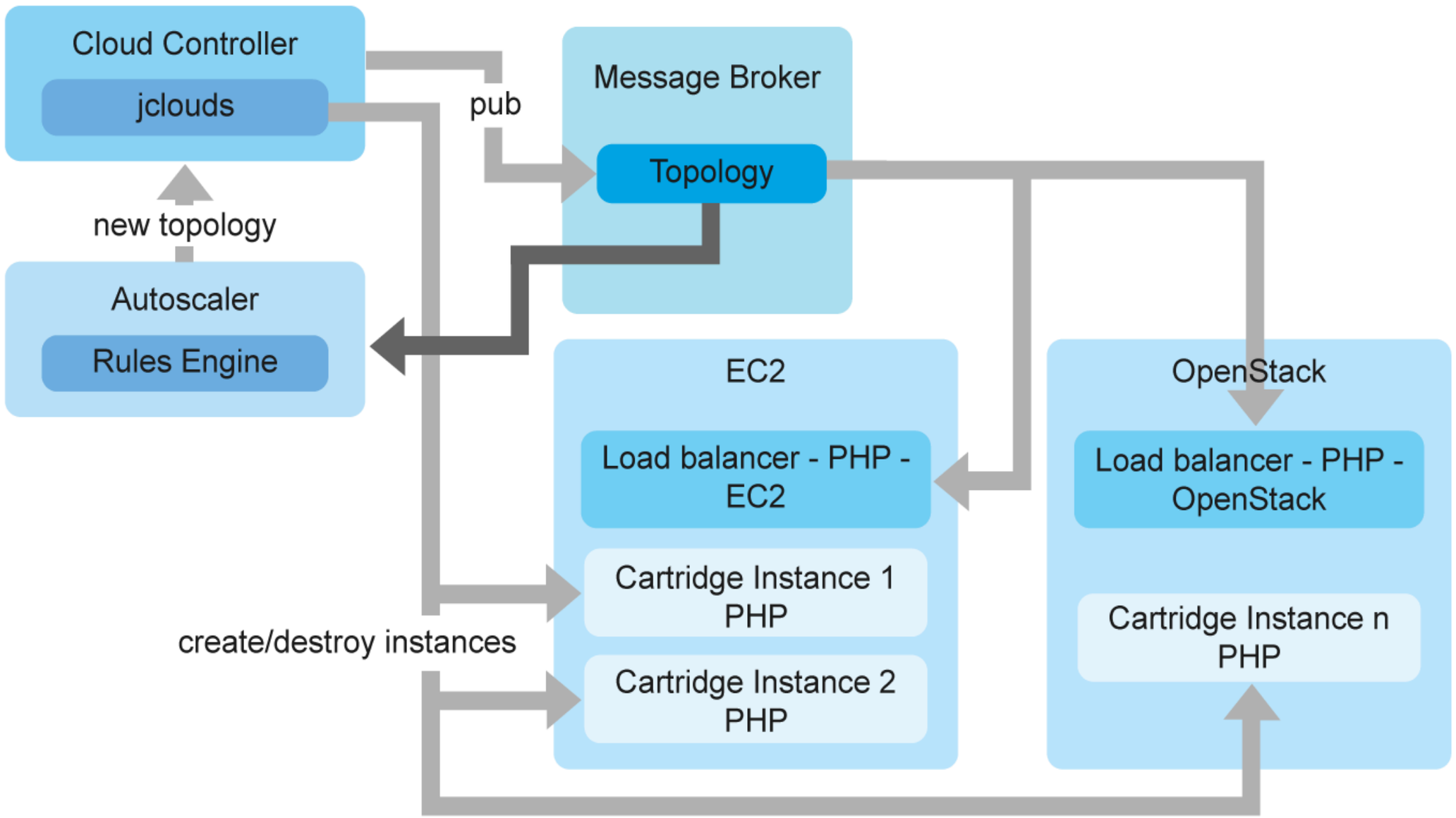


Auto Scaling Iteration	Predicted CPU	Instances		Predicted Memory	Instances	
		P1	P2		P3	P4
1	40%	1	1	40%	1	0
2	40%	2	2	85%	2	0
3	75%	3	2	50%	2	1
4	36%	2	1	40%	2	0

diagram - 04

Ever try to Cloud Burst Containers?

Burst based on policy and load



Demo Time

Container as a Service

- Setup CoreOS cluster, Discovery service, network service, Kubernetes master and minions
- Launch event backplane and load balancer
- Launch Platform as a Service components
- Register Kubernetes-CoreOS host cluster to Stratos
- Launch dockerized application
  - Deploy Application Model Policies
  - Deploy Docker based PHP Cartridge
  - Deploy PHP application using PHP Cartridge
- Test and Scale <- Iterate
  - Automated artifact updates
  - Manual Scaling
  - Autoscaling based on load avarage

Test Drive the Cloud in a Box Distro

apache Stratos

Kubernetes

κυβερνήτης: *Greek for "pilot" or "helmsman of a ship"*
the open source cluster manager from Google

CoreOS

docker

Download Stratos distribution, load balancer & samples:
https://dist.apache.org/repos/dist/dev/stratos/4.1.0-kubernetes-v6/

Follow Getting Started Guide: Beta Version
https://gist.github.com/imesh/b8f81fac8de39183a504

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