Unlimited Staging Environments with Kubernetes

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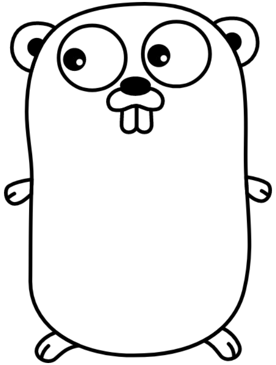
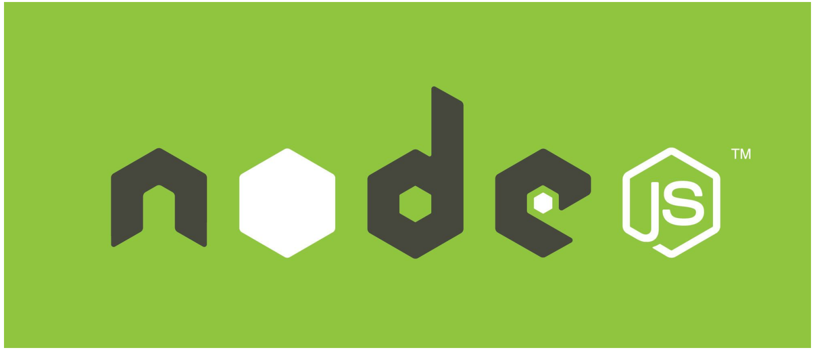
Dollar Shave Club

Technology

- 30+ applications
- Ruby, Rails, Node, Go, and Elixir apps
- 3000 containers
- Four different environments



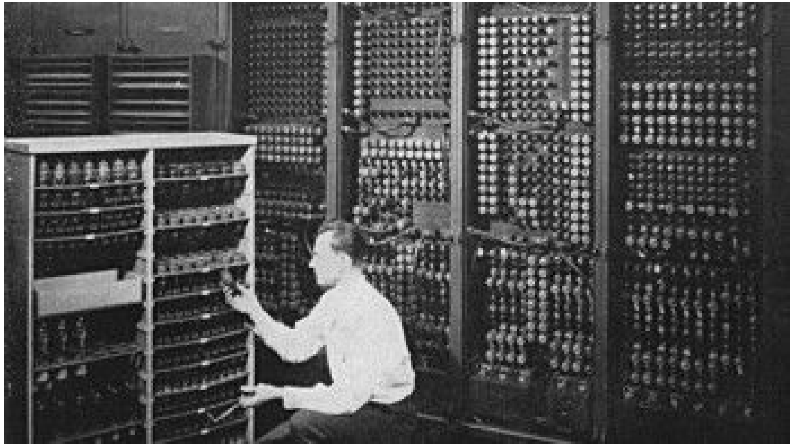


QA Environments

- Short-lived environments
- Contain entire DSC stack
- Use custom versions of all projects
- Used for demos, manual QA, and integration tests

Static QA Environments

- Complete DSC stack on a single machine managed by Ansible
- 10 different EC2 instances
- Developers had to reserve time on each machine
- This system scaled from a handful of engineers to about 30
- 10 servers bottlenecked team

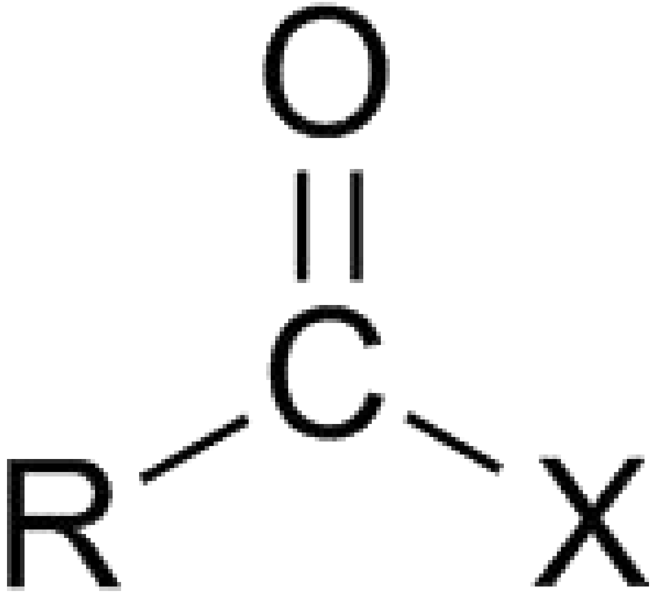


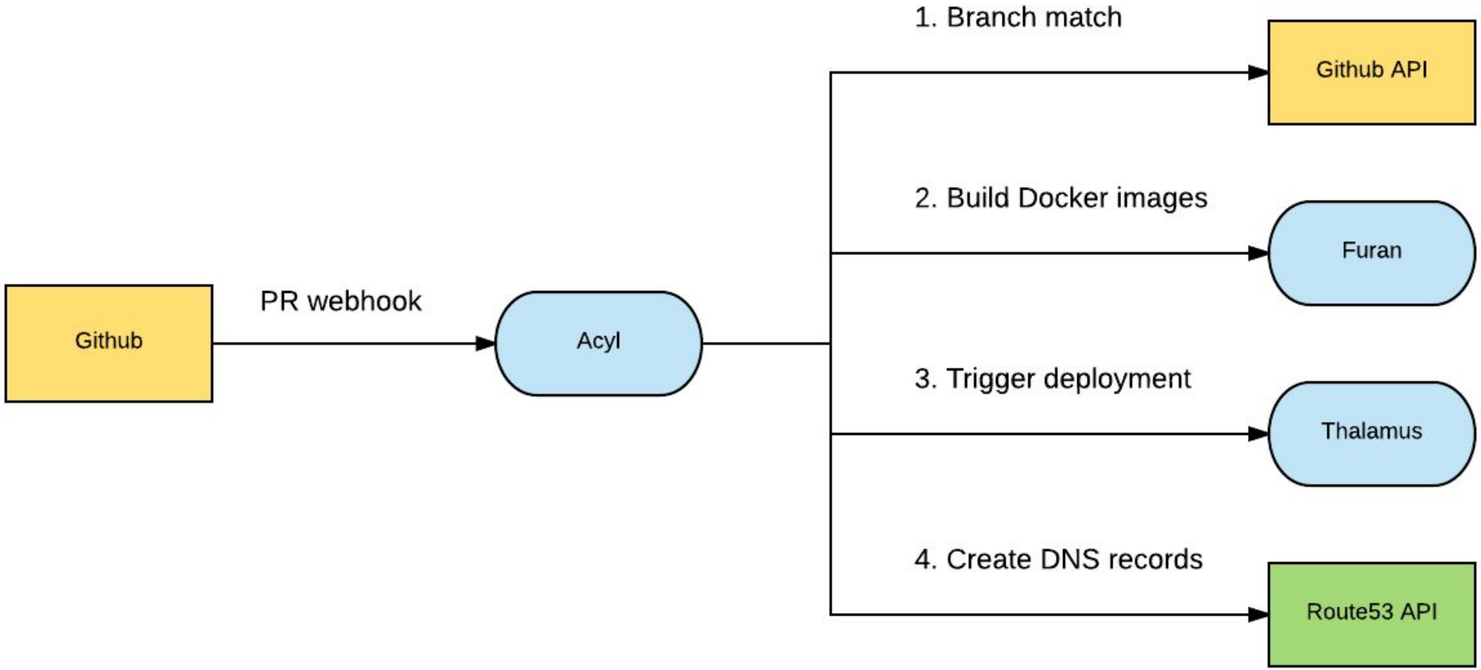
Dynamic QA Design

- Support arbitrary number of environments
- Build off of Github pull requests
- Match branches across repositories
- Recycle CoreOS/Docker container platform used on production

Acyl

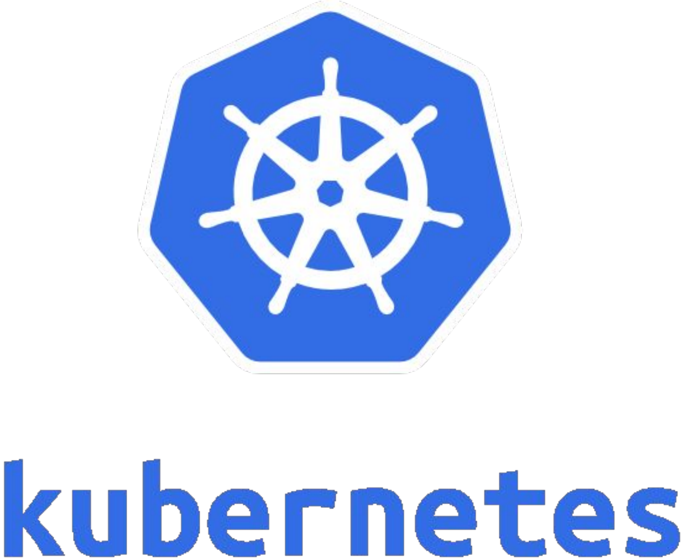
- Go application
- Orchestrates creating a new QA environment




Github
PR webhook
Acyl
1. Branch match
Github API
2. Build Docker images
Furan
3. Trigger deployment
Thalamus
4. Create DNS records
Route53 API

Issues

- Difficult to configure & templatize with cloudinit
- Environment boot time was slow
- Debugging had to be done via SSH
- Slow iteration speed during development

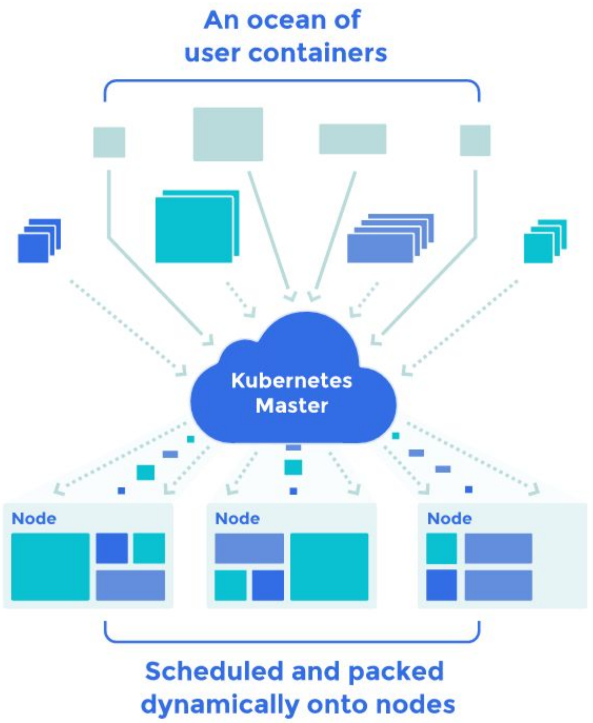


kubernetes

HELM

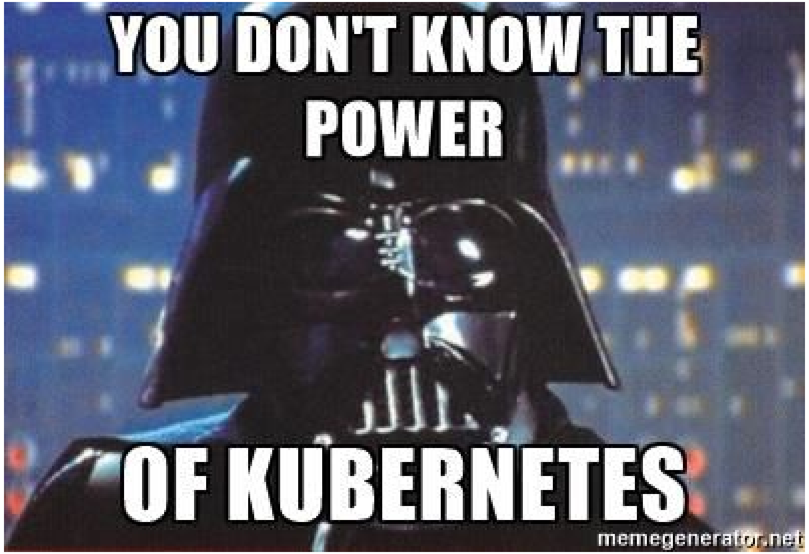
Kubernetes

- "Container orchestration system"
- Open-source project by Google inspired by their internal system, "Borg"
- A way to run Docker containers on top of a cluster of servers
- Similar systems: Docker Swarm, Apache Mesos, Hashicorp Nomad


An ocean of user containers
Kubernetes Master
Node
Node
Node
Scheduled and packed dynamically onto nodes

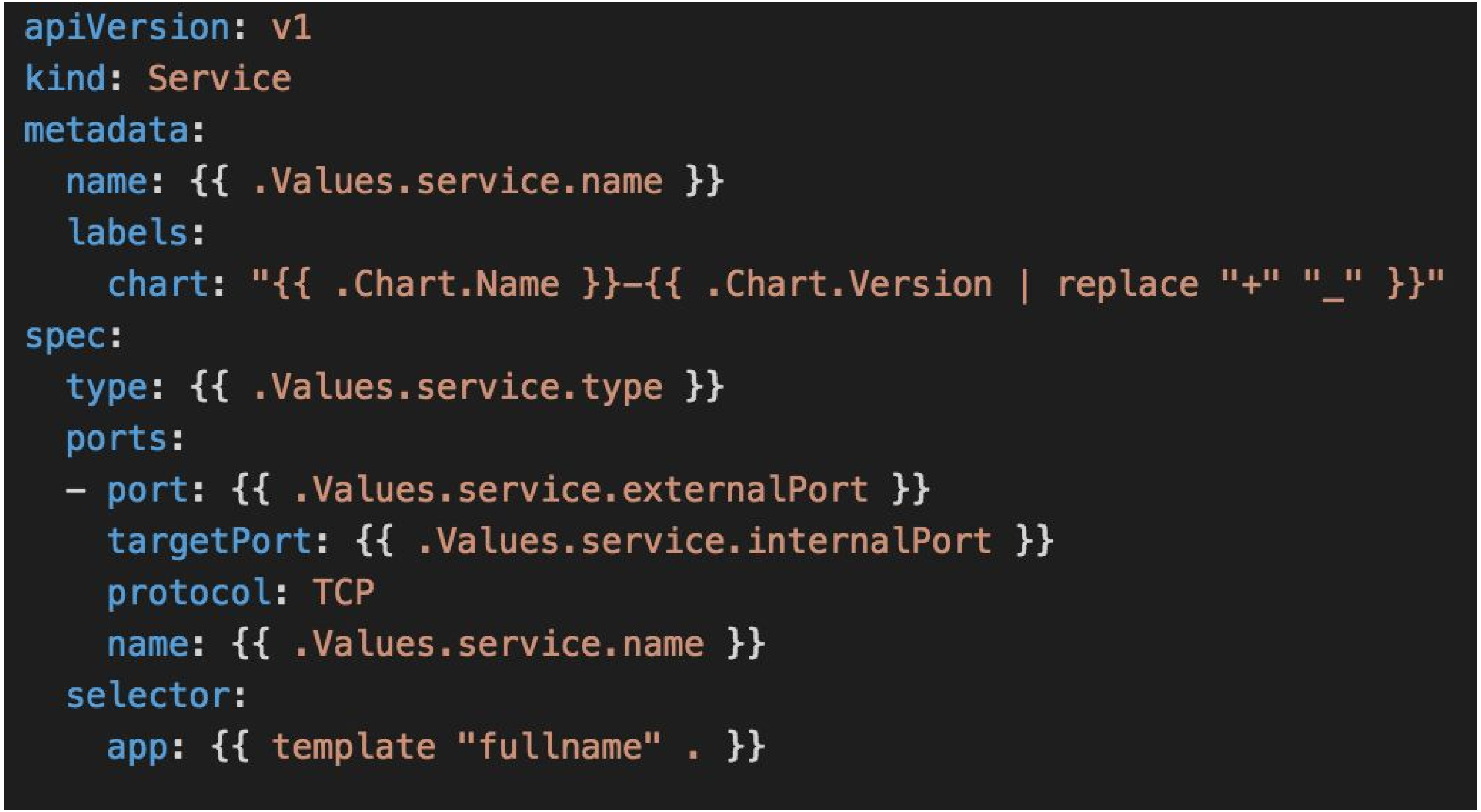
Useful Features

- Container bin packing
- “Controllers”
- Service discovery
- Docker image caching
- Granular API
- minikube
- kubectl



Helm

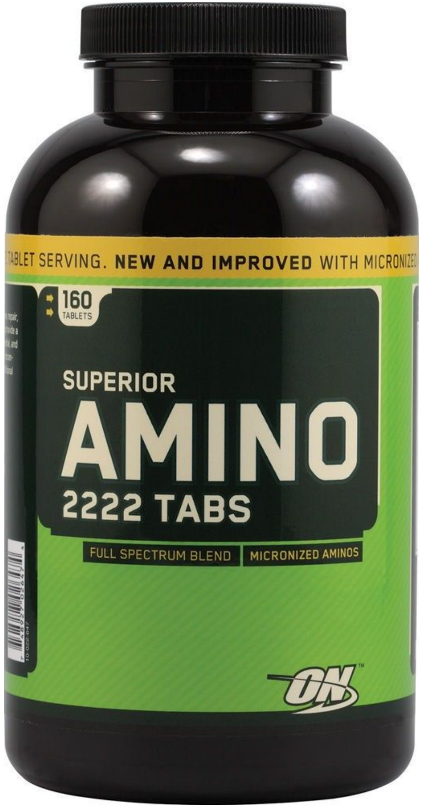
- Manages packages of Kubernetes resources, “charts”
- Offers templating
- Can validate packages by linting or performing a dry run
- A package can be compiled for different releases or environments
- Offers lifecycle management
- Packages can be developed and tested locally with minikube

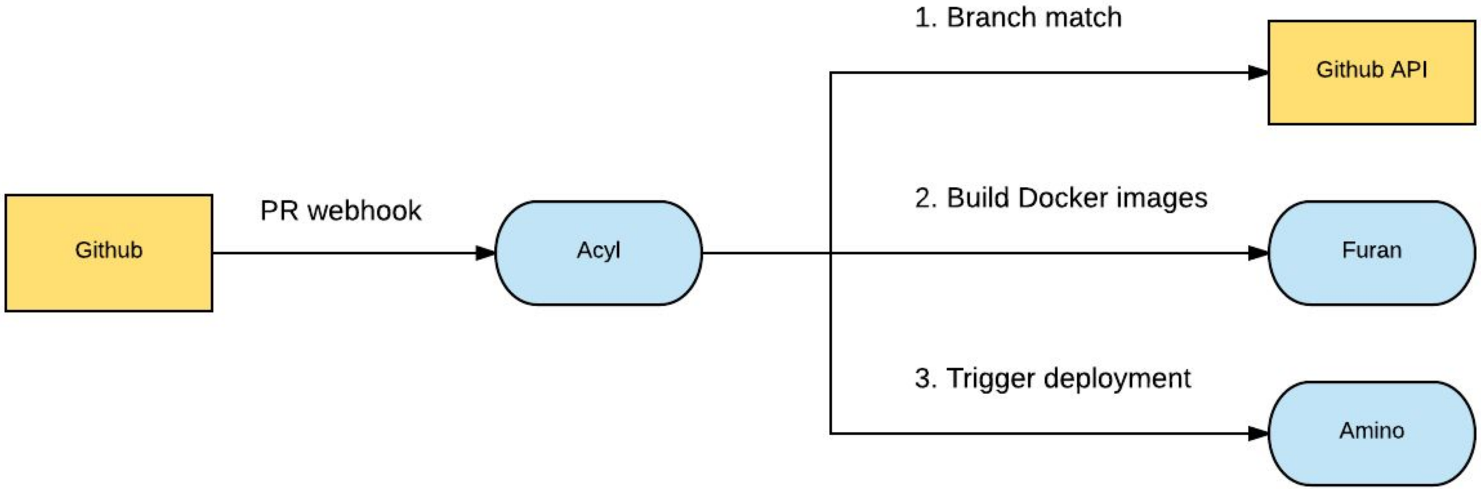


```yaml
apiVersion: v1
kind: Service
metadata:
  name: {{ .Values.service.name }}
  labels:
    chart: "{{ .Chart.Name }}-{{ .Chart.Version | replace "+" "_" }}"
spec:
  type: {{ .Values.service.type }}
  ports:
  - port: {{ .Values.service.externalPort }}
    targetPort: {{ .Values.service.internalPort }}
    protocol: TCP
    name: {{ .Values.service.name }}
  selector:
    app: {{ template "fullname" . }}
```

Amino

- New deployment backend for Acyl
- Most configuration is written as a Helm chart
- It offers an environment CRUD API
- Configuration is stored in Github and fetched when an environment is created

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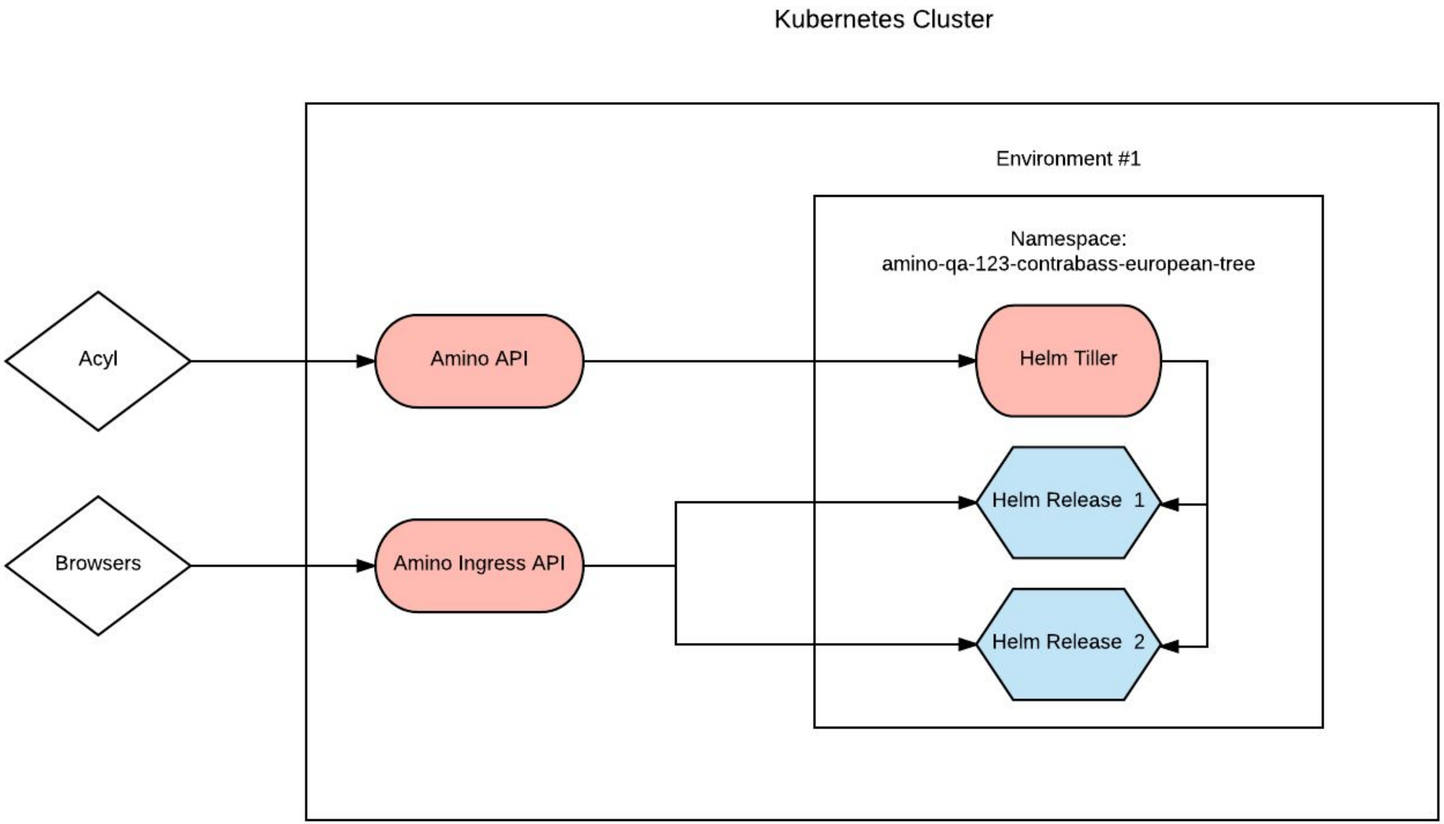
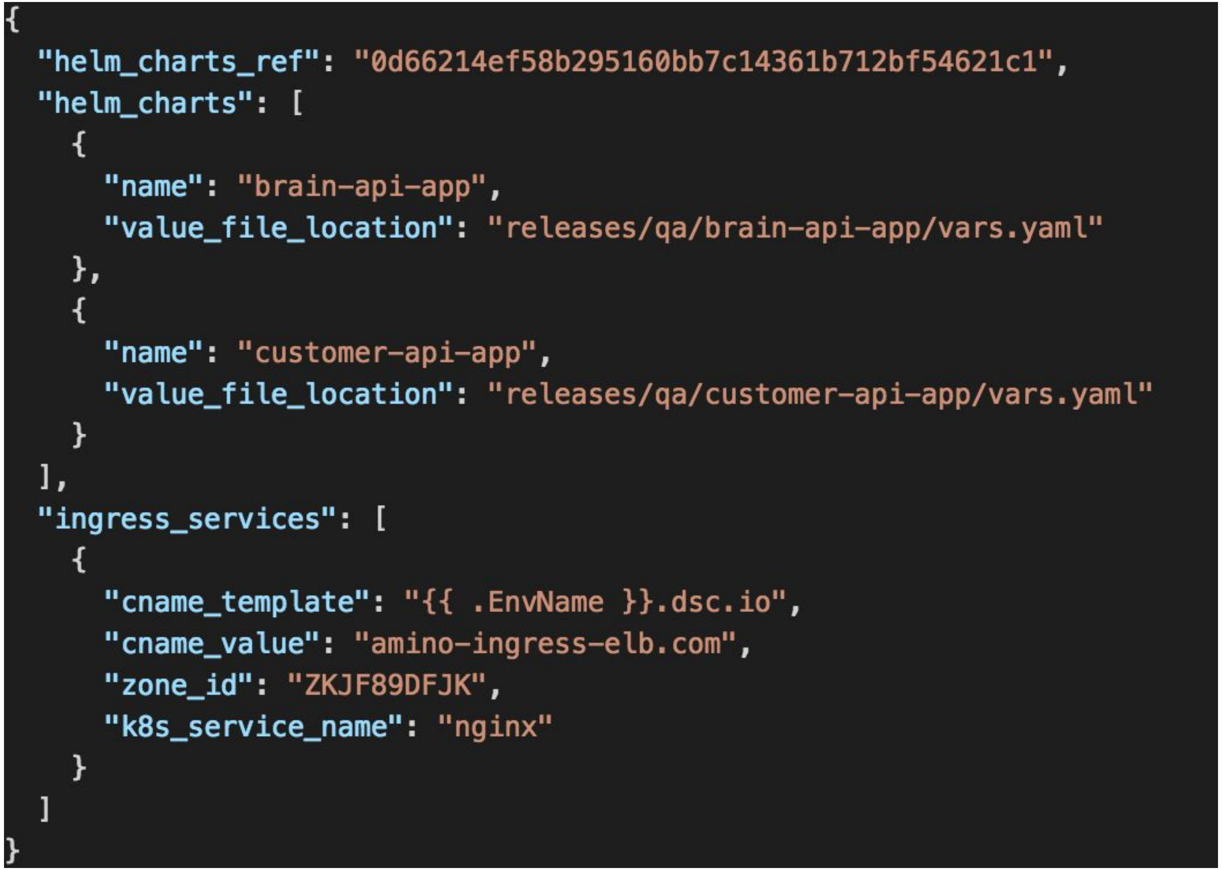

Kubernetes Cluster
Environment #1
Namespace:
amino-qa-123-contrabass-european-tree
Acyl
Amino API
Helm Tiller
Helm Release 1
Browsers
Amino Ingress API
Helm Release 2



```json
{
  "helm_charts_ref": "0d66214ef58b295160bb7c14361b712bf54621c1",
  "helm_charts": [
    {
      "name": "brain-api-app",
      "value_file_location": "releases/qa/brain-api-app/vars.yaml"
    },
    {
      "name": "customer-api-app",
      "value_file_location": "releases/qa/customer-api-app/vars.yaml"
    }
  ],
  "ingress_services": [
    {
      "cname_template": "{{ .EnvName }}.dsc.io",
      "cname_value": "amino-ingress-elb.com",
      "zone_id": "ZKJF89DFJK",
      "k8s_service_name": "nginx"
    }
  ]
}
```

Stats

- 1 monolithic QA environment with every digital product service
- 44 Kubernetes pods per environment
- Environment creation takes ~10 minutes
- All environments run on one 38 node Kubernetes cluster (8 CPU, 61GB RAM instances)
- Max capacity of ~80 environments

Limitations

- Kubernetes cluster runs 24/7
- QA environment capacity is fixed
- Occasionally run into Docker/Kubernetes scalability issues and bugs

The Aftermath

- Environments can now integration tests that span all microservices
- QA team can manually test essentially unlimited (~80) concurrent environments at once
- Kubernetes evaluation was a success
- Fewer bugs transitioning between environments due to shared Helm charts and platform (Kubernetes)

Future Work

- Open source all services
- Use Kubernetes Ingress

We're hiring

https://jobs.jobvite.com/dollarshaveclub

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Questions?