

Clusters as Cattle

How to Seamlessly Migrate Apps Across Kubernetes Clusters

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KubeCon 2018 · Copenhagen



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- Kubernetes contributor for several years
- Tech lead, Heptio Ark

github.com/ncdc

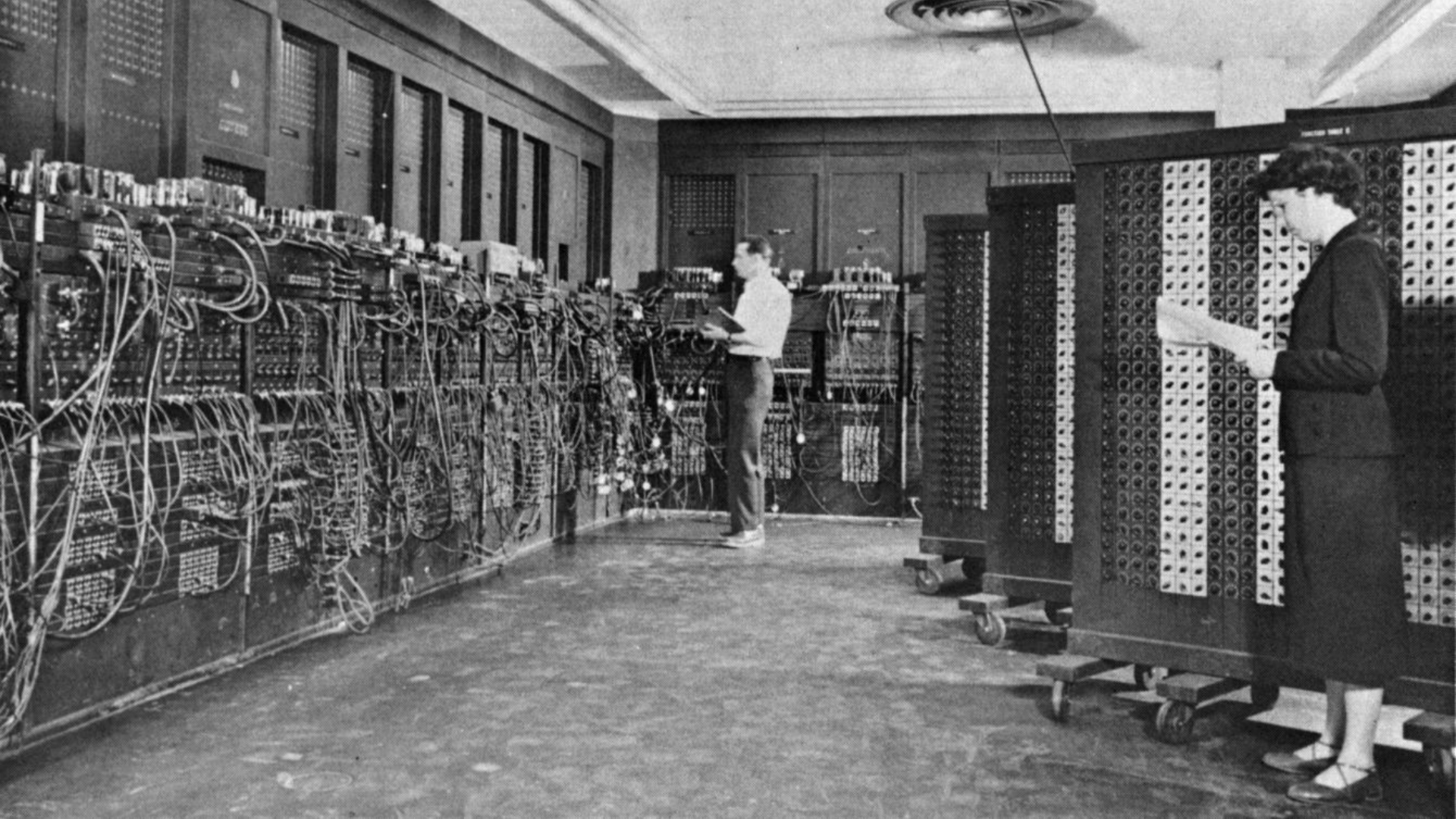
[@andygoldstein](https://twitter.com/andygoldstein)

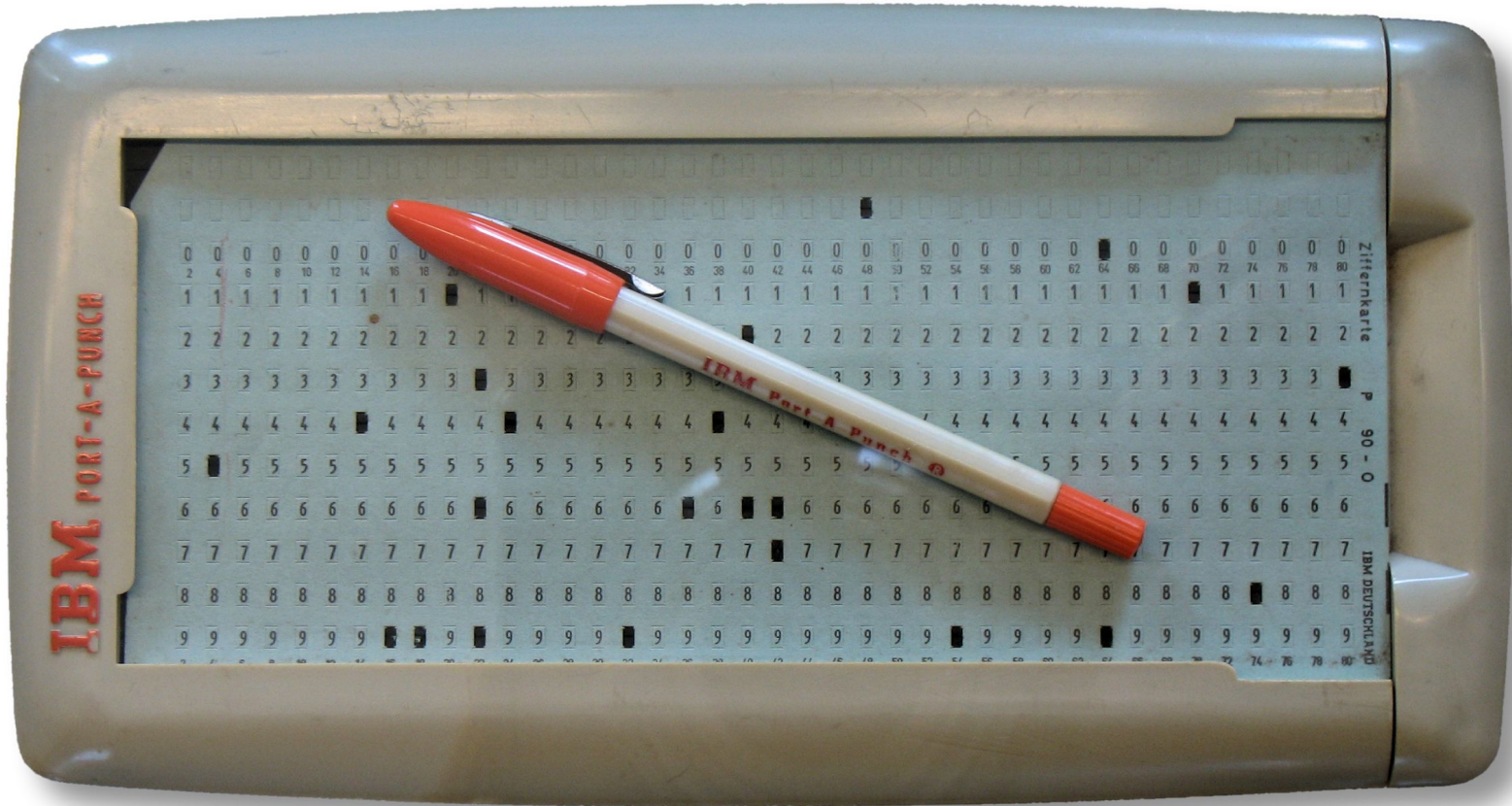
medium.com/@andy.goldstein

Overview



- A short history of developing & deploying apps
- Kubernetes & pets vs cattle
- App/workload migrations in Kubernetes
- Demo!
- Q&A

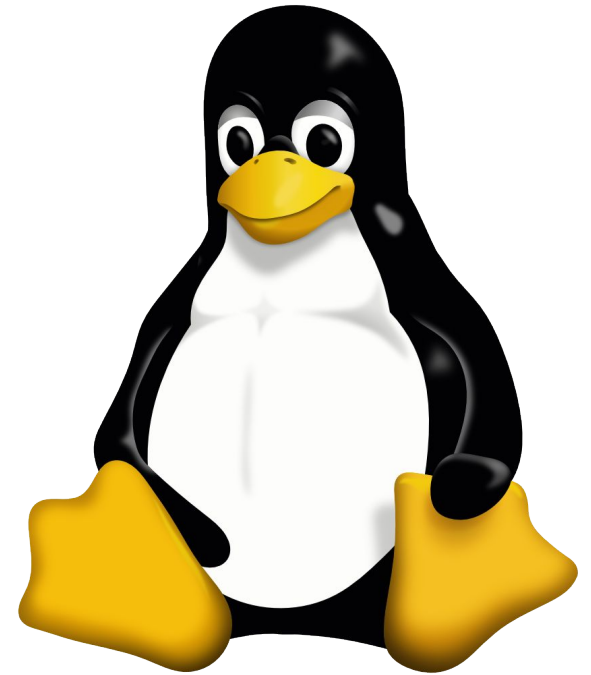
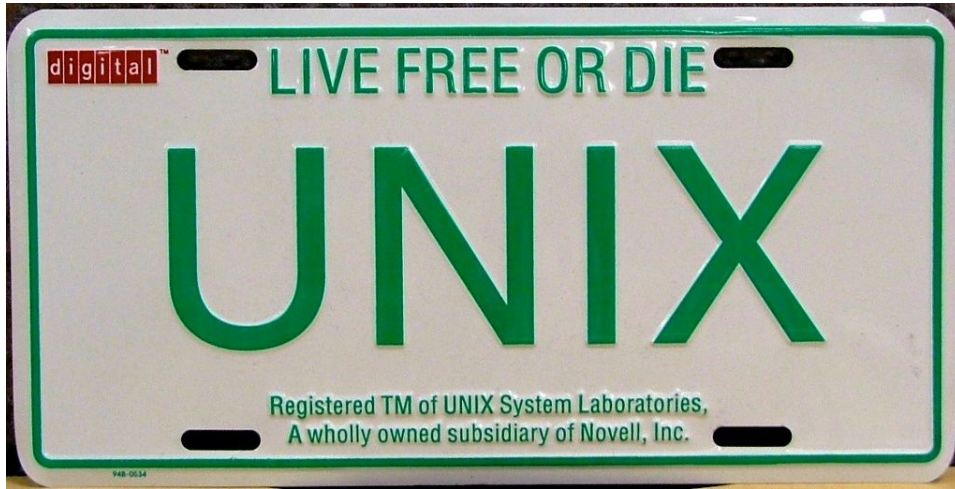




Punch cards!



IBM 704 Electronic Calculator



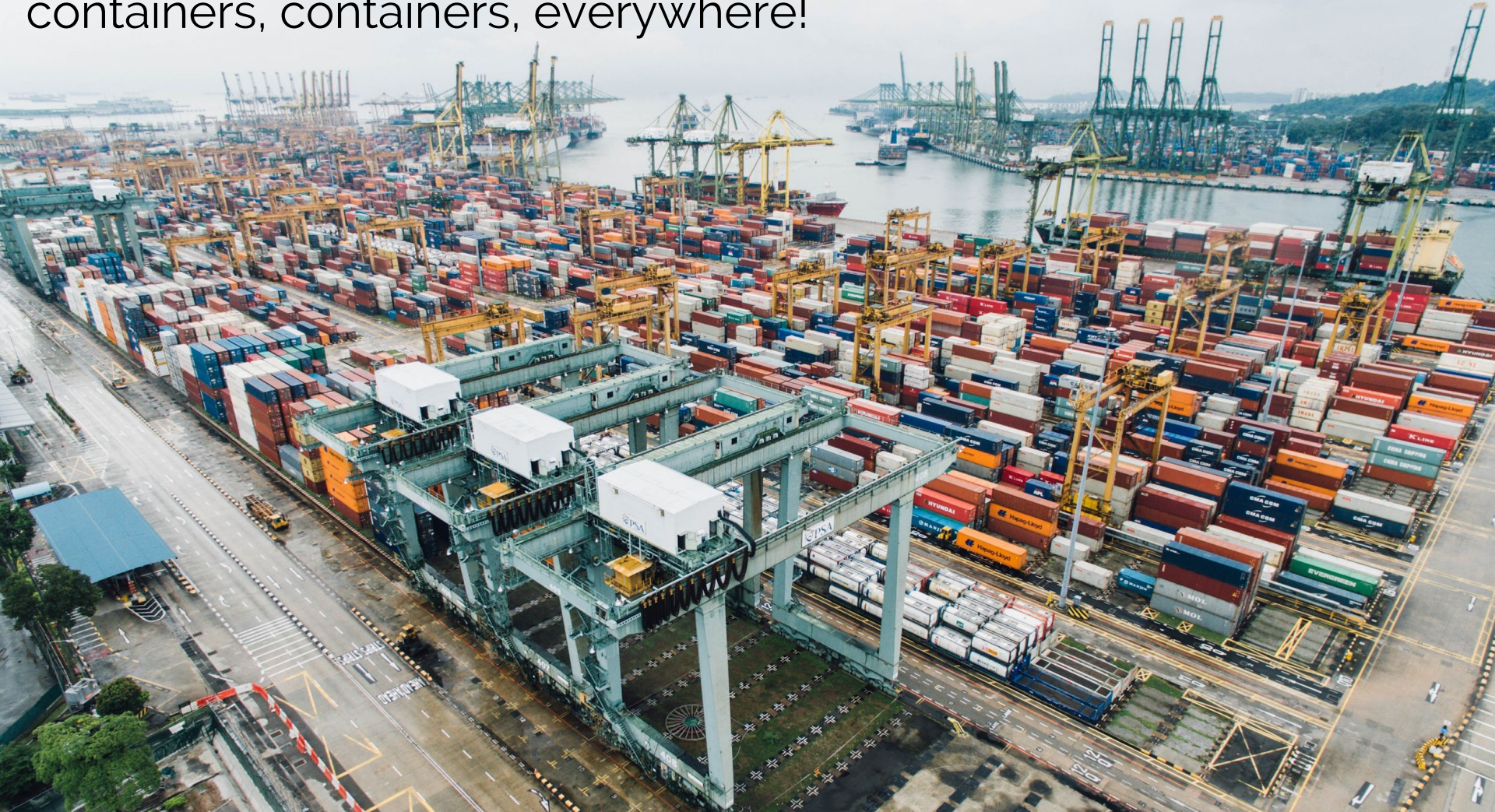
tickets
approvals
delays ...





cloud computing

containers, containers, everywhere!





(kubernetes)

k8s • Provision + Install



- Ansible
- Terraform
- Puppet
- Chef
- Kubeadm
- Kubicorn

k8s • Ansible + kubeadm



```
roles/kubernetes/defaults/main.yaml
```

```
kubernetes_version: "1.9.6"
```

```
kubernetes_cni_version: "0.6.0"
```

k8s • Ansible + kubeadm



```
roles/kubernetes/tasks/kubernetes.yaml
```

```
- name: Install prerequisite packages
  dnf:
    name:
      - kubectl-{{ kubernetes_version }}
      - kubeadm-{{ kubernetes_version }}
      - kubelet-{{ kubernetes_version }}
      - kubernetes-cni-{{ kubernetes_cni_version }}
```

k8s • Ansible + kubeadm



```
roles/kubernetes/tasks/kubernetes.yaml
```

```
- name: Start and enable kubelet
```

```
  systemd:
```

```
    name: kubelet
```

```
    state: started
```

```
    enabled: yes
```

k8s • Ansible + kubeadm



```
roles/kubernetes/templates/kubeadm.yaml
```

```
apiVersion: kubeadm.k8s.io/v1alpha1
```

```
kind: MasterConfiguration
```

```
kubernetesVersion: v{{ kubernetes_version }}
```

```
networking:
```

```
  podSubnet: 192.168.0.0/16
```

```
featureGates:
```

```
  CoreDNS: true
```


k8s • Ansible + kubeadm



```
roles/kubernetes/tasks/kubernetes.yaml
```

```
- name: Upload kubeadm config file
```

```
  template:
```

```
    src: templates/kubeadm.yaml
```

```
    dest: /tmp/kubeadm.yaml
```

```
- name: Initialize kubeadm
```

```
  command: "kubeadm init --config /tmp/kubeadm.yaml"
```

k8s • Ansible + kubeadm



```
roles/kubernetes/tasks/kubernetes.yaml
```

```
- name: Copy kubeadm kube config
  copy:
    src: /etc/kubernetes/admin.conf
    dest: "/home/{{ ansible_user }}/.kube/config"
    owner: "{{ ansible_user }}"
    group: "{{ ansible_user }}"
    mode: 0755
    remote_src: True
```

k8s • Ansible + kubeadm



```
roles/kubernetes/tasks/kubernetes.yaml
```

```
- name: Copy calico yaml
```

```
  copy:
```

```
    src: files/calico.yaml
```

```
    dest: /tmp/calico.yaml
```

```
- name: Install calico
```

```
  command: kubectl apply -f /tmp/calico.yaml
```

k8s • Ansible + kubeadm



```
playbooks/cluster.yaml
```

```
- hosts: all
  become: true
  tasks:
    - import_role:
        name: kubernetes
    - import_role:
        name: contour
```


k8s • App Migrations



- Can't pin apps to specific clusters/nodes forever
- Migrations are necessities
- Stateless is easier than stateful

Heptio Ark • Disaster Recovery



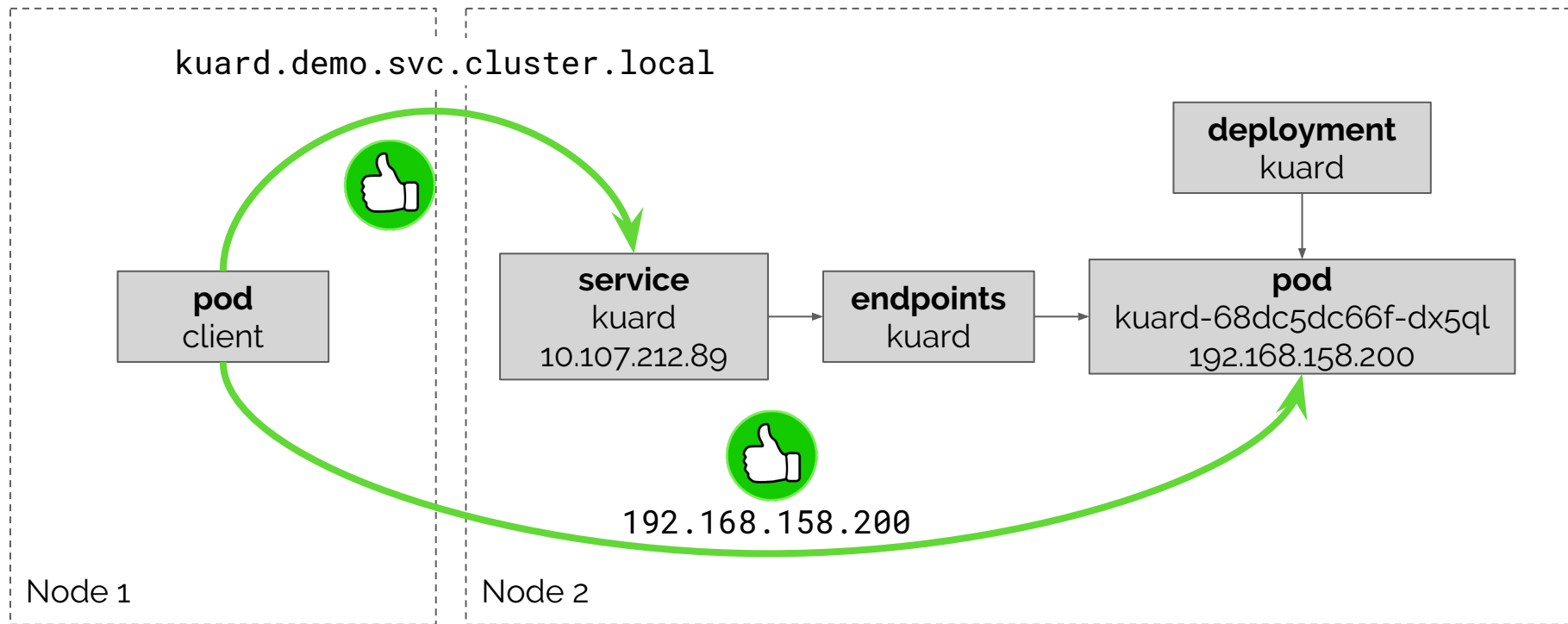
- On-demand + scheduled backups
- k8s resources + persistent volumes
- Selectively backup + restore namespaces, resources, etc.
- Extensible
- Also good for migrations

Scenario • k8s Upgrade

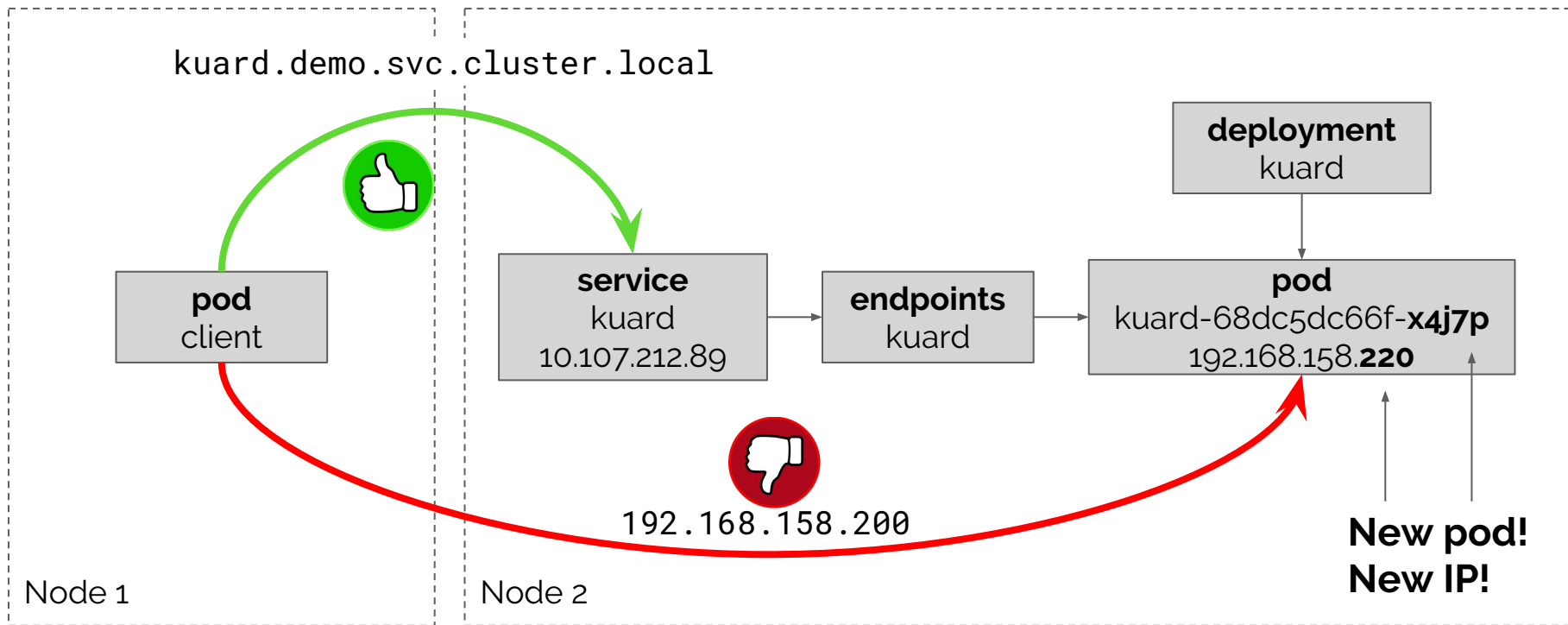


- App running in k8s 1.9.x
- Want to move to k8s 1.10.x
- Avoid downtime
- Transparent to users

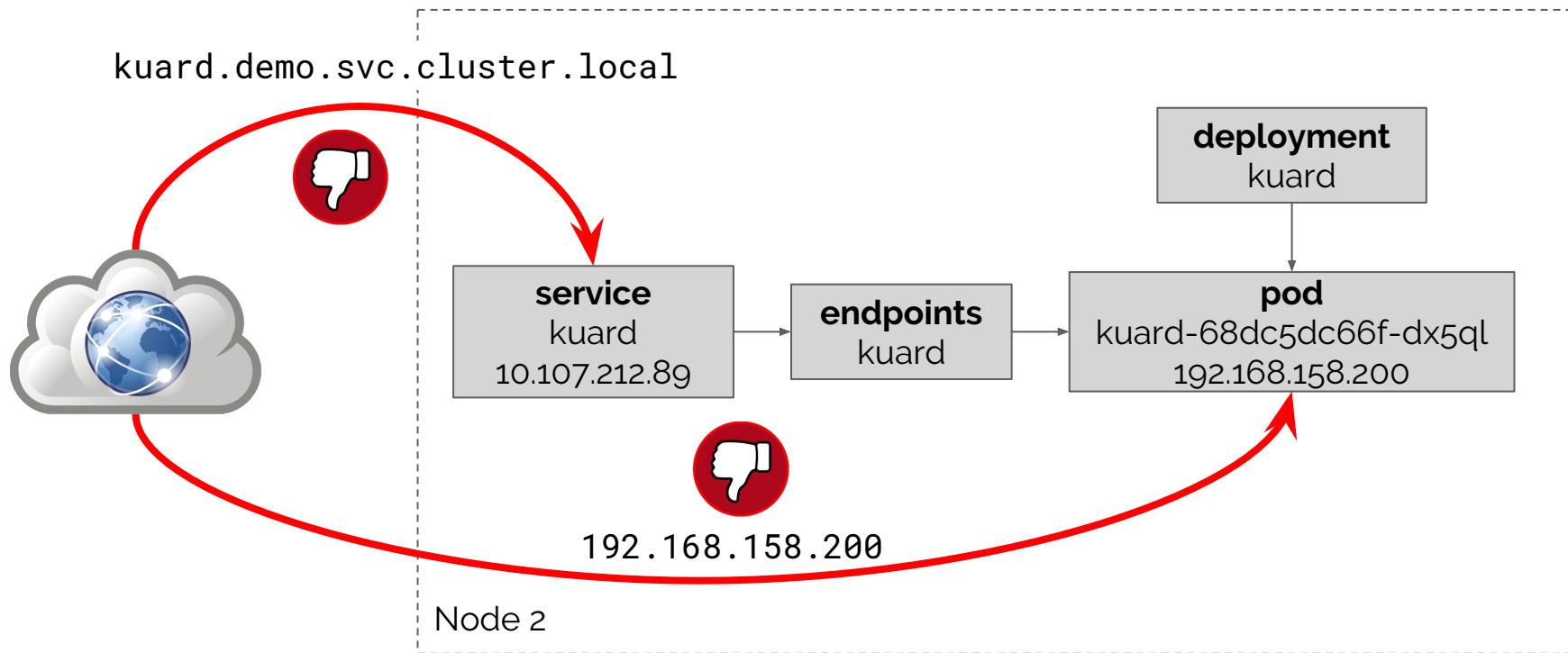
k8s • In-cluster Clients



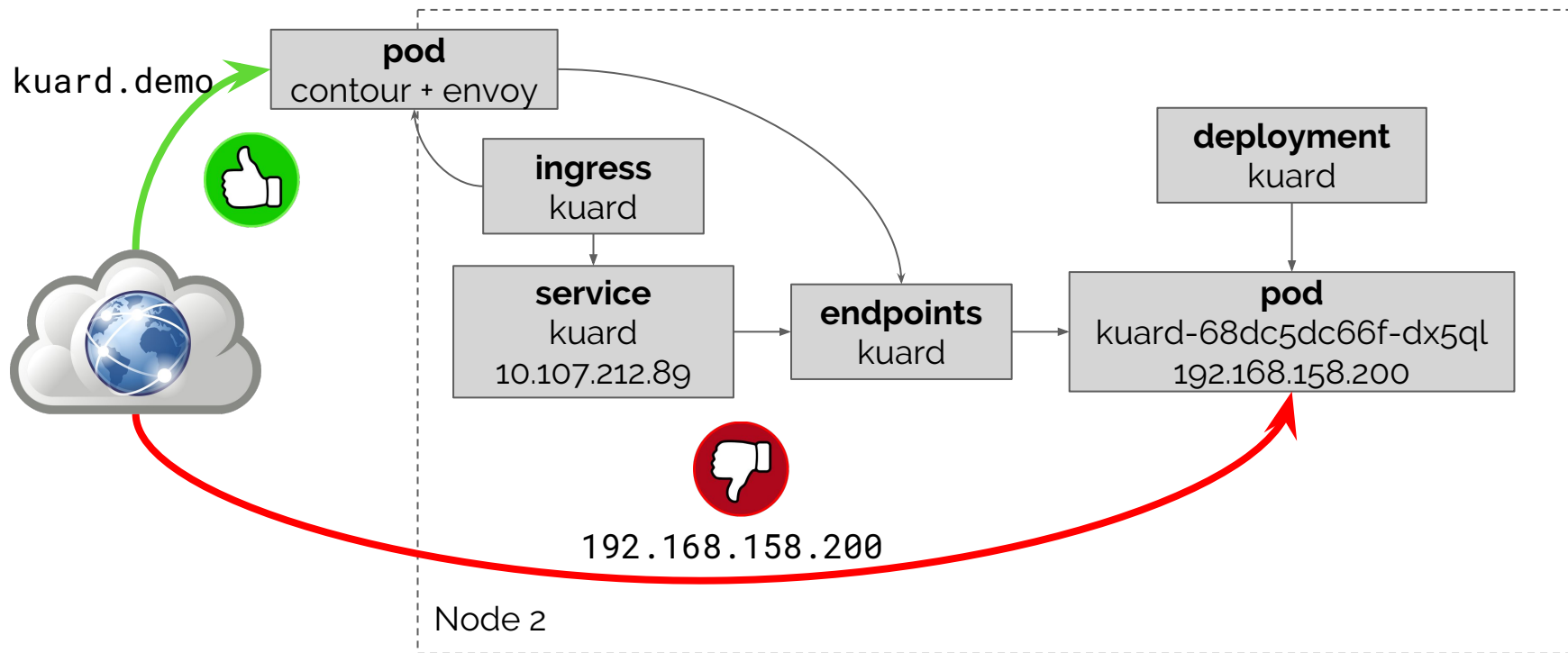
k8s • In-cluster Clients



k8s • External Clients



k8s • External Clients

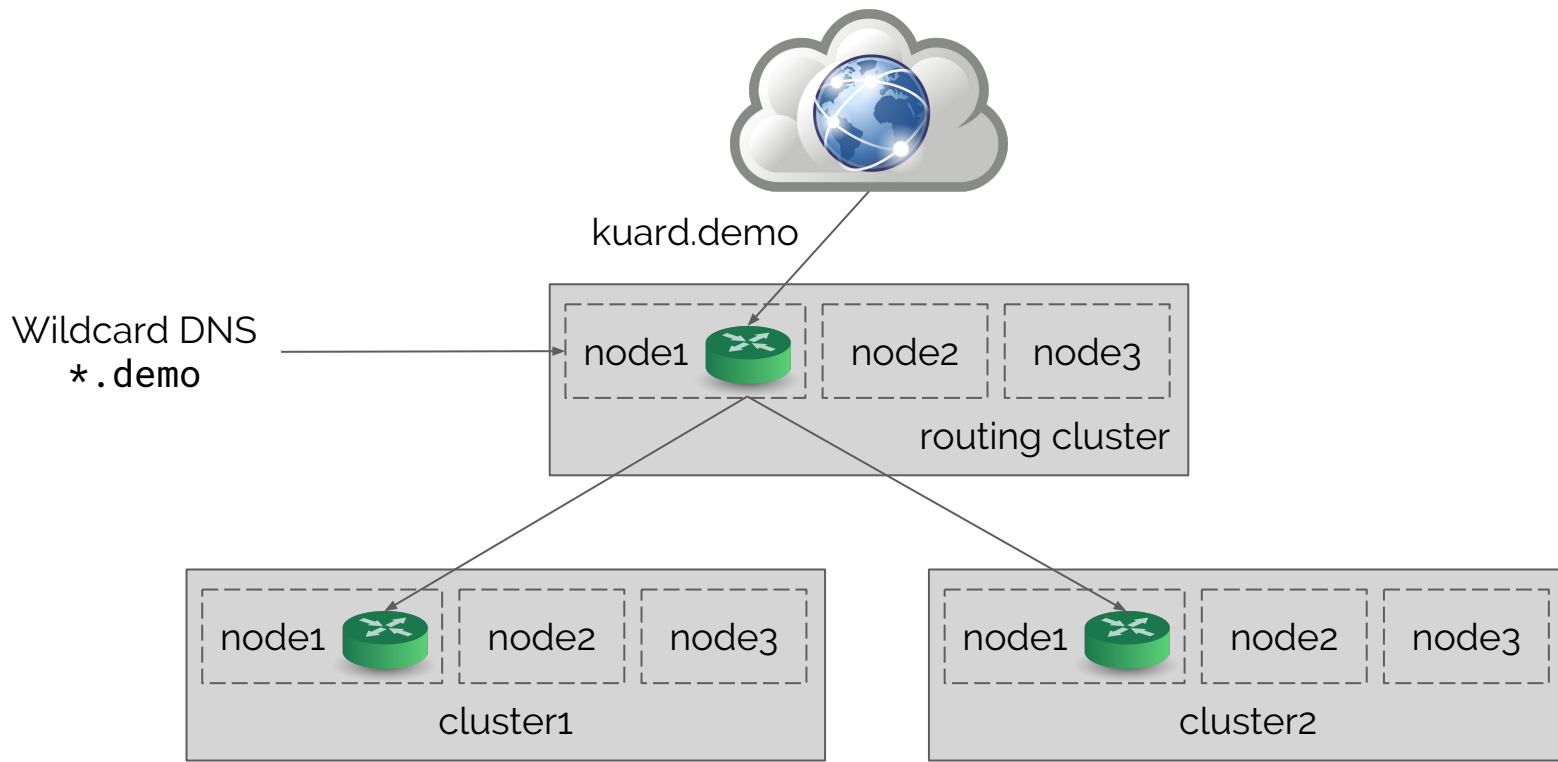


k8s + Contour + Envoy + DNS = 

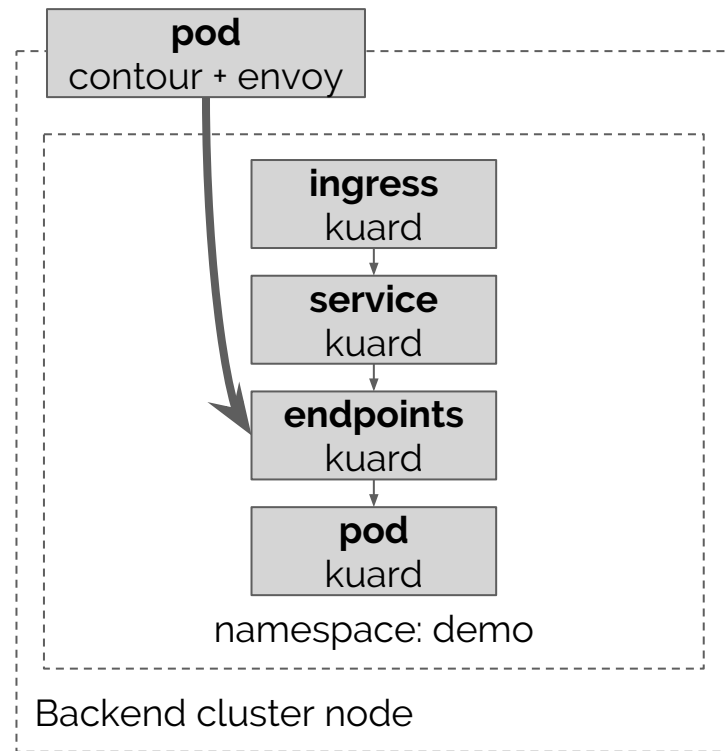
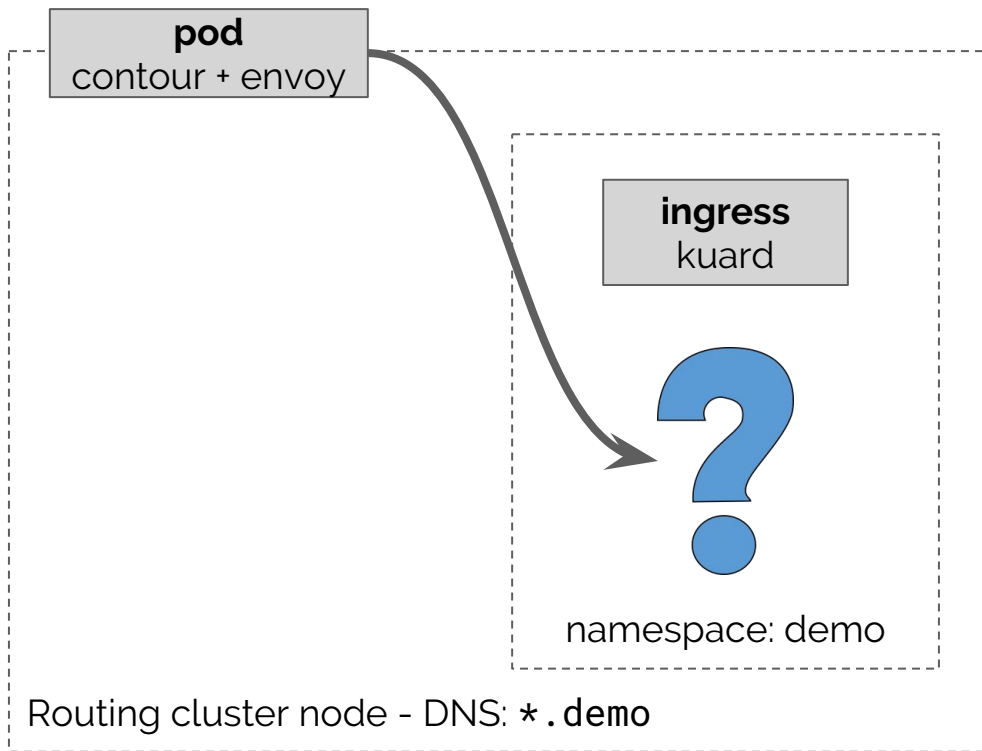


- Routing cluster (wildcard DNS, Contour/Envoy)
- Backend clusters (Contour/Envoy)
- Traffic shifting
- Start with a small % requests to new cluster
- Slowly transition to 100%

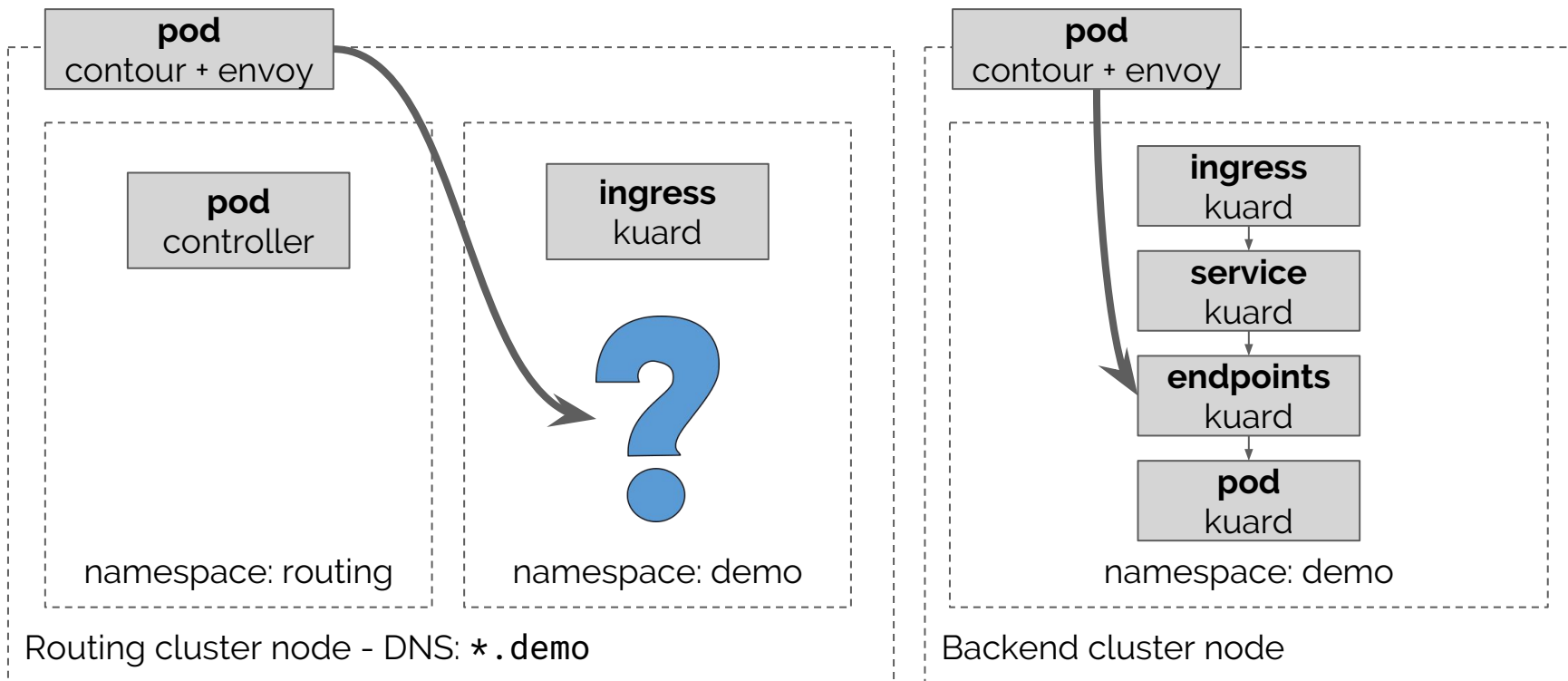
Demo • Routing Overview



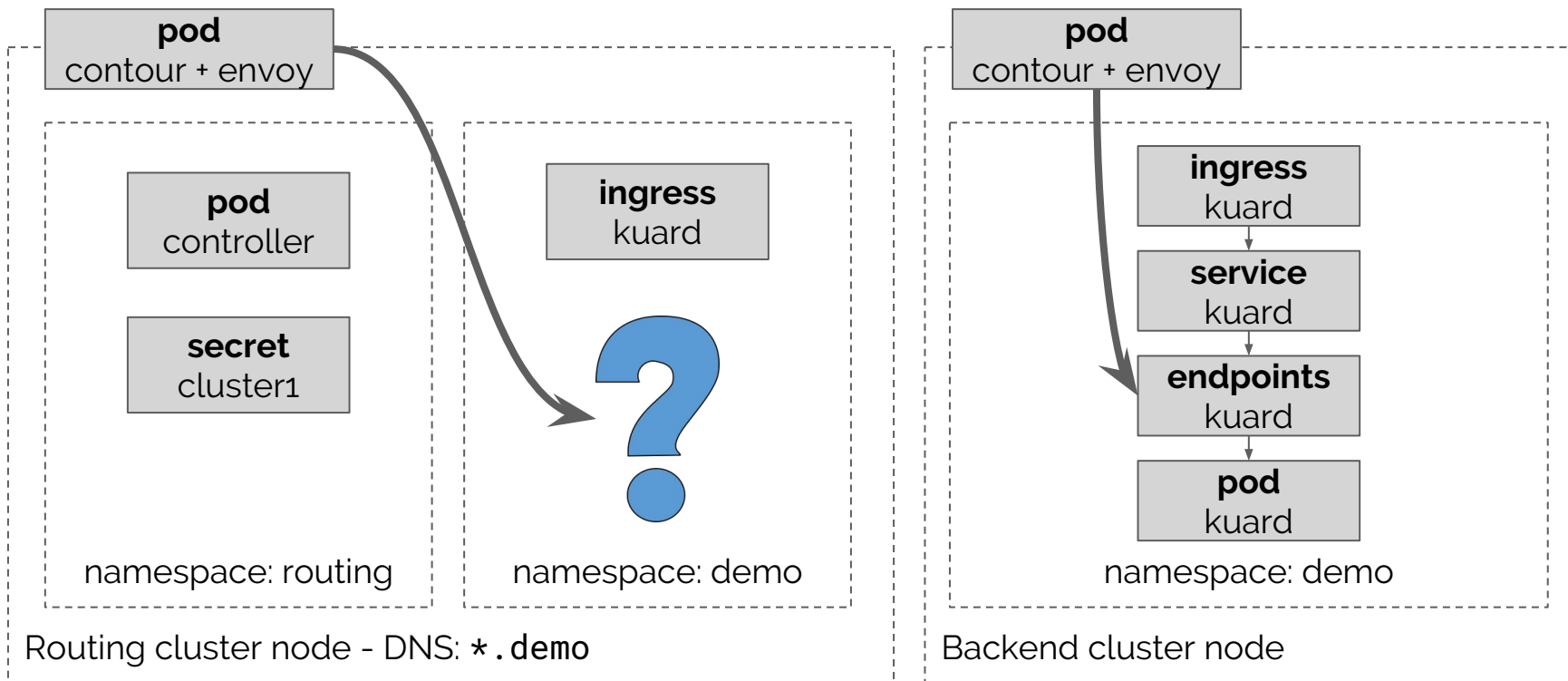
Demo • Routing Overview



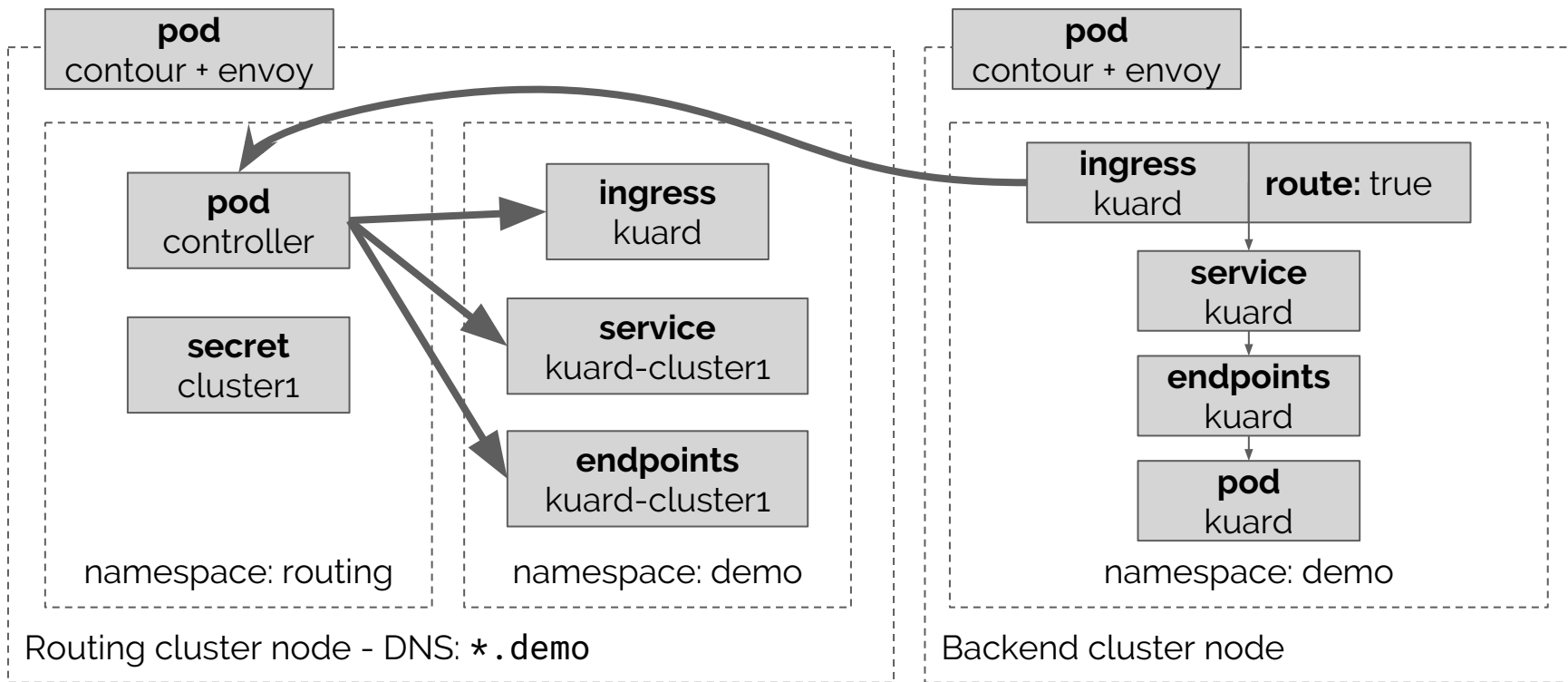
Demo • Routing Overview



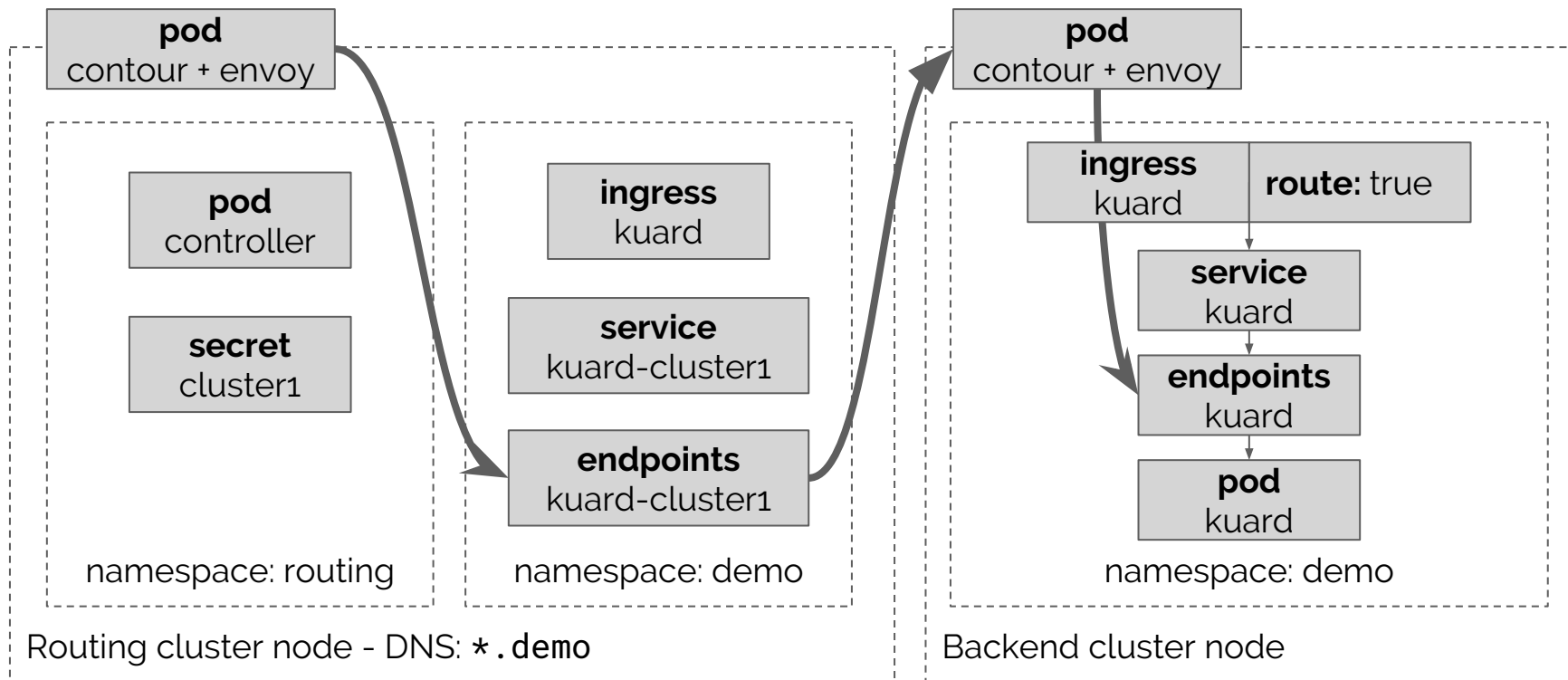
Demo • Routing Overview



Demo • Routing Overview



Demo • Routing Overview



Demo

Q & A

Links



- <https://github.com/heptio/ark>
- <https://github.com/heptio/contour>
- <https://www.envoyproxy.io>
- <https://github.com/ncdc/routingdemo-ansible>
- <https://github.com/ncdc/routingdemo>