GitOps-Driven Platform Engineering:

Mastering Cluster Fleet Management

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$ WHOAMI

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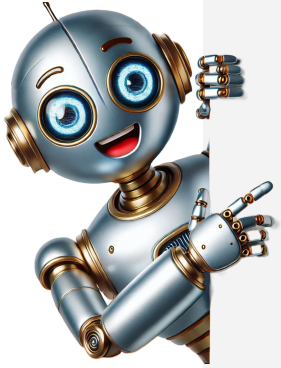
Backstory

Stepping back...

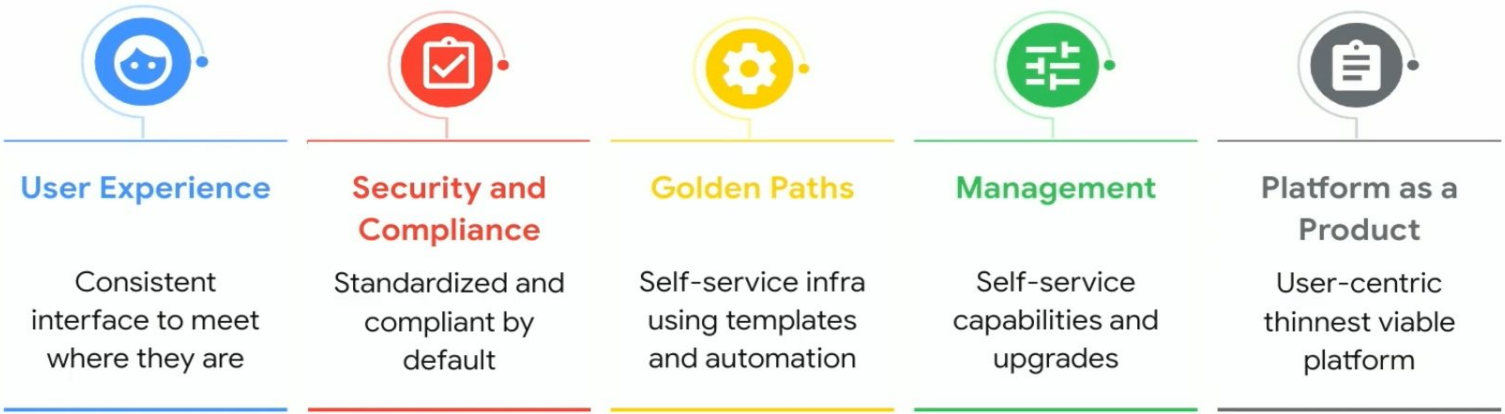
Cloud is complicated!

Teams are swamped.

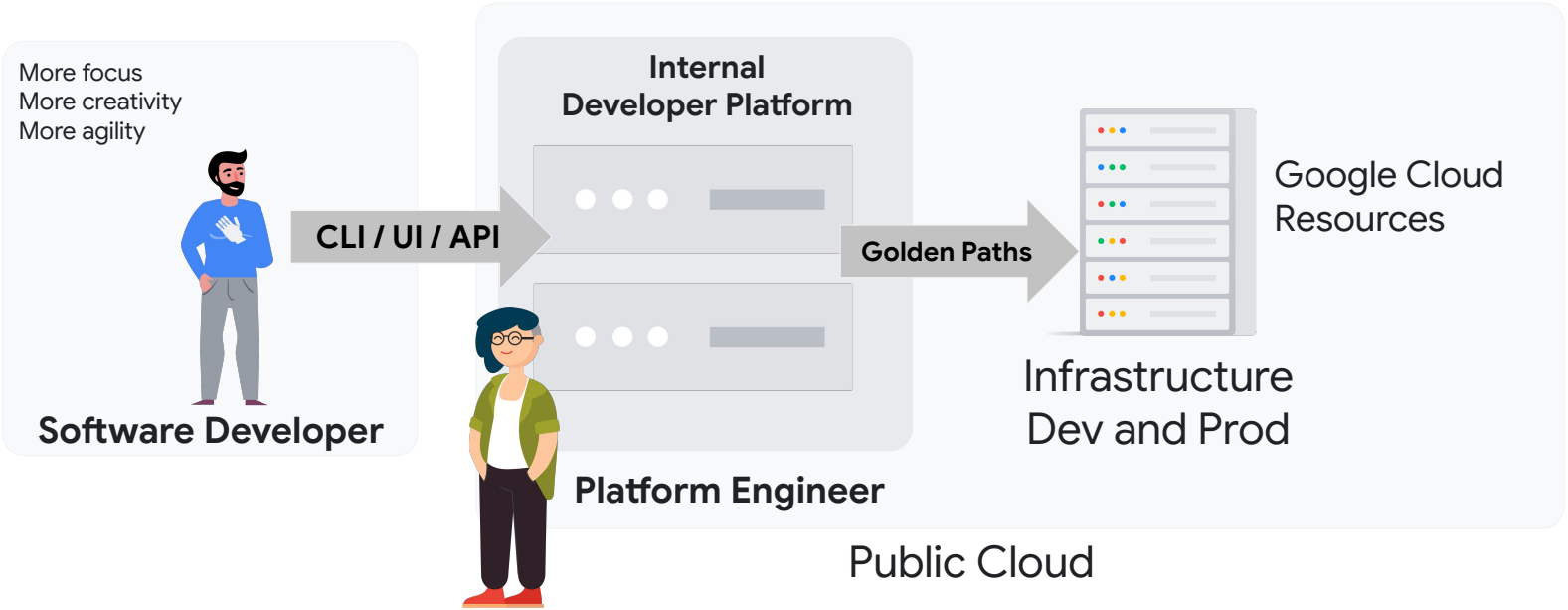


Platforms can help.

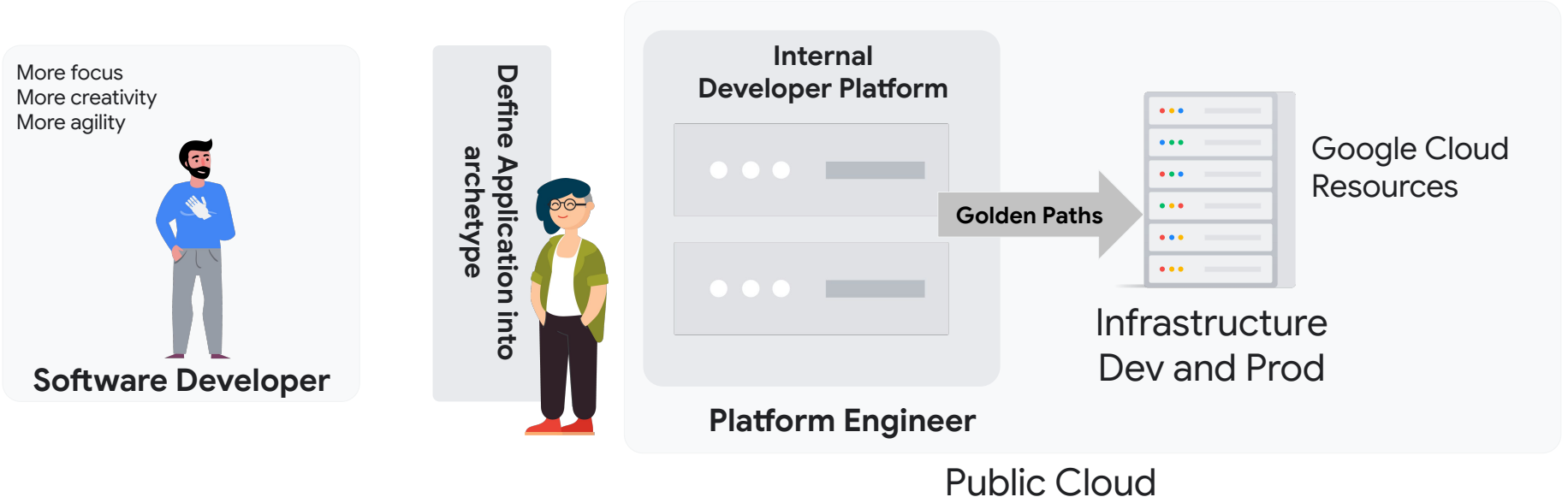
What is Platform Engineering ?!



Platform Engineering



Platform Engineering



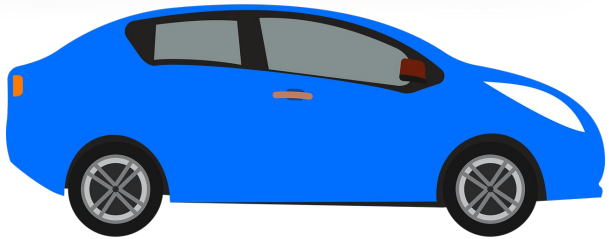
Archetypes Introduction

Let's Go: **Car Shopping**

"I need a new <vehicle>!"

Really:

A. I want to **go fast**
B. I need to carry **lots of stuff**
C. I don't want to **spend** much



Refinement

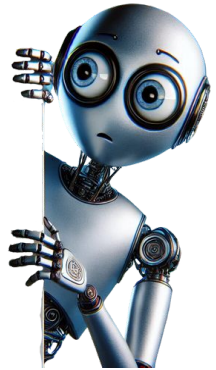
Once you pick a **type**, you can choose a **make** and **model**.

Customization

Then, you choose the **one for you**.

Maybe you make it even **more** for you.

NOT Car Shopping!



Too Much Choice can be Disastrous

What we think we want

vs

How it actually turns out

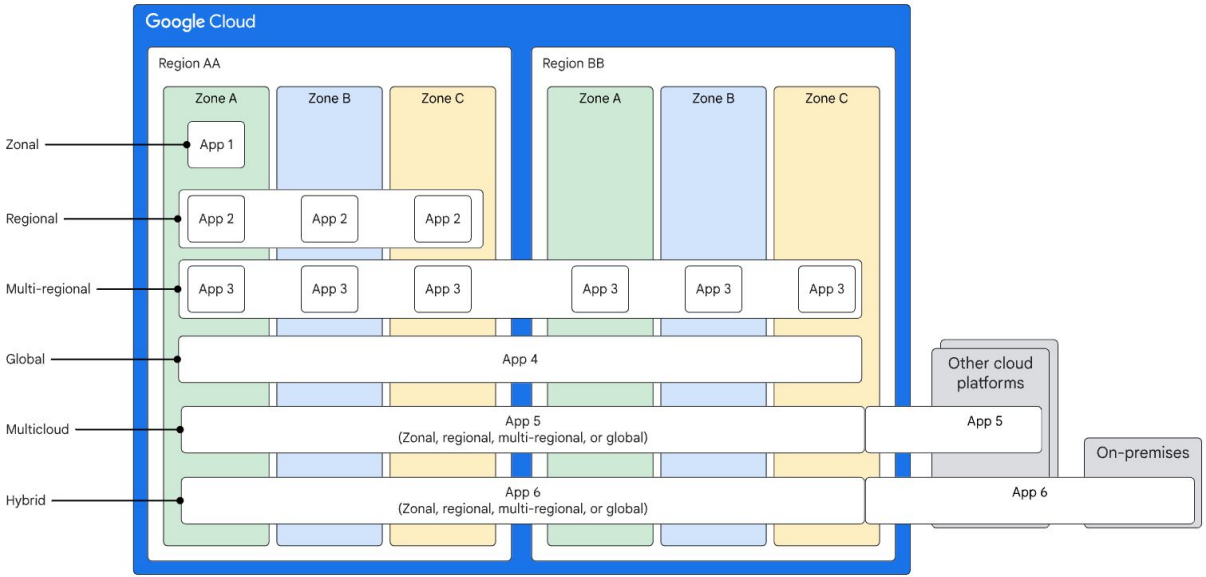
https://simpsons.fandom.com/wiki/The_Homer

"the type of car Americans really want, not the kind we tell them they want"

A deployment archetype is an abstract, provider-independent model that you use as the foundation to build application-specific *deployment architectures* that meet your business and technical requirements

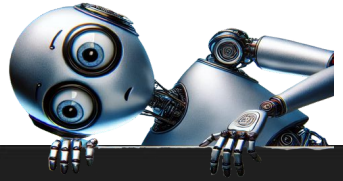
goo.gle/app-archetypes

Deployment Archetypes



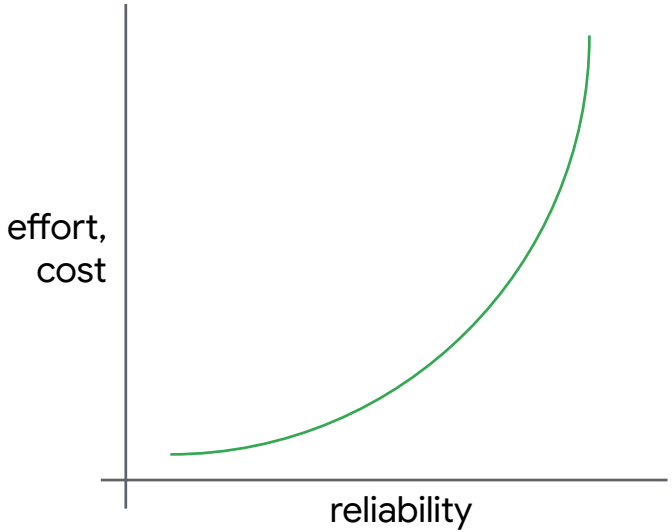
goo.gle/app-archetypes

From Abstract Model to Implementation



achetype.yaml

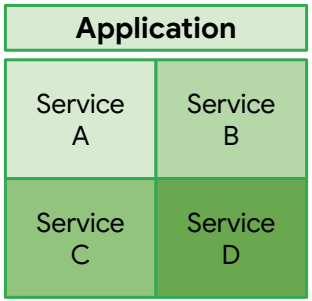
```yaml
---
apiVersion: company/apps/v1alpha1
kind: Application
metadata:
  name: whereami-frontend # Namespace, Service, Deployment, KSA, GSA, and repo names based on this.
spec:
  workload:
    application-group: "whereami" # Multiple Services belong to an application-group
    template: "golang" # Supported values are golang, python, java, javascript
    deployment-strategy: "global" # Strategies supported are multi-zonal, multi-regional, and global
    # Supported regions are us-west2, us-central1 (examples)
    # The "global" strategy ignores this field
    locations: ["us-west2", "us-central1"]
  service:
    ports: ["8080", "443"]
  config: ···
  traffic: ···
  security: ···
  access: ···
  deployment:
    dockerfile: "/path/to/Dockerfile" # Path to the Dockerfile.
    strategy: "canary" # Supported values are Rolling, Blue-Green and Canary, default is Rolling
    frequency: "daily" # Supported values are Hourly, Daily, Weekly, Fortnightly, Monthly, Quarterly, default is Daily
  infra:
    gcp:
      databases: ["sql","spanner"] # Supported values are "sql", "firestore", "spanner", "redis"
  requirements:
    availability: "99.999%"  # Target uptime percentage.
    latency: "200ms"  # Maximum acceptable response time.
    errorRate: "0.5%"  # Target maximum error rate percentage.
    throughput: "5000qps"  # Queries per second.
    durability: "99.99%"  # Data durability percentage.
    recoveryTimeObjective: "30m"  # Maximum time to recover services.
    recoveryPointObjective: "5m"  # Maximum acceptable data loss period.

```


effort,
cost
reliability

How to use Archetypes?

Services can be deployed to a **single archetype**

Applications can use services across **multiple archetypes**



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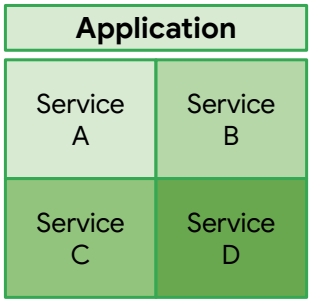
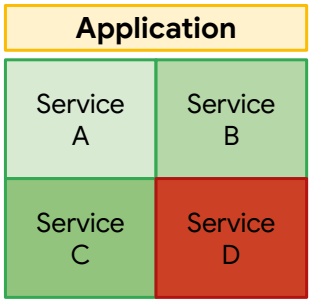
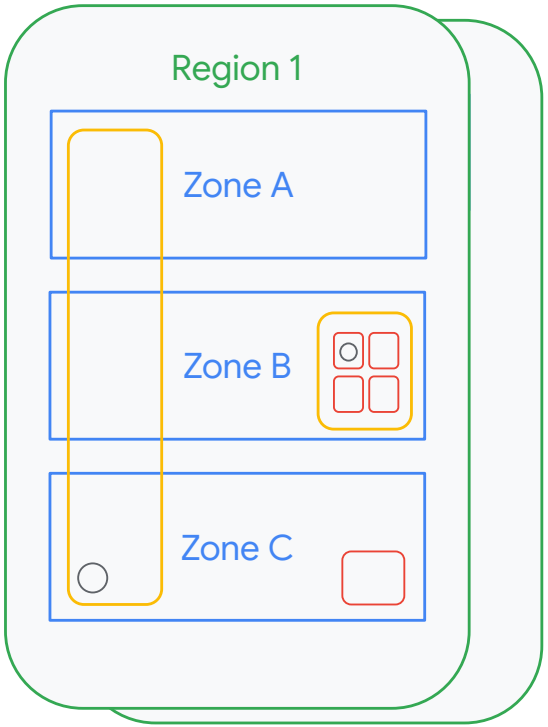


Applications should be designed for **graceful degradation**

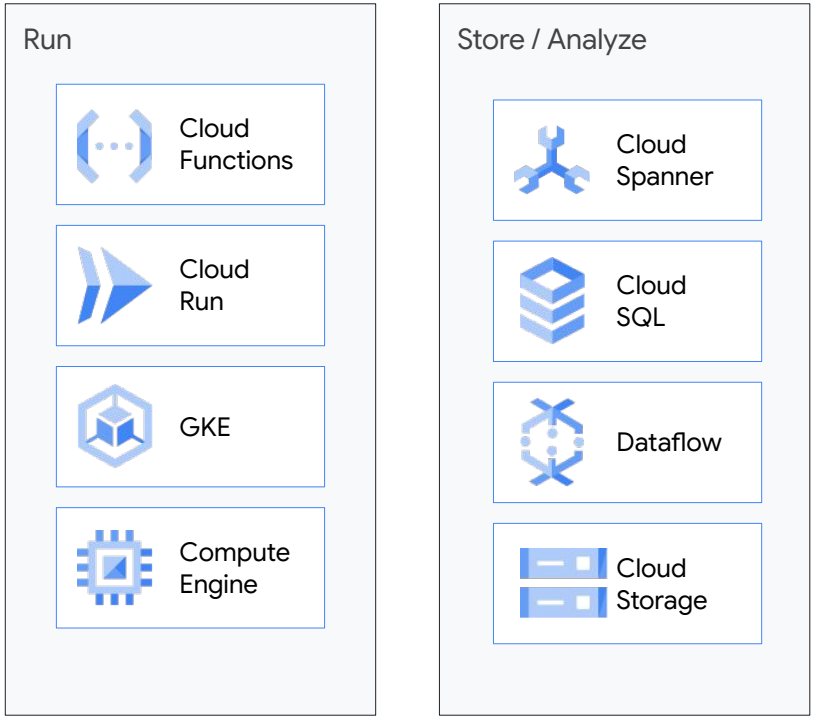


Cloud Failure Domains: Regions, Zones

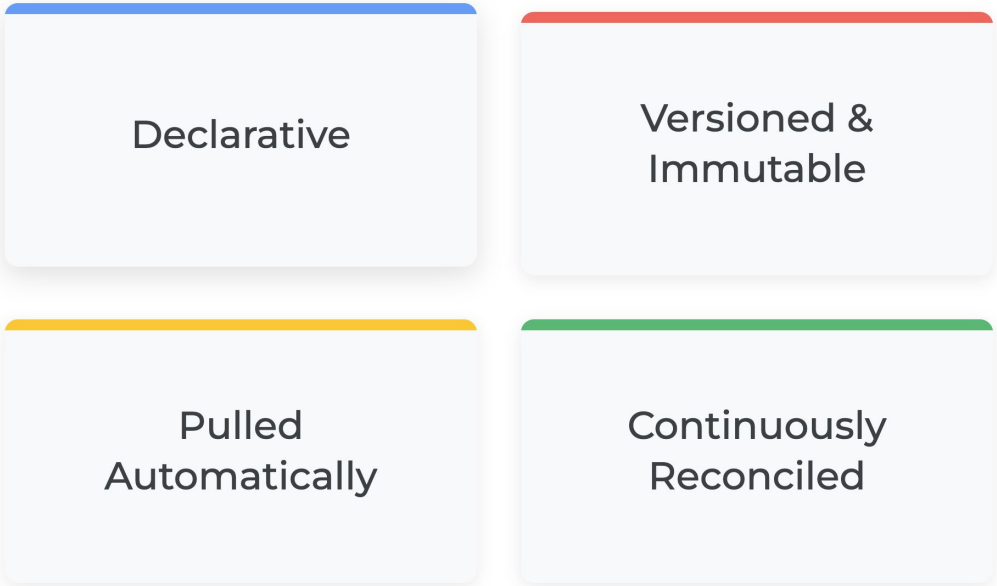
Clusters, Pods, Apps, Functions, VMs



Products expose their failure domains differently

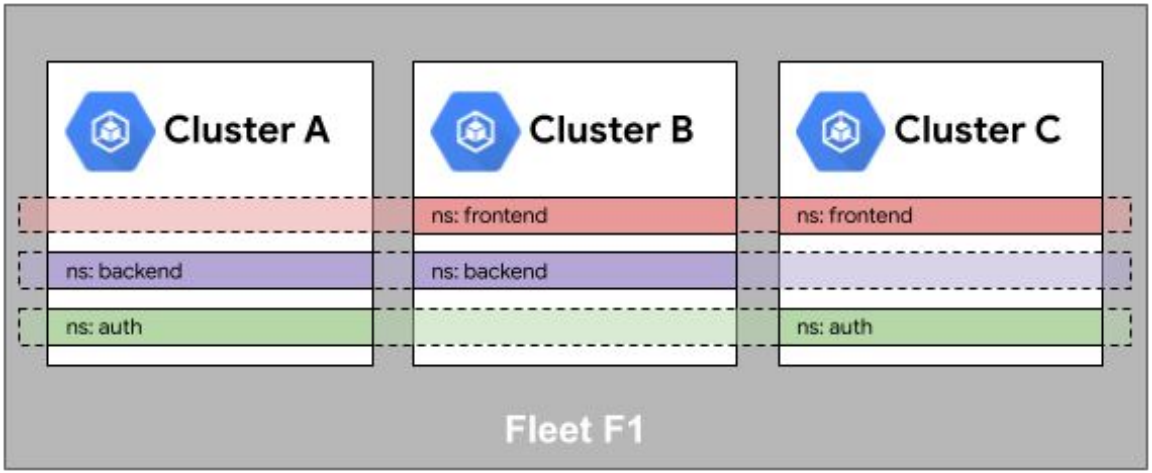


What is GitOps?



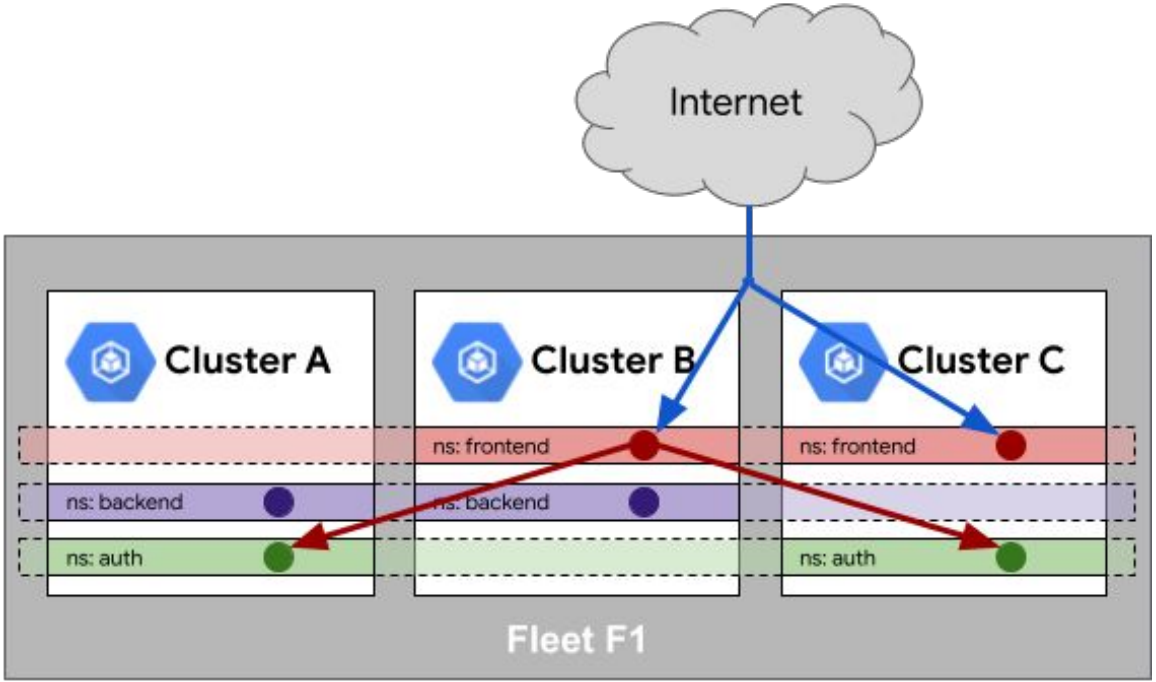
https://opengitops.dev/

What are Fleets of Clusters?



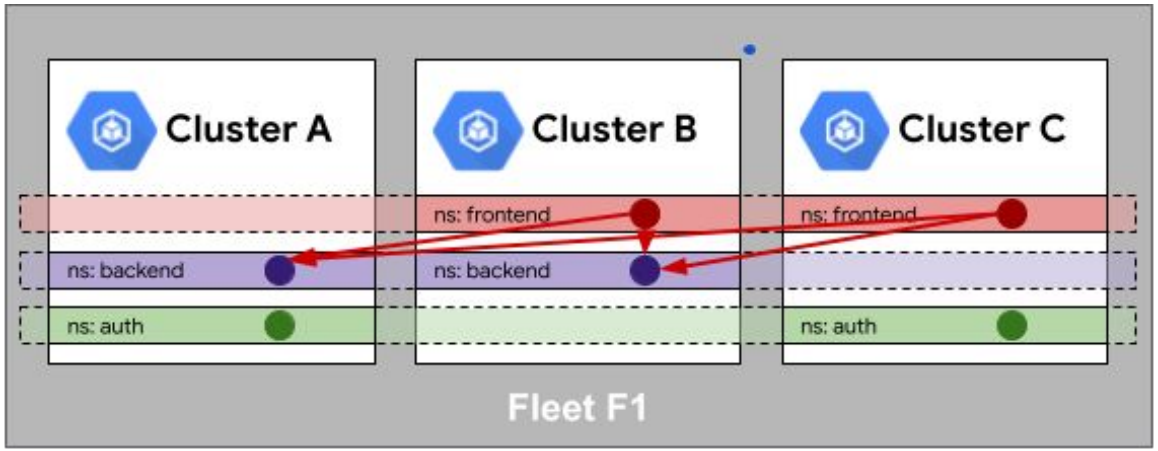
Namespace sameness in a fleet

What are Fleets of Clusters?



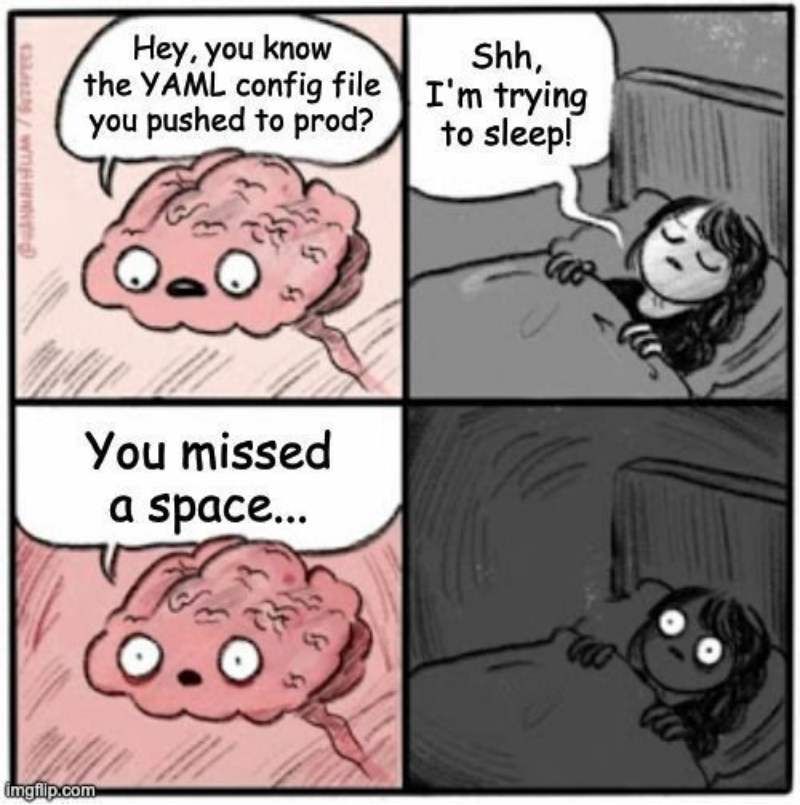
Service sameness in a fleet

What are Fleets of Clusters?



Identity sameness inside a fleet

Mastering Cluster Fleet Management



Demo

Demo video

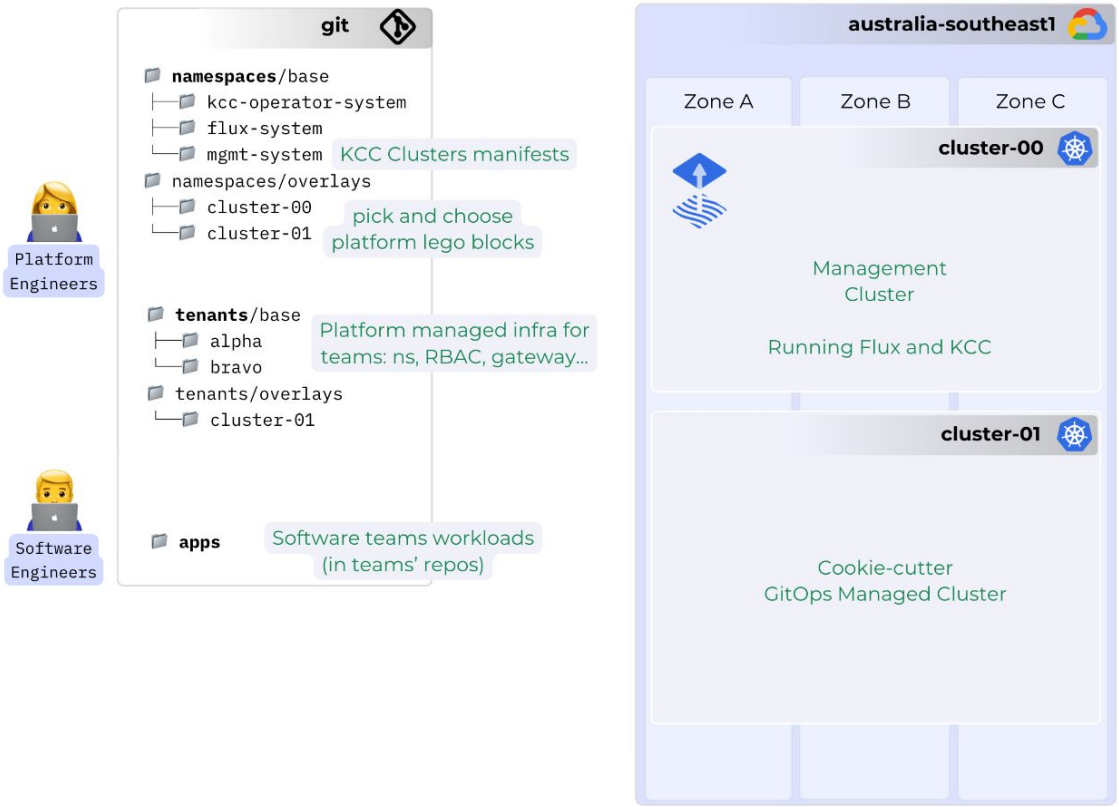
Unpacking the Demo - Principles

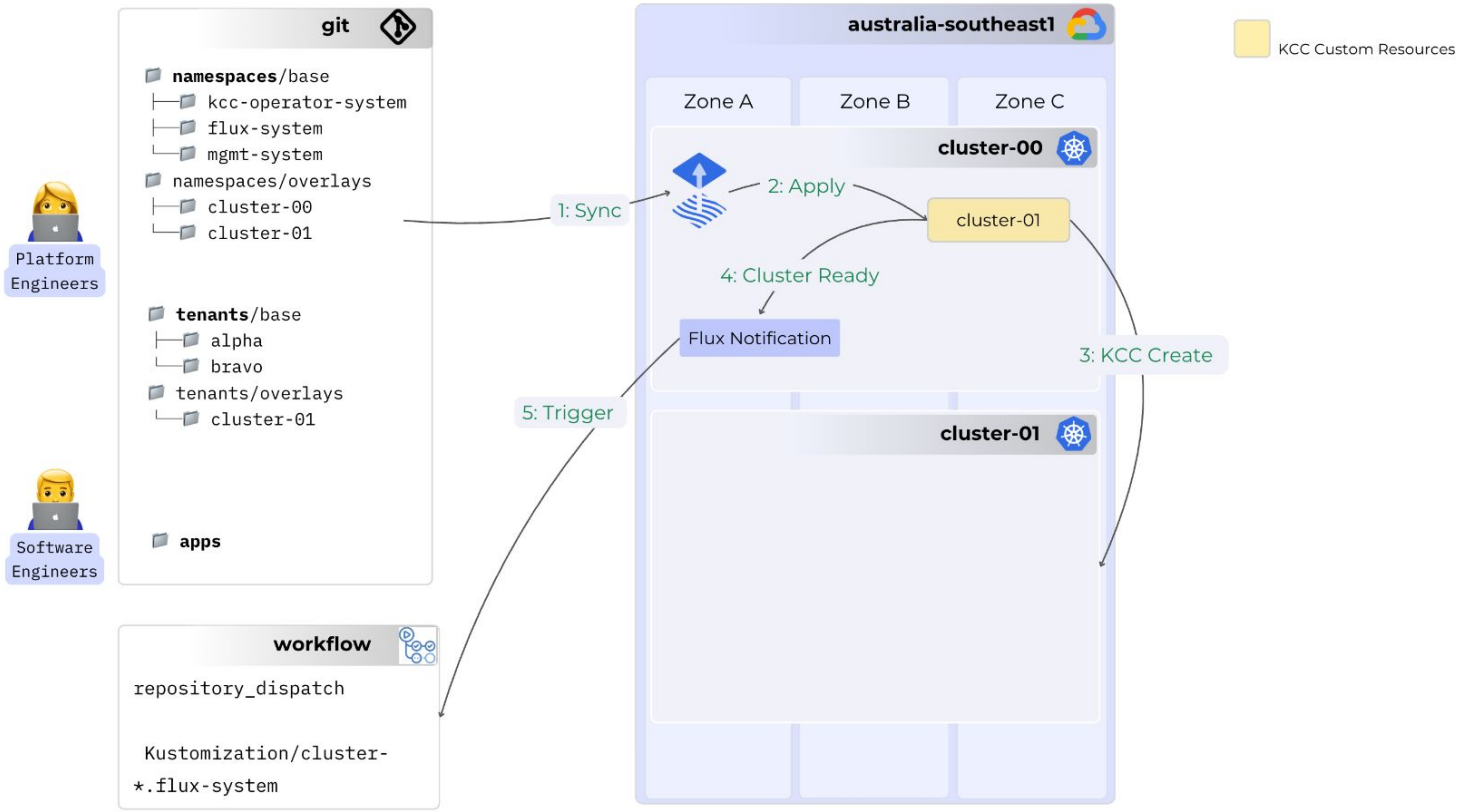
Platform Engineer

- Cookie-cutter reproducible clusters
- Clusters on-demand: Testing Environments, Disaster Recovery.
- Golden paths and guardrails
- Scalable

Application Developer

- Infrastructure management decoupled from Application
- App placement based on archetype
- Scale seamlessly to 5 or 500 clusters


git
namespaces/base
kcc-operator-system
flux-system
mgmt-system
KCC Clusters manifests
namespaces/overlays
cluster-00
cluster-01
pick and choose
platform lego blocks
Platform
Engineers
tenants/base
alpha
bravo
Platform managed infra for
teams: ns, RBAC, gateway...
tenants/overlays
cluster-01
apps
Software teams workloads
(in teams' repos)
Software
Engineers
australia-southeast1
Zone A
Zone B
Zone C
cluster-00
Management
Cluster
Running Flux and KCC
cluster-01
Cookie-cutter
GitOps Managed Cluster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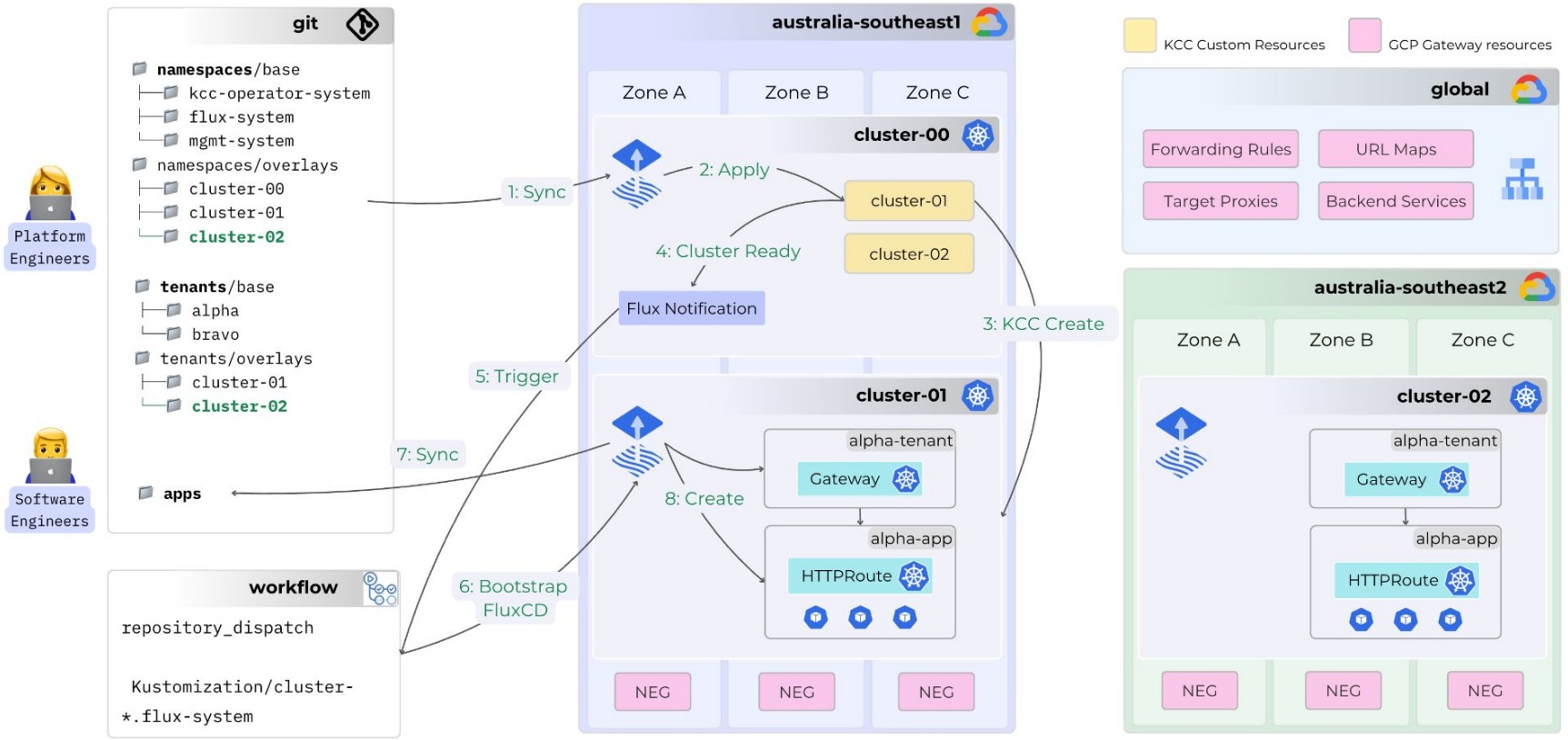
flux-system
mgmt-system
namespaces/overlays
cluster-00
cluster-01
tenants/base
alpha
bravo
tenants/overlays
cluster-01
apps
Platform Engineers
Software Engineers
1: Sync
australia-southeast1
Zone A
Zone B
Zone C
cluster-00
2: Apply
cluster-01
4: Cluster Ready
Flux Notification
3: KCC Create
5: Trigger
cluster-01
KCC Custom Resources
workflow
repository_dispatch
Kustomization/cluster-*.flux-system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1: Sync
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4: Cluster Ready
5: Trigger
6: Bootstrap FluxCD
7: Sync
8: Create
australia-southeast1
Zone A
Zone B
Zone C
cluster-00
cluster-01
cluster-02
Flux Notification
cluster-01
alpha-tenant
Gateway
alpha-app
HTTPRoute
NEG
NEG
NEG
KCC Custom Resources
GCP Gateway resources
global
Forwarding Rules
URL Maps
Target Proxies
Backend Services
australia-southeast2
Zone A
Zone B
Zone C
cluster-02
alpha-tenant
Gateway
alpha-app
HTTPRoute
NEG
NEG
NEG

Takeaways

Unlock the power of archetypes

Unlock the power GitOps

Scale kubernetes configuration

Conclusion & Links

- https://fluxcd.io/flux/
- https://control-plane.io/posts/d2-reference-architecture-guide/
- https://rawkode.academy/read/fluxcd-the-inevitable-choice/
- https://slsa.dev/spec/v1.2-rc1/use-cases
- https://cloud.google.com/architecture/deployment-archetypes
- https://opengitops.dev/
- https://platformengineering.org/blog/what-is-platform-engineering

Let’s Connect!

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