Consul

Consul overview

Microservices

Consul for Service Discovery

Terraform integration

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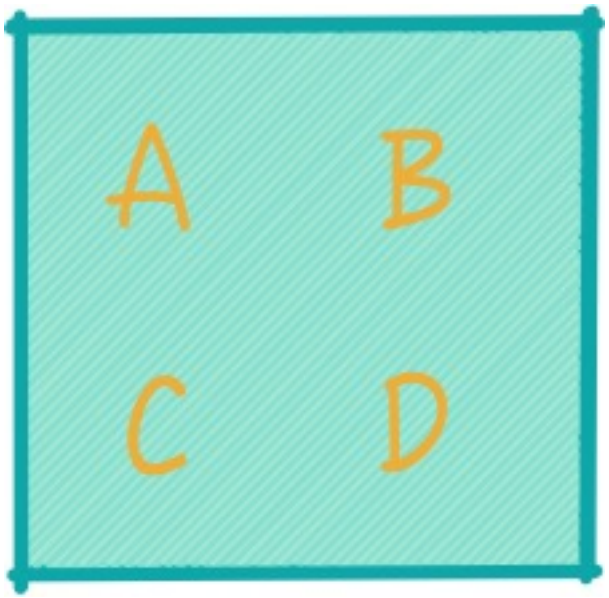
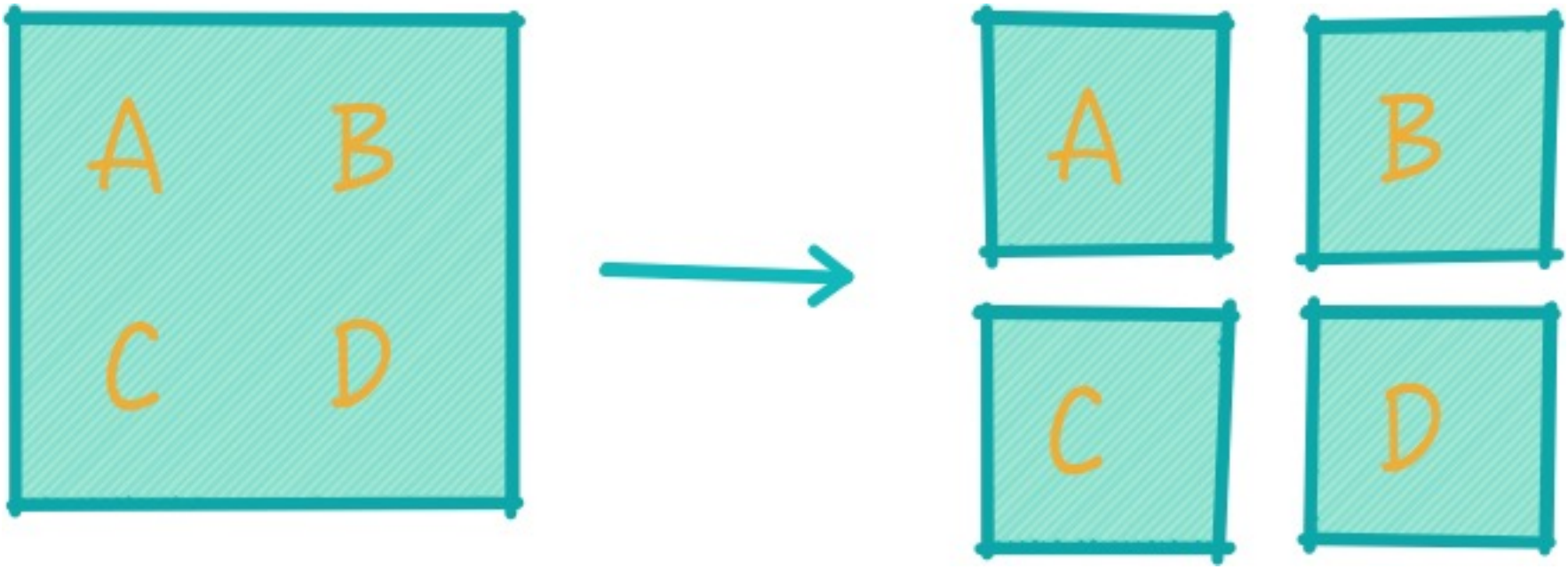
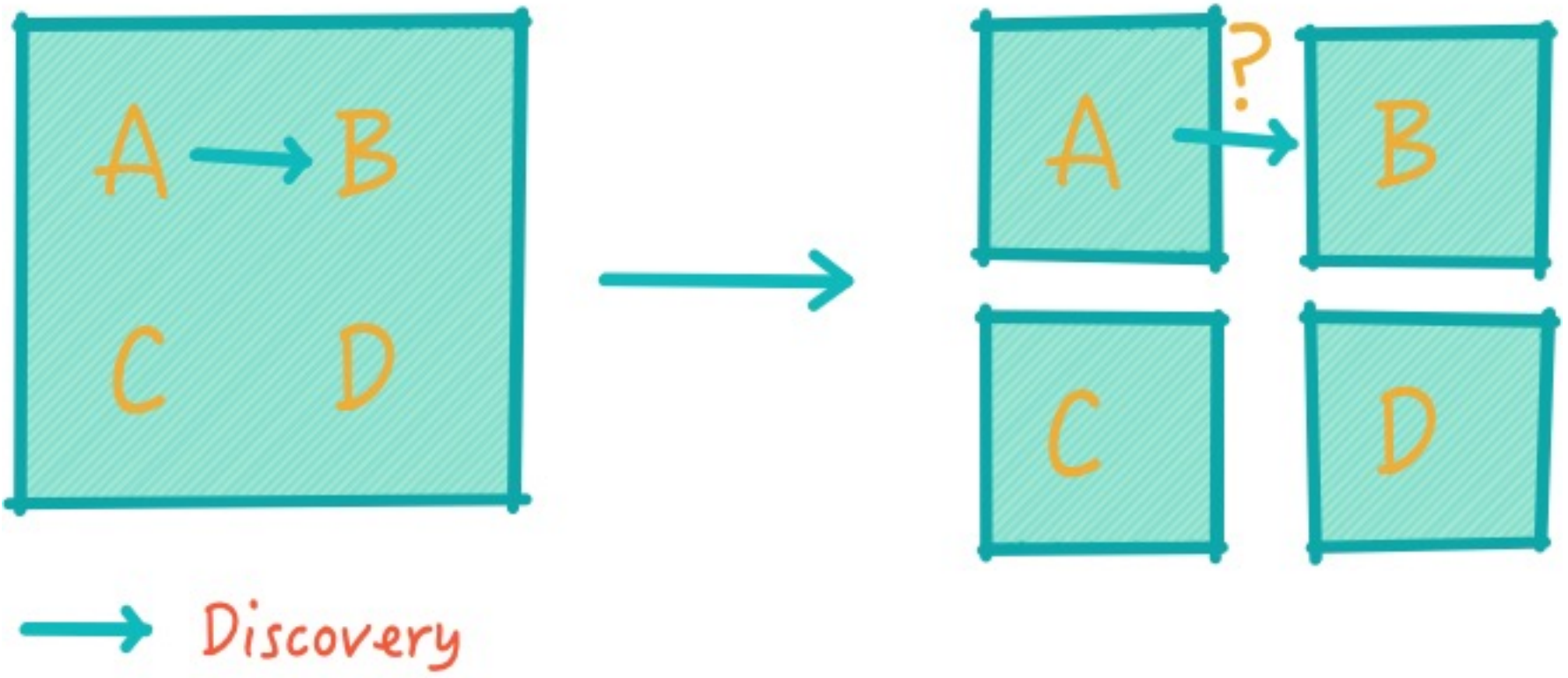
Monolith



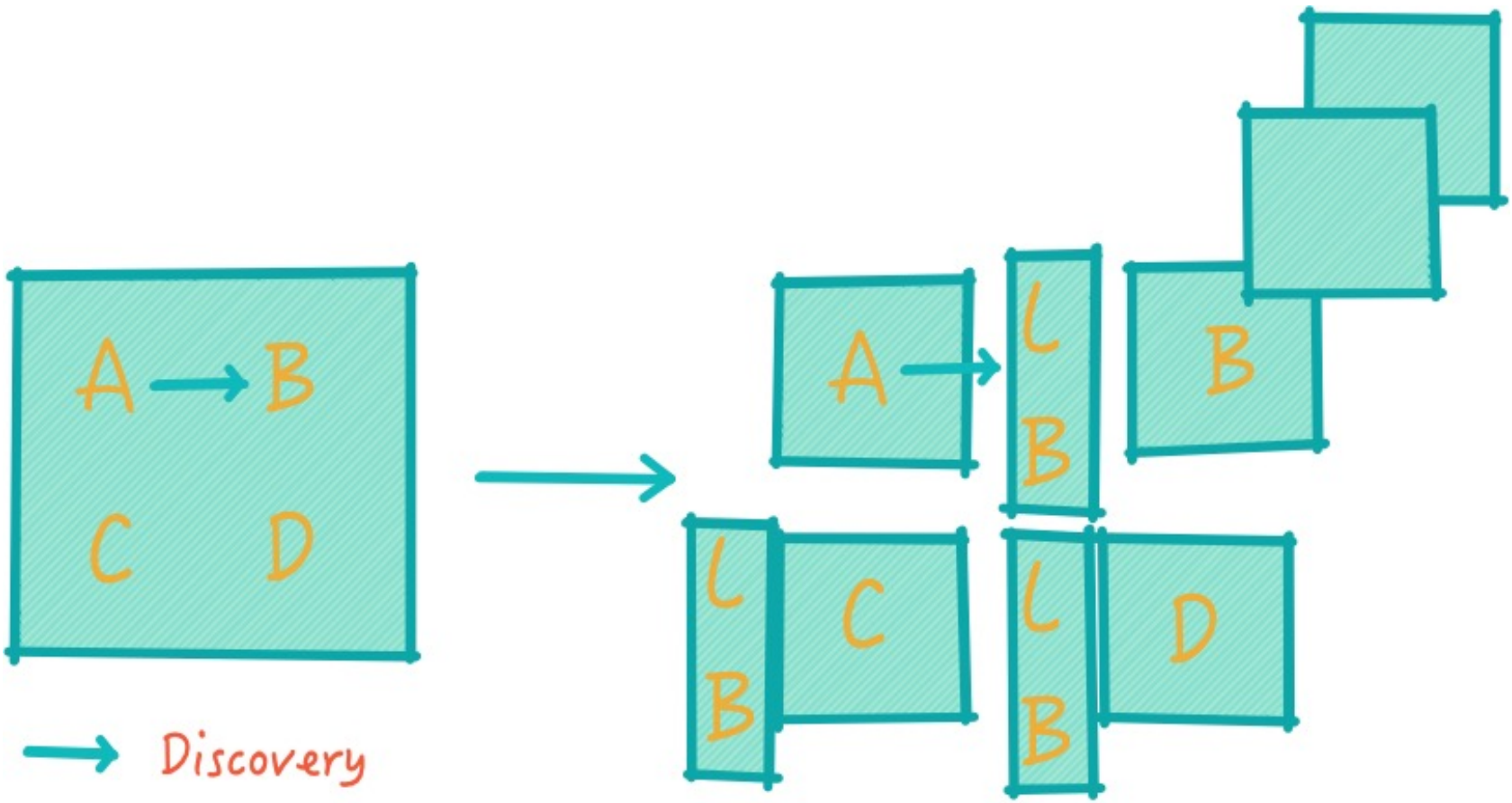
Microservices



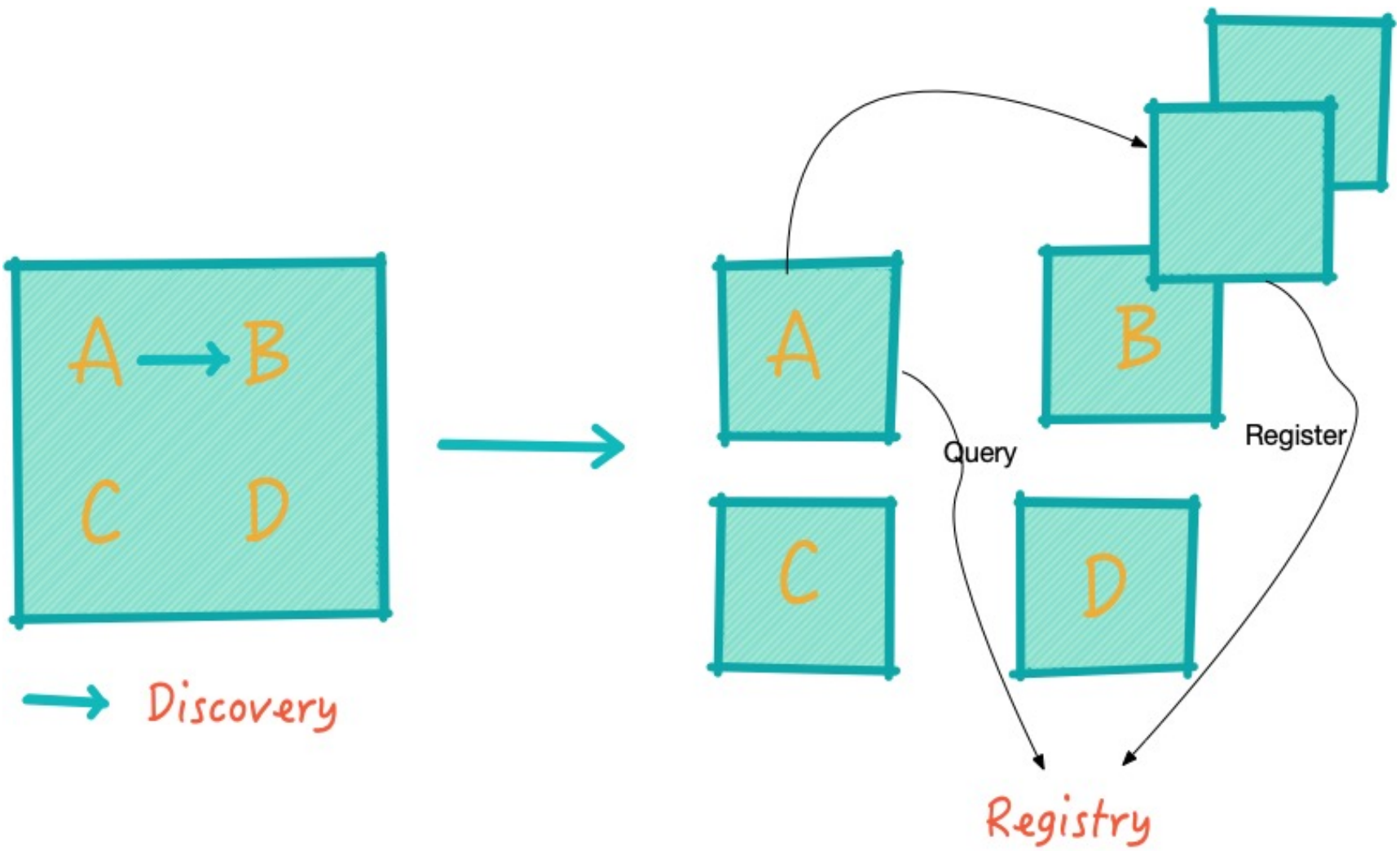
Discovery



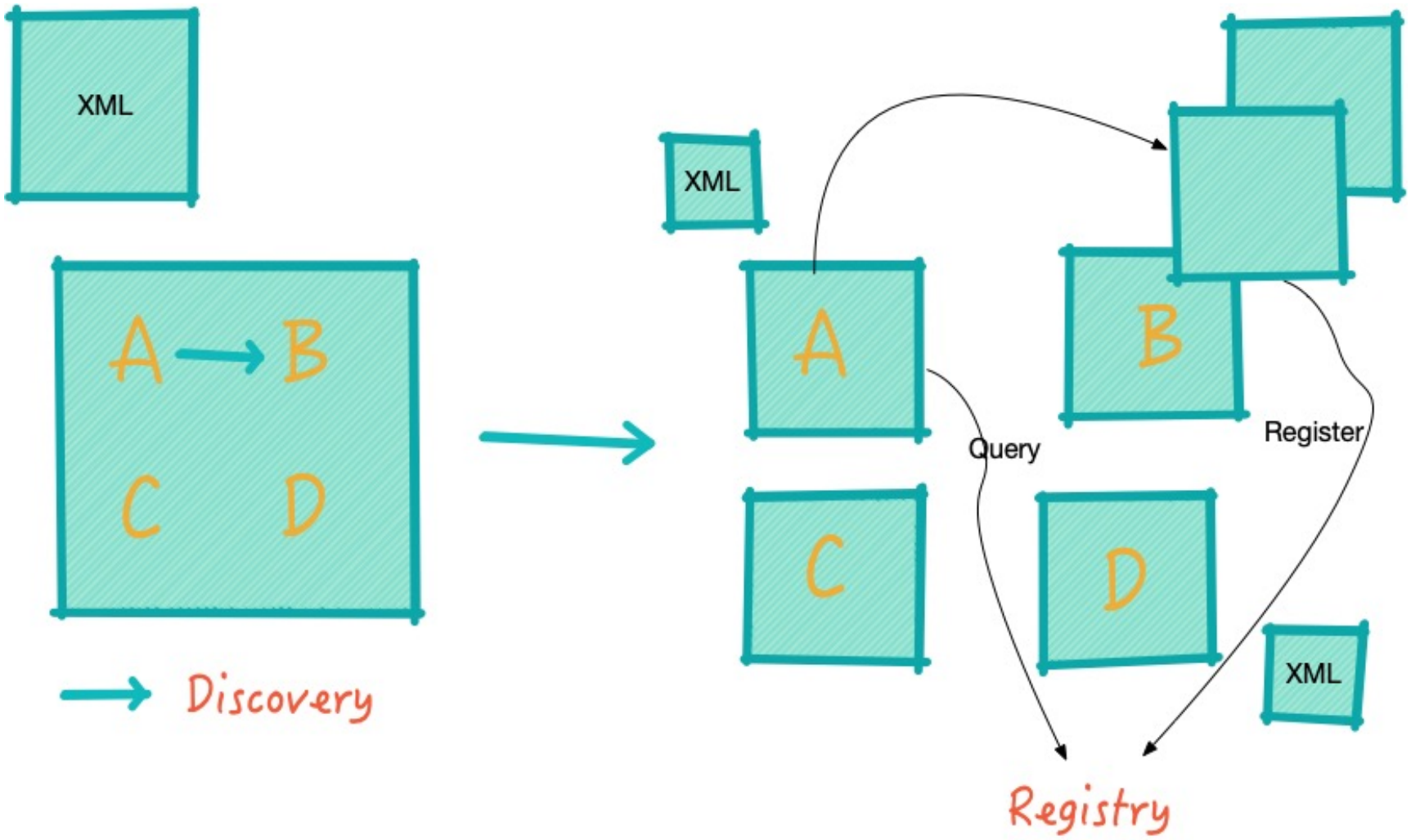
Load balancers?



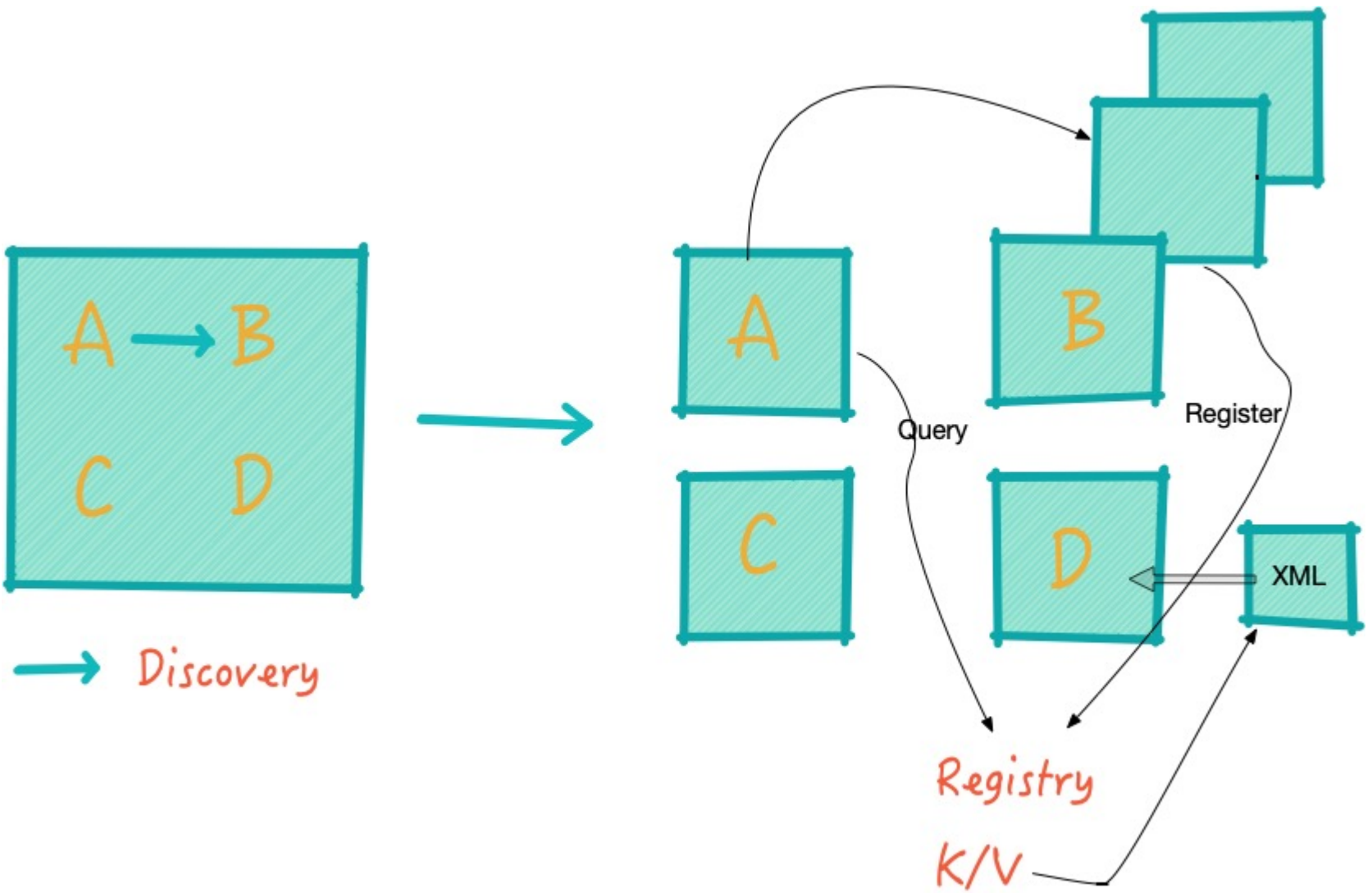
Registry



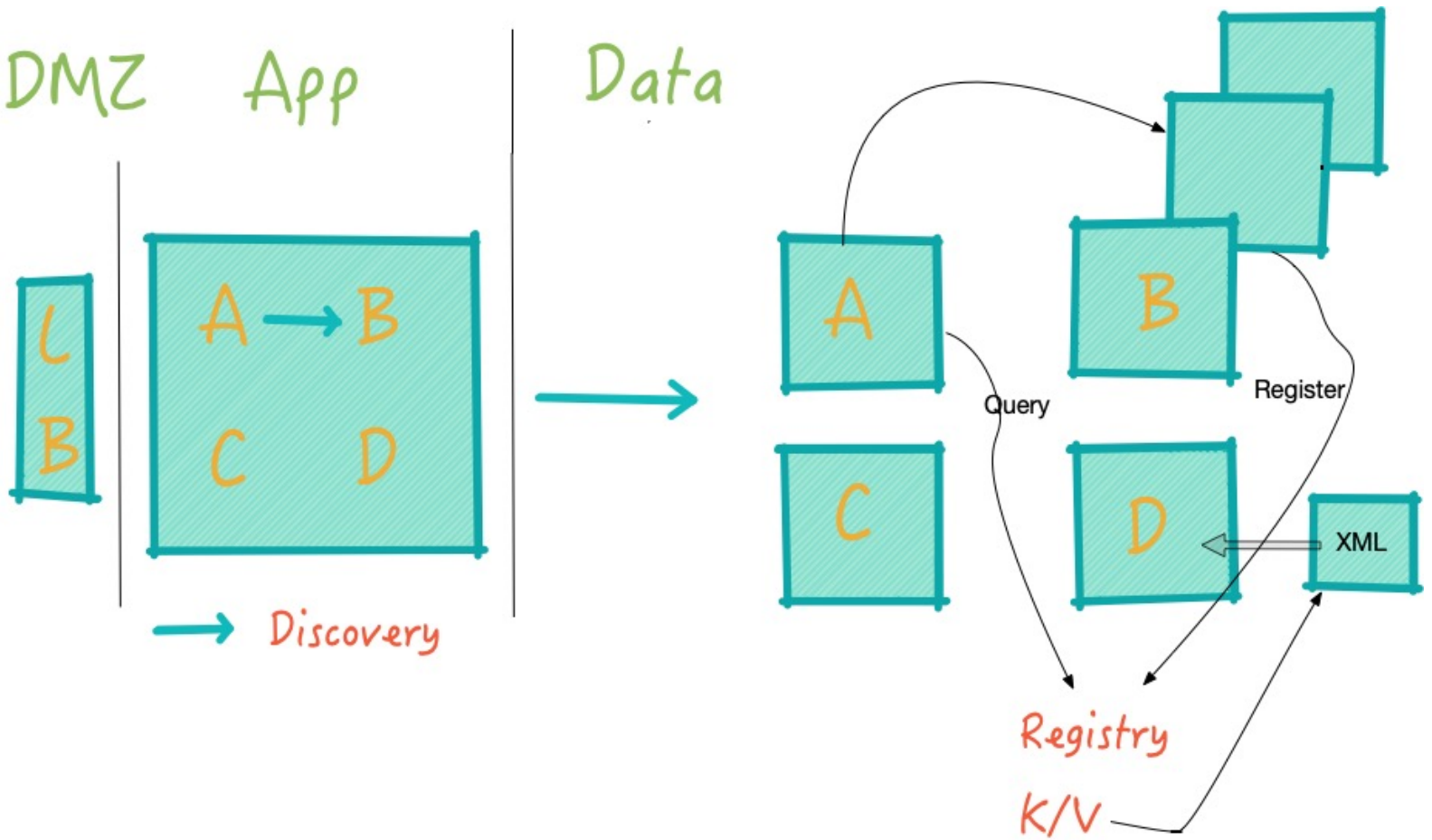
Configuration



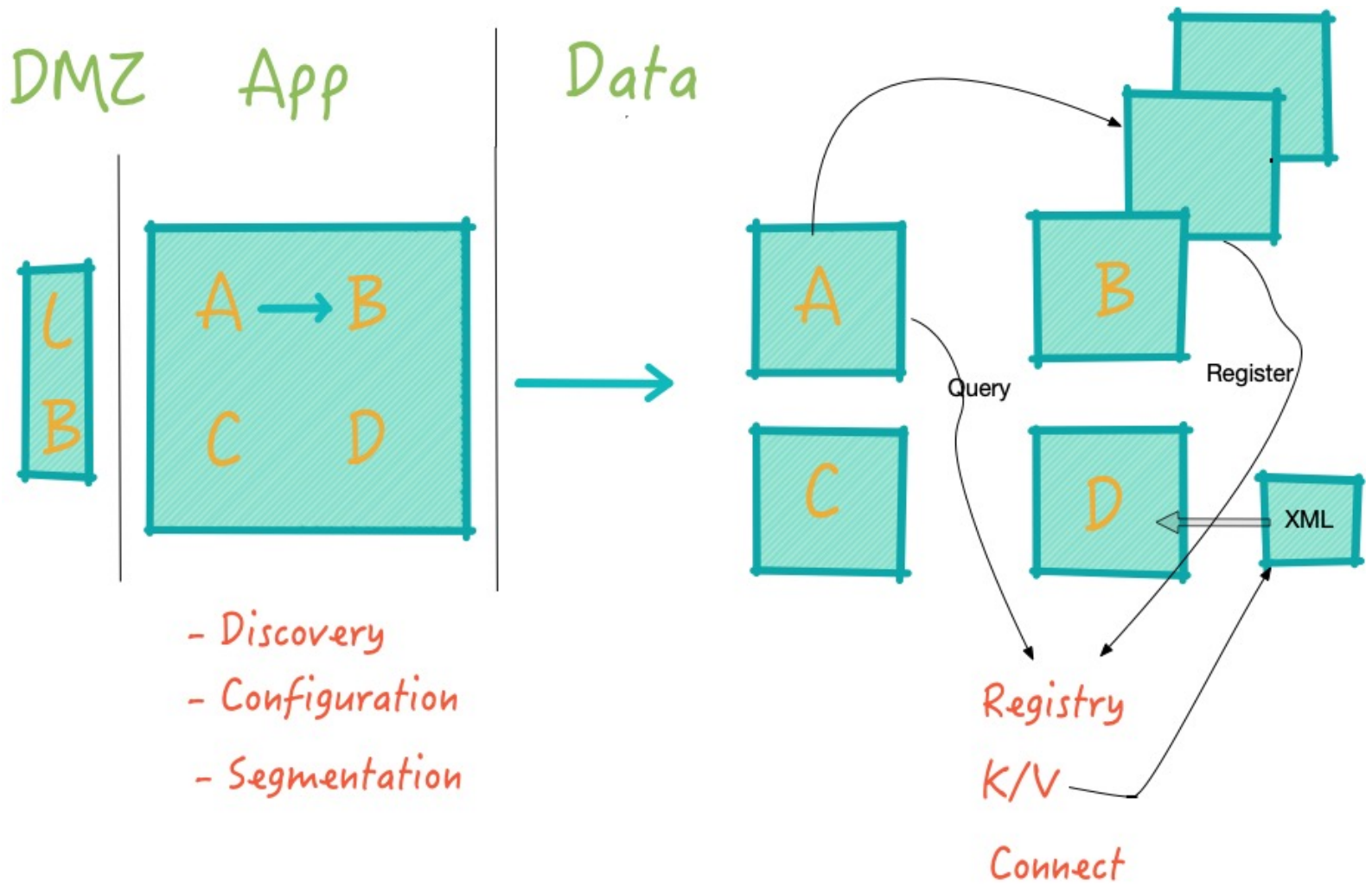
Configuration in Consul



Zones



Segmentation



Service graph

Service Graph

A->B

C->D

Web->DB

50*5???

Identity

Service Graph

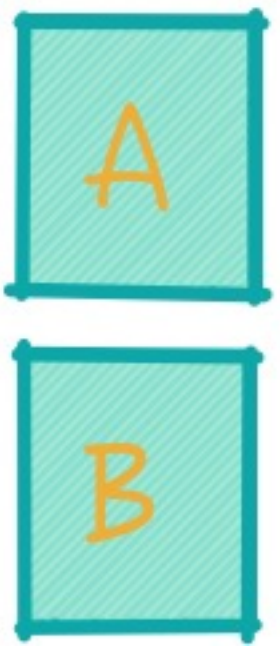
A->B

C->D

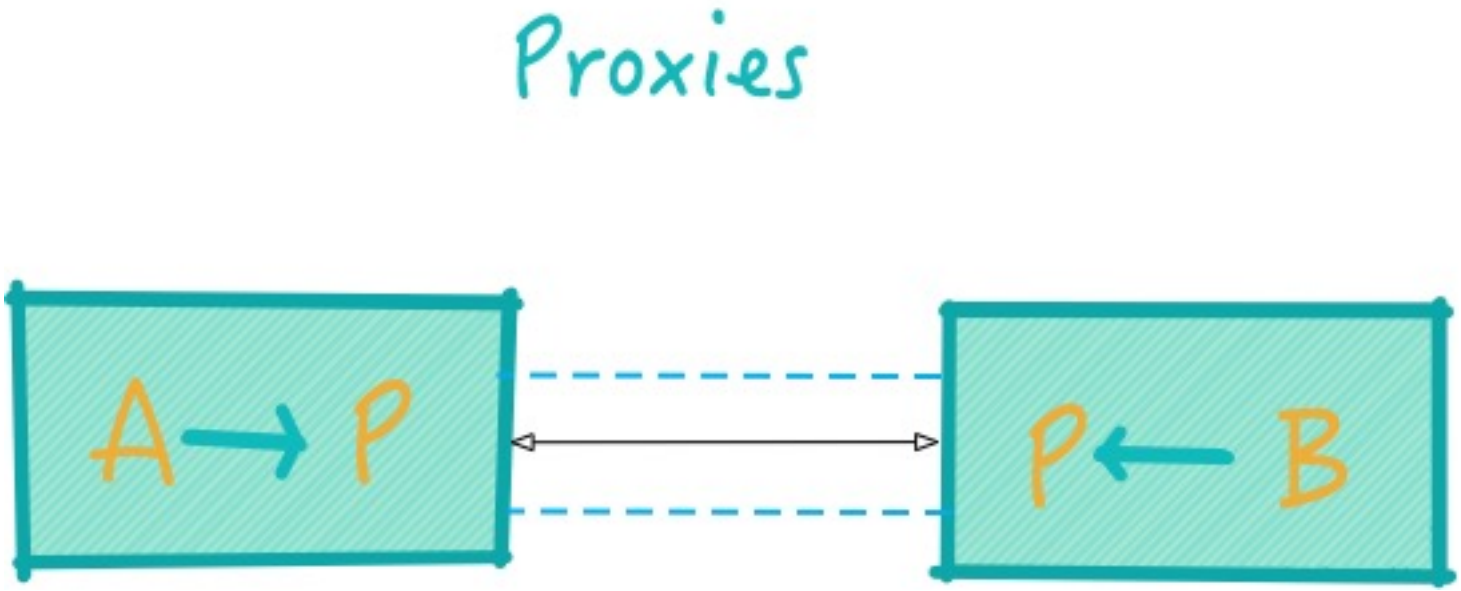
Web->DB

50*5???

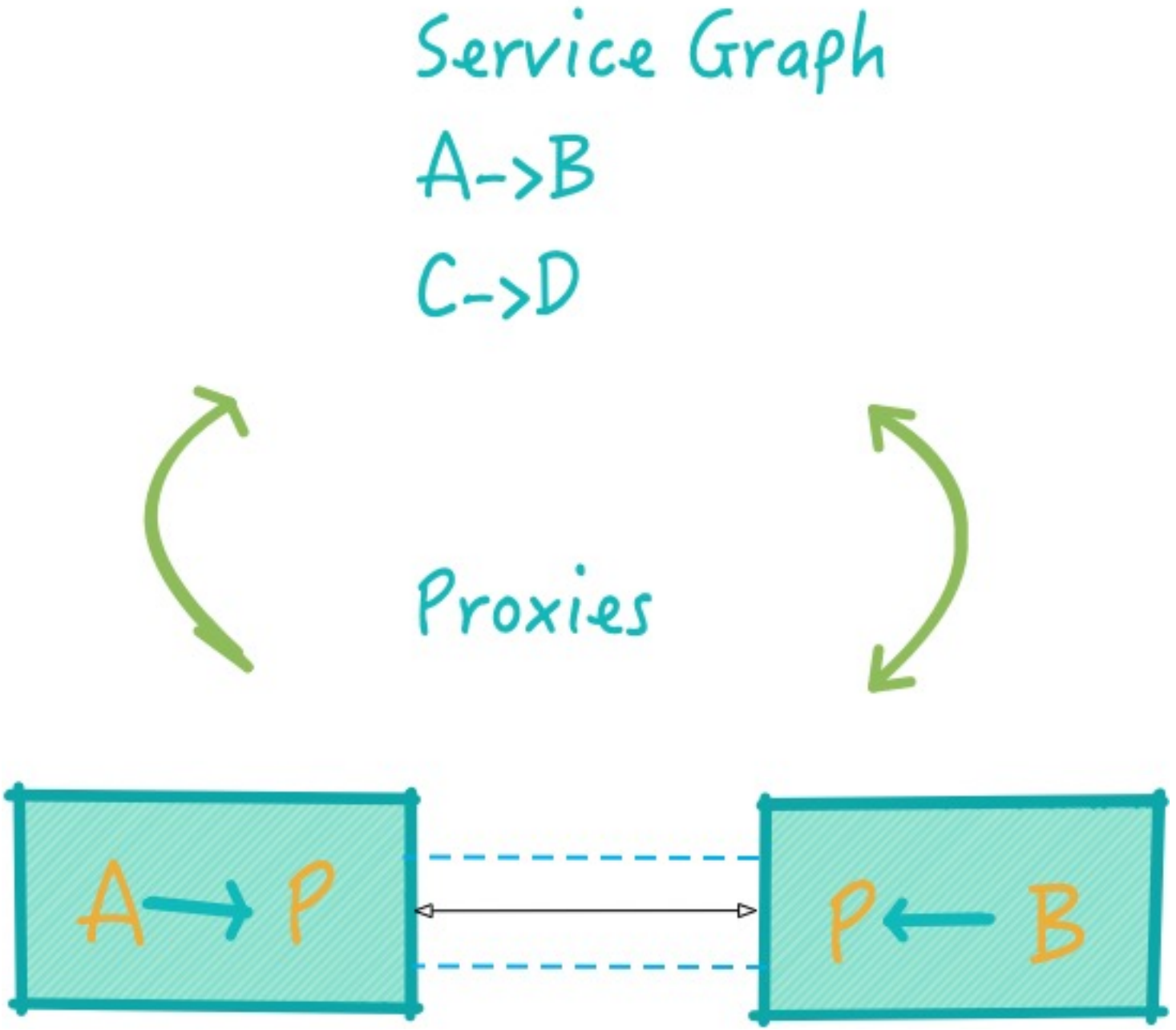
Cert Auth



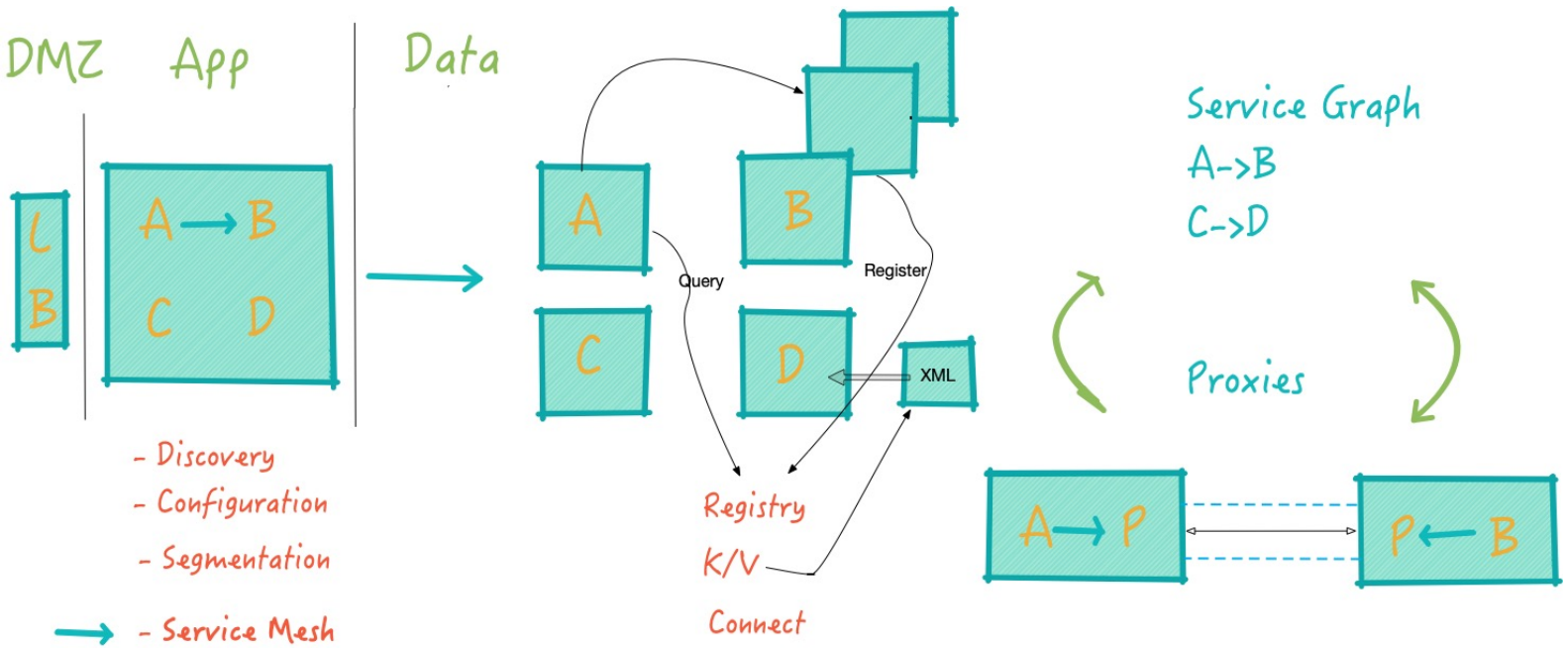
Proxies



Proxies and Service Graph



Service mesh



Lab: Consul install

- Please do lab 'lab31'
- https://github.com/elephantscale/vault-consul-labs-answers/tree/main/lab31

Consul for Service Discovery

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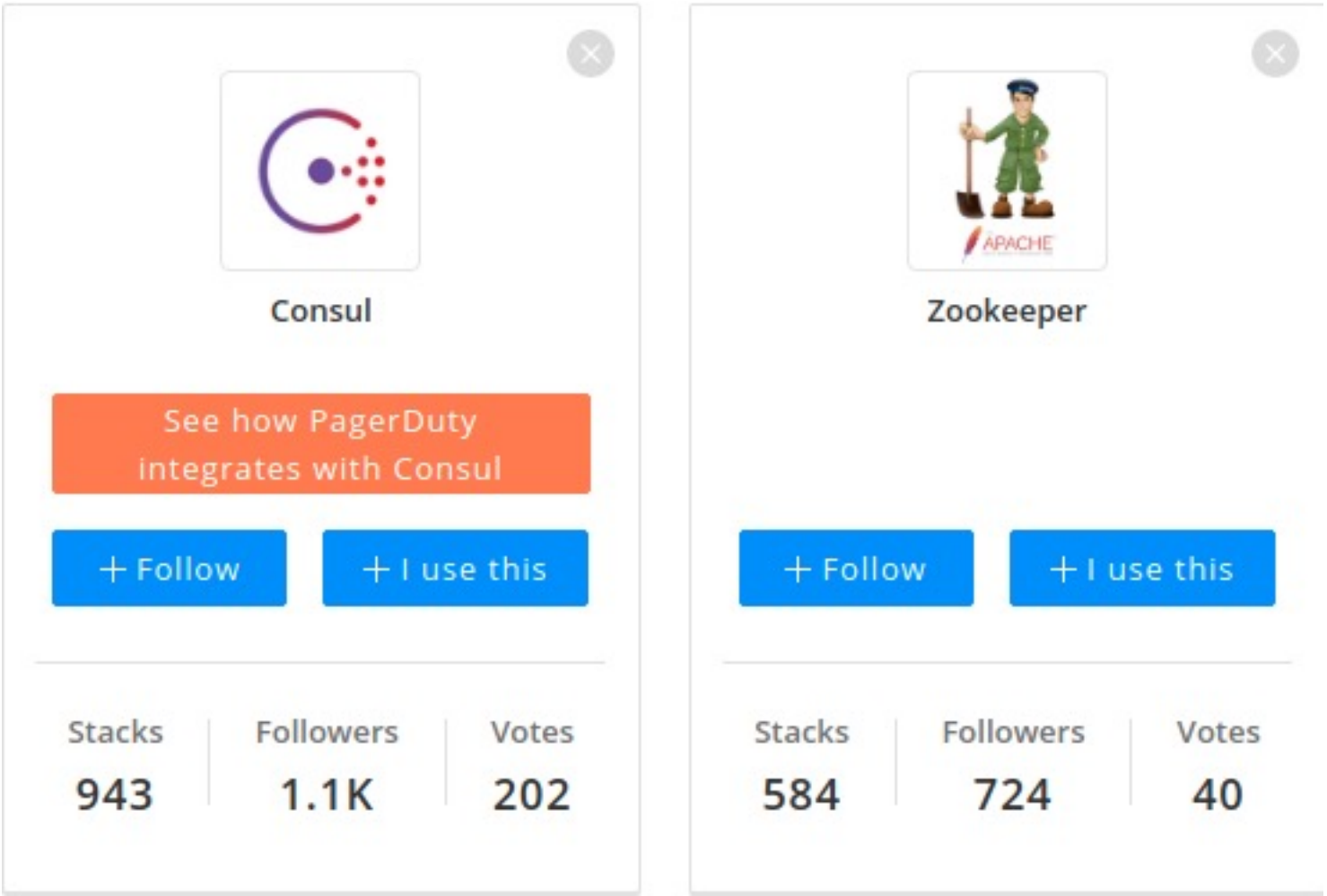
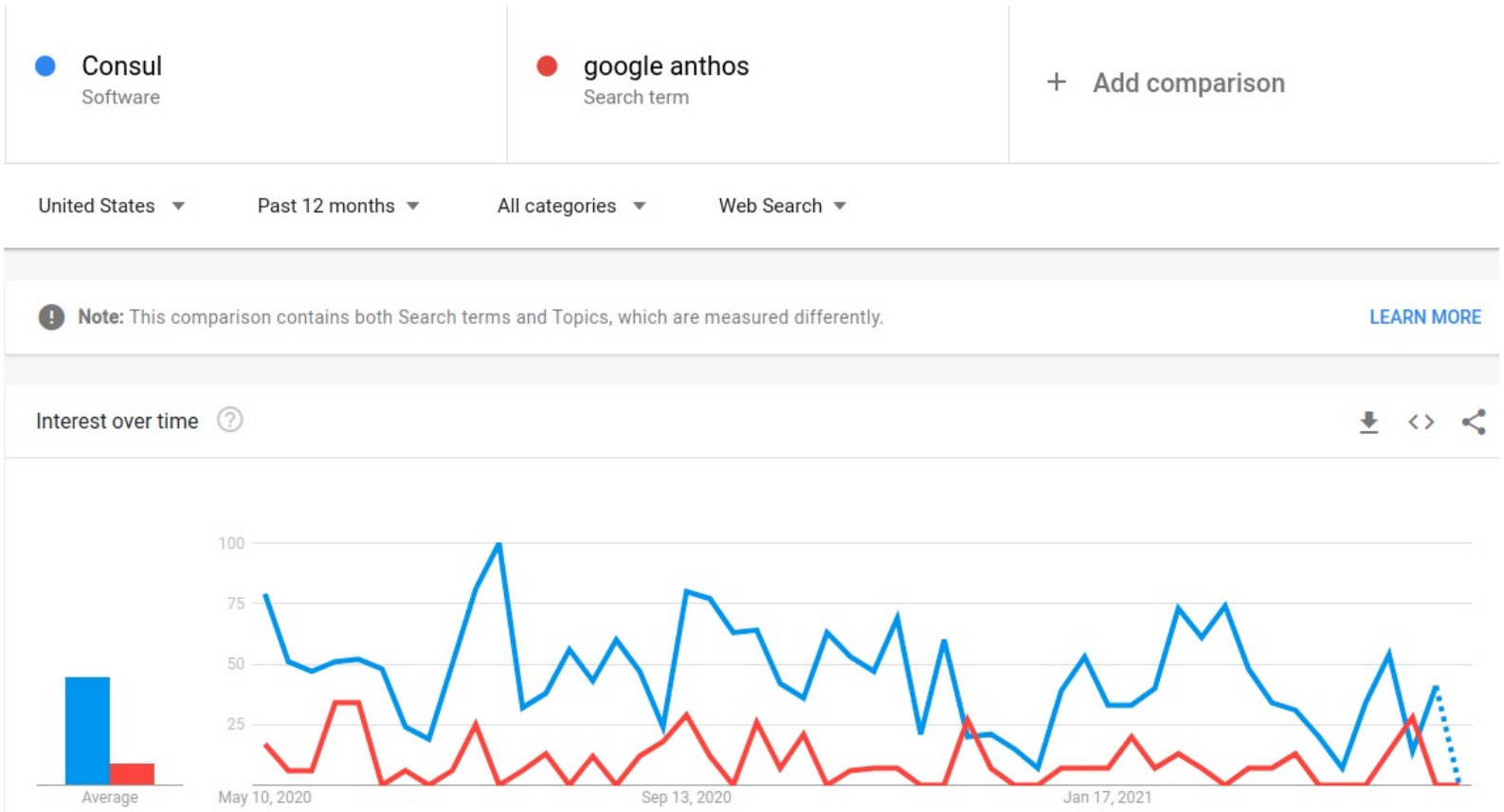
Why service discovery?

- Applications are running on dynamic infrastructure
- Need to determine services are running and how they can be accessed
- HashiCorp provides a solution, and it is Consul
- How?
  - applications and services register with Consul
  - service registry is populated
  - connect to critical services throughout the organization

Consul vs Zookeeper



Consul vs Google Anthos



Consul is from HashiCorp

- Consul is a solution provided by HashiCorp
- tight integration with Consul to simplifies access to Vault
- Users and applications can query Consul using either DNS or the API
- Consul responds to the query with the information needed to establish communication with the active Vault node
- Faster and smarter than a load balancer

Consul and Vault cluster

- Consul can also simplify the connectivity to standby nodes within the cluster
- Especially when running Vault Enterprise with performance standby nodes
- Performance standby nodes can service Vault read operations and help Vault operators scale those read operations within a cluster

Registering the Vault Service with Consul

- When you deploy a Vault cluster with Consul backend -
  - Vault service is automatically registered with the Consul service registry by default
- Best practice
  - If Consul service discovery is desired, a second Consul cluster should be deployed to manage this functionality

How to register

- The *service_registration* stanza is added to the Vault configuration
- This configuration includes
  - the address and port of the Consul cluster
  - the Consul ACL token to permit Consul access (if Consul ACLs are enabled)
  - other configurable parameters such as service_tags.

service_registration stanza example

```
service_registration "consul" {
   address           = "consul.example.com:8500"
   token             = "a1b2-c3d4e5f-6a7b-8c9d"
   service_tags      = "vault, production, us-east-1"
}
```

Connecting to Vault using Consul

- In Consul, all Vault cluster nodes are registered as the Vault service
- To use Consul to discover the active node in a cluster, a client can query Consul with the DNS name

```
1 active.vault.service.consul
```

Performance standby node(s)

- In Vault Enterprise
  - To discover the performance standby node(s)
  - client can query Consul for the DNS name

```
performance-standby.vault.service.consul
```

Terraform integration

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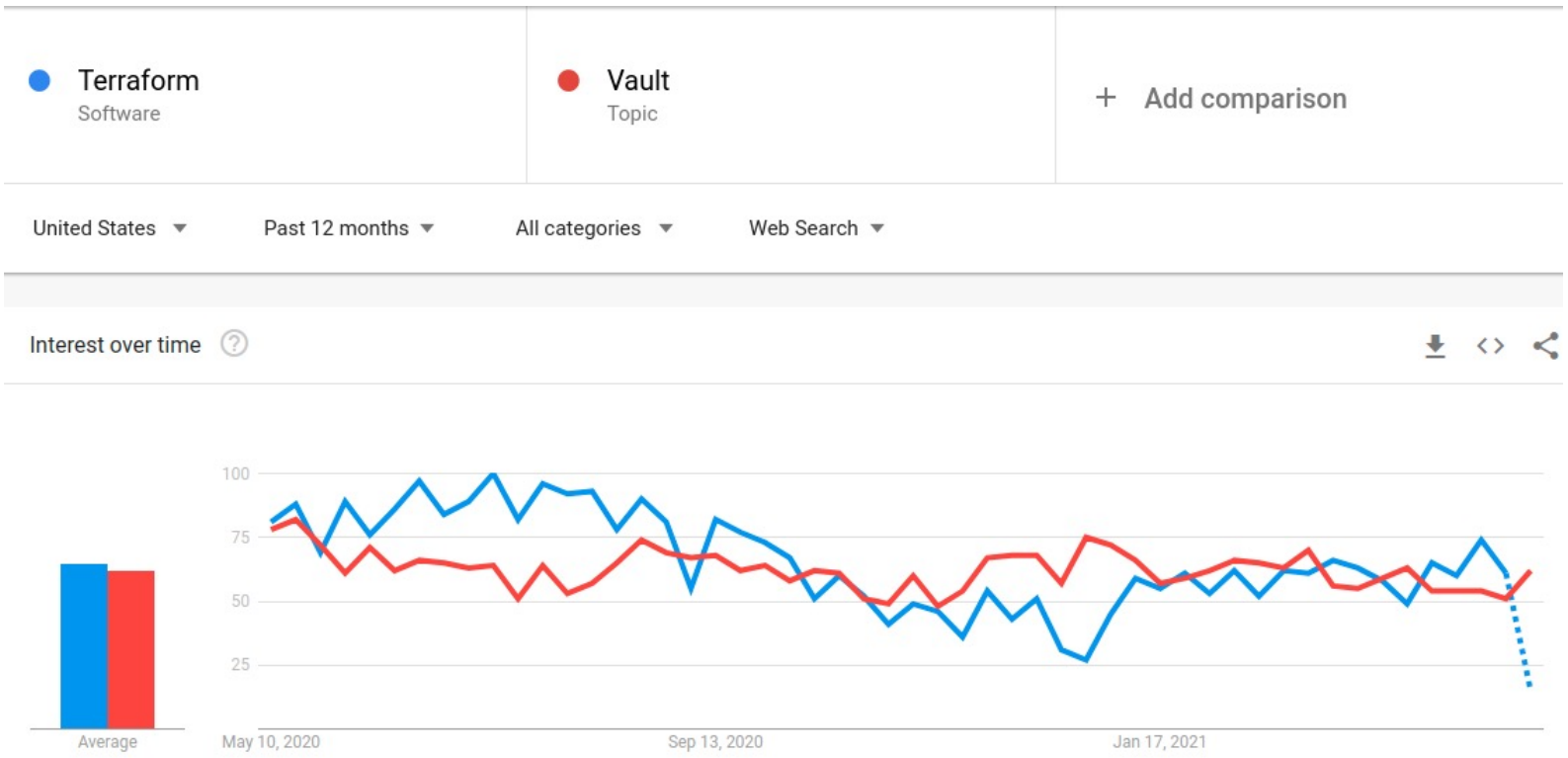
Terraform and Vault



Vault Infrastructure with Terraform

- Terraform and Vault often go together
- Your deployment may have custom Terraform modules
- If so, it may make sense to store the modules in the Terraform pubic registry

Vault Architecture

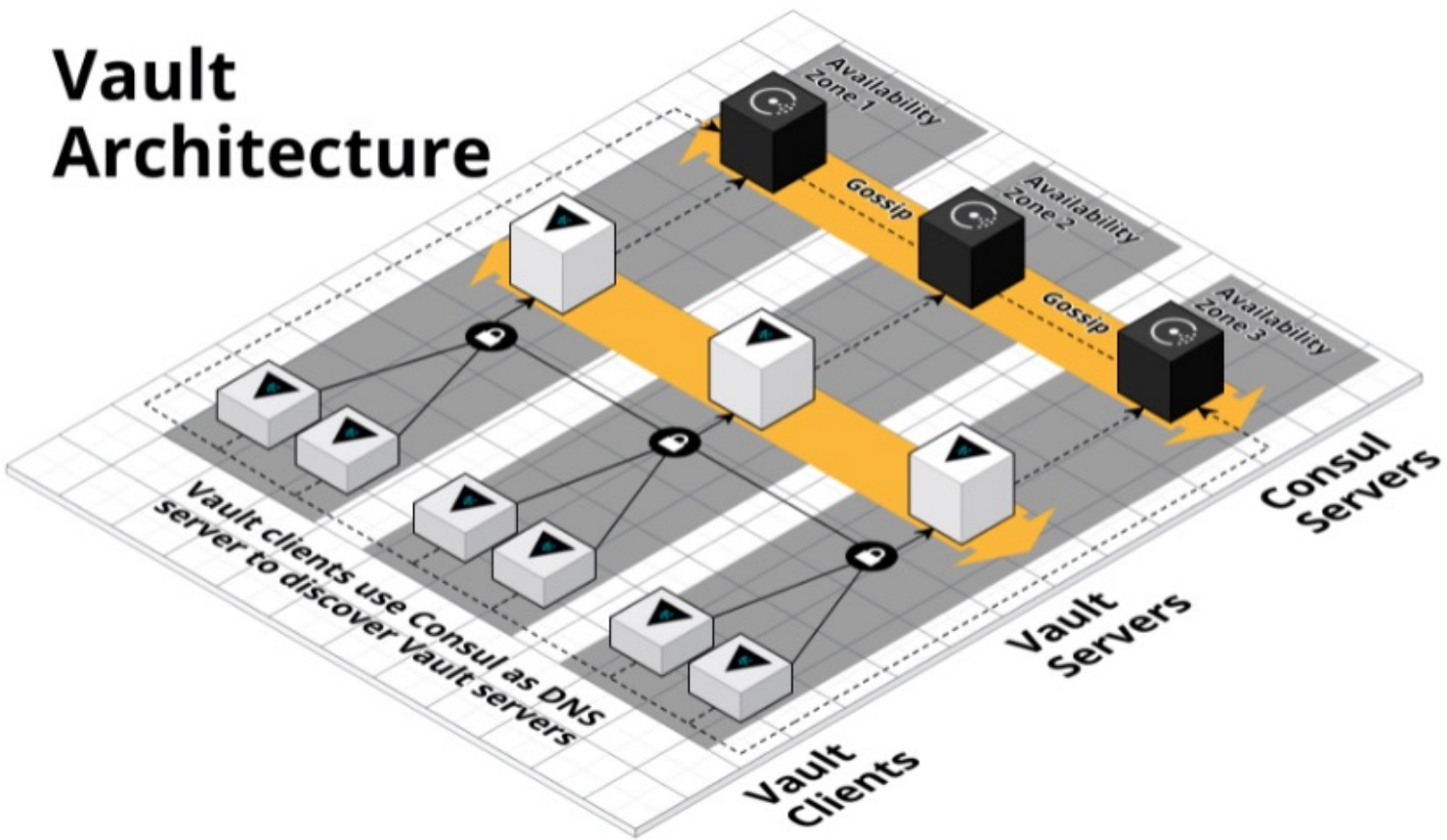
- Components to go in the Terraform configuration files:
  - Consul nodes
  - Vault nodes
  - load balancers
  - security groups
  - DNS records
  - network connectivity

Repeatability

- Repeatability if one the benefits of deploying Vault with Terraform
- Other benefits
  - performance or
  - disaster recovery
  - replicated clusters *high availability

Terraform configurations for Vault

- Amazon Web Services (https://github.com/hashicorp/terraform-aws-vault)
- Microsoft Azure (https://github.com/hashicorp/terraform-azurerm-vault)
- Google Cloud (https://github.com/terraform-google-modules/terraform-google-vault)



Configure Vault Provider and Credentials

- Similar to other Terraform providers:
  - declared within the Terraform configuration file
  - Sensitive information should be provided using environment variables
- Example
  - Terraform authenticates with Vault using a token
  - Vault address and token should be provided as an environment variable
  - VAULT_ADDR - the IP address or hostname of the targeted Vault cluster
  - VAULT_TOKEN, which is used to authenticate to Vault

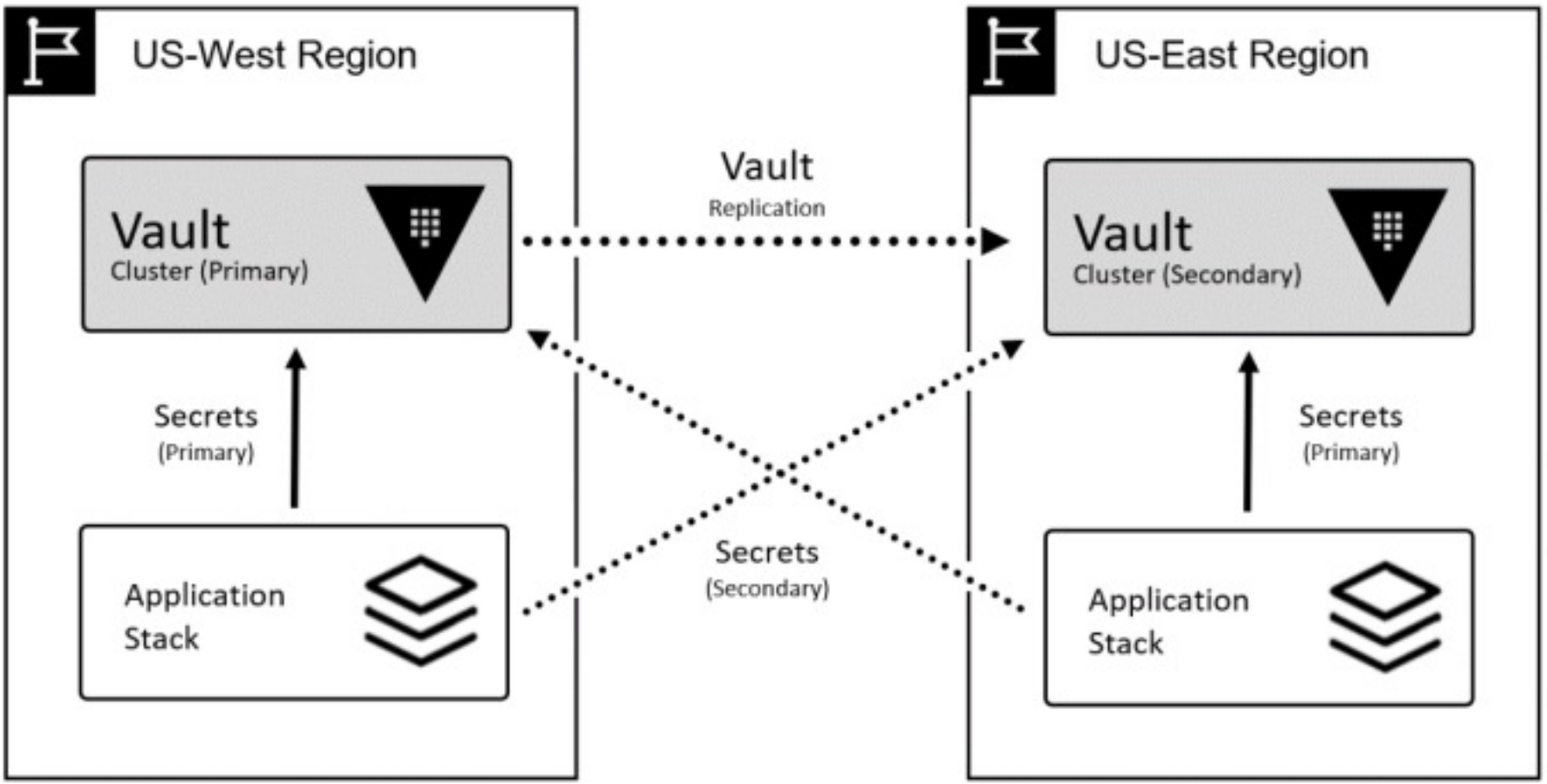
Consuming Secrets with Terraform

- Rather than provide Terraform with static credentials
- Terraform can integrate with Vault to retrieve or generate credentials before applying the configuration
- For example,
  - Terraform can retrieve temporary AWS credentials from Vault to deploy EC2 instances
  - After the lease has expired, Vault automatically revokes the AWS credentials.

Coding for Reliability

- Additional automated processes
  - automated processes can ensure applications can access the vault service
- Example
  - a team is responsible for managing a shared, multi-tenant Vault service for hundreds of internal teams
  - Vault environment was a large, multi-cluster Vault deployment
  - Each onboarded application was configured to attach to a single, local cluster.
- Solution
  - native disaster recovery options built into Vault, or
  - a load balancer in front of the Vault clusters, or even better
  - use the AppRole auth method since both RoleIDs and SecretIDs are replicated across all clusters

Reliability solution



More with Consul

- Now that we know the basics, what is next? Perfect your skills in the following areas:
  - Consul Service Mesh
  - Create a datacenter with Consul Docker containers as the agents
  - Learn how to deploy Consul on Kubernetes
  - Deploy HashiCorp Consul Service on Azure
  - Secure Nomad jobs with Consul service mesh