Getting started with CI/CD for cloud infrastructure

Waldemar Kindler
Michael Lihs

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Poll

Tools like Terraform are well established

Pipelines for infrastructure automation

Infrastructure changes take ages until applied to production

Often more of a “prey-and-hope” approach

How can we deliver infrastructure faster and safer...

... by making changes in small batches

... by making the process dead simple & easily reproducible

... providing a proper audit trail

Three principles of Continuous Delivery for infrastructure

There's more to it than writing infrastructure code!

1. Everything as code and in version control

- Infrastructure code
- Configuration
- Compliance
- Tests
- Pipeline
- Automation scripts

2. Continuously test and deliver all work in progress

- Build quality in
- Test as you work
- Integrate at least daily
- Reproducibility
- Proper audit trail

3. Small, simple pieces that you can change independently

- Reduce complexity
- Shorten feedback cycles
- Reduce blast radius
- Apply proper permission boundaries

How?

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Everything as Code

```
.
├── main.tf
├── pipeline.yaml
├── config.yaml
├── tests/
├── policies/
├── README.md
├── backend.tf
├── terraform-dev.tfvars
├── main.tf
└── ...
```

Traceability made easy
Every change is done via a commit to the repository.

Branching strategy
If you us branches merge at least daily!

Reproducibility
Tooling and infrastructure are versioned together.

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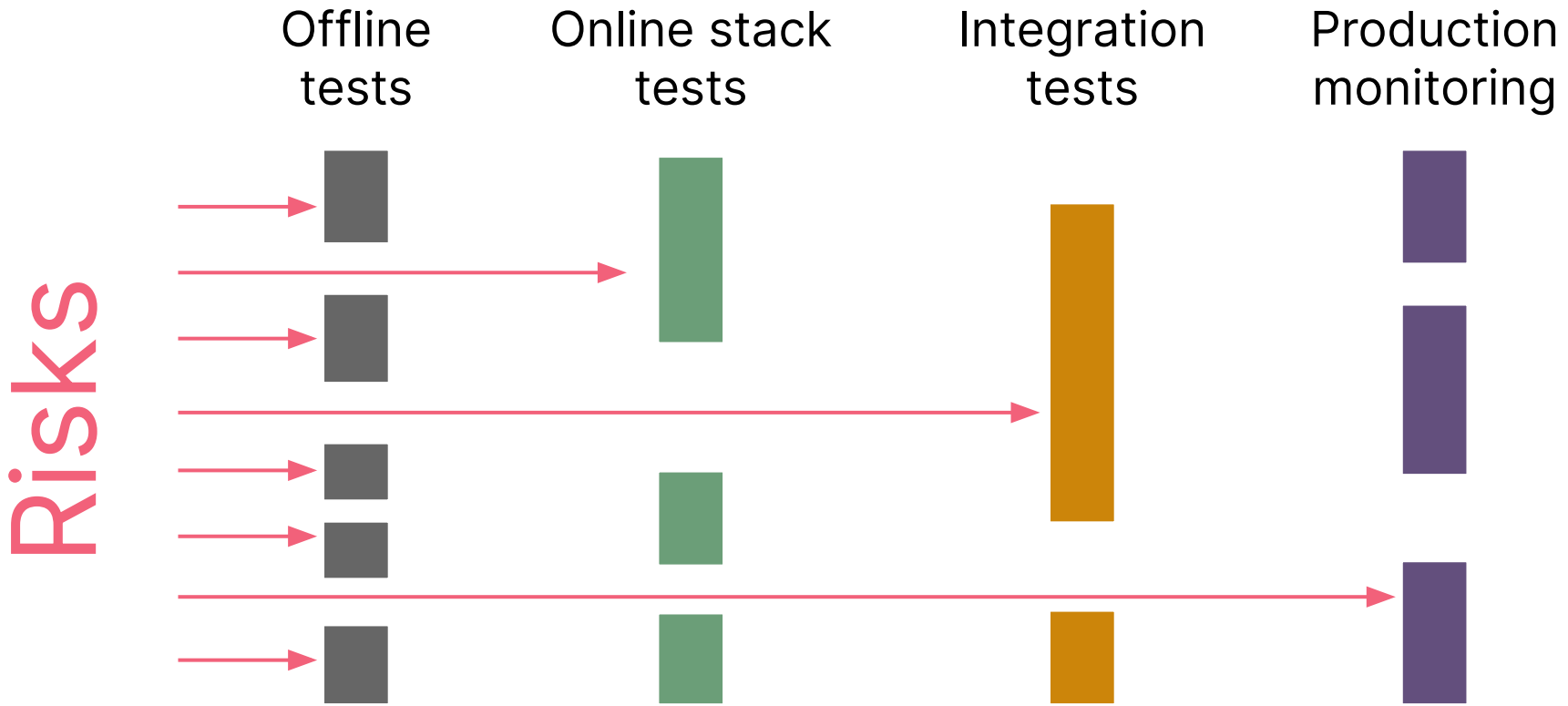
Swiss cheese testing model



Offline testing

```
.
├── backend.tf
├── config.dev.tfbackend
├── config.test.tfbackend
├── config.prod.tfbackend
├── main.tf
├── provider.tf
├── terraform.tfvars
├── variables.tf
├── terraform-dev.tfvars
├── terraform-test.tfvars
├── terraform-prod.tfvars
├── policies
├── .tflint.hcl
└── ...
```

```
# dev environment

terraform init -backend=false
terraform validate
tflint
trivy config --policy ./policies .
```

Shift left on
- **... quality**
- **... security**
- **... compliance**

Online testing

```
.
├── backend.tf
├── config.dev.tfbackend
├── config.test.tfbackend
├── config.prod.tfbackend
├── main.tf
├── provider.tf
├── terraform.tfvars
├── variables.tf
├── terraform-dev.tfvars
├── terraform-test.tfvars
├── terraform-prod.tfvars
├── tests
│   └── stack-test.go
└── ...
```

```
cd test
go test -v .
```

Don’t test the framework, but the behaviour

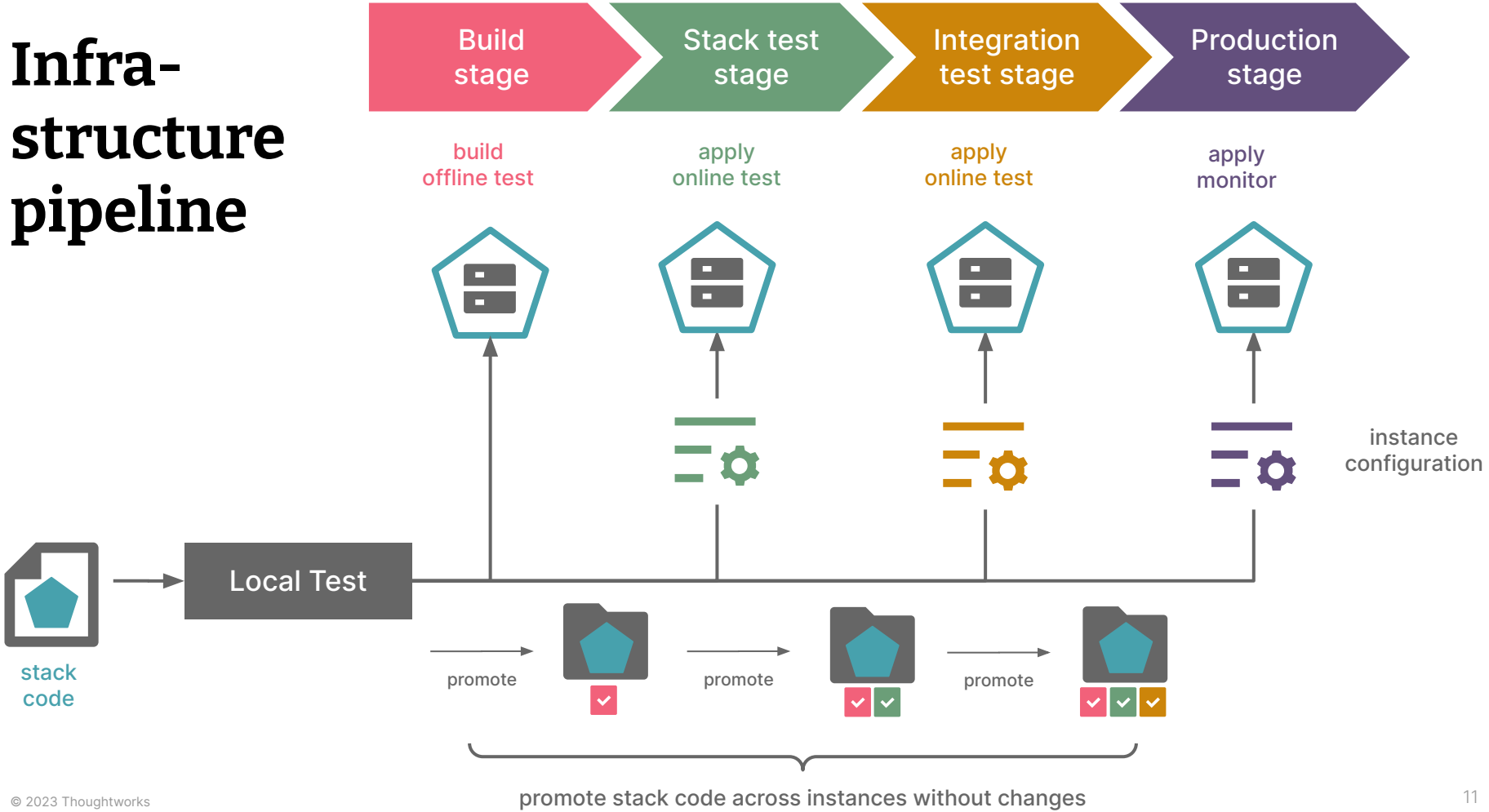
https://terratest.gruntwork.io/docs/getting-started/quick-start/

Reuse tested code across all environments

```
.
├── backend.tf
├── config.dev.tfbackend
├── config.test.tfbackend
├── config.prod.tfbackend
├── main.tf
├── provider.tf
├── terraform.tfvars
├── variables.tf
├── terraform-dev.tfvars
├── terraform-test.tfvars
├── terraform-prod.tfvars
└── ...
```


```
# dev environment

terraform init -backend-config= config.dev.tfbackend
terraform plan -var-file= terraform-dev.tfvars
terraform apply -var-file= terraform-dev.tfvars

# test environment

terraform init -backend-config= config.test.tfbackend
terraform plan -var-file= terraform-test.tfvars
terraform apply -var-file= terraform-test.tfvars

# prod environment
 ...
```

Infra-structure pipeline



Familiar workflow

1.

Write (infrastructure) code

2.

Commit your changes

3.

Push

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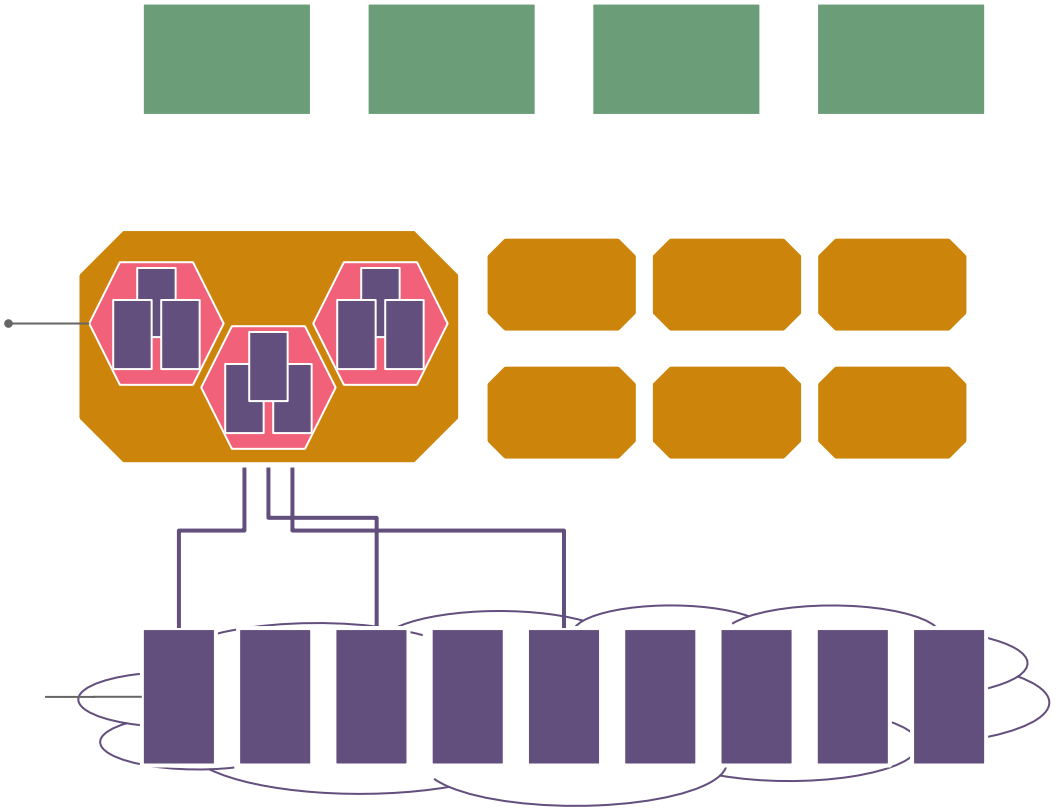
Key units of infrastructure architecture



Business capabilities
Products and applications

Infrastructure stacks
An infrastructure stack is a collection of cloud infrastructure resources, managed as a group

Technology capabilities
Eg. offered as an engineering platform

Infrastructure resources
The services that the cloud providers offer

Criteria for slicing infrastructure stacks

Team / Application / Domain boundaries

Change frequency

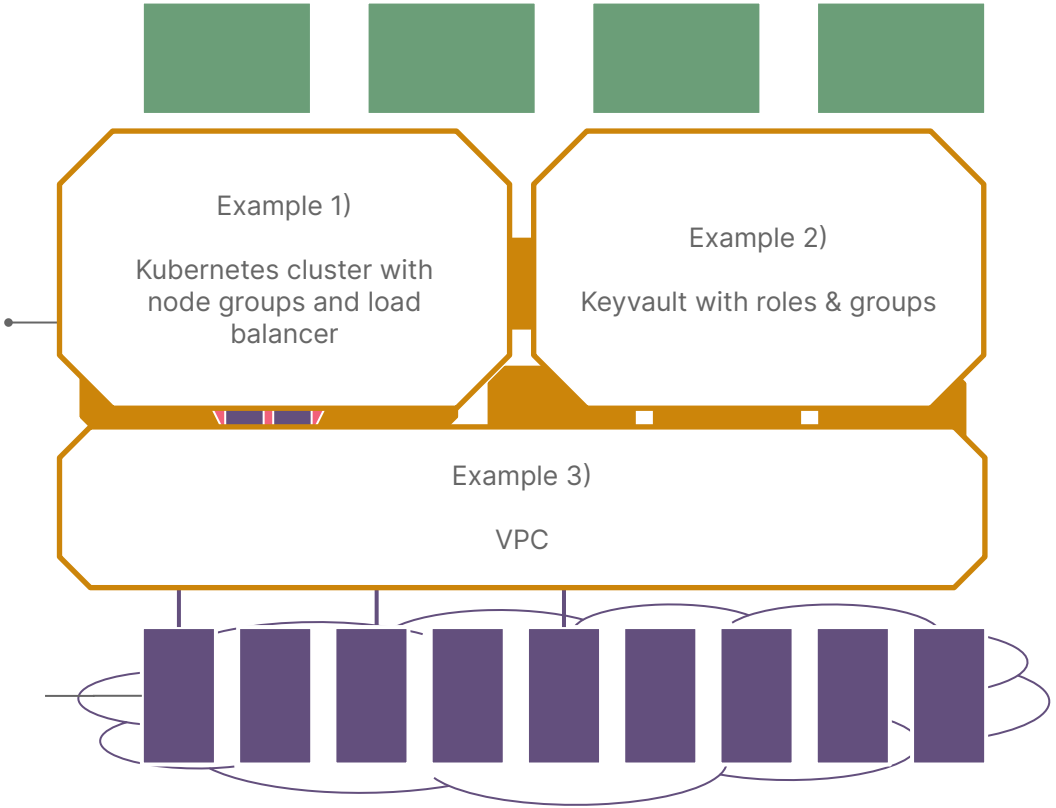
Technical capability

Permission boundaries

Careful with “re-use” - can easily become a bottleneck (DRY vs autonomy)

Key units of infrastructure architecture

Infrastructure stacks
An infrastructure stack is a collection of cloud infrastructure resources, managed as a group



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Challenges

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Blast Radius

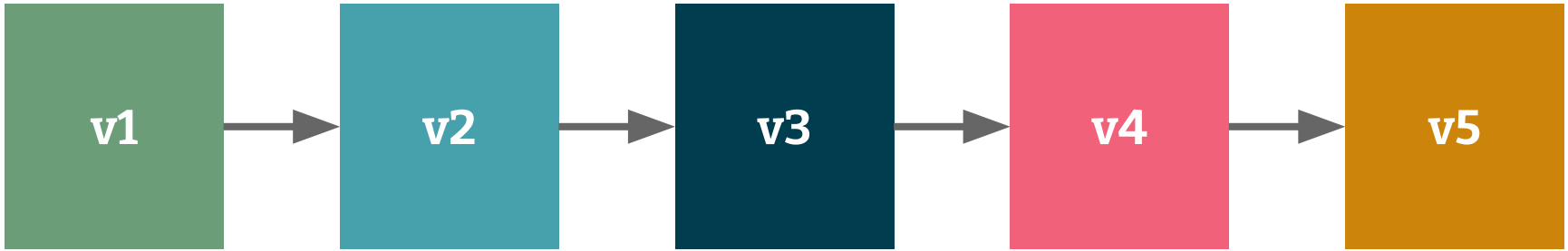
The term *blast radius* describes the potential damage a given change could make to a system. It's usually based on the elements of the system you're changing, what other elements depend on them, and what elements are shared.

Kief Morris, Infrastructure as Code 2nd Edition

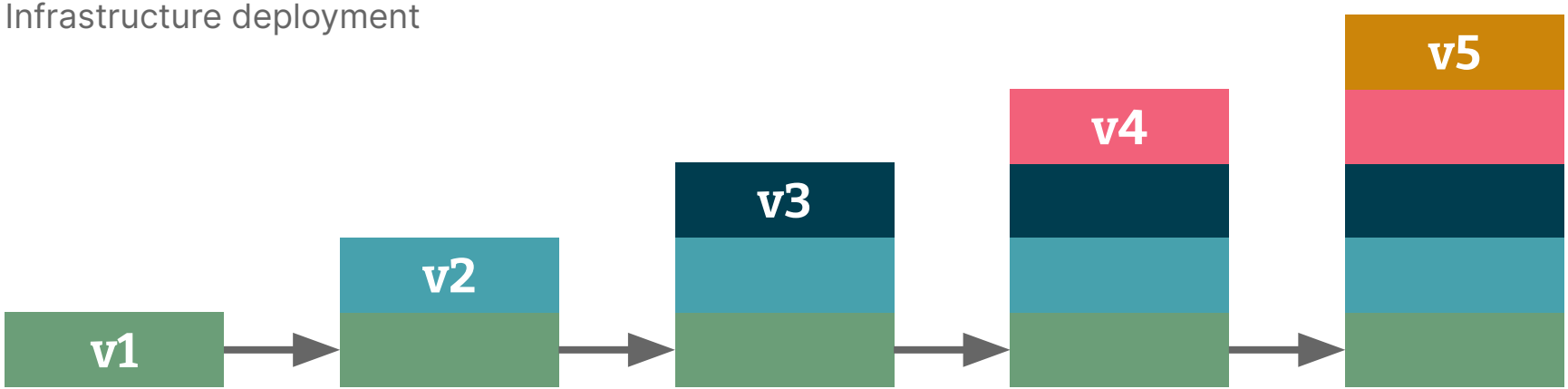
Image Source: commons.wikimedia.org

(Im)mutable deployment

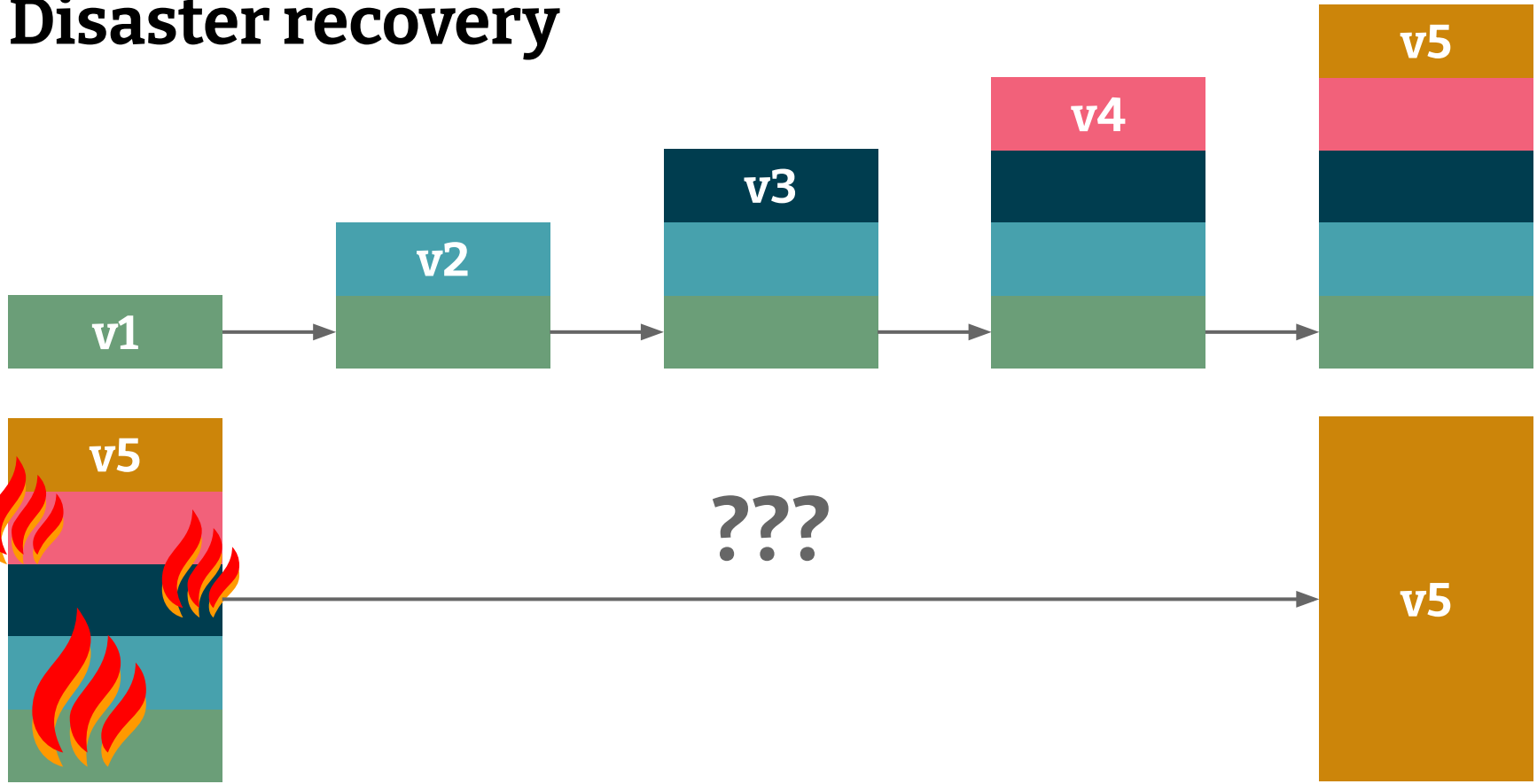
(Modern) application deployment



Infrastructure deployment



Disaster recovery



Summary

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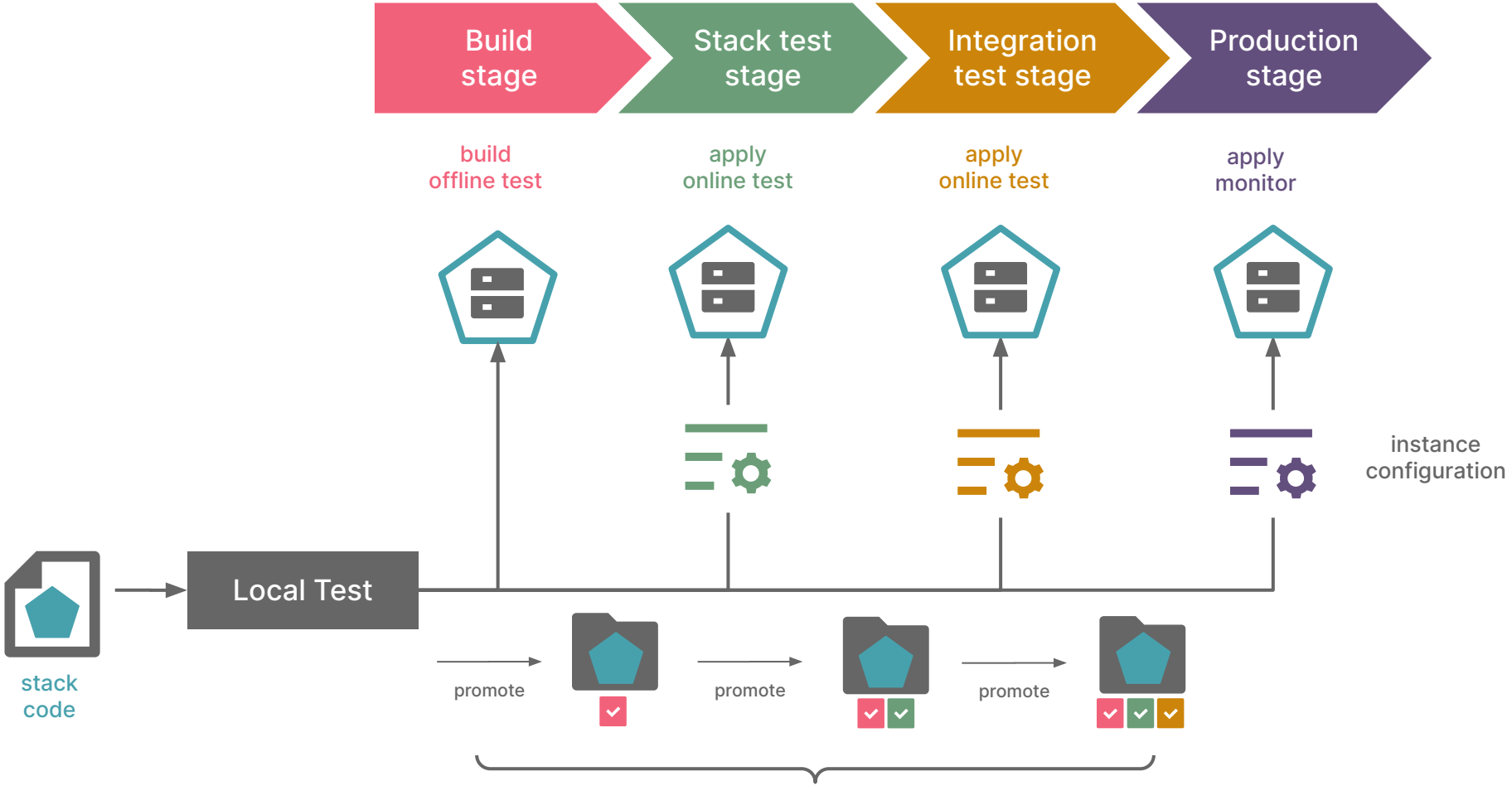

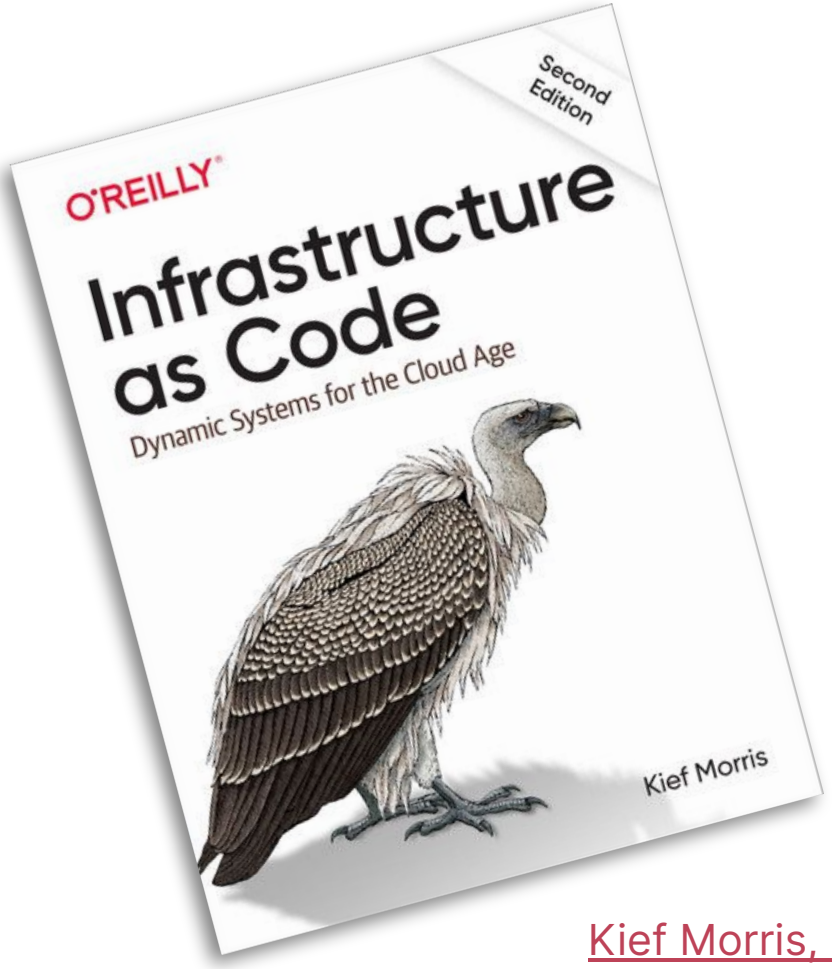

Kief Morris, Infrastructure as Code - 2nd Edition

Thank you for your attention

Waldemar Kindler
Infrastructure Consultant
waldemar.kindler@thoughtworks.com

linkedin.com/in/waldemar-kindler/

Michael Lihs
Infrastructure Consultant
michael.lihs@thoughtworks.com

linkedin.com/in/michael-lihs/

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References

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- Structuring Hashicorp Terraform Configuration for Production
- Running Terraform in Automation
- Test-Driven Development for Infrastructure
- Demo Repository: Handling Environment Variables
- What if Infrastructure-as-Code never existed