Taming secrets with Vault

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Oodrive

OPEN R&DAY {} #1

Secrets
&
Sensitive data

```yaml
zookeeper:
    hosts: zk.services.net
    environment: dev

datasource:
    driverClassName: org.postgresql.Driver
    username: tk_user
    password: qS5Ji;*bY*pX,94~gepF

management:
    enabled: true
    context-path: /manage
    health:
      enabled: true
    master-key: YXplcnR5dWlvcHFzZGZnaGprbG13eGN2Ym4sOzo9QCMK

server:
    port: 8080
```

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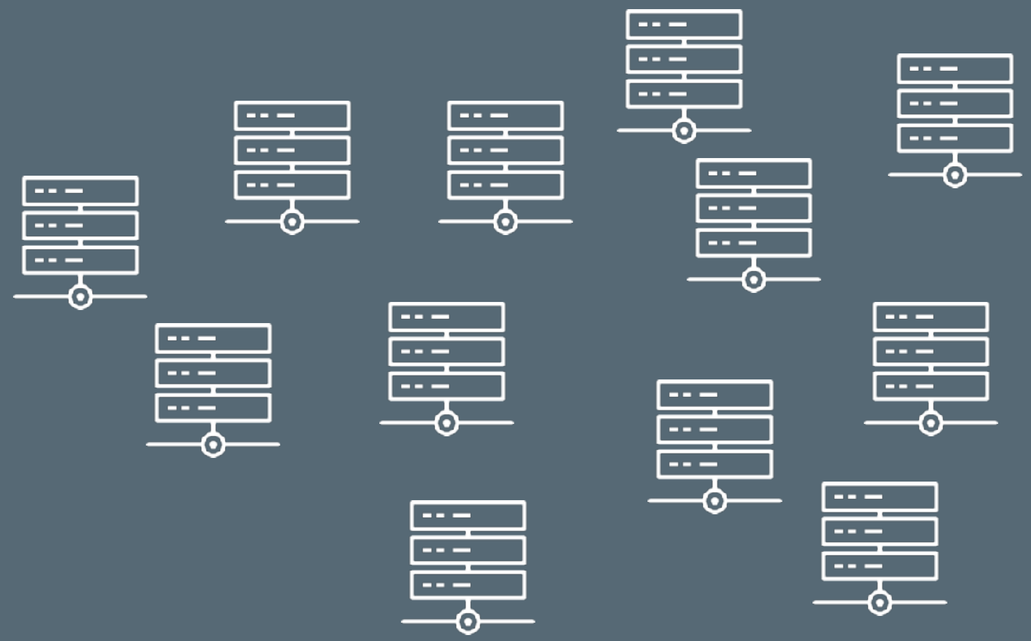
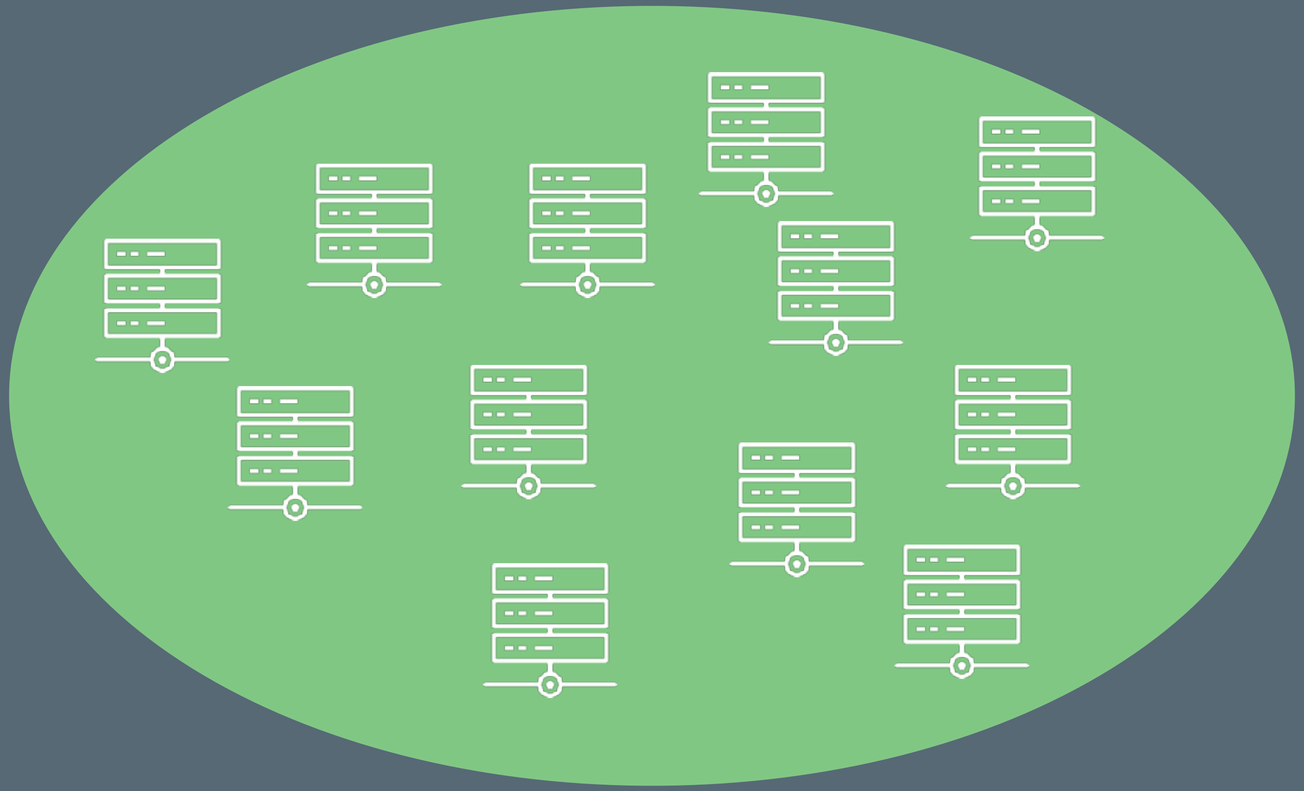
Why bother?

Traditional security



Traditional security



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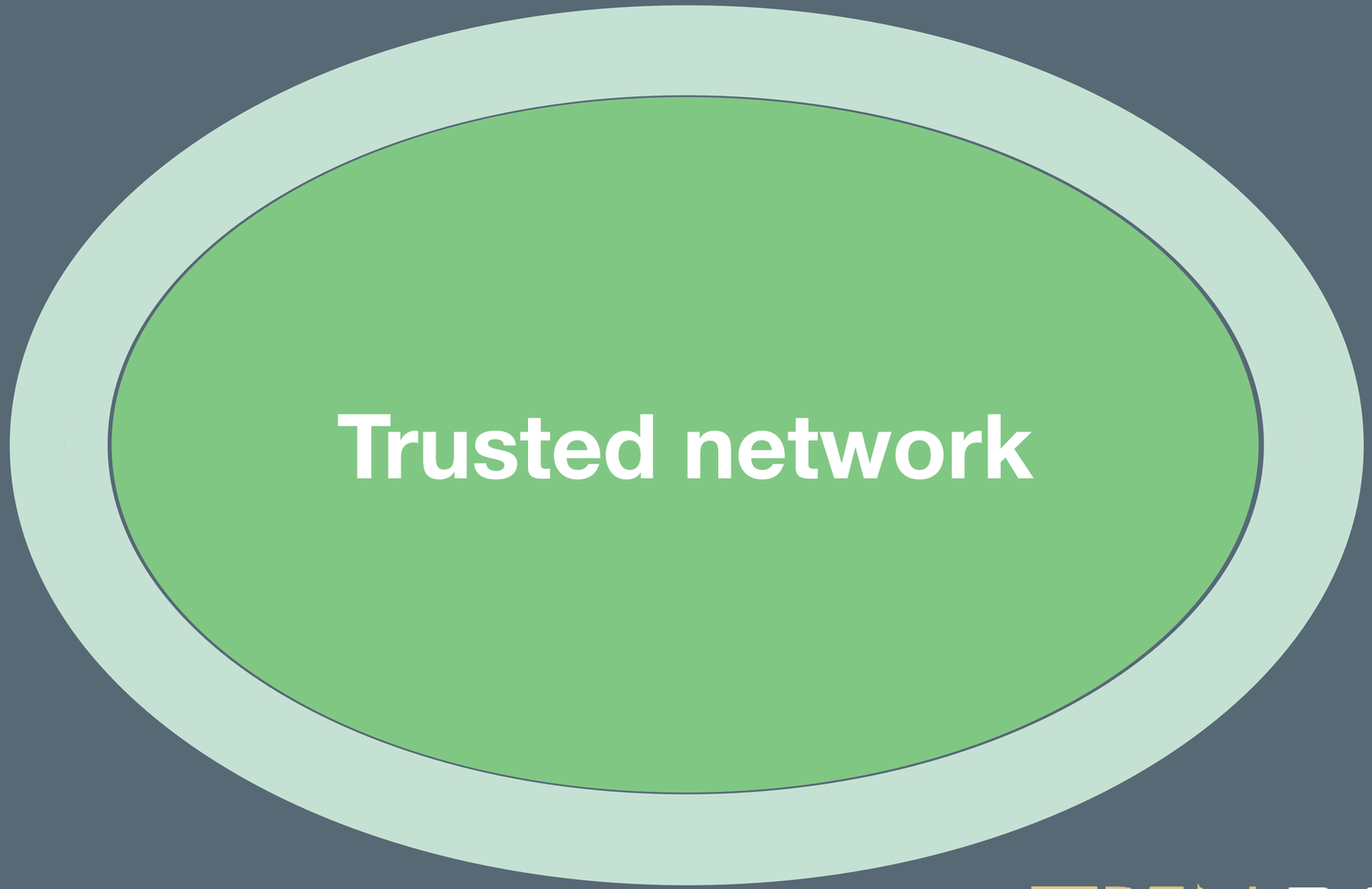
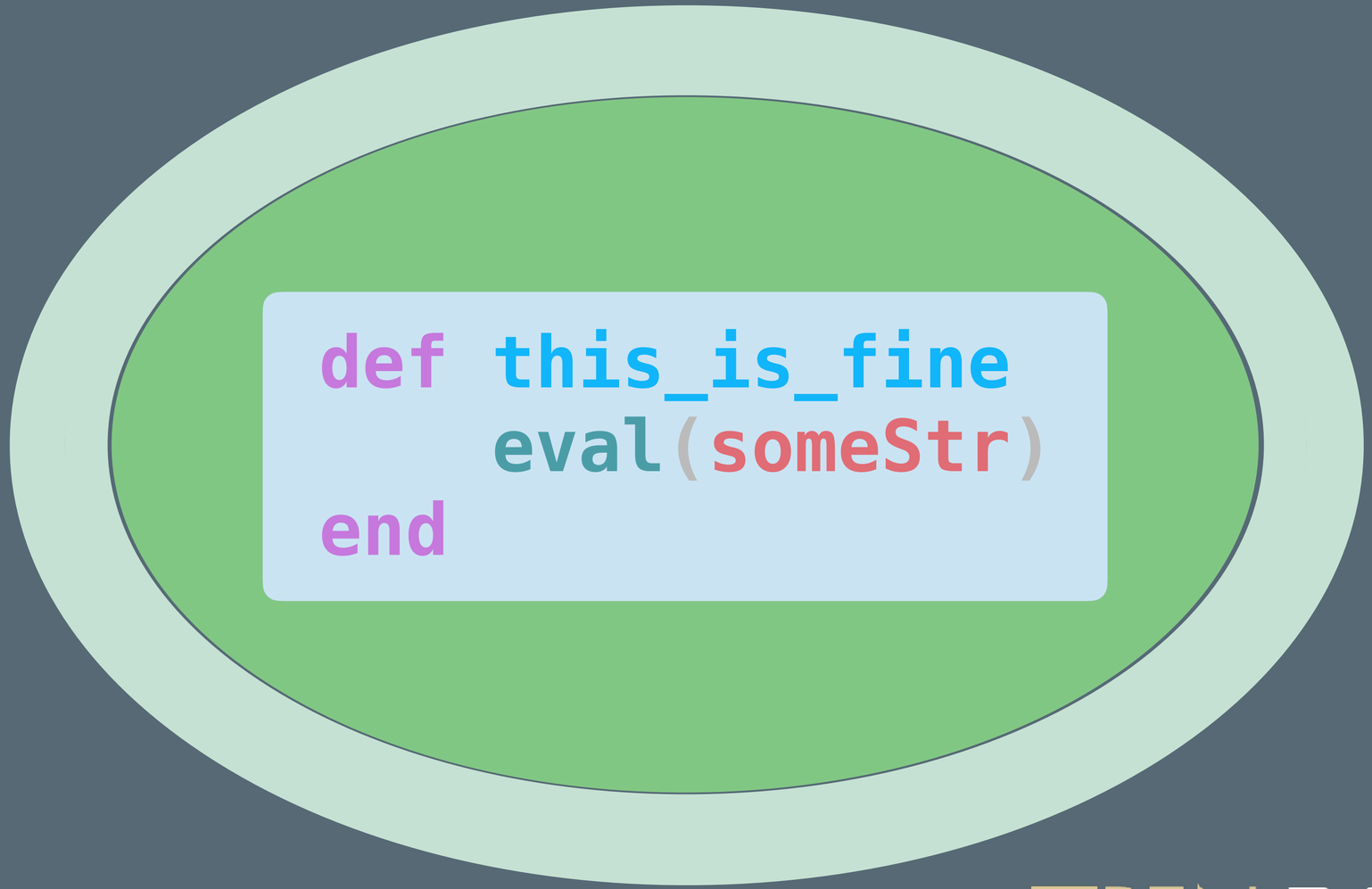
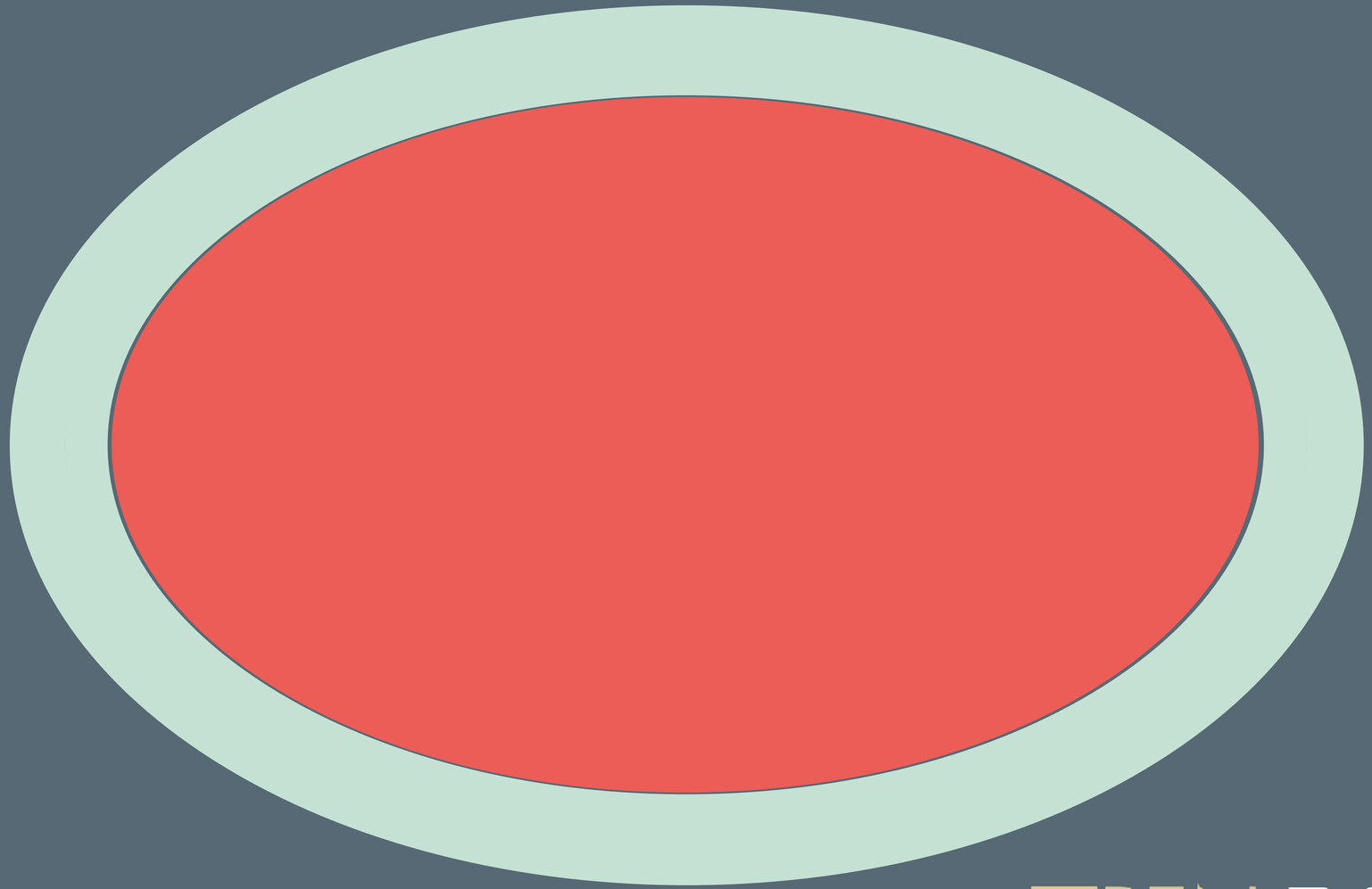


Traditional security



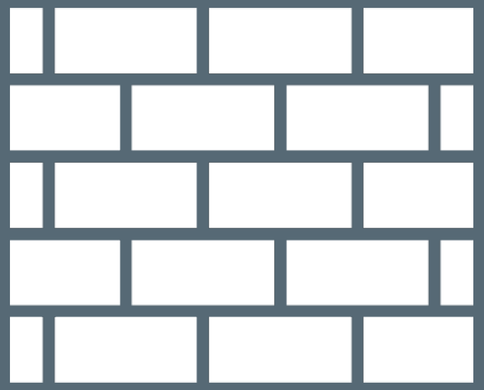
Traditional security



"*I’m simply saying that hackers, uh… finds a way.*"

Dr. Ian Malcolm

Defense in depth



Don't rely on a single line of defense

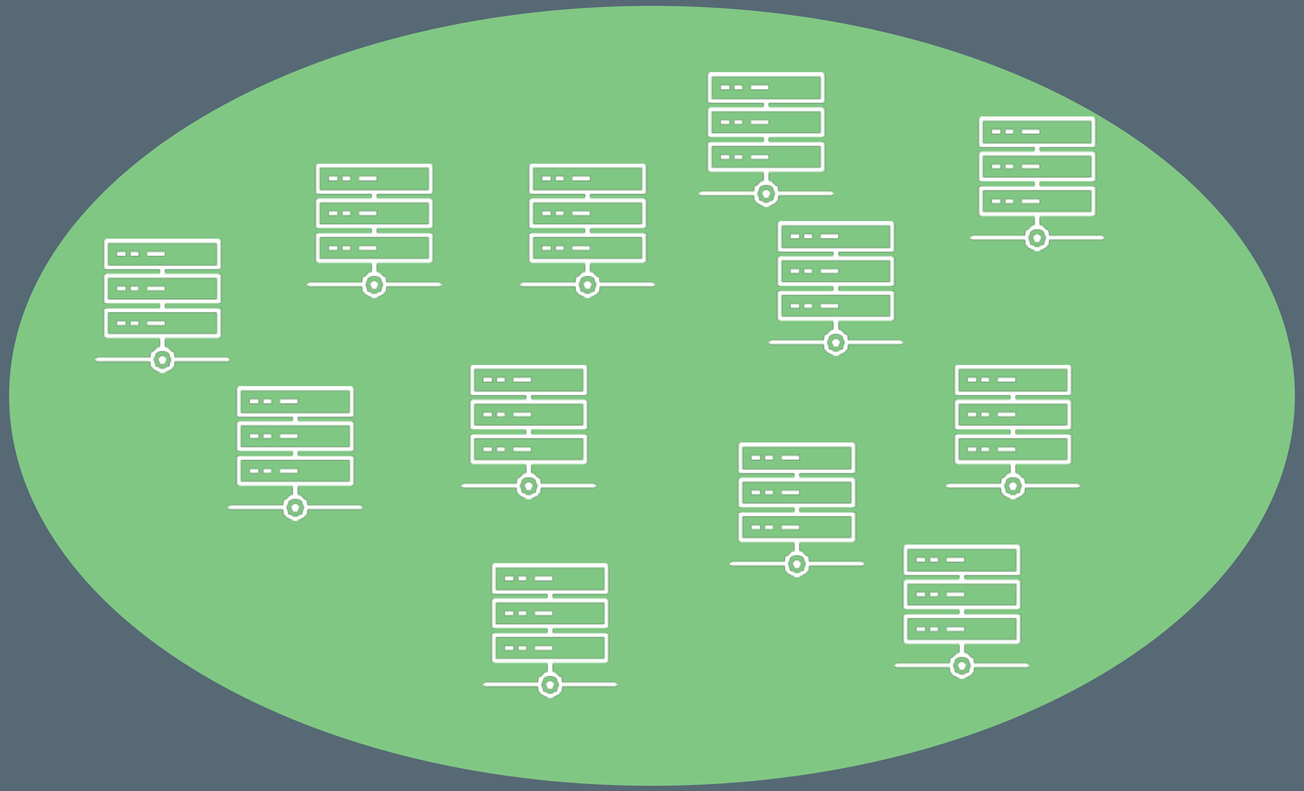
Defense in depth

Don't assume threats stop at the gateway

Defense in depth

Try smaller trust boundaries

From..



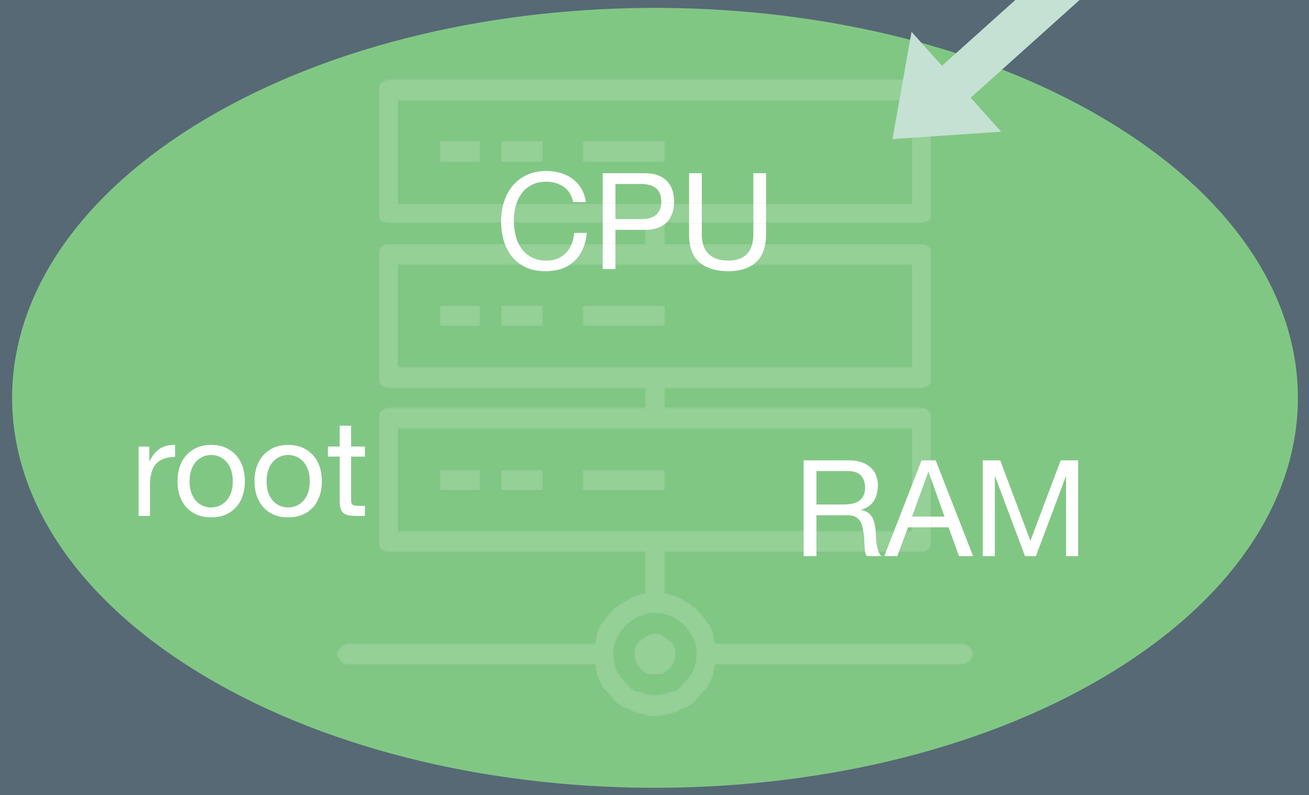
To…

To…

To…

Secrets go here

persistent storage



network?

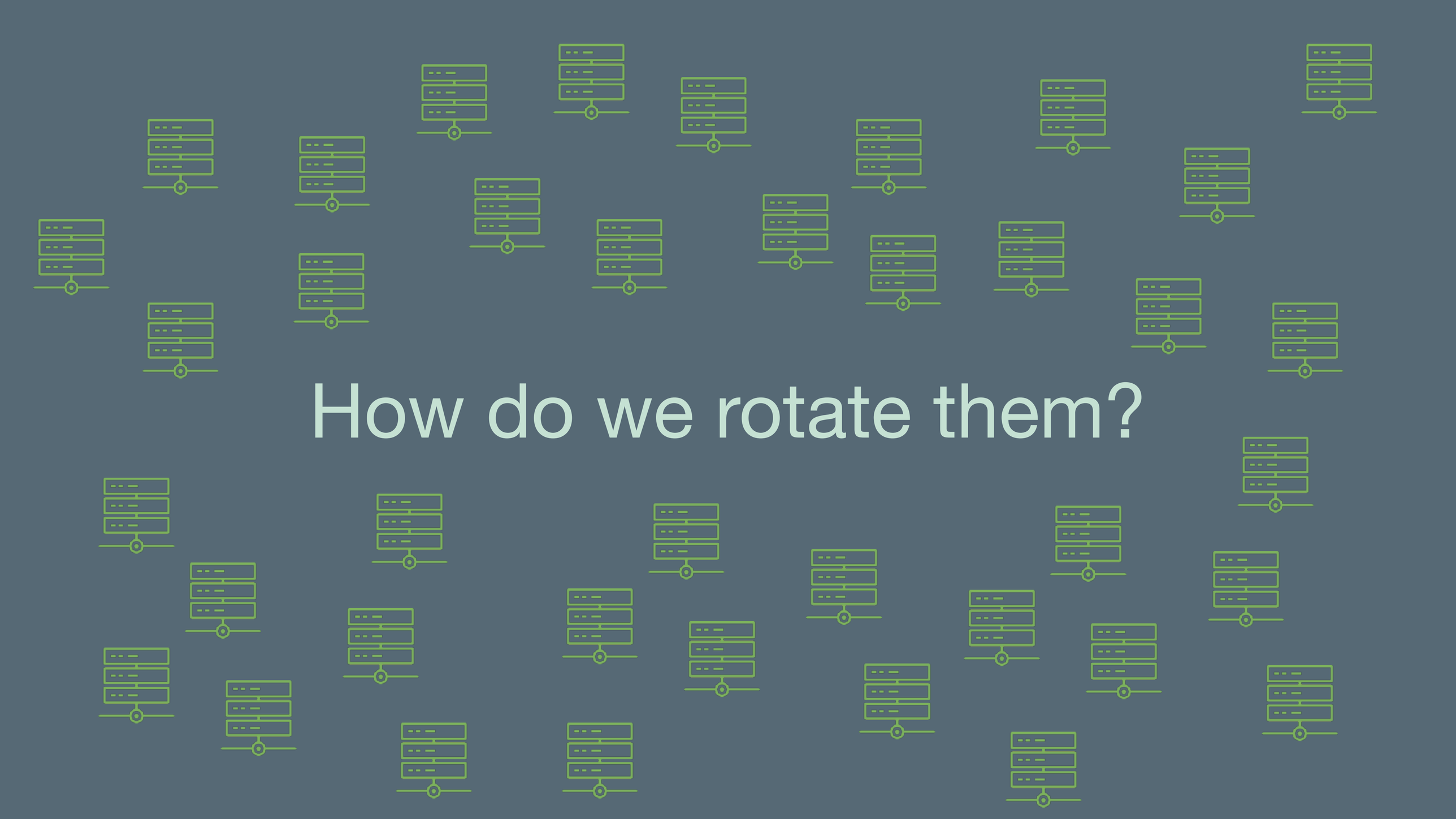
users

Traceability & Management


Where are our secrets?


Who can access them?


When are they accessed?


How do we rotate them?

We want those answers
BEFORE we need them

The right tool

SCM?

Configuration management?

Secrets management tool

Lots of secrets management tools nowadays

Keywhiz (Square)

Confidant (Lyft)

KMS (Amazon)

Docker Secret

Encryption-as-a-Service

Multiple storage backends

Standalone microservice

Multiple types of secrets

Vault

HashiCorp

Open Source

Audit friendly

High availability

Authentication & Authorization

API & CLI

Demo

```
$ vault write secret/srvA/credentials pwd=azerty
  Success! Data written to: secret/srvA/credentials
```

```
$ vault read secret/srvA/credentials
  Key                 Value
  ---                 -----
  refresh_interval    768h0m0s
  pwd                 azerty
```

```
$ vault read /sys/policy/my-service-A

  path "secret/srvA/*" {
    capabilities = ["read"]
  }
```

```
$ curl https://vault01/v1/secret/srvA/credentials
    -H 'X-Vault-Token:…'

  {
    "request_id": "f9e9b545-c624-ebbb-1dbd-
  d35e1074a478",
    "lease_id": "",
    "renewable": false,
    "lease_duration": 2764800,
    "data": {
      "pwd": "azerty"
    …
```

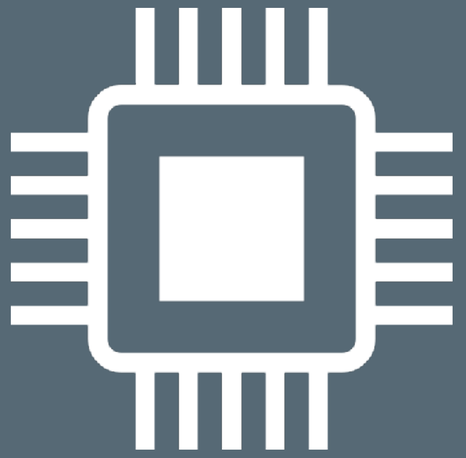
Protecting secrets

Turtles all the way down

How does Vault protect secrets?

Secrets are
encrypted at rest

How does Vault protect secrets?



Encryption keys only live in memory

How does Vault protect secrets?

How to obtain the Master Key?

Shamir secret sharing

Master key split in **N** shards

K shards required

Vault sealed until a quorum is reached

How do apps access secrets?

Ask Vault at runtime

Need an authentication token

How to pass the token to the app?

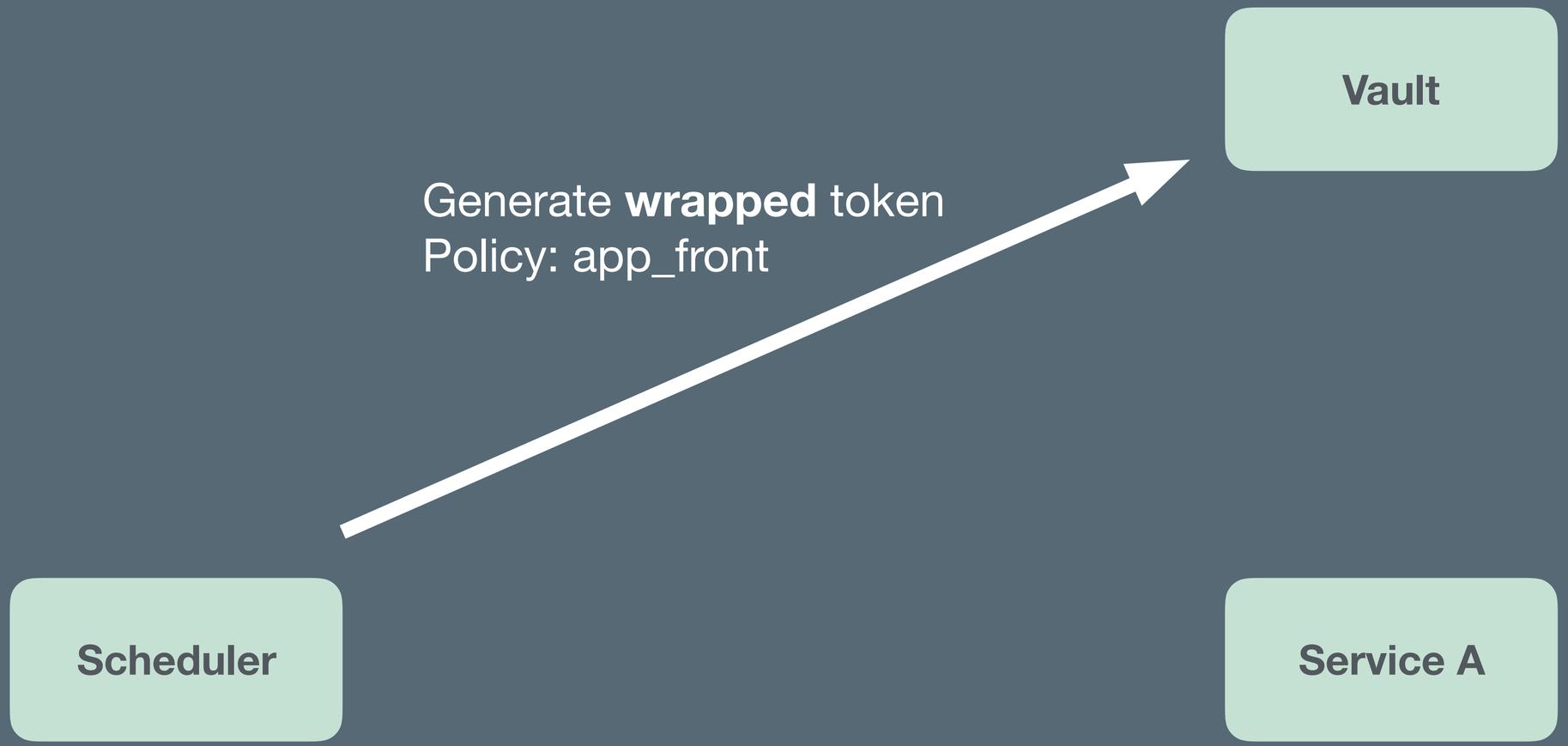
Secure introduction

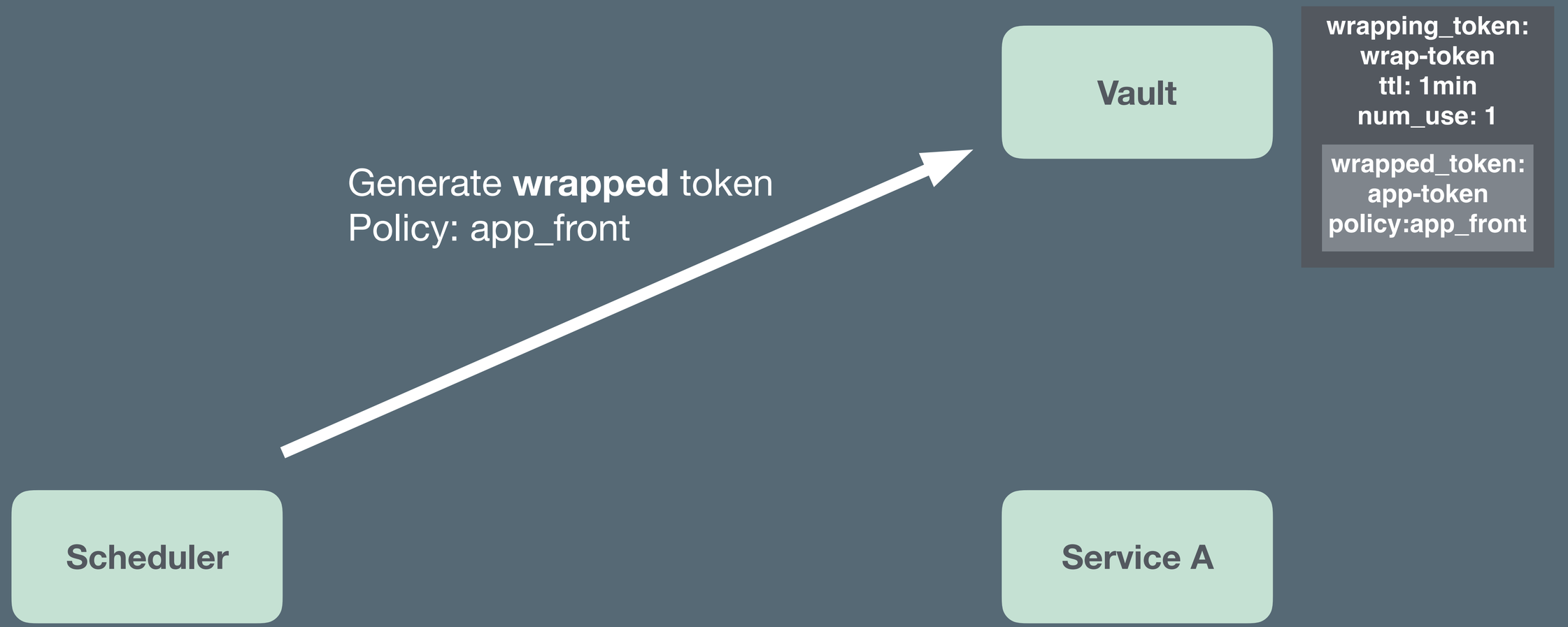
- ☐ Secure distribution
- ☐ Short token lifetime
- ☐ Access detection

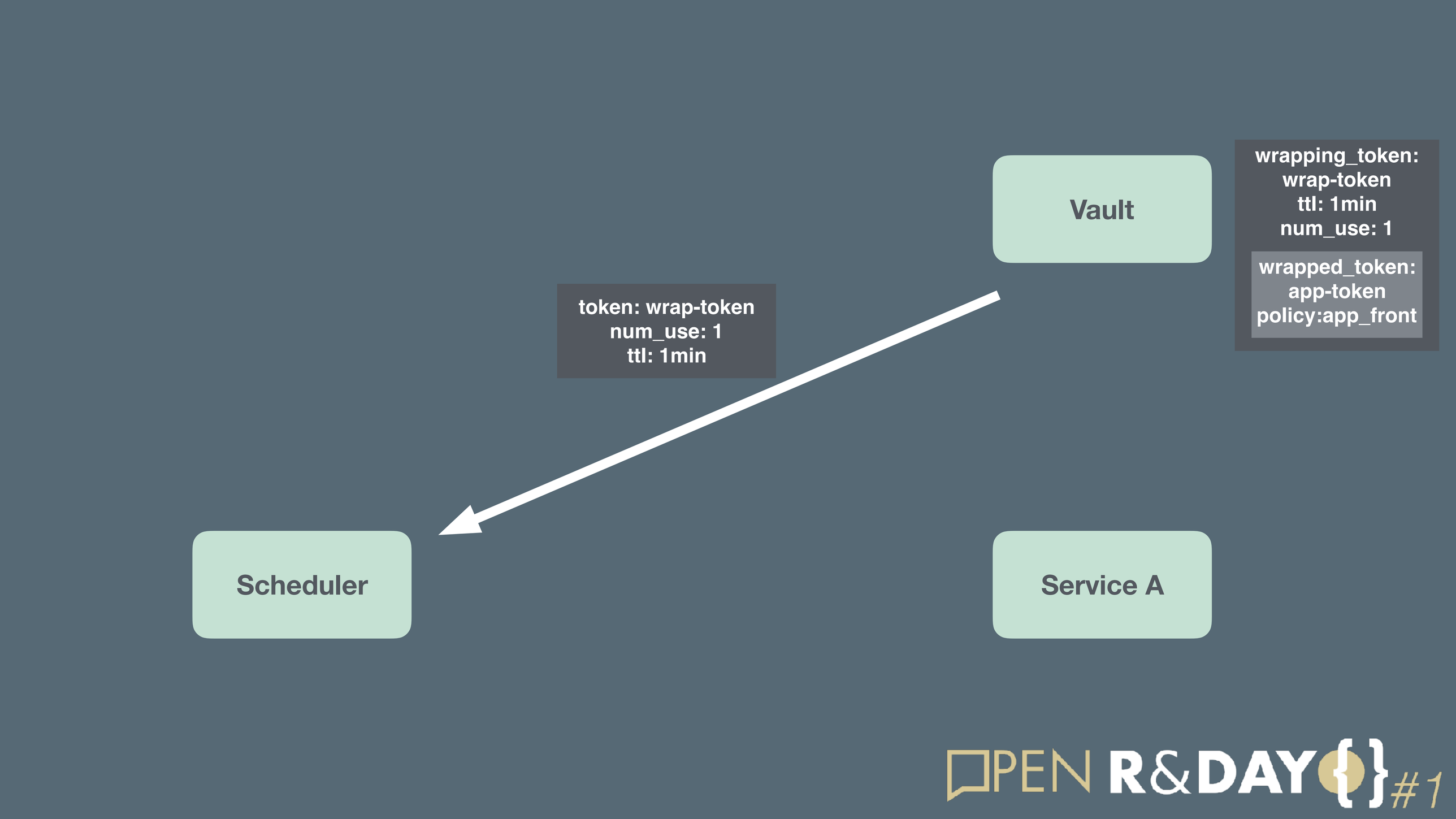
Vault

Scheduler

Service A


Vault
Generate **wrapped** token
Policy: app_front
Scheduler
Service A


Vault
wrapping_token:
wrap-token
ttl: 1min
num_use: 1
wrapped_token:
app-token
policy:app_front
Generate **wrapped** token
Policy: app_front
Scheduler
Service A


Vault
wrapping_token:
wrap-token
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wrapped_token:
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policy:app_front
token: wrap-token
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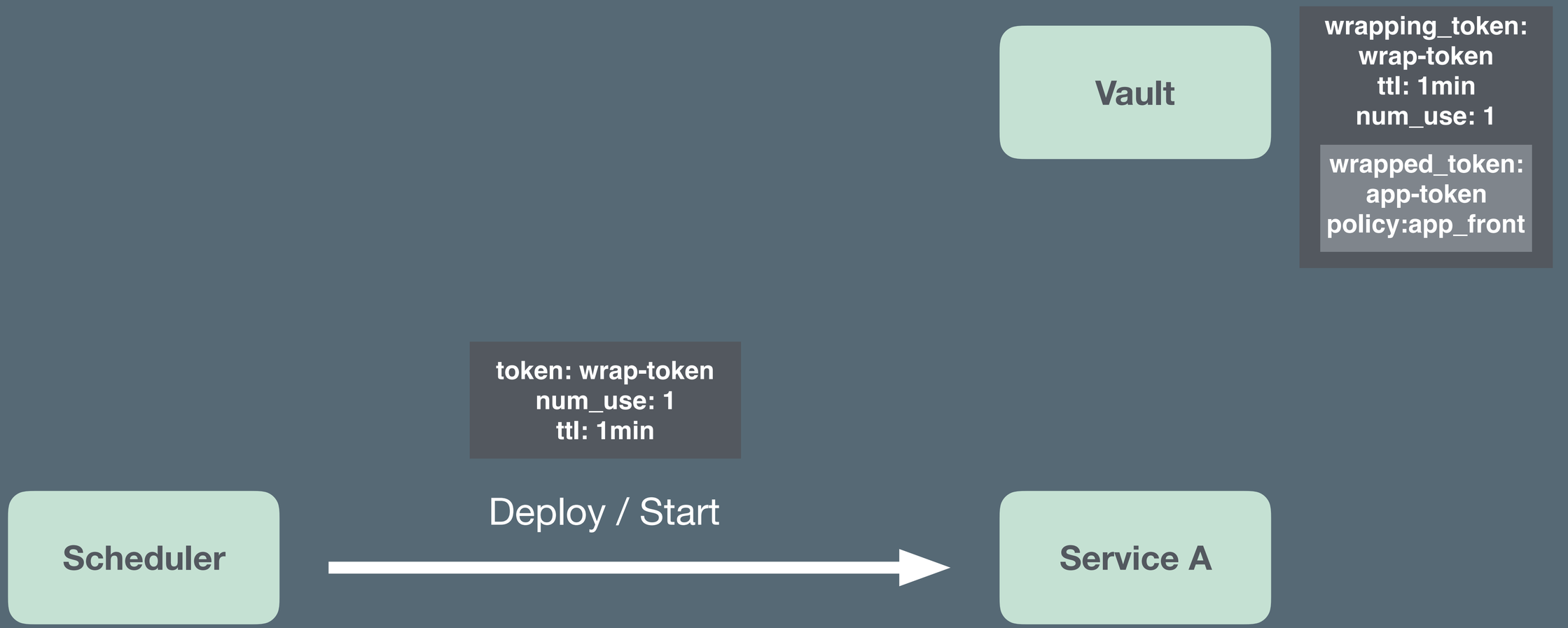
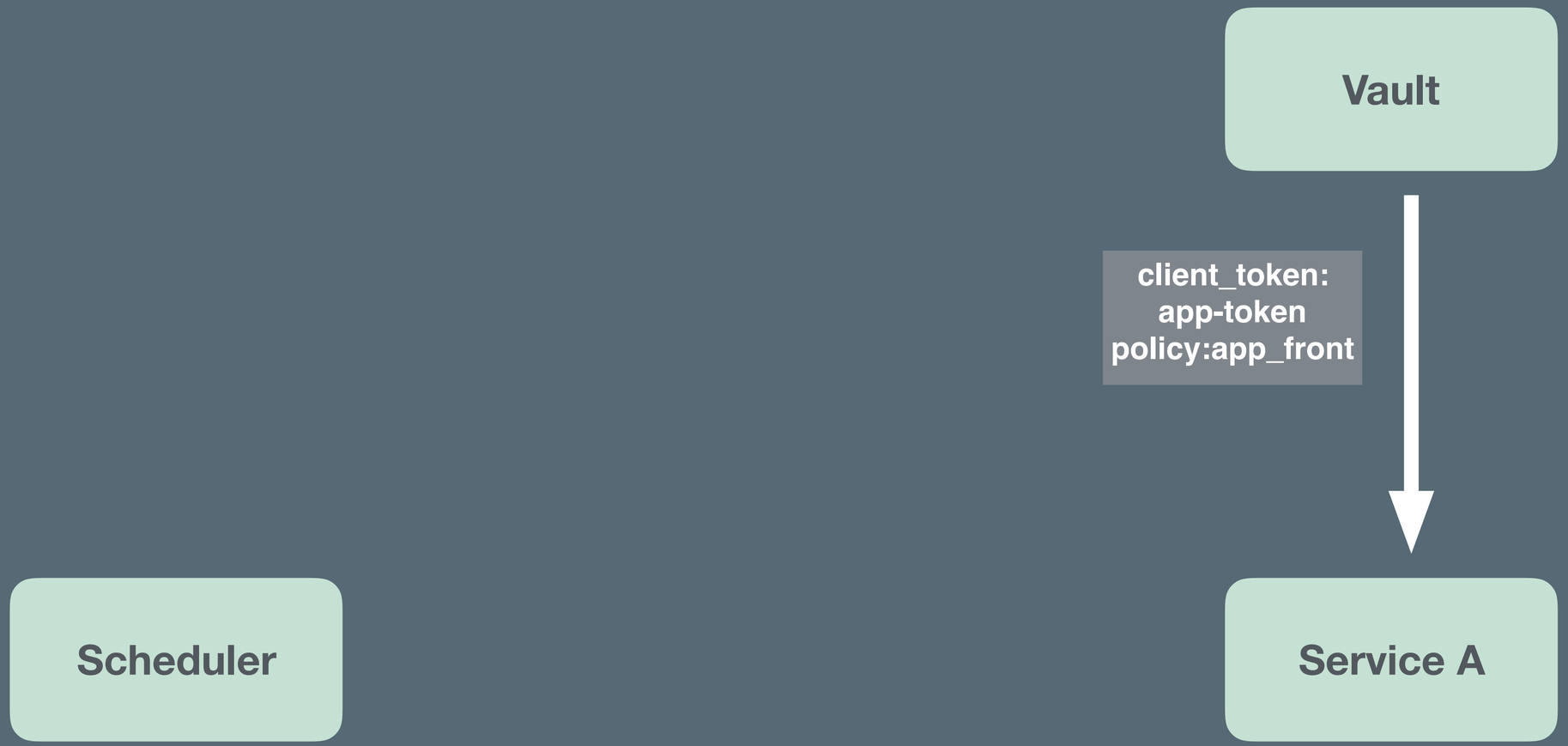
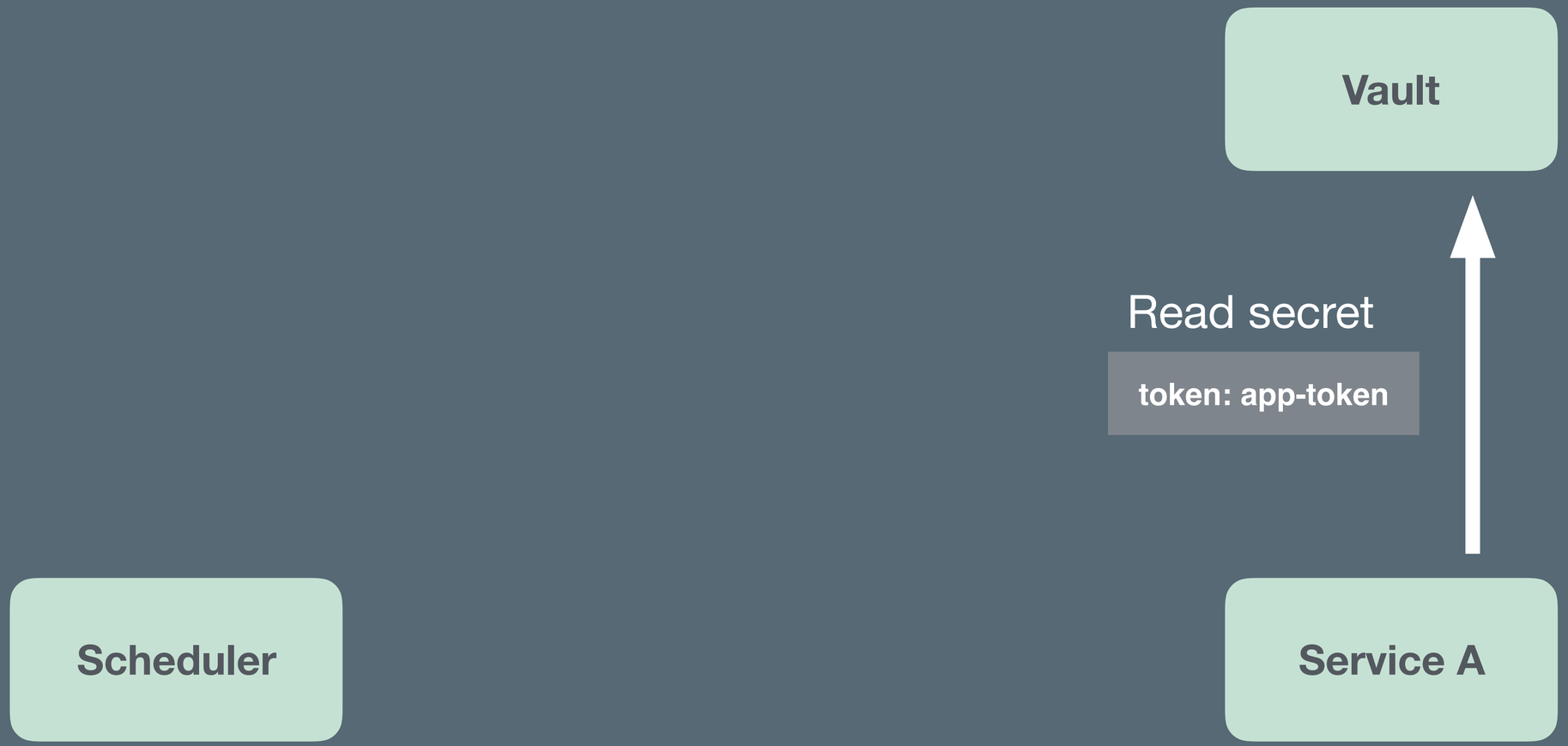
Scheduler
Service A


Vault
wrapping_token:
wrap-token
ttl: 1min
num_use: 1
wrapped_token:
app-token
policy:app_front
token: wrap-token
num_use: 1
ttl: 1min
Deploy / Start
Scheduler
Service A


Vault
wrapping_token:
wrap-token
ttl: 1min
num_use: 1
wrapped_token:
app-token
policy:app_front
Unwrap
token: wrap-token
num_use: 1
ttl: 1min
Scheduler
Service A


Vault
client_token:
app-token
policy:app_front
Scheduler
Service A


Vault
Read secret
token: app-token
Scheduler
Service A

Secure introduction

- [x] Secure distribution
- [x] Short token lifetime
- [x] Access detection

Vault @ Oodrive

Vault @ Oodrive

One service in staging

ZooKeeper as storage backend

"Good enough" introduction

Challenges @ Oodrive

Ongoing transition to an orchestrated architecture

Challenges @ Oodrive

For now: Puppet.

No scheduler.

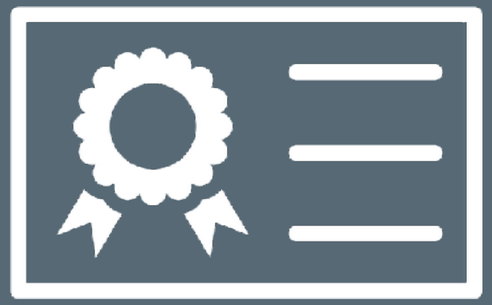
Challenges @ Oodrive

Don't want to break
everything twice

Challenges @ Oodrive

Puppet Server and init script as "scheduler"

Challenges @ Oodrive



Leverage existing Puppet authentication

Vanilla Java Client

```
VaultClient client = new Builder(vaultUri)
                             .withTokenAuth(token)
                             .build();

Credentials cred = client.readSecret(
                           "secret/my-service/db-credentials",
                           Credentials.class);
```

Spring

```
@SecretPath("credentials")
Secret<Credentials> credentialsSecret;

…

Credentials cred = credentialsSecret.getValue();
```

Hopefully to be
open sourced

Best practices

Least Privilege all the way!

Vault as single secrets repository

Secrets grouped under service name

Use roles for easier management

Enable ACL on ZooKeeper

Next steps

Fully secure introduction

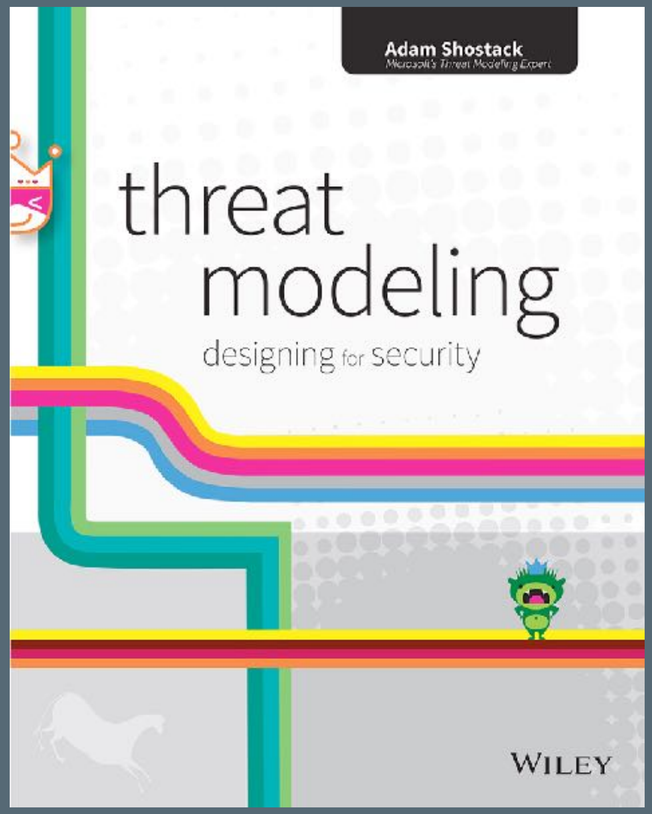
Dynamic secrets (db credentials)

Vault as internal PKI

Thanks

Questions?

To win!



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