SINGLE SIGN-ON FOR KUBERNETES

A look at OIDC and Pusher's journey to SSO

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PUSHER

@Pusher

WHO AM I?

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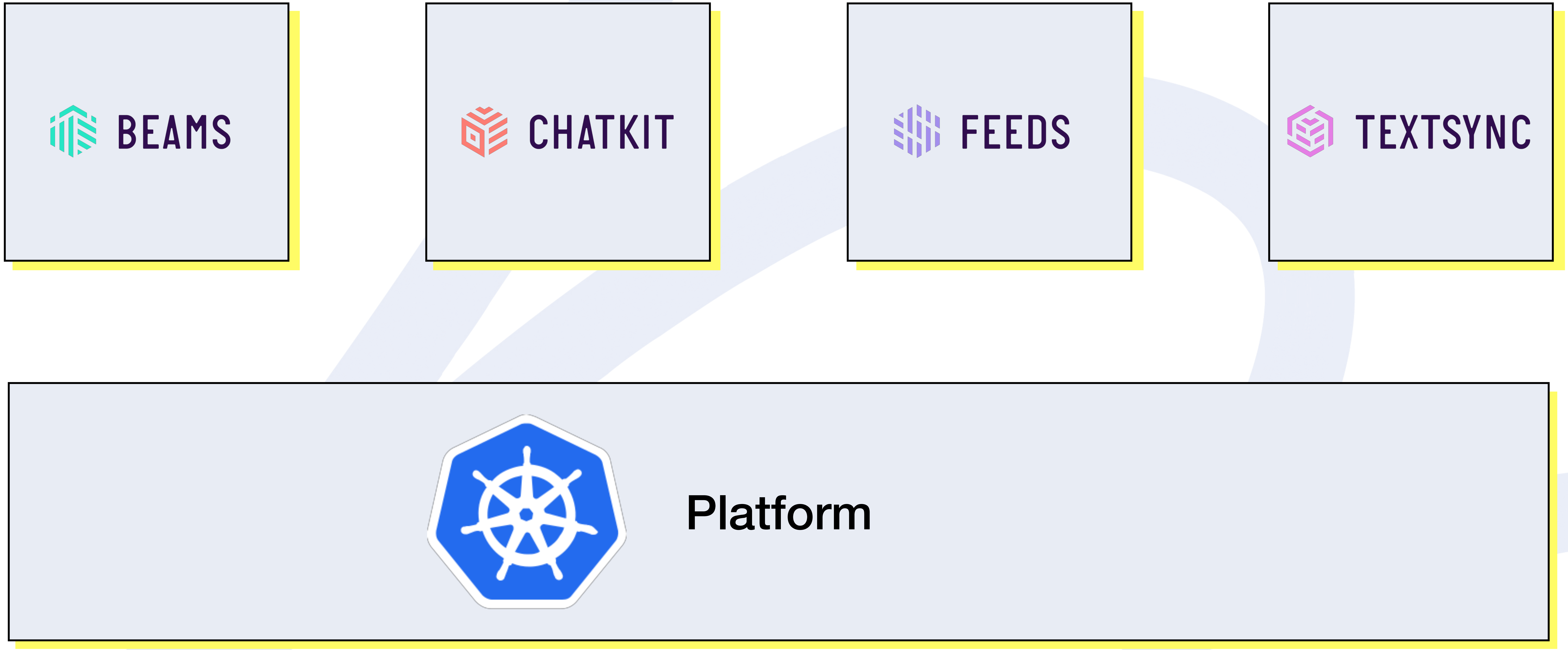
PUSHER

“WE SHOULD START USING RBAC”

WHY DO WE NEED RBAC?



GETTING STARTED (OUR DARK PAST)

One x509 Certificate.

One Identity.

30 Engineers.

WHAT DID WE WANT?

Individual user accounts

Group management

Scalable

UX

AUTHENTICATION OPTIONS

- X.509 Client Certs
- Static Token File
- Bootstrap Tokens
- Static Password File
- Service Account Tokens
- OpenID Connect Tokens
- Webhook Token Authentication
- Authenticating Proxy
- Keystone Password

Source: https://kubernetes.io/docs/reference/access-authn-authz/authentication/

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Source: https://kubernetes.io/docs/reference/access-authn-authz/authentication/

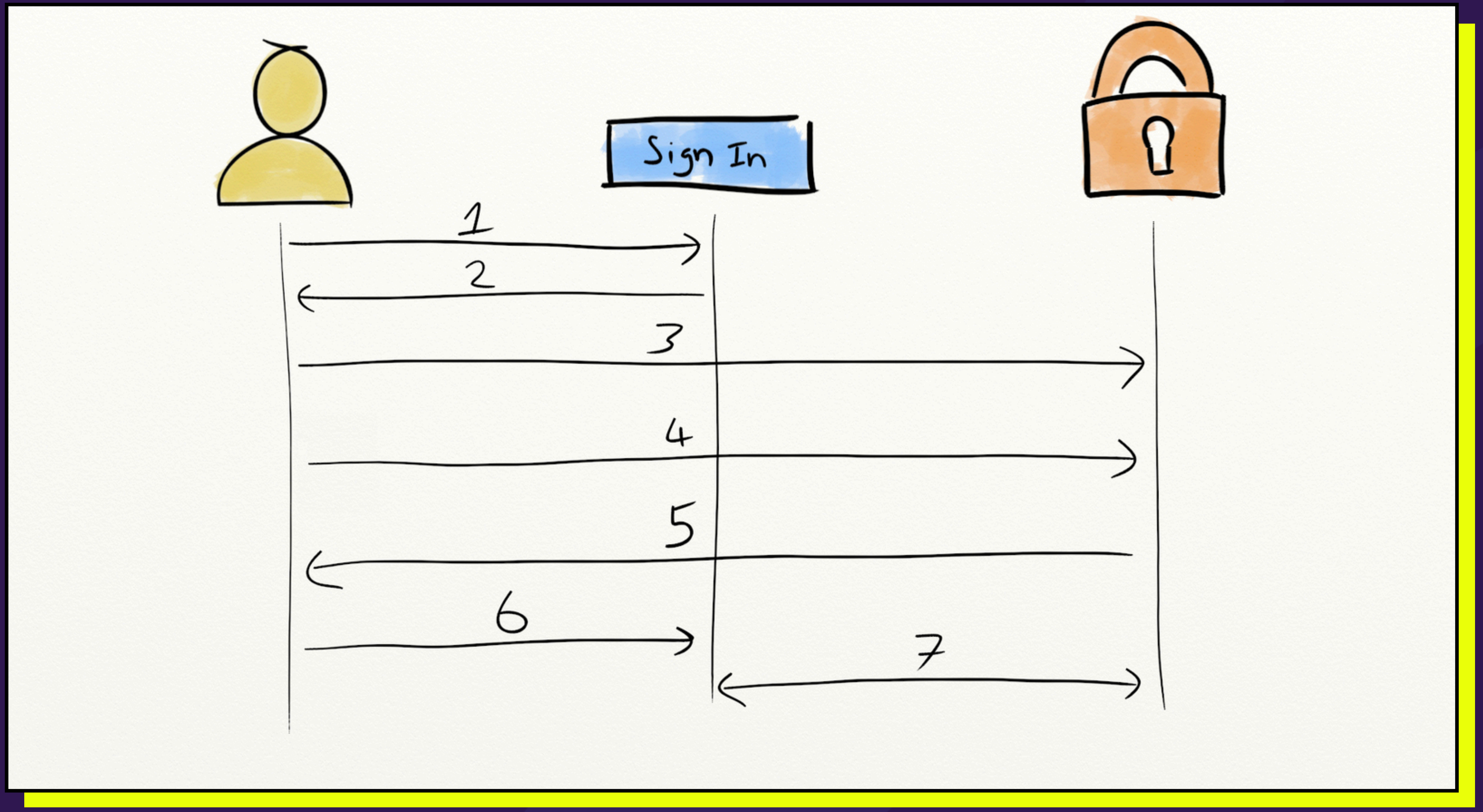
X.509 CLIENT CERTS

- Fixed lifetime. Cannot easily be revoked.
- Certificates must be signed by trusted CA.
- Self service is hard. Must verify CSR before signing certificate. How to manage users and groups?
- No Kubernetes Dashboard support
- Renewal is hard

OPEN ID CONNECT (OIDC)

- Fixed lifetime. Cannot easily be revoked (without control of the Identity Provider)
- Only a handful of providers (Google, Salesforce, Azure AD)
- Single Sign-On: Can re-use existing user accounts and groups
- Kubernetes Dashboard supports OIDC tokens
- Automatic refresh

AUTHENTICATION FLOW



1. Click Sign In

2/3. Redirect to Identity Provider

4. Enter username and password

5/6. Redirect back to the origin with authentication code

7. Origin server exchanges code for ID token

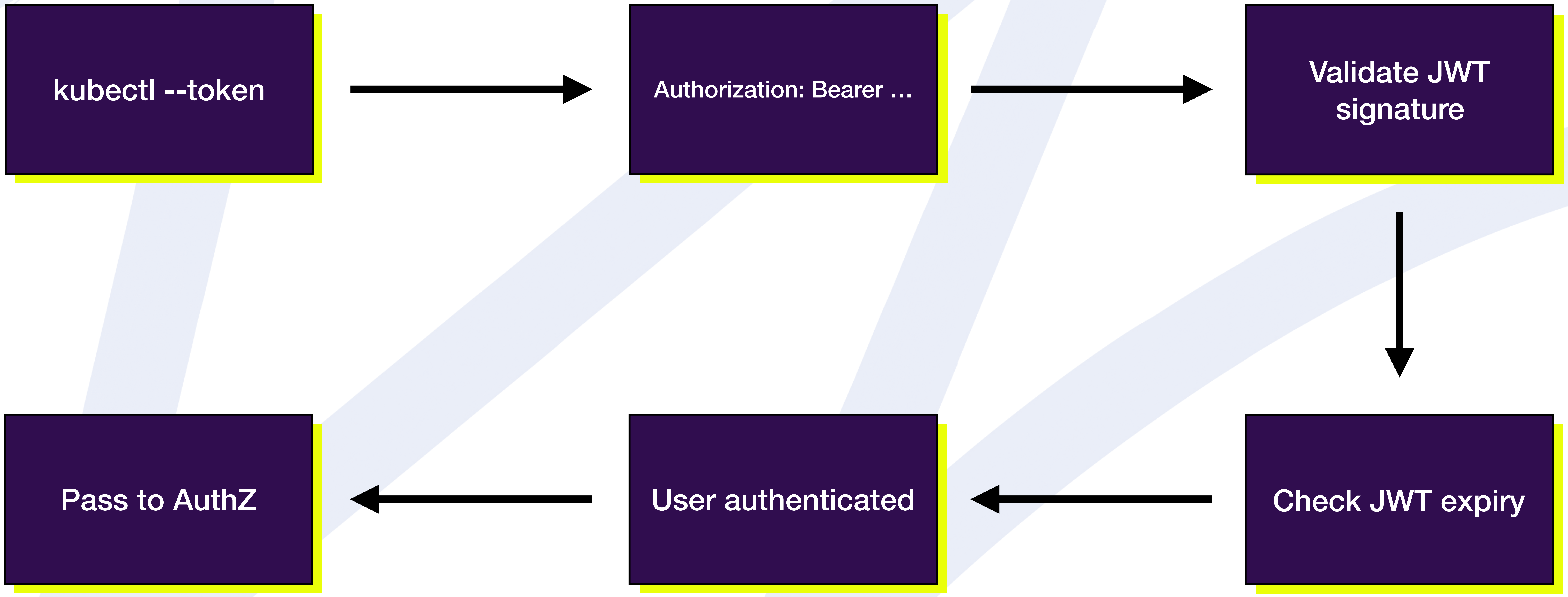
ID TOKENS (JWT)

```
<metadata>.<payload>.<signature>
```

```
eyJhbGciOiJIUzI1NiIsInR5cCI6Ikp
XVCJ9.eyJzdWIiOiIxMjM0NTY3ODkwI
iwibmFtZSI6IkpvaG4gRG9lIiwiYWRt
aW4iOnRydWV9.TJVA95OrM7E2cBab30
RMHrHDcEfxjoYZgeFONFh7HgQ
```

```
"iss": “https://auth.example.com/dex”,
"sub": “ChUxMDk0MzA2…”,
"aud": "kubernetes",
"exp": 1519123284,
"iat": 1519036884,
"at_hash": "X2G33w55vEm39VwyOMMjzg",
"email": "joel.speed@pusher.com",
"email_verified": true,
"groups": [
    "group1@pusher.com",
    "group2@pusher.com"
  ],
"name": "Joel Speed"
```

USING ID TOKENS



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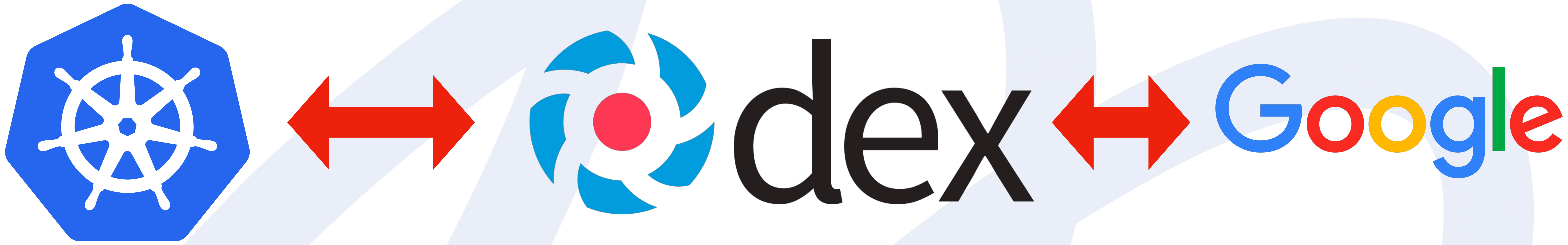
INTRODUCING DEX



Dex is an identity service that uses OpenID Connect to drive authentication for other apps.

LDAP, GitHub, SAML 2.0, GitLab, Open ID Connect, LinkedIn, Microsoft, AuthProxy

Image credits: Kubernetes, CoreOS, Google

WHY DEX IN THE MIDDLE?

CONTROL OF TOKEN LIFETIME

REVOKE TOKENS

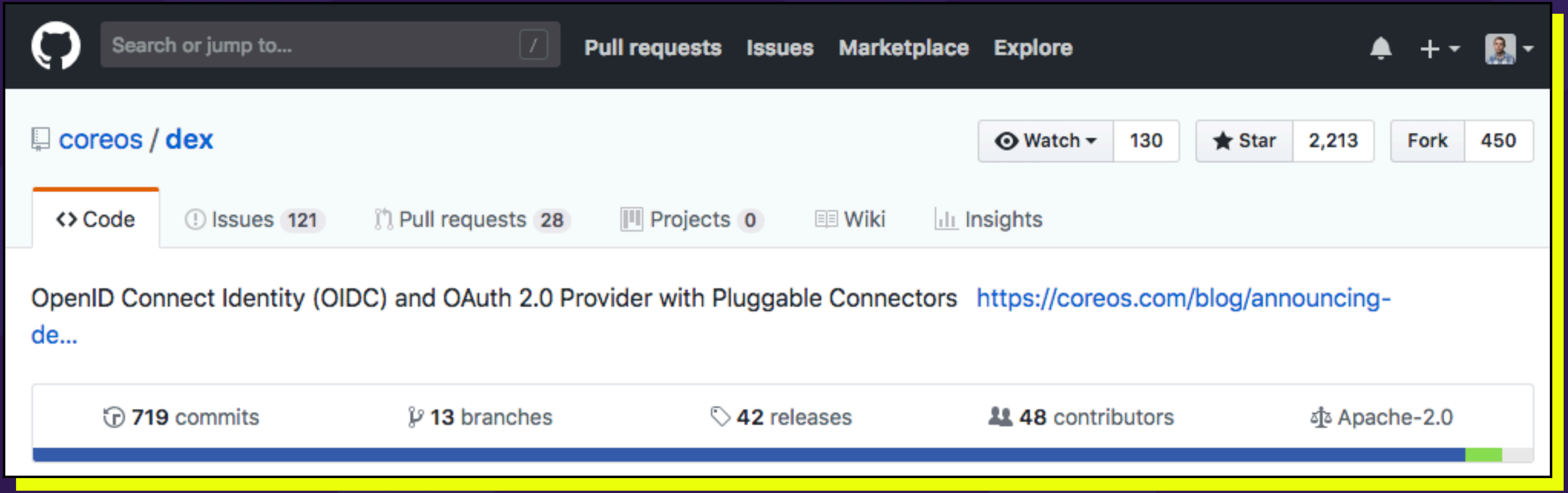
/DEX/.WELL-KNOWN/OPENID-CONFIGURATION

```
{
  "issuer": “https://auth.domain.com/dex",
  "authorization_endpoint": “https://auth.domain.com/dex/
auth",
  "token_endpoint": “https://auth.domain.com/dex/token",
  "jwks_uri": “https://auth.domain.com/dex/keys",
  "response_types_supported": [
    "code"
  ],
  "subject_types_supported": [
    "public"
  ],
  "id_token_signing_alg_values_supported": [
    "RS256"
  ],
  "scopes_supported": [
    "openid",
    "email",
    "groups",
    "profile",
    "offline_access"
  ],

. . .

}
```

ADD NEW CLIENTS

```
staticClients:
- id: kubernetes
  redirectURIs:
  - 'http://127.0.0.1:5555/callback'
  name: 'Kubernetes API'
  secret: <INSERT_CLIENT_SECRET_HERE>
```

PLUGGABLE



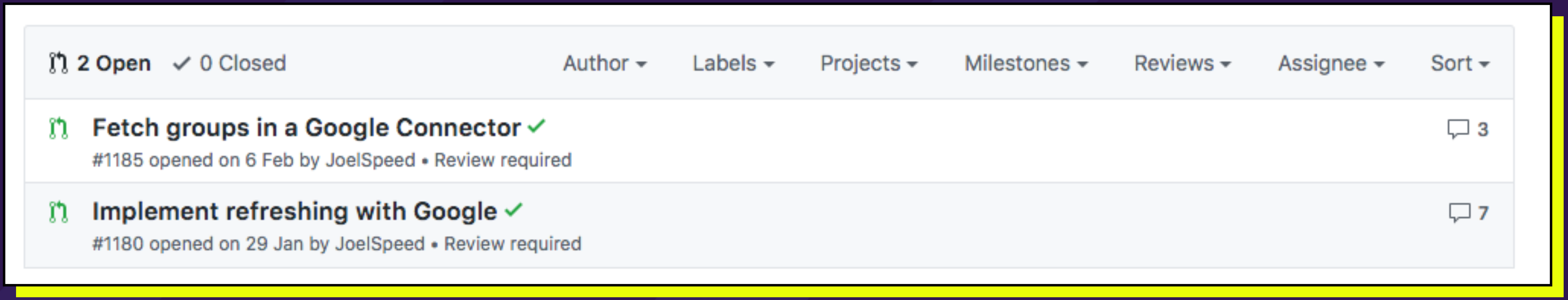
coreos / dex

Watch 130 | Star 2,213 | Fork 450

Code | Issues 121 | Pull requests 28 | Projects 0 | Wiki | Insights

OpenID Connect Identity (OIDC) and OAuth 2.0 Provider with Pluggable Connectors https://coreos.com/blog/announcing-de...

719 commits | 13 branches | 42 releases | 48 contributors | Apache-2.0



2 Open ✓ 0 Closed

Fetch groups in a Google Connector ✓ — 3
#1185 opened on 6 Feb by JoelSpeed • Review required

Implement refreshing with Google ✓ — 7
#1180 opened on 29 Jan by JoelSpeed • Review required

HOW DO I USE THIS?

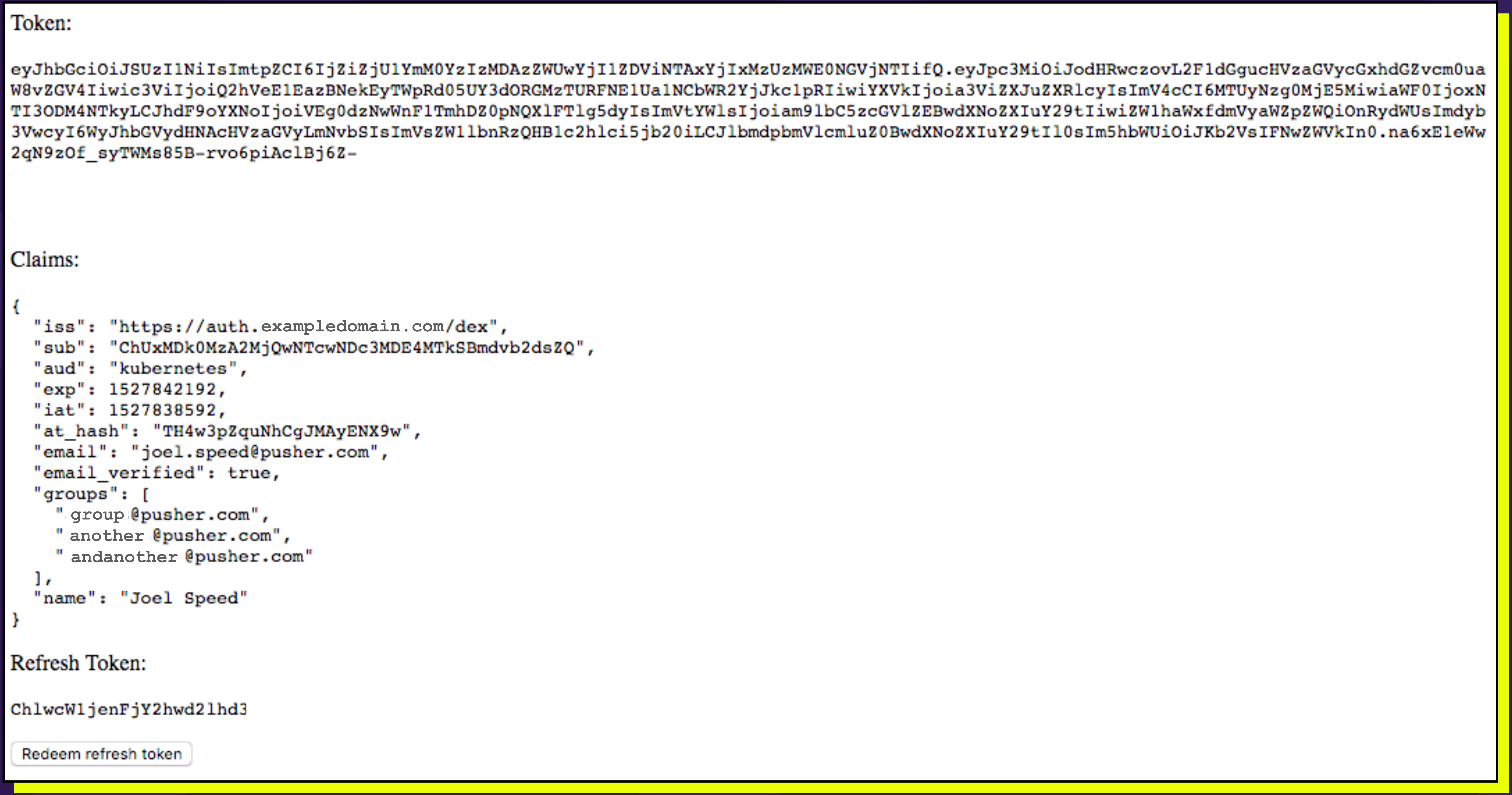
CONNECT K8S TO DEX

```
# The URL where Dex was available
--oidc-issuer-url=https://auth.example.com/dex

# The client ID configured in dex.
--oidc-client-id=kubernetes

# CA cert to verify Dex’s serving cert
--oidc-ca-file=/etc/kubernetes/ssl/dex-ca.pem

# The claim field to identify users
--oidc-username-claim=email

# The claim field to identify user’s group membership
--oidc-groups-claim=groups
```

CONFIGURE KUBECTL

```
users:
- name: my.email@my.domain.com
  user:
    auth-provider:
      config:
        client-id: kubernetes
        client-secret: <INSERT_CLIENT_SECRET_HERE>
        id-token: <GO_FETCH_YOURSELF_AN_ID_TOKEN>
        idp-issuer-url: https://auth.domain.com/dex
        refresh-token: <YOU’LL_PROBABLY_WANT_A_REFRESH_TOKEN_TOO>
      name: oidc
```

COREOS/DEX/CMD/EXAMPLE-APP



Token:

```
eyJhbGciOiJSUzI1NiIsImtpZCI6IjZiZjU1YmM0YzIzMDAzZWUwYjI1ZDViNTAxYjIxMzUzMWE0NGVjNTIifQ.eyJpc3MiOiJodHRwczovL2F1dGgucHVzaGVycGxhdGZvcm0ua
W8vZGV4Iiwic3ViIjoiQ2hVeE1EazBNekEyTWpRd05UY3dORGMzTURFNE1Ua1NCbWR2YjJkc1pRIiwiYXVkIjoia3ViZXJuZXRlcyIsImV4cCI6MTUyNzg0MjE5MiwiaWF0IjoxN
TI3ODM4NTkyLCJhdF9oYXNoIjoiVEg0dzNwWnF1TmhDZ0pNQXlFTlg5dyIsImVtYWlsIjoiam9lbC5zcGVlZEBwdXNoZXIuY29tIiwiZW1haWxfdmVyaWZpZWQiOnRydWUsImdyb
3VwcyI6WyJhbGVydHNAcHVzaGVyLmNvbSIsImVsZW1lbnRzQHB1c2hlci5jb20iLCJlbmdpbmVlcmluZ0BwdXNoZXIuY29tIl0sIm5hbWUiOiJKb2VsIFNwZWVkIn0.na6xE1eWw
2qN9zOf_syTWMs85B-rvo6piAc1Bj6Z-
```

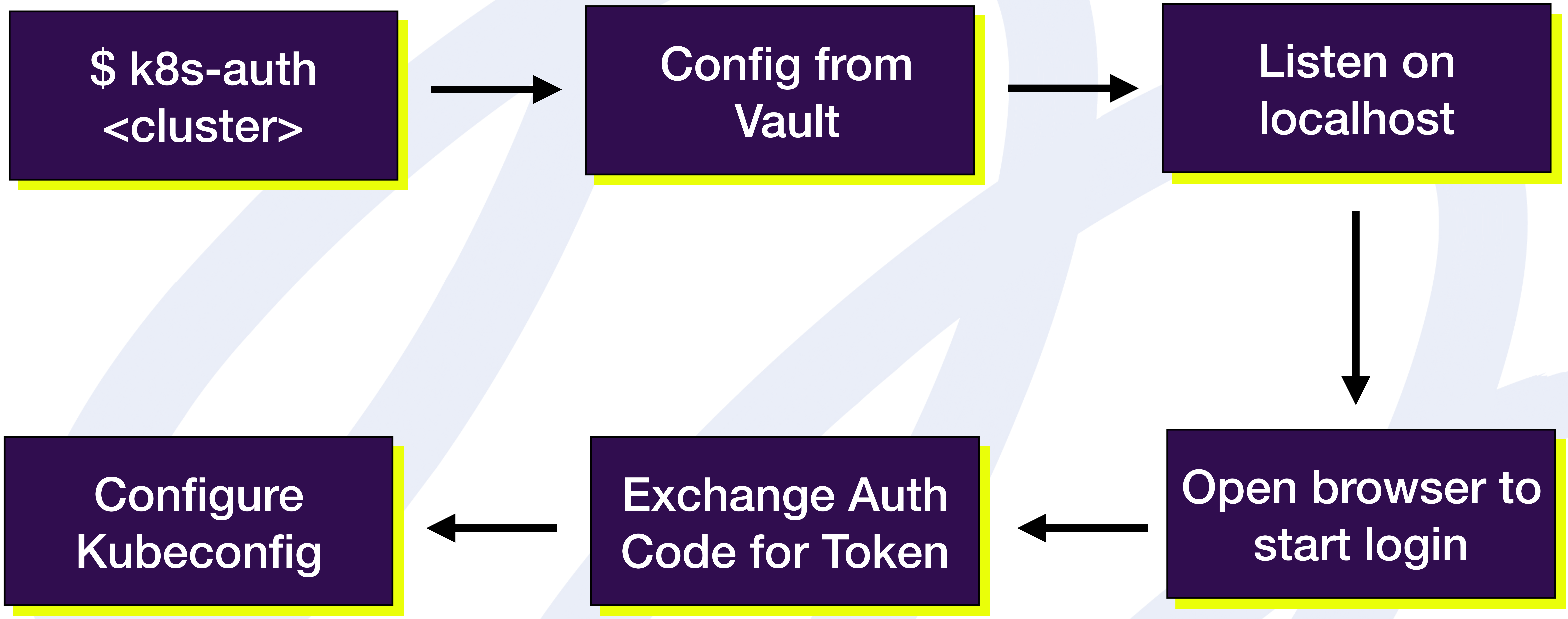
Claims:

```
{
  "iss": "https://auth.exampledomain.com/dex",
  "sub": "ChUxMDk0MzA2MjQwNTcwNDc3MDE4MTkSBmdvb2dsZQ",
  "aud": "kubernetes",
  "exp": 1527842192,
  "iat": 1527838592,
  "at_hash": "TH4w3pZquNhCgJMAyENX9w",
  "email": "joel.speed@pusher.com",
  "email_verified": true,
  "groups": [
    " group @pusher.com",
    " another @pusher.com",
    " andanother @pusher.com"
  ],
  "name": "Joel Speed"
}
```

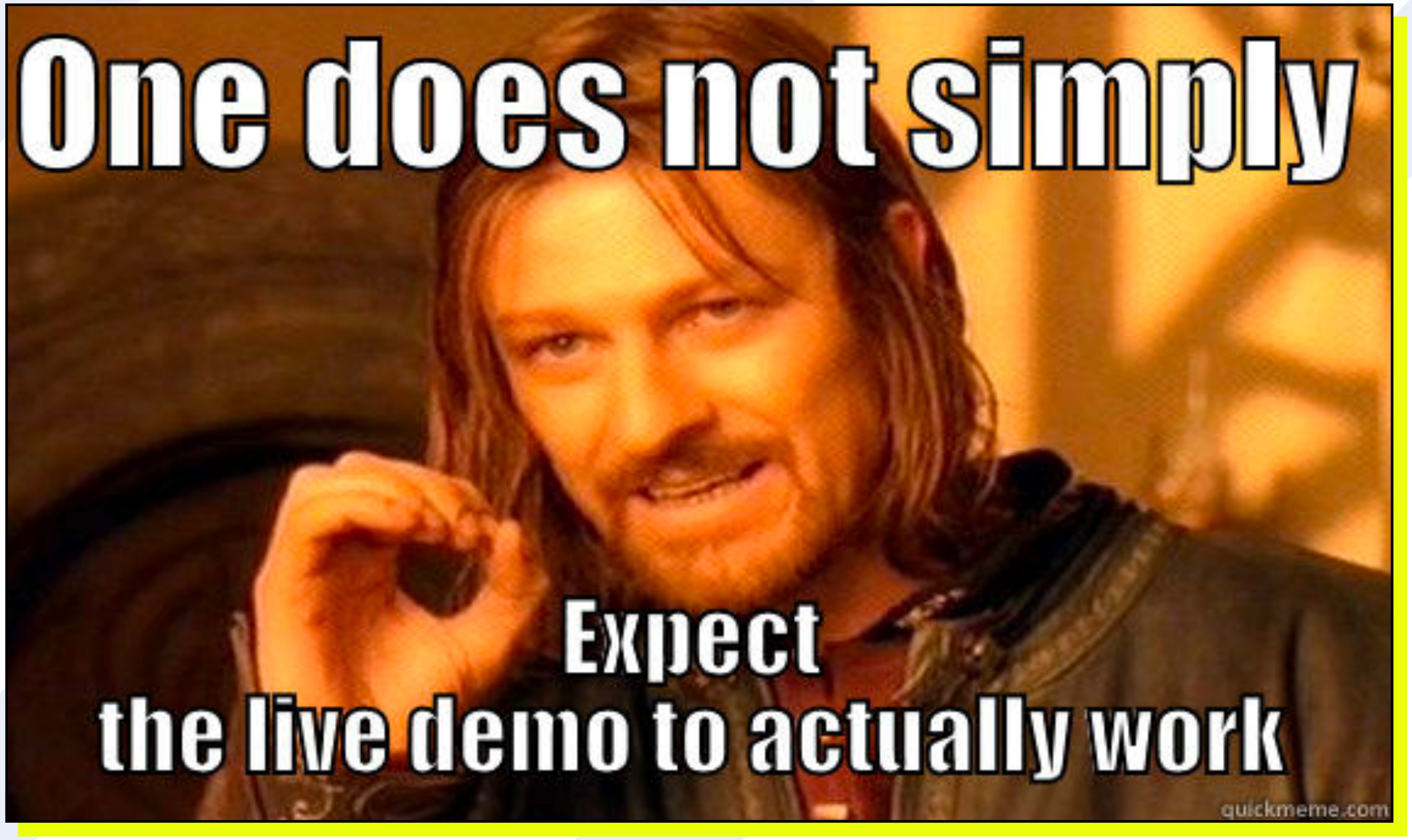
Refresh Token:

```
ChlwcW1jenFjY2hwd21hd3
```

K8S-AUTH

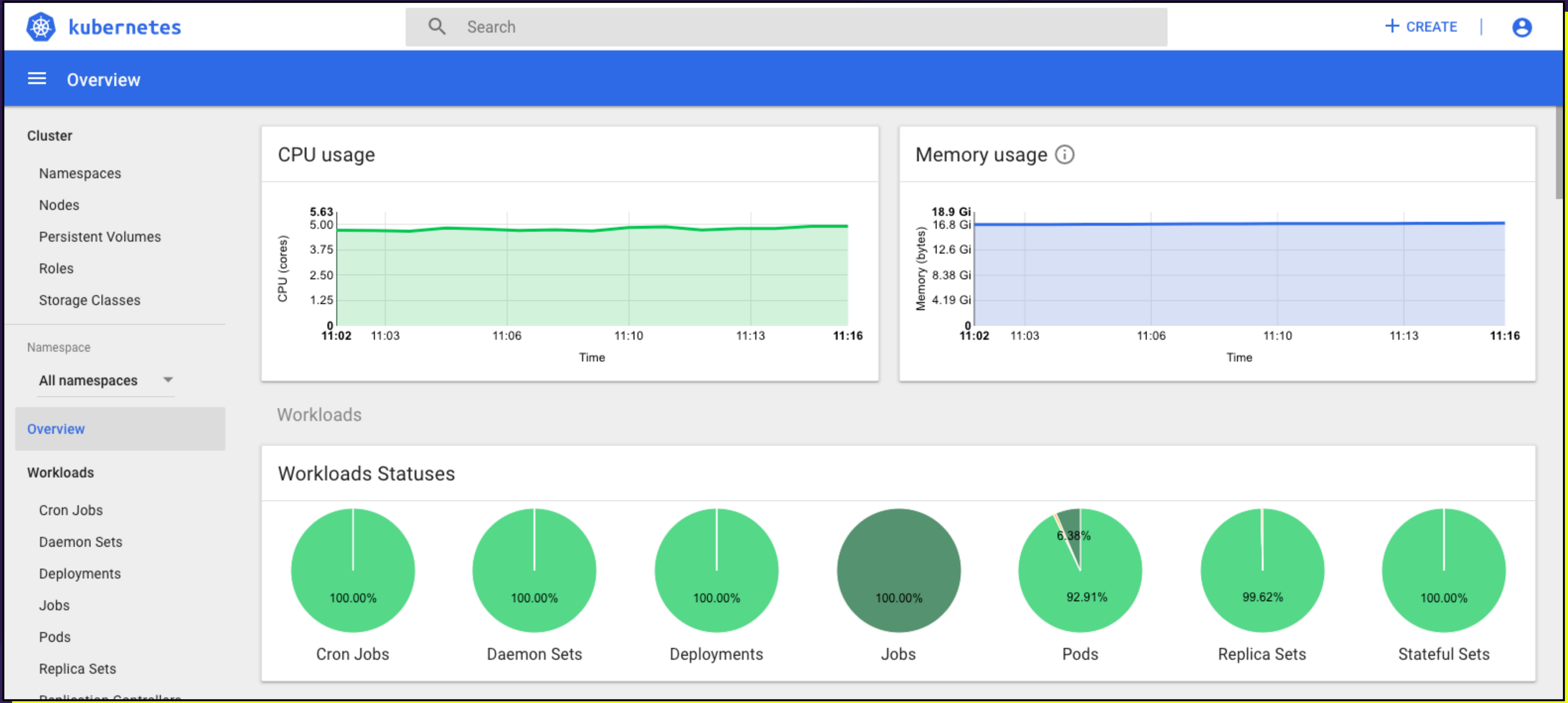

$ k8s-auth <cluster>
Config from Vault
Listen on localhost
Open browser to start login
Exchange Auth Code for Token
Configure Kubeconfig

DEMO

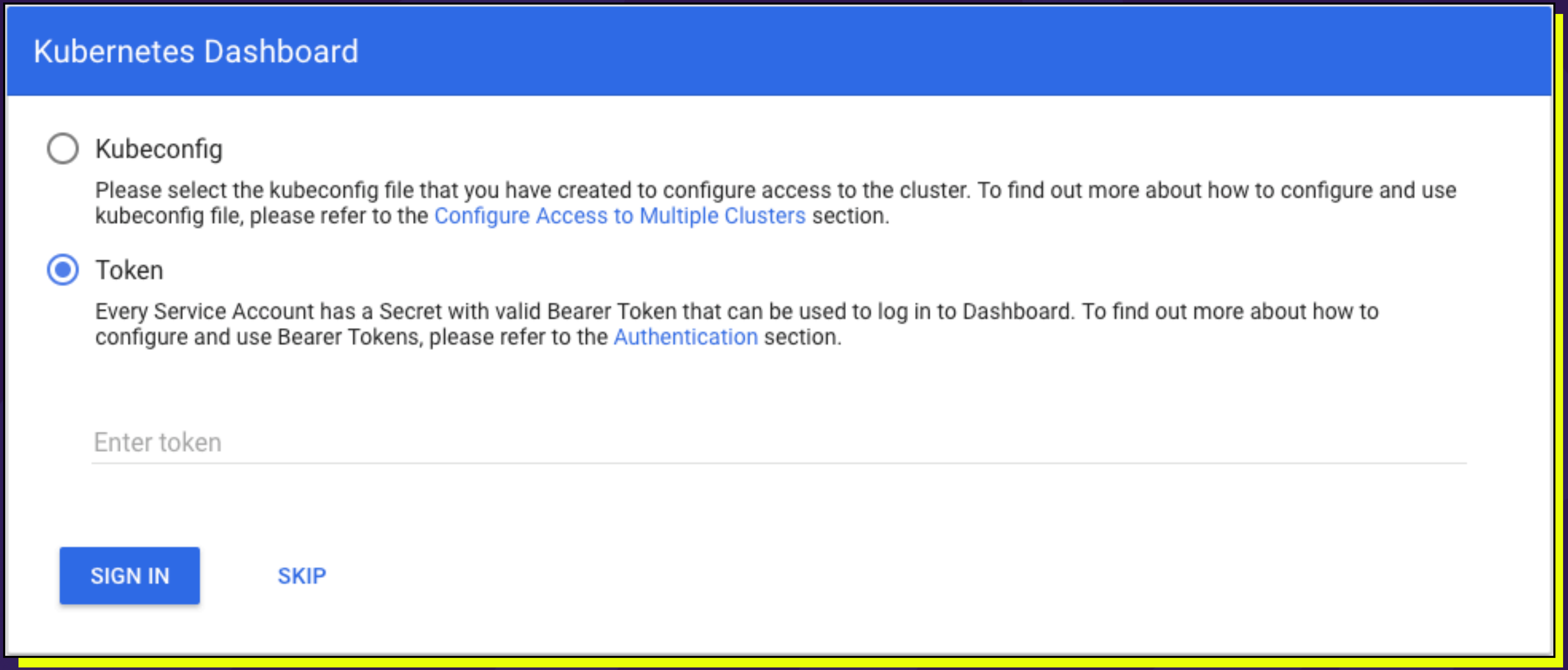

One does not simply
Expect
the live demo to actually work
quickmeme.com

GITHUB.COM/PUSHER/K8S-AUTH-EXAMPLE

KUBERNETES DASHBOARD



LOGIN



Kubernetes Dashboard

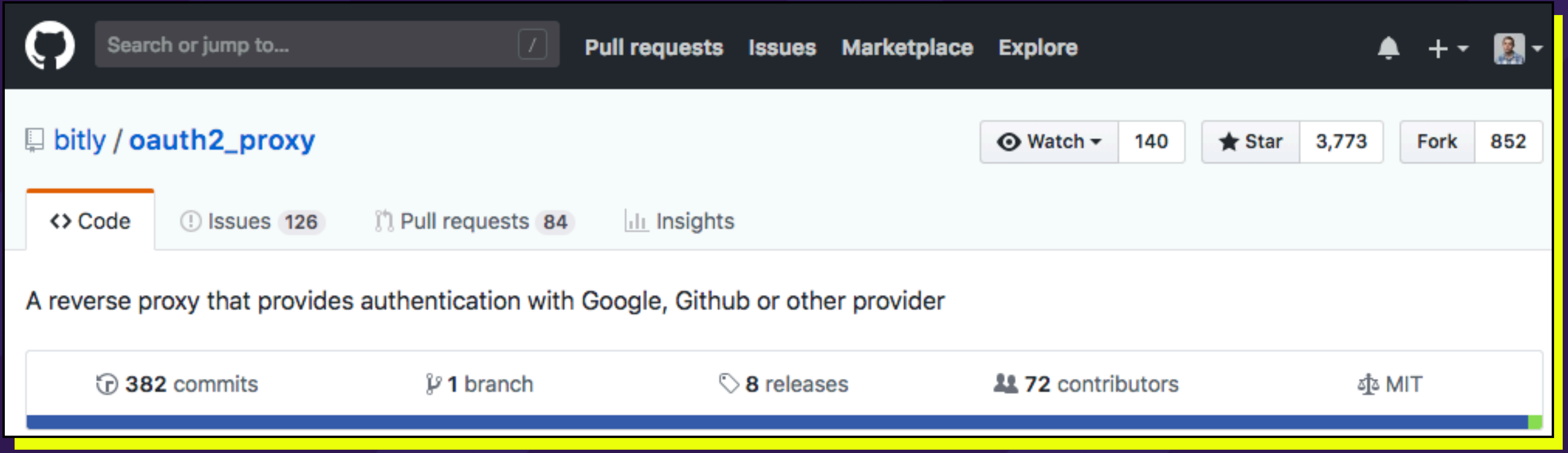
( ) Kubeconfig

Please select the kubeconfig file that you have created to configure access to the cluster. To find out more about how to configure and use kubeconfig file, please refer to the Configure Access to Multiple Clusters section.

(●) Token

Every Service Account has a Secret with valid Bearer Token that can be used to log in to Dashboard. To find out more about how to configure and use Bearer Tokens, please refer to the Authentication section.

BITLY OAUTH2 PROXY



Search or jump to... Pull requests Issues Marketplace Explore

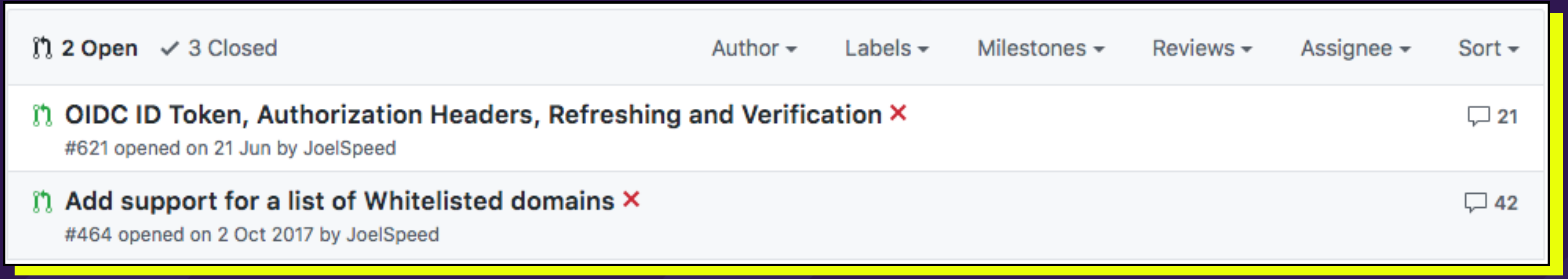
bitly / oauth2_proxy

Watch 140 Star 3,773 Fork 852

Code Issues 126 Pull requests 84 Insights

A reverse proxy that provides authentication with Google, Github or other provider

382 commits 1 branch 8 releases 72 contributors MIT



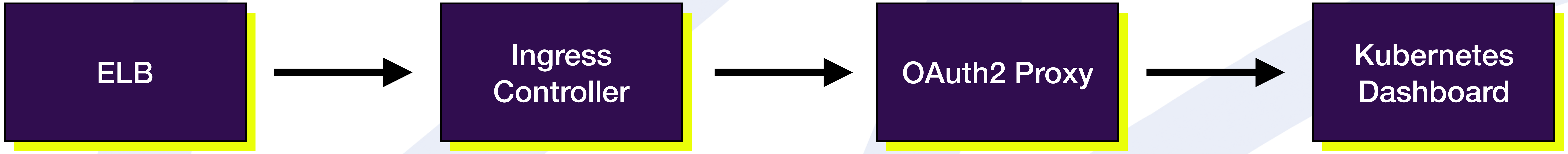
2 Open ✓ 3 Closed Author Labels Milestones Reviews Assignee Sort

OIDC ID Token, Authorization Headers, Refreshing and Verification ✗ 21
#621 opened on 21 Jun by JoelSpeed

Add support for a list of Whitelisted domains ✗ 42
#464 opened on 2 Oct 2017 by JoelSpeed

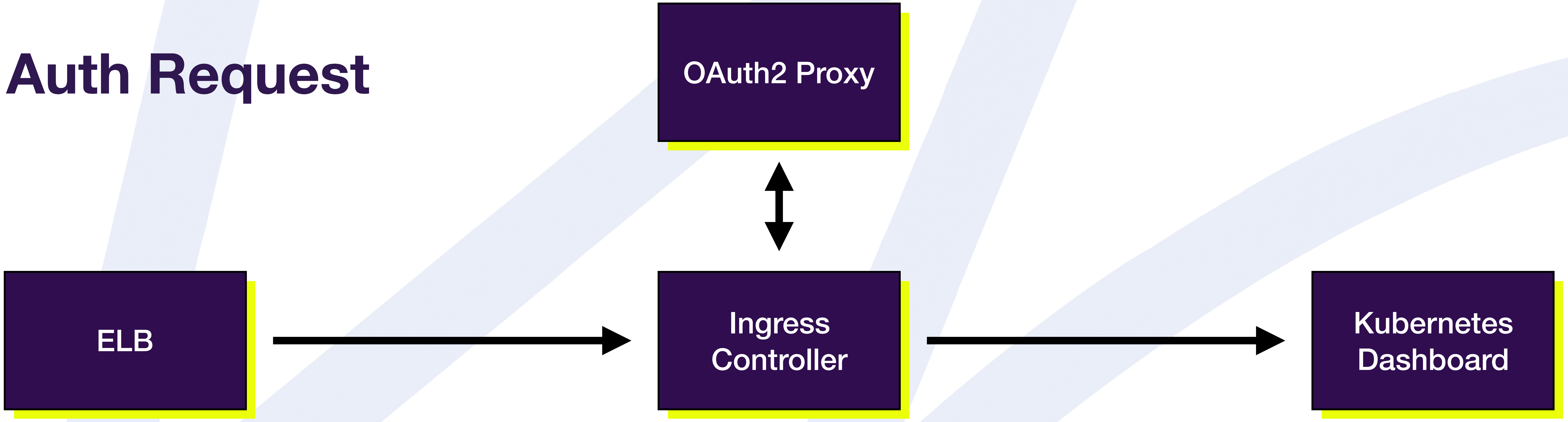
UPSTREAM VS AUTH REQUEST

Upstream



UPSTREAM VS AUTH REQUEST

Auth Request



NGINX CONFIG SNIPPET

```
# Configure Nginx Auth Request Module
ingress.kubernetes.io/auth-url: "https://auth.example.com/oauth2/auth"
ingress.kubernetes.io/auth-signin: "https://auth.example.com/oauth2/start?
                                    rd=https://$host$request_uri$is_args$args"

# Proxy Authentication header to Dashboard
# adds authorization header for kubernetes-dashboard
ingress.kubernetes.io/configuration-snippet: |
 auth_request_set $token $upstream_http_authorization;
 proxy_set_header Authorization $token;
```

DEMO

WHAT HAVE WE ACHIEVED?

Individual user accounts

Group management

Short lived tokens

Scalable

UX

WE'RE HIRING!

pusher.com/careers

Dex

https://github.com/coreos/dex
PR #1180: Token Refresh for Google
PR #1185: Fetch Groups from Google

Pusher

@Pusher
pusher.com
https://github.com/pusher/k8s-auth-example

OAuth2 Proxy

https://github.com/bitly/oauth2_proxy
PR #464: Whitelist redirect domains
PR #621: Authorization headers, Refreshing

Me

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