

# OAuth and OpenID Connect

(IN PLAIN ENGLISH)

MICAH SILVERMAN  
@AFITNERD  
@OKTADEV

# NATE BARBETTINI

@NBARBETTINI  
@OKTADEV



# Identity use cases (circa 2007)

- Simple login – forms and cookies
- Single sign-on across sites – SAML
- Mobile app login – ???
- Delegated authorization – ???

# Don't do it this way!

**Are your friends already on Yelp?**

Many of your friends may already be here, now you can find out. Just log in and we'll display all your contacts, and you can select which ones to invite! And don't worry, we don't keep your email password or your friends' addresses. We loathe spam, too.

Your Email Service

 Hotmail   YAHOO! MAIL   AOL Mail   Gmail

Your Email Address  (e.g. bob@gmail.com)

Your Gmail Password  (The password you use to log into your Gmail email)

[Skip this step](#)

# Don't do it this way!

The screenshot shows a three-step wizard for finding friends on Facebook:

- Step 1 Find Friends**: Shows a Gmail sign-in form with fields for 'Your Email:' and 'Email Password:', and a 'Find Friends' button.
- Step 2 Profile Information**: Not visible in the screenshot.
- Step 3 Profile Picture**: Not visible in the screenshot.

**Are your friends already on Facebook?**

Many of your friends may already be here. Searching your email account is the fastest way to find your friends on Facebook.

**Gmail**

Your Email:

Email Password:

**Find Friends**

Facebook will not store your password.

---

**Y! Yahoo!** [Find Friends](#)

---

**Windows Live Hotmail** [Find Friends](#)

---

**Other Email Service** [Find Friends](#)

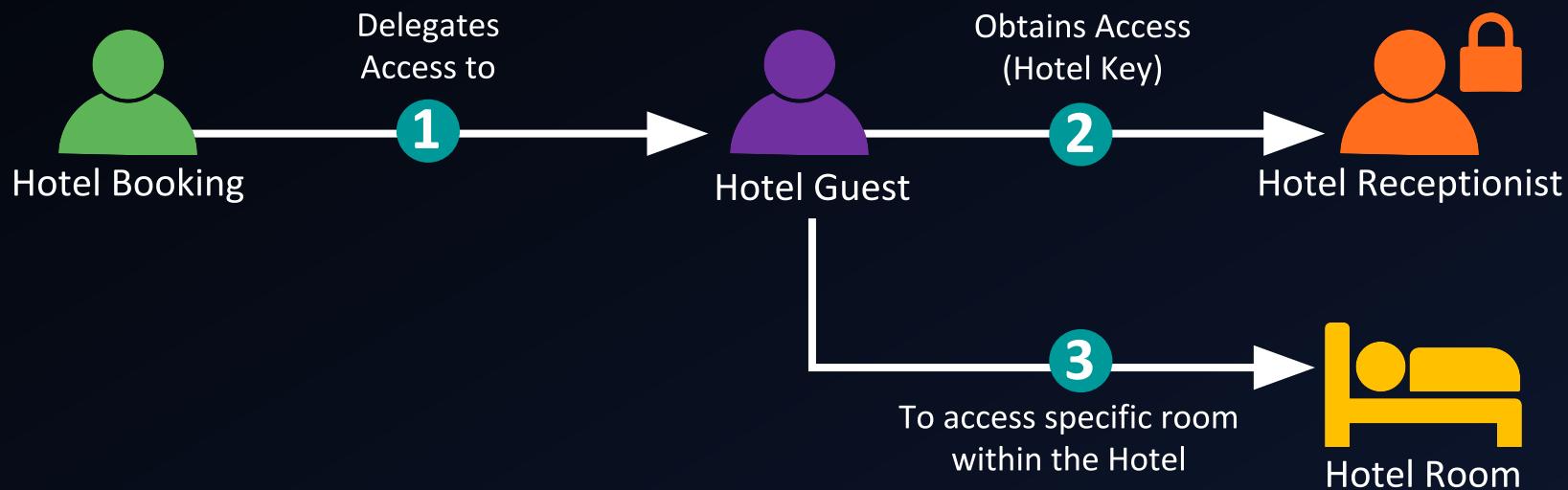
# The delegated authorization problem

HOW CAN I LET A WEBSITE ACCESS MY DATA  
(WITHOUT GIVING IT MY PASSWORD)?

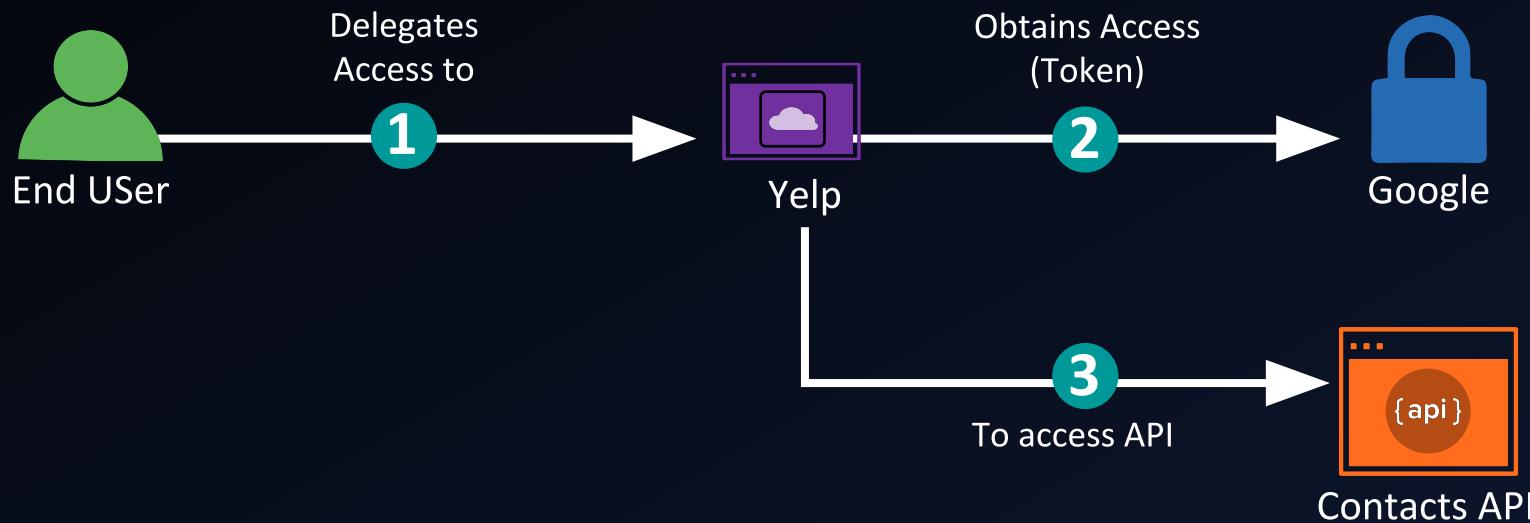
# A lot of confusion around OAuth & OIDC

- ✗ Terminology and jargon
- ✗ Incorrect advice
- ✗ To understand OpenID Connect, you need to learn first about OAuth
- ✗ Hard to find a life-like example

# Hotel Analogy



# OAuth: App Scenario



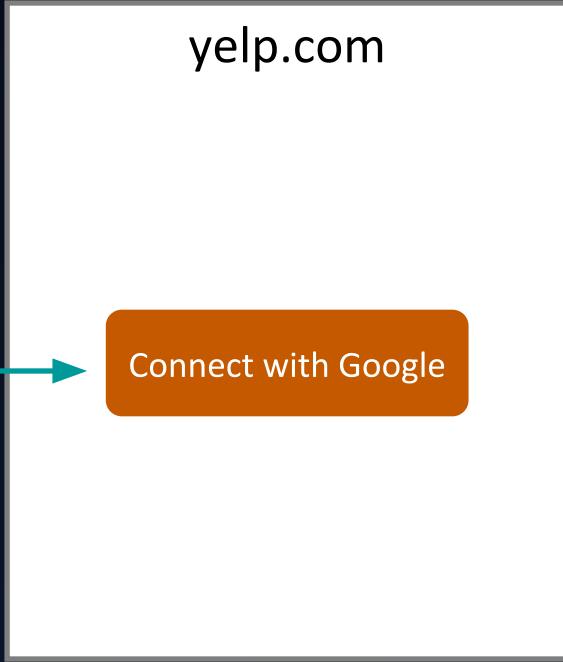
# OAuth 2.0 Terminology

Hotel	App	OAuth	Description
Hotel Booking	End User	Resource Owner	Wants a Client App to do something on their behalf
Hotel Guest	Yelp	Client Application	Needs authorization to interact with an API on behalf of a user
Hotel Receptionist	Google	Authorization Server	Grants access (in the form of tokens) to an app
Hotel Room	Contacts API	Resource Server	Has an API that an app can use if presented with a token

# Delegated authorization with OAuth 2.0



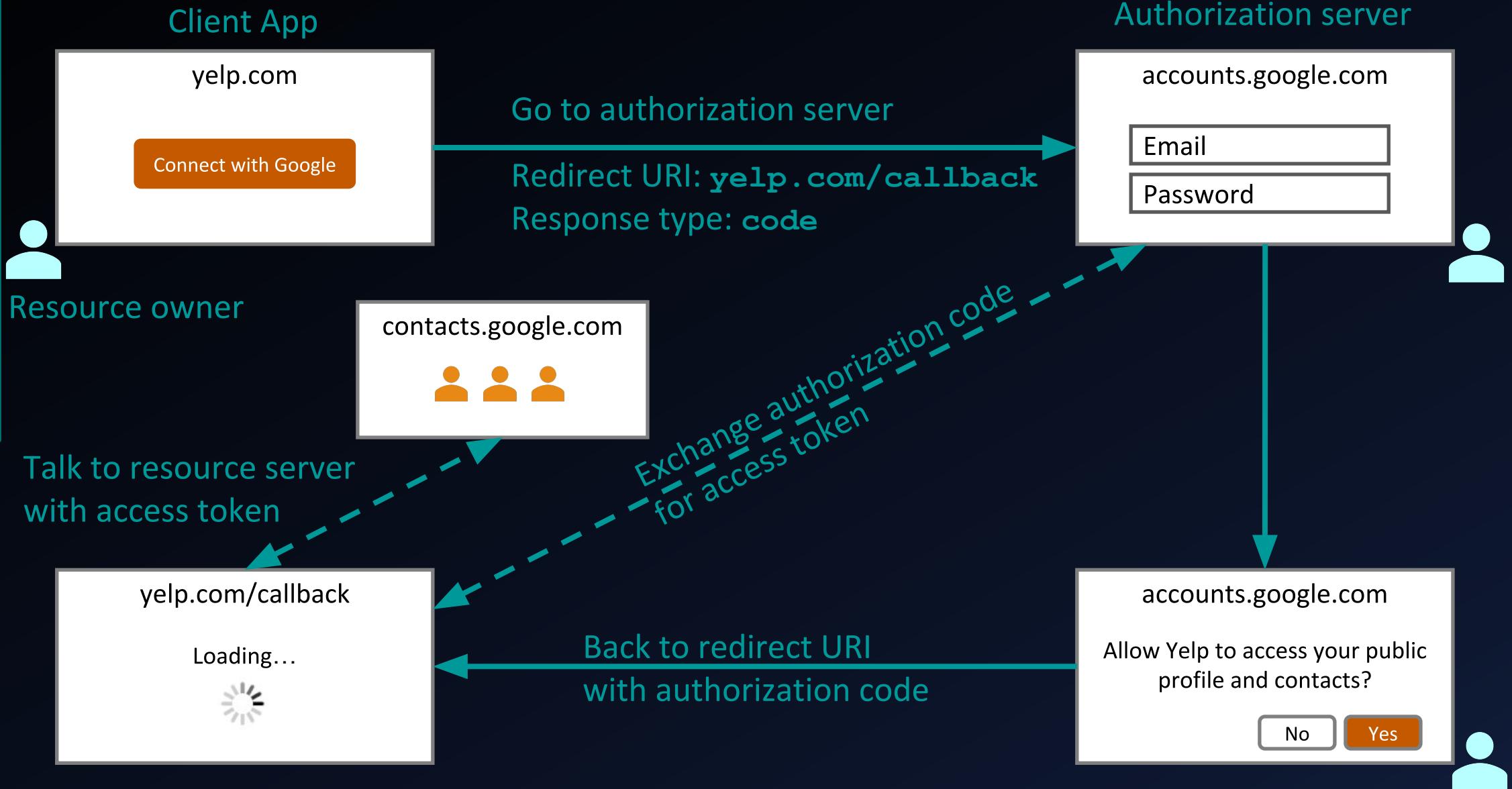
I trust Gmail and I kind of trust Yelp. I want Yelp to have access to my contacts only.



yelp.com

Connect with Google

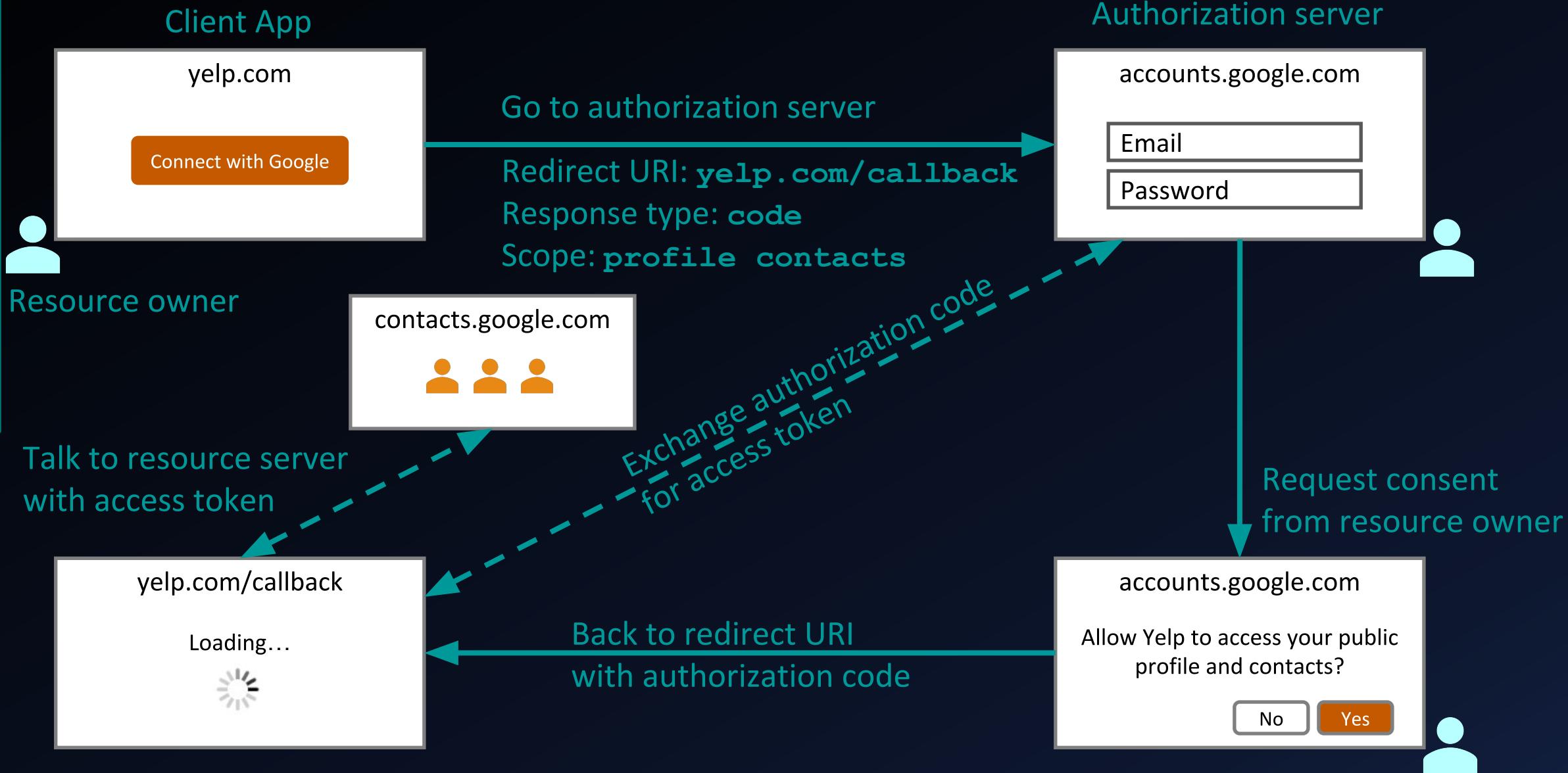
# OAuth 2.0 authorization code flow



# More OAuth 2.0 terminology

- Scope
- Consent

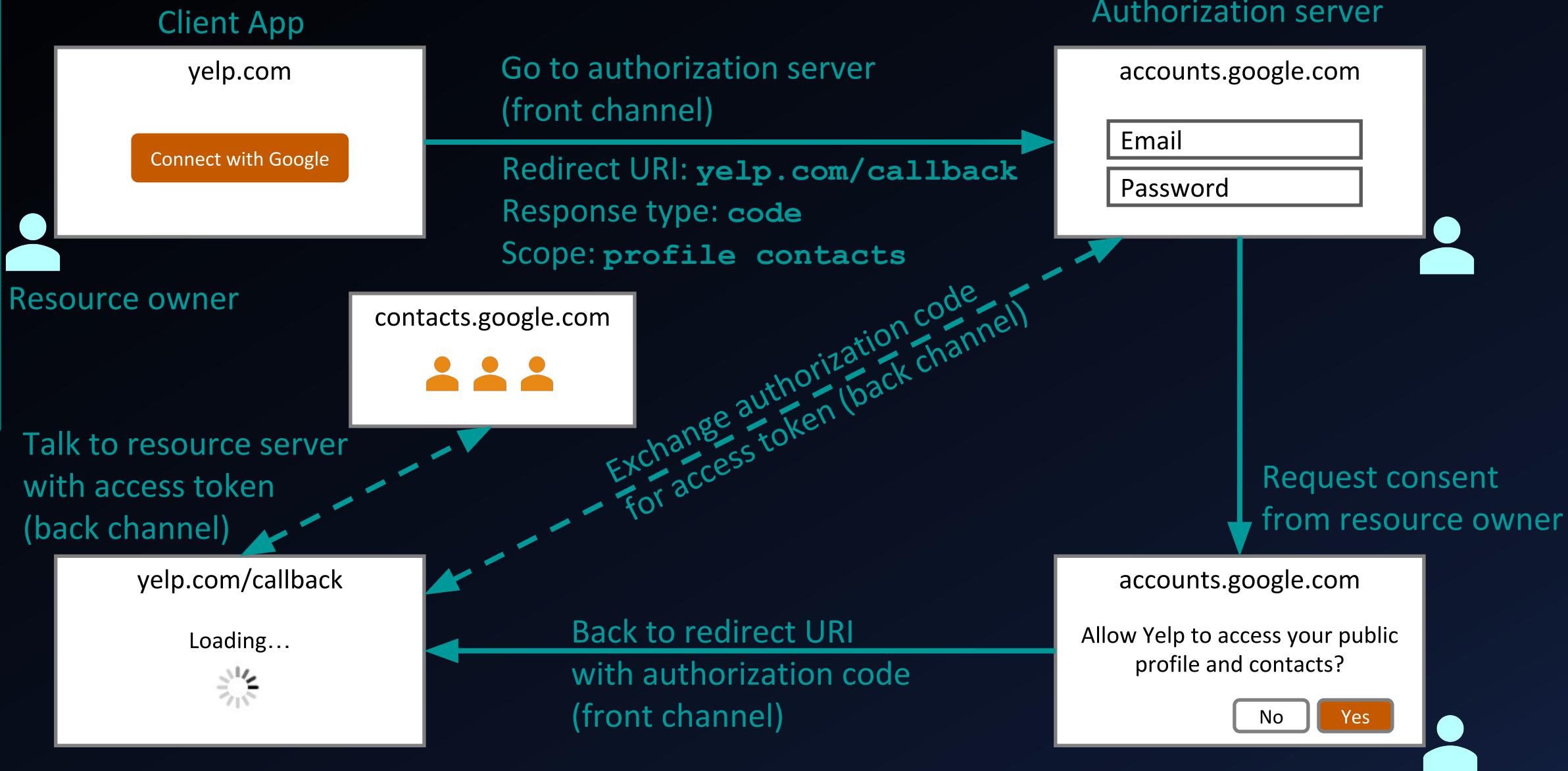
# OAuth 2.0 authorization code flow



# Even more OAuth 2.0 terminology

- Back channel (highly secure channel)
- Front channel (less secure channel)

# OAuth 2.0 authorization code flow



# Starting the flow

```
https://accounts.google.com/o/oauth2/v2/auth?  
client_id=abc123&  
redirect_uri=https://yelp.com/callback&  
scope=profile&  
response_type=code&  
state=foobar
```

# Calling back

```
https://yelp.com/callback?  
error=access_denied&  
error_description=The user did not consent.
```

```
https://yelp.com/callback?  
code=oMsCeLvIaQm6bTrgtp7&  
state=foobar
```

# Exchange code for an access token

```
POST www.googleapis.com/oauth2/v4/token  
Content-Type: application/x-www-form-urlencoded  
  
code=oMsCeLvIaQm6bTrgtp7 &  
client_id=abc123 &  
client_secret=secret123 &  
grant_type=authorization_code
```

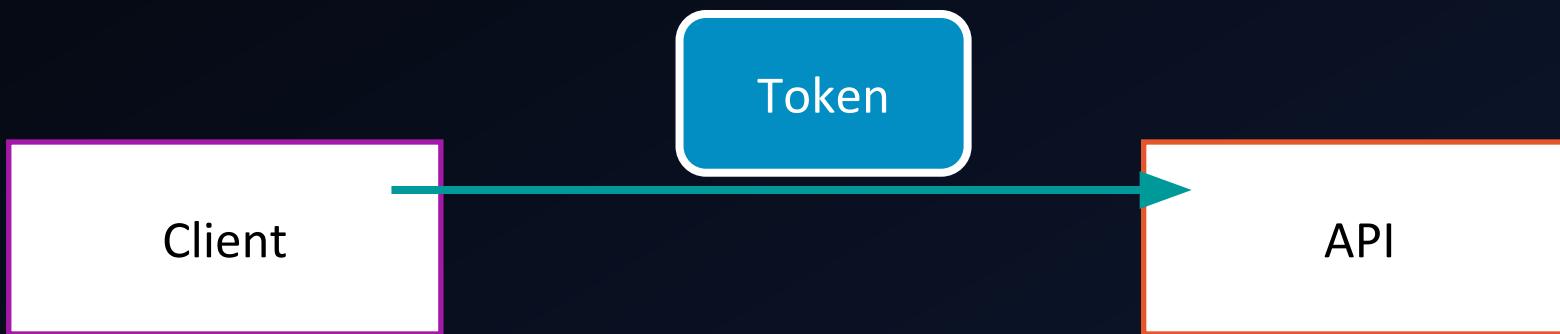
# Authorization server returns an access token

```
{  
  "access_token": "fFAGRNJru1FTz70BzhT3Zg",  
  "expires_in": 3920,  
  "token_type": "Bearer",  
}
```

# Use the access token

GET api.google.com/some/endpoint

Authorization: Bearer **ffAGRNJru1FTz70BzhT3Zg**



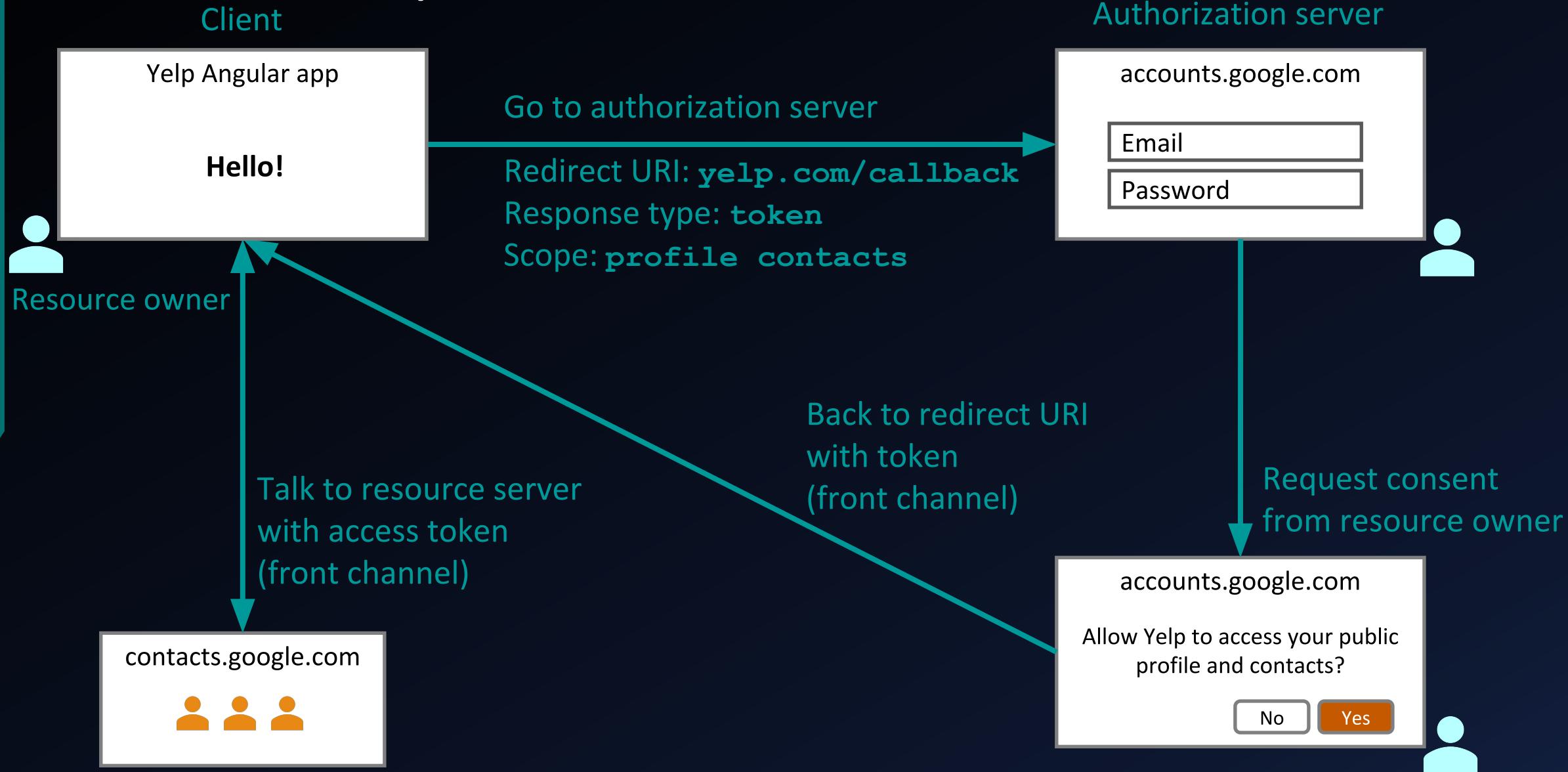
- Validate token
- Use token scope for authorization



# OAuth 2.0 flows

- Authorization code (front channel + back channel)
- Authorization code w/ PKCE (front channel + back channel)\*
- Implicit (front channel only)
- Resource owner password (back channel only)
- Client credentials (back channel only)

# OAuth 2.0 implicit flow



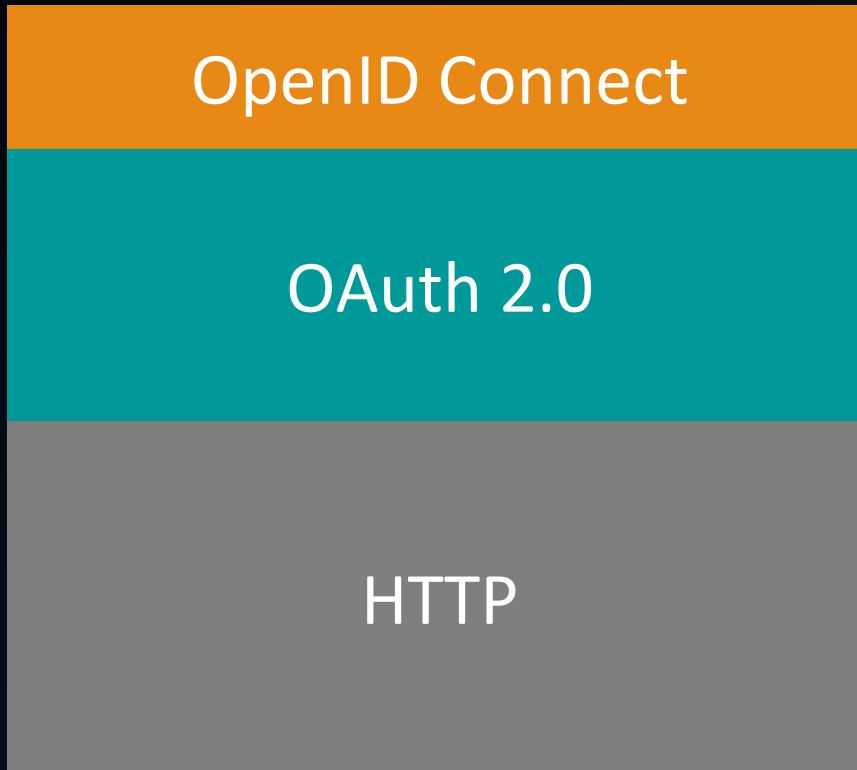
# Identity use cases (circa 2012)

- Simple login – OAuth 2.0 Authentication
- Single sign-on across sites – OAuth 2.0 Authentication
- Mobile app login – OAuth 2.0 Authentication
- Delegated authorization – OAuth 2.0 Authorization

# Problems with OAuth 2.0 for authentication

- No standard way to get the user's information
- Every implementation is a little different
- No common set of scopes

# OAuth 2.0 and OpenID Connect

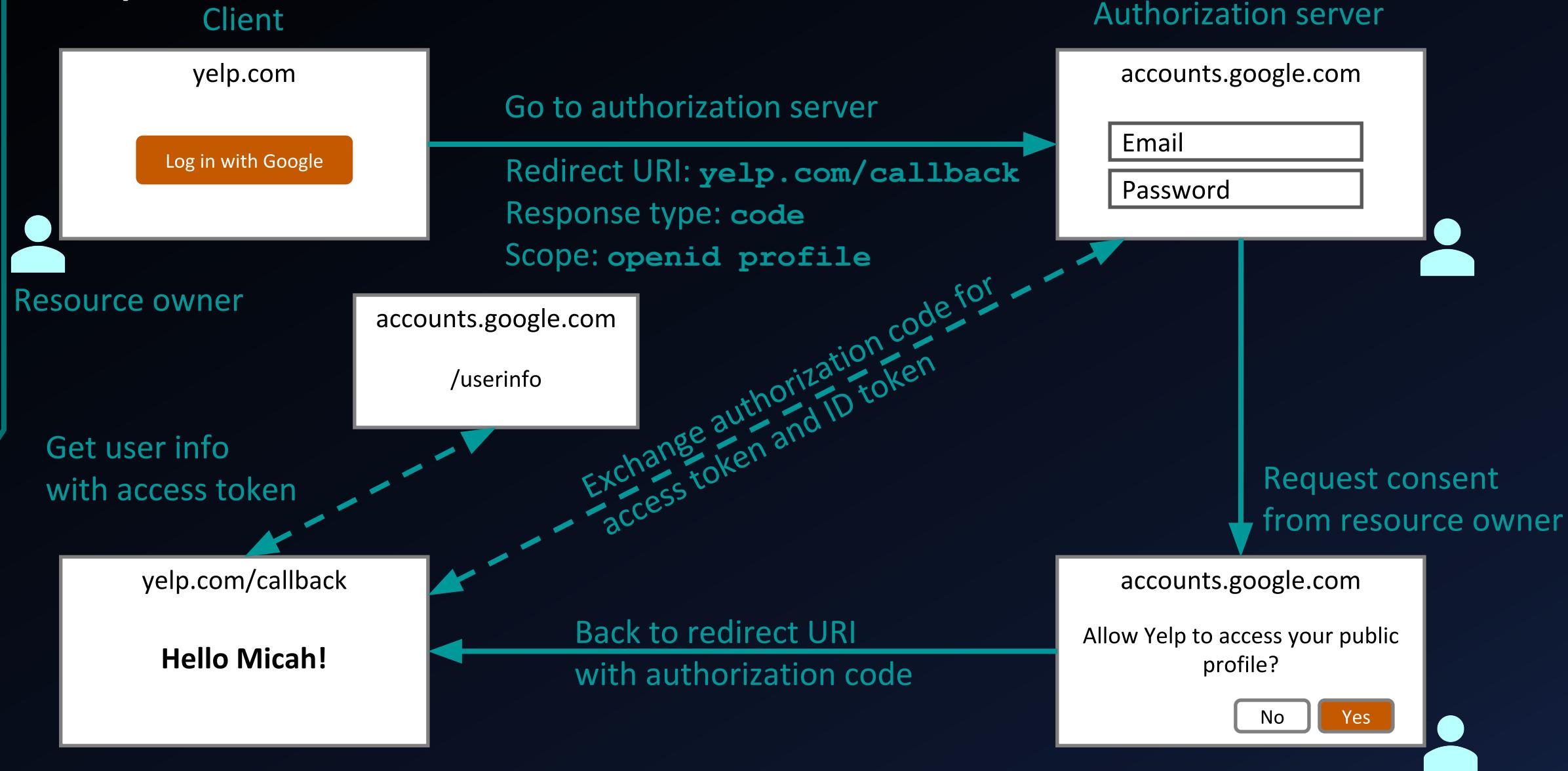


- OpenID Connect is for **authentication**
- OAuth 2.0 is for **authorization**

# What OpenID Connect adds

- ID token
- /userinfo endpoint for getting more user information
- Standard set of scopes
- Standardized implementation

# OpenID Connect authorization code flow



# Getting the discovery document

```
GET https://accounts.google.com/.well-known/openid-configuration
```

```
{
  "issuer": "https://accounts.google.com",
  "authorization_endpoint": "https://accounts.google.com/o/oauth2/v2/auth",
  "token_endpoint": "https://www.googleapis.com/oauth2/v4/token",
  "userinfo_endpoint": "https://www.googleapis.com/oauth2/v3 userinfo",
  "response_types_supported": [
    "code",
    "token",
    "id_token",
    "code token",
  ],
  ...
}
```

# Starting the flow

```
https://accounts.google.com/o/oauth2/v2/auth?  
client_id=abc123&  
redirect_uri=https://yelp.com/callback&  
scope=openid profile&  
response_type=code&  
state=foobar
```

# Calling back

```
https://yelp.com/callback?  
error=access_denied&  
error_description=The user did not consent.
```

```
https://yelp.com/callback?  
code=oMsCeLvIaQm6bTrgtp7&  
state=foobar
```

# Exchange code for access token and ID token

```
POST www.googleapis.com/oauth2/v4/token  
Content-Type: application/x-www-form-urlencoded  
  
code=oMsCeLvIaQm6bTrgtp7&  
client_id=abc123&  
client_secret=secret123&  
grant_type=authorization_code
```

# Authorization server returns access and ID tokens

```
{  
  "access_token": "fFAGRNJru1FTz70BzhT3Zg",  
  "id_token": "eyJraB03ds3F...",  
  "expires_in": 3920,  
  "token_type": "Bearer",  
}
```

# ID token (JWT)

eyJhbGciOiJSUzI1NiIsImtpZCI6IkRNA3Itd0JqRU1EYnh0Y25xaVJISVhu  
YUxubWI3UUUpfWF9rWmJyaEtBMGMifQ

.

eyJzdWIiOiIwMHU5bzFuawtqdk9CZzVabzBoNyIsInZlcI6MSwiaXNzIjoi  
aHR0cHM6Ly9kZXytMzQxNjA3Lm9rdGFwcmV2aWV3LmNvbS9vYXV0aDIVYXVz  
OW84d3ZraG9ja3c5VEwwaDciLCJhdWQiOiJsWFN1bkx4eFBpOGtRVmpKRTVz  
NCIsImIhdCI6MTUwOTA00Tg50CwiZXhwIjoxNTA5MDUzNDk4LCJqdGkiOijJ  
RC5oa2RXSXNBSXZTbnBGYVFHTVRUYGNVSmhhMkgwS2c5Yk13ZEVvVm1ZZHN3  
IiwiYW1yIjpbImtiYSIsIm1mYSIsInB3ZCJdLCJpZHAiOiIwMG85bzFuawpr  
aWpLeGNpbjBoNyIsIm5vbmNlIjoidWpwMmFzeHlqN2UiLCJhdXRoX3RpBWUi  
OjE1MDkwNDk3MT19

.

dv4Ek8B4BDee1PcQT\_4zm7kxDEY1sRIGbLoNtlodZcSzHz-XU5GkKy16sAVm  
dXOIPU1AIrJAhNfQwQ-\_XZLBVPjETiZE8CgNg5uqNmeXMUnYnQmvN5oW1XUZ  
8Gcub-GAbJ8-NQuyBmyec1j3gmGzX3wemke8NkuI6SX2L4Wj1PyvkknBtbjf  
iF9ud1-ERKbobaFbnjDFOFTzvL6g34SpMmZWy6uc\_Hs--n4IC-ex- Ps3FcM  
wRggCw\_-7o2Fph6rJTOGPZYr0x44n3ZwAu2dGm6axtPI-sqU8b6sw7DaHpog  
D\_hxsXgMIOzOBMbYsQEiczoGn71ZFz\_107FiW4dH6g

Header

Payload  
(claims)

Signature



# The ID token (JWT)

(Header)

.

{

```
"iss": "https://accounts.google.com",
"sub": "micah.silverman@okta.com",
"name": "Micah Silverman"
"aud": "s6BhdRkqt3",
"exp": 1311281970,
"iat": 1311280970,
"auth_time": 1311280969,
```

}

.

(Signature)

# Calling the userinfo endpoint

```
GET www.googleapis.com/oauth2/v4/userinfo
```

```
Authorization: Bearer ffAGRNJru1FTz70BzhT3Zg
```

```
200 OK
```

```
Content-Type: application/json
```

```
{  
  "sub": "you@gmail.com",  
  "name": "Nate Barbettini"  
  "profile_picture": "http://plus.g.co/123"  
}
```

# Identity use cases (today)

- Simple login – OpenID Connect Authentication
- Single sign-on across sites – OpenID Connect Authentication
- Mobile app login – OpenID Connect Authentication
- Delegated authorization – OAuth 2.0 Authorization

# OAuth and OpenID Connect

Use OAuth 2.0 for:

- Granting access to your API
- Getting access to user data in other systems

(Authorization)

Use OpenID Connect for:

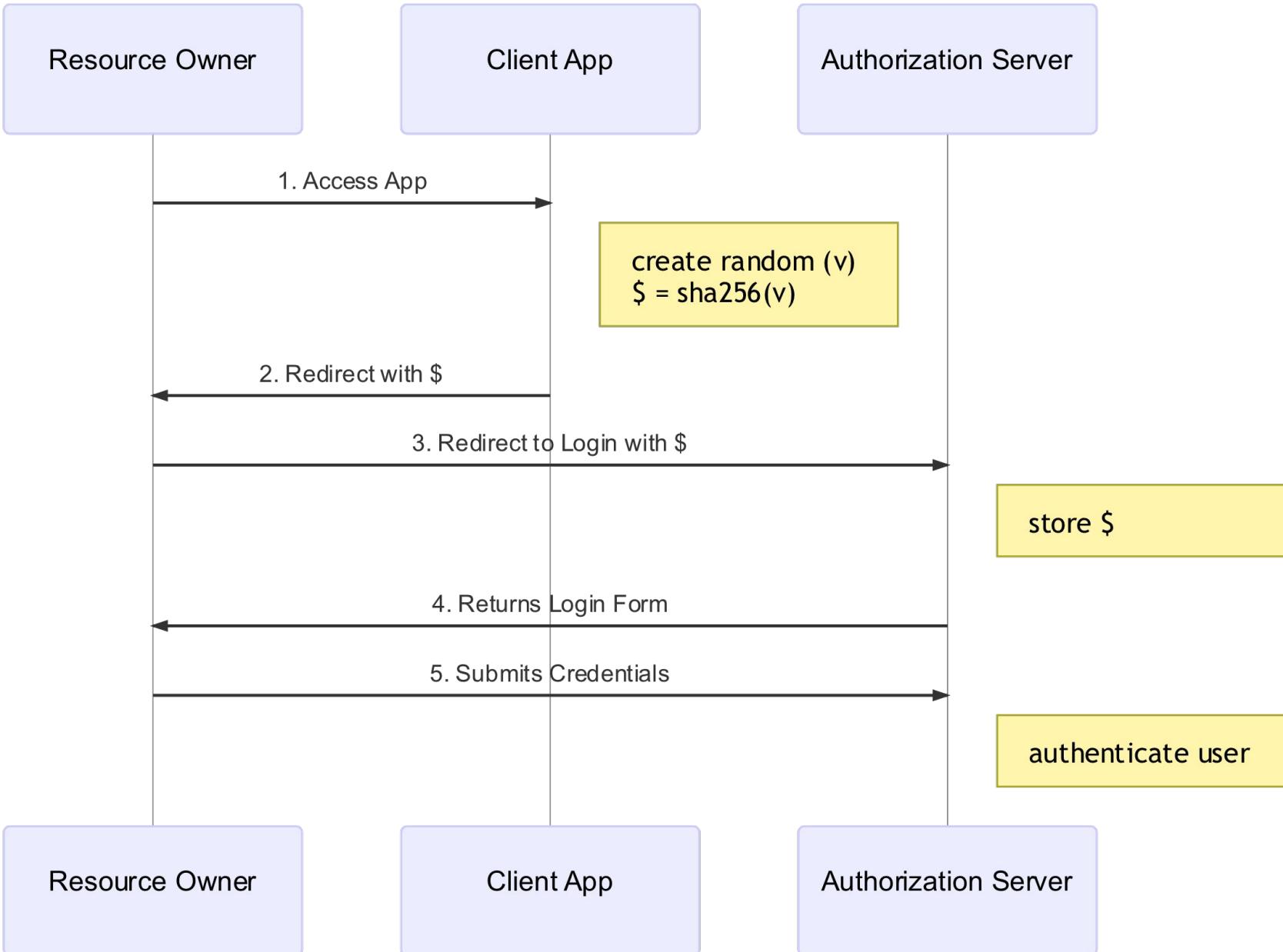
- Logging the user in
- Making your accounts available in other systems

(Authentication)

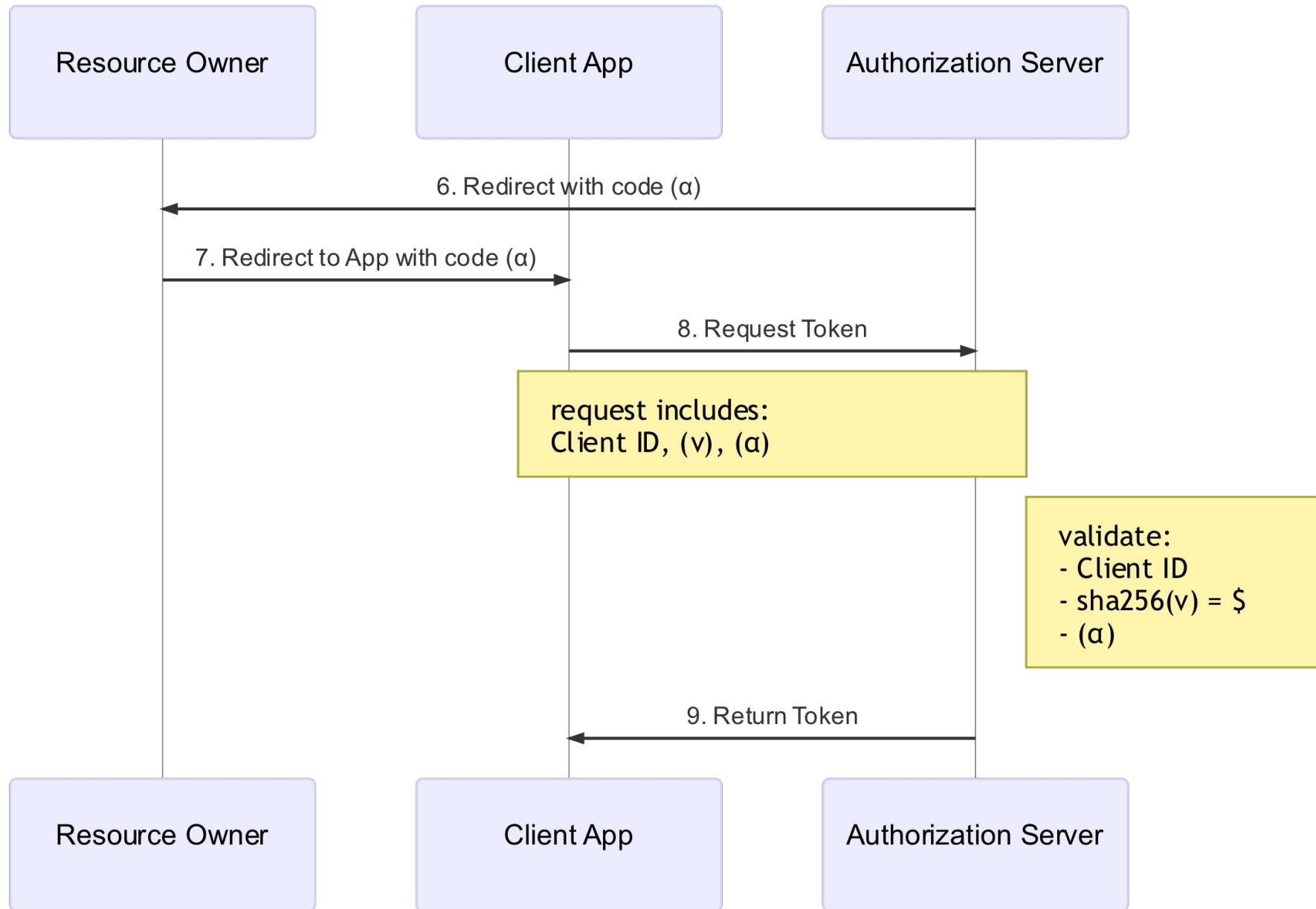
# Which flow (grant type) do I use?

- Web application w/ server backend: **authorization code flow**
- Native or mobile app: **authorization code with PKCE flow**
- JavaScript app (SPA): **authorization code with PKCE flow**
- Microservices and APIs: **client credentials flow**

# Authorization Code with PKCE Flow (Part 1)



# Authorization Code with PKCE Flow (Part 2)



# Token validation

- The fast way: local validation
  - Validate cryptographic signature
  - Check expiration timestamp
- The strong way: introspection

# Thanks y'all!

[github.com/dogearered/music-city-code-2019-oauth-and-oidc](https://github.com/dogearered/music-city-code-2019-oauth-and-oidc)

Micah Silverman  
@afitnerd

[oauth.com](https://oauth.com)  
@oktadev

Free hosted authorization server:  
[developer.okta.com](https://developer.okta.com)

