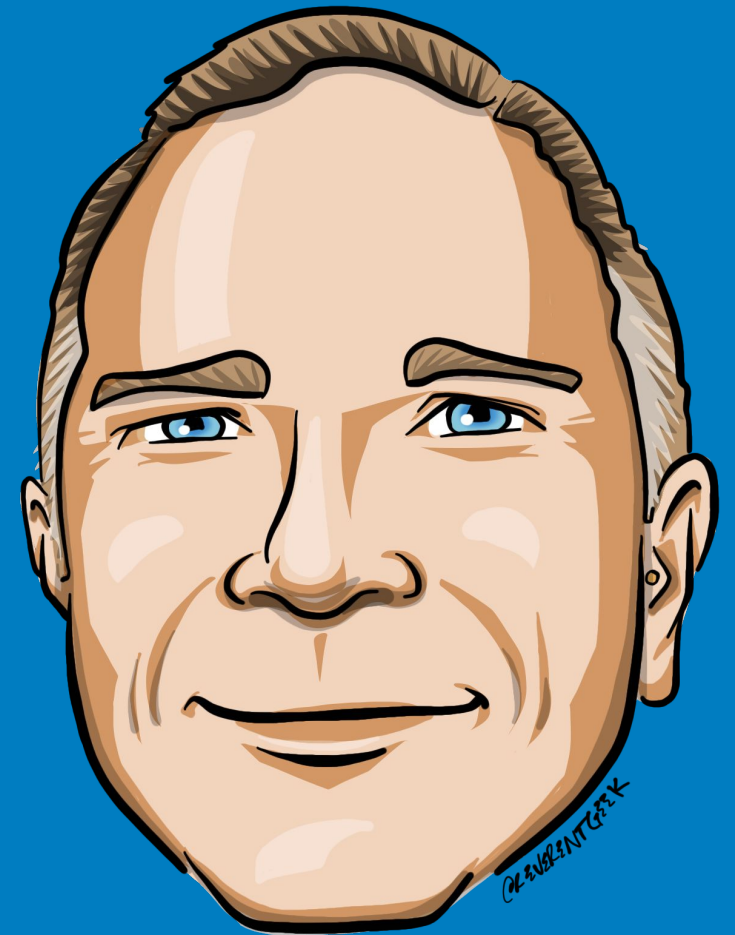


OAuth and OpenID Connect

(IN PLAIN ENGLISH)

MICAH SILVERMAN
@AFITNERD
@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



Your Email Address

(e.g. bob@gmail.com)

Your Gmail Password

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

[Skip this step](#)

Check Contacts

Don't do it this way!


Step 1
Find Friends

Step 2
Profile Information

Step 3
Profile Picture

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.

 Yahoo!

Find Friends

 Windows Live Hotmail

Find Friends

 Other Email Service

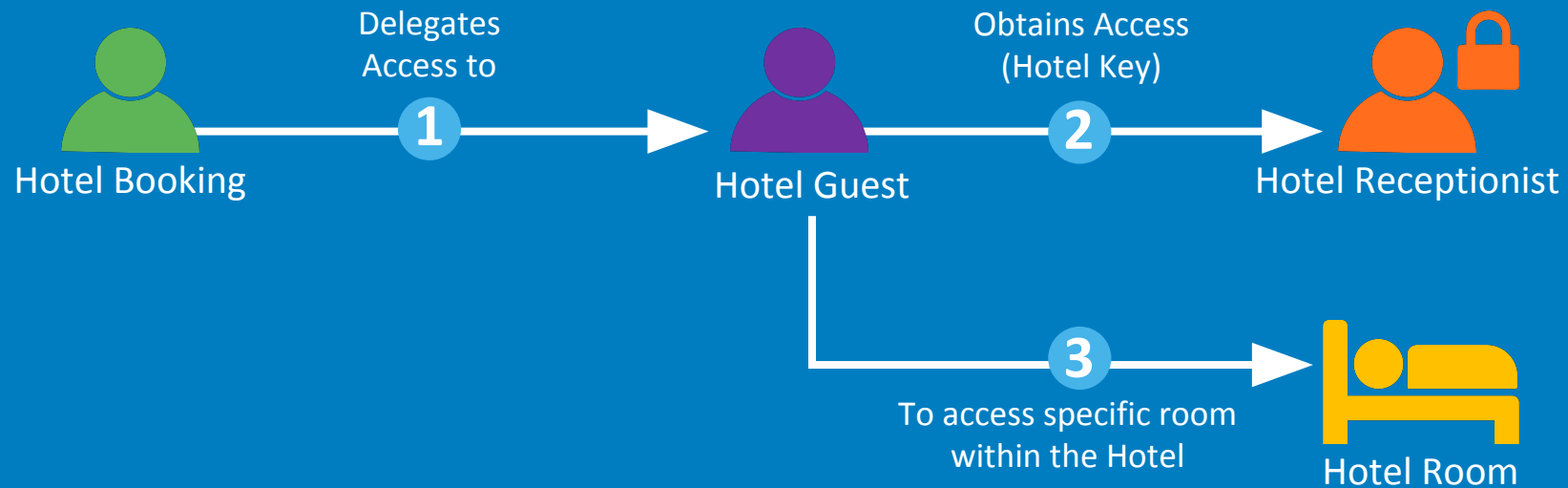
Find Friends

The delegated authorization problem
HOW CAN I LET A WEBSITE ACCESS
MY DATA, WITHOUT GIVING IT MY
PASSWORD?

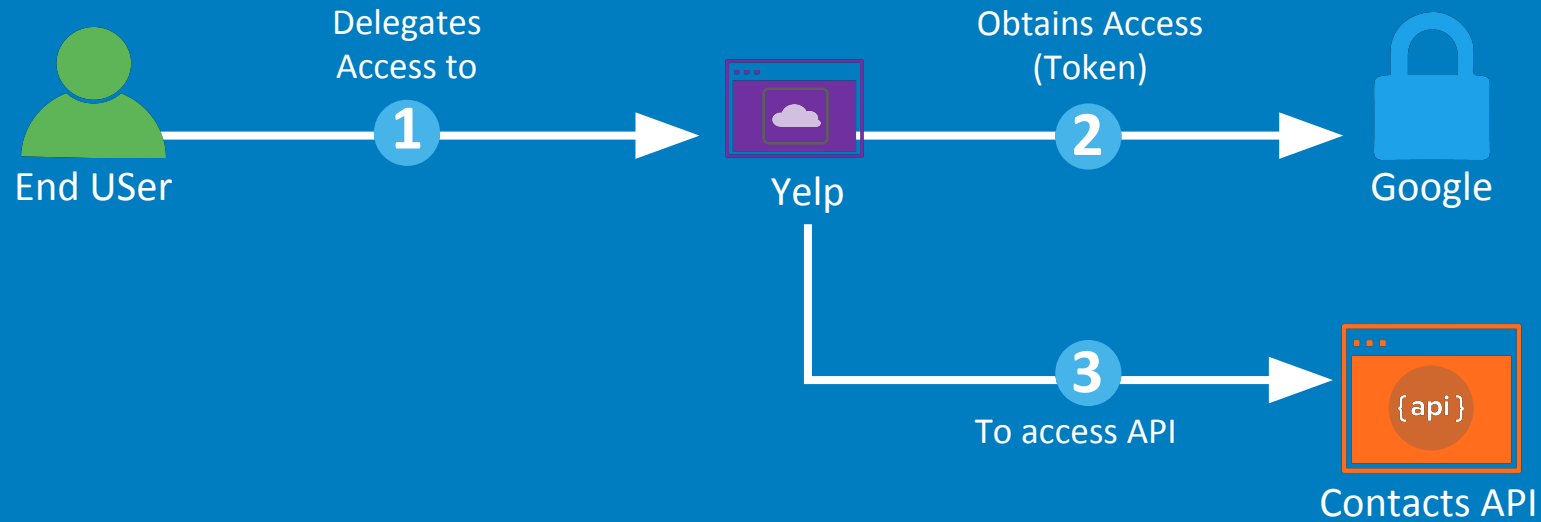
A lot of confusion around OAuth & OIDC

- ✗ 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



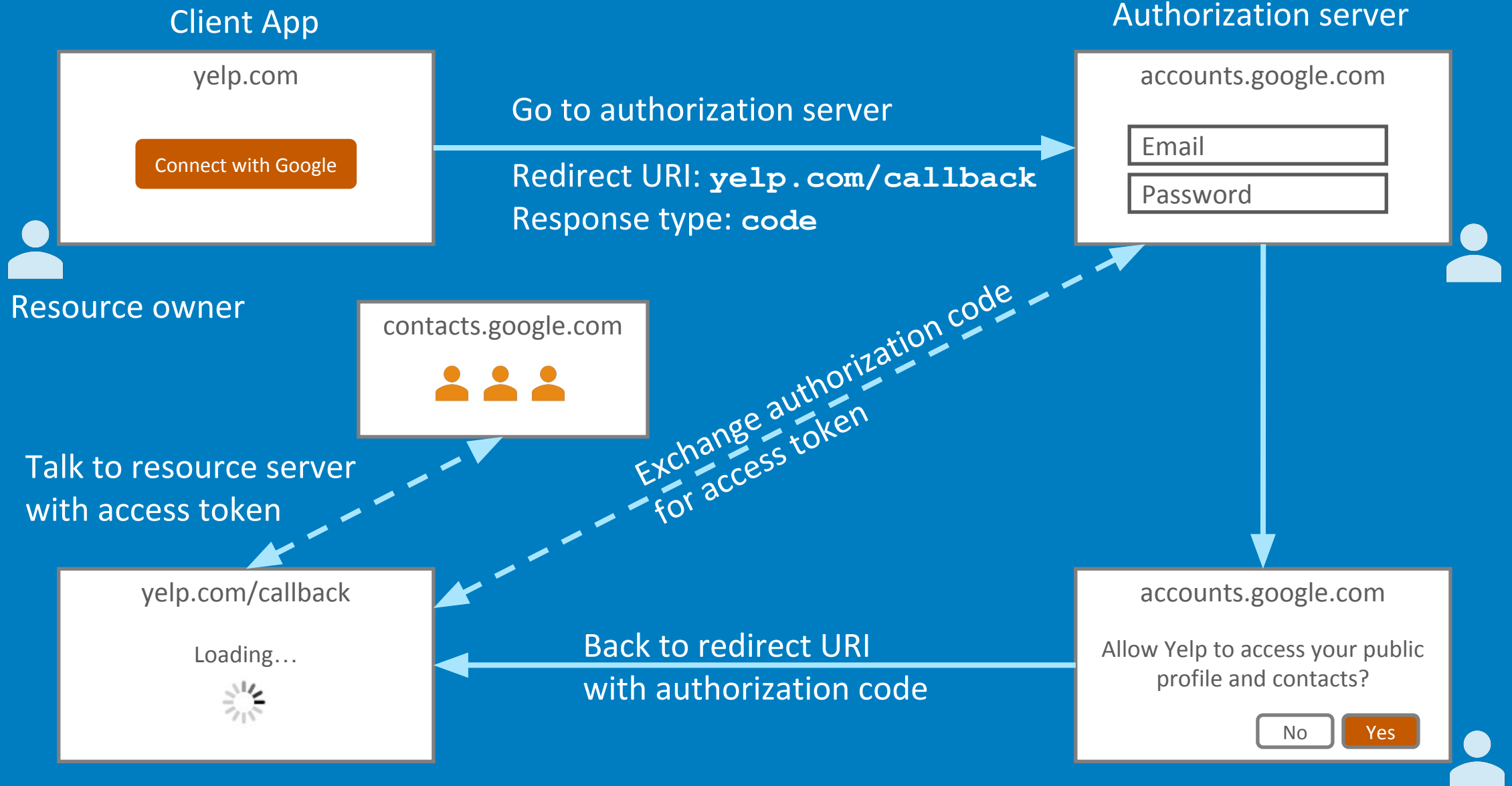
OAuth 2.0 Terminology

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



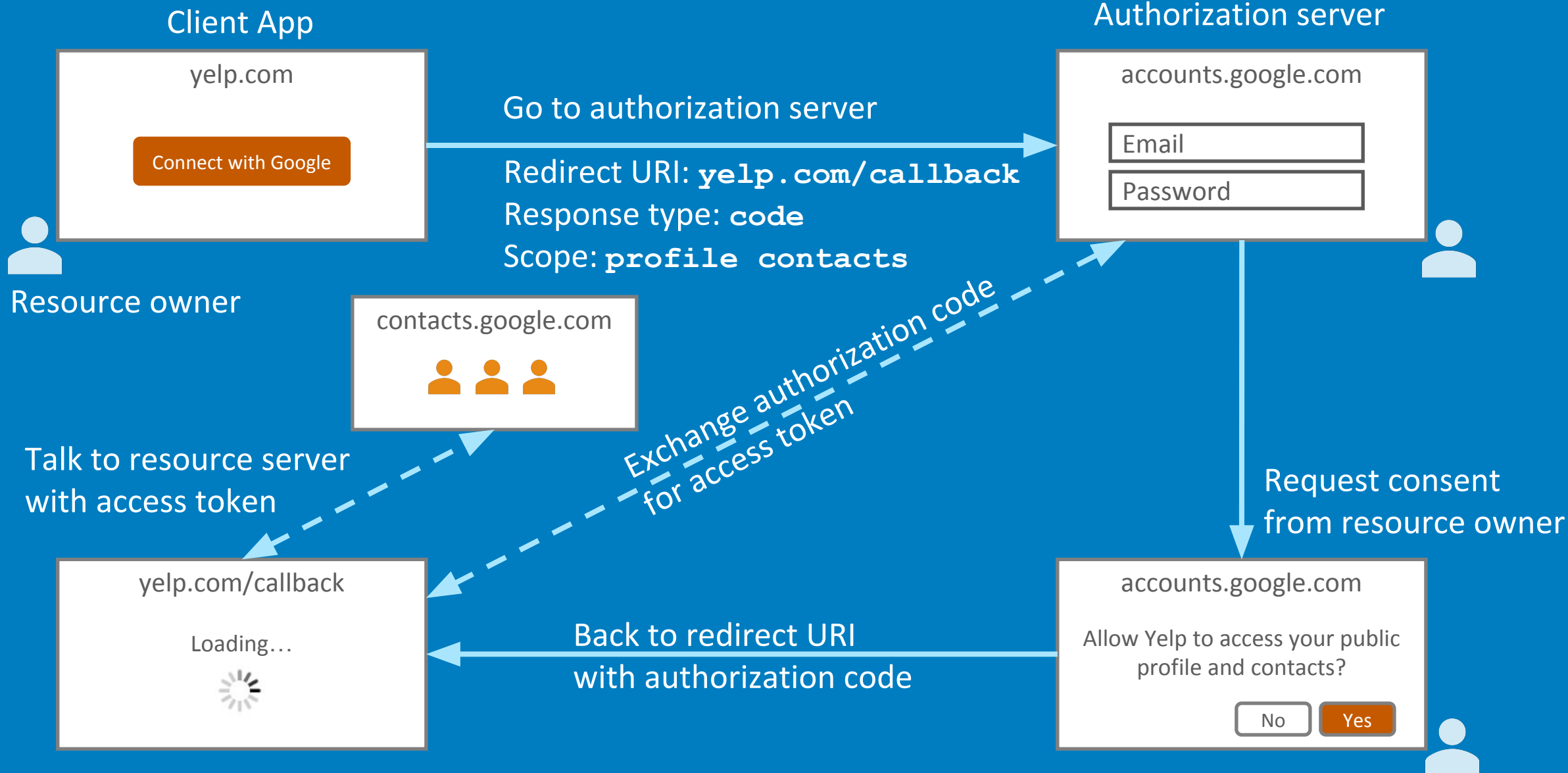
OAuth 2.0 authorization code flow



More OAuth 2.0 terminology

- ★ Scope
- ★ Consent

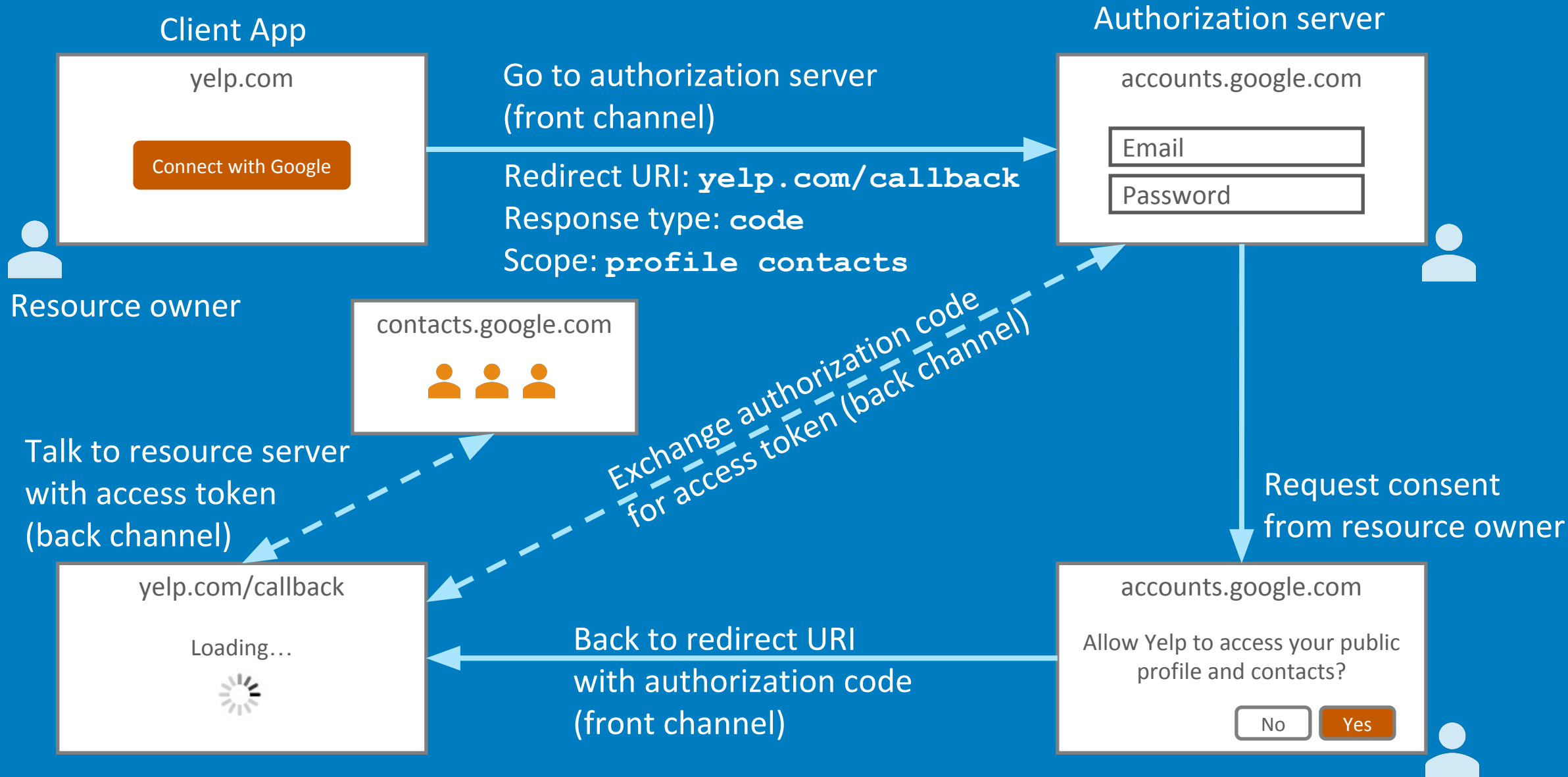
OAuth 2.0 authorization code flow



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`

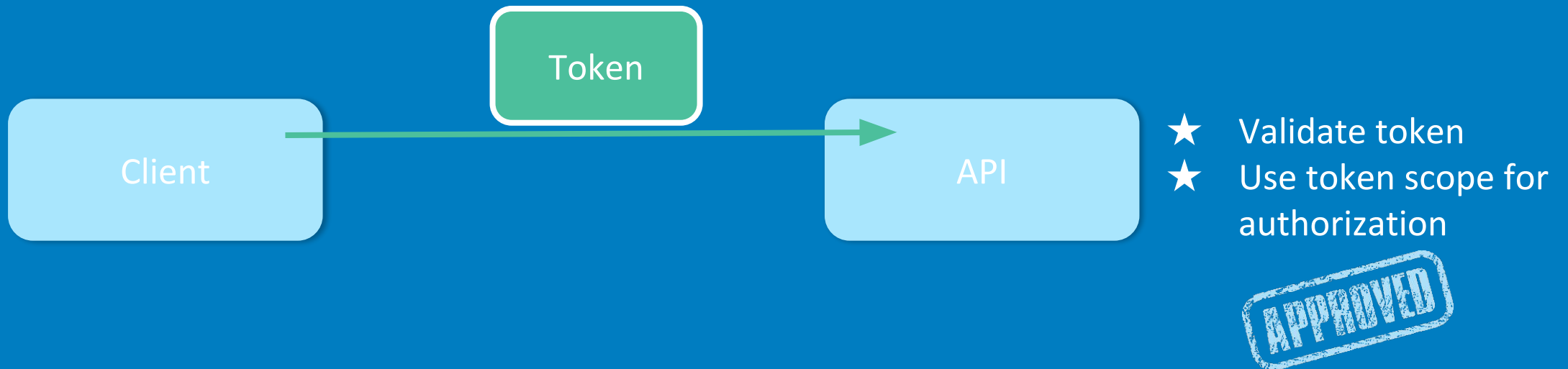
Authorization server returns an access token

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

Use the access token

`GET api.google.com/some/endpoint`

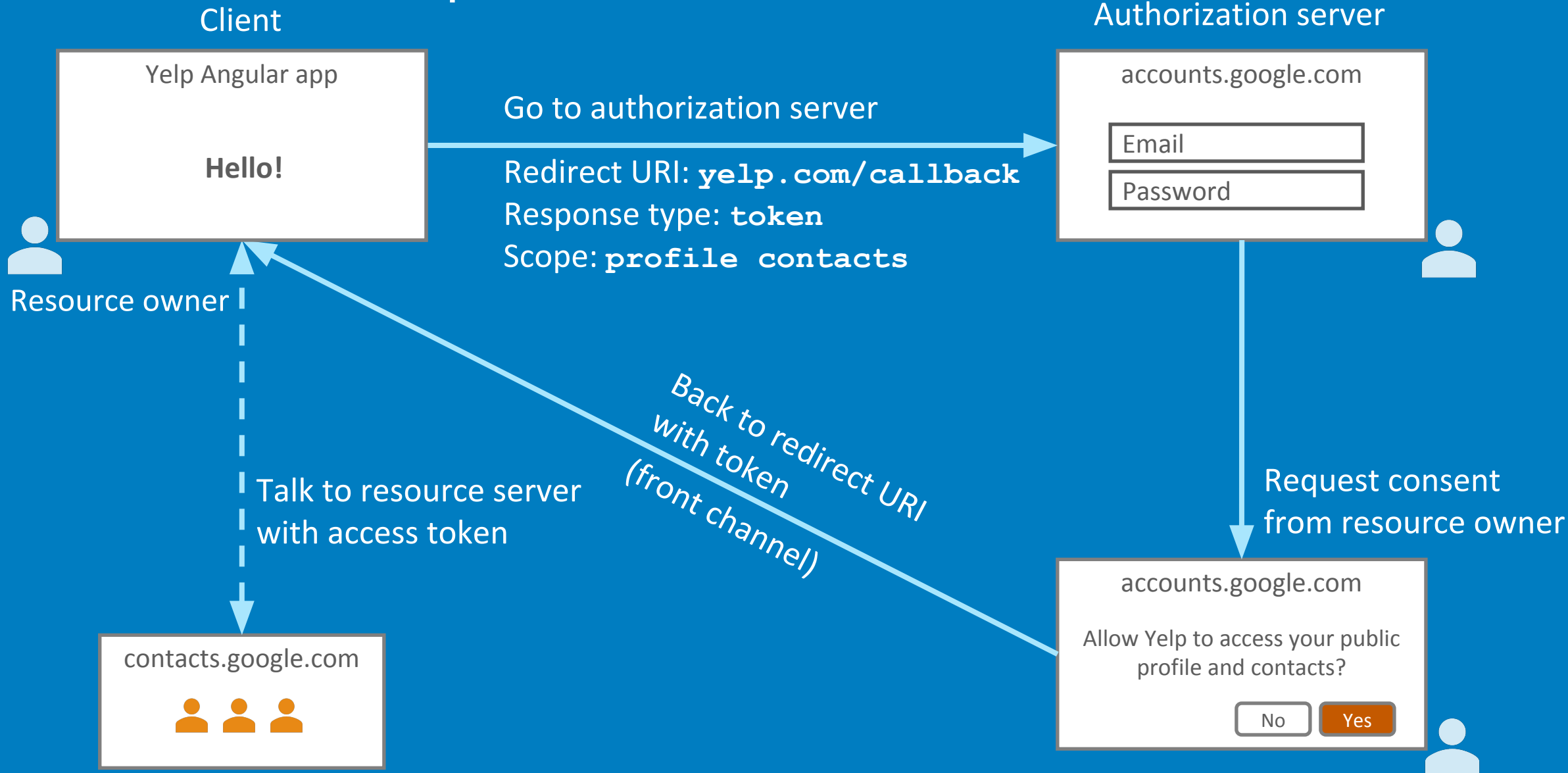
`Authorization: Bearer fFAGRNJru1FTz70BzhT3Zg`



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



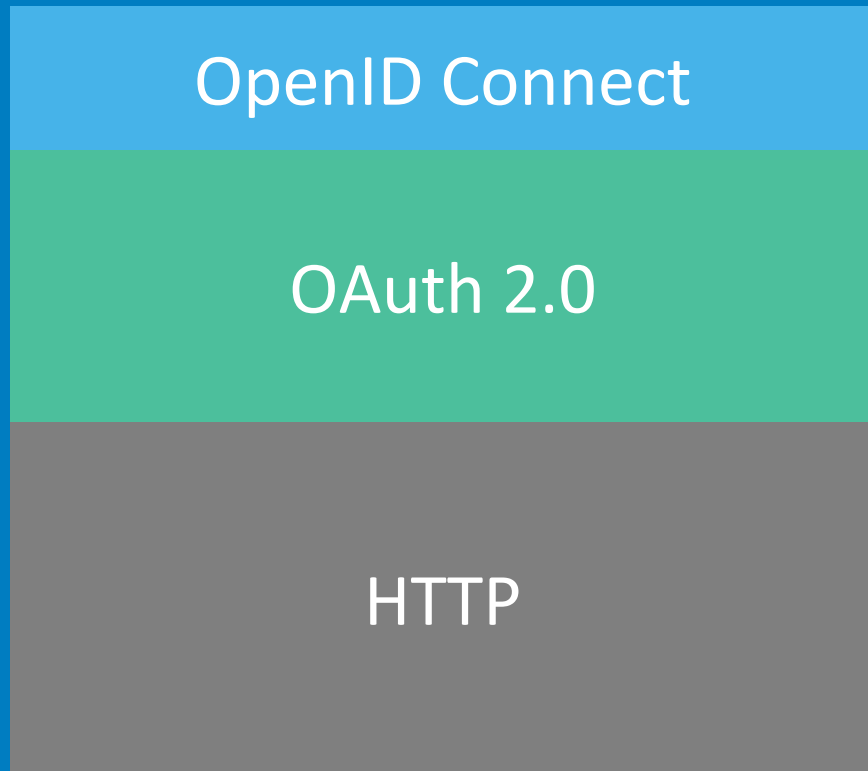
Identity use cases (circa 2012)

- ★ 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



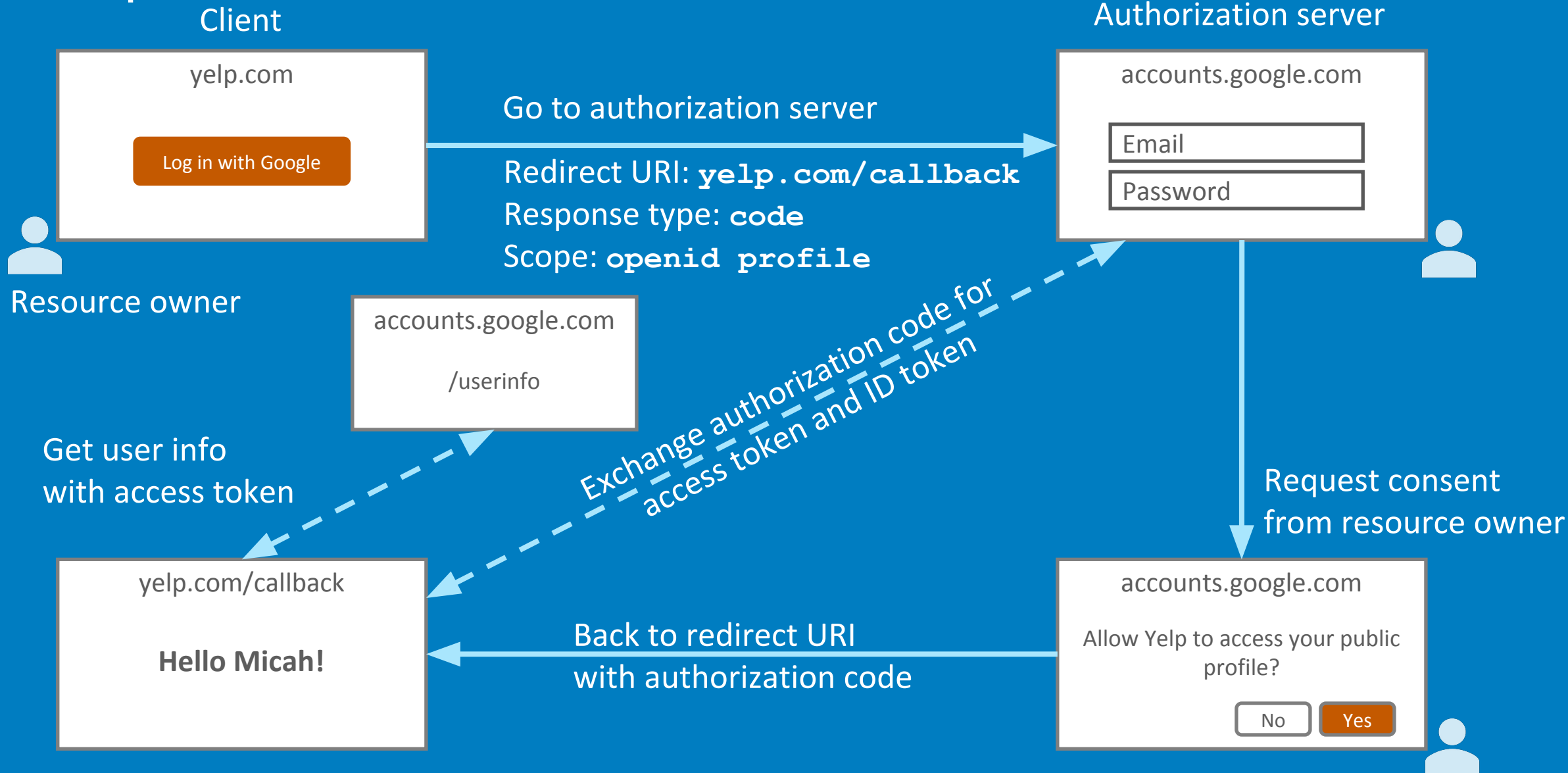
OpenID Connect is for
authentication

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)

Header

eyJzdWIiOiIwMHU5bzFuaWtqdk9CZzVabzBoNyIsInZlciI6MSwiaXNzIjoiaHR0cHM6Ly9kZXl0MzQxNjA3Lm9rdGFwcmV2aWV3LmNvbS9vYXV0aDIvYXVzOW84d3ZraG9ja3c5VEwwaDciLCJhdWQiOiJsWFNlbkx4eFBpOGtRVmpKRTVzNCIsIm1hdCI6MTUwOTA0OTg5OCwiZXhwIjoxNTA5MDUzNDk4LCJqdGkiOiJJRC5oa2RXSXNBSXZTbnBGYVFHTVRYUGNVSmhhMkgwS2c5Yk13ZEVvVm1ZZHN3IiwiaW1yIjpbImtiYSIsIm1mYSIsInB3ZCJdLCJpZHAiOiIwMG85bzFuaWpraWpLeGNpbjBoNyIsIm5vbmNIJjoiaWpwMmFzeH1qN2UiLCJhdXR0X3RpbWUiOjE1MDkwNDk3MT19

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": "micah.silverman@okta.com",  
  "name": "Micah Silverman"  
  "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

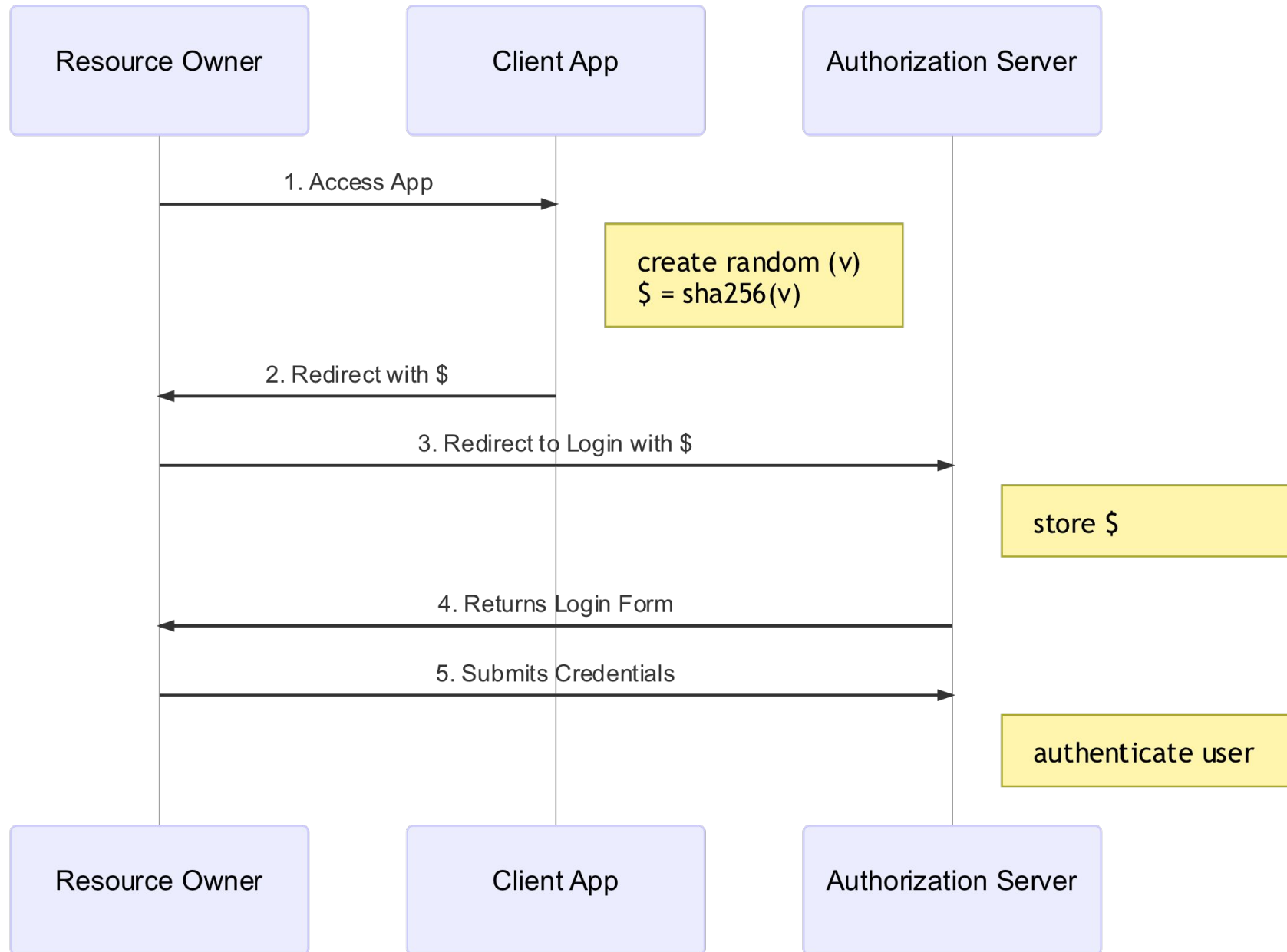
Making your accounts available in other systems

(Authentication)

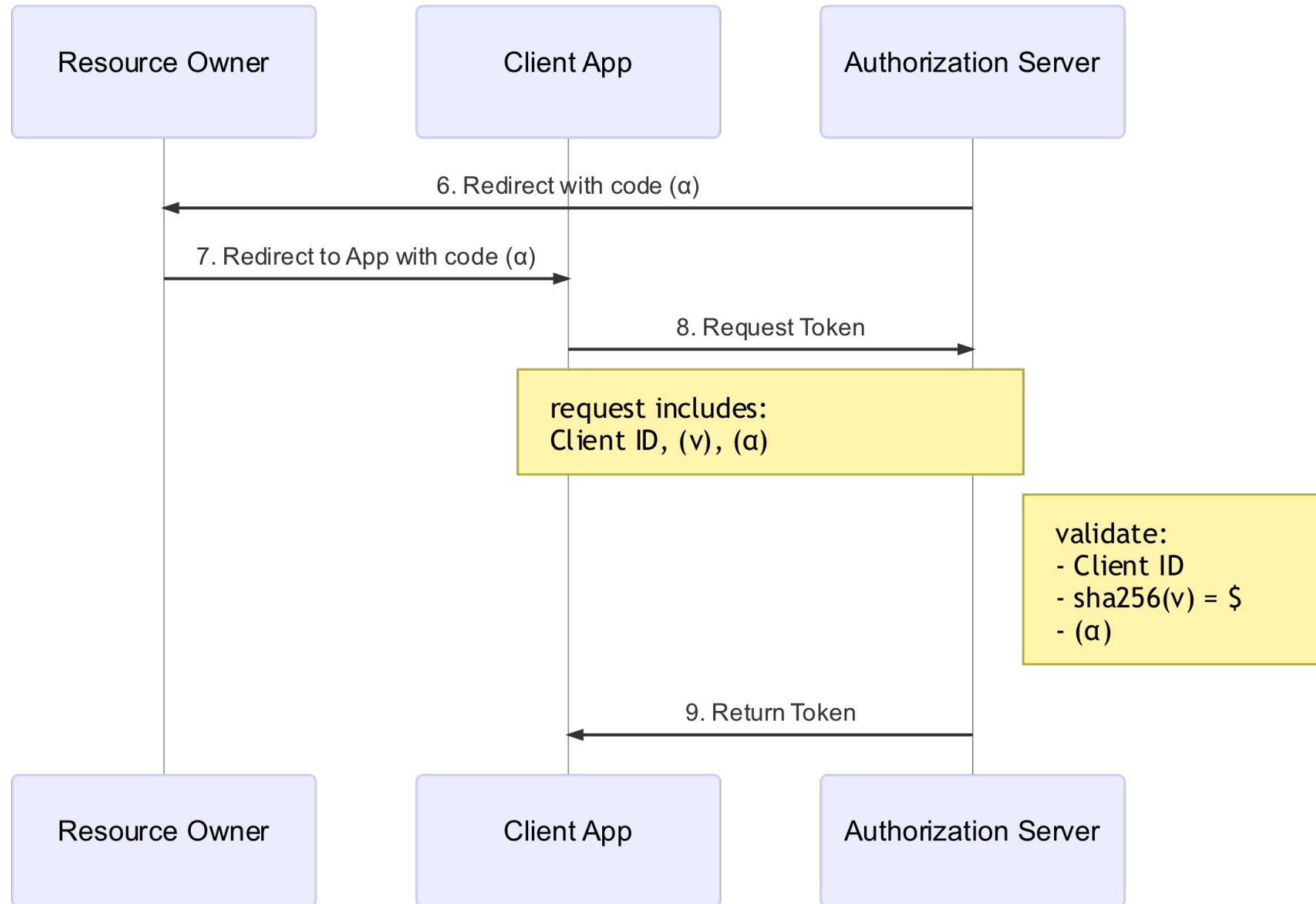
Which flow (grant type) do I use?

- ★ 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

Micah Silverman
@afitnerd

oauth.com
@oktadev



Free hosted authorization server:
developer.okta.com