

OAuth and OpenID Connect

(IN PLAIN ENGLISH)

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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

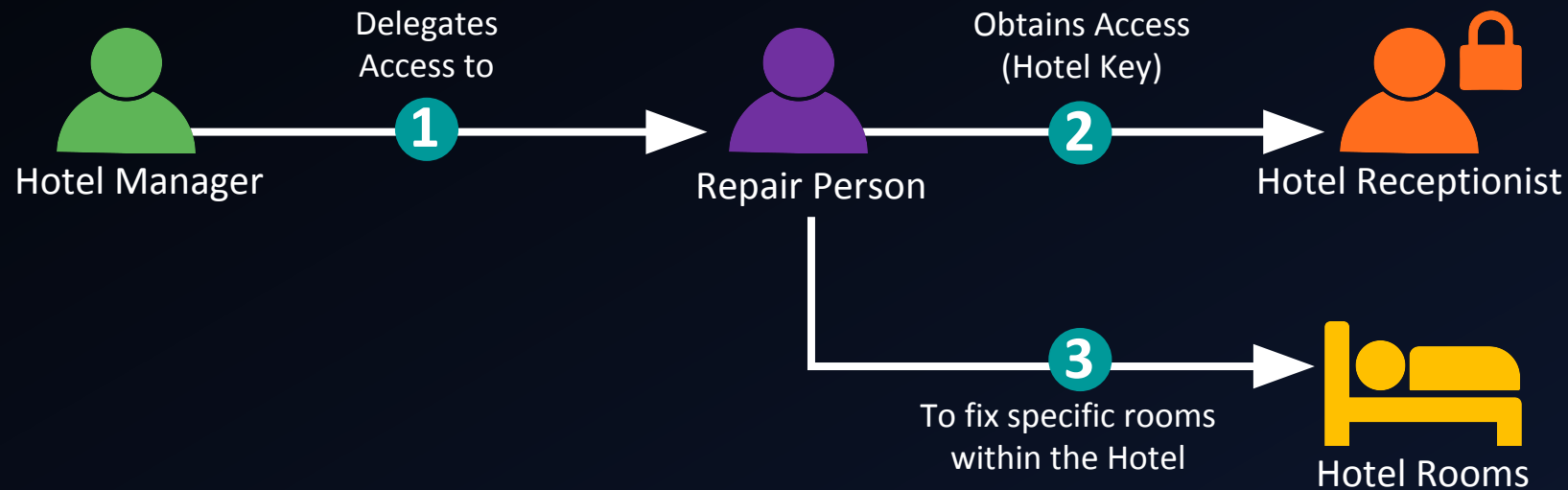
The delegated authorization problem

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

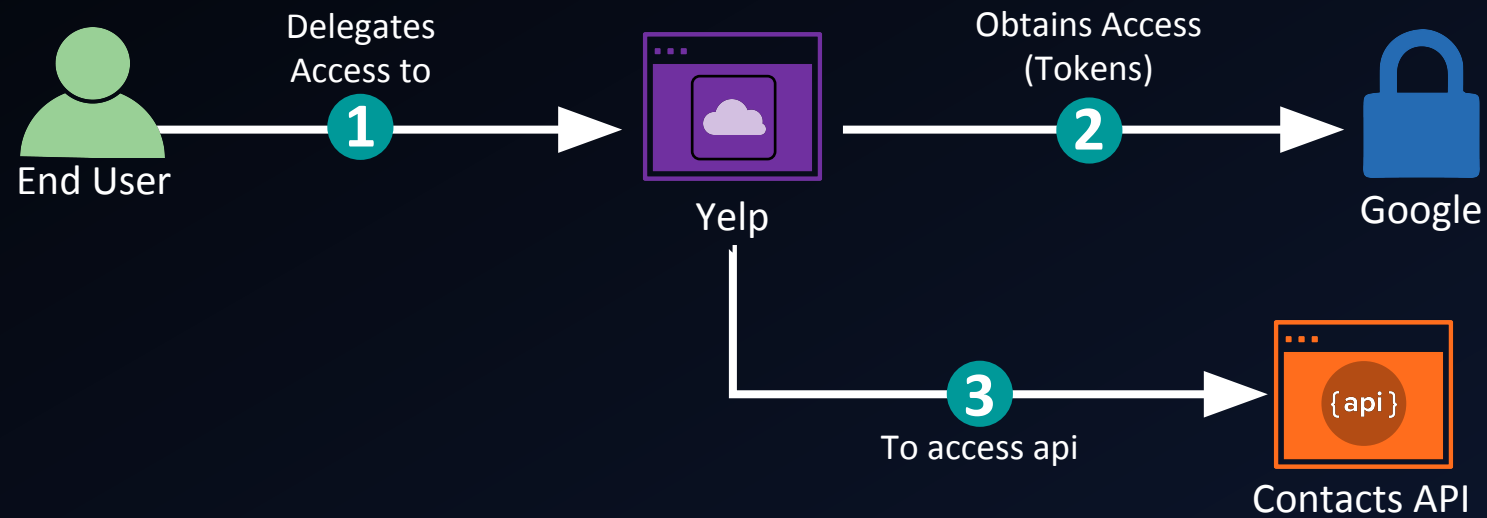
A lot of confusion around OAuth & OIDC

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

OAuth – A real world example: Hotel Analogy



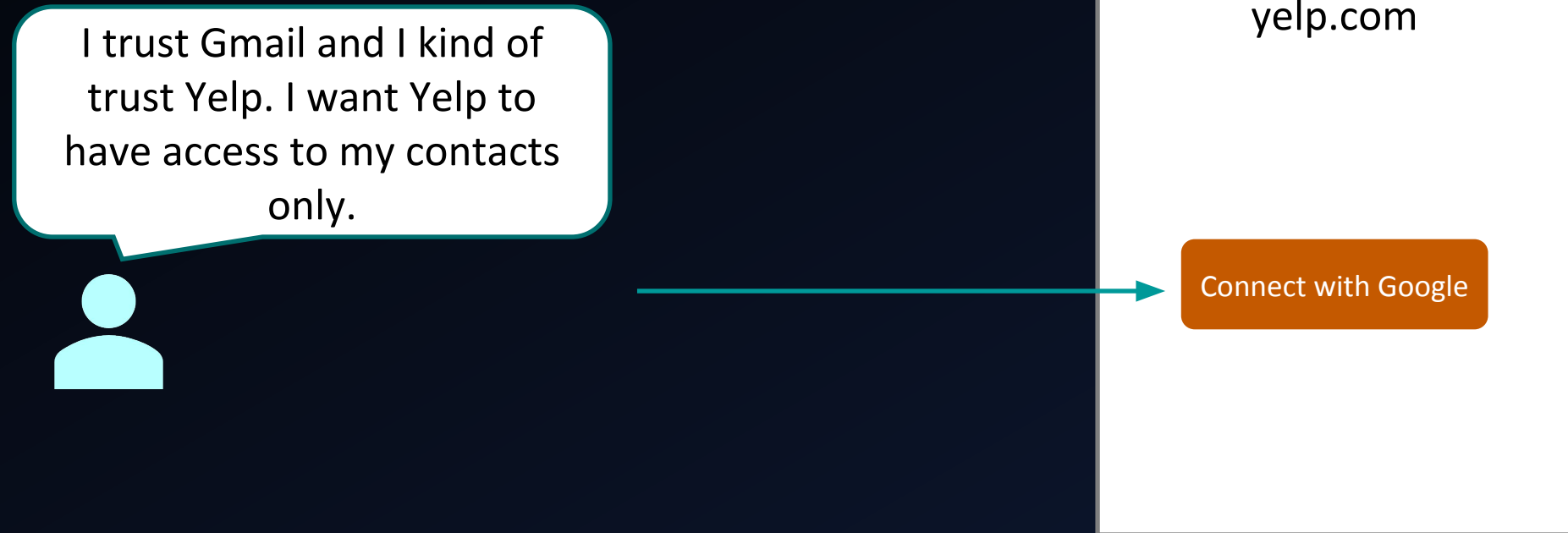
OAuth: App Scenario



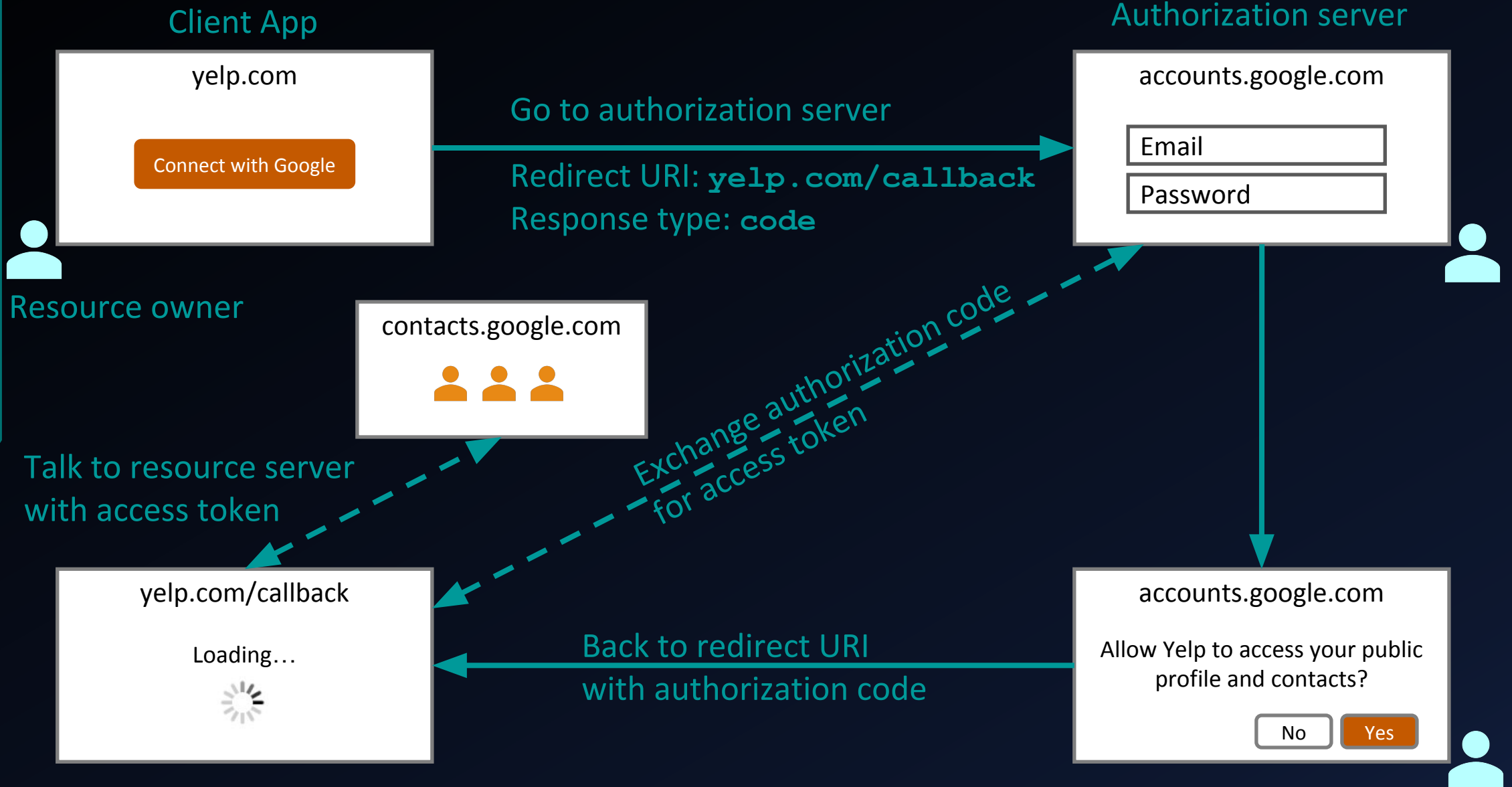
OAuth 2.0 Terminology

| Hotel | App | OAuth | Description |
|--------------------|--------------|----------------------|---|
| Hotel Manager | End User | Resource Owner | Wants a Client App to do something on their behalf |
| Repair Person | 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 Rooms | Contacts API | Resource Server | Has an API that an app can use if presented with a token |

Delegated authorization with OAuth 2.0



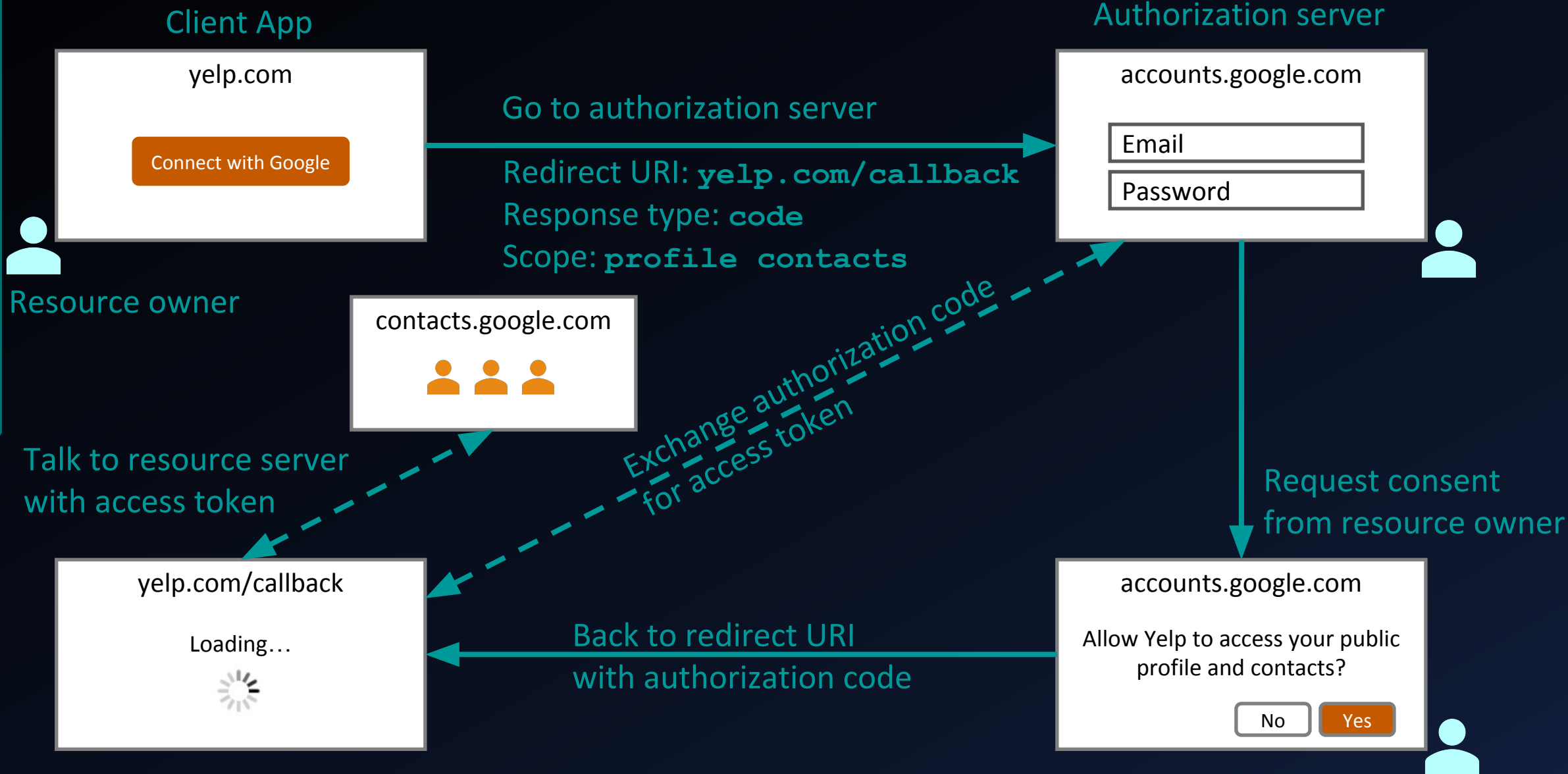
OAuth 2.0 authorization code flow



More OAuth 2.0 terminology

- Scope
- Consent

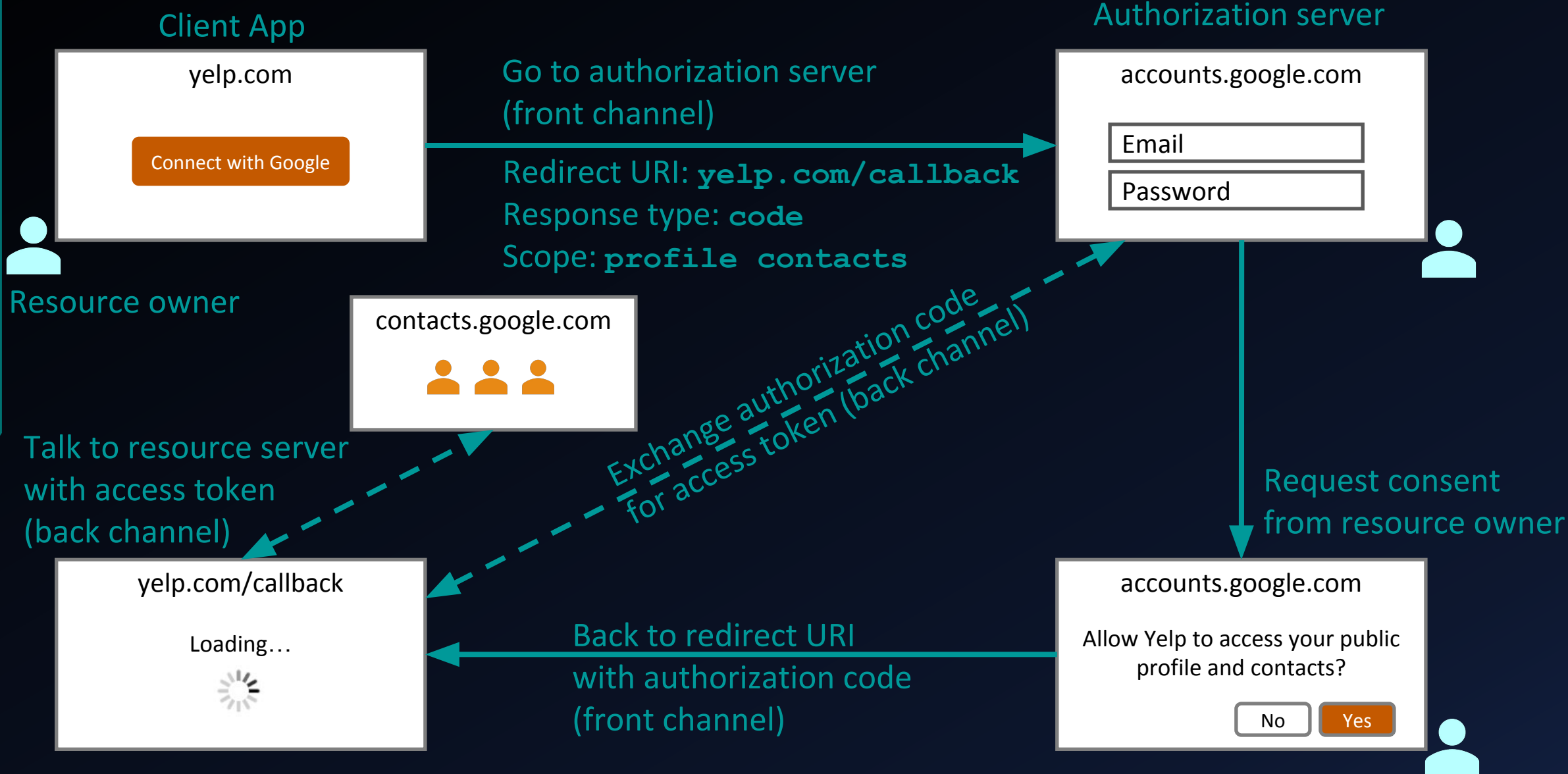
OAuth 2.0 authorization code flow



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`



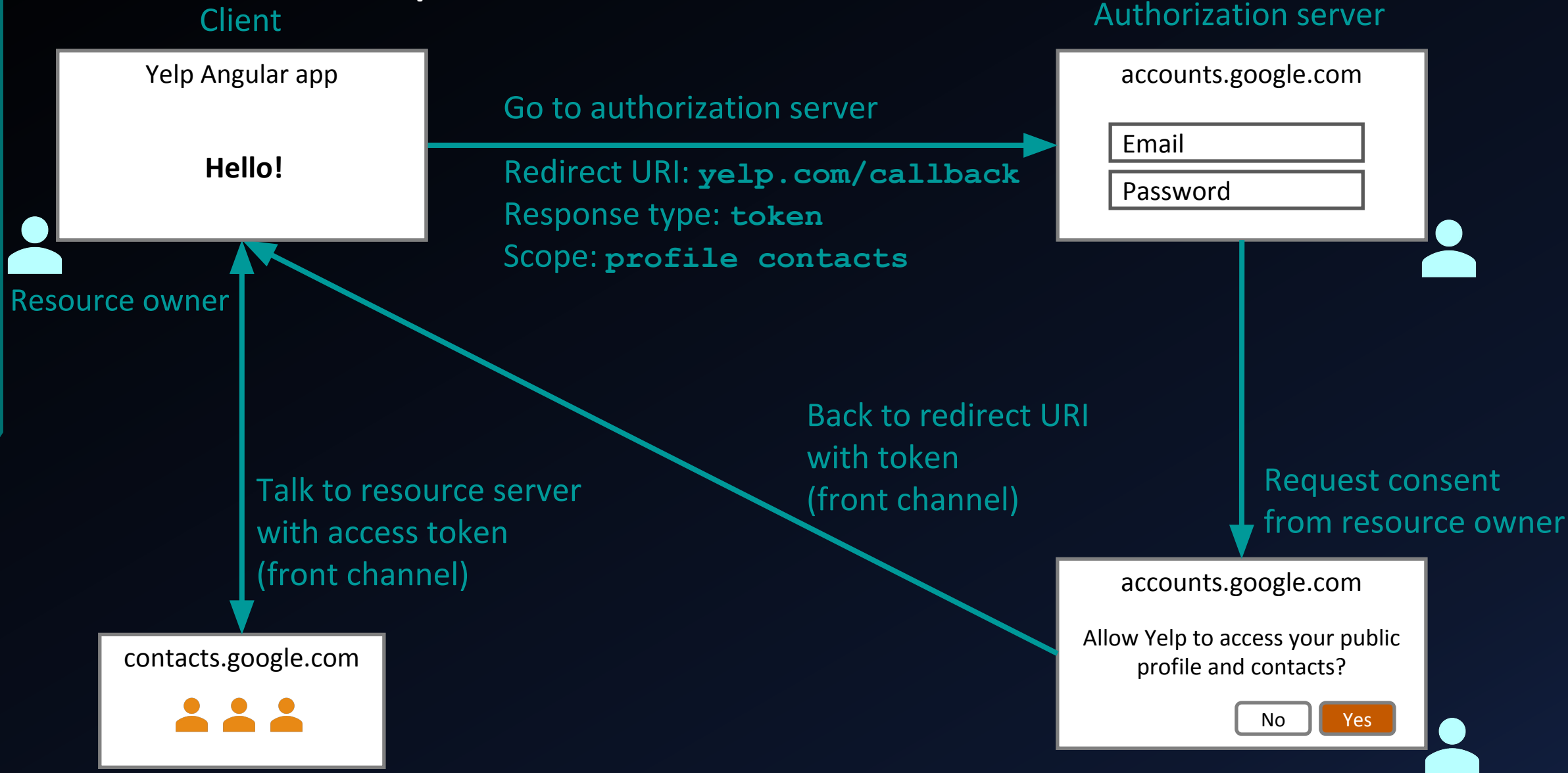
- Validate token
- Use token scope for authorization



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

Authentication

Authentication

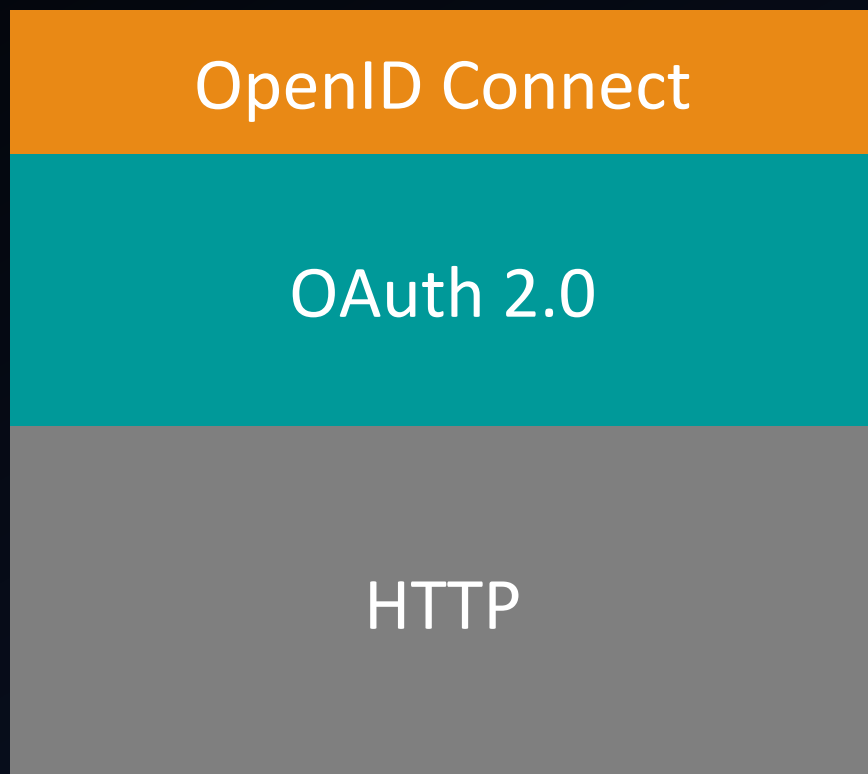
Authentication

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

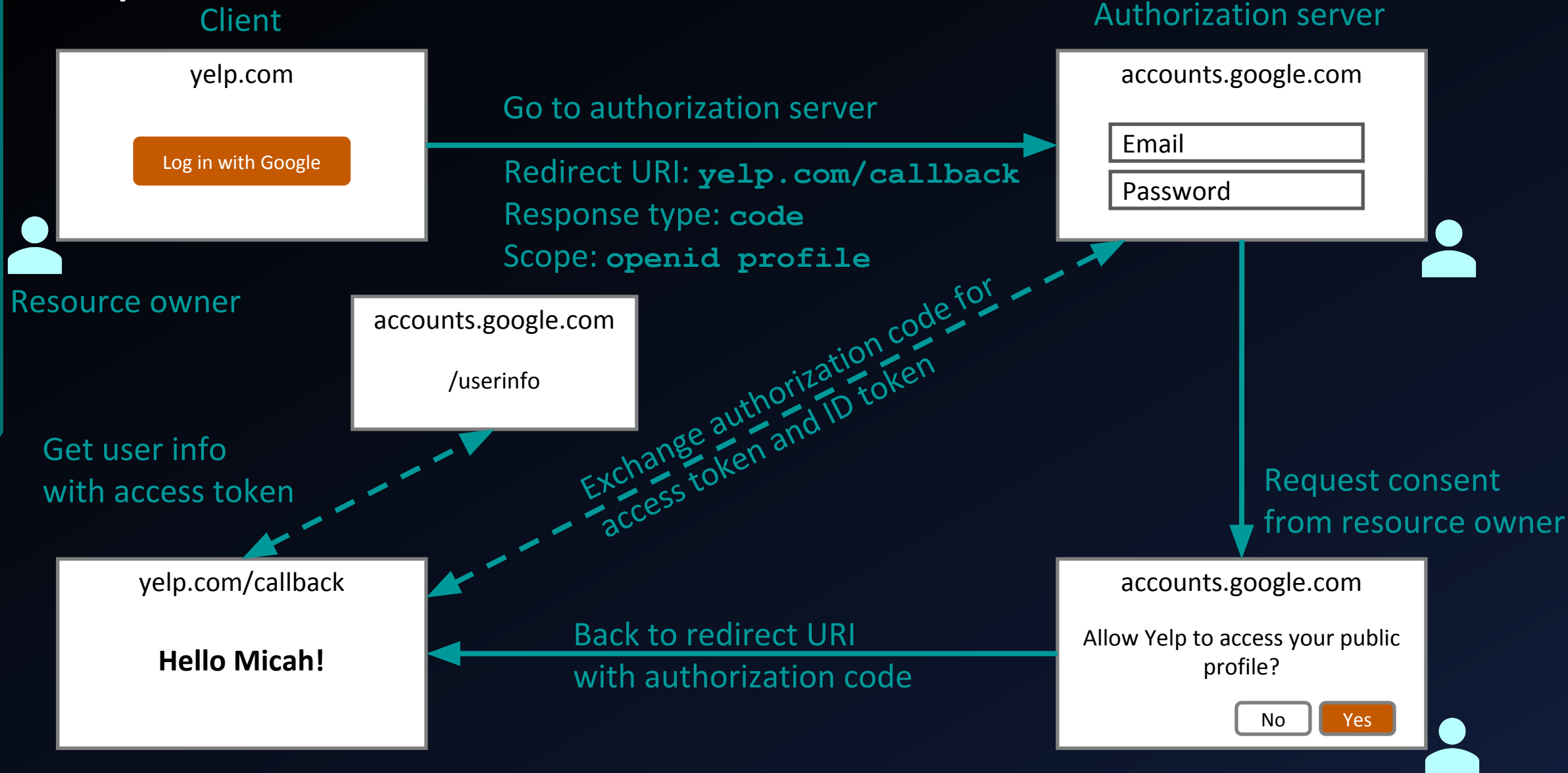


- OpenID Connect is for **authentication**
- OAuth 2.0 is for **authorization**

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

eyJzdWIiOiIwMHU5bzFuaWtqdG9CZzVabzBoNyIsInZlciI6MSwiaXNzIjoiaHR0cHM6Ly9kZXYtMzQxNjA3Lm9rdGFwcmV2aWV3LmNvbS9vYXV0aDIvYXVzOW84d3ZraG9ja3c5VEwwaDciLCJhdWQiOiJswFNlbkx4eFBpOGtRVmpKRTVzNCIsIm1hdCI6MTUwOTA0OTg5OCwiZXhwIjoxNTA5MDUzNDk4LCJqdGkiOiJJRC5oa2RXSXNBSXZTbnBGYVFHTVRYUGNVSmhhMkgwS2c5Yk13ZEVvVm1ZZHN3IiwiaW1yIjpbImtiYSIsIm1mYSIsInB3ZCJdLCJpZHAiOiIwMG85bzFuaWpralwpleGNpbjBoNyIsIm5vbmNlIjoidWpwMmFzeHlqN2UiLCJhdXR0X3RpbWUiOiJlMDkwNDk3MTl9

Payload (claims)

dv4Ek8B4BDee1PcQT_4zm7kxDEY1sRIGbLoNt1odZcSzHz-XU5GkKy16sAVm
dXOIPU1AIrJAhNfQWQ-_XZLBVPjETiZE8CgNg5uqNmeXMUnYnQmvN5oW1XUZ
8Gcub-GAbJ8-NQuyBmyec1j3gmGzX3wemke8NkuI6SX2L4Wj1PyvkknBtbjf
iF9ud1-ERKbobaFbnjDFOFTzvL6g34SpMmZWy6uc_Hs--n4IC-ex-_Ps3FcM
wRggCW_-7o2FpH6rJTOGPZYrOx44n3ZwAu2dGm6axtPI-sqU8b6sw7DaHpog
D_hxsXgMIOzOBMbYsQEiczoGn71ZFz_107FiW4dH6g

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:

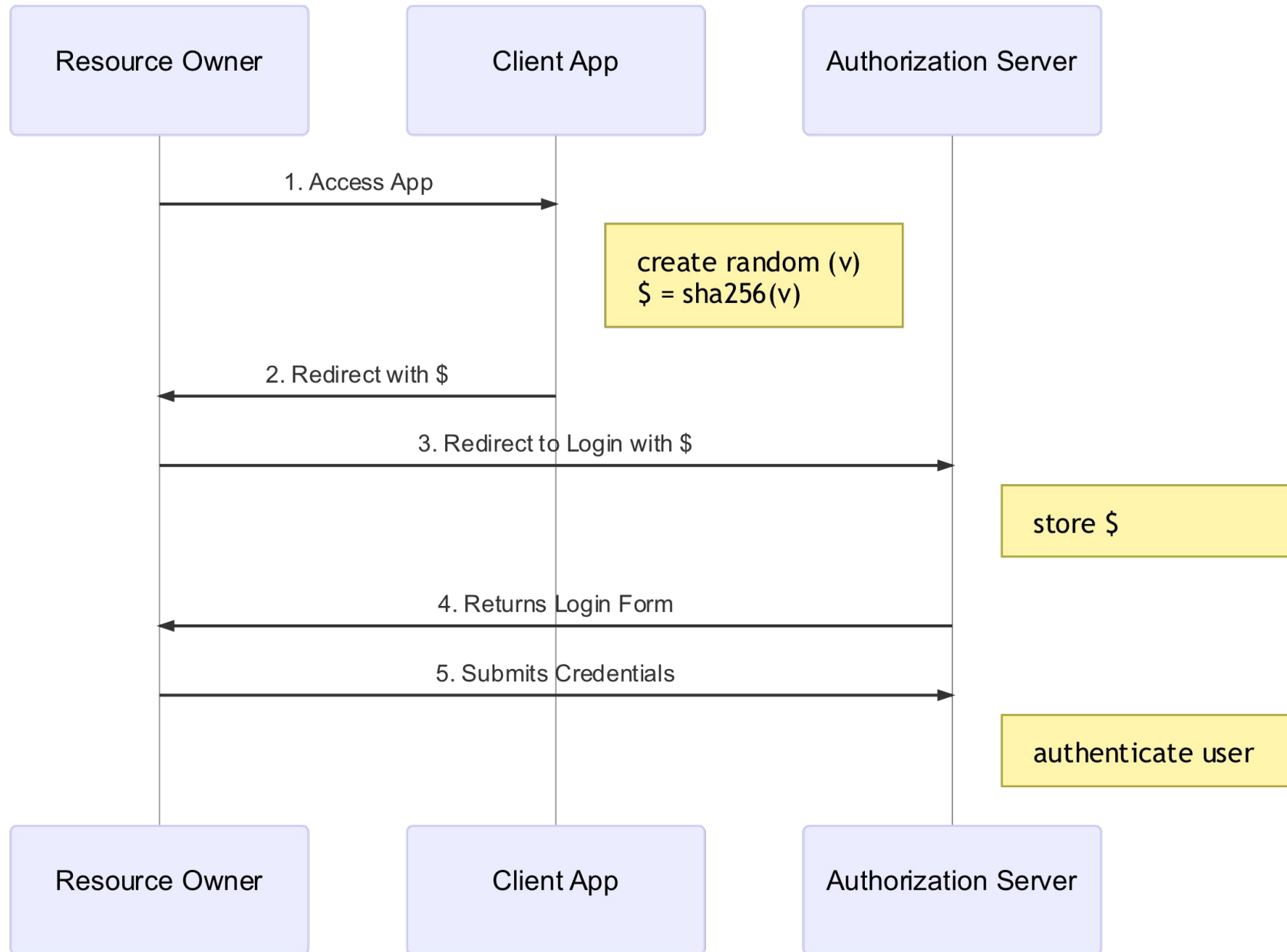
- Logging the user in
- Making your accounts available in other systems

(Authentication)

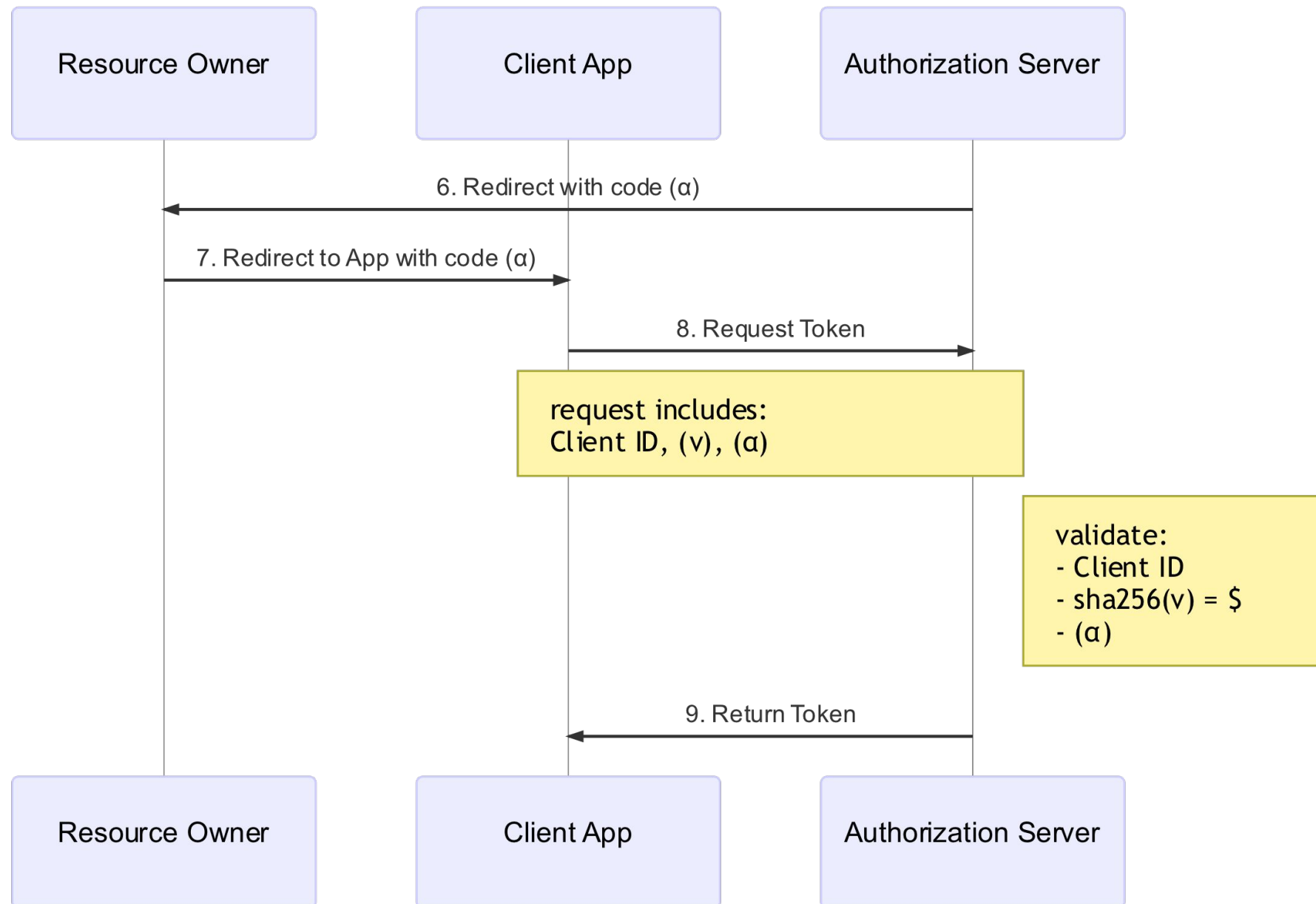
Which flow (grant type) do I use?

- Web application w/ server backend: **authorization code flow**
- Native or mobile app: **authorization code with PKCE flow**
- JavaScript app (SPA) w/ API backend:
 - **authorization code with PKCE flow (if you can)**
 - **implicit flow (if you must)**
- 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/dogearred/that-2019-oauth-and-oidc

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Free hosted authorization server:
developer.okta.com

