OAuth and OpenID Connect

(IN PLAIN ENGLISH)

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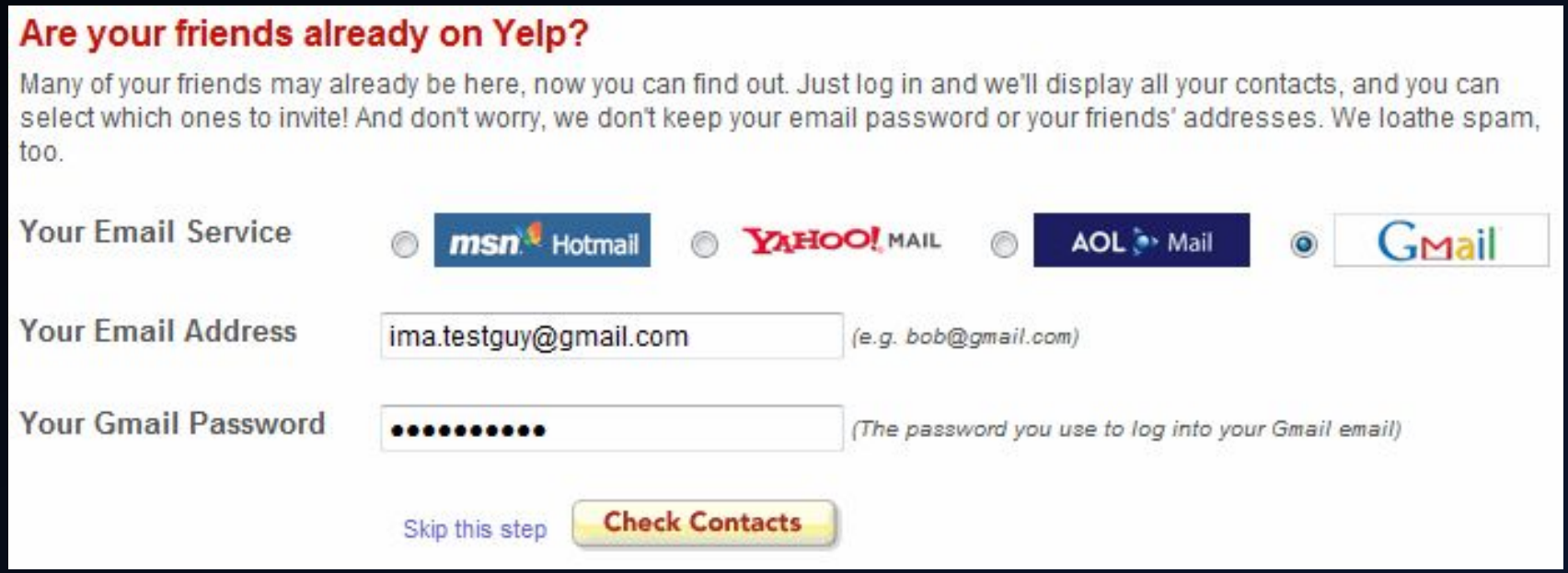
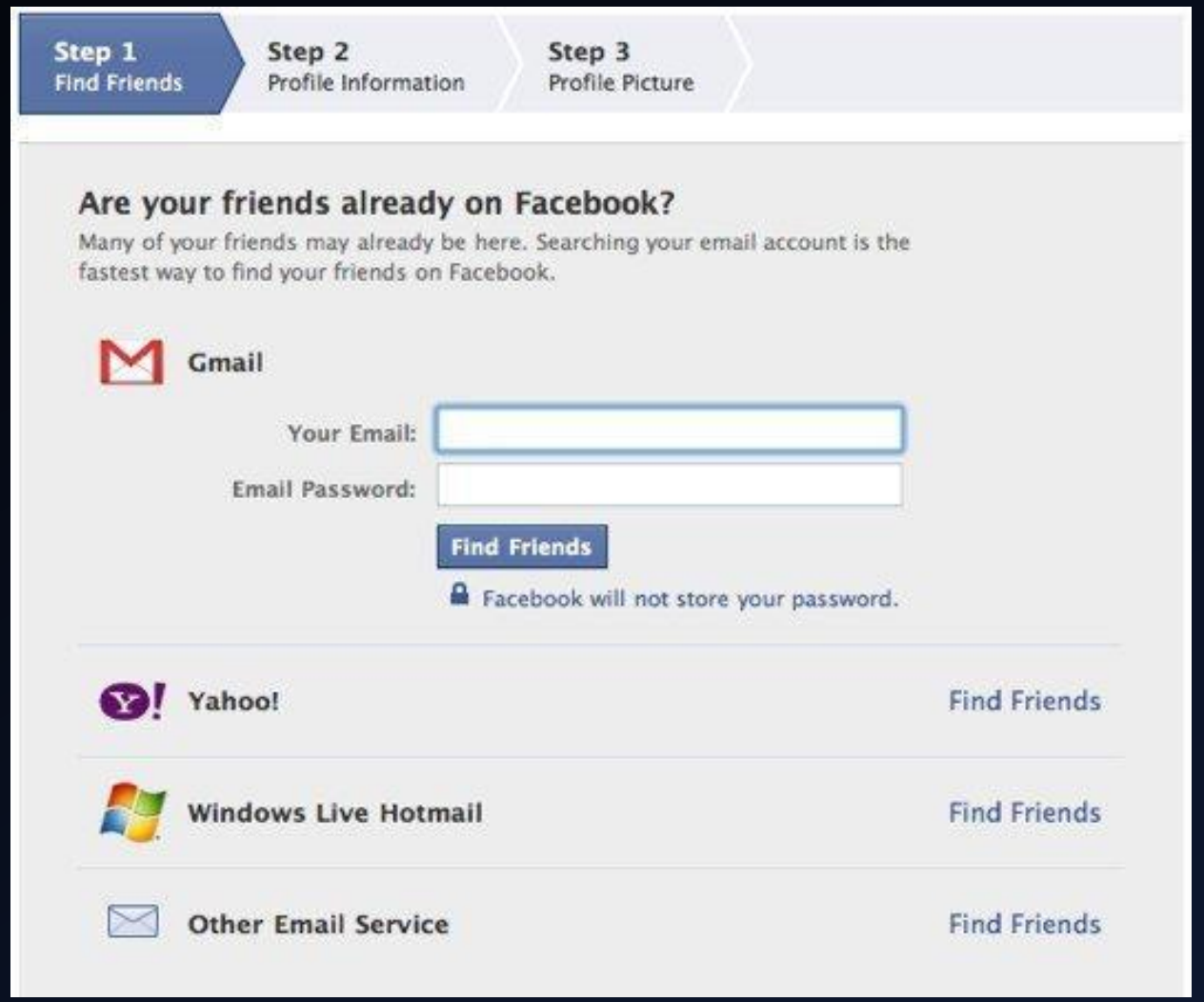
Identity use cases (circa 2007)

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

Don't do it this way!



Don't do it this way!



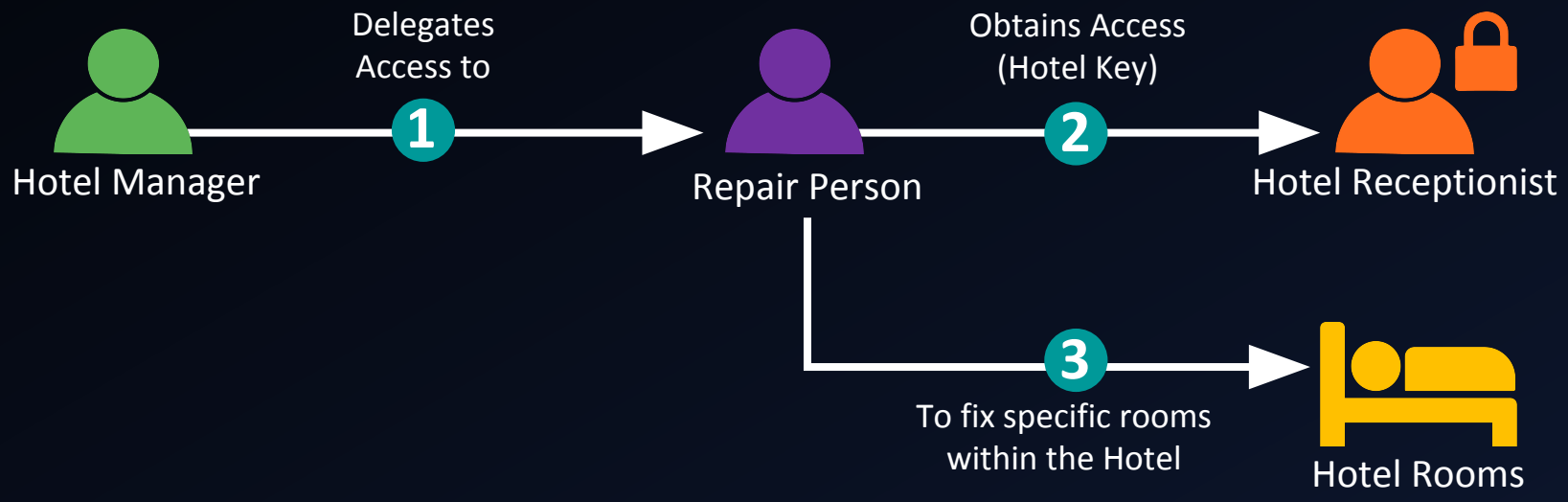
The delegated authorization problem

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

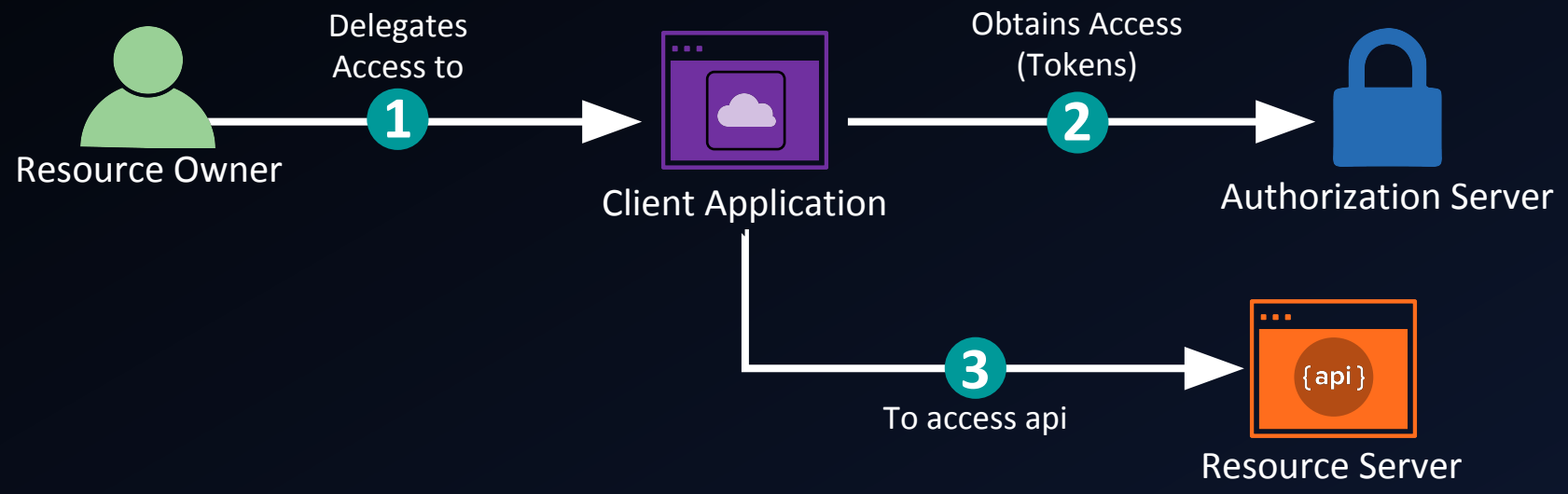
A lot of confusion around OAuth & OIDC

- 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



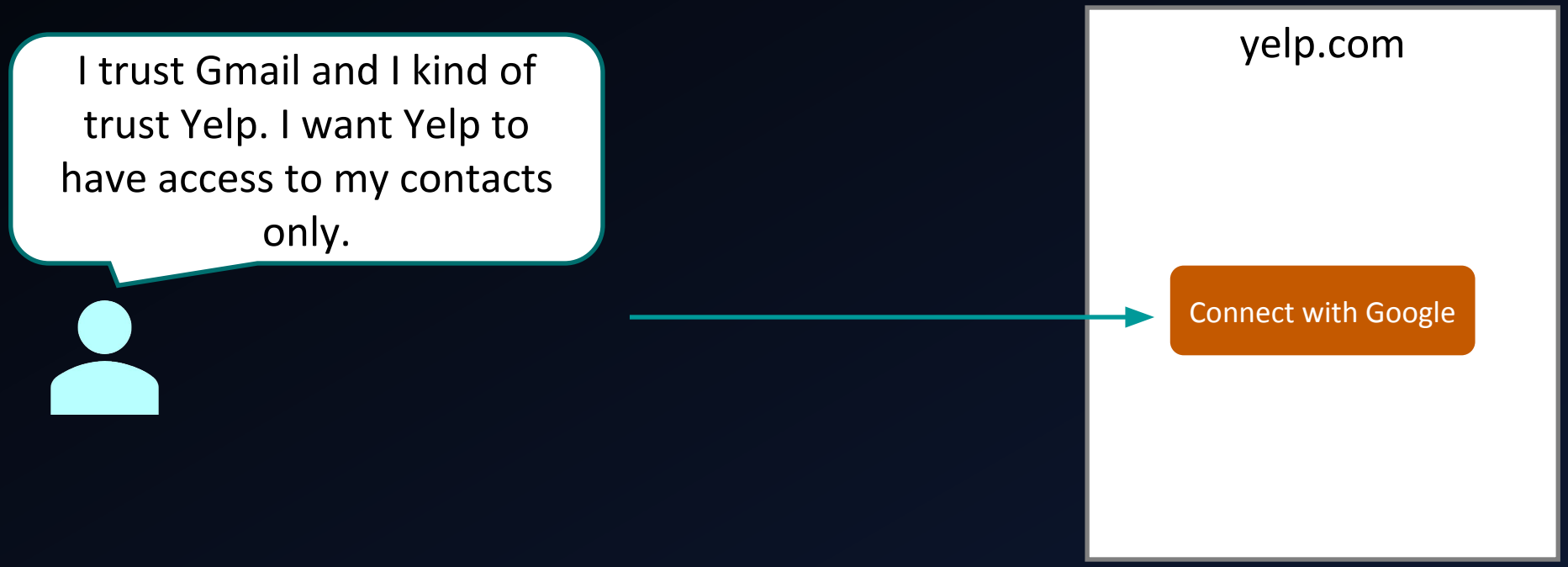
OAuth: App Scenario



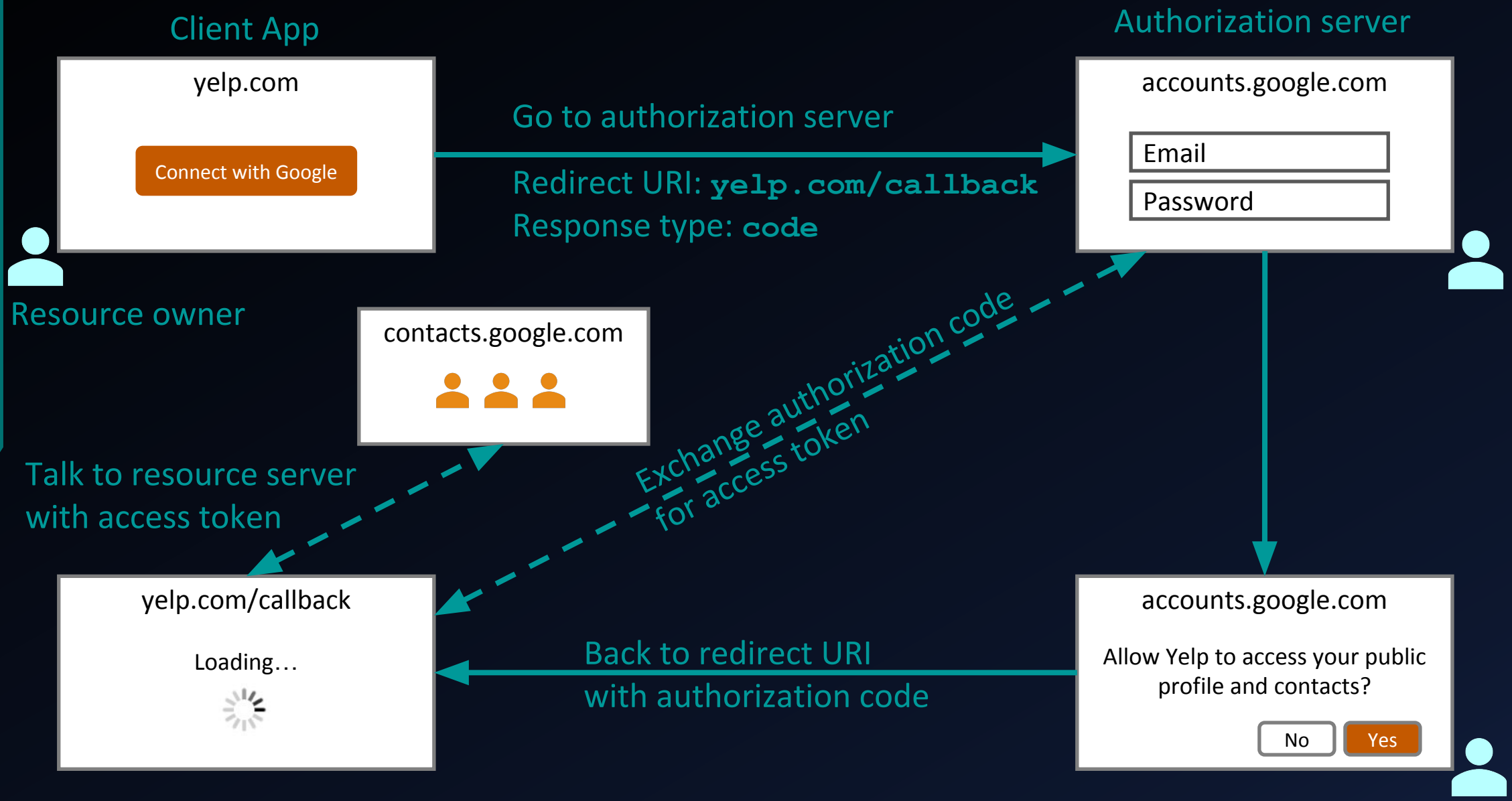
OAuth 2.0 Terminology

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	Google Contacts API	Resource Server	Has an API that a an app can use if presented with a token

Delegated authorization with OAuth 2.0



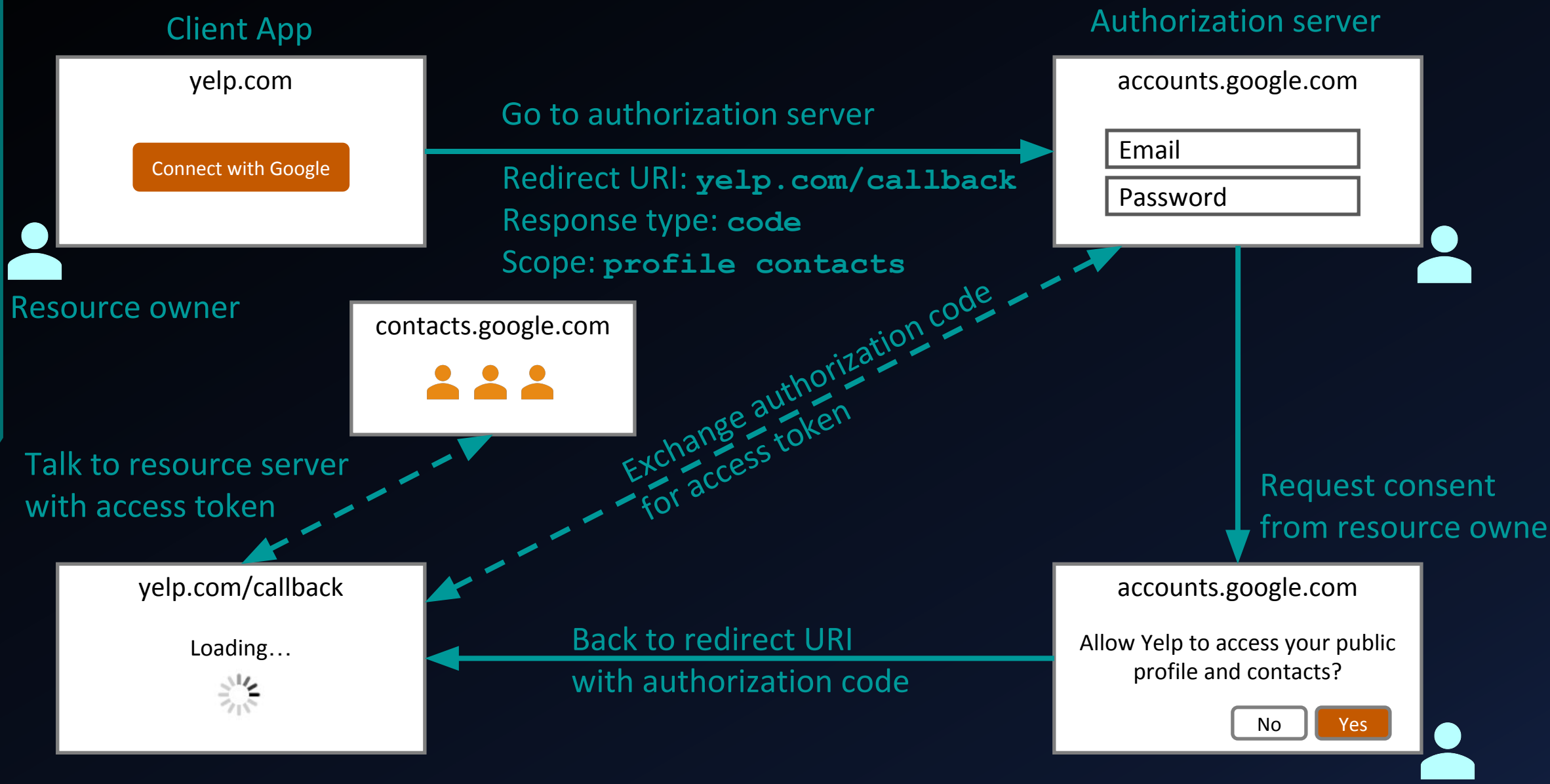
OAuth 2.0 authorization code flow



More OAuth 2.0 terminology

- Scope
- Consent

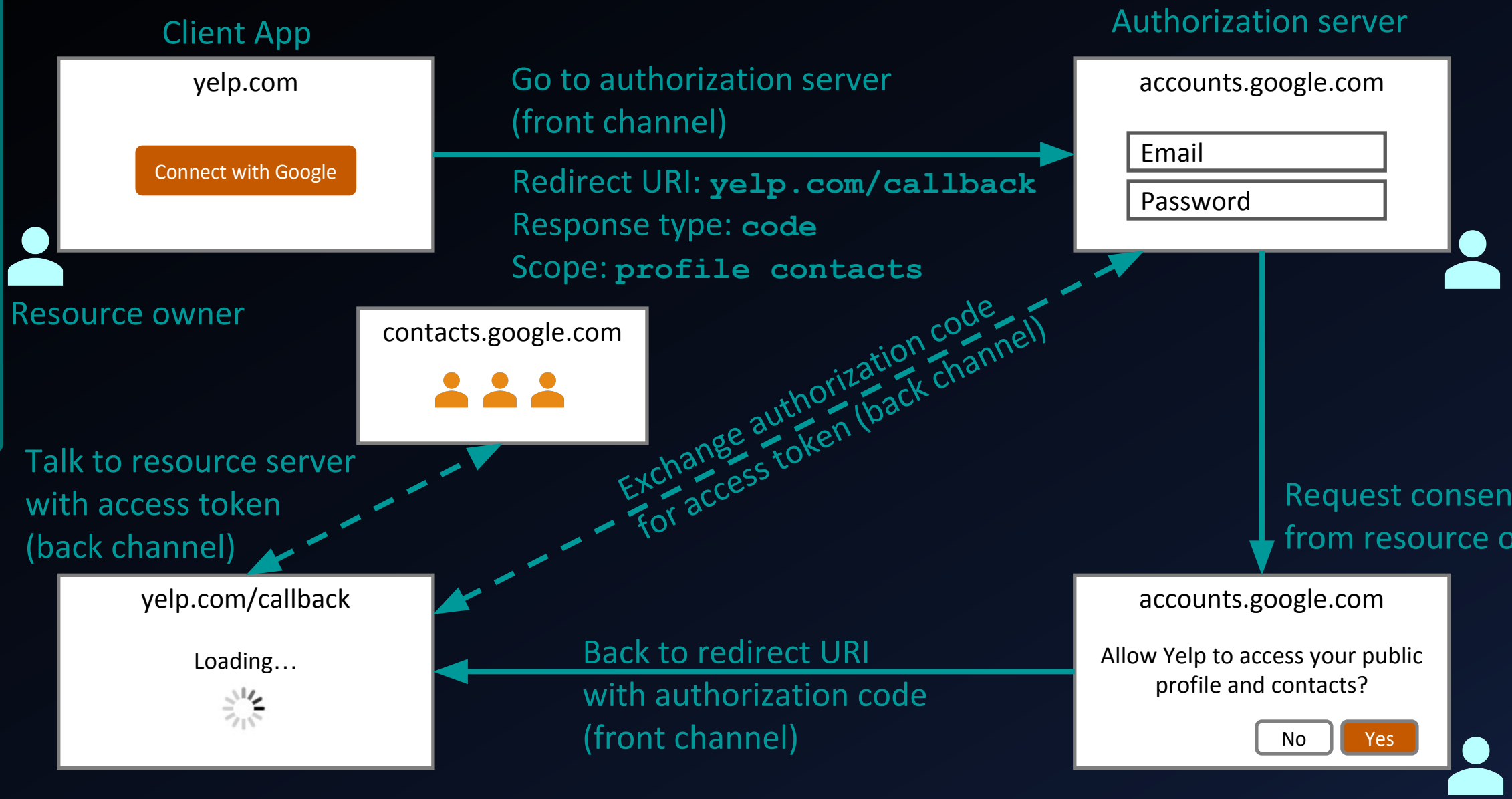
OAuth 2.0 authorization code flow



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
```

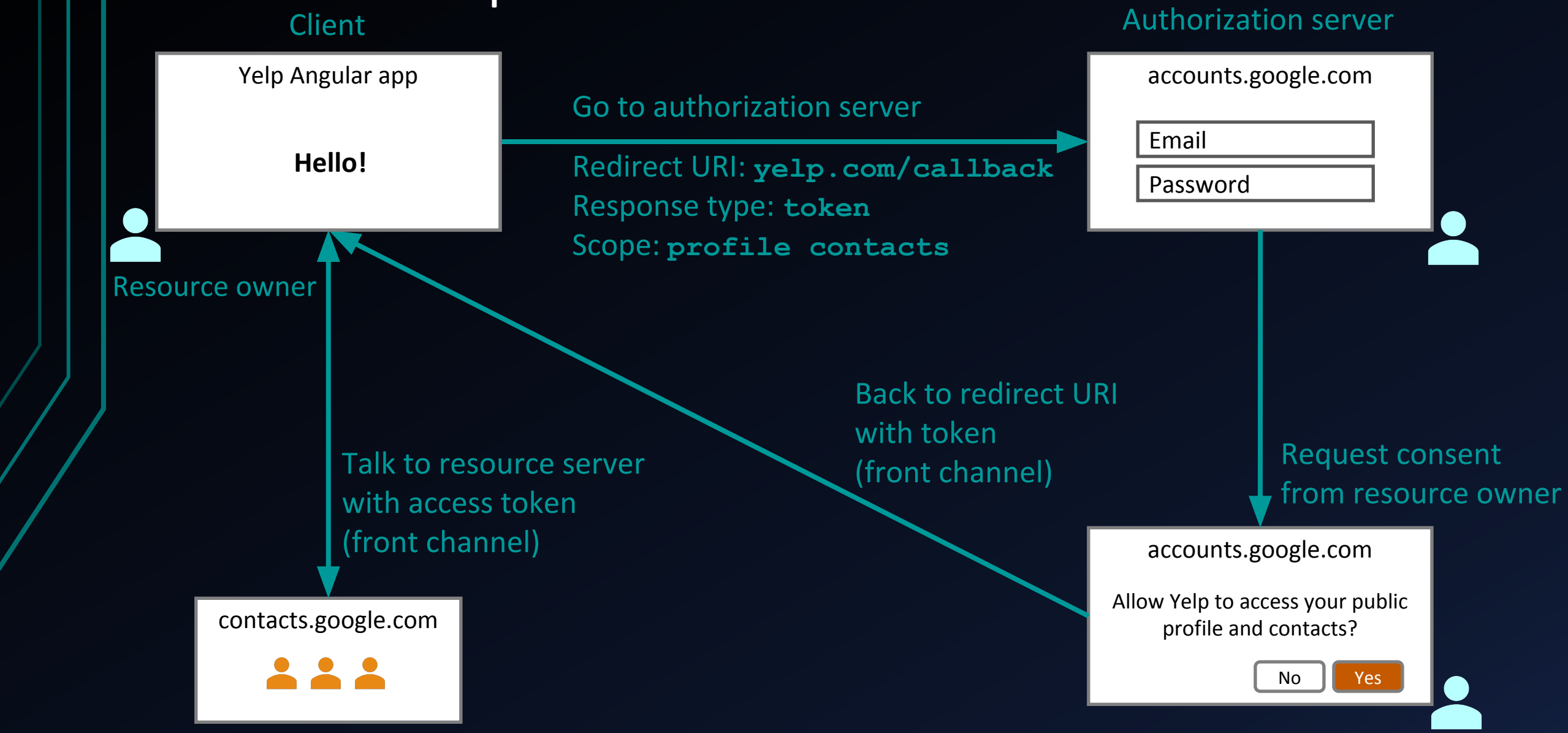
- Validate token
- Use token scope for authorization

OAuth 2.0 flows

- Authorization code (front channel + back channel)
- Authorization code w/ PKCE (front channel only)*
- Implicit (front channel only)

- Resource owner password (back channel only)
- Client credentials (back channel only)

OAuth 2.0 implicit flow



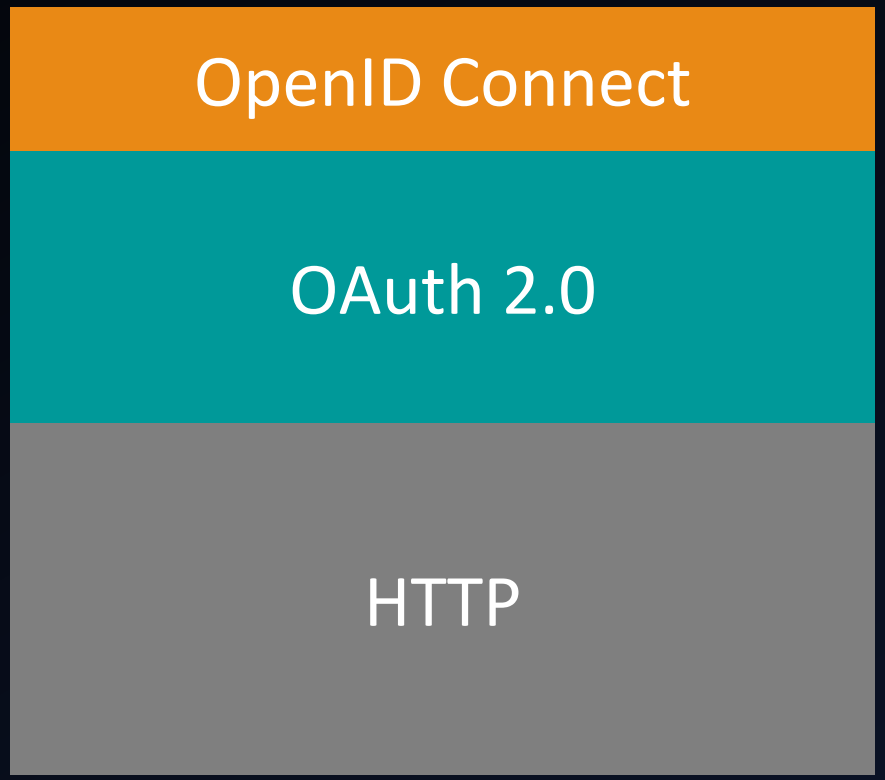
Identity use cases (circa 2012)

• 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

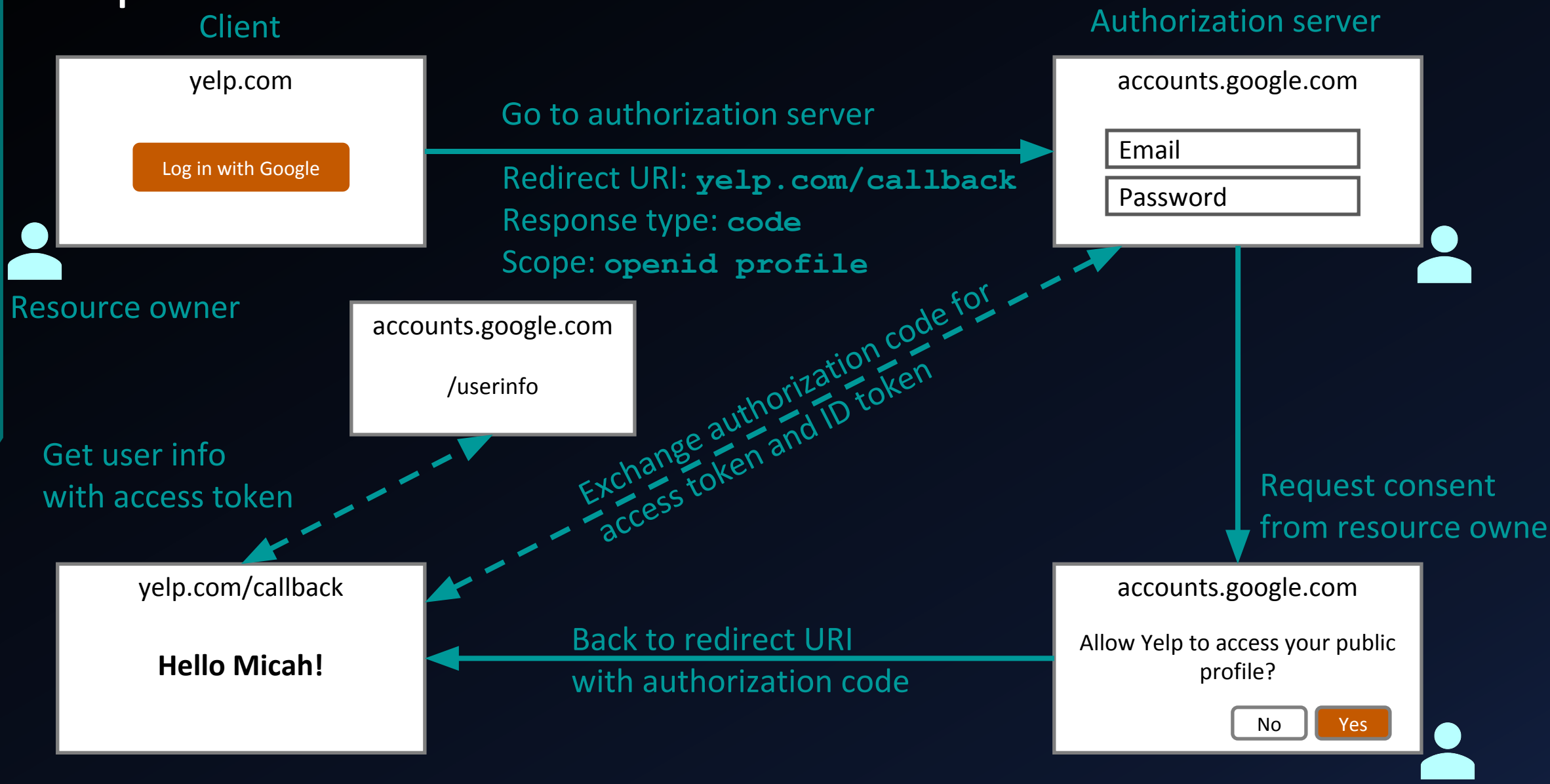


- OpenID Connect is for **authentication**
- OAuth 2.0 is for **authorization**

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)

eyJhbGciOiJSUzI1NiIsImtpZCI6IkRNa3Itd0JqRU1EYnhOY25xaVJISVhu
YUxubWI3UUpfWF9rWmJyaEtBMGMifQ
.
eyJzdWIiOiIwMHU5bzFuaWtqdk9CZzVabzBoNyIsInZlciI6MSwiaXNzIjoi
aHR0cHM6Ly9kZXYtMzQxNjA3Lm9rdGFwcmV2aWV3LmNvbS9vYXV0aDIvYXVz
OW84d3ZraG9ja3c5VEwwaDciLCJhdWQiOiJsWFNlbkx4eFBpOGtRVmpKRTVz
NCIsImlhdCI6MTUwOTA0OTg5OCwiZXhwIjoxNTA5MDUzNDk4LCJqdGkiOiJJ
RC5oa2RXSXNBSXZTbnBGYVFHTVRYUGNVSmhhMkgwS2c5Ykl3ZEVvVm1ZZHN3
IiwiYW1yIjpbImtiYSIsIm1mYSIsInB3ZCJdLCJpZHAiOiIwMG85bzFuaWpr
aWpLeGNpbjBoNyIsIm5vbmNlIjoidWpwMmFzeHlqN2UiLCJhdXRoX3RpbWUi
OjE1MDkwNDk3MTl9
.
dv4Ek8B4BDee1PcQT_4zm7kxDEY1sRIGbLoNtlodZcSzHz-XU5GkKyl6sAVm
dXOIPUlAIrJAhNfQWQ-_XZLBVPjETiZE8CgNg5uqNmeXMUnYnQmvN5oWlXUZ
8Gcub-GAbJ8-NQuyBmyec1j3gmGzX3wemke8NkuI6SX2L4Wj1PyvkknBtbjf
iF9ud1-ERKbobaFbnjDFOFTzvL6g34SpMmZWy6uc_Hs--n4IC-ex-_Ps3FcM
wRggCW_-7o2FpH6rJTOGPZYrOx44n3ZwAu2dGm6axtPI-sqU8b6sw7DaHpog
D_hxsXgMIOzOBMbYsQEiczoGn71ZFz_1O7FiW4dH6g

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:

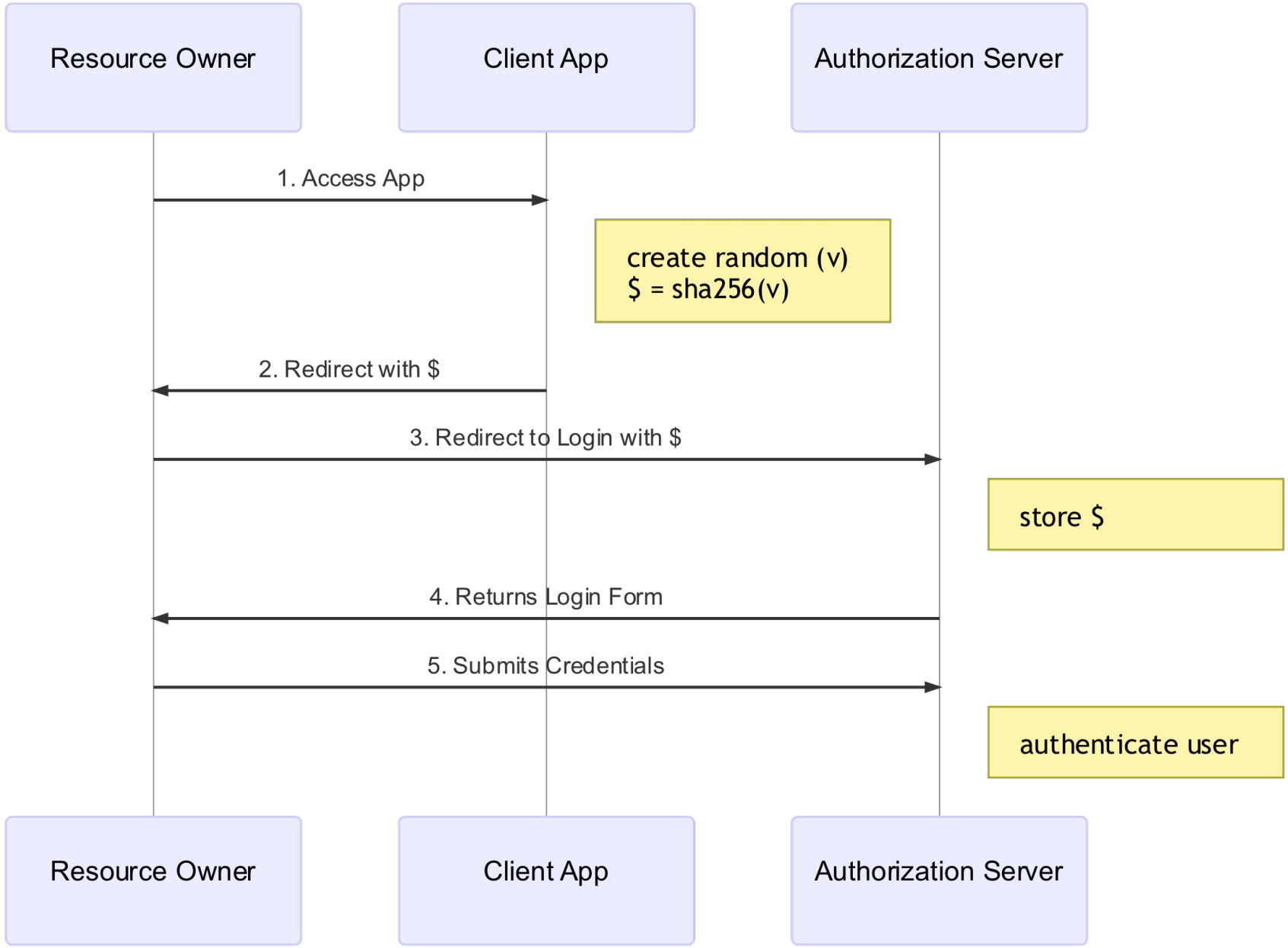
- Logging the user in
- Making your accounts available in other systems

(Authentication)

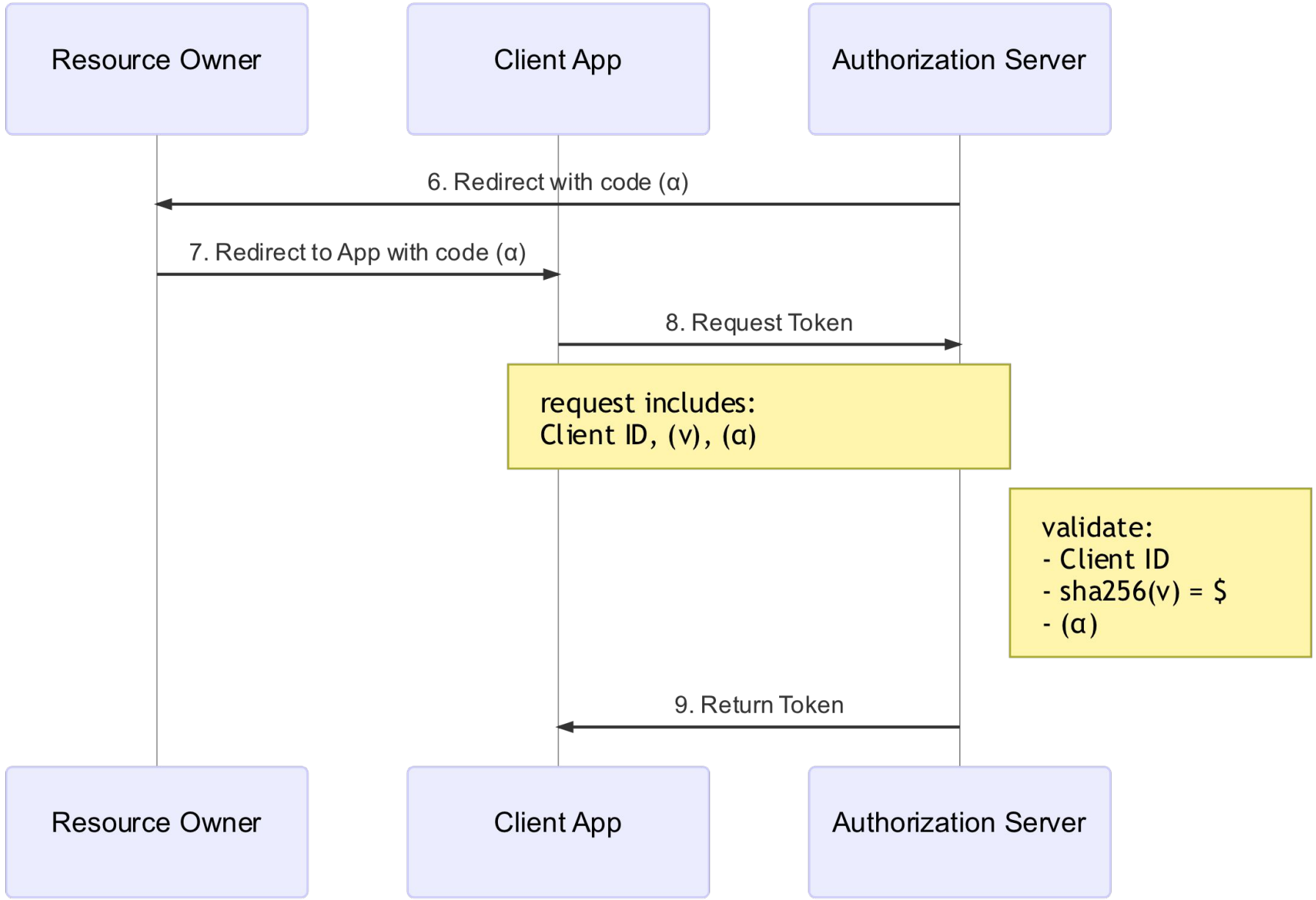
Which flow (grant type) do I use?

- Web application w/ server backend: **authorization code flow**
- Native or mobile app: **authorization code with PKCE flow**
- JavaScript app (SPA) 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/dogeared/kcdc-2019-oauth-and-oidc

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Free hosted authorization server:
developer.okta.com