OAuth and OpenID Connect

(IN PLAIN ENGLISH)

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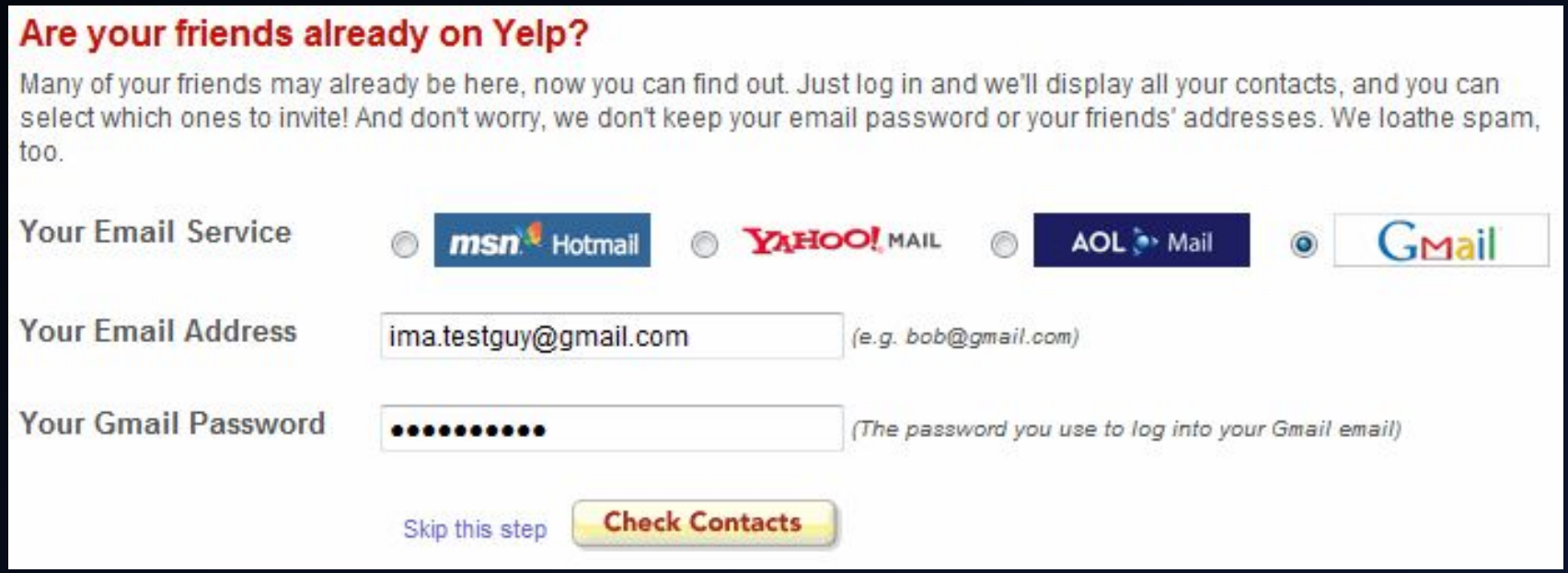
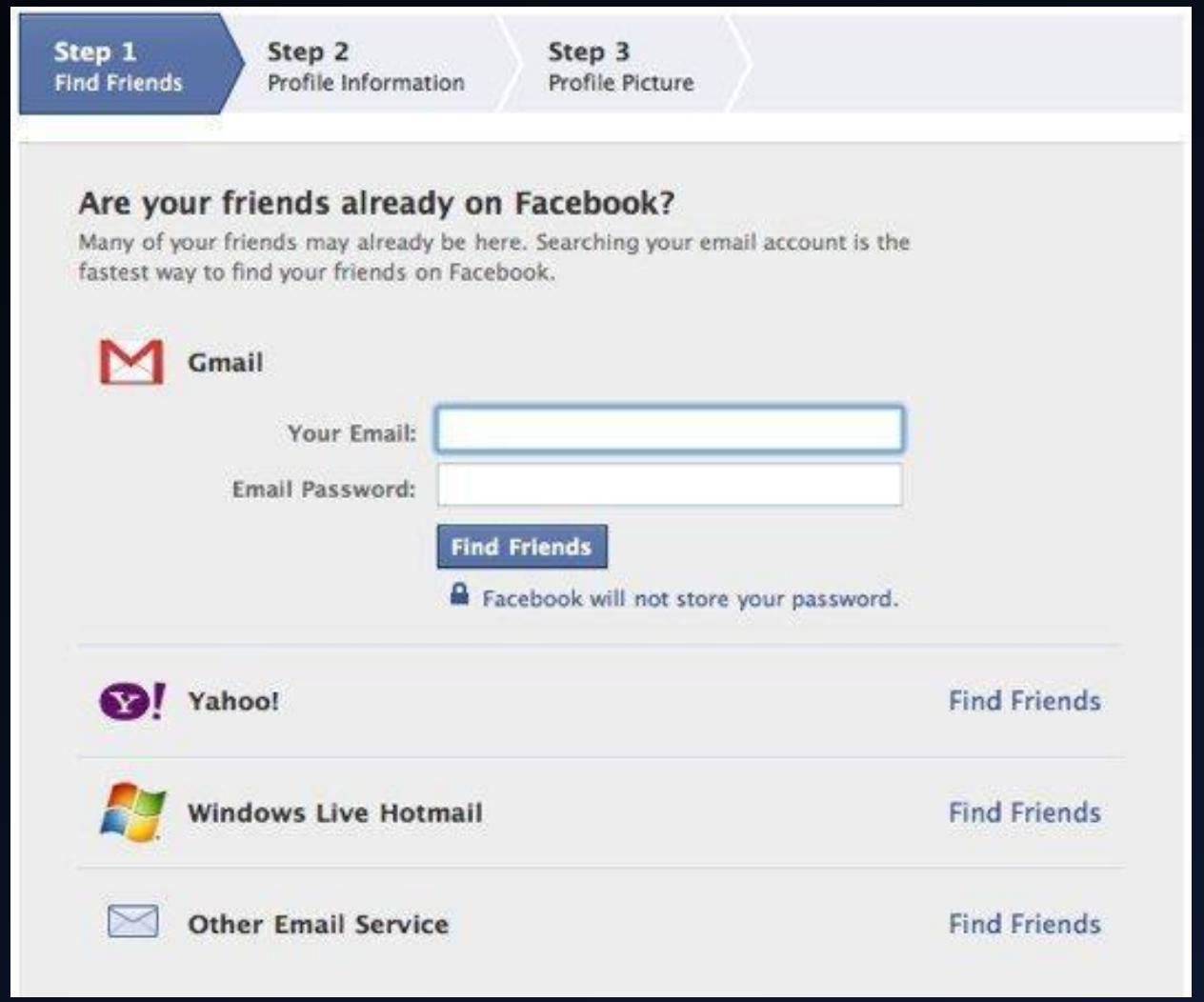
Identity use cases (circa 2007)

- 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!



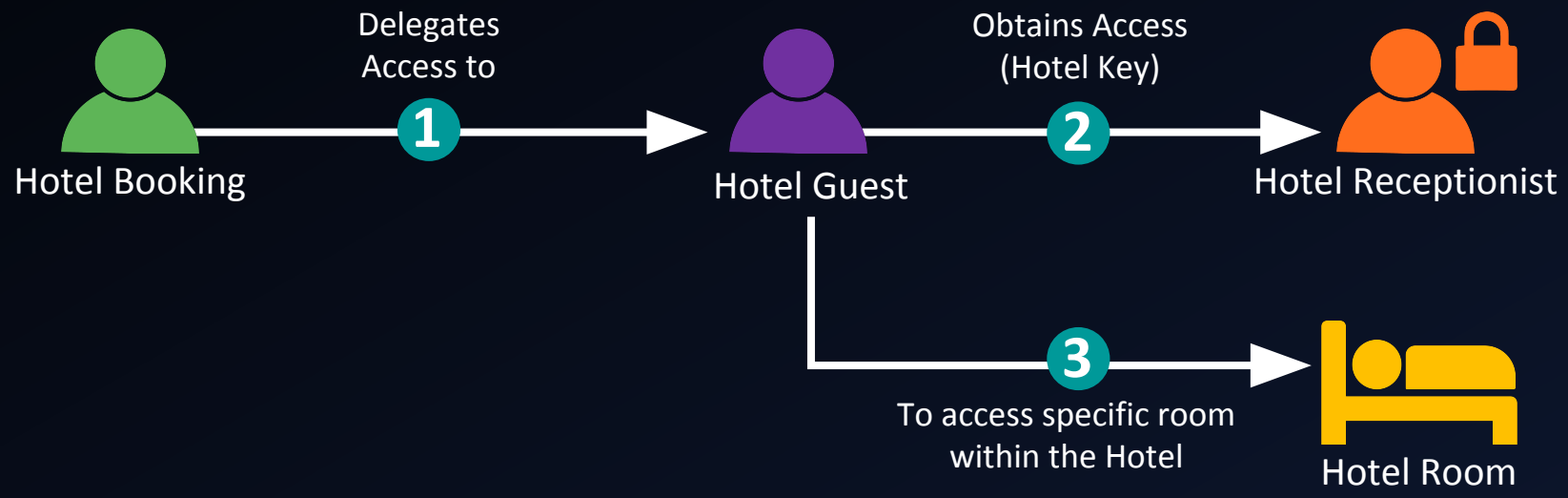
The delegated authorization problem

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

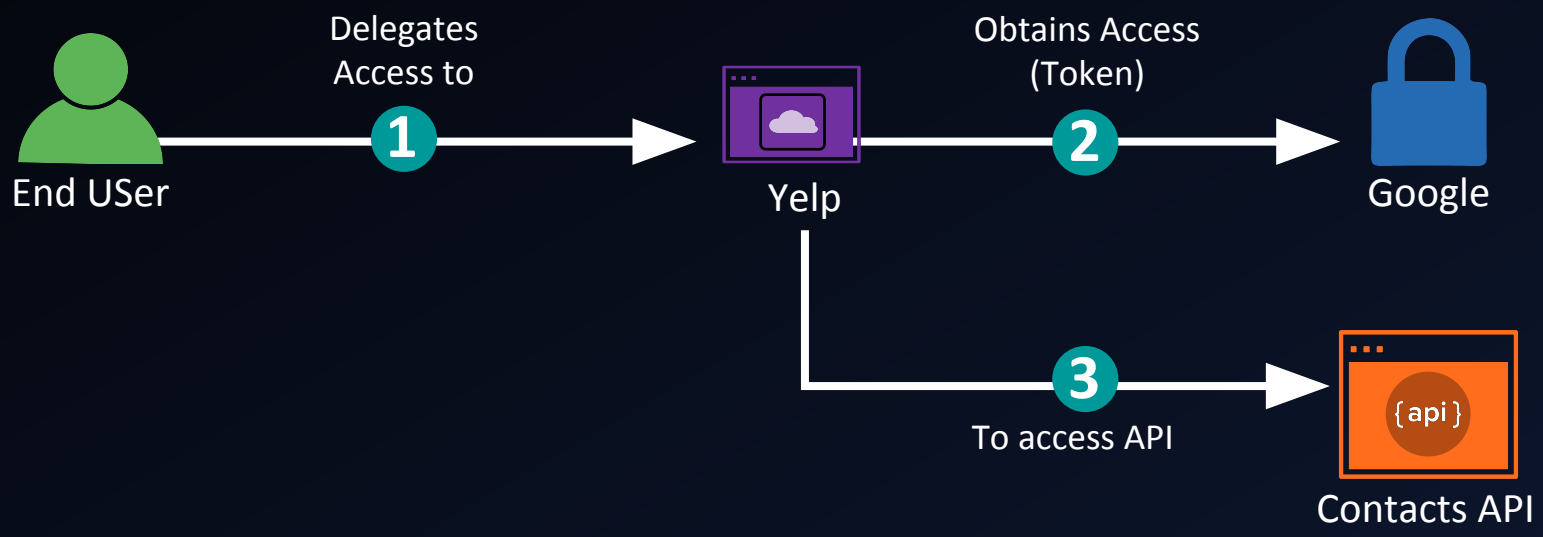
A lot of confusion around OAuth & OIDC

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

Hotel Analogy



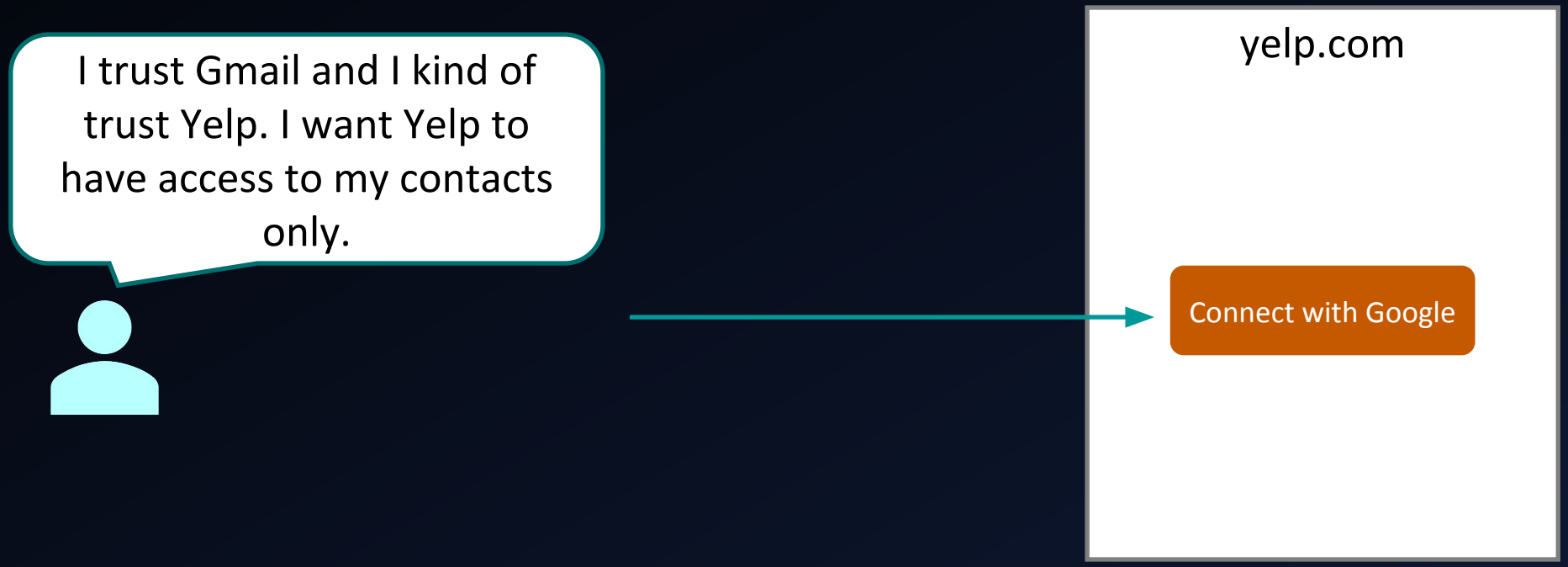
OAuth: App Scenario



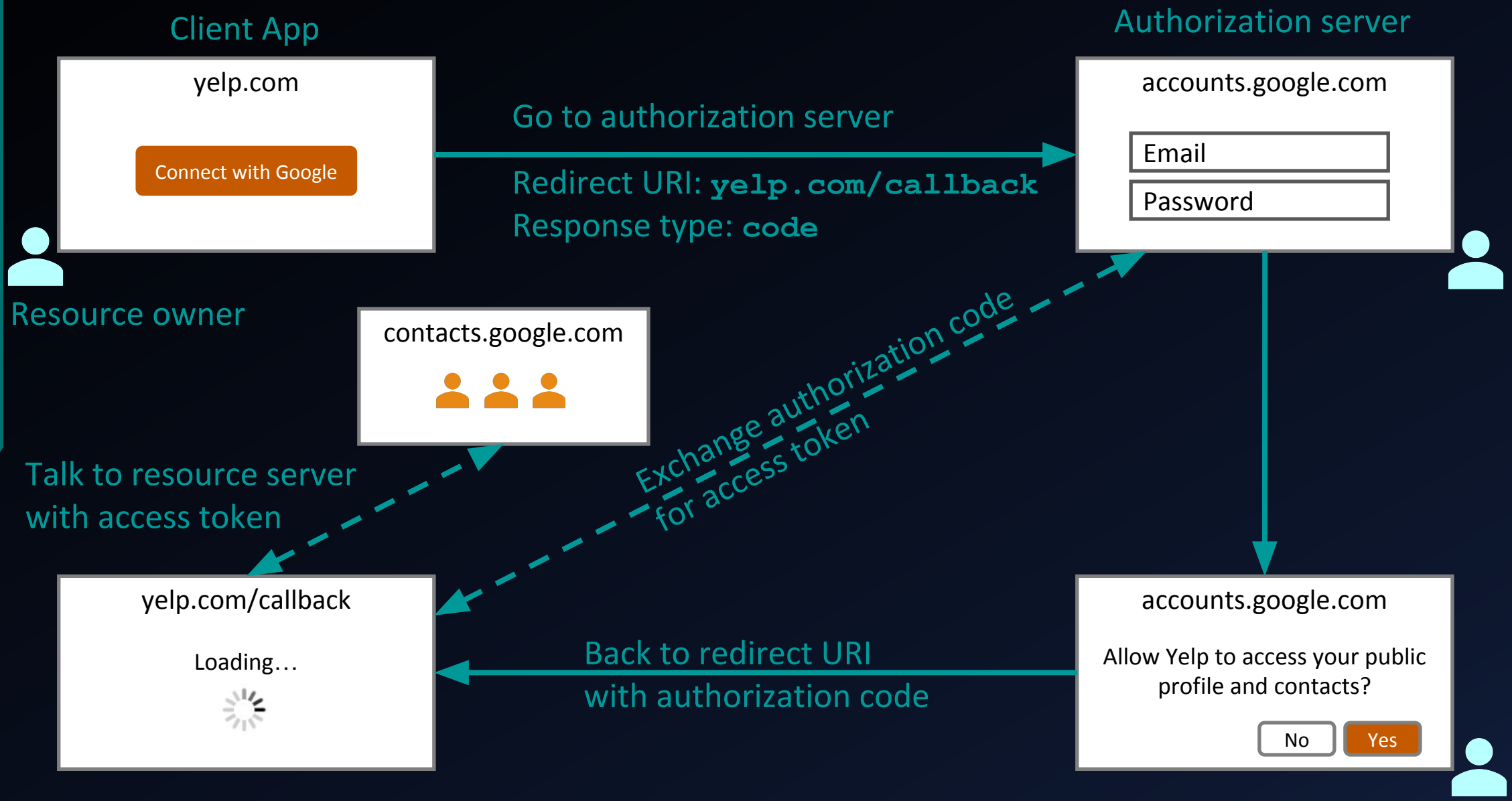
OAuth 2.0 Terminology

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



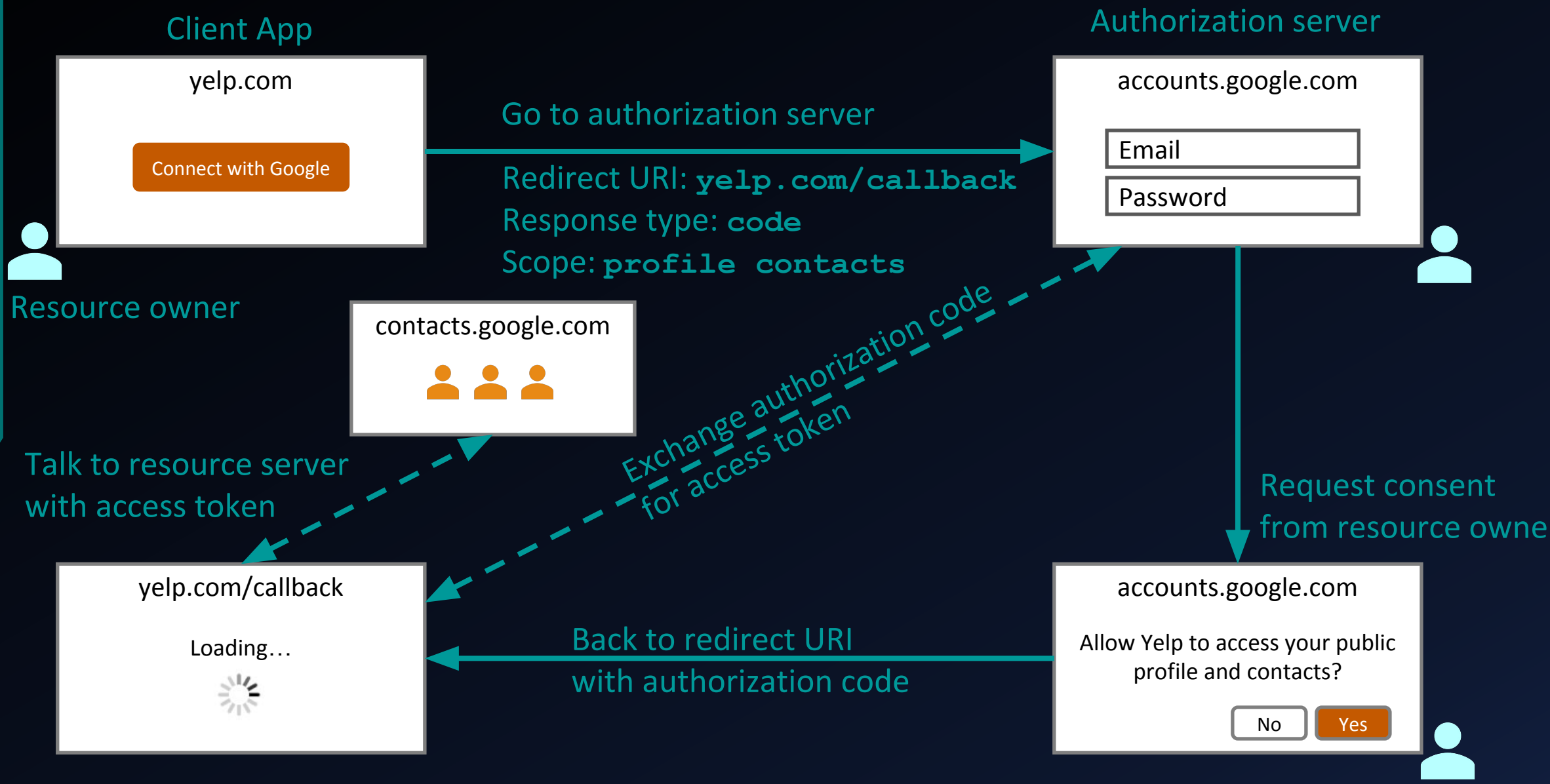
OAuth 2.0 authorization code flow



More OAuth 2.0 terminology

- Scope
- Consent

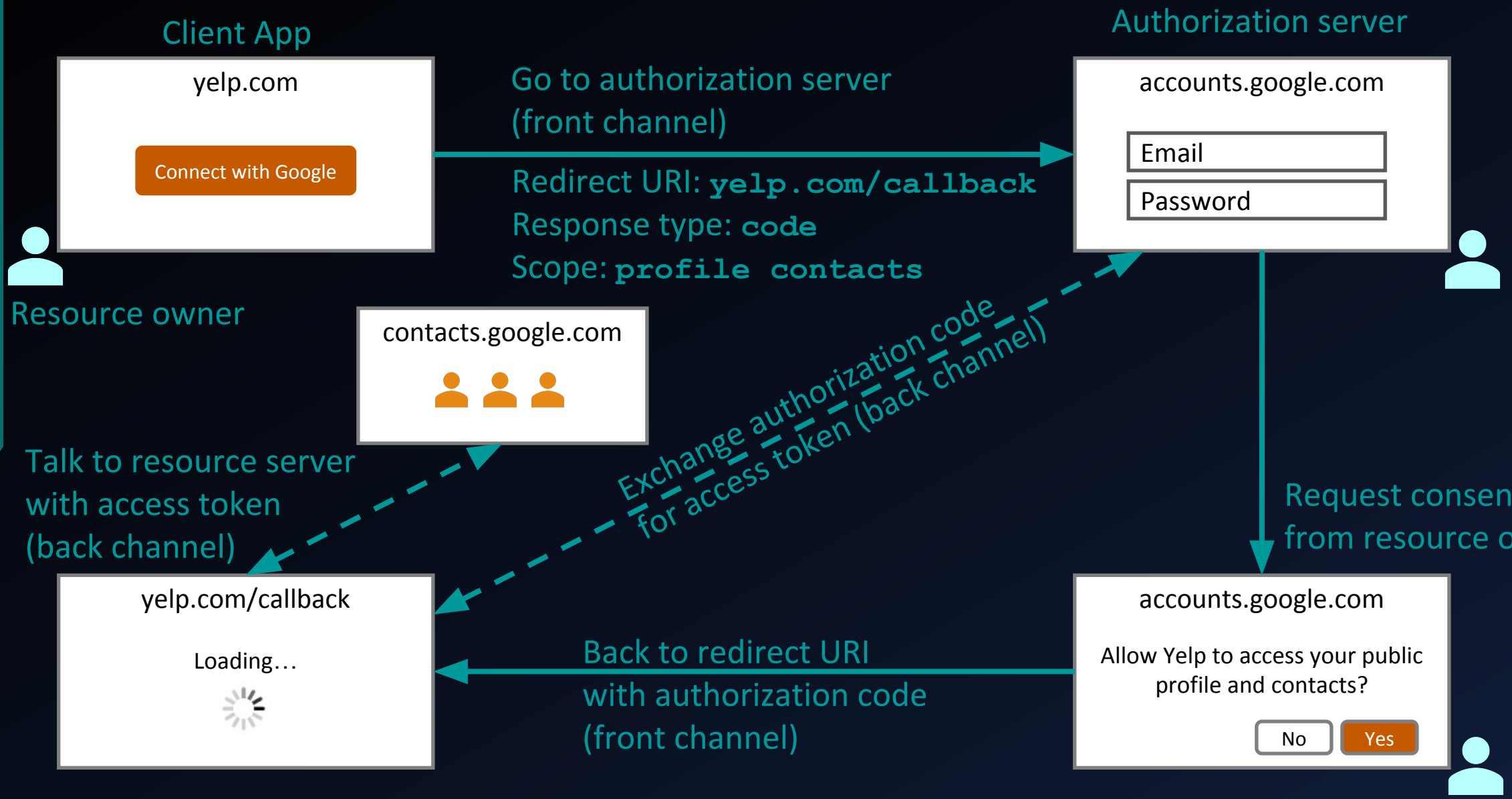
OAuth 2.0 authorization code flow



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
```

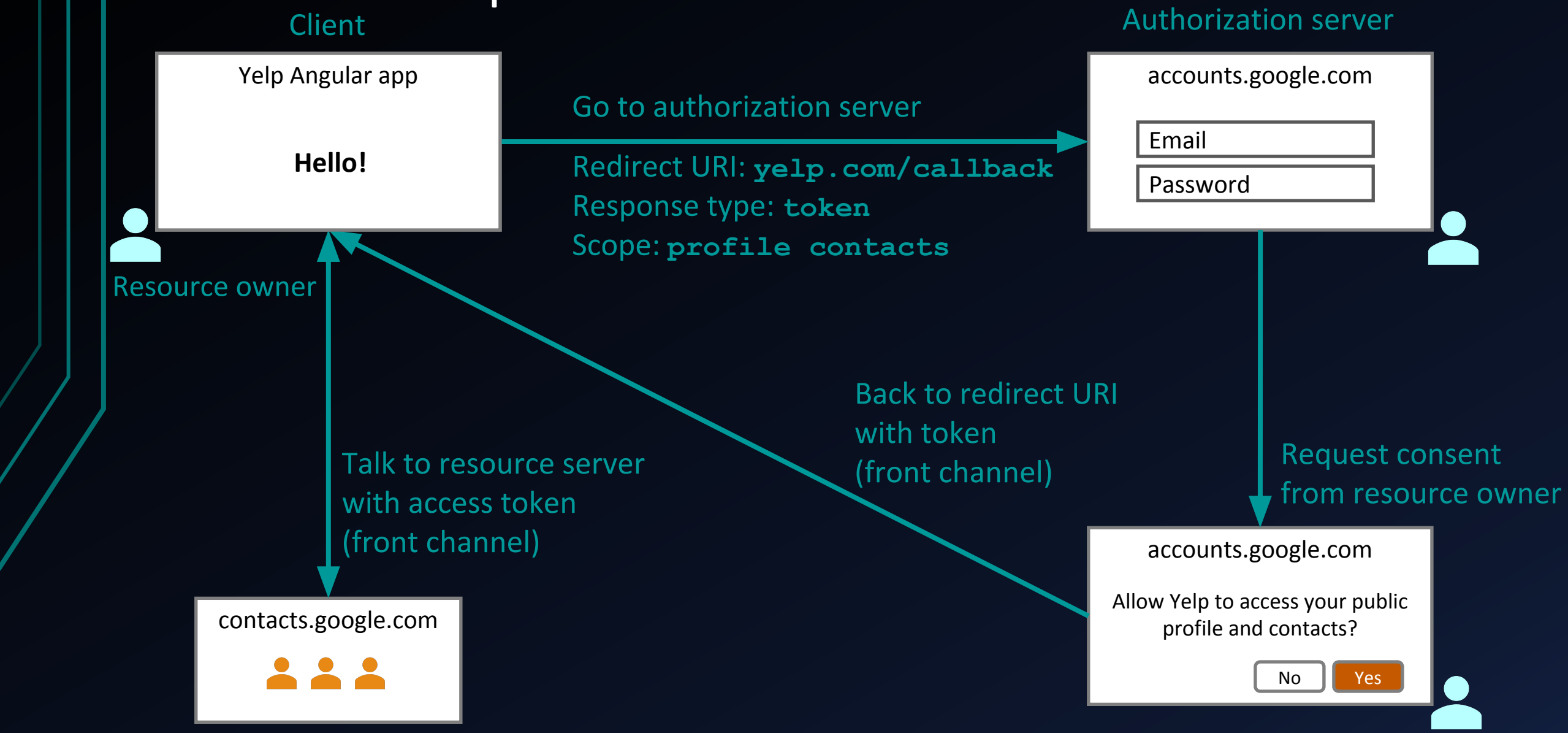
- Validate token
- Use token scope for authorization

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



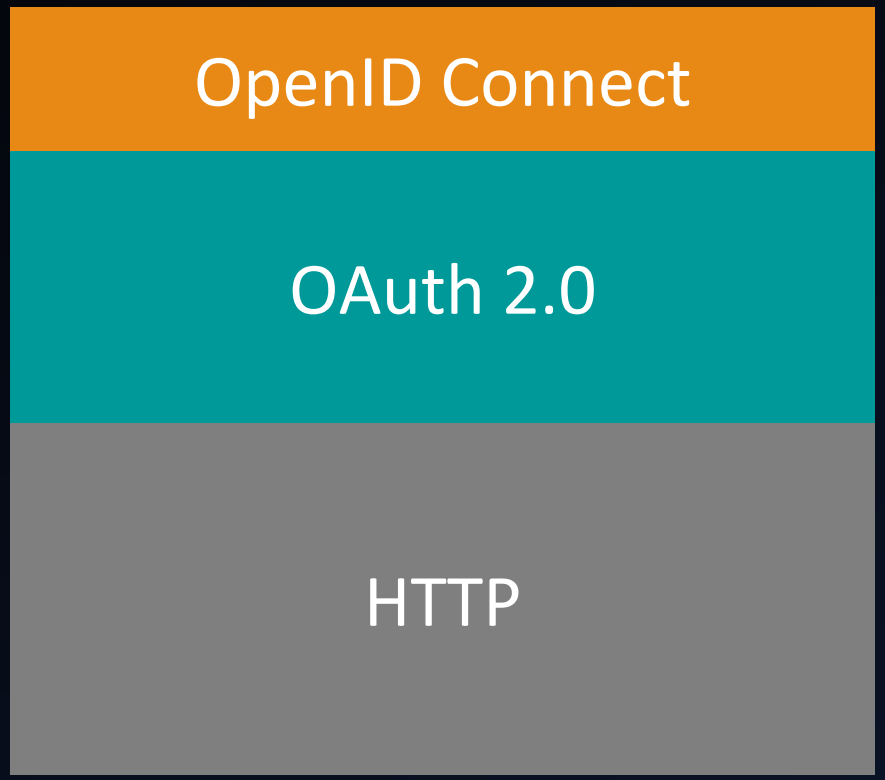
Identity use cases (circa 2012)

• 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

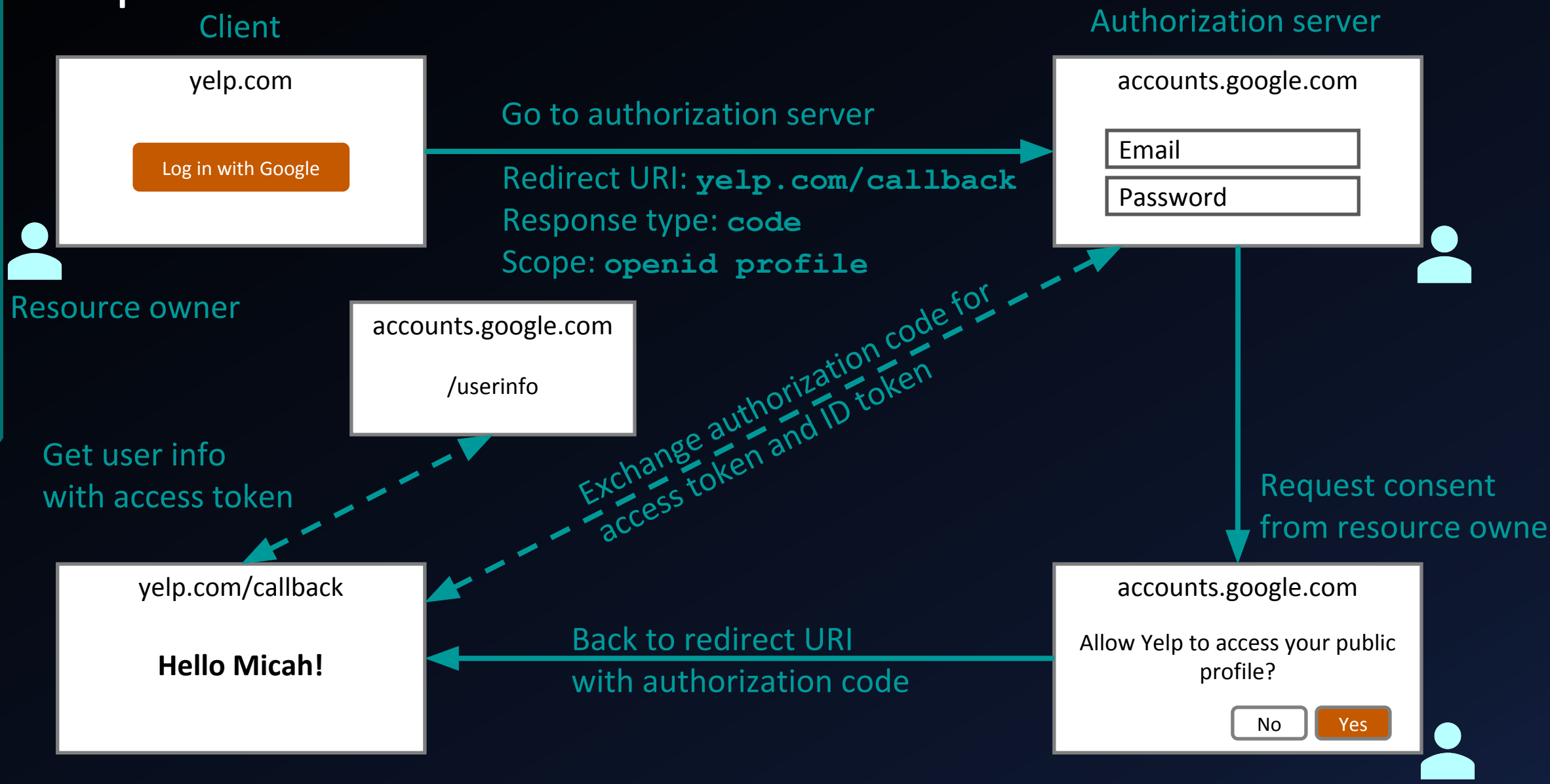


- OpenID Connect is for **authentication**
- OAuth 2.0 is for **authorization**

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&
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```

```
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:

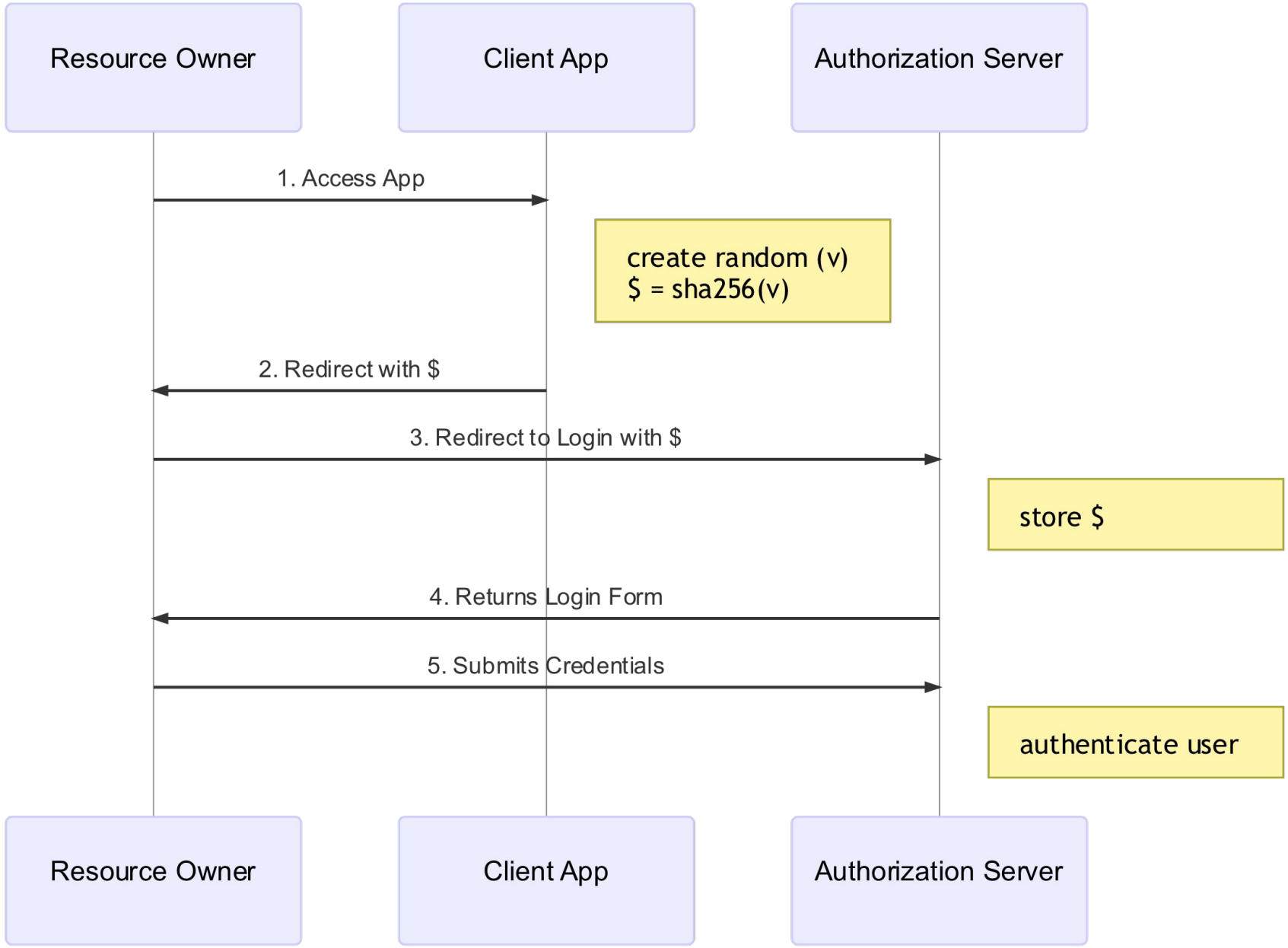
- Logging the user in
- Making your accounts available in other systems

(Authentication)

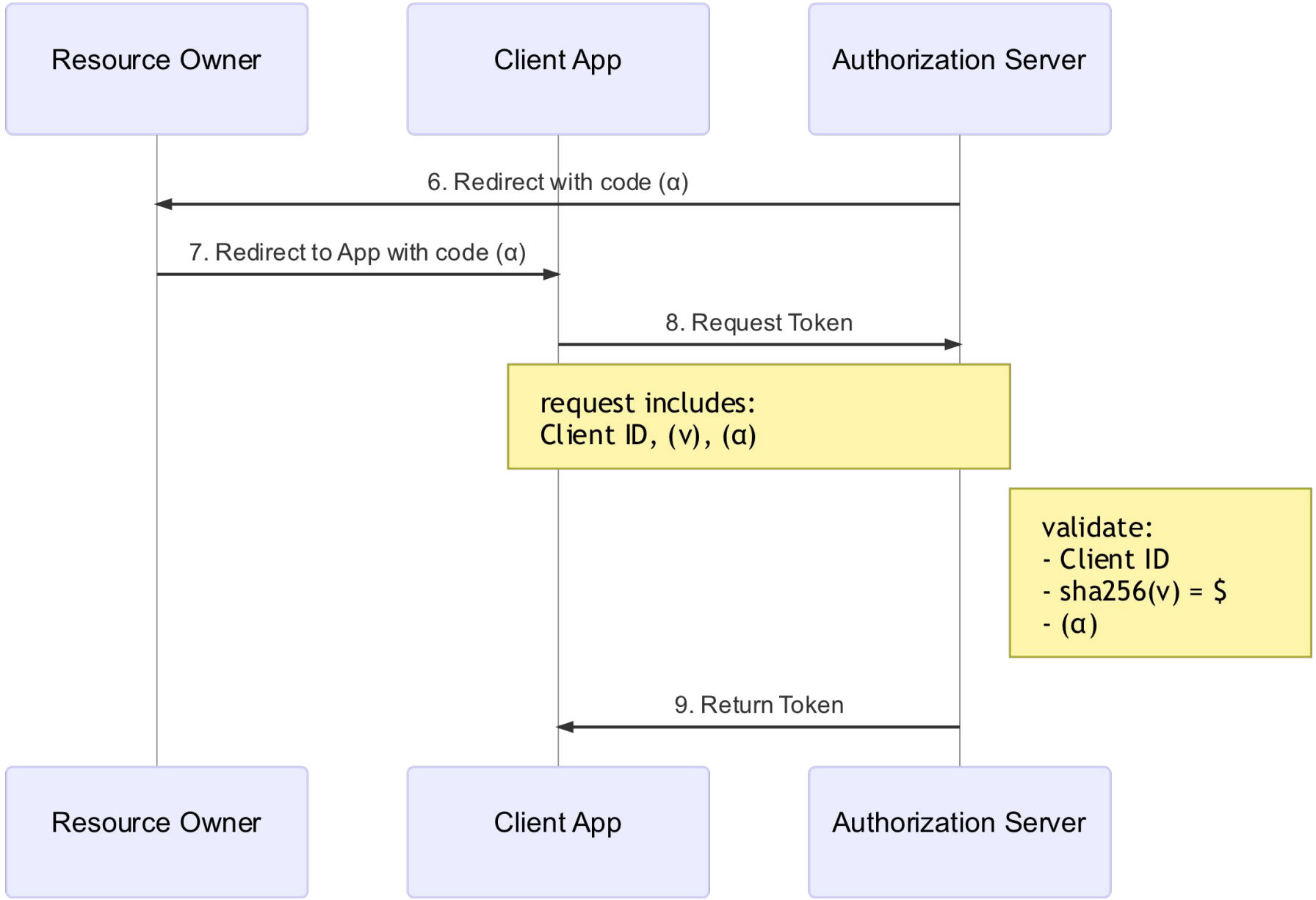
Which flow (grant type) do I use?

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

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Free hosted authorization server:
developer.okta.com