- 2 types of tokens should be there: **access token** (short validity; around 10 min) and **refresh token** (long validity; like 6 months)
  - When the *access token* is expired, the **refresh token** will be used to get a new *access token*.
  - Usually, **refresh token** is stored in the cookies, and get the *refresh token* from the cookies from backend (not in request payload) and validate the *refresh token*;
  - If the *refresh token* is valid then generate one new **access token** and return in response.
  - Use **http-only** cookies to store refresh token.

```
LoginResponseDto responseDto = authService.login(loginDto);

Cookie cookie = new Cookie( name: "refreshToken",  value: responseDto.getRefreshToken());
cookie.setHttpOnly(true);
  cookie.setSecure(true);

response.addCookie(cookie);

return ResponseEntity.ok( body: responseDto);
```

  - Just keep **user id** in the refresh token, no need to keep everything there.

```
public String generateRefreshToken( @NotNull User user) {  1 usage   Alok Ranjan Joshi
    return Jwts.builder()
            .subject( s: user.getId().toString())
            .issuedAt( date: new Date())
            .expiration( date: new Date( date: System.currentTimeMillis() + 1000L *60*60*24*30*6))
            .signWith(getSecretKey())
            .compact();
}
```

  - **Login service method** should get the user from **principal** not from ***database***

```
Authentication authentication = authenticationManager.authenticate(
        authentication: new UsernamePasswordAuthenticationToken( principal: loginDto.getEmail(),  credentials: loginDto.getPassword()));

User user = (User) authentication.getPrincipal();
String accessToken = jwtService.generateAccessToken(user);

String refreshToken = jwtService.generateRefreshToken(user);

return new LoginResponseDto(accessToken, refreshToken);
```

    - For this, **user** should be stored as principal instead of **username**.
  -

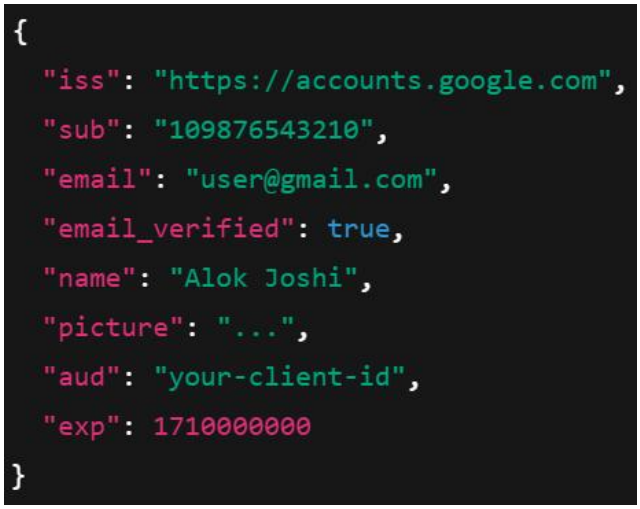
➢ Frontend & Backend in Google OAUTH2 (in general)

- In case of **"sign in with google",** There are **2** backends involved
  - Our own backend
  - Google's backend
- After clicking on that "sign in with google" button, the ***frontend*** triggers one request which is:
  - **GET /oauth2/authorization/google** (this is our backend's path; not google's)
  - We don't write this end point by our self; this is **auto-created** by Spring Security OAuth2 Client.
  - Internally it is handled by: **OAuth2AuthorizationRequestRedirectFilter**
- Now, our backend reads from ***application.yml*** file
  -
```yaml
spring:
  security:
    oauth2:
      client:
        registration:
          google:
            client-id: xxx
            client-secret: yyy
            scope: email, profile
```
  - Now, our backend knows about:
    - which provider (google)
    - client_id
    - scopes
    - redirect_uri template
- Now, our backend will build a **url having proper query parameters which will be sent as response to which the browser will redirect.**
  - The URL will look something like this
  -
```
https://accounts.google.com/o/oauth2/v2/auth
  ?client_id=123456789.apps.googleusercontent.com
  &response_type=code
  &scope=openid%20email%20profile
  &redirect_uri=https://your-backend.com/login/oauth2/code/google
  &state=KJH7823HJDS
```
  - Note: **redirect_uri** is present in this URL.

- Now, our Backend responds with one thing only
  - ```
    302 Redirect
    Location: https://accounts.google.com/o/oauth2/v2/auth?client_id=...
    ```
  - It is browser's rule: **If response status is 3xx and Location header is present → automatically navigate to that URL.**
  - There is no involvement of ***frontend*** in this case.
- Now, the browser redirects to **accounts.google.com** …. page directly.
  - Here there is no role of our backend, it is completely backed by **Google's backend**.
- Now, the user will interact with the ***google's UI*** and give the necessary permissions of the required details.
- Then, Google will authenticate the user and redirect the browser to ***our backend's path*** Using the same **redirect_uri** that your backend sent earlier
  - ```
    https://your-backend.com/login/oauth2/code/google?code=XYZ&state=ABC
    ```
  - This full path (not just backend's domain) is registered in Google console.
  - Note: **state** & **code** is present here.
  - **NOTE** ----------
  - So, in the Google Console you can register as many URIs you want, that will be treated as the allowed redirect URIs
  - And you need to pass the **redirect_uri** in the response so that google will get to know to which **uri** it has to redirect.
  - First Google will check if the given **uri** in the request URL is present in the access list, if present then it'll redirect back to that URI after authenticating the user.
  -
- Now, our backend's end point "**/login/oauth2/code/google**" will receive the request.
  - This endpoint is ALSO **auto-created** by Spring Security OAuth2 Client
  - Handled by: **OAuth2LoginAuthenticationFilter**
- Now, our backend validate the **state**
  - state is a random, unpredictable value generated by YOUR backend before redirecting the user to Google.
  - ```
    state = a8f9c2e4b3...
    ```
  - If the **state** matches, then continue; otherwise **reject**.
- Now **our Backend** exchanges **code** with **tokens**
  - code is an authorization code issued by Google after the user successfully authenticates and consents.
    ```

- Think of it as a one-time, short-lived voucher that your backend can exchange for token.
- Backend makes **server-to-server** call.
- It sends **client_id, client_secret, code, redirect_uri** and receives **access_token, id_token, expires_in**

- **id_token** is a JWT which contains the user details within it like the below



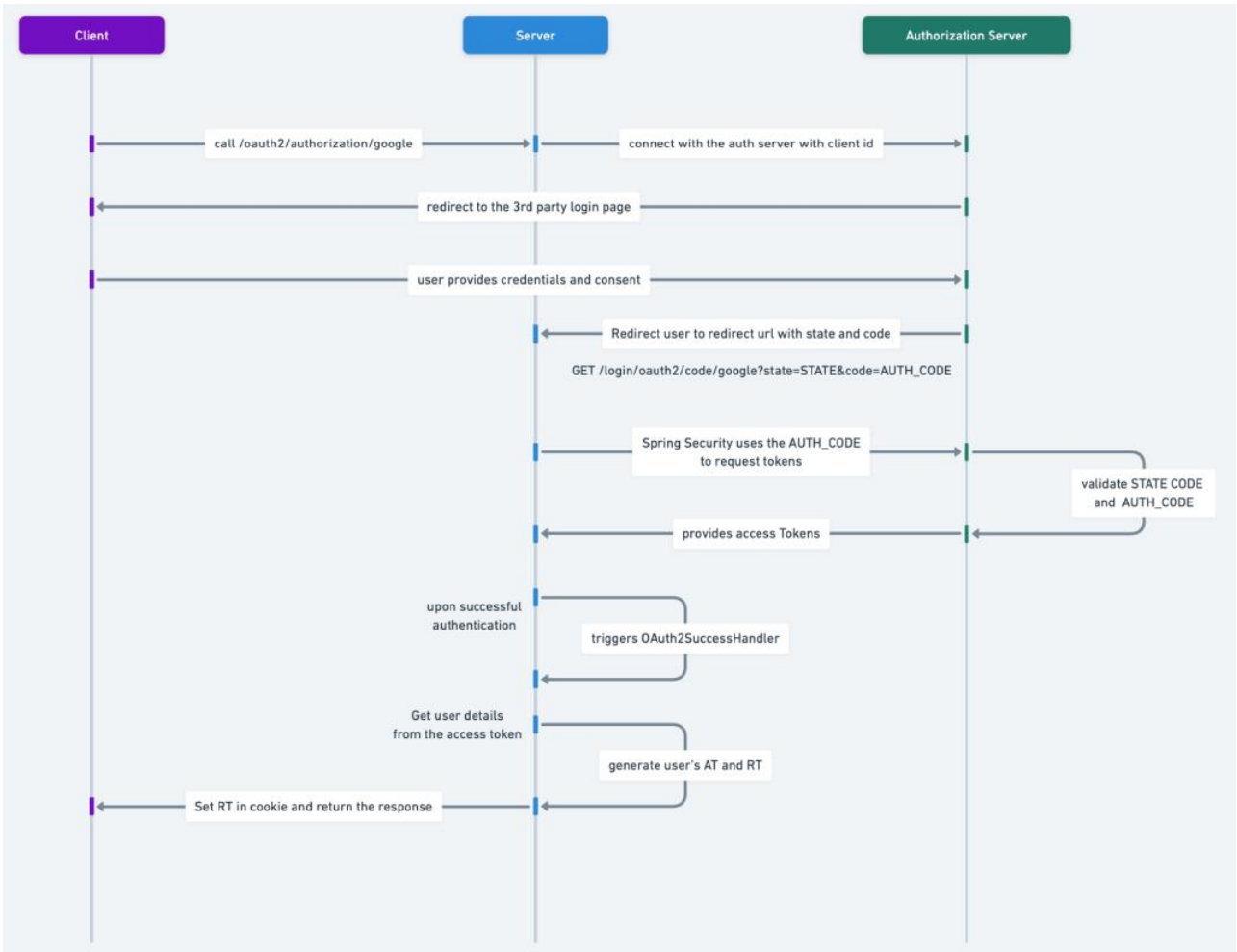
- You "use" only the authorization code; the **access_token** is returned because **OAuth** requires it, but if you don't call Google APIs, it is perfectly normal that it is never used.

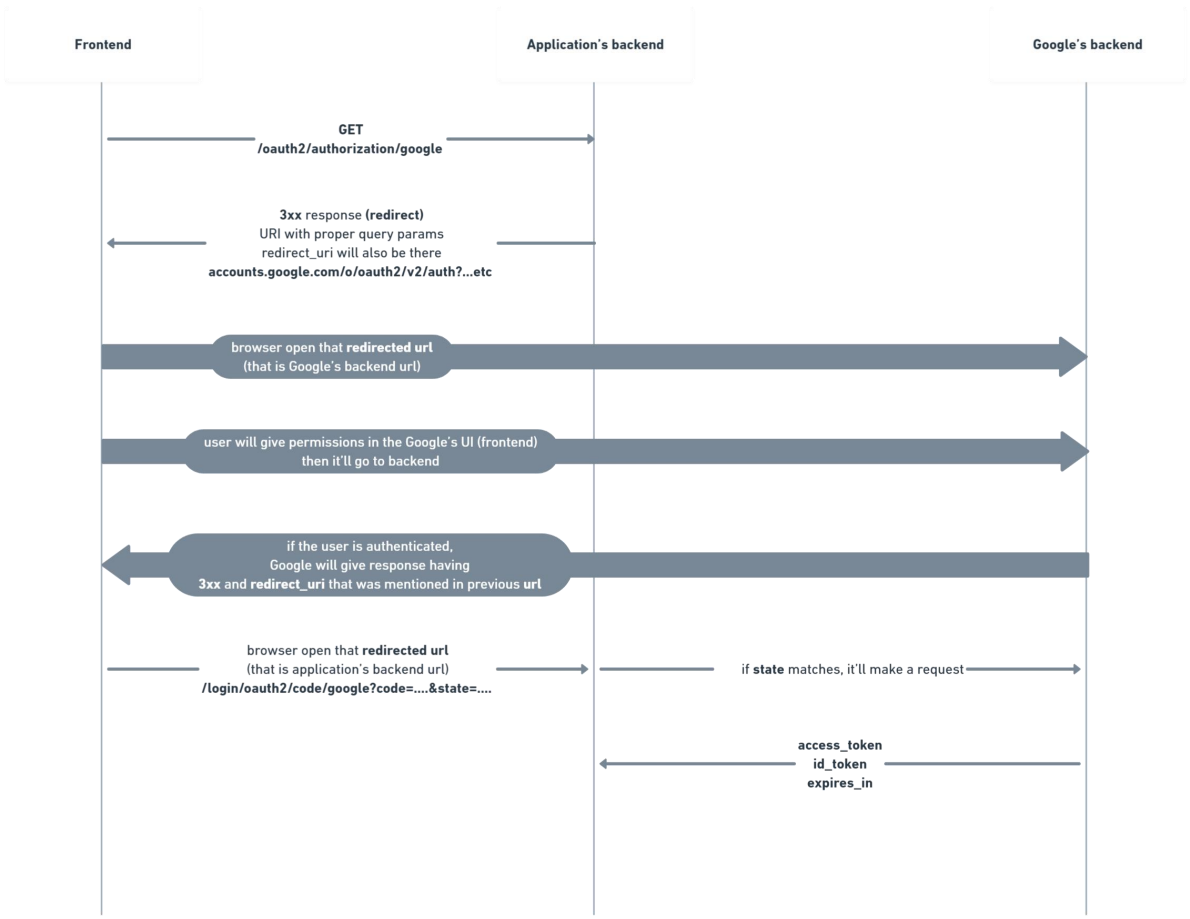
➢ Now, you can implement the normal login in our backend after getting those details.

➢ In one sentence:

- In Google OAuth login, the frontend only triggers navigation. The backend **constructs the authorization request**, redirects the **browser to Google**, and later receives the **authorization code**. Google authenticates the user, validates the redirect URI against its allow-list, and redirects back **to the backend**. The backend validates **state**, exchanges the **code for tokens**, extracts user identity, and then performs normal application login logic.

```
Frontend
  ↓
/oauth2/authorization/google   (our backend)
  ↓
accounts.google.com            (Google backend)
  ↓
/login/oauth2/code/google      (our backend)
  ↓
frontend/dashboard
```





Made with Whimsical

➤

```
id_token contains the details that are required like email, name etc etc
```

```
if http status is 3xx and location is present in response then browser will redirect that by default
```

Made with Whimsical

➤

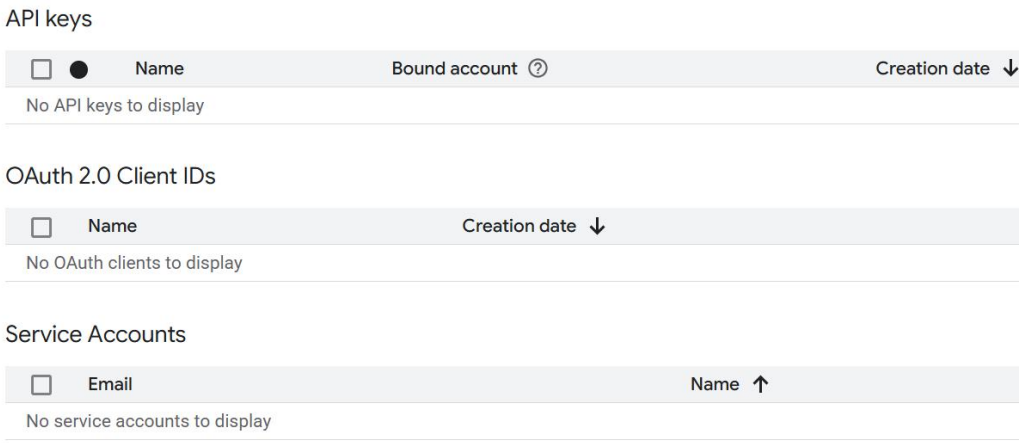
OAuth2 in Spring Boot

- What Spring tries to solve?
  - **OAuth2** is just one ***protocol***, not an ***implementation***.
  - Spring Security's job is to
    - implement OAuth2 **hiding** protocol's complexity behind **filters + config** ;
    - So, basically Spring Security provides an **OAuth2 client framework**.
- **Client & Provider**
  - **Client**: your backend application
  - **Provider**: system that actually authenticates users i.e. ***google, github, facebook***
-

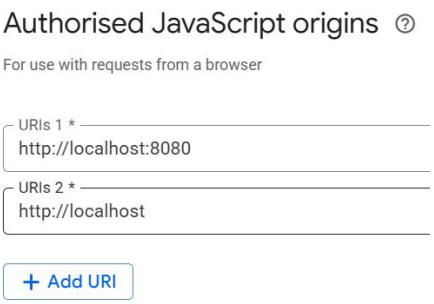
Steps

Google Console Setup

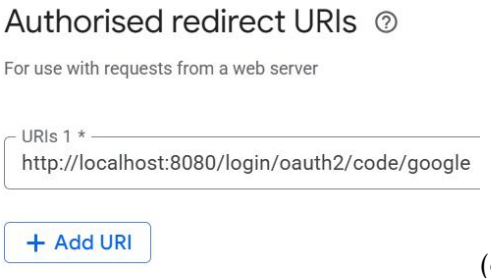
- Select the project in Google Console; and go to Dashboard
- API & Services >> Credentials



- **Create Credentials >> OAuth Client ID**
- **Configure Consent Screen**
  - You need to configure all the things separately.
  - Audience: either you can setup some test user or publish. Publish means anyone can try to login.
  - Data access: it is the scopes like which data do you want to access from google.
  - Clients: create the OAuth2 client;



    - It means Requests coming from a browser whose origin is "http://localhost:8080" are allowed to start OAuth.



    - (default URL of spring security)

- After creating the **Client**, you'll get the **client id** and **client secret**, copy those and paste in the *application.properties* or *application.yml* file.
- ---------- Google Console set-up done ----------
- **Application codes**
- Add the **oauth2Login** filter in the custom filter chain

```
httpSecurity
        .authorizeHttpRequests( authorizeHttpRequestsCustomizer: auth -> auth
                .requestMatchers( ...patterns: "/auth/**").permitAll()
                .anyRequest().authenticated())
        .csrf( csrfCustomizer: csrfConfig -> csrfConfig.disable())
        .sessionManagement( sessionManagementCustomizer: sessionManagementConfig -> sessionManagementConfig
                .sessionCreationPolicy( sessionCreationPolicy: SessionCreationPolicy.STATELESS))
        .addFilterBefore(jwtFilter,  beforeFilter: UsernamePasswordAuthenticationFilter.class)
        .oauth2Login( oauth2LoginCustomizer: oauth2Config -> oauth2Config
                .failureUrl( authenticationFailureUrl: "/login?error=true"));
```

- You need to also add the **success** handler, otherwise even after getting the response from authorization server (google in our case) it'll not do the required things after authenticating the user.
  - There is a class **SimpleUrlAuthenticationSuccessHandler**, that decides what to do after the authentication success.
  - Authentication can be of any type i.e. **OAuth**, **Form login**, **Username/password login** ..etc
  - This class contains one method **onAuthenticationSuccess** which is executed after the authentication gets succeeded.
  - So, if we create a **Bean** of a class extending **SimpleUrlAuthenticationSuccessHandler** class and overriding the method **onAuthenticationSuccess** then we can handle the authentication success case.
  - I created the below class:

```
@Slf4j  2 usages
@Component
@RequiredArgsConstructor
public class OAuth2SuccessHandler extends SimpleUrlAuthenticationSuccessHandler {
```

- Now just add that class's object in the SecurityFilterChain

```
.oauth2Login( oauth2LoginCustomizer: oauth2Config -> oauth2Config
        .failureUrl( authenticationFailureUrl: "/login?error=true")
        .successHandler(oAuth2SuccessHandler));
```

- I just checked if the user is present in the database, if present then do signup otherwise just create **access** and **refresh** token and send in response.

```
if(user == null) {
    User newUser = User.builder()
            .email(email)
            .name( name: oAuth2User.getAttribute( name: "name"))
            .build();
    user = userService.save(newUser);
}
String accessToken  = jwtService.generateAccessToken(user);
String refreshToken  = jwtService.generateRefreshToken(user);


Cookie cookie = new Cookie( name: "refreshToken",  value: refreshToken);
cookie.setHttpOnly(true);
cookie.setSecure("production".equals(deployEnv));
response.addCookie(cookie);

String frontendUrl = "http://localhost:8080/home.html?token=" + accessToken;
response.sendRedirect( s: frontendUrl);
```

-
  - It is inside the **onAuthenticationSuccess** method.
  - **response.sendRedirect()** will send a redirect-response so that the browser will redirect to this specific url.
  - **home.html** is nothing but a static file.
- F

- There is a class **ClientRegistration** which contains all the details about the OAuth2

```
public final class ClientRegistration implements Serializable {
    private static final long serialVersionUID = 620L;
    private String registrationId;
    private String clientId;
    private String clientSecret;
    private ClientAuthenticationMethod clientAuthenticationMethod;
    private AuthorizationGrantType authorizationGrantType;
    private String redirectUri;
    private Set<String> scopes = Collections.emptySet();
    private ProviderDetails providerDetails = new ProviderDetails();
    private String clientName;
```

- Spring puts all objects of type **ClientRegistration** inside **ClientRegistrationRepository**

```
public interface ClientRegistrationRepository {
    ClientRegistration findByRegistrationId(String registrationId);
}
```

- The class **InMemoryClientRegistrationRepository** implements this **ClientRegistrationRepository** and contains a map of **provider name** to **ClientRegistration** object

```
public final class InMemoryClientRegistrationRepository implements ClientRegistrationRepository,
    private final Map<String, ClientRegistration> registrations;
```

  - You can think it like:

```
google → ClientRegistration
github → ClientRegistration
```

- There is a filter **OAuth2AuthorizationRequestRedirectFilter** is present which generates the **uri** end-points for OAuth like
  - **/oauth2/authorization/google**

```
public class OAuth2AuthorizationRequestRedirectFilter extends OncePerRequestFilter {  21 usages
    public static final String DEFAULT_AUTHORIZATION_REQUEST_BASE_URI = "/oauth2/authorization";
```

- **NOTE ----------**
  - The redirected URIs are matches at the **filter** level, not **servlet level.** Spring Security is completely ***filter based***.

```
if (request.getRequestURI().equals("/oauth2/authorization/google")) {
    // handle here
}
```

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