M183 Applikationssicherheit Implementieren # 6

By Jürg Nietlispach

Recap # 5?

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1. 2-Factor Authentication: TOTP (vs. OTP)
2. Kurzintro Single Sign On

2-Factor-Authentication – the perfect solution?

Consider: one user has many tools to use …

What are the issues? And Why?

Usability Issues with 2-Factor-Authentication

1. Separate Credentials for every Portal? -> In practice NO!
2. Time consuming to do 2-Factor-Authentication for every tool the user uses
3. N Tools -> N Logins! (-> Minimize Attack Surface Area!)
4. N Tools -> N Logins -> N-times Password- and Profilechanges!
5. …

Solution?

Single Sign On!
(in combination with 2-Factor-Auth)

*"**Single sign-on** (**SSO**) is a property of access control of multiple related, yet independent, software systems. With this property, a user logs in with a single ID and password to gain access to a connected system or systems without using different usernames or passwords, or in some configurations seamlessly sign on at each system."*

Single Sign On - Types

- **Portal Solutions (SAML, OAuth2, OpenID Connect, traditional HTTP-Cookie)**
- Local Solutions (z.B. Passwordmanager)
- Ticketing System (Kerberos)
- …
- (Public Key Infrastructure: Digitales Zertifikat)

Single Sign On – Portal Solution 1

Motivation: Already Logged-In User on domain1.com automatically login on domain2.com

Solution: **share session information** across different domains

Single Sign On – Portal Solution 1

Problem?

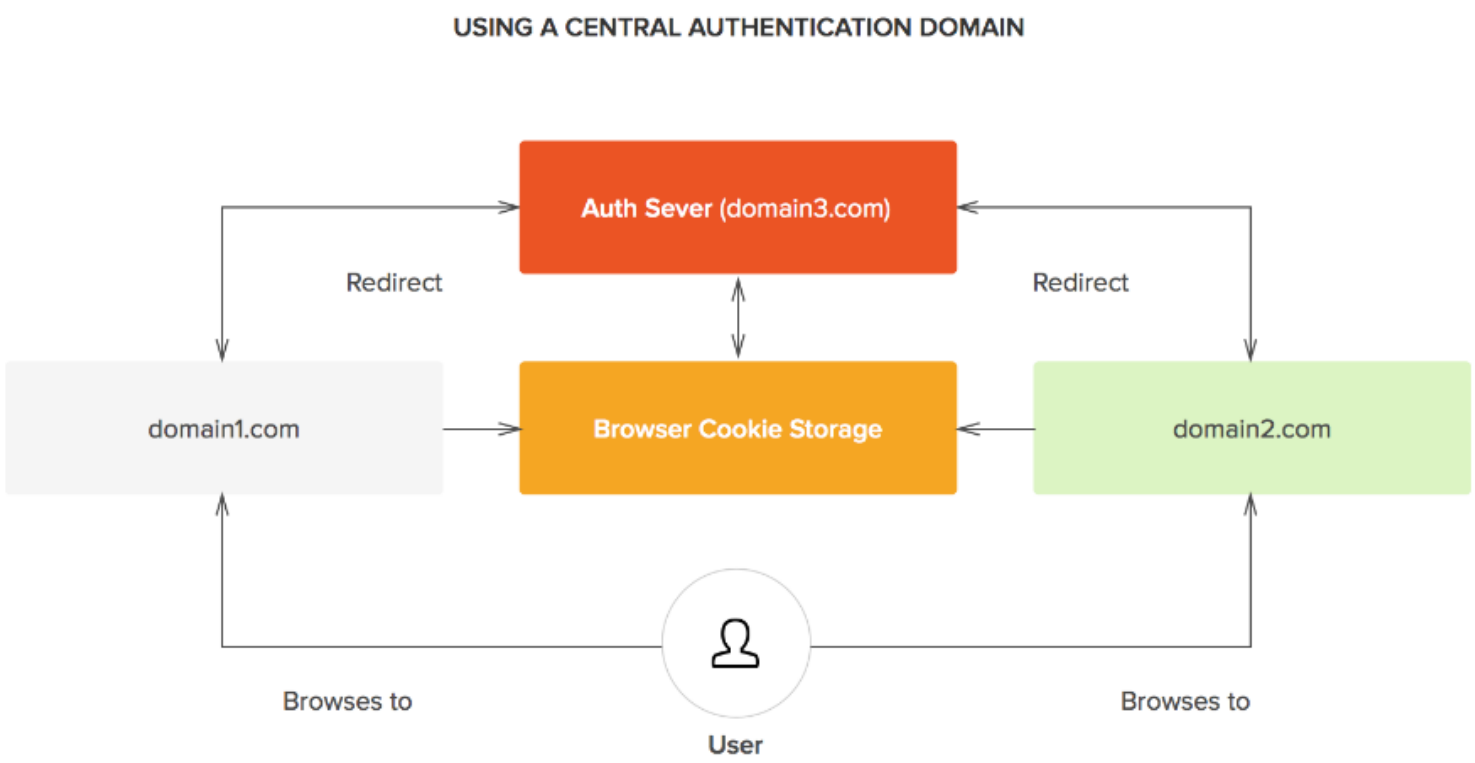
Single Sign On – Portal Solution 2

Problem: *same origin policy*. This policy dictates that cookies (and other locally stored data, JWT) can **only be accessed by its creator**! (i.e. domain1.com, subdomain.domain1.com etc.)

Single Sign On – Portal Solution 2

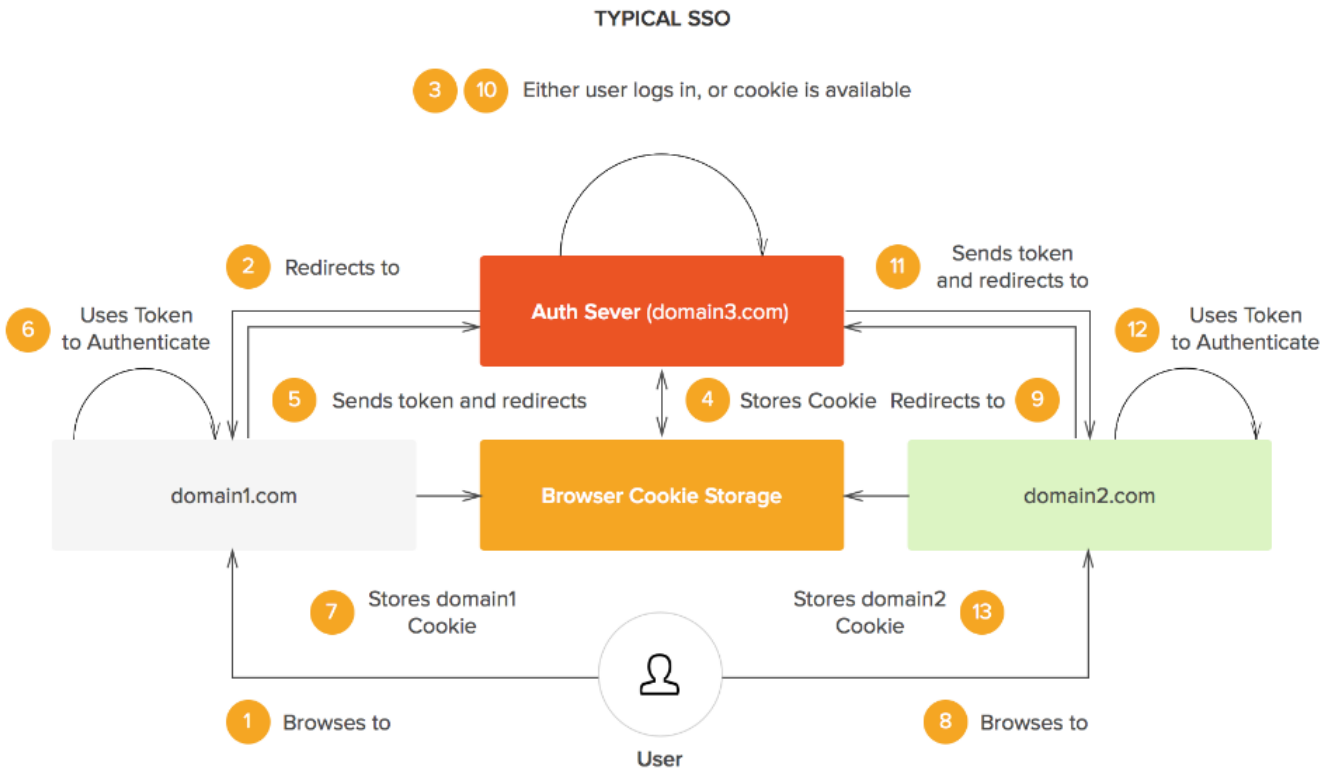
Solution?

Single Sign On – Portal Solution 3



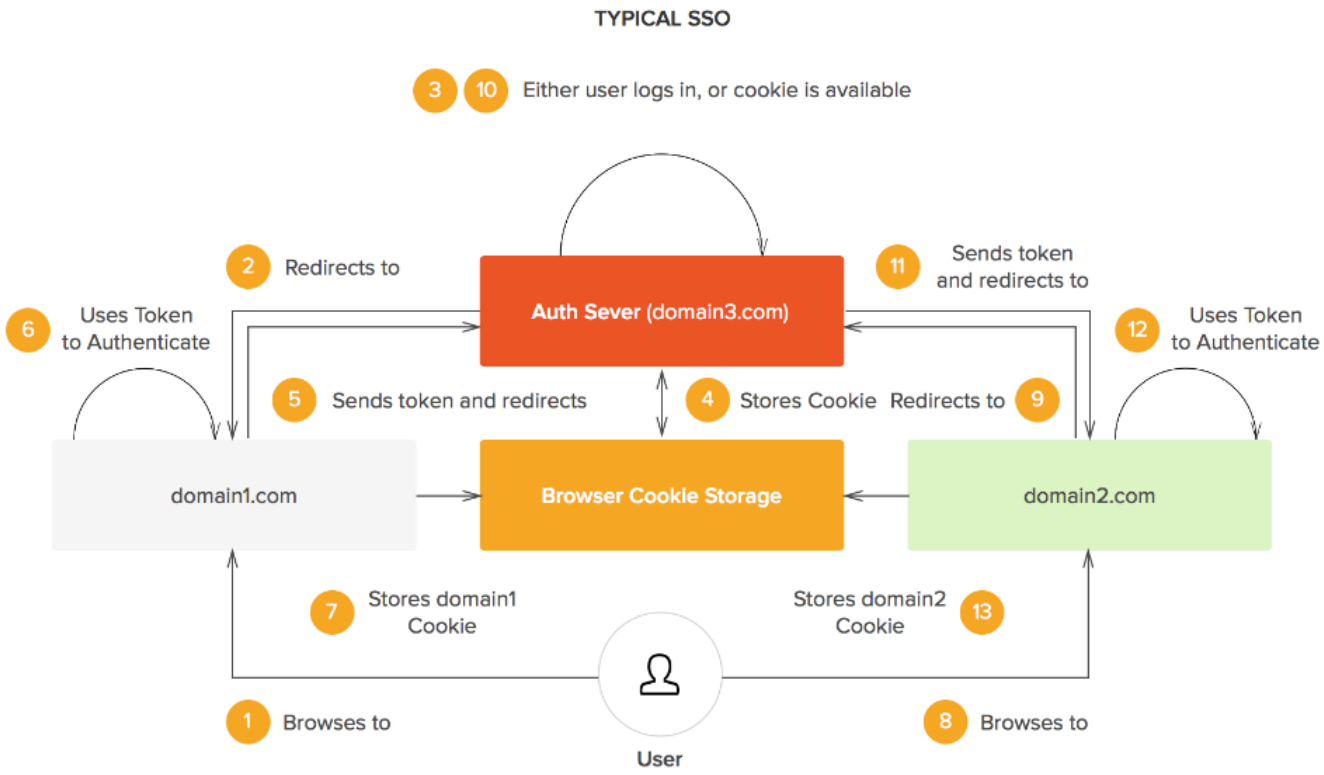
Solution 1: Central Authentication Provider!

Single Sign On – OpenId Connect



1. User navigates to Login on domain1.com
2. domain1.com redirects to Auth Server (Login with Google-Button)
3. User logs in at Auth Server
    1. User gets Cookie for the Auth Server (future logins)
    2. User gets a signed Ticket for domain1.com
4. Client is redirected back to domain1.com with the signed Ticket
5. Information of the signed Ticket are used to check back at the Auth Server (from domain1.com) whether the user is loggedin (ID Token)
6. domain1.com can send a session cookie to the user
7. domain1.com can request additional user information (Claims) using the ID Token

Single Sign On – OpenId Connect 2



8. User navigates to Login on domain2.com
9. domain2.com *redirects* to Auth Server (Login with Google Button)
10. User is **already loggedin** in at Auth Server
    8. User gets a signed Ticket for domain2.com
11. Client is *redirected* back to domain2.com with the signed Ticket
12. Information of the signed ticket are used to check back at the Auth Server (from domain2.com) whether the user is loggedin (ID Token)
13. domain2.com can send a session cookie to the user
14. domain2.com can request additional user information (Claims) using the ID Token

Single Sign On – OpenId Connect

1. Create Link (i.e. login with google button) on domain1.com (containing redirect_uri, client_id, etc)

```
HTTP/1.1 302 Found
Location: https://openid.c2id.com/login?
          response_type=code
          &scope=openid
          &client_id=s6BhdRkqt3
          &state=af0ifjsldkj
          &redirect_uri=https%3A%2F%2Fclient.example.org%2Fcb
```

1. This link redirects the user to the Auth Server User logs in at Auth Server
    1. The user gets Cookie for the Auth Server (future logins)
    2. Client is redirected back to domain1.com with a ticket

```
HTTP/1.1 302 Found
Location: https://client.example.org/cb?
          code=SplxlOBeZQQYbYS6WxSbIA
          &state=af0ifjsldkj
```

Single Sign On – OpenId Connect

1. Informations of the identity token are used to check back at the Auth Server whether the user is loggedin

```
POST /token HTTP/1.1
Host: openid.c2id.com
Content-Type: application/x-www-form-urlencoded
Authorization: Basic czZCaGRSa3F0MzpnWDFmQmF0M2JW

grant_type=authorization_code
 &code=SplxlOBeZQQYbYS6WxSbIA
 &redirect_uri=https%3A%2F%2Fclient.example.org%2Fcb
```

```
HTTP/1.1 200 OK
Content-Type: application/json
Cache-Control: no-store
Pragma: no-cache

{
  "id_token": "eyJhbGciOiJSUzI1NiIsImtpZCI6IjFlOWdkazcifQ.ewogImlzc
    yI6ICJodHRwOi8vc2VydmVyLmV4YW1wbGUuY29tIiwKICJzdWIiOiAiMjQ4Mjg5
    NzYxMDAxIiwKICJhdWQiOiAiczZCaGRSa3F0MyIsCiAibm9uY2UiOiAibi0wUzZ
    fV3pBMk1qIiwKICJleHAiOiAxMzExMjgxOTcwLAogImlhdCI6IDEzMTEyODA5Nz
    AKfQ.ggW8hZ1EuVLuxNuuIJKX_V8a_OMXzR0EHR9R6jgdqrOOF4daGU96Sr_P6q
    Jp6IcmD3HP99Obi1PRs-cwh3LO-p146waJ8IhehcwL7F09JdijmBqkvPeB2T9CJ
    NqeGpe-gccMg4vfKjkM8FcGvnzZUN4_KSP0aAp1tOJ1zZwgjxqGByKHiOtX7Tpd
    QyHE5lcMiKPXfEIQILVq0pc_E2DzL7emopWoaoZTF_m0_N0YzFC6g6EJbOEoRoS
    K5hoDalrcvRYLSrQAZZKflyuVCyixEoV9GfNQC3_osjzw2PAithfubEEBLuVVk4
    XUVrWOLrLl0nx7RkKU8NXNHq-rvKMzqg"
  "access_token": "SlAV32hkKG",
  "token_type": "Bearer",
  "expires_in": 3600,
}
```

Single Sign On – OpenId Connect

1. domain1.com can send a session cookie to the user
2. Additionally, domain1.com can now get further «Claims» about the user at the Auth Server (additional user infos) using the id_token

Single Sign On

Benefits

- One Authentication-Procedure for N Systems
  - Time
  - Security
  - less (weak) passwords per user
  - May reduce phishing attacks

Drawbacks

- Attacker has instantly access to all services as soon as he has the credentials
- Sign off (Time-Out)?
- Availability of a SSO-Service?

Übung – Single Sign On mit Google API

1. Setup Auth Server (Google API Account Infos) for Client / Button Integration (Google-Account wird benötigt)
   https://developers.google.com/identity/sign-in/web/devconsole-project

2. Setup Client / Button
   https://developers.google.com/identity/sign-in/web/sign-in

3. Get Profile Infos
   https://developers.google.com/identity/sign-in/web/people

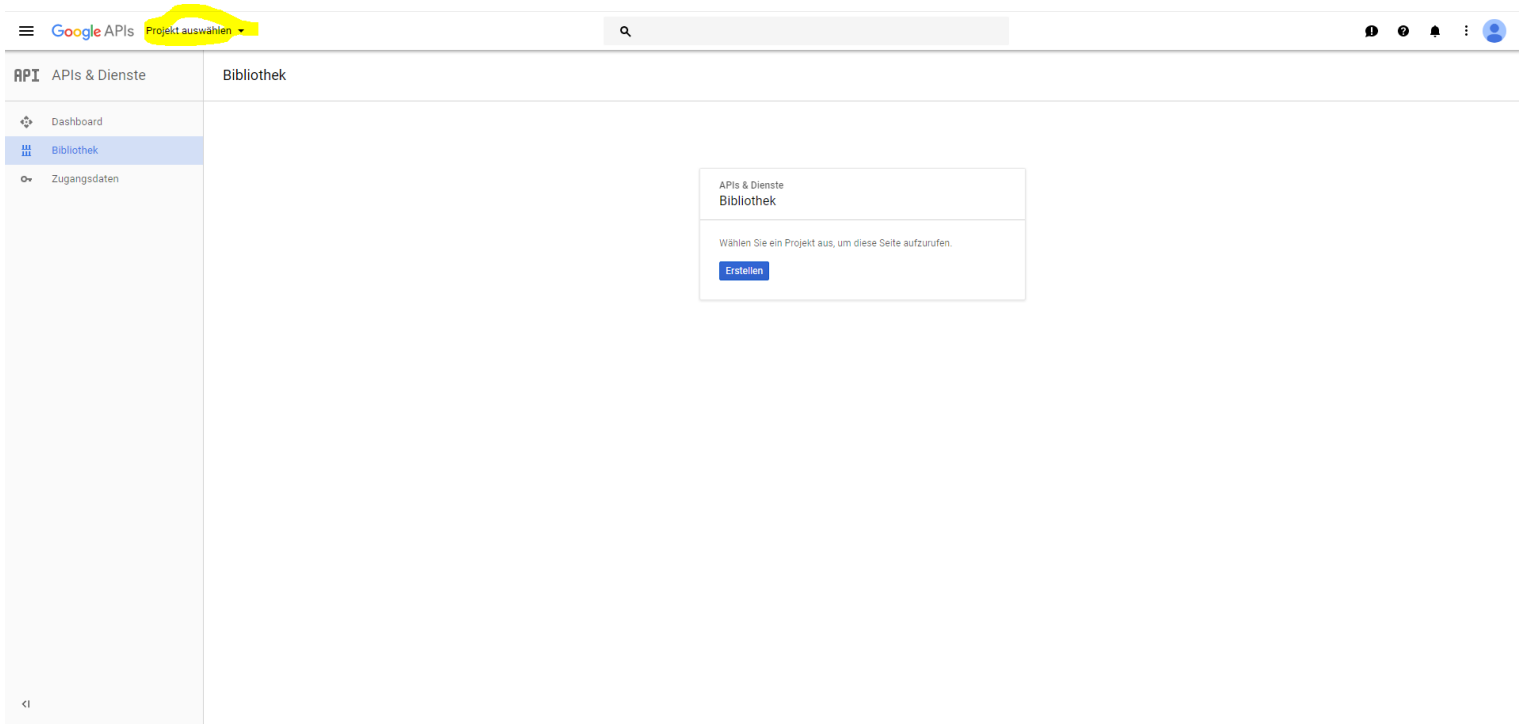
4. Authenticate with Backend Server (in order to get a session)
   https://developers.google.com/identity/sign-in/web/backend-auth

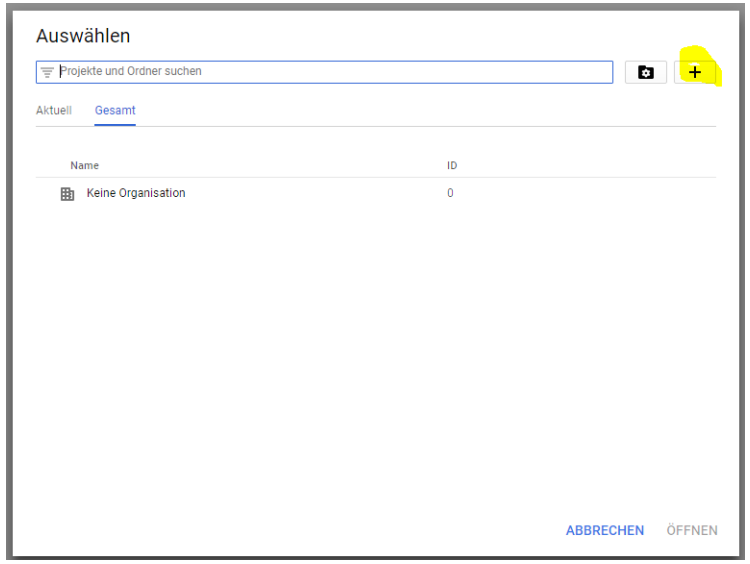
5. Sign Out Button
   https://developers.google.com/identity/sign-in/web/sign-in

Setup Auth-Server 1

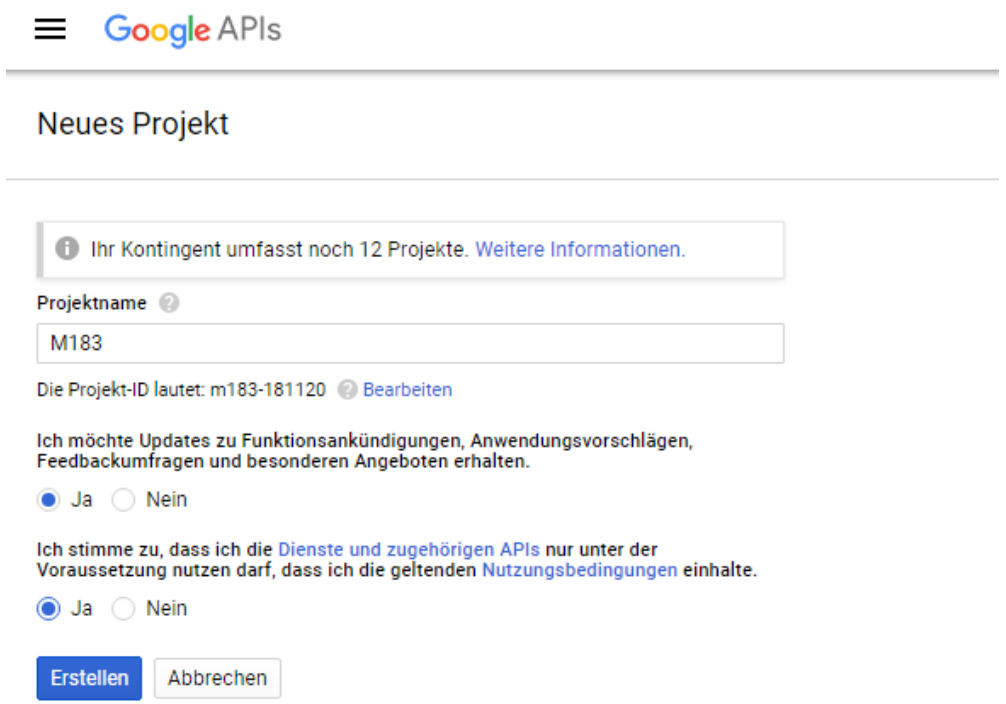
Google API Console Project:

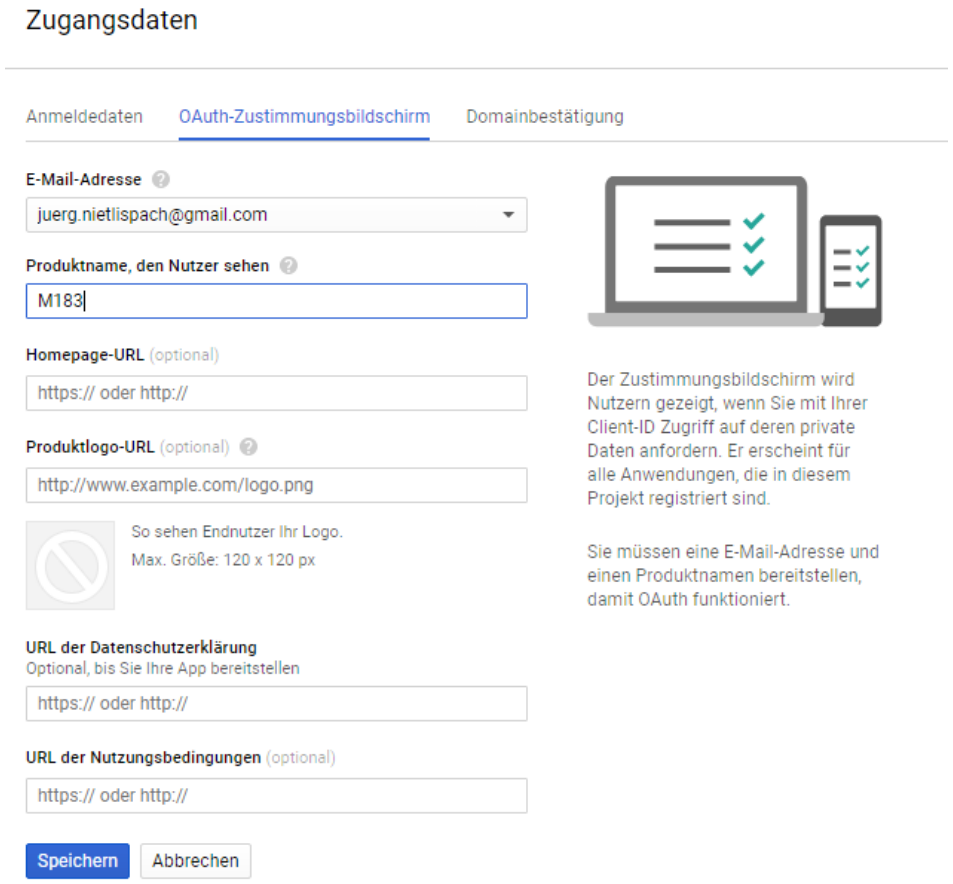
- https://developers.google.com/identity/sign-in/web/devconsole-project
- -> Follow the instructions (or see Screenshots):



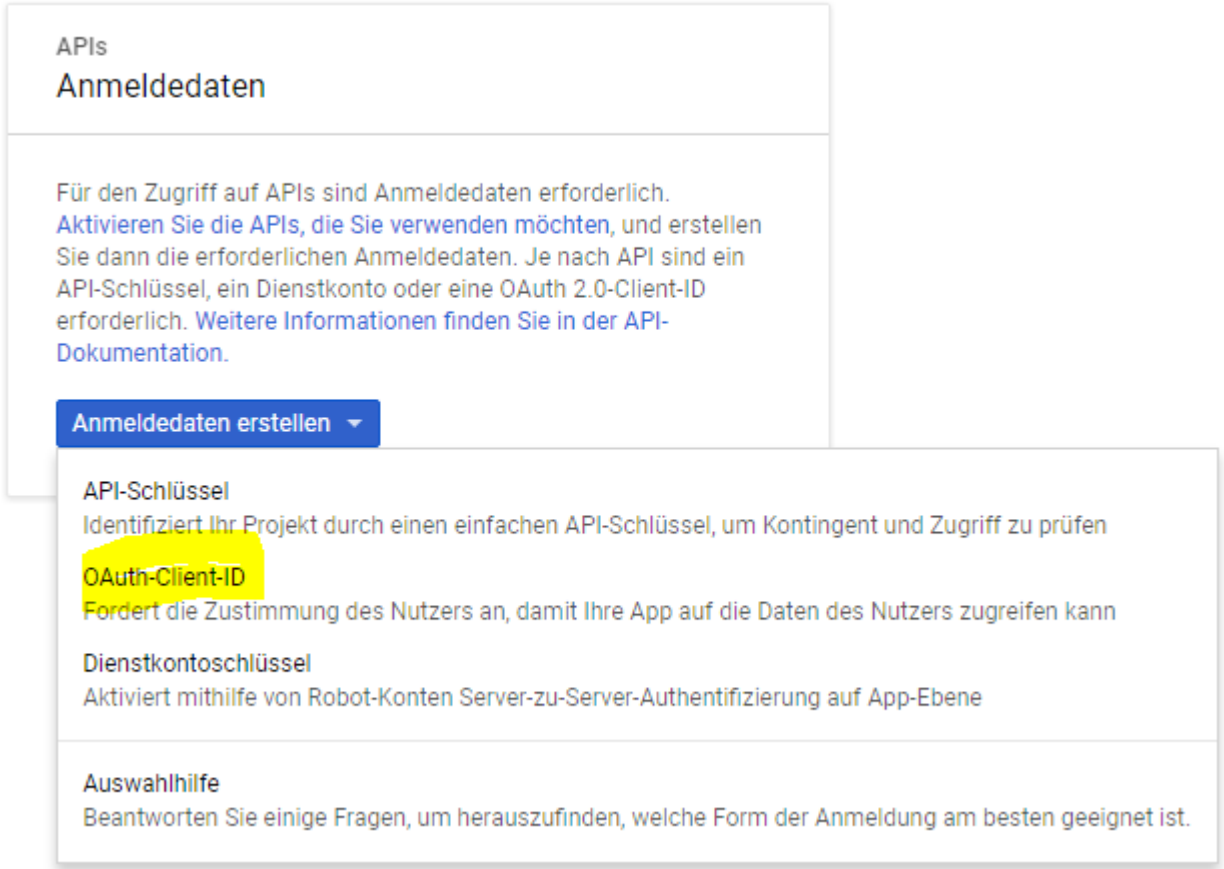


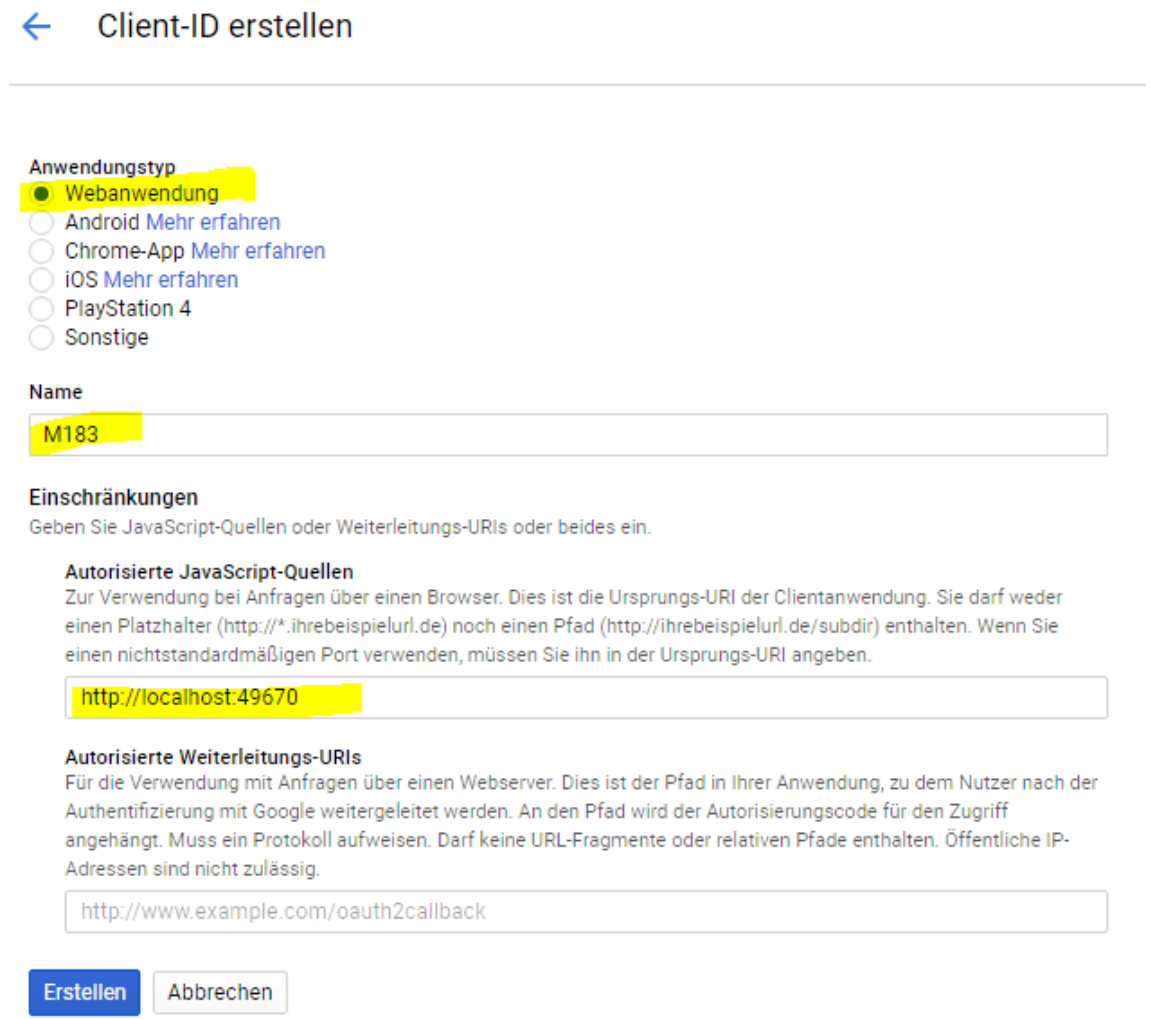
Setup Auth-Server 2



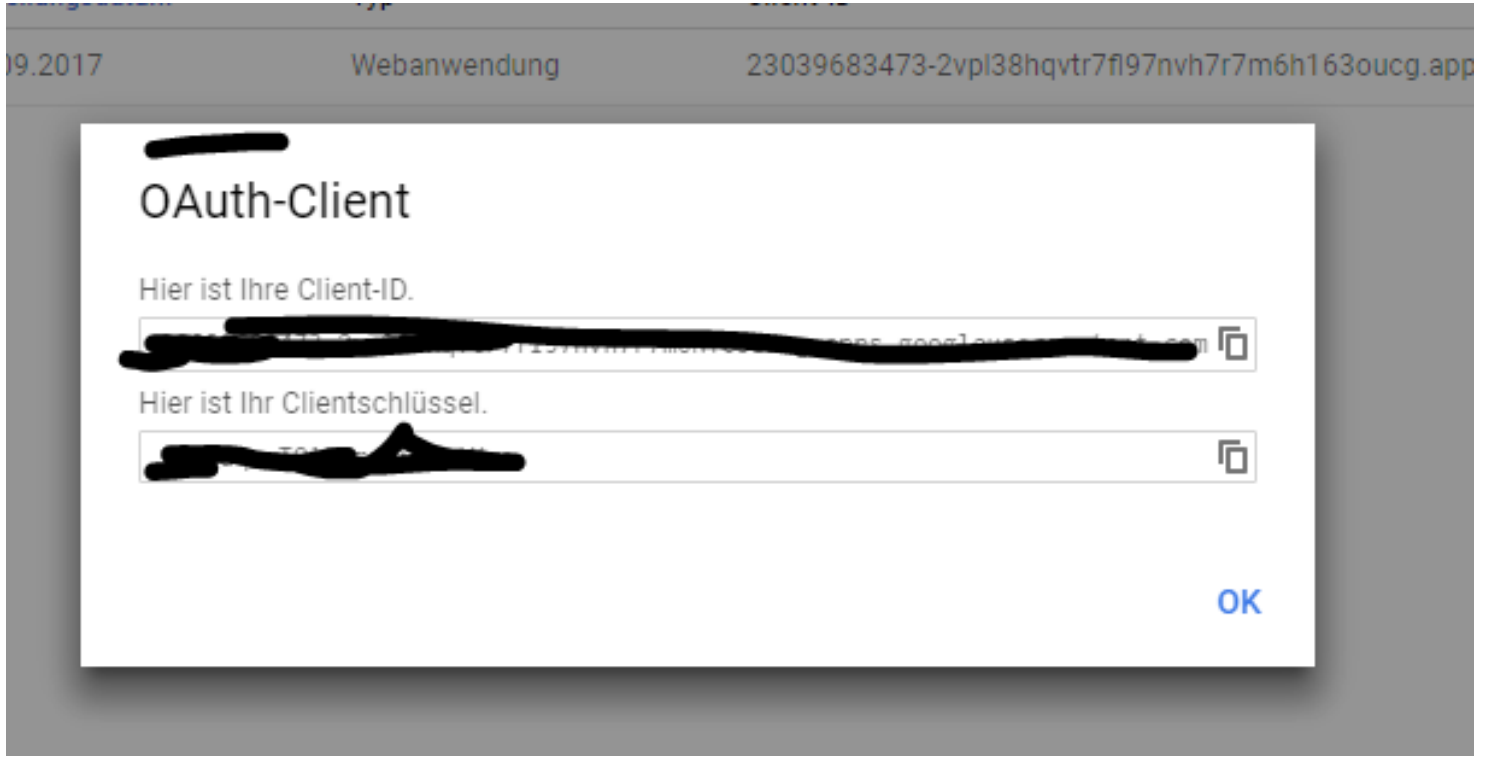


Setup Auth-Server 3





Setup Auth-Server 4



Setup Client / Button

1. Script in Header kopieren:
   <script src="https://apis.google.com/js/platform.js" async defer></script>

2. Meta-Tag in Header einbinden:
   <meta name="google-signin-client_id" content="YOUR_CLIENT_ID.apps.googleusercontent.com">

3. Button einbinden

Get Profile Infos

1. Profil-Informationen mittels JS eruieren:

```
function onSignIn(googleUser) {
    var id_token = googleUser.getAuthResponse().id_token;
    var profile = googleUser.getBasicProfile();
    console.log(profile.getId(), profile.getName(), profile.getImageUrl());
}
```

Pre-Setup Backend Server

1. Extend onSignOn() Javascript – Function:

```
function onSignOn(googleUser){

        var id_token = googleUser.getAuthResponse().id_token;

        var xhr = new XMLHttpRequest();
        xhr.open('POST', 'http://localhost:PORT/Home/SSOTokenSigin');
        xhr.setRequestHeader('Content-Type', 'application/x-www-form-urlencoded');
        xhr.onload = function() {
          console.log('Signed in as: ' + xhr.responseText);
        };
        xhr.send('idtoken=' + id_token);

 }
```

Setup Backend Server

1. Create a Route for id_token validation (http://localhost:PORT/api/validateidtoken/{id_token})

2. Validate token (integrity) using .NET Oauth Client Libary:
    1. https://developers.google.com/api-client-library/dotnet/apis/oauth2/v2

3. Check ID-Token at
    1. https://www.googleapis.com/oauth2/v3/tokeninfo?id_token={ID_TOKEN}

4. If token is valid -> return SESSION

Logout Button

1. Place Logout-Button

```
<a href="#" onclick="signOut();">Sign out</a>
```

2. Integrate Javascript Snippet

```
function signOut() {
  var auth2 = gapi.auth2.getAuthInstance();
  auth2.signOut().then(function () {
    console.log('User signed out.');
  });
}
```