Users like to keep their data in one place on the web where it's easily accessible. Whether it's YouTube videos, Google Drive files, Google contacts or one of many other types of data, users need a way to securely grant applications access to their data. OAuth is the key web standard for delegated data access and OAuth 2.0 is the next-generation version with additional security features. This session will cover the latest advances in how OAuth can be used for data access, but will also dive into how you can lower the barrier to entry for your application by allowing users to login using their Google accounts. You will learn, through an example written in Python, how to use OAuth 2.0 to incorporate user identity into your web application. Best practices for desktop applications, mobile applications and server-to-server use cases will also be discussed

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About Ryan Boyd

View full profile

Ryan is a Developer Advocate at Google, focused on cloud data services. He's been at Google for 5 years and previously helped build out the Google Apps ISV ecosystem. He published his first book "Getting Started with OAuth 2.0" with O'Reilly.

OAuth 2.0

Identity and Data Access

Ryan Boyd
Developer Advocate, Google

Google™ 12 I/O

Programming Clients for Secure Web API Authorization and Authentication

Getting Started with

OAuth 2.0

O'REILLY®

Ryan Boyd


SEARCHING
Authentication

Authorization

Have you ever shared your password with an app so it could use your data?

?

Yes :-(

Your opportunity

1) Eliminate the need for users to reveal their password to your app

2) Restrict the level of data available to your app

3) Allow users to revoke access to their data

OAuth 2.0
for Authorization

Do you use the same username & password for multiple web sites?

?

Yes :-(

How many keystrokes do you type to sign up for a new account?

?


50+!

Your opportunity

1) Minimize how many passwords users need

2) Discourage password re-use

3) Optimize sign-up flows to onboard users faster

OAuth 2.0 for Login (OpenID Connect)

Agenda

- Terminology
- Authorization
    - End-goal
    - Client-side in JavaScript
    - Server-side in Python
    - Mobile Apps
    - App-based in Python
- Authentication
- Resources

OAuth 2.0 for Authorization

35+ APIs!

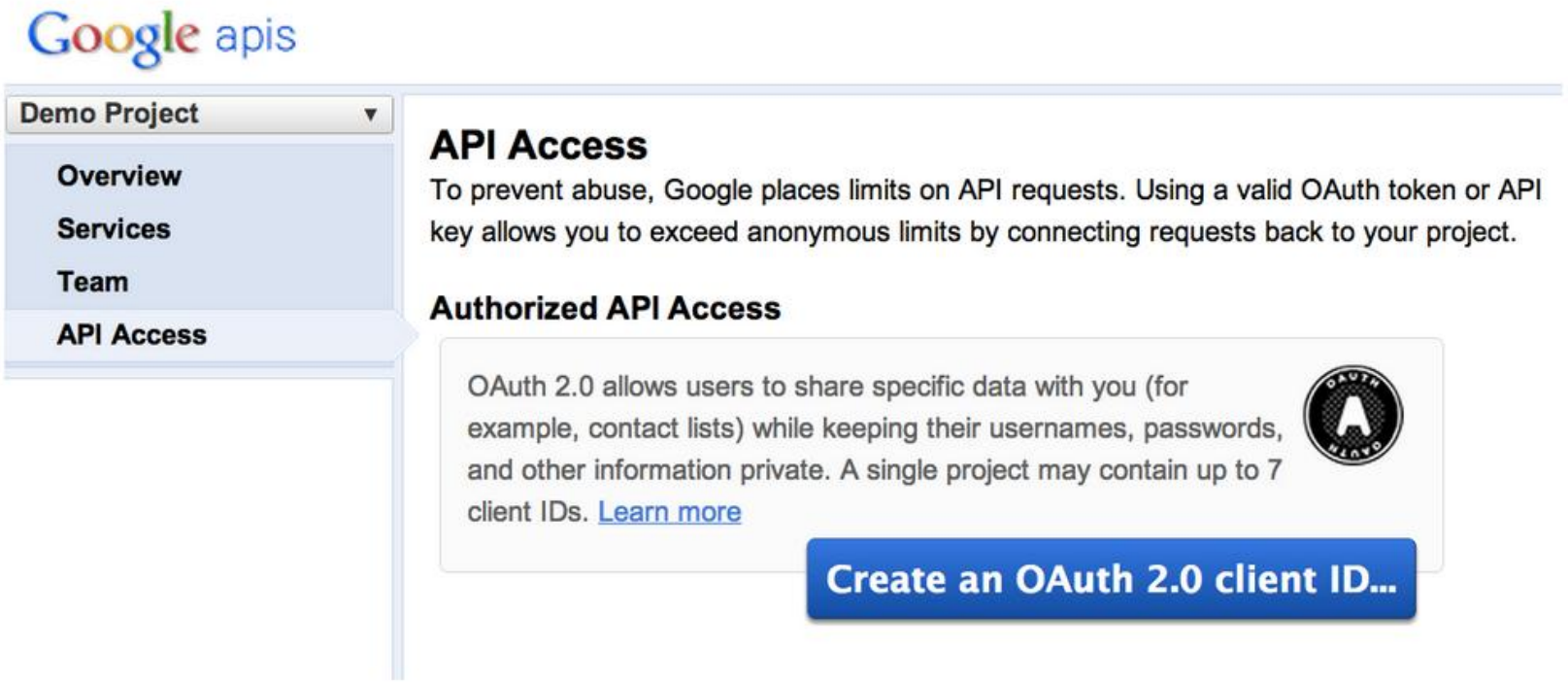

Goal


METROPOLITAN
ONE
FARE

Getting Started

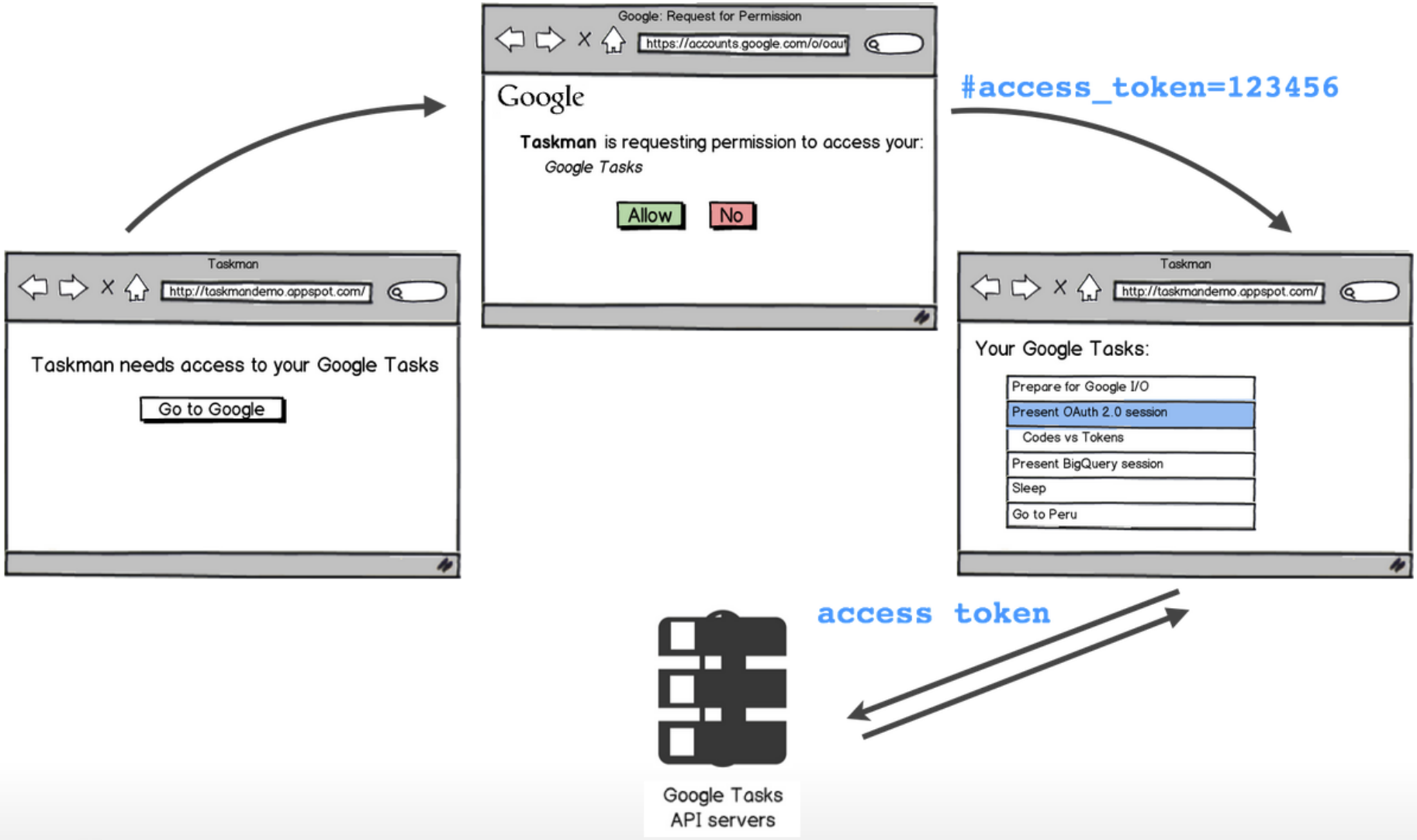
APIs Console

developers.google.com/console



Pure JavaScript Flow

Developing Client-side Applications


Google: Request for Permission
https://accounts.google.com/o/oaut
Google
Taskman is requesting permission to access your:
Google Tasks
Allow
No
#access_token=123456
Taskman
http://taskmandemo.appspot.com/
Taskman needs access to your Google Tasks
Go to Google
Taskman
http://taskmandemo.appspot.com/
Your Google Tasks:
Prepare for Google I/O
Present OAuth 2.0 session
Codes vs Tokens
Present BigQuery session
Sleep
Go to Peru
access token
Google Tasks
API servers

Client-side Flow in JavaScript

Google APIs Client Library for JavaScript

Let's see it in action!

Client-side Flow in JavaScript

Google APIs Client Library for JavaScript

JAVASCRIPT

```
gapi.auth.authorize({
  client_id: '387636757294.apps.googleusercontent.com',
  scope: 'https://www.googleapis.com/auth/tasks'},
  handleAuthResultPopup);

function handleAuthResultPopup() {
  alert(gapi.auth.getToken());
}
```

Client-side Flow in JavaScript

Step 1 - App directs the user to Google for Authorization

JAVASCRIPT

```
<script type="text/javascript">
    var clientId = '387636757294.apps.googleusercontent.com';
    var authorizationUrlBase = 'https://accounts.google.com/o/oauth2/auth';
    var redirectUri = 'https://taskmandemo.appspot.com/oauth2callback.html';
    var scope = 'https://www.googleapis.com/auth/tasks';

    function startOauth() {
      var url = authorizationUrlBase;
      url += '?response_type=token'
          +  '&redirect_uri=' + encodeURIComponent(redirectUri)
          +  '&client_id=' + encodeURIComponent(clientId)
          +  '&scope=' + encodeURIComponent(scope);
      var w = window.open(url, 'oauth', 'width=500,height=400');
    }
</script>
```

Client-side Flow in JavaScript

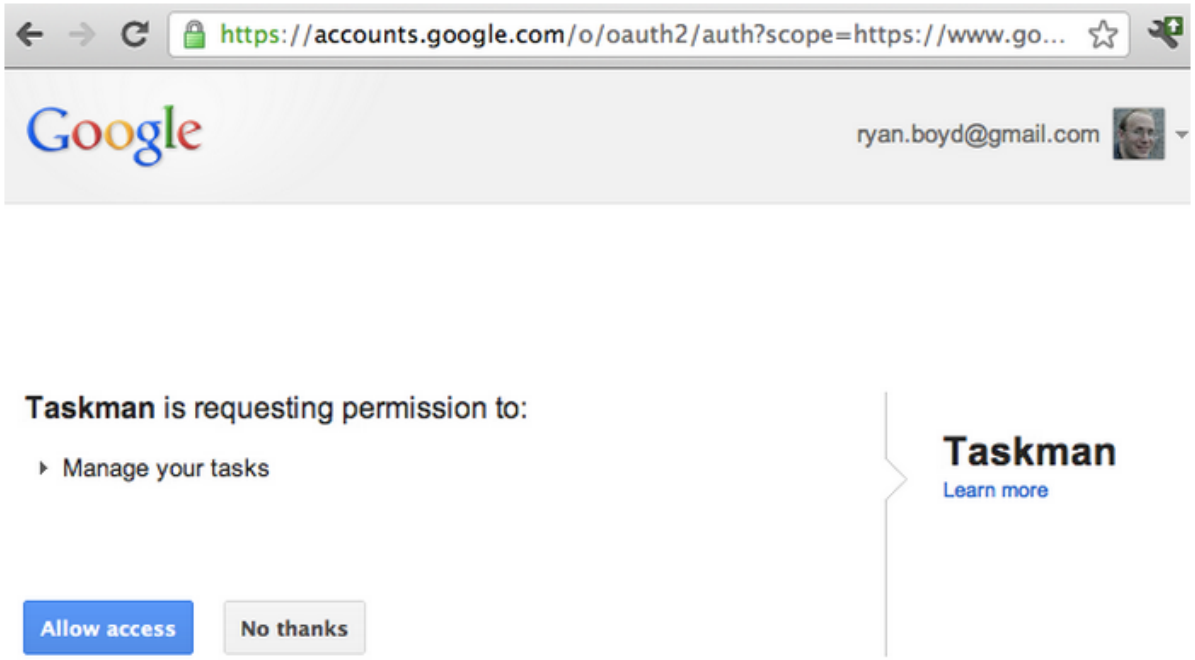
Step 1 - App directs the user to Google for Authorization

URL

```
https://accounts.google.com/o/oauth2/auth?
  client_id=387636757294.apps.googleusercontent.com&
  scope=https://www.googleapis.com/auth/tasks&
  redirect_uri=https://taskmandemo.appspot.com/oauth2callback.html&
  response_type=token
```

Client-side Flow in JavaScript

Step 2a - User authorizes access



Client-side Flow in JavaScript

Step 2b - User is redirected back to the app

URL

```
https://taskmandemo.appspot.com/oauth2callback.html#
    access_token=ya29.AHES6ZT8XLGWjlrYfP1KvkLQVvYj81C6uA_bUsaZBKWB4ZE&
    token_type=Bearer&
    expires_in=3600
```

GOAL!

Client-side Flow in JavaScript

Questions!

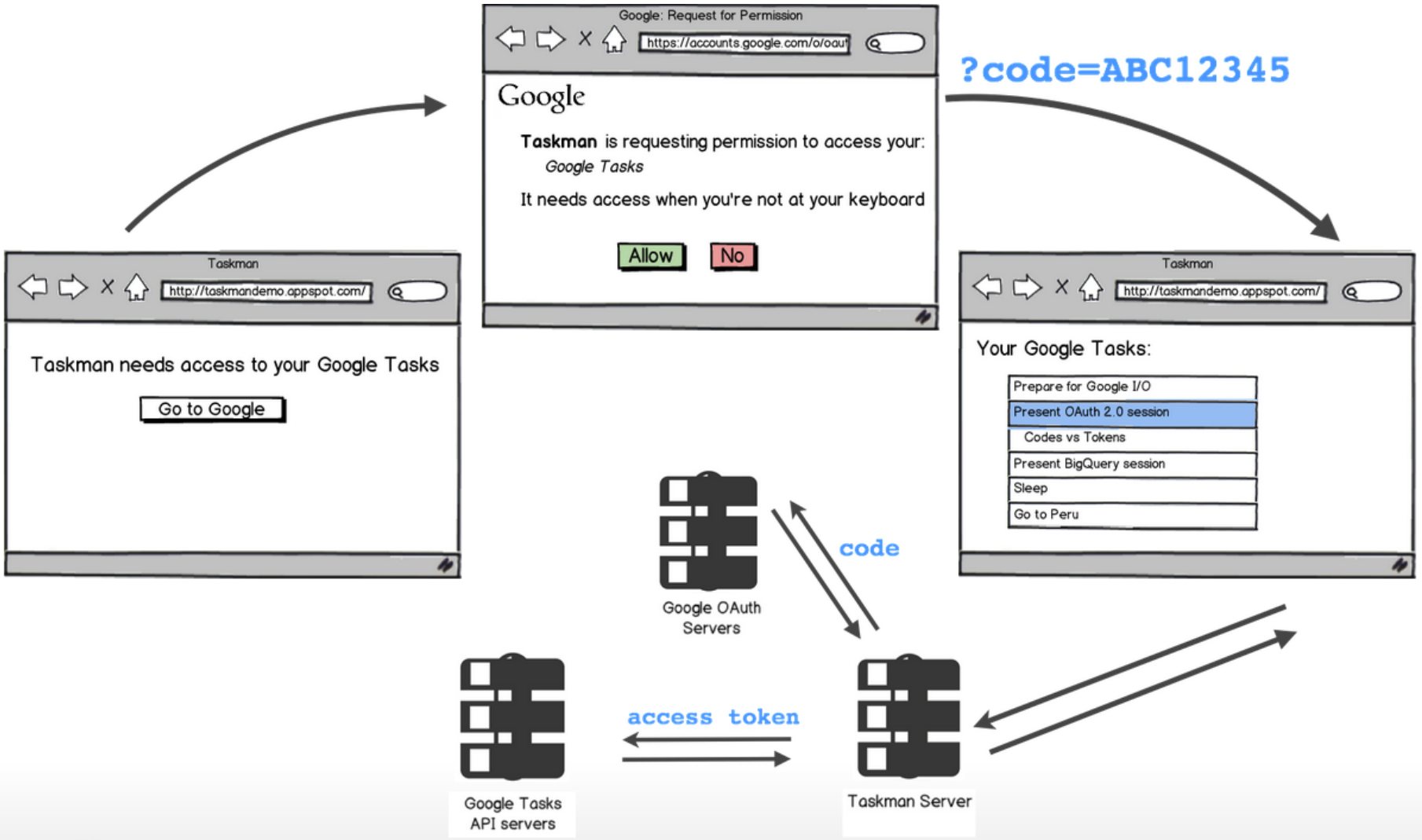
- How do I get the token back to the app from the popup window?
- How do I get another access token?
- What happens if the user isn't logged in?

Client-side Flow in JavaScript

Summary

- You're looking for simplicity
- You like coding in JavaScript
- You only need access when the user is logged into Google
- Learn more about the JavaScript library
  - Catch on YouTube: "Building Web Applications that use Google APIs and the JavaScript Client for Google APIs"

Server-side Flow in Python


Google: Request for Permission
https://accounts.google.com/o/oaut
Google
Taskman is requesting permission to access your:
Google Tasks
It needs access when you're not at your keyboard
Allow
No
?code=ABC12345
Taskman
http://taskmandemo.appspot.com/
Taskman needs access to your Google Tasks
Go to Google
Taskman
http://taskmandemo.appspot.com/
Your Google Tasks:
Prepare for Google I/O
Present OAuth 2.0 session
Codes vs Tokens
Present BigQuery session
Sleep
Go to Peru
code
Google OAuth Servers
access token
Google Tasks API servers
Taskman Server

Server-side Flow in Python

Step 1 - App re-directs the user

PYTHON

```
flow = OAuth2WebServerFlow(
    # Visit https://code.google.com/apis/console to
    # generate your client_id, client_secret and to
    # register your redirect_uri.
    client_id='387636757294.apps.googleusercontent.com',
    client_secret='-8IwOyyundwNY6W0B',
    scope='https://www.googleapis.com/auth/tasks')

callback = self.request.relative_url('/oauth2callback')
authorize_url = flow.step1_get_authorize_url(callback)
self.redirect(authorize_url)
```

Server-side Flow in Python

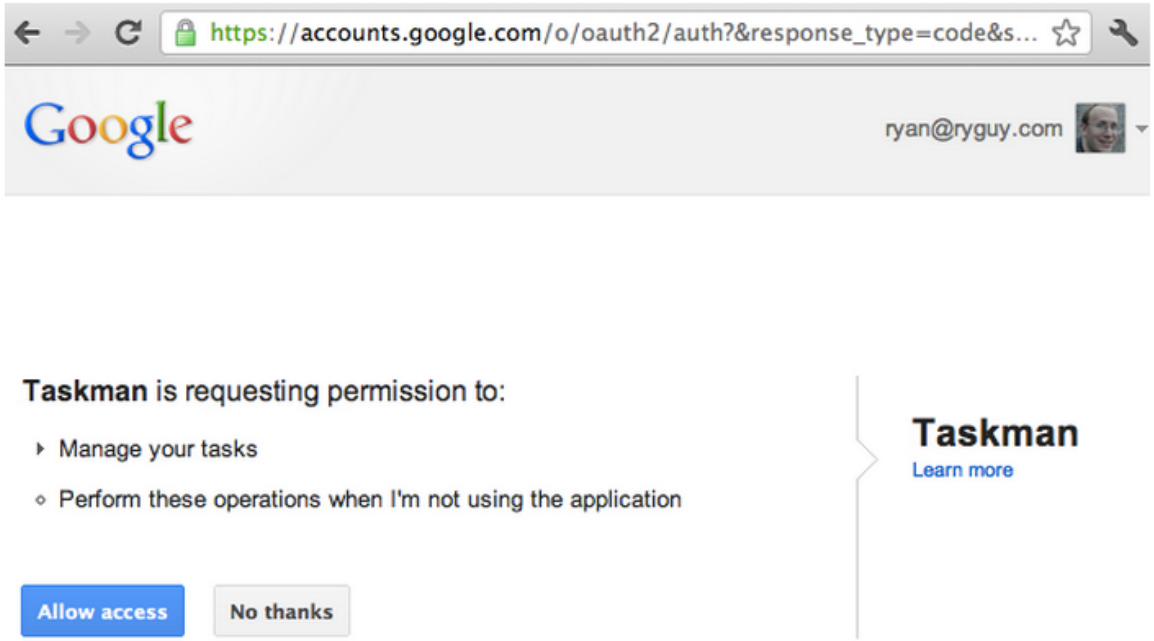
Step 1 - App re-directs the user

URL

```
https://accounts.google.com/o/oauth2/auth?
  client_id=387636757294.apps.googleusercontent.com&
  scope=https://www.googleapis.com/auth/tasks&
  redirect_uri=https://taskmandemo.appspot.com/oauth2callback&
  response_type=code&
  access_type=offline
```

Server-side Flow in Python

Step 2a - User authorizes access



Server-side Flow in Python

Step 2b - User is redirected back to the app

URL

```
https://taskmandemo.appspot.com/oauth2callback?
    code=4/jHpY6Rslb32PWBiR9bU6wJ4GrMmF.EjOUBPzd
```

Server-side Flow in Python

Step 3 - App exchanges authorization code for access token

```python
credentials = flow.step2_exchange(self.request.params)
print 'Access token: %s' % credentials.access_token
```

PYTHON

GOAL!

```python
print 'Refresh token: %s' % credentials.refresh_token
```

PYTHON

Server-side Flow in Python

Step 3 - App exchanges authorization code for access token

HTTP REQUEST

```
POST /o/oauth2/token HTTP/1.1
Host: accounts.google.com

client_id=387636757294.apps.googleusercontent.com&
redirect_uri=https://taskmandemo.appspot.com/oauth2callback&
grant_type=authorization_code&
code=4/jHpY6Rslb32PWBiR9bU6wJ4GrMmF.EjOUBPzd&
client_secret=-8IwOyyundwNY6W0B
```

HTTP RESPONSE

```
{
  "access_token":"1/fFAGRNJru1FTz70BzhT3Zg",
  "refresh_token":"1/xEoDL4iW3cxlI7yDbSRFYNG01kVKM2C-259HOF2aQbI"
  "expires_in":3600,
  "token_type":"Bearer",
}
```

Server-side Flow in Python

Step 4 - App exchanges refresh token for a new access token

PYTHON

```
# nothing to see here!
```

Server-side Flow in Python

Step 4 - App exchanges refresh token for a new access token

HTTP REQUEST

```
POST /o/oauth2/token HTTP/1.1
Host: accounts.google.com
Content-Type: application/x-www-form-urlencoded

client_id=387636757294.apps.googleusercontent.com&
client_secret=-8IwOyyundwNY6W0B&
refresh_token=1/xEoDL4iW3cxlI7yDbSRFYNG01kVKM2C-259HOF2aQbI&
grant_type=refresh_token
```

HTTP RESPONSE

```
{
  "access_token":"1/hGAFZKUio3NOc90BxjU48l",
  "expires_in":3600,
  "token_type":"Bearer"
}
```

Server-side Flow in Python

Questions!

- When do refresh tokens expire?
- How do I store the refresh tokens?

Server-side Flow in Python

Making it even easier: the decorator pattern

PYTHON

```
decorator = OAuth2Decorator(
  client_id='387636757294.apps.googleusercontent.com'
  client_secret='-8IwOyyundwNY6W0B'
  scope='https://www.googleapis.com/auth/tasks')

http = httplib2.Http(memcache)
service = build("tasks", "v1", http=http)

class MainHandler(webapp.RequestHandler):
  @decorator.oauth_required
  def get(self):
    http = decorator.http()
    tasks = service.tasks.list(tasklist='@default').execute(http)
```

Server-side Flow in Python

Summary

- You're looking for long-lived access to user data
- You need access when the user isn't at the keyboard
- You need to call the API from server-side code

I have the token. Now what?

Calling the API

But... how do I call the API?

Using access tokens

Using a HTTP Header:

```HTTP
GET /tasks/v1/lists/@default/tasks HTTP/1.1
Host: www.googleapis.com
Authorization: Bearer 1/hGAFZKUio3NOc90BxjU48l
```

Using a Query Parameter:

```HTTP
GET /tasks/v1/lists/@default/tasks?access_token=1/hGAFZKUio3NOc90BxjU48l HTTP/1.1
Host: www.googleapis.com
```

Tell me more about scopes

Getting authorization for multiple APIs at once

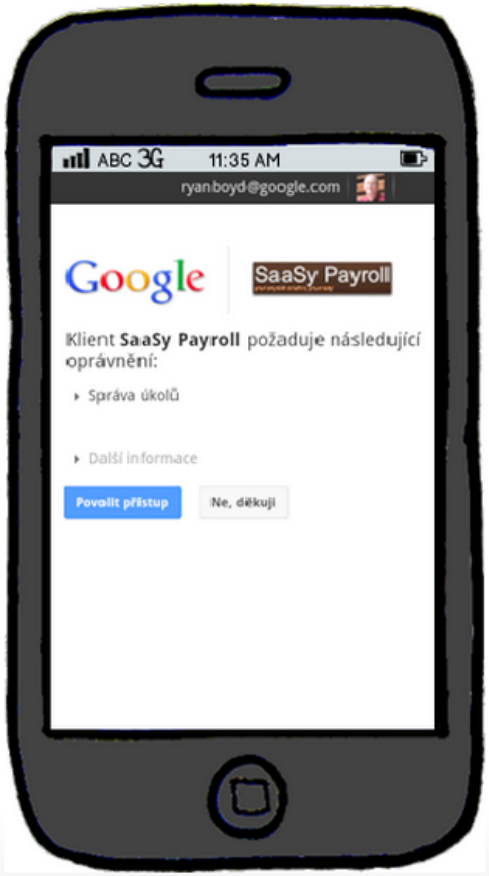
Space-delimited list!

```
https://www.googleapis.com/auth/tasks https://www.googleapis.com/auth/plus.me
```

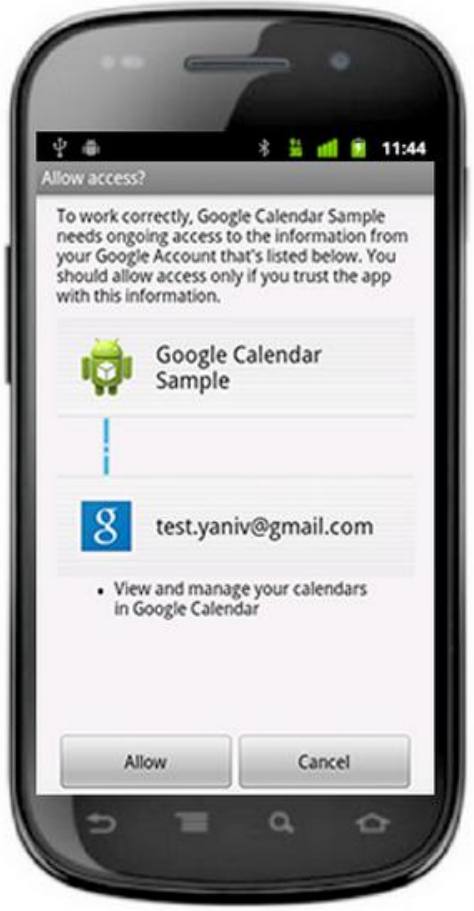
Mobile Authorization

Three Techniques

- Cross-platform - Embedded WebViews
- Cross-platform - System web browser
- Android-specific - GoogleAuthUtil

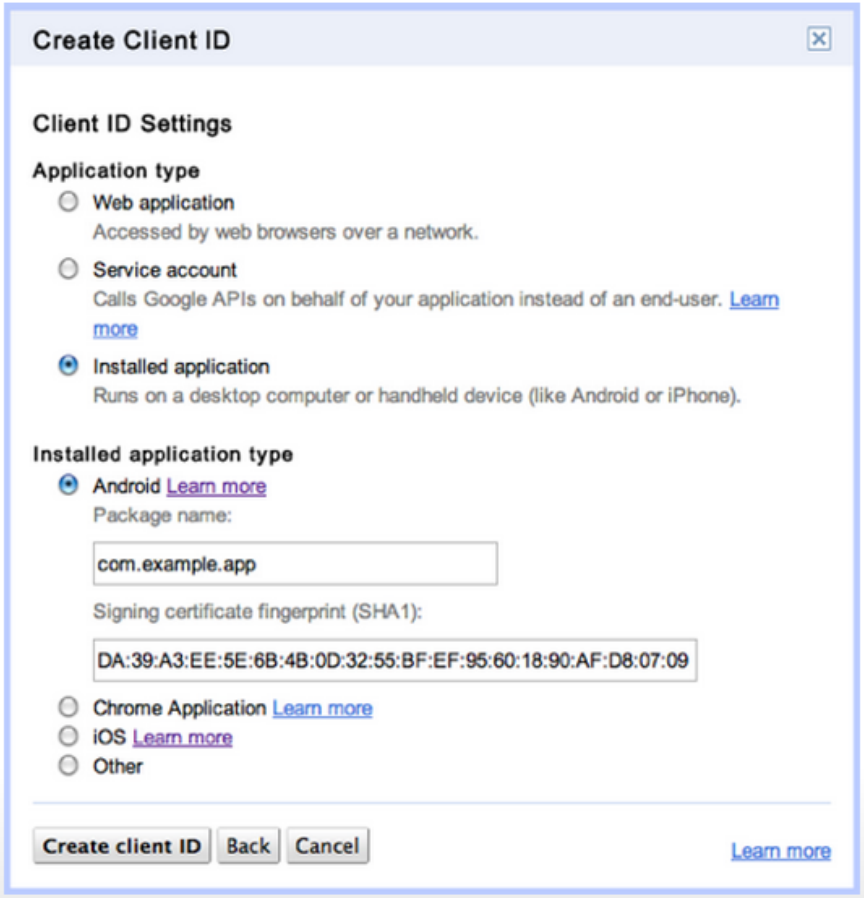


GoogleAuthUtil



GoogleAuthUtil

App Registration



GoogleAuthUtil

Acquiring an access token

ANDROID

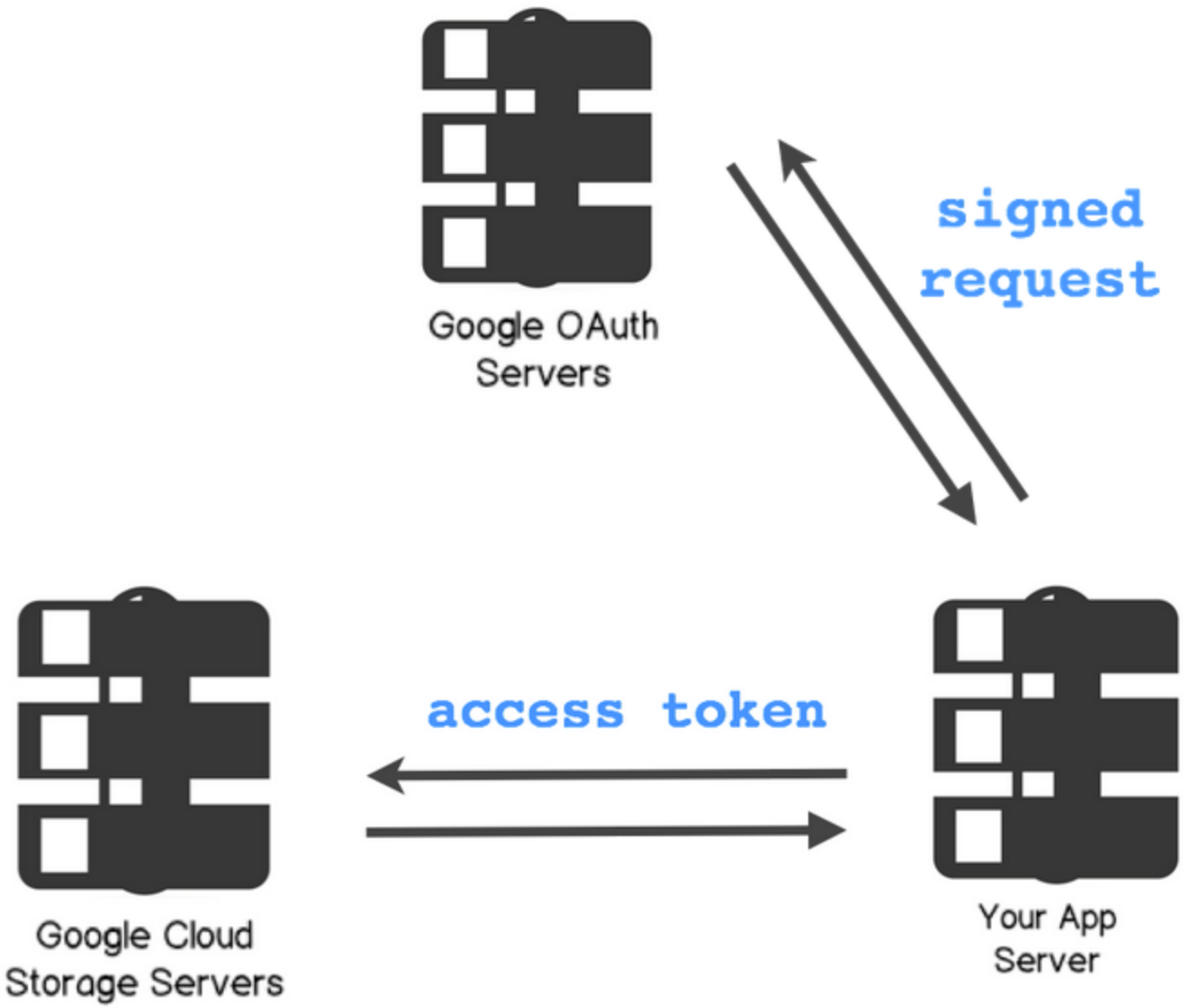
```
// Allow user to select an account
// AccountManager.getAccountsByType("com.google");

String scope = "https://www.googleapis.com/auth/tasks";

// Get an access token for 'email' account and requested scope
String token = GoogleAuthUtil.getToken(context, email, scope);
```

GOAL!

App-based Authorization


Google OAuth
Servers
signed
request
Google Cloud
Storage Servers
access token
Your App
Server

App-based Authorization

Using service accounts

PYTHON

```
# Load the key in PKCS 12 format that you downloaded from the Google APIs Console
f = file('key.p12', 'rb')
key = f.read()
f.close()

# Create an httplib2.Http object to handle our HTTP requests and authorize it
credentials = SignedJwtAssertionCredentials( '141491975384@developer.gserviceaccount.com',
    key,
    scope='https://www.googleapis.com/auth/devstorage.read_write')
http = httplib2.Http()
http = credentials.authorize(http)
print credentials.access_token
```

GOAL!

OAuth 2.0 for Login

Authentication Goals

Traditional signup form

Sign up today

Email Address:

First Name:

Last Name:

Profile picture: Choose File No file chosen

Username: what you'll use to log in

Password: at least 8 characters

Confirm Password:

Sign Up!

Authentication Goals

New signup form

First name:

Last name:

Email:

Profile:

Authentication Goals

- Make it faster and easier to onboard users
- Securely get a unique, stable user identifier
- Personalize your site

Authentication

Step 1 - Use OAuth to get an access token

Scope	Description
https://www.googleapis.com/auth/userinfo.profile	Unique id, name, profile photo, profile URL, country, language, timezone, birthdate, etc.
https://www.googleapis.com/auth/userinfo.email	E-mail address

Request access:

URL

```
https://accounts.google.com/o/oauth2/auth?
  client_id=387636757294.apps.googleusercontent.com&
  scope=https://www.googleapis.com/auth/userinfo.profile%20https://www.googleapis.com/auth/userinfo.email&
  redirect_uri=https://taskmandemo.appspot.com/oauth2callback-authn.html&
  response_type=token
```

Authentication

Step 1 - Use Google-provided button and library

JAVASCRIPT

```
<script src="http://plus.google.com/js/plusone.js"></script>
<g:plus action="connect"
  clientid="387636757294.apps.googleusercontent.com"
  callback="handleAuthResult">
</g:plus>
```

JAVASCRIPT

```
function handleAuthResult() {
  alert(gapi.auth.getToken());
}
```

Authentication

Step 2 - Use TokenInfo API to get a secure, unique user identifier

My id:

URL

```
https://www.googleapis.com/oauth2/v1/tokeninfo?
  access_token=
```

JSON


```
{
 "issued_to": "387636757294.apps.googleusercontent.com",
 "audience": "387636757294.apps.googleusercontent.com",
 "user_id": "113487456102835830811",
 "scope": "https://www.googleapis.com/auth/userinfo.profile https://www.googleapis.com/auth/userinfo.email",
 "expires_in": 3574,
 "email": "ryan@ryguy.com",
 "verified_email": true,
 "access_type": "online"
}
```

Personalization

Use UserInfo API to get user profile data

URL

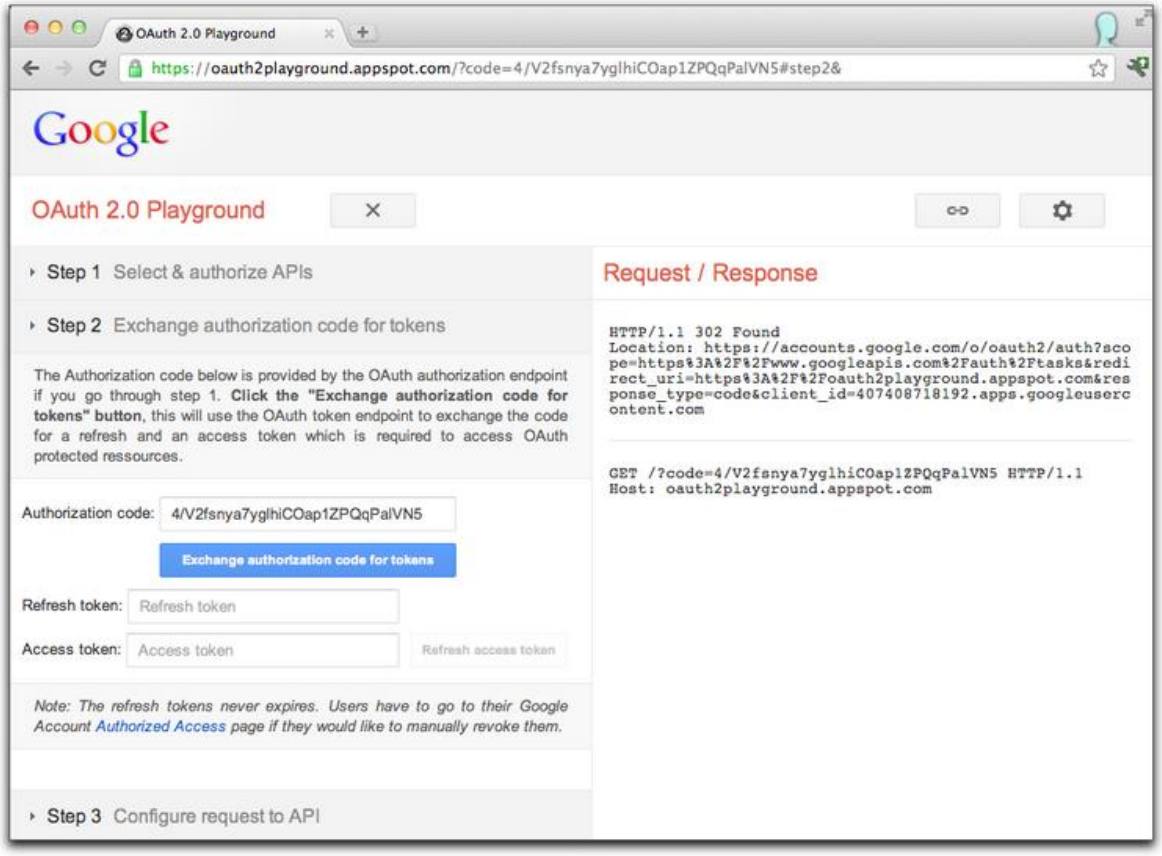
```
https://www.googleapis.com/oauth2/v1/userinfo?
  access_token=
```

JSON

```
{
 "id": "113487456102835830811",
 "email": "ryan@ryguy.com",
 "verified_email": true,
 "name": "Ryan Boyd",
 "given_name": "Ryan",
 "family_name": "Boyd",
 "link": "https://plus.google.com/113487456102835830811",
 "picture": "https://lh4.googleusercontent.com/-BET-bMzn99g/AAAAAAAAAAI/AAAAAAAAAQ8/wV0kQ3VUjOE/photo.jpg",
 "gender": "male",
 "birthday": "0000-10-05",
 "locale": "en"
}
```

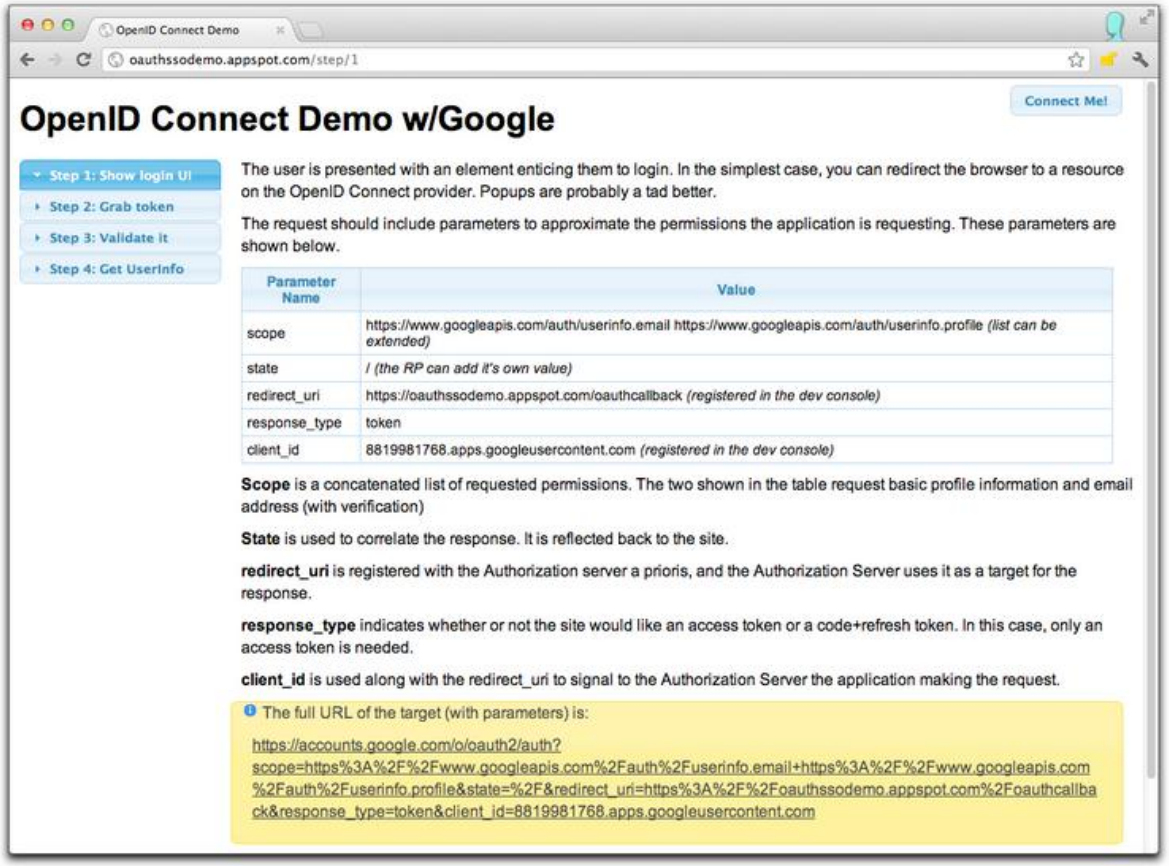
Tools

OAuth 2.0 Playground



code.google.com/oauthplayground

OAuth 2.0 Login Demo



oauthssodemo.appspot.com

Summary

Resources

- These slides - oauth2-preso.appspot.com
- APIs Console - developers.google.com/console
- JavaScript library - code.google.com/p/google-api-javascript-client
- Python library - code.google.com/p/google-api-python-client
- OAuth 2.0 Playground - code.google.com/oauthplayground
- OAuth 2.0 Login Demo - oauthssodemo.appspot.com
- Google Play Services - developers.google.com/android/google-play-services

<Thank You!>

g+ profiles.google.com/ryan.boyd
twitter @ryguyrg
www www.ryguy.com