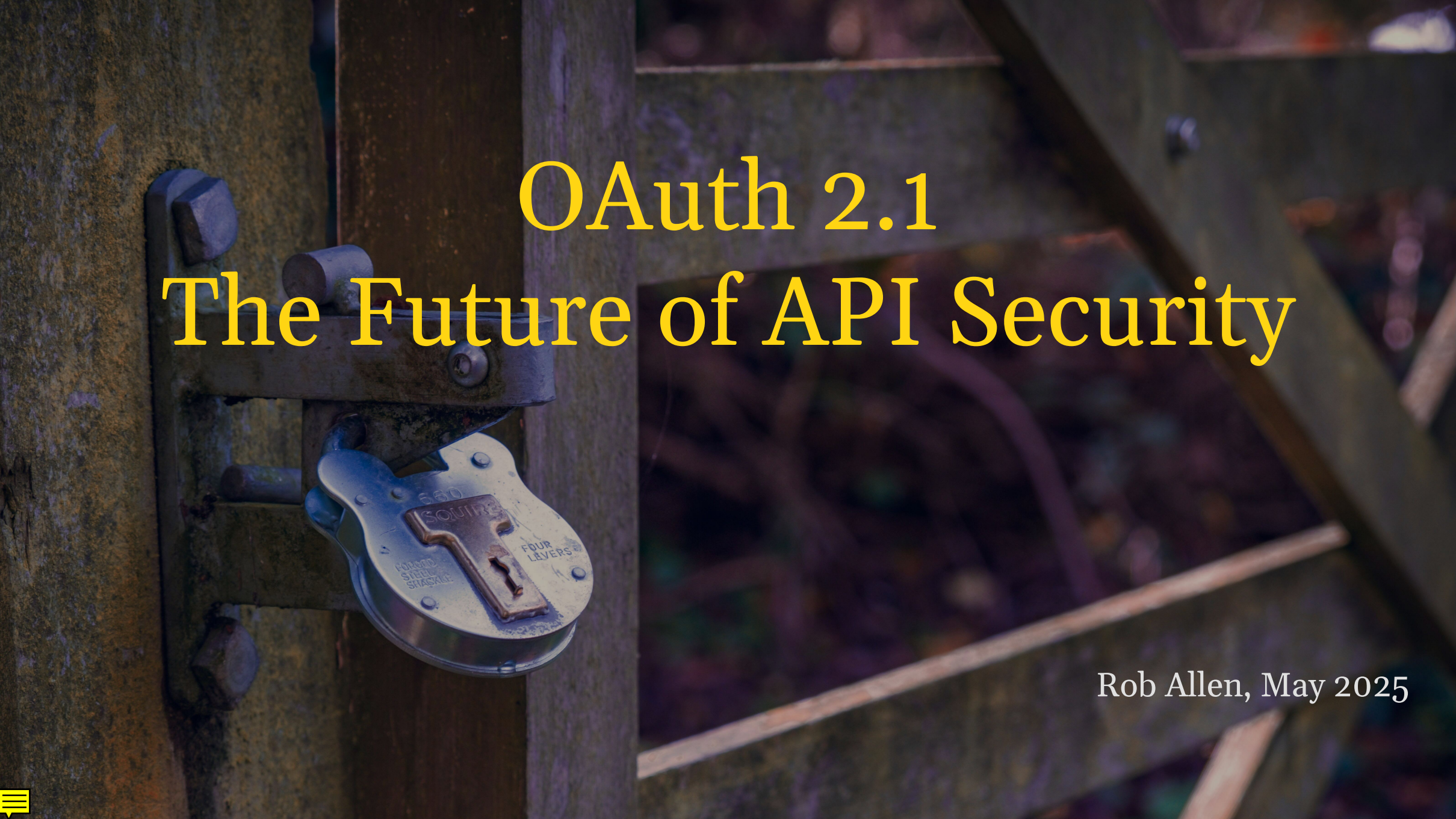


OAuth 2.1
The Future of API Security

Rob Allen, May 2025

OAuth is the standard for securing access to APIs

OAuth 2.0

A Refresher

OAuth 2.0 Roles

- Resource Owner (The User)
- Resource Server (The API)
- Client (The application that uses the API)
- Authorization Server (OAuth server)

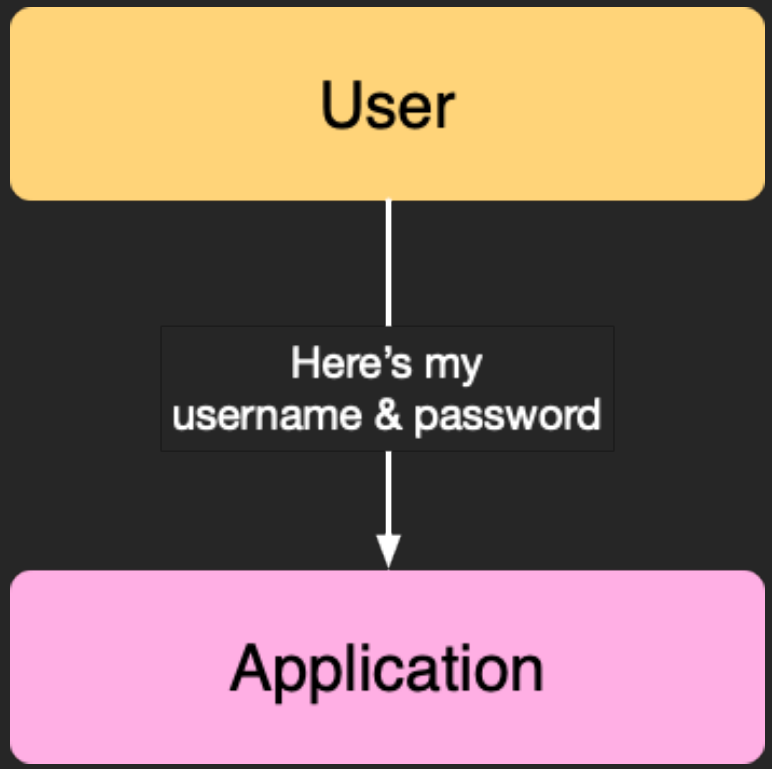
OAuth 2.0 Protocol Flows

- Resource Owner Password Credentials
- Authorization Code
- Implict
- Client Credentials

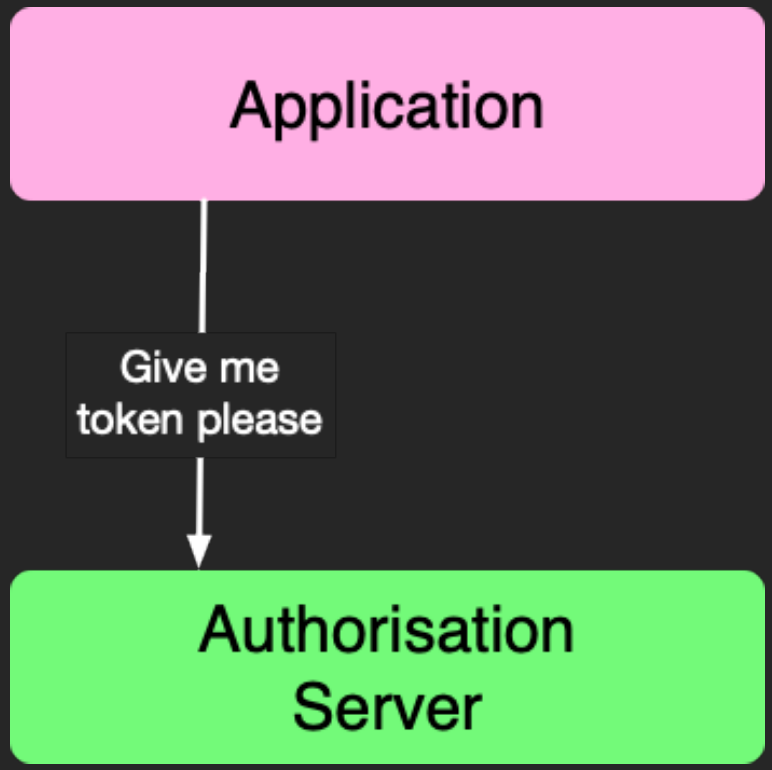
Password Credentials Flow

For logging into 1st party apps

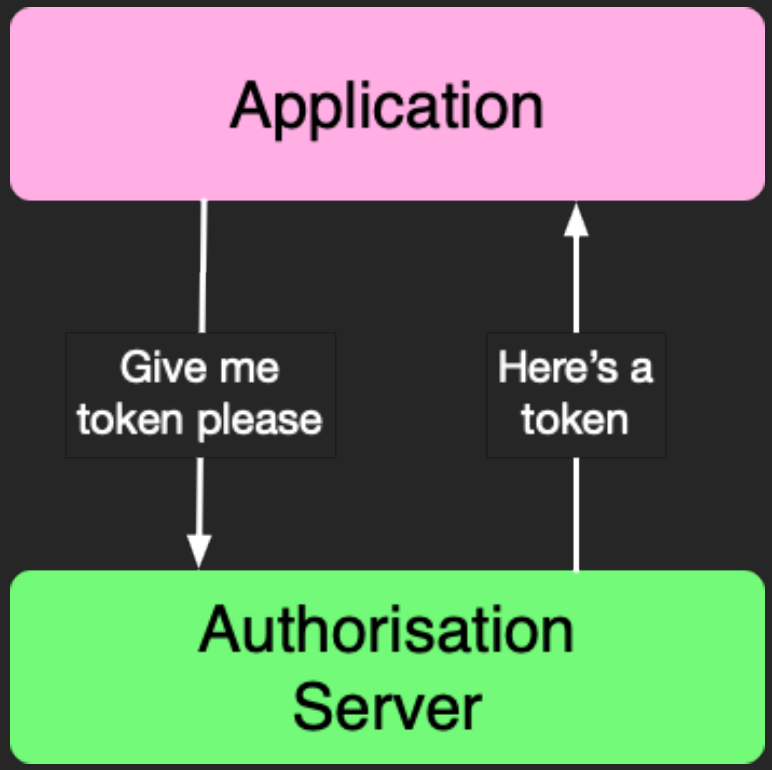
Password Credentials Flow



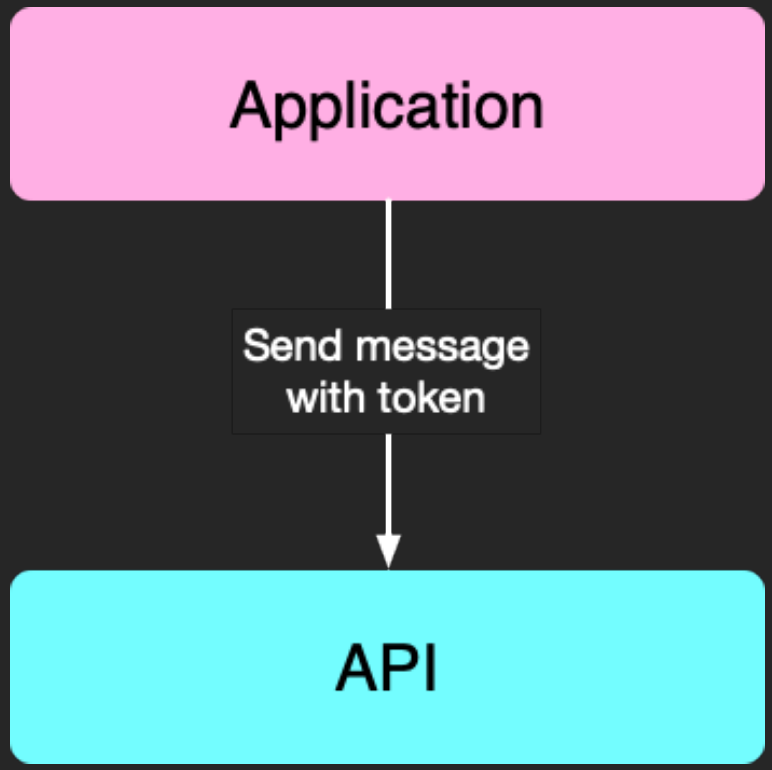
Password Credentials Flow



Password Credentials Flow



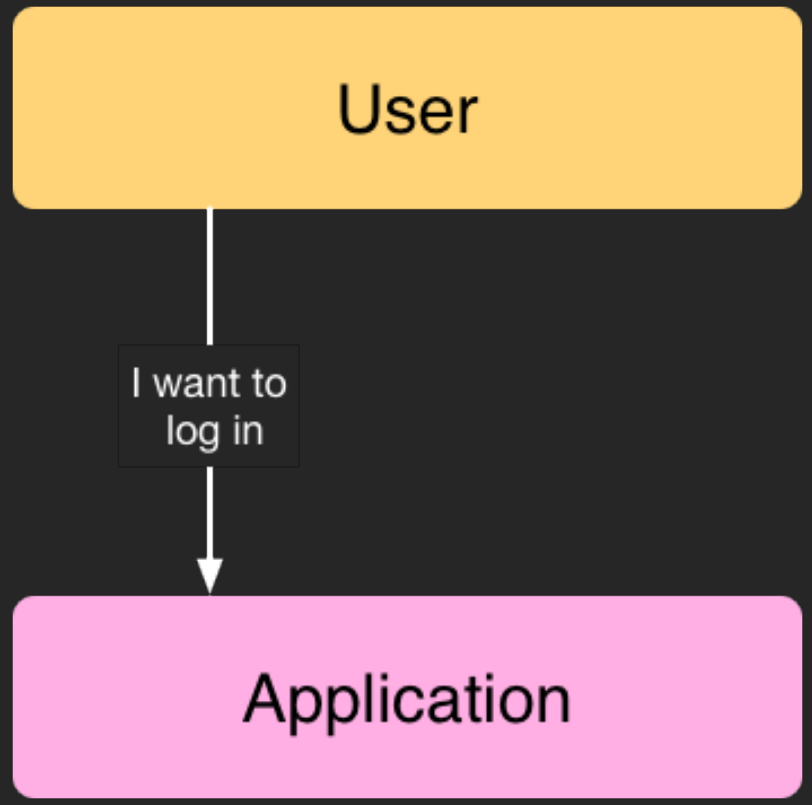
Password Credentials Flow



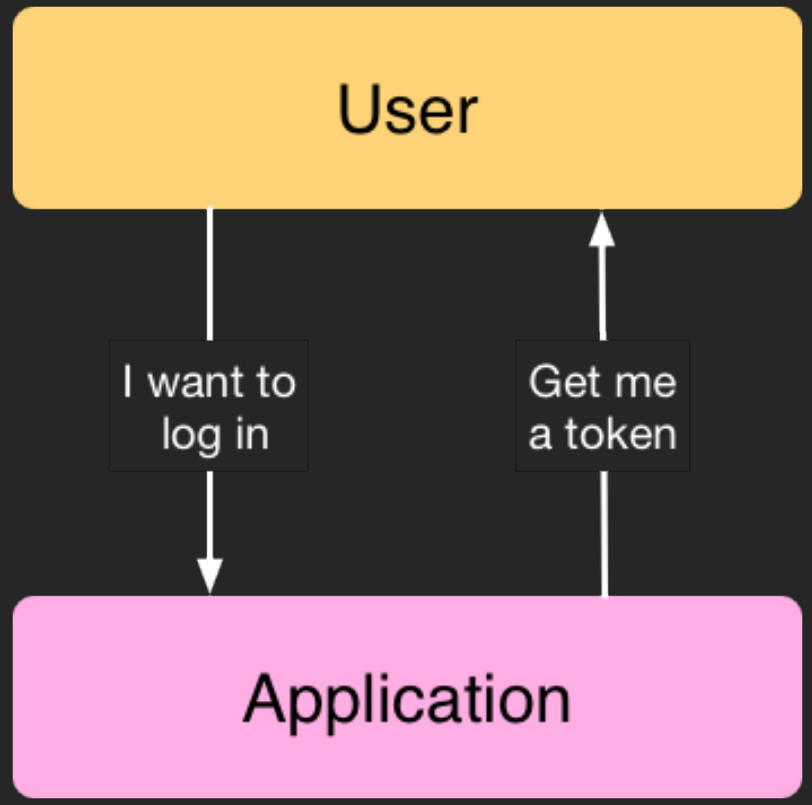
Authorization Code Flow

For logging into 3rd party websites

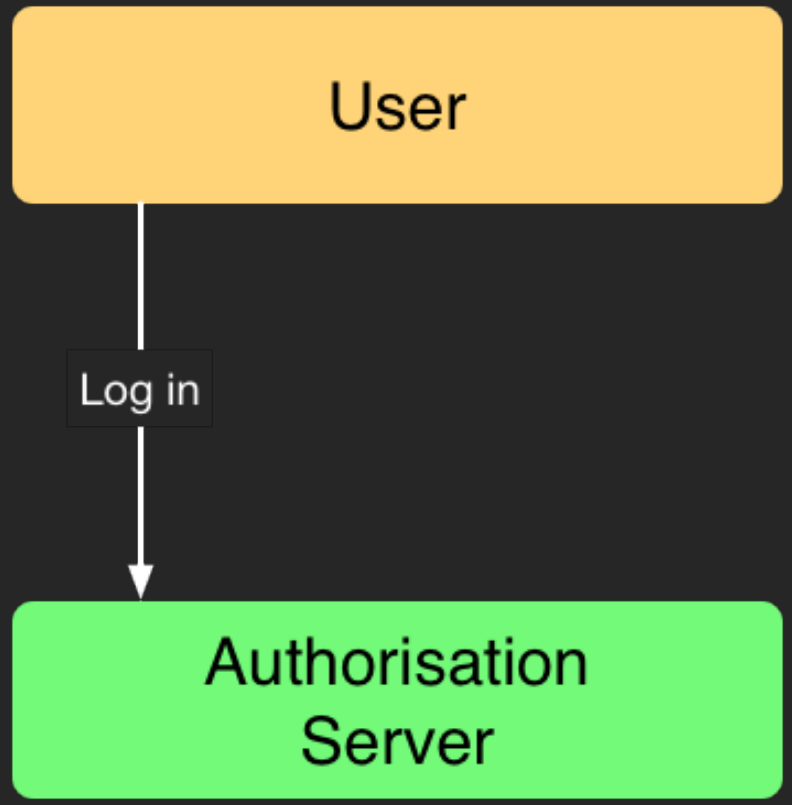
Authorization Code Flow



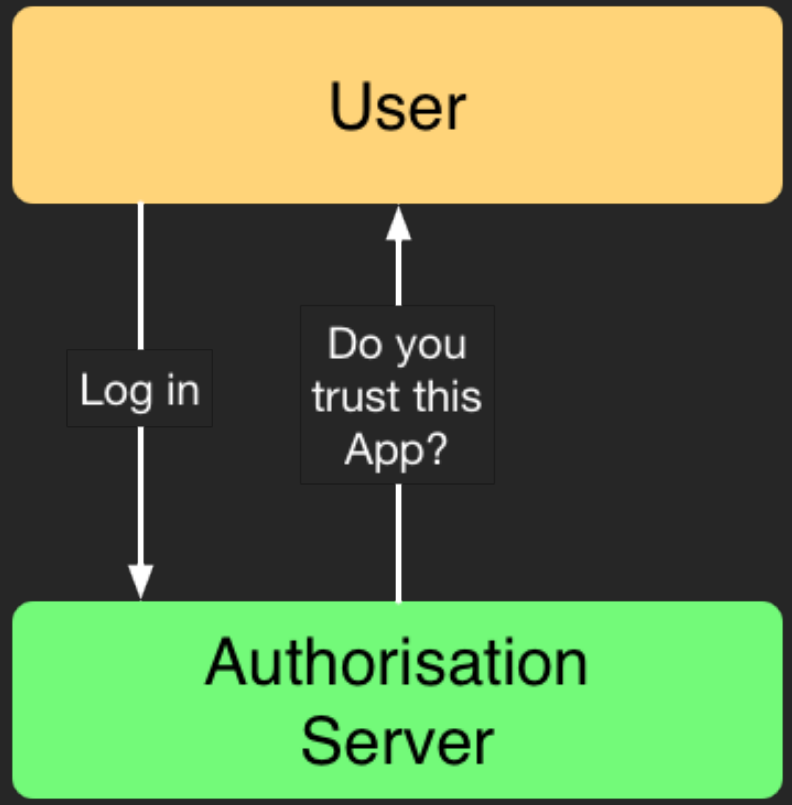
Authorization Code Flow



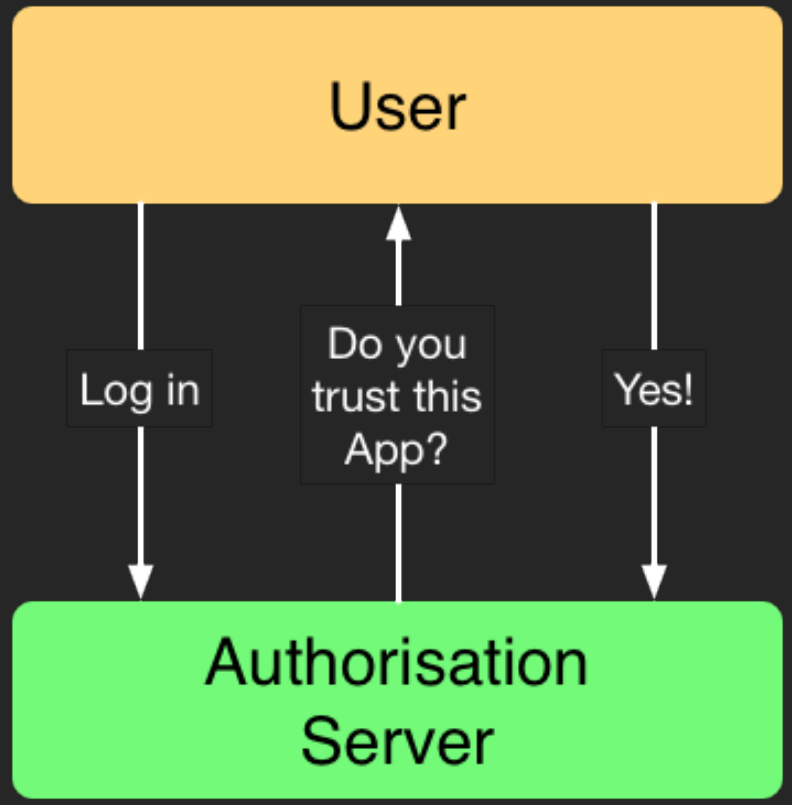
Authorization Code Flow



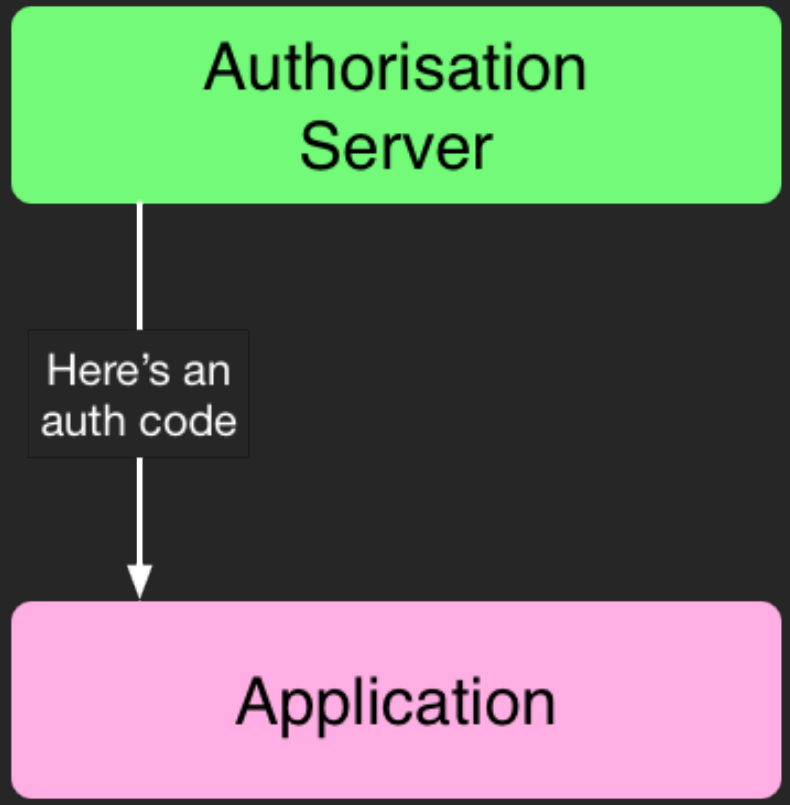
Authorization Code Flow



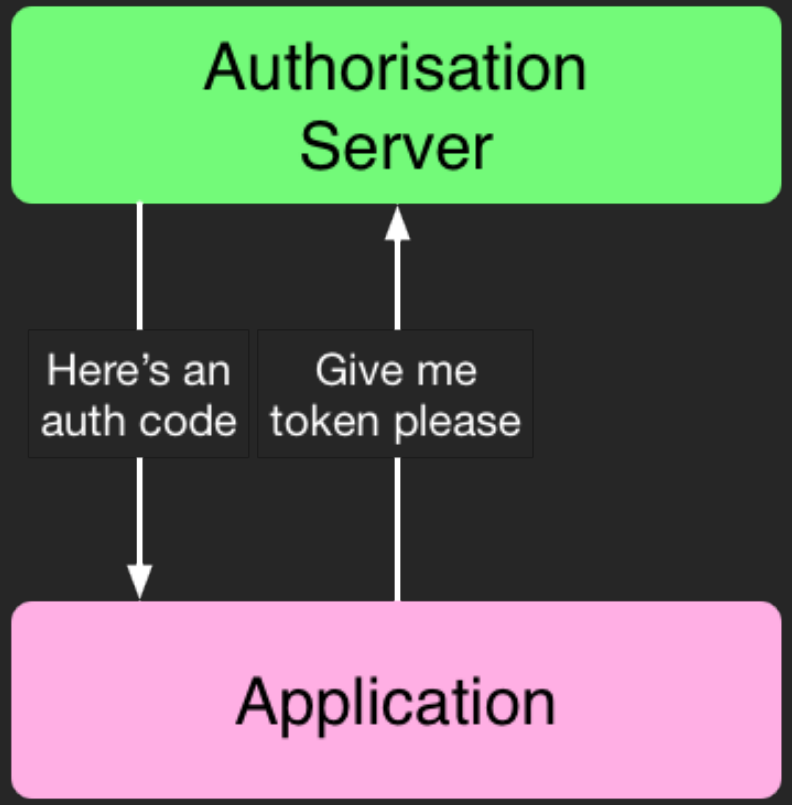
Authorization Code Flow



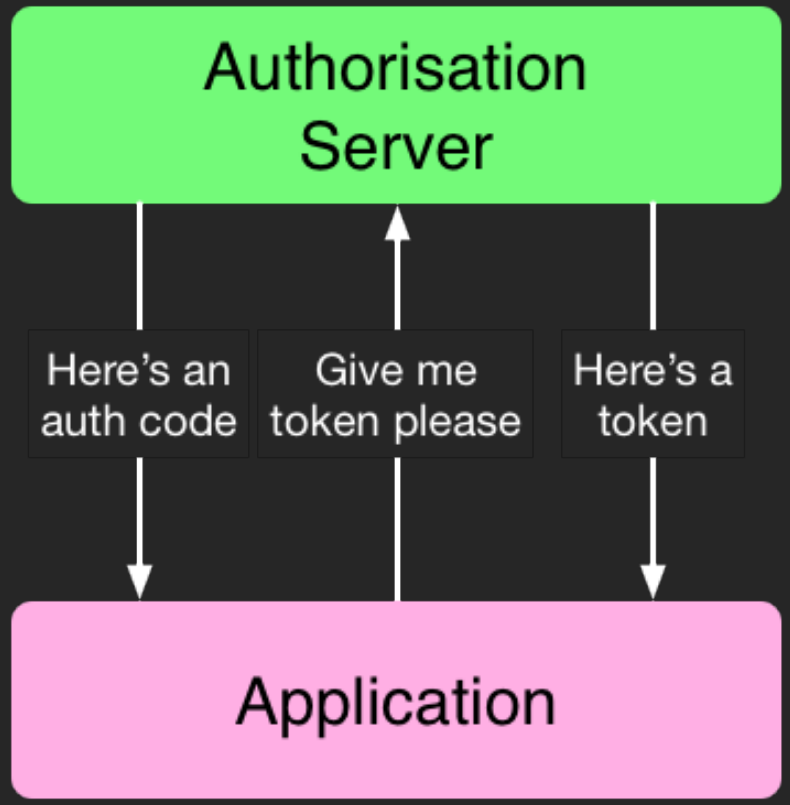
Authorization Code Flow



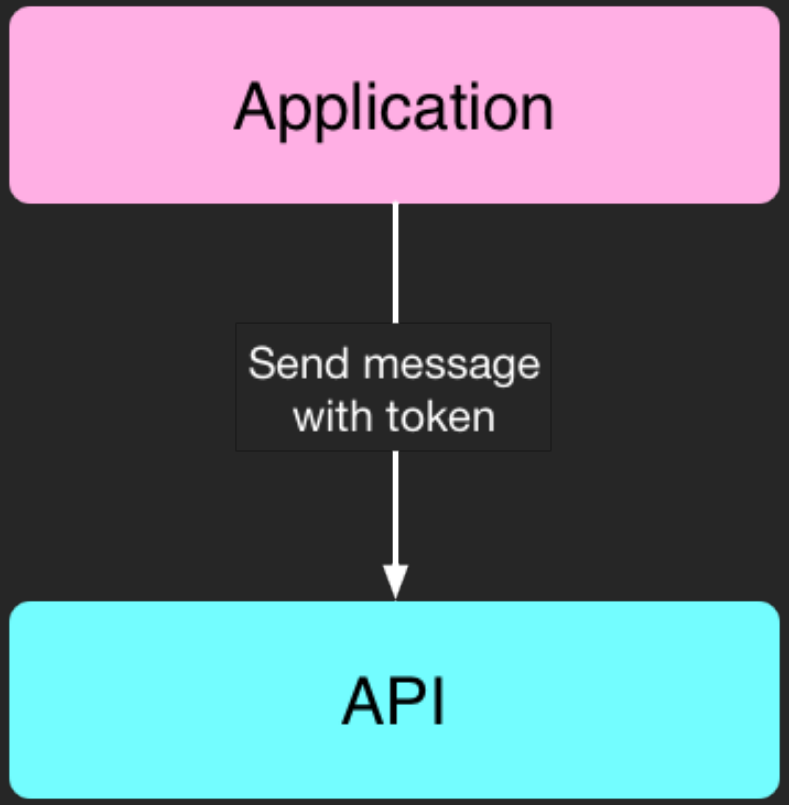
Authorization Code Flow



Authorization Code Flow



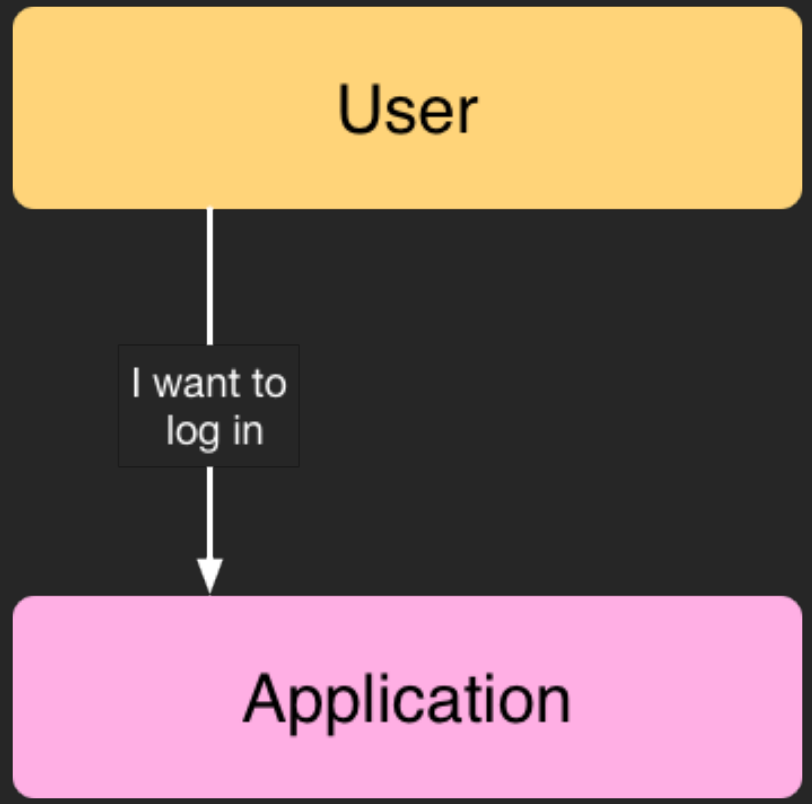
Authorization Code Flow



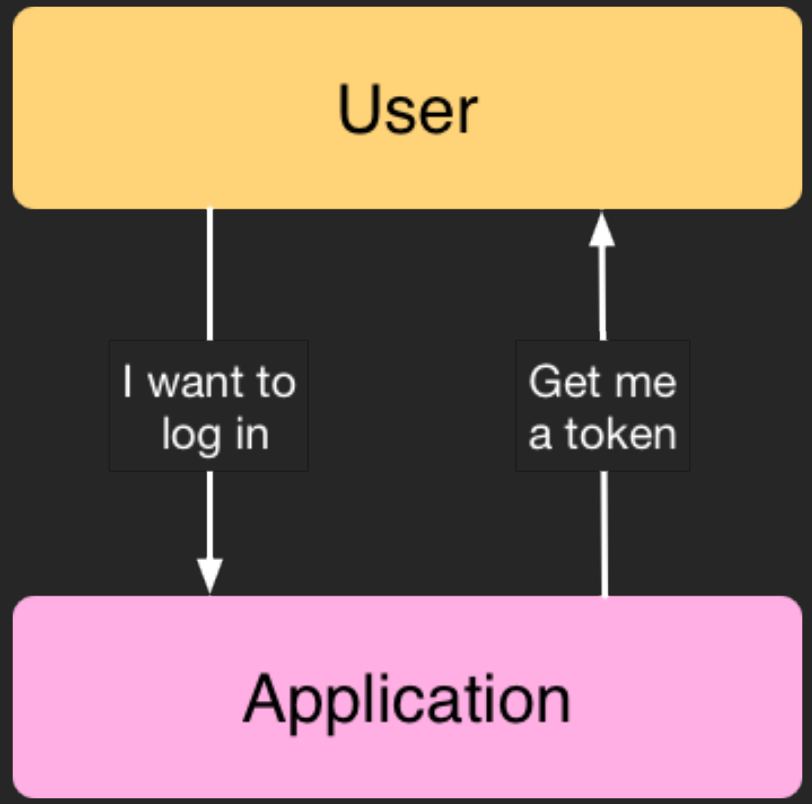
Implicit Flow

For logging into 3rd party apps and web SPAs

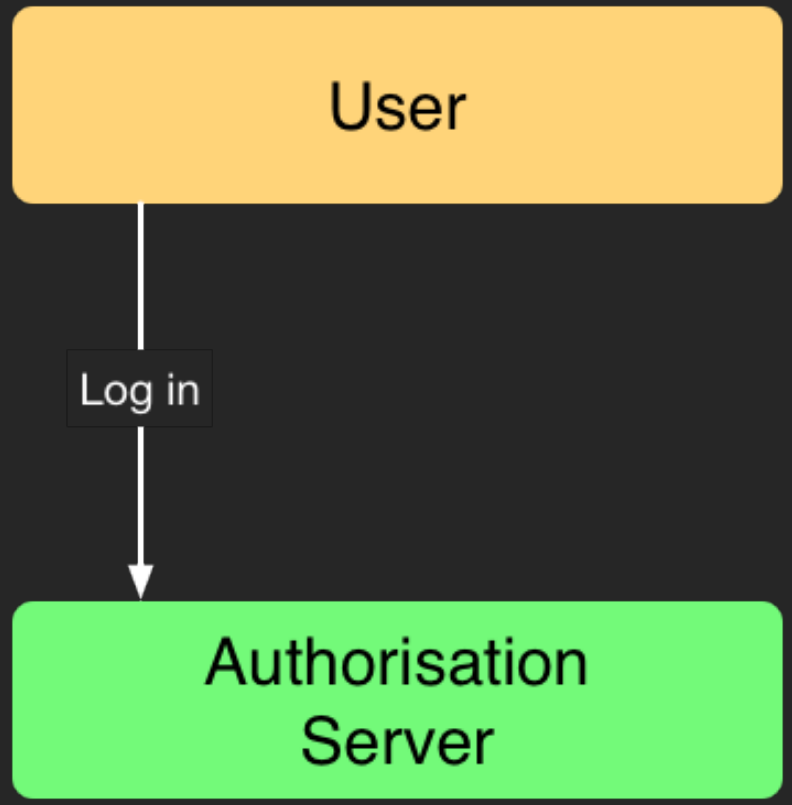
Implict Flow



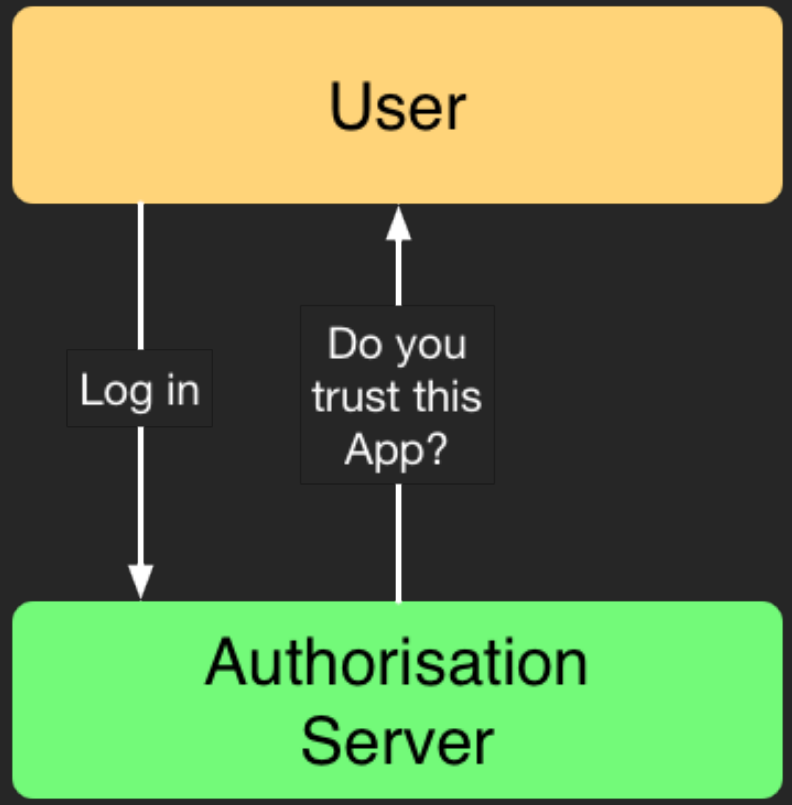
Implict Flow



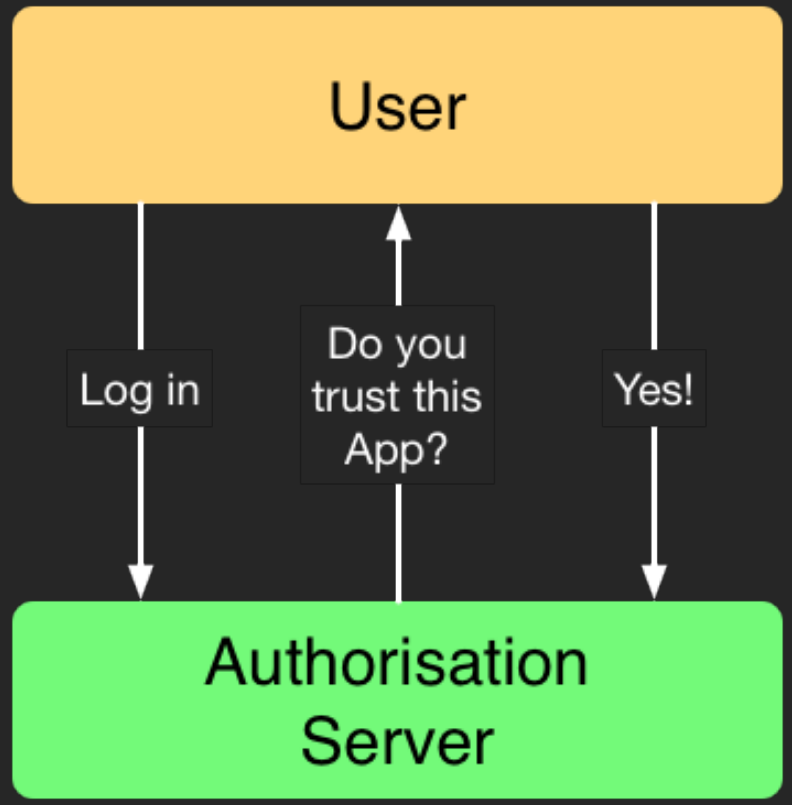
Implict Flow



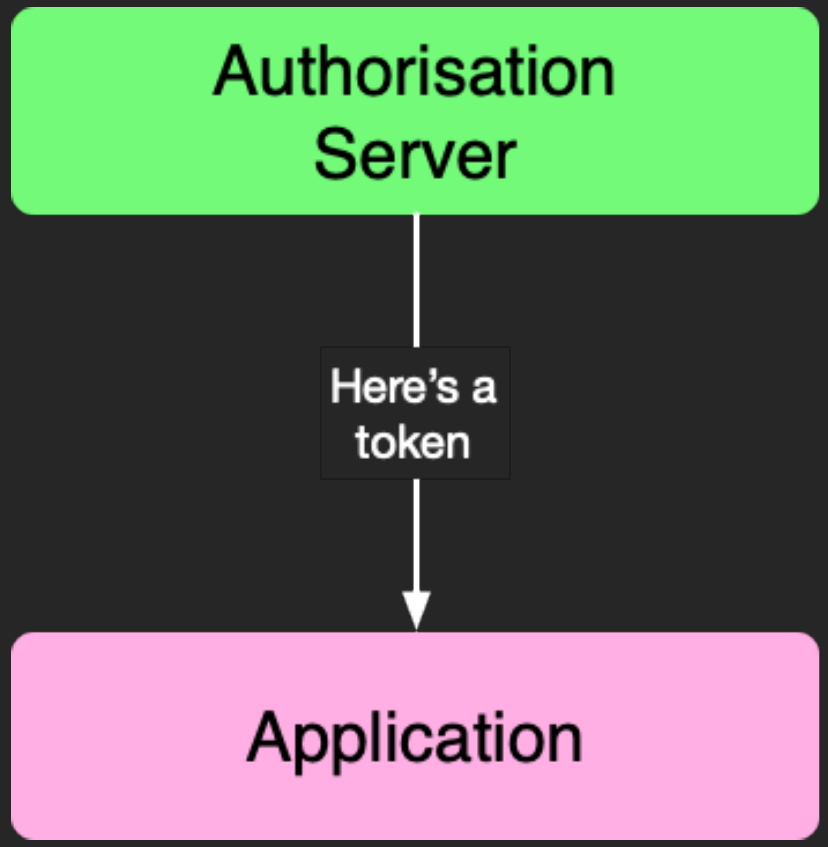
Implict Flow



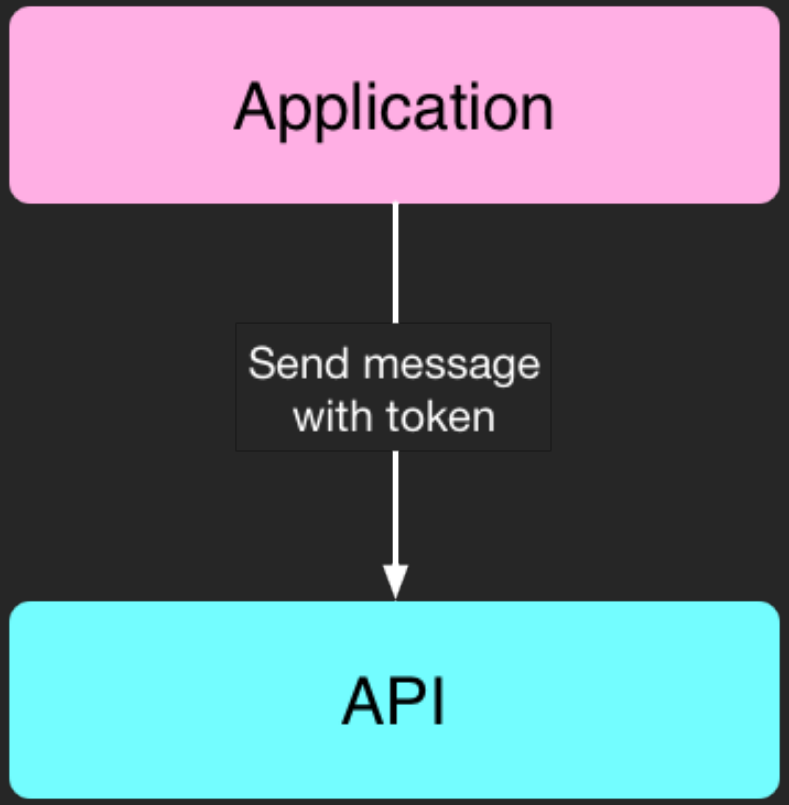
Implict Flow



Implict Flow



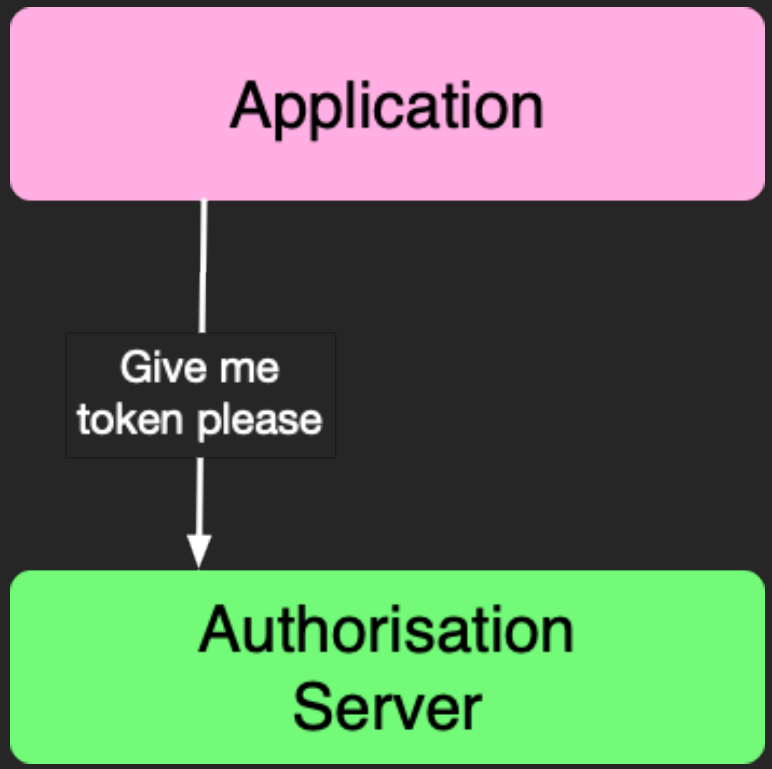
Implict Flow



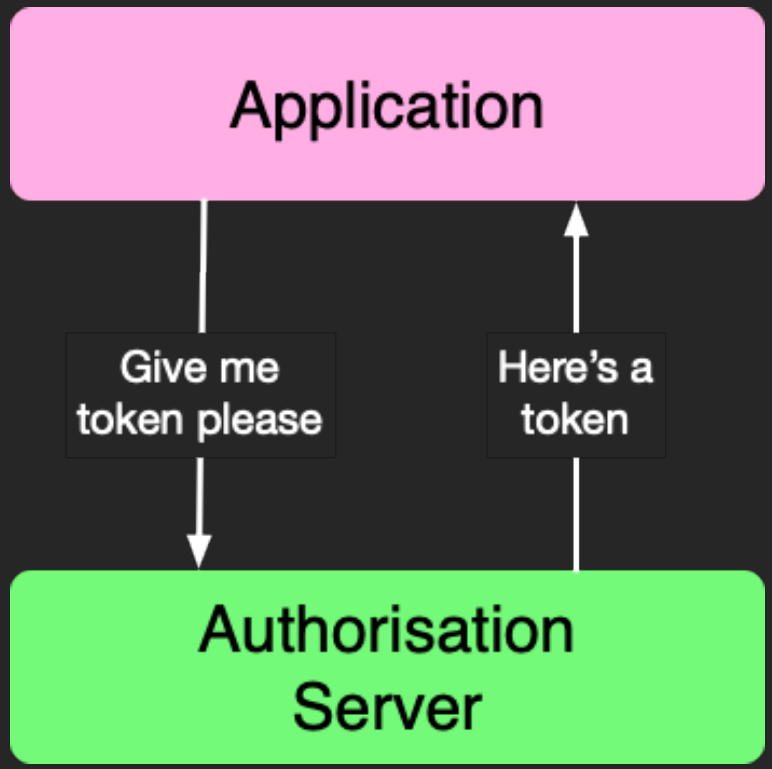
Client Credentials Flow

For jobs that don't need user permission

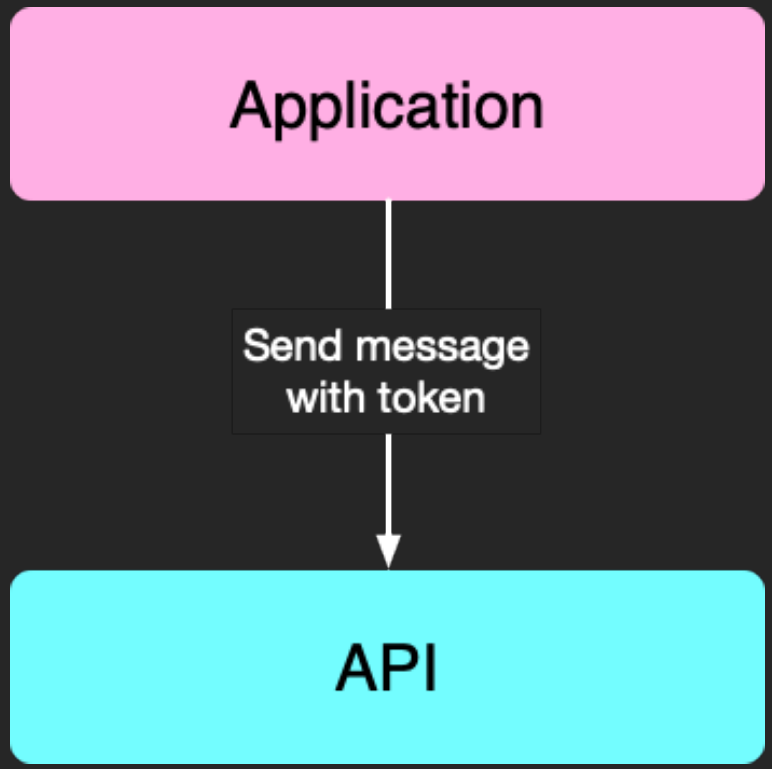
Client Credentials Flow



Client Credentials Flow



Client Credentials Flow



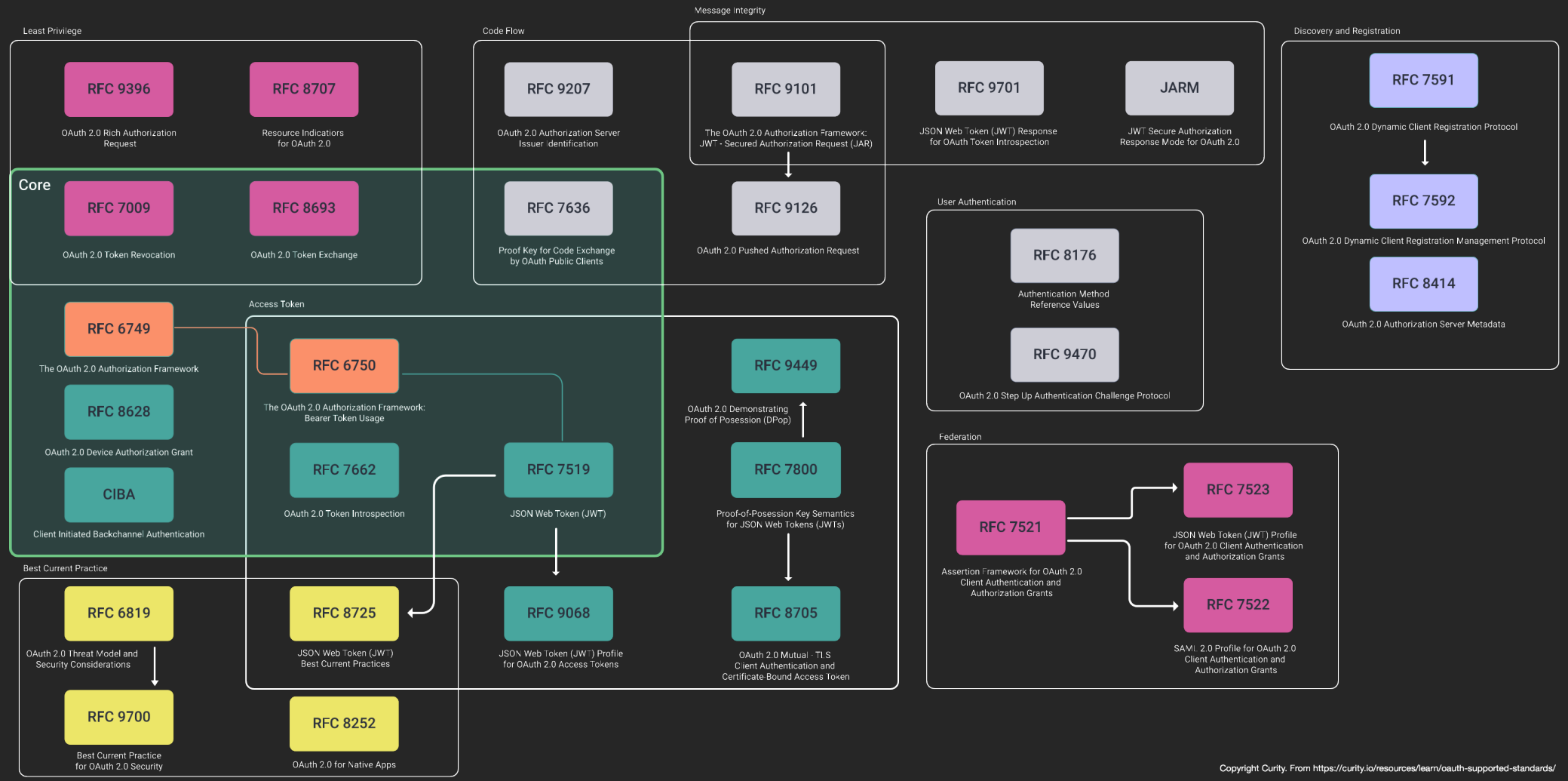
OAuth 2.0 Refresh token

- Allows the client to gain a new access token
- Refresh tokens need to be kept secure
- Authorization server can choose not to issue

OAuth 2.0 Since 2012

The OAuth 2.0 Framework in 2012

The OAuth 2.0 Framework Today



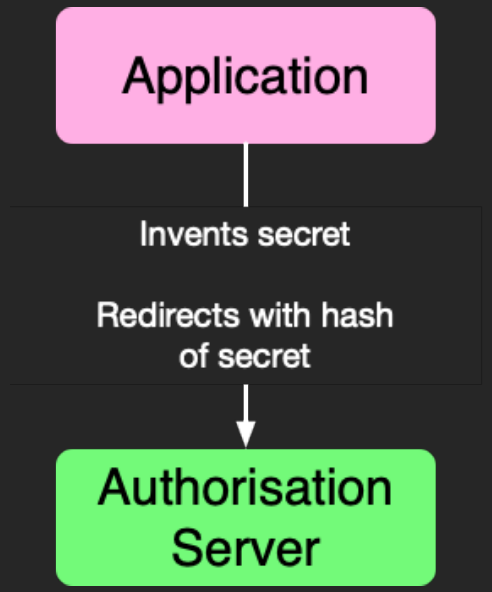
Key extensions since 2012

- RFC 7636: Authorization Code without a client secret (PKCE)
- RFC 8628: Device Authorization grant for devices

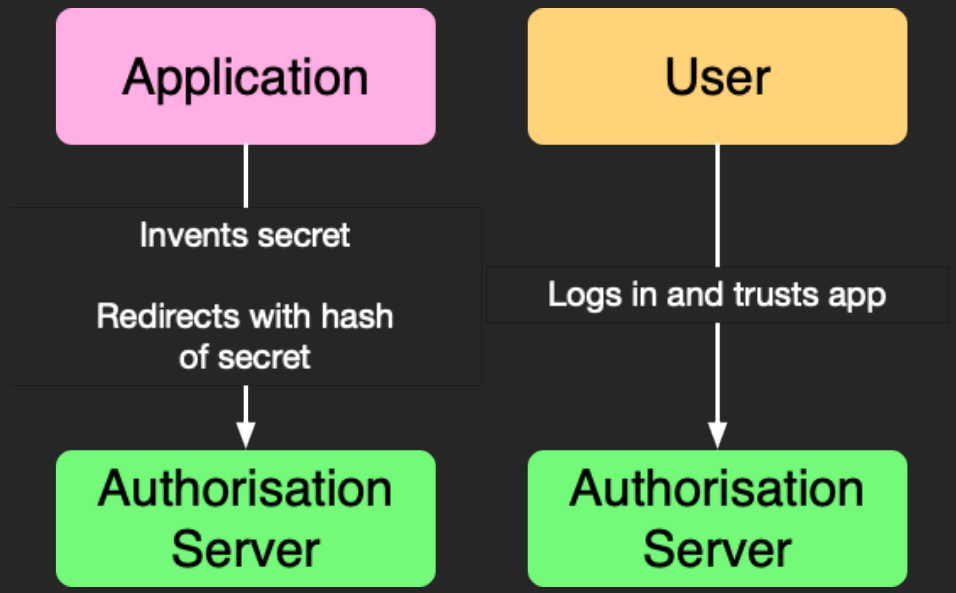
PKCE

- First created for mobile, but useful for all public clients
- Protects the authorization code in the redirect
- We know that the right client is converting the code to a token

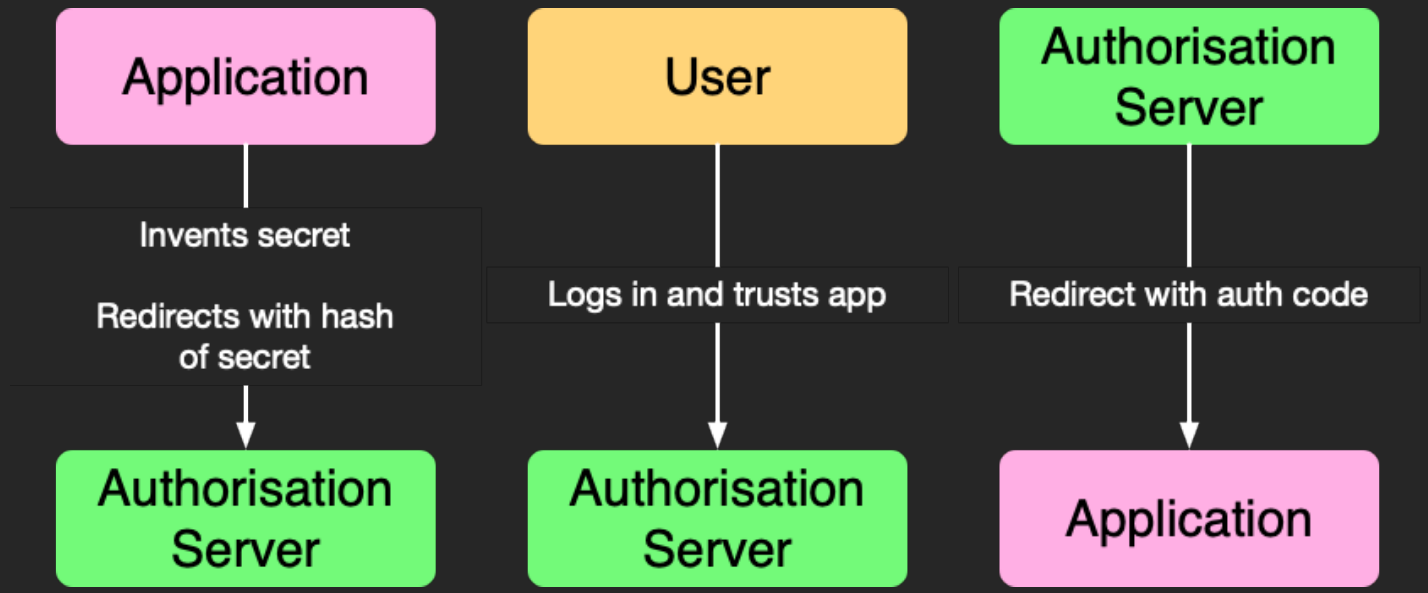
PKCE workflow



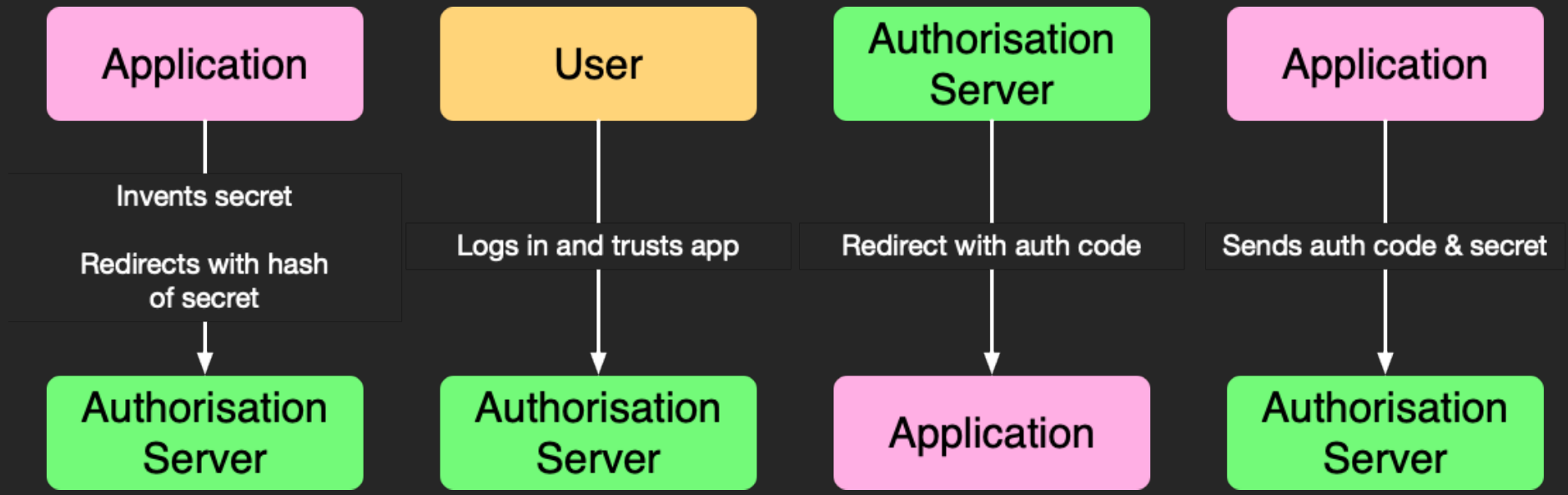
PKCE workflow



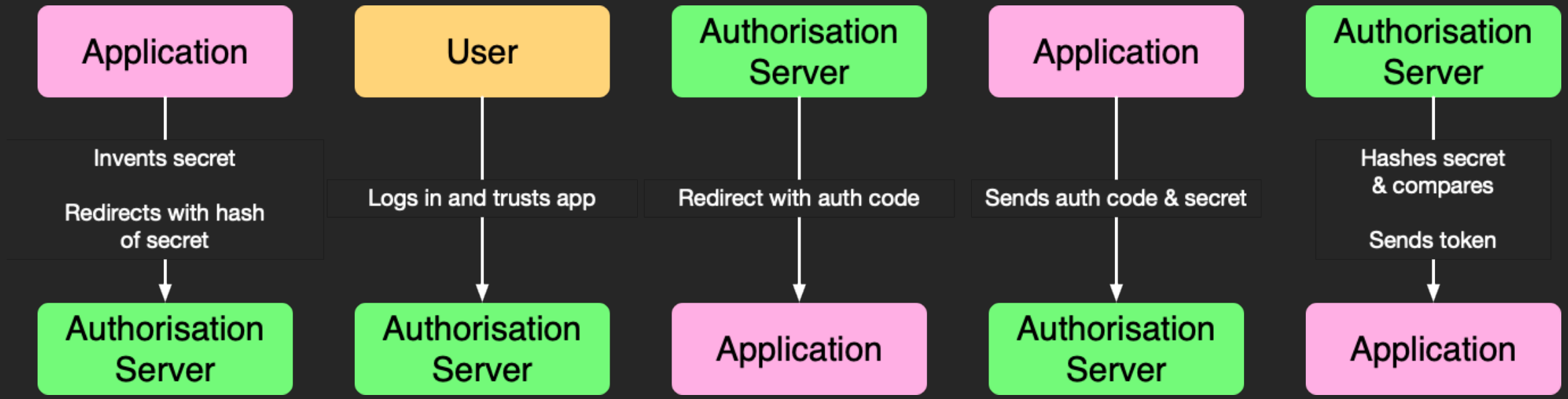
PKCE workflow



PKCE workflow



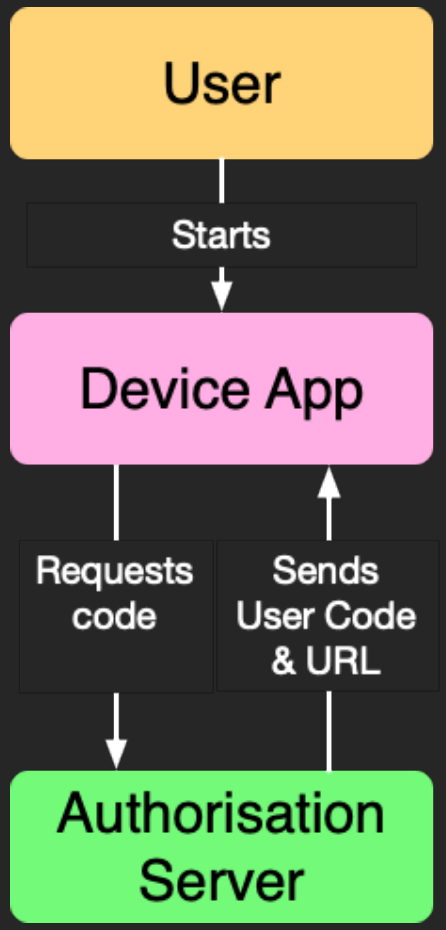
PKCE workflow



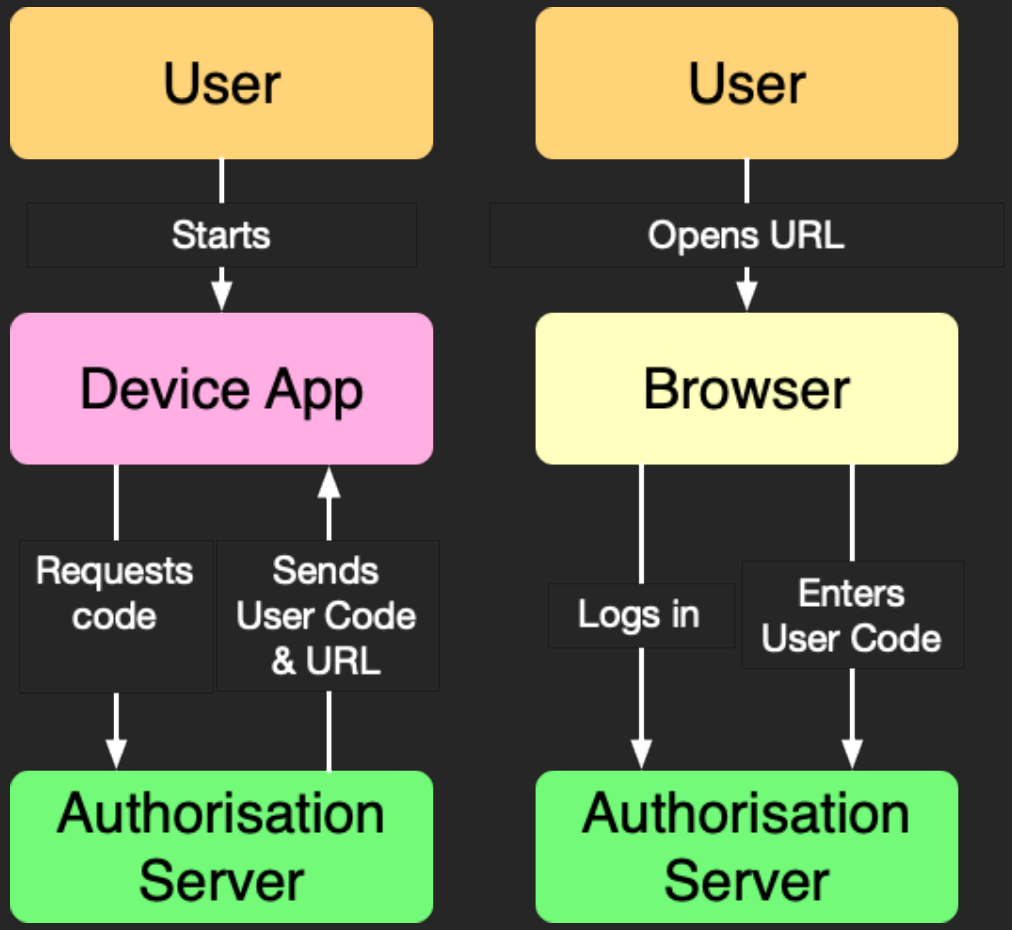
Device Authorization Flow

For apps with no browser (or keyboard)

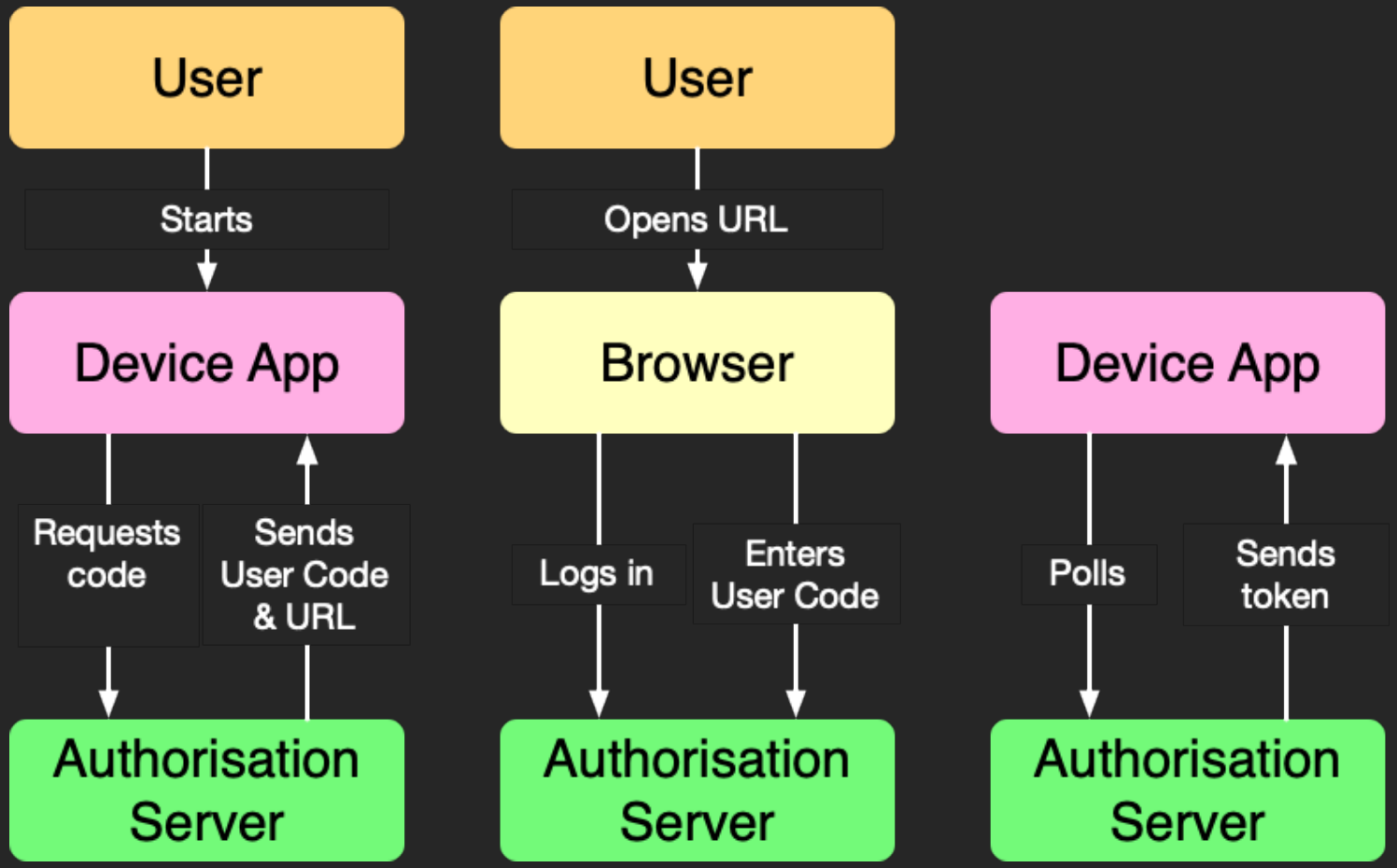
Device Authorization Flow



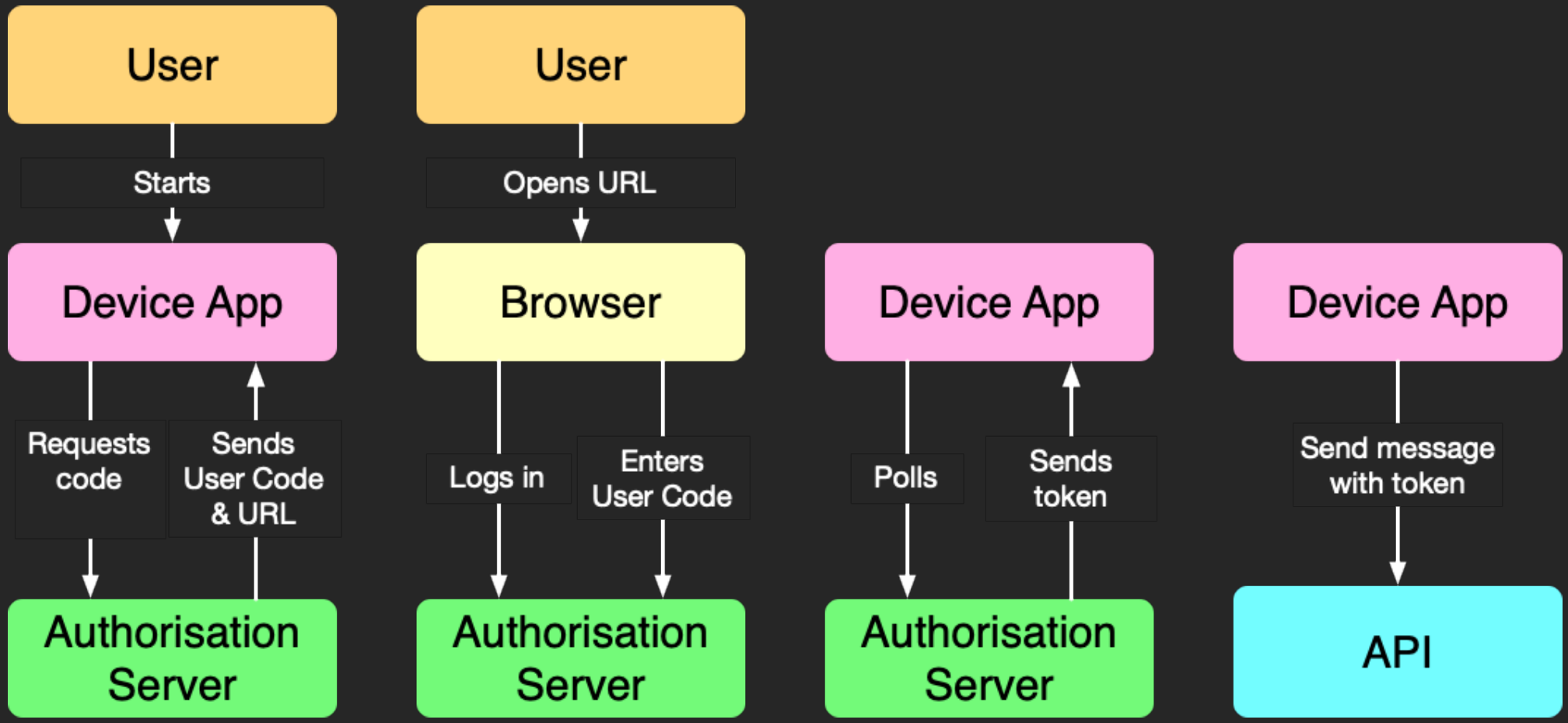
Device Authorization Flow



Device Authorization Flow



Device Authorization Flow



Best Practices since 2012

- RFC 7900: Best Current Practice for OAuth 2.0 Security
- RFC 8653: OAuth 2.0 for Native Apps
- OAUTH-WG: OAuth 2.0 for Browser Apps

Best Current Practice

- Always use PKCE with Authorization Code

Best Current Practice

- Always use PKCE with Authorization Code
- Don't use Implicit flow; use Authorization Code (with PCKE)

Best Current Practice

- Always use PKCE with Authorization Code
- Don't use Implicit flow; use Authorization Code (with PCKE)
- Don't use Password flow; use Authorization Code (with PCKE)

Best Current Practice

- Always use PKCE with Authorization Code
- Don't use Implicit flow; use Authorization Code (with PCKE)
- Don't use Password flow; use Authorization Code (with PCKE)
- Use exact string matching for redirect URIs

Best Current Practice

- Always use PKCE with Authorization Code
- Don't use Implicit flow; use Authorization Code (with PCKE)
- Don't use Password flow; use Authorization Code (with PCKE)
- Use exact string matching for redirect URIs
- No access tokens in query strings

Best Current Practice

- Always use PKCE with Authorization Code
- Don't use Implicit flow; use Authorization Code (with PCKE)
- Don't use Password flow; use Authorization Code (with PCKE)
- Use exact string matching for redirect URIs
- No access tokens in query strings
- Refresh tokens must be sender constrained or one-time use

Best Current Practice

- Always use PKCE with Authorization Code
- Don't use Implicit flow; use Authorization Code (with PCKE)
- Don't use Password flow; use Authorization Code (with PCKE)
- Use exact string matching for redirect URIs
- No access tokens in query strings
- Refresh tokens must be sender constrained or one-time use
- ... plus other good implementation information!

OAuth 2.1

My main goal with OAuth 2.1 is to capture the current best practices in OAuth 2.0 as well as its well-established extensions under a single name.

Aaron Parecki

Key Objectives of OAuth 2.1

- Not a new protocol

Key Objectives of OAuth 2.1

- Not a new protocol
- Simplifies the specification

Key Objectives of OAuth 2.1

- Not a new protocol
- Simplifies the specification
- Incorporation of Best Current Practices

OAuth 2.1 Flows

- Authorization Code + PKCE
- Device Authorization
- Client Credentials

Tokens

- Transfer only by HTTP header or POST form body
- Require sender contraints or one-time use refresh tokens
- Refined token management (shorter lifetimes, rotation policies)

Other things

- Redirect URIs must be exact matches
- State parameter is now mandatory for CSRF protection
- Confidential client now means a client that has credentials
- Otherwise it's public

Going forwards

Migrating to 2.1

Migrating to 2.1

- Review current implementation

Migrating to 2.1

- Review current implementation
- Adopt Authorization Code flow with PKCE

Migrating to 2.1

- Review current implementation
- Adopt Authorization Code flow with PKCE
- Remove deprecated flows

Migrating to 2.1

- Review current implementation
- Adopt Authorization Code flow with PKCE
- Remove deprecated flows
- Secure redirect Uris

Migrating to 2.1

- Review current implementation
- Adopt Authorization Code flow with PKCE
- Remove deprecated flows
- Secure redirect Uris
- Review and implement the Best Current Practices

Other relatively new OAuth features

Other relatively new OAuth features

- Demonstrating Proof of Possession (RFC 9449)
- Mutual TLS (RFC 8705)

Other relatively new OAuth features

- Demonstrating Proof of Possession (RFC 9449)
- Mutual TLS (RFC 8705)
- JWT Profile for Access Tokens (RFC 9068)
- JWT-Secured Authorization Requests (RFC 9101)

Other relatively new OAuth features

- Demonstrating Proof of Possession (RFC 9449)
- Mutual TLS (RFC 8705)
- JWT Profile for Access Tokens (RFC 9068)
- JWT-Secured Authorization Requests (RFC 9101)
- Rich Authorization Requests (RFC 9396)
- Pushed Authorization Requests (RFC 9126)


Donatello @ HÖR BERLIN
@firebel.ly
+ Follow
OAuth 2.0? That's last years tech, I'm ready for 2.1!!!
8 May 2024 at 02:15
1 like
1


Thank you!
slides: https://akrabat.com/7337
q&a and feedback: https://grusp.org/agenda
Rob Allen ~ akrabat.com