The OpenID Connect Protocol

RMLL
BEAUVAIS 2015
Destination libre

Savoir-faire LINUX

Clément OUDOT
@clementoudot

LDAP Synchronization Connector

LTB Project

- Founded in 1999
- >100 persons
- Montréal, Quebec City, Ottawa, Paris
- ISO 9001:2004 / ISO 14001:2008
- contact@savoirfairelinux.com

Microsoft CERTIFIED Partner

LIFERAY Community Excellence 2014 • 2013 2012 • 2011

Alfresco Gold Partner

redhat ADVANCED BUSINESS PARTNER

ORACLE PARTNER

odoo Gold Partner

BlueMind PREMIUM PARTNER

talend Gold Partner

Acquia

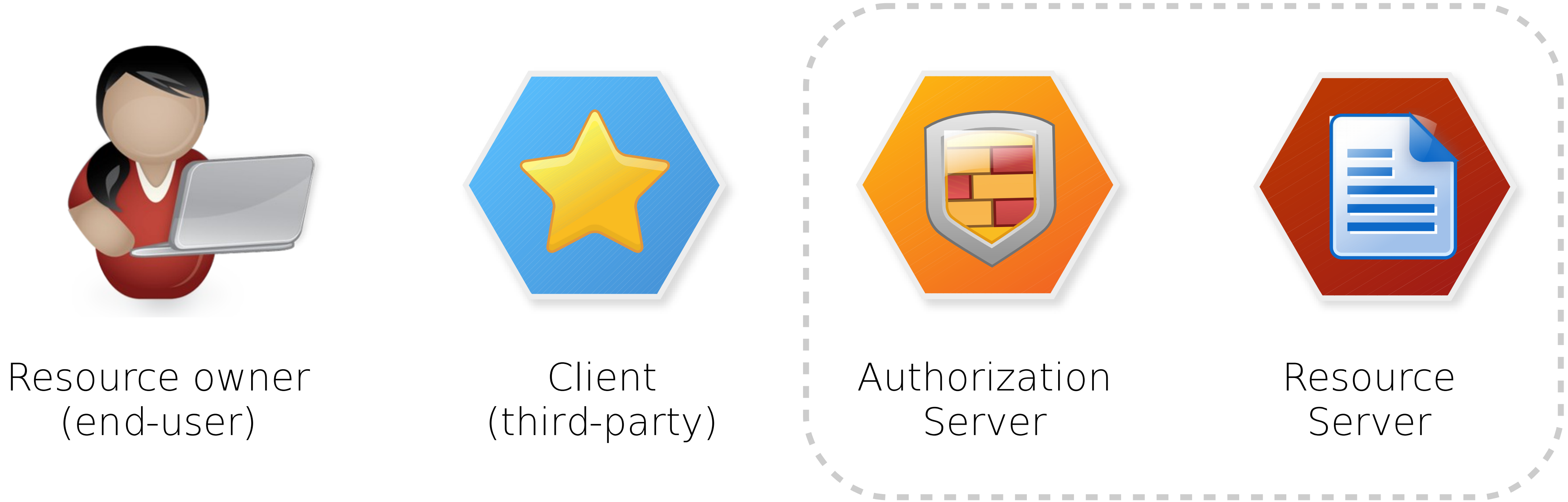
GET /summary

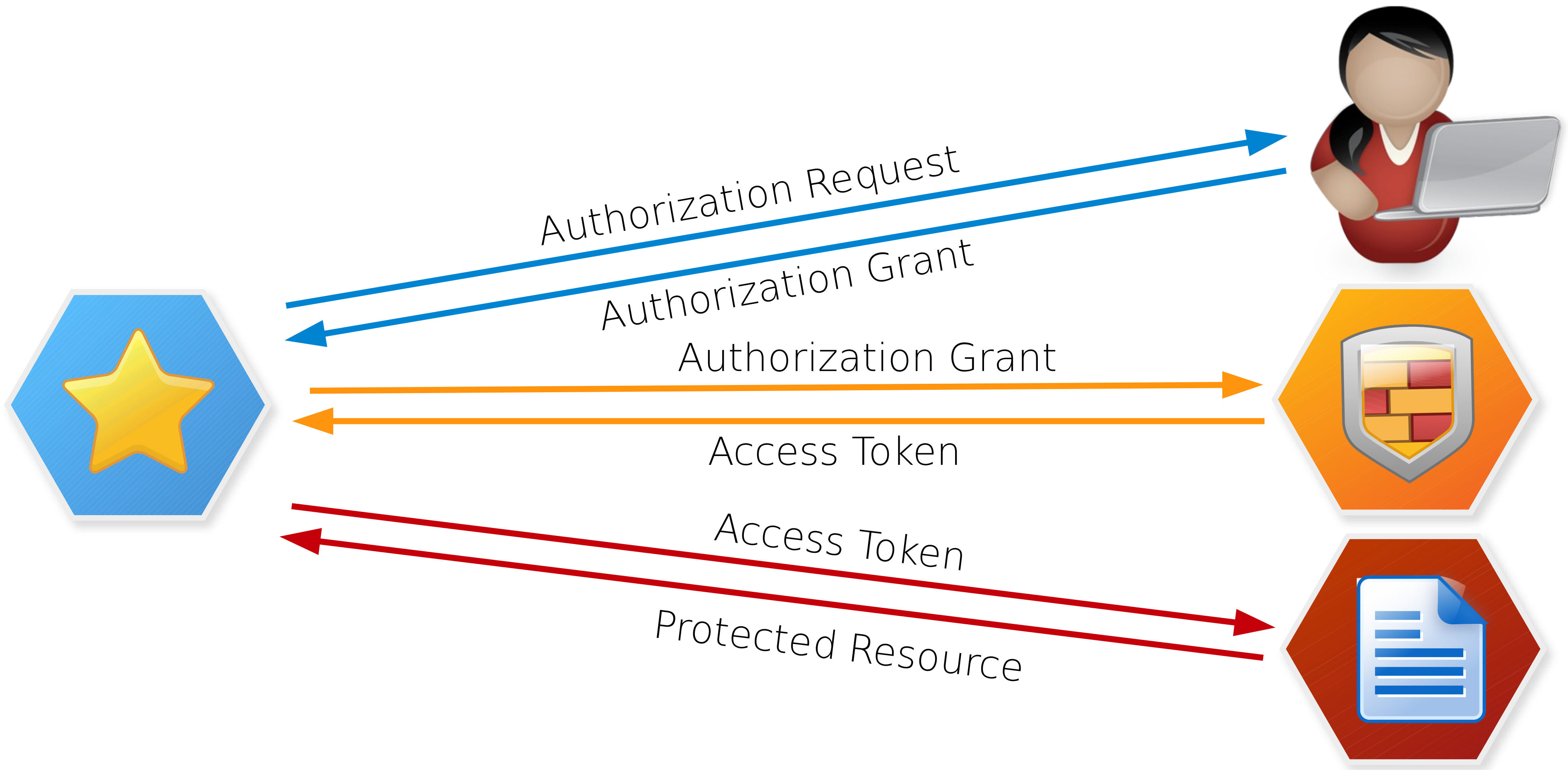
```
{
    “part1”:“Some words on OAuth 2.0”,
    “part2”:“The OpenID Connect Protocol”,
    “part3”:“OpenID Connect VS SAML”,
    “part4”:“Support of OpenID Connect in LL::NG”
}
```

RFC 6749

The OAuth 2.0 authorization **framework** enables a **third-party** application to obtain **limited** access to an **HTTP service**, either on behalf of a **resource owner** by orchestrating an approval interaction between the resource owner and the **HTTP service**, or by allowing the **third-party** application to obtain access on its own behalf. This specification replaces and obsoletes the OAuth 1.0 protocol described in RFC 5849.

Roles


Resource owner (end-user)
Client (third-party)
Authorization Server
Resource Server


Authorization Request
Authorization Grant
Authorization Grant
Access Token
Access Token
Protected Resource

Authorization Grant

Authorization Code

- More secure
- Server side applications
- Tokens hidden to end user

Implicit

- Access token directly sent
- Designed for JS client application

Resource Owner Password Credentials

- Requires high trust between end-user and client

Client credentials

- Client is often the resource owner

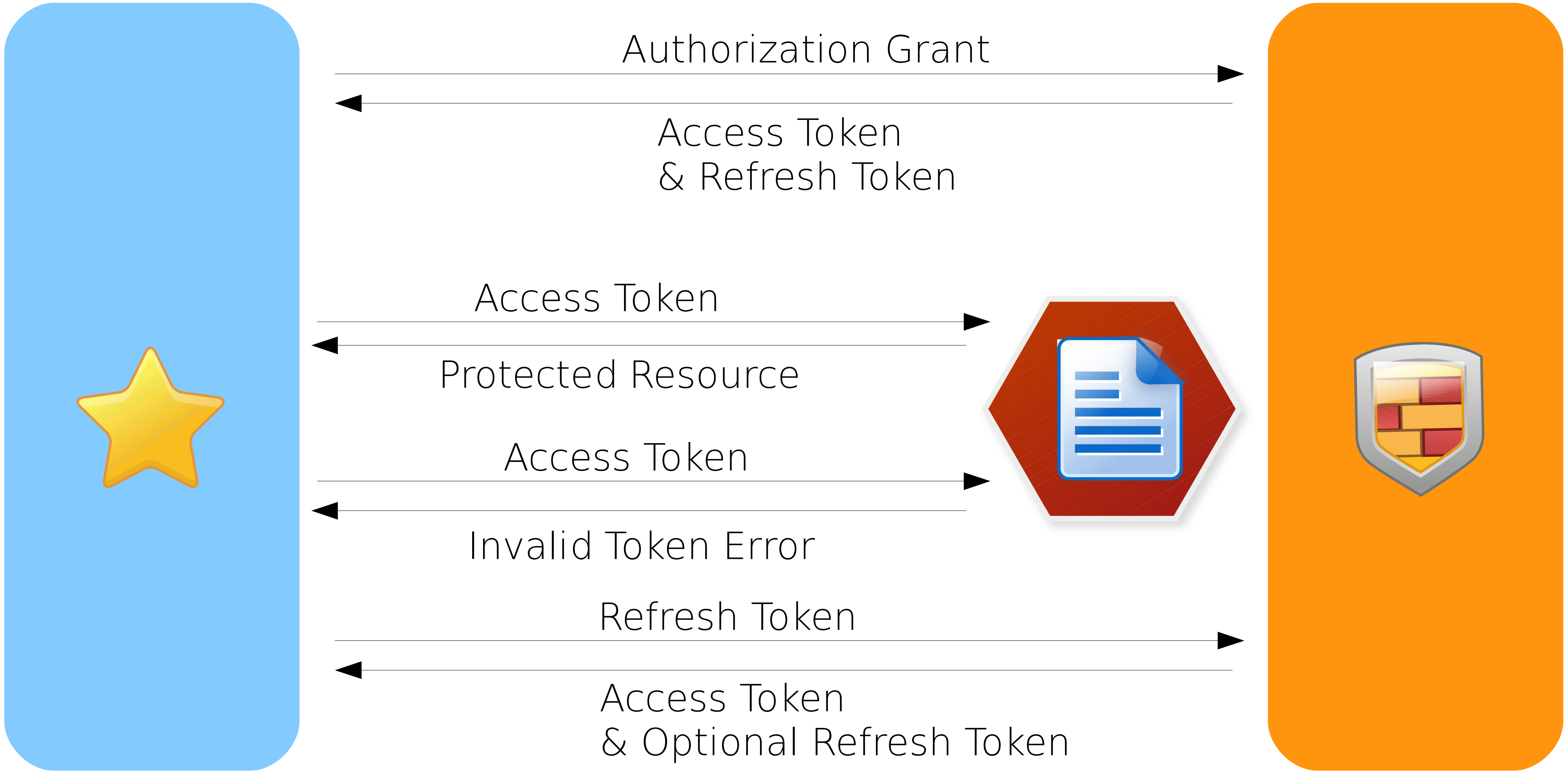
Tokens

Access Token :

- Opaque
- Limited duration
- Scope
- Give access to the resource server

Refresh Token :

- Allow to get a new access token
- Optional
- Can not be used as an access token


Authorization Grant
Access Token
& Refresh Token
Access Token
Protected Resource
Access Token
Invalid Token Error
Refresh Token
Access Token
& Optional Refresh Token

Client Registration

- Client has to be registered with the authorization server
- OAuth 2.0 do not specify how this registration is done
- Information that should be registered:
  - Client type
  - Redirection URIs
  - Other: application name, logo, etc.
- The client then received a client_id and a client_password

Client types

- **Confidential**: Clients **capable** of maintaining the confidentiality of their credentials :
  - Application on a secure server

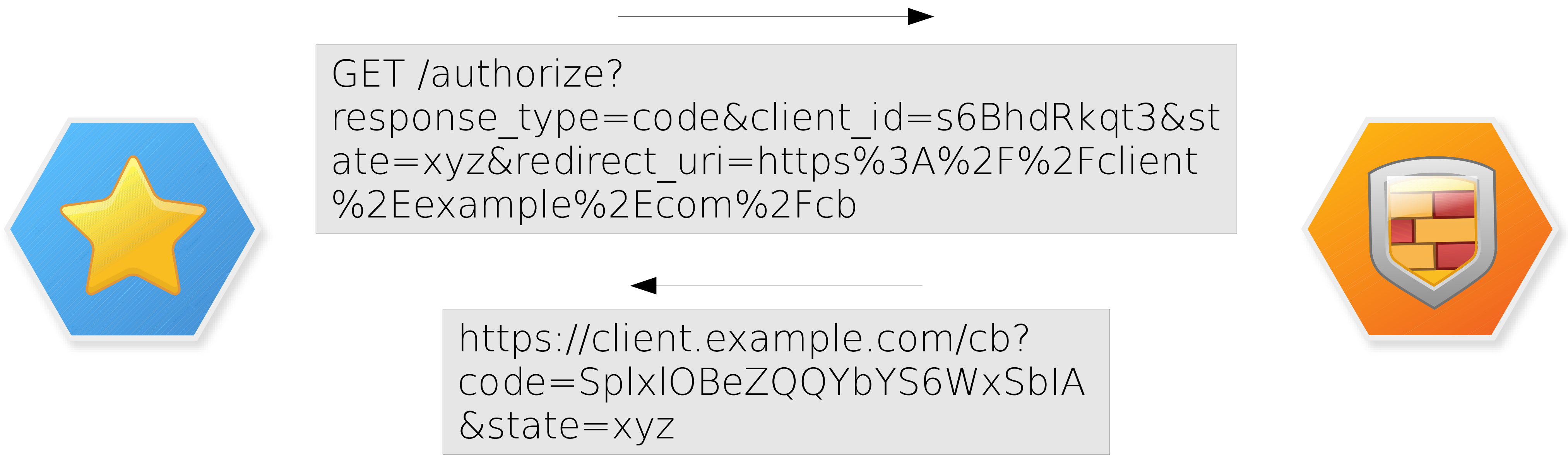
- **Public**: Clients **incapable** of maintaining the confidentiality of their credentials :
  - Native mobile application
  - Web browser based application

Endpoints

- Authorization Server:
  - Authorization: where the resource owner gives authorization
  - Token: where the client get tokens

- Client:
  - Redirection: where the resource owner is redirected after authorization

Authorization



```
GET /authorize?
response_type=code&client_id=s6BhdRkqt3&st
ate=xyz&redirect_uri=https%3A%2F%2Fclient
%2Eexample%2Ecom%2Fcb
```

```
https://client.example.com/cb?
code=SplxlOBeZQQYbYS6WxSbIA
&state=xyz
```

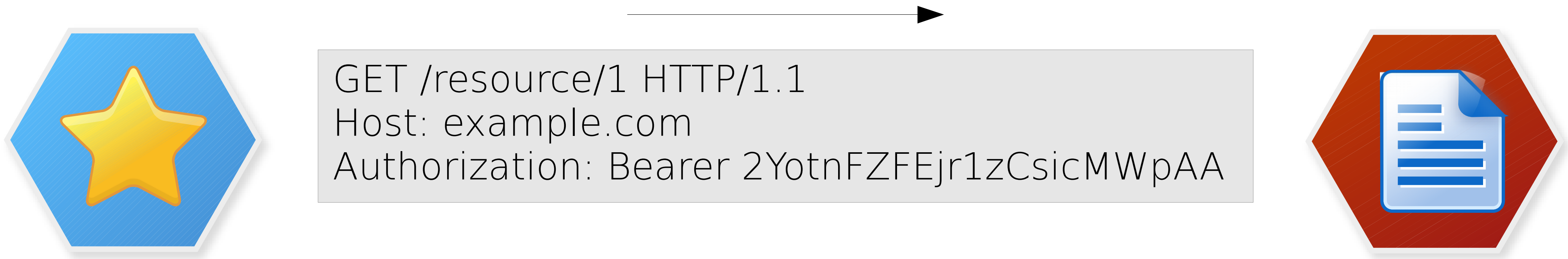
Token

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

grant_type=authorization_code&code=SplxlOBe
ZQQYbYS6WxSbIA&redirect_uri=https%3A%2F
%2Fclient%2Eexample%2Ecom%2Fcb
```

Token

```
HTTP/1.1 200 OK
Content-Type: application/json;charset=UTF-8
Cache-Control: no-store
Pragma: no-cache

{
"access_token":"2YotnFZFEjr1zCsicMWpAA",
"token_type":"example",
"expires_in":3600,
"refresh_token":"tGzv3JOkF0XG5Qx2TlKWIA",
"example_parameter":"example_value"
}
```

Resource



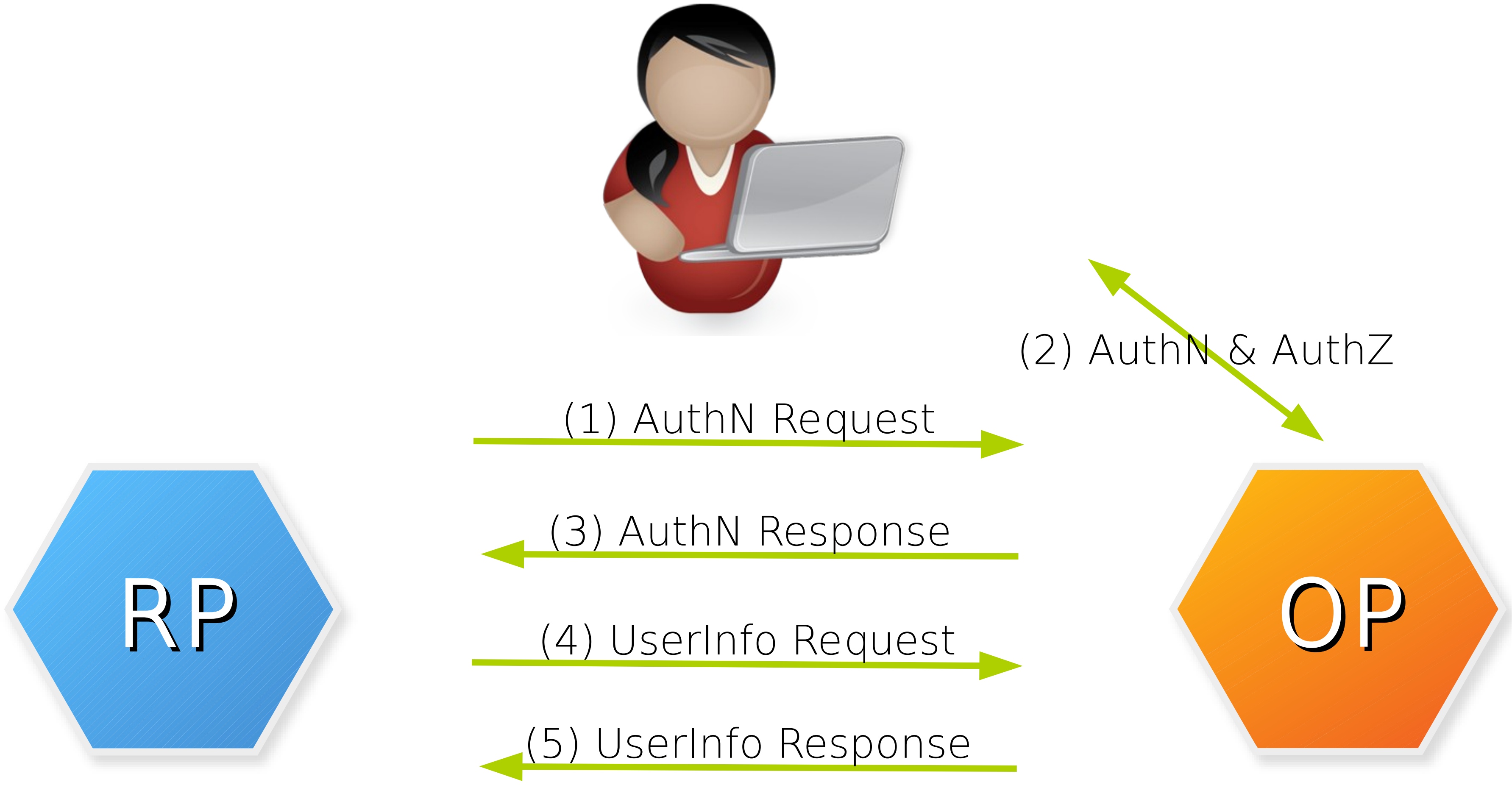
```
GET /resource/1 HTTP/1.1
Host: example.com
Authorization: Bearer 2YotnFZFEjr1zCsicMWpAA
```

OpenID Connect

OpenID 1.0

OpenID 2.0

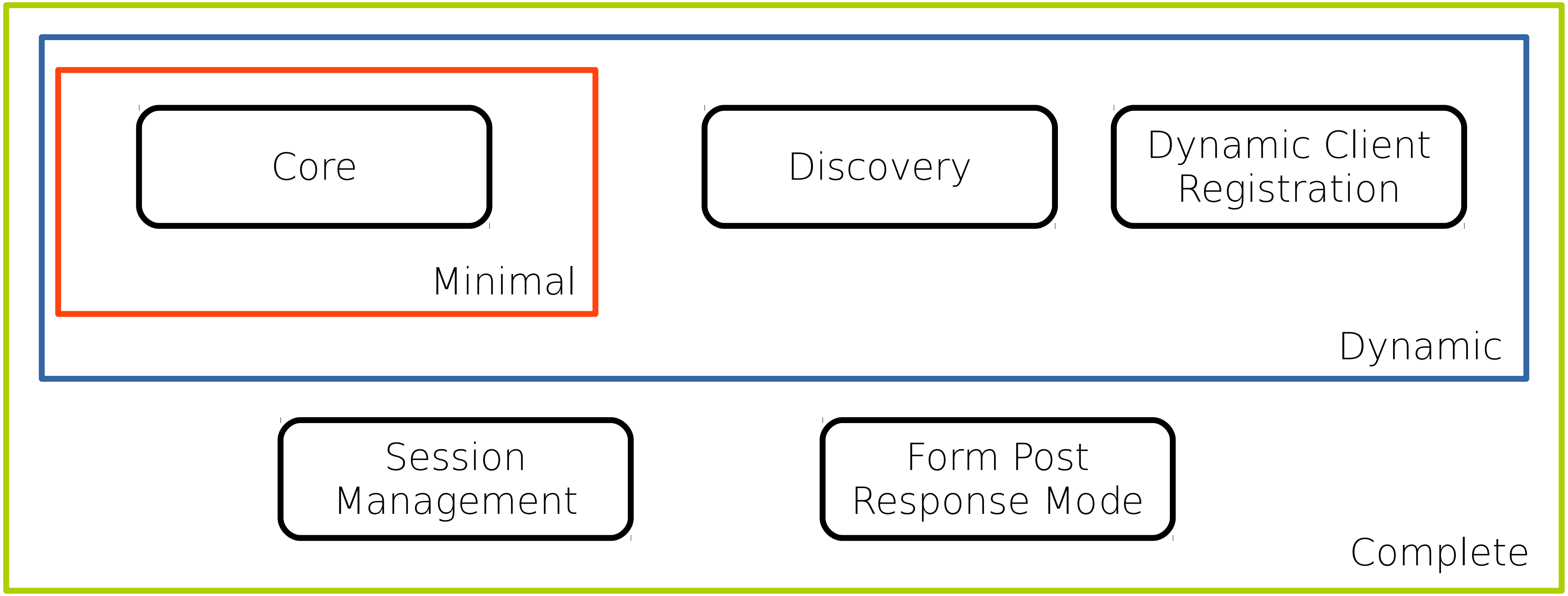
OpenID Connect


(2) AuthN & AuthZ
(1) AuthN Request
(3) AuthN Response
(4) UserInfo Request
(5) UserInfo Response
RP
OP

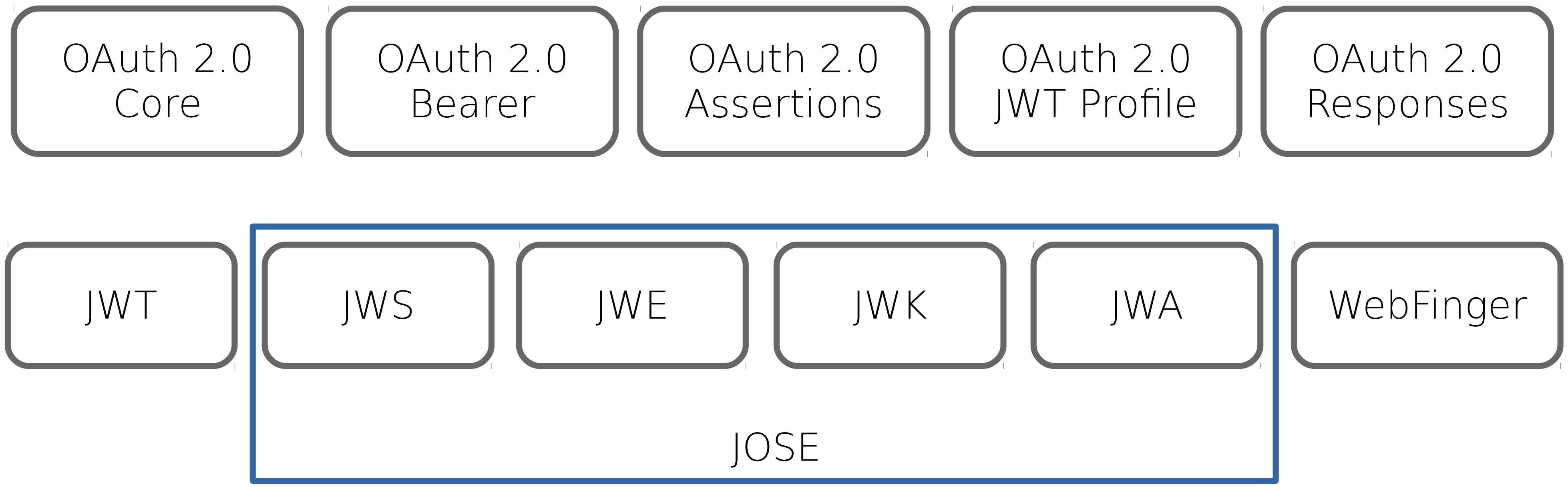
Built on top of OAuth 2.0

- Flows:
  - Based on OAuth 2.0 Authorization grants:
    - Authorization Code
    - Implicit
  - New flow: Hybrid
- Scope:
  - New scope: “openid”
- Endpoints:
  - Use Authorize, Token and Redirection endpoints
  - New endpoint: UserInfo
- Tokens:
  - Use access and refresh tokens
  - New token: ID token (JWT)

OpenID Connect Protocol Suite



Underpinnings



JOSE

Javascript

Object

Signing

and

Encryption

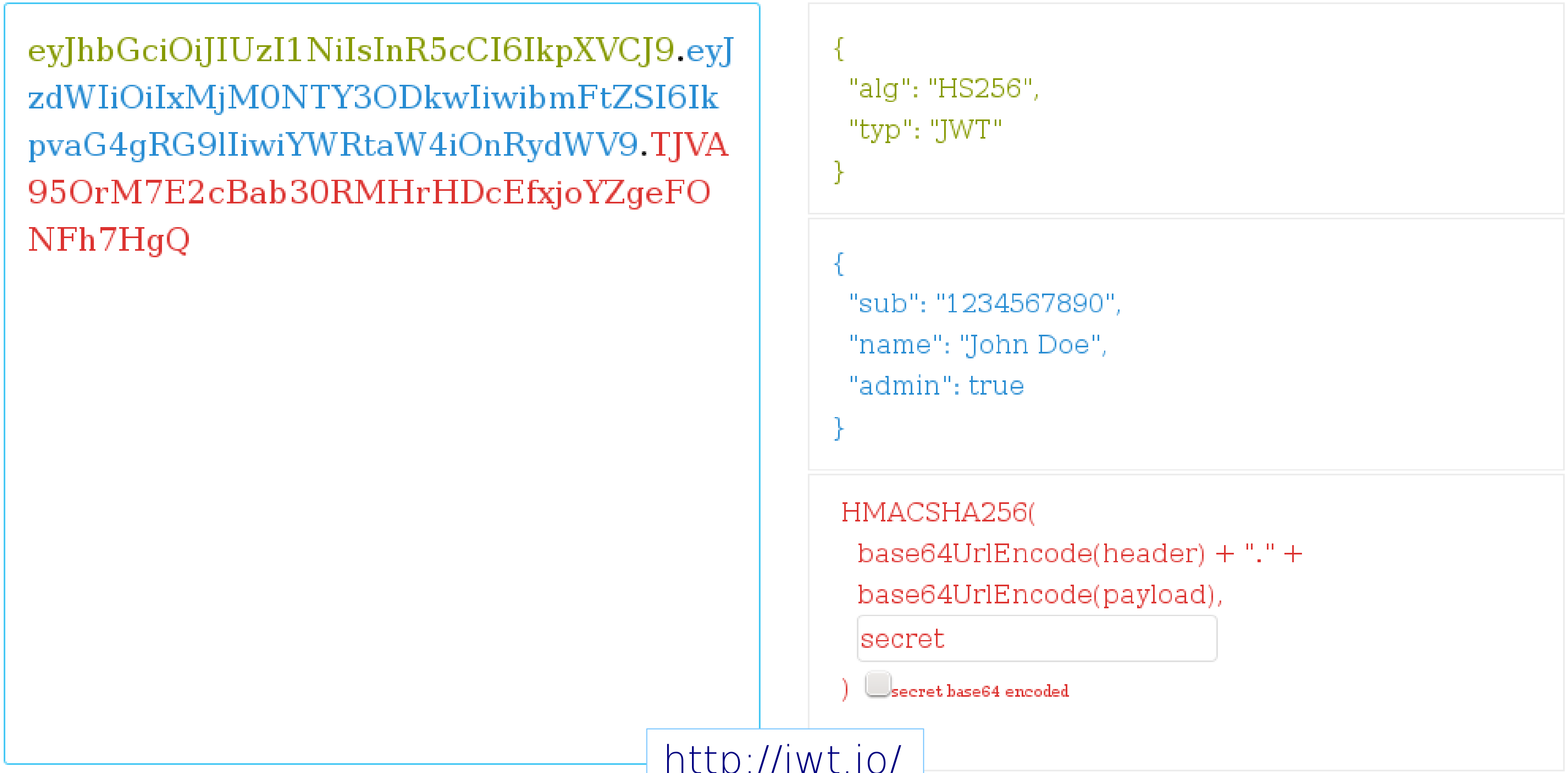
JWT

JSON

Web

Token

- Concatenation with dots of:
  - base64(Header)
  - base64(Payload)
  - base64(Signature)



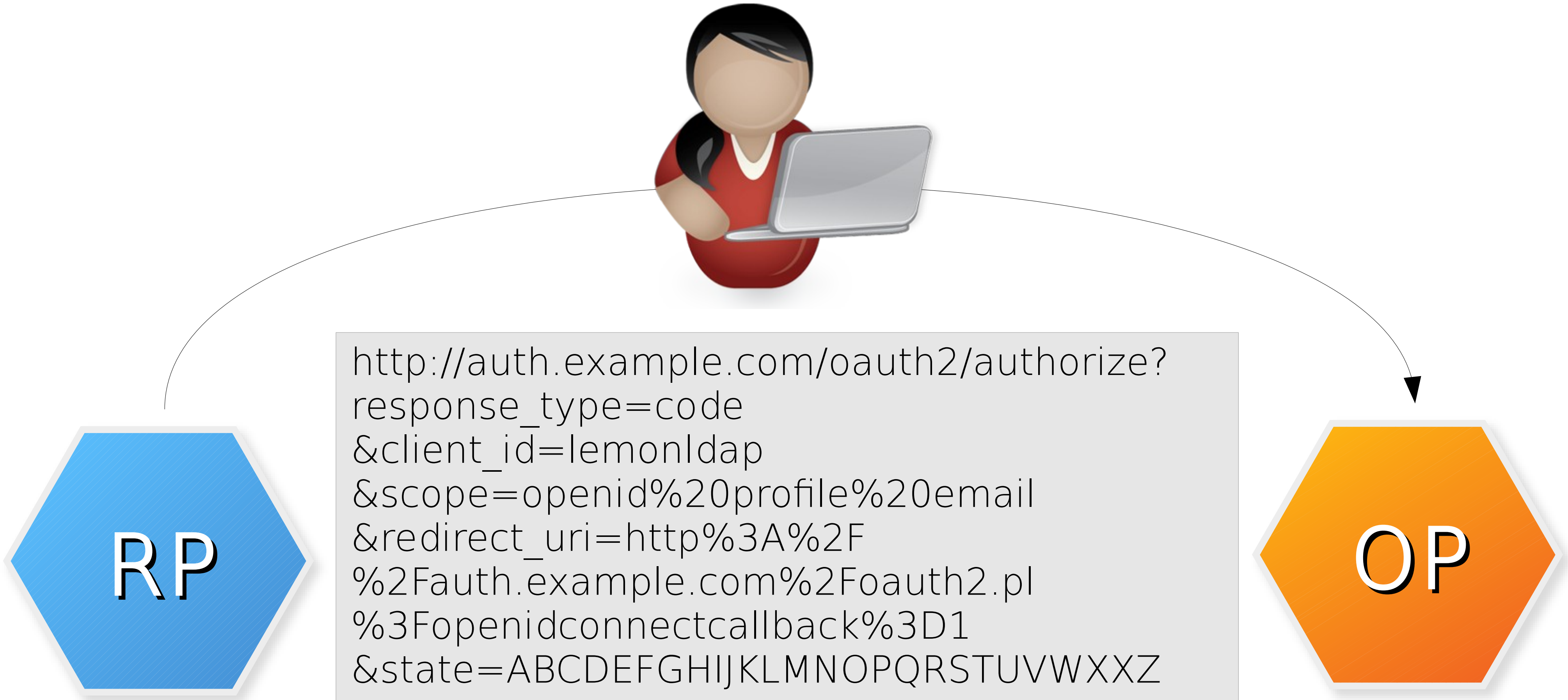
eyJhbGciOiJIUzI1NiIsInR5cCI6IkpXVCJ9.eyJzdWIiOiIxMjM0NTY3ODkwIiwibmFtZSI6IkpvaG4gRG9lIiwiYWRtaW4iOnRydWV9.TJVA95OrM7E2cBab30RMHrHDcEfxjoYZgeFONFh7HgQ

```
{
  "alg": "HS256",
  "typ": "JWT"
}
```

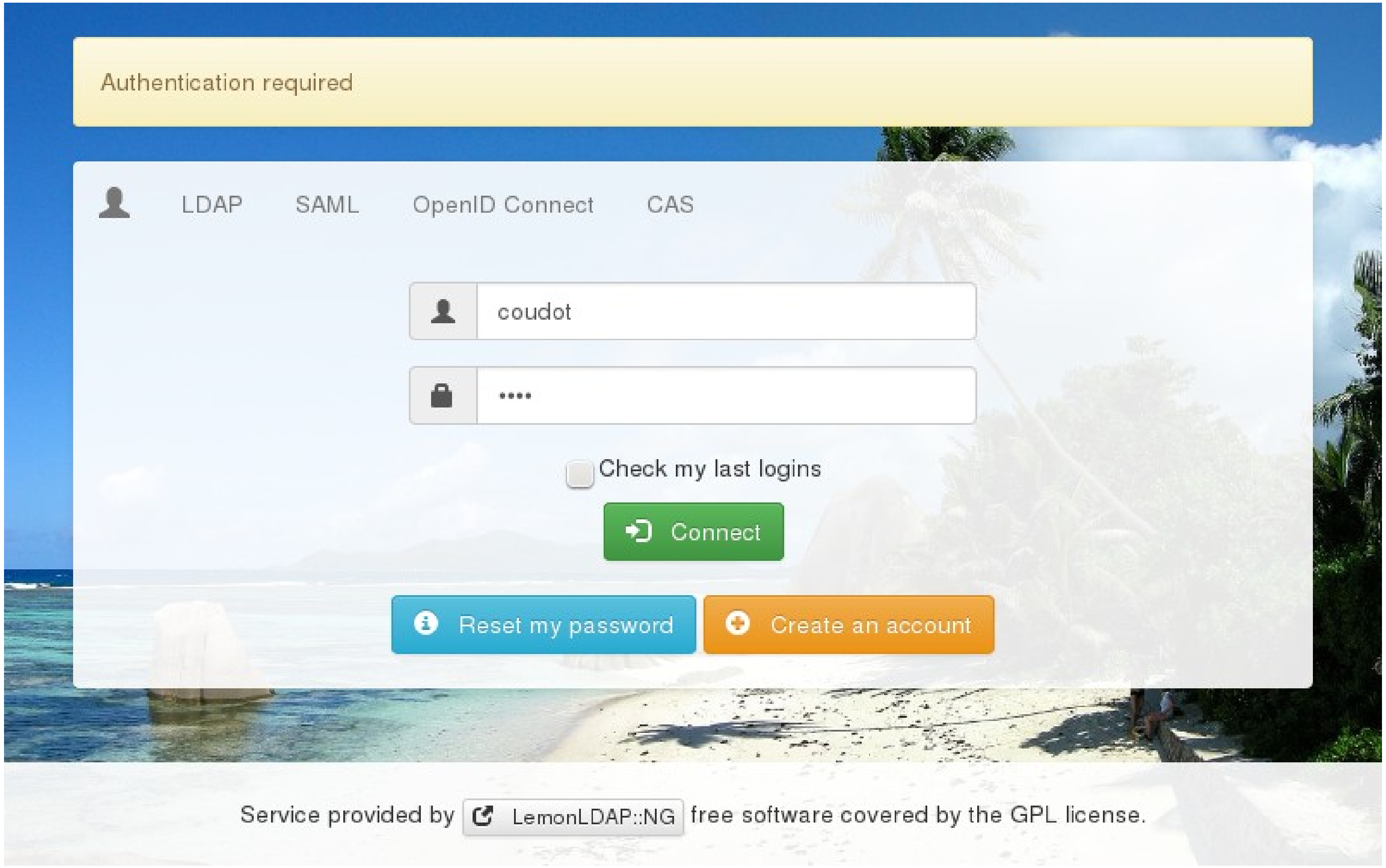
```
{
  "sub": "1234567890",
  "name": "John Doe",
  "admin": true
}
```

```
HMACSHA256(
  base64UrlEncode(header) + "." +
  base64UrlEncode(payload),
  secret
) ☐ secret base64 encoded
```

http://jwt.io/



```
http://auth.example.com/oauth2/authorize?
response_type=code
&client_id=lemonldap
&scope=openid%20profile%20email
&redirect_uri=http%3A%2F
%2Fauth.example.com%2Foauth2.pl
%3Fopenidconnectcallback%3D1
&state=ABCDEFGHIJKLMNOPQRSTUVWXXZ
```


Authentication required

LDAP SAML OpenID Connect CAS

coudot

••••

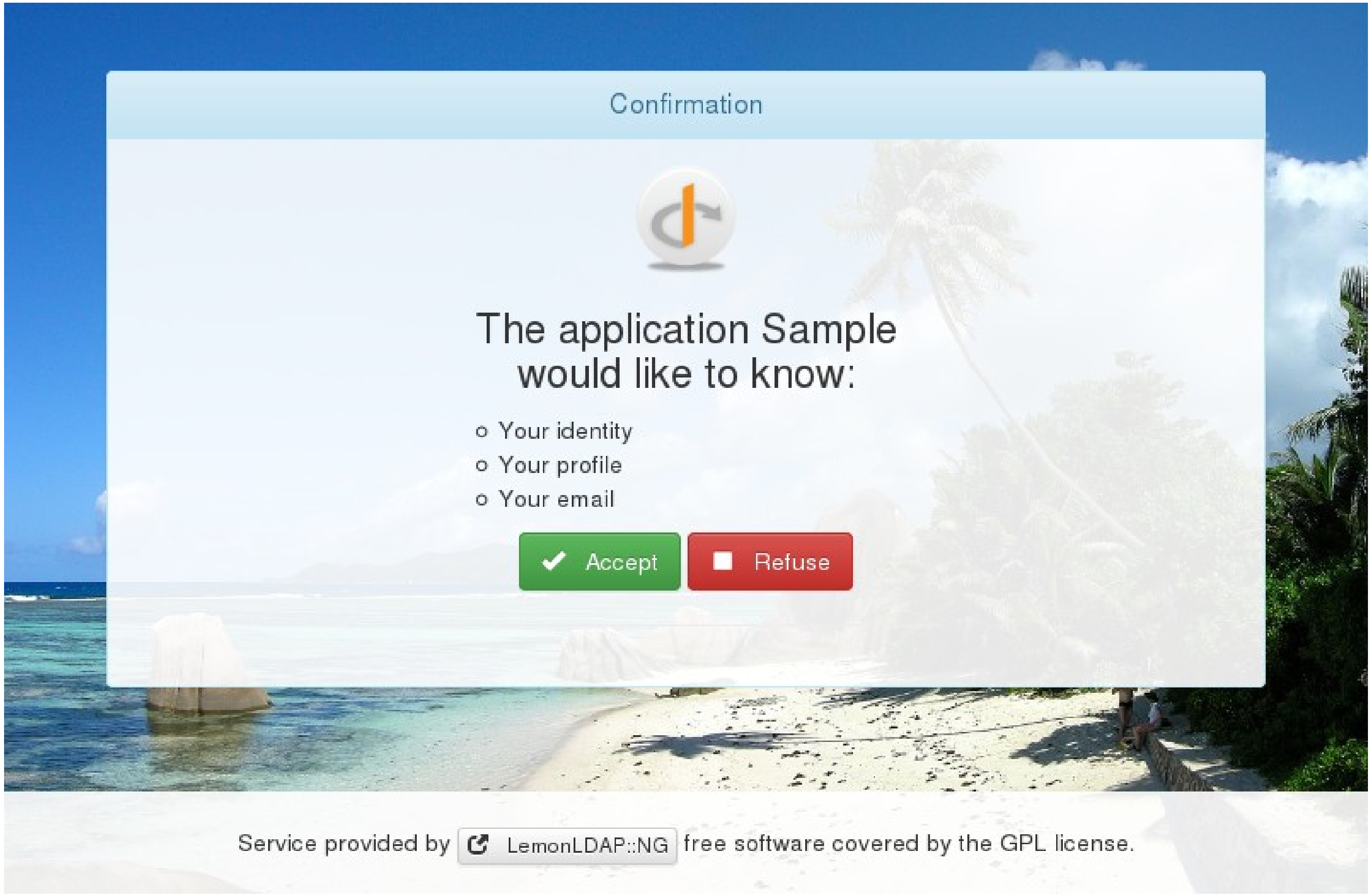
Check my last logins

Connect

Reset my password

Create an account

Service provided by LemonLDAP::NG free software covered by the GPL license.

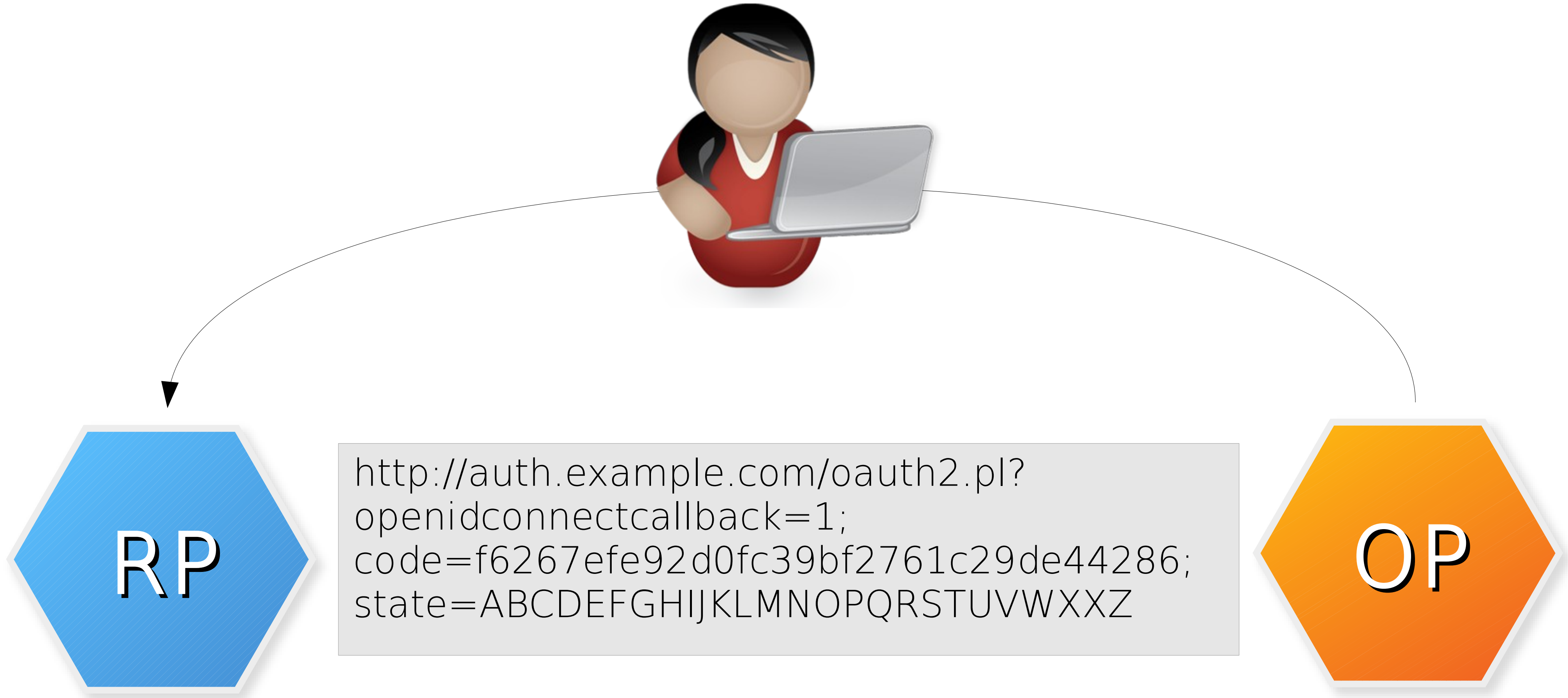


Confirmation

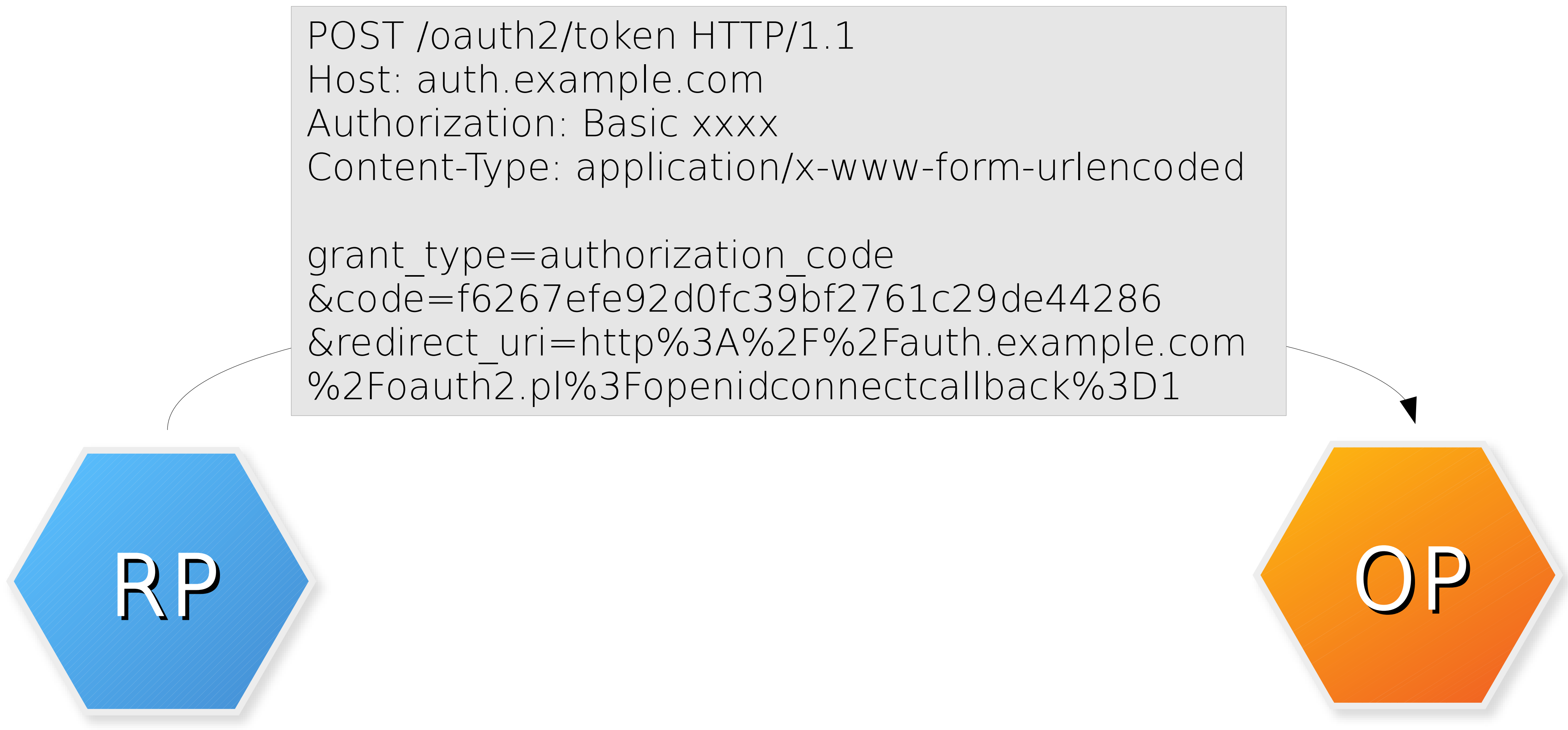
The application Sample would like to know:

- Your identity
- Your profile
- Your email

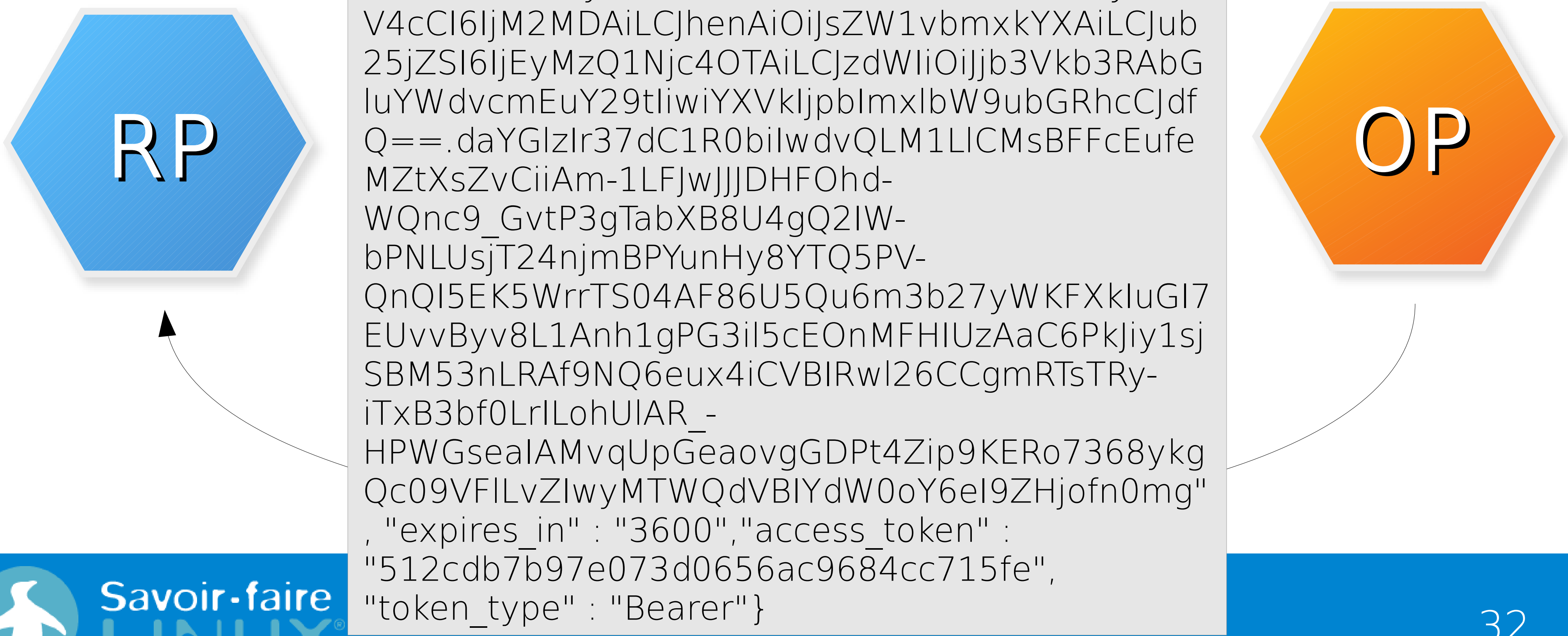
Service provided by LemonLDAP::NG free software covered by the GPL license.



```
http://auth.example.com/oauth2.pl?
openidconnectcallback=1;
code=f6267efe92d0fc39bf2761c29de44286;
state=ABCDEFGHIJKLMNOPQRSTUVWXXZ
```



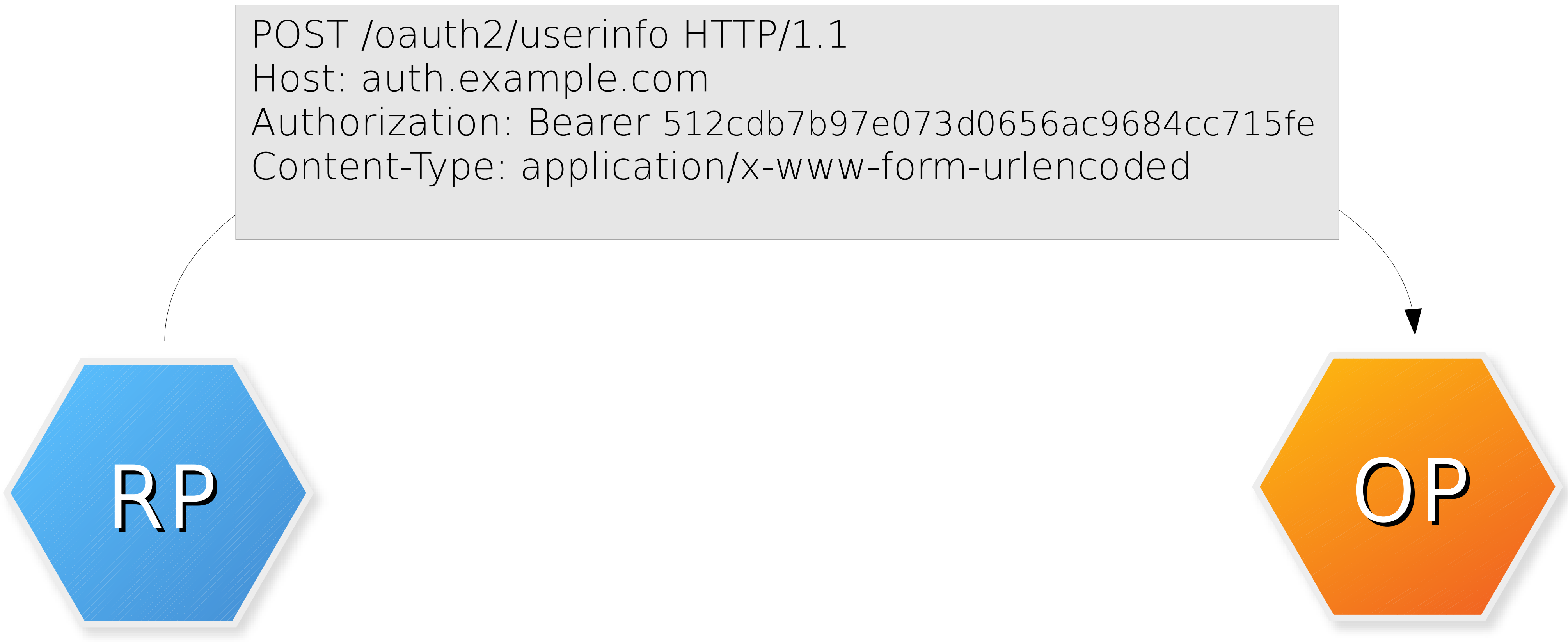
```
POST /oauth2/token HTTP/1.1
Host: auth.example.com
Authorization: Basic xxxx
Content-Type: application/x-www-form-urlencoded

grant_type=authorization_code
&code=f6267efe92d0fc39bf2761c29de44286
&redirect_uri=http%3A%2F%2Fauth.example.com
%2Foauth2.pl%3Fopenidconnectcallback%3D1
```



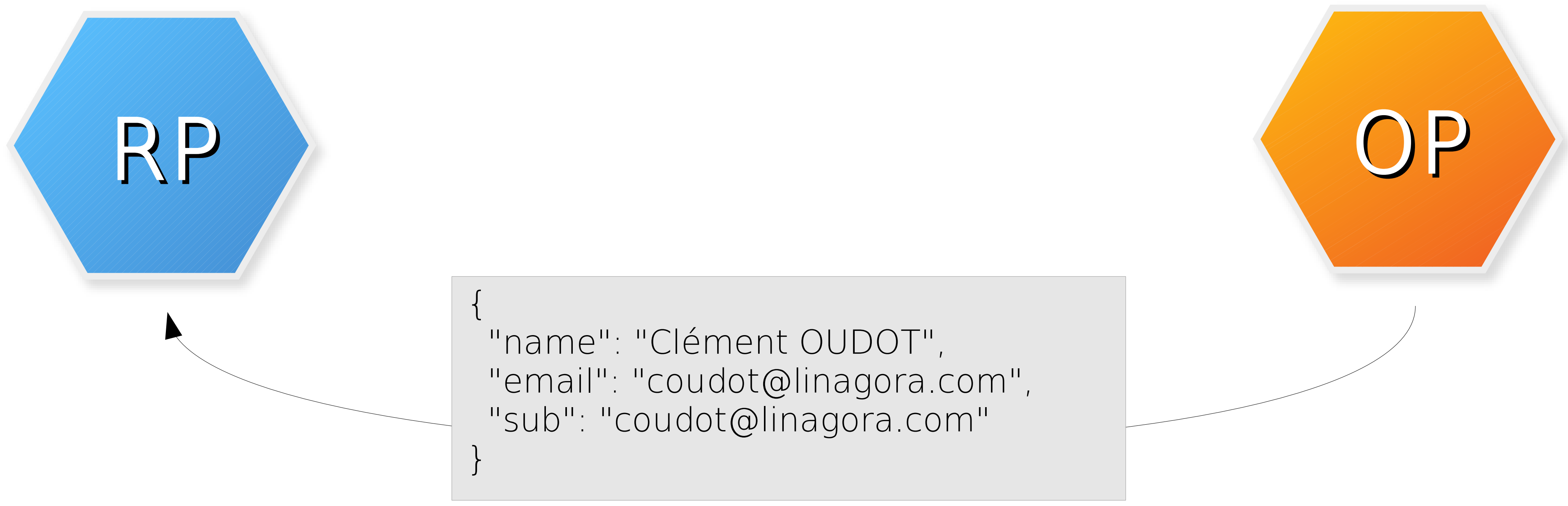
{"id_token" :"eyJhbGciOiJSUzI1NiIsInR5cCI6IkpXVCJ9.eyJhY3IiOiJsb2EtMiIsImF1dGhfdGltZSI6MTQzMjExMzU5MywiaWF0IjoxNDMyMTEzOTY2LCJhdF9oYXNoIjoiOWF4enNOaTlwTkRrNXpXZWZLc002QSIsImlzcyI6Imh0dHA6Ly9hdXRoLmV4YW1wbGUuY29tLyIsImV4cCI6IjM2MDAiLCJhenAiOiJsZW1vbmxkYXAiLCJub25jZSI6IjEyMzQ1Njc4OTAiLCJzdWIiOiJjb3Vkb3RAbGluYWdvcmEuY29tIiwiYXVkIjpbImxlbW9ubGRhcCJdfQ==.daYGlzIr37dC1R0bilwdvQLM1LlCMsBFFcEufeMZtXsZvCiiAm-1LFJwJJJDHFOhd-WQnc9_GvtP3gTabXB8U4gQ2IW-bPNLUsjT24njmBPYunHy8YTQ5PV-QnQI5EK5WrrTS04AF86U5Qu6m3b27yWKFXkIuGI7EUvvByv8L1Anh1gPG3il5cEOnMFHIUzAaC6PkJiy1sjSBM53nLRAf9NQ6eux4iCVBIRwl26CCgmRTsTRy-iTxB3bf0LrILohUlAR_-HPWGsealAMvqUpGeaovgGDPt4Zip9KERo7368ykgQc09VFlLvZIwyMTWQdVBIYdW0oY6eI9ZHjofn0mg", "expires_in" : "3600","access_token" : "512cdb7b97e073d0656ac9684cc715fe", "token_type" : "Bearer"}

ID Token payload

```
{
  "acr": "loa-2",
  "auth_time": 1432113593,
  "iat": 1432113966,
  "at_hash": "9axzsNi9pNDk5zWefKsM6A",
  "iss": "http://auth.example.com/",
  "exp": "3600",
  "azp": "lemonldap",
  "nonce": "1234567890",
  "sub": "coudot@linagora.com",
  "aud": [
    "lemonldap"
  ]
}
```

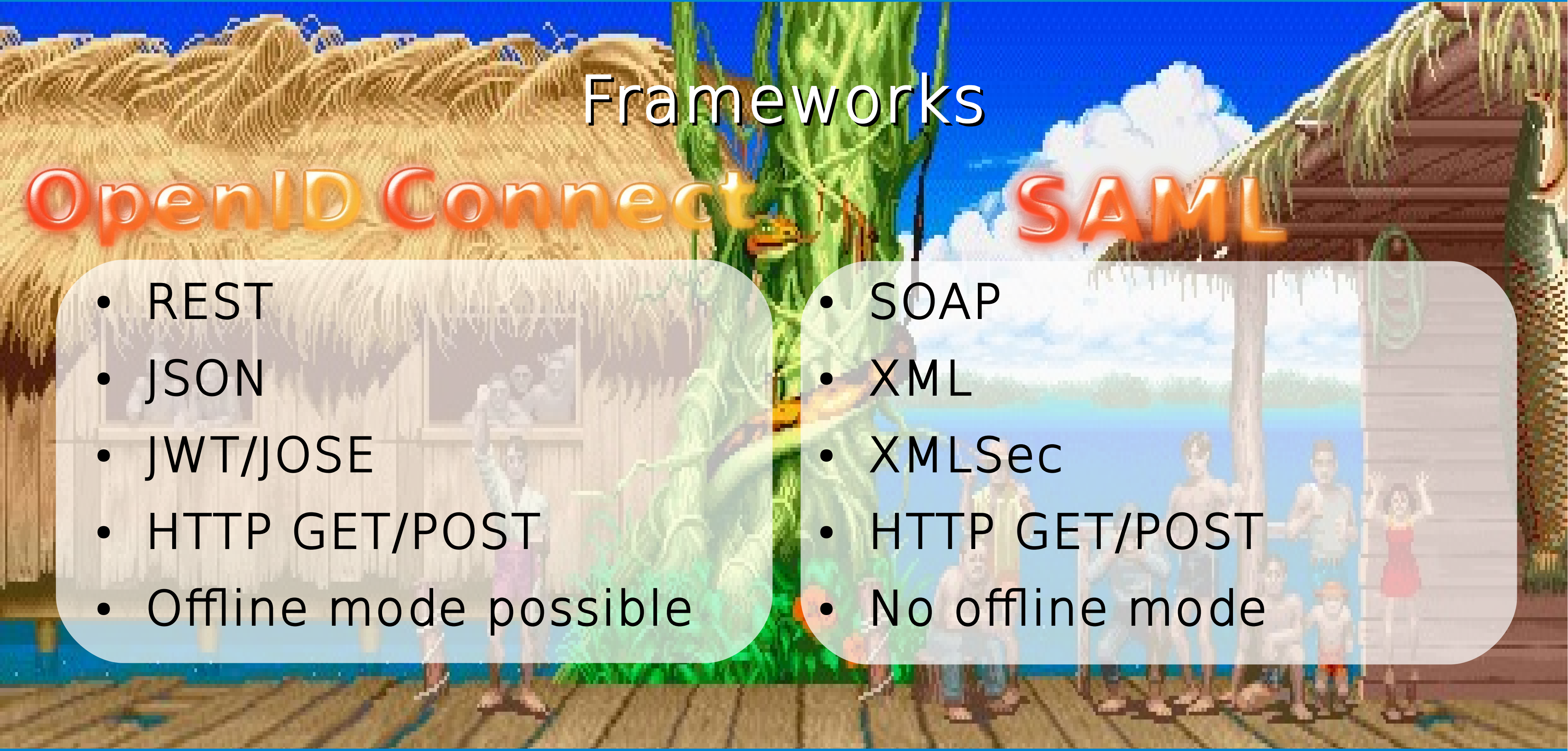


```
POST /oauth2/userinfo HTTP/1.1
Host: auth.example.com
Authorization: Bearer 512cdb7b97e073d0656ac9684cc715fe
Content-Type: application/x-www-form-urlencoded
```



```
{
  "name": "Clément OUDOT",
  "email": "coudot@linagora.com",
  "sub": "coudot@linagora.com"
}
```

KO
KEN
97
RYU
OpenID Connect
VS
SAML



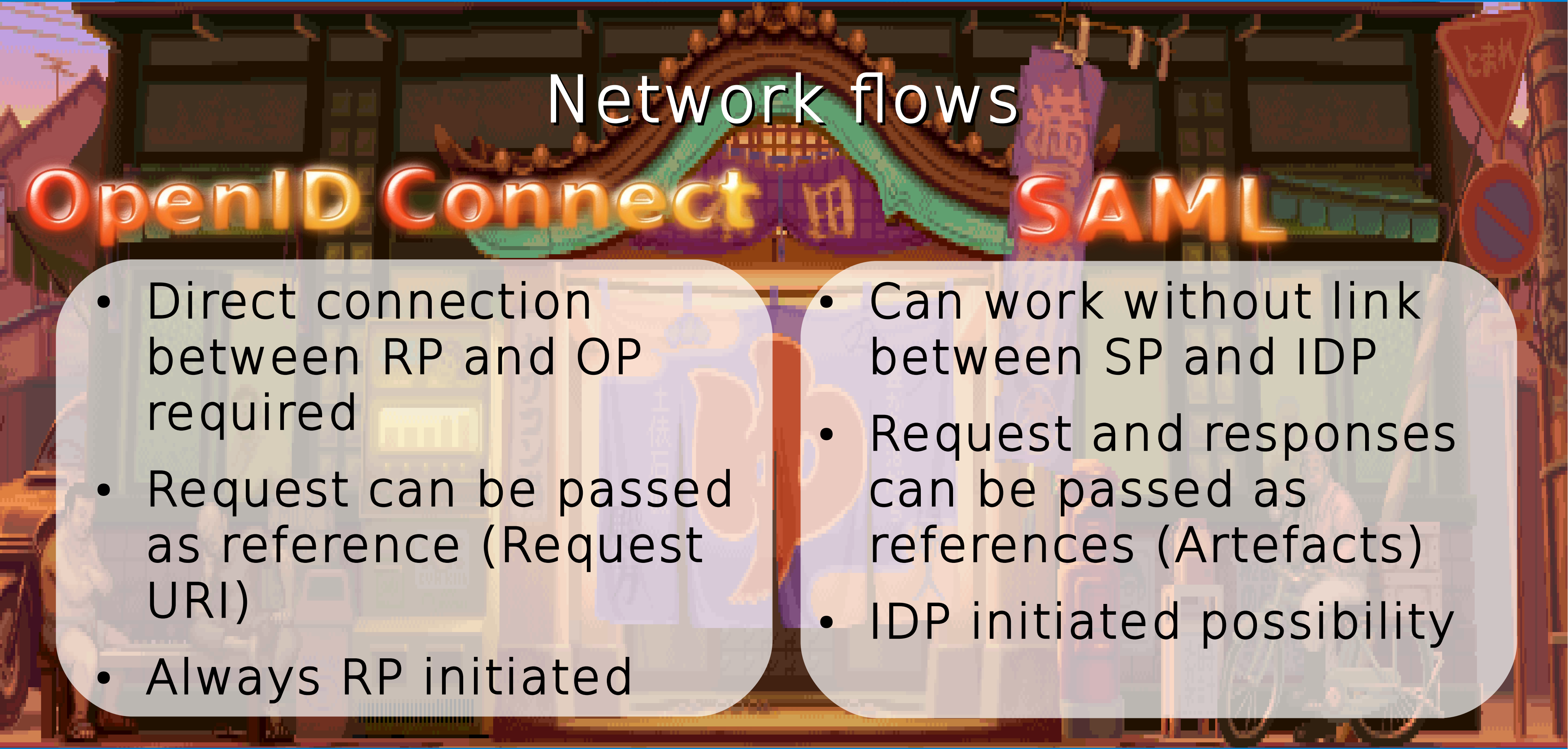
Frameworks

OpenID Connect

- REST
- JSON
- JWT/JOSE
- HTTP GET/POST
- Offline mode possible

SAML

- SOAP
- XML
- XMLSec
- HTTP GET/POST
- No offline mode



Network flows

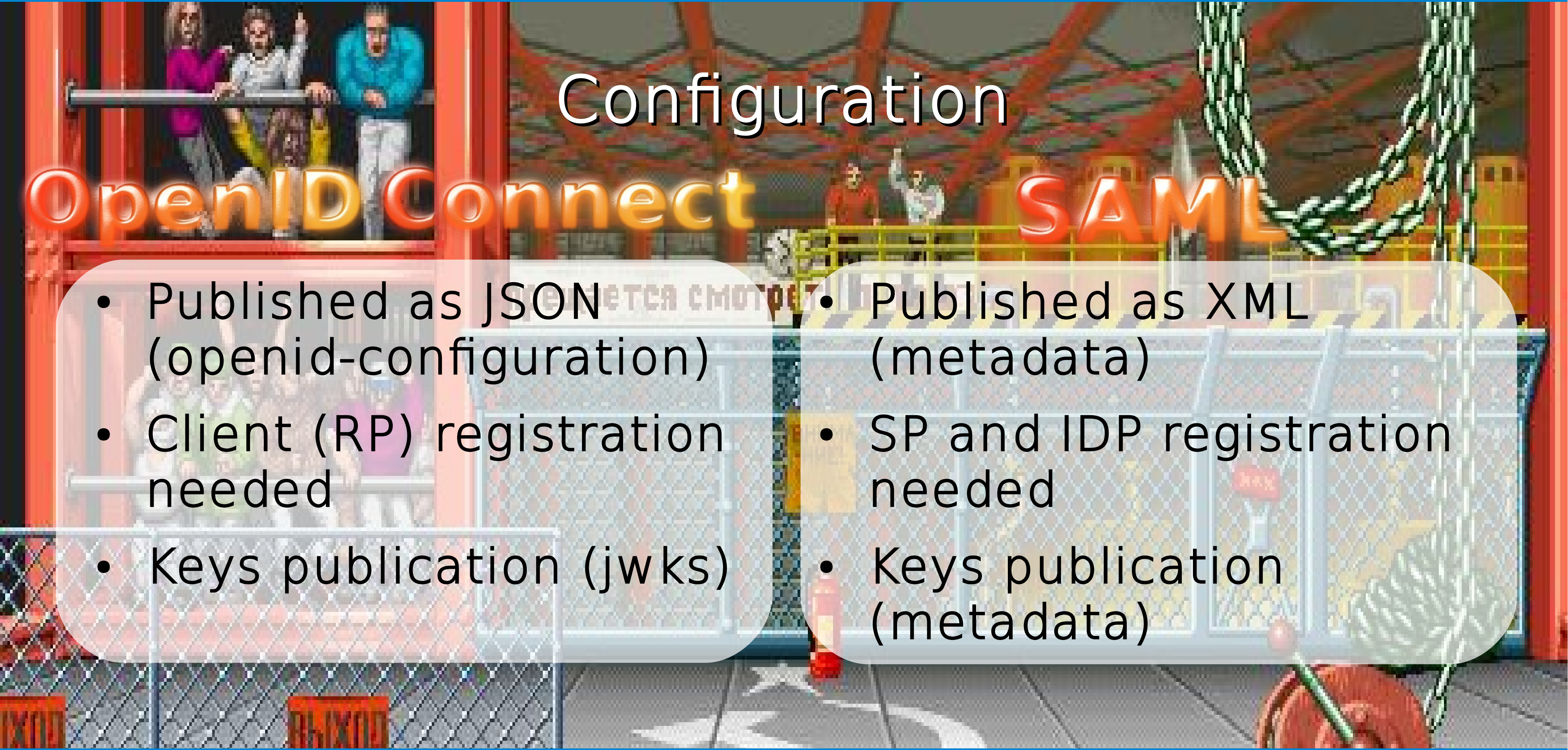
OpenID Connect

- Direct connection between RP and OP required
- Request can be passed as reference (Request URI)
- Always RP initiated

SAML

- Can work without link between SP and IDP
- Request and responses can be passed as references (Artefacts)
- IDP initiated possibility

Configuration



- Published as JSON (openid-configuration)
- Client (RP) registration needed
- Keys publication (jwks)

- Published as XML (metadata)
- SP and IDP registration needed
- Keys publication (metadata)

Security

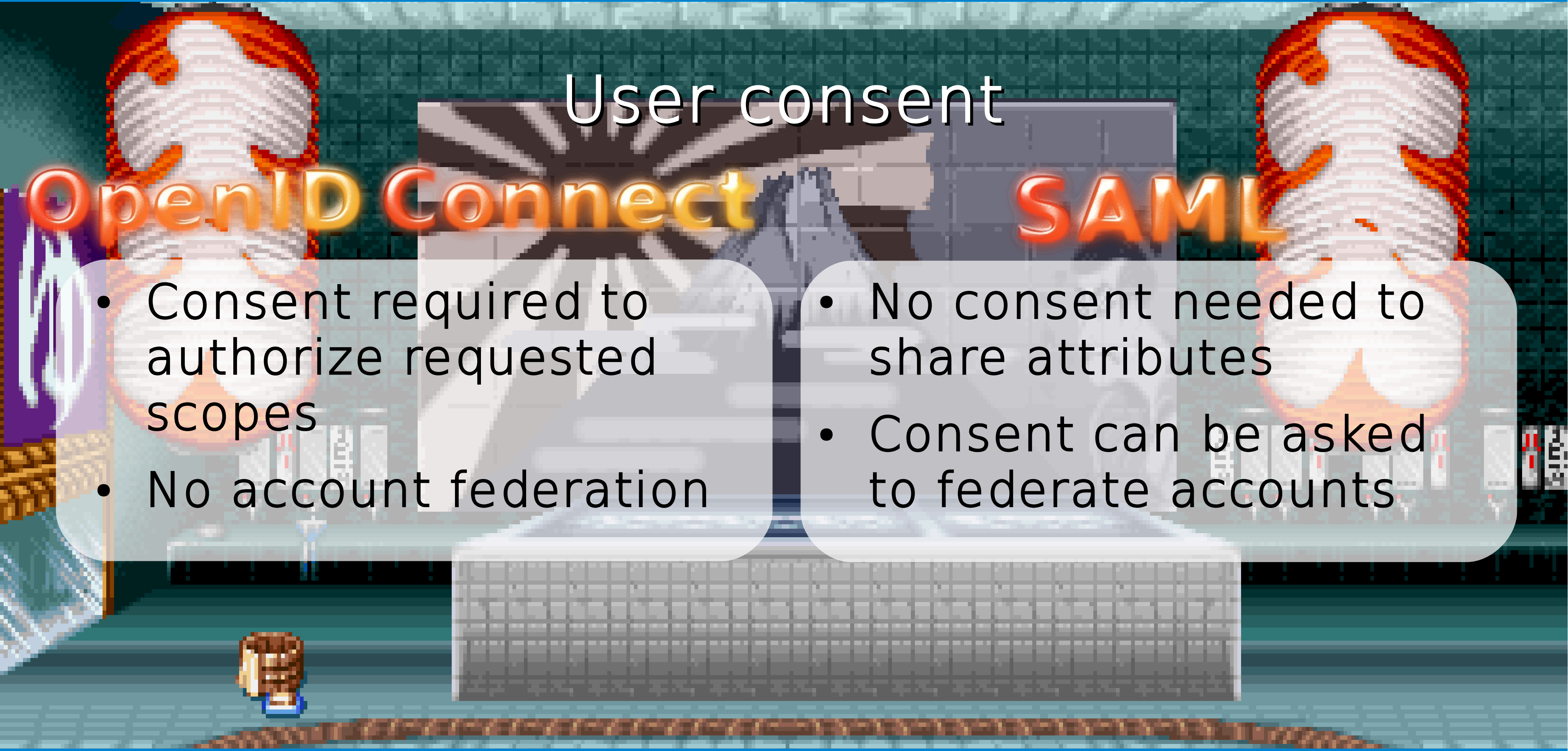
OpenID Connect

- HTTPS
- Signature and encryption of JWT

SAML

- HTTPS
- Signature and encryption of all messages

User consent

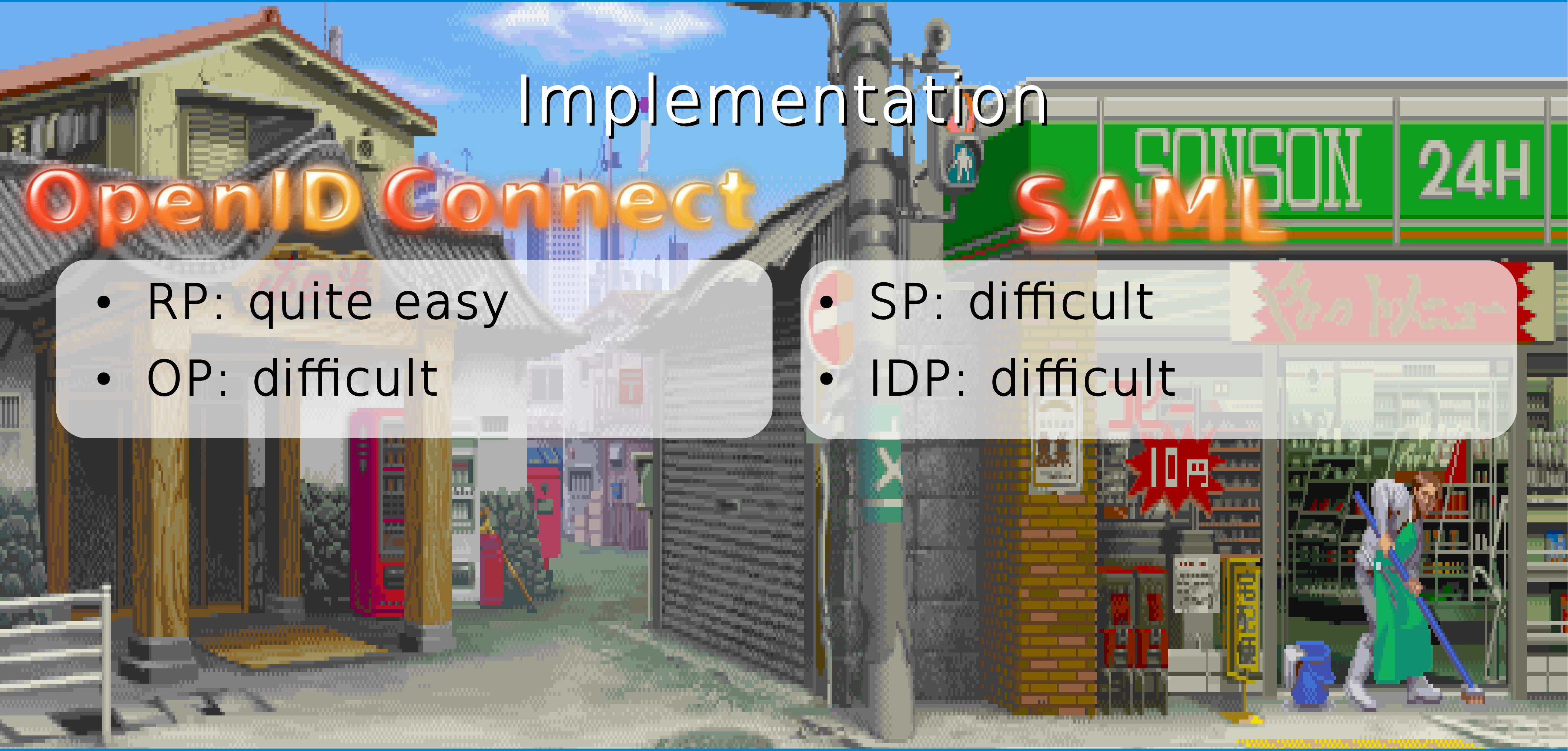


OpenID Connect

- Consent required to authorize requested scopes
- No account federation

SAML

- No consent needed to share attributes
- Consent can be asked to federate accounts



Implementation

OpenID Connect

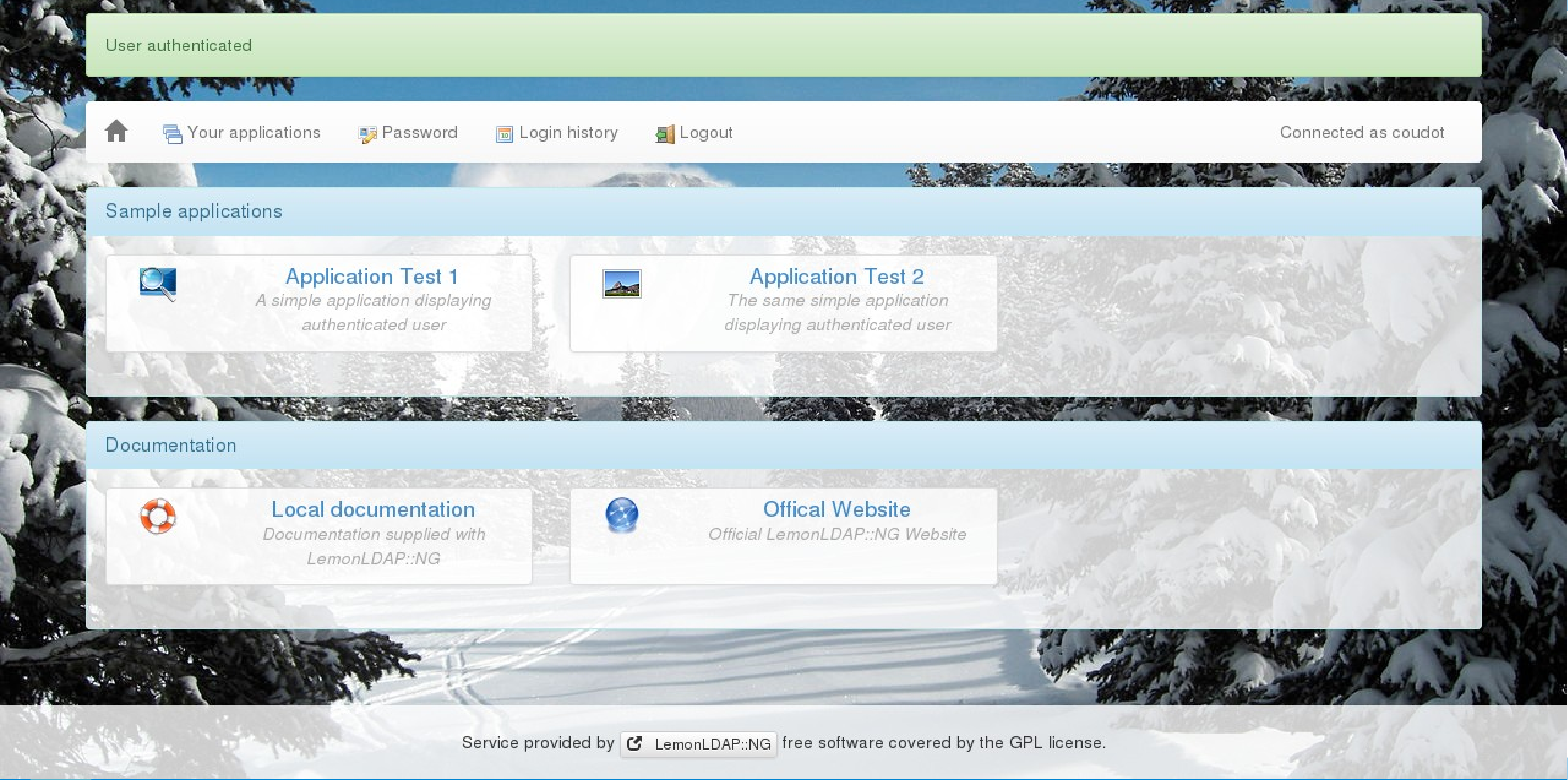
- RP: quite easy
- OP: difficult

SAML

- SP: difficult
- IDP: difficult

LemonLDAP::NG

- Free Software (GPLv2+) / OW2 consortium
- Single Sign On, Access Control
- Service Provider / Identity Provider
- Perl/Apache/CGI/FCGI
- Lost Password and Account Register self services
- http://www.lemonldap-ng.org


User authenticated

Connected as coudot

Sample applications

Application Test 1
A simple application displaying authenticated user

Application Test 2
The same simple application displaying authenticated user

Documentation

Local documentation
Documentation supplied with LemonLDAP::NG

Offical Website
Official LemonLDAP::NG Website

Service provided by LemonLDAP::NG free software covered by the GPL license.

OpenID Connect RP

- Authorization Code Flow
- OP selection screen
- JSON configuration and JWKS parsing
- Full configuration of authentication requests (scope, display, prompt, acr_values, etc.)
- Attributes mapping

OpenID Connect OP

- Authorization Code / Implicit / Hybrid Flows
- Signature: HS256, HS384, HS512, RS256, RS384, RS512
- Token endpoint authentication
- JSON configuration and JWKS publication
- Configuration of Authentication Contexts
- Attributes mapping

Seems all clear

Any question?