Full-stack OpenID solution

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What we'll build

- Keycloak in a multi-tenant setup
- 2 front-ends :
  - back-office with Vue.js: manage restaurants
  - Android mobile app with Flutter
- REST API
  - users: access user roles and relations to restaurants
  - realms, restaurants, menus and orders
- "Keycloak mapper" to add data from your APIs to tokens
- Keycloak admin API to create realms, roles, clients and users programmatically

UAA & Token

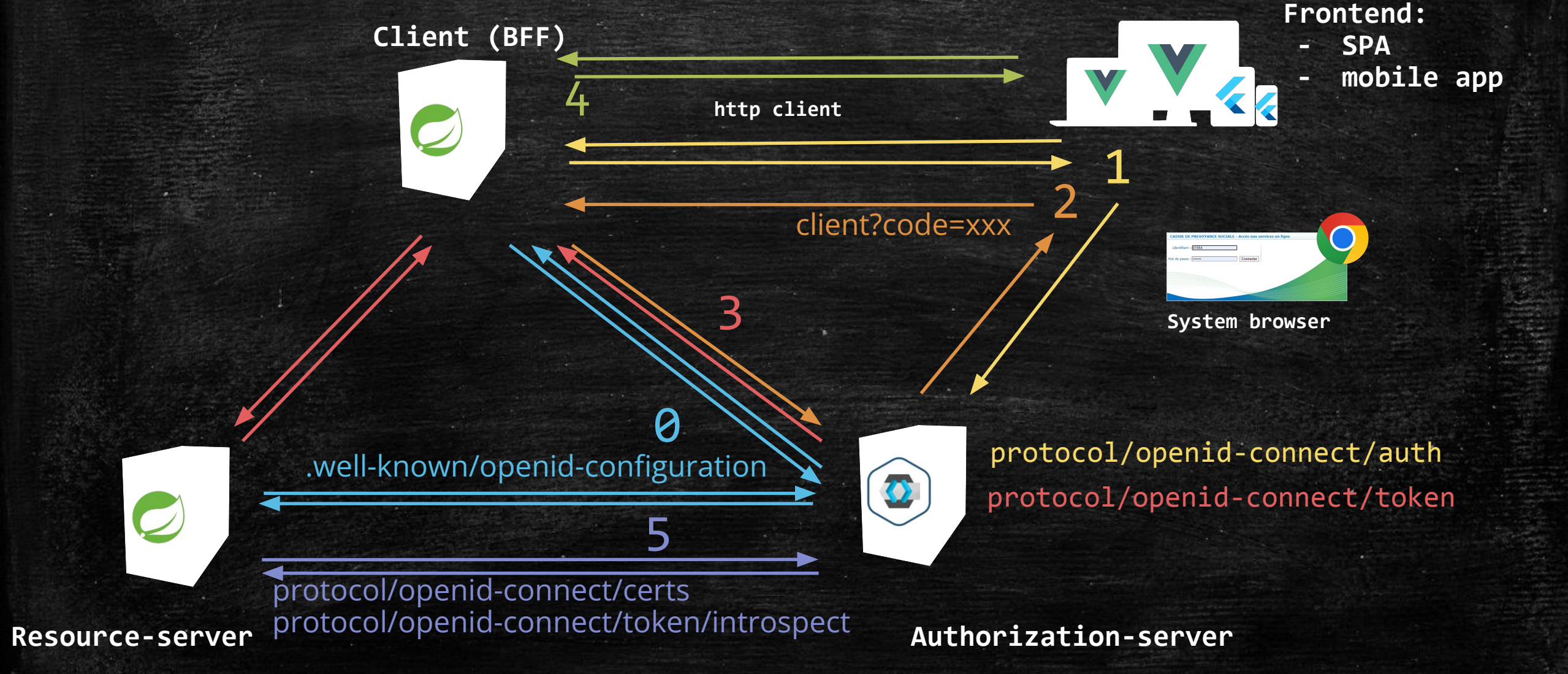
- « Authentication » : who (identity)
- « Authorization » : what can be done
- Token : grants from a "resource owner" to a "client"
  - authorization server identity (issuer)
  - resource-owner identity (subject)
  - client ID
  - Scope: filter to apply on resource owner grants
  - expires
  - …

OAuth2 OpenID	Keycloak	Spring-security
subject	subject	principal
Private claims	roles (realm & client)	GrantedAuthority
scope	scope	N/A

OAuth2 actors

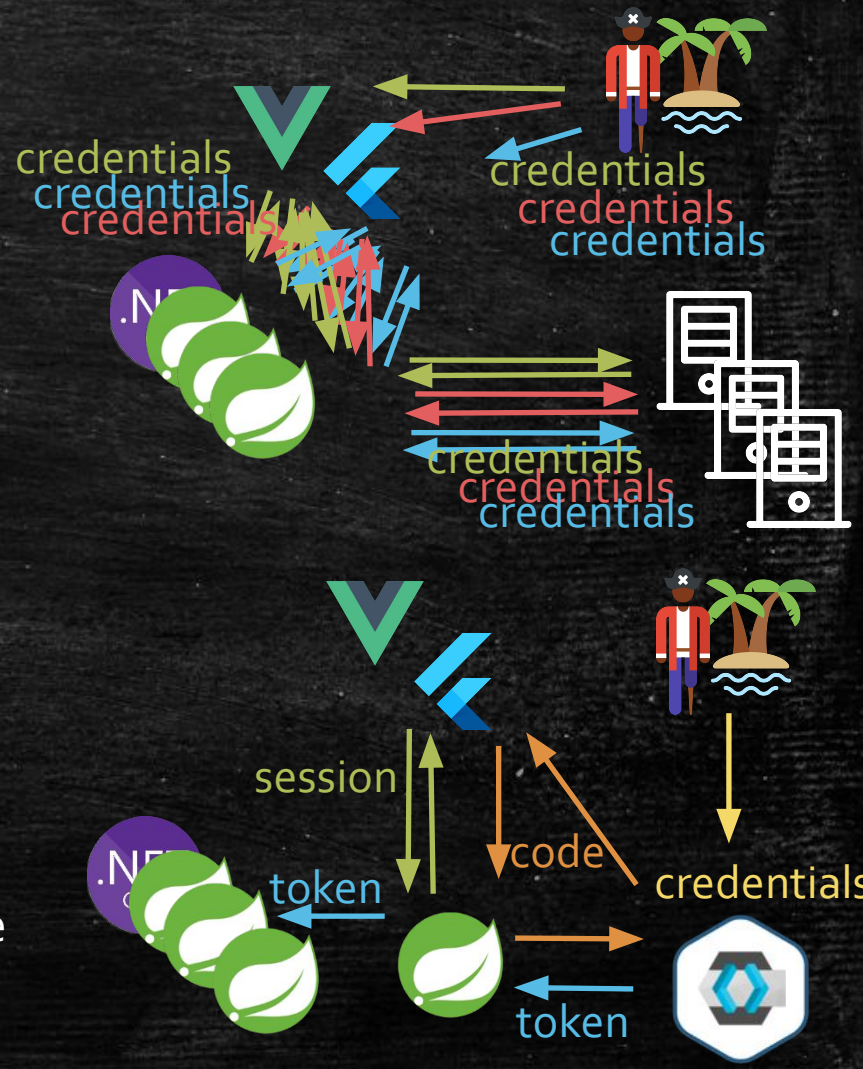
- « Authorization server »:
  - provides with identities
  - also known as OpenID Provider (or OP)
- « Resource server »
  - provides with **data** (REST API)
  - expects requests to be authorized with access tokens (which it validates)
  - stateless
- « Clients »:
  - provides with **services** (consumes data)
  - expects requests to be authorized with sessions
  - responsible for tokens acquisition and storage

« Authorization code » flow



Why using OpenID at all?

- Simplicity
  - Everything related to authentication is centralized
- UX
  - Makes it possible to share user accounts across applications
  - SSO (makes it possible to share even user sessions across apps)
- Safety
  - User credentials are manipulated by a single actor (maintained by security experts)
- Cost
  - Authentication and user accounts are developed and hosted only once
  - Many existing solutions (with UI, MFA, connectors to many identity sources, …)
- Scalability
  - stateless resource servers are fault tolerant and easy to load-balance



Configuration

Client	Resource Server	Authorization server
• Get tokens (initiates OAuth2 “flows”: authorization_code (login), client_credentials, refresh_token) • Store token	• Validates tokens (JWT decoder or introspection) • Implements access control	• Issues tokens • Exposes JWK-set or introspection endpoint
• Stateful for authorization code safety and tokens storage • Needs protection against CSRF	• Can be stateless • Insensible to CSRF	• Stateful (user authentication status) • Needs protection against CSRF • Needs CORS configuration
Responds with 302 (redirect to login) to unauthorized request (missing or invalid session)	Responds with 401 (unauthorized) to unauthorized requests	Depends on the provider

Backend For Frontend Pattern

- Why:
  - Single page and mobile apps can't keep a secret => "public" OAuth2 clients
  - Frameworks and end-user devices are more exposed to attacks (JS, storage)
  - Cookies can be flagged with "secure", "**http-only**" and "same-site"
- Solution:
  - "confidential" client OAuth2 on server
  - sessions with CSRF protection for exchanges between terminals and servers
  - client stores tokens in session and replaces the cookie with an access token before forwarding a request from a frontend to a REST API

Spring-cloud-gateway as BFF

- spring-cloud-gateway is a reactive application (webflux)
- SecurityWebFilterChain for an OAuth2 client with oauth2Login (authorization_code flow)
- filters:
  - TokenRelay
  - DedupeHeaders
  - StripPrefix
- predicates
- SecurityWebFilterChain for an OAuth2 resource server (resources not needing a session)

REST API as resource server

- accept tokens issued by the master realm
- implement role based access control
- unit-test access control
- enhanced Authentication with domain specific data
- advanced access control rules
- dynamic multi-tenancy (accept tokens from any realm)

Keycloak “mapper”

- Use Spring’s new RestClient
- Query the restaurants API to enrich tokens
  - who manages which restaurant
  - who is works in which restaurant

Vue.js Frontend

- Check the user status on the backend (Who am I? Until when is my identification valid? What am I granted with? …)
- Redirect the user to the BFF login entry-point
- POST to the BFF logout endpoint and redirect the user to the authorization-server endpoint

Flutter mobile frontend

- Add session and CSRF support to the http package
- Check the user status on the backend (Who am I? Until when is my identification valid? What am I granted with? …)
- Redirect the user to the BFF login entry-point (ensure a session is opened) and follow to the authorization server authorization-code endpoint using system browser
- Intercept the callback with a deep link (“app” or “universal” link)
- Forward the authorization-code to the BFF
- POST to the BFF logout endpoint and then to the authorization-server endpoint

Work with Keycloak “admin” API

- Add configuration for client_credentials to a service
- Declaring and using @FeignClient with OAuth2

Ressources

- https://docs.spring.io/spring-security/reference/servlet/oauth2/index.html (servlets)
- https://docs.spring.io/spring-security/reference/reactive/oauth2/index.html (reactive applications like spring-cloud-gateway)
- https://github.com/ch4mpy/egastro
- https://github.com/ch4mpy/spring-addons
- https://dzone.com/articles/spring-oauth2-resource-servers
- https://quiz.c4-soft.com/ui/quizzes
- ch4mp@c4-soft.com