OpenACS and EuroTcl/Tk 2023

Applications of OAuth in OpenACS

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Overview

- Introduction to OAuth
  - Motivation
  - Architecture
- Implementation in OpenACS
- Application areas + Demos

About me

- **2011 – 2016**
  - Business School
  - A-Levels in Business Information Systems (“Wirtschaftsinformatik”)
- **2019 – 2022**
  - Co-Worker in some Ruby-on-Rails based projects (e.g., norasports.at)
- **October 2022**
  - Member of the LEARN-Team
- **July 2023**
  - BSc in Business Economics and Social Sciences / IS major at WU
- **October 2023**
  - Master in Software Engineering & Internet Computing at TU Wien

Introduction to OAuth

- OAuth enables a third-party application to gain limited access to an HTTP service:

  a) on behalf of the resource owner
  b) on behalf of the application (= client) itself

- Version 1.0 → RFC 5849
- Version 2.0 → RFC 6749

- Uses **tokens instead of resource owner´s credentials**
  - Standard: Bearer Token (RFC 6750)

Motivation – Business Perspective

- Usage of third-party applications becomes almost inevitable, leading to
  - System breaks between the UIs of multiple applications → workflow interruptions
  - Bad user experience
  - Security issues

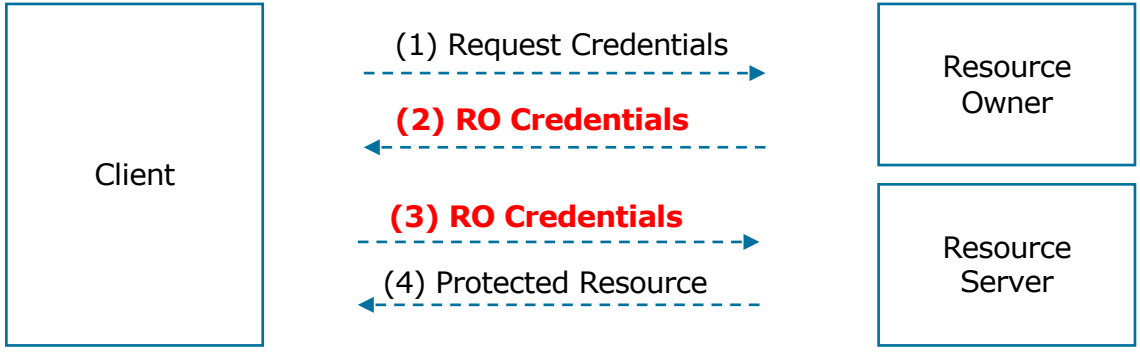
- Objectives
  - Improve the integration of third-party clients
  - Contribute to security standards
  - Improve user experience

Motivation – Technical Perspective

- Main objective:

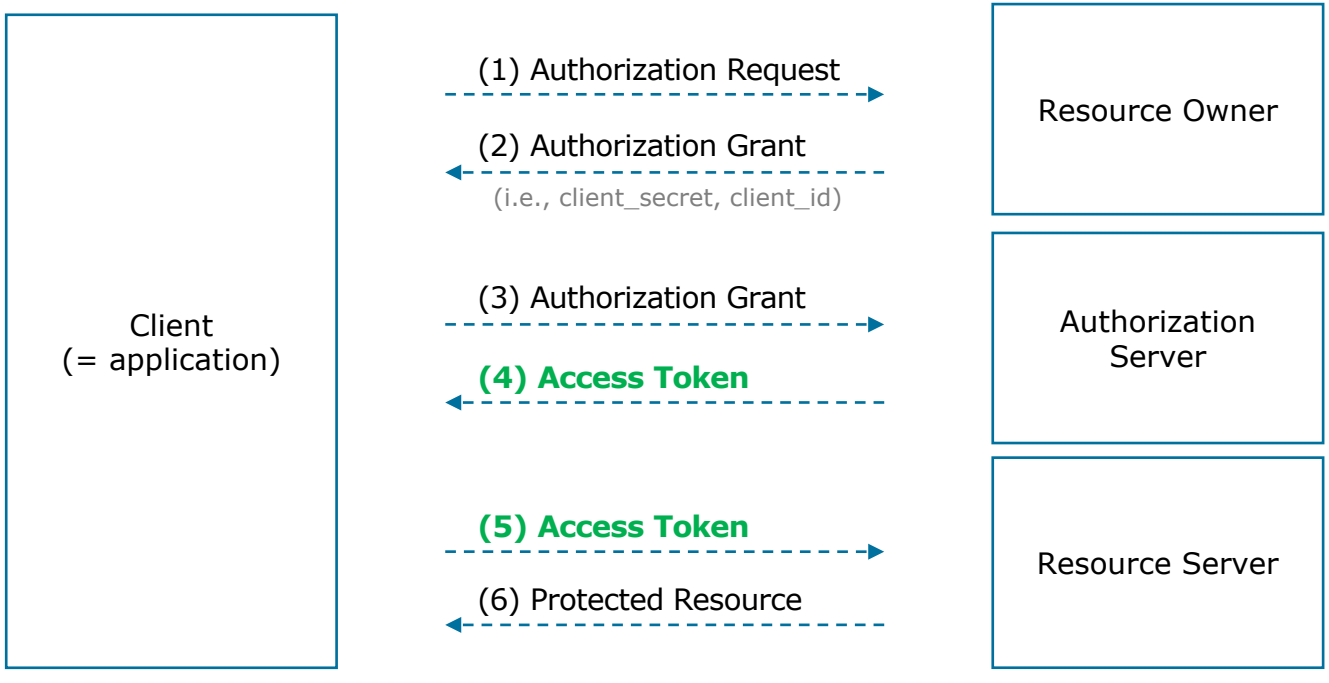
  = overcome the drawbacks of traditional client-server authentication

  - Third-party applications use/store credentials of the resource owner
  - Permissions cannot be set on a granular level (e.g., resources, duration)
  - Identical credentials are used for multiple clients → Security issue



RO = Resource Owner

OAuth 2.0 Protocol Flow



OAuth 2.0 – Implementation in OpenACS

- xooauth package
- Originally developed by Knowledge Markets (see https://km.at)

- Application areas

1. **App Communication**
   exchange of information with external applications over REST interfaces
   (e.g., with MS Teams over the MS Graph API)

2. **LTI Tools**
   communication with external applications in the context of LMS
   (e.g., BigBlueButton, Jupyter)

3. **Authentication**
   user authentication with Single-Sign-On on multiple software systems
   (e.g., via Microsoft Azure AD, GitHub)

Communicating with REST APIs

/usr/local/ns/config-oacs-${oacs_version}.tcl

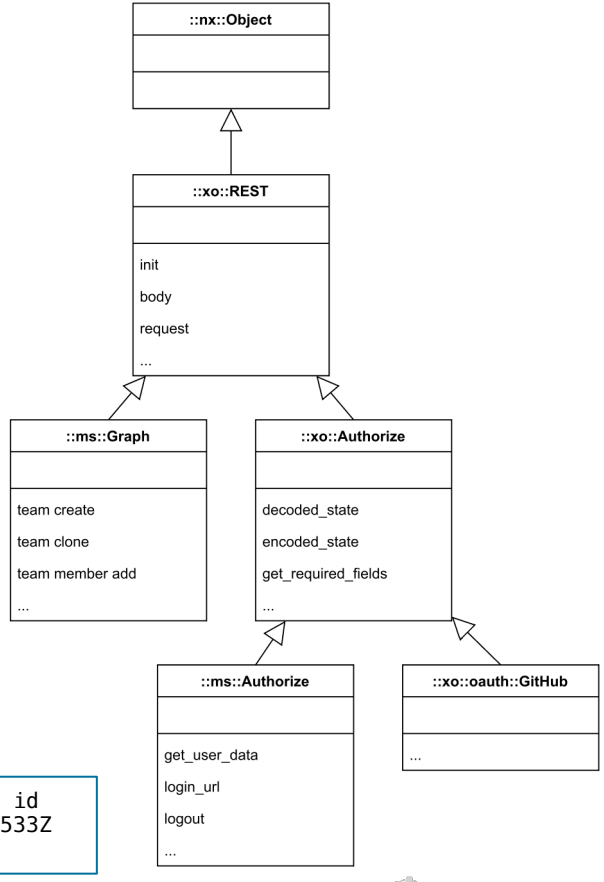
```
# e.g., for MS Graph

ns_section ns/server/${server}/acs/oauth/ms/graph {
       ns_param tenant ad0c8c4b-1fc3-4d69-8aea-7532e8b5310c
       ns_param client_id 5e5ad3aa-...
       ns_param client_secret qvj8Q~...
}
```

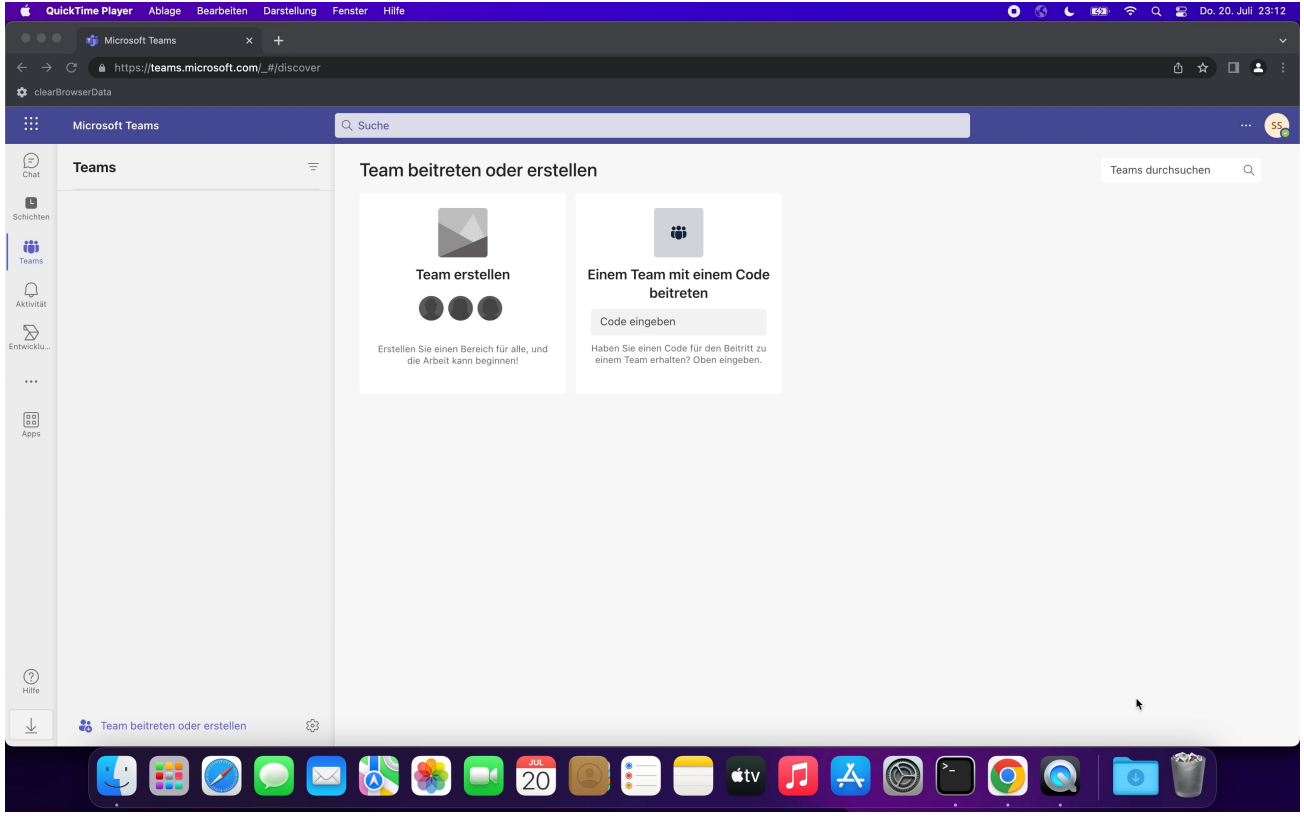
xooauth/tcl/ms-procs.tcl

```
        :public method "team get" {
            team_id
            {-expand ""}
            {-select ""}
        } {
            set r [:request -method GET -token [:token] \
                       -url /teams/$team_id?[:params {expand
select}]]
            return $r
        }
```

```
@odata.context {https://graph.microsoft.com/v1.0/$metadata#teams/$entity} id
1335050c-0f9c-4db2-b0dc-e778072e123e createdDateTime 2023-07-20T13:17:51.533Z
displayName {3119 Betriebliche Informationssysteme 1} ... }
```



Demo: Creating an MS Team in DotLRN



Communication with LTI Services (1)

- Learning Tools Interoperability
  - Standard, allowing the integration of rich learning applications into LMS
  - Developed by the IMS Global Learning Consortium (see e.g., http://www.imsglobal.org/activity/learning-tools-interoperability)
- Versions:
  - LTI <= 1.1 (using OAuth 1.0)
  - LTI 1.3 (using OAuth 2.0)
- Components:
  - Tool Provider (e.g., server, running an external tool, such as Jupyter)
  - Tool Consumer (= an LMS, e.g., LEARN)

Communication with LTI Services (2)

```
 /usr/local/ns/config-oacs-${oacs_version}.tcl

# e.g., for Jupyter

ns_section ns/server/${server}/lti/jupyter {
       ns_param launch_url http://${some_url}/hub/lti/launch
       ns_param shared_secret ${some_shared_secret}
       ns_param oauth_consumer_key ${some_consumer_key}
}

* shared_secret and oauth_consumer_key are created on the server via
  $ openssl rand -hex 32
```

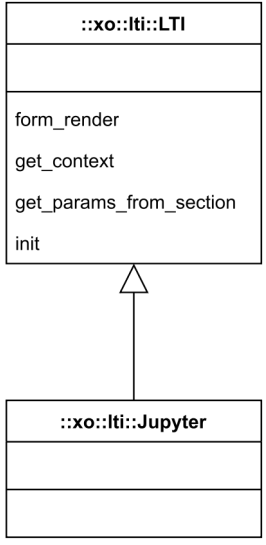
- *{{ launch-jupyter }}* includelet in an xowiki page
  - Defined in xooauth/tcl/lti-includelet-procs.tcl

```
::xowiki::IncludeletClass create launch-jupyter \
    -superclass LTI-LaunchButton

launch-jupyter instproc render {
    :get_parameters
    return [:render_form_button \
                -class ::xo::lti::Jupyter

...
}
```

instantiate



User Authentication (1)

- Authorization Code Grant Flow (defined in RFC 6749)
  - Authorization Endpoint
  - Query parameters
    - **response_type** (e.g., code, code+id_token in Microsoft-specific *hybrid flows*)
    - **client_id**
    - redirect_uri
    - scope (e.g., open_id, offline_access, profile)
    - state (to encode information about several aspects, e.g., last visited page)

```
e.g.,
https://login.microsoftonline.com/common/oauth2/authorize?
response_type=code+id_token
&redirect_uri=http://localhost:8000/azure-login-handler
&scope=openid+offline_access+profile
&client_id=5e5ad3aa-e158-48d2-af2f-…
&response_mode=form_post
```

User Authentication (2)

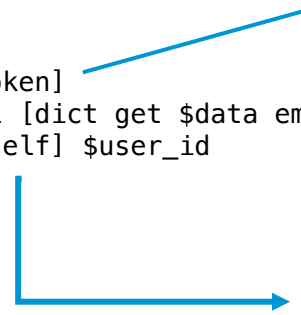
- Response = Claims → mapped to OpenACS-internal variables

e.g., *xooauth/tcl/ms-procs.tcl*: get_user_data

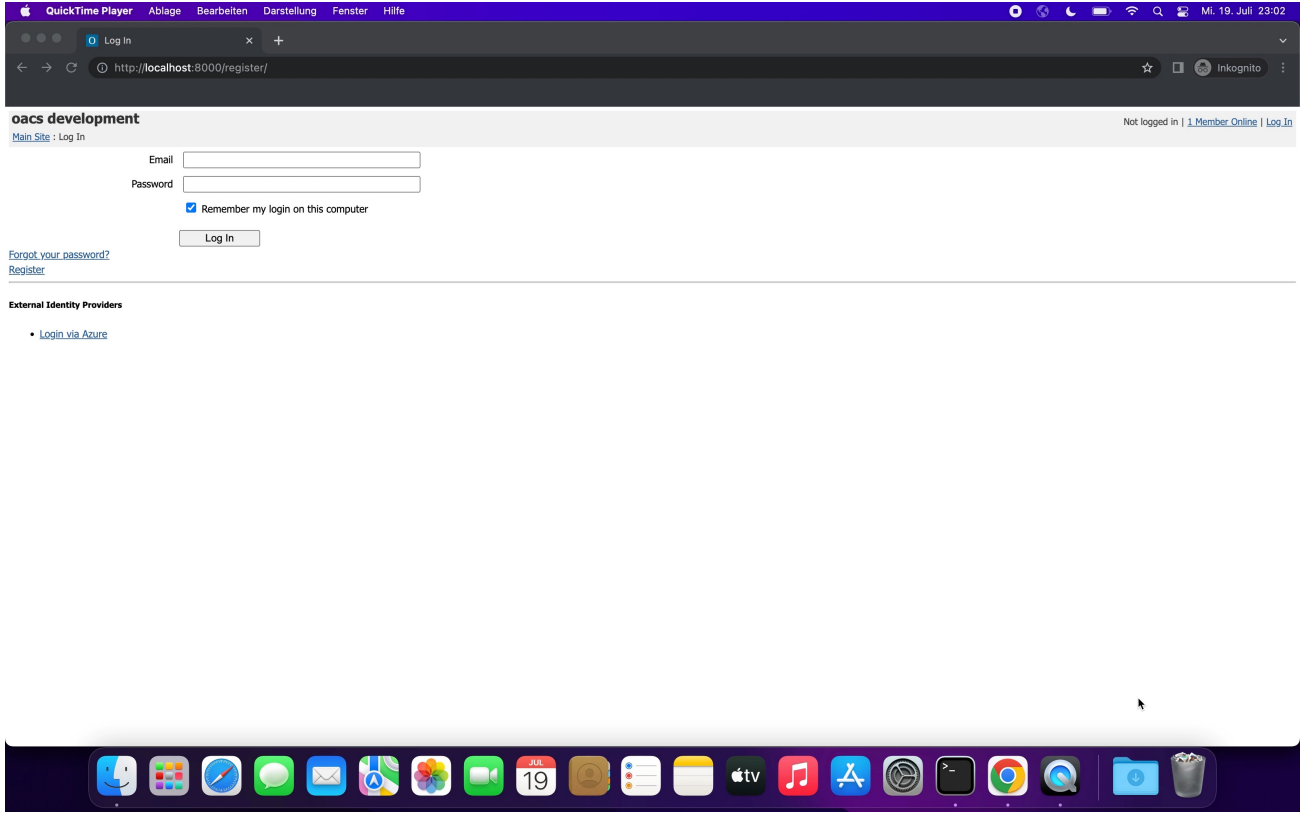
```
claims {
        ...
        family_name Scheder                    →  last_name
        given_name Sebastian                   →  first_names
        upn sscheder@wwzg1.onmicrosoft.com     →  email
        ...
}
```

xooauth/tcl/authorize-procs.tcl

```
perform_login {
...
} {
    set data [:get_user_data -token $token]
    set user_id [:lookup_user_id -email [dict get $data email]]
    ad_user_login -external_identity [self] $user_id
}
```



Demo: “Login with Microsoft”



Summary and Future Work

- OAuth2
- 3-Layer authorization procedure
- “Never use resource owner credentials to authorize multiple clients”

- Application areas implemented in xooauth
  - Communication with REST APIs
  - LTI Services
  - Authentication

- **Future Work**
  - Restructure the xooauth package
  - Update functionalities (e.g., oauth-server-procs.tcl)
  - Add functionality (e.g., MS Graph: list deleted teams, restore deleted teams)
  - Separate functionalities into dedicated packages

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