Open Virtual Mobility

O3-A1.4: Guidelines and editor functionality available

- Final -

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Imprint

Imprint: This publication is O3-A1 of the Open Virtual Mobility Erasmus+ strategic partnership founded by the European Commission 2017 - 2020 under **2017-1-DE01-KA203-003494,** URL: https://www.openvirtualmobility.eu/

This paper is about a guideline how to setup and use a competency directory in general for ones own competency framework. Specifically, a step-by-step manual is provided for using the existing competency directory of the Open Virtual Mobility project to setup one's own directory. Additionally, the use with Open Badges is described briefly.

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Executive summary

The competency directory is an Open Source development published, maintained and run by the Open Virtual Mobility project. One instance is available at http://cd.openvirtualmobility.eu which provides a web interface to the 33 competency and skill definitions of the Open Virtual Mobility skills framework. This document describes the setup of own instances using the Open Source code, explains the functionality and usage of the web frontend including the benefits of the unique deep links to entries which can be used as referencing URLs to either see the website or fetch machine readable data in JSON-LD format about the competencies. Finally, the documents explains how these deep links can be used to reference corresponding competency definitions from Open Badges as the Open badge Standard provides so called `AlignmentObjects` to add this metadata. Overall, this documents provides several guidelines to setup and use the competency directory, especially in use with Open Badges.

What are the objectives of this paper?

- Guidelines on setup of competency directory
- Manual of competency directory
- Guideline of usage with Open Badges’ alignment-field

Who is this paper for?

- Technicians interested in a.) using semantic competency definitions or b.) setting up an own competency directory.
- Pedagogues and didacticians interested in the technical infrastructure behind semantic competency definitions.

What topics are addressed in this paper?

Setup, REST API, Frontend, Languages, References, IRIs, Manual, Open Badges

Contributors

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1. Aims and Scope

This guideline should serve as a step-by-step manual for interested parties to use the competency directory on their own. Two scenarios are possible: First, download, installation and setup of the Open Source[1] release of the competency directory to provide own semantically cross-referenced competency definitions (of whatever competency framework). Second, use of the existing, maintained and running competency directory at http://cd.openvirtualmobility.eu with currently 33 entries of relevant competencies for virtual mobility as defined in the project Output 1.x?.
In both scenarios the REST API can be used to directly reference the competency definitions from anywhere by unique URLs. As an example, the use with Open Badge Standard 2.0 (alignment field) is described.
For details about the semantic vocabulary used, the REST-API endpoints and the overall system structure refer to former documents, e.g. *O3-A1.3 Competency directory - functional prototype*.

2. Guideline on setup of own competency directory

2.1 System setup requirements

The competency directory code can be run on any machine that supports Docker containers. Thus, install the Docker Engine[2] and Docker Compose[3] on your system. The source code itself needs NodeJS to serve the REST-API and to build the REACT-frontend. Install NodeJS v12[4] or higher. Additionally, it is recommended to have GIT version control installed[5] to fetch and update the source code directly from the repository. Alternatively, it can be downloaded manually.

2.2. Fetch the source code

The current repository of the competency directory can be found at GitHub[1]. Either use the command

```
git clone https://github.com/openVirtualMobility/competency-directory.git
```

or manually download the ZIP[6] and unpack it. The benefit of using GIT is an easy update to the latest source code version by the command `git pull` which keeps your local changes, e.g. to configuration files or database. You should see at least the files and directories shown in Figure 1.

[1] https://github.com/openVirtualMobility/competency-directory

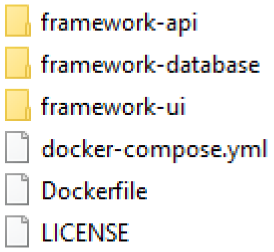
[2] https://docs.docker.com/install/

[3] https://docs.docker.com/compose/install/

[4] https://nodejs.org/en/download/

[5] https://git-scm.com/book/en/v2/Getting-Started-Installing-Git

[6] https://github.com/openVirtualMobility/competency-directory/archive/master.zip



framework-api
framework-database
framework-ui
docker-compose.yml
Dockerfile
LICENSE

Figure 1: Source code of competency directory components (file/dir listing)

2.3 Build a fresh version of the frontend UI

Change into directory `\framework-ui\` and run `npm install`. It takes a while to fetch all needed modules. Afterwards run `npm run build`. This will create the folder `.\build` within the folder `\framework-ui\`. Copy the whole folder `build` into the folder `\framework-api\src\`.

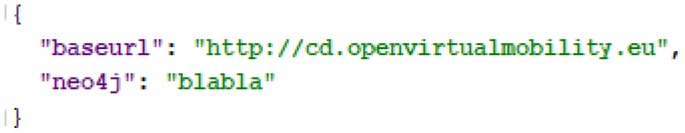
> ***Why?*** *Originally the frontend was running as an independent component, but this causes issues with port forwarding and JavaScripts. Currently the best solution is to let the server, which provides the REST-API, deliver the frontend as well. This is automatically done when you copy your build to the framework-api\src folder (afterwards there is a folder framework-api\src\build\ with all these files).*

2.4 Build the API-backend server

Change into folder `\framework-api\` and run `npm install`. This will fetch all modules needed for the server backend.

2.5 Edit configuration

In the file `\framework-api\src\config.json` you need to change the currently set base URL to your server's URL. The format is as shown in Figure 2.



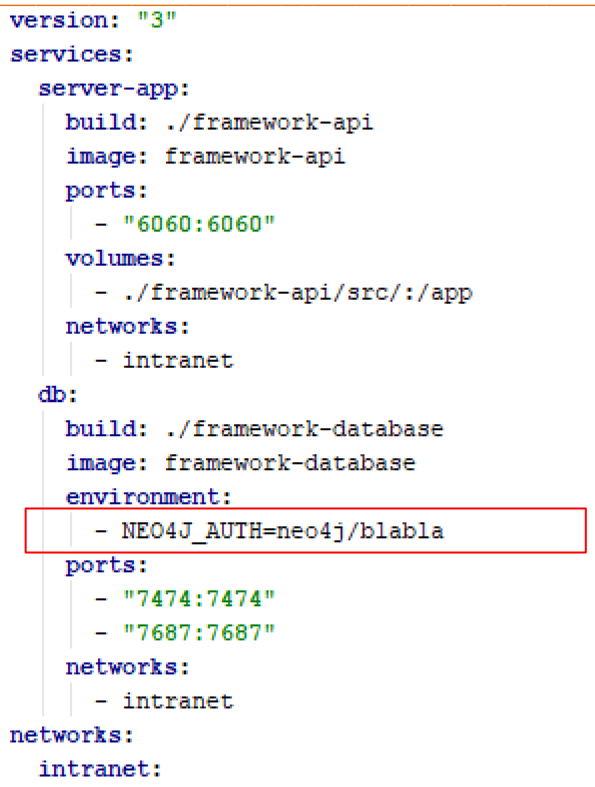
```
{
  "baseurl": "http://cd.openvirtualmobility.eu",
  "neo4j": "blabla"
}
```

Figure 2: config.json to set the base URL of the server

For security reasons change in the same file as well the password for your neo4j database-connection (from "`blabla`" to something secure). The same password needs to be set in your settings for docker-compose (see next section).

2.6 Edit docker-compose configuration

The file \docker-compose.yml contains the major information about which docker containers should be run and on which ports they will be available. As you see in Figure 3 you need to set the same password for the neo4j connection here (which is then used to create this neo4j authorization that is used by the server API from step 2.5 above).



```
version: "3"
services:
  server-app:
    build: ./framework-api
    image: framework-api
    ports:
      - "6060:6060"
    volumes:
      - ./framework-api/src/:/app
    networks:
      - intranet
  db:
    build: ./framework-database
    image: framework-database
    environment:
      - NEO4J_AUTH=neo4j/blabla
    ports:
      - "7474:7474"
      - "7687:7687"
    networks:
      - intranet
networks:
  intranet:
```

Figure 3: docker-compose.yml file (here you need to change the password for neo4j database as well)

2.7 Run the server

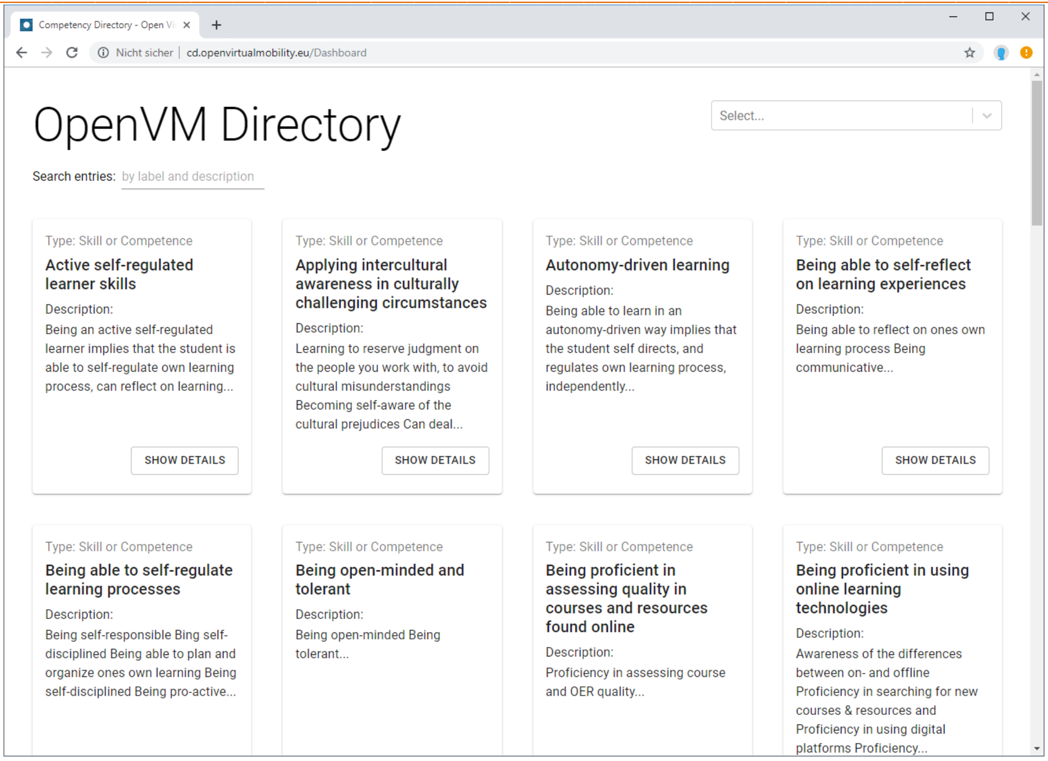
In your main installation folder (same level as the docker-compose.yml file) run the command
`docker-compose up -d`
Your server is now available on port `3000`. You can use a REST-API client like Postman or a web browser like Chrome to check if the server is running.
If you want to stop the containers run
`docker-compose stop`

> ***Note***: *For security reasons it is recommendable to use a webserver proxy as a HTTP service on a public domain server which accepts the HTTP requests (usually on port 80), forwards them internally to your local machine (that runs the competency directory on port 3000) and sends back the response to the client system. We recommend using Apache2 Reverse Proxy*[7].

3. Manual of using the existing competency directory

When you access the web frontend the first time via a web browser you see the default search interface in English language (see Figure 4).

[7] https://httpd.apache.org/docs/2.4/howto/reverse_proxy.html



OpenVM Directory

Search entries: by label and description

Type: Skill or Competence
Active self-regulated learner skills
Description:
Being an active self-regulated learner implies that the student is able to self-regulate own learning process, can reflect on learning...
SHOW DETAILS

Type: Skill or Competence
Applying intercultural awareness in culturally challenging circumstances
Description:
Learning to reserve judgment on the people you work with, to avoid cultural misunderstandings Becoming self-aware of the cultural prejudices Can deal...
SHOW DETAILS

Type: Skill or Competence
Autonomy-driven learning
Description:
Being able to learn in an autonomy-driven way implies that the student self directs, and regulates own learning process, independently...
SHOW DETAILS

Type: Skill or Competence
Being able to self-reflect on learning experiences
Description:
Being able to reflect on ones own learning process Being communicative...
SHOW DETAILS

Type: Skill or Competence
Being able to self-regulate learning processes
Description:
Being self-responsible Bing self-disciplined Being able to plan and organize ones own learning Being self-disciplined Being pro-active...

Type: Skill or Competence
Being open-minded and tolerant
Description:
Being open-minded Being tolerant...

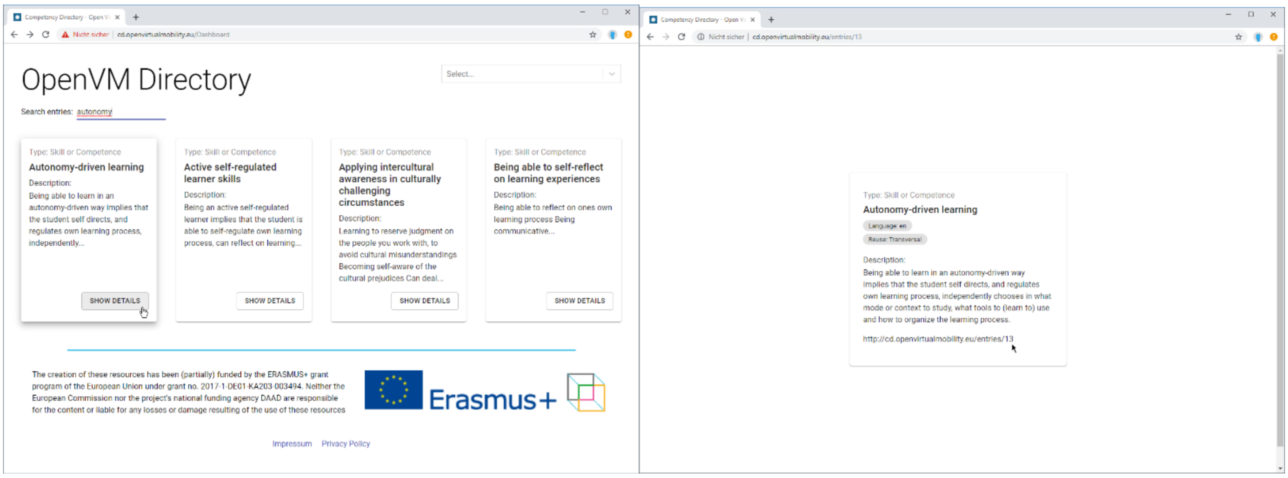
Type: Skill or Competence
Being proficient in assessing quality in courses and resources found online
Description:
Proficiency in assessing course and OER quality...

Type: Skill or Competence
Being proficient in using online learning technologies
Description:
Awareness of the differences between on- and offline Proficiency in searching for new courses & resources and Proficiency in using digital platforms Proficiency...

Competency Directory - Open V
Nicht sicher | cd.openvirtualmobility.eu/Dashboard
Select...

Figure 4: Main search interface of competency directory at http://cd.openvirtualmobility.eu/

By typing phrases into the search field on top, the list narrows directly to all entries that match these word-parts either in title or in description (see Figure 5, left). The order of the entries is decided by relevance. This is calculated by major weights for title matches and secondary by description matches.



OpenVM Directory

Search entries: autonomy

Type: Skill or Competence
Autonomy-driven learning
Description:
Being able to learn in an autonomy-driven way implies that the student self directs, and regulates own learning process, independently...
SHOW DETAILS

Type: Skill or Competence
Active self-regulated learner skills
Description:
Being an active self-regulated learner implies that the student is able to self-regulate own learning process, can reflect on learning...
SHOW DETAILS

Type: Skill or Competence
Applying intercultural awareness in culturally challenging circumstances
Description:
Learning to reserve judgment on the people you work with, to avoid cultural misunderstandings Becoming self-aware of the cultural prejudices Can deal...
SHOW DETAILS

Type: Skill or Competence
Being able to self-reflect on learning experiences
Description:
Being able to reflect on ones own learning process Being communicative...
SHOW DETAILS

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Impressum Privacy Policy

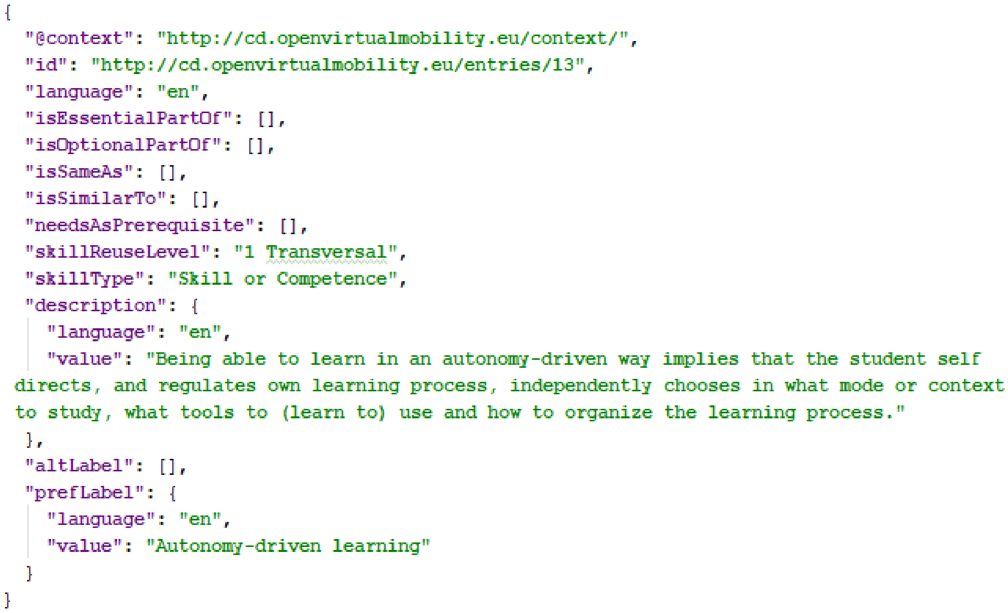
Type: Skill or Competence
Autonomy-driven learning
Language: en
Reuse: Transversal
Description:
Being able to learn in an autonomy-driven way implies that the student self directs, and regulates own learning process, independently chooses in what mode or context to study, what tools to (learn to) use and how to organize the learning process.
http://cd.openvirtualmobility.eu/entries/13

Competency Directory - Open V
Nicht sicher | cd.openvirtualmobility.eu/Dashboard
Select...
Erasmus+
Competency Directory - Open V
Nicht sicher | cd.openvirtualmobility.eu/entries/13

Figure 5: Search interface narrows down the list of matching entries while typing

When you click on one of the SHOW DETAILS buttons, the corresponding entry is opened solely and the URL is visible that can be used to deep-link to this competency. In Figure 5 (left side) you see Entry ID 13 Autonomy-driven learning with URL http://cd.openvirtualmobility.eu/entries/13 . This URL can be used in documents to cross-reference the proper competency descriptions. When a user opens this URL via a web browser the web frontend is shown as in Figure 5 (right side). It is also possible to use these URLs with a client-system that expects machine-readable semantic date in

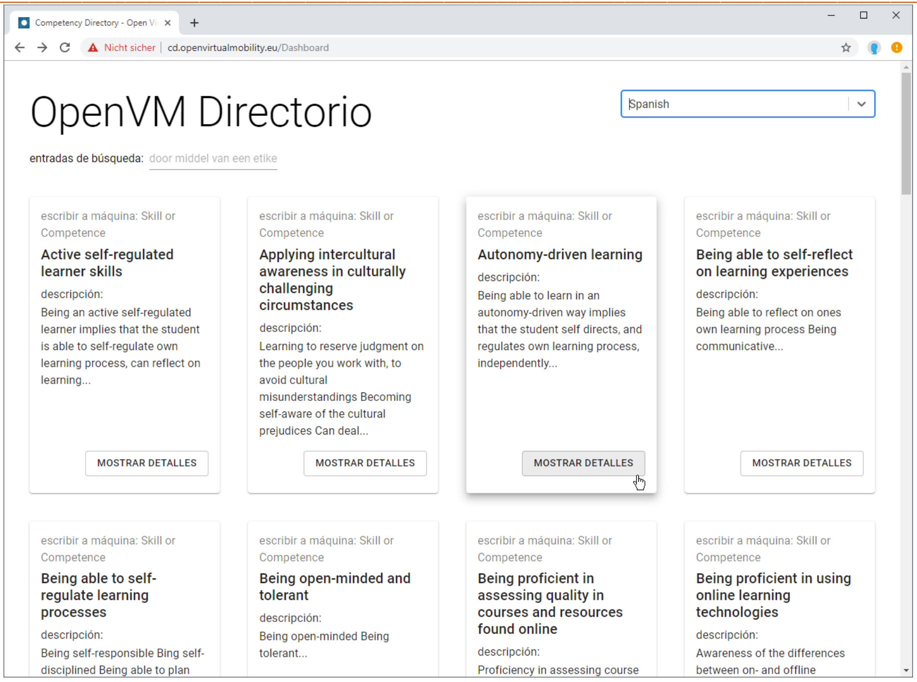
JSON-LD format. If the accept header of the HTTP-request is set to application/json the competency entries are delivered in JSON-LD instead (Example for the same entry with ID 13 is shown in Figure 6).



```
{
  "@context": "http://cd.openvirtualmobility.eu/context/",
  "id": "http://cd.openvirtualmobility.eu/entries/13",
  "language": "en",
  "isEssentialPartOf": [],
  "isOptionalPartOf": [],
  "isSameAs": [],
  "isSimilarTo": [],
  "needsAsPrerequisite": [],
  "skillReuseLevel": "1 Transversal",
  "skillType": "Skill or Competence",
  "description": {
    "language": "en",
    "value": "Being able to learn in an autonomy-driven way implies that the student self
 directs, and regulates own learning process, independently chooses in what mode or context
 to study, what tools to (learn to) use and how to organize the learning process."
  },
  "altLabel": [],
  "prefLabel": {
    "language": "en",
    "value": "Autonomy-driven learning"
  }
}
```

Figure 6: HTTP response for http://cd.openvirutalmobility.eu/entries/13 with accept-header set to application/json

Finally, the competency directory frontend supports all partner organizations' languages beside English (Dutch, German, Italian, French, Romanian, Spanish). The interface language can be chosen by the dropdown on the upper right corner (see Figure 7). The database of competency entries supports multi-language entries as well, but currently the competency definitions are available in English only. If they are translated to other languages, the search results will reflect the language selected from the interface, too. If no translation is available, the English entries are shown. Once the language has been selected, the browser is set to remember it on the next visits to the web frontend.



Competency Directory - Open Vi ×

Nicht sicher | cd.openvirtualmobility.eu/Dashboard

OpenVM Directorio

Spanish

entradas de búsqueda: door middel van een etike

escribir a máquina: Skill or Competence
Active self-regulated learner skills
descripción:
Being an active self-regulated learner implies that the student is able to self-regulate own learning process, can reflect on learning...
MOSTRAR DETALLES

escribir a máquina: Skill or Competence
Applying intercultural awareness in culturally challenging circumstances
descripción:
Learning to reserve judgment on the people you work with, to avoid cultural misunderstandings Becoming self-aware of the cultural prejudices Can deal...
MOSTRAR DETALLES

escribir a máquina: Skill or Competence
Autonomy-driven learning
descripción:
Being able to learn in an autonomy-driven way implies that the student self directs, and regulates own learning process, independently...
MOSTRAR DETALLES

escribir a máquina: Skill or Competence
Being able to self-reflect on learning experiences
descripción:
Being able to reflect on ones own learning process Being communicative...
MOSTRAR DETALLES

escribir a máquina: Skill or Competence
Being able to self-regulate learning processes
descripción:
Being self-responsible Bing self-disciplined Being able to plan

escribir a máquina: Skill or Competence
Being open-minded and tolerant
descripción:
Being open-minded Being tolerant...

escribir a máquina: Skill or Competence
Being proficient in assessing quality in courses and resources found online
descripción:
Proficiency in assessing course

escribir a máquina: Skill or Competence
Being proficient in using online learning technologies
descripción:
Awareness of the differences between on- and offline

Figure 7: Interface language selection

4. Using URLs of competencies with Open Badges

One additional application scenario to use the direct links to competency entries, is the interlinking of Open Badges with the corresponding competency definitions. If an Open Badge is designed as a digital certificate for a certain competency or set of competencies, the Open Badge Standard allows (since Version 2.0) to reference the competency definitions as so called `AlignmentObjects`. These are a set of well-defined fields in the metadata of an Open Badge as listed in Table 1.

Table 1: Metadata fields for AlignmentObjects of Open Badges (source: IMS Open Badge Spec 2.0[8]). Fields marked * are mandatory.

Property	Expected Type	Description
`targetName *`	Text	Name of the alignment.
`targetUrl *`	URL	URL linking to the official description of the alignment target, for example an individual standard within an educational framework.
`targetDescription`	Text	Short description of the alignment target.
`targetFramework`	Text	Name of the framework of the alignment target.
`targetCode`	Text	If applicable, a locally unique string identifier that identifies the alignment target within its framework and/or targetUrl.

[8] https://www.imsglobal.org/sites/default/files/Badges/OBv2p0Final/index.html#Alignment

As targetName we recommend to use the title of the competency (the name, e.g. "Autonomy-driven learning") and as targetUrl the direct URL to the competency entry from the competency directory (e.g. http://cd.openvirtualmobility.eu/entries/13). Optionally, the targetDescription can be copied, the targetFramework is the name of the competency framework (e.g. Open Virtual Mobility skills) and the targetCode is the ID of the entry (e.g. 13).

There are manifold benefits of using the AlignmentObjects to reference competencies from Open Badges. First, if later on the text of the competency is updated or new cross-references (dependencies, successors etc.) are defined, these are automatically visible to the Open Badge user because data is no longer copied, but referenced. Second, if several Open Badges reference the same competencies, these machine-readable information allows detection of similar/identical Open Badges, coverage of competency/skill sets and much more. Third, applications that visualize Open Badges can use this metadata to fetch the competency information (as JSON-LD data), display it, aggregate the information and navigate the graph of cross-referenced competency definitions. Fourth (and finally for now), users can follow these hyperlinks to competency definitions and browse the definition (in several languages), find out what prerequisites are defined, what other competencies are similar to this one and which other entries the competency framework offers that provides such an interactive competency directory frontend (as described in section 3 of this document).

Open Badges, which are issued by the OpenVM project, are hosted by project partner Cineca's Bestr platform and are all planned to contain the metadata AlignmentObject information for corresponding competency definitions. For a list of existing Open Badges in Open Virtual Mobility see https://bestr.it/project/show/107#!#badge.

8. Conclusion and outlook

This document provided a step-by-step guideline how to setup the competency directory to offer one's own competency framework with a REST-API and web interface. Additionally, the use of the frontend, search interface, multi-language interface and deep links was explained for interested end users. Exemplary the up and running instance at http://cd.openvirtualmobility.eu was shown in the screenshots. This instance currently hosts all 33 competency and skill definitions of the Open Virtual Mobility skills framework.

A more technical insight was given into the use of the unique URLs for entries to fetch the data in JSON-LD semantic and machine-readable format. Therefore, the unique URLs to competency entries can serve as well as identifiers and can be used as references in the AlignmentObject of Open Badges to point to the corresponding competency definitions. This has been explained in the last section of the document.

The published source code of the competency directory is actively maintained until the end of the project and beyond as long as the Open Source community supports these efforts.

Next envisioned steps in the project include the translation of all competency entries of Open Virtual Mobility skills into the languages supported by the project consortium.

Note: As the title of the milestone expresses, editor functionality (to update competencies via web frontend) is expected, too. Due to the vanishing demand from the project consortium due to shifting project priorities, this part was delayed. Still, the editor functionality will be delivered until project end for interested third parties.

9. References

References to tools and software are as footnotes directly in text.

Stoye, J. (2019). *Development of an Application for a Competency and Skill Framework*. Beuth University of Applied Sciences.

Attachments

none