Open Virtual Mobility

02 – A1 VIRTUAL MOBILITY LEARNING HUB CONCEPT

LH Concept, LH Functionalities, LH Technical features, LH User cases

- Final draft -

Outcome 2 Activity A1 Virtual Mobility Learning Hub Concept	
Document submission and review information	
Initial submission date of the first draft	1 March 2018
Review date of the first draft	1 May 2018
Final submission date of the improved draft	14 May 2018
Author and reviewer information	
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*The creation of these resources has been (partially) funded by the ERASMUS+ grant program of the European Union under grant no. **2017-1-DE01-KA203-003494**. Neither the European Commission nor the project's national funding agency DAAD are responsible for the content or liable for any losses or damage resulting of the use of these resources.*

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Imprint: This publication is O2-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 O2-A1 document produced as part of Outcome 02 – A1 Virtual Mobility Learning Hub Concept and aims at establishing the Virtual Mobility Learning Hub.

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Suggested citation

Andone, D., & Ternauciuc, A. (2018) O2-A1: Virtual Reality Learning Hub Concept. Timisoara, Romania. Retrieved from https://www.openvirtualmobility.eu/topics/outputs

This work was partially published in “Access to Knowledge in the 21st Century. The Interplay of Society, Education, ICT and Philosophy”, ISBN 978-3-9503983-5-9, following the 16th NETTIES Conference (Networking Entities) Reading Society, Corfu, Greece, May 3-4, 2018, under IAFeS – International Association for eScience. Part of this work will also be part of an IEEE article.

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Executive summary

This document proposes the design of the Virtual Mobility Learning Hub from the technical point of view. This Output is dedicated to designing, implementing and usability testing of an integrated Virtual Mobility Learning Hub for developing VM Skills using Online, Open & Flexible Higher Education Approaches and Practices.
The Open VM Learning Hub Concept incorporates several components, services and technologies.

The design of the VMLH starts with the desired functionalities previously discussed in partner meetings and conferences, as well as with the existing IT and e-learning infrastructures of the partners, and their desired connections with the Hub.
Several solutions were investigated, most of them in the area of open-source Personal Learning Environments (PLE). Based on the adopted concept, we propose to use the open-source learning management system Moodle as the basis for the **VM Learning** component, as well as, to some degree, for most of the other components.
The Open VM LH Structure comprises: VM Skills, VM e-Assessment, VM Open Credentials, VM Content, VM Activities, VM Market / Connections and VM Data.

What are the objectives of this paper?

- to propose the design of the Virtual Mobility Learning Hub from the technical point of view.
- outlining a possible implementation at the level of different technical components of the hub.

Who is this paper for?

- Pedagogues and didacticians interested in the design and technical infrastructure behind the Virtual Mobility Learning Hub.
- Researchers interested in discussion and presentation of currently existing challenges in the field of VLEs and user case scenarios.

What topics are addressed in this paper?

VLEs, OERs, MOOCs, XAPI, Open badges standards, Open Badges on Bestr, Bestr XAPI, Learning Record Store (LRS), Enterprise Learning Ecosystem, Learning Management System – Moodle 3.4., H5P, Mahara.

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Acknowledgements

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1. Aims of this Concept

The aim of this document is to propose the design of the Virtual Mobility Learning Hub from the technical point of view. Starting from the desired functions, this document outlines a possible implementation at the level of different technical components of the hub, in order to achieve those functions.
Despite numerous projects on Virtual Mobility there is no single European Learning Environment acting as a central hub for learning about Virtual Mobility and developing VM Skills in HE. This Output is dedicated to designing, implementing and usability testing of an integrated Virtual Mobility Learning Hub for developing VM Skills using Online, Open & Flexible Higher Education Approaches and Practices.

2. State of the Art

The Open VM Learning Hub Concept incorporates several components, services and technologies.
The design of the VMLH starts with the desired functionalities previously discussed in partner meetings and conferences, as well as with the existing IT and e-learning infrastructures of the partners, and their desired connections with the Hub.
Existing open-source entities were analyzed to see if and how they could be used to achieve the project's stated objectives.

We performed a distinct analysis of several tools: XAPI, Open badges standards, Open Badges Bestr, Bestr XAPI, Learning Record Store (LRS), Enterprise Learning Ecosystem, Learning Management System – Moodle 3.4., H5P, Mahara.

Different analyzed tools

xAPI is an open standard through which you can collect within a registry, called Learning Record Store, learning experiences in the form of statements that are readable by both humans and machines. This approach goes to change radically the way organizations collect and manage the tracking data generated by e-learning platforms.
E-learning platforms in xAPI terminology are called "activity provider" as they are to be understood in the broadest sense of the term and are not limited to traditional LMS, but embrace any platform capable of emitting xAPI statement.
The LRS is a system decoupled from e-learning platforms and can pick up statements from a

plurality of systems. The data collected may be shared amongst other LRS and it can be analyzed for a variety of purposes, for example for the award of a badge.
An experience, wherever it takes place, can be traced through a xAPI statement and collected in a centralized Learning Record Store.
Bestr, the Open Badge platform provided by project partner Cineca, includes its own Learning Record store and uses learning statements collected from (potentially) different platforms to evaluate automatic badge issuing policies.
The learning statement has the form of xAPI subject, verb, object, and contains the information required to identify the learner, action and activity.
The particular component as "actor" defined in the subject contains the email of the learner, the word identifies the action that you want to track (i.e. "completion") and the object contains the activity description and actor identification.
Badge assignment policies are described in the form of verbs and activities defined within the environment of learning or assessment.
As soon as the LRS receives statements from a given actor that correspond to a policy of issuing a badge, Bestr will start up the usual Badge issuing process: a claim email is sent to the "actor" contained within the statement.
The user must subscribe to Bestr, or simply log in if he/she already has an account, to get the Badge.
The Badge can now be downloaded and managed through the usual backpack systems.
Bestr also adds a statement ("earned") on the LRS to track the achievement of the badge. This kind of statement can become in turn an assignment policy for other badges.
This integration based on xAPI has been already used to integrate Bestr with Moodle LMS, particularly with the EduOpen platform[1], a MOOC system for a federation of italian universities LMS and Bestr LMS platforms.
The XAPI integration between Bestr and Moodle is based on the Logstore xAPI module that CINECA has helped to develop for integration in this ecosystem. The logstore type plugins handle the writing and reading of logs generated by Moodle stemming from events that are desired to be traced. The event associated with the completion of the course is what now is drawn, converted in statement and recorded on xAPI LRS.

Based on this analysis, several tools were included in the technical structure and implementation and some others were initially included and then excluded.

[1] http://www.eduopen.org/

3. Methodology

The Virtual Mobility Learning Hub is planned to be an innovative multilingual ICT-based environment unique in Europe (as a directory of virtual mobility attributes) with the main plan to promote collaborative learning, connectivist social networking as an instructional method, OERs as the main content, open digital credentials as recognition and validation of VM skills which can be applied to all ages and levels of digital education.

The VMLH needs to be built on a user-friendly interface, as well as the mobile interface, to encourage everyone to access it, engage in different open learning activities, connect with others and develop their VM competencies.

The applied methodology for the concept and implementation of the Virtual Mobility Learning Hub (VMLH) follows the principles of agile development (Beck, 2001), and socio-cognitive engineering method (Sharples, 2002; Andone, 2009), with focus on frequent technical and user cases iterations and then, user tests to improve user experience.

The methodology and tools will be applied in O2-A1 in relation to O2-A2:

- UPT Internal consultations on technical structure, user cases and functionalities, including the proposed technologies: LMS, xAPIs, Bestr and LRS.

- OpenVM Internal consultation with the technical team: Consultations with Bestr team, Beuth team, UNIT team, UniRoma team about different technologies and infrastructures needed. This consultation will be done during the Rome meeting.

- External consultation on OpenVM LH – within the partnership with experienced former teachers and students involved in virtual mobilities, in UPT two first consultations were held in March and April 2018 with teachers and students involved in the TalkTech 2017 project.

- external consultation on OpenVM LH with experts in open education, open badges and virtual mobilities during the OpenVM workshop in the EDEN Annual Conference in June 2018, Genoa, Italy.

- Continuous adaptation and improvements of the openVM LH user cases, functionalities and technical development – based on usability evaluations.

The development of the Virtual Mobility Learning Hub as a Personal Learning Environment (PLE) furthermore focuses on (a) the development of a responsive interoperable interface, (b) implementation of social software, (c) integration of tools for mobile learning, (d) development of a common working/collaboration space, (e) inclusion of features and learning analytics, (f) integrated self-assessment, and (g) validation of open digital credentials.

The development of the Virtual Mobility Learning Hub (VMLH) will imply an interdisciplinary approach from web technologies, mobile technologies, Web 2.0, interactive media and audio-video technologies, open access and tools for semantic technology. It will exist also in all partner languages (EN, DE, IT, NL, FR, ES, RO) with a possible extension to other languages which will allow communication at European, national and regional levels.

4. Expected results

The aim of the present document is to propose a technical solution to the required functions of the Virtual Mobility Learning Hub.

The functional diagram for the Virtual Mobility Learning Hub is displayed in **O2.A1 – Annex 1 VMLH Structure** and also schematic in **Figure 1**. It contains most of the functionalities of the VMLH as they are envisioned at this moment.

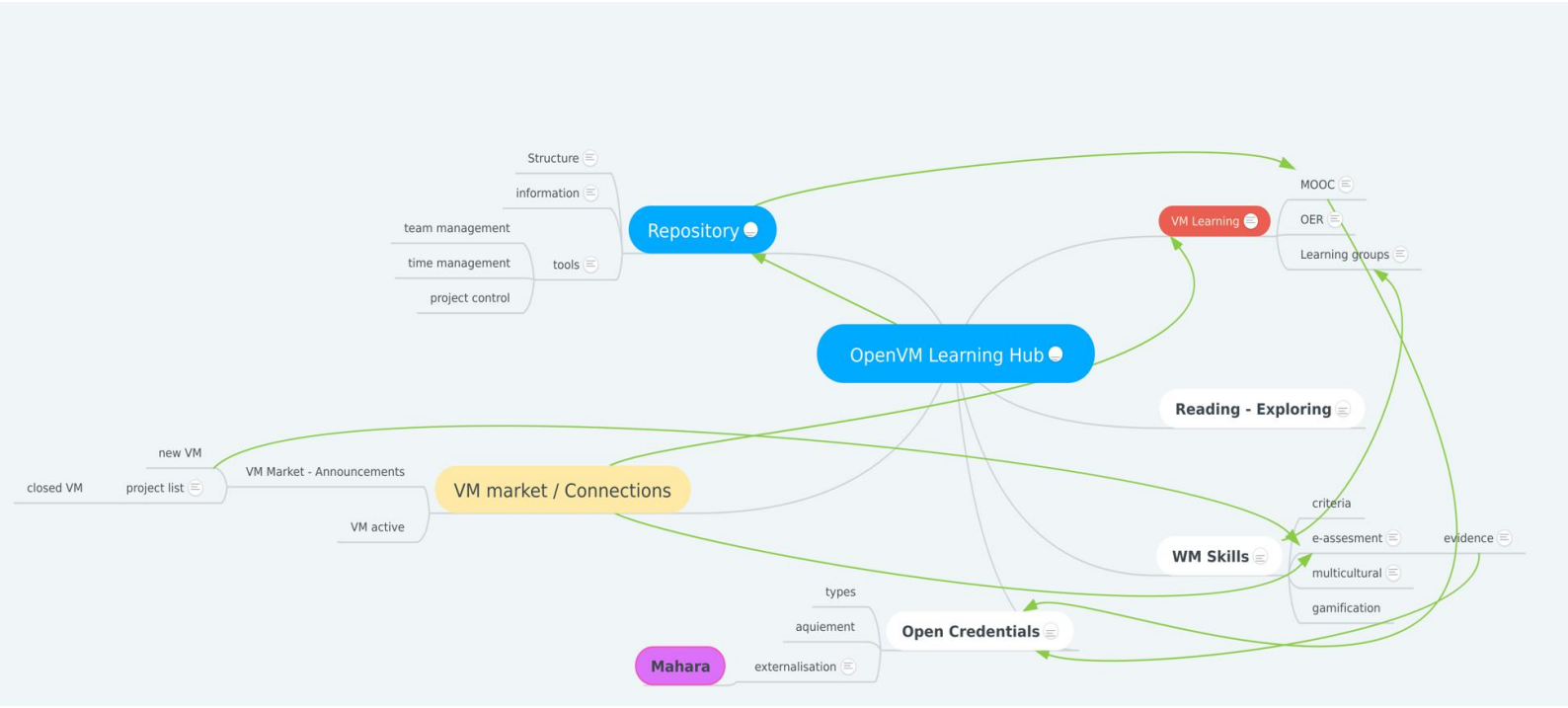

Figure 1. VMLH structural diagram

There are several elements in the diagram that can be viewed as sub-structures, each with their own semi-autonomous purpose:

- The VM skills – Represent the necessary abilities in order to conduct (teacher) or participate (student) in a Virtual Mobility; these skills are assessed (through the e-assessment mechanism/module), and if found lacking, can be acquired through the MOOC in the VM Learning section. This section presents the current user's currently validated skills (through the use of Open Badges?).
- The VM Learning component – ensures that participants acquire the VM skills needed to participate in a Virtual Mobility (MOOC); it also provides the structure for the deployment of the VMs themselves.
- The VM market – presents existing, past and future Virtual Mobilities to users visiting the HUB; the VMs are each described and categorized accordingly.
- The repository – is the Hub's section dedicated to Virtual Mobility creators and managers (teachers), containing a series of resources, tools and best-practice guides, in order to facilitate VM design and deployment.

Several solutions were investigated, most of them in the area of open-source Personal Learning Environments (PLE). Included here are edX and Academy (Moodle's official MOOC-oriented version).

However, based on the adopted concept, we propose to use the open-source learning management system Moodle as the basis for the **VM Learning** component, as well as, to some degree, for most of the other components. Moodle has all the features necessary to run online courses (MOOCs or otherwise), and its' open-source licensing allows the development of all the necessary extensions and improvements, as well as the use of existing third-party plugins.
Also, Moodle allows easy integration between different Moodle instances (as well as other types of platforms, such as Mahara), facilitating the connection between other LMSs (such as the e-learning platforms from the partner universities), if desired.
In order to prevent fragmentation, the proposed solution will revolve around this Moodle installation, and all the requirements will be integrated into this platform.
The main advantage is that even out-of-the-box, Moodle will cover many of the requirements for the other sections. A unified user management system and access control mechanisms are already in place.

One major disadvantage is that any development in areas not adjacent to Moodle's scope will need extra effort in order to integrate the resulting functionalities into the Moodle framework.

The Open VM LH Structure comprises:

(1) VM Skills - a description of virtual mobility skills including alignment to existing competency frameworks in a competency directory (O3);
(2) VM e-Assessment - different forms of digital self-/assessment including digital evidence (such as testimonials, digital assets, e-portfolios, crowd evidencing) applied as elements of open credentials and supporting open, evidence-based assessment (O4);
(3) VM Open Credentials - digital recognition of VM skills based on current forms of open digital credentials such as Open Badges and Blockcerts (O5);
(4) VM Content - User Generated Content, Open Educational Resources and other forms of Open Content to support learning about VM and developing VM Skills (O6);
(5) VM Activities - Open Learning Activities including learning in and through MOOCs, peer-to-peer activities, virtual/blended collaborations (O6);
(6) VM Market / Connections - finding cooperation partners for VM activities supported by such tools as the Matching Tool including matching for collaboration of groups (O3);
(7) VM Data - data about learning pathways and learning outcomes captured by xAPI and feeding into E-Assessment, Open Credentials and recommendations for learning.

The VM LH Functionalities are described in **Figure 2**. where the actions required by each module can be seen and analysed.

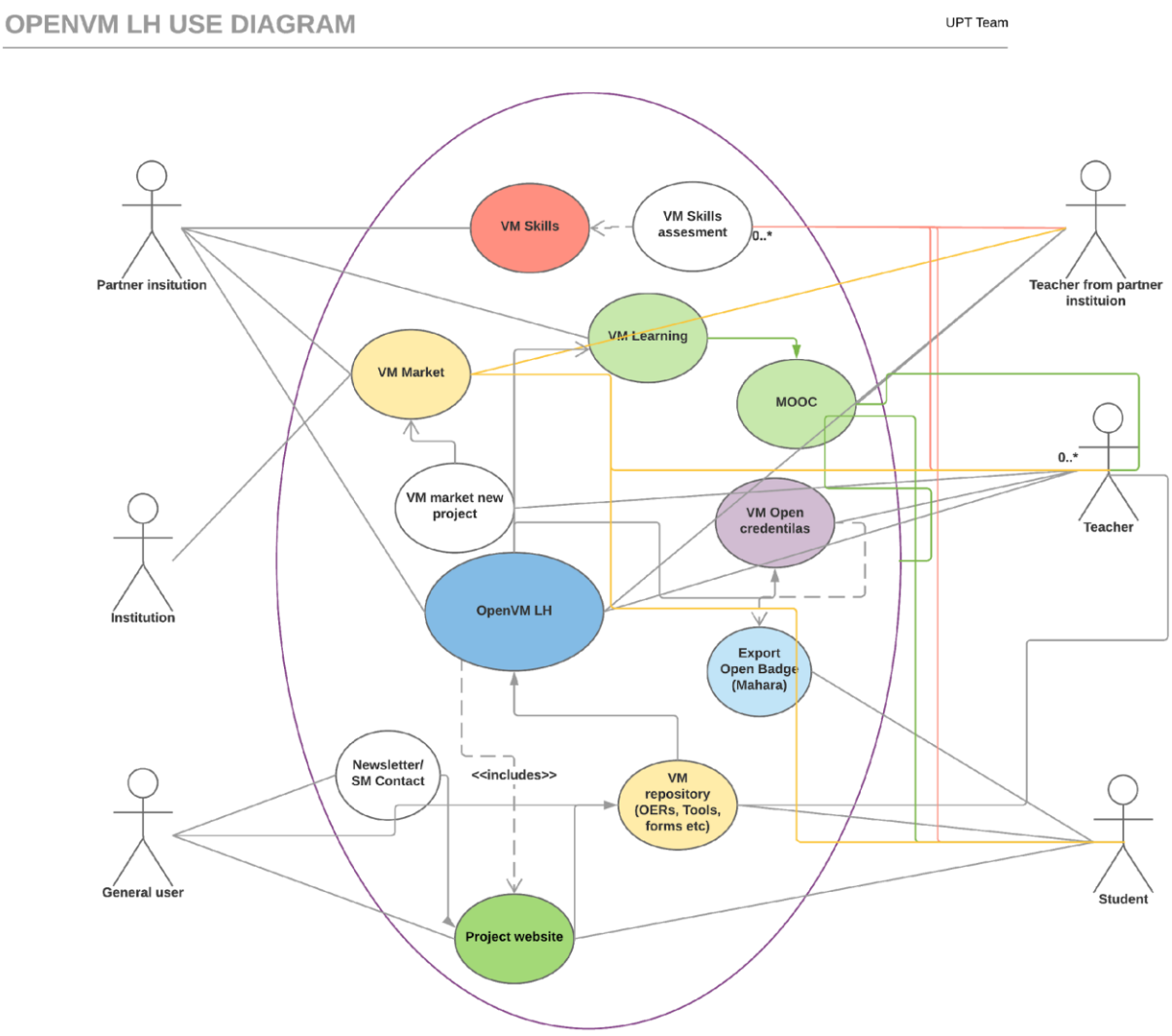

Figure 2. VMLH functional diagram

The **VM skills** will be certified using OpenBadges. The badges will be awarded by Bestr through integration with the VM Learning, as a recognition of accomplishments during the MOOC's or the VMs' activities. Bestr receives information from Moodle via the xAPI plugin, and awards the badges according to predefined scenarios.

We propose that the **Repository** should be a dedicated category of Moodle courses (or a single course). The Moodle "Single Activity" format allows the use of a single activity as the main course content (instead of topics or weeks), and the Wiki format might be a good solution to bring dynamic content to any interested users.

The **Reading/Exploring** section of the HUB could consist of static content pages, easily added/managed with the appropriate third-party plugin available in the Moodle official plugins repository.

The **Open Credentials** represent the section where each user can view and manage their backpack of badges, which would be awarded, stored and then retrieved from Bestr. A possible extension of this functionality could be a personal eportfolio management system, such as Mahara.

The **VM Market** segment of the VMLH, as previously stated, should present a list of Virtual Mobilities, either upcoming, ongoing, or archived. If these VMs are each a course in Moodle, this section could present an overview/description of each course, the starting date, the tutors, requirements (in skills, prerequisite knowledge/skills, etc.) and any other relevant information. New VMs could be proposed here, either by students or teachers, possibly through Moodle's forum modules.

The VM Market area is intended to be used for the OpenVM network, to promote VM and to encourage students or teachers to propose and to be part of a VM. Technically, it is integrated in a forum structure.

OpeVM LH User Case Scenarios

For the integration of the VM LH user case scenarios are designed and evaluated:
Teacher from a partner institution scenario - Figure 3.
Teacher scenario – similar with the Teacher from a partner institution scenario with the only exception that the teacher credentials will need to be verified offline by a person previously involved in OpenVM.
Student from a partner institution scenario – Figure 4.

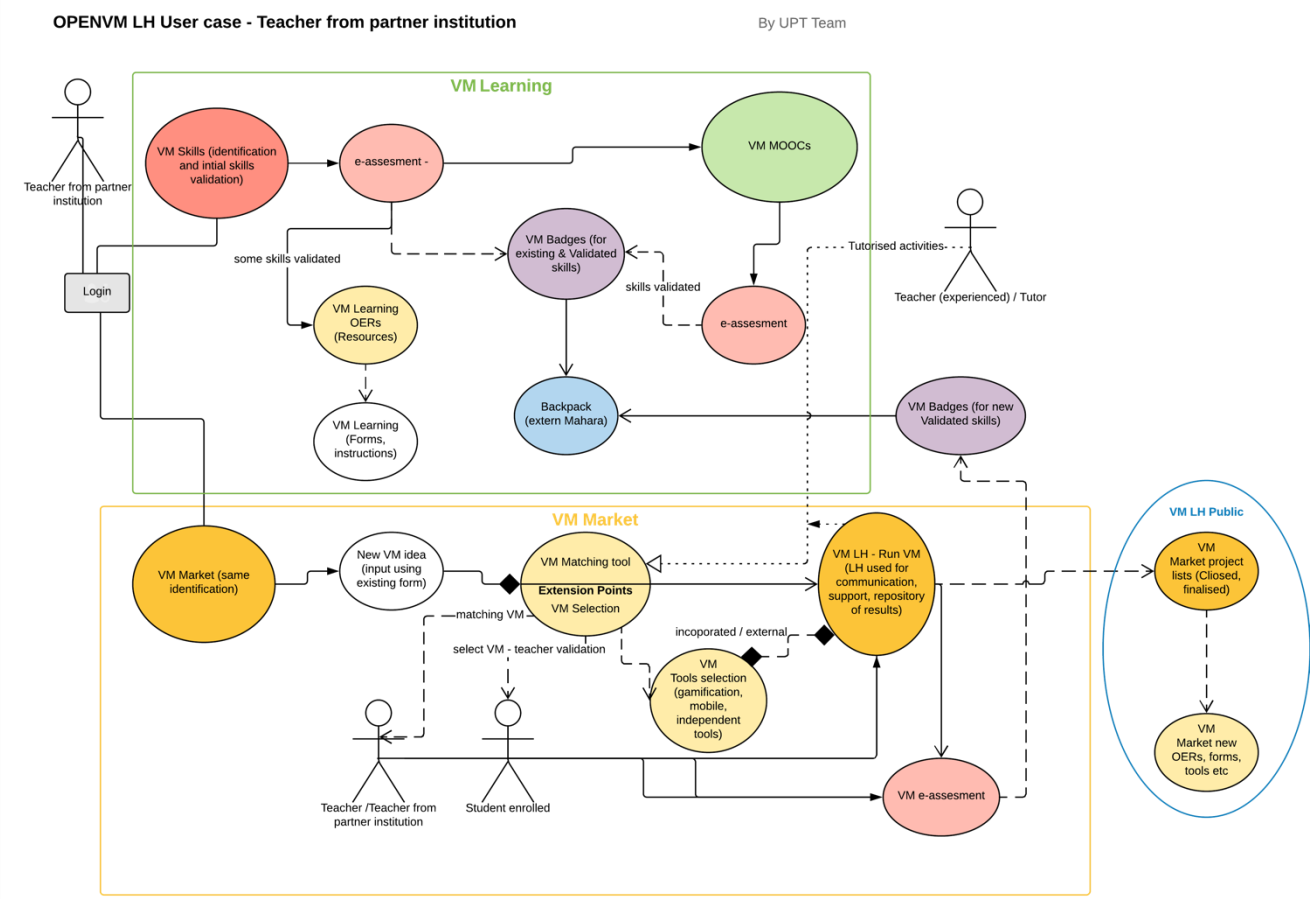

Figure 3. VMLH Teacher from a partner institution scenario

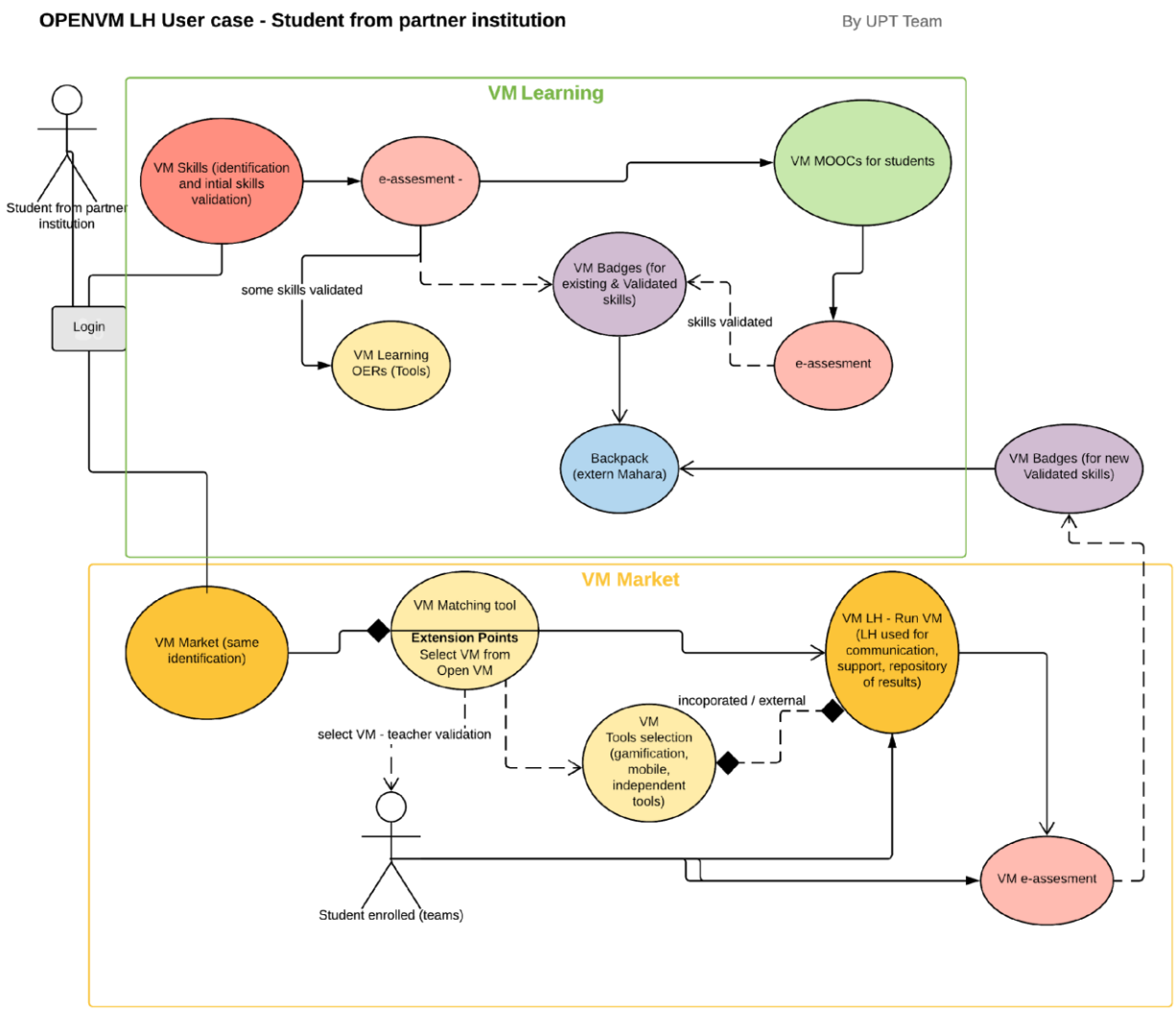

Figure 4. VMLH Student Scenario

5. Next steps

The next steps will include the continuous validation of this concept, user cases and functionalities.

Disclaimer

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International Association for eScience. Part of this work will also be part of an IEEE article.

References

Academy by Moodle
https://academy.moodle.net/

Bestr – Digital platform for Open Badges
https://bestr.it/

Logstore xAPI – Moodle plugin, Cineca custom version
https://github.com/CinecaElearning/moodle-logstore_xapi-cineca

Mahara – ePortfolio open-source platform
https://mahara.org

Moodle – the leading open-source Learning Management System
https://moodle.org/

Open edX – free and open-source Course Management System
https://open.edx.org/

Static pages – Moodle plugin
https://moodle.org/plugins/local_staticpage

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M. Sharples, N. Jeffery, J. Du Boulay, D. Teather, B. Teather, and G. Du Boulay, 'Socio-cognitive engineering: a methodology for the design of human-centred technology', European Journal of Operational Research, vol. 136, no. 2, pp. 310–323, 2002.

Attachments

Open VM Learning Hub Live Links

OpenVM Learning Hub Concept and sections

https://mm.tt/1037991785?t=7RUHRep823

OpenVM LH Technical Structure
https://www.lucidchart.com/invitations/accept/1648c383-98a9-4f47-83e7-db69728901ad

OpenVM LH Use Diagram
https://www.lucidchart.com/invitations/accept/a4517185-f733-4ca3-8b11-0f42602c9b15

OpenVM LH User Diagram - Teacher from Partner institution
https://www.lucidchart.com/invitations/accept/e94a31b9-0751-4a2a-92a1-38e3ac412117

OpenVM LH User Diagram - Student from Partner institution
https://www.lucidchart.com/invitations/accept/96198bf8-a791-4111-ad8e-91e84459907e

O2.A1 – Annex 1 VMLH Structure