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The Moodle REST function calls enables third party applications having access to the Moodle database's through Moodle Web services and REST (Representational state transfer) protocols. The access could be as learning content creation. According to Moodle architecture, the learning content creation, need to be placed on Moodle section tables. This is shown, a third party application should make or use the Moodle section when making a course. The "section" is the most essential component on Moodle. Because, the "section" contain documents, assignments, quiz for learners. However, some Moodle REST function calls, such as creating the "section" on Moodle courses, have not been implemented in the Moodle system, yet. And for our current development applications, it need to have an access to create complete learning content on section tables. With developing Moodle plugins, possibly create learning content in the Moodle sections, but needed Moodle REST function call to access developed plugin. Therefore, we propose solutions that developed a Moodle plugin to create learning content and solve an unprovided Moodle REST function call by developed another Moodle REST function call. This paper presents our current development to enable creation of learning content from third party application, using the developed Moodle plugin. As a result, with the developed Moodle plugin, success to create learning content on Moodle LMS, and developed another Moodle REST function call.

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I. Introduction

In 2013, more than 1500 Moodle have been already implemented among 3200 Higher Education Institution (HEI) in Indonesia [1] [2]. Using Moodle in Indonesia, limited by Internet infrastructure matters [3]. Our previous work, describe the importance of developing an authoring supportive tool with that solved two problems. The first problem about ease of use issues, with developed supportive tools, a lecturer could create course, no need complexity configuration compared to installing Moodle on local machines. Second, fit in Indonesia infrastructure, which still having bandwidth gap, and bring consequence that lecturers cannot access Moodle to create learning content on the on-line situation [4]. We propose solutions, enable lecturers to create learning content in off-line conditions, and when Lecturer laptop connected to the Moodle server (through Local Area Network Infrastructure), uploading the created learning content [4]. Those solutions have been implemented by developing third party application and successfully creates course on the remote Moodle Server through Moodle web service. Accessing Moodle through web services is more secure and convenient because administrator does not need configure user password for each lecturer. One way to access Moodle web service is using Moodle REST Function Call [4].

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- **Gul Tokdemir**, Cankaya University, Ankara, Turkey
- **Carmen Celina Torres Arcadia**, ITESM, Campus Monterrey, Monterrey, N L , Mexico
- **Manuel Travassos Valdez**, Instituto Superior de Engenharia de Coimbra, Coimbra, Portugal
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- **Luis Zorzano**, Universidad de La Rioja, Logroño, Spain
- **Susan Zvacek**, FHSU, Hays, United States

4C: Infrastructure and Technologies for Engineering Education (Full Papers)

Time: 09:00 - 10:30

Chair: Titov, Igor, Bauman Moscow State Technical University (BMSTU)

Location: Malazgirt 2

Presentations

Title: [Authoring Learning Designs: The Expressiveness of IMS LD and Collaboration Supports](#)

Author(s): Nurjanah, Dade

Organisation(s): Telkom School of Engineering, Indonesia

Presenter(s): Nurjanah, Dade

Abstract: To date, learning technologies have offered new opportunities to meet the needs of learners and teachers on learning systems that support collaborative and adaptive-personalised learning. These opportunities, however, come with challenges regarding the provision of learning resources. There are two issues: authoring approaches and the pedagogical expressiveness of knowledge representations. This paper discusses the pedagogical expressiveness of IMS LD for collaborative and adaptive-personalised learning. Furthermore, it proposes a collaborative authoring approach that can support learning designers to work effectively. Collaborative, rather than individual, authoring approach is taken into account regarding the complexity and the huge volume of learning resources. A qualitative experiment we conducted shows that learning designers can work effectively in asynchronous collaborative work with implicit coordination and awareness supports.

Title: [A review of webapp authoring tools for e-learning](#)

Author(s): Latorre, Miguel (1); Robles-Gómez, Antonio (2); Rodríguez, Luis (3); Orduña, Pablo (3); San Cristóbal, Elio (1); Caminero, Agustín C. (2); Tobarra, Llanos (2); Lequerica, Irene (1); Ros, Salvador (2); Hernández, Roberto (2); Castro, Manuel (1); López-de-Ipiña, Diego (3); García-Zubía, Javier (4)

Organisation(s): 1: Electrical and Computer Engineering Department, UNED, Spain; 2: Control and Communication System Department, UNED, Spain; 3: DeustoTech – Deusto Institute of Technology, University of Deusto, Spain; 4: Faculty of Engineering, University of Deusto, Spain

Presenter(s): Caminero, Agustín C.

Abstract: This paper aims to review the existing web application toolkits for distance education. In particular, we analyze their main features, requirements and issues, as well as the most promising areas for future improvement in this field.

Title: [From manuals towards product embedded interactive learning environments](#)

Author(s): Puchleitner, Thomas; Petrovic, Otto

Organisation(s): University of Graz, Austria

Presenter(s): Petrovic, Otto

Abstract: Late developments in information and communication technology show high impact on current implementation of technical documentation. The traditional use of technical documentations was solely defined as technical product information to aid the customer in cases of product learning or handling product malfunctions. Embedding technical documentation into the actual product opens new potentials for consumer learning as well as for various marketing purposes. For private sectors, in form of consumer electronics, and also for business scenarios like testing facilities or manufacturing installations, embedded learning environments enrich the product and open communication channels. By implementing feedback channels, interactive systems can be developed, providing useful information for users and letting businesses gain insights into product usage behaviors at the same time. We identify seven relevant factors for successful implementations of such systems. First implementations for diverse branches to demonstrate the current state-of-the-art in embedded interactive learning environments are depicted. In a critical analysis regarding the selected cases, current limitations and future potentials are highlighted. Finally, we focus on the product engineer's perspective. Utilizing the product as major communication channel expands the engineer's responsibilities, requiring new knowledge in business communication. A paradigm shift in the education of engineers is depicted as consequence of future developments.

Title: [Developing Moodle Plugin for Creating Learning Content with Another REST Function Call](#)

Author(s): Kautsar, Irwan Alharus (1); Kubota, Shin-Ichiro (2); Musashi, Yasuo (1); Sugitani, Kenichi (1)

Organisation(s): 1: Kumamoto University, Japan; 2: University of Miyazaki, Japan

Presenter(s): Kautsar, Irwan Alharus

Abstract: In Moodle Learning Management System (LMS), the REST function calls enable third party applications to access to the Moodle LMS database. However, some REST function calls have not been implemented in the Moodle system, yet. For example REST function call to create sections on Moodle course. Creating section is needed, because, learning content on Moodle need to be placed on section, according to Moodle architecture. Therefore, we developed unprovided Moodle LMS REST function calls as Moodle plugins. This paper presents our current development to enable creation of learning content from third party application, using our own developed Moodle plugin.

Developing Moodle Plugin for Creating Learning Content with Another REST Function Call.

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Abstract— The Moodle REST function calls enables third party applications having access to the Moodle database's through Moodle web services and REST (Representational state transfer) protocols. The access could be as learning content creation. According to Moodle architecture, the learning content creation, need to be placed on Moodle section tables. This is shown, a third party application should make or use the Moodle section when making a course. The "section" is the most essential component on Moodle. Because, the "section" contain documents, assignments, quiz for learners.

However, some Moodle REST function calls, such as creating the "section" on Moodle courses, have not been implemented in the Moodle system, yet. And for our current development applications, it need to have an access to create complete learning content on section tables. With developing Moodle plugins, possibly create learning content in the Moodle sections, but needed Moodle REST function call to access developed plugin. Therefore, we propose solutions that developed a Moodle plugin to create learning content and solve an unprovided Moodle REST function call by developed another Moodle REST function call.

This paper presents our current development to enable creation of learning content from third party application, using the developed Moodle plugin. As a result, with the developed Moodle plugin, success to create learning content on Moodle LMS, and developed another Moodle REST function call.

Keywords— Moodle, LMS, REST Function Call.

I. INTRODUCTION

In 2013, more than 1500 Moodle have been already implemented among 3200 Higher Education Institution (HEI) in Indonesia [1][2]. Using Moodle in Indonesia, limited by Internet infrastructure matters [3]. Our previous work, describe the importance of developing an authoring supportive tool with that solved two problems. The first problem about ease of use issues, with developed supportive tools, a lecturer could create course, no need complexity configuration compared to installing Moodle on local machines. Second, fit in Indonesia infrastructure, which still having bandwidth gap, and bring consequence that lecturers cannot access Moodle to create learning content on the on-line situation [4]. We propose solutions, enable lecturers to create learning content in off-line conditions, and when Lecturer laptop connected to the Moodle server (through Local Area Network Infrastructure), uploading the created learning content [4]. Those solutions have been implemented by developing third party application and successfully creates course on the remote Moodle Server through Moodle web service. Accessing Moodle through web services is more secure and convenient because administrator does not need configure user password for each lecturer. One way to access Moodle web service is using Moodle REST Function Call [4].

The completed Moodle learning content, consist the section, and the learning formats. The developing third party application, only successful creates course. And found the problem that not all Moodle REST Function Call is available yet, in order to create complete learning content. This paper present work in progress to solve this problem by developed two plugin, one is to create learning content, second is create external Moodle REST Function Call to access the created learning content.

The structure of this paper present as follows. Section II will outline the used of REST Protocol by Moodle LMS. Section III, describe our method and work to implement REST Protocol on Moodle and the experimental result. Conclusions and future work, will be explained in Section IV.

II. MOODLE LEARNING CONTENT, REST FUNCTION CALL AND PROBLEM ANALYSIS

A. Moodle Learning Content.

Each learning content, is defined on Moodle course. On Moodle course itself, each learning session, placed in space called section [4]. Within each section consist learning activity or resource. According to Moodle database, each learning content, defined by three kinds of table's. First, Moodle course tables. This table stores the identity of each course. For example, name of course and description, but not the learning content. This table named "mdl_course". Second, called section, this table named "mdl_course_section". Third, within each section, the author should define the learning activity. This learning activity, by default provided in 12 kinds of format. For example Scorm, Quiz and Forum. Depend on the format of learning activity, each format will be stored in a specific table. For example, learning activity format such as SCORM, will be stored in "mdl_scorm". In shorthand, while doing creation a complete Moodle learning content, Moodle will store data on those three kind of tables [4][5]. The connection between Moodle Course, Section and learning activity, illustrated in Figure 1.

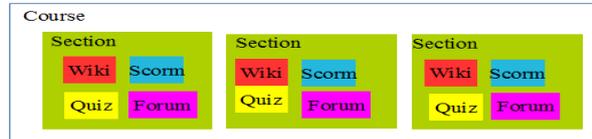


Fig. 1. Architecture of Moodle Learning Content.

B. REST Function Call

Accessing Moodle database (create, read, update and delete), instead of using user and password, it can be done by using REST Protocol [6][7]. The REST Protocol on Moodle, using function called "REST Function Call". This possibly our third party application uses Moodle Web Service to request the specific record of Moodle Database. For example, request data of Moodle course with REST function call named "core_course_get_courses". To use those REST Function Calls, need other information such as, Moodle server address and token that provided by Moodle. Combining Moodle server address, token and REST function call, into the single Uniform Resource Identifier (URI), could request Moodle data. Example URI to obtaining Moodle course data from Moodle server shown Table I.

TABLE I. EXAMPLE URI REQUEST MOODLE DATA.

URI
http://localhost:8888/moodle/webservice/rest/server.php?wstoken=3a5ae337b990d6dd4f5edfd336b94f3a&wsfunction=core_course_get_courses&options[ids][0]=2

The URI above consist of three components: 1. Moodle Server Address: <http://localhost:8888/moodle>, 2. Token: 3a5ae337b990d6dd4f5edfd336b94f3a, 3. Moodle Rest Function Call: core_course_get_courses. Next, the server will be respond requested data. The example of requested data, shown in Figure 2.

```

-<RESPONSE>
-<MULTIPLE>
-<SINGLE>
  -<KEY name="id">
    <VALUE>2</VALUE>
  </KEY>
  -<KEY name="shortname">
    <VALUE>AED</VALUE>
  </KEY>
  -<KEY name="categoryid">
    <VALUE>1</VALUE>
  </KEY>
  -<KEY name="categorysortorder">
    <VALUE>10003</VALUE>
  </KEY>
  -<KEY name="fullname">
    <VALUE>AED - Important to know it</VALUE>
  </KEY>
  -<KEY name="idnumber">
    <VALUE/>
  </KEY>
  -<KEY name="summary">
    <VALUE><p>Learning how using and practising AED</p></VALUE>
  </KEY>

```

Fig. 2. Moodle Server Respond.

C. Problem Analysis

In II.A, mentioned that, in order to make one complete learning content, should have an access in several tables on Moodle Database. Recently, we have been analyzed that, not all REST Function Calls were provided by Moodle. The needed REST function calls that have not been provided by Moodle, shown in Table II.

TABLE II. REST FUNCTION CALL BY MOODLE LMS.

No	Activity	REST Function Call	Accessed Table
1	Create Course	core_course_create_courses	mdl_course
2	Update Course	core_course_update_courses	mdl_course
3	Create Section	Not Available	mdl_course_section
4	Update Section	Not Available	mdl_course_section
5	Create Wiki	Not Available	mdl_wiki
6	Update Wiki	Not Available	mdl_wiki
7	Create SCORM	Not Available	mdl_scorm
8	Update SCORM	Not Available	mdl_scorm

According to Table II, found the problem that, not all REST Function Calls are provided by Moodle LMS, for example the REST function call to create a section. Creation or access a section table (mdl_section) is needed, because learning activity needs to placed on Moodle section. Although, the development of a REST Function Call to create a section, has already been proposed by Moodle Developer, but not implemented yet [8].

Other problems, are creations of learning activities. Learning activities are important elements on Moodle, because in this learning activity, the lecturer will be implemented, what activity will be done.

III. METHOD AND EXPERIMENT RESULT

Within Moodle web service support REST Protocol and provided REST function call, possibly access Moodle through mash up methods [9][10]. This mean, our third party application, could request Moodle data source from one or two REST function calls by use Moodle plugins. Our proposed method, solve the limitation by developing a plugin to create our own learning activities. Next, access the plugin with external REST function call. Development of the external REST function call, could be done by adding web service to some plugin [7]. Two plugins have been developed are:

A. The xlmsmemod plugin.

This plugin has been developed with the purpose to create learning activities from outside Moodle through Moodle web services. Appearance after installing on Moodle, shown on Figure 3.

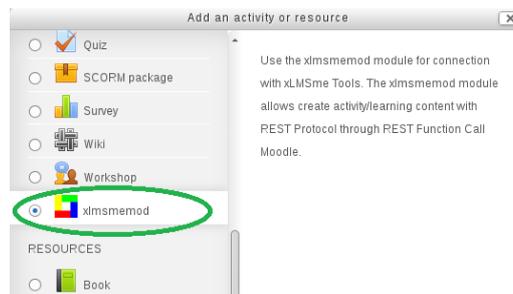


Fig. 3. The xlmsmemod plugin.

While installed, this plugin will create new tables called mdl_xlmsmemod on Moodle database. In order to test the effectiveness of creating a plugin and gain information relationship between Moodle core tables, we do experiment by creating example activity on xlmsmemod plugin, with this following parameter (described in Table III). As the results on the database, shown in Table IV.

TABLE III. PARAMETER FOR EXPERIMENT ON THE XLMSMEMOD PLUGIN.

Parameter	Value
Name	Course8-1-1
Descriptions	This content is on course 8 section 1 number 1

And figure 4 shows have successfully created a learning activity with The xlmsmemod plugin.

Our experiments target is not to document the relationships, but need to understand the prerequisites of what records to be inserted in the related table's, and what tables need to be affected, in order to make learning content/activity from our current development supportive tool.

Our target is answer a research question “Did we only need insert one record to ‘mdl_xlmsmemod’ table, as an alternative way to create learning activity with the xlmsmemod plugin instead of create Moodle sections?”.

For the second experiment, we were inserted records manually in Moodle Database through database editor and inserted with a parameter that shown in Table V.

TABLE V. PARAMETER FOR 2ND EXPERIMENT.

Parameter	Value
Name	Course8-1-2
Descriptions	This content is on course 8 section 1 number 2

The results are an activity not shown successfully as shown as Figure 4.

Next experiments, we inserted value from Table V, into related tables as same as Figure 5 and Figure 7. The result is an activity still not shown successfully as shown as Fig. 4.

From here, we found that in order to make learning content/activity, not only insert record on “mdl_xlmsmemod”, “mdl_course”, “mdl_course_sections” “mdl_course_modules”, but also other records in another table's in the Moodle database that's not described yet in Figure 5.

B. The xlmsmemodws plugin.

Second plugin's has been developed was The “xlmsmemodws” plugin. The main function of this plugin is to access The xlmsmemod plugin, which The xlmsmemod plugin is having an access directly to Moodle Databases.

To avoid an ambiguity in naming the plugins, we called second plugin “xlmsmemodws”, with “ws” means “web services”, as same as of its functions that enable access mdl_xlmsmemod table through external Moodle REST function call or Moodle Web Services.

The results of developing second plugin's are successfully creating new external REST function call, called “xlmsmemod_create_activity”. This REST function call, successfully showing its parameter in Moodle API Documentations as shown in Figure 8.

```

xlmsmemod_create_activity
Creates new activity to xlmsmemod resource

Arguments
xlmsmemod (Required)

General structure
list of (
  object {
    id int //id of xlmsmemod
    course int //course id
    intro string //activity description text
  }
)

XML-RPC (PSP structure)
[xlmsmemod] =>
  Array
  (
    [0] =>
      Array
      (
        [id] => int
        [course] => int
        [intro] => string
      )
  )

REST (POST parameters)
xlmsmemod[0][id]= int
xlmsmemod[0][course]= int
xlmsmemod[0][intro]= string
  
```

Fig. 7. Developed REST function call.

While developing Moodle plugins, we found some issue that's not documented in Moodle references. This possibly consuming researcher time, to solve other problems while developing Moodle plugins. The issue is the use of dash character “-“ for naming the developed plugin, will cause Moodle not detect the new plugin that being installed.

IV. CONCLUSION AND FUTURE WORKS

With new external REST Function Call for creating learning activity, open an opportunity obtained mash up applications from Moodle web services.

Other issues need to be addressed are the correct relationships within the table that created by external plugin and Moodle core table. Then confirmed with learning activity has to be successfully shown by inserting record manually in Moodle Database, instead of through Moodle section's interfaces.

By developing synchronization methods from our current development third party application to Moodle, became our approach towards interoperability the use of Moodle that fit with Indonesia internet infrastructure.

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