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**PROYECTO FIN DE CARRERA**

Desarrollo y uso de la librería MoodPhyt para la creación de

aplicaciones que interactúen con Moodle vía REST

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Summary

This document contains the description and development process of the Moodle Web Services Python Library. Firstly, it will be introduced the project itself with its motivation, its field, characteristics and its main objectives. Then, the document structure will be seen, listing each one of the chapters and summarizing their contents.

This is a summary of project’s structure:

* In first place, the starting Moodle's development point will be seen, which are his characteristics and what can be done with them.
* After that, it will be analyzed what kind of programs usually use Moodle as an external application and how they interact with it to work.
* Later, this python library solution will be explained. Also it will be said how external applications interacting with Moodle can be developed.
* Finally this library development process will be seen, his API and some examples of its use.

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# Introduction

This chapter summarizes preliminary information that the reader must acquire for a complete understanding of this document.

Throughout this document Moodle’s requirements, its main characteristics will be seen, its web services plug-in, the REST protocol sentences to interact with it, the python code to do it and diverse functionality provided by this python library.

**Project motivation**

Moodle has become a popular teaching support system all around the world. This and the increase of mobile capacities to interact with many systems in the web have made appear new applications for Moodle.

Because of this, Moodle developers decided to include some additional functionality to allow external applications work with Moodle since version 2.0.  
These functions are implemented as a Moodle plug-in, and its functionality initially was limited.

Later, the available functions list was extended on version 2.5, so you can do many things that Moodle can do but with this external service (for example, create courses, create group users or get submitted files).

However, the use of this Moodle functionality requires some advanced knowledge about Moodle functionality and REST or other applications data exchange protocols.

This project tries to give some tools to configure Moodle easily to get this functionality with a python library. This will provide some abstraction to users, so they can ignore Moodle’s communication process.

**Project Field**

The project is a Moodle Web Services Python Library, so the project fields are some Moodle parts (users’ roles, web services plug-in, enable REST protocol, API documentation, etc.), python code to connect with Moodle and how to make requests to get Moodle’s correct answers. Also it will be seen how to get answers in JSON format, to facilitate the data extraction.

**Project Objectives**

This library has been made to provide some external functions to facilitate the development of applications that interact with Moodle and to exploit this Moodle functionality.

However, Moodle system must be configured properly in order to that the library works correctly. So, a part of this memory is reserved to explain how to configure Moodle to work with this library.  
Also, to use this library you need to have accounts in your Moodle site, and users’ permissions changes this library behavior. In this way, it will be seen these permission repercussions over the library functionality.

Even though you have to take into account some factors in the Moodle’s configuration to use this library, this is not a Moodle use tutorial, so, only Moodle’s necessary sections to understand this project will be told.

Furthermore, the data structures returned by this library functions will be analyzed so the users will know how to obtain and manipulate the information they want.

**Memory sections**

As stated above, one goal of this project is to use the Moodle system with external applications.

To do this, the first step is study how to use Moodle. Logically, to do that first this Moodle system has to be installed. But this is not an objective this project, so this part will be summarized and referenced to some external official documentation, where this installation process is explained in detail.

Then, Moodle must be configured so it can receive and answer requests from other applications. In this step it will be seen the different protocols that can be used to do this, but after that we will assume that the protocol used will be the REST protocol. On that time, it will be analyzed Moodle’s permissions, administrated with system roles for users. It will be sown how these permissions affects at answers given by Moodle too.

Once Moodle has been adequately configured, study of communication process will be started.  
First it will be shown the options to get information from Moodle, and some application examples which use these options.  
One of these options is the web services plug-in. This will be the service used to interact with this python library.

There are 2 parts in this communication process. The first one is the authentication process, where a user has a password associated to a web service with some specific functions. The second one is the request itself, and the response will depend of the user capabilities.

After that, the request and responses involved in this communication will be studied, what data needs the web service and what data returns. In this step it will be show how to do that responses will be in JSON format, in order to facilitate the data extraction in python code.

Once this is done, web services API will be analyzed, and will see how to create some functions in python to do the library. These functions will have the same functionality than the functions provided by the Moodle’s web service.

Lastly we will see the library’s API, the functions implemented, their functionality, the parameters necessaries to use them and the data returned by these functions.

# State of the art

On this chapter it will be seen the different kind of applications for Moodle and how they work to get the information they need to work. After that it will be shown the solution to this problem chosen in this project and other possible solutions.

## Parsing HTML applications

Moodle web services are an additional functionality added to Moodle on its version 2.0 and later version. However, Moodle applications development started before this plugin exists, so they cannot use this system to interact with the Moodle system. Instead of this, they usually do a parsing the HTML got from a normal HTTP request to get the information they want.  
Those applications usually search through the HTML file some specific strings or HTML *tags* to get specific information, like the tag used to get the user’s name logged in or the courses shown in the main page. They take the links necessary to navigate in the Moodle site from this HTML, so they get the information like a normal web explorer would do.  
With this, the applications can work without any additional system and be compatible in different web pages without configuring anything.  
However, those applications have some important problems. One of them is that they could not work in some Moodle places because of changing their appearance or version will affect to the HTML received. This could cause that those strings used to search the information necessary to the application will not be found, and make a malfunction of the application.  
Also, the HTML processing can be very complex in some cases, with all the problems that this processing could bring.  
Another disadvantage is that each request gets the entire HTML file so much information is dropped because an external application do not need it (for example, the information used to show the elements in the web browser or that related with the page visual design). This carries several problems like using more bandwidth than necessary and therefore more delay in the obtaining data process.

Besides, the Moodle site cannot differentiate between users navigating with normal web browsers and applications that work on this way.

Look more: Application with HTML parsing: <https://github.com/praveendath92/MDroid>

## Using Moodle Mobile app

Another option to do this is to use the Moodle Mobile app web service. This solution is similar to the chosen one in this project. As its name indicates, this option uses a special Moodle web service developed for mobile applications. This service has some predefined web services functions and is available in the Moodle site by default since Moddle web services were implemented. However, like every web service, enabling web services option must be checked in the Moodle site to use it.

This web service functions are unchangeable and limited, not every web service function can be used with this service. Because of this, in this project is decided to use generic Moodle web services, with which ones you can add every function available and exploit all this Moodle plugin.

<https://play.google.com/store/apps/details?id=com.moodle.moodlemobile>

## Using other web services

A library similar to the one done on this proyect: <https://github.com/zikzakmedia/python-moodle>

**What is Moodle**

Moodle is an open source code system used for teaching and learning purposes. It allows creating on line dynamic web pages, creating courses and managing it with the web interface. This made it popular between teachers around the world as a tool to provide resources to students and support teaching. It needs a data base system, a web server and PHP to work properly.

Moodle can work with several data base systems and web servers. Supported data base systems are:

* MySQL (minimum version 5.1.33)
* PostgreSQL (minimum version 8.3)
* MSSQL (minimum version 9.0)
* Oracle (minimum version 10.2)
* SQLite (minimum version 2.0)

Recommended web servers are Apache or IIS. The minimum version of PHP is currently 5.3.2.

<http://docs.moodle.org/23/en/Installing_Moodle>

All images and references to Moodle parts will be done with the standard installation of Moodle version 2.5.

**Moodle’s web interface**

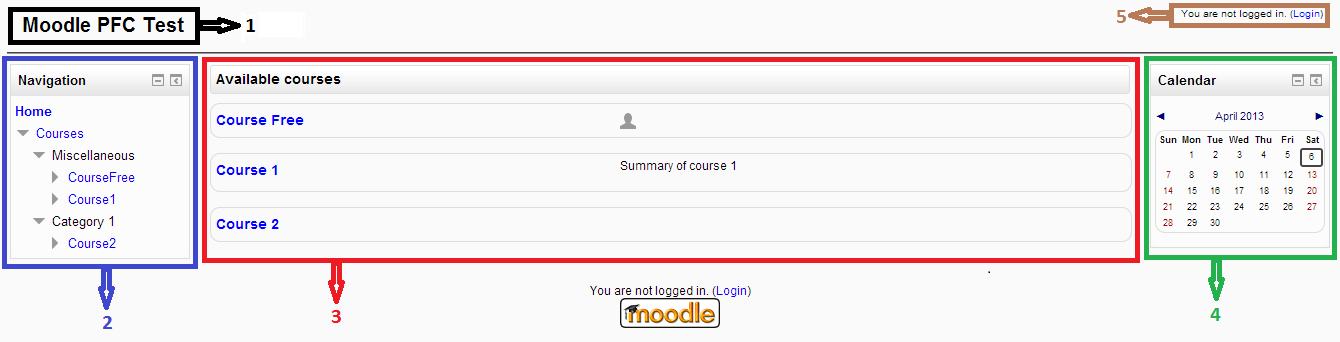
Once we have installed Moodle we see its main page in our web browser. It will looks like this:

Image 1: Moodle’s default web interface

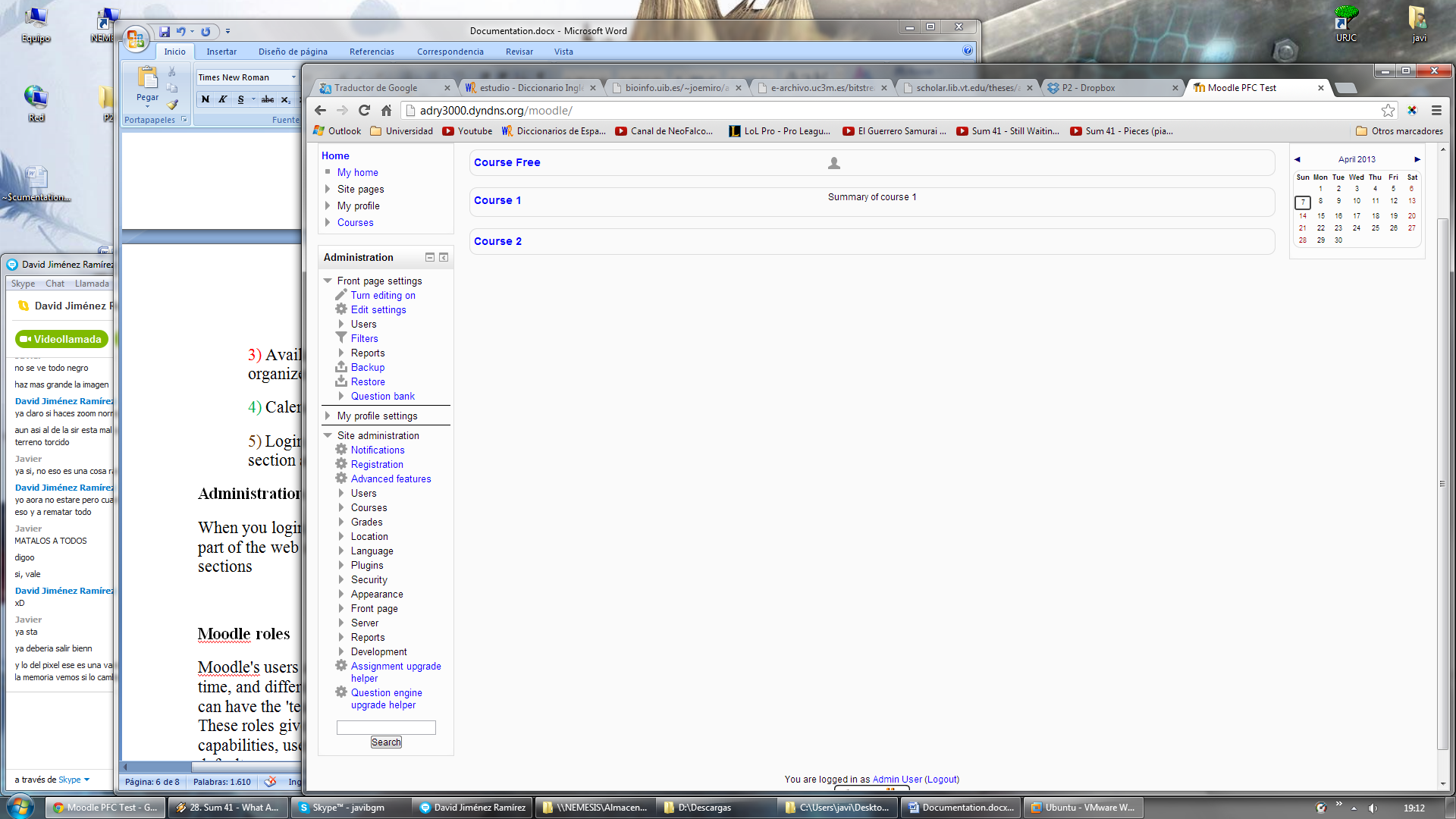
The fields marked are:

1) Moodle’s web site name

2) Navigation panel. With this you can navigate through categories and courses. An administrator can add more resources and panels to this main front page.

3) Available courses on this site. This section can be configured to show courses organized by categories.

4) Calendar panel.

5) Login user information. Once you have logged in you can see your name on this section and access to your user information.

**Administration panel**

When you login with a Moodle administrator account you can configure and modify every part of the web site. You can do this with the administration panel. It is divided in 3 sections:

* With the first section you can configure the web page in which you are.
* The second one is your user profile settings. This section is available for every registered user.
* The last one is where you can configure every part of the Moodle web site. This part is what we are interested in.

**Moodle roles**

Moodle's users are classified by roles. One user is able to have different roles at the same time, and different roles depending on the Moodle's part that he is. For example, one user can have the 'teacher' role in one course and the 'non editing teacher' role in another course. These roles give to users different capabilities on the system. Depending on these capabilities, users will be able to do some changes and consults to the system or not. By default, a user without role doesn’t have any capability on the system, so he can't do anything. The roles are what give the users the chance to do things in Moodle. There are some roles predefined in Moodle:

* Manger
* Course creator
* Teacher
* Non-editing teacher
* Student
* Guest
* Authenticated user
* Authenticated user on front page

These roles can be assigned to work on these contexts:

* System
* User
* Category
* Course
* Activity module
* Block

A category contains courses, and a course contains different type of activities separated in blocks.

<https://moodle.org/about/>

Moodle Web Services:

Moodle web services are additional Moodle modules that let you to use Moodle with other protocols than http such as AMF, SOAP, REST and XML-RPC. These services have been tough for interacting Moodle with other applications.

**Creating an external application using Moodle via Web Services**

* Moodle requirements:  
  REST protocol will be used in this application.

Using web services: <http://docs.moodle.org/24/en/Using_web_services>

To allow users to create and see their own security keys (token) a system role with these user capabilities must be assigned to those users. These capabilities are:

* + users [moodle/webservice:createtoken](http://docs.moodle.org/24/en/Capabilities/moodle/webservice:createtoken) (if not, the administrator must create the token manually for each user for the service)
  + [webservice/rest:use](http://docs.moodle.org/24/en/Capabilities/webservice/rest:use)
  + service required capability (depends of the service, check Settings 🡪 Site administration 🡪 Plugins 🡪 Web services 🡪 Manage services 🡪 Edit)
  + Required capabilities for the service functions.
  + Also, the web service function documentation should be enabled, in Settings 🡪 Site administration 🡪 Plugins 🡪 Web services 🡪 Manage protocols. With this, each user will have the documentation of the functions that they can use depending of their capabilities. If a user does not have the required capabilities to use a function, it will not appear in his documentation page.
* Get web services token:  
  <http://docs.moodle.org/dev/Creating_a_web_service_client>

Service short name info: <https://moodle.org/mod/forum/discuss.php?d=197187>

* Get JSON answers to REST requests: <https://moodle.org/mod/forum/discuss.php?d=204469>  
  In the request you must include the parameter "moodlewsrestformat=json"  
  example: /webservice/rest/server.php?wstoken=1cfc5fsd5a6fa75dfa&wsfunction=core\_webservice\_get\_site\_info&moodlewsrestformat=json

**Moodle web services API**

All information about Moodle web services is available in Settings 🡪 Site administration 🡪 Plugins 🡪 Web services 🡪 API Documentation. This section can be seen only by administrators so they can see the functions they want to activate with the web services in the Moodle site. Normal users only can see the functions they are able to use according with their capabilities with de Documentation link in the Administration 🡪 My profile settings 🡪 Security keys page.  
Here can be seen every function, their description, the structure and description of their input parameters and their return values.

**Errors (check spelling)**

You could get different types of errors, grouped in 2 categories:

* Library exceptions: it will get this kind of errors as a TypeError python exception when it is used wrongly one of the functions provided. For example, if a function needs a list and you give an integer as parameter to this function, you will get a TypeError exception. In the same way, if the request needs specific parameters and these are not provided, a KeyError exception will be thrown. However, if a function needs, for example, some parameters inside an array to work properly and these parameters are wrong it will be received a next type error, because this is not checked by the library.
* Moodle exceptions: once the library has processed the data provided to use a function, the request to Moodle site is done. However, you still can get an error by many reasons: the data requested doesn’t exist on this Moodle site, the requested parameters have wrong data types, are missing required parameters, etc. On this situation, Moodle will get an error message, and the library will throw a ValueError python exception specifying found problems.

**Bugs (check spelling)**

Function: get\_calendar\_events.

Bug: when you get global site events, only get global events if they had been created by the python library. Those created manually via web interface are not recognized.

Function call: MoodLib.get\_calendar\_events(userevents=0)

# Bibliography