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## 1. Terms and Definitions

The description of these terms will be also part of the envisioned category repository.

Terms and Definitions	Explanation
Drupal	Drupal is an open source content management platform powering millions of websites and applications. It's built, used, and supported by an active and diverse community of people around the world.
ECN	edacentrum GmbH
EDA	Electronic Design Automation
Partner platform	There are three existing partner platforms: IP at Design & Reuse, EuroTraining at COREP and Tools & Experts at edacentrum
User	A user is a person visiting the ACCESS or any partner's platform

## 2. Introduction

The goal of work package 5 within the R&D ACCESS Project is to create an infrastructure for collaborative cluster of excellences in form of a modular state-of-the-art Open Source Content Management System. Existing infrastructures such as from Design & Reuse, EuroTraining or the edaTools from the project partners have been extended with a new approach by dedicated interfaces to allow information exchange.

As a result an user will be able to get an overview of existing semiconductor design solutions that are spread over multiple and independent partner platforms without changing his access point.

Projects will be enabled to add or enrich their R&D results outside of their consortia to dissemination platforms that are connected through the ACCESS interface.

Last but not least R&D projects and centres of excellences will be attracted and may be demanded to make use of the ACCESS platform for better dissemination.

The approach that has been developed with the partner platforms Design & Reuse, EuroTraining and edaTools is a full functional example, and could be extended by connecting further platforms. This deliverable describes the interfaces that have to be implemented by further partner platforms to be connected to the R&D-ACCESS platform.

## 3. Interfaces Specifications and Implementation Examples

In general the R&D-ACCESS concept consists of the central R&D-ACCESS platform as a single point of access (Figure 1, top) for the users and multiple connected partner platforms (Figure 1, bottom). One connection between the platforms is achieved by the XML-RPC protocol another connection is established by integrated forms into the R&D-ACCESS platform that are hosted at the partner platforms.

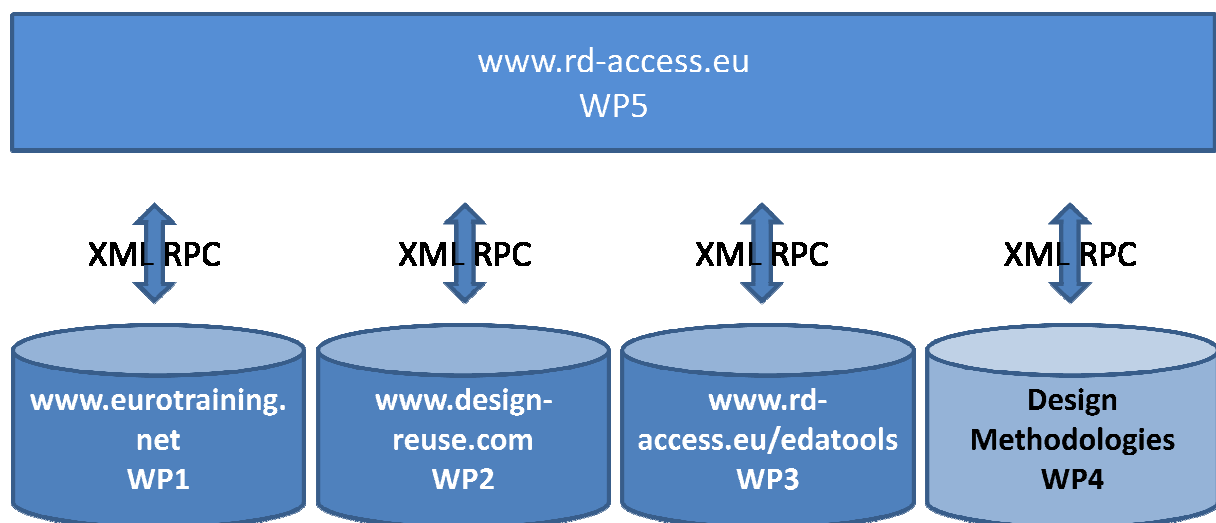


Figure 1: Concept of connecting interfaces

The different interfaces that the R&D-ACCESS platforms provides and the ones that a partner platform has to provide for a successful connection is described in the following.

### Search Interfaces

The R&D-ACCESS platform provides two kinds of search interfaces. One partner platform search page for each platform that does a specific search adapted to the partner platform and one search interface at the R&D-ACCESS platform that does a general search in all connected partner platforms.

A user may use the partner specific search pages by clicking one of the search buttons at the top of Figure 2 or navigate directly to <https://www.rd-access.eu/search-ip>, <https://www.rd-access.eu/search-methodology>, <https://www.rd-access.eu/search-tool>, and <https://www.rd-access.eu/search-training>. To use the general search interface the user has to click the “Search Everywhere” button at the bottom of Figure 2.



Figure 2: Search Interfaces

### Search Everywhere Interface

Search requests will be forwarded to each partner platform (as shown in Figure 1), while the results will be sent back to the R&D-ACCESS platform and be presented there. The following examples have been elaborated by COREP for the Eurotraining platform and may serve as an example for others.

The main idea for the connection between a partner platform and the R&D-ACCESS platform is the information exchange through well formatted documents, giving the R&D-ACCESS platform the possibility to collect a complete and organized list of item descriptions managed by the partner platform. The eXtensible Markup Language (XML) has been chosen since it is a well established standard and has the following advantages:

- Flexibility: different database could communicate with only one abstraction layer.
- Confidentiality: only few information is shared in XML documents.
- Simplicity: the XML meta-language can be manipulated with different programming language (PHP, AJAX, etc.)
- The IP-XACT Standard: Cores description in XML

With XML documents (XML is a set of rules for encoding documents in machine-readable form) partners may provide information to the R&D-ACCESS platform.

As shown in Figure 3 user requests can be collected in groups of Categories, Topics, and Keywords.

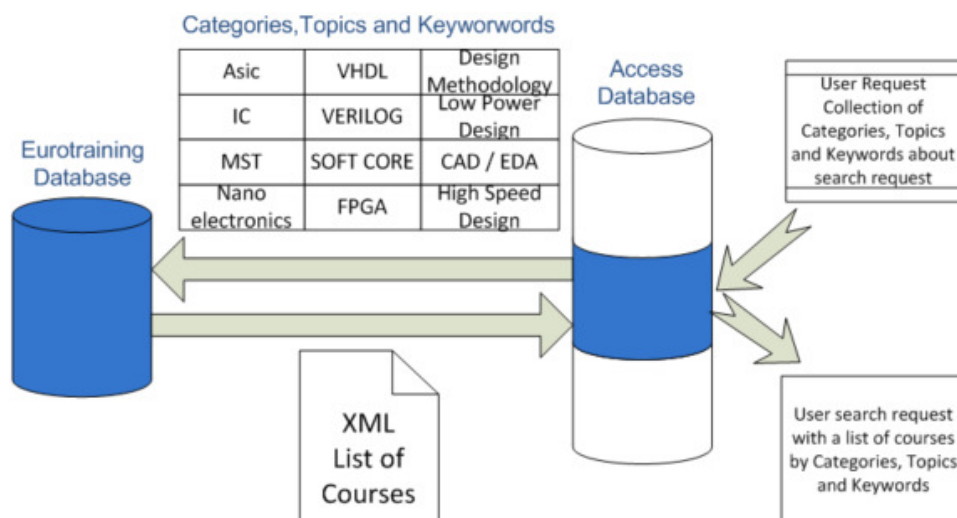


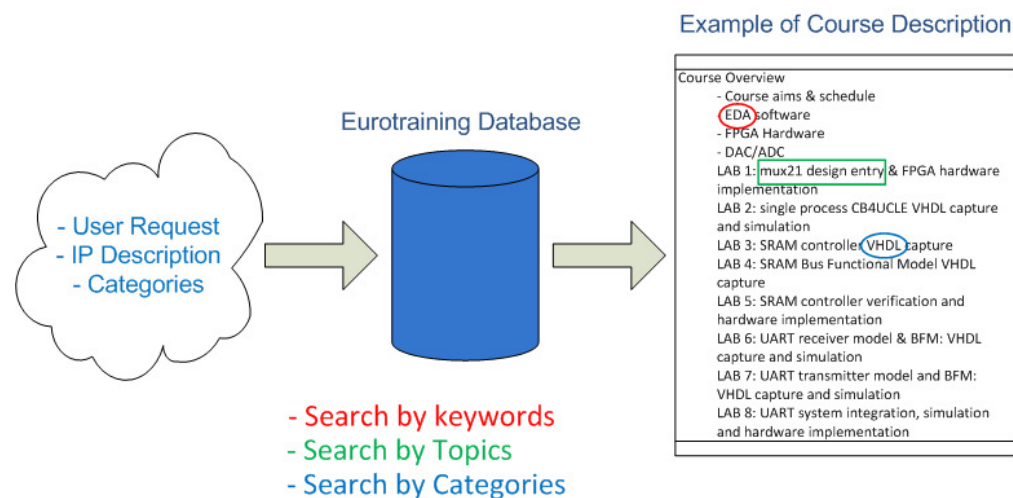
Figure 3: Example of XML Data Exchange

A partner platform has to accept requests of the following syntax:

```
<methodCall>
  <methodName>keywords</methodName>
  <params>
    <keywords>
      <value>
        <string>String with keywords</string>
      </value>
    </keywords>
  </params>
</methodCall>
```

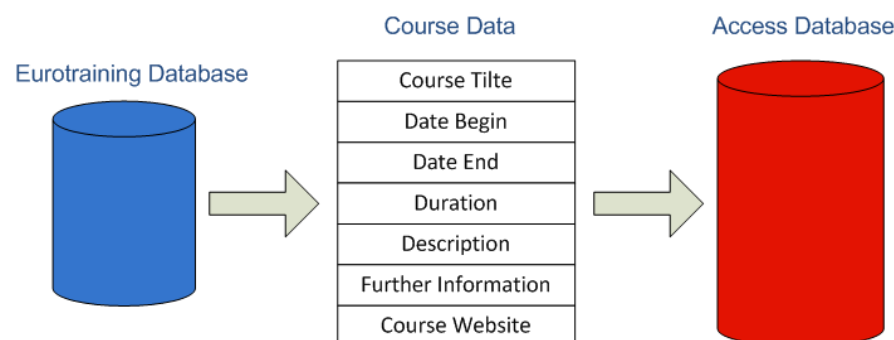
The "methodName" is the search typology (search by keywords), while the "string" field contains the keywords to search the database.

Each connected partner platform receives the query from the R&D-ACCESS platform and elaborates them with an XML parser as shown in Figure 4.



**Figure 4: Example of Communication Client Side**

The reply from the partner server should be a list of XML documents with all data organized in records (Figure 5).



**Figure 5: Example of Communication Server Side**

Those records are stored in a XML document with a couple of tags that describe the type of information. To implement this structure we have developed the following syntax for the answers:

```
<value>
  <struct>
    <member>
      <name>link</name>
      <value><string>Link to Eurotraining Page</string></value>
    </member>
    <member>
      <name>title</name>
      <value><string>Title of the Course</string></value>
    </member>
    <member>
      <name>venue</name>
      <value><string>Course Location</string></value>
    </member>
    <member>
      <name>description</name>
      <value><string>Course Location</string></value>
    </member>
  </struct>
</value>
```

In this answer the “name” tag is the type of information provided to the R&D-ACCESS platform, while the “value” tag represents the value of the information provided.

To exchange this type of document we need a protocol that can manage the XML tags. XML-RPC is a remote procedure call protocol which uses XML to encode its calls and HTTP as a transport mechanism (Figure 6).

XML-RPC works by sending a HTTP request to a server implementing the protocol. The client in that case is typically software wanting to call a single method of a remote system.

Multiple input parameters can be passed to the remote method, one value is returned. The parameter types allow nesting of parameters into maps and lists, thus larger structures can be transported.

Therefore XML-RPC can be used to transport objects or for structuring both input and output parameters.

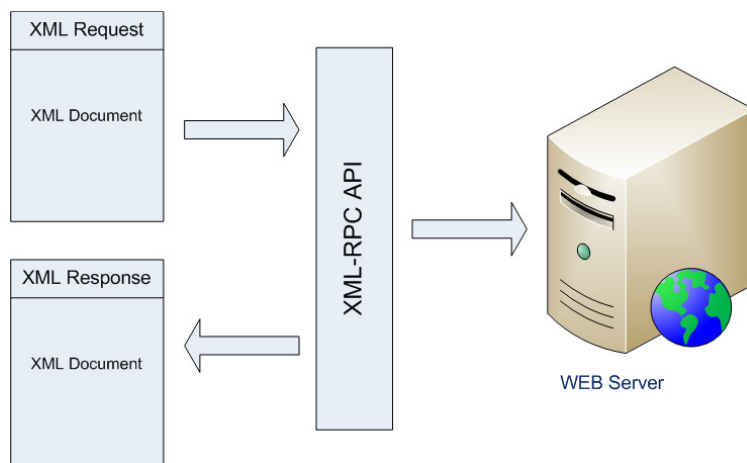


Figure 6: XML-RPC Interface

### Search Options

An XML interface between the EuroTraining and the ACCESS server has been created including the following search engines:

- Search by Keywords
- Search by Date
- Search by Course Main Category
- Search by Course Typologies
- Search by Venue

Through simple XML queries, the ACCESS platform investigates the EuroTraining database in order to extract the requested courses respecting the search criteria input.

The EuroTraining server responds with a list of courses and each of them includes the following information.

- Link to EuroTraining Course Page
- Course Title
- Date Begin
- Date End
- Course Description

The information outcome is formatted in an XML document.

A second XML interface has been created in order to retrieve the following information:

- List of Course Main Category
- List of Course Typology

The ACCESS platform needs this information in order to create scroll-down menus, augmenting the user friendliness as the different course typologies and categories are indicated.

#### *Refinement Category*

After an extensive analysis of the EuroTraining database and the feedback of an interview with potential users, within the environment of professional microelectronic system developers, we defined a set of keywords in order to help the users to identify their requirements.

The intention is to supply, not only a list of courses but also useful information in order for the user, to make a selection among the search results.

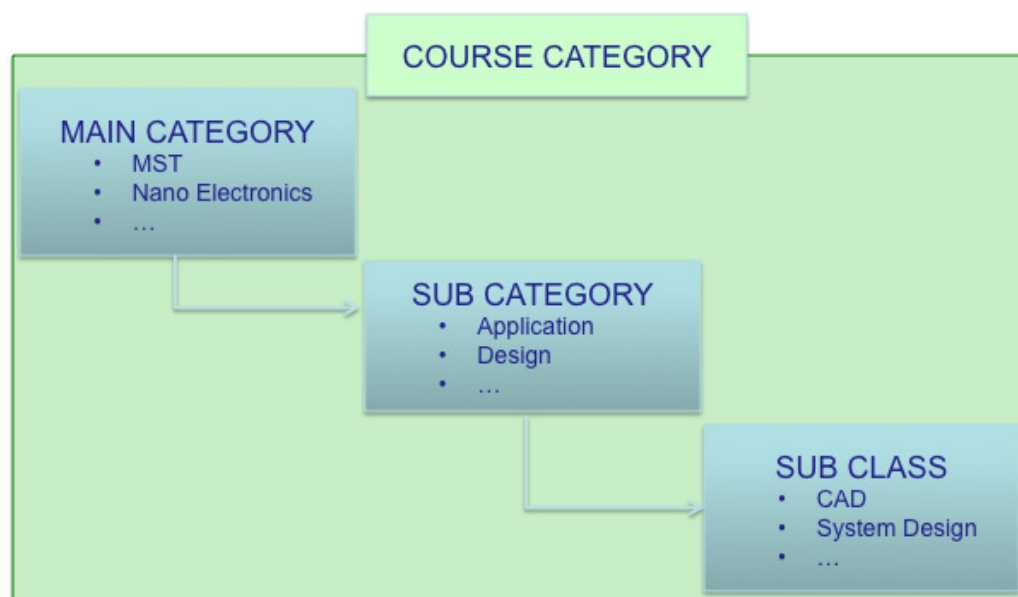
The XML reply from the EuroTraining server includes a set of member value with the information of four refinement categories:

- Course Category (Main Category, Sub Category, Sub Class)
- Date (Year, Month)
- Location (Country, Venue)
- Course Type (ECTS, Quality Labeled, Regular Course)

After performing a keyword based search, it is possible to make a refinement through these categories.

Shown in Figure 7 is the course category classification. After selection of the main category, the ACCESS platform will define the relevant sub-categories. Selection of one of the sub categories will result in a list of courses.

For instance: the Main category is MST, the sub category Design and Methodology and sub class CAD.



**Figure 7: Refinement Category by Course Category**

With the same method, also a date/period based search can be performed by first selecting the year and then the month – Figure 8. Only courses including the following information will be selected by the platform.

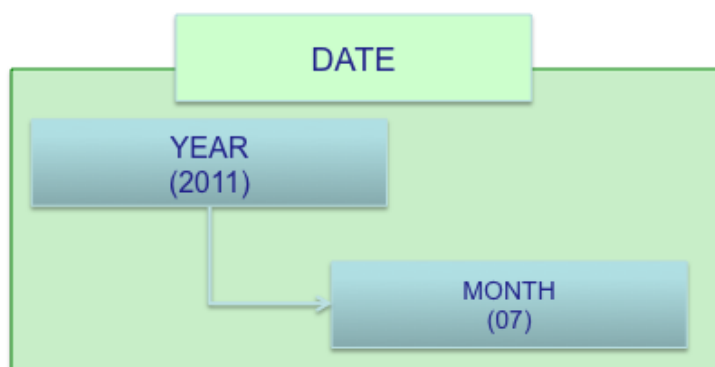


Figure 8: Refinement Category by Course Date

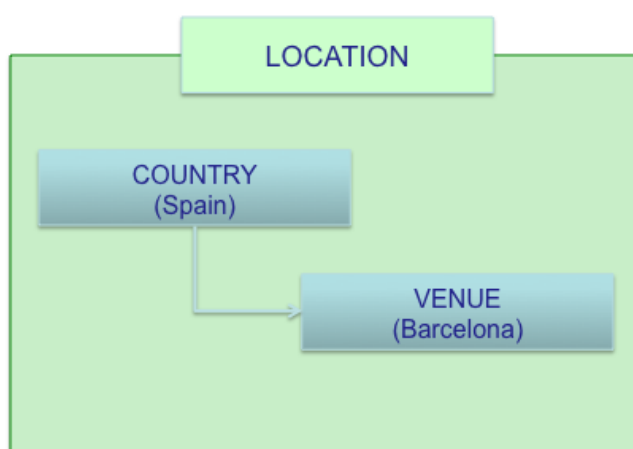


Figure 9: Refinement Category by Course Location

Figure 9 and Figure 10 are showing the course location and course typology categorization.



Figure 10: Refinement Category by Course Typology

For implementing this kind of information the EuroTraining server response to the user requests has been formatted by adding those tags:

```

<member>
  <name>refinementCategory::Name of Refinement</name>
  <value>
    <string>Value for Refinement</string>
  </value>
</member>
  
```

The “name” tag is the kind of refinement with you can select the course belongs to the category (Course Category, Course Type, Date, Location), while the “value” tag represent the category value.

### Platform Specific Search Interface

The platform specific search interface allows the user of the R&D-ACCESS platform to refine a search for specific attributes. While it may be useful to search for a start or end date in the Eurotraining platform it does not make much sense for an IP or Tool platform search. Figure 11 shows the <iframe>-integrated (see next section “Contribution Interface”) specific partner search form from Eurotraining.

#### Search Training

**Figure 11: Platform specific search interface for Training**

The partner platform has to provide the search form in the same way as for the contribution interface, that is described in the next section.

### Contribution Interface

For contributions to the partner platforms a consistent look and feel should be achieved, while taking into account that the partner platform has to maintain the contribution form and that the user of the R&D-ACCESS platform should be provided with a single point of access instead of being redirected to a partner platform with a different look and feel.

The contribution forms are reached by the user by clicking one of the container symbols in Figure 12 below or by navigating to the URLs <https://www.rd-access.eu/contribute-ip>, <https://www.rd-access.eu/contribute-methodology>, <https://www.rd-access.eu/contribute-tool>, and <https://www.rd-access.eu/contribute-training>.

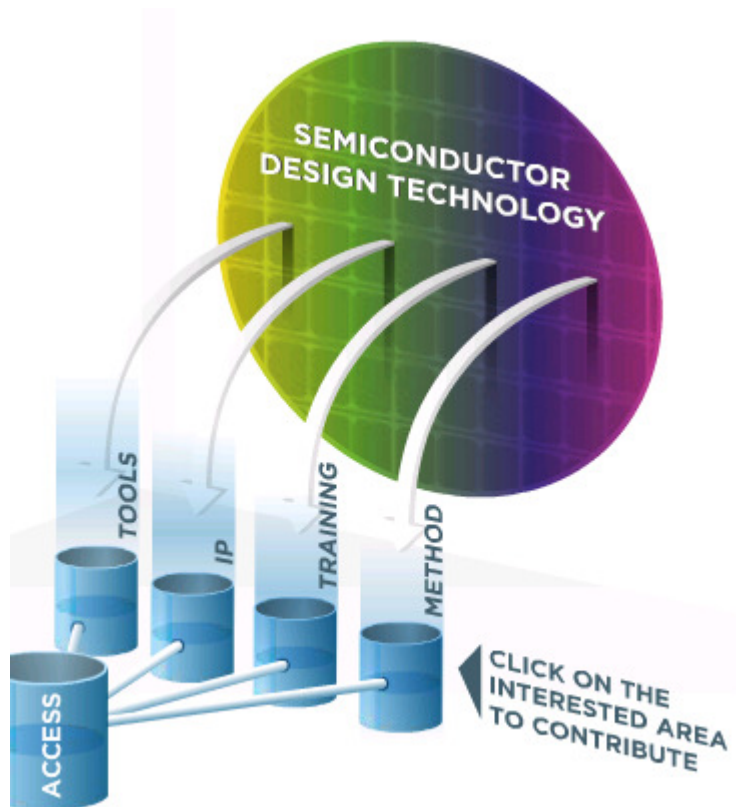


Figure 12: Reaching the contribution forms of the partner platforms

### Implementation at the R&D-ACCESS platform

The partner platform has to provide a HTML form that is integrated to the R&D-ACCESS platform by the `<iframe>` tag. This allows for an independent maintenance of the specific contribution form at the partner platform. Also a consistent look and feel of the R&D-ACCESS platform could be reached. Below the Eurotraining contribution form is integrated as an example.

```
<iframe name="contribute" src="http://www.eurotraining.net/access/insert.php" frameborder="0"
width="600" height="1500">

<p>Your browser is not able to display embedded frames: You can see the embedded page if you
click here: <a href="http://www.eurotraining.net/access/insert.php">Contribute trainings to
Eurotraining</a></p>

</iframe>
```

### Implementation at the partner platform

The partner platform has to provide a contribution form that asks a contributor for each attribute the partner platform has to know to properly insert the contribution into the own platform. This form is specific to the partner platform and should therefore provide. The form has to be coded in HTML. It does not matter if it is a static form or dynamically created as the Eurotraining example shows above (yellow highlighted).

The provided HTML should not make use of CSS and font styles, since this interferences a consistent look and feel of the R&D-ACCESS platform. The dynamically created HTML of the Eurotraining contribution form may serve as an example for others.

```
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN"
"http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
<meta http-equiv="Content-Type" content="text/html; charset=UTF-8" />
<title>Untitled Document</title>
</head>
<body>
<div id="main">
<h1 class="title">Course Module</h1>
<hr size="3" align="left" width="40%" />

<div><br />
```

```

<div align="justify">For a successful and smooth course submission, please read the
following note:
    <span class="black"><b>PDF files</b></span> often contain different characters and
that are not accepted by web forms,
        creating error messages during the submission process. Therefore, if the
course documentation
            is in PDF form, <span class="black"><b>please avoid the copy and
past function.</b></span> (By converting the file into a text file you can use the copy and
paste function all the same)</div>
    <br />

<form method="post" action="ins_course.php">

Course Title (max 100 char): <input name="title" type="text" maxlength="100" size="60" />
<br /><br />
Customised/On Request Course<input type="radio" name="onreq" value="f" checked="checked" />No
<input type="radio" name="onreq" value="t" />Yes<br />

    Distance Learning Course<input type="radio" name="dlearning" value="f" checked="checked"
/>No<input type="radio" name="dlearning" value="t" />Yes<br />
    <br />
Distance Learning Category:
    <select name="distance_cat">
        <option>None</option>
    <option>Documents</option>
    <option>WebCast</option>
    <option>OnLine_Tutorial</option>
    <option>Demo</option>

    </select>

    <br /><br />

Main Category:
    <select name="course_main_class">
        <option>ASIC</option>
    <option>Business & Management</option>
    <option>IC</option>
    <option>MCM</option>
    <option>Microsystems</option>
    <option>MST</option>
    <option>Packaging</option>
    <option>Nanotechnology</option>
    <option>Technical Economics</option>
    <option>Others</option>
    </select>

    <br /><br />

Category:
    <select name="course_class">
        <option>Analogue/Mixed A/D</option>
    <option>Design Management</option>
    <option>Design Methodology</option>
    <option>Digital</option>
    <option>Management</option>
    <option>Manufacturing</option>
    <option onclick="hideText4();">Nano chemistry</option>
    <option onclick="hideText4();">Nano electronics</option>
    <option onclick="hideText4();">Nano devices</option>
    <option>SW Engineering</option>
    <option>Technology</option>
    <option>Others</option>
    </select>

    <br /><br />

Sub Category:
    <select name="course_sub_class">
        <option>CAD</option>
    <option>Cleanroom Engineering</option>
    <option>DSP</option>
    <option>EMC</option>
    <option>FPGA & Gate Arrays</option>
    <option>High Speed Design</option>
    <option>Low Power Design</option>
    <option>MCM Design</option>
    <option>MCM Packaging</option>

```

```

<option>MCM Technology</option>
<option>MCM Test</option>
<option>Microcontrollers</option>
<option>Micromechanics</option>
<option>MST Design</option>
<option>MST Packaging</option>
<option>Micro/Nano biotechnology</option>
<option>Nano labelling</option>
<option>Nano materials</option>
<option>Optics</option>
<option>Packaging (general)</option>
<option>PCB & Packaging</option>
<option>Programming</option>
<option>Recycling</option>
<option>Reliability and Quality Systems</option>
<option>RF & Microwave</option>
<option>Sensors and Transducers</option>
<option>Signal Processing</option>
<option>Synthesis</option>
<option>System Design</option>
<option>Testing & Verification</option>
<option>VHDL & VHDL SW</option>
<option>Others</option>

</select>

<br /><br />

Date Begin (format: <b>dd/mm/yyyy</b>): <input name="date_begin" type="text" maxlength="10"
size="10" /><br /><br />
Date End (format: <b>dd/mm/yyyy</b>): <input name="date_end" type="text" maxlength="10"
size="10" /><br /><br />
Duration Day(s) (max 4 digit): <input name="duration" type="text" maxlength="2" size="2" /><br
/><br />
Language (max 20 char): <input name="language" type="text" maxlength="20" size="20" /><br
/><br />
Venue (max 50 char): <input name="venue" type="text" maxlength="20" size="50" /><br /><br />
Country (max 30 char): <input name="country" type="text" maxlength="30" size="30" /><br /><br
/>
Course Fee (max 4 char): <input name="course_fee" type="text" maxlength="10" size="10" />

Currency:
<select name="currency">
  <option>EURO</option>
  <option>BF</option>
  <option>CHF</option>
  <option>DM</option>
  <option>DKK</option>
  <option>FLUX</option>
  <option>FRF</option>
  <option>ITL</option>
  <option>IRL&#163;</option>
  <option>ISK</option>
  <option>MK</option>
  <option>NLG</option>
  <option>NOK</option>
  <option>PTS</option>
  <option>S</option>
  <option>SEK</option>
  <option>UK&#163;</option>
  <option>USD</option>
</select>
<br /><br />

Discount (max 50 char): <input name="other_discount" type="text" maxlength="50" size="50"
/><br /><br />
Description (max 1000 char):<br /> <textarea name="description" maxlength="1000" rows="13"
cols="60"></textarea>
<br /><br />

Further Information and Contact Person (max 200 char):<br /> <textarea
name="further_information" rows="4" cols="60" maxlength="200"></textarea>
<br /><br />
Web Link (max 200 char):<br /><input name="web_link" type="text" size="60" maxlength="200" />
<br /><br /><br />

<center><input type="submit" value="Submit" class="btn" onmouseover="this.className='btn
btnhov'" onmouseout="this.className='btn'" />

```

```

        <input type="reset" value="Reset" class="btn"
onmouseover="this.className='btn btnhov'" onmouseout="this.className='btn'" />
</center>
<br /><br />
</form>
</div>

</div>
</body>
</html>

```

## Statistics Interface

To provide the user of the R&D-ACCESSSS platform with objective measures about the search basis the statistics block is displayed at the bottom of the right side bar within the R&D-ACCESS platform (Figure 13). The numbers are collected from the connected partner platforms by an XML-RPC request.



Figure 13: R&D-ACCESS Statistics Block

## Implementation at the R&D-ACCESS platform

The following Drupal PHP function “\_get\_platform\_statistics” creates the XML-RPC requests for the connected platforms. After reception of the platforms XML-RPC answers the function “\_show\_platform\_statistics” displays the result with in the R&D-ACCESS Statistics Block. Both functions are retrieving and displaying the statistics block as well as the latest items block.

```

function _get_platform_statistics() {
    global $platforms;
    global $mail_log;

    $body = "<p>SUCCESS: _get_platform_statistics!</p>";

    $xmlrpc_repsonse = array();

    foreach ($platforms as $key => $platform) {
        drupal_set_message("$key: $platform");
        $xmlrpc_repsonse[$key] = xmlrpc($platform, 'getLastCourse');
        $error_no = xmlrpc_errno();
        $error_msg = xmlrpc_error_msg();
        // if ($xmlrpc_repsonse[$key] == FALSE or $xmlrpc_repsonse[$key] == array()) {
        if ($error_no != '' or $error_msg != '') {
            $mail_log[$key] .= "<p>ERROR: $error_no: $error_msg</p>";
        }

        drupal_set_message(print_r($xmlrpc_repsonse[$key], TRUE));

        $matches = $xmlrpc_repsonse[$key];
        foreach ($matches as $counter => $match) {
            $title = $match['title'];
            $link = $match['link'];

            // INSERT latest items to DB
            $query = db_query("INSERT INTO {access_platform_latest} (id, title, url, platform,
timestamp) VALUES (NULL , '%s', '%s', '%s', CURRENT_TIMESTAMP);", $title, $link, $key);
        }

        $xmlrpc_repsonse[$key] = xmlrpc($platform, 'get_items_count');
        $error_no = xmlrpc_errno();
        $error_msg = xmlrpc_error_msg();
        // if ($xmlrpc_repsonse[$key] == FALSE or $xmlrpc_repsonse[$key] == array()) {
        if ($error_no != '' or $error_msg != '') {

```

```

    $mail_log[$key] .= "<p>ERROR: $error_no: $error_msg</p>";
}
drupal_set_message(print_r($xmlrpc_repsonse[$key], TRUE));

$matches = $xmlrpc_repsonse[$key];
foreach ($matches as $counter => $match) {
    $count = $match['count'];

    // INSERT item numbers to DB
    $query = db_query("INSERT INTO {access_platform_items} (id, items, platform, timestamp)
VALUES (NULL , %d, '%s', CURRENT_TIMESTAMP);", (int)$count, $key);
}

_send_mail_log('function: _get_platform_statistics');
_show_platform_statistics();

return $body;
}

function _show_platform_statistics() {
    global $platforms;
    global $statistic_block;

    $content = '';
    $stat_body = '<p>Currently available:</p><ul>';

    foreach ($platforms as $key => $platform) {
        $latest_items = db_query("SELECT DISTINCT title, url FROM {access_platform_latest} WHERE
platform = '%s' ORDER BY timestamp DESC LIMIT 0, 3;", $key);
        // $body = "<p>$key: $platform</p>";
        $body = '<ul>';
        while ($latest_item = db_fetch_array($latest_items)) {
            $title = $latest_item['title'];
            $link = $latest_item['url'];

            $body .= "<li><a href=\"\$link\" target=\"_blank\">$title</a></li>";
        }
        $body .= '</ul>';
        $content .= $body;
        _update_latest_items_blocks("List of latest $key", $body, $statistic_block[$key]);

        $items = db_query("SELECT DISTINCT items FROM {access_platform_items} WHERE platform =
'%s' ORDER BY timestamp DESC LIMIT 0, 1;", $key);

        while ($item = db_fetch_array($items)) {
            $stat_body .= '<li>' . $item['items'] . " {$key}s</li>";
        }
    }

    $stat_body .= '</ul>';
    _update_latest_items_blocks("RD-ACCESS platform statistics", $stat_body, 8);

    $content .= $stat_body;

    return $content;
}

function access_platform_cron() {
    _get_platform_statistics();
    _show_platform_statistics();
}

```

### Implementation at the partner platform

While XML-RPC is supported by many programming languages and frameworks an implementation within the Drupal CMS is straightforward.

First the PHP functions that collect the data and return them have to be registered. This is done by the implementation of a so called hook. This is a function that's name ends in this case with “\_xmlrpc”. This function just has to define the function names that do the rest of the job.

```

function xmlrpc_search_edatools_xmlrpc() {
    $methods['get_items_count'] = 'xmls_get_items_count';
    return $methods;
}

```

```

}

function xmls_get_items_count() {
    $found = array();
    $query = "SELECT COUNT(nid) FROM {node} WHERE type = 'edatool'";
    $found[] = array(
        'count' => db_result(db_query($query)),
    );
    return $found;
}

```

The function “xmls\_get\_items\_count” retrieves the number of tools within edaTools platform and wraps the result within a defined data structure which is later converted by Drupal to the XML-RPC conform message that is sent back to the R&D-ACCESS platform.

## Latest Items Interface

To provide the user of the R&D-ACCESS platform with news about the connected partner platforms the latest-items-block is displayed at the right side bar within the R&D-ACCESS platform (Figure 14, example for edaTools). The data is collected from the connected partner platforms by an XML-RPC request.



Figure 14: R&D-ACCESS Latest edaTools Block

### Implementation at the R&D-ACCESS platform

The implementation is done in the same functions as for the statistics interface. Please refer to the section above to see the implemented source code.

### Implementation at the partner platform

Again the PHP function that collect the data and return them have to be registered. This is done by the implementation of a so called hook. This is a function that's name ends in this case with “\_xmlrpc”. This function just has to define the function names that do the rest of the job.

```

function xmlrpc_search_edatools_xmlrpc() {
    $methods['getLastCourse'] = 'xmls_getLastCourse';
    return $methods;
}

function xmls_getLastCourse() {
    $found = array();
    $query = "SELECT nid, title, created FROM {node} WHERE type = 'edatool' AND status = 1 ORDER BY created DESC LIMIT 0,3";
    $latest_tools = db_query($query);
    while ($latest_tool = db_fetch_array($latest_tools)) {
        $body .= "<li><a href='\"https://www.rd-access.eu/edatools/node/\" . $latest_tool['nid'] . \"'>\" . $latest_tool['title'] . \"</a></li>\"";
        $found[] = array(
            'title' => $latest_tool['title'],
            'link' => 'https://www.rd-access.eu/edatools/node/' . $latest_tool['nid'],
        );
    }
    return $found;
}

```

The function “getLastCourse” searches within the database of the edaTools platform for the latest three tools and wraps the result within a defined data structure which is later converted by Drupal to the XML-RPC conform message that is sent back to the R&D-ACCESS platform.

## 4. Literature

1. **Partners, Project.** *Annex I - Description of Work.* 2009. Grant agreement no: 246633.
2. **COREP and ECN.** *Specification of collaborative network of semiconductor R&D platforms.* Hannover : s.n., 2010. Deliverable 5.1 in M9.

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