

Design and Development of Leap2a based Mobile Application for Displaying, Modifying, and Creating ePortfolio

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ABSTRACT

EPortfolio becomes more widely accepted nowadays and has more flexible and various way to be created in various systems such as Mahara and PebblePad. The need to move user's account data from one system to another in an efficient way becomes more important. To fulfill the need, a small community of system developers has created Leap2A, a simple specification for transferring data between e-portfolio systems and tools. Leap2A has been successfully implemented in the ePortfolio solutions. However, working with ePortfolio still depends on the availability of internet access and in a web based environment. The mobile users will need some more solutions which they can work with their ePortfolio anytime and anywhere.

The purpose of this paper is to create a mobile application for displaying, modifying, and creating ePortfolio based on Leap2a file as an alternative solution. Leap2A file was exported from one ePortfolio system and the content was extracted and analyzed. The users should be able to open and manipulate the information in the Leap2A file using the application, which later should be imported again to the ePortfolio System without problem and without losing their information. The testing showed that the application could open, display, and manipulate user's information contained in Leap2A file. Additional feature was the ability to create new ePortfolio for the user who do not have ePortfolio yet. Both the modified and generated Leap2A file could be imported to ePortfolio system successfully.

Keywords

EPortfolio System, Leap2A standard, Mobile Application

1. INTRODUCTION

With so many ePortfolio platforms available, academists and researchers who already have an ePortfolio account in one system may find the need to move their data to another ePortfolio system in an efficient way. Eportfolio platforms which support the interoperability standard provide the possibility to export and import user account. JISC CETIS and JISC have been working with a small community of system developers to create Leap2A, a simple specification for transferring data between e-portfolio systems and tools. Since 2007 the JISC e-Learning programme has funded a number of pilot projects on portfolio interoperability (PIOP) to test the specification [1]. However, working with ePortfolio still depends on the availability of internet access and in a web based environment. The mobile users will need some more solutions where they can work with their ePortfolio at anytime and anywhere. To overcome the above problem, author

evaluates the possibility of utilizing the Leap2A standard file to be an alternative solution. The purpose of this research is to create a mobile application for displaying, modifying, and creating ePortfolio based on Leap2a file. This is an offline application so the user can work on their EPortfolio anytime and anywhere without internet access. Android platform is used to develop the application.

The paper is structured as follows: in section 2, we provide the theoretical concept of the term EPortfolio System, Leap2A file, and Android Platform. Section 3 presents the analysis of system requirement and the functional to reach this paper goal, section 4 section introduces the design of the architecture in building the application, section 5 describes the implementation of the application development and explains the algorithm used and finally section 6 concludes the paper and indicates the lines of future works.

2. THEORETICAL CONCEPT

2.1 EPortfolio System

An ePortfolio is a digitized collection of artifacts, including demonstrations, resources, and accomplishments that represent an individual, group, community, organization, or institution [2]. Here are some advantages of ePortfolio instead of Paper-based Portfolio:

- easily accessible online (anytime, anywhere)
- password protected
- determine access-right (who and which groups) to view our ePortfolio
- easy to share (just send links to the others)
- ability to add pictures, videos, documents, hyperlinks, and Charts

Furthermore, Roger et al. [3] reveal other advantages that carefully developed electronic portfolios have over more static paper models:

- Efficiency: By developing electronic system to access, store, view, and rate student material the amount of effort to manage the system is minimized.
- Asynchronous access: ePortfolio system is web based and access is made through the local area network using the user's network username and password. This allows the system to be accessed from anywhere at anytime.
- Validation of process: In designing the system requirements for the development of the software, it was found that the process of determining the design requirements forced us to

think through the purpose and scope of the system in ways that actually promoted the efficiency and validity of the process.

- Adaptability: One of the design constraints was that the system be developed to be adaptable to other forms of documentation and assessment.

Self-reflection is an important component of electronic portfolio development. Individuals can have a description of what they have achieved, done, or experienced; their plans and their thoughts or reflections; their personal information, their abilities and qualities; and any additional or supporting information in the form of media files or evidence from any source.

Cambridge [4] points out that “reflection is central to learning”, and the reflective core of sound learning portfolios is what transforms mere accumulated “information” to meaningful “knowledge”. This is followed up by Yancey [5] that “electronic portfolios are created through the same basic processes used for print portfolios: collection, selection, and reflection”.

A person can use an ePortfolio system to generate more than one ePortfolios, which will represent themselves to different viewers and for different purposes. It can be used also to create some artefacts to be shared with teachers, fellow students, potential employers, or even for completing the requirement of an application for getting a research funding.

2.2 Correlation between ePortfolio and Lifelong Learning

Lifelong learning is all learning activity undertaken throughout life, whether formal or informal. The concept of learning in the context of lifelong learning encompasses not only structured learning through school and social education but also learning through involvement in such areas as sports, cultural activities, hobbies, recreation and volunteer activities. The places for conducting learning activities are also diverse, including elementary and secondary schools, universities and other institutions of higher education, citizens' public halls, libraries, museums, cultural facilities, sports facilities, lifelong learning program facilities in the private sector, companies, and offices[6].

The idea of lifelong learning is now almost universally accepted and in recent years there has been a rapid increase in the number of e-portfolio tools and systems in universities and colleges to support lifelong learning.

But technology supported lifelong learning has a fundamental problem; technologies change over a lifetime. For learners moving through the education system it is at points of transition, between school and college, college and university, university and professional body when they will want to move their data from one system to another [1].

There has been increasing recent interest in the potential of e-learning tools and technologies to support more learner centered and personalised forms of learning, prompted in part by national strategies for e-learning and initiatives in favour of lifelong learning and personalised learning. These have all prompted interest in the benefits that e-portfolios may bring to personal development planning (PDP) and to 21st century models of learning, teaching and assessment.

JISC's aim with e-portfolios is to explore and develop effective practice in the use of e-portfolio systems and tools through the co-development of standards and piloting of e-portfolio related technologies and standards. JISC are working in partnership with other sectors and partners to develop the effective use of e-portfolios to support lifelong and life wide learning[7].

2.3 EPortfolio Exchange Format

There are some active specification development groups chartered to define standards for learning technology interoperability:

- ePortfolio (eP)

Standards for exchange of digital information (ePortfolios) that contain evidence of learning, education, training, and life experiences resulting in a more effective matching than traditional resumes of applicants to the offerings of potential employers, admissions offices, and so forth.

Applicable to: All systems that desire to store digital portfolios or exchange these portfolios with other systems - such as ePortfolio systems, learning platforms (LMS, CMS, VLE, IMS), learning portals, assessment systems, student systems, talent management systems, data analytics, social web[8].

- Learning Information Services (LIS)

Standards to support interactions and data exchange between learning systems and administrative, student, or human resource systems, including exchange of course rosters, learner profiles, competencies/learning objectives and learning outcomes.

Applicable to: All learning systems that provide access to online course materials in cooperation with an enterprise administrative system and administrative systems that exchange administrative data and learning outcomes with learning platforms - such as learning platforms (LMS, CMS, VLE, IMS), web-served content, assessment systems, learning portals, group collaboration systems, adaptive tutors, simulations, gaming systems, ePortfolio systems, classroom capture and management systems, student systems, data analytics systems, talent management systems[8].

- Leap2A

Leap2A represents portfolio information as an Atom feed, with optional attachments. An Atom feed consists of entries. One blog post corresponds to one entry. Whether information is represented in entries or in attachments depends on the kind of information [9].

2.4 Android Platform

Aside from the very generous SDK and the well-formed libraries that are available to us to develop with, the most exciting feature for Android developers is that we now have access to anything the operating system has access to. In other words, if we want to create an application that dials the phone, we have access to the phone's dialer; if we want to create an application that utilizes the phone's internal GP, we have access to it. The potential for developers to create dynamic and intriguing applications is now wide open. [10]

Android Application Resources

Android provides a class named Resources class for accessing an application's resources. The Android resource system keeps track of all non code assets associated with an application.



Two different devices, both using default resources.

Figure 1: Android Application Resources

It is always better to externalize the application’s resources such as images and strings from your application code, so that they can be maintained independently. By externalizing the resources, it allows the programmer to provide alternative resources that can support specific device configurations such as different languages or screen sizes, which becomes increasingly important as more Android-powered devices become available with different configurations. [11]

Comparison with other Platforms

Android sits alongside a new wave of mobile operating systems designed for increasingly powerful mobile hardware. Windows Mobile and Apple’s iPhone now provide a richer, simplified environment for mobile applications development. However, unlike Android, they’re built on proprietary operating systems that often prioritize native applications over those created by third parties and restrict communication among applications and native phone data. While Android is an open source software stack produced and supported by the Open Handset Alliance and designed to operate on any handset that meets the requirements. There’s been a lot of speculation regarding a Google-branded Android phone, but even should Google produce one, it will be just one company’s hardware implementation of the Android platform. Android offers new possibilities for mobile applications by offering an open development environment built on an open source Linux kernel. Hardware access is available to all applications through a series of API libraries. [12]

3. ANALYSIS

3.1 Leap2A Specification

Leap2 is a family of specifications that is intended to cover the representation of several kinds of information, centered around individuals, who collect, create, reflect on and use their own information for learning, development, self-presentation, or related purposes. [9]

This information is typically authored or collected by the individuals themselves. It may cover: what they have done, made, achieved, written, or are proud of; what or who helps or has helped them; what they aspire to; what they are good at; evidence for and reflections on any of these; and perhaps input from other people. Learning materials often have copyright restrictions, but in general portfolio information can be used freely by the individual that has authored or collected it.

It is not the purpose of these specifications to cover information gathered by others about an individual, over which that individual has no easy access or control.

Leap2A is a specification for this information using the Atom Syndication Format. Atom was chosen as the basis for Leap2A on the grounds that there was a reasonable fit between Atom

and portfolio information, and because Atom is widely implemented in many systems.

Leap2A has been successfully implemented in the ePortfolio solutions. It has been developed through a process of open debate and consensus which includes several ePortfolio providers. Leap2A was funded through the three phases of the JISC Portfolio Interoperability Projects (PIOP) program. The initial specification was developed as part of Phase 1 which ran from December 2007 - July 2008. Further development, implementation and piloting took place in the Phase 2 round of seven projects which ran from November 2008 to March 2009. Phase 3 involved eight projects which ran from February 2010 to July 2010. This work has been community led, funded by JISC and supported by JISC-CETIS.

Below are ePortfolio Systems that have implemented Leap2A[6]:

- Academy of Medical Royal Colleges Medical Interoperability Portfolio Standards : <http://www.mips.org.uk>
- ePet : <http://www.eportfolios.ac.uk/ePET>
- Mahara : <http://mahara.org>
- MedBiquitous : http://www.medbiq.org/working_groups/educational_trajectory/index.html
- MyKnowledgeMap : <http://www.myknowledgemap.com>
- MyProgressFile : <http://www.myprogressfile.com>
- PebblePad : <http://www.pebblepad.co.uk>
- TAG Developments : <http://www.maps-ict.com/>
- University of Derby's e-APEL system : <http://www.eapel.org.uk>

Partners at PebblePad, and the Universities of Newcastle and Nottingham, are still on the continuous work, to get more number of Leap2A compatible web services. The goal is to be able to manage learner information from one place.

Leap2A is an interoperability specification for the portability of e-portfolio information. It is based on Atom, and licenced with OWFa 1.0. In this research, the author will only include the core specification of Leap2A.

3.2 Leap2A Implementation

The development of the application is based on the Leap2A file exported from MaharaePortfolio system. Nowadays, Mahara seems to be the most supportive platform for Leap2A. Interoperability issue of Leap2A file between one system to another is the main aspect why author chose to work based on Mahara system for the Leap2A export and import testing.

Mahara’s Leap2A support means that the user can do both exporting a Leap2A file out from Mahara system, and importing it again to Mahara or other ePortfolio systems which already implement Leap2A.



Figure 2: Leap2A Implementation

There is documentation in Mahara site about how well the interoperability of Leap2A file from Mahara system to another and vice versa. [13]

1. ePET

Interoperability between ePET and Mahara is very poor. Due to well-formedness issue with ePETs export, importing the data into Mahara needs much improvement in ePETs exporter.

It is possible to import Mahara export into ePET but still in rudimentary fashion, because most entries are turned into blog posts. ePET cannot import any files as the importer cannot handle .zip file.

2. eProgress

Interoperability between eProgress and Mahara is very poor. Some eProgress file's information could be imported into Mahara but everything is being imported into miscellaneous blog, because eProgress is exporting with incorrect namespace information. It is unknown whether Mahara export can be imported to eProgress since it does not have yet an importer.

3. PebblePad

There are only small issues of interoperability between PebblePad and Mahara. Mahara export can be imported by PebblePad and vice versa, but information is lost along the way. Webfolios from PebblePad are currently not being imported. Files from PebblePad are imported as files in Mahara, but a folder from Mahara is imported to PebblePad as a blog, and exported again from there as blog.

3.3 Functional Requirements

The sections below describe the functional requirements to be fulfilled by the application:

1. Display Information from Leap2A file

The application should be able to display the information contained in the Leap2A file such as personal information, professional information (academic skills, academic goals, etc), and the media files.

This application will not display all the information included in the leap2a file as it works more as a prototype to show the ability of parsing a leap2a xml file and displaying the corresponding media files stored inside the leap2a folder. The Application is able to display the content of image file types (.jpg, .png, .bmp) and also .pdf file. It will give the user a better user experience as the user can view the content of the files first before editing the information or even delete them if no longer needed or wanted.

2. Enable the user to modify their profile information

The application should give the possibility to the user to edit their personal information. The modification should be saved in the leap2a file by updating the XML structure and information related.

3. Enable the user to delete the information including media files

The application should provide the possibility to the user to delete the information in the leap2a file that they no longer want. It includes the ability to delete the media files (remove them physically from the SD Card and remove the corresponding Node in the XML structure)

4. Create new profile

In this research, a possible way of creating a leap2a file should be found. The scope of this research will not give all

of the information field like provided in the web based ePortfolio systems, but more on the prototype of creating a new Leap2a file containing some basic information, by giving the user a form to be filled.

The application works offline so that the users can work on their ePortfolio without internet connection. They can edit or delete their profile data and save it as Leap2A, which later can be imported to any ePortfolio system that already implements the Leap2A standard. Users 'Views' will not be supported in this application. Their 'Views' will be neither displayed nor editable from the application, because 'View' cannot be replaced in mobile device as the appearance will be different as the users have designed in the website. Their 'View' won't be changed or broken by this application. Moreover, one device using this application should support more than one ePortfolio or LEAP2A file.

4. DESIGN OF THE APPLICATION

4.1 System Architecture

There are two process workflow of how the application works:

1. Select an existing ePortfolio

As shown in the figure below, the users who have already an account in Mahara platform can export their ePortfolio into a Leap2A file. The file should be saved in an SDCard to be read by the Android application. The Leap2A result is then imported back to Mahara system.



Figure 3: Select Existing EPortfolio

2. Create new ePortfolio

This application provides also the possibility for the user who does not have an ePortfolio yet, to create a new ePortfolio. The program can generate a new Leap2A file with some default information templates. This file can later be imported to the Mahara system to be used in a web based environment.



Figure 4: Create New EPortfolio

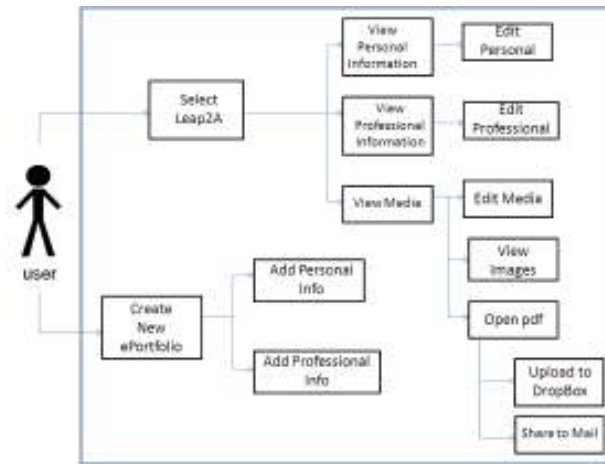


Figure 5: Use Case Diagram of the Application

4.2 Media Representation

Leap2A file exported from Mahara is a .zip file. It consists of a Leap2a.xml file and a “files” folder. This folder contains media files stored by the user. It can be any file types, such as image files with various extensions, pdf file, doc file, PowerPoint file, and video files.

The application will enable the user to display the media content. The scope in this research to be able to display image file types and pdf file.

There is also the built in feature for the pdf viewer which is also available in this application. For example, the user can search a text to be found inside the pdf document. Another advantage is the user can share his pdf document via Bluetooth to another Bluetooth enabled device, upload it into a dropbox account, sending via googlemail as well as via another email account.



Figure 6: Media Representation

5. IMPLEMENTATION

5.1 DOM Algorithm

DOM Algorithm is used for the XML Parsing in this work. The reason of using DOM algorithm is because an algorithm that makes manipulation of XML document possible is needed, while other algorithms only allow accessing of XML document.

The DOM presents an XML document as a tree-structure. DOM parsing on Android is fully supported and it works exactly as it works in Java code. To work with the information in an XML file, the file must be parsed to create a **Document object**. The Document object is an interface, so it can't be instantiated directly, so the application uses a factory instead.

The leap2a file stored in InputStream object (in) performs as the input or the document to be parsed. Within the try-catch block, the application creates the DocumentBuilderFactory, which it then uses to create the DocumentBuilder. Finally, the DocumentBuilder parses the file to create the DOM Document.

```
try {
    InputStream in =
        newBufferedInputStream(newFileInputStream(fileSource));
    DocumentBuilderFactory dbf =
        DocumentBuilderFactory.newInstance();
    DocumentBuilder db =
        dbf.newDocumentBuilder();
    doc = db.parse(newInputSource(in));
} catch (Exception e) {
    System.out.println("XML Parsing Exception = "
        + e);
}
```

Once the parser has created a Document, the application can step through it. With the DOM APIs, it is possible to display the content of a node, modify its value, or even delete the node itself.

5.2 Prototype

This is the initial view of the program. It gives the user option to choose an existing Leap2A file stored in the SD Card to be parsed or to create a new Leap2A file.

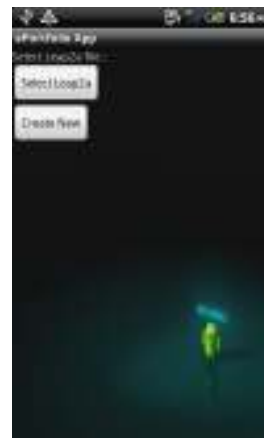


Figure 7: Initial View

If the user presses the “Select Leap2a” button, the user will be directed to the file explorer to choose the existing Leap2A. On the other hand, if the “Create New” is pressed, the user will get a new user form where the user can fill the form containing the basic information as a prototype of creating a new Leap2A file.

5.2.1 Select Existing EPortfolio

1. User Menu View

After selecting the Leap2A file from the file browser, the user will be directed to this menu page.

There are four options in this menu page. The user can select to view their Personal Information, Professional Information, Media, or Back to Leap2A Selection which leads to the file browser again.



Figure 8: Existing EPortfolio Menu

2. Personal Information and Edit Pages

Personal Information page gives information about the personal stuffs like first name, last name, email, date of birth, and some other things. The picture in this screenshot does not show all the information as shown in the actual application.

From this page the user can choose to go to the Edit Profile page or Back to Menu. The user can modify their information in the Edit Profile page as shown below.



Figure 9: Personal Information and the Edit Page

term: persondata	
definition:	data relevant to a person
notes:	
URI:	http://terms.leapspecs.org/persondata
domain:	person
data type:	string or URI
attributes:	<p>field (mandatory) see table of fields below</p> <p>label mandatory for the "other" field, otherwise optional; holds local label</p> <p>service mandatory for the "id" field</p> <p>countrycode recommended for the "country" field; this attribute must not appear elsewhere</p>
to degrade:	<p>append <i>///</i> (with <i>sss</i>): <i>vvv</i> to content where</p> <ul style="list-style-type: none"> <i>///</i> is the value of the label attribute if present; otherwise the value of the field attribute with any underscores replaced by spaces <i>sss</i> is the value of the service attribute <i>vvv</i> is the element text node <p>The value of a countrycode attribute should be appended, in parenthesis, to the country name</p>
Leap2A implementation:	<leap2:persondata leap2:field="..." leap2:service="..." leap2:label="..." leap2:countrycode="...">...</leap2:persondata>
links to examples:	
links to further documentation:	personal data field label service countrycode

Table 1: Leap2A Specification for Data about People[9]

The table showing the Leap2A specification as the reference for building the feature of Personal Information page is in the next page. The data displayed are based on the term:persondata from the XML file.

3. Professional Information and Edit Pages

The second option from the Menu List is to display the Professional Information Page. It displays the user information which is more related to the professional aspects in life, such as Academic Goals, Personal Goals, Work Skills, Personal Skills, Career Goals, Academic Skills, Occupation, and Industry.

The Professional Information area displays the value of the text node inside the <content> tag for the entry which has the node attribute mahara:plugin="resume" and mahara:plugin="internal" for the node mahara:artefactplugin.

Each entry in the Leap2A XML file which has one of the nodes below, will be included on the Professional Information page, and are enabled to be modified by the user:

- <mahara:artefactpluginmahara:type="careergoal"mahara:plugin="resume"/>
- <mahara:artefactpluginmahara:type="occupation"mahara:plugin="internal"/>

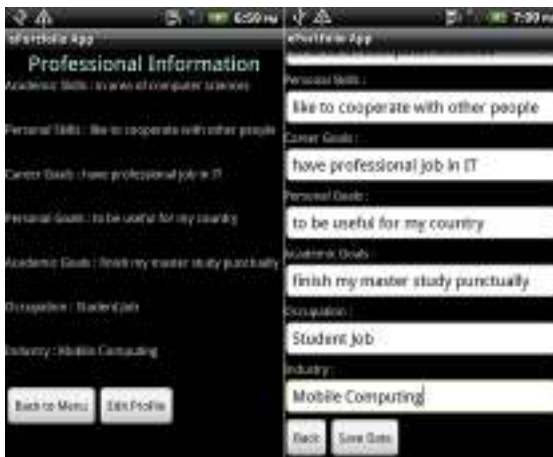


Figure 10: Professional Information and the Edit Page

The left side from the image above shows the information, and the right side shows the edit page to modify the information inside Leap2A. The edit page is called if the user selects the “Edit Profile” button. The way the application works for the data modification in this page is exactly the same as how it works by the Personal Information page.

4. Media and Edit Pages

The third option in the menu list is displaying the Media Information inside the Leap2A file. The user will get the lists of the media files he has uploaded to the web based ePortfolio system. It will display the file name of the media and also the summary (description) of each media.

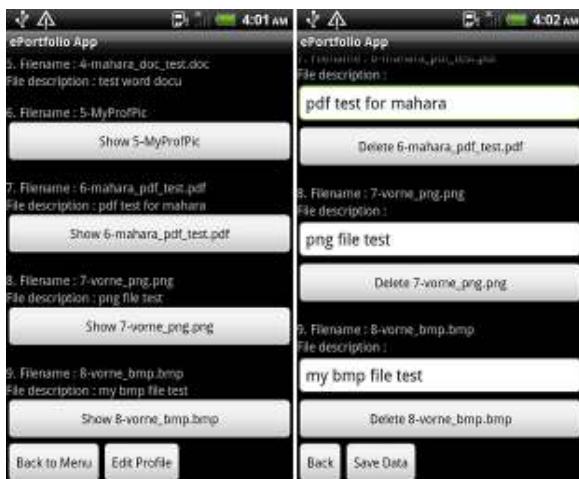


Figure 11: Media Files and the Edit Page

This part of the application will extract the information for all mahara:artefactplugin node which has mahara:plugin="file" attribute, except the node with mahara:type="folder". It means it will display all files but not a folder.

An additional feature in this edit page is the possibility to delete the media file. The user can just remove the file that is no longer needed or wanted. An important thing should be considered is that both the media file should be removed, not only physically from the storage (SDCard) but also the corresponding XML node in the Leap2A file.

5.2.2 Create New EPortfolio

The application provides not only to work with an existing ePortfolio, but also gives the possibility for a user who wants to create a new ePortfolio. If the “Create New” button is pressed from the initial application view, the user will be directed to this page.

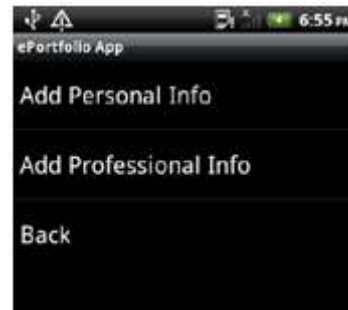


Figure 12: Add New User Information Menu

The user has the option to add the Personal and Professional Information. Each option will bring the user to the page which is the same with the “Edit Profile” in the first section (Select Existing EPortfolio section). The different is only that each text field is blank to indicate of filling a new user profile form.

This feature is done by providing a Leap2A file template inside the application. The template already has the XML nodes for information in the Personal and Professional parts. The content of the node itself will be updated by the value that the user fills in the form.

The figure below indicates the location of the Leap2A file template in the ePortfolio App project directory. The file is put inside the ‘raw’ folder. It means this Leap2A.xml file will be always inside the application wherever the application is installed. It will always be available in any device.

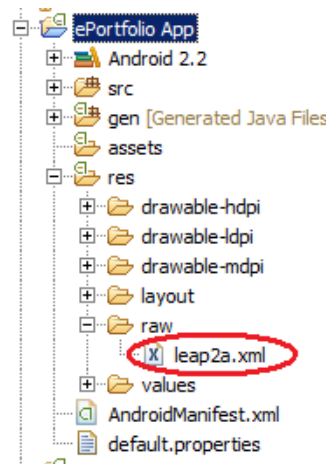


Figure 13: Leap2A Template File Location

The method `getResources()` returns a Resources instance for the application's package. The application works using this template and finally write out a new XML file in the SDCard as a new Leap2A file. The new leap2a.xml file will be saved in "/sdcard/newProfileDir/leap2a.xml" directory.

5.3 Testing

Mahara Platform is used as the base for the software development (Leap2A exported from Mahara system) and also for testing. Since this research is working with the latest version of Leap2A, the latest Mahara Platform which supports the latest

Leap2A must be installed on our own server. The reason to have our own installation is because an admin account is needed for importing a Leap2A file, that cannot be done by a public account such as in www.mahara.org.

However, Mahara provides a possibility to test the latest build of Mahara from a demo site under www.demo.mahara.org.



Figure 14: Mahara Demo Site

Testing of the program is done by simulating all the steps for the two alternatives of process workflows as mentioned in the fourth chapter:

1. Select an Existing EPortfolio

An existing EPortfolio is exported from Mahara system in the form of Leap2A file. This file is then copied to an SD card to be read by an Android device. The device used for testing is an HTC Desire S with Android Operating System Gingerbread (2.3.3). The user opens and manipulates the information in the Leap2A file using the application, which later should be imported again to the Mahara System without problem.

2. Create New EPortfolio

This feature is built for the users who do not have an ePortfolio yet. They can generate a new Leap2A file from this application. The output of Leap2A file from the program should be able to be read by Mahara system well. The user should not lose their information from the import process.

Both testing for the two alternatives show satisfying results. The application can maintain user's information without any worry of losing their data. The groups and views that are not supported by the application are not broken and not affected by the program. Information modification from the phone can be seen also form the web based Mahara system. Media files deletion gives also the correct result. The media file can be physically removed from storage, and the corresponding node is also removed. The images and pdf file can be displayed well so that the users can open them and see the content.

For .pdf file, the possibility to upload it to a Dropbox folder works as well. They can also attach their pdf file to be sent via gmail or other mail accounts.

Creating a new ePortfolio was done without problem. The new Leap2A file can be generated and saved to the SD card. This new file can later be opened and modified as well by the application.

6. CONCLUSION

Leap2A standard provides a huge advantage in the term of interoperability. It can increase the efficiency for exchanging ePortfolio between one system to another. The implementation

of the standard should be expanded also into mobile device. The possibility of working with ePortfolio anytime and anywhere would be more important. This research opens the chance of combining interoperability with mobility, which provides an alternative way for ePortfolio users.

The prospect of this work in the future is still wide. To enable of uploading media files, to give the easiness to change the profile picture or to improve a nicer user interface can be some examples. The most valuable thing would be the improvement of the application to work online. It can spare the time and increase the efficiency of working with ePortfolio significantly.

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