

COMP103P: Object- Oriented Programming Milestone 3 Documentation Computer Science

Project Name: *Smart Sense*

Compiled by Team 24:

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Supervisor:

Dr Dean Mohaemdally

In this documentation of project smart touch the following information will be included:

- Information sheet and Introduction
- Context and background data about project
 - General Requirements
- Design (UI design/ Mock-ups/ Technical Design)
 - Current Status and Evaluation

Information Sheet

Client Name: Microsoft Research (Touch Develop)
Contact: Peli de Halleux (Redmond, USA); Dean Mohaemdally
Team 24:
Mehul Modha (mehul.modha.14@ucl.ac.uk)
Jia Chi (Jessie) Tan (jia.tan.14@ucl.ac.uk)
Vlad Onu (vlad.onu.14@ucl.ac.uk)

Introduction

Information on Team 24:

Mehul Modha: Team Leader and Project Manager; Lead UI designer and User Testing; Technology Platform Research Lead

Prior to this assignment, I have had experience in leading a team in the ENG101P challenge 2 at UCL. Managing a team of nine members, I was in charge of a subdivision task, which required building and programming a model of a TB vaccine-culturing device. I will be the first point of contact for the clients should there be any enquiries. In addition I will be the lead for the User Interface (UI) design and testing. I have also had previous experience in designing a UI for a mobile application for a UCL project. In this, I have developed a UI for a coffee application and hope to bring the knowledge forth to this project. I have basic knowledge in programming and will be looking to improve these skills during the course of the project.

Jia Chi Tan: Documentation and Programming Lead; Technology Platform Research Lead

Having taken part in two challenges under the ENGS101P Integrated Engineering Program module and a group coursework under the ENGS102P Design and Professional Skills, Jia Chi Tan is capable in working in a team, as she understands that teamwork is very important to achieve success. According to her results in the Strength Finders, she is good in team building and fostering good relationships between team members. She has learnt up HTML, CSS, JavaScript and jQuery programming languages prior to this project. She is currently setting up a new website for ICMS (The International Council of Malaysian Scholars and Associates) in which she is a member in the council.

Vlad Onu: Device/ Platform Tester; Technology Platform Research Lead; Lead interviewer;

Vlad Onu is very passionate about computers and doing recreational activities like sports or reading. He is an energetic and friendly person who likes to be surrounded by interesting and ambitious people. He took part in the Sustainable Planet project, where he worked among other people from the engineering faculties to find out effective energy solutions for Yunnan Province in China. After he finished the Strengths Finder test he discovered he has these qualities: activator, maximizer, relator, intellection and individualization. These qualities help him to integrate very fast in a team and make him a colleague that everyone can count on. His lifetime goal is to start up his business in IT and live in a very peaceful place

What is Project Smart Sense?

This project is about advancing the use of *RFID (Radio Frequency Identification)* for *authentication by proximity*. The possibility and application of this system is endless and allows personalising activation based upon the user and the information associated with the RFID device. The general target is toward consumer usage. What we expect to deliver is a robust, secure and quick system, which can grant access to user using RFID technology. We hope to achieve this using *Touch Develop, Cordova and C*.

Context and background data about Project

Background and Challenge to solve

We hope to take the technology from project sense and advance the use of keychain service, which is already out in the market. Using RFID and authentication by proximity we can enhance the security measures yet speed up the process of logging into these services and accessing applications. We hope that this technology can be furthered using cloud-based technology so that a users keychain can be accessed from any computer.

Team Skills and Role Summary

Team Member	Skills (According to Strengths Finder)	Roles taken in this project
Mehul Mansukhlal Modha	<ol style="list-style-type: none"> 1. Achiever 2. Competition 3. Discipline 4. Individualisation 5. Relator 	<ol style="list-style-type: none"> 1. Team Leader and Project Manager 2. Lead UI designer and User Testing 3. Technology Platform Research Lead
Tan Jia Chi	<ol style="list-style-type: none"> 1. Adaptability 2. Connectedness 3. Harmony 4. Developer 5. Deliberative 	<ol style="list-style-type: none"> 1. Programming and Repository Lead 2. Technology Platform Research Lead 3. Documentation Lead
Vlad Alexandru Onu	<ol style="list-style-type: none"> 1. Activator 2. Individualisation 3. Intellection 4. Maximiser 5. Relator 	<ol style="list-style-type: none"> 1. Lead Interviewer for Requirements 2. Technology Platform Research Lead 3. Lead Device/Platform Tester

Work Plan

No.	Tasks	Member(s) in charge of	Weeks						
			12/1/15 - 18/1/15	19/1/15 - 25/1/15	26/1/15 - 1/2/15	2/2/15 - 8/2/15	9/2/15 - 15/2/15	16/2/15 - 20/2/15	
1	Learning Touch Develop & do research on RFID	ALL							
2	Documentation	Jia Chi							
3	Meeting up with Client	ALL							
4	Designing User Interface	Mehul							
5	Technical Design	Mehul							

Risks

Like any other projects, there will be risks, which may delay or prevent the completion of the project. We list out some potential risks and propose the solutions in the table given.

Issues	Solution
Insufficient knowledge regarding Touch Develop and RFID.	Do more research on Touch Develop and RFID. Seek professional help from teaching assistants. Teach each other whenever possible.
Client is not satisfied with our design.	1. Finish the prototype one week earlier than the proposed date so that we have enough time to make any necessary changes.
Missing documents needed for the project.	1. Everyone saves a copy of his or her own documents after uploading it in Google Drive.

General Requirements

MoSCoW style requirements list:

M- Must have requirements, which must be implemented to have an initial working application. **S - Should have requirements**, which should be in the delivered app but not the earlier development versions. **C - Could have requirements**, which could be included in the app if there is time to develop them. **W - Would (or Won't) have requirements**, which won't be included in the delivered app but should be recorded for possible future development.

Must have requirements: the basic requirements for this project means that the authentication of the *RFID device* should successfully work. It must communicate with the *Engduino* device. Which is connected to the computer. The computer will get the signal reading from the Engduino. If this matches a valid key, then it should allow a trigger of an action. This is the basic and fundamental requirement of the project.

Should have requirements: after the must have requirement are complete, the next process which should be taken and achieved is to allow authentication to trigger and action on some application. Example being setting a port for FTP file transfer service between phone and computer. We as a team are hoping to use this device as an access to a keychain account which can store all your login information on the system, which can then be access with 2-step verification, which is the use of the RFID and a 4-digit pin.

Could have requirements: if we have time develop an *intranet version*, which can work over the local network on a computer. This means that the users information would need to be save over a network and encrypted so that nobody but the user can retrieve the information.

Won't have requirements: have an Internet and cloud system, which allows you to access the keychain from any computer. This would be something to expand on for consumer use. Also have a vast list of programme, which the keychain will work on. However this would require a great deal of time and resources to work on.

Data Dictionary/ Glossary

Engduino- Device which the RFID will communicate with, this in turn will be connection to a computer. The hardware will send data via serial port USB.

Intranet- Is computer network that shares information or services within an organisation.

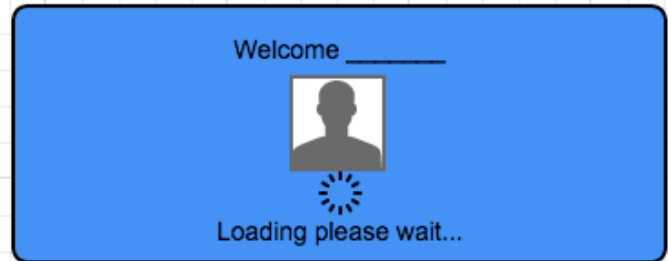
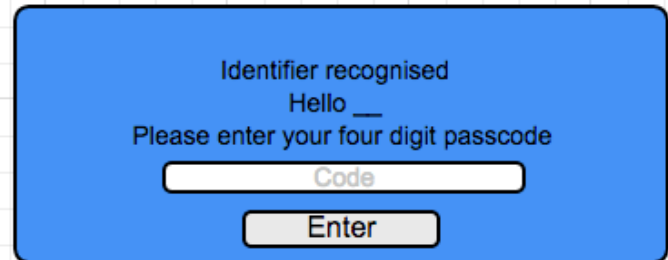
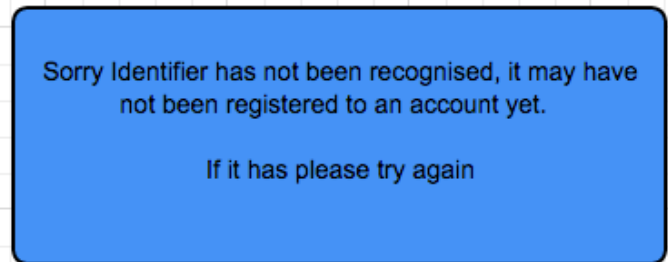
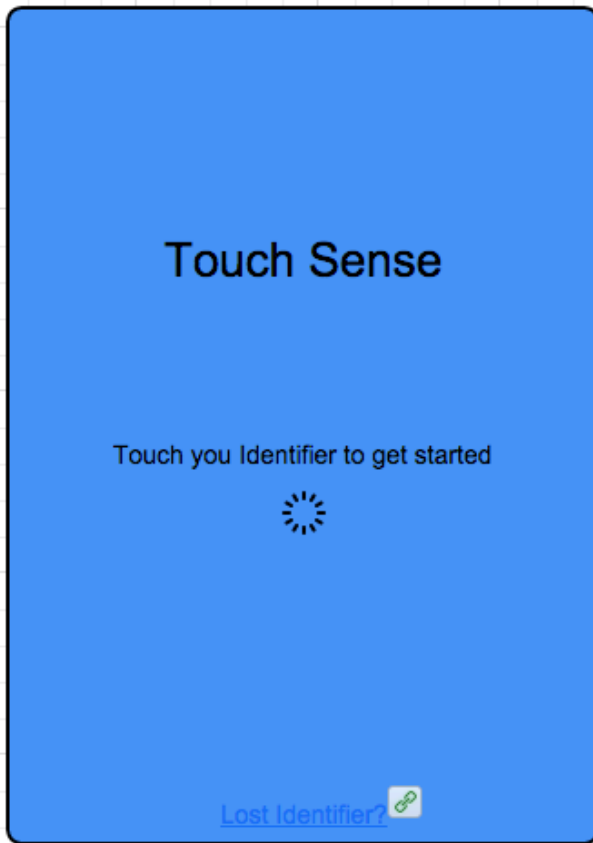
Keychain- Keychain is a service which will hold onto all the passwords and logins to various systems or application. This allows quicker access to all your information on multiple services such as Hotmail, local portals etc.

2-Step Verification- Method of security, which involves two subsequent, and dependant stages to check the identity of an entity accessing the service they require.


Any other information

The programming aspect will be done using a combination of C, Cordova and primarily, using Microsoft's Touch Develop.

Design (UI design/ Mock-ups/ Technical Design)



Here is some UI mock-up of a first design. These images above are of the login splash screens before launching into the program. If the user has for some reason lost or misplaced their RFID, the system has a backup login, which will still need the two-step verification.

Q Search for Specific Keychain ✕						User: 
						Logout
Add New Account	▼ Select	▼ Account Name	▼ Details	▼ Settings	▼ Autofill On or Off	
Settings ▶	<input type="checkbox"/>	Cell 1	Cell 2	Cell 3	<input type="checkbox"/>	
User Folders ▶						
Remove Accounts ▶	<input type="checkbox"/>	Cell 4	Cell 5	Cell 6	<input checked="" type="checkbox"/>	
View ▶	<input type="checkbox"/>	Cell 7	Cell 8	Cell 9	<input type="checkbox"/>	
About Us ▶						
Logout	<input type="checkbox"/>	Cell 10	Cell 11	Cell 12	<input type="checkbox"/>	

This is a rough design of the home page will include and the functionality. User will be able to store their accounts in folders and will be able to alter and control them from this page. Users will be able to add new account via the splash screen when they click on add new account. The splash screen will ask the user to fill in the details and submit to the system. Something, which could later be added, would be an initial check to see if the link and account details are valid.

Below is a design of the setting page where the user will be able to control system and hardware related to the software. User should be able to see which RFID device is associated to the account and be able to add and remove different RFID device to the account. For system control will be general setting such as logging off when computer sleeps.


Adding a new account?

Account name:

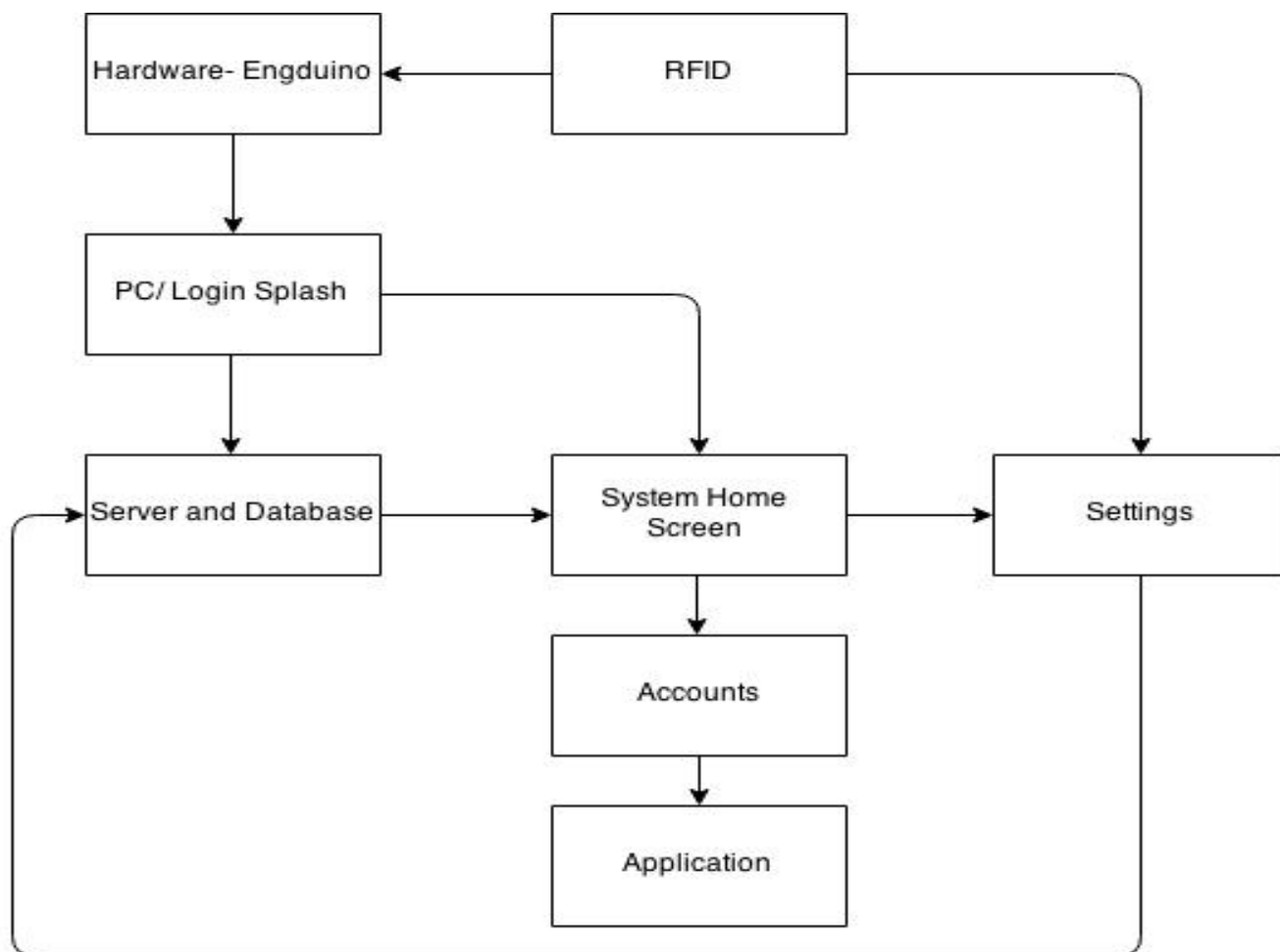
Username:

Password:

HTTP link:

Q Search for Specific Keychain ✕		User: 
		Logout
Add New Account	Settings	
Settings ▶	Hardware	
User Folders ▶		
Remove Accounts ▶	System	
View ▶		
About Us ▶		
Logout		

Technical Design



Status and Evaluation during Milestone one

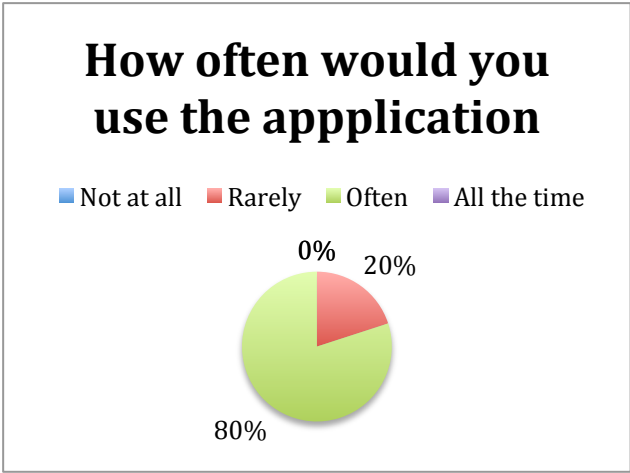
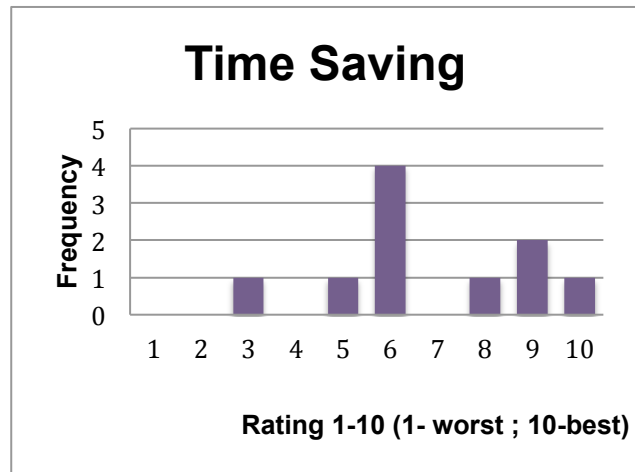
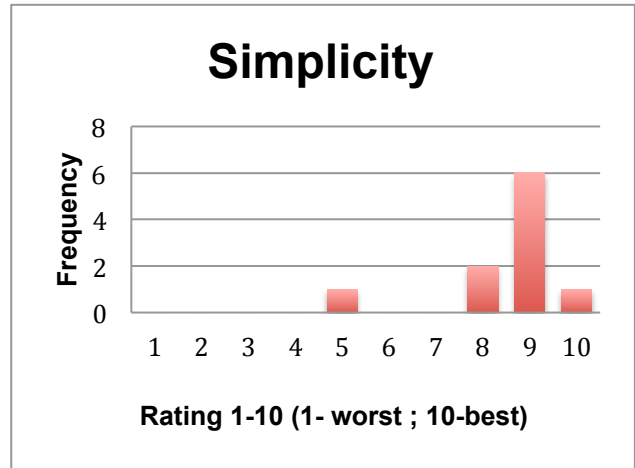
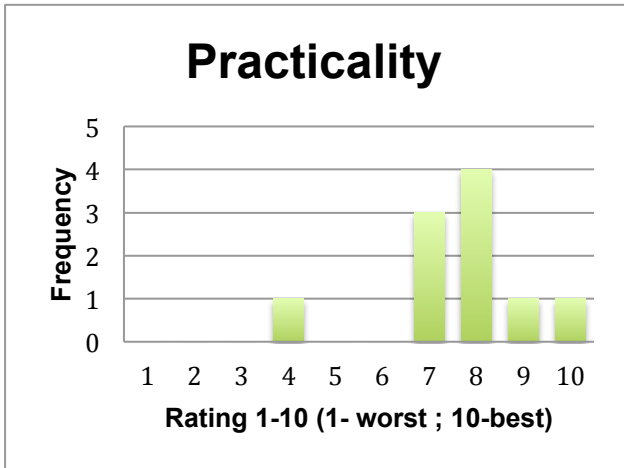
After 5 weeks of working together as a team, all three of us know each other better, especially after we know each other's strengths. We have met our client and have a better idea of the app, which we will be working on. We have also come up with a user interface and technical design. In the next few weeks, we will focus on developing the app by coding with the help of the teaching assistants.

To have a better understanding of the idea of our application, we used [touch develop.com](http://touchdevelop.com) and worked on the tutorials provided. The syntax used in Touch Develop is something new to us but after doing a fair amount of tutorials; we do not find it very hard to comprehend. We also did research on RFID.

Since we do not meet up very often, we always keep in touch in our WhatsApp group chat and upload the documents needed for the project in a Google Drive folder. We keep reminding each other when a deadline is approaching or teach each other when we do not understand anything regarding the project.

Overall, each of us is good in a certain field so everyone contribute a fair amount of work to this project. We look forward to learning more in the next few weeks and making this app a reality.

Data and Feed back from Questionnaires/ Interview



This was the data collated from interviewing people after demonstrating a working product version of our application. From the data, it shows that generally that user found it practical and simple to use however they didn't not feel that it saves much time and they felt sceptical about security even though it was above satisfactory rating of 5. Overall it shows that 80% of those who were demonstrated our application would use it often whereas 20% said they would rarely use it.

Some suggestions for improvement were to develop a cleaner Graphic User Interface, which is more appealing to the user as well as a desktop client for the application. Furthermore from the questionnaire feedback and comments, it would be beneficial to increase security measures; this may be the proper implementation of 2-step security verification.

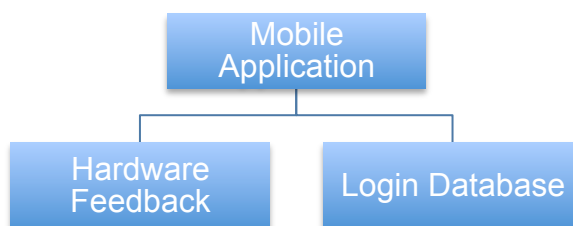
The data suggest this application is promising and that the user like the concept and with a complete product, it may be commercially viable. There is much room for improvement but the foundations have been developed.

Research and Algorithms

For this project we were using hardware that has source code prewritten to do the function that were required for us receive and send data through the Arduino via Bluetooth. It was a matter of research for the code required, combining and compiling the code for both the RFID and the Bluetooth modules we were provided with. RFID ID tag we were given was a Funduino 522 and the Bluetooth module was the Sparkfun RN42 silver. From these two modules we used the source code for the hardware to work. This was provided on the Arduino site and the sites from the manufacturers of the RFID and Bluetooth chips. As for the mobile application, we had to research how to use touch develop and begin working on the exercises and tutorials provided on the website. The work however is original and designed by team 24 using the basic library inside Touch Develop. The application was later exported to Cordova for android phones.

Package code design

For our application there were two main elements to the project the software and code for the hardware and the code for the application. They work independently of each other but then communicate with each other at the login phase of the application. The hardware then listens and provides feedback when a tag is tapped and recognised by the RFID scanner.



Once the application is loaded up, on the login screen it waits and listen to the Bluetooth port for a string from the hardware, the hardware will keep taking readings and sending the string values to the Bluetooth module until the string matches the entry in the login database for the application. Once this is complete the hardware stops communicating with the application and the application does the rest of the work. This is a very simple system and doesn't require a complex hierarchy.

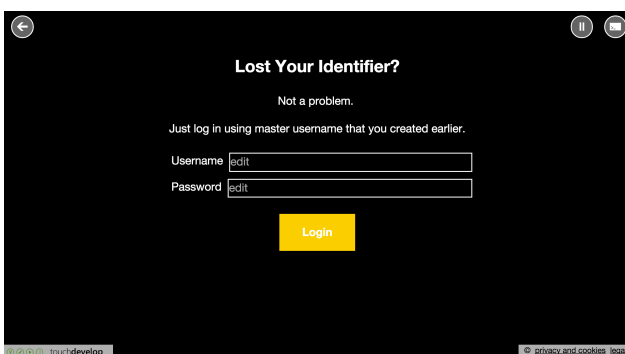
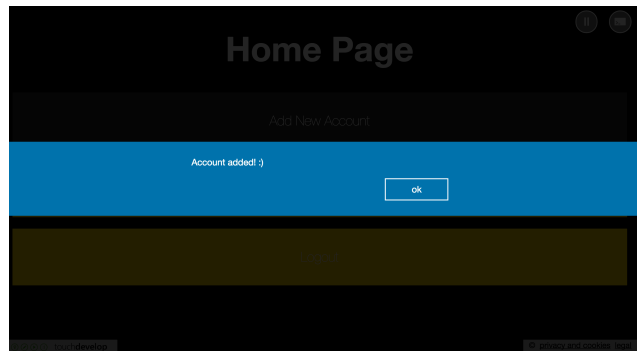
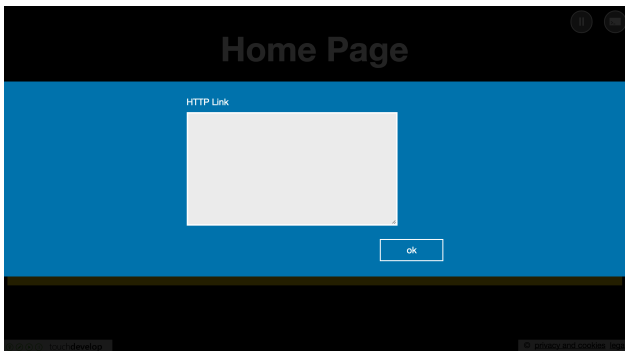
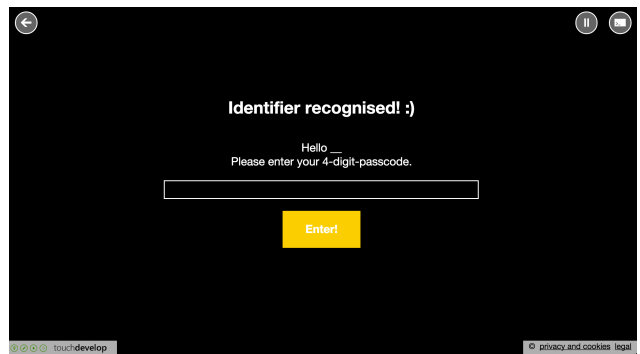
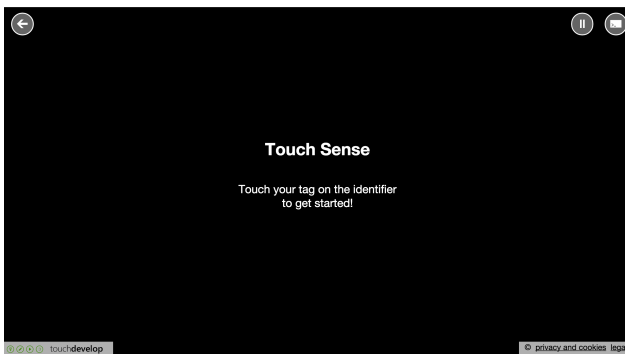
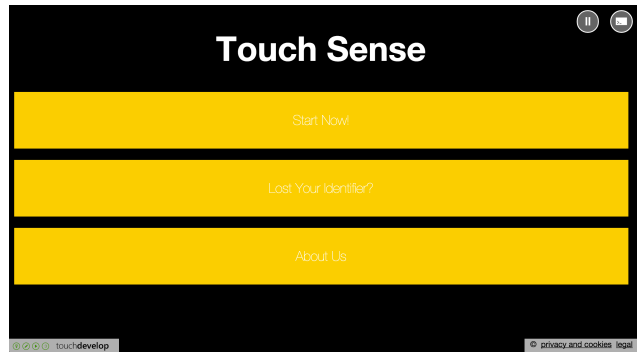
Work Packages completed

Mehul Modha: Combination of Bluetooth and RFID communication via Arduino Uno

Jia Chi Tan: Mobile Application on touch develop

Vlad Onu: SQL Database holding login and user database (Not Completed)

Screenshot of our application



..TOUCHSENSE..

User	Account Name	Username	Password	HTTP Link
Jessie				
User	Account Name	Username	Password	HTTP Link
Jessie	Test	User1	Hello	usertestingtouchsense.com

Here are screenshots of our application; it has been designed in Microsoft Touch Develop web application. As it can be seen, Touch Sense waits for the user to tap in with an RFID tag, once successful it request for the users four-digit pin associated with the tag (two step verification) for added security. Once users are logged in, they can add, remove and modify accounts that they would like to link and use to save (e.g. Facebook, Hotmail, Google mail etc.) Once added user can view which accounted they have added and then edit from there on.

Touch sense has a backup system should the user forget to bring their tag or lose it, they can login via the tradition method of using a master username and password, which has to be linked to the tag during setup of a touch sense account.

This is a simple design to the application and there is a lot of room for improvements and additional features. However time constrains has been a key concern during this project. There were many technical difficulties with the hardware, which ultimately delayed the project and the development of the application. Bluetooth communication was very difficult to get working however this problem was solved for Microsoft TouchDevelop.

Gantt chart- our project and work timeline

No.	Tasks	Member(s) Involved	Weeks									
			21/2	28/2	7/3	14/3	21/3	28/3	4/4	11/4	18/4	24/4
			- 27/2	- 6/3	- 13/3	- 20/3	- 27/3	- 3/4	- 10/4	- 17/4	- 24/4	- 29/4
1	Testing and Developing	All										
2	Designing User Interface on Touchdevelop	Jia Chi										
3	Milestone 2 Presentation	All										
4	Connection Setup between Arduino Uno board and phone	Mehul										
5	Film Short Demonstration Video	Mehul and Jia Chi										
6	Prepare Questionnaire	Mehul										

For this project we decided to adapt dynamic testing and this lasted throughout the whole project. The reason we had chosen this was to isolate problem along they way. In doing so we could determine whether it was hardware or a software fault. This allowed us to proficiently manage time and work out problems much quicker then having to find the problem once we combined the systems. A lot of the work was done individually in our own time and would meet up for progress update via Skype or in person. This allowed us to maximise time on the project. Meeting were used to outline problems and current tasks required or left to do. It provided us an outline whether we were on track or not.

Review of MoSCoW

From our MoSCoW requirements (refer above) we had met the 'must' and 'should' components of the requirement, which we believe to be satisfactory. The application is functional and the 'could' requirements can be used to improve and further our project from what it is. One thing we have not been able to do is to export the application on Cordova, which means this application only works on Windows Phones; this is due to some technical issues involving the Bluetooth communication.

Conclusion

Overall the project has been a tough exercise but we achieved in making a fully functional application which works on Touch Develop alongside the hardware which it required to login to the application. The application was able to store user data and could be shown on the database table. There are lots of merits to the concept and what has been achieved so far, but there is much to do in terms of the mobile application, databases and making a pc client so that this application is platform agnostic and can be implemented on a larger scale. It was a big learning curve of all us in the team, with little or no experience in app development or with the hardware we were given, we manage to at least have functional hardware and an app. One thing, which we were not able to do, was to export the application to Cordova due to issues involving Bluetooth communication.

Note to Assessors

During this project, one of our team members Vlad Onu did not contribute to the project with any work packages or to any of the documentation apart from the team strengths finder paragraph in milestone one. Mehul Modha (team leader) and Jia Chi Tan completed the work for this project.

Referencing

Hardware Code:

- I. Code required for RFID, sourced from GitHub *Gareth Halfacree 19 Sept 2011*
<https://github.com/ghalfacree/Arduino-Sketches/blob/master/RFID2560/RFID2560.pde>
- II. Bluetooth Module Research and Set Up code *Jim Lindblom 26th Feb 2013*
<https://www.sparkfun.com/products/12577>
<https://learn.sparkfun.com/tutorials/using-the-bluesmirf/example-code-using-command-mode>
- III. Hardware Schematics
<http://www.arduino.cc/en/main/arduinoBoardUno>

Software (Application):

- IV. Touch develop and exercise to learn language
<https://www.touchdevelop.com/>

With special thanks to Rae Harbird and Yun Fu for assistance with programming and Graeme McPhillips with hardware assistance from University College London.
With special thanks to Peli de Halleux for assistance with Touch Develop from Microsoft Research, Redmond.