Bi Weekly Report 1
COMP204P - Systems Engineering

Group 31

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Nuffield Health & Microsoft Project

1. Overview of progress

5th of October 2016

Introductory team meeting with all three of us gathering in an informal setting. This involved discussing our strengths and weaknesses, setting up the different communication channels and a common documentation platform. We launched a Slack thread and built a Google Drive from which our initial work would be conducted.

We chose Slack because of the integrated offering and ease of use of the service. Using Slack allows us to have a common venue from which virtually everything related to this module would be organised and discussed. Different aspects of the project - including the technical and non-technical ones - are gathered in split in dedicated chat rooms.

We use Google Drive because it is a accessible at any time and open to editing by every member of the team. It is a secure way of hosting our common material and allows us to work efficiently and safely together on a common platform.
Both of these tools are available on mobile, which is also why we chose them.
This meeting helped us prepare for the following meeting (the day after) with our client representative.
We also used this occasion to learn what were our different experiences within application development, teamwork in previous year's project and get to know each other on a more personal level.

6th of October 2016

This was our initial meeting with project coordinator from Nuffield Health, Alexandru Matei.
We learnt about our coordinator's background, got an introduction to Nuffield Health as an organisation, followed by our first exposure to the projects.
Three main topics were presented to us.
The proposals dealt with digital health aimed at improving a health service, and how to change a client's behaviour for the better.

The first proposal involved digital assistance using intelligent personal assistants such as Apple's Siri or Microsoft's Cortana, chatbots and emphasize on ease of use and interactive features.

The second project proposal is to deliver a real-time data visualisation dashboard, taking as input various data streams feeding into the current platform. Each data item will be a FHIR observation (i.e. a JSON message).

The third project proposal was about smart homes and internet of things where optimisation of certain things such as light or temperature can help consumers.

After some discussion with the team we have decided to take on the second project of real-time data visualisation dashboard. Specifically the project will cover the following:

- Investigation and proposal of a technology stack suitable for creating visualisations from FHIR messages. The teams should consider the event based, real time nature of the data. Database options to store FHIR messages might include MongoDB and Cassandra. For visualisation, the suggested library is D3 or a wrapper of it (a demo integration of D3 with MongoDB is given in). An example of real time visualisation is discussed in.
- Design of a dashboard that combines personal data from the EHR record, seen over time. Examples of visualisations specific to FHIR are given in and, and a more general example is given in.
- Implementation and integration with the FHIR server.

7th of October

Professor Philip Treleaven provided us with a wider context for our project, introduced us to the UCL Active initiative and existing clients that our application could have an impact on. We will be working closely with the Digital assistance team to deliver the final product. We have set up communication channels between our coordinators and a partner team in the same module that has the same clients (team 32). The overview of this project is that we create a system where personal records are stored where different clients can access for data mining and analytics.

Throughout this project we will be documenting the processes mentioned below:

- *user journeys - Demonstrating the way* users *currently interact with the service*
- *personas - the aspect of someone's character*
- *use cases - list of actions defining the interactions between a role, i.e a UML diagram*
- *scenarios - development of events.*
- *prototype - preliminary version of the service*
- *testing*

DASHBOARDS

After implementing the back end of the system (OAuth, messaging queue, mongoDB/cassandra database) we will be designing a dashboard to visualise the data from Nuffield hospital to showcase properties such as heart age, population level - heat maps etc. We hope to make this visualisation in real time and interactive.

If the project moves forward swiftly we will be trying to implement a proactive functionality within the visualisation, such as building a motivational agent, where there is coaching through visualisation. For example the user would be able to enter a personal objective and/or goal and the application would project a trajectory for the user and give reminders and 'instructions' to the user. By doing so the user will be able to reach their health objectives.

Furthermore, if there is enough time we would also like to implement a machine learning technique (classification problem) using BigML on the data in regards to gym attendance and to be able to predict when a member is likely to cancel their membership. However, this is more of a desired requirement and is very dependent on how we progress through the critical phases of our project.

General tasks to be completed:

- Start learning D3
- Read into the FIHR protocol
- Research how to display medical information in a motivational way
- Start preparing the "project website", deadline is 12th December
- Create a private shared github account for the team

<u>Individual section</u>

Marc de Fontenay

Last week we got to meet each other and started setting up our teamwork tools. We met out project coordinator and our clients. We've been given a good overview of the project and I feel the depth and breadth of it has been put to light. Individual fields of research and associated tasks have been attributed to members of the team. I've started a course on Lynda.com on D3.js and am actively learning about how the OAuth would be implemented in our project and how it works. I will prioritise the work on OAuth from now on.

Mo Afsharmoqaddam

In the previous week I firstly met my teammates unofficially to get know them and discuss briefly about the project and our personal strengths. After we set up meetings with the client and our supervisor in conjunction with an affiliate team who also working with the same client. In the client meeting we were proposed with three project which has been discussed in this report and after attending the supervisor meeting we were clear about the whole scope of the project and the specific elements that we have to implement in our work. After such meetings, we decided on team member roles and splitted the initial tasks between the members. My main responsibility right now is to decide on the technology stack for the back-end database system which will be a NoSQL database that will need to store FIHR messages. I will be exploring MongoDB and Cassandra to find the best fit for our project needs. After setting up the database I will be looking into how to store and send out data to visualise using D3.js in conjunction with the database.

Jas Semrl

During the previous week, I have contacted my two teammates and organised the first informal meeting where we were discussing strengths and weaknesses. Right away, I have set up the slack conversation for the team to communicate efficiently. After attending all other meetings with the clients, our academic supervisor, the other team working on Nuffield Health and Microsoft projects and the other team members, I helped deciding which of the proposed projects we will be working on and creating a clearer image of what has to be done. I have also helped summing up the project specification and the timeline of the project in a presentation for our supervisor. Afterwards, we have split our roles and I was assigned to research the messaging queue technology. In the following days, I will continue to research the Microsoft Event Hubs and Microsoft Service Bus to see which of the two meets the requirements better.

Individual Tasks that need to be completed by each member of the team:

Database Options to store FIHRE messages (Mo):

- Start researching about Cassandra and MongoDB, to find out which one is more suitable to use for the project or any other suitable option
- Create a document highlighting the advantages and disadvantages of both options and perhaps how they can be used
- Researching interactive visualisation between D3 and the database chosen of choice and how they can be linked

OAuth2 authorisation (Marc):

- Determine what part of the OAuth offering we need for our project
- Outline a specific authorisation flow for accessing the content and tools of the application
- Register a new app with the OAuth service. Provide basic information such as application name, website, a logo, etc.
- Register a redirect URI (callback entry point to the app) to be used for redirecting users to after permissions
- Receive a public client ID and a client secret from OAuth
- Sketch out an interface for the user

Messaging Queue (Jas):

Service for exchanging information between FHIR, UCL database, Nuffield database etc. (user is given an option who to share data with)

To do:

- Research Microsoft Event Hubs and Microsoft Service Bus
- Decide which technology meets the requirements
- Prepare documentation supporting pros and cons of both and justify the decision