University of London
Computing and Information Systems/Creative Computing
CO2226 Software engineering, algorithm design and analysis
Coursework assignment 1 2019–2020

The Internet of Things

***Note**: You will need to undertake some background reading on the Internet of Things (IoT) as part of this coursework assignment. This is factored into the time you are expected to spend on thinking, developing, writing and checking your answers to the questions. It is recommended that you devote between one fifth and one third of the time you spend on this coursework assignment on targeted background reading, primarily focused on the answer to Task 3.*

Submission details

Please submit **one** PDF document which is named using the following convention:

YourName_SRN_COxxxxcw#.pdf (e.g. GraceHopper_920000000_CO2226cw1.pdf)

- **YourName** is your full name as it appears on your student record (check your student portal),
- **SRN** is your Student Reference Number, for example 920000000
- **COxxxx** is the course number, for example CO2226, and
- **cw#** is either cw1 (coursework 1) or cw2 (coursework 2).

The scenario: Fitness4All is a new project, funded by a public-private partnership, aiming to provide an easy, affordable, intuitive, secure, and quick way for all citizens to be able to upload fitness data to a secure system in the cloud, as well as for registered GPs to access their patients' data. The aim is to develop an application that anyone with an internet connection can run from their browser, as well as apps running on all mobile platforms drawing data from the same data store (securely hosted and run by a separate company). The application will provide information on user fitness to the end user, as well as allowing health personnel (e.g. doctors, nurses) to access this data, add to it, log every access to the data store and provide doctors with automated alerts if any worrying pattern starts to develop. The system should allow for communication between patients and doctors, and if any consultation is required that does not require the patient to visit in person, then it should allow for the user to book and pay for it in a number of different ways. The application should also serve as an 'online get-together' space where webinars can be held between its members for providing information about what they should do to stay fit and ways of doing so while having fun. Some of its functionality will be a matter of interfacing to external systems, while the biggest part will be bespoke development.

Fitness4All has Peter Lee as the senior executive manager, who has been working in IT for about 15 years now, switching from a systems administrator background. Peter is now the senior partner and head of the Business IT Services division of Cloud Solutions Limited, employing around 100 people (on different work patterns – full-time, part-time, on demand, flexible contracts), each with different skills. Cloud Solutions Limited also employs a full-time administrative manager to manage the Business IT Services division, Katy Evans, and another to manage the specific project, Kam Patel.

Katy is liaising with Kam in order to ensure the quality of service delivery for Fitness4All, making sure the expectations of everyone involved are met and extensive testing has been carried out so that the application runs without problems and meets all functional and non-functional requirements. As the application will have access to personal, sensitive and confidential data, all GDPR requirements must be met. The system should allow customers to:

- authenticate using the traditional username/password method as well as any connectors/hooks that can be applied (e.g. Google accounts, LinkedIn, social media accounts, two-factor authentication, etc.);
- pay using credit cards, Paypal, bitcoins or a customer/corporate account;
- review any webinars they have attended;
- if they are on the system with special status that allows them to organise webinars, to advertise and manage them.

The application should also operate a forum as well as a real-time chat application where users could use any form of authentication for signing in (e.g. local account, social media account), and use the chat facility to also hold private conversations with any health personnel members they are attached to, or a public chat with other members who are online at the time.

The system should also keep track of customers' contact details as well as invoices and payments. Both the general public as well as NHS (National Health Service) organisations and private doctors should be able to open a customer or merchant account as applicable. Fitness4All wants to give all its users the option of setting up a 'hold account' where customers can top-up money and pay for their consultations this way, or for NHS organisations and private practitioners to build up their payments and transfer them to their bank account whenever they want to increase security (or get better deals on commission or for any other reason). Since Fitness4All is a growing and ambitious project, it is increasingly taking on staff, both full-time, part-time and on specific short term contracts.

After graduating with First Class Honours, you have recently joined Ubiquitous Computing Ltd. (UCL), a small software house which specializes in test-driven software development but has been able to provide services for any stage of a project's lifecycle. UCL has been approached by Fitness4All to estimate the cost of development and deployment of an integrated computer-based system for running the project. The Fitness4All team is in the process of growing; Kam Patel will be the office manager of an office team of 12, at the moment including only himself and Ms Evans. The 10 other staff to be hired will handle customer relations, marketing, HR administration, project and event support, and finances. Each of these new staff members should have access to their own dedicated 'area' within the proposed system.

More senior full-time employees have greater permission to review and make changes in all sections, while more junior employees can only look at their own section and have more limitations in what they can change. The more junior employees need to seek permission for larger, more elaborate changes, or for changes in the areas that they do not have permission to access. Part-time employees have no permission for changes, and have to request any changes they may need from a full-time employee with the relevant permissions.

Your manager at UCL, Dr. Sussanah Burns, has opted for a test-driven development model for the Fitness4All project, since UCL has a great deal of experience and

expertise in this area. She has asked you to develop an initial set of black box test cases.

Task 1

Identify the stakeholders and the relationships between them. Explain briefly how each will interface to the Fitness4All system.

[10 marks]

Task 2

Design a set of black box test cases for the Fitness4All project, which cover the critical areas of the business (no more than 20 should be needed). Your test cases should, **at the very least**, include:

- the input
- expected output
- prerequisites
- steps for conducting the test
- an explanation of the purpose of each test case.

Please also provide a **rationale** for the overall choice of test cases.

[50 marks]

Task 3

Dr. Burns is looking for ways the system can be made more 'intelligent' and as helpful and assistive for its customers as possible (e.g. by offering personalised choices, identifying associations between data and issues, integrating with smart devices, while at the same time observing GDPR legislation). She has been reading about the Internet of Things (IoT) trends online on resources such as IoT World Today, and she is considering attending the HealthyIoT 2019 conference to get more information about the opportunities that the IoT can provide to the project.

She has asked you to write a short report about the IoT and how it can be beneficial to Fitness4All. She is interested to learn how the IoT could be applied to the project and in which parts, such that the maximum value will be gained while at the same time any customers' private data will be kept in line with GDPR regulations.

Write a Report for Dr. Burns, explaining briefly the concept of the IoT, presenting tools and techniques that can be used, critically discussing which areas from the project system they might be applicable to and illustrating how these techniques could be applied to the Fitness4All project, as well as any issues and risks that might arise and how they can be dealt with.

[40 marks]

[Total 100 marks]

[END OF COURSEWORK ASSIGNMENT 1]