University of London

Computing and Information Systems/Creative Computing

CO2226 Software engineering, algorithm design and analysis

Coursework assignment 1 2020–2021

CyberSecurity

Note: You may need to undertake some background reading on CyberSecurity as part of this coursework assignment. This is factored into the time you are expected to spend on thinking, developing and writing and checking your answers to the questions. It is recommended that you devote between one fifth and one third of the time you devote to 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).

Reminder: It is important that your submitted coursework assignment is your own individual work and, for the most part, written in your own words. You must provide appropriate in-text citation for both paraphrase and quotation, with a detailed reference section at the end of your assignment (this should not be included in the word count). Copying, plagiarism, unaccredited and/or wholesale reproduction of material from books or from any online source is unacceptable, and will be penalised (see How to avoid plagiarism). You may also look at the end of any journal or conference paper to get an idea of how to cite your reference material appropriately.

The scenario

ShareYourFiles is a new project, funded by a public-private partnership. Its aims are to provide an easy, affordable, intuitive, secure and quick way for users (home or corporate) to be able to upload and share files to a secure system in the cloud, and to allow collaborators to access the uploaded data. The plan is to develop an application that anyone can run from their browser (along with apps for all mobile platforms) that will draw data from the same data store (securely hosted and run by a separate company). The application will provide information on files that the end user has uploaded, and allow anyone they share their data with (e.g. friends, project collaborators, and so on) to access the files. The owner of the file will be able to specify the permissions collaborators have on the shared files (e.g. read-only or edit) and the collaborators will be able to access the files with the permissions set. It will log every access to the data store and provide the owners of the file with automated alerts if any worrying pattern starts to develop. The application must allow for communication between file owners and collaborators as well as provide versioning of the files, i.e. the ability to log all changes and go back in time to a previous version of the file (how long this period will be will depend on the plan the user has signed up for). The application will also provide a 'communication channel' space where asynchronous online chat can happen, e.g. to discuss changes to files, agree plans, and so on. A history will be maintained for these chats and priority channels can be made available depending on the price plan that the user (home or corporate) is signed up for. Some functionality will be a matter of interfacing to external systems, while the biggest part will be bespoke development.

ShareYourFiles has Peter Lee as the senior executive manager. He has been working in IT for about 20 years, starting from a systems administrator background. Peter is the senior partner and head of the Business IT Services division of Cloud Solutions Limited, which employs around 100 people (on different work patterns – full-time, part-time, on demand, flexible contracts, and so on), each with different skills and from a wide variety of backgrounds. As this is a big project with sensitive and confidential data, Cloud Solutions Limited is recruiting regional and individual Customer Success Managers (each corporate account with more than fifty users will have a dedicated Customer Success Manager (CSM), smaller business customers will share a CSM, and personal users can also request a shared CSM, at an additional cost). Their job would be to become the 'eyes and ears' of their customers, identifing new business cases and functionalities currently missing, as well as ensuring that the software is fit for purpose for the customers they represent. They would be responsible for putting forward user stories via the ShareYourFiles management tool, and work closely with the development teams to prioritise requests and monitor the progress of the development.

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. Additionally, a Security team will be recruited to work closely with the developers to ensure that the developed system is secure and meets all legal requirements about privacy and security in all parts of the world. The team members have not been recruited yet, but it is expected to be a team of five led by an experienced Security Manager, who would be able to veto any development plan.

Katy is liaising with Kam in order to ensure the quality of service delivery for ShareYourFiles, making sure that the expectations of all stakeholders 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 and business-sensitive and potentially confidential data, all

GDPR requirements must be met. The system must 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, and so on)
- to pay using credit cards, Paypal, bitcoins or a customer/corporate account
- to review any chats they have attended or been invited to
- to request/organise/initiate private channels when these are included in their price plan, and to advertise and manage them.

The application will operate a forum as well as a real-time chat application where users will use various forms of authentication when signing in (e.g. local account, social media account, and so on). The chat facility will be used primarily to request advice from other members. The chat may require a specialised channel (e.g. there might be one for a specific department of a specific organisation) or a public channel, reaching out to everyone. Some of the more tech-savvy and experienced users might agree to be channel moderators in exchange for either an on-demand job contract or to cover their membership dues.

The system must also keep track of customers' contact details as well as invoices and payments. Both the general public as well as the organisations who sign up with the app should be able to open a customer or merchant account respectively (e.g. a lawyer could set up an account so that they can receive files from clients). ShareYourFiles wants to give all its users the option of setting up a 'hold account' where customers can top-up money and pay for their membership or forum consultations in this way, or for individuals acting as forum moderators or getting a job contract to build up their payments and transfer them to their bank account whenever they want, to increase security (or get better deals on commission rates or for any other reason). Since ShareYourFiles is a growing and ambitious project, it will be 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 specialising in test-driven software development, though they can provide services for any stage of a project's lifecycle. UCL has been approached by ShareYourFiles to estimate the cost of development and deployment of an integrated computer-based system for running the project. The ShareYourFiles team is growing, so that Kam Patel will be the office manager for a team of 12, though currently it includes only himself and Ms Evans. The 10 new staff will be handling customer relations, marketing, HR administration, project and event support, and finances. Each of these areas should have access to their own dedicated 'area' within the proposed system.

More senior full-time employees will require permission to review and make changes across all sections, while more junior employees will only be able to access their own section and have more limitations in what they can change, and will 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 will not have permission to make changes, and will have to request any changes 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 ShareYourFiles 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 ShareYourFiles system.

[10 marks]

Task 2
Design a set of black box test cases for the ShareYourFiles project that 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, and 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 particularly concerned about the security of the application given the personal, business, sensitive and confidential information it will hold, and is looking for ways to ensure the system is as robust, secure and reliable for its customers as possible. She has attended several related conferences, including InfoSec and the IEEE Symposium on Security and Privacy (SP) to stay up-to-date with the latest research on CyberSecurity trends, threats and approaches to mitigating them. She would like to establish which might be feasible to deploy on the project, given its complexity as well as the strong dependency links to third-party software and collaborators.

She has asked you to write a short report about CyberSecurity and how it can benefit the ShareYourFiles project. She is interested to learn how CyberSecurity should be applied to the project and in which parts, such that the maximum value will be gained, while ensuring all customers' (individuals or organisations) private data will be kept in line with the regulatory requirements.

Write a report for Dr Burns, briefly explaining the concept of CyberSecurity, and presenting tools and techniques that may be used in the project, critically discussing which areas of the project system they might be applied to, and illustrating how they could be applied to the ShareYourFiles project. You should also highlight any issues and risks that might arise and discuss how they might be dealt with.

[40 marks]

[Total: 100 marks]

[END OF COURSEWORK ASSIGNMENT 1]