STEPS TO DEVELOP A SAAS APPLICATION

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ABSTRACT: To develop a SaaS application requires a lot of time, experience, programming skills. These applications have high scalability, flexibility and data protection against accidental loss or malware attacks. In this paper, we present the necessary steps for the development of a SaaS application, with an example for the online content certification service (OCC). This service can be used by customers who want to protect their content posted online (certification of origin and integrity of content).

KEYWORDS: SaaS, cloud, online content certification, middleware, testing plan.

1. INTRODUCTION

To optimize and streamline the activities of firms, companies or institutions it is beneficial to develop SaaS applications [1]. These applications are hosted in the cloud and do not require any investment in terms of hardware equipment from the users (they are small expenses, only for subscription). Infrastructure costs are borne by the application provider. In addition, these apps allow easy access (just using an internet connection and a connecting device: laptop, tablet, phone or other connecting devices). They also provide enhanced data protection, in terms of data security against attempts to fraudulently access data (hacking) and against accidental data loss (due to damage or failure of storage devices or accidental deletion) by providing backups by the providers of these applications.

SaaS applications have become very popular (some are free, others require a subscription) and many examples can be given, such as [2] [3]:

- creating tools for team communication: fast, flexible and efficient (using Slack),
- using Dropbox to store and share files,
- managing customer relationships using SalesForces
- managing Google applications that are used and known as G Suite (Gmail, Google Drive, Google Docs, etc.)
- using the Zoom platform for virtual meetings (and the examples could go on).

2. PROBLEM FORMULATION

By reading the examples of the types of SaaS applications, anyone can see how commonly these applications are used and how important they are [4] [5].

Many companies choose to use the cloud concept to carry out certain activities in order to take advantage of the benefits [6].

Thus, the deployment of SaaS applications is a growing market for vendors and a challenge to optimise them.

The following will present some steps that need to be taken in order to build an application that meets the required characteristics. As an example, some elements for a SaaS application offering online content certification (OCC) services will be specified.

3. PROBLEM SOLUTION

SaaS applications are becoming increasingly popular for both developers (application providers) and customers/users. For the development of SaaS applications there is literature and

online courses that can be followed [8], proposing the following phases [7] [9]:

- planning,
- discovery,
- application design,
- architecture design,
- development and testing,
- application maintenance and further development.

All these phases are not clearly defined, and they may overlap or be adjusted during the development of the application (i.e. the phases already completed may be adjusted; the completion of the six phases is in fact a cyclical process).

In the planning phase, the aim is to find all the elements that will ensure the success of the application: researching the market (both competing companies and the target group), defining the aim, objectives and main characteristics, researching existing technologies in order to use the right ones.

In the discovery phase, several meetings are held with stakeholders to obtain details on: the requirements of the application (starting from the purpose and features), assessing risks and possible mitigation, assessing costs and budgeting for implementation, detailing the steps and estimating the time needed for implementation, finding the optimal team structure, etc.

In the application design phase, the user interface (UI) design will be carried out taking into account that it should provide a meaningful and relevant user experience (i.e. it addresses: ease of use of the application, user needs, clear presentation).

During the architecture design phase, the performance criteria required of the application will be taken into account: scalability (being able to handle a large number of clients), data protection and security (data backup and replication mechanisms, data and file encryption mechanisms and methods to prevent malware), flexibility and integration with other platforms, and alerting the responsible persons from the vendor (those maintaining the application) when emergencies occur.

In the development and testing phase, development specialists work to develop the front-end and back-end parts of the application and then quality assurance (QA) specialists perform testing for each component individually as well as part of the system. The development specialists, based on the feedback received from testing, eliminate shortcomings

In the application maintenance and further development phase based on feedback received from users and changes to certain requirements, specialists improve existing features or develop new ones.

To illustrate the above, some elements for the development of an online content certification application (OCC) are presented.

These applications are developed as a result of the online environment of information transmission and as a need to guarantee the authenticity of the content presented and its origin. Thus, by using the digital certificate it is possible to establish the author of a content posted online (sometimes it is difficult to establish the author of an online content and it can lead to a lack of trust of the message transmitted or the legal effects).

The structure of an online content certification system (also known as a component diagram) is shown in Figure 1.

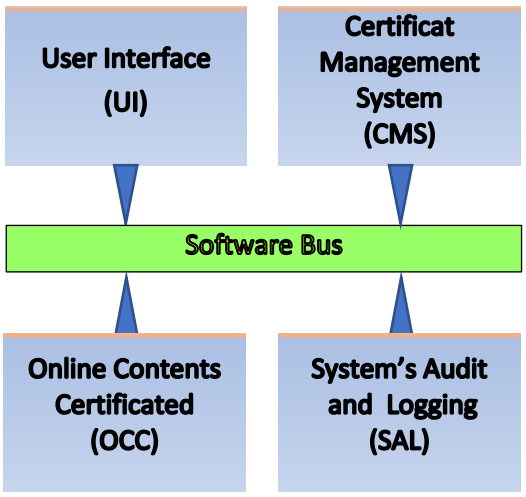

Figure 1 Structure of the content certification system

All components of the structure will communicate with each other via the Software Bus (subscribe to events posted on the bus). With the UI users will authenticate and sign an online content. The Certificate Management System component will manage digital certificates and cryptographic key pairs. The Online Contents Certificated component will manage contents that have been certified and are to be certified. The System's Audit and Logging will manage notifications to the other components related to operation and audit activities.
Figure 2 shows the UI use case diagram identifying the interaction of an unauthenticated user with the system (to register).

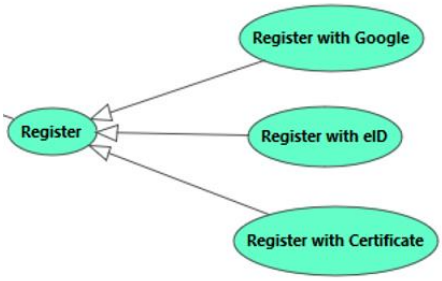

Figure 2 Use case diagram for an unauthenticated user

Middleware architecture and Amazon Web Services (AWS) tools are used for cloud application development.
Testing is done according to a plan developed in advance for each software module. For example, for a component X (as shown in Figure 1), it can be tested whether it consumes events occurring on the bus. Thus, in order to perform the test, the following steps are carried out:
- describe the test procedure: Component X will subscribe to the topic used by the other components for a given request
- show which are the dependencies: Software Bus functional + topic related to the created request
- show which is the input element: A specific request
- show which is the output element: the request was consumed from the Software Bus
- the acceptance criteria are shown: The test is passed if the request is consumed from the Software Bus
- severity is shown: Critical.
The test is done after a software module has been developed and possible malfunctions are passed on for correction.

CONCLUSIONS

Before starting to build a software application to be used, it is good to make an assessment to have a clear vision of the resources available and the time needed to build the application. In general, it is recommended that any company should take care of the activities it can do best and outsource those that are not within its reach to handle (such as software applications when the company does not have this area of activity in its portfolio. SaaS applications offer benefits to both providers and users.
The development of online content certification applications is necessary to certify that certain content that is signed with a valid digital certificate and found on certain sites, complies with the rule of a digital signature, ensuring the authenticity and integrity of the content.

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