Digitizing Schools using Azure Platform

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ABSTRACT

This paper describes the Software as a Service (SaaS) software delivery model along with its advantages and its issues. Further, the use of Microsoft Azure platform and its characteristics for SAAS application development are discussed, along with a few basic services which are required for deploying and using the application through Azure cloud. The next section illustrates the modules in this SAAS application, which basically aims at digitizing the tedious manual activities of the schools to minimize the time and effort involved in carrying out these activities. The aim is to make a robust, multi-tenant cloud based system for schools which would serve as a web portal for various school activities.

General Terms

Cloud computing, Microsoft Azure, Software as a Service

Keywords

SaaS (Software as a Service), SaaP (Software as a Product), Multi-Tenancy, vendor

1. INTRODUCTION

Currently there are a lot of new schools coming up in many cities and towns in India. A lot of schools have setup their IT infrastructure, but this is limited to bigger schools or school chains.Many small schools even in cities like Pune rely on manual processes. With the penetration of smart phones and tablets, there is an opportunity to start digitalizing these schools. The main objective of the research paper is to provide a software support solution for schools, to make use of the digital devices like tablets, cell phones, computers to provide students and their parents, an easier access to the day to day activities of the school. The objective of this research is to host a SaaS application on Microsoft Azure and deploy it on the Internet. Digitizing school work means reducing a lot of manual effort which is required in performing small activities by teachers, students, as well as the parents of the students.The motivation behind constructing such a system is to automate certain processes of the school, thus reducing manual intervention. Also, the system will work on Azure cloud, thus user will not have to worry about any updates, security concerns etc. The research contains the following modules: Career path recommendation, online buying and selling of used textbooks, School bus management system, Online tests, Online viewing of homework and notices, online payment of fees, online feedback from parents.

2. SOFTWARE AS A SERVICE

Software as a Service (SaaS) is a subscription based delivery model, in which the application is hosted on a central server. SAAS is on-demand software which can be accessed by a thin-client using a web browser. SAAS is a pay per use model in which the user is charged a subscription fee monthly or annually.

Multiple customers share the same copy of an application in SAAS. To bring down the costs of an SAAS application, Multi-Tenancy approach is used. Multi-Tenancy means that multiple businesses use the same application for serving their purposes, but are provided with abstractions such that they can access only the data related to their business.
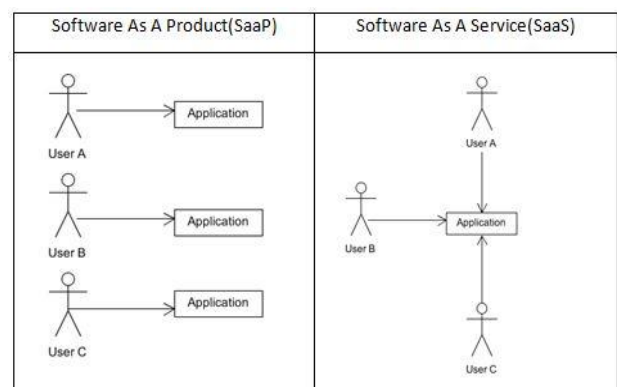

Fig 1: SaaP vs. SaaS[7]

There are many different strategies and models used for payment schemes or subscriptions. Some applications allow a modular approach in which customers can choose the functionalities which they want to use and pay and use only that part of the software. Some vendors provide freemium model by which the users can use some functionalities of the application for free but have to pay for the other, more advanced functionalities.

The main advantage of the SAAS delivery model is that the support and maintenance is handled by the SAAS provider that is the vendor. Customers have to only worry about using the application and rest all is handled at the vendor end. The updating and maintenance of software usually requires a lot of IT staff engagement for most of the organizations. Thus, outsourcing this task to the SAAS provider saves a lot of resources for the organizations.

The SAAS model also offers flexibility along with support and maintenance. Customers can edit or change the look and feel of their software as they desire. Configuration and customization of applications at the customer end are allowed up to some extent.

SAAS applications require minimum hardware and can work on even a dumb terminal, as it requires only a basic browser for its operations. Due to this, various compatibility issues with various computer architectures are completely avoided. SAAS applications can work with any kind of machine, with any operating system, thus eliminating the need for any specific kind of hardware.

Data is stored at the server end in SAAS applications, which causes issues regarding data security. These have to be appropriately handled by the vendor by providing strong encryptions for data and also controlling the access to the data by a limited number of users. The latency issue should also be addressed, as some applications require responses within a certain amount of time and latency might highly affect the performance of such softwares.

In the past decade, SAAS has become the preferred delivery model over the traditional SaaP (Software as a Product) model in the following areas:

- Accounting

- Collaboration

- Content Management systems

- Customer Relationship Management(CRM)

- Enterprise Resource Planning(ERP)

- Management Information Systems(MIS)

- Human Resource Management(HRM)

- Invoicing

For developing a SAAS application, various platforms can be used to make the development of the application simpler. For this application, this paper discusses the Microsoft Azure platform for easy development and deployment of the application on the cloud.

3. MICROSOFT AZURE

Microsoft Azure is a platform provided and managed by Microsoft. It was released on the 1st Feb, 2010. Azure is basically a cloud platform which enables users to develop, build, manage and deploy their applications on the cloud using the services of Azure. Azure provides support for many different programming languages like Ruby, Perl, Python, .Net, Java. It supports operating systems like Windows and Linux. Microsoft Azure provides many services which help to deploy our applications on the cloud at a faster rate. The applications are basically developed using IDE's like Visual Studio or eclipse and then deployed on Azure cloud.[7][8]

Some of the services provided by Microsoft Azure include

1. Azure SQL database
This is a relational database service provided by Azure which helps the developers to create and extend their applications on the cloud. SQL database allows querying on the stored data which may be in structured, unstructured or in semi-structured format. Using this service you can scale the size of your database as per the business requirements.[9]

2. Azure Active Directory(Azure AD)
Azure AD provides the users with an identity management service and access control capabilities for the cloud based SaaS applications. It is a multi-tenant cloud based directory. One of the important features of this service is the Single Sign-On (SSO) Using SSO user can access many cloud SaaS applications. It is possible to integrate the existing Windows Server Active Directory and the Azure AD.[9]

3. Azure Storage
This service offers non relational data storage including files, tables, queues and Blob. Blobs are used for storing unstructured data, tables store the structured data, and messages are stored in queues whereas files are used for storing existing new applications. It offers reliable storage for any size of data (having size of up to petabytes)[9]

4. Azure Cloud Services
This service provides the customers with the ability to build deploy and manage their SaaS applications. A cloud service is basically a collection of virtual machines that are hosted on the cloud.
It provides two roles:

    a. Web role: Windows Server with IIS(Internet Information Service)

    b. Worker role: Windows Server without IIS(Internet Information Service)[9]

5. Azure Automation
This service helps to simplify the cloud management. It allows the customers to automate the creation, deployment, monitoring and maintenance of the resources provided by Azure. It eliminates time consuming repetitive tasks thus allowing faster execution and improving reliability and efficiency.[9]

6. IAS(Internet Authentication Service)
There are certain security services like like RRAS (Routing and Remote Access Service) which provide authentication for a small network. Large networks need a dedicated infrastructure. RADIUS (Remote Authentication Dial In User Service) is one such standard. The IAS is a Microsoft implementation of RADIUS server. It stores authentication information in the Active Directory.

4. SCOPE OF THE APPLICATION
In most of the schools in India, even in developed cities, digital software is not used. Manual processing methods are used to carry out day to day activities. If software is developed for schools, the communication between parents, teachers and students will become extremely simple and will provide an efficient way to organize school activities. Thus, this paper proposes a system 'Digital School' which will provide easy access to the ongoing activities of the schools, reduce paper work. This SaaS (Software as a Service) application will be deployed on Azure Cloud, and multiple tenants (schools) will be able to use the software at the same time. The aim of this research paper is to make a robust multi-tenant, cloud based systems for schools to serve as a web portal for school's various activities. The students, teachers and parents will be provided with a registered account to login. The system will consist of the following modules:

1. Career Path Recommendation System for students
The software will provide a career path recommendation based on the historical data of a student's performance in academic subjects, tests, sports, and cultural activities, other co-curricular and extracurricular activities. This data will be analyzed and based on this analysis; the system will try to recommend the best career path for the concerned student. The system will take the Marks database data as the input, and based on the used algorithm, will give a recommendation for each student. The software will also take feedback from the teacher i.e. the teacher's opinion about a student's performance according to her observation. Thus the recommendation result will be based on the system recommended result and the input from the teachers.

2. Buying and selling of used textbooks
Students often have books of their previous academic year in a good condition which can be reused. Students interested in

selling their books can register their names and book on the portal. Students interested in buying can buy them by selecting the book/books and contacting the seller.

3. Bus Management System

The software will provide an efficient school bus management system which will take details about the student's home address from the database and allocate a particular school bus to a group of students living in a particular area. This will help in efficiently using the fuel and also manage the bus schedules.

4. Online Tests

The software will have a section for online tests where students can give online practice tests. Teachers using their accounts can send questions and based on their category as subjective and objective questions, text fields and radio buttons will be generated for writing the answers for students. Answers will be assessed and student can view the results.

5. Homework section and notices

There can be a homework section where teachers can send daily homework eliminating the need for maintaining school diaries reducing paper work. Notices will be uploaded on the portal which will be visible to the concerned students.

6. Online payment of fees

There can be a section for payment of fees where the parents can directly pay the fees online. The details of fee payment will automatically be generated according to the login details.

7. Feedback from parents

Parents can send feedback for the school regarding events, teachers, teaching methods, school amenities, etc. Here they can express their thoughts regarding the fields which can be improved, give their expectations and complaints if any.

5. SYSTEM ARCHITECTURE

The system can be accessed by multiple tenants at the same time and each tenant will feel that he is the only user of the system. Every user can access the system using digital devices like smart phones, tablets, laptops, desktop computers etc. The system will be deployed on the Azure Cloud which will provide security and automatic updates.
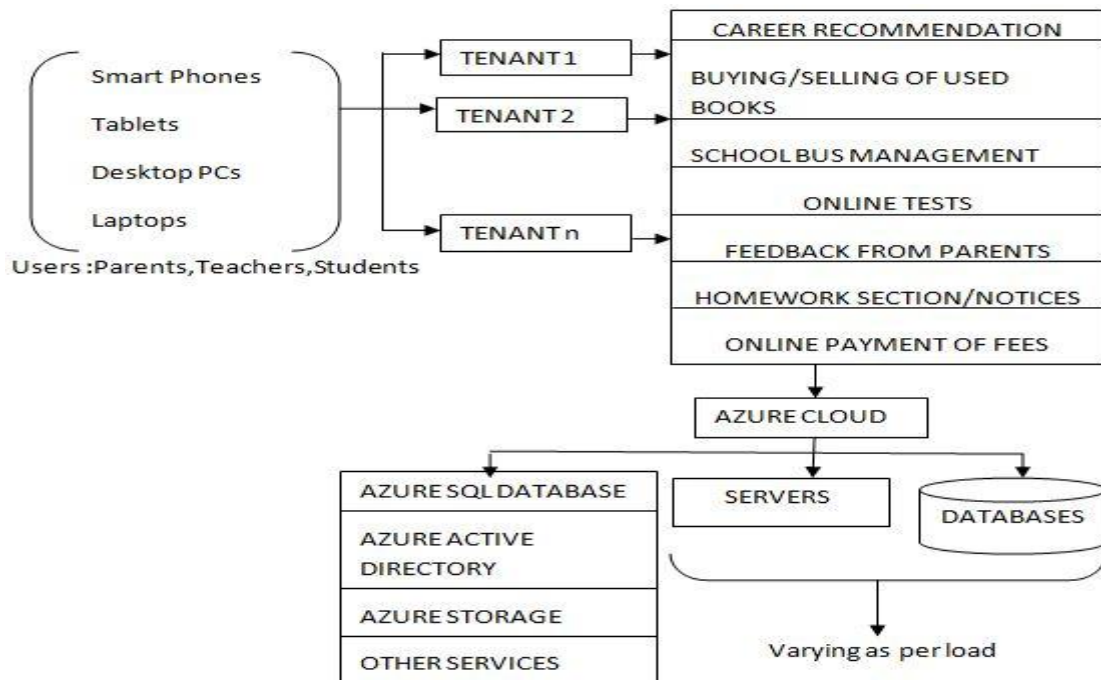

Fig 2: System Architecture

6. ALGORITHMIC METHODOLOGY AND EXPERIMENTAL EVALUATIONS

1) Acquiring databases from schools.

2) Subscribing to Microsoft Azure and keeping the use limited to free version limits.

3) Using .NET for basic UI designs of all the modules.

4) Module by module implementation of the system, keeping in mind the multi-tenant nature requirement of the final software.

5) Deployment of software using Azure cloud.

As the proposed project works in a Microsoft Azure environment which is a cloud computing platform and infrastructure, multiple schools will use the same system, but will be provided an abstracted view of the system, such that no information of one school will be provided to another school. The user name and password is verified while login else login error is recognized and displayed. User is not given access to any content before login credentials are verified. The application GUI is simple, easy to use and to understand. As the cloud uses a pay per use model of payment, the scale up or scale down is rapid according to the number of customers using the software at that time, as it will be essential for very high cost savings while using Azure cloud services. This research paper aims to build a robust system which would work efficiently even under varying load.
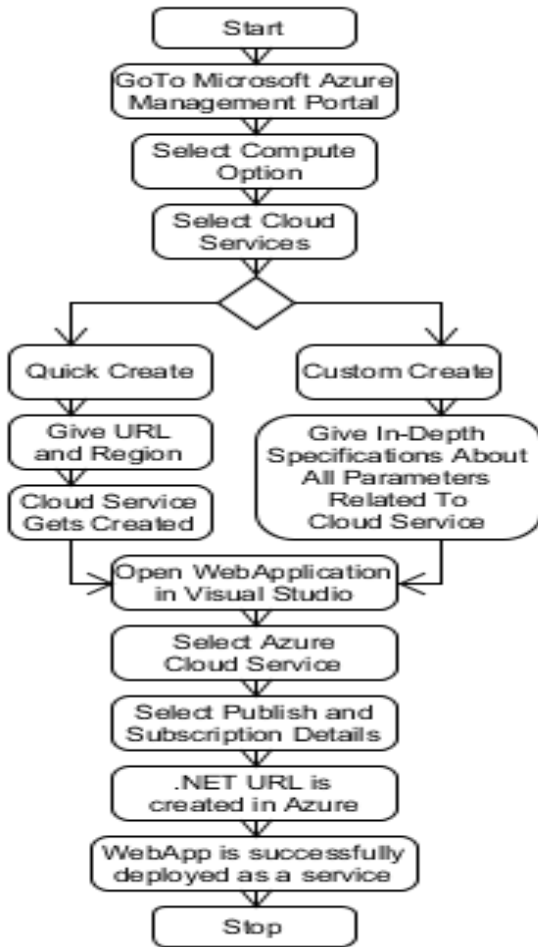
Fig 3: Deployment of Software using Azure Cloud

7. ADVANTAGES AND DISADVANTAGES

Advantages

- No installations of software or any special hardware are required for using this SAAS application.

- The system is robust and can handle varying loads and scales up/down according to the number of users.

- Upgrades and security is handled by Microsoft Azure.

- All in one application for handling almost all school activities.

- Multiple schools can use the same software with just a few variations (multiple tenants).

- Only a browser and working internet connection is required for using this SAAS system.

Disadvantages

- Sometimes security or latency issues may occur due to cloud.

- Total dependency on internet connection.

- Switching between SAAS vendors is difficult.

8. CONCLUSION

Thus, the proposed project will create a multi tenant system for various schools which will be much more effective as compared to manual processes which are currently being used in schools and also provides certain features which will make the life of the students, teachers and parents easier thus enhancing the communication between them.

The project can further be expanded for use by various colleges, institutions/ companies/ organizations instead of restricting it at school level. We can further include the following features in the system: Providing e-learning resources, Provision for sending and receiving online leave for teachers and students.

9. ACKNOWLEDGMENTS

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