

Cloud Computing Based System Integration in Education

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Abstract – In today's world, large organizations rely on different IT systems to manage their processes and data, and integrating them seamlessly can be a challenge. Cloud System Integration can solve problems faced by large organizations with processes and data sharing. Different IT organizations use it to improve the quality of their operations. System integration involves combining software from multiple subsystems to function as a single coordinated system. The task of managing an IT system in a college environment poses unique challenges. The present situation in many schools and colleges is that there are many disconnected systems managing many different tasks. Systems with different levels of functionality run independently of one another, causing multiple problems for the school's overall IT system. With cloud computing, we will automate all these processes, and it will also boost productivity at the same time.

Key Words: Cloud Computing, System Integration, Education, Technologies, Cloud deployment models, Students.

1. INTRODUCTION

System integration refers to the process of integrating all the physical and virtual components of an organization. Virtual components consist of databases, software, and applications. Integration has several major advantages for a company, including accelerating processes, improving work efficiency, ensuring effective information exchanges, and enabling the basic functions of the systems.

A traditional IT environment cannot provide the benefits of cloud computing. In cloud computing, computing resources are pooled and virtualized to achieve economies of scale. Cloud computing provides global access to information and services via a computing environment that is scalable on-demand and offers a low cost of entry. Moreover, cloud computing can provide pre-built solutions and services as well as the necessary skills for running and maintaining them, ensuring the institution no longer needs to maintain a highly skilled and difficult-to-find group of employees. Cloud computing offers benefits not found in traditional IT environments. It achieves economies of scale by pooling computing resources and utilising virtualization.

As information technology advances, higher education faces new challenges to provide services to students. As

the student population grows, it becomes more difficult to manage all the processes and data. The student management system, library management system and online campus selection system are integrated into one system to increase productivity, increase the data flow and reduce manual work. Systems integration solutions can provide education systems with greater productivity and quality in handling processes. This is because integrated systems provide an increase in the speed of information flows and a reduction in operational costs also promotes the connectivity necessary to overcome other software or hardware challenges associated with these flows. To satisfy the expectations of young millennial students, the university employs social, mobile, and cloud technology in addition to on-premise systems. A single source of data will be implemented and maintained in the proposed system, ensuring the highest level of data quality. When IT services, are shared among educational institutions, there is a larger likelihood that these institutions can focus more on research and core academic activities.

1.1. PURPOSE

Integration solutions can help the company increase productivity and quality in business operations. The reason for this is that integrated systems increase the speed of information flows, reduce operational costs, and also provide the connectivity necessary to overcome software and hardware challenges associated with these flows. Often, business leaders are surprised at how greatly an integrated system can improve their operations.

Businesses can eliminate re-entering the same data into their systems twice or more by bringing databases and data sources together to create a new system that provides valuable information and new products. Integration eliminates the need to store and manage data. The scalable and secure architecture allows it to provide a centralized system. Companies can achieve operational and cost efficiencies through improved data collection and retrieval, as well as other benefits. Integrating systems is a process that leverages the latest technologies to help businesses achieve their goals. Likewise, higher education in India is experiencing enormous and exponential growth in the number of students, which may make managing student data difficult. With cloud integration, we will automate all these processes, and it will also boost productivity at the same time.

1.2. OBJECTIVE

The objective of this project is to create a system that allows us to integrate one or more systems to work together, to solve the data problem by communicating with each other using the API database. This particular process will help to reduce the data delicacy by reducing the effort to create the data within the multiple systems. It adds more value to the business by adding the automation process, and it will upgrade the system to do the integration with various systems when needed.

3. TECHNICAL DESIGN

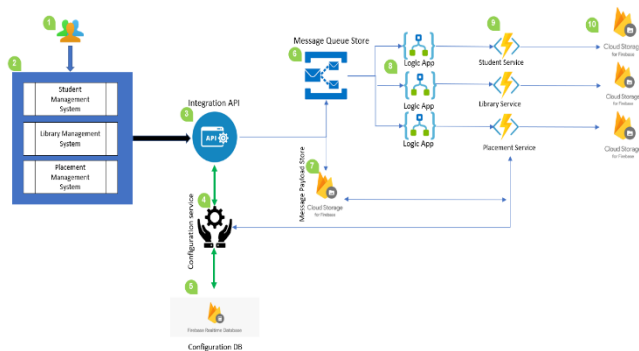


Fig- 1: Technical Design

In this project, three systems which are the Student management system, Library management system and Online Campus Selection System are linked to share student data so that data sharing can be done easily. Student Management System will help students to explore new courses, take online classes also to interact with skilled instructors. Library Management System will help students to buy books online, write blogs and explore news and events. And Placement Management System will help students to explore different courses, workshops and also apply for suitable company according to their requirement.

Integration service will be used by all three 3 systems to communicate and share the data. Configuration service is added to store manage the settings, configuration related to the service API, database credentials and methods information. The configuration service will maintain configuration in ConfigDB which will be a type of Cloud Firebase database. Message Queue store is used to make sure that requested are processed in the FIFO pattern. In the Queue store, only basic information is stored. All the incoming requests will send some data that will be getting stored in Cloud Firebase Realtime Database, in technical terms it is Payload.

The logic apps are used to connect the Queue store and read the message and execute the student service. The function app will be used to host service API of student,

library and exam management. This service is executed by Logic App to process the service bus message. The Firebase is used by all the management systems to store and manage the application data.

4. IMPLEMENTATION

The project is divided into 3 different services which are Request Accepting Service, Request Processing Service and Configuration Service. Request Accepting Service is the first phase. In this, the source system is sending the request and stores the request data in the queue. In Request Accepting Service, we have used REST API to accept the request; SQL Server to store the request details, request content and service bus queue to queue the messages. Request Processing Service is the second phase. In Request Processing Service, we will process the messages from the queue in a FIFO (First In First Out) manner and based upon the target system and action method received by Request Acceptance Service, it will get the service URI of the target system from the configuration service and send the request data to the target system. The last phase is configuration service; it acts as a common repository to manage the application configuration like database connection details, target system details, REST API information. The purpose of this service is to have a common API to provide configuration to Request Acceptance Service and Request Processing Service.

As a common service to accept the data from any system, hence integration request acceptance service is created, in REST API form. And it is considered that the calling system will send the data in a JSON object because it is the standard language. The API accepts a specific JSON format where we have predefined attributes to understand the request. As you can see, we have an attribute called route name which is used to define the communication path between the two systems. Request-id will be sent by the source system to identify the uniqueness of the request. Source and target systems are used to get the source and target name. Request action is used to get the action method name. Message content is the actual data of the source system which is needed to be shared with the target system.

When a system makes a call to this API, the API will perform multiple steps to store and enqueue the data. We are logging each step getting performed in the API method execution. Here you can see that we first make a call to store data in the database and later we make a call to the service bus to enqueue the request data. As a result of this service execution, two entries will be added to 2 individual tables which are request queues in which we store request information and message storage to store data that needs to be shared with the target system.

5. RESULTS

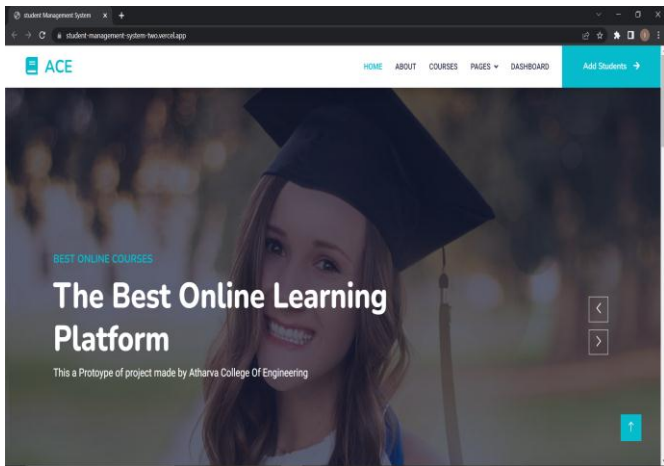


Fig - 2: Student Management system

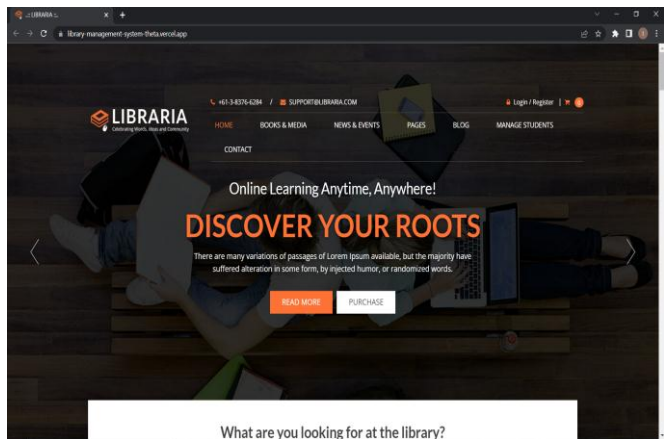


Fig - 3: Library Management System

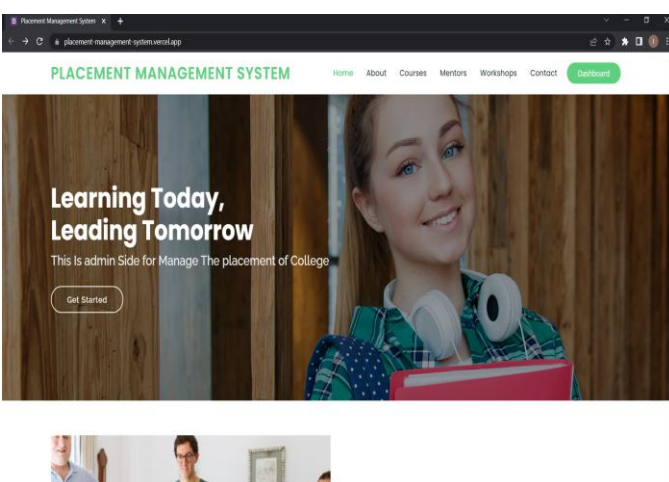


Fig - 4: Placement Management system

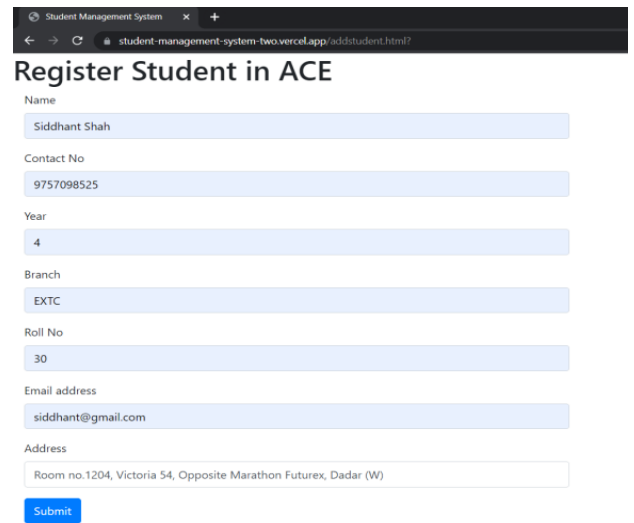


Fig - 5: Adding student in Student Management System

Dashboard for Student Manage

Refresh

SR	Name	Contact No	Year	Branch	Roll No	Email	Address
1	Siddhant Shah	9757098525	4	EXTC	30	siddhant@gmail.com	Room no.109, Victoria 54, Opposite Marathon Futurex, Dadar West.

Fig - 6: Student data added in the Student Management System

Dashboard for Student in Library

Refresh

SR	Name	Contact No	Year	Branch	Roll No	Email	Address
1	Siddhant Shah	9757098525	4	EXTC	30	siddhant@gmail.com	Room no.109, Victoria 54, Opposite Marathon Futurex, Dadar West.

Fig - 7: Student data is getting reflected in the library management system.

List Of Students

Refresh

SR	Name	Contact No	Year	Branch	Roll No	Email	Address
1	Siddhant Shah	9757098525	4	EXTC	30	siddhant@gmail.com	Room no.109, Victoria 54, Opposite Marathon Futurex, Dadar West.

Fig - 8: Student data is getting reflected in the placement management system

Figure 2 is the Student Management System, which will help students take online classes, explore new courses, and interact with skilled instructors. Figure 3 is the Library Management System, which will help students buy books online, write blogs and explore news and events. And Figure 4 is the Placement Management System, which will help students explore different courses, workshops, and also apply to suitable companies according to their requirements.

In Figure 5, students are added to the Student Management System. Figure 6 shows a student being successfully added to the Student Management System dashboard. Figure 7 and Figure 8 show that student data is also added in other systems, which are the Library Management System and the Placement Management System. The above integration of data makes data sharing easy. One of the use cases is adding student data to one of the systems and getting the same data reflected in the other systems. Like that, we can add different use cases and make the system more and more flexible.

6. CONCLUSION

System integrity is one of the most paramount concerns with the rapid digital expansion of higher education institutions. The intent of this project is to create an IT solution that would solve many of the problems endemic in the current systems. Some of the main issues with the current systems were identified, and changes for a better and more efficient system emerged. System integration can be a complicated method, especially as the project grows in complexity. With additional users, suppliers, functions, and subsystems, the system integration process can become extremely difficult. System integration refers to the interoperability and compatibility of items from many sources / companies in a system. Despite its limitations, system integration is a great solution for small and medium-sized businesses who are wasting time and money juggling different systems. The main outcome is an integrated system that eliminates the need for multiple disparate systems that were causing difficulties and inefficiencies for the college or school systems involved. After integrating these three different systems, the user will be able to access all the school or college services and systems with a single sign-on. The flexible aspect of cloud computing relieves staff of maintenance costs and duties, thus eliminating high operational costs and disaster recovery risks and costs. Also, cloud computing will surely offer connected applications of student information systems, eliminate the manual process, simplify data analysis, strengthen decision making, save significant time and reduce administrative paperwork.

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