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Computer Based Education: Study on Implementation of Service Approach with Educational Information System

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ABSTRACT

The current educational system has undergone a tremendous change in the way of teaching as well as learning and the administration techniques. This change is enabled through the implementation of technology. This technology has brought a new dimension to the traditional learning methods through various models like e-learning, virtual class rooms etc. This helps the user to have access to the classrooms and the materials even from the remote networks.. This paper is concentrating on the implementation of Service Oriented Architecture (SOA) with educational institutions and listing out the advantages and the implementation issues with the same.

KEYWORDS: Service Oriented Architecture, Web services, Educational Information System

1. Introduction

Today's computer world is mostly operating around the resources. The services are the individual processes with its invoking methods bundled together. As the number of services and the demand for the same increases, sharing of resources and services has become highly important. [1] The main need to implement SOA with the educational institutions is its characteristics like loose coupling, resource sharing and open standard etc. These characters are making the SOA more flexible and adoptable by various users spread across the network.

2. SOA with Educational Institutions

Nowadays many innovative practices have been implemented in educational systems all around the world. The virtual learning, e learning are the well known examples for the same. As the service utilization increases among the organizations, the importance of SOA has tremendously increased. There are several services, which can be kept common with in the educational institutions like the library, projects, placement services etc. This will avoid un-necessary duplication of the same / similar databases at multiple locations. Even though the method of invoking the services varies, the bases for these services are always the student details.

Consider the following services

1. Admission
2. Library Access
3. Examination
4. Placements

The above-mentioned services will be accessed by different users at different levels. Each and every user will have different level of information requirement and may have their own applications to invoke the data. However, it is crucial to have a common interface through which the users can interact with each other in an effective manner. This will minimize the redundancy of different applications available with various users. With the help of this, an enterprise can retrieve the relevant information it required, from the common database, as per its own specific requirements.

2.1. Working scenario:

This ESS (Educational Service System) will be containing the following segments:

1) Web client
2) Educational Server
a) Educational Service Center
b) Educational Service Providers
c) UDDI

The web clients are the service consumers. The service consumers may vary from the students, teachers, parents to placement agencies. For example the students query to access the books from the e-library will be forwarded to the educational server which will then be directed the service registry. The part of the keyword will be considered for the search and the e-bookaccess service will identify the content and distribute the same to the user through the interface. The interfaces can also be called as a web brokers who will enable the core character of SOA- Interoperability. The interfaces will help the different consumers to communicate from their own setup to a different application setup.

2.2. Components:

The educational server utilizes and manages the distributed education resources. This contains three components. [2].

1. Server registration
2. User registration
3. User profile updating
4. Content discovery

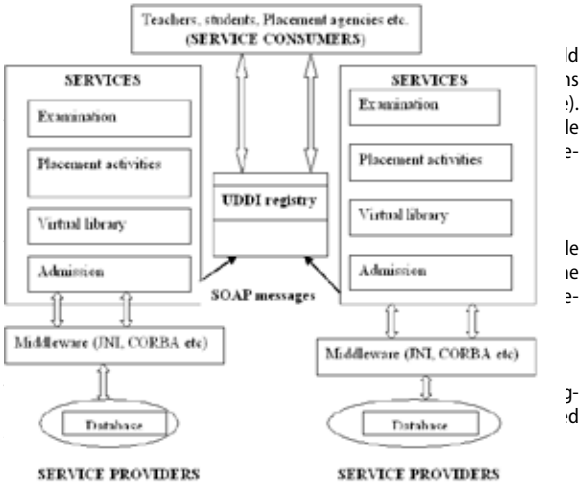


Fig 1. EDUCATIONAL INFORMATION SYSTEM

The above-mentioned diagram contains four different services with their own procedure defined. All the four services are accessing the corresponding data storage. This entire Educational Information System constitutes a complete Educational server. This can be accessed even from the external network through the SOAP protocols.

3. SOA And Web Services

As the services are described within the modules then it can be extended and launched beyond boundaries with the help of web services. The data can be centrally stored and the access will be made through SOAP messages. The services and its associated procedures are wrapped together and will be published in the service registry by the service providers.[3][4] The services can be invoked by the end users (service consumers) by using various web protocols messages, which in turn will locate the service in the registry and invoke the procedure through the provider. In the above-mentioned example, three different services and its procedures to invoke the data are registered into the service registry and the end user (service consumer) can be a student or a teacher or

an office administrator.

An Internet web server hosts each web service's Unique Resource Identifier. SOAP messages, which are typically HTTP binding, can be used to define the services. [5]

3.1. Characteristics of SOA:

a) Interoperability:
This allows different distributed web services to run on a variety of software platforms and hardware architectures.

b) Loose coupling:
A service can be located on any server, and relocated as necessary.

d) Service based collaboration:
There will be a common service model that allows seamless operation of business processes internal and external to the enterprise. [6]

e)Modularity:
A service supports a set of interfaces. These interfaces should be cohesive, meaning that they should all relate to each other in the context of a module.

4. Institutional Benefits:

When the SOA is implemented with educational institutions, the following benefits can be realized.

1) The complete combination of tools, fundamental structures and the standards can provide the overall support for the entire SOA lifecycle.
2) The services developed and registered by a particular service provider can be consumed by many service consumers based on their need from anywhere.
3) Basically the educational institutions needs ample knowledge and resource sharing like library books, projects, placement details etc. The SOA architecture enables the educational institutions to capitalize the resource sharing completely.
4) The individual part of an application can be developed, updated and maintained independently.
5) The interoperable nature of the SOA applications is allowing the organizations to espouse the benefits of latest services without much change in their own resources and the applications and only with the inclusion of a middleware. The middleware will manage the differences among the applications and providing the necessary service to the consumers within the limited time. So the turnaround time for the service utility is considerable reduced.
6) Generally the Indian educational system is mostly depending upon the grants and the donations which reduce the adoption of technology by many of the educational institutions especially in the remote areas. This SOA will allow all levels of organization to have higher standards with limited investment on the purchase of resources and enables them to have maximum utility of latest services.

5. Case Analysis

We considered a single institution with multiple courses and multiple databases for the analysis. The simulated model was implemented basically with two services named examination and admission process. The relativity among these services was studied and the activity graph for the same was created. If we consider a single entity – Arts, Science & Commerce College, the student database is the common property, which will have a different access pattern within itself with various streams.

Course	Admission
Science	Students with minimum 50% and Maths as a subject
Commerce	Students with minimum 45%
Arts	Students with minimum 40% with any subject

In the above table the student database is a common database, which is accessed in a different ways with different courses within the same institution.

Service ---------- Admission
Backend ---------- Student database
Consumers ---------- Students of Arts, Science & Commerce

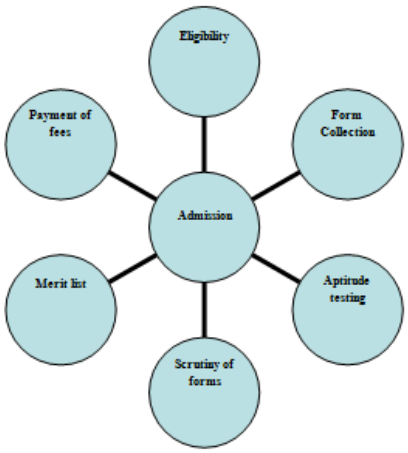


Fig 2. Admission Activity list

As the number of institutions attached varies, then the complexity of the data handling will also increase considerably. Each and every query will navigate through the entire database and the resultant data will be identified. The better way to bring out a seamless data base architecture among these applications will be the SOA with the web services.

With the help of web services the data among the various institutions that is disparate in nature can be brought into a single place and the required data can be accessed in the way the user requires without affecting each other. All institutions will store the data in a single data warehouse with its own access pattern bundled with it. Then the service brokers like middleware can be approached to identify the required service from the registry.

6. Findings

With the sample considered above, as and initial process the applications were prepared separately for each process like admission, examination, timetable, teaching plans, online quiz etc. Then the same has been encompassed into a portal, which was developed with PHP and MySql as a backend to provide the cross platform support.

The benefits are analyzed by taking 30 users in each category has been mainly analyzed under the parameters like Reusability, Availability, Speed of access , Turnaround time and Resource sharing etc., where the following conclusions were drawn.

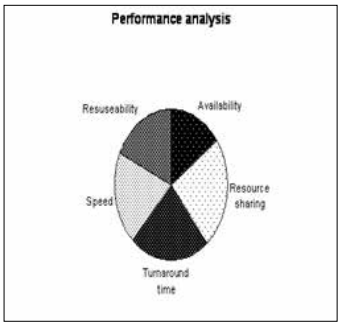


Fig 3. Performance analysis graph

7. Limitations

1. Even though the SOA is allowing the resource reusability the overall cost benefit analysis may vary from organization to organization based on their need and legacy system.
2. The Service utility is governed by the service level agreement. This SLA describes the security policies and the access control details. This increase the complexity in the utilization of simple application for small functions like individual performance analysis, daily attendance report etc. So the SOA is not necessary for a simple application development.
3. The security aspects of the SOA are governed by WS- Security policy. But the policy doesn't provide the complete security solution for the services developed individually and attached with the ESS. The interaction between one ESS to another ESS increases the number of SOAP message transfers and the complexity of the system function.

8. Future Work

The same architecture can be implemented with multiple services and the security issues of the same can be analyzed. This architecture is only projecting the service utility among two separate servers. The same can be extended with multiple servers and the SLA among the servers can be studied.

9. Conclusion

This service orientation with the educational institutions will be highly beneficial in such a way that it can provide data rich, platform independent, services. Even though certain shortcomings like middleware issues and the security problems are present with the current scenario, this can be improved in the future. This will definitely bring out a new progression in the educational field.

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