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Strategic Management System for Academic World

Expert System Based on Composition of Cloud Computing and Case Based Reasoning System

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Abstract. The Existing processes for student's and faculties' vital data collection require a great deal of labor work to collect, input and analyze the information. These processes are usually slow and error prone, introducing a latency that prevents real-time data accessibility. This scenario restrains the teaching strategies and monitoring capabilities. We propose a solution to automate this process by using "documents" attached to existing faculty/ student datasheet that are inter-connected to exchange service. The proposal is based on the concepts of utility computing and cloud computing networks. The information becomes available in the "cloud" from where it can be processed by expert systems and/or distributed to administrative staff. The proof-of-concept design applies commodity computing integrated to legacy education devices, ensuring cost effectiveness and simple integration.
In the presented paper, author proposed a concept of software realization of an expert system. Author would like to assemble experts experience in our dumb box (Personal Computer) as knowledge base. Presented paper based on the concept that 'knowledge never dies', once we adopt the knowledge of some experts and use it in our system it works more efficient than a simple work routine.

Keywords: cloud computing; case based; rule based; reasoning; academic; expert system; management;

1. Introduction

In the current scenario the academic institutions faces more complex problems while using conventional approaches. Requirement of industries changes at much faster speed in the age of dynamic evolution. We present a solution to automate this process from bedside data collection to information distribution and remote access by teaching staff. Our solution is based on concepts of Teaching Learning Process (TLP) documents and utility computing. "Documents" are attached to existing faculty/student datasheet that are inter-connected to exchange services; these are integrated to the institution's computing network infrastructure. The information becomes available in the "cloud", from where it can be processed by expert systems and/or distributed to administrative staff for analysis. We argue that these technologies provide desirable features for automation in academic environment addressing the challenges listed above.

Our contribution is two-folded in social and scientific fields. In social we demonstrate an innovative and low cost solution to improve the quality of academic assistance delivery and; in scientific field we address the challenges of how to integrate documents connected to legacy academician which cloud computing services to collect, process and delivery student's and faculties' vital data. Currently we are living in the age of dynamic evolution and in this situation the requirement of industries changes at a much faster speed. In the present scenario the academic organizations faces more complex problem for conventional approaches. To illustrate it, when we contrast Case Based Reasoning (CBR) with Rule Based System, we see that the methodology for building and refining Knowledge Base (KB) is more sophisticated than the syntactic checks performed by the Rule Based method.

The proposed solutions given in this paper is based on Expert Systems (ES), to solve complicated practical problems in the academic sectors of the world are becoming more and more widespread nowadays. Expert systems are being developed and deployed worldwide innumerable applications, mainly because of their explanation capabilities.

2. Cloud Computing

Cloud computing is an extension of old main frame concepts of sharing with the addition of networking and application runs. Cloud has several advantages like – costs, capacity additions, availability, security, experimentation with new technologies, IT management, minimal use of resources etc. The word cloud is associated with internet and networking [1]. It implies pervasive connectivity reaching millions of computers, multiple media, and many kinds of links, virtual connections, and access to billions of databases. Just as we search the web to get fruitful and meaningful information on a topic in reasonable time frame, we can also get services at a reasonable cost from the cloud of connected systems, software and devices. Services can be hardware, software, storage, or applications.

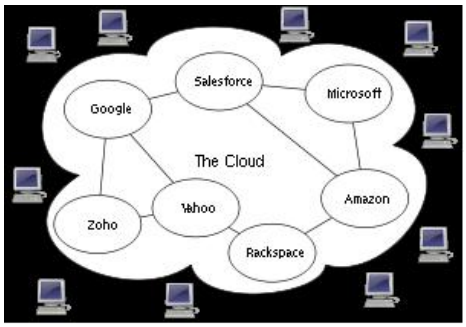

Figure-1: Cloud computing conceptual diagram

Cloud Computing is a style of computing where massively scalable IT-enables capabilities are provided "as a service" over th**e network**. It uses shared computing resources. It is an alternative to having local servers handle applications. It is location independence since users don't know where their applications are run.

The scalability and flexibility are the most important features that drive the emergence of the Cloud computing. Cloud services and computing platforms offered by computing Clouds could be scaled across various conce**rns, such as geographical locations, hardware performance, and software configurations.**

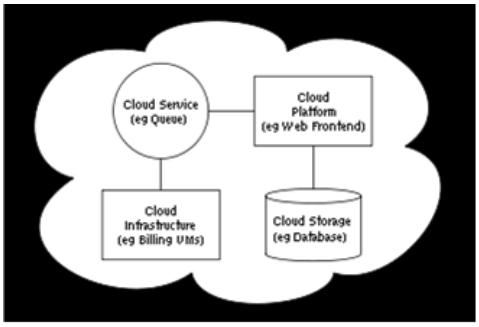

Figure-2: Cloud computing sample architecture

2.1. Layers of Cloud Computing:

Top layer (application layer) - Top layer applications delivered on demand in the software-as-a-service (***SaaS***) model.

- **Middle layer (platform layer) -** Middleware providing application services and a platform-as-a-service (*PaaS)* runtime environment for cloud applications.
- **Bottom layer (infrastructure layer) -** A flexible infrastructure of distributed data centre services connected via Internet Style Networking.

2.2. Management

Management of a cloud system in an automatic and autonomous manner is complex and is very important for the success of clouds.

- Deploying cloud applications as virtual appliances makes management significantly easier
- The appliance should have all programs it needs to work.
- Programs built in a very systematic way - automated, assembly line activity. Ensure agility.

There should be a control program similar to the OS but smaller in size and functions to control the flow and operation of various components of an application, run parallel streams, partition data and files, maintain queues and states of processes, do backups automatically, generate logs etc [2]. it should include a monitoring and performance measurement system. It should have detailed error control and management system.

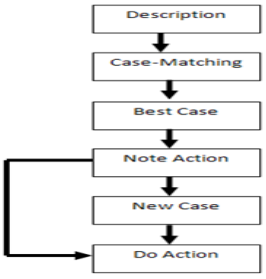

Figure 3: Flow Diagram for Case-Based Reasoning.

2.3. Considerations for Deploying a Tool Cloud

The goal of a tool cloud is to minimize or even eliminate common areas of pain felt by nearly every IT organization that has responsibility for acquiring, provisioning and managing the application development and database tools used within their company. Roughly speaking, these issues fall into one of three categories – tool acquisition, tool deployment, and license management. Here are several questions you can ask yourself to see if your organization is faced with any of these issues and could therefore benefit from a tool cloud implementation [1].

2.4. What is Case-Based Reasoning

Case-based reasoning is used to solve problems by remembering a previous similar situation and by reusing information and knowledge of that situation [3]. Let us illustrate this by following block diagram to solve the problem at some typical problem solving situations.

In response to that the receipt of a description of a current problem, a conventional CBR system retrieves the closest matching cases from a case database using a search engine and iteratively asked the user for additional descriptive information until the retrieved case or cases identified by the search engine are sufficiently similar to the current problem to be considered as possible solutions. If a new solution (not previously stored in the case database) is subsequently validated, the validated solution can be stored into the case database and utilized to solve future problems.

3. Working of Strategic Management System (PROPOSED EXPERT SYSTEM)

Director Academics expert system is based on the principles of Case Based and Rule Based Reasoning system. As like others expert system it also stores the cases and corresponding decisions in Knowledge Base (Case Base). When a problem encounters through the system, the processor may searches the best matching case among the stored cases in Case Base. As per rule of uncertainty, we know that no two problems are same, but it may be similar in some property. The Director Academics system searches the best matching case by Nearest Neighbor Algorithm based on the similar properties of the cases. Which case is almost similar to the encountered case/ problem may be selected and the corresponding decision stored with selected case is taken as the expert advice.

In some cases when system did not find the best suitable case for any problem it may update the knowledge base with new case and corresponding decision. The new case and decision may be combination of two or more than two cases stored in the knowledge base.

With planning, Cloud computing leads to optimum use of resources thereby reducing costs, improving efficiency of computing, virtually enlarging/adding capacities, innovating newer ways of computing, experimentation with new technologies, improving security at local level such as elimination of versus

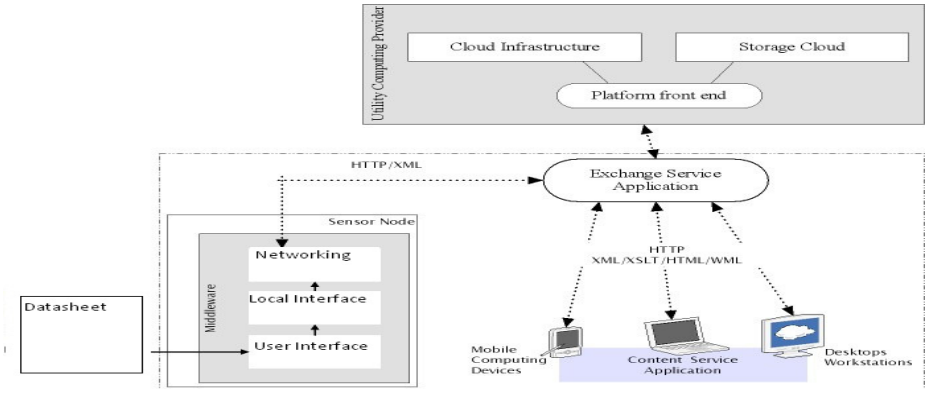

Figure-4: Schematic module for proposed System

For providing flexibility and security to our software, "*Director Academics*" we found SAAS (Software as a Service) to be an efficient solution. Although IBM is the technology leader in cloud computing but practically we found Microsoft and Google more suitable for our work. Among Microsoft and Google we found Google to be more cost effective which provides free computing for a limited amount of data. Then we took the initial step to connect our software with Google Docs. This was perhaps the most challenging task but was made possible using the dynamic link libraries available for this purpose. This improvement in our proposed software has made it much more flexible and secure and enhances the area of control of the managing boss.

3.1. Supports for Teaching Learning Process

In current scenario of getting accreditation and certification from different managing organization is very tough for institution. The accreditation agencies may ask for a lot of documents related to courses running in institute. These documents may include the syllabus, lecture planes with expected date of teaching and actual date of teaching with number of students present in the class. At the time of accreditation the Head of Department/ Institute requires these documents at a time. Director Academics helps them to get these documents. In the system the faculties may update the course file and lecture planes regularly, so that the head may get the updated information every time when he need.

Director Academics also have the provision of getting feedback of students and faculties time to time. It helps to decide what steps needed to improve the performance of student and faculty. In the feedback system students and faculty submit the course report to the system; feedbacks are based on some specific questioner regarding the subject, teaching methodology of faculty, grasping power of students, course material provided by authority etc. If the feedback will not be satisfactory, the system generates decision may be taken to improve the performance of the same.

4. Learning in Case-based Reasoning

Many of the community working in the field of education have put their effort in classroom practices that put students into situations where they must make hypotheses, collect data, and determine which data to use in the process of solving a problem or participating in some kind of realistic analysis or investigation. Research in Case Based Reasoning (CBR), provides a plausible model of learning from problem solving situations, it makes suggestions about education that are consistent with current educational theories and methodologies and provides added concreteness and detail [6]. It shows that how CBR's suggestions can enhance problem-based learning (PBL), which is already a well-worked-out and successful approach to education.

4.1. The CBR Cycle

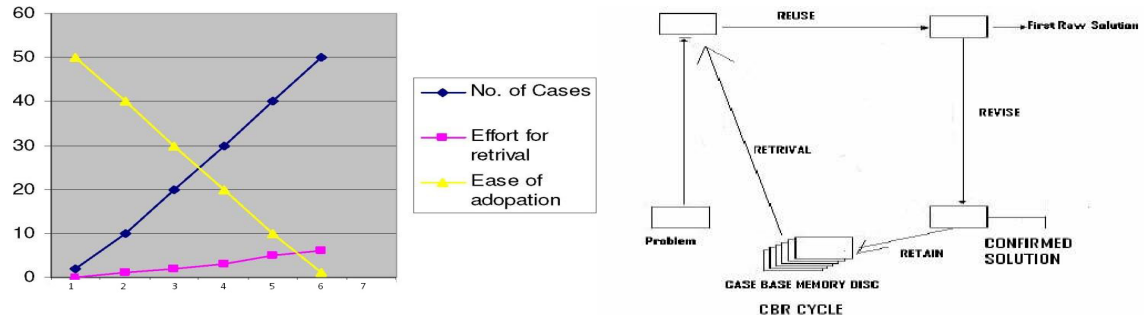

Figure-5: Proportionality of No. Cases with Ease of adoption and Effort for Retrieval and CBR Cycle.

CBR cycle can be represented as the following comparative graph. As we see in the figure 5. given below we can say that when the number of cases is more, the effort for retrieval is also high and vice versa, and ease of adoption is also high when no. of cases are high, or we can say that the effort for retrieval and ease of adoption is directly proportional to the number of cases. But when we see the proportionality between efforts for retrieval and ease of adoption it is reverse, when the Ease of adoption is low effort of retrieval is high and vice versa. In the above figure X-axis gives the scale for no. of cases and ease of retrieval and Y-axis gives the scale for effort for retrieval.

4.2. Working of CBR based Expert System

In the beginning CBR process number of cases is limited, most of the times we need to modify the solution but as the experience increases, the probability of similar or near similar case would increase. In normal times, a new problem is analyzed against cases in the Knowledge Base and one or more similar cases are retrieved. A solution suggested by the matching cases is then reused and tested for success [8]. Unless the retrieved case is a close match, the solution will probably have to be revised producing a new case that can be retained.

The CBR cycle presented above occurs without human intervention. For example many CBR tools act primarily as case retrieval and reuse systems. Case revision (i.e., adaptation) is often being undertaken by managers of the Knowledge Base [9]. However, it should not be viewed as weakness of CBR that encourages human collaboration in decision support. The following sections will outline how each process in the cycle can be handled.

5. Conclusion

- Cloud computing has become a mature technology. It is a cost saving technology. We can have different kinds of clouds - private, general purpose, specific etc.
- Security can be better than individual systems.
- We can experiment new and emerging technologies without compromising operations.
- Hardware requirements will be much less compared to large number of server farms of organizations.
- Cloud has several aspects suited for research at theoretical and practical levels.

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