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Convergence of CRM, BPM, DM & Cloud Computing for SME's

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Abstract— Several customer relationship management softwares are available in the market. In the present scenario the market demand is changing dynamically. To handle this demand and to keep up the growth, many large-scale enterprises have developed their own softwares. Business Process Management and Data Mining tools have integrated with CRM systems to make its process automated and to find and extract hidden customer information from large databases of CRM respectively. CRM has deployed on Cloud, which reduces CapEx (capital expenditure), provides on-demand services that are always on, anywhere, anytime, anyplace on any device and IT- Technology independent as well. The purpose of this research is to developed an application "CBCBD" (Cloud Based Integration of CRM systems with BPM and DM techniques for SMEs), that provides a centralized place to SMEs and users from where they can select CRM, BPM or integrated CRM-BPM-DM systems in a cloud.

Keywords— Customer Relationship Management(CRM), Business Process Management(BPM), Data Mining Technique(DM), Cloud Computing, Small & Medium Enterprises(SME)

I. INTRODUCTION

Cloud Computing refers to the delivery of configurable computing resources i.e. Networks, servers, and storage. The cloud computing provides availability and accessibility of on -demand services.[14] **CRM** is a system that provides the functionality to track sales, management of contacts and customer relations, examine sales process and analyze performance, productivity and customer satisfaction rate. A rising technology **BPM** is capable of modelling and automating business processes, so it is possible for individual company to custom-design its own customer relationship management software. **DM** discovers important patterns and rules which enable an organization to better understand its customers and improve its sales, customer support and satisfaction. Several customer relationship management softwares are available in the market. On integrating the CRM systems with Data mining tools and BPM system, developers can extract the valuable customers and make its process automated respectively. CRM has deployed on cloud, so that each user can access at any time from any place. In this research paper an application "CBCBD" (Cloud Based Integration of CRM systems with BPM and DM techniques for SMEs) is presented, that provides a centralized place to SMEs and users from where they can select CRM, BPM or integrated CRM-BPM-DM systems in a cloud.

II. LITERATURE SURVEY

The need for the development of application "CBCBD" (Cloud Based Integration of CRM systems with BPM and DM Technique for SMEs) has been suggested by the literature.

In 2010 the authors Armbrust et al. establish the subsequent aspects as new: (1) the elimination of up-front commitment to resources on the aspect of the cloud user, and (2) the illusion of infinite computing capability out there on demand, (3) the usage-bond rating for computing resources on a short basis.[10]

Prantosh kumar proposed in 2012 in research that the cloud computing has prospects, challenges and opportunities with special relation to its rising want within the tutorial and dealing space of knowledge Science.

Anca Apostu et.al established in 2012 that Cloud computing represents an enormous amendment within the manner computing is completed in companies.

Hasan Darvish et.al proposed in 2012 that within the last decade, the ever increasing pressure of competition featured by businesses has diode to the event of CRM. They proposed that CRM implementation has three strategic, three structure and two cultural problems.[3]

Chin Shan proposed in a research "Customer Relationship Management Associated Firm Performance: An Empirical Study of Freight Forwarder Services" in 2012 that CRM used for trial and examined its impacts on firm performance within the context of freight forwarder services.[5],[13]

Evert F. Duipmans et.al established a research paper "Towards a BPM Cloud design with knowledge and Activity Distribution". He has given the analysis work on distribution resolution during which a business process is separated into individual business processes to be dead within the cloud and on-premise.[6] Hubert Baumeister proposed in research "Customer Relationship Management for SME's" the advantages of CRM for SME's and their special needs to CRM software and limitations for SME during the implementation.[7] Sunil Yadav, Aaditya Desai, Vandana Yadav proposed in 2013 within the research "Knowledge Management in CRM mistreatment data mining Technique" that in today's competitive business world client may be a important quality to an enterprise and DM helps in extracting valuable customers[1],[12]. Kam Tin Seong, Aditya Hridaya Misra projected in 2013 in research "Be client Wise or Otherwise:

Combining data processing and interactive visual analytics to research massive and sophisticated customer resource management (CRM) information" that the analysis of client data of a supplying company is very important to improve sales and profits[2].

P. Sravanthi and M. Madhavi projected in 2012 that nowadays, client orientation has been one amongst the foremost issues of economic firms.[4]

III. PROBLEM STATEMENT

This research approaches some problems that exist now-a-days in CRM applications. There is no application which can provide "Cloud based integration of CRM systems with Data-Mining technique and BPM for SMEs". The integration of CRM system with BPM does not help in extracting information of hidden valuable customers from large databases. On the other hand, the integration of Data-Mining technique with CRM system can be applied on large databases, but it does not provide process flow management.

IV. PROPOSED SOLUTION

The application "CBCBD" is developed which provides cloud based integration of CRM systems with Apriori algorithm and BPM systems for small and medium enterprises and users. This application provides process flow management, extract information of hidden valuable customers and enable each user to use this application from everywhere and anytime.

A. Architecture of CBCBD application

The description of the roles and services are as follows:-

1. User: - User is an entity who sends a request for accessing cloud based application. The request of the user is first sent to cloud broker.

2. Cloud Broker: - Cloud Broker is an entity that provides a communication between cloud and users. Cloud broker forwards a request of user to the cloud.

3. Cloudbees:- CloudBees is a PaaS provider for developing and deploying java applications. After processing the request, users create accounts on cloud to access CloudBees services. According to the request, it provides facilities to users that are accessible from anywhere and at any time.

4. Cloud Coordinator: - Cloud Coordinator is an entity that provides a communication between clouds.

5. Cloud-Applications: - Cloud Applications are services for which user sends a request to use any of the four sub applications: - CRM system, BPM System, CRM&BPM system, CRM&Apriori on demand to users.

6. Storage Cloud: - Storage Cloud provides facility for creating and managing databases on the cloud. The database of CBCBD application has deployed on storage cloud.

7. Compute Cloud: - Compute Cloud manages load and no of request processing. For load balancing, it uses several virtual machines which are managed by VM manager.

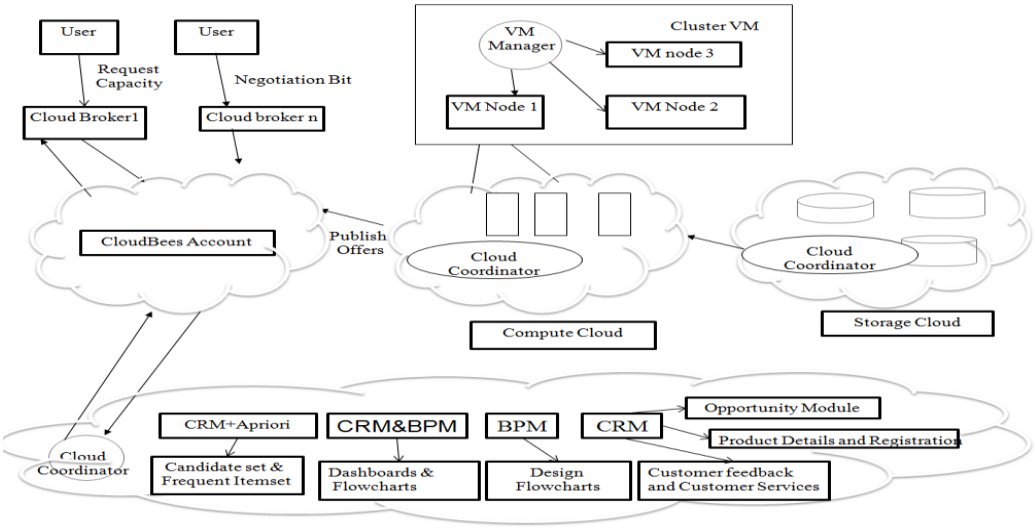

Fig. 1 Architecture of CBCBD for SME

B. Request Handling Architecture of CBCBD Application

The client sends request to the CloudBees via internet. The CloudBees Cloud includes a HTTP routing layer that handles clustering and load balancing for "CBCBD" web applications. When an HTTP request is received, the routing layer uses the HTTP host header to determine the target application. Once the target application is determined, the request is forwarded to a deployed instance of the application. If application has been configured to run in a cluster, requests are forwarded to instances. If the routing layer is unable to connect to the instance, the request will automatically be directed to the next deployed application instance. After the activation of deployed application, an application binds with the database and in response, the URL is sent to the user in by CloudBees Admin.

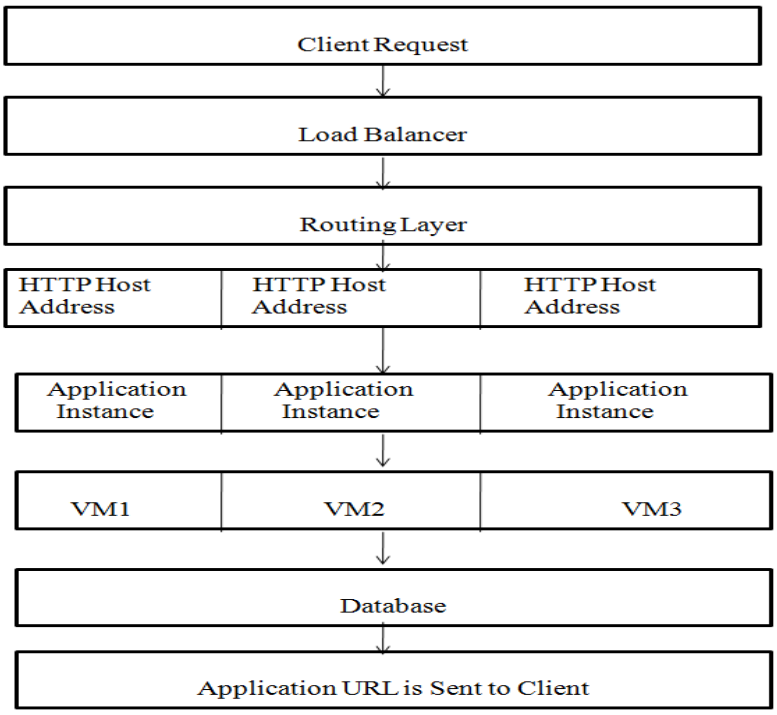

Fig. 2 Request Handling Architecture of CBCBD for SME

C. Snapshot of Implemented CBCBD Application

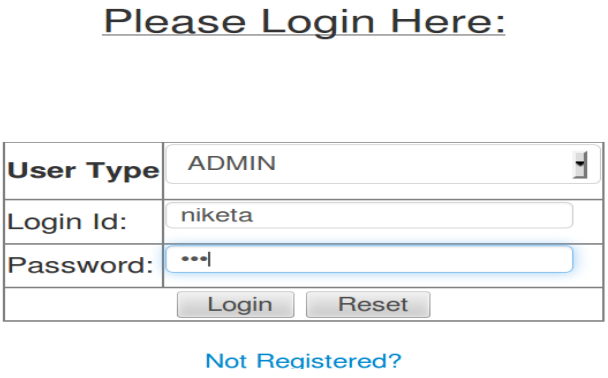

Fig. 3 Login Page of CBCBD Application

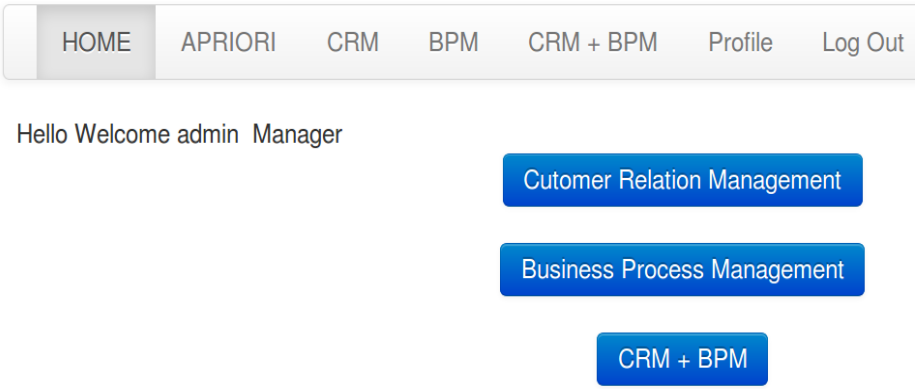

Fig. 4 Home Page of CBCBD Application

V. RESULTS

The application "CBCBD" has tested by web based Pingdom testing tool. Various features like load time, page request, page size, performance grades has tested by this testing tool. This integrated application has improved efficiency, performance, productivity, customer retention, customer satisfaction rate and profit of SMEs.

VI. CONCLUSION & FUTURE WORK

Before this research, there was no such application which can give advantage of integration of CRM, BPM and DM on cloud. The existing integration of CRM system with BPM does not help in extracting information of hidden valuable customers from large databases. On the other hand, the integration of Data-Mining technique with CRM system can be applied on large databases, but it does not provide process flow management. CBCBD application provides integration of CRM system with BPM system and Apriori algorithm (Data Mining Technique) on the cloud. As this application has deployed in cloud, now each user have access to this application at any time from any place. Integration of CRM systems with Apriori Algorithm and BPM Systems has increased the sale of products which give higher benefit to SMEs and users. This integrated application has thus resulted into improved efficiency, performance, productivity, customer retention, customer satisfaction rate and profit of SMEs. Some of the limitations are also required to be resolved in the future. This proposed system "cloud based integration of CRM system with BPM and DM Technique" can be applied for fuzzy logic and neural networks. Customizations can be applied at BPM&CRM level. BPM has many features like Rules Engine, Knowledge Management, Collaborative Tools, Document Management, so all these features can be used in the CRM systems at the time of BPM integration. To make communication easier with another system, the web-service can be designed for "CBCBD". Today as market demand of mobile applications are increasing, so to run an application in mobile environment or on mobile devices, development of new features is required.

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