Hybrid CRM Deployment Model

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Abstract--Over the past few years, the options for buying, deploying and accessing business applications have increased dramatically, none more than the ones seeking effective Customer Relationship Management (CRM) solution. The new environment of running CRM in the cloud has been in use for several years and the tendency of using cloud CRM and cloud computing in general is continuously growing. However, concerns about the data security and privacy still an issue for some companies. In this paper, we briefly propose a hybrid model that combines On Premise and Cloud CRM while highlighting their major capabilities in keeping today's businesses performing efficiently and securely. Then, a closer look is taken to exploring the hybrid model through number of CRM's main functions illustrated on a dynamic arc.

Keywords— **Cloud, On Premise, Hybrid solution, CRM, Deployment methods, Customer relationship Management, Business Strategy**

1. INTRODUCTION

Newly emerging companies tend to achieve business excellence quite more rapidly than they would in early decades. In the last 10 years, the competition level rose from being locally confined to the global levelwhich makes the customer's ability of switching between companies much easier.Hence, perusing the competitive advantage by acquire, service and retain that customer became a very difficult goal to achieve. The highly competitive environment urges the companies to adopt business strategies and technologies that best serve them to achieve that goal. Companies realized that it is impossible for them to succeed if they do not cater to the desires and needs of their customers.

A very popular yet effective solution being adapted by most companies is the use of the Customer Relationship Management (CRM) systems. CRM is the process a company uses to organize and keep track of all customer information and interactions. It results in helping business to streamline and become more effective. Although it's proven to be a very successful strategy, high costs are expected. Since large companies had to maintain their own servers and IT professionals to maintain the technology. Small to medium businesses on the other hand, may don't have the required infrastructure nor the expertise to maintain such system. So traditionally, it was expensive to adapt (or implement and maintain) such system.

Recently, the technology has become much more affordable and accessible to smart companies. Thanks to the new emerging concept "Cloud Computing", there is no longer a need to keep the software on companies' local servers or having an in house team of IT professionals to keep it up. All technologies are hosted in the Cloud. Cloud can be referred to as a software that is stored on remote server and shared by other companies. From business respective, that mean they no longer need to worry about things like maintenance, upgrade or buying expensive equipment. And it is cheaper too, because these technical resources are shared. It'll help the business to be more efficient and scale up their

business. Yet, security and privacy are still a very critical concern and may preclude adopting such option, for all its distinguishable features.

In the light thereof, a need for a hybrid system that combines the best of two worlds has been addressed. A model solves the privacy and security concerns yet maintains the affordability and scalability is proposed in this research. This work mainly discusses a hybrid model of both Cloud and on premise CRM solution to help businesses adopting such large solution as CRM within the cost, scalability, privacy and security constraints.

In this work, we will start our discussion in section 2 with a review and summarization of *related work* where the emphasis was on combining the CRM solution with Cloud Computing and other technologies; current deployment models, their costs, requirement and companies' sizes adapting each. A brief introduction of the CRM and Cloud is presented in section 3 and 4 respectively. The problem to be solved is presented later in section 5 followed by the proposed solution that will be discussed in section 6, In order to clarify the concept, we discuss four main CRM functions and detail their flow of work and present it visually through dynamic arc. in sections 7, 8 and 9. Finally, the proposed model's throughout study is presented in section 10.

2. RELATED WORK

Studies have showed that the current options for deploying a CRM solution fall broadly into three categories: On promise, Cloud and Partner Hosted\managed. Each with contradictory benefits, risks and costs which fulfills different requirements. On Promise model simply mean on-house implementation and deployment using the organization's internal IT infrastructure. The organization typically buys or finances the solution, and has a complete control over the application and associated security risks, stronger integration and ability to leverage the customization and development of the solution. This model has also a high up-front capital costs and a comparatively lower ongoing software maintenance charge. A study in 2009 entitled with" Meeting the Five Key Needs of Next-Generation Cloud Computing Networks with 10 GbE" claimed that CRM and cloud computing studied how selected companies are doing business in the Czech Republic using information technology and Relationship Management (CRM) business strategy. A comparison in terms of cost effectiveness, performance and money savings has been conducted between companies that sell the CRM solution as a standalone application (in-house implementation and deployment) and those who provide the Cloud CRM solution. The study results showed that small and medium sized Companies have tendency to buy and use complete software CRM solution, while larger companies tend to use Cloud CRM solution, which usually requires little or no IT infrastructure involvement, which eliminate extra costs for buying and maintaining the required IT infrastructure. In addition, it reduces the time of financial crisis and allows organizations to manage their data and information more effectively and enables them to provide better customer services. The study also addresses the critical factors that lead the companies to transpose into the Cloud CRM, including cost reduction, flexibility and convenience [1].

Other research in 2012 "Connections among CRM, Cloud Computing and Trading Income of Selected Companies", avoids the organization the costs and associated effort and infrastructure of deploying a CRM solution. This model typically requires the organization to finance the solution using a rental model, with a per-user, per month. The solution is hosted and managed by the organization that provides the solution through a Cloud, which means it has lower up-front costs but constant ongoing costs. Partner hosted\managed model can range from On Promise like to Cloud like model. It can be Cloud like, when a partner (not necessarily the supplier) own the hardware and software and licensed via rental fee. It could also be On Promise like model when the solution deployed within organization's internal IT infrastructure and just managed by the partner. This model has a key advantage of flexibility in terms of choosing which aspects needed to be supplemented or managed by a partner, a range of pricing models and the fact that the solution can usually be more customized to best suits the organization's requirements [2].

Generally, in 2014 Sage CRM shows that CRM can be either built in-house (with all related HW, SW and IT professionals) or subscribe In On Demand service. On demand service adapt the concept of Cloud computing, where all technologies are hosted in the Cloud. For small to medium sized business, On Demand CRM is a popular choice due to its efficiency and low costs. It allows them to manage their customers facing processes without

having to invest in HW or IT infrastructure. CRM solution offers a cloud-based services for all company's departments and a customization option for a relatively little startup cost. it also allowing the companies to access their data anywhere, anytime, customize the SW without programming, provide solutions for all company's departments, allowing the company's employees to spend less time in CRM and more time servicing customers and no installation is necessary[3].

Unfortunately, throughout our search in this field, there are fairly few researches found to be combining the two technologies; CRM and Cloud computing. A paper that discusses these two technologies and the interesting benefits that can be gained from adapting Cloud CRM has been nominated for discussion and review, next.

3. WHAT IS CRM

Customer Relationship Management (CRM) essentially starts off as a business strategy that puts together all of these related processes in an integrated form where the costumer relies in the center of all of the interactions. CRM's business processes are centered on enhancing, attracting and retaining that customer and making sure that this customer is valuable to the business. Hence, it helps businesses to organize and keep track of all customer information and interactions, streamlines their work and became more effective by providing a 360 degree view of the business costumer and his relations to everything from Marketing and Sales to Customer Support.

4. WHAT IS CLOUD

Cloud computing is an emerging computing technology that uses the internet and central remote servers to maintain data and applications. While the cloud concept has many definitions, all those agree that cloud computing assures a resilient environment for the scalable processing and storing data and for the dynamically varying needs and management of an access to that environment, employing virtualization and internet technologies. Cloud computing allows applications and data to be provided, according to demand, from a pool of hardware and software resources, and all those things are transparent for the consumers.

The three building blocks to cloud computing are: Software as a Service (SaaS), Platform as a Service (PaaS) and Infrastructure as a Service (Iaas). All of these allow users to run applications and store data online. However, each offers a different level of user flexibility and control.

- Cloud application services or "Software as a Service (SaaS)"

Allows users to run existing online applications. It is the easiest way to cloud computing and is where off-the-shelf applications are accessed over the internet as delivers software as a service eliminating the need to install and run the application on the customer's own computers and simplifying maintenance and support.

- Cloud platform services or "Platform as a Service (PaaS)"

Allows users to create their own cloud applications using supplier-specific tools and languages.

- Cloud infrastructure services or "Infrastructure as a Service (Iaas)"

Allows users to run any applications they please on cloud hardware of their own choice. This means that existing applications can be migrated from a company data center in order to reduce IT costs[4].

5. PROBLEM STATEMENT

The analysis study to the related work detailed in the previous section has shown that the large companies tend to adopt On premise CRM solution. This is mainly because of the security and privacy factors that may not be found in other deployment methods. Besides, the availability of the implementation requirements such as expertise, IT infrastructure, budget, etc. which make large companies capable of maintaining such solution. However, it's usually expensive to adapt (or implement and maintain) such system.

Therefore, small to medium companies on the other hand, who may not have the ability of adapting such costly solution, prefer to go with the Cloud CRM solution, due to the advantages it provides to such companies including, scalability, cost savings, mobile accessibility, etc. However, security and privacy is still a concern since it's

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usually hosted by some other company. Besides, some countries and companies regulations might be against such method when it's related to sensitive data such as citizens' information, account numbers, patient information, etc.

6. PROPOSED SOLUTION: HYBRID CRM MODEL

Our proposed model addresses the limitations of two common CRM's deployment models, On Premise and Cloud CRM.The proposed model introduces a hybrid deployment method that combines the best of the two worlds. Solutions (including large ones that require 3-Tier or n-Tier architecture like the case in hand; CRM) don't have to be located exclusively in the Cloud or exclusively on local On Promises resources. The proposed model will separate the data layer (Data Resource and Data Access Layer) in a separate tier located in local On Premise tier whereas the rest will be hosted in a Cloud. This will have the flexibility and affordability of Cloud while ensuring the security and privacy of the data by maintaining them locally at the companies' data centers. In addition, the owner company will have a full control over their sensitive data. Details to clarify the proposed model's concept are provided in the following sections.

7. MODEL ARCHITECTURE

The proposed model will be based on n-Tier architecture combining two deployment methods; On Premise and Cloud Computing. N-Tier architecture is known for their flexibility and security for large applications like CRM. On the other hand, deploying such system exclusively on the cloud may jeopardize the security and privacy of the data since they will be maintained and controlled by some other company without the intervention or supervision of the owner company.

In this section we will present the proposed model's global architecture, and describe the main layers, modules, main functions and finally the security aspects.

7.1. ARCHITECTURE DESCRIPTION

Layered application designs are popular since they maximize application performance, scalability, flexibility and also better and easy

management of code and contents of application. The proposed model will be composed of the following components:

1- The presentation layer
The front-end of the application design architecture that represent the user interface and provides interactive access to the application and displays data using **XML** and **HTT.**

2- The business layer
It serves as a bridge between the front-end and backend maintains rules of business and contains components that perform the core processing logic related to a specific service.

3- The data Access layer
It's the backend of the Application that manages the physical storage and access, retrieval, update and storage of data. This layer only allows the interacts to the database and data warehouse through queries using SQL or Oracle developer tools to get or set the data to the database or to make any operation to the database.

4- Middleware
It is acts as a level of indirection between end -user and other layers of the systems. It provides interoperability and transparent access to the underlying systems and distributing functionality among nodes (modules), it basically reduces the number of interfaces with the end-users.

5- End-user:
It is basically the person or entity who uses the software, hardware and to obtain the services.

6- Wrapper:
Wrappers add logic to the model and provide common interfaces to access the data and metadata of the objects in the backend and that combine data from different data sources.

Cloud solution providers are mainly "renting" the infrastructure while preserving the Cloud solution providers are mainly "renting" the infrastructure while preserving the rights of control and maintenance. That was the motivation to propose a hybrid deployment model that combines the Cloud computing and On Premise deployments to ensure the security and privacy of the data while sustaining the features provided by the Cloud computing.

7.2. INCORPORATING SECURITY

Cloud computing uses the internet as communication mean. When taking a closer look at security of data in cloud computing, the vendor has to provide some assurance in service level agreements to convince the customer on security issues. Organizations use cloud computing as a service infrastructure, need to examine the security and confidentiality issues for their business critical data and applications. Guaranteeing security of data layer in the "cloud" is difficult, if not impossible. Each service has its own security issues. So the Security Level Agreement (SLA) has to describe different levels of security and their complexity based on the services it provides, to clarify security policies that are being implemented to the customer. These issues of hosting data on the cloud is what made us adopt the Hybrid Model to keep all data at the company's data centers, behind its configured firewalls, which in turn apply stricter and more controlled data usage.

Keeping data on promise help in protecting critical data, such as database connection strings and passwords, because they requires careful consideration of a number of pertinent factors such as how sensitive the data is, how could an intruder gain access to it, how to balance security, performance, and maintainability, and so forth.

There are variety of techniques that can be used to protect data. One of the most important techniques is the use of an encrypted database which can be considered a technological control applied by applying Risk Management aspects to secure large scale data breaches. Communication encryption is commonly achieved through the implementation of tunneling protocols such as SSL or IPsec, wrapping the transmission of data from the server to any client applications or the processing server. Communications encryption is essential for N-tier applications that will be applied for communicating the presentation layer (user interface) with the logic layer, and the logic layer with the data access layer and database servers.

8. CRM Process workflow

In order to clarify the Hybrid CRM model, we will be discussing four main processes of CRM and how they will be travelling through the layers and tiers. Customer Support Management, Order Management, Reporting Management and Marketing Campaign Management are examples of the CRM main functions. The following sections will state out customer support function through a description of the steps' flow while highlighting where each step is taken place throughout the architecture and finally a dynamic architecture to visualize these steps on each layer.

8.1. Customer Support Management

Couple of decades ago, businesses used IT systems mainly to gain a definitive advantage over the competition. Establishing a competitive business model, method, or technique allowed companies to provide a product or service that was superior and created a competitive advantage. Technological solutions to achieve such level have been evolved over years and now they are widely available and adapted by most companies. This in turn created a highly competitive environment; companies tend to avoid falling behind the competition. This is critical for small and medium businesses that need to keep up with the competition with a limited budget and expertise. One of the main features CRM provides to companies is a Customer Support Management module. Companies started realizing that one of key factors of retaining the customer and further gain his loyalty is turning his complaints into opportunities. This is achieved by servicing him at a very high level to not only satisfying his needs, but also to understand these needs, analyze them and anticipate them to best achieve the goal of acquiring, servicing and retaining customers.

Below sections will present the process's main functions, flow of work of each step and where each is taken place.

8.1.1. CUSTOMER SUPPORT
PROCESS'S WORKFLOW

The details of the steps the process will go through are as follows:

1. A customer will use the company's website to place a support ticket\request.
1.1. The customer will open the support request and fill in the form with his\her issue, choose the request type from a drop down list (return a product, defect items, incomplete order, how to use a product, etc.) and submit the request. A priority\ranking will be assigned according to the customer's rank (rank will be assigned automatically to each customer according to his\her purchasing history, total revenue,

loyalty level, etc.). This rank will help in escalating the ticket later.

1.2. The ranked request will be saved.

1.3. For pending tickets: the system should sort and prioritize the pending tickets according to their rankings that rely on the customer's rank and how long has the ticket been opened (escalation).

The system will present the pending ticket on the employee's dashboard. A support team member will receive the opened ticket and assign it to the appropriate team, person.

1.4. The assigned ticket will be listed in the assignee's "assigned tasks" page, and an email notification will be also issued.

1.5. The assignee will handle the ticket, add his\her comments, assign task as a part of ticket handling (schedule for a call, send an email, etc.), and finally complete the task once the problem has been solved.

1.6. The changes applied on the ticket's status, associated tasks, activities, etc. will be saved on the DB.

1.7. The system will present the pending and completed tickets on the supervisor's page.

8.1.2. CUSTOMER SUPPORT DYNAMIC ARCHITECTURE

The steps that were detailed in the abovementioned section has a specific flow order, each will be taken place in a layer (or layers) of the hybrid n-Tier CRM. As mentioned earlier, the data will be stored locally at the company's data centers, whereas the remaining tiers will be hosted off site, on the cloud and accessed through the internet.
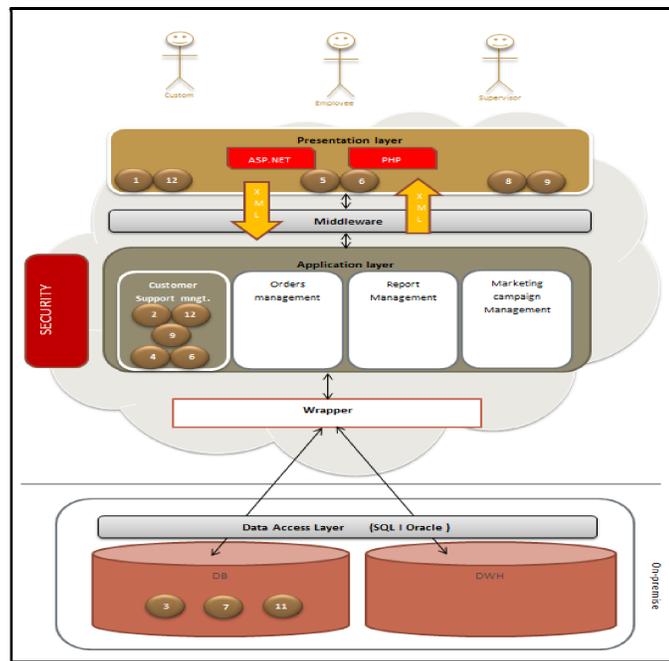

Figure 1. *Customer Support Dynamic arc*

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9. USE CASES' STEPS WORKFLOW

As discussed in previous sections, each User Case's (process) step is taken place in a specific layer\tier that is located either locally at the company's data centers (Om Premise deployment) or in the Cloud. Table 1 summarizes the flow of each step throughout the model.

Use Case	Step	On Cloud		On Premise
		Presentation	Business Logic	Data Layer
I. Customer Support	1.1.	√		
	1.2.	√	√	
	1.3.			√
	1.4.		√	
	1.5.	√		
	1.6.	√	√	
	1.7.			√

Table 1. Use Cases description and steps execution layer of each.

10. HYBRID CRM MODEL ANALYSIS

One of the biggest challenges keeps the companies from using Cloud CRM solution is that, the data hosting and management is located on the cloud controlled by the vendor (Cloud hosting provider). Accessing these data and replacing the data management system by another is difficult. The vendor looks after security - Internet scams, attacks on database servers and data security are all issues that affect any business.

Hybrid CRM model shifts the hosting, management and IT personnel responsibility and related costs of part of the solution to a remote, off-site location. As we are discussing n-tier architecture, this "part" will be the Business Logic Layer, middleware and the Presentation Layer. Since the main motivation of proposing such model was to address the security and privacy issues associated with companies' sensitive data, the Data Access Layers along with its Data Sources will be preserved at the company's data centers. This should give the owner company a full control over its data, while benefitting from the great Cloud Computing features.

As the organization that provides the Cloud solution will be responsible for overseeing all work associated with the deployment and administration of the application such as implementation, integration, testing, customization and maintenance. Hence, the costs associated with these tasks will decrease dramatically. The owner company will be only responsible for data related responsibilities and associated costs. So, this model combines the features gained from both deployment methods for a cost The proposed model avoids companies the need for having a full internal IT infrastructure that is capable to house and manage such huge solution. Companies can, instead, rent the infrastructure needed to house the software (excluding the DAL and its related data sources) using Cloud Computing solution and access it via the internet. The Cloud solution provider will be also responsible for overseeing all work associated with the deployment and administration of the application such as implementation, integration, testing, customization and maintenance. Hence, the costs associated with these tasks will decrease dramatically. The charges typically are monthly or annual fees, per user [6] [7] [8]. On the other hand, On Premise part will maintain the DAL and the needed databases\warehouse. This should preserve the privacy and security by provide the company with a full control over the data access, usage and distribution. Since only part of the software is maintained locally at the company's data centers, the costs will not be as high as a full On Premise deployment.

Although Hybrid model solves the two main concerns of the Cloud CRM, i.e. the security and privacy issue, other Cloud Computing risks are still

considered. Hybrid CRM model, just like Cloud CRM, is highly depending on the internet connectivity. This is not necessary an advantage, since the entire system become unavailable if the internet connection lost for one reason or another. The Cloud CRM model is based on a rental model. And just like any other rental contracts, there is usually a breakeven point in the long term whereby the total amount of the solution's outlay will be more than the cost of buying the solution's outright. On the other hand, there is a risk for having the system switched off quickly, and may end up with having solution that is not cost effective [3]. So for little extra cost (in comparison with pure public cloud model) the Hybrid CRM model has a key benefit of preservation of the data privacy and security, reducing the time and labor needed for having the solution up and running and lessening the maintenance burden placed on the internal IT infrastructure, while maintaining the affordability (since the hardware and software needed to be maintained will be for a part of the software, there are little up-front costs) and other Cloud Computing features.

11. CONCLUSION

Literature of existing research work on CRM was highlighted and analyzed. And even though major companies are aware of the great importance of CRM in reaping the rewards of customer loyalty and long run profitability, being able to preference a model that most fits the business requirements and need is highly crucial.

Through this study, we introduced a new hybrid model that combines two CRM's deployment methods; On Premise and Cloud. The proposed hybrid model addresses the issues of the Cloud CRM model, yet, combining the benefits of the current CRM deployment models. This was motivated by the need for having a secure and cost effective solution raised with the rapid adoption of Cloud Computing recently.

CRM is a field that attracts a lot of interest and adoption by growing businesses in last couple of years. Many companies, especially small to medium ones, tend to go with the Cloud CRM solution. For some, however, the risks associated with such method still need to be addressed and solutions to be introduced and tested. In this work, we proposed a model to overcome the privacy and security issue with Cloud CRM, especially for growing companies where the reputation and customers' trust is their main concern. For our future work, we are looking for enhancing the proposed solution by integrating it

with other technologies which in turn may serve as a fourth deployment method, a side of Cloud, On Premise and Partner Hosted\managed.

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