

## Implementing SaaS Solution for CRM

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*Greatest innovations in virtualization and distributed computing have accelerated interest in cloud computing (IaaS, PaaS, SaaS, aso). This paper presents the SaaS prototype for Customer Relationship Management of a real estate company. Starting from several approaches of e-marketing and SaaS features and architectures, we adopted a model for a CRM solution using SaaS Level 2 architecture and distributed database. Based on the system objective, functionality, we developed a modular solution for solve CRM and e-marketing targets in real estate companies.*

**Keywords:** E-Marketing, SaaS Architecture, Modular Development

### 1 Introduction

Internet marketing is the process of promoting an organization by means of the media and the online advertising panels in order to increase profit or meet management objectives.

E-Marketing requires a comprehensive strategy implementing the business and sale model of a company on a web page with its respective functionality and interface. The strategy needs to be adapted to the specific market and centered on an appropriate advertising mean (online, media) and using an appropriate design [1].

The e-marketing advantages bring to a business can be pointed at source level: market development, reduces the costs of the customer and opens new communications methods with clients. It develops the market, as it ensures a larger geographic coverage of the sales and opens markets otherwise inaccessible. It also promotes the label of a company in activity fields in which it is advertising, but also in fields in which it is not actually present. It reduces the costs of the customer service which allows clients to get information on the products and prices online and to communicate online with the representatives of the customer service in taking the decision of purchasing. It opens new communications methods with clients as e-marketing activities improve the information flow towards the online community [2].

As a new technique in software technology Software as a Service (SaaS) is assimilated with on-demand software service, provided by the vendors to consumers. It enables to hire any software application only when there is a requirement of such a utility. The licensing for using this kind of application may be with a single user or it can be shared with multiple users and offers a simple and economic way to have proper software facilities with a minimum of expenses.

The SaaS methodology became more popular in crisis period, because of its high services and less maintenance and costs. The availability on demand makes is highly flexible when the maintenance of the tool is taken into account. SaaS saves the complex hardware requirements, once the use of the software is over and enables a centralized control of the business by the service provider. The network of action is distributed amongst many users from a single server and offers sharing in the license. SaaS also omits re-installing of the software within an organization because of the central control.

Like End User License Agreement (EULA), sharing of license by SaaS within an organization makes companies cut down the expenditure on and offers individual security because there are no copies to distribution, which further extinguishes threats on security of individual system. SaaS is the perfect service to meet the demands of any software consumer [3].

This paper is structured as follows: after an introduction about e-marketing and SaaS in virtual organizations, Section 2 focused on SaaS features and characteristics. In Section 3 we present CRM prototype as a SaaS solution for real estate companies. We concern on the role of data storage in e-marketing, and then present a dynamic SaaS prototype. We start with architecture model and functionalities, then we point Mason features for dynamic reports and personalized query in back-end part of application. Section 4 contains conclusions about main benefits of project and the future work. The paper shall include an introduction on the current research in the papers field, original solutions, experimental results analysis, conclusions and references.

## 2 SaaS features and characteristics

More than a revolutionary technology, cloud computing is a relatively new concept, because various types of clouds designed for production-ready enterprise applications and hybrid computing [4].

Cloud computing is “a general term for anything that involves delivering hosted services over the Internet”. These services are divided into three categories: Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS) and Software-as-a-Service (SaaS) [5]. A cloud service has three distinct characteristics that differentiate it from traditional hosting: it is *sold on demand*, (by the minute or the hour), it is elastic, because a user can have as much or as little of a service as they want at any given time, and the service is *fully managed by the provider*, the consumer needs only a personal computer and Internet access. The goal of cloud computing is to provide easy, scalable access to computing resources and IT services [6]. A public cloud sells services to anyone on the Internet and a private cloud is a proprietary network or a data center that supplies hosted services to a limited number of people. Amazon Web Services is the largest public cloud provider. A service provider can use public cloud resources to create their private cloud, and obtain a *virtual private cloud* [5].

Infrastructure-as-a-Service (IaaS) provides virtual server instances with unique IP addresses and blocks of storage on demand. Customers use the provider's application program interface (API) to start, stop, access and configure their virtual servers and storage. Amazon Web Services is the significant example of IaaS [7]. Cloud computing allows a company to pay for only as much capacity as is needed, using pay-for-what-you-use model, and bring more online as soon as required.

Platform-as-a-service (PaaS) is defined as a set of software and product development tools hosted on the provider's infrastructure. PaaS providers may use APIs, website portal or gateway and developers create applications on the provider's platform over the Internet. Several PaaS examples are Force.com, Salesforce.com and GoogleApps. There are no standards for interoperability or data portability in the cloud and some providers will not allow software created by their customers to be moved off the provider's platform.

In the software-as-a-service (SaaS) cloud model, the vendor supplies the hardware infrastructure, the software product and interacts with the user through a front-end portal. Service provider hosts both the application and the data, and the end user can use the service from anywhere. SaaS is a very broad market because services can be anything from Web-based email to inventory control and database processing.

As a part of business modeling concept of cloud computing, SaaS can help in several ways: *controlling software licensing expenses, controlling rogue software installations, reducing infrastructure expenses*. *Controlling software licensing expenses* are reduced by utilizing a software service provider licensing, patches, upgrades, and renewals are tightly monitored. A company pays for what it needs as software elasticity. A software service provider allows the company to establish an approved applications list and keep it enforced. Also IT department no longer has to support random applications specific to one of users and streamlining ap-

plication support improves efficiencies, expertise and keeps everyone working and *control rogue software installations*. *Infrastructure expenses* are reduced based on Web-based application access, which allows companies to purchase only the amount of desktop horsepower needed for the job. Entire business suite of applications is installed on SaaS provider and for many roles, thin desktops and virtual operating systems are enough [8].

SaaS architecture is classified by Microsoft from primary maturity level 1 to 4, using several key attributes of the application: configurability, scalability and multi-tenant efficiency. The four levels are distinguished from each other by these attributes [9]:

- *Level 1 – The Ad-Hoc/Custom:* Every customer is equipped with its own modified version of a hosted application and is solely responsible to run their own instances of an application on the servers of the host. The effort required by the SaaS to transfer the non-networked in this level for the development is minimal and the operating cost is even reduced. The reduction is primarily due to consolidation of server hardware & administration.
- *Level 2 – Configurable:* SaaS offers greater flexibility and in this level, customers are provided with the metadata which is configurable by the user and this enables many customers to use separate cases of similar application codes. Various needs of the customers can easily be offered by the vendor or provided the customer with the detailed configuration options. Maintenance and updating of the common code bases are made easy and simple for the users.
- *Level 3 – Configurable & Multi-Tenant-Efficient:* In this level, we have lacks scalability but multi-tenancy makes way for the single program instance for serves each customer. Serves resources can be used to maximum.
- *Level 4 – Scalable, Configurable, and Multi-Tenant-Efficient:* This is the final maturity level, with all of the key attributes. It provides a complete balance of the identical application cases, which are running on the

variable count of servers and offers scalability. The capacity of the system can be varied according to the demand (by adding or taking away servers) and no changes have to be made in application software architecture [10].

One more key attribute, which may be used in SaaS architectures, is virtualization which replace multi-tenant attribute. The advantage of adding up virtualization over multi-tenant application in the architecture is that the system's capacity can be increased with no further programming. If both attribute are present, SaaS provide greater flexibility for tuning the system for best performance.

### 3 CRM Prototype – a SaaS approach

#### 3.1 Role of data storage in e-marketing

Companies constantly present on the market record information every time a client gets in touch with one of the departments of the firm. Contact points can be: an acquisition made by a client, a phone call at the clients request, an information enquiry in the online system or a sale card sent by mail. Client related details can be drawn out of several sources. In order to do so, a process of gathering, storing and analyzing the data is necessary. The data is used to get information on the clients. It stays as basis for future marketing activities, using the technology of data storage. In order for data base marketing to be used it must recoup the investment. The process of data gathering consists of several elements:

- Elements for extracting and transforming – for processing the data necessary for important applications;
- Tools for sorting data – for detecting and removing the data that is inaccurate, out of date, incomplete, redundant or in inappropriate format.
- Tools for moving the data – changing the storage place of the data (extraction, transformation and loading)
- Tools of data storage
- Tools for accessing data – for the extracting, viewing, manipulating, processing and presenting the data.

- Tools for delivering data – for communicating, storing and extracting data safely and providing it to the final user [11].
- All data that is gathered and processed by means of one of the above mentioned instruments is centralized in the contact unit of the firm. Thereafter, the information is organized as data storage.

**Table 1.** Marketing objective and on-line indicators

Marketing objectives	Indicators
Sale increase	S1. Sales – by visitors, by view S2. Sales – done online or by phone S3. Conversion rate (sales/visitors) S4. Purchase trend (hour/day/place) S5. Entry (from purchase browser, from a link from another site) S6. Exit S7. Click flow
Post-sale service	Ps1. View of FAQ page Ps2. Downloading files Ps3. Duration of visit
Generating clients' data	C1. Conversion rate (information/visitors) C2. Time spent on the site (prospecting and reviewing of the product) C3. Depth of visit
Brand development	B1. Number of visits/visitors B2. Time spent on the site B3. Depth of visit

The employees can register the data, search it according to different criteria and analyses it in order to draw useful conclusions regarding the needs and reactions of an individual client. The information offers a complete image on the relation with the client and can be subsequently used, for example, by telemarketers to answer questions. The marketing department is responsible with determining the extent to which the online objectives were met a proper indicators associated with it (Table 1).

Therefore, we can acknowledge the importance of a database for getting truly significant results that will assure a good development of the marketing activity done online. It can also provide success and continuity for the online business [12].

### 3.2 Architecture and functionality

A relative large number of teams work together to develop the application and, as a result, an UML diagram components was

needed, to help identifying and modeling the software components and their interfaces. Once the interfaces are defined and accepted by the teams, it becomes easier to manage the work of smaller teams.

The back-end application represents a solution developed by the studied company based on SaaS principles and it is used by users having the status of *administrators*, in order to assure a more efficient management of the site. Our proposal is based on SaaS Level 2 of maturity, offering for real estate companies or brokers as suitable customer configurable metadata, allowing user to fit the information to their needs. Also our model enables many customers to use separate cases of similar application codes for every e-marketing campaign. Various needs of the customers can easily be solved by developing Availability and Performance Modules. In addition we provide the customer with the detailed configuration options (Figure 1).

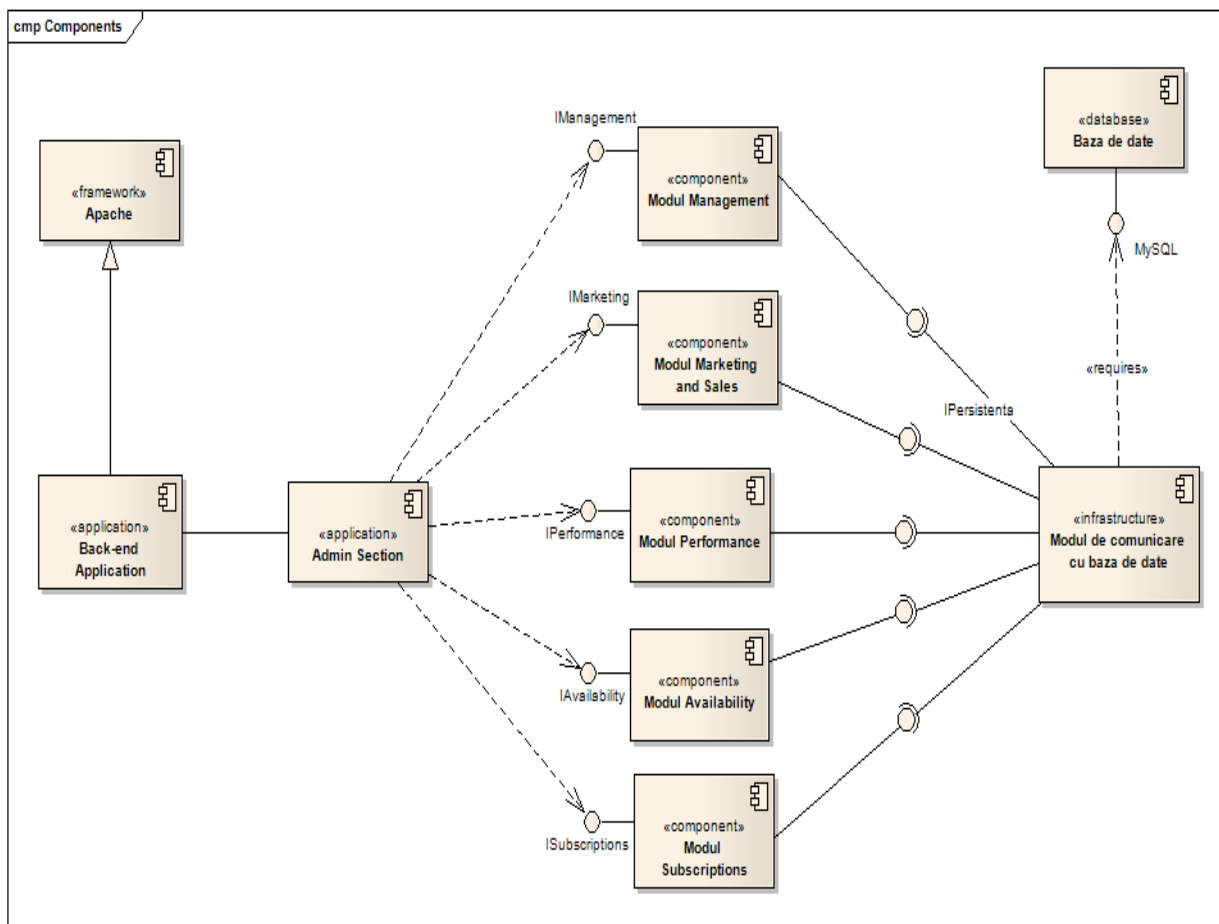


Fig. 1. Components diagram

This is divided in specialized modules for certain groups of users, on a certain domain of interest. For example, a module can offer a range of tools to the programming team that allows adding, deleting or updating components in the front-end section, as well as monitoring current tasks or the status of those that are in production. It also provides tools for statistics or customer service and an interface that facilitates the best practice of online marketing. Its functionality is based on the collaboration and the dependencies between the interface and the user, on one hand and with the databases, through the communication module, on the other hand, in order to obtain optimized results.

For the back-end section, the actors are considered to be the company’s marketing department members. An actor has the status of administrator, with unlimited permission rights for reading, updating or writing files. He can access the application based on user-

name and password. The main objective is to streamline the business process: to attract a high number of visitors on the site and to convert them into customers, by creating accounts and subscriptions.

In order to obtain the desired results, a section was created for the online marketing activity. It has the following options:

- Identifying new clients for later targeting;
- Access to statistics about the clients’ database;
- Extracting client lists based on specific criteria, for customizing the e-mail campaigns;
- Access to the records with the tasks completed by the marketing team and published by the press;

The corresponding scripts select, mostly, data about users such as personal information (first name, last name, and location), email address, profession or domain of interest, as

well as information concerning the account's type and the subscriptions they own. Also, these scripts use tables that store data about the properties listed on the site (building type, address, sale price, previous sales).

### 3.3 Using Mason for dynamic reports

Mason is a mechanism for embedding Perl code into HTML, using a particular set of choices when selecting the method to integrate the code. This is one of the reasons that make Mason very practical and straightforward. Mason was designed to simplify the process of creating, managing and maintaining complex sites or other groups of dynamically generated documents. It fully cooperates with Perl code, improving its popularity and success. It encourages the programmers to see the site in structural terms and not as a collection of scripts and procedural modules. The development of dynamic and complex sites represents the most common application in which Mason is applied. It can be used in almost any situation that implies mandatory control of the content, such as generating mail-merged from letters, creating files with custom configuration and even building dynamic GIF images, based on varying input parameters.

Mason provides multiple improvements in terms of templating systems written in Perl, using some features aimed at helping manage, in a more effective way, the building process of a site and its maintenance. The main features are:

- **Components** – modular design elements. A component is the basic unit of Mason that can accept input parameters and generate output results. Mason allows any component to call another component at any point during its execution in the same manner that Perl does (a subroutine can call another subroutine). A component may represent a single web page (for example, a navigation bar) or even a shared function that generates no output on its own.
- **Object inheritance** – it is considered to be one of the Mason's most important features and allows a component to inherit the behavior of other components, in

the same manner that classes and objects do in object-oriented hierarchy. In this way, every component can inherit from another component called auto-handler. The auto-handler implements the common behavior for all the components, for example, the content of header and footer sections. Individual components implement specific behavior, such as the body text of every single page.

- **Intelligent caching mechanism** – when working with dynamic sites, there are situations when certain portions can take longer to generate or they are semi-dynamic (its content is periodically updated, but remains static for long periods of time between the changes). In these cases, Mason provides a very sophisticated and complex caching mechanism that can be used to control how often the output of a component is rebuilt. The expiration decision is based on time, on certain key parameters (username or content) or an explicit agent can decide when a specific data expires [13].

### 3.4 E-marketing tools for marketing analysis and customer targeting

When adopting email campaigns as a promoting strategy for a business, it is essential that the targeted population is represented only by interested users. For a more accurate selection, the marketer has the possibility to use a wide range of tools that provide him data about both new and old users from the company's database. A first option allows him to generate a list with the new users on site. The search takes into consideration a specific date or a custom time range [14].

In order to obtain the proper results and, after that, to export them into an excel file, the application uses a query based on certain key criteria: a field that identifies if a user had a previous account and a subscription. Then, the results are exported into an Excel file and filtered to obtain a more specific targeted segment [15].

Statistics and other information about users offer the marketer the possibility to visualize the results as a list or a chart, grouped by specified fields: profession, primary region,

and secondary region, both primary and secondary regions. The graph is generated using a component called by the page that receives as input parameters the axis coordinates. The custom search is useful if you want to generate rapidly a list with clients that make the subject of your campaign. In this case, the marketer can track issues related to the region he targets, the users' profession or the type of his account / subscription [16]. For example, if the campaign's purpose is to generate traffic on the site from users interested in residential properties listed on the X

city's market, you have to choose a location based search (Primary Region) and to select the corresponding profession (homebuyer). The script runs a query on the involved tables, with the conditions mentioned before and returns a list with the results that can be exported as a .CSV file. The results are generated based on the logical OR operator between the two sections and the key words are limited as it follows: the comma is the equivalent for "OR" and the space for "AND". We used extended database from abroad because Romanian databases is not ready yet (Fig. 2).

Fig. 2. Custom search

A new section (Press) was created and its aim is to assure a more effective method for managing and monitoring the marketing department tasks that involve working with databases. This section keeps track of the activity developed by each employee, both for internal use and for press publications (online or written). Each marketer enters his task, specifying the following elements: the publication type (online, written, and other), a short description, the request date, the prepared date, the authors name and must upload the result file. The page is divided into two sections: the press request page that includes analysis made based on the requests received from different publications and the

press mentions page that records the articles in which the company was cited as data source [17]. The marketing department has to deal every day with a large number of requests concerning the real estate market. An automation of the gathering process reduces the time needed to complete a task and, also, the redundancies. We developed an accessible tool for every marketer, even if he does not have databases knowledge. This page is based on databases querying principles and involves the tables that record information about the properties listed on the market. After selecting the time range and the region of interest, the differ-

ence between the initial listing price and the current price is calculated. It provides a list with top 30 price changes in both ways: increase and decrease.

#### 4 Conclusions

The online promoting tends to become the most convenient marketing media for a company that helps it to enlarge its distribution channels for products and services. This is the point where integrating the databases in the process can make the difference between two companies.

The maintenance of a database with information about the consumers, their preferences and a track of their behavior can bring the following advantages for a company:

- Customizing e-mail campaigns based on specific target audience, which avoids mass promotion of products and services and address each class of customers according to their needs;
- Instant communication with the client, an online marketing strategy that can turn any online business into a real source of profit;
- Availability in time and customer feedback that allows him to react, express his opinions or send suggestions to the company;
- Real-time statistics for measuring the success of promotional campaigns, ob-

tained by querying the databases and a variety of other tools at the employees' disposal;

- The efficiency increase due to the considerable reduction of time by selecting a target segment for a given action and obtaining lists of thousands of customers who meet the requirements and will be the destination of the promotion campaigns;

The future development directions for a Business Intelligence module take into consideration:

- Extent of the searching criteria based on the product point of interest;
- Developing of the monitoring section for the marketing department;
- Implementation of a system that monitors and extracts statistics on income generated from the email campaigns;
- Implementation of new tools to achieve statistics on real-estate market;
- Making a section of HCI (Human Computer Interaction) to create customized popups by any team member.

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