MySQL databases as part of the Online Business, using a platform based on Linux

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The Internet is a business development environment that has major advantages over traditional environment. From a financial standpoint, the initial investment is much reduced and, as yield, the chances of success are considerably higher. Developing an online business also depends on the manager's ability to use the best solutions, sustainable on a long term. The current trend is to decrease the costs for the technical platform by adopting open-source license products. Such platform is based on a Linux operating system and a database system based on MySQL product. This article aims to answer two basic questions: "A platform based on Linux and MySQL can handle the demands of an online business?" and "Adopting such a solution has the effect of increasing profitability?"
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1 Introduction

The goal of any physical or legal entity is to be efficient, meaning long-term profitability. Profitability is the most important defining element; there is no economical reason for a business to continue its activity as long as the costs are constantly higher than the income. This main feature is not exclusive, meaning that one must take into consideration finding a competitive model that follows all the rules and eventually anticipates them.

Growth and maintaining profitability is achieved through continuous optimization of the factors that make up the business. Thus, the online component is used to increase performance, whether by applying it at the same time with a classical business, whether applied as a standalone item.

Comparing two businesses, a classical one and an online one, the second may have a higher success rate [1], due to how it can expand: a large number of potential clients readily available at low cost, high financial return which leads to performances for clients and

automatically in favor of business.

Among the most profitable companies in the world top, compiled by Fortune Magazine in 2010 [2], *Google* (activity carried out exclusively online) is ranked 19. This shows that the online environment is ideal for growing business. Moreover, there is an international support to this: preoccupation in the field (there is a strong tendency to support online environment by all major international companies), the legislative stimulating base, the context for research, special funds (including European funds).

The element with a strong impact in business stability is the cost given by business needs: human needs, technical needs, current expenses, miscellaneous costs, etc. When we speak of optimization the purpose is reducing costs for sub-assemblies, meaning reducing the total cost.

The optimization can only occur if actual estate of the online business is known, meaning if an internal audit that addresses to system classification and finding the vulnerabilities is realized, such as those nonperforming elements that can be

improved. Knowledge will be dynamic because the business has dynamic elements that require repetitive analysis and cycles of knowledge in a certain period of time. One example refers to the hardware part; the processing requirements should be known (the traffic that is recorded on the site) in order to meet them immediately, without users noticing a decrease in the quality of the provided service.

This document wants to provide ways to reduce the cost of the technical elements in an online business, in this case the ones with a database system by adopting qualitative, efficient, secure and grounded solutions. Thus, it is proposed a technical solution based on a Linux operating system and MySQL database. This proposal aims to increase profitability by reducing the costs with the technical platform.

2. Technical Platform

The platform is basic for an online business, integrating all those elements that participate directly or indirectly in this activity. One of these factors is the technical part and includes hardware and software ensembles with which the business is visible on the Internet. Thus, the technical platform has the physical server, the operating system (together with adjacent elements) and the main software product – the site itself.

2.1. Hardware Platform

The visibility on the Internet of the software product, also called web site, is provided by specialized computer - servers, which are designed to offer bi-directional support between the client and the site.

In qualitative terms, meaning physical location of the hardware platform in a specialized environment, there are the following solutions:

- Shared hosting: a web server hosting a number of sites; the processing resources are limited and shared. This solution is for online businesses that have minimal sites, the main advantage being the cost. The major disadvantage is that the processing resources are limited and used in common. So, there is the possibility that a particular site uses all available resources, the other ones becoming inaccessible.

  One of the biggest companies that offer such a service is *HostGator* (http://www.hostgator.com) and according to what they produce, customers have unlimited storage space and bandwidth at a modest monthly price. At first analysis, the offer is attractive, but if studied, it you will be noticed that there are limitations such as the number of files (existing nodes) - even if unlimited data is stored, dividing them into documents should not exceed maximum number of nodes allowed (example: 10 files can be stored, each having 200GB, but not 1000 files that cumulatively do not exceed 1GB); processing resources - an insignificant percentage of available memory can be used and the processor cannot be used over a short period of time. If those limitations are exceeded, the company reserves the right to suspend the hosted account.

- Hosting on a Virtual Personal Server (VirtualPrivateServer-VPS): the server resources are shared, each customer has processing capabilities provided with the possibility of using all available resources, if not used by other customers. The advantage of this type of hosting is that it ensures the minimum necessary for each entity, the solution being used by low complexity sites.

  As with shared hosting solutions, some limitations appear, in terms of processing data that is related to Central Processing Unit (CPU) usage. If on the disk space and memory there is a well-defined

share, the processor can cause problems because a minimum insufficient resource is provided and if there are additional requirements, those will be satisfied only if the processor is not used by other customers - chances this to happen are low. This is a transitional solution to the Dedicated Server or Cloud Computing hosting.

- Hosting on a Dedicated Server: a dedicated server is intended only for a single client that can fully use all its capabilities. The disadvantage is the high price that the customer must pay.

Also, what is related to the management server comes in the customer's duty: installing and configuring the operating system, the software products, startup, maintenance and updates. It should be noticed that this service is not a scalable hosting, hardware sizing cannot be dynamically made and, if done, may endanger the integrity and availability of the stored information on the website.

- Cloud Computing Hosting: this version is the best choice in terms of price / resource allocation. In Cloud Computing the needed resources are established by the client.

The VexxHost company (http://www.vexxhost.com) has implemented a system for this matter (see Figure 1.), which enables customers to increase processing and storage capabilities, as needed.

Thus, if at some point the website is accessed by a large number of users, processing capacities are dynamically resized depending on the requirements. As an example, if the online business management knows the state of the internal processes, it will propose increasing the hardware capabilities in the holiday months, knowing that the offered services will be of interest to much more clients, dramatically increasing the web traffic.

The advantage of this solution is given by the immediate access to additional resources and the cost that modifies according to the use of the hardware components.
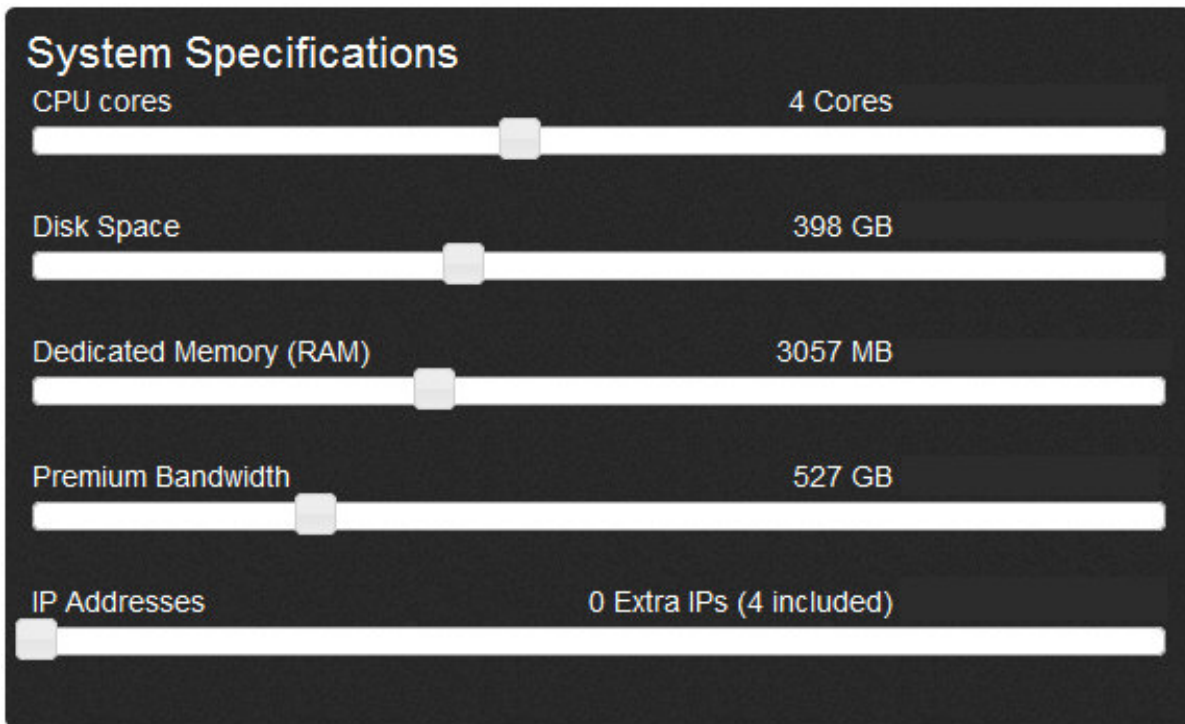
Figure 1. Establishing technical resources in a Cloud Computing system (vexxhost.com)

The Cloud Computing solution brings major advantages in terms of databases, such as: *"Improved availability: If there is a fault in one database system, will only affect one fragment of the information, not the entire database."* [3] and *"Improved performance: Data is located near the site with the greatest demand and the database systems are parallelized, which allow the load to be balanced among the servers"* [3].

2.2 Software Platform

The basic component in the software platform is the operating system and its capacity to manage hardware and software sub-modules resources related to the server.

Most operating systems on the market can be installed on a Web server, but there are two specialized products:

- *Microsoft Server*: developed by Microsoft; is a product based on a license.
- Linux based operating systems, free, such as *Ubuntu Server, Fedora, CentOS* or license based

like *Red Hat Enterprise Linux.*

The proposed operating system within the platform is the *Community Enterprise Operating System* (CentOS) and it is using Red Hat Enterprise Linux product code, published by the Red Hat company, licensed under General Public License (GPL). The differentiation is made by the identification (logos), the legal references for clients support and the licensing costs that are eliminated.

CentOS is a highly stable solution, being sustained by a large number of volunteer programmers and testers that contribute on maintaining and constantly improving the product.

CentOS is the best solution for the online environment servers, which is based on Red Hat Enterprise Linux product - used by large companies, such as *London Exchange Stock.*

What makes a server become a Web server is the Internet access and the suite of software installed. The main modules are:

- Web server such as Apache, IIS (Internet Information Services) or Apache Tomcat. Its role is to

mediate (see Figure 2) the connection between server and client. Thus, the web server takes the request from the user, redirects it to which software product it is addressed to, expects the outcome of the demand and then provides it to the client. Web

server is a node and deals with management input and output flows. This sub-component aggregates the subsystems and subservers, without the user noticing it, his feeling being that there is a unique system that communicates with him.
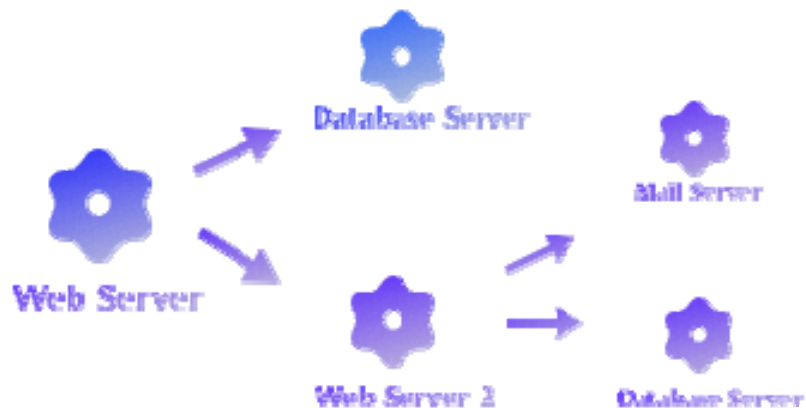

Figure 2. The Web Server as an interface

- Database server such as Oracle, MySQL Oracle, SQL Server, PostgreSQL or IBM DB2. This server handles the storage and data management, the performance being imperative. The database system must respond quickly to requests, manage and save data in an efficient manner, meaning that the interrogation should be done in an acceptable timeframe.
- Language Processor: PHP (Hypertext Preprocessor), Java, asp.NET, C #, etc. The supported programming language on the server has direct implication on other software products, by existing or not a committed working relationship. As an example, C #, as a Microsoft. Net component is optimized to work with Microsoft's Web server - Internet Information Services (IIS), as effectively as Hypertext Preprocessor (PHP) is working

with Apache web server.

3. Database System
There are many solutions for storing information using databases, but what should be taken into consideration is the optimal choice, to help the development of the owned online business.

The most widely used database systems are Oracle, Microsoft SQL Server, Oracle, MySQL and IBM IDB2.

The proposal of using a product that contains MySQL platform was motivated by the fact that this database system has increasingly became used in production because it offers advantages over the competition:

- There are no licensing costs.
- The product is open-source so, the community involvement makes the development progress to be steady.
- The functionalities are similar to the other database systems.
- Specialized companies (hosting, software selling companies, etc) provide default support for the

system database.
- It is not conditioned by a particular operating system. For example, SQL Server can only run on a Microsoft operating system.

MySQL can run on more than 20 operating systems [4], such as Windows (including Windows Server) or Linux

based systems. Performance, scalability and security system has made the greatest sites (see), in terms of popularity and traffic stored in the database, to adopt this solution. Among customers who use MySQL as a database system included in the individual platforms can be mentioned FaceBook.com, NetLog.com or Big Fish Games (see Figure 3).

Figure 3. Different customers using MySQL

3.1 MySQL based solution
Qualitatively, the difference between MySQL and the most important database systems is minimal, meaning functionality and performance are similar, with few exceptions.
The main advantage is the cost; MySQL is distributed with a GNU General Public License (GPL), meaning no running costs.

Thus, choosing a platform based on Linux operating system and having a MySQL database, the profitability rate will increase.

Profit can be calculated with the following formula:
Profit = Income – Cost

In the *initial situation*, in which it is used a database with non-free license, cost is composed of several sub costs (see Figure 4).

$$InitialCost = SoftwarePlatformCost + HardwarePlatformCost + ... + OtherCost$$

$$SoftwarePlatformCost = OperatingSystemLicenseCost + LicenseCostDataBaseSystem + MiscellaneousCost$$

Figure 4. Initial cost structure

After adopting a platform based on Linux operating system and a MySQL database,

freely available solutions, the cost structure is illustrated in Figure 5.

$$FinalCost = InitialCost - OperatingSystemLicenseCost - LicenseCostDataBaseSystem$$

Figure 5. The structure of the final cost

It can be observed that the total costs decrease by eliminating licensing costs with the operating system and database system. It should be mentioned that this decrease of the costs will bring long-term profit growth.

Another advantage of using MySQL is the online orientation; this is why it is one of the most used database systems, having native integration in software related systems, such as PHP processor.

3.2. MySQL Administration

Database management can be done with open source software. One such product is VirtualMin, for management applications (including database) installed on the Linux operating system (web server, mail server, operating system, system firewall, etc).

Installing and managing a database can be made:

- From the command line of the operating system [5], requiring technical skills.
- Using specialized software that has graphical user interface such

as Webmin, not requiring specific knowledge.

The installation is done by executing the VirtualMin script that handles itself the whole installation process. From the command line of the operating system, it should run the commands related to file downloading and running it. As an example, for a CentOS operating system, here are the steps:

- Downloading file: `wget - http://software.virtualmin.com/gpl/scripts/install.sh`
- Granting running rights : `chmod + x install.sh`
- Script installation :`. / install.sh`
- After executing the script, VirtualMin can be accessed on the server's address, port 10000, using a Web browser and having available a graphical interface.

From the admin panel, different modules can be installed, including MySQL. After installation, VirtualMin offers a submenu with options and information for managing the system database (see Figure 6).

Figure 6. Options for managing the database, offered by VirtualMin

Using VirtualMin can manage databases, tables, fields, settings related to running the MySQL server, different settings, without using a graphical interface that would involve knowing some specific

commands.

4. Putting into operation

The proposed platform consists of:

- Cloud Computing hosting solution

- CentOS operating system
- Apache Web Server
- MySQL database server
- VirtualMin and WeMin administration system
- Other adjacent products

Putting it into service requires installation, configuration and optimization of all used software.

Steps:

1. Installation Server. The company used as a hosting Cloud Computing provider is VexxHost. After registering a new account (by accessing the http://cloud.vexxhost.com website) a new server configuration application can be sent. The request will include details of chosen operating system (in this case CentOS) and related hardware data: sizes storage space, estimated monthly traffic, the number of processor cores, memory size,

number of additional IPs, etc. By sending the form, results computing the payment for the provided service, and after payment, building physical server to a node in the system.

2. Completing the server installation requires knowing the Internet Protocols (IPs) which identifies it on the Internet. Thus, accessing one of this IPs, makes possible managing the server remotely. Set up will be conducted through a Secure Shell (SSH) connection. The server management is made exclusively from the command line, graphical interface missing for reasons like lack of used resources.

3. The access to the server is done by using a utility that has implemented the SSH protocol (Putty user in this case - see Figure 7); the necessary data is: IP Address, admin username and password (data provided after installing the server).
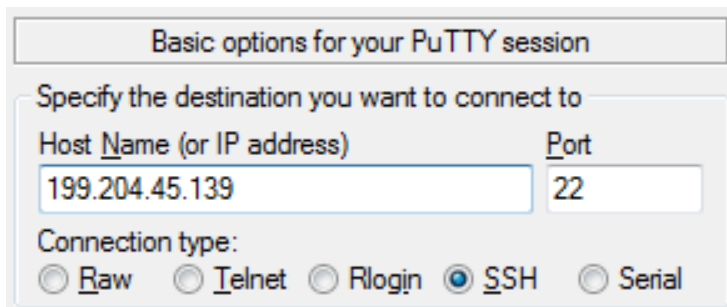

Figure 7. Putty New Connection

4. The next step is to install a software product that allows the server management to be realized using a graphical interface. This product is Webmin, containing VirtualMin module; the installation it described in 3.2 chapter. After installation, it can be accessed at the URL: *http://IPServer:10000* using the admin name and password.

5. Webmin and VirtualMin products simplify server management, the user using the Graphical user interface (GUI), so, there is no need for knowledge of specific Linux commands (except those related to the software installation).

5. Conclusions

Using open-source technologies will result in direct cost reduction, thus increasing profits. There is no general rule in this regard; such solutions should be analyzed, so as to see if in terms of quality are at the competition.

The platform based on Linux operating system and MySQL database is the optimum choice on helping develop a sustainable online business. This option can be used even if a shift is needed from the old solution, because long-term benefits are major. Besides the cost aspect, MySQL offers outstanding performance, so it can be said that there is no compromise.

The proposed platform is based on software products tested in specific conditions. The web server hosting the print service offered through the site must have certain performance features, this shown by the users experience on the site, meaning the degree of satisfaction. If a customer accesses the site and encounters technical issues, the chances that he quit the service increase.

The website quality (referring to the programming mode, the design and functionality) should be supported by the use of a suitable platform.

Using the presented platform brings a substantial cost reduction and increases business profitability through performance brought as support service.

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From the environmental point of view he presents Word Wide Web interest in new technologies and platforms, both conceptually, software and hardware too, developing over the time many complex and profitable web projects that were highly appreciated.