DISTRIBUTED APPLICATIONS DEVELOPMENT USING MICROSOFT WINDOWS COMMUNICATION FOUNDATION FRAMEWORK 4.0 APPLIED FOR BUSINESS ADMINISTRATION IN GEATURIM S.A.

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Summary. *The Tourism Transport Company GEATURIM SA runs different processes within the company, the information generated by these processes is vital for the proper performance of the functions of the company, so they need a proper administration and information management. The implementation of an administrative management system comes with the need to solve integration and management of information issues. A service-oriented application that meets the specifications and needs of the company was developed. The Administrative Management SGAG system is responsible for managing the administrative information generated by contracts. The technologies used in the system development meet the required standards for the implementation of a WCF application. The server database that it uses is SQL Express. We use c # 4.0 .Net technologies as programming language and frameworks like WCF and WPF. All the development process was documented generating different artifacts present in each stage of the project, for proper classification of the artifacts; we used the software development methodology RUP. This process includes the design as well as the system development and the execution of each activity proposed during the process. Finally, we present the most relevant details of the final system description, conclusions and recommendations.*

Keywords

WCF Distributed Applications.

1. Introduction

Nowadays contracts generated by the Company are manually handled in Excel Worksheets, therefore the Company doesn´t have updated information of the income that it generates. The Company is exposed to wrong data input or human mistakes like loss, duplicity and inconsistencies perhaps confusion when retrieving the Company´s information.

1.1 Issue Description

The company generates manual contracts for their customers which hinder the proper control of the movements made of each one of their employees. Today there is no such program that stores all data generated by the company, besides the lack of vital reports for managing information. Therefore the company doesn't have updated data of the income that it makes, at the same time they can´t keep an effective follow up of the reports that the Company needs.

Among some of the reasons to set up an automated system within the company, there is not a list of all the customers, this causes that each time a new customer comes in a massive Excel sheet has to be opened just to print all the information for the customer. Another reason is not having control over the movements or the income that the Company generates by each contract. These situations deserve many approaches one of them is to store all the client information in an automated system that will have control over the company´s movements and contracts.

1.2 Objectives

1.2.1 General Objective

Implementing a system using Microsoft Windows Communication Foundation Framework 4.0 for administrative management in Geaturim S.A.

1.2.2 Specific Objectives

Research about Microsoft Windows Communication Foundation Framework 4.0 management with Model View Presenter architecture.

Use a quality tool based on the proper methodology of software development.

Define different user roles that the system will have on the management Administration Geaturim S.A (SGAG).

Train users to correctly handle the application in order to acquire a perfect knowledge of the system and take advantage of its capacities.

1.3 Justifying Tools   and Study Methodologies

Tools used on this Project have as principal features interoperability and productivity which allows the Company to develop distributed applications based on service oriented architecture (SOA).

The application resides on a server at the company´s main office; it is also available to use it from the company´s intranet.

To set up (SGAG) Administrative Management Application System at GEATURIM S.A.; we use C# with Windows Presentation Foundation Framework WPF. It is one of the newest tools that allow creating interaction interfaces within Windows and Windows web applications. WPF is a Microsoft technology presented as part of View offering access to a set of development tools needed to create web servers, layers and data managed oriented applications.

Windows Communication Foundation WCF is a development tool implemented in this project because it saves a great amount of time to the developer and also contributes with powerful resources to develop service - client messaging applications and to obtain data within their Databases.

The application Server is Internet Information Server IIS. This server allows running applications developed in .net platforms. SQL Express 2012 is the database engine and it is used to store and managed information. This kind of software is used because its stability, reliability and because it offers a simple but powerful free Database.

RUP is a methodology used for the development of this Project because it is quick and easy to apply. It is a quick, iterative and effective way to manage projects.

2.   Solution Design

2.1 Problem Resolution

The Administrative Management of tourist transport company GEATURIM S.A. will be developed using Framework 4.0 WCF Y WPF which allows maintaining functions and information attainable at all times to its users. This Access will be granted according to users privileges within an intranet application.

This feature will ease employee's activities and decrease their work related burdens by assigning some of their activities among their coworkers.

The systems is developed by layers architecture which is a client-server architecture that breaks apart business from the design logic

The presentation layer shows the model of information to the user. This layer has to be of easy understanding, friendly and easy to use.

The business layer or model Layer is in which the most follow management rules, data, and logs are stored.

The Presenter allows controlling user entries through manipulation of the View interface.

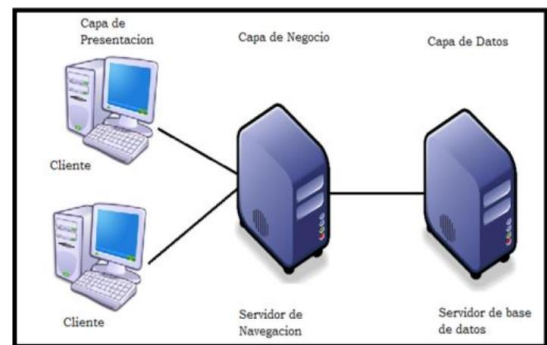There is a layer in the middle which allows communication between View and Presenter interfaces.

Figure 1. Design Model View Presenter MVP.

2.2 Scope

The system of administrative management (SGAG), will benefit tourist transport company GEATURIM S.A and to its customers. The application design focuses in contracts generation and the detail of the information generated for the company.

The application has as an end to efficiently systematized and managed information that will be used for the company´s workers. The delimitations under which the software application will be developed are global modules.

2.2.1 Requirement Determination

The system performs the following functions:

Allows creation and modification of system users.

Allows creation and modification of clients.

Allows creation and modification of drivers.

Allows creation and modification of vehicles.

Registers, modifies, cancels and prints contracts.

Assigns movements generated by the contracts.

Registers the company´s internal expenses.

Allows seeing and reprinting a contract.

Generates reports for different users.

Figura 2. System Modules.

Vehicles and Drivers Registration Module:

 It will perform:

Geaturim existing vehicles registration.

Drivers belonging to the Company registration.

Client Update and Registration Module: It allows updating or entering information about institutions or clients that had required service tourist transport from Geaturim S.A.

Contract Management Module:

It will perform:

Total or partial payments of contracts.

Transport vehicles assignment.

Driver's assignment.

Institution Assignment.

Contract duration.

Origen and destination of transportation.

Number of People.

Details of expenses with financial document numbers.

Automatized printing of contracts.

Internal Expenses Registration Module: It allows entering details of the internal expenses caused by vehicle maintenance and administrative expenses generated by the Company.

Management and Security Module: It will guarantee the use of the application by the user.

User creation.

Role assignment.

Encryption algorithms.

Analysis Information Module: It will allow obtaining the following reports:

Income reports by date.

Expenses reports by date.

Annual profits reports.

Contract reports by client.

Cancelled contracts by date.

Vehicle Maintenance reports.

2.3 System Architecture

2.3.1 Functional Architecture

To define the application architecture, we have many open code technological tools available on Internet for c# language. They use an MVP pattern as well as levels or layers structure. Therefore the architecture to use will be model, view and presenter.
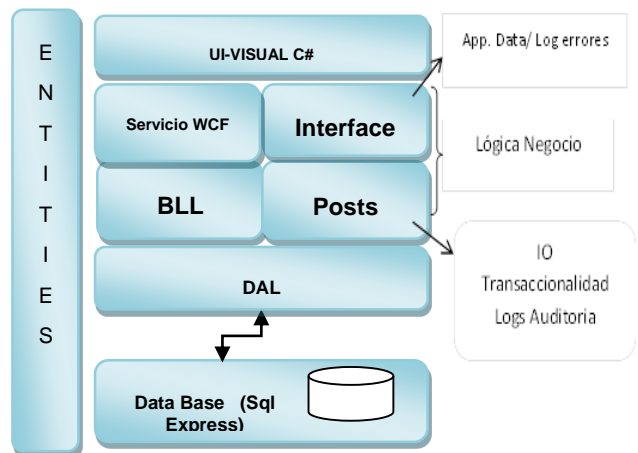

Figure 3. Software Architecture.

The Vista layer will be developed using c# framework 4.0 WPF from .Net. It allows user, window and storage interface management. An specific advantage from WPF is that XAML is a completely declarative language. In a declarative language program the developer (or designer) is the one who describes the behavior and integration of each one of the application components. In an XAML language the elements and attributes map the classes and properties within the API of c#. It also uses framework4.0 that allows to develop applications that send service – client's messages.

It also uses MVP which is a design pattern that splits data from its presentation. It will allow the developer to create system functions that allow access to data without worrying about how they are presented to the user.

The MVP model is responsible for data and system rules. It coordinates the business logic and database access. It manages every critical system action that is not related to the visual interface of the application.

For the business layer, it uses WCF which is a framework that allows creating services to manage security, automatic persistence and has application construction standards in .Net such as messages and contracts.

At data layer, it uses Microsoft Enterprise Library. It uses a set of tools and developing libraries that handle data using .NET platforms.

To store and manage information, it uses store procedures. They allow running commands directly at the SQL Express2012 Database Engine.

It also uses Internet Information Server as application server to expose the presenter layer and separates the business logic from the user interface.

3. Building the Application

3.1 System Roles

Reaching goals and building what the client needs, is the main concern of the work team, therefore an effective communication and interaction most be developed from each one of the team members.

The members of the Work team for the project are:

ROL	NAME	DESCRIPTION
Project Coordinator	Lic. Brilmo Montalvo	Project Responsible at Directive level.
Project Responsible	José Figueroa	TESIST
Developers Team	José Figueroa	TESIST

Table 1: System Roles.

3.2 Project Requirements

In the following table we will describe the analysis of requirements and divide them in small tasks that will take the developers a couple of days of implementation.

Analysis and Structure of the Project

ID	ACTIVITY	NOTES
T1	SQL Express Set Up and configuration.	It is necessary to install the Database engine in which all the necessary tables and its relations will be created. It will store all the system information.
T2	Visual Studio 2010 Set Up	It is necessary to install Visual Studio 2010 for developing purposes.
T3	SQL with .Net configuration.	It is necessary to test all connections between .NET and the Database engine
T4	System Database creation.	
T5	Setting Up of system tables needed with their respective principal keys, Foreign keys and indexes.	
T6	Creating Store Procedures to manage information within the Database.	
T7	IIS Set Up	It is necessary to set the Application Server from the Internet Information Service.

Table 2: Analysis and Structure of the project

Interface Arrangements

ID	ACTIVITY	NOTES
T8	Creating, modifying and deleting clients.	The client application exposes all the operations of the service and it will be developed on Visual C# with WPF.
T9	Creating, modifying and deleting vehicles.	The client application exposes all the operations of the service and it will be developed on Visual C# with WPF.
T10	Creating, modifying and deleting drivers.	The client application exposes all the operations of the service and it will be developed on Visual C# with WPF.
T11	Creating, modifying and deleting users.	The client application exposes all the operations of the service and it will be developed on Visual C# with WPF.
T12	Creating, modifying and deleting contracts.	The client application exposes all the operations of the service

ID	ACTIVITY	NOTES
T13	Creating, modifying and deleting agencies.	and it will be developed on Visual C# with WPF. The client application exposes all the operations of the service and it will be developed on Visual C# with WPF.
T14	Adding details about income and expenses from the System Contracts.	
T15	Contract Revocation.	
T16	Adding administrative income and expenses operations of the Company.	
T17	Administrative Operations Revocation.	
T18	Client report viewing.	
T19	Driver report viewing.	
T20	Vehicle report viewing.	
T21	Agencies report viewing.	
T22	User report viewing.	
T23	Contract report viewing.	
T24	Administrative Operations report viewing.	

Table 3: Interface Arrangements

Security and System Management

ID	ACTIVITY	NOTES
T25	Creating, modifying and deleting System Parameters.	It is necessary to set different parameters to gain access to the system.
T26	Data Structure design to control access to the system.	It is necessary to set system security to avoid non-authorized modifications to the system.
T27	Creating a log in system interface.	
T28	Setting up system securities that will ensure that each user that gain access to the application will be part of a domain and ask for a password.	
T29	Parameters report viewing.	

Table 4: Security and System Management

Reports

ID	ACTIVITY	NOTES
T25	Contract Reports.	It allows obtaining reports detailing vehicles, agencies and clients by system date.
T26	Administrative Operations reports.	It allows obtaining reports detailing vehicles, agencies by system date.
T27	Profit Reports	It allows obtaining the total value for income and expenses generated by the Company´s Administrative Operations and Contracts arranged by system date.

Table 5: Security and System Management

4. Conclusions and Findings

4.1 Conclusions

Creating and setting up SGAG system since May 2013; the company has obtained an improvement at managing and controlling processes, especially contract related processes.

Thanks to SGAG benefits, clients found a reliable and effective attention. This because the system allows an easy information management without affecting integrity and credibility.

SGAG allows keeping an appropriate control of the details of each contract generated within the Company. It also allows users to obtain managerial reports in a faster and effective way.

With training provided to the users of SGAG system improved productivity performance has been obtained in the processes carried out by the company. It also decreases the attention time to generate a contract.

Thanks to the use of the MVP architecture an independent user interface system was obtained. It exposes their methods through a WCF service that allows us to get a stable and versatile system that meets all user´s expectations.

The System allows the company´s General Manager to obtain updated information about contracts and detailed information of income and expenses generated by the company.

4.2 Findings

When finding Projects of this magnitude, it is important the right use of software development methodologies guidelines like RUP. It emphasizes in setting up use cases because they are the heart of the system.

Keeping a follow up to the system, in order to avoid issues that may develop during the time of the application use.

The system Front-End can be developed with free development tools because the business logic and methods that exposes it are independent and exposed in a WCF

service. For this case, we use WPF so it will improve the user application experience.

Development tendencies require a Framework because they offer friendly components to the user. It provides a secure exchangeable and reliable messaging service. WCF give us all these features at a low learning budget. WCF is also relevant to projects such as the SGAG system.

4.3 Impact Analysis

Impact Analysis allows us to establish the benefits and acceptance of the application within the Company.

To perform an impact analysis over the implementation of the application a run time processes description was implemented, also a before and after survey about the application has been established, too.

Some of the immediate results that the application will have over the workers are: decrease and removal of some of their job related burdens due to the integration and automation of functions. Workers will also see a decrease of paper work. An improvement in information quality due to integration and automation of data will be seen. It helps to decision making due to a real time availability of data, allowing management and execution of tasks in a faster and effective way. These benefits can be seen because all information comes from the same and only data source.

Visible Benefits

The visible benefits of the application are given by:

Cost reduction in documentation, paperwork, maintenance and physical space.

Control and monitoring of the company's revenues.

Company´s client updated information.

A better implementation of financial and material resources.

Effective information process.

Easy access to information, at any time.

Reliable information.

Immediate report generation.

Numeric mistakes elimination.

Imperceptible Benefits

Among the imperceptible benefits of the application, we can include:

Staff Training.

Staff production improvement.

Privacy of the information

Quality service improvement.

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