Analysis, Design and Implementation of a Helpdesk Management System - Case Study “Albanian Radio Television”

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Abstract - As companies grow, so do the complex demands placed on the IT Department. Without a good Help Desk Software, IT Departments can begin losing the ability to effectively provide employees with the technical support they need to do their jobs. Many enterprises rely on IT Ticketing Systems to deliver fast, reliable internal customer service, resulting in improved IT department operations and satisfied employees.

This paper describes the process of creating an IT Ticketing System from scratch for the IT Sector of a well-known organization in Albania - Albanian Radio Television, the public broadcaster of the country. The new way of collecting information about IT problems in the institution and also a new way of distributing work to the IT Staff members will bring benefits not only to the IT Sector but also to the employees which this sector supports.

The system is developed using JavaFX a software platform for creating and delivering desktop applications, as well as rich internet applications from Oracle.

Keywords – helpdesk management system, It ticketing, system analysis

I. INTRODUCTION

In today’s world every organization is heavily dependent on information technology. Information Technology has changed the way they work and function. Almost every employee in the today’s organization has to rely on an IT device like a computer, smart phone, tablet etc. to accomplish their everyday job. These devices make their job easier but also present to them a wide range of technology related problems, hardware or software related. The need for a help desk system where they can rely on to solve these problems is more than evident and many organizations use On Call Help Desk or Help Desk Software’s to support their employees [5, 15].

In the market today there are dozens of Help Desk Software [4, 3]. Developing companies are integrating every day more features in the attempt to get more market share. These features add value to the software but they have their down sides. The software’s are becoming bigger, are demanding more resources and expensive hardware. Their complexity has increased and the employees who will use them need to be trained first. So they have a learning curve associated. Last but not least important, the major part do need an initial investment, a monthly payment/copy or monthly payment for each user/month.

Even developing an IT Ticketing System from scratch, will not be better than today’s software on the market, which are developed from dozens of developers working on them for many years but it will have its main features:

- Lightweight with no expensive hardware needed.
- No installation needed on clients.
- Almost no learning curve
- Very simple and intuitive Graphical User Interface.
- Free. No initial investment and no monthly costs.
- Open for further development and improvements in the incoming Development Department of the Albanian Radio Television.

II. PROBLEM STATEMENT

Albania Radio Television (ALRT) is a well know organization in Albania. Until March 2017 there was no Help Desk Software in use in any of the Departments of the Albanian Radio Television. From this fact the idea of creating a Help Desk Software for the IT Sector developed [1].

The department offered help to every employee which requests it by calling on the department office number, sending an email to the department e-mail address, asking for help coming at the office or calling the head of the department in the mobile phone. The head of the department then sends one of the IT staff to help the employee or deal with a specific problem. After solving the problem, the staff reports back to the head of the department about the problem and the measures taken to solve it.

The overall process is very time consuming. Phone calls back and forth. Employees move from their desk to seek help at the office. Many of them call the IT staff directly after calling the head of the department.
The software purpose is to organize the work of the IT Sector increase efficiency, reduce the response time to the end user and measure the performance of the IT Sector staff. The system will offer help to employees based on tickets opened by them in the system with no need to make a phone call or to leave their desk.

A ticket is an entry in the list of issues or help requests which may include various information like a description of the problem or help request, a unique reference number, an issue number, a computer IP address (Internet Protocol address), MAC address (Media Access Control address) and location, the name of the user who created the ticket, the time and date when created, a priority index, a status etc.

The software should be installed in every computer of the organization and every employee will have a username and password to login in the system. The system has a very easy to use Graphical User Interface which will be different for different roles. There are four roles in the system:

- Administrator
- IT Manager
- IT Staff
- User

The role is automatically determined at the login and the system opens the correct GUI for each employee.

The system will try to solve problems like:

1. Give to the supervisor of the department a centralized system where can distribute and assign work to the team.

2. Help employees with technical problems, hardware or software related in a work environment.

3. Hold IT Sector staff accountable for their actions.

4. Not knowing where or to whom to address a problem of the hardware or software in a work environment.

5. Having no way to contact the IT Sector staff.

6. Minimize misunderstandings between IT Sector staff and other employees.

7. Measure the IT Sector staff performance, problem solving skills and their response time to problems.

8. Difficulties in describing IT problems from non-technical employees to the IT Sector staff.

9. Sending 2 people to solve the same work.

10. Track the frequency of help from a user or computer which may tell that the user is not qualified and need training or the hardware must be replaced.

The software is developed in Java [6, 7]. The Graphical User Interface (GUI) is created in JavaFx [8]. In the backend it has a MySQL (My Standard Query Language) database [11], a simple synchronization server developed in Java and running as a service in the database server machine. The software uses the local mail server to send emails to IT staff and employees and an online gateway to send SMS (Short Message Service) text messages in their mobile phones. The developing IDE (Integrated Development Environment) chosen was NetBeans IDE which is the official IDE for Java [2, 10].

III. SYSTEM ARCHITECTURE

When choosing the application network architecture, the two predominant architectural paradigms used in modern network applications, to be taken in consideration are: the client-server architecture [13] or the P2P (peer-to-peer) architecture [14].

The developed IT Ticketing System uses both of this architectures, the two-tier and the three-tier architecture. The two-tier is used in:

- Database
- GUI Synchronization
- E-mail Notification

The database and the GUI synchronization work over the Local Area Network (LAN) of the Albanian Radio Television, while the e-mail notification works over the internet because the e-mail server configuration doesn’t allow accessing it from the LAN. The IT Ticketing System clients belong to the fat-client model where the presentation logic and most of the application processing are done on the client making use of the client personal computer processing power. As we can see from the figure below, in each case the clients communicate directly with the server through LAN or Internet.

The three-tier architecture is used in:

- SMS Notification
Differently from the two-tier architecture the clients here don’t communicate directly with the mobile company server who sends the SMS to the Users or to the IT Staff. They send a request to the Nexmo Server through the Nexmo API, while the Nexmo server communicates with the mobile company server to send the requested SMS [9,17].

IV. SYSTEM DESIGN

The IT Ticketing System will improve the IT Staff everyday job and the support for the employees who request help every day. In the design process the focus is on the software quality characteristics like: Correctness, Usability, Efficiency, Reliability, Portability etc. [16].

The users of the IT Ticketing System will have an everyday interaction with the system so is very important to understand what users want from the system and what the system can accomplish for them. The process of capturing requirements for a system developed is represented in a Use Case Diagram [12].

In the use case diagram are represented the users of the system as actors and what the users can do with the system as use cases. The actor is not necessarily a user. It can be another system interacting with this system.

Figure 3. Use Case Diagram of the IT Ticketing System

A. Authentication

As we saw in the use case before there will be four actors in the IT Ticketing System. Each one will have different functions and options so the GUI will be different for each of them. An approach to the situation may be to build four different distributions of the login interface and install each of them in the employee’s computers based on the actor they represent to the system. But in this situation the Administrator and the Manager will have only one computer to login while the IT Staff and the Users can login at their office computer.

A better approach will be that the same login interface is used for all actors. Those, the software can be easily distributed to all computers with different technologies of distribution over the network.

To accomplish this, we need to know the department, sector and the role of the employee that is logging in. Having this information, the login interface will automatically identify which actor the employee represents:

1. If the user is the Director of the Human Resources, then the role will be Administrator.
2. If the user is the Chief of the IT Sector, then the role will be Manager.
3. If the user is a member of the IT Sector but is not the chief, then the role will be IT Staff.
4. If the user in none of three cases, then he can login as a User.

Figure 4. The login interface of the IT Ticketing System

B. Administrator

In the authentication section it was mentioned that the Administrator role in the It Ticketing System will be assigned to the Director of the Human Resources of the Albanian Radio Television. This was the obvious choice because the Human Resources have all the detailed information for each employee which is already hired in the institution.

After logging in, the Administrator is presented with the following interface:

Figure 5. The Administrator GUI of the IT Ticketing System
The GUI has four sections divided in tabs. In the first tab the Administrator manages the information about the Departments of the institution. The second section is the Sector Tab. Sectors are smaller organizational units and are parts of departments for example a department can have many sectors. The main difference here is that when inserting a new sector, the Administrator must choose which department it belongs to. The third section is the Roles Tab for managing role information. Roles are unique and are an attribute of the employee. Many employers can have the same role for example the role Director can be used for the Director of the Marketing Department, Director of Human Resources etc. The fourth section is the Employees Tab. There are differences in the amount of information requested to insert a new employee or the information which is allowed to update to an existing employee like his department, sector, role of the new employee, select his/her birthday from the calendar and enter other details like e-mail, phone number, username and password. The details are used by the system to login the employee and notify him/her by email and SMS for solved tickets.

Finally, as we can read through this role explanation the Administrator have nothing to do with help requests from users nor manages any work distribution in the system. He/she just fills in essential information which the system needs to function correctly.

C. IT Manager

The second actor in the use case diagram is the IT Manager. This role is naturally assigned to the chief of the IT Sector of the Albanian Radio Television. After logging in the following GUI is presented to the IT Manager.

![Figure 6. IT manager GUI of the IT Ticketing System](image)

The IT Manager can view and take action on all the tickets that are submitted to the system. Every submitted ticket has its status “Pending” and its marked with the red color. The IT Manager after reading the ticket details, assigns the ticket to one of its IT Staff. After the ticket is assigned to one of the employers of the IT Staff its status turns to “Processing” and its marked with the yellow color. The “Solved” status marked with green is for the solved tickets and its status is changed by the IT Staff at his/her GUI. After solving a ticket, the IT Staff marks the ticket as solved and must report back to the IT Manager what measures has taken to solve it.

D. IT Staff

The third actor in the use case diagram is the IT Staff. This role is for all the members of the IT Sector except the chief. After logging in, the following GUI is presented to the IT Staff.

![Figure 7. IT Staff GUI of the IT Ticketing System](image)

In the GUI, the IT employer who is logged in, has a list of tickets that are assigned to him by the IT Manager. After getting the required information like type of problem, description, name of person who issued the ticket, IP and Mac address of the computer, the IT employer takes all the measures to solve the problem. After solving the problem, he/she changes the ticket status to “Solved”. Then he/she has to report to the IT Manager the measures taken to solve the issue.

E. User

The fourth actor in the use case diagram is the User. This role is for all employers of the institution except for the Director of Human Resources and all the IT Sector. After logging in the following GUI is presented to the User.

![Figure 8. User GUI of the IT Ticketing System](image)

A list of all the ticket submitted by him/her are displayed. Every ticket has its status updated instantly and the user may get information about each of them. There is an option in the Edit menu to Delete a Ticket. The delete ticket option is made possible to the user because there may be cases in which after submitting a ticket the user solved the problem himself.

F. System Operations

There are some operations in the IT Ticketing System that are accomplished by the system itself and not by the user’s interaction but which are very important for the smooth operation.

Date and Time are used in every ticket submitted and solved to measure the time taken for the ticket to be solved. Taking in consideration that the system is used in
many computers, each computer date and time may be different and using the local date and time can bring confusion. The system solves this by entering in the database for each ticket submitted and solved the date and time of the server on which the database is operating.

IP address and MAC address are two other information useful for the IT Staff in identifying the computer from which the ticket was submitted. Also knowing the IP and MAC may help in problem solving. For example, if a user gets a new computer and the old computer IP address is assigned to the new but the computer still does not have internet access, the firewall MAC address filter may be preventing it accessing the internet because the old MAC address must be replaced with the new one. These information is extracted automatically and entered in the database at the ticket submission.

The ticket status is also identified and colored by the system automatically for two statuses, the Pending status and the Processing status. The system identifies and marks every ticket with Pending status and red color every ticket which is submitted but have not been assigned to one employer of the IT Staff to be solved and marks with Processing and yellow color every ticket submitted which have been assigned to be solved.

1) Notifications
The notification is an essential part of the IT Ticketing System because it saves time and effort to the Users, IT Staff and IT Manager. The users don’t have to make a phone call or go to the IT office to ask for help. The IT Manager doesn’t have to make a phone call or call its IT Staff to the office to give them the work to be done. The IT Staff doesn’t have to go to the IT Manager office to get the work or go to every User office to tell them that their problem is solved. The IT Ticketing System can notify in three different ways:

- Instant notification through the IT Manager, IT Staff and User GUI
- By E-mail
- By SMS

With this three notification ways, the system reduced to the minimum the time taken to assign a work to the IT Staff.

2) GUI Synchronization
The three main actors of the IT Ticketing System which use the system on an everyday basis are the IT Manager, the IT Staff and the User. These three actors along with the interaction with the system through their GUI must “communicate” with each other. Basically:
- The User asks for help the IT Manger.
- The IT Manager notifies the IT Staff that there’s a problem to deal with and the User that the IT Staff is working on the problem.
- The IT Staff notifies the IT Manager and the User that the problem is solved.

This is achieved through the GUI synchronization. The software synchronizes all the running instances of the GUI for all actors. The client part of the client/server architecture is already embedded in the IT Ticketing System. Every instance of the program registers as a client in the server.

3) E-mail
The second notification method is by e-mail. E-mail has been widely used in Help Desk software for notification or even to submit a ticket in the system. In this case it serves as a notification service only.

4) SMS
The third notification method is by SMS. In the today’s world every person has a mobile phone, and almost we can’t live without it.

Each IT Staff member and User receives along with the e-mail a SMS text message which notifies about an assigned ticket to be solved or a solved one.

V. CONCLUSION AND FUTURE WORK
In this paper, the process of designing and implementing a ticketing system for the IT Sector of the Albanian Radio Television is presented. This system not only will offer a centralized way of collecting information about IT problems in the institution but will also offer a better way to deal with them. It will organize the work of the IT Sector members but also will help other employers to report problems to the IT Sector easily and also get information if their problem is being processed or is solved. It also provides an easy way for work distribution, staff members performance measurement and their problem solving skills etc.

The contribution of this paper is that it can serve as guideline for other institutions and researchers facing the same problems.

REFERENCES


