Chapter 7
Evaluation and Testing

7.1. Introduction

Last chapter discussed the implementation of each module with their important code snippets. Comparison of HAM Alarm monitoring system functionalities and gathered user functionalities which are tested describe in this chapter.

7.2 Evaluation

7.2.1 Project assessment

The business environment is uncommon to the world. As a result of that each step start from the beginning and all the requirements gather from scratch. First of all major client requirements was identified, which need to resolve from the proposed system. From the beginning following requirements are gathered as major requirements.

They are;

- Alarm management
- Colour management
- History management
- Real-Time monitoring
- Search and printing

Beginning of the development phase, client informed not to include login system as all the officers have same authority level, then no need to define user levels. Also asked Standard colours must be given, if need they can be able to view the standard colours. Since it is a major requirement for client, the requirement is accepted.

Tune Alarm management is the critical task of the system. *Giving Alarm colour as Alarm Code, giving Duration colour as different between current time and Alarm record time, Hiding Not-Commissioned Sites, Showing Tool tip text with Alarm reason and battery bank duration* are identified under this main requirement and successfully achieved these functions in the new system.

Another major task of the project is Colour Management. It has several sub functions such as *Adding colours using horizontal colour bars, Colours are defined into Red, Green and Blue the 3 main basic colours, How to save this colour into a database, showing*

colors when selecting each Alarm Code which stored in the database and etc… Those functionalities are successfully achieved by the new system.

During the requirement gathering phase, it has noticed that Not-Commissioned Sites and commissioned Sites are located in the same database with status bit. And need to change status when needed. This problem has been solved by adding "Not-Commissioned" button to "Commissioned Site's Alarm History" form and adding "Commissioned" button to "Not-Commissioned Site" form. When selecting each button change the status of the Site as 1 or 0 and rotate the Site Name between above two forms.

One of the most important requirements of the client is searching Alarms by Site Name or Alarm Code. This task achieved using same input box for both numeric and text data. If numeric data input found it treats as Alarm Code and Text input found it treat as Site Name, is helped to achieve this requirement successfully.

Management need print reports and it is hard to print using data grid. A Crystal report is the most powerful tool for reporting and printing. As these modules are already developed and they are available on www.Codeproject.com, I added above module to my system for printing.

New features such as Sending SMS to relevant engineers, Give Alarm sound not included to the new system, as system isolate from internet due to virus issue, sending SMS is not practical to develop by considering security of the system. Alarm sound system also not practical as officers don't trust on sound system as the sound always giving noises and they trend to mute the sound systems.

7.2.2 Achievements

Accuracy
Each of the modules is tested by using proper test cases with wide range of test data.

Completeness
All the major requirements of the Hutchison Telecommunication Lanka (Pvt.) Ltd. were successfully achieved by the HAM Alarm Monitoring system.

Real-Time
The Time interval of the Alarm Timer is 1000ms. Then the System refresh at each 1 minute duration.

7.3 Testing

Testing is an iterative process that is carried out in conjunction with implementation. System testing follows the completion of the implementation.

System testing is one of the most important phases in software engineering life cycle. This chapter used to describe system testing. This chapter covers description of testing methodologies and techniques which are used to test proposed system.

All the system functionality and non functionality areas should be check using proper test cases with wide range of test data. This chapter includes major test cases, test data and test results.

7.3.1 Testing approach

Unit testing is carried out parallel with the development process. During the integration testing, different tested units are intergraded. Finally when all the units successfully integrated and tested system testing is carried out. The aim of doing system testing is ensure that all the user requirements are satisfied by the developed system. According to the system test plan document system testing is carried out. This plan includes all the test case with wide range of test data and expected outputs.

There are three main approaches for testing design.

- Black Box Testing approach
- White Box Testing approach
- Specification base testing

In the black box approach test values are defined without any knowledge of the internal structure of the system. That means only the functional specification of the system is considered. Because of that, black box testing is also called functional testing.

In white box testing, the internal structure of the system is considered. Because of that whole knowledge of the system is required for design test cases. White box testing approach is also known as structural testing. In this project Black box testing is used as it gives final Out put for given input without knowing internal structure.

We can use,

- Use-Case
- Use-Case Description
- Activity Diagram
- Sequence Diagram

,for the test cases.

As Activity Diagram give each interface for input and output, Activity Diagram were selected for Test Cases.

7.3.2 List of test cases

1. HAM Alarm Monitor
2. Alarm Maintenance –Select
3. Alarm Maintenance - Insert
4. Alarm Maintenance – Modify
5. Alarm Maintenance - Delete
6. Standard Colours- Apply
7. Maintain Not-Commissioned Sites -Select
8. Maintain Not-Commissioned Sites - Insert
9. Maintain Not-Commissioned Sites - Modify
10. Maintain Not-Commissioned Sites – Commissioned
11. Maintain Not-Commissioned Sites - Delete
12. Maintain Commissioned Site's Alarm History -Select
13. Maintain Commissioned Site's Alarm History - Insert
14. Maintain Commissioned Site's Alarm History - Modify
15. Maintain Commissioned Site's Alarm History - Not-Commissioned
16. Maintain Commissioned Site's Alarm History – Delete
17. Search Site Name/Alarm Code
18. Search and Print

7.3.3 Testing and Results

Test Case – HAM Alarm Monitor

Test Case ID	1	
Tested Component	Show Alarms	
Tested Area	Functionality	
Purpose	User can see Alarm Records and Its records are shown with different colours, Alarm reasons for Tooltip text. Not-Commissioned Site not shown from the "AlarmGrid".	
Prerequisites	Alarm records are available. Alarm Reasons, Colours must be stored for each Alarm Codes. Not-Commissioned Sites must be stored.	
Test Case Description		
No.	Test Case	Expected output
1	Select Show Alarms	Show Records with colour indication. "Alarm Stopped" label change colour to green and text "Running". When Cell break (Alarm Code 8196) existing, if power alarm (3862) for same Site Name, Tooltip reason must be "suspect power failure and battery drain" with battery bank duration. 3862 Alarm colour is colour "Red". 8196 Alarm Row is colour "Red". 8196 Tooltip text is common failure cause as History database with battery bank duration.

		Else Tooltip text of other Records must be Priority level shown with Alarm Name. SWR Alarm: Major Power failure Alarm: Critical Temperature Alarm: Minor If duration is < 1hours from current time “Green” colour for Time Cell. ElseIf duration is < 2hours from current time “Orange” colour for Time Cell. ElseIf duration is < 3hours from current time “Red” colour for Time Cell. Else duration is >3days from current time no colour indication for Time Cell.
2	Select Stop Alarms	“Alarm Stopped” label change colour to Red and font colour white, text change as “Alarm Stopped”.
	Test Results :	Pass

Table 7.1 – HAM Alarm Monitor

Test Case – Alarm Maintenance -Select

Test Case ID		2		
Tested Component		Select Alarm Code		
Tested Area		Functionality		
Purpose		User can select Alarm Code and Its records are shown on input box for editing purpose.		
Prerequisites		Alarm Code stored		
Test Case Description				
No.	Test Case	Sample Data	Expected output	Results
1	Select ”Alarm Maintenance”	–	“Alarm Maintenance” GUI should be given	Pass
2	Select the Alarm Code from the list box	_	Search records of selected Alarm Code and display on relevant input boxes Input Box: Alarm Code Input Box: Alarm Name Input Box: Priority	Pass

Table 7.2 – Alarm Maintenance -Select

7.4 Summary

All the Testing are Completed successfully. Next chapter is for conclusion & further works. Please refer to the Test Cases in Appendix G for more information.