CHAPTER 4: SYSTEM ANALYSIS

4.1 Requirements Process

“A requirements is a feature of the system or a description of something a system is capable of doing to fulfill the system’s purpose” (Pfleeger, 2001). Capturing the requirements of the system is important in software development process as the refined requirements documents will be transformed into a good design. Requirements can be documented in various notations. Finally, verification of the requirements is conducted to ensure that the requirements are correct, complete and consistent. There are two types of requirements: Functional and Non-functional.

4.1.1 Functional Requirements

Functional Requirements describe an interaction between the system and its environment. Since the requirements describe a system’s behavior, hence the functional requirement also explains how the system should behave given certain stimuli (Pfleeger, 1998).

In UML, a use case diagram is used to capture all the functional requirements as use cases. Functional Requirements of the Online Sudoku Competition System Administration Module are basically analyzed based on the system administrator module and user module. Below is the Use Case Diagram for the main package. The competition will be done in the Front End Usr Module together with two sub-modules from the main package.
Main Package Use Case Diagram

Add User

Delete User

Register

Login

Edit Profile

Enter Practice Session

Enter Competition

View Scoreboard

User Help

Sign in Chatroom

Choose Level of Difficulty

Create Admin

Update Player’s Score

Manage User’s Status

Create User

Enter Competition

Enter Practice Session

Provide Help

Generate Sudoku Puzzle

Produce Solution of Incomplete Puzzle

System Administration Module

Front End User Module

System

User

Administrator

Figure 4.1 Main Package Use Case Diagram
4.1.1.1 Administrator Module

Add up user

- The administrator are able to add users that have registered

Delete user

- The administrator can delete users that are non-active for a certain duration

Manage Administrator Status

- The super administrator ID should have higher security clearance that enabled him to change and add new administrator
- Others administrator should be block from viewing this function for security purposes

Manage Users’ Score

- The administrator should be able to retrieve and display the profile of each member
System

Generate Sudoku Puzzle

- The system can generate puzzles with variance difficulty level

Solution for Incomplete Solution

- System will create a solution for an entered puzzle. It will give a complete solution to the entered Sudoku puzzle

Help Documents

- System provides documents to the user on how to use the system
4.1.1.2 Front End User Module

Register Account

- The system should provide validation to ensure all the compulsory particulars is being filled by about-to-be member with relevant information
- The system should provide checking on login ID and every member must register with different login ID
- The system will deny the registration from the member if he/she has an existing account
- Successful registration will create a user account in database with member’s personal particulars

Edit Profile

- The system enables the user to edit their personal profile and password
- Users need to key in their old and new password for the system to verify and update the database

Login

- The system validates login with both login ID and password entered by user
- Login ID and password should be case sensitive
- The system displays welcoming message after user successfully login

Enter Practice Session

- System enables the user to enter practice session in order for the user to increase their level of skill
Enter competition

- Users are able to enter the competition and choose their opponent

View Scoreboard

- The users can view highest and lowest scores for each month and they are able to view their accomplishment

Sign-in Chatroom

- Users are able to chat with other players in the chatroom

Choose level of difficulty

- Users can choose the puzzle’s difficulty level based on their skill
4.1.2 Non-functional Requirements

The non-functional requirements will define constraints and restrictions imposed on the Online Sudoku Competition System. The non-functional requirements are as stated below:

Reliability

The system must provide a consistent and accurate performance for its intended functions. System failures must be minimized. The system has to be reliable and stable in any environment.

Authentication

Only authorized users are allowed to modify the system and information. Users are only authorized to modify their own profile.

Flexibility

The system should have the capability to implement changes and enhancement easily.

Usability

The system should be developed in a way that it is easy to use interfaces to enhance the interaction between users and the system. The simplicity of the interface allows users to become familiar with the system in a short time.
Efficiency

The system must ensure efficiencies in response time and data storage. By reducing some of the processing in the server to the client side can help provide a faster response time.
4.2 Web Technologies and Development Tools Specification

4.2.1 Web Server

Apache is chosen as the web server in developing this Online Sudoku Competition project since Apache is one of the world’s most popular Web Server as it provides sophisticated features and excellent performances. It is also easier to use and since it is an open-source program, the code that is freely available in the Internet. Furthermore, there are many add-ons given that anyone can make adaptation to the server for specific need resulting a large public library of Apache add-ons. In some aspects, there are similarities in the development of Apache with the development of the LINUX operating system. However, the original version of Apache was written for UNIX, but here are now versions that run under OS/2, Windows and other platforms.

4.2.2 Database System Management Technology

MySQL database was selected as the database system because it jells well with other Microsoft components. This provides integrity of processing as no lag time required. Besides that, SQL server achieved 227,097.15 transaction per minute that is , 575 times larger volume than eBay and Amazon.com combined (www.swynk.com/friends/knight/sql2000benchmark.asp). Hence it proves that SQL server is able to cater the need of Online Sudoku Competition users. The disadvantages of Microsoft Access are the limited capability of concurrent access to the database. This is not appropriate as the traffic flow predicted would exceed the allow numbers of access.
4.2.3 Data access technology

ODBC was preferred for the data access technology as it eases the way of programming. This is due to the application-programming interface (API), which hides the complicity of accessing the database. Consequently, very few modification will be require if there is a major change in the database system. JDBC was left out, as it cannot link VB.NET with MySQL server.
4.2.4 Programming Language

Microsoft Visual Basic 6.0 and Microsoft Visual Basic.NET were chosen as the web programming as it provides a higher throughput. We decided to integrate Microsoft Visual Basic 6.0 with Microsoft Visual Basic.NET since .NET programming environment provides higher website performance for small and medium sized system as well as offers a shorter period of development time by reducing the lines of codes required. A benchmark test was conducted using the Nile @Bench application. The result shows a significant performance of .NET environment against J2EE Java applications. Besides that, VB.NET is being part of the .NET framework provide ease of invoking function from ASP.NET, ADO.NET or other type of .NET framework.

Visual basic is derived form the BASIC programming languages, it is a Microsoft window programming language, visual basic program are created in an integrated development environment (IDE), which allows the programmer to create run and design visual basic programs conveniently it’s also allow a programmer to create working programs in a fraction of time that normally takes to code programs without using IDES. The wide spread use of BASIC Language with various types of computer (sometimes called hardware platform) led to many enhancement to the languages with the development of Microsoft windows graphical user interface (GVI) in the late 1980’s and the early 1990’s, the natural evolution of basic was visual basic which was created by Microsoft corporation in 1991. Visual basic is the worlds most widely use RAD language, (Rapid Application Development (RAD) is the process of rapidly creating an application. Visual Basic provide a powerful features such as graphical user interface, events handling assess to Win 32 API, object-oriented features, error handling, structured programming and much more. Not until Visual Basic appeared, developing Microsoft windows based
application was a difficult and cumbersome process. Visual basic greatly simplifies window application development.

Visual basic is a graphical based language which allows user to work directly with graphics that can be used to develop windows program quickly and easily. Visual Basic 6.0 gives a disciplined approach to writing programs that are clearer than unstructured programs, easier to test, debug and can be easily modify. It allows for the creation of powerful and professional looking application with less time and coding. It allows for strong typing i.e. has wide variety of input data types and support Rapid Application Development (RAD).It has a complete edifying and debugging facilities and has the ability to generate a Dynamic Link Libraries (DLL`S), it allows for easier management of document and it is easy to learn. Visual Basic is a complete form of package for building user interface effortless.

However, Visual Basic 6.0 doesn’t work on web platform and only work on Windows platform; therefore, we decided to integrate Visual Basic 6.0 with Visual Basic.NET in order for this system to perform on the web based application.
4.2.5 Visual Basic.NET

Visual Basic.NET is used as the development tool because of its powerful capability to debug as test the page. It incorporates with Microsoft Developers Network (MSDN) which provides a huge amount of help for developers with examples and syntax usage. Above all that, it provides a development for Active-X objects which can be easily ported over the web.

In terms of website performance, which refers to how fast a page can be displayed to a user, .Net has proven to be far superior to Cold Fusion MX, PHP and Java in real-world applications and in tests conducted by independent analysis firms. With respect to lines of code, an application can be written in .Net with 15% of the code required for the same application written in Java. This results in a more maintainable system that can be developed more quickly with fewer resources. In order to achieve the same type of coding methodology, a developer would need to implement Java, which would lump the “lines of code” results in with the Java analysis already mentioned. In general, Java is not used due to cost and time considerations, so the website pages load more slowly and the code is more difficult to maintain.

In general, .Net brings the power of an enterprise application into the cost range of a small and medium sized business by reducing the lines of code required. The reduction in code results in decreased development time, expensive development staff, maintenance and overall cost, while delivering superior website performance. Below is the comparison table between .NET, Java, and PHP language environment:
<table>
<thead>
<tr>
<th>Feature</th>
<th>.Net</th>
<th>Java</th>
<th>PHP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compiled Code – Increases website speed</td>
<td>Yes – both precompiled and dynamically compiled when a page is requested</td>
<td>Yes – both precompiled and dynamically compiled when a page is requested</td>
<td>No – a 3rd party accelerator can be used to increase performance but it is not installed on most shared hosting servers.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scripted Language – results in poor website performance</td>
<td>No</td>
<td>No</td>
<td>Yes – a 3rd party accelerator can be used to increase performance but it is not installed on most shared hosting servers.</td>
</tr>
<tr>
<td></td>
<td></td>
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</tr>
<tr>
<td>Object Oriented – Increases the ability for code reuse and provides enhanced features as well as reduced development time; since code is more reusable, results in fewer bugs that can be discovered by any client and fixed for everyone;</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>
encourages developers to write more maintainable code.

<table>
<thead>
<tr>
<th>Supported Development Languages – easier to find developers</th>
<th>C++, C#, Visual Basic.NET, Jscript.NET, Python, Perl, Java (J#), COBOL, Eiffel, Delphi – 25 languages supported currently</th>
</tr>
</thead>
<tbody>
<tr>
<td>Browser Specific HTML Rendering – different HTML is automatically sent to IE than to Netscape, reducing incompatibility issues</td>
<td>Yes</td>
</tr>
<tr>
<td>Open Source</td>
<td>No</td>
</tr>
</tbody>
</table>

Table 4.1 Comparison Between .NET, Java, and PHP Language
4.2.6 Web Markup Language

HTML is chosen as the Web markup language because it is the architecture of the initial Web when it started off back in 1990s. During the evolution period, developers like Mosaic popularize it. Hence this brings a big reliability to the usage of HTML as the language that everyone speaks on the Internet. The usage is back by the support of its long existence in history and establishment of World Wide Web Consortium (W3C), which monitor the development of HTMLs.

4.2.7 Web browser

Internet Explorer is the preferred web browser for loading the web page. The main thing is that Internet Explorer is required to load Active-X objects. Secondly, Internet Explorer is also the leading web browser usage.
4.3 **Hardware and Software Requirements**

The table shows the summary of hardware and software requirements that have been considered for this project.

<table>
<thead>
<tr>
<th><strong>Server Requirements</strong></th>
<th><strong>Client Requirement</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hardware Requirements</strong></td>
<td><strong>Hardware Requirements</strong></td>
</tr>
<tr>
<td>● Pentium or AMD with 500MHz and above motherboard</td>
<td>● Pentium or AMD with 133MHz and above motherboard</td>
</tr>
<tr>
<td>● Processor Intel 333 HZ</td>
<td>● At least 16 MB RAM and above</td>
</tr>
<tr>
<td>● At least 64 MB RAM</td>
<td>● Standard input and output devices</td>
</tr>
<tr>
<td>● Minimum 1GB Hard Disk</td>
<td></td>
</tr>
<tr>
<td>● Network connection with recommended bandwidth at 10 Mbps or more</td>
<td></td>
</tr>
<tr>
<td>● Standard input and output devices</td>
<td></td>
</tr>
<tr>
<td><strong>Software Requirements</strong></td>
<td><strong>Software Requirements</strong></td>
</tr>
<tr>
<td>● Window XP operating System</td>
<td>● Any operating system with graphical user interface</td>
</tr>
<tr>
<td>● Microsoft Visual Basic Ver 6.0</td>
<td>● Microsoft Internet</td>
</tr>
<tr>
<td></td>
<td>Explorer 4.0 and above</td>
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<tr>
<td>------------------------------------------</td>
<td>------------------------</td>
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<tr>
<td>- MySQL database management system</td>
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<tr>
<td>- Microsoft Internet Information Server</td>
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<tr>
<td>with .NET Framework</td>
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<tr>
<td>- Microsoft Visual Basic 2005 Express</td>
<td></td>
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<tr>
<td>Edition</td>
<td></td>
</tr>
</tbody>
</table>

Table 4.2 Summary of Hardware and Software requirements
4.4 Summary

In the system analysis, all the functional and non-functional requirements of the system are being captured and analyzed in the form of use cases. The analysis model is important to serve as a stepping stone to the design level.