Funcom Hardware Statistics System

Final Project Documentation

Project name		
Funcom Hardware Statistics System		
Client	**Acronym**	
Funcom N.V.	FHaSS	
Date	**Sensors & Supervisors**	
	Internal sensor	Olaf Hallan Graven
Author	***Internal supervisor***	Aurilla Aurelie Arntzen
	External supervisor	Rui M. Monteiro Casais

Group members

.....	.....	.....
Sondre Bjerkerud	Sverre Christoffer Thune	Kim Richard Johansen
.....	.....	
Dag Hem	Kent Brian Dreyer	

Table of documents

Funcom Hardware Statistics System

User Requirement Specification

Project name		
Funcom Hardware Statistics System		
Client	**Acronym**	
Funcom N.V.	FHaSS	
Date	**Sensors & Supervisors**	
10.01.12	***Internal sensor***	Olaf Hallan Graven
Author	***Internal supervisor***	Aurilla Aurelie Arntzen
Sondre Bjerkerud	***External supervisor***	Rui M. Monteiro Casais

Group members

.....	.....	.....
Sondre Bjerkerud	Sverre Christoffer Thune	Kim Richard Johansen
.....	.....	
Dag Hem	Kent Brian Dreyer	

User Requirement Specification

1 General Document Information

Deliverable nr:	D1.1.1
Deliverable type:	Report
Release:	Public
Workpackage:	1
Responsible:	Sondre Bjerkerud

1.1 Declaration of intention

This document contains the functional and non-functional requirements captured during two meetings with Funcom (e.g. September: at Funcom Oslo, 27.10.2011: Skype meeting).
This document gives a quick overview of what we are going to do/achieve in our project.

1.2 Definitions and Acronyms

DxDiag	Diagnostics file containing hardware and software information

1.3 Document History

Version	Description	Date
1.0	First version created	28.10.2011
1.5	Template added	10.01.2011
1.6	Updates after document review	29.05.2012

2 Table of contents

3 Functional requirements

1. As a user I want to be able to see information about the hardware of the client computers that crashed, because I can then see which type of hardware there are most problems with.
2. As a user I want to be able to filter crash information based on time period, region/geographical location (continent, countries, etc.) and hardware type, and all combinations of these.
3. As a user I want to get more accurate information from the DxDiag file than the current system, because there is currently a lot of unknown hardware.
4. As a user I want to add and remove hardware types to the database, because new types of hardware is entering the market as technology evolves.
5. As a user I want the system to group almost identical hardware, because in a separate state they would not give any extra relevant information.
6. As a user I want to see trends in what hardware the users are using as time passes.
7. As a user I want to be able to see a prediction of the hardware in the future based on the trend from a specific time period, because this will give me information about what type of hardware we will be developing games for.
8. As a user I want to be able to filter the information based on the game that was the source of the crash.

4 Non-functional requirements

1. It is important that the new system will interface with external systems (for instance BugZilla) in the same way as the current systems does.
2. The foundation of the system must be built general enough so that the same foundation can be used for the eventual improvement/implementation of the Crash Statistics Systems.

Funcom Hardware Statistics System

Programming Language Document

Project name		
Funcom Hardware Statistics System		
Client	**Acronym**	
Funcom N.V.	FHaSS	
Date	**Sensors & Supervisors**	
10.01.2012	***Internal sensor***	Olaf Hallan Graven
Author	***Internal supervisor***	Aurilla Aurelie Arntzen
Kent Brian Dreyer	***External supervisor***	Rui M. Monteiro Casais

Group members

.....	.....	.....
Sondre Bjerkerud	Sverre Christoffer Thune	Kim Richard Johansen
.....	.....	
Dag Hem	Kent Brian Dreyer	

Programming Language Document

5 General Document Information

Deliverable nr:	D1.2.2
Deliverable type:	Research
Release:	Public
Workpackage:	1
Responsible:	Kent B. Dreyer Dag C. Hem Kim R. Johansen

5.1 Declaration of intention

The purpose of this document is to clearly define the computer language(s) we will use for the development of our given task.

5.2 Definitions and Acronyms

ASP	Active Server Pages
Debugger	Tool for locating errors in software
CLR	Common Language Runtime
IDE	Integrated development environment

5.3 Document History

Version	Description	Date
1	First version created	15.12.2011
2	Document template added Information reviewed and updated	10.01.2012

6 Table of contents

7 Introduction

Through this document we will review different computer languages for the development of our project task. We need to find the technology that meets the necessary requirements needed. Our client has already requested that we use C# with ASP.NET so that the system is easy maintainable and accessible for future expansions.

8 Python

Python is a general-purpose, high-level programming language whose design philosophy emphasizes code readability.

This object-orientated language is quite similar to PHP in its ability to create dynamic web pages and various types of software web applications.
One of Pythons main strength's is its simple syntax and easy to read code. That means, even though this might be a new language for the team, we will be able to learn the language quite fast. Python is a cross-platform scripting language, and can easily connect to different databases on multiple platforms.

As mentioned earlier, Python is a general-purpose programming language; this means that we could also use Python as our database parser as we would with C#. Python is an old language, this means that it had time to grow, and developers has created a plethora of tools and frameworks for it to make Python perform tasks that were otherwise lacking or hard to achieve.

8.1 Is it possible to use this programming language to solve our bachelor task?

Yes, Python is versatile both when it comes to web development and database information retrieval, as well as parsing text. It would also be simple enough for us to learn without setting us back in productivity.

The current system was based on Python, but the client request was primarily to use C# with ASP.NET framework.

8.2 Does it work well with other planned programming languages?

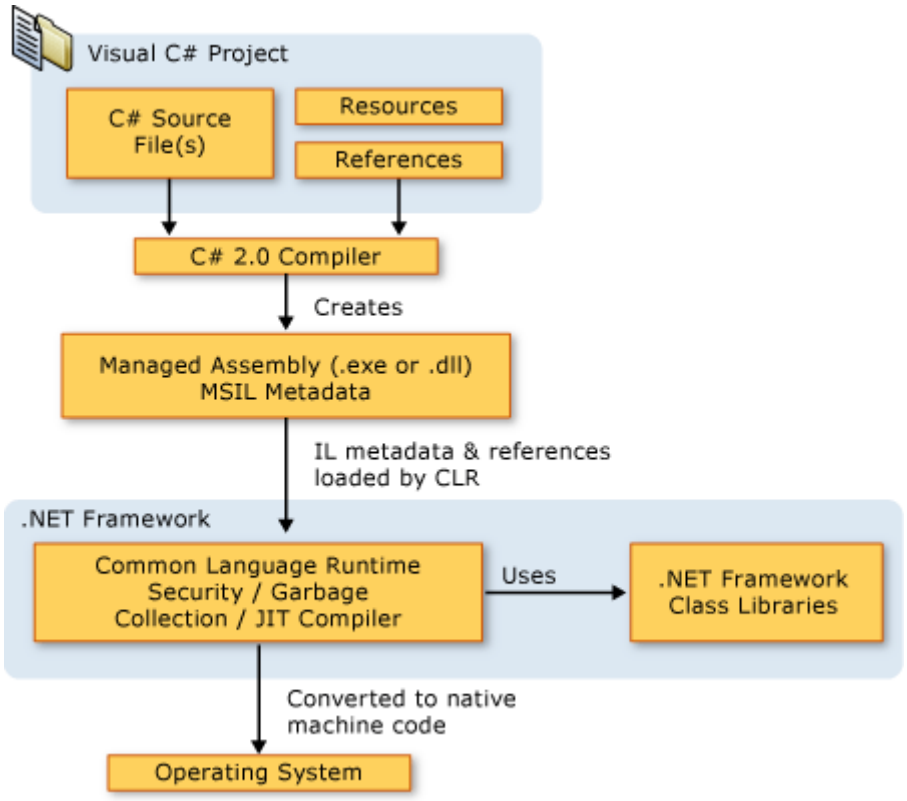
Yes, if we were to create our database parser in Python, it would have a minimal effect on either PHP or ASP.NET which would be used as our web development tools. We could choose to use Python as the main web development tool, and it would have no issues with a parser created from C#.

Benefits	Drawback
• Very fast, little memory/CPU usage • Open source • Can be used as both our database parser and our web development language	• No compilation, no debugger

9 C#

C# is a simple, modern, general-purpose, object-oriented programming language developed by Microsoft, running on the .NET Framework.

C# is part of the Common Language Runtime and the most widely used one. The CLR is the virtual machine component of Microsoft's .NET framework and is responsible for managing the execution of .NET programs.



Figur 1: A graphical representation from the initial execution of C# code and down the .NET framework hierarchy

C# uses visual studio as its native IDE, also developed by Microsoft for easy development for Windows operating systems. Very similar to other object oriented programming languages i.e. java and C++.

C# is however not a cross-platform language, so in order to make this run on Linux, Mac etc. a 3rd party framework called "*Mono*"is used.

The stated purpose of Mono is not only to be able to run Microsoft .NET applications cross-platform, but also to bring better development tools to Linux developers. Mono can be run on Android, BSD, iOS, Linux, Mac OS X, Windows, Solaris, and Unix operating systems as well as some game console operating systems.

10 C# with ASP.net

ASP.NET is part of the .NET Framework, and when coding ASP.NET applications you have access to classes in the .NET Framework. You can code your applications in any language compatible with the CLR, including Microsoft Visual Basic and C#. These languages enable you to develop ASP.NET applications that benefit from the common language runtime, type safety, inheritance, and so on.

By compiling C# you get compatible ASP.NET code. C# may also be compiled as a file that can be executed from a website. This gives great flexibility and makes code modification easy.

10.1 Is it possible to use this programming language to solve our bachelor task?

Yes, to build a parser, create threads and to make SQL queries it will prove very useful for this task, including the .NET debugger it will be easier to build solid code than with Python. Including the fact that we can generate the full web representation by calling ASP.NET from C# simplifies the development process greatly. C# with ASP.NET was also highly recommended by our client (Funcom) for possible future expansion.

10.2 Does it work well with other planned programming languages?

C# is interoperable with the rest of the .NET framework (ASP.NET) and by using this we can develop everything we would need for the given task with C# only.

C# is something that that the team hasn't worked with yet, but it merges with all of .NET. Paired with mono and the .NET debugger it is extremely versatile, and a solid cross compatible language for us to develop in.

Benefits	Drawback
• language interoperability with .NET framework • Cross-platform compatible with Mono. • Easy accessible SQL-querying • Great debugger through .NET	• IDE choice might be restricted

11 PHP: Hypertext Preprocessor

PHP is a quick and easy language to learn and a sophisticated language to master. Most (if not all) of our groups members have worked with PHP before in different degrees, this gives PHP a small advantage over the “new” languages since its going to take a lot less time for us to start using it for our purpose.

PHP is mostly run on a Linux environment connected to a MySQL database, and its mostly for this reason that it usually uses less memory during runtime than ASP.NET running on IIS(Internet Information Services). This may not, however, be an issue due to the fact that our system will only be used by a small amount of developers at a time.

The fact that PHP does not have a debugger present makes it the main reason we will probably choose C# with ASP.NET as our web development tool.

PHP can be developed in a handful of IDE’s, but NetBeans IDE would be the IDE of choice if we decided to use PHP because of its wide range of functions and we already have extensive knowledge of NetBeans IDE.

11.1 Is it possible to use this programming language to solve our bachelor task?

Yes, but it would not be optional over C# with ASP.NET because of its inability to easily debug and its bad error handling. Security is not much of an issue since our system will run on a closed intranet, neither is the server-side preprocessing (There will never be enough users using this system at the same time).

11.2 Does it work well with other planned programming languages?

As C# with ASP.NET would also be used as our web programming language, they would fulfill the same role. Our PHP supported web page would also have no trouble communicating with a database built up from either a C# or a Python developed parser.

Benefits	*Drawbacks*
• Less (server)memory usage than ASP.NET • Less learning curve • Cross-platform capable • Easy access to the database	• Lacks API Consistency • Scripted language, not compiled (Hard to debug/ Bad error handling) • Not thread safe • Does not have native support for Unicode or multibyte strings • No debugger

12 Conclusion

12.1 Languages used for database retrieving and web development

The choice stands between ASP.NET, PHP and Python. They are all pretty similar in functionality and all of them are capable of doing what is needed in our bachelor assignment, though ASP.NET is dependent of C# to perform database calls.

What separates these languages is C#'s ability to do threading, something PHP cannot. C# with ASP.NET is also a compiled language which makes it easier to debug and gives it a big advantage over working with Python and PHP.

One of Python's main benefits is the fact that it could be used as both a programming language for our parser, and as a web development tool, this would eliminate the need to learn two languages. The system our client is currently using was also created with Python.

So we could have used all the languages for web development, but since our client would prefer the use of C# in combination with ASP.NET for further possible expansion, ASP.NET and C# is the logical choice for us to use as our web development tool.

12.2 Languages used for database-parsing

We have the choice between C# and Python as they can both perform the job for parsing our received data into the databases and thread creation which PHP cannot.

Python's main benefit is the fact that we could use it for both database parsing and web development, something our clients have done for their current system.

Since we have chosen to use ASP.NET as our web development tool (which is dependent on the C# language) and our clients have already suggested that we use C# with ASP.NET, it is clear that C# would be the best choice for us to write our database parser in.

13 References

13.1 PHP

- http://www.pretechno.com/i/oracle-comparison-of-php-asp.net.html(Last visited 15.12.2011)
- http://www.cio.com/article/197152/PHP_s_Enterprise_Strengths_and_Weaknesses_Take_2?page=3&taxonomyId=3038(Last visited 15.12.2011)
- http://www.cio.com/article/176250/You_Used_PHP_to_Write_WHAT_(Last visited 12.12.2011)
- http://www.creativewebmall.com/cwm/php-strengths-and-weaknesses/444/ (Last visited 15.12.2011)
- http://coding.smashingmagazine.com/2009/02/11/the-big-php-ides-test-why-use-oneand-which-to-choose/(Last visited 14.12.2011)

13.2 C# / ASP.NET

- http://en.wikipedia.org/wiki/C_Sharp_(programming_language)(Last visited 14.12.2011)
- http://www.mono-project.com/Main_Page(Last visited 14.12.2011)
- http://msdn.microsoft.com/en-us/library/z1zx9t92(v=vs.80).aspx(Last visited 14.12.2011)
- http://en.wikipedia.org/wiki/Common_Language_Runtime(Last visited 15.12.2011)
- http://en.wikipedia.org/wiki/ASP.NET(Last visited 15.12.2011)
- http://en.wikipedia.org/wiki/List_of_CLI_languages(Last visited 15.12.2011)
- http://wiki.answers.com/Q/What_are_the_advantages_and_disadvantages_of_aspnet(Last visited 15.12.2011)
- http://msdn.microsoft.com/en-us/library/k4cbh4dh.aspx#Y10154(Last visited 14.12.2011)

13.3 Python

- http://wiki.python.org/moin/PythonVsPhp(Last visited 11.12.2011)
- http://python.org/doc/(Last visited 11.12.2011)
- http://en.wikipedia.org/wiki/Python_(programming_language)(Last visited 11.12.2011)

Funcom Hardware Statistics System

Vision Document

Project name		Acronym
Funcom Hardware Statistics System		FHaSS
Client	**Sensors & Supervisors**	
Funcom N.V.	***Internal sensor***	Olaf Hallan Graven
Date	***Internal supervisor***	Aurilla Aurelie Arntzen
10.01.2012	***External supervisor***	Rui M. Monteiro Casais

Group members

.....	.....	.....
Sondre Bjerkerud	Sverre Christoffer Thune	Kim Richard Johansen
.....	.....	
Dag Hem	Kent Brian Dreyer	

Vision Document

14 General Document Information

Deliverable nr	D1.3.3.1
Deliverable type	Research
Release	Public
Work package	1
Responsible	Sondre Bjerkerud

14.1 Declaration of intention

This document is intended to give the reader a fundamental insight into our project assignment by giving an introduction to our client and their area of business. It will give a more in-depth explanation of the context and background of the system to give the reader an understanding of the necessity of the system. Last but not least this document will go through what to improve about the current system, how to improve it, and the benefits our client will obtain by using the new system.

14.2 Definitions and Acronyms

MMORPG	Massive Multiplayer Online Role Playing Game
Crash	A crash is a term for when a software system fails. A crash usually occur because of incompatibility between the software code and the hardware.
Bug	An issue with the software application causing it to crash or behave in ways it isn't supposed to.
Patch	A minor software update that usually fix specific issues, do small changes to or add minor functionality.

14.3 Document History

Version	Description	Date
1	First version created. General outline/structure.	15.10.2011
1.5	Most text rewritten.	13.12.2011
2	Further detailing of text.	21.12.2011
2.5	Project document template adopted.	10.01.2012
3	Updates after document review	29.05.2012

15 Table of contents

16 Our client

Our client – Funcom – is Norway's largest game development company, and was founded in 1993 in Oslo. When internet became public property around 1995 Funcom began to head their game production more and more towards online games, especially so-called MMORPG's. In the year 2001 Funcom released their first game of this type, namely Anarchy Online, and the second game, Age of Conan, was released in 2008. The new MMORPG project that Funcom is currently working on is called The Secret World and is planned to be released in April 2012, that is in the middle of our project period [1].

17 Context of the study

17.1 Computer technology evolution

The evolution in the field of computer technology has in the last decades been enormous, with lots of new and improved hardware components entering the market every year. New manufacturers entering the market also increase the different amount of components available.

Take for instance the evolution when it comes to graphics processors and graphics cards on the PC market. There are two main producers of graphical processors today; nVidia and AMD [2], with their graphics processor series GeForce and Radeon, respectively. These processors are then bought by graphics cards manufacturers who build them into their own type of graphics card. There are far more graphics cards manufacturers than the two graphics processor producers, and many of the manufacturers are making graphics card versions based on both of the processor technologies. In addition, some manufacturers are even making several graphics card types based on the same processor. This all sums up in that there is a very large amount of different graphics cards being distributed on the user market.

An almost similar explanation can be given for other types of computer hardware such as processors, main boards, and memory, as well. Taking into account the evolution of the technology, this results in a market that is full of different computer components for the end user to buy. Because a regular PC consists of several different hardware types this again results in an enormous amount of different combinations of hardware a user potentially can have in his computer.

Funcom as a software developer has to take this fact into account when developing their games. Either specific hardware types or specific combinations of hardware may result in the game not functioning as it is supposed to. For instance outdated hardware will not be able to run - or run fast enough - software written with the capabilities of the state of the art hardware technology in mind. This specific problem is especially important when it comes to the gaming industry, because newer games are so dependent on the ability to display complex graphics on a computer screen. It is the job of the graphics card to create the graphics to be displayed, and with the game developers constantly pushing the limits of graphical complexity in their games, graphics cards have a very limited lifetime.

Several game developer companies have had to shut down their whole production, or at least having to do significant cuts in their staff, after releasing a game that was not compatible with large parts of the players hardware combinations. Funcom has themselves been the victim of such disasters when releasing their first two MMORPG games Anarchy Online [3] and Age of Conan [4].

17.2 Shortening of production time

The fact that the technology is evolving with the high velocity that it is, is resulting in shorter game development periods per game [5]. If game development companies had not shortened their development period their games would have been outdated when it entered the market, and thereby no one would have bought the game. Shorter development periods can be solved in two ways; by increasing the number of employees, or by using less time on less important parts of the development. The first solution will result in larger wage expenses, and an increase in staff usually is not proportional to the increase in development velocity – because of cooperation overhead. Because of the usually unstable and unpredictable economy of game development companies, the mentioned increase in staff size isn't always a good or even a possible solution. Thus are the companies forced the option of focusing less on some part of the development.

When choosing this solution, the companies are being met with the important decisions regarding what or which parts to prioritize less. This brings us to a short explanation of the process of developing a game. The source of a game is an idea. Based on the idea, a game designer is creating documentation describing what the game is supposed to contain. This documentation is then used as the foundation for the actual designing and implementation of the game. In the end the product has to be tested to ensure that it contains what the design documentation says, that all functionality works the way it is supposed to, and that it can be run on all the different hardware setups that it is supposed to. This short introduction to game development gives an idea of which parts the game development process the companies potentially can reduce focus on when shortening their development periods.

Let's take a look at each part and discuss which drawbacks can appear when reducing focus on them specifically. The inception of an idea is a more or less instant process and can be neglected regarding time consumption. The game design is a more or less time consuming activity, but requires just a single or a few employees to be done. In addition, the idea inception and the game design are tasks that can be done an unlimited time in advance to actual development of the game. So, to some extent those two activities can be disregarded.

Further on regarding the game design, it is now more and more common that game development companies work according to an agile project model which usually emphasizes the pre-development design phase a lot less than the models mainly used in the past. This reduces the focus on the game design part automatically without the administration having to actively reduce it.

Reducing the focus on the implementation phase will result in all or some of the functionality being of lesser quality than originally intended, or some earlier designed functionality not being developed at all. Consequently, the game title will not be as good as it was supposed to be, potentially resulting in less games sold and thereby less income for the company. As a result, most game development companies which are aiming for a large amount of sold games and having their existence depending upon their games selling well (like Funcom does), will not reduce the focus on the design and implementation phase. This phase is on the contrary the most important part of game production for such companies. The more cool features, graphics, and gameplay the game contains, the more games they sell.

The last part of the game production is the testing phase. Since none of the earlier phases have been cut down on it is given that this is the phase that most game development companies are doing the

largest cuts in. Less emphasis on the testing phase will result in less code specific testing and less hardware compatibility testing, which in turn can result in software code errors – so-called bugs – and hardware incompatibility. The word can is important in this relation because it leaves room for the possibility of an untested game being released without problems at all, or at least with few enough problems for the game to sell well. As mentioned above, if the companies were to cut down in the implementation phase it would almost without exception result in fewer sold games. If they on the contrary were to cut in the testing phase there is a possibility that it would not have the same effect. So in essence, the decision is easy to make for game development companies that rely on a lot of sold games; they do the cuts in the testing phase.

17.3 Fault-tolerance

For game development companies that develop ordinary standalone offline games, a released title with lots of bugs and/or hardware incompatibilities would not result in a lower release sales number than without (except if the game is so full of faults that the customers demand their money returned), but it will worsen the game title's and the game company's reputation [6]. This in turn could lead to less sold games for the next releases. This "game-fault-ignorance" is not possible for game development companies that rely heavily on periodic subscription fees, like Funcom does. Gameplay-ruining bugs or large hardware incompatibilities with a game title in this category will result in the players abandoning the game rather quickly, potentially resulting in a lot less income for the company than expected. Such companies therefore have to firstly release a game without major faults, and secondly create frequent updates (patches) for the game after the release to remove averagely and minor rated faults from the game. This will ensure that people don't stop to play the game, that is stop paying to play the game, because of insufficient testing and bug fixing.

So what is said above is actually that game development companies relying on periodic subscription fees have to do more complete testing than companies selling games with a one-time-purchase business model. This is not solely true. Companies that are producing online games, like for instance Funcom, use the fact that their games are online as an advantage. By implementing a bug report functionality in their games the players themselves can report back errors that has to be fixed. By taking this advantage even further and opening up the game for one or several pre-release beta testing periods, Funcom can get bug and crash information sent to them even before the official release of the game. This results in Funcom having to spend less time on testing and quality assurance for the games themselves, that is the costs of the testing phase is automatically reduced. Such companies can then use more time actually fixing the bugs rather than finding them.

The fact that Funcom employees will have to spend a lot of time fixing bugs and hardware incompatibilities has resulted in a demand of a system that effectively handles the information gathered about the faults in their games. Funcom is currently using a system for this purpose that is both not precise enough for their use nor hold the required functionality that Funcom needs.

17.4 Hardware trends

The evolution of the computer technology is as discussed earlier very fast paced. This is resulting in a problem for game development companies that it can be hard to determine what type of, or more precisely the capabilities of, the hardware that will be mainstream when their new game is planned to be released. Without this knowledge the companies would have to base this solely on guessing, which could result in a released game that is technically outdated, or on the contrary, a game that is

putting too high demands on the hardware components of the players computers. Both scenarios resulting in less sold games.

Funcom is of this reason in demand of a system that can capture the hardware evolution trend for a time period and extend it a certain amount of time into the future. The future trends will of course only be predictions, but they will undoubtedly limit, or even remove, the need for guesswork.

17.5 Online

The fact that Funcom is producing online games gives them a great opportunity of getting information regarding bugs, hardware incompatibilities, and hardware information in general, directly sent to them from the players over the internet. The only questions are how and when to send such information. Funcom is currently using a system in their games that is identifying when a crash has occurred. This system has the responsibility of informing the user that a crash has happened and to ask the user whether or not he wants to report information back to Funcom.

17.6 Usage of the system

There are different groups of Funcom employees that experience benefits from all of the collected crash-data. Quality Assurance and several managers watch the system for bugs and hardware incompatibilities and creates tasks for the programmers to fix these issues. The programming team use the system to test their patches, that is to find out whether the issue was actually fixed or not by trying to force the same situation that created the issue in the first place. The game developers in general use the collected information and read its hardware trends in order to be able to foresee what type of hardware will be mainstream when the product they are working on at the moment will be released. This will enhance hardware compatibility and make visible potential future problems.

A typical crash scenario

1. A player is playing one of Funcom's games.
2. The game crashes. A report of the crash including hardware specification and the part of the source code where the crash occurred is sent to a Funcom server.
3. The report is stored in a database. Employees access the database through a web interface to get crash specific and hardware information.

18 What to improve

18.1 Crash report parsing

When a crash occurs at a players computer a crash report is produced. This report consists of several parts:

- IP of the client, date, time, username, game server, etc.
- Where in, and the actual part of, the code where the crash was produced (the callstack).
- A so-called DxDiag file containing hardware information of the client computer in pure text format.

This report is sent to one of Funcom's web-servers where it is stored and extracted. A parser is then starting to extract information from the components of the report. The information is stored in a database for Funcom employees to later access.

The parser that extracts information does not extract enough nor exact enough information from the report. There are even somewhat many cases where the parser is not able to obtain any information at all about specific hardware, leaving the database field(s) as unknown. This results in insufficient and inaccurate information for the Funcom employees to view, which in turn can result in poor estimates. This part of the system will have to be improved.

18.2 Graphical User Interface

The Graphical User Interface (GUI) is not user friendly and is not representing the stored data in an easy-to-understand way. For instance is information regarding percentage usage of the different Windows versions displayed in a unaltered boring standard HTML table. The overall layout of the web-pages are not very good-looking.

Further on, all the information for the employees to see is squeezed into one page, making the web-browser's scroll functionality heavily used. This is usually seen on as negative, and leaves the users with a feeling of lack of overview and control.

18.3 Lack of functionality

Some functionality that Funcom employees would like to have in the system is not present in the current system.

There is no handling of almost identical hardware types. This results in large tables of statistics with rows for each and every type of GPU units ever discovered by the system. Since many hardware types are varying by only tiny factors it's very hard to get out the exact wanted information. For instance it is usually more informational for the employees to know the percentage difference in amounts of players that are using nVidia or ATI GPU's, rather than the amount that are using specific graphics cards from specific manufacturers.

It all comes down to the ability for the employees to filter what type of information they would like to see. Some information can be more informal to the user when they have been structured/grouped/organized in a certain way.

The current system is also lacking the future hardware evolution trend prediction functionality described in the "Context of the study" part of this document. This is the functionality that the employees can use to get a prediction of what hardware will be mainstream at a time in the future, for instance on the release date of a new game. By getting such information, employees can plan for optimizing the game towards the future mainstream hardware.

Further on there is currently no functionality for filtering the statistical data. That is; the statistics are based on absolutely all data stored in the database. This is an enormous amount of data and is gathered from players all over the world for many years and from several games. Funcom is therefore in need of functionality for filtering the statistical data based on certain criteria, such as geographical location of the players, time period, game title and game server.

19 How to improve it

To address the problem of a lot of unknown hardware we will be adding a functionality for adding hardware information manually by the users. When unknown hardware has been recognized by the

system the users are given the possibility of entering the required information about the new hardware type. This will then be reflected in the statistics with each entry of that specific hardware no longer being unknown, but instead represented by the information the user entered. It must also be possible to alter this information after the first time, in case of wrong input, input errors, etc.

The GUI can be enhanced a lot by generally giving the web-pages a good-looking and consistent layout. Further on the statistical information can be given more life – and in fact be easier readable and more containing – by displaying it as charts, as well as in tables.

For almost identical hardware types to be represented as one table row we will have to implement some kind of grouping functionality. In some way a rule set of which hardware types are corresponding to which table entry must be stored. This rule set must also either be automatically or manually maintained, or a combination of the two approaches.

The filtering functionality can somewhat easily be implemented with the help of a bit more critical and dynamic database queries than the current system is using. The actual filtering criteria can be given as user input through the web-page interface. And the resulting filtered statistics returned and shown through the same interface. For the users to be able to filter based on both geographical location, time period, game title and game server, each of these criteria must have their own possible input values.

20 Benefits

To both get rid of unknown hardware types and group almost identical hardware types as a single type will make the statistics a lot more informative and complete, which in turn gives the employees more and better hardware statistics of players of Funcom games. In other words the system is enhanced with regard to what was the purpose of the system in the first place.

Improved GUI will in the first place of course give the users a more pleasant system to work with. The statistics charts will put more information into less space, and graphs can also be read fast and efficient without having to go into a very detailed level. The detailed level is what the tables are for.

With the new filtering functionality an employee can get more accurate and precise information, as well as the more general information that the current system delivers. He/she can now for instance get statistical information about the hardware of Korean players of Age of Conan in 2010 playing on a specific server, as well as see the general statistics of all players ever reported a crash to the system. This functionality gives the employees new possibilities of searching for trends and hardware information based on their own criteria. For instance can geographically filtered information be very valuable when it comes to porting a game to another country or region like Funcom did with Age of Conan for the Asian market.

21 Sources

[1] http://en.wikipedia.org/wiki/Funcom (Last visited 13.12.2011)
[2] http://en.wikipedia.org/wiki/Graphics_processing_unit (Last visited 21.12.2011)
[3] http://www.vg.no/spill/artikkel.php?artid=182545 (Last visited 13.12.2011)
[4] http://www.idg.no/computerworld/article145027.ece (Last visited 13.12.2011)

[5] http://en.wikipedia.org/wiki/Video_game_development (Last visited 21.12.2011)
[6] http://www.shacknews.com/article/70451/rage-pc-players-report-bugs (Last visited 21.12.2011)

Funcom Hardware Statistics System

Current System Description

Project name		Acronym
Funcom Hardware Statistics System		FHaSS
Client	**Sensors & Supervisors**	
Funcom N.V.	***Internal sensor***	Olaf Hallan Graven
Date	***Internal supervisor***	Aurilla Aurelie Arntzen
10.01.2012	***External supervisor***	Rui M. Monteiro Casais

Group members

.....	.....	.....
Sondre Bjerkerud	Sverre Christoffer Thune	Kim Richard Johansen
.....	.....	
Dag Hem	Kent Brian Dreyer	

Current System Description

22 General Document Information

Deliverable nr:	D1.4.1.1
Deliverable type:	Reference
Release:	Public
Workpackage:	1
Responsible:	Kent B. Dreyer Sverre C. Thune

22.1 Declaration of intention

The purpose of this document is to help us understand how the current bug report system at Funcom works. This will help us integrate our own system into the environment at Funcom.

22.2 Definitions and Acronyms

SFTP	Secure File Transfer Protocol
GUI	Graphical User Interface
TAR	Tape Archive File
DxDiag	DirectX Diagnostics
Batch	A collection (of files)

22.3 Document History

Version	Description	Date
1	First version created	07.12.2011
1.5	Renamed document from "Current System Research" to "Current System Description", Updated structure	10.01.2012
2	Updates after document review	29.05.2012

23 Table of contents

24 The current system

24.1 Introduction

Funcom's current bug report system consists of three servers: the batchserver, the internal server and the GUI server. The first two are important for us to understand, because we will need to integrate our own system to co-exist with these. The third, we will completely replace.
This document contains descriptions of the current system which will be a good reference for ourselves when we are designing and implementing our system. Therefore it is quite technical. We describe the current code with and then take notice of some of the important things we will need to take into account.

24.2 The Batchserver

The Batchserver is what we call the server which receives the bugs from the players. It is located outside of the firewall of Funcom's network. It is responsible for creating batches (a collection) of bug files, which can then be downloaded to a server on the internal Funcom network.

A php file named ''bugsubmit'' receives the bug report files (the XML files) from the the players. These bug report files are then searched for keywords which define the category of the bug (ldberrors, clientcrashes, clientasserts, scripterrors, bugreports, silentasserts). When the category is detected the file is stored in a folder named ''batchtmp/subfolder'' (where ''subfolder'' are the different categories).

WebRestarter.py starts processes of BatchMaker.py for each of the different categories.

Each process of BatchMaker.py creates a list of files in the subfolder it is assigned to within the ''batchtmp'' folder. Then it creates a batch file (.tar) of all the files in that folder, and moves the batch file to a subfolder of the same category within the ''batches'' folder.

To sum up, the Batchserver receives bug reports, categorizes them and creates batches of the files to be downloaded.

Initially we will not change anything on the Batchserver; it works good as it is.

24.3 The Internal Server

The internal server consists of several python processes that together perform the downloading of files from the batchserver, and then the parsing and storing of bug reports and player hardware information.

This section explains the code of some of the important files in the current system, which we can use for future reference when implementing our system.

24.3.1 General description of python files

*see attachments for full flow of events on some of the files.

Restarter(Python):
Here all processes are started. Some even have multiple instances. (os.spawnvp())

Batchdownloader (Python, attachment 1):
The process receives arguments which sets the folder directory it will traverse. At this point it will start downloading batch files from this path and move the files in the folder to the batch server's "outgoing" folder, and download it to the "incoming" folder on the internal server.
It deletes original files after successful transfer.

The important thing to noticehere is the connection to the batch server with user name and password over **SFTP**. If we are going to replace the current system completely, we need to download the files from the batch server with a similar method. Initially however, we can develop our system to co-exist with the old one.

Reportdownloader(Python, attachment 2):
This file does similar work as the batch downloader, but moves files from the "complete "folder to the "outgoing" folder on the batch server, and then downloads from the "outgoing" folder to the "complete" folder on the internal server.
It deletes original files after successful transfer.

Also here the connection over SFTP is an important thing to notice(see explanation in previous section)

XMLBugReport (Python, attachment 3):
This file calls the processing of the XML files when they are downloaded (and extracted). It uses a method to parse the XML file, including the DxDiag file. It also moves the files to an archive when it is finished with them. See attachment 3 for a more detailed flow of events.

fcBugMain (Python):
The function "ProcessFile" runs the "bugParser" function which returns a parsed bug report object. This object is processed further and certain properties are updated if some conditions are true. Our client informs that this bug report system functions well, thus should initially not be changed.

After the bug report object has been processed, "fcBugDXDiag" function is called and the DxDiag file which belongs to the bug report is parsed.

After the DxDiag file is parsed, the bug report object is sendt to Bugzilla, which is a third party bug tracking server software. However if the object has the type "DxDiag", it is not sent. The type of the bug report object is the category of the bug (originally parsed from the XML file). Under certain conditions extra emails are sent to specific developers so that they get an alert when a certain bug occur.

When we are going to develop our own parser for the DxDiag file, changes will be needed here. We will want to keep the bugParsing, but use our own DXDiag parser. We might even use the already exsisting DxDiag parser, but then parse again to get better control on and more accurate information.

fcBugParser (Python, attachment 4):
Here we have the code responsible for parsing the XML files and creating bug report objects of them. A bug report contains a lot of information parsed from the XML file (see attachment 4), which includes the DxDiag file, the file we are initially interested in.

fcBugDXDiag.py
This file handles the parsing and storing of hardware information.

Some properties are taken from the bugReport:

- Username (player login name)
- Universe (game server)
- Bits (System architecture, 32bit / 64bit)

Then it collects text lines by parsing the DxDiag document for retrieving the following information:

- Operating system
- Processor
- Computer memory (RAM)
- Card name (Actual model name of graphic hardware)
- Video memory (Dedicated if exists, else display memory)
- Screen resolution
- Driver version (for the video card)

After the information is successfully retrieved from the document, it is inserted into the "hw_info" table in the database:

- insert into hw_info (username, universe, os, cpu, ram, vcard, vram, driver, resolution, bits, count)(Where count=count+1)

The insert sentence over displays the type of information that is currently being stored in the "hw_info" table of the database. See attachment 5 for an example of the text lines extracted from the DxDiag file. Because of the large file size we are not able to open the "hw_info" file in either notepad++ or PhpMyAdmin for a complete analysis of the table.

24.3.2 Miscellaneous Python files

There are several other important files in the system that perform different tasks. However these files are not essential to understand in detail for our first task (creating the new GUI), therefore we will not go into the details regarding the source code of these files at this time. Below is a list of these files with a general description of their responsibility.

fcBugEmail	Library designed for sending emails automatically regarding bugs or crashes to specific developers.
fcBugzilla	Library for communicating with Bugzilla
fcPreforce	Contains functions for version control with Preforce
BugStats	This class retrieves and represents data from the database in HTML. This works as the graphical representation of the system on the internal server.
fcBugStats	Library for manipulating the MySQL database.
fcBugSymbols	Library for processing files (e.g. callstack) for debug symbols.

24.3.3 Short rundown on remaining python files

DumpRevision	Simply calls upon fcPerforce.dumpRevisionList(63101, 63102)()
createTables	Simply calls upon the create_tables from the fcBugStats class
Reporter	Contionously prints the number of files in the category subfolders to the console
mapFileImporter	Collects and manages map files and sends it to fcBugSymbols for parsing

24.4 The GUI server

This is the server which runs the website GUI (in form of a website) for looking at the hardware information extracted from the DxDiag files.

Hardware information is selected from the hardware database. The information is then put through functions which results in the GUI website displaying some general statistics of the hardware information (e.g. how many types of a certain processor). In its current state this GUI is very basic and limited.

Our first task is to create a better and more useful GUI.

25 Summary

- The batch server creates batches of bug files and moves them to the appropriate folder to be downloaded.
- The internal server downloads the files and extracts them.
- The files are parsed, bug reports and hardware information is extracted.
- The hardware information is stored in hw_info table.

26 Sources & References

- http://www.bugzilla.org/ (Last visited 14.12.2011)
- http://www.perforce.com/ (Last visited 14.12.2011)
- Funcom's current bug System

27 Attachments

Attachment 1: batchdownloader.py

1. An argument sets the path of the folder the instance of this process looks through.
2. An infinite loop that handles downloading files from where this folder starts.
3. Connects to the batch server with user name and password over SFTP.
4. Opens the correct folder in ''batches'' on the batchserver and creates a list of all the files in the folder.
5. Moves the files in the list to the outgoing folder on the batchserver and then downloads them into the incoming folder on the internal server.

6. Deletes the original file from the outgoing folder on the batchserver.
7. Opens TAR-files in the incoming folder on the internal server and extracts them to the same folder.
8. Closes the TAR-file, writing to file and the folder paths.
9. Closes all contact with the SFTP and sockets.

Attachment 2: Reportdownloader.py

1. Sets the path to the complete folder.
2. An infinite loop that handles downloading files from this folder starts.
3. Connects to the batch server with user name and password over SFTP.
4. Opens the correct folder in ''batches'' on the batch server and creates a list of all the files in the folder.
5. Moves files from the complete folder to the outgoing folder on the batch server.
6. Downloads the files from the batch server and moves them to the complete folder on the internal server.
7. Deletes the original files in the outgoing folder on the batch server
8. The downloaded files will later on be handled by XMLBugReport described later.

Attachment 3: XMLBugReport.py

1. Handles arguments if they exsist (up to three: set incomingDir, logfile and forceid).
2. Infinite loop starts.
3. Creates a list of the files in the complete folder (on the internal server).
4. Moves the file from the complete folder to the processing folder.
5. Start to process the file (calls fcBugMain.ProcessFile, which parses the XML file, including dxdiag).
6. If the processing is successful, the file is moved to its own subfolder in the archive/old folder.
7. If the processing fails, the file is moved to a failed folder.

Attachment 4: List of contents of a ''bug report''

- IPAddress
- Date
- Username
- Title
- Type
- Email
- Category
- Universe
- Body
- Attachments
- BodyElements
- BuzillaCCs
- ExtraCCs
- TeleportHistory

Attachment 5: mapfileimporter.py

- Runs the function importMapFiles continously
- makes a directory list of the files in the “mapfiles” folder.
- Traverses the directory looking for files to import.

- Takes all files and calls parseFile function from fcBugSymbols
- Moves all files from “importMapFiles” folder to “archive” folder

Attachment 6: Example of extracted text lines from DxDiag

- Operating System: Windows XP Professional (5.1, Build 2600) Service Pack 3 (2600.xpsp_sp3_gdr.080814-1236)
- Processor: Intel(R) Celeron(R) M processor 1.60GHz
- Memory: 1016MB RAM
- Card name: Mobile Intel(R) 915GM/GMS,910GML Express Chipset Family
- Current Mode: 1280 x 800 (32 bit) (60Hz)
- Display Memory: 96.0 MB
- Driver Version: 6.14.0010.4609 (English)

Funcom Hardware Statistics System

Test Strategy

Project name		
Funcom Hardware Statistics System		
Client	**Acronym**	
Funcom N.V.	FHaSS	
Date	**Sensors & Supervisors**	
29.05.2012	***Internal sensor***	Olaf Hallan Graven
Author	***Internal supervisor***	Aurilla Aurelie Arntzen
Kim Richard Johansen	***External supervisor***	Rui M. Monteiro Casais

Group members

.....	.....	.....
Sondre Bjerkerud	Sverre Christoffer Thune	Kim Richard Johansen
.....	.....	
Dag Hem	Kent Brian Dreyer	

Test Strategy

28 General Document Information

Deliverable nr	D1.5.2
Deliverable type	Report
Release	Public
Work package	1
Responsible	Kim Richard Johansen

28.1 Declaration of intention

The intention of this document is to give the reader insight into how the group is planning to test the system they are to produce. It contains testing strategy, different testing methods and types we are going to use and how we plan to document our performed tests.

28.2 Definitions and Acronyms

Bug	An error in the programming code
API	Application Programming Interface

28.3 Document History

Version	Description	Date
1	First version created	15.12.2011
2	Document template added. Information reviewed and updated.	04.01.2012
2.5	Updates after document review	29.05.2012

29 Table of contents

30 Requirements for testing

The main purpose for testing is to ensure all specifications in the requirement specification are implemented and approved.

The tester should distinguish between constructive and destructive approaches to the test. Think about how the unit to be tested may fail, but do not be so critical that the unit never measure up and is seen as unacceptable.

It is important when the testing is executed that the person doing the test is not the same person who has written the code to be tested. This is because the person who has written the code often gets blind on their own work and does not want to find any errors in the code. If the person who executes the test has not written the code, the person goes deeper into the code and may think of other ways to test the code that the developer may not have thought of.

31 Test strategy

This will be a system were the importance of stability and reliability is high at any time. The producer of the game needs to get the information they want from the bug-system. The tests need to be accurate and test the system in all ways possible.

Our main strategy of testing will be a gradual step by step approach, critical to less important. The basic elements of the system will have the highest priority and will be tested first. Regression tests will be done after code alteration of previous tested functions or when new functions have been added to the system. This is to ensure that previously tested functions still work.

When we are getting closer to a full release and most of our grade A requirements have been completed and tested we will run an ad hoc test. This is to find functionality that may or may not be intended that can “break” the system. When this had been completed a strain test will be performed. This test simulates different work load for the system and will ensure us that our system may handle a high pressure of crash reports and that no data gets corrupted due to a high workload for the system.

32 Testing categories

In the following are short descriptions of different testing categories our tests will be categorized under.

32.1 Verification and validation

Verification tests of the system will answer if the system is built correctly based on the requirement specification.

Validation tests will answer if the software created is what the customer wants.

32.2 Functional and non-functional testing

Functional testing is testing that verifies a specific functionality of the system. These are usually directly related to the requirement specification.

Non-functional testing tests aspects of the system that may not be related to a specific functionality of the system. This can for example be performance or security.

32.3 Static and dynamic testing

Reviewing/reading the code is considered static testing, while debugging or executing the code is considered dynamic testing.

33 Testing methods

In the following are short descriptions of testing strategy and methods we will be using for testing throughout this project.

33.1 Strategy

33.1.1 Black-box testing

The tests performed under this strategy are made directly from the requirements specification. Black-box testing is a method of software testing for testing the functionality of the system without knowing the structure of the system. Expected data on the output is a result of the known input data, tests under this strategy are also called functional testing.

33.1.2 White-box testing

This strategy deals with the internal logic and structure of the code. It is possible to analyze the test element and decide exactly how the test is built up and what to test. When making a test based on white-box testing, knowledge about the structure for the element to be tested is needed.

33.2 Methods

33.2.1 Function test

A function test is written in order to check if a functional completed requirement behaves and works as planned.

33.2.2 Code Compilation

A successful compile of the code is a basic form of testing.

33.2.3 Debugging

This is a testing method done with the API to find out what part of the code that fails when a code compilation fails. When a verification test fails and a code compilation is successful, debugging can be used to go through the code step by step to indentify the error by examining the values of variables.

33.2.4 Code Review

A person just reading the code is a form of static testing. He should not be the same person that wrote the code.

33.2.5 User Interface

This type of testing is about confirming that the user get the correct response based on his actions.

33.2.6 Ad Hoc test

It's a test commonly done after large system implementations and late in the project where the tester goal is to "break" the system by trying different system functionality. This test is done without any formal test plan. This test can also include negative testing.

33.2.7 Strain test

The purpose of the strain test is to give the system variable amounts of data (e.g. bug reports) over a lengthy time to see how the system handles it. While the variable data is given to the system, we will use the website to load/show results from the database. The point behind this test is to see how the system handles/operates during what is looked at as normal phase (e.g. after bugs is fixed and software crashes has reduced) and a high pressure phase (e.g. after large software implementations/ game extensions) where they may be a high amount of crashes experienced. An even larger pressure will also be tested to ensure that the system will manage larger work than intended. All data inserted into the system is checked up against manually calculated results to ensure that no data has been corrupted due to high system load.

33.2.8 Regression test

The regression test is meant to see if previously tested functions in our system still work after new code has been implemented or after an update.

33.2.9 Performance test

This type of testing is to check if the systems performance is good enough (e.g. the time it takes for the website to load/show results as charts or tables with information from the database).

34 Test documentation

Test documentation will help us to quality assure our project. The documents will also give us some indication of the time used to quality assure our project in accordance to the requirements specification.

34.1 Test specification

The test specification contains information about every test to be done with cross reference to other documents that may be relevant.

34.2 Test log

The point behind a test log is to document every test that has been executed. It will contain:

- Name of tester
- When did the test occur
- What was the result
- Error list
- Evaluation

34.3 Test reports

Tests that constitute a module will be reported in a test report. The meaning for the report is that many of the tests are a part of the same module. The reports therefore create a good overview over all the tests and summarize them into modules.

Currently there is just one module, but as we work on the project, extensions (e.g. more requirements) may be added and from there more modules can be added.

Modules:

- Web functionality

35 Responsibility

There are three roles to be filled when it comes to testing:

- Test manager
- Test analyst
- Tester

In smaller projects it's most common for the roles Test manager and Test analyst to be filled by the same person. The Tester role is common to be filled by the whole group.

This is the case in our project.

35.1 Test manager

A test manager has the main responsibility for testing:

- Ensure that tests are planned and the requirements are arranged.
- Ensure that all test reports are made
- Keep all test documentation up to date and organized
- Define what test strategies to be used
- Verify test results with the rest of the group and the employer

35.2 Test analyst

The main responsibility for a test analyst is:

- Identify test elements
- Describe test progression
- Evaluate the quality of a unit tested

35.3 Tester

The tester role is a role every project member can take. The tester's tasks are:

- Follow the test procedure to execute the test
- Write a test log with results
- Separate errors to a separate list in the log

36 Sources

- *http://en.wikipedia.org/wiki/Test_management*(Last visited 15.12.2011)
- *http://en.wikipedia.org/wiki/Test_plan*(Last visited 15.12.2011)
- *http://www.aptest.com/glossary.html*(Last visited 15.12.2011)

- RIVET Test strategy document (HIBU Kongsberg library)
- Dragonfly Test strategy document (HIBU Kongsberg library)

Funcom Hardware Statistics System

Requirements Specification

Project name		
Funcom Hardware Statistics System		
Client	**Acronym**	
Funcom N.V.	FHaSS	
Date	**Sensors & Supervisors**	
10.01.2012	***Internal sensor***	Olaf Hallan Graven
Author	***Internal supervisor***	Aurilla Aurelie Arntzen
Sondre Bjerkerud	***External supervisor***	Rui M. Monteiro Casais

Group members

.....	.....	.....
Sondre Bjerkerud	Sverre Christoffer Thune	Kim Richard Johansen
.....	.....	
Dag Hem	Kent Brian Dreyer	

Requirements Specification

37 General Document Information

Deliverable nr	1.6.5
Deliverable type	Research
Release	Public
Work package	1
Responsible	Sondre Bjerkerud

37.1 Declaration of intention

The intention of this document is to give the reader an understanding of the requirements of the system we are to create. The requirements capturing methods we have been using will be explained as well as the priority levels used to organize the requirements. The later sections will give both a list of the requirements as well as a more in-depth description of each one. After having read this document the reader shall know what features the product is to hold and how the features shall work.

37.2 Definitions and Acronyms

BugZilla	Bug handling software used by Funcom.
CPU	Central Processing Unit
GPU	Graphical Processing Unit
RAM	Random Access Memory
DX	DirectX: A collection of application programming interfaces (APIs) for handling tasks related to multimedia, like for instance game programming.
URL	Uniform Resource Locator

37.3 Document History

Version	Description	Date
1	Created the document. Created “Requirements list” and “Requirements details” sections.	15.12.2011
2	Added priority explanation and requirement capturing sources. Updated origin and date fields of the requirement details tables.	19.12.2011
3	Rewrote the text about the requirement capturing meeting. Project document template incorporated.	3.01.2012
4	Added “Courses with Lorenzo Aurea” as a requirement capturing source. Added requirement A-NF-5. Rewrote/redefined requirements A-F-1, A-F-4, A-NF-2, and A-NF-3.	19.03.2012
5	Added paragraph under the “Meetings with	21.05.2012

	external supervisor" requirement capturing source. Added requirements B-NF-1, C-F-2, C-F-3, C-F-4, and C-NF-1. Rewrote/redefined requirement A-NF-6.	

38 Table of contents

39 Requirements capturing

The requirements has been captured from the following four (4) sources.

39.1 Meetings with the external supervisor

There have been carried out two major meetings where the assignment has been discussed; the first meeting at the Funcom office in Oslo in September, and a user requirements capturing meeting in October. In the first meeting a brief explanation of the assignment was given for the group to be able to consider accepting it, whereas a more in-depth requirements capturing interview was done in the second. The second meeting was held via Skype and the interview part lasted for about half an hour. The group asked a series of open questions regarding details about the assignment and eventual extensions of it.

Throughout the project period there has before and after each Scrum Sprint been held a set of three meetings with the external supervisor (Product Owner). In the latter of the three, the Sprint Planning meeting, there has several times come up completely new requirements, or changes or extensions to already existing requirements.

39.2 The Product Backlog

The Scrum project model is using a feature called the Product Backlog (PB) for the task of editing, organizing and prioritizing requirements. It is the responsibility of the Product Owner (in our case this is the external supervisor) to add so-called user stories to the PB. User stories are nothing more than user requirements formulated in a specific way. We have converted the user stories from the PB into ordinary requirements for this document. Most of the requirements in the PB are the same as those captured in the meetings as described in the section above.

39.3 Technical Research

A Technical Research with a Technical Document as the result has been used to confirm that some of the user requirements actually are the best possible choices for the given system.

39.4 Courses with Lorenzo Aurea

Lorenzo Aurea is an employee in Funcom and also one of the group's unofficial supervisors in this project. In the start of the development/implementation period of the project (after New Year) Lorenzo organized two courses for the group to ease the many problems we most probably would face with the technology we were to start using. In these courses some of the already defined requirements in the PB were further explained in a bit more detail and on a more technical level, and some new tweaks to them were introduced. Those tweaks has effected some of the requirements defined in this document.

40 Changes in requirements

The Scrum project model handles the problem of fluid requirements by letting the Product Backlog (PB) be fluid. It is up to the Product Owner to do changes, add, or delete user stories from the PB and prioritize them. This means that the requirements described in this document are by no means final, neither are the number, organization, nor the definition of them. The requirements are all fluid and modifications can happen at all times throughout the project period. The current requirements will act as a basis for the planning of, and the starting work with, the project, and in the case that no

changes are done to the PB they are the requirements we will work towards developing/implementing for the whole project period.

41 Requirements list

Following is a list of the requirements for the Hardware Statistics System. The requirements are organized by priority as they are given in the Product Backlog by the external supervisor. The Product Backlog is prioritized as a list without categories, but there are a couple of somewhat clear but not displayed lines partitioning the user stories with regard to priority. Of this reason it felt natural to separate the requirements into three priority categories; A requirements are major features necessary for the new system to be able to outdistance the current system, B requirements are feature extensions that will further extend the range of use of the system, and C requirements are features that can even further extend the range of use of the system, but which are of lesser importance.

The following is only sort of a list of the titles of the requirements organized in their respective priority category. Supplementary details for each requirement are given in the section “Requirements Details”.

41.1 A Requirements

41.1.1 Functional

A-F-1	Display hardware/software statistics table.
A-F-2	Display hardware/software evolution charts.
A-F-3	Filter statistics.
A-F-4	Hardware type management.
A-F-5	Hardware grouping.

41.1.2 Non-Functional

A-NF-1	Programming language.
A-NF-2	Model-View-Controller.
A-NF-3	Database type.
A-NF-4	Database connection.
A-NF-5	Database access.
A-NF-6	Web-page loading time.
A-NF-7	Wiki pages documentation.
A-NF-8	BugZilla interfacing.

41.2 B Requirements

41.2.1 Functional

B-F-1	Display hardware/network statistics.
B-F-2	Display software statistics.

41.2.2 Non-Functional

B-NF-1	Windows service.

41.3 C Requirements

41.3.1 Functional

C-F-1 Future hardware evolution prediction.

C-F-2 Chart raw data.

C-F-3 Chart zoom.

C-F-4 Textual help.

41.3.2 Non-Functional

C-NF-1 Filter URLs.

42 Requirements details

The requirements from the requirement list will in this section be explained in detail. Each requirement will be described using the following table:

Category		ID	
Date		Origin	
Description			

An explanation of the fields in the table:

- Category: A, B or C requirement.
- ID: The requirement specific identification.
- Date: The date the requirement was captured. In case the requirement has been captured several times the date of the first capture will be given.
- Origin: From what source was the requirement captured. The possibilities are the three mentioned capturing sources described in the section above.
- Description: Self-explanatory.

A-F-1: Display hardware/software statistics

Category	A	ID	A-F-1
Date	27.10.2011	Origin	Meetings & Product Backlog
Description	Display hardware information for players of Funcom games, over time, in table format in a web-page. The table shall contain the percentage distribution of the different possible hardware/software that players are using. The different hardware/software categories to be displayed statistics for are: a. CPU ○ Speed: In MHz ○ Number of cores. ○ Model. b. Graphics card ○ GPU model. ○ VRAM size/amount. ○ Primary Display Resolution. ○ Multi-Monitor Resolution. c. RAM size/amount. d. Windows OS: In groups by version, with 32 and 64 bit versions being separate groups.		

	The grouping criteria, that is the boundary values that separate on group from another, is to be defined/put in by the administrator(s) of the system. The time period of hardware data for which the calculations are based upon shall be put in by the user of the system.

A-F-2: Display hardware/software evolution charts

Category	A	ID	A-F-2
Date	27.10.2011	Origin	Meetings & Product Backlog
Description	Some of the hardware/software information that are displayed in tables (A-F-1) shall also be displayed as evolution charts. The horizontal axis of the charts shall describe time, and the vertical axis shall describe the percentage of players using the corresponding hardware/software at the given time. The different charts to be displayed are: a. CPU: Split between AMD and Intel. b. GPU: Split between nVidia, Intel, AMD and others. c. CPU cores: Split between 1, 2, 4, and other, number of cores. d. Windows OS version and DirectX version: Split between DX11 GPU & Windows 7, DX10 GPU & Windows 7, and DX10/DX11 and Windows XP. The current percentage distribution shall also be displayed in proximity to the chart. The time period that the charts are showing the evolution for is to be put in by the user of the system.		

A-F-3: Filter statistics

Category	A	ID	A-F-2
Date	27.10.2011	Origin	Meetings
Description	Filter the hardware and software statistics. It must be possible to filter by a combination of options from the different criteria. The criteria and their options are: a. Geographical location: All the different continents and countries that are registered in the database. The countries shall be grouped by their respective continent. b. Time period: Date from and to. c. Funcom game: The Secret World, Age of Conan, Pets Vs. Monsters. d. Game server: The list of servers respective to the game selected (c). If no game is selected it should not be possible to pick game server. All the filter criteria are to be put in by the user of the system.		

A-F-4: Hardware type management

Category	A	ID	A-F-2
Date	27.10.2011	Origin	Meetings
Description	It must be possible for an administrator of the system to add, edit, and delete, so-called general hardware types. The system must be able to recognize if new types of hardware has been registered. When this happens it must be possible for an administrator of the		

	system to map the newly recognized hardware type onto a general hardware type. The Hardware Statistics displayed in tables (A-F-1) and in charts (A-F-2) will only be displaying information for the general hardware types. The different categories of general hardware types that can be registered are: • CPU Model. • GPU Model.

A-F-5: Hardware grouping

Category	A	ID	A-F-2
Date	27.10.2011	Origin	Meetings
Description	The system must be able to recognize almost identical hardware types and group them to be shown as only one more general type in the statistics. The general hardware types are those of requirement A-F-2. The user shall be given information about currently registered but not recognized hardware types. The user will then manually have to decide what hardware type the different unrecognized hardware types is to be grouped under. Ungrouped/Unrecognized registered hardware shall be grouped in an "Unknown" group in the statistics.		

A-NF-1: Programming language

Category	A	ID	A-NF-1
Date	27.10.11	Origin	Meetings, Product Backlog & Technology Document
Description	The whole system is to be implemented using the programming language C# on top of the ASP.NET framework.		

A-NF-2: Model-View-Controller

Category	A	ID	A-NF-2
Date	11.12.11	Origin	Product Backlog
Description	The code of the web-interface shall be designed and implemented following the ASP.NET Model-View-Controller pattern.		

A-NF-3: Database type

Category	A	ID	A-NF-3
Date	11.12.11	Origin	Product Backlog
Description	The system must be compatible with a database of the type Oracle.		

A-NF-4: Database connection

Category	A	ID	A-NF-4
Date	11.12.11	Origin	Product Backlog
Description	The system, that is both the data collection from database and the parser, must make use of nHibernate for connecting to and accessing the database.		

A-NF-5: Database access

Category	A	ID	A-NF-5
Date	11.12.11	Origin	Lorenzo Aurea
Description	The web-interface shall be given an interface to the database from a Windows		

	Communication Foundation web-service. In other words, it shall not interface with the database directly.

A-NF-6: Web-page loading time

Category	A	ID	A-NF-5
Date	11.12.11	Origin	Product Backlog
Description	The web-page displaying the statistics defined in requirement A-F-1 must load within 10 seconds when the time filter defined in requirement A-F-3 is set to span over the last month.		

A-NF-7: Wiki pages documentation

Category	A	ID	A-NF-7
Date	11.12.11	Origin	Product Backlog
Description	The system must be documented using Wiki pages. Documentation shall consist of: • A user manual. • A system overview/specification/description.		

A-NF-8: BugZilla interfacing

Category	A	ID	A-NF-8
Date	27.10.11	Origin	Meetings
Description	The new system has to interface with BugZilla in the same way the current system does.		

B-F-1: Display hardware/network statistics

Category	B	ID	B-F-1
Date	11.12.11	Origin	Product Backlog
Description	This is an extension of requirement A-F-1. Two new types of information to be displayed are added to the list. The two types of information to be displayed statistics for and their specific grouping structure are as follows: a. HDD (Hard Disk Drive) a. Capacity: In the following groups: 10-99GB, 100-249GB, 250-499GB, 500-749GB, 750-999GB, and above 1TB. b. Type: In groups of SSD or Normal (Magnetic Disk). b. Network download speed: In groups of all the different speeds registered in the database. All the filter types of requirement A-F-3 shall be compatible with the two new types of information as well.		

B-F-2: Display software statistics

Category	B	ID	B-F-2
Date	11.12.11	Origin	Product Backlog
Description	Statistical information about specific software installed on the players computers shall be displayed in a table. The table shall contain entries for the different types of software and the corresponding percentage of players who have that software installed on his/her computer. The types of software are: a. Java b. Unity c. Flash		

	d. Web browsers: Microsoft Internet Explorer, Mozilla Firefox, Google Chrome, Opera.

B-NF-1: Windows service

Category	B	ID	B-NF-1
Date	24.04.12	Origin	Meetings
Description	Eventual modules needed to be implemented to support the web-interface and the windows communication foundations (WCF) application layers shall be implemented as a Windows Service.		

C-F-1: Future hardware prediction

Category	C	ID	C-F-1
Date	27.10.11	Origin	Meetings
Description	Calculation of a prediction of the hardware evolution of the players of Funcom games a set amount of time into the future based on the hardware evolution from a set amount of time backwards in time. The length of the future time period to be predicted and the backward time period to be the basis of the prediction, is to be put in by the user of the system. The prediction shall be displayed as extended chart lines in the charts of requirement A-F-2. It must be possible to toggle whether or not the future prediction shall be displayed or not.		

C-F-2: Chart raw data

Category	C	ID	C-F-2
Date	24.04.12	Origin	Meetings
Description	The system must be able to display the raw data that the charts defined in requirement A-F-2.		

C-F-3: Textual help

Category	C	ID	C-F-3
Date	24.04.12	Origin	Meetings
Description	Functionalities in the web-page interface that is not self-explanatory to a completely new user must be explained through some form of textual help in the interface. It must be possible for the user to see the help text in the current page he has loaded. In other words, he/she shall not have to enter another page to view the help text.		

C-F-4: Chart zoom

Category	C	ID	C-F-4
Date	4.05.12	Origin	Meetings
Description	It must be possible for the user to choose to get displayed a zoomed/enlarged version of one of the charts defined in requirement A-F-2.		

C-NF-1: Filter URLs

Category	C	ID	C-NF-1
Date	4.05.12	Origin	Meetings
Description	When the web-interface is displaying hardware statistics as defined in requirement A-F-1 and B-F-1, based on the filters defined in requirement A-F-3, the web browser must display an URL that when accessed at a later point in		

	time will make the system reproduce the same statistics/filter selection.

43 Attachments

- Product Backlog

Funcom Hardware Statistics System

Test Specification

Project name		
Funcom Hardware Statistics System		
Client	**Acronym**	
Funcom N.V.	FHaSS	
Date	**Sensors & Supervisors**	
24.05.2012	***Internal sensor***	Olaf Hallan Graven
Author	***Internal supervisor***	Aurilla Aurelie Arntzen
Kim Richard Johansen	***External supervisor***	Rui M. Monteiro Casais

Group members

..... Sondre Bjerkerud	..... Sverre Christoffer Thune	..... Kim Richard Johansen
..... Dag Hem	..... Kent Brian Dreyer	

Test Specification

44 General Document Information

Deliverable nr:	D1.7.4
Deliverable type:	Report
Release:	Public
Workpackage:	1
Responsible:	Kim Richard Johansen

44.1 Declaration of intention

This is a document containing information about all the tests that are to be done. All the tests are made with basis upon the requirements specification that contains a list of all the requirements.

44.2 Definitions and Acronyms

Bug	An error in the programming code.
Parser	Searches a data file for key words and copies the values it finds.
CPU	Central Processing Unit
GPU	Graphical Processing Unit
RAM	Random Access Memory
DX	DirectX
HDD	Hard Disk Drive
SSD	Solid State Disk: A type of HDD.
OS	Operating System
COS	Condition of Satisfaction

44.3 Document History

Version	Description	Date
1	First version created	15.12.2011
2	Document template adopted. Information reviewed and updated.	05.01.2012
3	Updated with new small scale tests to be used to test sprint results.	16.03.2012 24.04.2012
4	Updated document to latest QA standards. Updated information on tests.	24.05.2012
4.5	Document reviewed	29.05.2012

45 Table of contents

46 Test layout

46.1 Test data set

To test the system we will be creating a test data set that will be used in most of the tests. The type of tests is explained under test criteria for each of the tests. We will manually calculate values for the different categories beforehand of the tests and compare them to the results the website produces.

The data set will consist of fictional bug reports that will be used to test each part of the system such as testing the system web functionality (i.e. sorting and grouping algorithms + calculation algorithms) and testing the result by sending complete bug reports that ventures through the different modules of the system (i.e. parser, database and web functionality)i.

A complete fictional bug report will contain this information:

e. CPU
   - Speed
   - Number of cores
   - Manufacturer
   - Model

f. Graphics card
   - VRAM size
   - Primary Display Resolution
   - Manufacturer
   - Model

g. RAM size
h. Windows OS version
i. DirectX version
j. Geographical location (may be in the form of IP)
k. Date and time
l. Funcom game
   - Game server

Our system will group most of this information (e.g. CPU: speed, cores, GPU: Model, Manufacturer) and then show it in tables and charts. So to test the grouping functionality we need to put in some smart values that are close to or exactly in the boundary range of the different grouping ranges.

46.2 Test types

Tests types listed are explained in more detail in the "*Test strategy document*" and the procedure for the tests is listed under *Tests*.

- Function test
- Code Compilation
- Debugging
- Code Review
- User Interface
- Ad Hoc test
- Strain test
- Regression test
- Performance test

46.3 Identifying different tests and requirements

Short explanation of the ID used for requirements and tests.

Requirement ID

A-F-1
Letter explaining the importance of the requirement where A is highest and C lowest
Letter explaining the requirement as Functional (F) or non-functional (FN)
Requirement number

Test ID

T-R-1-2
Letter T means test.
Letter R means requirement.
The first number equals test number.
If a second number is present the test is divided into more than one test and the number represents the test number of that test.

47 Tests

47.1 Test template

Name	{Test Name}		Test ID	{Test ID}
Requirement ID:	{ID}			
Test description:	{Test description}			
Test date:	{dd.mm.yyyy}	Tester:	{Name of tester}	
Testing method:	{Test type, black box/ white box}			
Test approach:	1. {approach}			
Test criteria	{what type of criteria}			
Expected results	• {Expected errors and results}			
Test creator:	{name date, updated by: name date}			
Errors:	• {Encountered errors}			
Outcome	{What happened?}			

47.2 Validation tests

47.2.1 List of validation tests

- T-R-1 Display hardware / software statistics
- T-R-1-1 Display hardware / software statistics –CPU information
- T-R-1-2 Display hardware / software statistics –GPU information
- T-R-1-3 Display hardware / software statistics –RAM information
- T-R-1-4 Display hardware / software statistics –OS information
- T-R-1-5 Display hardware / software statistics –Direct X information
- T-R-2 Display hardware / software evolution charts
- T-R-3-1 Filter statistics
- T-R-3-2 Filter statistics – user interface test
- T-R-3-3 Filter statistics – game filter
- T-R-3-4 Filter statistics – server/universe filter
- T-R-3-5 Filter statistics – time period filter
- T-R-3-6 Filter statistics – geographical location filter
- T-R-4-1 Hardware type management and grouping
- T-R-4-2 Hardware type management and grouping –new hw type
- T-R-5 Display software statistics
- T-R-6 Future hardware prediction

47.2.2 Tests

Name	Display hardware / software statistics		Test ID	T-R-1
Requirement ID:	A-F-1 and B-F-1			
Test description:	Test to see if tables are created and contains accurate information about the different hardware/software stored in the database.			
Test date:	09.02.2012 25.03.2012	Tester:	Kim Richard Johansen	
Testing method:	Function test, black box			
Test approach:	1. Put in the time period for which the statistical data shall be produced with basis upon. 2. Choose to get to see statistical information for one of the hardware/software categories; CPU, Graphics Card, RAM, Windows OS, HDD, or Network download speed. 3. Wait for the web-page containing the information to load. 4. Compare the resulting percentages to the percentages that have been manually calculated from the test data set.			
Test criteria	• Database and website is up and running. • Test data set has been made and inserted into database			
Expected results:	• The percentages the system produces and displays on the web-page based on the test data set are similar to those calculated manually.			
Test creator:	Sondre Bjerkerud, Sverre C. Thune 21.12.2011 Updated by: Kim Richard Johansen 23.12.2011			
Errors:	• {Encountered errors}			
Outcome	{What happened?}			

Name	Display hardware / software statistics –CPU information		Test ID	T-R-1-1
Requirement ID:	A-F-1 and B-F-1			
Test description:	Test to see if tables are created and contains accurate information about the different CPUs stored in the database. It should be possible to toggle between number of entries and %. Data to be shown: • CPU speed by brackets (like Steam).Starting at 0 - 1.0hgz, Inc. at 400mhz. • Show split between AMD and Intel (and other) • Show number of cores			
Test date:	11.03.2012 27.04.2012	Tester:	Kim Richard Johansen	
Testing method:	Function test, black box			
Test approach:	1. Put in the time period for which the statistical data shall be produced with basis upon. 2. Choose to get to see statistical information for CPU. 3. Wait for the web-page containing the information to load. 4. Compare the resulting percentages to the percentages that have been manually calculated from the test data set.			

Test criteria	• Database and website is up and running. • Test data set has been made and inserted into database
Expected results:	• The percentages the system produces and displays on the web-page based on the test data set are similar to those calculated manually.
Test creator:	Kim Richard Johansen 23.12.2011
Errors:	• {Encountered errors}
Outcome	{What happened?}

Name	Display hardware / software statistics –GPU information	Test ID	T-R-1-2
Requirement ID:	A-F-1 and B-F-1		
Test description:	Test to see if tables are created and contains accurate information about the different GPUs stored in the database. It should be possible to toggle between number of entries and %. COS: Show split between nVidia, Intel, AMD, and others. Data to be shown: • Show video card model like Steam. • Show VRAM • Show Primary and multi-monitor resolution.		
Test date:	27.04.2012	Tester:	Kim Richard Johansen
Testing method:	Function test, black box		
Test approach:	1. Put in the time period for which the statistical data shall be produced with basis upon. 2. Choose to get to see statistical information for GPU. 3. Wait for the web-page containing the information to load. 4. Compare the resulting percentages to the percentages that have been manually calculated from the test data set.		
Test criteria	• Database and website is up and running. • Test data set has been made and inserted into database		
Expected results:	• The percentages the system produces and displays on the web-page based on the test data set are similar to those calculated manually.		
Test creator:	Kim Richard Johansen 23.12.2011		
Errors:	• {Encountered errors}		
Outcome	{What happened?}		

Name	Display hardware / software statistics –RAM information	Test ID	T-R-1-3
Requirement ID:	A-F-1 and B-F-1		
Test description:	Test to see if tables are created and contains accurate information about the different RAM stored in the database. It should be possible to toggle between number of entries and %. COS: Show the RAM from all systems in the DB and group them under different range groups.		

	Data to be shown: • RAM grouped under: Less than 513 MB 513 MB to 999 MB 1 GB 2 GB 3 GB 4 GB 5GB and higher Unknown
Test date:	13.03.2012 Tester: Kim Richard Johansen
Testing method:	Function test, black box
Test approach:	1. Put in the time period for which the statistical data shall be produced with basis upon. 2. Choose to get to see statistical information for GPU. 3. Wait for the web-page containing the information to load. 4. Compare the resulting percentages to the percentages that have been manually calculated from the test data set.
Test criteria	• Database and website is up and running. • Test data set has been made and inserted into database
Expected results:	• The percentages the system produces and displays on the web-page based on the test data set are similar to those calculated manually.
Test creator:	Kim Richard Johansen 13.03.2011
Errors:	• {Encountered errors}
Outcome	{What happened?}

Name	Display hardware / software statistics –OS information	Test ID	T-R-1-4
Requirement ID:	A-F-1 and B-F-1		
Test description:	Test to see if tables are created and contains accurate information about the different OS information stored in the database. It should be possible to toggle between number of entries and %. COS: Show the OS from all systems in the DB and group them under different groups. Data to be shown: • OS grouped under: Windows 7 64 bit Windows 7 32 bit Windows Vista 64 bit Windows Vista 32 bit Windows XP 64 bit Windows XP 32 bit		

	Unknown
Test date:	14.03.2012 Tester: Kim Richard Johansen
Testing method:	Function test, black box
Test approach:	1. Put in the time period for which the statistical data shall be produced with basis upon. 2. Choose to get to see statistical information for GPU. 3. Wait for the web-page containing the information to load. 4. Compare the resulting percentages to the percentages that have been manually calculated from the test data set.
Test criteria	• Database and website is up and running. • Test data set has been made and inserted into database
Expected results:	• The percentages the system produces and displays on the web-page based on the test data set are similar to those calculated manually.
Test creator:	Kim Richard Johansen 13.03.2011
Errors:	• {Encountered errors}
Outcome	{What happened?}

Name	Display hardware / software statistics –Direct X information	Test ID	T-R-1-5
Requirement ID:	A-F-1 and B-F-1		
Test description:	Test to see if tables are created and contain accurate information about the different Direct X information stored in the database. It should be possible to toggle between number of entries and %. COS: Show the Direct X from all systems in the DB and group them under different groups. Data to be shown: • Direct X grouped under: Direct X 11.1 Direct X 11.0 Direct X 10.1 Direct X 10.0 Direct X 9.0c Unknown		
Test date:	27.04.2012	Tester:	Kim Richard Johansen
Testing method:	Function test, black box		
Test approach:	1. Put in the time period for which the statistical data shall be produced with basis upon. 2. Choose to get to see statistical information for GPU. 3. Wait for the web-page containing the information to load. 4. Compare the resulting percentages to the percentages that have been manually calculated from the test data set.		
Test criteria	• Database and website is up and running.		

	• Test data set has been made and inserted into database
Expected results:	• The percentages the system produces and displays on the web-page based on the test data set are similar to those calculated manually.
Test creator:	Kim Richard Johansen 16.03.2011
Errors:	• {Encountered errors}
Outcome	{What happened?}

Name	Display hardware / software evolution charts	Test ID	T-R-2
Requirement ID:	A-F-2		
Test description:	Test to see if evolution charts are created and to see if the contained information is accurate against the test data set.		
Test date:	02.05.2012	Tester:	Kim Richard Johansen
Testing method:	Function test, black box		
Test approach:	1. Put in the time period for which the evolution charts are to be produced with basis upon. 2. Choose to get to see one of the possible evolution charts; CPU, GPU, CPU cores, or Windows OS version and DirectX version. 3. Wait for the chart to load. 4. Do as exact a comparison between the manually calculated data and the chart. The chart shall be compared to the manually calculated data at five (5) times/points with equal distance between them. The first and the last times/points are the same values that was put in at stage 1 of this test, which will be the start and end of the chart lines. 5. The percentages displayed in proximity to the chart are compared to the manually calculated percentages for the last time/point the chart is describing.		
Test criteria	• Database and website is up and running. • Test data set has been made and inserted into database		
Expected results:	• That the chart seems to display similar values to those who have been calculated manually for each of the five points/times of the chart. • That the percentages displayed in proximity to the chart based on the test data set are similar to those calculated manually.		
Test creator:	Sondre Bjerkerud, Sverre C. Thune 21.12.2011 Updated by: Kim Richard Johansen 23.12.2011		
Errors:	• {Encountered errors}		
Outcome	{What happened?}		

Name	Filter statistics	Test ID	T-R-3-1
Requirement ID:	A-F-3		
Test description:	Test to see if the different filter combinations are working correctly. • Test each filter by itself. That is for instance putting in values for the time period filter only, leaving the other filters with null value/the		

	standard value. • Test with all filters set. The filter values that will be beneficial to put in will depend on the data set. For instance should both values that are represented in the data set and values that are not represented in it (say for instance a specific Funcom game) be filtered upon. For the time period filter both the whole period which the test data set is describing, and only parts of it, and also with time periods where the to and from limits are stretched further into time or farther back in time than the test data set describes.
Test date:	23.05.2012 Tester: Kim Richard Johansen
Testing method:	Function test, black box
Test approach:	1. Put in the filter combination to be tested. 2. Wait for the web-page containing the filtered statistics to load. 3. Compare the produced filtered percentage statistics to the manually calculated percentages.
Test criteria	• Database and website is up and running. • Test data set has been made and inserted into database
Expected results:	• That the produced filtered percentages based on the test data set are similar to the manually calculated percentages for each of the tested filter combinations.
Test creator:	Sondre Bjerkerud, Sverre C. Thune 21.12.2011 Updated by: Kim Richard Johansen 23.12.2011
Errors:	• {Encountered errors}
Outcome	{What happened?}

Name	Filter statistics user interface test	Test ID	T-R-3-2
Requirement ID:	A-F-3		
Test description:	Test is run after T-R-3-1. Test to see if the user interface for the filter statistics option is working correctly. • Check if game server filter is available when a specific Funcom game is selected and unavailable when a game isn't selected.		
Test date:	24.05.2012	Tester:	Kent Brian Dreyer
Testing method:	User interface test, Black box		
Test approach:	1. Set all filter options blank/null. 2. Check if game server filter is unavailable. 3. Choose one of the available Funcom games as a filter. 4. Check if game server filter is available.		
Test criteria	• Database and website is up and running. • Test data set has been made and inserted into database		
Expected results:	• Game server filter works as explained in the test description.		

Test creator:	Kim Richard Johansen 09.01.2012
Errors:	• {Encountered errors}
Outcome	{What happened?}

Name	Filter statistics – game filter	Test ID	T-R-3-3
Requirement ID:	A-F-3		
Test description:	Test to see if the game filter combinations are working correctly. • Test if results after filtering show Funcom games and entries for each of them.		
Test date:	02.02.2012	Tester:	Kim Richard Johansen
Testing method:	Function test, black box		
Test approach:	1. Start the filter combination to be tested. 2. Wait for the web-page containing the filtered statistics to load. 3. Compare the produced filtered percentage statistics to the manually calculated percentages.		
Test criteria	• Database and website is up and running. • Test data set has been made and inserted into database		
Expected results:	• That the produced filtered percentages based on the test data set are similar to the manually calculated percentages for the tested filter combination.		
Test creator:	Kim Richard Johansen 31.01.2011		
Errors:	• {Encountered errors}		
Outcome	{What happened?}		

Name	Filter statistics – server filter	Test ID	T-R-3-4
Requirement ID:	A-F-3		
Test description:	Test to see if the server filter combinations are working correctly. • Test if results after filtering show Funcom servers and entries for each of them.		
Test date:	26.02.2012	Tester:	Kim Richard Johansen
Testing method:	Function test, black box		
Test approach:	1. Start the filter combination to be tested. 2. Wait for the web-page containing the filtered statistics to load. 3. Compare the produced filtered percentage statistics to the manually calculated percentages.		
Test criteria	• Database and website is up and running. • Test data set has been made and inserted into database		
Expected results:	• That the produced filtered percentages based on the test data set are similar to the manually calculated percentages for the tested filter		

	combination.
Test creator:	Kim Richard Johansen 31.01.2012
Errors:	• {Encountered errors}
Outcome	{What happened?}

Name	Filter statistics – time period filter	Test ID	T-R-3-5
Requirement ID:	A-F-3		
Test description:	Test to see if the time filter combinations are working correctly. • Test if the data shown on the website corresponds to the manually calculated results after setting a time filter.		
Test date:	27.04.2012	Tester:	Kim Richard Johansen
Testing method:	Function test, black box		
Test approach:	1. Set the filter combination to be tested. 2. Wait for the web-page containing the filtered statistics to load. 3. Compare the produced filtered percentage statistics to the manually calculated percentages.		
Test criteria	• Database and website is up and running. • Test data set has been made and inserted into database		
Expected results:	• That the produced filtered percentages based on the test data set are similar to the manually calculated percentages for the tested filter combination.		
Test creator:	Kim Richard Johansen 24.04.2012		
Errors:	• {Encountered errors}		
Outcome	{What happened?}		

Name	Filter statistics – geographical location filter	Test ID	T-R-3-6
Requirement ID:	A-F-3		
Test description:	Test to see if the geographical location filter combinations are working correctly. It should be possible to choose between continent and country as a filtering option. COS: That the data shown after choosing a continent or country corresponds to the manually calculated results. Continents to be able to choose from: North America South America Antarctica Africa Europe Asia		

	Australia		
Test date:	27.04.2012	Tester:	Kim Richard Johansen
Testing method:	Function test, black box		
Test approach:	1. Set the filter combination to be tested. 2. Wait for the web-page containing the filtered statistics to load. 3. Compare the produced filtered percentage statistics to the manually calculated percentages.		
Test criteria	• Database and website is up and running. • Test data set has been made and inserted into database		
Expected results:	• That the produced filtered percentages based on the test data set are similar to the manually calculated percentages for the tested filter combination.		
Test creator:	Kim Richard Johansen 24.04.2012		
Errors:	• {Encountered errors}		
Outcome	{What happened?}		

Name	Hardware type management and grouping	Test ID	T-R-4-1
Requirement ID:	A-F-5		
Test description:	Test to see if the hardware from the bug reports is grouped correctly under general hardware types and that it shows the correct percentage for each of them based on the total. This test will also contain: • Test if registered but unrecognized hardware is grouped in the unrecognized category and shows the right percentage.		
Test date:	22.05.2012	Tester:	Sverre C. Thune
Testing method:	Function test, black box		
Test approach:	1. Get the statistics page. Print out, write down, etc., the groups and their respective percentages. 2. Compare the group percentages to percentages manually calculated from the test data set.		
Test criteria	• Database and website is up and running. • There has to be one or more currently registered but not recognized hardware types. • Test data set has been made and inserted into database		
Expected results	• That the system produced percentages is the same as the manually calculated ones.		
Test creator:	Sondre Bjerkerud, Sverre C. Thune 21.12.2011 Updated by: Kim Richard Johansen 23.12.2011		
Errors:	• {Encountered errors}		
Outcome	{What happened?}		

Name	Hardware type management and grouping –new hw type	Test ID	T-R-4-2
Requirement ID:	A-F-4 and A-F-5		
Test description:	Test is run after T-R-4-1 Create a new general hardware type and choose which type of hardware it should contain from the unrecognized hardware group.		
Test date:	22.05.2012	Tester:	Sverre C. Thune
Testing method:	Function test, black box		
Test approach:	1. Get the statistics page. Print out, write down, etc., the groups and their respective percentages. 2. Create a new general hardware type of one of the possible categories; CPU, Graphics Card, or Windows OS. 3. Choose group one/some/all of the registered but not recognized hardware types under the newly created general hardware type. 4. Get the updated statistics page. Print out, write down, etc., the groups and their respective percentages. 5. Compare the new group percentages to percentages produced before adding the hardware type(s) to the new general hardware type (step 1). 6. Compare results the group percentages whit percentages manually calculated from the test data set.		
Test criteria	• Database and website is up and running. • There has to be one or more currently registered but not recognized hardware types. • Test data set has been made and inserted into database		
Expected results	• That the system produced percentages is the same as the manually calculated ones. That is, both the basis statistics page (step 1) and the updated statistics page (step 4) contain the same percentages as the manually calculated percentages for the two instances of the general hardware type grouping.		
Test creator:	Sondre Bjerkerud, Sverre C. Thune 21.12.2011 Updated by: Kim Richard Johansen 23.12.2011		
Errors:	• {Encountered errors}		
Outcome	{What happened?}		

Name	Display software statistics	Test ID	T-R-5
Requirement ID:	B-F-2		
Test description:	Test to see if the tables are created and contain the same percentage value as manually calculated from the test data set about the different software stored in the database.		
Test date:	14.04.2012	Tester:	Sverre C. Thune
Testing method:	Function test, black box		
Test approach:	1. Load the web-page containing the software statistics. 2. Compare the calculated percentages to the manually calculated percentages.		
Test criteria	• Database and website is up and running.		

	• Test data set has been made and inserted into database
Expected results	• The percentages the system produces and displays on the web-page based on the test data set are similar to those calculated manually.
Test creator:	Sondre Bjerkerud, Sverre C. Thune 21.12.2011 Updated by: Kim Richard Johansen 23.12.2011
Errors:	• {Encountered errors}
Outcome	{What happened?}

Name	Future hardware prediction	Test ID	T-R-6
Requirement ID:	C-F-1		
Test description:	Test to see if an extension of requirement A-F-2 works. The extension is to predict the future trend of hardware usage for the players of Funcom games. When the chart for requirement A-F-2 is shown it will be possible to toggle the prediction on and off. The prediction will extend the current lines for hardware evolution in the chart and predict the future evolution.		
Test date:	22.05.2012	Tester:	Kim Richard Johansen
Testing method:	Function test, black box		
Test approach:	1. Put in the amount of time into the future the system is to predict the hardware evolution for. 2. Load the web-page containing one of the possible charts containing future hardware prediction. 3. Toggle the chart to display the future hardware prediction chart lines if toggled off. 4. Check that the hardware evolution prediction lines are proportional. 5. Compare the updated percentages in proximity to the chart to the manually calculated percentages. This stage corresponds to testing the last time/point on the chart to the manually calculated percentages for the whole test data set for the whole time period put in (1).		
Test criteria	• Database and website is up and running. • Test data set has been made and inserted into database		
Expected results	• That the hardware evolution prediction lines are proportional. • The percentages the system produces and displays on the web-page based on the test data set are similar to those calculated manually.		
Test creator:	Sondre Bjerkerud, Sverre C. Thune 21.12.2011 Updated by: Kim Richard Johansen 23.12.2011		
Errors:	• {Encountered errors}		
Outcome	{What happened?}		

47.3 Verification tests

47.3.1 Code Review

All developed code shall be reviewed by another person than the one who developed it. The organization of code reviews will be as follows: The code developer notifies the Test Manager, Kim R. Johansen, when the code development has been completed. It is then up to the Test Manager to delegate the task of reviewing the code to another team member. The review shall result in a code review feedback document for the code developer to examine. The feedback document shall consist of comments and suggestions for improvements of the overall code or parts of the code. Code parts shall be identified using line numbers. It is up to the code developer to consider whether or not the comments and/or suggestions shall be taken into account/implemented. Both part can, and shall, request a short meeting/discussion when disagreements arise about the developed code. A third part can be brought into the meeting/discussion to further investigate the code.

47.3.2 Code Compilation

It is up to each code developer to ensure that the code he has produced compiles without errors or warnings. It is natural that compilation will be attempted regularly throughout the code development process and that the source of eventual errors/warnings is corrected before resuming the code development. This is to ensure that faults in the code are fixed as early in the development process as possible, which in turn will save development time because of the exponential growth of time needed to fix errors as development continues.

47.3.3 Debugging

Debugging will be used in two ways:

1. To identify the problem area(s) of the code when compilation of the code fails. This will help the developer to fix the error/warning to make the code compile without faults.
2. In the case that any of the verification tests fails there will be one or more logical errors in the code that the corresponding test(s) are testing. Debugging can be used to identify these errors by going through the code step by step and examining the values of the variables in the code.

47.3.4 User Interface Testing

When the user interface for our system has been designed, user interface tests can be created to ensure that the user interface behaves the way it is supposed to. These tests will be made and carried through when the user interface corresponding to the specific test has been designed and implemented.

47.3.5 Ad Hoc test

The Ad Hoc test is a test we will be done late in our project when most of our grade A requirements are completed and tested. This test is done without any formal test plan and the purpose of this test is to try and “break” the system by trying different system functionality. Since the purpose is to try and “break” the system, negative testing is allowed. Negative testing means that the tester can try to find not intended functionality that may “break” the system.

47.3.6 Strain test

The Strain test is a test that will be done when all our A grade requirement are completed and successfully tested. We will insert variable amounts of bug reports over a length time to ensure that the system can handle the pressure and still be operational by our client under the two second load time they wanted for their website. The bug reports will be created beforehand of the test and the results will be manually calculated to check up against the data from the website after the test. This is to ensure that the data from the bug reports did not get corrupted due to high work load the system encounters.

47.3.7 Regression test

Regression tests will be done after code alteration of previous tested functions or when new functions have been added to the system. This test is to ensure that previously successful tests still give the same results.

47.3.8 Performance test

This test is about measuring the performance of the system (e.g. the time it takes for the website to load/show results as charts or tables with information from the database).This test will be done regularly to ensure that a new functionality or code alteration keeps the loading times under two seconds as the client wants.

48 Sources

- *http://en.wikipedia.org/wiki/Test_plan*(Last visited 15.12.2011)
- *http://en.wikipedia.org/wiki/Test_case*(Last visited 15.12.2011)
- RIVET test specification (HIBU Kongsberg library)
- Dragonfly test specification (HIBU Kongsberg library)

Funcom Hardware Statistics System

Project Plan

Project name		
Funcom Hardware Statistics System		
Client	**Acronym**	
Funcom N.V.	FHaSS	
Date	**Sensors & Supervisors**	
20.03.2012	***Internal sensor***	Olaf Hallan Graven
Author	***Internal supervisor***	AurillaAurelieArntzen
SondreBjerkerud	***External supervisor***	Rui M. Monteiro Casais

Group members

.....	.....	.....
SondreBjerkerud	SverreChristoffer Thune	Kim Richard Johansen
.....	.....	
Dag Hem	Kent Brian Dreyer	

Project Plan

49 General Document Information

Deliverable nr	D2.1.3
Deliverable type	Research
Release	Public
Work package	WP2
Responsible	SondreBjerkerud

49.1 Declaration of intention

The intention of this document is to give the reader insight into what the project group is supposed to do at which times throughout the project period, at a reasonable abstraction level. The plan is supposed to work as a guideline for the team in the project period and the project progress shall be measured against it. The plan can eventually be updated if it becomes obvious that it won't be possible for the team to follow it. This document will also describe how responsibility areas are distributed between the team members, as well as give some insight into how the time estimations were done to produce the project plan. Lastly this document will summarize how the resource distribution ended up to be per month and for the whole project period.

49.2 Definitions and Acronyms

Product Owner	The stakeholder's representative when following the Scrum project model.
JS	JavaScript
HTML	Hyper Text Markup Language
CSS	Cascading Style Sheets

49.3 Document History

Version	Description	Date
1	First version created. Time estimations done and Gantt diagram made.	16.12.2011
2	Project document layout adopted. Resources, responsibility areas, and requirements breakdown sections added.	04.01.2012
3	Modified section Personnel under the main section Resources. Added section "Remake of the Requirement breakdown" under the main section "Requirement breakdown". Added section "Remake of the Gantt diagram" under the section "Gantt diagram".	19.03.2012
4	Added "Activity description" and "Actual resource usage" sections under the	28.05.2012

	"Resources" section. Also added "Milestones accomplishment" section under "Milestones" section.	

50 Table of contents

51 Resources

In the following are the different resources that are needed to complete this project. As you will see there are no resources needed for this project that aren't available at all times, that is all times that people are working on the project. Due to this fact there is no need for a resource plan defining when certain time critical resources can be used by whom/what and so forth.

51.1 Personnel

The project team is the main resource needed to get any project work done at all. The team members will be working eight (8) hours a day, three days a week until Easter, and five days a week from the end of Easter until project end. The project team will be having one full week of Easter vacation.

Take a look at the "Requirements breakdown" document attached to this document to get an overview of how the amount of work for the project has been estimated.

51.2 Hardware

Each of the members of the project team owns their own portable computer. These will be used for just about anything regarding the project work; development, project management, web-page updates, etc. The portable computers are of course available at all times.

51.3 Software

The project team will be using several software applications for the project work:

- GanttProject: Project management
- Microsoft Excel/Google Docs Spreadsheet: Project management
- Visual Paradigm: UML Design
- Visual Studio: Coding
- Perforce: Version control
- Microsoft Word: Documentation
- MySQL: Database

We will also be using several pieces of software that cannot be considered to be applications. The software are either necessary for the system to work or are required by our client to be used:

- ASP.NET with C#: Programming language& Compiler
- ASP.NET MVC: Web-page framework
- nHibernate: Database abstraction layer

51.4 Activity description

The following is a list of the different activities that the work hours has been categorized in, as well as a more detailed list of what types of specific activities that belong to each activity.

- **Meetings & Planning**
  - Meetings and preparation for meetings with supervisors and/or sensors as well as internally in the project team.
  - Completion of minutes.

- Mailing and Skype chatting in conjunction with meetings and/or planning.
- Scrum task breakdown, estimation, and picking.

- **Documentation**
  - Project documentation.
  - Wikipages documentation.
  - Project documentation research.

- **Research & Set-up**
  - Learning
  - Reading
  - Lessons
  - Installation of software.
  - Server set-up.
  - Fixing of software problems.

- **Implementation**
  - Coding (C#, C++, JS, HTML, CSS), debugging, building, and test executing new code.
  - Uploading files to file repository and resolving file merging issues.
  - Code review.
  - Bug fixing.
  - Stylecop/ReSharper code standard maintenance.

- **Design**
  - UML design.
  - UI design.
  - Design discussion (verbally and text chat).

- **Test**
  - Conduction
  - Preparation
  - Logging

- **Presentation**
  - Conduction
  - Preparation

- **Other**
  - Deployment to Funcom.
  - Test deployment.
  - Contracts
  - Room ordering.
  - Prepare documentation for delivery.
  - Etc.

51.5 Actual resource usage

51.5.1 Per month

51.5.1.1 September, October, and November

Activity/Person	Sondre	Sverre	Kent	Kim	Dag
Meetings & planning	18,25	10	10	10	10
Documentation	11	8	6	6	10
Research & Set-up			4	2	
Implementation					
Design					
Test					
Presentation					
Other	4				
Total	**33,25**	**18**	**20**	**18**	**20**

51.5.1.2 December

Activity/Person	Sondre	Sverre	Kent	Kim	Dag
Meetings & planning	8	4	2	2	2
Documentation	37,5	31	28	18,5	32
Research & Set-up	1	5	4	3	4,5
Implementation					
Design					
Test					
Presentation					
Other	1,5		2	2,5	
Total	**48**	**40,5**	**36**	**26**	**39,5**

51.5.1.3 January

Activity/Person	Sondre	Sverre	Kent	Kim	Dag
Meetings & planning	12,75	7,5	7	5	5
Documentation	14,75	8,5	12	38	8
Research & Set-up	49	37	39	25	42
Implementation	10,25		3		8,5
Design		12,5	1		3,5
Test				20	
Presentation	20	27	24	19	24
Other	2,75		29		6
Total	**109,5**	**92,5**	**115**	**107**	**97**

51.5.1.4 February

Activity/Person	Sondre	Sverre	Kent	Kim	Dag
Meetings & planning	15	8,75	5	3,5	4
Documentation	0,25	9,5		4	7,5
Research & Set-up	25,25	1	8	2,5	9,5
Implementation	54,75	49,5	61	20	48
Design	10,25	14,5	1		8
Test				30	
Presentation					
Other	2,75		4	3	2

Total	**108,25**	**83,25**	**79**	**63**	**79**

51.5.1.5 March

Activity/Person	Sondre	Sverre	Kent	Kim	Dag
Meetings & planning	5	7,5	3,5	3,5	3,5
Documentation	2,5	8	7	10	7
Research & Set-up	1,5		1	1	5
Implementation	88,75	53,5	42	33,5	49,5
Design	2,5	5		0,5	5
Test				12	
Presentation	21,5	20	22	21	22
Other	1,5	1	2	0,5	
Total	**123,25**	**95**	**77.5**	**82**	**92**

51.5.1.6 April

In the month of April the project team had one (1) whole week off from the project to load the batteries with some Easter vacation.

Activity/Person	Sondre	Sverre	Kent	Kim	Dag
Meetings & planning	4,75	2,5		1	2
Documentation	0,5	2			1,5
Research & Set-up	12,75		5		8,5
Implementation	44	34,5	51	21	42,5
Design	2	7		1	5
Test				24,5	
Presentation					
Other	10,25	1	2	1	
Total	**74,25**	**47**	**58**	**48,5**	**59,5**

51.5.1.7 May

Activity/Person	Sondre	Sverre	Kent	Kim	Dag
Meetings & planning	8,25	6,5	3	3	3
Documentation	26,75	30	39	31,5	32
Research & Set-up	4	16,5			8,5
Implementation	40,5	54	72.5	52	61,5
Design	7	4			6
Test		1		8	
Presentation	6				
Other	4,25	18	1	11,5	5
Total	**96,75**	**130**	**115.5**	**106**	**116**

51.5.1.8 June

Due to the fact that the final documentation delivery date is set to the 29th of May 2012 there has of course not been logged any work hours in June at this point. However, the project team has estimated that each team member will work approximately 40 hours on the “Presentation” activity in this month.

51.5.2 For the whole project period

The following table is a summary of the monthly tables given in the section “Hour list per month” and is thereby an hour list for each team member and the team as a whole for the whole project period.

Activity/Person	Sondre	Sverre	Kent	Kim	Dag
Meetings & planning	72	46,75	30.5	28	30
Documentation	93,25	97	92	106	98
Research & Set-up	93,5	59,5	61	33,5	78
Implementation	238,25	191,5	229.5	126,5	210
Design	21,75	43	2	1,5	28
Test	0	1	0	94,5	0
Presentation	87,5	87	86	80	86
Other	27	20,5	40	18,5	14
Total	**633,25**	**546,25**	**541**	**490,5**	**543**

Total number of work hours for the whole project	

52 Responsibility

52.1 Fields of responsibility

SondreBjerkerud

- Project Management (until 7.05.2012)
- ScrumMaster

Dag Hem

- Quality Assurance
- Risk

Kent B. Dreyer

- Implementation
- Web-page

Sverre C. Thune

- Project Management (from 7.05.2012)
- Design

Kim R. Johansen

- Test

52.2 Scrum team responsibilities

Following the Scrum project model a project team will be doing a standard meeting before each sprint (iteration). In this sprint startup meeting the team will together with the Product Owner (the stakeholders representative) decide which user stories (requirements) to implement in the following sprint. All the user stories agreed upon goes into the Sprint Backlog where they are broken down into tasks. It is then up to the team members to pick the tasks they would like to do in the following sprint.

In our project team we have somewhat clearly defined fields of responsibility as given in the section “Fields of responsibility”. These responsibilities will be the basis for task picking in the sprint startup meeting. For instance Sverre will mainly pick designing tasks, while Kent will mainly pick implementation tasks.

In the case when there will be an overweight of tasks relating to the fields of responsibility of only a part of the team, the other members will “help” the responsible persons by picking tasks from their

field of responsibility. However, the person with the field of responsibility relating to that task will have the head responsibility of the task, independently of who is actually doing it. For instance can Dag be implementing some functionality of the system, but it is still Kent - who has implementation as one of his fields of responsibility - who will be the person responsible for that task being done and done properly.

53 Requirements breakdown

To get an idea of what has to be done to manage to implement the functionality that the requirements are describing, we had to break down the requirements into tasks. These tasks had to be specific enough for us to be able to give a good estimate of the work required to do them, but also general enough so they could be used as the basis of a project plan. Too specific task definitions would also be way too time consuming to produce and would probably not improve the time estimates because of the lack of experience we've got in this specific technical area.

There is a document attached to this project plan called "Requirements breakdown". In that document the requirements breakdown lists and the time estimations for each task that was used as a basis for the project plan is given.

53.1 Remake of the Requirements breakdown

Closely related to the remake of the Gantt diagram (see section 6: Gantt diagram) is the remake of the Requirements breakdown. This breakdown is now estimating the time usage for implementing the User Stories in the Product Backlog instead of the requirements in the Requirements Specification.

For the user stories in the Product Backlog following the "Time Period Filter" it is still hard to make good time estimates for. We will therefore be keeping the time estimates for this portion of the Product Backlog as they were with the 1st version of the Project Plan. The portion of user stories following the "Time Period Filter" is basically the same functionality that the requirements "Display hardware/software statistics", "Display Software Statistics", and "Future Hardware Prediction", are describing. Therefore the time estimate for this portion of functionality is the same, but with the new version of course distributing the time between the user stories. The distribution has been done following our experience and intuition.

54 Milestones

Milestones functions as intermediate goals for the project work and will help the project manager with the task of knowing whether or not the project work is going according to the plan. When milestones are reached, can and should, the project team gather and celebrate that the goal has been achieved to strengthen the mentality and focus of the team members for the upcoming work period against the next milestone.

The following will list the milestones and their respective dates that the project team will work towards:

1. The 1st presentation (13.01.2012)
2. Release/Deployment: High Priority Requirements (19.03.2012)

3. The 2nd presentation (22.03.2012)
4. Release/Deployment: Middle Priority Requirements (5.05.2012)
5. Release/Deployment: Final release (19.05.2012)
6. The 3rd and final presentation (06.06.2012)

After each of the release/deployment milestones the system that we are producing will be deployed at the office in Oslo of our client Funcom and be taken into use by their employees.

54.1 Milestones accomplishment

Both the first project presentation milestones (1 and 3) were accomplished as expected.

Before the 1st project presentation the project team worked hard to be able to reach the first release/deployment milestone (2), but unfortunately more and more unforeseen problems appeared and the team realized that the milestone was not completeable at that point. However, after the 1st presentation, the team continued the work to get the 1st version of FhaSS deployed to the Funcom severs. Again, unfortunately, more and more problems occured, and the team had to rebuild large portions of the system. Due to this development/test deployment period the second release/deployment milestone was just more or less accomplished; The team managed to get a version of the system deployed, but it was not completely functional and did not have all of the middle priority requirements implemented. In essence the second release/deployment milestone was also not accomplished.

The final release milestone (5) on the other side is considered as accomplished. The project team did their last deployment to the Funcom servers on the 10th and 11th of May. However, the Funcom employees that also served as supervisors for the project team throughout the project period has at later dates done deployments to their own server, with some or none assistance from the project team. Some of these deployments has happened after the set milestone date of 19th of May, but the project team consider their last major deployment as the final deployment, and therefore consider this milestone as accomplished.

The sixth (6.) and last milestone date is yet to come, but the project team is on schedule wioth regard to the preparations for the 3rd and final project presentation.

55 Gantt diagram

In the attachment “Gantt diagram” of this document the Gantt diagram for the project periodis displayed. The Gantt diagram lists the requirements to be implemented and when the work on them should start and be finished. All the presentations are added to this diagram as well. The milestones “High Priority Requirements” and “Middle Priority Requirements” are displayed only as the end of their corresponding work packages.

55.1 Remake of the Gantt diagram

The first version of the Gantt diagram was based on the requirements in the Requirements Specification. Because some of those requirements include the functionality described in several user stories we found it hard to decide whether or not a specific requirement was completed or not. We decided of this reason to remake the Gantt diagram (31.01.2012) to instead be based on the User

Stories in the Product Backlog. This decision and remake has proven itself very useful as it is now a lot easier to gauge the progress of the project with regard to the diagram.

56 Conduction

56.1 Meetings

56.1.1 Meetings with internal supervisor

Meetings between the project team and the internal supervisor AurillaAurelieArntzen will occur on a regular basis throughout the project period. Each week, on the same day and time of the week, a follow-up meeting will be held between the two parts. A follow-up document is to be delivered to the internal supervisor at last 24 hours before the start of this meeting. The contents of these meetings will be a review of the follow-up document and other project related subjects that are of interest to/that should be discussed with, the internal supervisor.

56.1.2 Meetings with external supervisor

Following the Scrum project model the project team and the Product Owner shall arrange meetings before and after each sprint. All of the three following types of meetings will generally be held as one single meeting, separated into three parts, at the start of a new sprint. That means there will only be a sprint planning meeting at the start of the first sprint.

56.1.2.1 Sprint planning meeting

The purpose of this meeting is to decide on which user stories/requirements or which parts of them the project team shall be working on in the following sprint. It is mainly up to the Product Owner to decide which user stories/requirements the team shall focus on, but it is solely up to the team themselves to accept what to actually do. The amount of work the team accepts in this meeting shall and will be expected to be finished at the end of the sprint.

56.1.2.2 Sprint review meeting

The purpose of this meeting is for the project team to show off to the Product Owner what has been developed in the past sprint. The newly produced functionality shall either be accepted or denied by the Product Owner, or eventually form the basis for an eventual changes in the Product Backlog.

56.1.2.3 Sprint retrospective meeting

The purpose of this meeting is for the project team to discuss what went well and what went not so well in the past sprint. The conduction of such a discussion is supposed to improve the effectiveness and efficiency of the work of the project team.

56.2 Updates to the project plan

The Gantt diagram will typically be updated, if needed, after each sprint (every second week). The work velocity of the project team is very uncertain at this point, but estimates will probably improve drastically after just a few sprints, as well as the speed itself. The same goes for the requirements implementation time estimates. The result is that the project plan will probably have to be updated often, reflecting both a new work velocity estimate and the new requirements implementation time estimates.

56.3 File repository

The project team will be using two types of file repositories in this project:

1. Dropbox will be used for storing and sharing documentation and planning files.
2. Perforce is the versioning software that will be used to handle versioning and storage of files containing code. That is system specific files.

57 Attachments

- Requirements breakdown
- Gantt diagram

Funcom Hardware Statistics System

Risk Analysis Document

Project name		
Funcom Hardware Statistics System		
Client	**Acronym**	
Funcom N.V.	FHaSS	
Date	**Sensors & Supervisors**	
29.05.2012	***Internal sensor***	Olaf Hallan Graven
Author	***Internal supervisor***	Aurilla AurelieArntzen
Dag Hem	***External supervisor***	Rui M. Monteiro Casais

Group members

.....	.....	.....
Sondre Bjerkerud	Sverre Christoffer Thune	Kim Richard Johansen
.....	.....	
Dag Hem	Kent Brian Dreyer	

Risk Analysis Document

58 General Document Information

Deliverable nr:	D2.2.3
Deliverable type:	Guidelines
Release:	Public
Workpackage:	WP2
Responsible:	Dag Hem

58.1 Declaration of intention

The intention behind this document is to give its reader a quick understanding of what risks are and how to handle them properly so that we are better equipped when a risk strikes. This document will also list most known and large risk along with a small description of the risks consequence and a possible solution. By reading, understanding and using this document we will be more aware of the overhanging risks we face during this project and also how to avoid, or even solve them if they occurred. It is this documents main intention to lower the chances of risks happening, and help us handle them as quickly as possible when they occur.

The assessments that are made in this document are meant to guide the project group through hard choices regarding activities, priorities, strategic choices of solutions and project management.

58.2 Definitions and acronyms

Impact	The damage caused to our project. (Often in form of time-loss)
API	Application Programming Interface
NDA	Non-Disclosure Agreement
TSW	The Secret World
ID	Identity
Crash	When a program unexpectedly stops running
Browser	Internet browser
MVC	Model View Controller (.Net standard)
PM	Project Manager
N/A	Not applicable
WCF	Windows Communication Foundation

58.3 Document history

Version	Description	Date
1	First version created	1.12.2011
1.5	Peer reviewed	14.12.2011
2	Supervisor reviewed	10.01.2012

2.5	Correcting risks	20.03.2012
3	Finalized document	21.05.2012
3.5	Document reviewed	25.05.2012

59 Table of contents

60 Risk analysis

60.1 Risk handling

Risks are a large part of project management, and as the project grows larger, so does the amount of risks we are going face. As this is a small-scale project with only a handful of developers we do not expect to be overwhelmed by many risky decisions but it is nevertheless important to have a basic knowledge of the risks we are up against, and how to handle them in the best possible manner.

The understanding of risk revolves around two main problems; what are the chances of us running into this risk and how much threat does this risk pose to our project?
These two questions can be summarized in two words: probability and impact, and the product of these two become the total severity involved with a given risk. The following graph shows the connection between probability and impact.

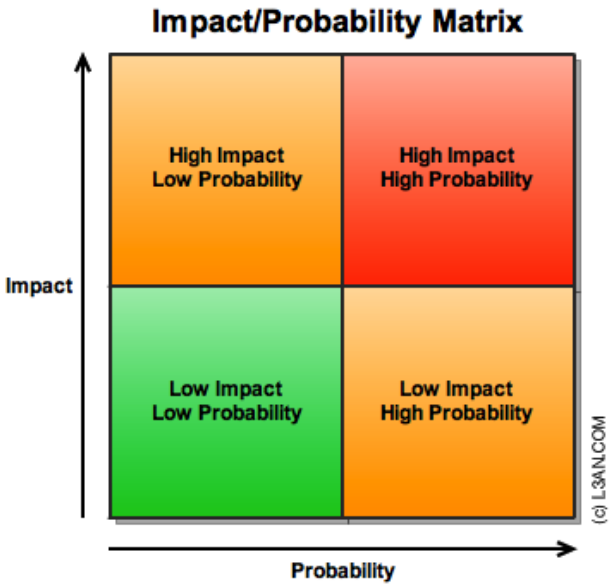


Fig 1: Risk probability matrix

The hard part about risk management is to detect large risks that may occur during the development of a project and identify these properly. If a risk can be foreseen and understood before it has the possibility to occur, we stand a much better chance at making the right decision when we know the gravity and seriousness of our choice.

If a new risk is found, and it is believed to be a viable threat to our project its will be brought to the risk manager for further research. If a risk is deemed dangerous enough the risk manager will analyze the risk in an effort to learn more about its nature, these are the most important subjects:

- The consequence of the risk – Time setback, data loss or other
- How to prevent the risk – If any measures can and should be taken to avoid this risk
- Finding a possible solution – If the risk have occurred and if it has any simple solutions

60.2 Risk table template

As risks are found and identified they are put in a basic risk table and categorized in the list of risks. A risks ID is written **R[Category number] – [ID]** in order to minimize clutter as we add and edit risks

during the course of this project.
Every risk will be given a unique risk ID which can be referenced to from other documents in the project if this is needed; the risks are also given an evaluation of their probability and impact (See fig 2 below).

R[Cat]-[ID]: [Risk name]			
Probability:	[The chance of occurrence]	Impact:	[The impact of the risk]
Description(If needed):	[A short description/clarification of the risk. Only if needed]		
Consequence:	[A short description of the consequence of this risk occurring]		
Prevention:	[A short guideline on how to prevent this risk from occurring]		
Possible solution(If any):	[If there is a simple solution to a risk that has occurred, it should be explained here]		

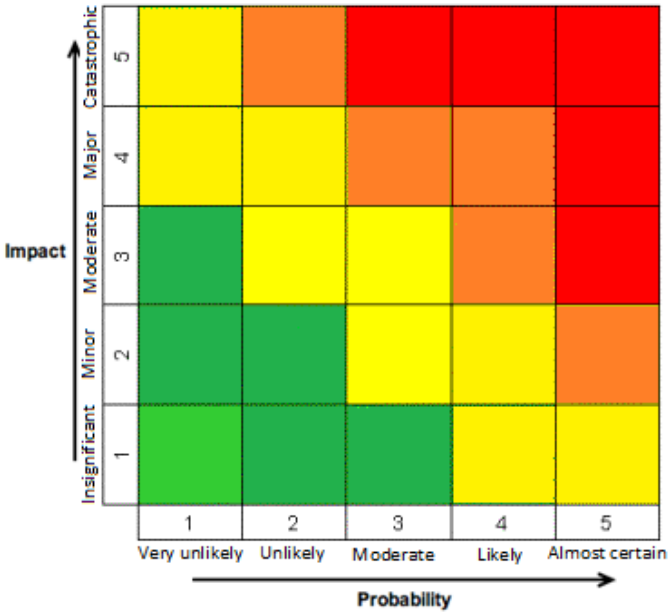


Fig 2: Color-coded chart describing the total severity of probability and impact.

61 Risks

Here is a list over all known and identified risks, placed into several categories.

Project requirements related risks:

- Any A-requirement not met
- Any B-requirement not met
- Any C-requirement not met

Technical & System risks:

- ASP.net or C# programming language difficulties
- Loss of data
- Slow web-page loading times

- Bad internal server performance
- Personal computer problems
- Web-page not viewed correctly by different internet browsers

Human risks:

- Broken NDA
- Miscommunication
- Lack of knowledge
- Teammate is unavailable of an extended amount of time
- Solution disagreement
- Internal conflicts
- Disencouragement and workload
- Major project changes/additions
- Change of supervisor
- Change of project manager

Other risks:

- Acquisition of computer hardware

61.1 Requirements related risks

R1-1: Any A-Requirement (functional & non-functional) not working			
Probability:	Very unlikely	Impact:	Catastrophic
Description:	Functional A requirements: Display statistics table & evolution charts, filter statistics, hardware type management and hardware grouping. Non-functional: Programming language, MVC, Database type/connection/access, loading times, wiki documentation, BugZilla interface, windows service		
Consequence:	Failing one or more A-requirements means our system will not be satisfactory for our clients use and will lack crucial functions.		
Prevention:	Planning ahead and keeping to the project plan and delivery dates. Detect any abnormalities early on and deal with them.		

R1-2: Any B-Requirement not working			
Probability:	Unlikely	Impact:	Major
Description:	B requirements: Display additional hardware, network and software statistics		
Consequence:	By being unable to meet any B-requirement in time we are failing to meet a secondary requirement set by the client resulting in a sub-optimal system.		
Prevention:	Keeping to the schedule and deal with abnormalities early will give us the needed time to develop and finish this feature.		

R1-3: Any C-Requirement not working

Probability:	Unlikely	Impact:	Moderate
Description:	C requirements: Future hardware evolution prediction		
Consequence:	By being unable to meet any C-requirement in time we are failing to meet a tertiary requirement set by the client resulting in a still functional system, but it will be lacking a highly desired functionality.		
Prevention:	Keeping to the schedule and deal with abnormalities early will give us the needed time to develop and finish this feature.		

61.2 Technical risks

R2-1: ASP.Net, nHibernate or C# difficulties			
Probability:	Unlikely	Impact:	Major
Description:	Since we are using a new programming language as well as a new programming standard, some trouble is to be expected. Can be caused by lacking understanding, API or documentation.		
Consequence:	By using too much time learning the language, our development timetable may be affected.		
Prevention:	A proper study done in the Programming Language document. Spending personal time getting used to the language if personal level is below your peers.		

R2-2: Data loss			
Probability:	Unlikely	Impact:	Moderate
Consequence:	May cost us varying amounts of time loss to restore the system.		
Prevention:	Keeping backup versions of documents manually, using version verifying software, securing personal computer with backup systems.		
Possible solution:	If data is lost and cannot be regained, the quickest solution would be for the project member losing the data to reproduce it as quickly as possible. We also rely heavily on version verifying software.		

R2-3: Slow web-page loading times			
Probability:	Unlikely	Impact:	Major
Description:	The user experiences that his browser uses a long time loading the hardware crash statistics web page. May be due to web-page programming or slow database connection.		
Consequence:	It may be undesirable for the user to even use our new system due to long loading time.		
Prevention:	Having a good understanding of ASP.Net and C# and good programming ethics will help reuse of code, no memory leaks, low memory usage and flexible yet robust code. Can be prevented by optimizing system & cleaning code after testing.		
Possiblesolution:	If this problem is persistent after several iterations and there is enough time, it		

	might be advisable to either take a closer look and restructure the architecture, or optimize the code.

R2-4: Bad internal server performance			
Probability:	Unlikely	Impact:	Major
Description:	If the internal server does not have enough resources to handle our parser and all its received data, it may slow down or even experience crashes.		
Consequence:	It may hinder the admittance of new data into the database and in a worst case situation slow down, or even break the database-connection to the user's web page.		
Prevention:	Enough system resources on the internal server to handle all the processing (Should be discovered during testing). Optimized parser-coding and web-page towards fewer and smaller data-connections.		
Possible solution:	Optimized parser-coding and web-page towards fewer and smaller data-connections. Either upgrade current server, or switch to a new one if the problem persists after several iterations with testing.		

R2-5: Personal Computer problems			
Probability:	Moderate	Impact:	Minor
Description:	One of the projects member's laptop breaks down, leaving him without a workstation at the school/other locations.		
Consequence:	Affected person will be unable to work outside of his home for the duration of the problem. Might hinder communication and workflow with other project members.		
Prevention:	Backup personal data, keep your system up to date, and check your warranty/guarantee.		
Possible solution:	We may be able to borrow workstations from both the school and our client.		

R2-6: System not viewed correctly by different internet browsers			
Probability:	Likely	Impact:	Minor
Description:	As different internet browsers handle html code differently there may be discrepancies between how the page is viewed on the different browsers.		
Consequence:	Minor visual glitches or lack of data on unsupported browsers.		
Prevention:	Writing structured and robust code will always help program stability. By testing our system up against different types of browsers and using code checking software we should be able to detect any malfunctioning browser.		
Possible solution:	A workaround solution would be to use a specific browser desired by the user.		

61.3 Human risks

R3-1: Broken NDA / Leaked data			
Probability:	Very unlikely	Impact:	Moderate
Description:	If one of our project group's members breaks our written NDA by disclosing information about FunCom's current system and their upcoming game: The Secret World.		
Consequence:	Project member will be unable to work for FunCom anymore, not wanted on the project group for breaking our trust.		
Prevention:	Keeping both our physical and digital information away from prying eyes by using password protected systems and common sense. Not discussing, or "leak" information about TSW to outsiders.		
Possible solution:	We may be able to change the projects scope in order to accommodate the missing group member.		

R3-2: Miscommunication			
Probability:	Unlikely	Impact:	Moderate
Description:	Problems often arise from misunderstandings and miscommunication between people; we would like to minimize these.		
Consequence:	The consequence may vary depending on the matter and the misunderstanding. The impact ranges from missing a workday and undesired design to extra work. All resulting in lost time.		
Prevention:	The user requirements and our product backlog prevent any misunderstandings towards the project requirements. Minutes from meetings helps us minimize the chance of misinterpreting the new information. Skype chatting with both our client and internal supervisor can help clear up misunderstandings quickly. Weekly meeting with our internal supervisor as well as daily internal meetings within the group.		

R3-3: Lack of knowledge			
Probability:	Likely	Impact:	Moderate
Description:	By lack of knowledge it is meant both your personal coding skill and your general understanding of the system we are creating. A lack of knowledge may hamper our teams work pace considerably. This is considered a likely probability due to the fact that we will use ASP.Net and C# as none of us is familiar with it.		
Consequence:	Beyond the slow work pace when working with an unfamiliar language you may also experience a morale decrease. Another consequence is our project plans may be written on the wrong basis if we have a shallow knowledge of the current system.		
Prevention:	It is each person's own responsibility to keep their coding skill at an acceptable level. To avoid misunderstandings around the system, we should use both our internal and external supervisors to help us gain a better understanding of what we're doing.		

R3-4: Group member is unavailable for an extended amount of time			
Probability:	Very unlikely	Impact:	Moderate
Description:	There are outside forces that may affect our ability to work, such as long term illness and jail time amongst others.		

Consequence:	This will leave the rest of the group with more work, while we may not be able to shorten down the project scope. The impact depends on the amount of time the missing member is unable to work.
Prevention:	It is not always possible to foresee or prevent this from occurring, but keeping healthy and abiding the law is a good start.
Possible solution:	Some possible solutions could be to either change project scope, getting an outside workforce or reuse some of the old system.

R3-5: Project related disagreement			
Probability:	Likely	Impact:	Minor
Description:	Many of the choices in a large project is often planned months ahead, or extensively researched if we are unsecure about how to proceed. We may, however, still come across small issues that need to be resolved quickly between us.		
Consequence:	The consequence will be minor, because of all the larger issues are already resolved. A conflict like this may take time if the parties does not seek out to find new information, or fail to reach an agreement.		
Prevention:	Many of these disagreements can be avoided by assigning a responsible person for a certain task and letting them decide.		
Possible solution:	If the parties fail to resolve the issue quickly, they could either take their argument to an objective team member, or if it seems fitting, ask our supervisors.		

R3-6: Internal Conflicts			
Probability:	Unlikely	Impact:	Moderate
Description:	Most people working closely together for an extended period of time are prone to internal conflicts. Internal conflicts are personal issues between two parties.		
Consequence:	Depending on the issue the impact may range between a team member having to work at home for a short time to relax away from the group, or removing them from the group permanently.		
Prevention:	Celebrate achievements together, discussing your issues with other people in a grown-up constructing way and have teambuilding sessions.		
Possible solution:	If an internal conflict occurs it is important to know that you can still keep things at a professional level between co-workers and not necessarily dragging personal feelings into the workplace.		

R3-7: Disencouragement and workload			
Probability:	Unlikely	Impact:	Minor
Description:	It is easy to lose morale and be discouraged if you put a lot of work on yourself for an extended period of time, this may cause burnout. But on the other hand it is quite easy to deliver uncompleted work and miss deadlines if you take your work too lightly.		
Consequence:	If a member of our group experiences burnout during the course of this project and renders himself discouraged from working we as a group need to use time and energy nursing our member into working normally. By taking our work too lightly, we risk missing deadlines and delivering sub-par products.		

Prevention:	Discussing your workload with the project leader, teambuilding and celebrating achievements.

R3-8: Major project changes/additions			
Probability:	Likely	Impact:	Moderate
Description:	If it is necessary to make major additions or changes to the project.		
Consequence:	The consequences may vary depending on the addition, but in large cases where new systems should be implemented it may mean an extra set of documentation in addition to the actual system development.		
Prevention:	There isn't much one can do, except having close communication with our client and supervisors to get an insight to their future plans.		
Possible solution:	If a major addition is added, the project leader should perhaps develop several different strategies for handling this additional problem and discussing the best solution with the project team or supervisors.		

R3-9: Change of Supervisor			
Probability:	Very unlikely	Impact:	Moderate
Description:	The risk of having to change either the internal or external supervisor because of illness, change of job, complications or other reasons.		
Consequence:	Having to change a supervisor will both be time-consuming and slowing down our project due to spending time replacing and briefing the new supervisor.		
Possible solution:	We could rely more on our other supervisor during a transition phase.		

R3-10: Change of Project Manager			
Probability:	Very unlikely	Impact:	Major
Description:	The risk of having to change the current project manager and reinstate another project member.		
Consequence:	A change of Project Manager would cost us a large amount of time to reinstate another project member. It would also severely decrease the morale of the affected member as well as the other members of the group. Loss of knowledge / routines.		
Prevention:	Clear communication with the other project members as well as the client and any supervisors so that any problem or issue may be solved through constructive criticism instead of a sudden change as the easiest solution.		
Possible solution:	The team must go together and to coordinate the PM change		

61.4 Other risks

R4-1: Acquisition of computer hardware			
Probability:	Very unlikely	Impact:	Moderate

Description:	To run and test our system we have the need for an internal server hosting our software.
Consequence:	If there are no servers available to us we will be unable to test the system in a proper and realistic environment.
Prevention:	Research if either the school or our client can offer/lend us the necessary hardware.
Possible solution:	We could test the system exclusively on our own systems, test the system at Funcom's location or acquire our own personal hardware.

R4-2: Relocation of offices / hosting			
Probability:	Unlikely	Impact:	Minor
Description:	If we for some reason have to relocate our equipment.		
Consequence:	Relocating would cause both a time-loss and other possible software/network/firewall issues.		
Prevention:	A thorough discussion with the possible parties that can accommodate us such as HiBu or Funcom to establish whether or not they can meet our requirements.		
Possible solution:	If we are unable to find a suitable office we may have to work at one of the project member's house. If we are unable to find a suitable hosting solution for our internal sever, we might be able to set it up in one of the project member's apartments.		

62 Occurred risks

62.1 Requirement related

R1-1 A single A-Requirement: BugZilla not implemented			
Sprint recognized:	N/A	Severity:	None
Description:	It was an early request made by our client, that our system should use their current BugZilla to post error reports.		
Consequence / Solution:	With agreement with our client, we decided to implement our own.		

62.2 Technical

R2-4: Bad internal server performance			
Sprint recognized:	Sprint nr 3	Severity:	Moderate
Description:	As we fetched more and more data from our database, we recognized a steadily increased load time for the site as data grew due to un-optimized code.		
Consequence / Solution:	We have done several updates, both to the client-side fetching and to database optimization through parsing & grouping.		

R2-4: Bad internal server performance			
Sprint recognized:	Sprint nr 9	Severity:	Minor
Description:	Our system required more and more information from the database as the system evolved thus slowing down loading-times further.		
Consequence / Solution:	We came up with a caching solution together with our external supervisors in order to greatly reduce loading times for a limited time span. The consequence for this was a large rewrite of our fetching mechanisms (basically some time loss).		

R2-2: Data-loss / Setback			
Sprint recognized:	Sprint nr 7	Severity:	Moderate
Description:	Due to inexperience with our version verifying software (Perforce) one of the project members inadvertently set an earlier version of the project as the current one, overwriting several updated files.		
Consequence / Solution:	After a heroic effort from several team members we were able to restore the system. Moderate amount of time-loss.		

R2-5: Personal Computer Problem			
Sprint recognized:	Sprint nr 6 & 8	Severity:	Minor
Description:	At the first occurrence, a laptop charger broke. Second time a team member lost their charger.		
Consequence / Solution:	In both occurrences the affected member had to work from home a small amount of time before fixing / acquiring new chargers.		

R2-6: System is not viewed the same on different browsers			
Sprint recognized:	Sprint nr 3	Severity:	Minor
Description:	Discovered some minor visual glitches on the page when using different browsers.		
Consequence / Solution:	Changed some deprecated css usage while agreeing with the client on to optimize towards a specific browser while maintaining functionality in other browsers.		

R2-1: Bad API/Documentation for nHibernate			
Sprint recognized:	n/a	Severity:	Moderate
Description:	nHibernate became an integral part of our system and we lacked the necessary experience to use and understand it correctly.		
Consequence / Solution:	More time spent learning the software than anticipated. Relied heavily on external supervisor's support. Designs were a bit off.		

62.3 Human

R3-3: Lack of knowledge			
Sprint recognized:	n/a	Severity	Moderate

Description:	The nature of the project required us to take use of some programming languages and standards we were inexperienced with, such as C#, the .Net MVC, WCF services and nHibernate.
Consequence / Solution:	These challenges did create some small issues during the course of our project. In the early stage, our inexperience made our analysis and designs somewhat faulty. The consequence was iterations on the system as our experience grew. In the middle stages we might "run into a wall" when we failed to properly grasp a specific concept and loose some morale. The consequence was to switch tasks and support each other when needed; work might have been a bit slower than optimal. In the later stages of the project we recognized that some people became a bit more specialized in a certain area the more they worked on it. The consequence became that we could get "tunnel vision" by focusing purely on our own areas loosing perspective.

R3-10: Change of Project Manager			
Sprint recognized:	Sprint nr 8	Severity:	Major
Description:	At the beginning of our 8th sprint, our supervisors and sensors decided to change the Project Manager due to some minor misunderstanding between the PM and our client.		
Consequence / Solution:	The transition between PM's went very good but we still lost a lot of sorely needed management expertise the original PM had. The consequence for this was a severely decreased morale across the board.		

62.4 Other

R4-2: Relocation of internal server			
Sprint recognized:	Sprint nr 1	Severity:	Minor
Description:	During our set-up sprint, the IT-Department at HiBu was unable to get our internal server through their firewall in time.		
Consequence / Solution:	We had to relocate the internal server to avoid additional downtime. We relocated it to our project manager's apartment.		

Funcom Hardware Statistics System

Project Model Document

Project name		
Funcom Hardware Statistics System		
Client	**Acronym**	
Funcom N.V.	FHaSS	
Date	**Sensors & Supervisors**	
10.01.2012	***Internal sensor***	Olaf Hallan Graven
Author	***Internal supervisor***	Aurilla Aurelie Arntzen
Sondre Bjerkerud	***External supervisor***	Rui M. Monteiro Casais

Group members

.....	.....	.....
Sondre Bjerkerud	Sverre Christoffer Thune	Kim Richard Johansen
.....	.....	
Dag Hem	Kent Brian Dreyer	

Project Model Documents

1 General Document Information

Deliverable nr:	D2.3.1
Deliverable type:	Research
Release:	Public
Work package:	WP2
Responsible:	Sondre Bjerkerud

1.1 Declaration of intention

This document will explain several project models that our team has considered working according to, as well as a conclusion discussing which model we believe will fit our project the best and why.

1.2 Definitions and Acronyms

UP	Unified process
XP	Extreme programming

1.3 Document History

Version	Description	Date
1.0	First version created	19.12.2011
1.1	Peer reviewed. Document template adopted.	10.01.2011

2 Table of contents

3 Unified Process

The Unified Process (UP) is an iterative and incremental development process. UP is supposed to work in close collaboration with the Unified Modeling Language (UML). A Use Case Diagram is used for requirements capturing. In each iteration the project team is developing a set of use cases entirely, that is all the way from requirements capturing to deployment. When using UP the team is supposed to address all possible risks as early as possible, both in the overall project period, and in each iteration.

The Unified Process consists of four major phases; Inception, Elaboration, Construction and Transition. Within each phase – especially in the three latter ones – it is common to work in iterations.

3.1 Inception

In this phase the project team is focusing on making major decisions for the work to come in the later phases. The scope of the project is established and the use cases are outlined as well as one or several potential system architectures. It is also in this phase that the major risk analysis is done and the project management is setting up a preliminary project plan as well as a cost estimate.

3.2 Elaboration

In the elaboration phase the work done in the inception phase is elaborated upon, with the primary goal being to address the risk factors and to establish and validate the system architecture. The architecture must be validated to ensure that it is possible to implement the major system requirements, which are also captured in this phase. A final deliverable is supposed to be a plan for the construction phase.

3.3 Construction

The project team will in this phase be building the complete system upon the foundation that came out of the Elaboration phase. This phase is the largest of the four and will be divided into a series of time boxed iterations.

3.4 Transition

In this phase the system is deployed at the user's location and feedback is gathered for a future system update. User training and conversion is also included in this phase.

4 Scrum

Scrum is one of several so-called agile software development methodologies which aims to be flexible throughout the whole project period regarding changes in requirements. They also aim to reduce the risk of the stakeholders by developing a part of the final system completely in each iteration.

Scrum represents requirements in terms of user stories. User stories are small stories that describes a specific thing that the system should do for a specific user, and if found necessary, why this is. User stories are added and prioritized throughout the project period by the Product Owner, that is the person that the stakeholders has decided that will represent them towards the Project Team, and are stored in a Product Backlog.

A project team working by the Scrum model is divided into several smaller teams consisting of about ten people at max. Teams work in time boxed iterations of one to four weeks called sprints where each team is supposed to completely develop one vertical slice of the final project. Before every sprint each team picks user stories from the Product Backlog that they commit to fulfill in the upcoming sprint in a sprint planning meeting. After each sprint the workflow and problem areas are discussed in a sprint evaluation meeting meant to improve the cooperation and effectiveness of the team. A so-called daily scrum meeting is a short meeting held each day in a sprint to ensure that the team is on track against their sprint goal and to let potential problems be discovered. Several sprints can be gathered and called a release. In the end of a release the developed software will be polished even more than after each sprint and potentially be shown off for the stakeholders or others.

In each team there is one ScrumMaster. The ScrumMaster's primary role is to address all problems that arise that can influence the optimal progress of the team and potentially result in the team not reaching their sprint goal(s). The ScrumMaster is not supposed to be a developer.

5 Extreme Programming

Extreme programming (XP), as the name hints, is a project model that takes programming to the extreme. That is to take all the beneficial elements of traditional software development to the extreme, on the theory that more is better. XP, like Scrum, is a project model of the agile family, and there are of this reason many similarities between the two.

XP is arranged around four basic activities; Listening, Designing, Implementing, and Testing. Listening is the activity of listening to the customer and produce a list of requirements which in turn the Designing, Implementing, and Testing activities, are supposed to accomplish.

With XP the team is working in short iterations, typically one week, and like Scrum also defines certain releases that is a set of iterations and where the result is a more polished version of the system developed so far. At the start of an iteration and/or a release a so-called Planning Game is done by the team accompanied by the client. At this meeting user requirements, in the form of user stories, are developed and the team is committing to complete a set, or subset, of them in the next iteration/release. Throughout the iteration/sprint the stakeholders can adjust the plan by adding, removing or editing requirements.

XP is known for its practice of Pair Programming where two people is programming on the same computer together. That is one who is writing the actual code and the other who is ensuring correctness of the code, and both taking part in the discussion of how to code. XP is also known for its frequent and in-depth testing throughout the development period.

6 Conclusion

There are mainly two forces pulling on us in a direction of which project model to use, so the decision is not actually one of the group to make.

Høgskolen I Buskerud (HiBU) requires of us to deliver certain documents at certain points in the project period. Many of the documents are typical deliverables in the standard Unified Process pre-face (Inception and Elaboration phases), but are documents that not usually are produced when

following the agile models Scrum or Extreme Programming. The agile models are a lot more straight to the point of development, whereas UP is starting up with a thorough pre-face before the actual development starts. So, in one way our school requires of us to more or less follow the practices of UP, which isn't a factor we can influence.

On the other side we've got our client Funcom. Game development companies in general have the last years more and more converted their workflow towards agile practices. This goes for Funcom as well, working by their own modified version of Scrum. Of this simple reason Funcom urged us to use Scrum as our project model.

When the UP type of requirements are already set from the school there isn't much that the project model choice is actually influencing. Even though we will try to take the practices of Scrum to the largest extent as possible – both because of the urge from Funcom but also because it seems to be the most appropriate model to work by for this project; given the team composition, the fluid requirements, and the good easy-to-understand and clearly defined structure of the Scrum model – this will probably at most influence the day-to-day workflow of the project, as well as maybe some per-iteration planning. We will also be adopting the short iterations of only one week that are usually the case when working by XP. The reason for this is that is gives the team more frequent chances of steering the development process, more frequent - and thereby more improvements of - time estimation for planning purposes, and more frequent evaluation of the development process for the purpose of improving the team's practices. All as a result of more frequent sprint planning and sprint evaluation meetings. It is however possible that the lengths of the sprints will be increased to two weeks after the initial couple of sprints, if we feel that this is more practical. In the start of the main project period we will only be working three days a week on the project and one full week of work (5 days a week) almost equals two weeks of three days a week. Therefore sprints will start out to be of two weeks length.

As a sum-up we can say that we will be following a combination of all three of the described project models; the preface in accordance to the Unified Process, the day-to-day workflow and practices in accordance to Scrum, but incorporating the short iterations common for XP.

Funcom Hardware Statistics System

IDE Document		
Project name		
Funcom Hardware Statistics System		
Client	**Acronym**	
Funcom N.V.	FHaSS	
Date	**Sensors & Supervisors**	
10.01.2012	***Internal sensor***	Olaf Hallan Graven
Author	***Internal supervisor***	Aurilla Aurelie Arntzen
Kent Brian Dreyer	***External supervisor***	Rui M. MonteiroCasais
Group members		
..... Sondre Bjerkerud	..... Sverre Christoffer Thune	..... Kim Richard Johansen
..... Dag Hem	..... Kent Brian Dreyer	

IDE-document

7 General Document Information

Deliverable nr:	D2.4.1
Deliverable type:	Research
Release:	Public
Workpackage:	2
Responsible:	Kent Brian Dreyer

7.1 Declaration of intention

The purpose of this document is to review available IDE options and clearly define which IDE will be most beneficial for us to use for this project, so that the team works with a standardized tool.

7.2 Definitions and Acronyms

IDE	Integrated Developer Environment
VS	Visual Studio
OS	Operating System

7.3 Document History

Version	Description	Date
1	First version created	15.12.2011
2	Document template added Information reviewed and updated	10.01.2012

8 Table of contents

9 Introduction

C# is an official Microsoft computer language and its native IDE is Visual Studio, also developed by Microsoft. There are also a few other good IDE's for C# development, but very few presents all the features and content that we require for our project.

In a sense, the other IDE's will be matched against VS, since it is generally considered the natural choice for C# and the .NET framework.

9.1 Visual Studio 2010 Ultimate

Visual Studio is Microsoft's own IDE for development in C# with .NET framework. The licensing for this IDE is not free, but via the e-Academy agreement with our school we have the possibility to get this license free of charge.

VS is a large software and thus will require more processing power to run than the other IDE's reviewed in this document. This also means that we will be in a safer position later in the implementation phase that we have access to required IDE functionality for our project.

Benefits	Drawback
• Code Snippet Manager(auto generation of code) • Database Designer Tools • Web Forms Designer • Superior auto-complete with Visual Studio IntelliSense • Custom debugger visualizers • Native IDE	• Large software • Reports that VS handles certain functionality suboptimal or buggy • Reported file cache problems • No edit and Continue functionality

9.2 #Develop

#Develop (SharpDevelop) is an IDE for Microsoft's C# with .NET platform. It is open-source and free.

#Develop is a lighter software to run than VS, which can be an important factor in the long run, working with it. The later stable releases of #develop is considered good enough by the community to compete with VS, but is really regarded as a free option to VS if you are on a budget. The fact that it is open source doesn't concern us as we will not spend time modifying the functionality of the IDE.

Benefits	Drawback
• Fast and responsive • Builds projects faster than other IDE's	• Shortcut keys aren't customizable • No edit and Continue functionality

9.3 MonoDevelop

MonoDevelop is another free alternative to VS and it is cross-platform, meaning we can use the same environment to develop on Windows, Mac OS X and Linux. In this project we will exclusively develop on Windows OS for Windows OS so advantages and drawbacks will not be listed as this IDE is severely lacking in the feature department, and is not considered a viable option for us.

10 Conclusion

For this project we will use **Visual Studio 2010 Ultimate** because of the best integration with the intended language. It has most features, including debugger, extensive auto-complete and features we might need in later phases of the implementation.

The sheer size of the IDE is a minor problem, and should not cause any problem for the team. As of the reported issues these are considered to unimportant for us to discard VS as the IDE choice.

11 References

- http://www.icsharpcode.net/opensource/sd/(Last visited 13.12.2011)
- http://community.sharpdevelop.net/blogs/mattward/pages/VisualStudioExpressComparison.aspx(Last visited 13.12.2011)
- http://blog.codebeside.org/post/2011/04/19/replacing-visual-studio-2010-with-sharpdevelop-4-1.aspx(Last visited 15.12.2011)
- http://desipenguin.com/techblog/2009/07/10/why-sharpdevelop-is-better-ide/(Last visited 11.15.2011)

Funcom Hardware Statistics System

Quality Assurance Document

Project name		
Funcom Hardware Statistics System		
Client	**Acronym**	
Funcom N.V.	FHaSS	
Date	**Sensors & Supervisors**	
29.05.2012	***Internal sensor***	Olaf Hallan Graven
Author	***Internal supervisor***	Aurilla Aurelie Arntzen
Dag Hem	***External supervisor***	Rui M. MonteiroCasais

Group members

.....	.....	.....
Sondre Bjerkerud	Sverre Christoffer Thune	Kim Richard Johansen
.....	.....	
Dag Hem	Kent Brian Dreyer	

Quality Assurance Document

12 General Document Information

Deliverable nr:	D2.5.3
Deliverable type:	Guidelines
Release:	Public
Workpackage:	WP2
Responsible:	Dag Hem

12.1 Declaration of intention

This quality assurance document should teach its readers the quality and standard that any of the project group's deliverables should uphold to reach the high quality standard needed to satisfy our client. This document will review the following:

- Group communication and information exchange
- Quality assurance regarding deliverables and documents
- Quality assurance regarding other publications (such as web-blog or posters)
- Code development standard

12.2 Definitions and Acronyms

QA	Quality Assurance
NDA	Non-disclosure agreement
MSN	Microsoft Network (Messenger)
WP	Workpackage
e.g.	Exemplī grātiā (for example)
FHaSS	FunCom Hardware Statistics System

12.3 Document History

Version	Description	Date
1	First version created	20.12.2011
1.5	Peer reviewed	15.03.2012
2	Updated	19.03.2012
3	Document finalization	29.05.2012
3.5	Document reviewed	28.05.2012

13 Table of contents

14 Introduction

As our group consists of persons from very different backgrounds we therefore have many different views on document layout, document and code quality, timeliness, communication and information exchange. This gives us the need for a collected set of rules and guidelines so that we are all on the same level regarding document, code and communication standards.

To ensure the highest possible quality in all our written forms (Deliverables, documents, code syntax and other publications) every member of the project group shall read and apply the rules discussed in this document to their work.

15 Communication and Information Exchange

This section is divided into two parts and contains information regarding the communication flow and information exchange between the members of the project group, the supervisors and our client.

The communications section handles how the group will communicate with others and what communication channels that are used while the information exchange section handles the management of digital files such as deliverables & documents, source files and other project files.

15.1 Communication

15.1.1 E-mail guidelines

E-mail is our main communication channel to both our supervisors and our client and will mainly be used for:

- Announcing completed documents that are ready for comment and review
- Announcing up-coming deadlines to our project members
- Administrating meetings (More information below)
- Notifications about large project changes or changes to the product backlog

While we use E-mail to announce documents that are to be reviewed (or that the review is completed), it is encouraged that comments and changes is added to the document using the built in office tool (See point*16.2.4Reviewing a deliverable*). If any large changes are to be made it should be announced via email to the parties involved.

15.1.2 Regular supervisor meetings

The project group will hold regular meetings with one or more of our supervisors approximately once a week. This meeting may be held in personor via teleconference.

The participants should be given approximately **1 day notification** email ahead of the meeting to give them the opportunity to reschedule. The meeting agenda should also be sent to all participants at least one day before the meeting as well as being placed in our Meetings/Notices and Agendas folder (See section*15.2.1Project files folder (Dropbox)*and section*17.1Notice of meeting, Agenda and Minutes guidelines*).

There should always be a secretary present to take minutes of the meeting that should be edited and distributed to all participants **within one workday** as well as being placed in our Meeting/Minutes folder.

Meeting topics may vary in scope, but will at a minimum, contain the following:

- Project updates on all completed work (Since last meeting) or work in progress.
- Questions from the team to the supervisor(s).
- Work to be done until the next meeting.
- Topics for the next meeting.
- Any conflicts/problems the supervisor should be aware of.

The meeting is always started and closed by the meeting leader; the meeting leader may alternate or change depending on the meeting.

15.1.3 Group communication

The project group will use additional communication means (such as Skype and MSN) between each other for faster and easier communication, however, any major item or news should be announced via email to all affected parties.

15.2 Information Exchange (File sharing)

15.2.1 Project files folder (Dropbox)

The project group will be using a collaboration tool called Dropbox to store and share all our project related files. Dropbox gives us easy access to all our files wherever we are, as well as synchronizing them to the latest version.

Only the project members and our supervisors will be given access to our Dropbox files.

16 Deliverable guidelines

This section covers the structure, layout and routines of the group's deliverables; it also defines the quality process and timelines that any group member should follow.

16.1 Deliverable distribution

Deliverable distribution between members of the project group will usually happen using an ad-hoc communications channel and as a benefit of using the Dropbox file sharing system we will always be able to reach our documents on our workstations. Any completed deliverable should be moved from its temporary folder to the "Deliverables" folder and then to the correct Workpackage.
Distributing a deliverable to either supervisor requires that the document has been completed and reviewed by a fellow project member (See section*16.2.3Pre-completion process*) before delivering the document either by e-mail, cd/dvd or a paper copy.

If a deliverable is to be delivered in paper format it should be printed out in color and stapled together at the top-left corner, also review the document and check if any page-layout errors are visible.

16.1.1 Deliverable list

An updated list off all deliverables and their respective delivery date is found in our Gantt-diagram which all project members and supervisors have access to.

16.1.2 Naming convention

Any completed deliverable should be named after the following format:

D[Workpackage nr] . [Deliverable nr] . [Version] [Document name]
(Ex: D2.5.1 Quality Assurance Document)

Where:

Field	Content
[Workpackage nr]	The workpackage the deliverable belongs in.
[Deliverable nr]	The deliverables number.
[Version]	Starts with**1** Minor changes add **0.5** to the version number. If it has gone through major changes or review it is increased by **1**
[Document name]	The entire name of the document

All the information needed is to be found in the project Gantt diagram where all the documents are listed.

16.1.3 File formats

Any new deliverable should be created from the pre-formatted template (See section *16.2.1Document creation and Structure*) and will therefore be of the Microsoft Office 2007(or later) Word format **.DOCX**.

After a document have been reviewed (See section *16.2.3Pre-completion process*) and completed it should be converted to the Adobe**.PDF** format.

16.2 Deliverable quality process

A deliverable is a document which will be passed to the sensors and supervisors both in electronic and paper form for extensive reviewing; it is therefore of the upmost importance that any deliverable holds the highest standard possible. The quality process is a guideline to make sure the deliverable meets the minimum of requirements, the quality process consists of:

- Having the correct document structure (Introduction, Content, Summary)
- Making sure all technical references are correct and valid
- Any comparison to other work in the field is adequate
- Following the document template
- Correcting any typographical errors such as spelling and sentence structure
- Using correct cross-references if you are referencing something within the same document

In addition, the process is also intended to ensure that every contributor to the deliverable ensures that their submission adequately reflects their intention.

16.2.1 Document creation and Structure

Any new deliverable is to be created from the document template foundin "*../Temporary"*.
This template contains the modified styles that are changed according to this projects color and layout, such as numbered headers, different theme colors and general structure examples.

A newly created deliverable or document that is yet to be completed should be placed in either the "*../Temporary"* folder or any personal folder.

Most deliverables should contain the most basic of content to keep the wanted document structure:

- A front page
- A general document information page
- A table of contents
- An introduction relative to the technical field the deliverable is about
- A summary or conclusion(Where applicable)
- A list of references and sources (Where applicable)

Beyond this, any deliverable should be neatly structured for easy navigation using the correct headers and sub-headers.

16.2.2 Timelines

A document should be completed by its original authors **at least 2 workdays** before the planned completion date, before it is given to another project member for a peer review(See section *16.2.3Pre-completion process*).

The peer review should be done **at least 2 workdays** before the delivery deadline and mailed to the internal supervisor by the original author for a final review.

16.2.2.1 Timeliness & exceptions

It is each author's own responsibility to ensure the on-time completion of their deliverable, and also their responsibility to make sure that each review step is completed on time. The project manager should, however, still keep track of each author's progress and give them a notification if it is believed that their deliverable should take longer than planned.

If a project member feels that their given time will not be enough to complete the deliverable they should discuss this with the project manager.

16.2.3 Pre-completion process

Completed 1st version:
When a document or deliverable is nearing completion its author should take his time to do a complete self-assessment review before deeming it completeand place it in the "Deliverables/[Correct WP]/" folder.

After a deliverable is considered completed by its author it should be reviewed by a suitable peer within the project group, this individual should ideally be:

- Knowledgeable about the subject

- Not a co-author of the document
- Have the time to perform a thorough review

Completed peer review:
After the peer has reviewed the document according to the QA specifications (See section *16.2.4Reviewing a deliverable)*he should update the deliverables versionand notify the original author.

After the original author reviews and accept any changes made by his peer he should place a backup version of the document under the "Deliverables/[Correct WP]/Old Versions" folder before sending it for a final review to our internal supervisor.

Completed supervisor review:
When the internal supervisor has reviewed the document and either applied changes or added comments the original author should go through these and make the appropriate adjustments to the deliverable and updating the document version. After the corrections have been made, the author should update the documents version.

16.2.4 Reviewing a deliverable

To make sure the reviewing process is performed optimally one should always follow these guidelines:

- Fix faulty typography(spell check, punctuation, etc.) and grammar
- Be critic about what you read (mark statements that lack proper citation)
- Optimize the document structure/layout if possible
- Make updates to the document if the document template has been changed
- Add comments and notes where needed.
- Use the "Track Changes" function of Microsoft Office Word
- Update all document references (To files, headings or web pages)

The reviewer should fix any minor errors if possible, but it is the author's job to be aware of and possibly improve any area commented by the reviewer.

17 Other publications and releases

In addition to formal deliverables the project group may from time to time publish material that does not count as a document and may even be open for public viewing; therefore certain guidelines have been created to keep any of our publications at a professional level with the same high quality standard one would find in our deliverables.

Any official project group document shall follow the given document guidelines to the extent necessary and work closely with the quality assurance manager in order to create new guidelines and templates if needed.

If any member of the project group is planning to create a publication or release information under the project group's name they must notify the other members of the group regarding the planned publication and provide the opportunity to both perform a quality check of a reasonable length and gain the approval of the project member's that the publication is bearing the project group's name.

17.1 Notice of meeting, Agenda and Minutes guidelines

17.1.1 Notice of meeting & Agendas

Any notice of meeting and agenda should be created using the Notice of Meeting Template found in "*../Meetings/Notices and Agendas/"*.

17.1.2 Minutes

Any minute from a meeting should be created using the Minutes template ("*../Meetings/Minutes")*, and one should also refer to the Minutes writing guidelines("*../Meetings/Minutes/*") for further assistance.

18 Coding standards and plugins

Because every member of the project group has taken the same classes during their bachelor it is natural that their "way of coding" (coding standard) resembles each other's to some degree, but we are still in the need of some external tools and predetermined set of rules to make sure we deliver code with a high standard and a clear conformitythroughout the project.

The project group will not be weighted down by a large list of specific rules, but rather take use of plugins that are tweaked for our specific needs and a small set of guidelines set by this document.

18.1 Coding guidelines

18.1.1 Naming conventions

It is the project group's intention that our code is easily readable and understandable by external viewers.
CamelCase: The project group will take use of "*CamelCase"* on variables, methods and classes**.** The initial letter is lower case on variables, while methods and classes use upper case on initial letters. (E.g. variable "*gpuModelDictionary"* and method "*RefreshCache*")
Descriptive naming: Every variable, method and class name should be descriptive of their respective purpose without creating unnecessary confusion.

18.1.2 VAR vs. specified type

In many situations it is faster to use a non-specified variable type, but it more often than not complicates code for a reader. A non-specified variable type should mostly be used where the variable has a simple and specific usage (e.g. the *int i* in a for-loop).

18.1.3 LINQ usage

LINQ may sometimes be used to refactor/simplify certain (for/foreach) loops in our code but it should be noted that LINQ is somewhat hard to read and understand for people with little previous knowledge of the system. Only use LINQ where it would be an improvement to the code, and comment it properly.

18.2 Versioning Control - Perforce

Perforce is a piece of version control software to help the project members share and merge their additions to the project in fast and simple manner. Perforce keeps the latest deployment/version of the system on its depot while each team member must “check out” any files they wish to edit and make additions to. After changes have been made, the team member uploads their addition to the project back into the depot.

Any member should only upload files that contain changes to the original file. They should also get the latest revision (if any) from the depot and thoroughly test this with their own version of the project. If everything works after merging with the latest deployment on the depot, the user should write a description explaining the changes they have done and the necessary precautions other users should be aware of (such as schema changes or getting acquainted with the new functionality).

After submitting a new build of the project, it is advised that at least one other project member immediately test this new version to uncover any bugs that might appear due to discrepancies between their versions (if any).

18.3 Plugins

Each student in the project group can and should take use of two additional plugins at their own leisure to help them conform to the set standards.

Each student is responsible for their own licenses.

18.3.1 StyleCop

StyleCop is an open source code analysis tool that helps us use the correct standards when it comes to code naming, readability, ordering, spacing, maintainability and layout amongst others. ReSharper helps us maintain our code standards and thereby keep the code as easy to read and structured as possible without hampering implementation.

We have implemented Funcom’s StyleCop rules into our own add-ons to make sure our codefollows our client’s standard.

Each student using StyleCop is advised to take use of the *configuration file*located in *“../Other/Settings.StyleCop”*

18.3.2 ReSharper

ReSharper is a refactoring and productivity extension used to point out bad programming practices and better solutions to our code. It is a tool that helps us with hints, errors and warnings to make sure our code is as quick and clean as possible.

We have implemented Funcom’s ReSharper rules into our own add-ons to make sure our code follows our client’s standard.

Each student using ReSharper is advised to use the*configuration file*located in *“../Other/ReSharper_CodeStyleSettings.v6”*

19 References

- http://blogs.msdn.com/b/sourceanalysis/ (Last visited 24.05.2012)
- http://www.jetbrains.com/resharper/ (Last visited 24.05.2012)
- http://www.perforce.com/ (Last visited 24.05.2012)
- https://www.dropbox.com/home (Last visited 24.05.2012)

Funcom Hardware Statistics System

Version Control Document

Project name		
Funcom Hardware Statistics System		
Client	**Acronym**	
Funcom N.V.	FHaSS	
Date	**Sensors & Supervisors**	
29.05.2012	***Internal sensor***	Olaf Hallan Graven
Author	***Internal supervisor***	Aurilla Aurelie Arntzen
Sverre C. Thune	***External supervisor***	Rui M. Monteiro Casais

Group members

.....	.....	.....
Sondre Bjerkerud	Sverre Christoffer Thune	Kim Richard Johansen
.....	.....	
Dag Hem	Kent Brian Dreyer	

Version Control Document

20 General Document Information

Deliverable nr:	D2.6.1.1
Deliverable type:	Research
Release:	Public
Workpackage:	2
Responsible:	Sverre C. Thune

20.1 Declaration of intention

The purpose of this document is to decide which version control system is best to use for our project.

20.2 Definitions and Acronyms

Impact	The damage caused to our project.
API	Application Programming Interface
NDA	Non-Disclosure Agreement
TSW	The Secret World
ID	Identity
IDE	Integrated development environment
Crash	When a program unexpectedly stops running
P4	Perforce, version control software
SVN	Subversion, version control software
Revision	A version of a file in the files history
Check out	A user checks out a copy of a file from the server which he can edit
Check in	A user checks in an edited copy of a file so the server so the server has the latest revision
Merge	Combine the changes from two users on the same file
User	A developer in the team

20.3 Document History

Version	Description	Date
1	First version created	16.12.2011
1.1	Supervisor suggestions integrated	03.01.2012
1.5	Updates after document review	29.05.2012

21 Table of contents

22 Introduction

In this document we will take into account that IDE document (our deliverable about which IDE we are going to use) concludes that we are going to use Visual Studio 2010 Ultimate to write code. So a prerequisite for this document is that we are using the Visual Studio 2010 Ultimate IDE and therefore need a version control system that works well with Visual Studio.

To work simultaneously on the same Visual Studio project we need a version control system. The purpose of this document is to decide which version control system is best to use for our project.

Certain operations that we need to do will be tested in the different version control systems. This includes installing the server and client, adding files, checking out files, checking in files, merging files, viewing changes between revisions and reverting to an older revision.

23 Version Control

Version control is also known as revision control and source control.

A version control system is software that keeps track of the history of your project, including code files, documents and any other type of file that you want to track. It is also a tool for sharing a project so that multiple people (a team) can work on the same project (even the same files) simultaneously. This is done by having a server which hosts the main project, every file that belong to the project is stored on this server. A user (a developer in the team) can then connect to the server and "check out" the files he is going to work on. When the user is finished working on the file he needs to "check in" the files he edited, so that the new revision is stored on the server. When a file is checked in, it becomes a part of the current revision of the project. Before it is checked in it is just an unfinished temporary copy of the file.

There are some criteria for checking in files that should be followed. The most important is that the project should always be able to build on the client before checking in updated files. If you check in a file that makes the project unable to build, this can lead to everyone working on the project to be not able to build. Never check in files that does this. Also every check in should have a comment attached that shortly describes what the changes are.

24 Perforce

Perforce (P4) is a version control system developed by Perforce Software. You can use P4 for free with either two users and five workspaces or unlimited users but up to 1000 files.

Installing the P4 server is very easy, you only need to download the installation file and run it. You need to make sure that the clients can connect through the firewall on the server, if there is one. The P4 GUI client is also as easy to install. When the client is installed you just run it and connect to the server with the IP address of the server. You also have to create an account to connect, but it is really fast to do it. Just input a username, if you want, a password, and an email address and you are ready to connect. You also need to install and set Visual Studio to use the Perforce SCC plug-in.

Setting up a project to use P4 is straightforward. First you create a project and then "add the solution to source control" in Visual Studio. After that, adding a file to the version control is easy. Just create

the file in Visual Studio and it is automatically added to the pending change list. Check in and the new files are added. To submit changes you are required to add a comment describing what the change is. This way it is easy to track the history, since you can view the comments of every change submitted. You can also use the P4 GUI client to add files, which can be useful for adding other types of files than code to the version control.

If files have been changed by other users, after you refresh your P4 GUI client (by pressing F5) you will get a notice that there is a new revision. By choosing "get latest revision" you download the newest changes from the server.

Checking out files can be done either manually through the P4 GUI client or automatically in Visual Studio just by starting to write in the code file. You can even see if files are checked out by other users and by whom.

After you are done editing a file (or multiple files) you need to check them in, just like when adding new files, you then have to submit the change in the "pending" list. As mentioned earlier, to submit you are required to add a comment describing what the change is. This way it is easy to track the history, since you can view the comments of every change submitted.

If two different users have checked out the same file and both wants to check them in a conflict occurs, and it has to be resolved. This can be done be merging the files. P4 has a tool for this, which works very well. You can view the changes from both of the users and compare them to both the current revision on the server and the automatically merged file. If you are happy with the result, accept the merge and re-submit the merged result. You can also edit the merge to your liking.

You can compare different revisions of files by using the "diff" function in the both visual studio and the P4V GUI client. Changes between the revisions are displayed very well and it is easy to understand. It is also no problem reverting to an older revision of a file.

Deleting files locally can create problems. You have to delete files with the P4 GUI client so the server knows. If you delete a file locally, it will not be downloaded again on successive updates because the server thinks you already have it. If this happens you may need the clean your local copy and download it again, which can be time consuming. By just making sure to delete files with the P4 GUI client this problem is avoided.

25 Subversion

Subversion is an open source version control system developed as a project of the Apache Software Foundation. There are different software that uses this open source project as a basis. For the server we will test "VisualSVN Server", and for the client we test "AnkhSVN", because these are free and recommended by multiple people (on stackoverflow.com). Throughout the document "SVN" (Subversion) will be used to refer to this system.

First we have to install the subversion server "VisualSVN Server". You have to set up users/accounts on the server which clients can connect with. Then we install "AnkhSVN" on the clients, which is the plug-in for Visual Studio. The installation process is straightforward and without problems.

Setting up a project to use SVN is straightforward. First create a project and then "add the solution to subversion" in Visual Studio. Commit the changes and it is done. After that, adding files works very well, just like with P4, you just have to create the file in Visual Studio and it will automatically be added to your pending change list. Then you just have to commit the change and the file is added.

Checking out files is also very easy, it is completely automatic, just start writing code in the file and it is checked out. With this plug-in you can't see if there is someone else who have checked out a file. Also you cannot see if there is a newer revision of the file on the server, you have to manually check if you can get a new revision.

Checking in files is also simple, just like with P4. Every file you change is automatically added to a pending list. Just click "commit" and the files are checked in.

The merging tool works well enough with AnkhSVN. The new code from two users is merged automatically, but some extra lines are added that show which user that part of the code was from, these extra lines you will need to remove manually before committing the change. There are also not simultaneous views to compare the different revisions that you want to merge.

Comparing changes between different revisions in the history of a file is simple. Right-click and choose view history and then choose two revisions to view the changes. It is simple and easy to use. There is no problem reverting a file to an older revision.

26 Other Systems

GIT and Mercurial are two other version control systems that could be used. They include similar features to P4 and SVN, but the server set-up is more complicated than just installing and running it (command-line seems to be unavoidable). Because the setup is not simple enough, these two alternatives are discarded and will not be compared or taken into account in the conclusion.

27 Comparison

The installation process for P4 and SVN are both quite easy. You only need to install one plug-in for each of the version control systems, but by also installing the P4 GUI client you get some extra features. For example being able to see if there are newer revisions of files on the server just by pressing refresh (F5) is one of these features that are very useful. With SVN this is not available.

Adding new files, checking out and checking in files in a project are easy with both systems, within Visual Studio it is done almost identically. You can also use the P4 GUI client.

Both systems have tools to merge a file edited by two different users. The merge tool in P4 works better than the merge tool in SVN. In P4 you can simultaneously view the current revision on the server, the two new revisions from the users and the automatically merged version. Changes are easily done and saved if needed. The tool with SVN works alright, but not as good as P4. The new code is merged, however some extra lines are added that show which user that part of the code was from, these you need to remove manually before committing the change. With SVN you also don't have the nice simultaneous view of all the revisions.

Viewing the changes between revisions of files is easy in both systems, but P4 does have better graphical representation of the changes. The lines highlighting the changes are linked between the views for the different revisions.

Reverting to an older revision works well and similarly with both systems.

28 Conclusion

Both systems work very well and include the features we need for our project. However, P4 is the optimal choice for us, because of the feature to easily view which revision of a file you have compared to the server, and if other users have checked out files. Also the merge tool in P4 is also better and easier to use.

A potential problem with P4 is that the free version will only allow 1000 files when working with more than two users. This is not a problem with SVN, but it is unlikely that our project will contain so many files, so P4 is still preferred.

29 Sources

- D2.4.1 IDE Document.docx project FHaSS (Last visited 03.01.2012)
- http://stackoverflow.com/questions/157429/what-are-the-benefits-of-using-perforce-instead-of-subversion (Last visited 16.12.2011)
- http://www.perforce.com/ (Last visited 19.12.2011)
- http://ankhsvn.open.collab.net/ (Last visited 19.12.2011)
- http://stackoverflow.com/questions/453481/what-subversion-plugins-for-visual-studio-are-there(Last visited 19.12.2011)
- http://johnhforrest.com/2010/09/how-to-subversion-server-for-windows/(Last visited 20.12.2011)

Funcom Hardware Statistics System

Design Document		
Project name		
Funcom Hardware Statistics System		
Client	**Acronym**	
Funcom N.V.	FHaSS	
Date	**Sensors & Supervisors**	
28.05.2012	***Internal sensor***	Olaf Hallan Graven
Author	***Internal supervisor***	Aurilla Aurelie Arntzen
Sverre C. Thune	***External supervisor***	Rui M. MonteiroCasais
Group members		

.....	.....	.....
Sondre Bjerkerud	Sverre Christoffer Thune	Kim Richard Johansen
.....	.....	
Dag Hem	Kent Brian Dreyer	

Design Document

30 General Document Information

Deliverable nr:	D4.1.16
Deliverable type:	Report
Release:	Public
Workpackage:	Independent
Responsible:	Sverre C. Thune

30.1 Declaration of intention

The purpose of this document is to present our design for user stories in the sprints. Each section of the document contains the design for a specific user story or larger overall updates to the design.

30.2 Definitions and Acronyms

FHaSS	Funcom Hardware Statistics
ASP.NET MVC3	ASP.NET MVC3 is a framework for how code should be structured using the Model View Controller pattern.
WCF Service	Windows Communication Foundation Service
nHibernate	A library for accessing a database
UML	Unified Modeling Language
OS	Operating System

30.3 Document History

Version	Description	Date
1	First version created	26.01.2012
1.5	Updated class diagram after review and feedback of the document from Funcom employees Lorenzo Aurea and Hans Birkeland	26.01.2012
2	Game filter design, added database diagram and server filter design	07.02.2012
3	Added design for CPU speed grouping	12.02.2012
4	Added redesign of WCF web service (Sondre). Added new database and parser design (Sverre) Added CSS & UI Design (Dag)	15.02.2012
5	Added design for GPU manufacturer and vram	23.02.2012
6	Added design for memory and os	29.02.2012
7	Added Redesign of responsibilities of WCF and Parser, and GPU user story (Sondre).	01.03.2012
8	Added HWParser Interface design (Dag)	01.03.2012
9	Update design with CPU model	14.03.2012
10	Updates after code review / before first deployment	19.03.2012
11	HighCharts	18.04.2012

	Geographical Location (Dag)	
12.0	Windows service	24.04.2012
13.0	General model relation search / manufacturer	27.04.2012
14.0	Hard disk information	04.05.2012
15.0	Filter storage and URL, exception handling and logging, caching	09.05.2012
16.0	Final updates after document review	28.05.2012

31 Table of contents

32 Introduction

The purpose of this document is to present our design for user stories in the sprints. Each section of the document contains the design for a specific user story or larger overall updates to the design. This document will be expanded when we create new designs throughout the project period, so one can see how the system has evolved. UML diagrams are used to describe the system, so general knowledge of UML is recommended to fully understand this document.

33 Game filter

Our first objective is to complete the "Game filter" user story. The goal of this user story is to display how many entries there are per Funcom game in the HW_INFO table.

There is no column in the HW_INFO table that tells us which game the row of information is connected to. There is however a column called Universe, which stores the name of the universe (server). We can use the universe name to find out the game. To do this we will create a table that contains different games and a table that contains the different universesand relations between these two tables so that when one searches for one specific game it will search through all the universes connected to that game. Below (figure 1) you can see the tables that will be in the database.

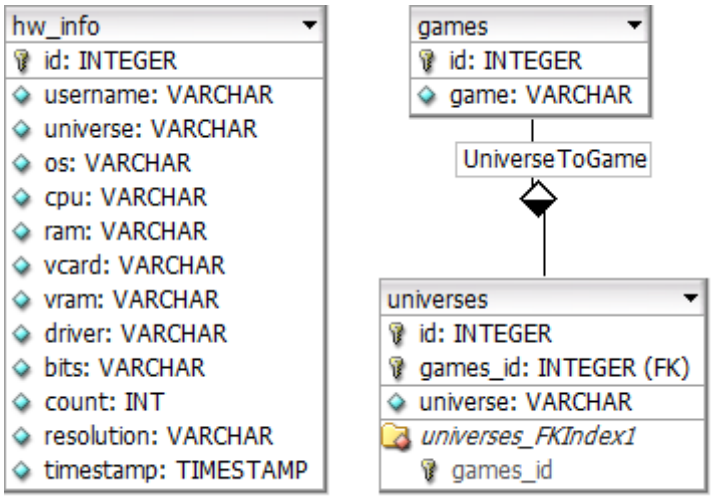


Figure 1 Database tables

The overall system will contain two applications. The WCF Service Application where the database queries and calculations will take place, and the ASP.NET MVC3 Application which is the web side application that displays the information from the database.

The WCF Service Application contains the IReadDataService.cs which is the interface of the service and the ReadDataService.svc which implements the interface. There are also the mapped classes which nHibernate uses to communicate with the database tables. Below (figure 2) shows the classes that will be in the ReadDataService application.

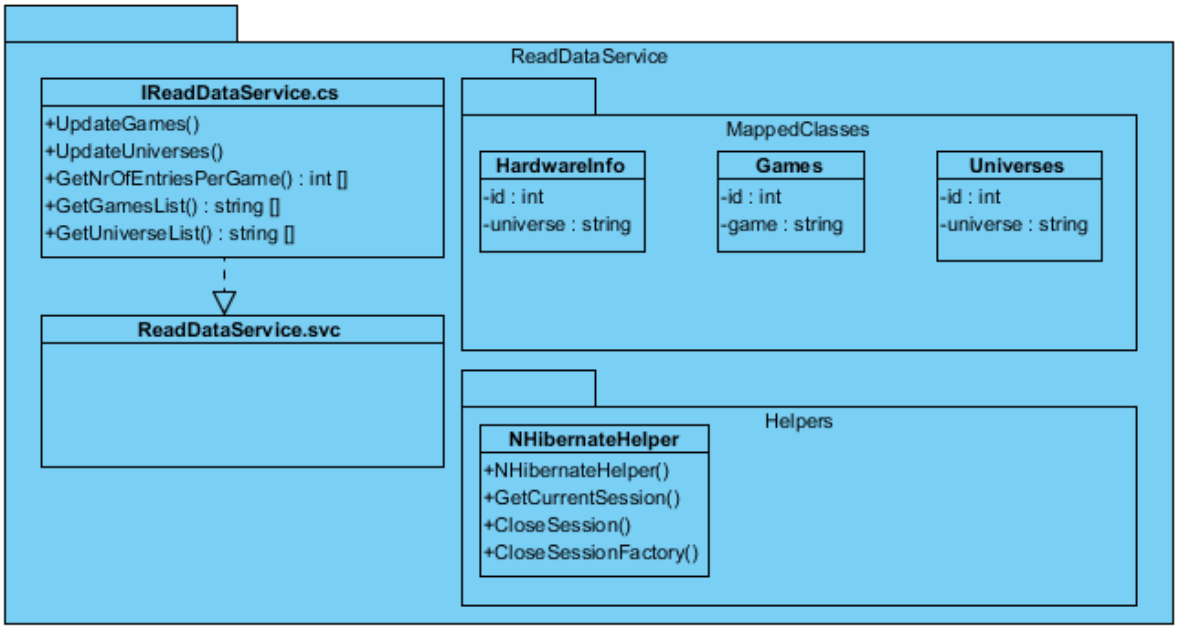


Figure 2 ReadDataService class diagram

By finding the universes that exist in the HW_INFO table, the system won't need to be updated in the future, as it will automatically detect new universes when they are added to the database. You only need to set up the new relations between the games and the universes, so that application will take the new server into account.

The ReadDataService will need a method that updates the Games table with all the distinct games and a method that updates the Universe table with all the distinct universes. Also a method that counts how many entries there are per game in the games table, and hold these numbers in a list.

ASP.NET MVC3 Application will have models to get the required information from the service, and we also need an appropriate controller and a view to finally display the amount of entries. We are also going to have a model, controller and views to let the user set up new game-to-universe relations easily through the web interface. Below (figure 3) you can see a figure of these classes. (The views are not really classes, however it is an important part of the MVC pattern so I decided to include it here).

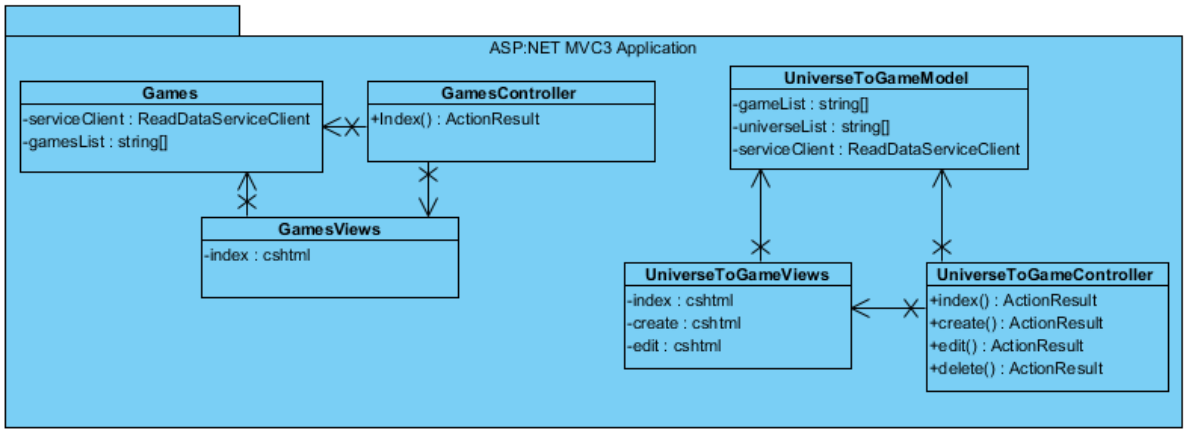


Figure 3: Game filter class diagram

The second user story is about the server (universe) filter. It should function like this: the user select the game, and then a specific server for that game. The view should then display the number of entries for the specific server for the game. A server is also called a universe, which is the name used in the database tables. See figure 2 (below) for a activity diagram describing the flow of events in this user story.

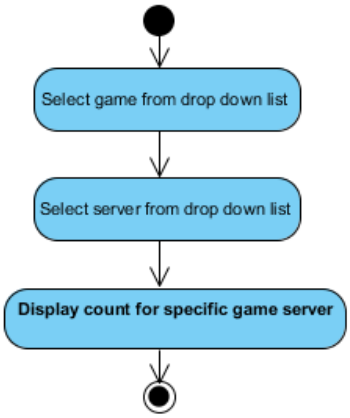


Figure 4: Server filter activity diagram

This user story will mostly use the same classes as the last one. The reason for this is that we already had the need for retrieving universes in the game filter user story, so most of the logic is already in place. Some methods will be created or modified in the ReadDataService to reach the desired information with new queries.

34 CPU Speed grouping

This user story entails showing CPU speeds by brackets starting at 1 GHz and incrementing with 400Mhz per bracket. We want to display both the number of entries within a speed group and the percentage that speed group is of the total.

Currently the CPU information is stored in the CPU column of the hw_info table. The information stored is the full line copied from a dxdiag file. This means that there is a lot of extra information stored, so we need to parse the CPU speed. To do this we will create a few new methods in the

ReadDataService (figure 5). This includes a method to get a list with all the CPU information from the database, a method to filter the strings and a method to count for the different speed groups.

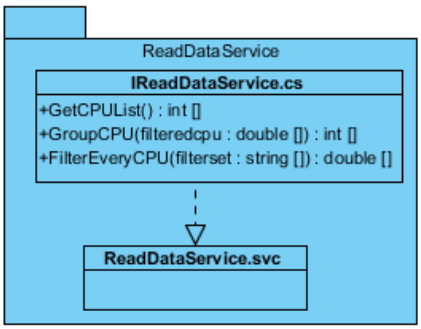


Figure 5: CPU grouping methods for the ReadDataService

A new model, controller and view (figure 6) also needs to be created so that we have a specific page that displays the information in this user story.

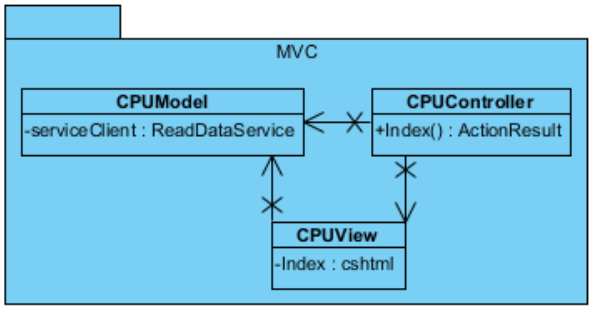


Figure 6: MVC Classes

After the second iteration it became clear to us that using the original hw_info database table by parsing the columns for the information we want (for example CPU speed) is very inefficient. The parsing of strings takes a lot of time so it is impossible to fulfill the performance requirement of max two seconds load time when searching through large amounts of data. However, if the hardware information we want is already parsed and stored in a way so that we can directly extract it from the database, it will go fast. Therefore we are going to create a new database with the exact information we want, and a parser that will be used to get the information from the original database to the new one. This is a temporary solution, in the future we will use integrate this into the current system that Funcom have, replacing the parser they have now instead of having an extra.

34.1 The new database

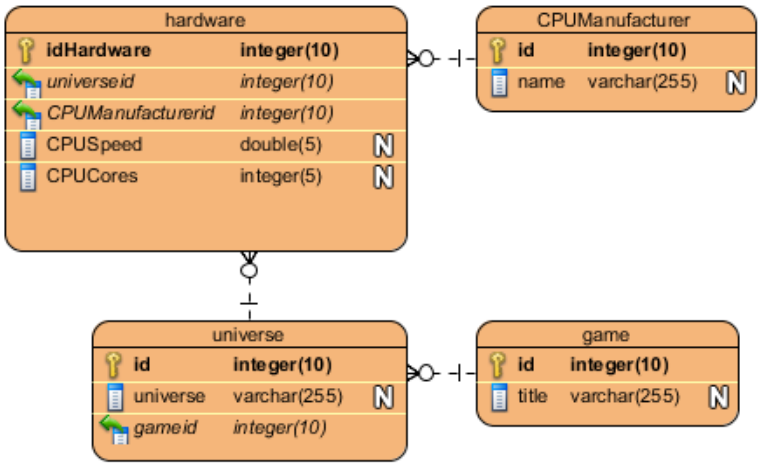


Figure 7: Database diagram

The new database (figure 7, above) will contain multiple tables, with the main table being the hardware table. The columns will as mentioned only contain the exact information we want. So the CPUCores will contain e.g. the integer 4, meaning four CPU cores.

34.2 The parser

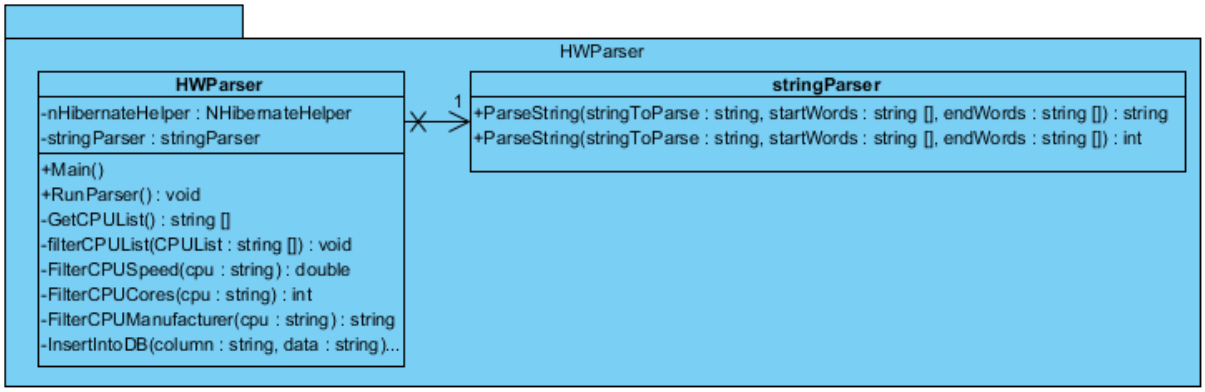


Figure 8: HWParser class diagram

The parser will contain the classes in the figure above (figure 8). The stringParser will be a class with methods to parse a general string based on a start and end keywords. E.g. "@" as start keyword and "GHz" as end keyword. In some cases the strings stored will need extra checks to be able to find what we want, as not every string use the same format.

Each of the filter methods in the HWParser will have specific keywords and this way find the desired result. Depending on if the result returned is text or a number we want to return a string or an integer, therefore we will need different methods in the stringParser that can return different types.

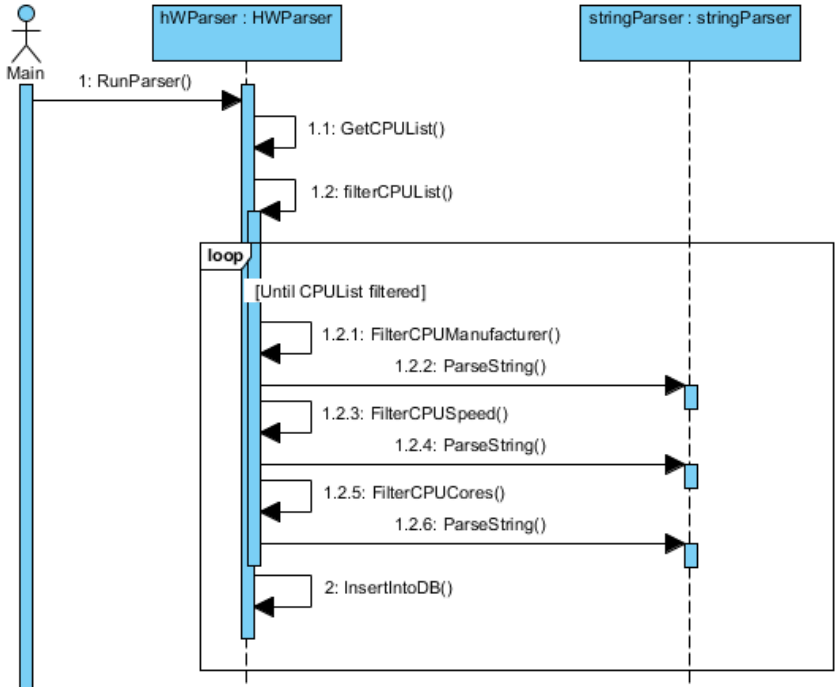


Figure 9: HWParser sequence diagram

The figure above (figure 9) shows how the parser will work. The RunParser method starts the sequence. First the GetCPULList method is called, this is going to return all the rows contained in the CPU column in the original database table (hw_info). This method should use nHibernate to communicate with the database. Then the FilterCPUList receives the list of strings containing the CPU information and runs a loop the calls the different filter methods that filters each string in the string list for the desired information. After a string is filtered the returned values will be inserted into the new database with the InsertIntoDB method (which will also use nHibernate). The loop continues filtering each string and inserting the information into the new database until the whole string list is filtered.

The parser will run in a console application containing a Main method with a loop that starts RunParser after a certain amount of time has passed. This console application will therefore need a timer to keep track of how much time has passed, so it will know if the RunParser method should be executed.

34.2.1 The Parser interface

Since the parsing and grouping of tables happen automatically as data is entered into the system or each time an administrator changes the grouping rules there is the need for an interface where it is possible to check the parser and grouping threads status due to their complex nature and long runtime.

Due to the nature of the current database structure and size we need to create a user-friendly interface to handle the separate parsing thread. The interface will provide basic functions to the user of the system so that they can control the parser and view parsing statistics without having access to the underlying systems.

To achieve this, the parser will be controlled by the help of an admin web-page where the user can start and stop the parser while reviewing the parsing status. The parser is design to run its own thread and terminate gracefully when the user so chooses.

The only communication between the parser and the web-page is by the model, and the model will call methods in the parser to achieve its goals. The MVC framework communicates in the normal way.

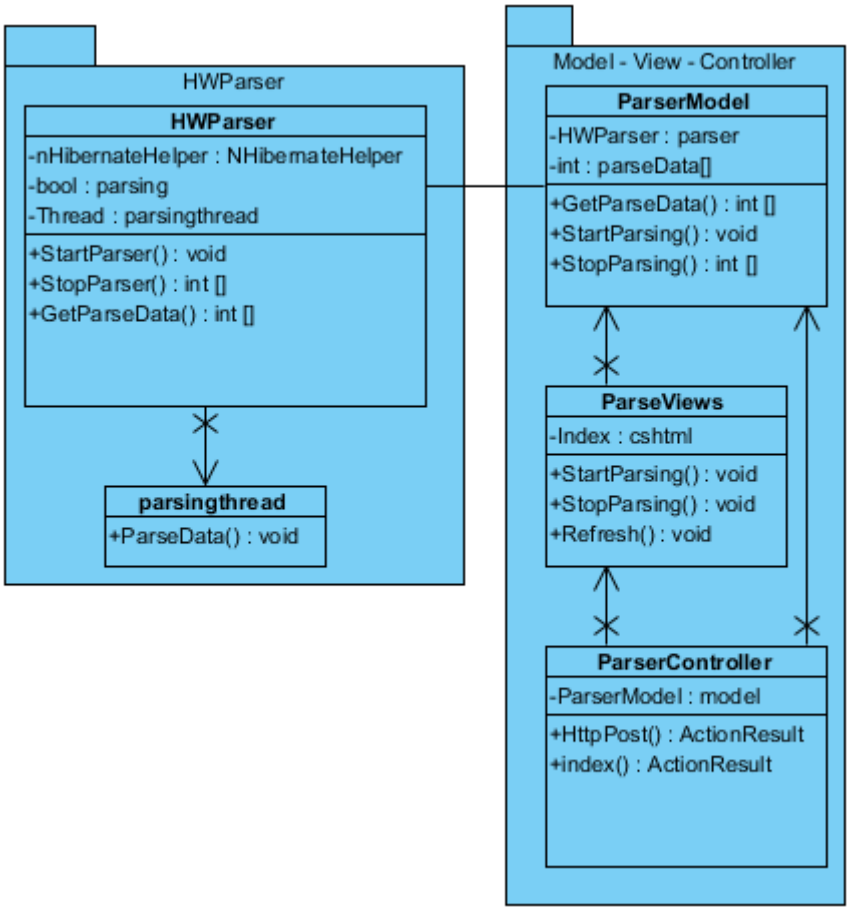


Figure 10: Class diagram of HWParsers interface system

The solution to graceful threading is to use a **volatile Boolean** to exit the while loop sustaining the thread alive.

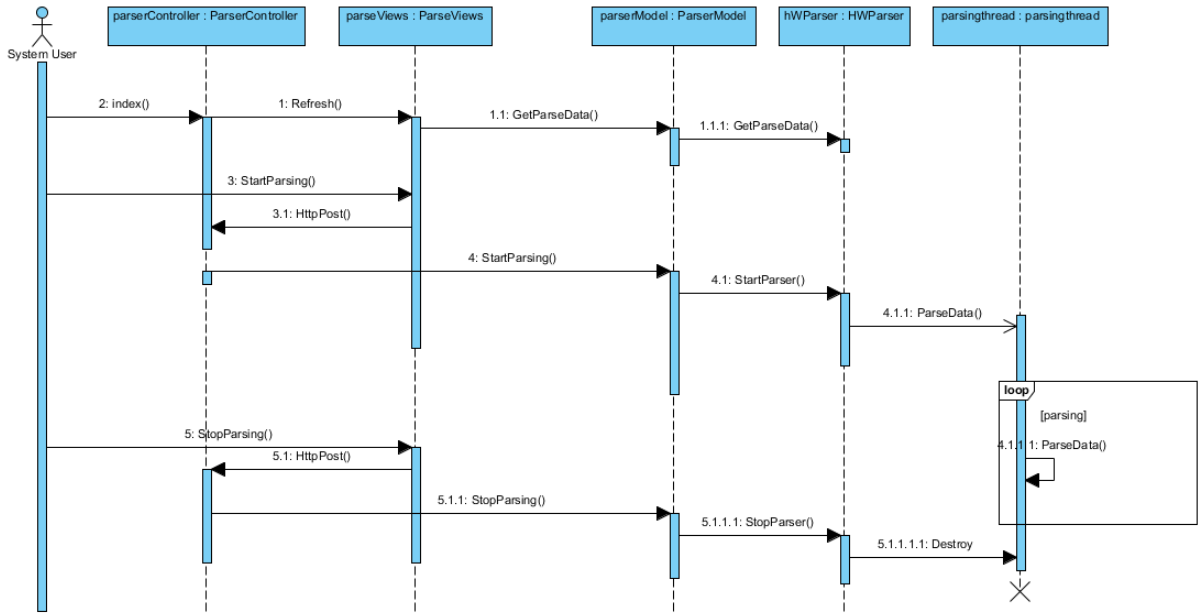


Figure 11: Sequence diagram of parser interface

As we can see from the diagram above, the MVC framework communicates through normal means while the parserModel calls method in the parser.

35 Redesign of the WCF web service

After discussion both internally and externally with the external supervisor and employees at Funcom we came to the solution to add a parsing application layer between the current hw_info table and a new hw_info table. The addition of this parser made it clear that some of the functionality that the WCF service currently possess would be transfered to this new parser layer.

After our discussion about the parser we also understood that the way the WCF service is currently handling queries to the database could be improved. We decided therefore to implement a more general database fetching method that is responsible for building up a query dynamically. The query shall be built based on filtering criteria given by the client (MVC) as arguments to the fetching method. This new method will also have the responsibility of sending the fetched result to private grouping methods in the WCF where the data will handled and grouped according to the requirement specifications. Lastly the method is responsible for returning the result back to the client.

Since the rules of WCF web services sets restrictions on what types of data can be returned to the client we had to think of a good way for returning the fetched and processed data. The conclusion we came to was to create two new classes; FetchResult and FetchResultPart, which has the responsibility of storing the results produced from the grouping methods. An instance of FetchResult, built up by a set of FetchResultPart's, is then returned to the client.

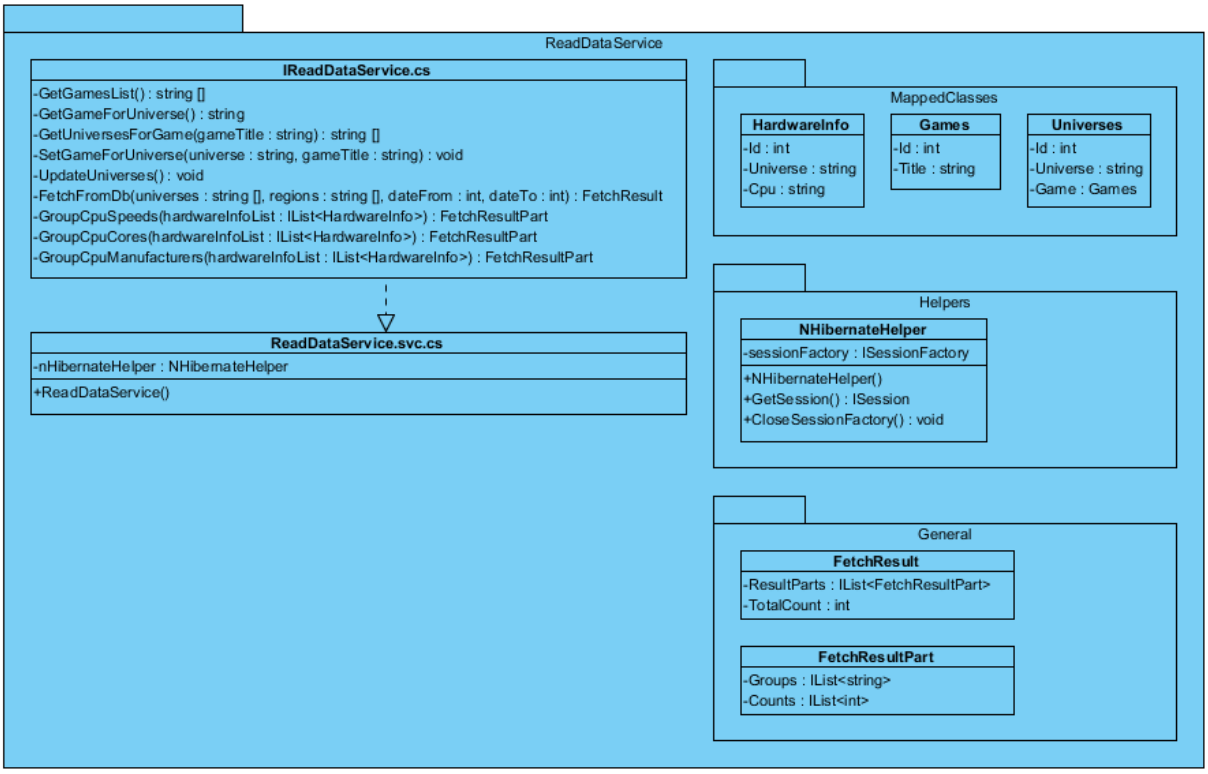


Figure 12: ReadDataService class diagram

After feedback from a Funcom employee we also decided to make the NhibernateHelper non-static, and instead initiate an instance of it in the ReadDataService.svc.cs class. Since the UpdateUniverses method will be run in its own thread we concluded to open a new session from the NhibernateHelper for each time our system is talking with the database.

36 Designing the page layout

The web-page design and layout have so far primarily been designed through internal discussion within the team as we add functionality to the page (such as the hardware statistics table).

Both we and our client have the need of a layout mockup and CSS design so that we have something steadfast to iterate on while we also make sure that our vision of the system matches with our clients. Because the system is still in its early stages there is a lot of unknown functionality that we cannot account for (or it simply isn't implemented yet) but we can still create a general layout for the page, and CSS styles from that.

The early designs were created from the idea that our system should replicate a similar system (Steam Hardware Survey©) in terms of functionality and appearance and from that a few key elements were quickly in place like the evolution charts, hardware statistics table, header and footer.

Our distinguished feature is the filter menu which can (in some situations) take a lot of room while it still needs to be readily available on the page. In addition to this we need to display meta-data (information about the selected entries) to the user as well as figure out how the menu, charts and table should behave from user input.

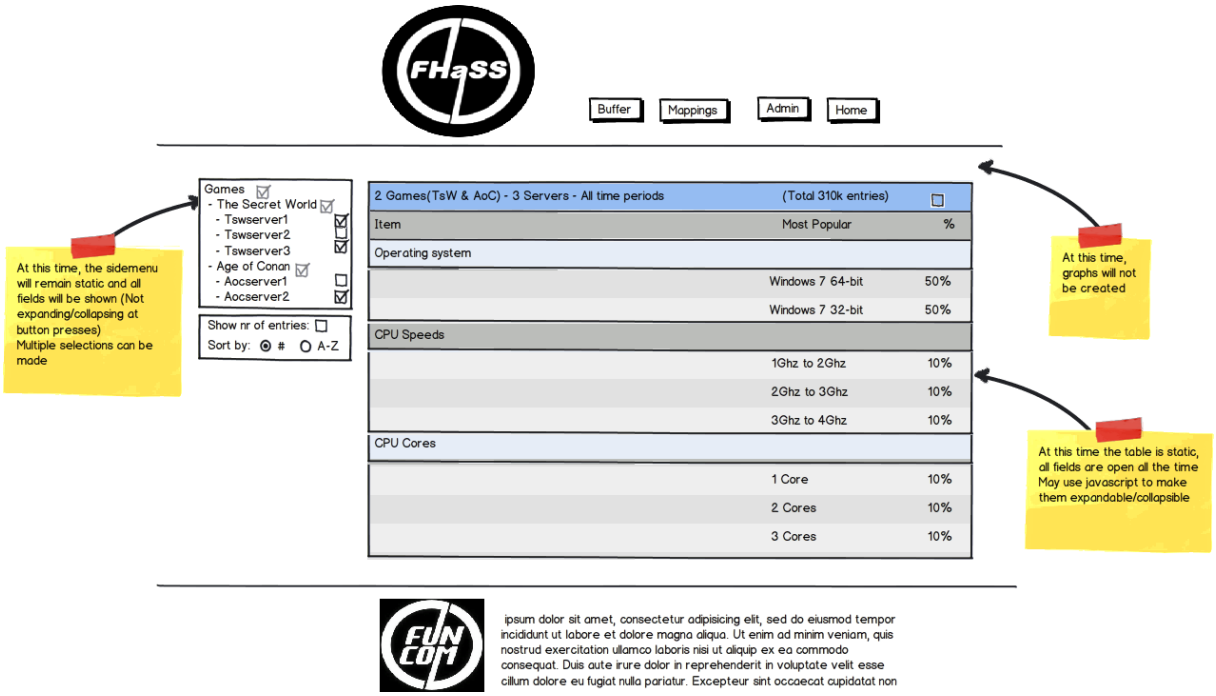


Figure 13: Early page design

In the earliest design it became clear that the filtermenu felt most natural on the left hand side of the page, it also seemed natural that the meta-information about the entries (where the data comes from in terms of universes, countries and time period) should be displayed in the table. Site navigation buttons also fit very nicely centered at the top of the page.

After getting good feedback about the initial design by our client we were confident that our vision of the system matched up with our clients. A few more mockups were created to illustrate different solutions we could have chosen for our page which in turn gave us some ideas for where to place the future functionality, but the layout itself stayed true to the original designs.

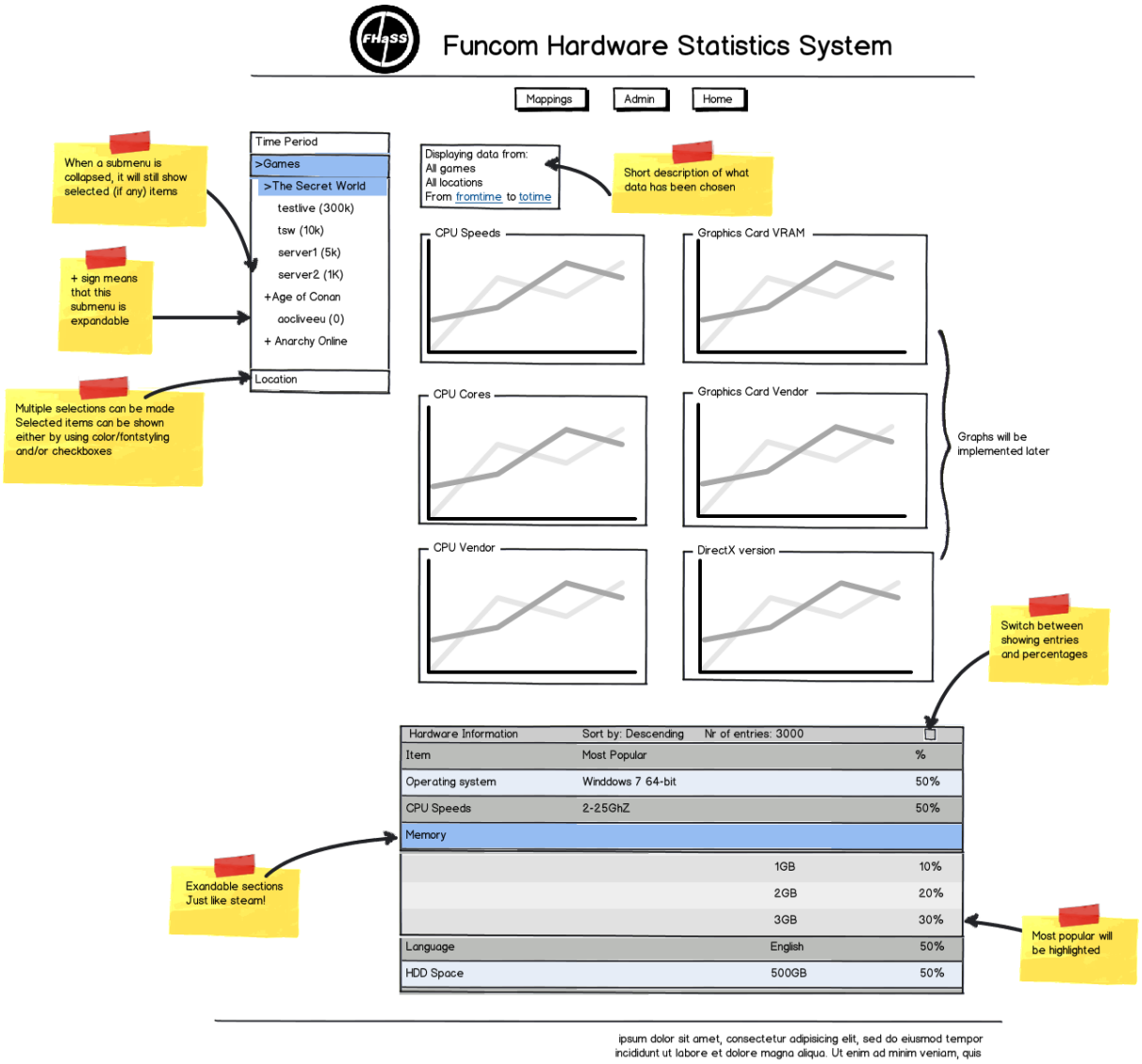


Figure 14: Final iteration

The final iteration design became a bit more complex as we factored in functionality that have not yet been planned (let alone implemented). The UI's behavior became more defined in this iteration when it comes to markings, expandable/collapsible fields, dynamic fields and how information should be displayed.

All in all, the design is quite simple but offers a clean natural look making it intuitive and easy to use for new users. Tooltips will also be implemented in a later stage to let users get acquainted with both the advanced features of the system as well as some tips and tricks.

As the mockup was done, the next step was to create a basic CSS layout for the main page which would prepare the page for implementation of the filtermenu amongst other functionality.

37 GPU Manufacturer and VRAM

This user story will add information about the GPU manufacturer and vram for the user to see information about. One should be able to see how many players use ATI, NVIDEA or Intel GPUs in both numbers and percentage and also how much vram they have.

The HWParser needs to be updated so it will filter the vcard column in the hw_info table for the manufacturer and the vram column for the amount of vram. Also the database needs to be extended to include this new information. Below are updated diagrams illustrating this.

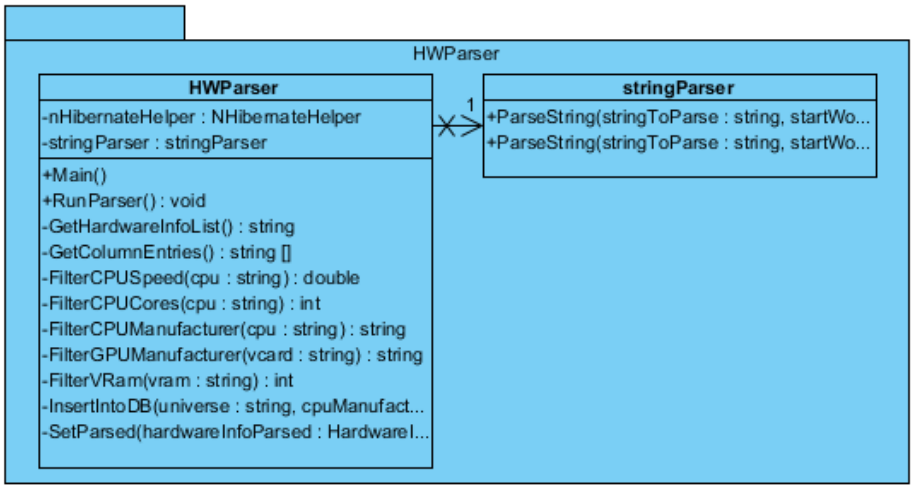


Figure 15: GPU methods added to HWParser class

The class diagram above (figure 11) shows the new GPU related methods and also some changes that were done to the design during implementation of the previous user story.

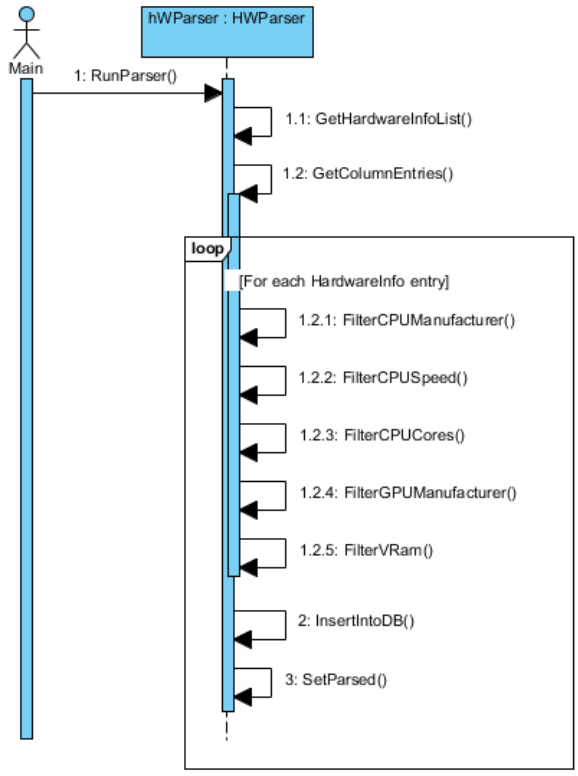


Figure 16: GPU methods added to HWParser sequence

The sequence diagram above (figure 12) shows how the GPU methods in the sequence for the HWParser and also some changes that were done to the design during implementation of the previous user story. The best way to actually transfer the GPU information to the new tables will be to delete all the previous entries and run the parser through fully once more.

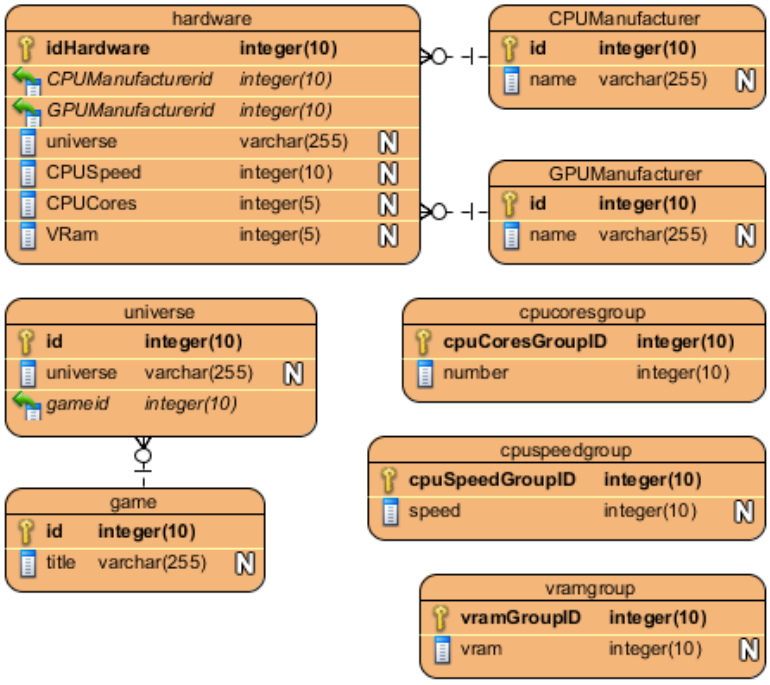


Figure 17: GPU info added to database

Above (figure 13) displays the additions to the database to store the GPU information. There is a new table that will contain the existing GPU manufacturers and the hardware table have a new foreign key and vram column.

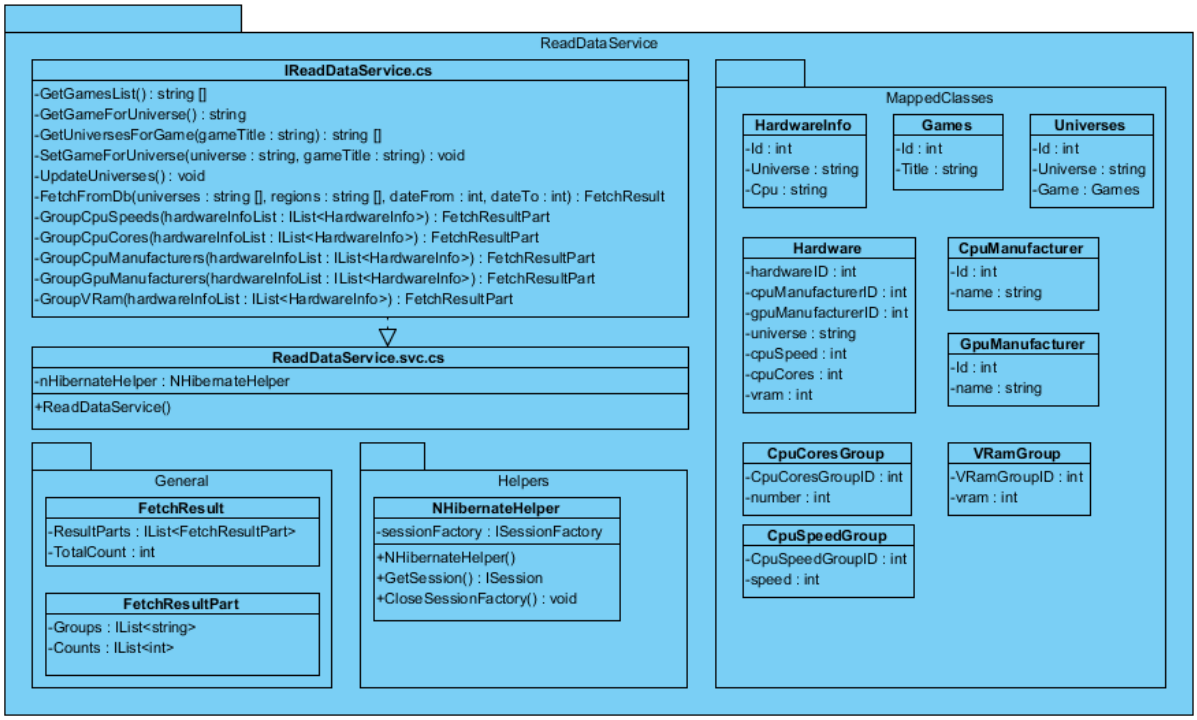


Figure 18: ReadDataService additions

The ReadDataService and the MVC also needs to be updated to include the GPU information (figure 14, above). First of all there is the mapped classes for the additional tables needs to be created. Then we have the new grouping methods for the GPU manufacturer and the Vram which will be similar to the previous grouping methods.

In the end the MVC also needs to be updated to display the GPU information the same way as for CPU information. Also new MVCs needs to be added for administrating the GPU manufacturer and VRam groups so that a user can manually change these.

38 Memory and OS user stories

For the memory user story we want to be able to see memory information by groups of memory amount. The OS user story includes windows version, bit version and DirectX version. For now we do not have any information stored about DirectX, so we will skip it.

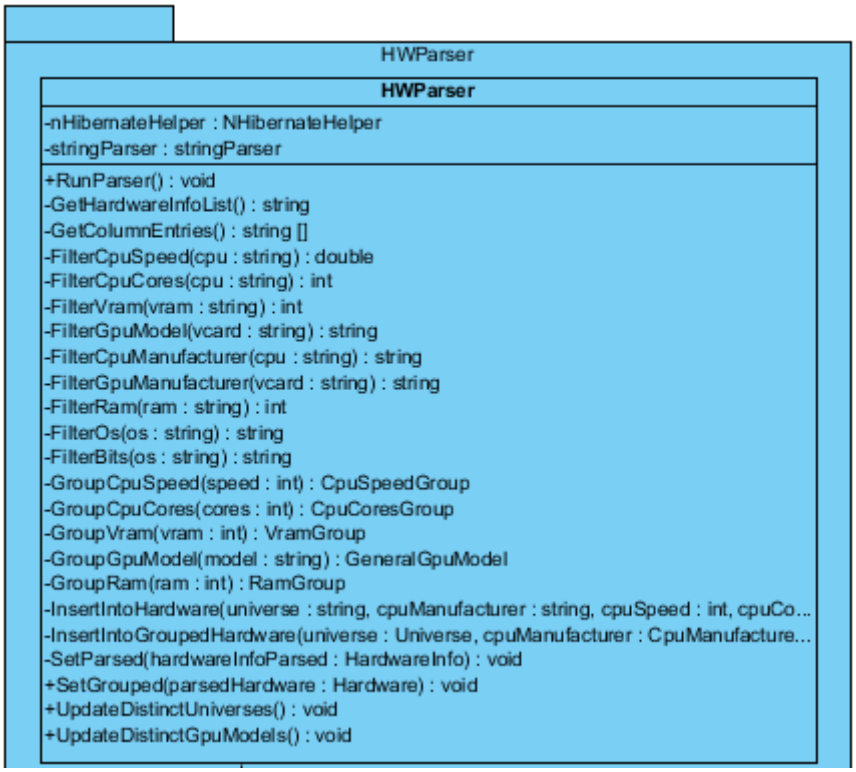


Figure 19: Memory, OS and bit methods

New filter methods needs to be created to get the data from hw_info and into the Hardware table. Also the InsertIntoHardwareDbTable method needs to be updated.

Below, we can see the new sequence of the methods in the HWParser.

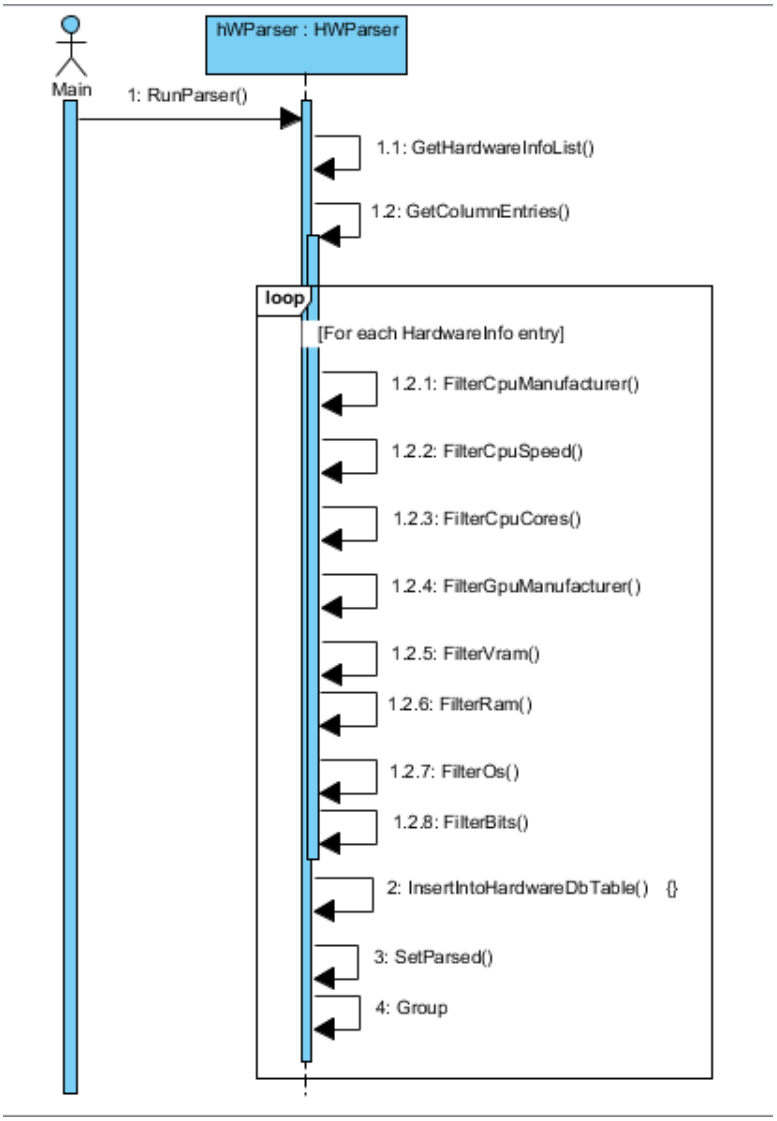


Figure 20: New HWParser sequence

Then we have the updates to the database.

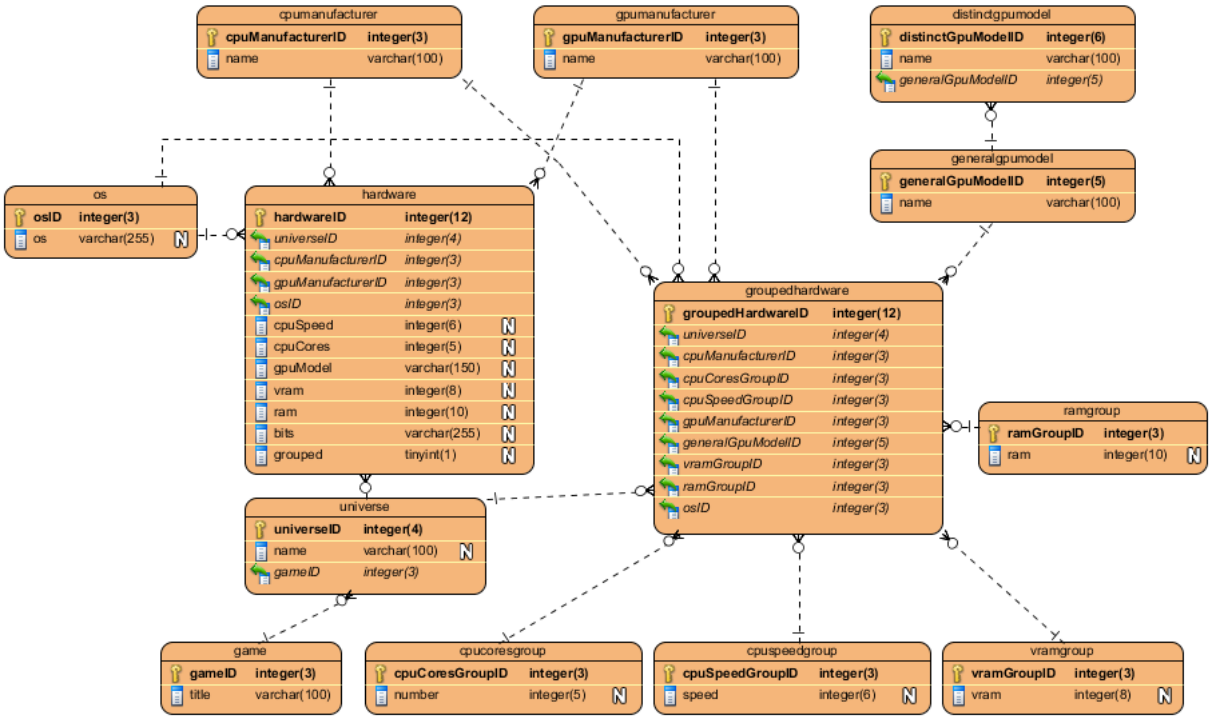


Figure 21: Database updates

The OS table will contain the different existing OS. the hardware table have new columns for ram, os and bits. Then we have the ramgroup table.

In the end new MVCs must be created to administrate the OS table and ramgroup table.

39 Redesigned responsibilities of WCF and Parser

Because of the bad performance that our system encountered when querying the database for large sets of data, we had to look into enhancing the data processing. The result we came to was to move the grouping functionality that was currently implemented in the WCF web service layer to the new Parser layer. This will make it possible for the system to do almost all the pre-display work even before the SQL query has been sent from the WCF.

Since the filtering and grouping operations of the current hw_info database are two separate operations that most often will be run independently and with different intervals in time, our solution was to create another hardware table called groupedhardware (see database illustration in previous section). With this separation of storage the grouping operations will be working on already parsed data stored in the hardware table, while the parsing functionality will be working on the raw data from the hw_info table.

The Parser will be running kind of more in the background than the WCF will do. The WCF will be doing its work on demand from the MVC, while the Parser will more or less almost always be running. Because of these different modes of runtime it is more appropriate that the Parser will be the process running the UpdateDistinctUniverses function that was previously implemented in the WCF, and also the new UpdateDistinctGpuModels function. Because of the decision that the Parser

will now take over the grouping functionality it would also be a breach of the separation of concerns to still have these functions still running in the WCF layer.

In meetings with Funcom employees we have found out that they want to be able to control almost everything related to the systems grouping functionality manually. Since the only interface our system has with the user is the MVC, and the only interface between the MVC and the database is the WCF, the WCF is of course then the part that will have to handle this database table updating.

The WCF has earlier only been used for retrieving data from the database and sending it to the MVC for display. Since the WCF has now been extended with this new administration functionality it has become obvious that the most appropriate action is to separate the earlier service methods and the new admin methods into their own services. The old functionality will still be stored in the ReadDataService service, while the new admin functionality will be stored in the AdminService service.

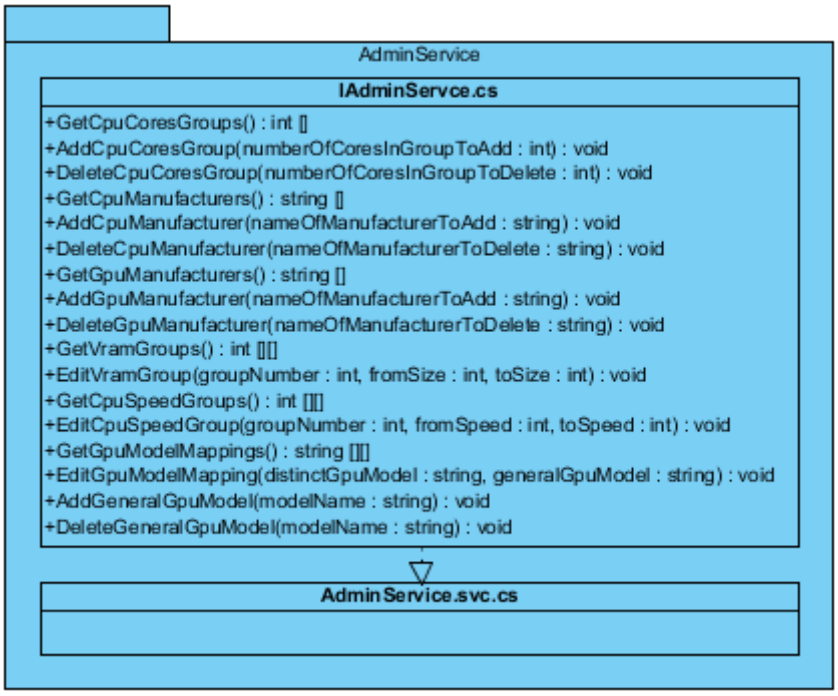


Figure 22: Admin Service class

40 GPU user story

Because of a large variety in the different GPU models that is registered in the hw_info database, a bit more sophisticated filtering and grouping functionality had to be used for this. If we had gone with the same functionality as used in earlier user stories the hardware statistics display would contain lots and lots of GPU models with both big and small differences in their names.

Our solution to this problem was to create two database tables; distinctgpumodel and generalgpumodel (see database illustration in section 8). The distinctgpumodel table will be a table similar to the universe table where all distinct registered GPU models in the hardware table are

stored. Then we let the user of our system create and maintain a set of more general GPU models, stored in the generalgpumodel, and choosing which distinct GPU models shall be mapped to which general GPU model. Our system will then generate all statistics and displays for GPU models as though the distinct GPU models actually was of the general GPU model it is mapped to, making the statistics a lot more readable and informing.

40.1 Resolution

For the resolution parsing filter we will create a new resolution table that will contain the resolutions that are going to be parsed.

41 CPU Model

Like the GPU user story Funcom wants to see statistics of general CPU models. For example they want to see how many percentage of the players have a Core 2 Duo or an i5 processor. A distinctcpumodel and a generalcpumodel table will be used and the user of our system will be able to create and maintain these general CPU models, just like with the GPU models. The user will be able to set the distinct CPU models relation to a general CPU model, and our system will then display all statistics as if the distinct CPU model actually was of the general CPU model it is mapped to.

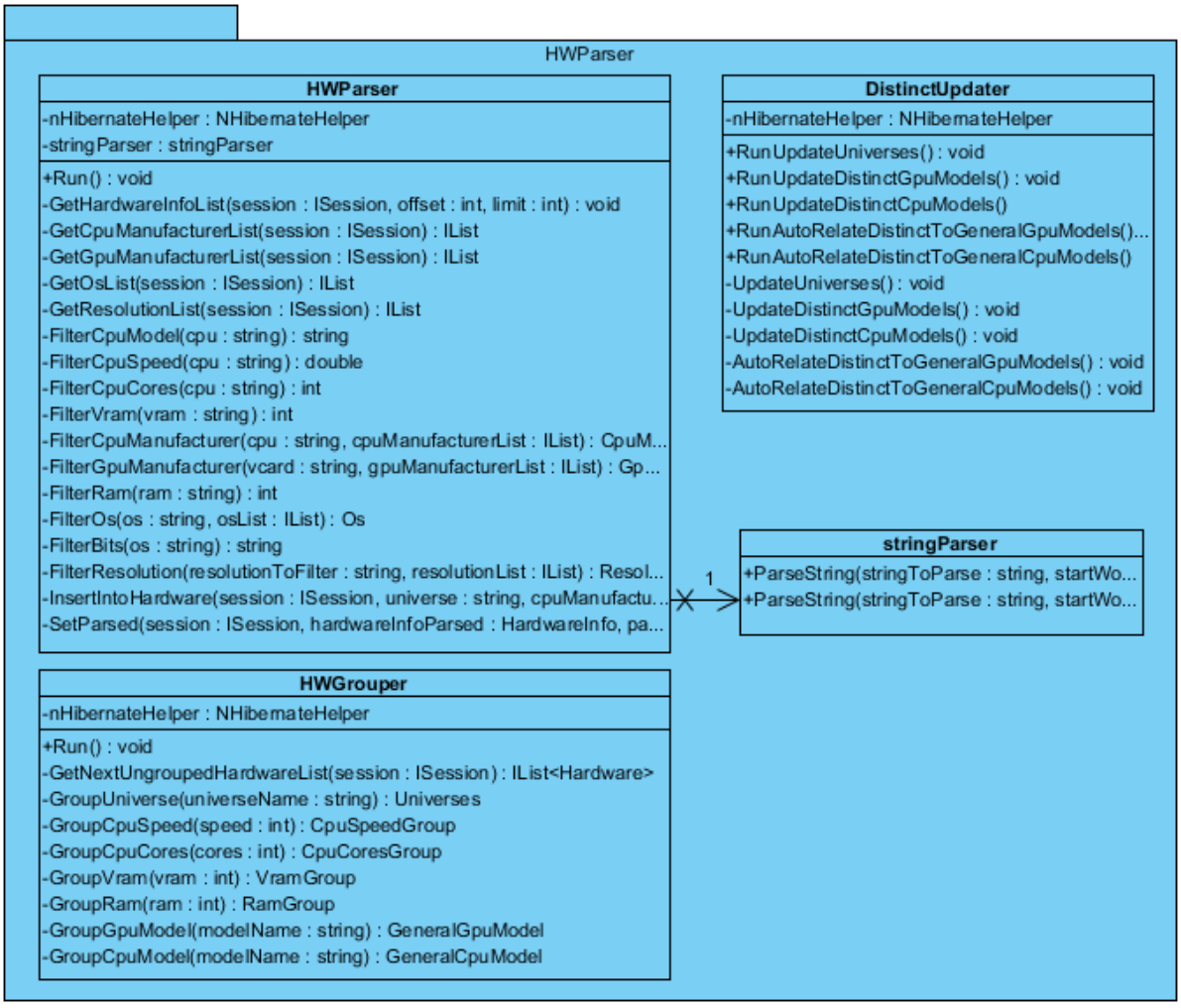


Figure 23: HWParser classes

The class diagram above shows the updated design of our parser, including the CPU model additions and also general updates to the design that have been made while implementing the code. The grouping logic have been moved to its own class, and so has the update and auto relate methods for the distinct tables.

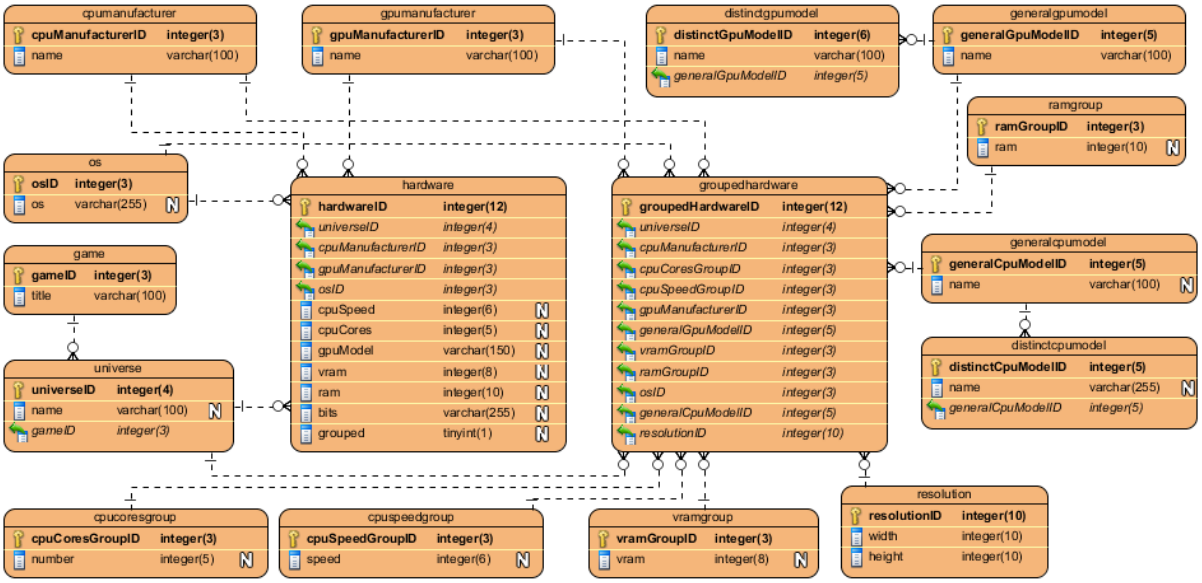


Figure 24: Database tables

Above are the tables in our database, including the distinctcpumodel and generalcpumodel tables.

In addition to the previous updates, all the data models that nHibernate uses and the nHibernate helper are moved to its own project.

42 Updates after code review / before first deployment

After reviewing our code before the first deployment, better ways to structure our system were discovered. These updates are represented in the updated UML diagrams below.

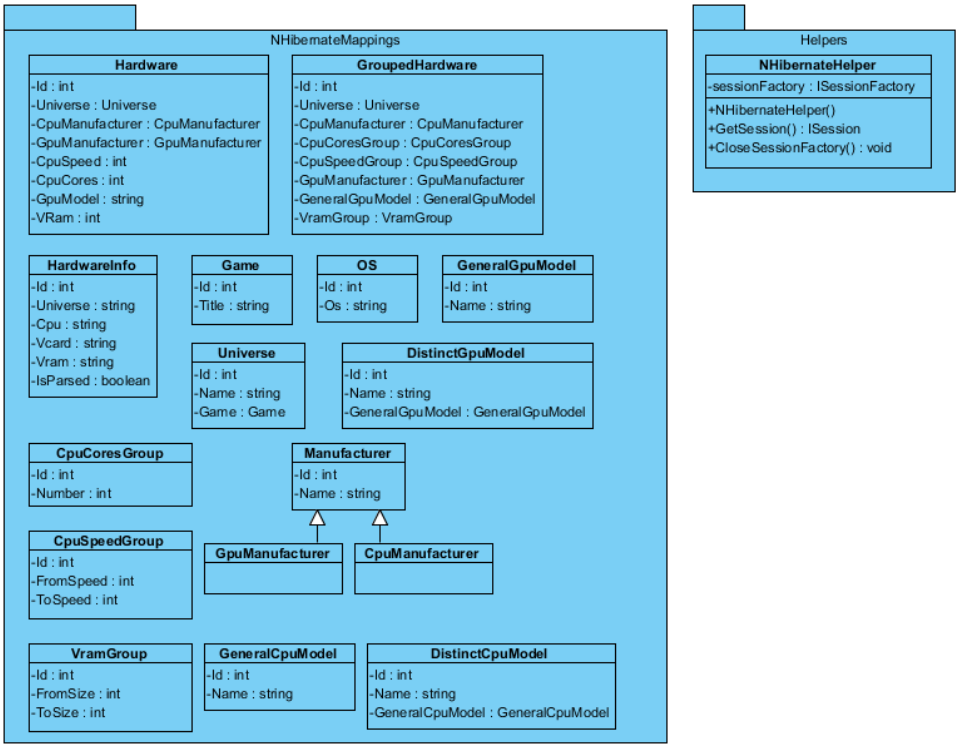


Figure 25: nHibernateMappings classes

All the MappedClasses created for nHibernate and the helper are moved to the new NHibernateMappings project so that the mappings can be used in both the services and the parser easily.

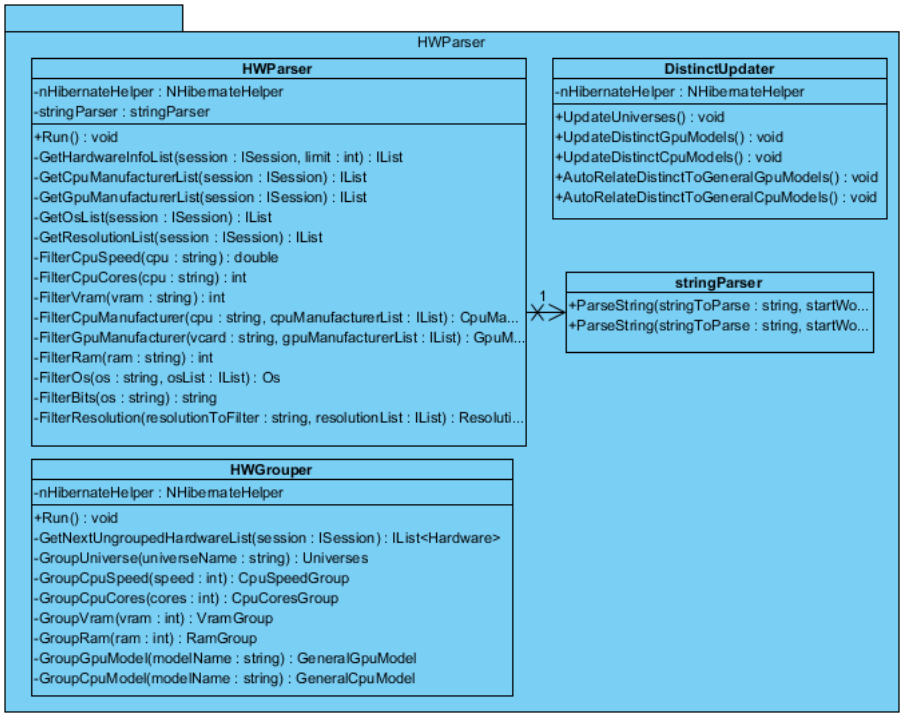


Figure 26: HWParser classes

Some unnecessary methods have been removed from the parser classes after rewriting parts of the code.

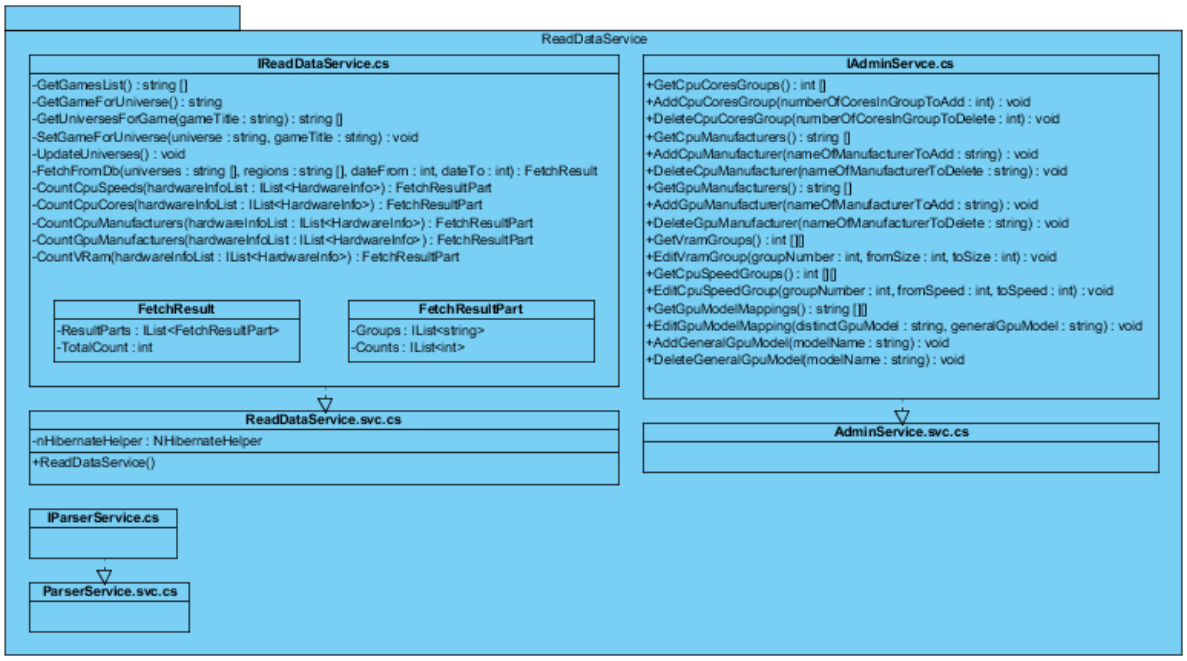


Figure 27: Service classes

A third service has been created to contain the code for communication with the parser object.

The diagram below shows the main components for the current system.

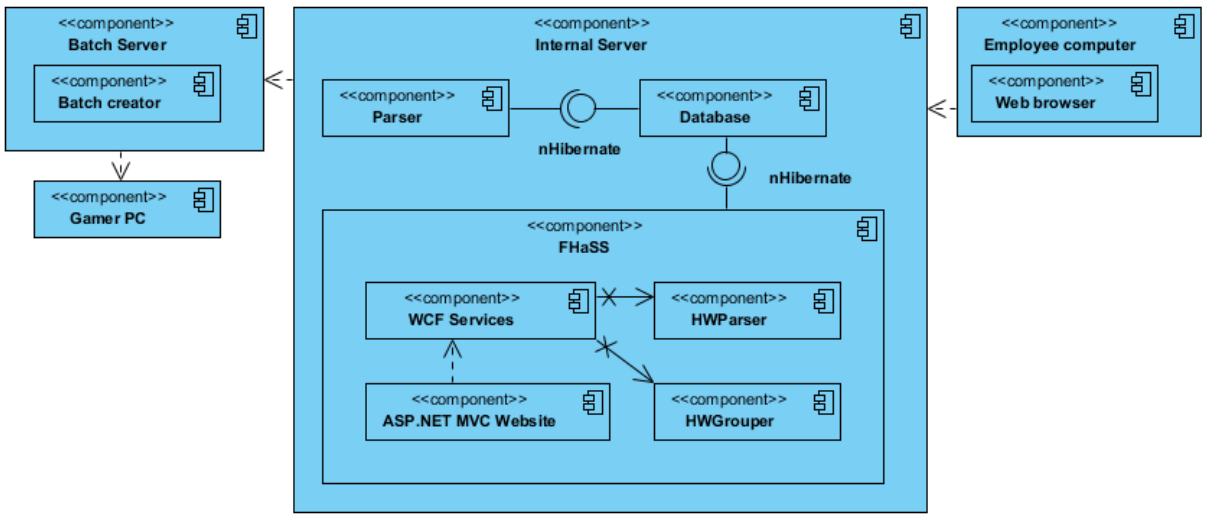


Figure 28: Overall system components

43 HighCharts

For creating the charts we were recommended to use a JavaScript API called HighCharts.
This API contains a lot of different functionalities and has a lot of customization options available to generate whichever charts necessary for displaying the relevant information.

The way they are generated is by dynamically generating JavaScript with Razor C# syntax using loops and conditions.

HighCharts are structured in a simple, yet expansive fashion. The UML diagram below shows a simple version of the structure, and shows the parts we used to generate the charts for our system.

The Highcharts.js file contains the main graph rendering tools, where as we customize it further with the use of the themes class to make it match our system's color scheme and the export class simply to export the charts as image- or PDF files.

There are many ways to define the options of the charts, either via an options instance or directly in the charts instance right before rendering. We went for the latter one giving us complete control to customize the individual parts of the charts from our dynamically generated hardware lists.

44 Geographical Location

Because of the nature of our system is to filter information according to what the user needs it is imperative to be able to filter the database entries by their geographical location. Being able to filter entries by location would help the users to easily see statistical differences (in hardware) between countries or entire regions.

In order to specify the origin of a bug report we would first need its IP address, but because of a limitation within Funcom's current python parser it does not currently provide this information.

There were also several other pieces of information that our new system needed (such as OS bit, resolution and DirectX information) and after we brought this to Funcom's attention they did the necessary alterations to the python parser in order to make this information available in our database.

Researching geotargeting quickly told us that we need some external pieces of software and data to retrieve a country from an IP address. Because a country does not have a predetermined range of IPs but rather a set of ranges that may vary you end up with a whole lot of different ranges to different countries, luckily this information is collected by interested parties and stored within a geolocation database which is available for free. In addition to requiring the data itself, we also need to implement an external C# class that handles the conversion of IP address to a number (IP number) which is used as the key for values within the database.

We settled with MaxMind®'s free GeoIP database as well as the accompanying open source C# *CountryLookup* class. The GeoIP data file is to be implemented as an embedded resource while the open source code is to be used as a standalone class in our parser.

45 Windows service

Originally the parser was a console application which had to be started by a exe file. A new requirement added late in the project period was that the parser had to be re-implemented as a windows service application. The reason for this is that it should be installed to run in the background.

So the parser had to be rewritten to support windows service functionality. Several new specific windows service methods needs to be added like for starting and stopping the service. Other than the new methods that are used to manage the application as a windows service the code of the parser is the same.

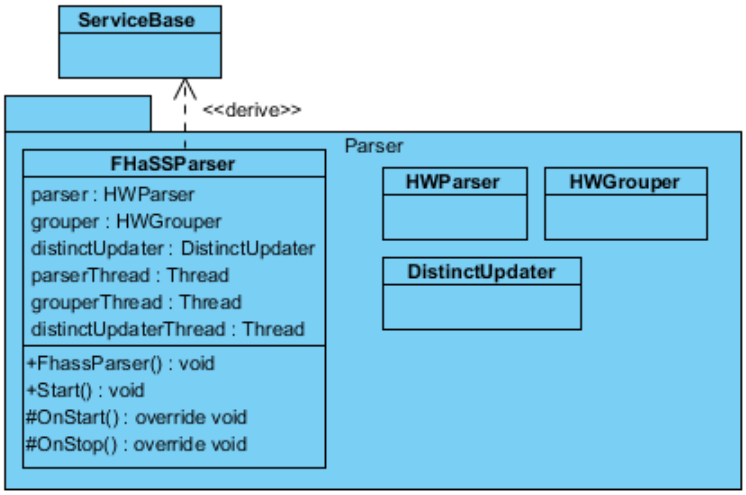


Figure 29: Illustrating the parser as a windows serivce

46 General model relation search / manufacturer

In the general CPU and GPU models section of the administration page it is possible to add new general models to the database, similar to the other administration pages. Specifically it works like the universe to game administration in the way that a general model will have a database relation to multiple distinct models. There are however a lot more distinct models to relate to a general model than there is universes for a game, therefore an easier way to relate many of the models automatically is wanted, so that the user can avoid relating one distinct model at a time.

The automatic relation should be done when the model is first created. A simple way to do this will be that the user provides a string that will occur in the distinct model names. One will then retrieve a list of all the distinct models that do not already have a relation, iterate through it and check if the names contains the provided string. If it does, the relation will be set to the newly created general model.

Another feature that is wanted is to easily be able to sort the models after manufacturer and also be able to display a logo for it. A simple way to do this is to let the user choose a manufacturer when he creates the general model. The general model can contain a database relation to the manufacturer and the manufacturer should also be added to the name of the general model.

So to summarize, to create a new general model the user should specify a name, a relation search (optional) and a manufacturer. The relation search is optional because the user should be able to choose to set the relations manually if wanted. If this is the case the relation search string should just be left empty and this needs to be handled by the system.

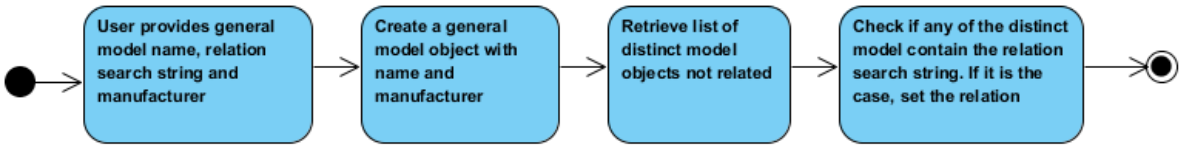


Figure 30: Sequence of automatically relating distinct to general models

47 Hard disk information

This task in our project requires code to be written that will be used in the game client to extract hardware information from the player pc and add this to the bug report that is sent to Funcom. The task was to make a prototype program that would find out if the hard disk is a SSD disk or not, based on the model number of the disk, and also the free and total space available on the disk.

The prototype should just get the information and then print it out. So the design is quite simple. All the disks on the pc should be found, and then the model number and free/total disk space should be extracted and printed. If the model number contains the keyword "SSD" it should be printed that it is an SSD disk. While the design is quite simple, the task is quite a challenge because it needs to be written in C++ without the use of .NET libraries or CLR, so that it eventually can be included in the “The Secret World” game client. This will require finding and learning to use low level functions in windows.

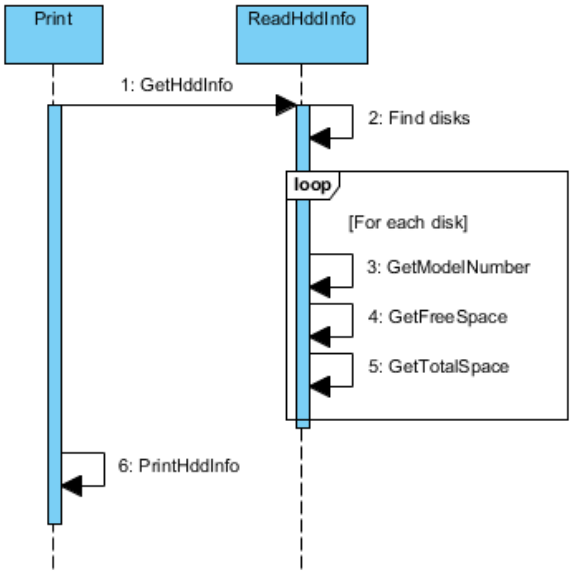


Figure 31: Sequence for finding hard disk information

48 Filter storage and URL

There are some filters the users of the system would like to be able to view easily and fast because it is information they regularly want to review or show to different people. Two new functionalities will give the users the ability to do this.

The first one is the filter storage. The user should be able to select what he wants in the filter menu and the give the filter a name and save it. The filter should then appear in a secondary menu that all users of the system can see. When the name of the filter is clicked the filter will be loaded. To store the filter some new database tables are needed. One table will store the name of the filter and the timer period. Another will store countries connected to saved filters and the last will store the universes connected to the saved filters.

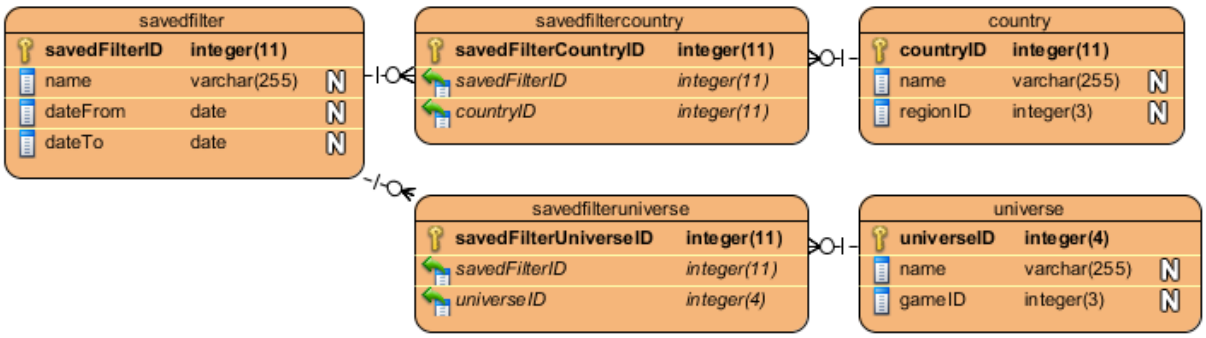


Figure 32: Database tables for storing filters

The second is that the filter should generate a unique URL which the user can then bookmark and/or share with other users. This will easily be done by changing theHTML request method of the Filter Menu form from POST to GET.This results in a resulting URL including all the forms inputs names and values. The URL can for instance be accessed by other users of the system, and he/she will get the exact same data presented.

49 Exception handling and logging

Late in the project period we have realized that a lot of the crashes we experienced with the parser / grouper are not really possible to always avoid. These are for instanceissues like timeouts to the database. The only realistic fix is to handle these exceptions that occur, because they can't always be avoided and will happen randomly.

Our solution is to try to run a method again when an exception occurs. The event should be logged to the database (if possible, if this fails then to a file). If the exception should occur again on the next attempt, then it needs to try again. This should repeat until it is successful or it have tried a maximum amount of times (four). Between each attempt it should wait a short but increasing amount of time before trying again, so that the other systems it is relying on can become available (e.g. the database connection). If it fails the last attempt the program should log this and then shut down and needs to be restarted. Functionality to automatically restart is included in the windows service.

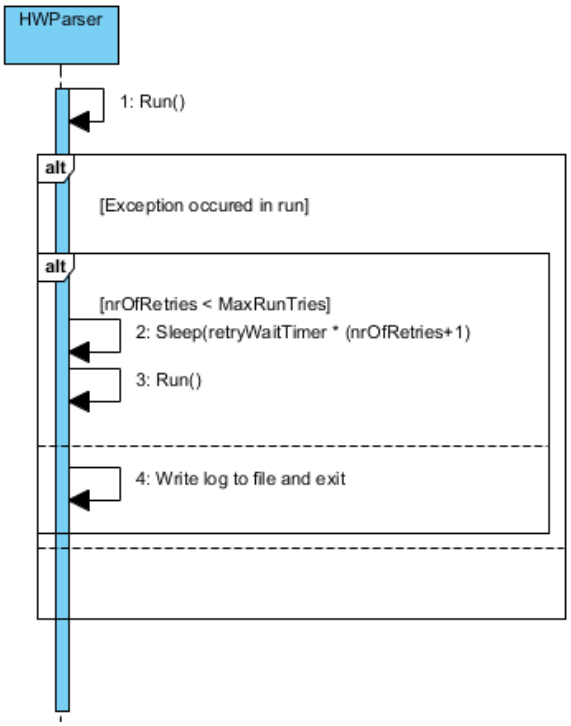


Figure 33: Sequence for exception handling

The last few entries in the log should be viewable on the administration page under the interface section.

50 Caching

As our queries to the database took longer and longer as the database grew we had no chance of meeting the loading time requirements with the current system, so after a discussion with the product owner and other Funcom employees this requirement has been dropped. Good performance is of course one of our top priorities so we (with the help of Funcom employees) developed a solution which could work as a compromise between extremely large amounts of data as well as fast loading times. The compromise would be that this solution only works on a preset time span of data, in our case this became one month of information.

By caching every entry for the last month into the service memory, any request regarding information within that time span would be processed without needed to query the database.

This way we avoid the heavy loading time caused by accessing the database with several million rows (about four and a half at the moment).

The caching is implemented by having the WCF service retrieve the database rows for the previous month and store this in memory. Every day it should update the memory so that this stays true. For example, one day the memory will contain data from 10.04.2012 to 10.05.2012 and the next day the memory will contain data from 11.04 to 11.05.

A logical check on the dates is needed in the ReadDataService to decide whether or not to use the cached memory, the input (parameters like universe and country) and the output (the result) from the service remains the same.

New methods need to be written to iterate through the cached entries for sorting, counting and grouping before returning the result in the same fashion a normal database query would.

51 Conclusion

The system has evolved quite a lot throughout the project period. Some of the requirements we have implemented have made us realize better ways to solve specific problems which have led us to rewrite parts of the code.

This is especially true for the parser, where the design and implementation has been changed quite a few times. It started out just as a simple console application that later was being handled by a WCF Service, but in the end we ended up designing and implementing it as a Windows Service.

On the MVC (i.e. the user interface) side, after our mock-ups were done of the system, not much have been changed other than implementing new features over time as we got to designing and implementing the requirements.

The WCF Service have changed quite a lot. From only doing database queries with nHibernate to using cache for faster loading times inside the last month.

Funcom Hardware Statistics System

Test summary		
Project name		
Funcom Hardware Statistics System		
Client	**Acronym**	
Funcom N.V.	FHaSS	
Date	**Sensors & Supervisors**	
29.05.12	***Internal sensor***	Olaf Hallan Graven
Author	***Internal supervisor***	Aurilla Aurelie Arntzen
Kim Richard Johansen	***External supervisor***	Rui M. MonteiroCasais
Group members		
..... Sondre Bjerkerud	..... Sverre Christoffer Thune	..... Kim Richard Johansen
..... Dag Hem	..... Kent Brian Dreyer	

Test summary

52 General Document Information

Deliverable nr:	D8.2.1
Deliverable type:	Report
Release:	Public
Workpackage:	Independent
Responsible:	Kim Richard Johansen

52.1 Declaration of intention

This is a document containing information about all tests that has been completed, successful and unsuccessful. Tests that have not been executed are also listed with an explanation for why it has not been completed. Verification tests are listed with a short summary.

52.2 Definitions and Acronyms

Bug	An error in the programming code.
Parser	Searches a data file for key words and copies the values it finds.
CPU	Central Processing Unit
GPU	Graphical Processing Unit
RAM	Random Access Memory
DX	DirectX: A collection of application programming interfaces (APIs) for handling tasks related to multimedia, like for instance game programming.
HDD	Hard Disk Drive
SSD	Solid State Disk: A type of HDD.
OS	Operating System
COS	Condition of Satisfaction
Bug	An error in the programming code
IDE	Integrated development environment

52.3 Document History

Version	Description	Date
1	First version created	24.05.2012
1.5	Updates after document review	28.05.2012

53 Table of contents

54 List of validation tests completed

Userstory	Name of test	Test id	Date
3: Game filter	Filter statistics –game filter	T-R-3-3	02.02.2012
4: Server filter	Filter statistics –server filter	T-R-3-4	26.02.2012
5: CPU information	Display hardware / software statistics –CPU information	T-R-1-1	27.04.2012 11.03.2012
6: Graphics card information	Display hardware / software statistics –GPU information	T-R-1-2	27.04.2012
6/7: Hardware type management and grouping	Hardware type management and grouping	T-R-4-1	22.05.2012
6/7: Hardware type management and grouping	Hardware type management and grouping –new hw type	T-R-4-2	22.05.2012
7: OS information	Display hardware / software statistics –OS information	T-R-1-4	14.03.2012
7: OS information	Display hardware / software statistics –Direct X information	T-R-1-5	27.04.2012
8: Memory information	Display hardware / software statistics –RAM information	T-R-1-3	13.03.2012
9: Geographical location filter	Filter statistics –geographical location filter	T-R-3-6	27.04.2012
11: Time period filter	Filter statistics –time period filter	T-R-3-5	27.04.2012
20: Trend charts	Display hardware / software evolution charts	T-R-2	02.05.2012
Other	Filter statistics	T-R-3-1	23.05.2012

55 Logs for validation tests performed

This is meant as a short overview for each of the validation tests performed.

Explanation:
Tests with outcome --Test Failure-- means that the test failed and the system worked as planned.
Tests with outcome --Test Successful-- means that the test successfully pointed out that something in the system did not work as planned. Modifications where needed on the system and a new test was scheduled.

55.1 Story 3: Game filter

Name	Filter statistics –game filter	Test ID	T-R-3-3
Requirement ID:	A-F-3		
Test description:	Test to see if the game filter combinations are working correctly. • Test if results after filtering show entries for each universe for that game		
Test date:	02.02.2012	Tester:	Kim Richard Johansen
Testing method:	Function test, black box		
Test approach:	4. Start the filter combination to be tested. 5. Wait for the web-page containing the filtered statistics to load. 6. Compare the produced filtered percentage statistics to the manually calculated percentages.		
Test criteria	• Database and website is up and running. • Test data set has been made and inserted into database		
Expected results:	• That the produced filtered percentages based on the test data set are similar to the manually calculated percentages for the tested filter combination.		
Test creator:	Kim Richard Johansen 01.31.2011		
Errors:	• None. Tried each filter combination and the right amount of entries did show for each of them.		
Outcome	Tried each game filter. The results after filtering did give the right amount of data from the universes for that game. The test data set confirms the result. Age of Conan 390 13 universes The Secret World 210 7 universes Global 90 3 universes At this stage in the project CPU results did show for the universe filtering, but due to the parser not being 100% at the moment, results did not match the test data set. ---Test Failure---		

55.2 Story 4: Server filter

Name	Filter statistics –server filter	Test ID	T-R-3-4
Requirement ID:	A-F-3		
Test description:	Test to see if the server filter combinations are working correctly. • Test if results after filtering universe show entries.		
Test date:	26.02.2012	Tester:	Kim Richard Johansen
Testing method:	Function test, black box		
Test approach:	1. Start the filter combination to be tested. 2. Wait for the web-page containing the filtered statistics to load.		

	3. Compare the produced filtered percentage statistics to the manually calculated percentages.
Test criteria	• Database and website is up and running. • Test data set has been made and inserted into database
Expected results:	• That the produced filtered percentages based on the test data set are similar to the manually calculated percentages for the tested filter combination.
Test creator:	Kim Richard Johansen 31.01.2012
Errors:	• None. Tried each filter combination and the right amount of entries did show for each of them.
Outcome	Tried each filter combination. Each of the 23 universes showed 30 entries and that is correct with the manual calculations in the test data set. Combining universes also worked, showed and combined entries correctly. At this stage in the project CPU results did show for the universe filtering, but due to the parser not being 100% at the moment, results did not match the test data set. ---Test Failure---

55.3 Story 5: CPU information

Name	Display hardware / software statistics –CPU information	Test ID	T-R-1-1
Requirement ID:	A-F-1 and B-F-1		
Test description:	Test to see if tables are created and contains accurate information about the different CPUs stored in the database. It should be possible to toggle between number of entries and %. Data to be shown: • CPU speed by brackets (like Steam). Inc. at 400mhz, staring at 1.0hgz. • Show split between AMD and Intel (and other) • Show number of cores		
Test date:	27.04.2012	Tester:	Kim Richard Johansen
Testing method:	Function test, black box		
Test approach:	5. Put in the time period for which the statistical data shall be produced with basis upon. 6. Choose to get to see statistical information for CPU. 7. Wait for the web-page containing the information to load. 8. Compare the resulting percentages to the percentages that have been manually calculated from the test data set.		
Test criteria	• Database and website is up and running. • Test data set has been made and inserted into database		
Expected results:	• The percentages the system produces and displays on the web-page based on the test data set are similar to those calculated manually.		
Test creator:	Kim Richard Johansen 23.12.2011		

Errors:	• None
Outcome	Test data set loaded into the data base and went through the parser and grouper functionality successfully. The information displayed on the website corresponded to the manually calculated results for different models, speed groups, manufacturer and number of cores. --Test Failure--

Name	Display hardware / software statistics –CPU information	Test ID	T-R-1-1
Requirement ID:	A-F-1 and B-F-1		
Test description:	Test to see if tables are created and contains accurate information about the different CPUs stored in the database. It should be possible to toggle between number of entries and %. Data to be shown: • CPU speed by brackets (like Steam). Inc. at 400mhz, staring at 1.0hgz. • Show split between AMD and Intel (and other) • Show number of cores		
Test date:	11.03.2012	Tester:	Kim Richard Johansen
Testing method:	Function test, black box		
Test approach:	1. Put in the time period for which the statistical data shall be produced with basis upon. 2. Choose to get to see statistical information for CPU. 3. Wait for the web-page containing the information to load. 4. Compare the resulting percentages to the percentages that have been manually calculated from the test data set.		
Test criteria	• Database and website is up and running. • Test data set has been made and inserted into database		
Expected results:	• The percentages the system produces and displays on the web-page based on the test data set are similar to those calculated manually.		
Test creator:	Kim Richard Johansen 23.12.2011		
Errors:	• Information display correctly on the web site but: - CPU manufacturer does not contain the right percentages - CPU speed does not contain the right percentages - CPU core does not contain the right percentages		
Outcome	Information displayed correctly but does not correspond with the data in the test data set. The reason for not showing the right percentages could be that the parser is not accurate enough when it comes to extracting the speed, manufacturer and cores from CPU information. A few entries differed for speed and manufacturer but cores did not even show all the different types. --Test Successful--		

55.4 Story 6: Graphics card information

Name	Display hardware / software statistics –GPU information	Test ID	T-R-1-2
Requirement ID:	A-F-1 and B-F-1		
Test description:	Test to see if tables are created and contains accurate information about the different GPUs stored in the database. It should be possible to toggle between number of entries and %. COS: Show split between nVidia, Intel, AMD, and others. Data to be shown: • Show video card model like Steam. • Show VRAM • Show Primary and multi-monitor resolution.		
Test date:	27.04.2012	Tester:	Kim Richard Johansen
Testing method:	Function test, black box		
Test approach:	5. Put in the time period for which the statistical data shall be produced with basis upon. 6. Choose to get to see statistical information for GPU. 7. Wait for the web-page containing the information to load. 8. Compare the resulting percentages to the percentages that have been manually calculated from the test data set.		
Test criteria	• Database and website is up and running. • Test data set has been made and inserted into database		
Expected results:	• The percentages the system produces and displays on the web-page based on the test data set are similar to those calculated manually.		
Test creator:	Kim Richard Johansen 23.12.2011		
Errors:	• None		
Outcome	Test data set loaded into the db and then went through the parser and grouper functionality. The information displayed on the website corresponded to the manually calculated results for video card model, VRAM and Primary resolution. Multi-monitor resolution has been changed to an extension of the system and therefore not a part of this test. --Test failure--		

55.5 Story 6/7: Hardware type management and grouping

Name	Hardware type management and grouping	Test ID	T-R-4-1
Requirement ID:	A-F-5		
Test description:	Test to see if the hardware from the bug reports is grouped correctly under general hardware types and that it shows the correct percentage for each of them based on the total.		

	This test will also contain: • Test if registered but unrecognized hardware is grouped in the unrecognized category and shows the right percentage.
Test date:	22.05.2012 Tester: Sverre C. Thune
Testing method:	Function test, black box
Test approach:	3. Get the statistics page. Print out, write down, etc., the groups and their respective percentages. 4. Compare the group percentages to percentages manually calculated from the test data set.
Test criteria	• Database and website is up and running. • There has to be one or more currently registered but not recognized hardware types. • Test data set has been made and inserted into database
Expected results	• That the system produced percentages is the same as the manually calculated ones.
Test creator:	Sondre Bjerkerud, Sverre C. Thune 21.12.2011 Updated by: Kim Richard Johansen 23.12.2011
Errors:	• None
Outcome	The statistics in the hardware info table show the same counts and percentages as the test data set. All the percentages add up to a hundred percent. --Test Failure--

Name	Hardware type management and grouping –new hw type	Test ID	T-R-4-2
Requirement ID:	A-F-4 and A-F-5		
Test description:	Test is run after T-R-4-1 Create a new general hardware type and choose which type of hardware it should contain from the unrecognized hardware group.		
Test date:	22.05.2012	Tester:	Sverre C. Thune
Testing method:	Function test, black box		
Test approach:	7. Get the statistics page. Print out, write down, etc., the groups and their respective percentages. 8. Create a new general hardware type of one of the possible categories; CPU, Graphics Card. 9. Choose group one/some/all of the registered but not recognized hardware types under the newly created general hardware type. 10. Get the updated statistics page. Print out, write down, etc., the groups and their respective percentages. 11. Compare the new group percentages to percentages produced before adding the hardware type(s) to the new general hardware type (step 1). 12. Compare results the group percentages whit percentages manually calculated from the test data set.		
Test criteria	• Database and website is up and running. • There has to be one or more currently registered but not recognized		

	hardware types. • Test data set has been made and inserted into database
Expected results	• That the system produced percentages is the same as the manually calculated ones. That is, both the basis statistics page (step 1) and the updated statistics page (step 4) contain the same percentages as the manually calculated percentages for the two instances of the general hardware type grouping.
Test creator:	Sondre Bjerkerud, Sverre C. Thune 21.12.2011 Updated by: Kim Richard Johansen 23.12.2011
Errors:	• None
Outcome	After mapping all the distinct GPU models and CPU models to general GPU models and CPU models, the values printed in the statistics table corresponded to the test data set. --Test Failure--

55.6 Story 7: OS information

Name	Display hardware / software statistics –OS information	Test ID	T-R-1-4
Requirement ID:	A-F-1 and B-F-1		
Test description:	Test to see if tables are created and contains accurate information about the different OS information stored in the database. It should be possible to toggle between number of entries and %. COS: Show the OS from all systems in db and group them under different groups. Data to be shown: • OS grouped under: Windows 7 64 bit Windows 7 32 bit Windows Vista 64 bit Windows Vista 32 bit Windows XP 64 bit Windows XP 32 bit Unknown		
Test date:	14.03.2012	Tester:	Kim Richard Johansen
Testing method:	Function test, black box		
Test approach:	5. Put in the time period for which the statistical data shall be produced with basis upon. 6. Choose to get to see statistical information for GPU. 7. Wait for the web-page containing the information to load. 8. Compare the resulting percentages to the percentages that have been manually calculated from the test data set.		
Test criteria	• Database and website is up and running.		

	• Test data set has been made and inserted into database
Expected results:	• The percentages the system produces and displays on the web-page based on the test data set are similar to those calculated manually.
Test creator:	Kim Richard Johansen 13.03.2011
Errors:	• None.
Outcome	After the test data set had been parsed and grouped the information displayed on the website was correct according to the manual calculated results in the test data set. Correct amount and percentages. --Test Failure--

Name	Display hardware / software statistics –Direct X information	Test ID	T-R-1-5
Requirement ID:	A-F-1 and B-F-1		
Test description:	Test to see if tables are created and contain accurate information about the different Direct X information stored in the database. It should be possible to toggle between number of entries and %. COS: Show the Direct X from all systems in db and group them under different groups. Data to be shown: • Direct X grouped under: Direct X 11.1 Direct X 11.0 Direct X 10.1 Direct X 10.0 Direct X 9.0c Unknown		
Test date:	27.04.2012	Tester:	Kim Richard Johansen
Testing method:	Function test, black box		
Test approach:	5. Put in the time period for which the statistical data shall be produced with basis upon. 6. Choose to get to see statistical information for GPU. 7. Wait for the web-page containing the information to load. 8. Compare the resulting percentages to the percentages that have been manually calculated from the test data set.		
Test criteria	• Database and website is up and running. • Test data set has been made and inserted into database		
Expected results:	• The percentages the system produces and displays on the web-page based on the test data set are similar to those calculated manually.		
Test creator:	Kim Richard Johansen 16.03.2011		
Errors:	• None.		
Outcome	Loaded test data set containing DirectX into the database and ran the parser and		

	grouper system. Loaded the website and checked if the information displayed corresponded to the manually calculated results. It did. --Test Failure--

55.7 Story 8: Memory information

Name	Display hardware / software statistics –RAM information	Test ID	T-R-1-3
Requirement ID:	A-F-1 and B-F-1		
Test description:	Test to see if tables are created and contains accurate information about the different RAM stored in the database. It should be possible to toggle between number of entries and %. COS: Show the RAM from all systems in db and group them under different range groups. Data to be shown: • RAM grouped under: Less than 512 MB 512 MB to 999 MB 1 GB 2 GB 3 GB 4 GB 5GB and higher Unknown		
Test date:	13.03.2012	Tester:	Kim Richard Johansen
Testing method:	Function test, black box		
Test approach:	5. Put in the time period for which the statistical data shall be produced with basis upon. 6. Choose to get to see statistical information for GPU. 7. Wait for the web-page containing the information to load. 8. Compare the resulting percentages to the percentages that have been manually calculated from the test data set.		
Test criteria	• Database and website is up and running. • Test data set has been made and inserted into database		
Expected results:	• The percentages the system produces and displays on the web-page based on the test data set are similar to those calculated manually.		
Test creator:	Kim Richard Johansen 13.03.2011		
Errors:	• Zero errors.		
Outcome	All the different universes gave the same results and they corresponded to the test data set.		

	--Test Failure--

55.8 Story 9: Geographical location filter

Name	Filter statistics –geographical location filter	Test ID	T-R-3-6
Requirement ID:	A-F-3		
Test description:	Test to see if the geographical location filter combinations are working correctly. It should be possible to choose between continent and country as a filtering option. COS: That the data shown after choosing a continent or country corresponds to the manually calculated results. Continents to be able to choose from: North America South America Antarctica Africa Europe Asia Australia		
Test date:	27.04.2012	Tester:	Kim Richard Johansen
Testing method:	Function test, black box		
Test approach:	4. Set the filter combination to be tested. 5. Wait for the web-page containing the filtered statistics to load. 6. Compare the produced filtered percentage statistics to the manually calculated percentages.		
Test criteria	• Database and website is up and running. • Test data set has been made and inserted into database		
Expected results:	• That the produced filtered percentages based on the test data set are similar to the manually calculated percentages for the tested filter combination.		
Test creator:	Kim Richard Johansen 24.04.2012		
Errors:	• None.		
Outcome	Combinations tested: Each country and combination of countries from different regions. Each region and combination of different regions. Mapping interface. All worked successfully. --Test failure--		

55.9 Story 11: Time period filter

Name	Filter statistics –time period filter		Test ID	T-R-3-5
Requirement ID:	A-F-3			
Test description:	Test to see if the time filter combinations are working correctly. • Test if the data shown on the website corresponds to the manually calculated results after setting a time filter.			
Test date:	27.04.2012	Tester:	Kim Richard Johansen	
Testing method:	Function test, black box			
Test approach:	4. Set the filter combination to be tested. 5. Wait for the web-page containing the filtered statistics to load. 6. Compare the produced filtered percentage statistics to the manually calculated percentages.			
Test criteria	• Database and website is up and running. • Test data set has been made and inserted into database			
Expected results:	• That the produced filtered percentages based on the test data set are similar to the manually calculated percentages for the tested filter combination.			
Test creator:	Kim Richard Johansen 24.04.2012			
Errors:	• None.			
Outcome	Tested information that gives an error in the date fields such as non numeric characters, nothing, 0, out of bounds (such as day nr 32 and month nr 13). It worked well. Default values are used when an error occurs. Worked. Tested predefined dates in from field and to field and checked if the total amount of entries displayed corresponded to the manually calculated results. They did. --Test failure--			

55.10 Story 20: Trend charts

Name	Display hardware / software evolution charts		Test ID	T-R-2
Requirement ID:	A-F-2			
Test description:	Test to see if evolution charts are created and to see if the contained information is accurate against the test data set.			
Test date:	02.05.2012	Tester:	Kim Richard Johansen	
Testing method:	Function test, black box			
Test approach:	6. Put in the time period for which the evolution charts are to be produced with basis upon. 7. Choose to get to see one of the possible evolution charts; CPU, GPU, CPU cores, or Windows OS version and DirectX version.			

	8. Wait for the chart to load. 9. Do as exact a comparison between the manually calculated data and the chart. The chart shall be compared to the manually calculated data at five (5) times/points with equal distance between them. The first and the last times/points are the same values that was put in at stage 1 of this test, which will be the start and end of the chart lines. 10. The percentages displayed in proximity to the chart are compared to the manually calculated percentages for the last time/point the chart is describing.
Test criteria	• Database and website is up and running. • Test data set has been made and inserted into database
Expected results:	• That the chart seems to display similar values to those who have been calculated manually for each of the five points/times of the chart. • That the percentages displayed in proximity to the chart based on the test data set are similar to those calculated manually.
Test creator:	Sondre Bjerkerud, Sverre C. Thune 21.12.2011 Updated by: Kim Richard Johansen 23.12.2011
Errors:	• None.
Outcome	The manually calculated results had data from 07.01.2012 to 12.31.2012 set with a time span resolution of 6. The same time span and resolution was chosen in the filtermenu and the site refreshed. The charts displayed correctly and the % values for each category and time resolution corresponded to the manually calculated results. --Test Failure--

Other

Name	Filter statistics	Test ID	T-R-3-1
Requirement ID:	A-F-3		
Test description:	Test to see if the different filter combinations are working correctly. • Test each filter by itself. That is for instance putting in values for the time period filter only, leaving the other filters with null value/the standard value. • Test with all filters set. The filter values that will be beneficial to put in will depend on the data set. For instance should both values that are represented in the data set and values that are not represented in it (say for instance a specific Funcom game) be filtered upon. For the time period filter both the whole period which the test data set is describing, and only parts of it, and also with time periods where the to and from limits are stretched further into time or farther back in time than the test data set describes.		
Test date:	23.05.2012	Tester:	Kim Richard Johansen

Testing method:	Function test, black box
Test approach:	7. Put in the filter combination to be tested. 8. Wait for the web-page containing the filtered statistics to load. 9. Compare the produced filtered percentage statistics to the manually calculated percentages.
Test criteria	• Database and website is up and running. • Test data set has been made and inserted into database
Expected results:	• That the produced filtered percentages based on the test data set are similar to the manually calculated percentages for each of the tested filter combinations.
Test creator:	Sondre Bjerkerud, Sverre C. Thune 21.12.2011 Updated by: Kim Richard Johansen 23.12.2011
Errors:	• None.
Outcome	Mapped all countries to their respective region and servers to their game. Tried to use just the time filter, just the geographical filter and just the universe filter. All data corresponded to the test data set. Tried combinations of time with both geographical and universe filter and all data corresponded to the test data set. Zero errors. --Test Failure--

56 Validation tests that were not performed and why

This is meant as a short summary for each of the validation tests that were not performed during our project period also with an explanation for why.

56.1 List of validation tests that were not performed

Name of test	Test id
Display hardware / software statistics	T-R-1
Filter statistics –user interface	T-R-3-2
Display software statistics	T-R-5
Future hardware prediction	T-R-6

56.2 T-R-1 Display hardware / software statistics

This test ended up being too vague due to covering all the information to be showed in the statistical table without going into details about each category. The test was therefore split into 5 new tests: T-R-1-1, T-R-1-2, T-R-1-3, T-R-1-4 and T-R-1-5.

Name	Display hardware / software statistics	Test ID	T-R-1
Requirement ID:	A-F-1 and B-F-1		

Test description:	Test to see if tables are created and contains accurate information about the different hardware/software stored in the database.		
Test date:	.-.-.-.-.-.-.-.-.-.-.	Tester:	Kim Richard Johansen
Testing method:	Function test, black box		
Test approach:	1. Put in the time period for which the statistical data shall be produced with basis upon. 2. Choose to get to see statistical information for one of the hardware/software categories; CPU, Graphics Card, RAM, Windows OS, HDD, or Network download speed. 3. Wait for the web-page containing the information to load. 4. Compare the resulting percentages to the percentages that has been manually calculated from the test data set.		
Test criteria	• Database and website is up and running. • Test data set has been made and inserted into database		
Expected results:	• The percentages the system produces and displays on the web-page based on the test data set are similar to those calculated manually.		
Test creator:	Sondre Bjerkerud, Sverre C. Thune 21.12.2011 Updated by: Kim Richard Johansen 23.12.2011		
Errors:			
Outcome			

56.3 T-R-3-2 Filter statistics –user interface

This test ended up being unnecessary due to change in the user interface originally planned. Now all the games and underling servers are always shown on the left side and it is now possible to filter with more than one game and not only one. The user interface has also been thoroughly tested in test T-R-3-1.

Name	Filter statistics user interface test	Test ID	T-R-3-2
Requirement ID:	A-F-3		
Test description:	Test is run after T-R-3-1. Test to see if the user interface for the filter statistics option is working correctly. • Check if game server filter is available when a specific Funcom game is selected and unavailable when a game isn't selected.		
Test date:	.-.-.-.-.-.-.-.-.-.-.	Tester:	Kent Brian Dreyer
Testing method:	User interface test, Black box		
Test approach:	5. Set all filter options blank/null. 6. Check if game server filter is unavailable. 7. Choose one of the available Funcom games as a filter. 8. Check if game server filter is available.		
Test criteria	• Database and website is up and running. • Test data set has been made and inserted into database		
Expected results:	• Game server filter works as explained in the test description.		

Test creator:	Kim Richard Johansen 9.01.2012
Errors:	
Outcome	

56.4 T-R-5 Display software statistics

This test was to check if the software programs (e.g. Skype, Steam, MSN...) stored on the computer from a player experiencing a game crash, would show up correctly in the right groups under the software statistics table. This functionality was not implemented due to other priorities and time and therefore there were no need for this test to be executed.

Name	Display software statistics	Test ID	T-R-5
Requirement ID:	B-F-2		
Test description:	Test to see if the tables are created and contains the same percentage value as manually calculated from the test data set about the different software stored in the database.		
Test date:	.-.-.-.-.-.-.-.-.-.-.	Tester:	Sverre C. Thune
Testing method:	Function test, black box		
Test approach:	3. Load the web-page containing the software statistics. 4. Compare the calculated percentages to the manually calculated percentages.		
Test criteria	• Database and website is up and running. • Test data set has been made and inserted into database		
Expected results	• The percentages the system produces and displays on the web-page based on the test data set are similar to those calculated manually.		
Test creator:	Sondre Bjerkerud, Sverre C. Thune 21.12.2011 Updated by: Kim Richard Johansen 23.12.2011		
Errors:			
Outcome			

56.5 T-R-6 Future hardware prediction

After discussion with the project manager we decided to not perform this test due to the time it would take to create the data for the test data set and this being a C requirement. The functionality is implemented and debug tested locally by the creator to ensure that it works, but it is not documented.

Name	Future hardware prediction	Test ID	T-R-6
Requirement ID:	C-F-1		
Test description:	Test to see if an extension of requirement A-F-2 works. The extension is to predict the future trend of hardware usage for the players of Funcom games. When the chart for requirement A-F-2 is shown it will be possible to toggle the prediction on and off. The prediction will extend the current lines for hardware evolution in the chart and predict the future evolution.		
Test date:	.-.-.-.-.-.-.-.-.-.-.	Tester:	Kim Richard Johansen
Testing method:	Function test, black box		

Test approach:	6. Put in the amount of time into the future the system is to predict the hardware evolution for. 7. Load the web-page containing one of the possible charts containing future hardware prediction. 8. Toggle the chart to display the future hardware prediction chart lines if toggled off. 9. Check that the hardware evolution prediction lines are proportional. 10. Compare the updated percentages in proximity to the chart to the manually calculated percentages. This stage corresponds to testing the last time/point on the chart to the manually calculated percentages for the whole test data set for the whole time period put in (1).
Test criteria	• Database and website is up and running. • Test data set has been made and inserted into database
Expected results	• That the hardware evolution prediction lines are proportional. • The percentages the system produces and displays on the web-page based on the test data set are similar to those calculated manually.
Test creator:	Sondre Bjerkerud, Sverre C. Thune 21.12.2011 Updated by: Kim Richard Johansen 23.12.2011
Errors:	
Outcome	

57 Verification tests

This is meant as a short summary for each of the verification tests performed during our project period.

57.1 Code review

Most of the code review work was not documented but instead orally communication between the project members was used and worked without problems.

57.2 Code compilation

When compiling produced code we removed most of the possibilities for a group member to upload a code to the source control with issues, but since more than one member could be working on the same code fileuser related issues still did occur.

57.3 Debugging

Debugging has been done regularly by each group member when developing functionality on the system. The built in debugger in our IDE Visual Studio was quite powerful and enable us to have a full overview of the system when we executed the code developed. Debugging has therefore been a big help when trying to indentify bugs/issues that occurred.

57.4 Strain test

This test ended up being unnecessary due to change in our project requirement. Our system will parse newly added entries in Funcoms database when theirown parser has parsed the bug

reportssupplied by players. The amount of entries to parse/group in our system is set to only deal with a fixed amount at a time so therefore the strain test was unnecessary.

57.5 Regression test/Ad hoc test

These tests have been performed by the test manager at regularly intervals to detect issues/bugs on the system. If something was detected the issue/bug has been added to a list. Group members that were responsible for theissues/bugs were notified of these bugs and when resolved they were removed from the list.

57.6 Performance test

Has been done regularly to keep track of loading times for the different web pages of our system and the time our parser and grouper uses average per workload.
All in all a big help for improving the performance of the code and finding new ways to do the same task but with a shorter loading time.

Funcom Hardware Statistics System

Project Reflection Document		
Project name		
Funcom Hardware Statistics System		
Client	**Acronym**	
Funcom N.V.	FHaSS	
Date	**Sensors & Supervisors**	
5/29/2012	***Internal sensor***	Olaf Hallan Graven
Author	***Internal supervisor***	Aurilla AurelieArntzen
All members	***External supervisor***	Rui M. Monteiro Casais
Group members		
..... Sondre Bjerkerud	..... Sverre Christoffer Thune	..... Kim Richard Johansen
..... Dag Hem	..... Kent Brian Dreyer	

Reflection Document

58 General Document Information

Deliverable nr:	D8.3.1
Deliverable type:	Report
Release:	Public
Workpackage:	W8
Responsible:	All members

58.1 Declaration of intention

The purpose of this document is to reflect on our work during the development period of our product and present features with intentions as well as what could have been done differently.

58.2 Definitions and Acronyms

FHaSS	Funcom Hardware Statistics System
JPEG / PNG	Standardized image file formats
nHibernate	A library for accessing a database
.NET	Framework library we use for the system
WCF	Windows Communication Foundation

58.3 Document History

Version	Description	Date
1	First version created	22.05.2012
2	Updated content, finalized document	29.05.2012

59 Table of contents

60 Introduction

The purpose of this document is to view our work and implementation period in retrospect, giving a short explanation of the implemented functionalities and features, evaluate what was excluded from the extensions and go into detail about what could be done differently and explain the workarounds we had to undergo with to get the FHaSS-system to the usable state it is in now.

61 Challenges

61.1 Loading time

When we first had a meeting with the product owner we were told that 2 seconds load time was the requirement, and that it was a quite feasible time to retrieve the entries from the database. Looking at this in retrospect we now understand that this wouldn't be doable, given that there are far beyond four million entries in the hardware statistics database and that this number will increase each day. At the start of our project we had huge problems with the loading time, which required us to constantly try to optimize the database fetching queries and algorithms.

In the first version of the system we handled everything on demand, per request. Everything in this context means; handling the request from the users web browser, setting up the connection with the WCF web-service, retrieving the hardware statistics from the database, process and prepare the data, and return them to the MVC layer for display. This solution gave us very long loading times for the final web-page displaying the hardware statistics. This was especially true for large time spans (large amounts of statistics data), and we quickly understood that some of the work that back then was done per request, had to be done in advance of the actual request instead, to decrease the overall loading time.

61.1.1 Parser

The second version of the systems backbone layer therefore had a new feature implemented; the Parser. Some of the work that in the previous version was done in the data processing and preparation phase had now been moved to another part of the system. Here the work could be done completely independent and in advance of the users requests. More specifically, the Parsers job is to improve the accuracy of the hardware information stored. For instance it is the job of the Parser to retrieve the CPU speed from the original CPU string that is sent by the crashed game clients. Having the more accurate data retrieved in advance and stored in another database table, one major operation earlier done per request had been removed.

61.1.2 Grouper

With the wide range of different hardware specifications in terms of memory, CPU frequency, storage and so forth we needed to group similar hardware in the database, to improve the load time and how we retrieve and present the data. The new version of the system worked well, and the loading time improvements were significant, but still they did not match the requirements of Funcom. After discussion with the Funcom employees we decided to again build more of the work, which at that point was done per request, into its own part of the system. We called the new part the Grouper and its job was to work on the data that was the product of the Parser and make them even more optimized for counting. By using a set of supporting database tables giving the restrictions and limits for the groups in each hardware category, the Grouper could group every hardware statistics

entry in to their respective group for all the hardware categories. For instance the grouper would group a hardware statistics entry with a CPU speed of 2300MHz into the CPU speed group that has a range from 2000 to 2400MHz, and in a highly optimized database table only store the CPU speed group id. After implementing the Parser and Grouper, the work left to be done per request was reduced a lot.

61.1.3 Further loading time improvements

The load times decreased even more after the implementation of the new Grouper, but still we were experiencing way too long loading times. The project team was out of ideas on how to improve the loading times and we had extensive discussions with the Funcom employees on possible solutions to this. The Funcom employees came up with several new ideas, two of which has been implemented in the current version of FHaSS; a single SQL query per hardware category and memory caching.

61.1.3.1 Single SQL query

Up until this point the WCF web-service interacting with the database had done one database query per hardware category per day. As a result, a lot of queries had to be done for each user request. By following the test-and-fail procedure the project team managed to put together more sophisticated SQL queries that retrieved all the information for all days for one hardware category. The load time improvement the system saw after this enhancement was enormous compared to the amount of work hours that had been used for the implementation of it.

61.1.3.2 Memory cache

There was a lot of back and forth regarding the load issue, but just needed the users to accept the fact that we are dealing with a lot of information here, this is a heavy system. So fetching all the entries in the database (4.000.000+ entries) takes about 40 seconds which is far from the original requirement, but thinking about it, how often does the users need to view this long term information? This is a quick analysis system to check on how the latest patches are working out, and what types of hardware that causes the most significant crashes, that's why we came up with the caching solution.

The caching was implemented by fetching every single entry for the last month and storing them in the program memory as a static variable, and because the entries were fetched using nHibernate it automatically created objects and groups of that fetch for us. Because the home page uses the last month by default the users will almost always be using the cached information.

This made our home index pop up almost instantly, given the fact that this is also the most relevant information to analyze this was a great solution to our load time issues. The drawback is that the cache needs to be built the first time the system starts up and the first time a user uses the page for the first time in a day to let the cache refresh itself, this should take as much time as a normal database fetch (as if a user wanted information about a time period that goes back more than one month).

We also considered using a thread that would do this at the turn of a day, but that could cause issues with the web client which is a singleton, meaning there's only one instance of the client at any given time. If several processes would try to access this simultaneously there could be problems. Workarounds for this problem could obviously been developed, but this was implemented in one of

the later periods of the project so we didn't have the resources or time to implement this potential improvement.

61.2 NHibernate

NHibernate is an object-relational mapper for the .NET framework and it was a requirement from Funcom to use this software for the systems database interaction. In essence NHibernate has been a big blunder to the project team. NHibernate was very stubborn, hard to work with and far from intuitive, and we had to make many workarounds to make this work. All the project members had previous experience with writing SQL database queries and handling the results of such. The transition to writing, reading, and thinking in the way of NHibernate Criteria Queries was nothing but painful. And so was the adaptation of having to write out the mapping database-table-to-object mapping XML documents. A stream of errors that felt endless, was hard to debug and even harder to fix, was awaiting the project members when we started out on the development phase of the project.

62 Filter saving

To save some time on inputting commonly used filter combinations, we created default saved filters for The Secret world, Age of Conan and a filter combination of both games. Aswell as access to these filters, the user can also save their own combinations of filter parameters for a quicker and easier hardware monitoring experience. The filters are saved on the database so that they will show up for all users accessing the system. This was implemented purely for the reason that we want this to be a quick-to-use system where the users can get specified information in no time.

In addition to this we wanted to implement a "dual-view" functionality e.g. to view a crash comparison of "The Secret World" and "The Age of Conan: Hyborian Adventure". This was a low priority extension however so sadly this did not get implemented the way we wanted, but the filter save functionality will somewhat fill the dual view's place and give them the specified information needed.

63 Read Data Service

Our system uses two WCF services in order to separate two largely different information services, where one handles everything related to administration of the system (the AdminService) while the other has the sole role of delivering the actual statistical data (the ReadDataService).

The ReadDataService uses (just as the AdminService) the nHibernate API to fetch and insert information to and from the database which has caused some issues during development. The main issue with nHibernate was a lack of experience from our side and the lack of documentation that came with nHibernate; this mainly caused minor problems where we were unsure about how we should use nHibernate to get the correct information back as simple as possible. nHibernate also caused some larger issues when we were unsure about how it worked and even what we could use it for (this is explained more in-depth elsewhere).

This WCF service slowly changed over the course of the project period due to a number of optimization efforts and the increasing the demand for more and more statistical information, this

way it has become a part that has been completely rewritten and gone through numerous iterations since we first created it in the beginning of the project.

The ReadDataService had to evolve to supply more and more data using less and less time, and is solely used to fetch, sort, count and group statistical information. It contains the following functionality (when fetching information it always accounts for the filtered options such as universes, country and time span):

- Fetching/Sorting/Counting/Grouping information for every hardware part from the database
- Fetching/Sorting/Counting/Grouping information for a single hardware part from the database
- Fetching information for a month and storing this in a cache
- Sorting/Counting/Grouping information for every hardware part from the cache
- Sorting/Counting/Grouping information for a single hardware part from the cache
- Estimate future values for a set of data

64 Graphs and visual presentation of data

64.1 HighCharts

For creating the visual graphs we were recommended to use a JavaScript API called **HighCharts**. This API contains a lot of different functionalities and has a lot of customization options available to generate whichever graph necessary for displaying the relevant information. Our graphs are of the type “Stacked Percent Area” which was a request from the product owner. This type of graph displays the percentage of entries for a hardware part based on the other hardware parts entries. We started out with having a fixed resolution of 12 x-axis points, where we printed out the date from and date to, summarizing the entries between the intervals as the y-axis value.

As we improved the fetching of data from the database we wanted the graphs to yield more precise information, thus we made an x-axis point for each single day of the filter period. Although this yields better information over short periods of time (1 – 4 months) it gets a bit overpopulated when they request data spanning over vast time periods. However, the visual information given by the graphs are not particularly affected by this.

If the user requests a date in the future, a mathematical formula will calculate the predicted entries based on the past entries. We didn’t get time to implement a way to indicate the transition to a future date in the graphs, since there was a problem extracting the point positions after the graph was rendered. A fix for this is possible, but alas we did not have the time to fully implement this since other known issues had a higher priority.

The tooltip also has a minor problem where it won’t show the dates if the x-point is an empty string, this is solely because HighCharts require that the series data and the x-axis categories (arrays) are of same length, so we had to print empty strings in order not to overlap the dates printed below the graphs.

In the end the graphs turned out quite nicely after a bit of trouble getting it dynamic and finely tuned to fit into the rest of the design and layout of the FHaSS-system

64.2 View raw data / view full screen graphs

Above the graphs there are two links which opens in a new browser tabs. The linked views contains raw graph data, showing all the entries in a HTML table for each date. The other link extends the desired graph in to a full screen window for in depth analysis. To store the filter information for use in a new View we store the settings in Session variables. These variables timeouts and resets after 20 min of inactivity, but can be increased in binding options. We experimented putting this information as cookies, but were deemed useless as the Session variables work better, keeping the time out in mind. These functionalities were a request from the product owner, but prior to this already noted as an extension task.

64.3 X-axis zoom for graphs

The graphs support zooming by clicking and dragging the mouse over the desired period. This works in the Home index as well as in the full screen extension. We experimented with making this zoom compatible for both X- and Y-axis but since the graphs are of the type “stacked Percent” graph zoom for the Y-axis would be irrelevant as the data must be compared to the other hardware entries, thus we did not include the y-axis zoom functionality.

64.4 Exporting the graphs

In the top right corner of the graphs we implemented a functionality to export the graphs to an image file (PNG / JPEG) as well as support for exporting it to a PDF-file. This was a feature implemented by us if the graphs are to be used in a presentation or similar.

64.5 Future prediction of hardware in graphs

We wanted to give the users the possibility to apply future dates to the filter menu, so instead of giving them some sort of an error or warning, we calculate the predicted trend pattern of the hardware parts with the use of linear regression based on previous entries, giving the developers an idea of what the coming days or months might bring in terms of hardware crashes. It has to be noted that the hardware info table will not get populated with this information, since this cannot be monitored in a day-to-day sense, and we do not want the table to yield any ‘false’ information regarding the crash statistics. This functionality was requested by the product owner, so we implemented it, but it should be used with care by the users since the entries are in a way just fictive predictions.

65 Administration side, full control to the user

In this section the users of the system can modify the structure of the database without the need to manually inject database queries, as well as start and stop the grouper and parser. This section was created to make the system modifiable and dynamic for future use. If there are hardware changes in the market or Funcom releases new titles, entries can be added, deleted, mapped and modified whilst making the parser and grouper aware of these changes. We managed to make the interface self-explanatory and intuitive yet expansive. Changes in this section however might require reparsing and regrouping of the database structure which can be time consuming for the back-end of the system. For this reason we display warnings before any changes are applied. The users should be aware of this and the administration section should not be used to frequent as it is designed for larger changes in the system.

We feel that we have covered every necessary option in this section, the Funcom employees has not raised any additional requests to this part. There was problems getting all of this completely debugged but as of now, none are reported.

66 Reflection

Looking back at the last months (of the development period) it is easy to see what mistakes the project team has done and what could have been done differently.

66.1 Requirements capturing

In the startup of the project the team should have put more time into understanding exactly what way and to what purpose the FHaSS was going to be used. A better understanding of this would have saved us very much time. On the other side we would have had to put in more time in the pre-face of the project, and probably much more time in a pre-face design period, which is not according to how the Scrum project model suggests the project workflow.

66.2 Differences in development and production environments

Ever since the first attempt to deploy the FHaSS in the Funcom offices in Oslo the differences between the project team's software development environment and Funcoms production environment has been prominent. A lot of thought and work hours have been put into solving problems that only occurred in the production environment throughout the latest half of the project development period.

We could probably have been able to become better known with the environment differences had we been able to spend more time in the Funcom offices in Oslo. However, this was not easy to accomplish both due to time and economy.

66.3 Very large amounts of data

The raw hardware statistics database table that Funcom was already using for their previous hardware statistics system had over four (4) million entries. With the help of the Funcom employees we quickly got a dump of this table downloaded to our server to test our system against. However, testing for instance the parser and grouper (discussed in section …) against such a large number of database table entries takes a lot of time. We are talking up to several days to complete such a process. As a result, the testing and debugging of the system in the development period has mainly been done on a subset of the original database table. While this gave us the opportunity to test more frequently and efficiently, it introduced another potential area of issues; the stability and endurance of the backbone of the system. We now see that this area was not tested as frequently and thorough as it probably should have, and as well there should have been created one or several tests in the test specification for testing this area specifically.

67 FHaSS extension suggestions

In the following will several ideas to extension features that either the project team has thought of themselves or that Funcom gave as feedback after the first successful deploy of the system, be discussed and given proposals to design solutions of.

67.1 CPU cores groups with range

The grouper is currently grouping hardware statistics entries for the CPU cores hardware category based on groups representing distinct number of cores values (for instance four (4) cores). Say in five years, the computer hardware market will have changed much, and the CPU evolution trend of more and more CPU cores onto a single CPU chip will most probably just continue. Using FHaSS, Funcom will then have to have one CPU cores group for each possible CPU cores number, while it is at this point probably more informative to get statistics for how many CPUs there are in this and this range of number of CPU cores (like FHaSS has for CPU speed for instance). The current system does not take this into account because it is not a demand of the current computer hardware market. A "range" solution would both work with the current market situation and an eventual future situation like explained above.

67.2 Physical and virtual CPU cores statistics

On the client side of their MMORPG games Funcom is using the DirectX Diagnostic (DxDiag) tool that comes with Windows to retrieve hardware statistics to return to their hardware statistics server. One of the problems with this approach is that the DxDiag tool does not take into account whether or not the amount of CPU cores that Windows is working on are physical cores on the CPU chip or just virtual cores. As a result, the statistics that FHaSS is producing about CPU number of cores is a merged statistics of both physical and virtual number of cores.

A possible solution for giving correct statistics in this context is to rewrite the hardware information gathering software to gather the CPU number of cores information from the msinfo32 system information tool instead of the DxDiag tool.

67.3 Saved filter administration with AJAX

Currently the saved filter administration functionality has got its own page in FHaSS. This functionality could potentially have been put in the administration section, but since all the functionality in the administration section controlled the backend part of the system it felt wrong to put frontend administration functionality like this in the same section. The functionality could also have been implemented into the Filter Menu on the Home page, but due to the Home page having to reload between each new HTTP request (which a deletion of a saved filter would produce) the user would get very bad loading times for a simple operation (having to wait for all the hardware statistics to load once more).

The solution that the project team has come up with to remove the need for the single Saved Filters administration page is to implement the administration functionality into the Filter Menu like explained above, by using AJAX. By using AJAX the web-browser can send HTTP requests without having to reload the page, and thereby good response times could be kept up while at the same time offering a good user interface to the Funcom employees.

67.4 Graph resolution

The graphs on the Home page of the web-page interface of FHaSS is currently displaying one data point for each day for each of the top six (6) groups of the hardware category. If the user choose to get statistics from the last year for instance (by using the Time Period Filter) the charts would display 365 * 6 = more than 2000 data points, which is quite a lot. Given that the charts are displayed side by side the amount of space they've got for displaying their data is limited, and with many data points

the charts are looking very spiky. The charts could potentially be more informative if the chart resolution (number of data points) was either static, variable and calculated based on the charts available space, or given by the user. With some more fixing in the backend of FHaSS such a solution could potentially also improve the loading times for the Home page.

67.5 Dual page view

Feedback from the Funcom employees said that it was wanted that the FHaSS web-page interface should be capable of displaying two or several pages of hardware statistics without having to reload the page. Such functionality would make it easier for the user to compare statistics calculated based on two or more different filter selections in the Filter Menu.

67.6 Toggle displaying individual charts

How the system works today is that all categories displayed in the statistical table have their own chart showing information. These charts will be created as long as the amount of days in the time span chosen is under 600 days.
An option to choose which charts to be created could be added to reduce the loading time of the statistical page or to just show the relevant ones and use less space.

67.7 Compare newest event log entry from database to local event log

How the parser, grouper and distinct updater of the system works today if an exception was to happen is that an event log about the exception is written to the database and to a local file where the windows service is stored. If the database connection is down (still after 4 retries) the event log will only be written to the local event log and another log saying could not log event to database. Today there is no functionality to check if the local file has newer log entries than the database. This could be implemented so the user could be given a message of this when viewing the event log on the parser interface page under administration without having to check this manually.

67.8 Recommended hardware/software to look into/these need attention

The group has come up with an extension of the system that could be helpful for Funcom employees using the FHaSS system. Another list could be added to the statistical table showing the most frequent hardware/software found in the database. This could identify the source of most recent crashes. This extension should also have the possibility to remove entries in the list if the hardware/software is not the cause of the bug but is just often used in computers that experience crashes or that the specific hardware/software issue has been resolved.