



# **New Web Interface for Men & Mice Suite**

## **Final report**

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## INTRODUCTION

The New Web Interface for Men & Mice Suite is a Final Project towards a BSc degree in Computer Science at Reykjavik University. The project's goal is to develop a new Web Interface for Men & Mice Suite and is implemented in cooperation with Men & Mice.

Men & Mice Suite enables DNS, DHCP and IP address management and Men & Mice is a leading developer and supplier to the IT market on a worldwide basis.

Further information on the project can be found in the following documentation that is included on the accompanying CD:

- User Guide
- Administration Guide
- Development Guide
- Progress Report

## DESCRIPTION

Founded in 1990, Men & Mice is a team of experts who have been in the DNS, DHCP and IP address management (DDI) sector for a long time. They have operations in the US, Europe and Asia as well as resellers in several countries. The Men & Mice Suite is an overlay management solution that supports both Microsoft and Unix environments and a mixture thereof. The solution is both flexible and scalable and is used by many global organizations.

The Men & Mice Suite maintains an overview of network address space and enables management of changing environments with minimum effort. The Suite is managed via a Windows GUI client, Command Line Interface or a Web Interface.

The main focus of the deliverable should be a robust and extendable web framework for Men & Mice to build the next generation of their Web Interface upon. The existing Web Interface code is difficult to maintain and the code design leaves a lot to be desired. The SOAP API and the client code is very coupled, leaving little room for changes and a significant part of business-logic running in the browser. The UI itself is outdated and needs a complete rewrite. These facts had led to the decision that the next release of the Web Interface would not depend on the existing code base at all but be written from the ground up and have a structure different from the existing product.

For the project to be successful it should be easy for Men & Mice to extend the functionality so they could easily leverage their experience and existing code base for future development on this platform.

Men & Mice had started work earlier on a similar project, and a UI prototype as well as some implementation ideas were supplied to kick start the project.

## ORGANIZATION

This part of the report will describe the methodology used and its main deliverables. Roles and diary will be explained and expanded on.

### DIARY

Part of the initial planning was to decide when we would work on the project together. The school semester is in two parts; 12 weeks for traditional lectures and tests and 3 weeks for dedicated project work. We decided to build our schedule around that. The team would work together on premises for at least 10 hours per week during the 12 week period, and 40 hours per week for the last 3 weeks.

Total time would therefore sum up to 720 hours. Apart from this time, all team members were free to spend whatever spare time they had on the project but attendance during agreed upon times should be a priority.

This arrangement worked well for the team with no major departures. There were times that weather, sickness or travels prevented all team members from being on site but that did not cause any problems. During the 3 week period all members put in a lot more hours than planned. Total time delivered on the premises turned out to be 960 hours or 33% more than planned. This was, however, a result of an expanded scope and great interest in the project rather than bad planning.

### METHODOLOGY

Men & Mice use Scrum for their development so using the same methodology suited us well as everyone was familiar with the process. We used Jira with the Greenhopper plugin for managing the backlog, the Scrum board and reports.

The following table contains an overview of the project's sprints.

Table 1. Sprint overview

| Sprint   | Starting date | Duration in days |
|----------|---------------|------------------|
| Sprint 0 | 21.01.2013    | 20               |
| Sprint 1 | 11.02.2013    | 14               |
| Sprint 2 | 25.02.2013    | 14               |
| Sprint 3 | 11.03.2013    | 14               |
| Sprint 4 | 25.03.2013    | 15               |
| Sprint 5 | 08.04.2013    | 17               |
| Sprint 6 | 25.04.2013    | 12               |

|          |            |   |
|----------|------------|---|
| Sprint 7 | 07.05.2013 | 7 |
| Sprint 8 | 14.05.2013 | 8 |

## ROLES

The roles the members took according to Scrum were as follows.

Table 2. Scrum roles.

| Title               | Name                           |
|---------------------|--------------------------------|
| Scrum Master        | Hans Pétur Jónsson             |
| Product Owner       | Eggert Thorlacius / Men & Mice |
| Programmer / tester | Árni Birgisson                 |
| Programmer / tester | Einar Tryggvi Leifsson         |

As the team is small the borders separating the roles were blurry at times and the members took part in all aspects of the project.

## CEREMONIES

The team adhered to all the Scrum ceremonies i.e. Sprint planning, review, retrospective and daily meetings. This aspect of the project put our discipline to the test as time boxing these activities was hard at times and understanding the tools used added to the difficulties. After the fact we do feel that the process got smoother as the project came along. We also decided to be satisfied with the result rather than keep blindly to the process.

## ARTIFACTS

The initial backlog for the project included some stories related to the implementation ideas from Men & Mice. The bulk of the backlog scoped a full featured basic DDI product. The plan was not to complete all stories from the backlog but rather to focus on the framework and implement some end to end functionality.

# DESIGN AND IMPLEMENTATION

## REQUIREMENT ANALYSIS

Examining the features and capabilities of the old web interface revealed that it was outdated and there was much room for improvements. Lead developers at Men & Mice had implementation ideas for a new interface and had already done some work in that direction. Their idea was to build a stateful web interface by using a unique thread for each logged in user. The system would be built up by modular components, called tasks, which are essentially a group of actions that can be performed on objects in the Men & Mice Suite. Having independent threads for each user would allow the code behind each task to be simpler, having the thread taking care of all communication between the user the backend.

The main requirement from Men & Mice was that the product would be a highly extendable web framework with a few simple tasks implemented and also that their implementation ideas would be used, at least as a reference. Implementing the web interface as a stateful threaded system was considered the biggest threat to the project mostly because of a lack of experience with threaded software. For that reason, it was agreed that this threat should be eliminated by the end of the second sprint by gathering knowledge about threading in web based software and by weighing the advantages and disadvantages of the implementation.

After careful consideration it was clear that the risks associated with the threaded implementation heavily outweighed the potential advantages. The team decided to introduce an alternative implementation to Men & Mice where the system would behave more like a regular web application. In this design any required state would be stored in a web session, therefore making threads obsolete. This alternative was reviewed in conjunction with Men & Mice, looking for corner cases and circumstances in which it would not be suitable. When each of those had been addressed, Men & Mice agreed that the proposed solution was preferable.

## IMPLEMENTATION

The original implementation idea and the code supplied by Men & Mice was written in Python. The system should also be cross-platform and for those two reasons Python was an obvious choice, although other candidates were considered and evaluated. Python 3 was chosen over Python 2.7 for multiple reasons; it is recommended by the Python community for new projects, Python 2.x will not see more major releases, and version 3 is more efficient and modern.

The original code used a Python micro web framework called Bottle. It offered rather limited functionality, lacking in features such as URL routing and session handling. There are many great web frameworks available for Python and many of them were considered for the project. Among them was the very popular Django framework which contains an extensive set of features, most of which are not needed for this project. Eventually, a minimalist web framework called CherryPy was selected. It is lightweight, offers all functionality needed and has a built in multi-threading web server for standalone deployment.

Once the biggest threat was eliminated and a framework selected, the next step was to design the basis for the system. Early in the design process it was decided to abstract the data layer by using dependency injection. Decoupling the solution from the data adapter in this way facilitated testing as a separate testing adapter was developed as a part of the testing framework. This also means that connecting to different backends is much easier.

The data layer is built up by model classes that reflect objects in the Men & Mice Suite. The models know how to make queries to the data adapter, how to save and delete themselves and implement all actions that need to be performed on them.

Tasks are self-contained Python modules that are dynamically discovered in the system by reading manifest files that all tasks must provide. Tasks can be as simple as a single class and a manifest file or a module with multiple sub modules and classes.

## CONTINUOUS INTEGRATION

The team placed great emphasis on building a solid foundation of tools and procedures to assist with writing high quality, testable components. This was important knowing that the project would be handed over to Men & Mice as a framework first and foremost, with more features and extensions being added by Men & Mice developers in the future. This resulted in the team applying more effort and time into deploying a Continuous Integration system with automated testing and code coverage reports.

All source code for the project was stored in a Git repository on BitBucket.org, where it was accessible to all members of the team. BitBucket was configured to trigger an automatic build on Jenkins, our Continuous Integration server, which in turn pulled in the latest version of the master branch. Then a Python virtual environment was created with necessary dependencies, all tests executed and code coverage reports generated. If the build was successful the latest version was deployed to our staging environment.

## WORKFLOW

From the initial commit to our Git repository and onwards, the team maintained a stable master branch. New features were developed on separate branches and merged to the master branch when considered stable. As the codebase grew larger, automating the testing process become more important, for assuring code quality and compatibility. The team strived to keep the code coverage above 85%. Having a comprehensive set of tests resulted in the team gaining more confidence when adding new features as we had a very short feedback loop.

## PROGRESS REPORT

### SPRINTS AND DEADLINE

The following lists time spent, sprint burndown and retrospective for each sprint as well as what was the focus of the work during the sprint. Further information including time spent and sprint retrospective can be found on the accompanying CD in a more complete Progress Report.

#### *SPRINT ZERO 21.01.2013 - 10.02.2013*

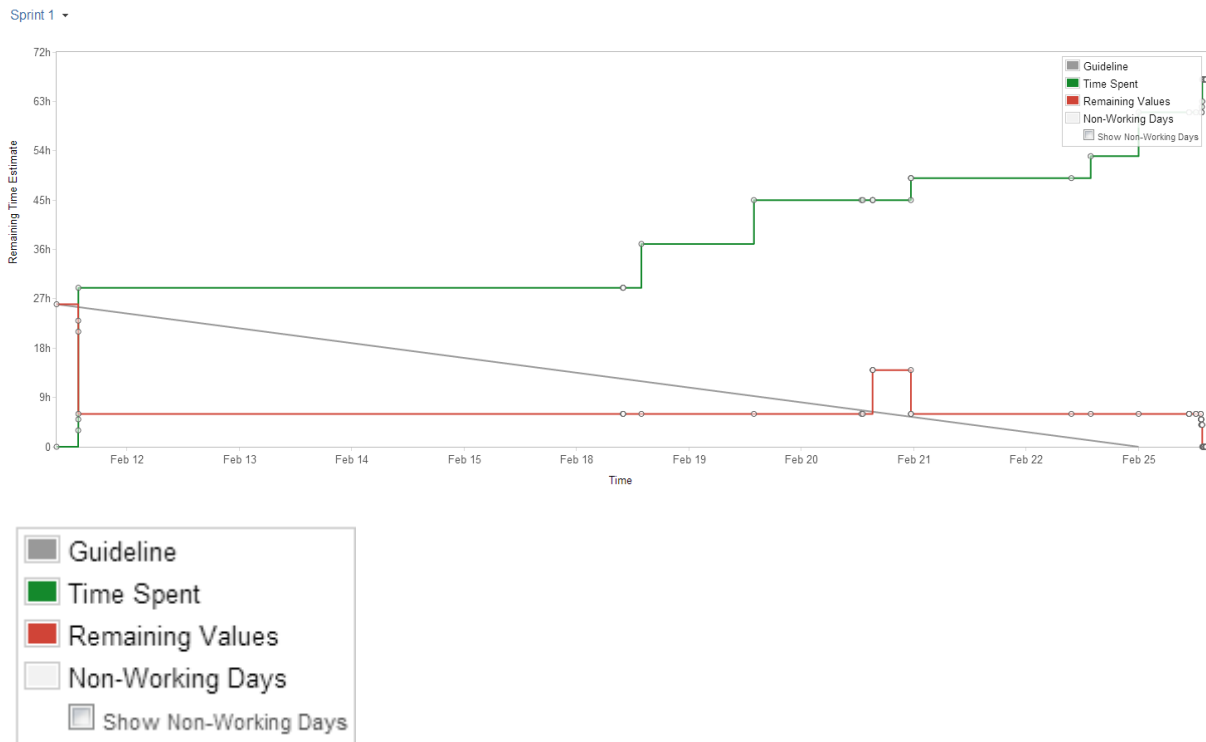
Sprint zero was successful with the team completing most of the tasks assigned. There were a number of collaboration sessions in which we set up the necessary systems, such as issue tracking, document collaboration, file sharing, time tracking and source control. Decisions on design and selection of a Python framework were completed. The issue list has been re-prioritized in collaboration with the Product Owner from Men & Mice.

The focus of the sprint was on organizing the work and deciding on tools.

## SPRINT 1 11.02.2013 - 24.02.2013

During sprint 1 the team focused on getting the tools up and running. Different versions of the project were set up and tested. Connection to Men & Mice Web Service was tested. Source code revision and build services were installed. The mission for the sprint was to have a working platform and implement some functionality on that platform. It complicated the work that at the same time we needed to find out if the customer's approach worked and had real benefits. Only half of the stories finished during the sprint but there had been substantial work done on many of them that moved with them onto the next sprint.

### Sprint 1 burndown chart



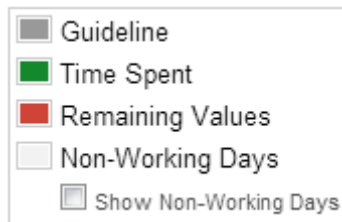
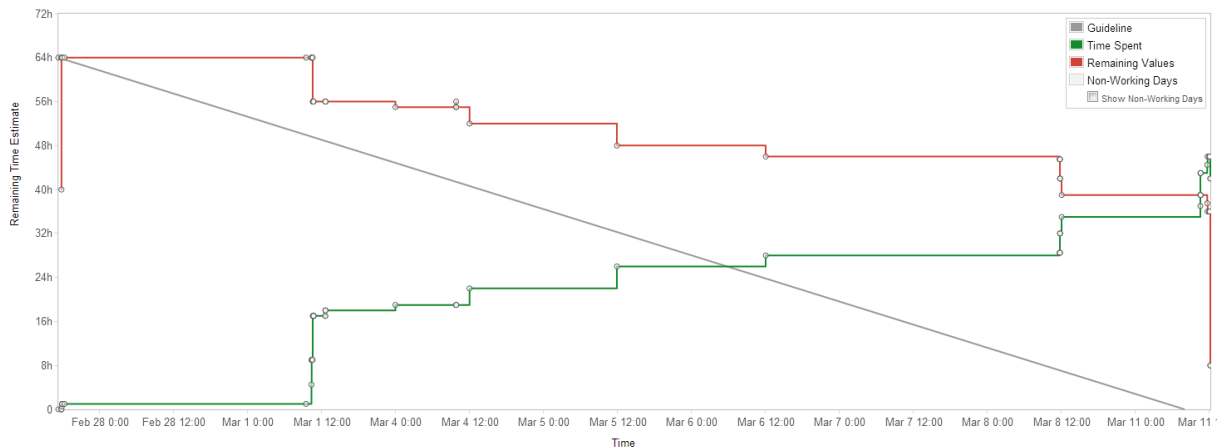


## SPRINT 2 25.02.2013 - 10.03.2013

The sprint started slower than anticipated as there was still a lot of red tape to take care of. However there was quite some work from sprint 1 that filtered over to this sprint and made a good foundation for work during this sprint. Greenhopper remained in many aspects a mystery so the reports are still not as we would like to have them. Resolution of the “thread implementation” was to abandon that and go for a session based MVC pattern. Again only half of the stories completed during the sprint and team velocity is the same as for sprint 1.

### Sprint 2 burndown chart

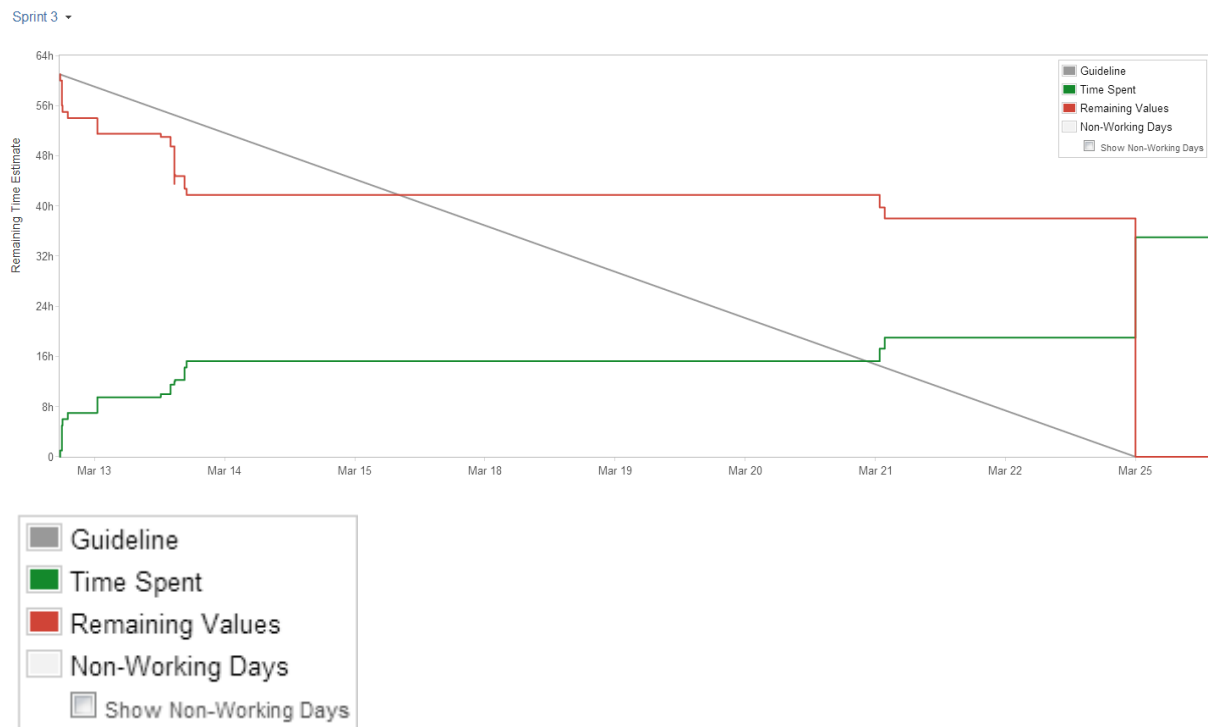
Sprint 2 ▾



### ***SPRINT 3 11.03.2013 - 24.03.2013***

The team added a working day to the schedule to get up to speed and had a flying start with this sprint. Other duties at school and work meant that little progress was made after the initial good start of the sprint but a really fruitful session at the end made the sprint a success and all story points were finished and fundamental functionality realized.

#### **Sprint 3 burndown chart**



### ***SPRINT 4 25.03.2013 - 08.04.2013***

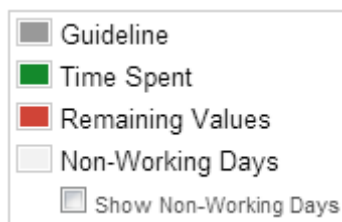
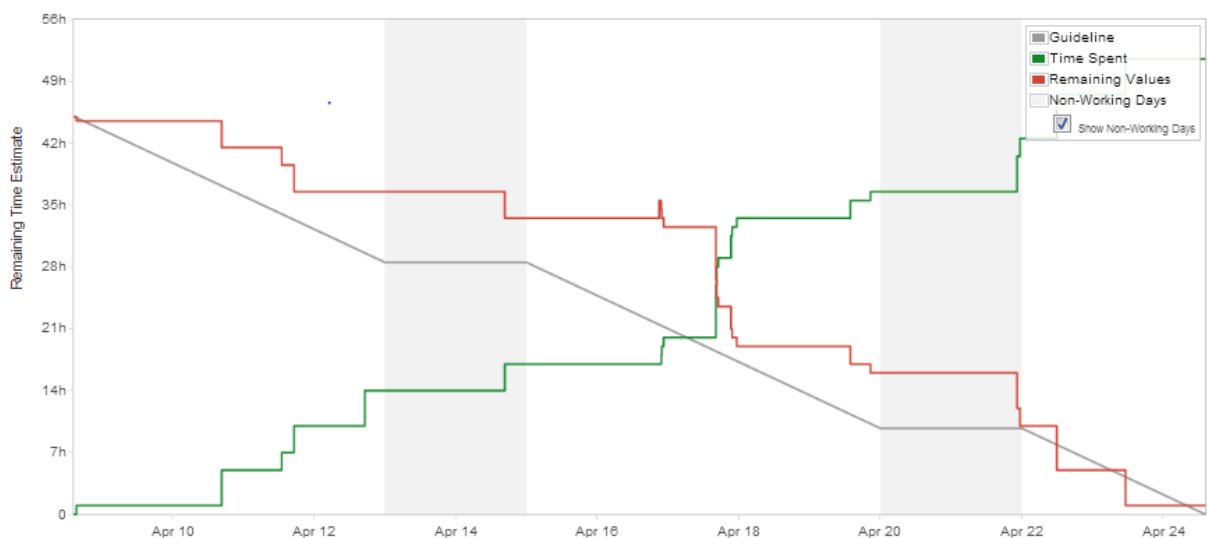
No story points were finished during this sprint. Time schedule did not hold. Travel, sickness and holiday festivities played havoc with our plan. As a consequence there is no burndown chart for this sprint. All was not lost though as the work that was performed was not in vain but moved to the next sprint.

### *SPRINT 5 08.04.2013 - 24.04.2013*

During this sprint fundamental framework components reached beta stage. Adding new functionality to the project proved to be as easy or even easier than anticipated. All story points were finished and finally the Grasshopper tool worked with us. Of course that also means we planned better for this sprint than the earlier ones.

### **Sprint 5 burndown chart**

Sprint 5 ▾

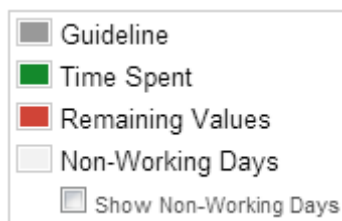
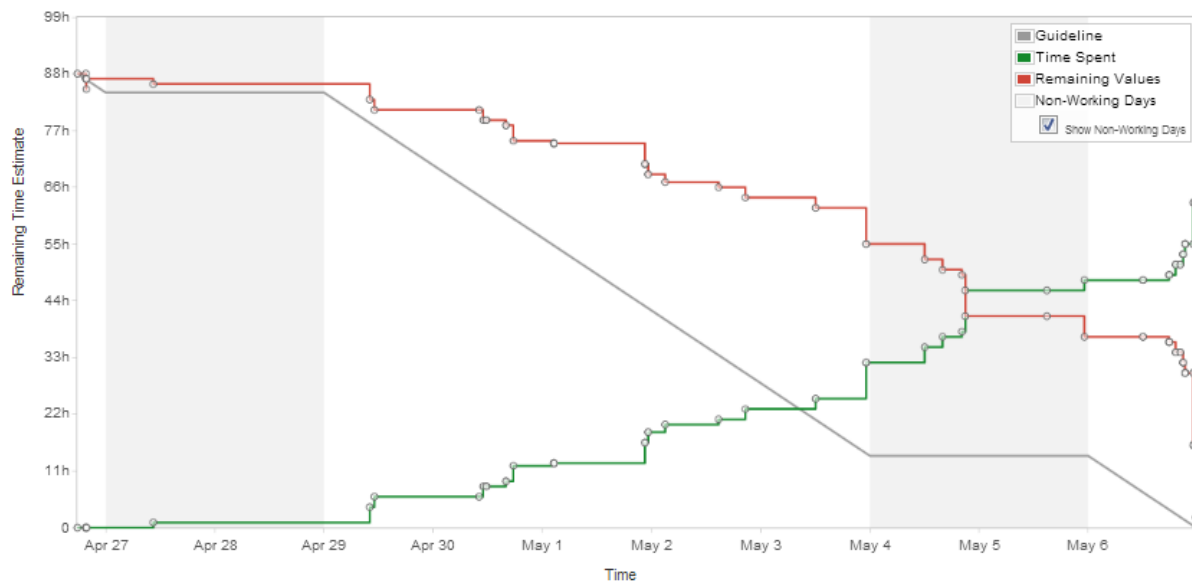


## SPRINT 6 25.04.2013 - 05.05.2013

A lot was accomplished during this sprint and most of the expected functionality is in place even though it needs to be polished and filled in. Refactoring and testing had a focus in this sprint.

### Sprint 6 burndown chart

Sprint 6 ▾

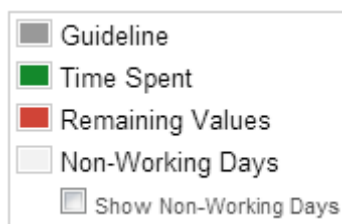
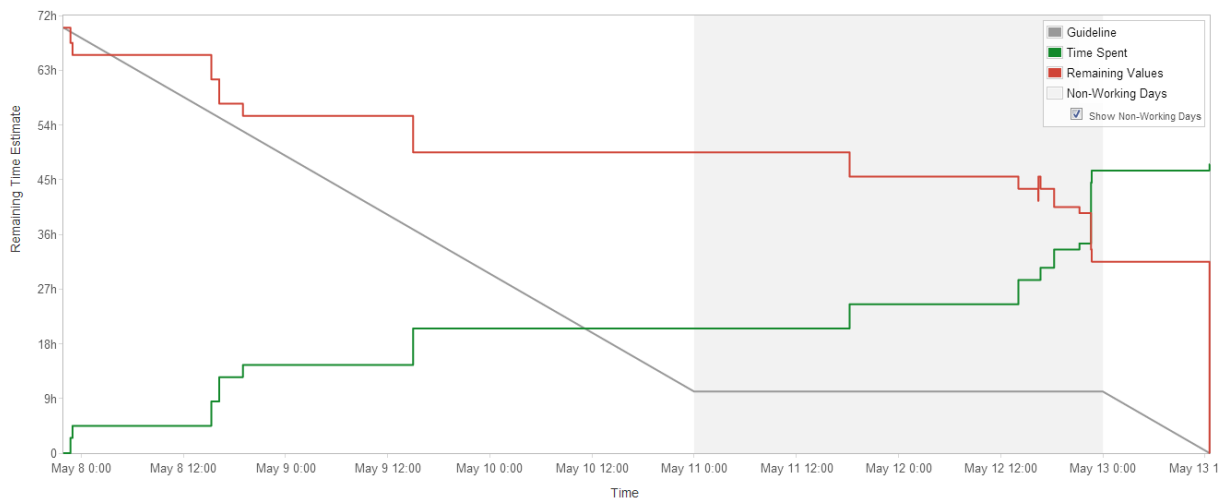


## SPRINT 7 06.05.2013 - 13.05.2013

During the sprint work started to focus on handover of the product. Refactoring, testing and documentation was the main agenda. Features are still being introduced and more work remains to be done regarding the magic feature. Manage server task and simplification of IPAM features add value to the project and to implement them team members invest more time in the project than originally planned.

### Sprint 7 burndown chart

Sprint 7 ▾

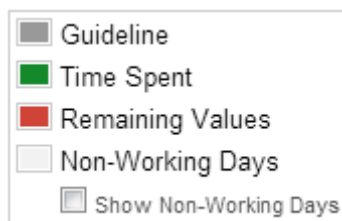
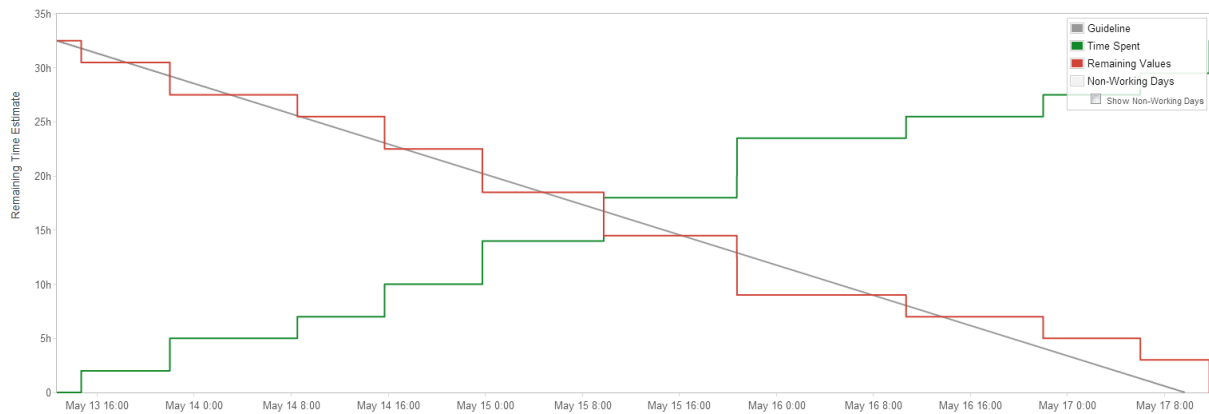


## SPRINT 8 14.05.2013 - 17.05.2013

This was the last sprint of the project and its main focus was on finalizing the global search functionality and finishing the deliverables. A lot of time was spent on polishing and refactoring the code as well as testing.

### Sprint 8 burndown chart

Sprint 8 ▾



## RESULTS

The purpose of the project was to lay a foundation for a new Web Interface for Men & Mice Suite. Men & Mice had some implementation ideas and a UI prototype for the style and structure. There were no specific requirements for desired behavior but of course there are already full featured clients available for the Suite that the team could use as a reference. The project started by thorough examination of the proposals Men & Mice had as well as brainstorming about new and more productive approaches to the problem. During this examination it occurred to us that in most cases a user has a very specific task in mind. However, DDI products have traditionally been heavily list based and usually require the users to browse and scroll through vast amounts of data before reaching their goals.

The resulting product does a good job at fulfilling the fundamental framework requirements and at the same time presents a novel way to manage DDI. By simply entering text the system will start suggesting which objects the user might be referring to and offer tasks related to those objects. This enables the user to quickly navigate to the task at hand.

Having the framework in place with basic functionality, we decided to put our platform to the test by trying to implement a task that would combine multiple actions in the Men & Mice suite. That resulted in an increased usability and proved the quality of our platform.

Going forward, this project will be used by Men & Mice as a platform for their web interface and deployed at some of the leading companies of the world.

## RECOMMENDATIONS AND FUTURE DEVELOPMENT

While working on the project, the team was very pleased with the completeness of the SOAP API of Men & Mice Suite. There are various improvements that can be made in future development and we are convinced that efficiency and speed can be optimized further by implementing certain functionality in the API.

## SUMMARY

Working on this project proved to be a challenging and rewarding experience. The team members had never worked together before but complemented each other very well and teamwork was a pleasure from the beginning.

Using the scrum methodology proved to be a good fit. We spent some time looking at different tools that could help us in this regard, ranging from simple spreadsheets to full featured solutions such as JIRA. In spite of warnings about the added complexity, we decided to use JIRA as it was already used by Men & Mice and they offered to support us as needed. JIRA had a steep learning curve and the system turned out to be inflexible in some ways but it is very complete and robust in what it does. We do not regret this decision and will probably advocate its use in the future.

The transition from the original idea to the final design was achieved successfully and in a professional manner. The end result fulfills the desired functionality while at the same time conforming to current best practices in web application design.

The project uses a number of open source libraries and in some cases they required additional functionality. In the spirit of the open source community we made contributions to those libraries, some of which have already been approved and are now available in current releases.

The workflow that we adopted proved to be a productivity booster and helped the team produce a high quality product. As developers we feel that using Continuous Integration, with a testing framework and automated builds, is essential for a successful project of this size.

## SPONSOR'S REVIEW

Men & Mice got a group of HR students to develop the foundation for a new web UI for the Men & Mice Suite. They were supplied with a UI prototype and some implementation ideas, but had significant freedom in how the UI should look. The first thing they did was to analyze the core implementation idea, point out that it would not work and suggest an alternate implementation. This was a brave move and in itself made the project worthwhile for Men & Mice. Then they continued with fleshing out the code, building on the ideas that they were fed and mixing in their own notions of how the flow of the UI should be. The result is a very slick system that holds a lot of promise for us to build new functionality on top of. Especially valuable is the fact that their code has a very good testing framework, which is crucial when handing it over to the Men & Mice developers. We were very impressed with the professionalism of the team and the quality and scope of the resulting system well exceeded our expectations.

*- Eggert Thorlacius, senior developer*