Real-Time Bridge Monitoring
Project Plan

Version 1.3

Revision History

Date	Version	Description	Author
2013-10-10	1.0	Initial Draft	DSD Staff
2013-10-28	1.1	Project Plan v1.0	Real-Time Bridge Monitoring team
2014-01-06	1.2	Update chapters 1, 2, 3 and 4 Text format	Andrea Bottoli
2014-01-07	1.3	Insert Configuration Part Text format	Lorenzo Paglairi

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1. Introduction

Real-Time Bridge Monitoring is a project for the Distributed Software Development course held by Politecnico di Milano, Mälardalen University and University of Zagreb.

1.1 Purpose of this document

The purpose of this document is to assist in the planning of the development of the project 'Real-Time Bridge Monitoring", as a part of the Distributed Software Development course.

This document will be the starting point and first deliverable of the project.

It is essential for the beginning phase of the development process, and will be slightly updated throughout the whole project.

1.2 Intended Audience

This document is written primarily for the development team.

The crucial planning decisions will be recorded in this document, so the development team will use it as a guidance while planning their time, splitting tasks and it will serve as a basis for the next phases of the project.

Also, this document is intended for the supervisors, in order to give them insight into our initial view and plan of the project.

1.3 Scope

This document will have main focus on the organization of the team and planning and distribution of work during the development process.

Firstly, the background and objectives of the project will be briefly explained.

After that, the organization within the team will be shown, regarding the distribution of work and responsibilities of each team member. Also, the stakeholders of the project will be introduced.

The development process that will be used in the development of the system will be presented in the fourth section. Here there will also be a brief description of each increment of the system.

Each deliverable will be described in the sixth section. This part will be updated throughout the project in order to record the delivered products and documents, and passed deadlines.

Further on, the inputs to the system will be presented. The inputs present the data that will be received from the customer and be processed by the system.

The document will also cover communication tools and conventions that we have agreed upon. In this chapter, it will be described in details how the information flow should look like.

Finally, configuration management and the project plan will be introduced. The project plan will cover the main planning decisions main about the project, regarding time, milestones, activities. This plan will be represented in an intuitive way, by using tables, charts and Gantt charts with timestamps.

1.4 Definitions and acronyms

1.4.1 Definitions

Keyword	Definitions
Real-Time Bridge Monitoring	The project name

1.4.2 Acronyms and abbreviations

Acronym or abbreviation	Definitions
POLIMI	Politecnico di Milano
MDH	Mälardalen University
FER	University of Zagreb
DSD	Distributed Software Development

1.5 References

Project homepage: http://www.fer.unizg.hr/rasip/dsd/projects/real-time_bridge_monitoring

Project application: http://161.53.67.134/BridgeMonitoring/

Project documents: http://www.fer.unizg.hr/rasip/dsd/projects/real-time_bridge_monitoring/documents

2. Background and Objectives

2.1 Project Goal

The Goal of this project is to develop a system that can help the monitoring process of bridges and to improve the speed of reaction at dangerous events. The system has to indicate the level of alarm in which the bridge is, so eventual security measures can be performed by the users; also make these information available on the web.

2.2 Project Requirements

2.2.1 Data sources

The system gathers data from various sensors that are:

- Anemometer
- Hydrometer
- Echo sonar
- Cameras

2.2.2 Data calculations

The system has to calculate the various characteristics of the bridge:

- The bridge stresses
- The forces acting on the bridge
- The wind speed
- The impact of the amount of traffic and its direction

2.2.3 User interface

The system has a user interface on which all the information will be displayed; it will also be displayed a temporal graph showing the temporal trend of values in the current day. The interface let to the users the possibilities to change some bounds or other variables.

There will be also the possibility to display historical data of the bridge on graph to allow the users to make comparison from the current state and the historical one; the users have to insert the period of time that they will want to see.

2.2.4 Web Application

The system can be reached on web to allow the uses to see all the information on their own devices.

2.3 Project Milestone

The main milestones are:

- Project Vision
- Project Plan
- Requirements definitions
- Design description
- Alpha prototype
- Beta prototype
- Acceptance test
- Final product

2.4 Project Deliverables

The deliverable are:

- Project Plan & Vision (with presentation)
- Project Plan Document
- Project Requirements and Architecture (with presentation)
- Design Description
- Alpha Prototype (with presentation)
- Beta Prototype (with presentation)
- Testing Report
- Final Project (with presentation**)**

2.5 Project testing

The testing phase expect to test the system reaction at some unexpected situations as the loss of network connection, loss of data, incorrect data, data missing and some other cases.

2.6 Project delivery

The final project/product will be delivered at 13-01-2014 on the web page with all the source codes.

3. Organization

3.1 Project group

The project group consists of seven members all together.

There are three members from the Italian side, that are coming from the Politecnico di Milano University: Andrea Bottoli, Lorenzo Pagliari and Marko Brčić.

The other four members are from the Mälardalens University: Dzana Kujan, Miraldi Fifo, Jörn Tillmanns and Nikola Radisavljevic.

Their roles in the group are defined and represented in the table below.

Name	Initials	Responsibility (roles)
Andrea Bottoli	**AB**	**Project Manager**
Dzana Kujan	***DK***	***Team Leader***
Marko Brcic	MB	Documentation manager
Lorenzo Pagliari	LP	Design manager
Miraldi Fifo	MF	Testing manager
Jorn Tillmanns	JT	Database manager
Nikola Radisavljevic	NR	Integration manager

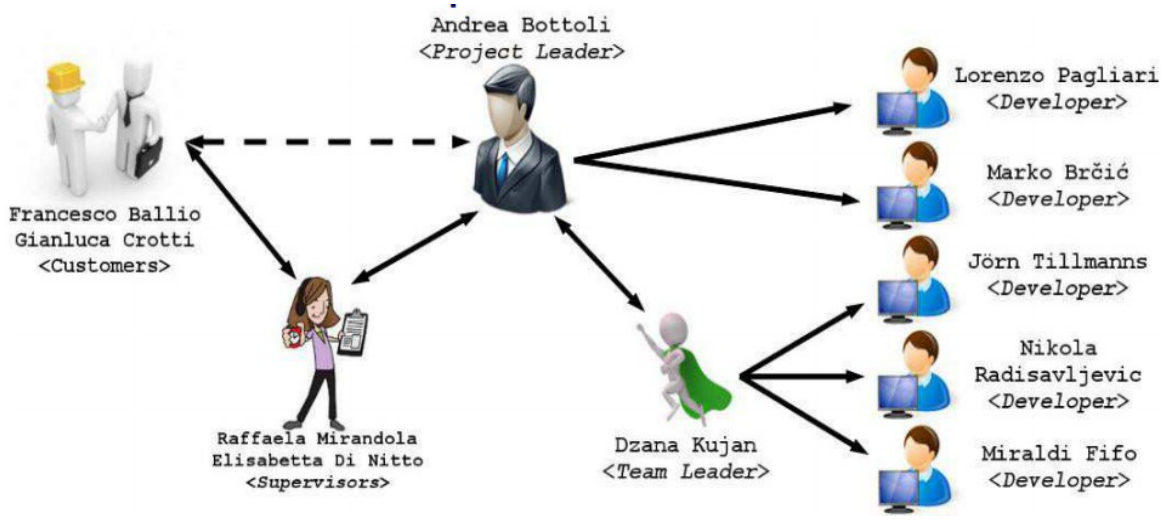
3.2 Customer

There are two customers in this project: they are Ballio Francesco and Crotti Gianluca.

3.3 Supervisor

There are two supervisors in this project: they are Mirandola Raffaela and Di Nitto Elisabetta.

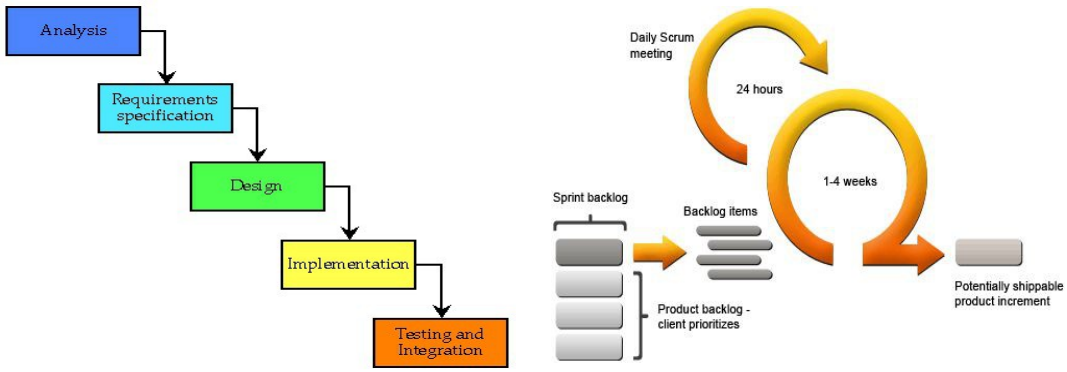
This organization structure is better depicted in the following picture.



4. Development process

4.1 Introduction

On the overall project the team follow a Waterfall model, but in the Requirements phase, Design phase and Implementation phase the team will follow a SCRUM model.



4.2 Project Phases

4.2.1 Analysis

In this phase the team analyzed the project, thinking at high level at the possible users, at the possible scenarios in which the system will work. Also works to build a shared vision of the project, on which each members of the team is agree.

4.2.2 Requirements Specification

In this phase the team set up with the customers the requirements of the project, focusing on the behavior of the final product and also on the type and structure of data in input at the system.

During the Design phase and Implementation phase the team can make some changes at the requirements, adding or removing some features depending on the issues that will rise.

4.2.3 Design

In this phase the team works on the design of the architecture of the system and on the behavior of the user interface to make it as user friendly, expressive and comprehensible as possible for the user.

4.2.4 Implementation

In this phase the team focus on the development of the various parts of the system.

4.2.5 Testing & Integration

In this phase the team will test the system's features in all the possible scenarios, to verify the correctness of the behavior of the system.

4.3 Roles

In the overall development process all the members of the team are developers. Adding this, threre are also other roles:

- Project leader
- Team leader
- Document manager
- Design manager
- Test manager
- Integration manager
- Database manager

4.4 Quality Assurance

During all the iterations of the Design phase and Implementation phase the Test manager will check that the system's features meet the customers desires.

Sometimes, the customers involvement guarantees that the product fits their needs.

5. Deliverables

To	Output	Planned week	Promised week	Late +/-	Delivered week	Rem
Supervisors/ DSD staff	Project Plan Document	43	44	+1	44	
Supervisors/ DSD staff	Requirements Definition Document	44	45	-	-	
Supervisors/ DSD staff	Design Description Document	45	45	-	-	
Supervisors/ DSD staff	Alpha Prototype	48	48	-	-	1
Supervisors/ DSD staff	Status Report	49	49	-	-	
Supervisors/ DSD staff	Beta Prototype	51	51	-	-	2
Supervisors/ DSD staff	Acceptance Test Plan	1	1	-	-	
Supervisors/ DSD staff	Test Report	2	2	-	-	
Supervisors/ DSD staff/ Customers	Final Project Presentation	2	2	-	-	
Supervisors/ DSD staff/ Customers	Final Project Report	3	3	-	-	
Supervisors/ DSD staff/ Customers	Final Product	3	3	-	-	3

5.1.1 Remarks

Remark Id	Description
1	The alpha prototype will have the basic features required, so the data parser and the DB integration
2	The beta prototype will have the main features of the product, like a math engine, graphs, statistics.
3	The final product will have all the features settled with the customers, like historical statistics, graphs, access control, system authentication.

6. Inputs

From	Required item	Planned week	Promised week	Late +/-	Delivered week	Rem
Anemometer	Yes	44	44	-	-	1
Hydrometer	Yes	44	44	-	-	2
Echo sounder	Yes	44	44	-	-	3
Camera	Yes	44	44	-	-	4

Comment: *Required week* = week when it is required by the project; *Promised week* indicates when the *From* expects to deliver; *Late* + indicates a discrepancy between *Required week* and *Promised week; Received week* is week when it was actually received; *Rem* is a remark index number.

6.1.1 Remarks

Remark Id	Description
1	Data that measure the wind speed
2	Data that measure the depth of water
3	Data that measure the presence of debris on the river's bed
4	Cameras that take pictures of pylons base for show the presence of debris on them.

7. Project risks

There are several risks that can affect the productivity of the team members and the accuracy of the final result of this project. Therefore, it is essential to be analyze the possibility of each risk happening, and to come up with a preventive action for each risk early in the project. This will increase the possibility of producing a high quality product and dealing with problems easier. In the table below, risks are listed, along with their possibility and preventive actions.

Possibility	Risk	Preventive action
H	Poor communication with the customer	Try to insist on more frequent meetings with the customers.
H	Undefined date for receiving input data	Try to insist on receiving it as soon as possible.
H	Unclear requirements	Try to have as much contact with customer, and ask them for feedback. Get acceptance of requirements from the customer early in the project.
M	Communication within the team	Define precise roles of the team members (team manager, team leader) and define communication flow between all the sides of the team. Also, define fixed dates for group meetings.
L	Communication within the distributed groups	This will be solved by planning to have daily meetings and try to have sprints together.
L	Lack of technical background	We deal with this by choosing technologies that are widely used and well known to the team members
L	Cultural differences	Be patient and open-minded
L	Language misunderstandings	Be patient and ask a lot of questions, in order to not get a wrong understanding of what a person meant
M	Information flow – risk of now receiving all information or of receiving correct one	Work on frequent communication especially between customer-project manager, project manager-team leader
M	Losing data	Always have a back-up of all the files that have been created during the project
M	Integration problems	Good interface definitions
L	Missing Inputs	Create fake .txt files and images with fake plausible data, to simulate the situation of the bridge

8. Communication

In this type of project when team members are physically separated, setting up communication protocols turns out to be a big deal. It is important to make it clear how the information will be shared among the team members and to make sure everyone has the same picture of the project.

In our team we have three separated groups of team members. We have four team members in Vastertas(SWE), two in Milan(ITA) and one in Zagreb(CRO). According to this we have agreed to have two subgroups. The first one consist of team members from Vasteras, and second one consist of members form Milano and Zagreb.

The subteam from Milano has a project manager and team from Vasteras has a team leader. Communication between these two people will be the most frequent, they will be in touch basically all the time and try to coordinate all team members and lead the project in the right direction. Having this frequent communication between these two people, we hope we will be able to react more quickly to any unexpected problem.

The next stage of communication within the group are group meetings. We agree to have at least one weekly meeting. More meetings during the week will be organized if needed. Each group meeting will be documented in the minutes of meeting document.

Finally, meetings within subgroups will be organized on a daily bases.

As technical support for communication, Skype, Google hangout and spreadsheets will be used. For sharing documentation and code Git will be used.

9. Configuration management

- Github will be the repository for code and product documentation
- The Github policy and the internal group policies provide information about coordinated usage and preventive action to take
- Google Drive is will be the tool used for drafting documents and to manage and coordinate some actions
- The Github manager and the Documentation manager will handle the corrective actions regarding merging or correcting the documents

10. Project plan

In this section, the project plan will be presented. It will include a list of all the milestones of the project along with the responsible team members associated with the milestone, and the planned week for the milestone. Also, the activity plan will be presented with a Gantt chart.

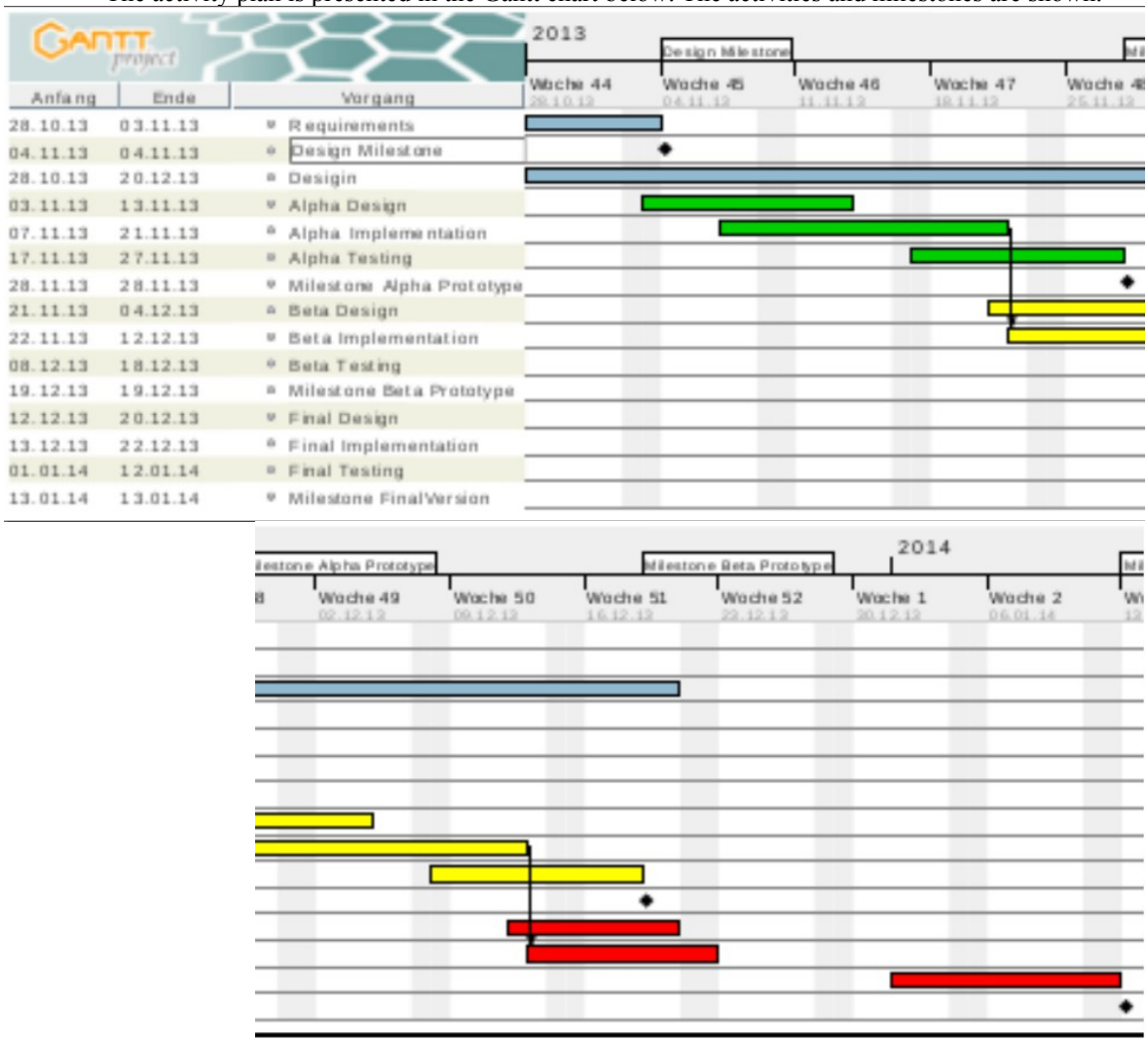
10.1 Time schedule

In the table below, the milestones are presented.

Id	Milestone Description	Responsible Dept./Initials	Finished week				Metr	Rem
			Plan	Forecast		Actual		
				Week	+/-			
M-001	Project Plan & Vision	All	42	42	0	43		
M-002	Requirements gathering	All	43	43	0	43		
M-003	Requirements document	All	43	44	1	43		
M-004	System Design	All	43	44	0	43		
M-005	Requirement Document	All	44	44	0	44		
M-006	Design Document	All	44	44	0	44		
M-007	Status Report	All	44	44	0	44		
M-008	Organize Repository	Marko Brcic	45	45	0	45		
M-009	Team Policies	Marko Brcic	45	45	0	45		
M-010	Share telephone number	All	45	45	0	45		
M-011	Modify Requirement Doc	Dzana Kujan	45	46	1	45		
M-012	Modify Design Doc	Lorenzo Pagliari	45	46	1	45		
M-013	Setup tools on PC	All	45	45	0	45		
M-014	Change DB	Jorn Tillmanns	45	45	0	45		
M-015	Implementation Parser	Jorn Tillmanns	45	45	0	45		
M-016	Implementation DAO	Jorn Tillmanns	45	45	0	45		
M-017	Start Implementation Math	Andrea Bottoli	45	46	1	45		
M-018	Test Parser	Miraldi Fifo	46	47	0	46		
M-019	Test Classes alpha prot.	Miraldi Fifo	46	47	0	46		
M-020	Alpha prototype	All	46	48	2	46		
M-021	Requirements Gathering	Andrea Bottoli	47	47	0	47		
M-022	Update Design Doc.	Andrea Bottoli	47	48	0	48		
M-023	Update Requirem. Doc.	Dzana Kujan	47	48	0	48		
M-024	Finalize Math Engine	Lorenzo Pagliari	48	49	1	48		
M-025	Web Design	Miraldi Fifo	48	49	1	48		
M-026	Status Report	All	49	49	0	48		
M-027	UserLoginSystem	Jorn Tillmanns	49	50	1	48		
M-028	Finalize Math Engine	Lorenzo Pagliari	49	50	0	49		
M-029	Junit tests v1	Miraldi Fifo	49	50	0	49		
M-030	Web Site Mockups	Nikola Radisavljevic	49	49	0	49		
M-031	Web Site Graphs	Dzana Kujan	49	50	0	49		
M-032	Beta Prototype	All	50	51	0	50		
M-033	Beta Prototype pres.	Lorenzo Pagliari	51	51	0	51		
M-034	Technical documentation	Andrea Bottoli	51	51	0	51		
M-035	Acceptance Test Plan	Miraldi Fifo	51	52	0	52		
M-036	Test Report	Miraldi Fifo	01	02	1	52		
M-037	Final Presentation	All	02	02	0	01		
M-038	Final Documentation	All	02	03	1	01		
M-039	Final Product	All	02	03	1	01		
M-040	Final Questionnaire	All	02	03	1	01		

10.2 Activity plan

The activity plan is presented in the Gantt chart below. The activities and milestones are shown.



The requirements analysis is planned to be finished earlier in the project, and it is not planned to be updated much in the following prototypes. This decision was made because the customers know what they want and are not available for frequent communication with the development team.

The design activity is planned throughout the project. This is due to the fact that the design decisions will be updated in each prototype development cycle. The design document will be also constantly updated, in order to be consistent with the working prototypes at all times. The design activity includes design of database, UI design and interface design, which should all be finished before starting work on the Alpha prototype.

The product will be developed incrementally, and as a result of that, there will be three increments: Alpha, Beta and Final prototype. Each prototype contains the activity of design, implementation and testing. This will ensure high quality of each prototype.

In the alpha prototype, the basic functionalities of the system will be implemented. At the end of this increment, we will have a working product which will contain at least reading of one sensor data from the database, and presenting that data on the user interface. This will be the foundation of the following increments, and the product that we will build upon.

The beta prototype will take longer time to develop, compared to the Alpha and Final prototypes. It is because the plan is to introduce most of the functionalities in this prototype. This means that the database will be upgraded to support all sensors, and all sensor data will be available on the UI, as well as all calculation results.

The final prototype will include the finalization of requirements and will concentrate on adding minor fixes, enhancing the UI or adding low priority functionality.

In order to achieve high quality of the product, each prototype will be tested.

ID	Predecessor	Activity	Days	Mdays	Rem.
M-001	/	Project Plan & Vision	6	35	
M-002	M-001, M-002	Requirements gathering	2	8	
M-003	M-001, M-002	Requirements document	3	12	
Design phase					
M-004	M-003	System Design	3	10	
M-006	M-003, M-004	Design Document	3	6	
Setup phase					
M-008	/	Organize Repository	2	4	
M-008	/	Team Policies	2	6	
M-008	M-003	Modify Requirement Doc	2	6	
M-008	M-006	Modify Design Doc	2	6	
Alpha phase					
M-014	M-008	Implement DB	2	20	
M-015	M-008,M-014	Implementation Parser	4	28	
M-016	M-008,M-014	Implementation DAO	4	20	
M-018	M-015,M-016	Test Parser	2	8	
M-019	M-018	Test Classes alpha prototype	2	8	
M-020	M-015,M-016	Alpha prototype	2	25	
Beta phase					
M-021		Requirements Gathering	1	4	
M-022	M-021	Update Design Doc.	1	4	

M-023	M-021	Update Requirement Document	1	4	
M-028	M-022,M-023, M-024	Finalize Math Engine	30	26	
M-029	M-028	Junit tests v1	2	10	
M-025	M-028	Web Design	2	9	
M-027	M-025	UserLoginSystem	5	5	
M-030	M-025,M-028	Web Site Mockups	1	3	
M-031	M-025, M-028	Web Site Graphs	3	20	
M-032	M-025,M-028 M-031	Beta Prototype	3	10	
Last phase					
M-039	M-032	Final Product	8	10	
M-034	M-022, M-023, M-039	Technical documentation	5	8	
M-035	M-023, M-039	Acceptance Test Plan	3	5	
M-036	M-039	Test Report	3	8	
M-038	M-039	Final Documentation	3	8	

Planned effort (days)	**Planned effort (man-days)**
110	336

10.2.1 Remarks

Remark Id	**Description**