Software Project Management Plan

Team Synergy

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1 Introduction

The Software Project Management Plan (SPMP) for the Synergy project defines the project management goals of the project and includes a description of the deliverables and deadlines.

The complexity of the embedded systems being developed in the automotive industry is increasing. At the same time the amount of time allowed for development is decreasing. To help alleviate this problem, the client, (Ford Motor Company) has created an archive of Simulink components that can be used to automatically compose a fully executable model from a list of components and an architectural description of the final model. In other words there is a need for a software tool that automates the steps of creation of the models that satisfy given architectural description for a model. The goal of the team Synergy is to help the client in the development of such Automated Model Compiler (AMC) tool. This tool should ultimately allow the users at Ford to be able to use it in their everyday activities.

Additionally, the team has a goal to fulfill the requirements of the Masters of Software Engineering (MSE) Studio program at Carnegie Mellon University.

The Synergy team consists of: Natasha Schevchenko, Manik Bhojwani, Greg Bylenok, Kevin Steppe and Goran Momiroski, as team members, and James Tomayko, David Garlan and Gil Taran as team mentors.

1.1 Project Summary

This section of the Software Project Management Plan (SPMP) gives an overview of the purpose, scope, and objectives of the project. It also contains sections regarding the assumptions and constraints, the project deliverables, the summary of the schedule, and the plan for change in the SPMP.

1.1.1 Purpose, scope and objective

The purpose of this document is to serve as a guide for development of the project and making sure that all requirements are met and the produced system functions according to the client's requirements. The SPMP will detail the major activities, resources, schedules and milestones for developing the AMC software system.

The objective of the project is the development of the AMC tool as well as meeting the requirements of the MSE Studio program.

- **Evaluation of the current tools/technologies.**
  This part of the project should provide evaluation of the currently existing model compiler infrastructure that is a part of the Vanderbilt's MoBIES project. This infrastructure includes:
  - Automated Model Compiler/Design Space Exploration Tool
  - Analysis Interchange Format
  - Instrumentation Interchange Format.
- **Automated Model Compiler tool.** Based upon the results of the evaluation, this part of the project will produce a working AMC tool that will satisfy the user requirements, as stated in the Synergy Software Requirements Specification (SRS) document.

1.1.2 Assumptions and constraints

There are several assumptions and constraints that are of importance for the project and its team members.

1.1.2.1 Assumptions

- The Synergy team expects to achieve reuse from the following:
  - Vanderbilt toolset.
  - Approach based on Acme ADL.
- The Synergy team has enough experience personally and as a whole to complete the project.
- The team will work together to complete the project.
- The client will respond in timely manner to all questions from the team.
- Additional human resources might be available to the project.

1.1.2.2 Constraints

- Due to the nature of the project and its dependability on already existing solutions and technologies, third party software and already available solutions will be used in the project as needed.
- Team members' time on the project will be limited to approximately 12 hours per week during the fall and spring semesters and 48 hours a week during the summer semester.
- Additional financial resources are not available for the project.

1.1.3 Project deliverables

The Synergy team will produce a working system, which is compliant with the Synergy SRS document. The Synergy team will deliver all of the software and documentation associated with its product to the client no later then August 10, 2003. In addition, a final report and presentation will be given to the MSE studio audience at that time. These deliverables are described below.

Only a single copy of each deliverable shall be provided. For material given to the customer, an electronic copy of the material on a CD-ROM shall be sufficient. For studio deliverables, a printed hardcopy will be provided.

Customer deliverables will be considered delivered when presented to the client. Studio deliverables will be considered delivered when given to either of the Synergy team mentors, or their designee.

1.1.3.1 Software deliverables

The Synergy team will deliver a working AMC system at the end of the project that satisfies the requirements.

1.1.3.2 Document deliverables

A number of documents will be delivered by the Synergy team during the course of the project. Some of the documents are intended for team use and are required by the MSE program, while other documents are part of the deliverable to the client.

1.1.3.2.1 Team documents

The following documents are for the team use and are required by the MSE program:

- Synergy Software Project Management Plan.
- Synergy Quality Assurance Plan.
- Synergy Configuration Management Plan.

- Synergy Risk Management Plan.

1.1.3.2.2 Client documents

The following documents will be delivered to the client:

- Synergy Statement of Work.
- Synergy Software Requirement Specification.
- AMC tool user documentation
- AMC tool developer documentation.

1.1.4 Schedule

The schedule of the project phases, milestones and corresponding documents is given in Table 1:

Project milestone	Project artifact	Due date
Project start		09/01/2002
Fall mid-semester presentation	MSP1	10/10/2002
Fall semester presentation	SRS, SOW, SPMP, EOSP1	12/13/2002
Spring mid-semester presentation	MSP2	March 2003
Phase 1 completion and spring semester presentation	Phase 1 delivery, SQAP, SCMP, EOSP2	May 2003
Phase 2 completion and summer mid-semester presentation	Phase 2 delivery, MSP3	June 2003
Phase 3 completion	Phase3 delivery	July 2003
Phase 4 completion and final project presentation (summer semester presentation)	Phase 4 delivery, user and developer documentation, EOSP3	August 2003

Table 1. Synergy team milestones and due dates

(Note: For the dates that are not known at time of writing this document, only the month and the year are given. The document will be updated accordingly when the correct dates are known).

Specific details about the deliverables in each of the phases of the project are given in Section 6.1.

1.2 Evolution of the SPMP

The SPMP for the AMC project will be under version control (as described in section 7.1), so any changes will be made to the plan itself. The updated document will be made available to all project members and interested stakeholders. Also, the most recent version of the document will be posted on the Synergy project's web site.

2 References

IEEE Std 1058-1998, *IEEE Standard for Software Project Management Plans*, IEEE 1998

Chris F. Kemerer *Software Project Management Readings and Cases*, Irwin, 1997

William Milam, Alongkrit Chuitinan *SmartVehicle Challenge Problems – Model Composition and Analysis Challenge Problems*, Ford Motor Company, 2001

Ken Butts, Dave Bostic, et al. *Usage Scenarios for an Automated Model Compiler*, Ford Research Laboratory, 2000

Watts S. Humphrey, *Introduction to the Team Software Process*, Addison-Wesley

3 Definitions

SPMP – Software Project Management Plan
SLOC – Source Lines of Code
AMC – Automated Model Compiler
COTS – Commercial Off The Shelf
ADL – Architecture Description Language
WBS – Work Breakdown Structure
SQAP – Software Quality Assurance Plan
SCMP – Software Configuration Management Plan
MSE – Master of Softwa re Engineering
CMU – Carnegie Mellon University
SEI – Software Engineering Institute
HCI – Human Computer Interaction
MSP – Mid Semester Presentation
EOSP – End of Semester Presentation
TSP – Team Software Process
MoBIES – Model Based Integration of Embedded Software
PIP – Process Improvement Process

4 Project organization

The SPMP will identify the organizational entities external to the project and their interaction with the project team, as well as internal project structure and roles and responsibilities for the project.

Section 4.1 describes the external interfaces to the Synergy project team, section 4.2 describes the internal structure of the team, while section 4.3 describes the roles performed by the team members.

4.1 External structure

The client for this project is Ford Motor Company, namely NPA Vehicle System Control Group, represented by Ken Butts and William Milam. All formal communication between the client and the team is facilitated by the customer liaison. The communication is done via e-mail on "as need basis" and through regular team meetings with the client.

All client meetings will be performed by means of conference calls. Team members are expected to participate in the client meetings. Correspondence with the client shall be recorded and made available for later retrieval.

4.2 Internal structure

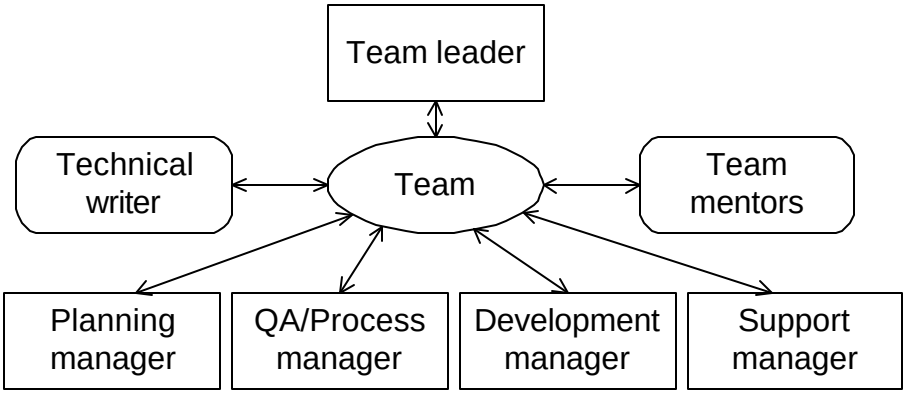

Figure 1. Internal team structure

Figure 1 shows the internal team structure with the team roles separated.

The team structure is hierarchical. There is a team leader, and the rest of the roles are assigned to the other team members. All team members have their own area of responsibility and everyone is expected to contribute equally to the project.

Also, the team has access to a technical writer that will help the team produce better documents. The team mentors will the team and will help the team in achieving its goals. The technical writer and the team mentors cannot be assigned any tasks other than document proofing and team mentoring.

The members of the team are encouraged to provide input for the decisions that the team makes. Decisions are being made using a voting mechanism in which each team member's vote is counted equally.

It is expected that each team members will change his/her the role in the project at the beginning of spring and summer semesters. This will allow the team members to be involved in more that one role.

The team will engage in regular weekly meetings. Additionally team members will communicate by e-mail on as needed basis. Personal communication between team members is strongly encouraged.

4.3 Roles and responsibilities

There are two types of roles and responsibilities that are shared among the members of the Synergy team:

- Process roles are allocated to each of the team member according to the TSP roles. These roles specific to TSP are summarized in Table 2.
- Development roles are allocated to each of the team members.

In addition to the roles defined by TSP the team used a meeting driver role, with the intention of improving the efficiency of the team's meetings. The meeting driver acts as a time keeper and meeting facilitator. The role is assigned to different team member before each meeting.

TSP Role	List of responsibilities
Team leader	- Motivate the team members to perform their tasks - Help the team in allocating the tasks and resolving issues - Creates and maintains Synergy SOW - Creates and maintains Synergy SRS
Development manager	- Lead the team in producing the development strategy - Lead the team in producing the preliminary size and time estimates for the products to be produced - Lead the development of Synergy SRS - Lead the team in producing the high-level design - Lead the team in producing the design specification - Lead the team in implementing the product - Lead the team in developing the build, integration and system test plans - Lead the team in developing the test materials and running the tests - Lead the team in producing the product's user documentation
Planning manager	- Lead the team in producing the task plan for the next development cycle - Lead the team in producing the schedule for the next development cycle - Lead the team in producing the balanced team plan - Track the team's progress against the plan - Creates and maintains Synergy SPMP
QA/Process manager	- Lead the team in producing and tracking the quality plan - Alerts the team to quality problems - Lead the team in defining and documenting its processes and in maintaining the process improvement process - Establish and maintain the team's development standards - Act as the team's inspection moderator - Act as recorder in the team's meetings
Support Manager	- Lead the team in determining its support needs and in

	obtaining the needed tools and facilities - Manage the configuration management system - Maintain the project notebook - Maintain the system glossary - Maintain the team's issue and risk tracking system

Table 2. List of TSP roles with respective responsibilities

5 Managerial process plan

The SPMP will specify the project management processes for the project and will include: the project start-up plan, risk management plan, project work plan, project control plan and project closeout plan.

In order to be successful the team must deliver a software product that will satisfy the needs of the client as outlined in the Synergy SRS and during the project the goals of the team are considered and achieved whenever possible.

In order to achieve its objectives the team has the following goals and priorities:

- Use good software engineering methods to develop the product.
  - Apply the methods learnt in the classes of MSE program.
  - Experience a new way of doing things.
  - Practice reflective learning.
- Deliver a quality product that meets the client expectation.
  - Deliver a product that is stable and relatively defect-free.
  - Deliver a system that addresses the client's needs.
- Honor our commitments.
  - Meet client and team deadlines.
  - Avoid unrealistic commitments.
- Conduct ourselves as professionals.
  - Value the time of team members, mentors, and the client.
  - Accept and support team decisions.
  - Communicate openly and frequently.
  - Take responsibility for the success of the project.
  - Be proactive
- Make efficient use of the resources available to the Synergy team.
  - Learn from each other.
  - Take advantage of the CMU and SEI staff and peer expertise.
  - Experiment with existing tools and processes.

5.1 Project start-up plan

The SPMP outlines the resources and materials needed to start the project and will include: estimation plan, staffing plan, resource acquisition plan and training plan.

5.1.1 Estimation plan

As soon as the high level architecture is created and the system is decomposed into subsystems /modules the team will prepare a size estimation plan and include it as a part of the SPMP. Before creating a size estimation plan, the team will have a discussion about the method that will be used for that purpose.

5.1.2 Staffing plan

The Synergy team has a fixed staff that was set at the beginning of the project and is mandated by the MSE program. The members of the team are introduced in Section 1.

5.1.3 Resource acquisition plan

The expectation is that all of the resources will be available from the beginning of the project until the project completion and they should not change for the duration of the project.

The resources needed for completion of the project can be separated into the following categories:

- Hardware resources.
- Software resources.
- Other resources.

5.1.3.1 Hardware resources

Each team member has a workstation, with Windows 2000 operating system for use during the project. Additionally there is a Synergy folder on the MSE Studio server that will be used for storing of the documents and other project artifacts.

Hardware resources are handled by the SCS help desk and are provided at the beginning of the project.

5.1.3.2 Software resources

Each team member is responsible for maintaining the required software resources, such as:

Making sure that every team member has the development tools available on his/her workstation before the start of the development.
Making sure that the needed engineering software such as Matlab and Simulink is available to each of the member of the team.

Additionally, any necessary software might be obtained with the help of the Studio Toolsmith and Librarian.

5.1.3.3 Other resources

There is a possibility that the additional resources will become available for the project during the spring and summer semesters. These resources include:

- A team from spring semester SE-IT class
- A person from the MSIT program.
- A person from the HCI program.

Details about their involvement will be included into the SPMP as soon as the given possibility realizes.

Additionally the resources available to the Synergy team members are listed in Table 3.

Resource	Contact person	Responsibility to obtain resource
Software	Studio Librarian	Each team member
Hardware	Studio Toolsmith	Each team member
EOSP presentation advisor	Linda Hutz Pesante	Team Leader
Technical writer	Linda Hutz Pesante, Poornima Bhavathy	Support manager
Risk evaluation assistance	Ray Williams	Team Leader
Administrative assistance	Ellen Saxon	Team Leader

Table 3. Resources and team contacts

5.1.4 Project staff training plan

There is no explicitly defined staff training plan for this project. The main training sources for this project are the MSE program courses, which include training in following areas: Methods of software development, software architecture, analysis of software artifacts, management of software development, models in software development, etc. Additionally, because the team is not familiar with the domain, each team member is expected to familiarize himself or herself in the following areas:

- Vanderbilt family of tools for automated model compilation.
- Matlab, Simulink toolsets for creating and executing simulation models.
- ACME architectural description language.
- Additional languages and tools as needed for the project.
- Materials provided by the client to help understand the domain problem.

5.2 Work plan

The SPMP will specify the work activities, schedule and resources for the AMC project.

5.2.1 Work activities

The overall project plan for the Synergy team is given in Table 4.

Id	Task name	Start date	Finish date
1	**Education and Requirements phase**	09/01/2002	12/11/2002
2	**Tool education**	09/01/2002	11/27/2002
3	Tools education	09/01/2002	11/27/2002
4	**Requirements phase**	09/02/2002	12/10/2002
5	Requirements gathering	09/02/2002	10/31/2002
6	Requirements analysis	11/01/2002	11/15/2002
7	SRS) preparation	11/18/2002	12/10/2002
8	**Required documents preparation**	09/01/2002	12/01/2002
9	Vision Statement	09/01/2002	12/01/2002
10	SOW	09/01/2002	12/01/2002
11	SPMP	09/01/2002	12/01/2002
12	**Fall semester presentation**	12/13/2002	12/13/2002
13			
14	**Phase 1**	01/15/2003	May 2003

15	**Spring mid-semester presentation**	March 2003	March 2003
16	**Spring semester presentation**	May 2003	May 2003
17	**Phase 2**	May 2003	June 2003
18	**Summer mid-semester presentation**	June 2003	June 2003
19	**Phase 3**	June 2003	July 2003
20	**Phase 4**	July 2003	August 2003
21	**Summer semester presentation**	August 2003	August 2003

Table 4. Overall Synergy project plan

The plan outlines the major work activities and their dependencies for the duration of the project. The itemized task list for all project phases is given in Section 6.1.

Details about the tasks in each phase will be added to the plan at a later time.

5.2.2 Schedule and resource allocation

The schedule for each of the team members will be established once for each phase of the project at the beginning of the phase. Additionally the team will make adjustments in the schedule for the team members depending on the workload that each of the members have for the given period. That will help ensure that the team workload is as balanced as possible.

5.3 Control plan

The SPMP will specify the metrics, reporting mechanisms, and control procedures necessary to measure, report and control the product requirements, the project schedule, resources and quality of work processes and work products.

A common characteristic of the plan is the fact that the software development will be done incrementally and iteratively during the overall project lifespan.

5.3.1 Requirements control plan

The requirements for the Synergy project will be documented in the Synergy SRS.

There are two aspects of the requirements control plan:

- Traceability. Traceability means that every artifact that is produced by this project should be traceable back to the requirements documents. Traceability will be addressed during the review meetings as well as deign and code walkthroughs.
- Change control. Even though that we do not expect any major change in requirements, once the SRS is formally released all changes will be approved and documented using the guidelines established in the Configuration Management Plan.

5.3.2 Schedule control plan

The schedule for the Synergy team shall be maintained as a separate document. This is a responsibility of the planning manager. The planning manager gathers information about the individual tasks for each team member and creates a plan for each project phase at the beginning of the phase. Each team member shall record the time spent on the project by updating the time log by the deadline time for each week. The time log will be posted on the project's document folder. This time shall be recorded by the planning manager and the project's plan shall be updated accordingly. Additionally, the time spend on tasks shall be reviewed during the team's weekly meetings. If slippage occurs in the plan the team shall make corrective measures to: (1) make a more reasonable schedule and (2) make sure that the schedule is followed.

During the team's meetings the planning manager shall provide an update on the status of the plan. The planning manager will report on tasks that are late and on the tasks that are due for following week. Each team member is responsible for providing accurate update of his/her status of the tasks.

Meeting minutes and tasks (both open and closed) shall be recorded and made available on the project's document folder and web site.

5.3.3 Quality control plan

Software quality control has a significant role in all of the stages of the Synergy project. The main drivers for quality control are:

- Make sure that the projects artifacts meet certain quality criteria.
- Provide the ability to verify that the project satisfies the requirements.
- Be able to find and remove defects in the earlier stages of the project.

The quality control plan for the Synergy team shall be specified in the Synergy QA Plan.

5.3.4 Reporting plan

The SPMP outlines the reporting mechanisms that are in place for the Synergy team. There are internal and external reporting mechanisms.

5.3.4.1 Internal reporting plan

Reporting for the Synergy team shall be informal. Based on each team member's status report, submitted to the planning manager by the given deadline each week, the planning manager will provide a team status report that will be discussed at each weekly meeting.

The team mentors are invited to the team weekly meetings. Additionally, each of the team members will have regularly scheduled personal meetings with their mentor.

The team might meet additionally during the week to address certain issues or work on the tasks that are current.

5.3.4.2 External reporting plan

In addition to the internal reporting plan, the Synergy team has requirements for external reporting. The external reporting is done in more formal ways and is used to inform various project stakeholders about the status of the project.

The external reporting plan includes a plan for providing updates to the client about the status of the project as well as presentations for the MSE Studio members. There are:

- 3 MSP, which will inform the Studio mentors and other students of the tasks accomplished by the team for the first half of the semester.
- 3 EOSP to the MSE Studio mentors and teams, about the items that are of importance for the Synergy project and the items that Synergy team have been worked on.

5.3.5 Metrics collection plan

The metrics for the project shall be limited to collecting the time spent on project's tasks. Later, during the development cycle the LOC and defects found will be also collected.

The details about the time collection process are outlined in Section 5.3.2 of this document. Details about the other metrics collection plan will be provided in the Synergy QA Plan before actual start of development.

5.4 Risk management plan

The SPMP shall specify:

- Risk management plan for identifying, analyzing and prioritizing project risk factors.
- Procedures for contingency planning and the methods that will be used for tracking certain risk factors, changes in levels of the factors and responses to those changes.

The Synergy team will maintain then project's risk factors and strategies for risk mitigation in a separate document, The Synergy Risk Management Plan.

5.5 Project closeout plan

The Synergy project will have an end in August 2003 at the same time as the other MSE studio projects. At that time, the Synergy team will:

- Provide the client a copy of all the documents in electronic format.
- Conduct a project postmortem.
- Archive all the project's artifacts (documents, source code, project plans, user documentation, etc).

6 Technical process plans

The SPMP will specify the development process model, technical models, tools and techniques that will be used to develop the work products, project infrastructure and product acceptance plan.

6.1 Process model

The Synergy project will follow an incremental and an iterative development model for its deliverables. The development will be done in several phases and each phase will represent a complete development cycle, with certain functionality of the system delivered at the end of each phase. The phased approach to delivery provides flexibility in what the team will deliver, gives an opportunity to reassess the effort for each phase and allows both the team and the client to change any of the phase's content.

The Synergy team will follow TSP as a process model. The TSP model is also used as a guide to software team development and it has been modified to suit the Studio processes. Additionally, the project phases with start, finish dated and goals for each phase and team Synergy are outlined in Table 5.

Phase	Start and finish date	Phase goals
Project Startup/Learning	09/01/2002 – 10/31/2002	- Strategy planning - Learning about the existing technologies (Vanderbilt and Acme ADL) - Create and review MSP
Requirements	11/01/2002-12/13/2002	- Become familiar with requirements - Create and review the required documents (SOW, SRS, SPMP) - Create and review EOSP
Phase 1	01/15/2003 – May 2003	- Format describing the architecture of assemblies - Component characterization format - Constraint expression language - Assembly builder - Constraint checker (topology, connectivity, compatibility – some level)
Phase 2	May 2003 – June 2003	- Simulink model assembler - Simulink model parser
Phase 3	June 2003 – July 2003	- Constraint checking report builder
Phase 4	July 2003 – August 2003	- Component characterization editor

Table 5. Team Synergy project phases and goals

The team will start with the project startup phase, where the initial TSP roles will be selected. Roles will be rotated among the team members on beginning of each semester, thus giving the opportunity for each team member to have more than on role during the course of the project. Each of the team members will create a list of tasks to be completed for the upcoming phase of the project. Then the time for each task will be allocated, followed by the workload balancing of the tasks. At the completion of each phase a postmortem analysis will be done to analyze the previous phase. All tasks that we not completed during a phase will be recorded and scheduled for completion in the upcoming phase.

6.2 Methods, tools and techniques

The Synergy team will consider using object-oriented methodology. Also, use of software patterns is greatly encouraged.

Synergy team has not made a firm decision for using any development tools at this point. Once the decision about the development tools is made, the section will be updated accordingly.

Additional tools that will be used are: Matlab, Simulink and MS Office 2000.

6.3 Infrastructure plan

The Synergy team has five Windows 2000 workstations available for this project. The MSE Windows 2000 Server is also available for use by the team, mainly for storing the team's documents and the project Web site. Additionally all the resources from the MSE program such as printers, copiers, etc are also available to the team.

6.4 Product acceptance plan

Every milestone of the project will be accepted formally by the client by signing appropriate acceptance documentation. At the end of every phase the client will install the product and perform an acceptance test. This may result in additional requests for change and improvements.

The details about the change plan are given in Section 5.3.1.

7 Supporting process plans

The SPMP will include the plans for the supporting processes that are part of the software project. These plans include: configuration management plan, verification and validation, software documentation, quality assurance, reviews and audits, problem resolution and subcontractor management.

7.1 Configuration management plan

The Synergy team configuration management plan is a part of a separate document, Synergy Configuration Management Plan and it will be maintained as such.

7.2 Verification and validation plan

The SPMP shall contain the verification and validation plan for the software project and it shall include tools, techniques and responsibilities for the verification and validation work activities. The verification and validation plan will be part of a separate document and will be maintained accordingly.

7.3 Documentation plan

There are a number of documents that will be produced during the lifetime of the project. All documents are responsibility of the project team members. The list of documents that will be created and maintained under version control include:

- Requirements specification – defines the functionality that is required by the client.
- Design specifications – defines the structure of the system.
- Test scripts and test results – tests that are executed have to be recorded.
- Risk analysis reports – involves risk handling issues.
- Defect log – log of all the defects and their current status.
- Change log – log of all requested changes.
- Metrics log – log of collected metrics data.
- Reviews – review documents of all phases of the project.

7.4 Quality assurance plan

The Synergy team quality assurance plan is a part of a separate document, Synergy Quality Assurance Plan and it will be maintained as such.

7.5 Reviews and audit plan

The SPMP specifies the plan, schedule and methods to be used in conducting product reviews and audits. So far, the only products that Synergy team has created are documents and the methods for their review and audit is part of the Synergy QA Plan. It is expected that in the future the details about the review and audits will be maintained within the Synergy QA Plan.

7.6 Problem resolution plan

The SPMP will specify the plans, methods and techniques for reporting and resolution of problems created during the project. The SPMP will be updated accordingly should the need for such a plan arises.

7.7 Subcontractor management plans

Synergy team plans to subcontract certain portions of the project to a team from SE-IT class. The team has three options for interaction with the SE-IT class:

- Formal specification.
- Joint specification.
- Sub team.

The Synergy team will level of interaction with the subcontracting team by the beginning of the spring semester, at that time the SPMP will be updated to provide further details.

7.8 Process improvement plan

Process improvement will be done as a part of the final project evaluation and “lessons learned” phase. At that time the process improvement plan will be created. Process improvement plan is maintained in the Synergy PIP document.