

# Agile Principles Applied to a Complex Long Term Research Activity - The PERIMETER Approach

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## 1. Introduction

Agile software development is a group of software development methodologies that are based on similar principles, as defined in the Agile Manifesto [1]. Agile software projects are characterized by iterative and incremental development, accommodation of changes and active customer participation [2].

The popularity of agile principles is steadily increasing [3]. Their adopters report that this development process leads to higher software quality and customer satisfaction ratings when compared to using traditional methods, with more productive and motivated developers [2]. Whilst smaller developer teams have cited higher success rates than larger teams [3], agile principles can and have been applied successfully to large scale projects and distributed teams, for example [4][5].

Despite these advantages, there are very few research activities that apply agile principles in their development. Perhaps this is due to the nature of research projects, which usually span years rather than months, frequently involve experimental work, and consist of team members with varying levels of experience, often coming from different organizations, research groups and countries. This paper examines how agile principles can be adapted to suit one such long term research activity; PERIMETER<sup>1</sup> [6].

## 2. PERIMETER Overview

The PERIMETER project entitled “User-Centric Paradigm for Seamless Mobility in Future Internet” is a

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495-person-month research activity, which spans a time period of 36 months, and gathers ten partners from different countries [6].

The development and integration of the project is conducted in three phases, each one correlating with the achievement of the functionality of increasingly complex scenarios. Validation and verification (V&V) is an extremely important aspect of the project, with several person-months being set aside for this task.

## 3. Reasons for the Application of Agile Principles

Agile was chosen as the development and testing methodology for PERIMETER for a number of reasons:

- The approach of increasingly complex scenarios creates a natural setting for the use of agile.
- Using agile, development, integration and testing are performed hand in hand following the Test-Driven Development (TDD) paradigm. This helps alleviate the common problem of complex and time-consuming integration at the end of the project lifecycle; a well known issue for research projects.
- Several members of PERIMETER have had successful experiences in using this methodology.

The consortium follows agile principles [1], with the following enhancements:

- Four-Week Iterations: This time frame allows partners to meet the other requirements of the project (documentation, dissemination, etc.) and still have adequate time to develop and test.
- Constant Communication: This is of vital importance, as the project developers are distributed across a number of different countries.

## 4. Development and Test Methodology

This section details the processes and supporting tools used in PERIMETER, essential for the success of agile and TDD in this large scale venture.

### 4.1. Build Process

The code submission and versioning procedure is clearly defined for the PERIMETER project. The code is submitted to PERIMETER's Subversion repository in accordance to a defined directory structure, following Subversion guidelines best practices [7].

Using the Hudson continuous integration tool [8] and Apache Ant [9] for software build automation, intermediate and nightly builds of the code are automated. Results of the builds are disseminated to the interested parties automatically.

### 4.2. Test Case Procedure

The PERIMETER project develops towards predefined scenarios, which are broken into sub-steps, then use cases, test suites and finally test cases. The test cases are used to validate and verify PERIMETER and the scenario under test. Where possible, testing is fully automated. Any defects that are discovered are logged using the Trac system [10]. Test forms based on the IEEE 829:1998 standard for software test documentation [11] are adapted and used in PERIMETER's V&V phase.

## 5. Preliminary Results and Future Work

Thus far, the PERIMETER project has primarily been dedicated to the requirements' specifications and to the definition of the system architecture. The bulk of the integration and testing activities has yet to take place. However, the application of agile principles even in this phase has already produced some valuable results. For example, paraphrasing [1]:

- The consortium has embraced the principle that "change of requirements can be beneficial" when following an agile development process. Substantial changes to the requirements between subsystems have taken place recently to better suit the final project's objectives.
- "Self-organizing teams" that include "both developers and managers" have been a reality from the beginning of the project, allowing the two different visions to create a truly innovative mobile network architecture.

One of the challenges regarding the use of agile principles within PERIMETER is how to quantify its success in the project. Measuring the success is an area that the PERIMETER consortium will further explore as the project continues.

## 6. Conclusion

For a large scale research and development project like PERIMETER, the success of the project depends heavily on the integration and co-operation of its individual software components over a heterogeneous infrastructure. Agile principles provide the appropriate perspective necessary for the iterative development process needed in this context. While the consortium has already had the opportunity to appreciate the effects of agile principles, the project is now entering the core of its development and integration phase, and will update the community on the experiences gained and the challenges to expect in using agility in such large scale research projects.

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