

# Preface

The military world has always shown great interest in the evolution of software and in the way it has been produced through the years. The first standard for software quality was originated by the US DOD (2167A and 498) to demonstrate the need for this particular user to implement repeatable and controllable processes to produce software to be used in high-reliability applications.

Military systems rely more and more on software than older systems did. For example, the percentage of avionics specification requirements involving software control has risen from approximately 8 % of the F-4 in 1960 to 45 % of the F-16 in 1982, 80 % of the F-22 in 2000, and 90 % of the F-35 in 2006. This reliance on software and its reliability is now the most important aspect of military systems. The area of application includes mission data systems, radars/sensors, flight/engine controls, communications, mission planning/execution, weapons deployment, test infrastructure, program lifecycle management systems, software integration laboratories, battle laboratories, and centers of excellence. Even if it is slightly less significant, the same scenario applies to the land component of the armed forces. Software is now embedded in all the platforms used in operations, starting from the wearable computers of the dismounted soldier up to various levels of command and control, and every detail of modern operations relies on the correct behavior of some software product.

Many of the mentioned criticalities are shared with other public security sectors such as the police, the firefighters, and the public health system. The rising awareness of the critical aspects of the described software diffusion convinced the Italian Army General Staff that a moment of reflection and discussion was needed and with the help of the universities, the SEDA conference cycle was started.

For the third conference SEDA 2014, it was decided to shift the focus of the event slightly away from the traditional approach to look at innovative software engineering. Considering the title: software engineering for defense application, this time, the emphasis was deliberately put on the “defense application” part. For the first time, papers not strictly connected to the “pure” concept of software

engineering, were accepted together with others that went deep into the heart of this science.

The reasons for this change were first of all the need for this event to evolve and widen its horizon and secondly the need to find more opportunities for the evolution of military capabilities. In a moment of economic difficulty, it is of paramount importance to find new ways to acquire capabilities at a lower level of funding using innovation as a facilitator. It was deemed very important, in a period of scarce resources to look ahead and leverage from dual use and commercial technologies.

Software is, as said, a very pervasive entity and is almost everywhere, even in those areas where it is not explicitly quoted. A mention was made to the changes in the area of software engineering experienced in the Italian Army and the starting of a new methodology which would then become “Italian Army Agile.”

The base of the new approach was presented this way by Gen. Angelo Messina in his introductory speech:

In the commercial world, “Agile” software production methods have emerged as the industry’s preferred choice for innovative software manufacturing. All the Android apps and similar software are generated using short and lean production cycles. Lately Agile practices seem to be in line with the objectives the USA DoD is trying to achieve with the reforms directed by Congress and DoD Acquisition Executives.

DoD Instruction 5000.02 (Dec 2013) heavily emphasizes tailoring program structures and acquisition processes to the program characteristics. At the same time, in May 2013, the Italian Army started looking for a way of solving the problem of the volatility of the user requirement that is at the base of the software development process. The area considered was the Command and Control one where a good deal of lessons learned were available from operations in Iraq and Afghanistan. It was observed that the mission needs in the area were not only changing from one mission to another but also in the time frame of the same mission.

It was evident that the traditional “waterfall” software factories approach was not usable any more. Agile development methods seemed to be capable of deploying quicker and less risky production lines by the adoption of simple principles:

- Responding rapidly to changes in operations, technology, and budgets;
- Actively involving users throughout development to ensure high operational value;
- Focusing on small, frequent capability releases;
- Valuing working software over comprehensive documentation.

Agile practices such as SCRUM include: planning, design, development, and testing into an iterative production cycle (Sprint) able to deliver working software at short intervals (3 weeks). The development teams can deliver interim capabilities (at demo level) to users and stakeholders monthly. These fast iterations with user community give a tangible and effective measure of product progress meanwhile reducing technical and programmatic risk. Response to feedback and changes stimulated by users is far quicker than using traditional methods.

The User/stakeholder community in the Army is very articulated, including Operational Units, Main Area Commands, and Schools. The first step we had to take was the establishment of a governance body which could effectively and univocally define the “Mission Threads” from which the support functions are derived.

Our first Scrum team (including members from Industry) was established in March 2014 and until now has successfully run 8 production cycles. Let me say proudly that there are not many similar production lines in the military software arena. Of course the introduction of the Agile Scrum methodology was not easy nor simple to be worked out. A relevant cultural change is required to switch from a Program Management, time goal, approach to a team centric, customer satisfaction, approach. I cannot say today that the process is concluded but we have enough confidence in the method now to see a clear way ahead.

We are ready to share, with our industrial partners the results of our experience to help them build solid and permanent agile production teams.

Proceedings of 4th International Conference in  
Software Engineering for Defence Applications  
SEDA 2015

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2016, XI, 330 p. 120 illus. in color., Softcover

ISBN: 978-3-319-27894-0