EVOLVABLE SOFTWARE SYSTEMS
IMPLEMENTATION WITH ASPECTJ AND RULER: A
CASE STUDY

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Abstract

Increasingly, today’s software requires higher levels of adaptability to cope with the ever-changing environments in which they function. Prior research has devised a logical account to model such kind of systems. That logical framework aims to formally analyze and specify the design of software systems considering their eventual need to evolve and adapt to their environment. In this framework, an evolvable component system is built from pairs of supervisors and supervisees, where the supervisor monitors the state of the supervisee and evolves it when needed. In this dissertation, a case study approach is taken to study the concrete implementation of software components that are designed in accordance to the guidelines given by said logical account. Specifically, an evolvable buffer is prototyped by using Java, AspectJ and RULER. By constructing an evolvable buffer we discover the suitability of these tools to modelling evolvable systems that are conformant to the logical framework. Java is used as the main platform for development while AspectJ provides source-level instrumentation to perform monitoring activities and the capability to change code at runtime. RULER provides formal runtime verification to passively analyze the execution of programs but can also provide feedback to trigger evolutionary processes. Different approaches are taken in the construction of the evolvable prototypes and each resulting system is analyzed to see how closely they match the expectations of the logical framework and what are the causes that keep them from completely fulfilling the requirements.