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Can file level characteristics help identify system level fault-proneness?

Eder, Kerstin (ed.) et al., Hardware and software: verification and testing. 7th international Haifa verification conference, HVC 2011, Haifa, Israel, December 6–8, 2011. Revised selected papers. Berlin: Springer (ISBN 978-3-642-34187-8/pbk). Lecture Notes in Computer Science 7261, 176-189 (2012).

Summary: In earlier studies of multiple-release systems, we observed that the number of changes and the number of faults in a file in the past release, the size of a file, and the maturity of a file are all useful predictors of the file's fault proneness in the next release. In each case the data needed to make predictions have been extracted from a configuration management system which provides integrated change management and version control functionality. In this paper we investigate analogous questions for the system as a whole, rather than looking at its constituent files. Using two large industrial software systems, each with many field releases, we examine a number of questions relating defects to system maturity, how often the system has changed, the size difference of a release from the prior release, and the length of time a release has been under development before the start of system testing. Most of our observations match neither our intuition, nor the relations observed for these two systems when similar questions were asked at the file level.

Keywords: software fault prediction; fault density; system maturity; system size; system changes; elapsed development time
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