Software Piracy Prevention through Diversity

Bertrand Anckaert
banckaer@elis.ugent.be

Bjorn De Sutter
brdsutte@elis.ugent.be

Koen De Bosschere
kdb@elis.ugent.be

Electronics and Information Systems Department
Ghent University
Sint-Pietersnieuwstraat 41
9000 Ghent, Belgium

ABSTRACT

Software piracy is a major concern for software providers, despite the many defense mechanisms that have been proposed to prevent it. This paper identifies the fundamental weaknesses of existing approaches, resulting from the static nature of defense and the impossibility to prevent the duplication of digital data. A new scheme is presented that enables a more dynamic nature of defense and makes it harder to create an additional, equally useful copy. Furthermore it enables a fine-grained control over the distributed software. Its strength is based on diversity: each installed copy is unique and updates are tailored to work for one installed copy only.

Categories and Subject Descriptors

K.5.1 [**Legal Aspects Of Computing**]: Hardware/Software Protection—*copyrights;licensing*; D.2.0 [**Software Engineering**]: General—*protection mechanisms*; D.2.7 [**Software Engineering**]: Distribution, Maintenance, and Enhancement

General Terms

Economics, Legal Aspects

Keywords

Copyright Protection, Software Piracy Prevention, Identification, Authentication, Intellectual Property Protection, Diversity, Tailored Updates

1. INTRODUCTION

According to reports on software piracy [14, 17], no existing protective measures have been able to meet the major challenge posed by software piracy. Among the approaches that have been explored in recent history to address the problem of software piracy are legal, ethical and technical means.

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Legal means are based on the fear of consequences of violating piracy laws. But while in most software piracy cases the legal means are available, prosecution on a case by case basis is economically inviable. Furthermore, it is conceived as bad publicity and can take a long time.

Ethical measures relate to making software piracy morally unappealing. While the intentions are laudable, it takes even more effort and time to change the moral standards of a large group of people.

The existing technical means almost all have a static nature of defense, in which a protection mechanism is built into the distributed software. Once this protection is broken no further steps can be taken to protect the intellectual property. And since any static protection is eventually broken, the existing techniques are not satisfactory at all.

To tackle this problem, this paper presents an alternative technical protection scheme, whose strength is based on diversity. In the scheme we present, each installed copy of a program is unique. More precisely, each installed copy differs enough from all other installed copies to guarantee that successful attacks on its embedded copyright protection mechanism cannot be generalized successfully to other installed copies.

Furthermore, the proposed scheme includes software updates to migrate from a static nature of defense to a more dynamic one. In particular, software updates in our scheme are crafted to ensure that they work for one, and only one, installed copy. When updates are no longer provided for installed copies that are known to be illegitimate, a pirate needs to break through a new line of defense with every critical update.

An additional advantage of the proposed scheme is a fine-grained level of control over the distributed copies. This follows from the fact that a software provider in our scheme can enable the installation of a copy on an arbitrary number of machines, or even tolerate an arbitrary level of software piracy. We will refer to the latter as *piracy discrimination.*

The remainder of this paper is structured as follows: Section 2 gives an overview of related work and identifies the fundamental weaknesses of existing technical means. Section 3 introduces the software distribution model we will assume, and the new scheme is presented in Section 4. Claims for the benefits of the scheme are made in section 5 and the need for piracy discrimination is discussed in Section 6. Practical issues are considered in Section 7 and the additional costs of the proposed scheme are explored in Section 8. Finally, Section 9 concludes.