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Subject: Costs of Digital Rights Management

**Introduction**

The software industry employs millions of people worldwide, and has a multi-trillion dollar impact on the global economy. In order to safeguard software sales against piracy, software developers have implemented various approaches to digital rights management, or DRM, designed to restrict software access to legitimate users. However, DRM schemes in software can have adverse economic and engineering consequences. The question of how to implement secure DRM without alienating consumers or adversely impacting legitimate end users is an active area of study in computer science.

**Issue**

The software industry encompasses both consumer and business products. These products include phone apps, personal computer productivity suites such as Adobe Photoshop or Microsoft Office, and entertainment software such as video games. The software industry was responsible for ten million jobs and a trillion dollars of the gross domestic product of the United States in 2016 [Software Alliance, website].

One challenge facing this industry is the widespread practice of software piracy. Approximately two out of every five software products in use globally is improperly licensed [Revulytics, website]. This represents a substantial loss of profit for software creators, who have turned to DRM as a means to enforce the use of properly licensed software.

The ability of pirates to distribute unlicensed software has grown with the proliferation of peer-to-peer technologies such as the BitTorrent protocol. The laws governing the enforcement of software licenses and the prevention of piracy, such as the Digital Millennium Copyright Act in the United States, have lagged behind the technological realities [Herman, 2012]. This has further forced software developers to take matters into their own hands with DRM.

DRM design is an area of study with significant crossover to the fields of cryptography, cyber-security, and operating systems. Many DRM schemes involve online activation of software or a periodic “phone-home” to an authentication server. While secure if implemented correctly, this approach comes with costs for the business, which must maintain the servers, and inconvenience for the consumer, who must be connected to the Internet to use the software. Modern DRM schemes, such as the Denuvo security and anti-tamper suite currently used to protect many entertainment software titles, make extensive use of virtualization to obfuscate the software’s code within a virtual machine. A virtual machine is a kind of operating system running within the user’s operating system. Virtualization comes with significant performance overhead, which can be minimized but not removed [VMware, website]. Since performance is critical to the end user experience in entertainment software, the virtual machine approach is not ideal. Even successful DRM schemes have costs, in terms of engineering and economics.

**Impact**

Digital rights management is a controversial topic, since it is an area where the priorities of software producers and the priorities of software consumers come into conflict. DRM raises ethical and legal questions about the rights of consumers pertaining to digital goods, including what it means to own software. Software developers reasonably want to maximize profits and enforce proper licensing of their products. Software consumers reasonably want convenience and speed from the products they purchase; they are understandably perturbed when a DRM scheme has an adverse impact on the legitimate use of a product they own.

To apply this dynamic to a real-world case, the 2013 game SimCity developed by Electronic Arts shipped with DRM requiring a continuous connection to an authentication server in order to play. Electronic Arts successfully deterred piracy with this scheme. However, the flawed implementation of the DRM, which often prevented even legitimate users from accessing the game in the initial weeks following its launch, provoked a backlash among consumers. Some consumers demanded refunds and spread negative word-of-mouth, to the extent that some retailers temporarily pulled the game from sale [BBC News, website].

**Recommendation**

While technological improvements have made it increasingly feasible to implement DRM that can prevent software piracy, it is also clear that even the best current DRM schemes come with costs that adversely impact the software’s performance or accessibility to legitimate users. Negative word of mouth caused by obtrusive DRM can have severe consequences in terms of deferred sales, as shown in the case of SimCity.

While software developers await better DRM technology, an interim approach may be to draw in consumers with convenience, speed, and ease of access by not including DRM in software at all. As an engineering solution, this approach has the advantage of simplicity. It eliminates many development costs associated with DRM, such as licensing fees for DRM suites like Denuvo, or the costs of maintaining authentication servers over a product’s lifetime. Additionally, the end result is a more accessible or faster product for legitimate end users.

This approach has been tested in the entertainment software area by Good Old Games, or GOG, a digital storefront which mandates that all software sold must be DRM-free. GOG’s parent company, CD Projekt, has seen significant growth and apparent success with this approach over the last two years [CD Projekt, website]. However, this approach does present risks for software developers, who may believe that DRM-free sales would do more harm than good in terms of profit, would constitute giving in to pirates ethically or legally, or would otherwise set a bad precedent by promoting a culture of piracy. Further experimentation would be necessary to see how DRM-free approaches would fare outside of GOG’s small niche in gaming in the West, which software developers in other areas of the field and other parts of the world may be understandably reluctant to undertake.

**Conclusion**

Widespread software piracy has prompted the development of DRM technology. However, DRM which is both secure and completely unobtrusive to the end user has yet to emerge in the software space, and is a topic of continuing development in computer science. While anticipating the emergence of technology that both consumers and producers of software can readily accept, a measure of the costs and benefits of existing DRM must be reached. The current balance of these economic and engineering realities suggests that DRM-free software sales might produce better outcomes for both consumers and producers.

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