**Digital Rights Management(DRM)**

**and Its Effectiveness**

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**Abstract:**

A lot of video games get released these days. Apart from their gameplay related software, there is a rather hidden bundle of software providing gameplay a secure and authorized environment to execute in, called DRMs.

We will briefly see what is DRM and its importance.

How they impact our experience and what are their benefits.

Then we will frame questions for what would determine effectiveness of a DRM. We will be using python based code to fetch relevant data for our questions from Crackwatch website.

This data will comprise of all information about triple-a title games released in last 5 years. Their relevant DRM and when they were cracked.

The data will be used to find percent of games a DRM managed to protect in the sales window of 2 months, the percent will be the effectiveness of the said DRM. we will also use data of individual DRMs to draw a conclusion about overall effectiveness of DRMs.

Lastly we will identify top 3 DRMs in terms of their effectiveness and overall effectiveness of DRMs.

**Introduction:**

DRM:

Digital Rights Management (DRM) tools refers to a software or a bundle of software which prevents making copies and redistribution of a digital content.[1]

Example:

When you purchase a DVD of movie on amazon, you get to play the DVD but you can not make copies of it to share with someone else, hence stopping you from making unauthorized copy of that content.

Depending of will of DRM provider, DVD may be region locked, meaning if DVD was bought in US, then it can't be played in any other country.[2]

Other more contemporary example would be when you get streaming service, say A Music streaming app,

That allows you to play music but would not allow you to make sharable offline copies of it, to listen on your friend hardware.

Again depending on the will of DRM provider, it is possible that you won't be able to play it on your own phone if you are travelling internationally, or may be able to play for short period of grace time before it stops playback for its geo locked.[3]

Example of DRM in Video Games:

Almost all commercial video games come with DRM.

They serve purpose of restricting gameplay to only allowed users and under specific conditions.

Popular DRM, steam, achieves this by allowing only one player to play with an account at once. It requires users to be online after every 2 weeks or be logged out of steam.[4]

These measures somewhat serves their purpose and also increases difficulty of actual user.

Like if steam is down you cannot play games using steam DRM, even outside of steam. Regularly being online even in offline games for verification infuriates user.

Other DRMs like Denuvo, while are better at their role, they also use a lot of resources sometimes in range of the game itself.

With our data at our hand we will see which DRM is how much effective.

**Literature Review**

DRMs

Various articles cite importance of DRM and their role to sustain business model of commercial games and various others their harm.

The Argument that DRMs prevent copyright infringement thus improving sales is countered by piracy has no impact on sales.

Prominent figures of computer science like Richard Stallman and John walker harshly critique it in their articles.

Richard Stallman calls DRM, Digital restrictions management rather than Digital Rights Management.[5]

While corporates hail its power as it protects game from being cracked within first few weeks of release.

Rather than focusing on moral obligations and qualitative aspects of DRM, we will only try to find effectiveness of DRMs quantitatively.

**Methods**

From here on these terms will have following meaning,

aaa-titled/triple-a title games:

higher marketing and development budget games.

Has potential to generate a lot of revenue.

Cracked Games:

A game whose DRM has been broken or bypassed such that it is freely available to play without costing money.

Un-cracked Games:

A game whose DRM has not been broken or bypassed such that user must pay to publisher before playing.

To understand effectiveness of a DRM we will gather data from 2015 to 2019 about them, with purpose to find answers to the following questions:

1. How many games were released by them?
2. Was game cracked within 4 weeks of release?

As most of the game sales tend to happen with in 30 days of release date, any crack after 30 days can be called a win for DRMs.[11]

3.How many games were un-cracked?

All games under data has to be released between 2015-2019,inclusivly.

All games must be AAA title, AAA title are most anticipated and high quality games.

A Website called Crackwatch is one of its kind, it is followed by many game piracy enthusiasts to keep an eye on when a game gets cracked.

We will be using it to collect necessary data for us.

Crackwatch provides an API to query data, with various arguments like, is\_aaa=true, is\_released=true.[6]

We will be using these two arguments to gather data.

Python is being used for API query and sorting data.

Code written and used is Publicly available [here](https://github.com/aditya24raj/DRM-Data-Collector).[7]

Here we are collecting all triple-a titled games released between year 2015-2019.

collectData.py[7] is the python program used for this purpose.

It asks for year input, suppose year input is 2015, then it will collect info about all triple-a titled games released in 2015 and saves it to a file named 2015.json .

Later on interpret.py[7] python program analyzes all data collected and based on DRM used by the game, its release date and its crack date it tries to calculate following,

“how many games got released under certain DRM”?,

and “how much time it took to get cracked?”.

Based on this data we find percentage of un-cracked games by a DRM and use it to define effectiveness of that DRM.

Later we take account of all games released and number of un-cracked, then with percentage of number of un-cracked games we state overall effectiveness of DRMs.

**Results**

**Yearly results**

Year: 2015

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| DRM | Steam | Denuvo | Uplay | Origin |
| Total games released | 120 | 4 | 3 | 2 |
| Uncracked games | 0 | 0 | 0 | 1 |
| Cracked in 7 days | 92 | 3 | 3 | 0 |
| Cracked in 14 days | 3 | 0 | 0 | 0 |
| Cracked in 21 days | 1 | 0 | 0 | 0 |
| Cracked in 28 days | 0 | 0 | 0 | 0 |
| Cracked in 56 days | 4 | 0 | 0 | 0 |
| Cracked in 56+ days | 20 | 1 | 0 | 1 |

|  |  |
| --- | --- |
| DRMs | Steam |
| Effectiveness(%)[12] | 16.66 |
| Overall Effectiveness(%)[13] | 16.66 |

Year: 2016

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| DRM | Steam | Denuvo | UWP | Battlenet | Origin | Uplay |
| Total games released | 105 | 9 | 3 | 1 | 1 | 1 |
| Uncracked Games | 1 | 0 | 0 | 1 | 1 | 1 |
| Cracked in 7 days | 81 | 3 | 0 | 0 | 0 | 0 |
| Cracked in 14 days | 2 | 0 | 0 | 0 | 0 | 0 |
| Cracked in 21 days | 2 | 0 | 0 | 0 | 0 | 0 |
| Cracked in 28 days | 0 | 0 | 0 | 0 | 0 | 0 |
| Cracked in 56 days | 3 | 0 | 1 | 0 | 0 | 0 |
| Cracked in 56+ days | 16 | 6 | 2 | 0 | 0 | 0 |

|  |  |  |
| --- | --- | --- |
| DRMs | Steam | Denuvo |
| Effectiveness(%)[12] | 16.19 | 66.66 |
| Overall Effectiveness(%)[13] | 41.42 | |

Year: 2017

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| DRM | Steam | Denuvo | UWP | Arxan | Nintendo Exclusive |
| Total games released | 96 | 27 | 3 | 1 | 1 |
| Uncracked Games | 4 | 1 | 0 | 0 | 0 |
| Cracked in 7 days | 76 | 11 | 0 | 1 | 1 |
| Cracked in 14 days | 3 | 4 | 0 | 0 | 0 |
| Cracked in 21 days | 1 | 1 | 0 | 0 | 0 |
| Cracked in 28 days | 1 | 0 | 0 | 0 | 0 |
| Cracked in 56 days | 1 | 2 | 0 | 0 | 0 |
| Cracked in 56+ days | 10 | 8 | 3 | 0 | 0 |

|  |  |  |
| --- | --- | --- |
| DRMs | Steam | Denuvo |
| Effectiveness(%)[12] | 14.58 | 33.33 |
| Overall Effectiveness(%)[13] | 23.95 | |

Year: 2018

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| DRM | Steam | Denuvo | UWP | Battlenet | Origin | UWP+Steam |
| Total games released | 81 | 29 | 2 | 1 | 1 | 1 |
| Uncracked Games | 6 | 3 | 0 | 1 | 0 | 1 |
| Cracked in 7 days | 68 | 3 | 0 | 0 | 0 | 0 |
| Cracked in 14 days | 2 | 1 | 0 | 0 | 0 | 0 |
| Cracked in 21 days | 0 | 2 | 1 | 0 | 0 | 0 |
| Cracked in 28 days | 0 | 1 | 0 | 0 | 0 | 0 |
| Cracked in 56 days | 1 | 4 | 0 | 0 | 1 | 0 |
| Cracked in 56+ days | 4 | 15 | 1 | 0 | 0 | 0 |

|  |  |  |
| --- | --- | --- |
| DRMs | Steam | Denuvo |
| Effectiveness(%)[12] | 12.34 | 62.06 |
| Overall Effectiveness(%)[13] | 37.2 | |

Year: 2019

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| DRM | Steam | Denuvo | EpicGames | Uplay | Denuvo+Origin | Rockstar | Battlenet | Uplay/Denuvo | Arxan | Steam/arc | Bethesda | Denuvo+Vmpotect | Origin | UWP |
| Total games released | 33 | 23 | 7 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Uncracked Games | 5 | 11 | 7 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 |
| Cracked in 7 days | 28 | 4 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |
| Cracked in 14 days | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| Cracked in 21 days | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cracked in 28 days | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cracked in 56 days | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cracked in 56+ days | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

|  |  |  |  |
| --- | --- | --- | --- |
| DRMs | Steam | Denuvo | EpicGames |
| Effectiveness(%)[12] | 15.15 | 60.86 | 0 |
| Overall Effectiveness(%)[13] | 25.33 | | |

**Comprehensive Result**

Year: 2015-2019

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| DRM | Steam | Denuvo | UWP | EpicGames | Uplay | Origin | Battlenet | Arxan | Denuvo+Origin | Rockstar | Uplay/Denuvo | Steam/arc | Bethesda | Denuvo+Vmpotect | Nintendo Exclusive | UWP+Steam |
| Total games released | 435 | 92 | 9 | 7 | 6 | 5 | 3 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Uncracked Games | 16 | 15 | 0 | 7 | 2 | 3 | 3 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 |
| Cracked in 7 days | 345 | 24 | 1 | 0 | 4 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 0 |
| Cracked in 14 days | 10 | 6 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cracked in 21 days | 4 | 4 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cracked in 28 days | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cracked in 56 days | 9 | 9 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cracked in 56+ days | 50 | 33 | 6 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| DRMs | Steam | Denuvo | UWP | EpicGames | Uplay | Origin |
| Effectiveness(%)[12] | 15.17 | 52.17 | 66.66 | 0 | 33.33 | 80 |
| Overall Effectiveness(%)[13] | 41.22 | | | | | |

**Conclusion**

Top Three DRMs in terms of their effectiveness in last five years(2015-2019):

1. Origin, 80% effective
2. UWP, 66.66% effective
3. Denuvo, 52.17% effective

Overall effectiveness of DRMs based on data from 2015-2019 is 41.22%.

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1. Denuvo History <https://en.m.wikipedia.org/wiki/Denuvo>
2. Effectiveness is percent of games which remained uncracked during first 56 days or 2 months of their release. Only DRMs having 5 more games released under them are considered. This formula is being used for calculating Effectiveness of DRMs

Effectiveness = (number of games cracked after 56 days + uncracked games/total number of games)\*100

1. Overall Effectiveness is average effectiveness of all DRMs in the context.