Piracy as an Antifragile System

custostech

Executive Summary

Attacks on the piracy economy have thus far been unsuccessful. The piracy community has not only shown resilience to these attacks, but has also become more sophisticated and resilient as a result of them. Systems that show this characteristic response to external stressors are defined as *antifragile*. Traditional centralized attacks are not only ineffective against such systems, but are counter-productive.

These systems are not impervious to attacks, however. Decentralized attacks that warp the connections between nodes destroy the system from within. Some system-based attacks on piracy have been attempted, but lacked the technology required to be effective.

A new technology, CustosTech, built on the Bitcoin blockchain, attacks the system by turning pirates against each other. The technology enables and incentivizes anyone in the world to anonymously act as an informant, disclosing the identity of the first infringer – the pirate uploader. This internal decentralized attack breaks the incentive structures governing the uploader-downloader relationship, and thus provides a sustainable deterrent to piracy.

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Introduction to Antifragility

Antifragility refers to a system that becomes better, or stronger, in response to shocks or attacks. Nassim Taleb developed the term[1] to explain systems that were not only resilient, but also thrived under stress. Our bodies become stronger, more fit, and less prone to disease with exercise. When a riot is resisted, it fires up. A glass, on the other hand, breaks when you drop it; a nail will not break when you drop it, but will bend if you hammer it wrong. A glass is fragile; a nail is robust, but becomes weak under pressure. Something that is antifragile becomes stronger under pressure.
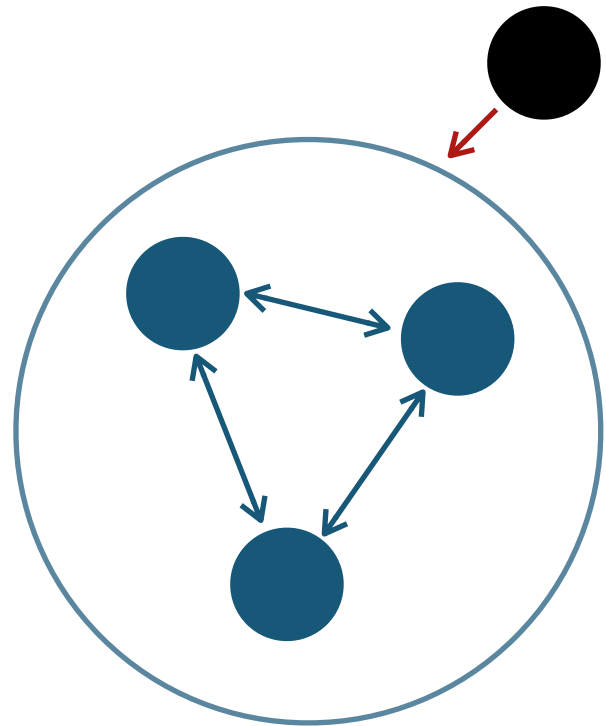
Fragile
Negative reaction to stress

Robust
Neutral reaction to stress

Antifragile
Positive reaction to stress

Nodes (blue dots) are connected to each other and are inside a demarcated environment (circle). An exogenous actor (black dot) can attack the system. How the connections are affected determines the nature of the system.
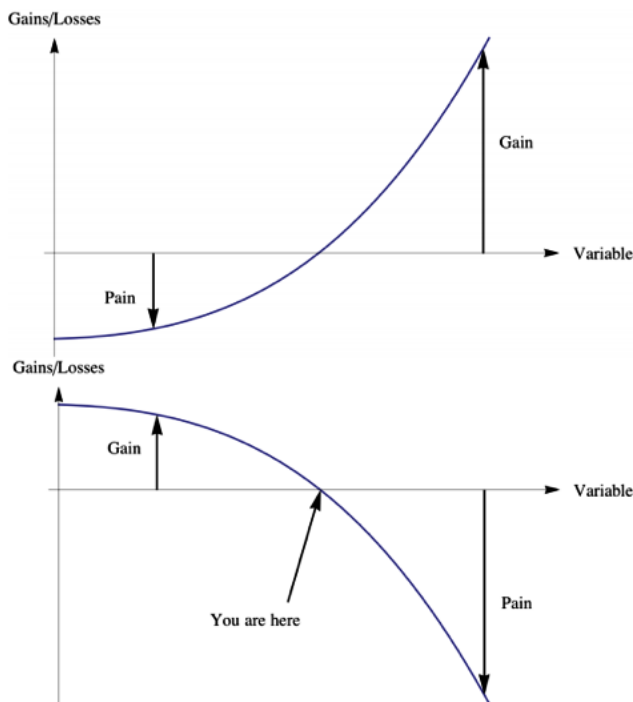
Features of Antifragile Systems

A system is a collection of nodes, with connections between them, set in an environment. The nodes can be muscle fibers, nation states, congregation members, computers, or any other set of objects that are interconnected. The environment defines the state variables within which the nodes function.

Nodes have intrinsic characteristics that can change over time. Some of these characteristics define them as part of the system, while others make them distinct within a system. For example, while everyone in a 5th-grade class is the same age, some are female and some male; some are taller and some are shorter. New nodes can be introduced into a system, and the connections between the nodes can strengthen or weaken as a result of intrinsic or extrinsic factors.

The way connections between nodes strengthen or weaken from extrinsic shocks defines a system as fragile, robust or antifragile.

In a fragile system, an exogenous shock, or stressor, has an exaggerated weakening effect on the connection. The connections between glass particles are easily weakened by even a small applied force. Technically, a fragile system is said to have a concave sensitivity to stressors, meaning simply that it experiences more harm than benefit from stressors. A robust system is defined as having a linear sensitivity to stressors, so the harm and benefit from stressors are balanced. An antifragile system has a convex response to stressors. Antifragile systems benefit substantially more from stressors than it is harmed by them, as shown below[2].

An antifragile system (top) has a convex response to stress - more upside than downside.
A fragile system (bottom) has a concave response to stress - more downside than upside.

Humans naturally form social systems – we construct social identities, demarcating the insiders from the outsiders. Frequently, superficial characteristics such as race or social status demarcate the limits of the group, with the boundaries materializing in reaction to external stressors.

Armies have exploited this since antiquity. In basic training, the recruits are exposed to a harsh environment, with the drill sergeant acting as a stressor. The camaraderie between the recruits build as they become demarcated relative to the 'other,' the drill-sergeant in this case. When the unit graduates, the shock and stress of the battlefield drive them closer together.

Social systems are naturally antifragile, even more so when the grouping is not based on superficial characteristics, but on beliefs. To quote the ancient Greek philosopher, Seneca: "Repeated punishment, while it crushes the hatred of a few, stirs the hatred of all … just as trees that have been trimmed throw out again countless branches." The Arab Spring was sparked by the Tunisian government confiscating a fruit stand[3]. The United States was unified in reaction to the British attempting to clamp down on smuggling.

Piracy as an Antifragile System

The piracy market has evolved into a global and complex ecosystem since the dawn of the information age. Before the Internet, piracy was limited by the physical distribution of the goods. If you had a dual cassette player you could make a copy of your friend's Queen tape, and in turn your friend could make a copy of your copy. This type of copying had two defining characteristics. First is the one-to-one nature of the copying. Certainly, there were some larger-scale operations, but in the peer-to-peer domain it was restricted by the analog nature of the medium. The second characteristic is the deterioration of the quality of the successive copies, limiting its reach.

With the rise of digital media, the copying became one-to-many, with perfect replicability. A hierarchy developed – with the release groups at the top, feeding into public sites and eventually into the computers of Jane and John Q. Pirate. The organization of the groups become looser further down the hierarchy, with the release groups governed by many written and unwritten laws, and strong trust-based ties. The system as a whole is

far from a homogenous or distinguishable community, and rather functions as an ecosystem with content moving like energy in a food chain.

In any food chain, when a component is taken out, other components will step in to take its place. While each component might be weak, the system as a whole can adapt and thrive with change. If a pack of wolves in Yellowstone Park does not survive a severe winter, its hunting ground will be open for a neighboring pack to expand to the following spring.

When The Pirate Bay was raided in December 2014, the site disappeared completely. The pirates were not fazed[4]:
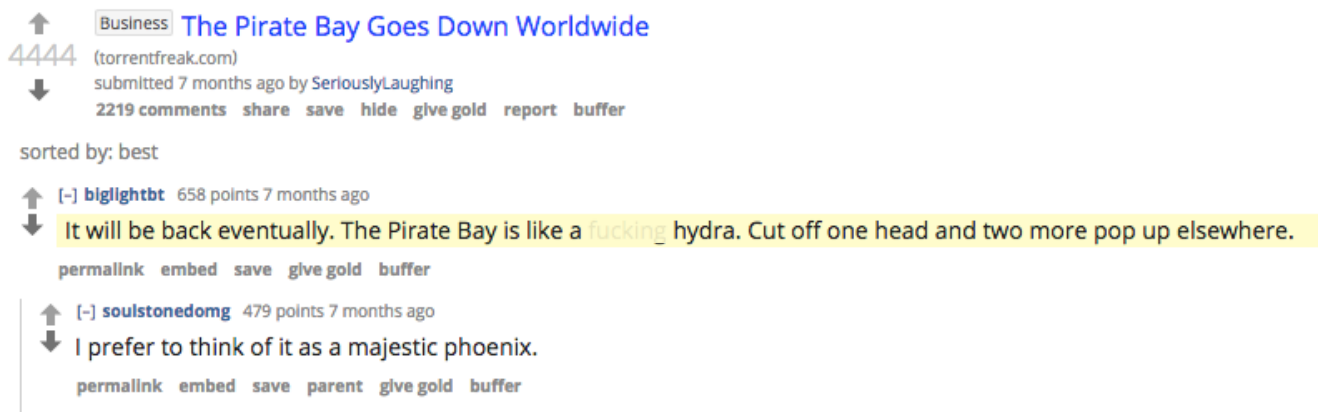
Excerpt from the Reddit comments on the Technology subreddit on a post about The Pirate Bay shutdown.

The website had come under attack before, and had come back stronger each time. For the pirate community it was a question of *when*, not whether it would come back online.

The previous significant attack was in 2005. Instead of throwing the ecosystem into disjoint, it catalyzed the creation of one of the most legitimized pirate actors: the Pirate Party[5]. Today there are 41 Pirate Party chapters globally[6]. While it is not the most successful party in any of the states where it is active, it is one of the most widespread.

While the alpha predator of the piracy ecosystem was down, the scavengers appeared. Copycats popped up everywhere to scam less sophisticated pirates[7].

Most pirates were not fooled, and directed their browsers to *Kickass.to*, boosting the traffic to the torrenting site, and establishing the current reigning duopoly, as shown below in the Google Trend results[8].

Soon enough, the phoenix was reborn, flaunting its immortality on its site. Instead of breaking the piracy ecosystem, the attack strengthened it – an antifragile system reacting to a stressor.

Sophisticated Pirates

When it became clear that the takedown was ineffective, governments enacted country-wide censorships on the website. Researchers at Carnegie Mellon found that instead of having the desired effect, it forced pirates to become more sophisticated by opting for VPNs or proxies, or merely switching to non-blocked sites. The researchers could find no increase in revenue to the legitimate rights holders [9].

What attacks like these do result in, is a more technically sophisticated piracy community, which is able to hide itself from the authorities. The Centre for Copyright Information, the company heading the US Six-Strike program, was fooled by this. In early 2014, they published a report on the first phase of the program[10]. Alerts are sent to repeat offenders, with increasing levels of alerts, ranging from educational to acknowledgement to mitigation. While the report is well-balanced, the reduction in alerts through the
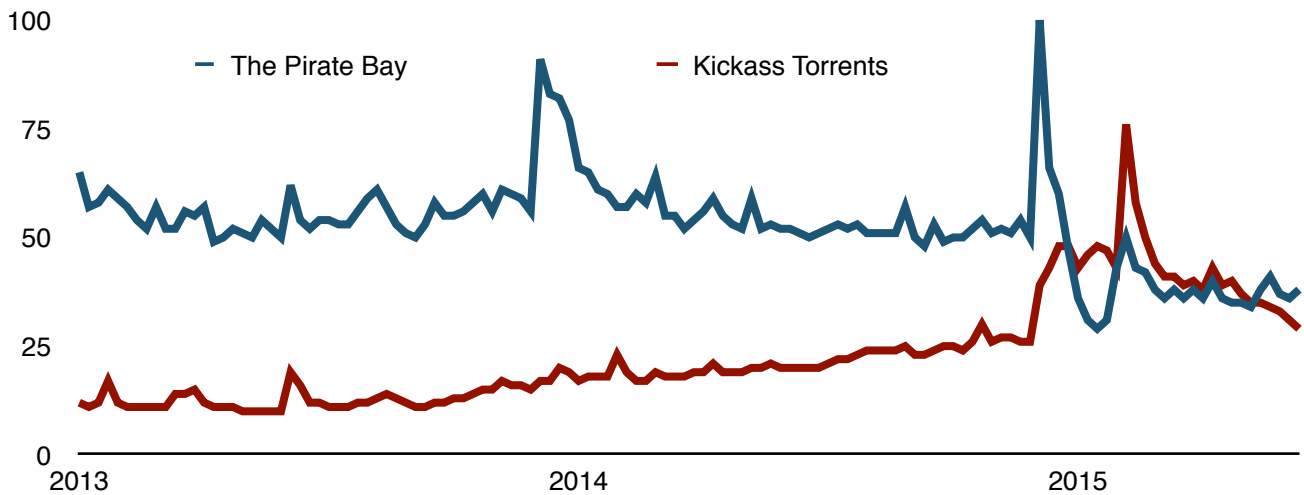
Relative incidence of Google searches for The Pirate Bay and Kickass Torrents over time. The increase in searches for The Pirate Bay at the end of 2014 is a result of the shutdown of the site. The trailing peak of Kickass Torrent searches shows how consumers adapted to the shutdown.

levels, as shown below, is attributed to the efficacy of the program.

This view is not supported by other data. A month after the program was initiated, The Pirate Bay enjoyed a record month of US-based traffic, a full 31% increase from the previous year. There did not seem to be any real effect on the actual piracy[11].

A similar program in France achieved equally lackluster results. Research by American and French economists found no substantial effect from the so-called Hadopi law, and commented that they found "evidence that individuals who

are better informed about the law and piracy alternatives substitute away from monitored P2P networks and illegally access content through unmonitored channels[12]."

There is an abundance of alternatives and workarounds born out of these attacks. VPNs have become cheap, easy to use, and feature-rich. The increasing focus on consumer-level piracy has further increased their business case. Some value-added piracy platforms, such as Popcorn Time, have one-click VPN integration, making it effortless for end-users to circumvent snooping.
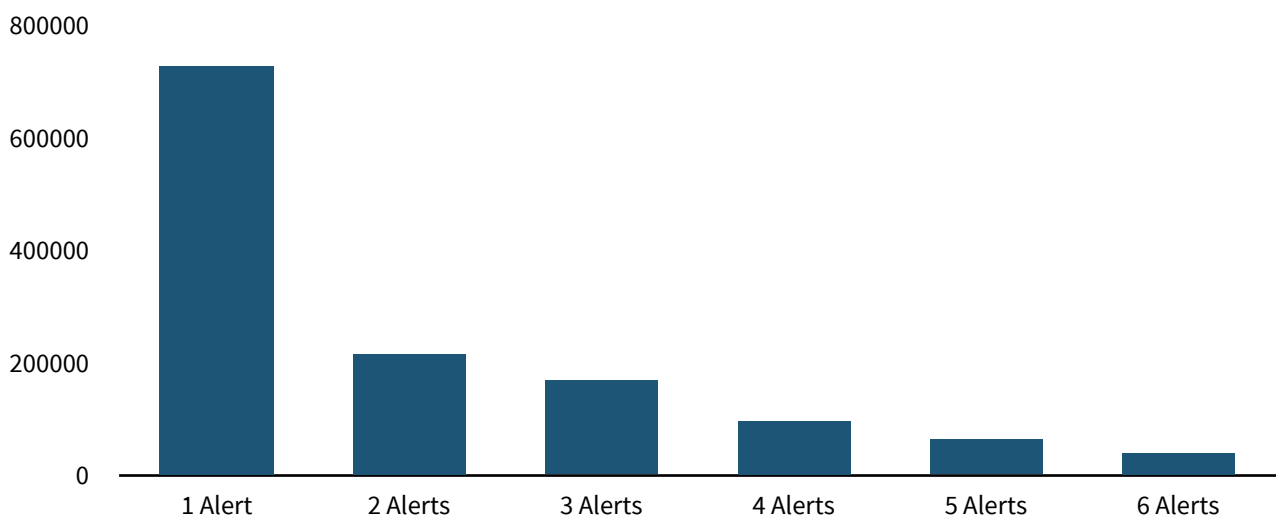
Number of individuals notified per alert level on the US 6-strike program. The downwards trend was claimed to be a sign of the success of the program, but realistically some pirates became more sophisticated in response to attack.

Popcorn Time

The piracy video-on-demand service *Popcorn Time* has come a long way in its short lifetime: The first hit when Googling 'popcorn' is no longer the Wikipedia page to the lifeblood of traditional cinemas, but a link to the website of the open-source BitTorrent client. This 'Netflix for Pirates' has crossed the last threshold of making piracy mainstream – the user experience. Now your grandmother can pirate too.

The meteoric rise of Popcorn Time did not go unnoticed. Pressure from the MPAA had the creators jumping the site between hosting providers, before eventually distancing themselves from the product.
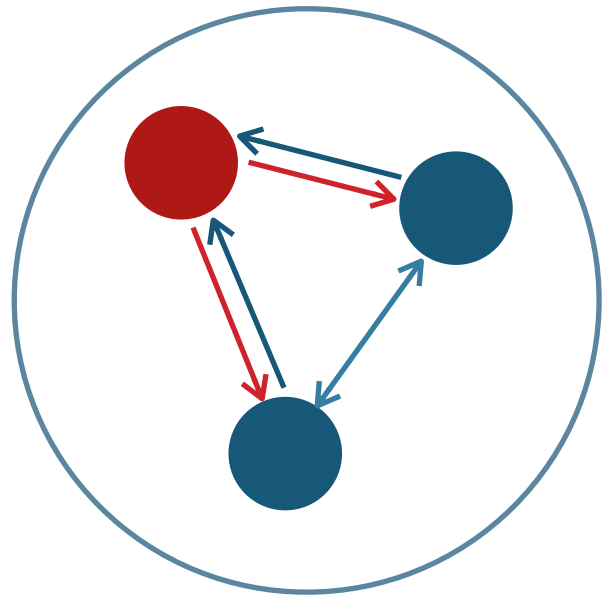
What might seem like a successful attack once again strengthened the antifragile system. The project went full open-source, with developers now contributing pseudonymously to the project from around the world. By decentralizing the product, it has become nearly impervious to centralized attack.

To attack an antifragile system, nodes should be turned against each other. An attack from the inside circumvents the antifragile characteristics of the system.

Attacking Antifragile Systems

According to the legend, Hercules drove the Hydra from its cave and cut off one of its heads with his sword, but the head grew back. Each time one of the necks was severed, two more took its place. Only when Hercules used the Hydra's poison against it was he able to slay the monster. By turning the power of the beast upon itself, he was able to kill it.

Antifragile systems are defined by how they react to stressors from outside. While a muscle strengthens from lifting weights, a disease can atrophy the muscle from within. Our immune system adapts to new pathogens and so becomes stronger, but something as simple as pollen can turn it against itself.

When attacking an antifragile system, these are the two things to consider: the internal forces at work that might be turned against the system, and where the barrier of the system is. There are typically various links between nodes, not just the ones strengthened by the outside stressors. If these links can be turned from 'pull' to 'push,' the system may start to atrophy from within.

Weakening a system from within is an age-old tactic. Teachers advise their students early on that 'no one likes a tattletale;' prison shows teach us that 'snitches get stitches.' Whether it's Judas Iscariot, Fredo Corleone or Cypher from The Matrix, snitches are portrayed as the worst that society has to offer, and for good reason: they weaken communities.

Attacking Piracy

If piracy must be stopped, how would these tactics work in this antifragile system?

The pirates romanticize themselves as revolutionaries in the struggle against big corporations and the unjust authorities. The MPAA is called the MAFIAA and the FBI is seen as war criminals. Those who are captured are made martyrs to the cause. After serving 10 months in prison, Pirate Bay co-founder Fredrik Neij remarked[13] that "It was well worth doing prison time for The Pirate Bay, when you consider how much the site means to people." One commentator on his statement called him "the greatest man I've ever used a product of," and stated that "it's pretty disgusting

how the MAFIAA corrupted European justice, but if they wanted a deterrent, it hasn't worked. I'd happily start Pirate Bay 2.0 tomorrow, even if I knew I'd serve 10 months. The Pirate Bay is a powerful symbol of internet freedom against corporate oppression and American e-colonialism."

This sense of community that binds the pirates together is based on quasi-altruistic incentive structures. In the private sites where pirated content is typically first uploaded, trust and competition binds the community together. Membership is earned or awarded to those who are worthy. Different groups and individuals compete for who can find new pirated content first and are rewarded with recognition. Bad content, content of bad quality or content infected with viruses, are 'nuked' and the uploader is discredited within the community.

On public sharing platforms, such as The Pirate Bay, sharing is typically done out of a misplaced sense of altruism – pirates feel they are giving back to the community. Whether the owners of the platforms are guided by altruistic motives, or profit, they need to cover infrastructure costs. Most sites are currently funded with ad revenue, which means slim margins[14]. Traffic on the sites are driven by the availability of high-quality and safe content. Since sites like The Pirate Bay rely on uploads from the community, they have an incentive to make the uploaders feel safe to upload the files. The Pirate Bay even had a page showing how legal threats to uploaders directed to the site were ignored[15]. Downloaders show their appreciation in the comment section of the torrent sites, and participate by seeding the peer-to-peer network.

Current Approaches

To compromise the system from within, the nodes should be turned against each other. The Business Software Alliance (BSA) has attempted this through rewarded reporting of unlicensed software[16].

This allows disgruntled employees to anonymously report their employers. While this initiative should be praised for its ingenuity, its scope is limited. Effectively it is only one end-point node acting against one other end-point node. It helps

to identify infringers, but not the initial pirate of the software. The breaking of the employee-employer trust relationship is not a great boon to fighting piracy. This is a local solution to a globalized problem.

The BSA campaign appealed to users on social media. The success of the campaign is limited by the scope of its effectiveness.

A more globally-relevant attack is the trojan horse approach - broken or infected torrents are uploaded with titles similar to popular content. Almost 30% of all torrent uploads to popular sites are fake[17].

Pirate sites have moderators and reporting links to root out fake torrents. Further, downloaders typically opt for the torrents based on the seeding ratio, which means that fake torrents will quickly be driven out by market forces. This results in this attack not being effective in breaking the system from within. The Pirate Bay itself is doing a much better job of spreading viruses through ads than these malicious torrents[18]. Even popular torrent clients have been found to pack malware[19].

New Tools

The invention of cryptocurrencies has given rise to a global internet-of-value. The decentralized currency allows anyone, or anything, to transfer value anonymously over the internet. Powerful disruptive technologies are being built on cryp-
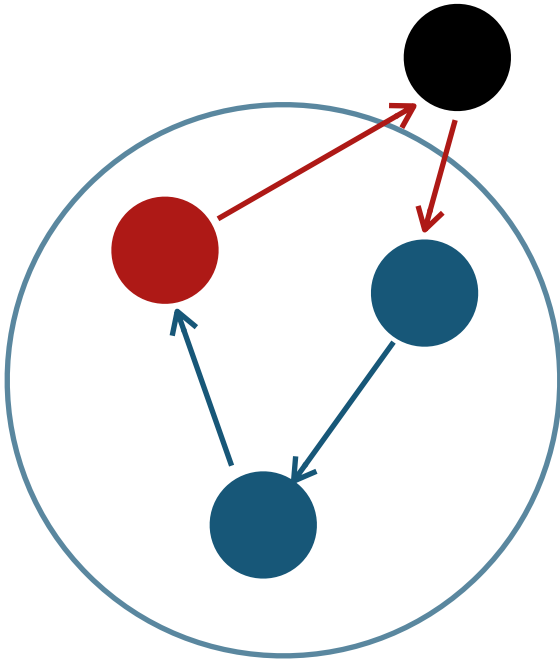
With the CustosTech technology any node can identify the pirate uploader. When the embedded bounty is claimed, the CustosTech system is automatically informed and the initial infringer identified.

tocurrencies, including in the piracy (see Joy-stream[20]) and anti-piracy spaces.

CustosTech[21] is technology that harnesses the global and anonymous nature of Bitcoin to incentivize pirates to turn on each other. It turns the greed of the pirates inward.

Unlike the trojan horse approach, the quality of the content is not compromised and the content is not infected by malware that can harm downloaders. Unlike the BSA reward scheme, the attack is global and uses any node to attack the origin-node - the first infringer.

How it Works

The technology works by embedding a reward into any media content, and making a tool available publicly with which to extract the reward. Each copy's reward is associated with the person buying the content.

The lawful user is unaffected by the embedded value, but when a pirate spreads the content to his peers, anyone of them can anonymously claim the reward. Once the reward is extracted, Cus-

tosTech is informed instantly and automatically through the Bitcoin protocol.

The pirate that uploaded the content unlawfully is identified and can be prosecuted, while the person that snitched on him remains unknown. All that the uploader knows is that it was one of his peers that turned on him.

With potential uploaders now threatened by the beneficiaries of their good-will, they may be disinclined to continue sourcing new content. This erodes the sense of community and altruistic motivations in the piracy ecosystem. Pirate platforms, realizing their own social structure might become at risk following such an attack, might advise against uploading CustosTech-protected content.

Conclusion

Piracy is an antifragile system, gaining from traditional centralized attack. Over the last decade, digital piracy has become the market leader in media distribution by reacting to environmental stressors from those trying to stop it. While individual platforms and users might be fragile and easy to attack, the system adapts to fill the void and protects itself from similar future attacks.

The way to attack an antifragile system is to use its nodes against each other, and in so doing break the system from within. In the anti-piracy space, some attempts have been made to do this, but they lacked the technology to accomplish a sustainable solution to piracy.

CustosTech is a new technology enabled by cryptocurrency technology that attacks piracy in a way that was impossible before. Pirates are incentivized to turn against each other, with their anonymity secured. This disturbs the incentive structures governing the uploader-downloader relationship, breaking the pirate community structure.

www.custostech.com

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Icons made by Freepik from www.flaticon.com

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