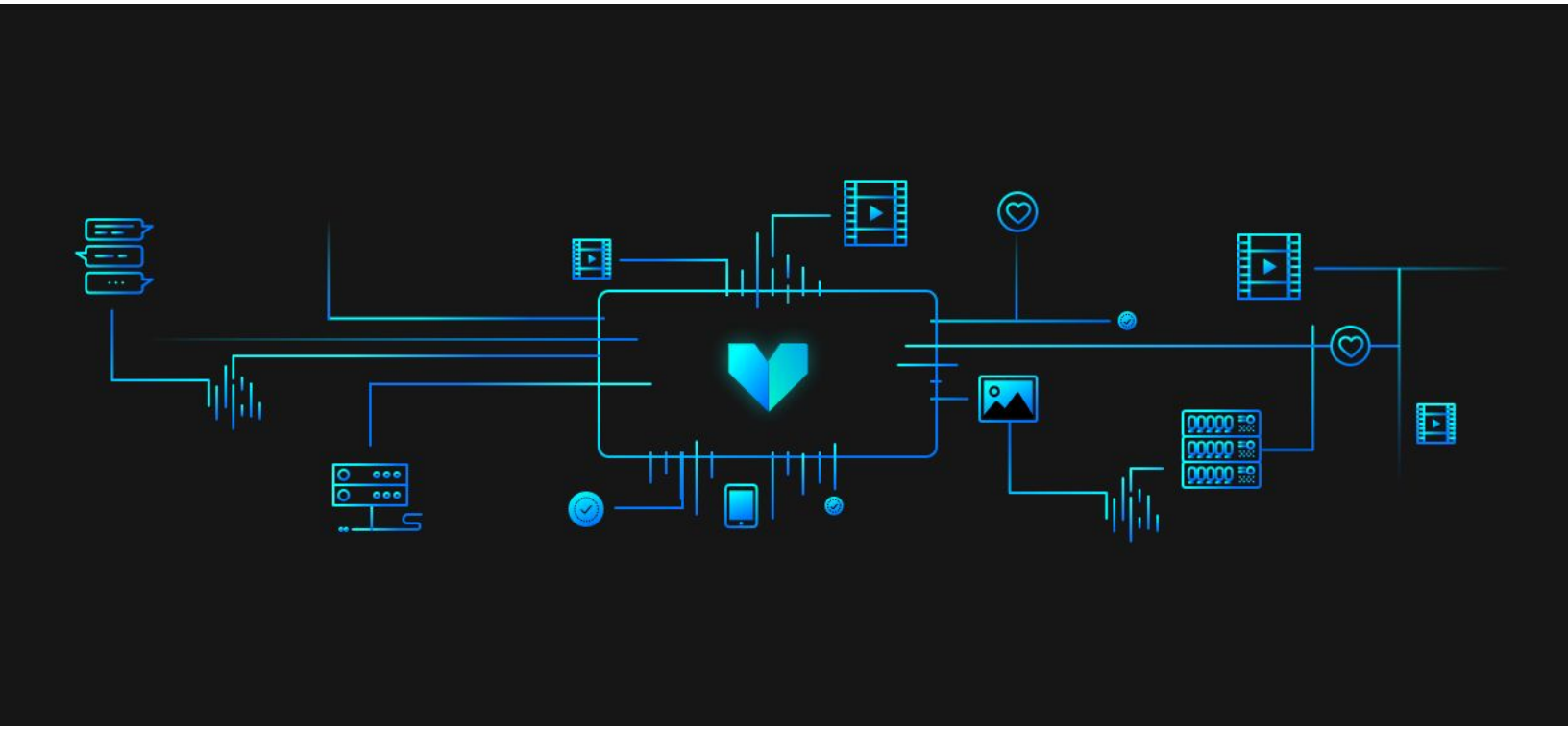

Viewly

WHITEPAPER

[January 20th 2018]

Table of Contents

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Viewly Inc. is a Federal Canadian corporation with headquarters in Calgary, Alberta, Suite 4300, 888 - 3rd Street S.W., Calgary AB T2P 5C5. Majority of the Board is located in Slovenia, European Union.

EXECUTIVE SUMMARY

Some of the greatest achievements in the arts and science of human history were made possible by the patronage of wealthy institutions and families. Nowadays, cultural expression has shifted to digital content distributed on the web. The majority of web content platforms are using an advertising-based revenue model which makes creators dependent on advertising dollars controlled by a few large corporations. One such platform is YouTube, a monopolist among web video platforms.

Centralized and advertising-based platforms have total control and put maximization of ad revenue above everything else. Unfortunately, this is not in the best interest of all other parties and leads to the following problems: viewers are bombarded with ads and manipulated into fast content consumption and creators receive only a fraction of revenue from value they create. Struggling to sustain on ad revenue alone, creators are pushed into mass-consumer market. They have few opportunities to engage with fans and grow their community when binge consumption is inherently promoted. Furthermore, advertising businesses lose out due to inefficiencies in reach and rampant ad fraud.

The ad-based business model exhibits inherently misaligned incentives between viewers, creators, and advertisers. It disproportionately profits the middlemen and it is the source of problems described above. Even incumbent platforms aren’t motivated to fix it as it would directly undercut their revenues.

We believe that there is a better way to monetize content and promote content creators.

That’s why we are building Viewly, a social video platform:

- Without pesky ads, where users’ privacy is respected.
- Where communities thrive and engagement between fans and creators is highly encouraged.
- Where creators with small, medium, or large-sized audiences can sustain themselves through modern monetisation: a combination of frictionless micro-payments, fan patronage, sponsored endorsements and commerce.
- Where businesses can improve advertising efficiency and lower costs by skipping the middlemen and sponsoring creators and supporting their communities directly.

Viewly is a decentralized video platform powered by blockchain and peer-to-peer video sharing technologies. **Run by the people, for the people**.

INTRODUCTION

Viewly is a next generation video platform, leveraging new technology for a design that better serves both viewers and creators.

The history of cultural creation and its reward has seen phase shifts which ingeniously solve problems of the past while creating new ones. In the mid-19th century, commissions for both artistic and scientific works began to shift from the old patronage model, which had arisen in aristocratic societies. While patronage funded many great works which still stand the test of time, the opportunity to shape the culture remained only in the hands of a wealthy few.

The shift into the mass consumer age effectively diffused patronage across society to all with even a little disposable income. Cultural consumption became focused upon the novel, theater, cinema, television and, today, the Internet. This heralded a great democratization of culture and a shift of values. However, it can be argued that the power of the mass market came at a price.

The patronage model funded some of the finest works of art, literature and scientific discovery in human history by liberating creators to produce great work, where lofty endeavors could soar without commercial pressures and corrupting enticements. The new commercial age, it can be argued, brought a crass commercialism, the triumph of pop culture, and a dependence on advertising that could often shackle and drown out the artist's message.

The modern online digital era has brought a new proliferation of free content and the largest audiences in history. However, we should here remember the old adage, "If you're not paying, you're what's being sold." Revenue generated by digital content creators is, for the most part, dependent on advertising dollars and controlled by a few large enterprises. Web users have become accustomed to ad-supported sites and services, which increasingly comes with the surrendering of personal data. This helps large networks profile users in order to serve them more "relevant" ads, as determined by advertisers.

Google, YouTube and Facebook, the three most popular websites in the world, all rely upon this ad-based business model.

There is a growing awareness and dissatisfaction with the flaws inherent in the ad-based model:

- the model increasingly results in the bombarding of viewers with ads,
- viewers are manipulated into fast content consumption,
- creators receive only a fraction of revenue from the value they create,
- advertisers also lose due to inefficiencies in reach and ad-fraud.

Enter Viewly.

The Viewly model is able to integrate strengths and lessons from the best models in history, thanks to the combination of new technology – specifically, peer-to-peer data sharing, blockchain technology and smart contracts.

Viewly has innovated a platform that enables the supporting of all creators, those with audiences from the largest to the smallest, through a combination of vote-based tipping, patronage-style recurring payments, business sponsored endorsements, and more. Features include:

- creators can be supported by their audience directly,
- no need to obsessively track the audience,
- no need to manipulate how the audience consumes the content;
- ad free.

Eras arrive and depart more rapidly in the modern digital age. Dissatisfaction is more quickly recognized, technology synthesized, and solutions innovated.

The social video platform is already due for an update.

The stage is set for Viewly.

Problems with present platforms

Demonetization and creator exploitation

Most creators struggle to build and sustain sufficient ad revenue, receiving only a small portion of the value they create. Additionally, even if they do manage to build a significant following, creators remain forever at the mercy of the platform on which their work is hosted which can demonetize their content overnight due to wholly arbitrary decisions. Suddenly, creators can find their income slashed or eradicated.

YouTube recently (Jan 2018) changed their eligibility thresholds for monetization, giving affected channels just 30 days to surpass the new levels or be demonetized. Under the new rules, only channels with more than 4,000 hours of watchtime within the past 12 months and more than 1,000 subscribers are eligible for monetization.

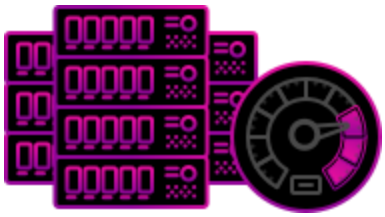
Viewly takes only a symbolic cut from creator earnings and does not demonetize.

Pesky ads

Nobody really likes watching ads. Their production has become a fine art in itself just to catch our attention. But, where there's a choice, audiences will skip them. Ad-based platforms distract us and promote binge watching in order to increase their revenue. Viewer experience and privacy are compromised for the sake of the platform's ad-based model.

There are no official stats on click-through rates (CTR) of video ads on platforms such as YouTube, but estimates range from just 1 to 3% [26]. This is an extremely high price to pay by viewers as a whole.

Viewly doesn't serve ads. Viewly aims to be ad free, removing incentives to track users and manipulate attention. Instead, meaningful engagement and community building between creators and fans is facilitated.



Expensive content delivery

The primary cost of present video platforms is global content delivery, which is unfairly passed on to creators. Under this model, creators pay hosting and storage for all the content, including content not creating value.

This model of centralized repositories for content now seems outdated in an increasingly decentralized and networked world.

Viewly not only reduces cost of video delivery by using a peer-to-peer content delivery network, but also enables users to earn VIEW tokens by leveraging their redundant resources and hosting videos.

Advertising revenue above everything else

Under the present system, great ingenuity has been set to work to develop machine learning algorithms to manipulate audience attention and maximize ad revenues. While advertising revenue is optimized, viewing experience is sacrificed. Click bait is employed to manipulate the audience into consuming more content than their natural interest would dictate, so as more ads can be consumed. This engenders a pressure upon content creation to appeal to lowest common denominator interests that capture the most attention.

There is less opportunity for deeper discovery, community building and bonding with the audience.

Viewers are being pushed around and force-fed content to be quickly consumed. Binge content consumption is promoted and quality content creators are treated as a commodity.

Viewly monetizes without advertising, in a way synchronized with the interests of content creators and their viewers – however diverse, for audiences of any size. We use nuanced machine learning that caters to the true interests of viewers.

Poor engagement between creators and fans

As already mentioned, the drive to maximize ad-revenue comes at a great cost. One method of dumbing down of content occurs via the exploitation of the dopamine reward circuit of the human brain. The fast delivery of diverse novelty triggers dopamine release, which increases total time spent on the platform and ultimately ad impressions and clicks.

Such platforms employ devious ingenuity to effectively hack human vulnerability and keep attention locked in for as long as possible. We are now learning of the personal and social cost of this kidnapping of attention. Users are complaining of growing dissatisfaction in hand with social media addiction they nevertheless cannot break. Engineers who designed these mechanisms are breaking rank to regretfully speak of designing such exploitative systems. For creators with a broader scope of ambition, such methods are also a poor foundation for the building of communities around their work.

Complaints also abound around the quality of commenting systems on established platforms. We speculate that their commenting systems may be deficient on purpose. After all, time spent in discussion means less time consuming ads. Stopping to participate in discussion will also break a video binge, and once more this means less ad consumption.

Current commenting systems do not provide an easy or consistent way of building a community for creators. This makes it difficult to identify genuine and active fans. From the audience's side, fans can't increase their reputation, because their valuable comments are dampened by random website links and spam.

With Viewly, every creator has a platform to build their community. Our model stimulates the development of content with true quality and meaningful community interactions. The Viewly economic model thrives with positive community building.

Mass-market preference

Ad-supported platforms are only a viable solution for creators who target a mass-consumer

market, equating to only the most popular 5-10% of YouTube creators making a living.

Many of the other 90-95% of creators produce highly valued work, yet too many fall foul of the present system and miss out.

An exceedingly large proportion of advertising revenue is taken by middlemen – the video platforms, ad and content networks. For example, YouTube takes a hefty 45% cut of ad revenue earned by content.

creators. Creators with near-sustainable medium-sized audiences are incentivized to produce more mass-market oriented content. While this might work for certain types of content, it tends to incentivize lower quality production.

Viewly's video monetization models are especially suited to niche and quality content creators with medium to small sized audiences, which otherwise lose out on ad-based legacy platforms.

Rampant ad fraud

Various independent reports estimate that ad fraud (advertising revenue earned via use of botnets that "watch" videos and click ads) is as high as 50%, costing businesses billions of dollars. Unsurprisingly, advertising platforms generally don't publicly disclose the extent of the fraud.

Ad fraud is an incredibly hard problem to solve as detection technology attempts to outfox ever evolving fraud technology. Additionally, solving the problem tends not to be a high priority of the platforms as it would deeply undercut their revenues.

Viewly's modern approach to content monetization circumvents this problem. The opportunity now exists to pioneer new approaches to online value creation.

Flawed advertising based model

As can be seen, the ad based model is deeply problematic and dated. Centralized platforms that use it hoard the power and are able subordinate all to the maximization of ad-revenue. This unbalanced system serves these platforms at the expense of viewers, creators and even advertisers.

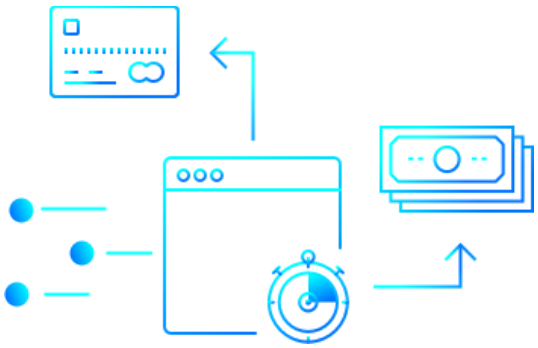
As incentives in the advertising model are inherently misaligned, when a platform optimizes for ad revenues, all other stakeholders lose:

- viewers are bombarded with ads,
- quality of content suffers,
- creators receive only a fraction of revenue from the value they create,
- advertisers lose due to inefficiencies in reach and ad fraud.

VIEWLY VIDEO PLATFORM

Viewly is a social video platform with a smart contract-based monetization system, enabling the transcending of the advertising-based model. This model is designed to better provide sustainable revenue for all creators, not just mainstream content producers.

Viewly also employs peer-to-peer video sharing technologies to establish a truly decentralized platform befitting the dawning of the blockchain era.



Direct monetization

The traditional advertising model has previously worked well for mainstream content that captures millions of impressions. But the model falls far short for most, particularly high-quality creators with modest audiences.

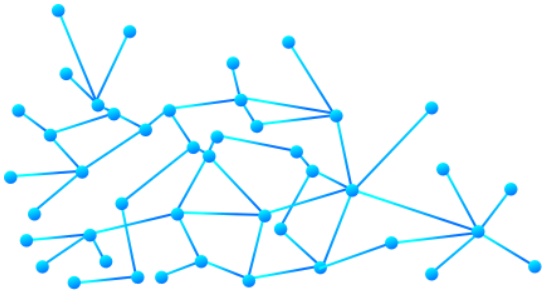
Viewly's solution seeks to better incorporate this group- the majority of creators (the mid tails of the distribution), enabling them to build greater audience engagement, while also earning far more than under the ad-based model.

The Viewly patronage model enables content creators to directly receive support from their fans, freed from such metrics as views, watch-time, and likes. With Viewly, fans gain control. They can choose to support content creators via small one-time donations, recurring

micro-payments based on newly published content, or periodic quota-based micro-payments to favorite categories and channels.

These frictionless micro-payments are made possible by the power of blockchain transactions, seamlessly integrated into the Viewly platform. Effectively, any kind of monetization idea will be possible, as business logic is programmable via smart contracts. As all payments and transactions also take place through smart contracts, trust is automated, eliminating the cost and risks incurred when using third parties.

A place where communities thrive



Viewly represents the next generation of video platform, leveraging new technology to enable innovative design that better serves creators and their audience.

With the outdated, ad-based model removed, the need to optimize for ad-revenue is also removed. Cynical measures, such as the manipulation of view count, are not in the best interest of viewers or creators. Better design enables networks and communities to thrive, with more benefits for more participants than in previous generations.

Viewly enables creators to build a community of fans and converse with them in new and unique ways, empowering fans to support their favorite artists and directly influence the content creation process.

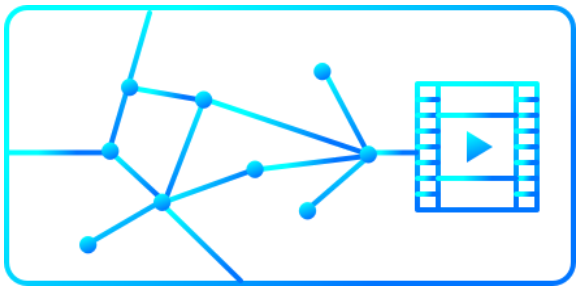
Viewly users have flexibility in how they chose to support content creators and become their patrons. In return, creators can set up multiple membership levels with various benefits, such as access to limited content, private chats discussing ideas for upcoming content, being featured in content, etc.

As rewards are customizable within the platform, the possibilities are endless and only depend on the ingenuity of content creators and their engagement with their audience. Furthermore,

there will be rewards for the biggest contributors in each category, ranging from special badges to influencing future content.

Creators publishing on Viewly will be able to invite sponsors and accept sponsorship deals. Unlike algorithms that feed users with irrelevant ads, these opportunities will be selected at the creator's discretion in order to provide value to their community. Unlike ads which can interrupt flow, they will be integrated into the content by the creator, enhancing it and providing value.

First decentralized video platform



Viewly is an entirely decentralized platform enabled by two foundational pieces:

1. peer-to-peer hosting network, and
2. smart contract-based transactions on the blockchain.

A non-governing user-facing web application that connects to this backbone will initially be implemented in traditional web architecture in order to lower barriers to adoption and accelerate growth. A decentralized version of the frontend application will also be built, but it will remain a secondary option until the DAPP technology stack matures and is suitable for large scale mass-market adoption.

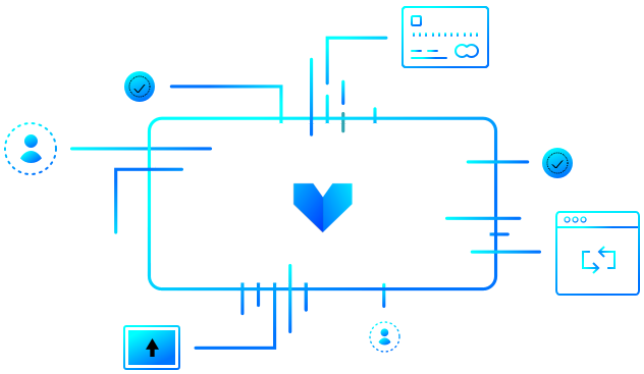
Transaction processing through smart contracts provides the framework for all interactions on the platform, including donations, micro-payments, sponsoring agreements, access level to limited content, etc. It has all the intrinsic qualities of blockchain systems, like immutability and transparency. The blockchain application also serves as a reward synchronization and enforcement layer for the peer-to-peer hosting.

Decentralized hosting networks are also a crucial piece of the Viewly platform. Since creators have to pay hosting providers for long-term storage of videos, it also serves as a content quality filter: creators are incentivised to remove early, or to not even publish low-value videos in the first place.

Furthermore, a decentralized architecture provides natural anti-fragility of the system. It is censorship resistant and much harder to be taken down by intervention of corrupt governments or by attacks of malicious hackers.

Content monetization models

In this section, we propose three models which respect user privacy, require no middlemen, and encourage the formation of positive, self-organizing communities.



Vote-based Tipping

Many people are naturally motivated to support their favorite creators. This support can be facilitated and further fostered via gamification, with incorporated special perks for supporters.

Our model provides a solid baseline mechanism to deal with rewards in a content abundant ecosystem. Via this mechanism, users are able to support multiple creators at once, without the mental overhead attached to traditional micropayments.

To establish such a system, we have developed a frictionless voting based micropayment model, in part influenced by the highly successful Patreon model and the voting model of Steem.

How does it work?

Each user has their own donation pool in the form of a virtual wallet. Based upon the user's upvoting patterns, this pool is automatically distributed to creators on a pro rata basis.

Gamification and status symbols

One potential way of gamifying support for creators is to add flares, perks, and other reward mechanisms which can be awarded to supporters. Contributions can also be quantified to increase their visibility to the creator and the wider the community. For example, social networks like Reddit rank comments by net upvotes. This system however strongly favors comments that come in first and get the first upvotes, pushing the rest of the conversation into obscurity.

Instead of favoring submission time, we can rank comments by the net size of a commenter's contributions to the creator and leverage community input (votes) to amplify the best replies, as well as filter spam.

Recurring patronage

Some creators may choose to create special content for their most loyal fans, accessed when a sufficient and recurring monthly pledge has been setup. The recurring pledge model is also extensible to other forms of value exchange.

Selling access to the content

We believe that direct content sales are a sub-optimal monetization strategy. Such a strategy adds overhead; additionally, in this era, most consumers prefer to avoid the extra hassle of making a payment to watch a single video.

Companies like Netflix and Spotify have popularized the subscription model which grants access to entire catalogs of content. Humble Indie Bundle also pioneered a "pay what you want" model, where any amount above a minimum threshold grants access.

We believe that we can apply these principles to the patronage model. Fans can pledge any amount of tokens on a monthly basis to their favorite creators, and if the pledge surpasses the threshold set by the content creator (e.g.: $5 per month worth of View tokens), access to special content, and perhaps, say, the creator's inner circle, is unlocked.

Value-added economy

While content is abundant, services, merchandise and other products are less so. With Viewly, content creators could create Kickstarter-like packages as up-sells to their most loyal fans. For

example, a fitness and bio-hacking channel might create its own food supplement or nootropic which they could distribute to fans in exchange for a monthly pledge.

In the future, we could expand these marketplace features to solve additional problems, such as crowdsourcing services. Content creators could hire editors, designers, writers and so on, through the network itself, paying for work completed in the native coin. The escrow model from sponsorships can be applied here as well.

Creator-delivered endorsements

While the patronage model is the purest form of value exchange – with near perfectly aligned incentives and an honest feedback loop, many creators today do depend on sponsorships. We would therefore like to provide a sponsorship option and encourage creators to foster such opportunities based on their understanding of, and alignment with, their audience.

We assume there will be a better alignment of values between sponsors, creators and viewers when a creator also creates the endorsement, since creators need to maintain a good relationship with their audience while simultaneously satisfying the demands of the sponsor.

The Viewly blockchain application will offer an on-chain escrow service (smart contract), that sponsors and creators can utilize once pricing structure and deliverables are agreed. After both parties have delivered on their commitments, the transaction is executed. The service will also be used for dispute resolution, to mediate re-negotiation for delivery of additional work, as well as offer options for a partial or full refund. If disputes escalate, a trusted (elected) third party will be used as an arbitrator. The process will be fully transparent and open to community feedback.

Market landscape

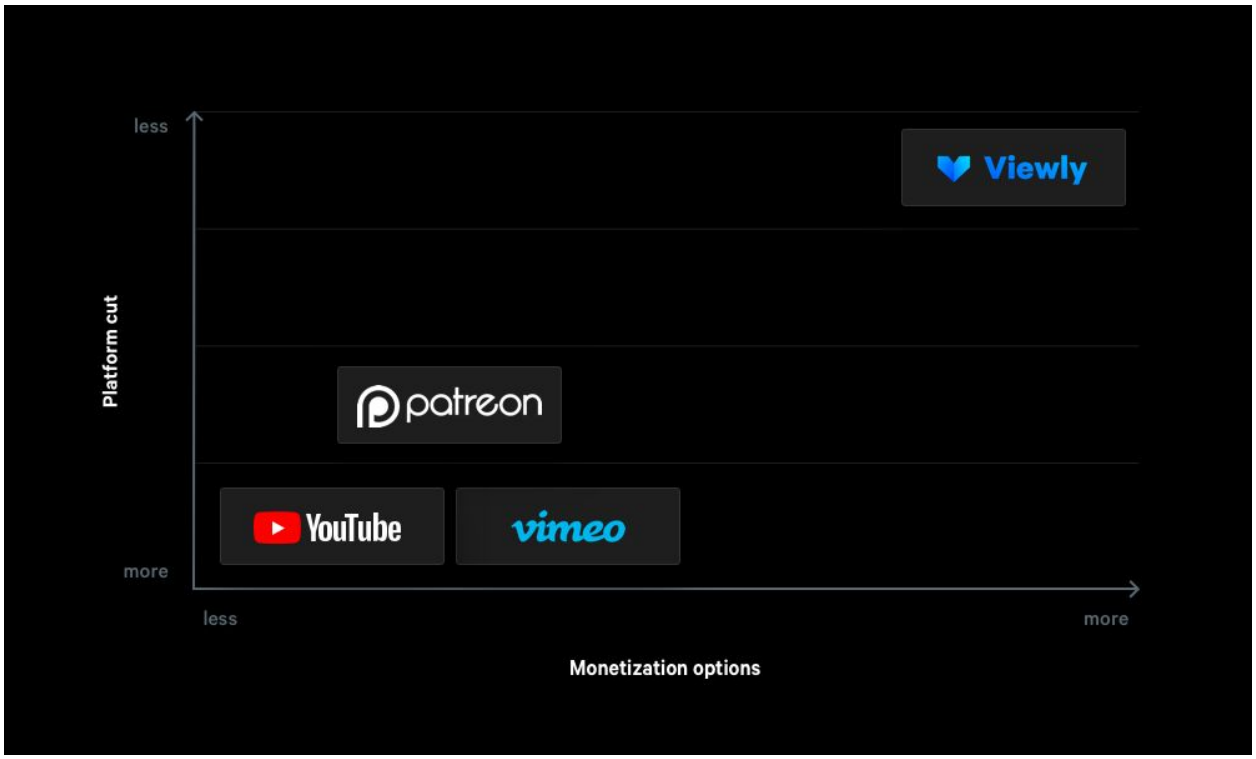
According to research firm Frost and Sullivan, the online video platform market will generate more than 800 million USD in revenue by 2019 and it is estimated to grow at a compounded annual growth rate of 14.88% by 2020, according to Research and Markets. As for the market value of the online video platform market, YouTube holds a 74% market share and is estimated to be worth in excess of 90 billion USD [9], yielding the total market value of online video platform companies at 122 billion USD. The next largest platform by market share is Vimeo, which holds 15% of the market. Together YouTube and Vimeo hold just shy of 90% of the total video platform market.

However, the majority of the current traditional platforms limit the monetization options available for content creators. By doing so, platforms also limit the kind of content that works on such platforms. For example, ad-based platforms works best for the mainstream and viral content, whereas niche content creators struggle to make a living on such platforms.

When analyzing the video platforms market, we believe that the platforms should be measured by two parameters: (1) breadth of monetization options and (2) the size of the cut that the platform takes for itself. If we look at the popular video platforms such as YouTube and Vimeo, we can observe that they take a substantial cut of advertising revenues. YouTube's recent moves into providing more monetization options only proves that we are heading in the right direction for better supporting content creators. Patreon promotes patronage-style recurring revenue options that are desired by most content creators. However, recent findings have shown that revenues of the content creators on Patreon are rather meager.

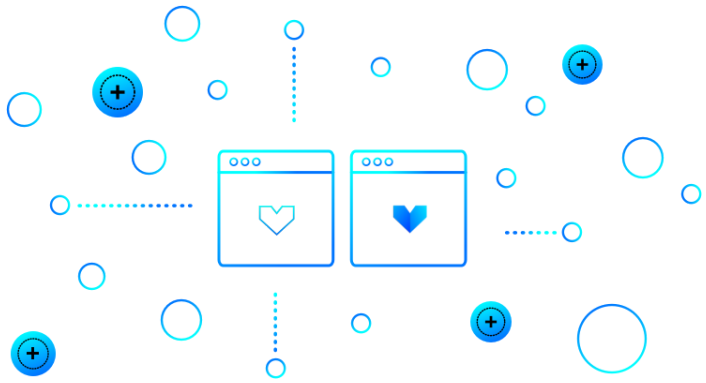
What all of the aforementioned platforms have in common are high percentage cuts that they take from content creators. Blockchain and smart contracts, cryptocurrencies and DAO governance style enables projects like Viewly to strive for very low cut- a cut that more accurately matches the content delivery costs.

As shown in the graphic below, most traditional online video platforms limit the monetization options and take a significantly high cut of the revenue.



THE VIEW TOKEN

These are our views and expectations on how the platform would use VIEW token. VIEW token will be used as a payment mechanism. Stakeholders, i.e. viewers and content creators, will need to hold certain amounts of tokens to ensure access to certain platform functionalities.



VIEW Token Utility

As already mentioned earlier, there are several monetization mechanisms in plan for content creators. Regardless of the monetization mechanism favored by the individual content creator, he will receive the payment in VIEW tokens.

On the other hand, content creators will use some of their VIEW tokens to pay CDNs for their services.

The platform will require the CDNs to keep some VIEW tokens as a deposit to ensure the quality of services. Similarly, content creators will need to keep some amount of tokens proportional to the number of their videos (e.g. 10 VIEW tokens per video) and viewers will need some amount of tokens if they want to actively participate, like upvote videos etc.

Disclaimer

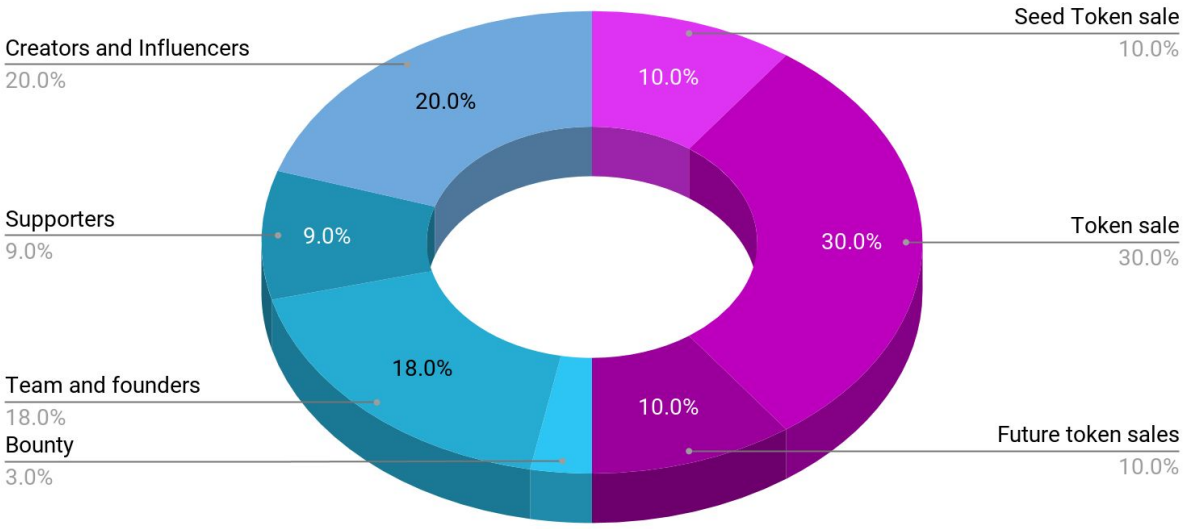
VIEW tokens are functional utility tokens within the Viewly platform. VIEW tokens are not securities. VIEW tokens are non-refundable. VIEW tokens are not for speculative investment. No promises of future performance or value are or will be made with respect to VIEW, including no promise of inherent value, no promise of continuing payments, and no guarantee that VIEW will hold any particular value. VIEW tokens are not participation in the Company and VIEW tokens hold no rights in said company. VIEW tokens are sold as a functional good and all proceeds received by Company may be spent freely by Company absent any conditions.

VIEWLY TOKEN SALE

A participant in the token sale represents that it is acquiring such tokens without a view to distribute or resale and understands that the Tokens have no guarantee that they will be freely transferable. There is no active trading market for the tokens being offered and it is possible no market may develop in the foreseeable future for such tokens.

You should only participate if you are able to bear the risk of the entire loss of your participation and have no need for immediate liquidity.

Ownership of a VIEW token carries no rights express or implied other than a limited right to use the Token and digital means to exchange the Token in Viewly's marketplace.



Token Sales

50% of the tokens are available for sale. 10% of the tokens have already been sold in the seed sale in October of 2017. 30% of the tokens are to be sold in the main token sale (February 2018). The remaining 10% are reserved for future sales.

Content Creators

20% of the token supply will be used to incentivize content creators to switch to Viewly and bring their existing audiences. This will be done through the curation/engagement game in a form of geometric rewards.

Supporters

9% of the token supply is to be used as incentives alignment mechanism for strategic partners, influencers and advisors.

Bounties

3% of the tokens will be used to reward our most dedicated community members for various contributions to the project.

Team and Founders

18% of the token supply is reserved for the core contributors. These tokens shall be distributed on a meritocratic basis to individuals that contribute significant value to the project. Up to 4% of the tokens are being vested to the Founding team over a 25-month period, based on the monthly performance evaluation

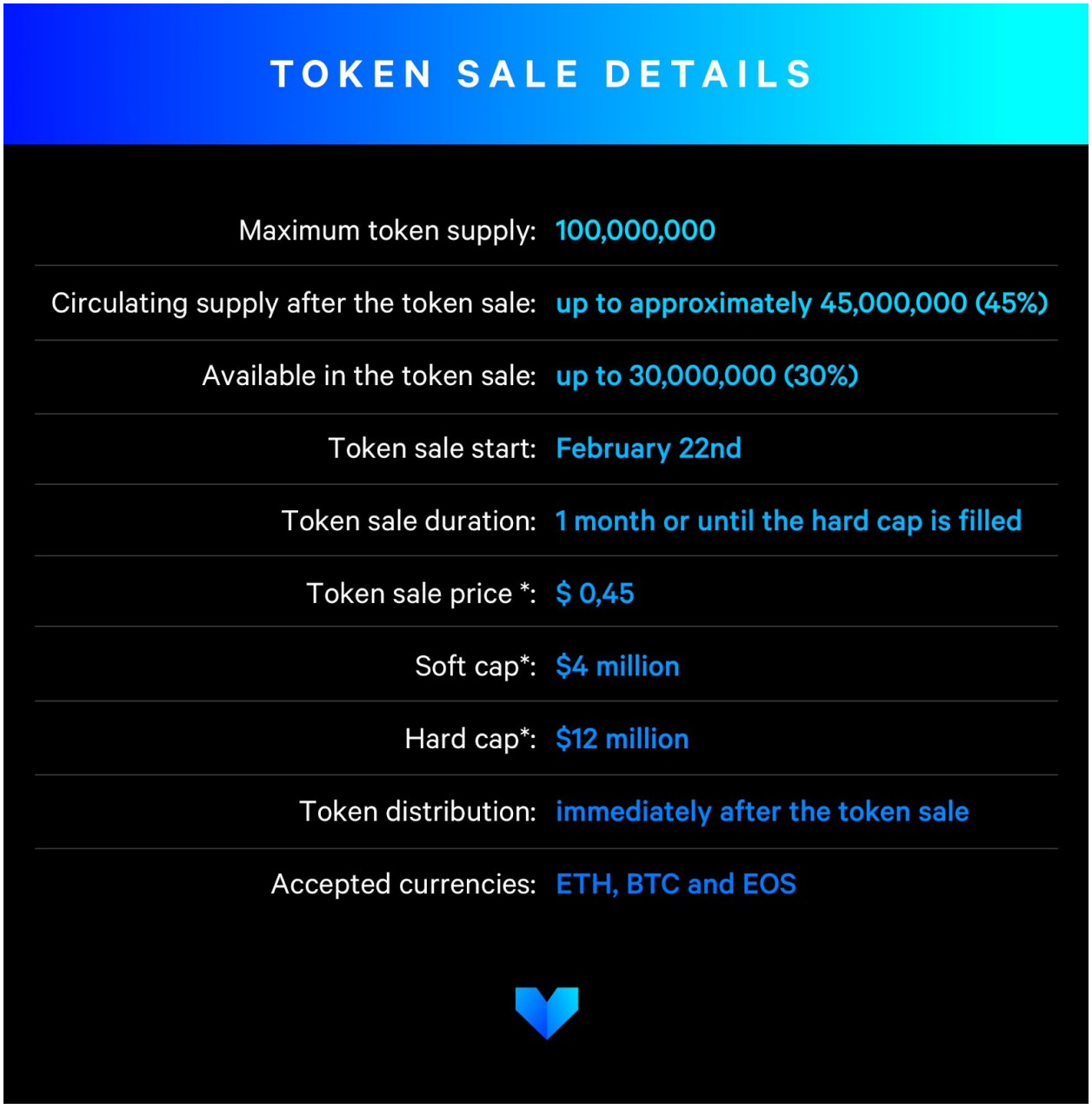
Leftover tokens

Tokens are minted on a Just-in-Time basis. Unsold tokens may be minted in the future for the purposes of DAO.

The DAO and its Treasury

Blockchain governance and DAOs are fairly novel concepts. If Viewly converges on a full-DAO model, all unminted tokens from the sale and distribution contract shall be minted into a DAO controlled Treasury. The max supply of VIEW tokens is capped at 100 million.

Token sale details



* we will publish the exact ETH amounts a few days prior to the token sale

Token sale contribution phases

Whitelisting

Whitelisting is the process of establishing KYC (Know-Your-Customer) and confirming your ETH wallet address to be able to take part in presale and crowdsale contribution phases.

Whitelisting will is done through the standardised KYC / AML solution IdentityMind Global (http://www.identitymindglobal.com). The solution does a KYC check, that among other seeks to confirm identity of an contributor and seeks proof-of-address. Besides the KYC solution also does AML checks against several databases to establish clean origin of the funds contributed to the Viewly token sale.

Only the Whitelisted individuals will have an option to contribute.

Pre-sale

Participating are assuming risks in their contribution per their local laws, and should be aware of the local laws in their jurisdiction for investing in crypto-tokens.

A presale for large and strategically aligned contributors opens on February 1st. The minimum participation threshold is 100 ETH, and the maximum bonus is 25%. Contributors above the 100 ETH threshold will be invited to do a Skype call with the team to confirm strategic alignment with the project.

A proportion of tokens will be reserved for people who whitelist before the February 20th. These tokens will be available to whitelisted contributors on a first come first served base starting February 20th (2 days before the public sale). The minimum participation threshold is 5 ETH. Contributors participating in this pre-sale will receive an early bird bonus of 5%.

If you're interested in participating in the presale, visit https://view.ly.

Public token sale

Participating are assuming risks in their contribution per their local laws, and should be aware of the local laws in their jurisdiction for investing in crypto-tokens.

The crowdsale will start on February 22nd. It will run until the total hard cap of $12 million has been reached or until 22nd of March. This sale will be done without discounts.

The minimum crowdsale participation threshold is 1 ETH.

VIEW Tokens will be "unlocked" after the token sale finishes.

ROADMAP

August 2017: Viewly Alpha
In August 2017, we delivered Viewly Alpha, essentially a "proof of technology" prototype. Viewly Alpha is based on Steem blockchain and IPFS technology.

October 2017: Seed token sale
In October, we successfully finished the seed token sale with limited number of early community and contributors.

November 2017: Team Expansion
November was a busy month as we grew our team by recruiting top talent across all fields, including experienced developers, advisors, marketing managers, and community experts.

December 2017: Brand and Website Refresh
In December, we worked on rebranding and refreshing our core materials including our value proposition as well as our website.

February 2018: Demo platform
In February, we anticipate releasing demo platform that will enable viewers to use tokens to reward their favourite content creators and allow early creators community to begin earning VIEW tokens for their content.

February 2018: Token Sale
Our main token sale event is set to begin in February. Details about the token sale will be announced soon. The funds raised in the sale will allow us to achieve many key objectives including implementing new features, scaling our platform, participating in marketing and influencer outreach efforts, and growing our organization as needed.

Mid-2018: More features and creator onboarding
In 2018, our goal is to work closely with quality content creators and viewer community to bring them on board of Viewly and develop more features to support amazing viewing experience.

End of 2018: Viewly CDN
By the end of this year, we plan to roll out our own content delivery network (CDN) that would be scalable enough to support the growing Viewly platform.

End of 2019: Viewly P2P CDN
By the end of 2019, we plan to complement Viewly CDN with peer-to-peer CDN network that will allow people with spare storage and bandwidth capacity to participate in the content delivery- and be compensated for their participation of course.

End of 2019: DAO
By the end of 2019, we will have started the gradual transition into a fully fledged DAO, which is our end goal.

Please note that roadmap and activities assumes that the token sale hits the 12.000.000$ contribution milestone.

TEAM

Stefan Furlan

Business & Organization

Stefan was the founder, partner or director of several startups in data science, analytics and blockchain space, including Dodona Analytics, Unblock Technology, Behaviour Exchange and Optilab. Stefan holds a PhD in computer science from the University of Ljubljana.

David Waslen

Business & Legal

A corporate finance, governance and structuring specialist with economics and engineering degrees from Dartmouth College as well as an MBA from London Business School, Dave will be providing executive management and business operations expertise.

Uros Jurglic

Product & Development

A senior software engineer with startup skills, Uros has worked for international companies like Scholastic and HoneycombTV, as well as founded several startups. He was the co-founding CTO of Printbox, the biggest print kiosk network in Europe. Uros holds a BS in computer science from the University of Ljubljana.

Denko Mancheski

Product & Development

An experienced software engineer, Denko brings video development experience into the team. Before joining Viewly, he was a senior software engineer and project lead in Vertex, a video broadcast solution company, and Adel, a blockchain incubator.

Furion

Development

An experienced software engineer, Furion brings blockchain development experience into the team. Before joining Viewly, Furion was a community developer who contributed to Steem's ecosystem and Steemit platform.

Jure Koren

Infrastructure & Development

Jure has spent over a decade as IT infrastructure engineer working for various clients, including global ad-tech leader Zemanta. He served both as a developer and a systems administrator, mainly focusing on high availability and scaling solutions.

Romina Kavcic

Design Strategist

Romina has over a decade of design experience working with startups as well as with larger institutions developing prototypes, designing products and brands. Her broad experience includes working with companies around the globe, such as Xamarin, Zemanta and Chipolo, Stellar, Outfit7, Databox, and more. Romina holds an MBA.

Munly Leong

Marketing

Before joining Viewly, Munly helped two notable crypto projects: Enjin and Etherparty. He's also a passionate game developer, filmmaker and entrepreneur. Munly holds a software engineering degree from University of Advancing Technology.

Tudor Ozy

Community Management

With a Bachelor's Degree in Engineering Industrial IT from Politehnica University Timisoara in Romania and a professional background in software engineering, Tudor is passionate about building Viewly community. Additionally, he is an excellent listener and strives to assist community members in any way possible.

Marko Stojkoski

Community Management

Marko is an account management professional who prides himself on delivering outstanding one-to-one service. After studying Informatics and Communication Technologies at the University Kliment Ohridski — Bitola, Marko put his skills to use by embarking on a career working as a community manager as well as managing sales and operations for retail and online market spaces.

Zoe Zorka

Lead Technical and Content Writer and Editor

Zoe brings almost a decade of experience as a technical and content writer to Viewly. She has worked for Upside Group Franchise Consulting for over five years as well as participated on several startup teams including Buildzoom and MediaLab. Additionally, she has written for CNN, Newsweek, and other publications. She is the current editor of #Herspiration Magazine. She holds a PhD in Business Administration.

Advisors

Charlie Shrem

Business & Cryptocurrencies

Charlie is most known for founding BitInstant, one of the earliest and most high-profile Bitcoin companies for facilitating Bitcoin retail transactions. Charlie currently serves as Jaxx's Chief Operating Officer. Prior to this role, Charlie served in a similar capacity at Decentral Toronto and Business Development at Payza. Charlie also founded the Bitcoin Foundation, a non-profit to standardize and advocate for Bitcoin in 2012 and served as its vice-Chairman in 2014.

Vasja Zupan

Cryptocurrencies & Media Strategy

Vasja Zupan is the COO at Bitstamp, the EU's first fully licensed digital currency exchange. Prior to this, Vasja spent 11 years at Central European Media Enterprises, the leading NASDAQ-listed CEE broadcaster, where he was the Joint Head of the Internet Division. Under his supervision, CME built a series of leading regional news and TV content related websites in the Czech Republic, Croatia, Slovenia, Slovakia, Bulgaria, Romania and Ukraine.

Bob Chandra

Product & Marketing

Bob Chandra is a product and marketing specialist, having spent 17 years in high-tech. His most recent role was with Amazon.com, where he served as a senior manager responsible for North American operations for the largest marketing channel online as measured by revenue. Prior to that, he managed a team of marketers and engineers at @WalmartLabs, driving innovation in Walmart.com's product discovery experience. Earlier, Chandra joined Twitter's Growth unit where he built Twitter's first organic search marketing analytics.

Shane Luis

Multimedia & Content

Shane is an entertainment multimedia specialist and is highly skilled in search engine optimization, branding, marketing, and advertising strategies. Shane is a founding member of Screenwave Media, one of the largest YouTube MCNs in the world. He is also the creator and host of the video series Rerez, which features his encyclopedic knowledge of the gaming industry. He brings first hand knowledge of what successful video producers look for in video distribution platforms.

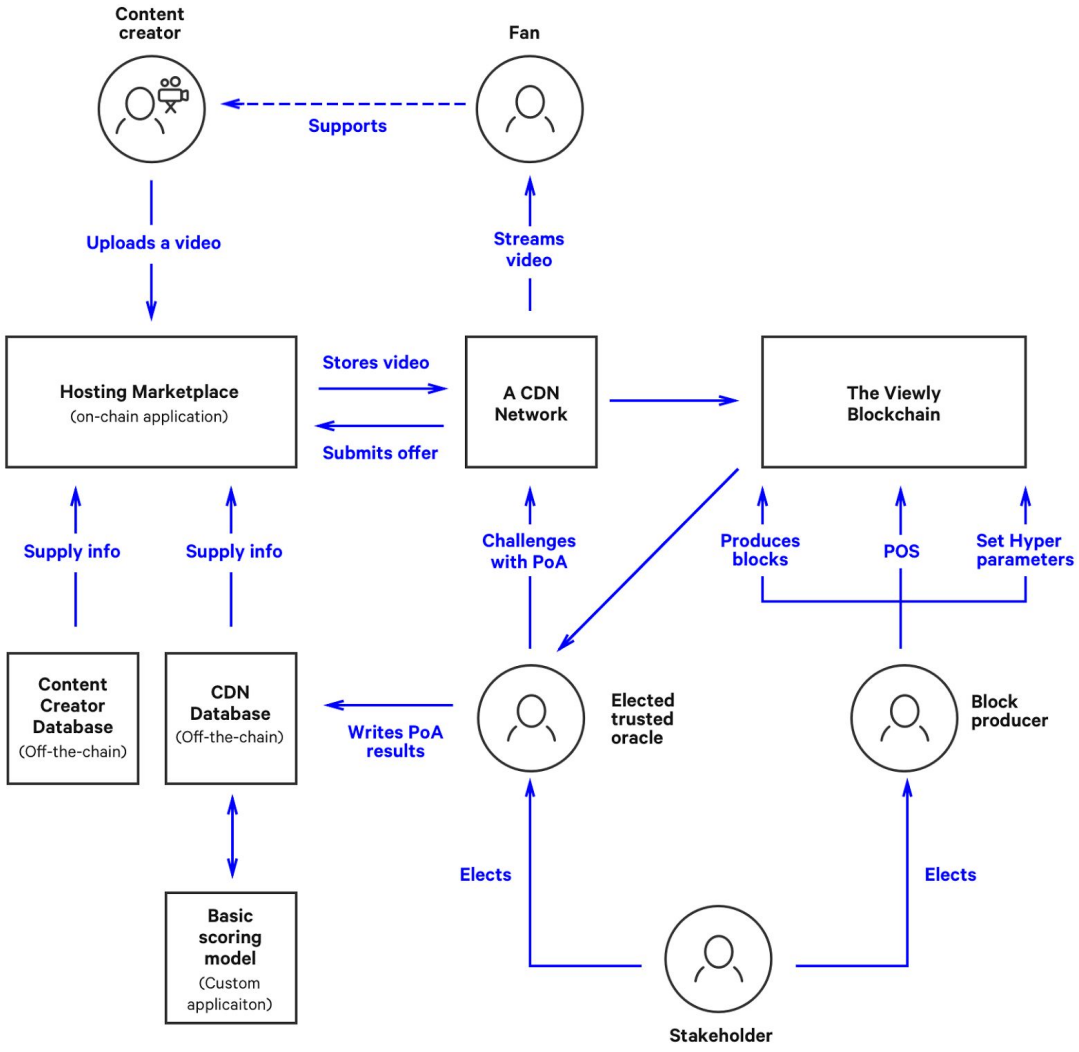
Pon Kattera

Design & Branding

Pon specializes in design, user experience, and prototyping. Formerly a Design Director at companies such as R/GA New York and Warby Parker. Pon also has a degree in Commerce and Information Technology from The Australian National University.

DECENTRALIZED STORAGE AND CONTENT DELIVERY NETWORK

The following diagram represents relationships between creators, storage/CDN providers, and governing bodies in the Viewly decentralized system.



Content creators

Content creators publishing on Viewly will be offered hosting contracts for a certain time period (e.g. one year). The price is determined by the hosting providers[1] on a basis of publicly available data and discretionary risk models.

We came to this price point after thorough research of current storage costs. We assessed a sample seven (7) minute 4k video that was stored in all the different playing formats (from low resolution to HD). Based on this analysis, we will use 2.4GB of space for one copy, which is 12 GB for five (5) distributed copies. According to current hosting prices charged by the hosting providers[2], projected retail cost of storing such video is in a scale of 1$ per year. The costs of storage will deteriorate over time due to increased market efficiency as well as being in line with Moore's law.

The price of storage will only be (1) a small proportion of earnings for popular content providers, (2) a small price to pay for storing videos with high intrinsic/emotional value and (3) too expensive for low quality content and/or spam, ultimately eliminating the surplus of unpopular and/or spam videos.

Hosting Marketplace

There will be an order book held and a real time bidding between content creators and hosting providers. Each video will be stored on at least three (3) distinct nodes to ensure the video is not lost. Each content creator will likely receive personalized offers from potential hosting providers, primarily influenced by popularity and risk profiles. To make this process easier, as well as to aid in matching the particular content creators with the optimal hosting providers, we should aggregate additional information based on usage of the Viewly app, such as viewership statistics (timing and frequency of views, average per-country aggregates) and the risk profiles (content id tags, copyright flags, and/or other disputes).

To make it easier for content creators to determine which hosting providers to trust, a reputation system is to be set in place. The reputation system is based on PoA challenges, as performed by elected oracles. These challenges ensure that at the bare minimum, the hosting

[1] Hosting providers and CDNs are used interchangeably throughout the paper and have the same meaning in the context of this paper.

[2] Popular hosting providers such as Amazon S3 and Dropbox charge between 100$ and 150$ per year for 1TB storage today (august 2017). Bandwidth not included.

provider (CDN) is capable of streaming the video in a reasonable amount of time (time challenge).

The selected host will issue a bond (e.g. 20% of the annual hosting price) as a collateral for actually storing the file. If the hosting node fails a Proof of Storage (PoS) or Proof of Availability (PoA) challenges, they will lose the bond and and the offer to host this video will re-enter the marketplace.

In the event where content is purposefully discarded, both the bond and remaining funds in the contract are burned. The hosting provider forgoes the bond for the sake of aversion of potential legal liability, and the original uploader loses the remaining funds in the hosting contract. The hosting provider also suffers a small loss in their reputation score.

Publicly available, fully transparent data

We will likely establish several distributed and open access systems to aid with (1) decision making (2) rankings and (3) user experience. These systems are off-chain for practical reasons.

The idea is that all the participants should have the best possible information at all times. This data includes, but is not limited to, results of PoA challenges, video demand statistics, copyright and content id tags and basic telemetry.

Opt-In Telemetry

Users of our app will also have an option of reporting anonymous telemetry information, primarily consisting of reports on streaming speeds and service disruptions. Since the telemetry information is recorded on the client side, it cannot be trusted, and as such is not useful for calculating the reputation score. It does however provide useful feedback in regards to the health of the network.

CDN Network

CDN network nodes will provide both storage and instant availability (bandwidth). The nodes will be constantly challenged with a set of two distinct challenges: (1) Proof of Storage- proving that they store a distinct copy of a video, as claimed, and (2) Proof of Availability-to prove that the stored video is available for streaming in acceptable time.

Proof of Storage

We introduce a cryptographic primitive Proof-of-Storage that will enable hosting node to prove to the verifier that they actually provided hosting services for a specific file in a specific time period. PoS builds on the work done by Moran & Orlov [21] and on works of Proof of Storage / Retrievability [22, 23, 24].

At this point, we would like to note that PoS is a work in progress and will need to withstand rigorous stress tests and therefore might consequently be considerably adapted in its final form.

Proof of Storage enables hosting nodes to prove to the network that it offered storage in a particular time period. In order to work, the PoS protocol assumes two phases (1) an initialization phase and (2) an execution phase, that is repeated multiple times. The protocol is designed in such a way, that the initialization phase is more costly than actually proving a hosting service.

We assume the verifier (V) and a prover (P) both have access to a random oracle (H). Just as in [21] we define the initiation and execution phase as follows.

Initialization phase. V and P receive a binary input string of length k and both produce state strings σ. The work w spent in the initialization phase should be larger than the work needed to actually provide a hosting service, to avoid rationality attack.

$$(\sigma_P, \sigma_V) \leftarrow \langle P^H(id), V^H(id) \rangle$$

Execution phase. V and P both receive their states and ids. It can run several times without repeating the initialization phase. At the end of each execution phase V produces an output which is either an acceptance or rejection.

$$(\cdot, out_V) \leftarrow \langle P^H(id,\ \sigma_P), V^H(id,\ \sigma_V) \rangle$$

Similar to [21] we define work / distinct storage tradeoff function f as the work / storage bound for the PoS proof.

As proved by Moran and Orlov [21], the protocol (P, V) is a Proof of Storage if it satisfies the properties of completeness and soundness.

Completeness. The Proof of Storage is perfectly complete if for any id and every H the following statement is true:

$$Pr\left[out_V = 1 : (\sigma_P, \sigma_V) \leftarrow \langle P^H(id), V^H(id) \rangle, (\cdot, out_V) \leftarrow \langle P^H(id, \sigma_P), V^H(id, \sigma_V) \rangle\right] = 1$$

Soundness. After Moran and Orlov [21] we define a security game with two phases and corresponding adversaries A = (A_1, A_2). They cannot communicate between themselves during the game itself or between phases.

Let each phase of the PoS n-Security Game correspond to a PoS phase as follows:

1) In the initialization A_1 chooses a set of ids {id_1, id_2… id_n} and then interacts with n independent verifiers and execute the initialization phase of PoS protocol, sending i-th verifier id_i. σ_A is the output of this phase and (σ_{V1}, σ_{V2}...σ_{Vn}) the outputs of the verifiers.

2) The adversary A_2 (id_1, id_2… id_n, σ_A) interacts with n independent verifiers executing the execution phase where i-th verifier is given (id_i, σ_A) as input. We denote a $Succ_n$ an event of adversary's success if all verifiers accept.

We define a PoS protocol as (ε,f)-sound (where s > 0 and n ≥ 1) if every adversary A = (A_1, A_2) that uses at most s storage satisfies the following conditions in the PoS security game:

1) Rational storage. Adversary spends at least ε fraction of time in the initialization phase.

$$E\left[q_{A1}^{\#}|Succ_n\right] \geq \varepsilon w n$$ [3]

2) Hosting tradeoff. Bounds of the trade-off between allocating storage resources and work.

$$E\left[q_{A2}^{\#}|Succ_n\right] \geq nf(s/n)$$

If we want to motivate honest provers to use storage rather than work, the following condition must hold true for every n ≥ 1, as in [21]:

1) The optimal strategy is storing an ε'-fraction of the honest storage.

$$s^* = arg\ min_s\ (n \cdot f(s/n) \cdot \gamma s) \geq \varepsilon' nm$$

2) Rerunning initialization is costlier than storage.

$$\varepsilon nw + nf(0) \geq \varepsilon' nm\gamma \quad \Leftrightarrow \quad \gamma \leq \frac{\varepsilon w + f(0)}{\varepsilon' m}$$

As proved by Moran and Orlov [21], the protocol satisfying these conditions, and the cost of storage unit is less than γ, the optimal strategy is to store at least ε' compared to the honest storage costs.

Optimizing CDN network topology

On the other side, CDN nodes network ensures streaming of videos all over the world. They are geographically distributed servers with high bandwidth. Although the network topology will be in the domain of CDN providers, we propose the following network topology optimization strategy.

Recent upticks in popularity of video on-demand streaming services have uncovered new challenges in how to stream high quality (large) videos to a large number of viewers and ensure sufficient quality of service while overcoming storage and bandwidth bottlenecks. There are many researchers and research groups that are tackling the problem from different angles, such as: peer-to-peer [16, 17, 19], distributed storage [13, 14, 19], statistical modeling of demand [16], efficient caching [15, 18], etc.

[3] We define $q^{\#}_{P}$ as a number of queries party P makes to an oracle H.

We are designing a P2P video streaming network with a high number of unreliable nodes having limited storage, bandwidth and availability; a set of reliable nodes that will assist when the unreliable nodes cannot meet the desired quality of service. As the demand varies, so should the data stored at each node. Research [19] has shown that the problem can be formulated as a static convex optimization problem and can be divided into three sub-problems: (1) what videos should be stored on which node, based on the demand and network capacity (2) topology of which nodes should cover which demand and (3) minimizing the need for the expensive reliable nodes. It has been shown that the problems are NP-hard [19].

As in the distributed P2P setting, we cannot affect the topology directly; we should optimize the problem with the topology as a given. We will use the optimization solution put forward by K. W. Lee et al [19]. What follows is a summary of their proposed solution of the optimization problem for the fixed overlay graph/topology.

We will allow nodes to hold fractional streams as defined below.

Given the data stream S_0 and rate x_0, $S_0(x_0)$, a fractional stream S(x) is defined as a stream, that satisfies the following conditions[4]:

1. Additivity. S(x) can be generated by $S(x_1)$ and $S(x_2)$ if $x_1 + x_2 \geq x$
2. Recovery. $S_0(x_0)$ can be generated by any S(x) if $x_1 \leq x$

Given the data stream $S_0(x_0)$, a cache can generate a fractional stream S(x) if and only if the cache stores no less than x/x_m fraction of the source file of the stream.

[4] Let x_1 denote a route rate of r.

Therefore the optimization problem can be formulated as follows[5]:

$$\max_{\substack{x\geq 0,0 \\ \leq W_{hm}\leq 1}} \sum_{u\in U} V^u(z_u)$$

Such that

$$x_{r:=(h,u)} \leq W_{hm\gamma m}{}^{6},\ A^g x \leq c^{7},\ W\beta \leq s^{8}$$

K. W. Lee et al [19] propose the problem can be solved by the three-step primal dual algorithm, that converges to the optimal solution. For the proof of the solution, see [20].

Step 1. Update the upload rate.

$$\dot{x} = \left[\delta_r(V_{x_r}(z_u) - \lambda_r - q_r)\right]^+_{x_r}$$

Where $V^u_{x_r}(z_u)$ is the derivative of function $V^u(z_u)$ over x_r. $q_r = \sum_{l:l\in r}\theta_l$ is the aggregate route price, where Θ_l is the single link price on link l, which is updated as:

$$\dot{\theta}_l = \left[\eta_l\left(\sum_{r,l\in r} x_r - c_l\right)\right]^+_{\theta_l}$$

Where δ_r and $\eta_l > 0$ are adaptation parameters.

Step 2. Update the demand index.

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[5] Let W_{hm} denote a storage of video m on cache h. Let u denote an user and U a set of users. Let $V^u(z)$ denote a function that represents the utility of user u when the perceived rate is z, and let that function be concave.

[6] The streaming rate from cache h to user u can be 0 if cache does not store the video m; otherwise the streaming rate cannot be greater than γ_m.

[7] Routing constraint

[8] Storage constraint

$$\dot{\lambda_r} = [\kappa_r(x_r - W_{hm\gamma m})]^+_{\lambda_r}$$

Where κ_r is a positive constraint that captures the relative demand (absolute demand minus supply) of video on route r.

Step 3. Update cache storage.

$$\begin{cases} \dot{W}_{hm} = [\iota_{hm}(\Lambda_{hm} - \beta_m \omega_h)]^{[0,1]}_{W_{hm}} \\ \dot{\omega}_h = \left[\nu_h \left(\sum_{m \in M} W_{hm}\beta_m - s_h\right)\right]^+_{\omega_h} \end{cases}$$

Where the Lagrangian variable ω_h is interpreted as the storage price of the storage constraint.

$$\Lambda_{hm} = \gamma_m \cdot \left(\sum_{\substack{r=(h,u):u \in U, \\ h \in N^g_u}} \lambda_r \right)$$

is the aggregate demand index and β_m the size of the video m.

We are aware of the sheer size and magnitude of what we are building compared to other projects built on the blockchain. A critical element to success will undoubtedly be engaging in an in-depth, proof-of-concept and proof-of-technology analysis to ensure the feasibility of the undertaking. The end product must be of supreme quality taking into account potential storage limitations and network capacity constraints. Our intention is to prove the feasibility and build the platform for the greater community to enjoy.

ADDITIONAL RESOURCES

We have omitted some additional concepts pertaining to the Viewly platform, however they are available on our blog.

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1. Towards server-less architecture with IPFS and WebAssembly[9]
2. Preventing Name-Squatting with Transient Names[10]

[9] https://blog.view.ly/post/client-side-encoding

[10] https://blog.view.ly/post/onboarding-millions-of-users

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