



The title of my talk is Sunny Days Tech, Rainy Days Law. You might be asking what does that mean, and why is there a jellyfish... The jellyfish is there because I've been recently fascinated by jellyfish, they kind of look like AI, so I like to infuse my slides with jellyfish these days. But the main point of my talk is about tech and law and how they work.



Recent past & near future... More jellyfish.

# Shared planetary network (Internet), document (Web)



If you look at the last several decades, we've seen people attack revolution. We've seen the Internet be created, from the rise of the ARPANET of the US military, but then Vint Cerf and Bob Kahn connect these networks that were talking to each other, and they created the network of networks, TCP/IP, that is the Internet, and that was the foundational infrastructure from which we built the World Wide Web a couple of decades later. The World Wide Web itself is 25 years old. One researcher in CERN, Tim Berners-Lee, came up with the idea, hacked it together in the space of a year and a half, and now that has fundamentally transformed society, and these are just a couple of examples of evolution towards this substrate for civilisation. We have a shared planetary network, the Internet, and that is public utility for the planet, and on top of that this shared planetary document, that is the World Wide Web. It's kind of cool, you can frame it as one big document, hypertext and links and all that, but that was just the start. What we're seeing now is some innovations that build on top of this as new public infrastructure for the planet.

# Shared planetary e-gold: Bitcoin



We have a shared planetary e-gold – or currency, depending on how you want to frame it – that is Bitcoin. It's been with us for 10 years already, and it has sparked a new evolution or revolution.

## Shared planetary database, file system, processing, and data



That inspired several other projects, and from a competition standpoint we've got other pieces of computational substrate emerging. They include databases like IPDB, something that I spent time on, file systems like IPFS, processing/ smart contracts, things like Ethereum, and another initiative I'm working on is shared planetary data, and this is a project called Ocean that I'm spending time on as well.

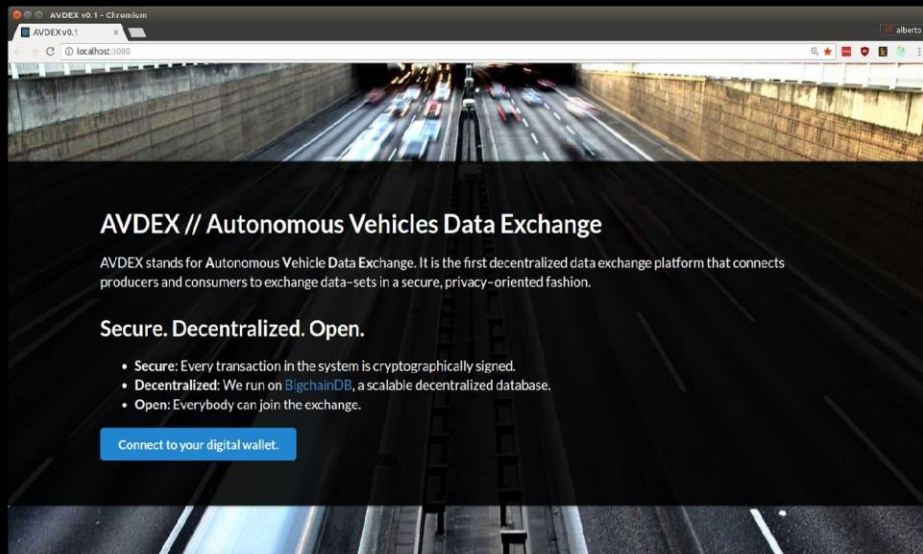




## **Tokenize the enterprise, for benefit of community**

Once again, that's infrastructure, but this is actually going to be leading to pretty big ramifications for society. One of them is a lot of institutions we have right now are large organisations, enterprises. They exist simply because the cost of communication makes it worth it to be like that, this is the enterprise. However, enterprises are beholden to shareholders; they are not beholden to the communities around them so much. This is why Facebook makes a lot of money off of the backs of its users, or Google or credit card companies, etc., so often the interests of the users aren't necessarily aligned with that of the corporation itself, there's a disparity between the goals of the shareholders and the goals of the community. The cool thing is we can actually improve this, we can improve this by aligning interests financially, have tokens that the shareholders as well as the community have, and then they're all going in the same direction. That's one example of a possible future where enterprises themselves start to melt into the community – tokenise the enterprise.

# Self-driving cars: fewer accidents, more mobility



But there's other things too, we're seeing self-driving cars emerging, and this is a really good thing for society as well. We have fewer accidents, therefore fewer deaths, more mobility for people as well, so self-driving cars can be very helpful.





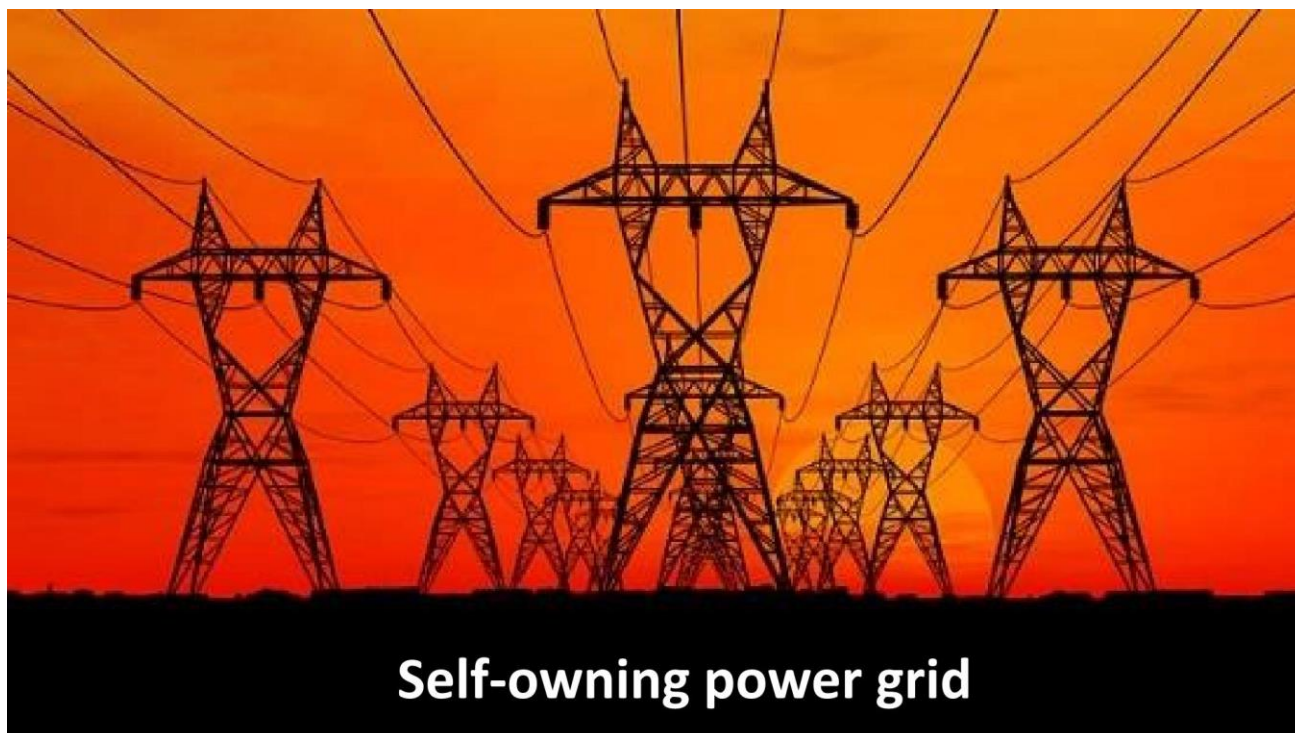
## Self-driving, self-owning cars

And why stop at self-driving? Why not make these cars self-owning as well? If you're Uber and you're doing the self-driving tech, you plan to buy \$100 million worth of cars to roll out your self-driving car fleet. Wouldn't it be much more capital efficient if you let those cars own themselves? And we're seeing this possibility, there are laws being changed right now to make this much easier. Imagine you create an AI that actually has rights, similar to a corporation. We could have self-driving, self-owning cars, and it can be extremely beneficial to society as well.



## Fleets of self-owning cars = car swarms

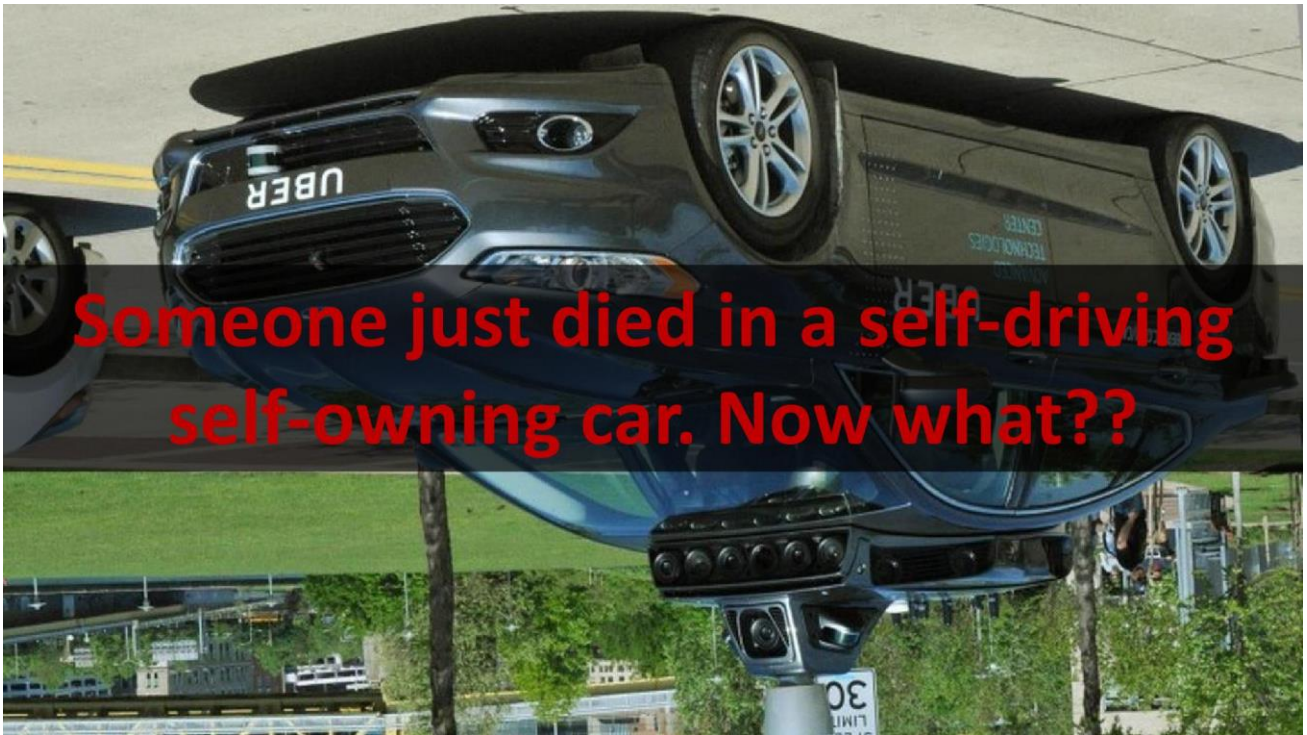
Of course then we can have fleets of these together, a whole bunch of self-driving, self-owning cars.



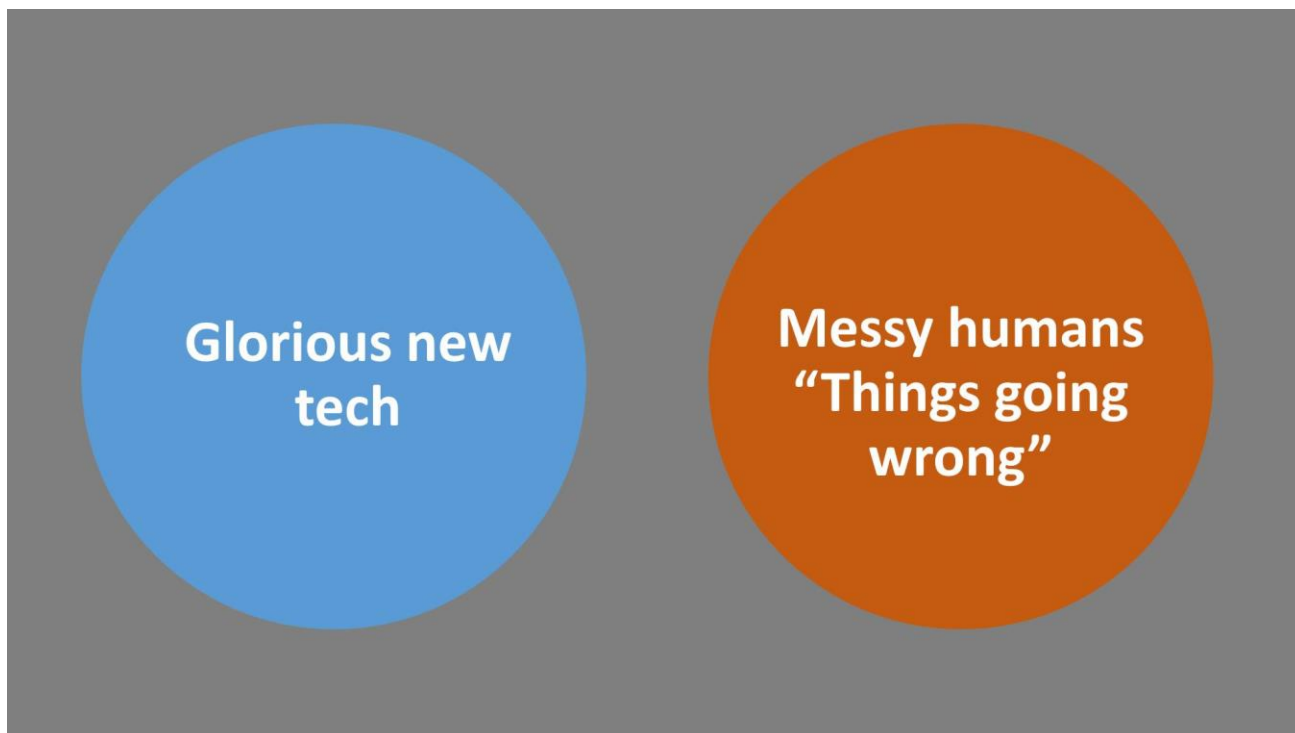
## Self-owning power grid

And it's not just cars; we can have the same thing for power grids and for other public utilities. Imagine that all of the things out there, as time goes on, bit by bit, public utility administered by some government somewhere actually starts to get owned and controlled by the community collectively. This is a possible future where in the end it's actually a big boost to society. That's laying the groundwork where we could be headed. We have tokenised ecosystems that become the new utilities. We have a glorious future, but it's not necessarily so glorious.

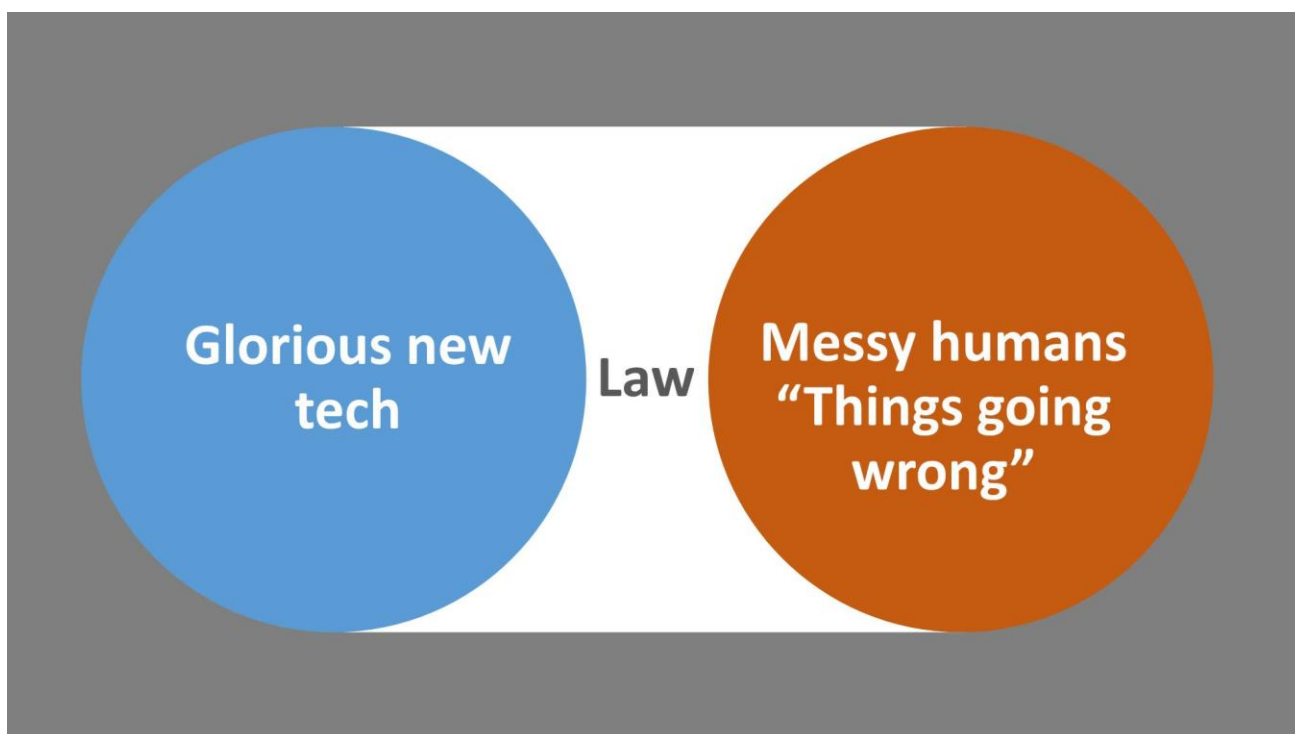




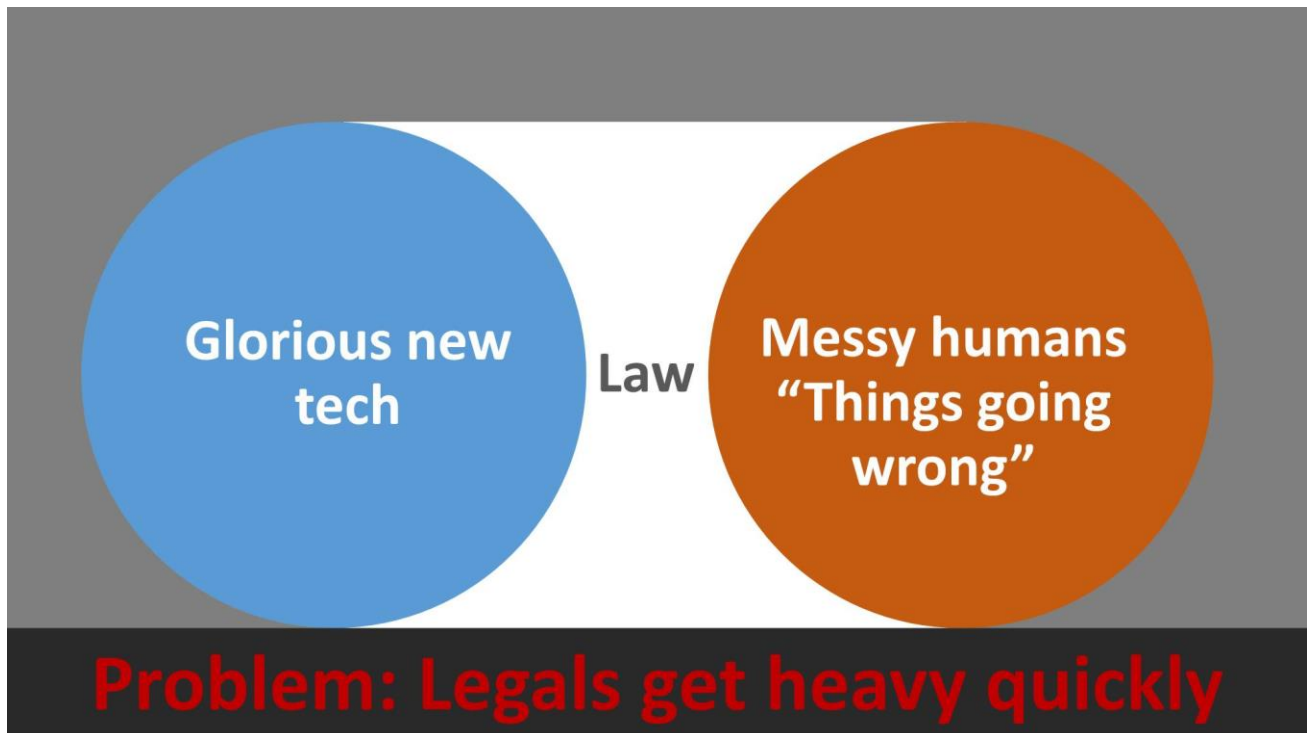
For example, what if you have a self-driving, self-owning car that crashes and kills someone. Who is responsible? The owner? Wait a minute, that's the car. The car manufacturer? They'll be like, "No, no, no..." The person who designed it? Maybe, maybe not. What are the ways to approach this? Part of the answer is the law.



The law can actually start to address what happens when things go wrong. You have this glorious new tech, this glorious new future that many of us are trying to build and aim towards. But at the same time, we've got messy humans, as Michael was referring to. There is possibilities for arbitration in all this too, but things to go wrong and you can't codify it all; ambiguity exists and we need to address it.



This is where law can help a lot. There has been a lot of language over the years that actually deals with ambiguity. For example, in contract law there is this idea that if someone did something reasonable, but "reasonable" is actually a fuzzy term that the judges themselves interpret, and there are lots of examples in this, the law is vague on purpose a lot of the time.



But there's a big problem with legals as well: how do we implement it in one of these systems? But not only that, the law itself gets very heavy. If you're a smart contract developer making some code, are you going to spend the time to go hire some lawyers and plug this all in and stuff? I'll show later how we did, but it was actually very, very heavy.

But not only that, if you make it where the default is the law upfront, that could cause problems too, and we have examples like this in society right now. For example, if you go online and go to some BitTorrent site and download a movie, you'll be getting a letter in the mail two months from now from lawyers, so it's actually insanely easy to trigger an avalanche of lawyers at your doorstep. That's really a problem, and if you think about it, it's kind of unreasonable. Imagine you go to a grocery store and you want to buy an apple, and you go to the checkout and you notice there's no checkout, so you just walk outside and suddenly this 400-pound security guard tackles you and said, "That will be \$500 please, because you just broke the law."

The example of BitTorrent and the example of the supermarket, those are examples where it is bad defaults. The supermarket thing sounds unreasonable, and it is, but this is exactly what we have on the Internet today. We have defaults that default directly to the law, and it causes trouble with usability of what we're trying to do. But the challenge is that it's hard to incorporate legals and tech. What I'm going to do now is talk about a couple of examples where legals and tech are incorporated, leveraging things like smart contracts. Done well, I think this is where we can have a glorious future, if we want, that reconciles the messy humans that we are.



**A guideline for designing decentralized &  
tokenized ecosystems:**  
**Sunny days tech**  
**rainy days law**

So, the overall principle is sunny days tech, rainy days law. If you're designing a tokenised ecosystem, or even just a simple decentralised ecosystem, this is the frame that I've realised makes a lot of sense.

**A guideline for designing decentralized & tokenized ecosystems:**

**Sunny days tech**  
**rainy days law**

**That is:**

**Constrain & bias to good behavior by default,**  
**via tech: ux, incentives/crypto, ai**  
**Use legal recourse as last resort**

This means that you want to constrain and bias to good behaviour by default using tech. You can use user experience design, you can use incentives and crypto or you can use AI, but the overall thing you want to do is the default behaviour gets addressed by technology. But when things get messy, that's when you have recourse to legals. So rather than one BitTorrent download getting this avalanche of lawyers, it's actually difficult to accidentally trigger that avalanche of lawyers; instead, you're compensating the creators upfront and so on. If you actually have good defaults, it will make a big difference. I'm going to give a couple of examples shortly, but the core principle is sunny days tech, rainy days law.

**Example:**  
**decentralized IP**  
**(ascribe)**

I'll give two examples from two of my projects: ascribe, which is why I started on this blockchain journey almost five years ago, and I'll talk about Ocean.

ascribe is a fundamentally new way to lock in attribution, securely share and trace where your digital work spreads.

ascribe is decentralised technology. It's not tokenised; it's decentralised. The problem that we arrived at was if you are a creator of digital art, it's really, really hard to make a living. Why? Because collectors of digital art don't really know how to pay for it. For example, how do I own an animated .gif? It turns out that there are actually legals, copyright law, but the art world and the gallery world doesn't administer them, or if they do, they have to spend \$5,000-10,000 for a legal project for that.

What we set out to do with ascribe was saying imagine if you could own digital art the way that you owned Bitcoin, that was the fundamental idea, which means you own a piece of digital art if you have the private key to it. It's backed by legals of course, and that's key, but the first cut, the sunny day tech side, is actually the blockchain side. We built ascribe, we rolled it out in early 2015, it's used by more than 15,000 people, including many of the top digital artists of the world. We've had the National Museum of Singapore, and others, so we're very proud of what with ascribe. It doesn't have 100,000 or a million users, but it was never designed for that; it was designed for professional digital artists working with galleries.



Register a new piece

https://www.ascribe.io/app/register\_piece

ascribe®

+ NEW WORK COLLECTION TRENT

### Register your work

Your Work

Drag file here  
or  
choose a file to upload

Artist Name  
(e.g. Andy Warhol)

Title  
(e.g. 32 Campbell's Soup Cans)

Year Created  
(e.g. 1962)

☐ Specify editions

Register work

Sunny day tech:  
Simple UX

One of our users, a well-known Dutch digital artist, signed up, got the username/password, the UX is easy, and then he simply drags & drops the file where it says "Drag file here". Then he types in his name as the artist, the name of the title, the year he created that work, and then he specifies the number of limited editions he wants. In the art world it's very key to have limited editions, because then you have this idea of scarcity. Just like we have scarcity of Bitcoins, you can have scarcity of pieces of a digital art, and the scarcity actually comes down to licensing. You can make all the copies you want, but it comes down to what rights you have to use that work in different places. So here's the sunny day tech, a simple UX to claim your copyright and to register your work.

.zip

[Share](#) [Tweet](#) [Download .zip](#)

Sunny day tech:  
Simple UX

## Event Listeners

CREATED BY Harm van den Dorpel  
DATE 2015

EDITION 24 of 100  
ID 1CbB2YEnBQUkHjWZvqfNNfjK8wh2cg69zQ  
OWNER Masha McConaghy  
ACTIONS

[EMAIL](#) [TRANSFER](#) [CONSIGN](#) [LOAN](#) [DELETE](#) ⓘ

+ Certificate of Authenticity

- Provenance/Ownership History

Apr. 17, 2015, 16:15:21  
Registered by mail@harmvandendorpel.com  
Apr. 20, 2015, 20:54:16  
Transferred to Masha McConaghy

+ Consignment History

+ Notes

Once he has registered, he can do other things like transfer it to others, and when he's transferring an edition to someone else, he's actually bequeathing some of those rights from himself to the next person so that they can resell. All these actions are linked to contracts, but they are also linked directly to blockchain, in this case we had built it on Bitcoin, we actually developed the protocol for IP that sat right on top of the Bitcoin blockchain. Once again, this sunny day tech with a simple UX is a key thing. So as a user, as a digital artist or a collector of digital art, you're just using this website; under the hood it has very good defaults for legal protection legally and leveraging blockchain as well.

## Rainy day law: Terms of service in Ricardian contract

contract unless you object to the inclusion via a-viz ascribe in writing with amendment. In case of such objection, ascribe has the right to extraordinary

3. ASCRIBE DEFINITIONS

You can access the ascribe service through our website [www.ascribe.io](http://www.ascribe.io).

3.1 WORK

"Works" are all physical, digital, or intellectual items, objects, or other properties or services that can be taxed digitally (e.g. 3D-Still files, photos, stocks, physical property, texts, music, videos, licenses).

3.2 EDITION

"Edition" is a digital copy of a Work that can be bought and sold on ascribe. Editions can be thought of as digital property, and can be used in the same way a physical Work could be used (e.g. displayed in private or in public, with or without admission being charged, rented for a fee, loaned, sold, etc.).

3.3 OWNERSHIP TRANSACTIONS

"Ownership transactions" are all actions pertaining to the ownership of, rights in, or license to a Work or Edition of a Work. These include, but are not exclusive to, registering the Work, assigning and un-assigning representation, and transferring editions of the Work.

3.4 THE SPOOL

The "SPOOL" is a **Secure, Public, Online Ownership Ledger**, which is used to record ownership transactions. When a Work is registered with ascribe, pseudonymous information pertaining to the user and the Work are recorded on the SPOOL, as well as other data related to the user and the Work, and transactions related to the Work. More information about the SPOOL can be found in the Registration of Works section and the Technical Overview page.

3.5 SELLER AND BUYER

These Terms use the terms Seller and Buyer as a generalization referring to the two parties needed as a minimum to close a contract (e.g. to rent or to transfer an Edition).

3.6 LIABILITY

Here's the legal side. Remember, there's the sunny day tech, so you as the user are using a simple UX, but under the hood you've got the legals to protect you in case things go wrong, in case you need to arbitrate. Here is the terms of service, so when you sign up to ascribe you sign the terms of service, and within that there's some key legals. We hired a lawyer full-time to work this out, so it actually works across more than 100 jurisdictions, leveraging a combination of copyright laws and contract law, which actually happens to be quite general. We have definitions of what it means to have a digital work, definitions for what it means to claim copyright, etc., and all of this is linked with the blockchain via a Ricardian contract. This is a very, very cool invention, very simple at the core, invented by Ian... I'm sure everyone today is going to reference Ian, so I'll do my part and reference Ian – thank you Ian!

The idea is with Ricardian contract you have a legal contract on one side that actually people say yes to, they sign it, etc., and then you have the code, they are linked by the hash, so you take the hash of the legal contract and you put that into the code and that goes under the blockchain, and that's a way of tying together these two things. You have this proof that you said yes to this contract, and this proof is stored on a blockchain in an immutable fashion, and this is a very clean way of linking the legals with the code. Mattereum I like to think of in some ways as Ricardian contract in a box; there's more to it than that, but it's a nice way of thinking about it. So for ascribe we have this Ricardian contract developed by a lawyer, and it's just in case things go wrong, in case there is need for arbitration.



## Certificate Of Authenticity

As of 30 November 2015, 17:36:00 GMT, Masha (Maria) McConaghy is the owner.  
To verify current owner, please visit <http://ascr.be/1luACpo>



DOLLAR  
EURO  
SWISS FRANCES  
JEFF KOONS  
BITCOIN

### Currency

Date: 2014  
Edition: 3 of 100  
Created by: Dan Perjovschi  
Owner: maria.mcconaghy@yahoo.com

### ARTWORK DETAILS

Artwork ID: 17u2BwSblG8y3vR8WwZfSPMjFVNctkG2  
File: currency-2014.jpg (499 KB)

### PROVENANCE/OWNERSHIP HISTORY

Apr. 30, 2015, 12:36:19 - Registered by mail@cointemporary.com  
May. 01, 2015, 09:46:08 - Transferred to admin  
May. 08, 2015, 13:04:59 - Transferred to trent  
Nov. 27, 2015, 19:35:14 - Transferred to maria.mcconaghy@yahoo.com

### CRYPTOGRAPHIC STAMP

Use the summary and signature below to authenticate this certificate:  
<http://ascr.be/15ra45G>

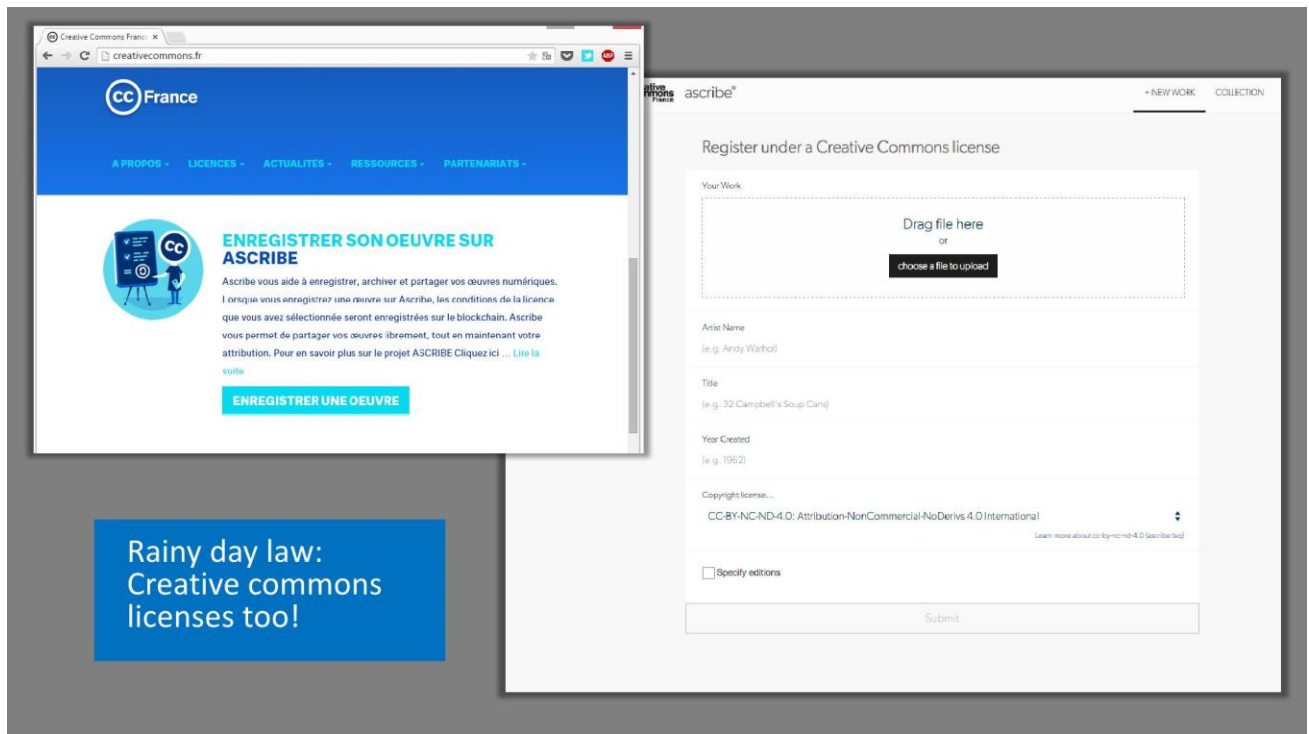
Summary: DanPerjovschi\*Currency\*3/100\*2014\*2015Apr30-12:36:19

Signature: 438824C608182FA3A828C285F867003F873F38CC0F73FD8A6  
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CA8EF6869BF8A991668A820F3F803A48C6A9ED5834716F6500  
6818E07E5266620BA815946DC2E5605023FAF016C346ACD48C  
9C75F0BDD0DEBD7AF55E4C80858940A44583F135C88399121824  
ED1L

Authenticated by ascribe®

Rainy day law:  
Blockchain-backed,  
digitally signed COA

Also, the art gallery owners and the collectors have Certificates of Authenticity, COA. At first they were traditional ones, they were like a proof that you owned this things. Of course they were very easy to tamper with, but we're in this digital era and we have good crypto, so we can create these documents that if you tamper with one single letter, then others can discover that you tampered with it. It looks pretty, it's useable by the galleries, but it actually has this very, very strong crypto element to it and is backed by contract law.



And you don't have to have just ownership; you can also bequeath the rights to others. We have very specific support for Creative Commons, and about 25% of the users actually use the Creative Commons licenses, and we work closely with Creative Commons on that.

## **Example: decentralized & tokenized IP (Ocean)**



That would be an example for a decentralised ecosystem, where it's tying together the blockchain, the easy UX, with the legals, sunny day tech with the rainy day legals. It might be decentralised, meaning no single entity owns or controls it, but you don't necessarily have native tokens to help run the infrastructure; instead, it might be just a federation of entities that have an intrinsic interest. But if you want you can go to a tokenised, where you have miners or keepers who maybe earn more if they run these nodes, and this is where we have things like Bitcoin and Ethereum, these public nodes.

I've been working on a project called Ocean, which is a protocol for decentralised data, and it is not only decentralised but it is also tokenised, so it has tokens to incentivise people to run the network collectively. You can bring legals in here too.



## Status quo



**Silo** Mo' Data  
(and mo' compute)



Mo' accuracy



Mo' \$

Some background about what Ocean is. You've probably seen and heard about the idea that data is the new oil. Oil was a lot of the currency of the 20th century, but in this 21st century we all live on the Internet and data is what flows, and if you can harness value from the data, then you can make money, you can make a business, so society runs on data. The challenge is to extract value from the data, you need to have really great AI, that's the best way to extract value: the more data, the more value. But there's only a handful of companies in the world that actually have deep access to the data and deep access to AI expertise to make this happen, and they have become some of the most valuable companies on the planet: Google, Facebook, Amazon, etc. They're incentivised to get these massive data silos and control them, from that they data mine with AI to get more accurate models, and from that they sell more ads or sell more products, and then it's a loop. This is what is happening right now. If you think about it though, if society is running on data, then we have a few very large organisations that treat data as their new mode, then that is actually risk to society and democracy itself.

*Change the status quo?*



~~Silo~~ *Pool* Mo' Data  
(and mo' compute)

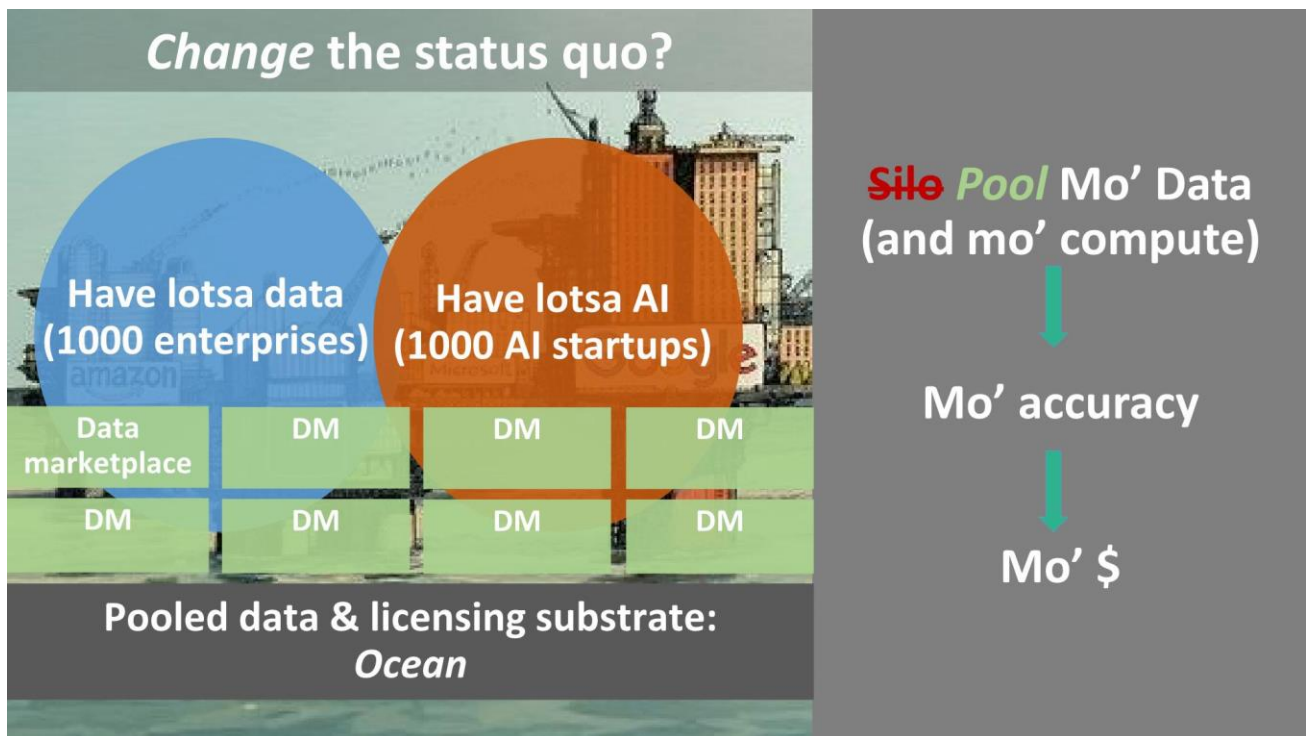


Mo' accuracy

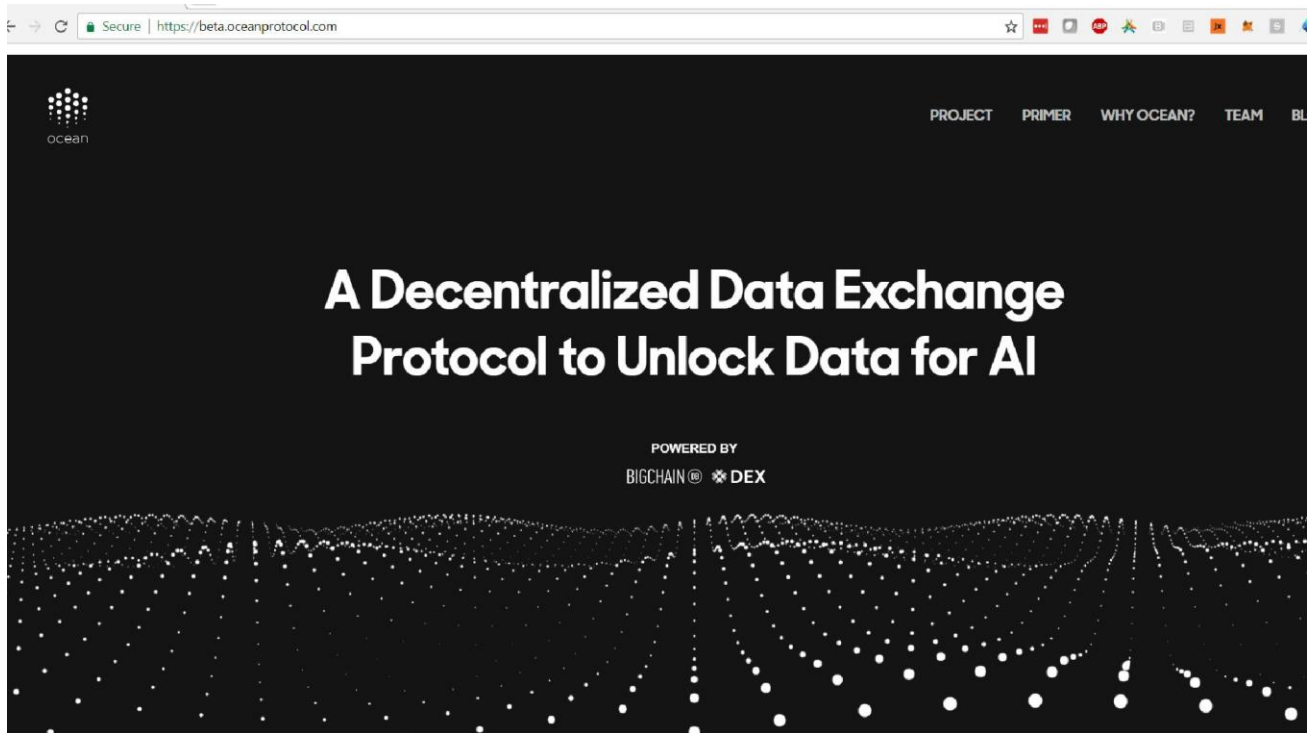


Mo' \$

What can we do about that? We can pool the data and make it much more accessible to the world at large. Of course that's all very kumbaya-sounding, but how do we make it work for businesses or enterprises who have a lot of data?



What you do is you connect the enterprises that have lots of data but don't have a lot of AI expertise with the AI startups who have AI expertise, you can connect them via data marketplaces. So you have a whole bunch of data marketplaces, not just one but eight, 8,000, 100,000; just like we have Sabre for airline, we want to have a Sabre for data. Sabre is this database for airline flights, where you can go to websites like Kayak or Trivago and buy flights, and they all tie into the same underlying database that's a combination of Sabre and Amadeus. Imagine if we had the same thing for data itself. This is actually what we're trying to do with Ocean, where you as the user or owner of the data maintain control of that data. So the idea is to pool the data in a financially proper way so that everyone can have equal access to the data, equal opportunity.



That's what Ocean is, a protocol to unlock data for AI via decentralised data exchange.



**AVDEX // Autonomous Vehicles Data Exchange**

AVDEX stands for Autonomous Vehicle Data Exchange. It is a platform for producers and consumers to exchange data-sets in a secure, decentralized, and open manner.

**Secure. Decentralized. Open.**

- **Secure:** Every transaction in the system is cryptographically signed.
- **Decentralized:** We run on **BigchainDB**, a scalable decentralized database.
- **Open:** Everybody can join the exchange.

[Connect to your digital wallet.](#)

**BigchainDB**

Welcome back, BigchainDB Home Create offer My Offers (2) Search Offers Logout

7KaKEt27h55wDfPMZmdzQo28BSGJ/CJK3dJR8kLUMankE  
<https://www.bigchaindb.com/>

**CH2\_002**

\$1500 4.4 GB transaction

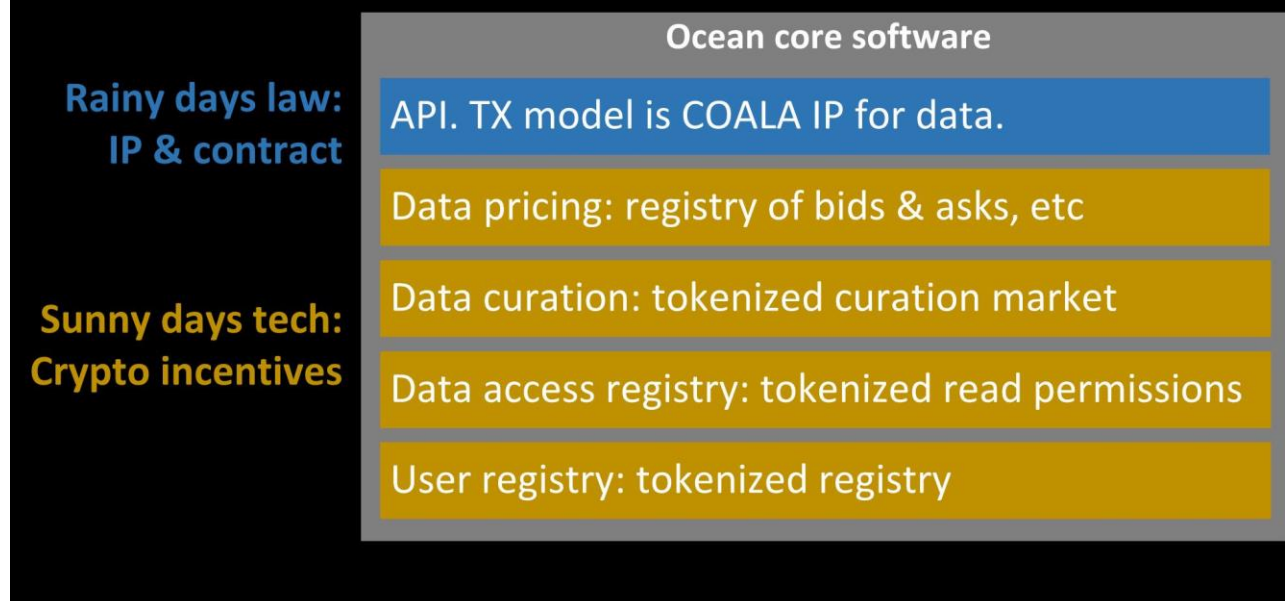
Date	Lighting	Conditions	Duration	Compressed Size	Direct Download	Torrent	MD5
11/18/2016	Daytime/Shadows	---	---	4.4GB	None	None	---

- HMB\_1: 221 seconds, direct sunlight, many lighting changes. Good turns in beginning, discontinuous shoulder lines, ends in lane merge, divided highway
- HMB\_2: 751 seconds, two lane road, shadows are prevalent, traffic signal (green), very tight turns where center camera can't see much of the road, direct sunlight, fast elevation changes leading to steep gains/losses over summit. Turns into divided highway around 250s, quickly returns to 2 lanes
- HMB\_4: 99 seconds, divided highway segment of return trip over the summit
- HMB\_5: 212 seconds, guardrail and two lane road, shadows in beginning may make training difficult, mostly normalizes towards the end
- HMB\_6: 371 seconds, divided multi-lane highway with a fair amount of traffic

[View >](#)

We've been working with Toyota on self-driving car data, and this is actually a very cool problem: what Toyota and other automakers have realised is they have the AI algorithms already, they're pretty good, but their accuracy is one crash every 10,000 miles. But that's not accurate enough, because then you still have lots and lots of people dying; you need to have one crash in a billion, you need to get way past the accuracy that humans have. You could try to have fancier and fancier algorithms, but it's actually hard, it takes years and years and years to get there. What Toyota and others have found is it's too expensive for them to gather this on their own. What if they could collectively join their data, they could pool their data and collectively build better AIs for driving their cars? This is actually a win for humanity, because you have better self-driving cars, you can roll it out, and then there's fewer accidents. We've built a prototype of that for Toyota.

# Inside Ocean Core Software



That has led to Ocean. *This* is a stack of the core software, think of it like a Bitcoin miner. There are a bunch of blocks inside for the sunny day tech, this is the crypto incentives, and there's one core block that is the rainy day laws. In the sunny days tech there's things the user registry, this is a tokenised registry, and I really liked when Michael talked about the clubs in shipping, where they have these organisations that collectively staked their value and arbitrated together. It turns out that in the world of blockchain something has emerged as a building block that is incredibly useful, the adChain folks have created a thing called tokenised registry. It's a list of whitelisted actors, where these whitelisted actors collectively stake each other, and they will only let others in if they see that they are good actors. You can use this to prevent civil attacks, etc., but it's incentives to act well without resorting to the law, just like these clubs that Michael described, there's incentives to act well without resorting to the law. On top of that, you also want to have good incentives around good data, so we have a curation market. Then at the very top you want to follow a protocol that links to the law, and the protocol that we use is something called COALA IP, which at the core links to the legals. So overall, Ocean has very strong incentives leveraging crypto, crypto incentives, tokens, to act well, act well as actors and to have good data, etc., but at the very, very top as a last recourse you have the legals.

## Sunny days tech: Tokenized write permissions Via role based access control (RBAC)



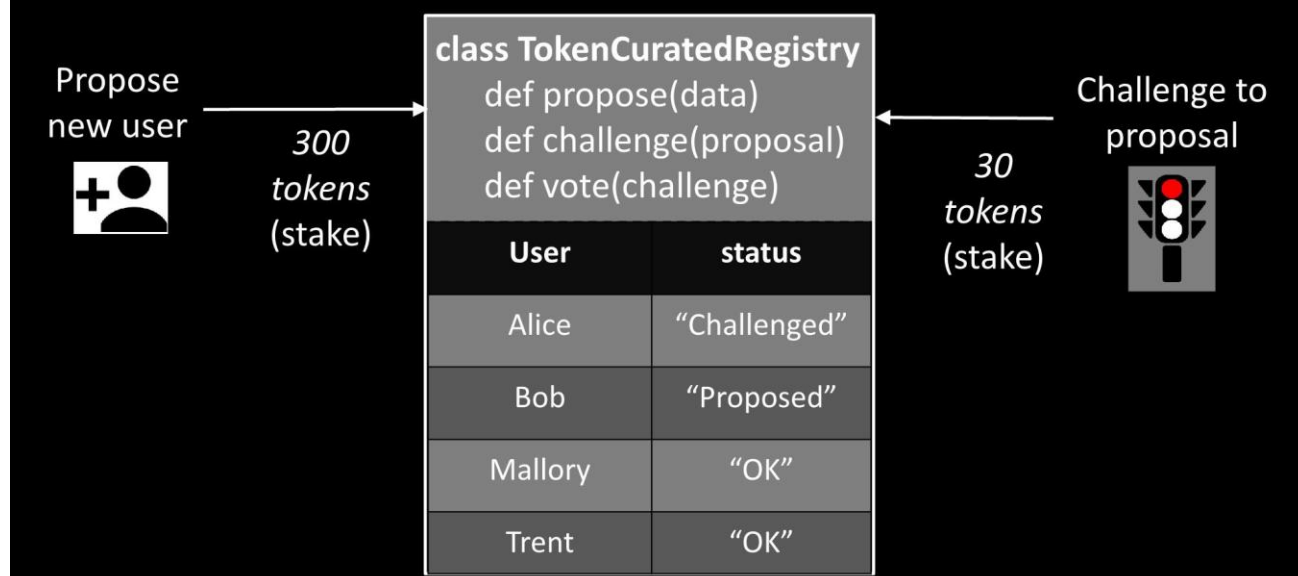
```
{  
  "asset": {  
    "ns": "ipdb.testapp.vehicle",  
    "link": "<hash>"  
  },  
  "id": "<hash>"  
}
```

Image Source: [Pixabay](https://pixabay.com/), CC0 license

To give you a feel, one of the building blocks is tokenised write permissions. In order to write for this, you need to be able to access with keys and so on. We have a building block that we've developed called RBAC, role based access control. I won't go into the details, but it's an example of a building block leveraging crypto and the right usage of keys to make it possible to write the data. We have other protocols as well.

## Sunny days tech: tokenized actors registry

A whitelist of good actors, incentivized to grow the list



I talked about these tokenised actors registries, this is a really important building block for crypto: it's a whitelist of good actors, they're incentivised to grow the list, but maintaining the high-quality actors. In this case someone can propose to join, and then the existing whitelisted folks, if any of them don't like the idea of this new actor joining, they can stake against them. There's a 28-day arbitration period, people can vote against this, and at the end if the person gets in then they don't lose their stake and the challenger loses their stake, but if they do get in the the opposite happens. It's a very nice mechanism for growing a whitelist, it's one of these clubs.



## Rainy Days Law: COALA IP

- A licensing framework for digital assets that:
  - Is easily approachable by all participants (*devs, rights holders, copyright societies, ...*)
  - Is easily extensible and future-proof
  - Guarantees immutability and tamper-resistance
  - Is blockchain-agnostic
  - Is free (free as in FOSS) for everyone to participate and use

That was the sunny day tech side of Ocean. *Here's* the rainy day law, and this comes down to COALA IP. We developed COALA IP with about 10 other organisations in the blockchain space, in ascribe we developed legals around claiming copyright and transferring some rights, but people started asking: what about multiple owners, fractional ownership? What about transferring rights to just one jurisdiction? We've realised that there's a rabbit hole there of challenges and complexities. So we looked around and asked, "What has been done elsewhere?" It turns out that there's been a lot of great work done for protocols for IP over the years, like DDEX for music, PLUS for photography, and that's all been generalised into something called LCC, which was actually partly developed here at Digital Catapult. LCC is a very nice protocol but wasn't blockchain-ready, so we used LCC and some other crypto building blocks and designed a protocol called COALA IP. COALA IP is a protocol for blockchain technology when you want to claim copyright and bequeath some rights to others, and it handles dispute resolution, it's basically a claim submission, and it's independent of blockchains, etc.

## Rainy Days Law: COALA IP Building blocks

- **LCC framework - concise and applicable**
  - Generalizes DDEX (music), PLUS (photos), more
  - By Copyright Hub with 90 partner orgs
- **Linked Data, it's easily extensible**
  - JSON-LD: URI-linking of JSON objects
- **IPLD**, for cryptographically verifiable integrity
  - Via Merkle-linking of JSON objects
- **Interledger Protocol**, allows IP to live on many ledgers
  - Linking of ordered transactions on blockchains

I talked about the LCC framework which has some its roots in copyright law. The other building blocks of COALA IP are linked data. There's been this long-standing agreement on the Web, where you can actually have the semantic Web on top, but it never took off in a big way. You start with JSON, which is a way of specifying a data structure for modern Web protocols, and then you can add this linked data angle that allows you to have one object linking to another. Then you can have claims on that too, you can say, "I see that this artist claims to have created that work. I claim that they're wrong," and all of those can be digitally signed, so you can claims on claims on claims, claims all the way down. That's actually incredibly valuable when it comes to the rainy day legal side: when you have a dispute, you want to see what things are made when and where, and COALA IP lays it out very specifically. The COALA IP protocol is designed to turn these things into direct contracts, we are seeing this already. DDEX and PLUS, these specifications have software that directly plants into template contracts. You have a contract, you can automatically fill in those parameters using software. So this is an off-the-shelf things, there are several companies using COALA IP now, and we're pretty excited about it. There's also IPLD and interledger, and those help with interoperability on blockchain.

## COALA IP: Creation (a *digital* Manifestation)

```
{
"@type": { "/" : "<hash pointing to RDF-Schema of Manifestn>" },
"name": "The Fellowship of the Ring",
"creation": { "/" : "<hash pointing to the Creation>" },
"digital_work": { "/" : "<hash pointing to file on eg IPFS>" },
"fingerprints": [
  "Qmbs2DxMBraF3U8F7vLAarGmZaSFry3vVY5zytuN3BxwaY",
  "<multihash/multifingerprint value>"
],
"locationCreated": "<URI pointing to a Place object>"
}
```

There's details, this is an example of creation, where you are claiming copyright. For example, you have the name of the work, you point to the creation itself, and you have the digital work and the fingerprints. The fingerprint is a key thing, because this points out that that it has been digitally signed, so there's a claim being made and it has been digitally signed. This is an example of this protocol, and it's very simple. It's interesting that most of the protocols being rolled out today are attached to a token, but they don't need to be. TCP/IP, the protocols on that don't have tokens. So you can still create protocols today that don't have tokens, and COALA IP is a wonderful example of that.



## Conclusion

**New tokenized ecosystems might change much of society.  
But humans are messy.**

**A guide:**

**Sunny days tech – tech bias to good behavior**

**Rainy days law – legal recourse if needed**

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To conclude, we have these new decentralised and/or tokenised ecosystems emerging, and they hold a lot of promise to change society, everything from the near-term goals of a database for the planet, Bitcoin and beyond, where we can have swarms of self-driving cars to increase mobility for all humans. But there's a challenge, and the challenge is that we as humans are messy: we crash into each other, we have disputes and so on. How do we handle that? Software is good at handling the very precise things, but what about the messy stuff? How we see things is a simple rule of thumb: use technology for the sunny days, and have legal recourse for the rainy days. Use technology to bias good behaviour: good UX, incentives with crypto, crypto constraints itself, even AI, and then legal recourse when needed. So make sure that when you're deploying these decentralised or tokenised ecosystems, that they link to the Ricardian contracts, that they have the well-specified ways of handling this, so that when you do have the messy disputes, the legal framework is there. This is where Mattereum comes in very nicely, you get this Ricardian contract in a box, and we're very excited with that, because we see that we won't have to build those pieces as we go forward; we'll just plug in. I will wrap it up with that – thank you!