

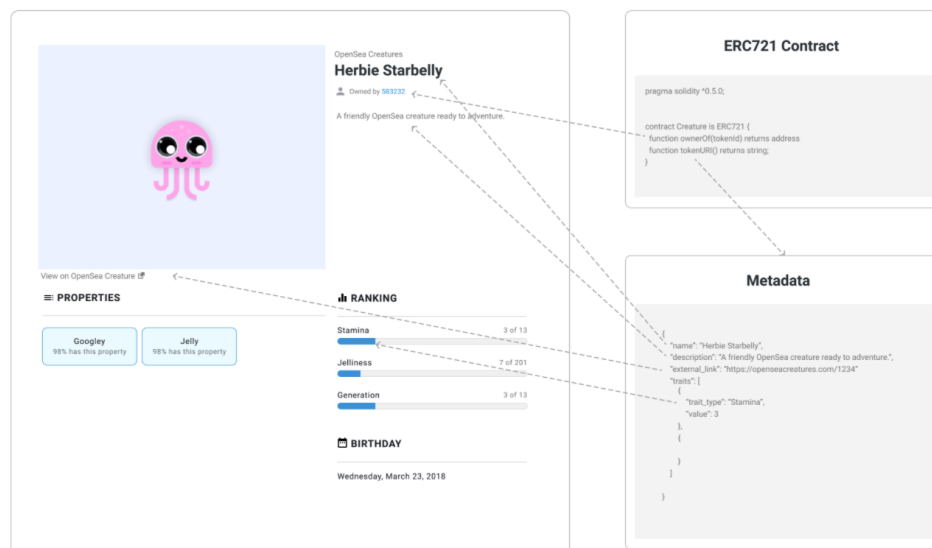
Arweave, or how to store your NFTs right

Verba volant, scripta manent

So you finally caved in and bought that cutesy non-fungible token (NFT) all your friends keep bringing up.¹ You are now in possession of an inalterable, timeless piece of art that will be part of your legacy for generations to come. That's the idea, isn't it? Not so fast, cowboy.

You see, that NFT could disappear in the blink of an eye; and with it, your dreams of dynastic wealth.

Most NFTs on Ethereum –and any other chain based on the Ethereum Virtual Machine or EVM (Avalanche, Binance Smart Chain, Polygon, etc)– follow the ERC721 token contract. This contract tells us who owns a unique token; who created it; and most importantly to NFT collectors, a description of the data of the NFT. This is called metadata.



Source: Messari

This metadata is rarely stored on-chain; it is quite expensive to do so. Instead, most NFTs contain a Uniform Resource Identifier (URI)² that points to where the data is stored. Usually, this is a Web2 centralised storage solution. Anyone with access to it can change the metadata of your precious Tubby Cat. Not so non-fungible after all.

¹ Replace with whatever cutesy PFP is en vogue now.

² A Uniform Resource Identifier (URI) is a unique sequence of characters that identifies a logical or physical resource used by web technologies. URIs may be used to identify anything, including real-world objects, such as people and places, concepts, or information resources such as web pages and books. Some URIs provide a means of locating and retrieving information resources on a network (either on the Internet or on another private network, such as a computer filesystem or an Intranet); these are Uniform Resource Locators (URLs). Source: Wikipedia.

A variety of different protocols aim to solve this, such as Filecoin, Sia or Storj. Yet, they, as their Web2 counterparts, need recurring payments to continue storing your data. You stop paying? Woosh, your data is gone. No bueno.

But what if I told you there is a solution to your problems? A way to store your data forever. With just one payment. Oh, and the best part, it also has smart contracts.

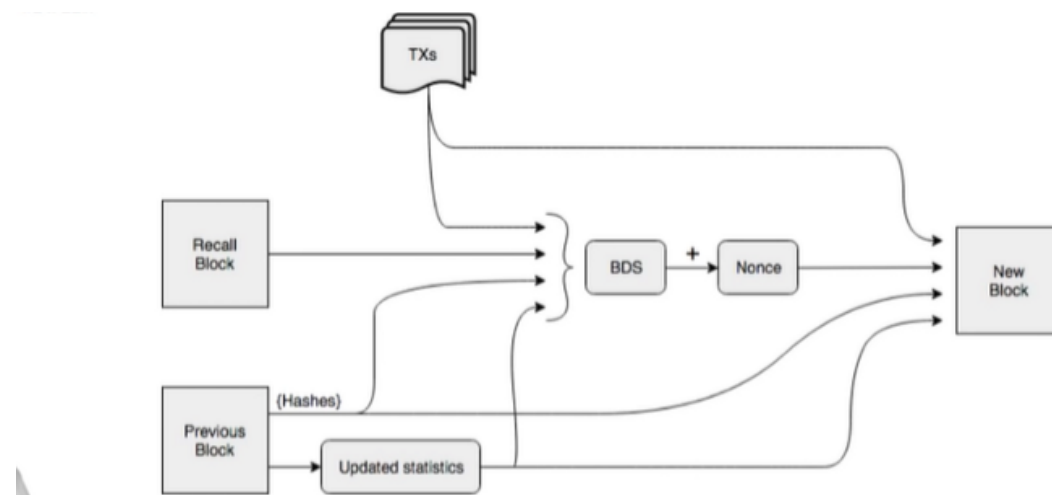
Enter Arweave.

What the heck is Arweave?

Arweave aims to achieve a *sustainable and permanent ledger of knowledge and history*³. And it does so by using something called the blockweave.

The Blockweave

The blockweave is a blockchain-like data structure. Each new block is linked to two prior blocks: the previous block in the chain (as with any other typical blockchain); and a prior block picked at random (the 'recall block'). This consensus algorithm is known as Succinct Proofs of Random Access, or SPoRA.



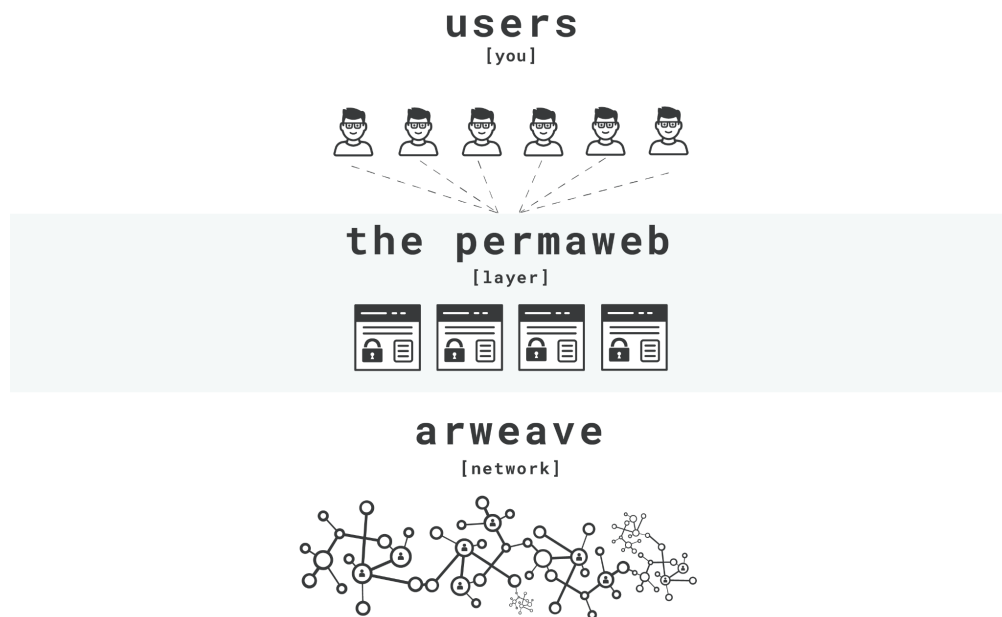
Source: Arweave's yellow paper

But why go through all the hassle of inventing a new consensus algorithm? Last I checked PoW and PoS were working fine. Well, when it comes to a blockchain whose aim is to store data, one would want to incentivize the miners to store large amounts of it. By introducing the recall block, miners are encouraged to store as many blocks as possible. This way, their chances of having the correct recall block increase, and so their chances of receiving the mining rewards.

³ Source: Arweave's yellow paper

The Permaweb

The permaweb is the layer on top of the Arweave network and works exactly as the “normal” web does. It is a series of documents, applications and other resources, connected by hyperlinks and identifiable by URLs. These are accessible over the Internet, as any other website.



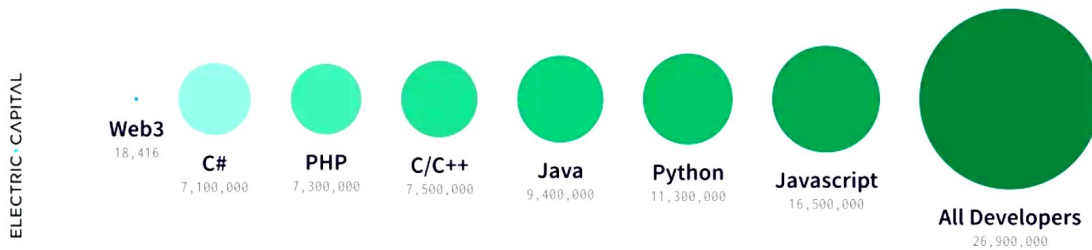
Source: Arweave's yellow paper

But that's not all. Because what would the web be without any applications built on it? Wait, are you telling me that Arweave is also its own Layer-1? Yes, yes I am.

The Smartweave

The Smartweave is a smart contracting platform built on top of the Arweave. It differs from other chains in two major aspects.

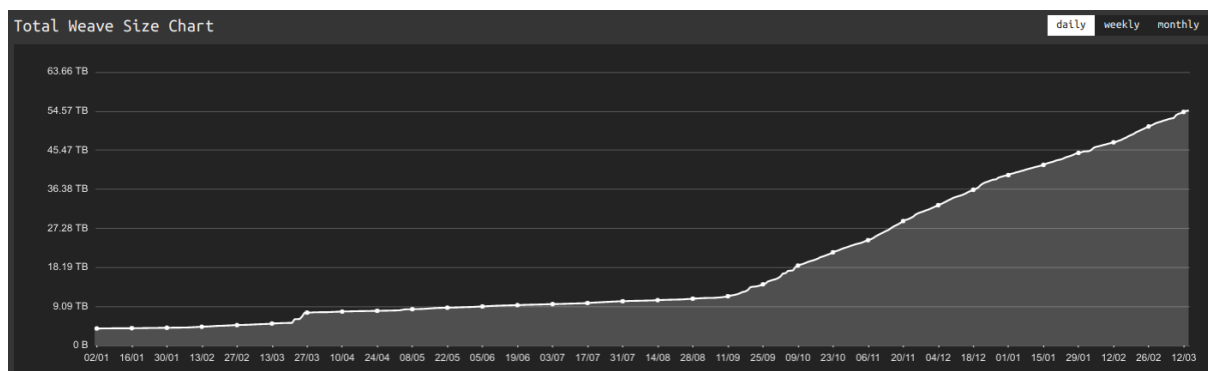
First, smart contracts on Arweave are written in Javascript (JS). Compare the number of native Web3 developers writing in Solidity (used in EVM chains) or the ones writing in Rust (Solana, Cosmos) to the ones writing in JS; and you can see how being able to write in JS opens the door for many more developers to join the space.



Number of developers. Source: Electric Capital

Second, instead of requiring nodes to execute the transactions, the transaction validation is performed by the users; the Arweave network is used as a data consensus and sharing layer. This way, one does not need gas to pay for smart contract interactions. Plus, heavy compute applications that would be impractical in other chains are now very much feasible.

One of the biggest drivers for Arweave's success at the moment is being the storage solution for many blockchains such as Solana, Cosmos, Avalanche, etc. This has resulted in a meteoric increase in Arweave's weave size (the size of the network) in the past few months.



Arweave's weave size. Source: ViewBlock

In the not-so-distant future, blockchains will likely use their L1 chains for security, L2 for computation and a different protocol for data storage. Arweave looks primed to be this data storage solution, as no other protocol offers the same capabilities.

The Economics of Arweave

Earlier we said that Arweave only requires an upfront payment to store your data forever. But how are they able to derive how expensive such a service would be? Well, storage costs have declined 31% on average per year over the past 50 years.⁴ Arweave's upfront payment model is based on a *highly conservative estimate of the perpetual storage cost*; i.e. prepare to pay up. At the time of writing, the cost of storing 1GB is ~\$7.66 USD.⁵

⁴ Source: Arweave's yellow paper

⁵ Source: <https://arweavefees.com/>

This is based on Arweave's assumption that data storage costs will only decrease 0.5% year over year. Arweave guarantees the user its data will be stored for the next 200 years. Should storage costs decrease more than 0.5%, the difference in fees paid versus modelled would be used to extend data storage after the first 200 years. For instance, at a 2% decrease rate in storage costs, Arweave would ensure that the data is stored for 300 years.

And what does one use to pay these fees? Well, Arweave's own token of course, AR. Only a portion of these fees, however, is paid out to miners right away. Most of it is placed in an on-chain endowment fund. This will start paying miners when the inflationary rewards and storage fees are not enough to cover their operating costs. This way, mining, validation of the network and hence permanent storage is ensured into the future.

As it stands right now, over 95% of the fees collected by miners come from inflationary rewards, and ~90% from the storage upfront fee goes to the endowment. But here's the interesting bit. Almost 80% of AR's total supply has already been mined, and its inflation rate is decreasing rapidly. The endowment is set to keep receiving the lion's share of the storage fees for the next 2-3 years –remember that the endowment is paid in AR–.

What happens when we have a coin with decreasing inflation, we throw in a black hole that sucks supply, and we sprinkle some mass adoption?
Price go up.

Could AR become deflationary? Sure. What happens then?

Price go up bigly.

This is all based on the assumption that Arweave will become the data storage solution in Web3 in years to come, of course. But as it stands right now, this is Arweave's race to lose.

So just wait for macro to settle down, back up the truck with AR, wait, and watch the fireworks. Your bank account will thank you.

"Who controls the past controls the future: who controls the present controls the past"
George Orwell's 1984