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Blockchain and Signed NFT as key technologies for the metaverse interoperability

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Session 1: Which key technologies powering the metaverse?
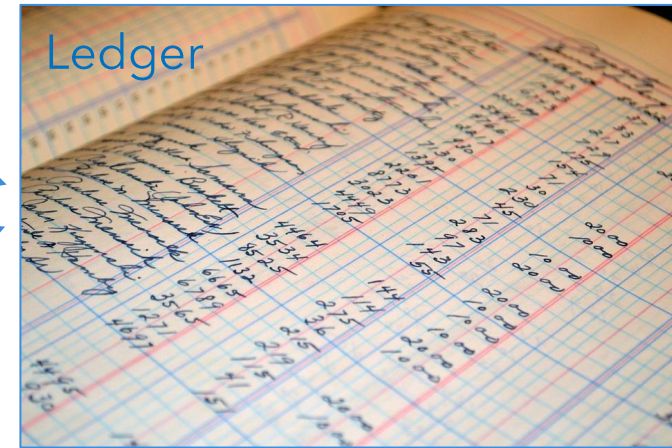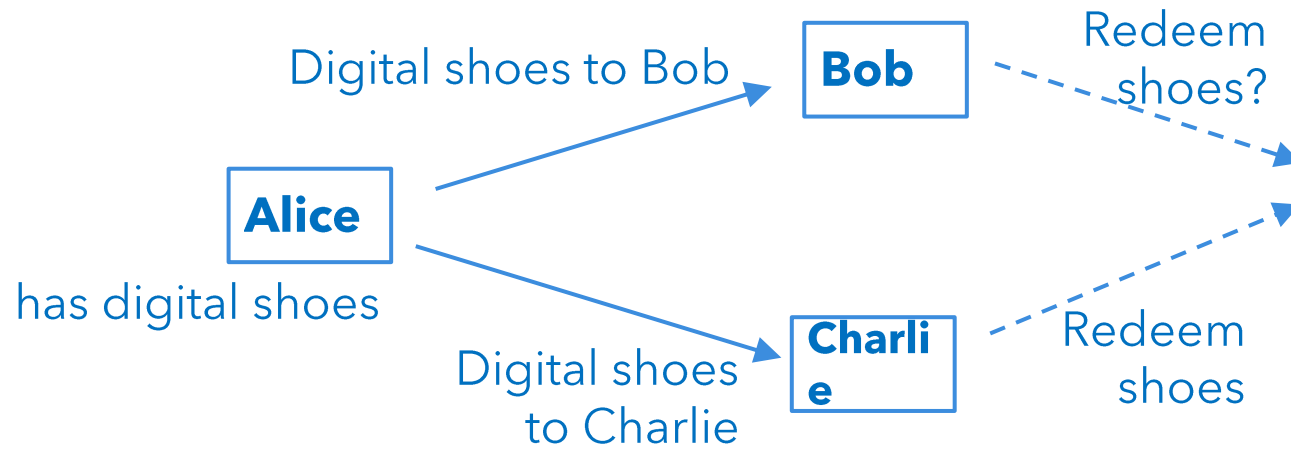
- Matthew Ball metaverse pillars:
  - **Be persistent** –it never "resets" or "pauses" or "ends", it just continues indefinitely
  - **Be synchronous and live**
  - **Be without any cap to concurrent users, while also providing each user with an individual sense of "presence"**
  - **Be a fully functioning economy**
  - **Be an experience that spans** both the digital and physical worlds, private and public networks/experiences, and open and closed platforms
  - **Offer unprecedented interoperability**
  - Be populated by "content" and "experiences" **created and operated by an incredibly wide range of contributors**, some of whom are independent individuals, while others might be informally organized groups or commercially-focused enterprises

How to ensure worldwide interoperable ownership of metaverse digital assets for a functioning economy?

Easy Double-Spending of digital assets in decentralized systems

Double-spending risk

Digital shoes to Bob → **Bob**

Alice

has digital shoes

Digital shoes to Charlie → **Charlie**

Redeem shoes? →

Redeem shoes →

Ledger

[Pixabay]

Blockchain definition

Ledger

[Pixabay]

A decentralized trust machine to allow two parties to trust each other without a single intermediary thanks to a large community that provides resources to the technical system secured by math and which is remunerated for its efforts

Non-Fungible Tokens (NFT)

- NFT is a particular type of cryptographic token that represents something unique; non-fungible tokens are thus not mutually interchangeable. This is in contrast to cryptocurrencies like Bitcoin or utility/payment tokens that are fungible in nature.

- Ethereum initial standard for NFT: ERC 721 started in 2018

  - ERC 1155 allows a mix of fungible and non-fungible tokens as well as other advanced features, which makes it difficult to check

  - ERC 20 is the standard for fungible tokens interoperability

- Some NFTs are sold as digital files (images, animations…) on marketplaces such as Open Sea or on virtual games or metaverse such as Decentraland

- Bitcoin has started to host NFT as ordinals linked to a Satoshi

  - A BRC 20 standard has also launched on Bitcoin blockchain

  - However, all these new features have congested the Bitcoin blockchain so far.

NFT Exchange?
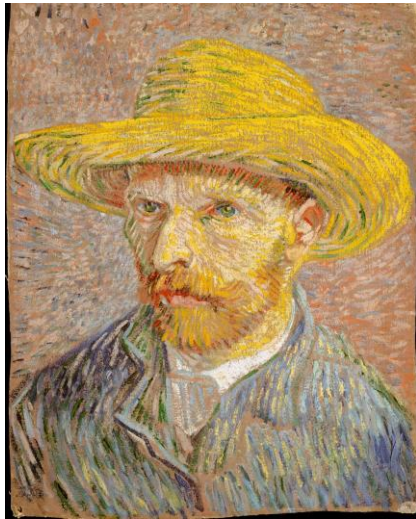
van Gogh, $50 million
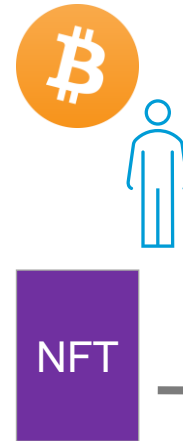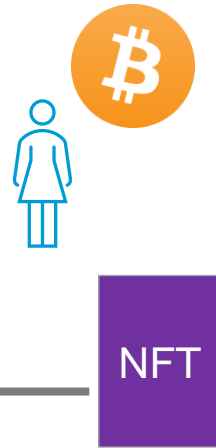
CryptoPunk #8926

Last sale: 10 ETH

NFT Technical Details

Contract blockchain address
(static)

NFT unique identifier
(uint256, static)

URI (may be mutable)

Metadata
(JSON schema):

Name

Description

Image URI

Important to
check the smart
contract
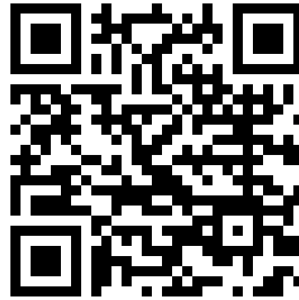implementation!

URI may be
broken!

Signed NFT Solution

- Solving the NFT legal uncertainties thanks to creating a digital document signed by the artist's legally valid signature, including the license terms, the NFT unique identifier (blockchain + token ID), the IPFS art hash with optional details (lower resolution image, description…).

- Use of Qualified Electronic Signatures (QES) that are already equivalent legally to handwritten signatures in the EU and Switzerland

- From a user-friendliness point of view, a digitally signed Adobe PDF is preferred because most users can read and verify the signature thanks to the free version of Adobe Acrobat reader.

- The NFT metadata pointed by the token URI should be stored on IPFS, and the metadata description should contain the IPFS hash of the PDF certificate.

- Even if the token URI is broken, the signed PDF is enough to know the NFT details. The signed PDF may include the signature of a signed message by the NFT creator's blockchain address private key to prove that the artist was really the creator of the NFT.

- The blockchain smart contract may not point to metadata besides the token ID because it can still enable ownership transfer without double-spending. In this case, it can be called a Private Signed NFT, which is better from a privacy point of view.

- Initial implementation on https://www.artistcert.art

Q&A

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