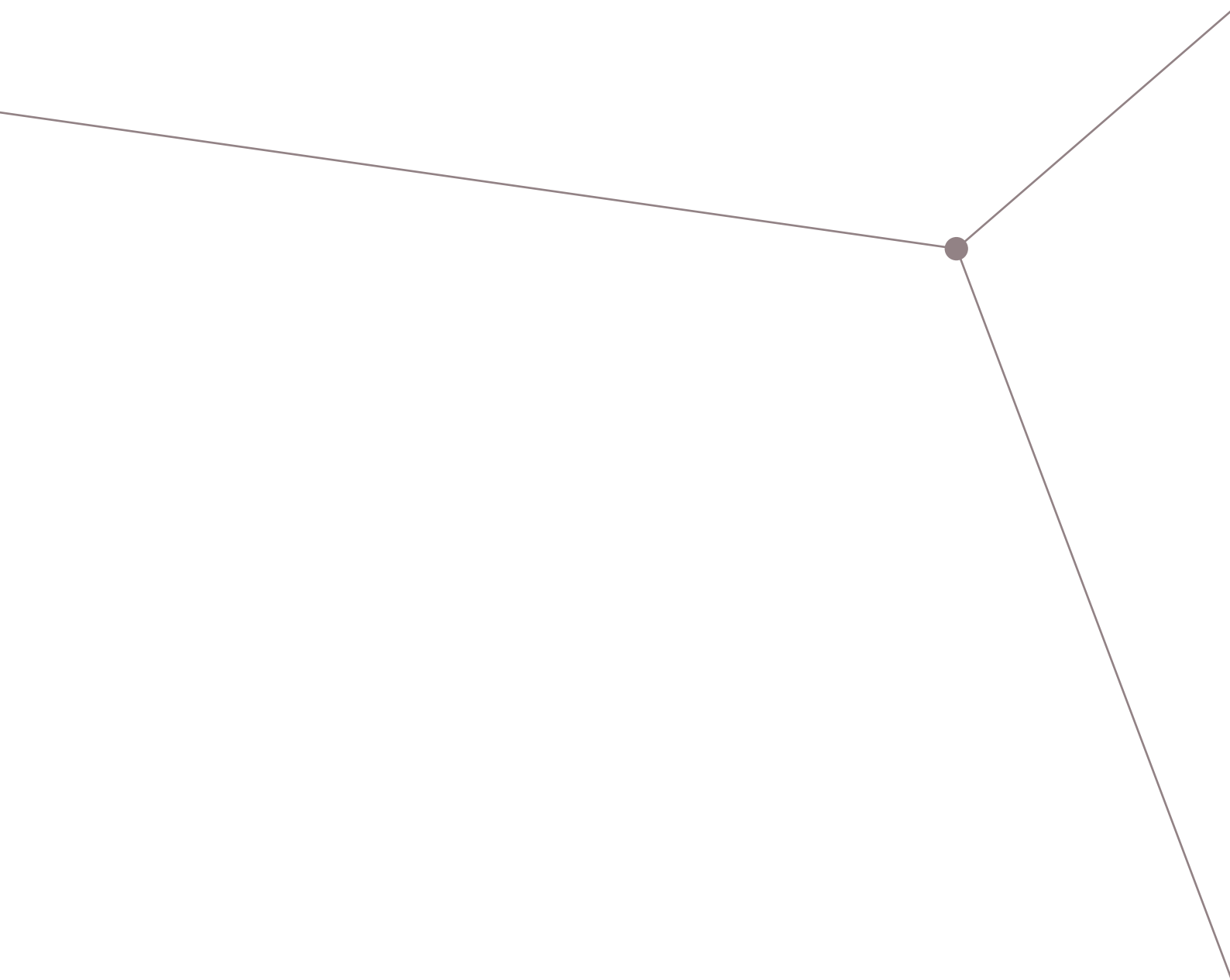

# Securing Non-Fungible Tokens using SECORA™ Blockchain

www.infineon.com/blockchain

# Abstract

The cryptocurrency market has been expanding rapidly since the end of 2020. Non-Fungible Tokens (NFTs) have received a lot of attention in this latest wave. This paper aims to briefly touch on the essential value of this idea and also explain why it is immensely important for owners and traders to protect their assets. In addition, the paper provides some practical security enhancement options that can be quickly deployed.



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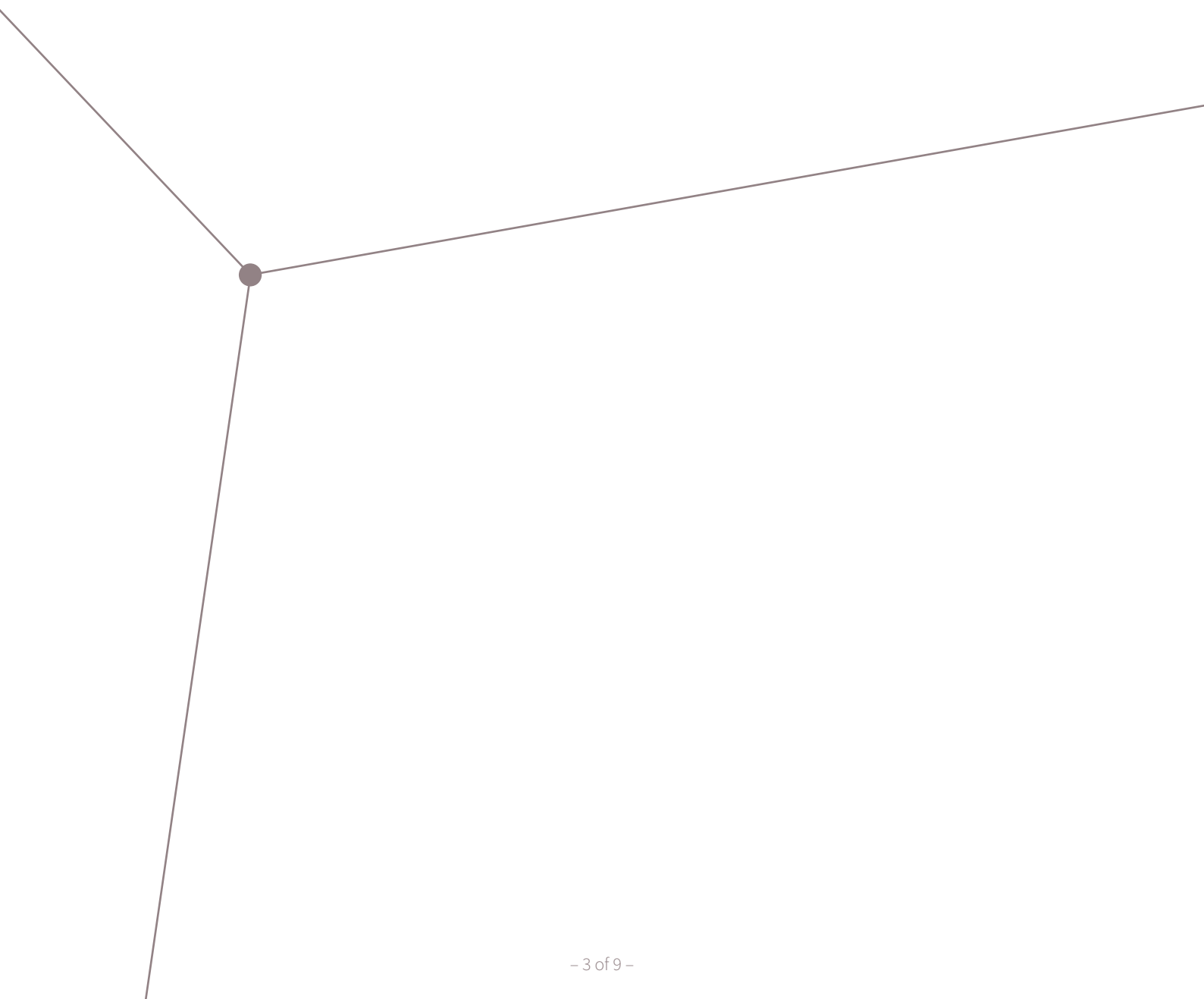


# 1. A brief introduction to Non-Fungible Tokens (NFTs)

At the peak of the crypto assets fever around March 2021, an NFT representing a digital artwork called "Everydays: the First 5000 Days" was sold for the record sum of 69.3 million dollars[1]. Looking back at the small beginnings of NFTs, which emerged around 2017 in the form of CryptoKitties[2] aimed more at gamers and hobby collectors, one has to wonder how the market has since exploded to this extent – with public figures such as New York Times columnist Kevin Roose[3] and Paris Hilton[4] riding the craze to raise money for good causes.

The essential task of an NFT is to prove that something is unique[5]. In theory, this "thing" could be anything from physical items such as real estate, yachts or sneakers to digital assets such as the above-mentioned digital artwork, source code, music, movies or patents. In addition to proving uniqueness, NFTs also define ownership – ownership that can then change hands in an exchange event. And since these transactions are captured in smart contracts, the potential use cases for NFTs are wide-ranging. The following figure shows the huge growth in NFT trade.

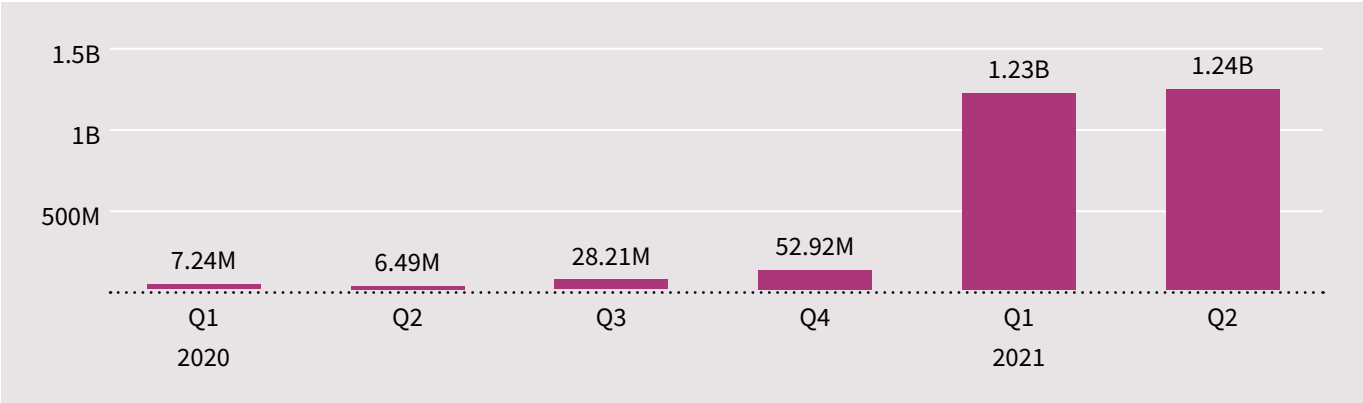



**Figure 1:** Quarterly NFT sales volumes in USD across multiple blockchains[6]

1 https://www.forbes.com/sites/abrambrown/2021/03/11/beeple-art-sells-for-693-million-becoming-most-expensive-nft-ever/
2 https://www.cryptokitties.co/
3 https://www.nytimes.com/2021/03/26/technology/nft-sale.html
4 https://decrypt.co/38969/paris-hilton-sells-ethereum-based-artwork-for-17000
5 https://ethereum.org/en/nft/
6 https://www.reuters.com/technology/nft-sales-volume-surges-25-bln-2021-first-half-2021-07-05/

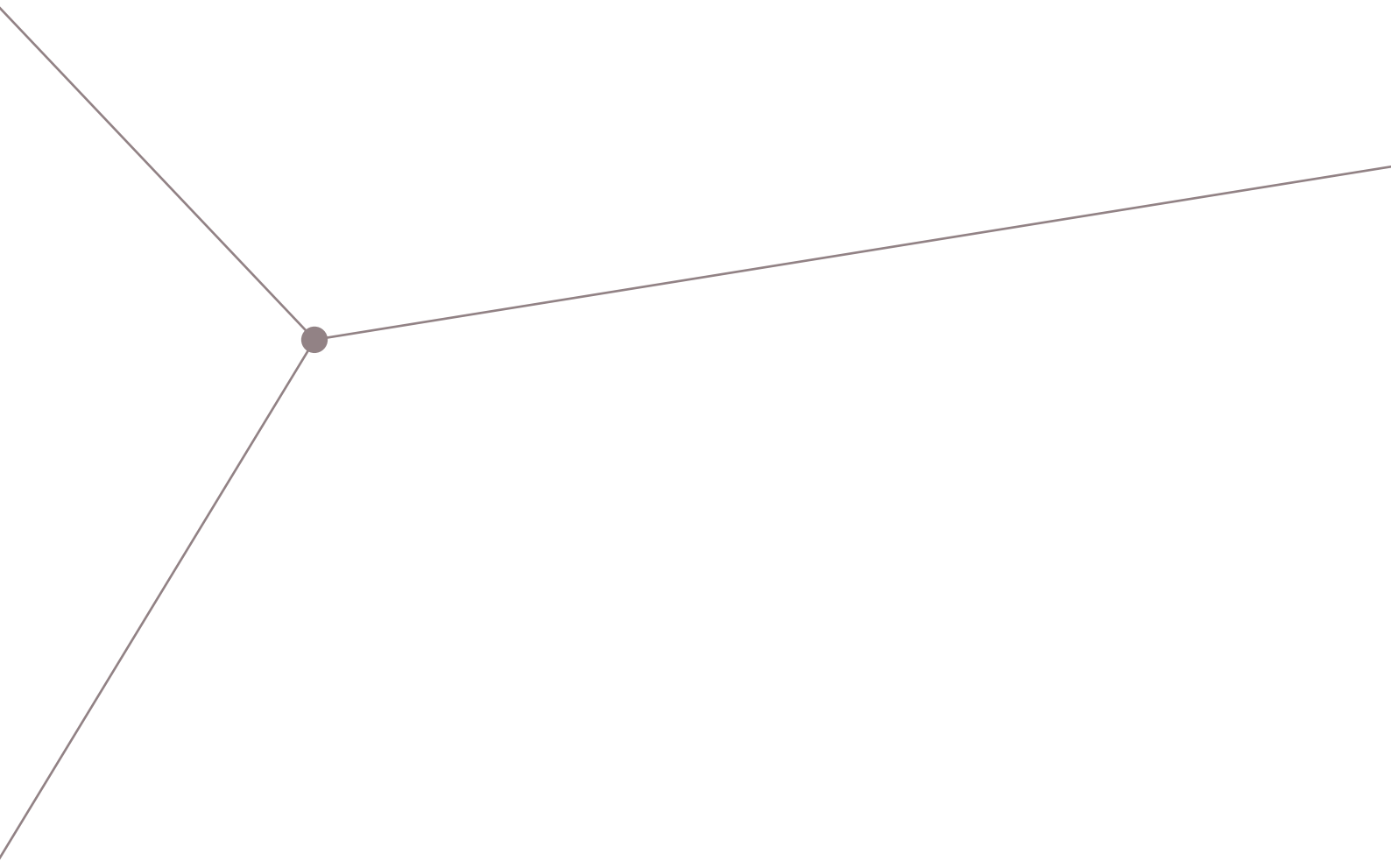
## 2. Main challenges

**Establishing a trusted, secured connection between a digital token and the physical object**

Looking at the very first step of NFT creation, also known as tokenization, it quickly becomes clear that the connection between the original object and the digital token is criterial. In other words, how can a buyer of a NFT be sure that this is really associated with the original object? One commonly quoted scam that illustrates just how prone the system is to fraud is the Banksy case[7], where an individual claimed to have the artist's original artworks and signature. The assets turned out to be fake, but by then, the scammer had already netted around 1 million dollars in Ethereum. With purely digital objects, NFT tokens can include hyperlinks to the original sources such as images or files. However, it is very difficult to establish a trusted link between the digital form of an NFT (the token) and the underlying physical object (the "thing"). In addition to this, NFTs must allow subsequent owners to verify the link to the real-world object.

**Transferring ownership during blockchain transactions**

Another critical aspect is the general risk involved in decentralized transactions. NFTs are designed to transfer ownership and therefore make the assets tradable at auctions or other selling events. If we take an Ethereum-based NFT as an example, the transaction happens in the way that the associated public key of old owner is changed to the one from new owner. The first owner's private key is needed to trigger this sale transaction. Hence the security of NFT asset handling and transactions hinges on the manner in which private keys are saved.



7 https://cointelegraph.com/news/nft-market-top-signal-fake-banksy-nets-over-1-million-in-eth-sales

## 3. How to use and protect NFT assets

**Safeguarding transactions with security chips**

Today, news outlets have to clearly display the owner or copyright of every picture they publish or use. In the case of NFTs, the ownership of the token can be easily established. Regardless of whether the token refers to a picture or a digital asset, the owner of the asset is the owner of the private key "holding" the NFT token. In other words, the ability to establish/ assert NFT ownership and securely access digital assets hinges on the ability to safeguard the private key. To enhance the crucial level of security needed to protect NFT ownership, private keys should thus always be generated and stored on dedicated security controllers. Infineon's Blockchain Security 2Go Starter Kit is the ideal way to generate private keys and keep them secured, similar to state-of-the-art hardware wallets.

**Figure 2:** Blockchain Security 2Go Starter Kit

**Security element: trust anchor linking digital and physical assets**

Infineon already demonstrated the link from the digital to the physical world back in 2019 using the game CryptoKitties as an example. Here, for the very first time, a physical version of the Ethereum-based CryptoKitties game was generated. To this end, one dedicated key of Infineon's Blockchain Security 2Go Starter Kit was read and converted to an Ethereum address. CryptoKitties are non-fungible ERC-721 tokens that enable different cats to have specific attributes – or this case "cattributes". Four kitties were purchased on the market and transferred to pre-prepared, printed cards. All transfers can be checked using etherscan.io[8]. This secured process established a trusted link between the digital token and the physical original. In this way, the chip is the only medium to combine both sides, e.g. the digital kitty and the printed physical item. Users can anytime verify this linking status by reading properties from the smart card and comparing them with data stored in the chain. This example showed how easily NFTs could be used to securely link digital assets with their underlying physical, real-world things.


**Figure 3:** Physical representation of CryptoKitties using Infineon's Blockchain Security 2Go Starter Kit[9]

**Tundra Sister:** https://etherscan.io/tx/0x65e4685a53efa804e976547b83abc1fe97b572c149dfa0dab03f2a297450dbf4
**Lulu Scootchrum:** https://etherscan.io/tx/0x147dcc8b343e7476a801bfac86337c5b7c34e9c968e532907cf944073d269a65
**Daniela Fuzzyhands:** https://etherscan.io/tx/0x39d8119652aaaa48980b0c36ad7294d933ad16ea64ab774e3f955f18f5db7bf4
**Fabiano Lilsmoochie:** https://etherscan.io/tx/0xa12fda9f27aa3e211dca80dfc07d3048cd4b22202ae3994d303955fe120ee522

As the example shows, digital assets such as CryptoKitties, Pokémons but also general NFTs for artwork can be transferred to a Blockchain Security 2Go Starter Kit[9] card. However, this process also works in the other direction. When an artist creates a work of art such as a picture, they usually finish it by adding their signature in the corner of the painting. In future, a digital twin of this art can be created (e.g. via an NFT) and stored on a secure element that is attached to the artwork.

8 https://github.com/Infineon/Blockchain/tree/master/hackathon
9 https://github.com/Infineon/Blockchain

## 4. Executive summary

NFTs must be secured, especially if they have been used to digitalize physical assets. Infineon's security solutions can help establish a more secure link between the digital and the physical world. With dedicated resources like Blockchain Security 2Go Starter Kit, Infineon enables security enhancements to be deployed rapidly. This gives owners, token vendors and users of blockchain systems much more confidence in the security of this creative technology, enabling them to use it more widely and extend it to all sorts of new use cases.

## 5. References


1. https://www.forbes.com/sites/abrambrown/2021/03/11/beeple-art-sells-for-693-million-becoming-most-expensive-nft-ever/
2. https://www.cryptokitties.co/
3. https://www.nytimes.com/2021/03/26/technology/nft-sale.html
4. https://decrypt.co/38969/paris-hilton-sells-ethereum-based-artwork-for-17000
5. https://ethereum.org/en/nft/
6. https://www.reuters.com/technology/nft-sales-volume-surges-25-bln-2021-first-half-2021-07-05/
7. https://cointelegraph.com/news/nft-market-top-signal-fake-banksy-nets-over-1-million-in-eth-sales
8. https://github.com/Infineon/Blockchain
9. https://github.com/Infineon/Blockchain/tree/master/hackathon

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