IN THE DIGITAL AGE, PRESERVING AND STORING DIGITAL ART FOR 1000 YEARS CAN BE A CHALLENGE.

The PDF presentation provides a comprehensive overview of these concepts and their applications in preserving digital art.

- Lossy compression formats such as JPEG and GIF can compromise the integrity of pixel art.
- AI-powered applications such as Deepfake technology can create realistic but fake images but not from pixel-art.
- By using blockchain technology and indexed palette PNG format for encoding pixel art, artists and collectors can ensure secure and cost-effective storage of their work.
- Most popular blockchain technology only accept text within smart contracts like NFTs, so it often uses Base64 encoding when dealing with data as text.
- Pixel art emulator up-scaling algorithms provide a reliable and efficient solution for generating high-quality images that retain the visual subject of the original pixel art.
- High-quality images can produces infinitely high-definition vector images in SVGs for examples.
- By understanding the importance of these technologies, we can preserve our digital heritage for future generations.

Download the PDF presentation (brought to you by Pixa.Pics) today to learn more about how these technologies can help you protect and preserve your digital identity and artwork for the future.

Introduction

In this content, we have explored the fascinating world of pixel art and its applications in the modern digital age. We have discussed the unique challenges of storing and preserving digital art for long periods of time, and how blockchain technology is providing a secure and cost-effective solution for this issue. We have also discussed the benefits of using indexed palette PNG format for encoding pixel art, and how this format preserves image quality while achieving smaller file sizes than other lossless compression formats. Additionally, we have explored the advantages of pixel art emulator upscaling algorithms and how they provide a bridge between raster and vector images, without relying on AI algorithms that can be unstable or require significant computational power. By understanding these concepts, we can appreciate the value of pixel art and its importance in preserving our digital heritage for future generations.

Storing images on blockchain

As digital art continues to gain popularity, the need for secure and long-term storage solutions becomes increasingly important. With traditional storage methods prone to data loss and corruption, it is imperative that we find new and innovative ways to preserve digital art for future generations. One such solution is blockchain technology, which offers a secure and cost-effective way to store digital art for 1000 years or more.

Blockchain technology is a decentralized ledger that records transactions and stores data across a network of computers. Each block in the chain contains a record of a transaction, along with a unique cryptographic hash that links it to the previous block. This creates an immutable record that is nearly impossible to alter or corrupt, making it an ideal solution for digital art preservation.

One of the key benefits of using blockchain technology for digital art storage is its redundancy. With data stored across a decentralized network, there is no single point of failure that can result in data loss. This means that even if one or more nodes in the network fail, the data remains intact and accessible.

Another advantage of using blockchain technology is its cost-effectiveness. While traditional storage methods can be expensive and require ongoing maintenance, blockchain storage requires only a one-time cost for storage and no ongoing maintenance fees. This makes it a more accessible and affordable option for art collectors and enthusiasts.

To store digital art on the blockchain, one option is to use NFTs (non-fungible tokens), which are unique digital assets that are stored on the blockchain. NFTs can be used to represent digital art,

providing a secure and permanent way to verify ownership and authenticity. By using smart contracts, which are self-executing contracts with the terms of the agreement directly written into code, NFTs can also be programmed to transfer ownership automatically when certain conditions are met.

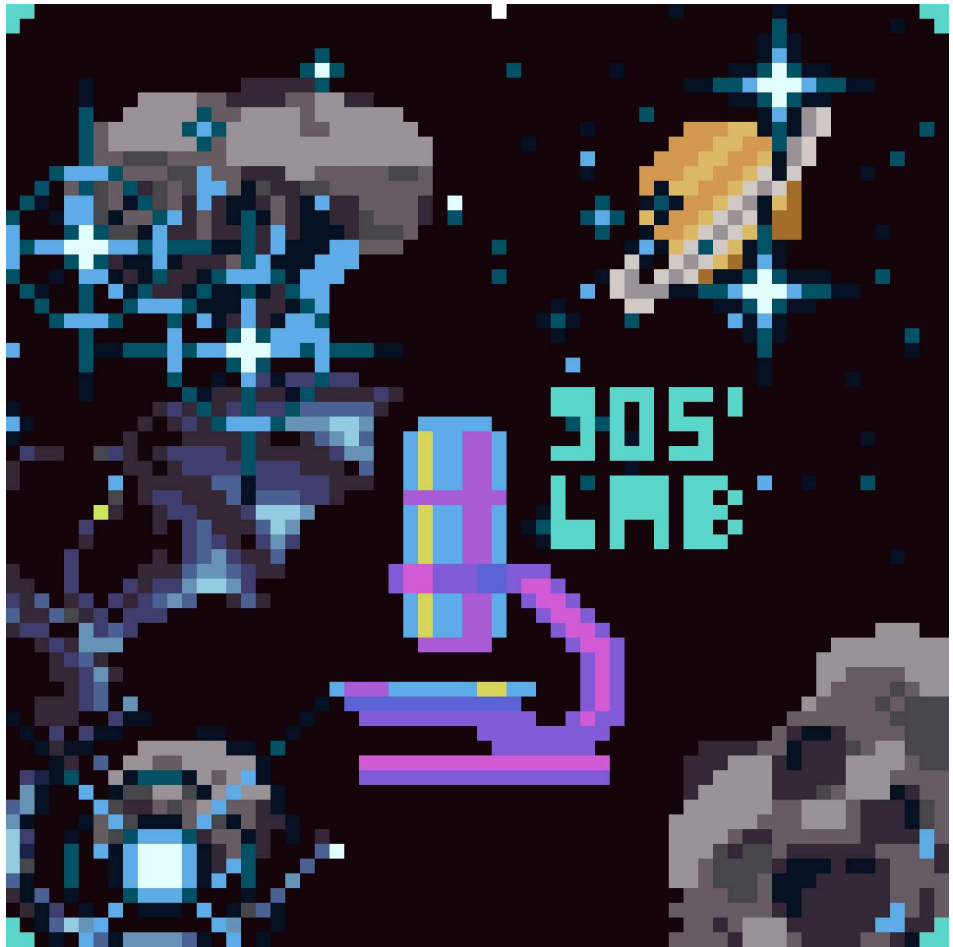
However, while blockchain technology offers a secure and cost-effective way to store digital art, it is not without its limitations. One potential issue is the potential for technological obsolescence. As technology evolves, there is a risk that the format used to store digital art on the blockchain could become outdated, making it difficult or impossible to access the data in the future. Additionally, there is a risk of losing access to private keys or passwords required to access the stored data.

In conclusion, preserving digital art for 1000 years or more requires a secure and cost-effective storage solution. Blockchain technology offers a promising option for achieving this goal, with its redundancy, immutability, and affordability.

By using NFTs and smart contracts, digital art can be stored securely and ownership can be verified and transferred automatically. While blockchain technology is not without its limitations, it provides a promising solution for preserving digital art for future generations.

Introduction to Base64 Indexed colors PNG

As digital art continues to grow in popularity, many artists and collectors are turning to blockchain technology as a secure and permanent way to store and transfer digital images. While blockchain technology offers many benefits for digital art storage, it can also be challenging to work with due to its unique technical requirements. In this article, we will explore the process of storing images on the blockchain, with a focus on pixel art in PNG type palette in base64 encoded string. Below is my drawing from pixa.



PNG (Portable Network Graphics) is a popular image format that uses lossless compression to reduce file size while preserving image quality. This makes it an ideal choice for storing digital images on the blockchain, where storage space can be limited and image quality is a top priority. Base64 encoding is a method of converting binary data into a string of ASCII characters, which can be easily transmitted over the internet and stored on the blockchain.

To store a PNG image in base64 encoded string on the blockchain, the first step is to convert the image data into a base64 string. This can be done using a variety of tools and libraries available for different programming languages. Once the image data is in base64 format, it can be stored as a string on the blockchain using a smart contract.

Pm+ZkpZnXGFdrOcVBQo0KDcGESOCW9ZGRktMYpTSW9aqW9Zmk7bj//
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The encoded text above which represent the minimal (tiniest, instead, at left it has been rendered in 24x up-scaling) **pixel art version of it weights around 1.2kB. You can past it** (it works like a offline link) **into a new browser tab or follow the “data-url” to see it.**

A smart contract is a self-executing contract with the terms of the agreement directly written into code. In the case of image storage on the blockchain, a smart contract can be used to store the base64 encoded image data, along with any additional information such as image metadata and ownership details. Smart contracts are typically written in a programming language such as Solidity, and are deployed to the blockchain using an Ethereum-compatible wallet such as Metamask.

One of the key advantages of storing images on the blockchain is the security and permanence it provides. Because the blockchain is a decentralized network with no central point of failure, images stored on the blockchain are nearly impossible to tamper with or lose. Additionally, because the blockchain is immutable, images stored on the blockchain can be verified and authenticated with a high degree of confidence, making it an ideal solution for storing valuable and rare digital artwork.

However, storing images on the blockchain can also be challenging due to the technical requirements and associated costs. For example, because the blockchain is a decentralized network with limited storage space, storing large or high-quality images on the blockchain can be expensive and impractical. Additionally, because the blockchain is a constantly evolving technology, there is a risk of technological obsolescence over time, which could potentially make it difficult or impossible to access images stored on the blockchain in the future.

In conclusion, storing images on the blockchain is a promising solution for digital art storage, particularly for pixel art in PNG type palette in base64 encoded string. With its security, permanence, and authenticity features, the blockchain provides a reliable way to store and transfer digital images. However, it is important to carefully consider the technical requirements and associated costs of storing images on the blockchain, as well as any potential risks such as technological obsolescence.

This tower is situated in Paris, France, it is called the “Tour Montparnasse” in french, and if you check it out you’ll see that it has an height of 210 meters which is one thousand time the smallest edge of this A4 sheet of paper, this is very impressive when you realize that the first image depicting laboratory tools in space weights approximately 1.2 kB. When you takes a picture with a smartphone, it easily weights more than 1.2 mB which is now as of 2023 more close to the 5mB but anyway, you might think of it as trying to store one construction brick only instead of this whole tower in terms of the length of the edges! It is not the same that to buy foods for one year or for a thousand years for the an entire family, here in terms of energy consumption it is the same. **But as a blockchain data is replicated sometimes more than 100 times, volume thinking is fine too!**

Blockchain storage limits and it’s impact on NFT

While blockchain technology offers many benefits for digital art storage, it is important to note that there are some limitations to consider, particularly when it comes to the size of data that can be stored on the blockchain. This is especially true when it comes to storing images in base64 encoded strings, as the size of the string can quickly become quite large.

In general, smart contracts have a limited amount of storage space available for data. This means that if the base64 encoded string for an image is too large, it may not be possible to store the entire image on the blockchain using a single smart contract. In this case, it may be necessary to split the image data into multiple pieces and store them in separate smart contracts, which can add complexity and cost to the storage process.

In the real world, there are examples of blockchain-based digital art platforms that have successfully implemented image storage using base64 encoded strings in smart contracts. One example is the SuperRare platform, which uses the Ethereum blockchain to store and transfer digital art in the form of non-fungible tokens (NFTs). Each NFT represents a unique digital asset, such as an image or animation, which is stored in a smart contract on the blockchain.

To address the limitations of storing large image data in smart contracts, SuperRare uses a process called lazy minting, which allows creators to mint new NFTs without actually uploading the image data to the blockchain until it is purchased. This reduces the amount of storage space required on the blockchain and allows creators to mint NFTs more easily.

In addition to lazy minting, SuperRare also uses a technique called off-chain storage, which involves storing large image data on centralized servers outside of the blockchain. This allows for faster and more efficient image transfers, while still maintaining the security and authenticity features of the blockchain.

Overall, while there are some limitations to storing images on the blockchain using base64 encoded strings in smart contracts, there are also solutions available that can address these limitations and provide a reliable way to store and transfer digital art. By carefully considering the technical requirements and associated costs of image storage on the blockchain, artists and collectors can make informed decisions about the best storage solution for their digital artwork.

The best choice for storing bytes 1000 years

Pixel art is a unique form of digital art that is characterized by its low resolution and often retro style. Because of its low resolution, pixel art is ideally suited for encoding in indexed palette PNG format, which is a lossless compression format that is specifically designed for images with limited color palettes.

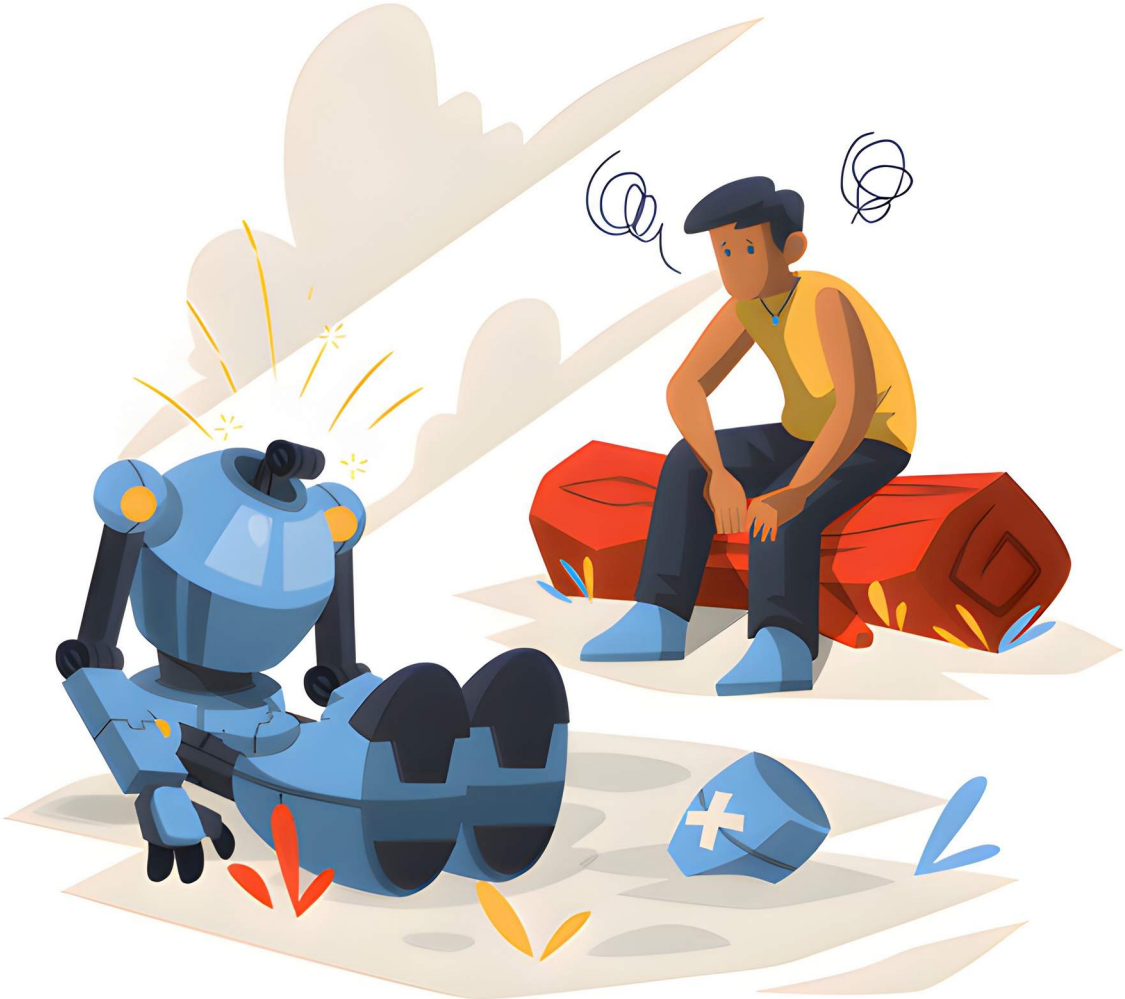
In an indexed palette PNG, each pixel in the image is assigned a color index, which corresponds to a specific color in the image's color palette. This allows for more efficient compression of the image data, as each pixel only needs to store an index value rather than a full RGB color value.

Compared to other lossy image compression formats such as JPEG and GIF, indexed palette PNG offers several advantages for pixel art. Firstly, because it is a lossless format, it preserves the image quality and clarity of the original artwork, which is especially important for pixel art where the individual pixels and color choices are often an integral part of the artistic expression.

Additionally, indexed palette PNG is able to achieve smaller file sizes than other lossless compression formats, such as BMP or TIFF, due to its ability to store the image data in a more efficient manner. This makes it a more practical choice for storing large collections of pixel art images on the blockchain or other storage solutions where storage space is at a premium.

In contrast, lossy compression formats like JPEG and GIF are designed for images with a large color palette and high detail, and are not well-suited for pixel art. These formats use complex algorithms to compress the image data, which can result in loss of detail and color accuracy in the final image. For pixel art, this can result in a loss of the intended artistic expression and aesthetic.

Overall, indexed palette PNG is the ideal format for encoding pixel art due to its ability to preserve image quality and achieve smaller file sizes than other lossless formats. By choosing the right compression format, artists and collectors can ensure that their pixel art is stored and transferred in a secure and efficient manner that preserves its artistic integrity.



The AI intelligence gathering threat

In today's digital age, we are constantly bombarded with requests for our personal information, including images of ourselves. While it may seem harmless to post high-definition images of ourselves on social media or other platforms, there are potential side effects that may not be immediately apparent. In this post, we will explore the potential risks of posting high-definition images of ourselves online, and discuss some strategies for protecting our privacy.

One of the main risks of posting high-definition images of ourselves online is the potential for these images to be used in AI-powered applications, such as Deepfake technology or avatar generators. These technologies can create incredibly realistic digital images and videos of individuals, which can then be used for a variety of purposes, including identity theft, fraud, or even blackmail.

Another risk is the use of automatic facial recognition software, which can identify individuals in images and track their movements and activities. While this technology can be used for legitimate purposes, such as security or law enforcement, it can also be used for more nefarious purposes, such as stalking or harassment.

Additionally, posting high-definition images of ourselves online can also contribute to the creation of detailed AI profiles, which can be used to build a detailed picture of our interests, preferences, and behaviors. This information can then be used for targeted advertising or other forms of manipulation.

To mitigate these risks, one strategy is to pixelate or reduce the color depth of images of ourselves before posting them online. This can help to remove unwanted data that can be used to identify us, while still allowing us to share our images with others. Additionally, we can be cautious about the types of images we share online, and limit the amount of personal information we share with strangers or unknown entities.

In conclusion, while it may be tempting to share high-definition images of ourselves online, it is important to be aware of the potential risks and take steps to protect our privacy. By being cautious about the types of images we share, and using tools like pixelation or color reduction, we can help to reduce the likelihood of our images being used for nefarious purposes.

Retro emulator upscaling

Pixel art emulator upscaling algorithms have been designed to preserve the original visual subject of an image, without adding any unwanted entropy that could lead to false estimations by AI algorithms. When we upscale a pixel art image using an algorithm like Omniscale, the output retains the original shape and visual characteristics of the image, while increasing the overall resolution.

The reason why pixel art emulator upscaling algorithms are able to maintain the visual subject of the image is that they do not add any new information to the image. Instead, they apply deterministic rules to the existing pixel data in order to generate a higher resolution version of the original image.

This means that the resulting image is still composed of the same basic set of data, with no additional information that could lead to false estimations by AI algorithms. This is important, as false estimations could lead to incorrect interpretations of the image, which could have significant consequences in certain contexts.

Another advantage of pixel art emulator upscaling algorithms is that they do not rely on AI, which can be unstable or require a significant amount of computational power. Instead, they use deterministic rules that are smart, efficient, and reliable, making them an ideal solution for applications where accuracy and efficiency are critical.

Additionally, when we upscale a pixel art image using Omniscale or other similar algorithms, we can generate SVG paths that can be used to create vector images. This creates a bridge between raster and vector images, allowing us to create complex images from a very small set of data.

Overall, pixel art emulator upscaling algorithms are an excellent tool for generating high-quality images that retain the visual subject of the original pixel art, while increasing resolution and detail. They are reliable, efficient, and do not rely on AI, making them a great option for a wide range of applications.

PNG to SVG technologies

SVG (Scalable Vector Graphics) is a powerful and versatile image format that allows for resolution-independent rendering of graphics on the web. While it has traditionally been used for creating high-quality graphics and animations, SVG technologies can also be used for practical applications in a variety of industries.

One interesting use case for SVG technologies is in the creation of high-quality images from pixel art. By using pixel art emulator upscaling algorithms to generate high-quality images, it is possible to then convert these images to SVG format. This process involves converting the pixel art into vector paths, which can then be manipulated and modified in various ways to create complex and intricate designs.

One practical use case for this technology is in the creation of logos and icons for websites and mobile applications. With SVG technologies, it is possible to create highly detailed and complex designs that can be scaled to any size without loss of quality. This is particularly useful for websites and mobile applications, which often need to display logos and icons at different sizes and resolutions.

Another potential application for SVG technologies is in the creation of interactive infographics and data visualizations. By using pixel art and upscaling algorithms to generate high-quality images, it is possible to then convert these images to SVG format and use them to create interactive graphics that can be manipulated and modified in real-time. This can be useful for conveying complex data and information in a visually engaging way.

In conclusion, SVG technologies offer a wide range of potential applications beyond traditional graphics and animations. By using pixel art and upscaling algorithms to generate high-quality images that can be converted to SVG format, it is possible to create intricate and complex designs that can be scaled to any size without loss of quality. Whether it is for creating logos and icons or interactive data visualizations, SVG technologies offer a powerful tool for designers and developers alike.

Below you'll find the SVG version of the image we've used previously weighting 1.2 kB! We used xBRZ and ImageTracerJS.

Why to avoid clouds when we have IPFS still to avoid against blockchain

In today's digital age, we are seeing a surge in the popularity of non-fungible tokens (NFTs) as a new form of digital asset that represents unique, one-of-a-kind items. From digital art to music, NFTs are being used to represent and sell all sorts of creative content.

However, one of the biggest challenges facing NFT creators and collectors is how to ensure the long-term preservation and security of their digital content. While cloud infrastructure and IPFS (InterPlanetary File System) offer solutions for storing and sharing digital content, they still depend on the goodwill of a few people and natural events. This makes them vulnerable to risks such as data loss or corruption, and makes them an unreliable option for long-term storage.

This is where pixel art comes in as a savior. By using indexed palette PNG format for encoding pixel art, NFT creators can achieve smaller file sizes than other lossless compression formats while preserving image quality. Additionally, pixel art emulator upscaling algorithms provide a reliable and efficient solution for generating high-quality images that retain the visual subject of the original pixel art.

But why should we avoid cloud and IPFS if no means to pay server after anyone's death is put in place? The answer is simple - these solutions are not self-sustaining. In the event of the death of the person responsible for maintaining the server, or in the event of natural disasters or other catastrophic events, there is no guarantee that the data will be preserved. This makes them unreliable options for storing valuable content.

On the other hand, blockchain technology offers a secure and self-sustaining solution for storing NFTs. With its self-evolving value, consensus, and technology, blockchain beats by a plethora of time the idea to store images worth millions on cheap solutions worth a few cents. By storing NFTs on the blockchain, creators and collectors can be assured that their content will be preserved and protected for generations to come.

In conclusion, pixel art is a savior for NFT creators and collectors looking for a reliable and secure solution for preserving their digital content. By avoiding cloud and IPFS and instead utilizing blockchain technology, we can ensure that our valuable content is preserved and protected for the long-term.

The cost of storing data on a blockchain

Storing data on a blockchain, especially large amounts like images, can be quite expensive because blockchain networks are designed for decentralized security, trust, and consensus, not for large-scale storage. The cost of storing data on a blockchain is determined by the network's storage fees and the gas fees associated with interacting with a smart contract.

Here's a rough estimation of the costs for storing a 10 KB image on some popular blockchain networks (prices may vary due to market fluctuations and network congestion):

- **Ethereum (ETH):**
  Gas price: ~50-200 Gwei (can vary significantly)
  Gas per byte: 68 (non-zero byte)
  10 KB image = 10,000 bytes
  Estimated cost: (10,000 * 68) * Gas price
  Cost range (in ETH): 0.034 - 0.136 ETH
  Cost range (in USD): $60 - $240 (assuming 1 ETH = $1,750)
- **Binance Smart Chain (BSC):**
  Gas price: ~5-20 Gwei (can vary)
  Gas per byte: 68 (non-zero byte)
  10 KB image = 10,000 bytes
  Estimated cost: (10,000 * 68) * Gas price
  Cost range (in BNB): 0.0034 - 0.0136 BNB
  Cost range (in USD): $1 - $4 (assuming 1 BNB = $300)
- **Cardano (ADA):**
  Storage fee: ~0.155 ADA/KB
  10 KB image = 10 KB
  Estimated cost: 10 * 0.155 ADA
  Cost (in ADA): 1.55 ADA
  Cost (in USD): $3.1 (assuming 1 ADA = $2)
- **Solana (SOL):**
  Storage fee: ~0.0001 SOL/KB
  10 KB image = 10 KB
  Estimated cost: 10 * 0.0001 SOL
  Cost (in SOL): 0.001 SOL
  Cost (in USD): $0.002 (assuming 1 SOL = $200)

Please note that these estimations are for illustration purposes only and are based on approximate costs. Actual costs may vary depending on the network's current state, transaction fees, and token prices. Additionally, it's worth noting that storing large amounts of data on-chain is not the intended use case for most blockchains.

For storing large amounts of data, you may want to consider using decentralized storage solutions like IPFS, Filecoin, or Arweave, and then storing the hash of the image in the smart contract instead.

Estimating the survival time of a file stored on a blockchain like Solana or Cardano

Estimating the survival time of a file stored on a blockchain like Solana or Cardano in the event of nuclear war or natural disasters is quite challenging due to the multitude of factors involved. However, we can attempt to make an educated guess based on some assumptions.

Blockchains are decentralized networks that rely on multiple nodes located around the world to function. The more distributed the network, the higher the likelihood of survival in the event of localized disasters. Both Solana and Cardano have numerous nodes distributed worldwide, which increases their resilience against natural disasters or geopolitical conflicts.

However, we must consider the following factors that could affect a blockchain's survival:

- **Node distribution:** If the majority of nodes are concentrated in specific geographical areas, a localized disaster or conflict could severely impact the network.
- **Interconnectivity:** The internet infrastructure is crucial for blockchain networks to function. Widespread internet outages or disruptions caused by natural disasters or war could temporarily or permanently affect the network's operation.
- **Human intervention:** In times of crisis, governments may impose restrictions or even shut down blockchain networks, which could lead to the loss of stored data.
- **Long-term adoption and network relevance:** The survival of a blockchain network also depends on its long-term adoption and relevance. If a network loses support or is replaced by a better technology, the stored data might be at risk.

With these factors in mind, it's impossible to provide a precise percentage estimation for the survival of a file stored on Solana or Cardano. However, we can generally state that the decentralized and distributed nature of these networks increases their resilience to disasters and conflicts.

Both Solana and Cardano are decentralized blockchain networks, meaning that data is replicated across multiple nodes worldwide to ensure security and redundancy. The exact number of nodes in each network can change over time as new nodes join or leave the network.

As of my knowledge cutoff in September 2021, the number of nodes in each network was as follows:

- **Solana:** Solana had over 400 validator nodes globally. It is essential to note that this number could have changed since then, as the Solana network continues to grow and attract new participants.
- **Cardano:** Cardano had over 2,500 stake pools (nodes) operating in its network. The number of nodes in the Cardano network has likely also increased since then, given the interest in the project and the launch of smart contracts.

It's important to keep in mind that the number of nodes does not directly translate to the number of times data is replicated. Some nodes may store only a portion of the entire blockchain, while others store a full copy. Additionally, the number of nodes in each network can change over time as new nodes join, existing nodes go offline, or the network's consensus mechanism evolves.

In both Solana and Cardano networks, as long as a sufficient number of nodes remain online and well-distributed geographically, the data stored on the blockchain should remain accessible and secure.

While it's true that storage costs have been decreasing over time due to technological advancements, it's essential to understand that blockchains are not designed primarily for storage purposes. They are designed for security, trust, and consensus in a decentralized manner. As a result, storing data on a blockchain can still be relatively expensive compared to traditional storage solutions.

The primary reasons for higher storage costs on blockchain are:

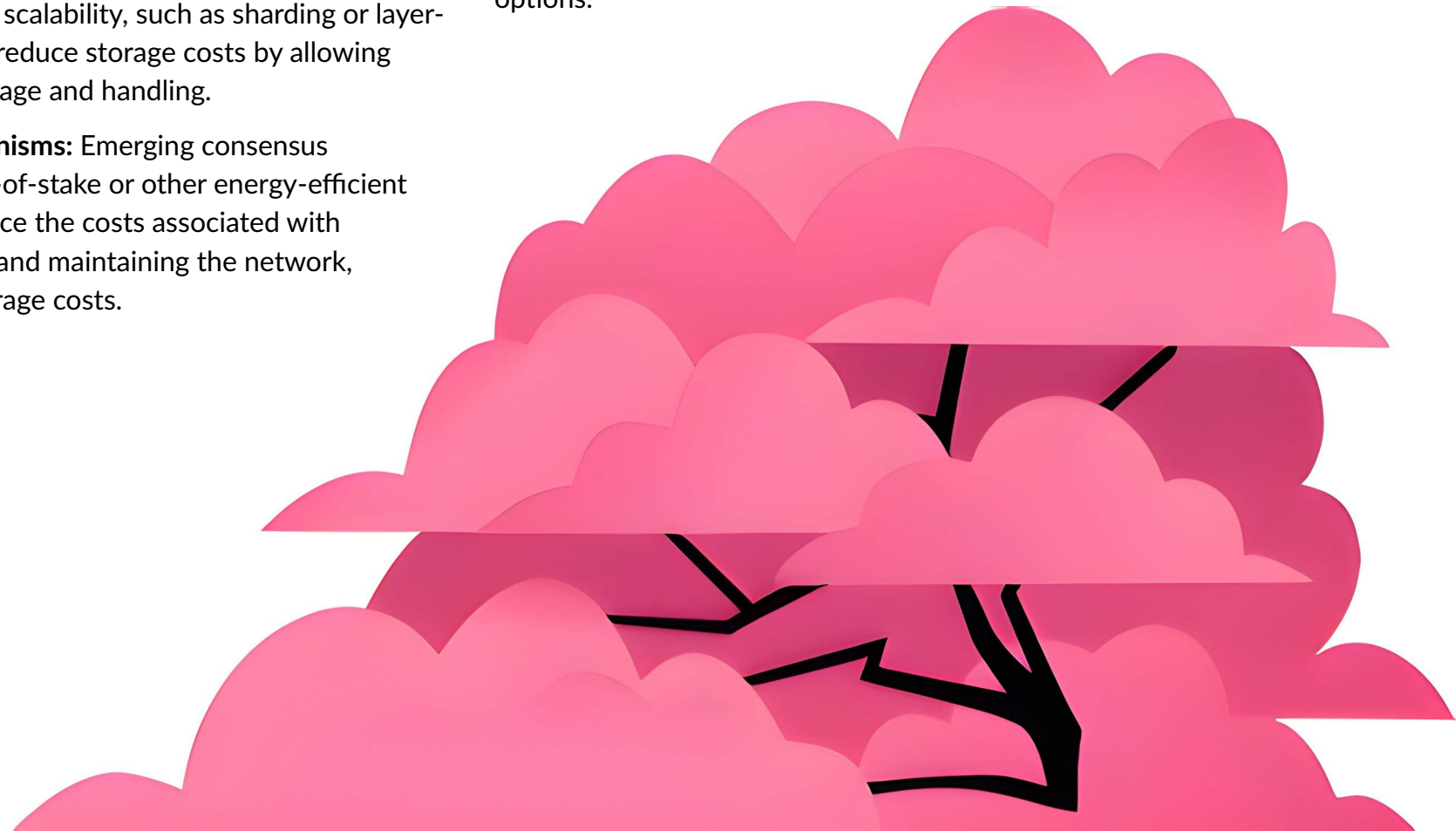
1. **Redundancy:** Data on a blockchain is stored across many nodes for redundancy, which increases the storage costs compared to centralized storage solutions. This redundancy is necessary for decentralization and security but comes at a cost.
2. **Scalability:** Blockchains have limited scalability, which affects storage capacity. As the network grows and more data is added to the blockchain, the storage cost for each transaction or data entry increases.
3. **Incentives:** Validators or miners need to be compensated for their efforts to maintain the network and validate transactions. These costs, along with the costs of running nodes (electricity, hardware, maintenance), contribute to higher storage costs.

Now, let's discuss how storage costs might change over the next 100 years. It's challenging to predict exact numbers, but we can make some educated guesses based on historical trends and the rapid pace of technological advancements.

1. **Technological advancements:** As technology continues to evolve, we can expect storage solutions to become more efficient and cost-effective. This could lead to cheaper storage solutions, even in the context of decentralized systems like blockchain.
2. **Improved scalability:** As blockchain technology matures, new solutions for increasing scalability, such as sharding or layer-2 solutions, could help reduce storage costs by allowing more efficient data storage and handling.
3. **New consensus mechanisms:** Emerging consensus mechanisms, like proof-of-stake or other energy-efficient alternatives, could reduce the costs associated with validating transactions and maintaining the network, ultimately lowering storage costs.

Taking these factors into account, it is reasonable to expect that the cost of storing data on a blockchain could decrease significantly over the next 100 years. However, predicting an exact reduction is nearly impossible due to the many variables and uncertainties involved in technological development and market dynamics.

It's also worth noting that while the storage costs on blockchains may decrease, they may still not be as cost-effective as traditional or other decentralized storage solutions. For this reason, it's crucial to consider the specific use case and the desired features (e.g., decentralization, security, immutability) when evaluating storage options.



Conclusion

In conclusion, the world of digital art and content creation is evolving rapidly, and with it comes new challenges and opportunities for preserving and protecting our valuable digital assets.

While cloud and IPFS solutions may provide a convenient means of storing and sharing digital content, they can also be unreliable and vulnerable to risks such as data loss or corruption.

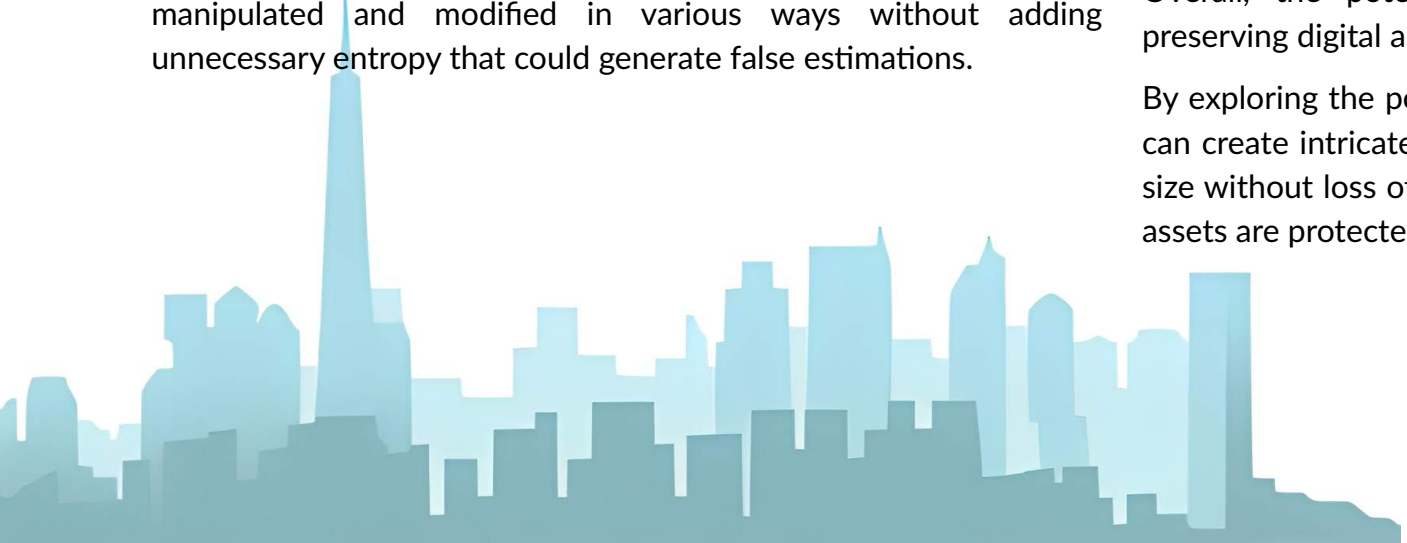
On the other hand, blockchain technology offers a secure and self-sustaining solution for storing NFTs and other valuable digital assets for the long-term.

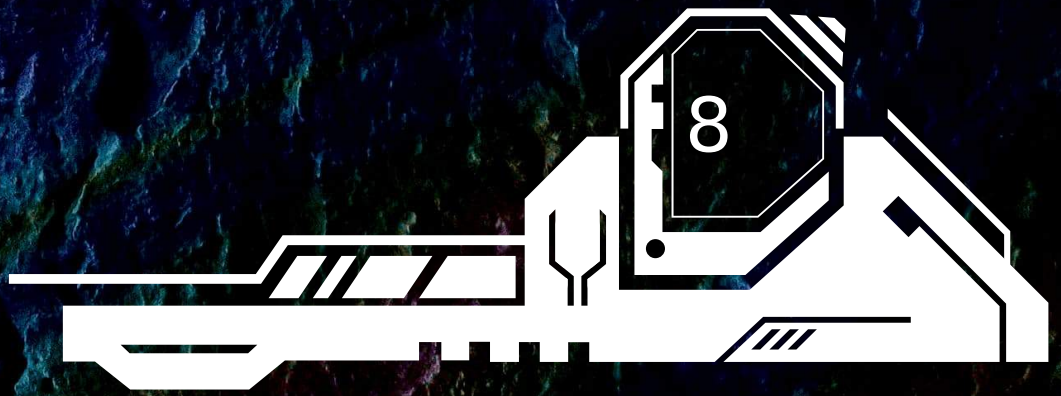
In addition, the rise of AI poses a new threat to the integrity and security of our digital assets.

By utilizing pixel art and indexed palette PNG format, NFT creators can achieve smaller file sizes while preserving image quality, and by using pixel art emulator upscaling algorithms and converting to SVG format, it is possible to create high-quality images that can be manipulated and modified in various ways without adding unnecessary entropy that could generate false estimations.

Overall, the potential of SVG technologies for creating and preserving digital art and content is truly remarkable.

By exploring the possibilities of pixel art and SVG technologies, we can create intricate and complex designs that can be scaled to any size without loss of quality, and can ensure that our valuable digital assets are protected for the long-term, even up to a thousand years.

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