UNIVERSITY of NICOSIA

Session 6

Beyond DeFi

BLOC 611: Introduction to Decentralized Finance

Objectives

- Explore the world of NFTs
- Break down the NFT sector
- Explore indicative NFT projects
- Recognize the different standards in major blockchain networks that support NFTs
- Acknowledge existing blockchain-based metaverses
- Introduce the concept of DeFi 2.0
- Present indicative DeFi 2.0 protocols

Boundaries between segments in NFTs and DeFi 2.0 are not always 100% clear in an area of constant innovation, experimentation, and practically infinite combinations of characteristics and functionalities.

Disclaimer: As usual, the inclusion of any particular blockchain project or organisation is for educational purposes only. This should not be construed as an endorsement or investment advice.

Agenda

1. The art of Digitization
2. Defining NFTs
3. NFT Hype
4. NFT Classification
5. NFT Standards
6. NFT Marketplaces
7. UNIC Initiatives
8. The Metaverse
9. DeFi 2.0
10. DeFi 2.0 – Protocols
11. Conclusions
12. Further Reading

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1. The Art of Digitization

The art of Digitization

- The potential of blockchain technology is not limited to cryptocurrencies
- As we demonstrated in the previous weeks, with tokenization and wrapped tokens, almost everything can be digitized (e.g., art, music, educational certificates, collectibles, event tickets etc.)
  - Jack Dorsey's Genesis Tweet, Grimes' artwork[1]
  - Digital blockchain-verifiable certificates (see Block.co)
- Cryptocurrencies are fungible tokens, i.e. they are (mostly) interchangeable (e.g. 1 bitcoin could be exchanged for any other 1 bitcoin without loss of value)

However, most things in the world is unique - they are NOT interchangeable (fungible)

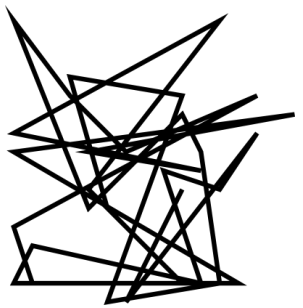
- Your phone, personal suitcase, house, car, dog …. all are unique

Non-fungible Tokens (NFTs) are a token type that enables the exchange of ownership of unique digital items, introducing a new proof of ownership

Source: 1.Cointelegraph, 2. jingculturecommerce.com

History of NFTs at a glance

- **Colored Coins** (c. 2012) – An attempt to represent real world assets on the Bitcoin blockchain, using bitcoin denominations (i.e., satoshis)
  - They exemplified a leap in the usage of Bitcoin blockchain
  - Not efficient, as the Bitcoin network was not designed with such uses in mind
- Artworld Ethereum (July 2014) by Rhea Myers – Oldest Ethereum art market one year before Ethereum mainnet launch (July 2015)
  - Myers showed how smart contracts could be used to create smart property
- Pepereum Project (2017) – NFT project focused on Pepe memes similar to Rare Pepes collectibles
  - Created a decentralized meme marketplace and trading card game
- John Watkinson and Matt Hall (Larva Labs) (June 23,2017) – CryptoPunks
  - 10,000 unique avatars on the Ethereum Blockchain



Source: 1. Wikipedia 2. Cointelegraph, 3. Cointelegraph, 4. Medium Article, 5. Metaversal, 6. OpenSea, 7. Larvalabs.com

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2. Defining NFTs

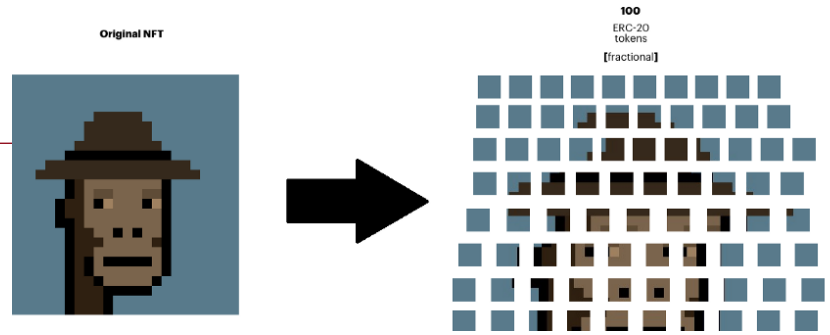
Defining NFTs

- **NFTs are digital assets that cannot generally be interchanged for another asset of the same type at par value**

- NFTs enable digital representations of information or data – proof of ownership
  - NFT ownership is recorded on the blockchain
  - Blockchain verification of NFTs establishes digital scarcity and uniqueness of each asset

Source: 1. Kraken Intelligence, 2. Wikipedia

NFT attributes (1/4)

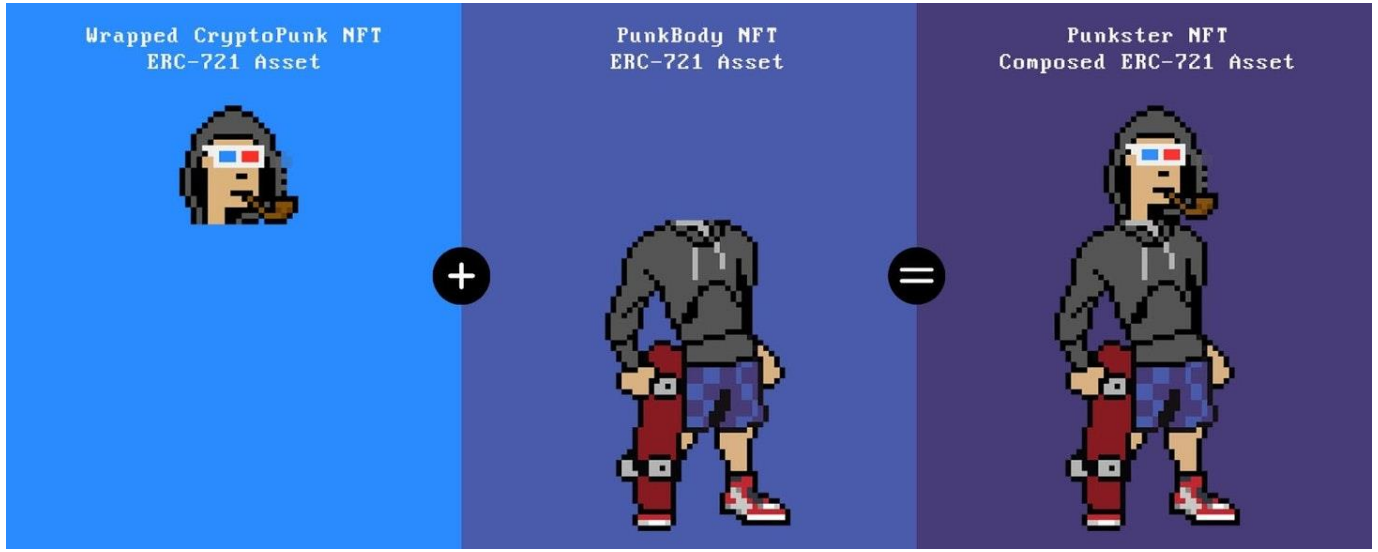


- **Indivisibility:** NFTs cannot be split into smaller denominations
  - E.g., You cannot purchase 10% of a plane ticket.
  - **Fractional ownership** of blockchain-based NFTs is however possible (just as many people can collectively be the owners of a certain painting – but the painting itself is not divisible)
    - An example is Fractional: a decentralized protocol that tokenizes fractional ownership of NFTs, providing the ability for several people to collectively own a single NFT.

Source: 1. Factional.art

NFT attributes (2/4)

- **Composability:** Ability of a token to combine different NFTs to represent a combination of digital assets
  - Composability enables NFT owners to formulate asset combinations
  - PunkBodies provides the ability to CryptoPunk owners to create a closet of “Bodies”, creating combos
  - PunksComic creates stories for Cryptopunks to create new digital assets.

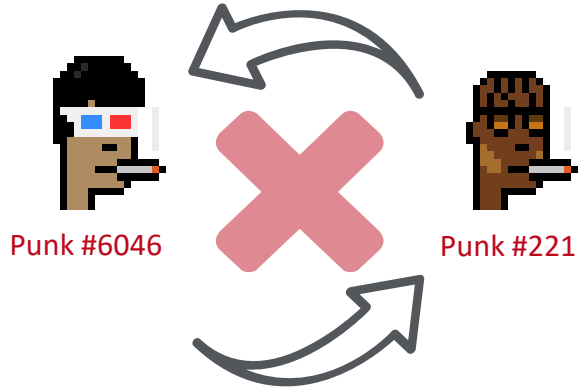


Source: 1. Metaversal, 2. PunkBodies

NFT attributes (3/4)

- **Scarcity:** NFTs generally have finite supply, determined by their creator
  - CryptoPunks are 10,000 uniquely generated characters
  - Similarly, the Bored Ape Yacht Club is a collection of 10,000 unique Bored Apes
  - In contrast, Nouns aim to create an infinite collection of NFTs, minting one daily forever.

- **Uniqueness:** Generally, NFTs are not interchangeable
  - NFTs represent uniqueness in a programmable way



Source: 1. Larvalabs.com,

NFT attributes (4/4)

- **Transparency:** Records of token issuance, transfer and activity can be publicly verified (in public, permissionless blockchains at least)
  - Buyers can trust and verify the authenticity of a specific NFT

- **Interoperability:** Theoretically, NFTs could be traded, purchased or sold across different DLTs
  - An NFT token can do different things in different DLTs. For example, a Bored Ape from the Bored Ape Yacht Club could be bridged to a different blockchain to be used as an avatar in a metaverse world

Source: 1. Kraken Intelligence, 2. Hedera, 3. BAYC

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3. NFT Hype

The NFT Hype

- The NFT market has experienced explosive growth in 2020-21
- In the whole of 2020, the NFT market had traded about $250M worth of tokens; in the first three quarters of 2021, this figure has increased more than **2,000%** to $5B
- NFTs are a horizontal technology that can disrupt many areas:
  - Art, Tickets, Coupons, Real Estate, Supply Chain, etc

Total volume traded in NFT per year				
	2018	**2019**	**2020**	**2021 (Q3)**
USD Traded[1]	$159 142 527	$62 862 687	$250 846 205	$5 915 337 738

Sources: 1. Data collected from nonfungible.com Yearly, Quarterly reports and reuters.com report

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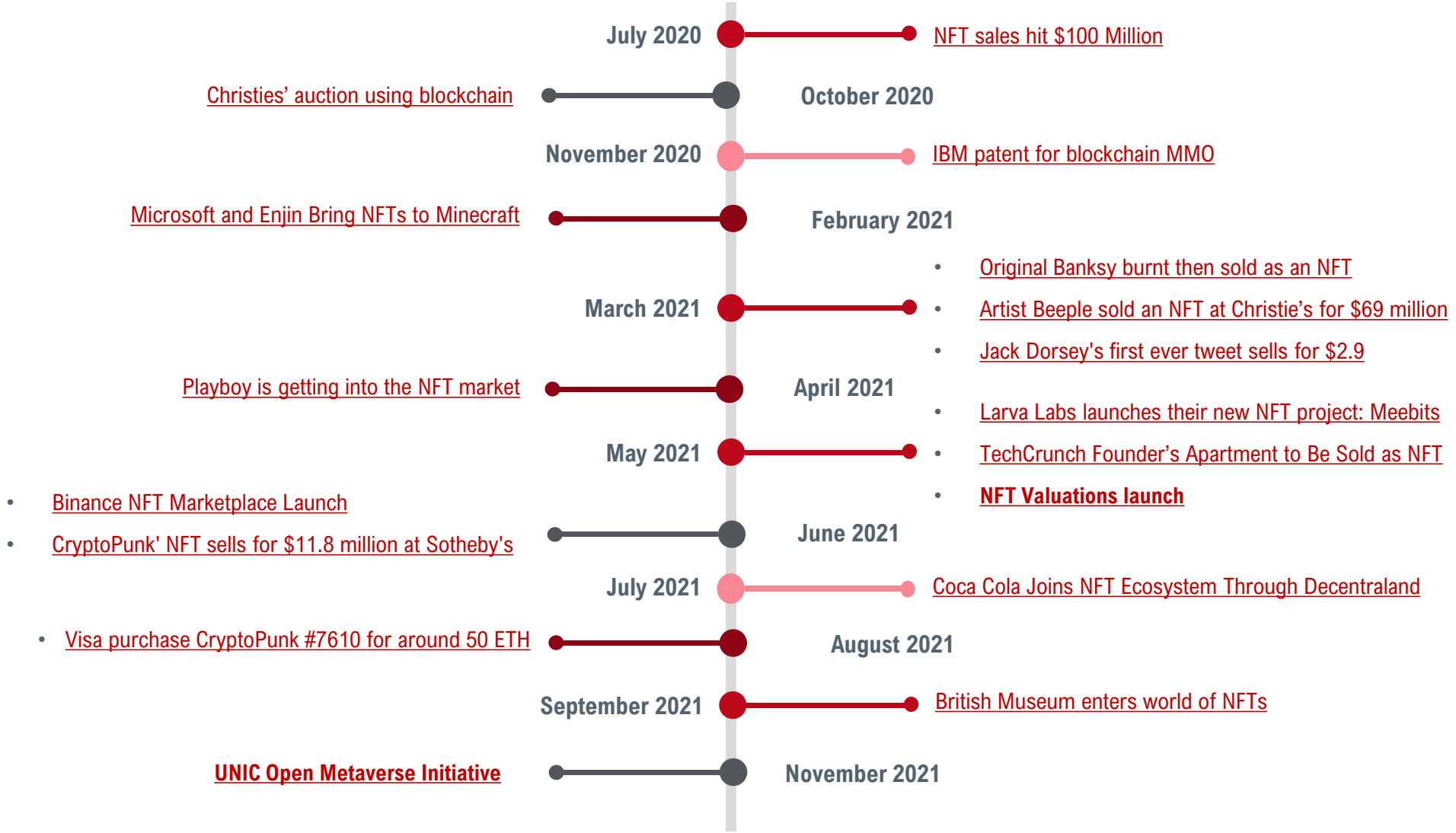

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4. NFT Classification

On-chain vs. Off-chain assets

- **Natively Digital (e.g., art, collectibles, music)**: Assets that exist only on-chain
  - A Bored Ape is stored as an ERC-721 token on Ethereum blockchain and it is hosted on IPFS
  - Loot – A randomized adventurer gear generated and stored on chain
- **Off-chain**: NFTs that represent ownership of a metadata file linked to some real-world asset
  - A land title may exist off-chain, but it could be tokenized as an NFT providing rights for usage to the holder. NFT metadata should include the details of the land title.
  - An event ticket could be tokenized as NFT, providing a verifiable proof of attendance for the owner. NFT metadata should include the details of the concert (e.g., concert title, date, event purchase price, etc.)

Sources: 1.IPFS.io, 2. 101Blockchains

Industry Segment (Application type)

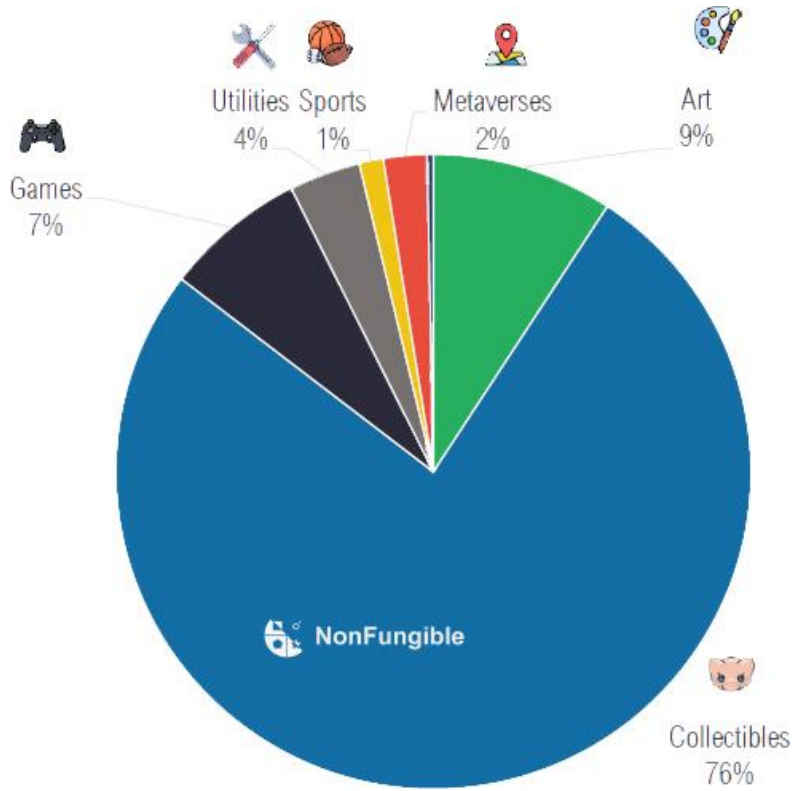
- Art – An NFT which is a work of art or relates directly to an art form, whether manual or generative
- Collectibles – A project whose primary function is to issue tokens intended to be collected. These tokens can be part of a system that includes gamification or a set of interactions between collectibles themselves or between collectors and players
- Gaming – Video game, game cards/items or any other gaming experience incorporating in NFT
- Metaverses – Parallel digital universes that offer a set of unique experiences to users. These virtual worlds may be accessible via a computer, virtual reality headset or smartphone.

Sources: 1.Non-fungible.com, 2. 101Blockchains

Industry Segment (Application type) (cont.)

- Sports – Tokens built around personalities from the world of sport, most often in connection with real-world players and teams, such as Formula 1, football clubs, etc.
- Utilities – A wide variety of projects in which the NFT itself does not have any of the above functions. Among others, NFTs can be domain names, assets that can grant access or specific rights to their owner, e.g. tickets, etc.

Market distribution (Q3-2021)



Sources: 1.Non-fungible.com, 2.101Blockchains

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5. NFT Standards

Ethereum NFT standards

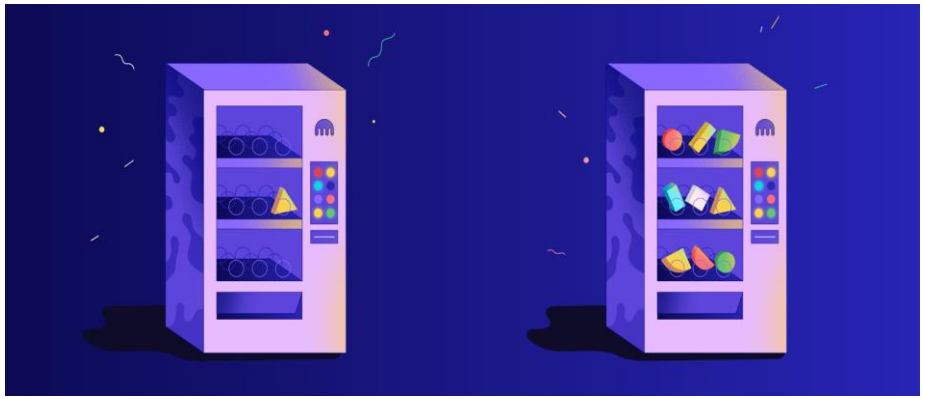
- Ethereum uses Ethereum Requests for Comment (ERC) to refer to the standards used for tokens that operate on the Ethereum blockchain
  - ERC-20 is the most popular standard for fungible tokens; ERC-721 introduced NFTs
- ERC-721 defines a minimum interface a smart contract must implement to allow unique tokens to be managed, owned and traded in the Ethereum blockchain
  - CryptoKitties were the first project to utilize ERC-721
  - Opened up a world of possibilities with NFTs – led several venture funds investing into the sector
    - Google Ventures (GV)
    - Andreessen Horowitz (a16z)
  - CryptoPunks were something between an ERC-721 and ERC-20 token (ERC-721 had not yet been issued)
    - Punks were an inspiration for the ERC-721 standard

Source: 1.Ethereum Improvement Proposals 2. Coindesk, 3. Ethereum.org

Ethereum NFT standards

- ERC-1155 – The MutliToken Standard
  - Designed to enable combinations of non-fungible and fungible tokens in a single smart contract
  - Decreases redundant bytecode on the Ethereum blockchain (ERC-721 requires a new smart contract deployment for each new class of token)

ERC-721 vs ERC-1155



Source: 1.Ethereum Improvement Proposals, 2. CryptoKitties, 3. CryptoPunks, 4. Kraken Intelligence

Other L1/L2s that support NFTs

- Near
- Hedera Hashgraph
- Flow
- Efinity
- Polygon
- Binance Smart Chain
- Solana

Other L1/L2s that support NFTs

- Near

  - A Proof-of-Stake (PoS) blockchain developed in 2018
  - Faster and with lower gas fees than Ethereum
  - Near Supports its own standards for token generation including:
    - NEP-171, NEP-177, NEP-178, NEP-181, NEP-199

- Hedera Hashgraph

  - A Proof-of-Stake (PoS) blockchain
  - Generation of tokens through Hedera Token Service (HTS)
  - Ability to issue tokens (both fungible and non-fungible), which are native to Hedera, with the same performance, security and efficiency as HBAR without a smart contract

Other L1/L2s that support NFTs

- Flow
  - Proof of Stake consensus
  - Has its own standard for NFTs, comparable to ERC-721 and ERC-1155.
- Efinity
  - Built by Enjin and aims to become the primary network for NFTs by supporting NFTs from any blockchain
  - Paratoken standard: Enjin developed a token for the Polkadot and Kusama parachains. Through the paratoken standard Efinity accepts tokens (both fungible and non-fungible) from any other chain, including ERC-20, ERC-721, ERC-1155.

Other L1/L2s that support NFTs

- Polygon (formerly called Matic)
  - L2 – A protocol and a framework for building and connecting Ethereum-compatible blockchain networks
  - Much faster (and cheaper) to use, supports all Ethereum NFT standards

- Binance Smart Chain
  - Proof of Staked Aut nsensus
  - EVM compatible
  - Has its owned standard for NFT tokens, called BEP-721

Other L1/L2s that support NFTs

- Solana 

  - One of the fasted blockchains available, with over 400 projects spanning DeFi, NFTs, Web3
  - Minting NFTs on Solana requires the invocation of the Solana Program Library (SPL)
  - Metaplex Token Metadata – A contract for supporting the linkage of metadata with SPL tokens.

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6. NFT Marketplaces

NFT Marketplaces

- Examples:
  - Opensea ~$10B*
  - Rarible ~ $260M*
  - SuperRare ~$168M*
  - Foundation ~$101M*

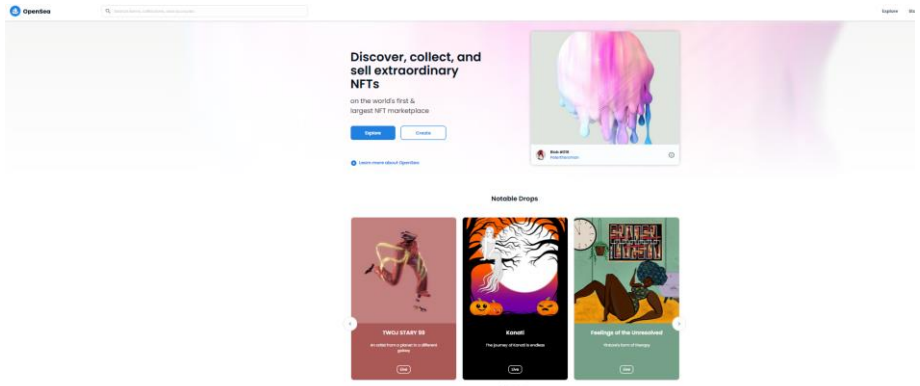
- Types of NFT Marketplaces
  - Focused on digital art – OpenSea, SuperRare, Rarible, Nifty Gateway, Foundation
  - Gaming/Metaverse/Collectibles/other – Axie Infinity, Sorare, Decentraland, OpenSea, The Sandbox, Enjinx

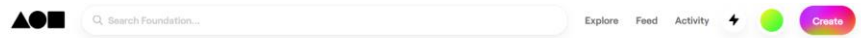
*All Time Volume – Captured early November 2021

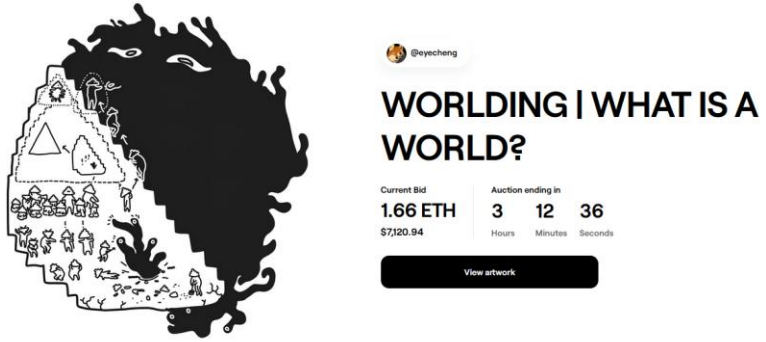
Source: 1. DappRadar

NFT Marketplaces (continued)

- Characteristics of Marketplaces
  - Buying NFTs – Explore collections and buy NFTs using a crypto wallet
  - Selling NFTs – Sales of bought, collected or created NFTs
  - Minting NFTs – Deploy NFT collections on the blockchain and make them available to the market







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7. UNIC Initiatives

NFT Valuations

- Building an automated, AI-based valuation tool for NFT collections
  - Establish a robust and defensible methodology for calculating NFT market capitalizations
  - Value of all NFTs within a specific NFT collection
- Challenges in valuing NFTs
  - As they are non-fungible, valuation models need to take into account the general price level in the ecosystem
  - Calculations of fungible token market capitalizations is trivial by comparison
  - The NFT ecosystem valuation is at least an order of magnitude more difficult
  - Large volatility swings in crypto-asset prices in general over time, which also complicates the modelling
- Valuation of CryptoPunks
  - Initial use case of an NFT ecosystem valuated – 1,543,250.40 ETH ($6.95B)* Early November 2021
- A second version of the NFT Valuations is about to launch soon – Stay Tuned

Sources: 1. NFTValuations

UNIC Open Metaverse Initiative

- Launching a free MOOC focused on NFTs/metaverse in February 2022
- Begun development of an MSc in Metaverse Systems
- Launching a new research center on the metaverse (The Center for an Open Metaverse)
- Launching the Open Metaverse Alliance
- Supporting innovation and entrepreneurship in the field
- Incubating two startups in the NFT space that will launch this fall
- Rolling out NFTs on campus
- Decentralized will have a significant NFT/metaverse track this year

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8. The Metaverse

Definition

- What is the metaverse
  - From the words “beyond” and “universe”
  - In a metaverse people could:
    - Participate in virtual shows, conferences, digital galleries, meet-ups with friends
    - Own digital plots, arts, clothes, items
    - Build digital houses, businesses
    - Do almost everything as in real life and beyond
  - Think of the metaverse as a 3D internet, with blockchain/crypto embedded

Examples of existing metaverse initiatives

- Decentraland – Decentralized Virtual World
- Axie Infinity – Decentralized Gaming Ecosystem
- The Sandbox - Decentralized Gaming Ecosystem

- NFTs are related to the metaverse with a reciprocal relationship:
  - NFTs are a fundamental building block of the metaverse (most items of a virtual world would need to be unique: avatars, land, items, etc.)
  - The metaverse is where NFTs could be hosted to have presence and uses in the 'real' (digital) world

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9. DeFi 2.0

From DeFi 1.0 to DeFi 2.0

DeFi is still at a nascent stage and evolving. One of the most recent developments is a collection of solutions that aim to address some of the shortcomings of liquidity dependent protocols.

As we have disucssed:

- DEXes rely on Automated Market Makers and Liquidity Providers to maintain their permissionless nature.
  - At the same time, they need to maintain “deep liquidity” so that users can execute trades at the best possible price.
  - To do so, DEXes rely on incentive programs to attact liquidity providers and users (liquidity mining and yield farming).
- Lending and Borrowing protocols also rely on liquidity providers to build a sustainable lending and borrowing market.
  - At the same time, to maintain their permissionless nature and mitigate coutnerparty risk, they must also rely on inefficeint mechanisms (overcollateralization).
  - Borrowing and lending protocols need to also reward borrowers and lenders.

Issues with DeFi 1.0 protocols

As we discussed in Week 4, one of the primary problem of DeFi 1.0 is that many protocols do not have deep liquidity, which leads to:

- AMMs for price discovery
- Overcollateralized loans
- Token rewards in an attempt to bootstrap and maintain liquidity

Which in turn result in a number of inefficiencies:

- Protocols need to promote token incentives to attract yield farmers and maintain liquidity.
- LPs earn by selling these tokens, thus putting downward pressure on prices.
- Lower prices means less incentives for LPs to provide liquidity.
- If/when incentives dry up, liquidity leaves the protocol in chase of higher yields.
- Vesting mechanisms (lock-up periods) only delay this inevitable exit.

Relevant quote

Liquidity mining is like a drug;
you have to wean yourself off it over time

Scoopy Trooples,
Co-founder Alchemix

Issues with DeFi 1.0 protocols (continued)

- Additionally, this model makes it hard to identify, and appropriately reward individuals that use the platform either for its services, or because they truly believe in it.
- Not only that, but these kinds of users are hurt the most, as yield farmers remove their liquidity and sell their tokens for profit.
- Finally, attacks, such as the vampire attack discussed in week 4, also feed on this incentive structure.

The explosive growth of DeFi has motivated new solutions that attempt to mitigate those problems.

- Protocols in DeFi 2.0 introduce the idea of **Protocol Controlled Liquidity (PCL)**.
- Instead of relying on LPs to bootstrap and maintain liquidity, DeFi 2.0 protocols own their own liquidity.

It is important to keep in mind that DeFi 2.0 is a very recent development. As such, there are no universally accepted definitions as to where exactly DeFi 2.0 begins or ends, and what exactly it encompasses. Another long period of experimentation, innovation and trial-and-error lies ahead for the community.

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10. DeFi 2.0 - Protocols

Olympus DAO

Olympus DAO, positions itself as a **reserve currency protocol**. It claims that no true store-of-value currently exists and that its native token OHM, is designed to fulfil this role. OHM is backed by a basket of assets that are stored in the Olympus DAO treasury.

The underlying logic is that since OHM is backed by assets that have utility and value outside of Olympus DAO, this creates an implicit price-floor for OHM, that is at least equal to the value of the assets backing it.

Users can participate in Olympus and earn OHM:

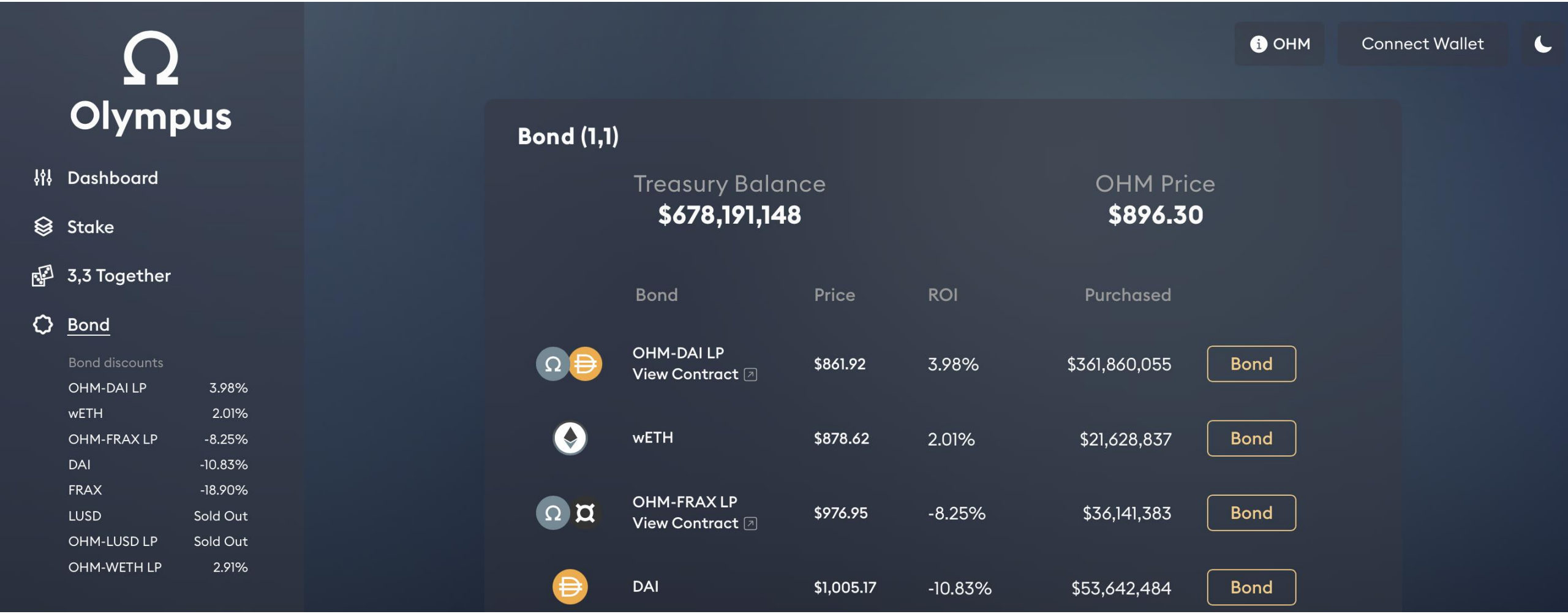
1. **Through the purchase of OHM-denominated bonds**

The protocol sells OHM at a discount from the market price (discount bond) in exchange for other assets. Besides wETH, DAI, FRAX, and more, **this also includes LP tokens that represent popular OHM exchange pairs in DEXes**. OHM acquired through bonds are locked for a short period (5 days). The discount (or markup) also varies depending on the type of token used to purchase the bond.

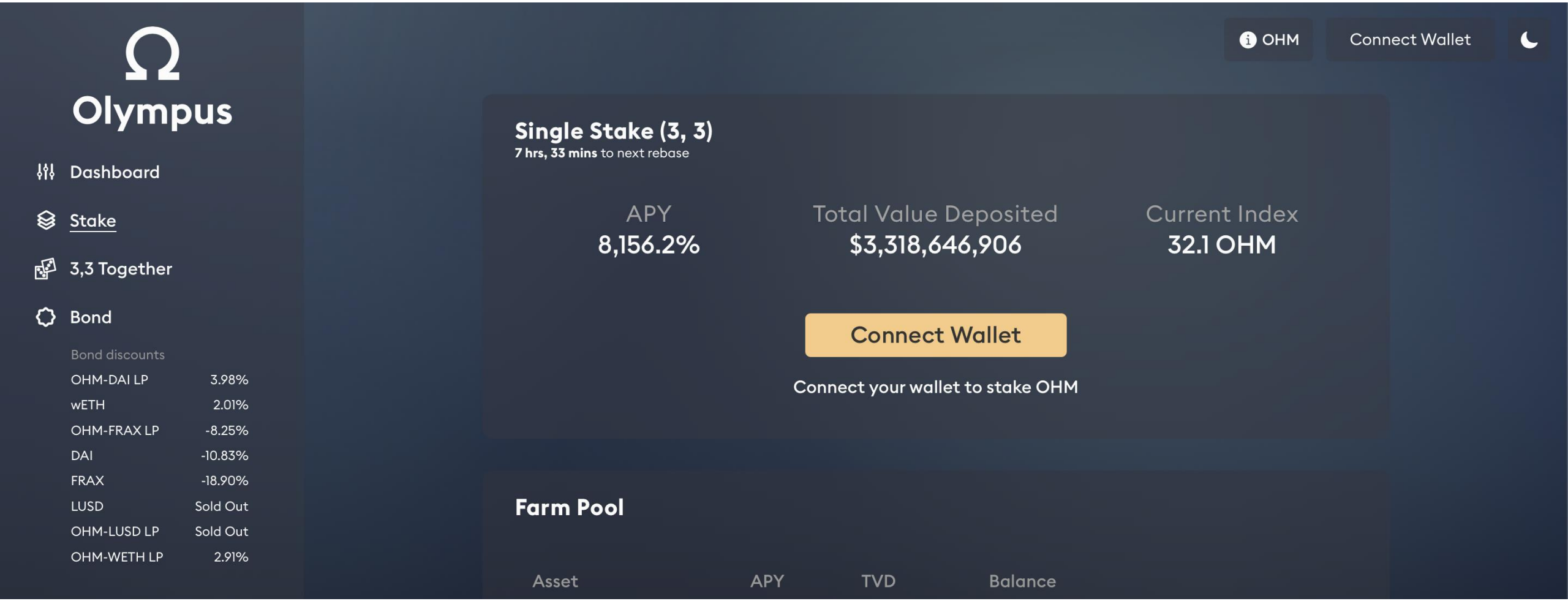
2. **By staking their OHM**

Users can stake OHM in exchange for rebase rewards (think of the example of algorithmic stablecoins in week 3)

Olympus DAO – bond interface



Olympus DAO – staking interface



Olympus DAO (continued)

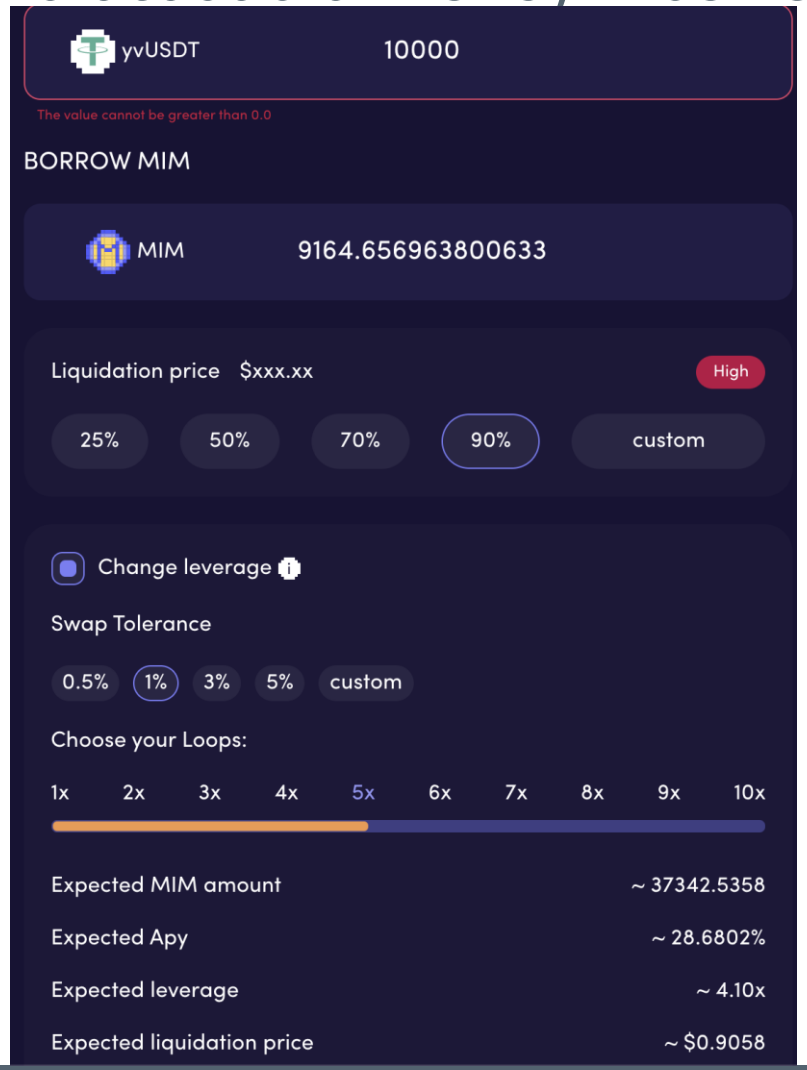
- The reserve assets of OHM include **LP tokens that represent popular OHM exchange pairs in DEXes.** This effectively means that the Olympus DAO effectively controls its own liquidity.
  - At the time of writing, Olympus owns 99.5% of its total LP supply across most major DEXes.
  - This, in theory, makes it immune to some of the problems we presented in the previous slides
  - Since bonds are sold at a discount from the market price, users can benefits from better prices
  - They also face no impermanent loss

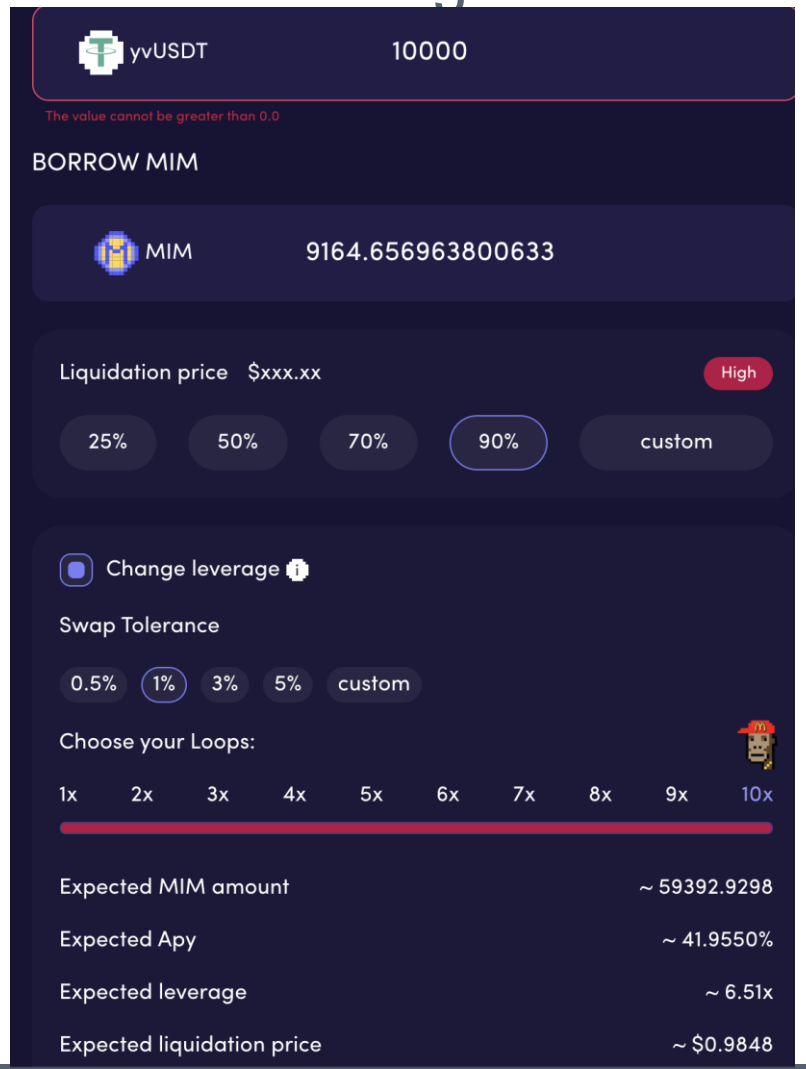
Moreover, Olympus has introduced Olympus Pro, making its bond system available to other protocols through a marketplace.

Abracadabra Money

- Abracadabra Money is a decentralized lending/borrowing protocol.
- Like MakerDAO, users can borrow against their collateral. However, instead of DAI, they receive Magic Internet Money (MIM), a stablecoin pegged to the USD.
- The main differentiation is that Abracadabra allows interest bearing tokens, such as yvYFI, yvUSDT, yvUSDC, and xSUSHI to be offered as collateral. This means that otherwise illiquid tokens can be used to generate additional and even leveraged yield.
- Imagine the following scenario:
  - A user has 10,000 in USDT (Tether)
  - They deposit it to a Yearn USDT vault with 2% returns
  - In exchange they receive yvUSDT, which is essentially the receipt that allows them to later withdraw their liquidity
  - Abracadabra allows users to deposit their yvUSDT (effectively worth $10,000) and borrow up to 90% against it
  - Users can even utilize a built-in function to repeatedly borrow and redeposit yxUSDT to abracadabra, effectively increasing their leverage
- Abracadabra makes borrowing more effective by giving users more control over their collateralization ratio (up to 90%), allowing for more stable and yield-earning collaterals (LPs of stablecoins)

Abracadabra Money – borrowing with x5 and x10 leverage





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11. Conclusions

Conclusions

- In this session, you have learned about non-fungible tokens (NFTS). You should now be able to differentiate between their different categories and segments like: art, collectibles, utilities, sport, metaverses, gaming. We have also explored the examples of NFT projects that made impact in the NFT space so far.
- Initiatives in the NFTs were presented and discussed including the NFT Valuations and the UNIC Open Metaverse Initiative
- We discussed the main elements of DeFi 2.0 and its potential to shape more efficient and robust protocols. You should now be ready to identify and anticipate new projects in the space, as well as old ones adopting new mechanisms and techniques

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12. Further Reading

Further Reading

Discover NFT collections, marketplaces rankings

- https://dappradar.com/nft

NFT Valuations Blog

- https://blog.nftvaluations.com/

NFT Museum

- https://www.architecturaldigest.com/story/the-worlds-largest-nft-museum-is-coming-to-new-york

Metaverse Festival

- https://nonfungible.com/blog/first-metaverse-festival-decentraland

A bad NFT Experiment

- https://metaversal.banklesshq.com/p/racoon-rugged-society

DeFi 2.0

- https://thedefiant.io/olympusdao-uniswap-defi-2-0-liquidity-mining/

Tip: Clicking while pressing Ctrl key opens a new tab in Chrome browser on non-Apple devices

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