UNIVERSITY *of* NICOSIA

Session 1

DeFi stack

BLOC 611: Decentralized Finance

Agenda

- The Defi Stack
  - Settlement layer
  - Asset layer
  - Protocol layer
  - Application layer
  - Aggregation layer
- DeFi Composability
  - What is DeFi Composability?
  - What is Not Composable
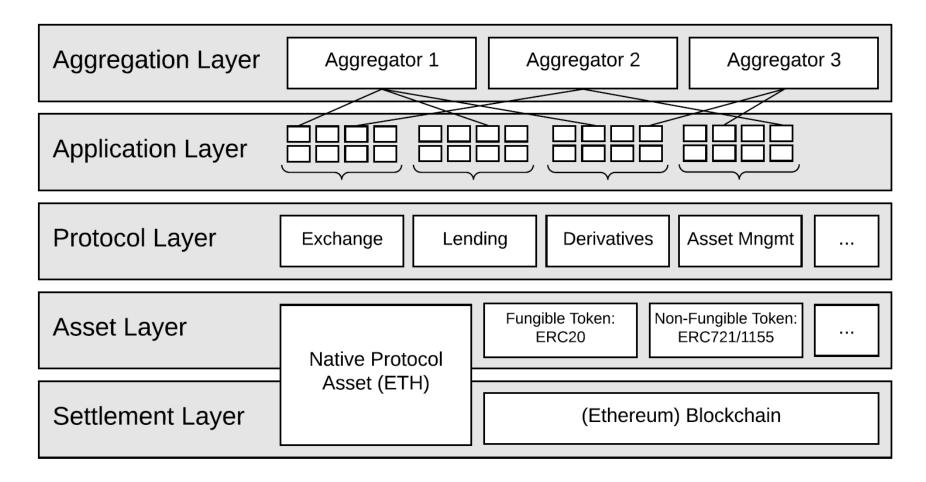 - What is Composable
  - DeFi the "Legos" of Finance
- Conclusions
- Further Reading

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.
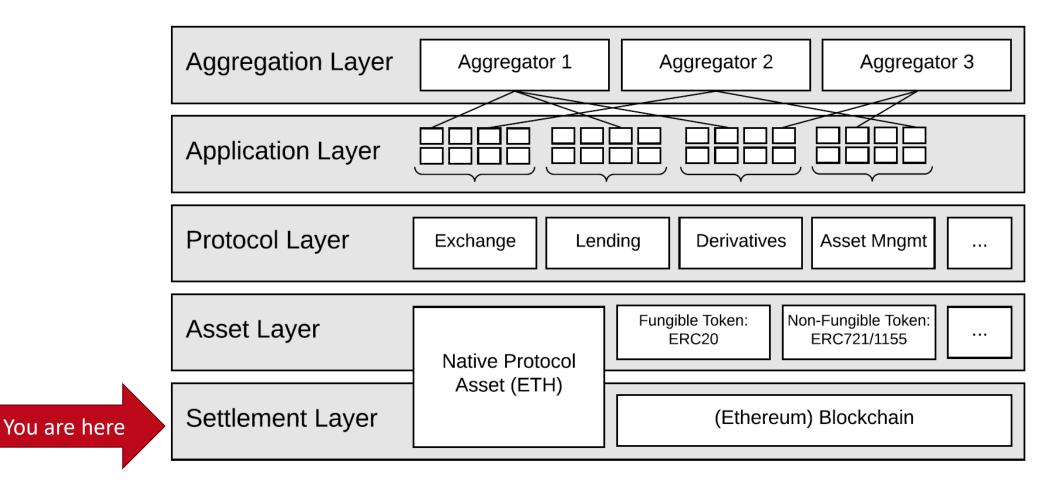
1. The DeFi Stack

The DeFi Stack

Source : Decentralized Finance: On Blockchain- and Smart Contract-based Financial Markets

Settlement Layer

Source : Decentralized Finance: On Blockchain- and Smart Contract-based Financial Markets

Settlement Layer

- Settlement layers are the **foundation** for all activities in a decentralized ecosystem, such as DeFi.

- They consist of the blockchain, as well as its native asset.

- In the case of Ethereum-based ecosystems, the settlement layer includes the Ethereum blockchain, and Ethereum's native asset, Ether.

- Settlement layers:

  - **Store** information and value, as well as ownership securely

  - Ensure that any **change** of the ownership status follows the the network's rules

  - Provide **trustless** execution

  - Serve as ultimate dispute resolution and settlement layer for transactions and state transitions

- Applications built on top of the settlement layer inherit the properties of the settlement layer (e.g., Security) and cannot influence its rules or functionality.

- More on Settlement Layer on **Session 2**

Indicative settlement layers

- Bitcoin
- Ethereum
- Tezos
- Avalance
- Binance Smart Chain
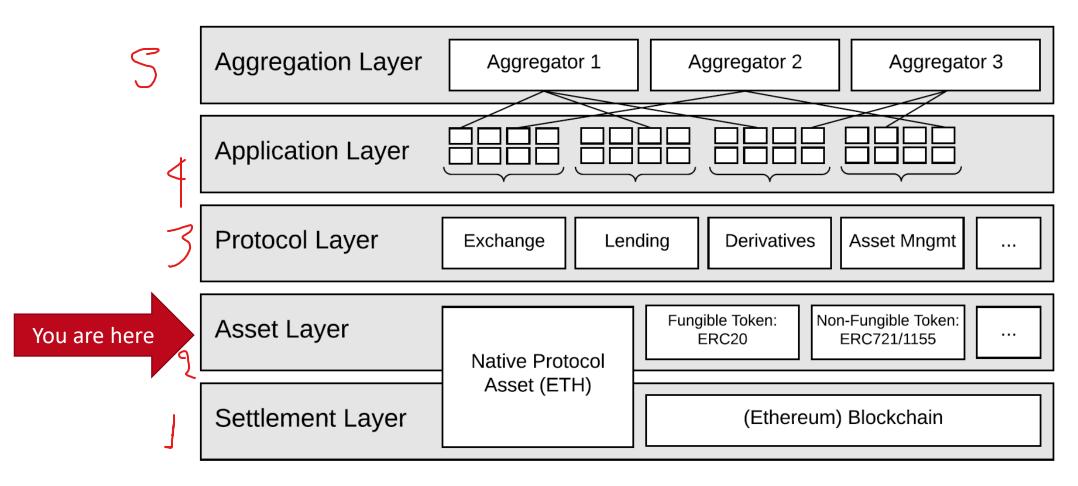- Solana
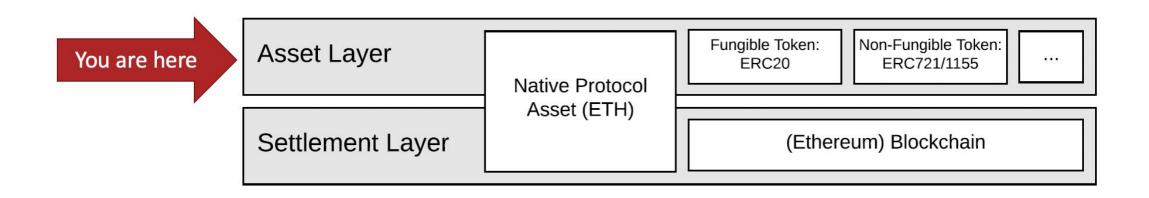- Polkadot
- Cardano
- Stellar
- EOS
- Etc.

Asset Layer

Asset Layer

- The asset layer consists of **all assets** that are issued on top of the settlement layer.

- This includes the network's native asset (e.g., in the case of Ethereum, Ether)

- Besides the native asset, other tokens in the asset layer can serve a plethora of functions

Asset Layer (Cont.)

- **Native Protocol Tokens**

  Native tokens of the Settlement layer serve as the *"lifeblood"* of the ecosystem, fueling, securing and underpining many of its basic functions, as well as of every application built on top of it. We discussed ETH and its properties in detail in week 1. Other examples include: BTC, ADA, XTZ, SOL, DOT and more

- **Tokens**

  Tokens are digital assets issued on top of a settlement layer. They serve numerous functionalities, and thus have unique characteristics and properties. In our introductory MOOC we have explored the various token types:

Asset Layer – Indicative Ethereum Token Standards

Tokens inherent their properties from specific token standards. In the case of Ethereum the most popular are the following:

- **ERC-20**

    The most standard API for fungible tokens. Blockchain-based projecs (dApps, DeFi) use this to issue their tokens on Ethereum, instead of creating an entirely new blockchain. ERC-20 tokens inherit many of the properties of the Ethereum network.

- **ERC-721**

    Is the token standard of the now-popular Non-Fungible Tokens (NFT). Unlike their fungible counterparts (e.g., ERC-20) NFTs, are unique and non-dividable. They are used for representing unique digital and physical asstets. More on that in Week 6.

- **ERC-1155**

    Supports different token types such as fungible, semi-fungible and nonfungible. It aims to minimize computational overhead and provide a gas-efficient token contract for developers.

Asset Layer – Indicative Ethereum Token Standards

- **Upcoming Token Standards**

  There are plenty of new token types that are being developed not only by the Ethereum foundation but across other Layer 1 protocols. A relatively recent example is that of the ERC-4337 token standard which allows for multisig wallets, social recovery and more efficient signature algorithms.

- **This is an ever-evolving space**

  You can find an exhaustive list of all token related standards proposed for the Ethereum network through this link.

Asset Layer – DeFi Tokens

DeFi has given rise to some special forms of tokens. We will explore those in detail in their respective sessions.
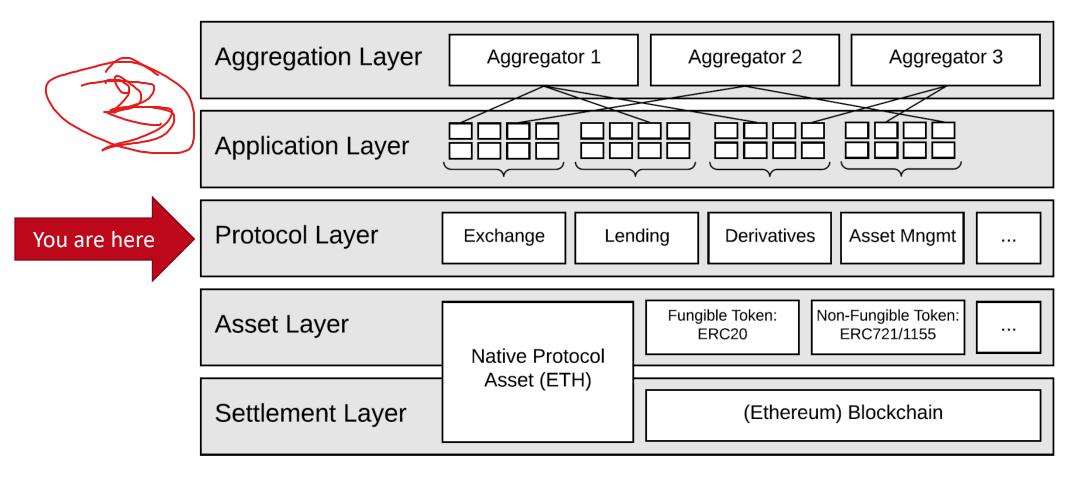
- **Governance Tokens**

  Serve as a mechanism for allowing the wider community to collaboratively decide the future of a decentralized protocol. Governance token holders can submit and vote on specific proposals. In the case of popular MakerDAO for example, users influence the complex financial and economics rules that keep the price of DAI stable.

- **Liquidity Provider (LP) Tokens**

  Liquidity provider tokens represent shares of individuals in liquidity pools, which are used by many Decentralized Exchanges. They provide liquidity providers with complete control over their tokens. We will discuss LP tokens and liquidity pools in detail in week 4.

Protocol Layer

Source : Decentralized Finance: On Blockchain- and Smart Contract-based Financial Markets
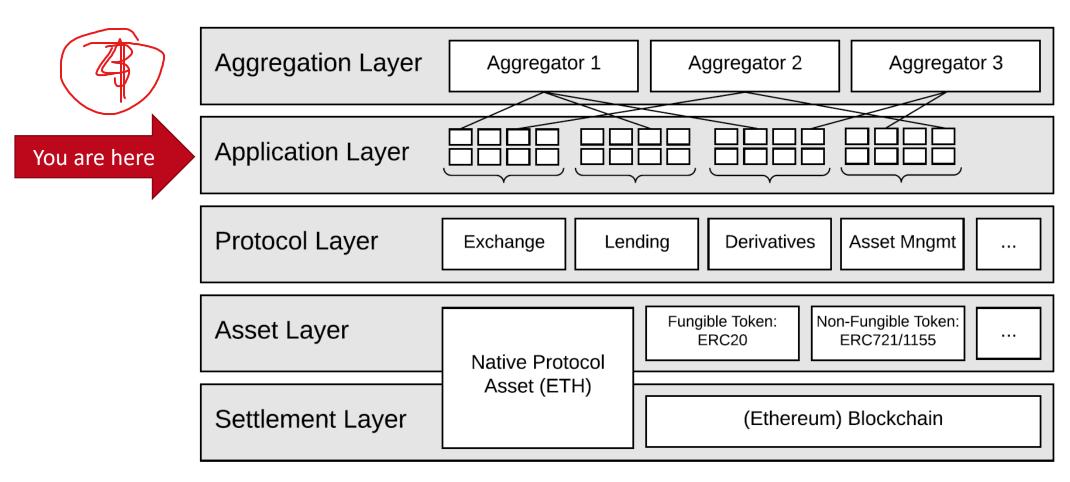
Protocol Layer

- The **Protocol Layer** is where the core functionality of decentralized applications, including DeFi lies. Decentralized applications are implemented as a smart contract, or collection of smart contracts that can be interacted with by a user or application in a standard Web 2 interface. The core functionality of virtually every dApp, including DeFi applications, "lives" in the protocol layer.

- This includes:
  - **Decentralized Exchanges**
  - **Stablecoins**
  - **Lending** and **Borrowing**
  - **Blockchain derivatives**
  - **And more**

- Because protocols are embedded into smart contracts the nature of this layer is highly interoperable.
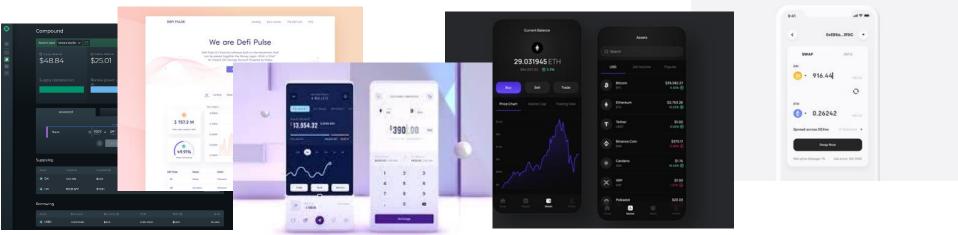
Application Layer

Source : Decentralized Finance: On Blockchain- and Smart Contract-based Financial Markets
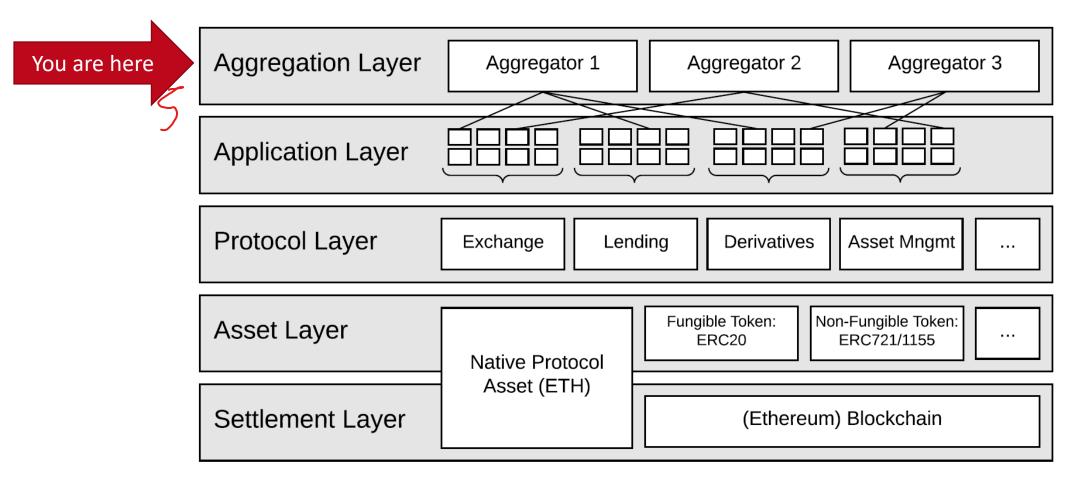
Application Layer

- Not all DeFi users have the ability to run code and execute transactions into the Layer 1 terminal. Therefore, it is a necessity applications to provide a **User Interface** (UI) for non-expert users to interact with the financial service.

- The Application Layer is the **front-end** layer that give **easy** access to the financial service for everyone.

- This Layer normally is a **web-based UI** that connects users to the rest of the DeFi app layers.

- Importantly, web applications are not the decentralized application itself.

Aggregation Layer

You are here

Source : Decentralized Finance: On Blockchain- and Smart Contract-based Financial Markets

Aggregation Layer

- This layer is an **extension** of the application layer. Like the application, it is another user-focused layer, that connects and combines several applications and protocols for convenience, comparability and cross-functionality. Many issues are addressed by aggregation layers, this includes:
  - Portfolio managers that provide granular views into what assets a user owns and on which applications.
  - This can be used for efficient **capital allocation** and optimization of **yield strategies**.
  - Price discovery, especially when it comes to decentralized exchanges (DEXes) – alongside the ability to interact with each platform.
- Promising platforms include:
  - **Zapper**
  - **InstaDapp**
  - **One of the several DEX aggregators (more on that in week 4)**

Aggregation Layer

- Offers a user-centric dashboard for open **positions** and their **corresponding value**

- Provides users with **capital allocation** services along a granular overview and management tools for their open positions

Session 1: Defi Stack

2. DeFi Composability

What is DeFi Composability?

- According to **Wikipedia**:

  "Composability is a system design principle that deals with the inter-relationships of components. A highly composable system provides components that can be selected and assembled in various combinations to satisfy specific user requirements."
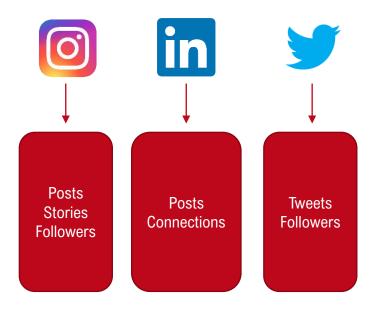
- As mentioned, the nature of the settlement layer and asset layer allow for interoperability.

- As we will see, special bridges also allow for transfer of information and value between different settlement and asset layers.

- Generally, **composability** in Decentralized Finance is the ability of decentralized applications, to interact with each other in a permissionless manner.

- Decentralized financial services can be combined to form novel and **complex** financial services.

- This is also known as the "Money Lego" aspect of DeFi.

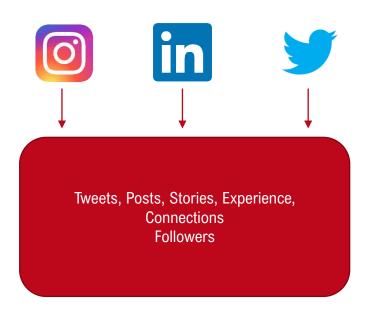Source: https://en.wikipedia.org/wiki/Composability

What is Composable?

- Now imagine that all your followers, friends, posts, photos, tweets are available to all your social accounts.

Non Composable

| Posts Stories Followers | Posts Connections | Tweets Followers |

Composable

Tweets, Posts, Stories, Experience, Connections
Followers

DeFi the "Lego" of Finance

- According to the **Defiprime** in the mid of 2021 there are more than **260** different DeFi projects in the ecosystem.

- Let's assume that each of the DeFi protocols is represented by a single piece of lego. If a user was like to combine just **3** of them then there are **17,576,000** different combinations.

- New users may find **ready-to-use** lego shapes, helping them to form even more complex financial combinations.

- DeFi projects can stand alone, but also, they can be integrated into other protocols and benefit further from their functionality.

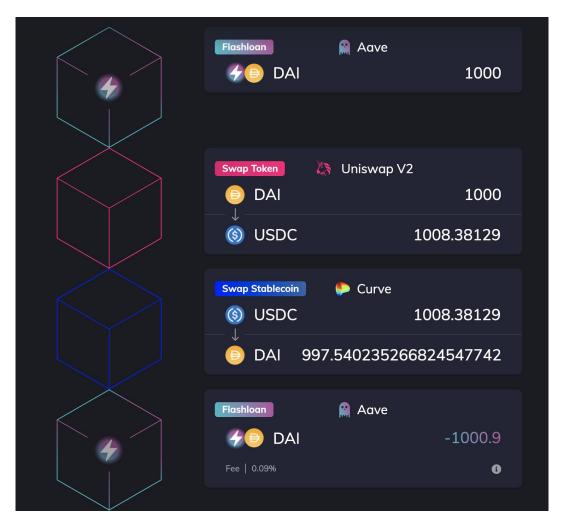# Let's Build Legos!

Compound

- DAI
- MakerDAO CDP Tool
- Compound Smart Contact

Zerion

- Uniswap
- MakerDAO CDP Tool
- Compound
- Coinbase Wallet

- MetaMask
- imToken
- TrustWallet
- Tokenary

Source: https://medium.com/totle/building-with-money-legos-ab63a58ae764

Build your own money lego!

Furucombo

Session 1: Defi Stack

3. Conclusions

Conclusions

- Decentralized Finance platforms consist of a **stack of layers**. This layers may include:
    - Settlement layer
    - Asset layer
    - Protocol layer
    - Application layer
    - Aggregation layer

- The **interoperable** nature of the layers makes DeFi a compatible system and doesn't restrict their participance on using only specific services or platforms.

- Such layer can be combined to form complex and personalized financial services thus *creating "Money Legos"*.

- Those financial services can be created by the users or be found ready **pre-made**.

Further Reading

DeFi Stack of Layers:

- Schär, Fabian. "Decentralized finance: On blockchain-and smart contract-based financial markets." FRB of St. Louis Review (2021).

DeFi the "Money Legos":

- Popescu, Andrei-Dragoş. "Decentralized finance (defi)–the lego of finance." Social Sciences and Education Research Review 7.1 (2020): 321-349.
- https://medium.com/totle/building-with-money-legos-ab63a58ae764

Ethereum Tokens:

- https://blog.makerdao.com/what-are-ethereum-tokens-a-guide-to-the-asset-types-of-defi/

DeFi Composability:

- https://medium.com/coinmonks/the-true-power-of-defi-composability-14fe8355e0d0

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

Questions?

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