

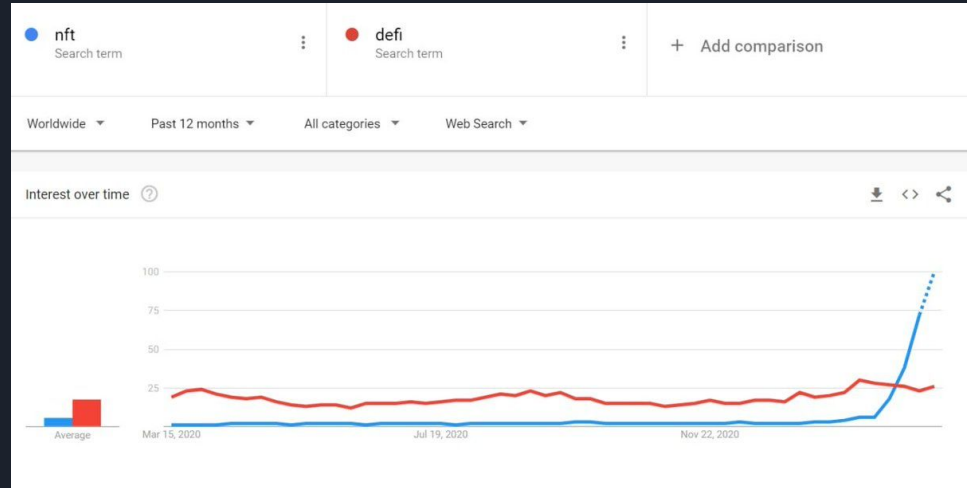


# Ethereum: Non-Fungible Tokens (ERC-721)

Astakhov Sergey  
ICS6-12M

# Introduction

- NFT allows to exchange assets with unique values, which makes them Non-fungible
- Is widely developed in Ethereum, because it provides suitable smart contracts infrastructure for storing and exchange custom tokens



NFT vs DeFi capitalization during 2020



# Smart contracts

- “Solidity” language
- open source
- executes and stores data “on chain”
- can transfer and store tokens and data
- everyone can publish his own smart contracts
- smart contract can represent a token - monetary unit of blockchain

```
pragma solidity ^0.7.0;

contract HelloWorld {

    string public message;

    constructor(string memory initMessage) {
        message = initMessage;
    }

    function update(string memory newMessage)
public        {
        message = newMessage;
    }
}
```

simple smart-contract



# ERC-20 & ERC-721 tokens

## ERC-20

- base for DeFi (decentralised finances)
- fungible, not unique
- replaces money and bonds
- blockchain stores information about amount of tokens for each user

## ERC-721

- base for NFT
- non-fungible, unique
- submits ownership for unique asset
- blockchain stores ownership relations between owners and each asset

# ERC-20 & ERC-721 interfaces

## IERC20

#

Interface of the ERC20 standard as defined in the EIP. Does not include the optional functions; to access them see [ERC20Detailed](#).

### FUNCTIONS

```
totalSupply()
balanceOf(account)
transfer(recipient, amount)
allowance(owner, spender)
approve(spender, amount)
transferFrom(sender, recipient, amount)
```

## IERC721

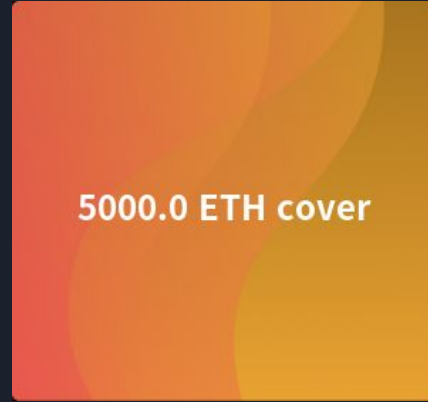
Required interface of an ERC721 compliant contract.

### FUNCTIONS

```
balanceOf(owner)
ownerOf(tokenId)
safeTransferFrom(from, to, tokenId)
transferFrom(from, to, tokenId)
approve(to, tokenId)
getApproved(tokenId)
setApprovalForAll(operator, _approved)
isApprovedForAll(owner, operator)
safeTransferFrom(from, to, tokenId, data)
```

# ERC-721 applications

- in-game items
- digital art
- subscription to services



5000.0 ETH Cover - An analogue of bank insurance for cryptocurrency transfer to the list of smart contracts

Cost: 350 ETH (now - \$1.3 M)

# ERC-721 applications



Pokras Lampas  
(Arseniy Pyzhenkov)

10th point of the kalligrofuturism manifesto:

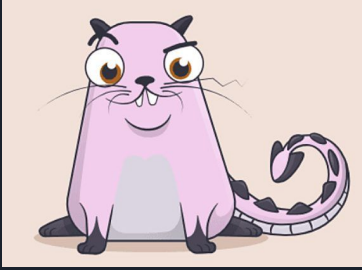
<<

Traditions dictate the rules for the  
formation of letters and their reading.  
This formation has been destroyed.  
These rules have been destroyed.  
These restrictions have been destroyed.

>>

Cost: 80 BNB (then - RUB 2.3 M)

# ERC-721 applications



CryptoKitties - collecting and trading NFT-based virtual kitties

Maximal cost: 600 ETH (then - \$270 K)



CryptoPunks - collecting and trading NFT-based pixel avatars

Maximal cost: 4200 ETH (then - \$7.58 M)



A decorative graphic on the left side of the slide. It consists of a blue parallelogram and a light green parallelogram, both tilted at an angle. The blue shape is in the foreground, and the green shape is partially behind it. They are set against a dark blue background with subtle diagonal lines.

Thank you for your attention