

Building Certificate Smart Contracts

FinTech
Lesson 22.3



Class Objectives

By the end of the class, you will be able to:



Define a smart contract based on the ERC-721 NFT standard to issue certificates.



Build a dApp using the Streamlit library.



Start working on your Capstone project.





What are some benefits of
Solidity events?

Recap

Some benefits of Solidity events:



They may have a lower cost for gas than functions do.



They allow you to keep an on-chain log of information.



They're significantly cheaper than contract storage.



They're the built-in way in Solidity to interact with something external, like a UI.



**What are some potential issues
that IPFS seeks to solve?**



IPFS seek to solve:

- File integrity issues, like not knowing whether files accessed over the web have changed.
- Security issues, like the fact that centralized servers provide a centralized attack vector.



Having written many smart contracts and now deployed a decentralized application, or dApp, what are some contracts that you believe a dApp can use?

A contract that tracks the unchanging
locations of historical landmarks.



A contract that transfers tokens between two users
in a decentralized product-swapping website.

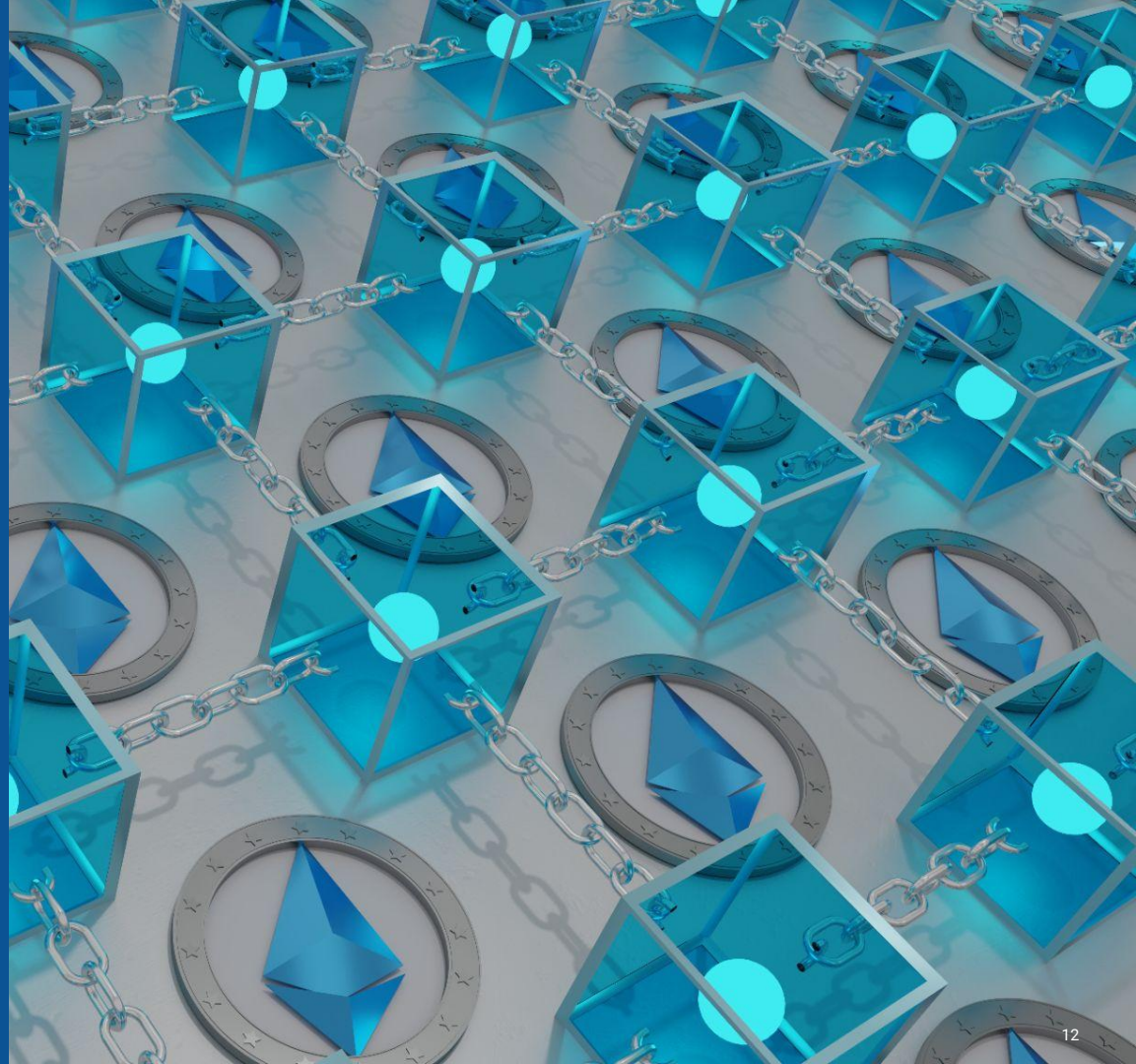


A contract that maintains an unchanging list of user achievements in an online course dApp.



**Any smart contract that
one can think of.**

The Ethereum blockchain is a
globally distributed data store
and supports the development
of any type of software
application that uses the
Solidity programming language.



Certificate Contract

Certificate Contract

Suppose that the administrators of this course decided to issue your fintech certificate of completion on the Ethereum blockchain.



Would you consider this certificate a fungible or a non-fungible token?



What kinds of information might the certificate include?



Would you include this information inside or outside the token?



Certificate Contract

Because certificates are unique to each individual, they're non-fungible assets.

Each certificate will likely include the program title, the date of completion, and the individual's name.

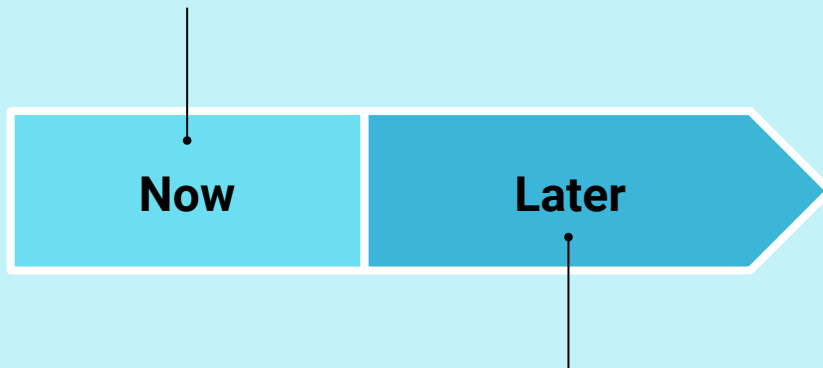
Although this information can be stored directly in the token, storing on-chain data has an associated cost.

This is because Ethereum [charges fees for smart contracts](#).



Certificate Contract

For the short term, we'll ignore those extra storage costs and focus on building a simple certificate token.



Later, with time permitting, we can expand the contract to use more-efficient methods of data storage.

Certificate Contract

We'll build our certificate token smart contract in sections:

01

Add the Pragma and Import Statements

02

Define the Contract

03

Define the Constructor

04

Define a Function to Award Certificate Tokens

05

Complete the Function



Time to Code



Certificate Contract

Suggested Time:

30 minutes

Questions?



Building Decentralized dApps

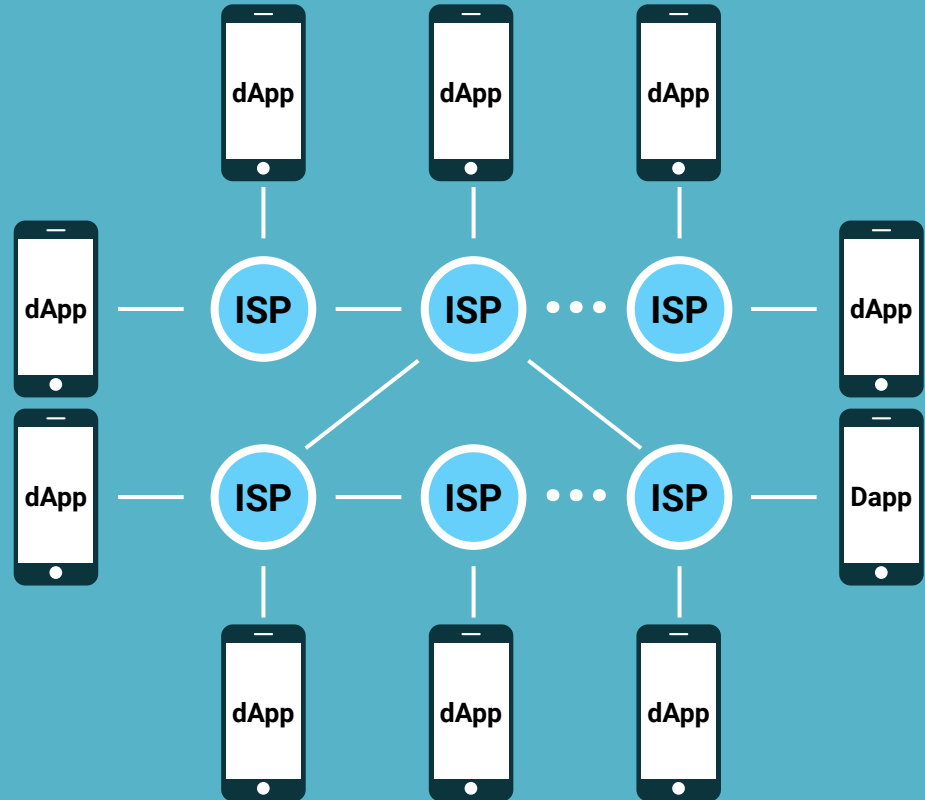


Can you explain what a dApp is and how it differs from a normal application?

One of the main features that's related to the success of Ethereum is dApps.

dApps

Run in a decentralized environment that the blockchain nodes provide.



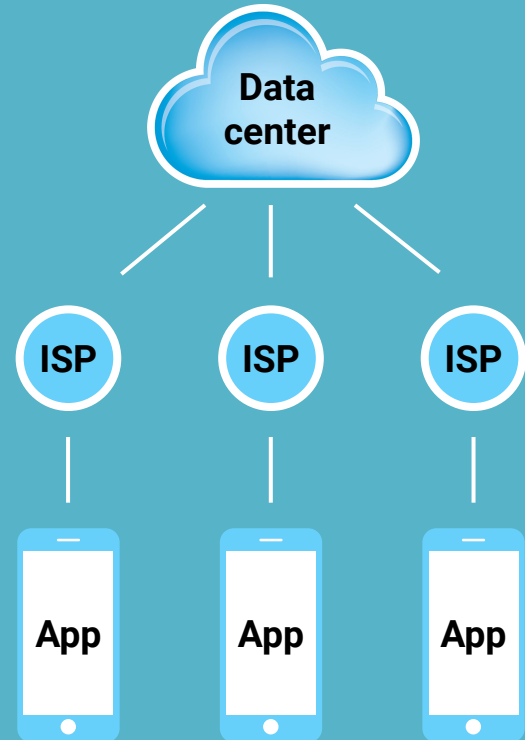
Most applications are centralized, with a central computer that runs the programming logic for the application.

Centralized applications suffer from many of the same limitations and issues as centralized financial systems.

These include having a single point of failure and ownership and governance issues.

Apps

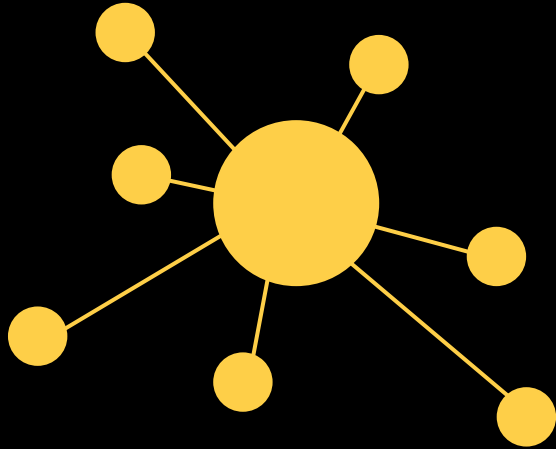
Run on a centralized server and use centralized storage.



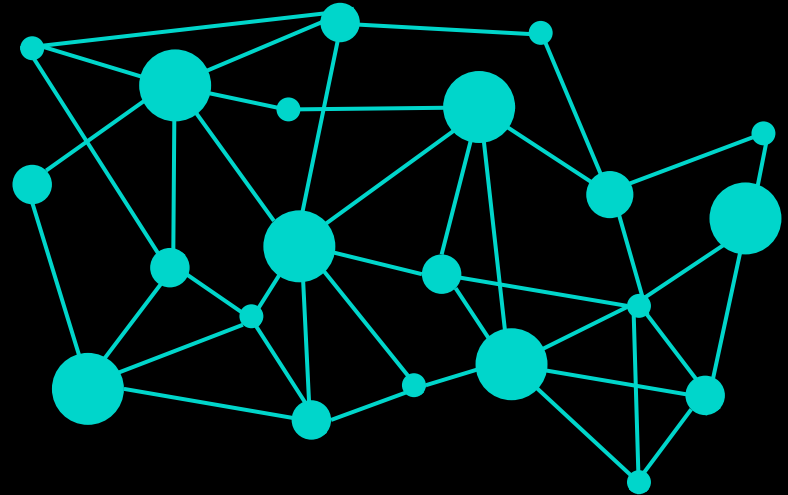
Building Decentralized dApps

Even though dApps often behave like regular applications, they run their core logic on the blockchain in a decentralized manner.

In fact, web applications themselves can become decentralized by using blockchain web hosting services.



Centralized



Decentralized

Building Decentralized dApps

dApps act as the bridge between the users and the contracts.





Time to Code

Building Decentralized dApps

Suggested Time:

20 minutes



Time to Code



Building a Certificate dApp

Suggested Time:

25 minutes



Time's Up! Let's Review.



Break



Time to Code



Project Work Time

Suggested Time:

70 minutes

Project Time

Implement best practices that you learned from your previous two projects:

01

Use office hours to ask questions about your project.

02

Communication is key when it comes to successfully completing a group project. Be sure to meet with your group regularly.

03

Plan to work with your group outside of class.

*The
End*