

# NFTix

## Fintech Capstone Project

Anti-scalping blockchain based event Ticketing system



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The image shows three NFTix ticket stubs, each with a unique color scheme and a QR code. Each ticket includes a block hash, author information, smart contract details, and a URL for the non-fungible token.

- Fintech TICKET** (Yellow background):
  - Author: 0x0ff...fca254723296e4a3888439ac7c10f7044379
  - Smart contract address: 0x3459523755083259a39ac97d464a80808f
  - Smart contract's ID: 49214
  - Non-fungible token
  - getURLfromID(49214)
  - http://127.0.0.1:8080/protocol/  
kgMyTAGQ8Wf71Exz7m09ktu8tctahdxvvn15fT2  
Gdewr1xYsssb1fkPpb1ax4eVrxz3l3U1Kradqdgw
  - Art, assets, files, etc.
- Toyota AFL Premiership Season TICKET** (Grey background):
  - Author: 0x0ff...fca254723296e4a3888439ac7c10f7044379
  - Smart contract address: 0x3459523755083259a39ac97d464a80808f
  - Smart contract's ID: 49214
  - Non-fungible token
  - getURLfromID(49214)
  - http://127.0.0.1:8080/protocol/  
kgMyTAGQ8Wf71Exz7m09ktu8tctahdxvvn15fT2  
Gdewr1xYsssb1fkPpb1ax4eVrxz3l3U1Kradqdgw
  - Art, assets, files, etc.
- Mission: Impossible—Dead Reckoning TICKET** (Red background):
  - Author: 0x0ff...fca254723296e4a3888439ac7c10f7044379
  - Smart contract address: 0x3459523755083259a39ac97d464a80808f
  - Smart contract's ID: 49214
  - Non-fungible token
  - getURLfromID(49214)
  - http://127.0.0.1:8080/protocol/  
kgMyTAGQ8Wf71Exz7m09ktu8tctahdxvvn15fT2  
Gdewr1xYsssb1fkPpb1ax4eVrxz3l3U1Kradqdgw
  - Art, assets, files, etc.

Each ticket also includes a barcode and the text "GOLD ACCESS", "SILVER ACCESS", or "PREMIUM ACCESS".

# Ticket scalping is a significant issue

Ticket scalping can lead to higher ticket prices, reduced accessibility, fraud and counterfeiting, and negative impacts on the event industry. For example, in 2019, it was reported that a scalper had made around \$18 million in profits from selling tickets to the Broadway show "Hamilton."



The New York Times

## Ticket Brokers Agree to Pay Millions in Scalping Settlements

The settlements are the first enforcement actions brought under the Better Online Ticket Sales Act, which was designed to prevent brokers from buying large numbers of tickets.

Give this article

By Sarah Bahr  
Jan. 22, 2021

THE WHY

## Why are concert, sporting event tickets so hard to get?

Not only are tickets scarce, but prices on the secondary market are also ridiculous!

Author: Pauline Smith (KHOU)  
Published: 8:04 AM CST February 16, 2023  
Updated: 8:04 AM CST February 16, 2023

## Why didn't we make ticket scalping illegal?

Rob Stock · 05:00, Feb 18 2023

Govt to take on ticket scalpers

ROBERT KITCHIN/REUTERS

The Government is set to take on ticket scalpers and re-sellers, saying "buyer beware" is not working. First published in May, 2019.

**ANALYSIS:** Anger was running so high with ticket scalping rip-offs in 2019 that the Commerce Commission was engaged in legal action against ticket reseller Viagogo, and Prime Minister Jacinda Ardern vowed better consumer protection.

But while the commission's case against Viagogo finally started at a judge-only trial in the High Court in Auckland on Wednesday, Ardern's reforms have died a silent death.

"It hit a stone wall. It literally did die," says Robyn Alexander, secretary of the New Zealand Promoters Association.

# Non Fungible Token (NFT) Ticketing

Event tickets using blockchain technology

The objective of this project is to build a resilient Non-Fungible Event ticketing application that has one-of-a-kind tokens stored on blockchain and can be transferred from the issuer to the buyer's wallet. The organizers of the event can mint as many tickets as they need.



## Authenticity

NFT ticketing ensures that tickets are unique and cannot be duplicated or counterfeited. This helps prevent ticket fraud and ensures that the tickets sold are legitimate.



## Transparency

NFT ticketing are a transparent way to track the entire lifecycle of a ticket. This includes information such as when the ticket was created, who bought it, and how many times it was transferred.



## Accessibility

NFT ticketing can make it easier for fans to access and purchase tickets. Since the tickets are stored digitally, they can be easily distributed and sold across the globe.



## Revenue Sharing

NFT ticketing enables event organizers to implement revenue-sharing models that can benefit both artists or performers. Blockchain can distribute royalties to the relevant parties based on predetermined rules.



## Collectibles

NFT tickets can become valued collectibles. Real-world tickets for famous events have become incredibly expensive collectors' items.

# Application Workflow

1

## Event Organizer

1. Event organizer inputs event details in Streamlit application
2. Once saved, event details are pushed to the PostgreSQL database in the backend
3. Flexible to edit event details in-case of any changes to the events.

2

## Event Participant

1. Event participants login to view registered events and schedules
2. Check available tickets and cost to purchase tickets
3. Choose the event, number of tickets and select a wallet to purchase ticket

3

## Solidity

1. Once submitted to purchase the transaction is executed though the algorithm written on Solidity.
2. Solidity Registers ticket Purchase on Ethereum Blockchain and generates a unique hash value as a receipt to uniquely identify the purchase
3. A successful transaction will make a database call to store the event\_id, transaction\_id and Buyer's contract Address in a table called "nftix.events\_sales" table.

NFTix - Anti-Scalping Blockchain-Based Event Ticketing System

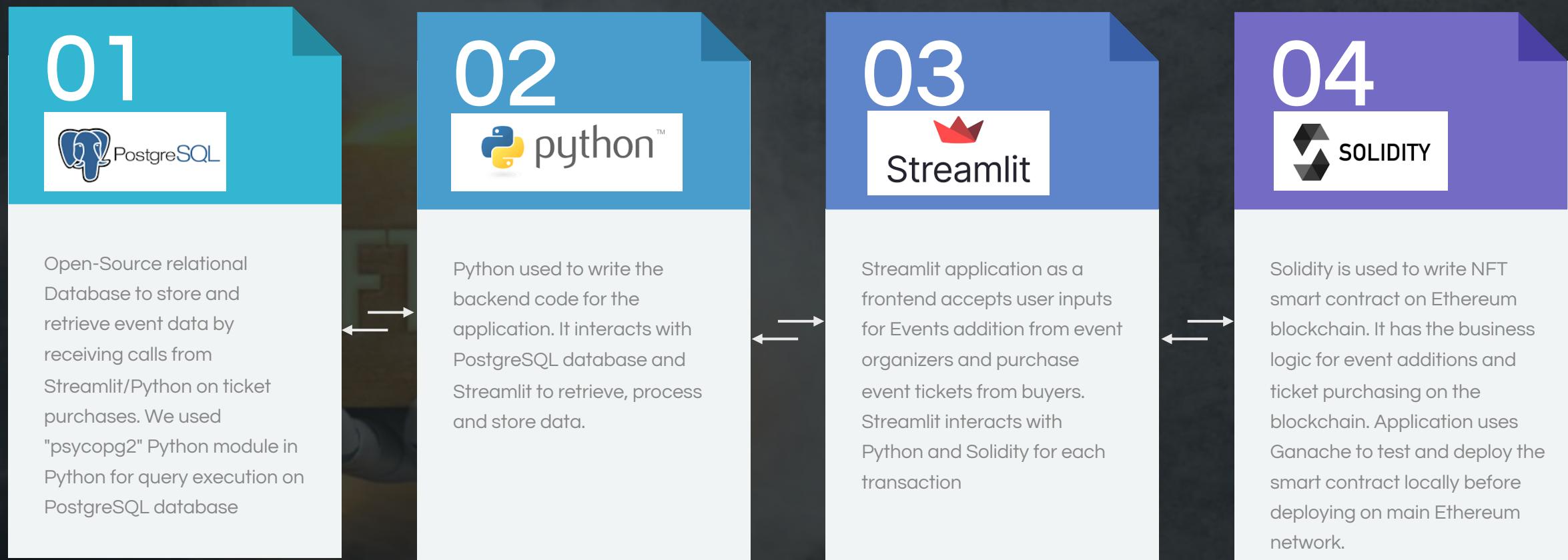
Available events

event_id	Event	Date	Venue	Price	Tickets_Available
7	Wine Festival Byron Bay, Australia - 2023	15-Oct-2023, 07:00:00	Byron Bay, Australia	300.00	6,500
8	Justin Bieber Live Concert - 2023	15-Nov-2023, 20:00:00	Hyde Park, Sydney, Australia	450.00	16,000
9	Cricket - BBL 2023 : Perth Scorchers vs Sydney Thunders	20-Dec-2023, 19:00:00	Perth, Australia	575.00	17,500
10	Blockchain Conference 2023	15-Jul-2023, 09:00:00	Sydney, Australia	320.00	550
11	Solidity for Smart Contracts - Work Shop 2023	10-Aug-2023, 08:00:00	Sydney, Australia	250.00	1,550
12	Crypto Digital assets SUMMIT 2023	25-May-2023, 09:00:00	London, UK	430.00	11,500
13	Blockchain Revolution SUMMIT	24-Jun-2023, 09:00:00	London	800.00	15,000
14	Crossborder Payments on Blockchain	24-Aug-2023, 09:00:00	San Francisco, USA	700.00	1,550
15	Blockchain Security	20-Nov-2023, 09:00:00	Dublin, Ireland	600.00	2,500
16	Easter Show	07-Apr-2023, 00:00:00	Sydney Olympic Park	50.00	5,000

Made with Streamlit

# Technical Architecture

NFTix technical architecture has four components. PostgreSQL as database, Python for backend processing, Streamlit for front end application interface and Solidity to write the NFT smart contract



# Dataflow

The application uses PostgreSQL database to store event details and transaction information for ticket purchases. The database has a "nftix" schema with two tables: "events" and "event\_sales", which respectively store details of upcoming events and ticket purchases.

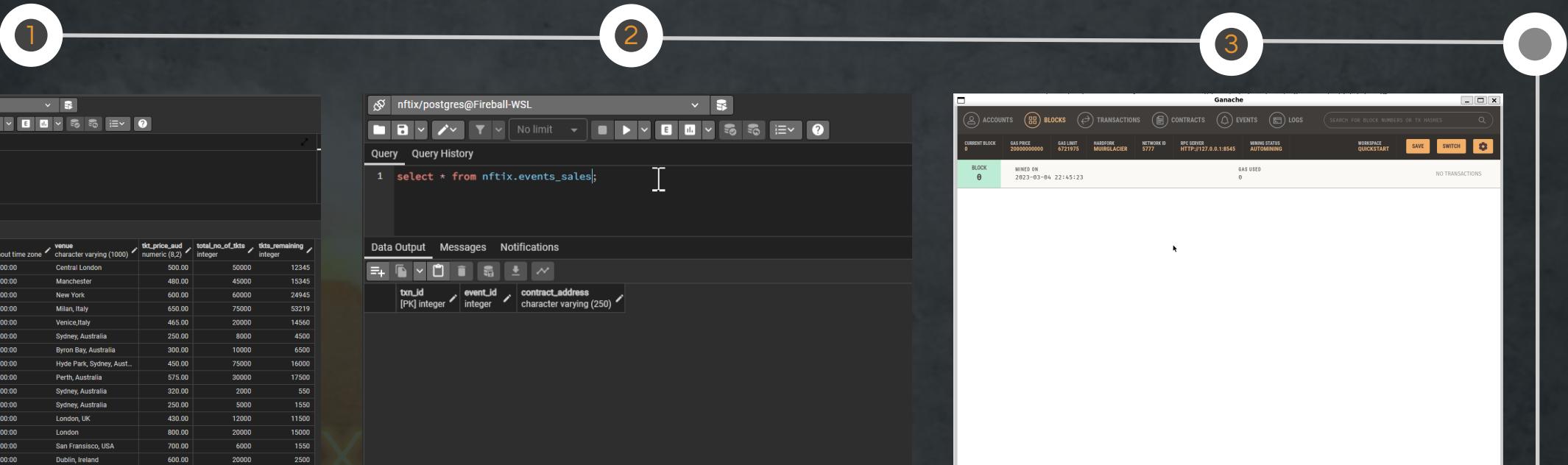
The Streamlit front-end interacts with both Python and Solidity.

Python interacts with the database and Streamlit to store and retrieve data, and also pushes transaction details to the database once a ticket purchase is successful.

Solidity is used to execute the actual ticket purchases on the blockchain, and Ganache is used as a test wallet for the purposes of the application.



# Our Approach



## Events Table

Events Table created in PostgreSQL that stores events available sale. The events table shows ticket prices, total number of tickets available and tickets remaining post purchase

## Events Sales Table

Event Sales Table that will record ticket purchase records consisting of buyer hash address, event ID from events table and create a transaction ID for the sale

## Ganache Block

Ganache is used to test the blocks for the application

# Our Approach contd..

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```
// SPDX-License-Identifier: MIT
pragma solidity ^0.5.5;

import "https://github.com/OpenZeppelin/openzeppelin-contracts/blob/release-v2.5.0/contracts/token/ERC721/ERC721Full.sol";
// import "@openzeppelin/contracts/token/ERC721/ERC721Full.sol";

contract TicketToken is ERC721Full {
    constructor() public ERC721Full("EventTicketToken", "TIX") {}

    struct Ticket {
        uint256 eventId;
        string buyerName;
        address payable buyerAddress;
        uint256 quantity;
    }

    mapping(uint256 => Ticket) public eventTicket;

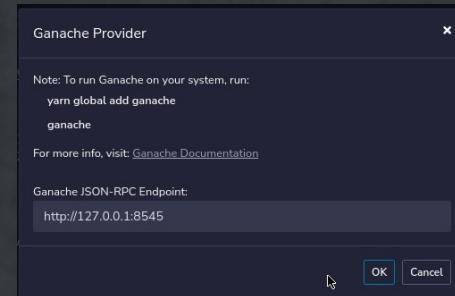
    // Should we consider using events?
    // event Appraisal(uint256 tokenId, uint256 appraisalValue, string reportURI);

    function registerTicket(
        // address owner,
        uint256 eventId,
        string memory buyerName,
        address payable buyerAddress,
        uint256 quantity
    ) public returns (uint256) {
        uint256 tokenId = totalSupply();
        // address owner = msg.sender;
        _mint(buyerAddress, tokenId);
    }
}
```

## Ganache Contract Deployment

Contract code in Solidity deployed in  
remix

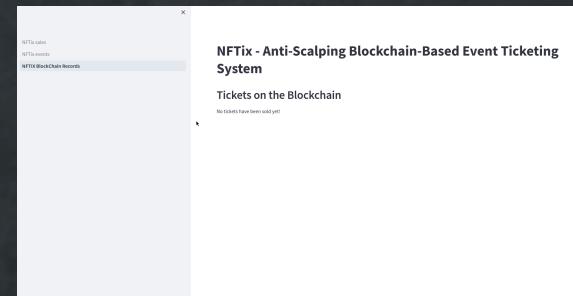
5



## Ganache Contract Deployment

Ganache address for contract deployment

4

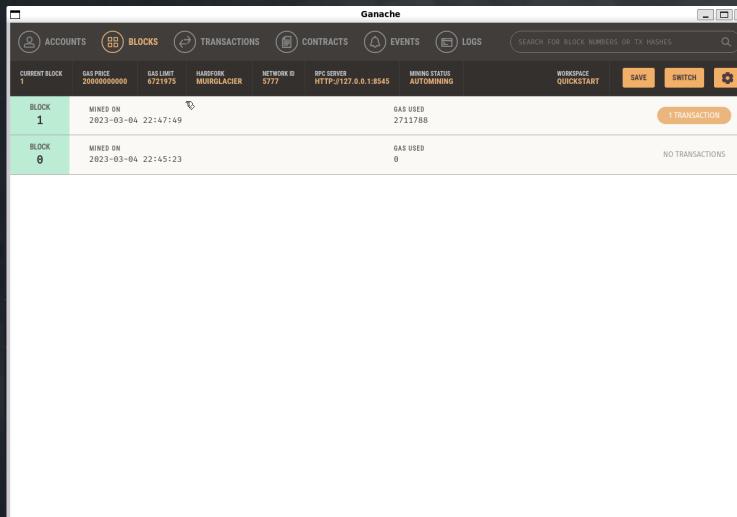


## Blockchain Streamlit

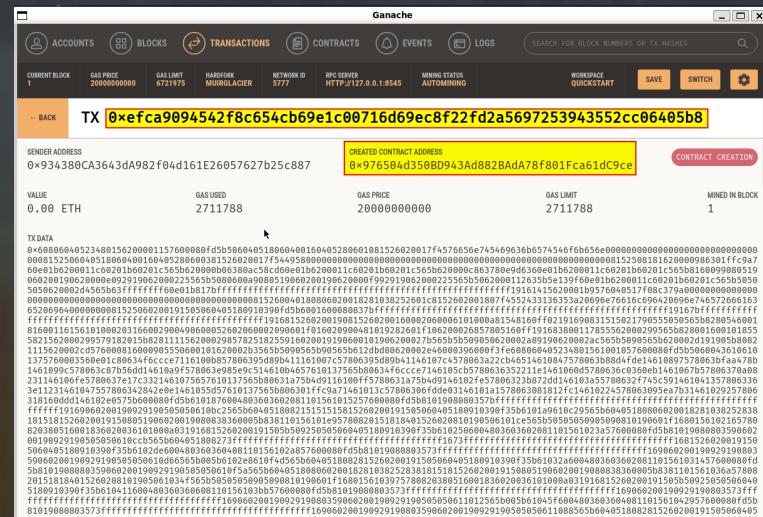
Blockchain records page on Streamlit to show ticket blocks minted with buyer name , buyer hash address and the number of tickets bought

# Our Approach contd..

7



8



9

```
.env
1 DBHOST=localhost
2 DBNAME=nftix
3 DBUSER=postgres
4 DBPASSWORD=postgres
5 WEB3_PROVIDER_URI = "HTTP://127.0.0.1:8545"
6 SMART_CONTRACT_ADDRESS="0x976504d350BD943Ad882BAdA78f801Fca61dc9ce"
```

## Ganache Contract Deployment

First blocked minted for the contract deployment

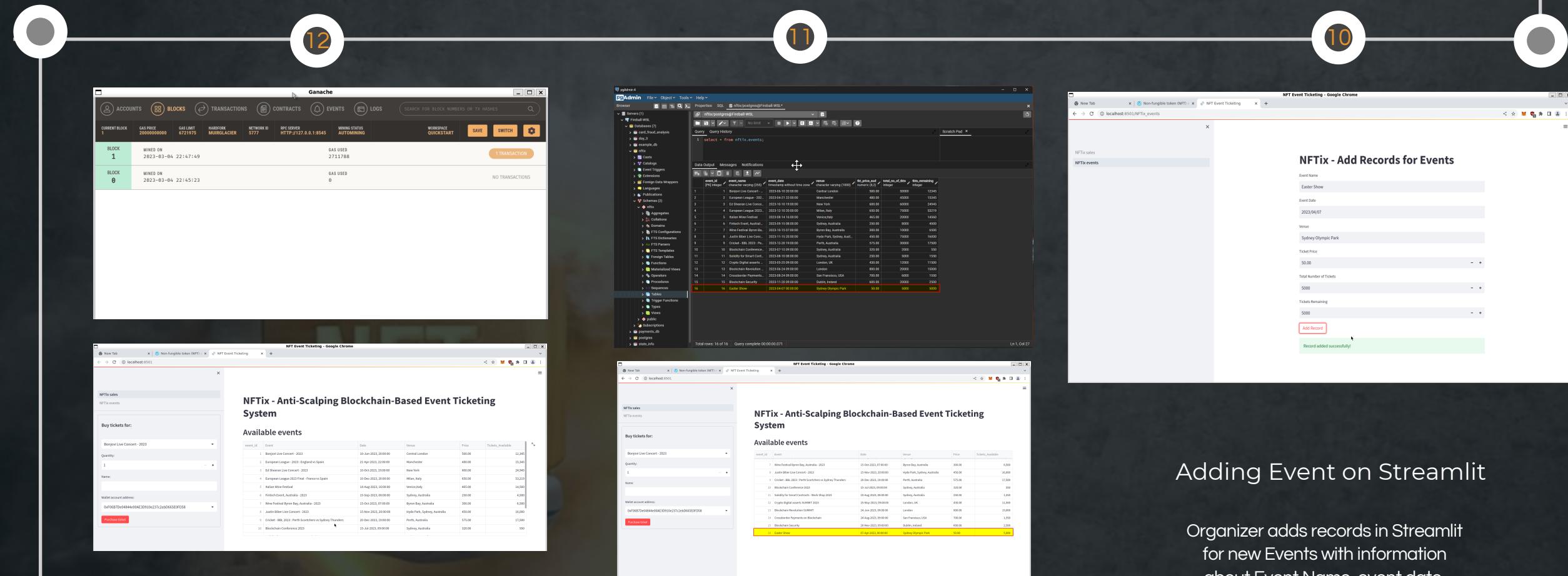
## Ganache Transaction

Transaction hash for the Block with the Contract Address

## Update .env file with contract Address

Contract address from step 8 is used to update .env file that will be used for future purchase transactions. The contract address has to match the deployed contract address for the application to run

# Our Approach contd..



## Ganache and Streamlit before Transaction

Ganache blocks showing only one block mined before the first transaction in the next step

## Record added to PostGreSQL

The record from Step 10 is added to Events Table in Post gre SQL and shows in Events list of Streamlit

## Adding Event on Streamlit

Organizer adds records in Streamlit for new Events with information about Event Name, event date, ticket price, total number of tickets available, and total tickets available. The record is added to PostgreSQL database from Step 1

# Our Approach contd..

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Available events

event_id	Event	Date	Venue	Price	Tickets_Available
7	Wine Festival Byron Bay, Australia - 2023	15-Nov-2023, 07:00:00	Byron Bay, Australia	300.00	6,500
8	Justin Bieber Live Concert - 2023	15-Nov-2023, 20:00:00	Hyde Park, Sydney, Australia	400.00	16,000
9	Cricket - BBL 2023 - Perth Scorchers vs Sydney Thunders	20-Dec-2023, 08:00:00	Perth, Australia	575.00	17,500
10	Blockchain Conference 2023	15-Jul-2023, 09:00:00	Sydney, Australia	300.00	550
11	Solidity for Smart Contracts - Work Shop 2023	10-Aug-2023, 08:00:00	Sydney, Australia	200.00	1,550
12	Crypto Digital Assets SUMMIT 2023	25-May-2023, 09:00:00	London, UK	450.00	11,500
13	Blockchain Revolution SUMMIT	24-Jun-2023, 09:00:00	London	800.00	15,000
14	Crossborder Payments on Blockchain	24-Aug-2023, 09:00:00	San Francisco, USA	700.00	1,500
15	Blockchain Security	20-Nov-2023, 09:00:00	Dublin, Ireland	600.00	2,500
16	Easter Show	07-Apr-2023, 08:00:00	Sydney Olympic Park	50.00	5,000

NFTix - Anti-Scalping Blockchain-Based Event Ticketing System

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9	Cricket - BBL 2023 - Perth Scorchers vs Sydney Thunders	20-Dec-2023, 08:00:00	Perth, Australia	575.00	17,500
10	Blockchain Conference 2023	15-Jul-2023, 09:00:00	Sydney, Australia	300.00	550
11	Solidity for Smart Contracts - Work Shop 2023	10-Aug-2023, 08:00:00	Sydney, Australia	200.00	1,550
12	Crypto Digital Assets SUMMIT 2023	25-May-2023, 09:00:00	London, UK	450.00	11,500
13	Blockchain Revolution SUMMIT	24-Jun-2023, 09:00:00	London	800.00	15,000
14	Crossborder Payments on Blockchain	24-Aug-2023, 09:00:00	San Francisco, USA	700.00	1,500
15	Blockchain Security	20-Nov-2023, 09:00:00	Dublin, Ireland	600.00	2,500
16	Easter Show	07-Apr-2023, 08:00:00	Sydney Olympic Park	50.00	5,000

NFTix - Anti-Scalping Blockchain-Based Event Ticketing System

Tickets on the Blockchain

Event_Id	Buyer_Name	Buyer_Address	Quantity
0	Smith Family	0x421001	4
0	David and Victoria Beckham	0xb6c4120001	20
0	Fintech Sept 2022 Cohort	0xb6c412001	12

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pgAdmin 4

Properties SQL nftix/postgres@Fireball-WSL

```
1 select * from nftix.events;
```

Data Output Messages Notifications

event_id	event_name	event_date	venue	lets_price_and	total_no_of_dats	tktz_remaining
1	Wine Festival Byron Bay, Australia - 2023	2023-10-21 22:00:00	Central London	300.00	5000	12345
2	Justin Bieber Live Concert - 2023	2023-11-03 22:00:00	Madison Square Garden, New York	400.00	14,000	13345
3	Cricket - BBL 2023 - Perth Scorchers vs Sydney Thunders	2023-10-19 18:00:00	New York	575.00	5000	2845
4	Blockchain Conference 2023	2023-10-10 09:00:00	Milan, Italy	600.00	7500	52319
5	Italian Wine Festival	2023-09-14 16:00:00	Venice, Italy	465.00	20000	14560
6	Fintech Event, Australia - 2023	2023-10-15 08:00:00	Sydney, Australia	250.00	8000	4500
7	Wine Festival Byron Bay, Australia - 2023	2023-10-15 07:00:00	Byron Bay, Australia	300.00	10000	6500
8	Justin Bieber Live Concert - 2023	2023-11-15 20:00:00	Hyde Park, Sydney, Australia	450.00	75000	16000
9	Solidity for Smart Contracts - Work Shop 2023	2023-10-20 19:00:00	Perth, Australia	575.00	3000	17500
10	Blockchain Conference 2023	2023-10-15 09:00:00	Sydney, Australia	320.00	2000	500
11	Solidity for Smart Contracts - Work Shop 2023	2023-10-10 08:00:00	Sydney, Australia	250.00	5000	1500
12	Crypto Digital Assets SUMMIT 2023	2023-09-25 09:00:00	London, UK	430.00	1100	11500
13	Blockchain Revolution SUMMIT	2023-09-24 09:00:00	San Francisco, USA	600.00	20000	15000
14	Crossborder Payments on Blockchain	2023-10-20 09:00:00	Dublin, Ireland	600.00	20000	2500
15	Blockchain Security	2023-09-24 07:00:00	Sydney Olympic Park	50.00	5000	4996

pgAdmin 4

Properties SQL nftix/postgres@Fireball-WSL

```
1 select * from nftix.events_sales;
```

Data Output Messages Notifications

tx_id	event_id	contract_address
1	16	0xa2c28c69e86d4ac643ef11138e2e4ce824ce921d191beb45847420034997c7d

## PostgreSQL

Post first transaction, PostgreSQL has events table updated with tickets remaining and sales table with contract address

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Ganache

ACCOUNTS BLOCKS TRANSACTIONS CONTRACTS EVENTS LOGS

CURRENT BLOCK 2 GAS PRICE 20000000000 GAS LIMIT 6721975 HARDFORK MUROLACER NETWORK ID 5777 RPC SERVER HTTP://127.0.0.1:8545 MINING STATUS AUTOMATING WORKSPACE QUICKSTART SAVE SWITCH

BLOCK 2 MINED ON 2023-03-04 23:03:11 GAS USED 198246

BLOCK 1 MINED ON 2023-03-04 22:14:149 GAS USED 2713788

BLOCK 0 MINED ON 2023-03-04 22:14:23 GAS USED 0

Ganache

ACCOUNTS BLOCKS TRANSACTIONS CONTRACTS EVENTS LOGS

CURRENT BLOCK 3 GAS PRICE 20000000000 GAS LIMIT 6721975 HARDFORK MUROLACER NETWORK ID 5777 RPC SERVER HTTP://127.0.0.1:8545 MINING STATUS AUTOMATING WORKSPACE QUICKSTART BACK BLOCK 2

TX HASH 0xa2c28c69e86d4ac643ef11138e2e4ce824ce921d191beb45847420034997c7d

FROM ADDRESS 0x934380CA3643dA982f0d161E26057627b25c87 TO CONTRACT ADDRESS 0+976584d350B943Ad882BaD7f801Fca61dC9ce GAS USED 198246 VALUE 0

Ganache

ACCOUNTS BLOCKS TRANSACTIONS CONTRACTS EVENTS LOGS

CURRENT BLOCK 3 GAS PRICE 20000000000 GAS LIMIT 6721975 HARDFORK MUROLACER NETWORK ID 5777 RPC SERVER HTTP://127.0.0.1:8545 MINING STATUS AUTOMATING WORKSPACE QUICKSTART BACK TX 0xa2c28c69e86d4ac643ef11138e2e4ce824ce921d191beb45847420034997c7d

BLOCK 2 MINED ON 2023-03-04 23:03:11 GAS USED 198246

BLOCK 1 MINED ON 2023-03-04 22:14:149 GAS USED 2713788

BLOCK 0 MINED ON 2023-03-04 22:14:23 GAS USED 0

TX HASH 0x934380CA3643dA982f0d161E26057627b25c87

FROM ADDRESS 0+976584d350B943Ad882BaD7f801Fca61dC9ce TO CONTRACT ADDRESS 0+976584d350B943Ad882BaD7f801Fca61dC9ce GAS USED 198246 VALUE 0.00 ETH GAS PRICE 20000000000 GAS LIMIT 2 MINED BLOCK 2

Ganache

ACCOUNTS BLOCKS TRANSACTIONS CONTRACTS EVENTS LOGS

CURRENT BLOCK 3 GAS PRICE 20000000000 GAS LIMIT 6721975 HARDFORK MUROLACER NETWORK ID 5777 RPC SERVER HTTP://127.0.0.1:8545 MINING STATUS AUTOMATING WORKSPACE QUICKSTART NO EVENTS

TX HASH 0x934380CA3643dA982f0d161E26057627b25c87

FROM ADDRESS 0+976584d350B943Ad882BaD7f801Fca61dC9ce TO CONTRACT ADDRESS 0+976584d350B943Ad882BaD7f801Fca61dC9ce GAS USED 198246 VALUE 0.00 ETH GAS PRICE 20000000000 GAS LIMIT 2 MINED BLOCK 2

## Ganache after a Transaction

Ganache has block 2 mined with the first transaction , showing the transaction hash and contract address

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# Results and conclusions from the analysis

Ethereum blockchain can be used to mint NFTs for Event Tickets that allows for a reliable and secure block chain based transaction

The screenshot shows a web application running on localhost:8501. The main page title is "NFT Event Ticketing - Google Chrome". The interface includes a sidebar with "NFTix sales" and "NFTix events" buttons, and a main area titled "Available events". A modal window titled "NFTix BlockChain Records" is open, showing a table of blockchain records.

**Main Page:**

- Buy tickets for:** Easter Show
- Quantity:** 4
- Name:** Smith Family
- Wallet account address:** 0xF06B7De04844e00AE3D910e237c2ebD665E0FD58
- Purchase ticket** button
- Buyer:** Smith Family, Purchased: 4, Total: \$200
- Wallet:** 0xF06B7De04844e00AE3D910e237c2ebD665E0FD58
- Event:** Easter Show
- Receipt:** 0xa7ac28c69e86d4ac643ef11138e2e4ce824ce921d191beb458474200349 97c7d

**NFTix BlockChain Records Modal:**

	Event_Id	Event	Date	Venue	Price	Tickets_Available	R
0	16	Smith Family	0x422E900a30f4e8cdB3b393768A88FDd9BFd8d061			4	
0	4	David and Victoria Beckham	0xBcE419249aa43Abf899A323398d0EfC495fa2A14			20	
0	11	Fintech Sept 2022 Cohort	0xBcE419249aa43Abf899A323398d0EfC495fa2A14			12	

Made with Streamlit

# What we could have done with more time

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1. Frontend is built on Streamlit and it has its limitations in terms of design, functionality, handling large datasets and security features. There is potential to use better frameworks such as REACT for a robust user interface
2. Need for a Robust Environment :
  - Debugging Tools: Debugging tools can be used to debug the blockchain script. These tools will allow us to step through code, inspect variables, and identify issues
  - Data Storage and Retrieval: To retrieve encrypted data, the environment should have a data storage solution such as a distributed file system IPFS
  - Test Ethereum Network for robust testing of the script before deployment, including test wallets
  - Better Database design to handle large and complex datasets
3. Need for a different deployment architecture that includes proper wallets for NFTix. A proper deployment architecture will enable for a better user experience, integration with payment gateways and enable better scalability
4. Build Mobile applications both frontend and backend
5. Find investors for full scale deployment: define investment requirements, research potential investors, network and develop a business plan, prepare a pitch deck, and conduct due diligence



**Thank you !**

# Appendix

# Dependencies and Script Execution Process

## Dependencies

To ensure the code executes well, below are the pre-requisites and dependencies to be full-filled :

- A PostgreSQL database must be installed and must be running on port 5432
- Login to the PostgreSQL database and run the following script so that the database is created with the required schema, tables and the data
- `psql -p 5432 postgres -U postgres\i FintechProj3_DB_build.sql`
- Ensure "Streamlit" is successfully installed
- Ensure "psycopg2" module is successfully installed
- Ensure Web3==5.17.0 is successfully installed

## Script Execution

Clone the Git repo as shown below :

```
git clone https://github.com/gadam/fintech_project_3.git
```

Go to the cloned directory

```
cd fintech_project_3
```

Execute the script as follows

```
streamlit run sales.py
```

# Readme Banner

## Non Fungible Token (NFT) Ticketing

Event tickets using blockchain technology

Guy Adam | Venkata Nagothi | Sreeni Patnaik

