blockchain JOURNAL

The Impact of Blockchain and Distributed Ledger Technology on the DevOps Experience

I come not to praise DLT,
but to describe it….

… and explain why it might be
interesting to you.

Purpose…

The purpose of this presentation is to provide an overview of blockchain and distributed ledger technology to devops professionals so that they may have a better understanding of what blockchain/DLT is about and how it is, and can be used in modern Information Technology
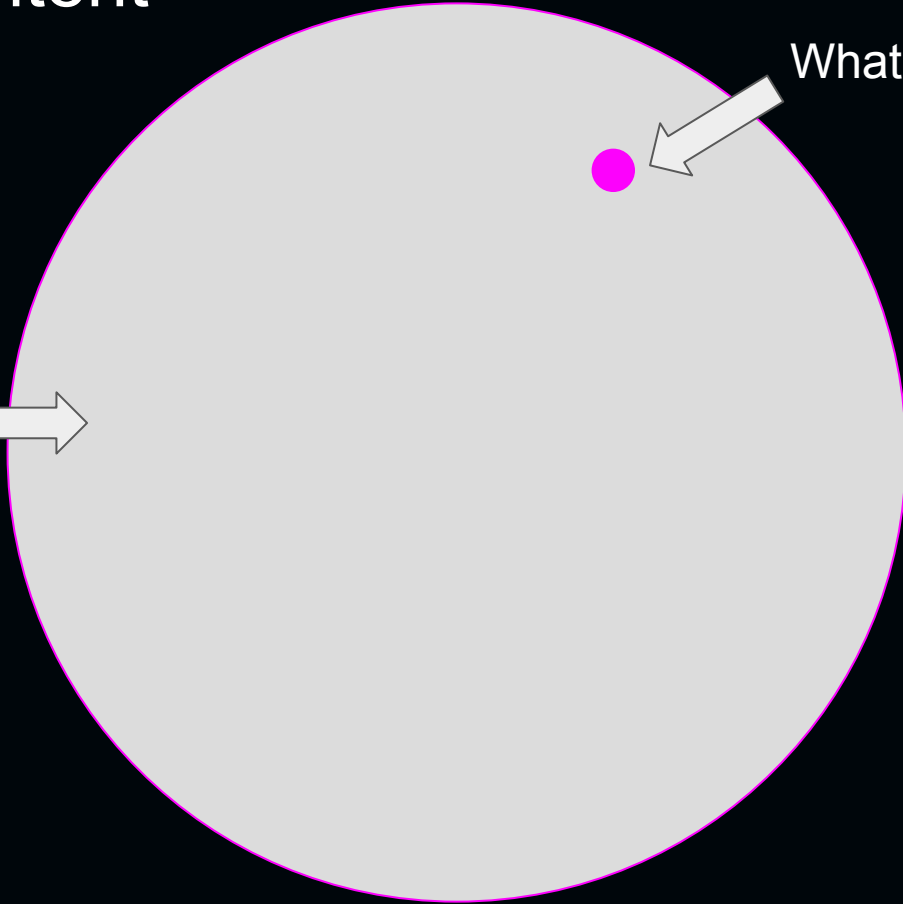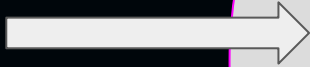
Agenda

- Whoami?
- The elephant in the living room
- My bottom line
- Blockchain/DLT 101
- Working with wallets
- Smart contracts
- The NFT stuff
- Creating a blockchain
- Programming stuff
- DevOps stuff
- Issues
- Bonus demo

Scope of Content

What I'll cover today

All there is to know about Blockchain and DLT
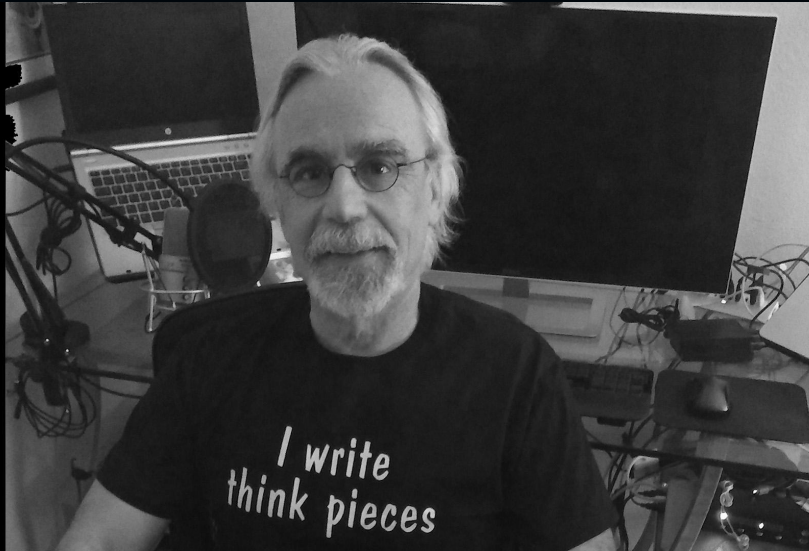
Who am I?

- Sr. Tech Analyst: Blockchain Journal
- Other technical analyst gigs:
  - Red Hat Developer and Enable Architect
  - Linux Foundations
  - Tech Crunch +
  - DevOps.com
  - TechTarget
  - … and more
- Once upon a time I did production level architecture and coding
- Today I like to do show and tell

All views expressed in this presentation are my own

Who are you?

- Do terms such as:
  - user address
  - *Proof of Stake*
  - *Ethereum*
  - *Solana*
  - *gas fee*
  - *USDT*
  - *Smart contract*
  - … have meaning for you?
- Do you have a cryptographic wallet such as MetaMask?
- Do you own cryptocurrency?
- Do you own an NFT?
- Have you programmed for a blockchain?
- Have you done any sort of application deployment activity that targets a blockchain?

Let's talk about the Elephant in the Living Room

People using their mobile phones to play the cryptocurrency game *Axie Infinity* in an alley in suburban Manila. Players had to buy teams of cartoon blobs and earned tokens by using them in battles. The game became a get-rich-quick craze in the Philippines. By October 2021, about two million people were playing the game every day. (*Left: Zeke Faux; right: Jam Sta. Rosa/AFP via Getty Images*)

In "Chinatown," a vast compound of derelict office towers in Sihanoukville, on Cambodia's western coast, thousands of migrants worked as online cryptocurrency scammers. Workers who have escaped say they were held against their will and forced to send spam text messages day and night. Some say they were beaten, tortured, and worse. This drone photograph shows the section known as Kaibo and the KB Hotel. (*Danielle Keeton-Olsen*)

Let's talk about the Elephant in the Living Room

Blockchain
2008 by an entity or person using the pseudonym Satoshi Nakamoto

Crypto Bros
Speculative Cryptocurrency Trading
NFT mania

Collapse
FTX
Celcius
Terra

Actually useful technology
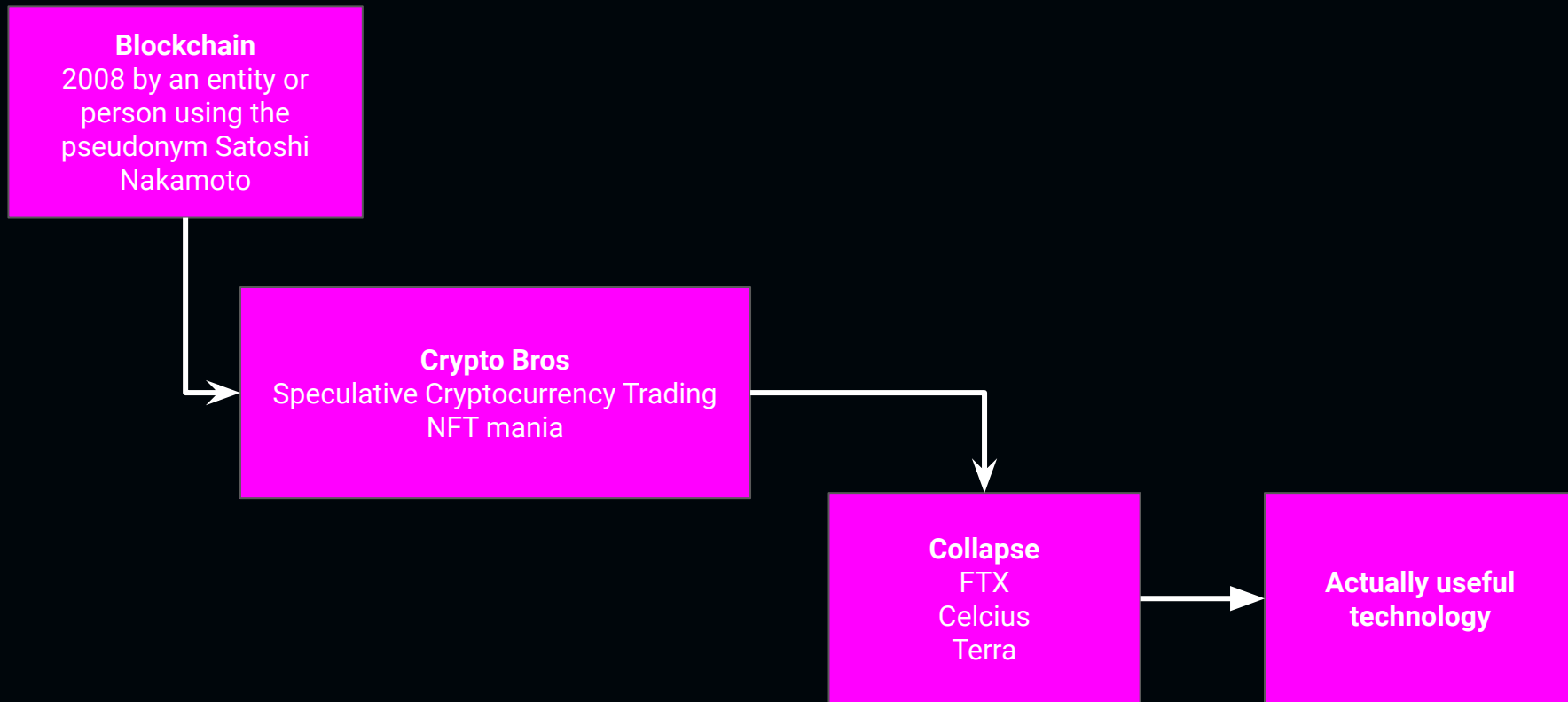
Let's talk about the Elephant in the Living Room
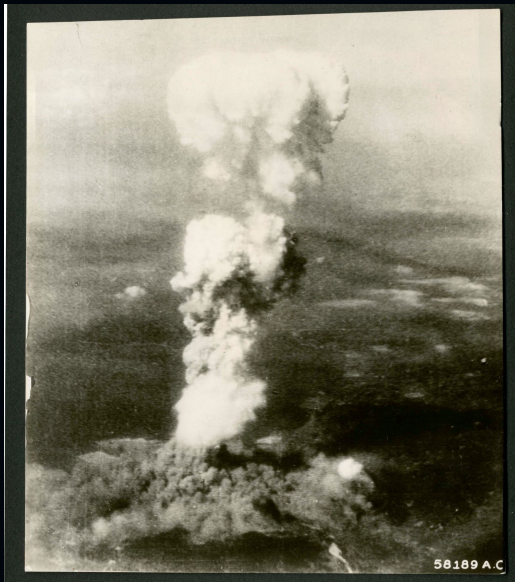
The atomic bomb named "Little Boy" was dropped on the Japanese city of Hiroshima on August 6, 1945

Calder Hall nuclear power station in the United Kingdom started operating on October 17, 1956

The Big Players respond…

What is blockchain?

Blockchain is a peer-to-peer, consensus driven technology in which data is stored immutably, in an identical manner among a large number of computers. Once a piece of data is stored on the blockchain, it can never be changed. And, no one computer is the sole source of truth for the data on the blockchain. If one computer on a blockchain network goes down, there are a number of other computers, storing the same data that will provide service. These networks can be public or they can be private. It all depends on the specific blockchain network.

Another term for blockchain is *distributed ledger technology* (DLT)

Blockchain 101

- Consensus techniques
  - Proof of Work (Bitcoin)
  - Proof of Stake (Ethereum)
  - Gossip about Gossip (Hedera)
  - Proof of History (Solana)
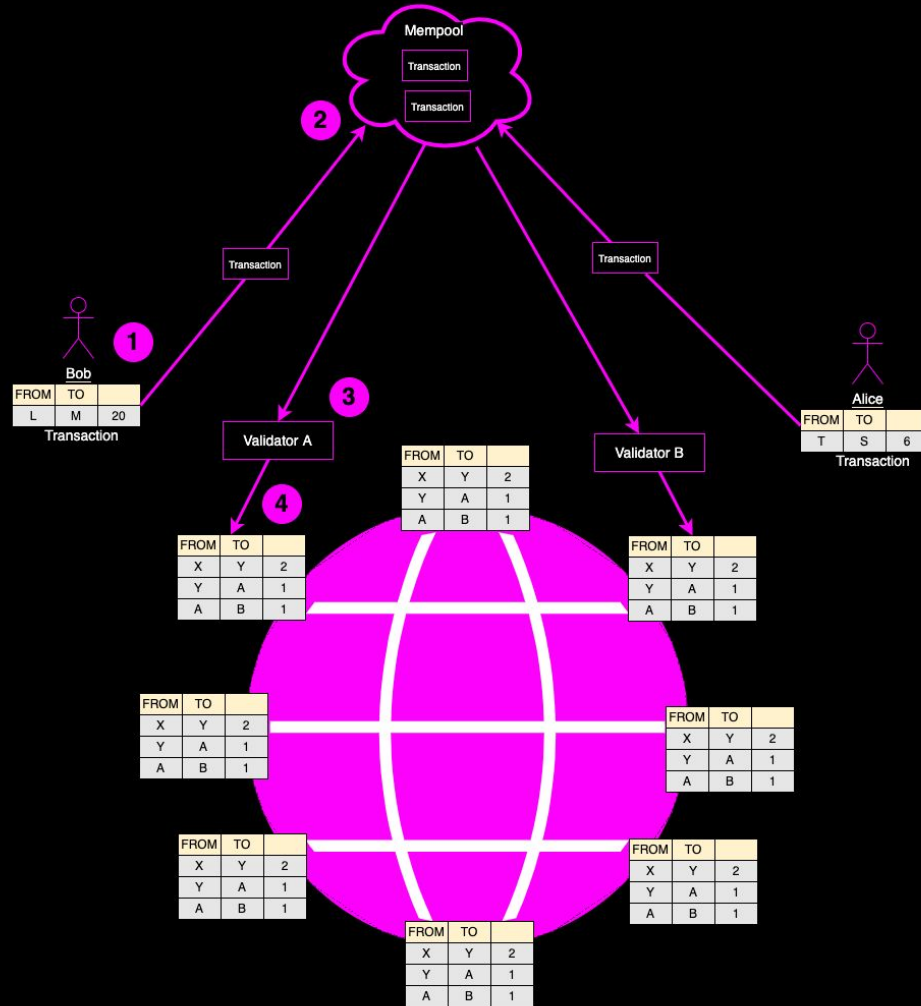
Blockchain 101

You can think of blockchain as one very, very big spreadsheet

Ledger

From	To	Count
Genesis Block (Mint)		50
Mint	Bob	20
Bob	Alice	8
Bob	Mike	6
Alice	Jane	4
Mike	Jane	2

Account Balances

Account	Count
Genesis Block (Mint)	30
Bob	6
Alice	4
Mike	4
Jane	6

There are many blockchain networks out there

Bitcoin

Ethereum

Hedera

Solana

Avalanche
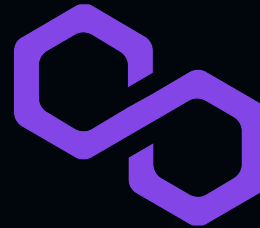
There are more…

Polygon

What can you do with DLT?

- Blockchain is more than a way to mint cryptocurrency any more than a printing press is a technology to only print money.
- Use cases
  - The company **Cario** is working with state level motor vehicle departments in the US to put all motor vehicle titles on the blockchain in order to make title auditing and title transfer easier.
  - Camera manufacturer **Canon**, in collaboration with the news organization Reuters and an academic research project named Starling Lab have developed a methodology by which digital images shot with certain Canon cameras have verification data that is embedded and stored on the blockchain immutably reducing the risk of visual misinformation.
  - Golden State Foods uses **IBM Food Trust** technology to monitor food freshness.

Creating a new blockchain

- Anybody can create a blockchain
- It's all about adoption and use
- Once it's deployed, that's it
- The rules for adding data to the chain are baked in by the given blockchain

My blockchain: reselcoin ➡️

Real world demo: reselcoin


```
{
  message: 'Constructing Block',
  level: 'info',
  timestamp: '2024-02-10T00:17:52.086Z'
}
{
  message: 'Executing ICO for 2000',
  level: 'info',
  timestamp: '2024-02-10T00:17:52.094Z'
}
{
  message: 'Constructing Transaction',
  level: 'info',
  timestamp: '2024-02-10T00:17:52.094Z'
}
```

```
/**
 * This method run an Initial Coin Offering against the blockchain adding coins to the
 * blockchain's Treasury
 * @numberOfCoinsToIssue amount, the number of coins issued during the ICO
 */
executeIco(numberOfCoinsToIssue: number){
    const tx = new Transaction( fromAddress: null, this.treasury.address , numberOfCoinsToIssue)
    this.addTransaction(tx);
    logger.info( message: `Mining transaction ${JSON.stringify(tx)}`)
    this.minePendingTransactions(this.miner.address);
    logger.info( message: `Mined transaction to ${tx.toAddress}`)
    const treasuryAddress = Treasury.getTreasury().address
    logger.info( message: `The  treasury at address ${treasuryAddress} now has  ${this.getBalanceOfAddress(treasuryAddress)} coins`)
}
```

https://github.com/reselbob/reselcoin

Wanna run an Ethereum node?

- Get a machine with a minimum specs include 4-8 GB RAM, 2 TB SSD, and an Intel NUC 7th gen or higher x86 processor
- Make sure you have a wired internet connection because it's essential for stable performance
- Install a client such as Geth, Nethermind, Erigon, or Besu to run your node
- Enjoy

Coins and Tokens

US Federal Reserve Bank

ReselChain

Mint

Mint

Working with wallets
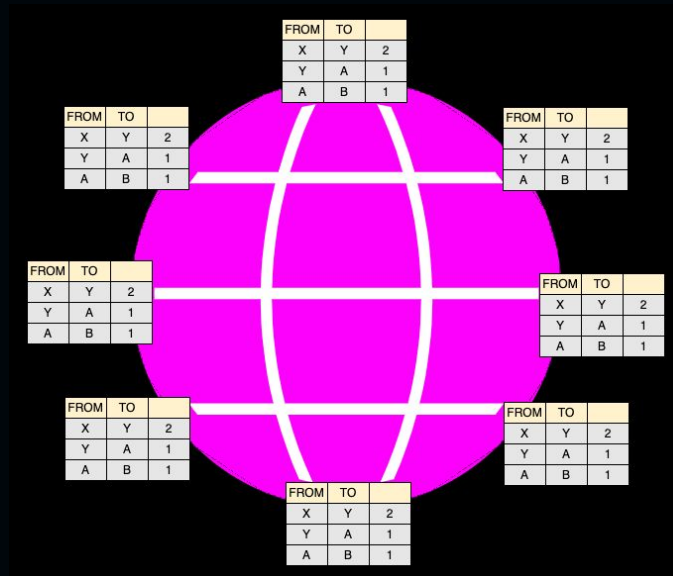
Real world demo: Wallet based login
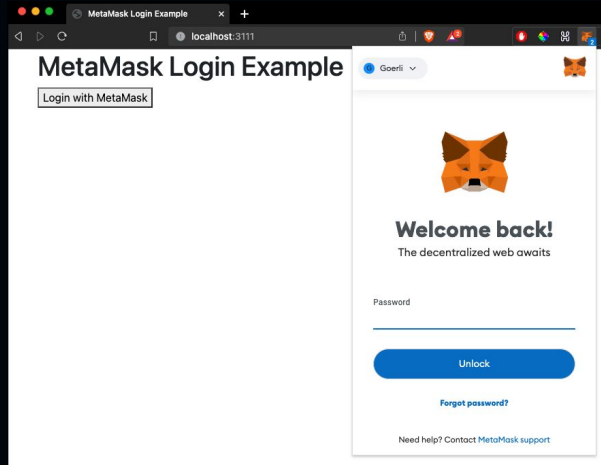
The NFT stuff: Fungible tokens

Subway tokens: New York, Boston, Chicago, Paris, Moscow
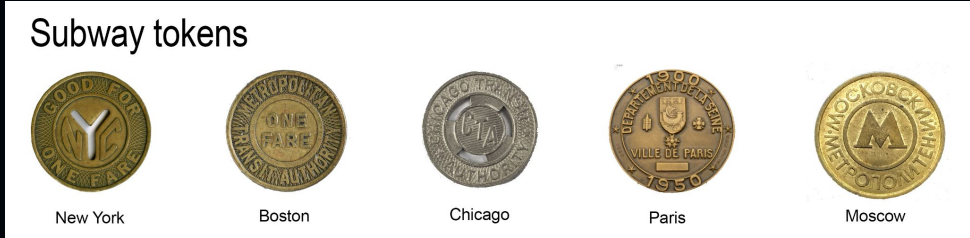
Basic blockchain example

Mike buys 10 subway tokens from the city →

Mike gives one of his tokens to Alice →

From	To	Count
Subway token manufacturer	City Transit Authority	50
City Transit Authority	Mike	10
Mike	Alice	1

The NFT stuff: Non-Fungible Token

Each car in unique and uniquely identifiable

From	To	VIN (fictitious)
Auto manufacturer	Bob the Automobile Dealer	1FAHP25NX8W111111
Auto manufacturer	Bob the Automobile Dealer	1FAHP25NX8W222222
Auto manufacturer	Bob the Automobile Dealer	1FAHP25NX8W333333
Bob the Automobile Dealer	Mike	1FAHP25NX8W111111
Mike	Alice	1FAHP25NX8W111111

Mike buys a car from Bob the Automobile Dealer

Mike sells the car to Alice

The NFT stuff: Interplanetary File System

It's a place to put assets

URLs describe content NOT the location of content

`ipfs://QmdrSbo7sCLKXE8Ai8eSFhhfzhLpbh79PCWyndRNs2C93p`

VS

`https://blockchainjournal.com/images/logo.svg`

Those things we call NFTs, the actual graphic files live on the IPFS

Real World Demo: IPFS
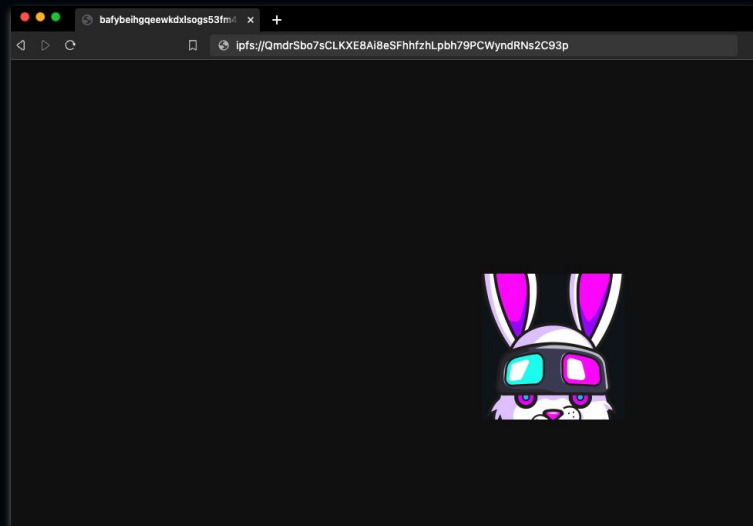
Game Changer: Smart contracts

A smart contract is an application that runs on the blockchain at a particular address. The most popular programming languages for creating smart contracts are Solidity, Rust and Python, but there's probably more… (things are moving pretty fast!).

Smart contracts are typically associated with blockchain platforms, such as Ethereum, Binance Smart Chain, or others that support the execution of decentralized applications (DApps). These contracts can be used for a wide range of applications, including financial transactions, supply chain management, voting systems, and more.

Real world demo: Solidity


```solidity
// SPDX-License-Identifier: MIT
pragma solidity ^0.8.0;


contract AddOperation {


  event LogAnswer(uint256 answer);


  function add(uint256 a, uint256 b) public returns (uint256) {
    uint256 result = a + b;
    emit LogAnswer(result);
    return result;
  }
}
```

Working with a blockchain application 101

Blockchain

The Virtuous Cycle

Local blockchains
Geth

CI/CD Tools Running Scripts
Jenkins
Circle CI

Web3 Clients

Smart Contracts

Development framework
e.g Hardhat tasks in JavaScript
(EVM),
Solana Anchor framework

CODE

PLAN

DEPLOY

BUILD

RELEASE

DEV

OPS

OPERATE

TEST

MONITOR

Test networks:
e.g. Sepolia, Goerli

Blockchain explorers
Etherscan
Blockscout
OpenSea (NFT)
Quine (block security
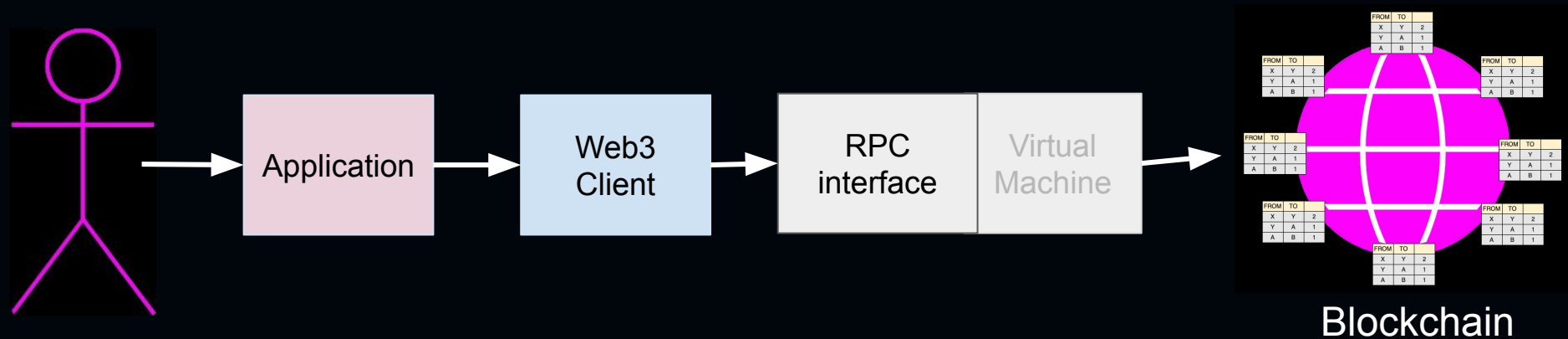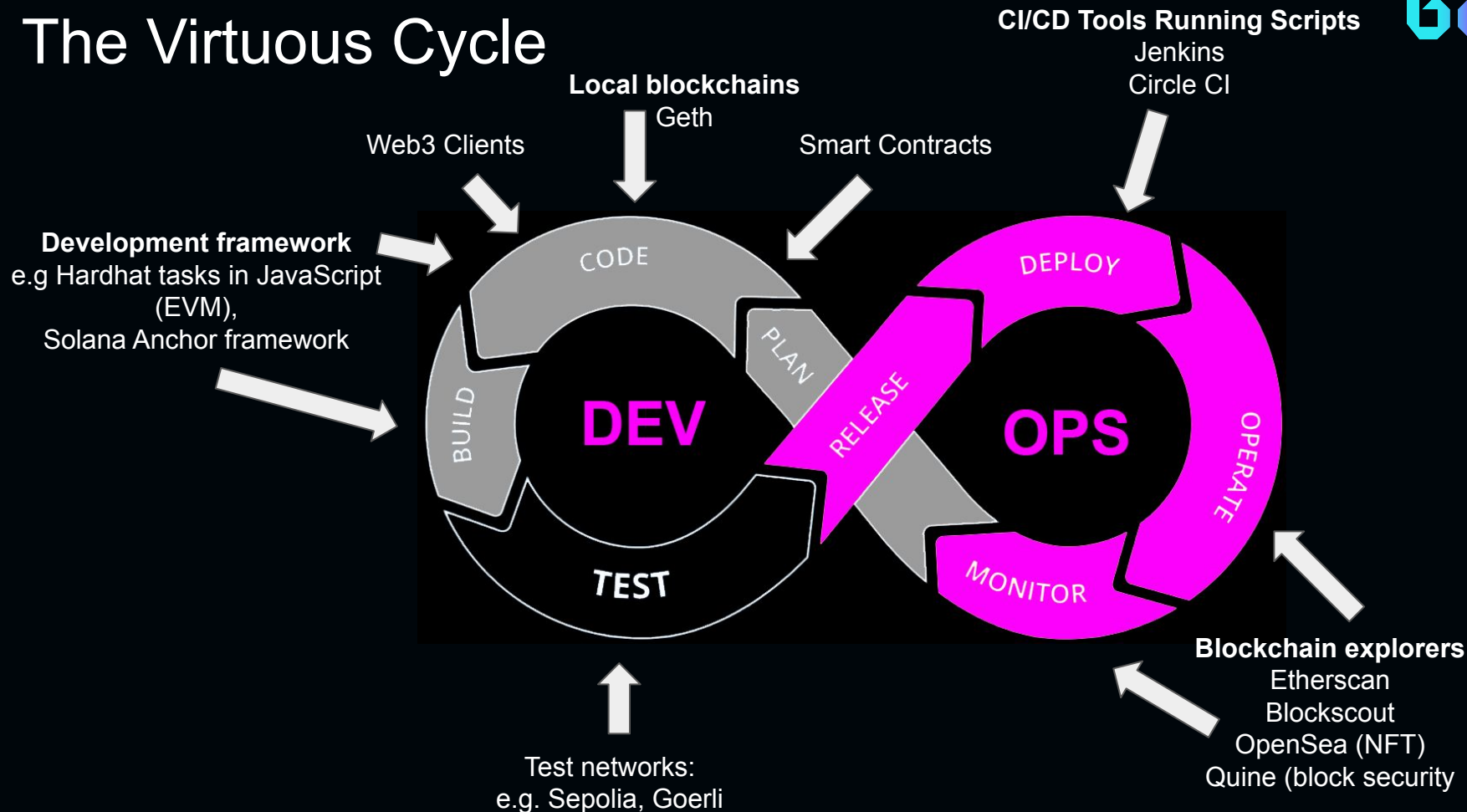
The issues

- In general
  - Transaction speed
  - Gas fees
  - Immutability
  - Security
  - Ever evolving complexity
- For DevOps:
  - CI/CD is hard
  - Local nets vs public Testnets

Real world demo: Token Gating

https://github.com/BlockchainJournal/Create-Tokengate-Demo

How it works

□ = chain activity

□ = application activity

```
┌─────────────────┐     ┌─────────────────┐     ┌─────────────────┐     ┌─────────────────┐
│ Create image to │ ──▶ │  Put image on   │ ──▶ │ Create metadata │ ──▶ │ Create NFT that │
│  assign to NFT  │     │      IPFS       │     │ JSON and put it │     │  includes URI to│
│                 │     │                 │     │    on IPFS      │     │  metadata JSON  │
└─────────────────┘     └─────────────────┘     └─────────────────┘     └─────────────────┘
```
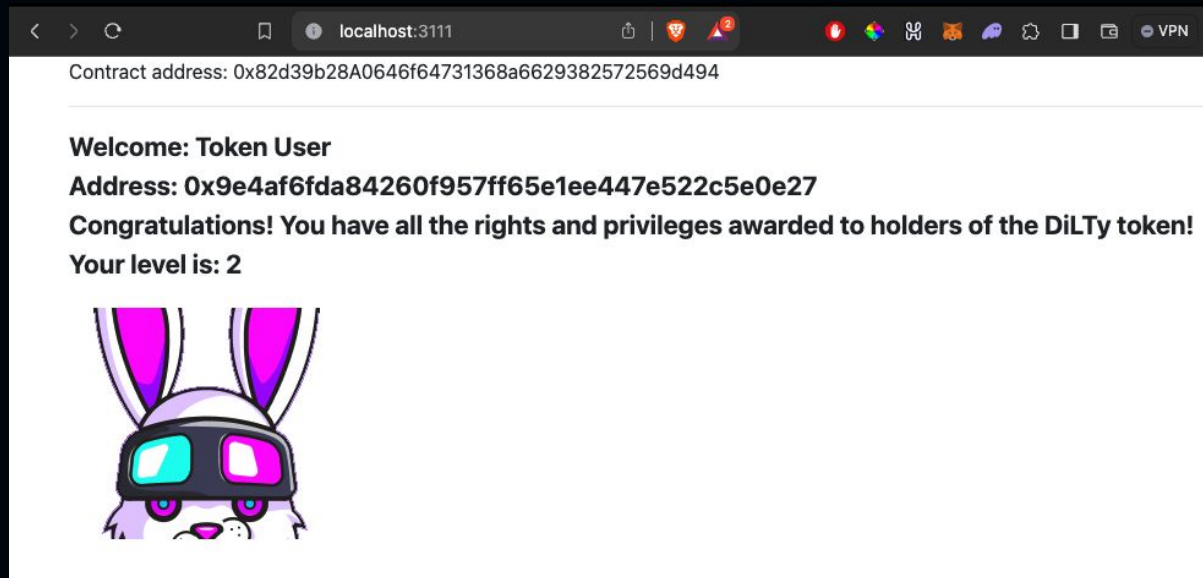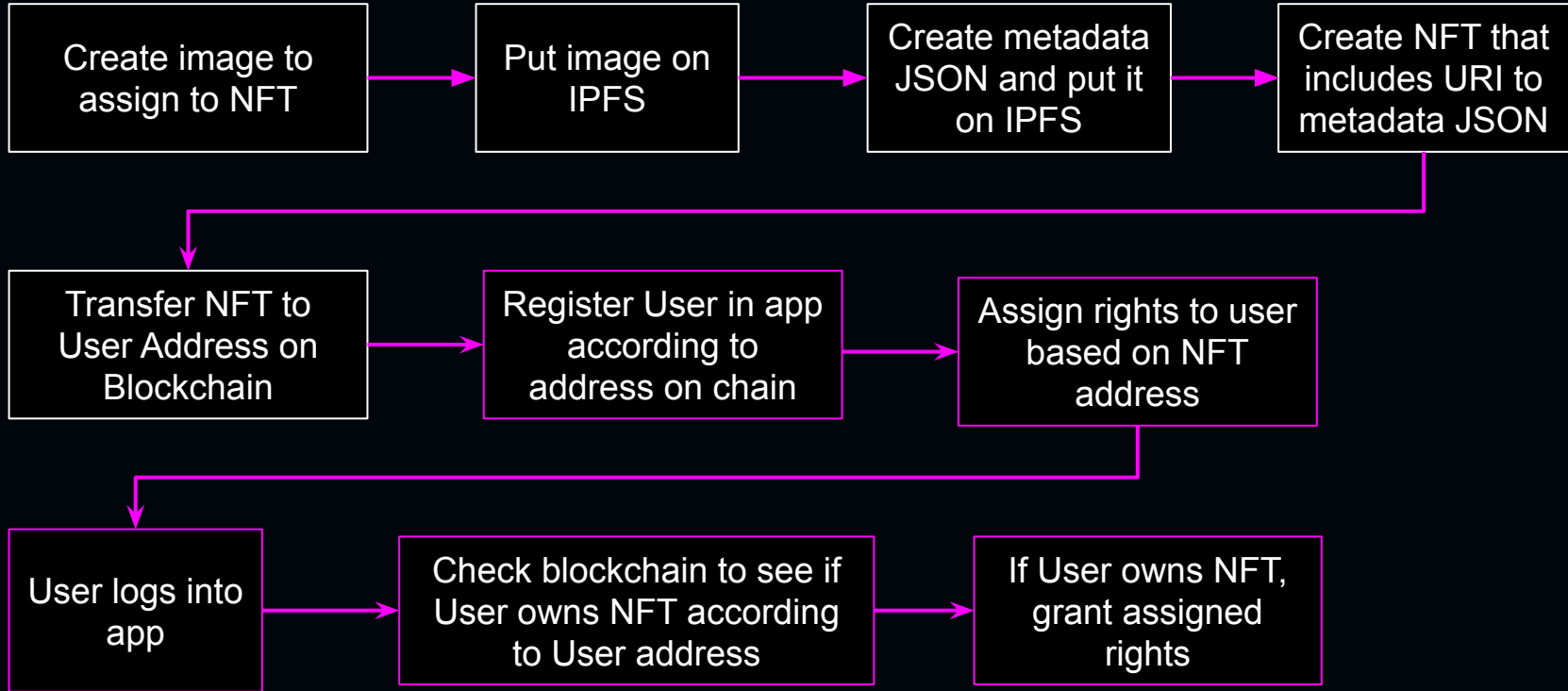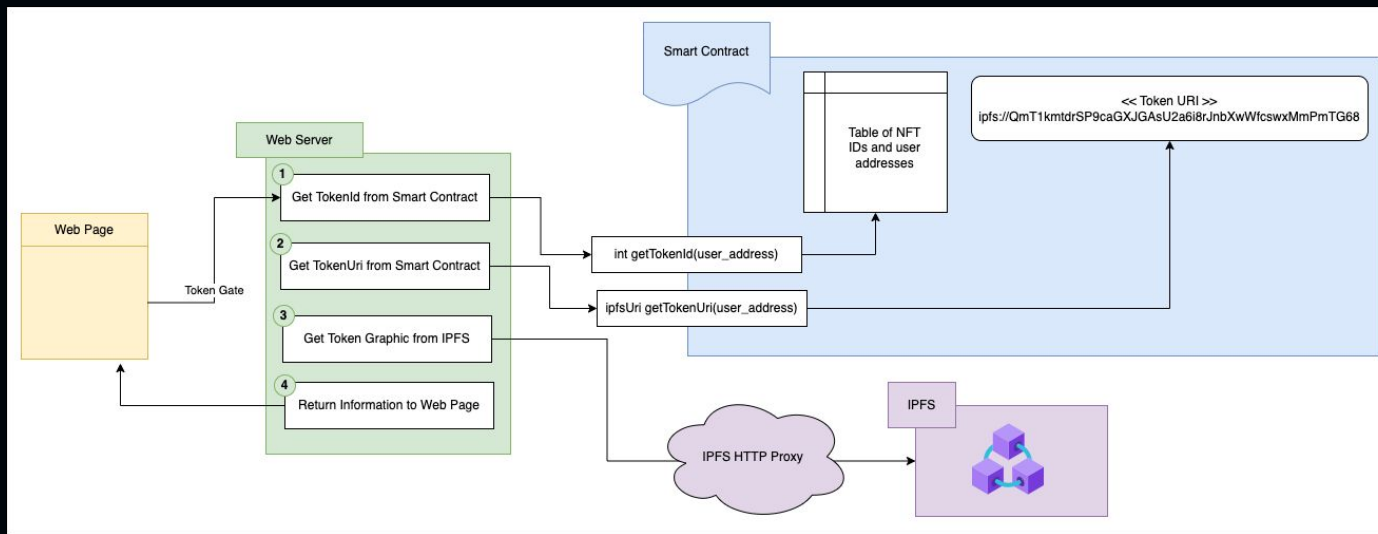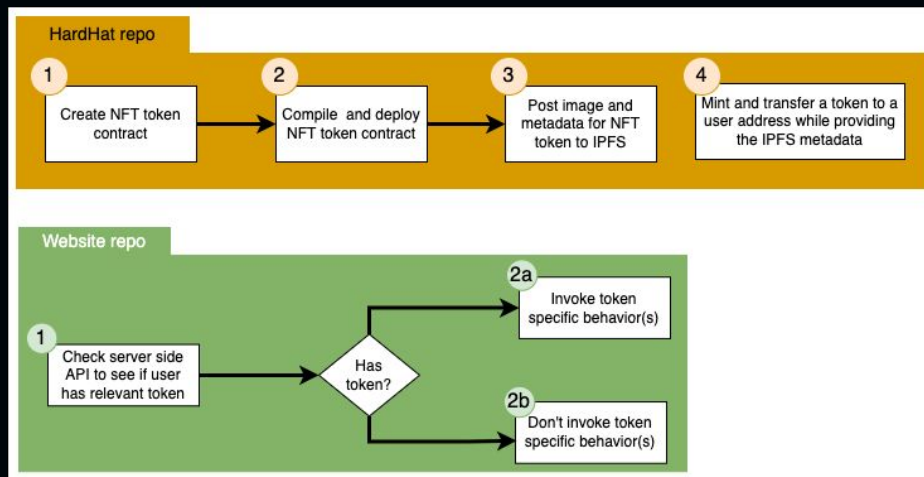
```
┌─────────────────┐     ┌─────────────────┐     ┌─────────────────┐
│ Transfer NFT to │ ──▶ │ Register User in│ ──▶ │Assign rights to │
│ User Address on │     │ app according to│     │   user based on │
│   Blockchain    │     │ address on chain│     │   NFT address   │
└─────────────────┘     └─────────────────┘     └─────────────────┘
```

```
┌─────────────────┐     ┌─────────────────┐     ┌─────────────────┐
│  User logs into │ ──▶ │Check blockchain │ ──▶ │ If User owns NFT│
│       app       │     │ to see if User  │     │  grant assigned │
│                 │     │owns NFT according│    │      rights     │
│                 │     │to User address  │     │                 │
└─────────────────┘     └─────────────────┘     └─────────────────┘
```

The Big Picture

The Demo

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Thank you for your time…

Links to the code

https://github.com/reselbob/reselcoin

https://github.com/BlockchainJournal/Wallet-Login-Demo

https://github.com/BlockchainJournal/Create-Tokengate-Demo