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.
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: Zake 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**

<table>
<thead>
<tr>
<th>From</th>
<th>To</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Genesis Block (Mint)</td>
<td></td>
<td>50</td>
</tr>
<tr>
<td>Mint</td>
<td>Bob</td>
<td>20</td>
</tr>
<tr>
<td>Bob</td>
<td>Alice</td>
<td>8</td>
</tr>
<tr>
<td>Bob</td>
<td>Mike</td>
<td>6</td>
</tr>
<tr>
<td>Alice</td>
<td>Jane</td>
<td>4</td>
</tr>
<tr>
<td>Mike</td>
<td>Jane</td>
<td>2</td>
</tr>
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</table>

**Account Balances**

<table>
<thead>
<tr>
<th>Account</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Genesis Block (Mint)</td>
<td>30</td>
</tr>
<tr>
<td>Bob</td>
<td>6</td>
</tr>
<tr>
<td>Alice</td>
<td>4</td>
</tr>
<tr>
<td>Mike</td>
<td>4</td>
</tr>
<tr>
<td>Jane</td>
<td>6</td>
</tr>
</tbody>
</table>
There are many blockchain networks out there:

- Bitcoin
- Ethereum
- Hedera
- Solana
- Avalanche
- Polygon

There are more...
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

```javascript
{
  message: 'Constructing Block',
  level: 'info',
  timestamp: '2024-02-10T08:17:52.086Z'
}
{
  message: 'Executing ICO for 2000',
  level: 'info',
  timestamp: '2024-02-10T08:17:52.094Z'
}
{
  message: 'Constructing Transaction',
  level: 'info',
  timestamp: '2024-02-10T08:17:52.094Z'
}

/**
 * This method runs an Initial Coin Offering against the blockchain, adding coins to the
 * blockchain's treasury.
 * @param {number} numberOfCoinsToIssue Number of coins to issue during the ICO.
 */
function executeIco(numberOfCoinsToIssue) {
  const tx = new Transaction({fromAddress: null, this.treasury.address, numberOfCoinsToIssue})
  this.addTransaction(tx);
  logger.info('Mining transaction ' + JSON.stringify(tx));
  this.minePendingTransactions(this.miner.address);
  logger.info('Mined transaction to ' + tx.toAddress);
  const treasuryAddress = Treasury.getTreasury().address;
  logger.info('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

Mint

ReselChain

Mint
Working with wallets

Wallet is a public key, private key and address

0x0A8EBb6a D5A8e499E550 ae2C46119762 4c6e667

Transaction

To: xxx
From: yyy
Amount: ##

Wallet creates a signature using private key and passed transaction and public key to blockchain processor

Processor validates the signature against the declared address and adds the transaction to a block for the blockchain
Real world demo: Wallet based login

![Diagram showing the process of wallet-based login](image_url)
The NFT stuff: Fungible tokens

Basic blockchain example

<table>
<thead>
<tr>
<th>From</th>
<th>To</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subway token manufacturer</td>
<td>City Transit Authority</td>
<td>50</td>
</tr>
<tr>
<td>City Transit Authority</td>
<td>Mike</td>
<td>10</td>
</tr>
<tr>
<td>Mike</td>
<td>Alice</td>
<td>1</td>
</tr>
</tbody>
</table>

Mike buys 10 subway tokens from the city

Mike gives one of his tokens to Alice
The NFT stuff: Non-Fungible Token

<table>
<thead>
<tr>
<th>From</th>
<th>To</th>
<th>VIN (fictitious)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auto manufacturer</td>
<td>Bob the Automobile Dealer</td>
<td>1FAHP25NX8W11111</td>
</tr>
<tr>
<td>Auto manufacturer</td>
<td>Bob the Automobile Dealer</td>
<td>1FAHP25NX8W22222</td>
</tr>
<tr>
<td>Auto manufacturer</td>
<td>Bob the Automobile Dealer</td>
<td>1FAHP25NX8W33333</td>
</tr>
<tr>
<td>Bob the Automobile Dealer</td>
<td>Mike</td>
<td>1FAHP25NX8W11111</td>
</tr>
<tr>
<td>Mike</td>
<td>Alice</td>
<td>1FAHP25NX8W11111</td>
</tr>
</tbody>
</table>

Each car in unique and uniquely identifiable.
The NFT stuff: Interplanetary File System

It’s a place to put assets

URLs describe content NOT the location of content

```
ipfs://QmdrSbo7sCLKXE8Ai8eSFhfhfzhLpbh79PCWyndRNs2C93p
```

VS

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

Those things we call NFTs, the actual graphic files live on the IPFS
Real World Demo: IPFS
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.
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
The Virtuous Cycle

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

Local blockchains
- Geth

Web3 Clients
- e.g. Sepolia, Goerli

Smart Contracts

CI/CD Tools Running Scripts
- Jenkins
- Circle CI

Jenkins
- Circle CI

Blockchain explorers
- Etherscan
- Blockscout
- OpenSea (NFT)
- Quine (block security)

Test networks:
- e.g. Sepolia, Goerli

CODE -> PLAN -> BUILD

DEV

TEST

DEPLOY

OPS

RELEASE

MONITOR

OPERATE

Monitor
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

Welcome: Token User
Address: 0x9e4af6fda84260f957ff65e1ee447e522c5e0e27
Congratulations! You have all the rights and privileges awarded to holders of the DiLTy token!
Your level is: 2

https://github.com/BlockchainJournal/Create-Tokengate-Demo
How it works

Create image to assign to NFT → Put image on IPFS → Create metadata JSON and put it on IPFS → Create NFT that includes URI to metadata JSON

Transfer NFT to User Address on Blockchain → Register User in app according to address on chain → Assign rights to user based on NFT address

User logs into app → Check blockchain to see if User owns NFT according to User address → If User owns NFT, grant assigned rights
The Big Picture
The Demo
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