# The Design and Implementation of a Low-Cost Bitcoin Vending Machine

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## Introduction

*What is Bitcoin?*

- Bitcoin (BTC) is a virtual and decentralized cryptocurrency and currency trading platform [1].

*Why is it important?*

- The odds of experiencing a data breach are 1 in 4 [2].

*How is Bitcoin flawed?*

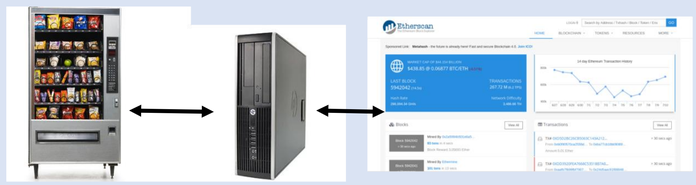
- The average timing for BTC transactions is 10 minutes [1].

- Current solutions reduce the transaction time, but use expensive components in terms of computation power and monetary cost [3], [4].

## Research Question

Can a low-cost vending machine be designed and implemented to support Bitcoin transactions?

## System Overview



a. Vending machine b. WiFi-enabled computing device c. Full Ethereum node, etherscan.io

Figure 1: Design of Bitcoin vending machine system

## Fast Transactions

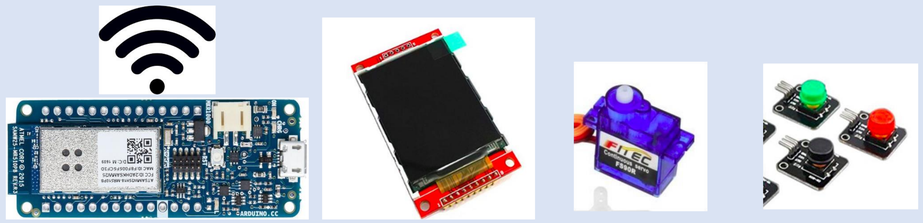
- Ethereum's (ETH) smart contract functionality will be used to speed up BTC transactions.

- The average time for one ETH transaction confirmation is 15 seconds [5].

- Twelve confirmations will be the base for a secure transaction [5].

## System Architecture

- The vending machine setup shown in figure 2.
  - Board cost: $31 (2018), operating on 3.3 volts.
  - Each module cost: < $12, operating on 5 volts.
- The vending machine interfaces with a server of any computing caliber.
- Using etherscan.io is much more inexpensive than hosting our own Ethereum node.



a. WiFi-enabled Arduino board b. LCD display monitor c. 360 degree servo motor d. Microswitch buttons

Figure 2: Vending machine architecture and modules

## Transaction Process


Figure 3: Design and visualization of the transaction process.

Steps 2 to 4 are completed on the server:

- Step 2 and 3 are interfaced with the Ethereum node.
- Step 4 is interfaced with the Arduino board.

## Discussion

BTC hasn't been adapted for use in time-constrained environments. Current solutions are costly in terms of money and power consumption. Our design is low-cost and more viable, allowing future work to be more feasible.

## Conclusion

By adapting BTC payments for time-constrained transactions, society is able to move away from third party trust. In a world where hacking and data breaches happen every day, Bitcoin is important for keeping our information out of the wrong hands.

## Future Work

- Same design; no server.
- Timing and security analyses.
- Implementation in grocery stores, retailers, bus stations, and more.

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## References

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