Not Enough IoT After All: Visiting Transactional Characteristics of IoT Blockchains

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Overview

1. Introduction
2. Dataset Overview
3. IoT Blockchain Analysis
   - IoTeX
   - Helium
4. Conclusion

Blockchain Introduction

- Decentralized ledger for recording transactions
- Recorded as Block or chain of transactions (DAG)
- A transaction can initiate several actions
- Blocks/txns are mined or validated as per Consensus rules
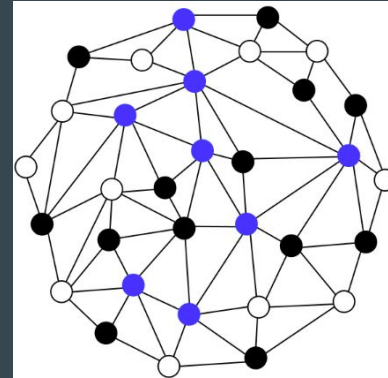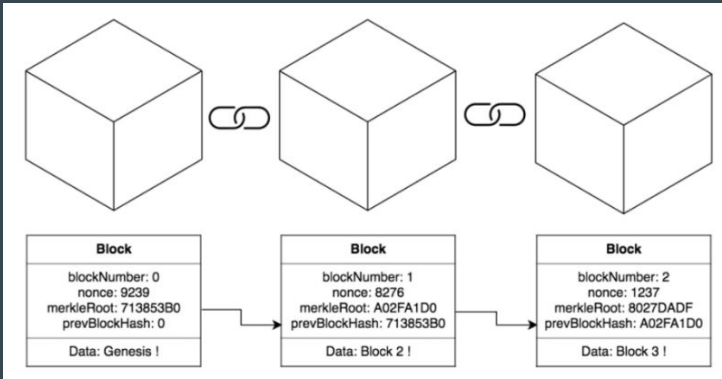
Blockchain Introduction

- Block production time (epoch) depends on consensus protocol
- Epochs have varying definitions across different blockchains.
- Throughput/Utilization capability is defined as transactions per block
- Time per block is defined in IoTeX and Helium blockchains

IoT Blockchain

- IoT devices are resource constrained, lightweight
- Typically everything that blockchain operation requires, they don't have enough of it
- Usually connected using edge computing, not directly connected to the network

Connected devices

special channels

LoRa
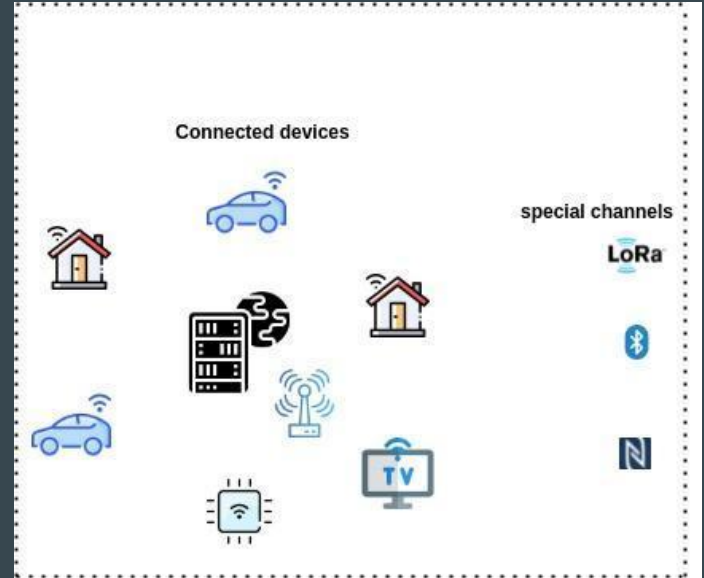
Dataset Overview

Dataset Overview

- IoTeX -   Blocks: 1 to 19,500,000

  Transactions: 29,412,868

  April 2019 till September 2022

- Helium - Blocks: 1 to 1,531,124

  Transactions: 498,291,572

  July 2019 to September 2022

Framework - https://github.com/WiSeCom-UPF/blockchain-analyzer

Dataset Overview

IoTeX Blockchain			
Category	**Action name**	**Count**	**Percentage %**
Peer-to-peer transactions	Transfer	1,718,711	6%
Smart Contract	Verified SCs	11,498,337	39%
	Unverified SCs	9,224,124	31%
Others transactions	Governance	6,971,696	24%
Total		29,412,868	100%

Dataset Overview

Helium Blockchain			
Category	**Action name**	**Count**	**Percentage %**
Proof of Coverage Challenge	PoC Request	292,828,528	59%
Proof of Receipts	Version 1	141,012,708	28%
	Version 2	39,419,556	8%
Validator	Heartbeat	18,498,289	4%
	Stake Validator	4121	
	Transfer Stake	706	
	Unstake Validator	492	
Assert Location	Version 1	65,971	0.4%
	Version2	2,202,359	
Payment	Version 1	381,502	0.5%
	Version2	2,140,718	
Hotspot	Add gateway	950,300	0.2%
	Transfer Hotspot V1	82,616	
	Transfer Hotspot V2	94,434	
Others	rewards, state channels, etc.	609,272	0.1%
Total		498,291,572	100%

IoTeX Analysis

IoTeX Analysis

- Top 5 Smart Contracts 62% traffic, no IoT DApp
- 95% Smart contract traffic comes from just 50 DApps
- Non-IoT apps are dominating the traffic
- Traffic and price correlated on several intervals
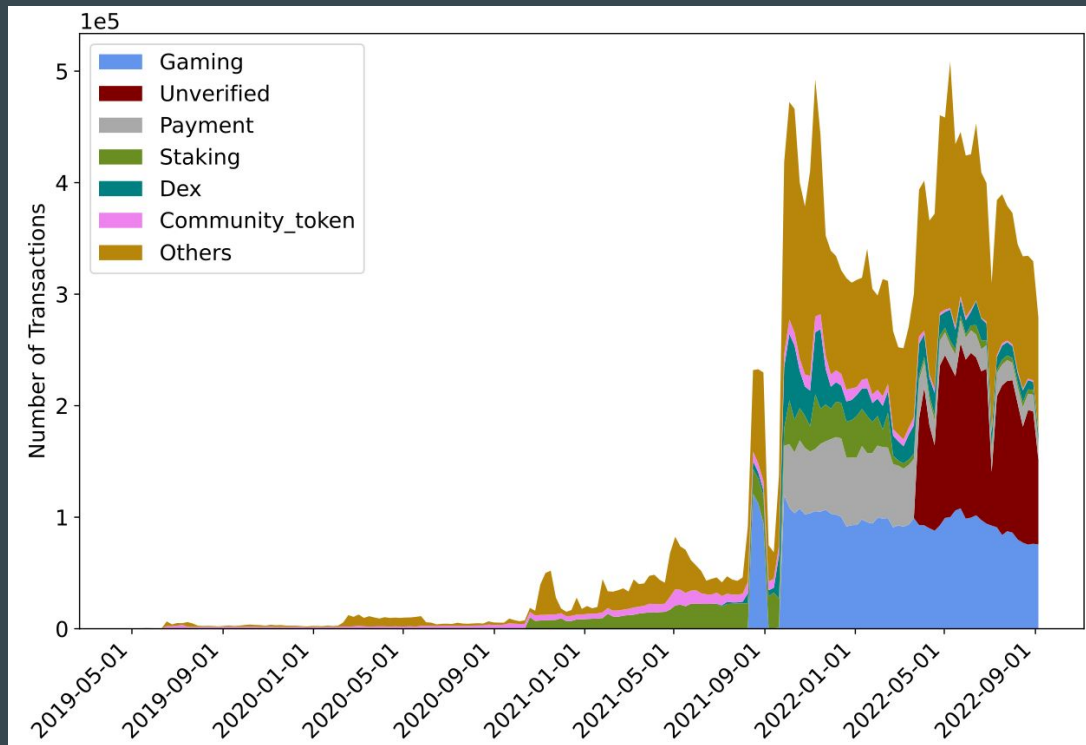
Low Transaction spam - IoTeX Analysis

- August 2021 Low-value P2P transaction spam
- 0xe3DF5d103551b1D3d8117c59223AB62f1Ad15552 sending 0.1 IOTX to random unique address, 14% of all P2P
- Recipients didn't move even a single token
- Right before secondary market sale which is followed by a Seed investment round
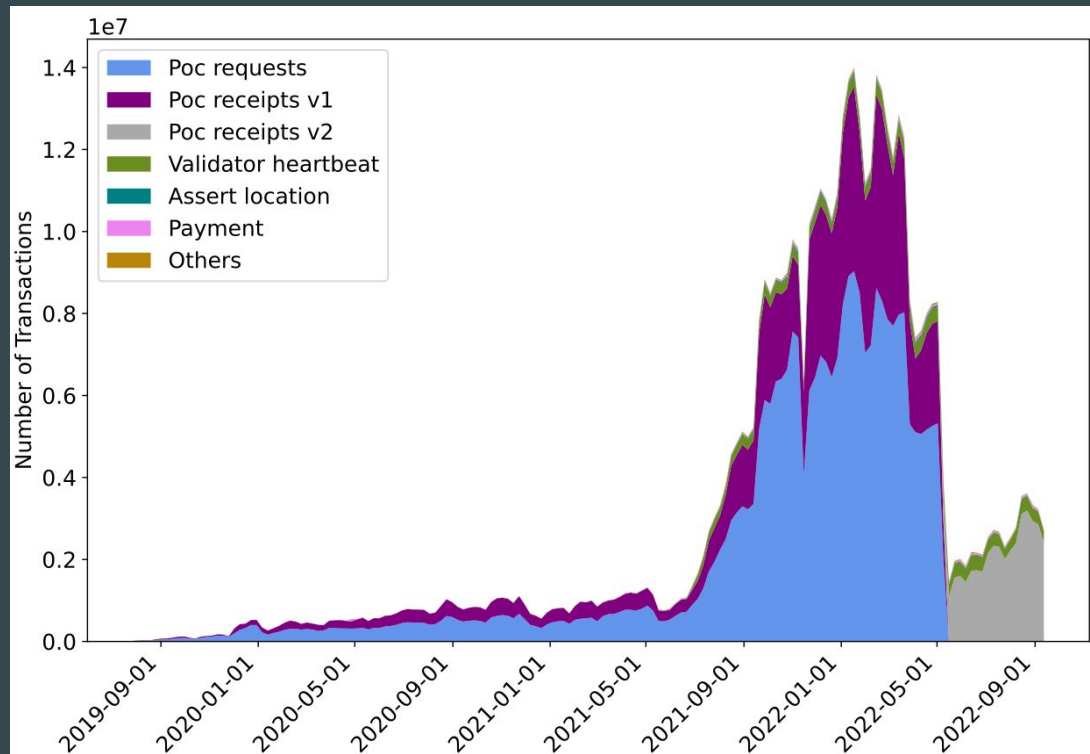
IoTeX Analysis

- 24% on-chain governance transactions
- Block rewards related
- Not used in any application
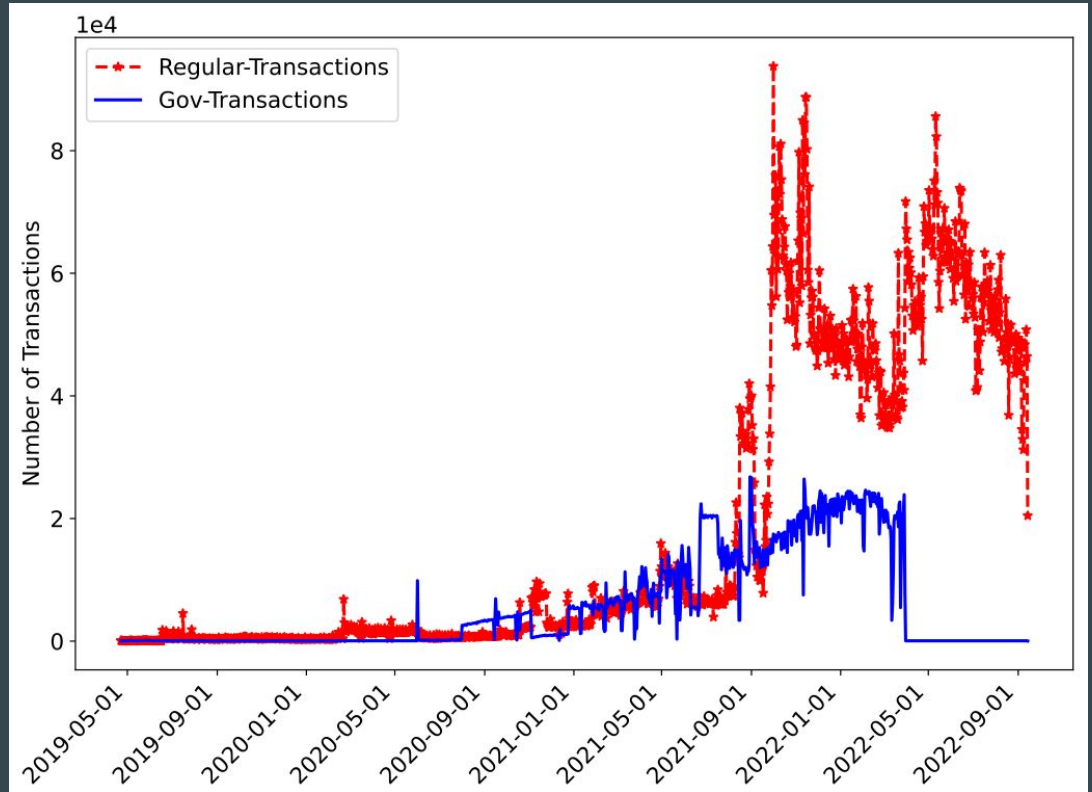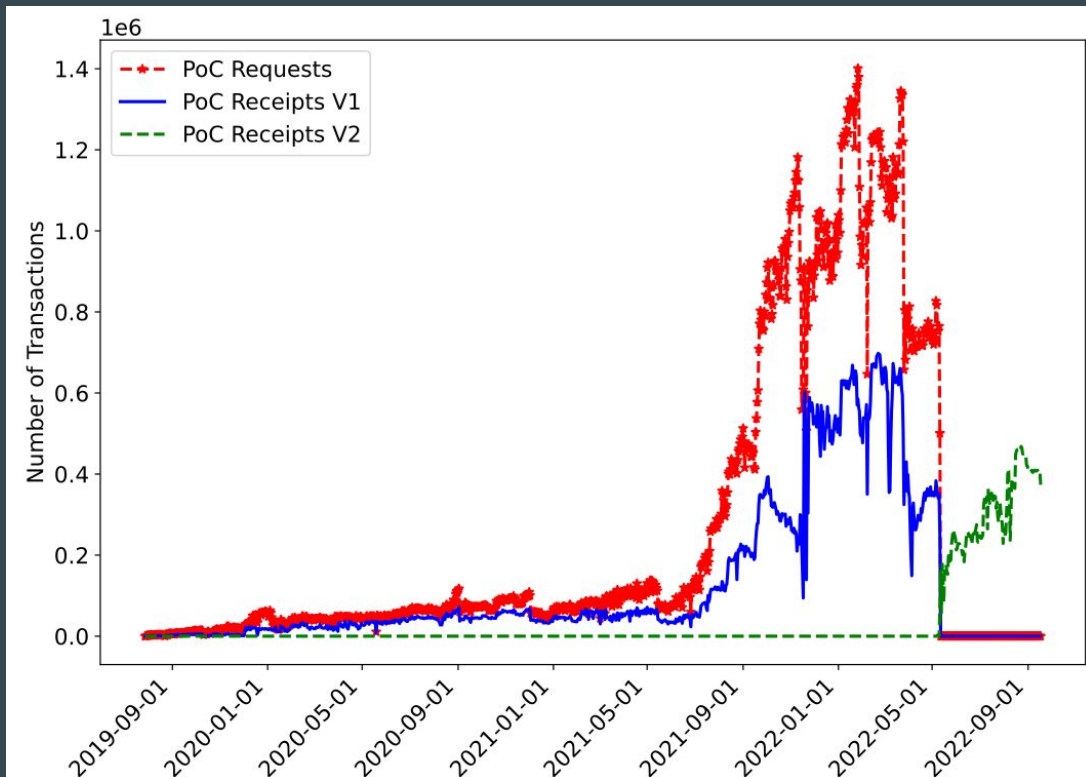
Helium Analysis

Helium Analysis

- Network congestion with PoC request
- Useful IoT traffic accounts for less 0.1%
- Usual network outages due to protocol congestion
- P2P txns have 0.5% share

Helium Analysis

- Vast difference between PoC request and PoC receipt
- 150 Millions stale PoC requests
- Protocol inefficiencies lead to resource wastage

Conclusion

- IoTeX and Helium traffic suggest non-IoT adoption
- Both are highly inefficient due to protocol design issues, not fit for on IoT device client
- Helium is tending towards modular decompose of protocol (long awaited)
- IoTeX published half of the blocks empty, EVM clone with lower transaction fee