

Blockchain Oriented IoT Monitoring Architecture with an Efficient Miner Selection



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Abstract

- ❖ Blockchain based decentralized architecture for the storage of IoT data produced from smart home/cities. The architecture includes a secure communication protocol using a sign-encryption technique between power constrained IoT devices and a Gateway.
- ❖ We propose that a Software Agent executing on the Gateway selects a Miner node using performance parameters of Miners

Objectives

- ❖ To safeguard against a Denial of Service attack and a single point of failure.
- ❖ Addressing the security and privacy challenges while collecting records from IoT devices.
- ❖ Optimizing the response time and energy consumption in the Blockchain.

Related Works

- ❖ Optimized Blockchain for smart home monitoring by Ali et al. Blockchain based Secured framework for collecting IoT data by Biswas. Decentralized private Blockchain based approach for trading and managing the production of renewable energy by Mengelkamp
- ❖ A scalable Blockchain consensus protocol called Bitcoin-NG(Next Generation) by Eyal et al. A random miner selection consensus protocol like MultiChain by Peterson et al.

Reference

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2. A. Dorri, S. S. Kanhere, R. Jurdak, and P. Gauravaram, "Blockchain for iot security and privacy: The case study of a smart home," in *Pervasive Computing and Communications Workshops (PerCom Workshops), 2017 IEEE International Conference on*, IEEE, 2017, pp. 618–623.
3. P. K. Sharma, M.-Y. Chen, and J. H. Park, "A software defined fog node based distributed blockchain cloud architecture for iot," *IEEE Access*, vol. 6, pp. 115–124, 2018.
4. M. A. Uddin, A. Stranieri, I. Gondal, and V. Balasubramanian, "A patient agent to manage blockchains for remote patient monitoring," *Studies in health technology and informatics*, vol. 254, pp. 105–115, 2018.

Blockchain based IoT Monitoring Framework

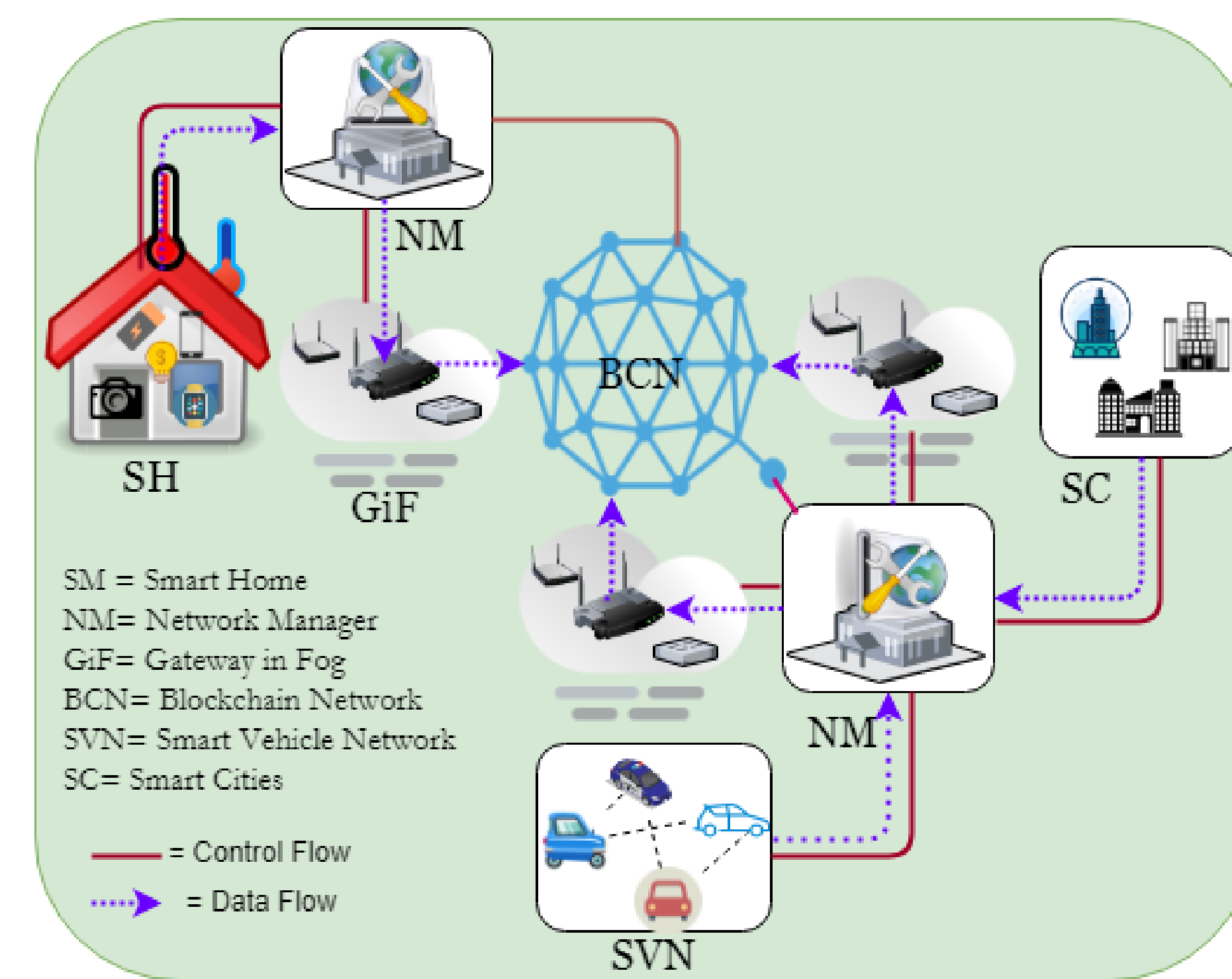


Figure 1: Blockchain based distributed architecture for IoT monitoring

- ❖ **Network Manager(NM):** Network Manager is a semi trusted powerful entity that might be owned by a particular organization such as government institution, or research center. It plays a role in initializing IoT devices of smart home network/smart cities, managing membership of IoT devices, and generating keys.

Sign Encryption to Protect privacy of IoT devices

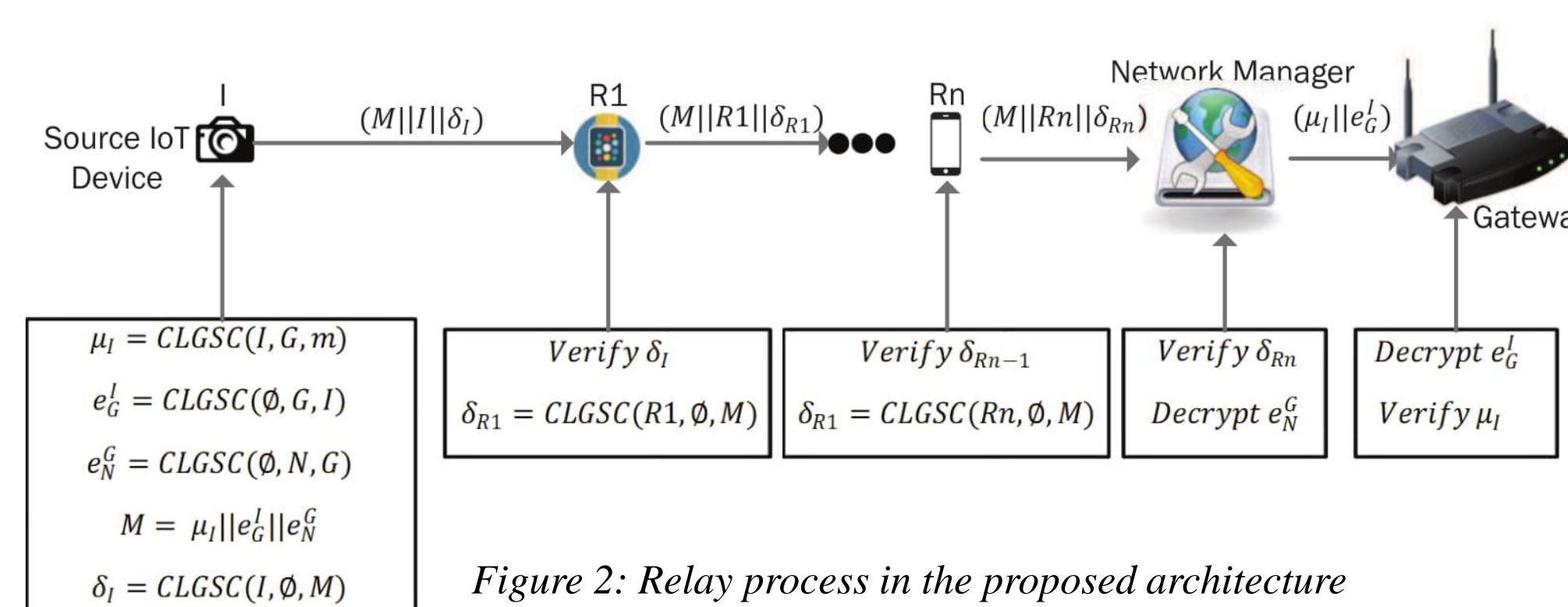


Figure 2: Relay process in the proposed architecture

- ❖ Advantage of sing encryption
 - ❖ Signature and encryption by the same algorithm
 - ❖ Unlink ability
 - ❖ Forward security
 - ❖ Anonymity and contextual privacy

Gateway Controlled Blockchain

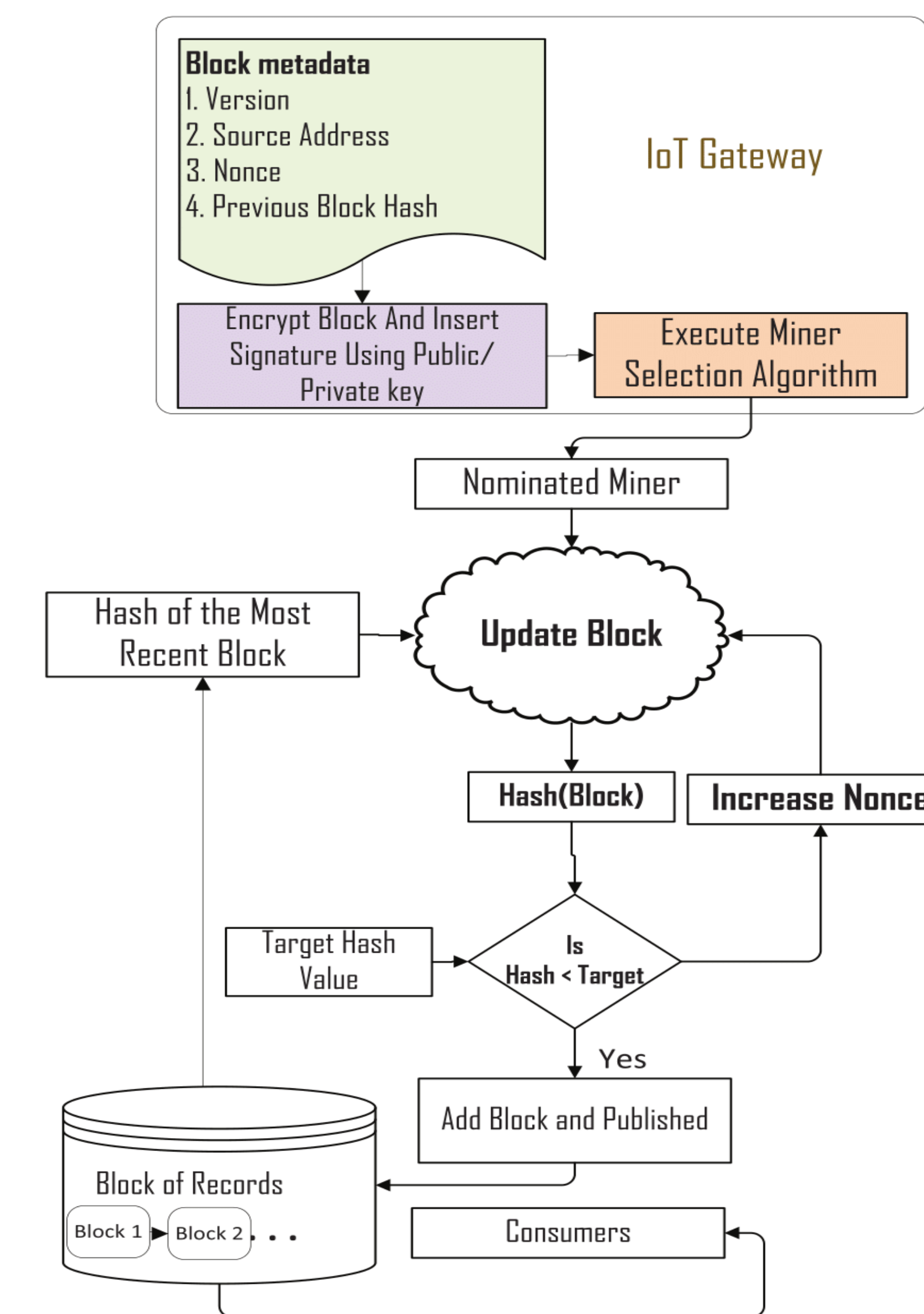


Figure 3: The Gateway controlled Blockchain

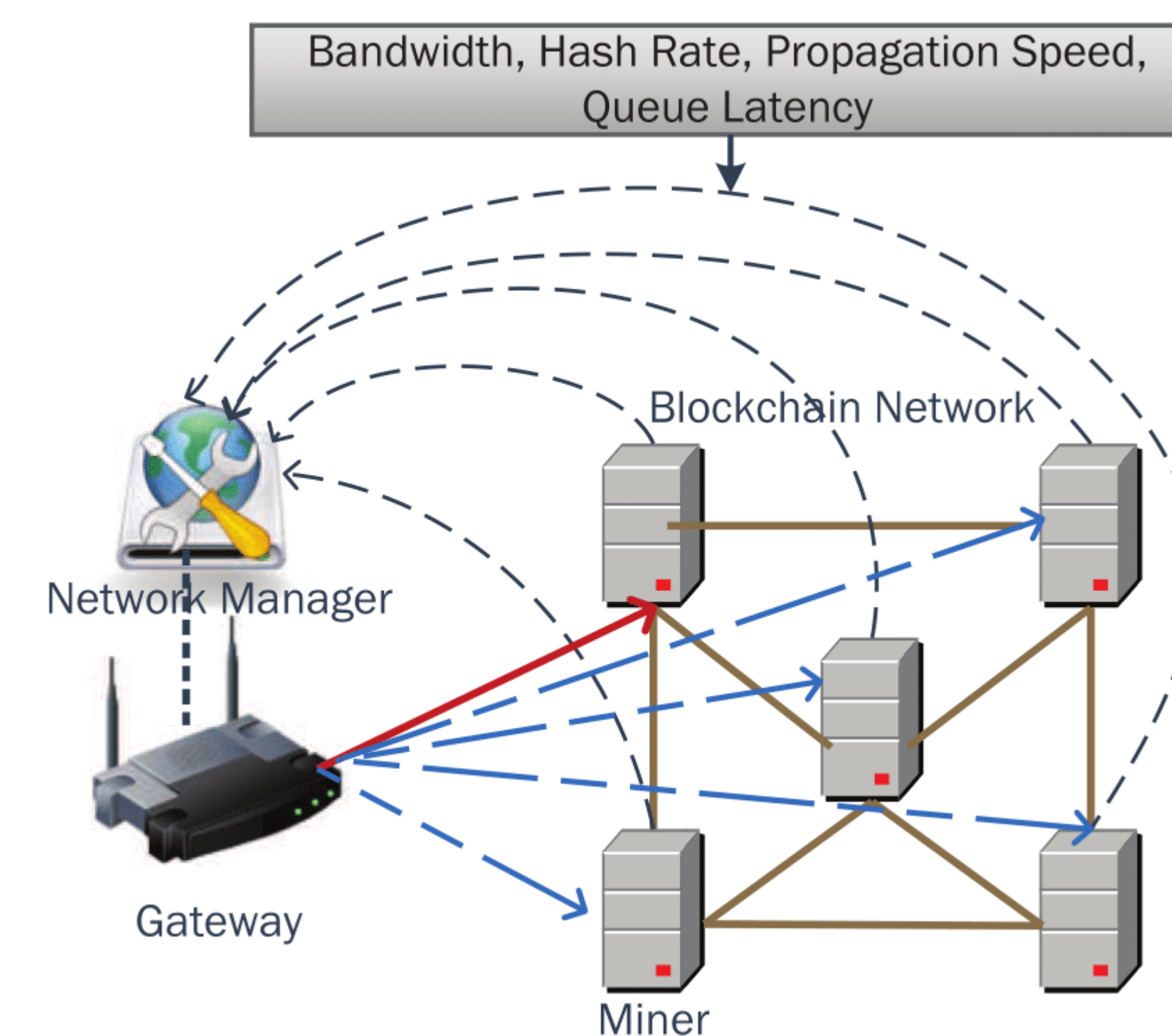


Figure 4: Miner Selection by the Gateway

Performance Analysis

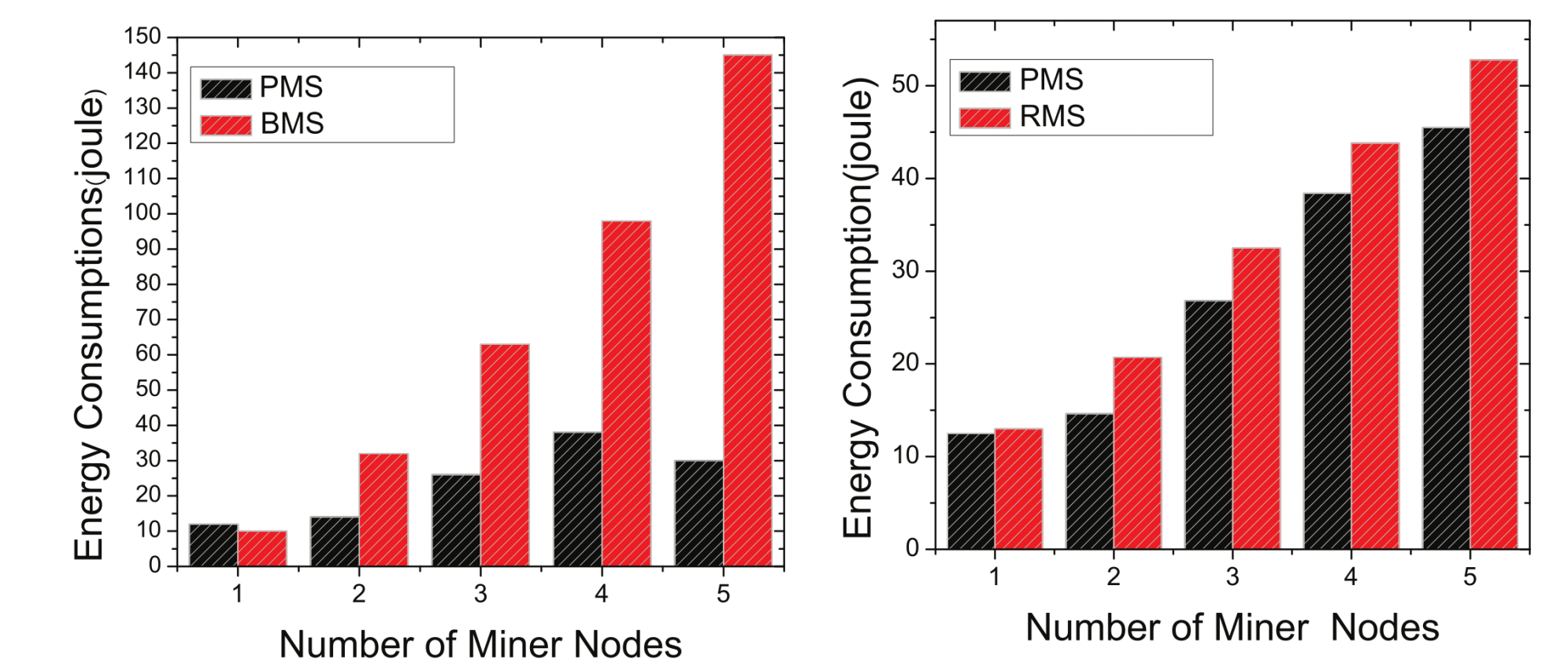


Figure 4: The comparison of energy consumption among three mining approaches

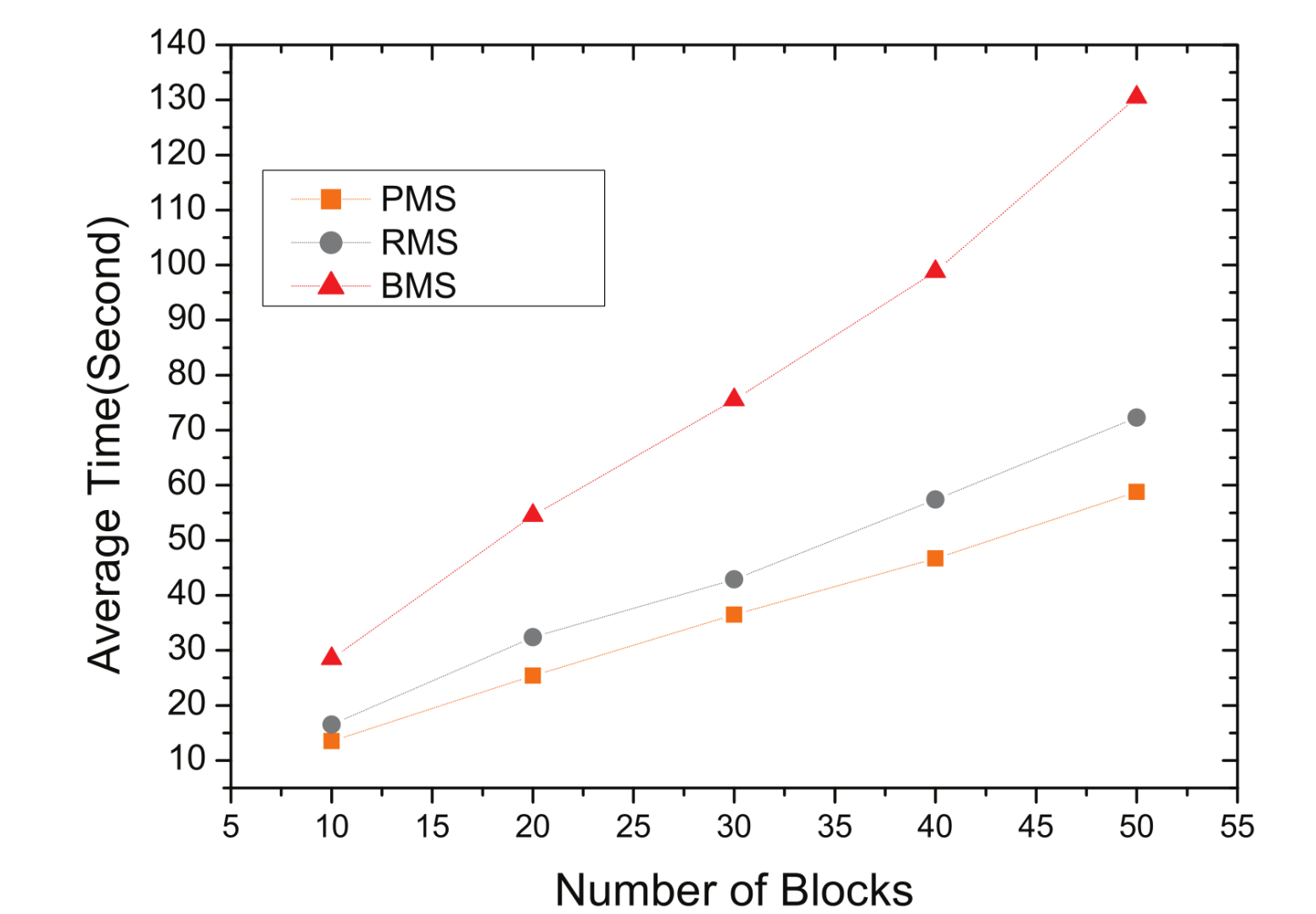


Figure 5: Block processing time of proposed, random and Bitcoin miner selection

Conclusion

- ❖ The sign-encryption technique which is a lightweight cryptography for IoT devices has been used to ensure the privacy and security of IoT devices.
- ❖ We further advanced the functionality of Gateway as a Miner Selector to bridge the gap between power and memory constraint IoT devices and Blockchain. The Gateway selects a small set of efficient Miners based on performance to make the Blocks' processing faster.

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