Interactive IoT-Blockchain System for Big Data Processing

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Abstract : The spectrum of IoT devices is becoming widely diversified, entering almost all possible fields and finding applications in industry, health, finance, logistics, education, to name a few. The IoT active endpoint sensors and devices exceeded the 12 billion mark in 2021 and are expected to reach 27 billion in 2025, with over $34 billion in total market value. This sheer rise in numbers and use of IoT devices bring with it considerable concerns regarding data storage, analysis, manipulation and protection. IoT Blockchain-based systems have recently been proposed as a decentralized solution for large-scale data storage and protection. COVID-19 has actually accelerated the desire to utilize IoT devices as it impacted both demand and supply and significantly affected several regions due to logistic reasons such as supply chain interruptions, shortage of shipping containers and port congestion. An IoT-blockchain system is proposed to handle big data generated by a distributed network of sensors and controllers in an interactive manner. The system is designed using the Ethereum platform, which utilizes smart contracts, programmed in solidity to execute and manage data generated by IoT sensors and devices. such as Raspberry Pi 4, Rasbpian, and add-on hardware security modules. The proposed system will run a number of applications hosted by a local machine used to validate transactions. It then sends data to the rest of the network through InterPlanetary File System (IPFS) and Ethereum Swarm, forming a closed IoT ecosystem run by blockchain where a number of distributed IoT devices can communicate and interact, thus forming a closed, controlled environment. A prototype has been deployed with three IoT handling units distributed over a wide geographical space in order to examine its feasibility, performance and costs. Initial results indicated that big IoT data retrieval and storage is feasible and interactivity is possible, provided that certain conditions of cost, speed and thorough put are met.

Keywords : IoT devices, blockchain, Ethereum, big data

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