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Blockchain Technology Needs in Edge Computing Environment

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Abstract: Blockchain and Edge computing tinge on the concept of distributed networking, the two can be a rough pair working in unification. Especially edge computing often entails influential graphical processing units which can help speed up the processing of blockchain transactions. Internet of Things(IoT) devices without sufficient resources for blockchain operations can offload these difficulties to the edge layer, thereby simplifying such operations. Blockchain has the budding to solve the security and privacy issues connected with edge computing, such as access control, privacy, and authentication. Edge computing in combination with blockchain, appears to be endearing combination for developing a secure, scalable and distributed IoT platform.

Keywords: - Internet of Things, Edge Computing and Blockchain

Introduction:

Edge Computing stores and processes data nearby. IoT device was created on, at the "edge" of the network. Only required data is synced to a cloud or an on premise server. Edge Computing is a distributed computing paradigm which processing and computation are performed mainly on secret device nodes known as smart devices or edge devices as opposed to processed in a centralized cloud environment or data center. It supports to provide data analysis, server resources and artificial intelligence to data collection sources and cyber-physical sources like smart sensors and actuators. Blockchain technology also defined as a decentralized, shared ledger of all transactions across a peer-to-peer network. It allows Bitcoin and is useful to many business processes. This safeguards the indistinctness and security of the users. Blockchain technology's aim is to allow digital information to be dispersed and recorded, but not rewritten. Integrated Blockchain Edge computing(IBEC) helps allow us to build a distributed and secure edge computing architecture that can stimulate the safety and integrity of IoT data throughout its lifespan. As the number of claims and their need for secure, real-time data access raises.

Internet of Things(IoT):

IoT is the network of physical substances embedded with sensors, software and network connectivity, which permits these objects to collect and exchange data. IoT allows objects to be recognized and controlled remotely across surviving network infrastructure, making opportunities for more direct integration between the physical world and computer based systems and resulting in better efficiency, accuracy and financial benefit. These devices collect valuable data with the help of various existing technologies and then autonomously flow the data among other devices [1].

How It Works?

IoT is not the result of a single new technology in its place several paired technical developments provide competences that taken together help to bond the gap between the virtual and physical world. It includes Communication, Identification and Embedded Information Processing.

Technological Challenges of IoT:

- Interaction and Short range communication.
- Scalability.
- Technological Standardization.
- Software complexity.
- Data volumes and interpretation.
- Fault tolerance.

Edge Computing:

A network of micro data centers that store or process critical data locally and push received data to a centre data center or repository of cloud storage. Typically, in IoT use cases, a massive chunk of data goes through the data center but Edge Computing processes the data nearby results in compact traffic in the central source. This is done by IoT devices, transferring the data to the local device, which includes storage, compute, and network connectivity. After that, data is processed at the edge while another portion is sent to storage repository or central processing in the data center.

Why is Edge Computing Important?

- Easier configurations.
- New Functionalities are offered.
- The load on the server is reduced.
- Increases Extensibility.
- Centralized Management.

Internet of Things (IoT) and Edge Computing:

In IoT, with the help of edge computing, intelligent moves to the edge. There are various scenarios where speed and high-speed data are the main components for management power issues, analytics and real-time need, etc. Supports to process data with Edge Computing in IoT.

Benefits of Enabling Edge Computing for the Internet of Things (IoT):

- Security and Privacy.
- Reduced Data Exposure.
- Costs and Autonomous Operation.
- Lesser Network Load.
- Zero Latency.
- Computational Efficient.

Security in Edge Computing:

One of them is that the security in edge computing is better than any other part of the data storage application because data is not traveling over the network. It stays where it is created. The flip side of it is that security in edge computing is less secure because the edge devices in themselves can be more vulnerable. Data encryption, access control and the use of virtual private networks are crucial elements to protect the edge computing system.

Edge Computing becomes critical:

- Predictive maintenance.
- Having low latency.
- High cost of transferring data to the cloud.
- Cybersecurity constraints.
- Energy Efficiency Management.

Blockchain:

A blockchain is a public ledger dispersed over a network it records transactions performed between different network contributors. Every transaction is tested by network nodes according to a mainstream consensus mechanism before being added to the blockchain. At any time recorded data cannot be modified or deleted and each transaction history can be reconstructed at any time. A blockchain system must provide some basic features in order to ensure a perfect and trustworthy platform for crypto currencies [3].

Blockchain features include:

- Decentralization
- Distributed Ledger Technology
- Tamper-proof environment
- Security & Privacy
- Consensus Mechanism
- Faster Transactions

A blockchain is a distributed ledger technology that is shared among the nodes of a computer network. As a database, a blockchain stores information in digital format. Blockchains play a vital role in the cryptocurrency ecosystems, such as Bitcoin, Ethereum, etc., to create and maintain a highly secure and decentralized ledger of transactions. The upheaval with a blockchain is that it has the potential to cater to the need for fidelity and security of a record of data and yields trust without the need for a trusted third

party. The fundamental distinction between a typical database and a blockchain is the structuring of data. A blockchain accumulates information together in chunks, known as blocks, that contain sets of information. Each block can hold only a specific amount of data and, when topped up, will be closed and linked to the previously loaded block, composing a chain of data together known as the blockchain. Whatever information that will be added newly will be compiled into a block formed at the later stage which will then proceed towards the addition to the primary blockchain once they're completely filled [2].

Need of Blockchain technology in Edge Computing:

IoT devices are also susceptible to cyberattacks. Millions of coupled devices generate huge amounts of data, which are then communicated over the internet. Edge computing helps crack this issue by fetching compute, storage and analytics closer to users and the devices that produce the data. As a outcome, data travels over tinier distances, which can result in lower latency and faster response times. IBEC looks to be part of a perfect combination for building a secure, scalable and distributed platform for IoT [4].

IoT architecture can be divided into three layers: IoT device layer, Edge layer and a Cloud layer.

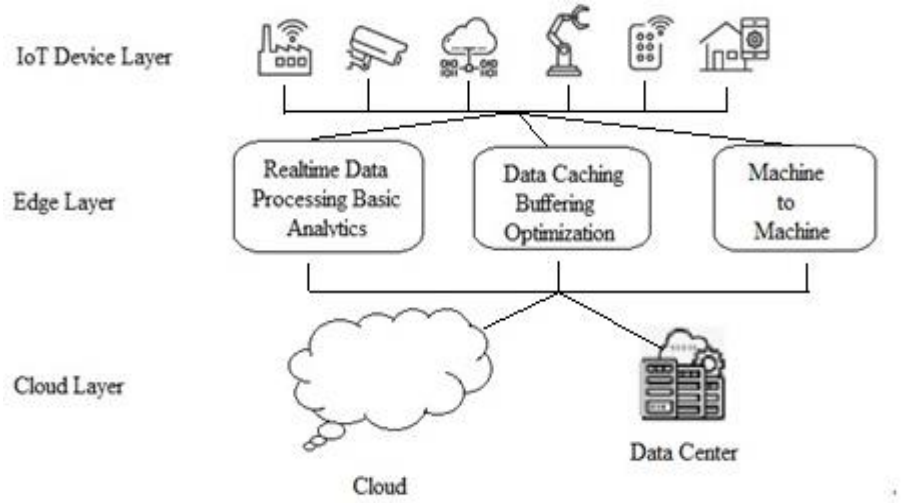

Figure-1: IoT Architecture with Edge and Cloud

Edge computing and blockchain enhance the security of IoT device records. IoT device data can then be encrypted and sent to edge servers. Edge servers store this data on the edge blockchain for better-quality data security and confidentiality. Authorized person can access the data from the edge much faster than if they were to access the data from the cloud. Edge servers transmit any data that is not required for real-time scrutiny to the cloud. IBEC helps allow us to build a distributed and secure edge computing architecture that can promote the safety and integrity of IoT data throughout its lifespan. Now a day all applications and their need for secure, real-time data access grows. So IBEC is emerge in new technology [5].

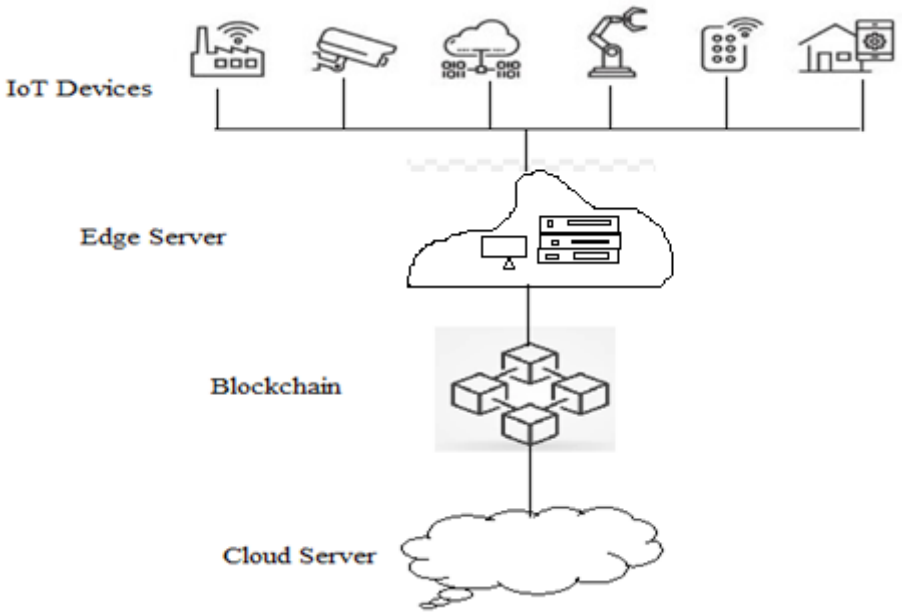

Figure-2: IoT devices, Integrated Blockchain and Edge Computing with Cloud Server

The Integration of Blockchain and Edge Computing (IBEC) is an auspicious paradigm since both the two technologies can be balancing to construct frameworks to solve problems in several fields.

Conclusion:

IBEC technology with IoT devices have been used to realize secure and well-organized resource management, computation divesting and data sharing. This paper starts with a brief introduction of IoT, Edge Computing and blockchain then presents the architecture of an IoT devices, IBEC system with Cloud transfer the data more efficiently in secure manner. So we conclude Blockchain Technology Needs in Edge Computing Environment is powerful in future.

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