

모바일 P2P 환경에서 DLT 서비스 지원을 위한 고려사항

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A Study on Support for DLT Services in the Mobile P2P Environment

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Abstract

There is a growing interest in distributed ledger technology (DLT) and blockchain, a type of DLT, in academia, industries, and governments. DLT can be used for various services in the mobile environment, including smart homes, vehicular communications, healthcare, banking, cryptocurrency, and smart grid for its building nature of decentralization, transparency, immutability, traceability, and resiliency. In addition, DLT can support privacy and security by establishing cooperative trust management among the network entities. Every node in the DLT network may need a lot of processing power, storage capability, and energy to support the functional activities of the DLT network, e.g., to validate a new event or store a state in the new or existing chain or storage. DLT-based applications can be used in various mobile P2P environments where there are multiple types of devices such as sensor devices and IoT appliances, without enough resources. Sensors and IoT devices may not have enough capacity to run the DLT-based applications. This paper presents issues and challenges, describes opportunities, and provides the future research direction regarding the support for DLT services in the mobile P2P environment.

I. Introduction

Distributed ledger technology (DLT) is typically managed by a peer-to-peer (P2P) network for use as a publicly distributed ledger, where nodes collectively adhere to a protocol to communicate and validate new events. P2P networking is a distributed architecture that partitions tasks or workloads between peers. Peers are equally privileged, equipotent participants in the application, and they form a P2P network of nodes. Peers make a portion of their resources, such as processing power, disk storage, or network bandwidth, directly available to other network participants, without the need for central coordination by servers or stable hosts. This resource management is a challenging issue in the mobile P2P network due to various heterogeneous connectivities and limited resources.

II. Issues on DLT in the Mobile P2P Network

DLT is classified into permissioned, permissionless, and hybrid distributed ledger systems [1]. Permissionless distributed ledger systems are open to anyone validating blocks without needing permission from any authority, and permissioned distributed ledger systems require permissions. Hybrid distributed ledger systems combine the privacy benefits of a permissioned distributed ledger with the security and transparency benefits. This gives stakeholders significant flexibility to choose what data they want to make public and transparent and what data they want to keep private.

Figure 1 shows a possible architecture of the mobile P2P network. Several challenges need to be addressed to adopt the DLT concept in the mobile P2P environment. For example, every node requires authentication and authorization to ensure privacy and security support, stability, lifetime, energy, and processing power to support DLT functionalities, link lifetime, and stability to support a stable communication path between remote mobile nodes. But, in some cases, many mobile devices do not have enough resources to be a participant in the DLT network.

There are various benefits of DLT-enabled mobile P2P networks, e.g., resource sharing between hosts by alleviating trust and security concerns among heterogeneous network entities, boosting trusted data interaction, secure access control, and privacy protection,

providing tracing capability, certification and supervision functionalities for existing 5G and future 6G networks. More specifically, the new functionalities of cloud processing, mobile edge computing (MEC), software-defined networking (SDN), and network function virtualization (NFV) may also get benefits from the DLT-based shared resource management.

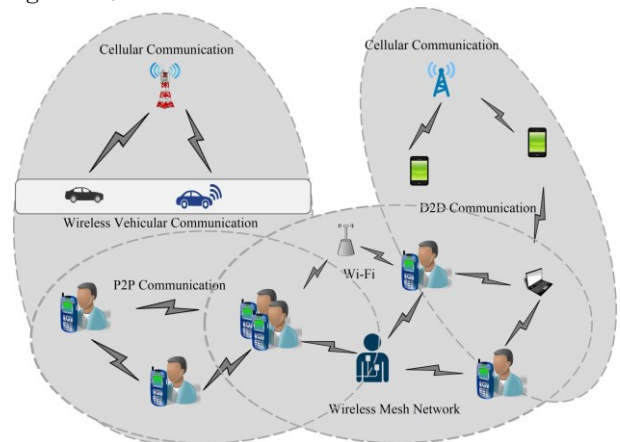


Figure 1: A possible mobile P2P network architecture

III. Concluding Remark

This paper presented some challenges and benefits of the DLT-based services, and future work includes a framework and detailed mechanisms to support existing DLT functionalities in the mobile P2P network.

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