Promoting Device-to-Device Communication in Cellular Networks by Hashing Techniques

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ABSTRACT

In the current generation network traffic has become a major problem.D2D communication has been proposed as a promising technique to improve resource utilization of cellular networks by offloading the traffic through base station.D2D communication in cellular networks is direct communication between two devices without traversing the base station or core network.In this article we fill the gap by designing incentive mechanisms to encourage users to work under D2D mode. To recognize the proximity based devices, every one of the devices should initially discover close proximity devices by using device discovery mechanism. This mechanism discovers the nearby devices by broadcasting the discovery signals. The main aim of the project is to achieve direct transmission of data between devices in a secured manner. For secure wireless transmission we use hashing techniques which protects the data from being exposed.
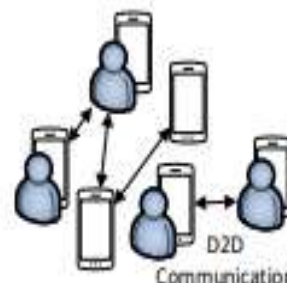
Keywords: *D2D communication, Cellular networks, Resource utilization, device discovery, hashing*

I. INTRODUCTION

A constant need to increase the network capacity for meeting the growing demands has led to the evolution of cellular networks.[6]Such large number of connections demand for higher data rates, lesser delays and improved resource utilization. An emerging facilitator of upcoming high data rate demand for next generations is device-to-device (D2D) communication. [4] In traditional cellular network, all transmissions must go through the base station even if both the communication parties are within the range for D2D communication i.e, the data should first be uploaded to the base station along cellular uplinks, and then forwarded to the receiver along cellular downlinks. Due this there maybe delay in transmission.D2D communications allow direct data transmission between two devices.[6]The three major issues in the existing system include: delay in transmission, increased data rate and security. [4]Device-to-Device (D2D) communication was initially proposed in cellular networks as a new paradigm to enhance network performance. [5]D2D communications can potentially improve throughput, energy efficiency, delay.

Device-to-Device Communication

⟷ --- D2D links

With an increasing demand to improve spectrum efficiency and energy efficiency in cellular networks, device-to-device (D2D) communications have drawn a lot of attention. D2D communications allow for

direct data transmissions between two mobile users (MUs) without control or with limited control of the base station (BS), using the same spectrum resources in a cellular network.

Information exchange between people has been fundamentally changed by new technologies, such as mobile computing and wireless communication.While the information is exchanged between devices in a wireless communication there may be chance of information being exposed.To avoid such kind of problems and to ensure secure transmission we use the hashing.When the user sends a secure message, a hash of intended message is generated and encrypted, and is sent along with the message.When the message is received, the receiver decrypts the hash as well as the message. If the two hashes are matched then it implies secured transmission.

II. Literature Survey

A.Device-to-Device Communication in LTE-Advanced Networks: A Survey

Among the LTE-A communication techniques, Device-to-Device (D2D) communication which is defined to directly route data traffic between spatially closely located mobile user equipments (UEs), holds great promise in improving energy efficiency, throughput, delay, as well as spectrum efficiency. As a combination of ad-hoc and centralized communication mechanisms, D2D communication enables researchers to merge together the long-term development achievements in previously disjoint domains of ad-hoc networking and centralized networking. To help researchers to have a systematic understanding of the emerging D2D communication, we provide in this paper a comprehensive survey of available D2D related research works ranging from technical papers to experimental prototypes to standard activities, and outline some open research problems which deserve further studies.

B. Cooperative Device to Device communication in cellular networks

[2] To meet the increasing demand of wireless broadband applications in 4G/beyond 4G cellular networks, D2D communication can serve as a candidate paradigm to improve spectrum efficiency. By reusing the spectrum of cellular users, two D2D users can form a direct data link without routing base stations and core networks; thus, the spectral efficiency can be improved. Further, when the

cooperation between cellular users and D2D users is enabled, a win-win situation can be achieved to make all users better off. Thus motivated, we propose a cooperative D2D communication framework in this article, which introduces the cooperative relay technique to conventional underlay/overlay D2D communications. Adaptive mode selection and spectrum allocation schemes are also presented to ensure better performance for both cellular and D2D users. Extensive numerical results show the effectiveness of the proposed framework for a variety of scenarios.

C. Relay-by-Smartphone: Realizing Multi-Hop Device-to-Device Communications
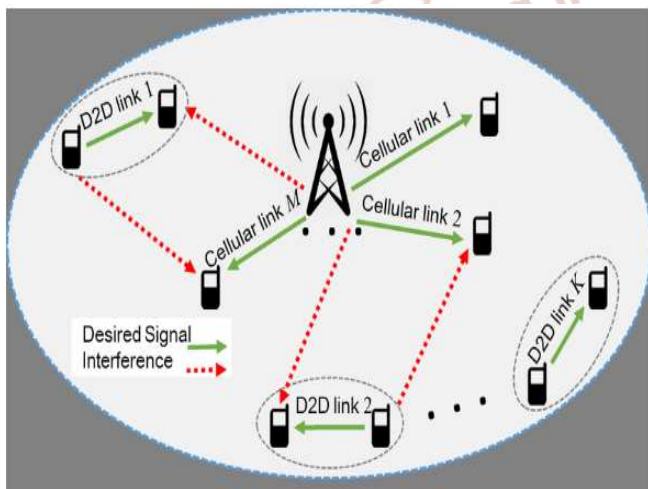
The Great East Japan Earthquake and Tsunami drastically changed Japanese society, and the requirements for ICT was completely redefined. After the disaster, it was impossible for disaster victims to utilize their communication devices, such as cellular phones, tablet computers, or laptop computers, to notify their families and friends of their safety and confirm the safety of their loved ones since the communication infrastructures were physically damaged or lacked the energy necessary to operate. Due to this drastic event, we have come to realize the importance of device-to-device communications. With the recent increase in popularity of D2D communications, many research works are focusing their attention on a centralized network operated by network operators and neglect the importance of decentralized infrastructureless multihop communication, which is essential for disaster relief applications. In this article, we propose the concept of multihop D2D communication network systems that are applicable to many different wireless technologies, and clarify requirements along with introducing open issues in such systems. The first generation prototype of relay by smartphone can deliver messages using only users' mobile devices, allowing us to send out emergency messages from disconnected areas as well as information sharing among people gathered in evacuation centers. The success of field experiments demonstrates steady advancement toward realizing user-driven networking powered by communication devices independent of operator networks.

III. Existing work

For transmission of file from one device to another device a base station is required. Consider a scenario

where a user would like to share a video or photo with his friend nearby using cellular networks. Traditionally, all data transmissions should go through the base station, i.e. the data should first be uploaded to the base station along cellular uplinks, and then forwarded to the receiver along cellular downlink. Driven by ever-increasing popularity of smartphones and tablets in recent years, wireless cellular networks have become one of the major access systems to the Internet for a huge number of customers. But there is no proper security, and so the information can be exposed and mobile communications is struggling to support booming traffic demand due to the rapid proliferation of smart devices and multimedia services. So, a new technology need to be developed to improve resource utilization and provide security.
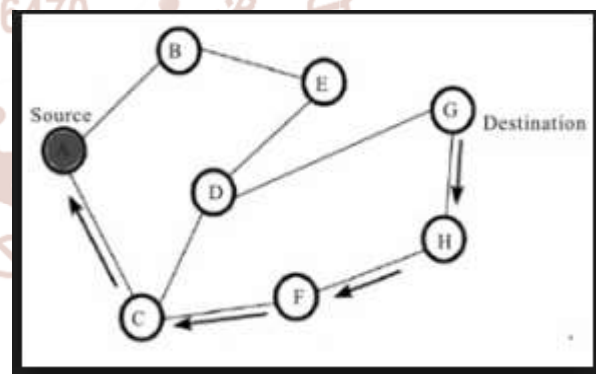

IV. Proposed work

[2] The current generation of mobile communications is struggling to support booming traffic demand due to the rapid proliferation of smart devices and multimedia services. New techniques need to be developed in order to enhance spectrum/ energy efficiency and reduce transmission delay in cellular networks. Among numerous proposed technologies to meet the increasing demands, device-to-device (D2D) communication is viewed as one of the most promising techniques. [4]Device-to-Device (D2D) communication enable devices to communicate directly without the interaction of access points or base stations. However, a conventional cellular system does not allow devices to directly communicate with each other, instead all communications take place through the base stations. [6]The aim of D2D is to leverage the physical proximity of communicating devices to extend the cellular coverage mostly in sparse environments. The

basic concept of D2D is proposed for data exchange between peer nodes. In device-to-device communication the devices can communicate with each other only if they are within a specified interference range.[6]A device discovery mechanism is being used which identifies the neighboring nodes by broadcasting the discovery signals. It provides security for the data being transmitted by hashing. It prevents the data from being exposed to the attackers. In this system we use AODV protocol which establishes routes to destinations on demand and supports both unicast and multicast routing.

AODV Routing Protocol:

The AODV protocol builds routes between nodes only if they are requested by source nodes. AODV is therefore considered an on-demand algorithm and does not create any extra traffic for communication along links. The routes are maintained as long as they are required by the sources.. Network nodes that need connections broadcast a request for connection. The remaining AODV nodes forward the message and record the node that requested a connection. Thus, they create a series of temporary routes back to the requesting node.A node that receives such messages and holds a route to a desired node sends a backward message through temporary routes to the requesting node. The node that initiated the request uses the route containing the least number of hops through other nodes.

Hashing:

Hashing means generating a value from a string of text. It is one of the technique which allows secure transmission of data when the message is intended only for a particular destination. In this paper we use hashing to secure the message from being exposed to the attackers. [1] As it is wireless communication the data is vulnerable to attacks. Hashing secures the data/message from being attacked. When the user sends a secure message, a hash of intended message is

generated and encrypted, and is sent along with the message. When the message is received, the receiver decrypts the hash as well as the message. If the two hashes are matched then it implies secured transmission.

V. Future Enhancements

V2V communications have opened up numerous opportunities for new applications, such as traffic updates and road safety systems

D2D communication has a lot a scope in future and is a promising research area. Looking at the ever increasing demand of data rate and limited available spectrum, alternative approaches must be considered for the forthcoming generation of wireless communications.

D2D communications have opened up various opportunities for new applications, such as traffic updates and road safety systems. [3]It can be developed in field of social networks for providing secure connection. Pricing mechanisms can be developed to ensure that D2D receivers are charged properly for the services availed. They can also be improved in terms of performance, and the interference range can be increased i.e, the distance up to which the devices are allowed to communicate with each other directly.

VI. Conclusion

In this paper, we provided an extensive survey on D2D communications in cellular networks. We categorized the available literature based on the communication spectrum of D2D transmission. We have discussed about the existing system and the need for developing D2D communication in cellular networks. The major issue faced currently is delay in transmission, increased data rate and security. This solves all these issues and improves its performance and throughput. We have also discussed about hashing technique which provides security to the data while transmission. We presented various protocols and mechanisms (Device discovery mechanism) which have been used to support D2D communication. This paper also tells us the future research directions and improvements which can be done and the need to improve understanding about D2D communications.

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