

Advanced Electronic Communication Systems



Lecture 2

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Dr.Eng. Basem ElHalawany

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Rawan Alkurd; Raed M. Shubair; Ibrahim Abualhaol

New Circuits and Systems Conference (NEWCAS), 2014 IEEE 12th International

Year: 2014

Pages: 361 - 364; DOI: 10.1109/NEWCAS.2014.6934057

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Device-to-Device (D2D) communications has been proposed to cellular networks in order to optimize spectrum efficiency and resources utilization. In D2D-assisted networks, the traditional cellular communication techniques are not applicable but rather need to be redesigned to fulfill new requirements. Therefore, new communication techniques are proposed to take the advantages of the ...

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2. Proposed Algorithm:
 - Sub-sections.....

1. Results and Performance Analysis
2. Conclusion
3. References

1. Biography
2. Appendices

Survey on Device-to-Device Communications: Challenges and Design Issues

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Abstract—Device-to-Device (D2D) communications has been proposed to cellular networks in order to optimize spectrum efficiency and resources utilization. In D2D-assisted networks, the traditional cellular communication techniques are not applicable but rather need to be redesigned to fulfill new requirements. Therefore, new communication techniques are proposed to take the advantages of the D2D connectivity in the network. In this paper, we describe the concept of D2D communications. Then, we review the main challenges and design issues of D2D-assisted networks. This survey focuses on cooperative communications in D2D-assisted networks and addresses challenges which limit the performance of the cooperative D2D-assisted networks such as relay selection, power consumption and multi-casting. Moreover, design issues and approaches to overcome these limitations are explained.

I. INTRODUCTION

DEVICE-TO-DEVICE (D2D) communications were introduced many years ago in the context of wired communication networks. Recently, there are around five billion devices connected to the cellular network. This raised the need for high capacity and energy efficient mobile networks. Hence, D2D communications one of the proposed paradigms in the next generation cellular network. D2D communications is about enabling the direct flow of data between devices. In contrast to Human-to-Human (H2H) communications, D2D communications do not require human interaction. Instead, devices initiate the request for communication with near devices. The cellular network is optimized for traffic characteristics which are different from the characteristics of data traffic between devices. The length of the session, data rate, and communication patterns are the main differences between H2H and D2D communications. The transmission over D2D is a small burst transmission one-way data traffic.

In this survey, we first introduce the concept of D2D communications in section II. In section III, an overview of the main challenges and research issues in D2D-assisted cellular networks is introduced. Section IV focuses on the employment of cooperative communications in D2D-assisted networks and summarizes the advantages of using cooperation in such networks. Finally, in section V, we address the main challenges in the design process of cooperative D2D-assisted networks and summarize the different approaches in literature to reduce the effects of these limitations on network performance.

II. D2D COMMUNICATIONS

D2D communication networks can be classified into two main structures as shown in Fig.1. The first structure, illustrated in Fig.1.a, is called *Stand-Alone D2D* communica-

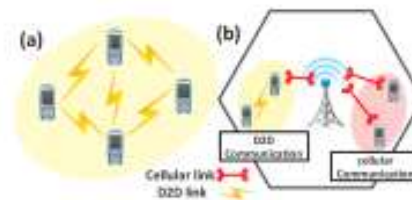


Fig. 1. D2D communications: (a) without infrastructure (Stand-Alone D2D) (b) with infrastructure (Network-Assisted D2D).

tions, whereas the second structure, illustrated in Fig.1.b, is called *Network-Assisted D2D* communications. The difference between the two structures is the existence of a helping infrastructure in (b) to organize the communications and resource utilization in the cell. On the other hand, in (a), the devices organize the communications themselves without the infrastructure help. Fig.2 delineate the fundamental network architecture of D2D communications, consisting of D2D area network, network management and D2D applications. The D2D area network consists of swarm of D2D devices communicating with each other directly using D2D links. D2D aggregators collect data from devices intending to connect to the core network and send them to gateways which connect to the access network. The access network can be wired or wireless network. The core network connects devices with service providers who manage the different D2D services. The

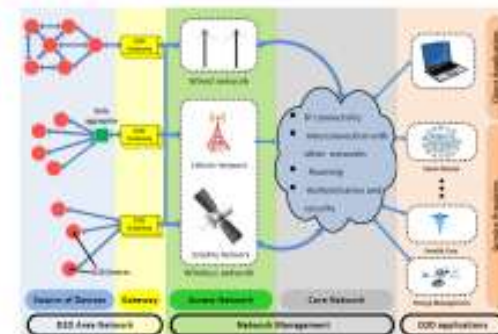


Fig. 2. D2D Network Architecture

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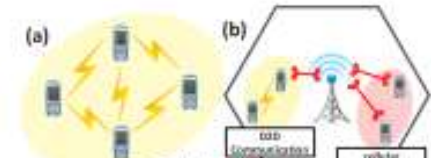
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Survey on Device-to-Device Communications: Challenges and Design Issues

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2. Different Models
3. Different Applications
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5. Proposed Algorithms based on the classifications and comparisons

communications do not require human interaction. Instead, devices initiate the request for communication with near devices. The cellular network is optimized for traffic characteristics which are different from the characteristics of data traffic between devices. The length of the session, data rate, and communication patterns are the main differences between H2H and D2D communications. The transmission over D2D is a small burst transmission one-way data traffic.

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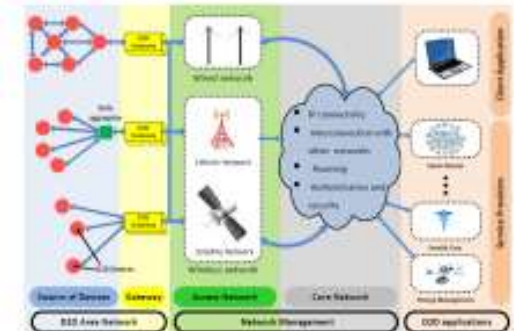


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