

Effect of increasing the network capacity using device-to-device technology for next generation networks

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ABSTRACT

Device-to-device (D2D) communication is one of the key technologies in the fifth generation of wireless communication systems, which is defined as a direct communication between two mobile users without traversing the base station. D2D communication plays an increasingly important role and which improves communication capability and reduces communication delay and power consumption. D2D communication that enables direct communication between nearby mobiles is an exciting and innovative feature of next generation cellular networks. In order to meet the rising subscriber demands and provide them satisfactory services, D2D communication is being looked upon as an emerging technology of the next generation networks.

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1. INTRODUCTION

Device-to-Device system model of telecommunication have been considered as a promising future method to reduce the up and coming traffic weight on center systems because of the short transmission separation of D2D pairs, the range of productivity can be essentially improved by the range reuse with cellular users (CUs). In spite of the fact that uplink assets are typically accommodated D2D interchanges, uplink and downlink traffic is turning into less asymmetric in future systems [1-3].

D2D communication is another worldview in cell systems and it permits user equipment (UEs) in closeness to convey utilizing an immediate connection as opposed to having their radio flag travel entirely through the base station (BS) or the center system. The main advantages is the low latency in wireless communication because of a shorter signal traversal way [4-6].

Regardless of the main advantages of device to device communications in the basic model, impedance the executives, and energy efficiency have turned out to be central necessities in keeping the interference brought about by the device to device clients leveled out, while at the same time broadening the battery lifetime of the User Equipment (UE) [7]. (see, e.g., [8, 9]).

In this research paper, the first provide of device to device communication system model in section two. Then we summarize in section three power control with device to device communication. The simulation experiments and results for different user condition, discussed in section four. Finally, section five conclude effect of increasing the network capacity using device-to-device technology for next generation networks.

2. DEVICE TO DEVICE SYSTEM MODEL

In this research paper, we think about the next-generation remote system, which is characterized as the system structure where device to device and cellular communications exist together to have a similar radio assets [10-12]. A next-generation organize situation, backing device-to-device communication alongside some broad use cases is delineated in Figure 1.



Figure 1. Overview of D2D broadcast

There are four principle kinds of device level communications:

- a) Device relaying with operator controlled (DR-OC) system

In fact if the device is in poor inclusion region then it will be able to link with base station depending on the hand-off data by means of different device. At this circumstances; a link from the administrator with the device will be enabled while the device transfers data halfway or full control connect foundation. Figure 2 Outline of device transferring communication operator controlled link establishment (DR-OC). A device links with the base station through handing-off its data by means of other devices [13, 14].

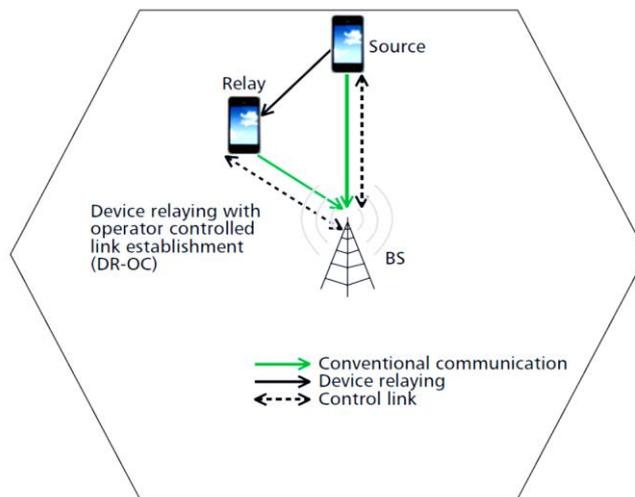


Figure 2. Diagram of DR-OC system [13]

- b) Direct D2D communication with operator controlled (DC-OC) system

The goal and source devices link and trade information without the requirement for base station, yet these devices are helped by administrator for the foundation of these connections. Figure 3 shows DC-OC system where the source and goal devices can link and trade information with one another without the requirement for a base station, however they are helped by the base station through a control interface [15].

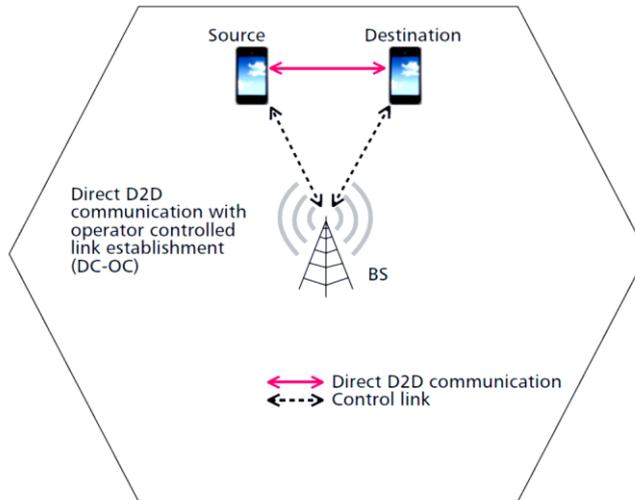


Figure 3. Diagram of DC-OC System [13]

c) Device relaying with device controlled (DR-DC) system

The administrator isn't engaged with the procedure of connection foundation. Figure 4 shows the device relaying communication with device controlled link establishment (DR-DC). Source and goal device legitimately converse with one another and don't utilize any control interface from the administrator [16-17].

d) Direct D2D communication with device controlled (DC-DC) system

The goal and source devices have direct communication with each other with no administrator control. In this manner, these devices should utilize the asset so as to guarantee restricted interference with various gadgets in a similar level and the large scale cell level. Figure 5 DC-DC. Reader will discover a rundown of legitimate overviews and proposed research on D2D communication in [18-20].

Figure 6 illustrates the side connection is the special sort of communication system among device and device without experiencing eNB. It implies that it requires another physical layer plan. In any case, to limit the structure changes of a current execution, the new physical layer is planned not to vary excessively. We will utilize a fundamentally the same as waveform dependent on SC-FDMA [21-23] in the two direction.

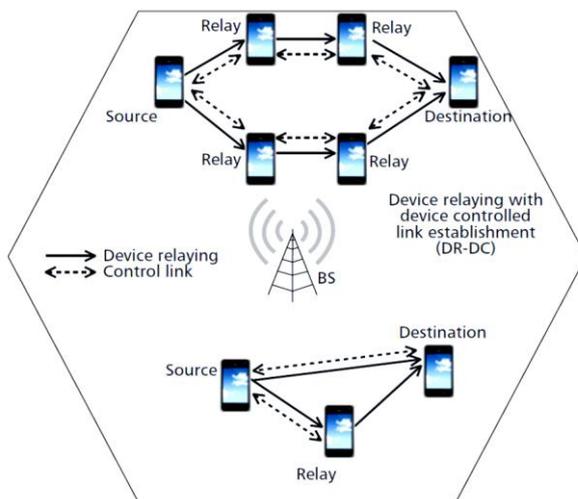


Figure 4. Diagram of DR-DC system [13]

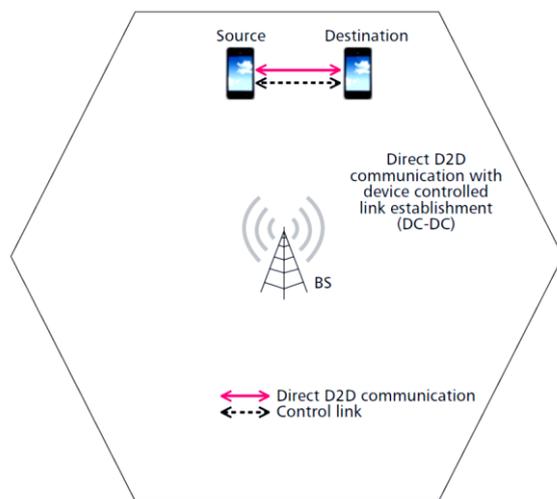


Figure 5. Diagram of DC-DC system [13]

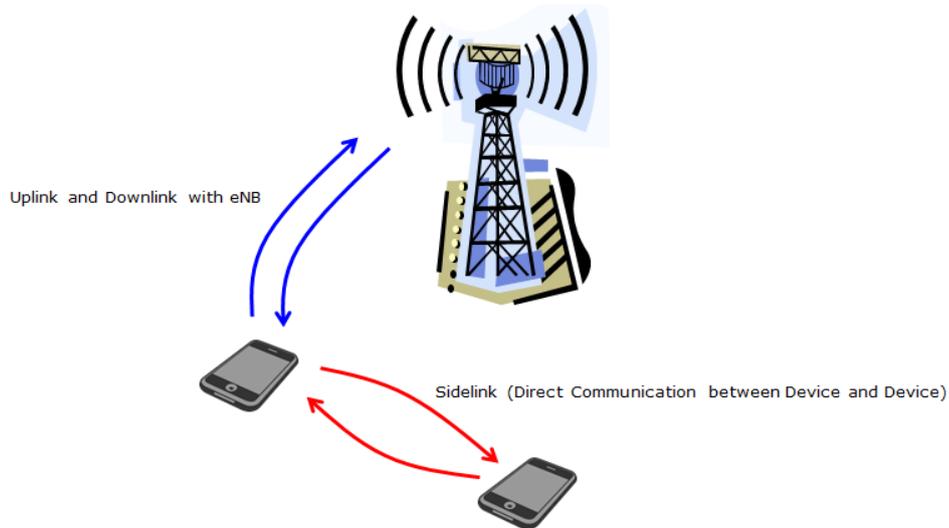


Figure 6. Device to device side link architecture

3. SIMULATION EXPERIMENTS AND RESULTS

This section discusses about a mode determination component and execution of device to device system to get high throughput and spectral effectiveness, a mode choice is the instrument empowering the chief to progressively alter the transmission method of device to device pairs. D2D model communication the data rate of cell and D2D user equipment’s incredibly relies upon the separation between D2D pair just as the separation of D2D pair to the serving eNB and the cell client [24-25]. Moreover, when there are somewhere around two transmitter devices dealing with a comparative frequency, the SNR of an AWGN channel of a particular transmitter- recipient pair and the supported data rate can be figured by Shannon's demeanor as:

$$\gamma = \frac{\bar{P}}{I + N_0} \tag{1}$$

$$\eta = W \log_2(1 + \gamma) \tag{2}$$

As shown in (1), \bar{P} represents the power of the received signal while I is the power gained from the interference at the receiver and N_0 is the power of the received thermal noise. As shown in (2) depends the whole bandwidth of the channel (W). Figure 7 outlines the reachable throughput of a cell client working on the common range with various device to device pairs. This case, it is expected that the D2D transmitters which cause impedance at the cell client are somewhere in the range of 50 and 100 m far from the cell client. Plots demonstrate that by expanding the number of sets the throughput of cell client gets degraded. Then again, as the separation between cell client and the serving eNB builds, the data rate of the cell client decreases.

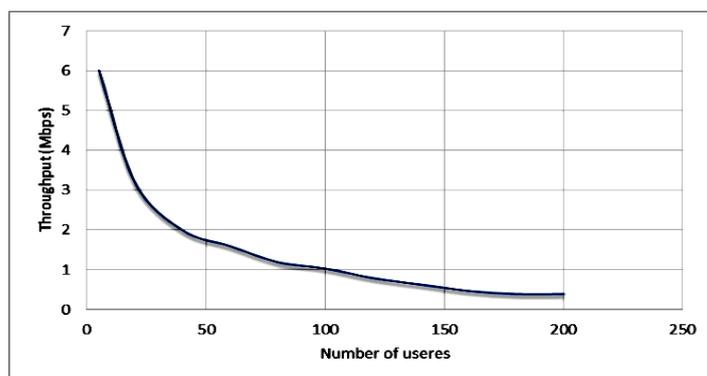


Figure 7. Throughput when distance from Enb equal one cellular user D2D

At the point, when a device to device pair works on committed process, these UEs can communicate with one another without making high interference to the cell client. Be that as it may, this circumstance is just conceivable when additional resources are available in the framework and furthermore because of the way that range is a genuinely costly and rare resource, it should be viewed as how the range can be shared and used effectively.

Figure 8 outlines the achievable goals data rate of a cell client working on the mutual range with device to device pair. This case, it is expected that the device to device transmitters which cause impedance at the cell client are somewhere in the range of 50 and 100 m far from the cell client.

Figure 9 shows demonstrate that by expanding the number of clients to three, the throughput of cell client gets corrupted. Then again, as the range between cell client and the supporting eNB increases, the throughput data rate of the cell client decreases.

Moreover, increasing the number of device to device clients to four, the interference level on the cell client increments and the accomplished throughput diminishes, the throughput decrease is negligible. As shows in Figure 10.

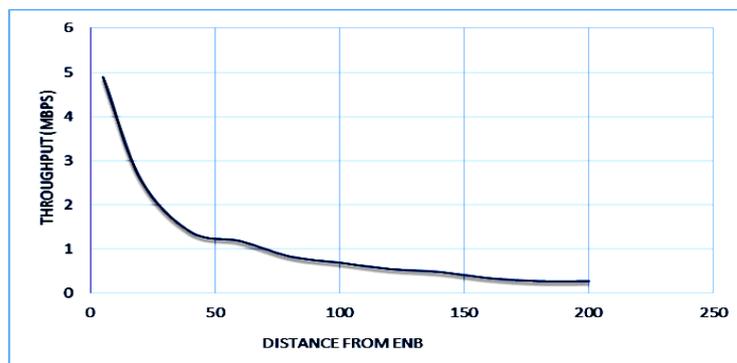


Figure 8. Throughput when distance from Enb equal two user D2D

Outcomes from the results of Figure 11 and Figure 12, for a cell user equipment, the closer to eNB and more distant from device to device clients the higher throughput data rate will be accomplished, and the other way around. In this manner, to pick the working method of a device to device, in situations that the goal is to augment the throughput of the cell client, the device to device pair can work on a common asset so long as the separation of the device to device transmitter to cell client is large.

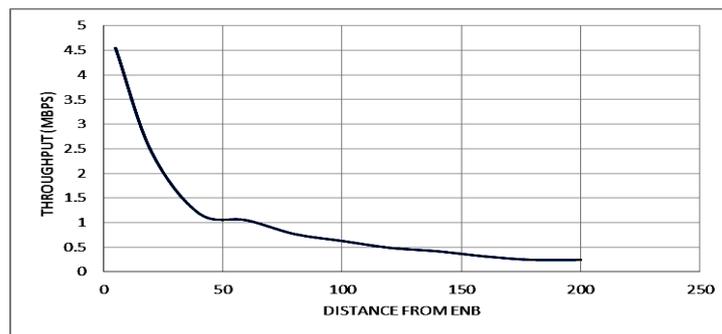


Figure 9. Throughput when distance from Enb equal three user D2D

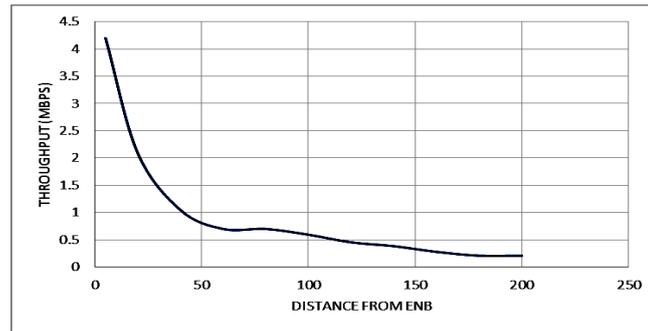


Figure 10. Throughput when distance from Enb equal four user D2D

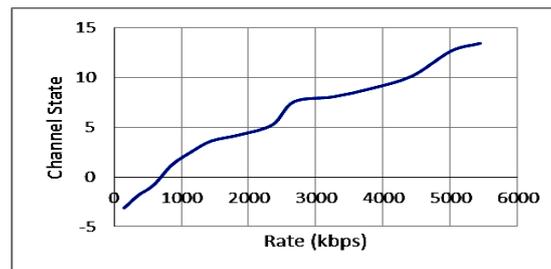


Figure 11. SNR Threshold (dB) and Rates (Kbps)

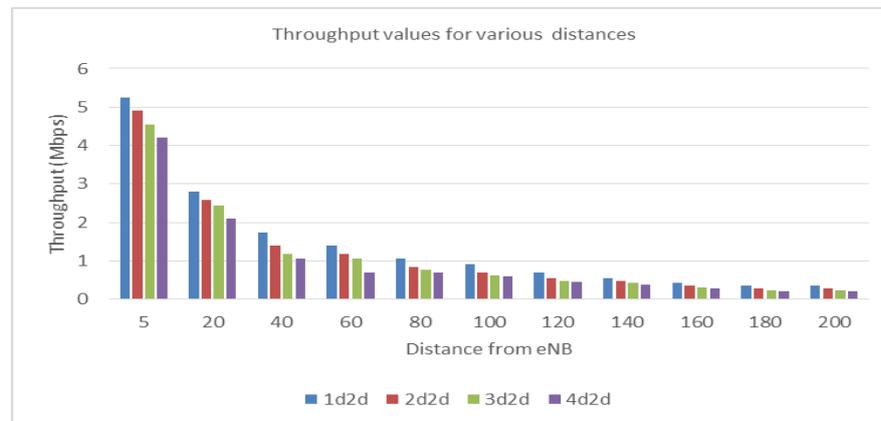


Figure 12. Throughput values for various distances

In order to make an increasingly vigorous choice on what number of device to device pairs can work on a spectrum and the ideal separation between the cell client and the pairs of device to device, a specific threshold to accept SNR when the cell client can be characterized.

4. CONCLUSIONS

We have introduced a brief advancement of device-to-device with terms of its utilization cases, design and the fundamental specialized difficulties to its execution. Device to device model communication guarantees three kinds of additions, firstly radio resources OFDM and physical resource blocks between the D2D and cell layers might be reused. Besides, Device to device connect utilizes a single hop between the transmitter and recipient. In addition, because of the closeness and conceivably positive spread conditions, high peak data rates might be accomplished. At last, when devices links over an immediate connection, the base station handling is easy route and the start to finish dormancy can diminish. In this paper, we can take note of the enhancement of intensity utilization, improvement of asset assignment and reuse of cell frequencies.

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