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# A STATE OF THE ART SURVEY ON 3GPP STANDARDIZATION

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## ***Abstract***

*Device-to-device (D2D) connectivity in a cellular network is increasingly transforming into a viable method of information exchange. This has a very low end-to-end latency and can improve a cellular network's spectral quality. The new 3GPP specification releases have given significant attention to standardising this mode of communication and incorporating it into the advanced LTE ecosystem. This will give the advancement of D2D technologies and their acceptance by mobile operators more impetus. As specified in Release 12 and subsequent releases of 3GPP specifications, this paper presents a discussion and critical review of the key features of D2D communication.*

**Keywords:** *Device-to-device (D2D), 3GPP, LTE-advanced, Cellular Networks, 5G, Wireless application.*

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## **I. INTRODUCTION**

The steady rise in demand for high data rates and low end-to-end delays are one of the main challenges faced by telecom operators. One way to do it is by correspondence from device to device (D2D). D2D communication allows for direct communication between nearby equipment that bypasses the base station [1]. As D2D connectivity promises ultra-low latency between users for communication, researchers working on the upcoming 5th generation cellular networks have attracted great interest[2].

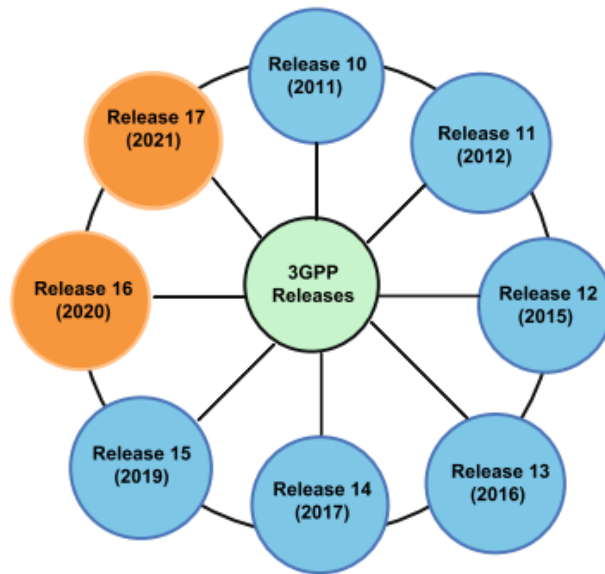


Fig. 1: Illustrates the 3rd generation partnership protocol (3GPP) Releases.

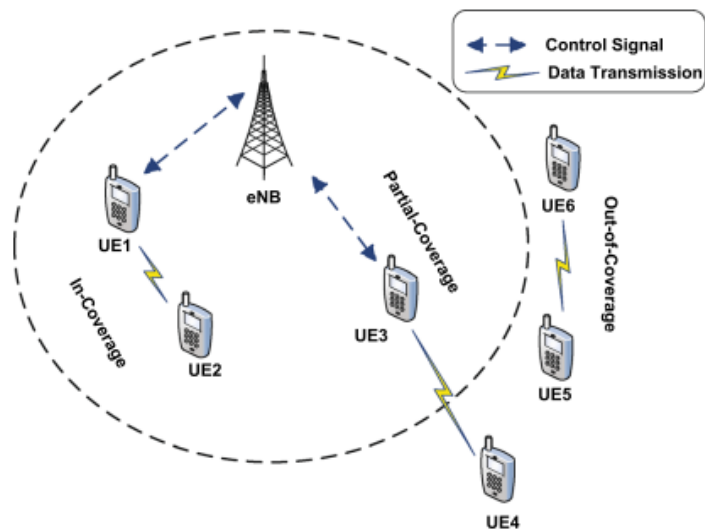


Fig. 2: Illustrates D2D (Device to Device) communication setups in 3GPP Release 12 [3].

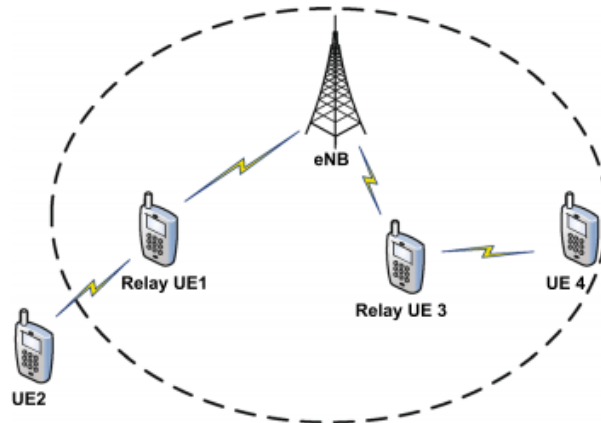


Fig. 3: Depicts the Relay-aided D2D (Device to Device) communication setups supported in 3GPP Release 13 [4].

D2D communication will operate using both the licenced cellular spectrum and the unlicensed spectrum; both modes are known as in-band and out-band communication, respectively. In the first example, D2D communication and cellular communication can both function over the entire licenced cellular spectrum; this is referred to as the underlying D2D communication mode [5]. Figure 1 illustrates the 3rd generation partnership protocol (3GPP) Releases. Figure 2 illustrates D2D (Device to Device) communication setups in 3GPP Release 12. Figure 3 depicts the Relay-aided D2D (Device to Device) communication setups supported in 3GPP Release 13.

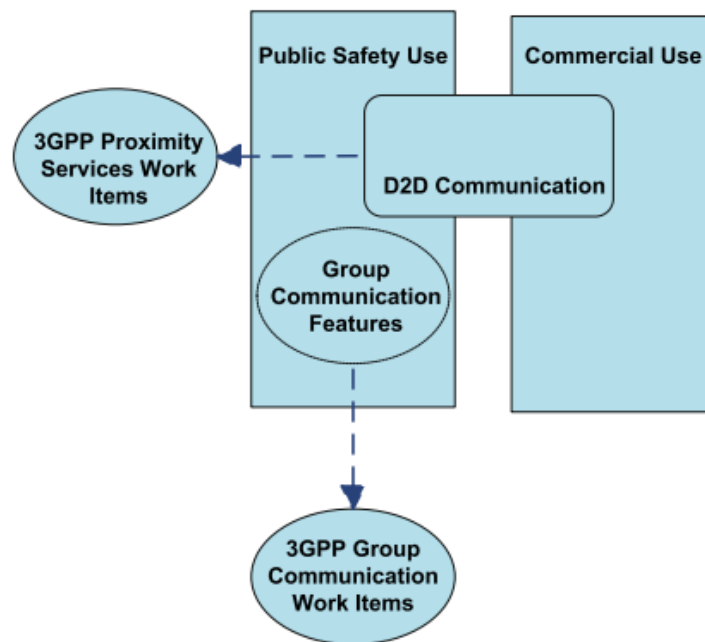


Fig. 4: Depicts the cases for D2D (Device to Device) communication in 3GPP Release 12 [6].

## II. LITERATURE REVIEW

A survey on stochastic geometry research on device-to-device communication as a disaster relief solution was conducted by Akram et al. Public safety (PS) agencies are increasingly dependent on such networks for their mission-critical communications, with the unparalleled new capabilities introduced by advanced broadband wireless networks. Device-to-device (D2D) connectivity is one of the main enablers for this adoption, where mobile devices can communicate directly with each other without the need for a base station (BS) or a switching centre to manage and route traffic. In the event of a network infrastructure failure or a natural disaster, this function is a critical connectivity backup. In this paper, during major infrastructure failure, we analytically measure the performance of the cellular network, where some terminals can play the role of low-power relay nodes forming multi-hop communication links to assist more terminals beyond the scope of healthy network coverage [7].

## III. DISCUSSION AND CONCLUSION

In the forthcoming 5G cellular network, D2D contact will play a big role. We have provided a brief description of the standardisation of D2D communication in this report. 3GPP Version 12 and subsequent releases are the basis of the standardisation. The architecture, discovery process, synchronisation, and direct communication strategies of D2D communication have been explored in detail. In D2D communication, we have also highlighted some important problems. D2D connectivity in future cellular networks is expected to play a crucial role in both public safety and multiple commercial use cases.

The technical specifications set out in the 3GPP standards are very well structured and approved globally. After a thorough study of recent efforts to standardise, we find that there are many critical problems and scope for improvement in D2D communication. We also highlight the advantages that the new 5G cellular network will offer for D2D communication.

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