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A Review on Handover Mechanisms in Software Defined Networks

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Abstract:- **With Software-Defined Networking (SDN) is considered promising to simplify network management and enable research innovations based on the decomposition of the control and data planes. Wireless networks require specific features such as mobility management, dynamic channel configuration, and rapid client re-association [1]. In cases which require some extension to an existing wired topology, and there is little motivation to make fundamental changes to the existing topology, Wireless Software-defined Networks (SDWN) can be used. The key difference between SDN and traditional networking is infrastructure: SDN is software-based, while traditional networking is hardware-based. Because the control plane is software-based, SDN is much more flexible than traditional networking. It allows administrators to control the network, change configuration settings, provision resources, and increase network capacity. This paper presents a review on the handover mechanism among software defined networks.**

Keywords: Software Defined Network (SDN), Cellular SDNs, Device to Device Communication (D2D) SDNs,, Quality of Service (QoS).

Introduction: Satisfying the basic demands of cellular users, such as voice calls and text messages, is not sufficient anymore. The cellular network operators face many problems in dealing with emerging mobile applications developed for the new generation of cellular devices, such as smart phones and tablets.

These new cellular devices allow users to use services with high quality of service (QoS) requirements such as video/audio streaming, online gaming, video calls and social networking. The rapid growth of Smartphone has been so fast that the operator fails to cop up the existing infrastructure to deal with these new technologies. Although the third and fourth) are designed to accommodate high speed data services, the operators are still struggling with the increased bandwidth demands of cellular users. These challenges need of new communication prototype that revolutionizing the existing cellular architecture. D2D communication represents a promising technology since it allows for direct and low power communication among devices thus contributing to reduce interference and system load and improving its overall performance.

D2D communications is one of such prototype that has been introduced to harness these increasing bandwidth requirements. D2D communication in cellular networks is capable of direct communication between two cellular devices located in vicinity of each other. One of the main functions of cellular base station (BS) in conventional cellular networks is to relay traffic between cellular users. In D2D communication, the data bypasses the BS and it is instead sent using a direct communication link between the users. By-passing the BS allows D2D communications to significantly increase the spectral efficiency of the dense cellular network.

The direct communication mode requires half of the resource as compared to cellular communication mode thus offering double spectral efficiency per connection typically. Also if devices in direct communication mode are closer to each other than transmission power could be lower than in cellular mode which can be then turned into battery savings at the device and reduced interference levels in the system.

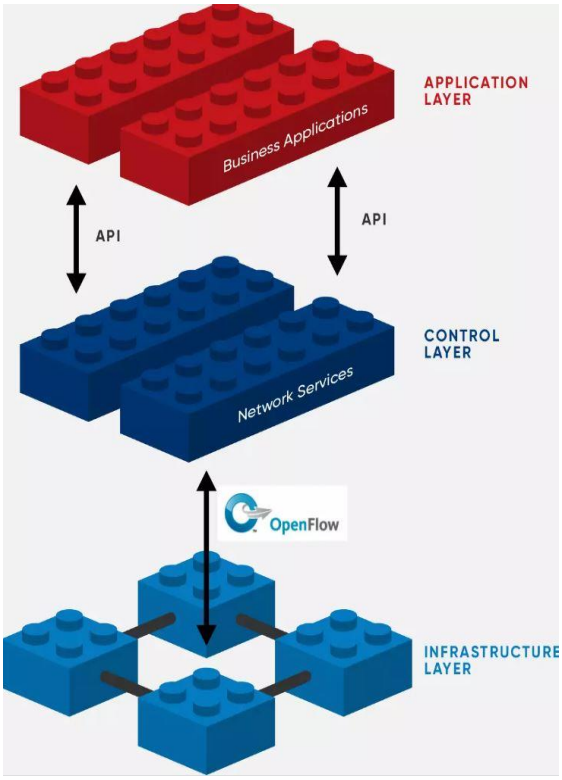

Fig.1 SDN Architecture

Further, reduced interference levels in system lead to higher system capacity and spectrum efficiency. Furthermore, D2D communications can improve the throughput, power efficiency and cell coverage. D2D users can either reuse the cellular network resources in the licensed spectrum (i.e., in band D2D) or use the resources from the unlicensed spectrum (i.e., out band D2D).

Related Work

Mohseni et al. proposed that Software Defined Networks allow network operators to easily add new services to the network and quickly adapt the network to their own requirements. The main feature of this architecture is separation of control plane and data plane, and logically concentrating network strategic intelligence in a network location. Real-time traffics generated by mobile users still require small end-to-end delay and small handover latency during the user handover, to make smooth communication for users. Most IoT application traffic fall within this category. While the amount of transmitted data in IoT applications might be considerably smaller than that of real-time multimedia applications, many IoT applications have low tolerance to large delays. In this paper, we improved end-to-end delay and handover latency by proposing an SDN-based scheme with a cross-layer approach. Authors show that the mentioned delays are reduced by using the proposed method.

Rafique et al. proposed that Software-Defined Networking (SDN) enables effective network management by presenting a global perspective of the network. While SDN was not explicitly developed for IoT challenges, it can, however, provide impetus to solve the complexity issues and help in efficient IoT service orchestration. The current IoT paradigm of massive data generation, complex infrastructures, security vulnerabilities, and requirements from the newly developed technologies make IoT realization a challenging issue. In this research, we provide an extensive survey on SDN and the edge computing ecosystem to solve the challenge of complex IoT management. We present the latest research on Software-Defined Internet of Things orchestration using Edge (SDIoT-Edge) and highlight key requirements and standardization efforts in integrating these diverse architectures. An extensive discussion on different case studies using SDIoT-Edge computing is presented to envision the underlying concept.

Tang et al. showed that it is always a challenge to mitigate the effects of partially overlapping channels in the D2D model of data transfer. In such a case, it becomes mandatory to design a mechanism to circumvent the possibilities of overlapping of user data for different D2D pairs and revert the effects of BER and Outage of the system. In such a case, the concept of game theory is useful to evaluate the chance of overlap among user data for different pairs. This is to be employed in both in-band and out-band systems to improve the performance of the system.

.Wang et al. proposed a mechanism for energy harvesting for the efficiency enhancement of D2D networks. In this case, the system designed also used

the UAV assisted technique. The energy harvesting concept is basically a technique to leverage the available energy resources of the network so as to enhance the signal strength and thereby increase the signal to noise ratio. It is shown that such a mechanism is effective to enhance the performance of the conventional D2D based network.

Chen et al. showed that it is necessary to devise a mechanism for D2D switching distance. The switching distance is necessary to ascertain the distance at which the strength of a particular mode of data transmission is higher in the underlay network. The two modes are the conventional cellular mode and the D2D mode. It is necessary to compare the strengths of the signal modes prior to choosing a certain one at a particular distance 'd'. It is however not only dependent on the distance alone and also depends on other parameters such as shadowing effects and signal fading. Hence it is necessary to compute the optimum distance so as to gauge the coverage of the D2D network.

Givi et al. proposed a technique for mode selection in n D2D networks. It was shown that the Bit Error Rate (BER) is a serious errant in the performance in D2D networks. The bit error rate is closely related to the signal strength of the D2D network. Since the Base station is unavailable for boosting the signal strength and routing the network traffic, therefore the BER is a serious challenge to be reduced within acceptable limits. The major blow is the decrease in the signal strength of the signal which gets weakened due to the fading effects. Hence the bit error rate takes a surge due to decreasing signal to noise ratio. To circumvent this issue, corrective measures need to be taken based on the mode selection which would lead to least BER for a particular transmission mode.

Ghavami et al. proposed a mechanism for the evaluation of the outage in D2D networks undergoing Suzuki Fading. The outage means the chance of unacceptable quality of service. The outage primarily depends on the signal to noise ratio and the bit error rate of the system. The system outage often is represented in terms of the complementary cumulative distribution function or the CCDF. The need for using a probabilistic model for the description of the outage of the system is due to the fact that neither the BER no the SNR of the system can be used to ascertain the outage since both are subjective performance metrics. In general, it is shown that the outage is a function of the signal to noise plus interference ratio, the D2D distance and the channel fading effects

Stefanovic proposed a mechanism for the evaluation of the level crossing rate (LCR) for a general alpha and mu fading channel model. The level crossing rate (LCR) is the measure of the number of time the signal strength plummets below a fading dip threshold. The significance of the fading dip based analysis is the fact that it helps to gauge the number of times the system needs to switch from the D2D mode to the cellular mode of data transmission, The threshold for the fading dip of the LCR is generally considered to switch from cellular to D2D and D2D to cellular mode of data transmission. Another important aspect tis the variation of the level crossing rate with the signal to noise ratio. Often a chance of false alarm is obtained due to the noise effects in alpha-Mu fading environment. This often results in the increasing BER of the system.

Tetreault et al. explained the concept of multi-path propagation and synchronization in D2D networks. The effect of multi-path propagation is the fact that the channel response is not a single impulse response. In this case, the multi-path propagating waves traverse different distances and hence have different run lengths. This results in the different times of travel and different time of arrival at the receiving D2D device. This is also results in the fading and interference effects. The wave clusters arriving at slightly different times often create in interference pattern which causes the strength to wax and wean and hence makes the strength variable. This may lead to the occurrence of inter symbol interference.

Dorcheh et. al. showed that beamforming and equalization are effective for relay networks. The relay model needed pre and post equalization due to the fact that the multiple paths in the relay model had

different channel gains. The need for equalization stems from the fact that wireless channel generally do not follow an ideal nature and tend to behave in a practical manner with a varying frequency response and non-linear phase response. The deviation of the channel response from the ideal characteristics results in the increase in the BER of the system and this further has a cascading effect on the outage of the system. Beamforming and equalization are shown to reduce the negative effects.

X.Li et al. proposed a mathematical model of a D2D Network. The uplink and downlink models have been designed. It is shown that the D2D network is a part of a larger Cellular network and devices have the choice of connecting via the D2D mode or the cellular mode. A mathematical model for the device link establishment, transmitted power, receiver power, node density needs to be designed in order to investigate the performance of the D2D network. The fading effects of the D2D mode signal have also been evaluated. The performance evaluation has been done for the mathematical model of the uplink and downlink models.

Conclusion:

From the previous discussions, it can be concluded that there are three important challenges in the detection of multiple signals corresponding to multi-user detection in Software Defined Networks (SDNs). The major challenge looming large on SDNs is the multipath propagation and varying media (channel conditions) in terms of fading which result in reduced strength resulting in poor quality of service, increase bit and packed error rates resulting in SDN system outage, large latencies and relatively low throughput. This paper presents a comprehensive review in SDNs, associated challenges and also introduces the necessity of automated handover so as to enhance the quality of service (QoS) and reliability.

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