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GRAPH BASED FILE DISPATCHING PROTOCOL WITHBD2D ENHANCED

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ABSTRACT

- Wireless communication is the transfer of information between two or more points that are not connected by an electrical conductor.
- The most common wireless technologies use radio. With radio waves distances can be short, such as a few meters for television or as far as thousands or even millions of kilometers for deep-space radio communications.
- It was initially used from about 1890 for the first radio transmitting and receiving technology, as in wireless telegraphy, until the new word radio replaced it around 1920.

BACKGROUND

The current cellular technology and vehicular networks cannot satisfy the mighty strides of vehicular network demands. Resource management has become a complex and challenging objective to gain expected outcomes in a vehicular environment. The 5G cellular network promises to provide ultra-high-speed, reduced delay, and reliable communications. The development of new technologies such as the network function virtualization (NFV) and software defined networking (SDN) are critical enabling technologies leveraging 5G. The SDN-based 5G network can provide an excellent platform for autonomous vehicles because SDN offers open programmability and flexibility for new services incorporation. This separation of control and data planes enables centralized and efficient management of resources in a very optimized and secure manner by having a global overview of the whole network. The SDN also provides flexibility in communication administration and resource management, which are of critical importance when considering the ad-hoc nature of vehicular network infrastructures, in terms of safety, privacy, and security, in vehicular network environments. In addition, it promises the overall improved performance. In this paper, we propose a flow-based policy framework on the basis of two tiers virtualization for vehicular networks using SDNs. The vehicle to vehicle (V2V) communication is quite possible with wireless virtualization where different radio resources are allocated to V2V communications based on the flow classification, i.e., safety-related flow or non-safety flows, and the controller is responsible for managing the overall vehicular environment and V2X communications. The motivation behind this study is to implement a machine learning-enabled architecture to cater the sophisticated demands of modern vehicular Internet infrastructures. The inclination towards robust communications in 5G-enabled networks has made it somewhat tricky to manage network slicing efficiently

OBJECTIVES

The objectives of my project are as follows:

- Understand the current scenario with respect to the chat bot and need of SDN Traffic.
- 5G cellular network promises to provide ultra-high-speed, reduced delay, and reliable communications. The development of new technologies such as the network function virtualization (NFV) and software defined networking (SDN)

INTRODUCTION

In recent years, the application of unmanned aerial vehicles (UAVs) has an explosive growth, especially in the military and commercial fields. Various implementations of UAVs have gradually emerged in the civil field as well. In some places, where traditional terrestrial transportation is inconvenient or where natural disasters occur, UAVs can be deployed rapidly and complete various missions, such as reconnaissance, surveillance, mapping, and disaster rescue [1]. In addition to these applications, UAV-assisted communications has been of particular interest owing to its significant advantages. Compared with the terrestrial communication systems, the deployment of UAVs is more convenient and flexible. Communication links can be quickly established by the UAVs, which eliminates the wiring link on the ground [2], [3]. The UAVs can be flexibly deployed or recycled when working as mobile base stations (MBSs) for file dispatching to solve the tide effect of business demand and reduce network costs. Meanwhile, UAV-assisted communication systems may have wider coverage and better channel conditions because the UAVs are more likely to have line-of-sight (LOS) links when flying above the ground users (GUEs) as an MBS [4], [5]. The 3rd Generation Partnership Project (3GPP) has already proposed various possibilities of the UAV-assisted communications and carried out a series of relevant researches, since 2017 in the release R15 [6], [7]. For many of the applications in internet of things (IoT) such as information broadcasting/multicasting, where the target users/nodes are quasi stationary, UAV-aided communications can really improve the flexibility and efficiency of completing the mission [8]. An example is the scenario that the vehicles in large parking lots have the request for pre loading data files, which can be maps or media data. Or the scenario that edge computing is applied to fully utilize the computational resources of the vehicles in parking lots [9]–[11]. UAV-aided communications can be used as the supplement or offloading of traditional communication networks [12], [13]. Power domain non-orthogonal multiple access (NOMA) is a promising key multiple access technology in the 5thgeneration (5G) communication systems [14], [15]. The main idea of NOMA is to realize multiple access through different power levels via the same time-frequency resource block (RB), which can improve the spectral efficiency and access quantity And thus, NOMA meets the explosive data growth and access demand of 5G systems [16], [17]. Since NOMA is suitable for the future system deployment [18], [19], it becomes fashionable to adopt NOMA in UAV-assisted communication networks for file dispatching. Considering the advantages of NOMA, we apply NOMA in the UAV-assisted communication systems to support multicast services. The requested data files can be dispatched with the help of NOMA, which can improve the transmission efficiency, save the UAV's energy, and reduce the mission latency. In order to utilize the UAV's flying time effectively and further improve the system performance, device-to-device (D2D) communications technique is adopted among the GUEs to share the received data files. D2D communications have been considered to be an effective way of cellular data offloading [20], [21]. With appropriate resource management and power control, the D2D links can reuse the same resources with the NOMA links based on spatial reuse to reduce the transmission load of the NOMA-based file downloading and further reduce the mission latency [22], [23]. In this paper, we investigate the mission latency minimization problem of UAV-assisted file dispatching in a largescale network. To this end, we apply NOMA in the multicast service of the file dispatching from the UAV to the GUEs. Besides, the UAV divides the data files into different file blocks (FBs), so that the GUEs can share their received FBs using D2D communications to reduce the transmission load of the UAV and improve the network performance. In the D2Denhanced UAV-NOMA network, spatial-reuse-based resource sharing between the NOMA links and the D2D links is allowed under centralized management. Hence, the network has a dynamic topology since the D2D links are established based on the GUEs' received FBs after the NOMA transmission. The interference environment is complicated because of the co-existence of the intra-group interference caused by NOMA and the inter-group interference caused by dynamic resource reuse. At the same time, the optimization problem is also complicated due to the overlap of the UAV's flying time, the NOMA transmission time, and the D2D transmission time. In order to solve the mission latency minimization problem, we propose a graph-based file dispatching (GFD) protocol in our investigated D2D-enhanced UAV-NOMA network by dividing the problem into three sub-problems. First, we optimize the UAV's trajectory to make the path of the UAV that traverses the whole studied area as short as possible, while ensuring the coverage of all the GUEs. Afterwards, when the UAV flies over each coverage area, the UAV dispatches FBs with the help of NOMA. In this part, we use graph theory to group NOMA users and allocate transmit power in order to maximize the efficiency of the UAV file dispatching. Finally, the GUEs that have received complete FBs are allowed to share their FBs using D2D via the same resources used by the NOMA links. Simulation results verify the efficiency of our proposed GFD protocol. The main contributions are summarized as follows. • For the first time, we propose to effectively combine NOMA and D2D file sharing together to support the UAV-assisted file dispatching in a large-scale network, in order to minimize the mission latency and improve the network performance. In such a system, the UAV flies over the entire studied area to cover all the GUEs and uses NOMA to dispatch FBs to the GUEs, while the GUEs with different FBs can share their FBs via the same resources at the same time. • In order to efficiently deal with the dynamic network topology, the complicated interference environment, and the working time overlap, we decompose the optimization problem into three sub-problems and propose a novel and efficient GFD protocol to solve them. • In the proposed GFD protocol, the UAV's trajectory and the NOMA user groups are optimized reasonably, and the interference between the NOMA links and the D2D links is well controlled by graph based algorithms. As a consequence, the UAV's efficiency in accomplishing the file dispatching mission is well improved

LITERATURE SURVEY

Title 1: Scenarios, Requirements and KPIs for 5G Mobile and Wireless

System

Author: Metis

Year: 2013

Broadband wireless sits at the confrere communications industry in recent years. Both wireless and broadband have on their effluence of two of the most remarkable growth stories of the own enjoyed rapid mass-market adoption. Wireless mobile services grew from 11 million subscribers worldwide in 1990 to more than 2 billion in 2005. During the same period, the Internet grew from being a curious academic tool to having about a billion users. This staggering growth of the Internet is driving demand for higher-speed Internet-access services, leading to a parallel growth in broadband adoption.

In less than a decade, broadband subscription worldwide has grown from virtually zero to over 200 million. Will combining the convenience of wireless with the rich performance of broadband be the next frontier for growth in the industry? Can such a combination be technically and commercially viable? Can wireless deliver broadband applications and services that are of interest to the endusers? Many industry observers believe so. Before we delve into broadband wireless, let us review the state of broadband access today.

Digital subscriber line (DSL) technology, which delivers broadband over twisted-pair telephone wires, and cable modem technology, which delivers over coaxial cable TV plant, are the predominant mass-market broadband access technologies today. Both of these technologies typically provide up to a few megabits per second of data to each user, and continuing advances are making several tens of megabits per second possible. Since their initial deployment in the late 1990s, these services have enjoyed considerable growth. The United States has more than 50 million broadband subscribers, including more than half of home Internet users. Worldwide, this number is more than 200 million today and is projected to grow to more than 400 million by 2010. The availability of a wireless solution for broadband could potentially accelerate this growth.

Advantages: faster and easier deployment and revenue realization, lower operational costs for network maintenance.

Disadvantages: a null is placed in the direction of the interferers, so the antenna gain is not maximized at the direction of the desired user.

Title 2: Recent Advances in Radio Resource Management for Heterogeneous LTE/LTE-A Networks,

Author: Y. L. Lee et al

Year: 2014

A software Defined Radio (SDR) device employs a reconfigurable hardware (Universal Software Radio Peripheral-USRP) that may be programmed over-the-air or software (GNU Radio) to function under different Wireless standards. This paper analyzes the effect of various parameters such as channel noise, frequency offset, timing offset, timing beta, FLL (Frequency Lock Loop) bandwidth, Costas loop (phase) bandwidth, filter roll off factor and multiply const on OFDM signal in WiMAX physical layer with concatenated coding using SDR test bed. Concatenated coding is performed by suggesting RM coder and Convolutional coders as inner code and outer codes respectively.

Moreover, bit error rate and symbol error rates performance are analyzed by varying bits per symbol, window size and modulation scheme. Results proved that BER and SER values are improved as modulation scheme size (M) is increased. OFDM signal transmission and reception is performed using USRP N210 and configured by GNU radio in the laboratory environment.

The field of channel coding is pertained with transmitting a stream of data at as high a rate as possible over a given communications channel, and then decoding the original data reliably at the receiver, employing encoding and decoding algorithms that are executable to carry out in a given technology. The motivation for concatenating two coding schemes is to achieve large coding gains with affordable decoding complexity. In coding theory, concatenated codes form a class of error-correcting codes that are gained by combining inner and outer codes. In this paper concatenated coding structured as Convolutional coding as outer code and Reed Muller coding as inner code.

The data flow processing through physical layer is described as follows. A signal with 6 GHz frequency is captured from the environment by using CBX daughterboard (in USRP N210) and GNU radio. The captured 6 GHz signal is passed to scrambler and it scrambles an input stream employing an LFSR (Linear Feedback Shift Register). This block influences on the LSB only of the input data stream, i.e., on an "unpacked binary" stream, and develops the same format on its output. The CCSDS encoder block executes convolutional encoding applying the CCSDS standard polynomial ("Voyager").

Advantages: The most obvious benefit is the reduction in complexity and cost because of less hardware usage

Disadvantages: There is no provision to "flush" the encoder.

Title 3: Optimal Renewable Resources Mix for Distribution System Energy Loss Minimization

Author: Y. M. Atwa et al

Year: 2010

The use of millimeter-wave frequencies is seen as a strong candidate for realizing future, very high data-rate radio systems. Millimeter-wave frequencies offer large bandwidths for short range indoor communications and outdoor point-to-point radio links. In this thesis, millimeter wave antenna solutions and radio wave propagation channels are studied. One of the key questions that needs to be answered before millimeter-wave devices can be produced profitably in large quantities is how to realize a low-cost antenna that is efficient and can be integrated with other parts of the transceiver.

In the first part of the thesis, different solutions for realizing integrated antennas in the 60-GHz frequency range are presented. In this work, several antenna designs utilizing micromachining techniques have been developed and evaluated. In addition, beam steering has been demonstrated with the developed antenna arrays. The goal of the propagation part is to measure and model propagation channels in hospital environments, where 60-GHz radio systems can be used to improve the efficiency of medical operations and in urban outdoor environments, where millimeter-wave point-to-point links can be used for last mile access and backhaul of mobile networks.

Advantages: significant cost reduction and improved design flexibility due to the absence of the inter-connection between the MMIC and the antenna.

Disadvantages: a low total efficiency, which is typically only 10 % at 60 GHz and low gain

Title 4: Second Memorandum Opinion and Order

Author: FCC

Year: 2010

Orthogonal frequency division multiplexing (OFDM) provides an effective and low complexity means of eliminating inter symbol interference for transmission over frequency selective fading channels. This technique has received a lot of interest in mobile communication research as the radio channel is usually frequency selective and time variant. In OFDM system, modulation may be coherent or differential. Channel state information (CSI) is required for the OFDM receiver to perform coherent detection or diversity combining, if multiple transmit and receive antennas are deployed. In practice, CSI can be reliably estimated at the receiver by transmitting pilots along with data symbols.

Pilot symbol assisted channel estimation is especially attractive for wireless links, where the channel is time-varying. When sing differential modulation there is no need for a channel estimate but its performance is inferior to coherent system. In this paper we investigate and compare various efficient pilot based channel estimation schemes for OFDM systems. In this present study, two major types of pilot arrangement such as block type and comb-type pilot have been focused employing Least Square Error (LSE) and Minimum Mean Square Error (MMSE) channel estimators. Block type pilot sub-carriers is especially suitable for slow-fading radio channels whereas comb type pilots provide better resistance to fast fading channels.

Also comb type pilot arrangement is sensitive to frequency selectivity when comparing to block type arrangement. The channel estimation algorithm based on comb type pilots is divided into pilot signal estimation and channel interpolation. The symbol error rate (SER) performances of OFDM system for both block type and comb type pilot subcarriers are presented in this paper.

Advantages: The major advantage of OFDM lies in processing frequency-selective channels as multiple flat-fading sub-channels.

Disadvantages: high peak-to-average-power ratio (PAPR), bit error rate (BER) and high sensitivity to carrier frequency offset (CFO).

Title 5: Cognitive Radio Based Hierarchical Communications Infrastructure for Smart Grid

Author: R. Yu et al.

Year: 2011

The mobile WiMAX system is based on the IEEE 802.16m standard which is used to develop an advanced air interface (AAI) to meet the requirements for IMT-Advanced next generation networks , which are able to provide high speed access and are used to provide a rate of broadband data for low mobility scenarios up to 1 Gbit/sec. This paper investigates the application of link adaptation techniques (AM and AMC) to the downlink for the IEEE 802.16m-depending on the mobile WiMAX networks to achieve spectral efficiency gain. Also, by use of link adaptation it is possible to combine the

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MIMO technique with link adaptation in order to maximize the throughput.

This paper considers six various MCS for link adaptation in order to find the largest throughput improvement. The working thresholds of the SNR for the various combinations of modulation, coding and MIMO will be determined through utilizing the ITU pedestrian channel model. Therefore, through employing a system level simulation, the performance evaluation results explain that the adaptive modulation and coding (AMC) system is noticeably superior compared to the systems that utilize fixed modulation (FM) or adaptive modulation (AM) schemes with regard to the spectral efficiency.

Link adaptation may be defined as a key solution that increases the spectral efficiency of wireless systems. It is utilized to set the modulation and the coding, in order to reflect the features for the wireless link, and to maximize the throughput. However, if the channel changes quickly such that it cannot be estimated in a reliable manner and fed back to the transmitter then the execution of the adaptive techniques will be poorer. This study uses two important mechanisms such as adaptive modulation (AM) and adaptive modulation and coding (AMC) for improving the robustness of the link in the system.

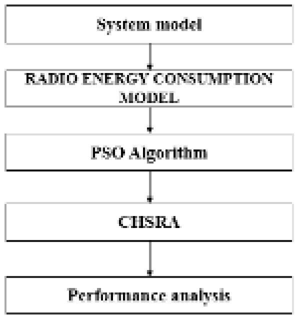
Advantages: It utilizes lower levels of modulation and lower rates of channel coding whenever the channel condition is comparatively harsh.

Disadvantages: access is difficult for stations that are already suffering good indication conditions.

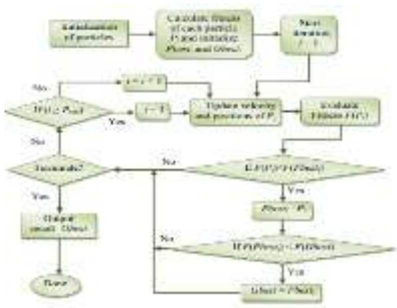
IMPLEMENTATION

- System model
- Cluster head
- PSO algorithm for routing path
- Performance Metrics

BLOCK DIAGRAM:



FLOW DIAGRAM:



SYSTEM MODEL

With salient features of agility, re-programmability, elasticity, scalability and flexibility, the illustration of system model in Het-V-Net in represented in figure 2. The information from the vehicles are transmitted through cellular based D2D communication to e-Node-B, cellular based V2I and DSRC based V2V communication to the core network for improving the locational reliability and accuracy. The figure 2 illustrated the proposed system model, which is designed as a three tier, single tier as well as a heterogeneous network with single BS (base station) in every tier. The UE (user equipment) exploits CC (composite carriers) from all the tiers by accumulating them, thus their bandwidth could be efficiently utilized. Further, every BSs were presumed to operate in single frequency band, and hence the intra brand contiguous carrier aggregation was performed by utilizing adjacent carriers in frequency band. The spacing between guard band calculations as well as adjacent carriers were obtained later.

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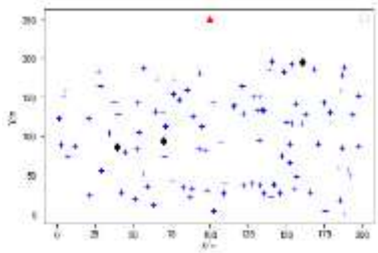
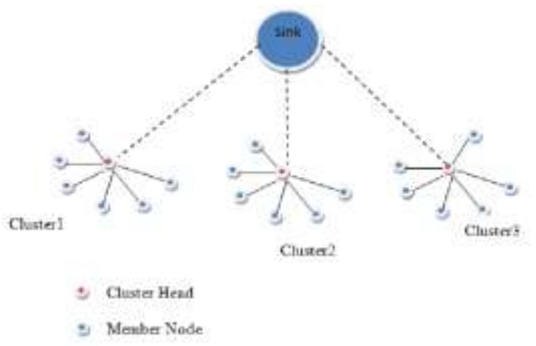


CLUSTER HEAD

The LEACH protocol changes the cluster head every cycle in order to uniformly select all nodes and distribute the energy consumption without the cluster head having high energy consumption The cluster heads can be selected **randomly or based on one or more criteria**. Selection of cluster head largely affects WSNs lifetime. Ideal cluster head is the one which has the highest residual energy, the maximum number of neighbour nodes, and the smallest distance from base station



PSO Algorithm:

Particle swarm optimization (PSO) is inspired by natural life, like bird flocking, fish schooling and random search methods of evolutionary algorithm It can be observed from the nature that animals, especially birds, fishes, etc. always travel in a group without colliding. This is because each member follows the group by adjusting its position and velocity using the group information. Thus it reduces individual's effort for searching of food, shelter etc. The various steps of a PSO are depicted in the flowchart as shown in Fig. 2. PSO consists of a swarm of a predefined size (say NP) of particles. Each particle gives a complete solution to the multidimensional optimization problem. The dimension D of all the particles is equal

respectively:

$$V_{id}(t) = w \times V_{id}(t-1) + c_1 \times r_1 \times (Xpbest_{id} - X_{id}(t-1)) + c_2 \times r_2 \times (Xgbest_d - X_{id}(t-1)) \quad (3.2)$$

$$X_{id}(t) = X_{id}(t-1) + V_{id}(t) \quad (3.3)$$

where w is the inertial weight, c1 and c2 are two non-negative constants called acceleration factor and r1 and r2 are two different uniformly distributed random numbers in the range [0,1]. The update process is iteratively repeated until either an acceptable Gbest is achieved or a fixed number of iterations tmax is reached.

PERFORMANCE ANALYSIS

Energy efficiency

The energy efficiency is considered as the ratio of overall spectral efficiency to overall power consumption. Therefore the energy efficiency of the hybrid vehicular network can be represented as the following equation,

$$P_{CKT} = N_t P_{RF} + P_m + P_{ADC}$$

From the above equation, N_t is considered as the number of antennas, whereas P_{RF} indicates the power consumption due to the RF chain. P_{ADC} is said to be the power consumption because of AD.

Spectral efficiency

In similar way, the spectral efficiency for the microwave vehicular networks can be represented as the following equation,

$$\eta_{ES,\mu} = \frac{\eta_{S,\mu}}{P_{T,\mu}}$$

The spectral efficiency for hybrid vehicular network is represented as the following,

$$\eta_{ES,PS} = \frac{\eta_{S,PS,m} + \eta_{S,PS,\mu}}{P_{T,m} + P_{T,\mu}}$$

CONCLUSION

The secure optimization routing algorithm solves both the energy issue and the communication latency between hops. Bacteria for Aging Optimization Algorithm has been used to produce an efficient routing approach (BFOA). The Fuzzy clustering approach is used in the first stage to calculate the CHs with the maximum trust values for direct, indirect, and recent trust. In the second stage, the CHs with the maximum trust values for direct, indirect, and recent trust are computed. The detection of intruded nodes is dependent on the threshold value that has been set. The CHs are in charge of routing data packets to the drain, which must go through a number of hops on their way there. In MANET, on the other hand, the most promising candidate for advanced routing is identified via the use of the PSO Algorithm optimization .The suggested approach has a faster convergence rate, and it optimizes storage, throughput, and route connection limitations. The suggested technique achieved a minimum energy of 0.10 m joules, a negligible latency of 0.0035 m sec, a maximum throughput of 0.70 bps, and an 83 percent detection rate with 100 nodes. Similarly, the suggested technique showed satisfactory results for the selective packet dropping attack when compared to existing approaches

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