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DIVERSITY BASED INTERNET ACCESS IN VEHICULAR NETWORK

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Abstract - Demand for Internet access frommoving vehicles has been rapidly growing.Meanwhile, the overloading issue of cellularnetworks is escalating due tomobile data explosion. Thus, WiFi networks are considered as a promising technology to cellularnetworks. However, there pose many challenging problems in highly dynamic vehicular environments for WiFi networks. For example,connections can be easily disrupted by frequent handoffs between access points (APs). A scheme, called DIVERSITY, is proposed tosupport seamless and WiFi-based Internet access formoving vehicles. In uplink, DIVERSITY operates in a "group unicast" manner. All APs are with the same MAC and IP addresses, so that packets sent froma client can be received bymultipleAPs within its transmission range. Unlike broadcast ormonitor mode, group unicast exploits the diversity ofmultipleAPs, while keepingall the advantages of unicast. To avoid possible collisions of ACKs fromdifferent APs, the conventional ACK decodingmechanismisenhancedwith an ACK detection function. In downlink, a packet destined for a client is pushed to a group of APs throughmulticast.This AP group is maintained dynamically to followthemoving client. The packet is then fetched by the client.With the above innovativedesign, DIVERSITY achieves seamless roaming with reliable link, high throughput, and low packet loss. Testbed implementation andexperiments are conducted to validate the effectiveness of the ACK detection function. Extensive simulations are carried out toevaluate the performance of DIVERSITY. Experimental results show thatDIVERSITY outperforms existing schemes remarkably.

Keywords –ACK detection, Internet access, vehicle, WiFi.

I. INTRODUCTION

With the penetration of portable smart devices, thedemand for Internet access from moving vehicles hasgrown sharply in recent years. An increasing number ofcommuters and passengers prefer accessing the Internetusing their smart phones or tablet computers while traveling,such as browsing the web, dealing with E-mails, makingVoIP calls, watching videos. Due to theexplosive growth of the subscriber number and the mobiledata, cellular networks are suffering overload, and the usersare experiencing service quality degradation.WiFi, based on IEEE 802.11, is another technology to providewireless connectivity. It has undergone rapid developmentand has entered a new period of prosperity. To date,WiFi hotspots are deployed widely and densely in manycities, and the trend continues [2]. Compared with cellularnetworks, WiFi has obvious advantages: lower cost and higher peak throughput.

In this paper, it mainly focus on preserving the privacy of individual information from unauthorized user. Here, individual information refers as microdata that containName, Age, Gender, Zipcode, Address, and Salary. Anonymization is the process that removes identifiers such as Name, Address, Social Security number which is publicly available data such as Voter Registration data, After removing the identifiers, it classify the table as Sensitive attributes (Medical condition, Salary) and Non-Sensitive attributes (Age, Zipcode, Nationality). Anonymization is performed to hide the sensitive information of a respondent,The attribute values in data stream tuples can be generalizedto satisfy given privacy requirements. Generalizationof relational data attributes introduces imprecision bound for the query results. This imprecision bound can be used to reduce delay in publishing of stream data.

The advantages of DIVERSITY are summarized below:

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1) By exploiting the AP diversity and opportunistictransmission, the link reliability is enhanced, andpacket loss is reduced.
2) An ACK detection function is designed to eliminatethe adverse effect of multiple ACKs. This functionensures that ACK-based rate control mechanismscan be adopted in DIVERSITY to improve the efficiency of the channel utilization.
3) By all APs with the same setting, bothlayer-2 and layer-3 handoffs of the mobile client areeliminated, and seamless roaming within the coverageof the entire network is achieved.
4) The two-stage packet delivery in downlink communications dramatically increases the probability of transmissions.

A. Related Works

The related work can be into three categories. Thedifferences between our solution and the representativeschemes in each category are explained below.Internet access frommoving vehicles. With a rapid growth ofdemand for Internet access from moving vehicles, researcherscome up with a number of solutions based on the cellularnetworks or the WiFi networks. MAR [4] is a cellularbased solution, while MobTorrent and jointlyconsider cellular networks and WiFi networks by utilizingtheir complementary functions.Measurement studies ofWiFi connectivity in the vehicular environments can be found in. Drive-thruInternet [9] and Cabernet [10] are designed to maximize thetransmission opportunity and link utilization in a networkwith sparse AP deployment and intermittent connectivity.Several literatures propose particular methods for uploading [11] or downloading has been releasedto support wireless access in vehicular networks, and manystudies are based on this standard, e.g., .The major difference between the above references andour work is that DIVERSITY takes advantage of AP diversityto overcome the issue of unreliable links and unstableconnections.AP diversity. The association scheme in the WiFi contextis i.e., a client is associated with a certain AP atany time. The consequence of this limitation is that, if theassociated AP of the client receives a packet with errors,the transmission fails even if a neighboring AP overhearsthe packet successfully. In order tofrom the broadcastnature of the wireless links, a number of works exploit AP diversity to improve systemperformance.

In our proposed DIVERSITY, theAP diversity is achieved in the same way as [16]. To avoid performance degradation caused by possible collision of ACKs from different APs, the ACK decoding at the client side is enhanced with an ACK detection function. Therefore, ACK-based rate controlmechanisms can be easily applied to improve wireless channel utilization The transmission succeeds if at least one AP receives thepacket correctly.

B. Contributions

In our proposed DIVERSITY, the AP diversity is achieved in the same way as [16]. To avoid performance degradation caused by possible collision of ACKs from different APs, the ACK decoding at the client side is enhanced with an ACK detection function. Therefore, ACK-based rate control mechanisms can be easily applied to improve wireless channel utilization. The transmission succeeds if at least one AP receives the packet correctly, which also increases the Fast handoff in WiFi networks. The mobility of clients make fast handoff become a critical issue in WiFi networks. A number of papers aim at minimizing the handoff delay in WLANs and WMNs Several approaches (e.g., Sync Scan [19] and Proactive Scan [20]) reduce handoff delay by decoupling the time-consuming channel scan from the actual handoff. As previously mentioned, client handoff delay is eliminated in and in that APs have exactly the same Nonetheless, an interference map needs to be generated in, while anappropriate AP needs to be selected to serve a client in [16].Both of them are for highly dynamic vehicular environments.In SMesh [21], the mesh node, which believes ithas the best connectivity with the client, sends a gratuitousARP message to the client. The client then updates its ARPcache, and the handoff is accomplished. Moreover, IEEE802.11r standard [22] has been promulgated to reduce handoffdelay to support real-time applications, such as VoIP.All the above-mentioned approaches are not designedfor the scenario that clients move at a vehicular speed. InDIVERSITY, a client is not associated with a certain AP,and no handoff is triggered when the client roams withincoverage of the entire network. Therefore, DIVERSITY isthemost appropriate for the WiFi-based communications invehicular environments.

II. SYSTEM MODEL

In this model, a system is completely covered by open WiFiaccess points (APs), and coverage of each AP may overlapwith others. Each AP is equipped with two interfaces; one isfor client access based on WiFi, while the other uses wiredor wireless medium to form a backhaul. Hence, the backhaulcan be either a local area network (LAN) or a wirelessmesh network. The backhaul connects to the Internetthrough a gateway. It is assumed that both bandwidth andreliability of backhaul links are higher than that of accesslinks, and packet loss in backhaul is negligible. Moreover,only the between clients and the Internet is taken intoaccount in this paper. When APs have established routingpaths to the gateway, the backhaul is organized into a treetopology with the gateway as the root and APs as leaves.In [8], the researchers conduct a large number of measurementsin

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real vehicular environments, and the followingexperimental observations are revealed:
1) Gray-zone behavior (i.e., intermediate packet loss rate) is a dominating phenomenon;
2) Temporal correlation is weak;
3) Spatial correlation is weak;
4) Incoming and outgoing links exhibit a strong symmetriccorrelation.

These issues are properly addressed by DIVERSITY.Since packet loss is severe in vehicular environments, APhash function maps a MAC address to a class A private IPaddress in the form of 10.A.B.C. The default gateway on theclient is set to the IP address of the virtual AP. When the clienttransmits a packet to the virtual AP, actually multipleAPs within its transmission range are able to receive thepacket. Owing to weak temporal and spatial correlation, thereceptions of different APs can be viewed to be independent.When an AP misses a packet, its neighbor AP mayreceive it. As long as the packet is received by one AP, it canbe forwarded to the Internet, and thus the successful transmissionprobability increases.To avoid performance degradation caused by possible collision of ACKs from different APs, the ACK decoding at the client side is enhanced with an ACK detection function.

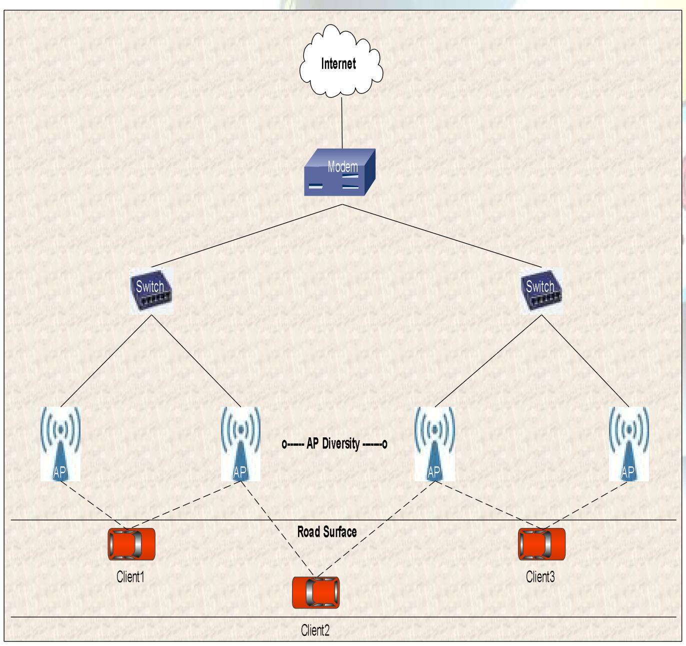

Fig 1. System Architecture

A. Initialize Virtual AP

Configuring all the APs with the same MAC and IP addresses with such a configuration, a client gets a graceful illusion that only one ("virtual") AP exists, and will always be associated with this "virtual" AP.A group of APs are employed to communicate with a client (called "AP diversity"). Both IP-layer and MAC-layer handoff are eliminated. Hence, connection disruptions caused by the handoffs and re-associations are avoided.

B. Client Joining

When the client intends to join the network, it is associated with this virtual AP, and requests an IP address through DHCP (Dynamic Host Configuration Protocol). Christo Ananth et al. [5] discussed about Reconstruction of Objects with VSN. By this object reconstruction with feature distribution scheme, efficient processing has to be done on the images received from nodes to reconstruct the image and respond to user query. Object matching methods form the foundation of many state- of-the-art algorithms. Therefore, this feature distribution scheme can be directly applied to several state-of- the-art matching methods with little or no adaptation. The future challenge lies in mapping state-of-the-art matching and reconstruction methods to such a distributed framework. The reconstructed scenes can be converted into a video file format to be displayed as a video, when the user submits the query. This work can be brought into real time by implementing the code on the server side/mobile phone and communicate with several nodes to collect images/objects. This work can be tested in real time with user query results.

If multiple APs receive a packet, each of them will transmit an ACK after a period of short inter-frame space (SIFS). These multiple copies of ACKs may collide at the client. Hence, a new scheme is designed to handle such collisions. A strategy of dropping duplicate packets as early as possible is taken to reduce such redundancy.

C. Uplink communication

The uplink communications, when the client transmits a packet to the virtual AP, actually multiple APs within its transmission range are able to receive it. These problems overcome following ways

3.1) ACK Detection Scheme
3.2) Transmission Redundancy.

3.1) *ACK Detection Scheme*

Multiple APs receive a packet, each of them will transmit an ACK after a period of short inter-frame space (SIFS). These multiple copies of ACKs may collide

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at the client.Hence, a new scheme is designed to handle such collisions. In the new scheme, the ACK decoding is enhanced with ACK detection.In this scheme the strength of one signal is considerably higher than the strength of the other one. Under the condition, the weak signal is dropped by the filter of the receiver, and only the strong signal is retained to be decoded.

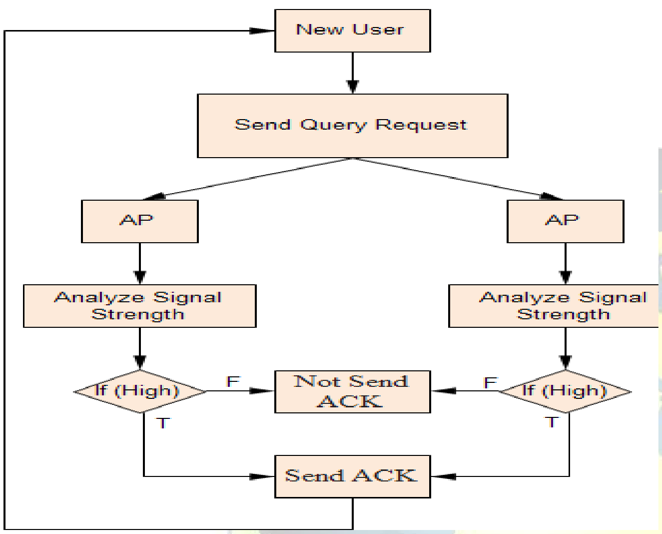

Fig 2.*ACK Detection Scheme*

3.2) Transmission Redundancy

A packet can be received by multiple APs. If all copies of the same packet are forwarded to the gateway, extra overhead is introduced to the backhaul.An intermediate node in the backhaul network receives a packet that has been forwarded, it simply drops the duplicated packet.To determine whether a packet has been delivered before, a few fields of the packet are checked to identify the packet.When a node transmits a packet to its upper-layer node, other nodes in the same subnet can overhear the packet as well.

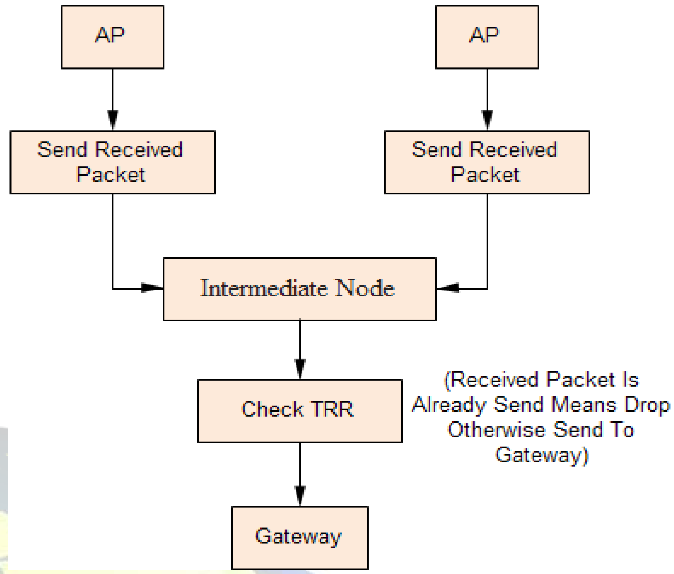

Fig 3.Tranmission Redundancy

D. Downlink Communication

The downlink communication is divided into two stages. In the first stage, packets destined for a client are delivered to a group of APs through multicast. This AP multicast group is maintained dynamically to follow the moving client.In the second stage, the client periodically sends downlink packet requests (DPRs) to fetch its packets buffered in the AP group.The two-stage strategy significantly reduces unnecessary transmissions when channel condition is poor, and dramatically improves the downlink transmission efficiency.

III. CONCLUSION

Now a day, WIFI hotspots are deployed widely and densely in many cities and the trend continues. Compared with cellular networks, WIFI has obvious advantages: lower cost and higher peak throughput. Thus, WIFI is considered as a suitable solution for cellular traffic offloading. However, it is still challenging to provide WIFI -based Internet access for users in moving vehicles. The above problems solve our proposed AP DIVERSITY concept.The two-stage strategy significantly reduces unnecessary transmissions when channel condition is poor, and dramatically improves the downlink transmission efficiency. To support seamless and efficient

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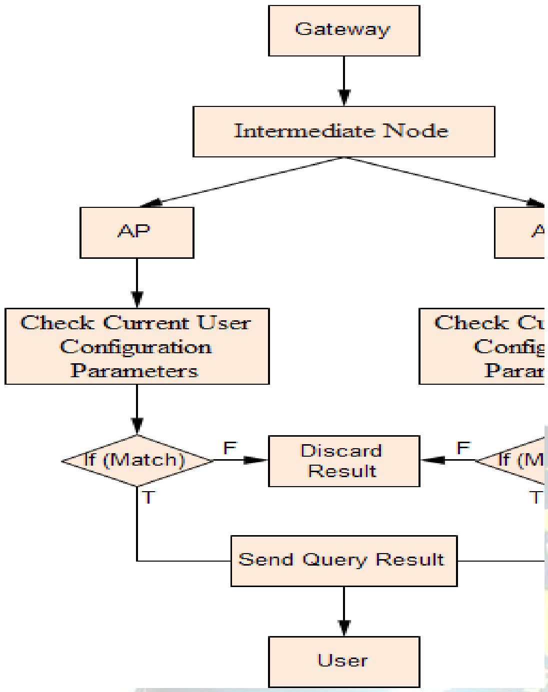

Fig.4 Downlink Communication

WIFI-based Internet access for moving vehicles. It consists of innovative protocols in both uplink and downlink. Seamless roaming of clients was gracefully achieved, while channel utilization efficiency was dramatically improved. Will prove diversity is high performance of compared to existing system.

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IV. FUTURE ENHANCEMENT

In future work, DHCP provide network configuration details to new user but DHCP not consider this same configuration is used to any other user or not. It is create a problem of one user's data reached to another user. In this problem rectify our feature work using Bloom filter algorithm.A Bloom filter is a space-efficient probabilistic data structure. That is used to test whether an element is a member of a set. False Positive matches are possible, but false negatives are not, thus a Bloom filter has a 100% recall rate.In other words, a query returns either "possibly in set" or "definitely not in set". Elements can be added to the set, but not removed (though this can be addressed with a "counting" filter). The more elements that are added to the set, the larger the probability of false positives.

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